ANL-7411
Supplement 8

ANL-7411
Supplement 8

Argonne National Laboratory

ARGONNE CODE CENTER: COMPILATION OF PROGRAM ABSTRACTS

by

M. K. Butler, H. S. Edwards, C. Harrison, Jr.,
Catherine E. Hughes, Marianne Legan,
T. Menozzi, L. Ranzini,
and William J. Snow

RETURN TO REFERENCE FILE
TECHNICAL PUBLICATIONS
DEPARTMENT

The facilities of Argonne National Laboratory are owned by the United States Government. Under the terms of a contract (W-31-109-Eng-38) between the U. S. Atomic Energy Commission, Argonne Universities Association and The University of Chicago, the University employs the staff and operates the Laboratory in accordance with policies and programs formulated, approved and reviewed by the Association.

MEMBERS OF ARGONNE UNIVERSITIES ASSOCIATION

The University of Arizona
Carnegie-Mellon University
Case Western Reserve University
The University of Chicago
University of Cincinnati
Illinois Institute of Technology
University of Illinois
Indiana University
Iowa State University
The University of Iowa
Kansas State University
The University of Kansas
Loyola University
Marquette University
Michigan State University
The University of Michigan
University of Minnesota
University of Missouri
Northwestern University
University of Notre Dame
The Ohio State University
Ohio University
The Pennsylvania State University
Purdue University
Saint Louis University
Southern Illinois University
The University of Texas at Austin
Washington University
Wayne State University
The University of Wisconsin

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Atomic Energy Commission, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately-owned rights.

Printed in the United States of America
Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151
Price: Printed Copy $13.60; Microfiche $1.45

ANL-7411 Supplement 8
Mathematics and Computers

ARGONNE NATIONAL LABORATORY
9700 South Cass Avenue
Argonne, Illinois 60439

ARGONNE CODE CENTER: COMPILATION OF PROGRAM ABSTRACTS

by

M. K. Butler, H. S. Edwards, C. Harrison, Jr.,
Catherine E. Hughes, Marianne Legan, T. Menozzi,
L. Ranzini, and William J. Snow

Applied Mathematics Division

February 1974

ANL-7411 SUPPLEMENT 8

This publication is the eighth supplement to and revision of ANL-7411 issued in January 1968. Supplement 1 was issued in October 1968, supplement 2 in April 1969, supplement 3 in November 1969, supplement 4 in May 1970, supplement 5 in February 1971, supplement 6 in March 1972 and supplement 7 in January 1973. Supplemental and replacement pages contained in this publication are as follows:

PAGES TO BE INSERTED	PAGES TO BE REMOVED	COMMENT
1-21	1-21	Revised cover, title page, table of contents, and Sections I through IV
31-34	31-34	ACC Abstract 29 revised
57-60	57-60	ACC Abstract 51 revised
76.1-76.2	76.1-76.2	ACC Abstract R80 revised
125-128	125-128	ACC Abstract 136 revised
139-140	139-140	ACC Abstract 146 revised
187-190	187-190	ACC Abstract 168 revised
221-222.2	221-222.2	ACC Abstract 185 revised
285-286	285-286	ACC Abstract 216 revised
301-302	301-302	ACC Abstract 224 revised
349-352	349-352	ACC Abstract 249 revised
363-364	363-364	ACC Abstract 255 revised
383-384	383-384	ACC Abstract 265 revised
405-406.2	405-406.2	ACC Abstract R275 revised
419-420, 420.1-420.2	419-420	ACC Abstract R282 revised
439-442	439-442	ACC Abstract 292 revised
455-457.1, 457.2-458	455-458	ACC Abstract R299 revised
473-476	473-476	ACC Abstract 308 revised
541-542	541-542	ACC Abstract 340 revised
579-582	579-581.1, 581.2-582	ACC Abstract 358 revised
631-634	631-634	ACC Abstract 384 revised
639-640, 640.1-640.2, 641-642	639-642	ACC Abstracts 387 and 388 revised
691-692	691-692	ACC Abstract R412 revised
733-738	733-738	ACC Abstracts 432 and 433 revised
769-771.1, 771.2-772	769-772	ACC Abstract 450 revised
795-798	795-798	ACC Abstract R462 revised
803-808, 809-809.1, 809.2-810, 811-814	803-814	ACC Abstracts 465, 467, and 469 revised
825-828	825-828	ACC Abstract 475 revised
853-854	853-854	ACC Abstract 487 revised
877-878	877-878	ACC Abstract 498 revised
883-888	883-888	ACC Abstracts 501 and 502 revised
903-906	903-906	ACC Abstract 510 revised
933-934, 935-935.1, 935.2-936	933-936	ACC Abstract 523 revised
941-944	941-944	ACC Abstract 527 revised
965-1349	965-1038	ACC Abstracts 538 through 610 added; Section VI Library Programs by Classification revised; Section VII KWIC Index revised; References replaced

TABLE OF CONTENTS

		Page
PREFACE		9
I.	HISTORY AND ACKNOWLEDGMENTS	10
II.	ABSTRACT FORMAT	11
III.	RECOMMENDED PROGRAM PACKAGE CONTENTS	14
IV.	PROGRAM CLASSIFICATION GUIDE AND THESAURUS	16
V.	ABSTRACT COLLECTION	21

NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	
7	FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY	LRL	709	F2	RS	C	23
9	FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	360	F4	RS L T	C	24
14	HAFEVER, HAUSER-FESHBACH INELASTIC SCATTERING	CDC	1604	F63	RS P	A	26
18	2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	7090	FLCCC	RSBP	C	28
28	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	7090	F2	RS P T	C	30
28	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	CDC	1604	F63	RS P T	C	30
28	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625	F4	RS T	C	30
29	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS PL T	C	32
29	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PL T	C	32
29	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	OSUC	370	F4	RS PL CT	C	32
30	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	1604	F63	RS	C	34
30	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC	360	F4	RS F	C	34
30	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	7090	F2	RS	C	34
32	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	CDC	1604	F63	RS P T	C	36
32	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	F2	RS P T	C	36
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PLX T	B	38
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	F63	RS LX T	B	38
33	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	F2	RS PLX T	B	38
39	EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	7090	F2	RS P T	C	40
40	2DGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	CDC	1604	F63	RS P T	C	42
40	2DGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	F2	RS P T	C	42
41	ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB T	A	44
42	TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	F+FAP	RSB T	A	46
R 43	CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	6600	F+ASC	RS P T	P	47.1
45	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	CDC	1604	F63	RS P	J	48
45	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	F2	RS P	J	48
46	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	CDC	1604	F63	RS P	J	50
46	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	F2	RS F	J	50
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	CDC	1604	F63	RS P	G	52
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	F4	RS P	G	52
47	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	F2	RS P	G	52
48	FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	7090	F2	RS	I	54
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	CDC	1604	F63	RS PL T	B	56
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	360	F4	RS PL T	B	56
50	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS PL T	B	56
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	CDC	1604	F63	RS PL T	B	58
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	F2	RS PL T	B	58
51	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	OSUC	370	F4	RS PLXCT	B	58
52	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	F2	RS P	B	60
52	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	F63	RS P	B	60
53	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	7090	F2	RS	B	62
53	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	F63	RS P	B	62
55	AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	AI	7090	F2	RS P	D	64
56	SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA	7090	F2	RS T	A	66
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	360	F4	RSBP X T	D	68
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	7090	F2	RS L T	D	68
58	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	F63	RS L T	D	68
59	MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PFCC	7090	F2	RS P	C	70
62	LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094	F4	RS T	P	72
75	GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW	7090	FLOCO	RSBP T	C	74
R 80	SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	F4	RS P T	I	76.1
87	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	7090	F2	RS P T	C	77

TABLE OF CONTENTS

NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE		CAT	Page
87	EQLIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	CDC	1604	F63	RS P	T	C	77
89	ARES2, RESONANCE INTEGRAL X-SECTION CALC	AI	7090	F2	RS PL	T	A	79
89	ARES2, RESONANCE INTEGRAL X-SECTION CALC	CDC	1604	F63	RS PL	T	A	79
91	FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	7090	F2	RS		J	81
99	CCB, 2-C FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	7090	F+FAP	RSBP	T	D	83
102	AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	CDC	3600	F63	RSBP		F	85
103	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7090	F+FAP	RSBPL	T	C	87
103	CRAM, 1-C AND 2-C MULTI-GP DIFFUSION PROGRAM	AAEC	360	F+BAL	RS P	T	C	87
108	BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	F2	RS P		B	90
109	4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	F+FAF	RS	T	I	92
110	SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	AI	7090	F2	RS		J	93
111	SCAR1, SCATTER FROM A RING SNAP GEOMETRY	AI	7090	F2	RS		J	95
112	CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS		I	97
113	ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	7090	FLOCO	RS P		B	98
114	SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	7090	F2	RS		I	100
117	FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	F2	RSB	T	C	101
118	ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAP	RS L	T	C	103
119	QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	7090	F+FAP	RS L	T	B	105
120	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	F+FAF	RS L	T	C	107
120	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	CDC	1604	F63	RS PLX	T	C	107
120	FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BPSC	360	F4	RS P	T	C	107
121	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7090	F2	RS		E	110
121	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEE	360	F4	RS P		E	110
121	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	1604	F63	RS P		E	110
122	SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	7090	F2	RS		E	112
123	LIPRECAN1, MC NEUTRON PENETRATION CALCULATION	CAC	7090	F2	RSBP		J	114
129	CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LRL	7090	F2	RS P		F	116
132	W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	7090	F2	RS P	T	C	118
133	WED, W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W	7090	F2	RS		N	120
134	NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	ORNL	7090	F2	RSBP		D	122
135	TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS	ANL	3600	F63	RSBP	T	E	124
136	HERESY3, 2-C HETEROGENEOUS REACTOR CALCULATION	DP	3608	F4	RSBP	CT	C	126
141	RATRAF, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090	F2	RS P		J	128
142	MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090	F2	RS		J	130
143	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	F2	RSBPL	T	J	132
143	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	ANL	3600	F63	RSBPL	T	J	132
144	DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC	UNC	1604	F63	RS PL	T	C	135
145	WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	F2	RS F		F	137
146	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	7090	F2	RSBP		D	139
146	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	LEC	6600	F4	RS P		D	139
147	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	F+FAP	RS PL	T	B	141
147	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	360	F4	RS PLX	T	B	141
148	TOPIC, 1-C FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	F2	RS F	T	C	144
148	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	F4	RS P	T	C	144
149	TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	F+FAP	RS PL	T	B	146
150	DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	AEG	7090	F2	RS		B	148
151	ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	F4	RSBPLX	T	C	150
151	DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	7090	F2	RS PLX	T	C	150
152	ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER	ANL	3600	F63	RSBP	T	H	153
153	HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	7090	F2	RSB		F	155
154	CROCO90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	F2	RS P		C	157
155	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	7094	F2	RSBP	T	H	159
156	EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	7090	F+FAP	RS P	T	C	161
156	EXTERMINATOR2, 2-C MULTI-GP DIFFUSION PROGRAM	ORNL	360	F4	RS P	T	C	161
156	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CE	6600	F4	RS P	T	C	161
156	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	625	F4	RS	T	C	161
159	MOMLS, X-SECTION LIBRARY UTILITY PROGRAM	AI	7094	F+FAP	RS L	T	M	165
160	SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LRL	7090	F+FAP	RS P	T	B	167
161	FORTRAN TOC, 2-C MULTI-GP SN APPROXIMATION RZ	PW	1604	F63	RS F	T	C	169
162	GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	7094	F+FAP	RS PL	T	B	172
163	AIRCS, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	7094	F+FAP	RS F	T	E	174
164	BURP1, DETECTOR EFFICIENCY POINT SOURCE	UM	7090	MAD	RSB		D	177
165	BURP2, DETECTOR EFFICIENCY DISK SOURCE	UM	7090	MAD	RSB		D	179
166	BURP3, DETECTOR EFFICIENCY POINT SOURCE	UM	7090	MAD	RSB		C	182
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	CDC	3600	F63	RSBP	T	C	185
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	635	F4	RS P	T	C	185
167	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360	F4	RS P	CT	C	185
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	F4	RS		E	187
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	360	F4	RS P		E	187
168	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	3600	F63	RSBP		E	187
169	BURP4, GAMMA-RAY PHOTOFRACTION SOLID CRYSTAL	UM	7090	MAD	RSB		D	190
170	BURP5, GAMMA-RAY PHOTOFRACTION WELL CRYSTAL	UM	7090	MAD	RSB		C	192
171	NEARREX, COMPOUND NUCLEUS X-SECTION CALC	ANL	3600	F63	RSBP		A	194

TABLE OF CONTENTS

NO.	KWC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	Page
172	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	7094	F+FAP	RS P T	G	196
172	R153, PARAMETRIC SITE REQUIREMENT STUDY	ANL	3600	F63	RSBP T	G	196
172	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	360	F4	RS P T	G	196
173	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GGA	1108	F5	RS P T	C	198
173	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	F63	RS	C	198
174	FORE2, FAST REACTOR EXCURSION CALCULATIONS	NEC	635	F4	RS P X T	F	200
174	FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360	F4	RS P X T	F	200
174	FORE, FAST REACTOR EXCURSION CALCULATIONS	NED	2000	F4	RS P T	F	200
176	RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NEC	2000	F2	RS P	A	203
177	DOPIE, RESOLVED RESONANCE X-SECTION CALC	NEC	2000	F2	RS P	A	205
178	SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NED	2000	F2	RS P	B	207
179	ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	1604	F63	RS P	D	209
180	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	7090	F2	RSBP	C	211
180	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	1604	F63	RS P	D	211
181	XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE	ANL	3600	F63	RSBP T	M	213
182	AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H	215
183	AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	F2	RSBP	H	217
184	BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	1108	F5	RS PLX T	B	219
184	THERMCS(ANL), THERMAL SPECTRUM X-SECTION CALC	ANL	3600	F63	RSBP XCT	B	219
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625	F4	RS PLX T	B	221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	F+FAP	RS PL T	B	221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107	F4	RS PL T	B	221
185	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVA	6400	F4	RS PLX T	B	221
186	LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET	PW	1604	F+CDP	RS P T	P	223
187	PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY	PW	1604	F63	RS P T	I	225
188	CMPXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	F63	RS P	E	227
189	SNC, CALCULATION OF SN CONSTANTS FOR DSN TOC	PW	1604	F63	RS P	L	229
190	WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	1604	F63	RS	I	230
191	AX-TAT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH	PW	1604	F63	RS P	F	232
192	2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW	1604	F63	RS T	C	235
193	CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L	237
194	CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	F63	RS	L	239
195	FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	1604	F+CDP	RS P X T	B	241
195	FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	GGA	7044	F4	RS P T	B	241
196	CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	F+FAP	RS PL T	G	244
197	SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC	AI	7094	F+FAP	RS P	J	246
198	HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER	AI	7094	F+FAP	RS P T	H	248
199	TDP, 2-D PERTURBATION TOC OR 2DXY FLUX INPUT	PW	1604	F63	RS	C	250
200	SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT	KE	7094	F+MAP	RSBP T	G	252
201	EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	NEC	7094	F+FAP	RS P T	B	254
202	MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	7090	FLCCC	RS P	E	256
203	COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	7040	F+MAP	RS P	A	258
204	AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	7090	F+FAP	RSBPLX T	B	260
205	BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER	GGA	7044	F+MAP	RS P T	H	262
206	UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE	GGA	7044	F+MAP	RSBP	M	264
207	CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES	GGA	7044	F+SPS	RSBP T	N	266
208	TRIX1, RESONANCE INTEGRAL X-SECTION CALC	AI	7094	F+MAP	RS PLX T	A	268
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC	625	F+MAP	RS P T	C	270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	ANL	360	F+BAL	RS P T	C	270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	F4	RS P T	C	270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LEF	7094	F4	RS P T	C	270
209	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	6600	F4	RS P T	C	270
210	DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT	PW	1604	LAG1	RS P	N	273
211	MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	PW	1604	LAG1	RS P	C	275
212	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	6600	F4	RS P T	C	277
212	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	360	F4	RS P T	C	277
213	RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	F36	RSBP X T	E	279
214	MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	F36	RSBP	A	281
215	CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	7094	F+MAP	RS P	A	283
216	FSCP3, POINTWISE XSECS. FROM B-W PARAMETERS	GGA	1108	F5	RS P CT	A	285
217	LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	7044	F4	RS P X	A	287
218	GAVER, ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	F4	RS P	L	289
219	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	F+MAP	RS P T	B	291
219	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	F+MAP	RS P T	B	291
220	GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	7044	F4	RS P T	C	293
221	RELCAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	GGA	7044	F4	RS P T	D	295
222	GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	1108	F+BAL	RS P T	C	297
222	GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY	GGA	7044	F+MAP	RSBP T	C	297
223	REVISED-GAC, FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	F4	RS P T	D	299
224	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	6600	F4	RS P	D	301
224	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044	F4	RS P	D	301
225	TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	GGA	7044	F4	RS P T	C	303
226	OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY	GGA	7044	F+MAP	RS P T	C	305

TABLE OF CONTENTS

NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	Page
227	STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	7044	F4	RS P T	C	307
228	FRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044	F4	RS X T	G	309
229	ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY	CGA	7044	F4	RS P T	G	311
231	RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044	F4	RS F	C	315
232	GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	F4	RS P	I	317
233	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	CGA	7044	F4	RS	I	319
234	CPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS	LASL	7090	F+FAP	RS P T	L	321
235	GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	CEC	7094	F4	RS P	B	323
236	DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	ENL	7090	F+FAP	RS F T	M	325
237	BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090	F2	RS P	P	327
238	EXT, X-SECTIONS FROM P-W RESONANCE PARAMETERS	WANL	7094	F2	RS P	A	329
239	CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES	WANL	7094	F+FAP	RSBPL T	N	331
240	ASSALT, 2-D MULTI-GP DIFFUSION DEPLETION CODE	CRNL	7090	F+FAP	RS P T	D	333
241	HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BNW	1107	F4	RS F T	C	336
242	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7030	F4	RS T	H	338
242	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7094	FAP	RS P T	H	338
243	AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	7090	F2	RS F T	P	340
244	CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	7094	F2	RS PL T	I	342
246	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	F4	RS P	H	344
246	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094	F2	RS F	H	344
247	FLANGE1, SCATTERING LAW X-SECTION CALCULATION	CGA	1108	F5	RS P	A	346
248	COINC, COINCIDENCE COUNTING DATA REDUCTION	ANL	3600	F63	RSBP	C	348
249	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA	360	F4	RSBPLXCT	B	350
249	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	WAFD	7094	F+MAP	RS PLX T	B	350
250	SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RSBF CT	I	353
251	SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	F4	RS P T	I	355
252	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	CGA	1108	F4	RS P	I	357
252	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	BNL	6600	F4	RS P T	I	357
253	SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	GGA	1108	F4	RS P	I	359
254	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	7094	F2	RS P T	A	361
254	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	ANL	3600	F63	RSBP T	A	361
255	R1C1, SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094	F4	RS P	E	363
255	R1C1, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	3600	F63	RSBP	E	363
255	R1C1, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	360	F4	RS P	E	363
256	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NEC	635	F4	RS P T	H	365
256	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600	F4	RS P T	H	365
257	REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NEC	635	F4	RS P T	B	367
258	EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NEC	635	F4	RS P T	O	369
259	MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	F4	RS F T	J	371
260	GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	F4	RS P T	D	373
261	GADUSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	CGA	1108	F4	RS T	G	375
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	FORD	6500	F4	RS PLX T	C	377
262	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	F36	RS P X T	C	377
263	GASKET, THERMAL SCATTERING LAW CALCULATION	CGA	1108	F4	RS P	A	379
264	VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	7094	F4	RS P X T	C	381
265	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	360	F4	RSBP CT	G	383
R266	CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600	F4	RS T	I	385
R267	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600	F4	RS T	H	387
268	TRANS-FLOW1, TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	F2	RS P T	G	389
269	CTF-BURN, 1-D MULTI-GP CTF4 WITH DEPLETION	LASL	7030	F4	RS P T	D	391
270	CABSAR4,LIELST, 1-D MULTI-GP DIFFUSION + LIB	AI	360	F4	RSBPLX T	C	393
271	CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	360	F4	RSB L T	M	396
R272	FICRO, LWBR FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	F4	RS P T	H	398
273	THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	360	F4	RSBP T	K	400
R274	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	F4	RS F T	F	402
R274	WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	F4	RS P T	F	402
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	EW	6600B	F+ASC	RS P T	D	405
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	6600C	F+ASC	RS P T	C	405
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	ANC	360E	F+BAL	RS P XCT	D	405
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BCS	6600E	F+ASC	R B T	D	405
R275	PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION	BAPL	66CCA	F+ASC	RS P T	D	405
276	AVOID, ANNULAR VOID X-SECTION CALCULATION	CEC	625	F4	RS P	B	407
277	HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM	DP	360	F+BAL	RS P XCT	B	409
278	WATER-HAMMER, LIQUID ELOWCHAN ANALYSIS LOFT	UGA	360	F4	RS P	G	411
278	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600E	F36	RSBP	G	411
279	LEOPARC, SPECTRA CALCULATION WITH DEPLETION	JNC	11CB	F5	RS LX T	B	413
279	LEOPARC, SPECTRA CALCULATION WITH DEPLETION	WAFD	360	F4	RS PLX T	B	413
R280	MOBOT, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600	F4	RS T	B	415
281	RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	F36	RSBP X T	B	417
R282	SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	6600B	F4	RS P T	I	419
R282	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	F4	RS P T	I	419
R282	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	360	F4	RS P T	I	419
R283	MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	F4	RS P T	I	421

TABLE OF CONTENTS

NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	Page
R284	MO555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P T	G	423
R285	RESC2,RESCO,CBF1, RESONANCE INTEGRAL HEX CELL	BAPL	6600	F+ASC	RS P X T	B	425
R286	HCT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	F4	RS P T	H	427
287	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NEC	635	F4	RS PL T	C	429
287	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	1108	F4	RS P T	C	429
288	SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	3600	F36	RS P T	C	432
289	CAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	GGA	1108	F4	RS P	A	434
290	GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108	F4	RS P	E	436
291	HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA	1108	F4	RS	B	438
292	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA	1108	F4	RS P	A	440
292	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	ENEA	360	F4	RS P	A	440
293	MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY	APDA	7094	F4	RS P	F	442
R294	MO899,HOH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	F4	RS P T	H	444
R294	MO899,HOH, STEAM TABLES 14.5-2538 PSIA	ANL	1604	F63	RS P	H	444
R295	FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	F4	RS P T	G	446
296	GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	1108	F4	RS P	L	448
298	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600	F4	RS L T	B	452
298	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108	F4	RS PLX T	B	452
R299	LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	6600	F+ASC	RS P T	H	456
R299	LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	F4	RS P T	H	456
300	SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA	1108	F4	RS P	I	458
301	FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108	F4	RS P	D	460
302	GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	F4	S T	D	462
303	BLOCSTE, COMBINED KINETICS 2-D HEAT TRANSFER	GGA	1108	F+BAL	RS P T	E	464
304	PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	1108	F4	RS P	C	466
305	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	F4	RS	A	468
306	FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW	1108	F4	RS P T	B	470
307	HWCOR-SAFE, 2-D MONTE CARLO CELL CALCULATION	AI	360	F+BAL	RS P X T	B	472
308	JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION	ORNL	1604	F63	RS P T	A	474
308	JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	360	F4	RS P CT	A	474
309	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	F4	RS P T	F	476
309	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	7094	F+MAP	RS P T	F	476
310	GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION	GGA	1108	F4	RS P T	F	478
311	BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	NED	635	F4	RS P T	C	480
312	TOSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	F+MAP	RS P T	C	482
313	CINDER,MO102, POINT DEPLETION FISSION PRODUCT	DP	360	F+BAL	RS P T	C	484
313	CINDER,MO102, POINT DEPLETION FISSION PRODUCT	BAPL	6600	F4	RS P	D	484
314	NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	F4	RSBPLX T	C	486
315	WIREX, COMPUTER-PRODUCED WIRING LISTS UNTREX	LASL	7090	F+FAP	RS P	I	488
316	GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108	F4	RS P X T	B	490
317	GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108	F4	RS P	E	493
318	FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108	F4	RS P T	D	495
319	GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	1108	F4	RS P T	C	497
320	TEMCO7, TEMPERATURE COEFFICIENT CALCULATION	GGA	1108	F4	RS P T	C	499
321	EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LRL	7094	F2	RS P	P	501
322	ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	1604	F63	RS P	D	503
322	ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	360	F+BAL	RS P	D	503
323	MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	ORNL	7090	F4	RSBP	A	505
324	FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	F2	RS P	P	507
325	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	F4	RS P T	D	509
325	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	F4	RS P T	D	509
325	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600	F4	RSBP T	D	509
326	AIROS2A, SIMULATION OF REACTOR DYNAMICS	AI	360	F+BAL	RS P T	E	511
R327	CAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	6600	F4	RS P T	P	514
328	NLRLCC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	6400	F4	RS P T	G	516
R329	MO457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	F4	RS P T	I	518
330	ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL	6400	F4	RS P T	C	520
R331	FLCT1,MO219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	F4	RS P T	H	522
332	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	F4	RS P T	I	524
332	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	ORNL	360	F+BAL	RS P T	I	524
333	TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA	GGA	1108	F+BAL	RS P T	C	526
334	PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL	1604	F63	RS P	A	528
335	RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	F63	RS P	A	530
R336	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	IBM	360A	F+BAL	RS P T	D	531
R336	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION	MIT	3608	F+BAL	RSBP T	D	531
R337	STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	6600	F4	RS P	I	533
R338	TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	F4	RS F	F	535
R338	TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	F4	RS P T	F	535
339	GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	F4	RS P T	D	538
340	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	UEC	6600	F4	RS P	D	541
340	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL	1604	F63	RS P	D	541
341	GANDY, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108	F4	RS P	A	543
R342	MO648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600	F4	RS T	C	546

TABLE OF CONTENTS

NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	Page
R343	MO756,LETO, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	F4	RS P T	J	548
R344	GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	6600	F+ASC	RS P T	I	550
345	GAND, GAFGAR X-SECTION LIBRARY PREPARATION	CGA	1108	F4	RS P X T	L	552
346	THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	F+GMP	RSBP T	H	554
347	CCDILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	360	F4	RS P	A	556
R348	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	EAFL	6600	F4	RS P T	H	558
349	TCODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION	PPCO	7044	F+MAP	RS P T	H	560
350	ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	360	F4	RS P CT	M	562
350	ETOE, ENDF/B TO MC**2 DATA CONVERSION	APDA	3600	ASAF4	RS P T	M	562
351	ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LRL	7094	F+FAP	RS PL T	M	564
R352	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAFL	6600	F4	RS P	F	567
353	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	F36	RSBP	I	569
354	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	6600	F4	RS P T	D	571
354	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	360	F4	RS P T	C	571
355	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	360	F4	RS P CT	B	573
355	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600	F36	RS P T	B	573
356	ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES	GGA	1108	BIN	R L T	Z	575
357	SUPCRAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	3600	F36	RS P T	I	578
358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600B	F4	RS P T	C	580
358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	3600B	F4	RS F CT	C	580
358	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	6600B	F4	RS P T	C	580
R359	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	F4	RS P T	A	582
360	TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	6600	F4	RS P T	A	584
361	GLEN, GROUP CONSTANT CALC FROM TOR CUTPUT DATA	LASL	6600	F4	RS P T	B	586
362	WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360	F4	RS P	B	588
363	BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB	360	F4	RS P	E	590
R364	SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	6600	F+ASC	RS P T	P	592
365	BCW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	F36	SBP	I	594
366	CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	F36	RSBP	G	596
367	ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	1108	F5	RSBPL T	C	598
368	FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	360	F4	RS P XCT	A	600
369	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	1108	F4	RS P T	G	602
369	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	6600	F4	RS P T	G	602
369	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	360	F4	RSBP XCT	G	602
370	GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	F4	RS P T	F	604
R371	NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	F4	RS P T	F	607
372	RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	AEC	635	F4	RS P	D	609
R373	EL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	F4	RS P T	L	611
374	IDX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108	F4	RS P X T	B	613
375	SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION	ZI	360	F+BAL	RSB L CT	M	615
376	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	7094	F4	RS P	A	617
376	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	6600	F4	RS P	A	617
377	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	6600	F4	RS P	A	619
R378	TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	F4	RS P	I	621
379	SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS	GGA	1108	F4	RS P	I	623
380	GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108	F4	RS P T	C	625
381	LYANE, WCCDS-SAXON POTENTIAL SHAPE CALCULATION	ORNL	7090	F2	RS	A	627
R382	RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	6600	F4	RS P	H	628
R383	MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	F4	RS P T	I	630
384	CHECKER,CRECT,DAMPET,FLCTFB,... ENDF/B V1 FROC	BNL	6600B	F4	RS T	M	632
385	COHEE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108	F4	RS P X	A	635
R386	DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	F+COM	RSB T	M	637
387	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL	3600	F4	RS P T	K	639
388	ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX	HECL	1108B	F4	RS P X T	B	641
R389	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	F4	RS P	F	644
390	CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	360	F4	RS P	O	646
R391	SORSOB, PRESSURE VESSEL STRESS AND FATIGUE	KAFL	6600	F4	RS	I	648
392	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	360	F+BAL	RS P T	B	650
392	RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC	ORNL	7090	F+FAP	RS P T	B	650
393	XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	360	F4	RS PLX T	B	652
R394	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P T	O	654
395	FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	1108	F5	RS P	H	656
R396	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	F4	RS P T	H	658
R397	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	F+COM	RS P T	I	660
R398	BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	6600	F4	RS P T	C	662
R399	SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	F4	RS P T	A	664
400	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	F4	RS P T	F	666
400	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	6600	F4	RS P T	F	666
401	CAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH	GGA	1108	F+BAL	RS P T	C	668
R402	SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	360	F4	RS P T	I	670
R403	TIGIR2, MOLECULAR DOCUMENT INFORMATION SYSTEM	KAPL	6600	F	R B T	H	673
R404	FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600	F4	RS P X	I	675
405	NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	F4	RS P T	F	677

TABLE OF CONTENTS

NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	Page
R406	CATATRAN 2-C GEOMETRY INPUT, PREPARATION, EDIT	KAPL	6600	F+ASC	RS P T	L	679
R407	DATATRAN UTILITY MODULES, 2-C + 3-C PLOTTING	KAPL	6600	F+ASC	RS P T	P	681
408	TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	F5	RS P T	H	683
409	LARCA, FLUX-WEIGHTING OF CTF4 CROSS SECTIONS	LASL	6600	F4	RS P	N	685
410	TACASI, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	1108	F4	RS P T	A	687
R411	MO661,MO657,MO626, POLYNOMIAL CURVE FITTING	BAPL	6600	F4	RS P T	P	689
R412	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	6600B	F4	RS P T	I	691
413	ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA	ORNL	360	F4	RS P	C	693
414	TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	1108	F5	RS P T	H	695
415	CEXE,INCEXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	360	F4	RS P X T	F	697
416	PARTI, OPTIMAL GROUP OR MESH COLLAPSING	TRW	6500	F4	RS P	B	699
417	ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL	360	F4	RS P T	A	701
418	CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GEC	635	F4	RSBP	C	703
419	CASCADE,CLUSTER, RADIATION DAMAGE IN METALS	GEC	635	F+FAP	RSBP T	G	705
420	GROLSE, SPACE-DEPENDENT X-SECTION GENERATION	GEC	635	F4	RSBP T	B	707
421	MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635	F4	RSBP	C	709
422	SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	7090	FAP	RSBP X T	Q	711
423	DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC	635	F4	RSBP	D	713
R424	GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	6600	F4	RS P T	H	715
R425	REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	F4	RS P T	O	717
R426	PAXO3, HARMONY-PDQ X-SECTION GENERATION CODE	BAPL	6600	F+CCM	RS P X T	E	719
427	FAREC, 1-C FAST REACTOR DESIGN & SURVEY STUDY	BW	6600	F+CCM	RS P X T	C	721
R428	DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE	KAPL	6600	F+ASC	RS P T	P	725
R429	ASPIS, GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAPL	6600	F+ASC	RS P T	J	727
430	GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL	GGA	1108	F+BAL	RS P T	C	729
431	SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	ORNL	360	F4	RS P T	B	731
432	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	3600	F4	RS P T	H	733
432	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	6600C	F4	RS P T	H	733
432	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	1108C	F4	RS P T	H	733
433	CONTEMPT-LT/022, PRESSURE-TEMPERATURE RESPONSE	ANC	360	F+BAL	RSBP CT	G	735
434	HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	6600	F4	RS P	N	738
435	BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	FPCO	360	F4	RS P X	C	740
436	ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6600	F4	RS P T	B	742
437	ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	6600	F4	RS PL T	B	744
438	BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ	GGA	1108	F+BAL	RS P T	D	747
439	BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH	GGA	1108	F+BAL	RS P T	D	749
440	DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	F4	RS P T	H	751
441	PWCOST, REACTOR FUEL CYCLE COST CALCULATION	GGA	1108	F4	RS P T	D	753
R442	SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL	6600	F+ASC	RS	P	755
443	HAB3, COAGULATION OF HETEROGENEOUS AEROSOLS	AI	360	F4	RS P T	G	757
R444	RCPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	6600	F4	RS P	P	759
R445	LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	6600	F+ASC	RS P T	P	761
R446	MCST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	F4	RS P	P	763
447	ETOG1 DATA LIBRARIES, MUFT4 CR 5, GAM1 CR 2	WAPD	6600	BCD	R L T	Z	764
R448	FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	6600	F4	RS P T	G	766
R449	CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	6600	F4	RS P T	I	768
450	KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFD	6600	F+CCM	RS P T	C	770
450	KENO, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	360	F+BAL	RSBPL CT	C	770
451	SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	GGA	1108	F5	RS P T	I	772
452	SHELL5, THIN SHELL 3-C STRUCTURAL ANALYSIS	GGA	1108	F5	RS P T	I	774
453	RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	360	F4	RS P T	B	776
454	PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	F4	RS P T	D	778
455	DAC1, SN PERTURBATION CODE USING CTF4 FLUXES	LASL	6600	F4	RS P	N	781
456	DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNWL	1108	F5	RS P T	C	783
457	GSSLRN1B, LEAST SQUARES PHOTOPEAK SPECTRA CODE	BNWL	1108	F+BAL	RS P T	C	785
458	VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NEC	635	F4	RS P T	H	787
459	CCT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NED	635	F4	RS P T	C	789
460	LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	360	F4	RS P T	I	791
R461	EPOCH, NEUTRON AGE CALCULATION CF ENDF/B DATA	BAPL	6600	F4	RS P T	B	793
R462	SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE	BAPL	6600B	F+ASC	RS P T	J	795
463	3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	F4	RS P T	C	799
R464	DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	F4	RS P	C	801
R464	DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	F4	RS P	O	801
465	RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES	ENL	6600B	F4	RS P T	A	803
466	APRFX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING	APRF	6600	F4	RS	B	806
467	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	360	F4	RS PLX T	B	808
467	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	1108	F4	RS PLX T	B	808
R468	BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	6600	F4	RS P T	I	810
469	PMS1, FAST NEUTRON POLARIZATION EXPERIMENT	UCNC	360B	F+BAL	RS P	O	812
R470	GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	6600	F4	RS P	A	814
471	GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT	GGA	1108	F5	RS P T	N	816
472	MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	360	F4	RS	M	818
472	MERMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES	ANL	3600	36F	RSBP T	M	818

TABLE OF CONTENTS

NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	Page
R473	CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	F4	RS P T	H	820
474	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	360	F4	RS PL CT	F	822
474	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	3600	36F	RS PL CT	F	822
475	CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	F4	RS P T	M	825
475	CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC	BNL	6600B	F4	RS T	M	825
476	CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES	1108	F5	RS P T	O	829
R477	3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	F4	RS P T	D	831
478	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BW	6600B	F+ASC	RS T	P	833
478	BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	BAPL	6600A	F+ASC	RS T	P	833
478	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2	CDC	6600C	F+COM	RS T	P	833
478	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3	CDC	6600D	F+COM	RS T	P	833
478	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0	CDC	7600	F4	RS T	P	833
479	FREACM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NED	635	F4	RS P T	G	836
480	FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NEC	635	F4	RS P T	D	839
R481	BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	F4	RS P T	I	841
482	CCMNUC,CASCADE, COMPOUND NUCLEUS REACTION	AI	360	F+BAL	RS P T	A	843
483	REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW	1108	F5	RS P T	H	845
484	FIGS, IBM360&225C FORTRAN GRAPHICS SUBROUTINES	AI	360	F+BAL	RS T	P	847
R485	GASPAN, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600	F4	RS T	O	849
486	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	F4	RS P T	E	851
486	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	6600	F4	RS P T	E	851
487	STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BGEE	360	F4	RS T	H	853
488	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	7090	F4	RS P T	F	855
488	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	1108	F5	RS P X T	F	855
489	TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360	F4	RS P	E	857
490	JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY	DP	360	F+BAL	S T	M	859
491	MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360	F4	RS P X T	E	861
492	RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL	6600	F4	RS P	A	864
493	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	F5	RS P T	M	866
493	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NEC	635	F4	RS P T	M	866
494	ADEP, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	F4	RS P T	F	868
495	SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NED	635	F+GMP	RS P T	D	870
R496	KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES	KAPL	6600	F+COM	RS T	P	873
R497	RELO1, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	6600	F4	RS P	F	875
498	CONCEPT2, POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL	3608	F4	RS P XCT	D	877
499	MIRAB,MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400	F4	RS P	G	879
500	FRCRL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	F4	RS P	G	882
501	ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	GESV	635	F+GMP	RS P XCT	B	884
502	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	6600	F4	RS P T	M	887
502	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	360B	F4	RS P T	M	887
R503	CUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	F+COM	RS P T	I	889
504	THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600	F4	RS P	A	892
505	TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	635	F+GMP	RS P XCT	L	894
R506	JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	6600	F4	RS P T	A	896
R507	PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	6600	F4	RS P T	A	898
508	MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400	F4	RS P X T	G	900
509	ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPD	7600	F4	RS P T	B	902
510	VIM1X, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	360	F4	RSEPL CT	C	904
510	VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600	F4	RS PLX T	C	904
511	VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	360	F4	RS P XCT	F	907
512	THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC	360	F4	RSBP X T	G	910
513	TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	3600	F36	RS P XCT	C	912
514	FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	ORNL	6600	F4	RS P	P	914
514	GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	635	F+GMP	RS T	P	916
516	PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360	ANC	360	PL1	RS P T	P	920
517	HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	ORNL	360	F4	RS P T	H	922
518	ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC	360	F4	RS PL CT	M	924
519	NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM	ANC	360	BAL	RSB T	P	926
520	PROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	360	F4	RS PLXCT	B	928
521	SODOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	F4	RS P	G	930
521	SODOOL2, SODIUM-FUEL INTERACTION ANALYSIS	HEDL	1108	F4	RS P	G	930
522	ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES	ANL	360	F+BAL	RS P CT	M	932
523	ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	360	F+BAL	RSBPL CT	C	934
524	BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600	F4	RS P	A	936
525	ORTHIS,ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	360	F4	RS P X T	H	938
526	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	JAER	230	F4	RS P T	B	940
526	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	360	F4	RS P T	B	940
527	HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS	HECL	1108	F+SL	RS P XCT	R	942
528	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	360	F4	RSBP CT	K	944
528	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	1108	F4	RS P T	K	944
529	ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCC	635	F4	RS	G	946
530	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	6600	F4	RS P	L	948
530	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	360	F4	RS P	L	948

TABLE OF CONTENTS

NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	Page
R531	CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	6600	F4	RS P	A	950
532	LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL	6600	BCD	R LX T	Z	952
533	ARC-NUI002, BCD INPUT DATA PROCESSING MODULE	ANL	360	F4	RSBP CT	L	954
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	660C	F4	RS X T	P	956
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	635	F4	RS X T	P	956
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	1108	F4	RS X T	P	956
534	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	360	F4	RSB XCT	P	956
R535	MLLTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	6600	F4	RS P	A	959
536	RAPAR, JOSHUA SYSTEM LATTICE PHYSICS MODULES	DP	360	F+BAL	S X T	B	961
R537	FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	F4	RS P T	I	963
538	ETOG3, ENDF/B TO MLFT, GAM, ANISN X-SEC FORMAT	WAPD	7600	F4	RS P T	B	965
539	STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	360	F4	RSBP CT	I	968
540	PACTOLUS,CLOTHC, NUCLEAR POWER PLANT COST CODE	HECL	1108	F5	RS P X T	D	970
541	WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG	ANL	360	F+ASM	RSB CT	P	972
542	PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	360	F4	RS P CT	I	974
543	THERMOS LIBRARY, 30-GF ENDF/B SCAT KERNELS	CP	360	BCD	R LX T	Z	976
544	PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	360	F4	RS P T	A	978
R545	BETTY, ENTRAINED PARTICLES SAMPLING STUDY	BAPL	6600	F4	RS P T	O	980
546	EMERALD, PWR PLANT RADIATION RELEASE & DOSE	FGE	360	F4	RS P CT	G	982
547	GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	660C	F4	RS L T	B	984
548	CEBLG, STEAM GENERATOR SODIUM-WATER REACTION	CENC	7600	F4	RS P T	G	987
549	BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC	ORNL	1604	F2	RS P	H	989
550	REXCC-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360	F4	RS P CT	F	991
551	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	360	F4	RSBP XCT	H	993
551	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	1108	F4	RS P T	H	993
552	PWR-PPM, BORATION-DILUTION TABLES FOR PWR CPN	OPPD	6400	F4	S P	H	995
553	U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES	AI	360	F+BAL	RS P CT	B	997
554	DISPER, AEROSOL PARTICLE TRANSPORT STUDY	RFD	3600	F36	RS P	G	999
555	PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	360	F+BAL	RSBPL CT	G	1001
556	KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	ORNL	360	F4	RS P	P	1004
R557	SHLCG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	660C	F4	RS P T	M	1006
558	TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	ORNL	360	F4	RS P XCT	F	1008
559	SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	F4	RS P T	C	1010
R560	HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	6600	F+COM	RS P	H	1012
561	TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	360	F4	RS P	X	1014
562	AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E	ANL	360	F+P+A	RS T	P	1016
563	AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F	ANL	360	F+BAL	RS T	F	1022
564	AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL	360	F+P+A	RS T	P	1028
565	INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC	360	F4	RS PL CT	B	1031
566	RESPOND, DISSIMILAR MEDIA TLC CORRECTION CALC	AI	360	F4	RS P T	C	1033
567	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEDL	1108	F4	RS P T	C	1035
567	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360	F4	RS P CT	C	1035
R568	BEHAVF2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	GESV	635	F4	RS P CT	I	1038
569	VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	ANC	360	F4	RSBP CT	J	1040
R570	STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING	BAPL	6600	F4	RS P	I	1042
571	RIGEL, ENDF/B V3 DATA PROCESSING CODE	ANL	360	F4	RS T	M	1044
571	CHECK3,RIGEL3, ENDF/B V3,V4 PROCESSING CODES	BNL	6600	F4	RS T	M	1044
572	XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B	ORNL	360	F4	RSBP XCT	B	1046
573	TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH	LASL	7600	F4	RS P T	C	1049
574	MACS LATTICE VIBRATION NEUTRON SCATTRING CODES	ANC	360	F4	RS P CT	W	1051
575	MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	360	F4	RS P CT	W	1056
576	GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS	360	F4	RS P CT	C	1059
577	FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	6600	F4	RS P	V	1061
R578	PLOTR, 2D CONTOUR PLOTS & AREA CALCULATION	SLA	6600	F4	RS P	P	1063
579	DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	F4	RSPP CT	C	1065
580	ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	360	F4	RS P T	H	1067
581	SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA	6600	F4	RS P T	I	1069
582	MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360	F4	RSBP CT	C	1072
583	STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	ORNL	360	F4	RS P C	G	1074
584	FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	F4	RSBP CT	I	1076
585	TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	GESV	H600	F4	RS P CT	C	1078
586	PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	CP	360	F4	RS P	H	1080
587	AEC-ALO FAU, RADIO FREQUENCY MANAGEMENT SYSTEM	ALOO	360	COBOL	RS P	M	1082
588	ORCOST, POWER PLANT CAPITAL COST ESTIMATING	ORNL	360	F4	RS P T	O	1084
R589	BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA	1108	COBOL	RS P	M	1086
R589	BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS	SLA	360	COBOL	RSBP CT	M	1086
590	INTEG,INSPEC, MARKOV SIMULATION OF REACTOR CPN	CP	360	F4	RS P	G	1088
591	PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE	ANL	GETS	F	P	F	1090
592	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600	F4	RS P	P	1092
593	TSO-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSO	ANL	360	F+BAL	R B L T	F	1094
594	ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION	ANL	360	F4	RSRPL CT	L	1096
595	MAPPER, PREDICTING MANUFACTURING REQUIREMENTS	GEPI	GETS	BASIC	P	M	1098
596	ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS	GGA	1108	F5	RS P T	B	1100

TABLE OF CONTENTS

NO.	KWIC TITLE	INSTALLATION	MACH	LANG	PACKAGE	CAT	Page
R597	MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS	BAPL	6600	F+COM	RS P X T	I	1104
R598	PELEN, FUEL PELLET TEMPERATURE & DEFORMATION	BAPL	6600	F4	RS P T	I	1107
599	TCPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HEDL	110R	F5	RS P T	R	1109
600	EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	CP	360	F4	RS P	G	1111
601	ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	F4	RS P	P	1113
602	LENSDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	6600	F+COM	RS P T	P	1115
G603	RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMO	360	F+C+R	RSBP T	M	1117
R604	TCR01, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	6600	F4	RS P	I	1119
605	GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)	ANC	360	F4	RSBP XCT	W	1121
606	GAPERID, 1-D TRANSPORT PERTURBATION THEORY	GGA	110R	F4	RS P XCT	C	1123
R607	SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	110R	F+BAL	RSBP T	M	1125
608	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	F4	RS P T	C	1127
608	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	F4	RSBP CT	C	1127
608	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	F4	RS P T	C	1127
609	INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	6600	F+COM	RS P T	C	1129
610	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	110R	F5	RS P X T	P	1131
610	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	6600	F4	RS P X T	P	1131
610	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	360	F4	RS P X T	P	1131

VI. LIBRARY PROGRAMS BY PROBLEM CLASSIFICATION 1135

A. Cross-section and Resonance-integral Calculations. 1137

B. Spectrum Calculations, Generation of Group Constants, Lattice and Cell Problems 1146

C. Static Design Studies 1161

D. Depletion, Fuel Management, Cost Analysis, and Reactor Economics 1173

E. Space-independent Kinetics 1185

F. Space-Time Kinetics, Coupled Neutronics-Hydrodynamics-Thermodynamics and Excursion Simulations 1189

G. Radiological Safety, Hazard and Accident Analysis 1195

H. Heat Transfer and Fluid Flow 1206

I. Deformation and Stress Distribution Computations, Structural Analysis and Engineering Design Studies 1214

J. Gamma Heating and Shield Design 1223

K. Reactor Systems Analysis. 1227

L. Data Preparation. 1228

M. Data Management 1231

N. Subsidiary Calculations 1237

O. Experimental Data Processing. 1239

P. General Mathematical and Computing System Routines. 1244

TABLE OF CONTENTS

	Page
Q. Materials	1259
R. Environmental and Earth Sciences	1260
V. Particle Accelerators and High Voltage Machines	1261
W. Physics	1262
X. Controlled Thermonuclear Research	1263
Z. Data	1264
VII. KWIC INDEX	1267
REFERENCES	1349

ARGONNE CODE CENTER: COMPILATION OF PROGRAM ABSTRACTS

by

M. K. Butler, H. S. Edwards, C. Harrison, Jr.,
Catherine E. Hughes, Marianne Legan, T. Menozzi,
L. Ranzini, and William J. Snow

PREFACE

This is the second complete revision of program abstracts undertaken by the Code Center since its inception in 1960. This revision has eliminated from our collection those programs for machines of the 704 era and earlier. With the assistance of installation representatives and authors, existing program abstracts have been revised and material added to the library to complete, whenever possible, the program package for each program in the Center's collection.

This is the first attempt at a formal publication. Previous abstracts have been processed by use of multilith masters from high-speed printers. Publishing this as an AEC document makes it more easily referenced and accessed. Additions and corrections will be published as previously, with provision for a complete revision in this form after another 3- to 5-year period.

The table of contents lists in order of accession, the KWIC title of each program, the originating installation, the machine, the programming language, the package symbols, and the category. This title information was then used to provide the index which follows the abstracts. The package symbols included are defined as follows:

R = reference report or document,
S = source deck or tape,
B = binary or run deck or tape,
P = sample problem data,
L = library information, e.g., cross-section library, random-number library,
X = auxiliary routines or information,
C = control or operating system language statements,

and

T = magnetic tape(s) required for transmittal of card and/or tape material.

This collection includes programs in which the program number is preceded by the letter R or G. The letter R denotes restricted, and U.S. citizens are required to file a release form with the Center for use of the program on either official U.S. government or commercial (nonmilitary) applications at a U.S. installation. The letter G designates programs which are limited to use on U.S. government contracts only. In addition to the release form requirement, the contract identification, and the signature of the contracting officer must be furnished when requesting such programs. The Code Center is not authorized to distribute these programs outside the United States.

To best service the interests of AEC contractors, university nuclear engineering departments, and the nuclear industry, the Center will, upon request, supply to an installation, a copy of any of the material listed as available under Item 16 of the abstract. Should that installation modify the program, convert it to a usable form on another computer, uncover an error, or have difficulty in using the program, they are asked to notify the Center so that their efforts in turn might benefit other recipients. The Center maintains records of the recipients of all library material so that if a correction or new version is prepared, all previous recipients of the program are notified promptly.

Program abstracts for the OECD Nuclear Energy Agency Computer Program Library programs in the Argonne Code Center collection have not been included in this compilation. Separate compilations are distributed regularly to our contributing installations.

I. HISTORY AND ACKNOWLEDGMENTS

In 1956, at the Second Annual Meeting of the American Nuclear Society, the initial meeting of an informal group called the Nuclear Codes Group was held. This group was composed of "persons interested in the development and use of computer programs for reactor design." The group held regular meetings in conjunction with the semiannual ANS meetings and published and distributed a Newsletter containing code abstracts submitted by members. These abstracts followed the format of the Atomic Energy Commission document AECU-3078, "A Bibliography of Available Digital Computer Codes for Nuclear Reactor Problems."[1]

From September 1956 to December 1959, ten Newsletters were published and distributed through the auspices of the AEC Computing Facility at New York University.[2] In 1959, Ward Sangren and personnel at General Atomics edited and published 300 abstracts collected from Group members.[3] A supplementary list of 100 abstracts was published the following year.[4]

In 1959 also, the Nuclear Codes Group became the nucleus of the American Nuclear Society's Mathematics and Computation Division. With stature came a desire for a central facility for the computer program library

and the dissemination of information concerning programs written in the areas of nuclear physics, reactor design, and engineering. In 1960, a proposal was made whereby, with the cooperation of Division members and installation representatives, and the Atomic Energy Commission's approval, Argonne National Laboratory undertook to serve as this central agency and the Argonne Code Center was established.

Procedures were drafted defining the material to be collected--the abstract and the "package"--and the responsibilities of the Center and the Installation Representatives. The submission of the material is the responsibility of the authors either directly, or through their Installation Representative. The Center edits and publishes the abstracts, and collects, maintains, tests, and distributes the packages. The representatives at AEC laboratories, contracting establishments, and universities serve as a source of information to the Center concerning programs or requests emanating from their installation, and it is they, in collaboration with the personnel at the Argonne Center, who supply the answers to the questions and nonroutine inquiries received. They are responsible for library programs at their installations.

In 1965 the Argonne Center became a separately-budgeted operation of the Reactor Physics Branch of the USAEC Division of Reactor Development and Technology. In September of 1972 the Argonne Code Center was designated as the AEC-wide computer program exchange and information center responsible for the dissemination of unclassified computer programs developed with AEC funds. The Center is currently supported by the USAEC Reactor Research and Development and Military Application Divisions and the Office of Information Services. Acquisition of ADP services by AEC offices and contractors and program (code) exchange and dissemination services of the Center program are defined in Parts VII and VIII of AEC Manual Appendix 1801 Data Processing Equipment and Services.

From 1961 until issuance of this publication in January 1968, the Argonne Code Center published 12 distributions containing abstracts of approximately 265 programs.[5] This collection represents a complete revision of those previously published abstracts and includes, in addition, abstracts prepared and revised from 1968 to date.

II. ABSTRACT FORMAT

The program abstract has been modified considerably over the years. Its evolution from the original AECU-3078 format is due primarily to our experience at the Center and cooperative efforts undertaken with the NEA library personnel and the American Nuclear Society's ANS-10 subcommittee membership.[6]

A. Name or Designation of Program

This is the name or designation given the program(s) by the author.

B. Computer for Which Program is Designed and Others upon Which It Is Operable

The computer hardware system for which the program or system was prepared is identified and names of other computers for which versions are available are listed.

C. Description of Problem or Function

A brief description of the problem being solved or a definition of the data processing activity being carried out is given.

D. Method of Solution

A short summary of the mathematical methods employed, numerical algorithms adopted, or procedures incorporated in the program should appear under this entry.

E. Restrictions on the Complexity of the Problem

This item includes restrictions implied by storage allocation, such as maximum number of energy groups and mesh points, as well as those due to approximations used, such as implied argument-range limitations, etc.

F. Typical Running Time

Information intended to enable the user to estimate machine time requirements is listed.

G. Unusual Features of the Program

Distinguishing features and special capabilities of the program are enumerated. Information given under this item should allow the user to select, from a number of similar programs, the one most suitable for his particular problem.

H. Related and Auxiliary Programs

If this program supersedes or is an extension of an earlier program, this is noted here. Programs used in conjunction with this program, especially those coupled through use of external data files should be mentioned.

I. Status

The Center lists here the initial date of publication of the abstract. Versions in the library are identified and the date they were submitted is given. Testing completed at the Center is noted.

J. References

Available publications pertinent to the program are cited.

K. Machine Requirements

This item lists the hardware components essential for full utilization of the program.

L. Programming Language(s) Used

The programming language or languages in which the program was written are identified with an indication of the percentage of each used. If certain routines are in assembly rather than compiler language, these should be identified.

M. Operating System or Monitor under Which Program Is Executed

This item identifies the operating system, associated subroutine or function library, and installation support software used by the program. The version used is identified and deviations or exceptions noted.

N. Any Other Programming or Operating Information or Restrictions

Additional information needed by the reader to implement the program or determine the extent of the necessary implementation effort is summarized.

O. Name and Establishment of Author

The names and addresses of the authors of the program and of other machine versions are listed. If the author is no longer responsible for the program, the person to be contacted should be listed, as well.

P. Material Available

This lists the material being distributed, i.e., the contents of the program package.

Q. Category

The problem classification assigned from the Center program or system classification guide.

Keywords

This is a listing of the keywords associated with the program, supplied by the program author and/or Center based on the Argonne Code Center thesaurus.

III. RECOMMENDED PROGRAM PACKAGE CONTENTS

The "program package" is defined as the collection of card decks, tapes, and documentation, associated with a computer program, necessary for its modification and effective use by an individual other than the author on a computer system different from that on which it was developed.

The material required may include all of the following:

1. Source Decks (S)

Compiler and assembly language program decks or card-image tape records.

2. Run Decks (B)

Language processor object decks, or load modules, prepared as required for program execution. If source decks cannot be distributed for proprietary or other reasons, run decks may be substituted. For certain system-dependent programs this may be the preferable form, and in interchange between users of like systems, it may be more cost-effective and provide redundancy when used in conjunction with the source material.

3. Sample Problems (P)

Test case input data decks or card-image tape records for use in checking out program implementation.

4. Data Libraries (L)

External data files required for program operation; e.g., cross-section libraries, steam table data. It is preferable that decimal form be used for numerical data files for exchange purposes.

5. Control Information (C)

Operating system control cards or control language decks required for compilation or assembly of the program and execution of the sample problem at the originating installation. This information includes device assignments, format information, storage allocation, overlay structure definitions, etc

6. Auxiliary Routines and Information (X)

Program package items for subsidiary programs used in preparing input information, processing results, maintaining data libraries, etc., for the program. Computer-readable information provided as documentation for use with text-processing facilities.

7. Documentation (R)

The traditional documentation associated with the computer program and its application. This material may be compiled in a single comprehensive report or it may exist as several independent documents--published paper reprints, program reports, user's manuals, program maintenance manuals, installation memoranda, computer output listings, etc. It may, regardless of form, include all of the following:

a. Problem definition or function description--Information providing the raison d'etre for the computer program or system, a description of the problem solved or of the processing performed. A description of the mathematical model used and the computational algorithms and techniques employed should be included.

b. Application information--Documentation directed to the program user; i.e., a User's Manual, if a separate publication. Operating instructions, program options, and a description of the input and output formats should be covered in sufficient detail to enable the user to specify his own problem and interpret the results correctly. An example is helpful; if the identical sample problem of item 3 is used the selected output for it can be shown in this document; otherwise, it is essential to include a copy of the computer output listing obtained from execution of the item 3 sample problem in the program package.

c. Programming information--A detailed description of the program addressed to the programmer responsible for maintenance or transfer of the program; i.e., a Program Maintenance Manual, if a separate publication. Material covered should include the overall program structure and logic, identification of subprograms and detailed information on their use, glossaries showing the relationship between problem variables and program symbols, definitions of external data files, system hardware and software requirements, shared storage assignments, overlay or segment structures, and system-dependent programming considerations.

d. Installation environment information--A description of the environment in which the program was developed and installation support facilities utilized such as installation-dependent library routines for mathematical functions, plotting, microfilm recording and the like. It is recommended that general Installation Environment Reports issued by individuals responsible for the computer environment at the program-originating installation be utilized for this part of the program documentation. Such documents can greatly simplify the preparation of portable program packages and facilitate effective program exchange.

Program package items 1 through 6 are most effectively maintained and transmitted in punched card or magnetic tape form; item 7 as printed material. If a substantial number of cards are involved, these should be recorded

on magnetic tape in card-image format. Data libraries (item 4) are often computer-generated and exist only on tape. Control information (item 5) may, alternatively, be supplied as a computer output listing since this information is rarely identical at different installations.

IV. PROGRAM CLASSIFICATION GUIDE AND THESAURUS

A program classification scheme is being initiated with this report. It is intended to serve as a guide to those library programs dealing with the solution of a specific physical problem or area of related problems. In addition, a thesaurus has been prepared as a basis for the assignment of keywords to the library programs. The category and keywords listed as Abstract Item 17 have been assigned by the Code Center staff, but it is hoped that in the future they will be selected from the guide and thesaurus by the author of the program and/or abstract. The thesaurus follows the concept and design of the EURATOM thesaurus[7] insofar as practicable. Accepted keywords not included in the thesaurus include specific reactor and computer code names that are always followed by the word "reactors" or "codes," e.g., HTGR reactors, AITP3 codes. Other accepted keywords are the element names and combinations of an element name and a mass number, e.g., hydrogen, uranium-238.

Program Classification Guide

A. Cross-section and Resonance-integral Calculations

Computation of reaction cross sections from nuclear theory such as the optical or Hauser-Feshbach models, resonance cross sections by Breit-Wigner or multilevel theory, determination of differential scattering cross sections, cross-section evaluation, and compilation programs.

B. Spectrum Calculations, Generation of Group Constants, Lattice and Cell Problems

Determination of the slowing-down density or thermal spectrum, weighting and averaging of cross sections and related quantities for the production of group constants, and evaluation of design parameters by lattice and cell calculation.

C. Static Design Studies

Calculation of the reactivity and flux distribution of the reactor system, and adjustment of design parameters to prescribed specifications, i.e., criticality and power distribution search procedures.

D. Depletion, Fuel Management, Cost Analysis, and Reactor Economics

Includes burnup programs, isotope and fission-product buildup and decay computations, and optimization studies.

E. Space-independent Kinetics

Studies of the time-behavior of reactors, including delayed-neutron effects and feedback mechanisms, and transfer-function evaluation.

F. Space-Time Kinetics, Coupled Neutronics-Hydrodynamics-Thermodynamics and Excursion Simulations

Programs that consider spatial design characteristics and accompanying effects in studying the time behavior of the reactor.

G. Radiological Safety, Hazard and Accident Analysis

Calculation of internal and external dose rates, determination of reactor thermodynamic and hydrodynamic properties following an accident, e.g., release of radioactive materials, coolant system blowdown, steam generator rupture.

H. Heat Transfer and Fluid Flow

Steady-state and transient heat transfer computations, fluid-flow studies and calculations of thermodynamic properties.

I. Deformation and Stress Distribution Computations, Structural Analysis, and Engineering Design Studies

Includes fuel-element design evaluations, core-configuration studies, and composite structure analysis.

J. Gamma Heating and Shield Design

Gamma and photon transport calculations, computation of heat-generation rates, and penetration analysis and leakage calculations for shielding.

K. Reactor Systems Analysis

Combinations of programs, designed as systems, for solving correlated problems from several of the categories A through I.

L. Data Preparation

Generation of program parameters; checking, editing, and formatting of problem input information.

M. Data Management

Construction, maintenance, and retrieval of data files, e.g., cross-section libraries; management systems such as payroll, personnel and

financial systems, property and equipment systems, network-oriented project management and indexing and retrieval systems, etc.

N. Subsidiary Calculations

Plotting, editing, and display routines that process output data from other programs.

O. Experimental Data Processing

Programs designed to process data directly acquired from an experimental situation or to assist the experimenter in the design of the experiment.

P. General Mathematical and Computing System Routines

Calculation of mathematical functions, statistical analysis, special-language routines with general data-processing capabilities, and software systems.

Q. Materials

Measurements and computation of the physical and mechanical properties of materials, simulation of radiation damage processes, corrosion studies, and determination of crystallographic functions.

R. Environmental and Earth Sciences

Environmental impact studies, geology, seismology, geophysics calculations, hydrology and ground water studies, bioenvironmental systems analyses, meteorological calculations relating to the atmosphere and its phenomena, studies of airborne particulate matter, climatology, etc.

S. Space Sciences

Analysis of orbits and trajectories, astronomy and astrophysics computations, wave propagation studies, and the calculation of reentry parameters.

T. Electronics and Engineering Equipment

Automated design of electronic equipment, engineering computations for numerically controlled machine tools and process control programs.

U. Chemistry

Chemical analysis, mass spectroscopy, radiation chemistry, radiolysis studies, etc.

V. Particle Accelerators and High Voltage Machines

Programs relating to the design, development and operation of high-voltage machines and particle accelerators such as Van de Graaff generators, linear accelerators, cyclotrons, synchrotrons, etc.

W. Physics

Calculations relating to theory of atomic or molecular structure or properties, charged particle collision studies that involve phenomena such as charge exchange, excitation, ionization, dissociation, etc., elementary particle theories and models, scattering theory, quantum field theory and quantum electrodynamics studies, general relativity and gravitation theory computations.

X. Controlled Thermonuclear Research

Electric discharge phenomena and plasma physics computations, electrodynamics and magnetic hydrodynamics studies.

Y. Biology and Medicine

Biological, medical and radiological studies of the structure, functions, chemistry, biophysics, reproduction, and heredity of bacteria, plants, laboratory animals, and humans.

Z. Data

Data prepared in specified program formats for program testing and evaluation, benchmark studies, or library use.

Thesaurus

1-dimensional
1-group
2-dimensional
2-group
3-dimensional
absorption
accidents
activation
aerosols
age
algorithm
alpha decay
angular distribution
anisotropic scattering
annular space
assembler
atmosphere
averages
B_L method
background
beams
blowdown
Breit-Wigner formula
breeding
Brown-St. John model
buckling
capture
cell calculation
cladding
coefficients
Cohen equation
coincidence methods
communications
compound nuclei
containment
contamination
continuous release
control
control rods
coolants
correlation
criticality
cross sections
crystals
currents
cylinders
Dancoff correction
data processing
decay
deformation
depletion
design
differential equations
diffraction
diffusion
disadvantage factors
distance
distribution
Doppler broadening
Doppler coefficient
dose rates
dynamics
economics

efficiency
eigensystems
elastic
elasticity
electrons
elementary functions
ENDF/B
enthalpy
epithermal
equations
equifield
equipotentials
excursions
expansion
factor
failures
fast
feedback
few-group
finite-element
fire
fission
fission products
floating-point arithmetic
fluid flow
fluids
flux
Fourier transform
frequency
fuel cycle
fuel elements
fuels
fusion reactors
gamma radiation
gas coolants
gases
geometries
graphs
group constants
Hauser-Feshbach theory
heat conduction
heat transfer
heating
heavy
helium
heterogeneous
hexagonal
homogeneous
hydrodynamics
incoherent approximation
inelastic
infinite media
input data
instantaneous release
interpolation
isotopes
isotropic scattering
kernels
kinetics
Laplace equation
lattices
leakage
least squares
Legendre coefficients
libraries
lifetime
light
linear equations
liquids
liquid metals
magnetic
magnetohydrodynamics
maintenance
mass matrices
Maxwell distribution
measurements
minimization
moderators
Monte Carlo method
multidimensional
multigroup
multilevel
networks
neutrons
noise
nonlinear
nonlinear least squares
numerical calculations
operating systems
operation
optical model
optimization
output data
parameters
particles
performance
perturbation theory
photomultipliers
photon
pipes
P_L method
plates
poison
polarization
pollution
polynomials
potentials
potential scattering
power
power plants
predictor-corrector
preparation
pressure
production
programming languages
pumps
quadrature
r-theta
r-theta-z
r-z
radiation effects
radioactivity
reaction rates
reactivity
reactor safety
reactors
remote job entry
resolved region
resonance
resonance escape probability
resonance integrals
retrieval
sampling
scattering
scattering law
scintillation counters
searches
Selengut-Goertzel equation
shells
shielding
slabs
slowing down
S_n method
solids
solutions
space
space-independent
space-time
special functions
spectra
spheres
spherical harmonics
statistics
steam generators
stresses
structural analysis
swelling
synthesis
temperature
temperature coefficient
thermal
thermal utilization
thermalization
thermodynamics
time-sharing
Tokamak
transfer functions
transients
transport theory
triangular
tubes
unresolved region
utility routines
vapors
variations
velocity
vibrations
viscoelasticity
waste solutions
water
weight
Wigner-Wilkins model
Wilkins equation
x-ray
x-y
x-y-z
xenon

V. ABSTRACT COLLECTION

As programs are submitted to the Argonne Center, they are assigned accession numbers that are used to identify the program and its abstract. Whenever the abstract is modified, the month and year of the modification appear in the abstract heading in the format MM/YY. Since this collection represents a complete revision, all abstracts appearing herein will be dated October 1967 or later, and the date in the abstract heading will appear as 10/67, etc.

15. NAME AND ESTABLISHMENT OF AUTHORS -

7090 R. A. BLAINE
SUPERVISOR, REACTOR COMPUTING SYSTEMS UNIT
MATHEMATICS AND COMPUTER SCIENCES

1604 S. ELKIN
NUCLEAR APPLICATIONS COMPUTATION CENTER
CONTROL DATA CORPORATION
COMPUTER DIVISION
3145 PORTER DRIVE
P. O. BOX 10111
PALO ALTO, CALIFORNIA 94303

625 R. L. BRUNNENMEYER AND R. A. MICKLE
BECHTEL CORPORATION
50 BEALE STREET
SAN FRANCISCO, CALIFORNIA 94119

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7090-2843 CARDS, 1604-2851 CARDS, 625-2861 CARDS)
SAMPLE PROBLEMS (7090-39 CARDS, 1604-66 CARDS)
REFERENCE REPORT AND NOTE

17. CATEGORY - C
KEYWORDS - DIFFUSION EQUATIONS, 1-DIMENSIONAL, FEW-GROUP, SLABS, CYLINDERS, SPHERES, CRITICALITY SEARCHES, FLUX DISTRIBUTION

ACC ABSTRACT 29 02/74

1. NAME OR DESIGNATION OF PROGRAM - AIM6

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090,370, CDC1604

3. DESCRIPTION OF PROBLEM OR FUNCTION - AIM6 SOLVES THE ONE-DIMENSIONAL MULTIGROUP DIFFUSION EQUATIONS UTILIZING A MICROSCOPIC CROSS SECTION LIBRARY. ANY OF THREE GEOMETRIES ARE AVAILABLE SLAB, CYLINDER OR SPHERE. CRITICALITY SEARCHES ARE PROVIDED INCLUDING A CONCENTRATION SEARCH ON ONE OR TWO ELEMENTS. HOMOGENEOUS AND INHOMOGENEOUS PROBLEMS MAY BE SOLVED WITH A VARIETY OF BOUNDARY CONDITION OPTIONS.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   10 SPACE POINTS
   18 ENERGY GROUPS
   ONLY DOWNSCATTER IS PERMITTED, AND, IN THE CURRENT VERSION, NEUTRONS FROM A GIVEN GROUP ARE PERMITTED TO SCATTER ONLY TO A MAXIMUM OF 5 SUCCESSIVE LOWER GROUPS.

6. TYPICAL RUNNING TIME - FOR 16 GROUPS, 3 MINUTES WOULD BE A TYPICAL TIME FOR A SINGLE PROBLEM, ALTHOUGH TIMES MAY BE AS LOW AS 30 SECONDS. THE SAMPLE PROBLEM REQUIRES 2 MINUTES ON THE IBM370.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - FOG (ACC ABSTRACT 28)

9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1962.
   IBM7090 VERSION SUBMITTED JANUARY 1962.
   CDC1604 VERSION SUBMITTED AUGUST 1963.
   IBM370 VERSION SUBMITTED JULY 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - H. P. FLATT AND D. C. BALLER, THE AIM-6 CODE, NAA PROGRAM DESCRIPTION, JANUARY 1961, ERRATA AND ADDENDA.
    D. P. SATKUS, LIBRARY, A PROGRAM TO PUNCH MICROSCOPIC CROSS SECTION LIBRARY IN COLUMN BINARY FORM FOR A VARIABLE NUMBER OF GROUPS, NAA PROGRAM DESCRIPTION, APRIL 19, 1960.
    D. P. SATKUS, LIST, A PROGRAM TO LIST LIBRARY FOR A VARIABLE NUMBER OF GROUPS, NAA PROGRAM DESCRIPTION, APRIL 19, 1960.
    AIM-6, NOTES CONCERNING THE CONTROL DATA VERSION.

11. MACHINE REQUIREMENTS - 300K BYTES AND 1 SCRATCH UNIT ON THE IBM370

12. PROGRAMMING LANGUAGES USED - FORTRAN II AND FAP (IBM7090), FORTRAN 63 (CDC1604), FORTRAN IV (IBM370)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - FORTRAN MONITOR SYSTEM (IBM7090), CCCP (CDC1604), OS/370 (IBM370).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

7090 R. A. BLAINE
SUPERVISOR, REACTOR COMPUTING SYSTEMS UNIT
MATHEMATICS AND COMPUTER SCIENCES
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

1604 S. ELKIN
NUCLEAR APPLICATIONS COMPUTATION CENTER
CONTROL DATA CORPORATION
COMPUTER DIVISION
3145 PORTER DRIVE
P. O. BOX 10111
PALO ALTO, CALIFORNIA 94303

370 S. NAKAMURA AND W. BENNEDICT
NUCLEAR ENGINEERING
THE OHIO STATE UNIVERSITY
206 WEST 18TH AVENUE
COLUMBUS, OHIO 43210

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7090-3849 CARDS, 1604-3285 CARDS, 370-3503 CARDS)
SAMPLE PROBLEMS (7090-36 CARDS, 1604-29 CARDS, 370-30 CARDS)
LIBRARIES (7090-1221 CARDS, 1604-3317 CARDS, 370-337 CARDS)
CONTROL INFORMATION (JCL 370-9 CARDS)
SAMPLE PROBLEM OUTPUT (370-17 PAGES)
REFERENCE REPORTS, ERRATA, ADDENDA, AND NOTES

17. CATEGORY - C
KEYWORDS - DIFFUSION EQUATIONS, 1-DIMENSIONAL, MULTIGROUP, SLABS, CYLINDERS, SPHERES, CRITICALITY SEARCHES, FLUX DISTRIBUTION, FOG CODES

ACC ABSTRACT 30 03/72

1. NAME OR DESIGNATION OF PROGRAM - PERT

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090,360, CDC1604

3. DESCRIPTION OF PROBLEM OR FUNCTION - PERT IS A PERTURBATION PROGRAM DESIGNED FOR USE WITH THE AIM6 AND FOG PROGRAMS. PUNCHED CARD OUTPUT FROM THESE CODES IS USED AS INPUT TO PERT. USING CROSS SECTION DATA, FLUXES, AND ADJOINT FLUXES, THE RELATIVE CHANGE IN KEFF CAN BE CALCULATED. CROSS SECTIONS MAY BE WEIGHTED WITH THE ADJOINT FLUX AND/OR DIRECT FLUX. THE NEUTRON LIFETIME FOR THE DELAY GROUPS MAY ALSO BE DETERMINED.

4. METHOD OF SOLUTION - A LINEAR PERTURBATION THEORY IS USED FOR THE CALCULATIONS OF THE RELATIVE CHANGE IN KEFF.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - ABOUT 30 SECONDS ARE REQUIRED FOR A TYPICAL PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - AIM6 (ACC ABSTRACT 29) AND FOG (ACC ABSTRACT 28)

9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1962.
IBM7090 VERSION SUBMITTED JANUARY 1962.
CDC1604 VERSION SUBMITTED MARCH 1964.
IBM360 VERSION SUBMITTED JUNE 1967.

10. REFERENCES - H. P. FLATT, PERT, NAA PROGRAM DESCRIPTION, FEBRUARY 1961.
PERT, NOTES CONCERNING THE CONTROL DATA VERSION.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN II (7090), FORTRAN 63 (1604), AND FORTRAN IV (360)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

7090 R. A. BLAINE
SUPERVISOR, REACTOR COMPUTING SYSTEMS UNIT
MATHEMATICS AND COMPUTER SCIENCES
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - IBSYS (7090) AND OS360 (360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

7090 R. H. SHUDDE AND J. DYER
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA

360 G. GOWINS
BOEING HUNTSVILLE SIMULATION CENTER
THE BOEING COMPANY
HUNTSVILLE, ALABAMA 35807

1604 S. ELKIN
NUCLEAR APPLICATIONS COMPUTATION CENTER
CONTROL DATA CORPORATION
COMPUTER DIVISION
3145 PORTER DRIVE
P. O. BOX 10111
PALO ALTO, CALIFORNIA 94303

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7090-2145 CARDS, 1604-1298 CARDS, AND 360-1280 CARDS)
SAMPLE PROBLEMS (7090-10 CARDS, 1604-11 CARDS, AND 360-21 CARDS)
LIBRARIES (7090-765 CARDS, 1604-741 CARDS, AND 360-764 CARDS)
SAMPLE PROBLEM OUTPUT (360-14 SELECTED PAGES)
REFERENCE REPORTS, NOTES

17. CATEGORY - B
KEYWORDS - THERMALIZATION, WIGNER-WILKINS MODEL LIGHT MODERATORS, WILKINS EQUATION HEAVY MODERATORS, MAXWELL DISTRIBUTION, THERMAL SPECTRA

ACC ABSTRACT 51 10/73

1. NAME OR DESIGNATION OF PROGRAM - FORM

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090,370, CDC1604

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE FORM, OR FORTRAN-MUFT, PROGRAM IS A FOURIER TRANSFORM SLOWING-DOWN CODE. A LIBRARY TAPE CONTAINING 54-GROUP MICROSCOPIC CROSS SECTIONS, RESONANCE PARAMETERS, INELASTIC SCATTERING MATRICES, AND SOURCE SPECTRA IS USED TO GENERATE A 54-GROUP FLUX SPECTRUM AND FEW-GROUP CONSTANTS.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - ABOUT 5 TO 6 SECONDS ARE REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - MUFT, LIBRARY EDITING ROUTINES ARE INCLUDED AS AUXILIARY CODES. AITP1 PREPARES THE IBM370 VERSION BINARY LIBRARY TAPE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1962.
IBM7090 VERSION SUBMITTED MARCH 1962.
CDC1604 VERSION SUBMITTED MARCH 1964.
IBM370 VERSION SUBMITTED JULY 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - D. J. MCGOFF, FORM, A FOURIER TRANSFORM FAST SPECTRUM CODE FOR THE IBM709, NAA-SR-MEMO-5766, 1960.
FORM, NOTES CONCERNING THE CONTROL DATA VERSION.
ATOMICS INTERNATIONAL FORM CROSS-SECTION LIBRARY, AI NOTE, NOVEMBER 1962.
P. KAZEMERSKY AND S. NAKAMURA, THE FORM CODE, OHIO STATE MODIFICATIONS TO NAA-SR-MEMO-5766, 1972.

11. MACHINE REQUIREMENTS - 32K WITH 2 TAPE UNITS

12. PROGRAMMING LANGUAGES USED - FORTRAN II (IBM7090), FORTRAN 63 (CDC1604), FORTRAN IV (IBM370)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - FORTRAN MONITOR SYSTEM (IBM7090), CCCP (CDC1604), OS/370 (IBM370).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
7090 R. A. BLAINE AND D. J. MCGOFF
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

1604 S. ELKIN
NUCLEAR APPLICATIONS COMPUTATION CENTER
CONTROL DATA CORPORATION
COMPUTER DIVISION
3145 PORTER DRIVE
P. O. BOX 10111
PALO ALTO, CALIFORNIA 94303

370 S. NAKAMURA AND P. KAZEMERSKY
NUCLEAR ENGINEERING
THE OHIO STATE UNIVERSITY
206 WEST 18TH AVENUE
COLUMBUS, OHIO 43210

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (FORM 7090-1620 CARDS, 1604-1697 CARDS, 370-1141 CARDS, AITP1 370-227 CARDS)
SAMPLE PROBLEMS (7090-14 CARDS, 1604-14 CARDS, 370-34 CARDS)
LIBRARIES (7090-5847 CARDS, 1604-5847 CARDS, 370-8319 CARDS)
CONTROL INFORMATION (FORM JCL 370-9 CARDS, AITP1 JCL 370-8 CARDS)
REFERENCE REPORT, NOTES, AND MODIFICATIONS

17. CATEGORY - B
KEYWORDS - FOURIER TRANSFORM SLOWING DOWN, FAST SPECTRA, FEW-GROUP GROUP CONSTANTS, AITP1 CODES

ACC ABSTRACT 52 03/72

1. NAME OR DESIGNATION OF PROGRAM - SAIL

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090, CDC1604

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE MONOENERGETIC NEUTRON TRANSPORT EQUATION IS SOLVED USING THE DISCRETE SN METHOD FOR A ONE-DIMENSIONAL PLANE CELL. CELL PROPERTIES ARE COMPUTED.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
   PLANE GEOMETRY
   ORDER OF APPROXIMATION = 2, 4, 6, OR 8
   1 ENERGY GROUP
   MAXIMUM NUMBER OF REGIONS = 100
   MAXIMUM NUMBER OF INTERVALS = 100

6. TYPICAL RUNNING TIME - THE RUNNING TIME IS GENERALLY LESS THAN ONE MINUTE. A SAMPLE S4 PROBLEM INVOLVING 7 MESH POINTS REQUIRED 21 SECONDS, INCLUDING LOADING THE PROGRAM INTO MEMORY.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1962.
   IBM7090 VERSION SUBMITTED MARCH 1962.
   CDC1604 VERSION SUBMITTED MARCH 1964.

10. REFERENCES - B. J. LEMKE, SAIL, NAA PROGRAM DESCRIPTION, FEBRUARY 1961, AI-64-MEMO-179 PUBLICATION, AUGUST 1964.
    B. CARLSON, NUMERICAL SOLUTION OF TRANSIENT AND STEADY-STATE NEUTRON TRANSPORT PROBLEMS, LA-2260, 1960.
    SAIL, NOTES CONCERNING THE CONTROL DATA VERSION.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN II (IBM), FORTRAN 63 (CDC)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
    7090 B. J. LEMKE
    ATOMICS INTERNATIONAL
    P. O. BOX 309
    CANOGA PARK, CALIFORNIA

ACC ABSTRACT 80 10/73

1. NAME OR DESIGNATION OF PROGRAM - SOR3

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - SOR3 IS USED FOR THE ANALYSIS OF SYMMETRICALLY LOADED SHELLS OF REVOLUTION. THE PROGRAM COMPUTES STRESSES, STRAINS, FORCES AND DEFLECTIONS PRODUCED BY THERMAL AND MECHANICAL LOADS. NORMAL AND TRANSVERSE SHEAR STRESSES AND WALL THICKNESS CHANGES ARE TAKEN INTO ACCOUNT. THE PROGRAM IS BASED ON CONSTITUTIVE EQUATIONS WHICH RETAIN TERMS THROUGH THE SECOND ORDER IN THE RATIO OF THE THICKNESS TO THE LOCAL RADII OF CURVATURE. THESE FEATURES MAKE THE PROGRAM APPLICABLE TO SHELL STRUCTURES WITH MODERATELY LARGE THICKNESS TO RADIUS RATIOS.

4. METHOD OF SOLUTION - THE NUMERICAL INTEGRATION OF THE GOVERNING DIFFERENTIAL EQUATIONS IS PERFORMED BY A VARIABLE INTERVAL SIZE ADAMS-MOULTON METHOD. THE PROBLEM IS FIRST CONVERTED FROM A TWO-POINT BOUNDARY VALUE PROBLEM TO AN INITIAL-VALUE PROBLEM. FIVE SEPARATE INTEGRATIONS WITH DIFFERENT SETS OF INITIAL CONDITIONS ARE REQUIRED. EACH INTEGRATION PROCEEDS WITH AUTOMATIC ADJUSTMENT OF INTERVAL SIZE FOR MAXIMUM SPEED WITHIN THE LIMITATION OF PRESET BOUNDS ON THE ASSOCIATED TRUNCATION ERROR.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   30 SHELLS INTO WHICH THE STRUCTURE IS DIVIDED
   30 INPUT POINTS FOR THE SHELL
   10 POINTS AT WHICH DETAILED STRESS PRINTOUT IS TO BE PROVIDED FOR BRITTLE FRACTURE PURPOSES

6. TYPICAL RUNNING TIME - AN AVERAGE TIME OF 10 SECONDS PER CASE IS REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM - SOR3 HAS A BRANCHED-SHELL OPTION WHICH AUTOMATICALLY PERFORMS THE CUT AND FIT OPERATIONS ASSOCIATED WITH THE ANALYSIS OF SUCH STRUCTURES AS A PRESSURE VESSEL CONNECTED TO A SUPPORT SKIRT. SPECIAL OUTPUT OPTIONS TAILORED TO THE NEEDS OF STRESS, FATIGUE AND BRITTLE FRACTURE DESIGN EVALUATIONS ARE AVAILABLE.

8. RELATED AND AUXILIARY PROGRAMS - SOR3 IS AN EXTENSION OF THE EARLIER SOR2 PROGRAM. ONE OF THE SOR3 OPTIONS PROVIDES FOR PUNCHED CARD OUTPUT WHICH CAN BE FED DIRECTLY TO SORSDB (ACC ABSTRACT 391), A KAPL PROGRAM WRITTEN TO FACILITATE THE CHECKING OF A GIVEN DESIGN AGAINST STRUCTURAL DESIGN BASIS CRITERIA.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
   CDC6600 VERSION OF SOR2 SUBMITTED JUNE 1968, REPLACED BY REVISED VERSION JULY 1969, REPLACED BY SOR3 FEBRUARY 1973.

10. REFERENCES - J. R. FITCH AND R. L. FAGAN, SOR-3, A PROGRAM FOR THE STRESS ANALYSIS OF SHELLS OF REVOLUTION, KAPL-M-7100(L), AUGUST 30, 1971.
J. A. MIRABAL AND D. G. DIGHT, SOR-II - A PROGRAM TO PERFORM STRESS ANALYSIS OF SHELLS OF REVOLUTION, KAPL-2292, SEPTEMBER 15, 1963.
F. C. CARLSON AND R. E. DOBSON, SORSDE, A COMPUTER PROGRAM FOR THE STRESS AND FATIGUE EVALUATION OF SHELLS OF REVOLUTION, KAPL-M-6729, APRIL 1969.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.0.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
J. R. FITCH AND R. L. FAGAN
KNOLLS ATOMIC POWER LABORATORY
GENERAL ELECTRIC COMPANY
SCHENECTADY, NEW YORK 12301

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (3232 CARDS)
SAMPLE PROBLEM (354 CARDS)
REFERENCE REPORT, KAPL-M-7100(L)

17. CATEGORY - I
KEYWORDS - STRESSES, SHELLS, SPHERES, CYLINDERS, TEMPERATURE DISTRIBUTION, SOR2 CODES, SORSDB CODES

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

JUDITH KOERNER AND C. K. SANATHANAN
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2122 CARDS)
BINARY DECK (711 CARDS)
SAMPLE PROBLEM (23 CARDS)
REFERENCE REPORTS, ANL-6716, AMDPL 1520/RE277, R149

17. CATEGORY - E
KEYWORDS - TRANSFER FUNCTIONS, FREQUENCY MEASUREMENTS

ACC ABSTRACT 136 10/73

1. NAME OR DESIGNATION OF PROGRAM - HERESY3

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - HERESY3 SOLVES THE TWO-DIMENSIONAL FEW-GROUP STATIC REACTOR EIGENVALUE PROBLEM USING THE HETEROGENEOUS (SOURCE-SINK OR FEINBURG-GALANIN) FORMALISM. THE SOLUTION YIELDS THE REACTOR K EFFECTIVE AND ABSORPTION REACTION RATES FOR EACH ROD NORMALIZED TO THE MOST ABSORPTIVE ROD IN THE THERMAL LEVEL. EPITHERMAL FISSIONS ARE ALLOWED AT EACH RESONANCE LEVEL, AND LATTICE AVERAGED VALUES OF THERMAL UTILIZATION, RESONANCE ESCAPE PROBABILITY, THERMAL AND RESONANCE ETA VALUES, AND THE FAST FISSION FACTOR ARE CALCULATED. KERNELS IN THE CALCULATION ARE BASED ON AGE DIFFUSION THEORY. BOTH FINITE REACTOR LATTICES AND INFINITELY REPEATING REACTOR SUPERCELLS MAY BE CALCULATED. ROD PARAMETERS MAY BE CALCULATED BY SEVERAL INTERNAL OPTIONS, AND A DIRECT INTERFACE IS PROVIDED TO A HAMMER SYSTEM (ACC ABSTRACT 277) LATTICE LIBRARY TAPE TO OBTAIN CELL PARAMETERS. CRITICALITY SEARCHES ARE PROVIDED ON THERMAL UTILIZATION, THERMAL ETA, AND AXIAL LEAKAGE BUCKLING.

4. METHOD OF SOLUTION - DIRECT POWER ITERATION ON MATRIX FORM OF THE HETEROGENEOUS CRITICAL EQUATION IS USED.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF-
   - 50 FLUX/GEOMETRY SYMMETRY POSITIONS
   - 20 PHYSICALLY DIFFERENT ASSEMBLIES
   - 9 RESONANCE LEVELS
   - 5000 ROD COORDINATE POSITIONS

6. TYPICAL RUNNING TIME - FINITE REACTOR LATTICE OF 50 RODS REQUIRES ABOUT 3 MINUTES, AN INFINITE SUPERCELL OF 15 RODS ABOUT 2 MINUTES, AND AN AXIAL BUCKLING CRITICALITY SEARCH ABOUT 5 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - HERESY3 IS INTERFACED TO ACCEPT CELL DATA FROM A HAMMER SYSTEM (ACC ABSTRACT 277) LATTICE LIBRARY TAPE AND CALCULATE HETEROGENEOUS ROD PARAMETERS AND MODERATOR CONSTANTS DIRECTLY.

9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1964.
   IBM7090 VERSION OF HERESY1/KERNEL SUBMITTED DECEMBER 1963, DELETED APRIL 1972.
   IBM360 VERSION OF HERESY3 SUBMITTED APRIL 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - D. R. FINCH, HERESY3 COMPUTER CODE, DP-1284, FEBRUARY 1972.
C. N. KLAHR, L. B. MENDELSOHN, AND J. HEITNER, HETEROGENEOUS REACTOR CALCULATION METHODS, FINAL REPORT, NYO-2680,

10. REFERENCES (CONTINUED)
JUNE 30, 1961.
C. N. KLAHR, L. B. MENDELSOHN, AND J. HEITNER, HETEROGENEOUS REACTOR CALCULATION METHODS, QUARTERLY PROGRESS REPORT NO. 6, NYO-2678, SEPTEMBER 30, 1960.

11. MACHINE REQUIREMENTS - 45K SINGLE-PRECISION WORDS OF HIGH SPEED CORE PLUS 50K SINGLE-PRECISION WORDS OF DISK (OR DRUM) STORAGE

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
D. R. FINCH
E. I. DU PONT DE NEMOURS
SAVANNAH RIVER LABORATORY
AIKEN, SOUTH CAROLINA 29801

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5264 CARDS)
SAMPLE PROBLEM (60 CARDS)
CONTROL INFORMATION (JCL-16 CARDS)
REFERENCE REPORT, DP-1284

17. CATEGORY - C
KEYWORDS - REACTIVITY, THERMAL UTILIZATION, RESONANCE ESCAPE PROBABILITY, 2-DIMENSIONAL, POWER DISTRIBUTION, LATTICES, THERMAL FISSION, HETEROGENEOUS REACTORS, HERESY1 CODES, HAMMER CODES

ACC ABSTRACT 141 03/72

1. NAME OR DESIGNATION OF PROGRAM - RATRAP

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE RATRAP PROGRAM COMPUTES THE DOSE RATE AT SPECIFIED SPATIAL POINTS ABOUT A SYSTEM OF SNAP GEOMETRY.

4. METHOD OF SOLUTION - AN ATTENUATION MODEL BASED ON MEAN FREE PATHS TRAVERSED ALONG A STRAIGHT LINE TRAJECTORY IS USED.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
   MAXIMUM NUMBER OF CORE-REFLECTOR SOURCE POINTS = 1000
   MAXIMUM NUMBER OF DOSE POINTS = 50 (DIMENSIONS MAY BE ENTERED IN CENTIMETERS OR INCHES)

6. TYPICAL RUNNING TIME - ABOUT 100 POINTS PER SECOND CAN BE RUN ON THE IBM7094 WHERE NUMBER OF POINTS = (NUMBER OF SOURCE POINTS) * (NUMBER OF DOSE POINTS).

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - MORTIMER (ACC ABSTRACT 142)

9. STATUS - ABSTRACT FIRST DISTRIBUTED NOVEMBER 1964.
   IBM7090 VERSION SUBMITTED FEBRUARY 1964.

10. REFERENCE - W. B. GREEN, THE RATRAP CODE - A MODIFICATION OF THE FARSE METHOD FOR SNAP SHIELD GEOMETRY, NAA@SR@MEMO@8968, SEPTEMBER 13, 1963.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN II

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
R. A. BLAINE
SUPERVISOR, REACTOR COMPUTING SYSTEMS UNIT
MATHEMATICS AND COMPUTER SCIENCES
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA

16. MATERIAL AVAILABLE -
   SOURCE DECK (1322 CARDS)
   SAMPLE PROBLEM (13 CARDS)
   REFERENCE REPORT

ACC ABSTRACT 146 10/73

1. NAME OR DESIGNATION OF PROGRAM - NPRFCCP

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090, CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - NUCLEAR FUEL CYCLE COSTS IN DOLLARS PER YEAR ($/YR), AND IN MILLS PER KILOWATT-HOUR (MILLS/KWHR) ARE COMPUTED AND TABULATED FOR EACH REGION OF A MULTIREGION REACTOR CORE, ON THE BASIS OF AEC-LEASED NUCLEAR FUEL MATERIAL AND OF PRIVATELY-OWNED NUCLEAR FUEL MATERIAL. FUEL CYCLE COSTS ARE COMPUTED SEPARATELY FOR EACH REGION OR ZONE, FOR CORE DESIGNS OF ANY CONFIGURATION OR COMBINATION OF MATERIAL DEPLETION OR ENRICHED URANIUM FUEL OR OTHER SPECIAL NUCLEAR MATERIAL. PRINTED OUTPUT OF THE PROGRAM INCLUDES (A) DETAILED FUEL CYCLE COSTS FOR EACH ZONE IN TABULAR FORM, FOR AEC-LEASED AND PRIVATELY-OWNED NUCLEAR FUEL MATERIAL, RESPECTIVELY, (B) A SUMMARY TABULATION OF NUCLEAR FUEL COSTS FOR ALL REGIONS OF THE COMPLETE CORE, INCLUDING FIXED CHARGES ON WORKING CAPITAL REQUIRED FOR CORE FABRICATION AND FOR NUCLEAR FUEL MATERIAL, (C) A SUMMARY TABULATION OF CERTAIN COMPUTED PERFORMANCE AND ECONOMIC DATA, VIZ., AVERAGE RESIDENCE TIME, ANNUAL FUEL THROUGHPUT, UNIT ELECTRICAL ENERGY YIELD, ANNUAL POWER GENERATION, AND CORE FABRICATION COSTS, AND (D) A TABULATION OF ALL INPUT DATA FOR ALL REGIONS. THE PRINTING OF DATA DESCRIBED IN (A) AND (D) ABOVE IS OPTIONAL WITH PROGRAM USE.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
   MAXIMUM NUMBER OF REGIONS OR ZONES = 10

6. TYPICAL RUNNING TIME - 1 TO 2 MINUTES ARE REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM - CERTAIN OF THE OPERATING AND ECONOMIC PARAMETERS WILL GENERALLY REMAIN CONSTANT FOR A WIDE RANGE OF REACTOR CORE DESIGNS. THEREFORE, THE PROGRAM INCLUDES A SET OF STANDARD VALUES FOR THESE PARAMETERS SO THAT THE AMOUNT OF BASIC INPUT DATA REQUIRED IS MINIMAL. THE USE OF THESE SO-CALLED STANDARD VALUES IS OPTIONAL WITH THE PROGRAM USER, AND ANY COMBINATION OF OR ALL OF THESE STANDARD VALUES MAY BE MODIFIED AS DESIRED. FUEL PROCESSING COSTS MAY BE COMPUTED FOR SPENT-FUEL MANAGEMENT PROGRAMS WHICH PROVIDE FOR THE REPROCESSING, SEPARATELY OR IN ANY COMBINATION, OF SINGLE OR MULTIPLE SPENT-FUEL BATCHES FROM ONE OR MORE REGIONS HAVING THE SAME OR DIFFERENT FINAL ENRICHMENTS. THUS, THE LOWEST COST SPENT-FUEL MANAGEMENT PROGRAM CAN BE READILY DETERMINED.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED NOVEMBER 1964.
   IBM7090 VERSION SUBMITTED JUNE 1964.
   CDC6600 VERSION SUBMITTED APRIL 1973.

10. REFERENCE - J. T. JACKMAN, GUIDE TO NUCLEAR POWER COST EVALUATION, TID-7025, APRIL 30, 1963.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN II (IBM7090), FORTRAN IV (CDC6600)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3 (CDC6600).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

7090 J. T. JACKMAN
KAISER ENGINEERS
KAISER INDUSTRIES CORPORATION
KAISER CENTER
300 LAKESIDE DRIVE
OAKLAND, CALIFORNIA 94604

6600 FRANK D. TYSON
TECHNICAL COMPUTER SERVICES
UNITED ENGINEERS AND CONSTRUCTORS, INC.
1401 ARCH STREET
PHILADELPHIA, PENNSYLVANIA 19105

16. MATERIAL AVAILABLE -
SOURCE DECKS (7090-1444 CARDS, 6600-1446 CARDS)
BINARY DECK (7090-367 CARDS)
SAMPLE PROBLEMS (7090-137 CARDS, 6600-136 CARDS)
REFERENCE REPORT, APPENDIX A

17. CATEGORY - D
KEYWORDS - FUEL CYCLE ECONOMICS, PERFORMANCE

ACC ABSTRACT 168 10/73

1. NAME OR DESIGNATION OF PROGRAM - INVERSE KINETICS (R102)

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600, IBM7094,360

3. DESCRIPTION OF PROBLEM OR FUNCTION - GIVEN THE SPACE-INDEPENDENT, ONE ENERGY GROUP REACTOR KINETICS EQUATIONS AND THE INITIAL CONDITIONS, THIS PROGRAM DETERMINES THE TIME VARIATION OF REACTIVITY REQUIRED TO PRODUCE THE GIVEN INPUT OF FLUX-TIME DATA.

4. METHOD OF SOLUTION - TIME DERIVATIVES OF NEUTRON DENSITY ARE OBTAINED BY APPLICATION OF -
   (1) FIVE-POINT QUARTIC,
   (2) THREE-POINT PARABOLIC,
   (3) FIVE-POINT LEAST-MEAN-SQUARE CUBIC,
   (4) FIVE-POINT LEAST-MEAN-SQUARE PARABOLIC, OR
   (5) FIVE-POINT LEAST-MEAN-SQUARE LINEAR
   FORMULAE TO THE NEUTRON DENSITY OR TO THE NATURAL LOGARITHM OF THE NEUTRON DENSITY. BETWEEN EACH DATA POINT THE NEUTRON DENSITY IS ASSUMED TO BE -
   (1) EXPONENTIAL*(THIRD ORDER POLYNOMIAL),
   (2) EXPONENTIAL, OR
   (3) LINEAR.
   CHANGES IN REACTIVITY BETWEEN DATA POINTS ARE OBTAINED ALGEBRAICALLY FROM THE KINETICS EQUATIONS, NEUTRON DENSITY DERIVATIVES, AND THE ALGEBRAIC REPRESENTATION OF NEUTRON DENSITY. FIRST AND SECOND TIME DERIVATIVES OF THE REACTIVITY ARE OBTAINED BY USE OF ANY OF THE FORMULAE APPLICABLE TO THE NEUTRON DENSITY.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   50 DELAY GROUPS
   1000 DATA POINTS
   99 DATA BLOCKS
   (A DATA BLOCK IS A SEQUENCE OF INPUT POINTS CHARACTERIZED BY A FIXED TIME INTERVAL BETWEEN POINTS, A SMOOTHING OPTION AND A NUMBER OF REPETITIONS OF THE SMOOTHING OPTION).

6. TYPICAL RUNNING TIME - USING SIX DELAY GROUPS, THE PROGRAM COMPUTES AND OUTPUTS APPROXIMATELY 30 POINTS PER SECOND (3600).

7. UNUSUAL FEATURES OF THE PROGRAM - THIS PROGRAM HAS BEEN USED FOR THE DETERMINATION OF FEEDBACK PARAMETERS, CONTROL ROD DESIGN AND EVALUATION OF CONTROL ROD WORTH. VARIOUS MODES OF SOLUTION ALLOW HIGH PRECISION WITH ANALYTIC DATA OR THE ANALYSIS OF DIGITALIZED DATA FROM RECORDING EQUIPMENT. SMOOTHING OF INPUT DATA MAY BE OBTAINED BY SINGLE OR REPEATED APPLICATION OF -
   (1) FIVE-POINT CUBIC,
   (2) FIVE-POINT PARABOLIC,

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
   (3) THREE-POINT LINEAR, OR
   (4) FIVE-POINT LINEAR
LEAST-MEAN-SQUARE SMOOTHING FORMULAS. TABULAR OUTPUT INCLUDES EXCESS REACTIVITY, ITS FIRST AND SECOND DERIVATIVES, INPUT AND SMOOTHED INPUT DATA, INTEGRAL OF NEUTRON DENSITY, AND INSTANTANEOUS PERIOD. PRECURSOR DATA MAY BE INPUT OR OBTAINED FROM THE PROGRAM LIBRARY. STEADY-STATE INITIAL CONDITIONS MAY BE SPECIFIED BY INPUT OF A CONSTANT REACTIVITY OR PERIOD. NON-STEADY-STATE CONDITIONS REQUIRE PRECURSOR DENSITY INFORMATION. DISCONTINUOUS CHANGES IN REACTIVITY MAY BE GIVEN AS INPUT OR CALCULATED BY THE PROGRAM. ANY NUMBER OF RERUNS WITH VARYING SOLUTION MODES AND SMOOTHING OPTIONS MAY BE SCHEDULED.

8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM SUPERCEDES RE138 AND RE171, ANL IBM704 PROGRAMS.

9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1966.
   CDC3600 VERSION SUBMITTED DECEMBER 1965, SAMPLE PROBLEM EXECUTED BY ACC.
   IBM7094 VERSION SUBMITTED DECEMBER 1965.
   IBM360 VERSION SUBMITTED FEBRUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - PRECURSOR LIBRARY IN PROGRAM IS FROM ANL-5800, SECOND EDITION, REACTOR PHYSICS CONSTANTS, JULY 1963.
   J. J. KAGANOVE, ANL-AMD PROGRAM LIBRARY REPORT R102, JUNE 1965.
   W-ANL NOTE - CHANGES MADE TO CONVERT R102+ TO FORTRAN IV.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN 63 (CDC3600), FORTRAN IV (IBM7094,360)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (3600), IBSYS VERSION 13 (7094), AND OS/360 (360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

3600,360 J. J. KAGANOVE
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

7094 C. P. SAALBACH AND P. J. RICHARD
WESTINGHOUSE ELECTRIC CORPORATION
ASTRONUCLEAR LABORATORY
P. O. BOX 10864
PITTSBURGH, PENNSYLVANIA 15236

16. MATERIAL AVAILABLE -
    SOURCE DECKS (3600-752 CARDS, 7094-814 CARDS, 360-825 CARDS)
    BINARY DECK (3600-403 CARDS)
    SAMPLE PROBLEMS (3600-525 CARDS, 360-525 CARDS)
    SAMPLE PROBLEM OUTPUT (360-27 SELECTED PAGES)
    REFERENCE REPORT AND NOTE

17. CATEGORY - E
    KEYWORDS - SPACE-INDEPENDENT KINETICS, REACTIVITY

1. NAME OR DESIGNATION OF PROGRAM - BURP4

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090

3. DESCRIPTION OF PROBLEM OR FUNCTION - BURP4 CALCULATES THE PHOTOFRACTION FOR MONOENERGETIC GAMMA RAYS INTERACTING IN SOLID CYLINDRICAL SCINTILLATION DETECTORS. PHOTOFRACTION IS DEFINED AS THE FRACTION OF INTERACTING SOURCE GAMMAS THAT ARE TOTALLY ABSORBED (INCLUDING SECONDARIES) IN THE CRYSTAL. ISOTROPIC SOURCE GEOMETRIES ALLOWED ARE ISOTROPIC POINTS (ON OR OFF-AXIS), DISKS, CYLINDRICAL VOLUMES. ALLOWED MONODIRECTIONAL SOURCES, NORMAL TO CRYSTAL FACE, ARE NARROW BEAM COLLIMATED TO CRYSTAL AXIS, BROAD BEAM ILLUMINATING ENTIRE CRYSTAL FACE, AND COLLIMATED BEAM OF ANY SPECIFIED DIAMETER.

4. METHOD OF SOLUTION - USES MONTE CARLO METHODS TO SIMULATE TRANSPORT OF GAMMAS, AND SECONDARIES (ELECTRONS AND BREMSSTRAHLUNG).

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - SOURCE ENERGY RANGE MUST BE 0.01-30 MEV. SOLID CYLINDRICAL CRYSTALS ONLY.

6. TYPICAL RUNNING TIME - 4 MEV SOURCE ENERGY (2000 PRIMARY INTERACTIONS) - APPROXIMATELY 3 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM - ESCAPE OF ELECTRONS GENERATED BY PRIMARY GAMMA PROCESSES IS DETERMINED BY SAMPLING FROM TRANSMISSION DATA. BREMSSTRAHLUNG PHOTONS ARE GENERATED AND FOLLOWED THROUGH MEDIUM. ELECTRON TRANSMISSION DATA AND BREMSSTRAHLUNG SPECTRA DATA INCLUDED IN PROGRAM FOR NAI, AND ABOVE APPROXIMATELY 3 MEV, SOME ERROR IS INTRODUCED IF CALCULATION IS MADE FOR MATERIAL OTHER THAN NAI. GAMMA RAY CROSS SECTIONS FOR NAI ARE INCLUDED IN PROGRAM, BUT OTHER CROSS SECTION DATA MAY BE READ FOR DIFFERENT SCINTILLATION MATERIALS.

8. RELATED AND AUXILIARY PROGRAMS -
   (A) FOR ABSOLUTE TOTAL EFFICIENCIES -
      (1) BURP1 ISOTROPIC POINT SOURCE ON AXIS OF SYMMETRY.
      (2) BURP2 SYMETRICALLY LOCATED ISOTROPIC DISK AND HOMOGENEOUS CYLINDRICAL VOLUME SOURCES (CAN INCLUDE SOURCE ABSORPTION AND SCATTERING).
      (3) BURP3 ISOTROPIC POINT SOURCE LOCATED OFF AXIS OF SYMMETRY.
   (B) FOR PHOTOFRACTIONS -
      (1) BURP5 WELL CRYSTAL, ALL ISOTROPIC SOURCES AND COLLIMATED SOURCES.

9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1966.
   IBM7090 VERSION SUBMITTED DECEMBER 1965.

ACC ABSTRACT 185 03/74

1. NAME OR DESIGNATION OF PROGRAM - GAMTEC2

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7090, UNIVAC1107, GE625, CDC6400

3. DESCRIPTION OF PROBLEM OR FUNCTION - GAMTEC2 GENERATES MULTIGROUP CONSTANTS IN THE ENERGY RANGE FROM 0 TO 10 MEV FOR EITHER HOMOGENEOUS MIXTURES OR HETEROGENEOUS ARRAYS CONSISTING OF CYLINDERIZED LATTICE CELLS. THE THERMAL GROUP CONSTANTS ARE AVERAGED OVER EITHER (1) WIGNER-WILKINS LIGHT MODERATOR SPECTRUM, (2) WILKINS HEAVY MODERATOR SPECTRUM, OR (3) A MAXWELLIAN DISTRIBUTION. FOR HETEROGENEOUS ARRAYS THE SPATIAL THERMAL FLUX IS CALCULATED BY A MONOENERGETIC P3 APPROXIMATION. FOR EPITHERMAL ENERGIES, THE SLOWING-DOWN DISTRIBUTION IS DESCRIBED BY EITHER A B1 OR P1 APPROXIMATION TO THE BOLTZMANN EQUATION. RESONANCE ABSORPTION AND FISSION ARE TREATED BY THE ADLER-NORDHEIM METHOD. AN IMPROVED METHOD OVER THAT IN GAM-I FOR AVERAGING THE RESONANCE ABSORPTION CONTRIBUTION TO THE MULTIGROUP CONSTANTS IS INCLUDED. FUEL LUMPING EFFECTS ON THE FAST FISSION OF U238 AND TH232 ARE TREATED BY AN N-FLIGHT COLLISION PROBABILITY TECHNIQUE. GROUP CONSTANTS ARE PUNCHED ON CARDS IN HFN (DIFFUSION CODE) AND DTF (SN TRANSPORT CODE) FORMATS.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM NUMBER OF CONCENTRIC REGIONS IN THE UNIT LATTICE CELL IS SIXTEEN. EACH REGION MAY CONTAIN UP TO TEN ISOTOPES. GROUP CONSTANTS MAY BE COMPUTED FOR ONE THERMAL GROUP AND FROM 1 TO 34 EPITHERMAL GROUPS.

6. TYPICAL RUNNING TIME - A PROBLEM REQUIRES FROM ONE TO THREE MINUTES ON THE IBM7090, DEPENDING ON THE COMPLEXITY AND OPTIONS UTILIZED, AND 20 TO 25 SECONDS ON THE CDC6400.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - GAMTEC2 COMBINES THE ATOMICS INTERNATIONAL TEMPEST (ACC ABSTRACT 50) AND THE GENERAL ATOMIC GAM1 (ACC ABSTRACT 33) CODES TO COMPUTE MULTIGROUP CONSTANTS FOR BOTH THERMAL AND EPITHERMAL NEUTRONS IN ONE OPERATION. THE GAM1 CODE HAS BEEN EXTENDED TO TREAT RESONANCE FISSION BY THE ADLER-NORDHEIM METHOD. ALSO, AN IMPROVED METHOD WAS USED FOR AVERAGING THE RESONANCE ABSORPTION CONTRIBUTION TO THE MULTIGROUP CONSTANTS.

9. STATUS - ABSTRACT FIRST DISTRIBUTED FEBRUARY 1966.
IBM7090 VERSION SUBMITTED SEPTEMBER 1965.
UNIVAC1107 VERSION SUBMITTED FEBRUARY 1967.
GE625 VERSION SUBMITTED JULY 1968.
CDC6400 VERSION SUBMITTED JANUARY 1973.

10. REFERENCES - L. L. CARTER, C. R. RICHEY AND C. E. HUGHEY, GAMTEC-II - A CODE FOR GENERATING CONSISTENT MULTIGROUP CONSTANTS UTI-

10. REFERENCES (CONTINUED)
LIZED IN DIFFUSION AND TRANSPORT THEORY CALCULATIONS, BNWL-35, MAY 1965, AND ERRATA.
C. R. RICHEY, NOTE TO USERS OF 7090 VERSION OF GAMTEC-II, FEBRUARY 1967.
C. R. RICHEY, GAMTEC-II NOTE, FEBRUARY 1967.
R. L. BRUNNENMEYER AND R. A. MICKLE, GAMTEC-II GE-625 VERSION (NE572) USERS NOTES, BECHTEL NOTE, JULY 1968.

11. MACHINE REQUIREMENTS - THE CODE REQUIRES THE USE OF TWO TAPE UNITS IN ADDITION TO THE USUAL INPUT AND OUTPUT UNITS UTILIZED IN THE IBM FORTRAN-II MONITOR SYSTEM - ONE UNIT FOR THE SINGLE DATA LIBRARY TAPE AND A SCRATCH TAPE IS MOUNTED ON THE OTHER. ALSO, AN ON-LINE CARD PUNCH IS REQUIRED. THE CDC6400 VERSION USES DISK AS SCRATCH STORAGE.

12. PROGRAMMING LANGUAGES USED - FORTRAN II AND FAP (7090) AND FORTRAN IV (1107, 625, 6400)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - FORTRAN II MONITOR SYSTEM (IBM7090), EXEC2 (UNIVAC1107), SCOPE 3.4 (CDC6400).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE GE625 VERSION HAS BEEN MODIFIED TO INCORPORATE A SIMPLE ROUTINE FOR CALCULATING DANCOFF CORRECTION FACTORS AND TO PROVIDE PUNCHED OUTPUT FOR FOG (ACC ABSTRACT 28). THE CDC6400 VERSION REQUIRES THE RUN COMPILER.

15. NAME AND ESTABLISHMENT OF AUTHORS -

7090,1107 L. L. CARTER AND C. R. RICHEY
PACIFIC NORTHWEST LABORATORIES
BATTELLE
P. O. BOX 999
RICHLAND, WASHINGTON 99352

7090,1107 C. E. HUGHEY
GENERAL ELECTRIC COMPANY
RICHLAND, WASHINGTON 99352

625 R. L. BRUNNENMEYER AND R. A. MICKLE
BECHTEL CORPORATION
50 BEALE STREET
SAN FRANCISCO, CALIFORNIA 94119

6400 R. A. RYDIN
NUCLEAR ENGINEERING DEPARTMENT
REACTOR FACILITY
UNIVERSITY OF VIRGINIA
CHARLOTTESVILLE, VIRGINIA 22901

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7090-8234 CARDS, 1107-9925 CARDS, 625-6140 CARDS,

16. MATERIAL AVAILABLE (CONTINUED)
6400-6347 CARDS)
SAMPLE PROBLEM (7090-18 CARDS, 1107-18 CARDS, 625-16 CARDS, 6400-19 CARDS)
AUXILIARY ROUTINES (625-757 CARDS, 6400-1062 CARDS)
BCD LIBRARY (12,398 CARDS)
BINARY LIBRARY (7090-FILES 3,4,5)
REFERENCE REPORT, ERRATA, AND NOTES

17. CATEGORY - B
KEYWORDS - MULTIGROUP GROUP CONSTANTS, SPECTRA, LATTICES, CYLINDERS, WIGNER-WILKINS MODEL, LIGHT MODERATORS, WILKINS EQUATION, HEAVY MODERATORS, MAXWELL DISTRIBUTION, PL METHOD, BL METHOD, THERMAL, EPITHERMAL, DANCOFF CORRECTION

ACC ABSTRACT 216 04/73

1. NAME OR DESIGNATION OF PROGRAM - FSDP3

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - FSDP3 COMPUTES POINTWISE CROSS SECTIONS FROM SINGLE-LEVEL BREIT-WIGNER RESONANCE PARAMETERS.

4. METHOD OF SOLUTION - THE CROSS SECTION AT EACH ENERGY IS COMPUTED FROM A SUMMATION OF CONTRIBUTIONS FROM A SPECIFIED NUMBER OF NEIGHBORING RESONANCES. THE CONTRIBUTION FROM EACH RESONANCE IS EXPRESSED IN TERMS OF CONVENTIONAL SYMMETRIC AND ASYMMETRIC DOPPLER LINE SHAPE FUNCTIONS WHICH ARE CALCULATED FROM CONVERGENT OR ASYMPTOTIC SERIES APPROXIMATIONS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM NUMBER OF NEUTRON ENERGIES IS 5000 WHEN THE ENDF/B FORMAT INPUT OPTION IS USED AND LIMITED ONLY BY COMPUTING TIME CONSIDERATIONS OTHERWISE. A MAXIMUM OF 3000 RESONANCES PER L-J STATE MAY BE USED WITH THE ENDF/B FORMAT INPUT OPTION AND 3000 S-WAVE RESONANCES WITH THE OLD INPUT FORMAT. THE NUMBER OF RESONANCES TO BE CONSIDERED ON EACH SIDE OF EACH NEUTRON ENERGY MAY BE THE SAME AS THE TOTAL NUMBER OF RESONANCES PER L-J STATE EXCEPT WHEN THE MULTILEVEL BREIT-WIGNER SCATTERING OPTION IS USED IN WHICH CASE A MAXIMUM OF 100 RESONANCES PER L-J STATE ON EACH SIDE IS ALLOWED. RELATIVE ORBITAL ANGULAR MOMENTUM VALUES L GREATER THAN 3 ARE NOT ALLOWED (L=0 IS AN S-WAVE INTERACTION). THE MATHEMATICAL ASSUMPTIONS NEEDED TO EXPRESS THE RESULTS IN TERMS OF THE CONVENTIONAL DOPPLER LINE SHAPE FUNCTIONS MAY BE INVALID AT VERY LOW NEUTRON ENERGIES. THE BASIC FORMULATION IS INCOMPLETE FOR THE VERY HIGH TEMPERATURES ATTAINABLE IN STARS OR IN NUCLEAR EXPLOSIONS.

6. TYPICAL RUNNING TIME - APPROXIMATELY 0.1 SECOND PER NEUTRON ENERGY IS REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM - THE TRUE NEUTRON ENERGY DEPENDENCE OF THE TOTAL RESONANCE WIDTH IS USED. THE MULTI-LEVEL BREIT-WIGNER SCATTERING OPTION IS PROGRAMMED SO THAT NO ADDITIONAL DOPPLER LINE SHAPE FUNCTION EVALUATIONS ARE REQUIRED WHEN THIS OPTION IS USED.

8. RELATED AND AUXILIARY PROGRAMS - THE FSDP2 (UNDOCUMENTED) AND THE FASDOP CODES ARE EARLIER VERSIONS OF THE FSDP3 CODE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JULY 1966.
IBM7044 VERSION OF FASDOP SUBMITTED FEBRUARY 1966, DELETED AUGUST 1972.
UNIVAC1108 VERSION OF FSDP3 SUBMITTED AUGUST 1972.

10. REFERENCES - D. R. MATHEWS, FSDP3, A COMPUTER PROGRAM FOR COMPUTING CROSS SECTIONS FROM RESONANCE PARAMETERS, GULF-GA-A12052,

10. REFERENCES (CONTINUED)
APRIL 5, 1972.
C. A. STEVENS, FASDOP, A FORTRAN IV COMPUTER PROGRAM FOR COMPUTING CROSS SECTIONS FROM RESONANCE PARAMETERS, GAMD-6562, AUGUST 9, 1965.

11. MACHINE REQUIREMENTS - 50,511 DECIMAL WORDS FOR DATA STORAGE PLUS 7995 WORDS FOR INSTRUCTIONS, A CROSS SECTION OUTPUT TAPE IS OPTIONAL, AND 2 SCRATCH FILES (TAPE OR DRUM) ARE REQUIRED.

12. PROGRAMMING LANGUAGE USED - FORTRAN V

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC-8.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - NO UNUSUAL PROGRAMMING TRICKS ARE USED. THE PROGRAM STRUCTURE CONSISTS OF A MAIN PROGRAM (FSDP3) AND FIVE SUBROUTINES (FSDP, UPDN, REVERS, QPUN, AND DELTM). ARRAY EQUIVALENCING IS USED ONLY FOR THE PUNCHED OUTPUT SUBROUTINE QPUN. SUBROUTINE DELTM CALLS A SYSTEM ROUTINE NAMED TICKER WHICH RETURNS THE TIME OF DAY IN UNITS OF 1/60 OF A SECOND. FOR A GIVEN ORBITAL ANGULAR MOMENTUM L, ONLY RESONANCES WITH THE SAME COMPOUND NUCLEUS SPIN J (AND HENCE THE SAME STATISTICAL FACTOR GJ) ARE ALLOWED TO INTERFERE. THIS MEANS THAT, IN CASES IN WHICH AN AVERAGE VALUE OF THE SPIN J HAS BEEN USED FOR CERTAIN RESONANCE LEVELS BECAUSE OF INSUFFICIENT EXPERIMENTAL DATA, ALL SUCH LEVELS WILL INTERFERE AMONG THEMSELVES WHEN THE MULTILEVEL BREIT-WIGNER SCATTERING OPTION IS USED.

15. NAME AND ESTABLISHMENT OF AUTHOR -
D. R. MATHEWS
GULF GENERAL ATOMIC COMPANY
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1063 CARDS)
SAMPLE PROBLEM (94 CARDS)
CONTROL INFORMATION (25 CARDS)
REFERENCE REPORT, GULF-GA-A12052

17. CATEGORY - A
KEYWORDS - RESONANCE CROSS SECTIONS, BREIT-WIGNER, MULTILEVEL, SCATTERING, FSDP2 CODES, FASDOP CODES

ACC ABSTRACT 224 10/73

1. NAME OR DESIGNATION OF PROGRAM - WAMPUM

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7044, CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PROGRAM CALCULATES FUEL CYCLE COSTS ON A DETAILED BASIS, USING RESULTS OF NUCLEAR DEPLETION CALCULATIONS AND CERTAIN SPECIFIED ECONOMICS ASSUMPTIONS. THE PURPOSE IS TO PROVIDE A MEASURE OF PERFORMANCE FOR COMPARING OR OPTIMIZING FUEL CYCLES AND ASSOCIATED REACTOR CORE AND FUEL ELEMENT CHARACTERISTICS.

4. METHOD OF SOLUTION - WAMPUM FOLLOWS A PROCEDURE SIMILAR TO THAT OUTLINED IN GUIDE TO NUCLEAR POWER COST EVALUATION, TID-7025, VOLUME 4, WITH SOME MODIFICATION TO PROVIDE MORE GENERALITY IN APPLICATION.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - LESS THAN 1 MINUTE IS REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM -
   (A) BOTH GOVERNMENT AND PRIVATE FUEL OWNERSHIP CONSIDERED.
   (B) CAPITAL COSTS OF FUEL CYCLE OPERATIONS ARE EVALUATED DIRECTLY, BY APPLYING AN INTEREST RATE TO THE FABRICATION COST AND INVENTORY VALUE, AND IMPLICITLY, BY HOLDING CONSTANT THE PRESENT VALUE OF EACH COST ITEM OVER THE IRRADIATION PERIOD.
   (C) PROVISION IS MADE FOR DISTINGUISHING BETWEEN FED AND BRED FUEL.
   (D) TWO FUEL PARTICLE TYPES HAVING DIFFERENT ENRICHMENTS CAN BE ACCOMMODATED WHICH PERMITS CALCULATIONS INVOLVING SEGREGATED FUEL.

8. RELATED AND AUXILIARY PROGRAMS - REVISED GAD (ACC ABSTRACT 223)

9. STATUS - ABSTRACT FIRST DISTRIBUTED JULY 1966.
   IBM7044 VERSION SUBMITTED FEBRUARY 1966.
   CDC6600 VERSION SUBMITTED APRIL 1973.

10. REFERENCE - F. W. TODT AND J. R. TRIFLETT, A GENERAL FUEL CYCLE ECONOMICS CODE, GA-5316, OCTOBER 27, 1965.

11. MACHINE REQUIREMENTS - 32K IBM7044, 3 TAPES (INPUT, OUTPUT, SYSTEM)

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - IBM7040/7044 OPERATING SYSTEM (16/32K), VERSION 9, SCOPE 3.3 (CDC6600).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

7044 F. W. TODT AND J. R. TRIPLETT
GULF GENERAL ATOMIC INCORPORATED
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112

6600 FRANK D. TYSON
TECHNICAL COMPUTER SERVICES
UNITED ENGINEERS AND CONSTRUCTORS, INC.
1401 ARCH STREET
PHILADELPHIA, PENNSYLVANIA 19105

16. MATERIAL AVAILABLE -
SOURCE DECKS (7044-1009 CARDS, 6600-1019 CARDS)
SAMPLE PROBLEMS (7044-62 CARDS, 6600-62 CARDS)
REFERENCE REPORT

17. CATEGORY - D
KEYWORDS - FUEL CYCLE ECONOMICS, DEPLETION, PERFORMANCE, FUEL ELEMENTS, REVISED GAD CODES

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
CDC3600 VERSION SUBMITTED JUNE 1966, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - A. DE VOLPI, K. G. PORGES AND G. JENSEN, COMPUTER CODE FOR REDUCTION OF COINCIDENCE COUNTING DATA, INTERNATIONAL JOURNAL OF APPLIED RADIATION AND ISOTOPES, VOL. 17, 1966.
G. JENSEN, COINC, FOR REDUCTION OF COINCIDENCE COUNTING DATA, ANL PROGRAM LIBRARY REPORT 1198/RP-258, JUNE 9, 1966.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN 63

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
A. DE VOLPI, K. G. PORGES, AND G. JENSEN
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE -
SOURCE DECK (3600-416 CARDS)
BINARY DECK (3600-217 CARDS)
SAMPLE PROBLEM (3600-31 CARDS)
REFERENCE REPORTS

17. CATEGORY - D
KEYWORDS - COINCIDENCE METHODS, STATISTICS, DECAY MEASUREMENTS, DATA PROCESSING

1. NAME OR DESIGNATION OF PROGRAM - LASER

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7094,360/370

3. DESCRIPTION OF PROBLEM OR FUNCTION - LASER IS BASED ON MODIFIED VERSIONS OF THE SLOWING-DOWN PROGRAM MUFT AND THE THERMALIZATION TRANSPORT THEORY PROGRAM THERMOS, AND PERFORMS A CALCULATION OF THE NEUTRON SPECTRUM IN A UNIFORM LATTICE MADE UP OF CYLINDRICAL RODS, CLADDING, AND SURROUNDING MODERATOR. THE THERMAL CUTOFF IN LASER IS 1.855 EV. THE PROGRAM PERFORMS A BURNUP CALCULATION FOR THE LATTICE. THE SPATIAL DISTRIBUTION OF BURNUP WITHIN THE FUEL RODS IS EXPLICITLY CALCULATED. THE PROGRAM WILL, AT OPTION, ACCOUNT FOR ALL NON-LINEARITIES AND MUTUAL CONNECTIONS IN THE SYSTEM OF BURNUP EQUATIONS. THIS CALCULATION ACCOUNTS FOR THE VARIATION OF THE NEUTRON FLUX IN SPACE AND ENERGY DURING EACH TIME-STEP. A BUCKLING AND A BORON POISON SEARCH (CRITICALITY SEARCH) ARE PROVIDED AS OPTIONS. OUTPUT INCLUDES EDITS IN THE ENERGY RANGE ZERO LESS THAN OR EQUAL TO E LESS THAN OR EQUAL TO 0.625 EV.

4. METHOD OF SOLUTION - THE METHODS USED IN SOLVING THE NEUTRON TRANSPORT EQUATION ARE ESSENTIALLY THOSE UTILIZED BY THE MUFT AND THERMOS PROGRAMS. THE NON-LINEAR EFFECTS IN THE BURNUP EQUATIONS ARE ACCOUNTED FOR BY COMPUTING THE RATE OF CHANGE OF THE NEUTRON FLUX WITH TIME AND BY USING THE RUNGE-KUTTA NUMERICAL PROCEDURE TO RECOVER THE FLUX AS A FUNCTION OF TIME. THE DEPLETION EQUATIONS ARE SOLVED BY ASSUMING A POLYNOMIAL EXPANSION FOR EXPONENTIAL FUNCTIONS. THE PRODUCTION AND LOSS OF CHAIN MEMBERS DURING IRRADIATION ARE EVALUATED BY SIMPLE MATRIX ALGEBRA. THE PROCEDURE ALLOWS FOR A TIME-DEPENDENT FLUX, IN THE FORM OF A POWER SERIES.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THIS VERSION OF LASER IS RESTRICTED TO ONE-DIMENSIONAL, CYLINDRICAL GEOMETRY. THE MAXIMUM NUMBER OF SPACE POINTS IS 14, WITH A MAXIMUM OF 5 SPACE POINTS IN THE FUEL REGION. THE CODE IS RESTRICTED TO 4 MIXTURES (FUEL, CLADDING, MODERATOR, AND NON-ABSORBING HEAVY SCATTERER). THE MODERATOR CAN BE EITHER LIGHT WATER (NELKIN OR FREE GAS SCATTERING KERNEL), OR HEAVY WATER (NELKIN SCATTERING KERNEL). THE CLADDING MATERIAL CAN BE STAINLESS STEEL, ALUMINUM OR ZIRCALLOY-2. THE FUEL CAN BE A METAL, OXIDE OR CERMET. THE EPITHERMAL AND FAST ENERGY RANGES INCLUDE 50 ENERGY GROUPS. THE THERMAL RANGE INCLUDES 35 ENERGY GROUPS. ONLY THE U235 CHAIN (THROUGH U236) AND THE U238 CHAIN (THROUGH PU242) ARE AVAILABLE IN THE CODE. THE FISSION PRODUCTS ARE SEPARATED INTO XE135, THE DIRECTLY PRODUCED SM149, AND ALL OTHER FISSION PRODUCTS LUMPED INTO ONE PSEUDO FISSION PRODUCT. THE CROSS SECTIONS FOR THE LUMPED FISSION PRODUCTS ARE REPRESENTED BY POLYNOMIALS IN THE BURNUP. THE SPATIAL DISTRIBUTION OF U238 RESONANCE CAPTURES WITHIN THE FUEL RODS IS INPUT.

6. TYPICAL RUNNING TIME - THE GREATER PART OF THE LASER EXECUTION TIME IS CONSUMED BY THE THERMOS CALCULATION. EXECUTION TIMES FOR

6. TYPICAL RUNNING TIME (CONTINUED)
NO-BURNUP CASES ARE APPROXIMATELY 1-2 MINUTES WHEN THE MAXIMUM NUMBER OF SPACE POINTS IS SPECIFIED. FOR A BURNUP PROBLEM, EXECUTION TIME IS 1-2 MINUTES WHEN THE LINEAR APPROXIMATION IS CHOSEN, AND 4-6 MINUTES WHEN NON-LINEAR EFFECTS ARE INCLUDED.

7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM PROVIDES A COMPLETE EDIT FOR THE LATTICE IN THE ENERGY RANGE ZERO LESS THAN OR EQUAL TO E LESS THAN OR EQUAL TO TEN MEV, INCLUDING INTEGRAL QUANTITIES AND HOMOGENIZED FEW-GROUP CROSS SECTIONS. THE USER HAS A CHOICE OF THERMAL NEUTRON SCATTERING KERNELS, RESONANCE SELF-SHIELDING TREATMENTS, AND CELL CRITICALITY SEARCHES. A LINEAR AND A NON-LINEAR TREATMENT OF THE BURNUP EQUATIONS ARE PROVIDED. THE DETAILED SPATIAL BURNUP DISTRIBUTION WITHIN THE FUEL RODS IS TAKEN INTO ACCOUNT. A BURNUP PROBLEM CAN BE CONTINUED AFTER ANY TIME-STEP, BY USING A SPECIAL INPUT DECK PUNCHED AFTER EACH TIME-STEP.

8. RELATED AND AUXILIARY PROGRAMS - LIBP4 GENERATES THE THERMAL LIBRARY TAPE. SIG1 CONVERTS, BY INTERPOLATION, THE CROSS SECTION DATA CORRESPONDING TO A GIVEN ENERGY MESH TO CROSS SECTION DATA SUITABLE FOR INPUT TO THE LIBP4 PROGRAM.

9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
IBM7094 VERSION SUBMITTED AUGUST 1966.
IBM360 VERSION SUBMITTED FEBRUARY 1973, REPLACED SEPTEMBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - C. G. PONCELET, BURNUP PHYSICS OF HETEROGENEOUS REACTOR LATTICES, WCAP-6069, JUNE 1965.
C. G. PONCELET, LASER - A DEPLETION PROGRAM FOR LATTICE CALCULATIONS BASED ON MUFT AND THERMOS, WCAP-6073, APRIL 1966.
LASER, ACC NO. 249.360, ACC PROGRAMMING NOTE 74-7, OCTOBER 1973.

11. MACHINE REQUIREMENTS - 32K IBM7094,7090,7094-II WITH OVERLAY TAPE, LIBRARY TAPE, AND 3 SCRATCH TAPES. 15CK IBM360 WITH LIBRARY TAPE AND 2 SCRATCH UNITS.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV (IBM7094,360), LIBRARY (IBM7094) IN MAP

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - STANDARD IBM FORTRAN IV MONITOR (IBM7094), OS/360 (IBM360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
7094 C. G. PONCELET
ATOMIC POWER DIVISIONS
PWR PLANTS DIVISION
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 355

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
PITTSBURGH, PENNSYLVANIA 15230

360 C. E. CARSON
NUCLEAR ENGINEERING BRANCH
TENNESSEE VALLEY AUTHORITY
303 POWER BUILDING
CHATTANOOGA, TENNESSEE 37401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (LASER 7094-5844 CARDS, 360-7762 CARDS, LIBP 7094-422 CARDS, 360-385 CARDS, SIG1 7094-170 CARDS, 360-165 CARDS)
SAMPLE PROBLEMS (LASER 7094-17 CARDS, 360-15 CARDS, LIBP 7094-1498 CARDS, 360-1496 CARDS)
LIBRARIES (LASER 7094-2664 CARDS, 360-140 BINARY RECORDS)
LOAD MODULE LASER.LOAD (360-320 BLOCKS)
CONTROL INFORMATION (JCL 360-24 CARDS)
REFERENCE REPORTS AND ACC NOTE

17. CATEGORY - B
KEYWORDS - SLOWING DOWN, THERMALIZATION, SPECTRA, LATTICES, DEPLETION, 1-DIMENSIONAL, CYLINDERS, CRITICALITY SEARCHES, LIBP4 CODES, SIG1 CODES

ACC ABSTRACT 255 10/73

1. NAME OR DESIGNATION OF PROGRAM - R101

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600, IBM7094,360

3. DESCRIPTION OF PROBLEM OR FUNCTION - R101 SOLVES THE SPACE-INDEPENDENT, ONE-ENERGY GROUP REACTOR KINETICS EQUATIONS TO DETERMINE THE TIME VARIATION OF NEUTRON DENSITY GIVEN SPECIFIED INITIAL CONDITIONS. ANY OF FOUR PROGRAMMED REPRESENTATIONS OF EXCESS REACTIVITY CAN BE SELECTED.

4. METHOD OF SOLUTION - THE METHOD OF SOLUTION WAS ORIGINALLY DESCRIBED IN ANL-5577.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
   MAXIMUM NUMBER OF DELAY GROUPS = 20

6. TYPICAL RUNNING TIME - APPROXIMATELY 360 CALCULATIONS PER SECOND CAN BE PERFORMED ON THE CDC3600.

7. UNUSUAL FEATURES OF THE PROGRAM - AN INTERRUPT FACILITY IS INCORPORATED WHICH PERMITS PARAMETER CHANGES AND EDIT OR TERMINATION WHEN A SPECIFIED VALUE OF A PARAMETER IS ATTAINED.

8. RELATED AND AUXILIARY PROGRAMS - R102 (ACC ABSTRACT 168) IS THE INVERSE PROGRAM.

9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
   CDC3600 VERSION SUBMITTED OCTOBER 1966, SAMPLE PROBLEM EXECUTED BY ACC.
   IBM7094 VERSION SUBMITTED NOVEMBER 1966.
   IBM360 VERSION SUBMITTED FEBRUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - J. J. KAGANOVE, REACTOR KINETICS, R101 AMD PROGRAM LIBRARY REPORT, OCTOBER 7, 1964.
    R. C. BRITTAN, SOME PROBLEMS IN THE SAFETY OF FAST REACTORS, ANL-5577, MAY 1956.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN 63 (CDC3600) AND FORTRAN IV (IBM7094,360)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC3600), IBSYS (IBM7094), OS/360 (IBM360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
    3600,360 J. J. KAGANOVE
    APPLIED MATHEMATICS DIVISION

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

7094 L. I. ORTENBERG AND P. J. SIPUSH
WESTINGHOUSE ASTRONUCLEAR LABORATORY
P. O. BOX 10864
PITTSBURGH, PENNSYLVANIA 15236

16. MATERIAL AVAILABLE -
SOURCE DECKS (3600-439 CARDS, 7094-392 CARDS, 360-450 CARDS)
BINARY DECK (3600-165 CARDS)
SAMPLE PROBLEMS (3600-36 CARDS, 7094-36 CARDS,360-36 CARDS)
REFERENCE REPORT, AMD PROGRAM LIBRARY REPORT

17. CATEGORY - E
KEYWORDS - SPACE-INDEPENDENT KINETICS, REACTIVITY

ACC ABSTRACT 265 04/73

1. NAME OR DESIGNATION OF PROGRAM - RSAC

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - RSAC GENERATES A FISSION PRODUCT INVENTORY FROM A GIVEN SET OF REACTOR OPERATING CONDITIONS AND THEN COMPUTES THE EXTERNAL GAMMA DOSE, THE DEPOSITION GAMMA DOSE, AND/OR THE INHALATION-INGESTION DOSE TO CRITICAL BODY ORGANS AS A RESULT OF EXPOSURE TO THESE FISSION PRODUCTS. PROGRAM OUTPUT INCLUDES REACTOR OPERATING HISTORY, FISSION PRODUCT INVENTORY, DOSAGES, AND INGESTION PARAMETERS.

4. METHOD OF SOLUTION - THE FISSION PRODUCT INVENTORY GENERATED BY THE REACTOR OPERATING CONDITIONS AND THE INVENTORY REMAINING AT VARIOUS TIMES AFTER RELEASE ARE COMPUTED USING THE EQUATIONS OF W. RUBINSON IN JOURNAL OF CHEMICAL PHYSICS, VOL. 17, PAGES 542-547, JUNE 1949. THE EXTERNAL GAMMA DOSE AND THE DEPOSITION GAMMA DOSE ARE CALCULATED BY DETERMINING DISINTEGRATION RATES AS A FUNCTION OF SPACE AND TIME AND THEN INTEGRATING USING HERMITES NUMERICAL TECHNIQUES FOR THE SPATIAL DEPENDENCE. THE INHALATION-INGESTION DOSE IS DETERMINED BY THE TYPE AND QUANTITY OF ACTIVITY INHALED AND THE BIOLOGICAL RATE OF DECAY FOLLOWING INHALATION. THESE QUANTITIES ARE INTEGRATED WITH RESPECT TO TIME TO OBTAIN THE DOSAGE. THE INGESTION DOSE IS RELATED TO THE INHALATION DOSE BY AN INPUT CONSTANT.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - ABOUT 6 MINUTES ARE REQUIRED TO RUN BOTH SAMPLE PROBLEMS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED APRIL 1967.
IBM7040 (MAP) VERSION SUBMITTED JANUARY 1967, DELETED AUGUST 1968.
IBM7040 (FORTRAN) VERSION SUBMITTED AUGUST 1968, DELETED JULY 1972.
IBM360 VERSION SUBMITTED JULY 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - R. L. COATES AND N. R. HORTON, RSAC - A RADIOLOGICAL SAFETY ANALYSIS COMPUTER PROGRAM, IDO-17151, MAY 1966.
L. C. RICHARDSON, USERS MANUAL FOR FORTRAN VERSION OF RSAC, A RADIOLOGICAL SAFETY ANALYSIS COMPUTER PROGRAM, IDO-17261, MAY 1968.

11. MACHINE REQUIREMENTS - 150K BYTES AND 1 TAPE DRIVE

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

L. C. RICHARDSON
AEROJET NUCLEAR CORPORATION
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECK (2344 CARDS)
    SAMPLE PROBLEM (965 CARDS)
    CONTROL INFORMATION (JCL 63 CARDS)
    LOAD MODULE (120 BLOCKS)
    REFERENCE REPORTS

17. CATEGORY - G
    KEYWORDS - RADIOACTIVITY, CONTINUOUS RELEASE, INSTANTANEOUS RELEASE, FISSION PRODUCTS, ATMOSPHERE, DOSE RATES

ACC ABSTRACT 275 12/73

NAME OR DESIGNATION OF PROGRAM - PDQ7

COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360

DESCRIPTION OF PROBLEM OR FUNCTION - PDQ7 SOLVES FEW-GROUP NEUTRON DIFFUSION-DEPLETION PROBLEMS IN ONE, TWO, AND THREE DIMENSIONS. ADJOINT SOLUTIONS ARE ALSO AVAILABLE AND TWO OVERLAPPING THERMAL GROUPS MAY BE USED IN ONE AND TWO-DIMENSIONAL PROBLEMS. EITHER POINTWISE OR REGIONWISE DEPLETION MAY BE PERFORMED USING THE HARMONY DEPLETION SYSTEM. THE GEOMETRY MAY BE RECTANGULAR, CYLINDRICAL, OR SPHERICAL IN ONE DIMENSION, RECTANGULAR, CYLINDRICAL, OR HEXAGONAL IN TWO DIMENSIONS, AND RECTANGULAR OR HEXAGONAL IN THREE DIMENSIONS. ALL GEOMETRIES PROVIDE FOR VARIABLE MESH SPACING IN ALL DIMENSIONS. ZERO FLUX, ZERO CURRENT, AND ROTATIONAL SYMMETRY BOUNDARY CONDITIONS ARE AVAILABLE, AND BOUNDARY VALUE PROBLEMS MAY BE SOLVED BY SPECIFYING THE FLUX VALUES ON ONE OR MORE BOUNDARIES. THE BETTIS REVISED PDQ7 MAY BE USED TO ALSO SOLVE ADDITIVE FAST-SOURCE AND SIMPLIFIED PL PROBLEMS AS WELL AS THE THREE-DIMENSIONAL SYNTHESIS EIGENVALUE PROBLEM. CONTROL SEARCHES, THERMAL FEEDBACK, AND XENON FEEDBACK ARE OPTIONAL. THE IBM360 AND VERSION CAN BE USED TO SOLVE THREE-DIMENSIONAL SYNTHESIS PROBLEMS.

METHOD OF SOLUTION - DIFFERENCE EQUATIONS ARE OBTAINED AT EACH POINT BY INTEGRATING THE DIFFERENTIAL EQUATIONS OVER AN APPROPRIATE MESH ELEMENT. THE RESULTING EQUATIONS ARE THREE-POINT, FIVE-POINT, AND SEVEN-POINT IN ONE, TWO, AND THREE DIMENSIONS EXCEPT FOR HEXAGONAL GEOMETRY, WHERE THE NUMBER OF POINTS IS INCREASED BY TWO. THE GROUP EQUATIONS ARE SOLVED USING A SINGLE-LINE CYCLIC CHEBYSHEV SEMI-ITERATIVE TECHNIQUE AND THE SOURCE ITERATIONS ARE ACCELERATED BY A PROCEDURE BASED ON CHEBYSHEV POLYNOMIALS.

RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE TOTAL NUMBER OF GROUPS IS LIMITED TO 5. THE PRODUCT OF GROUPS AND POINTS CANNOT EXCEED 300,000 AND THE PLANE SIZE IN THREE-DIMENSIONAL PROBLEMS IS RESTRICTED TO 8000 POINTS. FOR THE BETTIS REVISED PDQ7 SIX EQUATIONS MAY BE SOLVED WHEN THE FAST GROUP TREATMENT IS SIMPLIFIED P3. THERE ARE VERY FEW FIXED CONSTRAINTS ON SPATIAL PROBLEM SIZES. THE BETTIS REVISED PDQ7 HAS SUCCESSFULLY RUN EXPLICIT THREE-DIMENSIONAL PROBLEMS UP TO ABOUT 800,000 GROUP POINTS. THREE-DIMENSIONAL SYNTHESIS PROBLEMS UP TO 15,000,000 GROUP POINTS HAVE ALSO BEEN EXECUTED SUCCESSFULLY.

TYPICAL RUNNING TIME - THE RUNNING TIME IN HOURS MAY BE ESTIMATED BY DIVIDING THE PRODUCT OF GROUPS AND POINTS BY 150000. THE ACTUAL TIME MAY VARY WIDELY FROM THIS ESTIMATE DUE EITHER TO SPECIAL CONVERGENCE DIFFICULTIES OR TO THE COMPLEXITY OF THE DEPLETION FORMULATION. SAMPLE PROBLEM RUNNING TIME ON THE 360/195 IS ABOUT 4 MINUTES.

UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - HARMONY TABLE SETS MAY BE INPUT ON CARDS OR MAY BE OBTAINED FROM A FILE GENERATED BY A CROSS SECTION PROGRAM. ON REQUEST, PDQ7 WILL PREPARE OUTPUT FILES CONTAINING FLUX, CONCENTRATION, POWER, INTEGRAL, GEOMETRY, AND SYNTHESIS INTEGRAL DATA, AND THESE FILES MAY BE FURTHER PROCESSED IN AUXILIARY PROGRAMS. THE BETTIS VERSION OF PDQ7 USES THE NEW BETTIS ENVIRONMENTAL ROUTINES, WHICH HAVE NOT YET BEEN RELEASED. THE B+W VERSION USES THE B+W VERSION OF THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
CDC6600 (BETTIS) VERSION SUBMITTED MAY 1967, REPLACED BY UPDATED VERSION JUNE 1971.
IBM360 (IBM) VERSION SUBMITTED FEBRUARY 1969, DELETED NOVEMBER 1971.
CDC6600 (BABCOCK AND WILCOX) VERSION SUBMITTED FEBRUARY 1970.
IBM360 (AEROJET NUCLEAR) VERSION SUBMITTED APRIL 1970, REVISED APRIL 1971, REPLACED BY THIRD REVISION AUGUST 1972, REVISED MARCH 1973, SAMPLE PROBLEM EXECUTED BY ACC.
CDC6600 KRONOS (BOEING) VERSION SUBMITTED JULY 1973.

10. REFERENCES - W. R. CADWELL, PDQ-7 REFERENCE MANUAL, WAPD-TM-678, JANUARY 1967.
R. J. BREEN, O. J. MARLOWE, AND C. J. PFEIFER, HARMONY - SYSTEM FOR NUCLEAR REACTOR DEPLETION COMPUTATION, WAPD-TM-478, JANUARY 1965.
OUTPUT FOR THE BETTIS CDC-6600 REVISED VERSION OF PDQ7, 1971.
C. J. PFEIFER, PDQ-7 REFERENCE MANUAL II, WAPD-TM-947(L), FEBRUARY 1971.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
INSTALLATION OF PDQ-7 ON THE CDC 6600 IN CONJUNCTION WITH MODEL, CDC NOTE, 1971.
A. W. BROWN, J. A. MCCLURE, AND R. J. WAGNER, SUMMARY OF PDQ-7 (IBM-360-370 VERSION) INPUT DATA REQUIREMENTS AND OPERATING PROCEDURES, ANCR-1061, MARCH 1972.
PDQ-7 TRANSMITTAL TAPE (ACC NO. 275.360D), ANC NOTE, 1972.
R. J. WAGNER, OPERATIONAL NOTES FOR PDQ-7/14, ACC NO. 275.360D, ANC NOTE, 1972.
UPD, A PROGRAM TO UPDATE SOURCE DECKS, ANC NOTE P01750.
NRTS ENVIRONMENTAL SUBROUTINE MANUAL, ANC DOCUMENT, DECEMBER 1972.
PDQ7, ACC NO. R275.6600D, ARGONNE CODE CENTER PROGRAMMING NOTE 74-16, DECEMBER 3, 1973.

11. MACHINE REQUIREMENTS - THE CENTRAL MEMORY SIZE FOR THE BETTIS VERSION MUST BE AT LEAST 64K AND THERE MUST BE FOUR NON-SYSTEM DISKS, EACH ON ITS OWN CHANNEL. THE 360 VERSION REQUIRES AT LEAST 400K BYTES OF CORE AND MODEL 2314 OR 3330 DISK PACKS.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT (6600), FORTRAN IV(H) AND BAL (360)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.0 (BETTIS REV.), SCOPE 3.1.6 (B+W 6600), OS/360(360), AND KRONOS 2.0 (BCS 6600).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE REQUIRED SOFTWARE ENVIRONMENT IS DESCRIBED IN REFERENCE 5. IT INCLUDES ROUTINES FOR PROGRAM LOADING, INPUT CONVERSION AND PROCESSING, STORAGE AND RETRIEVAL OF PERMANENT FILES, SCRATCH INPUT/OUTPUT, AND STORAGE ALLOCATION. CALL REMARK IN SUBROUTINE CASENN REFERS TO A 6600 SYSTEM ROUTINE FOR DISPLAY OF MESSAGES ON THE OPERATOR SCOPE. CALL TICK REFERS TO A 6600 SYSTEM ROUTINE FOR LOGGING JOB TIME USED. SUBSTITUTE ROUTINES WILL BE REQUIRED FOR USE OF THIS PROGRAM ON OTHER MACHINES.

15. NAME AND ESTABLISHMENT OF AUTHORS -

6600 W. R. CADWELL AND C. J. PFEIFER
WESTINGHOUSE ELECTRIC CORPORATION
BETTIS ATOMIC POWER LABORATORY
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

360 R. J. CREASY
INTERNATIONAL BUSINESS MACHINES CORPORATION
2670 HANOVER STREET
PALO ALTO, CALIFORNIA 94304

360 R. J. WAGNER, J. A. MCCLURE, AND A. W. BROWN
COMPUTER SCIENCE BRANCH
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

6600 B+W M. L. DECH AND R. W. MCCRANEY
CONTROL DATA CORPORATION
G. R. POETSCHAT AND G. L. RUSSELL
THE BABCOCK + WILCOX COMPANY
POWER GENERATION DIVISION
P. O. BOX 1260
LYNCHBURG, VIRGINIA 24505

6600 KRONOS F. M. KNOX
BOEING COMPUTER SERVICES, INC.
P. O. BOX 24346
SEATTLE, WASHINGTON 98124

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL (BETTIS 6600-3 TAPES, B+W 6600-2 TAPES, AEROJET 360-1 TAPE, BCS 6600-1 TAPE)
SOURCE DECKS (BETTIS 6600-51,497 CARDS, B+W 6600-27,446 CARDS,

16. MATERIAL AVAILABLE (CONTINUED)
AEROJET 360-38,258 CARDS)
UPDATE FILES (BOEING UPDATE OLDPL OF PDC7 6600-238 RECORDS, UPDATE OLDPL OF BETTIS ENVIRONMENTAL ROUTINES 6600-130 RECORDS, MODIFY CPL OF PDQ,MFN,CATLIST 6600-20 RECORDS)
IBM 2314 LOAD MODULE (AEROJET PDS PDQTRNMT 360-1811 BLOCKS)
SAMPLE PROBLEMS (BETTIS 6600-80 CARDS, AEROJET 360-761 CARDS, B+W 6600-69 CARDS)
AUXILIARY PROGRAMS (AEROJET BUFR 246 CARDS, PDQDI 41 CARDS, PDQD 148 CARDS, PDQR 107 CARDS, PDQTL 53 CARDS, MISCELLANEOUS 3127 CARDS)
FLUX FILES (AEROJET 360-137 BLOCKS)
SAMPLE PROBLEM OUTPUT LISTINGS (BETTIS 6600-36 PAGES, AEROJET 360-89 PAGES)
REFERENCE REPORTS, WAPD-TM-678, WAPD-TM-668, WAPD-TM-947(L), ANCR-1061, NRTS MANUAL, AND NOTES

17. CATEGORY - D
KEYWORDS - DEPLETION, DIFFUSION EQUATIONS, 1-DIMENSIONAL, SLABS, CYLINDERS, SPHERES, 2-DIMENSIONAL, HEXAGONAL, X-Y, R-Z, 3-DIMENSIONAL, X-Y-Z, SYNTHESIS, FEW-GROUP, SEARCHES, HARMONY CODES, UPD CODES, BUFR CODES, PDQDI CODES, PDQD CODES, PDQR CODES, PDQTL CODES

ACC ABSTRACT 282 10/73

1. NAME OR DESIGNATION OF PROGRAM - SEALSHELL2 (M0110)

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE SEALSHELL2 PROGRAM DETERMINES STRESSES, STRAINS, DEFLECTIONS, AND REACTIONS IN A THICK SHELL OF REVOLUTION WITH AXISYMMETRIC LOADING. THE LOADING CONSISTS OF A TEMPERATURE DISTRIBUTION, INSIDE AND OUTSIDE PRESSURE DISTRIBUTIONS, AND CIRCUMFERENTIAL FORCES AND MOMENTS APPLIED TO THE MIDDLE SURFACE. THE SHELL IS LINEAR-ELASTIC WITH TENSILE, BENDING, AND SHEAR STRAINS.

4. METHOD OF SOLUTION - THE SHELL IS DIVIDED INTO 2 TO 100 SEGMENTS. EACH SEGMENT IS SUBJECTED TO 11 DEFORMATION SHAPES, WHOSE MAGNITUDES ARE CALCULATED BY THE PRINCIPLE OF VIRTUAL WORK. THAT IS, FOR SMALL VIRTUAL CHANGES IN MAGNITUDE, THE CHANGES IN STRAIN ENERGY AND EXTERNAL WORK ARE DETERMINED. THEN EQUATING THE ENERGY TO THE WORK GIVES A SET OF SIMULTANEOUS EQUATIONS WHICH MAY BE SOLVED FOR THE MAGNITUDES.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   100 SEGMENTS
   11 DEFORMATION SHAPES PER SEGMENT

6. TYPICAL RUNNING TIME - EXECUTION TIME ON AN IBM360/40 IS 0.7 MINUTES PER ELEMENT.

7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM WILL HANDLE THICK SHELLS OF REVOLUTION, AS WELL AS THE USUAL THIN SHELL STRUCTURES. AS DISCUSSED IN ADDENDUM I, AN OPTION ALLOWS THE REQUESTOR TO INPUT INFLUENCE COEFFICIENTS OF THE FLEXIBILITY MATRIX OF ANY SEGMENT. THE COEFFICIENTS MAY BE FOR ANY AXISYMMETRIC STRUCTURE, SUCH AS A TUBE SHEET IN A HEAT EXCHANGER. IN THIS WAY, DIFFERENT BRANCHES OF SHELLS MAY BE CONNECTED TOGETHER. ANOTHER APPLICATION IS TO CONDENSE A GROUP OF SEGMENTS INTO A SINGLE ELEMENT WHICH MAY BE USED IN A SERIES OF PROBLEMS AND SO CUT DOWN RUNNING TIME ON THE COMPUTER. ALSO, USING THE CONDENSED GROUPS OF SEGMENTS AS A SINGLE SEGMENT ALLOWS THE USER TO SPECIFY MORE ELEMENTS IN THE ANALYSIS OF A CRITICAL REGION IN THE SHELL.

8. RELATED AND AUXILIARY PROGRAMS - THE CDC6600 VERSION A USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
   CDC6600 VERSION A SUBMITTED AUGUST 1967, REVISED JULY 1969.
   IBM360 VERSION SUBMITTED JANUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.
   CDC6600 VERSION B SUBMITTED NOVEMBER 1972.

10. REFERENCES - C. M. FRIEDRICH, SEAL-SHELL-2, A COMPUTER PROGRAM FOR THE STRESS ANALYSIS OF A THICK SHELL OF REVOLUTION WITH AXISYMMETRIC PRESSURES, TEMPERATURES, AND DISTRIBUTED LOADS, WAPD-TM-398, DECEMBER 1963, ADDENDUM I, APRIL 1967, AND ADDENDUM II, JUNE 1969.

C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.

L. MORAN, EXCERPT FROM WESTINGHOUSE TELE-COMPUTER CENTER STANDARDS AND FACILITIES REPORT, 1969.

DOCUMENTATION DIFFERENCES PERTAINING TO WTSC VERSION OF SEALSHELL2, WTSC NOTE, NOVEMBER 1972.

11. MACHINE REQUIREMENTS - 32K MEMORY (CDC6600), 185K BYTES MEMORY (IBM360)

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 2.0 (CDC6600) AND OS/360 (IBM360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - AN OPTION IS INCLUDED TO PLOT THE SHELL GEOMETRY ON THE CDC280 MICROFILM RECORDER WITH THE 6600 VERSION A OR ON THE CALCOMP663 WITH THE 360 VERSION. THE 6600 VERSION B INCLUDES AN OPTION FOR A SHELL GEOMETRY PLOT AND A STRESS PLOT ON EITHER THE CALCOMP OR THE DATAGRAPHIX PLOTTER USING THE WTSC PLOT PACKAGE OF SUBROUTINES WHICH ARE IN THE WTSC LIBRARY AND ARE DESCRIBED IN REFERENCE 3, BUT ARE NOT INCLUDED IN THE SOURCE DECK. THESE SUBROUTINES INCLUDE PLOT1, PLOT2, PLOT3, LINE, RAISE, PRESET, WXACNV, WXLABL, PSCHR, AND PDVICE. THE PROGRAM WILL RUN WITHOUT PLOTS IF THESE SUBROUTINES ARE DUMMIED OUT.

15. NAME AND ESTABLISHMENT OF AUTHORS -

6600A C. M. FRIEDRICH
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

360 P. G. GARSIDE
STEARNS-ROGER INCORPORATED
700 SOUTH ASH
P. O. BOX 5888
DENVER, COLORADO 80217

6600B W. P. KUNKEL
MANAGER, APPLICATION SUPPORT
WESTINGHOUSE TELE-COMPUTER SYSTEMS CORPORATION
2040 ARDMORE BOULEVARD
PITTSBURGH, PENNSYLVANIA 15221

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL

16. MATERIAL AVAILABLE (CONTINUED)
SOURCE DECKS (6600A-1999 CARDS, 360-2059 CARDS, 6600B-2202 CARDS)
SAMPLE PROBLEMS (6600A-31 CARDS, 360-31 CARDS, 6600B-31 CARDS)
SAMPLE PROBLEM OUTPUT (25 SELECTED PAGES)
REFERENCE REPORTS, WAPD-TM-398, ADDENDUM I, ADDENDUM II, EXCERPT, AND NOTE

17. CATEGORY - I
KEYWORDS - STRESSES, SHELLS, PRESSURE DISTRIBUTION, TEMPERATURE DISTRIBUTION, DEFORMATION, ELASTICITY

15. NAME AND ESTABLISHMENT OF AUTHOR -
Y. D. NALIBOFF
GULF GENERAL ATOMIC INCORPORATED
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112

16. MATERIAL AVAILABLE -
SOURCE DECK (1108-358 CARDS)
REFERENCE REPORT

17. CATEGORY - B
KEYWORDS - ELASTIC SCATTERING CROSS SECTIONS, HEXAGONAL LATTICES, ANISOTROPIC SCATTERING, AVERAGES

ACC ABSTRACT 292 10/73

1. NAME OR DESIGNATION OF PROGRAM - PSEUDC

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - RESONANCE PARAMETERS ARE CONSTRUCTED FROM AVERAGE NUCLEAR PROPERTIES IN THE RESOLVED RESONANCE REGION.

4. METHOD OF SOLUTION - RANDOM SAMPLING TECHNIQUES ARE USED TO SELECT FROM ASSUMED DISTRIBUTION FUNCTIONS FOR LEVEL SPACINGS AND WIDTHS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   500 LADDERS
   4000 RESONANCES PER LADDER

6. TYPICAL RUNNING TIME - 9 SECONDS ARE REQUIRED FOR ONE LADDER OF 1248 RESONANCES.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - OUTPUT DATA MAY BE PREPARED FOR THE GAM2, GAROL (ACC ABSTRACT 219), OR GAP (ACC ABSTRACT 316) PROGRAMS.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
   UNIVAC1108 VERSION SUBMITTED JULY 1967.
   IBM360 VERSION SUBMITTED JUNE 1969, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCE - M. W. DYOS, CONSTRUCTION OF STATISTICAL RESONANCES IN THE UNRESOLVED RESONANCE REGION, THE PSEUDO CODE, GA-7136, MAY 26, 1966.

11. MACHINE REQUIREMENTS - 15K MEMORY

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC II (UNIVAC1108), OS/360 (IBM360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE USER CAN CHOOSE EITHER TWO OR THREE DEGREES OF FREEDOM FOR THE DISTRIBUTION OF FISSION WIDTHS.

15. NAME AND ESTABLISHMENT OF AUTHORS -

1108 D. MATHEWS
GULF GENERAL ATOMIC INCORPORATED
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112

360 L. GARCIA DE VIEDMA

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
NEA COMPUTER PROGRAM LIBRARY
ISPRA, ITALY

16. MATERIAL AVAILABLE -
SOURCE DECKS (1108-326 CARDS, 360-318 CARDS)
SAMPLE PROBLEMS (1108-6 CARDS, 360-6 CARDS)
REFERENCE REPORT

17. CATEGORY - A
KEYWORDS - RESOLVED REGION, RESONANCE PARAMETERS, STATISTICS, INPUT DATA PREPARATION

ACC ABSTRACT 293 03/72

1. NAME OR DESIGNATION OF PROGRAM - MARS

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7094

3. DESCRIPTION OF PROBLEM OR FUNCTION - MARS PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION FOR A FINITE CYLINDER CORE WITH CONCENTRIC REGIONS OF DIFFERENT COMPOSITIONS AND CHARACTERISTICS TO OBTAIN THE TIME-DEPENDENT ENERGY RELEASE THAT RESULTS FROM THE INSERTION OF REACTIVITY ACCORDING TO A PRESCRIBED PROGRAM. THE BASIC USE FOR THIS PROGRAM IS FOUND IN ANALYSIS OF FAST REACTOR CORE COLLAPSE ACCIDENTS. THE REACTIVITY CHANGES DUE TO MATERIAL DISPLACEMENT IS DETERMINED BY THE USE OF PERTURBATION THEORY AND THE PRESSURE GENERATION FOR THE HYDRODYNAMICS CALCULATION IS DETERMINED BY THE THE USE OF AN EXPONENTIAL FORM FOR THE SATURATED VAPOR PRESSURE CURVE. THE DOPPLER EFFECT IS DETERMINED BY THE USE OF A FLEXIBLE T**(-N) FORM WHERE N IS A PARAMETER THAT IS SPECIFIED AT THE TIME OF EXECUTION. THE EXTERNAL REACTIVITY INSERTION CAN BE IN THE FORM OF A STEP, A LINEAR RAMP OR A PARABOLIC RAMP, WITH A LIMIT ON THE AMOUNT OF REACTIVITY WHICH CAN BE INSERTED BEING A DEFINABLE QUANTITY. TABULATED VALUES OF THE POWER AND MATERIAL WORTH DISTRIBUTIONS ARE ACCEPTED AS INPUT. THE CHARACTERISTICS OF EACH REGION (DENSITY, SPECIFIC HEAT, DOPPLER COEFFICIENT, EQUATION OF STATE, GEOMETRIC LIMITS) ARE SPECIFIED INDEPENDENTLY FOR EACH REGION TO PROVIDE FLEXIBILITY IN THE TREATMENT OF CORES OF UNUSUAL CONFIGURATION. THE NEUTRON KINETICS CALCULATIONS ARE DONE WITH A POINT REACTOR MODEL AND DELAYED NEUTRONS ARE USED.

4. METHOD OF SOLUTION - THE APPROXIMATE HYDRODYNAMICS EQUATIONS AND THE NEUTRON KINETICS EQUATIONS ARE SOLVED BY THE RUNGE-KUTTA METHOD. THE FEEDBACK REACTIVITY DUE TO MATERIAL MOTION IS CALCULATED BY SIMPLE NUMERICAL SUMMATIONS TO APPROXIMATE SURFACE AND VOLUME INTEGRALS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   6 REGIONS
   6 DELAYED NEUTRON GROUPS

6. TYPICAL RUNNING TIME - 5 MINUTES ARE REQUIRED WHEN 2 REGIONS ARE USED AND THE PROBLEM IS STARTED FROM DELAYED CRITICAL.

7. UNUSUAL FEATURES OF THE PROGRAM - MARS WILL SOLVE THE SEVERE EXCURSION PROBLEM IN AN R-Z GEOMETRY FOR A CYLINDRICAL CORE WITH AS MANY AS 6 REGIONS.

8. RELATED AND AUXILIARY PROGRAMS - THE RUNGE-KUTTA SUBROUTINE SPDEQ (GENERAL MOTORS) IS USED.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
   IBM7094 VERSION SUBMITTED AUGUST 1967.

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

GULF GENERAL ATOMIC INCORPORATED
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112

6600 AUTHOR

D. W. DRAWBAUGH
WESTINGHOUSE ELECTRIC CORPORATION
ASTRONUCLEAR LABORATORY
BOX 10864
PITTSBURGH, PENNSYLVANIA 15236

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (4 TAPES)
SOURCE DECKS (GGC4 1108-11,567 CARDS, WTFG 1646 CARDS, MAKE 1033 CARDS, MST 463 CARDS, PRINT 769 CARDS, MIXER 500 CARDS, MGT3 251 CARDS, SPRINT 334 CARDS, COMBIN 479 CARDS, DCP 927 CARDS, GGC4 6600-11,504 CARDS)
SAMPLE PROBLEMS (GGC4 1108-38 CARDS, 6600-38 CARDS)
FAST DATA TAPE (60 NUCLIDES - TAPE 2 - 1108-2772 BINARY RECORDS, 6600-1703 BINARY RECORDS)
FAST DATA TAPE (151 NUCLIDES - TAPE 3 - 1108-7362 BINARY RECORDS, 6600-4436 BINARY RECORDS)
THERMAL DATA TAPE (222 NUCLIDES - TAPE 4 - 1108-2854 BINARY RECORDS, 6600-1539 BINARY RECORDS)
REFERENCE REPORTS AND NOTES

17. CATEGORY - B
KEYWORDS - MULTIGROUP CROSS SECTIONS, AVERAGES, FAST, THERMAL, SPECTRA, DOPPLER BROADENING, DANCOFF CORRECTION, ANGULAR DISTRIBUTION, RESONANCE PARAMETERS, MAKE CODES, MST CODES, PRINT CODES, MIXER CODES, WTFG CODES, MGT3 CODES, SPRINT CODES, COMBIN CODES, DOP CODES

1. NAME OR DESIGNATION OF PROGRAM - LION4

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600, UNIVAC 1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - LION4 IS A COMPUTER PROGRAM FOR CALCULATING ONE, TWO, OR THREE DIMENSIONAL TRANSIENT AND STEADY-STATE TEMPERATURE DISTRIBUTIONS IN REACTOR AND REACTOR PLANT COMPONENTS. IT IS USED PRIMARILY FOR THERMAL-STRUCTURAL ANALYSES. IT UTILIZES FINITE DIFFERENCE TECHNIQUES WITH FIRST-ORDER FORWARD DIFFERENCE INTEGRATION AND IS CAPABLE OF HANDLING A WIDE VARIETY OF BOUNDING CONDITIONS.
   HEAT TRANSFER SITUATIONS ACCOMMODATED INCLUDE FORCED AND FREE CONVECTION IN BOTH REDUCED AND FULLY-AUTOMATED TEMPERATURE DEPENDENT FORMS, COOLANT FLOW EFFECTS, A LIMITED THERMAL RADIATION CAPABILITY, A STATIONARY OR STAGNANT FLUID GAP, A DUAL DEPENDENCY (TEMPERATURE DIFFERENCE AND TEMPERATURE LEVEL) HEAT TRANSFER, AN ALTERNATIVE HEAT TRANSFER MODE COMPARISON AND SELECTION FACILITY COMBINED WITH HEAT FLUX DIRECTION SENSOR, AND ANY FORM OF TIME-DEPENDENT BOUNDARY TEMPERATURES. THE PROGRAM, WHICH HANDLES TIME AND SPACE DEPENDENT INTERNAL HEAT GENERATION, CAN ALSO PROVIDE TEMPERATURE DEPENDENT MATERIAL PROPERTIES WITH LIMITED NON-ISOTROPIC PROPERTIES. USER-ORIENTED CAPABILITIES AVAILABLE INCLUDE TEMPERATURE MEANS WITH VARIOUS WEIGHTINGS AND A COMPLETE HEAT FLOW RATE SURVEILLANCE SYSTEM.

4. METHOD OF SOLUTION - THE MODELING IS BASED ON THE CONCEPT OF NODAL POINTS CONNECTED BY ONE-DIMENSIONAL THERMAL CONDUCTANCE EQUATIONS IN AS MANY AS SIX DIRECTIONS SIMULTANEOUSLY. THE EXPLICIT, OR FIRST FORWARD DIFFERENCE METHOD, IS THEN USED TO OBTAIN THE SOLUTIONS TO THESE EQUATIONS FOR THE THREE-DIMENSIONAL FIELD. THE TEMPERATURE CHANGE FOR A SURFACE NODE IS CALCULATED BY APPLYING THE OHMS LAW ANALOGY FOR HEAT FLOW TO A NODE WITH NO CAPACITANCE.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - DYNAMIC ALLOCATION
   11*D1 + 26*D2 + 20*D3 + 3*D4 + 17*D5 + 3*D6 + S1 + S2 + S3 + S4
   LESS THAN OR EQUAL TO 24500
      VARIABLE NUMBER OF EXTERNAL CONNECTIONS (D1)
      VARIABLE NUMBER OF INTERNAL NODES (D2)
      VARIABLE NUMBER OF SURFACE NODES (D3)
      VARIABLE NUMBER OF BOUNDARY NODES (D4)
      VARIABLE NUMBER OF COOLANT NODES (D5)
      VARIABLE NUMBER OF INTERFACE NODES (D6)
      S1=STORAGE FOR TEMPERATURE MEANS AND DIFFERENCES
      S2=STORAGE FOR HEAT FLOW SUBROUTINE
      S3=STORAGE FOR CONVECTIVE HEAT TRANSFER CALCULATION
      S4=STORAGE FOR VARIABLE LIBRARIES
   USING INCREASED NODAL CAPABILITY FEATURE WITH ADMITTANCE MATRIX IN ECS THIS ALGORITHM BECOMES--
   11*D1 + 10*D2 + 4*D3 + 3*D4 + 17*D5 + 3*D6 + S1 + S2 + S3 + S4
      15 MATERIALS
      7*D2 INTERNAL CONNECTIONS

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)
   12 COOLANT CHANNELS (EACH WITH 4 SIDES MAXIMUM)
   77 PRINTOUTS
   7 INTERNAL CONNECTIONS PER INTERNAL NODE
   6 SURFACE CONNECTIONS PER SURFACE NODE
   6 TYPES OF TEMPERATURE MEANS AND DIFFERENCES SETS
   10 GRAPHS (CDC6600,7600 ONLY)
   12 CURVES PER GRAPH (CDC6600,7600 ONLY)
   17 TYPES OF QUANTITIES GRAPHABLE (CDC6600,7600 ONLY)
   4 SUB-COOLED NUCLEATE BOILING REGIONS
   5 TYPES OF HEAT FLOW RATE SETS

6. TYPICAL RUNNING TIME - THE RUNNING TIME ON THE CDC6600 IS STRONGLY DEPENDENT ON THE NUMBER OF NODES, THEIR RELATIVE AND ABSOLUTE SIZE, AND THE TIME RANGE CONSIDERED. THE SAMPLE PROBLEM EXECUTES IN ONLY A FEW SECONDS ON THE CDC6600. EXECUTION OF THE UNIVAC1108 SAMPLE PROBLEM REQUIRES 5 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM - SUBCOOLED NUCLEATE BOILING MAY BE CONSIDERED. HOWEVER, THIS CONSIDERATION IS LIMITED TO WATER.

8. RELATED AND AUXILIARY PROGRAMS - SUPPORT PROGRAMS INCLUDE THE PLI SERIES OF PREPROCESSORS FOR SELECTED GEOMETRIES, THE GRAPL GRADIENT PLOTTER, HCAL2, WHICH EVALUATES HEAT TRANSFER COEFFICIENT EQUATIONS FOR SELECTED CONDITIONS, AND CONLI, WHICH RENUMBERS INPUT DATA AND INSERTS SPARE NODE NUMBERS OF 3 DIFFERENT KINDS TO PERMIT CONSOLIDATION OF GEOMETRY INPUT FOR ENTRY INTO A LARGE PROBLEM. LION SUPERCEDES EARLIER IBM704 AND PHILCO 2000 PROGRAMS CALLED TIGER.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
   CDC6600 VERSION SUBMITTED OCTOBER 1967, REPLACED BY FIRST REVISION AUGUST 1968, REPLACED BY SECOND REVISION JANUARY 1970, REPLACED BY THIRD REVISION JULY 1973.
   UNIVAC1108 VERSION SUBMITTED JUNE 1971.

10. REFERENCES - J. R. SCHMID, G. L. LECHLITER, AND W. W. FISCHER, LION TEMPERATURE DISTRIBUTIONS FOR ARBITRARY SHAPES AND COMPLICATED BOUNDARY CONDITIONS, KAPL-M-6532 (EC-57), JULY 27, 1966.
W. W. FISCHER, LION TALES A USERS MANUAL FOR THE LION THERMAL-STRUCTURAL EVALUATION CODE, KAPL-M-6533 (EC-58), JULY 31, 1967.
R. J. CULLEN, 6600 CALCOMP PLOTTER ROUTINES, KAPL NOTE, JULY 25, 1966.
E. J. BINNEY, ADDITIONS TO LION CODE, KAPL NOTE, SEPTEMBER 30, 1969.
E. J. BINNEY, ADDITIONS TO LION CODE EFFECTIVE WITH SEPTEMBER 1970 VERSION, KAPL NOTE, SEPTEMBER 22, 1970.
W. W. FISCHER AND M. N. GOLDSMITH, GRAPL A GRADIENT PLOTTER FOR LION, KAPL-M-7164, OCTOBER 13, 1970.
E. J. BINNEY, ADDITIONS TO LION CODE EFFECTIVE WITH THE DECEMBER 1970 VERSION, KAPL NOTE, DECEMBER 18, 1970.
E. J. BINNEY, ADDITIONS TO THE LION CODE EFFECTIVE

10. REFERENCES (CONTINUED)

FEBRUARY 26, 1971, KAPL NOTE, FEBRUARY 26, 1971.

E. J. BINNEY, MODIFICATION TO THE LION CODE EFFECTIVE MARCH 31, 1971, KAPL NOTE, APRIL 8, 1971.

E. J. BINNEY, HEAT BALANCE CAPABILITY IN LION, KAPL NOTE, APRIL 30, 1971.

E. J. BINNEY, ADDITIONS TO THE LION CODE EFFECTIVE FEBRUARY 29, 1972, KAPL NOTE, FEBRUARY 29, 1972.

E. J. BINNEY, LION NEWSLETTER NO. 1, KAPL NOTE, JUNE 5, 1972.

E. J. BINNEY, LION4 NEWSLETTER NO. 2, KAPL NOTE, OCTOBER 5, 1972.

M. N. GOLDSMITH AND W. W. FISCHER, THE PLI--SERIES OF PREPROCESSORS FOR THE LION CODE, KAPL-M-7289, JULY 6, 1972.

JPARAM SYSTEMS PROGRAMMING INFORMAL PROGRAM DESCRIPTION, EXCERPT FROM USERS GUIDE TO CDC SYSTEMS AT KAPL, JULY 27, 1972.

W. W. FISCHER, CONVECTIVE HEAT TRANSFER COEFFICIENT CALCULATIONAL SYSTEM FOR LION, KAPL-M-7301(L), DECEMBER 18, 1972.

11. MACHINE REQUIREMENTS - THE PLOTTER ROUTINE APPLE IS USED TO PRODUCE THE INPUT REQUIRED BY THE ASSOCIATED CALCOMP PLOTTER FOR GRAPHICAL OUTPUT.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT (CDC6600,7600), FORTRAN IV (UNIVAC1108)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC6600,7600) AND EXEC8 (UNIVAC1108).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - DATA SAVING ON TAPE AND OPTIONS TO PROVIDE PLOTTING OF A VARIETY OF PARAMETERS VERSUS TIME ARE INCLUDED IN LION4. BECAUSE OF THE LARGE SIZE OF LION4, IT WAS NECESSARY TO SEGMENT THE PROGRAM. THE UNIVAC1108 CON VERSION IS BASED ON THE JANUARY 1970 VERSION AND DOES NOT INCLUDE THE ADDED FEATURES OF THE RECENT KAPL EDITION NOR DOES IT INCLUDE A PLOTTING CAPABILITY.

15. NAME AND ESTABLISHMENT OF AUTHORS -

6600,7600 E. J. BINNEY
KNOLLS ATOMIC POWER LABORATORY
GENERAL ELECTRIC COMPANY
BOX 1072
SCHENECTADY, NEW YORK 12301

1108 DARRELL BARTKOWSKI
CHI CORPORATION
11000 CEDAR AVENUE
CLEVELAND, OHIO 44106

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (6600-5470 CARDS, 1108-2447 CARDS)

16. MATERIAL AVAILABLE (CONTINUED)
    SAMPLE PROBLEMS (6600-161 CARDS, 1108-156 CARDS)
    SAMPLE PROBLEM OUTPUT (6600-33 PAGES, 1108-22 PAGES)
    REFERENCE REPORTS, NEWSLETTERS, AND NOTES

17. CATEGORY - H
    KEYWORDS - TEMPERATURE DISTRIBUTION, FLUID FLOW, THERMAL, 3-DIMENSIONAL, HEAT TRANSFER, LIQUIDS, VAPORS, TIGER CODES

ACC ABSTRACT 300 03/72

1. NAME OR DESIGNATION OF PROGRAM - SAFE-CREEP

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - SAFE-CREEP PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE OR AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES WITH AGE- AND TEMPERATURE-DEPENDENT CREEP DATA.

4. METHOD OF SOLUTION - THE PROGRAM USES THE FINITE ELEMENT METHOD WHICH REDUCES THE PROBLEM TO THE SOLUTION OF A SYSTEM OF COUPLED INTEGRAL EQUATIONS. THE METHOD OF SOLUTION IS ITERATIVE ON THE SPACE VARIABLE AND UTILIZES THE TRAPEZOIDAL RULE INTEGRATION FOR THE TIME VARIABLE.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   350 NODES
   750 ELEMENTS
   60 TIME INCREMENTS

6. TYPICAL RUNNING TIME - 90 MINUTES ARE REQUIRED FOR A FULL-CAPACITY PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - GRDWRK (ACC ABSTRACT 296), SAFE-PCRS (ACC ABSTRACT 250), SAFE-PLANE (ACC ABSTRACT 252), SAFE-SHELL (ACC ABSTRACT 253)

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1967.
   UNIVAC1108 VERSION SUBMITTED OCTOBER 1967.

10. REFERENCES - Y. RASHID AND W. ROCKENHAUSER, PRESSURE VESSEL ANALYSIS BY FINITE ELEMENT TECHNIQUE, GA-7810, 1967.
    R. D. BROWN, PROPERTIES OF CONCRETE IN REACTOR VESSELS, PAPER NO. 13, CONFERENCE ON PRESTRESSED CONCRETE PRESSURE VESSELS, LONDON, MARCH 13-17, 1967.
    F. J. DE ARRIAGA AND Y. R. RASHID, SAFE-CREEP, A COMPUTER PROGRAM FOR THE VISCOELASTIC ANALYSIS OF AXISYMMETRIC AND PLANE CONCRETE STRUCTURES, A USERS MANUAL, GA-8111, JULY 31, 1967.

11. MACHINE REQUIREMENTS - 65K MEMORY AND 13 TAPES

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - CALL TICKER REFERS TO AN 1108 SYSTEM ROUTINE FOR LOGGING JOB TIME USED. A SUBSTITUTE ROUTINE WILL BE REQUIRED FOR USE OF THIS PROGRAM ON ANOTHER MACHINE.

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
WRITTEN TO HANDLE IDENTICAL CYLINDRICAL RODS IN THREE-DIMENSIONAL FINITE OR INFINITE ARRAYS.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
IBM360 VERSION SUBMITTED OCTOBER 1967.

10. REFERENCES - L. B. LEVITT AND R. C. LEWIS, HWOCR-SAFE, A MONTE CARLO REACTOR ANALYSIS CODE, AI-CE-MEMO-69, JUNE 30, 1967.
RELICS INPUT DESCRIPTION, AI NOTE.
INPUT DESCRIPTION FOR HWOCR-SAFE CROSS SECTION TAPE MAKER, AI NOTE.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN IV (H) AND BAL

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - VARIATIONS OF THIS PROGRAM HAVE BEEN PREPARED FOR THE CDC6600 AND IBM7094 COMPUTERS.

15. NAME AND ESTABLISHMENT OF AUTHORS -
L. B. LEVITT AND R. C. LEWIS
HWOCR PROGRAM OFFICE
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (SAFE 2682 CARDS, RELICS 76 CARDS, TAPE-MAKER 262 CARDS)
SAMPLE PROBLEMS (SAFE 245 CARDS, RELICS 30 CARDS, TAPE-MAKER 1835 CARDS)
REFERENCE REPORT AND NOTES

17. CATEGORY - B
KEYWORDS - CELL CALCULATION, 2-DIMENSIONAL, MONTE CARLO METHOD, HWOCR REACTORS, REACTIVITY, RELICS CODES, TAPE-MAKER CODES

1. NAME OR DESIGNATION OF PROGRAM - JUPITOR1(JP1)

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC1604, IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - JUPITOR1 IS USED TO PERFORM COUPLED-CHANNEL CALCULATIONS TO EVALUATE THE CROSS SECTIONS FOR THE SCATTERING OF NUCLEAR PARTICLES BY VARIOUS COLLECTIVE NUCLEII.

4. METHOD OF SOLUTION - IN SOLVING THE COUPLED DIFFERENTIAL EQUATIONS THE PREDICTION-CORRECTION METHOD DUE TO STORMER IS USED.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMA OF SIX STATES AND 30 PARTIAL WAVES CAN BE COUPLED AT ONE TIME. IF THE PROJECTILE ENERGY BECOMES NEGATIVE IN SOME EXCITED CHANNELS THIS MAXIMUM IS REDUCED TO 25 PARTIAL WAVES. THE MAXIMUM VALUE OF THE ORBITAL ANGULAR MOMENTUM IS 69. DIFFERENTIAL CROSS SECTIONS FOR UP TO 100 ANGLES FOR ANY NUMBER OF STATES CAN BE COMPUTED UNLESS A POLARIZED BEAM OR TARGET IS CONSIDERED, IN WHICH CASE THE MAXIMUM IS 35.

6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES ABOUT 2 MINUTES ON THE IBM360.

7. UNUSUAL FEATURES OF THE PROGRAM - SPIN OF THE PROJECTILE CAN BE 0, 1/2, OR 1 FOR NON-ADIABATIC CALCULATIONS, 0 OR 1/2 FOR ADIABATIC. TARGETS CAN BE EITHER VIBRATIONAL (SPHERICAL) OR ROTATIONAL (PERMANENTLY DEFORMED) AND OF EITHER EVEN OR ODD A. WHEN THE TARGET IS DEFORMED, EXCITATION OF STATES BELONGING TO HIGHER (VIBRATIONAL) BANDS CAN BE CONSIDERED. COULOMB EXCITATION CAN BE INCLUDED, AND THE FORM FACTOR CAN BE EITHER REAL OR COMPLEX.

8. RELATED AND AUXILIARY PROGRAMS - JUPITOR2 IS UNDER PREPARATION TO HANDLE SMALLER SETS OF EQUATIONS MORE EFFICIENTLY.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
CDC1604 VERSION SUBMITTED NOVEMBER 1967.
IBM360 VERSION SUBMITTED DECEMBER 1970, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - T. TAMURA, COMPUTER PROGRAM JUPITOR-1 FOR COUPLED-CHANNEL CALCULATIONS, ORNL-4152, AUGUST 1967, ADDENDUM I, AUGUST 14, 1967, ADDENDA/CORRIGENDA NO. 2, NOVEMBER 27, 1967.
T. TAMURA, REVS. MOD. PHYS., VOL. 37, P. 679, 1965.

11. MACHINE REQUIREMENTS - CDC1604 WITH 32K CORE MEMORY

12. PROGRAMMING LANGUAGES USED - FORTRAN 63 (CDC1604), FORTRAN IV (IBM360)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

1604 TARO TAMURA
PHYSICS DIVISION
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37831

360 L. GARCIA DE VIEDMA
NEA COMPUTER PROGRAM LIBRARY
ISPRA, ITALY

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (1604-2954 CARDS, 360-4216 CARDS)
SAMPLE PROBLEMS (1604-92 CARDS, 360-18 CARDS)
CONTROL INFORMATION (JCL 360-37 CARDS)
PUNCHED OUTPUT (360-108 CARDS)
SAMPLE PROBLEM PRINTED OUTPUT (360-5 PAGES)
REFERENCE REPORT, ORNL-4152 AND ADDENDA

17. CATEGORY - A
KEYWORDS - SCATTERING, CROSS SECTIONS, COMPOUND NUCLEUS, ANGULAR DISTRIBUTION

1. NAME OR DESIGNATION OF PROGRAM - TSN

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM7094,360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE TIME-DEPENDENT NEUTRON TRANSPORT EQUATION IS SOLVED. ENERGY DEPOSITION IS ALLOWED TO CAUSE VARIATION IN THE NEUTRON CROSS SECTIONS FOR THE CORE REGION, IN THE CORE DENSITY, AND IN CORE HEIGHT. THE RESULT IS A KINETICS CALCULATION INCLUDING SPATIAL DEPENDENCE BOTH IN FEEDBACK EFFECTS AND IN NEUTRON DENSITY. THE RESULTS ARE SUMMARIZED IN A MANNER SIMILAR TO POINT-KINETICS CODES, AND SPATIAL DISTRIBUTIONS ARE ALSO GIVEN. GRAPHICAL SUMMARIES OF THE SIGNIFICANT VARIABLES AND SPATIAL DISTRIBUTIONS ARE GIVEN. IN THE IBM360 VERSION, EITHER THE NEUTRON YIELD FROM FISSION OR THE THICKNESS OF A SPECIFIED ZONE CAN BE CHANGED AS AN INDEPENDENT FUNCTION OF TIME AS SPECIFIED BY THE USER. THIS PROVIDES TWO WAYS OF ALLOWING EXPLICIT REACTIVITY VARIATION WITH TIME.

4. METHOD OF SOLUTION - CARLSONS SN METHOD IS USED TO SOLVE THE NEUTRON TRANSPORT EQUATION. ANALOGOUS FINITE-DIFFERENCE TECHNIQUES ARE USED TO SOLVE THE FEEDBACK EQUATIONS. THE VARIATIONS IN CROSS SECTIONS AND DENSITIES WITH ENERGY DEPOSITION ARE EVALUATED FROM POLYNOMIAL COEFFICIENTS SUPPLIED BY THE USER.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - 2 VELOCITY GROUPS, 100 SPATIAL INTERVALS, 1-DIMENSIONAL GEOMETRY S4 (CYLINDRICAL) OR S6 (PLANE OR SPHERE). IN THE IBM7094 VERSION, THE CORE MUST BE THE FIRST ZONE AND MUST BE HOMOGENEOUS. THE 1/V TERM IS NEGLECTED FOR THE FAST GROUP. THESE LAST RESTRICTIONS HAVE BEEN REMOVED IN THE IBM360 VERSION.

6. TYPICAL RUNNING TIME - A TYPICAL PROBLEM SUPPLIED WITH THE DOCUMENTATION RAN 5.2 MINUTES ON THE IBM7094 AND 18.1 MINUTES ON THE IBM360, MODEL 50. THE LATTER TIME CAN BE REDUCED BY APPLYING THE OPTIMIZATION FEATURE OF FORTRAN IV LEVEL H, WHERE AVAILABLE.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - TSN IS BASED ON AND USES PORTIONS OF ANISN (ACC ABSTRACT 151).

9. STATUS - ABSTRACT FIRST DISTRIBUTED JUNE 1968.
IBM7094 VERSION SUBMITTED NOVEMBER 1967.
IBM360 VERSION SUBMITTED NOVEMBER 1967.

10. REFERENCES - W. A. RHOADES AND J. G. MORGAN, THE TSN COMPUTER CODE FOR SPATIALLY DEPENDENT REACTOR KINETICS CALCULATIONS, NAA-SR-MEMO-12319, APRIL 18, 1967.
M. A. BOLING AND W. A. RHOADES, AICRT3-3, SPRNTV, AND FLINGV, GENERAL PURPOSE SUBROUTINES FOR DISPLAY OF DIGITAL DATA, NAA-SR-TDR-11915, APRIL 1966.

ACC ABSTRACT 340 02/74

1. NAME OR DESIGNATION OF PROGRAM - POWERCO

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC1604A,6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - POWERCO CALCULATES THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ASSUMING ALL CASH EXPENSES SUCH AS INVESTMENT AND FUEL COSTS, OPERATING EXPENSES, AND TAXES ARE KNOWN. THE POWER COST IS HELD CONSTANT THROUGHOUT THE PROJECT LIFE.

4. METHOD OF SOLUTION - THE COST CALCULATION IS BASED ON THE REQUIREMENT THAT INCOMES RECEIVED MUST PROVIDE FOR RECOVERY OF INVESTMENT, RETURN ON INVESTMENT, AND ALL OPERATING EXPENSES. EQUATIONS ARE DEVELOPED TO CALCULATE TRUE FIXED CHARGE RATES AND TRUE AVERAGE FUEL WORKING CAPITAL.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF - 180 TIME PERIODS

6. TYPICAL RUNNING TIME - ABOUT 1 MINUTE PER PROBLEM IS REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM - POWERCO USES A PRESENT-WORTHED CASH FLOW PROCEDURE. FIXED CHARGE RATES AND FUEL WORKING CAPITAL ARE NOT REQUIRED. INCOME TAXES ARE CALCULATED INTERNALLY.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED MARCH 1969.
CDC1604A VERSION SUBMITTED JUNE 1968.
CDC6600 VERSION SUBMITTED APRIL 1973.

10. REFERENCE - ROYES SALMON, A PROCEDURE AND A COMPUTER CODE (POWERCO) FOR CALCULATING THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ORNL-3944, JUNE 1966.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN 63 (CDC1604A), FORTRAN IV (CDC6600)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3 (CDC6600).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
1604A ROYES SALMON
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

6600 FRANK D. TYSON
TECHNICAL COMPUTER SERVICES
UNITED ENGINEERS AND CONSTRUCTORS, INC.
1401 ARCH STREET
PHILADELPHIA, PENNSYLVANIA 19105

16. MATERIAL AVAILABLE -
SOURCE DECKS (1604A-444 CARDS, 6600-442 CARDS)
SAMPLE PROBLEMS (1604A-36 CARDS, 6600-36 CARDS)
REFERENCE REPORT

17. CATEGORY - D
KEYWORDS - POWER PLANTS, ECONOMICS

15. NAME AND ESTABLISHMENT OF AUTHOR -

A. H. MARCHERTAS
REACTOR ENGINEERING DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2230 CARDS)
SAMPLE PROBLEM (25 CARDS)
REFERENCE REPORT AND SUPPLEMENT

17. CATEGORY - I
KEYWORDS - STRUCTURAL ANALYSIS, STRESSES, DEFORMATION

1. NAME OR DESIGNATION OF PROGRAM - TWOTRAN2

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600,6600, IBM360/195

3. DESCRIPTION OF PROBLEM OR FUNCTION - TWOTRAN2 SOLVES THE TWO-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN (X,Y), (R,THETA), AND (R,Z) GEOMETRIES. BOTH REGULAR AND ADJOINT, INHOMOGENEOUS AND HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO VACUUM, REFLECTIVE, PERIODIC, WHITE OR INPUT-SPECIFIED BOUNDARY FLUX CONDITIONS ARE SOLVED. GENERAL ANISOTROPIC SCATTERING IS ALLOWED AND ANISOTROPIC INHOMOGENEOUS SOURCES ARE PERMITTED.

4. METHOD OF SOLUTION - THE DISCRETE ORDINATES APPROXIMATION FOR THE ANGULAR VARIABLE IS USED IN FINITE DIFFERENCE FORM WHICH IS SOLVED WITH THE CENTRAL (DIAMOND) DIFFERENCE APPROXIMATION. NEGATIVE FLUXES ARE ELIMINATED BY A LOCAL SET-TO ZERO AND CORRECT ALGORITHM. STANDARD INNER (WITHIN-GROUP) AND OUTER ITERATIVE CYCLES ARE ACCELERATED BY A COARSE-MESH REBALANCING ON A COARSE MESH WHICH MAY BE INDEPENDENT OF THE MATERIAL MESH.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VARIABLE DIMENSIONING IS USED SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A CONTAINER ARRAY LESS THAN MAXLEN CAN BE ACCOMMODATED. ON IBM MACHINES, TWOTRAN2 WILL EXECUTE IN THE 4-BYTE MODE SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A CONTAINER ARRAY LESS THAN MAXLEN CAN BE ACCOMMODATED. MAXLEN CAN BE SEVERAL HUNDRED THOUSAND AND MOST PROBLEMS CAN BE CORE-CONTAINED. ON THE CDC MACHINES MAXLEN CAN BE SLIGHTLY GREATER THAN 40,000 WORDS AND PERIPHERAL STORAGE IS USED FOR MOST GROUP-DEPENDENT DATA.

6. TYPICAL RUNNING TIME - A SIX-GROUP, S4, 42 X 42 MESH POINT, KEFF CALCULATION OF AN EBR-II MODEL REQUIRES ABOUT 3.9 MINUTES OF CDC7600 TIME. THE SAMPLE PROBLEMS REQUIRE 6 MINUTES ON THE IBM360.

7. UNUSUAL FEATURES OF THE PROGRAM - PROVISION IS MADE FOR CREATION OF STANDARD INTERFACE OUTPUT FILES FOR SN CONSTANTS, ANGLE-INTEGRATED FLUXES AND ANGULAR FLUXES. STANDARD INTERFACE INPUT FILES FOR SOURCES, FLUXES, CROSS SECTIONS AND SN CONSTANTS MAY BE READ. ALL BINARY OPERATIONS ARE LOCALIZED IN SUBROUTINES CALLED REED AND RITE. DETAILED EDIT OPTIONS, INCLUDING ANGULAR FLUXES, DUMPS AND RESTART CAPABILITY ARE PROVIDED. OPTIONAL USE OF AN ARBITRARY REBALANCE MESH INDEPENDENT OF THE MATERIAL MESH IS ALLOWED.

8. RELATED AND AUXILIARY PROGRAMS - TWOTRAN2 IS AN IMPROVED VERSION OF THE TWOTRAN PROGRAM. MANY COMMENT CARDS WERE ADDED AND MUCH SIMPLIFYING PROGRAMMING WAS PERFORMED TO MAKE TWOTRAN2 AS EASY TO UNDERSTAND AS POSSIBLE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.
UNIVAC1108 X-Y VERSION SUBMITTED DECEMBER 1968, REPLACED BY UPDATED VERSION JUNE 1970, DELETED JUNE 1973.
IBM360 X-Y VERSION SUBMITTED APRIL 1969, REPLACED BY TWOTRAN2 JUNE 1973, SAMPLE PROBLEM EXECUTED BY ACC.
UNIVAC1108 R-Z VERSION SUBMITTED OCTOBER 1969, DELETED JUNE 1973.
CDC6600 GENERAL GEOMETRY VERSION SUBMITTED JULY 1970, REPLACED BY TWOTRAN2 JULY 1973.
CDC7600 VERSION OF TWOTRAN2 SUBMITTED JUNE 1973.

10. REFERENCES - K. D. LATHROP AND F. W. BRINKLEY, TWOTRAN-II, AN INTERFACED, EXPORTABLE VERSION OF THE TWOTRAN CODE FOR TWO-DIMENSIONAL TRANSPORT, LA-4848-MS, JULY 1973.
K. D. LATHROP AND F. W. BRINKLEY, THEORY AND USE OF THE GENERAL-GEOMETRY TWOTRAN PROGRAM, LA-4432, APRIL 1970.

11. MACHINE REQUIREMENTS - FIVE OUTPUT UNITS, FIVE INTERFACE UNITS (USE OF INTERFACE UNITS IS OPTIONAL) AND TWO SYSTEM INPUT/OUTPUT UNITS ARE REQUIRED. A LARGE BULK MEMORY IS DESIRABLE, BUT IT CAN BE REPLACED BY DISK, DRUM OR TAPE STORAGE.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
K. D. LATHROP AND F. W. BRINKLEY
LOS ALAMOS SCIENTIFIC LABORATORY
BOX 1663
LOS ALAMOS, NEW MEXICO 87544

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (7600-7047 CARDS, 6600-7048 CARDS, 360-7429 CARDS)
SAMPLE PROBLEMS (7600-1985 CARDS, 6600-686 CARDS, 360-1984 CARDS)
CONTROL INFORMATION (JCL 360-32 CARDS)
REFERENCE REPORT, LA-4848-MS

17. CATEGORY - C
KEYWORDS - 2-DIMENSIONAL, TRANSPORT THEORY, SN METHOD, X-Y, R-Z, R-THETA, CRITICALITY SEARCHES, FLUX DISTRIBUTION, ANISOTROPIC SCATTERING, 2DF CODES, TWOTRAN CODES

1. NAME OR DESIGNATION OF PROGRAM - PUN1

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - PUN1 EVALUATES UNRESOLVED RADIATIVE CAPTURE INTEGRALS AND RELATED MULTIGROUP CROSS SECTIONS. THE UNRESOLVED DISTRIBUTIONS MAY HAVE VARIOUS ORBITAL ANGULAR MOMENTUM QUANTUM NUMBERS AND THE EFFECTS OF DOPPLER BROADENING AND SELF-SHIELDING ARE INCLUDED.

4. METHOD OF SOLUTION - THE PSI(THETA,X) FUNCTION IS EVALUATED ON THE INTERVAL (0,20/THETA) BY THE DFB ROUTINE DEVELOPED BY GELBARD (SEE REFERENCE 2). THE J(THETA,BETA) FUNCTION IS OBTAINED FROM THE PSI(THETA,X) FUNCTION BY TWO TRAPEZOIDAL INTEGRATIONS, FOLLOWED BY RICHARDSON EXTRAPOLATION PLUS A WING CORRECTION FOR X GREATER THAN 20/THETA. THE INTEGRAL INVOLVING CHI-SQUARE FLUCTUATION OF THE REDUCED NEUTRON WIDTH, GAMMA(NO), IS EVALUATED BY GAUSSIAN QUADRATURE. THE INTEGRATION OVER THE NEUTRON WEIGHTING SPECTRUM IS APPROXIMATED BY GAUSS QUADRATURE FOR THE 1/E CASE AND TRAPEZOIDAL INTEGRATION FOR OTHER WEIGHTING SPECTRA.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - NO MORE THAN 20 SPIN STATES PER CASE AND 54 ENERGY GROUPS ARE ALLOWED. AN ARBITRARY ENERGY WEIGHTING SPECTRUM OF UP TO 498 POINTS MAY BE USED, BUT ALL POINTS MUST BE POSITIVE (W(E) GREATER THAN 0).

6. TYPICAL RUNNING TIME - LESS THAN 1/4 SECOND PER SPIN STATE PER GROUP IS REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM -
   (A) ANGULAR MOMENTUM QUANTUM NUMBER L = 0, 1, 2, 3, 4 PERMITTED.
   (B) GAMMA(NO) PERMITTED TO FLUCTUATE WITH A CHI-SQUARE DISTRIBUTION OF UP TO 8 DEGREES OF FREEDOM FOR EACH SPIN STATE.
   (C) EVALUATION OF THE INTEGRAL CONTRIBUTION FROM LEVELS WITH GAMMA(NO) LESS THAN SOME FRACTION OF THE AVERAGE PERMITTED.
   (D) AN ARBITRARY GROSS ENERGY WEIGHTING SPECTRUM PERMITTED.
   (E) DANCOFF CORRECTION IS COMPUTED INTERNALLY FOR EITHER HEXAGONAL OR SQUARE LATTICE ARRAYS OF CYLINDRICAL CLAD FUEL RODS.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.
   CDC6600 VERSION SUBMITTED APRIL 1969.

10. REFERENCES - N. M. STEEN, PUN-1 - A FORTRAN-IV PROGRAM FOR THE EVALUATION OF UNRESOLVED RESONANCE INTEGRALS AND RELATED MULTIGROUP CROSS SECTIONS (LWBR DEVELOPMENT PROGRAM), WAPD-TM-768,

10. REFERENCES (CONTINUED)
CENTER, UTF4-01, AUGUST 2, 1961.
C. M. FRIEDRICH, STRUCTURE DESIGN NOTES - CALCULATION OF STRESSES, FORCES, AND DEFLECTIONS IN LINEAR-ELASTIC SKELETON STRUCTURES WITH TEMPERATURE, PRESSURES, APPLIED LOADS, AND REDUNDANT LOADS, WAPD-TM-417, APRIL 1964.
J. L. BITNER, DEVELOPING FLEXIBILITY MATRICES USING CTAC RULE, WAPD-TM-749, OCTOBER 1968.

11. MACHINE REQUIREMENTS - 105,000 OCTAL LOCATIONS, INPUT TAPE, OUTPUT TAPE, ONE SCRATCH TAPE, AND PRINTER

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
W. A. WENZEL
WESTINGHOUSE ELECTRIC CORPORATION
BETTIS ATOMIC POWER LABORATORY
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (946 CARDS)
SAMPLE PROBLEM (30 CARDS)
BETTIS ENVIRONMENTAL ROUTINES (21,123 CARDS)
REFERENCE REPORTS, WAPD-TM-739(L) AND WAPD-TM-668

17. CATEGORY - I
KEYWORDS - STRUCTURAL ANALYSIS, FREQUENCY, STRESSES, BEAMS, ELASTIC, DESIGN

1. NAME OR DESIGNATION OF PROGRAM - CHECKER/CRECT/DAMMET/PLOTFB/SLAVE3

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PACKAGE OF FIVE PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B (EVALUATED NUCLEAR DATA FILE VERSION B) VERSION I TAPES.

   CHECKER CHECKS THAT THE ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERYWHERE POSITIVE.

   CRECT, WHICH CAN PROCESS ENDF/B VERSION III DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETION OF DATA.

   DAMMET SELECTIVELY MERGES DATA FROM ONE OR TWO ENDF/B LIBRARY TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) AND ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PROCESS.

   PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

   SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PROCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

4. METHOD OF SOLUTION - IN CHECKER MOST DATA ARE SUBMITTED TO RANGE LIMIT CHECKS TO ENSURE THE STRUCTURE AGREES WITH ENDF/B-DEFINED SPECIFICATIONS. THE DEVIANT POINT CHECK (DETECTION OF MISPUNCHED VALUES) IS ACCOMPLISHED BY SEQUENTIALLY CHECKING FIVE DATA POINTS, TWO POINTS ON EITHER SIDE OF THE POINT UNDER SCRUTINY, FORWARD EXTRAPOLATION ON THE FIRST TWO POINTS, REVERSE EXTRAPOLATION ON THE FOURTH AND FIFTH, AND INTERPOLATIONS BETWEEN THE SECOND AND FOURTH POINTS. IF THE THIRD POINT DOES NOT FALL WITHIN THE RANGE OF THE VALUES CALCULATED BY EXTRAPOLATIONS AND INTERPOLATION, THE VALUE IS LISTED AS DEVIANT. IN ESSENCE, THE ABOVE PROCEDURE MERELY SIMULATES A CHECKING OF GRAPHICAL DATA BY EYE. CHECKING OF LEGENDRE COEFFICIENTS FOR FEASIBILITY AND POSITIVITY IS ACCOMPLISHED BY CONVERTING THE COEFFICIENTS TO MOMENTS, CHECKING WHETHER MOMENTS ARE PHYSICALLY POSSIBLE AND TESTING WHETHER THE LEGENDRE EXPANSION IS NEGATIVE WITHIN THE INTERVAL -1 TO 1 BY THE STURM SEQUENCE METHOD. IF THE LEGENDRE EXPANSION IS NEGATIVE, IT IS DEFINED OVER THE NEGATIVE REGION(S) AND INTEGRATED, THUS DETERMINING THE TOTAL NEGATIVE PROBABILITY.

   CRECT ACCEPTS A DATA TAPE TO BE CORRECTED AS INPUT AND LOCATES AREAS TO BE CORRECTED BY SEQUENCE AND MATERIAL NUMBERS. A CORRECTED TAPE IS THEN GENERATED REFLECTING THE INSERTIONS AND DELETIONS.

   WHEN MERGING TWO TAPES AND CONVERTING TO A DATA FORMAT OTHER

4. METHOD OF SOLUTION (CONTINUED)
THAN THAT OF EITHER INPUT TAPE, DAMMET PERFORMS A TWO-PASS OPERATION. THE FIRST PASS CONSISTS OF SELECTING ONLY THE DATA REQUIRED AND CONVERTING IT TO THE FORMAT OF THE FINAL TAPE, WITH STORAGE OF THE DATA ON AN INTERMEDIATE TAPE. UPON COMPLETION OF THE FIRST PASS ON BOTH TAPES, RESULTING IN TWO INTERMEDIATE TAPES, THE SECOND PASS MERGES BOTH INTERMEDIATE TAPES TO THE FINAL DATA TAPE.
IN PLOTFB THE SPECIFIED STRUCTURE OF THE LIBRARY ALLOWS DATA TO BE SUBCLASSIFIED UNDER NUCLIDES, CLASSES OF DATA, AND REACTION TYPES. THE WELL-DEFINED STRUCTURE PERMITS THE ASSOCIATED INFORMATION TO BE ACCESSED BY CONVERTING MATERIAL NUMBERS TO HOLLERITH TITLES, ETC. PLOTS ARE GENERATED UTILIZING A PLOTTING PACKAGE WHICH INCLUDES SCALING, GRID, AND NORMALIZATION ROUTINES. PLOTS CAN BE GENERATED IN EITHER LINEAR-LOG AXIS OR A MIXTURE OF BOTH.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
IN CHECKER CORRECT STRUCTURE OF THE DATA TAPE IS ASSUMED AND MINOR ANOMALIES ARE NOTED. COMMON AND MAJOR IRREGULARITIES CAUSE TERMINATION OF EXECUTION ACCOMPANIED BY A CORE DUMP.
IN CRECT CORRECT SEQUENCE AND MATERIAL FIELDS OF THE DATA TAPE ARE ASSUMED. IN BOTH CHECKER AND CRECT DATA MUST BE IN ENDF/B BCD STANDARD ARRANGEMENT CARD IMAGE FORMAT.
IN DAMMET A SPECIFIC REACTION CANNOT BE EXTRACTED FROM A TAPE UNLESS IT IS WITHIN A FILE OR MATERIAL SELECTED.

6. TYPICAL RUNNING TIME - .007 SECOND OF CPU TIME IS REQUIRED TO PROCESS ONE RECORD OF BCD INFORMATION IN CHECKER. TYPICAL CPU TO PP TIME RATIO FOR THE SHORT FORM OUTPUT IS 1 TO 4, FOR LONG FORM OUTPUT, 1 TO 6.
IN CRECT 2 SECONDS OF CPU TIME ARE REQUIRED. TYPICAL CPU TO PP TIME RATIO IS 1 TO 5.
IN DAMMET 3 TO 7 MINUTES OF CPU TIME ARE REQUIRED TO PROCESS 13 NUCLIDES. TYPICAL CPU TO PP TIME RATIO IS APPROXIMATELY 3 TO 1.
IN PLOTFB 4 MINUTES OF CPU TIME AND 10 MINUTES OF PP TIME ARE REQUIRED TO LIST AND PLOT 35 MATERIALS (APPROXIMATELY 3500 DATA CARDS).
IN SLAVE3 RUNNING TIME IS DEPENDENT ON THE SELECTION OF SUBROUTINES AND PROCESSING REQUIREMENTS. TYPICAL CPU TO PP TIME RATIO IS 1 TO 3, AND AN AVERAGE RUN IS 4 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM - IN CHECKER THERE ARE TWO OUTPUT OPTIONS - (A) LONG FORM, WHICH LISTS EACH CARD IMAGE AS WELL AS THE ANOMALIES ENCOUNTERED, AND (B) SHORT FORM, WHICH LISTS ONLY THE ANOMALIES ENCOUNTERED BY THE PROGRAM (MINIMUM OUTPUT OPTION).

8. RELATED AND AUXILIARY PROGRAMS - ALL FIVE PROGRAMS PERFORM AN INDEPENDENT OPERATION ON ENDF/B DATA. CRECT MAY BE USED TO CORRECT ERRORS DETECTED BY CHECKER.

9. STATUS - ABSTRACT FIRST DISTRIBUTED SEPTEMBER 1969.
CDC6600 VERSION SUBMITTED APRIL 1969, CRECT REPLACED BY LATER VERSION AUGUST 1972.

10. REFERENCES - NATIONAL NEUTRON CROSS SECTION CENTER, DESCRIPTION OF THE ENDF/B PROCESSING CODES CHECKER, CRECT, DAMMET, PLOTFB, AND RETRIEVAL SUBROUTINES, ENDF-110, BNL-13582, SEPTEMBER 1967, REVISED APRIL 1969.
H. C. HONECK, ENDF/B - SPECIFICATIONS FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066, MAY 1966, REVISED JULY 1967.

11. MACHINE REQUIREMENTS - FOR CHECKER 56,300 OCTAL (APPROXIMATELY 24,000 DECIMAL) WORDS OF CORE STORAGE AND ONE TAPE (OR DISC) UNIT (BESIDES INPUT AND OUTPUT UNITS).
FOR CRECT 13,000 OCTAL WORDS OF CORE STORAGE AND TWO DATA STORAGE UNITS.
FOR DAMMET 61,000 OCTAL (ABOUT 25,000 DECIMAL) WORDS OF CORE STORAGE AND A MAXIMUM OF FIVE TAPE (OR DISC) UNITS.
FOR PLOTFB 73,700 OCTAL (ABOUT 30,000 DECIMAL) WORDS OF CORE STORAGE AND THREE TAPE (OR DISC) UNITS.
FOR SLAVE3 40,000 OCTAL (APPROXIMATELY 18,000 DECIMAL) WORDS OF CORE STORAGE AND ONE OR TWO TAPE (OR DISC) UNITS WILL BE REQUIRED FOR A TYPICAL JOB.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE3 (LOCALLY MODIFIED).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - WHEN USING NON-CDC6600 VERSIONS OF FORTRAN IV THE IMPLEMENTATION OF AND/OR OPERATIONS AND EOF TESTING OPERATIONS SHOULD BE CHECKED.

15. NAME AND ESTABLISHMENT OF AUTHORS -
D. E. CULLEN, W. KROPP, S. PEARLSTEIN,
AND C. OZER
NATIONAL NEUTRON CROSS SECTION CENTER
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CHECKER 2355 CARDS, CRECT 259 CARDS, DAMMET 1867 CARDS, PLOTFB 4037 CARDS, SLAVE3 2245 CARDS)
REFERENCE REPORT, BNL-13582

17. CATEGORY - M
KEYWORDS - DATA PROCESSING, CROSS SECTIONS, GRAPHS, INPUT DATA, LIBRARIES, MAINTENANCE, RETRIEVAL

ACC ABSTRACT 387 02/74

1. NAME OR DESIGNATION OF PROGRAM - CITATION

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - CITATION IS DESIGNED TO SOLVE PROBLEMS INVOLVING THE FINITE-DIFFERENCE REPRESENTATION OF DIFFUSION THEORY TREATING UP TO THREE SPACE DIMENSIONS WITH ARBITRARY GROUP-TO-GROUP SCATTERING. X-Y-Z, THETA-R-Z, HEXAGONAL-Z, AND TRIAGONAL-Z GEOMETRIES MAY BE TREATED. DEPLETION PROBLEMS MAY BE SOLVED AND FUEL MANAGED FOR MULTI-CYCLE ANALYSIS. EXTENSIVE FIRST-ORDER PERTURBATION RESULTS MAY BE OBTAINED, GIVEN MICROSCOPIC DATA AND NUCLIDE CONCENTRATIONS. STATICS PROBLEMS MAY BE SOLVED AND PERTURBATION RESULTS OBTAINED WITH MICROSCOPIC DATA.

4. METHOD OF SOLUTION - EXPLICIT, FINITE-DIFFERENCE APPROXIMATIONS IN SPACE AND TIME HAVE BEEN IMPLEMENTED. THE NEUTRON-FLUX-EIGENVALUE PROBLEMS ARE SOLVED BY DIRECT ITERATION TO DETERMINE THE MULTIPLICATION FACTOR OR THE NUCLIDE DENSITIES REQUIRED FOR A CRITICAL SYSTEM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CITATION HAS BEEN DESIGNED TO ATTACK PROBLEMS WHICH CAN BE RUN IN A REASONABLE AMOUNT OF TIME. STORAGE OF DATA IS ALLOCATED DYNAMICALLY TO GIVE THE USER FLEXIBILITY IN DIMENSIONING. TYPICALLY, A FINITE-DIFFERENCE DIFFUSION PROBLEM COULD HAVE 200 DEPLETING ZONES, 10,000 NUCLIDE DENSITIES AND 30,000 SPACE-ENERGY POINT FLUX VALUES.

6. TYPICAL RUNNING TIME - THE TWO-DIMENSIONAL FINITE-DIFFERENCE DIFFUSION THEORY EIGENVALUE PROBLEMS ITERATE AT A RATE OF ABOUT 0.1 MILLISECOND PER POINT PER ITERATION WITH ALTERNATING-DIRECTION LINE RELAXATION (TWO SWEEPS PER ITERATION) WITH 8-BYTE WORDS ON THE IBM360/91 (0.5 ON THE 360/75). SINCE ABOUT 30 ITERATIONS ARE REQUIRED FOR EACH SUCCEEDING EIGENVALUE PROBLEM, MACHINE TIME FOR A DEPLETION PROBLEM IS ABOUT .003 SECOND PER POINT PER TIME-STEP. MACHINE TIME FOR MOST AUXILIARY CALCULATIONS IS USUALLY INSIGNIFICANT. FOR A REPRESENTATIVE FAST BREEDER DEPLETION PROBLEM, 68 PERCENT OF THE MACHINE CPU TIME IS SPENT IN SOLVING EIGENVALUE PROBLEMS.

7. UNUSUAL FEATURES OF THE PROGRAM - CITATION IS CONSIDERED UNUSUAL IN THAT IT SHOULD BE RELATIVELY EASY TO MODIFY THE CONTENTS OR TO ADD ROUTINES. EFFECTIVE TECHNIQUES ARE INCORPORATED TO DETERMINE A CRITICAL SYSTEM. MORE THAN ONE SET OF MICROSCOPIC CROSS SECTIONS MAY BE USED IN A SYSTEM AND NUCLIDE BEHAVIOR CAN BE FOLLOWED ON A SUB-ZONE SCALE WITHIN DEPLETION REGIONS. THE USER HAS FLEXIBLE CONTROL OVER THE ROUTE OF A CALCULATION AS WELL AS OF THE EDIT OF RESULTS.

8. RELATED AND AUXILIARY PROGRAMS - THE MICROSCOPIC CROSS SECTION TAPE FOR THIS PROGRAM MAY BE GENERATED BY VARIOUS CODES, BUT XSDRN

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
(ACC ABSTRACT 393) IS DESIGNED SPECIFICALLY FOR THIS PURPOSE. THE MICROSCOPIC CROSS SECTION ROUTINES, FORMERLY AN AUXILIARY PROGRAM, WERE INTEGRATED INTO THE CODE TO PERMIT SUCH DATA TO BE SUPPLIED FROM CARDS OR MODIFIED IN THE SAME RUN AS A PROBLEM IS SOLVED.

9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
IBM360 VERSION SUBMITTED JULY 1969, REVISED JANUARY 1970, 2ND REVISION APRIL 1970, 3RD REVISION NOVEMBER 1971, 4TH REVISION APRIL 1972, 5TH REVISION JUNE 1972, 6TH REVISION AUGUST 1972, 7TH REVISION NOVEMBER 1972.

10. REFERENCES - T. B. FOWLER, D. R. VONDY, AND G. W. CUNNINGHAM, NUCLEAR REACTOR CORE ANALYSIS CODE CITATION, ORNL-TM-2496, REVISION 2, JULY 1971, SUPPLEMENT 1, OCTOBER 1971, SUPPLEMENT 2, MARCH 1972, SUPPLEMENT 3, JULY 1972.
N. M. GREENE AND C. W. CRAVEN, JR., XSDRN, A DISCRETE ORDINATES SPECTRAL AVERAGING CODE, ORNL-TM-2500, JULY 1969.
D. R. VONDY AND T. B. FOWLER, JOB STREAM OF CASES FOR THE COMPUTER CODE CITATION, ORNL-TM-3793, JULY 1972.

11. MACHINE REQUIREMENTS - IBM360/91 OR EQUIVALENT WITH AT LEAST 128,000 4-BYTE WORDS OF DIRECTLY-ADDRESSABLE CORE STORAGE, 7 TO 32 I/O DEVICES DEPENDING UPON THE CALCULATION, EXCLUDING INPUT AND OUTPUT DEVICES AND SYSTEM REQUIREMENTS.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - NOW CITATION CONTAINS ABOUT 25,000 SOURCE STATEMENTS. WITHOUT OVERLAY, STORAGE FOR THE CODE INSTRUCTIONS WOULD APPROACH 150,000 4-BYTE WORDS, BUT WITH OVERLAY THE STORAGE REQUIREMENT IS ABOUT 43,000 FOR THE PROGRAM AND FIXED STORAGE, INCLUDING 10,000 FOR SYSTEM LIBRARY ROUTINES.

15. NAME AND ESTABLISHMENT OF AUTHORS -
T. B. FOWLER, D. R. VONDY, AND G. W. CUNNINGHAM
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (28,476 CARDS)
SAMPLE PROBLEM (850 CARDS)
REFERENCE REPORT, ORNL-TM-2496, REV.2, SUPPLEMENTS 1, 2, AND 3
REFERENCE REPORT, ORNL-TM-3793, AVAILABLE UPON REQUEST

17. CATEGORY - K
KEYWORDS - 1-DIMENSIONAL, 2-DIMENSIONAL, 3-DIMENSIONAL, MULTI-

17. KEYWORDS (CONTINUED)
GROUP, DIFFUSION, CRITICALITY SEARCHES, BUCKLING,
X-Y-Z, R-THETA, HEXAGONAL, DEPLETION, FUEL MANAGEMENT

1. NAME OR DESIGNATION OF PROGRAM - ETOX3

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - ETOX3 (ENDF/B TO 1DX) CALCULATES MULTIGROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS USING DATA FROM THE EVALUATED NUCLEAR DATA FILE (ENDF/B) VERSION II OR VERSION III FORMAT. IT CAN ALSO PROCESS VERSION I MATERIALS THAT DO NOT CALL FOR PARTIAL ENERGY DISTRIBUTION LAWS 1, 2, 4, 6, OR 8 (SEE END/F, FILE 5). THE CODE IS DESIGNED TO COMPUTE AND PUNCH -
   (A) INFINITE DILUTE CROSS SECTIONS,
   (B) TEMPERATURE DEPENDENT SELF-SHIELDING FACTORS FOR ARBITRARY VALUES OF MICROSCOPIC SIGMAO (TOTAL CROSS SECTION PER ATOM) IN THE RUSSIAN (BONDARENKO) FORMAT, AND
   (C) INELASTIC SCATTERING PROBABILITY MATRICES.

4. METHOD OF SOLUTION - MICROSCOPIC CROSS SECTION VALUES ARE CONSTRUCTED AS SPECIFIED BY THE ENDF/B. GROUP CONSTANTS ARE OBTAINED BY INTEGRATING THE MICROSCOPIC DATA OVER GROUP INTERVALS USING THE FLUX WEIGHTING SCHEME--
PHI(U) IS PROPORTIONAL TO 1/SIGMAT(U), SIGMAT(U)=N(J)*MICROSOPIC SIGMAT(J)+N(J)*MICROSCOPIC SIGMAO.
INTEGRATION METHODS USED INCLUDE ROMBERG, GAUSSIAN QUADRATURE, N-POINT, SIMPSON AND TRAPEZOIDAL. THE CODE ALLOWS AS INPUT ARBITRARY SETS OF VALUES OF GROUP ENERGIES, TEMPERATURES, AND MICROSCOPIC SIGMAO, SIGMAS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - 26-GROUP DATA FOR A REPRESENTATIVE SET OF 14 ISOTOPES REQUIRES ABOUT 28 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - WLIB IS A SHORT PROGRAM INCLUDED WITH ETOX3. IT CREATES A TABLE OF COMPLEX INTEGRALS USED BY ETOX3. ETOX3 REQUIRES THE ENDF/B TAPE IN STANDARD ARRANGEMENT BINARY MODE. SINCE THE ENDF/B TAPES DO NOT NORMALLY COME IN THIS MODE, THEY MUST BE PROCESSED BY THE DAMMET CODE (ACC ABSTRACTS 384 AND 475) PRIOR TO USING THEM WITH ETOX3. THE FORMAT OF THE ETOX3 OUTPUT IS COMPATIBLE FOR INPUT TO THE COMPUTER CODE 1DX (ACC ABSTRACT 374), A MULTIPURPOSE DIFFUSION CODE FOR GENERATING CROSS SECTIONS TO BE USED IN FAST REACTOR ANALYSIS.

9. STATUS - ABSTRACT FIRST DISTRIBUTED MAY 1970.
UNIVAC1108 VERSION OF ETOX SUBMITTED JULY 1969, REVISED APRIL 1970, REPLACED BY ETOX2 DECEMBER 1970, REPLACED BY ETOX3 JUNE 1973.

10. REFERENCES - R. E. SCHENTER, J. L. BAKER, AND R. B. KIDMAN, ETOX, A CODE TO CALCULATE GROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS, BNWL-1002, MAY 1969.

R. B. KIDMAN, ETOX-3 OPERATING INSTRUCTIONS, OVERLAY STRUCTURE, AND CARD INPUT INSTRUCTIONS, WADCO NOTE.

H. C. HONECK, ENDF/B, SPECIFICATION FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066, MAY 1966, REVISED JULY 1967.

R. W. HARDIE AND W. W. LITTLE, JR., 1DX, A ONE-DIMENSIONAL DIFFUSION CODE FOR GENERATING EFFECTIVE NUCLEAR CROSS SECTIONS, BNWL-954, MARCH 1969.

I. I. BONDARENKO (EDITOR), GROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS, CONSULTANTS BUREAU, NEW YORK, 1964.

W. ROMBERG, VEREINFACHTE NUMERISCHE INTEGRATION, DET. KONG. NORSKE VIDENSKABER SELSKAB FORHANDLINGER, BAND 28, NR. 7, 1955.

M. ALBRAMOWITZ AND I. A. STEGUN (EDITORS), HANDBOOK OF MATHEMATICAL FUNCTIONS, DOVER PUBLICATIONS, INC., P. 916, 1965.

D. M. OSHEA, B. J. TOPPEL, AND A. L. RAGO, MC**2, A CODE TO CALCULATE MULTIGROUP CROSS SECTIONS, ANL-7318, JUNE 1967.

R. B. KIDMAN AND R. E. SCHENTER, GROUP CONSTANTS FOR FAST REACTOR CALCULATIONS, HEDL-TME-71-36, MARCH 1971.

11. MACHINE REQUIREMENTS - 65K MEMORY, 5 TAPE UNITS (3 OF WHICH ARE SCRATCH TAPES), AND RANDOM ACCESS DRUM STORAGE

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - ETOX3 USES RANDOM DRUM STORAGE TO MAKE MAXIMUM USE OF CORE. THE TAPE OF COMPLEX INTEGRALS PREPARED BY WLIB SHOULD BE MOUNTED AS LOGICAL UNIT 9. THE ENDF/B TAPE IN STANDARD ARRANGEMENT BINARY MODE SHOULD BE MOUNTED AS LOGICAL UNIT 12.

15. NAME AND ESTABLISHMENT OF AUTHOR -

R. B. KIDMAN
HANFORD ENGINEERING DEVELOPMENT LABORATORY
WESTINGHOUSE HANFORD COMPANY
P. O. BOX 1970
RICHLAND, WASHINGTON 99352

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (ETOX3 4909 CARDS, WLIB 205 CARDS)
SAMPLE PROBLEM (ETOX3 11 CARDS)
PUNCHED OUTPUT (200 CARDS)
REFERENCE REPORT, BNWL-1002, AND WADCO NOTE

17. CATEGORY - B
KEYWORDS - GROUP CONSTANTS, INELASTIC SCATTERING, FAST REACTORS, TEMPERATURE, INPUT DATA, ENDF/B, 1DX CODES, WLIB CODES, DAMMET CODES

1. NAME OR DESIGNATION OF PROGRAM - MANE1

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE MANE1 PROGRAM FINDS THE MAGNETIC FLUX IN EACH BRANCH OF A MAGNETIC NETWORK CONSISTING OF A NUMBER OF BRANCHES OF IRON AND AIR. THE PROBLEM IS ONE STEP IN THE DESIGN OF SLOW SPEED RELUCTANCE MOTORS IN WHICH THE MAGNETIC FLUX IS DETERMINED IN ALL COMPONENT PARTS FOR A POSITION OF THE ROTOR WITH RESPECT TO THE STATOR.

4. METHOD OF SOLUTION - THE EQUATIONS TO BE SOLVED ARE OBTAINED BY APPLYING OHMS LAW AND KIRCHOFFS LAW TO THE MAGNETIC NETWORK. THE RESULTING NONLINEAR EQUATIONS ARE SOLVED BY THE NEWTON-RAPHSON METHOD OF ITERATION. THE LINEARIZED EQUATIONS ARE SOLVED BY USING KRONS FUNDAMENTAL FORMULA FOR MESH ANALYSIS OF AN ELECTRICAL CIRCUIT.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE NETWORK CONSISTS OF A NUMBER OF MAJOR RECTANGLES OR LOOPS CONNECTED TO EACH OTHER IN A CYCLIC FASHION. EACH LARGE RECTANGLE IS SUBDIVIDED INTO A NUMBER OF SMALLER RECTANGLES. EACH SIDE (NETWORK BRANCH) HAS A RELUCTANCE BUT ONLY ONE BRANCH OF EACH MAJOR RECTANGLE HAS A DRIVING FORCE CORRESPONDING TO THE APPLIED AMPERE TURNS IN THE STATOR. IF THERE ARE L LOOPS AND R RECTANGLES PER LOOP, THEN LR LINEAR EQUATIONS MUST BE SOLVED. A RULE OF THUMB LIMITATION IS LR LESS THAN OR EQUAL TO 90, ALTHOUGH THE PROGRAM IS ACTUALLY LIMITED ONLY BY THE AMOUNT OF CORE STORAGE AND THE ADEQUACY OF GAUSS ELIMINATION WITH PIVOTAL CONDENSATION.

6. TYPICAL RUNNING TIME - FOR VALUES OF LR = 24 THE SOLUTION IS OBTAINED IN 5 TO 10 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM - GIVEN THE MAGNETIZATION CHARACTERISTICS OF THE VARIOUS STEELS (REPRESENTED BY POINTS ON A TABLE), MANE1 FINDS A POINT ON EACH CURVE AND CALCULATES THE EQUATION OF A TANGENT TO THE CURVE INSTEAD OF A STRAIGHT LINE FROM THE CALCULATED POINT TO THE ORIGIN. REGARDLESS OF THE COMPLICATION OF THE NETWORK, THE PROGRAM SOLVES THE PROBLEM IN LESS THAN 10 ITERATIONS. THE PROGRAM ALSO CALCULATES THE TOTAL MAGNETIC ENERGY IN THE ENTIRE NETWORK.

8. RELATED AND AUXILIARY PROGRAMS - MANE1 IS AN IMPROVED VERSION OF M0565 AND USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
CDC6600 VERSION SUBMITTED OCTOBER 1969, REPLACED BY REVISED VERSION APRIL 1973.

10. REFERENCES - D. A. GUERDAN, C. J. MARLOWE, MANE1 - A DIGITAL COMPUTER PROGRAM TO SOLVE A RECTANGULAR MAGNETIC NETWORK, WAPD-TM-790, SEPTEMBER 1969.
D. A. GUERDAN, MO565, A PROGRAM TO SOLVE A RECTANGULAR MAGNETIC NETWORK FOR USE ON THE PHILCO-2000 COMPUTER, WAPD-TM-557, FEBRUARY 1966.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.

11. MACHINE REQUIREMENTS - FOR SMALL PROBLEMS, LR = 18, 35,000 (OCTAL) CORE LOCATIONS ARE REQUIRED. FOR LARGE PROBLEMS, LR = 80, 154,000 (OCTAL) CORE LOCATIONS ARE REQUIRED.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FORTRAN INTEGER AND REAL VARIABLES ARE EQUIVALENCED. IT IS ASSUMED THAT VARIABLES ARE ALLOCATED THE SAME NUMBER OF STORAGE BITS INDEPENDENTLY OF THIS TYPE DESIGNATION.

15. NAME AND ESTABLISHMENT OF AUTHORS -
D. A. GUERDAN AND C. J. MARLOWE
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (870 CARDS)
SAMPLE PROBLEM (14 CARDS)
SAMPLE PROBLEM OUTPUT (9 PAGES)
REFERENCE REPORTS, WAPD-TM-790 AND WAPD-TM-668

17. CATEGORY - I
KEYWORDS - DESIGN, MAGNETIC FLUX, MO565 CODES

ACC ABSTRACT 432 02/74

1. NAME OR DESIGNATION OF PROGRAM - COBRA3C

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, IBM370, CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - COBRA3C CALCULATES THE STEADY-STATE AND TRANSIENT FLOW, ENTHALPY AND PRESSURE DROP IN THE SUBCHANNELS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS DURING BOTH BOILING AND NONBOILING CONDITIONS. THE PROGRAM USES A MATHEMATICAL MODEL THAT INCLUDES THE EFFECTS OF TURBULENT AND DIVERSION CROSSFLOW MIXING BETWEEN THE SUBCHANNELS. A THERMAL MODEL OPTION IS INCLUDED TO CALCULATE RADIAL FUEL TEMPERATURE DISTRIBUTION AS A FUNCTION OF USER-SPECIFIED POWER GENERATION AND HEAT TRANSFER CORRELATIONS. CRITICAL HEAT FLUX CALCULATIONS CAN ALSO BE PERFORMED BY USER OPTION. FORCED CROSSFLOW MIXING DUE TO DIVERTER VANES OR WIRE WRAPS CAN BE CONSIDERED.

4. METHOD OF SOLUTION - THE EQUATIONS FOR THE FLUID FLOW AND HEAT TRANSFER MODEL ARE SOLVED AS A BOUNDARY-VALUE PROBLEM BY USING IMPLICIT FINITE DIFFERENCE EQUATIONS THAT ARE STABLE FOR ALL TIME-STEPS. THE BOUNDARY CONDITIONS FOR THE FLOW SOLUTION ARE THE INLET ENTHALPY, INLET FLOW, INLET CROSSFLOW AND EXIT PRESSURE. A COMBINATION OF GAUSS ELIMINATION AND ITERATION IS USED TO PERFORM THE SOLUTION. THE SOLUTION MUST RELY UPON INPUT CORRELATIONS TO SPECIFY THE TURBULENT CROSSFLOW MIXING, SUBCHANNEL PRESSURE GRADIENT, AND HEAT TRANSFER COEFFICIENTS DURING BOTH STEADY-STATE AND TRANSIENTS.

5. RESTRICTIONS UPON THE COMPLEXITY OF THE PROBLEM - ADJUSTABLE DIMENSIONS ARE INCLUDED TO ALLOW THE USER TO EXPAND OR CONTRACT THE SIZE OF THE PROGRAM TO ACCOMMODATE HIS COMPUTER STORAGE CAPABILITY. THE PROGRAM HAS PERFORMED SUCCESSFULLY WITH 36 SUBCHANNELS, 25 FUEL RODS AND 60 SUBCHANNEL CONNECTIONS.

6. TYPICAL RUNNING TIME - ABOUT 2 MINUTES OF UNIVAC1108 TIME ARE REQUIRED FOR 4 TIME-STEPS, 60 AXIAL NODES, 9 SUBCHANNELS, AND 7 RADIAL FUEL NODES. ABOUT 4 MINUTES ARE REQUIRED TO RUN THE SAMPLE PROBLEM ON THE IBM360.

7. UNUSUAL FEATURES OF THE PROGRAM - COBRA3C IS A RATHER GENERAL PROGRAM WHICH CAN BE USED FOR THERMAL-HYDRAULIC ANALYSIS OF ALMOST ANY ROD BUNDLE FUEL ELEMENT CONFIGURATION.

8. RELATED AND AUXILIARY PROGRAMS - THIS IS AN IMPROVED VERSION OF THE COBRA3 PROGRAM DESCRIBED IN REFERENCE 2.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
   UNIVAC1108 VERSION OF COBRA2 SUBMITTED DECEMBER 1970, REPLACED BY COBRA3 IN JUNE 1971, REPLACED BY COBRA3C IN APRIL 1973.
   IBM360 VERSION OF COBRA2 SUBMITTED FEBRUARY 1970, REPLACED BY COBRA3 IN SEPTEMBER 1971, REPLACED BY

9. STATUS (CONTINUED)
COBRA3C IN APRIL 1973, SAMPLE PROBLEM EXECUTED BY ACC.
CDC6600 VERSION OF COBRA3C SUBMITTED JUNE 1973.

10. REFERENCES - D. S. ROWE, COBRA-IIIC, A DIGITAL COMPUTER PROGRAM FOR STEADY-STATE AND TRANSIENT THERMAL-HYDRAULIC ANALYSIS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS, BNWL-1695, MARCH 1973.
D. S. ROWE, COBRA-III, A DIGITAL COMPUTER PROGRAM FOR STEADY-STATE AND TRANSIENT THERMAL-HYDRAULIC SUBCHANNEL ANALYSIS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS, BNWL-B-82, JULY 1971.

11. MACHINE REQUIREMENTS - 32K MEMORY

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CSCX (UNIVAC1108), OS/370 (IBM370), SCOPE 4.3 (CDC6600 CYBER70).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - COBRA3 IS STILL UNDER DEVELOPMENT. THIS INTERIM VERSION IS BEING MADE AVAILABLE TO EXPEDITE ITS USE BY THE NUCLEAR INDUSTRY. THE CODE SHOULD BE USED WITH DISCRETION AND WITH FULL UNDERSTANDING OF ITS PRESENT LIMITATIONS.

15. NAME AND ESTABLISHMENT OF AUTHORS -

1108,6600 D. S. ROWE
PACIFIC NORTHWEST LABORATORIES
BATTELLE
P. O. BOX 999
RICHLAND, WASHINGTON 99352

370 R. L. CURTIS
COMPUTER SCIENCE CENTER
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (1108-2563 CARDS, 6600-2973 CARDS, 370-2997 CARDS)
SAMPLE PROBLEMS (1108-181 CARDS, 6600-179 CARDS, 370-181 CARDS)
REFERENCE REPORT, BNWL-1695

17. CATEGORY - H
KEYWORDS - THERMODYNAMICS, FLUID FLOW, FUEL ELEMENTS, LIQUIDS, VAPORS, ENTHALPY, PRESSURE, COBRA CODES

ACC ABSTRACT 433 02/74

1. NAME OR DESIGNATION OF PROGRAM - CONTEMPT-LT/022

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE CONTEMPT-LT PROGRAM PREDICTS THE PRESSURE-TEMPERATURE RESPONSE OF A DRY WELL OR A DRY WELL WITH VENTS AND PRESSURE SUPPRESSION SYSTEM TO A LOSS-OF-COOLANT ACCIDENT. AN ADDITIONAL DUAL CONTAINMENT COMPARTMENT MAY ALSO BE MODELED IF DESIRED. THE DRY WELL IS SEPARATED INTO A LIQUID REGION AND A VAPOR REGION. EACH REGION IS ASSUMED TO HAVE A UNIFORM TEMPERATURE BUT THE TEMPERATURES OF THE TWO REGIONS MAY BE DIFFERENT. THE CONTAINMENT BUILDING IS REPRESENTED AS CONSISTING OF SEVERAL HEAT CONDUCTING STRUCTURES WHOSE THERMAL BEHAVIOR CAN BE DESCRIBED BY THE ONE-DIMENSIONAL MULTI-REGION HEAT CONDUCTION EQUATIONS. WATER AND ENERGY RATES FROM DISCHARGE OF COOLANT, BOILING OF RESIDUAL WATER BY REACTOR DECAY HEAT, SUPERHEATING OF STEAM PASSING THROUGH THE CORE, AND METAL-WATER REACTIONS ARE ASSUMED AVAILABLE FROM PREVIOUS CALCULATIONS AND ARE INPUT DATA TO THE PROGRAM. PROGRAM OUTPUT INCLUDES CONTAINMENT VOLUME PRESSURE AND TEMPERATURE, TEMPERATURES THROUGH THE BUILDING STRUCTURES, AND THE AMOUNT OF WATER, VAPOR, AND ENERGY IN THE CONTAINMENT VOLUMES. THE PRESSURE SUPPRESSION CALCULATIONS INCLUDE VENT CLEARING AND FLOW OF A TWO-COMPONENT TWO-PHASE WATER-AIR MIXTURE THROUGH THE VENTS, AND A MASS-ENERGY BALANCE IN THE WET WELL. THERE ARE PROVISIONS FOR NORMAL BUILDING LEAKAGE, LEAKAGE FROM PENETRATIONS, A FAN COOLER SYSTEM, AND DRY AND WET WELL SPRAY SYSTEMS.

4. METHOD OF SOLUTION - THE INITIAL CONDITIONS OF THE CONTAINMENT ATMOSPHERE ARE CALCULATED FROM INPUT VALUES, AND THE INITIAL TEMPERATURE DISTRIBUTIONS THROUGH THE CONTAINMENT STRUCTURES ARE DETERMINED FROM THE STEADY-STATE SOLUTION OF THE HEAT CONDUCTION EQUATIONS. A TIME ADVANCEMENT PROCEEDS AS FOLLOWS. THE INPUT WATER AND ENERGY RATES ARE EVALUATED AT THE MIDPOINT OF A TIME INTERVAL AND ADDED TO THE CONTAINMENT SYSTEM. PRESSURE SUPPRESSION, SPRAY SYSTEM EFFECTS, AND FAN COOLER EFFECTS ARE CALCULATED USING CONDITIONS AT THE BEGINNING OF A TIME-STEP. LEAKAGE AND HEAT LOSSES OR GAINS, EXTRAPOLATED FROM THE LAST TIME-STEP, ARE ADDED TO THE CONTAINMENT SYSTEM. CONTAINMENT VOLUME PRESSURE AND TEMPERATURES ARE ESTIMATED BY SOLVING THE MASS, VOLUME, AND ENERGY BALANCE EQUATIONS. USING THESE RESULTS AS BOUNDARY CONDITIONS, THE HEAT CONDUCTION EQUATIONS DESCRIBING STRUCTURE BEHAVIOR ARE ADVANCED USING AN IMPLICIT TECHNIQUE. THE RESULTING HEAT TRANSFER RATES ARE USED TO CORRECT THE PREVIOUS ESTIMATES OF THE WATER AND ENERGY STORAGE IN THE CONTAINMENT VOLUME, AND THE CONTAINMENT CONDITIONS ARE OBTAINED BY SOLVING FOR THE SECOND TIME THE CONTAINMENT BALANCE EQUATIONS. THE PRESSURE SUPPRESSION ROUTINES USE THE CONDITIONS AT THE BEGINNING OF A TIME-STEP TO CALCULATE BOTH THE INITIAL EXPULSION OF WATER FROM THE VENTS AND THE FLOW THROUGH THE VENTS. FROM THE CALCULATED FLOW RATES, MASS AND ENERGY ARE REMOVED FROM THE DRY WELL AND ADDED TO THE WET WELL.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   20 HEAT STRUCTURES
   101 MESH POINTS PER STRUCTURE
   SEVERAL METHODS FOR DESCRIBING NON-CONSTANT HEAT TRANSFER COEFFICIENTS ARE PROVIDED, BUT THE THERMAL CONDUCTIVITY AND HEAT CAPACITY ARE CONSTANT. WATER THERMODYNAMIC PROPERTIES ARE DETERMINED FROM TABLE LOOKUP AND INTERPOLATION PROCEDURES.

6. TYPICAL RUNNING TIME - ON THE IBM360/75, APPROXIMATELY .021 SECOND PER TIME ADVANCEMENT WITH 90 MESH POINTS FOR HEAT STRUCTURES WITHOUT PRESSURE SUPPRESSION IS REQUIRED. THE PRESSURE SUPPRESSION TIMING IS NOT EASILY PREDICTED BUT TWO SAMPLE PROBLEMS RANGED FROM .3 TO 2 SECONDS PER TIME ADVANCEMENT.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - CONTEMPT-LT REPLACES CONTEMPT (ACC ABSTRACT 297), CONTEMPT-CONPS, AND CONTEMPT-PS.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
   IBM360 VERSION OF CONTEMPT-CONPS SUBMITTED FEBRUARY 1970, REPLACED BY CONTEMPT-PS APRIL 1971, REPLACED BY CONTEMPT-LT/020 AUGUST 1973, REPLACED BY CONTEMPT-LT/022 DECEMBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - L. C. RICHARDSON, L. J. FINNEGAN, R. J. WAGNER, AND J. M. WAAGE, CONTEMPT, A COMPUTER PROGRAM FOR PREDICTING THE CONTAINMENT PRESSURE-TEMPERATURE RESPONSE TO A LOSS-OF-COOLANT ACCIDENT, IDO-17220, JUNE 1967.

C. F. CARMICHAEL AND S. A. MARKC, CONTEMPT-PS - A DIGITAL COMPUTER CODE FOR PREDICTING THE PRESSURE-TEMPERATURE HISTORY WITHIN A PRESSURE-SUPPRESSION CONTAINMENT VESSEL IN RESPONSE TO A LOSS-OF-COOLANT ACCIDENT, IDO-17252, APRIL 1969.

R. J. WAGNER, CONTEMPT MODIFICATIONS, PHILLIPS PETROLEUM MEMO WAG-24-68 AM, SEPTEMBER 23, 1968.

R. J. WAGNER, CONTEMPT-CONPS MODIFICATIONS, WAG-19-69A-M, MAY 14, 1969.

C. F. CARMICHAEL, MODIFICATIONS TO CONTEMPT/CONPS CODE, IDAHO NUCLEAR MEMO CARM-16-69, SEPTEMBER 17, 1969.

L. C. RICHARDSON, DATE SUBROUTINE S0000010, PHILLIPS PETROLEUM NOTE, NOVEMBER 1968.

R. J. WAGNER, CVI INPUT SUBROUTINE, IDAHO NUCLEAR NOTE, MAY 1969.

R. L. MUELLER, 360/75 INTERVAL TIMER ROUTINE S00030, PHILLIPS PETROLEUM NOTE, OCTOBER 10, 1968.

K. D. RICHERT, BUFIO, A SUBROUTINE TO PERMIT FORTRAN ACCESS TO IOOP, PHILLIPS PETROLEUM NOTE, FEBRUARY 1966.

A. J. SMITH, CALCOMP PLOTTER SUBROUTINES, PHILLIPS PETROLEUM DESCRIPTION, FEBRUARY 1969.

NRTS ENVIRONMENTAL SUBROUTINE MANUAL, ANC DOCUMENT, DECEMBER 1972.

R. J. WAGNER AND L. L. WHEAT, CONTEMPT-LT USERS

10. REFERENCES (CONTINUED)
MANUAL, INTERIM REPORT I-214-74-12.1, AUGUST 1973.
L. L. WHEAT, CONTEMPT-LT/021 CONTAINMENT CODE - LLW-7-73, AEROJET NOTE, SEPTEMBER 6, 1973.
L. L. WHEAT, CONTEMPT-LT/022 PROGRAM AVAILABILITY - LLW-12-73, AEROJET NOTE, DECEMBER 17, 1973.

11. MACHINE REQUIREMENTS - 270K BYTES AND A CALCOMP PLOTTER USED FOR PLOTTING

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 MVT.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
R. J. WAGNER AND L. L. WHEAT
AEROJET NUCLEAR COMPANY
550 SECOND STREET
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CONTEMPT 5182 CARDS, NRTS ENVIRONMENTAL SUBROUTINES 12,187 CARDS)
LOAD MODULE CONTEMPT (342 BLOCKS)
SAMPLE PROBLEM (60 CARDS)
CONTROL INFORMATION (JCL 53 CARDS)
REFERENCE REPORTS, PROGRAM MODIFICATION MEMORANDA, SUBROUTINE DESCRIPTIONS, INTERIM REPORT, AND AEROJET NOTES

17. CATEGORY - G
KEYWORDS - ACCIDENTS, TEMPERATURE DISTRIBUTION, PRESSURE DISTRIBUTION, CONTAINMENT, WATER, THERMODYNAMICS, LEAKAGE, HEAT TRANSFER, CONTEMPT CODES

ACC ABSTRACT 434 03/72

1. NAME OR DESIGNATION OF PROGRAM - HEATMESH

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - HEATMESH IS USED TO GENERATE GEOMETRICAL DATA REQUIRED FOR STUDIES OF HEAT TRANSFER IN AXISYMMETRIC STRUCTURES REPRESENTED AS SURFACES OF REVOLUTION. THE PROGRAM CONSISTS OF TWO DISTINCT PHASES. THE FIRST SUBDIVIDES THE GIVEN PARTS INTO A NODAL NETWORK AND EVALUATES THE GEOMETRICAL PROPERTIES OF THE NODES. THE SECOND DETERMINES ADJACENT NODES AND EDITS GEOMETRICAL DATA FOR THE THERMAL MODEL.

4. METHOD OF SOLUTION - THE STRUCTURE TO BE STUDIED, REPRESENTED AS A BODY OF REVOLUTION, IS DIVIDED INTO PARTS HAVING COMMON MATERIAL PROPERTIES AND REPRESENTED AS BODIES OF REVOLUTION. EACH PART IS THEN DESCRIBED AS FOUR SURFACES OF REVOLUTION SUBDIVIDED INTO NODES WHICH FORM A MESH. DATA FOR EACH PART ARE COLLECTED, I.E. VOLUME, AREA, AND PART NUMBER OF EACH NODE, AND NODE SURFACES ON THE PART BOUNDARY AND INSIDE THE PART BOUNDARY. THE DISTANCE BETWEEN THE CENTER AND THE MIDPOINT OF EACH SURFACE OF THE NODE IS TABULATED ALSO.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
   NUMBER OF SUBDIVISIONS BETWEEN 1 AND 50 FOR SIDES 1 AND 3
   NUMBER OF SUBDIVISIONS BETWEEN 1 AND 12 FOR SIDES 2 AND 4

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM - THE INPUT DATA ARE CONSTRUCTED IN THE SAME MANNER AS USED IN THE APT PROGRAM. DATA GENERATED BY APT CAN BE USED IN HEATMESH WITH ONLY MINOR CHANGES.

8. RELATED AND AUXILIARY PROGRAMS - THE DATA GENERATED BY HEATMESH ARE USED IN THE DIFFERENCE EQUATIONS OF THE HEATFLOW PROGRAM WHICH SOLVES TRANSIENT HEAT TRANSFER PROBLEMS.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1970.
   CDC6600 VERSION SUBMITTED JANUARY 1970.

10. REFERENCES - V. K. GABRIELSON, HEATMESH, A COMPUTER CODE FOR GENERATING GEOMETRICAL DATA REQUIRED FOR STUDIES OF HEAT TRANSFER IN AXISYMMETRIC STRUCTURES, SCL-DR-67-30, SEPTEMBER 1967, AND ERRATA, 1970.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.

11. MACHINE REQUIREMENTS - 140,000 OCTAL WORDS

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - CYGRO3 CALLS A SUBROUTINE TICK WHICH IS NOT INCLUDED WITH THE PROGRAM NOR WITH THE BETTIS ENVIRONMENTAL ROUTINES. THEREFORE, THE USER WILL HAVE TO PROVIDE HIS OWN SUBROUTINE TICK. CALL TICK(HRS) IS USED TO OBTAIN ELAPSED TIME FOR THE CURRENT JOB. IT SETS HRS (REAL) TO THE ELAPSED CHARGE TIME IN HOURS.

15. NAME AND ESTABLISHMENT OF AUTHORS -

E. DUNCOMBE AND C. M. FRIEDRICH
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5206 CARDS)
SAMPLE PROBLEM (95 CARDS)
SAMPLE PROBLEM OUTPUT (15 PAGES)
REFERENCE REPORTS

17. CATEGORY - I
KEYWORDS - STRESSES DISTRIBUTION, FUEL ELEMENTS, DEFORMATION, TEMPERATURE, PRESSURE, CYGRO CODES

1. NAME OR DESIGNATION OF PROGRAM - KENO/KENO2

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - KENO IS A MULTIGROUP MONTE CARLO CRITICALITY CODE CONTAINING A SPECIAL GEOMETRY PACKAGE WHICH ALLOWS EASY DESCRIPTION OF SYSTEMS COMPOSED OF CYLINDERS, SPHERES, AND CUBOIDS (RECTANGULAR PARALLELEPIPEDS) ARRANGED IN ANY ORDER WITH ONLY ONE RESTRICTION (EACH GEOMETRICAL REGION MUST BE DESCRIBED AS COMPLETELY ENCLOSING ALL REGIONS INTERIOR TO IT). FOR SYSTEMS NOT DESCRIBABLE USING THIS SPECIAL GEOMETRY PACKAGE, THE PROGRAM CAN USE THE GENERALIZED GEOMETRY PACKAGE (GEOM) DEVELOPED FOR THE O5R MONTE CARLO CODE. IT ALLOWS ANY SYSTEM THAT CAN BE DESCRIBED BY A COLLECTION OF PLANES AND/OR QUADRATIC SURFACES, ARBITRARILY ORIENTED AND INTERSECTING IN ARBITRARY FASHION. RECTANGULAR ARRAYS OF FISSILE UNITS ARE ALLOWED WITH OR WITHOUT EXTERNAL REFLECTOR REGIONS. OUTPUT FROM KENO CONSISTS OF KEFF FOR THE SYSTEM PLUS AN ESTIMATE OF ITS STANDARD DEVIATION AND THE LEAKAGE, ABSORPTION, AND FISSIONS FOR EACH ENERGY GROUP PLUS THE TOTALS FOR ALL GROUPS. FLUX AS A FUNCTION OF ENERGY GROUP AND REGION AND FISSION DENSITIES AS A FUNCTION OF REGION ARE OPTIONAL OUTPUT.

4. METHOD OF SOLUTION - THE SCATTERING TREATMENT USED IN KENO ASSUMES THAT THE DIFFERENTIAL NEUTRON SCATTERING CROSS SECTION CAN BE REPRESENTED BY A P1 LEGENDRE POLYNOMIAL. ABSORPTION OF NEUTRONS IN KENO IS NOT ALLOWED. INSTEAD, AT EACH COLLISION POINT OF A NEUTRON TRACKING HISTORY THE WEIGHT OF THE NEUTRON IS REDUCED BY THE ABSORPTION PROBABILITY. WHEN THE NEUTRON WEIGHT HAS BEEN REDUCED BELOW A SPECIFIED POINT FOR THE REGION IN WHICH THE COLLISION OCCURS, RUSSIAN ROULETTE IS PLAYED TO DETERMINE IF THE NEUTRONS HISTORY IS TO BE TERMINATED AT THAT POINT OR IF THE NEUTRON IS TO SURVIVE WITH AN INCREASED WEIGHT. SPLITTING OF HIGH WEIGHT NEUTRONS IS ALLOWED IN ORDER TO MINIMIZE THE VARIANCE IN KEFF FOR SYSTEMS WITH REGIONS OF WIDELY VARYING AVERAGE WEIGHTS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - THE FIRST SAMPLE PROBLEM REQUIRES JUST OVER 2 MINUTES OF EXECUTION TIME ON THE IBM360/91 AND 6 MINUTES ON THE IBM360/75. TYPICAL PROBLEMS RUN BETWEEN 2 AND 30 MINUTES ON THE CDC6600, DEPENDING ON THE NUMBER OF HISTORIES REQUESTED, THE STATISTICAL WEIGHTING USED, AND THE PRESENCE OR ABSENCE OF REFLECTORS.

7. UNUSUAL FEATURES OF THE PROGRAM - THE MIXED BOX FEATURE PERMITS THE CALCULATION OF MANY DIFFERENT TYPES OF UNITS. KENO2 INPUT IS EXTENSIVELY CHECKED FOR CONSISTENCY AND COMPLETENESS.

8. RELATED AND AUXILIARY PROGRAMS - ANISN (ACC ABSTRACT 151), DOT, GEOM, O5R

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION OF KENO SUBMITTED MAY 1970, REPLACED BY SECOND VERSION SEPTEMBER 1971, SAMPLE PROBLEM EXECUTED BY ACC.
CDC6600 VERSION OF KENO2 SUBMITTED JULY 1973.

10. REFERENCES - G. E. WHITESIDES AND N. F. CROSS, KENO - A MULTIGROUP MONTE CARLO CRITICALITY PROGRAM, CTC-5, SEPTEMBER 10, 1969.
KENO DATA GUIDE, CTC-5 ERRATA PP.21-32, SEPTEMBER 1971.
DESCRIPTION OF ALBEDO AND CROSS SECTION DATA, ORNL NOTE, SEPTEMBER 1971.
ACC PROGRAMMING NOTE, KENO TAPE SETUP, JANUARY 1972.
DEANNE DICKINSON, ROCKY FLATS KENO II MANUAL, APRIL 1973.
ACC 450 KENO2 CDC6600 PROGRAMMING NOTES, JULY 1973.

11. MACHINE REQUIREMENTS - CDC6600 PROGRAM REQUIRES 64K WORDS OF FAST CORE, A DISK FACILITY OR ONE OR MORE TAPE UNITS.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV, EXCEPT FOR 3 MACHINE LANGUAGE SUBROUTINES (IBM360) AND FTN FORTRAN WITH COMPASS SUBROUTINES (CDC6600).

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360) AND SCOPE 3.3 (CDC6600).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - IBM360 SAMPLE PROBLEM CAN BE EXECUTED BY MOUNTING THE DISTRIBUTION TAPE AND USING THE JCL CARDS FROM FILE 5 TO RETRIEVE THE OBJECT PROGRAM AND ANY NEEDED CROSS SECTION OR ALBEDO DATA. THE ENCLOSED CROSS SECTION AND ALBEDO DATA ARE INCLUDED FOR THE SOLE PURPOSE OF ALLOWING THE SAMPLE PROBLEMS TO BE RUN FOR INSTRUCTIONAL PURPOSES AND SHOULD NOT BE ASSUMED USEFUL FOR ANY OTHER PURPOSE WITHOUT CLOSE EXAMINATION AS TO THEIR APPLICABILITY.
THE 3 MACHINE LANGUAGE SUBROUTINES MENTIONED IN ITEM 12 INCLUDE A RANDOM NUMBER PACKAGE RANDNUM (ENTRIES FLTRN, AZIRN, EXPRN, AND GTISC), A TIMING SUBROUTINE PULL (ENTRIES PULL AND ITIME), AND MODEL, A SUBROUTINE USED AT OAK RIDGE TO IDENTIFY THE MACHINE ON WHICH A PROBLEM IS BEING RUN.

15. NAME AND ESTABLISHMENT OF AUTHORS -

360 G. E. WHITESIDES AND N. F. CROSS
MATHEMATICS DIVISION
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

6600 DEANNE DICKINSON
ROCKY FLATS DIVISION
DOW CHEMICAL USA
P. O. BOX 888
GOLDEN, COLORADO 80401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (360-6 FILES)
    SOURCE DECK (360-FILE5 5230 CARDS, 6600-5109 CARDS)
    OBJECT DECK (360-FILE3 3347 CARDS)
    SAMPLE PROBLEMS (360-FILE6 1664 CARDS, 6600-369 CARDS)
    LIBRARIES (360-CROSS SECTION FILE1 110 VARIABLE-SIZED BINARY RECORDS AND ALBEDOS FILE2 39 VARIABLE-SIZED BINARY RECORDS)
    CONTROL INFORMATION (360-JCL FILE4 29 CARDS)
    SAMPLE PROBLEM OUTPUT (360-110 SELECTED PAGES, 6600-58 PAGES)
    REFERENCE REPORT, ERRATA, MANUAL, AND NOTES

17. CATEGORY - C
    KEYWORDS - MULTIGROUP, MONTE CARLO METHOD, CRITICALITY, LEAKAGE, ABSORPTION, FISSION, STATISTICS, ANISN CODES, DOT CODES, GEOM CODES, OSR CODES

ACC ABSTRACT 451 03/72

1. NAME OR DESIGNATION OF PROGRAM - SAFE-CRACK

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - SAFE-CRACK PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE AND AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES SUBJECTED TO TRANSIENT TEMPERATURE AND MECHANICAL LOADINGS. THE SPECIFIC CREEP OF CONCRETE AS AN AGE AND TEMPERATURE DEPENDENT FUNCTION, AND CONCRETE FAILURE UNDER COMBINED STRESSES ARE CONSIDERED. PARTICULAR EMPHASIS IS PLACED ON THE CRACKING ANALYSIS IN CONCRETE STRUCTURES AND THE NONLINEAR DEPENDENCE OF CREEP PROPERTY ON TRANSIENT TEMPERATURE.

4. METHOD OF SOLUTION - THE PROGRAM USES THE FINITE-ELEMENT METHOD WHICH REDUCES THE PROBLEM TO THE SOLUTION OF A SYSTEM OF COUPLED INTEGRAL EQUATIONS. THE CHOLESKY METHOD IS USED TO SOLVE THE LINEAR SYSTEM OF EQUATIONS AND THE TRAPEZOIDAL RULE IS APPLIED FOR THE TIME INTEGRATION.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   300 NODES
   675 ELEMENTS
   70 TIME-STEPS

6. TYPICAL RUNNING TIME - 90 MINUTES ARE REQUIRED FOR A FULL-CAPACITY PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - SAFE-CREEP (ACC ABSTRACT 300)

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
   UNIVAC1108 VERSION SUBMITTED MAY 1970.

10. REFERENCES - Y. R. RASHID, NONLINEAR QUASI-STATIC ANALYSIS OF TWO-DIMENSIONAL CONCRETE STRUCTURES, PART I THEORY, PART II COMPUTER PROGRAM MANUAL, GA-9994, MARCH 23, 1970.
   R. D. BROWNE, PROPERTIES OF CONCRETE IN REACTOR VESSELS, CONFERENCE ON PRESTRESSED CONCRETE PRESSURE VESSELS AT CHURCH HOUSE, WESTMINSTER, S.W. 1, 13-17 MARCH 1967, THE INSTITUTE OF CIVIL ENGINEERS, LONDON, 1968, PP. 131-151.
   NTRAN, I/O ROUTINES FOR TAPE AND DRUM, EXCERPT FROM UNIVAC 1107 FORTRAN IV PROGRAMMERS REFERENCE MANUAL, UP-3569, REV. 1.

11. MACHINE REQUIREMENTS - 65K MEMORY AND 13 TAPES

12. PROGRAMMING LANGUAGE USED - FORTRAN V

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC II.

ACC ABSTRACT 462 11/73

1. NAME OR DESIGNATION OF PROGRAM - SPAN4

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - SPAN4 CALCULATES THE FAST NEUTRON DOSE RATE, THERMAL NEUTRON FLUX, GAMMA-RAY FLUX, DOSE RATE, AND ENERGY-ABSORPTION RATE IN RECTANGULAR, CYLINDRICAL, AND SPHERICAL GEOMETRIES BY INTEGRATING APPROPRIATE EXPONENTIAL KERNELS OVER A SOURCE DISTRIBUTION. THE SHIELD CONFIGURATION IS FLEXIBLE - A FIRST-LEVEL SHIELD MESH, USING ANY ONE OF THE THREE GEOMETRIES, IS SPECIFIED. REGIONS OF THIS SAME GEOMETRY OR OF OTHER GEOMETRIES, HAVING THEIR OWN (FINER) MESHES, MAY THEN BE EMBEDDED BETWEEN THE FIRST-LEVEL MESH LINES, DEFINING SECOND-LEVEL SHIELD MESHES. THIS PROCESS IS TELESCOPIC - THIRD-LEVEL SHIELD MESHES MAY BE EMBEDDED BETWEEN SECOND-LEVEL MESH LINES IN TURN. ALL MESHES MAY HAVE VARIABLE SPACING. SOURCES AND DETECTORS MAY BE LOCATED ARBITRARILY WITH RESPECT TO ANY SHIELD MESH. THE SOURCE IS DEFINED BY THE FUNCTION -

```
S=S0+S1(A)*S2(B)*S3(C)+S4(A,B)*S3(C)+S5(A,C)*S2(B)+S6(B,C)
  *S1(A)+S7(A,B,C)
```

WHERE A, B, AND C REPRESENT COORDINATES. IF ANY FACTOR IS MISSING, THE CORRESPONDING TERMS ARE ZERO. CROSS SECTIONS, BUILDUP FACTORS, STANDARD COMPOSITIONS, ENERGY STRUCTURES, DOSE-CONVERSION FACTORS, INFINITE LINE AND INFINITE PLANE SOURCE KERNELS, AND QUADRATURES ARE CONTAINED IN A LIBRARY OF APPROXIMATELY 10,000 ITEMS.

4. METHOD OF SOLUTION - ALL KERNELS USED ASSUME EXPONENTIAL ATTENUATION. BY RAY TRACING, THE STRAIGHT-LINE DISTANCES BETWEEN POINTS IN THE SOURCE AND DOSE POINTS ARE FOUND, TO BE USED IN CALCULATING THE ATTENUATION. INTEGRALS ARE EVALUATED BY GAUSS-LEGENDRE, GAUSS-LAGUERRE, OR LOBATTO QUADRATURE. ACCURACY IS DEPENDENT ON THE ACCURACY OF THE LIBRARY DATA AND ON THE ORDERS OF QUADRATURE USED. IN THERMAL NEUTRON FLUX CALCULATIONS, THE DOSE POINTS MUST BE LOCATED WITHIN OR BEYOND HYDROGENOUS REGIONS, UNLESS THE REMOVAL CROSS SECTIONS FOR THE NON-HYDROGENOUS CASE ARE KNOWN.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - DYNAMIC STORAGE IS USED FOR LARGE BLOCKS OF DATA. HOWEVER, THE FOLLOWING LIMITS ARE TO BE OBSERVED - MAXIMA OF -

   75 SHIELD UNITS
   75 COMPOSITION MATRICES
    9 SOURCES AND DETECTORS
    9 FIELD-POINT LISTS
  450 DIFFERENT DYNAMICALLY-STORED ARRAYS. THE NUMBER OF SUCH ARRAYS IS 3*(NUMBER OF SHIELD UNITS)+NUMBER OF COMPOSITION MATRICES+10*(NUMBER OF SOURCES+NUMBER OF DETECTORS)+NUMBER OF FIELD POINT LISTS+1.
  400 DIFFERENT COMPOSITION NUMBERS
  200 MESH LINES IN ANY DIRECTION IN ANY SHIELD UNIT
   33 EMBEDDED GEOMETRIES IN THE PATH OF ONE RAY

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)

9 COMBINED FIELD-POINT LISTS
33 INTEGRATIONS IN ONE CASE
15 DECAY-TIMES LISTS
2000 ITEMS IN ANY ONE DATA GROUP, EXCEPT SOURCE STRENGTHS
2000 PRODUCT OF THE ORDERS OF THE THREE QUADRATURE NUMBERS

MAXIMUM ADDITIONS TO THE LIBRARY -

1016 CROSS SECTION DATA ENTRIES OR 32 NEW ELEMENTS
1060 COMPOSITION DATA ENTRIES OR 279 COMPOSITIONS
190 ENERGY-STRUCTURE DATA ENTRIES OR 19 ENERGY STRUCTURES
350 BUILDUP-FACTOR DATA ENTRIES OR 3 NEW BUILDUP-FACTOR MATERIALS

6. TYPICAL RUNNING TIME - A CONSERVATIVE ESTIMATE OF THE COMPUTER TIME REQUIRED FOR A RUN IS GIVEN BY -

T(SEC)=25+(0.00042*NG*NI+0.1*(E-1)+0.02*NC)*NF

WHERE NG IS THE PRODUCT OF THE ORDERS OF THE QUADRATURES USED IN INTEGRATING OVER THE SOURCE VOLUME, NI IS THE NUMBER OF MESH LINES CROSSED IN RAY-TRACING FROM A TYPICAL GAUSS POINT TO A TYPICAL FIELD POINT, NF IS THE NUMBER OF FIELD POINTS IN THE RUN, E IS THE NUMBER OF ENERGY LEVELS IN THE ENERGY STRUCTURE, AND NC IS THE NUMBER OF DIFFERENT COMPOSITIONS.

7. UNUSUAL FEATURES OF THE PROGRAM - THE EXTREME FLEXIBILITY OF THE SHIELD GEOMETRY OPTIONS ALLOWS NEARLY EXACT REPRESENTATIONS OF VERY COMPLEX REACTORS, SHIELDS, AND REACTOR COMPARTMENT SITUATIONS. COMPLEX REACTORS AND OTHER DEVICES ARE REPRESENTED BY EMBEDDING PORTIONS OF ONE GEOMETRY IN ANOTHER AS FOLLOWS.

A BASIC GEOMETRY (RECTANGULAR, CYLINDRICAL, OR SPHERICAL) IS DEFINED FOR THE SHIELD CONFIGURATION, AND IS USED TO SPECIFY THE MESHLINES IN THE FIRST-LEVEL SHIELD UNIT. THE FIRST-LEVEL SHIELD USUALLY ENCOMPASSES ALL OF THE SHIELDS AND COMPONENTS WHICH ARE TO BE REPRESENTED IN THE PROBLEM. AFTER THE FIRST-LEVEL SHIELD UNIT HAS BEEN SPECIFIED, NEW SHIELD UNITS MAY BE DEFINED (USING A DIFFERENT GEOMETRY THAN THE FIRST-LEVEL SHIELD IF DESIRED), AND PORTIONS OF THESE NEW SHIELD UNITS MAY BE EMBEDDED BETWEEN THE MESHLINES OF THE FIRST-LEVEL SHIELD UNIT. THESE NEW SHIELD UNITS BECOME SECOND-LEVEL SHIELDS.

THE EMBEDDING PROCESS IS TELESCOPIC, SUCH THAT THIRD-LEVEL SHIELD UNITS MAY BE DEFINED AND EMBEDDED IN THE SECOND-LEVEL SHIELD UNITS, AND EACH NEW LEVEL OF SHIELD GEOMETRY IS EMBEDDED IN THE NEXT LOWER LEVEL. THE MESHLINES WHICH ARE SPECIFIED IN EACH SHIELD MAY HAVE VARIABLE SPACING.

EACH CELL FORMED BY THE MESHLINES OF EACH SHIELD UNIT MAY THEN BE SPECIFIED TO CONTAIN EITHER A COMPOSITION (THAT IS VOID, ELEMENT, COMPOUND, OR MIXTURE) OR A CELL-SHAPED PORTION OF A HIGHER-ORDER SHIELD UNIT. THE HIGHEST-ORDER SHIELD UNIT(S) IN A PROBLEM WILL THEREFORE HAVE A COMPOSITION IN EVERY CELL.

MULTIPLE SOURCES AND DETECTORS ARE ALLOWED, THUS SIMPLIFYING SOME TYPES OF STUDIES. NINE SOURCE AND DETECTOR GEOMETRIES MAY BE DEFINED IN A SPAN4 PROBLEM, AND AGAIN THE GEOMETRIES MAY BE RECTANGULAR, CYLINDRICAL, OR SPHERICAL. SOURCES AND DETECTORS MAY BE LOCATED ARBITRARILY WITH RESPECT TO ANY SHIELD UNIT, AND THE

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
REGIONS OF INTEGRATION (OR DETECTORS) OVER WHICH THE FLUX, DOSE RATE, OR ENERGY-ABSORPTION RATE ARE CALCULATED MAY BE PARTS OF RECTANGULAR SOLIDS, PARTS OF CYLINDERS, OR PARTS OF SPHERES.
THE ENERGY OUTPUT OR PARTICLE EMISSION OF EACH SOURCE IS DESCRIBED BY A GENERAL THREE-DIMENSIONAL DISTRIBUTION FUNCTION. THE VARIATION OF THE SOURCE DISTRIBUTION FUNCTION BETWEEN MESH-LINES MAY BE LINEAR, SEMI-LOG, OR LOG-LOG. THE GENERALITY OF THE FUNCTION REQUIRES THAT THE INTEGRAL BE ESTIMATED BY MEANS OF GAUSS-LEGENDRE, GAUSS-LAGUERRE, OR LOBATTO QUADRATURES. A NUMBER OF AUXILIARY PROGRAMS WHICH PREPARE SPAN4 INPUT FILES AND PROCESS SPAN4 OUTPUT FILES EXIST. ISOTROPIC SOURCES ARE USUALLY ASSUMED. A COSINE SOURCE OPTION ALLOWS THE SIMULATION OF ANISOTROPIC SOURCES.

8. RELATED AND AUXILIARY PROGRAMS - SPAN4 IS AN EXTENSION OF, AND SUPERCEDES, SPAN3. SPAN4 USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSION A SUBMITTED SEPTEMBER 1970, REPLACED BY VERSION B FEBRUARY 1973.

10. REFERENCES - O. J. WALLACE, SPAN-4 - A POINT-KERNEL COMPUTER PROGRAM FOR SHIELDING, WAPD-TM-809(L)-ISSUE 2, VOLS. I AND II, OCTOBER 1972.
O. J. WALLACE, SPAN-4 - A POINT-KERNEL COMPUTER PROGRAM FOR SHIELDING, WAPD-TM-809, DECEMBER 1969.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
W. H. GUILINGER, N. D. COOK, AND P. A. GILLIS, SPAN-3 A SHIELD DESIGN PROGRAM FOR THE PHILCO-2000 COMPUTER, WAPD-TM-235, FEBRUARY 1962.
CONTROL DATA 6400/6500/6600 COMPUTER SYSTEMS SCOPE 3.1 REFERENCE MANUAL, PUBL. NO. 60189400A, FEBRUARY 1968.

11. MACHINE REQUIREMENTS - 64K CENTRAL MEMORY AND ONE SYSTEM DISK. MICROFILM IS REQUIRED IF THE PLOT OPTIONS ARE TO BE USED.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND ASCENT

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SPAN4 IS STRUCTURED INTO DISTINCT PARTS WHICH ARE LOADED INTO CENTRAL MEMORY AS REQUIRED. THESE PARTS ARE REFERRED TO AS OVERLAYS AS DESCRIBED IN REFERENCE 5. ESSENTIALLY AN OVERLAY REPRESENTS THE AMOUNT OF PROGRAM TEXT IN CENTRAL MEMORY. WITH OVERLAY LOADING, THE MAIN OVERLAY IS ALWAYS IN MEMORY, AND, IN ADDITION, A PARTICULAR PRIMARY AND ONE SECONDARY OVERLAY MAY ALSO BE IN CENTRAL MEMORY. SPAN4 CONTAINS A MAIN OVERLAY, 7 PRIMARY OVERLAYS, AND 8 SECONDARY OVERLAYS. OVERALL PROGRAM CONTROL IS VESTED IN

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
THE MAIN OVERLAY AND THE PRIMARY AND SECONDARY OVERLAYS ARE LOADED AND EXECUTED THROUGH THE USE OF THE NEXT SUBROUTINE DESCRIBED IN REFERENCE 3.

15. NAME AND ESTABLISHMENT OF AUTHOR -

O. J. WALLACE
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL (2 TAPES)
SOURCE DECK (PART 1 11,080 CARDS, PART 2 11,553 CARDS)
SAMPLE PROBLEMS (466 CARDS)
REFERENCE REPORTS, WAPD-TM-809(L), VOLS. 1 AND 2

17. CATEGORY - J
KEYWORDS - DOSE RATES, SHIELDING DESIGN, GAMMA RADIATION, SPAN3 CODES

ACC ABSTRACT 465 10/73

1. NAME OR DESIGNATION OF PROGRAM - RESEND/ADLER

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, PDP10

3. DESCRIPTION OF PROBLEM OR FUNCTION - RESEND GENERATES INFINITELY DILUTE, UNBROADENED POINT CROSS SECTIONS IN THE ENDF FORMAT BY COMBINING ENDF FILE 3, BACKGROUND CROSS SECTIONS WITH POINTS CALCULATED FROM ENDF FILE 2, RESONANCE PARAMETER DATA.
   ADLER CALCULATES TOTAL, CAPTURE AND FISSION CROSS SECTIONS FROM THE CORRESPONDING ADLER-ADLER PARAMETERS IN THE ENDF/B FILE 2 VERSION II DATA AND ALSO DOPPLER-BROADENS CROSS SECTIONS.

4. METHOD OF SOLUTION - RESEND CALCULATIONS ARE DONE IN TWO STEPS BY TWO SEPARATE SECTIONS OF THE PROGRAM. THE FIRST SECTION DOES THE RESONANCE CALCULATION AND STORES THE RESULTS ON A SCRATCH FILE. THE SECOND SECTION COMBINES THE DATA FROM THE SCRATCH FILE WITH BACKGROUND CROSS SECTIONS AND PRINTS THE RESULTS.
   ADLER USES THE ADLER-ADLER FORMALISM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - RESEND EXPECTS ITS INPUT TO BE A STANDARD MODE BCD ENDF FILE (VERSION II/III). SINCE THE OUTPUT IS ALSO A STANDARD MODE BCD ENDF FILE, THE PROGRAM IS LIMITED BY THE SIX SIGNIFICANT FIGURE ACCURACY INHERENT IN THE ENDF FORMATS. (IF THE CROSS SECTION HAS BEEN CALCULATED AT TWO POINTS SO CLOSE IN ENERGY THAT ONLY THEIR LEAST SIGNIFICANT FIGURES DIFFER, THAT INTERVAL IS ASSUMED TO HAVE CONVERGED, EVEN IF OTHER CONVERGENCE CRITERIA MAY NOT BE SATISFIED.) IN THE UNRESOLVED RANGE THE CROSS SECTIONS HAVE BEEN AVERAGED OVER A PORTER-THOMAS DISTRIBUTION. IN SOME REGIONS THE CALCULATED RESONANCE CROSS SECTIONS MAY BE NEGATIVE. IN SUCH CASES THE STANDARD CONVERGENCE CRITERION WOULD CAUSE AN UNNECESSARILY LARGE NUMBER OF POINTS TO BE PRODUCED IN THE REGION WHERE THE CROSS SECTION BECOMES ZERO. FOR THIS REASON AN ADDITIONAL INPUT CONVERGENCE CRITERION MAY BE USED (AVERR), BY MEANS OF WHICH IF THE ABSOLUTE VALUE OF THE CROSS SECTION AT BOTH ENDS OF AN INTERVAL IS LESS THAN AVERR THEN THE INTERVAL IS ASSUMED TO HAVE CONVERGED. THERE ARE NO LIMITATIONS ON THE TOTAL NUMBER OF POINTS GENERATED. THE PRESENT ENDF (VERSION II/III) FORMATS RESTRICT THE TOTAL NUMBER OF POINTS THAT CAN BE GIVEN FOR A REACTION TYPE TO 5000.
   ADLER CAN HANDLE RESONANCE DATA UP TO A MAXIMUM OF 10 ISOTOPES WITH A TOTAL NUMBER OF 500 RESONANCES. THE CODE ASSUMES THAT THE RESOLVED RESONANCE PARAMETERS ARE GIVEN FOR ONE ENERGY RANGE WHICH IS THE SAME FOR ALL THE ISOTOPES OF AN ELEMENT. THE MESH POINTS AT WHICH THE CROSS SECTIONS ARE CALCULATED CAN BE VARIED. SINCE THE CALCULATED DATA ARE NOT STORED, AN INCREASE IN THE NUMBER OF MESH POINTS DOES NOT CONFLICT WITH ANY STORAGE REQUIREMENT.

6. TYPICAL RUNNING TIME - TO PRODUCE THE U238 (ENDF MAT = 1103) CROSS SECTIONS WITH A 1 PERCENT ACCURACY (ERR = 0.01) RESEND GENERATES ABOUT 12,000 RESONANCE POINTS AND REQUIRES ABOUT 1 HOUR ON THE PDP10. FOR LESS COMPLEX MATERIALS RUNNING TIME IS CONSIDERABLY

6. TYPICAL RUNNING TIME (CONTINUED)
SHORTER.
ADLER CALCULATIONS OF CROSS SECTIONS OF ONE ISOTOPE WITH 37 RESONANCES AND 20 MESH POINTS BETWEEN RESONANCES REQUIRES 21 SECONDS WITHOUT DOPPLER BROADENING AND 209 SECONDS WITH DOPPLER BROADENING.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - RESEND COMBINES THE FEATURES OF THE RESONANCE REGION CODES AVRAGE3, AVRAGE4, AND SIGMA2. ADDITIONAL SUBROUTINES UNDER DEVELOPMENT WILL FURTHER ENABLE IT TO REPLACE ADLER AND RAMP1 (ACC ABSTRACT 492).

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSIONS OF AVRAGE3,4, SIGMA2, AND ADLER SUBMITTED OCTOBER 1970, REPLACED BY REVISED VERSION DECEMBER 1971. AVRAGE3,4, AND SIGMA2 REPLACED BY PDP10 VERSION OF RESEND AUGUST 1972.

10. REFERENCES - M. R. BHAT, ENDF/B PROCESSING CODES FOR THE RESONANCE REGION, BNL-50296 (ENDF-148), JUNE 1971.
M. K. DRAKE, ED., DATA FORMATS AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50274(T-601) (ENDF-102), VOL. 1, OCTOBER 1970.
ODELLI OZER, PROGRAM RESEND, BNL-17134, JANUARY 1972.
D. B. ADLER AND F. T. ADLER, ANALYSIS OF NEUTRON RESONANCES IN FISSILE ELEMENTS, PROGRAMS CODILLI, CURVEPLOT AND SIGMA, COO-1546-3, SEPTEMBER 1966.

11. MACHINE REQUIREMENTS - RESEND REQUIRES 24K DECIMAL CORE WITH 2 SCRATCH UNITS, AN INPUT UNIT FOR THE ENDF DATA, AN OUTPUT UNIT, A UNIT FOR READING IN THE RUN PARAMETERS (TELETYPE OR SYSTEM INPUT) AND A UNIT FOR PRINTING OUT RUN ASSOCIATED MESSAGES (TELETYPE OR SYSTEM OUTPUT). ADLER REQUIRES 37K OCTAL MEMORY.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.0.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
M. R. BHAT AND O. OZER
NATIONAL NEUTRON CROSS SECTION CENTER
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (RESEND 2321 CARDS, ADLER 892 CARDS)
SAMPLE PROBLEM (ADLER 157 CARDS)
REFERENCE REPORTS, BNL-50296 AND BNL-17134

17. CATEGORY - A
KEYWORDS - AVERAGES, SCATTERING, CAPTURE, FISSION, CROSS SECTIONS, ENDF/B, DOPPLER BROADENING, MULTILEVEL, BREIT-WIGNER FORMULA, AVRAGE3 CODES, AVRAGE4 CODES, SIGMA2 CODES, RAMP1 CODES

1. NAME OR DESIGNATION OF PROGRAM - APREX1

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - APREX1 COLLAPSES AND COMBINES CROSS SECTION SETS FOR MULTIGROUP TRANSPORT CALCULATIONS. IT PERFORMS GROUP COLLAPING FOR AS MANY ISOTOPES, MIXTURES AND LEGENDRE EXPANSION SETS AS DESIRED FROM THE DLC-2B LIBRARY. THE DLC-2B LIBRARY STRUCTURE EMPLOYS TENTH LETHARGY UNIT INTERVALS FROM 15 MEV TO 111 KEV AND QUARTER LETHARGY INTERVALS DOWN TO 0.414 EV. A 100TH GROUP 0.0 TO 0.414 EV IS USED AS A SINK GROUP. THE CODE ALSO DETERMINES THE BROAD GROUP INPUT SOURCE AND GENERATES AVERAGED NEUTRON VELOCITIES FOR USE WITH TRANSPORT CALCULATIONS.

4. METHOD OF SOLUTION - THE FINE GROUP CROSS SECTIONS ARE COLLAPSED TO A BROAD GROUP STRUCTURE ACCORDING TO A FLUX SPECTRUM EITHER INPUT BY THE USER OR CALCULATED BY THE CODE. FINE GROUP CROSS SECTIONS ARE AVERAGED TO FORM EITHER MACROSCOPIC OR MICROSCOPIC ISOTOPE CROSS SECTIONS AND ANY COMBINATION OF MACROSCOPIC MIXTURES OF THESE CROSS SECTIONS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THIS VERSION OF THE CODE USES THE DLC-2B LIBRARY IN ANISN-DOT FORMAT. UPSCATTERING IS NOT INCLUDED.

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - THE PROGRAM UTILIZES THE 99 GROUP DLC-2B NEUTRON CROSS SECTION LIBRARY. THIS LIBRARY IS DERIVED FROM THE ENDF/B DATA BY USE OF SUPERTOG (ACC ABSTRACT 431) AND IS IN THE ANISN-DOT FORMAT. THE CODE FUNCTIONS SIMILARLY TO ZOT (ACC ABSTRACT 113) WRITTEN AT LOS ALAMOS SCIENTIFIC LABORATORY.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSION SUBMITTED OCTOBER 1970.

10. REFERENCES - PAUL S. PICKARD, NEUTRON CROSS SECTION COLLAPSING CODE APREX1, AMXRD-BNL(12-70), JUNE 1, 1970.
PAUL S. PICKARD AND DONALD O. WILLIAMS, CALCULATED NEUTRON ENERGY SPECTRA FOR THE APRF REACTOR, AMXRD-BNL(9-70), APRIL 28, 1970.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

AUTHOR

PAUL S. PICKARD

CONTACT

DR. A. H. KAZI
ARMY PULSE RADIATION FACILITY
U. S. DEPARTMENT OF THE ARMY
ABERDEEN RESEARCH AND DEVELOPMENT CENTER
ABERDEEN PROVING GROUND, MARYLAND 21005

16. MATERIAL AVAILABLE -
SOURCE DECK (646 CARDS)
REFERENCE REPORTS

17. CATEGORY - B
KEYWORDS - CROSS SECTIONS, MULTIGROUP, GROUP CONSTANTS, SUPERTOG CODES, ANISN CODES, ZOT CODES, DOT CODES

1. NAME OR DESIGNATION OF PROGRAM - HRG3

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, IBM360/370

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE CODE COMPUTES THE SLOWING DOWN SPECTRUM OVER THE ENERGY RANGE 10 MEV TO .414 EV IN EITHER THE B1 OR P1 APPROXIMATION, USING 68 GROUPS OF NEUTRONS WITH A CONSTANT GROUP WIDTH OF DELTA U = .25. THE CALCULATED FLUX AND CURRENT SPECTRA ARE USED TO REDUCE THE ORIGINAL 68-GROUP CROSS SECTION DATA TO AVERAGE VALUES OVER AS MANY AS 33 BROAD GROUPS. OUTPUT IS PRINTED AND MAY ALSO BE PUNCHED IN FORMATS FOR INPUT TO ANY OF SEVERAL SPATIAL MULTIGROUP CODES.

4. METHOD OF SOLUTION - THE 68 FINE-GROUP FLUXES AND CURRENTS ARE CALCULATED BY ONE SWEEP THROUGH THE GROUP STRUCTURE, STARTING FROM A SPECIFIED SOURCE DISTRIBUTION. THE SOURCE MAY BE SELECTED FROM AMONG THE 8 AVAILABLE ON THE DATA TAPE OR MAY BE INPUT. THE MULTIGROUP MODEL USES A FULL DOWNSCATTERING MATRIX, WITH INELASTIC, N2N, AND P0 AND P1 COMPONENTS OF ELASTIC SCATTERING EXPLICITLY INCLUDED. MACROSCOPIC FINE-GROUP PARAMETERS ARE CONSTRUCTED FROM INPUT NUCLIDE CONCENTRATIONS AND MICROSCOPIC PARAMETERS, AVAILABLE ON THE DATA TAPE FOR MORE THAN 200 INDIVIDUAL NUCLIDES. THERE IS NO RESTRICTION, OTHER THAN AVAILABILITY, ON THE NUMBER OF NUCLIDES USABLE IN A CASE. A SPECIAL CALCULATION IS MADE IN THE RESONANCE RANGE FOR CERTAIN NUCLIDES, USING AN ADAPTATION OF THE ADLER, HINMAN, AND NORDHEIM METHOD TO OBTAIN AN INTERMEDIATE RESONANCE APPROXIMATION FOR BOTH THE ABSORBER NUCLIDE AND AN ADMIXED MODERATOR. THE RESONANCE CONTRIBUTION IS ALLOCATED TO THE FINE-GROUPS IN A CONSISTENT MANNER PROVIDING SELF-SHIELDING IN BOTH SPACE AND ENERGY. ADDITIONAL SELF-SHIELDING FACTORS MAY BE READ IN FOR ANY NUCLIDE, IF DESIRED. THE FINE-GROUP FLUXES AND CURRENTS ARE USED AS WEIGHTING FUNCTIONS IN AVERAGING MACROSCOPIC AND MICROSCOPIC PARAMETERS OVER THE SPECIFIED BROAD-GROUP STRUCTURE. AS AN OPTION, THE NEUTRON AGE IN AN INFINITE MEDIUM MAY BE CALCULATED BY THE MOMENTS METHOD.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM NUMBER OF BROAD GROUPS IS 33. BROAD-GROUP BOUNDARIES ARE ADJUSTED INTERNALLY TO COINCIDE WITH ONE OF THE 68 FINE-GROUP BOUNDARIES.

6. TYPICAL RUNNING TIME - FOR 10 NUCLIDES, INCLUDING 4 WITH RESONANCE CALCULATION AND NO PUNCHED OUTPUT, 40 SECONDS ARE REQUIRED FOR THE FIRST CASE IN A RUN, AND 20 SECONDS FOR EACH SUCCEEDING CASE.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - NUTAPE2 UPDATES AND/OR PRINTS THE HRG3 DATA TAPE. BINHDT CONVERTS A BCD LIBRARY TO THE BINARY FORMAT USED BY HRG3.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
UNIVAC1108 VERSION SUBMITTED OCTOBER 1970.
IBM360 VERSION SUBMITTED MARCH 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - J. L. CARTER, HRG3 - A CODE FOR CALCULATING THE SLOWING-DOWN SPECTRUM IN THE P1 OR B1 APPROXIMATIONS, BNWL-1432, JUNE 1970.
HRG-3 CHANGES IN CONVERSION TO IBM 360/370, TVA NOTE, 1973.

11. MACHINE REQUIREMENTS - 64K MEMORY, NORMAL INPUT, OUTPUT, PROGRAM, AND PUNCH UNITS, 1 UNIT FOR LIBRARY, 1 TO 4 SCRATCH UNITS OR THEIR EQUIVALENT ON DRUM (UNIVAC1108), 200K MEMORY, STANDARD I/O UNITS, 1 UNIT FOR LIBRARY, AND 1 SCRATCH UNIT (IBM360)

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CSCX (UNIVAC1108), OS/360 (IBM360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - A FEW SPECIAL FEATURES OF CSCX ARE USED BY THE UNIVAC1108. THEIR FUNCTIONS ARE DESCRIBED IN THE REFERENCE REPORT BNWL-1432.

15. NAME AND ESTABLISHMENT OF AUTHORS -

1108 J. L. CARTER
REACTOR PHYSICS DEPARTMENT
PACIFIC NORTHWEST LABORATORIES
BATTELLE
P. O. BOX 999
RICHLAND, WASHINGTON 99352

360 G. W. PERRY
TENNESSEE VALLEY AUTHORITY
303 POWER BUILDING
CHATTANOOGA, TENNESSEE 37401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (1 OR 3 TAPES)
SOURCE DECKS (HRG3 1108-2512 CARDS, 360-2116 CARDS, NUTAPE2 1108-815 CARDS, 360-858 CARDS, BINHDT 1108-278 CARDS, 360-286 CARDS)
SAMPLE PROBLEMS (HRG3 1108-48 CARDS, 360-21 CARDS, BINHDT 1108-26 CARDS, 360-1 CARD, NUTAPE2 360-3 CARDS)
LIBRARIES (1108-1417 BINARY RECORDS, 360 AND 1108 TAPE 2 17,635 CARDS, TAPE 3 19,530 CARDS)
CONTROL INFORMATION (HRG3 360-11 CARDS, BINHDT 360-16 CARDS, NUTAPE2 360-14 CARDS)
SAMPLE PROBLEM OUTPUT (BINHDT-11 PAGES)
REFERENCE REPORT AND TVA NOTE

17. CATEGORY - B
KEYWORDS - SLOWING DOWN, GROUP CONSTANTS, CROSS SECTIONS, ELASTIC SCATTERING, INELASTIC SCATTERING, NUTAPE2 CODES, BINHDT CODES

1. NAME OR DESIGNATION OF PROGRAM - BUBL1

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - BUBL1 PREDICTS FUEL SWELLING AND FISSION GAS RELEASE FROM NUCLEAR FUELS, BASED ON MOVEMENT OF FISSION GAS BUBBLES IN SOLIDS BY A SURFACE DIFFUSION MECHANISM UNDER THE ACTION OF A THERMAL GRADIENT (SEE REFERENCE 3). INTERACTIONS OF THE BUBBLES WITH DISLOCATIONS AND GRAIN BOUNDARIES PROVIDE TEMPORARY TRAPPING SITES, PRIOR TO RELEASE.

4. METHOD OF SOLUTION - BUBL1 IS A COMPUTER SIMULATION OF A FUEL REGION. WITHIN THIS REGION, FISSION GAS EVENTS ARE FOLLOWED VIA A MONTE CARLO TECHNIQUE. INDIVIDUAL BUBBLES ARE FOLLOWED THROUGH THEIR TIME HISTORY FROM NUCLEATION TO RELEASE FROM THE FUEL, WITH INTERACTIONS AT DISLOCATIONS AND GRAIN BOUNDARIES. SPECIFIC BUBBLE SIZES ARE DETERMINED FROM EITHER THE IDEAL GAS LAW OR THE VAN DER WAALS EQUATION OF STATE AS MODIFIED BY A LOCAL HYDROSTATIC PRESSURE TERM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE CURRENT VERSION OF BUBL1 IS RESTRICTED TO ISOTHERMAL PROBLEMS WITH NON-VARYING HYDROSTATIC PRESSURE AND THERMAL GRADIENT HISTORIES.

6. TYPICAL RUNNING TIME - ONE MINUTE PER CASE IS REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM - BUBL1 IS A UNIQUE ANALYSIS TOOL IN THAT IT IS THE ONLY KNOWN PROGRAM WHICH EXPLICITLY DESCRIBES A FUEL REGION AND FOLLOWS FISSION GAS ATOMS FROM NUCLEATION UNTIL RELEASE FROM THE FUEL REGION OCCURS. IT IS THE ONLY MODEL AVAILABLE WHICH PREDICTS THE PHENOMENA OF SATURATION IN GASEOUS SWELLING AT HIGH TEMPERATURE AND A TEMPERATURE OF MAXIMUM SWELLING, BOTH HAVING BEEN OBSERVED EXPERIMENTALLY.

8. RELATED AND AUXILIARY PROGRAMS - THE LONG RANGE PLAN IS TO INTEGRATE THE BUBL SWELLING AND GAS RELEASE MODEL WITH CYGRO3 (ACC ABSTRACT 449). BUBL1 USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSION SUBMITTED OCTOBER 1970.

10. REFERENCES - H. R. WARNER, BUBL-1 - A STATISTICAL FUEL SWELLING AND FISSION GAS RELEASE MODEL, WAPD-TM-942, SEPTEMBER 1970.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
F. A. NICHOLS, BEHAVIOR OF GASEOUS FISSION PRODUCTS IN OXIDE FUEL ELEMENTS, WAPD-TM-570, OCTOBER 1966.
E. DUNCOMBE AND C. M. FRIEDRICH, CYGRO-3 - A COMPUTER PROGRAM TO DETERMINE TEMPERATURES, STRESSES AND DEFORMATION IN OXIDE FUEL RODS, WAPD-TM-961, MARCH 1970.

11. MACHINE REQUIREMENTS - 65K MEMORY, A PRINTER, AND A PLOTTER

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - BUBL1 USES PLOTTING ROUTINES DESCRIBED IN REFERENCE 2. FUNCTION SUBROUTINE RANGEN IS ENTERED IN THE BUBL1 PROGRAM BY THE REAL FUNCTION RANDOM(0), WHICH PRODUCES A REAL RANDOM NUMBER R SUCH THAT 0.0 LESS THAN OR EQUAL R LESS THAN 1.0.

15. NAME AND ESTABLISHMENT OF AUTHOR -

H. R. WARNER
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1366 CARDS)
SAMPLE PROBLEM (12 CARDS)
REFERENCE REPORTS, WAPD-TM-942 AND WAPD-TM-668

17. CATEGORY - I
KEYWORDS - FUELS, SWELLING, FISSION GASES, SOLIDS, MONTE CARLO METHOD, CYGRO3 CODES

ACC ABSTRACT 469 10/73

1. NAME OR DESIGNATION OF PROGRAM - PMS1

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - PMS1 CORRECTS EXPERIMENTAL FAST NEUTRON POLARIZATION DATA FOR FINITE GEOMETRY AND MULTIPLE SCATTERING EFFECTS, WHEN LIQUID HELIUM IS THE POLARIZER ANALYZER.

4. METHOD OF SOLUTION - THE MONTE CARLO CODE SIMULATES THE ACTUAL GEOMETRY OF THE EXPERIMENT, TRACES SCATTERING HISTORIES TO ESTIMATE MULTIPLE-SCATTERING ASYMMETRY FOR AN INCIDENT NEUTRON BEAM OF ARBITRARY POLARIZATION. THE CODE USES PHASE SHIFTS TO CALCULATE THE NECESSARY PARAMETERS, THE ANGULAR DISTRIBUTIONS (D SIGMA)/(D OMEGA), THE POLARIZATION P AND THE SPIN ROTATION PARAMETER BETA NEEDED FOR CONSISTENT TRACKING OF POLARIZATION EFFECTS IN SUCCESSIVE SCATTERING. THE PHASE SHIFT DATA ARE TAKEN FROM THE FITTED DATA OF HOOP AND BARSCHALL ABOVE 1.5 MEV AND FROM MORGAN AND WALTER BELOW 1.5 MEV. THE CODE ADJUSTS THE INITIAL INPUT POLARIZATION NEEDED TO REPRODUCE THE MEASURED LEFT-RIGHT COUNT RATIO FOR THE TWO DETECTORS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - NO MORE THAN FIVE COLLISIONS ARE ALLOWED AND LIQUID HELIUM MUST BE THE POLARIZER ANALYZER. THE TOTAL NUMBER OF ENERGY POINTS FOR WHICH PHASE SHIFTS ARE GIVEN MUST BE LESS THAN 100.

6. TYPICAL RUNNING TIME - ABOUT 3 MINUTES PER CASE ARE REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION SUBMITTED OCTOBER 1970, REPLACED BY UPDATED VERSION APRIL 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - G. W. MORRISON, T. G. MILLER, AND F. P. GIBSON, PMS1 - A FORTRAN MONTE CARLO CODE FOR CORRECTING EXPERIMENTAL FAST-NEUTRON POLARIZATION DATA, CTC-9, DECEMBER 1969.
B. HOOP AND H. H. BARSCHALL, SCATTERING OF NEUTRONS BY ALPHA-PARTICLES, NUCLEAR PHYSICS, VOL. 83, P. 65, 1966.

11. MACHINE REQUIREMENTS - 32K MEMORY

12. PROGRAMMING LANGUAGES USED - FORTRAN IV(H) AND BAL

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

G. W. MORRISON
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830
F. P. GIBSON AND T. G. MILLER
U. S. ARMY MISSILE COMMAND
REDSTONE ARSENAL, ALABAMA 35808

16. MATERIAL AVAILABLE -
SOURCE DECK (1040 CARDS)
SAMPLE PROBLEM (31 CARDS)
SAMPLE PROBLEM OUTPUT (6 PAGES)
REFERENCE REPORT

17. CATEGORY - O
KEYWORDS - MONTE CARLO METHOD, STATISTICS, ELASTIC SCATTERING, POLARIZATION, HELIUM

ACC ABSTRACT 470 03/72

1. NAME OR DESIGNATION OF PROGRAM - GRAMP

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - GRAMP RANDOMLY GENERATES REICH AND MOORE PARAMETERS FOR MULTILEVEL UNRESOLVED RESONANCES OF FISSILE ISOTOPES.

4. METHOD OF SOLUTION - PARAMETERS ARE SELECTED RANDOMLY FROM THE APPROPRIATE DISTRIBUTION FUNCTIONS. RESONANCE ENERGIES ARE CHOSEN FROM THE WIGNER DISTRIBUTION. PARTIAL FISSION WIDTHS AND THE REDUCED NEUTRON WIDTH ARE CHOSEN FROM THE PORTER-THOMAS DISTRIBUTION. THE FISSION WIDTH FOR A GIVEN RESONANCE IN THE REICH AND MOORE FORMALISM IS THE SUM OF A SET OF PARTIAL WIDTHS CORRESPONDING TO THE OPEN FISSION CHANNELS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM NUMBER OF RESONANCES PER SPIN STATE IS 100. TWO COMPOUND NUCLEUS SPIN STATES ARE ALLOWED AND EACH SPIN STATE MAY HAVE 2 OPEN FISSION CHANNELS.

6. TYPICAL RUNNING TIME - PARAMETERS FOR 1000 RESONANCES ARE GENERATED IN 6 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - GRAMP OUTPUT MAY BE PUNCHED ON CARDS WHICH SERVE AS INPUT TO RECAP-O.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSION SUBMITTED NOVEMBER 1970.

10. REFERENCES - M. GOLDSMITH, GRAMP-A PROGRAM TO GENERATE REICH AND MOORE PARAMETERS FOR MULTILEVEL UNRESOLVED RESONANCES, WAPD-TM-939, MAY 1970.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THIS PROGRAM USES THE BETTIS ENVIRONMENTAL ROUTINES INTTAP, OUTTAP AND FINISH (ACC ABSTRACT 478). SETRAN INITIALIZES THE RANDOM NUMBER SEQUENCE AND THE RANDOM(O) FUNCTION PROVIDES THE NEXT RANDOM NUMBER FROM THE RANGEN, RANDOM NUMBER GENERATING ROUTINE, WHICH PROVIDES REAL NUMBERS, R, RANDOMLY DISTRIBUTED IN THE RANGE O LESS THAN OR EQUAL R LESS THAN 1.

ACC ABSTRACT 475 03/74

1. NAME OR DESIGNATION OF PROGRAM - CRECT/CHECKER/RIGEL/PLOTFB/ LISTFC/DICTION/SLAVE3/DAMMET

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PACKAGE OF EIGHT PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B II (EVALUATED NUCLEAR DATA FILE VERSION B FORMAT II) TAPES.

CRECT, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETION OF DATA.

CHECKER CHECKS THAT THE ENDF/B BCD CARD IMAGE FORMAT TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE CHECKED TO ENSURE THEY ARE EVERYWHERE POSITIVE.

RIGEL WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTO FROM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE VERSA) AND CHANGE TAPE MODE.

LISTFC, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PRODUCES INTERPRETED LISTINGS OF INFORMATION FROM BCD STANDARD ARRANGEMENT ENDF/B TAPES.

DICTION CONSTRUCTS A NEW SECTION DICTIONARY (FILE 1, SECTION 451) FOR AN ENTIRE ENDF/B TAPE. IF A SECTION DICTIONARY IS ALREADY PRESENT IT IS REPLACED.

PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PROCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

DAMMET SELECTIVELY MERGES DATA FROM ONE OR TWO ENDF/B LIBRARY TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) AND ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PROCESS.

4. METHOD OF SOLUTION - CRECT ACCEPTS A BCD TAPE IN ENDF/B FORMAT AS INPUT AND PRODUCES A CORRECTED ENDF/B TAPE AS OUTPUT. CORRECTIONS CONSIST OF INSERTIONS, DELETIONS AND CHANGES SPECIFIED ON INPUT CARDS.

CHECKER - MOST DATA ARE SUBMITTED TO RANGE LIMIT CHECKS. TABULATED DATA ARE CHECKED FOR SMOOTHNESS IN ORDER TO DETECT POSSIBLE MISPUNCHED VALUES. LEGENDRE COEFFICIENTS ARE CONVERTED TO MOMENTS AND MOMENTS ARE CHECKED TO DETERMINE IF THEY ARE PHYSICALLY POSSIBLE. THE LEGENDRE EXPANSION IS CHECKED FOR POSITIVITY IN THE INTERVAL -1 .LE. COS THETA .LE. 1.

IN PLOTFB THE SPECIFIED STRUCTURE OF THE LIBRARY ALLOWS DATA TO

4. METHOD OF SOLUTION (CONTINUED)
BE SUBCLASSIFIED UNDER NUCLIDES, CLASSES OF DATA, AND REACTION TYPES. THE WELL-DEFINED STRUCTURE PERMITS THE ASSOCIATED INFORMATION TO BE ACCESSED BY CONVERTING MATERIAL NUMBERS TO HOLLERITH TITLES, ETC. PLOTS ARE GENERATED UTILIZING A PLOTTING PACKAGE WHICH INCLUDES SCALING, GRID, AND NORMALIZATION ROUTINES. PLOTS CAN BE GENERATED IN EITHER LINEAR-LOG AXIS OR A MIXTURE OF BOTH.

WHEN MERGING TWO TAPES AND CONVERTING TO A DATA FORMAT OTHER THAN THAT OF EITHER INPUT TAPE, DAMMET PERFORMS A TWO-PASS OPERATION. THE FIRST PASS CONSISTS OF SELECTING ONLY THE DATA REQUIRED AND CONVERTING IT TO THE FORMAT OF THE FINAL TAPE, WITH STORAGE OF THE DATA ON AN INTERMEDIATE TAPE. UPON COMPLETION OF THE FIRST PASS ON BOTH TAPES, RESULTING IN TWO INTERMEDIATE TAPES, THE SECOND PASS MERGES BOTH INTERMEDIATE TAPES TO THE FINAL DATA TAPE.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

IN CRECT CORRECT SEQUENCE AND MATERIAL FIELDS OF THE DATA TAPE ARE ASSUMED. IN BOTH CHECKER AND CRECT DATA MUST BE IN ENDF/B BCD STANDARD ARRANGEMENT CARD IMAGE FORMAT.

IN CHECKER CORRECT STRUCTURE OF THE DATA TAPE IS ASSUMED AND MINOR ANOMALIES ARE NOTED. COMMON AND MAJOR IRREGULARITIES CAUSE TERMINATION OF EXECUTION ACCOMPANIED BY A CORE DUMP.

DICTION CAN HANDLE ONLY ENDF/B BCD STANDARD ARRANGEMENT TAPES WITH 1000 OR FEWER SECTIONS.

IN PLOTFB DATA MUST BE IN EITHER THE ENDF/B BCD OR BINARY STANDARD ARRANGEMENT CARD IMAGE FORMAT. PLOTFB CAN EXTRACT DATA ONLY TO THE MATERIAL AND FILE LEVEL OF DATA WITHIN THE ENDF LIBRARY.

IN DAMMET A SPECIFIC REACTION CANNOT BE EXTRACTED FROM A TAPE UNLESS IT IS WITHIN A FILE OR MATERIAL SELECTED.

6. TYPICAL RUNNING TIME -

CDC 6600 -

.007 SECONDS OF CP TIME IS REQUIRED TO PROCESS ONE RECORD OF BCD INFORMATION IN CHECKER. TYPICAL CP TO PP TIME RATIO FOR THE SHORT FORM OUTPUT IS 1 TO 4, FOR LONG FORM OUTPUT, 1 TO 6.

IN CRECT 2 SECONDS OF CP TIME ARE REQUIRED. TYPICAL CP TO PP TIME RATIO IS 1 TO 5.

IN DAMMET 3 TO 7 MINUTES OF CP TIME ARE REQUIRED TO PROCESS 13 NUCLIDES. TYPICAL CP TO PP TIME RATIO IS APPROXIMATELY 3 TO 1.

IN PLOTFB 4 MINUTES OF CP TIME AND 10 MINUTES OF PP TIME ARE REQUIRED TO LIST AND PLOT 35 MATERIALS (APPROXIMATELY 3500 DATA CARDS).

IN SLAVE3 RUNNING TIME IS DEPENDENT ON THE SELECTION OF SUBROUTINES AND PROCESSING REQUIREMENTS. TYPICAL CP TO PP TIME RATIO IS 1 TO 3, AND AN AVERAGE RUN IS 4 MINUTES.

IBM360 -

CHECKER REQUIRES ABOUT 1 MINUTE FOR EACH 6000 CARD IMAGES ON THE INPUT TAPE.

CRECT REQUIRES ABOUT 1 MINUTE FOR EACH 5000 CARD IMAGES ON THE INPUT TAPE.

7. UNUSUAL FEATURES OF THE PROGRAM - IN CHECKER THERE ARE TWO OUTPUT OPTIONS - (A) LONG FORM, WHICH LISTS EACH CARD IMAGE AS WELL AS THE ANOMALIES ENCOUNTERED, AND (B) SHORT FORM, WHICH LISTS ONLY THE ANOMALIES ENCOUNTERED BY THE PROGRAM (MINIMUM OUTPUT OPTION).

8. RELATED AND AUXILIARY PROGRAMS - ALL EIGHT PROGRAMS PERFORM AN INDEPENDENT OPERATION ON ENDF/B DATA. CRECT MAY BE USED TO CORRECT ERRORS DETECTED BY CHECKER.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
CDC6600 VERSIONS OF ALL 8 CODES SUBMITTED DECEMBER 1970, CRECT REPLACED BY LATER VERSION AUGUST 1972, LISTFC REPLACED BY LATER VERSION DECEMBER 1972.
IBM360 VERSIONS OF CHECKER AND CRECT SUBMITTED MARCH 1971, SAMPLE PROBLEM EXECUTED BY ACC MAY 1971.

10. REFERENCES - NATIONAL NEUTRON CROSS SECTION CENTER, DESCRIPTION OF THE ENDF/B PROCESSING CODES AND RETRIEVAL SUBROUTINES, BNL-50300 (ENDF-110), SEPTEMBER 1967, REVISED APRIL 1969, REVISED SEPTEMBER 1970, REVISED JUNE 1971.
H. C. HONECK, ENDF/B - SPECIFICATIONS FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066, MAY 1966, REVISED JULY 1967.
M. K. DRAKE, DATA FORMAT AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50274, OCTOBER 1970.

11. MACHINE REQUIREMENTS -
CDC 6600 -
FOR CHECKER 56,300 OCTAL (APPROXIMATELY 24,000 DECIMAL) WORDS OF CORE STORAGE AND ONE TAPE (OR DISC) UNIT
FOR CRECT 13,000 OCTAL WORDS OF CORE STORAGE AND TWO DATA STORAGE UNITS.
FOR PLOTFB 73,700 OCTAL (ABOUT 30,000 DECIMAL) WORDS OF CORE STORAGE AND THREE TAPE (OR DISC) UNITS.
FOR SLAVE3 40,000 OCTAL (APPROXIMATELY 18,000 DECIMAL) WORDS OF CORE STORAGE AND ONE OR TWO TAPE (OR DISC) UNITS WILL BE REQUIRED FOR A TYPICAL JOB.
FOR DAMMET 61,000 OCTAL (ABOUT 25,000 DECIMAL) WORDS OF CORE STORAGE AND A MAXIMUM OF FIVE TAPE (OR DISC) UNITS.
IBM 360 -
CHECKER REQUIRES 300K BYTES FOR EXECUTION.
CRECT REQUIRES 150K BYTES FOR EXECUTION.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC6600), OS/360 (IBM360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
6600 ODELLI OZER
NATIONAL NEUTRON CROSS SECTION CENTER

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973

360 E. M. PENNINGTON
APPLIED PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CRECT 6600-259 CARDS, 360-274 CARDS, CHECKER 6600-3192 CARDS, 360-3199 CARDS, RIGEL 6600-2060, LISTFC 6600-3172 CARDS, DICTION 6600-200 CARDS, PLOTFB 6600-4015 CARDS, SLAVE3 6600-2240 CARDS, DAMMET 6600-1957 CARDS)
SAMPLE PROBLEM (CHECKER 360-8 CARDS)
REFERENCE REPORT, BNL-50300

17. CATEGORY - M
KEYWORDS - DATA PROCESSING, CROSS SECTIONS, GRAPHS, INPUT DATA, LIBRARIES, MAINTENANCE, RETRIEVAL

ACC ABSTRACT 487 02/74

1. NAME OR DESIGNATION OF PROGRAM - STEAM-67

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - STEAM-67 IS A SET OF ROUTINES FOR CALCULATING THE PROPERTIES OF STEAM AND WATER ACCORDING TO THE ASME STEAM TABLES, 1967, WHICH HAVE BEEN MODIFIED IN ACCORDANCE WITH THE ASME PAPER (REFERENCE 3). MODIFICATIONS WERE MADE TO IMPROVE PROGRAM RUNNING TIME AS WELL AS TO CORRECT SOME EXISTING PROGRAM ERRORS. CORRECTIONS WERE ALSO MADE TO ROUTINES FOR THE LIQUID REGION TO IMPROVE ACCURACY ON THE IBM360 COMPUTER.

4. METHOD OF SOLUTION - FOR THE USUAL CASE, WHERE PRESSURE AND/OR TEMPERATURE ARE KNOWN, THE VISCOSITY, SPECIFIC VOLUME, ENTHALPY OR ENTROPY MAY BE CALCULATED IN EITHER THE LIQUID OR VAPOR REGIONS. IN THE VAPOR REGION, QUALITY MAY BE CALCULATED AS A FUNCTION OF PRESSURE AND ENTROPY OR ENTHALPY.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION SUBMITTED JUNE 1970, REVISED SEPTEMBER 1973.

10. REFERENCES - R. J. SPITZNAS, STEAM-67 TABLES, BALTIMORE GAS AND ELECTRIC NOTE, MAY 18, 1970.
C. A. MEYER, ET AL., THERMODYNAMIC AND TRANSPORT PROPERTIES OF STEAM, COMPRISING TABLES AND CHARTS FOR STEAM AND WATER, NEW YORK, 1967.
R. B. MCCLINTOCK AND G. J. SILVESTRI, SOME IMPROVED STEAM PROPERTY CALCULATION PROCEDURES, TRANSACTIONS OF THE ASME, VOL.92, PP.123-134, APRIL 1970.
R. B. MCCLINTOCK AND G. J. SILVESTRI, FORMULATIONS AND ITERATIVE PROCEDURES FOR THE CALCULATION OF PROPERTIES OF STEAM, ASME PUBLICATION (H-17), 1968.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV(G)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - DUE TO PRECISION REQUIREMENTS, ALL SUBPROGRAMS ARE WRITTEN IN

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
DOUBLE-PRECISION. HOWEVER, ARGUMENTS ARE TRANSMITTED TO AND FROM CALLING PROGRAMS IN STANDARD PRECISION. BECAUSE OF THIS INTERFACE BETWEEN STANDARD AND DOUBLE-PRECISION, THE USER IS CAUTIONED TO ADHERE STRICTLY TO THE LISTED CALLS AND PARAMETERS AND NOT TO USE ANY OTHER AVAILABLE ENTRY POINTS. AN ERROR-HANDLING ROUTINE IS INCLUDED AS PART OF THE PACKAGE. IT WILL DOCUMENT NON-CONVERGENCE OR ARGUMENTS OUT OF ACCEPTABLE RANGE, LISTING THE CALLING ROUTINE AND ITS ARGUMENTS.

15. NAME AND ESTABLISHMENT OF AUTHOR -
RAYMOND J. SPITZNAS
BALTIMORE GAS AND ELECTRIC COMPANY
GAS AND ELECTRIC BUILDING
BALTIMORE, MARYLAND 21203

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2408 CARDS)
REFERENCE NOTE, TABLES AND CHARTS, AND ASME TRANSACTIONS PRE-PRINT

17. CATEGORY - H
KEYWORDS - THERMODYNAMICS, WATER, PRESSURE, TEMPERATURE, LIQUIDS, VAPORS

ACC ABSTRACT 498 09/73

1. NAME OR DESIGNATION OF PROGRAM - CONCEPT2

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - CONCEPT2 GENERATES A CAPITAL COST ESTIMATE FOR A SELECTION OF PWR, BWR, COAL, AND OIL STEAM-ELECTRIC POWER PLANTS WITH RUN-OF-RIVER, MECHANICAL DRAFT, OR NATURAL DRAFT COOLING SYSTEMS OF SPECIFIED ELECTRICAL OUTPUT (IN THE RANGE OF 500 TO 2000 MW(E)) FOR ANY OF TWENTY U. S. CITIES, A HYPOTHETICAL MIDDLETOWN, AND TWO CANADIAN CITIES, AND PRINTS AS A RESULT A DETAILED COST BREAKDOWN.

4. METHOD OF SOLUTION - CONCEPT2 IS SUPPORTED BY TWO AUXILIARY-GENERATED LIBRARIES - (1) CONTAC WHICH GENERATES A COST MODEL TAPE WHERE THE MODEL IS EXTRAPOLATED BY CONCEPT TO OTHER SIZES BY INTERNAL SCALING EQUATIONS, AND (2) CONLAM WHICH GENERATES A TAPE CONTAINING HISTORICAL DATA FOR LABOR AND MATERIALS THAT ARE USED FOR ADJUSTING COSTS AT A BASE LOCATION AND TIME TO A SPECIFIED LOCATION AND TIME.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - POWER LEVELS OF 500 TO 2000 MW(E) ARE ACCEPTABLE. THE AUXILIARY PROGRAM CONLAM IS LIMITED TO 30 TIME PERIODS OF COST HISTORY FOR 23 LOCATIONS WITHOUT PROGRAM ALTERATIONS.

6. TYPICAL RUNNING TIME - A SINGLE COST ESTIMATE IS GENERATED IN LESS THAN ONE MINUTE ON THE MODEL 65.

7. UNUSUAL FEATURES OF THE PROGRAM - CONCEPT2 UTILIZES EXECUTION-TIME NAMELIST VARIATIONS OF STORED CONSTANTS, PRINTER PLOTTING CASH-FLOW CURVES, AND NUMEROUS OUTPUT AND SOLUTION OPTIONS.

8. RELATED AND AUXILIARY PROGRAMS - CONCEPT2 REQUIRES THE USE OF CONLAM TO GENERATE A USER FILE OF LABOR AND MATERIALS COST HISTORY AND CONTAC TO GENERATE A USER FILE OF COST MODELS TO SUPPORT CONCEPT2.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1972.
IBM360 VERSION OF CONCEPT SUBMITTED SEPTEMBER 1971,
REPLACED BY CONCEPT2 MARCH 1973.

10. REFERENCE - H. I. BOWERS, R. C. DELCZIER, L. D. REYNOLDS, AND B. E. SRITE, CONCEPT - COMPUTERIZED CONCEPTUAL COST ESTIMATES FOR STEAM-ELECTRIC POWER PLANTS - PHASE II USERS MANUAL, ORNL-4809, APRIL 1973.

11. MACHINE REQUIREMENTS - 150K BYTES, ONE SCRATCH DISK OR TAPE, TWO SUPPORT TAPES, AND THE STANDARD I/O UNITS

12. PROGRAMMING LANGUAGE USED - FORTRAN IV(G)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE MAIN PROGRAM USES THE IBM FORTRAN EXTENDED ERROR FEATURE (ERRSET) TO PERMIT ZERO DIVISION AND EXPONENT OVERFLOW WHICH MAY REQUIRE LOCAL ALTERATIONS.

15. NAME AND ESTABLISHMENT OF AUTHORS -

AUTHORS

H. I. BOWERS
OAK RIDGE NATIONAL LABORATORY
P. O. BOX Y
OAK RIDGE, TENNESSEE 37830
R. C. DELOZIER, L. D. REYNOLDS, AND B. E. SRITE
COMPUTING TECHNOLOGY CENTER
P. O. BOX P
OAK RIDGE, TENNESSEE 37830

OPERATIONS CONTACT

R. J. BARNARD
COMPUTING TECHNOLOGY CENTER
P. O. BOX P
OAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CONCEPT2 1545 CARDS, CONLAM 496 CARDS, CONTAC 644 CARDS)
SAMPLE PROBLEMS (CONCEPT2 79 CARDS, CONLAM 111 CARDS AND 2899 CARDS, CONTAC 12 FILES 737 CARDS EACH)
CONTROL INFORMATION (CONCEPT2 13 CARDS, CONLAM 20 CARDS, CONTAC 65 CARDS)
REFERENCE REPORT

17. CATEGORY - D
KEYWORDS - ECONOMICS, POWER PLANTS, PWR REACTORS, CONCEPT CODES, CONLAM CODES, CONTAC CODES

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

ROBERT L. RITZMAN
BATTELLE MEMORIAL INSTITUTE
COLUMBUS LABORATORIES
505 KING AVENUE
COLUMBUS, OHIO 43201

16. MATERIAL AVAILABLE -
    SOURCE DECK (293 CARDS)
    SAMPLE PROBLEM (58 CARDS)
    REFERENCE REPORT

17. CATEGORY - G
    KEYWORDS - FISSION PRODUCTS, FUEL ELEMENTS, ACCIDENTS

ACC ABSTRACT 5C1 02/74

1. NAME OR DESIGNATION OF PROGRAM - ENDRUN2

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635

3. DESCRIPTION OF PROBLEM OR FUNCTION - ENDRUN2 IS USED TO CALCULATE MULTIGROUP CONSTANTS FROM ENERGY-DEPENDENT, MICROSCOPIC CROSS SECTIONS, RESONANCE PARAMETERS, AND INELASTIC LEVEL DATA INPUT IN THE EVALUATED NUCLEAR DATA FILE (ENDF/B) FORMATS. DATA IS PROCESSED FOR ONE MATERIAL AT A TIME AND THE OUTPUT MULTIGROUP FILE INCLUDES BOTH INFINITELY-DILUTE GROUP CROSS SECTIONS AND SELF-SHIELDING, BONDARENKO-TYPE F-FACTORS SO THAT THE RESULTING GENERALIZED FILE IS INDEPENDENT OF REACTOR COMPOSITION. THE MULTIGROUP DATA MAY BE OUTPUT ON PUNCHED CARDS, A STANDARD LIBRARY TAPE, OR PLOTTED OVER ANY ENERGY RANGE.

4. METHOD OF SOLUTION - RESOLVED RESONANCE PARAMETERS ARE EVALUATED ACCORDING TO THE DOPPLER BROADENED BREIT-WIGNER, SINGLE-LEVEL LINE SHAPE EQUATIONS. RESONANCE CONTRIBUTIONS ARE AVERAGED OVER EACH FINE GROUP WITH AN EXTRAPOLATED ROMBERG INTEGRATION SCHEME. UNRESOLVED RESONANCE CALCULATIONS EMPLOY AN AVERAGING OVER THE CHI-SQUARED STATISTICAL DISTRIBUTION OF RESONANCE PARAMETERS. SHELF-SHIELDING IS ACCOMPLISHED BY WEIGHTING WITH A 1/(SIGMA(T) + SIGMA(O)) FLUX, WHERE SIGMA(O) IS AN INPUT VALUE REPRESENTING THE TOTAL OTHER-MATERIAL CROSS SECTION. PROVISIONS ARE MADE FOR THE OVERLAP OF RESOLVED AND UNRESOLVED RESONANCE SEQUENCES AND SMOOTH DATA. SEPARATE INELASTIC, ELASTIC, AND N,2N MATRICES ARE CALCULATED.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - ENDRUN MAY BE USED ON ANY ENDF/B MATERIAL WITH FEWER THAN 9 ISOTOPES. A CASE MAY INCLUDE UP TO 100 COARSE GROUPS AND 30 FINE GROUPS PER COARSE GROUP. MAXIMUM TRANSFER MATRIX SIZE IS 70 X 50. UP TO 5 SIGMA(O) VALUES AND 3 TEMPERATURES MAY BE PROVIDED AS INPUT DATA FOR SELF-SHIELDING.

6. TYPICAL RUNNING TIME - A SIMPLE 29-GROUP CASE FOR ANY MATERIAL WITHOUT RESONANCE DATA IS PROCESSED IN ONLY A FEW SECONDS ON THE GE635. A SIMILAR CASE FOR U-238 WITH ALL SELF-SHIELDING OPTIONS MAY RUN OVER AN HOUR.

7. UNUSUAL FEATURES OF THE PROGRAM - ENDRUN IS DESIGNED TO ALLOW MAXIMUM USER FLEXIBILITY IN CREATING A MULTIGROUP FILE OR TESTING DATA, E.G. SEVERAL ENDF/B REACTIONS MAY BE COMBINED IN A SINGLE OUTPUT CROSS SECTION, ANY TYPE OF DATA OR SINGLE CROSS SECTION MAY BE PROCESSED SEPARATELY, INPUT MAY COME FROM CARDS, BCD OR BINARY TAPE, OR COMPRESSED BINARY TAPE, AND MATRICES MAY BE OUTPUT SEPARATELY OR COMBINED.

8. RELATED AND AUXILIARY PROGRAMS - ENDRUN2 IS A DESCENDANT OF THE ENDRUN1 CODE OF APRIL 1970 AND RETAINS MOST OF THE MAJOR SUB-ROUTINES FROM THE EARLIER CODE. IT USES SEVERAL OF THE ENDF/B

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
RETRIEVAL SUBROUTINES IN PROCESSING THE ENDF/B DATA FILE AND ALSO THE QUICKW TABLE LOOK-UP ROUTINE FROM MC**2 (ACC ABSTRACT 355). A GENERALIZED DATA FILE TAPE (GMUG) MAY BE CREATED FOR DIRECT USE BY THE TDOWN CODE (ACC ABSTRACT 505).

9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
GE635 VERSION SUBMITTED OCTOBER 1971.

10. REFERENCES - B. A. HUTCHINS, C. L. COWAN, M. D. KELLEY, J. E. TURNER, ENDRUN-II, A COMPUTER CODE TO GENERATE A GENERALIZED MULTIGROUP DATA FILE FROM ENDF/B, GEAP-13704 (ENDF-145), MARCH 1971.
I. I. BONDARENKO, GROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS, CONSULTANTS BUREAU, NEW YORK, 1964.
H. C. HONECK, ENDF/B SPECIFICATIONS FOR AN EVALUATED NUCLEAR DATA FILE FOR REACTOR APPLICATIONS, BNL-50066, MAY 1966, REVISED JULY 1967.
DRAW, GESV NOTE, JANUARY 15, 1968.
REREAD, CONVRT SUBROUTINE DESCRIPTION, GESV NOTE, SEPTEMBER 11, 1967.

11. MACHINE REQUIREMENTS - THE CODE REQUIRES 52K MEMORY, INCLUDING A 10K OVERLAP WITH LOADING ROUTINES. UP TO 5 TAPES AND 7 AUXILIARY UNITS (DISCS IN THE AUTHORS ENVIRONMENT) MAY BE REQUIRED, BUT THE NUMBER OF TAPES MAY BE REDUCED BY USE OF PERMANENT DISC FILES WITH THE CARD READER AS THE INPUT UNIT.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV EXCEPT FOR USE OF RWSBT AND NPOST IN THE GE COMPRESSED BINARY INPUT AND OUTPUT ROUTINES. FORTRAN VERSIONS OF THESE ROUTINES ARE AVAILABLE, ALSO.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GECOS III.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PRIMARY CHANGES TO CONVERT THIS PROGRAM TO ANOTHER MACHINE WOULD BE IN THE INPUT AND OUTPUT ROUTINES, AUXILIARY UNIT ASSIGNMENTS, AND THE PLOTTING ROUTINES WHICH ARE PARTICULARLY MACHINE DEPENDENT.

15. NAME AND ESTABLISHMENT OF AUTHORS -
B. A. HUTCHINS, C. L. COWAN, M. D. KELLEY,
AND J. E. TURNER
GENERAL ELECTRIC COMPANY
NUCLEAR ENERGY DIVISION
31 DEGUIGNE DRIVE
SUNNYVALE, CALIFORNIA 94086

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (ENDRUN2 12,142 CARDS, QUICKW 276 CARDS, AUXILIARY ROUTINES 503 CARDS)
SAMPLE PROBLEM (ENDRUN2 215 CARDS)

16. MATERIAL AVAILABLE (CONTINUED)
CONTROL CARDS (ENDRUN2 412 CARDS, QUICKW 26 CARDS)
SAMPLE PROBLEM OUTPUT (38 PAGES)
REFERENCE REPORT, GEAP-13704, AND NOTES

17. CATEGORY - B
KEYWORDS - MULTIGROUP CROSS SECTIONS, BREIT-WIGNER FORMULA, DOPPLER BROADENING, ELASTIC SCATTERING, INELASTIC SCATTERING, ELASTIC REMOVAL, FISSION, CAPTURE, TOWN CODES, ENDF/B, LMFBR REACTORS

ACC ABSTRACT 502 02/74

1. NAME OR DESIGNATION OF PROGRAM - EDITOR

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - EDITOR PRODUCES READABLE LISTINGS OF THE CONTENTS OF ENDF/B NUCLEAR DATA CROSS SECTION TAPES. IT ALSO ALLOWS COPYING, ALTERING MODE, MERGING AND PUNCHING OF THE DATA ON ONE OR MORE ENDF/B TAPES.

4. METHOD OF SOLUTION - EDITOR PROCESSES MATERIALS, FILES (IN THE ENDF/B SENSE) OR SECTIONS (REACTION TYPES) ACCORDING TO INPUT INSTRUCTIONS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 50 MATERIALS MAY BE HANDLED IN ONE BATCH, WHERE A BATCH IS A GROUP OF ASSOCIATED INPUT INSTRUCTIONS. A MAXIMUM OF 5 FILES PER MATERIAL AND 15 SECTIONS PER FILE MAY BE REQUESTED IN EACH BATCH. FILES 1 TO 5, 7, 12 TO 15, AND 23 WILL BE PROCESSED BY THE PROGRAM. OTHER FILES WILL BE IGNORED.

6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM COMPILES AND EXECUTES ON THE IBM360 IN LESS THAN 3 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION A SUBMITTED SEPTEMBER 1971, REPLACED BY VERSION B FEBRUARY 1973.
CDC6600 VERSION SUBMITTED FEBRUARY 1973.

10. REFERENCES - C. L. THOMPSON, J. R. STOCKTON, L. M. PETRIE, R. Q. WRIGHT, S. K. PENNY, EDITOR, A PROCESSING CODE FOR ENDF/B FORMAT DATA, ORNL-TM-3266 (ENDF-142), FEBRUARY 1971.

11. MACHINE REQUIREMENTS - APPROXIMATELY 300K BYTES OF CORE

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360), SCOPE (CDC6600).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - EDITOR MAY BE USED TO APPEND MATERIALS TO AN EXISTING TAPE, IF THE ORIGINAL TAPE IS NOT BLOCKED.

15. NAME AND ESTABLISHMENT OF AUTHORS -
C. L. THOMPSON, J. R. STOCKTON, L. M. PETRIE,
R. Q. WRIGHT, AND S. K. PENNY
OAK RIDGE NATIONAL LABORATORY

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (360-3044 CARDS, 6600-3057 CARDS)
SAMPLE PROBLEMS (360-4 CARDS, 6600-5 CARDS)
CONTROL INFORMATION (JCL 360-12 CARDS)
LIBRARIES (360-430 CARDS, 6600-430 CARDS)
SAMPLE PROBLEM OUTPUT (360-26 SELECTED PAGES, 6600-27 SELECTED PAGES)
REFERENCE REPORT

17. CATEGORY - M
KEYWORDS - DATA PROCESSING, CROSS SECTIONS, LIBRARIES, ENDF/B, MAINTENANCE, RETRIEVAL

11. MACHINE REQUIREMENTS - THE CODE REQUIRES 50K (DECIMAL) MEMORY ON THE CDC7600, USES 1 SCRATCH TAPE, 1 LIBRARY TAPE, AND THE STANDARD INPUT/OUTPUT AND PUNCH UNITS.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CDC7600 SCOPE 1.7.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM CONSISTS OF 6 OVERLAYS.

15. NAME AND ESTABLISHMENT OF AUTHORS -

C. L. BEARD AND R. A. DANNELS
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS
BOX 355
PITTSBURGH, PENNSYLVANIA 15230

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (5714 CARDS)
SAMPLE PROBLEM (5 CARDS)
REFERENCE REPORT, WCAP-7363

17. CATEGORY - L
KEYWORDS - ENDF/B, CROSS SECTIONS, LIBRARIES, KATE CODES, THERMOS CODES, TEMPEST CODES, LASER CODES, ETOM1 CODES

1. NAME OR DESIGNATION OF PROGRAM - VIM1/VIM1X

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600, IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - VIM1 IS A MONTE CARLO CODE DESIGNED FOR THE ANALYSIS OF FAST CRITICAL EXPERIMENTS. IT HAS BEEN EXPRESSLY PREPARED FOR THE ANALYSIS OF FAST CRITICAL ASSEMBLIES OF THE PLATE-DRAWER TYPE SUCH AS ZPPR, ZPR-3, AND ZEBRA. THE LIBRARY USES POINT CROSS SECTION DATA, RATHER THAN MULTIGROUP CONSTANTS.

4. METHOD OF SOLUTION - THE MONTE CARLO METHOD IS USED WITH NEUTRONS STARTED FROM AN INITIAL SOURCE DISTRIBUTION IN SPACE, ANGLE, AND ENERGY WITH A STATISTICAL WEIGHT OF UNITY. THEY ARE FOLLOWED FROM COLLISION TO COLLISION UNTIL CAPTURE, ESCAPE FROM THE SYSTEM, OR FISSION OCCURS. THE SPATIAL COORDINATE WHERE FISSION OCCURS, ALONG WITH THE NUMBER OF NEUTRONS PRODUCED AT EACH POINT, PROVIDE THE BASIS FOR DETERMINING THE SOURCE DISTRIBUTION FOR THE NEXT GENERATION. VIM1 REGARDS THIS SET OF WEIGHTED SOURCE POINTS AS A DISTRIBUTION FUNCTION FROM WHICH THE SOURCE NEUTRON STARTING POINTS ARE SELECTED EACH WITH INITIAL STATISTICAL WEIGHT OF UNITY. THE INELASTIC SCATTERING MODEL INCLUDES BOTH THE EVAPORATION MODEL AND A DISCRETE EXCITATION LEVEL APPROACH. ABSORPTION WEIGHTING OF VARIABLE AMOUNT IS OPTIONALLY PERMITTED.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VIM1 IS RESTRICTED TO CRITICAL ASSEMBLIES OF THE PLATE DRAWER TYPE, AND THE ENERGY RANGE MUST BE BETWEEN 10 MEV AND 10 EV.

```
 7600 MAXIMA -
            13 MATERIALS
            36 ROWS IN THE CRITICAL ASSEMBLY MATRIX
            36 COLUMNS IN THE CRITICAL ASSEMBLY MATRIX
  360 MAXIMA -
      250,000 HISTORIES PER PROBLEM
        1,000 HISTORIES PER BATCH
            6 DRAWER TYPES
           50 ROWS IN THE MATRIX
           51 COLUMNS
           13 ISOTOPES IN PROBLEM
          150 ZONES
           27 GROUPS FOR EDITS
           30 ENERGY BANDS FOR STRATIFIED SAMPLING OF SOURCE NEU-
              TRON ENERGIES
            9 CENTRAL FISSION RATIOS COMPUTED
```

6. TYPICAL RUNNING TIME - APPROXIMATELY 1 SECOND PER 1200 COLLISIONS IS REQUIRED ON THE CDC7600. THE IBM360/75 EXECUTES THE SAMPLE PROBLEM IN 2 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM -
   USE OF CROSS SECTION PROBABILITY TABLES IN THE UNRESOLVED

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
RESONANCE RANGE,
USE OF POINT CROSS SECTION DATA IN LIEU OF MULTIGROUP CONSTANTS, AND
USE OF CUMULATIVE DISTRIBUTION FUNCTIONS OF THE CENTER-OF-MASS SCATTERING ANGLE TO DESCRIBE ANGULAR DISTRIBUTIONS INSTEAD OF LEGENDRE COEFFICIENTS.

8. RELATED AND AUXILIARY PROGRAMS - A CROSS SECTION LIBRARY TAPE GENERATOR IS INCLUDED IN THE PROGRAM PACKAGE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC7600 VERSION SUBMITTED NOVEMBER 1971.
IBM360 VERSION SUBMITTED JANUARY 1972, REVISED FEBRUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - L. B. LEVITT, R. C. LEWIS, VIM1, A NON-MULTIGROUP MONTE CARLO CODE FOR ANALYSIS OF FAST CRITICAL ASSEMBLIES, AI-AEC-12951, MAY 15, 1970.
INPUT DESCRIPTION FOR VIM1 - 7600, ATOMICS INTERNATIONAL MEMORANDUM, NOVEMBER 1971.
F. L. FILLMORE, USERS MANUAL FOR THE VIM-IX MONTE CARLO CODE, ANL ZPR-TM-121, SEPTEMBER 20, 1972.
VIM1 360 VERSION TAPE CONTENTS DESCRIPTION, ACC PROGRAMMING NOTE 73-19, MARCH 1973.
PARAMETER CARD FOR LIBREAD, ACC PROGRAMMING NOTE 73-20, APRIL 5, 1973.

11. MACHINE REQUIREMENTS - 65K (DECIMAL) FAST CENTRAL MEMORY, 80K ECS, AND 1 MAGNETIC TAPE UNIT ARE REQUIRED ON THE CDC7600. 650K BYTES AND 2 TAPE UNITS ARE REQUIRED ON THE IBM360.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV (7600) AND FORTRAN IV AND BAL (360)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 1. (7600) AND OS/360 (360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - VIM PRESENTLY USES A CROSS SECTION LIBRARY BASED ON ENDF/B II DATA INCLUDING CODING TO USE PROBABILITY TABLES IN THE UNRESOLVED RESONANCE REGION. AN ENDF/B III LIBRARY FOR USE WITH VIM HAS BEEN PREPARED AND VIM IS BEING UPDATED TO ACCOMMODATE IT.
THE 360 ROUTINE TLEFT IS PART OF THE ANL 360 ENVIRONMENT. IT RETURNS TO A CALLING PROGRAM THE DIFFERENCE, IN HUNDREDTHS OF A SECOND, BETWEEN THE TIME ESTIMATE ON THE JOB CARD AND THE TOTAL ELAPSED CPU + VOLUNTARY WAIT TIME. THE FUNCTION IS CALLED WITH ONE DUMMY ARGUMENT. THE VALUE RETURNED IS IN SINGLE PRECISION, FLOATING-POINT BINARY. THE VALUE OF THE DUMMY ARGUMENT REMAINS UNCHANGED.

15. NAME AND ESTABLISHMENT OF AUTHORS -
L. B. LEVITT AND R. C. LEWIS

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (VIM1 7600-2025 CARDS, VIM1X 360-3111 CARDS, LIBREAD 360-276 CARDS)
LOAD MODULE VIM.MODLIB (360-188 BLOCKS)
SAMPLE PROBLEMS (7600-385 CARDS, 360-272 CARDS)
LIBRARIES (14 FILES)
CONTROL INFORMATION (JCL 360-32 CARDS)
SAMPLE PROBLEM OUTPUT (7600-24 PAGES)
REFERENCE REPORTS, INPUT DESCRIPTION MEMORANDUM, AND ACC PROGRAMMING NOTES

17. CATEGORY - C
KEYWORDS - MONTE CARLO METHOD, FAST REACTORS, CRITICALITY, ZPR-3 REACTORS, ZPPR REACTORS, ZEBRA REACTORS

11. MACHINE REQUIREMENTS - THE RESIDENT PORTION OF THE SYSTEM ITSELF REQUIRES ABOUT 15K BYTES. TO TEST THE SYSTEM REQUIRES ABOUT 220K BYTES PLUS ONE PERIPHERAL I/O DEVICE.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV, ASSEMBLER LANGUAGE, AND MACRO DEFINITIONS

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 RELEASE 19.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE ASSEMBLER LANGUAGE ROUTINE IHCFIOSH (MACRO IHCFIOSM) IS A SLIGHTLY MODIFIED VERSION OF THE IBM ROUTINE FOR RELEASE 19 OF OS/360. SYSTEMS OPERATING UNDER EARLIER RELEASES SHOULD SIMILARLY MODIFY THIS ROUTINE AND RE-LINKEDIT THE MODULE ARCIBCOM.

15. NAME AND ESTABLISHMENT OF AUTHORS -
L. C. JUST, H. HENRYSON II, A. S. KENNEDY,
S. D. SPARCK, B. J. TOPPEL, AND P. M. WALKER

CONTACT B. J. TOPPEL
APPLIED PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PDS ARC.SOURCE)
OBJECT MODULES (PDS ARC.SEGLIB)
LINKAGE EDITOR CONTROL STATEMENTS (PDS ARC.OVERLAY)
LOAD MODULES (PDS ARC.MODLIB)
MACRO DEFINITIONS (PDS ARC.MACLIB)
CONTROL INFORMATION (JCL-IEHMOVE DECK-16 CARDS)
SAMPLE PROBLEM (153 CARDS)
SAMPLE PROBLEM OUTPUT (IEHMOVE-3 PAGES, EXECUTION-8 PAGES)
REFERENCE REPORTS AND ACC NOTE

17. CATEGORY - M
KEYWORDS - MODULAR SYSTEM, DATA PROCESSING, ARC CODES

ACC ABSTRACT 523 02/74

1. NAME OR DESIGNATION OF PROGRAM - ESP

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75,91

3. DESCRIPTION OF PROBLEM OR FUNCTION - ESP IS A GENERAL-PURPOSE MONTE CARLO REACTOR ANALYSIS CODE. IT COVERS THE COMPLETE ENERGY RANGE OF INTEREST IN REACTOR CALCULATIONS AND IS DESIGNED FOR BOTH EIGENVALUE AND FIXED SOURCE REACTOR AND REACTOR CELL CALCULATIONS. BASIC DATA ARE ACCEPTED ONLY IN THE VERSION I, II, AND III ENDF/B FORMAT. IN ADDITION TO SMOOTH DATA, THE CROSS SECTION PREPARATION INCLUDES A DETAILED TREATMENT OF RESOLVED AND UNRESOLVED RESONANCES AND THE FREE GAS AND S(ALPHA,BETA) THERMAL MODELS. THE COLLISION AND SOURCE ROUTINES UTILIZE THE ENDF/B NONELASTIC SECONDARY DISTRIBUTIONS, THE ANISOTROPIC SCATTERING DATA, AND THE FISSION SPECTRA. THE ENERGY RANGE MAY BE DIVIDED INTO AS MANY AS 25,000 INTERVALS, AND OVER EACH INTERVAL THE APPROPRIATELY AVERAGED CROSS SECTIONS ARE USED AS CONSTANT POINT-ENERGY VALUES. A GENERAL THREE-DIMENSIONAL GEOMETRY DESCRIPTION IS AVAILABLE, AS WELL AS SEVERAL SPECIALIZED GEOMETRIES. USE OF FIXED-SOURCE OPTIONS ALLOWS CALCULATIONS ON NON-MULTIPLYING SYSTEMS. A STEADY-STATE ANALYSIS OF NEUTRON HISTORIES IS PERFORMED IN COMPUTER CORE FOR SUCH QUANTITIES AS NEUTRON FLUXES, REACTION RATES, AND CROSS SECTIONS, AVERAGED OVER ARBITRARY ENERGY AND SPATIAL REGIONS.

4. METHOD OF SOLUTION - ESP UTILIZES STANDARD MONTE CARLO TECHNIQUES IN THE NEUTRON TRACKING AND COLLISION PROCESSES. ANALYSIS OF HISTORIES IS PERFORMED BY EITHER COLLISION DENSITY OR TRACK LENGTH ESTIMATION. THE NUCLIDES ARE ASSUMED TO BE AT REST EXCEPT IN THE THERMAL ENERGY RANGE. NON-ABSORPTION WEIGHTING, SPLITTING, AND RUSSIAN ROULETTE ARE USED AS VARIANCE REDUCTION METHODS. IN ORDER TO OBTAIN ESTIMATES OF THE STATISTICAL ERROR OF ESP CALCULATIONS, THE NEUTRON HISTORIES ARE PROCESSED IN BATCHES. THE FISSION NEUTRONS PRODUCED IN A BATCH MAY BE USED AS THE STARTING NEUTRONS FOR THE NEXT BATCH. ANISOTROPIC SCATTERING IS HANDLED BY THE COVEYOU TECHNIQUE. THE RESONANCE CROSS SECTIONS ARE COMPILED USING THE DOPPLER BROADENING SINGLE-LEVEL BREIT-WIGNER MODEL. A DETAILED STATISTICAL TREATMENT IS APPLIED TO THIS MODEL IN THE UNRESOLVED RESONANCE ENERGY REGION.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE ENERGY RANGE IS RESTRICTED TO NEUTRON ENERGIES FOR WHICH DATA IS AVAILABLE IN THE ENDF/B FILES. EACH PHYSICAL BOUNDARY OF THE SYSTEM MUST BE DESCRIBABLE BY A GENERAL SECOND-ORDER ALGEBRAIC EQUATION. THERE MAY BE AS MANY AS 25 NUCLIDES IN AS MANY AS 16 DIFFERENT MIXTURES IN THE SYSTEM.

6. TYPICAL RUNNING TIME - RUNNING TIMES ARE HIGHLY PROBLEM DEPENDENT. LESS THAN 5 MINUTES ARE USED ON THE IBM360/91 FOR DATA PREPARATION, TRACKING, AND ANALYSIS OF 20,000 HISTORIES FOR GODIVA. A HETEROGENEOUS MOCKUP OF ZPR3 ASSEMBLY 48 TAKES 3 HOURS.

7. UNUSUAL FEATURES OF THE PROGRAM - ESP MAY BE RUN IN ONE PROBLEM SETUP AND COMPUTER PASS. NO PERIPHERAL SUBROUTINE PREPARATION OR TAPE PROCESSING IS NECESSARY, ALTHOUGH SOME INFORMATION CONCERNING A CALCULATION MAY BE RETAINED ON TAPE FOR USE IN FUTURE CALCULATIONS. REALISTIC REACTOR SYSTEMS MAY BE CALCULATED IN COMPLETE GEOMETRIC DETAIL WITH A VERSION OF ESP WHICH UTILIZES A FICTITIOUS SCATTERING MODEL AND AN ARRAY VERSION OF GENERALIZED GEOMETRY.

8. RELATED AND AUXILIARY PROGRAMS - ESP IS ONE OF SEVERAL CODES RECENTLY DEVELOPED AT OAK RIDGE NATIONAL LABORATORY WHICH HAS THE O5R CODE AS ITS PREDECESSOR.

9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
IBM360 VERSION SUBMITTED FEBRUARY 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - S. N. CRAMER, R. S. CARLSMITH, G. W. MORRISON, G. W. PERRY, AND J. L. LUCIUS, ESP, A GENERAL MONTE CARLO REACTOR ANALYSIS CODE, ORNL-TM-3164, JANUARY 1972.
D. C. IRVING, R. M. FREESTONE, JR., AND F. B. K. KAM, O5R, A GENERAL-PURPOSE MONTE CARLO NEUTRON TRANSPORT CODE, ORNL-3622, FEBRUARY 1965.
S. N. CRAMER, MONTE CARLO ANALYSIS OF THE EXACT GEOMETRIC MOCKUP OF ZPR-III ASSEMBLY 48, ORNL-TM-3596, OCTOBER 1971.
ESP TAPE CONTENTS DESCRIPTION, ACC PROGRAMMING NOTE 73-18, MARCH 1973.

11. MACHINE REQUIREMENTS - AT LEAST 350K BYTES OF COMPUTER CORE

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
S. N. CRAMER, R. S. CARLSMITH, G. W. MORRISON,
G. W. PERRY, AND J. L. LUCIUS
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (PDS ESP.SORCELIB 1557 BLOCKS, ASSEMBLY LANGUAGE ROUTINES 266 CARDS)
OBJECT DECKS (ESP 16 BLOCKS, GENL. GEOM. 17 BLOCKS, RAFFLE GEOM. 26 BLOCKS, SPH. GEOM. 2 BLOCKS, CYL. GEOM. 7 BLOCKS, ESPGUTS 309 BLOCKS)
SAMPLE PROBLEM (29 CARDS)
LIBRARY (85 BLOCKS)
CONTROL INFORMATION (JCL 102 CARDS)
REFERENCE REPORT, ORNL-TM-3164, AND ACC PROGRAMMING NOTE 73-18

17. CATEGORY - C
KEYWORDS - MONTE CARLO METHOD, CRITICALITY, CELL CALCULATION, ENDF/B, CROSS SECTIONS, O5R CODES

ACC ABSTRACT 524 12/72

1. NAME OR DESIGNATION OF PROGRAM - BESFIT

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - BESFIT CALCULATES DIFFERENTIAL ELASTIC SCATTERING CROSS SECTIONS USING A BESSEL FUNCTION EXPANSION, BASED ON A DIFFRACTION MODEL. CONSTANT TERMS MAY EITHER BE SUPPLIED AS INPUT DATA OR OBTAINED BY A LEAST SQUARES FITTING OF THE DATA.

4. METHOD OF SOLUTION - BESFIT USES THE DIFFRACTION MODEL TO SOLVE THE PROBLEM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 101 ANGULAR POINTS CAN BE USED.

6. TYPICAL RUNNING TIME - EACH CASE RUNS IN APPROXIMATELY 30 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM - FIRST ORDER ESTIMATES OF THE DIFFERENTIAL ELASTIC SCATTERING CROSS SECTION ARE OBTAINED BY SPECIFYING ONLY THE INCIDENT NEUTRON ENERGY AND TARGET MASS.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
CDC6600 VERSION SUBMITTED MARCH 1972.

10. REFERENCES - S. PEARLSTEIN, PROGRAM BESFIT, FEBRUARY 1972.
S. PEARLSTEIN, NEUTRON ANGULAR DISTRIBUTION ANALYSIS USING CYLINDRICAL BESSEL FUNCTIONS, BNL-16530, FEBRUARY 1972.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - STANDARD MONITOR.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
S. PEARLSTEIN
NATIONAL NEUTRON CROSS SECTION CENTER
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973

16. MATERIAL AVAILABLE -
SOURCE DECK (657 CARDS)
SAMPLE PROBLEM (34 CARDS)
REFERENCE REPORT AND PROGRAM DESCRIPTION

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SUBROUTINES PACK AND UNPACK CALL A ROUTINE WHICH FINDS THE LOGICAL SUM OF TWO INTEGERS. THIS SUBROUTINE MUST BE USER-SUPPLIED.

15. NAME AND ESTABLISHMENT OF AUTHORS -

FACOM230-60 KEIICHIRO TSUCHIHASHI
JAPAN ATOMIC ENERGY RESEARCH INSTITUTE
TOKAI RESEARCH ESTABLISHMENT
TOKAI-MURA, NAKA-GUN, IBARAKI-KEN
JAPAN

IBM360 P. HENLINE
HIGH ENERGY PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 S. CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (FACOM-2645 CARDS, 360-2677 CARDS)
SAMPLE PROBLEMS (FACOM-43 CARDS, 360-47 CARDS)
SAMPLE PROBLEM OUTPUT (33 SELECTED PAGES)
REFERENCE REPORT AND MEMORANDA

17. CATEGORY - B
KEYWORDS - FUEL ELEMENTS, CELL CALCULATIONS, POISON, FLUX DISTRIBUTION

1. NAME OR DESIGNATION OF PROGRAM - HERMES

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE HERMES MODEL CALCULATES THE REGIONAL RADIONUCLIDE RELEASES AND RADIATION DOSE TO THE POPULACE IN A GIVEN YEAR ARISING FROM THE OPERATION OF NUCLEAR FACILITIES TO MEET ELECTRICAL GENERATION DEMANDS WITHIN A GIVEN STUDY REGION.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE FOLLOWING ARE ALL APPROXIMATE DIMENSION RESTRICTIONS -
   12 TIME PERIODS (MONTHS)
   50 RADIONUCLIDES
   200 RADIONUCLIDE SOURCES (NUCLEAR SITES)
   300 RECEPTOR LOCATIONS

6. TYPICAL RUNNING TIME - THE HERMES MODEL CONSISTS OF TEN SUBMODELS DESIGNED TO BE EXECUTED SEQUENTIALLY, BUT EACH OF THE SUBMODELS MAY BE USED INDIVIDUALLY TO STUDY A GIVEN ASPECT OF THE EVENTS LEADING TO DOSE. RUNNING TIME OF EACH SUBMODEL VARIES FROM ABOUT 1 MINUTE TO 1 HOUR DEPENDING ON THE SUBMODEL AND THE COMPLEXITY OF THE PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM - THIS PROGRAM PROVIDES A REGIONAL ANALYSIS OF RADIATION DOSE FROM THE NUCLEAR POWER INDUSTRY, PERMITTING EVALUATION OF THE RESULTANT EFFECTS OF OPERATING LARGE NUMBERS OF NUCLEAR FACILITIES. OPTIONS IN COMPONENT CODES OF THE PROGRAM PERMIT CONSIDERATION OF A VARIETY OF RADIATION WASTE TREATMENT SYSTEMS. DOSE EVALUATIONS MAY BE OBTAINED IN VARYING DETAIL.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED OCTOBER 1972.
   UNIVAC1108 VERSION SUBMITTED MARCH 1972.

10. REFERENCES - J. F. FLETCHER AND W. L. DOTSON, HERMES - A DIGITAL COMPUTER CODE FOR ESTIMATING REGIONAL RADIOLOGICAL EFFECTS FROM THE NUCLEAR POWER INDUSTRY, HEDL-TME-71-168, DECEMBER 1971.
    UNIVAC SYSTEM DESCRIPTIONS FOR NTRAN, ETIME, ETIMEF, AND DOY.
    HERMES CONTROL CARDS, ACC PROGRAMMING NOTE 74-6, SEPTEMBER 7, 1973.

11. MACHINE REQUIREMENTS - 65K MEMORY AND A MAGNETIC DRUM OR ALTERNATIVE DEVICE FOR STORAGE OF LARGE AMOUNTS OF DATA.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND SLEUTH

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CSCX.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - MOST OF THE SUBMODELS OF HERMES WOULD REQUIRE VERY LITTLE CONVERSION EFFORT TO EXECUTE ON OTHER COMPUTERS, ALTHOUGH THOSE SUBMODELS REQUIRING DRUM DEVICES FOR STORAGE OF DATA WOULD REQUIRE MORE EFFORT. ASSEMBLY LANGUAGE ROUTINES ARE USED FOR TIMING INPUT-OUTPUT UNIT ASSIGNMENTS AND SIMILAR ACTIVITIES. SEVERAL CALLS ARE MADE TO SUBROUTINE SETDAR. THIS SUBROUTINE DYNAMICALLY ALLOCATES STORAGE FOR ARRAYS AND MUST BE SUPPLIED BY THE USER. SAMPLE PROBLEM INPUT DECKS FOR RADREL, ARTRAN AND WTRAN CONTAIN UNIVAC 1108 CONTROL STATEMENTS WHICH HAVE A MULTIPLE 7-8 PUNCH IN COLUMN 1. FOR DISTRIBUTION ON CODE CENTER EQUIPMENT IT WAS NECESSARY TO MODIFY SUCH STATEMENTS; THE MULTIPLE 7-8 PUNCH IN COLUMN 1 WAS REPLACED BY A MULTIPLE 12-1 PUNCH, A LETTER A.

15. NAME AND ESTABLISHMENT OF AUTHORS -

B. W. BENTLEY, W. E. BLACK, W. L. DOTSON,
J. F. FLETCHER, D. R. HAFFNER, L. D. JACOBSON,
D. E. PETERSON AND K. R. WISE
HANFORD ENGINEERING DEVELOPMENT LABORATORY
WESTINGHOUSE HANFORD COMPANY
P. O. BOX 1970
RICHLAND, WASHINGTON 99352
J. K. SOLDAT
PACIFIC NORTHWEST LABORATORIES
BATTELLE
P. O. BOX 999
RICHLAND, WASHINGTON 99352

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (SITE 173 CARDS, MOPOSH 427 CARDS, RADREL 796 CARDS, DOSIS 1355 CARDS, REPARE 1672 CARDS, TRANS 259 CARDS, FIGURE 338 CARDS, ARTRAN 1763 CARDS, WTRAN 2716 CARDS, DOSE 3280 CARDS)
SAMPLE PROBLEMS (SITE 35 CARDS, MOPOSH 33 CARDS, RADREL 58 CARDS, DOSIS 5 CARDS, REPARE 5 CARDS, ARTRAN 152 CARDS, WTRAN 345 CARDS, DOSE 1315 CARDS)
SAMPLE PROBLEM OUTPUT (SITE 4 PAGES, MOPOSH 13 PAGES, RADREL 20 PAGES, DOSIS 6 PAGES, REPARE 9 PAGES, ARTRAN 16 PAGES, WTRAN 14 PAGES, DOSE 17 PAGES)
DOCUMENTATION (480 CARDS)
REFERENCE REPORT, SYSTEM DESCRIPTIONS, AND ACC NOTE

17. CATEGORY - R
KEYWORDS - RADIATION EFFECTS, REACTOR SAFETY, DOSE RATES, POWER PLANTS

1. NAME OR DESIGNATION OF PROGRAM - PREP/KITT

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE PREP/KITT COMPUTER PROGRAM PACKAGE OBTAINS SYSTEM RELIABILITY INFORMATION FROM A SYSTEM FAULT TREE. THE PREP PROGRAM FINDS THE MINIMAL CUT SETS AND/OR THE MINIMAL PATH SETS OF THE SYSTEM FAULT TREE. (A MINIMAL CUT SET IS A SMALLEST SET OF COMPONENTS SUCH THAT IF ALL THE COMPONENTS ARE SIMULTANEOUSLY FAILED THE SYSTEM IS FAILED. A MINIMAL PATH SET IS A SMALLEST SET OF COMPONENTS SUCH THAT IF ALL OF THE COMPONENTS ARE SIMULTANEOUSLY FUNCTIONING THE SYSTEM IS FUNCTIONING.) THE KITT PROGRAMS DETERMINE RELIABILITY INFORMATION FOR THE COMPONENTS OF EACH MINIMAL CUT OR PATH SET, FOR EACH MINIMAL CUT OR PATH SET, AND FOR THE SYSTEM. EXACT, TIME-DEPENDENT RELIABILITY INFORMATION IS DETERMINED FOR EACH COMPONENT AND FOR EACH MINIMAL CUT SET OR PATH SET. FOR THE SYSTEM, RELIABILITY RESULTS ARE OBTAINED BY UPPER BOUND APPROXIMATIONS OR BY A BRACKETING PROCEDURE IN WHICH VARIOUS UPPER AND LOWER BOUNDS MAY BE OBTAINED AS CLOSE TO ONE ANOTHER AS DESIRED. THE KITT PROGRAMS CAN HANDLE INDEPENDENT COMPONENTS WHICH ARE NONREPAIRABLE OR WHICH HAVE A CONSTANT REPAIR TIME. ANY ASSORTMENT OF NONREPAIRABLE COMPONENTS AND COMPONENTS HAVING CONSTANT REPAIR TIMES CAN BE CONSIDERED. ANY INHIBIT CONDITIONS HAVING CONSTANT PROBABILITIES OF OCCURRENCE CAN BE HANDLED. THE FAILURE INTENSITY OF EACH COMPONENT IS ASSUMED TO BE CONSTANT WITH RESPECT TO TIME. THE KITT2 PROGRAM CAN ALSO HANDLE COMPONENTS WHICH DURING DIFFERENT TIME INTERVALS, CALLED PHASES, MAY HAVE DIFFERENT RELIABILITY PROPERTIES.

4. METHOD OF SOLUTION - THE PREP PROGRAM OBTAINS MINIMAL CUT SETS BY EITHER DIRECT DETERMINISTIC TESTING OR BY AN EFFICIENT MONTE CARLO ALGORITHM. THE MINIMAL PATH SETS ARE OBTAINED USING THE MONTE CARLO ALGORITHM. THE RELIABILITY INFORMATION IS OBTAINED BY THE KITT PROGRAMS FROM NUMERICAL SOLUTION OF THE SIMPLE INTEGRAL BALANCE EQUATIONS OF KINETIC TREE THEORY.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PREP PROGRAM WILL OBTAIN THE MINIMAL CUT AND/OR PATH SETS FOR ANY TREE WITH UP TO 2000 COMPONENTS AND 2000 LOGICAL GATES. ALL GATES OF THE FAULT TREE MUST BE AND AND OR GATES, AND NO GATE MAY HAVE MORE THAN 7 INPUTS CONSISTING OF BOTH COMPONENTS AND OTHER GATES. PREP CAN OBTAIN AT MOST 1000 MINIMAL CUT SETS WITH A MAXIMUM OF 19 COMPONENTS PER SET, AND CAN OBTAIN AT MOST 500 MINIMAL PATH SETS WITH A MAXIMUM OF 29 COMPONENTS PER SET. KITT1 WILL OBTAIN RELIABILITY INFORMATION FOR UP TO 500 MINIMAL CUT OR PATH SETS CONTAINING A TOTAL OF AT MOST 400 DISTINCT COMPONENTS AND INHIBIT CONDITIONS. KITT2 WILL OBTAIN RELIABILITY INFORMATION FOR UP TO 500 MINIMAL CUT OR PATH SETS CONTAINING A TOTAL OF AT MOST 350 DISTINCT COMPONENTS AND INHIBIT CONDITIONS. KITT2 CAN OBTAIN RELIABILITY INFORMATION FOR EACH OF 50 DIFFERENT PHASES PER COMPONENT.

ACC ABSTRACT 538 02/74

1. NAME OR DESIGNATION OF PROGRAM - ETOG3

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600

3. DESCRIPTION OF PROBLEM OR FUNCTION - ETOG3 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN ENDF/B VERSION III FORMAT PRODUCING DATA DECKS FOR USE IN GENERATION OF MUFT4, MUFT5, GAM1, GAM2, AND ANISN LIBRARIES.

4. METHOD OF SOLUTION - ETOG3 PERFORMS A STRAIGHTFORWARD GROUP AVERAGE OF CROSS SECTIONS USING AN INPUT WEIGHTING FUNCTION AND THE MICROSCOPIC DATA FROM THE ENDF/B FILES. THE BREIT-WIGNER SINGLE-LEVEL AND MULTI-LEVEL FORMULAE ARE ASSUMED TO YIELD RESOLVED RESONANCE CROSS SECTIONS WITH REASONABLE ACCURACY. TREATMENT OF UNRESOLVED CROSS SECTIONS IS SIMILAR TO THAT OF MC**2 (ACC ABSTRACT 355).

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - IN ADDITION TO THE RESTRICTIONS ON THE ENDF/B DATA ITSELF, ETOG3 HAS THE FOLLOWING MAXIMA -
   99 MULTIGROUPS
   500 RESOLVED RESONANCES

6. TYPICAL RUNNING TIME -

LIBRARY	ENDF DATA HAS FEW RESONANCE PARAMETERS	ENDF DATA HAS NO RESONANCE PARAMETERS
MUFT, 54 GROUP	35 SECONDS*	6 SECONDS
GAM1, 68 GROUP	100 SECONDS**	48 SECONDS**
GAM2, 99 GROUP	180 SECONDS**	96 SECONDS**
ANISN, 99 GROUP	180 SECONDS**	96 SECONDS**

* EASILY GOES UP TO 450 SECONDS FOR 400 RESONANCES
** ESTIMATE

7. UNUSUAL FEATURES OF THE PROGRAM - IN THE ESTABLISHMENT OF TRANSFER MATRICES, ANALYTICAL RESULTS ARE EMPLOYED WHERE POSSIBLE IN THE NORMALIZATION OF OUTPUT DATA. FOR EXAMPLE, IN THE GENERATION OF THE ELASTIC SCATTERING MATRIX IN THE ENERGY RANGE IN WHICH THE SCATTER IS ISOTROPIC IN THE CENTER-OF-MASS SYSTEM, RESULTS OF THE NUMERICAL INTEGRATION PERFORMED ARE NORMALIZED TO VALUES DERIVED ANALYTICALLY.

8. RELATED AND AUXILIARY PROGRAMS - ETOG3 SUPERSEDES ETOG1 IN THAT (A) MORE ACCURATE DATA DECKS ARE PRODUCED FOR USE IN CREATING LIBRARIES, (B) ADDITIONAL DATA DECKS MAY BE GENERATED FOR USE IN CREATING LASER LIBRARIES, AND (C) VERSION-III ENDF/B FORMATS AND FORMULAE ARE DIGESTIBLE. IN THE PROGRAM, USE IS MADE OF THE GENERAL PURPOSE PROCESSOR AND RETRIEVAL SUBROUTINES WRITTEN AT BROOKHAVEN FOR HANDLING ENDF/B DATA FILES (ACC ABSTRACTS 384,465,475).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED SEPTEMBER 1973.

10. REFERENCES - M. RAYMUND, SUPPLEMENT TO WCAP-3845-1, ETOG-1, A FORTRAN IV PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THE MUFT, GAM AND ANISN FORMATS, WCAP-3845-1 (ENDF-114) SUPPLEMENT, AUGUST 1973.

D. E. KUSNER AND S. KELLMAN, ETOG-1, A FORTRAN IV PROGRAM TO PROCESS DATA FROM THE ENDF/B FILE TO THE MUFT, GAM AND ANISN FORMATS, WCAP-3845-1 (ENDF-114), DECEMBER 1969, AND ERRATA.

M. K. DRAKE, ED., DATA FORMATS AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50274 (ENDF-102), VOL. 1, OCTOBER 1970.

C. G. PONCELET, LASER - A DEPLETION PROGRAM FOR LATTICE CALCULATIONS BASED ON MUFT AND THERMOS, WCAP-6073, APRIL 1966.

O. OZER, DESCRIPTION OF THE ENDF/B PROCESSING CODES AND RETRIEVAL SUBROUTINES, ENDF/110, REVISED JUNE 1971.

H. BOHL, JR., E. M. GELBARD, AND G. H. RYAN, MUFT-4, FAST NEUTRON SPECTRUM CODE FOR THE IBM-704, WAPD-TM-72, JULY 1957.

H. BOHL, JR. AND A. P. HEMPHILL, MUFT-5 - A FAST NEUTRON SPECTRUM PROGRAM FOR THE PHILCO-2000, WAPD-TM-218, FEBRUARY 1961.

G. D. JOANOU AND J. S. DUDEK, GAM-I, A CONSISTENT P1 MULTIGROUP CODE FOR THE CALCULATION OF FAST NEUTRON SPECTRA AND MULTIGROUP CONSTANTS, GA-1850, MAY 1961.

G. D. JOANOU AND J. S. DUDEK, GAM-II, A B3 CODE FOR CALCULATION OF SLOWING DOWN SPECTRUM AND ASSOCIATED MULTIGROUP CONSTANTS, GA-4265, SEPTEMBER 16, 1963.

W. W. ENGLE, JR., A USERS MANUAL FOR ANISN, A ONE-DIMENSIONAL DISCRETE ORDINATES CODE WITH ANISOTROPIC SCATTERING, K-1693, MARCH 30, 1967.

D. M. OSHEA, B. J. TOPPEL AND A. L. RAGO, MC**2 - A CODE TO CALCULATE MULTIGROUP CROSS SECTIONS, ANL-7318, JUNE 1967.

11. MACHINE REQUIREMENTS - 42,000 DECIMAL LOCATIONS AND 4 SCRATCH AND PUNCH UNITS, 17,000 DECIMAL LOCATIONS OF EXTENDED CORE MEMORY

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 2.0.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM CONSISTS OF 9 OVERLAYS.

15. NAME AND ESTABLISHMENT OF AUTHORS -

M. RAYMUND, D. E. KUSNER, R. A. DANNELS,
AND S. KELLMAN
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS
P. O. BOX 355
PITTSBURGH, PENNSYLVANIA 15230

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (ETOG3 13,877 CARDS, UPDATE 13,947 CARDS, MODIFICATIONS 77 CARDS)
SAMPLE PROBLEM (2 CARDS)
REFERENCE REPORT, WCAP-3845-1, AND SUPPLEMENT 1

17. CATEGORY - B
KEYWORDS - CROSS SECTIONS, BREIT-WIGNER FORMULA, GROUP CONSTANTS, AVERAGES, LIBRARIES, ETOM CODES, GAM CODES, ANISN CODES, MUFT CODES

1. NAME OR DESIGNATION OF PROGRAM - STRAP

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE CODE STRAP (STRUCTURAL ANALYSIS PACKAGE) WAS DEVELOPED TO ANALYZE THE RESPONSE OF STRUCTURAL SYSTEMS TO STATIC AND DYNAMIC LOADING CONDITIONS. STRAP-S SOLVES FOR THE DISPLACEMENTS AND MEMBER FORCES OF STRUCTURAL SYSTEMS UNDER STATIC LOADS AND TEMPERATURE GRADIENTS. STRAP-D WILL SOLVE NUMERICALLY A GIVEN STRUCTURAL DYNAMICS PROBLEM.

4. METHOD OF SOLUTION - STRAP-S GENERATES THE STIFFNESS MATRIX OF A STRUCTURE BY THE FINITE ELEMENT METHOD AND SOLVES THE RESULTING EQUATIONS FOR STRUCTURAL DISPLACEMENTS AND MEMBER FORCES. STRAP-D GENERATES THE STIFFNESS MATRIX, SOLVES FOR EIGENVALUES AND EIGENVECTORS, UNCOUPLES AND SOLVES THE SERIES OF SECOND-ORDER ORDINARY DIFFERENTIAL EQUATIONS, AND THEN CALCULATES AND PLOTS THE REQUESTED MEMBER FORCES.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -
   STRAP-S MAXIMA -
      250 DEGREES OF FREEDOM
      100 MEMBERS
   STRAP-D MAXIMA -
      100 DEGREES OF FREEDOM
       80 TIME-STEPS IN THE FORCING FUNCTION INPUT

6. TYPICAL RUNNING TIME - STRAP-S RUNNING TIME IS ABOUT 5 SECONDS FOR A 97 DEGREE OF FREEDOM PROBLEM. STRAP-D RUNNING TIME IS APPROXIMATELY 15 SECONDS FOR A PLANE FRAME, 6 DEGREES OF FREEDOM, 6 MODAL SHAPE (0 TO 1 SECOND) PROBLEM WITH 3 PLOTS, WHILE 1.5 MINUTES ARE REQUIRED FOR A VIBRATING BEAM, 41 DEGREE OF FREEDOM, 2 MODES (0 TO 1 SECOND) PROBLEM WITH 5 PLOTS.

7. UNUSUAL FEATURES OF THE PROGRAM - STRAP-D ALLOWS FORCING FUNCTIONS INPUT TO BE IN THE FORM OF PRESSURES, FORCES, OR GROUND ACCELERATIONS. INITIAL CONDITIONS (DISPLACEMENTS AND VELOCITIES) CAN BE SPECIFIED AS ZERO, OR DISPLACEMENTS CAN BE CALCULATED, OR DISPLACEMENTS AND VELOCITIES CAN BE READ FROM INPUT. MEMBER FORCES CAN BE CALCULATED AND PLOTTED BY STRAP-D.

8. RELATED AND AUXILIARY PROGRAMS - INTEGRAL PARTS OF STRAP-D INCLUDE AN EIGENVALUE-EIGENVECTOR ROUTINE (THJCOB) BY C. NOBLE, A STIFFNESS GENERATOR (STIFGN) BY J. A. DEARIEN, A RUNGE-KUTTA INTEGRATION TECHNIQUE (RKINTZ) BY R. D. PEAK, AND A MATRIX INVERSION ROUTINE (MAINV) BY D. H. GIPSON.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   IBM360 VERSION OF STRAP-S SUBMITTED APRIL 1972, SAMPLE PROBLEM EXECUTED BY ACC.
   IBM360 VERSION OF STRAP-D SUBMITTED APRIL 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - J. A. DEARIEN, C. NOBLE, AND E. D. ULDRICH, STRAP, A COMPUTER CODE FOR STATIC AND DYNAMIC STRUCTURAL ANALYSIS AND STUDIES MADE USING THE CODE, IN-1362, JUNE 1970.

J. A. DEARIEN, STRAP-S, STRUCTURAL ANALYSIS PACKAGE-STATIC, AND PROGRAM WRITEUP, OCTOBER 1969.

L. J. SIEFKEN, STRAP-D, STRUCTURAL ANALYSIS PACKAGE-DYNAMIC, AND PROGRAM WRITEUP, OCTOBER 1971.

W. WEAVER, JR., COMPUTER PROGRAMS FOR STRUCTURAL ANALYSIS, D. VAN NOSTRAND CO., INC., PRINCETON, NEW JERSEY, 1967.

W. C. HURTY AND M. F. RUBINSTEIN, DYNAMICS OF STRUCTURES, PRENTICE-HALL, INC., ENGLEWOOD CLIFFS, NEW JERSEY, 1964.

S. L. ROGERS, DYNAMICS OF FRAMED STRUCTURES, JOHN WILEY + SONS, INC., NEW YORK, 1959.

J. B. SCARBOROUGH, NUMERICAL MATHEMATICAL ANALYSIS, THE JOHN HOPKINS PRESS, BALTIMORE, MARYLAND, 1955.

W. T. THOMSON, VIBRATION THEORY AND APPLICATIONS, PRENTICE-HALL, INC., ENGLEWOOD CLIFFS, NEW JERSEY, 1965.

N. WILLEMS AND W. M. LUCAS, MATRIX ANALYSIS FOR STRUCTURAL ENGINEERS, PRENTICE-HALL, INC., ENGLEWOOD CLIFFS, NEW JERSEY, 1968.

11. MACHINE REQUIREMENTS - 300K BYTES OF MEMORY FOR EACH PROGRAM PLUS 5 TO 7 DIRECT ACCESS STORAGE DEVICES BESIDES STANDARD I/O FOR STRAP-D

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - STRAP-D USES PLOTTING SUBROUTINES CURRENTLY IN THE NRTS OPERATING SYSTEM.

15. NAME AND ESTABLISHMENT OF AUTHORS -

J. A. DEARIEN AND E. D. ULDRICH
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECKS (STRAP-S 1209 CARDS, STRAP-D 5067 CARDS)
    SAMPLE PROBLEMS (STRAP-S 34 CARDS, STRAP-D 138 CARDS)
    CONTROL INFORMATION (JCL STRAP-S 18 CARDS, STRAP-D 61 CARDS)
    LOAD MODULES (STRAP-S, STRAP-D STEP1, STRAP-D STEP2, AND STRAP-D STEP3)
    SAMPLE PROBLEM OUTPUT (STRAP-S 7 PAGES, STRAP-D 31 SELECTED PAGES)
    REFERENCE REPORT, IN-1362, AND PROGRAM WRITEUPS

17. CATEGORY - I
    KEYWORDS - STRUCTURAL ANALYSIS, DIFFERENTIAL EQUATIONS, FINITE-ELEMENT, DYNAMICS, MASS MATRICES

1. NAME OR DESIGNATION OF PROGRAM - PACTOLUS/CLOTHO

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - PACTOLUS IS A CODE FOR COMPUTING NUCLEAR POWER COSTS USING THE DISCOUNTED CASH FLOW METHOD. THE CASH FLOWS ARE GENERATED FROM INPUT UNIT COSTS, TIME SCHEDULES AND BURNUP DATA. CLOTHO CALCULATES AND COMMUNICATES TO PACTOLUS MASS FLOW DATA TO MATCH A SPECIFIED LOAD FACTOR HISTORY.

4. METHOD OF SOLUTION - PLANT LIFETIME POWER COSTS ARE CALCULATED USING THE DISCOUNTED CASH FLOW METHOD.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   40 ANNUAL TIME PERIODS INTO WHICH ALL COSTS AND MASS FLOWS ARE ACCUMULATED
   20 ISOTOPIC MASS FLOWS CHARGED INTO AND DISCHARGED FROM THE REACTOR MODEL

6. TYPICAL RUNNING TIME - FOR TYPICAL NUCLEAR PLANTS HAVING A LIFETIME OF 30 YEARS AND BETWEEN 50 AND 200 CHARGE-DISCHARGE FUELING EVENTS, A RUN TIME OF 10 TO 25 SECONDS CAN BE EXPECTED.

7. UNUSUAL FEATURES OF THE PROGRAM - ALTHOUGH THE PACTOLUS/CLOTHO CODE IS DESIGNED PRIMARILY FOR NUCLEAR POWER PLANT COST ANALYSIS, BY PROPER INPUT OF MASS FLOWS AND UNIT COSTS ANY SIMILAR PLANT SUCH AS A FOSSIL-FUELED POWER PLANT OR A HYDROELECTRIC PLANT CAN BE SIMULATED. AN OPTION OF PACTOLUS ALLOWS DIRECT READING OF MASS FLOWS OF LIGHT-WATER REACTORS FROM A BURNUP TAPE PROVIDED BY THE ALTHAEA BURNUP CODE DESCRIBED IN REFERENCE 4. ANY SIMILAR BURNUP TAPE COULD BE USED FOR ANY SPECIFIC REACTOR DESIGN, OR CARD INPUT CAN BE PROVIDED THROUGH CLOTHO.

8. RELATED AND AUXILIARY PROGRAMS - THE POWER COST CALCULATION IN PACTOLUS/CLOTHO IS A MODIFIED VERSION OF A TECHNIQUE DEVELOPED BY ROYES SALMON OF OAK RIDGE NATIONAL LABORATORY AND DESCRIBED IN THE REPORT, A PROCEDURE AND A COMPUTER CODE (POWERCO) FOR CALCULATING THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ORNL-3944, JUNE 1966. SEE ACC ABSTRACT 340.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   UNIVAC1108 VERSION SUBMITTED APRIL 1972.

10. REFERENCES - C. H. BLOOMSTER, J. H. NAIL, AND D. R. HAFFNER, PACTOLUS, A CODE FOR COMPUTING NUCLEAR POWER COSTS, BNWL-1169, JANUARY 1970.
J. H. NAIL, PACTOLUS, A CODE FOR COMPUTING NUCLEAR POWER COSTS, PART 1, USERS MANUAL, BNWL-429, JUNE 1967.
J. H. NAIL, CLOTHO, A CODE FOR COMMUNICATING REACTOR MASS BALANCE DATA TO REACTOR ECONOMICS CODES, BNWL-770, JUNE 1968.
E. T. MERRILL, ALTHAEA PART 1, A ONE-DIMENSIONAL TWO-

10. REFERENCES (CONTINUED)
GROUP DIFFUSION CODE WITH AN EFFECTIVE FOUR-GROUP BURNUP, BNWL-462, MAY 1971.
R. SALMON, EXCERPTED PAGES FROM ORNL-4116, AUGUST 1969.
D. R. HAFFNER, OPERATION OF THE PACTOLUS/CLOTHO CODE, HEDL MEMO, FEBRUARY 21, 1973.
SELECTED PAGES FROM CSCX RJE/CRJE REFERENCE, E00003-02-00, VOL. 2.
NTRAN I/O ROUTINES DESCRIPTION, EXCERPT FROM UP-3569, REV. 1.

11. MACHINE REQUIREMENTS - 65K MEMORY WITH DRUM STORAGE OF INPUT DATA TO SPEED UP PROCESSING

12. PROGRAMMING LANGUAGE USED - FORTRAN V

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - CSCX.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
D. R. HAFFNER
HANFORD ENGINEERING DEVELOPMENT LABORATORY
WESTINGHOUSE HANFORD COMPANY
P. O. BOX 1970
RICHLAND, WASHINGTON 99352

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PACTOLUS 4793 CARDS, PDOC 782 CARDS)
SAMPLE PROBLEMS (PACTOLUS 16 CARDS, PDOC 40 CARDS, CLOTHO 311 CARDS)
SAMPLE PROBLEM OUTPUT (PACTOLUS 20 PAGES, CLOTHO 2 PAGES)
REFERENCE REPORTS, BNWL-770 AND BNWL-1169, EXCERPTS, AND MEMO

17. CATEGORY - D
KEYWORDS - DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, REACTOR ECONOMICS, POWERCO CODES, ALTHAEA CODES

ACC ABSTRACT 541 02/74

1. NAME OR DESIGNATION OF PROGRAM - WSP-HASP/DCS

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE WSP (WORK STATION PACKAGE) IS A MODIFICATION OF THE STANDARD HASP/RMT360 PACKAGE SUPPLIED BY IBM AND RUNS ON A MULTIPROGRAMMED DOS SYSTEM/360/30 USING MULTI-LEAVING AND BINARY SYNCHRONOUS COMMUNICATIONS TO COMMUNICATE WITH A SYSTEM/360/195/ASP CENTRAL CPU.

4. METHOD OF SOLUTION - WSP IS A MODIFICATION OF A COMPONENT OF THE HASP II (360D-05.1.014) VERSION 3, MODIFICATION LEVEL 1 IBM PROGRAM. WSP RUNS IN A FOREGROUND PARTITION OF A DOS MFT SYSTEM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - WSP NORMALLY RUNS CONTINUOUSLY IN THE FOREGROUND PARTITION.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - HASP/RMT360 PACKAGE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 DOS VERSION SUBMITTED SEPTEMBER 1973.

10. REFERENCES - ROBERT J. MCMAHON, THE ARGONNE HASP/DOS WORKSTATION PACKAGE (WSP), ARGONNE NATIONAL LABORATORY MEMORANDUM, SEPTEMBER, 1973.

11. MACHINE REQUIREMENTS - WSP HAS BEEN DESIGNED FOR A SYSTEM/360/30 WITH AN IBM 2540 READER-PUNCH, TWO IBM 1403 PRINTERS, AN IBM 1052 PRINTER KEYBOARD CONSOLE, AND AN IBM 2701 DATA ADAPTER UNIT.

12. PROGRAMMING LANGUAGE USED - DOS ASSEMBLER LANGUAGE

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - 360 DOS RELEASE 26.1. THE ANL SYSTEM/360/195 ASP CENTRAL CPU IS OPERATING WITH VERSION 2.6.5 OF ASP REQUIRING NO CHANGES.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PERSON RESPONSIBLE FOR WSP INSTALLATION AND OPERATION SHOULD BE WELL-VERSED IN HASP, DOS, AND ASP. DEVIATIONS FROM THE CONFIGURATION SPECIFIED IN 11, MAY REQUIRE ADDITIONAL PROGRAMMING.

15. NAME AND ESTABLISHMENT OF AUTHOR -

ROBERT J. MCMAHON
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 S. CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    ARGONNE MODIFICATIONS TO THE STANDARD HASP/RMT360 PACKAGE - SOURCE (597 CARDS)
    WSP DRIVER AND B-TRANSIENT PROGRAM PLUS DOS LINK-EDIT JOBS - SOURCE (42 CARDS)
    WSP OBJECT DECK (294 CARDS)
    REFERENCE REPORT

17. CATEGORY - P
    KEYWORDS - OPERATING SYSTEMS, DATA PROCESSING, REMOTE JOB PROCESSING, COMPUTER NETWORKS

1. NAME OR DESIGNATION OF PROGRAM - PSA2

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370

3. DESCRIPTION OF PROBLEM OR FUNCTION - PSA2 COMPUTES THE REACTIONS AND STRESSES CAUSED BY THERMAL EXPANSION AND LOADS IN A MULTI-ANCHOR PIPING SYSTEM WHICH MAY CONTAIN LOOPS AND MAY BE PARTIALLY RESTRAINED AT ANY POINT IN ANY DIRECTION.

4. METHOD OF SOLUTION - THE LINEAR EQUATIONS FOR THE STATICALLY INDETERMINATE PIPE SYSTEM ARE SET UP BY A GENERALIZATION OF BROCKS MATRIX METHOD. BY A SYSTEMATIC USE OF LINEAR TRANSFORMS, THE MATRIX OF THE SYSTEM OF LINEAR EQUATIONS CAN BE OBTAINED BY INCIDENCE ALGEBRA IN THE FORM OF A SYMMETRIC BANDED MATRIX.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF - 36 SECTIONS

6. TYPICAL RUNNING TIME - 1 TO 3 MINUTES ARE REQUIRED ON A MODEL 50.

7. UNUSUAL FEATURES OF THE PROGRAM - PSA2 TAKES INTO ACCOUNT -
   (A) ELASTICITY OF THE ATTACHMENT OF THE PIPE TO THE FOUNDATION,
   (B) RESTRAINTS ON PIPE DISPLACEMENTS BY ANCHORS AND INTERMEDIATE PARTIAL CONSTRAINTS OF LINEAR TYPE,
   (C) GIVEN CONSTANT FORCES AND MOMENTS ACTING UPON THE PIPE SYSTEM,
   (D) THERMAL EXPANSION,
   (E) ANY GEOMETRICAL STRUCTURE OF THE PIPE SYSTEM,
   (F) SEVERAL CASES OF STRESSING PER PIPE SYSTEM, AND
   (G) BOTH METRIC AND ENGLISH UNITS.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   IBM360 VERSION SUBMITTED MAY 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCE - B. H. BOONSTRA, A. N. NICKOLS, W. J. HUGHES, AND W. D. GROSS, PIPE STRESS ANALYSIS CODE, PSA2, AI-64-MEMO-142, REVISION 1.

11. MACHINE REQUIREMENTS - 64K MEMORY

12. PROGRAMMING LANGUAGE USED - FORTRAN IV (H)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FUNCTION LOC MUST BE USER-SUPPLIED. IT RETURNS THE ADDRESS OF ITS ARGUMENT AS AN INTEGER TO THE CALLING PROGRAM.

15. NAME AND ESTABLISHMENT OF AUTHOR -

A. N. NICKOLS
CODES COORDINATOR
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

16. MATERIAL AVAILABLE -
SOURCE DECK (1356 CARDS)
SAMPLE PROBLEM (20 CARDS)
CONTROL INFORMATION (JCL 21 CARDS)
REFERENCE REPORT

17. CATEGORY - I
KEYWORDS - STRESSES, THERMAL EXPANSION, PIPES

1. NAME OR DESIGNATION OF PROGRAM - ENDF/B-THERMOS

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE -

3. DESCRIPTION OF PROBLEM OR FUNCTION - THESE DATA ARE 30-GROUP THERMOS THERMAL SCATTERING KERNELS FOR P0 TO P5 LEGENDRE ORDERS FOR EVERY TEMPERATURE OF EVERY MATERIAL FROM S(ALPHA,BETA) DATA STORED IN THE ENDF/B LIBRARY. THESE SCATTERING KERNELS WERE GENERATED USING THE FLANGE2 COMPUTER CODE (ACC ABSTRACT 368). TO TEST THE KERNELS, THE INTEGRAL PROPERTIES OF EACH SET OF KERNELS WERE DETERMINED BY A PRECISION INTEGRATION OF THE DIFFUSION LENGTH EQUATION AND COMPARED TO EXPERIMENTAL MEASUREMENTS OF THESE PROPERTIES. IN GENERAL, THE AGREEMENT WAS VERY GOOD. DETAILS OF THE METHODS USED AND RESULTS OBTAINED ARE CONTAINED IN THE REFERENCE. THE SCATTERING KERNELS ARE ORGANIZED INTO A TWO VOLUME MAGNETIC TAPE LIBRARY FROM WHICH THEY MAY BE RETRIEVED EASILY FOR USE IN ANY 30-GROUP THERMOS LIBRARY. THE CONTENTS OF THE TAPES ARE AS FOLLOWS -

VOLUME I

MATERIAL	ZA	TEMPERATURES (DEGREES K)
MOLECULAR H2O	100.0	296, 350, 400, 450, 500, 600, 800, 1000
MOLECULAR D2O	101.0	296, 350, 400, 450, 500, 600, 800, 1000
GRAPHITE	6000.0	296, 400, 500, 600, 700, 800, 1000, 1200, 1600, 2000
POLYETHYLENE	205.0	296, 350
BENZENE	106.0	296, 350, 400, 450, 500, 600, 800, 1000

VOLUME II

MATERIAL	ZA	TEMPERATURES (DEGREES K)
ZR BOUND IN ZRHX	203.0	296, 400, 500, 600, 700, 800, 1000, 1200
H BOUND IN ZRHX	230.0	296, 400, 500, 600, 700, 800, 1000, 1200
BERYLLIUM-9	4009.0	296, 400, 500, 600, 700, 800, 1000, 1200
BERYLLIUM OXIDE	200.0	296, 400, 500, 600, 700, 800, 1000, 1200
URANIUM DIOXIDE	207.0	296, 400, 500, 600, 700, 800, 1000, 1200

4. METHOD OF SOLUTION - KERNEL GENERATION IS PERFORMED BY DIRECT INTEGRATION OF THE THERMAL SCATTERING LAW DATA TO OBTAIN THE DIFFERENTIAL SCATTERING CROSS SECTIONS FOR EACH LEGENDRE ORDER. THE INTEGRAL PARAMETER CALCULATION IS DONE BY PRECISION INTEGRATION OF THE DIFFUSION LENGTH EQUATION FOR SEVERAL MODERATOR ABSORPTION CROSS SECTIONS FOLLOWED BY A LEAST SQUARES FIT TO OBTAIN THE FIRST THREE MOMENTS OF K**2/SIGMA-A AS A FUNCTION OF SIGMA-A. THE DIFFUSION PARAMETERS D0, C AND OTHER INTEGRAL PARAMETERS WERE THEN OBTAINED FROM THE FITTED MOMENTS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - A RETRIEVAL PROGRAM TO PRINT AND/OR PUNCH SCATTERING KERNELS FROM THE LIBRARIES IS INCLUDED. PART OF THE ROUTINE IS A GENERAL SUBROUTINE THAT WILL POSITION A LIBRARY IN FRONT OF A SPECIFIED KERNEL. THE SUBROUTINE MAY BE USED IN ANY USER PROGRAM.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
THIS VERSION SUBMITTED APRIL 1972.

10. REFERENCE - F. J. MCCROSSON, D. R. FINCH, AND E. C. OLSEN, TESTING OF ENDF/B - THERMOS CROSS SECTIONS FOR H2O, D2O, C, ZRH2, (C2H4)X, BE, BEO, C6H6, AND UO2, CP-1276 (ENDF-158), OCTOBER 1971.

11. MACHINE REQUIREMENTS - THE RETRIEVAL PROGRAM REQUIRES 1 TAPE DRIVE AND A SMALL AMOUNT OF HIGH-SPEED CORE.

12. PROGRAMMING LANGUAGE USED - AUXILIARY PROGRAM WRITTEN IN FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
F. J. MCCROSSON AND D. R. FINCH
SAVANNAH RIVER LABORATORY
E. I. DU PONT DE NEMOURS AND COMPANY
AIKEN, SOUTH CAROLINA 29801

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (3 TAPES)
LIBRARY (TAPE 1 22,787 CARDS, TAPE 2 24,875 CARDS)
AUXILIARY PROGRAM (203 CARDS)
REFERENCE REPORT

17. CATEGORY - Z
KEYWORDS - SCATTERING KERNELS, ENDF/B, DATA PROCESSING, THERMOS CODES, FLANGE2 CODES

ACC ABSTRACT 544 02/74

1. NAME OR DESIGNATION OF PROGRAM - PLOT-3D

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75 WITH AN IBM2280 FILM RECORDER OR A CALCOMP 780 PLOTTER

3. DESCRIPTION OF PROBLEM OR FUNCTION - PLOT-3D IS A PACKAGE OF SUBPROGRAMS DESIGNED TO DRAW THREE-DIMENSIONAL SURFACES FROM ARRAYS OF POINTS (X,Y,Z). THE SURFACES CAN BE DRAWN AFTER ARBITRARY ROTATIONS ABOUT THE THREE COORDINATE AXES.

4. METHOD OF SOLUTION - PLOT-3D IS A COMPUTER PROGRAM TO PLOT ANY SURFACE FOR WHICH EACH COORDINATE PAIR (X,Y) IS ASSOCIATED WITH A UNIQUE Z IN THE SET OF POINTS (X,Y,Z). IT USES MATRIX TRANSFORMATION OF THE POINTS TO GENERATE DIFFERENT VIEWS OF THE SURFACE AFTER ARBITRARY ROTATIONS ABOUT THE THREE COORDINATE AXES. FOUR VERSIONS OF PLOT-3D ARE AVAILABLE. OUTPUT OF VERSION 1 AND 3 IS BY FILM RECORDER. OUTPUT OF VERSION 2 AND 4 IS BY CALCOMP PLOTTER. VERSIONS 3 AND 4 DO NOT DRAW LINES WHICH WOULD BE INVISIBLE TO A VIEWER LOOKING AT AN OPAQUE SURFACE, WHEREAS VERSIONS 1 AND 2 DRAW EVERY LINE ON THE SURFACE.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VERSIONS 3 AND 4 LIMIT NUMBER OF ROWS IN ARRAYS (X,Y,Z) TO 100 AND ALSO NUMBER OF COLUMNS IN ARRAYS (X,Y,Z) TO 100.

6. TYPICAL RUNNING TIME - USING A 20 X 10 GRID AND PRODUCING SIX 3-D PICTURES REQUIRES 15 SECONDS WITH VERSION 1, 20 SECONDS WITH VERSION 2, 4 MINUTES AND 30 SECONDS WITH VERSION 3, AND 3 MINUTES AND 28 SECONDS WITH VERSION 4.

7. UNUSUAL FEATURES OF THE PROGRAM - THE PLOT-3D PACKAGE IS READILY ADAPTABLE TO OTHER HARDWARE. IT IS INTENDED FOR GRAPHICAL REPRESENTATION OF SURFACES DETERMINED BY SINGLE-VALUED FUNCTIONS OF TWO INDEPENDENT VARIABLES.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MAY 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - D. BASINGER AND J. GVILDYS, THREE-DIMENSIONAL GRAPHICAL REPRESENTATION OF SURFACES BY COMPUTER (FAST REACTOR CONTAINMENT PROGRAM), ANL-7633, NOVEMBER 1971.
R. BRUCE CANWRIGHT, JR. AND PAUL SWIGERT, PLOT 3-D - A PACKAGE OF FORTRAN SUBPROGRAMS TO DRAW THREE-DIMENSIONAL SURFACES, NASA TM-X-1598, JUNE 1968.
RUTH A. NEISS, BE VISION, A PACKAGE OF IBM 7090 FORTRAN PROGRAMS TO DRAW ORTHOGRAPHIC VIEWS OF COMBINATIONS OF PLANE AND QUATRIC SURFACES, JOURNAL OF THE ASSOCIATION OF COMPUTER MACHINERY, PP. 194-204, APRIL 1966.

10. REFERENCES (CONTINUED)

HENRY MARGENAU AND GEORGE M. MURPHY, THE MATHEMATICS OF PHYSICS AND CHEMISTRY, SECOND EDITION, D. VAN NOSTRAND CO., INC., PP. 565-570, 1956.

D. CARSON, A FILM-PLOTTING SUBROUTINE PACKAGE (FSP) FOR THE IBM 2280 FILM RECORDER, ANL-AMD TECHNICAL MEMORANDUM NO. 167, JUNE 17, 1968.

RONALD F. KRUPP, S/360 PROGRAMMING TECHNIQUES FOR THE CALCOMP 780, ANL-AMD TECHNICAL MEMORANDUM NO. 130, REVISED JUNE 13, 1972.

11. MACHINE REQUIREMENTS - VERSIONS 1 AND 3, FOR THE IBM 2280 FILM RECORDER, REQUIRE 7810 AND 58,285 BYTES OF CORE STORAGE, EXCLUSIVE OF FILM RECORDER SUBROUTINES AND ARRAYS. VERSIONS 2 AND 4, FOR THE CALCOMP PLOTTER, REQUIRE 6670 AND 62,435 BYTES OF CORE STORAGE, EXCLUSIVE OF CALCOMP PLOTTER SUBROUTINES AND ARRAYS.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 ASP.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

D. BASINGER AND J. OVILDYS
REACTOR ANALYSIS AND SAFETY DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE -
SOURCE DECKS (VERSION 1 251 CARDS, VERSION 2 245 CARDS, VERSION 3 557 CARDS, VERSION 4 558 CARDS)
SAMPLE PROBLEM OUTPUT (12 PAGES)
REFERENCE REPORT, ANL-7633

17. CATEGORY - N
KEYWORDS - 3-DIMENSIONAL, X-Y-Z, GRAPHS

1. NAME OR DESIGNATICN CF PRCGRAM - BETTY

2. COMPUTER FCR WHICH PROGRAM IS DESIGNED AND OTHERS UPCN WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM CR FUNCTION - BETTY DESCRIBES SPATIAL AND TEMPCRAL CCNCENTRATICN BEHAVIOR OF A SUSPENSICN IN A PIPE, AS A RESULT OF DEPOSITICN AND ERCSICN CF THE PARTICLES.

4. METHOD OF SOLUTICN - THE PARTIAL DIFFERENTIAL EQLATICNS DESCRIBING THE CONCENTRATION BEHAVIOR ARE SOLVED BY A COMBINATICN CF ANALYTICAL ANC NUMERICAL INTEGRATION USING A SIMPLE FCRWARD DIFFERENCING TECHNIQUE.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PRCBLEM - NO MCRE THAN 900 AXIAL INCREMENTS MAY BE USED.

6. TYPICAL RUNNING TIME - A PROBLEM WITH 1CC AXIAL INCREMENTS REQUIRES ABOLT TWC SECCNDS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED ANC AUXILIARY PROGRAMS - BETTY USES SEVERAL ROUTINES FROM THE BETTIS ENVIRONMENTAL PACKAGE (ACC ABSTRACT 478) AND SUBROUTINE HCH (ACC ABSTRACT 294) TO CALCULATE WATER ANC STEAM PROPERTIES.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED JUNE 1972.

10. REFERENCES - S. K. BEAL, THE ROLE OF EROSICN AND DEPCSITICN IN SAMPLING ENTRAINED PARTICLES, WAPC-TM-1014, APRIL 1972.
C. J. PFEIFER, CDC-6600 FCRTRAN PRCGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
L. L. LYNN, A DIGITAL CCMPUTER PRCGRAM FOR NUCLEAR DESIGN WATER PROPERTIES, WAPD-TM-68C, JULY 1967.

11. MACHINE REQUIREMENTS - 63K 6C-BIT WCRDS CF CORE STCRAGE

12. PRCGRAMMINC LANGUAGE USEC - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PRCGRAM IS EXECUTEC - SCCPE 3.2.

14. ANY OTHER PROGRAMMING OR OPERATING INFCRMATICN CR RESTRICTICNS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
S. K. BEAL
BETTIS ATCMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CCRPCRATICN
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
    SOURCE DECK (599 CARDS)
    SAMPLE PROBLEM (22 CARDS)
    SAMPLE PROBLEM OUTPUT (13 PAGES)
    REFERENCE REPORT, WAPD-TM-1014

17. CATEGORY - H
    KEYWORDS - PIPES, PARTICLES, SAMPLING

ACC ABSTRACT 546 02/74

1. NAME OR DESIGNATION OF PROGRAM - EMERALD

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/85

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE EMERALD PROGRAM IS DESIGNED FOR THE CALCULATION OF RADIATION RELEASES AND EXPOSURES RESULTING FROM NORMAL AND ABNORMAL OPERATION OF A LARGE PRESSURIZED WATER REACTOR. THE APPROACH USED IN EMERALD IS SIMILAR TO AN ANALOG SIMULATION OF A REAL SYSTEM. EACH COMPONENT OR VOLUME IN THE PLANT WHICH CONTAINS A RADIOACTIVE MATERIAL IS REPRESENTED BY A SUBROUTINE, WHICH KEEPS TRACK OF THE PRODUCTION, TRANSFER, DECAY AND ABSORPTION OF RADIOACTIVITY IN THAT VOLUME. DURING THE COURSE OF THE ANALYSIS OF AN ACCIDENT, ACTIVITY IS TRANSFERRED FROM SUBROUTINE TO SUBROUTINE IN THE PROGRAM AS IT WOULD BE TRANSFERRED FROM PLACE TO PLACE IN THE PLANT. FOR EXAMPLE, IN THE CALCULATION OF THE DOSES RESULTING FROM A LOSS-OF-COOLANT ACCIDENT THE PROGRAM FIRST CALCULATES THE ACTIVITY BUILT UP IN THE FUEL BEFORE THE ACCIDENT, THEN RELEASES SOME OF THIS ACTIVITY TO THE CONTAINMENT VOLUME. SOME OF THIS ACTIVITY IS THEN RELEASED TO THE ATMOSPHERE. THE RATES OF TRANSFER, LEAKAGE, PRODUCTION, CLEANUP, DECAY, AND RELEASE ARE READ IN AS INPUT TO THE PROGRAM. SUBROUTINES ARE ALSO INCLUDED WHICH CALCULATE THE ON-SITE AND OFF-SITE RADIATION EXPOSURES AT VARIOUS DISTANCES, FOR INDIVIDUAL ISOTOPES AND SUMS OF ISOTOPES. THE PROGRAM CONTAINS A LIBRARY OF PHYSICAL DATA FOR THE TWENTY-FIVE ISOTOPES OF MOST INTEREST IN LICENSING CALCULATIONS, AND OTHER ISOTOPES CAN BE ADDED OR SUBSTITUTED. BECAUSE OF THE FLEXIBLE NATURE OF THE SIMULATION APPROACH, THE EMERALD PROGRAM CAN BE USED FOR MOST CALCULATIONS INVOLVING THE PRODUCTION AND RELEASE OF RADIOACTIVE MATERIALS, INCLUDING DESIGN, OPERATIONAL AND LICENSING STUDIES.

4. METHOD OF SOLUTION - EXPLICIT SOLUTIONS OF FIRST-ORDER LINEAR DIFFERENTIAL EQUATIONS ARE INCLUDED. IN ADDITION, A SUBROUTINE IS PROVIDED WHICH SOLVES A SET OF SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   25 ISOTOPES
   7 TIME PERIODS
   15 VOLUMES OR COMPONENTS
   10 DISTANCES

6. TYPICAL RUNNING TIME - LESS THAN A MINUTE IS REQUIRED TO RUN THE SAMPLE PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM - THE USE OF FORTRAN IV LANGUAGE, MODULAR DESIGN, GENERIC VARIABLE NAMES, AND EXTENSIVE INTERNAL COMMENTS MAKES EMERALD EASILY ADAPTED TO THE USERS PARTICULAR MODELS AND PROBLEMS.

8. RELATED AND AUXILIARY PROGRAMS - SUBROUTINE SIMQ, WHICH IS DOCUMENTED IN IBM SYSTEM 360 SCIENTIFIC SUBROUTINE PACKAGE (360A-CM-30X), VERSION III, PROGRAM MANUAL H20-0205-3, IS INCLUDED.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MAY 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - W. K. BRUNOT, EMERALD - A PROGRAM FOR THE CALCULATION OF ACTIVITY RELEASES AND POTENTIAL DOSES FROM A PRESSURIZED WATER REACTOR PLANT, PACIFIC GAS AND ELECTRIC COMPANY, OCTOBER 1971, AND ERRATA AND ADDITIONS, MAY 31, 1972, AND DECEMBER 12, 1972.
EMERALD - A PROGRAM FOR THE CALCULATION OF PWR RADIATION DOSES, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, JUNE 1972.

11. MACHINE REQUIREMENTS - 520K BYTES ON THE IBM 360/85

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
W. K. BRUNOT
MECHANICAL AND NUCLEAR ENGINEERING DEPARTMENT
PACIFIC GAS AND ELECTRIC COMPANY
77 BEALE STREET
SAN FRANCISCO, CALIFORNIA 94106

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (3985 CARDS)
SAMPLE PROBLEMS (1337 CARDS)
CONTROL INFORMATION (JCL 8 CARDS)
REFERENCE REPORT WITH ERRATA AND ADDITIONS

17. CATEGORY - G
KEYWORDS - DOSE RATES, ACCIDENTS, FISSION PRODUCTS, GAMMA RADIATION, POWER PLANTS, RADIOACTIVITY, PWR REACTORS

1. NAME OR DESIGNATION OF PROGRAM - GAMB1T

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - GAMB1T IS A PROGRAM THAT WAS DESIGNED TO CALCULATE MULTIGROUP NEUTRON CROSS SECTIONS IN THE HIGH ENERGY AND THE THERMAL ENERGY RANGES. IT WAS CREATED BY JOINING GAM, WHICH DOES THE HIGH ENERGY CALCULATION, AND B1T, WHICH DOES THE THERMAL CALCULATION.

4. METHOD OF SOLUTION - GAMB1T PROVIDES BROAD-GROUP FLUX AND CURRENT-AVERAGED NEUTRON CROSS SECTIONS. THEY ARE BASED ON A THERMAL CROSS SECTION LIBRARY CONSISTING OF 99 FINE GROUPS (0-2.38 EV), AND A FAST NEUTRON LIBRARY CONSISTING OF 68 FINE GROUPS (0.414 EV - 10 MEV, 1/4 LETHARGY INTERVALS). THE FLUXES AND CURRENTS REQUIRED TO OBTAIN THE BROAD-GROUP CROSS SECTIONS MAY BE CALCULATED WITH GAMB1T OR MAY BE ENTERED INTO THE PROGRAM. IN ADDITION, A MAXWELLIAN SPECTRUM MAY BE USED IN THE THERMAL RANGE. IF THE FLUX IS CALCULATED, EITHER THE B1 OR P1 METHODS OF SOLVING THE TRANSPORT EQUATION MAY BE USED. IN EFFECT, THE STEADY-STATE TRANSPORT EQUATION IS SOLVED FOR AN INFINITE MEDIUM PROBLEM. THE PROGRAM PROVIDES CROSS SECTIONS FOR A FULL P1 TRANSPORT CALCULATION. CARDS ARE PUNCHED OUT IN A FORMAT SUITABLE FOR INPUT TO THE ANISN AND DOT DISCRETE-ORDINATES TRANSPORT CODES.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   20 NUCLIDES PER PROBLEM
   32 GAM (FAST) BROAD ENERGY GROUPS
   48 B1T (THERMAL) BROAD ENERGY GROUPS

6. TYPICAL RUNNING TIME - 5 MINUTES ARE REQUIRED FOR A TYPICAL PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM - B1T SOLVES EQUATIONS IN THE THERMAL ENERGY RANGE (0 LESS THAN OR EQUAL E LESS THAN OR EQUAL 2.38 EV) THAT ARE CONSISTENT WITH THE EQUATIONS SOLVED WITHIN THE GAM PROGRAM AND COMPARABLE TO THOSE SOLVED WITH THE GATHER PROGRAM. B1T PROVIDES FLUXES AND CURRENTS AND INCLUDES BOTH P0 AND P1 SCATTERING MATRICES IN ITS CROSS SECTION LIBRARY. INITIAL FINE ENERGY GROUP FLUXES AND CURRENTS MAY BE OBTAINED FROM GAMB1T WHICH CAN BE USED IN OBTAINING BROAD-GROUP CROSS SECTIONS. SUBSEQUENTLY FINE-GROUP FLUXES AND CURRENTS OBTAINED FROM A TRANSPORT THEORY CALCULATION MAY BE INPUT TO GAMB1T TO OBTAIN IMPROVED BROAD-GROUP CROSS SECTIONS.

8. RELATED AND AUXILIARY PROGRAMS - GAM (ACC ABSTRACT 33), GATHER, AND QUERY

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   CDC6600 VERSION SUBMITTED MAY 1972.

10. REFERENCES - G. COLLIER, G. GIBSON, L. L. MORAN, R. K. DISNEY, AND R. S. KAISER, SECOND VERSION OF THE GAMBIT CODE, WANL-TME-1969, NOVEMBER 1969.

W. H. GRAY AND G. COLLIER, GAMBIT USERS MANUAL, WANL-TME-1751, FEBRUARY 1968.

G. COLLIER AND G. GIBSON, GAMBIT PROGRAM, WANL-TME-1752, APRIL 1968.

L. L. MORAN, G. COLLIER, A. S. JOHNSTON, AND G. GIBSON, THERMAL RANGE LIBRARY FOR GAMBIT PROGRAM, WANL-TME-1830, JULY 1968.

G. COLLIER AND L. L. MORAN, UTILITY PROGRAMS FOR GAMBIT THERMAL RANGE LIBRARY, WANL-TME-1970, OCTOBER 1969.

G. COLLIER, S. A. FODY, G. GIBSON, AND L. L. MORAN, NEW CROSS SECTIONS FOR THE GAMBIT LIBRARY, TAPES FSGAM24 AND CGBIT11, WANL-TME-1965, OCTOBER 1969.

S. A. FODY, G. GIBSON, N. A. NICE, AND J. L. WYTIAZ, NEW CROSS SECTIONS FOR THE GAMBIT LIBRARY, TAPES FSGAM29 AND CGBIT15, WANL-TME-2690, APRIL 1970.

11. MACHINE REQUIREMENTS - 64K MEMORY AND 8 TAPES

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.0.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - OPTIONS INCLUDED IN THE SECOND VERSION OF GAMBIT ARE -

(A) THE FLUX AND CURRENT SPECTRUM CALCULATED IN A PRECEDING PROBLEM MAY BE REUSED IN A SUBSEQUENT STACKED PROBLEM WITHOUT RECALCULATION,

(B) CROSS SECTION DATA IN THE EXTERMINATOR2 (ACC ABSTRACT 156) TWO-DIMENSIONAL DIFFUSION THEORY CODE FORMAT CAN BE PRODUCED,

(C) THE TOTAL ELASTIC SCATTERING CROSS SECTION INCLUDING THE ANISOTROPIC SCATTERING EFFECT IN THE CENTER-OF-MASS SYSTEM IS CALCULATED IN THE APPROPCS DATA PREPARATION CODE FORMAT, AND

(D) ALL OUTPUT MAY BE PRODUCED ON EITHER CARDS OR MAGNETIC TAPE OR BOTH. ALL CROSS SECTION SETS THAT ARE PUNCHED AND/OR PUT ON TAPE ARE PRINTED.

GAMBIT IS OF LIMITED USE TO OTHER THAN CDC6600 INSTALLATIONS BECAUSE THE LIBRARY TAPES ARE IN CDC6600 BINARY FORMAT NOT READILY ADAPTED TO OTHER MACHINES.

15. NAME AND ESTABLISHMENT OF AUTHORS -

G. GIBSON
WESTINGHOUSE ELECTRIC CORPORATION
ADVANCED REACTOR DIVISION
WALTZ MILL SITE
P. O. BOX 158
MADISON, PENNSYLVANIA 15663
G. COLLIER

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR ENERGY SYSTEMS
P. O. BOX 355
PITTSBURGH, PENNSYLVANIA 15230

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL (5 TAPES)
SOURCE DECK (4992 CARDS)
SAMPLE PROBLEM (28 CARDS)
CONTROL INFORMATION (15 CARDS)
LIBRARIES (TAPE 2 - GAM LIBRARY 752 BINARY RECORDS, TAPE 3 - B1T LIBRARY 2761 BINARY RECORDS, TAPE 4 - QUERY LIBRARY 27 BINARY RECORDS, TAPE5 - GAS LIBRARY 1754 BINARY RECORDS)
REFERENCE REPORTS, ALL EXCEPT WANL-TME-1751 WHICH IS AVAILABLE ONLY ON MICROFICHE

17. CATEGORY - B
KEYWORDS - MULTIGROUP CROSS SECTIONS, FAST SPECTRA, THERMAL SPECTRA, GAM CODES, B1T CODES, GATHER CODES, QUERY CODES, ANISN CODES, DOT CODES, EXTERMINATOR2 CODES, APPROPOS CODES

1. NAME OR DESIGNATION OF PROGRAM - CEBLG

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6400,6600,7600

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE TRANSIENT HYDRAULIC BEHAVIOR OF THE SODIUM IN A SODIUM-HEATED STEAM GENERATOR IN WHICH A SODIUM-WATER REACTION OCCURS DUE TO A LARGE WATER LEAK IS CALCULATED FOR FLOWS IN UP TO THREE DIMENSIONS.

4. METHOD OF SOLUTION - THE METHOD OF FINITE ELEMENTS IS USED TO CALCULATE THE PRESSURES IN THE MULTI-DIMENSIONAL BUBBLE GROWTH REGION.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   140 ELEMENTS IN 3-D REGION (INCLUDING TRANSITION ELEMENTS)
   30 CHANNELS
   30 CHANNEL NODES
   5 TRANSITION ELEMENTS
   1 COVER GAS SPACE
   28 CONNECTIONS TO FINITE ELEMENTS FOR EACH TRANSITION ELEMENT
   4 CONNECTIONS TO CHANNELS FOR EACH TRANSITION ELEMENT
   200 TIME-STEPS SAVED IN PLOT OUTPUT ARRAY
   IN GENERAL, THE FOLLOWING ASSUMPTIONS ALSO APPLY -
   A SINGLE WATER LEAK OCCURS INSTANTANEOUSLY.
   THE CHEMICAL REACTION IS INSTANTANEOUS.
   ALL WATER REACTS TO FORM NA2O AND H2 AT 1800 DEGREES F.
   THE HYDROGEN BUBBLE EXPANDS ISOTHERMALLY.
   THE SODIUM IS INCOMPRESSIBLE.
   THE STEAM GENERATOR DOES NOT DEFORM.
   THE ANALYSIS STOPS WHEN THE HYDROGEN BUBBLE REACHES A COVER GAS SPACE OR COMPLETELY FILLS A FLOW CHANNEL.

6. TYPICAL RUNNING TIME - THIS IS HIGHLY PROBLEM DEPENDENT. THE SAMPLE PROBLEM WITH 130 FINITE ELEMENTS, 1 TRANSITION ELEMENT, AND 1 CHANNEL IS USED AS AN EXAMPLE. THIS WAS A 5-TUBE LEAK WHICH TOOK 0.39 SECONDS FOR THE HYDROGEN BUBBLE TO REACH THE TRANSITION ELEMENT.

COMPUTER	CPU TIME
6400	435 SECONDS
6600	188 SECONDS
7600	20 SECONDS

7. UNUSUAL FEATURES OF THE PROGRAM -
   (A) LEAK RATE - USER SPECIFICATION OF WATER LEAK RATE ALLOWS ANY DESIRED SITUATION TO BE MODELED (ALL LEAKS MUST BE IN ONE FINITE ELEMENT). ANY AXIAL AND RADIAL LOCATION OF THE LEAK IS POSSIBLE. BACK PRESSURE EFFECTS ON THE LEAK RATE ARE CALCULATED AUTOMATICALLY.
   (B) MODEL - UP TO 3 DIMENSIONS MAY BE MODELED IN THE FINITE ELEMENT REGION. ONE-DIMENSIONAL LUMPED-PARAMETER CHANNELS MAY BE USED TO MODEL REMAINDER OF SYSTEM. A COVER GAS MAY

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
BE MODELED. FORM, FRICTIONAL, AND INERTIAL FLOW RESISTANCES MAY BE USED.
(C) PRESSURE RELIEF SYSTEM - TRIGGERED BY PRESSURE ABOVE USER-SET THRESHOLD. TWO-COMPONENT COMPRESSIBLE FLOW IS MODELED.
(D) GENERAL - ANY L/D STEAM GENERATOR MAY BE MODELED. BUBBLE PRESSURE, SODIUM PRESSURE AND SODIUM FLOW THROUGHOUT THE SYSTEM ARE CALCULATED. RELIEF SYSTEM FLOW AND MATERIAL INVENTORY ARE CALCULATED. SELECTED PRESSURES AND FLOWS ARE RETAINED FOR AN AUTOMATED PLOTTING PACKAGE.

8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS A MAJOR EXTENSION OF THE APDA PROGRAM BUG3. A PLOTTING PACKAGE SPECIFIC TO C-E IS CALLED BY CEBUG. A DUMMY SUBROUTINE, GRAPH, IS PROVIDED IN PLACE OF IT AND CAN BE REPLACED BY A LOCAL EQUIVALENT WITH APPROPRIATE CALLS.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED JUNE 1973.

10. REFERENCES - P. K. DOHERTY AND C. W. STUTEVILLE, CEBUG - A CODE FOR STEAM GENERATOR SODIUM-WATER REACTION ANALYSIS, CEND-368, DECEMBER 21, 1972.
P. K. DOHERTY, DOUBLE PRECISION VERSION OF CEBUG, CEND NOTE, MAY 17, 1973.

11. MACHINE REQUIREMENTS - 21,000 WORD MEMORY (CDC6400,6600), 17,000 WORD MEMORY (CDC7600)

12. PROGRAMMING LANGUAGE USED - ANSI FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3 (CDC6400,6600), SCOPE 2.0 (CDC7600).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - FOR COMPUTERS WITH WORD LENGTH LESS THAN 60 BITS, DOUBLE PRECISION MAY BE NECESSARY. SEE REFERENCE ON DOUBLE PRECISION USE WITH CEBUG.

15. NAME AND ESTABLISHMENT OF AUTHORS -
P. K. DOHERTY AND C. W. STUTEVILLE
COMBUSTION ENGINEERING, INC.
1000 PROSPECT HILL ROAD
WINDSOR, CONNECTICUT 06095

16. MATERIAL AVAILABLE -
SOURCE DECK (1299 CARDS)
SAMPLE PROBLEM (146 CARDS)
REFERENCE REPORT AND NOTE

17. CATEGORY - G
KEYWORDS - FINITE ELEMENT, STEAM GENERATOR, LEAKAGE, WATER, SODIUM, SODIUM-WATER REACTION

ACC ABSTRACT 549 02/74

1. NAME OR DESIGNATION OF PROGRAM - BIGDEAL

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC1604

3. DESCRIPTION OF PROBLEM OR FUNCTION - BIGDEAL IS USED TO (1) CALCULATE THE MAXIMUM TEMPERATURES OF A SPENT YANKEE ATOMIC TYPE POWER REACTOR FUEL ASSEMBLY (36 0.305-IN. -OD BY 102-IN. - LONG STAINLESS STEEL FUEL RODS ON 0.422-IN. CENTERS) DURING SHEAR-LEACH PROCESSING, AND (2) CALCULATE PRESSURE BUILDUP WITHIN A BATCH DISSOLVER AS THE HOT FUEL IS QUENCHED BY COLD NITRIC ACID IN PREPARATION FOR AQUEOUS PROCESSING. THE FOLLOWING FIVE CASES, RELATED TO THE UNIT OPERATIONS OF SHEAR-LEACH, MAY BE INVESTIGATED - (1) FUEL SUBASSEMBLY SUSPENDED VERTICALLY IN WATER, (2) SUBASSEMBLY SUSPENDED HORIZONTALLY IN AIR, (3) SUBASSEMBLY CONTAINED WITHIN THE SHEAR FEED ENVELOPE, (4) 16 5-, 7-3/4-, OR 10-IN. ID BASKETS OF SHEARED FUEL STORED IN A 4 X 4 ARRAY ON 12-IN. CENTERS, AND (5) LEACHING OF 6 BASKETS IN A BATCH DISSOLVER.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - TEMPERATURES ARE CALCULATED OVER A RANGE OF BURNUPS FROM 8000 TO 50,000 MWD/METRIC TON (U), SPECIFIC POWER FROM 10 TO 70 WATTS PER GRAM OF URANIUM, AND DECAY TIMES FROM 180 TO 1080 DAYS.

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC1604 VERSION SUBMITTED JUNE 1972.

10. REFERENCES - G. E. ABRAHAM II AND B. C. FINNEY, CALCULATED MAXIMUM TEMPERATURES OF SPENT YANKEE ATOMIC TYPE POWER REACTOR FUEL DURING SHEAR-LEACH PROCESSING, ORNL-3948, NOVEMBER 1966.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN 63

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

G. E. ABRAHAM II AND B. C. FINNEY
CHEMICAL TECHNOLOGY DIVISION
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE -
    SOURCE DECK (652 CARDS)
    SAMPLE PROBLEM (122 CARDS)
    SAMPLE PROBLEM OUTPUT (1 PAGE)
    REFERENCE REPORT

17. CATEGORY - D
    KEYWORDS - FUEL ELEMENTS, TEMPERATURES, POWER REACTORS

1. NAME OR DESIGNATION OF PROGRAM - REXCO-H (RELEASE 1)

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/195

3. DESCRIPTION OF PROBLEM OR FUNCTION - REXCO-H CALCULATES THE TWO-DIMENSIONAL HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT TO A HIGH-ENERGY EXCURSION.

4. METHOD OF SOLUTION - EQUATION OF HYDRODYNAMICS AND EQUATION OF STATE OF REACTOR MATERIALS ARE EXPRESSED IN LAGRANGIAN FORM AND SET INTO FINITE-DIFFERENCE EQUATIONS. SHOCK DISCONTINUITIES ARE ELIMINATED BY THE USE OF THE VON NEUMANN-RICHTMYER PSEUDOVISCOSITY FACTOR, Q. PROPAGATION OF SHOCK WAVES, LOADS IMPOSED ON DIFFERENT PARTS OF THE REACTOR COMPONENTS, AND THE RESULTING DAMAGE ARE DETERMINED AT EVERY TIME-STEP, UNTIL THE VESSEL RUPTURES OR THE FORCE ACTING ON THE SHIELD PLUG EXCEEDS THE STRENGTH OF THE PLUG HOLDDOWN DEVICE. CALCULATED DISPLACEMENTS AND PRESSURES AT ALL SPATIAL POINTS AT ANY INSTANT OF TIME ALSO ARE GIVEN IN PICTORIAL FORM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   3000 GRID ZONES
   1000 CYCLES PER RUN, IF CALCOMP DISPLAY IS REQUIRED
   20 MATERIALS
   20 SECTIONS
   10 REACTOR VESSELS
   50 POINTS FOR STRESS-STRAIN TABLE FOR REACTOR MATERIAL

6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES ABOUT 1.5 MINUTES FOR 100 CYCLES.

7. UNUSUAL FEATURES OF THE PROGRAM - THE REACTOR VESSELS IN THIS PROGRAM ARE TREATED AS THIN SHELL STRUCTURES.

8. RELATED AND AUXILIARY PROGRAMS - PLOT3D (ACC ABSTRACT 544)

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   IBM360 VERSION SUBMITTED OCTOBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - Y. W. CHANG, J. GVILDYS, AND S. H. FISTEDIS, TWO-DIMENSIONAL HYDRODYNAMICS ANALYSIS FOR PRIMARY CONTAINMENT, ANL-7498, NOVEMBER 1969.

Y. W. CHANG, J. GVILDYS AND S. H. FISTEDIS, HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT TO HIGH-ENERGY EXCURSION, NUCL. ENG. DESIGN VOL. 12, PP. 344-360 (1970).

Y. W. CHANG AND J. GVILDYS, DYNAMIC RESPONSE OF REACTOR CONTAINMENT TO HIGH-ENERGY EXCURSION, PROC. THE 1ST INTL. CONF. ON STRUCTURAL MECHANICS IN REACTOR TECHNOLOGY, BERLIN, GERMANY (1971).

J. VON NEUMANN AND R. D. RICHTMYER, A METHOD OF THE

10. REFERENCES (CONTINUED)
NUMERICAL CALCULATION OF HYDRODYNAMIC SHOCKS, J. APP. PHYSICS, VOL. 21(3), PP. 232-237 (1950).
J. E. ASH AND R. T. JULKE, COMPARISON OF A TWO-DIMENSIONAL HYDRODYNAMICS CODE (REXCC) TO EXCURSION REACTOR CONTAINMENT, ANL-7911, JANUARY 1972.
J. E. ASH, Y. W. CHANG, AND R. T. JULKE, COMPARISON OF A TWO-DIMENSIONAL HYDRODYNAMIC CODE (REXCC) TO EXCURSION EXPERIMENTS FOR FAST REACTOR CONTAINMENT, ANL-7911, SUPPL. 1, JULY 1972.

11. MACHINE REQUIREMENTS - 500K BYTES OF CORE, TWO 9-TRACK TAPE UNITS, ONE 7-TRACK TAPE UNIT, IBM 2280 FILM RECORDER, CALCOMP 780 PLOTTER.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - TO EXECUTE THE PICTORIAL DISPLAY, THE PROGRAM USES THE ANL SYSTEM INSTALLATION SUBROUTINES DESCRIBED IN ANL-AMD TECHNICAL MEMORANDUM NO. 167, A FILM-PLOTTING SUBROUTINE PACKAGE (FSP) FOR THE 2280 FILM RECORDER, BY D. CARSON, JUNE 17, 1968, AND TO EXECUTE THE CALCOMP PLOTS, THE PROGRAM USES THE SUBROUTINES DESCRIBED IN ANL-AMD TECHNICAL MEMORANDUM NO. 130, S/360 PROGRAMMING TECHNIQUES FOR THE CALCOMP 780, BY R. F. KRUPP, JANUARY 6, 1967.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
Y. W. CHANG, J. GVILDYS, AND S. H. FISTEDIS
REACTOR ANALYSIS AND SAFETY DIVISION
ARGONNE NATIONAL LABORATORY
9700 S. CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (2440 CARDS)
SAMPLE PROBLEM (300 CARDS)
CONTROL INFORMATION (JCL 18 CARDS)
SAMPLE PROBLEM OUTPUT (59 SELECTED PAGES)
REFERENCE REPORT, ANL-7498

17. CATEGORY - F
KEYWORDS - 2-DIMENSIONAL, CONTAINMENT, EXCURSIONS, HYDRODYNAMICS, REACTOR SAFETY, FAST REACTORS, FLOT3D CODES

ACC ABSTRACT 551 12/73

1. NAME OR DESIGNATION OF PROGRAM - MOXY/MOD1

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - MOXY COMPUTES HEAT TRANSFER IN A BOILING WATER REACTOR FUEL ELEMENT. CONDUCTION, CONVECTION, AND RADIATION MODES OF HEAT TRANSFER ARE CONSIDERED, AS WELL AS HEAT ADDITION BY METAL-WATER REACTION. CONVECTION HEAT TRANSFER COEFFICIENTS ARE INPUT AS TABULAR FUNCTIONS OF TIME.

4. METHOD OF SOLUTION - AN IMPLICIT NUMERICAL SOLUTION OF THE ONE-DIMENSIONAL FOURIER HEAT CONDUCTION EQUATION IS USED.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - APPROXIMATELY 4 MINUTES PER 700-SECOND TRANSIENT ARE REQUIRED ON THE IBM360.

7. UNUSUAL FEATURES OF THE PROGRAM - MOXY ALLOWS THE USE OF FAIRLY LARGE TIME-STEPS (GREATER THAN 1 SECOND).

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JUNE 1972, SAMPLE PROBLEM EXECUTED BY ACC.
UNIVAC1108 VERSION SUBMITTED JUNE 1972.

10. REFERENCES - D. R. EVANS, MOXY, A DIGITAL COMPUTER CODE FOR CORE HEAT TRANSFER ANALYSIS, IN-1392, AUGUST 1970.
MOXY/MOD001*01/04/71*CRE CODE DESCRIPTION, AEROJET NOTE, 1972.

11. MACHINE REQUIREMENTS - 125K BYTES OF CORE

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360).

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - MOXY READS THE RADIATION MATRIX FROM A DIRECT ACCESS STORAGE DEVICE.

15. NAME AND ESTABLISHMENT OF AUTHOR -
D. R. EVANS
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECKS (MOXY 360-900 CARDS, 1108-1412 CARDS, BLOCK DATA PROGRAM 360-697 CARDS)
    SAMPLE PROBLEMS (360-49 CARDS, 1108-46 CARDS)
    CONTROL INFORMATION (JCL 360-39 CARDS)
    LOAD MODULE L.ELSMOXY (360-93 BLOCKS)
    SAMPLE PROBLEM OUTPUT (30 SELECTED PAGES)
    REFERENCE REPORT AND NOTE

17. CATEGORY - H
    KEYWORDS - HEAT TRANSFER, BWR REACTORS, FUEL ELEMENTS, ZIRCONIUM

ACC ABSTRACT 552 02/74

1. NAME OR DESIGNATION OF PROGRAM - PWR-PPM

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6000 SERIES

3. DESCRIPTION OF PROBLEM OR FUNCTION - PWR-PPM GENERATES BORATION-DILUTION TABLES USED BY THE REACTOR OPERATOR OF A PWR. THE COMPUTER PRINTED TABLES PLOT INITIAL AND FINAL REACTOR COOLANT SYSTEM BORON CONCENTRATION IN UNITS OF PPM BORON AGAINST THE GALLONS OF MAKEUP WATER AND BORIC ACID SOLUTION REQUIRED TO OBTAIN THE DESIRED PPM CHANGE. THESE TABLES REPLACE NOMOGRAPHS NORMALLY REQUIRED FOR BORATION AND DILUTION OPERATIONS.

4. METHOD OF SOLUTION - PWR-PPM UTILIZES THE EXPLICIT SOLUTION OF THE SINGLE SYSTEM DILUTION AND BORATION EQUATIONS AND LINEAR INTERPOLATION OF THE COMPRESSED LIQUID TABLES.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE TEMPERATURE BETWEEN AND INCLUDING 100 DEGREES F. TO 600 DEGREES F. AND THE PRESSURE BETWEEN AND INCLUDING 200 PSIG TO 6000 PSIG.

6. TYPICAL RUNNING TIME - RUNNING TIME USUALLY DOES NOT EXCEED 5 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM - ONLY FIVE INPUT PARAMETERS ARE REQUIRED -
   (1) WEIGHT PER CENT OF BORIC SOLUTION IN MAKE-UP STEAM,
   (2) VOLUME OF THE REACTOR COOLANT SYSTEM,
   (3) TEMPERATURE OF THE REACTOR COOLANT SYSTEM,
   (4) PRESSURE OF THE REACTOR COOLANT SYSTEM, AND
   (5) TITLE CARD.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   CDC6400 VERSION SUBMITTED JUNE 1972.

10. REFERENCE - J. H. KEENAN AND F. G. KEYES, THERMODYNAMIC PROPERTIES OF STEAM, WILEY AND SONS, INC., NEW YORK, 1967.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - KRONOS SCOPE 3.3.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM WILL COMPUTE A SET OF BORATION-DETECTION TABLES FOR EACH SET OF PRESSURE AND TEMPERATURE DATA INPUT.

15. NAME AND ESTABLISHMENT OF AUTHORS -

R. L. JAWORSKI AND V. I. SWISHER
FORT CALHOUN NUCLEAR STATION
OMAHA PUBLIC POWER DISTRICT
1623 HARNEY STREET
OMAHA, NEBRASKA 68102

16. MATERIAL AVAILABLE -
SOURCE DECK (250 CARDS)
SAMPLE PROBLEM (5 CARDS)
SAMPLE PROBLEM OUTPUT (2 SELECTED PAGES)

17. CATEGORY - H
KEYWORDS - OPERATION, PWR REACTORS, COOLANTS, BORON

ACC ABSTRACT 553 01/74

1. NAME OR DESIGNATION OF PROGRAM - U3R

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370

3. DESCRIPTION OF PROBLEM OR FUNCTION - U3R NUMERICALLY CONSTRUCTS A TABLE OF THE CUMULATIVE PROBABILITY DISTRIBUTION FUNCTIONS OF UNRESOLVED RESONANCE CROSS SECTIONS IN A NARROW ENERGY RANGE.

4. METHOD OF SOLUTION - THE PROCEDURE IS:
   A) TO GENERATE A LADDER OF RESOLVED RESONANCES OVER THE ENERGY RANGE USING PRESCRIBED AVERAGE VALUES AND DISTRIBUTION FUNCTIONS OF RESONANCE PARAMETERS;
   B) TO CALCULATE DOPPLER-BROADENED POINT CROSS SECTIONS FOR THE LADDER;
   C) TO DISTRIBUTE THE POINT CROSS SECTIONS WITH THEIR PROBABILITIES (FRACTIONAL ENERGY INCREMENTS) INTO A TABLE.

   ADDITIONAL LADDERS ARE ACCUMULATED INTO THE TABLE UNTIL THE DESIRED ACCURACY OF TABLE ENTRIES IS OBTAINED. THUS, POINTWISE CROSS SECTION DATA WHICH ARE PROPERTIES OF THE INDIVIDUAL ISOTOPES, RATHER THAN GROUP AVERAGE SETS ARE OBTAINED.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   20 UNRESOLVED RESONANCE (L,J) SERIES
   4 TEMPERATURES
   100 LADDERS
   UNLIMITED ENERGIES
   99 AS THE TABLE LENGTH

6. TYPICAL RUNNING TIME - 1 MINUTE PER ENERGY POINT IS REQUIRED FOR A NON-FISSILE PROBLEM AND 5 MINUTES PER ENERGY POINT FOR A FISSILE PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM - U3R PROVIDES POINTWISE UNRESOLVED RESONANCE CROSS SECTION DATA IN A HIGHLY COMPACT FORM.

8. RELATED AND AUXILIARY PROGRAMS - A SINGLE-PRECISION VERSION OF THE CODE WAS PRODUCED FOR THE CDC6600.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   IBM360 VERSION SUBMITTED JUNE 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - J. M. OTTER, R. C. LEWIS, AND L. B. LEVITT, U3R, A CODE TO CALCULATE UNRESOLVED RESONANCE CROSS SECTION PROBABILITY TABLES, AI-AEC-13024, JULY 31, 1972.
    INTERNAL SORT, NORTH AMERICAN ROCKWELL CORPORATION AEROSPACE AND SYSTEMS GROUP ENGINEER'S COMPUTING MANUAL EXCERPT, DECEMBER 8, 1969.

11. MACHINE REQUIREMENTS - 470K MEMORY (DOUBLE PRECISION)

12. PROGRAMMING LANGUAGES USED - FORTRAN IV, ASSEMBLY LANGUAGE RANDOM NUMBER GENERATOR

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

J. M. OTTER, R. C. LEWIS, AND L. B. LEVITT
APPLIED PHYSICS UNIT
NUCLEAR ENGINEERING REPORT UNIT
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECK (2148 CARDS)
    SAMPLE PROBLEM (12 CARDS)
    CONTROL INFORMATION (JCL 14 CARDS)
    REFERENCE REPORT AND MANUAL EXCERPT

17. CATEGORY - A
    KEYWORDS - PROBABILITY TABLES, UNRESOLVED RESONANCE CROSS SECTIONS, INPUT DATA, ENDF/B, U238, U235, PU239

ACC ABSTRACT 554 12/73

1. NAME OR DESIGNATION OF PROGRAM - DISPER

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC3600,3800

3. DESCRIPTION OF PROBLEM OR FUNCTION - DISPER DETERMINES THE AEROSOL PARTICLE SOURCE STRENGTH OUTSIDE AN ENCLOSURE DUE TO A RELEASE OF AEROSOL PARTICLES WITHIN THE ENCLOSURE. THE RELEASE IS ASSUMED TO PRESSURIZE THE ENCLOSURE AND THE AIRBORNE PARTICLES ARE CARRIED BY THE ESCAPING GAS INTO LEAK PATHS IN THE ENCLOSURE WALLS. HERE, THEY MAY BE DEPOSITED ON THE LEAK PATH WALLS OR REMAIN ENTRAINED AND ESCAPE FROM THE ENCLOSURE.

4. METHOD OF SOLUTION - THE CODE OPERATES IN TWO MODES - (1) PRESSURE DEPENDENT, AND (2) PRESSURE INDEPENDENT. IN THE PRESSURE DEPENDENT MODE, THE NUMBER AND RADIUS OF THE LEAK PATHS ARE COMPUTED BY THE CODE BASED ON AN ENCLOSURE LEAKAGE RATE AT A GIVEN OVERPRESSURE AND A PAIR OF PRESSURE RESPONSE PARAMETERS. IN THE PRESSURE INDEPENDENT MODE, THE COMPLETE DESCRIPTION OF THE LEAK PATHS IS CODE INPUT. IN BOTH MODES, THE AEROSOL PARTICLE SOURCE STRENGTH AND SIZE DISTRIBUTION IS INPUT ALONG WITH PARAMETERS WHICH DETERMINE THE PROBABILITY OF PARTICLES (1) ENTERING LEAK PATHS, AND (2) BEING DEPOSITED IN THE LEAK PATHS. THE PARTICLE SOURCE STRENGTH, ALONG WITH THERMAL INPUT CONSTANTS SPECIFYING THE THERMAL EQUILIBRIUM IN THE ENCLOSURE, DETERMINE THE ENCLOSURE OVERPRESSURE AND RESULTANT LEAKAGE PATH GAS FLOW VELOCITY.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMUM OF - 20 LEAKAGE PATH SETS

6. TYPICAL RUNNING TIME - 8 SECONDS ARE REQUIRED FOR EACH SOURCE STRENGTH VALUE COMPUTED IN THE PRESSURE DEPENDENT MODE AND 5 SECONDS IN THE PRESSURE INDEPENDENT MODE.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC3600 VERSION SUBMITTED JULY 1972.

10. REFERENCES - D. C. HUNT, DISPER - AN AEROSOL PARTICLE TRANSPORT CODE, RFP-1855, SEPTEMBER 1972.
D. C. HUNT, THE PROBABILITY OF HAZARDOUS ENVIRONMENTAL PLUTONIUM RELEASES, RFP-1543, APRIL 14, 1971.

11. MACHINE REQUIREMENTS - 13,000 48-BIT WORDS, NO TAPES, ALL CARD INPUT

12. PROGRAMMING LANGUAGE USED - 3600 FORTRAN

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - DRUMSCOPE.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

D. C. HUNT
DOW CHEMICAL COMPANY
ROCKY FLATS DIVISION
P. O. BOX 888
GOLDEN, COLORADO 80401

16. MATERIAL AVAILABLE -
SOURCE DECK (347 CARDS)
SAMPLE PROBLEM (50 CARDS)
SAMPLE PROBLEM OUTPUT (18 SELECTED PAGES)
REFERENCE REPORTS

17. CATEGORY - G
KEYWORDS - PARTICLES, AEROSOLS, LEAKAGE

ACC ABSTRACT 555 02/74

1. NAME OR DESIGNATION OF PROGRAM - PARET

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PROGRAM IS DESIGNED FOR USE IN PREDICTING THE COURSE AND CONSEQUENCES OF NONDESTRUCTIVE REACTIVITY ACCIDENTS IN SMALL REACTOR CORES.

4. METHOD OF SOLUTION - THE ANALYSIS IS BASED ON COUPLED THERMAL, HYDRODYNAMIC, AND NUCLEAR EFFECTS IN THE CORE. THE MODEL CONSISTS OF A WATER-COOLED CORE WITH A MAXIMUM OF FOUR FUEL ELEMENTS. THUS THE CORE CAN BE DIVIDED INTO FOUR OR FEWER REGIONS, EACH HAVING DIFFERENT POWER GENERATION, COOLANT MASS FLOW RATE, HYDRAULIC PARAMETERS, AND OTHER ASSOCIATED CONDITIONS, WITH EACH REGION REPRESENTED BY A SINGLE FUEL PIN OR PLATE PLUS ITS ASSOCIATED COOLANT CHANNEL. A TRANSIENT PROBLEM IS FORCED THROUGH SPECIFICATION OF EXTERNALLY INSERTED REACTIVITY VERSUS TIME, OR AVERAGE CORE POWER VERSUS TIME. THE PROGRAM EMBODIES HEAT TRANSFER CALCULATIONS, CONTINUOUS REACTIVITY FEEDBACK, AND HYDRODYNAMIC CALCULATIONS ALLOWING FOR COOLANT FLOW REVERSAL.

HEAT TRANSFER IN EACH FUEL ELEMENT IS COMPUTED ON THE BASIS OF A ONE-DIMENSIONAL CONDUCTION SOLUTION IN EACH OF UP TO A MAXIMUM OF 20 AXIAL SECTIONS. LOCAL HEAT GENERATION IS DETERMINED FROM THE CALCULATED OR SPECIFIED CORE AVERAGE POWER LEVEL AND SPATIAL WEIGHTING FACTORS. PARET EMPLOYS EMPIRICAL CONVECTIVE HEAT TRANSFER CORRELATIONS IN ESTIMATING THE RATE OF HEAT TRANSFER AT THE CLAD-COOLANT INTERFACE.

THE HYDRODYNAMICS CALCULATIONS ARE BASED ON A ONE-DIMENSIONAL MODIFIED MOMENTUM INTEGRAL MODEL IN WHICH EQUATIONS REPRESENTING CONSERVATION LAWS ARE SOLVED IN EACH COOLANT CHANNEL AT EACH TIME NODE. THE SOLUTIONS TO THESE EQUATIONS YIELD THE PRESSURE DROP ACROSS THE CORE, AND THE POINT-WISE FLUID ENTHALPIES, PRESSURES, AND MASS FLOW RATES ALONG EACH CHANNEL. THE COOLANT IS ALLOWED TO RANGE FROM SUBCOOLED LIQUID, THROUGH THE TWO-PHASE REGION, UP TO AND INCLUDING SUPERHEATED STEAM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PARET MODEL IS SUBJECT TO SEVERAL RECOGNIZED LIMITATIONS WHICH MAY LIMIT THE APPLICABILITY IN ANY SPECIFIC SITUATION, DEPENDING ON THE NATURE OF THE TRANSIENT UNDER CONSIDERATION. THE CODE EMPLOYS STEADY-STATE HEAT TRANSFER CORRELATIONS THROUGHOUT, POSSIBLY BEING UNREALISTIC IN CERTAIN TRANSIENT SITUATIONS. ANY COMPLETE DESCRIPTION OF A SEVERE TRANSIENT MUST INCLUDE PROVISION FOR SOME SORT OF THERMAL OR HYDRAULIC CRISIS. PARET IS LIMITED IN PREDICTING A THERMAL CRISIS BY THE FACT THAT IT EMPLOYS A STEADY-STATE CNB CORRELATION, SINCE NO TRANSIENT CORRELATION WITH DEMONSTRATED RELIABILITY WAS DEVELOPED. ACCURATE DESCRIPTION OF HYDRAULIC INSTABILITY DEPENDS UPON ACCURATE CALCULATION OF TRANSIENT PRESSURE AND FLOW FLUCTUATIONS. PARET IS LIMITED IN THIS RESPECT BECAUSE IT EMPLOYS AN INCOMPRESSIBLE MODEL AND A SIMPLIFIED VOID VOLUME GENERATION EQUATION. ALSO, THE MAGNITUDE OF

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)
LOCAL PRESSURES PREDICTED TO ACCOMPANY COOLANT EXPULSION IS STRONGLY AFFECTED BY THE NUMBER OF AXIAL SECTIONS CHOSEN IN THE COMPUTATIONS. AS A RESULT, THE HYDRODYNAMIC OUTPUT SHOULD BE INTERPRETED AS A QUALITATIVE INDICATION OF A POSSIBLE CRISIS RATHER THAN A RELIABLE QUANTITATIVE PREDICTION.
THE PRINCIPAL UNCERTAINTIES IN THE CODE LIE IN THE REALM OF BOILING. THESE UNCERTAINTIES, COUPLED WITH THE FACT THAT APPLICATION OF THE CODE TO BOILING SITUATIONS HAS NOT BEEN FULLY VERIFIED, MAKE IT IMPERATIVE TO CONSIDER THE BOILING MODEL TO BE IN THE DEVELOPMENT STAGE.
PARET IS NOT APPLICABLE TO EITHER DESTRUCTIVE EXCURSIONS OR SITUATIONS IN WHICH THERE IS A SPACE-TIME EFFECT IN NEUTRON FLUX.

6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES LESS THAN 22 SECONDS OF CPU TIME TO PROCESS 65 TIME-STEPS ON 4 CHANNELS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - THIS CODE IS AN EXTENSION OF THE CHIC-KIN CODE (ACC ABSTRACT R473).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED AUGUST 1972, REPLACED BY REVISED VERSION MAY 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - C. F. OBENCHAIN, PARET, A PROGRAM FOR THE ANALYSIS OF REACTOR TRANSIENTS, IDO-17282, JANUARY 1969.
J. A. REDFIELD, CHIC-KIN, A FORTRAN PROGRAM FOR INTERMEDIATE AND FAST TRANSIENTS IN A WATER-MODERATED REACTOR, WAPD-TM-479, JANUARY 1965.
CHANGE TO PARET PROGRAM, AEROJET NOTE, 1972.
EXCERPTS FROM NRTS ENVIRONMENTAL SUBROUTINE MANUAL, DECEMBER 1972.
C. J. SMITH AND W. A. CODY, ANL DATE ROUTINE, ANL SUBROUTINE DESCRIPTION Q054S, FEBRUARY 1968.

11. MACHINE REQUIREMENTS - 240K BYTES PLUS ONE MAGNETIC TAPE

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND BAL

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SUBROUTINE INLK WAS COMPILED WITH THE FORTH450 COMPILER WITH 640K. THE NORMAL COMPILER COULD NOT PROCESS OPT=2 BECAUSE THIS ROUTINE IS TOO LONG.

15. NAME AND ESTABLISHMENT OF AUTHOR -
P. D. ADOLF
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECK (6771 CARDS)
    OBJECT DECKS (2692 CARDS)
    SAMPLE PROBLEM (103 CARDS)
    CONTROL INFORMATION (JCL 20 CARDS)
    LIBRARY (62 BLOCKS OF VARIABLE-SIZED BINARY RECORDS)
    SAMPLE PROBLEM OUTPUT (38 SELECTED PAGES)
    REFERENCE REPORT, IDO-17282, AND NOTES

17. CATEGORY - G
    KEYWORDS - REACTIVITY ACCIDENTS, HEAT TRANSFER, HYDRODYNAMICS, FEEDBACK, CHIC-KIN CODES

ACC ABSTRACT 556 12/73

1. NAME OR DESIGNATION OF PROGRAM - KEELE

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - KEELE IS A LINEARLY CONSTRAINED NONLINEAR PROGRAMMING ALGORITHM FOR LOCATING A LOCAL MINIMUM OF A FUNCTION OF N VARIABLES WITH THE VARIABLES SUBJECT TO LINEAR EQUALITY AND/OR INEQUALITY CONSTRAINTS.

4. METHOD OF SOLUTION - A VARIABLE METRIC PROCEDURE IS USED WHERE THE DIRECTION OF SEARCH AT EACH ITERATION IS OBTAINED BY MULTIPLYING THE NEGATIVE OF THE GRADIENT VECTOR BY A POSITIVE DEFINITE MATRIX WHICH APPROXIMATES THE INVERSE OF THE MATRIX OF SECOND PARTIAL DERIVATIVES ASSOCIATED WITH THE FUNCTION.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - ARRAY DIMENSIONS LIMIT THE NUMBER OF VARIABLES TO 20 AND THE NUMBER OF CONSTRAINTS TO 50. THESE CAN BE CHANGED BY THE USER.

6. TYPICAL RUNNING TIME - TOTAL EXECUTION TIME FOR THE FOUR EXAMPLES IN THE REPORT IS APPROXIMATELY 10 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM - ALL INPUT IS THROUGH THE ARGUMENT LIST AND/OR THE COMMON BLOCK /BAMRWF/.

8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS A MODIFICATION OF THE CORRESPONDING PROGRAM DESCRIBED IN REFERENCE 2.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED AUGUST 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - G. W. WESTLEY, A LINEARLY CONSTRAINED NONLINEAR PROGRAMMING ALGORITHM, ORNL-4644, JANUARY 1971.
G. W. WESTLEY AND J. A. WATTS, THE COMPUTING TECHNOLOGY CENTER NUMERICAL ANALYSIS LIBRARY, CTC-39, 1970.

11. MACHINE REQUIREMENTS - 31K BYTES

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THREE SUBROUTINES MUST BE USER-SUPPLIED. GRADNT DEFINES THE GRADIENT OF THE RESPONSE SURFACE, CONSTR DEFINES THE CONSTRAINTS ON THE VARIABLES, AND FVAL DEFINES THE RESPONSE SURFACE.

15. NAME AND ESTABLISHMENT OF AUTHOR -
G. W. WESTLEY

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

MATHEMATICS DIVISION
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE -
SOURCE DECK (1019 CARDS)
SAMPLE PROBLEMS (117 CARDS)
SAMPLE PROBLEM OUTPUT (9 PAGES)
REFERENCE REPORT, ORNL-4644

17. CATEGORY - P
KEYWORDS - MINIMIZATION ALGORITHM, NONLINEAR

ACC ABSTRACT 557 02/74

1. NAME OR DESIGNATION OF PROGRAM - SHLOG

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - SHLOG PROVIDES GENERAL-PURPOSE DATA MANIPULATION FUNCTIONS FOR DATA ANALYSIS. THESE FUNCTIONS INCLUDE CREATING, MAINTAINING, AND STORING FILES, DISPLAYING THE CONTENTS OF A FILE VIA EITHER THE LINE PRINTER OR AN ON-LINE PLOTTER, SEARCHING FOR DATA POINTS BY COMPARING VALUES WITH SPECIFIED CRITERIA, AND PERFORMING CERTAIN STATISTICAL OPERATIONS ON THE DATA POINTS.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - SHLOG USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED AUGUST 1972.

10. REFERENCES - H. BOHL, JR., SHLOG, A FORTRAN PROGRAM TO PROVIDE GENERAL TECHNICAL DATA FUNCTIONS, WAPD-TM-963, JANUARY 1972.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
H. BOHL, JR. AND O. J. MARLOWE, THE FINK/PANTRY STORAGE AND RETRIEVAL SYSTEM FOR A COMPUTER, WAPD-TM-710, REV., JULY 1969.

11. MACHINE REQUIREMENTS - 100,000 (OCTAL) CENTRAL MEMORY, INPUT/OUTPUT VIA MAGNETIC TAPE OR DISK, MAP OUTPUT ON LINE PRINTER OR MICROFILM DEVICE, GRAPHS ON MICROFILM DEVICE

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

H. BOHL, JR.
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (10,686 CARDS)
SAMPLE PROBLEM (302 CARDS)
REFERENCE REPORT, WAPD-TM-963

17. CATEGORY - M
KEYWORDS - DATA PROCESSING, LIBRARIES, MAINTENANCE, STATISTICS, GRAPHS, OUTPUT DATA, UTILITY ROUTINES

1. NAME OR DESIGNATION OF PROGRAM - TASK

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - TASK SOLVES THE ONE-DIMENSIONAL MULTIGROUP FORM OF THE REACTOR KINETICS EQUATIONS, USING EITHER TRANSPORT OR DIFFUSION THEORY AND ALLOWING AN ARBITRARY NUMBER OF DELAYED NEUTRON GROUPS. THE PROGRAM CAN ALSO BE USED TO SOLVE STANDARD STATIC PROBLEMS EFFICIENTLY SUCH AS EIGENVALUE PROBLEMS, DISTRIBUTED SOURCE PROBLEMS, AND BOUNDARY SOURCE PROBLEMS. CONVERGENCE PROBLEMS ASSOCIATED WITH SOURCES IN HIGHLY MULTIPLICATIVE MEDIA ARE CIRCUMVENTED, AND SUCH PROBLEMS ARE READILY CALCULABLE.

4. METHOD OF SOLUTION - TASK EMPLOYS A COMBINATION SCATTERING AND TRANSFER MATRIX METHOD TO ELIMINATE CERTAIN DIFFICULTIES THAT ARISE IN CLASSICAL FINITE DIFFERENCE APPROXIMATIONS. AS SUCH, WITHIN-GROUP (INNER) ITERATIONS ARE ELIMINATED AND SOLUTION CONVERGENCE IS INDEPENDENT OF SPATIAL MESH SIZE. THE TIME VARIABLE IS REMOVED BY LAPLACE TRANSFORMATION. (A LATER VERSION WILL PERMIT DIRECT TIME SOLUTIONS.) THE CODE CAN BE RUN EITHER IN AN OUTER ITERATION MODE OR IN CLOSED (NONITERATIVE) FORM. THE RUNNING MODE IS DICTATED BY THE NUMBER OF GROUPS TIMES THE NUMBER OF ANGLES, CONSISTENT WITH AVAILABLE STORAGE.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PRINCIPAL RESTRICTIONS ARE AVAILABLE STORAGE AND COMPUTATION TIME. SINCE THE CODE IS FLEXIBLY DIMENSIONED AND HAS AN OUTER ITERATION OPTION THERE ARE NO INTERNAL RESTRICTIONS ON GROUP STRUCTURE, QUADRATURE, AND NUMBER OF ORDINATES. THE FLEXIBLE-DIMENSIONING SCHEME ALLOWS OPTIONAL USE OF CORE STORAGE. THE GENERALIZED CYLINDRICAL GEOMETRY OPTION IS NOT COMPLETE IN VERSION I OF THE CODE. THE FEEDBACK OPTIONS AND OMEGA-MODE SEARCH OPTIONS ARE NOT INCLUDED IN VERSION I.

6. TYPICAL RUNNING TIME - A TYPICAL 13-REGION, 5-GROUP, S4, FAST REACTOR STATIC PROBLEM REQUIRES ABOUT 0.5 MINUTES ON THE IBM360/91, WHEREAS THE ENTIRE KINETIC RESPONSE CAN BE COMPUTED IN 8 TO 10 MINUTES. A 16-GROUP, S16, STATIC, 125-CM FE SLAB SHIELDING PROBLEM REQUIRES ABOUT 4 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - TWO AUXILIARY PROGRAMS ARE INCLUDED WITH TASK. PROGRAM ACPSD READS THE FLUX TAPE(S) WRITTEN (OPTIONALLY) BY TASK AND COMPUTES AN ARBITRARY NUMBER OF DETECTOR RESPONSES, USING DETECTOR ENERGY RESPONSES AS PROVIDED BY THE USER AND THE GROUP FLUXES AT SPACE POINTS SELECTED BY THE USER. THE PROGRAM ALSO CALCULATES THE CROSS-POWER SPECTRAL DENSITY (CPSD) AND AUTO-POWER SPECTRAL DENSITY (APSD) FOR SELECTED PAIRS OF DETECTORS. PROGRAM FITSPEC FITS THE POINT REACTOR MODEL TO THE

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
REAL PART OF THE CROSS-POWER SPECTRAL DENSITIES AND TO THE AUTO-POWER SPECTRAL DENSITIES GENERATED BY PROGRAM ACPSD.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED AUGUST 1972, REPLACED BY REVISED VERSION I JANUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCE - A. R. BUHL, R. A. LILLIE, F. L. DODDS, JR., O. W. HERMANN, J. C. ROBINSON, AND R. J. HINTON, A USERS MANUAL FOR TASK, A GENERALIZED ONE-DIMENSIONAL TRANSPORT AND DIFFUSION KINETICS CODE, ORNL-TM-3811, DECEMBER 1972.

11. MACHINE REQUIREMENTS - TASK REQUIRES 154K BYTES OF STORAGE PLUS DATA BLOCK STORAGE AND 1 TAPE IF USING THE FLUX TAPE OPTION.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

A. R. BUHL
NEUTRON PHYSICS DIVISION
C. W. HERMANN AND R. J. HINTON
MATHEMATICS DIVISION
OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE 37830
F. L. DODDS, JR.
SAVANNAH RIVER LABORATORY
E. I. DUPONT DE NEMOURS AND COMPANY, INC.
AIKEN, SOUTH CAROLINA 29801
J. C. ROBINSON AND R. A. LILLIE
THE UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE 37901

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (TASK 3617 CARDS, ACPSD 362 CARDS, FITSPEC 270 CARDS)
SAMPLE PROBLEMS (TASK 984 CARDS, ACPSD 6 CARDS, FITSPEC 261 CARDS)
CONTROL INFORMATION (JCL TASK 13 CARDS, ACPSD 12 CARDS, FITSPEC 9 CARDS)
PUNCHED OUTPUT (ACPSD 30 CARDS)
SAMPLE PROBLEM PRINTED OUTPUT, AVAILABLE UPON REQUEST (TASK 391 BLOCKS, ACPSD 16 BLOCKS, FITSPEC 36 BLOCKS)
REFERENCE REPORT

17. CATEGORY - E
KEYWORDS - 1-DIMENSIONAL, MULTIGROUP, REACTOR KINETICS, ACPSD CODES, FITSPEC CODES

1. NAME OR DESIGNATION OF PROGRAM - SOFIRE2 1- AND 2-CELL

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - SOFIRE2 ONE CELL, CALCULATES THE CONSEQUENCES OF A SODIUM POOL FIRE IN A CLOSED VAULT. GAS PRESSURE IN THE VAULT IS CALCULATED FROM THE GAS DENSITY AND TEMPERATURE. SOFIRE2 TWO CELL, CALCULATES THE CONSEQUENCES OF A SODIUM POOL FIRE IN A VAULT CONNECTED TO A CONTAINMENT STRUCTURE THROUGH A RESTRICTED OPENING. COLD GAS FLOWS FROM THE CONTAINMENT TO THE VAULT DUE TO MASS DIFFERENCES WHILE HOT GAS FLOWS FROM THE VAULT TO THE CONTAINMENT TO EQUILIBRATE PRESSURES. PRESSURE IN THE CONTAINMENT IS CALCULATED FROM THE GAS DENSITY AND TEMPERATURE. IN BOTH PROGRAMS THE SODIUM BURNING RATE IS GOVERNED BY THE RATE OF OXYGEN DIFFUSION TO THE SODIUM SURFACE.

4. METHOD OF SOLUTION - BOTH PROGRAMS USE THE FINITE DIFFERENCE METHOD TO CALCULATE TRANSIENT TEMPERATURES IN A NODAL NETWORK DESIGNED TO SIMULATE A PHYSICAL SYSTEM (ONE CELL PROGRAM) OR THE TWO CELL GEOMETRY (TWO CELL PROGRAM).

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE ONE CELL PROGRAM HAS A TOTAL OF 12 NODES AVAILABLE FOR SYSTEM COMPONENTS, WHILE THE TWO CELL PROGRAM HAS A TOTAL OF 16 NODES.

6. TYPICAL RUNNING TIME - THE ONE CELL PROGRAM REQUIRES 1 MINUTE FOR A 12 HOUR REAL TIME PROBLEM, WHILE THE TWO CELL PROGRAM REQUIRES 12 SECONDS FOR A 24 HOUR REAL TIME PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION OF BOTH PROGRAMS SUBMITTED AUGUST 1972, SAMPLE PROBLEMS EXECUTED BY ACC.

10. REFERENCE - P. BEIRIGER, J. HOPENFELD, M. SILBERBERG, R. P. JOHNSON, L. BAURMASH, AND R. L. KOONTZ, SOFIRE II USER REPORT, AI-AEC-13055, MARCH 30, 1973.

11. MACHINE REQUIREMENTS - 134K BYTES (ONE CELL PROGRAM), 148K BYTES (TWO CELL PROGRAM)

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - IF AN SC-4020 GRAPHICAL DISPLAY DEVICE IS NOT AVAILABLE, A DUMMY ROUTINE CAN BE USED FOR SUBROUTINE AICRT3, OR THE ROUTINE MAY BE REWRITTEN. THE NAA SC-4020 SUBROUTINE PACKAGE IS AVAILABLE THROUGH -

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
LAIDE LIBRARIAN
C/O STROMBERG-CARLSON
P. O. BOX 2449
SAN DIEGO, CALIFORNIA

15. NAME AND ESTABLISHMENT OF AUTHOR -
MELVIN SILBERBERG
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

16. MATERIAL AVAILABLE -
SOURCE DECKS (1-CELL 489 CARDS, 2-CELL 570 CARDS)
SAMPLE PROBLEMS (1-CELL 37 CARDS, 2-CELL 49 CARDS)
REFERENCE REPORT

17. CATEGORY - G
KEYWORDS - CONTAINMENT, SODIUM, FIRE, LEAKAGE, REACTOR SAFETY, ACCIDENTS

1. NAME OR DESIGNATION OF PROGRAM - HYMAS

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - HYMAS GENERATES THE HYDRODYNAMIC MASS MATRIX PER UNIT DEPTH ASSOCIATED WITH A MULTI-MASS SYSTEM IMMERSED IN A LIQUID ENVIRONMENT. IT IS ASSUMED THAT THE LIQUID ENVIRONMENT MAY BE REPRESENTED BY A SERIES OF FLOW-CHANNELS AND NODES. FLOW-CHANNELS ARE INTRODUCED IN THE REGION BETWEEN SURFACES OF NEIGHBORING SOLIDS, AND NODES ARE USED TO CONNECT TWO OR MORE FLOW-CHANNELS. ALSO, IT IS ASSUMED THAT THE SOLID BODIES UNDERGO UNIDIRECTIONAL MOTION, THAT POTENTIAL FLOW THEORY IS APPLICABLE, THAT THE WIDTH OF A FLOW-CHANNEL IS SMALL COMPARED WITH THE LENGTH SO THERE IS NO PRESSURE DROP ACROSS THE FLOW-CHANNEL, AND THAT NODAL VOLUME IS SMALL COMPARED WITH FLOW-CHANNEL VOLUME.

4. METHOD OF SOLUTION - FORMULATION OF THE GENERAL MATRIX EQUATION FOR HYDRODYNAMIC MASS WAS ACCOMPLISHED BY FIRST DEVELOPING THE GOVERNING EQUATION FOR FLUID FLOW IN A CHANNEL OF UNIT DEPTH BOUNDED BY TWO PARALLEL SURFACES WHICH MAY MOVE IN TRANSLATION BOTH PERPENDICULAR AND PARALLEL TO THE DIRECTION OF FLOW. THIS RESULT WAS THEN UTILIZED TO OBTAIN THE EQUATION FOR A VARIABLE AREA FLOW-CHANNEL. NEXT, THE CONTINUITY EQUATION FOR AN ARBITRARY NODE WAS WRITTEN. THE GENERAL MATRIX EQUATION FOR COMPUTING HYDRODYNAMIC MASS WAS THEN OBTAINED BY APPLYING THE DEVELOPED EQUATIONS TO A PARTICULAR PROBLEM. THE PROGRAM HYMAS IS IN ESSENCE THIS GENERAL MATRIX EQUATION.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE NUMBER OF SUBDIVISIONS IN A FLOW-CHANNEL IS LIMITED TO 50.

6. TYPICAL RUNNING TIME - LESS THAN 30 SECONDS ARE REQUIRED FOR A TYPICAL PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM - HYMAS COMPUTES THE HYDRODYNAMIC MASS MATRIX FOR A LUMPED-PARAMETER SYSTEM.

8. RELATED AND AUXILIARY PROGRAMS - THE OUTPUT OF HYMAS MAY BECOME PART OF THE MASS MATRIX INPUT TO ANY LUMPED-PARAMETER DYNAMIC ANALYSIS PROGRAM. HYMAS USES SUBROUTINES INTTAP, OUTTAP, FINISH, SUBERR, AND JOBCRD FROM THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
CDC6600 VERSION SUBMITTED DECEMBER 1973.

10. REFERENCES - G. R. SHARP AND W. A. WENZEL, HYDRODYNAMIC MASS MATRIX FOR A MULTIBODIED SYSTEM, WAPD-TM-1087, SEPTEMBER 1973.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.

11. MACHINE REQUIREMENTS - 30000 (OCTAL) OF FAST MEMORY, PLUS EXTENDED CORE STORAGE

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.5.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

G. R. SHARP AND W. A. WENZEL
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
    SOURCE DECK (806 CARDS)
    SAMPLE PROBLEM (14 CARDS)
    REFERENCE REPORT, WAPD-TM-1087

17. CATEGORY - H
    KEYWORDS - FLUID FLOW, HYDRODYNAMICS, MASS MATRICES, LUMPED-PARAMETER SYSTEMS

ACC ABSTRACT 561 02/74

1. NAME OR DESIGNATION OF PROGRAM - TOKMINA/TOKMINA2

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - TOKMINA FINDS THE MINIMUM MAGNETIC FIELD, BM, REQUIRED AT THE TOROIDAL COIL OF A TOKAMAK TYPE FUSION REACTOR WHEN THE INPUT IS BETA(RATIO OF PLASMA PRESSURE TO MAGNETIC PRESSURE), Q(KRUSKAL-SHAFRANOV PLASMA STABILITY FACTOR), AND Y(RATIO OF PLASMA RADIUS TO VACUUM WALL RADIUS: RP/RW) AND ARRAYS OF PT(TOTAL THERMAL POWER FROM BOTH D-T AND TRITIUM BREEDING REACTIONS), PW(WALL LOADING OR POWER FLUX) AND TB(THICKNESS OF BLANKET), FOLLOWING THE METHOD OF GOLOVIN, ET AL. TOKMINA2 FINDS THE TOTAL POWER, PT, OF SUCH A FUSION REACTOR, GIVEN A SPECIFIED MAGNETIC FIELD, BM, AT THE TOROIDAL COIL.

4. METHOD OF SOLUTION - TOKMINA: THE ASPECT RATIO(A) IS MINIMIZED, GIVING A MINIMUM VALUE FOR BM.
TOKMINA2: A SEARCH IS MADE FOR PT; THE VALUE OF PT WHICH MINIMIZES BM TO THE REQUIRED VALUE WITHIN 50 GAUSS IS CHOSEN.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - INPUT ARRAYS PRESENTLY ARE DIMENSIONED AT 20. THIS RESTRICTION CAN BE OVERCOME BY CHANGING A DIMENSION CARD.

6. TYPICAL RUNNING TIME - TOKMINA: APPROXIMATELY 30 SECONDS FOR 100 SETS OF INPUT VALUES.
TOKMINA2: APPROXIMATELY 1 MINUTE FOR 700 SETS OF INPUT VALUES.

7. UNUSUAL FEATURES OF THE PROGRAM - OUTPUT FOR EACH SET OF INPUT VALUES ARE TB, BT(TOROIDAL MAGNETIC FIELD ON THE MINOR AXIS), R(MAJOR RADIUS OF THE TOROID), RP, RM(DISTANCE BETWEEN THE MAJOR AXIS AND THE BLANKET IN THE MIDPLANE), N(DENSITY OF THE PLASMA) AND I(PLASMA CURRENT). THESE VALUES, AS WELL AS BM AND PT MAY BE STUDIED AS A FUNCTION OF BLANKET THICKNESS.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED AUGUST 1972, SAMPLE PROBLEMS EXECUTED BY ACC.

10. REFERENCES - I. N. GOLOVIN, YU. N. DNEVSTROVSKY AND D. P. KOSTOMAROV, TOKAMAK AS A POSSIBLE FUSION REACTOR - COMPARISON WITH OTHER C. T. R. DEVICES, BNES NUCLEAR FUSION REACTOR CONFERENCE AT CULHAM LABORATORY, SEPTEMBER 1969.
A. J. HATCH AND J. ETZWEILER, A SIMPLIFIED PARAMETRIC STUDY OF TOKAMAK FUSION REACTORS, PROCEEDINGS OF THE TEXAS SYMPOSIUM ON FUSION REACTORS, NOVEMBER 22-23, 1972, CONF-721111.

11. MACHINE REQUIREMENTS - 160K BYTES OF CORE

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

A. J. HATCH
PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE -
SOURCE DECKS (TOKMINA-153 CARDS, TOKMINA2-198 CARDS)
SAMPLE PROBLEMS (TOKMINA-4 CARDS, TOKMINA2-5 CARDS)
SAMPLE PROBLEM OUTPUT (TOKMINA-2 PAGES, TOKMINA2-28 PAGES)
REFERENCE REPRINT, CONF-721111

17. CATEGORY - X
KEYWORDS - FUSION REACTORS, TOKAMAK, MAGNETOHYDRODYNAMICS

1. NAME OR DESIGNATION OF PROGRAM - AMDLIBAE

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75

3. DESCRIPTION OF PROBLEM OR FUNCTION - AMDLIBAE IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE NATIONAL LABORATORY. THIS SUBSET INCLUDES LIBRARY CATEGORIES A-E:

IDENTIFICATION			DESCRIPTION
A152S	A	MPA	MULT. PREC. FLOATING POINT ARITH. PACKAGE
B156S	A	ARSIN	ARCSINE, ARCCOSINE
B157S	A	SIN/COS	SINE, COSINE
B158S	A	DSIN/DCOS	DP SINE, COSINE
B159S	A	DTAN/DCOT	DP TANGENT, COTANGENT
B252S	A	SINH/COSH	HYPERBOLIC SINE, COSINE
B353S	A	ALOG	SP LOGARITHM
B354S	A	DEXP	DP EXPONENTIAL
B355S	A	DLOG	DP LOGARITHM
B456S	A	DCUBRT	DP CUBE ROOT
B457S	A	ARGPOWER	X**Y
B458S	A	ARGFDXPD	DP X**Y
C150S	F	DQD	Q. D. ALGORITHM APPLIED TO A POWER SERIES
C151S	F	DCONF1	EVAL. CONT. FRACT. Q. D. OF POWER SERIES
C250S	F	CUBIC	ROOTS OF CUBIC POLYNOMIAL EQUATION
C251S	F	QUARTIC	ROOTS OF QUARTIC POLYNOMIAL EQUATION
C252S	F	RSSR	ALL ROOTS OF POLY EQS. WITH REAL COEF.
C253S	F	POLDRV	DRIVER FOR C254S
C254S	F	CPOLY	ROOTS ARB. POLY. JENKINS-TRAUB ALGORITHM
C353S	F1		ANG. MOM. COEF.- CLEBSCH, RACAH, WIGNER
C354S	A	ELLIPK	SP COMPLETE ELLIPTIC INTEGRAL K
C355S	A	ELLIPE	SP COMPLETE ELLIPTIC INTEGRAL E
C365S	A	ALGAMA	LOGARITHM OF THE GAMMA FUNCTION
C366S	A	DGAMMA/DLGAMA	DP GAMMA AND LOG(GAMMA) FUNCTIONS
C367S	A	GAMMA/ALGAMA	GAMMA AND LOG(GAMMA) FUNCTIONS
C368S	F	EONE	EXPONENTIAL INTEGRAL E1
C369S	F	DEONE	DP EXPONENTIAL INTEGRAL E1
C370S	F	BESJY	BESSEL FUNCTIONS J AND Y
C371S	F	BESIK	BESSEL FUNCTIONS I AND K
C372S	F	CHIPRB	CHI-SQUARE INTEGRAL
C373S	A	DELIPK	DP COMPLETE ELLIPTIC INTEGRAL K
C374S	A	DELIPE	DP COMPLETE ELLIPTIC INTEGRAL E
C375S	F1	DEI	EXPONENTIAL INTEGRALS IN LONG PRECISION
C377S	F1	DDAW	DAWSON'S INTEGRAL IN DOUBLE PRECISION
C380S	F	DRZETA	LONG PRECISION ZETA, ZETA-1 FUNCTIONS
C382S	F	DCGAM	LONG PRECISION COMPLEX GAMMA
C383S	A	DERF/DERFC	DP ERROR FUNCTION
C384S	F	BFJ1	BESSEL FUNCTION J1
C385S	F	COULMB	REGULAR COULOMB WAVE FUNCTIONS
C386S	F1	DSGMAL	COULOMB PHASE SHIFT
C387S	F	BFJYR	BESSEL FUNCTIONS J0,J1,Y0,Y1
C388S	F	IRCOUL	LF IRREGULAR COULOMB WAVE FUNCTIONS

3. DESCRIPTION OF PROBLEM OR FUNCTION (CONTINUED)

C389S	F	GAMIN	INCOMPLETE GAMMA FUNCTION
C390S	F	LC	ASSOC. LEGENDRE FUNCTIONS OF 2ND. KIND
C393S	F	CDEONE	MODIFIED COMPLEX EXPONENTIAL INTEGRAL
D150S	F	HAVIE	QUADRATURE BY HAVIE'S ALGORITHM
D150S	P	HAVIEP	QUADRATURE BY HAVIE'S ALGORITHM
D151S	F	ROMBRG	ROMBERG QUADRATURE
D151S	P	ROMBRG	ROMBERG QUADRATURE
D152S	F1	CHEB	CLENSHAW-CURTIS QUADRATURE
D153S	F	DROMB	TWO-DIMENSIONAL ROMBERG QUADRATURE
D153S	P	DROMBP	TWO-DIMENSIONAL ROMBERG QUADRATURE
D154S	F	CMQUAD	MODIFIED CLENSHAW-CURTIS QUADRATURE
D155S	F	SIMP	ADAPTIVE SIMPSON QUADRATURE
D157S	F	ASIMP	IMPROVED ADAPTIVE SIMPSON QUADRATURE
D157S	P	ASIMPP	IMPROVED ADAPTIVE SIMPSON QUADRATURE
D158S	F	ANC4	ADAP. QUAD. USING 4-TH ORDER NEWTON-COTES
D158S	P	ANC4P	ADAP. QUAD. USING 4-TH ORDER NEWTON-COTES
D161S	F	GAUSS	ARBITRARY GAUSSIAN WEIGHTS AND NODES
D162S	F	SQUANK	SIMPSON'S QUAD. USED ADAPTIVELY
D252S	F	DDFSUB	OP NEVILLE OR STOER SOL. LIN. DIF. EQNS.
D253S	F	DDFSYS	DRIVER FOR D252S
D254S	F	DEGEAR	GEAR'S SOL. OF DIF. EQS.
D255S	F	DFBND	STOER SOL. DIF. EQS. WITH ERROR BOUNDS
D256S	F	DFBDRV	DRIVER FOR D256
E206S	F	LSQPOL	LEAST SQUARES WEIGHTED POLYNOMIAL FIT
E208S	F1		ARBITRARY FUNCTION FIT, LEAST SQUARES
E209S	F	CALLSQ	DRIVER FOR E206S
E212S	F		GENERAL LEAST SQUARES FIT + FNCTION EVAL.
E250S	F	VA02A	LEAST SQUARES FUNCT. MIN. W/O DERIVATIVES
E252S	F	MINMAX	CHEBYSHEV LINE FIT
E253S	F		ARBITRARY FUNCTIONAL FIT II
E256S	F	BOPOL	LEAST SQUARES FIT WITH POLYNOMIALS
E257S	F	BGLSSQ	LEAST SQUARES FIT WITH ARBITRARY FUNCTION
E350S	F	SMOOTH	SMOOTHING BY CUBIC SPLINES

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - AMDLIBF (ACC ABSTRACT 563) AND AMDLIBGZ (ACC ABSTRACT 564)

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED SEPTEMBER 1972.

10. REFERENCES - B. T. SMITH, THE ANL-AMD SUBROUTINE LIBRARY (ACC 562, 563, AND 564), ACC PROGRAMMING NOTE 73-5, SEPTEMBER 1, 1972.
ANL-AMD SYSTEM/360 LIBRARY SUBROUTINE DESCRIPTIONS:
K. E. HILLSTROM, MPA, MULTIPLE-PRECISION FLOATING-

10. REFERENCES (CONTINUED)

POINT ARITHMETIC PACKAGE FOR THE SYSTEM/360, A152S, NOVEMBER 1971.

W. J. CODY AND K. PACIOREK, ARGARSIN, OS/360 FORTRAN IV SYSTEMS SUBROUTINE FOR ARCSINE, ARCCOSINE FUNCTION (SINGLE PRECISION), B156S, FEBRUARY 1969.

K. HILLSTROM AND K. PACIOREK, SIN/COS, CS/360 FORTRAN IV ROUTINE FOR THE SINE AND COSINE, B157S, FEBRUARY 1969.

K. HILLSTROM, DSIN/DCOS, OS/360 FORTRAN IV COMPATIBLE ROUTINE FOR THE SINE AND COSINE FUNCTION, B158S, OCTOBER 1969.

K. HILLSTROM, DTAN/DCOTAN, FORTRAN IV COMPATIBLE ROUTINE FOR THE TANGENT AND COTANGENT FUNCTION, B159S, OCT. 1969.

W. J. CODY AND K. PACIOREK, ARGSINH, CS/360 FORTRAN IV LIBRARY ROUTINE FOR HYPERBOLIC SINE AND COSINE FUNCTIONS (SINGLE-PRECISION), B252S, FEBRUARY 1969.

NANCY W. CLARK, ALOG, OS/360 FORTRAN IV SYSTEMS ROUTINE FOR NATURAL OR BASE 10 LOGARITHMS, B353S, FEBRUARY 1969.

NANCY CLARK, DEXP, OS/360 FORTRAN IV SYSTEMS ROUTINE FOR DOUBLE-PRECISION E**X, B354S, FEBRUARY 1969.

NANCY W. CLARK, DLOG, FORTRAN IV SYSTEMS ROUTINE FOR NATURAL OR BASE 10 DP LOGARITHMS, B355S, FEBRUARY 1969.

KATHLEEN A. PACIOREK, DCUBRT, SYSTEM/360 ASSEMBLY LANGUAGE SUBROUTINE WHICH COMPUTES THE DP CUBE ROOT OF A NORMALIZED DP FLOATING POINT ARGUMENT, B456S, OCTOBER 1967.

DONALD F. JORDAN, ARGPOWER, IBM S/360 FORTRAN IV SINGLE-PRECISION POWER FUNCTION, B457S, FEBRUARY 1969.

N. A. CLARK, W. J. CODY, AND K. A. PACIOREK, ARGEDXPD, IBM S/360 FORTRAN IV DP POWER FUNCTION, B458S, MAY 1969.

H. C. THACHER, JR. AND KATHLEEN A. PACIOREK, DQD, DP FORTRAN IV QUOTIENT-DIFFERENCE ALGORITHM, C150S, JULY 1969.

H. C. THACHER, JR. AND KATHLEEN A. PACIOREK, DCONF1, DP FORTRAN IV ROUTINE TO EVALUATE AN S-FRACTION, C151S, JULY 1969.

BURTON S. GARBOW, CUBIC, ROOTS OF CUBIC POLYNOMIAL EQUATIONS, C250S, DECEMBER 1967.

BURTON S. GARBOW, QUARTI, ROOTS OF QUARTIC POLYNOMIAL EQUATIONS, C251S, DECEMBER 1967.

BURTON S. GARBOW, RSSR, ZEROES OF POLYNOMIALS WITH REAL COEFFICIENTS, C252S, DECEMBER 1968.

K. PACIOREK, POLDRV, FORTRAN IV DOUBLE-PRECISION DRIVER FOR ANL C254S, C253S, APRIL 1969.

KATHLEEN PACIOREK, CPOLY,RPOLY,BNDZRO, A FORTRAN IV DOUBLE-PRECISION POLYNOMIAL ROOTFINDER PACKAGE, C254S, APRIL 1969.

DONALD F. JORDAN AND KENNETH HILLSTROM, PACKAGE FOR COMPUTATION OF ANGULAR MOMENTUM COEFFICIENTS, C353S-1, AUG. 1971.

KATHLEEN A. PACIOREK, ELLIPK, EVALUATION OF THE SP COMPLETE ELLIPTIC INTEGRAL K(K**2), C354S, FEBRUARY 1969.

KATHLEEN A. PACIOREK, ELLIPE, EVALUATION OF THE SP COMPLETE ELLIPTIC INTEGRAL E(K**2), C355S, FEBRUARY 1969.

K. HILLSTROM, ALGAMA, FORTRAN IV COMPATIBLE ROUTINE FOR THE NATURAL LOG OF THE REAL GAMMA FUNCTION, C365S, MARCH 1967.

K. HILLSTROM, DGAMMA/DLGAMA, OS/360 FORTRAN IV COMPATIBLE ROUTINE FOR THE GAMMA FUNCTION AND THE NATURAL LOG OF THE GAMMA FUNCTION, C366S, MAY 1969.

K. HILLSTROM, GAMMA/ALGAMA, CS/360 FORTRAN IV COMPA-

10. REFERENCES (CONTINUED)

TIBLE ROUTINE FOR THE GAMMA FUNCTION AND THE NATURAL LOG OF THE GAMMA FUNCTION, C367S, FEBRUARY 1969.

DONALD F. JORDAN, EONE, EXPONENTIAL INTEGRAL, C368S, MARCH 1968.

DONALD F. JORDAN, DEONE - EXPONENTIAL INTEGRAL, C369S, MARCH 1968.

DONALD F. JORDAN, BESJY, BESSEL FUNCTIONS, C370S, OCTOBER 1967.

DONALD F. JORDAN, BESIK, BESSEL FUNCTIONS, C371S, NOVEMBER 1967.

KATHLEEN PACIOREK, CHIPRB, FORTRAN IV DOUBLE-PRECISION SUBROUTINE WHICH FINDS THE PROBABILITY THAT X**2 FOR N DEGREES OF FREEDOM EXCEEDS X, C372S, JANUARY 1968.

KATHLEEN A. PACIOREK, DELIPK, EVALUATION OF THE COMPLETE ELLIPTIC INTEGRAL K(K**2), C373S, FEBRUARY 1969.

KATHLEEN A. PACIOREK, DELIPE, EVALUATION OF THE COMPLETE ELLIPTIC INTEGRAL E(K**2), C374S, FEBRUARY 1969.

K. PACIOREK AND W. CODY, DEI, A FORTRAN IV FUNCTION SUBROUTINE TO CALCULATE EXPONENTIAL INTEGRALS E-SUB-I(X), E-SUB-1(X), OR EXP(-X)*E-SUB-I(X) FOR A LONG PRECISION ARGUMENT X, C375S-1, JUNE 1971.

KATHLEEN A. PACIOREK AND W. J. CODY, DDAW, FORTRAN IV FUNCTION WHICH CALCULATES DAWSONS INTEGRAL, C377S-1, JULY 1970.

K. HILLSTROM, DRZETA, FORTRAN IV (H) ROUTINE FOR THE RIEMANN ZETA FUNCTION ZETA(S) OR ZETA(S)-1, C380S, OCTOBER 1970.

K. HILLSTROM AND H. KUKI, DCGAM/DCLGAM/CDGAMA/CDLGAM, OS/360 FORTRAN IV(H) ROUTINE FOR THE DOUBLE-PRECISION COMPLEX GAMMA AND LOG GAMMA FUNCTIONS, C382S-1, NOVEMBER 1970.

K. HILLSTROM, DERF/DERFC, OS/360 FORTRAN IV COMPATIBLE ROUTINE FOR THE ERROR FUNCTION AND THE COMPLEMENTARY ERROR FUNCTION, C383S, MARCH 1969.

K. HILLSTROM, BFJ1, OS/360 FORTRAN IV ROUTINE FOR THE BESSEL FUNCTION OF THE FIRST KIND AND ORDER, C384S, APRIL 1969.

KATHLEEN A. PACIOREK, COULMB, A DP FORTRAN IV ROUTINE TO CALCULATE REGULAR COULOMB WAVE FUNCTIONS, C385S, AUGUST 1969.

K. HILLSTROM, DSGMAL, OS/360 FORTRAN IV(H) ROUTINE FOR THE COULOMB PHASE SHIFT SIGMAL(N), (L=0,1,2,...,N), C386S-1, JULY 1970.

J. GREGORY, BFJYR, OS/360 FORTRAN IV ROUTINE FOR THE BESSEL FUNCTION OF THE FIRST AND SECOND KIND AND OF ORDER ZERO AND ORDER ONE, C387S, JULY 1970.

A. STRECOK, IRCOUL, IRREGULAR COULOMB WAVE FUNCTIONS GL(N,P), C388S, AUGUST 1970.

A. STRECOK, GAMIN, OS/360 FORTRAN IV (H) DP ROUTINE FOR THE INCOMPLETE GAMMA FUNCTION, C389S, JANUARY 1971.

A. STRECOK, LQ, A FORTRAN IV DP ROUTINE FOR ASSOCIATED LEGENDRE FUNCTIONS OF THE SECOND KIND, C390S, SEPTEMBER 1971.

A. STRECOK, CDEONE, MODIFIED COMPLEX EXPONENTIAL INTEGRAL, C393S, MAY 1972.

K. HILLSTROM, HAVIE, OS/360 FORTRAN IV ROUTINE FOR HAVIE QUADRATURE, D150S, NOVEMBER 1968.

K. HILLSTROM, HAVIEP, OS/360-PL/I ROUTINE FOR HAVIE

10. REFERENCES (CONTINUED)

QUADRATURE, D150S-P, JULY 1970.

K. HILLSTROM, ROMBRG, OS/360 FORTRAN IV ROUTINE FOR ROMBERG QUADRATURE, D151S, NOVEMBER 1968.

K. HILLSTROM, ROMBERG, OS/360-PL/I ROUTINE FOR ROMBERG QUADRATURE, D151S-P, JULY 1970.

K. HILLSTROM, CHEB, OS/360 FORTRAN IV ROUTINE FOR CHEBYSHEV QUADRATURE, D152S-1, AUGUST 1970.

K. HILLSTROM, DROMB, OS/360 FORTRAN IV ROUTINE FOR TWO-DIMENSIONAL ROMBERG QUADRATURE, D153S, NOVEMBER 1968.

K. HILLSTROM, DROMBP, OS/360 PL/I ROUTINE FOR TWO-DIMENSIONAL ROMBERG QUADRATURE, D153S-P, JULY 1970.

K. HILLSTROM, CMQUAD, OS/360 FORTRAN IV ROUTINE FOR MODIFIED CHEBYSHEV QUADRATURE, D154S, NOVEMBER 1968.

K. HILLSTROM, SIMP, OS/360 FORTRAN IV ROUTINE FOR ADAPTIVE SIMPSON RULE QUADRATURE, D155S, NOVEMBER 1968.
ADAPTIVE SIMPSON RULE QUADRATURE, D155S, NOVEMBER 1968.

K. HILLSTROM, ASIMP, OS/360 FORTRAN IV ROUTINE FOR ADAPTIVE SIMPSON RULE QUADRATURE, D157S, NOVEMBER 1968.

K. HILLSTROM, ASIMPP, OS/360 PL/I ROUTINE FOR ADAPTIVE SIMPSON RULE QUADRATURE, D157S-P, JULY 1970.

K. HILLSTROM, ANC4, OS/360 FORTRAN IV ROUTINE FOR ADAPTIVE QUADRATURE USING THE 4TH NEWTON-COTES FORMULA, D158S, NOVEMBER 1968.

K. HILLSTROM, ANC4P, PL/1 ROUTINE FOR ADAPTIVE QUADRATURE BASED ON THE NEWTON-COTES 5-POINT RULE, D158S-P, JULY 1970.

K. HILLSTROM, GAUSS, OS/360 FORTRAN IV ROUTINE FOR GUASSIAN QUADRATURE FORMULA GENERATION, D161S, DECEMBER 1968.

J. N. LYNESS AND K. E. HILLSTROM, SQUANK, FORTRAN IV ROUTINE FOR ADAPTIVE SIMPSON RULE QUADRATURE, D162S, JULY 1970.

KATHLEEN PACIOREK, DDFSUB, FORTRAN IV SUBROUTINE WHICH PERFORMS ONE DP INTEGRATION STEP FOR A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS, D252S, SEPTEMBER 1968.

KATHLEEN PACIOREK, DDFSYS, FORTRAN IV DP ROUTINE WHICH PROVIDES INPUT/OUTPUT AND CONTROL FOR USE WITH THE DP ROUTINE AND D252S - DDFSUB TO INTEGRATE A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS, D253S, MAY 1967.

C. W. GEAR, DEGEAR, OS/360 FORTRAN IV PROGRAM FOR THE NUMERICAL INTEGRATION OF ORDINARY DIFFERENTIAL EQUATIONS WITH INITIAL VALUE BOUNDARY CONDITIONS, D254S, DECEMBER 1967.

KATHLEEN PACIOREK, DFBND-DIFI, FORTRAN IV DOUBLE-PRECISION ROUTINES WHICH ESTIMATE THE ERROR IN THE BULIRSCH-STOER METHOD FOR SOLUTION OF A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS, D255S, OCTOBER 1969.

KATHLEEN A. PACIOREK, DFBDRV, FORTRAN IV DP ROUTINE WHICH PROVIDES INPUT/OUTPUT AND CONTROL FOR USE WITH THE DP ROUTINES AND D255S DFBND-DIFI TO INTEGRATE A SYSTEM OF FIRST-ORDER ORDINARY DIFFERENTIAL EQUATIONS, D256S, OCTOBER 1969.

KATHLEEN PACIOREK, LSQPOL, LEAST SQUARE POLYNOMIAL FIT, E206S, SEPTEMBER 1967.

K. SZABO AND K. HILLSTROM, ARBITRARY FUNCTIONAL FIT, E208S-1, JANUARY 1970.

K. PACIOREK, CALLSQ, FORTRAN IV DP ROUTINE WHICH

10. REFERENCES (CONTINUED)
PROVIDES INPUT/OUTPUT AND CONTROL FOR USE WITH THE DP VERSION OF ANL E206S - LSQPOL TO DO A LEAST SQUARE POLYNOMIAL FIT, E209S, SEPTEMBER 1967.

J. B. COHEN, A GENERAL PROGRAM FOR THE EVALUATION OF AN ARBITRARY FUNCTION, AND FOR THE LEAST SQUARES DETERMINATION OF THE COEFFICIENTS OF A FUNCTION, LINEAR IN THE COEFFICIENTS, INVOLVING ONE OR MORE INDEPENDENT VARIABLES, E212S, JANUARY 1967.

BURTON S. GARBOW, VA02A,SV01A, LEAST SQUARES FUNCTIONAL MINIMIZATION WITHOUT DERIVATIVES, E250S, AUGUST 1968.

BURTON S. GARBOW, MINMAX, CHEBYSHEV LINE FIT, E252S, OCTOBER 1968.

A. MEYER AND I. K. ABU-SHUMAYS, ARBITRARY FUNCTIONAL FIT II, E253S, APRIL 1969.

K. E. HILLSTROM AND W. J. CODY, BGPOL, LINEAR LEAST SQUARES SOLUTION BY HOUSEHOLDER TRANSFORMATIONS, E256S, DEC. 1971.

K. E. HILLSTROM AND W. J. CODY, BGLSS, LEAST SQUARES SOLUTIONS OF SYSTEMS OF LINEAR EQUATIONS BY ORTHOGONAL HOUSEHOLDER TRANSFORMATIONS WITH STATISTICAL CALCULATIONS, E157S, DEC. 1971.

BURTON S. GARBOW, SMOOTH, SMOOTHING BY CUBIC SPLINES, E350S, DECEMBER 1968.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - ASSEMBLY LANGUAGE, FORTRAN IV, AND PL/I EACH INDICATED BY A, F OR P IN THE IDENTIFICATION GIVEN IN ITEM 3 ABOVE.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 RELEASE 19.6.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
CONTACT B. T. SMITH, PROGRAM LIBRARIAN
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (19,180 CARDS)
ACC NOTE AND SUBROUTINE DESCRIPTIONS

17. CATEGORY - P
KEYWORDS - FLOATING-POINT ARITHMETIC, ELEMENTARY FUNCTIONS, POLYNOMIALS, DIFFERENTIAL EQUATIONS, QUADRATURE, INTERPOLATION, SPECIAL FUNCTIONS

1. NAME OR DESIGNATION OF PROGRAM - AMDLIBF

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75

3. DESCRIPTION OF PROBLEM OR FUNCTION - AMDLIBF IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE. THIS SUBSET INCLUDES LIBRARY CATEGORY F:

IDENTIFICATION		DESCRIPTION
F105S F	MATEQ,UNIQUE	GENERALIZED MAT. INV. AND SOL. LIN. EQS.
F150S F	HERM	EIGENSYSTEMS OF HERMITIAN MATRICES
F152S F	SYMINV	INVERT SYM. MATRICES, SOLVE LIN. SYSTEMS
F154S A	DOTP	DOUBLE PLUS PRECISION ACCUM. INNER PROD.
F155S F	HESSEN	RED. COMPLEX NON-HERM. MAT. TO UP. HESS.
F156S F	RAYCOR	RAYLEIGH CORRECTIONS FOR EIGENVALUES
F157S F	SINGLVL	SINGULAR VALUE DECOMP. OF REAL MATRIX
F161S F	XTRADP	A FAST EXTENDED PRECISION INNER PRODUCT
F202S F1	EIGEN	EIGENSYSTEM FOR REAL SYMMETRIC MATRIX
F203S F		DRIVER FOR F202S
F220S F	ELTRAN	ACCUM. TRANSFORMATIONS FROM ELMHES (HQR2)
F221S F	ORTRAN	ACCUM. TRANSFORMATIONS FROM ORTHES (HQR2)
F222S F	FIGI2	REDUCE NONSYM. TO SYM. TRIDIAG. (TQL2)
F223S F1	TINVIT	FIND SOME EIGENVEC. OF SYM. TRIDIAG. MAT.
F224S F	REDUC	REDUCE GEN. SYM. EIGENPROB. AX-L*BX
F225S F	REBAK	BACKTRANSFORM VECTORS REDUC FORMED MATRIX
F226S F	BANDR	REDUCE BAND SYM. MATRIX TO SYM. TRIDIAG.
F227S F	BANDV	FIND EIGENVECTORS OF BAND SYM. MATRIX
F228S F	TRED3	REDUCE PACKED SYM. MAT. TO SYM. TRIDIAG.
F229S F	TRBAK3	BACKTRANSFORM VECTORS TRED3 FORMED MATRIX
F250S F	FRANCI	EIGENVALUES OF A REAL MATRIX
F251S F	FRANCC	EIGENVALUES OF COMPLEX MATRICES
F252S F	GEIGEN	GENERALIZED SYMMETRIC EIGENPROBLEM
F255S F	SDIAG	EIGENSYSTEM OF REAL SYM. DP MATRICES
F257S F	TSTMTZ	GENERATES TEST MATRICES
F258S F	LRCHZ	EIG. VALS. REAL SYM. MAT. VIA LR-CHOLEC.
F259S F	BYSECT	EIGENVALUES OF TRIDIAG. MAT. BY BISECTION
F260S F	JACOBI	EIGENSYSTEM OF REAL MATRICES
F261S F	EIGINV	INVERSE EIGENVALUE PROBLEM
F262S F	VEC5	EIGENVECTORS OF PENTADIAG. SYM. MATRICES
F263S F	BANDRD	REDUCE SYM. BAND MATRIX TO TRIDIAG. FORM
F264S F	BANDVC	ORTHONORM. EIGENVEC. OF SYM. BAND MAT.
F265S F	EIGENP	EIGENSYSTEM OF REAL GENERAL MATRIX
F269S F1	BALANC	BALANCE A REAL GENERAL MATRIX
F270S F1	BALBAK	BACKTRANSFORM VECTORS BALANCE FORMED MAT.
F271S F1	CBAL	BALANCE A COMPLEX GENERAL MATRIX
F272S F1	CBABK2	BACKTRANSFORM VECTORS CBAL FORMED MATRIX
F273S F1	ELMHES	REDUCE REAL MATRIX TO REAL HESS. (ELEM.)
F274S F1	ELMBAK	BACKTRANSFORM VECTORS ELMHES FORMED MAT.
F275S F1	ORTHES	REDUCE REAL MAT. TO REAL HESS. (ORTHOG.)
F276S F1	ORTBAK	BACKTRANSFORM VECTORS ORTHES FORMED MAT.
F277S F1	TRED1	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
F278S F1	TRED2	REDUCE SYM. MAT. TO SYM. TRIDIAG. (TQL2)

3. DESCRIPTION OF PROBLEM OR FUNCTION (CONTINUED)

F279S F1 TRBAK1		BACKTRANSFORM VECTORS TRED1 FORMED MATRIX
F280S F1 FIGI		REDUCE NONSYM. TO SYM. TRIDIAG. MATRIX
F281S F1 BAKVEC		BACKTRANSFORM VECTORS FIGI FORMED MATRIX
F282S F1 COMHES		REDUCE COMPLEX MATRIX TO COMPLEX HESS.
F283S F1 COMBAK		BACKTRANSFORM VECTORS COMHES FORMED MAT.
F284S F1 HTRIDI		REDUCE HERMITIAN MATRIX TO SYM. TRIDIAG.
F285S F1 HTRIBK		BACKTRANSFORM VECTORS HTRIDI FORMED MAT.
F286S F1 HQR		FIND ALL VALUES OF REAL HESS. MATRIX
F287S F1 HQR2		FIND ALL VALUES/VECTORS REAL HESS. MAT.
F288S F1 INVIT		FIND SOME VECTORS OF REAL HESS. MATRIX
F289S F2 TQL1		FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
F290S F2 TQL2		ALL VALUES/VECTORS SYM. TRIDIAG. MAT.
F291S F1 IMTQL1		FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
F292S F1 IMTQL2		ALL VALUES/VECTORS SYM. TRIDIAG. MAT.
F293S F1 TSTURM		SOME VALUES/VECTORS SYM. TRIDIAG. MAT.
F294S F2 BISECT		FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
F295S F1 COMLR		FIND ALL VALUES OF COMPLEX HESS. MATRIX
F296S F1 COMLR2		ALL VALUES/VECTORS COMPLEX HESS. MAT.
F297S F1 CINVIT		FIND SOME VECTORS OF COMPLEX HESS. MATRIX
F298S F1 RATQR		FIND EXTREME VALUES OF SYM. TRIDIAG. MAT.
F299S FA1EISPAC		CONTROL PROGRAM F220S-F223S + F269S-F298S
F402S F MATINV		MATRIX INVERSION AND SOL. OF LINEAR EQNS.
F403S F		DRIVER FOR F402S
F452S F CHOLLU,CHOLEQ		SYM. DECOMP. OF POS. DEF. BAND MATRICES
F453S F MATINC		INVERSION OF COMPLEX MATRICES
F454S F CROUT		SOLUTION OF SIMULTANEOUS LINEAR EQUATIONS
F455S F CROUTC		SOL. OF SIMULTANEOUS COMPLEX LINEAR EQNS.
F456S F1 DIAG		INTEGER PRESERVING GAUSSIAN ELIMINATION

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - AMDLIBAE (ACC ABSTRACT 562) AND AMDLIBGZ (ACC ABSTRACT 564)

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED SEPTEMBER 1972.

10. REFERENCES - B. T. SMITH, THE ANL-AMD SUBROUTINE LIBRARY (ACC 562, 563, AND 564), ACC PROGRAMMING NOTE 73-5, SEPTEMBER 1, 1972.

BURTON S. GARBOW, MATEQ,UNIQUE, GENERALIZED SOLUTION OF MATRIX EQUATIONS, F105S, DECEMBER 1968.

VIRGINIA KLEMA, HERM, PACKAGE OF ROUTINES TO PERFORM THE HOUSEHOLDER REDUCTION AND CALCULATE THE EIGENSYSTEM OF HERMITIAN MATRICES, F150S, MAY 1968.

BURTON S. GARBOW, SYMINV, SYMMETRIC MATRIX INVERSION WITH ACCOMPANYING SOLUTION OF LINEAR EQUATIONS, F152S, JUNE 1968.

10. REFERENCES (CONTINUED)

DONALD F. JORDAN, DOTP, EXTRA-PRECISION ACCUMULATING INNER PRODUCT, F154S, NOVEMBER 1967.

VIRGINIA KLEMA, HESSEN, SUBROUTINE TO REDUCE A SP COMPLEX NON-HERMITIAN MATRIX TO UPPER HESSENBERG FORM, F155S, JANUARY 1968.

VIRGINIA KLEMA, RAYCOR, RAYLEIGH CORRECTIONS TO EIGENVALUES OF A REAL SYMMETRIC MATRIX, F156S, MAY 1968.

BURTON S. GARBOW, SINGVL, SINGULAR VALUE DECOMPOSITION OF A REAL MATRIX, F157S, MAY 1969.

A. STRECOK, XTRADP, A FORTRAN IV FUNCTION SUBROUTINE TO CALCULATE A FAST EXTENDED PRECISION INNER PRODUCT OF TWO REAL*8 VECTORS, F161S, SEPTEMBER 1971.

BURTON S. GARBOW, EIGEN, EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC MATRIX, F202S-1, DECEMBER 1969.

BURTON S. GARBOW, MAIN, A GENERAL PROGRAM FOR THE COMPUTATION OF EIGENVALUES AND EIGENVECTORS OF A REAL SYMMETRIC MATRIX, F203S, DECEMBER 1968.

CLEVE MOLER, B. GARBOW, ELTRAN, A FORTRAN IV SUBROUTINE TO ACCUMULATE THE TRANSFORMATIONS IN THE REDUCTION OF A REAL GENERAL MATRIX BY ELMHES, F220S, JANUARY 1972.

CLEVE MOLER, B. GARBOW, ORTRAN, A FORTRAN IV SUBROUTINE TO ACCUMULATE THE TRANSFORMATIONS IN THE REDUCTION OF A REAL GENERAL MATRIX BY ORTHES, F221S, JANUARY 1972.

B. GARBOW, FIGI2, A FORTRAN IV SUBROUTINE TO TRANSFORM A CERTAIN REAL NON-SYMMETRIC TRIDIAGONAL MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX ACCUMULATING THE DIAGONAL TRANSFORMATIONS, F222S, JANUARY 1972.

B. GARBOW, TINVIT, A FORTRAN IV SUBROUTINE TO DETERMINE SOME EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX, F223S-1, JANUARY AND FEBRUARY 1972.

B. GARBOW, REDUC, A FORTRAN IV SUBROUTINE TO REDUCE A CERTAIN GENERALIZED SYMMETRIC EIGENPROBLEM TO THE STANDARD SYMMETRIC EIGENPROBLEM USING CHOLESKY DECOMPOSITION, F224S, FEBRUARY 1972.

B. GARBOW, REBAK, A FORTRAN IV SUBROUTINE TO BACK TRANSFORM THE EIGENVECTORS OF THAT DERIVED SYMMETRIC MATRIX DETERMINED BY REDUC, F225S, FEBRUARY 1972.

B. GARBOW, BANDR, A FORTRAN IV SUBROUTINE TO REDUCE A REAL SYMMETRIC BAND MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX USING AND OPTIONALLY ACCUMULATING ORTHOGONAL TRANSFORMATIONS, F226S, FEBRUARY 1972.

B. GARBOW, BANDV, A FORTRAN IV SUBROUTINE TO DETERMINE SOME EIGENVECTORS OF A REAL SYMMETRIC BAND MATRIX, F227S, FEBRUARY 1972.

B. GARBOW, TRED3, A FORTRAN IV SUBROUTINE TO REDUCE A REAL SYMMETRIC MATRIX, STORED AS A ONE-DIMENSIONAL ARRAY, TO A SYMMETRIC TRIDIAGONAL MATRIX USING ORTHOGONAL TRANSFORMATIONS, F228S, FEBRUARY 1972.

B. GARBOW, TRBAK3, A FORTRAN IV SUBROUTINE TO BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY TRED3, F229S, FEBRUARY 1972.

BURTON S. GARBOW, FRANCI, EIGENVALUES OF REAL

10. REFERENCES (CONTINUED)

MATRICES, F250S, JANUARY 1968.

BURTON S. GARBOW, FRANCC, EIGENVALUES OF COMPLEX MATRICES, F251S, NOVEMBER 1968.

BURTON S. GARBOW, GEIGEN, GENERALIZED EIGENVALUE PROGRAM FOR SYMMETRIC MATRICES, F252S, DECEMBER 1967.

VIRGINIA KLEMA, SDIAG, COMPLETE EIGENSYSTEM OF A REAL SYMMETRIC DOUBLE-PRECISION MATRIX, F255S, NOVEMBER 1968.

B. GARBOW, TSTMTZ, OS/360 FORTRAN IV ROUTINE FOR GENERATING TEST MATRICES, F257S, JANUARY 1968.

VIRGINIA KLEMA AND B. GARBOW, LRCHZ, FORTRAN IV DP ROUTINE FOR THE LR ALGORITHM, F258S, NOVEMBER 1968.

VIRGINIA KLEMA, BYSECT, EIGENVALUES OF A TRIDIAGONAL MATRIX BY BISECTION, F259S, JULY 1968.

BURTON S. GARBOW, JACOBI, EIGENVALUES AND EIGENVECTORS OF REAL MATRICES, F260S, SEPTEMBER 1968.

BURTON S. GARBOW, EIGINV, SOLUTION OF THE INVERSE EIGENVALUE PROBLEM, F261S, OCTOBER 1968.

BURTON S. GARBOW, VEC5, EIGENVECTORS OF A PENTADIAGONAL SYMMETRIC MATRIX, F262S, NOVEMBER 1968.

BURTON S. GARBOW, BANDRC, TRIDIAGONALIZATION OF A SYMMETRIC BAND MATRIX, F263S, MAY 1969.

BURTON S. GARBOW, BANDVC, EIGENVECTORS OF A SYMMETRIC BAND MATRIX, F264S, MAY 1969.

BURTON S. GARBOW, EIGENP, EIGENVALUES AND EIGENVECTORS OF A REAL GENERAL MATRIX, F265S, MAY 1969.

VIRGINIA KLEMA AND B. GARBOW, BALANC, A FORTRAN IV ROUTINE TO BALANCE A REAL GENERAL MATRIX, F269S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, BALBAK, A FORTRAN IV SUBROUTINE TO BACK TRANSFORM THE EIGENVECTORS OF THAT REAL MATRIX TRANSFORMED BY BALANC, F270S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, CBAL, A FORTRAN IV ROUTINE TO BALANCE A COMPLEX GENERAL MATRIX, F271S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, CBABK2, A FORTRAN IV SUBROUTINE TO BACK TRANSFORM THE EIGENVECTORS OF THAT COMPLEX MATRIX TRANSFORMED BY CBAL, F272S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, ELMHES, A FORTRAN IV SUBROUTINE TO REDUCE A REAL GENERAL MATRIX TO UPPER HESSENBERG FORM USING ELEMENTARY TRANSFORMATIONS, F273S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, ELMBAK, A FORTRAN IV SUBROUTINE TO BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY ELMHES, F274S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, ORTHES, A FORTRAN IV SUBROUTINE TO REDUCE A REAL GENERAL MATRIX TO UPPER HESSENBERG FORM USING ORTHOGONAL TRANSFORMATIONS, F275S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, ORTBAK, A FORTRAN IV SUBROUTINE TO BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY ORTHES, F276S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, TRED1, A FORTRAN IV ROUTINE TO REDUCE A REAL SYMMETRIC MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX USING ORTHOGONAL TRANSFORMATIONS, F277S-1, JAN. 1972.

VIRGINIA KLEMA AND B. GARBOW, TRED2, A FORTRAN IV SUBROUTINE TO REDUCE A REAL SYMMETRIC MATRIX TO A SYMMETRIC TRI-

10. REFERENCES (CONTINUED)

DIAGONAL MATRIX ACCUMULATING THE ORTHOGONAL TRANSFORMATIONS, F278S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, TRBAK1, A FORTRAN IV SUBROUTINE TO BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY TRED1, F279S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, FIGI, A FORTRAN IV SUBROUTINE TO TRANSFORM A CERTAIN REAL NON-SYMMETRIC TRIDIAGONAL MATRIX TO A SYMMETRIC TRIDIAGONAL MATRIX, F280S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, BAKVEC, A FORTRAN IV SUBROUTINE TO BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY FIGI, F281S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, COMHES, A FORTRAN IV ROUTINE TO REDUCE A COMPLEX GENERAL MATRIX TO COMPLEX UPPER HESSENBERG FORM USING ELEMENTARY TRANSFORMATIONS, F282S-1, JAN. 1972.

VIRGINIA KLEMA AND B. GARBOW, COMBAK, A FORTRAN IV SUBROUTINE TO BACK TRANSFORM THE EIGENVECTORS OF THAT UPPER HESSENBERG MATRIX DETERMINED BY COMHES, F283S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, HTRIDI, A FORTRAN IV SUBROUTINE TO REDUCE A COMPLEX HERMITIAN MATRIX TO A REAL SYMMETRIC TRIDIAGONAL MATRIX USING UNITARY TRANSFORMATIONS, F284S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, HTRIBK, A FORTRAN IV SUBROUTINE TO BACK TRANSFORM THE EIGENVECTORS OF THAT SYMMETRIC TRIDIAGONAL MATRIX DETERMINED BY HTRIDI, F285S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, HQR, A FORTRAN IV SUBROUTINE TO DETERMINE THE EIGENVALUES OF A REAL UPPER HESSENBERG MATRIX, F286S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, HQR2, A FORTRAN IV SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX, F287S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, INVIT, A FORTRAN IV ROUTINE TO DETERMINE THOSE EIGENVECTORS OF A REAL UPPER HESSENBERG MATRIX CORRESPONDING TO SPECIFIED EIGENVALUES, F288S-1, JAN. 1972.

VIRGINIA KLEMA AND B. GARBOW, TQL1, A FORTRAN IV SUBROUTINE TO DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX, F289S-2, FEBRUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, TQL2, A FORTRAN IV SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX, F290S-2, FEBRUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, IMTQL1, A FORTRAN IV SUBROUTINE TO DETERMINE THE EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX, F291S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, IMTQL2, A FORTRAN IV SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX, F292S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, TSTURM, A FORTRAN IV SUBROUTINE TO DETERMINE SOME EIGENVALUES AND EIGENVECTORS OF A SYMMETRIC TRIDIAGONAL MATRIX, F293S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, BISECT, A FORTRAN IV SUBROUTINE TO DETERMINE SOME EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX, F294S-2, FEBRUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, COMLR, A FORTRAN IV

10. REFERENCES (CONTINUED)

SUBROUTINE TO DETERMINE THE EIGENVALUES OF A COMPLEX UPPER HESSENBERG MATRIX, F295S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, COMLR2, A FORTRAN IV SUBROUTINE TO DETERMINE THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX UPPER HESSENBERG MATRIX, F296S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, CINVIT, A FORTRAN IV SUBROUTINE TO DETERMINE THOSE EIGENVECTORS OF A COMPLEX UPPER HESSENBERG MATRIX CORRESPONDING TO SPECIFIED EIGENVALUES, F297S-1, JANUARY 1972.

VIRGINIA KLEMA AND B. GARBOW, RATQR, A FORTRAN IV SUBROUTINE TO DETERMINE SOME EXTREME EIGENVALUES OF A SYMMETRIC TRIDIAGONAL MATRIX, F298S-1, JANUARY 1972.

JAMES M. BOYLE, EISPAC, A CONTROL PROGRAM FOR THE EIGENSYSTEM PACKAGE (ANL F269S TO F298S AND F220S TO F223S), F299S-1, FEBRUARY 1972.

BURTON S. GARBOW AND C. CHAMCT, MATINV, MATRIX INVERSION WITH ACCOMPANYING SOLUTION OF LINEAR EQUATIONS, F402S, FEBRUARY 1969.

BURTON S. GARBOW, MAIN, A GENERAL PROGRAM FOR MATRIX INVERSION AND SOLUTION OF LINEAR EQUATIONS, F403S, DECEMBER 1968.

BURTON S. GARBOW, CHOLLU,CHOLEQ, SYMMETRIC DECOMPOSITION OF POSITIVE-DEFINITE BAND MATRICES, F452S, JULY 1968.

BURTON S. GARBOW, MATINC, COMPLEX MATRIX INVERSION WITH ACCOMPANYING SOLUTION OF LINEAR EQUATIONS, F453S, JUNE 1968.

BURTON S. GARBOW, CROUT, SOLUTION OF LINEAR EQUATIONS BY THE CROUT METHOD, F454S, APRIL 1968.

BURTON S. GARBOW, CROUTC, SOLUTION OF COMPLEX LINEAR EQUATIONS BY THE CROUT METHOD, F455S, JUNE 1968.

BURTON S. GARBOW, DIAG, INTEGER-PRESERVING GAUSSIAN ELIMINATION, F456S-1, SEPTEMBER 1970.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - ASSEMBLY LANGUAGE AND FORTRAN IV EACH INDICATED BY A OR F IN THE IDENTIFICATION GIVEN IN ITEM 3.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 RELEASE 19.6.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

CONTACT B. T. SMITH, PROGRAM LIBRARIAN
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (13,629 CARDS)
ACC NOTE AND SUBROUTINE DESCRIPTIONS

17. CATEGORY - P
KEYWORDS - MATRICES. SIMULTANEOUS LINEAR EQUATIONS, EIGENSYSTEMS

1. NAME OR DESIGNATION OF PROGRAM - AMDLIBGZ

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75

3. DESCRIPTION OF PROBLEM OR FUNCTION - AMDLIBGZ IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE NATIONAL LABORATORY. THIS SUBSET INCLUDES LIBRARY CATEGORIES G-Z:

IDENTIFICATION	DESCRIPTION
G552S F RANF	RANDOM NUMBER GENERATOR
J552S F1 PLOTSFLM	CALCOMP PLOTS TO IBM 2280
J952S F YCLYPLOT	CALCOMP PLOTS
J955S P GRAF	PRINTS A GRAPH OF POINTS ON LINE PRINTER
K250S A1	CORE TO CORE CONVERSION
K251S A HEXINP	HEXADECIMAL INPUT FOR PL/I PROGRAMS
K252S A HEXOUT	HEXADECIMAL OUTPUT CONV. PL/I PROGRAMS
M101S F SQRT	ALGEBRAIC SQRT
M150S F CSQRT	ALGEBRAIC SQRT
M151S P2 ANLKWIC	KWIC SORT
M250S A SMALLIST	SQUEEZES ASSEMBLER LISTING TO 8X11
N251S A ABEND	CALLS ABEND DUMP
Q052S A CLOCK	TIME
Q053S A COPYAGO	COPY LOAD MODULE FROM TAPE TO DISK
Q054S A DATE	CURRENT DATE IN FORM MM/DD/YY
Q055S A TIME	TIME (24 HOUR CLOCK) IN EBCDIC HH.MM.SS
Z013S F	VARIABLE METRIC MINIMIZATION
Z057S A LOCF	LOCATE MACHINE ADDRESSES OF VARIABLES
Z071S A ALLOC	ALLOCATE LCS FOR FORTRAN PROGRAMS
Z073S A LCSGET	ALLOCATE LCS FOR PL/I PROGRAMS
Z074S A ANLMNP	EXPONENT + MANTISSA MANIPULLATIVE FUNCTS.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - AMDLIBAE (ACC ABSTRACT 562) AND AMDLIBF (ACC ABSTRACT 563)

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED SEPTEMBER 1972.

10. REFERENCES - B. T. SMITH, THE ANL-AMD SUBROUTINE LIBRARY (ACC 562, 563, AND 564), ACC PROGRAMMING NOTE 73-5, SEPTEMBER 1, 1972.
ANL-AMD SYSTEM/360 LIBRARY SUBROUTINE DESCRIPTIONS:
NANCY W. CLARK, RANF, OS/360 FORTRAN IV ROUTINE TO PRODUCE A SERIES OF RANDOM NUMBERS, G552S, JULY 1967.
NANCY CLARK, PLOTSFLM, OS/360 FORTRAN IV ROUTINE TO

10. REFERENCES (CONTINUED)
PROVIDE 35MM FILM OUTPUT ON THE IBM 2280 USING CALCOMP CALLING SEQUENCES, J552S-1, DECEMBER 1970.

CYNTHIA CHAMOT, YOLYPLOT, J952S, DECEMBER 1966.
GEORGE M. HAUSER, GRAF, A PL/I PROCEDURE TO PLOT POINTS ON A LINE PRINTER, J955S, OCTOBER 1971.
DANIEL CARSON, CORE TO CORE CONVERSION, K250S-1, FEBRUARY 1970.
ANTHONY J. STRECOK, HEXINP, HEXADECIMAL CONVERSION FOR PL/I, K251S, APRIL 1970.
ANTHONY J. STRECOK, HEXOUT, HEXADECIMAL OUTPUT FOR PL/I, K252S, APRIL 1970.
KATHLEEN A. PACIOREK, SORT, M101S, OCTOBER 1968.
KATHLEEN A. PACIOREK, OSORT, M150S, OCTOBER 1968.
DONALD F. JORDAN, K. DRITZ, W. J. CODY, AND K. HILLSTROM, ANL KWIC KEY WORD IN CONTEXT, M151S-2, MAY 1971.
ROBERT P. TANNURA, SMALLIST, M250S, DECEMBER 1967.
G. DUFFY, ABEND, ABNORMAL TERMINATION DUMP CALL FROM FORTRAN IV, N251S, APRIL 19, 1967.
G. DUFFY, CLOCK, VALUE OF CLOCK UPON CALL FROM FORTRAN IV, QC52S, APRIL 19, 1967.
G. DUFFY, COPYAGO, COPY A LOAD MODULE FROM TAPE TO DISK AND EXECUTE IT, C053S, APRIL 19, 1967.
C. J. SMITH AND W. J. CODY, DATE, CURRENT DATE IN GREGORIAN CALENDAR, FORTRAN IV CALLABLE, Q054S, FEBRUARY 1968.
K. HILLSTROM, TIME, 24 HOUR CLOCK, FORTRAN IV CALLABLE, C055S, FEBRUARY 1970.
JANET HERMAN, VARIABLE METRIC MINIMIZATION, Z013S, APRIL 1967.
JOHN A. OHDE, LOOP, Z057S, OCTOBER 1968.
JOHN A. OHDE, ALLOC, Z071S, OCTOBER 1968.
JOHN A. OHDE, PLILOS, Z073S, OCTOBER 1968.
K. E. HILLSTROM, ANLMNP, EXPONENT AND MANTISSA MANIPULATION FUNCTIONS, Z074S, JULY 1971.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - ASSEMBLY LANGUAGE, FORTRAN IV, AND PL/I EACH INDICATED BY A, F OR P IN THE IDENTIFICATION GIVEN IN ITEM 3 ABOVE.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 RELEASE 19.6.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

CONTACT B. T. SMITH, PROGRAM LIBRARIAN
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECK (2866 CARDS)
    ACC NOTE AND SUBROUTINE DESCRIPTIONS

17. CATEGORY - P
    KEYWORDS - GRAPHS, INPUT DATA, OUTPUT DATA, UTILITY ROUTINES

ACC ABSTRACT 565 02/74

1. NAME OR DESIGNATION OF PROGRAM - INCITE

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - INCITE GENERATES ENERGY-DEPENDENT THERMAL NEUTRON SPECTRA AND APPROPRIATE AVERAGE MULTI-GROUP CROSS SECTIONS USING ARBITRARY SCATTERING KERNELS. THE PHYSICAL MODEL IS A HOMOGENEOUS, CRITICAL, ONE-DIMENSIONAL BASE SLAB CORE.

4. METHOD OF SOLUTION - THE PROGRAM EMPLOYS A NORMALIZED GAUSS-SEIDEL ITERATION TECHNIQUE TO SOLVE THE ENERGY-DEPENDENT INTEGRAL FORM OF THE B-1 APPROXIMATION TO THE BOLTZMANN TRANSPORT EQUATION.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 101 FINE ENERGY POINTS AND 50 BROAD GROUPS IS PERMITTED. A LIBRARY TAPE CONTAINING THE APPROPRIATE ABSORPTION AND SCATTERING CROSS SECTIONS AT THESE ENERGY POINTS IS REQUIRED.

6. TYPICAL RUNNING TIME - THE RUNNING TIME FOR A TYPICAL PROBLEM ON THE IBM360 IS NORMALLY LESS THAN 15 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - LIBMOD, AN AUXILIARY PROGRAM FOR MODIFICATION OR CREATION OF INCITE CROSS SECTION DATA LIBRARIES. THE CURRENT MASTER LIBRARY IS FOR THE ENERGY RANGE 0.0 TO 2.38 EV.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
IBM360 VERSION SUBMITTED JANUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC FEBRUARY 1974.

10. REFERENCES - R. L. CURTIS AND R. A. GRIMESEY, INCITE - A FORTRAN-IV PROGRAM TO GENERATE THERMAL NEUTRON SPECTRA AND MULTI-GROUP CONSTANTS USING ARBITRARY SCATTERING KERNELS, IN-1062, NOVEMBER 1967.

11. MACHINE REQUIREMENTS - APPROXIMATELY 300K BYTES OF CORE MEMORY, ONE CROSS SECTION LIBRARY TAPE, AND THREE I/O SCRATCH UNITS ARE REQUIRED FOR EXECUTION.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
R. L. CURTIS AND R. A. GRIMESEY
AEROJET NUCLEAR COMPANY

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (2022 CARDS)
SAMPLE PROBLEM (26 CARDS)
CONTROL INFORMATION (JCL 29 CARDS)
LIBRARY (569 BLOCKS OF VARIABLE-SIZED BINARY RECORDS)
SAMPLE PROBLEM OUTPUT (37 PAGES)
REFERENCE REPORT

17. CATEGORY - B
KEYWORDS - THERMAL SPECTRA, MULTIGROUP CROSS SECTIONS, LIBRARIES, INELASTIC SCATTERING KERNELS, THERMALIZATION

ACC ABSTRACT 566 12/73

1. NAME OR DESIGNATION OF PROGRAM - RESPOND

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/370

3. DESCRIPTION OF PROBLEM OR FUNCTION - RESPOND CALCULATES THE RELATIVE ENERGY ABSORPTION OF A SMALL REGION OF ONE MATERIAL IN A LARGE BODY OF ANOTHER MATERIAL EXPOSED TO GAMMA- OR X-RADIATION.

4. METHOD OF SOLUTION - THE RELATIVE ENERGY ABSORBED BY THE SMALL REGION FROM ENERGETIC ELECTRONS PRODUCED IN THE SURROUNDING MEDIUM AND THE RELATIVE ENERGY ABSORBED FROM THE ELECTRONS PRODUCED WITHIN THE REGION ARE CALCULATED AS A FUNCTION OF PHOTON ENERGY AND COMBINED BY THE METHOD OF T. E. BURLIN. THIS ENERGY-DEPENDENT RESPONSE FUNCTION IS AVERAGED OVER AN INPUT PHOTON SPECTRUM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE ENERGY DIVISION IS INTO 100 EQUAL INTERVALS. ONLY 2 REGIONS MAY BE SPECIFIED.

6. TYPICAL RUNNING TIME - 14 SECONDS PER CASE ARE REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM - RESPOND IS SPECIFICALLY INTENDED FOR CALCULATING THE CORRECTION FACTOR FOR THERMOLUMINESCENT DOSIMETERS (TLD) IN DISSIMILAR MEDIUM.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED SEPTEMBER 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - R. J. TUTTLE, MEASUREMENTS OF GAMMA-RAY HEATING BY THERMOLUMINESCENT DOSIMETERS, TI-707-140-022, MAY 1972.
T. E. BURLIN, RADIATION DOSIMETRY, VOL. I, P. 331, FRANK H. ATTIX AND WILLIAM C. ROESCH, EDITORS, ACADEMIC PRESS, NEW YORK, 1968.

11. MACHINE REQUIREMENTS - 84K MEMORY

12. PROGRAMMING LANGUAGE USED - FORTRAN IV (H)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

R. J. TUTTLE
ATOMICS INTERNATIONAL
P. O. BOX 309
CANOGA PARK, CALIFORNIA 91304

16. MATERIAL AVAILABLE -
    SOURCE DECK (266 CARDS)
    SAMPLE PROBLEM (207 CARDS)
    SAMPLE PROBLEM OUTPUT (10 PAGES)
    REFERENCE REPORT, TI-707-140-022

17. CATEGORY - Q
    KEYWORDS - DOSE RATES, GAMMA RADIATION, HEATING

ACC ABSTRACT 567 01/74

1. NAME OR DESIGNATION OF PROGRAM - 3DB

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108, IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - 3DB IS A THREE-DIMENSIONAL (X-Y-Z,R-THETA-Z,TRIANGULAR-Z) MULTIGROUP DIFFUSION CODE FOR USE IN DETAILED FAST-REACTOR CRITICALITY AND BURNUP ANALYSIS. THE CODE CAN BE USED TO -
   (A) COMPUTE KEFF AND PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION, REACTOR COMPOSITION, AND REACTOR DIMENSIONS BY MEANS OF EITHER A FLUX OR AN ADJOINT MODEL,
   (B) COMPUTE MATERIAL BURNUP USING A FLEXIBLE MATERIAL SHUFFLING SCHEME, AND
   (C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANEOUS SOURCE.

4. METHOD OF SOLUTION - EIGENVALUES ARE COMPUTED BY STANDARD SOURCE-ITERATION TECHNIQUES. GROUP REBALANCING AND SUCCESSIVE OVERRELAXATION WITH LINE INVERSION ARE USED TO ACCELERATE CONVERGENCE. ADJOINT SOLUTIONS ARE OBTAINED BY INVERTING THE INPUT DATA AND REDEFINING THE SOURCE TERMS. MATERIAL BURNUP IS BY REACTOR ZONE. THE BURNUP RATE IS DETERMINED BY THE ZONE AND ENERGY-AVERAGED CROSS SECTIONS WHICH ARE RECOMPUTED AFTER EACH TIME-STEP. THE ISOTOPIC CHAINS, WHICH CAN CONTAIN ANY NUMBER OF ISOTOPES ARE FORMED BY THE USER. THE CODE DOES NOT CONTAIN BUILT-IN OR INTERNAL CHAINS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - SINCE VARIABLE DIMENSIONING IS EMPLOYED, NO SIMPLE BOUNDS CAN BE STATED.

6. TYPICAL RUNNING TIME - A KEFF CALCULATION WITH A 20 X 20 X 20 MESH USING 2 ENERGY GROUPS REQUIRES APPROXIMATELY 30 MINUTES ON A UNIVAC1108. EACH SUCCESSIVE BURNUP TIME-STEP TAKES ABOUT A QUARTER OF THE ABOVE TIME. ON AN IBM360/195 COMPILATION AND LINK EDIT REQUIRE ABOUT 1 MINUTE AND EXECUTION ABOUT 7 MINUTES FOR THE SAMPLE PROBLEM WITH 10 X 10 X 10 MESH USING 2 ZONES AND 2 ENERGY GROUPS.

7. UNUSUAL FEATURES OF THE PROGRAM - THE INPUT DATA ARE ARRANGED SO THE CODE CAN BE USED EASILY FOR KEFF AND SEARCH CALCULATIONS WITHOUT BURDENING THE USER WITH BURNUP PARAMETERS.

8. RELATED AND AUXILIARY PROGRAMS - THE FORMAT OF THE INPUT DATA (E. G. CROSS SECTIONS, GEOMETRY, AND COMPOSITION SPECIFICATIONS) IS COMPATIBLE WITH THE ONE- AND TWO-DIMENSIONAL TRANSPORT CODES DTF4 (ACC ABSTRACT 209) AND 2DF (ACC ABSTRACT 173), THE PERTURBATION CODE PERT5, THE ONE-DIMENSIONAL CROSS SECTION GENERATING CODE 1DX (ACC ABSTRACT 374), AND THE TWO-DIMENSIONAL DIFFUSION BURNUP CODE 2DB (ACC ABSTRACT 325). ALL SIX CODES USE THE SAME INPUT MODULE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED OCTOBER 1972.
IBM360 VERSION SUBMITTED JULY 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - R. W. HARDIE AND W. W. LITTLE, JR., 3DB, A THREE-DIMENSIONAL DIFFUSION THEORY BURNUP CODE, BNWL-1264, MARCH 1970.
K. D. LATHROP, DTF-IV, A FORTRAN-IV PROGRAM FOR SOLVING THE MULTIGROUP TRANSPORT EQUATION WITH ANISOTROPIC SCATTERING, LA-3373, JULY 15, 1965.
2DF, A TWO-DIMENSIONAL TRANSPORT CODE, DEVELOPED AT THE LOS ALAMOS SCIENTIFIC LABORATORY, (UNPUBLISHED).
R. W. HARDIE AND W. W. LITTLE, JR., PERT-V, A TWO-DIMENSIONAL PERTURBATION CODE FOR FAST REACTOR ANALYSIS, BNWL-1162, SEPTEMBER 1969.
R. W. HARDIE AND W. W. LITTLE, JR., 1DX, A ONE-DIMENSIONAL DIFFUSION CODE FOR GENERATING EFFECTIVE NUCLEAR CROSS SECTIONS, BNWL-954, MARCH 1969.
W. W. LITTLE, JR. AND R. W. HARDIE, 2DB USERS MANUAL REVISION 1, BNWL-831, REV. 1, FEBRUARY 1969.
NTRAN DESCRIPTION, EXCERPT FROM UNIVAC1107 FORTRAN IV MANUAL, UP-3569, REV. 1.
ETIME,ETIMEF,SETCR DESCRIPTIONS, EXCERPT FROM CSCXRJE/CRJE REFERENCE, VOL. 2, LIBRARY ELEMENTS, F00003-02-00, APRIL 1971.

11. MACHINE REQUIREMENTS - 65K WORD MEMORY AND 11 PERIPHERAL STORAGE DEVICES (UNIVAC1108), 500K BYTES AND SAME NUMBER OF MASS STORAGE UNITS (IBM360)

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC-8 (UNIVAC1108), OS/360 (IBM360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - DUE TO DIFFERENCES IN WORD SIZE, THE IBM VERSION USES DOUBLE PRECISION. IN ADDITION, CERTAIN I/O ROUTINES FROM THE UNIVAC LIBRARY HAD TO BE WRITTEN IN FORTRAN FOR THE IBM VERSION.

15. NAME AND ESTABLISHMENT OF AUTHORS -

1108 R. W. HARDIE AND W. W. LITTLE, JR.
HANFORD ENGINEERING DEVELOPMENT LABORATORY
WESTINGHOUSE HANFORD COMPANY
P. O. BOX 1970
RICHLAND, WASHINGTON 99352

360 W. MROZ
APPLIED MATHEMATICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECKS (1108-2971 CARDS, 360-3804 CARDS)
    SAMPLE PROBLEMS (1108-76 CARDS, 360-76 CARDS)
    CONTROL INFORMATION (JCL 360-30 CARDS)
    REFERENCE REPORT, BNWL-1264, AND EXCERPTS

17. CATEGORY - D
    KEYWORDS - 3-DIMENSIONAL, X-Y-Z, R-THETA-Z, TRIANGULAR-Z, MULTI-GROUP DIFFUSION, FAST REACTORS, CRITICALITY, BURNUP, DTF4 CODES, 2DF CODES, PERT5 CODES, 1DX CODES, 2DB CODES

ACC ABSTRACT 568 02/74

1. NAME OR DESIGNATION OF PROGRAM - BEHAVE2

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE635

3. DESCRIPTION OF PROBLEM OR FUNCTION - BEHAVE2 CALCULATES THE POSITION IN SPACE OF CLADDING, FUEL, AND VOIDAGE IN AN OPERATING OXIDE FUEL PIN WITH UNFAILED CLADDING. AXIAL SYMMETRY IS ASSUMED THROUGHOUT THE PROGRAM. ALSO CALCULATED ARE STRESS, STRAIN, DISPLACEMENT, AND TEMPERATURE FIELDS. INFLUENTIAL PROCESSES SIMULATED INCLUDE CRACKING OF FUEL, DILATATION OF FUEL AND CLADDING DUE TO IRRADIATION EFFECTS AND THERMAL EXPANSION, FUEL DENSIFICATION BY BOTH STRESS- AND DIFFUSION-CONTROLLED PROCESSES, AXIAL SLIPPAGE OR LOCKING AT THE FUEL-CLADDING INTERFACE AND AXIAL FLOW OF FUEL.

4. METHOD OF SOLUTION - THE FINITE-ELEMENT METHOD IS USED IN THE CLADDING AND OUTER FUEL ZONES. DISPLACEMENT COMPATIBILITY IS MAINTAINED AXIALLY AS WELL AS RADIALLY BETWEEN ADJACENT ELEMENTS. CIRCULAR CYLINDRICAL RING ELEMENTS WITH THREE DEGREES OF FREEDOM ARE USED IN THE FUEL AND CLADDING. NO RELATIVE SHEAR DEFORMATION IS PERMITTED BETWEEN RING ELEMENTS, BUT A SPECIAL SHEAR ELEMENT AT THE FUEL-CLADDING INTERFACE PERMITS RELATIVE SLIPPAGE OR PRODUCES FRICTION-INDUCED FUEL PELLET LOCKING. AN INTERIOR INVISCID FUEL ZONE INTERACTS WITH THE OUTER, STRUCTURAL FUEL ZONE AS A CONSTANT PRESSURE BOUNDARY CONDITION. WITHIN THE INVISCID ZONE, AXIAL TRANSFER OF FUEL BY A FLOW PROCESS OCCURS UNDER CERTAIN CONDITIONS. SWELLING OF FUEL AND CLADDING AND FISSION GAS RELEASES ARE REPRESENTED BY EMPIRICALLY DERIVED MODELS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PROGRAM IS DIMENSIONED FOR A MAXIMUM GRID STRUCTURE AS DEFINED BELOW -
   CLADDING DIVIDED RADIALLY INTO 10 RINGS,
   OUTER (STRUCTURAL) FUEL ZONE DIVIDED RADIALLY INTO 10 RINGS,
   MIDDLE (NONTRANSPORT) FUEL REGION DIVIDED RADIALLY INTO 10 RINGS,
   INNER (TRANSPORT) FUEL REGION DIVIDED RADIALLY INTO 10 RINGS,
   FUEL AND CLADDING DIVIDED AXIALLY INTO 5 SECTIONS.

6. TYPICAL RUNNING TIME - A PROBLEM EMPLOYING THE MAXIMUM GRID STRUCTURE IN THE FUEL, 2 RINGS IN THE CLADDING, AND 37 TIME-STEPS REQUIRES ABOUT 13 MINUTES OF GE635 PROCESSOR TIME.

7. UNUSUAL FEATURES OF THE PROGRAM -
   (A) AXIALLY INTERACTIVE EFFECTS ARE CALCULATED.
   (B) CRACKS ARE REPRESENTED AS A CONTINUUM, PRODUCING ZERO STRESS NORMAL TO THE CRACK PLANE. CRACKING OCCURS UNDER ANY POSITIVE STRESS NORMAL TO TWO POSSIBLE DIRECTIONS OF CRACKING, (R,THETA) AND (R,Z) PLANES.
   (C) RAPID CLOSURE OF THE FUEL-CLADDING GAP IS ASSUMED, PERMITTED BY IMMEDIATE CRACKING OF THE FUEL AT THE FIRST APPLICATION OF POWER.

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
   (D) FUEL IS DIVIDED INTO TWO PHENOMENOLOGICAL ZONES, THE INNER ZONE BEING MADE UP OF TWO REGIONS. BOUNDARIES BETWEEN THE ZONES AND REGIONS ARE DEFINED BY TIME-TEMPERATURE RELATIONS AND MOVE IN SPACE AS A FUNCTION OF TIME. CRACK CLOSURE IS ASSUMED IN THE INNER ZONE.
   (E) THE NODAL GRID IS REDEFINED IN THE RADIAL DIRECTION EVERY TIME-STEP BY AVERAGING CONDITIONS FROM THE OLD GRID. A FINE GRID IS IMPOSED IN REGIONS OF RAPIDLY CHANGING PROPERTIES.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   GE635 VERSION SUBMITTED OCTOBER 1972.

10. REFERENCES - S. OLDBERG, JR., BEHAVE-2, OXIDE FUEL PERFORMANCE CODE IN TWO SPATIAL DIMENSIONS AND TIME, GEAP-13788, FEBRUARY 1972.
    LLINK DESCRIPTION, GE NOTE, BN90, PPS. 3-18, 7-1 THROUGH 7-5, 1972.

11. MACHINE REQUIREMENTS - 41K FAST MEMORY

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GECOS III, SAL-3.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
    S. OLDBERG, JR.
    BREEDER REACTOR DEPARTMENT
    GENERAL ELECTRIC COMPANY
    310 DEGUIGNE DRIVE
    SUNNYVALE, CALIFORNIA 94086

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
    MAGNETIC TAPE TRANSMITTAL
    SOURCE DECK (6268 CARDS)
    SAMPLE PROBLEM (37 CARDS)
    CONTROL INFORMATION (129 CARDS)
    SAMPLE PROBLEM OUTPUT (36 SELECTED PAGES)
    REFERENCE REPORT AND GE NOTE

17. CATEGORY - I
    KEYWORDS - FUEL ELEMENTS, STRESSES, CLADDING, THERMAL EXPANSION, FINITE-ELEMENT

ACC ABSTRACT 569 11/73

1. NAME OR DESIGNATION OF PROGRAM - VIEWPIN

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE PROGRAM CALCULATES VIEW FACTORS FOR CYLINDRICAL PINS WHENEVER THE PROBLEM CAN BE REPRESENTED TWO-DIMENSIONALLY.

4. METHOD OF SOLUTION - THE PROGRAM USES A MAXIMUM OF TWO SHADOWING PINS AND PERFORMS A SINGLE INTEGRATION.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE LENGTH OF THE CYLINDRICAL PINS OF THE PHYSICAL PROBLEM MUST BE MUCH GREATER THAN THE DIAMETER OF ANY OF THE PINS.

6. TYPICAL RUNNING TIME - THE CODE WILL CALCULATE FOUR VIEW FACTORS PER SECOND WITH AN ACCURACY EXCEEDING 0.01%, ON THE IBM 360/75.

7. UNUSUAL FEATURES OF THE PROGRAM - A RENORMALIZATION PROCEDURE IS PROVIDED BY THE CODE.

8. RELATED AND AUXILIARY PROGRAMS - RADHT, A ROUTINE FOR COMPUTING RADIATION HEAT TRANSFER IN THE BWR-FLECHT ROD BUNDLE

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED OCTOBER 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCE - G. L. SINGER, VIEWPIN, A FORTRAN PROGRAM TO CALCULATE VIEW FACTORS FOR CYLINDRICAL PINS, ANCR-1054, MARCH 1972.

11. MACHINE REQUIREMENTS - 50K BYTES

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
G. L. SINGER
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (550 CARDS)
SAMPLE PROBLEM (106 CARDS)
CONTROL INFORMATION (JCL 9 CARDS)
LOAD MODULE PROLIBC (39 BLOCKS)
REFERENCE REPORT

17. CATEGORY - J
KEYWORDS - FUEL ELEMENTS, CYLINDERS, RADIATION EFFECTS, 2-DIMENSIONAL, RADHT CODES

1. NAME OR DESIGNATION OF PROGRAM - STRIPE(M0650)

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - STRIPE EXAMINES THE DEFORMATIONS IMPOSED ON THE CLADDING OF CYLINDRICAL FUEL ELEMENTS DUE TO DIFFERENTIAL THERMAL EXPANSIONS DURING ABRUPT POWER INCREASES. THE TITLE IS TAKEN FROM STRESSES AND CRACKING IN PELLETS. THE CALCULATIONAL MODEL INCLUDES EFFECTS OF PELLET CRACKING, THE CONSTRAINT OF SYSTEM PRESSURE AND CLADDING, COMPRESSIVE PLASTIC FLOW IN THE FUEL AND THE TEMPERATURE DEPENDENCE OF MATERIAL PROPERTIES.

4. METHOD OF SOLUTION - THICK-WALLED INTEGRAL SOLUTIONS ARE USED FOR VARIOUS REGIONS OF THE FUEL PELLETS AND CLADDING. TRAPEZOIDAL INTEGRATION IS USED IN FINITE-DIFFERENCE EQUATIONS TO APPROXIMATE THESE INTEGRALS THAT RESULT IN DESCRIBING DIFFERENTIAL THERMAL EXPANSION. THE METHOD OF BISECTION ITERATION SCHEME IS USED TO SOLVE A PAIR OF NONLINEAR ALGEBRAIC-INTEGRAL EQUATIONS TO DETERMINE THE DEPTH OF CRACKING.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   100 RADIAL SECTIONS IN THE FUEL FOR THE COMPUTING GRID
   50 RADIAL SECTIONS IN THE CLAD FOR THE COMPUTING GRID
   ELASTIC-PERFECTLY PLASTIC PROPERTIES ARE USED FOR BOTH THE PELLET AND CLAD.

6. TYPICAL RUNNING TIME - RUNNING TIME IS TYPICALLY ABOUT 5 SECONDS PER CASE. IF PLASTIC FLOW OR CLAD YIELDING CALCULATIONS ARE REQUIRED, THE COMPUTER TIME INCREASES TO ABOUT 30 SECONDS PER CASE.

7. UNUSUAL FEATURES OF THE PROGRAM - STRIPE DETERMINES THE DEPTH OF RADIAL CRACKING AND ITS EFFECTS ON PELLET EXPANSION. IT ACCOUNTS FOR A PLASTIC INNER ZONE IN THE FUEL PELLET AS WELL AS YIELDING OF THE CLADDING. SEVERAL AXIAL RESTRAINT OPTIONS SUCH AS PLANE STRAIN OR PLANE STRESS ARE AVAILABLE.

8. RELATED AND AUXILIARY PROGRAMS - ESSENTIAL TEMPERATURE PROFILES MAY BE OBTAINED FROM OUTPUT OF THE PROGRAM FIGRO (ACC ABSTRACT 272), WHICH SOLVES THE RADIAL HEAT CONDUCTION PROBLEM FOR CYLINDRICAL FUEL ELEMENTS, USING A TEMPERATURE VARYING THERMAL CONDUCTIVITY FOR OXIDE FUELS. STRIPE USES THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   CDC6600 VERSION SUBMITTED NOVEMBER 1972.

10. REFERENCES - W. J. O'DONNELL, W. G. CLARKE, AND W. R. CAMPBELL, AN ANALYSIS OF TRANSIENT CLAD STRAINS IN CYLINDRICAL FUEL ELEMENTS INCLUDING THE EFFECTS OF OXIDE PELLET CRACKING (STRIPE), WAPD-TM-652, FEBURARY 1970.

10. REFERENCES (CONTINUED)
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.

11. MACHINE REQUIREMENTS - 45,000 OCTAL LOCATIONS OF CENTRAL MEMORY

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
W. J. O'DONNELL
O'DONNELL AND ASSOCIATES, INC.
5100 CENTRE AVENUE
PITTSBURGH, PENNSYLVANIA 15232
W. G. CLARKE AND W. R. CAMPBELL
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (987 CARDS)
SAMPLE PROBLEM (114 CARDS)
REFERENCE REPORT, WAPD-TM-652

17. CATEGORY - I
KEYWORDS - DEFORMATION, CYLINDERS, FUEL ELEMENTS, CLADDING, THERMAL EXPANSION, STRESSES

1. NAME OR DESIGNATION OF PROGRAM - CHECK3/RIGEL3

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600, IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THESE PROGRAMS ARE USED TO PROCESS ENDF/B VERSION III DATA. IN ADDITION, THE CDC6600 PROGRAMS WILL PROCESS ENDF/B VERSION IV DATA. CHECK3 CHECKS THAT THE ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERYWHERE POSITIVE. RIGEL3 WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTO FROM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE-VERSA) AND CHANGE TAPE MODE.

4. METHOD OF SOLUTION - IN CHECK3 MOST DATA ARE SUBMITTED TO RANGE LIMIT CHECKS TO INSURE THE STRUCTURE AGREES WITH ENDF/B-DEFINED SPECIFICATIONS. THE DEVIANT POINT CHECK (DETECTION OF MISPUNCHED VALUES) IS ACCOMPLISHED BY SEQUENTIALLY CHECKING FIVE DATA POINTS, TWO POINTS ON EITHER SIDE OF THE POINT UNDER SCRUTINY, FORWARD EXTRAPOLATION ON THE FIRST TWO POINTS, REVERSE EXTRAPOLATION ON THE FOURTH AND FIFTH, AND INTERPOLATIONS BETWEEN THE SECOND AND FOURTH POINTS. IF THE THIRD POINT DOES NOT FALL WITHIN THE RANGE OF THE VALUES CALCULATED BY EXTRAPOLATIONS AND INTERPOLATION, THE VALUE IS LISTED AS DEVIANT. IN ESSENCE, THE ABOVE PROCEDURE MERELY SIMULATES A CHECKING OF GRAPHICAL DATA BY EYE. CHECKING OF LEGENDRE COEFFICIENTS FOR FEASIBILITY AND POSITIVITY IS ACCOMPLISHED BY CONVERTING THE COEFFICIENTS TO MOMENTS, CHECKING WHETHER MOMENTS ARE PHYSICALLY POSSIBLE AND TESTING WHETHER THE LEGENDRE EXPANSION IS NEGATIVE WITHIN THE INTERVAL -1 TO 1 BY THE STURM SEQUENCE METHOD. IF THE LEGENDRE EXPANSION IS NEGATIVE, IT IS DEFINED OVER THE NEGATIVE REGION(S) AND INTEGRATED, THUS DETERMINING THE TOTAL NEGATIVE PROBABILITY.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - IN CHECK3 CORRECT STRUCTURE OF THE DATA TAPE IS ASSUMED AND MINOR ANOMALIES ARE NOTED. COMMON AND MAJOR IRREGULARITIES CAUSE TERMINATION OF EXECUTION ACCOMPANIED BY A CORE DUMP.

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM - IN CHECK3 THERE ARE TWO OUTPUT OPTIONS - (A) LONG FORM, WHICH LISTS EACH CARD IMAGE AS WELL AS THE ANOMALIES ENCOUNTERED, AND (B) SHORT FORM, WHICH LISTS ONLY THE ANOMALIES ENCOUNTERED BY THE PROGRAM (MINIMUM OUTPUT OPTION).

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSIONS OF CHECK3 AND RIGEL3 SUBMITTED AUGUST

9. STATUS (CONTINUED)
1972.
IBM360 VERSION OF RIGEL3 SUBMITTED JUNE 1972.

10. REFERENCE - NATIONAL NEUTRON CROSS SECTION CENTER, DESCRIPTION OF THE ENDF/B PROCESSING CODES AND RETRIEVAL SUBROUTINES, BNL-50300 (ENDF-110), SEPTEMBER 1967, REVISED APRIL 1969, REVISED SEPTEMBER 1970, REVISED JUNE 1971.

11. MACHINE REQUIREMENTS - FOR CHECK3 2 SCRATCH DEVICES

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE (CDC6600), OS/360 (IBM360).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

6600 CODELLI OZER
NATIONAL NEUTRON CROSS SECTION CENTER
BROOKHAVEN NATIONAL LABORATORY
UPTON, LONG ISLAND, NEW YORK 11973

360 E. M. PENNINGTON
APPLIED PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (CHECK3 6600-3455 CARDS, RIGEL3 6600-2125 CARDS, 360-2123 CARDS)
REFERENCE REPORT

17. CATEGORY - M
KEYWORDS - DATA PROCESSING, CROSS SECTIONS, GRAPHS, INPUT DATA, ENDF/B, LIBRARIES, MAINTENANCE, RETRIEVAL

1. NAME OR DESIGNATION OF PROGRAM - XLACS

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - XLACS CALCULATES FINE-GROUP AVERAGED NEUTRON CROSS SECTIONS FROM ENDF/B DATA. ITS PRIMARY PURPOSE IS TO PRODUCE FULL RANGE MULTIGROUP LIBRARIES FOR THE XSDRN PROGRAM (ACC ABSTRACT 493). PROVISIONS ARE INCLUDED FOR TREATING FAST, RESONANCE, AND THERMAL ENDF/B DATA. FINE-GROUP ENERGY STRUCTURES AND EXPANSION ORDERS USED TO REPRESENT DIFFERENTIAL CROSS SECTIONS FOR XSDRN CAN BE ARBITRARILY SET BY THE USER. CROSS SECTIONS CAN BE AVERAGED OVER AN ARBITRARY INPUT WEIGHTING FUNCTION OR BY ANY OF SEVERAL BUILT-IN FUNCTIONS.

4. METHOD OF SOLUTION - IN THE RESOLVED RESONANCE RANGE XLACS ACCEPTS EITHER SINGLE OR MULTI-LEVEL BREIT-WIGNER PARAMETERS AND CALCULATES INFINITE DILUTION AND BACKGROUND CROSS SECTIONS CONSISTENT WITH THE NORDHEIM INTEGRAL TREATMENT USED IN XSDRN. DOPPLER BROADENING IS PROVIDED THROUGH THE USE OF PSI AND CHI ROUTINES. THE UNRESOLVED TREATMENT STEMS FROM MC**2 (ACC ABSTRACT 355) BUT HAS BEEN MODIFIED TO TREAT THE OVERLAP OF UNRESOLVED RESONANCE SEQUENCES. UNRESOLVED CROSS SECTIONS INCLUDE SOME SHIELDING EFFECTS THROUGH A (1/SIGMAT) WEIGHTING AND CAN INCLUDE DOPPLER BROADENING. SMOOTH CROSS SECTIONS ARE CALCULATED BY AVERAGING THE ENDF/B POINT DATA OVER EITHER A USER-SUPPLIED INPUT SPECTRUM OR BUILT-IN SPECTRA. ELASTIC SCATTERING MATRICES ARE COMPUTED FROM THE SCATTERING ANGULAR DISTRIBUTION DATA SPECIFIED AS LEGENDRE EXPANSION COEFFICIENTS. AN INELASTIC SCATTERING TREATMENT IS PROVIDED FOR ALL PRESENT FORMS OF ENDF/B FILE 5 DATA USING EITHER A DISCRETE LEVEL OR AN EVAPORATION MODEL. THERMAL CROSS SECTION MATRICES ARE CALCULATED THROUGH THE USE OF PROCEDURES TAKEN FROM THE FLANGE2 CODE (ACC ABSTRACT 368).

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PRINCIPAL RESTRICTION IS THE AVAILABILITY OF ADEQUATE CORE STORAGE TO ASSIMILATE REQUIRED ARRAYS. THE CODE IS FLEXIBLY-DIMENSIONED WHICH MEANS THAT ARRAY SIZES ARE SET FOR THE PARTICULAR PROBLEM AT EXECUTION TIME. CORE STORAGE REQUIREMENTS ARE NOT AFFECTED BY THE NUMBER OF NUCLIDES IN A CASE.

6. TYPICAL RUNNING TIME - RUNNING TIME IS A FUNCTION OF NUMBER OF RESONANCES, NUMBER OF GROUPS, DOPPLER BROADENING, AND NUMBER OF THERMAL SCATTERING KERNELS BEING CALCULATED. A U238 CALCULATION WITH 68 GROUPS, NO THERMAL CALCULATION, AND NO DOPPLER BROADENING REQUIRES 1.65 MINUTES. A PU239 CALCULATION WITH 123 GROUPS (30 THERMAL), ONE THERMAL KERNEL, AND DOPPLER BROADENING TAKES 6.72 MINUTES. THE CALCULATION OF BOTH FE AND H2O WITH 123 GROUPS (30 THERMAL), AND ONE THERMAL KERNEL REQUIRES 4.74 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM - IN CONTRAST WITH MOST ENDF/B PROCESSING PROGRAMS, THE VARIABLE DIMENSIONING TECHNIQUE EMPLOYED

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
BY XLACS PERMITS OPTIMAL USE OF AVAILABLE CORE STORAGE. THE PROGRAM TREATS BOTH FAST AND THERMAL ENDF/B DATA IN A SINGLE CALCULATION. MIXED ENDF/B TAPE MODES (BCD AND BINARY) ARE PERMITTED. FOR CONVENIENCE, EDITING, UPDATING, AND PLOTTING CAPABILITIES ARE PROVIDED.

8. RELATED AND AUXILIARY PROGRAMS - WHEN ANGULAR DISTRIBUTIONS OF SECONDARY NEUTRONS ARE SPECIFIED AS TABULAR FUNCTIONS THE SAD PROGRAM MUST BE USED PRIOR TO RUNNING XLACS TO CONVERT THE DATA TO LEGENDRE EXPANSION COEFFICIENTS. THE XSDRN PROGRAM USES THE CROSS SECTIONS GENERATED BY XLACS. HOWEVER, THE XSDRN TAPE FORMAT PRODUCED BY XLACS IS SOMEWHAT MORE GENERAL THAN THE TAPE FORMAT USED BY PRESENT XSDRN CODES. AN AUXILIARY PROGRAM, CONVERT, IS AVAILABLE TO CONVERT TO THE USABLE FORMAT.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED NOVEMBER 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - N. M. GREENE, J. L. LUCIUS, J. E. WHITE, R. Q. WRIGHT, C. W. CRAVEN, JR., AND M. L. TOBIAS, XLACS, A PROGRAM TO PRODUCE FINE GROUP AVERAGED NEUTRON CROSS SECTIONS FROM ENDF/B, ORNL-TM-3646, APRIL 3, 1972.

M. K. DRAKE, EDITOR, DATA FORMATS AND PROCEDURES FOR THE ENDF NEUTRON CROSS SECTION LIBRARY, BNL-50279, OCTOBER 1970.

N. M. GREENE AND C. W. CRAVEN, JR., XSDRN, A DISCRETE ORDINATES SPECTRAL AVERAGING CODE, ORNL-TM-2500, JULY 1969.

L. W. NORDHEIM, THE THEORY OF RESONANCE ABSORPTION, SYMPOSIUM ON APPLIED MATHEMATICS, VOL. 11, 1961.

D. M. O'SHEA, B. J. TOPPEL, AND A. L. RAGO, MC**2 - A CODE TO CALCULATE MULTIGROUP CROSS SECTIONS, ANL-7318, JUNE 1967.

H. C. HONECK AND D. R. FINCH, FLANGE-II, A CODE TO PROCESS THERMAL NEUTRON DATA FROM AN ENDF/B TAPE, DP-1278, OCTOBER 1971.

11. MACHINE REQUIREMENTS - 330K BYTES OF CORE STORAGE AND EXTERNAL STORAGE DEVICES SUCH AS MAGNETIC TAPES OR DISKS

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM IS PRESENTLY USED IN A 3-LEVEL OVERLAY STRUCTURE CONSISTING OF 19 SEPARATE SEGMENTS. TWO FUNCTIONS, MODEL AND ICLOCK, ARE NOT INCLUDED WITH THE PROGRAM AND SHOULD BE DUMMIED OUT.

15. NAME AND ESTABLISHMENT OF AUTHORS -
N. M. GREENE, J. L. LUCIUS, J. E. WHITE,
R. Q. WRIGHT, C. W. CRAVEN, JR., AND M. L. TOBIAS

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (XLACS 12,973 CARDS, CONVERT 593 CARDS)
SAMPLE PROBLEMS (XLACS 47 CARDS)
CONTROL INFORMATION (XLACS 80 CARDS)
LOAD MODULE XLAC (567 BLOCKS)
SAMPLE PROBLEM OUTPUT ON TAPE (PROBLEM1 99 BLOCKS, PROBLEM2 89 BLOCKS)
SAMPLE PROBLEM OUTPUT (42 SELECTED PAGES)
REFERENCE REPORT, ORNL-TM-3646

17. CATEGORY - B
KEYWORDS - NEUTRON CROSS SECTIONS, MULTIGROUP LIBRARIES, ENDF/B, XSDRN CODES, SAD CODES, MC**2 CODES, FLANGE2 CODES

1. NAME OR DESIGNATION OF PROGRAM - TWOTRAN-PNVW

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600/7600

3. DESCRIPTION OF PROBLEM OR FUNCTION - TWOTRAN-PNVW SOLVES TWO-DIMENSIONAL PARTICLE TRANSPORT PROBLEMS FOR X-Y, R-Z, AND R-THETA GEOMETRIES. BOTH DIRECT AND ADJOINT, HOMOGENEOUS (KEFF OR PARAMETRIC EIGENVALUE SEARCHES) OR INHOMOGENEOUS TIME-INDEPENDENT PROBLEMS ARE SOLVED SUBJECT TO VACUUM, REFLECTIVE, PERIODIC OR INPUT SPECIFICATION OF BOUNDARY FLUX CONDITIONS. BOTH ANISOTROPIC INHOMOGENEOUS PROBLEMS AND GENERAL ANISOTROPIC SCATTERING PROBLEMS ARE TREATED.

4. METHOD OF SOLUTION - TWOTRAN-PNVW IS DESIGNED TO SOLVE DISCRETE ORDINATES EQUATIONS THAT HAVE BEEN CONVERTED TO EQUATIONS LIKE SPHERICAL HARMONICS EQUATIONS TO ELIMINATE RAY EFFECTS. THE CONVERSION IS ACCOMPLISHED BY USING A SPECIALLY CONSTRUCTED SOURCE. CONSTRUCTION OF THE SPECIAL SOURCE IS OPTIONAL SO THAT NORMAL DISCRETE ORDINATES EQUATION SOLUTIONS ARE ALSO POSSIBLE. SPACE DEPENDENCE IS APPROXIMATED USING A VARIABLE-WEIGHTED DIAMOND-DIFFERENCE SCHEME FOR CALCULATING SPATIAL DERIVATIVES. ENERGY DEPENDENCE IS TREATED BY THE MULTIGROUP APPROXIMATION. ANISOTROPIC SCATTERING AND ANISOTROPIC INHOMOGENEOUS SOURCES ARE REPRESENTED BY FINITE SPHERICAL HARMONICS EXPANSIONS. WITHIN GROUP ITERATIONS, KEFF ITERATIONS AND EIGENVALUE SEARCH ITERATIONS ARE ACCELERATED BY A COARSE MESH PARTICLE REBALANCING ALGORITHM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE VARIABLE-DIMENSIONING CAPABILITY OF FORTRAN IV IS USED SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A COMMON VECTOR LENGTH LESS THAN MAXLEN CAN BE USED. MAXLEN IS SLIGHTLY GREATER THAN 40,000 WORDS FOR THE CDC7600. WITH A FEW EXCEPTIONS ONLY WITHIN-GROUP PROBLEM DATA ARE STORED IN FAST MEMORY. DATA FOR ALL OTHER GROUPS ARE STORED IN AUXILIARY STORAGE. ARBITRARY NUMBERS OF GROUPS OF UP OR DOWN SCATTERING ARE ALLOWED.

6. TYPICAL RUNNING TIME - A ONE-GROUP, S8 CONVERTED TO P5, ISOTROPIC PROBLEM WITH MESH SIZE 20 X 20 REQUIRES 12 SECONDS ON THE CDC7600.

7. UNUSUAL FEATURES OF THE PROGRAM - UNUSUAL FEATURES INCLUDE OPTIONAL SPHERICAL HARMONIC OR DISCRETE ORDINATE SOLUTION, COARSE MESH CONVERGENCE ACCELERATION, COARSE MESH SPATIAL AND ANGULAR ORGANIZATION TO PERMIT LARGER PROBLEMS, GENERAL ANISOTROPIC SCATTERING AND INHOMOGENEOUS SOURCE OPTION, INPUT SPECIFICATION OF TOP, BOTTOM OR RIGHT BOUNDARY FLUXES, BUILT-IN DISCRETE ORDINATES CONSTANTS (S2, S4, ...S16) AND FIDO CROSS SECTION INPUT OPTION.

8. RELATED AND AUXILIARY PROGRAMS - TWOTRAN GENERAL-GEOMETRY (ACC ABSTRACT 358)

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED NOVEMBER 1972.

10. REFERENCES - K. D. LATHROP, F. W. BRINKLEY, AND P. ROOD, THEORY AND USE OF THE SPHERICAL HARMONICS, FIRST COLLISION SOURCE, AND VARIABLE WEIGHT VERSIONS OF THE TWOTRAN PROGRAM, LA-4600, MARCH 1972.

K. D. LATHROP AND F. W. BRINKLEY, THEORY AND USE OF THE GENERAL-GEOMETRY TWOTRAN PROGRAM, LA-4432, MAY 1970.

RAY DAVENPORT (ED.), ELEMENTARY GUIDE TO THE CONTROL DATA 7600, UNIVERSITY OF CALIFORNIA, LOS ALAMOS SCIENTIFIC LABORATORY, PROGRAMMERS INFORMATION MANUAL, VOL. 5A, 1972.

11. MACHINE REQUIREMENTS - 5 OUTPUT UNITS (DISK, DRUMS OR TAPES) IN ADDITION TO 2 SYSTEM INPUT/OUTPUT UNITS, A CDC EXTENDED CORE STORAGE UNIT OR A LARGE BULK MEMORY (DISK, DRUMS OR TAPES CAN BE SUBSTITUTED FOR THIS REQUIREMENT)

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OROS.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

K. D. LATHROP AND F. W. BRINKLEY
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (6394 CARDS)
SAMPLE PROBLEM (86 CARDS)
SAMPLE PROBLEM OUTPUT (30 PAGES)
REFERENCE REPORT, LA-4600

17. CATEGORY - C
KEYWORDS - 2-DIMENSIONAL, X-Y, R-Z, R-THETA, TRANSPORT THEORY, SPHERICAL HARMONICS, TWOTRAN GENERAL GEOMETRY CODES

ACC ABSTRACT 574 12/73

1. NAME OR DESIGNATION OF PROGRAM - MACS LATTICE VIBRATION CODES

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THIS PACKAGE OF SEVEN RELATED CODES IS BASICALLY AIMED AT GIVING MAXIMUM CAPABILITY FOR CALCULATING SLOW-NEUTRON SCATTERING BY MODERATORS.

MACS-C COMPUTES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF PARTS ARISING FROM SHORT-RANGE FORCES AND LONG-RANGE COULOMB INTERACTIONS. IT ALSO OBTAINS JACOBIAN MATRICES FOR DETERMINING ADJUSTMENTS IN FORCE CONSTANTS AND IONIC CHARGE WHICH CAN LEAD TO IMPROVED AGREEMENT WITH DATA. STRUCTURE FACTORS FOR NEUTRON INELASTIC SCATTERING CAN ALSO BE CALCULATED.

MACS-J COMPUTES THE DYNAMICAL MATRIX FOR THE HARMONIC OSCILLATIONS OF A CRYSTAL, ITS EIGENVALUES AND EIGENVECTORS, THE CORRESPONDING STRUCTURE FACTORS FOR COHERENT SINGLE-PHONON SCATTERING OF NEUTRONS, AND JACOBIAN MATRICES FOR USE IN ADJUSTING FORCE CONSTANTS TO FIT CALCULATED TO OBSERVED DISPERSION CURVES.

REVISED-D CALCULATES VALANCE COORDINATES IN TERMS OF MASS ADJUSTED ATOM DISPLACEMENTS, TOGETHER WITH COORDINATES WHICH DEFINE RIGID GROUP ROTATIONS.

REVISED-MVFC CONSTRUCTS FORCE CONSTANT MATRICES FOR USE IN VALANCE FORCE POTENTIAL FUNCTIONS WHICH ARE USED IN OTHER PROGRAMS DEALING WITH MOLECULAR AND CRYSTAL VIBRATIONS.

ADJUSTER IS A FORCE ADJUSTER PROGRAM TO OBTAIN A LEAST SQUARES FIT TO OBSERVED FREQUENCIES OF MOLECULES AND CRYSTALS.

DIPOLE-SUM CALCULATES DIPOLE SUMS FOR AN ARBITRARY CRYSTAL.

MODEL-PI CALCULATES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF SHORT-RANGE AND LONG-OR INTERMEDIATE-RANGE TERMS IN THE DIPOLE COORDINATE APPROXIMATION. IT ALSO OBTAINS JACOBIAN MATRICES FOR USE IN ADJUSTING INPUT PARAMETERS.

4. METHOD OF SOLUTION -

IN MACS-C, ADJUSTER, AND REVISED-D, MATRIX MANIPULATIONS ARE APPLIED TO MATRICES WHICH DESCRIBE PHYSICAL CONDITIONS.

IN MACS-J, FIRST-ORDER DIFFERENCE EQUATIONS ARE SUBSTITUTED FOR PARTIAL DIFFERENTIAL EQUATIONS FOR JACOBIAN ELEMENTS.

IN MVFC THE USER EMPLOYS A SET OF CRITERIA FOR DEFINING DIFFERENT TYPES OF INTERACTIONS TO PREPARE BY HAND THE INPUT TO THE PROGRAM. FOR EXAMPLE, IF TWO-ANGLE COORDINATES WHICH HAVE A COMMON ATOM AT THE END OF A LEG OF EACH ANGLE INTERACT, THE USER MUST SPECIFY THE ASSOCIATED CRITERIA WHICH INCLUDE THE DISTANCE BETWEEN THE TWO APEX ATOMS AND BETWEEN THE FARTHEST SEPARATED LEG ATOMS. THE REVISED-MVFC CODE USES THE POSITIONS IN THE PRIMITIVE CELL AND SEARCHES FOR ALL COORDINATE INTERACTIONS WHICH SATISFY EACH OF THE CRITERIA STIPULATED IN MVFC. THE USER IS SPARED THE TEDIOUS TASK OF CALCULATING ANGLES BETWEEN BONDS, DISTANCES BETWEEN ATOMS, ETC.

IN DIPOLE-SUM, THE PROCEDURE OF KAPLAN AND SULLIVAN IS APPLIED.

IN MODEL-PI, THE EIGENVALUES AND EIGENVECTORS OF A COMPLEX HERMITIAN MATRIX ARE USED.

5. RESTRICTIONS UPON THE COMPLEXITY OF THE PROBLEM -
FOR ALL CODES WHICH PRODUCE EIGENVECTORS, NEARLY EQUAL EIGENVALUES CAN BE ENCOUNTERED, IN WHICH CASE THE BASIS VECTORS FOR THE CORRESPONDING VECTOR SUBSPACE ARE NOT UNIQUELY DETERMINED.
IN MACS-C, THE LARGEST JACOBIAN MATRIX WHICH CAN BE COMPUTED IS 40 X 15. THE LARGEST FORCE CONSTANT VECTOR APPLIED IS OF DIMENSION 15. THE LARGEST REAL OR COMPLEX MATRICES ARE 40 X 40.
IN MACS-J, THE LARGEST REAL AND COMPLEX MATRICES ARE 32 X 32. THE LARGEST FORCE CONSTANT VECTOR IS OF DIMENSION 50.
IN REVISED-D, THE LARGEST NUMBER OF ELEMENTS IN 3-DIMENSIONAL ARRAYS IS 2400. THE MAXIMUM NUMBER OF GROUPS IS 20. THE MAXIMUM NUMBER OF ATOMS PER GROUP IS 50. THE LARGEST FORCE CONSTANT VECTOR IS OF DIMENSION 30.
IN REVISED-MVFC, THE LARGEST INDICES OF 3-DIMENSIONAL VARIABLES ARE (20,8,8). THE LARGEST MATRICES ARE 150 X 150. THE DIMENSION OF THE LARGEST FORCE CONSTANT VECTOR IS 60.
IN ADJUSTER, THE LARGEST MATRICES ARE 32 X 32.
IN DIPOLE-SUM, THE LARGEST NUMBER OF ALPHA-BETA PAIRS IS 15. THE LARGEST NUMBER OF K-KPRIME PAIRS IS 15.
IN MODEL-PI, THERE CANNOT BE MORE THAN 4 DIPOLES PER PRIMITIVE CELL. THE LARGEST MATRICES ARE 32 X 32. THE DIMENSION OF THE LARGEST FORCE CONSTANT VECTOR IS 50.

6. TYPICAL RUNNING TIME -
A MACS-C SAMPLE PROBLEM DEALING WITH 6 MATRICES OF SIZE 16 X 6 REQUIRES LESS THAN 3 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 42 SECONDS.
A MACS-J SAMPLE PROBLEM DEALING WITH 6 MATRICES OF SIZE 16 X 6 AND 7 DIMENSIONAL FORCE CONSTANT VECTORS REQUIRES LESS THAN 50 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 74 SECONDS.
A REVISED-D SAMPLE PROBLEM DEALING WITH 6 ATOM GROUPS CONTAINING (4,4,2,2,2,2) ATOMS REQUIRES LESS THAN 4 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 26 SECONDS.
A REVISED-MVFC SAMPLE PROBLEM WHICH DEFINES 21 ELEMENTS IN F, USING 8 ATOMS IN EACH OF 2 GROUPS REQUIRES LESS THAN 10 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 47 SECONDS.
AN ADJUSTER SAMPLE PROBLEM DEALING WITH A 13 X 6 MATRIX REQUIRES LESS THAN 7 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 25 SECONDS.
A DIPOLE-SUM SAMPLE PROBLEM WITH 4 ATOM POSITIONS REQUIRES LESS THAN 10 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 27 SECONDS.
A MODEL-PI SAMPLE PROBLEM DEALING WITH FIVE 32 X 12 MATRICES REQUIRES LESS THAN 92 SECONDS WITH COMPILE-RUN-WAIT TIME LESS THAN 140 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM - VALENCE FORCE POTENTIAL FUNCTIONS FOR CRYSTALS MAY BE USED AS WELL AS CONVENTIONAL INTERACTIONS BETWEEN ATOM PAIRS.

8. RELATED AND AUXILIARY PROGRAMS -
MACS-C IS A REVISION OF AT LEAST TWO PREDECESSOR CODES. THE IMPROVEMENTS AND REASONS FOR THE CHANGES ARE DESCRIBED IN DETAIL IN REFERENCE REPORT IN-1280.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSIONS SUBMITTED NOVEMBER 1972, SAMPLE PROBLEMS EXECUTED BY ACC.

10. REFERENCES - J. K. BOYTER, H. L. MCMURRY, A. W. SOLBRIG, JR., AND R. M. MARTIN, MACS C, A COMPUTING PROGRAM FOR CRYSTAL VIBRATIONS WHICH INCLUDES LONG-RANGE COULOMB INTERACTIONS, IN-1280, MARCH 1969.

J. K. BOYTER AND A. W. SOLBRIG, JR., MACS J, A PROGRAM FOR COMPUTING CRYSTAL PHONON DISPERSION RELATIONS, STRUCTURE FACTORS FOR NEUTRON INELASTIC SCATTERING, AND JACOBIAN MATRICES, IN-1147, JANUARY 1968.

J. K. BOYTER AND H. L. MCMURRY, REVISED D, A COMPUTER PROGRAM FOR CALCULATING VALENCE COORDINATES IN TERMS OF MASS ADJUSTED ATOM DISPLACEMENTS, TOGETHER WITH COORDINATES DEFINING RIGID GROUP ROTATIONS, AND NOTE P00441 (PPCO 40*1176), JANUARY 1969.

J. K. BOYTER AND H. L. MCMURRY, REVISED MVFC, A COMPUTER PROGRAM FOR CONSTRUCTING FORCE CONSTANT MATRICES FOR USE IN VALENCE FORCE POTENTIAL FUNCTIONS IN MOLECULES AND CRYSTALS, AND NOTE P00311, AUGUST 1969.

J. K. BOYTER AND H. L. MCMURRY, MVFC, A COMPUTER PROGRAM FOR CONSTRUCTING FORCE CONSTANT MATRICES FOR USE IN VALENCE FORCE POTENTIAL FUNCTIONS IN MOLECULES AND CRYSTALS, IN-1282, APRIL 1969.

J. K. BOYTER AND H. L. MCMURRY, ADJUSTER, A FORCE CONSTANT ADJUSTER PROGRAM TO OBTAIN LEAST SQUARES FIT TO OBSERVED FREQUENCIES OF MOLECULES AND CRYSTALS, IN-1148, DECEMBER 1967.

J. K. BOYTER AND T. G. WORLTON, DIPOLE SUM, A COMPUTER PROGRAM FOR CALCULATING DIPOLE SUMS FOR AN ARBITRARY CRYSTAL, IN-1226, OCTOBER 1968.

W. J. SUITT AND A. W. SOLBRIG, JR., MODEL PI, AND NOTE P01800, JULY 1970.

H. KAPLAN AND J. J. SULLIVAN, PHYSICAL REVIEW, VOL. 130, P. 120, 1963.

11. MACHINE REQUIREMENTS - 650K BYTES OF CORE ARE REQUIRED FOR EACH OF THE PROGRAMS.

IN ADDITION TO STANDARD INPUT/OUTPUT, MACS-C USES SCRATCH UNITS 1, 2, 3, 4, 8, 9, AND 10. 162K OF LCS WAS INDICATED AFTER COMPILING.

IN ADDITION TO STANDARD INPUT/OUTPUT, MACS-J USES SCRATCH UNITS 1, 2, 3, 4, 8, 9, AND 10. 158K OF LCS WAS INDICATED AFTER COMPILING.

144K OF LCS WAS INDICATED AFTER COMPILING REVISED-D.

356K OF LCS WAS INDICATED AFTER COMPILING REVISED-MVFC.

100K OF LCS WAS INDICATED AFTER COMPILING ADJUSTER.

50K OF LCS WAS INDICATED AFTER COMPILING DIPOLE-SUM.

IN ADDITION TO STANDARD INPUT/OUTPUT, MODEL-PI USES SCRATCH UNITS 2, 3, 4, 8, 9, 11, 12, 13, 14, 15, 16, AND 17. 330K OF LCS WAS INDICATED AFTER COMPILING.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE SOURCE PROGRAMS REQUIRE THE FORTH450 COMPILER USING 650K.
MACS-J RESULTS CAN BE AFFECTED BY CROSS-OVER ERRORS IN CERTAIN PARTS OF JACOBIAN RESULTS. SEE PAGE 10 OF REFERENCE IN-1147. THE SAMPLE PROBLEM RESULTS CONTAINED NEARLY EQUAL EIGENVALUES, AS DID SAMPLE PROBLEMS FOR MACS-C AND MODEL PI.
REVISED-D RESULTS FOR RIGID GROUP ROTATIONS MAY BE IN ERROR AND SHOULD BE CAREFULLY EXAMINED. SEE PAGE 2, REFERENCE P00441.
REVISED-MVFC INSERTS 7.7777E-07 INTO THE CALCULATIONS WHEN THE NUMBER OF UNIQUE INTERACTIONS FOR TWO SETS OF COORDINATES OF A PARTICULAR INTERACTION TYPE EXCEEDS TWENTY.

15. NAME AND ESTABLISHMENT OF AUTHORS -

H. L. MCMURRY AND W. J. SCITT
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401
T. G. WORLTON
SOLID STATE SCIENCE DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439
R. M. MARTIN
XEROX CORPORATION
XEROX PARK
3180 PORTER DRIVE
PALO ALTO, CALIFORNIA 94304

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (MACS-C 1259 CARDS, MACS-J 1208 CARDS, REVISED-D 947 CARDS, REVISED-MVFC 1518 CARDS, ADJUSTER 195 CARDS, DIPOLE-SUM 212 CARDS, MODEL-PI 1919 CARDS)
SAMPLE PROBLEMS (MACS-C 190 CARDS, MACS-J 274 CARDS, REVISED-D 56 CARDS, REVISED-MVFC 145 CARDS, ADJUSTER 20 CARDS, DIPOLE-SUM 18 CARDS, MODEL-PI 234 CARDS)
CONTROL INFORMATION (MACS-C 14 CARDS, MACS-J 14 CARDS, REVISED-D 6 CARDS, REVISED-MVFC 6 CARDS, ADJUSTER 6 CARDS, DIPOLE-SUM 6 CARDS, MODEL-PI 30 CARDS)
SAMPLE PROBLEM OUTPUT (MACS-C 3 PAGES, MACS-J 26 SELECTED PAGES, REVISED-D 11 PAGES, REVISED-MVFC 41 SELECTED PAGES, DIPOLE-SUM 3 PAGES, MODEL-PI 35 SELECTED PAGES)
REFERENCE REPORTS AND NOTES

17. CATEGORY - W
KEYWORDS - CRYSTAL VIBRATIONS, NEUTRON INELASTIC SCATTERING, EIGENSYSTEMS, MODERATORS

ACC ABSTRACT 575 02/74

1. NAME OR DESIGNATION OF PROGRAM - MSCAT

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - IN A THERMAL NEUTRON SCATTERING EXPERIMENT, THE MEASURED CROSS SECTION INCLUDES BOTH SINGLE AND MULTIPLE SCATTERING EVENTS. IN ORDER TO EXTRACT THE SINGLE SCATTERING CROSS SECTION, THE CROSS SECTION FOR MULTIPLE SCATTERING MUST BE KNOWN. SINCE THIS CONTRIBUTION IS GENERALLY A SMOOTHER FUNCTION OF ANGLE AND SCATTERED ENERGY THAN THE SINGLE SCATTERING, IT IS LESS SENSITIVE TO DETAILS OF THE SINGLE SCATTERING CROSS SECTION. IT IS THEREFORE FEASIBLE TO CALCULATE THE MULTIPLE SCATTERING USING AN APPROXIMATE SCATTERING FUNCTION, AND TO SUBTRACT IT FROM THE MEASUREMENTS IN ORDER TO OBTAIN THE SINGLE SCATTERING. MSCAT CALCULATES THE SINGLE AND MULTIPLE SCATTERING CROSS SECTIONS, FOR A SPECIFIED EXPERIMENTAL SITUATION, GIVEN A SINGLE SCATTERING FUNCTION AS INPUT.

4. METHOD OF SOLUTION - MSCAT IS ADAPTED FROM A PROGRAM WRITTEN BY BISCHOFF (SEE REFERENCE 2). THE BASIC STRUCTURE IS UNCHANGED, BUT MANY MODIFICATIONS HAVE BEEN INCORPORATED IN ORDER TO TREAT A WIDER VARIETY OF PROBLEMS. GIVEN A SCATTERING FUNCTION, THE PROGRAM TRACKS SUCCESSIVE NEUTRONS WITHIN THE SAMPLE AND/OR SAMPLE CONTAINER IN A MONTE CARLO FASHION. AT EACH SCATTERING POINT, THE RESPONSE, WITHIN EACH TIME CHANNEL AND FOR EACH DETECTOR, IS CALCULATED. A CUTOFF IS IMPOSED TO AVOID TRACKING NEUTRONS INDEFINITELY. SINGLE AND MULTIPLE SCATTERING CONTRIBUTIONS FOR EACH TIME CHANNEL AND FOR EACH ANGLE ARE SEPARATELY ACCUMULATED.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - APART FROM SPACE AND TIME LIMITATIONS, THE PROGRAM IS LIMITED TO THREE TARGET GEOMETRIES, AND TO NO MORE THAN 8 SCATTERING ANGLES. THESE AND OTHER LESS SIGNIFICANT RESTRICTIONS MAY BE REMOVED BY SUITABLY MODIFYING THE PROGRAM. THE SAMPLE (AND SAMPLE CONTAINER) MUST BE ISOTROPIC MATERIALS.

6. TYPICAL RUNNING TIME - ONCE THE SCATTERING FUNCTION HAS BEEN SET UP, THE MONTE CARLO LOOP TAKES 0.2 TO 0.5 MILLISECONDS PER COLLISION, PER ANGLE, PER TIME CHANNEL. TYPICAL RUNNING TIMES FOR A COMPLETE PROBLEM ARE OF ORDER 1 TO 10 MINUTES ON THE IBM360/195. IF ELASTIC COHERENT SCATTERING IS TO BE CALCULATED, THE PROGRAM MAY TAKE CONSIDERABLY LONGER TO OBTAIN ADEQUATE STATISTICS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - MSCAT REPRESENTS A MODIFIED, EXTENDED, AND LARGELY REWRITTEN, VERSION OF THE PROGRAM DESCRIBED BY BISCHOFF.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED AUGUST 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - J. R. D. COPLEY, MONTE CARLO CALCULATION OF MULTIPLE SCATTERING EFFECTS IN THERMAL NEUTRON SCATTERING EXPERIMENTS, COMPUTER PHYSICS COMMUNICATIONS PREPRINT, 1973.

F. G. BISCHOFF, M. L. YEATER, AND W. E. MOORE, MONTE CARLO EVALUATION OF MULTIPLE SCATTERING AND RESOLUTION EFFECTS IN DOUBLE-DIFFERENTIAL NEUTRON SCATTERING CROSS-SECTION MEASUREMENTS, NUCLEAR SCIENCE AND ENGINEERING, VOL. 48, PP. 266-80, 1972.

F. G. BISCHOFF, GENERALIZED MONTE CARLO METHODS FOR MULTIPLE SCATTERING PROBLEMS IN NEUTRON AND REACTOR PHYSICS, PH.D. THESIS, RENSSELAER POLYTECHNIC INSTITUTE, UNIVERSITY MICROFILMS 70-19931, 1970.

J. R. D. COPLEY, MONTE CARLO CALCULATION OF MULTIPLE SCATTERING EFFECTS IN THERMAL NEUTRON SCATTERING EXPERIMENTS, MODIFICATION TO HORIZONTAL CYLINDER GEOMETRY, COMPUTER PHYSICS COMMUNICATIONS PREPRINT, 1973.

J. R. D. COPLEY, MONTE CARLO CALCULATION OF MULTIPLE SCATTERING EFFECTS IN THERMAL NEUTRON SCATTERING EXPERIMENTS, MODIFICATION TO SLAB GEOMETRY, COMPUTER PHYSICS COMMUNICATIONS PREPRINT, 1973.

11. MACHINE REQUIREMENTS - NORMAL I/O DEVICES PLUS A HIGH SPEED DISK TO STORE UP TO 3 FILES WRITTEN BY THE PROGRAM AND A CORE REQUIREMENT OF 46,000 WORDS

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360, RELEASE 20.1.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - IF INELASTIC SCATTERING IS INCLUDED, FURTHER HIGH SPEED STORAGE IS REQUIRED. THE AMOUNT OF EXTRA STORAGE IS AT THE DISCRETION OF THE USER, DEPENDING ON HOW ACCURATELY HE WISHES TO DEFINE THE INELASTIC SCATTERING FUNCTIONS. IN THE PRESENT CASE AN EXTRA 26,000 WORDS ARE USED TO STORE THESE FUNCTIONS. MSCAT IS WRITTEN FOR VERTICAL CYLINDER GEOMETRY, WITH SOURCE DECKS INCLUDED IN THE PACKAGE ENABLING THE USER TO MODIFY MSCAT FOR EITHER SLAB OR HORIZONTAL CYLINDER GEOMETRY.

15. NAME AND ESTABLISHMENT OF AUTHOR -

J. R. D. COPLEY
INSTITUT LAUE-LANGEVIN
B.P. 156 CENTRE DE TRI
38 GRENOBLE, FRANCE

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (MSCAT-5472 CARDS, TARGET SLAB-392 CARDS, TARGET CYL-298 CARDS)
SAMPLE PROBLEM (37 CARDS)
CONTROL INFORMATION (JCL-10 CARDS)
SAMPLE PROBLEM OUTPUT (MSCAT, MSLAB, MCYL 16 PAGES EACH)
REFERENCE PREPRINTS AS SUBMITTED BY AUTHOR

17. CATEGORY - W
KEYWORDS - THERMAL NEUTRON SCATTERING, ELASTIC SCATTERING, INELASTIC SCATTERING, MONTE CARLO METHOD

ACC ABSTRACT 576 12/73

1. NAME OR DESIGNATION OF PROGRAM - GEM

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - GEM IS USED TO PREDICT FUEL CYCLE COSTS FOR ANY TYPE NUCLEAR SYSTEM (I.E., BWR, HTGR, PWR, LMFBR, GCFR, . . .). THE CURRENT VERSION IS LIMITED TO THERMAL REACTORS. GEM IS DESIGNED FOR PRODUCTION USE BY LARGE UTILITIES WHICH HAVE SEVERAL REACTOR TYPES ON THEIR SYSTEM. GEM HAS BEEN WRITTEN SO AS TO ACCOMMODATE ALL MAJOR FUEL MANAGEMENT ACTIVITIES UNDERTAKEN BY A UTILITY -
   (1) FUEL BID ANALYSIS,
   (2) EVALUATION OF ACTUAL DAY TO DAY OPERATION, AND
   (3) SYSTEM SIMULATION AND OPTIMIZATION STUDIES.

4. METHOD OF SOLUTION - COSTS ARE CALCULATED USING PRESENT-WORTH TECHNIQUES AND CONTINUOUS COMPOUNDING. THE EQUATIONS ARE BASED ON AN INVESTOR-OWNED UTILITY CAPITALIZATION STRUCTURE WHICH EASILY COVERS THE RANGE OF INDUSTRIAL, PRIVATE, AND PUBLIC (GOVERNMENT) OWNED UTILITIES. THREE DISTINCT TYPES OF ANALYSIS (CASHFLOW, ALLOCATED COSTS, YEARLY CASHFLOW) ARE PERFORMED, EACH YIELDING IDENTICAL RESULTS. USING THESE AS A BASIS MANY OTHER ANALYSES ARE UNDERTAKEN.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - DIMENSIONS OF ALL ARRAYS ARE CARRIED AS VARIABLES THROUGHOUT THE ANALYSIS. THE MAXIMUM SIZE OF EACH ARRAY IS SET BY THE USER IN PROGRAM MAIN. CURRENT VALUES ARE SET SO THAT MAXIMA ARE -
   50 BATCHES PER CASE STUDY
   20 YEAR BATCH LIFE
   30 YEAR CASE STUDY
   120 BATCH BURN TIME-STEPS
   20 INDIVIDUAL PAYMENTS (SALES) ASSOCIATED WITH EACH COST COMPONENT

6. TYPICAL RUNNING TIME - 1/3 SECOND PER BATCH IS REQUIRED.

7. UNUSUAL FEATURES OF THE PROGRAM - GEM
   (1) IS BROKEN INTO THREE MAJOR SECTIONS - INPUT, GENERAL ECONOMIC ANALYSIS, AND OUTPUT. THE LAST TWO SECTIONS ARE ABLE TO PERFORM AN ECONOMIC ANALYSIS OF ANY TYPE REACTOR SYSTEM TO ANY DESIRED DEGREE OF PRECISION. THE INPUT SECTION CONVERTS DATA SPECIFIC TO A REACTOR TYPE INTO A GENERAL FORM ACCEPTABLE TO THE LAST TWO SECTIONS. THE CURRENT INPUT SECTIONS AVAILABLE HANDLE BWR, PWR, AND HTGR.
   (2) USES CONTINUOUS COMPOUNDING.
   (3) CONTAINS THREE DISTINCT TYPES OF ECONOMIC ANALYSIS - CASHFLOW, ALLOCATED COST, AND YEARLY CASHFLOW.
   (4) CALCULATES FUEL CYCLE COST ON A BATCH, YEAR, CASE, CUMULATIVE BATCHWISE, AND CUMULATIVE YEARWISE BASIS.

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
   (5) HAS SEPARATE ESCALATION ROUTINES AVAILABLE FOR EACH TYPE OF COST COMPONENT.
   (6) ACCEPTS PU AND U RECYCLE BIDS.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   IBM360 VERSION SUBMITTED OCTOBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - J. A. HUGHES AND D. F. HANG, PROGRAM GEM, GENERAL ECONOMIC MODEL TO ANALYZE NUCLEAR FUEL CYCLE COSTS, UNIVERSITY OF ILLINOIS NUCLEAR ENGINEERING PROGRAM REPORT, SEPTEMBER 1973.
   D. F. HANG, FUEL CYCLE ECONOMICS, EDUCATION AND RESEARCH IN THE NUCLEAR FUEL CYCLE, PP. 67-83, 1972.
   J. A. HUGHES AND D. F. HANG, DEVELOPMENT OF ENGINEERING ECONOMIC BASIS TO ANALYZE NUCLEAR FUEL CYCLE COSTS, TRANSACTIONS OF AMERICAN NUCLEAR SOCIETY ANNUAL MEETING, PP. 48-50, JUNE 1972.

11. MACHINE REQUIREMENTS - 274K BYTES (202K WITH OVERLAY STRUCTURE) AND ONE NON-SYSTEM DISK (OR TAPE)

12. PROGRAMMING LANGUAGES USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
   J. A. HUGHES AND D. F. HANG
   UNIVERSITY OF ILLINOIS
   217 NUCLEAR ENGINEERING LABORATORY
   URBANA, ILLINOIS 61801

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
   SOURCE DECK (4479 CARDS)
   SAMPLE PROBLEM (431 CARDS)
   CONTROL INFORMATION (JCL 10 CARDS)
   REFERENCE REPORT

17. CATEGORY - D
   KEYWORDS - FUEL CYCLE, ECONOMICS, POWER PLANTS, PRODUCTION, REACTORS, OPERATION

ACC ABSTRACT 577 02/74

1. NAME OR DESIGNATION OF PROGRAM - FFEARS

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - FFEARS IS GENERALLY APPLICABLE FOR THE SOLUTION OF BOUNDARY VALUE PROBLEMS INVOLVING THE LAPLACE EQUATION USING DIFFERENCE EQUATIONS IN AXISYMMETRIC OR RECTANGULAR COORDINATES. IT WILL HANDLE VIRTUALLY ANY CONFIGURATION OF DIELECTRICS AND FLOATING ELECTRODES, PRODUCING BOTH EQUIPOTENTIAL AND EQUIFIELD PLOTS, IF DESIRED.

4. METHOD OF SOLUTION - BASIC RELAXATION TECHNIQUES ARE USED. THE DIFFERENCE EQUATIONS EMPLOYED ARE DERIVED FROM LAPLACE'S EQUATION FOR ISOTROPIC DIELECTRICS. THESE ARE SOLVED ITERATIVELY AT ALL POINTS WITHIN THE ELECTRODE CONFIGURATION EXCEPT ON THE INTERFACES BETWEEN MATERIALS OF DIFFERENT DIELECTRIC CONSTANT. DIELECTRIC INTERFACES ARE SOLVED BY A TECHNIQUE DEVELOPED BY C. N. DORNY (LETTERS, PROC. IEEE, VOL. 57, PP. 856-858). FLOATING ELECTRODES ARE TREATED AS SPECIAL DIELECTRICS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE PROGRAM TREATS ANY RECTANGULAR OR AXISYMMETRIC CONFIGURATION OF DIELECTRICS AND SMALL FLOATING ELECTRODES THAT CAN BE DESCRIBED BY A MATRIX OF UP TO 201 X 201 POINTS. ALL ELECTRODE AND DIELECTRIC SURFACES MUST LIE ON MATRIX POINTS.

6. TYPICAL RUNNING TIME - SOLUTIONS WITH ERRORS OF LESS THAN FIVE PERCENT ARE OBTAINED IN LESS THAN TEN MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM - A BLOWUP ROUTINE PERMITS THE EXPANSION AND RECOMPUTATION OF SECTIONS OF THE PLOT TO PERMIT GREATER RESOLUTION.

8. RELATED AND AUXILIARY PROGRAMS - THIS PACKAGE IS A MODIFICATION OF ALO-00262, TRANSFERRED FROM THE ALO-COSMIC COLLECTION.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
CDC6600 VERSION SUBMITTED MAY 1973.

10. REFERENCES - J. E. BOERS, FFEARS, A DIGITAL COMPUTER PROGRAM FOR THE SIMULATION OF LAPLACE EQUATION INCLUDING DIELECTRIC INTERFACES AND SMALL UNGROUNDED ELECTRODES, SC-RR-71 0377, JULY 1971.
ENVIRONMENTAL SUBROUTINES REQUIRED BY FFEARS, ARGONNE CODE CENTER PROGRAMMING NOTE 74-21, JANUARY 1974.

11. MACHINE REQUIREMENTS - 173500 (OCTAL) OF CORE STORAGE, AND 14 FILES ON DISK STORAGE.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV, COMPILED UNDER FORTRAN EXTENDED OPT2.

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.3.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SEVERAL SUBROUTINES AND FUNCTIONS NECESSARY TO THE OPERATION OF THE PLOTTING PORTION OF THE PROGRAM ARE NOT INCLUDED IN THE SOURCE DECK. THEY ARE A PART OF THE STANDARD SCORS PLOTTER PACKAGE FOR THE SC-4020 PLOTTER, AND MUST BE FURNISHED BY THE USER OR REPLACED BY EQUIVALENT LOCALLY-AVAILABLE SUBROUTINES.

15. NAME AND ESTABLISHMENT OF AUTHOR -

J. E. BOERS
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1396 CARDS)
SAMPLE PROBLEM (258 CARDS)
SAMPLE PROBLEM OUTPUT (70 PAGES, PLOTTER OUTPUT-7 PAGES)
REFERENCE REPORT AND ACC PROGRAMMING NOTE 74-21

17. CATEGORY - V
KEYWORDS - POTENTIALS, EQUIPOTENTIALS, EQUIFIELD, LAPLACE EQUATION

ACC ABSTRACT 578 03/74

1. NAME OR DESIGNATION OF PROGRAM - PLOTR

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - PLOTR AND THE AUXILIARY ROUTINE XYGRD CONTOUR A FUNCTION DEFINED OVER A TWO-DIMENSIONAL GRID AND COMPUTE THE AREA WITHIN THE CONTOURS.

4. METHOD OF SOLUTION - PLOTR AND XYGRD UTILIZE A SO-CALLED FOUR-POINT CELL METHOD. THE FUNCTION TO BE CONTOURED MUST BE TABULATED IN A TWO-DIMENSIONAL ARRAY WHERE THE POSITION OF EACH ELEMENT F(I,J) IS SPECIFIED BY THE COORDINATES X(I) AND Y(J). THESE COORDINATES MAY BE IN EITHER CARTESIAN OR POLAR FORM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAXIMUM ALLOWABLE RANGE BETWEEN MINIMUM AND MAXIMUM ANGLES IS 180 DEGREES.

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - PLOTR UTILIZES THE SCORS PLOTTING ROUTINES (REFERENCE 2) TO PRODUCE AN OUTPUT FILE FOR THE SC-4020 MICROFILM PLOTTER.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED JANUARY 1970.

10. REFERENCES - SUSAN M. MILLY, PLOTR, A TWO-DIMENSIONAL CONTOURING AND AREA-CALCULATING ROUTINE, SC-RR-69-685, OCTOBER 1969.
DIVISION 9424, SC-4020 USAGE WITH IBM-7090/7094, CDC-3600, UNIVAC-1107/1108, CDC-6600, SANDIA LABORATORIES, ALBUQUERQUE, NEW MEXICO, MAY 1969.
PLOTTING ROUTINES REQUIRED BY PLOTR, ACC NO. 578, ACC PROGRAMMING NOTE 74-24, FEBRUARY 1974.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE REFERENCE SC-RR-69-685 DOES NOT CORRESPOND EXACTLY TO THE LATEST VERSION. IN THE CURRENT VERSION OF PLOTR, THE PARAMETER F HAS BEEN DROPPED FROM THE CALL LIST. THE PARAMETER ANS SHOULD NOW CONTAIN THE ARRAY OF FUNCTION VALUES TO BE CONTOURED ON INPUT.

15. NAME AND ESTABLISHMENT OF AUTHOR -
SUSAN MILLY DAVENPORT
SANDIA LABORATORIES

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (714 CARDS)
SAMPLE PROBLEM (114 CARDS)
REFERENCE REPORT, SC-RR-69-685, AND ACC NOTE

17. CATEGORY - P
KEYWORDS - CONTOUR, 2-DIMENSIONAL, CARTESIAN, POLAR, COORDINATES

ACC ABSTRACT 579 02/74

1. NAME OR DESIGNATION OF PROGRAM - DWARF

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - DWARF ALLOWS ONE-DIMENSIONAL SIMULATION OF REACTOR BURNUP AND XENON OSCILLATION PROBLEMS IN SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY USING A FEW-GROUP DIFFUSION THEORY MODEL.

4. METHOD OF SOLUTION - THE FEW-GROUP, NEUTRON DIFFUSION THEORY EQUATIONS ARE REDUCED TO A SYSTEM OF FINITE DIFFERENCE EQUATIONS THAT ARE SOLVED FOR EACH GROUP BY THE GAUSS METHOD AT EACH TIME POINT. FISSION NEUTRON SOURCE ITERATION CAN BE ACCELERATED WITH CHEBYSHEV EXTRAPOLATION. A THERMAL FEEDBACK ITERATIVE LOOP IS USED TO OBTAIN CONSISTENT SOLUTIONS FOR THE DISTRIBUTIONS OF REACTOR POWER, NEUTRON FLUX, AND FUEL AND COOLANT PROPERTIES WITH THE NEUTRON GROUP CONSTANTS FUNCTIONS OF THE LATTER. SOLUTIONS FOR THE NEW NUCLIDE CONCENTRATIONS OF A TIME POINT ARE MADE WITH THE FLUX ASSUMED CONSTANT IN THE TIME INTERVAL.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   4 GROUPS
   40 REGIONS
   50 MACROSCOPIC MATERIALS*
   50 NUCLIDES PER REGION
   250 MESH POINTS
   * ONLY 10 ARE FUNCTIONS OF THE FEEDBACK VARIABLES.

6. TYPICAL RUNNING TIME - PRIMARILY A FUNCTION OF THE NUMBER OF FEEDBACK ITERATIONS REQUIRED, RUNNING TIME RANGES FROM LESS THAN A SECOND TO SEVERAL SECONDS PER TIME-STEP.

7. UNUSUAL FEATURES OF THE PROGRAM - THE NEUTRON GROUP CONSTANTS FOR THE MACROSCOPIC MATERIALS CAN BE USER-SPECIFIED FUNCTIONS OF THE FEEDBACK VARIABLES AND THE GROUP CONSTANTS CAN BE A MIXTURE OF THE NONDEPLETION MACROSCOPIC AND DEPLETING MICROSCOPIC MATERIAL DATA IN A REGION. AUTOMATIC SEARCHES ON BUCKLING, POISON, REGION DIMENSIONS, A REGION INTERFACE POSITION, OR TOTAL POWER CAN BE DONE AT EACH TIME POINT. BASIC INPUT DATA AND MATERIAL CONSTANTS CAN BE CHANGED FREELY AT ANY TIME DURING PROBLEM EXECUTION. THE SOLUTIONS FOR THE COOLANT THERMAL PROPERTIES COVER THE ENTIRE RANGE FROM THE SUBCOOLED THROUGH THE SUPERHEATED VAPOR REGIMES WITH CONSTANT PRESSURE AND MASS FLOW RATE ASSUMED. A PLOTTED OUTPUT ROUTINE CAN PLOT UP TO THREE DISTRIBUTIONS (OR FLUX, POWER, TEMPERATURES, DENSITIES, ETC.) PER FRAME VERSUS THE ONE-DIMENSIONAL SPACE VARIABLE.

8. RELATED AND AUXILIARY PROGRAMS - CORA, A FEW-GROUP, ONE-DIMENSIONAL DIFFUSION PROGRAM AND SINBAD, A NUCLIDE DEPLETION PROGRAM.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JUNE 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - E. C. ANDERSON AND G. E. PUTNAM, DWARF, A FEW GROUP, ONE-DIMENSIONAL DIFFUSION THEORY PROGRAM FOR REACTOR DEPLETION WITH ADJUSTABLE REACTIVITY FEEDBACK, ANCR-1083, NOVEMBER 1972.

11. MACHINE REQUIREMENTS - 330K BYTES OF CORE STORAGE PLUS 8 FORTRAN LOGICAL UNITS, INCLUDING UNITS FOR CARD INPUT, PRINTED OUTPUT, AND PLOTTED OUTPUT

12. PROGRAMMING LANGUAGE USED - FORTRAN IV (H)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM COMPILES WITH THE FORTRAN H COMPILER, OPTIMIZATION LEVEL 2. IT CONSISTS OF A ROOT MAIN SEGMENT THAT CALLS 5 OVERLAYS SERIALLY. THE CLOCK AND PLOTTED OUTPUT ROUTINES ARE INSTALLATION DEPENDENT.

15. NAME AND ESTABLISHMENT OF AUTHORS -
E. C. ANDERSON AND G. E. PUTNAM
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (8278 CARDS)
SAMPLE PROBLEM (149 CARDS)
CONTROL INFORMATION (JCL 66 CARDS)
LOAD MODULE DWARF (289 BLOCKS)
SAMPLE PROBLEM OUTPUT (26 PAGES)
REFERENCE REPORT

17. CATEGORY - D
KEYWORDS - FEW-GROUP, ONE-DIMENSIONAL, DIFFUSION, SLABS, CYLINDERS, SPHERES, REACTIVITY FEEDBACK, CORA CODES, SINBAD CODES

ACC ABSTRACT 580 02/74

1. NAME OR DESIGNATION OF PROGRAM - ASTEM

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - ASTEM IS A MODULAR SET OF FORTRAN IV SUBROUTINES TO EVALUATE THE GIBBS, HELMHOLTZ, AND SATURATION LINE FUNCTIONS AS PUBLISHED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (1967). ANY THERMODYNAMIC QUANTITY INCLUDING DERIVATIVE PROPERTIES CAN BE OBTAINED FROM THESE ROUTINES BY A USER-SUPPLIED MAIN PROGRAM.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - UNLESS REDIMENSIONED BY THE USER, THE HIGHEST DERIVATIVE ALLOWED IS ORDER 9. ALL ARRAYS WITHIN ASTEM ARE ONE-DIMENSIONAL TO SAVE STORAGE AREA.

6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES LESS THAN A MINUTE.

7. UNUSUAL FEATURES OF THE PROGRAM - THE MAIN PROGRAM IS THE SAMPLE PROBLEM.

8. RELATED AND AUXILIARY PROGRAMS - STEAM-67 (ACC ABSTRACT 487)

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JUNE 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - K. V. MOORE, ASTEM - A COLLECTION OF FORTRAN SUBROUTINES TO EVALUATE THE 1967 ASME EQUATIONS OF STATE FOR WATER/STEAM AND DERIVATIVES OF THESE EQUATIONS, ANCR-1026, OCTOBER 1971.
C. A. MEYER, R. B. MCCLINTOCK, G. J. SILVESTRI, AND R. C. SPENCER, JR., 1967 ASME STEAM TABLES - THERMODYNAMIC AND TRANSPORT PROPERTIES OF STEAM, NEW YORK, THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, 1967.
P. W. BRIDGMEN, THE THERMODYNAMICS OF ELECTRICAL PHENOMENA IN METALS AND A CONDENSED COLLECTION OF THERMODYNAMIC FORMULAS, NEW YORK, DOVER PUBLICATIONS, INC., 1961.

11. MACHINE REQUIREMENTS - 68K BYTES

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
K. V. MOORE

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)

AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1551 CARDS)
SAMPLE PROBLEM (83 CARDS)
REFERENCE REPORT, ANCR-1026

17. CATEGORY - H
KEYWORDS - THERMODYNAMICS, WATER, PRESSURE, TEMPERATURE, LIQUIDS, VAPORS, STEAM-67 CODES

1. NAME OR DESIGNATION OF PROGRAM - SLADE-D

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - SLADE-D ANALYZES THE TRANSIENT DYNAMIC RESPONSE OF ELASTIC SHELLS.

4. METHOD OF SOLUTION - SLADE-D USES THE FINITE ELEMENT METHOD IN SPACE AND CENTRAL DIFFERENCE SCHEME IN TIME.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   650 ELEMENTS
   700 NODAL POINTS

6. TYPICAL RUNNING TIME - RUNNING TIME IS CONTROLLED BY THE SIZE OF THE MESH AND THE LENGTH IN TIME FOR WHICH THE RESPONSE IS SOUGHT.

7. UNUSUAL FEATURES OF THE PROGRAM - SLADE-D IS DESIGNED FOR THE DYNAMIC ANALYSIS OF THIN SHELLS. A DOUBLY CURVED, ARBITRARY QUADRILATERAL ELEMENT IS UTILIZED. THE ELEMENT IS BASED ON A MINIMUM POTENTIAL ENERGY PRINCIPLE FOR THIN SHELLS. A SIMPLE CENTRAL DIFFERENCE TIME INTEGRATION SCHEME TOGETHER WITH A DIAGONAL MASS MATRIX IS USED TO COMPUTE THE TRANSIENT DYNAMIC RESPONSE. SINCE THE MAJORITY OF AEROSPACE STRUCTURES ARE BASED ON SHELLS OF REVOLUTION, THE PROGRAM IS DESIGNED SPECIFICALLY FOR A SHELL THE REFERENCE SURFACE OF WHICH IS A PORTION OF AN AXISYMMETRIC SURFACE. THE PROGRAM ALLOWS UP TO FIVE SEPARATE LAYERS AND UP TO FIVE SEPARATE ELASTIC ANISOTROPIC MATERIALS WITH TEMPERATURE-DEPENDENT PROPERTIES. SLADE-D HANDLES VARIABLE THICKNESS SHELLS AND ALLOWS THICKNESS DISCONTINUITIES ALONG ELEMENT BOUNDARIES. IT PROVIDES FOR BOTH NORMAL AND TANGENTIAL SURFACE LOADS AND FOR TEMPERATURE CHANGES THROUGH THE THICKNESS AS WELL AS VARYING TEMPERATURES OVER THE REFERENCE SURFACE. OVER ANY PORTION OF THE BOUNDARY, A CHOICE OF THIRTEEN SEPARATE BOUNDARY CONDITIONS IS AVAILABLE. TO EASE DATA PREPARATION, SIMPLE BUT EFFECTIVE GENERATION SCHEMES ARE BUILT INTO THE PROGRAM. SLADE-D COMPUTES DYNAMIC DEFORMATIONS, VELOCITIES, STRESSES, AND STRESS RESULTANTS OCCURRING IN THE SHELL. SINCE IT IS DESIGNED FOR USE BY A LARGE NUMBER OF PEOPLE, IT CONTAINS ERROR CHECKS WHEREVER POSSIBLE AND, EXCEPT WHERE NEEDED FOR EFFICIENCY, VERY STRAIGHTFORWARD LOGIC. SLADE-D USES A SINGLE-DIMENSIONED STORAGE ARRAY FOR THE TOTAL STIFFNESS MATRIX, MASS MATRIX, AND LOAD VECTOR. IF A GIVEN PROBLEM FITS WITHIN THE LIMITS OF THIS STORAGE ARRAY, THE PROGRAM FUNCTIONS AS AN IN-CORE PROGRAM. IF ADDITIONAL STORAGE IS REQUIRED, THE PROGRAM SEEKS ON-LINE AUXILIARY STORAGE WHICH MUST BE RANDOMLY ACCESSIBLE.

8. RELATED AND AUXILIARY PROGRAMS - SLADE-D IS AN OUTGROWTH OF AN EARLIER STATIC SHELL PROGRAM, SLADE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED SEPTEMBER 1973.

10. REFERENCES - SAMUEL W. KEY AND ZELMA E. BEISINGER, SLADE D, A COMPUTER PROGRAM FOR THE DYNAMIC ANALYSIS OF THIN SHELLS, SLA-73-0079, JANUARY 1973.
S. W. KEY AND Z. E. BEISINGER, SLADE, A COMPUTER PROGRAM FOR THE STATIC ANALYSIS OF THIN SHELLS, SC-RR-69-369, NOVEMBER 1970.

11. MACHINE REQUIREMENTS - 79,000 DECIMAL WORD CORE, EXTENDED CORE STORAGE, AND MASS STORAGE DISK FILES

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.2.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE STIFFNESS MATRIX, MASS MATRIX, AND LOAD VECTOR GENERATED ARE STORED IN A, A ONE-DIMENSIONAL ARRAY OF 6056 LOCATIONS. IF THE MATRICES AND VECTOR GENERATED REQUIRE MORE THAN 6056 CORE LOCATIONS, EITHER RANDOM ACCESS EXTENDED CORE STORAGE, RANDOM ACCESS MASS STORAGE DISK FILES, OR THE EQUIVALENT IS REQUIRED. AS THE PROGRAM IS CURRENTLY WRITTEN, THE MASS STORAGE CALLS WRITED AND READED ARE USED IN CONJUNCTION WITH A CDC 6635 EXTENDED CORE STORAGE UNIT, AND THE MASS STORAGE CALLS OPENMS, WRITMS, AND READMS ARE USED IN CONJUNCTION WITH THE SYSTEM DISK FILES.
THE REQUIRED NUMBER OF BLOCKS NEEDED TO STORE THE STIFFNESS MATRIX, MASS MATRIX AND LOAD VECTOR IS SET UP AS ONE FILE OF INFORMATION IN EXTENDED CORE STORAGE OR IN DISK FILE STORAGE. EXTENDED CORE STORAGE IS SOUGHT FIRST, AND, IF THE FILE LENGTH EXCEEDS THE SPACE AVAILABLE, THE FILE IS PLACED IN DISK STORAGE. EACH BLOCK COMPRISES 6056 CORE LOCATIONS, LOCATED IN THE ARRAY A WHEN IN THE CORE OF THE COMPUTER. THE MASS STORAGE CALLS ALLOW ANY NUMBER OF WORDS TO BE TRANSFERRED TO OR FROM THE FILE STARTING AT ANY POINT IN THE FILE. THE RESULT IS A RANDOMLY ACCESSIBLE FILE. ANY BLOCK IS ACCESSIBLE AT ANY TIME. THE RANDOM ACCESS FEATURE IS REQUIRED IN THE ASSEMBLY OF THE STIFFNESS MATRIX, MASS MATRIX, AND LOAD VECTOR IN MERGEX. THE TIME INTEGRATION IN INTEGX USES THE FILE SEQUENTIALLY.

15. NAME AND ESTABLISHMENT OF AUTHORS -
S. W. KEY AND Z. E. BEISINGER
DIVISION 1541
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (3409 CARDS)
SAMPLE PROBLEM (61 CARDS)
REFERENCE REPORT, SLA-73-0079

17. CATEGORY - I
KEYWORDS - SHELLS, FINITE ELEMENT, DYNAMICS, STRUCTURAL ANALYSIS, DEFORMATION, STRESSES, MASS MATRICES, SLACE CCDES

ACC ABSTRACT 582 11/73

1. NAME OR DESIGNATION OF PROGRAM - MONA

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - MONA SOLVES THE MULTIGROUP, ONE-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS IN SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY FOR EITHER THE DIRECT OR ADJOINT FLUX. BOUNDARY SOURCES AND SPATIALLY DEPENDENT VOLUME SOURCES CAN BE GROUP DEPENDENT. MULTIPLE THERMAL GROUPS ARE ALLOWED.

4. METHOD OF SOLUTION - THE SYSTEM OF FINITE DIFFERENCE EQUATIONS OF A GROUP ARE SOLVED BY THE GAUSS METHOD. OUTER ITERATIONS ON THE NEUTRON FISSION SOURCE CAN BE ACCELERATED WITH THREE-POINT CHEBYSHEV EXTRAPOLATION, AND INNER ITERATIONS ON MULTIPLE THERMAL GROUPS CAN BE ACCELERATED WITH TWO-POINT EXTRAPOLATION OR GROUP SCALING.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   50 GROUPS
   50 REGIONS
   20 MACROSCOPIC MATERIALS
   999 LIBRARY MATERIALS
   500 MESH POINTS

6. TYPICAL RUNNING TIME - A SAMPLE PROBLEM WITH 22 GROUPS, 41 MESH POINTS AND NO UPSCATTER REQUIRES 0.35 SECONDS OF CPU TIME PER OUTER ITERATION.

7. UNUSUAL FEATURES OF THE PROGRAM - FLUX-VOLUME WEIGHTED FEW-GROUP CONSTANTS CAN BE GENERATED. PARAMETER SEARCHES THAT CONVERGE TO USER-SPECIFIED EIGENVALUES INCLUDE BUCKLING, POISON, DIMENSION, BOUNDARY, AND CONCENTRATION SEARCHES. OUTPUT EDITS INCLUDE ARBITRARILY NORMALIZED FLUX, SOURCE, AND POWER DISTRIBUTIONS; FLUX SPECTRA; MEDIAN AND AVERAGE ENERGY DISTRIBUTIONS FOR VARIOUS REACTION RATES; DETAILED NEUTRON BALANCE DATA; ACTIVATION TRAVERSES; AND DISTRIBUTIONS OF RATIOS OF ARBITRARY REACTION RATES.

8. RELATED AND AUXILIARY PROGRAMS - MANY OF THE DETAILED ALGORITHMS AND GENERAL METHODS OF THE MONA CODE WERE TAKEN DIRECTLY FROM THE FEW-GROUP, ONE-DIMENSIONAL DIFFUSION CODE CORA.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   IBM360 VERSION SUBMITTED NOVEMBER 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - G. E. PUTNAM, MONA, A MULTIGROUP ONE-DIMENSIONAL NEUTRONICS ANALYSIS CODE, ANCR-1051, MARCH 1972.
   R. L. MUELLER, 360/75 INTERVAL TIMER ROUTINE, EXCERPT FROM NRTS ENVIRONMENTAL SUBROUTINE MANUAL, OCTOBER 1968.

11. MACHINE REQUIREMENTS - 300K BYTES OF CORE STORAGE, 5 FORTRAN LOGICAL UNITS FOR PROGRAM-REQUIRED DATA SETS, 3 FORTRAN LOGICAL UNITS FOR CARD INPUT, PRINTED OUTPUT, AND PUNCHED CARD OUTPUT

12. PROGRAMMING LANGUAGE USED - FORTRAN IV (H)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM COMPILES WITH THE FORTRAN H COMPILER, OPTIMIZATION LEVEL 2. IT CONSISTS OF A ROOT MAIN SEGMENT THAT CALLS 8 OVERLAYS SERIALLY. MONA CALLS 3 INSTALLATION-DEPENDENT ROUTINES--TIMSET, TIMER, AND TIMJ. THE FIRST TWO ARE DESCRIBED IN REFERENCE 2. TIMJ IS A SMALL CLOCK (ELAPSED CPU TIME) ROUTINE THAT CAN BE EASILY REPLACED OR DUMMIED. AN IBM360 SYSTEM ROUTINE ERRSET, DESCRIBED IN GC28-6817-2, IBM SYSTEM/360 OPERATING SYSTEM, FORTRAN IV (G AND H) PROGRAMMERS GUIDE, IS ALSO CALLED AND MAY BE DUMMIED.

15. NAME AND ESTABLISHMENT OF AUTHOR -

G. E. PUTNAM
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECK (9282 CARDS)
    LOAD MODULE MONA (250 BLOCKS)
    SAMPLE PROBLEM (223 CARDS)
    CONTROL INFORMATION (JCL 35 CARDS)
    REFERENCE REPORT AND EXCERPT

17. CATEGORY - C
    KEYWORDS - MULTIGROUP, 1-DIMENSIONAL, DIFFUSION, CRITICALITY SEARCHES, SLABS, CYLINDERS, SPHERES, CORA CODES

ACC ABSTRACT 583 11/73

1. NAME OR DESIGNATION OF PROGRAM - STEFEG

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - STEFEG CALCULATES GASEOUS SOURCE TERMS. IT COMPUTES THE GASEOUS RELEASES THROUGH VARIOUS PATHS FROM BOILING WATER REACTORS AND/OR PRESSURIZED WATER REACTORS.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - 20 ISOTOPES, AND 6 REPORTS EACH FOR PRESSURIZED WATER REACTOR AND BOILING WATER REACTOR.

6. TYPICAL RUNNING TIME - 12 REPORTS REQUIRE ABOUT 14 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED DECEMBER 1972, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - F. T. BINFORD, T. P. HAMRICK, G. W. PARKER, AND T. H. ROW, ANALYSIS OF POWER REACTOR GASEOUS WASTE SYSTEMS, 12TH AEC AIR CLEANING CONFERENCE, AND ERRATA.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
F. T. BINFORD, T. P. HAMRICK,
G. W. PARKER, AND T. H. ROW
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE -
SOURCE DECK (652 CARDS)
SAMPLE PROBLEM (63 CARDS)
CONTROL INFORMATION (JCL 9 CARDS)
REFERENCE REPORT AND ERRATA

17. CATEGORY - G
KEYWORDS - POWER REACTORS, GASES, RADIOACTIVITY, WASTE SOLUTIONS

1. NAME OR DESIGNATION OF PROGRAM - FPFM

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - FPFM IS USED IN RADIOLOGICAL SAFETY ANALYSES OF LINE REACTORS (BWR'S AND PWR'S ONLY) TO CALCULATE: (1) MAXIMUM NOBLE GAS RELEASE TO THE FUEL CLADDING GAP FOR TOTAL CORE DURING STEADY-STATE OPERATION, (2) NOBLE GAS RELEASED TO THE REACTOR PRIMARY SYSTEM FOR SELECTED PIN PERFORATIONS, AND (3) INTERNAL PIN PRESSURE (OPTIONAL).

4. METHOD OF SOLUTION - AN ANALYTICAL METHOD IS USED BASED ON A STEADY-STATE RELEASE MODEL. THIS METHOD WHICH EMPLOYS FISSION GAS CAPSULE DATA AND CONSERVATIVE ASSUMPTIONS HAS PROVIDED GOOD CORELATIONS OF CAPSULE RELEASE DATA AND DESCRIBED FISSION PRODUCT DISTRIBUTION IN URANIUM OXIDE FUELS. THE ASSUMPTIONS USED ARE THAT THE RELEASE OF IODINE-131 IS EQUAL TO THE FRACTIONAL RELEASE OBSERVED FOR XENON-131, AND THAT ALL THE FUEL PINS HAVE A LOW FUEL-TO-SHEATH HEAT TRANSFER COEFFICIENT AND, THEREFORE, A HIGH FUEL SURFACE TEMPERATURE WHICH INCREASES RELEASE FOR ALL CORRESPONDING HEAT RATINGS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - FPFM APPLIES ONLY TO WATER-COOLED REACTORS.

6. TYPICAL RUNNING TIME - LESS THAN 1 MINUTE IS REQUIRED FOR A TYPICAL PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JANUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - V. F. BASTON, J. H. MCFADDEN, W. A. YUILL, AN ANALYTICAL METHOD FOR CALCULATING STEADY-STATE FISSION GAS RELEASE--FISSION PRODUCT FUEL MODE (FPFM) CODE, ANCR-1010, SEPTEMBER 1971.

11. MACHINE REQUIREMENTS - 70K STORAGE SINGLE-PRECISION

12. PROGRAMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SOURCE CODE DECK IS MODIFIED TO CALL LATER VERSION OF THE CALCOMP PLOTTING PACKAGE.

15. NAME AND ESTABLISHMENT OF AUTHOR -
V. F. BASTON
AEROJET NUCLEAR COMPANY
P. O. BOX 1845
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (131 CARDS)
SAMPLE PROBLEM (18 CARDS)
CONTROL INFORMATION (8 CARDS)
LOAD MODULE (PROLIBC-69 BLOCKS)
REFERENCE REPORT

17. CATEGORY - G
KEYWORDS - GASES, FISSION PRODUCTS, RADIOACTIVITY, CLADDING, WATER COOLANTS, POWER REACTORS, OPERATION

1. NAME OR DESIGNATION OF PROGRAM - TRIAL

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - H6000

3. DESCRIPTION OF PROBLEM OR FUNCTION - TRIAL CARRIES OUT A SIMPLE LINKING OF SEVERAL TWO-DIMENSIONAL, MULTIGROUP NEUTRON (DIRECT OR ADJOINT) FLUX SETS TO GIVE A THREE-DIMENSIONAL REPRESENTATION.

4. METHOD OF SOLUTION - THE FLUX LINKING APPROACH ASSUMES THAT THE REACTOR SYSTEM CAN BE WELL REPRESENTED IN CYLINDRICAL GEOMETRY AND REQUIRES INPUT OF ONE (R,Z) MULTIGROUP FLUX SET AND ONE OR MORE (X,Y) MULTIGROUP FLUX SETS FOR SELECTED PLANES PERPENDICULAR TO THE Z-AXIS. POINTS OF INTERSECTION BETWEEN THE TRANSVERSE PLANES AND SELECTED AXIAL LINE SHAPE FUNCTIONS ARE USED TO ESTABLISH FUNCTIONAL DISTRIBUTIONS WHICH DEPEND ON THE SPECTRA (E.G., THE PU239 FISSION RATE, B10 ABSORPTION RATE, ETC.). FOR EACH TRANSVERSE PLANE, A WEIGHTED FUNCTIONAL IS DETERMINED BY AVERAGING THE POINTWISE FUNCTIONALS OVER ALL THE INTERSECTING NODES OF THE AXIAL LINES AND THAT PLANE. THE WEIGHTED FUNCTIONS ARE THEN USED AS NORMALIZATION CONSTANTS IN A SIMPLE INTERPOLATION (OR EXTRAPOLATION) ROUTINE FOR COMPUTING THE THREE-DIMENSIONAL FLUX REPRESENTATION.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A MAXIMUM OF 25 TWO-DIMENSIONAL FLUX SETS MAY BE INPUT TO TRIAL. OTHERWISE, VARIABLE-DIMENSIONED ARRAYS ARE USED EXCLUSIVELY WITHIN THE PROGRAM AND PROBLEM SIZE LIMITATIONS WILL BE DICTATED BY THE AMOUNT OF AVAILABLE COMPUTER MEMORY.

6. TYPICAL RUNNING TIME - A PROBLEM CONSISTING OF A 20 X 20 X 31 MESH ARRAY, 7 INPUT (X,Y) FLUX SETS AND 3 AXIAL LINE SHAPE FUNCTIONS REQUIRES APPROXIMATELY 3 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - TRIAL USES THE GENED ENVIRONMENTAL SUBROUTINE PACKAGE (ACC ABSTRACT 515).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
H6000 VERSION SUBMITTED FEBRUARY 1973.

10. REFERENCES - C. L. COWAN, P. GREEBLER, B. A. HUTCHINS, M. D. KELLEY, AND R. PROTSIK, A DESCRIPTION AND EVALUATION OF THE FLUX LINKING APPROACH FOR COMPUTING THREE-DIMENSIONAL FLUXES - THE COMPUTER CODE TRIAL, GEAP-13931, MARCH 1973.
B. M. CARMICHAEL, D. A. MENELEY, AND C. R. VONDY, REPORT ON THE SUBCOMMITTEE ON STANDARD INTERFACE FILES, PREPARED FOR THE COMMITTEE ON COMPUTER CODE COORDINATION, SEPTEMBER 1, 1971.

11. MACHINE REQUIREMENTS - 32K MEMORY, A MINIMUM OF 4 LOGICAL UNITS FOR THE PERIPHERAL STORAGE OF INPUT, WORKING, AND OUTPUT FLUX SETS, PLUS AN ADDITIONAL LOGICAL UNIT FOR EACH ADDITIONAL INPUT (X,Y) FLUX SET GREATER THAN ONE

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GCOS6000.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - ALL INPUT FLUX SETS AND THE OUTPUT 3-D FLUX SET ARE PRESCRIBED IN THE FORMAT OF THE STANDARD INTERFACE FILE, AS RECOMMENDED BY THE STANDARD INTERFACE FILE SUBCOMMITTEE OF THE COMPUTER CODE COORDINATION COMMITTEE (SEE REFERENCE 2).

15. NAME AND ESTABLISHMENT OF AUTHOR -

C. L. COWAN
BREEDER REACTOR DEPARTMENT
GENERAL ELECTRIC COMPANY
310 DEGUIGNE DRIVE
SUNNYVALE, CALIFORNIA 94086

16. MATERIAL AVAILABLE -
    SOURCE DECK (971 CARDS)
    SAMPLE PROBLEM (23 CARDS)
    CONTROL INFORMATION (96 CARDS)
    REFERENCE REPORT, GEAP-13931

17. CATEGORY - C
    KEYWORDS - 3-DIMENSIONAL, REACTION RATES, POWER DISTRIBUTIONS, LMFBR REACTORS

ACC ABSTRACT 586 02/74

1. NAME OR DESIGNATION OF PROGRAM - PLENUM

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - BULK FLOW DISTRIBUTION IN A CYLINDRICAL REACTOR COOLANT INLET PLENUM IS CALCULATED USING POTENTIAL FLOW THEORY.

4. METHOD OF SOLUTION - THE LAPLACE EQUATION FOR THE VELOCITY POTENTIAL IS SOLVED FOR GENERAL, SYMMETRIC BOUNDARY CONDITIONS AND ONE INLET NOZZLE BY GAUSS-SEIDEL RELAXATION (PART 1). NONSYMMETRIC, DIMENSIONAL SOLUTIONS ARE THEN FORMED BY SUPERPOSITION OF THE GENERAL SOLUTION (PART 2).

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE CODE IS DIMENSIONED FOR 8000 MESH POINTS IN AN (R,THETA,Z) ARRAY. DIMENSIONS CAN BE EXPANDED AT THE EXPENSE OF RUN TIME AND CORE SIZE.

6. TYPICAL RUNNING TIME - RUN TIME FOR PART 1 IS PROPORTIONAL TO N**2, WHERE N IS THE NUMBER OF MESH POINTS. WITH 2299 MESH POINTS CPU TIME IS 42 SECONDS ON A 360/195. RUN TIME FOR PART 2 IS 1 SECOND PER PROBLEM. SAMPLE PROBLEM RUNNING TIME IS 2 MINUTES FOR PART 1 AND 1 MINUTE FOR PART 2.

7. UNUSUAL FEATURES OF THE PROGRAM - THE CODE APPROXIMATES BULK FLUID MOTION THROUGH LARGE CYLINDRICAL HEADERS IN CIRCUMSTANCES WHERE DETAILS OF THE FLOW, SUCH AS BOUNDARY LAYER EFFECTS, MAY BE NEGLECTED. THREE-DIMENSIONAL EFFECTS ARE CALCULATED, SO THAT ASYMMETRIC FLUID INPUT AND OUTPUT PROBLEMS MAY BE CALCULATED. USE OF A LINEAR FIELD EQUATION PERMITS RAPID SOLUTION BY SUPERPOSITION OF MANY COMBINATIONS OF INPUT AND OUTPUT BOUNDARY CONDITIONS. FIRST ORDER EFFECTS OF FRICTION MAY BE INCLUDED BY ADDITION OF CONSTANT COEFFICIENTS IN THE FINITE DIFFERENCE FORMULATIONS.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JUNE 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCE - S. D. HARRIS AND J. W. REECE, APPLICATION OF POTENTIAL FLOW THEORY TO REACTOR COOLANT CIRCULATION, PROCEEDINGS OF THE EIGHTH SOUTHEASTERN SEMINAR ON THERMAL SCIENCES, CF-MS-71-13, MARCH 23-24, 1972.

11. MACHINE REQUIREMENTS - 240K BYTES OF STORAGE AND AN ON-LINE PUNCH AND PRINTER

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - PLENUM IS WRITTEN AS TWO SEPARATE PROGRAMS. PART 1 PROVIDES A GENERAL DIMENSIONLESS SOLUTION TO THE FIELD EQUATION. FOR A GIVEN HEADER THIS CODE NEED ONLY BE EXECUTED ONCE. PART 2 USES PUNCHED OUTPUT FROM PART 1 TO DETERMINE SOLUTIONS FOR A VARIETY OF USER-SPECIFIED BOUNDARY CONDITIONS BY DIMENSIONALIZATION AND SUPERPOSITION.

15. NAME AND ESTABLISHMENT OF AUTHOR -

S. D. HARRIS
SAVANNAH RIVER LABORATORY
E. I. DU PONT DE NEMOURS
AIKEN, SOUTH CAROLINA 29801

16. MATERIAL AVAILABLE -
SOURCE DECKS (PART1 312 CARDS, PART2 220 CARDS)
SAMPLE PROBLEMS (PART1 3 CARDS, PART2 16 CARDS)
PUNCHED OUTPUT (PART1 419 CARDS)
SAMPLE PROBLEM OUTPUT (PART1 31 PAGES, PART2 11 PAGES)
REFERENCE REPORT

17. CATEGORY - H
KEYWORDS - CYLINDERS, REACTOR COOLANTS, FLUID FLOW, R-THETA-Z

1. NAME OR DESIGNATION OF PROGRAM - AEC-ALO FAU

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/50

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE AEC-ALO RADIO FREQUENCY ASSIGNMENTS AND USES PROGRAM (FAU) PROVIDES FOR MAINTAINING RADIO FREQUENCY ASSIGNMENT AND TRANSACTION RECORDS. IT LISTS ALL RADIO FREQUENCY ASSIGNMENTS AND USES FROM INITIAL APPLICATION (AEC-310) THROUGH AUTHORIZATIONS (IRAC DOCKET). THE PROGRAM ALLOWS FOR SORTING BY OFFICE, SYSTEM NUMBER, LOCATION, FREQUENCY, EXPIRATION DATE, ALO OR AEC SERIAL NUMBER, AND IRAC DOCKET NUMBER.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - A GENERAL FAMILIARITY WITH AEC APPENDIX 0270, PART IV AND THE OTP MANUAL IS ASSUMED.

6. TYPICAL RUNNING TIME - 5 MINUTES ARE REQUIRED FOR SEVEN REPORTS, 1000 RECORDS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - AN EARLIER VERSION OF THIS PROGRAM WAS WRITTEN FOR THE BURROUGHS B-5500. THIS IS A MODIFIED COBOL VERSION OF A USAEC NUO FORTRAN PROGRAM.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED FEBRUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - AEC-ALO MEMORANDUM, AEC-ALO RADIO FREQUENCY ASSIGNMENTS AND USES (FAU), (1973).
AEC-ALO MEMORANDUM, DESCRIPTION OF RADIO FREQUENCY BOOKKEEPING PROGRAM, (1973).

11. MACHINE REQUIREMENTS - THIS SYSTEM REQUIRES DISK-SORT OF INPUT DATA AND THE MASTER TAPE RECORDS. PERIPHERAL EQUIPMENT REQUIRED IS CARD READER, LINE PRINTER (132 CHARACTER/LINE), AND TWO MAGNETIC TAPE UNITS.

12. PROGRAMMING LANGUAGES USED - COBOL

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE SYSTEM CONSISTS OF TWO PROGRAMS, M2501 THE TAPE UPDATE PROGRAM, AND M2502 THE REPORT PREPARATION PROGRAM.

15. NAME AND ESTABLISHMENT OF AUTHORS -

J. H. GRAYSON, G. S. HEARRON,
AND GEORGE KOJIMA
ALBUQUERQUE OPERATIONS OFFICE
U. S. ATOMIC ENERGY COMMISSION
P. O. BOX 5400
ALBUQUERQUE, NEW MEXICO 87115

16. MATERIAL AVAILABLE -

SOURCE DECKS (M2501-485 CARDS, M2502-374 CARDS)
SAMPLE PROBLEMS (M2501-43 CARDS, M2502-1 CARD)
SAMPLE PROBLEM OUTPUT (M2501-11 PAGES, M2502-10 PAGES)
REFERENCE MEMORANDA

17. CATEGORY - M

KEYWORDS - DATA PROCESSING, MAINTENANCE, SEARCHES, RETRIEVAL

ACC ABSTRACT 588 02/74

1. NAME OR DESIGNATION OF PROGRAM - ORCOST

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - ORCOST ESTIMATES DIRECT AND INDIRECT CAPITAL COSTS OF NUCLEAR AND FOSSIL-FUELED STEAM-ELECTRIC POWER PLANTS. THE COSTS ARE CALCULATED USING BASE COST MODELS WHICH ARE INCLUDED IN THE PROGRAM FOR EACH OF THE FOLLOWING TYPES OF PLANTS - PWR, BWR, COAL, GAS, AND OIL.

4. METHOD OF SOLUTION - THE CODE FOLLOWS THE GUIDELINES OF AEC REPORT NUS-531. A BASE PLANT COST MODEL IS SELECTED AND ADJUSTED FOR DESIRED SIZE, LOCATION, DATE, ETC. CONTINGENCY, SPARE PARTS, OVERTIME, INDIRECTS, INTEREST AND ESCALATION ARE THEN INCLUDED BEFORE PRINTING A REPORT OF COST.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - EXECUTION TIME FOR A SINGLE CASE IS APPROXIMATELY ONE SECOND.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - COST MODELS WERE DEVELOPED FROM THE CONCEPT CODE (ACC ABSTRACT 498).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MARCH 1973, REPLACED BY REVISED VERSION JULY 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - L. C. FULLER, C. A. SWEET, H. I. BOWERS, ORCOST- A COMPUTER CODE FOR SUMMARY CAPITAL COST ESTIMATES OF STEAM-ELECTRIC POWER PLANTS, USER'S MANUAL, ORNL-TM-3743, SEPTEMBER 1972.

11. MACHINE REQUIREMENTS - 56K BYTES

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
H. I. BOWERS, L. C. FULLER, AND C. A. SWEET
OAK RIDGE NATIONAL LABORATORY
P. O. BOX X
OAK RIDGE, TENNESSEE 37830

16. MATERIAL AVAILABLE -
SOURCE DECK (1005 CARDS)

16. MATERIAL AVAILABLE (CONTINUED)
    SAMPLE PROBLEM (5 CARDS)
    REFERENCE REPORT

17. CATEGORY - D
    KEYWORDS - REACTOR ECONOMICS, POWER PLANTS, PWR REACTORS, BWR REACTORS, CONCEPT CODES

1. NAME OR DESIGNATION OF PROGRAM - BECCM

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/50, UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - AEC REGULATIONS REQUIRE THAT A PURCHASE VS. LEASE ANALYSIS BE MADE ON EACH PIECE OF DATA PROCESSING EQUIPMENT AS PART OF THE STUDY PRECEDING THE LEASE OR PURCHASE OF SUCH EQUIPMENT. IN ADDITION, IT IS REQUIRED THAT A PURCHASE VS. LEASE ANALYSIS BE PREPARED ANNUALLY FOR EACH ITEM OF DATA PROCESSING EQUIPMENT LEASED WITH AEC FUNDS. BECOM WAS DEVELOPED TO FACILITATE THE RAPID AND ACCURATE PREPARATION OF AN AEC PURCHASE VS. LEASE SCHEDULE FOR AN ITEM OF DATA PROCESSING EQUIPMENT.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - BECOM IS RESTRICTED TO A 6 YEARS' STUDY.

6. TYPICAL RUNNING TIME - ON THE UNIVAC1108 50 STUDIES CAN BE DONE IN LESS THAN A MINUTE. ON THE IBM360 THE SAMPLE PROBLEM REQUIRES ABOUT 30 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS A MODIFICATION OF ALO-178 AND ALO-251 TRANSFERRED FROM THE ALO-COSMIC COLLECTION.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED JANUARY 1973, SAMPLE PROBLEM EXECUTED BY ACC.
UNIVAC1108 VERSION SUBMITTED JANUARY 1973.

10. REFERENCES - BRUNO D. NAVALESI, BECCM, A COMPUTER PROGRAM TO CALCULATE BREAK-EVEN POINT OF PURCHASE VS. LEASE FOR COMPUTING EQUIPMENT IN THE AEC, SANDIA LABORATORIES MANUAL.

BRUNO D. NAVALESI, BECOM, A COMPUTER PROGRAM TO CALCULATE BREAK-EVEN POINT OF PURCHASE VS. LEASE FOR COMPUTING EQUIPMENT IN THE AEC, SANDIA LABORATORIES MANUAL, MODIFIED FEBRUARY 1971.

BRUNO NAVALESI, PURCHASE VS. LEASE PROGRAM LISTING (BECOM) FOR IBM360/50, SANDIA LABORATORIES REPORT, JANUARY 24, 1973.

BRUNO NAVALESI, PURCHASE VS. LEASE PROGRAM LISTING (BECOM) FOR UNIVAC 1108 EXEC-8, SANDIA LABORATORIES REPORT, JANUARY 23, 1973.

11. MACHINE REQUIREMENTS - 300K BYTES OF STORAGE (IBM360)

12. PROGRAMMING LANGUAGE USED - COBOL

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360), EXEC8 (UNIVAC1108).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

BRUNO NAVALESI
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (360-1423 CARDS, 1108-960 CARDS)
SAMPLE PROBLEMS (360-97 CARDS, 1108-97 CARDS)
CONTROL INFORMATION (360-9 CARDS)
LOAD MODULE BECOM (42 BLOCKS)
REFERENCE REPORTS

17. CATEGORY - M
KEYWORDS - DATA PROCESSING, ECONOMICS

ACC ABSTRACT 590 02/74

1. NAME OR DESIGNATION OF PROGRAM - INTEG/INSPEC

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - THESE PROGRAMS ANALYZE THE CHARACTERISTICS OF A GENERAL MODEL DEVELOPED TO REPRESENT THE SAFETY ASPECTS OF AN OPERATING NUCLEAR REACTOR. THESE CHARACTERISTICS ARE THE FREQUENCIES OF INCIDENTS THAT ARE DEPARTURES FROM THE EXPECTED BEHAVIOR OF THE REACTOR. EACH INCIDENT IS ASSUMED TO BE PRECEDED BY A SEQUENCE OF EVENTS STARTING AT SOME INITIATING EVENT. AT EACH MEMBER IN THIS SEQUENCE THERE MAY BE FUNCTIONS SUCH AS SAFETY CIRCUITS, AND PERSONNEL OPERATIONS THAT STOP THE SEQUENCE AT THAT MEMBER. WHEN MECHANICAL DEVICES FAIL THEY ARE ASSUMED TO REMAIN INOPERATIVE UNTIL REPAIRED. THE MODEL ACCOUNTS FOR SCHEDULED INSPECTION AND MAINTENANCE OF ALL EQUIPMENT IN THE SYSTEM.

4. METHOD OF SOLUTION - IN INTEG, THE DISCONTINUOUS DENSITY FUNCTION IS INTEGRATED BY THE TRAPEZOIDAL RULE FROM TIME EQUALS ZERO TO TIME EQUALS T. INSPEC IS BASED ON THE SIMULATION OF REACTOR OPERATION AS A MARKOV PROCESS. A VECTOR OF PROBABILITIES IS SUCCESSIVELY MULTIPLIED BY A TRANSITION MATRIX.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - INSPEC IS LIMITED TO SUBSYSTEMS WITH NO MORE THAN 7 SAFETY CIRCUITS. THE TRANSITION MATRIX CAN BE MADE UP AS DESIRED SO THAT ANY INTERCORRELATIONS BETWEEN FAILURES OF CIRCUITS CAN BE ACCOMMODATED. IN INTEG, FAILURE RATES OF SAFETY CIRCUITS ARE RESTRICTED TO INDEPENDENCE.

6. TYPICAL RUNNING TIME - THE INTEG SAMPLE PROBLEM CONTAINING FIVE PROBLEMS, EACH WITH 3,000 STEPS OF TRAPEZOIDAL INTEGRATION AND WITH AN AVERAGE OF 4.6 SAFETY CIRCUITS, REQUIRES A TOTAL CPU TIME OF 2 SECONDS ON AN IBM360/195, WHILE THE INSPEC SAMPLE PROBLEM WITH THREE SAFETY CIRCUITS RUNS FOR 500 TRANSITIONS WITH AN INDICATED CPU TIME LESS THAN 2 SECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MARCH 1973, SAMPLE PROBLEMS EXECUTED BY ACC.

10. REFERENCE - L. M. ARNETT, QUANTITATIVE ANALYSIS OF REACTOR SAFETY, DP-1168, NOVEMBER 1968.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

L. M. ARNETT
SAVANNAH RIVER LABORATORY
E. I. DU PONT DE NEMOURS
AIKEN, SOUTH CAROLINA 29801

16. MATERIAL AVAILABLE -
SOURCE DECKS (INTEG 143 CARDS, INSPEC 159 CARDS)
SAMPLE PROBLEMS (INTEG 28 CARDS, INSPEC 10 CARDS)
SAMPLE PROBLEM OUTPUT (INTEG 13 PAGES, INSPEC 2 PAGES)
REFERENCE REPORT

17. CATEGORY - G
KEYWORDS - REACTOR SAFETY, OPERATION

ACC ABSTRACT 591 02/74

1. NAME OR DESIGNATION OF PROGRAM - PLETHS

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE-400 TIME-SHARING

3. DESCRIPTION OF PROBLEM OR FUNCTION - PLETHS IS A TIME-SHARING ISOPLETH-AREA PROGRAM FOR DETERMINING GROUND-LEVEL AREAS OF HIGH POLLUTANT CONCENTRATION DOWNWIND OF A SINGLE SOURCE OF EMISSION. THESE ELLIPTICAL AREAS ARE ENCLOSED BY ISOPLETHS OF CONSTANT CONCENTRATION PRODUCED BY CONTINUOUS POLLUTANT EMISSIONS FROM ONE SMOKE STACK OR GROUND SOURCE, OR FROM A CLOSELY ASSOCIATED GROUP OF SINGLE SOURCES. STACK HEIGHT, WEATHER CONDITIONS, AND SOURCE EMISSION RATE ARE TYPED IN AND THE PROGRAM CALCULATES AND DESCRIBES THE HIGH POLLUTION AREAS ENCLOSED BY ISOPLETHS.

4. METHOD OF SOLUTION - CONCENTRATIONS FOR EACH POINT OF A SQUARE GRID ARE CALCULATED BY MEANS OF THE PLUME MODEL FOR ATMOSPHERIC DISPERSION OR (FOR LOW WIND SPEEDS) THE PUFF MODEL.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CALCULATIONS CAN BE PERFORMED FOR ANY (NONREACTING) GAS OR PARTICULATE MATTER. THE RESULTING CONCENTRATIONS AND ISOPLETHS ARE IN PARTS PER MILLION (FOR GASES OF GIVEN MOLECULAR WEIGHT) OR IN MICROGRAMS PER CUBIC METER (FOR ANY POLLUTANT).

6. TYPICAL RUNNING TIME - LESS THAN A MINUTE IS REQUIRED WITH AVERAGE CONNECT TIME ABOUT 15 TO 20 MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM - THE PARTICULAR ADVANTAGE OF THE TIME-SHARING PROGRAM IS THAT ISOPLETHS CAN BE CALCULATED FOR ANY COMBINATION OF SOURCE STRENGTH AND ISOPLETH LEVEL, AS WELL AS ANY COMBINATION OF WIND SPEED, STABILITY, AND OTHER METEOROLOGICAL CONDITIONS. ANY BOOK OF TABLES IS NECESSARILY LIMITED BY SIZE TO A SMALL SET OF CASES.

8. RELATED AND AUXILIARY PROGRAMS - THE TIME-SHARING PROGRAM IS BASED ON THE ISOPLETH-AREA CODE DESCRIBED IN REFERENCE 1. THIS CODE ALSO FORMED THE NUCLEUS OF THE PUFF CODE ASSOCIATED WITH THE APICS SYSTEM, REFERENCE 2.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
GE-400 TIME-SHARING PROGRAM RECEIVED MAY 1973.

10. REFERENCES - L. A. CONLEY, E. J. CROKE, A. S. KENNEDY, R. F. KING, J. E. NORCO, J. J. ROBERTS, A. D. ROSSIN, AND T. D. WOLSKO, ISOPLETH-AREA TABLES, ANL/ES-8, OCTOBER 1971.
J. J. ROBERTS, EDITOR, CHICAGO AIR POLLUTION SYSTEMS ANALYSIS PROGRAM: FINAL REPORT, ANL/ES-CC-009, FEBRUARY 1971.
RICHARD F. KING, TIME-SHARING ISOPLETH-AREA PROGRAM, ANL/ES-13, SEPTEMBER 1972.

11. MACHINE REQUIREMENTS - CODE LENGTHS ARE: SOURCE, ABOUT 22,500 BYTES, OBJECT, ABOUT 13,000 BYTES, 3-BYTES PER 24-BIT WORD.

12. PROGRAMMING LANGUAGES USED - GE-400 TIME-SHARING FORTRAN

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GSA TIME-SHARING SYSTEM.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

RICHARD F. KING
ENERGY AND ENVIRONMENTAL SYSTEMS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE -
REFERENCE REPORT, ANL/ES-13, CONTAINING SOURCE LISTING, SAMPLE PROBLEM INPUT AND OUTPUT INFORMATION

17. CATEGORY - R
KEYWORDS - TIME-SHARING, POLLUTANTS CONCENTRATION, PARTICLES, ATMOSPHERE

ACC ABSTRACT 592 02/74

1. NAME OR DESIGNATION OF PROGRAM - GEAR

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600

3. DESCRIPTION OF PROBLEM OR FUNCTION - GEAR IS A PACKAGE OF SUBROUTINES FOR THE NUMERICAL SOLUTION OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS, GIVEN THE INITIAL VALUES. IT IS PARTICULARLY WELL-SUITED FOR STIFF SYSTEMS, BUT CAN BE USED GENERALLY.

4. METHOD OF SOLUTION - THE BASIC METHODS USED ARE OF THE LINEAR MULTISTEP PREDICTOR-CORRECTOR TYPE. GEAR CONTAINS BOTH THE IMPLICIT ADAMS METHODS AND THE LINEAR MULTISTEP METHODS OF C. W. GEAR AS OPTIONS, AND IS BASED ON A PROGRAM WRITTEN BY GEAR.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - CHOICE OF EITHER IMPLICIT ADAMS METHODS TO ORDER 12, OR GEAR METHODS TO ORDER 5 IS ALLOWED.

6. TYPICAL RUNNING TIME - THIS IS PROBLEM- AND MACHINE-DEPENDENT.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600-7600 VERSION SUBMITTED JULY 1973.

10. REFERENCES - C. W. GEAR, NUMERICAL INITIAL VALUE PROBLEMS IN ORDINARY DIFFERENTIAL EQUATIONS, PRENTICE-HALL, 1971.
A. C. HINDMARSH, LINEAR MULTISTEP METHODS FOR ORDINARY DIFFERENTIAL EQUATIONS: METHOD FORMULATIONS, STABILITY, AND THE METHODS OF NORDSIECK AND GEAR, UCRL-51186, MARCH 1972.
A. C. HINDMARSH, THE CONTROL OF ERRORS IN THE GEAR PACKAGE FOR ORDINARY DIFFERENTIAL EQUATIONS, IN CONSTRUCTION OF MATHEMATICAL SOFTWARE, F. N. FRITSCH, ED., UCID-30050 PART 3, AUGUST 7, 1972.
A. C. HINDMARSH, GEAR: ORDINARY DIFFERENTIAL EQUATION SYSTEM SOLVER, UCID-30001 REV. 2, AUGUST 20, 1972.

11. MACHINE REQUIREMENTS - UNDER ORDER OR CHAT THE SPACE REQUIRED FOR THE ENTIRE PACKAGE, INCLUDING DRIVES, BUT EXCLUDING THE COMMON BLOCKS AND THE Y ARRAY IS 1837 DECIMAL.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - PROGRAM RUNS UNDER ORDER AND CHAT SYSTEMS ON THE CDC6600 AND CDC7600, AND WITH MINOR CHANGES UNDER CHIP ON THE CDC6600. FOR OTHER SYSTEMS, ONLY MINOR MODIFICATIONS SHOULD BE NECESSARY.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE SUBROUTINES IN THE GEAR PACKAGE--DRIVES, STIFF, COSET, DECOMP, AND SOLVE--ARE HEAVILY AUGMENTED WITH COMMENT CARDS. IF STIFF IS USED ON MACHINES OTHER THAN THE CDC6600,7600, THE CONSTANT ANOISE SET IN A DATA STATEMENT MUST BE SET TO THE APPROXIMATE MACHINE NOISE LEVEL. THE PACKAGE CAN BE USED IN ONE OF TWO MODES. THE USER CAN CALL SUBROUTINE STIFF FROM HIS OWN PROGRAM FOR EACH STEP OF THE INTEGRATION OR ALTERNATIVELY, THE USER CAN MAKE A SINGLE CALL TO THE DRIVES SUBROUTINE WHICH CONTAINS THE LOOPING AND ERROR-TREATMENT CODING NECESSARY TO COMPLETE THE PROBLEM.

15. NAME AND ESTABLISHMENT OF AUTHOR -

A. C. HINDMARSH
NUMERICAL MATHEMATICS GROUP, L-310
LAWRENCE LIVERMORE LABORATORY
P. O. BOX 808
LIVERMORE, CALIFORNIA 94550

16. MATERIAL AVAILABLE -
SOURCE DECKS (982 CARDS)
SAMPLE PROBLEM (82 CARDS)
SAMPLE PROBLEM OUTPUT (3 PAGES)
REFERENCE REPORT, UCID-30001 REV. 2

17. CATEGORY - P
KEYWORDS - DIFFERENTIAL EQUATIONS, NUMERICAL CALCULATIONS, PREDICTOR-CORRECTOR

ACC ABSTRACT 593 02/74

1. NAME OR DESIGNATION OF PROGRAM - TSO-SPEAKEASY

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360,370

3. DESCRIPTION OF PROBLEM OR FUNCTION - SPEAKEASY IS A GENERAL-PURPOSE LANGUAGE PROCESSOR OPERATING AS A SUPER DESK CALCULATOR UNDER TSO.

4. METHOD OF SOLUTION - THE LANGUAGE SYNTAX CLOSELY RESEMBLES THAT OF MATHEMATICS. USER-DEFINED VARIABLES ARE CLASSIFIED AS SCALARS, ARRAYS, VECTORS, OR MATRICES. CLASS-DIRECTED OPERATORS SIMPLIFY THE LANGUAGE.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE MAJOR VERSIONS DEVELOPED WERE (1) AN IBM360/370 STANDARD JOB BATCH VERSION, (2) AN INTERACTIVE VERSION WHICH USED THE IBM2250 DISPLAY CONSOLE OFFERING GRAPHIC CAPABILITIES, AND (3) AN INTERACTIVE VERSION THAT RUNS UNDER TSO.

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM - SPEAKEASY IS AN EXTENSIBLE LIBRARY-DIRECTED PROCESSOR. AVAILABLE FACILITIES INCLUDE ARRAY ALGEBRA, COMPLETE MATRIX ALGEBRA, STATISTICAL PACKAGES, GRAPHICAL PACKAGES, AND ASSORTED SPECIAL FUNCTIONS. AN ACTIVE USER COMMUNITY EXISTS.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 IOTA VERSION 3F SUBMITTED NOVEMBER 1973.
THIS VERSION IS VALID ONLY THROUGH DECEMBER 1974.

10. REFERENCES - S. COHEN, THE SPEAKEASY-3 REFERENCE MANUAL, ANL-8000, MAY 1973.
S. COHEN, SPEAKEASY: "RAKUGO", FIRST USA-JAPAN COMPUTER CONFERENCE PROCEEDINGS REPRINT, OCTOBER 3-5, 1972.
S. COHEN, TSO-SPEAKEASY NEWSLETTERS, NO. 1 (AUG. 7, 1972), NO. 2 (SEPT. 5, 1972), NO. 3 (DEC. 13, 1972), NO. 4 (MAR. 28, 1973), NO. 5 (MAY 23, 1973), NO. 6 (JULY 24, 1973), NO. 7 (OCT. 1, 1973).

11. MACHINE REQUIREMENTS - A 130K OR LARGER TSO REGION IS REQUIRED FOR THIS TSO VERSION.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV AND ASSEMBLER LANGUAGE

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360, RELEASE 21.6, VS1, AND VS2.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

S. COHEN
PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SPEAK.ICTA LOAD MODULE (286 BLOCKS)
SPEAK.EMESS ERROR MESSAGES (66 BLOCKS)
SPEAK.LINKULES SYSTEM LINKULE LIBRARY (1227 BLOCKS)
SPEAK.HELP CURRENT HELP LIBRARY (276 BLOCKS)
SPEAK.PROCLIB TUTORIAL AND TAILORING INFORMATION (109 BLOCKS)
REFERENCE REPORTS, REPRINT, NEWSLETTERS, AND INSTALLATION INSTRUCTIONS

17. CATEGORY - P
KEYWORDS - PROGRAMMING LANGUAGES, NUMERICAL CALCULATIONS, LIBRARIES

ACC ABSTRACT 594 02/74

1. NAME OR DESIGNATION OF PROGRAM - ARC-XSEC1

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - ARC-XSEC1 PROVIDES THE CAPABILITY OF MANIPULATING MULTIGROUP MICROSCOPIC CROSS SECTION DATA IN THE XS.ISO FORMAT TO AFFECT MODIFICATIONS OF THE ISOTOPIC CROSS SECTION COMPONENTS, TO COLLAPSE THE ENERGY GROUP STRUCTURE TO FEWER GROUPS, AND TO HOMOGENIZE MIXTURES INTO MATERIAL AND COMPOSITION LEVEL DATA FOR USE BY THE NEUTRONICS MODULES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM.

4. METHOD OF SOLUTION - ARC-XSEC1 CONSISTS OF FOUR RELATED MODULES - AJC007, NUI006, NUI001, AND NUC001. THE MODULE AJC007 PROVIDES A GROUP COLLAPSE OF THE MULTIGROUP XS.ISO DATA INTO A USER-SPECIFIED GROUP STRUCTURE AND WRITES THE BINARY INTERFACE DATA SET XS.ISO2. NUI006 PRODUCES RUN-TIME MODIFICATIONS OF ISOTOPIC CROSS SECTION COMPONENTS OF THE CARD IMAGE DATA SET A.NIP. THE MODULE NUI001 PROCESSES THE MATERIAL AND COMPOSITION LEVEL MIXING DATA SPECIFIED IN A.NIP AND PRODUCES MIX TABLES AS THE BINARY INTERFACE DATA SET B.HOMOG. NUC001 USES THE MIX TABLES OF B.HOMOG TO PRODUCE HOMOGENIZED MATERIAL AND COMPOSITION LEVEL CROSS SECTION DATA SETS IN THE BINARY INTERFACE DATA SET FORMATS XS.M.MIN, XS.M.ANI, XS.M.AUX, XS.C.MIN, XS.C.ANI, XS.C.AUX, RESPECTIVELY.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM PROVIDED WHICH CONSISTS OF MULTIPLE OPERATIONS, REQUIRES ABOUT 71 SECONDS ON AN IBM360/195.

7. UNUSUAL FEATURES OF THE PROGRAM - THE MODULAR DESIGN ALLOWS THE USE OF ANY OR ALL OF THE MODULES IN THIS PACKAGE WITH OTHER DESIRED MODULES. THE HOMOGENIZATION CAPABILITY, NUI001 AND NUC001, IS USED TO PROVIDE CROSS SECTION DATA FOR EACH OF THE NEUTRONICS MODULES WITH COMMUNICATION VIA INTERFACE DATA SETS.

8. RELATED AND AUXILIARY PROGRAMS - THE NEUTRONICS PATHS OF THE ARC SYSTEM UTILIZE THE CAPABILITIES PROVIDED BY THESE MODULES. THE ARC SYSTEM ENVIRONMENT IS PROVIDED BY ARC-SYSTEM (ACC ABSTRACT 522). THE BCD INPUT PROCESSOR MODULE FOR THE ARC-SYSTEM IS ARC-NUI002 (ACC ABSTRACT 533).

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED APRIL 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - E. A. KOVALSKY, J. ZAPATKA, H. HENRYSON, II, J. HOOVER, AND P. M. WALKER, THE ARC SYSTEM CROSS SECTION HOMOGENIZATION AND MODIFICATION CAPABILITIES, ANL-7714, JUNE 1971.
L. C. JUST, H. HENRYSON, II, A. S. KENNEDY, S. D.

10. REFERENCES (CONTINUED)
SPARCK, B. J. TOPPEL, AND P. M. WALKER, THE SYSTEM ASPECTS AND INTERFACE DATA SETS OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM, ANL-7711, APRIL 1971.
B. J. TOPPEL, SUPPLEMENTAL INFORMATION, ANL MEMO, 1973.

11. MACHINE REQUIREMENTS - 300K BYTES WITH A 10,000 DOUBLEWORD CONTAINER (DEFAULT) AND 2 PERIPHERAL I/O DEVICES

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
AUTHORS E. A. KOVALSKY, J. ZAPATKA, H. HENRYSON, II, J. HOOVER, AND P. M. WALKER

CONTACT B. J. TOPPEL
APPLIED PHYSICS DIVISION
ARGONNE NATIONAL LABORATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (PDS ARC.XSOURCE)
OBJECT MODULES (PDS ARC.XSEGLIB)
LINKAGE EDITOR CONTROL STATEMENTS (PDS ARC.XOVERLAY)
LOAD MODULES (PDS ARC.XMODLIB)
CONTROL INFORMATION (JCL IEHMOVE DECK)
SAMPLE PROBLEM (425 CARDS)
LIBRARIES (XS.ISO.F1 AND XS.ISO.F2)
SAMPLE PROBLEM OUTPUT (98 PAGES)
REFERENCE REPORTS

17. CATEGORY - L
KEYWORDS - MODULAR SYSTEM, MULTIGROUP CROSS SECTIONS, INPUT DATA, GROUP CONSTANTS, ARC CODES

ACC ABSTRACT 595 02/74

1. NAME OR DESIGNATION OF PROGRAM - MAPPER

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - GE MARK III TIME-SHARING

3. DESCRIPTION OF PROBLEM OR FUNCTION - MAPPER IS A COMPUTER PROGRAM FOR PREDICTING EQUIPMENT REQUIREMENTS. IT WAS DESIGNED AS AN AID TO MANAGEMENT AND CAN INTERPRET COMPONENT PRODUCTION REQUIREMENTS BACKWARD FROM SHIPPING SCHEDULES TO THE PROCESS OF INTEREST, CALCULATE EQUIPMENT CAPACITY, DISPLAY SIX MONTHS PRIOR EQUIPMENT UTILIZATION AND PROCESS YIELD DATA.

4. METHOD OF SOLUTION -

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - 1 TO 2 SECONDS ARE REQUIRED FOR A TYPICAL PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
GE MARK III TIME-SHARING PROGRAM LISTING SUBMITTED AUGUST 1973.

10. REFERENCES - R. J. DI PRIMA, MANUFACTURING PROGRAM FOR PREDICTING EQUIPMENT REQUIREMENT (MAPPER), GEPP-103, 1973.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - BASIC

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - GE MARK III TIME-SHARING OPERATION.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE PROGRAM USES THE MARK III SYSTEM PLOTTING ROUTINE EZGRAF.

15. NAME AND ESTABLISHMENT OF AUTHOR -
R. J. DI PRIMA
NEUTRON DEVICES DEPARTMENT
GENERAL ELECTRIC COMPANY
P. O. BOX 11508
ST. PETERSBURG, FLORIDA 33733

16. MATERIAL AVAILABLE -
REFERENCE REPORT CONTAINING SOURCE LISTING, SAMPLE PROBLEM INPUT AND OUTPUT INFORMATION
SOURCE PROGRAM ON PAPER TAPE (AVAILABLE UPON REQUEST)

17. CATEGORY - M
KEYWORDS - MANAGEMENT AID, EQUIPMENT REQUIREMENTS, MANUFACTURING

1. NAME OR DESIGNATION OF PROGRAM - ENDFB2/GAND2/GFE2

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - ENDFB2 CONVERTS ENDF/B CROSS SECTION DATA FROM A CARD-IMAGE TO A BINARY TAPE FOR USE BY THE GAND2 AND/OR GFE2 CODES.

   GAND2 PREPARES THE CROSS SECTIONS NEEDED FOR DETAILED COMPUTATIONS OF NEUTRON ENERGY SPECTRA IN REACTORS FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B VERSION II OR III FORMATS (ALSO RETAINS THE ENDF/B VERSION I CAPABILITY OF GAND).

   GFE2 PREPARES 1/E OR FISSION-SPECTRUM WEIGHTED, ZERO TEMPERATURE, INFINITE DILUTION GROUP-AVERAGED CROSS SECTIONS AND SCATTERING TRANSFER ARRAYS FOR USE IN THE FAST SECTIONS OF THE GGC AND MICROX CODES FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B VERSION II OR III FORMATS (THE ENDF/B VERSION I FORMAT CAPABILITY OF THE ORIGINAL GFE CODE IS ALSO RETAINED).

4. METHOD OF SOLUTION - GAND2 PREPARES FINE GROUP CROSS SECTIONS AND SCATTERING TRANSFER ARRAY COEFFICIENT ARRAYS FOR USE IN THE GAF CODE USING MODIFIED VERSIONS OF THE ROUTINES USED TO PREPARE GGC4 (ACC ABSTRACT 298) DATA TAPES AS WELL AS THE GANDY CODE (ACC ABSTRACT 341) FOR UNRESOLVED RESONANCE REGION CROSS SECTION GENERATION. POINTWISE RESOLVED RESONANCE REGION CROSS SECTIONS FOR USE IN THE GAR AND MICROX CODES AS WELL AS THE GAROL OPTION (ACC ABSTRACT 219) OF THE GGC5 CODE ARE PREPARED USING THE PSEUDO CODE (ACC ABSTRACT 292) TO GENERATE STATISTICAL RESONANCES IN THE UNRESOLVED RESONANCE REGION AND THE FSDP3 CODE (ACC ABSTRACT 216) TO GENERATE THE CROSS SECTIONS FROM BOTH THE STATISTICAL RESONANCES AND THE RESOLVED RESONANCE PARAMETERS. CROSS SECTION VALUES IN THE THERMAL NEUTRON ENERGY RANGE MAY BE PREPARED FOR NON-MODERATOR NUCLIDES (THOSE NUCLIDES FOR WHICH NO DETAILED SCATTERING LAW DATA ARE GIVEN IN FILE 7) USING EITHER A STRICTLY POINTWISE CALCULATION OR AN ULTRA-FINE MESH AVERAGING PROCEDURE USING A NEUTRON ENERGY SPECTRUM OBTAINED BY INTERPOLATION FROM AN INPUT SPECTRUM.

   GFE2 IS AN EXTENDED SPECIAL-PURPOSE VERSION OF THE GAF CROSS SECTION PREPARATION SECTION OF THE GAND2 CODE. THE EXTENSIONS INCLUDE THE COMPUTATION OF P3 INSTEAD OF P1 SCATTERING TRANSFER ARRAYS AND A HIGH-SPEED, ZERO TEMPERATURE, INFINITE DILUTION RESOLVED RESONANCE CALCULATION VIA THE INDER CODE (GA-7158).

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - ENDFB2 PROCESSES FILES 1 THROUGH 7 OF THE CURRENT ENDF/B FORMAT.

   GAND2 MAXIMA INCLUDE -

   20 ENDF/B MATERIALS PROCESSED IN A SINGLE PROBLEM
   35 RESONANCE LEVELS ON EITHER SIDE OF THE INCIDENT NEUTRON ENERGY
   1000 RESOLVED RESONANCES PER ISOTOPE (375 PER L-STATE PER ISOTOPE IN GFE2 VERSION)
   500 ENERGIES PER L-STATE PER ISOTOPE FOR ENERGY-DEPENDENT UNRESOLVED RESONANCE PARAMETERS (LRU=2, LRF=1 OR 2)

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM (CONTINUED)

1740 GROUPS FOR GAF
5000 WORDS PER RECORD ON GAF DATA TAPES
2000 WORDS PER RECORD ON GAR DATA TAPES
10 TEMPERATURES PER GAR PROBLEM
10 ISOTOPES PER GAR PROBLEM
800 ENERGIES (GROUPS) IN THE THERMAL NEUTRON CROSS SECTION PREPARATION SECTION

GFE2 MAXIMA INCLUDE -

20 ENDF/B MATERIALS PER PROBLEM
375 RESOLVED RESONANCES PER L-STATE (ANGULAR MOMENTUM STATE) PER ISOTOPE
375 ENERGIES PER L-STATE PER ISOTOPE FOR ENERGY-DEPENDENT UNRESOLVED RESONANCE PARAMETERS (LRU=2, LRF=1 OR 2)
99 GROUPS (LIMITED BY SUBROUTINE INDER AND BY TRANSFER ARRAY ACCUMULATION IN SUBROUTINE GACJ)

LF=1 OR 5 SECONDARY ENERGY DISTRIBUTION LAWS IN FILE 5 CANNOT BE PROCESSED IN THE PRESENT VERSION OF GAND2 AND GFE2. INELASTIC SCATTERING IS ASSUMED TO BE ISOTROPIC IN THE CENTER-OF-MASS SYSTEM.

6. TYPICAL RUNNING TIME - ENDFB2 PROCESSING ONE MATERIAL TAKES LESS THAN A MINUTE. TOTAL TIME IS DETERMINED BY THE POSITION OF THE MATERIAL ON THE CARD-IMAGE TAPE. A FULL CARD-IMAGE TAPE (CONTAINING APPROXIMATELY 23,000 RECORDS) TAKES ABOUT 9 MINUTES TO READ.

GAND2 REQUIRES 15 MINUTES OR LESS FOR A TYPICAL GAF OR GAR PROBLEM, 1 MINUTE FOR THE THERMAL NEUTRON CROSS SECTION OPTION. 5 MINUTES ARE REQUIRED FOR A TYPICAL GFE2 PROBLEM.

7. UNUSUAL FEATURES OF THE PROGRAM - ENDFB2 WRITES THE BINARY OUTPUT TAPE USING THE UNIVAC SPECIAL I/O ROUTINE NTRAN. IF THE NUMBER OF TABULAR POINTS FOR A GIVEN ENDF/B FILE 3 REACTION TYPE EXCEEDS 2000, THE REACTION DATA IS BLOCKED INTO MULTIPLE RECORDS. REDUNDANT INELASTIC SCATTERING DATA IS ALSO ELIMINATED.

THE RESOLVED AND UNRESOLVED RESONANCE CALCULATIONS IN GAND2 CAN TREAT PROCESSES INVOLVING NEUTRONS OF ORBITAL ANGULAR MOMENTA ZERO THROUGH THREE (S-, P-, D-, AND F-WAVE INTERACTIONS). THE VERSION OF THE PSEUDO CODE USED IN THIS PROGRAM HAS BEEN MODIFIED TO ALLOW 1 TO 4 DEGREES OF FREEDOM FOR THE DISTRIBUTION OF FISSION WIDTHS AND HAS BEEN MODIFIED IN GAND2 TO OPERATE FROM HIGHER TO LOWER ENERGIES FOR MUCH GREATER SPEED IN PREPARING 14,500 POINT GAR DATA FOR NUCLIDES SUCH AS U235. A VIRTUALLY UNLIMITED (OVER 2 MILLION) NUMBER OF TABULAR ENERGIES MAY BE USED IN THE ENDF/B FORMAT FILE 3 DATA. THIS IS ACHIEVED BY BREAKING THE ENDF/B FILE 3 DATA UP INTO 2000 WORD BLOCKS. A SIMILAR SCHEME IS USED TO PROCESS THE ANGULAR DISTRIBUTION DATA FROM AN ENDF/B FORMAT FILE 4 WITHOUT SIGNIFICANT RESTRICTIONS ON THE AMOUNT OF INPUT DATA.

THE RESOLVED AND UNRESOLVED RESONANCE CALCULATIONS IN GFE2 CAN TREAT PROCESSES INVOLVING NEUTRONS OF ORBITAL ANGULAR MOMENTA ZERO THROUGH THREE (S-, P-, D-, AND F-WAVE INTERACTIONS). A VIRTUALLY UNLIMITED (OVER 2 MILLION) NUMBER OF TABULAR ENERGIES MAY BE USED IN THE ENDF/B FORMAT FILE 3 DATA. THIS IS ACHIEVED BY BREAKING THE ENDF/B FILE 3 DATA UP INTO 2000 WORD BLOCKS. A SIMILAR SCHEME

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
IS USED TO PROCESS THE ANGULAR DISTRIBUTION DATA FROM AN ENDF/B FORMAT FILE 4 WITHOUT SIGNIFICANT RESTRICTIONS ON THE AMOUNT OF INPUT DATA.

8. RELATED AND AUXILIARY PROGRAMS - THE BINARY ENDF/B FORMAT NUCLEAR DATA TAPES REQUIRED BY THE GAND2 AND GFE2 CODES ARE PREPARED FROM CARDS OR ENDF/B CARD-IMAGE TAPES BY THE ENDFB2 CODE, WHICH IS SIMILAR TO THE DAMMET CODE (ACC ABSTRACT 384). OUTPUT FROM THE GAND2 CODE IS INTENDED FOR USE IN THE GAFGAR CODE (ACC ABSTRACT 316), THE GAROL OPTION OF THE GGC5 CODE, AND MICROX CODE, AND THE WTFG CODE. OUTPUT OF THE GFE2 CODE IS INTENDED FOR USE AS INPUT TO THE MAKE CODE WHICH PREPARES DATA TAPES (GAM TYPE) FOR USE IN THE FAST SECTIONS OF THE GGC4 AND GGC5 CODES. THESE GAM-TYPE DATA TAPES ARE ALSO USED TO PREPARE DATA TAPES FOR USE IN THE MICROX CODE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED JULY 1973.

10. REFERENCES - R. J. ARCHIBALD AND D. R. MATHEWS, THE GAF/GAR/GAND FAST REACTOR CROSS SECTION PREPARATION SYSTEM, GAFGAR - A PROGRAM FOR THE CALCULATION OF NEUTRON SPECTRA AND GROUP-AVERAGED CROSS SECTIONS, GA-7542, VOL. I, 1968, AND ERRATA, MAY 1968.

R. J. ARCHIBALD AND D. R. MATHEWS, THE GAF/GAR/GAND FAST REACTOR CROSS SECTION PREPARATION SYSTEM, GAND2 AND GFE2 - COMPUTER PROGRAMS FOR PREPARING INPUT DATA FOR THE GAFGAR, GGC AND MICROX CODES FROM AN ENDF/B FORMAT NUCLEAR DATA FILE, GA-7542, VOL. II, MARCH 1973, AND ERRATA, FEBRUARY 18, 1974.

M. K. DRAKE (ED.), DATA FORMATS AND PROCEDURES FOR THE ENDF/B NEUTRON CROSS SECTION LIBRARY, BNL-50274, OCTOBER 1970.

M. K. DRAKE, C. V. SMITH, AND L. J. TODT, DESCRIPTION OF AUXILIARY CODES USED IN THE PREPARATION OF DATA FOR THE GGC-3 CODE, GA-7158, AUGUST 1971.

S. C. COHEN AND P. K. KOCH, GANDY - A COMPUTER PROGRAM FOR THE EVALUATION OF EFFECTIVE CROSS SECTIONS IN THE UNRESOLVED RESONANCE REGION, GA-8003, MAY 1967.

M. W. DYOS, CONSTRUCTION OF STATISTICAL RESONANCES IN THE UNRESOLVED RESONANCE REGION - THE PSEUDO CODE, GA-7136, MAY 26, 1966.

D. R. MATHEWS, FSDP3, A COMPUTER PROGRAM FOR COMPUTING CROSS SECTIONS FROM RESONANCE PARAMETERS, GULF-GA-A12052, APRIL 5, 1972.

D. MATHEWS, ET AL., GGC-5, A COMPUTER PROGRAM FOR CALCULATION OF NEUTRON SPECTRA AND GROUP CONSTANTS, GA-8871, SEPTEMBER 27, 1971.

J. ADIR AND K. D. LATHROP, THEORY OF METHODS USED IN THE GGC-4 MULTIGROUP CROSS SECTION CODE, GA-9021, OCTOBER 1968.

P. WALTI AND P. KOCH, MICROX - A TWO-REGION FLUX SPECTRUM CODE FOR THE EFFICIENT CALCULATION OF GROUP CROSS SECTIONS, GULF-GA-A10827, APRIL 14, 1972.

11. MACHINE REQUIREMENTS - 11,000 WORDS FOR ENDFB2 PROGRAM AND DATA AND A MAXIMUM OF 4 MAGNETIC TAPE UNITS, 65K WORD AVAILABLE FAST MEMORY AND 4 TO 8 MAGNETIC TAPE UNITS PLUS 5 SCRATCH FILES TOTALING ABOUT 1310K WORDS IN CAPACITY FOR GAND2, 65K WORD AVAILABLE FAST MEMORY AND 2 MAGNETIC TAPE UNITS PLUS 7 SCRATCH FILES TOTALING ABOUT 1310K WORDS IN CAPACITY FOR GFE2

12. PROGRAMMING LANGUAGE USED - FORTRAN V (1108)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC-8 (1108).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE UNIVAC1108 VERSION OF THESE PROGRAMS USES THE UNIVAC NTRAN I/O ROUTINES, UNIVAC FORTRAN V PROCEDURE ELEMENTS, AS WELL AS THE INCLUDE AND PARAMETER STATEMENTS.

15. NAME AND ESTABLISHMENT OF AUTHORS -

1108 D. R. MATHEWS AND R. J. ARCHIBALD
GULF GENERAL ATOMIC
P. O. BOX 608
SAN DIEGO, CALIFORNIA 92112

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (ENDFB2 1108-790 CARDS, GAND2 1108-9217 CARDS, GFE2 1108-6228 CARDS)
SAMPLE PROBLEMS (ENDFB2 1108-13 CARDS, GAND2 1108-53 CARDS, GFE2 1108-32 CARDS)
REFERENCE REPORT, GA-7542, VOL. II

17. CATEGORY - B
KEYWORDS - CROSS SECTIONS, DATA PREPARATION, ENDF/B, GGC4 CODES, GANDY CODES, GAROL CODES, GGC5 CODES, PSEUDO CODES, FSDP3 CODES, GAFGAR CODES, MICROX CODES, WTFG CODES, MAKE CODES, DAMMET CODES

1. NAME OR DESIGNATION OF PROGRAM - MATUS

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600,7600

3. DESCRIPTION OF PROBLEM OR FUNCTION - MATUS PERFORMS SMALL-STRAIN ELASTIC ANALYSIS OF THREE-DIMENSIONAL SOLIDS.

4. METHOD OF SOLUTION - THE FINITE-ELEMENT METHOD IS USED, WITH EIGHT-NODE TRILINEAR ISOPARAMETRIC ELEMENTS. THE PRINCIPLE OF VIRTUAL WORK IS USED TO DEVELOP THE STIFFNESS EQUATIONS. THE STIFFNESS EQUATIONS ARE SOLVED BY A DIRECT METHOD (CROUTS METHOD) WHICH TAKES ADVANTAGE OF THE SYMMETRY, BANDEDNESS, AND SPARSENESS OF THE STIFFNESS MATRIX.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - PROBLEMS WITH UP TO ABOUT 3200 NODES CAN BE SOLVED (WITH A CENTRAL MEMORY FIELD LENGTH OF 170,000 OCTAL). LARGE BANDWIDTHS CAN CAUSE OVERFLOW OF DATA FROM EXTENDED CORE STORAGE TO LOWER SPEED DISK STORAGE WHICH CAN GREATLY INCREASE THE RUNNING TIME OF A PROBLEM.

6. TYPICAL RUNNING TIME - RUNNING TIME DEPENDS ON THE PROBLEM SIZE AND THE COMPUTER. THE PROGRAM RUNS ABOUT FIVE TIMES FASTER ON THE CDC7600 THAN ON THE CDC6600. THE FORWARD ELIMINATION (FACTORIZATION) PHASE OF THE DIRECT SOLUTION PROCESS IS THE MOST TIME CONSUMING PHASE OF A TIME-STEP. THIS FORWARD ELIMINATION TIME (CP PLUS I/O TIME) CAN BE ESTIMATED FROM THE FORWARD ELIMINATION TIME (IN SECONDS) APPROXIMATELY EQUAL TO 1/C TIMES THE SUMMATION FROM 1 TO N OF (BW(SUB N))**2 WHERE BW(SUB N) IS THE BANDWIDTH OF ROW N OF THE STIFFNESS MATRIX AND N IS THE NUMBER OF NODES. THE CONSTANT C EQUALS 2000 IF THE CDC6600 IS USED OR EQUALS 10,000 IF THE CDC7600 IS USED. IF THE MAXIMUM BANDWIDTH IS GREATER THAN THE NUMBER OF ROWS OF THE STIFFNESS MATRIX THAT WILL FIT IN EXTENDED CORE STORAGE (ECS), THE RUNNING TIME WILL GREATLY EXCEED THE ESTIMATE GIVEN ABOVE. WITH AN ECS FIELD LENGTH OF 1,200,000 OCTAL, PROBLEMS WITH BANDWIDTHS UP TO ABOUT 162 CAN BE SOLVED WITHOUT CAUSING OVERFLOW FROM ECS TO DISK.

7. UNUSUAL FEATURES OF THE PROGRAM - THE PROGRAM HAS A TEMPERATURE-DEPENDENT MATERIAL PROPERTY CAPABILITY. SOME CRITICAL LOOPS IN THE FORWARD ELIMINATION (FACTORIZATION) PART OF THE DIRECT SOLUTION ALGORITHM HAVE BEEN PROGRAMMED IN COMPASS ASSEMBLY LANGUAGE IN ORDER TO SPEED UP THE SOLUTION PROCESS. A RESTART OPTION ALLOWS THE USER TO SAVE THE FACTORED STIFFNESS MATRIX AND TO RETRIEVE IT IN A LATER JOB IN WHICH THE SAME PROBLEM IS SUBMITTED WITH DIFFERENT LOADING CONDITIONS. THE USE OF THIS OPTION RESULTS IN A CONSIDERABLE (80-95 PERCENT) SAVINGS IN RUN TIME, SINCE IT ELIMINATES THE NECESSITY TO RE-GENERATE THE FACTORED STIFFNESS MATRIX.

8. RELATED AND AUXILIARY PROGRAMS - PEDCOM (REF. 1) READS, PROCESSES, AND CHECKS THE INPUT DATA FOR MATUS. MESH3D (REF. 3) CAN BE USED

8. RELATED AND AUXILIARY PROGRAMS (CONTINUED)
TO AUTOMATICALLY GENERATE A FINITE-ELEMENT MESH FOR MATUS. APACHE (REF. 2) CAN BE USED TO GENERATE THE TEMPERATURE DISTRIBUTIONS AND, ALSO, TO CALCULATE NODAL POINT VALUES OF STRESS AND STRAIN. PLOTZ (APPENDIX D OF REF. 1) CAN BE USED TO GENERATE DEFORMED GEOMETRY PLOTS AND TEMPERATURE, STRESS, AND STRAIN CONTOUR PLOTS. PRINS (APPENDIX E OF REF. 1) CAN BE USED TO COMPUTE PRINCIPAL STRESSES AND STRAINS AT THE CENTERS OF THE MATUS ELEMENTS.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600,7600 VERSIONS SUBMITTED MAY 1973.

10. REFERENCES - D. N. HUTULA AND B. E. WIANCKO, MATLS, A THREE-DIMENSIONAL FINITE ELEMENT PROGRAM FOR SMALL-STRAIN ELASTIC ANALYSIS, WAPD-TM-1081, MARCH 1973.
D. N. HUTULA, B. E. WIANCKO, AND S. M. ZEILER, APACHE, A THREE-DIMENSIONAL FINITE ELEMENT PROGRAM FOR STEADY-STATE OR TRANSIENT HEAT CONDUCTION ANALYSIS, WAPD-TM-1080, MARCH 1973.
D. N. HUTULA AND S. M. ZEILER, MESH3D, A THREE-DIMENSIONAL FINITE ELEMENT MESH GENERATOR PROGRAM FOR EIGHT-NODE ISOPARAMETRIC ELEMENTS, WAPD-TM-1079, MARCH 1973.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
ACC NO. R597 MATUS, ARGONNE CODE CENTER PROGRAMMING NOTE 74-1, JULY 1973.
ACC NO. R597 MATUS, ARGONNE CODE CENTER PROGRAMMING NOTE 74-10, NOVEMBER 1973.

11. MACHINE REQUIREMENTS - THE PROGRAM WAS WRITTEN FOR A CDC6600 OR A CDC7600 WITH A CENTRAL MEMORY SIZE OF 64K AND AN EXTENDED CORE SIZE OF 512K. THE ACTUAL AMOUNT OF CENTRAL MEMORY AND EXTENDED CORE USED BY THE PROGRAM DEPENDS ON THE PROBLEM SIZE. THE PROGRAM REQUIRES A CARD READER, A LINE PRINTER, A SYSTEM DISK, AND 2 SCRATCH DISKS. ALSO, A DRIVER THAT ALLOWS WRITING-IN-PLACE IS REQUIRED FOR THE 2 SCRATCH DISKS.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - A DESCRIPTION OF THE SOFTWARE ENVIRONMENT AND THE HARDWARE USAGE ASSUMED BY THE PROGRAM IS CONTAINED IN REFERENCE 4. IN PARTICULAR, THE PROGRAM IS DESIGNED TO RUN UNDER THE SCOPE 3.1.5 OPERATING SYSTEM ON THE CDC6600 AND UNDER SCOPE 1.1 OPERATING SYSTEM ON THE CDC7600.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - MATUS IS ORGANIZED FOR OVERLAY LOADING, WHEREBY CENTRAL MEMORY IS OCCUPIED AT ANY GIVEN TIME BY THE MAIN OVERLAY (ROOT) AND A SINGLE PRIMARY OVERLAY. THERE ARE FIVE PRIMARY OVERLAYS. THE ROOT CONTAINS MANY OF THE FCHIP ROUTINES (REF. 4), INCLUDING NEXT, WHICH LOADS EACH OVERLAY AS NEEDED. THE ROOT DECLARES A BLANK COMMON ARRAY OF LENGTH ONE. IF THERE ARE M WORDS FROM THE START OF

14. ANY OTHER INFORMATION OR RESTRICTIONS (CONTINUED)
BLANK COMMON TO THE FIELD LENGTH AND N WORDS OF TEXT IN THE LONGEST OVERLAY, THE STORAGE SPACE ACTUALLY AVAILABLE FOR PROBLEM DATA IS M-N WORDS. THESE M-N WORDS OF BLANK COMMON ARE DYNAMICALLY ALLOCATED TO ACCOMMODATE THE ARRAYS NEEDED FOR A PARTICULAR PROBLEM. EXTENDED CORE STORAGE, ALSO DYNAMICALLY ALLOCATED, IS USED TO STORE MATERIAL PROPERTY TABLES, SOME LARGE ARRAYS, AND, MOST IMPORTANTLY, AS MUCH OF THE STIFFNESS MATRIX AS IS POSSIBLE.

APACHE AND MESH3D ARE SIMILARLY ORGANIZED.

IN APACHE THE TRIO ROUTINES (A SCRATCH I/O SYSTEM) CONTAIN CALLS TO MLOAD, WHICH CALLS A PP SUBROUTINE, DD7. THESE ARE CALLS TO A DISK DRIVER, WHICH COULD NOT BE INCLUDED WITH THIS TRANSMISSION.

IN MATUS THERE WILL BE AN UNSATISFIED EXTERNAL CALLED STPLAN. THIS IS NOT USED, AND ALL CALLS ON THIS ROUTINE MAY BE DELETED.

15. NAME AND ESTABLISHMENT OF AUTHORS -

D. N. HUTULA AND B. E. WIANCKO
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
PITTSBURGH, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL (2 TAPES)
SOURCE DECKS (MATUS 10,918 CARDS, MESH3D 6778 CARDS, APACHE 8309 CARDS, PEDCOM 3356 CARDS, PLOTZ 2328 CARDS, PRINS 876 CARDS, 7600 ECSRW ROUTINE 274 CARDS, 6600 TRIO ROUTINES 1438 CARDS)
SAMPLE PROBLEMS (MESH3D AND APACHE 685 CARDS, PEDCOM 204 CARDS)
REFERENCE REPORTS AND ACC NOTES

17. CATEGORY - I
KEYWORDS - ELASTIC ANALYSIS, 3-DIMENSIONAL, FINITE-ELEMENT, HEAT CONDUCTION, PEDCOM CODES, MESH3D CODES, APACHE CODES, PLOTZ CODES, PRINS CODES

ACC ABSTRACT 598 02/74

1. NAME OR DESIGNATION OF PROGRAM - PELEN

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - PELEN SOLVES A TWO-DIMENSIONAL, AXISYMMETRICAL MODEL OF A FUEL PELLET AND CLAD ELEMENT FOR THE TEMPERATURE, STRESS, AND DEFORMATION THROUGHOUT A TIME HISTORY. IN A GENERAL TIME INCREMENT, THE COMPUTATIONAL SEQUENCE IS - (1) A HEAT CONDUCTION ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CURRENT TEMPERATURE FIELD WHICH IS DEPENDENT ON THE POWER RATE, THE MATERIAL PROPERTIES, AND THE GEOMETRICAL CONFIGURATION, (2) AN INCREMENTAL STRESS ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CURRENT STRESS AND DEFORMATION FIELDS WHICH ARE DEPENDENT ON THE INELASTIC STRAIN INCREMENTS (TEMPERATURE, CREEP, VOLUME EXPANSION, ETC.), THE MATERIAL PROPERTIES, AND THE GEOMETRICAL CONFIGURATION, AND (3) A CONTACT ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CORRECTED CURRENT STRESS AND DEFORMATION FIELDS WHICH ARE DEPENDENT ON THE EXTENT OF CONTACT BETWEEN ADJACENT FUEL PELLETS AND/OR THE FUEL AND CLAD.

4. METHOD OF SOLUTION - FOR THE MATHEMATICAL MODEL, THE HISTORY IS SUBDIVIDED INTO A SET OF TIME INCREMENTS AND THE GEOMETRY IS SUBDIVIDED INTO AN ASSEMBLAGE OF FINITE ELEMENTS SUCH THAT EACH ELEMENT IS A RING WITH A TRIANGULAR CROSS SECTION. EACH FINITE ELEMENT HAS AT MOST A LINEAR DISTRIBUTION OF TEMPERATURE AND DISPLACEMENT SPECIFIED BY THE NODAL VALUES. THE FIELD EQUATIONS WITH THE NODAL VALUES AS UNKNOWNS ARE DERIVED BY VARIATIONAL PRINCIPLES FOR HEAT CONDUCTION AND STRESS ANALYSES. THE SOLUTION IS OBTAINED BY MATRIX INVERSION TECHNIQUES.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - MAXIMA OF -
   25 HISTORY INTERVALS AS INPUT, WHERE EACH INTERVAL CAN HAVE AN ARBITRARY NUMBER OF SUBDIVISIONS
   200 FINITE ELEMENTS

6. TYPICAL RUNNING TIME - RUNNING TIME DEPENDS ON THE COMPLEXITIES OF THE HISTORY INPUT AND NUMBER OF FINITE ELEMENTS. APPROXIMATELY 2.5 SECONDS OF COMPUTATION TIME PER TIME INCREMENT ARE REQUIRED FOR 18 FINITE ELEMENTS.

7. UNUSUAL FEATURES OF THE PROGRAM - PELEN HAS A MINIMUM OF GEOMETRY INPUT DATA TO GENERATE THE FINITE ELEMENTS. IT INTERNALLY UPDATES THE GEOMETRICAL CONFIGURATION TO INCLUDE DIMENSIONAL CHANGES FROM THE REFERENCE CONFIGURATIONS.

8. RELATED AND AUXILIARY PROGRAMS - INPF, THE BETTIS INPUT DATA PACKAGE IS PART OF THE BETTIS ENVIRONMENTAL ROUTINES (ACC ABSTRACT 478). ECSFIL, THE BETTIS EXTENDED CORE STORAGE FILE PACKAGE IS DESCRIBED IN REFERENCE 2.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED SEPTEMBER 1973.

10. REFERENCES - R. B. STOUT, E. DUNCOMBE, AND J. K. FISCHER, PELEN - A COMPUTER PROGRAM TO ANALYZE AXIAL AND RADIAL VARIATIONS OF TEMPERATURE AND DEFORMATION IN ZIRCALOY-CLAD OXIDE FUEL RODS, WAPD-TM-1001(L), DECEMBER 1971.
C. J. PFEIFER, CDC-6600 FORTRAN PROGRAMMING - BETTIS ENVIRONMENTAL REPORT, WAPD-TM-668, JANUARY 1967.
J. J. URBANIAK, ARF DESCRIPTION, SEPTEMBER 1969.

11. MACHINE REQUIREMENTS - 140,000 OCTAL WORDS OF CORE STORAGE, A PRINTER, AND EXTENDED CORE STORAGE UNITS

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -
R. B. STOUT, E. DUNCOMBE, AND J. K. FISCHER
BETTIS ATOMIC POWER LABORATORY
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (6086 CARDS)
SAMPLE PROBLEM (45 CARDS)
REFERENCE REPORT, WAPD-TM-1001(L), AND ARF DESCRIPTION

17. CATEGORY - I
KEYWORDS - 2-DIMENSIONAL, TEMPERATURE, STRESSES, DEFORMATION, HEAT CONDUCTION, FINITE-ELEMENT

ACC ABSTRACT 599 02/74

1. NAME OR DESIGNATION OF PROGRAM - TOPLYR2

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - TOPLYR2 APPLIES THE FIRST LAW OF THERMODYNAMICS TO COMPUTE THE TEMPERATURE OF A WATER MASS FLOWING IN AN OPEN CHANNEL. THE PROGRAM IS DESIGNED TO ACCOMMODATE VARIABLE DEPTH, VELOCITY, AND CROSS SECTION. THE SOURCE OF ENERGY (LOCATION OF THE DISCHARGE) IS ASSUMED TO BE SUFFICIENTLY DISTANT FROM THE RIVER SEGMENT UNDER EXAMINATION THAT THE MOMENTUM ASSOCIATED WITH THE DISCHARGE IS INSIGNIFICANT. VELOCITY DISTRIBUTION AT BOTH THE INLET AND OUTLET OF THE REACH AS WELL AS THE TEMPERATURE DISTRIBUTION AT THE INLET AS A FUNCTION OF TIME AND AT THE OUTLET INITIALLY ARE SPECIFIED. EDDY DIFFUSIVITIES, AMBIENT METEOROLOGICAL CONDITIONS, AND GEOMETRY ARE ALSO SUPPLIED TO THE CODE. ALTHOUGH THE LATERAL EDDY DIFFUSIVITY IS ALLOWED TO VARY SPATIALLY, THE EFFECT OF DENSITY DISPARITY IS NOT TREATED EXPLICITLY BY THE CODE. TEMPORAL BEHAVIOR INDUCED BY VARIATIONS IN THE AMBIENT METEOROLOGICAL AND BOUNDARY CONDITIONS ARE COMPUTED.

4. METHOD OF SOLUTION - TOPLYR2 DIVIDES THE WATER MASS INTO AN ARRAY OF RECTANGULAR PRISMS OF NON-UNIFORM DEPTH WHERE VERTICALLY AVERAGED QUANTITIES ARE EMPLOYED. THE MATHEMATICAL MODEL EMPLOYS AN ENERGY BALANCE OF TEMPERAL, CONVECTIVE, DIFFUSIONAL AND SOURCE TERMS AND A MASS BALANCE. THE EQUATIONS ARE TRANSFORMED TO A SECOND-ORDER FINITE-DIFFERENCE FORM AND AN ALTERNATING DIRECTION IMPLICIT SCHEME IS USED TO COMPUTE THE TEMPERATURE FIELD. THE TWO-DIMENSIONAL TRIDIAGONAL ARRAYS PRODUCED BY THE ADI METHOD ARE SOLVED BY GUASSIAN ELIMINATION. PROVISIONS HAVE BEEN INCLUDED IN THE PROGRAM TO ACCOMMODATE NON-UNIFORM DIFFUSIVITY. THE ENERGY SOURCE RESULTS FROM WEATHER CONDITIONS AND NEWTON'S COOLING LAW BOUNDARY CONDITIONS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - SUBSCRIPTED VARIABLES ARE DIMENSIONED AT COMPILATION TIME USING THE UNIVAC1108 PROCEDURE DEFINITION PROCESSOR. CODE INSTRUCTIONS REQUIRE RELATIVELY LITTLE STORAGE. A TYPICAL RIVER SIMULATION PROBLEM WITH ADEQUATE GEOMETRIC-TIME MESH INVOLVES ABOUT 10000 DECIMAL WORDS OF STORAGE (INSTRUCTIONS, BLANK COMMON AND DATA).

6. TYPICAL RUNNING TIME - FOR A TYPICAL 17 X 10 NODE SPATIAL GRID AND 200 TIME-STEPS, 1 TO 3 MINUTES ARE REQUIRED DEPENDING UPON PROBLEM COMPLEXITY.

7. UNUSUAL FEATURES OF THE PROGRAM - TO ELIMINATE THE POSSIBILITY OF ANY NON-PHYSICALLY PLAUSIBLE TEMPERATURE FORM ENTERING INTO THE ANALYSIS A SCHEME PROPOSED BY HAINS IS EMPLOYED. THE USE OF THE HAINS PRINCIPLE ASSURES THAT THE SECOND LAW OF THERMODYNAMICS IS NOT VIOLATED. A DEFAULT ALGORITHM ASSIGNS A UNIFORM DIFFUSION COEFFICIENT TO THE FLOW FIELD. LOCAL DEPTH AND VELOCITY ARE AVAILABLE FOR THE USER TO CONSTRUCT A NON-UNIFORM DIFFUSION COEFFICIENT

7. UNUSUAL FEATURES OF THE PROGRAM (CONTINUED)
MATRIX. CURRENTLY, AN ALGORITHM BASED ON ONE-DIMENSIONAL FRICTIONAL FLOW IS PROVIDED.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED JUNE 1973.

10. REFERENCES - D. C. KOLESAR, J. C. SONNICHSEN, TOPLYR2 - A TWO-DIMENSIONAL THERMAL-ENERGY TRANSPORT CODE, HEDL-TME-72-46, MARCH 1972.
D. C. KOLESAR, MATHEMATICAL MODELING OF THERMAL PLUME DISPERSION IN A RECEIVING WATER BODY, PRESENTED AT THE SECOND ANNUAL THERMAL POWER CONFERENCE, WASHINGTON STATE UNIVERSITY, PULLMAN, WASHINGTON, OCTOBER 1971.
A. J. POLICASTRO, J. V. TOKAR, HEATED-EFFLUENT DISPERSION IN LARGE LAKES, STATE-OF-THE-ART OF ANALYTICAL MODELING ANL/ES-11 (1972) PART 1, CRITIQUE OF MODEL FORMULATIONS, 1972.
TOPLYR2, ACC NO. 599, HEDL NOTE, 1973.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN V

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC2 OR OSCX.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - TWO VERSIONS OF TOPLYR2 ARE AVAILABLE - ONE EMPLOYS A CONSTANT DIFFUSIVITY AND THE OTHER A LOCAL DEPTH AND VELOCITY DEPENDENT DIFFUSIVITY. THE LATTER VERSION IMPLEMENTS THE EMPIRICAL CORRELATION.

15. NAME AND ESTABLISHMENT OF AUTHORS -
D. C. KOLESAR AND J. C. SONNICHSEN
HANFORD ENGINEERING DEVELOPMENT LABORATORY
WESTINGHOUSE HANFORD COMPANY
P. O. BOX 1970
RICHLAND, WASHINGTON 99352

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (1996 CARDS)
SAMPLE PROBLEM (61 CARDS)
REFERENCE REPORT, HEDL-TME-72-46, AND HEDL NOTE

17. CATEGORY - R
KEYWORDS - THERMODYNAMICS, WATER, VELOCITY DISTRIBUTION, TEMPERATURE DISTRIBUTION

ACC ABSTRACT 600 12/73

1. NAME OR DESIGNATION OF PROGRAM - EGAD

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/195

3. DESCRIPTION OF PROBLEM OR FUNCTION - EGAD CALCULATES GAMMA DOSE INTEGRALS TO A GROUND LEVEL RECEPTOR, FOR INCREMENTAL VALUES OF THE VERTICAL DISPERSION PARAMETER SIGMA-Z, AS A FUNCTION OF GAMMA ENERGY AND SPATIAL DISTRIBUTION OF THE RADIOACTIVE MATERIAL. THE DOSE INTEGRALS ARE REPRESENTATIVE OF SECTOR AVERAGES SINCE THE DISTRIBUTION OF MATERIAL IS ASSUMED TO BE GAUSSIAN IN THE VERTICAL, HOMOGENEOUS IN THE HORIZONTAL, AND BOUNDED BETWEEN GROUND LEVEL AND AN INVERSION LID. CALCULATED DOSE INTEGRALS ARE INDEPENDENT OF RADIOACTIVE DECAY, TRANSPORT VELOCITY, DOWNWIND DISTANCE, AND SECTOR WIDTH. SPACE ATTENUATION AND BUILDUP ARE TAKEN INTO ACCOUNT.

4. METHOD OF SOLUTION - THE PLUME OF RADIOACTIVE MATERIAL IS ASSUMED TO REMAIN CONSTANT IN SHAPE AND SIZE DURING PASSAGE OVER A RECEPTOR POINT. THE SPACE DISTRIBUTION OF MATERIAL IS THEN REPRESENTED AS PARALLEL LINE SOURCES. THE LINE CONTRIBUTIONS ARE INTEGRATED ANALYTICALLY BY TRANSFORMING TO BESSEL AND RELATED FUNCTIONS, REDUCING THE SPATIAL DISTRIBUTION TO A VERTICAL PLANE AT THE RECEPTOR POINT. PLANE INTEGRATIONS ARE THEN PERFORMED BY GAUSSIAN QUADRATURES.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM -

6. TYPICAL RUNNING TIME - RUNNING TIME TO EVALUATE INTEGRALS IS TYPICALLY LESS THAN 30 MSEC FOR EACH ENERGY AND RECEPTOR POINT.

7. UNUSUAL FEATURES OF THE PROGRAM - EGAD PROVIDES AN EFFICIENT MEANS OF COMPILING TABULAR DATA OF DOSE INTEGRALS AS A FUNCTION OF INCREMENTAL VALUES OF ENERGY AND THE VERTICAL DISPERSION PARAMETER. THESE DATA MAY THEN BE INTERPOLATED FOR SPECIFIC VALUES OF THE VARIABLES RESULTING IN LARGE COMPUTATIONAL SAVINGS IF LARGE AMOUNTS OF METEOROLOGY DATA ARE TO BE PROCESSED.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360 VERSION SUBMITTED MAY 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCE - R. E. COOPER, A COMPUTER PROGRAM TO COMPUTE DOSE INTEGRALS FROM EXTERNAL GAMMA EMITTERS, DP-1304, SEPTEMBER 1972.

11. MACHINE REQUIREMENTS - 40K BYTES OF CORE STORAGE

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

R. E. COOPER
SAVANNAH RIVER LABORATORY
E. I. DU PONT DE NEMOURS
AIKEN, SOUTH CAROLINA 29801

16. MATERIAL AVAILABLE -
SOURCE DECK (222 CARDS)
SAMPLE PROBLEM (6 CARDS)
SAMPLE PROBLEM OUTPUT (1 PAGE)
REFERENCE REPORT

17. CATEGORY - G
KEYWORDS - DOSE RATES, GAMMA RADIATION, RADIOACTIVITY

ACC ABSTRACT 601 02/74

1. NAME OR DESIGNATION OF PROGRAM - ERF,ERFC

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - ERF AND ERFC ARE USED TO COMPUTE VALUES OF THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION FOR ANY REAL NUMBER. THEY MAY BE USED TO COMPUTE OTHER RELATED FUNCTIONS SUCH AS THE NORMAL PROBABILITY INTEGRALS.

4. METHOD OF SOLUTION - THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION ARE APPROXIMATED BY RATIONAL FUNCTIONS. THREE SUCH RATIONAL APPROXIMATIONS ARE USED DEPENDING ON WHETHER -
   $|X| < 0.46875$,
   $0.46875 <$ OR $= |X| < 4.0$, OR
   $|X| >$ OR $= 4.0$.
   IN THE FIRST REGION THE ERROR FUNCTION IS COMPUTED DIRECTLY AND THE COMPLEMENTARY ERROR FUNCTION IS COMPUTED VIA THE IDENTITY $ERFC(X) = 1 - ERF(X)$. IN THE OTHER TWO REGIONS THE COMPLEMENTARY ERROR FUNCTION IS COMPUTED DIRECTLY AND THE ERROR FUNCTION IS COMPUTED FROM THE IDENTITY $ERF(X) = 1.0 - ERFC(X)$. THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION ARE REAL-VALUED FUNCTIONS OF ANY REAL ARGUMENT. THE RANGE OF THE ERROR FUNCTION IS (-1,1). THE RANGE OF THE COMPLEMENTARY ERROR FUNCTION IS (0,2).

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE USER IS CAUTIONED AGAINST USING ERF TO COMPUTE THE COMPLEMENTARY ERROR FUNCTION BY USING THE IDENTITY $ERFC(X)=1.0-ERF(X)$. THIS SUBTRACTION MAY CAUSE PARTIAL OR TOTAL LOSS OF SIGNIFICANCE FOR CERTAIN VALUES OF X.

6. TYPICAL RUNNING TIME - RUNNING TIME DEPENDS ON THE ARGUMENT VALUE AND WILL VARY BETWEEN 70 AND 110 MICROSECONDS.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - THIS PACKAGE IS A MODIFICATION OF ALO-00241 TRANSFERRED FROM THE ALO-COSMIC COLLECTION.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
   CDC6600 VERSION SUBMITTED MAY 1973.

10. REFERENCE - J. E. VOGEL, ERF AND ERFC: MATHEMATICAL ROUTINES FOR COMPUTING THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION, SC-M-70-275, MAY 1970.

11. MACHINE REQUIREMENTS - ERF AND ERFC EACH REQUIRE ABOUT 260 (OCTAL) LOCATIONS.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

J. E. VOGEL
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115

16. MATERIAL AVAILABLE -
    SOURCE DECK (129 CARDS)
    SAMPLE PROBLEM (48 CARDS)
    SAMPLE PROBLEM OUTPUT (1 PAGE)
    REFERENCE REPORT

17. CATEGORY - P
    KEYWORDS - DATA PROCESSING, ERROR FUNCTION, COMPLEMENTARY ERROR FUNCTION

ACC ABSTRACT 602 02/74

1. NAME OR DESIGNATION OF PROGRAM - LENSDES

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600,6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - LENSDES ANALYZES THE PERFORMANCE OF OPTICAL LENSES BY COMPUTING THE IMAGE ERRORS FOUND WHEN BUNDLES OF SKEW RAYS ARE TRACED FROM OBJECT POINTS TO THE IMAGE SURFACE. LENS PERFORMANCE IS OPTIMIZED BY VARYING SELECTED LENS PARAMETERS UNDER DIRECTION OF THE NONLINEAR LEAST SQUARES PROGRAM, OPTIMIZ.

4. METHOD OF SOLUTION - LENS DESIGN IS TREATED AS AN APPLICATION OF NONLINEAR LEAST SQUARES OPTIMIZATION OF A CONTINUOUS N-PARAMETER SYSTEM.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - ALL OPTICAL SURFACES MUST BE CENTERED.

6. TYPICAL RUNNING TIME - ONE MINUTE IS REQUIRED ON THE CDC7600.

7. UNUSUAL FEATURES OF THE PROGRAM - RAPIDLY AND STEADILY DECREASING ERROR FUNCTION.

8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS A LATER VERSION OF ALO-00010, AN IBM7090 PROGRAM IN THE ALC-COSMIC COLLECTION. LASL-1962 AND JPL FOLDP-1967 LENS DESIGN CODES ARE EARLIER VERSIONS DEVELOPED AT LASL.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED MAY 1973.

10. REFERENCES - T.C. DOYLE, NONLINEAR LEAST SQUARES OPTIMIZATION OF A CONTINUOUS N-PARAMETER SYSTEM, LA-DC-72-1018, 1972.
T. C. DOYLE, AUTOMATIC LENS DESIGN BY NONLINEAR LEAST SQUARES OPTIMIZATION OF A CONTINUOUS N-PARAMETER SYSTEM, LA-UR-73-518, 1973.
B. BRIXNER, FASTER LASL LENS DESIGN PROGRAM, APPLIED OPTICS REPRINT, VOL. 12, PP. 2703-2708 (1973).
LASL SPECIAL SYSTEM SUBROUTINES USED TO ACCESS EXTENDED CORE STORAGE, LASL NOTE, 1973.
THOMAS C. DOYLE, AUTOMATIC LENS DESIGN BY NONLINEAR LEAST SQUARES OPTIMIZATION OF A CONTINUOUS N-PARAMETER SYSTEM, LASL MEMO T4AB, APRIL 1, 1973.
THOMAS C. DOYLE, NONLINEAR LEAST SQUARES OPTIMIZATION OF A CONTINUOUS N-PARAMETER SYSTEM, LASL MEMO E4AA, APRIL 1, 1973.

11. MACHINE REQUIREMENTS - 32K WORDS OF MEMORY, BUT VERY LARGE PROBLEMS MAY REQUIRE EXTENDED CORE STORAGE (ECS) ON THE CDC6600 OR LARGE CORE MEMORY (LCM) ON THE CDC7600.

12. PROGRAMMING LANGUAGES USED - FORTRAN IV AND COMPASS

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OPERABLE UNDER CDC SCOPE 3.1 ON CDC66CO OR UNDER THE LASL-DEVELOPED CRCS SYSTEM ON THE CDC7600.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

BERLYN BRIXNER AND THOMAS C. DOYLE
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECKS (3768 CARDS)
    SAMPLE PROBLEMS (335 CARDS)
    SAMPLE PROBLEM OUTPUT (PHIGRAD(V) 35 SELECTED PAGES, PHIGRAD(U) 38 SELECTED PAGES)
    REFERENCE REPORTS, REPRINT, NOTE, AND MEMORANDA

17. CATEGORY - P
    KEYWORDS - NONLINEAR LEAST SQUARES, OPTIMIZATION

ACC ABSTRACT 603 03/74

1. NAME OR DESIGNATION OF PROGRAM - RALCRTPH

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - RALCRTPH IS A RESOURCE ALLOCATION SYSTEM USED TO PROVIDE THE PROJECT PLANNER WITH A TOOL TO HELP HIM SCHEDULE RESOURCES INVOLVED IN A PROJECT. INFORMATION ON WHICH JOBS ARE CRITICAL AND THE RESOURCES AVAILABLE IS NECESSARY FOR PROJECT SCHEDULING. THIS SYSTEM IS ORIENTED TOWARD THE USER WHO IS PLANNING A PLANT SHUTDOWN. HOWEVER, IT ALSO HAS APPLICATIONS IN OTHER AREAS.

4. METHOD OF SOLUTION - THE RESOURCE ALLOCATION SYSTEM PERFORMS TWO BASIC FUNCTIONS -
   (1) CALCULATES THE CRITICAL PATH, AND
   (2) LEVELS RESOURCES AND SCHEDULES ACTIVITIES.

   IF ONLY A CRITICAL PATH REPORT IS REQUIRED, THE SYSTEM EDITS THE INPUT DATA FOR LOOPING AND SYNTACTICAL ERRORS AND PRINTS THE CRITICAL PATH REPORT. THE SYSTEM CAN THEN PROCEED TO SCHEDULE A PROJECT WITHIN USER-SPECIFIED RESOURCE LIMITATIONS. AFTER SCHEDULING A PROJECT A SERIES OF REPORTS CAN BE PRINTED. THIS SERIES INCLUDES THE RESOURCE UTILIZATION SUMMARY, ACTIVITY LISTING FOR ALL RESOURCES, ACTIVITY LISTING FOR SPECIFIED RESOURCES, ACTIVITY BAR GRAPH FOR ALL RESOURCES, ACTIVITY BAR GRAPH FOR SPECIFIED RESOURCES, A WORK SCHEDULE FOR ALL RESOURCES, AND A WORK SCHEDULE FOR SPECIFIED RESOURCES.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE SIZE OF THE ARROW DIAGRAM THAT CAN BE READ INTO THE EDIT AND CRITICAL PATH PROGRAMS IN THE FORM OF ACTIVITY CARDS IS DETERMINED BY THE MEMORY AVAILABLE IN THE COMPUTER. THE PRESENT LIMITATION IS 3000. THE LIMITATIONS ON NODE NUMBERS ARE ALSO CONTROLLED IN THE CRITICAL PATH PROGRAM. THE PRESENT RANGE OF ACCEPTABLE NUMBERS IS 1 TO 3000. THE UPPER LIMIT MAY BE INCREASED. HOWEVER, 0 OR NEGATIVE NODE NUMBERS ARE UNACCEPTABLE. THE PRESENT QUEUE SIZES IN THE RESOURCE ALLOCATION PROGRAM ARE 300 EACH FOR THE PROCESS AND THE WAIT QUEUES. THE LIMITATIONS ON RESOURCES PER ACTIVITY (4) AND THE TOTAL NUMBER OF RESOURCES (51) ARE ALSO CONTROLLED BY THE RESOURCE ALLOCATION PROGRAM.

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
   IBM360 VERSION SUBMITTED AUGUST 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCE - C. T. SIGLER, RESOURCE ALLOCATION USERS GUIDE, MONSANTO MANAGEMENT INFORMATION AND SYSTEMS DEPARTMENT FINAL REPORT, SEPTEMBER 1, 1967.

11. MACHINE REQUIREMENTS - 128K BYTES OF MEMORY, CARD READER, PRINTER, 3 TAPES OR DISK DRIVES

12. PROGRAMMING LANGUAGES USED - FORTRAN IV(H), COBOL, AND RPG

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS II, LEVEL 8.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
    C. T. SIGLER
    MONSANTO CORPORATION
    TEXAS CITY, TEXAS 77590

16. MATERIAL AVAILABLE - RESTRICTED TO USE ON GOVERNMENT CONTRACTS
    MAGNETIC TAPE TRANSMITTAL
    SOURCE DECKS (FORTRAN 5089 CARDS, COBOL 1202 CARDS, RPG 58 CARDS)
    SAMPLE PROBLEMS (542 CARDS)
    LOAD MODULE RALLIB (487 BLOCKS)
    SAMPLE PROBLEM OUTPUT (PART1 41 PAGES, PART2 46 PAGES)
    REFERENCE REPORT

17. CATEGORY - M
    KEYWORDS - CRITICAL PATH CALCULATION, RESOURCE ALLOCATION, SCHEDULING

ACC ABSTRACT 604 02/74

1. NAME OR DESIGNATION OF PROGRAM - TCB01

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - A TUBE UNDER EXTERNAL PRESSURE, AT ELEVATED TEMPERATURE, AND INITIALLY OUT-OF-ROUND WILL CREEP, BECOMING MORE OUT-OF-ROUND AND EVENTUALLY WILL COLLAPSE. TCB01 ATTEMPTS TO PREDICT THE TIME OF COLLAPSE.

4. METHOD OF SOLUTION - USING THE SOLUTION AT THE PREVIOUS TIME POINT AND THE TIME INCREMENT, STRESS AND STRAINS ARE CALCULATED AT RADIAL STATIONS WHICH LIE ON THE RADIUS THROUGH THE POINT OF MINIMUM RADIUS OF CURVATURE. WHEN THE CHANGE IN EXTERNAL MOMENT CALCULATED FROM THE CHANGE IN STRAIN CANNOT BE BALANCED BY THE CHANGE IN INTERNAL MOMENT DUE TO STRESS, THE TUBE HAS COLLAPSED. THE STRAIN HARDENING RULE MAY BE USED WITH EITHER THE TRESCA OR VON MISES CRITERION. THE TEMPERATURE MAY VARY WITH TIME.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - IT IS ASSUMED THAT PLANE SECTIONS REMAIN PLANE, THE RADIAL STRESS IS ZERO, THE TEMPERATURE ACROSS THE THICKNESS IS CONSTANT, THE INITIAL OUT-OF-ROUNDNESS FOLLOWS A COSINE LAW, AND THE TUBE IS FIXED AXIALLY. THE PROGRAM ANALYZES A SIMPLE TUBE OF A SINGLE MATERIAL. AT THE PRESENT TIME ZIRCALOY IS THE ONLY MATERIAL AVAILABLE.

6. TYPICAL RUNNING TIME - THE SAMPLE PROBLEM REQUIRES LESS THAN A MINUTE.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
CDC6600 VERSION SUBMITTED NOVEMBER 1973.

10. REFERENCE - W. K. WILSON, A METHOD OF ANALYSIS FOR THE CREEP-BUCKLING OF TUBES UNDER EXTERNAL PRESSURE, WAPD-TM-956, SEPTEMBER 1970.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3.1.5.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -
W. K. WILSON
BETTIS ATOMIC POWER LABORATORY

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 79
WEST MIFFLIN, PENNSYLVANIA 15122

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
SOURCE DECK (873 CARDS)
SAMPLE PROBLEM (10 CARDS)
REFERENCE REPORT

17. CATEGORY - I
KEYWORDS - BUCKLING, TUBES, PRESSURE, LWBR REACTORS

ACC ABSTRACT 605 02/74

1. NAME OR DESIGNATION OF PROGRAM - GAUSS5

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360/75

3. DESCRIPTION OF PROBLEM OR FUNCTION - GAUSS5 IS USED TO DETERMINE GAMMA-RAY ENERGIES AND INTENSITIES FROM SPECTRA OBTAINED WITH A GE(LI) DETECTOR AND A MULTICHANNEL PULSE-HEIGHT ANALYSIS SYSTEM.

4. METHOD OF SOLUTION - THE SPECTRUM ANALYSIS IS GENERALLY CARRIED OUT IN THE FOLLOWING STEPS -
   (A) THE PEAKS ARE LOCATED AUTOMATICALLY BY MEANS OF AN AUTO-CORRELATION ROUTINE. MANUAL PEAK SELECTION IS ALSO AVAILABLE.
   (B) EACH PEAK IS FITTED WITH A GAUSSIAN FUNCTION PLUS A LINEAR FUNCTION REPRESENTING THE SPECTRAL BACKGROUND. NORMALLY, ONLY THE THREE GAUSSIAN PARAMETERS (HEIGHT, WIDTH AND POSITION) ARE ALLOWED TO VARY. ALSO, THE PROGRAM USES ONLY THE DATA POINTS ABOVE ABOUT THE HALF-HEIGHT IN THE FIT, UNLESS THE USER SPECIFIES OTHER LIMITS.
   (C) IF THE USER SUPPLIES THE GAMMA-RAY ENERGIES OF SOME CALIBRATION LINES, A LINEAR AND/OR QUADRATIC ENERGY VS. CHANNEL FUNCTION IS DETERMINED. THIS CALCULATION INCLUDES CORRECTIONS FOR THE PREVIOUSLY MEASURED NONLINEARITY OF THE ELECTRONIC SYSTEM. THE ENERGIES OF ALL LINES ARE THEN COMPUTED ALONG WITH THE UNCERTAINTIES.
   (D) IF A DETECTOR EFFICIENCY TABLE IS AVAILABLE, THE GAMMA-RAY INTENSITIES ARE COMPUTED.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - GAUSS5 WILL HANDLE SPECTRA OF UP TO 4096 CHANNELS WITH UP TO 300 PEAKS AND 50 ENERGY CALIBRATION LINES.

6. TYPICAL RUNNING TIME - TYPICAL SPECTRA CAN BE ANALYZED AT A RATE OF ABOUT 5 PER MINUTE.

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - GAUSS5 SUPERSEDES GAUSS3 WHICH HAS BEEN DESCRIBED IN NUCLEAR INSTRUMENTS AND METHODS 57, 46 (1967). THE PROGRAM LOTAPE IS USED TO TRANSFER THE NONLINEARITY CORRECTION AND EFFICIENCY TABLES TO DISK.

9. STATUS - ABSTRACT FIRST DISTRIBUTED JANUARY 1974.
   IBM360 VERSION SUBMITTED SEPTEMBER 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCE - R. G. HELMER AND M. H. PUTNAM, GAUSS V, A COMPUTER PROGRAM FOR THE ANALYSIS OF GAMMA-RAY SPECTRA FROM GE(LI) SPECTROMETERS, ANCR-1043, JANUARY 1972.

11. MACHINE REQUIREMENTS - ONE 9-TRACK TAPE FOR SPECTRAL LIBRARY AND FOUR DISKS, A PRINTER AND CARD PUNCH

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 MVT.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHORS -

R. G. HELMER AND M. H. PUTNAM
AEROJET NUCLEAR COMPANY
550 SECOND STREET
IDAHO FALLS, IDAHO 83401

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECKS (GAUSS5 3639 CARDS, LOTAPE 164 CARDS)
    SAMPLE PROBLEMS (GAUSS5 424 CARDS, LOTAPE 24 CARDS)
    CONTROL INFORMATION (GAUSS5 25 CARDS, LOTAPE 10 CARDS)
    LOAD MODULE GSS5 (133 BLOCKS)
    PUNCHED OUTPUT (GAUSS5 104 CARDS)
    SAMPLE PROBLEM OUTPUT (GAUSS5 15 PAGES, LOTAPE 3 PAGES)
    REFERENCE REPORT

17. CATEGORY - B
    KEYWORDS - GAMMA-RAY SPECTRA, GE(LI) SPECTROMETERS, GAUSS FUNCTION, LOTAPE CODES, GAUSS3 CODES

ACC ABSTRACT 606 02/74

1. NAME OR DESIGNATION OF PROGRAM - GAPER1D

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - REACTIVITY COEFFICIENTS ARE COMPUTED USING FIRST-ORDER TRANSPORT PERTURBATION THEORY FOR ONE-DIMENSIONAL MULTI-REGION REACTOR ASSEMBLIES. THE NUMBER OF SPATIAL MESH POINTS AND ENERGY GROUPS IS ARBITRARY. AN ELEMENTARY SYNTHESIS SCHEME IS EMPLOYED FOR TREATMENT OF TWO- AND THREE-DIMENSIONAL PROBLEMS. THE CONTRIBUTIONS TO THE CHANGE IN INVERSE MULTIPLICATION FACTOR, DELTA(1/K), FROM PERTURBATIONS IN THE INDIVIDUAL CAPTURE, NET FISSION, TOTAL SCATTERING, (N,2N), INELASTIC SCATTERING, AND LEAKAGE CROSS SECTIONS ARE COMPUTED. A MULTI-DIMENSIONAL PROMPT NEUTRON LIFETIME CALCULATION IS ALSO AVAILABLE.

4. METHOD OF SOLUTION - BROAD GROUP CROSS SECTIONS FOR THE CORE AND PERTURBING OR SAMPLE MATERIALS ARE REQUIRED AS INPUT. SCALAR NEUTRON FLUXES AND CURRENTS, AS COMPUTED BY SN TRANSPORT CALCULATIONS, ARE THEN UTILIZED TO SOLVE THE FIRST-ORDER TRANSPORT PERTURBATION THEORY EQUATIONS. A SYNTHESIS SCHEME IS USED, ALONG WITH INDEPENDENT SN CALCULATIONS IN TWO OR THREE DIMENSIONS, TO TREAT A MULTI-DIMENSIONAL ASSEMBLY. SPHERICAL HARMONICS EXPANSIONS OF THE ANGULAR FLUXES AND SCATTERING SOURCE TERMS ARE USED WITH LEAKAGE AND ANISOTROPIC SCATTERING TREATED IN A P1 APPROXIMATION. THE ANGULAR INTEGRATIONS IN THE PERTURBATION THEORY EQUATIONS ARE PERFORMED ANALYTICALLY. VARIOUS REACTIVITY COEFFICIENTS AND MATERIAL WORTHS ARE THEN EASILY COMPUTED AT SPECIFIED POSITIONS IN THE ASSEMBLY.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE FORMULATION OF THE SYNTHESIS SCHEME USED FOR TWO- AND THREE-DIMENSIONAL PROBLEMS ASSUMES THAT THE FLUXES AND CURRENTS WERE COMPUTED BY THE DTF4 CODE (ACC ABSTRACT 209). THEREFORE, FLUXES AND CURRENTS FROM TWO- OR THREE-DIMENSIONAL TRANSPORT OR DIFFUSION THEORY CODES CANNOT BE USED.

6. TYPICAL RUNNING TIME - A THREE-DIMENSIONAL, 11-GROUP SERIES OF EIGHT PROBLEMS WITH EIGHT REGIONS DEFINED FOR A 9X9X9-INTERVAL MESH REQUIRES 12 SECONDS. A ONE-DIMENSIONAL, 20 GROUP SERIES OF 6 PROBLEMS WITH 5 REGIONS DEFINED FOR A 50-INTERVAL MESH REQUIRES 22 SECONDS.

7. UNUSUAL FEATURES OF THE CODE - PROBLEMS INVOLVING CALCULATIONS FOR DIFFERENT ASSEMBLIES CAN BE RUN CONSECUTIVELY IF DESIRED.

8. RELATED AND AUXILIARY CODES - GAPER AND GAPER2D (ACC ABSTRACT 471). GAPER1D IS AN UPDATED VERSION OF THE GAPER CODE.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED JULY 1973.

10. REFERENCES - D. A. SARGIS, GAPER - A TRANSPORT PERTURBATION THEORY PROGRAM, GA-8667, APRIL 26, 1968.
K. LATHROP, DTF-IV, A FORTRAN IV PROGRAM FOR SOLVING THE MULTIGROUP TRANSPORT EQUATION WITH ANISOTROPIC SCATTERING, LA-3373, JULY 15, 1965.
R. J. ARCHIBALD AND D. A. SARGIS, GAPER-2D, A TWO-DIMENSIONAL TRANSPORT PERTURBATION THEORY PROGRAM, GA-10103, APRIL 29, 1970.
GAPER-1D SAMPLE PROBLEM DESCRIPTION, GULF NOTE, 1973.
P. KOCH, GAPER-1D DESCRIPTION, GULF INTERNAL MEMORANDUM, JULY 11, 1973.

11. MACHINE REQUIREMENTS - ONE I/O DEVICE FOR READING INPUT AND PRINTING RESULTS AND ONE TAPE DRIVE TO READ THE CODE FROM TAPE. CORE STORAGE REQUIREMENTS ARE VARIABLE.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC8.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - GAPER1D IS CORE-CONTAINED. PARAMETER STATEMENTS ARE USED TO SET DIMENSION LIMITS ON THE ARRAYS.

15. NAME AND ESTABLISHMENT OF AUTHOR -
P. K. KOCH
GULF GENERAL ATOMIC COMPANY
P. O. BOX 81608
SAN DIEGO, CALIFORNIA 92138

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (GAPER1D 2038 CARDS, DTF4 MODIFICATIONS 46 CARDS)
SAMPLE PROBLEM (642 CARDS)
CONTROL INFORMATION (11 CARDS)
SAMPLE PROBLEM OUTPUT (40 PAGES)
REFERENCE REPORT, GA-8667, GULF NOTE, AND INTERNAL MEMORANDUM

17. CATEGORY - N
KEYWORDS - REACTIVITY, PERTURBATION THEORY, 1-DIMENSIONAL, SN METHOD, DTF4 CODES, GAPER CODES

ACC ABSTRACT 607 03/74

1. NAME OR DESIGNATION OF PROGRAM - SPIRAL

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - THE GENERAL ABILITY OF SPIRAL IS BUILDING, PERHAPS GRADUALLY, A MACHINE-READABLE ENCYCLOPEDIA OF INFORMATION ITEMS THAT ARE OR MAY BECOME IMPORTANT TO A PARTICULAR PROJECT, AND THEN LATER, RECALLING BITS OF INFORMATION AS REQUIRED. THE INFORMATION CONTENT OF A COLLECTION CAN RANGE FROM CRYPTIC COMMENTS (AS OCCUR IN SOME TEST AND INSPECTION RECORDS) TO MORE LENGTHY ENTRIES (SUCH AS TECHNICAL ABSTRACTS AND MANAGEMENT BRIEFS) AS WELL AS FULL TEXT OF DOCUMENTS.

4. METHOD OF SOLUTION - THE INDEXING PHASE INCLUDES ELIMINATION OF EXCLUSION WORDS, SUFFIX TRUNCATION, AND HAS CODING OF WORDS. THE RESULTING CODES ARE INSERTED INTO A MULTILEVEL INDEX FILE STRUCTURE. USING THIS STRUCTURE, THE RETRIEVAL SYSTEM APPLIES A COMBINATION OF BINARY AND SEQUENTIAL SEARCH OPERATIONS TO FIND DOCUMENTS AND PARAGRAPHS WITHIN DOCUMENTS THAT ARE PERTINENT TO AN INQUIRY.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - INPUT DOCUMENTS MUST CONTAIN LESS THAN 4096 PARAGRAPHS, AND PARAGRAPHS MUST CONTAIN LESS THAN 4096 WORDS. FOR PROCESSING EFFICIENCY, A GIVEN ACCUMULATION OF DOCUMENTS SHOULD NOT EXCEED APPROXIMATELY 1000 DOCUMENTS OR APPROXIMATELY A MILLION WORDS. OTHERWISE, A GIVEN COLLECTION IS LIMITED TO AVAILABLE ON-LINE STORAGE FOR CONTAINING THE DATA BASE. THE RETRIEVAL SYSTEM IS LIMITED TO PROCESSING NO MORE THAN 100 INQUIRIES SIMULTANEOUSLY.

6. TYPICAL RUNNING TIME - THE INDEXING AND STORAGE SYSTEM OPERATES AT BETWEEN 5000 AND 20,000 WORDS PER MINUTE. PRIMARILY, THE VARIATION IS DUE TO THE LENGTH OF DOCUMENTS, THE LENGTH OF PARAGRAPHS, AND THE NUMBER OF DOCUMENTS BEING INPUT DURING A GIVEN PROCESSING CYCLE. IN THE RETRIEVAL PROCESS, RUN TIME PER INQUIRY IS GOVERNED BY THE COMPLEXITY OF INQUIRIES, THE NUMBER OF INQUIRIES BEING PROCESSED SIMULTANEOUSLY, AND THE AMOUNT OF RELEVANT INFORMATION CONTAINED IN THE DATA BASE. BECAUSE OF THESE FACTORS, RUN TIME PER INQUIRY MAY VARY FROM A FEW SECONDS TO A FEW MINUTES.

7. UNUSUAL FEATURES OF THE PROGRAM - AMONG THE PERHAPS NOVEL FEATURES OF THE SYSTEM ARE -
   (A) THE METHOD OF DATA COMPRESSION (HASH CODING) USED IN BUILDING THE CORPUS INDEX AND IN CONSTRUCTING INQUIRIES,
   (B) THE METHOD OF MACHINE-COMPILING THE INQUIRIES SUCH THAT MANY CAN BE PROCESSED SIMULTANEOUSLY,
   (C) THE METHOD FOR CODING AND COMPARISON OF PHRASES, AND
   (D) A METHOD TO DETECT VOCABULARY SIMILARITY BETWEEN PARAGRAPHS.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
UNIVAC1108 VERSION SUBMITTED SEPTEMBER 1973.

10. REFERENCES - L. E. WEST, SPIRAL REVISITED, SC-M-72 0175, MARCH 1972.
LESLIE E. WEST, SPIRAL (SANDIA'S PROGRAM FOR INFORMATION RETRIEVAL AND LISTING), PROCEEDINGS OF THE AMERICAN SOCIETY FOR INFORMATION SCIENCE, ANNUAL MEETING, 1969.

11. MACHINE REQUIREMENTS - UNIVAC1108 FASTRAND II DRUM, FH-432 DRUM, CARD READER, PRINTER, AND TAPE DRIVE

12. PROGRAMMING LANGUAGES USED - FORTRAN V AND ASSEMBLY LANGUAGE

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - EXEC 8.

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - SPIRAL USES THE UNIVAC1108 SORT/MERGE AND NTRAN I/O PACKAGES. USER PROGRAMMING MAY BE REQUIRED TO REFORMAT EXISTING MACHINE-READABLE TEXT TO SPIRAL'S TEXT INPUT FORMAT.

15. NAME AND ESTABLISHMENT OF AUTHOR -
L. E. WEST
DIVISION 2644
SANDIA LABORATORIES
P. O. BOX 5800
ALBUQUERQUE, NEW MEXICO 87115

16. MATERIAL AVAILABLE - RESTRICTED DISTRIBUTION
MAGNETIC TAPE TRANSMITTAL
SOURCE DECK (8636 CARDS)
SAMPLE PROBLEM (1037 CARDS)
ELEMENT FILE (980 VARIABLE-LENGTH BINARY RECORDS)
REFERENCE REPORT, SC-M-72 0175, AND PROCEEDINGS REPRINT

17. CATEGORY - M
KEYWORDS - RETRIEVAL, DATA PROCESSING, SEARCHES

ACC ABSTRACT 608 02/74

1. NAME OR DESIGNATION OF PROGRAM - TRIPLET

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC7600,6600, IBM360

3. DESCRIPTION OF PROBLEM OR FUNCTION - TRIPLET SOLVES THE TWO-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN PLANAR GEOMETRIES USING A REGULAR TRIANGULAR MESH. REGULAR AND ADJOINT, INHOMOGENEOUS AND HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO VACUUM, REFLECTIVE OR SOURCE BOUNDARY CONDITIONS ARE SOLVED. GENERAL ANISOTROPIC SCATTERING IS ALLOWED AND ANISOTROPIC DISTRIBUTED SOURCES ARE PERMITTED.

4. METHOD OF SOLUTION - THE DISCRETE ORDINATES APPROXIMATION IS USED FOR THE ANGULAR VARIABLES. A FINITE ELEMENT METHOD IN WHICH THE ANGULAR FLUX IS ASSUMED TO BE GIVEN BY A LOW-ORDER POLYNOMIAL IN EACH TRIANGLE IS USED TO SOLVE THE DISCRETE ORDINATES EQUATIONS. ANGULAR FLUXES ARE ALLOWED TO BE DISCONTINUOUS ACROSS TRIANGLE BOUNDARIES, AND THE ORDER OF THE POLYNOMIAL IS INPUT DATA TO THE CODE. BOTH INNER (WITHIN-GROUP) AND OUTER ITERATION CYCLES ARE ACCELERATED BY EITHER SYSTEM OR FINE MESH REBALANCE.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - VARIABLE DIMENSIONING IS USED SO THAT ANY COMBINATION OF PROBLEM PARAMETERS LEADING TO A CONTAINER ARRAY LESS THAN MAXLEN CAN BE ACCOMMODATED. ON CDC MACHINES MAXLEN CAN BE ABOUT 40,000 WORDS AND PERIPHERAL STORAGE IS USED FOR MOST GROUP-DEPENDENT DATA. ON IBM MACHINES TRIPLET WILL EXECUTE IN SINGLE-PRECISION (4 BYTES PER WORD) SO THAT MAXLEN CAN BE SEVERAL HUNDRED THOUSAND AND MOST PROBLEMS CAN BE CORE-CONTAINED.

6. TYPICAL RUNNING TIME - A SIX-GROUP, S2, 1700 TRIANGLE, KEFF CALCULATION OF AN EBR-II CORE REQUIRES ABOUT 4.4 MINUTES OF CDC7600 TIME. RUNNING TIMES VARY ALMOST LINEARLY WITH THE TOTAL NUMBER OF UNKNOWNS.

7. UNUSUAL FEATURES OF THE PROGRAM - SOURCES, FLUXES, SN CONSTANTS, AND CROSS SECTIONS MAY BE INPUT FROM STANDARD INTERFACE FILES. CREATION OF STANDARD INTERFACE OUTPUT FILES FOR SN CONSTANTS AND SCALAR AND ANGULAR FLUXES IS OPTIONAL. ALL BINARY DATA TRANSFERS ARE LOCALIZED IN SUBROUTINES CALLED REED AND RITE. FLEXIBLE EDIT OPTIONS, INCLUDING DUMPS AND RESTART CAPABILITY, ARE PROVIDED.

8. RELATED AND AUXILIARY PROGRAMS - TRIPLET IS BASED IN LARGE PART ON THE TWO-DIMENSIONAL ORTHOGONAL MESH CODE TWOTRAN2 (ACC ABSTRACT 358), WHICH IS AN IMPROVED VERSION OF THE TWOTRAN PROGRAM.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC7600 VERSION SUBMITTED AUGUST 1973.
CDC6600 VERSION SUBMITTED AUGUST 1973.
IBM360 VERSION SUBMITTED AUGUST 1973, SAMPLE PROBLEM EXECUTED BY ACC.

10. REFERENCES - WM. H. REED, T. R. HILL, F. W. BRINKLEY, AND K. D. LATHROP, TRIPLET: A TWO-DIMENSIONAL, MULTIGROUP, TRIANGULAR MESH, PLANAR GEOMETRY, EXPLICIT TRANSPORT CODE, LA-5428-MS, OCTOBER 1973.

11. MACHINE REQUIREMENTS - SIX OUTPUT (SCRATCH) UNITS AND TWO SYSTEM I/O UNITS ARE REQUIRED. USE OF FIVE INTERFACE UNITS IS OPTIONAL. ON THE CDC MACHINES A LARGE BULK MEMORY IS REQUIRED.

12. PROGRAMMING LANGUAGE USED - FORTRAN IV

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED -

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS - THE CODE IS WRITTEN TO READ THE CASE INPUT DATA FROM FSET10 (7600) OR TAPE10 (6600) AND TO WRITE THE OUTPUT INFORMATION ON FSET9 (7600) OR TAPE9 (6600), WHICH ARE NOT EQUIVALENT TO THE SYSTEM INPUT AND OUTPUT UNITS.

15. NAME AND ESTABLISHMENT OF AUTHOR -

T. R. HILL
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
    SOURCE DECKS (7600-8253 CARDS, 6600-8254 CARDS, 360-8639 CARDS)
    SAMPLE PROBLEMS (7600-661 CARDS, 6600-661 CARDS, 360-661 CARDS)
    CONTROL INFORMATION (JCL 360-31 CARDS)
    IBM 2314 LOAD MODULE (360-TRIPLET 306 BLOCKS)
    SAMPLE PROBLEM OUTPUT (7600,6600-50 SELECTED PAGES, 360-45 SELECTED PAGES)
    REFERENCE REPORT

17. CATEGORY - C
    KEYWORDS - 2-DIMENSIONAL, MULTIGROUP, TRANSPORT THEORY, TRIANGULAR MESH, ANISOTROPIC SCATTERING, FINITE-ELEMENT, TWOTRAN2 CODES

ACC ABSTRACT 6C9 11/73

1. NAME OR DESIGNATION OF PROGRAM - INDX

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - CDC6600

3. DESCRIPTION OF PROBLEM OR FUNCTION - INDX PROVIDES A MEANS FOR RAPIDLY DEFINING AND TESTING TRIAL UNIT CELLS AS AN AID TO INDEXING POWDER PATTERNS OF CRYSTAL STRUCTURES OF UNKNOWN SYMMETRY.

4. METHOD OF SOLUTION - INDX ATTEMPTS TO INDEX X-RAY DIFFRACTION POWDER PATTERNS BY FINDING A REDUCED TRICLINIC CELL WHOSE CALCULATED Q VALUES (Q=1/(D**2)) MATCH A DESIRED PERCENTAGE OF THE OBSERVED Q VALUES WITHIN A GIVEN LIMIT OF ERROR. IF A REDUCED TRICLINIC CELL IS FOUND, THE CELL CONSTANTS MAY BE USED TO FORM A RECTANGULAR ARRAY (I.E., A NIGGLI MATRIX). REFERENCE TO PUBLISHED TABLES OF GENERAL AND SPECIAL NIGGLI MATRICES REVEALS WHETHER OR NOT THE SPECIFIC TRICLINIC CELL MAY BE TRANSFORMED TO A CELL OF HIGHER SYMMETRY. THE RESULTS OF THIS PROGRAM ARE THE REAL SPACE CELL CONSTANTS OF EACH INDIVIDUAL TRIAL CELL AND THE POSITION OF THE CELL IN THE POSSIBLE CELLS LIST.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE NUMBER OF OBSERVED Q VALUES CANNOT EXCEED 100. THE MAXIMUM VALUE OF Q=2.0.

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM -

8. RELATED AND AUXILIARY PROGRAMS - THIS PROGRAM IS THE ALO-00154 PROGRAM TRANSFERRED FROM THE ALC-COSMIC COLLECTION.

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
CDC6600 VERSION SUBMITTED JULY 1973.

10. REFERENCES - R. B. ROOF, JR., INDX, A COMPUTER PROGRAM TO AID IN THE INDEXING OF X-RAY POWDER PATTERNS OF CRYSTAL STRUCTURES OF UNKNOWN SYMMETRY, LA-3920, JULY 1968.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGE USED - FORTRAN IV AND COMPASS

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - SCOPE 3 (CDC6600).

14. ANY OTHER PROGRAMMING OR OPERATING INFORMATION OR RESTRICTIONS -

15. NAME AND ESTABLISHMENT OF AUTHOR -

R. B. ROOF, JR.
LOS ALAMOS SCIENTIFIC LABORATORY
P. O. BOX 1663
LOS ALAMOS, NEW MEXICO 87544

16. MATERIAL AVAILABLE -
    SOURCE DECK (746 CARDS)
    SAMPLE PROBLEM (63 CARDS)
    REFERENCE REPORT

17. CATEGORY - Q
    KEYWORDS - X-RAY DIFFRACTION, CRYSTALS

ACC ABSTRACT 610 03/74

1. NAME OR DESIGNATION OF PROGRAM - FUNPACK

2. COMPUTER FOR WHICH PROGRAM IS DESIGNED AND OTHERS UPON WHICH IT IS OPERABLE - IBM360, CDC6600,7600, UNIVAC1108

3. DESCRIPTION OF PROBLEM OR FUNCTION - FUNPACK IS A COLLECTION OF FORTRAN SUBROUTINES TO EVALUATE CERTAIN SPECIAL FUNCTIONS. THE INDIVIDUAL SUBROUTINES ARE -

IDENTIFICATION		DESCRIPTION
DEI	F1EI	EXPONENTIAL INTEGRALS
DELIPK	F1EK	COMPLETE ELLIPTIC INTEGRAL OF THE FIRST KIND
DELIPE	F1EE	COMPLETE ELLIPTIC INTEGRAL OF THE SECOND KIND
DAW	F1DW	DAWSON'S INTEGRAL
BESKO	F1KO	BESSEL FUNCTION K-SUB-0
BESK1	F1K1	BESSEL FUNCTION K-SUB-1
MONERR	F1MO	ERROR MONITORING PACKAGE

4. METHOD OF SOLUTION - FUNPACK USES EVALUATION OF MINIMAX APPROXIMATIONS.

5. RESTRICTIONS ON THE COMPLEXITY OF THE PROBLEM - THE IBM DISTRIBUTION INCLUDES ALL PROGRAMS LISTED UNDER ITEM 3. OTHER MACHINE VERSIONS DO NOT INCLUDE BESKO F1KO AND BESK1 F1K1.

6. TYPICAL RUNNING TIME -

7. UNUSUAL FEATURES OF THE PROGRAM - THESE ROUTINES HAVE BEEN CERTIFIED UNDER THE NATS PROJECT FOR THE MACHINES AND OPERATING SYSTEMS INDICATED IN ITEM 13 AND FOR THE COMPILERS INDICATED IN ITEM 12. EXTENSIVE TESTING ON THESE MACHINES HAS SHOWN NO EVIDENCE OF PERFORMANCE DIFFICULTIES. EXCEPTIONS, IF ANY, FOLLOW -

CDC VERSIONS OF THESE SUBROUTINES ARE TUNED TO PERFORM BEST USING THE ROUNDED ARITHMETIC OPTION ON CDC COMPILERS.

THE ACCURACY OF THE SUBROUTINES FOR THE ELEMENTARY FUNCTIONS (EXP, ALOG, ETC.) CAN AFFECT THE ACCURACY OF FUNPACK SUBROUTINES.

THE IBM VERSION OF THIS PACKAGE ASSUMES THE IBM-SUPPLIED TRACEBACK SUBROUTINE ERRTRA IS AVAILABLE.

THE NATS PROJECT FULLY SUPPORTS CERTIFIED ROUTINES IN THE SENSE THAT DETAILED INFORMATION ON THE TESTING PROCEDURES IS AVAILABLE AND REPORTS OF THE POOR OR INCORRECT PERFORMANCE ON AT LEAST THE MACHINES AND OPERATING SYSTEMS LISTED WILL GAIN IMMEDIATE ATTENTION FROM THE DEVELOPERS.

8. RELATED AND AUXILIARY PROGRAMS -

9. STATUS - ABSTRACT FIRST DISTRIBUTED DECEMBER 1973.
IBM360,370 VERSION SUBMITTED AUGUST 1973, SAMPLE PROBLEMS EXECUTED BY ACC SEPTEMBER 1973.
CDC6600,7600 VERSION SUBMITTED AUGUST 1973.
UNIVAC1108 VERSION SUBMITTED AUGUST 1973.

10. REFERENCES - J. M. BLAIR AND A. E. RUSSCN, RATIONAL MINIMAX APPROXIMATIONS FOR THE BESSEL FUNCTIONS KO(X) AND K1(X), AECL-3461, 1969.

W. J. CODY, CHEBYSHEV APPRCXIMATIONS FOR THE COMPLETE ELLIPTIC INTEGRALS K AND E, MATH. COMP. 19, 105-112, 1965.

W. J. CODY, K. A. PACIOREK, AND H. C. THACHER, JR., CHEBYSHEV APPROXIMATIONS FOR DAWSON'S INTEGRAL, MATH. COMP. 24, 171-178, 1970.

W. J. CODY AND HENRY C. THACHER, JR., RATIONAL CHEBYSHEV APPROXIMATIONS FOR THE EXPONENTIAL INTEGRAL E1(X), MATH. CCMP. 22, 641-649, 1968.

CHEBYSHEV APPROXIMATIONS FCR THE EXPONENTIAL INTEGRAL EI(X), MATH. COMP. 23, 289-303, 1969.

11. MACHINE REQUIREMENTS -

12. PROGRAMMING LANGUAGES USED - FORTRAN IV(G) (IBM360/75,195, AND 370/165), FORTRAN IV(G1) (IBM360/75,195), FCRTRAN IV(H) (IBM360/65,67,75,195), FCRTRAN IV(H EXTENDEC) (IBM360/195), WATFIV (IBM360/67), FORTRAN RUN, FTN, AND FUN (CDC6600,7600), AND FCRTRAN V (UNIVAC1108)

13. OPERATING SYSTEM OR MONITOR UNDER WHICH PROGRAM IS EXECUTED - OS/360 (IBM360/75,65,195, AND 370/165), MTS (IBM360/67), STAN (IBM360/67), PURD (CDC6500), LLL (CDC6600,7600), UTEX (CDC6600,6400), NCAR (CDC6600,7600), SCOPE 3.3 (CDC6400), LBL (CDC6600,7600), AND EXEC 8 (UNIVAC1108).

14. ANY CTHER PROGRAMMING OR OPERATING INFORMATICN OR RESTRICTIONS - LCCATIONS AND MACHINES USED FOR FUNPACK TESTING WERE -

MACHINE	TEST SITE
IBM360/75,195	ARGONNE NATIONAL LABORATORY
IBM360/65	THE UNIVERSITY OF CHICAGO
IBM360/67	THE UNIVERSITY OF MICHIGAN
IBM360/65	AMES LABORATORY, IOWA STATE UNIVERSITY
IBM360/67	STANFORD UNIVERSITY (STAN)
IBM360/67	THE UNIVERSITY OF NEW MEXICO
IBM370/165	THE UNIVERSITY OF TCRCNTC
CDC6600,7600	LAWRENCE BERKELEY LABORATORY (LBL)
CDC6600,7600	LAWRENCE LIVERMORE LABORATORY (LLL)
CDC6600/6400	THE UNIVERSITY OF TEXAS AT AUSTIN (UTEX)
CDC6600,7600	NATIONAL CENTER FOR ATMCSPHERIC RESEARCH (NCAR)
CDC6400	NORTHWESTERN UNIVERSITY
CDC6500	PURDUE UNIVERSITY
UNIVAC1108	ILLINOIS INSTITUTE OF TECHNOLOGY
UNIVAC1108	UNIVERSITY OF WISCONSIN

15. NAME AND ESTABLISHMENT OF AUTHOR -
CONTACT BURTON S. GARBOW

15. NAME AND ESTABLISHMENT OF AUTHOR(S) (CONTINUED)
APPLIED MATHEMATICS DIVISION
ARGONNE NATICNAL LABCRATORY
9700 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

16. MATERIAL AVAILABLE - MAGNETIC TAPE TRANSMITTAL
SOURCE DECKS (IBM360,370 1831 CARDS, CDC6600,7600 1374 CARDS, UNIVAC1108 1377 CARDS)
DEMONSTRATION PROGRAM SOURCE DECKS (IBM360,370 987 CARDS, CDC6600,7600 632 CARDS, UNIVAC1108 652 CARDS)
MACHINE READABLE DOCUMENTATION (IBM360,370 ABOUT 2137 CARDS, OTHER MACHINES ABOUT 1573 CARDS)

17. CATEGORY - P
KEYWORDS - SPECIAL FUNCTIONS, EXPONENTIAL INTEGRALS, COMPLETE ELLIPTIC INTEGRALS, DAWSCN'S INTEGRAL, BESSEL FUNCTIONS

VI. LIBRARY PROGRAMS BY PROBLEM CLASSIFICATION

176 RAPTURE THIS CODE COMPUTES RESONANCE INTEGRALS, AVERAGES THEM OVER RESONANCE PARAMETRIC DISTRIBUTIONS, AND COMPUTES FISSION AND CAPTURE CROSS SECTIONS AS A FUNCTION OF FUEL TEMPERATURE AND OF POTENTIAL SCATTERING CROSS SECTION PER ABSORBER ISOTOPE.

177 DOPIE DOPIE WAS DEVELOPED TO STUDY THE EFFECTS OF -

(1) OVERLAP OF RESONANCES OF UNLIKE FUEL ISOTOPES SUCH AS U238 AND THE PLUTONIUM ISOTOPES, AND
(2) THE TEMPERATURE DEPENDENCE OF THE AVERAGE FLUX OVER AN ENERGY INTERVAL CONTAINING RESONANCES IN THE CALCULATION OF THE DOPPLER COEFFICIENT.

DOPIE COMPUTES FLUX-AVERAGED CROSS SECTIONS OVER A GIVEN ENERGY RANGE UNDER THE FOLLOWING ASSUMPTION

(1) INTERFERENCE SCATTERING CORRECTIONS WILL BE SMALL AND CAN BE IGNORED.
(2) SCATTERED NEUTRONS ARE DISTRIBUTED UNIFORMLY OVER THE RANGE OF ENERGY DEGRADATION CONSTANT FOR EACH MATERIAL.
(3) ALL RESONANCES ARE RESOLVED OR CAN BE TREATED AS RESOLVED.
(4) LEAKAGE IS INSIGNIFICANT, MAKING SIGMA R(J) = POTENTIAL SCATTERING.

203 COMBCO (40.0279) THE PROGRAM PERMITS COMPUTING AND CONVOLUTING A COMBINATION CROSS SECTION CURVE COMPOSED OF THE CROSS SECTION CURVES OF A SAMPLE AND UP TO FOUR CONTAMINANTS.

208 TRIX1 TRIX1 CALCULATES MULTI-GROUP, DOPPLER-BROADENED EFFECTIVE RESONANCE INTEGRALS AND CROSS SECTIONS AND THEIR TEMPERATURE COEFFICIENTS FOR A HETEROGENEOUS RESONANCE ABSORBER. USING BASIC RESONANCE PARAMETERS, GEOMETRY AND CONCENTRATIONS, THE CODE COMBINES RESOLVED RESONANCE, UNRESOLVED RESONANCE, AND 1/V AND NEGATIVE ENERGY RESONANCE CALCULATIONS. FISSILE ISOTOPE CALCULATION IS AVAILABLE. L=1 UNRESOLVED RESONANCE CALCULATIONS ARE AVAILABLE FOR ISOTOPES OF ALL SPINS. EQUIVALENCE RELATIONSHIPS ARE CODED FOR CYLINDERS, SPHERES, AND PLANES. INTERFERENCE BETWEEN RESONANCE AND POTENTIAL SCATTERING AND ITS TEMPERATURE DEPENDENCE ARE AVAILABLE. THE NARROW-RESONANCE, INFINITE-MASS, AND INTERMEDIATE REPRESENTATIONS OF SCATTERINGS WITH ABSORBER ATOMS ARE ALL AVAILABLE. THE ISOLATED SINGLE-LEVEL BREIT-WIGNER LINE SHAPE IS USED.

214 MISH MASH THE PROGRAM COMPUTES RESONANCE INTEGRALS FOR INFINITE HOMOGENEOUS MIXTURES FOR ABOVE THERMAL ENERGIES. THE MAJOR PHYSICAL APPROXIMATION IS THAT RESONANCES ARE REPRESENTED BY THE SINGLE-LEVEL BREIT-WIGNER FORMULATION. IT IS ALSO ASSUMED THAT SCATTERING IS ELASTIC AND THAT A NONRESONANT MATERIAL HAS A CONSTANT SCATTERING CROSS SECTION.

215 CHAD CHAD IS DESIGNED TO FACILITATE ANALYSIS AND HANDLING OF DIFFERENTIAL NEUTRON SCATTERING DATA. IT PRODUCES LEGENDRE SCATTERING COEFFICIENTS FROM ANGULAR DISTRIBUTION DATA TABULATED IN MANY DIFFERENT FORMATS. IT CAN TRANSFORM ANGULAR DATA INTO LEGENDRE SCATTERING COEFFICIENTS IN EITHER THE LABORATORY OR THE CENTER-OF-MASS FRAME OF REFERENCE. IT CALCULATES THE AVERAGE COSINE OF THE SCATTERING ANGLE IN THE LABORATORY SYSTEM AND THE AVERAGE LOGARITHMIC ENERGY DECREMENT PER ELASTIC COLLISION.

216 FSDP3 FSDP3 COMPUTES POINTWISE CROSS SECTIONS FROM SINGLE-LEVEL BREIT-WIGNER RESONANCE PARAMETERS.

217 LEGCOEF3/GEORGE CALCULATES LEGENDRE EXPANSION COEFFICIENTS FOR THE ANGULAR DISTRIBUTION OF ELASTICALLY SCATTERED NEUTRONS.

238 EXT/XO GIVEN A SET OF BREIT-WIGNER RESONANCE PARAMETERS (ZERO TEMPERATURE) EXT CALCULATES THE EFFECTIVE DOPPLER-BROADENED CROSS SECTIONS FOR ANY TEMPERATURE. THE EFFECTIVE CROSS SECTION WHEN MULTIPLIED BY THE TARGET DENSITY AND THE NEUTRON VELOCITY (LAB) GIVES THE REACTION RATE PER INCIDENT NEUTRON. A MAXWELLIAN VELOCITY DISTRIBUTION IS ASSUMED FOR THE TARGET NUCLEI. THE ANALYSIS IS CARRIED OUT FOR SUFFICIENTLY LOW ENERGIES SO THAT ONLY ZERO NEUTRON ANGULAR MOMENTA (L = 0) INTERACTIONS ARE IMPORTANT. INTERFERENCE BETWEEN LEVELS IS NEGLECTED, HOWEVER, INTERFERENCE BETWEEN RESONANCE SCATTERING AND POTENTIAL SCATTERING IS INCLUDED. THERE ARE PROVISIONS FOR ADDING A CORRECTION CROSS SECTION OF THE FORM 1.0/SQRT(E) FOR LEVELS NOT EXPLICITLY CONSIDERED. ALSO THE CROSS SECTION IN THE WINGS OF A NEGATIVE ENERGY RESONANCE, CONSTANT/(SQRT(E)*(E-E0)**2) MAY BE ADDED.

347 CODILLI A LEAST SQUARES ANALYSIS OF NEUTRON RESONANCE DATA IS PERFORMED USING THE MULTI-LEVEL EXPANSION. THE PROGRAM CAN HANDLE ONLY ONE SET OF CROSS SECTIONS AT A TIME. OPTIONS ARE PROVIDED FOR THE ANALYSIS OF REACTION OR TOTAL CROSS SECTION DATA, AND FOR THE DIRECT HANDLING OF TRANSMISSION DATA. BY OPTION, ONE CAN INCLUDE THE MULTI-LEVEL INTERFERENCE OR PERFORM THE FIT IN TERMS OF SUPERIMPOSED SYMMETRIC BREIT-WIGNER LINES, WHILE THE POTENTIAL SCATTERING INTERFERENCE IS ALWAYS INCLUDED IN THE TRIAL FUNCTION FOR THE TOTAL CROSS SECTION. PROVISIONS ARE GIVEN FOR GAUSSIAN AND NON-GAUSSIAN RESOLUTION FUNCTIONS. IN THE LATTER CASE, MODIFICATION OF ONE SUBROUTINE ALLOWS FOR ADAPTATION TO ANY KIND OF EXPERIMENTAL CONDITIONS. THE RELEVANT CONVOLUTION INTEGRALS INVOLVING THE TRIAL FUNCTION ARE EVALUATED BY SIMPSON INTEGRATION WITH AN OPTIONAL NUMBER OF INTEGRATION STEPS. BESIDES THE RESONANCES TO BE FITTED, THE TRIAL FUNCTION CONTAINS AN OPTIONAL NUMBER OF RESONANCES HAVING KNOWN PARAMETERS, WHICH MAY REPRESENT RESONANCES EXTERNAL TO THE REGION BEING FITTED AS WELL AS RESONANCES WITHIN THE ENERGY INTERVAL OF INTEREST, THUS PERMITTING IMPURITY EFFECTS TO BE DESCRIBED, OR, IF NEEDED, SPIN STATES SEPARATED.

359 PUN1 PUN1 EVALUATES UNRESOLVED RADIATIVE CAPTURE INTEGRALS AND RELATED MULTIGROUP CROSS SECTIONS. THE UNRESOLVED DISTRIBUTIONS MAY HAVE VARIOUS ORBITAL ANGULAR MOMENTUM QUANTUM NUMBERS AND THE EFFECTS OF DOPPLER BROADENING AND SELF-SHIELDING ARE INCLUDED.

360 TOR THE TOR PORGRAM CALCULATES THE SCATTERING LAW FOR A CRYSTALLINE MATERIAL IN THE INCOHERENT APPROXIMATION, FROM THE PHONON FREQUENCY DISTRIBUTION AND A SPECIFIED TEMPERATURE. A PROPORTIONAL QUANTITY IS PUNCHED IN THE FORM OF A TABLE FOR INTERPOLATION OF THE DOUBLE DIFFERENTIAL CROSS SECTION. AS AN ALTERNATIVE, THE PROGRAM OBTAINS THE ANALOGOUS QUANTITIES FOR A MONATOMIC GAS.

376 AVERAGE AVERAGE CALCULATES AVERAGE SCATTERING, CAPTURE, AND FISSION CROSS SECTIONS FROM S- AND P-WAVE DATA OF THE UNRESOLVED PARAMETERS OF FILE 2 OF ENDF/B.

377 SIGPLOT SIGPLOT CALCULATES THE SCATTERING, CAPTURE, FISSION, AND TOTAL CROSS SECTIONS FROM RESONANCE PARAMETERS OF VERSION I DATA FROM FILE 2 OF ENDF/B. SCATTERING CROSS SECTIONS MAY BE CALCULATED WITH OR WITHOUT LEVEL-LEVEL INTERFERENCE. PROVISION IS ALSO MADE TO NUMERICALLY DOPPLER-BROADEN ANY OF THE CROSS SECTIONS.

381 LYNNE LYNN PERFORMS A MULTIPOLE EXPANSION OF THE WOODS-SAXON POTENTIAL. THE NUMBERS GENERATED ARE SUITABLE FOR MICROSCOPIC CALCULATIONS OF INELASTIC SCATTERING FROM NUCLEI WHICH USE A WOODS-SAXON INTERACTION BETWEEN THE PROJECTILE AND THE TARGET NUCLEONS.

385 COHBE/PREP THE PROGRAMS, PREP AND COHBE CALCULATE THE COHERENT ONE-PHONON SCATTERING LAW FOR POLYCRYSTALLINE BERYLLIUM, USING AN ISOTROPIC DEBYE-WALLER FACTOR AS AN APPROXIMATION FOR BERYLLIUM. THE DEBYE-WALLER FACTOR W IS CONSISTENT WITH THE DEFINITION EXP**(-2*W*ALPHA) IN THE SCATTERING LAW.

399 SUMOR(M0271) SUMOR CALCULATES S-WAVE NEUTRON CROSS SECTIONS AT SELECTED ENERGIES. THE CROSS SECTIONS ARE CALCULATED IN THREE APPROXIMATIONS TO R-MATRIX THEORY - THE REICH AND MOORE APPROXIMATION, THE FESHBACH, PORTER, AND WEISSKOPF APPROXIMATION, AND THE SUMS OF SINGLE-LEVEL FORMULAE APPROXIMATION. THESE CALCULATED CROSS SECTIONS OR, ALTERNATIVELY, INPUT LISTS OF CROSS SECTIONS, ARE DOPPLER BROADENED USING EXACT CALCULATION FOR TARGET NUCLEI IN MAXWELLIAN MOTION. CALCULATED CROSS SECTIONS OR CROSS SECTIONS DIVIDED BY NEUTRON ENERGY CAN BE INTEGRATED BETWEEN ARBITRARY ENERGY LIMITS.

410 TACASI TACASI IS USED TO DETERMINE THE PARAMETERS OF A SINGLE NEUTRON RESONANCE. THE CODE ACCEPTS MEASURED VALUES OF CAPTURE AREAS, SELF-INDICATION AREAS, SELF-INDICATION RATIOS AND TRANSMISSION AREAS AND THEIR ASSOCIATED UNCERTAINTIES IN ANY COMBINATION AND DETERMINES BEST ESTIMATES OF THE NEUTRON AND RADIATION WIDTHS AND THEIR STANDARD DEVIATIONS.

417 ATHENA4 ATHENA4 COMPUTES FORM FACTORS FOR INELASTIC SCATTERING CALCULATIONS, USING SINGLE-PARTICLE WAVE FUNCTIONS THAT ARE EIGENSTATES OF MOTION IN EITHER A WOODS-SAXON POTENTIAL WELL OR A HARMONIC OSCILLATOR WELL. TWO-BODY FORCES OF GAUSS, COULOMB, YUKAWA, AND A SUM OF CUT-OFF YUKAWA RADIAL DEPENDENCES ARE AVAILABLE.

465 RESEND/ADLER RESEND GENERATES INFINITELY DILUTE, UNBROADENED POINT CROSS SECTIONS IN THE ENDF FORMAT BY COMBINING ENDF FILE 3, BACKGROUND CROSS SECTIONS WITH POINTS CALCULATED FROM ENDF FILE 2, RESONANCE PARAMETER DATA.

ADLER CALCULATES TOTAL, CAPTURE AND FISSION CROSS SECTIONS FROM THE CORRESPONDING ADLER-ADLER PARAMETERS IN THE ENDF/B FILE 2 VERSION II DATA AND ALSO DOPPLER-BROADENS CROSS SECTIONS.

33 GAM1/REP/UPDATE THIS PROGRAM COMPUTES THE SLOWING-DOWN SPECTRUM IN EITHER THE P1 OR THE B1 APPROXIMATION USING 68 GROUPS OF NEUTRONS WITH A CONSTANT GROUP WIDTH DU=0.25, MULTIGROUP CONSTANTS ARE CALCULATED FOR UP TO 32 FAST GROUPS.

50 TEMPEST2 TEMPEST2 IS A NEUTRON THERMALIZATION PROGRAM BASED UPON THE WIGNER-WILKINS APPROXIMATION FOR LIGHT MODERATORS AND THE WILKINS APPROXIMATION FOR HEAVY MODERATORS. A MAXWELLIAN DISTRIBUTION MAY ALSO BE USED. THE MODEL USED MAY BE SELECTED AS A FUNCTION OF ENERGY. THE SECOND-ORDER DIFFERENTIAL EQUATIONS ARE INTEGRATED DIRECTLY RATHER THAN TRANSFORMED TO THE RICCATI EQUATION. THE PROGRAM PROVIDES MICROSCOPIC AND MACROSCOPIC CROSS SECTION AVERAGES OVER THE THERMAL NEUTRON SPECTRUM.

51 FORM THE FORM, OR FORTRAN-MUFT, PROGRAM IS A FOURIER TRANSFORM SLOWING-DOWN CODE. A LIBRARY TAPE CONTAINING 54-GROUP MICROSCOPIC CROSS SECTIONS, RESONANCE PARAMETERS, INELASTIC SCATTERING MATRICES, AND SOURCE SPECTRA IS USED TO GENERATE A 54-GROUP FLUX SPECTRUM AND FEW-GROUP CONSTANTS.

52 SAIL THE MONOENERGETIC NEUTRON TRANSPORT EQUATION IS SOLVED USING THE DISCRETE SN METHOD FOR A ONE-DIMENSIONAL PLANE CELL. CELL PROPERTIES ARE COMPUTED.

53 S4 CYLINDRICAL GEOMETRY CELL C THIS PROGRAM SOLVES THE ONE-DIMENSIONAL MONOENERGETIC BOLTZMANN EQUATION IN CYLINDRICAL GEOMETRY, USING THE S4 APPROXIMATION. IN ADDITION TO THE FLUX DISTRIBUTION, CELL-AVERAGED PARAMETERS ARE COMPUTED.

108 BAM BAM COMPUTES THERMAL CONSTANTS, SPATIAL AND ENERGY DISTRIBUTIONS IN HETEROGENEOUS CYLINDRICAL CELLS BY ASSUMING SEPARABILITY OF SPACE AND ENERGY IN THE BOLTZMANN EQUATION.

113 ZOT ZOT TAKES MULTIGROUP NEUTRON CROSS SECTION SETS IN THE SN FORMAT (SNG, DSN, ETC.) AND REDUCES THE NUMBER OF GROUPS (COLLAPSES) ACCORDING TO A GIVEN OR COMPUTED MULTIGROUP FLUX SPECTRUM. AVERAGE VELOCITIES FOR THE FEW-GROUP SET MAY BE GENERATED ON THE BASIS OF THE FLUXES AND VOLUMES FOR A GIVEN REACTOR CONFIGURATION.

119 QUICKIE QUICKIE SOLVES THE NEUTRON SLOWING DOWN AND THERMALIZATION PROBLEM IN INFINITE MEDIA BY INVERTING A SET OF SIMULTANEOUS MULTIGROUP EQUATIONS. THE CODE USES THE ULCER (ACC ABSTRACT 118) LIBRARY TAPE AND IS IN EXCELLENT AGREEMENT WITH ULCER FOR THOSE CASES WHERE BUCKLING IS KNOWN.

147 AILMOE AILMOE IS A MODIFIED FORM OF THE ANL ELMOE PROGRAM. THE FOURIER TRANSFORM OF THE FAST NEUTRON FLUX IS FOUND FOR A MIXTURE OF MODERATORS HEAVIER THAN HYDROGEN WITH THE MODERATOR SCATTERING LAW RIGOROUSLY ACCOUNTED FOR.

149 TYCHE3 TYCHE3 IS A MONTE CARLO CODE DESIGNED TO FIND THE SECOND, FOURTH AND SIXTH MOMENTS OF THE NEUTRON SLOWING DOWN DENSITY DISTRIBUTION IN AN INFINITE HOMOGENEOUS MEDIUM. NEUTRON WEIGHTS ARE USED TO AVOID THE TERMINATION OF A HISTORY BY ABSORPTION AND MINIMIZE THE RUNNING TIME. PROVISIONS ARE MADE FOR RESTART OF NON-CONVERGED PROBLEMS, GRAPHICAL DISPLAYS OF THE MOMENTS AND AVERAGE FISSION ENERGY AS A FUNCTION OF THE NUMBER OF SETS OF HISTORIES AND CALCULATION OF THE CORRECTION TO FLUX MOMENTS.

150 DANCOFF JR. THIS CODE EVALUATES MODERATOR SPACE CHORD DISTRIBUTION FUNCTIONS OF ZEROTH AND FIRST ORDER, PLUS THEIR LINEAR, SQUARE, LOGARITHMIC AND EXPONENTIAL MOMENTS, FOR REGULAR AND IRREGULAR LATTICES OF CYLINDRICAL FUEL RODS CLAD WITH MATERIAL OF NEGLIGIBLE TOTAL CROSS SECTION. OF PARTICULAR SIGNIFICANCE FOR REACTOR DESIGN CALCULATIONS IS THE EXPONENTIAL MOMENT, OR DANCOFF CORRECTION, WHICH CAN BE CALCULATED EXACTLY IN INFINITE SQUARE AND HEXAGONAL LATTICES, IN CLUMPED SQUARE LATTICES WITH STRAIGHT OR CRUCIFORM WATER GAPS, OR IN CLUSTERS OF TWO, THREE, SEVEN, AND NINETEEN FUEL RODS.

160 SOPHIST SOPHIST1 CALCULATES TEMPERATURE-DEPENDENT MULTIGROUP ENERGY TRANSFER COEFFICIENTS FOR A MAXWELL GAS MODERATOR WITH ELASTIC, ISOTROPIC SCATTERING IN THE CENTER OF MASS SYSTEM. SOPHIST2 CALCULATES TEMPERATURE-DEPENDENT MULTIGROUP CROSS SECTIONS FOR A MAXWELL GAS. SOPHIST5 CALCULATES MULTIGROUP ENERGY TRANSFER MATRICES FOR ANISOTROPIC ELASTIC SCATTERING.

162 GRAVE GRAVE IS THE PROGRAM TO FORM GROUP-AVERAGED CROSS SECTIONS USING THE NEUTRON CROSS SECTION MASTER TAPE DEVELOPED UNDER THE ATOMICS INTERNATIONAL AUTOMATED CROSS SECTION PROGRAM. NINETEEN GROUP-AVERAGED PARAMETERS ARE OBTAINABLE AS FOLLOWS - SIGMA T, SIGMA EL, SIGMA N, SIGMA F, NUBAR, MUBAR, XIBAR, SIGMA IN, SIGMA N-ALPHA, SIGMA N-P, SIGMA N-2N, SIGMA A, SIGMA TR, SIGMA NON-EL, ALPHABAR, XI*SIGMA EL, NU* SIGMA F, MUBAR*SIGMA EL, AND SIGMA R.
THE SPECTRUM IS CONSTRUCTED FROM A COMBINATION OF FISSION, E**-N, POWER SERIES, MAXWELLIAN OR INPUT SPECTRA.

178 SPARTA SPARTA COMPUTES SPATIALLY-AVERAGED DOPPLER COEFFICIENTS AND SPATIALLY-AVERAGED DOPPLER REACTIVITY CHANGES.

184 ANL THERMOS/BRT1 ANL THERMOS AND BRT1, LIKE THE ORIGINAL THERMOS CODE DEVELOPED BY H. HONECK OF BROOKHAVEN NATIONAL LABORATORY, COMPUTE THE SCALAR THERMAL NEUTRON SPECTRUM AS A FUNCTION OF POSITION IN A LATTICE BY SOLVING THE INTEGRAL TRANSPORT EQUATION WITH ISOTROPIC SCATTERING. ONE-DIMENSIONAL SLAB OR CYLINDRICAL GEOMETRY MAY BE USED. AS OUTPUT THE CODE SUPPLIES FLUX-AVERAGED VALUES OF SIGMA A, SIGMA F, NU SIGMA F, SIGMA S, AND D FOR THE CELL COMPOSITION AND THE VALUES OF SIGMA A, SIGMA F, NU SIGMA F, SIGMA S, AND SIGMA TR FOR THE ISOTOPIC CONSTITUENTS.

185 GAMTEC2 GAMTEC2 GENERATES MULTIGROUP CONSTANTS IN THE ENERGY RANGE FROM 0 TO 10 MEV FOR EITHER HOMOGENEOUS MIXTURES OR HETEROGENEOUS ARRAYS CONSISTING OF CYLINDERIZED LATTICE CELLS. THE THERMAL GROUP CONSTANTS ARE AVERAGED OVER EITHER (1) WIGNER-WILKINS LIGHT MODERATOR SPECTRUM, (2) WILKINS HEAVY MODERATOR SPECTRUM, OR (3) A MAXWELLIAN DISTRIBUTION. FOR HETEROGENEOUS ARRAYS THE SPATIAL THERMAL FLUX IS CALCULATED BY A MONOENERGETIC P3 APPROXIMATION. FOR EPITHERMAL ENERGIES, THE SLOWING-DOWN DISTRIBUTION IS DESCRIBED BY EITHER A B1 OR P1 APPROXIMATION TO THE BOLTZMANN EQUATION. RESONANCE ABSORPTION AND FISSION ARE TREATED BY THE ADLER-NORDHEIM METHOD. AN IMPROVED METHOD OVER THAT IN GAM-I FOR AVERAGING THE RESONANCE ABSORPTION CONTRIBUTION TO THE MULTIGROUP CONSTANTS IS INCLUDED. FUEL LUMPING EFFECTS ON THE FAST FISSION OF U238 AND TH232 ARE TREATED BY AN N-FLIGHT COLLISION PROBABILITY TECHNIQUE. GROUP CONSTANTS ARE PUNCHED ON CARDS IN HFN (DIFFUSION CODE) AND DTF (SN TRANSPORT CODE) FORMATS.

195 FORTRAN FMC-N/FMC-G THE FLEXIBLE MONTE CARLO PROGRAMS FMC-N AND FMC-G WERE ORIGINALLY WRITTEN IN ASSEMBLY LANGUAGE FOR THE IBM704 BY GE-ANP. THESE PROGRAMS HAVE BEEN CONVERTED TO FORTRAN FOR THE CDC1604B BY PRATT AND WHITNEY. THE PROGRAMS APPLY MONTE CARLO METHODS TO SIMULATE NEUTRON AND GAMMA RAY LIFE HISTORIES, RESPECTIVELY, IN A SOURCE-SHIELD CONFIGURATION. AS THE NAMES IMPLY, THE CODES ARE DESIGNED FOR FLEXIBILITY IN THE GEOMETRICAL, MATERIAL, NUCLEAR, AND SOURCE DESCRIPTIONS OF SOURCE-SHIELD CONFIGURATIONS AND VARIANCE REDUCTION TECHNIQUES.

201 EPITHERMOS THE EPITHERMOS CODE IS A MODIFICATION OF THE THERMOS THERMAL TRANSPORT THEORY CODE OF HONECK. THE ESSENTIAL DIFFERENCE BETWEEN THE CODES IS IN THE LIBRARY PREPARATION SUBROUTINE BASK. THE EPITHERMOS CODE IS DESIGNED TO COMPUTE THE NEUTRON DENSITY ABOVE 0.7849 EV, THE MAXIMUM ENERGY OF THE USUAL THERMOS CALCULATION. EPITHERMOS COMPUTES THE SCALAR NEUTRON DENSITY AS A FUNCTION OF POSITION AND SPEED IN A ONE-DIMENSIONAL SLAB OR CYLINDRICAL SYSTEM. THE SCATTERING MODEL IS ARBITRARY IN THE THERMAL RANGE AND THE BUILT-IN FREE GAS MODEL IS USED IN THE EPITHERMAL RANGE.

202 MCS THE MCS CODE DETERMINES THE SPATIAL DISTRIBUTION OF SOME NUCLEAR REACTION FOR A GIVEN NEUTRON SOURCE IN A GIVEN CONFIGURATION OF MATERIALS. THE MONTE CARLO ESTIMATE OF THE SOLUTION CONSISTS OF PICKING A SAMPLE OF NEUTRONS FROM THE GIVEN SOURCE AND FOLLOWING EACH NEUTRON THROUGH A SEQUENCE OF SURFACE CROSSINGS AND COLLISIONS UNTIL THE NEUTRON EITHER ESCAPES OR IS NO LONGER OF INTEREST TO THE SOLUTION. THE DESIRED FLUX OR COLLISION DENSITY IS ACCUMULATED FOR EVERY NEUTRON OF THE SAMPLE, AND THE SAMPLE SIZE INCREASED UNTIL RESULTS OF SUFFICIENT STATISTICAL SIGNIFICANCE ARE OBTAINED.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS, LATTICE AND CELL PROBLEMS 3/74

204 AGN-GAM AGN-GAM CALCULATES THE SUBGROUP FLUXES AND CURRENT TERMS FROM A SOLUTION OF THE P1 OR B1 EQUATIONS. THE P1 EQUATIONS INCORPORATE BOTH VOLUME AND SURFACE SOURCES, ALLOWING SPECTRAL CALCULATIONS IN REFLECTOR REGIONS. OTHER SPECTRAL OPTIONS ARE FLUX KNOWN, CURRENT TERM CALCULATED AND BOTH FLUX AND CURRENT TERMS KNOWN. THE AGE FOR THE MATERIAL IS OBTAINED FROM A SECOND MOMENTS CALCULATION. THE 75 SUBGROUPS USED IN THE CALCULATIONS ARE ESTABLISHED AS QUARTER LETHARGY GROUPS FROM 10 MEV TO 0.07EV. ELASTIC SCATTERING MATRICES MAINTAIN THE ENERGY-ANGLE CORRELATION BY INCLUDING BOTH P0 AND P1 TERMS. ISOTROPIC SCATTERING MATRICES ARE INCLUDED FOR INELASTIC AND (N,2N) PROCESSES. THE METHOD OF ADLER, HINMAN AND NORDHEIM IS USED TO CALCULATE RESONANCE ABSORPTION AND FISSION CROSS SECTIONS. MULTIGROUP CONSTANTS ARE GENERATED BY SPECTRAL AVERAGING OVER THE SUBGROUPS.

213 RIFF RAFF RIFF RAFF COMPUTES RESONANCE INTEGRALS FOR ABSORBERS IN A ROD IN A TWO-REGION CIRCULARIZED CELL FOR ABOVE THERMAL ENERGIES. THE FLUX DISTRIBUTION IN THE CELL IS ALSO COMPUTED AND CAN BE PRINTED. THE METHOD OF SOLUTION IS BASED UPON THE FOLLOWING ASSUMPTIONS - ISOTROPIC SCATTERING IN THE LABORATORY SYSTEM, CONSTANT TOTAL CROSS SECTION IN THE MODERATOR AND ISOTROPIC NEUTRON FLUXES ENTERING AND LEAVING THE ROD.

219 GAROL GAROL COMPUTES EFFECTIVE GROUP CROSS SECTIONS FOR THE RESOLVED RESONANCES OF A MIXTURE OF ISOTOPES IN A TWO-REGION CELL. BASIC CROSS SECTIONS INCLUDE TEMPERATURE DEPENDENCE. THE PROGRAM ALLOWS A CHOICE OF GEOMETRIES AND CAN ACCEPT AN ARBITRARY TABLE OF ESCAPE PROBABILITIES. A DANCOFF CORRECTION MAY BE USED TO ACCOUNT FOR SHADOWING EFFECTS IN A TIGHT LATTICE, AND CROSS SECTIONS MAY BE 1/V, CONSTANT, COMPUTED FROM BREIT-WIGNER RESONANCE PARAMETERS, OR GIVEN IN TABULAR FORM. THE MESH MAY BE CHOSEN AT EQUAL ENERGY OR LETHARGY INTERVALS, PROPORTIONAL TO THE NEUTRON VELOCITY, OR AS AN ARBITRAR TABLE OF VALUES.

235 GAMMA-P (NMP468) CROSS SECTIONS FOR THE PRODUCTION OF GAMMA RAYS BY NEUTRON RADIATIVE CAPTURE, BY NEUTRON INELASTIC SCATTERING, AND BY NEUTRON-INDUCED FISSIONING ARE COMPUTED AS A FUNCTION OF NEUTRON LETHARGY GROUPS AND PHOTON ENERGY GROUPS.

237 BOUNCE BOUNCE DETERMINES THE ONE-GROUP THERMAL NEUTRON FLUX DISTRIBUTION WITHIN THE PIN BUNDLE OF A MULTIPLE-PIN FUEL ELEMENT. ALL SCATTERING WITHIN THE PINS IS CONSIDERED TO BE ISOTROPIC. ELEMENTS WITH 6, 7, 12, 13, 18, AND 19 FUEL PINS, WHERE EACH PIN IS COMPOSED OF A CENTRAL FUEL PELLET SURROUNDED BY A CLADDING MATERIAL, MAY BE TREATED. THE COOLANT REGION AROUND THE PINS IS ASSUMED TO CONTAIN A VOID.

243 AGN-SIGMA AGN-SIGMA CALCULATES THE LEGENDRE COMPONENTS OF THE MULTIGROUP TRANSFER MATRICES SIGMA(L,G TO G+N) FOR FAST NEUTRONS. REACTIONS CONSIDERED ARE ELASTIC SCATTERING, INELASTIC SCATTERING (LEVEL EXCITATION AND THE EVAPORATION MODEL), AND THE FOLLOWING FIVE DECAY MODES FOR THE (N,2N) REACTION -- A(N,N1)A*(N2)(A-1)*, 3- AND 4- BODY PHASE SPACE MODEL, EVAPORATION MODEL, AND THE CLUSTER MODEL, WHERE A* IS THE RECOIL NUCLEUS. ALL NUCLEAR LEVELS INVOLVED IN THE TRANSITIONS ARE DISCRETE. THE CODE MAY ALSO BE USED TO CALCULATE GROUP AVERAGED CROSS SECTIONS AS WELL AS TO MANIPULATE, E.G., ADD, MULTIPLY, ETC., THE OUTPUT MATRICES. THE NEUTRON SPECTRUM MAY BE A COMBINATION OF FISSION AND 1/E OR ARBITRARY INPUT DATA.

249 LASER LASER IS BASED ON MODIFIED VERSIONS OF THE SLOWING-DOWN PROGRAM MUFT AND THE THERMALIZATION TRANSPORT THEORY PROGRAM THERMOS, AND PERFORMS A CALCULATION OF THE NEUTRON SPECTRUM IN A UNIFORM LATTICE MADE UP OF CYLINDRICAL RODS, CLADDING, AND SURROUNDING MODERATOR. THE THERMAL CUTOFF IN LASER IS 1.855 EV. THE PROGRAM PERFORMS A BURNUP CALCULATION FOR THE LATTICE. THE SPATIAL DISTRIBUTION OF BURNUP WITHIN THE FUEL RODS IS EXPLICITLY CALCULATED. THE PROGRAM WILL, AT OPTION, ACCOUNT FOR ALL NON-LINEARITIES AND MUTUAL CONNECTIONS IN THE SYSTEM OF BURNUP EQUATIONS. THIS CALCULATION ACCOUNTS FOR THE VARIATION OF THE NEUTRON FLUX IN SPACE AND ENERGY DURING EACH TIME-STEP. A BUCKLING AND A BORON POISON SEARCH (CRITICALITY SEARCH) ARE PROVIDED AS OPTIONS. OUTPUT INCLUDES EDITS IN THE ENERGY RANGE ZERO LESS THAN OR EQUAL TO E LESS THAN OR EQUAL TO 0.625 EV.

257 REAX REAX CALCULATES EPITHERMAL FLUX, ACTIVITIES AND CROSS SECTIONS AS A FUNCTION OF RADIUS AND ENERGY FOR A CONSTANT TEMPERATURE FUEL ROD IMMERSED IN A HOMOGENEOUS MEDIUM.

276 AVOID AVOID COMPUTES THE EQUIVALENT DIFFUSION COEFFICIENT AND LOSS CROSS SECTION OF AN ANNULAR VOID IN A CYLINDRICAL REACTOR AND THE RADIAL FLUX DISTRIBUTION IN THE VOID.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS, LATTICE AND CELL PROBLEMS 3/74

277 HAMMER/LITHE/HELP HAMMER PERFORMS INFINITE LATTICE, ONE-DIMENSIONAL CELL MULTIGROUP CALCULATIONS, FOLLOWED (OPTIONALLY) BY ONE-DIMENSIONAL, FEW-GROUP, MULTIREGION REACTOR CALCULATIONS WITH NEUTRON BALANCE EDITS.

279 LEOPARD/SPOTS LEOPARD IS A UNIT CELL HOMOGENIZATION AND SPECTRUM GENERATION (MUFT-SOFOCATE) PROGRAM WITH A FUEL DEPLETION OPTION.

280 MOBOT MOBOT SOLVES THE TWO-DIMENSIONAL FIXED-SOURCE DIFFUSION EQUATION FOR THE ABSORPTION AND REMOVAL MACROSCOPIC CROSS SECTIONS REQUIRED TO YIELD A SPECIFIED REACTION RATE DISTRIBUTION.

281 RABBLE/WLIB/FLAT RABBLE COMPUTES EFFECTIVE CROSS SECTIONS FOR ABOVE THERMAL ENERGIES BASED ON RESOLVED SINGLE-LEVEL RESONANCE PARAMETERS FOR INFINITE HOMOGENEOUS OR HETEROGENEOUS SYSTEMS.

285 RESQ2/RESQO/DBF1 RESQ2 CALCULATES THE RESONANCE INTEGRAL IN A TWO-DIMENSIONAL, HEXAGONAL SYSTEM CONSISTING OF FUEL, CLAD AND WATER WITH A REFLECTING BOUNDARY CONDITION.

291 HEXSCAT HEXSCAT CALCULATES P0 THROUGH P3 COMPONENTS OF THE POLYCRYSTALLINE COHERENT ELASTIC NEUTRON SCATTERING CROSS SECTION PER NUCLEUS FOR A HEXAGONAL LATTICE. THE CODE AVERAGES POINT VALUES OVER INPUT GROUP BOUNDARIES TO GIVE SMOOTHED GROUP CROSS SECTIONS.

298 GGC4 THE GGC4 PROGRAM SOLVES THE MULTIGROUP SPECTRUM EQUATIONS WITH SPATIAL DEPENDENCE REPRESENTED BY A SINGLE POSITIVE INPUT BUCKLING. BROAD GROUP CROSS SECTIONS (SHIELDED OR UNSHIELDED) ARE PREPARED FOR DIFFUSION AND TRANSPORT CODES BY AVERAGING WITH THE CALCULATED SPECTRA OVER INPUT-DESIGNATED ENERGY LIMITS. THE CODE IS DIVIDED INTO THREE MAIN PARTS. A FAST (GAM) SECTION WHICH COVERS THE ENERGY RANGE FROM 14.9 MEV TO 0.414 EV, A THERMAL (GATHER) SECTION WHICH COVERS THE ENERGY RANGE FROM 0 TO 2.38 EV, AND A COMBINING (COMBO) SECTION WHICH COMBINES FAST AND THERMAL CROSS SECTIONS INTO SINGLE SETS. BASIC NUCLEAR DATA FOR THE FAST SECTION WHICH CONSISTS OF FINE GROUP-AVERAGED CROSS SECTIONS AND RESONANCE PARAMETERS IS READ OFF A DATA TAPE. THE FINE GROUP ABSORPTION AND FISSION CROSS SECTIONS MAY BE ADJUSTED BY PERFORMING A RESONANCE INTEGRAL CALCULATION. UTILIZING A FISSION SOURCE AND AN INPUT BUCKLING, THE CODE SOLVES THE P1, B1, B2, OR B3 APPROXIMATION TO OBTAIN THE ENERGY-DEPENDENT FAST SPECTRUM. TWO OR SIX SPATIAL MOMENTS OF THE SPECTRUM (DUE TO A PLANE SOURCE) MAY ALSO BE EVALUATED. INSTEAD OF PERFORMING A SPECTRUM CALCULATION, THE USER MAY ENTER THE LEGENDRE COMPONENTS OF THE ANGULAR FLUX DIRECTLY. FOR AS MANY INPUT-DESIGNATED BROAD GROUP STRUCTURES AS DESIRED, THE CODE CALCULATES AND SAVES (FOR THE COMBINING SECTION) SPECTRUM-WEIGHTED AVERAGES OF MICROSCOPIC AND MACROSCOPIC CROSS SECTIONS AND TRANSFER ARRAYS. SLOWING DOWN SOURCES ARE CALCULATED AND SAVED FOR USE IN THE LOWER ENERGY RANGE. GIVEN BASIC NUCLEAR DATA, THE THERMAL SECTION OF GGC4 DETERMINES A THERMAL SPECTRUM BY EITHER READING IT AS INPUT, BY CALCULATING A MAXWELLIAN SPECTRUM FOR A GIVEN TEMPERATURE, OR BY AN ITERATIVE SOLUTION OF THE P3, B0, P1, OR B1 EQUATIONS FOR AN INPUT BUCKLING. TIME MOMENTS OF THE TIME AND ENERGY-DEPENDENT DIFFUSION EQUATIONS ARE CALCULATED (AS AN OPTION) USING THE INPUT BUCKLING TO REPRESENT LEAKAGE. BROAD GROUP CROSS SECTIONS ARE PREPARED BY AVERAGING FINE GROUP CROSS SECTIONS OVER THE CALCULATED SPECTRA. BROAD GROUP STRUCTURES ARE READ AS INPUT. THE COMBINING SECTION OF GGC4 TAKES THE BROAD GROUP-AVERAGED CROSS SECTIONS FROM THE FAST AND THERMAL PORTIONS OF GGC4 AND FORMS MULTIGROUP CROSS SECTION TABLES. THESE TABLES ARE PREPARED IN STANDARD FORMATS FOR TRANSPORT OR DIFFUSION THEORY CALCULATIONS. IN ADDITION, IT IS POSSIBLE TO USE THE COMBINING SECTION TO PRODUCE MIXTURES NOT USED IN THE SPECTRUM CALCULATION OR TO COMBINE THE RESULTS OF DIFFERENT FAST AND THERMAL SECTION CALCULATIONS AND SO ON. THESE OPTIONS ARE DESCRIBED IN REFERENCE 2.

306 FCC4 FCC4 IS A MULTIPURPOSE DATA MANIPULATION CODE FOR USE IN FAST REACTOR ANALYSIS. THE CODE CAN BE USED TO - (A) COMPUTE RESONANCE-SHIELDED CROSS SECTIONS USING DATA IN THE RUSSIAN FORMAT (SHIELDING FACTORS AND INFINITE-DILUTION CROSS SECTIONS), (B) COMPUTE MULTIGROUP FUNDAMENTAL-MODE FLUX AND ADJOINT FLUX, (C) COMPUTE AND PUNCH GROUP-COLLAPSED MICROSCOPIC OR MACROSCOPIC CROSS SECTIONS IN THE DTF FORMAT, (D) COMPUTE FUEL BURNUP AT CONSTANT FLUX OR POWER DENSITY.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS, LATTICE AND CELL PROBLEMS 3/74

307 HWOCR-SAFE HWOCR-SAFE IS A MONTE CARLO THERMAL REACTOR ANALYSIS PROGRAM DESIGNED FOR USE WITH PROPOSED HWOCR LATTICE CONFIGURATIONS. IT IS A BENCHMARK TOOL TO CHECK MULTIGROUP DIFFUSION AND TRANSPORT CALCULATIONS AND TO EVALUATE THE EFFECT OF THEIR USE OF GEOMETRIC APPROXIMATIONS.

316 GAFGAR/P3T/PROC/TAPCOP THE PROBLEM IS TO OBTAIN VERY DETAILED NEUTRON FLUX AND CURRENT DISTRIBUTIONS AS FUNCTIONS OF ENERGY CONSIDERING EXPLICITLY THE POSSIBLE OVERLAP EFFECTS BETWEEN RESONANCES OF A RESONANCE ABSORBER AND OF MIXTURES OF RESONANCE ABSORBERS AND TO USE THESE DISTRIBUTIONS TO PREPARE GROUP-AVERAGED CROSS SECTIONS AND TRANSFER ARRAYS FOR USE IN FAST REACTOR ANALYSES.

355 MC**2 MC**2 IS USED TO CALCULATE MULTIGROUP CROSS SECTIONS USING AN EVALUATED NUCLEAR DATA FILE (ENDF) AND THESE CROSS SECTIONS ARE SUITABLE FOR DIRECT USE BY NEUTRONICS CODES WITHOUT PERFORMING ANCILLARY CALCULATIONS.

361 GLEN THE GLEN PROGRAM INTERPOLATES VALUES OF A FACTOR PROPORTIONAL TO THE SCATTERING LAW FROM THE PUNCHED OUTPUT OF THE TOR CODE (ACC ABSTRACT 360). THE DIFFERENTIAL CROSS SECTION DETERMINED FROM THESE IS INTEGRATED OVER THE SCATTERING ANGLE TO OBTAIN COEFFICIENTS OF AN EXPANSION IN LEGENDRE POLYNOMIALS OF THIS ANGLE FOR L = 0, 1, 2, 3. INTEGRATION OVER FINAL ENERGIES YIELDS VALUES OF THE TOTAL SCATTERING CROSS SECTION AND TRANSPORT CROSS SECTION. FOR EACH OF A SERIES OF ISOTOPIC COMPOSITIONS (UP TO 10 COMPOSITIONS) THE GLEN CODE CALCULATES THE DIFFUSION LENGTH AND VALUES OF THE FLUX-WEIGHTED GROUP AVERAGE MACROSCOPIC SCATTERING, ABSORPTION, FISSION, AND TRANSFER CROSS SECTIONS.

362 WELWING WELWING WAS DEVELOPED TO CALCULATE THE MATERIAL BUCKLING OF REACTOR SYSTEMS CONSISTING OF ANNULAR FUEL ELEMENTS IN HEAVY WATER AS MODERATOR FOR VARIOUS MODERATOR TO FUEL RATIOS. THE MODERATOR TO FUEL RATIO FOR THE MAXIMUM MATERIAL BUCKLING FOR THE PARTICULAR SYSTEM IS SELECTED AUTOMATICALLY AND THE CORRESPONDING MATERIAL BUCKLING IS CALCULATED.

368 FLANGE2(71-1) FLANGE2 TAKES CROSS SECTIONS, ANGULAR DISTRIBUTION, RESONANCE PARAMETER, AND THERMAL SCATTERING LAW DATA FROM ENDF/B FORMAT II OR III DATA TAPES AND PREPARES THERMAL MULTIGROUP CROSS SECTIONS AND SCATTERING MATRICES.

374 1DX 1DX IS A MULTIPURPOSE, ONE-DIMENSIONAL DIFFUSION CODE FOR GENERATING CROSS SECTIONS TO BE USED IN FAST REACTOR ANALYSES. THE CODE IS DESIGNED TO -

(A) COMPUTE AND PUNCH RESONANCE SHIELDED CROSS SECTIONS USING DATA IN THE RUSSIAN (SEE REFERENCE 2) FORMAT,
(B) COMPUTE AND PUNCH GROUP-COLLAPSED MICROSCOPIC AND/OR MACROSCOPIC CROSS SECTIONS AVERAGED OVER THE SPECTRUM IN ANY SPECIFIED ZONE, AND
(C) COMPUTE KEFF AND PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION, MATERIAL CONCENTRATIONS, ZONE DIMENSIONS, AND BUCKLING USING EITHER A FLUX OR AN ADJOINT MODEL.

388 ETOX3 ETOX3 (ENDF/B TO 1DX) CALCULATES MULTIGROUP CONSTANTS FOR NUCLEAR REACTOR CALCULATIONS USING DATA FROM THE EVALUATED NUCLEAR DATA FILE (ENDF/B) VERSION II OR VERSION III FORMAT. IT CAN ALSO PROCESS VERSION I MATERIALS THAT DO NOT CALL FOR PARTIAL ENERGY DISTRIBUTION LAWS 1, 2, 4, 6, OR 8 (SEE END/F, FILE 5). THE CODE IS DESIGNED TO COMPUTE AND PUNCH -

(A) INFINITE DILUTE CROSS SECTIONS,
(B) TEMPERATURE DEPENDENT SELF-SHIELDING FACTORS FOR ARBITRARY VALUES OF MICROSCOPIC SIGMAC (TOTAL CROSS SECTION PER ATOM) IN THE RUSSIAN (BONDARENKO) FORMAT, AND
(C) INELASTIC SCATTERING PROBABILITY MATRICES.

392 RAFFLE RAFFLE CALCULATES NEUTRON FIRST FLIGHT COLLISION PROBABILITIES FOR A WIDE VARIETY OF THREE-DIMENSIONAL CELL GEOMETRY CONFIGURATIONS. THE OUTER BOUNDARIES OF THE CELL CROSS SECTION MAY BE CIRCULAR, SQUARE, OR HEXAGONAL. THE CELL MAY CONTAIN ANNULAR REGIONS AND/OR CLUSTERS OF RODS.

393 XSDRN XSDRN USES THE NORDHEIM INTEGRAL TREATMENT, NARROW RESONANCE, OR INFINITE MASS APPROXIMATION TO PROCESS RESONANCE DATA ON A MASTER CROSS SECTION LIBRARY AND THUS OBTAIN MICROSCOPIC FINE-GROUP CROSS SECTIONS FOR A LARGE NUMBER OF NUCLIDES. THE CODE WILL THEN USE THESE CROSS SECTIONS IN AN INDEPENDENT CALCULATION TO SOLVE FOR FLUXES, EIGENVALUES, CRITICAL DIMENSIONS, ETC., USING DISCRETE ORDINATES, DIFFUSION, OR AN INFINITE MEDIUM THEORY CALCULATION. THE FINE-GROUP FLUXES THUS OBTAINED CAN THEN BE USED TO COLLAPSE THE FINE-GROUP CROSS SECTION DATA TO A MORE TENABLE BROAD-GROUP STRUCTURE FOR USE IN SEVERAL INDEPENDENT COMPUTER CODES.

416 PARTI PARTI IS A GROUP COLLAPSING CODE WHICH DETERMINES THE OPTIMUM DISCRETE REPRESENTATION OF A VARIABLE FOR SUBSEQUENT REPETITIVE CALCULATIONS.

420 GROUSE GROUSE COMPUTES EFFECTIVE MULTIGROUP CROSS SECTIONS AS A FUNCTION OF POSITION IN THE CORE OF A REACTOR OR THE ABSORBER REGION OF A FUEL OR CONTROL ELEMENT. THE FLUX WEIGHTING USES SYNTHESIZED FLUXES GENERATED IN FINE ENERGY DETAIL FROM PARAMETRIC FLUX TRAVERSES SUPPLIED AS INPUT AS A FUNCTION OF THE CORE ABSORPTION AND SCATTER CROSS SECTIONS.

426 PAX03 PAX03 PERFORMS INFINITE MEDIUM, TIME-DEPENDENT CALCULATIONS OF NEUTRON FLUX SPECTRA IN HOMOGENEOUS, HYDROGENOUS MEDIA. A HARMONY FILE CONTAINING FEW-GROUP MICROSCOPIC AND/OR MACROSCOPIC CROSS SECTIONS FOR PDQ7 PROBLEMS MAY BE GENERATED. THE ONE-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION MAY BE SOLVED USING A P1 TO P7 APPROXIMATION IN RECTANGULAR, CYLINDRICAL, OR SPHERICAL GEOMETRY. HETEROGENEOUS RESONANCE INTEGRALS AND THERMAL SHIELDING FACTORS ARE CALCULATED FOR EITHER PLATE OR ROD GEOMETRY. BLACKNESS PARAMETERS ARE CALCULATED AND COEFFICIENTS FOR TEMPERATURE FEEDBACK CALCULATIONS ARE OBTAINED. FEW-GROUP CONSTANTS ARE AVAILABLE IN BOTH THE FAST AND THERMAL ENERGY RANGES.

431 SUPERTOG SUPERTOG ACCEPTS NUCLEAR DATA IN EITHER A POINT BY POINT OR PARAMETRIC REPRESENTATION AS SPECIFIED BY ENDF/B. THIS DATA IS AVERAGED OVER EACH SPECIFIED GROUP WIDTH. THE EXPLICIT ASSUMPTION IS MADE THAT THE FLUX PER UNIT LETHARGY IS CONSTANT OR THAT A SUITABLE WEIGHT FUNCTION WILL BE SUPPLIED BY THE USER. WHEN RESONANCE DATA IS AVAILABLE, RESOLVED AND UNRESOLVED RESONANCE CONTRIBUTIONS ARE CALCULATED AND USED AS SPECIFIED BY INPUT OPTIONS. FINE GROUP CONSTANTS SUCH AS ONE-DIMENSIONAL REACTION ARRAYS (ABSORPTION, FISSION, ETC.), PN ELASTIC SCATTERING MATRICES, AND INELASTIC AND (N,2N) SCATTERING MATRICES ARE GENERATED AND PLACED ON TAPES IN FORMATS SUITABLE FOR USE BY THE GAM1 (ACC ABSTRACT 33), GAM2, ANISN, OR DOT PROGRAMS.

436 ETOM1 ETOM1 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN THE ENDF/B FORMAT AND PRODUCES DATA DECKS FOR USE IN GENERATION OF MUFT4 AND MUFT5 LIBRARIES.

437 ETOG1 TOG1 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN THE ENDF/B FORMAT AND PRODUCES DATA DECKS FOR USE IN GENERATION OF MUFT4, MUFT5, GAM1, GAM2, AND ANISN LIBRARIES.

453 RICE THE PROGRAM CALCULATES AN ENERGY EXCHANGE MATRIX WHICH DESCRIBES THE PROBABILITY THAT A NEUTRON WITH ENERGY E WILL PRODUCE A RECOIL ATOM WITH ENERGY T IN A GIVEN MATERIAL. IN ADDITION, THE PROGRAM CAN CALCULATE THE PRIMARY RECOIL ATOM ENERGY SPECTRUM FOR A GIVEN NEUTRON SPECTRUM, THE DAMAGE CROSS SECTION FOR THE MATERIAL, AND AN OPTIMUM LOWER ENERGY LIMIT FOR USE IN COMPARING THE RELATIVE DAMAGE IN DIFFERENT REACTOR SPECTRA. THE PROGRAM ACCEPTS NEUTRON SCATTERING DATA DIRECTLY FROM THE ENDF/B LIBRARY TAPES AND, IN THE CASE OF A RESONANCE NUCLIDE, FROM A TAPE GENERATED BY THE PROGRAM SUPERTOG (ACC ABSTRACT 431).

461 EPOCH EPOCH SOLVES FOR FINE DETAIL P-1 FLUX SPECTRA IN SIMPLY BUCKLED MEDIA AND IS ABLE TO CALCULATE NEUTRON AGES FROM THE SPECTRA. IT OBTAINS NUCLEAR CROSS SECTIONS FROM THE ENDF/B LIBRARY IGNORING RESONANCE FILES AND IS MOST USEFUL FOR HIGHER ENERGIES WHERE RESONANT REACTIONS ARE WEAK OR ABSENT. THE PRESENT VERSION READS ONLY VERSION 1 ENDF/B TAPES.

466 APRFX1 APRFX1 COLLAPSES AND COMBINES CROSS SECTION SETS FOR MULTIGROUP TRANSPORT CALCULATIONS. IT PERFORMS GROUP COLLAPING FOR AS MANY ISOTOPES, MIXTURES AND LEGENDRE EXPANSION SETS AS DESIRED FROM THE DLC-2B LIBRARY. THE DLC-2B LIBRARY STRUCTURE EMPLOYS TENTH LETHARGY UNIT INTERVALS FROM 15 MEV TO 111 KEV AND QUARTER LETHARGY INTERVALS DOWN TO 0.414 EV. A 100TH GROUP 0.0 TO 0.414 EV IS USED AS A SINK GROUP. THE CODE ALSO DETERMINES THE BROAD GROUP INPUT SOURCE AND GENERATES AVERAGED NEUTRON VELOCITIES FOR USE WITH TRANSPORT CALCULATIONS.

467 HRG3 THE CODE COMPUTES THE SLOWING DOWN SPECTRUM OVER THE ENERGY RANGE 10 MEV TO .414 EV IN EITHER THE B1 OR P1 APPROXIMATION, USING 68 GROUPS OF NEUTRONS WITH A CONSTANT GROUP WIDTH OF DELTA U = .25. THE CALCULATED FLUX AND CURRENT SPECTRA ARE USED TO REDUCE THE ORIGINAL 68-GROUP CROSS SECTION DATA TO AVERAGE VALUES OVER AS MANY AS 33 BROAD GROUPS. OUTPUT IS PRINTED AND MAY ALSO BE PUNCHED IN FORMATS FOR INPUT TO ANY OF SEVERAL SPATIAL MULTIGROUP CODES.

B. SPECTRUM CALCULATIONS, GENERATION OF GROUP CONSTANTS, LATTICE AND CELL PROBLEMS 3/74

501 ENDRUN2 ENDRUN2 IS USED TO CALCULATE MULTIGROUP CONSTANTS FROM ENERGY-DEPENDENT, MICROSCOPIC CROSS SECTIONS, RESONANCE PARAMETERS, AND INELASTIC LEVEL DATA INPUT IN THE EVALUATED NUCLEAR DATA FILE (ENDF/B) FORMATS. DATA IS PROCESSED FOR ONE MATERIAL AT A TIME AND THE OUTPUT MULTIGROUP FILE INCLUDES BOTH INFINITELY-DILUTE GROUP CROSS SECTIONS AND SELF-SHIELDING, BONDARENKO-TYPE F-FACTORS SO THAT THE RESULTING GENERALIZED FILE IS INDEPENDENT OF REACTOR COMPOSITION. THE MULTIGROUP DATA MAY BE OUTPUT ON PUNCHED CARDS, A STANDARD LIBRARY TAPE, OR PLOTTED OVER ANY ENERGY RANGE.

505 TDOWN TDOWN GENERATES SPATIAL AND COMPOSITION DEPENDENT CROSS SECTION SETS FROM A BONDARENKO TYPE, GENERALIZED CROSS SECTION FILE CALLED GMUG. A TDOWN PROBLEM CAN BE A SIMPLE DESCRIPTION OF MATERIAL COMPOSITIONS WITH AN INPUT FLUX SPECTRA OR A PROBLEM CAN CONSIST OF A MULTI-REGIONAL TWO-DIMENSIONAL REACTOR DESCRIPTION WITH SEVERAL 0- OR 1-DIMENSIONAL FLUX SOLUTIONS TO PROVIDE THE FLUX FOR SPECTRAL ADJUSTMENTS OF THE CROSS SECTION SETS.

520 PHROG PHROG GENERATES ENERGY DEPENDENT FAST NEUTRON SPECTRA AND ASSOCIATED MULTIGROUP CROSS SECTION DATA SUITABLE FOR USE IN DIFFUSION AND TRANSPORT THEORY REACTOR DESIGN ANALYSIS. THE SOLUTION UTILIZES 68 EQUAL LETHARGY GROUPS OF CROSS SECTION, SOURCE, AND LEAKAGE DATA OVER AN ENERGY RANGE EXTENDING FROM 10 MEV TO .414 EV. THESE DATA ARE THEN COALESCED INTO BROAD GROUP FORM USING THE FLUXES AND CURRENTS AS WEIGHTING FUNCTIONS.

521 SOCOOL2 SOCOOL2 CALCULATES THE TRANSIENT TEMPERATURES, PRESSURES, AND MECHANICAL WORK ENERGY WHEN A MOLTEN MATERIAL IS INSTANTANEOUSLY AND UNIFORMLY DISPERSED IN LIQUID SODIUM WHICH IS INITIALLY UNDER ACOUSTIC CONSTRAINT.

526 CLUP77 CLUP77 COMPUTES THE COLLISION PROBABILITIES IN A MULTI-REGION SQUARE ASSEMBLY OF CLUSTERED FUEL RODS. THE ASSEMBLY CAN BE MADE UP OF RODS OF INFINITE HEIGHT AND DIVIDED INTO RECTANGULAR PILLARS CONTAINING A NEST OF CONCENTRIC ANNULI OF DIFFERENT MATERIALS. THE OUTER BOUNDARY OF THE ASSEMBLY MAY BE TREATED AS REFLECTIVE OR A VACUUM.

536 RAHAB LATTICE PHYSICS MODULES RAHAB IS A TWO-DIMENSIONAL, MULTIGROUP, NEUTRON INTEGRAL TRANSPORT CODE. ITS CAPABILITY INCLUDES FULL OR SUBDIVIDED ANNULAR, SQUARE AND HEXAGON REGIONS, CLUSTERS AND MULTICELL (MIXED LATTICES). THE MULTIGROUP STRUCTURE CAN INCLUDE THERMAL, EPITHERMAL, AND FAST ENERGY REGIONS. THE NUMBER OF ENERGY GROUPS IS VARIABLE FROM 1 TO 100. BUCKLING AND TIME EIGENVALUE SEARCHES ARE ALLOWED OPTIONS.

538 ETOG3 ETOG3 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN ENDF/B VERSION III FORMAT PRODUCING DATA DECKS FOR USE IN GENERATION OF MUFT4, MUFT5, GAM1, GAM2, AND ANISN LIBRARIES.

547 GAMB1T GAMB1T IS A PROGRAM THAT WAS DESIGNED TO CALCULATE MULTIGROUP NEUTRON CROSS SECTIONS IN THE HIGH ENERGY AND THE THERMAL ENERGY RANGES. IT WAS CREATED BY JOINING GAM, WHICH DOES THE HIGH ENERGY CALCULATION, AND B1T, WHICH DOES THE THERMAL CALCULATION.

565 INCITE INCITE GENERATES ENERGY-DEPENDENT THERMAL NEUTRON SPECTRA AND APPROPRIATE AVERAGE MULTI-GROUP CROSS SECTIONS USING ARBITRARY SCATTERING KERNELS. THE PHYSICAL MODEL IS A HOMOGENEOUS, CRITICAL, ONE-DIMENSIONAL BASE SLAB CORE.

572 XLACS XLACS CALCULATES FINE-GROUP AVERAGED NEUTRON CROSS SECTIONS FROM ENDF/B DATA. ITS PRIMARY PURPOSE IS TO PRODUCE FULL RANGE MULTIGROUP LIBRARIES FOR THE XSDRN PROGRAM (ACC ABSTRACT 493). PROVISIONS ARE INCLUDED FOR TREATING FAST, RESONANCE, AND THERMAL ENDF/B DATA. FINE-GROUP ENERGY STRUCTURES AND EXPANSION ORDERS USED TO REPRESENT DIFFER-ENTIAL CROSS SECTIONS FOR XSDRN CAN BE ARBITRARILY SET BY THE USER. CROSS SECTIONS CAN BE AVERAGED OVER AN ARBITRARY INPUT WEIGHTING FUNCTION OR BY ANY OF SEVERAL BUILT-IN FUNCTIONS.

596 ENDFB2/GAND2/GFE2 ENDFB2 CONVERTS ENDF/B CROSS SECTION DATA FROM A CARD-IMAGE TO A BINARY TAPE FOR USE BY THE GAND2 AND/OR GFE2 CODES.

GAND2 PREPARES THE CROSS SECTIONS NEEDED FOR DETAILED COMPUTATIONS OF NEUTRON ENERGY SPECTRA IN REACTORS FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B VERSION II OR III FORMATS (ALSO RETAINS THE ENDF/B VERSION I CAPABILITY OF GAND).

GFE2 PREPARES 1/E OR FISSION-SPECTRUM WEIGHTED, ZERO TEMPERATURE, INFINITE DILUTION GROUP-AVERAGED CROSS SECTIONS AND SCATTERING TRANSFER ARRAYS FOR USE IN THE FAST SECTIONS OF THE GGC AND MICROX CODES FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B VERSION II OR III FORMATS (THE ENDF/B VERSION I FORMAT CAPABILITY OF THE ORIGINAL GFE CODE IS ALSO RETAINED).

605 GAUSS5 GAUSS5 IS USED TO DETERMINE GAMMA-RAY ENERGIES AND INTENSITIES FROM SPECTRA OBTAINED WITH A GE(LI) DETECTOR AND A MULTICHANNEL PULSE-HEIGHT ANALYSIS SYSTEM.

7 FIRN FIRN SOLVES THE TWO-DIMENSIONAL SN APPROXIMATION IN FINITE CYLINDRICAL GEOMETRY. IT IS A FORTRAN ADAPTATION OF THE LOS ALAMOS TDC PROGRAM WRITTEN BY BENGT CARLSON AND CLARENCE LEE. FIRN IS LIMITED TO A MAXIMUM OF SIX GROUPS AND THE S2, S4 OR S6 APPROXIMATION.

9 FIRE5 FIRE5 SOLVES THE ONE-DIMENSIONAL MULTIGROUP AGE-DIFFUSION EQUATIONS FOR SLAB (SYMMETRIC AND ASYMMETRIC), CYLINDER, AND SPHERE GEOMETRIES. AN EXTENSION OF THE ORIGINAL LOS ALAMOS FIRE PROGRAM WRITTEN BY F. W. BRINKLEY AND C. B. MILLS, IT CONTAINS A 34-GROUP LIBRARY OF 10 ELEMENTS. FIRE5 CAN BE USED FOR CELL CALCULATIONS WITH THE BOUNDARY CONDITION THAT THE CURRENT BE ZERO ON THE OUTER BOUNDARY. THE EFFECTIVE CROSS SECTIONS AND DIFFUSION COEFFICIENTS FOR A HOMOGENISED REGION CONSISTING OF ANY NUMBER OF NEIGHBORING REGIONS CAN ALSO BE OBTAINED, BUT ONLY FOR CYLINDRICAL GEOMETRY. FIRE5 ALSO COMPUTES THE MACROSCOPIC FLUX-WEIGHTED CROSS SECTIONS FOR COLLAPSED GROUPS IN EACH REGION.

18 2DXY THE 2DXY PROGRAM SOLVES THE HOMOGENEOUS OR INHOMOGENEOUS MULTIGROUP EQUATIONS IN X-Y GEOMETRY, USING THE SN TRANSPORT EQUATION APPROXIMATION. VACUUM, SURFACE SOURCE, OR REFLECTING BOUNDARY CONDITIONS ARE AVAILABLE AS OPTIONS. IN THE HOMOGENEOUS CASE THE USER MAY REQUEST THE COMPUTATION OF REACTIVITY, REACTOR PERIOD, CRITICAL CONCENTRATIONS OF SOME COMPOSITION, OR THE CRITICAL THICKNESS OF A ZONE.

28 FOG THE FOG PROGRAM SOLVES THE ONE-DIMENSIONAL FEW-GROUP DIFFUSION EQUATIONS IN ANY OF THREE GEOMETRIES SLAB, CYLINDER, OR SPHERE. PROVISIONS ARE MADE FOR CALCULATING THE FLUX, THE ADJOINT FLUX, AND VARIOUS CRITICALITY SEARCHES AS WELL AS A BUCKLING ITERATION AND AUTOMATIC TSCHEBYSCHEFF POLYNOMIAL COMPUTATION OF SOURCE EXTRAPOLATION FACTORS.

29 AIM6 AIM6 SOLVES THE ONE-DIMENSIONAL MULTIGROUP DIFFUSION EQUATIONS UTILIZING A MICROSCOPIC CROSS SECTION LIBRARY. ANY OF THREE GEOMETRIES ARE AVAILABLE SLAB, CYLINDER OR SPHERE. CRITICALITY SEARCHES ARE PROVIDED INCLUDING A CONCENTRATION SEARCH ON ONE OR TWO ELEMENTS. HOMOGENEOUS AND INHOMOGENEOUS PROBLEMS MAY BE SOLVED WITH A VARIETY OF BOUNDARY CONDITION OPTIONS.

30 PERT PERT IS A PERTURBATION PROGRAM DESIGNED FOR USE WITH THE AIM6 AND FOG PROGRAMS. PUNCHED CARD OUTPUT FROM THESE CODES IS USED AS INPUT TO PERT. USING CROSS SECTION DATA, FLUXES, AND ADJOINT FLUXES, THE RELATIVE CHANGE IN KEFF CAN BE CALCULATED. CROSS SECTIONS MAY BE WEIGHTED WITH THE ADJOINT FLUX AND/OR DIRECT FLUX. THE NEUTRON LIFETIME FOR THE DELAY GROUPS MAY ALSO BE DETERMINED.

32 WHIRLAWAY WHIRLAWAY SOLVES THE TWO-GROUP, THREE-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN X-Y-Z GEOMETRY.

39 EQUIPOISE3 EQUIPOISE3 SOLVES THE TWO-GROUP, TWO-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY.

40 2OGRAND 2OGRAND SOLVES THE FEW-GROUP, TWO-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY.

59 MIST MIST OBTAINS THE SOLUTION TO THE ONE-DIMENSIONAL BOLTZMANN EQUATION IN SLAB GEOMETRY. THE NUMERICAL APPROXIMATION USED IS A LINEAR ONE WHICH CAN BE DESCRIBED AS AN EXTENSION AND GENERALIZATION OF THE SN APPROXIMATION. THE EQUATIONS ARE FORMULATED IN TERMS OF A DOUBLE SN APPROXIMATION. THE BOUNDARY CONDITIONS FOR EACH GROUP MAY BE INDEPENDENTLY SPECIFIED AND PERMIT VERY GENERAL SPECIFICATIONS WITH RESPECT TO -

(A) PERFECT MIRROR REFLECTION OR SYMMETRY, BY INPUT OF MIRROR ALBEDOS,
(B) ANISOTROPIC DIFFUSE SOURCES, BY INPUT OF LEGENDRE POLYNOMIAL COEFFICIENTS UP TO LAMBDA = 9, OR A SHORT TABLE DESCRIBING A KNOWN ANGULAR DISTRIBUTION OF THE FLUX,
(C) ISOTROPIC (LAMBERT SURFACE) REFLECTION.

ISOTROPIC VOLUME SOURCES IN EACH GROUP MAY ALSO BE INDEPENDENTLY SPECIFIED. THE SCATTERING FROM ONE GROUP TO ANOTHER IS ASSUMED TO BE ISOTROPIC BUT THE SCATTERING FUNCTION WITHIN EACH GROUP CAN BE A SECOND-ORDER LEGENDRE POLYNOMIAL SERIES.

75 GE-HAPO-S13 PROGRAM S CONSTRUCTS BILINEARLY COUPLED TIME-VARIANT MULTIENERGY NEUTRON-AND-PHOTON TRANSPORT AND NUCLIDE-TRANSMUTATION FIELDS HAVING SLAB, CYLINDRICAL, OR SPHERICAL SYMMETRY. ASSURANCE OF UNBIASED CONVERGENCE IS PROVIDED BY USE OF A DUAL ADJOINT-AND-FLUX LOOP CONSTRUCTED IN PRECISE CORRESPONDENCE WITH THE PHYSICS OF SUCCESSIVE FREE FLIGHTS.

87 EQUIPOISE-3A EQUIPOISE-3A SOLVES THE TWO-DIMENSIONAL TWO-GROUP DIFFUSION EQUATIONS IN CYLINDRICAL OR SLAB GEOMETRY. IT IS A SLIGHTLY REVISED VERSION OF EQUIPOISE3 (ACC ABSTRACT 39). IN ADDITION TO THE STANDARD OUTPUT, A PICTURE IS PRINTED OF THE MATERIAL ARRANGEMENT IN THE REACTOR. IF THE ADJOINT FLUX OPTION IS USED, THE PROMPT NEUTRON LIFETIME IS CALCULATED AND PRINTED, WITH THE REACTIVITY PER UNIT CHANGE IN EACH GROUP CONSTANT IN EACH REGION OF THE REACTOR.

103 CRAM CRAM IS USED TO SOLVE THE MULTIGROUP DIFFUSION EQUATIONS IN TWO-DIMENSIONS (R-Z, X-Y, OR R-THETA GEOMETRY), OR IN ONE-DIMENSION (SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY). NEUTRONS MAY SCATTER FROM ANY GROUP TO ANY OTHER. REAL, ADJOINT, AND SOURCE-TYPE PROBLEMS ARE ALL SOLVABLE. THE PROGRAM WILL COMPUTE THE K-EFFECTIVE OF THE SYSTEM OR ALTERNATIVELY SEARCH FOR CRITICALITY BY MOVING SPATIAL BOUNDARIES, VARYING MATERIAL COMPOSITIONS, OR VARYING TRANSVERSE BUCKLING.

118 ULCER ULCER IS A MULTIGROUP, ONE-DIMENSIONAL DIFFUSION EQUATION CODE WITH UPSCATTER BASED ON FAIM (ACC ABSTRACT 120). ULCER DIFFERS FROM FAIM IN THAT -

(A) UPSCATTERING IS INCLUDED,
(B) DOWNSCATTER TO ALL LOWER GROUPS,
(C) MICROSCOPIC CROSS SECTIONS ARE ON TAPE,
(D) PROVISION FOR MULTIPLE FISSION SPECTRA,
(E) RESTART DUMP,
(F) FEW-GROUP REDUCTION, AND
(G) SPECTRUM COMPUTATION AND GRAPHICAL DISPLAY.

120 FAIM/FAIMOS FAIM IS A MULTIGROUP, ONE-DIMENSIONAL DIFFUSION EQUATION PROGRAM BASED ON AIM6 (ACC ABSTRACT 29). THE PRINCIPAL FEATURES ARE -

(A) THREE GEOMETRIES,
(B) CALCULATION OF FLUXES AND MULTIPLICATION FACTOR,
(C) ONE-ITERATION PROBLEMS,
(D) CHOICE OF ONE OF FIVE SETS OF BOUNDARY CONDITIONS AT BOTH BOUNDARIES,
(E) CRITICALITY SEARCHES ON TRANSVERSE BUCKLING, HOMOGENEOUS POISON, CRITICAL RADIUS, ONE, TWO, OR THREE ELEMENT CONCENTRATION, LOCATION OF POISON REGION BOUNDARY, LOCATION OF A FUEL REGION BOUNDARY,
(F) ADJOINT FLUX CALCULATION, AND
(G) EXTENSIVE DATA EDIT.

FAIMOS IS A MODIFIED VERSION OF FAIM. THREE GENERAL MODIFICATIONS WERE MADE -

(A) THE MICROSCOPIC CROSS SECTION LIBRARY AND ITS ASSOCIATED SUBROUTINES WERE REMOVED. AS A RESULT, OPTIONS REQUIRING THE USE OF MICROSCOPIC CROSS SECTIONS ARE NOT AVAILABLE.
(B) FAIM RAN AS A CHAIN JOB. OVERLAYS ARE NOT USED BY FAIMOS.
(C) THE PROGRAM LANGUAGE WAS CONVERTED FROM FORTRAN II TO FORTRAN IV(H). THIS MODIFICATION MADE NECESSARY A MINOR CHANGE IN THE DATA INPUT FORMAT.

132 W-DSN W-DSN SOLVES THE DISCRETE SN EQUATIONS IN CYLINDRICAL GEOMETRY. THE EIGENVALUE OPTION IS REACTIVITY (KEFF) ONLY. VOLUME DISTRIBUTED SOURCES ARE ALLOWED, BUT NO SURFACE SOURCES.

136 HERESY3 HERESY3 SOLVES THE TWO-DIMENSIONAL FEW-GROUP STATIC REACTOR EIGENVALUE PROBLEM USING THE HETEROGENEOUS (SOURCE-SINK OR FEINBURG-GALANIN) FORMALISM. THE SOLUTION YIELDS THE REACTOR K EFFECTIVE AND ABSORPTION REACTION RATES FOR EACH ROD NORMALIZED TO THE MOST ABSORPTIVE ROD IN THE THERMAL LEVEL. EPITHERMAL FISSIONS ARE ALLOWED AT EACH RESONANCE LEVEL, AND LATTICE AVERAGED VALUES OF THERMAL UTILIZATION, RESONANCE ESCAPE PROBABILITY, THERMAL AND RESONANCE ETA VALUES, AND THE FAST FISSION FACTOR ARE CALCULATED. KERNELS IN THE CALCULATION ARE BASED ON AGE DIFFUSION THEORY. BOTH FINITE REACTOR LATTICES AND INFINITELY REPEATING REACTOR SUPERCELLS MAY BE CALCULATED. ROD PARAMETERS MAY BE CALCULATED BY SEVERAL INTERNAL OPTIONS, AND A DIRECT INTERFACE IS PROVIDED TO A HAMMER SYSTEM (ACC ABSTRACT 277) LATTICE LIBRARY TAPE TO OBTAIN CELL PARAMETERS. CRITICALITY SEARCHES ARE PROVIDED ON THERMAL UTILIZATION, THERMAL ETA, AND AXIAL LEAKAGE BUCKLING.

144 DTF THE DTF PROGRAM IS A ONE-DIMENSIONAL MULTIGROUP PROGRAM FOR SOLVING THE NEUTRON TRANSPORT EQUATION. THE PROGRAM CAN DETERMINE THE REGULAR OR ADJOINT SOLUTION FOR SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY. ISOTROPIC OR A FORM OF LINEAR ANISOTROPIC SCATTERING MAY BE CONSIDERED. VARIOUS BOUNDARY CONDITIONS ARE ALLOWED SO THAT CELLS OR TIME-DEPENDENT SOLUTIONS MAY BE OBTAINED USING FINITE AS WELL AS INFINITE CONFIGURATIONS IN THE CASE OF SLABS OR CYLINDERS. THE PROGRAM ALSO CONTAINS A NUMBER OF SEARCH OPTIONS WHEREBY ONE CAN VARY DIMENSIONS OR CONCENTRATIONS TO ARRIVE AT A PREDETERMINED EIGENVALUE. DISTRIBUTED OR SHELL SOURCES MAY BE SPECIFIED AT ANY POSITION WITHIN THE CONFIGURATION. AS OUTPUT THE PROGRAM SUPPLIES THE EIGENVALUE, ANGULAR FLUXES, TOTAL FLUXES, FISSION DISTRIBUTIONS, AND OTHER QUANTITIES. A LIBRARY OF CROSS SECTIONS IS AVAILABLE ON MAGNETIC TAPE. CROSS SECTIONS MAY BE READ FROM THIS LIBRARY TAPE AND/OR FROM CARDS.

148 TOPIC TOPIC SOLVES THE ONE-DIMENSIONAL BOLTZMANN EQUATION IN CYLINDRICAL GEOMETRY WITH UP TO SIX ENERGY GROUPS, 240 SPACE POINTS, 40 REGIONS, AND ANISOTROPIC (P1) SCATTERING.
THE BOUNDARY CONDITIONS FOR EACH GROUP CAN BE INDEPENDENTLY SPECIFIED AND THE FLEXIBILITY OF THE SPECIFICATIONS PERMIT A

(A) PERFECT MIRROR REFLECTION OR SYMMETRY,
(B) ISOTROPIC REFLECTION (LAMBERT SURFACE REFLECTION), AND
(C) ANISOTROPIC DIFFUSE SOURCES BY MEANS OF EITHER A P1 LEGENDRE SERIES OR A SHORT TABLE OF POINT VALUES FOR THE ANGULAR FLUX.

INDEPENDENT SPECIFICATION OF ISOTROPIC FIXED VOLUME SOURCES FOR EACH GROUP IS ALSO ALLOWED.
AS IMPLIED, BOTH HOMOGENEOUS AND INHOMOGENEOUS PROBLEMS ARE SOLVED, AND FISSIONS CAN OCCUR IN EITHER TYPE OF PROBLEM.

151 DTF2/ANISN THE MULTIGROUP, ONE-SPACE DIMENSION NEUTRON TRANSPORT EQUATION IS SOLVED. ISOTROPIC OR LINEAR ANISOTROPIC SCATTERING IS PERMITTED BETWEEN ALL GROUPS AND A DIFFUSION SOLUTION MAY BE OBTAINED FOR ANY OR ALL GROUPS. HIGH-ORDER ANISOTROPIC SCATTERING PROBLEMS (PL) CAN BE RUN USING ANISN, THE 360 VERSION OF DTF2. WHITE/GREY BOUNDARY CONDITIONS ARE AVAILABLE, AND AN ALBEDO CAN BE SPECIFIED FOR EACH GROUP. A VOID STREAMING CORRECTION IS INCLUDED. A COMPLETE SHELL SOURCE DESCRIPTION BY GROUP, POSITION, AND ANGLE IS AVAILABLE. GRAPHICAL DISPLAY (CRT) FEATURES ARE AVAILABLE WITH ANISN.

156 EXTERMINATOR/EXTERMINATOR2 THE MULTIGROUP, TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN X-Y, R-Z, OR R-THETA GEOMETRY.

161 FORTRAN TDC TDC SOLVES THE BOLTZMANN EQUATION IN MULTIGROUP FORM FOR THE TRANSPORT OF NEUTRONS OR THE ADJOINT EQUATION IN FINITE (R,Z) CYLINDRICAL GEOMETRY BY THE DISCRETE SN METHOD. THE PROBLEM MAY BE HOMOGENEOUS (NO SOURCES INDEPENDENT OF FLUXES) OR INHOMOGENEOUS, BUT ALL SOURCES MUST BE ISOTROPIC. NEUTRON SCATTERING MUST ALSO BE ISOTROPIC. A HOMOGENEOUS PROBLEM MAY BE SOLVED FOR THE EIGENVALUE K-EFF OR THE EIGENVALUE ALPHA (TIME CONSTANT). ALTERNATIVELY, THE HOMOGENEOUS PROBLEM MAY BE SOLVED FOR THE SIZE (RADIUS, HEIGHT OR BOTH) OF THE SYSTEM CORRESPONDING TO A SPECIFIED K-EFF OR FOR THE ATOM CONCENTRATION OF SOME MATERIAL CORRESPONDING TO A SPECIFIED EIGENVALUE K-EFF OR ALPHA. FOR INHOMOGENEOUS PROBLEMS, THE IMPOSED SOURCE MAY BE AN ISOTROPIC VOLUME-DISTRIBUTED SOURCE OR AN ISOTROPIC SHELL SOURCE ON THE OUTER BOUNDARY.

167 FLARE FLARE IS AN INEXPENSIVE CALCULATIONAL METHOD TO DETERMINE CORE REACTIVITY AND CORE POWER DISTRIBUTION. A SCOPING CALCULATION OF THIS TYPE IS VALUABLE IN APPRAISING THE PHYSICS CHARACTERISTICS OF PLANNED TEST MODES OF OPERATION SO THAT DETAILED ANALYSIS CAN BE RESERVED FOR THOSE CORE CALCULATIONS OF GREATER INTEREST FROM EITHER A TECHNICIAN OR SAFETY STANDPOINT.

173 2DF 2DF IS A TWO-DIMENSIONAL MULTIGROUP PROGRAM WRITTEN IN FORTRAN FOR SOLVING THE NEUTRON TRANSPORT EQUATION USING THE SN METHOD. THE PROGRAM CAN DETERMINE THE REAL OR ADJOINT SOLUTION FOR X-Y, R-Z, OR R-THETA GEOMETRY. ISOTROPIC OR A FORM OF LINEAR ANISOTROPIC SCATTERING MAY BE CONSIDERED. VARIOUS BOUNDARY CONDITIONS ARE ALLOWED. THE PROGRAM ALSO CONTAINS A NUMBER OF SEARCH OPTIONS WHEREBY ONE CAN VARY DIMENSIONS OR CONCENTRATIONS TO ARRIVE AT A PREDETERMINED EIGENVALUE. A DISTRIBUTED SOURCE MAY BE SPECIFIED. A LIBRARY OF CROSS SECTIONS IS AVAILABLE ON MAGNETIC TAPE. CROSS SECTIONS MAY BE READ FROM THE LIBRARY TAPE AND/OR FROM CARDS.

192 2DXYL THE 2DXY PROGRAM (ACC ABSTRACT 18) HAS BEEN CONVERTED FROM FLOCO TO FORTRAN 63 FOR USE ON THE CDC1604 WITH CHANGES TO PERMIT THE INCLUSION OF FIXED SOURCE TERMS FROM TDC - TERMS REPRESENTING THE EFFECTIVE NET LOSS PER UNIT VOLUME DUE TO AXIAL LEAKAGE. IN THIS MANNER, A THREE-DIMENSIONAL FLUX SYNTHESIS CODE IS ACHIEVED.

199 TDP TDP IS A TWO-DIMENSIONAL LINEAR PERTURBATION THEORY CODE WHICH CALCULATES REACTIVITY COEFFICIENTS, PROMPT NEUTRON LIFETIMES, AND EFFECTIVE DELAYED FRACTIONS USING FLUXES FROM TDC CYLINDRICAL (R-Z) OR RECTANGULAR (X-Y) GEOMETRY.

209 DTF4 THE LINEAR, TIME-INDEPENDENT, BOLTZMANN EQUATION FOR PARTICLE TRANSPORT IS SOLVED FOR THE ENERGY SPACE, AND ANGULAR DEPENDENCE OF THE PARTICLE DISTRIBUTION IN ONE-DIMENSIONAL SLABS, CYLINDERS, AND SPHERES. INDEPENDENT SOURCE OR EIGENVALUE (MULTIPLICATION, TIME-ABSORPTION, ELEMENT CONCENTRATION, ZONE THICKNESS OR SYSTEM DIMENSION) PROBLEMS ARE SOLVED SUBJECT TO VACUUM, REFLECTIVE, OR PERIODIC BOUNDARY CONDITIONS. A COMPLETE ENERGY-TRANSFER SCATTERING MATRIX IS ALLOWED FOR EACH LEGENDRE COMPONENT OF THE SCATTERING CROSS SECTION MATRICES.

211 MGDSN, MANY GROUP DSN MGDSN IS A MODIFICATION OF DSN, THE ONE-DIMENSIONAL THEORY CODE DESIGNED TO ACCOMMODATE 100 GROUP ISOTROPIC MATERIAL CROSS SECTION DATA TAPES PREPARED BY CSP1 AND CSP2A.

212 VARI-QUIR THE TIME-DEPENDENT, MULTI-GROUP, TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN X-Y OR R-Z GEOMETRY.

220 GASP2 GASP2 CALCULATES THE ONE-DIMENSIONAL DISTRIBUTION OF FISSILE AND FERTILE MATERIALS IN A NUCLEAR REACTOR WHICH WILL YIELD ANY DESIRED POWER DISTRIBUTION AND APPROXIMATELY RETAIN THIS DESIRED POWER DISTRIBUTION DURING THE BURNUP HISTORY OF THE REACTOR CORE. A POISON AND POISON DISTRIBUTION SEARCH FOR A DESIRED MULTIPLICATION AND MINIMUM POWER DISTRIBUTION PERTURBATION CAN ALSO BE PERFORMED.

222 GAMBLE4/GAMBLE5 THE HOMOGENEOUS 2-DIMENSIONAL MULTIGROUP DIFFUSION THEORY EQUATIONS WITH ARBITRARY GROUP-TO-GROUP SCATTERING AND ARBITRARY FISSION TRANSFER ARE SOLVED FOR HETEROGENEOUS ASSEMBLIES IN X-Y AND R-Z GEOMETRY. HOMOGENEOUS LOGARITHMIC BOUNDARY CONDITIONS ARE USED AT THE OUTER SURFACE OF THE ASSEMBLY AND AT THE SURFACE OF NON-DIFFUSION REGIONS. THE RESULTS INCLUDE THE GROUP AND POINT DEPENDENT NEUTRON FLUXES, THE POWER DISTRIBUTION, THE NEUTRON MULTIPLICATION FACTOR (K-EFFECTIVE), AND A DETAILED NEUTRON BALANCE.

225 TEMCO TEMCO COMPUTES REACTOR TEMPERATURE COEFFICIENTS.

241 HFN HFN SOLVES THE HOMOGENEOUS OR INHOMOGENEOUS ONE-DIMENSIONAL MULTIGROUP DIFFUSION EQUATION FOR IT LOWEST EIGENVALUE AND THE CORRESPONDING DIRECT AND/OR ADJOINT EIGENVECTORS. INHOMOGENEOUS BOUNDARY CONDITIONS AND A FLEXIBLE SCATTER-TRANSFER MATRIX STRUCTURE ARE INCLUDED. OPTIONAL CALCULATIONS INCLUDE CRITICALITY SEARCHES, DETECTOR ACTIVATION TRAVERSES, AND INTEGRALS FOR PERTURBATION THEORY ANALYSIS.

262 MACH1 MACH1 PERFORMS ONE-DIMENSIONAL MULTIGROUP DIFFUSION SOLUTIONS AND ASSOCIATED CALCULATIONS, INCLUDING CRITICALITY SEARCHES, PERTURBATION, REACTION SUMMARY, BETA EFFECTIVE, GROUP COLLAPSING, AND POINTWISE REACTION RATES AND RATIOS. SEVERAL CARD DUMPS OF COMPUTED DATA ARE AVAILABLE ON OPTION.

264 VARI-QUIR3 THE STEADY-STATE, MULTIGROUP, TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN X-Y, R-Z, AND R-THETA GEOMETRY.

270 CAESAR4/LIBLST CAESAR4 SOLVES THE ONE-DIMENSIONAL, MULTIGROUP DIFFUSION EQUATIONS IN ANY OF THREE GEOMETRIES AND PROVIDES A WIDE CHOICE OF BOUNDARY CONDITIONS, CRITICALITY SEARCHES, EDITS AND OTHER AUXILIARY COMPUTATIONS.

287 BISYN BISYN SOLVES THE TWO-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION EQUATIONS IN X-Y OR R-Z GEOMETRY USING A NONITERATIVE SYNTHESIS METHOD. THIS APPROACH IS DESIGNED TO GREATLY REDUCE THE COMPUTER COST OF RUNNING TWO-DIMENSIONAL MULTIGROUP PROBLEMS AT THE RISK OF SOME LOSS IN ACCURACY OF THE DETAILED FLUX DISTRIBUTION.

288 SNARG-1D THE PROGRAM IS DESIGNED TO SOLVE THE ONE-DIMENSIONAL NEUTRON TRANSPORT EQUATIONS. SNARG-1D IS WRITTEN FOR THE SOLUTION OF ONE-DIMENSIONAL PROBLEMS USING THE ORDER N = 2, 4, 6, 8, 12, 16, OR 32, AND APPLICABLE TO PLANE, CYLINDRICAL AND SPHERICAL GEOMETRIES. THE REAL OR ADJOINT SOLUTION MAY BE CALCULATED AND HOMOGENEOUS OR INHOMOGENEOUS PROBLEMS MAY BE SOLVED. FOUR CRITICALITY SEARCH OPTIONS ARE PROVIDED FOR WHICH A FIXED KEFF OR ALPHA, INVERSE PERIOD, VALUE MAY BE SPECIFIED RATHER THAN THE CRITICALITY VALUE, KEFF = 1. EITHER OF TWO INHOMOGENEOUS SOLUTIONS MAY BE OBTAINED (SHELL OR DISTRIBUTED SOURCE CALCULATIONS). LINEAR ANISOTROPIC COMPONENTS OF BOTH THE SHELL SOURCE AND THE SCATTERING CROSS SECTIONS MAY BE INCLUDED. FISSION SPECTRUM MATRICES ARE ALLOWED AS BOTH MATERIAL-DEPENDENT AND INCIDENT NEUTRON ENERGY-DEPENDENT FUNCTIONS.

304 PERT4 PERT4 COMPUTES REACTIVITY COEFFICIENT TRAVERSES IN X-Y, R-Z, CR R-THETA GEOMETRY USING THE FIRST-ORDER PERTURBATION EQUATIONS IN THE DIFFUSION APPRCXIMATION. FLUX AND ADJOINT INPUT CAN BE TAKEN DIRECTLY FROM 2-D CALCULATIONS OR SYNTHESIZED FROM RADIAL AND AXIAL 1-D CALCULATIONS. THE CODE CAN ALSO BE USED TO COMPUTE ACTIVITY TRAVERSES FOR ANY CROSS SECTION OF ANY MATERIAL, THE NEUTRON GENERATION TIME, AND THE EFFECTIVE DELAYED NEUTRON FRACTICN.

312 TDSN THE LINEAR, TIME-INDEPENDENT, BOLTZMANN EQUATION IS SOLVED FOR THE ENERGY, SPACE, AND ANGULAR DEPENDENCE OF THE NEUTRON DISTRIBUTION IN ONE-DIMENSIONAL SLABS, CYLINDERS OR SPHERES OR IN TWO-DIMENSIONAL X-Y OR R-Z GECMETRY. FIXED SOURCE OR MULTIPLICATION FACTOR (ADJOINT OR FLUX) PROBLEMS ARE SOLVED SUBJECT TO VACUUM, PLANE REFLECTIVE, ISOTROPIC REFLECTIVE OR 180 DEGREE ROTATIONALLY SYMMETRIC BCUNDARY CONDITIONS. A COMPLETE ENERGY TRANSFER SCATTERING MATRIX IS ALLOWED FOR EACH LEGENDRE COMPONENT OF SCATTERING CRCSS SECTION MATRICES THROUGH P1.

319 GASP7 GASP7 CALCULATES THE ONE DIMENSIONAL DISTRIBUTION OF FISSILE AND FERTILE MATERIALS IN A NUCLEAR REACTOR WHICH WILL YIELD ANY DESIREC POWER DISTRIBUTION DURING THE BURNUP HISTORY OF THE REACTOR CORE. A POISON AND POISON DISTRIBUTION SEARCH FOR A DESIRED MULTIPLICATION AND MINIMUM POWER DISTRIBUTION PERTURBATION CAN ALSC BE PERFORMED.

320 TEMCO7 TEMCO7 COMPUTES REACTOR TEMPERATURE COEFFICIENTS.

342 MO648 MO648 SCLVES THE ONE-DIMENSIONAL SLAB TRANSPORT PROBLEM WITH SLOWING DOWN FOR AN ARBITRARY SPATIAL EXTERNAL SOURCE AND ARBITRARY SCATTERING.

358 TWOTRAN2 TWCTRAN2 SOLVES THE TWO-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN (X,Y), (R,THETA), AND (R,Z) GEOMETRIES. BOTH REGULAR AND ADJOINT, INHOMOGENEOUS AND HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO VACUUM, REFLECTIVE, PERIODIC, WHITE OR INPUT-SPECIFIED BOUNDARY FLUX CONDITIONS ARE SOLVEC. GENERAL ANISOTROPIC SCATTERING IS ALLOWED AND ANISOTROPIC INHOMOGENEOUS SOURCES ARE PERMITTED.

380 GATT GATT IS A THREE-DIMENSIONAL FEW-GROUP NEUTRON DIFFUSION THEORY PROGRAM FOR CALCULATING THE DETAILED SPATIAL FLUX AND POWER DISTRIBUTION FOR REACTORS WITH HEXAGONAL CORE CONFIGURATION. THE PROGRAM USES A UNIFORM TRIANGULAR MESH IN THE HORIZONTAL MESH PLANES AND ASSUMES A RELATIVELY SIMPLE REGION STRUCTURE IN THE AXIAL DIRECTION. IT WAS DESIGNED TO REPRESENT THE SPECIAL PATCH-TYPE CORE STRUCTURE OF THE HTGR REACTOR AS CLOSELY AS POSSIBLE.

398 BE21 BE21 SOLVES THE FEW-GROUP DISCRETE ORDINATES EQUATIONS IN SLAB GEOMETRY. EITHER HOMOGENEOUS OR INHOMOGENEOUS PROBLEMS CAN BE SOLVED.

401 GAMTRI THE HOMOGENEOUS TWO-DIMENSIONAL MULTIGROUP DIFFUSION THEORY EQUATIONS WITH ARBITRARY GROUP-TO-GROUP SCATTERING AND ARBITRARY FISSION TRANSFER ARE SOLVED FOR HETEROGENEOUS ASSEMBLIES IN (UNIFORM MESH) TRIANGULAR GEOMETRY. HOMOGENEOUS LOGARITHMIC BOUNDARY CONDITIONS ARE USED AT THE OUTER SURFACE OF NON-DIFFUSION REGIONS. THE RESULTS INCLUDE THE GROUP AND POINT-DEPENDENT NEUTRON FLUXES, THE POWER DISTRIBUTION, THE NEUTRON MULTIPLICATION FACTOR, AND A DETAILED NEUTRON BALANCE.

430 GAZE2 GAZE2 IS A ONE-DIMENSIONAL, MULTIGROUP, NEUTRON DIFFUSION THEORY PROGRAM. IT INCLUDES ALL FOUR OF THE STANDARD ONE-DIMENSIONAL GEOMETRIES - SLAB, SPHERE, RADIAL CYLINDER, AND AXIAL CYLINDER, THE LAST OF WHICH IS IDENTICAL TO SLAB GEOMETRY EXCEPT WHEN THE ZOOM ALBEDO-TYPE TRANSVERSE BOUNDARY CONDITION IS USED.

450 KENO/KENO2 KENO IS A MULTIGROUP MONTE CARLO CRITICALITY CODE CONTAINING A SPECIAL GEOMETRY PACKAGE WHICH ALLOWS EASY DESCRIPTION OF SYSTEMS COMPOSED OF CYLINDERS, SPHERES, AND CUBOIDS (RECTANGULAR PARALLELEPIPEDS) ARRANGED IN ANY ORDER WITH ONLY ONE RESTRICTION (EACH GEOMETRICAL REGION MUST BE DESCRIBED AS COMPLETELY ENCLOSING ALL REGIONS INTERIOR TO IT). FOR SYSTEMS NOT DESCRIBABLE USING THIS SPECIAL GEOMETRY PACKAGE, THE PROGRAM CAN USE THE GENERALIZED GEOMETRY PACKAGE (GEOM) DEVELOPED FOR THE O5R MONTE CARLO CODE. IT ALLOWS ANY SYSTEM THAT CAN BE DESCRIBED BY A COLLECTION OF PLANES AND/OR QUADRATIC SURFACES, ARBITRARILY ORIENTED AND INTERSECTING IN ARBITRARY FASHION. RECTANGULAR ARRAYS OF FISSILE UNITS ARE ALLOWED WITH OR WITHOUT EXTERNAL REFLECTOR REGIONS. OUTPUT FROM KENO CONSISTS OF KEFF FOR THE SYSTEM PLUS AN ESTIMATE OF ITS STANDARD DEVIATION AND THE LEAKAGE, ABSORPTION, AND FISSIONS FOR EACH ENERGY GROUP PLUS THE TOTALS FOR ALL GROUPS. FLUX AS A FUNCTION OF ENERGY GROUP AND REGION AND FISSION DENSITIES AS A FUNCTION OF REGION ARE OPTIONAL OUTPUT.

459 DOT2DB DOT2DB SOLVES BOTH THE MULTI-GROUP DISCRETE ORDINATES TRANSPORT THEORY AND THE MULTIGROUP DIFFUSION THEORY EQUATIONS IN TWO DIMENSIONS. ANISOTROPIC SCATTERING OF ANY ORDER LEGENDRE EXPANSION IS ALLOWED IN THE TRANSPORT THEORY OPTION. ANISOTROPIC SCATTERING IN THE DIFFUSION THEORY OPTION IS TREATED WITH THE TRANSPORT APPROXIMATION, USING THE P1 SCATTERING MATRIX, WHEN PROVIDED, TO CALCULATE THE TRANSPORT CROSS SECTION. OPTIONS INCLUDE SOLUTIONS IN (X,Y), (R,Z), (R,THETA), AND, IN THE DIFFUSION THEORY OPTION, TRIANGULAR GEOMETRIES. BOTH DIRECT AND ADJOINT FLUXES MAY BE COMPUTED FOR FIXED VOLUME-DISTRIBUTED SOURCE, MULTIPLICATION CONSTANT ITERATION, TIME ABSORPTION ITERATION, CONCENTRATION SEARCH, ZONE THICKNESS SEARCH, AND FIXED BOUNDARY SOURCE PROBLEMS. IN ADDITION TO THE FIXED BOUNDARY SOURCE PROBLEM, OPTIONS INCLUDE VACUUM, REFLECTION, PERIODIC AND WHITE BOUNDARY CONDITIONS. CROSS SECTIONS MAY BE ENTERED FROM CARDS OR FROM TAPE IN THE DTF FORMAT. ACTIVITIES FOR ANY MATERIAL IN THE SYSTEM MAY BE OUTPUT BY INTERVAL (OPTIONAL) AND ZONE. OTHER OUTPUT INCLUDES THE INTERVAL FLUXES AND SOURCES AND A REACTION SUMMARY TABLE FOR EACH ZONE AND FOR THE SYSTEM.

510 VIM1/VIM1X VIM1 IS A MONTE CARLO CODE DESIGNED FOR THE ANALYSIS OF FAST CRITICAL EXPERIMENTS. IT HAS BEEN EXPRESSLY PREPARED FOR THE ANALYSIS OF FAST CRITICAL ASSEMBLIES OF THE PLATE-DRAWER TYPE SUCH AS ZPPR, ZPR-3, AND ZEBRA. THE LIBRARY USES POINT CROSS SECTION DATA, RATHER THAN MULTIGROUP CONSTANTS.

513 TESS TESS SOLVES THE TRANSPORT EQUATION IN SLAB AND SPHERICAL GEOMETRY USING THE DOUBLE-SN APPROXIMATION FOR SLAB GEOMETRY.

523 ESP ESP IS A GENERAL-PURPOSE MONTE CARLO REACTOR ANALYSIS CODE. IT COVERS THE COMPLETE ENERGY RANGE OF INTEREST IN REACTOR CALCULATIONS AND IS DESIGNED FOR BOTH EIGENVALUE AND FIXED SOURCE REACTOR AND REACTOR CELL CALCULATIONS. BASIC DATA ARE ACCEPTED ONLY IN THE VERSION I, II, AND III ENDF/B FORMAT. IN ADDITION TO SMOOTH DATA, THE CROSS SECTION PREPARATION INCLUDES A DETAILED TREATMENT OF RESOLVED AND UNRESOLVED RESONANCES AND THE FREE GAS AND S(ALPHA,BETA) THERMAL MODELS. THE COLLISION AND SOURCE ROUTINES UTILIZE THE ENDF/B NONELASTIC SECONDARY DISTRIBUTIONS, THE ANISOTROPIC SCATTERING DATA, AND THE FISSION SPECTRA. THE ENERGY RANGE MAY BE DIVIDED INTO AS MANY AS 25,000 INTERVALS, AND OVER EACH INTERVAL THE APPROPRIATELY AVERAGED CROSS SECTIONS ARE USED AS CONSTANT POINT-ENERGY VALUES. A GENERAL THREE-DIMENSIONAL GEOMETRY DESCRIPTION IS AVAILABLE, AS WELL AS SEVERAL SPECIALIZED GEOMETRIES. USE OF FIXED-SOURCE OPTIONS ALLOWS CALCULATIONS ON NON-MULTIPLYING SYSTEMS. A STEADY-STATE ANALYSIS OF NEUTRON HISTORIES IS PERFORMED IN COMPUTER CORE FOR SUCH QUANTITIES AS NEUTRON FLUXES, REACTION RATES, AND CROSS SECTIONS, AVERAGED OVER ARBITRARY ENERGY AND SPATIAL REGIONS.

573 TWOTRAN-PNVW TWOTRAN-PNVW SOLVES TWO-DIMENSIONAL PARTICLE TRANSPORT PROBLEMS FOR X-Y, R-Z, AND R-THETA GEOMETRIES. BOTH DIRECT AND ADJOINT, HOMOGENEOUS (KEFF OR PARAMETRIC EIGENVALUE SEARCHES) OR INHOMOGENEOUS TIME-INDEPENDENT PROBLEMS ARE SOLVED SUBJECT TO VACUUM, REFLECTIVE, PERIODIC OR INPUT SPECIFICATION OF BOUNDARY FLUX CONDITIONS. BOTH ANISOTROPIC INHOMOGENEOUS PROBLEMS AND GENERAL ANISOTROPIC SCATTERING PROBLEMS ARE TREATED.

582 MONA MONA SOLVES THE MULTIGROUP, ONE-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS IN SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY FOR EITHER THE DIRECT OR ADJOINT FLUX. BOUNDARY SOURCES AND SPATIALLY DEPENDENT VOLUME SOURCES CAN BE GROUP DEPENDENT. MULTIPLE THERMAL GROUPS ARE ALLOWED.

585 TRIAL TRIAL CARRIES OUT A SIMPLE LINKING OF SEVERAL TWO-DIMENSIONAL, MULTIGROUP NEUTRON (DIRECT OR ADJOINT) FLUX SETS TO GIVE A THREE-DIMENSIONAL REPRESENTATION.

608 TRIPLET TRIPLET SOLVES THE TWO-DIMENSIONAL MULTIGROUP TRANSPORT EQUATION IN PLANAR GEOMETRIES USING A REGULAR TRIANGULAR MESH. REGULAR AND ADJOINT, INHOMOGENEOUS AND HOMOGENEOUS (KEFF AND EIGENVALUE SEARCHES) PROBLEMS SUBJECT TO VACUUM, REFLECTIVE OR SOURCE BOUNDARY CONDITIONS ARE SOLVED. GENERAL ANISOTROPIC SCATTERING IS ALLOWED AND ANISOTROPIC DISTRIBUTED SOURCES ARE PERMITTED.

55 AIMFIRE THIS PROGRAM WAS DESIGNED TO COMPARE THE COSTS OF VARIOUS FUEL CYCLES. THE PROGRAM CONTAINS A LIBRARY OF FAST AND THERMAL MICROSCOPIC CROSS SECTIONS, DECAY CONSTANTS, AND FISSION YIELDS FOR 50 ISOTOPES. THE PRESENT VERSION IS USED TO INVESTIGATE THE ECONOMICS OF URANIUM FUEL SYSTEMS.

58 SIZZLE SIZZLE SOLVES THE ONE-DIMENSIONAL, OR MULTIGROUP BURNUP PROBLEM IN THE DIFFUSION THEORY APPROXIMATION FOR FAST INTERMEDIATE REACTORS. AFTER THE INITIAL CALCULATION AT T=0, AVERAGE CROSS SECTIONS ARE COMPUTED FOR FURTHER CALCULATIONS USING ONE TO SIX ENERGY GROUPS. CRITICALITY MAY BE MAINTAINED BY USE OF A CONCENTRATION SEARCH. THE CONCENTRATION OF THE VARIOUS ISOTOPES IS PERMITTED TO VARY ONLY FROM REGION-TO-REGION. CHAINS INCLUDED ARE TH232, U238, AND A FISSION PRODUCT POISON CHAIN.

99 DUO DIMENSIONAL BURNOUT (DDB) THE FIVE-GROUP, TWO-DIMENSIONAL, NEUTRON DIFFUSION EQUATIONS IN CYLINDRICAL GEOMETRY ARE SOLVED WITH BURNOUT OPTIONS AND CONTROL ROD SEARCH OPTIONS.

117 FEVER FEVER PERFORMS ONE-DIMENSIONAL FEW-GROUP DEPLETION CALCULATIONS. OPTIONS ARE AVAILABLE TO ADJUST CONTROL POISONS IN VARIOUS REGIONS OF THE REACTOR, SELF-SHIELDING OF LUMPED POISONS, AND TO CALCULATE HOT MAXIMUM AND COLD SHUT-DOWN MULTIPLICATION.

134 NUCY THE CALCULATION OF NUCLIDE CONCENTRATIONS AT A POINT IN A REACTOR AT SUCCESSIVE TIME INTERVALS, WITH EXPOSURE TO A TWO-GROUP NEUTRON FLUX. INFINITE SYSTEM CRITICALITY IS CALCULATED.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS

146 NPRFCCP NUCLEAR FUEL CYCLE COSTS IN DOLLARS PER YEAR ($/YR), AND IN MILLS PER KILOWATT-HOUR (MILLS/KWHR) ARE COMPUTED AND TABULATED FOR EACH REGION OF A MULTIREGION REACTOR CORE, ON THE BASIS OF AEC-LEASED NUCLEAR FUEL MATERIAL AND OF PRIVATELY-OWNED NUCLEAR FUEL MATERIAL. FUEL CYCLE COSTS ARE COMPUTED SEPARATELY FOR EACH REGION OR ZONE, FOR CORE DESIGNS OF ANY CONFIGURATION OR COMBINATION OF MATERIAL DEPLETION OR ENRICHED URANIUM FUEL OR OTHER SPECIAL NUCLEAR MATERIAL. PRINTED OUTPUT OF THE PROGRAM INCLUDES (A) DETAILED FUEL CYCLE COSTS FOR EACH ZONE IN TABULAR FORM, FOR AEC-LEASED AND PRIVATELY-OWNED NUCLEAR FUEL MATERIAL, RESPECTIVELY, (B) A SUMMARY TABULATION OF NUCLEAR FUEL COSTS FOR ALL REGIONS OF THE COMPLETE CORE, INCLUDING FIXED CHARGES ON WORKING CAPITAL REQUIRED FOR CORE FABRICATION AND FOR NUCLEAR FUEL MATERIAL, (C) A SUMMARY TABULATION OF CERTAIN COMPUTED PERFORMANCE AND ECONOMIC DATA, VIZ., AVERAGE RESIDENCE TIME, ANNUAL FUEL THROUGHPUT, UNIT ELECTRICAL ENERGY YIELD, ANNUAL POWER GENERATION, AND CORE FABRICATION COSTS, AND (D) A TABULATION OF ALL INPUT DATA FOR ALL REGIONS. THE PRINTING OF DATA DESCRIBED IN (A) AND (D) ABOVE IS OPTIONAL WITH PROGRAM USE.

179 ISOTOPES THIS PROGRAM CAN BE USED TO CALCULATE FOR ANY NEUTRON FLUX THE OPTIMUM TIME OF IRRADIATION FOR MAXIMUM YIELD, THE SPECIFIC ACTIVITY OF THE PRODUCT ISOTOPE IN CURIES PER GRAM OF TARGET MATERIAL, AND THE COMBINED SPECIFIC ACTIVITY OF THE TARGET AND PRODUCT ISOTOPES. THE PRODUCT ISOTOPE MAY BE PRODUCED BY ANY SIMPLE REACTION SUCH AS (N,GAMMA), (N,P), (N,2N), ETC., OR IT MAY BE PRODUCED BY DECAY OF A PARENT ISOTOPE.

180 ISOCRUNCH ISOCRUNCH CAN BE USED TO COMPUTE THE AMOUNT OF EACH ISOTOPE IN A REACTION AND DECAY CHAIN FOR ANY SPECIFIED NEUTRON FLUX AND TIME, TO SUM THE CONTRIBUTIONS OF VARIOUS CHAINS TO THE SAME ISOTOPE, TO GRAPH ON AN ASSOCIATED ELECTROPLOTTER OR CALCOMP THE YIELD OF AN ISOTOPE VS. TIME FOR A GIVEN FLUX, AND TO FIND THE OPTIMUM TIME FOR MAXIMUM YIELD OF AN ISOTOPE IN A CHAIN. THE PROGRAM DOES NOT TAKE INTO ACCOUNT THE SELF-SHIELDING OF A TARGET IN A REACTOR OR THE DEPENDENCE OF REACTION CROSS SECTIONS ON NEUTRON ENERGY WHICH CAN BE HANDLED BY ADJUSTING THE INPUT DATA.

221 RELOAD FEVER A FEW-GROUP, 1-D DEPLETION CALCULATION WHICH ALLOWS FUEL IN VARIOUS STAGES OF IRRADIATION TO BE HOMOGENIZED INTO THE SAME REGION FOR PURPOSES OF THE DIFFUSION CALCULATION BUT FOLLOWS THE DEPLETION OF EACH OF THE SUB-REGIONS SEPARATELY. THE CALCULATION MAY BE INTERRUPTED PERIODICALLY FOR REFUELING ONE OR MORE REGIONS. RECYCLING IS OPTIONAL AND THERE IS NO LIMIT TO THE NUMBER OF REFUELINGS WHICH MAY BE PERFORMED. A CONTROL POISON SEARCH IS AVAILABLE AND CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ONE LUMPED POISON.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS 3/74

223 REVISED GAD THIS INFINITE-MEDIUM DEPLETION PROGRAM PERFORMS FUEL CYCLE CALCULATIONS ON REACTORS EMPLOYING PARTIAL REFUELING. THE BURN-UP OF UP TO 12 DISCRETE FUEL COMPOSITIONS (REGIONS OR STAGES OF IRRADIATION) MAY BE FOLLOWED SIMULTANEOUSLY. THE BURN-UP CALCULATION MAY BE INTERRUPTED PERIODICALLY TO REMOVE THE CONTENTS AND TO REFUEL ONE OR MORE REGIONS. FUEL MAY BE PARTIALLY OR COMPLETELY RECYCLED.

224 WAMPUM THIS PROGRAM CALCULATES FUEL CYCLE COSTS ON A DETAILED BASIS, USING RESULTS OF NUCLEAR DEPLETION CALCULATIONS AND CERTAIN SPECIFIED ECONOMICS ASSUMPTIONS. THE PURPOSE IS TO PROVIDE A MEASURE OF PERFORMANCE FOR COMPARING OR OPTIMIZING FUEL CYCLES AND ASSOCIATED REACTOR CORE AND FUEL ELEMENT CHARACTERISTICS.

226 OPUS THE CODE GENERATES A FLOW NETWORK EQUIVALENT TO A GAS-COOLED NUCLEAR POWER PLANT OF SPECIFIED ELECTRICAL OUTPUT (IN THE RANGE OF 100 TO 1000 MW) ACCORDING TO INPUT DATA AND PROGRAMMED RULES, PROCEEDS TO EVALUATE THE PLANT PERFORMANCE AND PRICE OF THE TURBOGENERATOR SET (ACCORDING TO GENERAL ELECTRIC PRICE DATA), AND PRINTS AS A RESULT A CODED LIST OF ALL PLANT COMPONENTS AND A DETAILED PERFORMANCE MAP.

227 STMGEN STMGEN CAN BE USED IN A PLANT OPTIMIZATION PROGRAM. THIS CODE DETERMINES THE AREA OF EACH SECTION OF A STEAM GENERATOR REQUIRED TO SATISFY THE DESIGN CONDITIONS OF HEAT TRANSFER, PRESSURE DROP AND MAXIMUM TUBE TEMPERATURE CONSTRAINTS. THE COST OF THE GENERATOR IS COMPUTED AS A FUNCTION OF THE TOTAL HEAT TRANSFER AREA, THE NON-PRODUCTIVE TUBE LENGTH REQUIRED TO CONNECT THE HEADERS, PLUS THE COST OF THE HEADERS.

231 RAD2 THIS PROGRAM CALCULATES THE FISSION PRODUCT ACTIVITY DISTRIBUTIONS IN A HIGH TEMPERATURE GAS-COOLED REACTOR SYSTEM.

240 ASSAULT MULTIGROUP, TWO-DIMENSIONAL REACTOR DEPLETION. GIVEN NUCLIDE CONCENTRATIONS AND MICROSCOPIC CROSS SECTIONS, THE STEADY-STATE MULTIREGION, MULTIGROUP DIFFUSION EQUATIONS ARE SOLVED IN ONE OR TWO DIMENSIONS OVER A FINITE-DIFFERENCE SYSTEM OF MESH POINTS. THE CALCULATED NEUTRON FLUXES ARE THEN USED TO DETERMINE NUCLIDE CONCENTRATIONS AFTER A SPECIFIED PERIOD OF EXPOSURE. THESE CALCULATIONS ARE REPEATED FOR A SPECIFIED NUMBER OF TIME-STEPS.

260 GARGOYLE GARGOYLE IS AN INFINITE-MEDIUM DEPLETION CODE FOR FUEL CYCLE CALCULATIONS ON REACTORS EMPLOYING PARTIAL REFUELING. THE BURNUP OF UP TO 12 DISCRETE FUEL COMPOSITIONS (REGIONS OR STAGES OF IRRADIATION) MAY BE FOLLOWED SIMULTANEOUSLY. THE BURNUP CALCULATION MAY BE INTERRUPTED PERIODICALLY TO REMOVE THE CONTENTS OF AND TO REFUEL ONE OR MORE REGIONS. FUEL MAY BE COMPLETELY OR PARTIALLY RECYCLED. A CONTROL POISON SEARCH MAY BE PERFORMED AT EACH TIME-STEP. FEED FUEL SEARCHES ARE PERMITTED AT THE END OF EACH BURNUP CYCLE BEFORE REFUELING. CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ANY NUCLIDE EXCEPT MODERATORS. THE NUCLIDE SCHEME EMPLOYED, ALTHOUGH NOT COMPLETELY GENERAL, IS FLEXIBLE.

269 DTF-BURN DTF-BURN IS A ONE-DIMENSIONAL, MULTIGROUP BURNUP CODE BASED ON TRANSPORT THEORY. A DIFFERENT TYPE OF EIGENVALUE CALCULATION (MULTIPLICATION, PERIOD, NUCLIDE CONCENTRATION, ZONE THICKNESS, OR SYSTEM DIMENSION) CAN BE PERFORMED AT THE BEGINNING OF EACH OF A SPECIFIED SET OF TIME-STEPS. THIS FEATURE PERMITS THE SIMULATION, IN A SINGLE PROBLEM RUN, OF A SYSTEM IN WHICH VARIOUS CONTROL METHODS ARE USED AS A FUNCTION OF TIME. THE CONCENTRATION OF THE VARIOUS NUCLIDES IS PERMITTED TO VARY FROM REGION-TO-REGION OR POINT-BY-POINT. NUCLIDES CONSIDERED ARE U235, U236, U238, NP239, PU239, PU240, PU241, PU242, AND FP, A PSEUDO FISSION PRODUCT PAIR.

275 PDQ7 PDQ7 SOLVES FEW-GROUP NEUTRON DIFFUSION-DEPLETION PROBLEMS IN ONE, TWO, AND THREE DIMENSIONS. ADJOINT SOLUTIONS ARE ALSO AVAILABLE AND TWO OVERLAPPING THERMAL GROUPS MAY BE USED IN ONE AND TWO-DIMENSIONAL PROBLEMS. EITHER POINTWISE OR REGIONWISE DEPLETION MAY BE PERFORMED USING THE HARMONY DEPLETION SYSTEM. THE GEOMETRY MAY BE RECTANGULAR, CYLINDRICAL, OR SPHERICAL IN ONE DIMENSION, RECTANGULAR, CYLINDRICAL, OR HEXAGONAL IN TWO DIMENSIONS, AND RECTANGULAR OR HEXAGONAL IN THREE DIMENSIONS. ALL GEOMETRIES PROVIDE FOR VARIABLE MESH SPACING IN ALL DIMENSIONS. ZERO FLUX, ZERO CURRENT, AND ROTATIONAL SYMMETRY BOUNDARY CONDITIONS ARE AVAILABLE, AND BOUNDARY VALUE PROBLEMS MAY BE SOLVED BY SPECIFYING THE FLUX VALUES ON ONE OR MORE BOUNDARIES. THE BETTIS REVISED PDQ7 MAY BE USED TO ALSO SOLVE ADDITIVE FAST-SOURCE AND SIMPLIFIED PL PROBLEMS AS WELL AS THE THREE-DIMENSIONAL SYNTHESIS EIGENVALUE PROBLEM. CONTROL SEARCHES, THERMAL FEEDBACK, AND XENON FEEDBACK ARE OPTIONAL. THE IBM360 ANC VERSION CAN BE USED TO SOLVE THREE-DIMENSIONAL SYNTHESIS PROBLEMS.

301 FREVAP6 THE FREVAP TYPE OF CODE FOR ESTIMATING THE RELEASE OF LONGER-LIVED METALLIC FISSION PRODUCTS FROM HTGR FUEL ELEMENTS HAS BEEN DEVELOPED TO TAKE INTO ACCOUNT THE COMBINED EFFECTS OF THE RETENTION OF METALLIC FISSION PRODUCTS BY FUEL PARTICLES AND THE RATHER STRONG ABSORPTION OF THESE FISSION PRODUCTS BY THE GRAPHITE OF THE FUEL ELEMENTS. RELEASE CALCULATIONS ARE MADE ON THE BASIS THAT THE LOSS OF FISSION PRODUCT NUCLIDES SUCH AS OF STRONTIUM, CESIUM, AND BARIUM IS DETERMINED BY THEIR EVAPORATION FROM THE GRAPHITE SURFACES AND THEIR TRANSPIRATION INDUCED BY THE FLOWING HELIUM COOLANT. THE CODE IS DEVISED SO THAT CHANGES OF FISSION RATE (FUEL ELEMENT POWER), FUEL TEMPERATURE, AND GRAPHITE TEMPERATURE MAY BE INCORPORATED INTO THE CALCULATION. TEMPERATURE IS QUITE IMPORTANT IN DETERMINING RELEASE BECAUSE, IN GENERAL, BOTH RELEASE FROM FUEL PARTICLES AND LOSS BY EVAPORATION (TRANSPIRATION) VARY EXPONENTIALLY WITH THE RECIPROCAL OF THE ABSOLUTE TEMPERATURE.

302 GAFFE A ZERO-DIMENSIONAL CALCULATION OF FEED FUEL REQUIREMENTS IS PERFORMED TO PRODUCE A SPECIFIED END OF CYCLE MULTIPLICATION FACTOR FOR THE EQUILIBRIUM FUEL CYCLE, GIVEN FEED COMPOSITION, LENGTH OF CYCLE AND REACTOR POWER. IT IS ALTERNATELY POSSIBLE TO COMPUTE CYCLE LENGTH OR FEED ENRICHMENT. THE CODE IS A SURVEY TOOL WHICH ASSUMES PERIODIC REFUELING AND PERMITS COMPLETE OR PARTIAL RECYCLING OF MATERIALS. THE SEGREGATED FUEL CONCEPT CAN BE HANDLED WITHIN THE FRAMEWORK OF THE CALCULATION.

313 CINDER(M0102) CINDER IS A FOUR-GROUP, ONE-POINT DEPLETION AND FISSION PRODUCT PROGRAM BASED ON THE EVALUATION OF A GENERAL ANALYTICAL SOLUTION OF NUCLIDES COUPLED IN ANY LINEAR SEQUENCE OF RADIOACTIVE DECAYS AND NEUTRON ABSORPTIONS IN A SPECIFIED NEUTRON FLUX SPECTRUM. THE DESIRED DEPLETION AND FISSION PRODUCT CHAINS AND ALL PHYSICAL DATA ARE SPECIFIED BY THE PROBLEM ORIGINATOR. THE PROGRAM COMPUTES INDIVIDUAL NUCLIDE NUMBER DENSITIES, ACTIVITIES, NINE ENERGY-GROUP DISINTEGRATION RATES, AND MACROSCOPIC AND BARNS/FISSION POISONS AT EACH TIME-STEP AS WELL AS SELECTED SUMMARIES OF THESE DATA.

314 NAP NAP CALCULATES THE SPECTRUM AND SPATIAL DISTRIBUTION IN ONE DIMENSION OF ACTIVATION GAMMA RAYS FOLLOWING NEUTRON IRRADIATION.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS

318 FEVER7 FEVER7 PERFORMS A MULTIGROUP, 1-DIMENSIONAL DEPLETION CALCULATION WHICH ALLOWS FUEL IN VARIOUS STAGES OF IRRADIATION TO BE HOMOGENIZED INTO THE SAME REGION FOR PURPOSES OF THE DIFFUSION CALCULATION BUT FOLLOWS THE DEPLETION OF EACH OF THE SUBREGIONS SEPARATELY. THE CALCULATION MAY BE INTERRUPTED PERIODICALLY FOR REFUELING ONE OR MORE REGIONS. RECYCLING IS OPTIONAL AND THERE IS NO LIMIT TO THE NUMBER OF REFUELINGS WHICH MAY BE PERFORMED. A CONTROL POISON SEARCH IS AVAILABLE AND CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO A NUMBER OF LUMPED POISONS.

322 ISOSEARCH THE PROGRAM WAS DEVELOPED TO CALCULATE THE UNKNOWN REACTION CROSS SECTION, FLUX VALUE, OR PRODUCT ACTIVITY IN AN ISOTOPE-PRODUCTION SCHEME CONSISTING OF TWO OR THREE NUCLIDES.

325 2DB 2DB IS A FLEXIBLE, TWO-DIMENSIONAL (X-Y, R-Z, R-THETA, HEX GEOMETRY) DIFFUSION CODE FOR USE IN FAST REACTOR ANALYSES. THE CODE CAN BE USED TO -

(A) COMPUTE FUEL BURNUP USING A FLEXIBLE MATERIAL SHUFFLING SCHEME,

(B) PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION (ALPHA), MATERIAL CONCENTRATIONS, AND REGION DIMENSIONS USING A REGULAR OR ADJOINT MODEL. CRITICALITY SEARCHES CAN BE PERFORMED DURING BURNUP TO COMPENSATE FOR FUEL DEPLETION,

(C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANEOUS SOURCE.

336 PDQ5 THE FEW-GROUP TWO-DIMENSIONAL NEUTRON DIFFUSION EQUATIONS ARE SOLVED. UP TO FIVE GROUPS MAY BE USED WITH SCATTERING ALLOWED BETWEEN ADJACENT GROUPS. IN ADDITION, DEPLETION PROBLEMS MAY BE SOLVED WITH PDQ5.

339 GAUGE THE TWO-DIMENSIONAL FEW-GROUP NEUTRON DIFFUSION THEORY EQUATIONS FOR A UNIFORM TRIANGULAR MESH ARE SOLVED TO OBTAIN THE MULTIPLICATION FACTOR AND THE SPATIAL FLUX AND POWER DISTRIBUTION OF REACTORS WITH HEXAGONAL CORE CONFIGURATION. COMPLETE REACTOR LIFE HISTORIES WITH PARTIAL REFUELLING AT A NUMBER OF RELOAD TIME POINTS CAN BE CALCULATED. AT EACH DISCRETE TIME POINT A CONTROL ROD SEARCH MAY BE PERFORMED TO MAINTAIN CRITICALITY AT ALL TIMES. THE DEPLETION SCHEME OF ALL BURNABLE NUCLIDES IS SPECIFIED BY THE USER AT EXECUTION TIME. THREE MODES OF OPERATION ARE POSSIBLE - (1) STRAIGHT BURNUP CALCULATION, (2) CONTROL ROD CRITICALITY SEARCH, ALLOWING THE ADJUSTMENT OF A NUMBER OF CONTROL ROD BANKS ACCORDING TO A PRESCRIBED ROD SEQUENCING SCHEME, AND (3) A SERIES OF STATIC CALCULATIONS WITH INSERTION OF RODS INTO FIXED PRESCRIBED POSITIONS.

C. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS

340 POWERCO POWERCO CALCULATES THE COST OF ELECTRICITY PRODUCED BY NUCLEAR POWER STATIONS, ASSUMING ALL CASH EXPENSES SUCH AS INVESTMENT AND FUEL COSTS, OPERATING EXPENSES, AND TAXES ARE KNOWN. THE POWER COST IS HELD CONSTANT THROUGHOUT THE PROJECT LIFE.

354 CINCAS CINCAS IS A NUCLEAR FUEL CYCLE COST CODE WHICH MAY BE USED FOR EITHER ENGINEERING ECONOMY PREDICTIONS OF FUEL CYCLE COSTS OR FOR ACCOUNTING FORECASTING OF SUCH COSTS. FEATURES OF CINCAS INCLUDE -

(1) MONTHLY CALCULATION OF DOLLAR COSTS AND MASS INVENTORY ON A BATCH AND CASE BASIS FOR EACH MONTH OF A PERIOD WHICH IS USUALLY DEFINED AS (BUT NOT RESTRICTED TO) BEGINNING WITH THE DELIVERY OF FUEL TO THE REACTOR SITE AND ENDING WITH THE WITHDRAWAL OF FUEL FROM THE REACTOR.

(2) A GENERAL FORMULA FOR THE UNIT PRICE OF ENRICHED URANIUM WHICH ALLOWS FOR VARIABLE FEED AND TAILS ENRICHMENTS, COSTS OF FEED, CHEMICAL CONVERSION, SEPARATIVE WORK, AND LOSSES IN CONVERSION AND FABRICATION.

367 ISOGEN ISOGEN CALCULATES RADIOISOTOPE GENERATION AND DECAY, USING TWO-GROUP NEUTRON CROSS SECTIONS.

372 RAPFU RAPFU CALCULATES EQUILIBRIUM FUEL CYCLE ISOTOPICS IN FAST BREEDER REACTORS. THE RECYCLED PLUTONIUM IS PERMITTED TO HAVE DIFFERENT ISOTOPIC COMPOSITIONS IN TWO DIFFERENT CORE ZONES, AND SEVERAL RECYCLE SCHEMES ARE AVAILABLE AS OPTIONS. OUTPUT DATA INCLUDES THE INITIAL, AVERAGE, AND DISCHARGED FUEL ISOTOPIC CONCENTRATIONS FOR EACH REGION OF THE CORE ZONES AND THE BLANKETS, BREEDING RATIO, DOUBLING TIME, AND (OPTIONALLY) FUEL COSTS CALCULATED USING SIMPLIFIED RELATIONSHIPS.

418 CHAINS CHAINS COMPUTES THE ATOM DENSITY OF MEMBERS OF A SINGLE RADIOACTIVE DECAY CHAIN. THE LINEARITY OF THE BATEMAN EQUATIONS ALLOWS TRACING OF INTERCONNECTING CHAINS BY MANUALLY ACCUMULATING RESULTS FROM SEPARATE CALCULATIONS OF SINGLE CHAINS. RE-ENTRANT LOOPS CAN BE TREATED AS EXTENSIONS OF A SINGLE CHAIN. LOSSES FROM THE CHAIN ARE ALSO TALLIED.

423 DOS DOS COMPUTES THE LOCAL NEUTRON FLUX PER REFERENCE REACTOR POWER LEVEL WHICH WILL PRODUCE THE MEASURED ACTIVITY OF A DOSIMETER. ALTERNATIVELY, IF THE FLUX VALUE IS SUPPLIED, THE CORRESPONDING DOSIMETER ACTIVITY WILL BE CALCULATED.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS 3/74

427 FARED FARED CONTAINS AN INTERNAL CROSS SECTION AVERAGING ROUTINE WHICH IS RESPONSIBLE FOR PREPARING BROAD GROUP CROSS SECTION SETS FOR VARIOUS MATERIAL REGIONS OF THE REACTOR. THE CROSS SECTION AVERAGING IS PERFORMED IN PROGRAM REGA, WHICH COMPUTES A B1 FLUX AND CURRENT IN UP TO 20 REACTOR BLOCK COMPOSITIONS FOR USE AS WEIGHTING FUNCTIONS IN THE CROSS SECTION COLLAPSING CALCULATION. A HOMOGENEOUS OR HETEROGENEOUS RESOLVED AND UNRESOLVED RESONANCE TREATMENT IS PROVIDED TO COMPUTE EFFECTIVE MICROGROUP RESONANCE CROSS SECTIONS FOR THE BLOCK MIXTURE OR UP TO 2 CELL TYPES PER BLOCK. REAL AND ADJOINT FLUX DISTRIBUTIONS ARE CALCULATED FOR ONE-DIMENSIONAL SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRIES. THE REAL FLUXES ARE NORMALIZED TO YIELD DESIRED TOTAL REACTOR POWER. CRITICALITY SEARCHES MAY BE PERFORMED ON THE REACTOR DIMENSION, TRANSVERSE BUCKLING OR ZONE COMPOSITIONS. ENRICHMENT SEARCHES MAY BE PERFORMED TO YIELD DESIRED RATIOS OF MAXIMUM (OR AVERAGE) POWER DENSITIES IN SEVERAL ZONES. ZONEWISE DEPLETION IS CALCULATED EITHER FOR A GIVEN TIME PERIOD OR UNTIL SPECIFIED CRITICALITY, BURNUP OR NUCLIDE CONCENTRATIONS ARE SATISFIED. FLEXIBLE FUEL MANAGEMENT IS AVAILABLE PERMITTING SPECIFIED MATERIAL UNITS TO BE MOVED INTO, OUT OF OR SHUFFLED WITHIN THE REACTOR. A WIDE VARIETY OF EDITS MAY BE PERFORMED, INCLUDING PERTURBATION AND KINETIC PARAMETERS CALCULATIONS.

438 BUG2 THE 2-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION THEORY EQUATIONS FOR X-Y OR R-Z GEOMETRY ARE SOLVED TO OBTAIN THE MULTIPLICATION FACTOR AND THE SPATIAL FLUX AND POWER DISTRIBUTIONS. COMPLETE REACTOR LIFE HISTORIES WITH PARTIAL REFUELING AT A NUMBER OF RELOAD POINTS CAN BE CALCULATED. THE DEPLETION SCHEME OF ALL BURNABLE NUCLIDES IS SPECIFIED BY THE USER AT EXECUTION TIME. A REGIONWICE DEPLETION SCHEME IS USED. CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ANY NUCLIDE.

439 BUGTRI THE 2-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION THEORY EQUATIONS FOR TRIANGULAR GEOMETRY ARE SOLVED TO OBTAIN THE MULTIPLICATION FACTOR AND THE SPATIAL FLUX AND POWER DISTRIBUTIONS. COMPLETE REACTOR LIFE HISTORIES WITH PARTIAL REFUELING AT A NUMBER OF RELOAD TIME POINTS CAN BE CALCULATED. THE DEPLETION SCHEME OF ALL BURNABLE NUCLIDES IS SPECIFIED BY THE USER AT EXECUTION TIME. A REGIONWISE DEPLETION SCHEME IS USED. CONCENTRATION DEPENDENT SELF-SHIELDING FACTORS MAY BE APPLIED TO ANY NUCLIDE.

441 PWCOST PWCOST IS USED TO CALCULATE NUCLEAR REACTOR FUEL CYCLE COSTS. INPUT FOR ALL COMPONENTS OF THE FUEL CYCLE ARE TIME-DEPENDENT. WORKING CAPITAL CHARGE RATES MAY BE SPECIFIED SEPARATELY FOR IN-CORE AND OUT-OF-CORE TIME PERIODS.

454 PHENIX PHENIX IS A TWO-DIMENSIONAL, MULTIGROUP, DIFFUSION-BURNUP-REFUELING CODE FOR USE WITH FAST REACTORS. THE CODE IS DESIGNED PRIMARILY FOR FUEL-CYCLE ANALYSIS OF FAST REACTORS AND CAN BE USED TO CALCULATE THE DETAILED BURNUP AND REFUELING HISTORY OF FAST BREEDER REACTOR CONCEPTS HAVING ANY GENERALIZED FRACTIONAL BATCH RELOADING SCHEME. EITHER ORDINARY KEFF CALCULATIONS OR SEARCHES ON MATERIAL CONCENTRATION OR REGION DIMENSIONS CAN BE PERFORMED AT ANY TIME DURING THE BURNUP HISTORY. THE COMPLETE FUEL CYCLE HISTORY CAN BE CALCULATED IN ONE RUN, OR THE INDIVIDUAL BURNUP INTERVALS CAN BE TREATED SEPARATELY. THE REFUELING OPTION OF THE CODE ACCOUNTS FOR THE SPATIAL FLUX SHIFTS OVER THE REACTOR LIFETIME IN THE CALCULATION OF FUEL DISCHARGE.

456 DBUFIT1 DBUFTI1 IS DESIGNED TO EXTRACT INTEGRAL CROSS SECTION INFORMATION FROM ISOTOPIC BURNUP DATA. THIS INFORMATION IS OBTAINED BY FITTING BURNUP EQUATIONS TO THE ISOTOPIC DATA USING LEAST SQUARES FITTING TECHNIQUES. BURNUP EQUATIONS FOR THE FOLLOWING TRANSMUTATION CHAINS HAVE BEEN PROGRAMMED - PU239 TO PU242, U238 TO PU242, PU242 TO CM244 AND U235 TO PU238.

463 3DDT 3DDT IS A THREE-DIMENSIONAL (X-Y-Z OR R-THETA-Z) MULTIGROUP DIFFUSION THEORY CODE FOR USE IN FAST REACTOR ANALYSIS. THE CODE CAN BE USED TO COMPUTE KEFF OR TO PERFORM CRITICALITY SEARCHES ON REACTOR COMPOSITION, TIME ABSORPTION, AND REACTOR DIMENSIONS BY EITHER THE REGULAR OR THE ADJOINT FLUX EQUATIONS. MATERIAL BURNUP AND FISSION PRODUCT BUILDUP CAN BE COMPUTED FOR SPECIFIED TIME INTERVALS, AND CRITICALITY SEARCHES CAN BE PERFORMED DURING BURNUP TO COMPENSATE FOR FUEL DEPLETION AND FISSION PRODUCT GROWTH.

477 3DXT/DEP3 THESE TWO CODES WERE DEVELOPED FOR USE WITH DETAILED REACTOR PHYSICS CALCULATIONS TO OBTAIN 3-DIMENSIONAL XENON TRANSIENT (3DXT) AND DEPLETION (DEP3) CALCULATIONS. THEY ARE WELL SUITED FOR SURVEY STUDIES AND BECAUSE THEY INCORPORATE THREE-DIMENSIONAL EFFECTS WITH THERMAL FEEDBACK AND ROD SEARCH CAPABILITIES, ARE USEFUL FOR ASSESSING SITUATIONS SUCH AS ROD MISALIGNMENTS OR FUEL LOADING AND COOLANT FLOW ASYMMETRIES WHICH ARE TIME-CONSUMING AND OFTEN IMPOSSIBLE TO DETECT WITH DETAILED 1- OR 2-DIMENSIONAL CODES.

480 FUMBLE FUMBLE COMPUTES THE FUEL BURNUP IN REACTOR OPERATIONS. THIS INCLUDES THE EVALUATION OF REACTIVITY EFFECTS, BREEDING (OR DEPLETION) AND INVENTORIES OF FUEL, AND FUEL COSTS FOR CHANGING ECONOMIC CONDITIONS AND SUPPLIED FUEL COMPOSITIONS THROUGHOUT THE REACTOR LIFETIME (OR FOR AS MANY REFUELING OPERATING INTERVALS AS DESIRED). CONSIDERABLE FLEXIBILITY IS ALLOWED IN THE SPECIFICATIONS OF REACTOR REFUELING, INCLUDING FUEL COMPOSITIONS FOR THE STARTUP REACTOR, RECYCLE SCHEMES AND FISSILE MAKEUP COMPOSITIONS FOR SUBSEQUENT CORE LOADINGS, AMOUNTS OF FUEL TO BE REPLACED IN DIFFERENT POSITIONS OF THE REACTOR AT ANY REFUELING, AND SHUFFLING OF FUEL FROM ONE PART OF THE REACTOR TO ANOTHER OR TEMPORARILY STORING FUEL DISCHARGED FROM THE REACTOR FOR LATER ADDITIONAL BURNUP. THE REFUELING SPECIFICATIONS MAY BE CHANGED FROM ONE REFUELING OPERATING INTERVAL TO ANOTHER, AS WELL AS OPERATING INTERVAL TIME, POWER RATING, AND LOAD FACTOR. FUEL COSTS MAY BE EVALUATED FOR SEVERAL DIFFERENT SETS OF COST INPUT DATA (DIFFERENT ECONOMIC ASSUMPTIONS) AND MAY BE BASED ON NET COSTS ACCRUED AND ENERGY PRODUCED BY SPENT FUEL BATCHES AND/OR ON NET COSTS INCURRED FOR ALL FUEL HELD AND ENERGY PRODUCED BY THE ENTIRE REACTOR FOR EACH OPERATING INTERVAL.

495 SYN SYN CONTAINS TWO MAJOR SEGMENTS, BISYN AND BICYCL. THE BISYN SEGMENT SOLVES THE TWO-DIMENSIONAL MULTIGROUP NEUTRON DIFFUSION THEORY EQUATIONS IN R,Z OR X,Y GEOMETRY USING A NONITERATIVE SYNTHESIS METHOD. THIS APPROACH IS DESIGNED TO GREATLY REDUCE THE COMPUTER COST OF RUNNING TWO-DIMENSIONAL MULTIGROUP PROBLEMS AT THE RISK OF SOME LOSS IN ACCURACY OF THE DETAILED FLUX DISTRIBUTION. THIS SEGMENT ALSO CONTAINS A PERTURBATION AND EFFECTIVE DELAYED NEUTRON FRACTION CALCULATION.

THE BICYCL SEGMENT USES OUTPUT FROM BISYN TO SOLVE THE ONE-GROUP NEUTRON DEPLETION EQUATIONS. BICYCL ALLOWS THE USER TO SEARCH ON MAKEUP OR RECYCLE ISOTOPIC COMPOSITIONS FOR A FIRST CYCLE OF A FIRST CORE OR FOR EQUILIBRIUM CONCENTRATIONS. IT ALSO HAS PROVISIONS FOR FUEL SHUFFLING AND THE OPTION TO CYCLE BACK TO BISYN IN ORDER TO UPDATE THE FLUXES, ONE-GROUP CROSS SECTIONS, ETC.

498 CONCEPT2 CONCEPT2 GENERATES A CAPITAL COST ESTIMATE FOR A SELECTION OF PWR, BWR, COAL, AND OIL STEAM-ELECTRIC POWER PLANTS WITH RUN-OF-RIVER, MECHANICAL DRAFT, OR NATURAL DRAFT COOLING SYSTEMS OF SPECIFIED ELECTRICAL OUTPUT (IN THE RANGE OF 500 TO 2000 MW(E)) FOR ANY OF TWENTY U. S. CITIES, A HYPOTHETICAL MIDDLETOWN, AND TWO CANADIAN CITIES, AND PRINTS AS A RESULT A DETAILED COST BREAKDOWN.

540 PACTOLUS/CLOTHO PACTOLUS IS A CODE FOR COMPUTING NUCLEAR POWER COSTS USING THE DISCOUNTED CASH FLOW METHOD. THE CASH FLOWS ARE GENERATED FROM INPUT UNIT COSTS, TIME SCHEDULES AND BURNUP DATA. CLOTHO CALCULATES AND COMMUNICATES TO PACTOLUS MASS FLOW DATA TO MATCH A SPECIFIED LOAD FACTOR HISTORY.

549 BIGDEAL BIGDEAL IS USED TO (1) CALCULATE THE MAXIMUM TEMPERATURES OF A SPENT YANKEE ATOMIC TYPE POWER REACTOR FUEL ASSEMBLY (36 0.305-IN. -OD BY 102-IN. - LONG STAINLESS STEEL FUEL RODS ON 0.422-IN. CENTERS) DURING SHEAR-LEACH PROCESSING, AND (2) CALCULATE PRESSURE BUILDUP WITHIN A BATCH DISSOLVER AS THE HOT FUEL IS QUENCHED BY COLD NITRIC ACID IN PREPARATION FOR AQUEOUS PROCESSING. THE FOLLOWING FIVE CASES, RELATED TO THE UNIT OPERATIONS OF SHEAR-LEACH, MAY BE INVESTIGATED - (1) FUEL SUBASSEMBLY SUSPENDED VERTICALLY IN WATER, (2) SUBASSEMBLY SUSPENDED HORIZONTALLY IN AIR, (3) SUBASSEMBLY CONTAINED WITHIN THE SHEAR FEED ENVELOPE, (4) 16 5-, 7-3/4-, OR 10-IN. ID BASKETS OF SHEARED FUEL STORED IN A 4 X 4 ARRAY ON 12-IN. CENTERS, AND (5) LEACHING OF 6 BASKETS IN A BATCH DISSOLVER.

567 3DB 3DB IS A THREE-DIMENSIONAL (X-Y-Z,R-THETA-Z,TRIANGULAR-Z) MULTIGROUP DIFFUSION CODE FOR USE IN DETAILED FAST-REACTOR CRITICALITY AND BURNUP ANALYSIS. THE CODE CAN BE USED TO -

(A) COMPUTE KEFF AND PERFORM CRITICALITY SEARCHES ON TIME ABSORPTION, REACTOR COMPOSITION, AND REACTOR DIMENSIONS BY MEANS OF EITHER A FLUX OR AN ADJOINT MODEL,
(B) COMPUTE MATERIAL BURNUP USING A FLEXIBLE MATERIAL SHUFFLING SCHEME, AND
(C) COMPUTE FLUX DISTRIBUTIONS FOR AN ARBITRARY EXTRANEOUS SOURCE.

576 GEM GEM IS USED TO PREDICT FUEL CYCLE COSTS FOR ANY TYPE NUCLEAR SYSTEM (I.E., BWR, HTGR, PWR, LMFBR, GCFR, . . .). THE CURRENT VERSION IS LIMITED TO THERMAL REACTORS. GEM IS DESIGNED FOR PRODUCTION USE BY LARGE UTILITIES WHICH HAVE SEVERAL REACTOR TYPES ON THEIR SYSTEM. GEM HAS BEEN WRITTEN SO AS TO ACCOMMODATE ALL MAJOR FUEL MANAGEMENT ACTIVITIES UNDERTAKEN BY A UTILITY -

(1) FUEL BID ANALYSIS,
(2) EVALUATION OF ACTUAL DAY TO DAY OPERATION, AND
(3) SYSTEM SIMULATION AND OPTIMIZATION STUDIES.

579 DWARF DWARF ALLOWS ONE-DIMENSIONAL SIMULATION OF REACTOR BURNUP AND XENON OSCILLATION PROBLEMS IN SLAB, CYLINDRICAL, OR SPHERICAL GEOMETRY USING A FEW-GROUP DIFFUSION THEORY MODEL.

D. DEPLETION, FUEL MANAGEMENT, COST ANALYSIS, AND REACTOR ECONOMICS 3/74

588 ORCOST ORCOST ESTIMATES DIRECT AND INDIRECT CAPITAL COSTS OF NUCLEAR AND FOSSIL-FUELED STEAM-ELECTRIC POWER PLANTS. THE COSTS ARE CALCULATED USING BASE COST MODELS WHICH ARE INCLUDED IN THE PROGRAM FOR EACH OF THE FOLLOWING TYPES OF PLANTS - PWR, BWR, COAL, GAS, AND OIL.

121 AIREK3 AIREK3 FINDS THE NUMERICAL SOLUTION TO THE SPACE INDEPENDENT REACTOR KINETICS EQUATIONS BASED ON THE METHOD DEVELOPED BY E. R. COHEN. INPUT AND OUTPUT ARE SIMPLIFIED AND THE POWER, INVERSE PERIOD, FEEDBACKS, AND PRECURSORS ARE DISPLAYED GRAPHICALLY.

122 SNAPKIN5/SNAPKIN-5A SNAPKIN5 PROVIDES A ONE-REGION TIME-DEPENDENT CALCULATION OF POWER, ENERGY, TEMPERATURE, REACTIVITY, INVERSE PERIOD, AND HYDROGEN LOSS IN A SNAP REACTOR AFTER A PERTURBATION FROM GIVEN INITIAL CONDITIONS. SNAPKIN-5A, IN ADDITION, WEIGHTS POWER, HEAT CAPACITY, AND REACTIVITY IMPORTANCE FOR TWENTY-FIVE OR FEWER REGIONS.

135 TRAFICORPORATION, COMPLEX TRAN EXPERIMENTAL FREQUENCY RESPONSE DATA OBTAINED FROM A LINEAR DYNAMIC SYSTEM IS PROCESSED TO OBTAIN THE TRANSFER FUNCTION AS A RATIO OF TWO FREQUENCY-DEPENDENT POLYNOMIALS. THE TRANSFER FUNCTION MAY HAVE NON-MINIMUM PHASE.

163 AIROS AIROS SOLVES THE SPACE-INDEPENDENT REACTOR KINETICS EQUATIONS AND PROVIDES FOR THE DETERMINATION OF REACTIVITY BY SOLVING IN ADDITION THE DISCRETIZED EQUATIONS WHICH REPRESENT THE SPATIAL HEAT AND MASS TRANSFER MODEL FOR SEVERAL FUEL CHANNELS. IN ADDITION, VARIATION OF THE FILM COEFFICIENT WITH FLOW IS ACCOUNTED FOR AS WELL AS THE PROVISION FOR FLOW DECAY AND AFTERGLOW HEATING. SCRAMS CAN BE INITIATED BY DELAYED SIGNALS FROM INSTRUMENTS WHICH SENSE ANY QUANTITY CALCULATED, E.G., POWER, INVERSE PERIOD OR TEMPERATURE. GENERALIZED FEEDBACK EQUATIONS ARE USED TO PROVIDE FLEXIBILITY IN THE MODELS THAT REPRESENT MULTICHANNEL HEAT TRANSFER INCLUDING CONDUCTION AND CONVECTION, ENERGY, PRESSURE AND OTHER PHENOMENON. THE REACTIVITY EQUATION IS ALSO GENERALIZED. THE REACTIVITY FEEDBACK COEFFICIENTS CAN BE CONSTANT OR VARY AS THE SQUARE ROOT OR RECIPROCAL OF TEMPERATURE. FURTHERMORE ANY FEEDBACK VARIABLE CAN BE USED TO INITIATE A REACTIVITY SCRAM, EACH WITH A UNIQUE DELAY TIME.

168 INVERSE KINETICS (R102) GIVEN THE SPACE-INDEPENDENT, ONE ENERGY GROUP REACTOR KINETICS EQUATIONS AND THE INITIAL CONDITIONS, THIS PROGRAM DETERMINES THE TIME VARIATION OF REACTIVITY REQUIRED TO PRODUCE THE GIVEN INPUT OF FLUX-TIME DATA.

188 CMPXMAT A SYSTEM OR N LINEAR EQUATIONS DERIVED FROM THE LAPLACE TRANSFORM OF A SET OF LINEARIZED DIFFERENTIAL EQUATIONS IS SOLVED FOR AMPLITUDE AND PHASE ANGLE AS A FUNCTION OF FREQUENCY.

255 R101 R101 SOLVES THE SPACE-INDEPENDENT, ONE-ENERGY GROUP REACTOR KINETICS EQUATIONS TO DETERMINE THE TIME VARIATION OF NEUTRON DENSITY GIVEN SPECIFIED INITIAL CONDITIONS. ANY OF FOUR PROGRAMMED REPRESENTATIONS OF EXCESS REACTIVITY CAN BE SELECTED.

290 GASA (GENERAL ATOMIC STABILITY GASA DETERMINES THE STABILITY OF ANY PHYSICAL SYSTEM WHOSE MOTION IS DESCRIBABLE BY A SET OF FIRST-ORDER LINEAR DIFFERENTIAL EQUATIONS. IN PARTICULAR GASA EVALUATES THE STABILITY OF A REACTOR DESCRIBED BY THE LINEAR REACTOR KINETICS EQUATIONS WITH TEMPERATURE FEEDBACK, AGAINST PERTURBATIONS ABOUT ANY OPERATING POWER LEVEL. THE PROGRAM WILL ALSO CALCULATE AND PLOT THE TRANSFER FUNCTION BETWEEN ANY STATE VARIABLE OF THE SYSTEM AND A GIVEN EXTERNAL FORCING FUNCTION (SUCH AS AN EXTERNAL REACTIVITY PERTURBATION) OR ANOTHER STATE VARIABLE OF THE SYSTEM.

303 BLOOST6 BLOOST6 COMBINES A REACTOR SPACE-INDEPENDENT KINETICS CODE WITH A TWO-DIMENSIONAL HEAT TRANSFER CODE, AND A TIME-DEPENDENT SPHERICAL GEOMETRY HEAT TRANSFER ROUTINE FOR FUEL PARTICLES. THE CODE IS APPLICABLE TO PROBLEMS FOR WHICH THE SPACE-INDEPENDENT FORM OF THE REACTOR KINETICS EQUATION IS APPLICABLE.

317 GAPOTKIN GAPOTKIN IS A POINT KINETICS CODE THAT SOLVES THE SPACE-INDEPENDENT KINETICS EQUATIONS FOR A VERY GENERAL FORM OF THE REACTIVITY FUNCTION.

326 AIROS2A AIROS2A SOLVES THE SPACE-INDEPENDENT REACTOR KINETICS EQUATIONS AND PROVIDES FOR THE DETERMINATION OF REACTIVITY BY SOLVING IN ADDITION THE DISCRETIZED EQUATIONS THAT REPRESENT THE SPATIAL HEAT AND MASS TRANSFER MODEL FOR SEVERAL FUEL CHANNELS. IN ADDITION, VARIATION OF THE FILM COEFFICIENT WITH FLOW IS ACCOUNTED FOR ALONG WITH THE PROVISION FOR FLOW DECAY AND AFTERGLOW HEATING. SCRAMS CAN BE INITIATED BY DELAYED SIGNALS FROM INSTRUMENTS THAT SENSE ANY QUANTITY CALCULATED, E.G., POWER, INVERSE PERIOD OR TEMPERATURE. GENERALIZED FEEDBACK EQUATIONS ARE USED TO PROVIDE FLEXIBILITY IN THE MODELS THAT REPRESENT MULTICHANNEL HEAT TRANSFER INCLUDING CONDUCTION AND CONVECTION, ENERGY, PRESSURE AND OTHER PHENOMENON SUCH AS FUEL MELTING, COOLANT BOILING AND VOIDING BURN-OUT. THE REACTIVITY EQUATION IS ALSO GENERALIZED. THE REACTIVITY FEEDBACK COEFFICIENTS CAN BE CONSTANT OR VARY AS THE SQUARE ROOT OR RECIPROCAL OF TEMPERATURE. FURTHERMORE, ANY FEEDBACK VARIABLE CAN BE USED TO INITIATE A REACTIVITY SCRAM, EACH WITH A UNIQUE DELAY TIME. AN INPUT GENERATOR COMPUTES THE CONDUCTION AND CONVECTION COEFFICIENTS FOR AN N X M NODAL, MULTICHANNEL SYSTEM USING BUILT-IN TABLES OF SPECIFIC HEAT, DENSITY, CONDUCTIVITY AND VISCOSITY FOR THE COMMON FUEL, STRUCTURE AND COOLANT MATERIALS, AND PERFORMS AN INITIAL TEMPERATURE CALCULATION. THE FILM COEFFICIENTS MAY BE SPECIFIED OR CALCULATED USING LYONS EQUATION OR THE DITTUS-BOELTER EQUATION.

363 BLAST BLAST HAS BEEN DEVELOPED TO STUDY ACCIDENT CONDITIONS IN CRITICAL AND SUBCRITICAL THERMAL MULTIPLYING SYSTEMS. THE PROGRAMME COMPUTES THE TIME BEHAVIOUR OF THE THERMAL NEUTRON DENSITY AND THE SYSTEM TEMPERATURE FOLLOWING A STEP CHANGE IN REACTIVITY. THE INTEGRATED THERMAL NEUTRON DENSITY IS ALSO COMPUTED, FROM WHICH THE TOTAL NUMBER OF FISSIONS DURING AN EXCURSION MAY BE OBTAINED.

486 ANCON ANCON SOLVES THE POINT-REACTOR KINETIC EQUATIONS INCLUDING THERMAL FEEDBACK. LUMP-TYPE HEAT BALANCE EQUATIONS ARE USED TO REPRESENT THE THERMODYNAMICS, AND THE HEAT CAPACITY OF EACH LUMP CAN VARY WITH TEMPERATURE. THERMAL FEEDBACK CAN BE EITHER A LINEAR OR A NON-LINEAR FUNCTION OF LUMP TEMPERATURE, AND THE IMPRESSED REACTIVITY CAN BE EITHER A POLYNOMIAL OR SINUSOIDAL FUNCTION.

489 TRIFIDO THE CODE CALCULATES THE DECAY CONSTANT AND THE POPULATION OF THE FUNDAMENTAL PROMPT NEUTRON MODE EXTRAPOLATED TO INITIAL TIME, USING PULSED NEUTRON EXPERIMENTAL DATA. THESE DATA ARE THE RESULTING TIME PROFILE OF THE NEUTRON DENSITY OF A SUBCRITICAL MULTIPLICATIVE ASSEMBLY WHICH IS REPETITIVELY PULSED WITH SHORT BURSTS OF NEUTRONS. THE TIME PROFILE IS MEASURED WITH AN APPROPRIATE DETECTOR AND RECORDED WITH A TIME ANALYSER. WITH THE CALCULATED PARAMETERS THE CODE DETERMINES THE VALUES OF (K*BETA)/L AND REACTIVITY BY MEANS OF THE GARELIS-RUSSELL METHOD, AND REACTIVITIES USING THE GOZANI AND SJOSTRAND METHODS.

491 MOD5 MOD5 CALCULATES THE TIME- AND ENERGY-DEPENDENT EVOLUTION OF THE NEUTRON DENSITY IN HOMOGENEOUS MEDIA FOLLOWING INITIATION OF A) A MONOENERGETIC SOURCE DISTRIBUTED OVER A FINITE TIME INTERVAL, OR B) A SOURCE OF ARBITRARY SPECTRUM WITH A DELTA-FUNCTION DISTRIBUTION IN TIME. EFFECTIVELY THE CODE PRODUCES GREENS FUNCTION SOLUTIONS TO THE SLOWING-DOWN EQUATION IN DISCRETE NUMERICAL FORM. LEAKAGE IS TREATED IN THE DIFFUSION APPROXIMATION. THE PROGRAM A) CALCULATES SPECTRA AND ENERGY MOMENTS AT SELECTED TIMES FOLLOWING THE BURST OF SOURCE NEUTRONS, B) EVALUATES THE TIME-DEPENDENT NEUTRON DENSITY AND SLOWING-DOWN DENSITY AT SELECTED ENERGIES AND COMPUTES MOMENTS OF THESE DENSITIES, C) CALCULATES TIME-DEPENDENT DISTRIBUTIONS OF CAPTURE, LEAKAGE AND FIRST FISSION, AND MOMENTS OF THESE DISTRIBUTIONS, D) CALCULATES STEADY-STATE CENTRAL CORE NEUTRON FLUX AND LEAKAGE FLUX IN DETAIL AND IN GROUP-AVERAGED FORM, AND E) CALCULATES PARAMETERS SUCH AS KEFF.

558 TASK TASK SOLVES THE ONE-DIMENSIONAL MULTIGROUP FORM OF THE REACTOR KINETICS EQUATIONS, USING EITHER TRANSPORT OR DIFFUSION THEORY AND ALLOWING AN ARBITRARY NUMBER OF DELAYED NEUTRON GROUPS. THE PROGRAM CAN ALSO BE USED TO SOLVE STANDARD STATIC PROBLEMS EFFICIENTLY SUCH AS EIGENVALUE PROBLEMS, DISTRIBUTED SOURCE PROBLEMS, AND BOUNDARY SOURCE PROBLEMS. CONVERGENCE PROBLEMS ASSOCIATED WITH SOURCES IN HIGHLY MULTIPLICATIVE MEDIA ARE CIRCUMVENTED, AND SUCH PROBLEMS ARE READILY CALCULABLE.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS 3/74

102 AX1 AX1 PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION. GIVEN A SPHERICALLY SYMMETRIC, SUPERPROMPT CRITICAL SYSTEM, THE PROGRAM COMPUTES THE VARIATION IN TIME AND SPACE OF THE SPECIFIC ENERGY, TEMPERATURE, PRESSURE, DENSITY AND VELOCITY.

129 CONEC CONEC IS A COUPLED NEUTRONIC-ELASTICITY CODE DESIGNED FOR APPLICATION TO PULSED FAST REACTOR SYSTEMS. IT IS A ONE-DIMENSIONAL CALCULATION, CAPABLE OF DEALING WITH SOLID SPHERES OR SPHERICAL SHELLS. SPECIFICALLY, CONEC CALCULATES THE ALPHA OF A SYSTEM, THE TEMPERATURE DISTRIBUTION, THE RADIAL AND TANGENTIAL STRESS DISTRIBUTIONS, AND FROM THESE THE ACCELERATIONS, VELOCITIES, AND DISPLACEMENTS THROUGHOUT THE SYSTEM.

145 WEAK EXPLOSION PROGRAM THIS PROGRAM PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION FOR A SPHERICALLY SYMMETRIC REACTOR CORE WITH A GIVEN COMPOSITION TO OBTAIN THE TIME-DEPENDENT ENERGY RELEASE THAT RESULTS FROM THE INSERTION OF REACTIVITY AT A GIVEN RATE. THE BASIC USE FOR THIS PROGRAM IS FOUND IN ANALYSIS OF FAST REACTOR CORE COLLAPSE ACCIDENTS.

153 HATCHET HATCHET IS A MAJOR MODIFICATION OF THE AX1 CODE DESIGNED TO STUDY BURST CHARACTERISTICS OF A SUPERPROMPT CRITICAL, CONCENTRIC SHELL, PULSED REACTOR. IT COMPUTES SPECIFIC ENERGY, TEMPERATURE, PRESSURE, DENSITY AND VELOCITY VARIATIONS AS A FUNCTION OF TIME AND SPACE. THE CODE ALSO COMPUTES REACTIVITY AS A FUNCTION OF INVERSE REACTOR PERIOD, POWER, THE TOTAL AND KINETIC ENERGIES, AND THE POSITION OF THE SHELLS WHICH COMPRISE THE SYSTEM.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS

174 FORE/FORE2 FORE CALCULATES REACTOR POWER AND TEMPERATURES OF FUEL, COOLANT, CLAD, AND STRUCTURE AS FUNCTIONS OF TIME IN RESPONSE TO A PROGRAMMED REACTIVITY INSERTION SPECIFIED AS A SERIES OF RAMPS. TEMPERATURE PROFILES ARE COMPUTED AT SPECIFIED AXIAL POSITIONS FOR AN AVERAGE CHANNEL AND FOR THE PEAK POWER (CENTRAL) CHANNEL. THE HEAT OF FUSION ACCOMPANYING FUEL MELTING IS TAKEN INTO ACCOUNT. FEEDBACK REACTIVITY MECHANISMS THAT RESPOND TO CHANGES OF TEMPERATURES INCLUDE THE FUEL DOPPLER EFFECT AND THERMAL EXPANSION OF THE CORE (AND AXIAL BLANKET OR REFLECTOR) MATERIALS. FORE2 IS A COUPLED THERMAL HYDRAULICS-POINT KINETICS DIGITAL COMPUTER CODE DESIGNED TO CALCULATE SIGNIFICANT REACTOR PARAMETERS UNDER STEADY-STATE CONDITIONS, OR AS FUNCTIONS OF TIME DURING TRANSIENTS. THE TRANSIENTS MAY RESULT FROM A PROGRAMMED REACTIVITY INSERTION OR A POWER CHANGE. VARIABLE INLET COOLANT FLOW RATE AND TEMPERATURE ARE CONSIDERED. THE CODE CALCULATES THE REACTOR POWER, THE INDIVIDUAL REACTIVITY FEEDBACKS, AND THE TEMPERATURE OF COOLANT, CLADDING, FUEL, STRUCTURE, AND ADDITIONAL MATERIAL FOR UP TO SEVEN AXIAL POSITIONS IN THREE CHANNEL TYPES WHICH REPRESENT RADIAL ZONES OF THE REACTOR. THE HEAT OF FUSION ACCOMPANYING FUEL MELTING, THE LIQUID METAL VOIDING REACTIVITY, AND THE SPATIAL AND THE TIME VARIATION OF THE FUEL CLADDING GAP COEFFICIENT DUE TO CHANGES IN GAP SIZE ARE CONSIDERED.

191 AX-TNT AX-TNT SOLVES

(A) THE COUPLED HYDRODYNAMIC, THERMODYNAMIC AND NEUTRONIC EQUATIONS WHICH DESCRIBE A SPHERICAL, SUPER-PROMPT CRITICAL REACTOR SYSTEM DURING AN EXCURSION,

(B) THE COUPLED EQUATIONS OF MOTION, AND IDEAL GAS EQUATION OF STATE FOR THE DETONATION OF A SPHERICAL CHARGE IN A GAS.

274 WIGL2 WIGL2 IS A ONE-DIMENSIONAL TWO-GROUP SPACE-TIME DIFFUSION THEORY PROGRAM WITH ZERO, ONE, OR SIX DELAYED NEUTRON GROUPS. THE PROGRAM WILL TREAT SLAB, CYLINDRICAL, AND SPHERICAL GEOMETRIES AND INCLUDES NON-BOILING HEAT TRANSFER. IT ACCOUNTS FOR XENON FEEDBACK AND FEEDBACK EFFECTS DUE TO FUEL AND COOLANT TEMPERATURE. CONTROL ROD MOTION AND CONTROL SYSTEM FEEDBACK BASED ON TOTAL CORE POWER OR OUTLET COOLANT TEMPERATURE CAN BE SIMULATED. TRANSIENTS MAY BE EXCITED BY PRESCRIBED CHANGES IN INLET COOLANT TEMPERATURE, COOLANT FLOW RATE, OR ROD POSITION.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS 3/74

293 MARS MARS PERFORMS A COUPLED NEUTRONICS-HYDRODYNAMICS CALCULATION FOR A FINITE CYLINDER CORE WITH CONCENTRIC REGIONS OF DIFFERENT COMPOSITIONS AND CHARACTERISTICS TO OBTAIN THE TIME-DEPENDENT ENERGY RELEASE THAT RESULTS FROM THE INSERTION OF REACTIVITY ACCORDING TO A PRESCRIBED PROGRAM. THE BASIC USE FOR THIS PROGRAM IS FOUND IN ANALYSIS OF FAST REACTOR CORE COLLAPSE ACCIDENTS. THE REACTIVITY CHANGES DUE TO MATERIAL DISPLACEMENT IS DETERMINED BY THE USE OF PERTURBATION THEORY AND THE PRESSURE GENERATION FOR THE HYDRODYNAMICS CALCULATION IS DETERMINED BY THE THE USE OF AN EXPONENTIAL FORM FOR THE SATURATED VAPOR PRESSURE CURVE. THE DOPPLER EFFECT IS DETERMINED BY THE USE OF A FLEXIBLE T**(-N) FORM WHERE N IS A PARAMETER THAT IS SPECIFIED AT THE TIME OF EXECUTION. THE EXTERNAL REACTIVITY INSERTION CAN BE IN THE FORM OF A STEP, A LINEAR RAMP OR A PARABOLIC RAMP, WITH A LIMIT ON THE AMOUNT OF REACTIVITY WHICH CAN BE INSERTED BEING A DEFINABLE QUANTITY. TABULATED VALUES OF THE POWER AND MATERIAL WORTH DISTRIBUTIONS ARE ACCEPTED AS INPUT. THE CHARACTERISTICS OF EACH REGION (DENSITY, SPECIFIC HEAT, DOPPLER COEFFICIENT, EQUATION OF STATE, GEOMETRIC LIMITS) ARE SPECIFIED INDEPENDENTLY FOR EACH REGION TO PROVIDE FLEXIBILITY IN THE TREATMENT OF CORES OF UNUSUAL CONFIGURATION. THE NEUTRON KINETICS CALCULATIONS ARE DONE WITH A POINT REACTOR MODEL AND DELAYED NEUTRONS ARE USED.

309 TSN THE TIME-DEPENDENT NEUTRON TRANSPORT EQUATION IS SOLVED. ENERGY DEPOSITION IS ALLOWED TO CAUSE VARIATION IN THE NEUTRON CROSS SECTIONS FOR THE CORE REGION, IN THE CORE DENSITY, AND IN CORE HEIGHT. THE RESULT IS A KINETICS CALCULATION INCLUDING SPATIAL DEPENDENCE BOTH IN FEEDBACK EFFECTS AND IN NEUTRON DENSITY. THE RESULTS ARE SUMMARIZED IN A MANNER SIMILAR TO POINT-KINETICS CODES, AND SPATIAL DISTRIBUTIONS ARE ALSO GIVEN. GRAPHICAL SUMMARIES OF THE SIGNIFICANT VARIABLES AND SPATIAL DISTRIBUTIONS ARE GIVEN. IN THE IBM360 VERSION, EITHER THE NEUTRON YIELD FROM FISSION OR THE THICKNESS OF A SPECIFIED ZONE CAN BE CHANGED AS AN INDEPENDENT FUNCTION OF TIME AS SPECIFIED BY THE USER. THIS PROVIDES TWO WAYS OF ALLOWING EXPLICIT REACTIVITY VARIATION WITH TIME.

310 GAKIN THE MULTIGROUP, 1-DIMENSIONAL TIME-DEPENDENT DIFFUSION THEORY EQUATIONS ARE SOLVED IN SLAB, CYLINDRICAL OR SPHERICAL GEOMETRY WITH DELAYED NEUTRONS TAKEN INTO ACCOUNT. AN ARBITRARY SCATTERING MATRIX IS ALLOWED, TOGETHER WITH A PIECE-WISE, LINEAR, TIME-DEPENDENT, INHOMOGENEOUS SOURCE TERM. FEEDBACK IS AVAILABLE FROM TIME-DEPENDENT CROSS SECTION CHANGES AND BUILDUP IN XENON. THE TIME INTEGRATION IS DIVIDED INTO TIME ZONES WITH UNIQUE FEEDBACK AND SOURCE DATA FOR EACH ZONE.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS 3/74

338 TWIGL/TWIGGLE TWIGL SOLVES THE TWO-DIMENSIONAL, TWO-GROUP, SPACE-TIME NEUTRON DIFFUSION EQUATIONS IN RECTANGULAR OR CYLINDRICAL GEOMETRY IN THE PRESENCE OF TEMPERATURE FEEDBACK. THE NEUTRON DIFFUSION AND DELAYED PRECURSOR EQUATIONS ARE DIFFERENCED IN BOTH SPACE AND TIME. THE THERMAL-HYDRAULIC DESCRIPTION IS BASED ON A NO-BOILING, ONE-PASS MODEL FORMULATED IN TERMS OF REGIONWISE-AVERAGED COOLANT AND FUEL METAL TEMPERATURES.

352 RAUMZEIT RAUMZEIT SOLVES SYSTEMS OF ONE-DIMENSIONAL, TIME-DEPENDENT, MULTIGROUP DIFFUSION-TYPE EQUATIONS USING EITHER OF TWO TREATMENTS OF THE TIME DEPENDENCE, FINITE DIFFERENCING OR THE TIME-INTEGRATED APPROACH (SEE REFERENCE 2).

370 GAKIT GAKIT SOLVES THE MULTIGROUP, ONE-DIMENSIONAL, TIME-DEPENDENT DIFFUSION THEORY KINETICS EQUATIONS INCLUDING DELAYED NEUTRON EFFECTS AND TEMPERATURE FEEDBACK BASED ON TWO-DIMENSIONAL HEAT TRANSFER CALCULATIONS. FOR THE ONE-DIMENSIONAL MULTIGROUP KINETICS EQUATIONS AN ARBITRARY SCATTERING MATRIX AND ARBITRARY FISSION TRANSFER ARE ALLOWED, AND PLANE, CYLINDRICAL, OR SPHERICAL GEOMETRY MIGHT BE USED. A PIECEWISE LINEAR TIME-DEPENDENT INHOMOGENEOUS SOURCE CAN BE SPECIFIED. FEEDBACK IS AVAILABLE FROM XENON BUILDUP AND TEMPERATURE DEPENDENCE OF CROSS SECTIONS. THE HEAT TRANSFER CALCULATION IS PERFORMED FOR TWO-DIMENSIONAL R-Z FUEL ELEMENT MODELS ASSUMING PREDETERMINED AXIAL POWER SHAPE FUNCTIONS AND TIME-DEPENDENT POWER AMPLITUDES OBTAINED FROM THE ONE-DIMENSIONAL KINETICS CALCULATIONS. FOR THE FUEL ELEMENTS AVERAGE FUEL AND MODERATOR TEMPERATURES ARE CALCULATED WHICH DETERMINE, BASED ON TABLES, THE TEMPERATURE-DEPENDENT CROSS SECTIONS. TRANSIENTS MAY BE INTRODUCED BY STEP CHANGES OF CROSS SECTIONS, BY PIECEWISE LINEAR TIME-DEPENDENT CROSS SECTIONS (ROD WITHDRAWAL ACCIDENTS), BY STEP CHANGES OF THE FLOW RATES OR BY STEP CHANGES OF THE COOLANT INLET TEMPERATURES.

371 NOWIG NOWIG IS USED TO SOLVE THE ONE-DIMENSIONAL TWO-GROUP NEUTRON DIFFUSION AND DELAYED PRECURSOR EQUATIONS USING A SHAPE-SPECIFIED POINT KINETICS APPROXIMATION. FEEDBACK DUE TO CHANGES IN THE FUEL METAL TEMPERATURE AND COOLANT DENSITY IS ACCOUNTED FOR BY USING A MODEL WHICH IS IDENTICAL WITH THAT USED IN THE WIGL2 (ACC ABSTRACT 274) PROGRAM.

389 STINT3 STINT3 SOLVES STATIC (EIGENVALUE) AND TIME-DEPENDENT SYSTEMS OF COUPLED, ONE-DIMENSIONAL, DIFFUSION TYPE EQUATIONS IN SLAB GEOMETRY AND IS PRIMARILY INTENDED FOR SOLVING SINGLE-CHANNEL, FLUX-SYNTHESIS EQUATIONS. THE CODE PROVIDES FOR CONTROL ROD MOTION AND TEMPERATURE FEEDBACK.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS 3/74

400 SAS1A SAS1A IS USED FOR THE ANALYSIS OF FAST REACTOR POWER AND FLOW TRANSIENTS. THE PROGRAM CONSISTS OF FOUR DRIVER PROGRAMS EACH CALLED BY THE MAIN PROGRAM. THESE DRIVERS HANDLE THE AREAS OF (1) INPUT/OUTPUT, WITH DIAGNOSTICS, (2) STEADY-STATE INITIALIZATION, TO DEFINE THE CORE OPERATING CONDITIONS BEFORE THE INITIATION OF THE TRANSIENT, (3) THE TRANSIENT PORTION, AND (4) THE DISASSEMBLY (WEAK EXPLOSION) ANALYSIS.

405 NOAH NOAH SOLVES THE ONE-DIMENSIONAL, ONE-GROUP SPACE-TIME DIFFUSION EQUATION ACCOUNTING FOR THE EFFECTS OF FUEL, CLAD, AND COOLANT TEMPERATURES (OR BY CHANGING SUBROUTINES FUEL, COOLANT, AND SOLID MODERATOR TEMPERATURES) ON FISSION AND ABSORPTION CROSS SECTIONS, AND ON THE DIFFUSION COEFFICIENT AND THE TRANSVERSE BUCKLING. IT CAN ACCOUNT FOR THE EFFECTS OF XENON-IODINE FEEDBACK. IF DESIRED, IT WILL DETERMINE LONG-TIME XENON-FLUX BEHAVIOR ASSUMING THE TEMPERATURES TO BE IN QUASI-STATIC EQUILIBRIUM. NUMEROUS METHODS OF PERTURBATION ARE ALLOWED AND CONTROL OF THE TRANSIENT IS ALSO PROVIDED.

415 CEXE/INCEXE CEXE SOLVES THE THREE-DIMENSIONAL XYZ TIME-DEPENDENT XENON SPATIAL OSCILLATION PROBLEM USING A MODIFIED ONE ENERGY GROUP THEORY AND A NODAL REPRESENTATION.

474 QX1 QX1 SOLVES THE MULTIGROUP, ONE-DIMENSIONAL, TIME-DEPENDENT DIFFUSION EQUATIONS. PROBLEM GEOMETRY MAY BE PLANE, CYLINDRICAL, OR SPHERICAL. STEADY-STATE INITIAL CONDITIONS MAY BE ESTABLISHED EITHER FOR A SOURCE-FREE SYSTEM OR FOR A SYSTEM WITH AN EXTERNAL NEUTRON SOURCE. THE REACTOR MAY BE PERTURBED BY CHANGING MATERIAL VOLUME FRACTIONS AND/OR TEMPERATURES OR BY CHANGING THE NEUTRON SOURCE LEVEL. A FIRST-COLLISION PULSED SOURCE DISTRIBUTION MAY BE SPECIFIED. RESONANCE ABSORPTION FEEDBACK IS CALCULATED BY GROUPWISE INTERPOLATION IN A CROSS-SECTION VERSUS TEMPERATURE TABLE. A HIGHLY SIMPLIFIED FUEL TEMPERATURE MODEL IS INCLUDED.

488 NOISY1 AUTO- AND CROSS-SPECTRAL DENSITY FUNCTIONS ARE CALCULATED FOR NEUTRON FLUCTUATIONS IN NUCLEAR REACTORS. THE CALCULATIONS ARE POINT-WISE, SPACE-DEPENDENT IN CUBICAL REACTORS WHICH ARE HOMOGENEOUS AND BARE. EITHER NEUTRON FLUCTUATIONS OR THE FLUCTUATIONS SEEN BY A NEUTRON DETECTOR CAN BE SPECIFIED. FLUCTUATIONS BETWEEN EITHER TWO POINTS OR BETWEEN TWO FINITE REGIONS CAN BE CONSIDERED. THE FINITE REGIONS OR SIMULATED DETECTORS MUST EITHER FULLY OVERLAP OR NOT OVERLAP AND ARE RESTRICTED IN SHAPE TO RECTANGULAR PARALLELEPIPEDS.

F. SPACE-TIME KINETICS, COUPLED NEUTRONICS-HYDRODYNAMICS-THERMODYNAMICS AND EXCURSION SIMULATIONS 3/74

494 ADEP THE TIME-DEPENDENT FEW-GROUP NEUTRON DIFFUSION EQUATIONS ARE SOLVED IN ONE OR TWO DIMENSIONS. LUMPED PARAMETER THERMAL-HYDRAULIC EQUATIONS ARE USED TO CALCULATE FEEDBACK.

511 VENUS VENUS COMPUTES THE POWER, ENERGY RELEASE AND SPACE-TIME (R-Z GEOMETRY) HISTORY OF THE TEMPERATURE, PRESSURE, DENSITY AND MATERIAL MOTION OF AN LMFBR DURING A DISASSEMBLY EXCURSION. REACTIVITY FEEDBACK DUE TO DOPPLER BROADENING AND MOTION OF THE REACTOR MATERIAL IS TAKEN INTO ACCOUNT.

550 REXCO-H (RELEASE 1) REXCO-H CALCULATES THE TWO-DIMENSIONAL HYDRODYNAMIC RESPONSE OF PRIMARY REACTOR CONTAINMENT TO A HIGH-ENERGY EXCURSION.

47 CLOUD THE CLOUD PROGRAM CALCULATES THE EXTERNAL GAMMA-RAY DOSE RATE AND TOTAL INTEGRATED DOSE RESULTING FROM THE CONTINUOUS RELEASE OF RADIOACTIVE MATERIALS TO THE ATMOSPHERE.

172 AISITE2/R153 AISITE2 IS LARGELY BASED ON METHODS PROPOSED BY THE AEC IN TID-14844 BUT DIFFERS IN CERTAIN OF THE ASSUMPTIONS AND MODELS. THE CODE AUTOMATICALLY VARIES ANY ONE OF 46 PARAMETERS SUCH AS REACTOR POWER, BUILDING LEAK RATE, IODINE CLEAN-UP RATE, AND HALOGEN FILTER EFFICIENCY, COMPUTING THE EXCLUSION AREA, AND LOW POPULATION BOUNDARY ZONES AS FUNCTIONS OF THAT PARAMETER. THE EDIT INCLUDES DOSE VS. DISTANCE DATA, FRACTIONAL CONTRIBUTION BY ISOTOPE GROUP TO THE INHALATION DOSE, AND CRITICAL DISTANCES PROVIDING BOTH PRINTED AND GRAPHICAL DATA. THREE MODELS ARE AVAILABLE FOR FISSION PRODUCT RELEASE WITH UP TO 4 LEVELS OF CONTAINMENT.

196 CURIE/DOSE/THUNDERHEAD CURIE CALCULATES THE FISSION PRODUCT INVENTORY PRODUCED IN A REACTOR DURING CONSTANT POWER OPERATION AND RELEASES DIFFERENT PERCENTAGES OF THE NOBLE GASES, HALOGENS, AND PARTICULATES TO THE ATMOSPHERE AT REACTOR SHUTDOWN. DOSE CALCULATES THE TOTAL DOSE TO 13 INTERNAL BODY ORGANS RESULTING FROM INHALATION OF THE PASSING RADIOACTIVE CLOUD. THUNDERHEAD CALCULATES THE EXTERNAL CLOUD GAMMA EXPOSURE DOSE FROM THE RELEASED FISSION PRODUCTS.

200 SATURATED BLOWDOWN2 CALCULATION OF LOCAL PRESSURES, MASS FLOW RATES, FLUID QUALITIES, SPECIFIC VOLUMES, TEMPERATURES AND LOCAL HEAT TRANSFER COEFFICIENTS AT WETTED WALLS, DURING BLOWDOWN OF THE REACTOR PRIMARY COOLANT LOOP.

228 PRECON THE PURPOSE OF THE PROGRAM IS TO DETERMINE, FOR A GAS-COOLED REACTOR, THE CONTAINMENT PRESSURE AS A FUNCTION OF TIME, AFTER RUPTURES HAVE BEEN ASSUMED TO OCCUR IN THE PRIMARY SYSTEM OR IN CONJUNCTION WITH STEAM GENERATOR RUPTURES.

229 ELBOW DEFLECTIONS, RESTRAINT FORCES AND STRESSES ARE DETERMINED IN A FUEL ELEMENT SUBJECTED TO ASYMMETRIC POWER GENERATION, CIRCUMFERENTIALLY NON-UNIFORM COOLANT TEMPERATURE DISTRIBUTION, AND ASYMMETRIC FAST NEUTRON FLUX DAMAGE.

261 GADOSE/DOSET THE GADOSE PROGRAM CALCULATES RADIOACTIVITY AND DOSES RESULTING FROM INSTANTANEOUS ACCIDENTAL RELEASE OF ACTIVITY WHILE THE COMPANION PROGRAM DOSET INCLUDES THE EFFECTS OF A TIME-DEPENDENT ACCIDENTAL FISSION PRODUCT RELEASE FOR THE HTGR TYPE OF PLANT. GIVEN AN INITIAL FISSION PRODUCT INVENTORY RELEASED INTO A REACTOR VESSEL OR CONTAINMENT VOLUME, THE QUANTITY OF EACH ISOTOPE IS CALCULATED AT A NUMBER OF TIMES AT A NUMBER OF LOCATIONS (IN THE CONTAINMENT, CONTAINMENT RECIRCULATING CLEANUP FILTERS, LEAK COLLECTOR, PLANT EXHAUST FILTERS AND IN THE ATMOSPHERE AT A NUMBER OF DISTANCES FROM THE PLANT). EACH DECAY CHAIN IS CALCULATED SEPARATELY CONSIDERING BUILDUP AND DECAY OF EACH ISOTOPE. RADIOLOGICAL DOSES ARE CALCULATED FOR ANY THREE BODY ORGANS AND THE WHOLE BODY BASED ON METEOROLOGICAL AND PHYSIOLOGICAL INPUT PARAMETERS. FALLOUT AND RAINOUT ARE INCLUDED.

265 RSAC RSAC GENERATES A FISSION PRODUCT INVENTORY FROM A GIVEN SET OF REACTOR OPERATING CONDITIONS AND THEN COMPUTES THE EXTERNAL GAMMA DOSE, THE DEPOSITION GAMMA DOSE, AND/OR THE INHALATION-INGESTION DOSE TO CRITICAL BODY ORGANS AS A RESULT OF EXPOSURE TO THESE FISSION PRODUCTS. PROGRAM OUTPUT INCLUDES REACTOR OPERATING HISTORY, FISSION PRODUCT INVENTORY, DOSAGES, AND INGESTION PARAMETERS.

268 TRANS-FUGUE1 TRANS-FUGUE1 IS A TRANSIENT SINGLE CHANNEL, TWO-PHASE FLOW, AND HEAT TRANSFER CODE FOR ANALYSIS OF POSTULATED REACTOR INCIDENTS INVOLVING BOILING. THE CODE IS BASED ON A HOMOGENEOUS HYDRODYNAMIC MODEL WHICH ASSUMES EQUAL PHASE TEMPERATURES AND VELOCITIES. IT ASSUMES VAPOR GENERATION TO BE HEAT TRANSFER LIMITED ONLY, AND CALCULATES AXIAL DISTRIBUTION OF VELOCITY, VOID FRACTION, PRESSURE, COOLANT TEMPERATURE, AND FUEL TEMPERATURE. TRANSIENTS SIMULATING POWER EXCURSIONS, LOSS OF FLOW, LOSS OF PRESSURE AND CHANNEL PLUGGING CAN BE STUDIED.

278 WHAM/WATER-HAMMER WHAM IS USED TO CALCULATE PRESSURE, VELOCITY, AND FORCE TRANSIENTS IN THE LIQUID FILLED PIPING NETWORKS. IT CAN BE APPLIED TO MULTI-LOOP, COMPLEX PIPING NETWORKS CONSISTING OF ANY NUMBER OF DEAD ENDS, ELBOWS, ORIFICES, MULTIPLE BRANCH TEES, CHANGES OF FLOW PASSAGE CROSS SECTIONS, CHECK VALVES, PUMPS, PRESSURIZERS OR TANKS, AND EXIT VALVES. HYDRAULIC LOSSES ARE CONSIDERED. TRANSIENTS CAN BE INITIATED EITHER, BY CLOSURE OR BY OPENING OF ONE OR MORE EXIT VALVES (OR BY THE SYSTEM RUPTURE AT ONE OR MORE PLACES), OR BY A PRESCRIBED CHANGE IN THE TANK (OR PRESSURIZER) PRESSURE, OR BY THE PUMP POWER FAILURE. WHAM IS AN EXTENSION OF THE PROGRAM WATER-HAMMER. WATER-HAMMER ANALYZES HYDRAULIC TRANSIENTS IMPOSED BY THE SUDDEN DISCHARGE OF LIQUID FROM THE PRIMARY COOLANT LOOP, BEFORE ANY GENERATION OF VAPOR HAS TAKEN PLACE. EFFECTS OF HYDRAULIC LOSSES ARE NEGLECTED, THE LOOP PRESSURIZER IS ASSUMED TO REMAIN CONSTANT AT INITIAL PRESSURE AND THE PRESENCE OF A PUMP IS IGNORED. IT WAS DESIGNED FOR THE EARLY BLOWDOWN ANALYSIS FOR LOFT.

284 MO555(ACT1) THIS PROGRAM WILL PREDICT THE PRESSURE TRANSIENT IN THE CONTAINMENT VESSEL AS A FUNCTION OF TIME AS A RESULT OF A MAJOR RUPTURE IN THE PRIMARY SYSTEM OF A PRESSURIZED WATER REACTOR. MEANS ARE AVAILABLE FOR INTRODUCING WATER AND HEAT INTO THE CONTAINMENT VESSEL. THERE ARE ALSO PROVISIONS FOR SPECIFYING VARIOUS TYPES OF HEAT SINKS FOR ENERGY ABSORPTION. THE TEMPERATURE DISTRIBUTION IN THESE HEAT SINKS IS CALCULATED AS A FUNCTION OF TIME. DISCHARGE RATES OF THE CONTAINMENT MAY ALSO BE DETERMINED AS A FUNCTION OF BOTH TIME AND THE INTERNAL PRESSURE.

295 FLASH3 FLASH3 DETERMINES THE TRANSIENT RESPONSE OF A WATER-COOLED REACTOR TO A LOSS-OF-COOLANT ACCIDENT OR SEVERE VARIABLE PRESSURE OPERATION.

297 CONTEMPT THE CONTEMPT COMPUTER PROGRAM PREDICTS THE PRESSURE-TEMPERATURE RESPONSE OF A DRY WELL CONTAINMENT BUILDING TO A LOSS-OF-COOLANT ACCIDENT. THE CONTAINMENT VOLUME IS SEPARATED INTO A LIQUID REGION AND A VAPOR REGION. EACH REGION IS ASSUMED TO HAVE A UNIFORM TEMPERATURE BUT THE TEMPERATURE OF THE TWO REGIONS MAY BE DIFFERENT. THE CONTAINMENT BUILDING IS REPRESENTED AS CONSISTING OF SEVERAL HEAT CONDUCTING STRUCTURES WHOSE THERMAL BEHAVIOR CAN BE DESCRIBED BY THE ONE-DIMENSIONAL MULTIREGION HEAT CONDUCTION EQUATION. WATER AND ENERGY RATES FROM DISCHARGE OF COOLANT, THE BOILING OF RESIDUAL WATER BY REACTOR DECAY HEAT, THE SUPERHEATING OF STEAM PASSING THROUGH THE CORE, AND METAL-WATER REACTIONS ARE ASSUMED AVAILABLE FROM PREVIOUS CALCULATIONS AND ARE INPUT DATA TO CONTEMPT. PROGRAM OUTPUT INCLUDES CONTAINMENT VOLUME PRESSURE AND TEMPERATURES, TEMPERATURE THROUGH BUILDING STRUCTURES, AND THE AMOUNT OF WATER, VAPOR, AND ENERGY IN THE CONTAINMENT VOLUMES. THE PROGRAM ALSO CALCULATES BUILDING LEAKAGE AND THE EFFECTS OF ENGINEERED SAFEGUARD DEVICES SUCH AS WATER SPRAY AND FAN COOLER SYSTEMS.

328 NURLOC-1.0 NURLOC-1.0 PERFORMS CORE/PRESSURE VESSEL THERMAL ANALYSIS FOR A NUCLEAR REACTOR LOSS-OF-COOLANT ACCIDENT.

330 ECCSA4 ECCSA4 PREDICTS THE THERMAL AND HYDRAULIC BEHAVIOR OF A SINGLE FUEL ROD AND ITS ASSOCIATED CORE FLOW CHANNEL DURING A LOSS-OF-COOLANT ACCIDENT AND SUBSEQUENT EMERGENCY CORE COOLING INJECTION.

366 CHEMLOC2 CHEMLOC2 IS USED TO COMPUTE THE EXTENT OF CORE HEATING AND METAL-STEAM REACTION FOLLOWING A HYPOTHETICAL LOSS-OF-COOLANT ACCIDENT, INCLUDING EMERGENCY CORE-COOLING FAILURE, IN A WATER-COOLED REACTOR. THE PROGRAM INCLUDES THE EFFECTS OF HEAT PRODUCTION BY DECAY HEATING IN THE FUEL AS WELL AS BY STEAM-METAL CHEMICAL REACTION, HEAT TRANSFER FROM THE CORE TO THE BOTTOM AND TOP GRID-SUPPORT PLATES AND TO THE WALL SURROUNDING THE CORE, AND METHODS OF CALCULATING THE EFFECTS OF CORE MOVEMENT AND MATERIAL TRANSFER ON REACHING SLUMPING TEMPERATURE.

369 RELAP3 RELAP3 IS USED TO CALCULATE FLOWS, MASS INVENTORIES, PRESSURES, TEMPERATURES, REACTIVITIES, AND REACTOR POWER FOR THE PRIMARY SYSTEM OF A WATER REACTOR DURING SEVERE TRANSIENTS OR ACCIDENTS. THE SPECIFIC ACCIDENT FOR WHICH THE PROGRAM WAS WRITTEN IS THE LOSS-OF-COOLANT BUT OTHERS, SUCH AS LOSS-OF-PUMPING-POWER OR INSERTION-OF-REACTIVITY, CAN ALSO BE HANDLED. THE REACTOR PRIMARY SYSTEM CAN BE APPROXIMATED BY AN ARBITRARY NUMBER OF CONTROL VOLUMES, INTERCONNECTED IN AN ARBITRARY MANNER BY JUNCTIONS. ANY NUMBER OF VOLUMES CAN BE CHOSEN TO CONTAIN ENERGY SOURCES (CORE REGIONS) OR ENERGY SINKS (HEAT EXCHANGERS). ANY NUMBER OF JUNCTIONS CAN BE SELECTED TO REPRESENT COOLANT SINKS (LEAKS), COOLANT SOURCES (FILL SYSTEMS), OR NORMAL JUNCTIONS (CONNECTIONS BETWEEN CONTROL VOLUMES). PROVISIONS ARE MADE FOR THE USE OF PUMPS, CHECK VALVES, CONTROL ROD INSERTION, AND OTHER FEATURES OF WATER-COOLED REACTORS.

433 CONTEMPT-LT/022 THE CONTEMPT-LT PROGRAM PREDICTS THE PRESSURE-TEMPERATURE RESPONSE OF A DRY WELL OR A DRY WELL WITH VENTS AND PRESSURE SUPPRESSION SYSTEM TO A LOSS-OF-COOLANT ACCIDENT. AN ADDITIONAL DUAL CONTAINMENT COMPARTMENT MAY ALSO BE MODELED IF DESIRED. THE DRY WELL IS SEPARATED INTO A LIQUID REGION AND A VAPOR REGION. EACH REGION IS ASSUMED TO HAVE A UNIFORM TEMPERATURE BUT THE TEMPERATURES OF THE TWO REGIONS MAY BE DIFFERENT. THE CONTAINMENT BUILDING IS REPRESENTED AS CONSISTING OF SEVERAL HEAT CONDUCTING STRUCTURES WHOSE THERMAL BEHAVIOR CAN BE DESCRIBED BY THE ONE-DIMENSIONAL MULTI-REGION HEAT CONDUCTION EQUATIONS. WATER AND ENERGY RATES FROM DISCHARGE OF COOLANT, BOILING OF RESIDUAL WATER BY REACTOR DECAY HEAT, SUPERHEATING OF STEAM PASSING THROUGH THE CORE, AND METAL-WATER REACTIONS ARE ASSUMED AVAILABLE FROM PREVIOUS CALCULATIONS AND ARE INPUT DATA TO THE PROGRAM. PROGRAM OUTPUT INCLUDES CONTAINMENT VOLUME PRESSURE AND TEMPERATURE, TEMPERATURES THROUGH THE BUILDING STRUCTURES, AND THE AMOUNT OF WATER, VAPOR, AND ENERGY IN THE CONTAINMENT VOLUMES. THE PRESSURE SUPPRESSION CALCULATIONS INCLUDE VENT CLEARING AND FLOW OF A TWO-COMPONENT TWO-PHASE WATER-AIR MIXTURE THROUGH THE VENTS, AND A MASS-ENERGY BALANCE IN THE WET WELL. THERE ARE PROVISIONS FOR NORMAL BUILDING LEAKAGE, LEAKAGE FROM PENETRATIONS, A FAN COOLER SYSTEM, AND DRY AND WET WELL SPRAY SYSTEMS.

435 BURST1 BURST1 PROVIDES FOR THE STUDY OF PRESSURIZED LIQUID IN A CYLINDRICAL SYSTEM IMMEDIATELY AFTER A RUPTURE OCCURS AT ONE OR BOTH ENDS OF THE SYSTEM. PRESSURE, MASS VELOCITY, AND ENTHALPY ARE CALCULATED AT EQUALLY-SPACED MESH POINTS ALONG THE LENGTH OF THE SYSTEM. THIS IS A ONE-DIMENSIONAL REPRESENTATION, ASSUMING UNIFORM CONDITIONS THROUGHOUT ANY GIVEN CROSS-SECTIONAL AREA. FORCES ON DESIGNATED SECTIONS OF THE SYSTEM CAN ALSO BE COMPUTED, WITH PROVISION FOR DIRECTIONAL CHANGES.

443 HAA3 HAA3 EVALUATES AN APPROXIMATION TO THE GENERAL INTEGRO-DIFFERENTIAL EQUATION WHICH DESCRIBES AEROSOL BEHAVIOR. THE PHYSICAL MODEL INCLUDES PARTICLE GENERATION, BROWNIAN AND GRAVITATIONAL AGGLOMERATION, SETTLING, PLATING, AND LEAKAGE FOR SPHERICAL PARTICLES. THE APPROXIMATION IS THE REQUIREMENT THAT THE SIZE DISTRIBUTION FUNCTION BE LOG-NORMAL. THE TIME-DEPENDENT PHYSICAL QUANTITIES COMPUTED ARE (1) PLATED, SETTLED, SUSPENDED, AND LEAKED VOLUME FRACTIONS, (2) GEOMETRIC MEAN DEVIATION, NUMBER CONCENTRATION, AND GEOMETRIC MEAN RADIUS FOR THE LOG-NORMAL DISTRIBUTION OF THE SUSPENDED MATERIAL, (3) THE 50 PERCENT RADIUS (BY MASS) FOR THE SUSPENDED MATERIAL, (4) THE NUMBER AND VOLUME DISTRIBUTIONS (FUNCTIONS OF RADIUS) FOR THE SETTLED, PLATED, AND LEAKED MATERIAL, (5) THE EFFECTIVE RADII FOR THE SUSPENDED, SETTLED, AND PLATED MATERIAL.

448 FLASH4 FLASH4 IS USED TO DETERMINE THE TRANSIENT RESPONSE OF A WATER-COOLED REACTOR OR HYDRAULIC SYSTEM TO SEVERE VARIABLE PRESSURE OPERATION.

479 FREADM1 FREADM1 IS A FAST REACTOR MULTICHANNEL ACCIDENT ANALYSIS PROGRAM DESIGNED TO EFFICIENTLY SIMULATE A REACTOR TRANSIENT FROM INITIATION TO THE POINT OF CORE DISASSEMBLY. MODELS ARE INCLUDED FOR NUCLEAR KINETICS (POINT MODEL), CORE THERMO-HYDRAULICS, VOIDING, FUEL REDISTRIBUTION, FAILURE PROPAGATION, PROGRAMMED REACTIVITY INSERTION, AND THE DYNAMICS OF PRIMARY SYSTEM COOLANT FLOW. A BROAD RANGE OF ASSUMED ACCIDENT INITIATING AND PROPAGATING ACTIVITIES MAY BE SIMULATED USING TRIGGERING LOGIC INCLUDED IN THE CODE.

499 MIRAB/MIRAP THE CODE MIRAB IS USED FOR BWR REACTORS AND MIRAP IS FOR PWR REACTORS. THE CODES CALCULATE THE REMOVAL OF FISSION PRODUCT IODINE FROM A DRY-TYPE BWR/PWR CONTAINMENT SYSTEM ATMOSPHERE UNDER REACTOR ACCIDENT CONDITIONS. THE METHOD CONSIDERS THE SIMULTANEOUS REMOVAL BY NATURAL DEPOSITION ON SURFACES OR ABSORPTION IN WATER, BY ENGINEERED SPRAY SYSTEM OPERATION, BY ADSORPTION ON FILTERS, AND BY LEAKAGE FROM THE CONTAINMENT. IN ADDITION, THE SIMULTANEOUS BEHAVIOR OF THREE IODINE FORMS IS MODELED - SPECIFICALLY ELEMENTAL IODINE, METHYL IODINE, AND PARTICULATE IODINE. THE PROGRAMS GENERATE IODINE CONCENTRATIONS AND ACCUMULATIONS THROUGHOUT THE CONTAINMENT SYSTEM AS A FUNCTION OF TIME AFTER START OF THE ACCIDENT.

500 FRCRL2 THE CODE CALCULATES THE CUMULATIVE FRACTIONAL RELEASE OF FISSION PRODUCTS FROM NUCLEAR REACTOR FUEL UNDER POSTULATED LOSS-OF-COOLANT ACCIDENT CONDITIONS. THE MATHEMATICAL MODEL FOR RELEASE IS BASED ON SIMPLE VOLUME DIFFUSION THEORY AND THE EQUIVALENT-SPHERE APPROXIMATION OF FUEL POROSITY. BOTH THE OPERATIONAL PREACCIDENT RELEASE COMPONENT AND THE ACCIDENT CORE THERMAL TRANSIENT-INDUCED RELEASE COMPONENT ARE CALCULATED. DETAILED CORE TEMPERATURE DATA ARE NEEDED TO MAKE THE LATTER SET OF COMPUTATIONS. IN ADDITION, SPECIFIC CORE POWER DISTRIBUTION FACTORS AND FISSION PRODUCT DIFFUSION PARAMETERS MUST BE SUPPLIED.

508 MUCHA1/MUCHA2 MUCHA1 PREDICTS THE THERMAL AND HYDRAULIC BEHAVIOR OF ANY TWO REACTOR FUEL RODS AND THEIR ASSOCIATED PARALLEL FLOW CHANNELS DURING A LOSS-OF-COOLANT ACCIDENT USING AS BOUNDARY CONDITIONS PLENUM FLUID CONDITIONS DETERMINED BY MUCHA2 OR A SYSTEM-ORIENTED CODE. MUCHA2 PREDICTS THE THERMAL AND HYDRAULIC BEHAVIOR OF THE PRIMARY COOLANT WITHIN THE REACTOR PRESSURE VESSEL DURING A LOSS-OF-COOLANT ACCIDENT. THE HEATED CORE IS REPRESENTED BY TWO EQUIVALENT FUEL RODS AND THEIR ASSOCIATED PARALLEL FLOW CHANNELS. A PLENUM MODEL HAS BEEN DEVELOPED TO PREDICT THE UPPER AND LOWER PLENUM FLUID CONDITIONS THROUGHOUT THE ACCIDENT SEQUENCE FOR USE AS BOUNDARY CONDITIONS FOR THE PARALLEL CORE CHANNELS.

512 THETA1B THETA1B COMPUTES THE THERMAL RESPONSE CHARACTERISTICS OF A NUCLEAR FUEL ROD SUBJECTED TO A LOSS-OF-COOLANT ACCIDENT ENVIRONMENT.

528 PREP/KITT THE PREP/KITT COMPUTER PROGRAM PACKAGE OBTAINS SYSTEM RELIABILITY INFORMATION FROM A SYSTEM FAULT TREE. THE PREP PROGRAM FINDS THE MINIMAL CUT SETS AND/OR THE MINIMAL PATH SETS OF THE SYSTEM FAULT TREE. (A MINIMAL CUT SET IS A SMALLEST SET OF COMPONENTS SUCH THAT IF ALL THE COMPONENTS ARE SIMULTANEOUSLY FAILED THE SYSTEM IS FAILED. A MINIMAL PATH SET IS A SMALLEST SET OF COMPONENTS SUCH THAT IF ALL OF THE COMPONENTS ARE SIMULTANEOUSLY FUNCTIONING THE SYSTEM IS FUNCTIONING.) THE KITT PROGRAMS DETERMINE RELIABILITY INFORMATION FOR THE COMPONENTS OF EACH MINIMAL CUT OR PATH SET, FOR EACH MINIMAL CUT OR PATH SET, AND FOR THE SYSTEM. EXACT, TIME-DEPENDENT RELIABILITY INFORMATION IS DETERMINED FOR EACH COMPONENT AND FOR EACH MINIMAL CUT SET OR PATH SET. FOR THE SYSTEM, RELIABILITY RESULTS ARE OBTAINED BY UPPER BOUND APPROXIMATIONS OR BY A BRACKETING PROCEDURE IN WHICH VARIOUS UPPER AND LOWER BOUNDS MAY BE OBTAINED AS CLOSE TO ONE ANOTHER AS DESIRED. THE KITT PROGRAMS CAN HANDLE INDEPENDENT COMPONENTS WHICH ARE NONREPAIRABLE OR WHICH HAVE A CONSTANT REPAIR TIME. ANY ASSORTMENT OF NONREPAIRABLE COMPONENTS AND COMPONENTS HAVING CONSTANT REPAIR TIMES CAN BE CONSIDERED. ANY INHIBIT CONDITIONS HAVING CONSTANT PROBABILITIES OF OCCURRENCE CAN BE HANDLED. THE FAILURE INTENSITY OF EACH COMPONENT IS ASSUMED TO BE CONSTANT WITH RESPECT TO TIME. THE KITT2 PROGRAM CAN ALSO HANDLE COMPONENTS WHICH DURING DIFFERENT TIME INTERVALS, CALLED PHASES, MAY HAVE DIFFERENT RELIABILITY PROPERTIES.

529 ANVENT THE ANVENT PROGRAM WAS DEVELOPED TO ANALYZE THERMAL EFFECTS OF A LOSS-OF-COOLANT ACCIDENT (LOCA) IN A WESTINGHOUSE ICE CONDENSER NUCLEAR UNIT, SIMILAR TO THE DUKE POWER COMPANYS MCGUIRE UNITS. THE PROGRAM IS CAPABLE OF EVALUATING (1) STEADY-STATE RADIAL TEMPERATURE DISTRIBUTIONS CORRESPONDING TO FIXED INSIDE AND OUTSIDE TEMPERATURES, (2) RADIAL TEMPERATURE DISTRIBUTIONS IN THE STEEL CONTAINMENT SHELL AND THE CONCRETE REACTOR (SHIELD) BUILDING DURING THE POST-LOCA TRANSIENT, (3) TEMPERATURE AND PRESSURE IN THE ANNULUS BETWEEN THE CONTAINMENT SHELL AND REACTOR BUILDING DURING THE POST-LOCA TRANSIENT, AND (4) CAPABILITY OF THE ANNULUS VENTILATION FAN TO QUICKLY ATTAIN AND MAINTAIN A VACUUM IN THE ANNULUS AFTER A LOCA OCCURS.

546 EMERALD THE EMERALD PROGRAM IS DESIGNED FOR THE CALCULATION OF RADIATION RELEASES AND EXPOSURES RESULTING FROM NORMAL AND ABNORMAL OPERATION OF A LARGE PRESSURIZED WATER REACTOR. THE APPROACH USED IN EMERALD IS SIMILAR TO AN ANALOG SIMULATION OF A REAL SYSTEM. EACH COMPONENT OR VOLUME IN THE PLANT WHICH CONTAINS A RADIOACTIVE MATERIAL IS REPRESENTED BY A SUBROUTINE, WHICH KEEPS TRACK OF THE PRODUCTION, TRANSFER, DECAY AND ABSORPTION OF RADIOACTIVITY IN THAT VOLUME. DURING THE COURSE OF THE ANALYSIS OF AN ACCIDENT, ACTIVITY IS TRANSFERRED FROM SUBROUTINE TO SUBROUTINE IN THE PROGRAM AS IT WOULD BE TRANSFERRED FROM PLACE TO PLACE IN THE PLANT. FOR EXAMPLE, IN THE CALCULATION OF THE DOSES RESULTING FROM A LOSS-OF-COOLANT ACCIDENT THE PROGRAM FIRST CALCULATES THE ACTIVITY BUILT UP IN THE FUEL BEFORE THE ACCIDENT, THEN RELEASES SOME OF THIS ACTIVITY TO THE CONTAINMENT VOLUME. SOME OF THIS ACTIVITY IS THEN RELEASED TO THE ATMOSPHERE. THE RATES OF TRANSFER, LEAKAGE, PRODUCTION, CLEANUP, DECAY, AND RELEASE ARE READ IN AS INPUT TO THE PROGRAM. SUBROUTINES ARE ALSO INCLUDED WHICH CALCULATE THE ON-SITE AND OFF-SITE RADIATION EXPOSURES AT VARIOUS DISTANCES, FOR INDIVIDUAL ISOTOPES AND SUMS OF ISOTOPES. THE PROGRAM CONTAINS A LIBRARY OF PHYSICAL DATA FOR THE TWENTY-FIVE ISOTOPES OF MOST INTEREST IN LICENSING CALCULATIONS, AND OTHER ISOTOPES CAN BE ADDED OR SUBSTITUTED. BECAUSE OF THE FLEXIBLE NATURE OF THE SIMULATION APPROACH, THE EMERALD PROGRAM CAN BE USED FOR MOST CALCULATIONS INVOLVING THE PRODUCTION AND RELEASE OF RADIOACTIVE MATERIALS, INCLUDING DESIGN, OPERATIONAL AND LICENSING STUDIES.

548 CEBUG THE TRANSIENT HYDRAULIC BEHAVIOR OF THE SODIUM IN A SODIUM-HEATED STEAM GENERATOR IN WHICH A SODIUM-WATER REACTION OCCURS DUE TO A LARGE WATER LEAK IS CALCULATED FOR FLOWS IN UP TO THREE DIMENSIONS.

554 DISPER DISPER DETERMINES THE AEROSOL PARTICLE SOURCE STRENGTH OUTSIDE AN ENCLOSURE DUE TO A RELEASE OF AEROSOL PARTICLES WITHIN THE ENCLOSURE. THE RELEASE IS ASSUMED TO PRESSURIZE THE ENCLOSURE AND THE AIRBORNE PARTICLES ARE CARRIED BY THE ESCAPING GAS INTO LEAK PATHS IN THE ENCLOSURE WALLS. HERE, THEY MAY BE DEPOSITED ON THE LEAK PATH WALLS OR REMAIN ENTRAINED AND ESCAPE FROM THE ENCLOSURE.

555 PARET THIS PROGRAM IS DESIGNED FOR USE IN PREDICTING THE COURSE AND CONSEQUENCES OF NONDESTRUCTIVE REACTIVITY ACCIDENTS IN SMALL REACTOR CORES.

559 SOFIRE2 1- AND 2-CELL SOFIRE2 ONE CELL, CALCULATES THE CONSEQUENCES OF A SODIUM POOL FIRE IN A CLOSED VAULT. GAS PRESSURE IN THE VAULT IS CALCULATED FROM THE GAS DENSITY AND TEMPERATURE. SOFIRE2 TWO CELL, CALCULATES THE CONSEQUENCES OF A SODIUM POOL FIRE IN A VAULT CONNECTED TO A CONTAINMENT STRUCTURE THROUGH A RESTRICTED OPENING. COLD GAS FLOWS FROM THE CONTAINMENT TO THE VAULT DUE TO MASS DIFFERENCES WHILE HOT GAS FLOWS FROM THE VAULT TO THE CONTAINMENT TO EQUILIBRATE PRESSURES. PRESSURE IN THE CONTAINMENT IS CALCULATED FROM THE GAS DENSITY AND TEMPERATURE. IN BOTH PROGRAMS THE SODIUM BURNING RATE IS GOVERNED BY THE RATE OF OXYGEN DIFFUSION TO THE SODIUM SURFACE.

583 STEFEG STEFEG CALCULATES GASEOUS SOURCE TERMS. IT COMPUTES THE GASEOUS RELEASES THROUGH VARIOUS PATHS FROM BOILING WATER REACTORS AND/OR PRESSURIZED WATER REACTORS.

584 FPFM FPFM IS USED IN RADIOLOGICAL SAFETY ANALYSES OF LINE REACTORS (BWR'S AND PWR'S ONLY) TO CALCULATE: (1) MAXIMUM NOBLE GAS RELEASE TO THE FUEL CLADDING GAP FOR TOTAL CORE DURING STEADY-STATE OPERATION, (2) NOBLE GAS RELEASED TO THE REACTOR PRIMARY SYSTEM FOR SELECTED PIN PERFORATIONS, AND (3) INTERNAL PIN PRESSURE (OPTIONAL).

590 INTEG/INSPEC THESE PROGRAMS ANALYZE THE CHARACTERISTICS OF A GENERAL MODEL DEVELOPED TO REPRESENT THE SAFETY ASPECTS OF AN OPERATING NUCLEAR REACTOR. THESE CHARACTERISTICS ARE THE FREQUENCIES OF INCIDENTS THAT ARE DEPARTURES FROM THE EXPECTED BEHAVIOR OF THE REACTOR. EACH INCIDENT IS ASSUMED TO BE PRECEDED BY A SEQUENCE OF EVENTS STARTING AT SOME INITIATING EVENT. AT EACH MEMBER IN THIS SEQUENCE THERE MAY BE FUNCTIONS SUCH AS SAFETY CIRCUITS, AND PERSONNEL OPERATIONS THAT STOP THE SEQUENCE AT THAT MEMBER. WHEN MECHANICAL DEVICES FAIL THEY ARE ASSUMED TO REMAIN INOPERATIVE UNTIL REPAIRED. THE MODEL ACCOUNTS FOR SCHEDULED INSPECTION AND MAINTENANCE OF ALL EQUIPMENT IN THE SYSTEM.

600 EGAD EGAD CALCULATES GAMMA DOSE INTEGRALS TO A GROUND LEVEL RECEPTOR, FOR INCREMENTAL VALUES OF THE VERTICAL DISPERSION PARAMETER SIGMA-Z, AS A FUNCTION OF GAMMA ENERGY AND SPATIAL DISTRIBUTION OF THE RADIOACTIVE MATERIAL. THE DOSE INTEGRALS ARE REPRESENTATIVE OF SECTOR AVERAGES SINCE THE DISTRIBUTION OF MATERIAL IS ASSUMED TO BE GAUSSIAN IN THE VERTICAL, HOMOGENEOUS IN THE HORIZONTAL, AND BOUNDED BETWEEN GROUND LEVEL AND AN INVERSION LID. CALCULATED DOSE INTEGRALS ARE INDEPENDENT OF RADIOACTIVE DECAY, TRANSPORT VELOCITY, DOWNWIND DISTANCE, AND SECTOR WIDTH. SPACE ATTENUATION AND BUILDUP ARE TAKEN INTO ACCOUNT.

152 ARGUS (RE248) THIS PROGRAM CALCULATES TRANSIENT TEMPERATURES IN A CONCENTRIC, CYLINDRICAL CONFIGURATION. UP TO 25 CONCENTRIC REGIONS ARE ALLOWED, EACH CONTAINING EITHER A STATIONARY (SOLID OR NON-FLOWING LIQUID) OR TURBULENTLY FLOWING (LIQUID OR GAS) MATERIAL. ANY STATIONARY REGION CAN HAVE SPATIAL- AND TIME-DEPENDENT HEAT GENERATION. TEMPERATURES ARE CALCULATED AT NODE POINTS EQUALLY-SPACED WITHIN A REGION. FILM COEFFICIENTS ON FLOWING REGION BOUNDARIES ARE CALCULATED BY THE PROGRAM. TIME-DEPENDENT COOLANT VELOCITIES ARE PERMITTED. THE HEAT SOURCE IS ASSUMED TO BE ANGULAR INDEPENDENT. AXIAL HEAT CONDUCTION IS NEGLECTED, BUT AXIAL HEAT TRANSPORT DUE TO MATERIAL MOTION IS CONSIDERED IN THE FLOWING REGIONS.

155 PTH1 THIS PROGRAM CALCULATES CONTAINMENT SHELL PRESSURE-TEMPERATURE HISTORY RESULTING FROM AQUEOUS COOLANT SYSTEM BLOWDOWN.

182 AXFLU AXFLU CALCULATES HEAT TRANSFER FROM A LATTICE OF FLUID CYLINDRICAL FUEL PINS TO COOLANT IN EITHER SLUG OR FULLY-DEVELOPED LAMINAR FLOW. SOLUTION IS ANALYTIC AND CLOSED, EXCEPT FOR SATISFYING BOUNDARY CONDITIONS AT A FINITE, (BUT ARBITRARY), NUMBER OF BOUNDARY POINTS.

183 AXTHRM AXTHRM CALCULATES HEAT TRANSFER FROM A TRIANGULAR LATTICE OF CLAD SOLID CYLINDRICAL FUEL PIN TO COOLANT IN EITHER SLUG OR FULLY-DEVELOPED LAMINAR FLOW. SOLUTION IS ANALYTIC AND CLOSED, EXCEPT FOR SATISFYING BOUNDARY CONDITIONS AT A FINITE, (BUT ARBITRARY), NUMBER OF BOUNDARY POINTS.

198 HEATING2 HEATING2 IS A GENERALIZED HEAT TRANSFER CODE CAPABLE OF SOLVING TRANSIENT AND/OR STEADY-STATE COORDINATE SYSTEMS. THE SIMPLIFIED INPUT MAKES IT A VERY USEFUL CODE FOR THOSE PROBLEMS HAVING GEOMETRICAL CONFIGURATIONS WHICH CAN BE DESCRIBED BY PARALLEL AND PERPENDICULAR LINES OR PLANES, OR CONCENTRIC CIRCLES. THESE FIGURES CAN BE BROKEN UP INTO A MAXIMUM OF 100 ONE-MATERIAL REGIONS WITH POSITION AND TIME-DEPENDENT VOLUMETRIC HEAT GENERATION RATES. UP TO 40 MATERIALS WITH CONSTANT PROPERTIES CAN BE DESCRIBED, AND THE INITIAL TEMPERATURES OF THESE REGIONS ARE POSITION-DEPENDENT. THE BOUNDARIES OF THESE REGIONS CAN BE CONTACT, INSULATED, TIME-DEPENDENT TEMPERATURE CONTROLLED, OR FORCED CONVECTION WITH A TIME-DEPENDENT SINK TEMPERATURE. ALSO A RADIATION BOUNDARY WITH A TIME-DEPENDENT SINK TEMPERATURE IS INCLUDED.

205 BLOOST5 BLOOST5 COMBINES A REACTOR KINETICS CODE WITH A TWO-DIMENSIONAL HEAT TRANSFER CODE, AND IS APPLICABLE TO PROBLEMS FOR WHICH THE SPACE-INDEPENDENT FORM OF THE REACTOR KINETICS EQUATION IS APPLICABLE.

242 RATH MESHER/RATH WANTON THESE CODES SOLVE THE TWO- AND THREE-DIMENSIONAL HEAT CONDUCTION PROBLEM IN GENERAL GEOMETRIES. TIME, TEMPERATURE, AND POSITION-DEPENDENT PHYSICAL PROPERTIES CAN BE USED.

246 FLOW-MODEL A MULTI-CHANNEL, TWO-DIMENSIONAL, TWO-PHASE FLOW MODEL, DESIGNED TO COMPUTE THE AXIAL AND RADIAL COOLANT DENSITY AND QUALITY PROFILES, THE AXIAL PRESSURE PROFILE AND THE WEIGHT FLOW DISTRIBUTION FOR AN OPEN MATRIX FLOW, BOILING WATER REACTOR.

256 MANTA MANTA IS A PROGRAM WHICH PROVIDES A THERMAL-HYDRAULIC NODAL ANALYSIS IN THE STEADY STATE. IT WAS DESIGNED TO ANALYZE FUEL ELEMENT CONFIGURATION IN THE SUPER-HEAT DEVELOPMENT PROGRAM. MANTA ANALYZES MIXING BETWEEN COOLANT CHANNELS, ALLOWS FOR TEMPERATURE VARIANT CONDUCTIVITY IN ADMITTANCE CALCULATIONS, AND MULTIPLE STACKED SEGMENTS THROUGH THE FUEL REGION FOR A 7 ELEMENT CLUSTER ANALYSIS OVER A LENGTH OF UP TO 8 FEET. MANTA IS DESIGNED FOR SINGLE-PASS STEAM FLOW. THE FLOW DIRECTION IN THE COOLANT CHANNELS MAY BE EITHER UP OR DOWN, THEREBY PERMITTING THE ANALYSIS OF TWO-PASS AS WELL AS SINGLE-PASS FUEL ELEMENTS. MANTA ACCOUNTS FOR THE HEAT TRANSFER AND PRESSURE DROP THAT MAY OCCUR BETWEEN COOLANT CHANNELS DUE TO MIXING AS WELL AS TO THE CONVENTIONAL HEAT TRANSFER AND PRESSURE DROP RELATIONSHIPS DUE TO FRICTION, DISCONTINUITIES, ACCELERATION, CONVECTION, CONDUCTION, AND RADIATION. MANTA ALLOWS FOR THE CALCULATION AT EACH NODE OF THE MATERIAL PROPERTIES VISCOSITY, SPECIFIC HEAT, CONDUCTIVITY, AND SPECIFIC VOLUME TO CORRESPOND TO THE ACTUAL NODE TEMPERATURE BEING SOLVED FOR. THE CDC6600 VERSION USES SODIUM FOR THE WORKING FLUID RATHER THAN STEAM.

267 WATER WATER IS A SUBROUTINE USED TO EXTRACT THERMODYNAMIC AND TRANSPORT PROPERTIES OF LIQUID, VAPOR, AND SUPERCRITICAL WATER BY TABULAR INTERPOLATION OVER THE RANGE OF STATES - 14.5 TO 14,500 PSIA AND 32 TO 1472 DEGREES F. THESE PROPERTIES ARE SPECIFIC VOLUME, SPECIFIC ENTHALPY, DYNAMIC VISCOSITY, AND THERMAL CONDUCTIVITY, TABULATED FOR PRESSURE AND TEMPERATURE CONDITIONS.

272 FIGRO FIGRC CALCULATES THE ONE-DIMENSIONAL STEADY-STATE TEMPERATURE DISTRIBUTION AND TOTAL FUEL SWELLING FOR METAL-CLAD, AXISYMMETRIC, BULK-OXIDE CYLINDRICAL FUEL ELEMENTS. THE FUEL PELLET MAY BE SOLID, ANNULAR, OR CONTAIN TWO RADIAL ZONES. OXIDE FUEL THERMAL CONDUCTIVITY IS A FUNCTION OF TEMPERATURE, DEPLETION, AND POROSITY. FUEL SWELLING IS A FUNCTION OF TEMPERATURE, DEPLETION, INTERNAL HYDROSTATIC PRESSURE, AND FISSIONING RATE. FUEL-CLAD GAP CONDUCTANCE IS A FUNCTION OF GAS COMPOSITION, TEMPERATURE, AND GAP THICKNESS AT OPERATING CONDITIONS. EITHER THE CLAD SURFACE FLUX OR THE TEMPERATURE AT THE INSIDE RADIUS OF THE FUEL MAY BE SPECIFIED AS A BOUNDARY CONDITION FOR THE HEAT CONDUCTION EQUATION. THERMAL EXPANSION OF THE FUEL AND CLADDING IS ACCOUNTED FOR. TRANSIENT TEMPERATURE CALCULATIONS CAN THEN BE PERFORMED STARTING FROM THE STEADY-STATE SOLUTION WITH USER-SPECIFIED HEAT GENERATION AND WATER TEMPERATURE TABLES.

286 HOT2 HOT2 IS A DIGITAL COMPUTER PROGRAM TO SOLVE TWO-DIMENSIONAL PLANE AND AXIALLY SYMMETRIC STEADY-STATE AND TRANSIENT HEAT CONDUCTION PROBLEMS WITH DIAGONAL BOUNDARIES AND INTERFACES. MESH SPACING (AT MOST 5000 POINTS) IS COMPLETELY VARIABLE. AS MANY AS 99 REGIONS ARE PERMITTED IN ORDER TO DESCRIBE SPATIAL VARIATIONS IN MATERIAL PROPERTIES, HEAT GENERATION RATES, AND BOUNDARY CONDITIONS. THE HEAT GENERATION RATE AND BOUNDARY CONDITIONS MAY VARY WITH TIME.

294 M0899/HOH BY MAKING CALLS ON A SUBROUTINE CALLED HOH, M0899 EDITS THERMODYNAMIC AND TRANSPORT PROPERTIES OF WATER OVER THE RANGE 14.5 TO 2538 PSIA AND UP TO 608 DEGREES FAHRENHEIT BELOW SATURATION AND 932 DEGREES FAHRENHEIT ABOVE SATURATION.

299 LION4 LION4 IS A COMPUTER PROGRAM FOR CALCULATING ONE, TWO, OR THREE DIMENSIONAL TRANSIENT AND STEADY-STATE TEMPERATURE DISTRIBUTIONS IN REACTOR AND REACTOR PLANT COMPONENTS. IT IS USED PRIMARILY FOR THERMAL-STRUCTURAL ANALYSES. IT UTILIZES FINITE DIFFERENCE TECHNIQUES WITH FIRST-ORDER FORWARD DIFFERENCE INTEGRATION AND IS CAPABLE OF HANDLING A WIDE VARIETY OF BOUNDING CONDITIONS.

HEAT TRANSFER SITUATIONS ACCOMMODATED INCLUDE FORCED AND FREE CONVECTION IN BOTH REDUCED AND FULLY-AUTOMATED TEMPERATURE DEPENDENT FORMS, COOLANT FLOW EFFECTS, A LIMITED THERMAL RADIATION CAPABILITY, A STATIONARY OR STAGNANT FLUID GAP, A DUAL DEPENDENCY (TEMPERATURE DIFFERENCE AND TEMPERATURE LEVEL) HEAT TRANSFER, AN ALTERNATIVE HEAT TRANSFER MODE COMPARISON AND SELECTION FACILITY COMBINED WITH HEAT FLUX DIRECTION SENSOR, AND ANY FORM OF TIME-DEPENDENT BOUNDARY TEMPERATURES. THE PROGRAM, WHICH HANDLES TIME AND SPACE DEPENDENT INTERNAL HEAT GENERATION, CAN ALSO PROVIDE TEMPERATURE DEPENDENT MATERIAL PROPERTIES WITH LIMITED NON-ISOTROPIC PROPERTIES. USER-ORIENTED CAPABILITIES AVAILABLE INCLUDE TEMPERATURE MEANS WITH VARIOUS WEIGHTINGS AND A COMPLETE HEAT FLOW RATE SURVEILLANCE SYSTEM.

331 M0219(FLOT1) FLOT1 WILL PREDICT THE STEADY-STATE FLOW AND THE FLOW TRANSIENT DUE TO THE SUBSEQUENT LOSS OF POWER TO ALL PUMPS AND TERMINATE THE TRANSIENT AT A SPECIFIED TIME OR IT WILL PREDICT THE FLOW TRANSIENT IN WHICH ONLY SOME OF THE PUMPS ARE LOST. THIS LATTER TRANSIENT MAY BE TERMINATED BY A MAXIMUM TRANSIENT TIME OR BY CHECK VALVE CLOSURES IN ALL LOOPS IN WHICH PUMPING POWER IS LOST. IN THE LATTER EVENT, THE PROGRAM WILL PREDICT THE SUBSEQUENT STEADY-STATE FLOW DISTRIBUTION.

346 THTE THTE (TRANSIENT HEAT TRANSFER VERSION E) PROVIDES A SOLUTION CAPABILITY FOR LARGE COMPLEX, THREE-DIMENSIONAL TRANSIENT AND STEADY-STATE HEAT TRANSFER PROBLEMS WHICH CAN INCLUDE CONDUCTION, CONVECTION, AND RADIATION WITH THE OPTION TO COMPUTE FLUID FLOW RATES ON A ONE-DIMENSIONAL BASIS.

348 TOPS THE TOPS PROGRAM IS A DIGITAL SIMULATION OF PRESSURIZER DYNAMICS BASED ON A RIGOROUS APPLICATION OF THE FIRST LAW OF THERMODYNAMICS AND PHENOMOLOGICAL HEAT AND MASS TRANSFER LAWS WITH EMPIRICALLY DETERMINED COEFFICIENTS. THE PROGRAM IS USEFUL IN STUDYING THE THERMODYNAMIC PATHS OF PRESSURIZER TRANSIENTS AND IS CONVENIENT TO USE AS A DESIGN TOOL.

349 TOODEE THE TOODEE PROGRAM CALCULATES TEMPERATURES AT THE CENTER POINTS OF A TWO-DIMENSIONAL ARRAY IN X-Y, R-Z, OR R-THETA GEOMETRY. THE MESH IN THIS ARRAY MAY BE VARIABLY-SPACED. AVERAGED MATERIAL CONSTANTS ARE USED WHICH MAY BE SPATIAL AND TEMPERATURE DEPENDENT. PROVISION IS MADE IN THE PROGRAM FOR MATERIAL PHASE CHANGES. CHANNELS FOR FORCED FLOW COOLANT MAY BE INCLUDED AT EXTERIOR BOUNDARIES. IN ADDITION TO THE TEMPERATURE ARRAY, PROGRAM OUTPUT INCLUDES SURFACE TEMPERATURES AND HEAT FLUXES.

382 RAPP RAPP COMPUTES THE RELATIONSHIP AMONG MASS FLOW, PRESSURE, AND PIPING RESISTANCE (K-FACTOR) FOR HIGH VELOCITY FLOW OF A TWO-PHASE MIXTURE OF STEAM AND WATER. THE SOURCE FLUID MAY BE SUBCOOLED OR SATURATED WATER, SATURATED STEAM, OR A MIXTURE OF STEAM AND WATER. THE DOWNSTREAM PRESSURE MUST BE BELOW THE SATURATION PRESSURE OF THE SOURCE FLUID. SPECIFIC APPLICATIONS INCLUDE PRESSURIZER SURGE LINE PRESSURE DROP AND PRESSURE DISTRIBUTION DOWNSTREAM OF A RELIEF VALVE.

395 FLAC THE FLOW ANALYSIS CODE FLAC CALCULATES THE STEADY-STATE FLOW AND PRESSURE DISTRIBUTION IN AN ARBITRARY NETWORK. THE PROGRAM INCLUDES THE POSSIBILITY OF HEAT ADDITION AND MASS ADDITION IN ANY PORTION OF THE NETWORK.

396 WASP WASP USES A UNIQUE METHOD TO QUICKLY CALCULATE VARIOUS WATER AND STEAM PHYSICAL PROPERTIES OVER AN EXTREMELY WIDE RANGE.

408 TAC2D TAC2D IS DESIGNED TO TREAT TRANSIENT, TWO-DIMENSIONAL HEAT TRANSFER PROBLEMS. STEADY-STATE PROBLEMS ARE TREATED BY CONSIDERING THE PROBLEM TO BE A TRANSIENT, STARTING WITH AN ASSUMED TEMPERATURE DISTRIBUTION AND RUNNING UNTIL EQUILIBRIUM CONDITIONS ARE ESTABLISHED. GEOMETRICALLY, RECTANGULAR (X-Y), CYLINDRICAL (R,Z), OR CIRCULAR (R,THETA) COORDINATES MAY BE USED.

414 TAC3D TAC3D IS DESIGNED TO TREAT TRANSIENT, THREE-DIMENSIONAL HEAT TRANSFER PROBLEMS. STEADY-STATE PROBLEMS ARE TREATED BY CONSIDERING THE PROBLEM TO BE A TRANSIENT, STARTING WITH AN ASSUMED TEMPERATURE DISTRIBUTION AND RUNNING UNTIL EQUILIBRIUM CONDITIONS ARE ESTABLISHED. GEOMETRICALLY, THE PROBLEM MAY BE DEFINED BY EITHER RECTANGULAR (X,Y,Z) OR CYLINDRICAL (R,Z,THETA) COORDINATES.

424 GLUB1 GLUB1 SOLVES THE WATERLOGGING TRANSIENT CAUSED BY THE EXISTENCE OF A FUEL ELEMENT CLADDING DEFECT DURING AN INCREASE IN POWER. THE POWER IS EITHER - CASE 1, PUT IN AS AN ARBITRARY FUNCTION OF TIME, OR CASE 2, ASSUMED TO BE A SERIES OF LINEAR RAMPS TO A NEW STEADY-STATE WITH STEEPER AND STEEPER SLOPES. ALL THE GEOMETRY AND METAL PROPERTIES ARE INPUT QUANTITIES. WATER PROPERTIES ARE OBTAINED FROM INTERNAL TABLES. CLAD AND FUEL THERMAL, STRESS, AND STRAIN COMPUTATIONS ARE PERFORMED. THE OUTPUT CONSISTS OF INTERNAL PRESSURE AND DEFECT FLOW. FOR CASE 1, THE CLAD STRESS VERSUS TIME IS OUTPUT, AND FOR CASE 2, THE NEW STEADY-STATE POWER WHICH JUST CAUSES CLAD FAILURE IS OUTPUT.

432 COBRA3C COBRA3C CALCULATES THE STEADY-STATE AND TRANSIENT FLOW, ENTHALPY AND PRESSURE DROP IN THE SUBCHANNELS OF ROD BUNDLE NUCLEAR FUEL ELEMENTS DURING BOTH BOILING AND NONBOILING CONDITIONS. THE PROGRAM USES A MATHEMATICAL MODEL THAT INCLUDES THE EFFECTS OF TURBULENT AND DIVERSION CROSSFLOW MIXING BETWEEN THE SUBCHANNELS. A THERMAL MODEL OPTION IS INCLUDED TO CALCULATE RADIAL FUEL TEMPERATURE DISTRIBUTION AS A FUNCTION OF USER-SPECIFIED POWER GENERATION AND HEAT TRANSFER CORRELATIONS. CRITICAL HEAT FLUX CALCULATIONS CAN ALSO BE PERFORMED BY USER OPTION. FORCED CROSSFLOW MIXING DUE TO DIVERTER VANES OR WIRE WRAPS CAN BE CONSIDERED.

440 DYNAM DYNAM PERFORMS A DYNAMIC ANALYSIS OF ONCE-THROUGH BOILING FLOW OSCILLATIONS WITH STEAM SUPERHEAT. THE MODEL DESCRIBING THE SUPERHEAT REGIME (SINGLE-PHASE, VARIABLE DENSITY FLUID) FOR SUBCRITICAL PRESSURE OPERATION IS ALSO APPLICABLE TO THE STUDY OF ONCE-THROUGH OPERATION USING SUPERCRITICAL PRESSURE WATER.

458 VELVET2 VELVET2 SOLVES THE COUPLED HEAT TRANSFER EQUATIONS IN THE FUEL, GAP, CLADDING, AND COOLANT FOR A TRIANGULAR-SPACED, CLOSE-PACKED FUEL ROD BUNDLE WITH LIQUID METAL COOLANT. THE MODEL INCLUDES TEMPERATURE-DEPENDENT MATERIAL PROPERTIES, TURBULENT VELOCITY DISTRIBUTION IN THE COOLANT, AND CONTRIBUTIONS TO COOLANT HEAT TRANSFER BY TURBULENT MIXING.

473 CHIC-KIN CHIC-KIN TREATS FAST AND INTERMEDIATE REACTIVITY TRANSIENTS IN A WATER-COOLED HETEROGENEOUS NUCLEAR REACTOR. THE PROGRAM CALCULATES THE POWER, TEMPERATURES, AND INTERNAL PRESSURE SURGES WHEN CONTROL ROD MOTION, INLET TEMPERATURE, INLET FLOW, AND SYSTEM PRESSURE ARE KNOWN FUNCTIONS OF TIME. THE REACTOR MODEL CONSIDERED IS A SINGLE PASS WATER-COOLED CORE REPRESENTED BY A SINGLE FUEL ELEMENT-COOLANT PASSAGE SYSTEM WITH REACTIVITY FEEDBACK TO THE KINETICS EQUATIONS.

483 REPP THE REPP COMPUTER CODE PROVIDES A METHOD FOR (1) EVALUATING FUEL TEMPERATURES AND CRITICAL HEAT FLUX MARGINS FOR A FIXED REACTOR CORE AND FUEL DESIGN, (2) DETERMINING THE NUMBER OF FUEL PINS REQUIRED TO MAINTAIN SPECIFIED HEAT FLUX MARGINS FROM BURNOUT AT A GIVEN REACTOR POWER LEVEL, (3) DETERMINING THE DIAMETER OF A FUEL PIN TO DESIGN WITHIN FUEL CENTERLINE TEMPERATURE LIMITS AT A SPECIFIED REACTOR POWER LEVEL, (4) EVALUATING THE SINTERING EFFECT ON FUEL TEMPERATURE, (5) CALCULATING PRESSURE DROP AND COOLANT PROPERTIES FOR SINGLE-PHASE AND TWO-PHASE FLOW FOR FUEL OPERATING AT AVERAGE REACTOR CONDITIONS AND A THEORETICAL HOT PIN HOT CHANNEL CONDITION, AND (6) CALCULATING PRESSURE DROP ACROSS SEVERAL TYPES OF FUEL PIN SPACERS.

487 STEAM-67 STEAM-67 IS A SET OF ROUTINES FOR CALCULATING THE PROPERTIES OF STEAM AND WATER ACCORDING TO THE ASME STEAM TABLES, 1967, WHICH HAVE BEEN MODIFIED IN ACCORDANCE WITH THE ASME PAPER (REFERENCE 3). MODIFICATIONS WERE MADE TO IMPROVE PROGRAM RUNNING TIME AS WELL AS TO CORRECT SOME EXISTING PROGRAM ERRORS. CORRECTIONS WERE ALSO MADE TO ROUTINES FOR THE LIQUID REGION TO IMPROVE ACCURACY ON THE IBM360 COMPUTER.

517 HEATING3 HEATING3 IS DESIGNED TO SOLVE STEADY-STATE AND/OR TRANSIENT HEAT CONDUCTION PROBLEMS IN ONE-, TWO-, OR THREE-DIMENSIONAL CARTESIAN OR CYLINDRICAL COORDINATES. THERMAL CONDUCTIVITY, DENSITY, AND SPECIFIC HEAT MAY BE DEPENDENT ON TEMPERATURE. HEAT GENERATION RATES MAY BE DEPENDENT ON POSITION AND TIME, AND THE BOUNDARY TEMPERATURES MAY BE TIME-DEPENDENT. THE BOUNDARY CONDITIONS MAY BE FIXED TEMPERATURES OR ANY COMBINATION OF CONSTANT HEAT FLUX, FORCED CONVECTION, NATURAL CONVECTION, AND RADIATION. THEY CAN BE FROM SURFACE-TO-BOUNDARY, SURFACE-TO-SURFACE, OR SURFACE-TO-SURFACE PLUS CONDUCTION. THE MESH SPACING CAN BE VARIABLE ALONG EACH AXIS.

525 ORTHIS/ORTHAT ORTHIS AND ORTHAT ARE DESIGNED TO SOLVE STEADY-STATE AND TRANSIENT HEAT CONDUCTION PROBLEMS, RESPECTIVELY, IN TWO-DIMENSIONAL GEOMETRIES. EITHER CARTESIAN (X-Y) OR CYLINDRICAL (R-Z, R-THETA) COORDINATE SYSTEMS MAY BE USED. THERMAL PROPERTIES, HEAT GENERATION RATES, AND BOUNDARY CONDITIONS MAY BE FUNCTIONS OF POSITION, TIME, OR TEMPERATURE.

545 BETTY BETTY DESCRIBES SPATIAL AND TEMPORAL CONCENTRATION BEHAVIOR OF A SUSPENSION IN A PIPE, AS A RESULT OF DEPOSITION AND EROSION OF THE PARTICLES.

551 MOXY/MOD1 MOXY COMPUTES HEAT TRANSFER IN A BOILING WATER REACTOR FUEL ELEMENT. CONDUCTION, CONVECTION, AND RADIATION MODES OF HEAT TRANSFER ARE CONSIDERED, AS WELL AS HEAT ADDITION BY METAL-WATER REACTION. CONVECTION HEAT TRANSFER COEFFICIENTS ARE INPUT AS TABULAR FUNCTIONS OF TIME.

552 PWR-PPM PWR-PPM GENERATES BORATION-DILUTION TABLES USED BY THE REACTOR OPERATOR OF A PWR. THE COMPUTER PRINTED TABLES PLOT INITIAL AND FINAL REACTOR COOLANT SYSTEM BORON CONCENTRATION IN UNITS OF PPM BORON AGAINST THE GALLONS OF MAKEUP WATER AND BORIC ACID SOLUTION REQUIRED TO OBTAIN THE DESIRED PPM CHANGE. THESE TABLES REPLACE NOMOGRAPHS NORMALLY REQUIRED FOR BORATION AND DILUTION OPERATIONS.

560 HYMAS HYMAS GENERATES THE HYDRODYNAMIC MASS MATRIX PER UNIT DEPTH ASSOCIATED WITH A MULTI-MASS SYSTEM IMMERSED IN A LIQUID ENVIRONMENT. IT IS ASSUMED THAT THE LIQUID ENVIRONMENT MAY BE REPRESENTED BY A SERIES OF FLOW-CHANNELS AND NODES. FLOW-CHANNELS ARE INTRODUCED IN THE REGION BETWEEN SURFACES OF NEIGHBORING SOLIDS, AND NODES ARE USED TO CONNECT TWO OR MORE FLOW-CHANNELS. ALSO, IT IS ASSUMED THAT THE SOLID BODIES UNDERGO UNIDIRECTIONAL MOTION, THAT POTENTIAL FLOW THEORY IS APPLICABLE, THAT THE WIDTH OF A FLOW-CHANNEL IS SMALL COMPARED WITH THE LENGTH SO THERE IS NO PRESSURE DROP ACROSS THE FLOW-CHANNEL, AND THAT NODAL VOLUME IS SMALL COMPARED WITH FLOW-CHANNEL VOLUME.

580 ASTEM ASTEM IS A MODULAR SET OF FORTRAN IV SUBROUTINES TO EVALUATE THE GIBBS, HELMHOLTZ, AND SATURATION LINE FUNCTIONS AS PUBLISHED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (1967). ANY THERMODYNAMIC QUANTITY INCLUDING DERIVATIVE PROPERTIES CAN BE OBTAINED FROM THESE ROUTINES BY A USER-SUPPLIED MAIN PROGRAM.

586 PLENUM BULK FLOW DISTRIBUTION IN A CYLINDRICAL REACTOR COOLANT INLET PLENUM IS CALCULATED USING POTENTIAL FLOW THEORY.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES 3/74

48 FUGUE THE FUGUE PROGRAM COMPUTES STEADY-STATE WALL AND BULK FLUID TEMPERATURE, VOID FRACTION, AND LOCAL PRESSURE IN LIQUID-COOLED CLOSED CHANNELS IN WHICH THE HEATING RATE IS SPECIFIED. THE REQUIRED RELATIONSHIPS ARE EXPRESSED IN GENERAL, NON-DIMENSIONAL FORM AND COMBINED IN AN INTERNALLY CONSISTENT MANNER TO ALLOW PREDICTIONS FOR A VARIETY OF COOLANTS AND SPECIFIED OPERATING CONDITIONS.

80 SOR3 SOR3 IS USED FOR THE ANALYSIS OF SYMMETRICALLY LOADED SHELLS OF REVOLUTION. THE PROGRAM COMPUTES STRESSES, STRAINS, FORCES AND DEFLECTIONS PRODUCED BY THERMAL AND MECHANICAL LOADS. NORMAL AND TRANSVERSE SHEAR STRESSES AND WALL THICKNESS CHANGES ARE TAKEN INTO ACCOUNT. THE PROGRAM IS BASED ON CONSTITUTIVE EQUATIONS WHICH RETAIN TERMS THROUGH THE SECOND ORDER IN THE RATIO OF THE THICKNESS TO THE LOCAL RADII OF CURVATURE. THESE FEATURES MAKE THE PROGRAM APPLICABLE TO SHELL STRUCTURES WITH MODERATELY LARGE THICKNESS TO RADIUS RATIOS.

109 4RESTRAINT PIPE STRESS CODE THIS PROGRAM EVALUATES A FOUR RESTRAINT PIPING SYSTEM DESIGNED FOR HIGH TEMPERATURE OPERATION.

112 CROCK CROCK SELECTS THE MINIMUM WEIGHT DESIGN FOR A SPACE POWER PLANT IN WHICH THE WASTE CYCLE HEAT IS RADIATED DIRECTLY TO SPACE FROM THE CONDENSER. IT ACCOUNTS FOR HEAT TRANSFER, FLUID FLOW, METEOROID PROTECTION, AND THE GEOMETRIC PROPERTIES OF A RADIATOR-CONDENSER.

114 SHOCK SHOCK SELECTS THE MINIMUM WEIGHT DESIGN FOR A HEAT-REJECTION SYSTEM FOR A SPACE POWER PLANT IN WHICH THE SENSIBLE HEAT LOST FROM A SINGLE-PHASE FLUID IS RADIATED TO SPACE. IT ACCOUNTS FOR HEAT TRANSFER, FLUID FLOW, METEOROID PROTECTION AND RADIATOR GEOMETRY.

187 CENTRIFUGAL PUMP IMPELLER DESI THIS SYSTEM HAS BEEN DEVELOPED FOR THE DESIGN AND DEVELOPMENT OF HIGH SPEED TURBOMACHINERY FOR PUMPING HIGH TEMPERATURE LIQUID METALS. AFTER INITIALING THE ANALYSIS AND DESIGN EFFORT BY ESTABLISHING THE PUMP CONDITIONS OF SERVICE THE CODES ARE USED TO DEFINE THE PUMP IMPELLER DESIGN. IN ALL PROGRAMS, REAL FLUID EFFECTS ARE NOT CONSIDERED. THE MACHINING CODE PRODUCES A PAPER TAPE FOR USE IN THE ACTUAL FABRICATION OF THE IMPELLER.

190 WOPEXPRT, WEIGHT OPTIMIZATION THE PURPOSE OF THE CODE IS TO CHOOSE THE LIGHTEST REACTOR RESULTING FROM ALL POSSIBLE COMBINATIONS OVER THE RANGE OF REACTOR INDEPENDENT VARIABLES SPECIFIED. THE ENGINEERING CALCULATIONS FOR EACH REACTOR DESIGN ARE BASED ON A LIQUID-COOLED CYLINDRICAL REACTOR HAVING PIN-TYPE FUEL ELEMENTS. REACTOR CONTROL IS ASSUMED TO BE EFFECTED BY MOVABLE SIDE REFLECTORS SURROUNDING THE CORE. NECESSARY PHYSICS DATA IS INPUT IN THE FORM OF SECOND-DEGREE EQUATIONS AS A FUNCTION OF THE INDEPENDENT VARIABLES.

232 GAZELLES DETERMINATION OF GAS-COOLED FAST REACTOR CORE PROPORTIONS REQUIRED TO SATISFY SPECIFIED DESIGN CONSTRAINTS AND COMPUTATION OF RESULTING PERFORMANCE CHARACTERISTICS.

233 CORE THE REACTOR CORE CONFIGURATION DESIGNED BY THE CORE PROGRAM CONSISTS OF CYLINDRICAL FUEL ELEMENTS ARRANGED ON AN EQUILATERAL PITCH SPACING WITH INTERNAL AND EXTERNAL COOLING. THE FUEL ELEMENT IS COMPOSED OF THREE CONCENTRIC GRAPHITE RINGS, AN INTERNAL COOLANT CHANNEL, AND A SPINE. THE COOLANT CHANNEL IS FORMED BY THE SPINE AND INNER GRAPHITE RING. THE FUEL IS CONTAINED IN THE MIDDLE GRAPHITE RING. CORE WILL DETERMINE THE NUMBER OF FUEL ELEMENTS OF A SPECIFIED DIAMETER AND LENGTH REQUIRED TO SATISFY A GIVEN CENTRAL FUEL TEMPERATURE. IT ALSO ADJUSTS THE PITCH SPACING REQUIRED TO PRODUCE A DESIRED PRESSURE DROP AS WELL AS PROVIDING A SPECIFIED INTERNAL COOLING RATE.

244 CYCLOPS1 CYCLOPS1 IS A PROGRAM FOR THE ANALYSIS OF THERMODYNAMIC SYSTEMS. IT IS A GENERAL PURPOSE PROGRAM THAT PERFORMS A HEAT AND MASS BALANCE FOR THERMODYNAMIC SYSTEMS COMPOSED OF PUMPS, TURBINES, SEPARATORS, HEAT EXCHANGERS, COMPRESSORS AND FLOW THROTTLING DEVICES. THESE COMPONENTS MAY BE CONNECTED IN ANY DESIRED WAY. THE THERMODYNAMIC FLUIDS THAT MAY BE USED ARE WATER, AIR, NITROGEN, AND PARA-HYDROGEN.

250 SAFE-PORS SAFE-PORS NUMERICALLY DETERMINES THE STRESS AND STRAIN DISTRIBUTION WITHIN EITHER HOMOGENEOUS OR HETEROGENEOUS THICK-WALLED BODIES OF REVOLUTION. IT IS DESIGNED FOR THE ANALYSIS OF MULTI-MATERIAL AXISYMMETRIC COMPOSITE STRUCTURES SUCH AS REINFORCED AND/OR PRESTRESSED CONCRETE VESSELS. DEFORMATIONS MUST BE WITHIN THE ELASTIC LIMIT OF THE MATERIALS CONSIDERED AND ONLY BODIES OF REVOLUTION SUBJECTED TO AXISYMMETRIC LOADING CAN BE TREATED.

251 SAFE-AXISYM SAFE-AXISYM IS A PROGRAM FOR THE ANALYSIS OF MULTI-MATERIAL AXISYMMETRIC COMPOSITE STRUCTURES. IT IS DESIGNED FOR THE ANALYSIS OF HETEROGENEOUS STRUCTURES SUCH AS REINFORCED AND/OR PRESTRESSED CONCRETE VESSELS. THE STRUCTURE IS ASSUMED TO BE LINEARLY ELASTIC, AND ONLY BODIES OF REVOLUTION SUBJECTED TO AXISYMMETRIC LOADING CAN BE TREATED.

252 SAFE-PLANE SAFE-PLANE IS APPLIED TO TWO-DIMENSIONAL STRUCTURES OF ARBITRARY GEOMETRY UNDER IN-PLANE LOADS. EITHER PLANE STRESS OR PLANE STRAIN CONDITIONS MAY BE IMPOSED. MECHANICAL AND/OR THERMAL LOADS ARE PERMITTED.

253 SAFE-SHELL SAFE-SHELL IS USED TO DESIGN AND ANALYZE AXISYMMETRIC THIN SHELL STRUCTURES OF ARBITRARY GENERATRICES UNDER AXISYMMETRIC MECHANICAL AND/OR THERMAL LOADING CONDITIONS. THE INTERSECTION OF TWO OR MORE SHELLS CAN BE TREATED.

266 CYGRO2 CYGRO2 IS USED TO DETERMINE STRESSES AND STRAINS DURING STEADY-STATE AND TRANSIENT POWER OPERATION OF AN OXIDE-FUELED, METAL CLAD ROD-TYPE FUEL ELEMENT IN A PRESSURIZED ENVIRONMENT. MAJOR LOADING CONDITIONS INCLUDE FUEL SWELLING, FISSION GAS AND COOLANT PRESSURE, CLAD GROWTH AND DIFFERENTIAL THERMAL EXPANSION. THE APPLICATION FOR WHICH THE PROGRAM HAS BEEN DEVELOPED IS ZIRCALOY TUBES CONTAINING BULK OXIDE FUEL. AXIAL AND AZIMUTHAL SYMMETRY OF TEMPERATURE AND STRESSES IS ASSUMED.

282 SEALSHELL2 (M0110) THE SEALSHELL2 PROGRAM DETERMINES STRESSES, STRAINS, DEFLECTIONS, AND REACTIONS IN A THICK SHELL OF REVOLUTION WITH AXISYMMETRIC LOADING. THE LOADING CONSISTS OF A TEMPERATURE DISTRIBUTION, INSIDE AND OUTSIDE PRESSURE DISTRIBUTIONS, AND CIRCUMFERENTIAL FORCES AND MOMENTS APPLIED TO THE MIDDLE SURFACE. THE SHELL IS LINEAR-ELASTIC WITH TENSILE, BENDING, AND SHEAR STRAINS.

283 M0552 M0552 SOLVES THE TRANSIENT RESPONSE PROBLEM OF LINEAR ELASTIC, LUMPED-MASS SYSTEMS SUBJECTED TO A UNIDIRECTIONAL FOUNDATION TRANSIENT THAT CAN BE EITHER A VELOCITY OR ACCELERATION TRANSIENT. NORMAL MODE THEORY IS USED AND THE INPUT TO THE PROGRAM CONSISTS OF THE MODE SHAPES, FREQUENCIES, AND FOUNDATION TRANSIENT. ELEMENT EFFECTS ARE ALSO EVALUATED AS A FUNCTION OF TIME. MODAL DAMPING COEFFICIENTS MAY BE SPECIFIED.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES 3/74

300 SAFE-CREEP SAFE-CREEP PERFORMS A VISCO-ELASTIC ANALYSIS OF PLANE OR AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES WITH AGE- AND TEMPERATURE-DEPENDENT CREEP DATA.

315 WIREX WIREX PRODUCES WIRING LISTS CONTAINING ALL THE INFORMATION NORMALLY FOUND ON DETAILED WIRING DRAWINGS. THESE LISTS ARE PRESENTED TO THE ELECTRICIANS AS A JOB BOOK CONTAINING INFORMATION IN THE ORDER IN WHICH IT IS REQUIRED FOR LOGICAL PROCEDURE THROUGH A WIRING JOB. WIREX LISTS WERE USED EXTENSIVELY DURING INSTALLATION FOR THE UHTREX PROJECT.

329 M0457(PIPE) PIPE PERFORMS AN ELASTIC STRESS ANALYSIS OF A 3-DIMENSIONAL PIPING STRUCTURE WITH THERMAL STRESSES, REDUNDANT LOOPS, AND CONCENTRATED LOADS.

332 SAFE-3D SAFE-3D IS A FINITE-ELEMENT PROGRAM FOR THE THREE-DIMENSIONAL ELASTIC ANALYSIS OF HETEROGENEOUS COMPOSITE STRUCTURES. THE PROGRAM USES THE FOLLOWING TYPES OF FINITE ELEMENTS - (1) TETRAHEDRAL ELEMENTS TO REPRESENT THE CONTINUUM, (2) TRIANGULAR PLANE STRESS MEMBRANE ELEMENTS TO REPRESENT INNER LINER OR OUTER CASE, AND (3) UNIAXIAL TENSION-COMPRESSION ELEMENTS TO REPRESENT INTERNAL REINFORCEMENT. THE STRUCTURE CAN BE OF ARBITRARY GEOMETRY AND HAVE ANY DISTRIBUTION OF MATERIAL PROPERTIES, TEMPERATURES, SURFACE LOADINGS, AND BOUNDARY CONDITIONS.

337 STEM STEM CALCULATES AND PUNCHES OUT PARTIALLY-COUPLED MASS, STIFFNESS AND INTERNAL LOAD FUNCTION MATRICES FOR A STRUCTURAL SYSTEM OF BEAMS HAVING PRISMATIC SEGMENTS. SHEAR DEFORMATION AND ROTATIONAL INERTIA ARE INCLUDED IN THE CALCULATIONS.

344 GEM GEM IS INTENDED PRIMARILY TO PERFORM VIBRATION STUDIES WITH THE CAPABILITY OF GENERATING INPUT FOR THE VEP (VIBRATION EIGENVALUE PROBLEM) ROUTINE AND PERFORMING ADDITIONAL OPERATIONS ON THE OUTPUT FROM THE SHO (SHOCK) SEGMENT. GIVEN A SYSTEM OF MASSES AND SPRINGS, THE VEP ROUTINE COMPUTES THE NATURAL FREQUENCIES OF THE VIBRATING SYSTEM AS WELL AS THE MODE SHAPES FOR EACH FREQUENCY. GIVEN THE MODE SHAPES, FREQUENCIES, AND MASSES OF A VIBRATING SYSTEM, THE SHO ROUTINE WILL COMPUTE THE DEFLECTIONS AND FORCES AT THE MASS POINTS.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES 3/74

353 SWELL2 SWELL2 WAS DEVELOPED TO PROVIDE THE FUEL-ELEMENT LIFETIME DATA REQUIRED FOR POWER PLANT OPTIMIZATION STUDIES. THE PROGRAM COMMENCES BY CALCULATING RADIAL AND AXIAL TEMPERATURES IN A FUEL ELEMENT. THE FUEL WHICH IS HOTTER THAN THE EFFECTIVE-FISSION-GAS-RELEASE-TEMPERATURE IS CONSIDERED TO RELEASE ITS FISSION GAS IMMEDIATELY TO A PLENUM, AND THE PRESSURE OF ALL PLENUM GAS IS CALCULATED. THE PRESSURE OF THE GAS RETAINED FOR A WHILE IN THE COLDER FUEL IS ALSO CALCULATED. AT EACH AXIAL POSITION THE PLENUM PRESSURE IS COMPARED WITH THE PRESSURE EXERTED BY RETAINED FISSION GAS, AND THE LARGER OF THE TWO PRESSURES IS CONSIDERED TO BE THE EFFECTIVE PRESSURE AS FAR AS CLADDING DAMAGE IS CONCERNED. THE CLADDING IS ASSUMED TO FAIL WHEN ITS CUMULATIVE DAMAGE EQUALS UNITY AT ANY AXIAL POSITION. DAMAGE COMPONENTS ARE PRIMARY CREEP, SECONDARY CREEP, RATCHETING GROWTH DUE TO THERMAL CYCLING, FATIGUE DUE TO THERMAL CYCLING, AND STRAIN DUE TO INEXORABLE FUEL SWELLING. AT EACH STEP OF THE CALCULATIONS THE FUEL ELEMENT IS SUBJECTED TO SEVERAL CONDITIONS OF ABNORMAL OPERATION (OVERPOWER, FLOW COASTDOWN, ETC.) TO ENSURE THEY COULD NOT PRODUCE ENOUGH ADDITIONAL DAMAGE TO CAUSE FAILURE AT THAT TIME.

357 SUPORAN SUPORAN SOLVES FOR STEADY-STATE DEFORMATION AND STRENGTH CHARACTERISTICS OF A NUCLEAR REACTOR CORE SUPPORT STRUCTURE. THIS STRUCTURE IS ASSUMED TO BE MADE OF TWO CIRCULAR PLATES WHICH ARE LOCATED ABOVE EACH OTHER AND ARE INTERCONNECTED PERPENDICULARLY WITH CONCENTRIC ROWS OF TUBULAR MEMBERS. THE GEOMETRY OF THE STRUCTURE AND ITS LOADING (TRANSVERSE PRESSURE AND INTERNAL TEMPERATURE GRADIENTS) ARE ALL OF AXISYMMETRICAL NATURE.

365 BOW2 BOW2 IS USED TO CALCULATE DEFLECTIONS OF CLOSELY-SPACED PARALLEL BEAMS, EACH WITH LIMITED-PIVOT SUPPORT AT ONE END, POSSIBLE BEAM INTERACTIONS AT THE OTHER END AND AT ONE INTERMEDIATE POSITION, ASSUMING AN ARBITRARY TEMPERATURE DISTRIBUTION.

378 TUBE TUBE SOLVES FOR THE STRESSES DUE TO PRESSURE AND TEMPERATURE IN A U-TUBE TYPE HEAT EXCHANGER. SPECIFICALLY, IT HANDLES A CONFIGURATION CONSISTING OF A SPHERICAL HEAD, PRIMARY TRANSITION CYLINDER, AND SECONDARY CYLINDER. THE TRANSITION CYLINDERS MAY BE CONICAL AND TAPERED IN THICKNESS, BUT THE REMAINING SHELLS ARE OF UNIFORM THICKNESS. THE SPHERICAL HEAD AND THE TRANSITION CYLINDERS MAY BE OMITTED FROM A PROBLEM.

379 SAFE-2D SAFE-2D PERFORMS THE ELASTIC STRESS ANALYSIS OF GENERAL AXISYMMETRIC, PLANE, AND COMBINED AXISYMMETRIC AND PLANE COMPOSITE STRUCTURES.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES 3/74

383 M0266 M0266 COMPUTES THE DYNAMIC SHOCK FORCES AND MODAL FREQUENCIES ACTING ON A LUMPED MASS, LINEAR ELASTIC MODEL OF A STRUCTURE SUBJECTED TO SHOCK SPECTRUM INPUTS. THE MODEL EMPLOYED IS A COLLECTION OF LUMPED MASSES CONNECTED BY WEIGHTLESS FLEXIBLE ELEMENTS. IF THE ORIGINAL STRUCTURE IS NOT STATICALLY DETERMINATE, REDUNDANT FORCES MUST BE INTRODUCED TO ENSURE A PRIMARY STRUCTURE THAT IS.

391 SORSDB SORSDB WAS WRITTEN TO CALCULATE THE STRESS INTENSITIES AND FATIGUE USAGE FACTORS FOR PRESSURE VESSELS (STRUCTURAL MEMBERS) IN ACCORDANCE WITH THE ASME CODE, NUCLEAR VESSELS, SECTION 3. THE INPUT REQUIRES THE BASIC MEMBRANE AND BENDING STRESSES GENERATED BY THE SCR2 CODE (ACC ABSTRACT 80) OR ANY ADAPTABLE SHELL PROGRAM. THE OUTPUT INCLUDES STRESS DIFFERENCES, STRESS INTENSITIES, AND FATIGUE USAGE FACTORS.

402 SABOR4 SABOR4 IS A DISCRETE ELEMENT DISPLACEMENT PROGRAM FOR THE LINEAR-ELASTIC, STATIC, LOAD-DEFLECTION ANALYSIS OF MERIDIONALLY-CURVED, VARIABLE-THICKNESS, BRANCHED, THIN SHELLS OF REVOLUTION WHICH MAY BE SUBJECTED TO CONCENTRATED OR DISTRIBUTED EXTERNAL LOADING AND TO ISOTHERMAL OR NONUNIFORM TEMPERATURE CONDITIONS. THE PROGRAM CONSISTS OF FIVE PRIMARY SUBPROGRAMS - HAL4, MELT4, LANCE4, MAINS4, AND SUMPLOT4. THREE OF THESE (HAL4, MELT4, AND LANCE4) PROCESS EXTERNAL-MECHANICAL-LOAD OR THERMAL-LOAD DATA TO DETERMINE THE GENERALIZED NODAL FORCES FOR EACH DISCRETE ELEMENT. MAINS4 COMPUTES THE DISCRETE-ELEMENT STIFFNESS AND MASS MATRICES AND FORMS THESE MATRICES FOR THE ASSEMBLED STRUCTURE. SUMPLOT4 CALCULATES THE OTHER QUANTITIES OF INTEREST, SUMS CONTRIBUTIONS FROM VARIOUS LOADING HARMONICS, AND PREPARES RESULTS FOR CALCOMP PLOTTING.

404 FINEL FINEL IS A COLLECTION OF 3 PROGRAMS FOR THE CALCULATION OF THE ELASTIC AND PLASTIC BEHAVIOR OF STRUCTURES. THE STRUCTURES ARE BUILT UP FROM PLATES AND BARS, WHICH CAN BE ARRANGED IN EITHER 2-DIMENSIONAL OR 3-DIMENSIONAL ASSEMBLIES. THE PLATES CAN BE IN PLANE STRESS OR PLANE STRAIN. FINEL2 HANDLES 2-D STRUCTURES ONLY. FINEL3 CAN HANDLE BOTH 2- AND 3-D STRUCTURES, BUT IS SLOWER.

412 MANE1 THE MANE1 PROGRAM FINDS THE MAGNETIC FLUX IN EACH BRANCH OF A MAGNETIC NETWORK CONSISTING OF A NUMBER OF BRANCHES OF IRON AND AIR. THE PROBLEM IS ONE STEP IN THE DESIGN OF SLOW SPEED RELUCTANCE MOTORS IN WHICH THE MAGNETIC FLUX IS DETERMINED IN ALL COMPONENT PARTS FOR A POSITION OF THE ROTOR WITH RESPECT TO THE STATOR.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES

449 CYGRO3 CYGRO3 IS AN EXTENSIVE MODIFICATION OF CYGRO1 AND CYGRO2 (ACC ABSTRACT 266). BASICALLY THE PROGRAM CALCULATES TEMPERATURES, DEFORMATION, AND STRESSES IN CLADDED FUEL RODS AS A FUNCTION OF A HISTORY OF POWER AND COOLANT CONDITIONS. AXIAL AND CIRCUMFERENTIAL UNIFORMITY ARE ASSUMED. BUBBLE GROWTH AND MIGRATION ARE INCLUDED. THE MAIN CHANGES FROM CYGRO1 AND CYGRO2 ARE IN THE AREA OF VOID MIGRATION, FUEL CRACKING, CLAD COLLAPSE, REPRESENTATION OF IN-PILE CREEP AND CLAD ANISOTROPY.

451 SAFE-CRACK SAFE-CRACK PERFORMS A VISCOELASTIC ANALYSIS OF PLANE AND AXISYMMETRIC COMPOSITE CONCRETE STRUCTURES SUBJECTED TO TRANSIENT TEMPERATURE AND MECHANICAL LOADINGS. THE SPECIFIC CREEP OF CONCRETE AS AN AGE AND TEMPERATURE DEPENDENT FUNCTION, AND CONCRETE FAILURE UNDER COMBINED STRESSES ARE CONSIDERED. PARTICULAR EMPHASIS IS PLACED ON THE CRACKING ANALYSIS IN CONCRETE STRUCTURES AND THE NONLINEAR DEPENDENCE OF CREEP PROPERTY ON TRANSIENT TEMPERATURE.

452 SHELL5 SHELL5 PERFORMS AN ELASTIC STRESS ANALYSIS OF SMOOTHLY CURVED, ARBITRARILY SHAPED, THREE-DIMENSIONAL THIN SHELLS WITH ANY DESIRED DISTRIBUTIONS OF MATERIAL PROPERTIES, BOUNDARY CONSTRAINTS, AND MECHANICAL, THERMAL, AND DISPLACEMENT LOADING CONDITIONS.

460 LIFE1 LIFE1 IS DESIGNED TO PREDICT THE IN-PILE BEHAVIOR OF CYLINDRICAL FAST REACTOR FUEL ELEMENTS. ASSUMING AXIAL SYMMETRY, THE GENERALIZED PLANE-STRAIN ANALYSIS COMBINES MODELS FOR FUEL RESTRUCTURING, MIGRATION OF FUEL CONSTITUENTS, FUEL SWELLING DUE TO ACCUMULATION OF FISSION PRODUCTS, FISSION GAS RELEASE, HOT PRESSING OF THE FUEL, AND CLAD SWELLING DUE TO VOID NUCLEATION AND GROWTH. AN ITERATIVE PROCEDURE ALLOWS THE CODE TO COMPUTE THE DETAILED THERMAL AND MECHANICAL RESPONSE OF THE FUEL ELEMENT DURING ANY SPECIFIED HISTORY OF NORMAL REACTOR POWER CYCLING. UP TO 10 AXIAL SECTIONS ARE ALLOWED TO ACCOUNT FOR VARIATIONS IN POWER AND COOLANT TEMPERATURE, AND AN OPTION IS INCLUDED FOR TREATMENT OF ENCAPSULATED ELEMENTS.

468 BUBL1 BUBL1 PREDICTS FUEL SWELLING AND FISSION GAS RELEASE FROM NUCLEAR FUELS, BASED ON MOVEMENT OF FISSION GAS BUBBLES IN SOLIDS BY A SURFACE DIFFUSION MECHANISM UNDER THE ACTION OF A THERMAL GRADIENT (SEE REFERENCE 3). INTERACTIONS OF THE BUBBLES WITH DISLOCATIONS AND GRAIN BOUNDARIES PROVIDE TEMPORARY TRAPPING SITES, PRIOR TO RELEASE.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES 3/74

481 BUSHL BUSHL DETERMINES THE LOAD AT WHICH A FINITE LENGTH SHELL OF REVOLUTION WILL BUCKLE WHEN SUBJECTED TO HYDROSTATIC PRESSURE, AXIAL COMPRESSION, OR A COMBINATION OF THE TWO. ELASTIC-PLASTIC MATERIAL PROPERTIES ARE USED WITH DEFORMATION THEORY AND THIN SHELL THEORY TO ANALYZE THE SHELL. BUSHL WAS DEVELOPED PRIMARILY FOR THE BUCKLING COLLAPSE ANALYSIS OF ZIRCALOY-CLAD OXIDE FUEL RODS.

503 DUZ2 DUZ2 PERFORMS TWO-DIMENSIONAL ELASTIC-PLASTIC STRESS CALCULATIONS. THE PROGRAM TREATS AXIALLY SYMMETRIC BODIES OR PLANE REGIONS (PLANE STRESS OR PLANE STRAIN) ASSUMING DEFORMATION THEORY. LOADING CONDITIONS MAY BE A NON-UNIFORM TEMPERATURE DISTRIBUTION, BODY FORCES, AND BOUNDARY DISPLACEMENTS OR STRESSES.

537 M0678(FUGIT1) FUGIT1 PERFORMS A TRANSIENT STEP ANALYSIS OF AN ELASTIC STRUCTURE MOUNTED ON A RIGID BASE WHICH HAS A GIVEN SHOCK HISTORY OF MOTION. THE STRUCTURE MAY HAVE NONLINEAR CONSTRAINTS AND DAMPING.

539 STRAP THE CODE STRAP (STRUCTURAL ANALYSIS PACKAGE) WAS DEVELOPED TO ANALYZE THE RESPONSE OF STRUCTURAL SYSTEMS TO STATIC AND DYNAMIC LOADING CONDITIONS. STRAP-S SOLVES FOR THE DISPLACEMENTS AND MEMBER FORCES OF STRUCTURAL SYSTEMS UNDER STATIC LOADS AND TEMPERATURE GRADIENTS. STRAP-D WILL SOLVE NUMERICALLY A GIVEN STRUCTURAL DYNAMICS PROBLEM.

542 PSA2 PSA2 COMPUTES THE REACTIONS AND STRESSES CAUSED BY THERMAL EXPANSION AND LOADS IN A MULTI-ANCHOR PIPING SYSTEM WHICH MAY CONTAIN LOOPS AND MAY BE PARTIALLY RESTRAINED AT ANY POINT IN ANY DIRECTION.

568 BEHAVE2 BEHAVE2 CALCULATES THE POSITION IN SPACE OF CLADDING, FUEL, AND VOIDAGE IN AN OPERATING OXIDE FUEL PIN WITH UNFAILED CLADDING. AXIAL SYMMETRY IS ASSUMED THROUGHOUT THE PROGRAM. ALSO CALCULATED ARE STRESS, STRAIN, DISPLACEMENT, AND TEMPERATURE FIELDS. INFLUENTIAL PROCESSES SIMULATED INCLUDE CRACKING OF FUEL, DILATATION OF FUEL AND CLADDING DUE TO IRRADIATION EFFECTS AND THERMAL EXPANSION, FUEL DENSIFICATION BY BOTH STRESS- AND DIFFUSION-CONTROLLED PROCESSES, AXIAL SLIPPAGE OR LOCKING AT THE FUEL-CLADDING INTERFACE AND AXIAL FLOW OF FUEL.

I. DEFORMATION AND STRESS DISTRIBUTION COMPUTATIONS, STRUCTURAL ANALYSIS, AND ENGINEERING DESIGN STUDIES 3/74

570 STRIPE(M0650) STRIPE EXAMINES THE DEFORMATIONS IMPOSED ON THE CLADDING OF CYLINDRICAL FUEL ELEMENTS DUE TO DIFFERENTIAL THERMAL EXPANSIONS DURING ABRUPT POWER INCREASES. THE TITLE IS TAKEN FROM STRESSES AND CRACKING IN PELLETS. THE CALCULATIONAL MODEL INCLUDES EFFECTS OF PELLET CRACKING, THE CONSTRAINT OF SYSTEM PRESSURE AND CLADDING, COMPRESSIVE PLASTIC FLOW IN THE FUEL AND THE TEMPERATURE DEPENDENCE OF MATERIAL PROPERTIES.

581 SLADE-D SLADE-D ANALYZES THE TRANSIENT DYNAMIC RESPONSE OF ELASTIC SHELLS.

597 MATUS MATUS PERFORMS SMALL-STRAIN ELASTIC ANALYSIS OF THREE-DIMENSIONAL SOLIDS.

598 PELEN PELEN SOLVES A TWO-DIMENSIONAL, AXISYMMETRICAL MODEL OF A FUEL PELLET AND CLAD ELEMENT FOR THE TEMPERATURE, STRESS, AND DEFORMATION THROUGHOUT A TIME HISTORY. IN A GENERAL TIME INCREMENT, THE COMPUTATIONAL SEQUENCE IS - (1) A HEAT CONDUCTION ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CURRENT TEMPERATURE FIELD WHICH IS DEPENDENT ON THE POWER RATE, THE MATERIAL PROPERTIES, AND THE GEOMETRICAL CONFIGURATION, (2) AN INCREMENTAL STRESS ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CURRENT STRESS AND DEFORMATION FIELDS WHICH ARE DEPENDENT ON THE INELASTIC STRAIN INCREMENTS (TEMPERATURE, CREEP, VOLUME EXPANSION, ETC.), THE MATERIAL PROPERTIES, AND THE GEOMETRICAL CONFIGURATION, AND (3) A CONTACT ANALYSIS OF BOTH FUEL AND CLAD TO DETERMINE THE CORRECTED CURRENT STRESS AND DEFORMATION FIELDS WHICH ARE DEPENDENT ON THE EXTENT OF CONTACT BETWEEN ADJACENT FUEL PELLETS AND/OR THE FUEL AND CLAD.

604 TCB01 A TUBE UNDER EXTERNAL PRESSURE, AT ELEVATED TEMPERATURE, AND INITIALLY OUT-OF-ROUND WILL CREEP, BECOMING MORE OUT-OF-ROUND AND EVENTUALLY WILL COLLAPSE. TCB01 ATTEMPTS TO PREDICT THE TIME OF COLLAPSE.

45 GRACE1 GRACE1 IS A MULTIGROUP, MULTIREGION, GAMMA-RAY ATTENUATION PROGRAM DESIGNED PRIMARILY FOR COMPUTING GAMMA-RAY HEATING AND GAMMA-RAY DOSE RATES IN MULTIREGION FINITE OR SEMI-INFINITE SLAB SHIELDS. A DIFFERENT BUILDUP FACTOR MAY BE SPECIFIED FOR EACH SOURCE REGION CONSIDERED.

46 GRACE2 GRACE2 IS A MULTIGROUP, MULTIREGION, GAMMA-RAY ATTENUATION PROGRAM TO COMPUTE THE TOTAL DOSE RATE OR HEAT GENERATION RATE FROM EITHER A SPHERICAL OR A CYLINDRICAL SOURCE. THE SOURCE, WHICH MAY BE LOCATED IN EITHER THE CENTRAL REGION OF THE SYSTEM OR IN A CONCENTRIC SHELL REGION SURROUNDING IT, MAY BE UNIFORM, EXPONENTIAL, OR HAVE A POLYNOMIAL VARIATION IN THE RADIAL DIRECTION. IN THE CASE OF CYLINDRICAL GEOMETRY, IT MAY ALSO HAVE A POLYNOMIAL VARIATION IN THE AXIAL DIRECTION.

91 FARSE-1A THE PROGRAM COMPUTES THE NEUTRON LEAKAGE FROM A SHIELD ANNULUS. THE REMOVAL CROSS SECTIONS INCORPORATE MULTISCATTERING EFFECTS. DOSE DEPOSIT AT THE TARGET MESH IS THEN DETERMINED FROM THE ANGULAR DISTRIBUTION OF THE LEAKAGE NEUTRONS, INTEGRATED OVER THE SHIELD SURFACE.

110 SCARF2 SCARF2 EVALUATES THE FIRST-ORDER APPROXIMATION OF THE FAST NEUTRON CURRENT AT THE PAY LOAD SURFACE DUE TO NEUTRONS WHICH SCATTER FROM THE RADIATOR FINS. IT USES SNAP GEOMETRY AND IS A COMPLEMENTARY PROGRAM TO FARSE.

111 SCAR1 SCAR1 PERFORMS SINGLE SCATTER RAY TRACING AND EVALUATES SCATTERING FROM A RING. IT IS COMPLEMENTARY TO FARSE.

123 LIPRECAN1 LIPRECAN1 IS A TWO-DIMENSIONAL MONTE CARLO PROGRAM TO COMPUTE THE PENETRATION AND ENERGY DEPOSITION OF NEUTRONS IN PURE HYDROGENOUS MEDIA. THE CODE OFFERS THREE POSSIBLE GEOMETRIES, I. E., CONICAL, CYLINDRICAL AND ONE-DIMENSIONAL INFINITE SLAB GEOMETRY (THIS LATTER OPTION TO THE EXTENT THAT AN INFINITE SLAB MAY BE APPROXIMATED BY A CYLINDER OF LARGE RADIUS). THE CODE MAY BE USED WITH A MONO-DIRECTIONAL POINT OR BEAM SOURCE AND IS MODIFIED EASILY TO HANDLE ANGULAR DISTRIBUTIONS. ISOTROPIC SCATTERING IN THE CENTER OF MASS SYSTEM IS ASSUMED. THE FOLLOWING RESULTS ARE TABULATED WITH EACH SUMMARY -

(A) ENERGY DEPOSITION DISTRIBUTION,
(B) PARTICLE DEPOSITION DISTRIBUTION,
(C) PARTICLE LEAKAGE FRACTION,
(D) PARTICLE ABSORPTION FRACTION,
(E) THE FRACTION OF PARTICLES REACHING THE CUTOFF ENERGY WHICH HAVE NEITHER LEAKED NOR HAVE BEEN ABSORBED,
(F) THE AVERAGE ENERGY PER PARTICLE LEAKING FROM THE SYSTEM,
(G) THE AVERAGE ENERGY PER PARTICLE REMAINING IN THE SYSTEM AS HEAT GENERATION,
(H) THE AVERAGE NUMBER OF COLLISIONS PER HISTORY,
(I) THE TOTAL NUMBER OF HISTORIES CURRENTLY BEING SUMMARIZED,
(J) THE AVERAGE ENERGY DEPOSIT PER HISTORY THROUGH ABSORPTION,
(K) THE AVERAGE ENERGY OF PARTICLES ABSORBED.

141 RATRAP THE RATRAP PROGRAM COMPUTES THE DOSE RATE AT SPECIFIED SPATIAL POINTS ABOUT A SYSTEM OF SNAP GEOMETRY.

142 MORTIMER MORTIMER COMPUTES THE DOSE RATE AT SPECIFIED SPATIAL POINTS ABOUT A SYSTEM OF SNAP GEOMETRY.

143 MAC MAC PERFORMS SLAB GEOMETRY, MULTIGROUP NEUTRON AND GAMMA RAY PENETRATION ANALYSIS FOR A MULTI-REGION REACTOR SHIELD. THE CODE CALCULATES THE FOLLOWING INFORMATION AS A FUNCTION OF DISTANCE THROUGH A REACTOR SHIELD ASSEMBLY -

NEUTRON FLUXES FOR UP TO 35 ENERGY GROUPS,
NEUTRON DOSE RATES,
THE APPROXIMATE NEUTRON SPECTRUM,
GAMMA RAY FLUXES FOR 7 ENERGY GROUPS,
TOTAL GAMMA DOSE RATE, WITH A BREAKDOWN OF THE CONTRIBUTION FROM SOURCES IN EACH REACTOR AND SHIELD REGION,
THE APPROXIMATE GAMMA RAY SPECTRUM.

197 SHOE THE SHOE CODE MAKES USE OF THE METHOD OF STEEPEST DESCENT TO FIND THE DIMENSIONS OF A MINIMUM-WEIGHT, THREE-LAYER SHIELD IN SPHERICAL GEOMETRY. THE WEIGHT MINIMIZATION IS CARRIED OUT SUBJECT TO THE CONSTRAINING CONDITION OF A CONSTANT DOSE RATE AT SOME SELECTED POINT OUTSIDE THE SHIELD.

259 MUSCAT MUSCAT COMPUTES THE INCIDENT SCATTERED NEUTRON CURRENTS AS A FUNCTION OF POSITION WITHIN (1) THE CAVITY FORMED BY TWO TRUNCATED CONCENTRIC SPHERES, (2) THE CAVITY BETWEEN TWO CONCENTRIC CIRCULAR CYLINDERS, OR (3) A CYLINDRICAL CAVITY.

343 M0756(LETO) LETO WILL SOLVE THE GAMMA RAY TRANSPORT AND ENERGY DEPOSITION PROBLEM IN ONE-DIMENSIONAL LAMINAR SLAB GEOMETRY. THE ENERGY GROUP SCHEME IS EMPLOYED TO ACCOUNT FOR PHOTON ENERGY DEGRADATION. AN ARBITRARY EXTERNAL SPATIAL ISOTROPIC SOURCE MAY BE SPECIFIED WITH AN ARBITRARY ENERGY SPECTRUM. THE BOUNDARY CONDITIONS MAY BE (A) FREE BOUNDARIES WITH ARBITRARY INCIDENT, (B) SYMMETRY ON THE LEFT ARBITRARY INCIDENT ON THE RIGHT, AND (C) SYMMETRY ON BOTH ENDS.

429 ASPIS ASPIS COMPUTES THE ENERGY, DOSE AND ENERGY DEPOSITION BUILDUP FACTORS FOR MONOENERGETIC GAMMA RAYS FOR A PLANE ISOTROPIC, PLANE MONODIRECTIONAL, OR PLANE SLANT SOURCE, IN AN ARBITRARY LAMINAR ARRAY.

462 SPAN4 SPAN4 CALCULATES THE FAST NEUTRON DOSE RATE, THERMAL NEUTRON FLUX, GAMMA-RAY FLUX, DOSE RATE, AND ENERGY-ABSORPTION RATE IN RECTANGULAR, CYLINDRICAL, AND SPHERICAL GEOMETRIES BY INTEGRATING APPROPRIATE EXPONENTIAL KERNELS OVER A SOURCE DISTRIBUTION. THE SHIELD CONFIGURATION IS FLEXIBLE - A FIRST-LEVEL SHIELD MESH, USING ANY ONE OF THE THREE GEOMETRIES, IS SPECIFIED. REGIONS OF THIS SAME GEOMETRY OR OF OTHER GEOMETRIES, HAVING THEIR OWN (FINER) MESHES, MAY THEN BE EMBEDDED BETWEEN THE FIRST-LEVEL MESH LINES, DEFINING SECOND-LEVEL SHIELD MESHES. THIS PROCESS IS TELESCOPIC - THIRD-LEVEL SHIELD MESHES MAY BE EMBEDDED BETWEEN SECOND-LEVEL MESH LINES IN TURN. ALL MESHES MAY HAVE VARIABLE SPACING. SOURCES AND DETECTORS MAY BE LOCATED ARBITRARILY WITH RESPECT TO ANY SHIELD MESH. THE SOURCE IS DEFINED BY THE FUNCTION -

```
S=S0+S1(A)*S2(B)*S3(C)+S4(A,B)*S3(C)+S5(A,C)*S2(B)+S6(B,C)
  *S1(A)+S7(A,B,C)
```

WHERE A, B, AND C REPRESENT COORDINATES. IF ANY FACTOR IS MISSING, THE CORRESPONDING TERMS ARE ZERO. CROSS SECTIONS, BUILDUP FACTORS, STANDARD COMPOSITIONS, ENERGY STRUCTURES, DOSE-CONVERSION FACTORS, INFINITE LINE AND INFINITE PLANE SOURCE KERNELS, AND QUADRATURES ARE CONTAINED IN A LIBRARY OF APPROXIMATELY 10,000 ITEMS.

569 VIEWPIN THE PROGRAM CALCULATES VIEW FACTORS FOR CYLINDRICAL PINS WHENEVER THE PROBLEM CAN BE REPRESENTED TWO-DIMENSIONALLY.

273 THREDES THREDES IS A SCIENTIFIC APPLICATIONS PROGRAMMING SYSTEM. INCORPORATED IN THIS SYSTEM ARE THE NECESSARY MODULES TO PERFORM PARAMETRIC DESIGN STUDIES OF THERMAL REACTORS INCLUDING THE THERMAL CELL HOMOGENIZATION (BAM - ACC ABSTRACT 108), THE FAST SPECTRUM CALCULATION (FORM - ACC ABSTRACT 51), REACTOR DIFFUSION THEORY (FOG - ACC ABSTRACT 28), AND ZERO-DIMENSIONAL BURNUP (KINDLE) CALCULATIONS. THESE MODULES CAN BE USED IN CONJUNCTION WITH ONE ANOTHER OR INDIVIDUALLY.

387 CITATION CITATION IS DESIGNED TO SOLVE PROBLEMS INVOLVING THE FINITE-DIFFERENCE REPRESENTATION OF DIFFUSION THEORY TREATING UP TO THREE SPACE DIMENSIONS WITH ARBITRARY GROUP-TO-GROUP SCATTERING. X-Y-Z, THETA-R-Z, HEXAGONAL-Z, AND TRIAGONAL-Z GEOMETRIES MAY BE TREATED. DEPLETION PROBLEMS MAY BE SOLVED AND FUEL MANAGED FOR MULTI-CYCLE ANALYSIS. EXTENSIVE FIRST-ORDER PERTURBATION RESULTS MAY BE OBTAINED, GIVEN MICROSCOPIC DATA AND NUCLIDE CONCENTRATIONS. STATICS PROBLEMS MAY BE SOLVED AND PERTURBATION RESULTS OBTAINED WITH MICROSCOPIC DATA.

189 SNC CALCULATION OF SN CONSTANTS FOR DSN AND TDC.

193 CSP2A THIS CODE PREPARES 100 GROUP FORWARD AND ADJOINT MACROSCOPIC MIXTURE CROSS SECTIONS FOR SN TYPE CODES. THE 100 GROUP MICROSCOPIC CROSS SECTIONS ARE TAKEN FROM THE CROSS SECTION TAPE WRITTEN BY THE CODE CSP1. THE OUTPUT OF CSP2A IS IN THE FORM OF TWO TAPES, ONE CONTAINING THE FORWARD AND THE OTHER THE ADJOINT MACROSCOPIC CROSS SECTIONS. THE CROSS SECTIONS ARE ALSO PRINTED, IF DESIRED.

194 CSP1 THIS CODE PREPARES 100 GROUP MICROSCOPIC CROSS SECTIONS FOR SN TYPE REACTOR CODES, USING THE GAM2 NUCLEAR DATA TAPE FOR THE CROSS SECTION DATA FOR THE FIRST 99 GROUPS. THE DATA FOR GROUP 100 IS PART OF THE PUNCHED CARD INPUT. THE 100 GROUP SN CROSS SECTIONS, PREPARED BY THE CODE, ARE WRITTEN ON TAPE AND PRINTED, IF DESIRED. THE CROSS SECTIONS ARE FOR THE ISOTROPIC OPTION OF THE SN CODES. THE DIAGONAL TRANSPORT APPROXIMATION HAS BEEN USED IN CALCULATING THE TRANSPORT AND IN-GROUP SCATTERING CROSS SECTIONS. THE CORRECTION TERM USED TO CALCULATE THESE TWO CROSS SECTIONS IS SIMPLY 1/3 OF THE P1 SCATTERING CROSS SECTION. THE NUMBER OF OUT-OF-GROUP SCATTERING TERMS IS OPTIONAL. WHEN LESS THAN THE NUMBER APPEARING ON THE GAM2 TAPE ARE REQUESTED, THE REMAINING TERMS, FOR A GIVEN SOURCE GROUP, ARE SUMMED AND ADDED TO THE LAST DOWN-SCATTERING TERM SAVED. WHEN CROSS SECTIONS ARE LISTED IN THE SN FORMAT, IT IS POSSIBLE THAT ONE OR MORE INTERMEDIATE DOWN-SCATTERING TERMS WILL BE ZERO. WHEN THIS SITUATION ARISES, THE CODE WILL REPLACE THESE INTERMEDIATE ZEROS WITH THE QUANTITY 1.0*10**(-20).

218 GAVER GAVER CALCULATES GROUP AVERAGED CROSS SECTIONS FROM POINTWISE CROSS SECTION DATA FOR THE GAM2 99 FINE-GROUP LIBRARY. THE INPUT DATA ARE USED TO OBTAIN A SET OF INTERPOLATED CROSS SECTIONS, WHERE 20 INTERPOLATED CROSS SECTIONS ARE OBTAINED FOR EACH FINE GROUP. WHERE INPUT DATA DO NOT COVER THE FULL RANGE OF A FINE GROUP, THE GROUP-AVERAGED CROSS SECTION IS SET TO ZERO.

234 DPC DPC PREPARES INPUT DATA FOR TWO-DIMENSIONAL NEUTRONIC CALCULATIONS FROM ENGINEERING DATA. A GENERAL DESCRIPTION OF REGIONS, IN TERMS OF MULTIPLE SUBREGIONS, ALLOWS FOR EXPLICIT CONSIDERATION OF DETAILED STRUCTURAL FORMS. DURING THE TRANSFORMATION OF DATA, GENERAL THERMAL EXPANSIONS ARE INCLUDED. ALSO, CONSIDERABLE DATA CHECKING AND EVALUATION ARE PERFORMED. COMBINED WITH THE FLEXIBLE NARRATIVE INPUT, THESE FEATURES MAKE THE CODE USEFUL IN THE PREPARATION OF ERROR-FREE INPUT FOR COMPLEX PROBLEMS.

296 GRDWRK GRDWRK GENERATES AS PUNCHED OUTPUT THE BASIC FINITE ELEMENT REFERENCE GRID WORK FOR THE SAFE CODES. THIS GENERATED GRID CONSISTS OF TRIANGULAR ELEMENTS AND NODES, UNIAXIAL ELEMENTS, SUCH AS REINFORCEMENT BARS, TENDONS, AND ANCHORS, AND BIAXIAL MEMBRANES, SUCH AS ANY THIN SHELL OR LINER. THE PUNCHED OUTPUT SERVE AS DIRECT INPUT DATA TO THE SAFE CODES.

345 GAND GAND PREPARES THE CROSS SECTIONS NEEDED FOR DETAILED COMPUTATIONS OF NEUTRON ENERGY SPECTRA IN FAST REACTORS FROM A FILE OF BASIC NUCLEAR DATA IN THE ENDF/B FORMAT.

373 BL47 BL47 IS A PLOTTING ROUTINE DESIGNED FOR PLANE STRUCTURES THAT ARE TO UNDERGO STRESS ANALYSIS. POINTS AND LINES ARE INPUT IN VARIOUS PARAMETRIC FORMS, AND CURVED SEGMENTS ARE DRAWN BETWEEN GIVEN POINTS ALONG THE GIVEN LINES. THE PROGRAM MAY BE USED AS A DRAFTING TOOL TO CONSTRUCT ENGINEERING DRAWINGS. BL47 USES THREE POINTS ON A STRAIGHT LINE SEGMENT TO OBTAIN DIMENSIONS FOR SEALSHELL2 (ACC ABSTRACT 282) INPUT DATA.

406 DATATRAN 2-D GEOMETRY INPUT THIS SERIES OF DATATRAN MODULES IS DESIGNED TO FACILITATE THE PREPARATION OF GEOMETRIC INPUT TO 2-DIMENSIONAL FINITE DIFFERENCE PROGRAMS FROM DATA READILY TRANSCRIBED FROM ENGINEERING DRAWINGS AND TO CHECK AND EDIT THE INPUT DATA GENERATED.

509 ETOT2 ETOT2 PROCESSES BASIC NUCLEAR INFORMATION GIVEN IN THE ENDF/B LIBRARY TAPE FORMATS I AND II AND PRODUCES DATA DECKS FOR USE IN THE GENERATION OF KATE, THERMOS (ACC ABSTRACT 184), TEMPEST (ACC ABSTRACT 50), AND LASER (ACC ABSTRACT 249) LIBRARIES.

530 GENRD GENRD WILL READ AND PROCESS FREE-FORMAT NUMERIC AND HOLLERITH INPUT DATA FROM CARDS.

533 ARC(NUI002) BCD INPUT PROCESSOR THE MODULE ARC(NUI002) PROCESSES GENERAL NEUTRONICS INPUT DATA SETS FOR SUBSEQUENT USE BY THE NEUTRONICS-COMPUTATIONAL MODULES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM.

594 ARC-XSEC1 ARC-XSEC1 PROVIDES THE CAPABILITY OF MANIPULATING MULTIGROUP MICROSCOPIC CROSS SECTION DATA IN THE XS.ISO FORMAT TO AFFECT MODIFICATIONS OF THE ISOTOPIC CROSS SECTION COMPONENTS, TO COLLAPSE THE ENERGY GROUP STRUCTURE TO FEWER GROUPS, AND TO HOMOGENIZE MIXTURES INTO MATERIAL AND COMPOSITION LEVEL DATA FOR USE BY THE NEUTRONICS MODULES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM.

159 MOMUS MOMUS IS THE PROGRAM USED TO CONSTRUCT AND MAINTAIN THE NEUTRON CROSS SECTION MASTER TAPE DEVELOPED UNDER THE ATOMICS INTERNATIONAL AUTOMATED CROSS SECTION PROGRAM. THE LIBRARY CONTAINS 21 ELEMENTS WITH DATA FOR 11 PARAMETERS IN THE RANGE 0.001 EV TO 10 MEV. MOMUS WILL PERFORM THE FOLLOWING TASKS -

(A) MAKE THE BINARY MASTER TAPE FROM CARDS,
(B) LIST SELECTED ELEMENTS,
(C) UPDATE - ADD, CORRECT AND REPLACE ANY DATA,
(D) MAKE A SHORT TAPE CONTAINING SELECTED ELEMENTS,
(E) PROVIDE GRAPHICAL DISPLAY OF SELECTED DATA, AND
(F) PUNCH MICROSCOPIC DATA.

181 XLIBIT USING THE ANL STANDARD CROSS SECTION DATA CARDS AS INPUT, THE PROGRAM CAN PERFORM THE FOLLOWING OPERATIONS -

(A) PREPARE A LIBRARY TAPE CONSISTING OF THE CROSS SECTION DATA FOR SETS OF MATERIALS, INCLUDING A DIRECTORY GIVING THE SETS ON THE TAPE AND THE MATERIALS IN EACH SET,
(B) GIVEN AN EXISTING LIBRARY TAPE, THE PROGRAM CAN PREPARE A DUPLICATE TAPE OR A MODIFIED TAPE, THE MODIFICATIONS CONSISTING OF THE ADDITION AND DELETION OF SETS, THE ADDITION AND DELETION OF MATERIALS WITHIN A SET, AND THE RE-ORDERING OF THE SETS ON THE TAPE,
(C) ANY OF THE DATA ON A LIBRARY TAPE MAY BE PRINTED, AND THE PROGRAM WILL PUNCH THE CROSS SECTION DATA CARDS THAT WERE USED TO PLACE ANY OF THE MATERIALS OR SETS ON THE TAPE WITH ALTERED SET AND MATERIAL NAMES IF DESIRED.

206 UNPACK UNPACK RETRIEVES NEUTRON CROSS SECTION DATA AND RELATED INFORMATION FROM A SCISRS (BROOKHAVEN NATIONAL LABORATORY) DATA TAPE. THE FORMAT AND STRUCTURE OF THE SCISRS TAPE IS DESCRIBED IN BNL-883 BY FRIEDMAN AND PLATT, JULY 1964.

236 DFSR DATA FILE SERVICE ROUTINES (DFSR) ARE USED TO STORE, DISTRIBUTE, AND CHECK THE DATA ON THE EVALUATED NUCLEAR DATA FILE (ENDF). THERE ARE 6 ROUTINES -

DFSR1 - STORES DATA ON MASTER LIBRARY TAPES.
DFSR2 - PROCESSES REQUESTS FOR DATA BY FINDING THE APPROPRIATE DATA ON THE MASTER TAPES AND COPYING THEM ONTO THE REQUESTORS TAPE.
DFSR3 - CORRECTS DATA ON THE MASTER TAPES.
DFSR4 - COPIES/PRINTS/PUNCHES SELECTED DATA FROM THE MASTER TAPES.
DFSR5 - PRINTS LIST OF DATA RECENTLY ADDED TO MASTER TAPES AND PREPARES A CROSS-REFERENCE LIST OF ALL DATA ON THE MASTER TAPES.
DFSR6 - MAKES COPIES AND CHECKS THE MASTER TAPES.

271 CLIP CLIP IS THE CROSS SECTION LIBRARY PREPARATION AND MAINTENANCE PROGRAM FOR FORM AND THREDES.

350 ETOE ETOE (ENDF/B TO MC**2 DATA CONVERSION) ACCEPTS CROSS SECTION DATA FROM A MODE 2 ENDF/B TAPE (SEE REFERENCE 3) AND PREPARES THE BINARY CROSS SECTION AND LEGENDRE POLYNOMIAL TAPE FOR THE MC**2 CODE WRITTEN BY ARGONNE NATIONAL LABORATORY. THE ETOE PROGRAM PROCESSES FORMATS I, II, AND III ENDF/B DATA TAPES.

351 ECSIL ECSIL (EXPERIMENTAL CROSS SECTION INFORMATION LIBRARY) IS A SYSTEM FOR THE STORAGE, RETRIEVAL, AND DISPLAY OF EXPERIMENTAL NEUTRON DATA. THE HEART OF THE ENTIRE SYSTEM IS THE COLLECTION OF DESIGNATORS USED TO IDENTIFY THE TYPE OF NEUTRON DATA, E.G., WHETHER THE MEASUREMENT IS A FISSION CROSS SECTION, AN ANGULAR DISTRIBUTION FOR EMERGENT NON-ELASTIC NEUTRONS BETWEEN TWO NEUTRON ENERGIES, ETC. THERE ARE THREE DICTIONARIES USED FOR INPUT TO THE DATA FILE - ONE FOR THE REACTION-TYPE DESIGNATOR, ONE FOR THE STATUS OF THE DATA, AND ONE TO FLAG THE PROGRAM TO PERFORM CERTAIN CONVERSIONS. EXPERIMENTAL NEUTRON DATA ARE, IN GENERAL, COMPOSED OF TWO INTERDEPENDENT, BUT LOGICALLY SEPARABLE PARTS, THE BIBLIOGRAPHIC INFORMATION AND THE ACTUAL EXPERIMENTAL VALUES. THE REFERENCE ACCESSION NUMBER, WHICH IS ASSIGNED TO A REFERENCE AND ITS ASSOCIATED SET OF DATA AS THEY ARE ACQUIRED, SERVES AS A LINK BETWEEN THE BIBLIOGRAPHIC AND THE EXPERIMENTAL DATA FILES. AFTER A REFERENCE ACCESSION NUMBER IS ASSIGNED TO A NEW REFERENCE, THE FOLLOWING INFORMATION IS ENTERED INTO THE BIBLIOGRAPHIC FILE - THE COMPLETE BIBLIOGRAPHIC CITATION, THE LABORATORY WHERE THE MEASUREMENT WAS PERFORMED, A BRIEF DESCRIPTION OF THE EXPERIMENTAL TECHNIQUE, CORRECTIONS THAT HAVE BEEN MADE TO THE RESULTS, AND NORMALIZATIONS, IF ANY. IN ADDITION, ANY CHANGES MADE TO THE DATA (RENORMALIZATIONS TO BETTER STANDARDS, CORRECTIONS, ETC.) ARE RECORDED HERE. SUPPLEMENTARY REFERENCES ARE CARRIED ALONG AS SEE ALSOS.

375 SCORE3 SCORE IS AN INTERACTIVE NEUTRON CROSS SECTION EVALUATION SYSTEM.

384 CHECKER/CRECT/DAMMET/PLOTFB/ THIS PACKAGE OF FIVE PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B (EVALUATED NUCLEAR DATA FILE VERSION B) VERSION I TAPES.

CHECKER CHECKS THAT THE ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERYWHERE POSITIVE.

CRECT, WHICH CAN PROCESS ENDF/B VERSION III DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETION OF DATA.

DAMMET SELECTIVELY MERGES DATA FROM ONE OR TWO ENDF/B LIBRARY TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) AND ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PROCESS.

PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PROCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

386 DATATRAN DATATRAN SUPPLIES A LINKAGE SYSTEM FOR MODULARIZED PROGRAMS, ENABLES A HIERARCHICAL NAMING TECHNIQUE, AND SIMPLIFIES HANDLING OF STRUCTURED DATA LISTS.

403 TIGIR2 TIGIR IS A MODULAR PROGRAM DESIGNED TO GENERATE AND MAINTAIN LIBRARIES OF DOCUMENT INFORMATION (ABSTRACTS, BIBLIOGRAPHIC INFORMATION, INDEX TERMS, AND OTHER SIGNIFICANT INFORMATION), TO RETRIEVE THE INFORMATION SELECTIVELY, TO PRINT THE RETRIEVED INFORMATION IN VARIOUS OUTPUT FORMATS, AND TO GENERATE STATISTICS OF THE INFORMATION FILES.

472 MERMC2/MAGIC THE PROGRAMS MERMC2 AND MAGIC ARE SERVICE ROUTINES FOR USE WITH THE BINARY CROSS-SECTION LIBRARY TAPES OF THE MC**2 MULTIGROUP CROSS-SECTION PROGRAM.

MERMC2 TAKES AS INPUT TWO MC**2 LIBRARY TAPES AND PRODUCES A NEW MC**2 LIBRARY TAPE CONTAINING DATA FROM BOTH INPUT TAPES WITH DELETION OF PARTICULAR MATERIALS AS DESIRED, OR MERMC2 MAY BE USED TO CREATE A NEW LIBRARY TAPE FROM A SINGLE INPUT TAPE BY SIMPLY DELETING SELECTED MATERIALS.

MAGIC PRODUCES LIBRARY TAPE LISTINGS AND TAPES FOR OFF-LINE CALCOMP PLOTTING OF SELECTED DATA FROM AN MC**2 LIBRARY TAPE.

475 CRECT/CHECKER/RIGEL/PLCTFB/ THIS PACKAGE OF EIGHT PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B II (EVALUATED NUCLEAR DATA FILE VERSION B FORMAT II) TAPES.

CRECT, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETICN CF DATA.

CHECKER CHECKS THAT THE ENDF/B BCD CARD IMAGE FORMAT TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE CHECKED TO ENSURE THEY ARE EVERYWHERE POSITIVE.

RIGEL WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTC FRCM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE VERSA) AND CHANGE TAPE MODE.

LISTFC, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PRODUCES INTERPRETED LISTINGS OF INFORMATION FROM BCD STANDARD ARRANGEMENT ENDF/B TAPES.

DICTION CONSTRUCTS A NEW SECTION DICTIONARY (FILE 1, SECTICN 451) FOR AN ENTIRE ENDF/B TAPE. IF A SECTION DICTIONARY IS ALREADY PRESENT IT IS REPLACED.

PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PRCCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

DAMMET SELECTIVELY MERGES DATA FRCM CNE CR TWO ENDF/B LIBRARY TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) AND ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PRCCESS.

490 JOSHUA OPERATING SYSTEM JOSHUA IS A SYSTEM WHICH EFFECTIVELY STORES LARGE VOLUMES OF DATA AND RETRIEVES IT FOR DISPLAY AND COMPUTATION.

493 TROUT TRCUT IS A FILE MAINTENANCE PROGRAM WHICH ALLOWS THE USER TO ALTER, MERGE, DELETE, OVERLAY OR CREATE MULTIGROUP CROSS SECTION FILES IN MUG FORMAT.

502 EDITOR EDITOR PRODUCES READABLE LISTINGS OF THE CONTENTS OF ENDF/B NUCLEAR DATA CROSS SECTION TAPES. IT ALSO ALLOWS COPYING, ALTERING MODE, MERGING AND PUNCHING OF THE DATA ON CNE CR MCRE ENDF/B TAPES.

522 ARC-SYSTEM ARC-SYSTEM IS THE COLLECTION OF SYSTEMS SUBPROGRAMS AND MODULES WHICH PROVIDE THE SOFTWARE ENVIRONMENT NECESSARY TO EXECUTE THE MODULAR COMPUTATIONAL CAPABILITIES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM ON IBM360 SYSTEMS.

557 SHLOG SHLOG PROVIDES GENERAL-PURPOSE DATA MANIPULATION FUNCTIONS FOR DATA ANALYSIS. THESE FUNCTIONS INCLUDE CREATING, MAINTAINING, AND STORING FILES, DISPLAYING THE CONTENTS OF A FILE VIA EITHER THE LINE PRINTER OR AN ON-LINE PLOTTER, SEARCHING FOR DATA POINTS BY COMPARING VALUES WITH SPECIFIED CRITERIA, AND PERFORMING CERTAIN STATISTICAL OPERATIONS ON THE DATA POINTS.

571 CHECK3/RIGEL3 THESE PROGRAMS ARE USED TO PROCESS ENDF/B VERSION III DATA. IN ADDITION, THE CDC6600 PROGRAMS WILL PROCESS ENDF/B VERSION IV DATA. CHECK3 CHECKS THAT THE ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERYWHERE POSITIVE. RIGEL3 WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTO FROM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE-VERSA) AND CHANGE TAPE MODE.

587 AEC-ALO FAU THE AEC-ALO RADIO FREQUENCY ASSIGNMENTS AND USES PROGRAM (FAU) PROVIDES FOR MAINTAINING RADIO FREQUENCY ASSIGNMENT AND TRANSACTION RECORDS. IT LISTS ALL RADIO FREQUENCY ASSIGNMENTS AND USES FROM INITIAL APPLICATION (AEC-310) THROUGH AUTHORIZATIONS (IRAC DOCKET). THE PROGRAM ALLOWS FOR SORTING BY OFFICE, SYSTEM NUMBER, LOCATION, FREQUENCY, EXPIRATION DATE, ALO OR AEC SERIAL NUMBER, AND IRAC DOCKET NUMBER.

589 BECOM AEC REGULATIONS REQUIRE THAT A PURCHASE VS. LEASE ANALYSIS BE MADE ON EACH PIECE OF DATA PROCESSING EQUIPMENT AS PART OF THE STUDY PRECEDING THE LEASE OR PURCHASE OF SUCH EQUIPMENT. IN ADDITION, IT IS REQUIRED THAT A PURCHASE VS. LEASE ANALYSIS BE PREPARED ANNUALLY FOR EACH ITEM OF DATA PROCESSING EQUIPMENT LEASED WITH AEC FUNDS. BECOM WAS DEVELOPED TO FACILITATE THE RAPID AND ACCURATE PREPARATION OF AN AEC PURCHASE VS. LEASE SCHEDULE FOR AN ITEM OF DATA PROCESSING EQUIPMENT.

475 CRECT/CHECKER/RIGEL/PLCTFB/ THIS PACKAGE OF EIGHT PROGRAMS IS DESIGNED FOR PROCESSING ENDF/B II (EVALUATED NUCLEAR DATA FILE VERSION B FORMAT II) TAPES.

CRECT, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PROVIDES A MEANS OF CORRECTING ASSEMBLED DATA ON A TAPE BY INSERTION AND DELETICN CF DATA.

CHECKER CHECKS THAT THE ENDF/B BCD CARD IMAGE FORMAT TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE CHECKED TO ENSURE THEY ARE EVERYWHERE POSITIVE.

RIGEL WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTC FRCM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE VERSA) AND CHANGE TAPE MODE.

LISTFC, WHICH PROCESSES VERSION III ENDF/B DATA AS WELL AS EARLIER VERSIONS, PRODUCES INTERPRETED LISTINGS OF INFORMATION FROM BCD STANDARD ARRANGEMENT ENDF/B TAPES.

DICTION CONSTRUCTS A NEW SECTION DICTIONARY (FILE 1, SECTICN 451) FOR AN ENTIRE ENDF/B TAPE. IF A SECTION DICTIONARY IS ALREADY PRESENT IT IS REPLACED.

PLOTFB PROCESSES ENDF/B LIBRARY TAPES WHICH CONTAIN DATA EMBEDDED WITHIN A NECESSARY LIBRARY STRUCTURE IN ORDER TO PRODUCE COMPREHENSIVE LISTINGS AND/OR PLOTS. THE LISTINGS AND/OR PLOTS CONTAIN AN EXTENSIVE AMOUNT OF INFORMATION RELATED TO THE DATA, SUCH AS TEMPERATURE DEPENDENCE, PHYSICAL UNITS OF THE DATA, INTERPOLATION LAWS FOR THE DATA, CRYPTIC TITLES DEFINING THE REACTION TYPE, ETC.

SLAVE3 PROVIDES MODULAR SUBROUTINES WHICH CAN BE ASSEMBLED TO RETRIEVE AND PRCCESS ENDF/B DATA FOR A SPECIFIC PROBLEM.

DAMMET SELECTIVELY MERGES DATA FRCM CNE CR TWO ENDF/B LIBRARY TAPES ONTO A FINAL TAPE. THE MODE (BCD OR BINARY) ANC ARRANGEMENT (STANDARD OR ALTERNATE) MAY BE CHANGED DURING THIS PROCESS.

490 JOSHUA OPERATING SYSTEM JOSHUA IS A SYSTEM WHICH EFFECTIVELY STORES LARGE VOLUMES OF DATA ANC RETRIEVES IT FOR DISPLAY AND COMPUTATION.

493 TROUT TRCUT IS A FILE MAINTENANCE PROGRAM WHICH ALLOWS THE USER TO ALTER, MERGE, DELETE, OVERLAY OR CREATE MULTIGROUP CROSS SECTION FILES IN MUG FORMAT.

502 EDITOR EDITOR PRODUCES READABLE LISTINGS OF THE CONTENTS OF ENDF/B NUCLEAR DATA CROSS SECTION TAPES. IT ALSO ALLOWS COPYING, ALTERING MODE, MERGING AND PUNCHING OF THE DATA ON CNE CR MCRE ENDF/B TAPES.

522 ARC-SYSTEM ARC-SYSTEM IS THE COLLECTION OF SYSTEMS SUBPROGRAMS AND MODULES WHICH PROVIDE THE SOFTWARE ENVIRONMENT NECESSARY TO EXECUTE THE MODULAR COMPUTATIONAL CAPABILITIES OF THE ARGONNE REACTOR COMPUTATION (ARC) SYSTEM ON IBM360 SYSTEMS.

557 SHLOG SHLOG PROVIDES GENERAL-PURPOSE DATA MANIPULATION FUNCTIONS FOR DATA ANALYSIS. THESE FUNCTIONS INCLUDE CREATING, MAINTAINING, AND STORING FILES, DISPLAYING THE CONTENTS OF A FILE VIA EITHER THE LINE PRINTER OR AN ON-LINE PLOTTER, SEARCHING FOR DATA POINTS BY COMPARING VALUES WITH SPECIFIED CRITERIA, AND PERFORMING CERTAIN STATISTICAL OPERATIONS ON THE DATA POINTS.

571 CHECK3/RIGEL3 THESE PROGRAMS ARE USED TO PROCESS ENDF/B VERSION III DATA. IN ADDITION, THE CDC6600 PROGRAMS WILL PROCESS ENDF/B VERSION IV DATA. CHECK3 CHECKS THAT THE ENDF/B TAPES ARE IN PROPER FORMAT AND ALL FIELDS ARE WITHIN SPECIFIED LIMITS, RATHER THAN THE PHYSICS OF THE DATA LIBRARY. ANGULAR DISTRIBUTIONS RECONSTRUCTED FROM LEGENDRE COEFFICIENTS ARE EVERYWHERE POSITIVE. RIGEL3 WILL PERFORM ANY OR ALL OF THE FOLLOWING OPERATIONS - SELECTIVELY RETRIEVE ENDF/B DATA ON FROM 1 TO 9 ENDF/B TAPES, MERGE RETRIEVED ENDF/B DATA ONTO FROM 1 TO 8 ENDF/B RESULT TAPES, CHANGE TAPE ARRANGEMENT (FROM STANDARD TO ALTERNATE OR VICE-VERSA) AND CHANGE TAPE MODE.

587 AEC-ALO FAU THE AEC-ALO RADIO FREQUENCY ASSIGNMENTS AND USES PROGRAM (FAU) PROVIDES FOR MAINTAINING RADIO FREQUENCY ASSIGNMENT AND TRANSACTION RECORDS. IT LISTS ALL RADIO FREQUENCY ASSIGNMENTS AND USES FROM INITIAL APPLICATION (AEC-310) THROUGH AUTHORIZATIONS (IRAC DOCKET). THE PROGRAM ALLOWS FOR SORTING BY OFFICE, SYSTEM NUMBER, LOCATION, FREQUENCY, EXPIRATION DATE, ALO OR AEC SERIAL NUMBER, AND IRAC DOCKET NUMBER.

589 BECOM AEC REGULATIONS REQUIRE THAT A PURCHASE VS. LEASE ANALYSIS BE MADE ON EACH PIECE OF DATA PROCESSING EQUIPMENT AS PART OF THE STUDY PRECEDING THE LEASE OR PURCHASE OF SUCH EQUIPMENT. IN ADDITION, IT IS REQUIRED THAT A PURCHASE VS. LEASE ANALYSIS BE PREPARED ANNUALLY FOR EACH ITEM OF DATA PROCESSING EQUIPMENT LEASED WITH AEC FUNDS. BECOM WAS DEVELOPED TO FACILITATE THE RAPID AND ACCURATE PREPARATION OF AN AEC PURCHASE VS. LEASE SCHEDULE FOR AN ITEM OF DATA PROCESSING EQUIPMENT.

595 MAPPER MAPPER IS A COMPUTER PROGRAM FOR PREDICTING EQUIPMENT REQUIREMENTS. IT WAS DESIGNED AS AN AID TO MANAGEMENT AND CAN INTERPRET COMPONENT PRODUCTION REQUIREMENTS BACKWARD FROM SHIPPING SCHEDULES TO THE PROCESS OF INTEREST, CALCULATE EQUIPMENT CAPACITY, DISPLAY SIX MONTHS PRIOR EQUIPMENT UTILIZATION AND PROCESS YIELD DATA.

603 RALCRTPH RALCRTPH IS A RESOURCE ALLOCATION SYSTEM USED TO PROVIDE THE PROJECT PLANNER WITH A TOOL TO HELP HIM SCHEDULE RESOURCES INVOLVED IN A PROJECT. INFORMATION ON WHICH JOBS ARE CRITICAL AND THE RESOURCES AVAILABLE IS NECESSARY FOR PROJECT SCHEDULING. THIS SYSTEM IS ORIENTED TOWARD THE USER WHO IS PLANNING A PLANT SHUTDOWN. HOWEVER, IT ALSO HAS APPLICATIONS IN OTHER AREAS.

607 SPIRAL THE GENERAL ABILITY OF SPIRAL IS BUILDING, PERHAPS GRADUALLY, A MACHINE-READABLE ENCYCLOPEDIA OF INFORMATION ITEMS THAT ARE OR MAY BECOME IMPORTANT TO A PARTICULAR PROJECT, AND THEN LATER, RECALLING BITS OF INFORMATION AS REQUIRED. THE INFORMATION CONTENT OF A COLLECTION CAN RANGE FROM CRYPTIC COMMENTS (AS OCCUR IN SOME TEST AND INSPECTION RECORDS) TO MORE LENGTHY ENTRIES (SUCH AS TECHNICAL ABSTRACTS AND MANAGEMENT BRIEFS) AS WELL AS FULL TEXT OF DOCUMENTS.

133 WED THIS PROGRAM EDITS THE MAGNETIC TAPE PRODUCED BY W-DSN CALCULATING REACTION RATES BY ENERGY AND BY VOLUME WITH TOTALS. IT CAN ALSO PRODUCE REACTION RATES FOR FED-IN CROSS SECTIONS.

207 CROSSPLOT/CROSSPLOT DATA TAPE AUTOMATIC PLOTS ARE GENERATED FROM NEUTRON CROSS SECTION DATA.

210 DTX THE DTX CODE CALCULATES EFFECTIVE MACROSCOPIC, HOMOGENEOUS, GROUP CROSS SECTIONS WHICH ARE SPACE-AVERAGED OVER THE FLUXES AND CURRENTS PRE-CALCULATED IN A ONE-DIMENSIONAL NEUTRON TRANSPORT CODE SUCH AS DTK OR DSN. ISOTROPIC AND ANISOTROPIC CROSS SECTIONS MAY BE INCLUDED.

239 CPS CPS PROVIDES A GRAPHICAL MEANS OF COMPARING EXPERIMENTAL CROSS SECTION VALUES OBTAINED FROM THE SCISRS LIBRARY TAPE WITH AN OPTION TO INCLUDE READING IN NEW EXPERIMENTAL OR CALCULATED VALUES.

409 LARCA MULTIGROUP CROSS SECTIONS ARE WEIGHTED BY THE FLUX IN THE APPROPRIATE GROUPS AND REGIONS, AND CROSS SECTIONS FOR THE ASSEMBLY ARE COMPUTED AND PUNCHED IN DTF4 FORMAT. THE PROGRAM ALSO COMPUTES THE INFINITE MEDIUM FLUX, REACTION RATES, AND THE INFINITE MULTIPLICATION FACTOR AND MATERIAL BUCKLING.

434 HEATMESH HEATMESH IS USED TO GENERATE GEOMETRICAL DATA REQUIRED FOR STUDIES OF HEAT TRANSFER IN AXISYMMETRIC STRUCTURES REPRESENTED AS SURFACES OF REVOLUTION. THE PROGRAM CONSISTS OF TWO DISTINCT PHASES. THE FIRST SUBDIVIDES THE GIVEN PARTS INTO A NODAL NETWORK AND EVALUATES THE GEOMETRICAL PROPERTIES OF THE NODES. THE SECOND DETERMINES ADJACENT NODES AND EDITS GEOMETRICAL DATA FOR THE THERMAL MODEL.

455 DAC1 DAC1 USES ANGULAR FLUXES FROM THE DTF4 SN CODE TO CALCULATE REACTIVITY PERTURBATIONS, EFFECTIVE DELAYED NEUTRON FRACTIONS, AND GENERATION TIMES IN REACTORS. THE REFERENCE REACTOR SPECIFICATIONS ARE INPUT TO DAC1 BY A DIRECT READING OF THE DTF4 INPUT DECK. CONSEQUENTLY, THE ONLY ADDITIONAL INPUT NEEDED ARE THE PERTURBATION SPECIFICATIONS.

471 GAPER2D GAPER2D IS A TWO-DIMENSIONAL TRANSPORT PERTURBATION THEORY PROGRAM USING THE REAL AND ADJOINT FLUXES AND CURRENTS FROM 2DF (ACC ABSTRACT 173) PROBLEM RESULTS TO COMPUTE REACTIVITY CHANGES DUE TO SMALL PERTURBATIONS IN REFLECTED MULTIREGION SYSTEMS.

544 PLOT-3D PLOT-3D IS A PACKAGE OF SUBPROGRAMS DESIGNED TO DRAW THREE-DIMENSIONAL SURFACES FROM ARRAYS OF POINTS (X,Y,Z). THE SURFACES CAN BE DRAWN AFTER ARBITRARY ROTATIONS ABOUT THE THREE COORDINATE AXES.

606 GAPER1D REACTIVITY COEFFICIENTS ARE COMPUTED USING FIRST-ORDER TRANSPORT PERTURBATION THEORY FOR ONE-DIMENSIONAL MULTI-REGION REACTOR ASSEMBLIES. THE NUMBER OF SPATIAL MESH POINTS AND ENERGY GROUPS IS ARBITRARY. AN ELEMENTARY SYNTHESIS SCHEME IS EMPLOYED FOR TREATMENT OF TWO- AND THREE-DIMENSIONAL PROBLEMS. THE CONTRIBUTIONS TO THE CHANGE IN INVERSE MULTIPLICATION FACTOR, DELTA(1/K), FROM PERTURBATIONS IN THE INDIVIDUAL CAPTURE, NET FISSION, TOTAL SCATTERING, (N,2N), INELASTIC SCATTERING, AND LEAKAGE CROSS SECTIONS ARE COMPUTED. A MULTI-DIMENSIONAL PROMPT NEUTRON LIFETIME CALCULATION IS ALSO AVAILABLE.

154 CROC90 THE CROC90 CODE WAS DEVELOPED FOR USE IN THE DATA REDUCTION OF OUT-OF-PILE FLUID FLOW EXPERIMENTS ON THE ML-1 FUEL ELEMENTS. THE CODE IS SPECIFICALLY DESIGNED TO EVALUATE FRICTION FACTORS, ENTRANCE AND EXIT COEFFICIENTS, AND ORIFICE CALIBRATIONS FROM HYDRODYNAMIC DATA OBTAINED FROM SINGLE PHASE EXPERIMENTAL FLUID FLOW TESTS IN AXIAL FLOW DUCTS.

164 BURP1 THE PROGRAM CALCULATES ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAY INTERACTIONS IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR THE POINT ISOTROPIC SOURCE LOCATED ALONG THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL.

165 BURP2 THE PROGRAM CALCULATES THE ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAYS INTERACTING IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR HOMOGENEOUS, ISOTROPIC CIRCULAR DISK OR CYLINDRICAL VOLUME SOURCES. SOURCES MUST BE SYMMETRICAL WITH THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL. SOURCE ABSORPTION AND SCATTERING MAY BE INCLUDED FOR VOLUME SOURCES.

166 BURP3 THE PROGRAM CALCULATES ABSOLUTE TOTAL EFFICIENCY FOR MONOENERGETIC GAMMA RAY INTERACTIONS IN CYLINDRICAL SCINTILLATION DETECTORS. THE ABSOLUTE TOTAL EFFICIENCY IS DEFINED AS THE FRACTION OF SOURCE GAMMAS WHICH INTERACT AT LEAST ONCE WITH THE CRYSTAL DETECTOR. CALCULATIONS ARE MADE FOR POINT ISOTROPIC SOURCES LOCATED BOTH ON AND OFF THE AXIS OF SYMMETRY FOR SOLID CYLINDRICAL CRYSTALS, WITH OR WITHOUT A COAXIAL CYLINDRICAL WELL. THE EFFICIENCIES FOR POINTS LOCATED AT SPECIFIED RADIAL OFF-AXIS POSITIONS, FOR A SINGLE AXIAL SOURCE-CRYSTAL DISTANCE, ARE NORMALIZED TO THE ON-AXIS EFFICIENCY FOR THE SAME AXIAL DISTANCE. THE ABSOLUTE EFFICIENCY FOR THE ON-AXIS POINT IS GIVEN.

394 JITER JITER COMPUTES THE FOLLOWING QUANTITIES MEASURED IN REACTOR FLUCTUATION EXPERIMENTS - THE DISPERSION PARAMETER Y, THE MODIFIED COEFFICIENT OF CORRELATION MCC, THE FREQUENCY DEPENDENT PART OF THE POWER SPECTRAL DENSITY PSD, AND THE CROSS POWER SPECTRAL DENSITY CPSD.

413 ALPHA-M ALPHA-M IS USED FOR DETERMINING RADIOISOTOPES BY LEAST SQUARES RESOLUTION OF THE GAMMA RAY SPECTRA. IT CAN HANDLE A VERY LARGE LIBRARY OF GAMMA RAY SPECTRA AND TAKES INTO ACCOUNT CORRECTIONS SUCH AS BACKGROUND SUBTRACTION, COUNTING TIME, DECAY TIME, DEAD TIME, AUTOMATIC COMPENSATION FOR GAIN AND THRESHOLD SHIFTS, SIZE OF THE ALIQUOT, VOLUME REDUCTION PRIOR TO COUNTING, AND SO ON.

421 MICHRD THE VICKERS PYRAMID NUMBER AND THE MICROHARDNESS INCREMENT FRACTION ARE COMPUTED FROM FILAR MICROMETER EYEPIECE READINGS. THESE READINGS ARE MADE ON INDENTS, WHICH HAVE BEEN MADE BY AN INDENTER, IN THE MATERIAL BEING TESTED.

425 REDUX REDUX IS USED FOR THE REDUCTION OF DATA FROM REACTOR FLUCTUATION EXPERIMENTS. FROM INPUT COUNT SAMPLES RECORDED BY ONE OR TWO COUNTING CHANNELS, THE PROGRAM COMPUTES UNBIASED SAMPLE ESTIMATES OF MOMENTS AND FUNCTIONS OF MOMENTS OF THE COUNT DISTRIBUTIONS, INCLUDING THE DISPERSION PARAMETER Y AND THE MODIFIED COEFFICIENT OF CORRELATION MCC. STANDARD ERROR ESTIMATES ARE COMPUTED FOR Y AND MCC.

457 GSSLRN1B GSSLRN1B IS UTILIZED FOR EVALUATIONS AND STATISTICAL DETERMINATION OF PHOTOPEAKS IN PHOTON SPECTRA. THE CODE PERFORMS EVALUATIONS OF PHOTOPEAK SPECTRA USING AS INPUT THE DIGITIZED PULSE HEIGHT DISTRIBUTION WHICH IS OUTPUT FROM A LARGE MULTICHANNEL ANALYZER. PHOTOPEAKS ARE LOCATED, FUNCTIONS FIT TO EACH REAL PEAK, AND THE RELATIVE INTENSITY OF EACH FITTED PEAK ABOVE THE BACKGROUND CONTINUUM IS CALCULATED. THE CODE IS EASILY ADAPTABLE FOR ANALYSIS OF ANY SPECTRA WHICH CAN BE ADEQUATELY DEFINED BY PEAKS REPRESENTED IN ANALYTIC FORM.

464 DYNO1 DYNO1 CALCULATES THE DISTRIBUTION OF ELECTRONS THAT ARE EMITTED FROM A PHOTOMULTIPLIER COMPOSED OF A SERIES OF DYNODES.

469 PMS1 PMS1 CORRECTS EXPERIMENTAL FAST NEUTRON POLARIZATION DATA FOR FINITE GEOMETRY AND MULTIPLE SCATTERING EFFECTS, WHEN LIQUID HELIUM IS THE POLARIZER ANALYZER.

476 CAGE/BIRD/SPEC CAGE/BIRD/SPEC IS A PACKAGE OF THREE INDEPENDENT CODES DESIGNED FOR THE REDUCTION AND PROCESSING OF NEUTRON TIME-OF-FLIGHT SPECTRA IN PULSED MULTIPLYING OR NON-MULTIPLYING ASSEMBLIES.

485 GASPAN GASPAN ANALYZES OUTPUT PULSES FROM A LITHIUM-DRIFTED GERMANIUM SEMICONDUCTOR DETECTOR TO DEFINE COMPLEX GAMMA-RAY SPECTRA OF ROUTINE CRUD AND FILTRATE SAMPLES.

43 CURFIT CURFIT IS A COMPOSITE PROGRAM FOR FITTING EXPERIMENTAL DATA POINTS WITH DIFFERENT TYPES OF COMMON ANALYTIC CURVES. THERE ARE AT PRESENT FIVE FITS AVAILABLE -

(1) POLYNOMIAL Y = SUMMATION OVER I OF A(I)*(X**(I))
(2) EXPONENTIAL Y = A*EXP(BX)
(3) COSINE Y = A*COS(B(X+C))
(4) SERIES OF CUBICS Y = A(J)+B(J)*X+C(J)*(X**2)+D(J)*(X**3)
(5) FOURIER SERIES

62 LOS ALAMOS LEAST SQUARES THIS PROGRAM PERFORMS LEAST SQUARES FITTING OF LINEAR OR NONLINEAR FUNCTIONS IN SEVERAL INDEPENDENT VARIABLES. THE PROGRAM WILL DETERMINE AN ESTIMATE OF A IN THE FUNCTION Y=F(X,A) BY MINIMIZING THE SUM OF SQUARES.
IN THE FUNCTION, X IS A VECTOR OF OBSERVED VARIABLES AND A IS A VECTOR OF PARAMETERS TO BE DETERMINED. IN THIS CONTEXT, A LINEAR FUNCTION IS ONE WHOSE PARTIAL DERIVATIVES WITH RESPECT TO THE ELEMENTS OF A ARE ALL INDEPENDENT OF A. A NONLINEAR FUNCTION HAS AT LEAST ONE OF THE ELEMENTS OF A APPEARING IN AT LEAST ONE OF THESE PARTIAL DERIVATIVES.

186 LAG1/LAG2 LAG IS A SINGLE PASS LOAD AND GO ASSEMBLER DESIGNED TO ACCEPT IBM7090 FLOCO II INSTRUCTIONS.

321 EXPALS THIS PROGRAM FITS BY LEAST SQUARES A FUNCTION WHICH IS A LINEAR COMBINATION OF REAL EXPONENTIAL DECAY FUNCTIONS. THE FUNCTION IS

Y(K) = SUMMATION OVER J OF A(J) * EXP(-LAMBDA(J) * K).

VALUES OF THE INDEPENDENT VARIABLE (K) AND THE DEPENDENT VARIABLE Y(K) ARE SPECIFIED AS INPUT DATA. WEIGHTS MAY BE SPECIFIED AS INPUT INFORMATION OR SET BY THE PROGRAM (W(K) = 1/Y(K)).

324 FRANTIC FRANTIC IS DESIGNED TO PROCESS RAW COUNTING DATA AND TO FIT IN THE LEAST SQUARES SENSE THESE DATA TO THE MULTIPLE EXPONENTIAL GROWTH AND DECAY EQUATIONS. THE PROGRAM CAN BE USED FOR SUMS OF EXPONENTIALS WITH POSITIVE, NEGATIVE, OR ZERO EXPONENTS AND POSITIVE OR NEGATIVE COEFFICIENTS.

327 DAFT1 DAFT1 IS A PROGRAM FOR WEIGHTED LEAST SQUARES FITTING OF 0.0253 EV NEUTRON DATA FOR FISSILE NUCLIDES. THE PROGRAM ALSO CARRIES OUT COMPUTATIONS RELEVANT TO DISCERNING OVERALL GOODNESS OF FIT, PARTICULARLY DEVIANT DATA, AND DATA WHOSE IMPROVEMENT WOULD LEAD TO LARGE REDUCTIONS IN ERROR OF EACH FITTED PARAMETER.

364 SNEQ SNEQ CONSISTS OF THE TWO CODES, SNAP AND EQPLT, WHICH HAVE BEEN MERGED DUE TO THEIR COMMON USE OF THE SLIP COMPILER. SNAP INTERPRETS AND SOLVES PSEUDO-FORTRAN INPUT EQUATIONS REPRESENTING NONLINEAR ALGEBRAIC SYSTEMS. EQPLT INTERPRETS PSEUDO-FORTRAN INPUT EQUATIONS AND CALCULATES AND PLOTS MULTIPLE CURVES ON A SINGLE GRAPH. EQPLT IS USEFUL FOR PARAMETER STUDIES.

407 DATATRAN UTILITY MODULES PLOT2 WAS DESIGNED TO PROVIDE ROUTINE X-Y PLOTS USING THE CALCOMP PLOTTER, MICROFILM UNIT, OR PRINTER AS THE OUTPUT DEVICE. PLOT3 WAS DESIGNED TO PREPARE CONTOUR, PERSPECTIVE, AND STEREOGRAPHIC PLOTS FOR THE CALCOMP PLOTTER OR MICROFILM UNIT OF FUNCTIONS OF TWO VARIABLES.

411 M0661, M0657, M0626 M0661, M0657, AND M0626 PERFORM STATISTICAL ANALYSES OF DATA BASED ON A LEAST SQUARES POLYNOMIAL FIT.

428 DOGGY DOGGY CAN PERFORM MOST ROUTINE FORM SHEET CALCULATIONS. THE PROGRAM CAN HANDLE COMMON ARITHMETIC MANIPULATIONS ON COLUMNS OF INPUT SUCH AS ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION. IT ALSO HAS PROVISIONS FOR THE USE OF SPECIAL FUNCTIONS SUCH AS LOGARITHMIC, TRIGONOMETRIC, ARC TRIGONOMETRIC, HYPERBOLIC, EXPONENTIAL, SQUARE ROOT, MAXIMA, MINIMA, AND RAISING A NUMBER TO ANY POWER. DOGGY ALSO CALCULATES WATER PROPERTIES SUCH AS THERMAL CONDUCTIVITY, VISCOSITY, AND PRANDTL NUMBER OVER A WIDE RANGE OF TEMPERATURE AND PRESSURE.

442 SIMPLE1 SIMPLE1 COMPILES AND EXECUTES MULTISTATEMENT CALCULATIONS TYPED IN A FAMILIAR ALGEBRAIC NOTATION AT A TIME-SHARED TERMINAL, IMMEDIATELY RETURNING REQUESTED RESULTS TO THE TERMINAL AND PERMITTING AD LIB CONTINUATION OF A CALCULATION. THE USER MAY USE THE SYSTEM AS AN EXTENDED AND POWERFUL ELECTRONIC CALCULATOR OR AS A CALCULATOR OF SMALL LOAD-AND-GO RUNS. ERRORS ARE DETECTED AND CORRECTED ON AN AS-YOU-GO BASIS. CALCULATIONS MAY INCLUDE INTERACTIVE INPUT/OUTPUT, FUNCTIONS, AND LOOPS.

444 ROPE ROPE IS USED TO CALCULATE ROOTS OF POLYNOMIALS.

445 LIZARD4 LIZARD4 IS USED TO SOLVE NON-LINEAR, ORDINARY DIFFERENTIAL EQUATIONS AS A ONE-SHOT EFFORT. IT WAS WRITTEN TO SOLVE INITIAL VALUE EQUATIONS, THAT IS, THE VALUES OF THE DEPENDENT VARIABLES MUST BE SPECIFIED AT SOME INITIAL VALUE OF THE INDEPENDENT VARIABLE. ONE-DIMENSIONAL STEADY-STATE BOUNDARY VALUE PROBLEMS CAN BE SOLVED WITH LIZARD4, PROVIDING AN ITERATIVE METHOD IS EMPLOYED BY THE USER WHERE ONE OF THE BOUNDARY CONDITIONS IS SPECIFIED AND INTEGRATION PROCEEDS UNTIL THE ALTERNATE BOUNDARY CONDITION IS MET.

446 MOST MOST IS DESIGNED TO VARY A SET OF COORDINATES (X1,X2, . . . ,XN) REPRESENTING THE VECTOR X IN SUCH A WAY THAT A SPECIFIED FUNCTION Y(X), Y(X) GREATER THAN OR EQUAL TO 0, IS MINIMIZED.

478 BETTIS ENVIRONMENTAL ROUTINES/ THE BETTIS ENVIRONMENTAL ROUTINES EXTEND THE FORTRAN LANGUAGE BY MODIFYING SOME OF THE STANDARD CDC6600 LIBRARY ROUTINES AND BY ADDING ROUTINES TO THE LIBRARY TO FACILITATE DECIMAL INPUT AND OUTPUT, FILE MAINTENANCE, SCRATCH I/O, STORAGE ALLOCATION, UTILITY FUNCTIONS, OPERATING SYSTEM INTERFACING, AND OPERATOR COMMUNICATION.

MODEL (MODIFIED ENVIRONMENTAL LIBRARY) DIFFERS FROM THE ORIGINAL BETTIS VERSION IN THAT IT ALLOWS THE OPERATING SYSTEM, RATHER THAN THE ENVIRONMENTAL PACKAGE, TO CONTROL THE OPERATING ENVIRONMENT.

484 FIGS FIGS IS A FORTRAN CALLABLE SUBROUTINE PACKAGE FOR THE SUPPORT OF INTERACTIVE COMPUTING PROGRAMS UTILIZING AN IBM SYSTEM/360 COMPUTER AND AN IBM2250 DISPLAY UNIT.

496 KAPLPLOT KAPLPLOT IS THE SET OF STANDARD CALCOMP SUBROUTINES WRITTEN AT KNOLLS ATOMIC POWER LABORATORY TO PROVIDE GRAPHIC OUTPUT.

GRLIN IS USED TO DRAW AN AXIS SYSTEM, ESTABLISH SCALING FACTORS, AND ENABLE THE USER TO DRAW LINEAR GRAPHS.

GRLOG IS USED TO DRAW AN AXIS SYSTEM, ESTABLISH SCALING FACTORS, AND PERMIT USERS TO DRAW FULL LOGARITHMIC GRAPHS.

LINLG PROVIDES THE CAPABILITY OF DRAWING SEMI-LOGARITHMIC GRAPHS WITH LINEARLY SCALED ABSCISSAS WHILE LOGLN PROVIDES THE SAME CAPABILITY WITH LINEARLY SCALED ORDINATES.

PENSET INITIALIZES THE PLOTTING SUBROUTINES AND DRAWS THE JOB IDENTIFICATION, TIME, DATE, AND CHARGE NUMBER.

PENEND MOVES THE PEN OFF A COMPLETED PLOT AND PREVENTS SUBSEQUENT PLOTS FROM OVERWRITING THE COMPLETED PLOTS.

IPLOT MOVES THE PLOTTER PEN FROM ITS CURRENT POSITION TO A NEW POSITION.

IDPLOT MOVES THE PEN A SPECIFIED INCREMENTAL DISTANCE IN INCHES FROM ITS PRESENT POSITION.

PSCALE ESTABLISHES THE VALUE OF FACTORS TO BE USED BY THE SPLOT SUBROUTINE IN SCALING USER DATA TO FIT ON PLOTTER COORDINATES.

SPLOT CAUSES THE PEN TO MOVE TO COORDINATES WHICH ARE OBTAINED BY APPLYING PSCALE SCALE FACTORS TO USER DATA.

XCPLOT AND YCPLOT CAUSE ALPHABETIC INFORMATION TO BE WRITTEN PARALLEL TO THE DIRECTION OF THE ABSCISSA AXIS, XCPLOT, OR THE ORDINATE AXIS, YCPLOT.

PMARK CAUSES A DISTINCTIVE SYMBOL TO BE PLOTTED AT THE CURRENT POSITION OF THE PEN.

PLTSIZE CONVEYS TO THE PLOTTING SYSTEM INFORMATION WHICH WILL ENABLE THE PLOTTING SYSTEM TO PLACE THE MAXIMUM NUMBER OF PLOTS IN A MINIMUM LENGTH OF PAPER.

497 RELO1 RELO1 COMPUTES THE FAILURE PROBABILITY FOR A SINGLE FAILURE MODE. TWO OPTIONS ARE AVAILABLE - OPTION 1 CALCULATES THE INTERACTION OF TWO NORMALLY DISTRIBUTED VARIATES AND OPTION 2 CALCULATES THE INTERACTION OF TWO TRUNCATED NORMALLY DISTRIBUTED VARIATES.

514 FORSIM FORSIM IS A FORTRAN ORIENTED SIMULATION PROGRAM FOR THE CONTINUOUS TRANSIENT SOLUTION OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS. THE USER WRITES HIS EQUATIONS IN A FORTRAN SUBROUTINE, FOLLOWING PRESCRIBED RULES, AND LOADS THIS ROUTINE ALONG WITH THE EXECUTIVE ROUTINES. THE EXECUTIVE ROUTINES THEN READ IN INITIAL DATA SUPPLIED BY THE USER AND PROCEED WITH THE INTEGRATION.

515 GENED ENVIRONMENTAL ROUTINES THE GENED ENVIRONMENTAL ROUTINES CONSIST OF A SET OF STANDARD ROUTINES WRITTEN AT THE GENERAL ELECTRIC NUCLEAR ENERGY DIVISION AND A SET OF STANDARD GE635 SYSTEM ROUTINES. THE FIRST SET INCLUDES THE FOLLOWING -

BITA MOVES BITS FROM ONE WORD TO ANOTHER WITHOUT ALTERING THOSE BITS OUTSIDE THE RANGE OF THE CALL.

CASE POSITIONS AN INPUT FILE SO THAT THE INPUT DATA FOLLOWING A CASE CARD CAN BE READ.

CASERR ASSUMES THAT AN ERROR WAS DETECTED IN THE LAST DATA CASE AND FORCES THE CASE SUBROUTINE TO ADVANCE THE DATA INPUT FILE TO THE NEXT INDEPENDENT CASE CARD OR TO THE END OF THE INPUT DATA, WHICHEVER OCCURS FIRST.

DRAW IS A GENERAL-PURPOSE PLOTTING ROUTINE USED TO (A) DRAW A GRID NETWORK, (B) LABEL THE GRID NETWORK, (C) DRAW CURVES WITHIN THE GRID NETWORK, (D) ALLOW TWO DIFFERENT Y-AXIS VALUES, AND (E) PRODUCE A BAR OR HISTOGRAM PLOT.

ERRSYS IS A GENERAL ERROR INDICATING ROUTINE THAT SETS UP DIAGNOSTIC INFORMATION FOR USE IN ERROR RECOVERY WITHIN PROGRAM SYSTEMS.

F4TRBK PROVIDES A TRACE OF CALLING PROGRAMS FROM LEVEL TO LEVEL UP TO THE ORIGINAL CALLING LEVEL. F4TRAC PRINTS OUT A TRACE AND THEN RETURNS TO THE STATEMENT AFTER THE CALL TO F4TRAC. F4TRID PROVIDES THE NAME OF THE PROGRAM WHICH CALLED ERRSYS.

FLEXO WRITES A MESSAGE ON THE ON-LINE TYPEWRITER DURING PROGRAM EXECUTION TO SERVE AS A GUIDE TO THE OPERATOR OR USER.

FLTBCD CONVERTS A FORTRAN FLOATING-POINT NUMBER TO A BCD NUMBER IN EITHER F OR E FORMAT.

FSNOW IS A SPECIAL SUBROUTINE TO SAVE A FILE CODE IN THE CELL .SPFC.

FSUP PERMITS THE USER TO SUPPRESS A FLOATING-POINT NUMBER OR BINARY CONFIGURATION WHEN PRINTING OR PUNCHING WITH FORTRAN I/O.

FSUPC IS CALLED TO DISABLE THE SUPPRESS FUNCTION PERFORMED BY FSUP AND RETURN TO NORMAL FORTRAN I/O PROCESSING.

HELP IS USED TO SUPPLY A USER WITH THE TYPE OF DEVICE (TAPE/DISC/DRUM) AND THE NUMBER OF LINKS USED IF THE DEVICE IS A DISC OR DRUM UNIT.

IDFTAP CREATES A LOGICAL UNIT DESIGNATOR (REFERRED TO AS A LUD), FROM THE INFORMATION GIVEN TO THE IDFTAP FUNCTION BY THE USER, AND RETURNS THE LUD TO THE USER.

ISERVE IS A FUNCTION WITH VARIOUS OPTIONS TO PICK UP AND/OR CONVERT ONE OF THE FOLLOWING - DATE, CLOCK TIME, CASE NUMBER, USER IDENTIFICATION, AND COMPUTER PROCESSOR TIME.

ISUP PERMITS THE USER TO SUPPRESS A FIXED-POINT NUMBER OR BINARY CONFIGURATION WHEN PRINTING OR PUNCHING WITH FORTRAN I/O.

ISUPC IS CALLED TO DISABLE THE SUPPRESS FUNCTION PERFORMED BY ISUP AND RETURN TO NORMAL FORTRAN I/O PROCESSING.

LIMRTN PERMITS THE USER TO REGAIN CONTROL AFTER AN I8 ABORT (RUNNING TIME EXCEEDED) OCCURS, ALLOWING THE PROGRAM AN ADDITIONAL 5 MINUTES OF PROCESSOR TIME.

LISTFORM CONSISTS OF TWO SUBPROGRAMS, JGEGEN AND JGEOUT, AND ENABLES THE FORTRAN USER TO WRITE OUTPUT TAPES (FOR PRINTING OR PUNCHING) IN A MORE EFFICIENT AND FASTER MANNER THAN IS POSSIBLE WITH A FORTRAN WRITE (I,N) LIST STATEMENT, WHICH MUST SCAN THE FORMAT STATEMENT EACH TIME OUTPUT IS INITIATED.

LOCF4 IS A FUNCTION USED TO CONVERT THE ADDRESS OF A VARIABLE

OR AN ARRAY INTO A FORTRAN INTEGER.

NBCDFX CONVERTS A BCD NUMBER, INCLUDING THE SIGN, TO A FORTRAN INTEGER.

NFXBCD CONVERTS A FORTRAN INTEGER TO A BCD NUMBER.

NIPS INTERPRETS AN ARRAY OF BCD CHARACTERS IN INTEGER, REAL, OR HOLLERITH FORMAT.

NPOST IS A MULTIPLE ENTRY SUBROUTINE INCORPORATING THE FUNCTIONS OF VTAB, REWIND, POSWDS, POSLIN, POSTMW, POSASN, POSPOS, PRID, PWID, POSTSF, POSTSB, POSTRB, AND POSTWB. IT SERVES AS A DRIVER TO RWSBT FOR GROUPS OF DATA WHICH ARE UNIQUELY DEFINED ON A PHYSICAL DEVICE CALLED A LINE (A DISK, DRUM, OR TAPE FILE).

NSORT PROVIDES A FLEXIBLE ASCENDING-ORDER SORTING CAPABILITY TO A FORTRAN PROGRAM THAT REQUIRES A TAPE OR DISC SORT.

PLOTRC PROVIDES A SERIES OF CALCOMP PLOTTER ROUTINES. THESE INCLUDE PENSET, PSCALE, SPLOT, IPLOT, IDPLOT, XCPLOT, YCPLOT, PMARK, AND PENEND.

PRNTHD CAUSES A PRINTER OUTPUT HEADING TO BE WRITTEN AT THE TOP OF A NEW PAGE.

REREAD ALLOWS THE USER TO RE-READ (RE-FORMAT) THE LAST BCD RECORD READ IN, UNDER A DIFFERENT FORMAT CONTROL. CONVRT PERMITS CHARACTER MANIPULATION AND CONVERSION OF ANY DATUM/DATA IN MEMORY.

RWSBT MANIPULATES INFORMATION IN BINARY FORM ON TAPE, DISC, OR DRUM PHYSICAL DEVICES. IT INCLUDES BLKSIZ, RDBT, WTBT, SBITF, SBITB, RWD, RWDLO, AND MOVEBT.

VAMPIR PROVIDES THE COMPLETE SETUP OF LINEAR GRAPHS TO BE PRODUCED ON A DIGITAL PLOTTER.

ZERO CAUSES DIVISION BY ZERO TO YIELD A FIXED OR FLOATING POINT ZERO AS THE DIVIDEND INSTEAD OF THE MACHINES MAXIMUM. IT ALSO SUPPRESSES THE ASSOCIATED DIVIDE CHECK AND ERROR MESSAGES.

THE SET OF STANDARD GE635 SYSTEM ROUTINES INCLUDE -

DUMP WHICH DUMPS THE INDICATED LIMITS OF CORE STORAGE AND TERMINATES EXECUTION BY RETURNING CONTROL TO THE OPERATING SYSTEM.

PDUMP WHICH DUMPS THE INDICATED LIMITS OF CORE STORAGE AND THEN CONTINUES EXECUTION.

LINK WHICH ENABLES THE PROGRAMMER TO CALL PROGRAM OVERLAYS AND LLINK WHICH LOADS A LINK AND THEN RETURNS TO THE NEXT SEQUENTIAL STATEMENT OF THE CALLING ROUTINE.

FLGEOF WHICH IS USED TO PROCESS END-OF-FILE CONDITIONS.

516 PTAC11 PTAC11 ALLOWS A PROGRAMMER TO ASSEMBLE BINARY CODE FOR THE DIGITAL EQUIPMENT CORPORATION PDP-11 COMPUTER ON THE IBM360/75, TAKING ADVANTAGE OF THE FACILITIES AND SPEED OF THE LARGER MACHINE.

518 ERREST ERREST SORTS THE ROD BUNDLE LIBRARY OF CRITICAL HEAT FLUX DATA AND PERFORMS ERROR CALCULATIONS ON SORTED SUBSETS.

519 NRTS OS/360 REMOTE JOB ENTRY NRTS ALLOWS USERS AT REMOTE LOCATIONS TO SUBMIT JOBS OVER SLOW OR HIGH SPEED COMMUNICATION LINES TO AN IBM SYSTEM 360/75 USING THE OPERATING SYSTEM THAT PROVIDES MULTIPROGRAMMING WITH A VARIABLE NUMBER OF TASKS. THIS PROGRAM IS AN EXTENSION OF THE STANDARD RJE PROGRAM. ONCE A JOB HAS BEEN ENTERED EXECUTION PROCEEDS UNDER OS JOB MANAGEMENT ROUTINES.

534 EISPACK EISPACK IS A COLLECTION OF FORTRAN SUBROUTINES TO SOLVE THE STANDARD EIGENPROBLEM FOR ANY ONE OF THE FOLLOWING CLASSES OF MATRICES - REAL GENERAL, CERTAIN REAL TRIDIAGONAL, REAL SYMMETRIC, REAL TRIDIAGONAL SYMMETRIC, COMPLEX GENERAL AND COMPLEX HERMITIAN MATRICES. THE INDIVIDUAL SUBROUTINES ARE -

IDENTIFICATION		DESCRIPTION
BALANC	E2F269	BALANCE A REAL GENERAL MATRIX
BALBAK	E2F270	BACK TRANSFORM VECTORS OF MATRIX FORMED BY BALANC
CBAL	E2F271	BALANCE A COMPLEX GENERAL MATRIX
CBABK2	E2F272	BACK TRANSFORM VECTORS OF MATRIX FORMED BY CBAL
ELMHES	E2F273	REDUCE REAL MATRIX TO REAL HESS. (ELEMENTARY)
ELMBAK	E2F274	BACK TRANSFORM VECTORS OF MATRIX FORMED BY ELMHES
ORTHES	E2F275	REDUCE REAL MATRIX TO REAL HESS. (ORTHOGONAL)
ORTBAK	E2F276	BACK TRANSFORM VECTORS OF MATRIX FORMED BY ORTHES
TRED1	E2F277	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
TRED2	E2F278	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
TRBAK1	E2F279	BACK TRANSFORM VECTORS OF MATRIX FORMED BY TRED1
FIGI	E2F280	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
BAKVEC	E2F281	BACK TRANSFORM VECTORS OF MATRIX FORMED BY FIGI
COMHES	E2F282	REDUCE COMPLEX MATRIX TO COMPLEX HESS.
COMBAK	E2F283	BACK TRANSFORM VECTORS OF MATRIX FORMED BY COMHES
HTRIDI	E2F284	REDUCE HERMITIAN MATRIX TO SYM. TRIDIAG.
HTRIBK	E2F285	BACK TRANSFORM VECTORS OF MATRIX FORMED BY HTRIDI
HQR	E2F286	FIND ALL VALUES OF REAL HESS. MATRIX
HQR2	E2F287	FIND ALL VALUES/VECTORS OF REAL HESS. MATRIX
INVIT	E2F288	FIND SOME VECTORS OF REAL HESS. MATRIX
TQL1	E2F289	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
TQL2	E2F290	FIND ALL VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
IMTQL1	E2F291	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
IMTQL2	E2F292	FIND ALL VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
TSTURM	E2F293	FIND SOME VALUES/VECTORS OF SYM. TRIDIAG. MATRIX
BISECT	E2F294	FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
COMLR	E2F295	FIND ALL VALUES OF COMPLEX HESS. MATRIX
COMLR2	E2F296	FIND ALL VALUES/VECTORS OF COMPLEX HESS. MATRIX
CINVIT	E2F297	FIND SOME VECTORS OF COMPLEX HESS. MATRIX
RATQR	E2F298	FIND EXTREME VALUES OF SYM. TRIDIAG. MATRIX
ELTRAN	E2F220	ACCUMULATE TRANSFORMATIONS FROM ELMHES (FOR HQR2)
ORTRAN	E2F221	ACCUMULATE TRANSFORMATIONS FROM ORTHES (FOR HQR2)
FIGI2	E2F222	REDUCE NONSYM. TRIDIAG. MATRIX TO SYM. TRIDIAG.
TINVIT	E2F223	FIND SOME VECTORS OF SYM. TRIDIAG. MATRIX
EISPAC	E2F299	CONTROL PROGRAM FOR EISPACK

541 WSP-HASP/DOS THE WSP (WORK STATION PACKAGE) IS A MODIFICATION OF THE STANDARD HASP/RMT360 PACKAGE SUPPLIED BY IBM AND RUNS ON A MULTIPROGRAMMED DOS SYSTEM/360/30 USING MULTI-LEAVING AND BINARY SYNCHRONOUS COMMUNICATIONS TO COMMUNICATE WITH A SYSTEM/360/195/ASP CENTRAL CPU.

556 KEELE KEELE IS A LINEARLY CONSTRAINED NONLINEAR PROGRAMMING ALGORITHM FOR LOCATING A LOCAL MINIMUM OF A FUNCTION OF N VARIABLES WITH THE VARIABLES SUBJECT TO LINEAR EQUALITY AND/OR INEQUALITY CONSTRAINTS.

562 AMDLIBAE AMDLIBAE IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE NATIONAL LABORATORY. THIS SUBSET INCLUDES LIBRARY CATEGORIES A-E:

IDENTIFICATION	DESCRIPTION
A152S A MPA	MULT. PREC. FLOATING POINT ARITH. PACKAGE
B156S A ARSIN	ARCSINE, ARCCOSINE
B157S A SIN/COS	SINE, COSINE
B158S A DSIN/DCOS	DP SINE, COSINE
B159S A DTAN/DCOT	DP TANGENT, COTANGENT
B252S A SINH/COSH	HYPERBOLIC SINE, COSINE
B353S A ALOG	SP LOGARITHM
B354S A DEXP	DP EXPONENTIAL
B355S A DLOG	DP LOGARITHM
B456S A DCUBRT	DP CUBE ROOT
B457S A ARGPOWER	X**Y
B458S A ARGFDXPD	DP X**Y
C150S F DQD	Q. D. ALGORITHM APPLIED TO A POWER SERIES
C151S F DCONF1	EVAL. CONT. FRACT. Q. D. OF POWER SERIES
C250S F CUBIC	ROOTS OF CUBIC POLYNOMIAL EQUATION
C251S F QUARTIC	ROOTS OF QUARTIC POLYNOMIAL EQUATION
C252S F RSSR	ALL ROOTS OF POLY EQS. WITH REAL COEF.
C253S F POLDRV	DRIVER FOR C254S
C254S F CPOLY	ROOTS ARB. POLY. JENKINS-TRAUB ALGORITHM
C353S F1	ANG. MOM. COEF.- CLEBSCH, RACAH, WIGNER
C354S A ELLIPK	SP COMPLETE ELLIPTIC INTEGRAL K
C355S A ELLIPE	SP COMPLETE ELLIPTIC INTEGRAL E
C365S A ALGAMA	LOGARITHM OF THE GAMMA FUNCTION
C366S A DGAMMA/DLGAMA	DP GAMMA AND LOG(GAMMA) FUNCTIONS
C367S A GAMMA/ALGAMA	GAMMA AND LOG(GAMMA) FUNCTIONS
C368S F EONE	EXPONENTIAL INTEGRAL E1
C369S F DEONE	DP EXPONENTIAL INTEGRAL E1
C370S F BESJY	BESSEL FUNCTIONS J AND Y
C371S F BESIK	BESSEL FUNCTIONS I AND K
C372S F CHIPRB	CHI-SQUARE INTEGRAL
C373S A DELIPK	DP COMPLETE ELLIPTIC INTEGRAL K
C374S A DELIPE	DP COMPLETE ELLIPTIC INTEGRAL E
C375S F1 DEI	EXPONENTIAL INTEGRALS IN LONG PRECISION
C377S F1 DDAW	DAWSON'S INTEGRAL IN DOUBLE PRECISION
C380S F DRZETA	LONG PRECISION ZETA, ZETA-1 FUNCTIONS
C382S F DCGAM	LONG PRECISION COMPLEX GAMMA
C383S A DERF/DERFC	DP ERROR FUNCTION
C384S F BFJ1	BESSEL FUNCTION J1
C385S F COULMB	REGULAR COULOMB WAVE FUNCTIONS
C386S F1 DSGMAL	COULOMB PHASE SHIFT
C387S F BFJYR	BESSEL FUNCTIONS J0,J1,Y0,Y1
C388S F IRCOUL	LP IRREGULAR COULOMB WAVE FUNCTIONS
C389S F GAMIN	INCOMPLETE GAMMA FUNCTION
C390S F LQ	ASSOC. LEGENDRE FUNCTIONS OF 2ND. KIND
C393S F CDEONE	MODIFIED COMPLEX EXPONENTIAL INTEGRAL
D150S F HAVIE	QUADRATURE BY HAVIE'S ALGORITHM
D150S P HAVIEP	QUADRATURE BY HAVIE'S ALGORITHM
D151S F ROMBRG	ROMBERG QUADRATURE
D151S P ROMBRG	ROMBERG QUADRATURE
D152S F1 CHEB	CLENSHAW-CURTIS QUADRATURE

D153S	F	DROMB	TWO-DIMENSIONAL ROMBERG QUADRATURE
D153S	P	DROMBP	TWO-DIMENSIONAL ROMBERG QUADRATURE
D154S	F	CMQUAD	MODIFIED CLENSHAW-CURTIS QUADRATURE
D155S	F	SIMP	ADAPTIVE SIMPSON QUADRATURE
D157S	F	ASIMP	IMPROVED ADAPTIVE SIMPSON QUADRATURE
D157S	P	ASIMPP	IMPROVED ADAPTIVE SIMPSON QUADRATURE
D158S	F	ANC4	ADAP. QUAD. USING 4-TH ORDER NEWTON-COTES
D158S	P	ANC4P	ADAP. QUAD. USING 4-TH ORDER NEWTON-COTES
D161S	F	GAUSS	ARBITRARY GAUSSIAN WEIGHTS AND NODES
D162S	F	SQUANK	SIMPSON'S QUAD. USED ADAPTIVELY
D252S	F	DDFSUB	DP NEVILLE OR STOER SOL. LIN. DIF. EQNS.
D253S	F	DDFSYS	DRIVER FOR D252S
D254S	F	DEGEAR	GEAR'S SOL. OF DIF. EQS.
D255S	F	DFBND	STOER SOL. DIF. EQS. WITH ERROR BOUNDS
D256S	F	DFBDRV	DRIVER FOR D256
E206S	F	LSQPOL	LEAST SQUARES WEIGHTED POLYNOMIAL FIT
E208S	F1		ARBITRARY FUNCTION FIT, LEAST SQUARES
E209S	F	CALLSQ	DRIVER FOR E206S
E212S	F		GENERAL LEAST SQUARES FIT + FNCTION EVAL.
E250S	F	VA02A	LEAST SQUARES FUNCT. MIN. W/O DERIVATIVES
E252S	F	MINMAX	CHEBYSHEV LINE FIT
E253S	F		ARBITRARY FUNCTIONAL FIT II
E256S	F	BGPOL	LEAST SQUARES FIT WITH POLYNOMIALS
E257S	F	BGLSSQ	LEAST SQUARES FIT WITH ARBITRARY FUNCTION
E350S	F	SMOOTH	SMOOTHING BY CUBIC SPLINES

563 AMDLIBF AMDLIBF IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE. THIS SUBSET INCLUDES LIBRARY CATEGORY F:

IDENTIFICATION	DESCRIPTION
F105S F MATEQ,UNIQUE	GENERALIZED MAT. INV. AND SOL. LIN. EQS.
F150S F HERM	EIGENSYSTEMS OF HERMITIAN MATRICES
F152S F SYMINV	INVERT SYM. MATRICES, SOLVE LIN. SYSTEMS
F154S A DOTP	DOUBLE PLUS PRECISION ACCUM. INNER PROD.
F155S F HESSEN	RED. COMPLEX NON-HERM. MAT. TO UP. HESS.
F156S F RAYCOR	RAYLEIGH CORRECTIONS FOR EIGENVALUES
F157S F SINGLVL	SINGULAR VALUE DECOMP. OF REAL MATRIX
F161S F XTRADP	A FAST EXTENDED PRECISION INNER PRODUCT
F202S F1 EIGEN	EIGENSYSTEM FOR REAL SYMMETRIC MATRIX
F203S F	DRIVER FOR F202S
F220S F ELTRAN	ACCUM. TRANSFORMATIONS FROM ELMHES (HQR2)
F221S F ORTRAN	ACCUM. TRANSFORMATIONS FROM ORTHES (HQR2)
F222S F FIGI2	REDUCE NONSYM. TO SYM. TRIDIAG. (TQL2)
F223S F1 TINVIT	FIND SOME EIGENVEC. OF SYM. TRIDIAG. MAT.
F224S F REDUC	REDUCE GEN. SYM. EIGENPROB. AX-L*BX
F225S F REBAK	BACKTRANSFORM VECTORS REDUC FORMED MATRIX
F226S F BANDR	REDUCE BAND SYM. MATRIX TO SYM. TRIDIAG.
F227S F BANDV	FIND EIGENVECTORS OF BAND SYM. MATRIX
F228S F TRED3	REDUCE PACKED SYM. MAT. TO SYM. TRIDIAG.
F229S F TRBAK3	BACKTRANSFORM VECTORS TRED3 FORMED MATRIX
F250S F FRANCI	EIGENVALUES OF A REAL MATRIX
F251S F FRANCC	EIGENVALUES OF COMPLEX MATRICES
F252S F GEIGEN	GENERALIZED SYMMETRIC EIGENPROBLEM
F255S F SDIAG	EIGENSYSTEM OF REAL SYM. DP MATRICES
F257S F TSTMTZ	GENERATES TEST MATRICES
F258S F LRCHZ	EIG. VALS. REAL SYM. MAT. VIA LR-CHOLEQ.
F259S F BYSECT	EIGENVALUES OF TRIDIAG. MAT. BY BISECTION
F260S F JACOBI	EIGENSYSTEM OF REAL MATRICES
F261S F EIGINV	INVERSE EIGENVALUE PROBLEM
F262S F VEC5	EIGENVECTORS OF PENTADIAG. SYM. MATRICES
F263S F BANDRD	REDUCE SYM. BAND MATRIX TO TRIDIAG. FORM
F264S F BANDVC	ORTHONORM. EIGENVEC. OF SYM. BAND MAT.
F265S F EIGENP	EIGENSYSTEM OF REAL GENERAL MATRIX
F269S F1 BALANC	BALANCE A REAL GENERAL MATRIX
F270S F1 BALBAK	BACKTRANSFORM VECTORS BALANCE FORMED MAT.
F271S F1 CBAL	BALANCE A COMPLEX GENERAL MATRIX
F272S F1 CBABK2	BACKTRANSFORM VECTORS CBAL FORMED MATRIX
F273S F1 ELMHES	REDUCE REAL MATRIX TO REAL HESS. (ELEM.)
F274S F1 ELMBAK	BACKTRANSFORM VECTORS ELMHES FORMED MAT.
F275S F1 ORTHES	REDUCE REAL MAT. TO REAL HESS. (ORTHOG.)
F276S F1 ORTBAK	BACKTRANSFORM VECTORS ORTHES FORMED MAT.
F277S F1 TRED1	REDUCE SYM. MATRIX TO SYM. TRIDIAG.
F278S F1 TRED2	REDUCE SYM. MAT. TO SYM. TRIDIAG. (TQL2)
F279S F1 TRBAK1	BACKTRANSFORM VECTORS TRED1 FORMED MATRIX
F280S F1 FIGI	REDUCE NONSYM. TO SYM. TRIDIAG. MATRIX
F281S F1 BAKVEC	BACKTRANSFORM VECTORS FIGI FORMED MATRIX
F282S F1 COMHES	REDUCE COMPLEX MATRIX TO COMPLEX HESS.
F283S F1 COMBAK	BACKTRANSFORM VECTORS COMHES FORMED MAT.
F284S F1 HTRIDI	REDUCE HERMITIAN MATRIX TO SYM. TRIDIAG.
F285S F1 HTRIBK	BACKTRANSFORM VECTORS HTRIDI FORMED MAT.
F286S F1 HQR	FIND ALL VALUES OF REAL HESS. MATRIX

F287S	F1	HQR2	FIND ALL VALUES/VECTORS REAL HESS. MAT.
F288S	F1	INVIT	FIND SOME VECTORS OF REAL HESS. MATRIX
F289S	F2	TQL1	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
F290S	F2	TQL2	ALL VALUES/VECTORS SYM. TRIDIAG. MAT.
F291S	F1	IMTQL1	FIND ALL VALUES OF SYM. TRIDIAG. MATRIX
F292S	F1	IMTQL2	ALL VALUES/VECTORS SYM. TRIDIAG. MAT.
F293S	F1	TSTURM	SOME VALUES/VECTORS SYM. TRIDIAG. MAT.
F294S	F2	BISECT	FIND SOME VALUES OF SYM. TRIDIAG. MATRIX
F295S	F1	COMLR	FIND ALL VALUES OF COMPLEX HESS. MATRIX
F296S	F1	COMLR2	ALL VALUES/VECTORS COMPLEX HESS. MAT.
F297S	F1	CINVIT	FIND SOME VECTORS OF COMPLEX HESS. MATRIX
F298S	F1	RATQR	FIND EXTREME VALUES OF SYM. TRIDIAG. MAT.
F299S	FA1	EISPAC	CONTROL PROGRAM F220S-F223S + F269S-F298S
F402S	F	MATINV	MATRIX INVERSION AND SOL. OF LINEAR EQNS.
F403S	F		DRIVER FOR F402S
F452S	F	CHOLLU,CHOLEQ	SYM. DECOMP. OF POS. DEF. BAND MATRICES
F453S	F	MATINC	INVERSION OF COMPLEX MATRICES
F454S	F	CROUT	SOLUTION OF SIMULTANEOUS LINEAR EQUATIONS
F455S	F	CROUTC	SOL. OF SIMULTANEOUS COMPLEX LINEAR EQNS.
F456S	F1	DIAG	INTEGER PRESERVING GAUSSIAN ELIMINATION

564 AMDLIBGZ AMDLIBGZ IS A SUBSET OF THE IBM 360 SUBROUTINE LIBRARY AT THE APPLIED MATHEMATICS DIVISION AT ARGONNE NATIONAL LABORATORY. THIS SUBSET INCLUDES LIBRARY CATEGORIES G-Z:

IDENTIFICATION	DESCRIPTION
G552S F RANF	RANDOM NUMBER GENERATOR
J552S F1 PLOTSFLM	CALCOMP PLOTS TO IBM 2280
J952S F YOLYPLOT	CALCOMP PLOTS
J955S P GRAF	PRINTS A GRAPH OF POINTS ON LINE PRINTER
K250S A1	CORE TO CORE CONVERSION
K251S A HEXINP	HEXADECIMAL INPUT FOR PL/I PROGRAMS
K252S A HEXOUT	HEXADECIMAL OUTPUT CONV. PL/I PROGRAMS
M101S F SORT	ALGEBRAIC SORT
M150S F CSORT	ALGEBRAIC SORT
M151S P2 ANLKWIC	KWIC SORT
M250S A SMALLIST	SQUEEZES ASSEMBLER LISTING TO 8X11
N251S A ABEND	CALLS ABEND DUMP
Q052S A CLOCK	TIME
Q053S A COPYAGO	COPY LOAD MODULE FROM TAPE TO DISK
Q054S A DATE	CURRENT DATE IN FORM MM/DD/YY
Q055S A TIME	TIME (24 HOUR CLOCK) IN EBCDIC HH.MM.SS
Z013S F	VARIABLE METRIC MINIMIZATION
Z057S A LOCF	LOCATE MACHINE ADDRESSES OF VARIABLES
Z071S A ALLOC	ALLOCATE LCS FOR FORTRAN PROGRAMS
Z073S A LCSGET	ALLOCATE LCS FOR PL/I PROGRAMS
Z074S A ANLMNP	EXPONENT + MANTISSA MANIPULATIVE FUNCTS.

578 PLOTR PLOTR AND THE AUXILIARY ROUTINE XYGRD CONTOUR A FUNCTION DEFINED OVER A TWO-DIMENSIONAL GRID AND COMPUTE THE AREA WITHIN THE CONTOURS.

592 GEAR GEAR IS A PACKAGE OF SUBROUTINES FOR THE NUMERICAL SOLUTION OF SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS, GIVEN THE INITIAL VALUES. IT IS PARTICULARLY WELL-SUITED FOR STIFF SYSTEMS, BUT CAN BE USED GENERALLY.

593 TSO-SPEAKEASY SPEAKEASY IS A GENERAL-PURPOSE LANGUAGE PROCESSOR OPERATING AS A SUPER DESK CALCULATOR UNDER TSO.

601 ERF,ERFC ERF AND ERFC ARE USED TO COMPUTE VALUES OF THE ERROR FUNCTION AND COMPLEMENTARY ERROR FUNCTION FOR ANY REAL NUMBER. THEY MAY BE USED TO COMPUTE OTHER RELATED FUNCTIONS SUCH AS THE NORMAL PROBABILITY INTEGRALS.

602 LENSDES LENSDES ANALYZES THE PERFORMANCE OF OPTICAL LENSES BY COMPUTING THE IMAGE ERRORS FOUND WHEN BUNDLES OF SKEW RAYS ARE TRACED FROM OBJECT POINTS TO THE IMAGE SURFACE. LENS PERFORMANCE IS OPTIMIZED BY VARYING SELECTED LENS PARAMETERS UNDER DIRECTION OF THE NONLINEAR LEAST SQUARES PROGRAM, OPTIMIZ.

610 FUNPACK FUNPACK IS A COLLECTION OF FORTRAN SUBROUTINES TO EVALUATE CERTAIN SPECIAL FUNCTIONS. THE INDIVIDUAL SUBROUTINES ARE -

IDENTIFICATION		DESCRIPTION
DEI	F1EI	EXPONENTIAL INTEGRALS
DELIPK	F1EK	COMPLETE ELLIPTIC INTEGRAL OF THE FIRST KIND
DELIPE	F1EE	COMPLETE ELLIPTIC INTEGRAL CF THE SECOND KIND
DAW	F1DW	DAWSON'S INTEGRAL
BESKO	F1KO	BESSEL FUNCTICN K-SUB-O
BESK1	F1K1	BESSEL FUNCTION K-SUB-1
MONERR	F1MO	ERRCR MONITORING PACKAGE

419 CASCADE/CLUSTER CASCADE IS A SIMULATION OF THE COLLISION CASCADE RESULTING FROM THE DISPLACEMENT OF A PRIMARY KNOCK-ON ATOM BY AN ENERGETIC NEUTRON IN A BODY-CENTERED-CUBIC OR FACE-CENTERED-CUBIC CRYSTAL STRUCTURE. CLUSTER ANALYZES THE SPATIAL DISTRIBUTION OF THE RESULTING RADIATION DAMAGE IN TERMS OF VACANCY AND INTERSTITIAL CLUSTERS, TAKING INTO ACCOUNT THE EXACT CRYSTAL STRUCTURE.

422 SPECTRA SPECTRA COMPUTES THE NUMBER AND SPECTRUM OF PRIMARY KNOCK-ON ATOMS RESULTING FROM NEUTRON COLLISION SEQUENCES IN A MATERIAL UNDER IRRADIATION.

566 RESPOND RESPOND CALCULATES THE RELATIVE ENERGY ABSORPTION OF A SMALL REGION OF ONE MATERIAL IN A LARGE BODY OF ANOTHER MATERIAL EXPOSED TO GAMMA- OR X-RADIATION.

609 INDX INDX PROVIDES A MEANS FOR RAPIDLY DEFINING AND TESTING TRIAL UNIT CELLS AS AN AID TO INDEXING POWDER PATTERNS OF CRYSTAL STRUCTURES OF UNKNOWN SYMMETRY.

527 HERMES THE HERMES MODEL CALCULATES THE REGIONAL RADIONUCLIDE RELEASES AND RADIATION DOSE TO THE POPULACE IN A GIVEN YEAR ARISING FROM THE OPERATION OF NUCLEAR FACILITIES TO MEET ELECTRICAL GENERATION DEMANDS WITHIN A GIVEN STUDY REGION.

591 PLETHS PLETHS IS A TIME-SHARING ISOPLETH-AREA PROGRAM FOR DETERMINING GROUND-LEVEL AREAS OF HIGH POLLUTANT CONCENTRATION DOWNWIND OF A SINGLE SOURCE OF EMISSION. THESE ELLIPTICAL AREAS ARE ENCLOSED BY ISOPLETHS OF CONSTANT CONCENTRATION PRODUCED BY CONTINUOUS POLLUTANT EMISSIONS FROM ONE SMOKE STACK OR GROUND SOURCE, OR FROM A CLOSELY ASSOCIATED GROUP OF SINGLE SOURCES. STACK HEIGHT, WEATHER CONDITIONS, AND SOURCE EMISSION RATE ARE TYPED IN AND THE PROGRAM CALCULATES AND DESCRIBES THE HIGH POLLUTION AREAS ENCLOSED BY ISOPLETHS.

599 TOPLYR2 TOPLYR2 APPLIES THE FIRST LAW OF THERMODYNAMICS TO COMPUTE THE TEMPERATURE OF A WATER MASS FLOWING IN AN OPEN CHANNEL. THE PROGRAM IS DESIGNED TO ACCOMMODATE VARIABLE DEPTH, VELOCITY, AND CROSS SECTION. THE SOURCE OF ENERGY (LOCATION OF THE DISCHARGE) IS ASSUMED TO BE SUFFICIENTLY DISTANT FROM THE RIVER SEGMENT UNDER EXAMINATION THAT THE MOMENTUM ASSOCIATED WITH THE DISCHARGE IS INSIGNIFICANT. VELOCITY DISTRIBUTION AT BOTH THE INLET AND OUTLET OF THE REACH AS WELL AS THE TEMPERATURE DISTRIBUTION AT THE INLET AS A FUNCTION OF TIME AND AT THE OUTLET INITIALLY ARE SPECIFIED. EDDY DIFFUSIVITIES, AMBIENT METEOROLOGICAL CONDITIONS, AND GEOMETRY ARE ALSO SUPPLIED TO THE CODE. ALTHOUGH THE LATERAL EDDY DIFFUSIVITY IS ALLOWED TO VARY SPATIALLY, THE EFFECT OF DENSITY DISPARITY IS NOT TREATED EXPLICITLY BY THE CODE. TEMPORAL BEHAVIOR INDUCED BY VARIATIONS IN THE AMBIENT METEOROLOGICAL AND BOUNDARY CONDITIONS ARE COMPUTED.

577 FFEARS FFEARS IS GENERALLY APPLICABLE FOR THE SOLUTION OF BOUNDARY VALUE PROBLEMS INVOLVING THE LAPLACE EQUATION USING DIFFERENCE EQUATIONS IN AXISYMMETRIC OR RECTANGULAR COORDINATES. IT WILL HANDLE VIRTUALLY ANY CONFIGURATION OF DIELECTRICS AND FLOATING ELECTRODES, PRODUCING BOTH EQUIPOTENTIAL AND EQUIFIELD PLOTS, IF DESIRED.

574 MACS LATTICE VIBRATION CODES THIS PACKAGE OF SEVEN RELATED CODES IS BASICALLY AIMED AT GIVING MAXIMUM CAPABILITY FOR CALCULATING SLOW-NEUTRON SCATTERING BY MODERATORS.

MACS-C COMPUTES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF PARTS ARISING FROM SHORT-RANGE FORCES AND LONG-RANGE COULOMB INTERACTIONS. IT ALSO OBTAINS JACOBIAN MATRICES FOR DETERMINING ADJUSTMENTS IN FORCE CONSTANTS AND IONIC CHARGE WHICH CAN LEAD TO IMPROVED AGREEMENT WITH DATA. STRUCTURE FACTORS FOR NEUTRON INELASTIC SCATTERING CAN ALSO BE CALCULATED.

MACS-J COMPUTES THE DYNAMICAL MATRIX FOR THE HARMONIC OSCILLATIONS OF A CRYSTAL, ITS EIGENVALUES AND EIGENVECTORS, THE CORRESPONDING STRUCTURE FACTORS FOR COHERENT SINGLE-PHONON SCATTERING OF NEUTRONS, AND JACOBIAN MATRICES FOR USE IN ADJUSTING FORCE CONSTANTS TO FIT CALCULATED TO OBSERVED DISPERSION CURVES.

REVISED-D CALCULATES VALANCE COORDINATES IN TERMS OF MASS ADJUSTED ATOM DISPLACEMENTS, TOGETHER WITH COORDINATES WHICH DEFINE RIGID GROUP ROTATIONS.

REVISED-MVFC CONSTRUCTS FORCE CONSTANT MATRICES FOR USE IN VALANCE FORCE POTENTIAL FUNCTIONS WHICH ARE USED IN OTHER PROGRAMS DEALING WITH MOLECULAR AND CRYSTAL VIBRATIONS.

ADJUSTER IS A FORCE ADJUSTER PROGRAM TO OBTAIN A LEAST SQUARES FIT TO OBSERVED FREQUENCIES OF MOLECULES AND CRYSTALS.

DIPOLE-SUM CALCULATES DIPOLE SUMS FOR AN ARBITRARY CRYSTAL.

MODEL-PI CALCULATES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF SHORT-RANGE AND LONG- OR INTERMEDIATE-RANGE TERMS IN THE DIPOLE COORDINATE APPROXIMATION. IT ALSO OBTAINS JACOBIAN MATRICES FOR USE IN ADJUSTING INPUT PARAMETERS.

575 MSCAT IN A THERMAL NEUTRON SCATTERING EXPERIMENT, THE MEASURED CROSS SECTION INCLUDES BOTH SINGLE AND MULTIPLE SCATTERING EVENTS. IN ORDER TO EXTRACT THE SINGLE SCATTERING CROSS SECTION, THE CROSS SECTION FOR MULTIPLE SCATTERING MUST BE KNOWN. SINCE THIS CONTRIBUTION IS GENERALLY A SMOOTHER FUNCTION OF ANGLE AND SCATTERED ENERGY THAN THE SINGLE SCATTERING, IT IS LESS SENSITIVE TO DETAILS OF THE SINGLE SCATTERING CROSS SECTION. IT IS THEREFORE FEASIBLE TO CALCULATE THE MULTIPLE SCATTERING USING AN APPROXIMATE SCATTERING FUNCTION, AND TO SUBTRACT IT FROM THE MEASUREMENTS IN ORDER TO OBTAIN THE SINGLE SCATTERING. MSCAT CALCULATES THE SINGLE AND MULTIPLE SCATTERING CROSS SECTIONS, FOR A SPECIFIED EXPERIMENTAL SITUATION, GIVEN A SINGLE SCATTERING FUNCTION AS INPUT.

561 TOKMINA/TOKMINA2 TOKMINA FINDS THE MINIMUM MAGNETIC FIELD, BM, REQUIRED AT THE TOROIDAL COIL OF A TOKAMAK TYPE FUSION REACTOR WHEN THE INPUT IS BETA(RATIO OF PLASMA PRESSURE TO MAGNETIC PRESSURE), Q(KRUSKAL-SHAFRANOV PLASMA STABILITY FACTOR), AND Y(RATIO OF PLASMA RADIUS TO VACULM WALL RADIUS: RP/RW) AND ARRAYS OF PT(TOTAL THERMAL POWER FROM BOTH D-T AND TRITIUM BREEDING REACTIONS), PW(WALL LOADING OR POWER FLUX) AND TB(THICKNESS OF BLANKET), FOLLOWING THE METHOD OF GOLOVIN, ET AL. TOKMINA2 FINDS THE TOTAL POWER, PT, OF SUCH A FUSION REACTOR, GIVEN A SPECIFIED MAGNETIC FIELD, BM, AT THE TOROIDAL COIL.

574 MACS LATTICE VIBRATION CODES THIS PACKAGE OF SEVEN RELATED CODES IS BASICALLY AIMED AT GIVING MAXIMUM CAPABILITY FOR CALCULATING SLOW-NEUTRON SCATTERING BY MODERATORS.

MACS-C COMPUTES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF PARTS ARISING FROM SHORT-RANGE FORCES AND LONG-RANGE COULOMB INTERACTIONS. IT ALSO OBTAINS JACOBIAN MATRICES FOR DETERMINING ADJUSTMENTS IN FORCE CONSTANTS AND IONIC CHARGE WHICH CAN LEAD TO IMPROVED AGREEMENT WITH DATA. STRUCTURE FACTORS FOR NEUTRON INELASTIC SCATTERING CAN ALSO BE CALCULATED.

MACS-J COMPUTES THE DYNAMICAL MATRIX FOR THE HARMONIC OSCILLATIONS OF A CRYSTAL, ITS EIGENVALUES AND EIGENVECTORS, THE CORRESPONDING STRUCTURE FACTORS FOR COHERENT SINGLE-PHONON SCATTERING OF NEUTRONS, AND JACOBIAN MATRICES FOR USE IN ADJUSTING FORCE CONSTANTS TO FIT CALCULATED TO OBSERVED DISPERSION CURVES.

REVISED-D CALCULATES VALANCE COORDINATES IN TERMS OF MASS ADJUSTED ATOM DISPLACEMENTS, TOGETHER WITH COORDINATES WHICH DEFINE RIGID GROUP ROTATIONS.

REVISED-MVFC CONSTRUCTS FORCE CONSTANT MATRICES FOR USE IN VALANCE FORCE POTENTIAL FUNCTIONS WHICH ARE USED IN OTHER PROGRAMS DEALING WITH MOLECULAR AND CRYSTAL VIBRATIONS.

ADJUSTER IS A FORCE ADJUSTER PROGRAM TO OBTAIN A LEAST SQUARES FIT TO OBSERVED FREQUENCIES OF MOLECULES AND CRYSTALS.

DIPOLE-SUM CALCULATES DIPOLE SUMS FOR AN ARBITRARY CRYSTAL.

MODEL-PI CALCULATES CRYSTAL VIBRATIONS WHEN THE POTENTIAL ENERGY IS A SUM OF SHORT-RANGE AND LONG- OR INTERMEDIATE-RANGE TERMS IN THE DIPOLE COORDINATE APPROXIMATION. IT ALSO OBTAINS JACOBIAN MATRICES FOR USE IN ADJUSTING INPUT PARAMETERS.

575 MSCAT IN A THERMAL NEUTRON SCATTERING EXPERIMENT, THE MEASURED CROSS SECTION INCLUDES BOTH SINGLE AND MULTIPLE SCATTERING EVENTS. IN ORDER TO EXTRACT THE SINGLE SCATTERING CROSS SECTION, THE CROSS SECTION FOR MULTIPLE SCATTERING MUST BE KNOWN. SINCE THIS CONTRIBUTION IS GENERALLY A SMOOTHER FUNCTION OF ANGLE AND SCATTERED ENERGY THAN THE SINGLE SCATTERING, IT IS LESS SENSITIVE TO DETAILS OF THE SINGLE SCATTERING CROSS SECTION. IT IS THEREFORE FEASIBLE TO CALCULATE THE MULTIPLE SCATTERING USING AN APPROXIMATE SCATTERING FUNCTION, AND TO SUBTRACT IT FROM THE MEASUREMENTS IN ORDER TO OBTAIN THE SINGLE SCATTERING. MSCAT CALCULATES THE SINGLE AND MULTIPLE SCATTERING CROSS SECTIONS, FOR A SPECIFIED EXPERIMENTAL SITUATION, GIVEN A SINGLE SCATTERING FUNCTION AS INPUT.

561 TOKMINA/TOKMINA2 TOKMINA FINDS THE MINIMUM MAGNETIC FIELD, BM, REQUIRED AT THE TOROIDAL COIL OF A TOKAMAK TYPE FUSION REACTOR WHEN THE INPUT IS BETA(RATIO OF PLASMA PRESSURE TO MAGNETIC PRESSURE), Q(KRUSKAL-SHAFRANOV PLASMA STABILITY FACTOR), AND Y(RATIO OF PLASMA RADIUS TO VACULM WALL RADIUS: RP/RW) AND ARRAYS OF PT(TOTAL THERMAL POWER FROM BOTH D-T AND TRITIUM BREEDING REACTIONS), PW(WALL LOADING OR POWER FLUX) AND TB(THICKNESS OF BLANKET), FOLLOWING THE METHOD OF GOLOVIN, ET AL. TOKMINA2 FINDS THE TOTAL POWER, PT, OF SUCH A FUSION REACTOR, GIVEN A SPECIFIED MAGNETIC FIELD, BM, AT THE TOROIDAL COIL.

356 GAF/GAR DATA TAPES USED IN GGA A BENCHMARK STUDY OF ZPR-III ASSEMBLY 48 USING ENDF/B CROSS SECTIONS WAS UNDERTAKEN TO IDENTIFY POSSIBLE CROSS SECTION DISCREPANCIES IN THE MICROSCOPIC ENDF/B DATA. THIS WORK WAS DONE FOR THE CSEWG TESTING SUBCOMMITTEE AS PART OF THEIR PHASE I DATA TESTING. THIS PACKAGE CONTAINS THE CROSS SECTION DATA GENERATED FOR THIS STUDY IN THE FORM OF THE ULTRA-FINE GROUP CROSS SECTIONS OF THE MATERIALS OF ZPR-III ASSEMBLY 48 IN THE FORMAT OF THE GGA GAF/GAR PROGRAM DATA TAPES.

447 ETOG1 DATA FOR MUFT AND GAM THE DATA REQUIRED FOR THE CREATION OF MUFT4, MUFT5, GAM1 AND GAM2 LIBRARIES WERE GENERATED FROM THE BROOKHAVEN NATIONAL NEUTRON CROSS SECTION CENTER ENDF/B TAPES 114 THROUGH 117 BY THE ETOG1 PROGRAM (ACC ABSTRACT 437).

532 LOS ALAMOS GROUP-AVERAGED CROS GROUP CONSTANTS AND COMPUTED NEUTRON CROSS SECTIONS ARE TABULATED FOR A VARIETY OF MATERIALS INCLUDING - AL, B, BE, C, CD, CL, D, GA, F194, FE, H, K, LI6, MO, NA, NI, O, PU239, PU240, PU249, TH, U233, U235, U238, AND ZR. THESE ARE PRESENTED AS 18-, 24-, AND 25-GROUP CALCULATIONS FOR REACTORS WITH NEUTRON ENERGIES RANGING FROM FAST TO THERMAL.

543 ENDF/B-THERMOS THESE DATA ARE 30-GROUP THERMOS THERMAL SCATTERING KERNELS FOR P0 TO P5 LEGENDRE ORDERS FOR EVERY TEMPERATURE OF EVERY MATERIAL FROM S(ALPHA,BETA) DATA STORED IN THE ENDF/B LIBRARY. THESE SCATTERING KERNELS WERE GENERATED USING THE FLANGE2 COMPUTER CODE (ACC ABSTRACT 368). TO TEST THE KERNELS, THE INTEGRAL PROPERTIES OF EACH SET OF KERNELS WERE DETERMINED BY A PRECISION INTEGRATION OF THE DIFFUSION LENGTH EQUATION AND COMPARED TO EXPERIMENTAL MEASUREMENTS OF THESE PROPERTIES. IN GENERAL, THE AGREEMENT WAS VERY GOOD. DETAILS OF THE METHODS USED AND RESULTS OBTAINED ARE CONTAINED IN THE REFERENCE. THE SCATTERING KERNELS ARE ORGANIZED INTO A TWO VOLUME MAGNETIC TAPE LIBRARY FROM WHICH THEY MAY BE RETRIEVED EASILY FOR USE IN ANY 30-GROUP THERMOS LIBRARY. THE CONTENTS OF THE TAPES ARE AS FOLLOWS -

VOLUME I

MATERIAL	ZA	TEMPERATURES (DEGREES K)
MOLECULAR H2O	100.0	296, 350, 400, 450, 500, 600, 800, 1000
MOLECULAR D2O	101.0	296, 350, 400, 450, 500, 600, 800, 1000
GRAPHITE	6000.0	296, 400, 500, 600, 700, 800, 1000, 1200, 1600, 2000
POLYETHYLENE	205.0	296, 350
BENZENE	106.0	296, 350, 400, 450, 500, 600, 800, 1000

VOLUME II

MATERIAL	ZA	TEMPERATURES (DEGREES K)
ZR BOUND IN ZRHX	203.0	296, 400, 500, 600, 700, 800, 1000, 1200
H BOUND IN ZRHX	230.0	296, 400, 500, 600, 700, 800, 1000, 1200
BERYLLIUM-9	4009.0	296, 400, 500, 600, 700, 800, 1000, 1200
BERYLLIUM OXIDE	200.0	296, 400, 500, 600, 700, 800, 1000, 1200
URANIUM DIOXIDE	207.0	296, 400, 500, 600, 700, 800, 1000, 1200

VII. KWIC INDEX

```
A-E  ANL   360  F+P+A RS      T P $ AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT.    562
AAEC  360  F+BAL RS P   T C $ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM       103
ABSORPTION REMOVAL X-SECS BAPL 6600  F4     RS      T B $ MO807, 2-D DIFFUSION   280
ABSORPTION, CELL    ANL  3600  F36    RSBP  X T B $ RABBLE,WLIB,FLAT, RESONANCE  281
ACCIDENT ANALYSIS       BAPL 6600  F4     RS P    T G $ FLASH3, LOSS-OF-COOLANT  295
ACCIDENT ANALYSIS    NED    635  F4     RS P    T G $ FREADM1, FAST REACTOR CORE 479
ACCIDENT ANALYSIS  BAPL 6600  F4     RS P    T G $ MO555,ACT1, LOSS-OF-COOLANT  284
ACCIDENT ANALYSIS DOSE CALC GGA  1108  F4     RS      T G $ GADOSE,DOSET, HTGR   261
ACTIVITY DIST STUDY GGA  7044  F4     RS P      D $ RAD2, HTGR FISSION PRODUCT   231
ACTIVITY RELATION  GEC    635  F4     RSBP      D $ DOS, NEUTRON FLUX-DOSIMETER  423
ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS  BAPL 6600  F4     RS P    T G $ MO555,   284
ADEP, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS  BCL  6400  F4     RS P    T F $   494
ADLER, ENDF/B RESONANCE XSECTION CODES  BNL  6600B F4     RS P    T A $ RESEND,  465
AEB   360  F4     RS  L  T C $ FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE      9
AEB   360  F4     RS P      B $ WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS     362
AEB   360  F4     RS P      E $ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK    121
AEB   360  F4     RS P      E $ BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY   363
AEC DP PURCHASE VERSUS LEASE ANALYSIS   SLA   360  COBOL RSBP  CT M $ BECOM,     589
AEC DP PURCHASE VERSUS LEASE ANALYSIS   SLA  1108  COBOL RS P     M $ BECOM,     589
AEC-ALO FAU, RADIO FREQUENCY MANAGEMENT SYSTEM ALOO  360  COBOL RS P     M $    587
AEG  7090  F2     RS        B $ DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT     150
AEROSOL PARTICLE TRANSPORT STUDY        RFD  3600  F36    RS P      G $ DISPER,  554
AEROSOLS    AI    360  F4     RS P    T G $ HAA3, COAGULATION OF HETEROGENEOUS   443
AGC  7090  F+FAP RSBPLX T B $ AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC      204
AGC  7090  FLOCO RSBP     C $ 2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM        18
AGC  7090  F2     RS P    B $ BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT        237
AGC  7090  F2     RS P    D $ CROCSO, ML-1 FLUID FLOW EXPERIMENT ANALYSIS        154
AGC  7090  F2     RS P    T B $ AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES    243
AGC  7090  F2     RSB     F $ HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE     153
AGE CALCULATION OF ENDF/B DATA  BAPL 6600  F4     RS P    T B $ EPOCH, NEUTRON   461
AGE-DIFFUSION SLAB CYLINDER SPHERE  AEB   360  F4     RS  L  T C $ FIRE5, 1-D      9
AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC  AGC  7090  F+FAP RSBPLX T B $    204
AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES  AGC  7090  F2     RS P    T B $   243
AI    360  F+BAL RS       T P $ FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES   484
AI    360  F+BAL RS P     T A $ COMNUC,CASCADE, COMPOUND NUCLEUS REACTION        482
AI    360  F+BAL RS P     T E $ AIROS2A, SIMULATION OF REACTOR DYNAMICS          326
AI    360  F+BAL RS P  CT B $ U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES     553
AI    360  F+BAL RS P X T B $ HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION       307
AI    360  F+BAL RSB L CT M $ SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION     375
AI    360  F4     RS P    T F $ TSN, SPATIALLY-DEPENDENT REACTOR KINETICS        309
AI    360  F4     RS P    T G $ AISITE2, PARAMETRIC SITE REQUIREMENT STUDY       172
AI    360  F4     RS P    T G $ HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS      443
AI    360  F4     RS P    T G $ SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS   559
AI    360  F4     RS P    T Q $ RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC    566
AI    360  F4     RS P  CT I $ PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM     542
AI    360  F4     RS PLX T B $ AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES    147
AI    360  F4     RSB L   T M $ CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE    271
AI    360  F4     RSBP    T K $ THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM      273
AI    360  F4     RSBP X T D $ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION         58
AI    360  F4     RSBPLX T C $ ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC        151
AI    360  F4     RSBPLX T C $ CAESAR4,LIBLST, 1-D MULTI-GP DIFFUSION + LIB      270
AI   7090  F+FAP RS         T I $ 4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC    109
AI   7090  F+FAP RS  L      T B $ QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS   119
AI   7090  F+FAP RS  L      T C $ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE   120
AI   7090  F+FAP RS  L      T C $ ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE  118
AI   7090  F+FAP RS PL      T B $ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS   50
AI   7090  F+FAP RS PL      T C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE    29
AI   7090  F2    RS         B $ S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION       53
AI   7090  F2    RS         C $ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES      30
AI   7090  F2    RS         E $ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK    121
AI   7090  F2    RS         E $ SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY     122
AI   7090  F2    RS         I $ CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION     112
AI   7090  F2    RS         I $ FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION     48
AI   7090  F2    RS         I $ SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION     114
```

```
AI    7090  F2     RS        J $ FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE          91
AI    7090  F2     RS        J $ MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY       142
AI    7090  F2     RS        J $ SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM        110
AI    7090  F2     RS        J $ SCAR1, SCATTER FROM A RING SNAP GEOMETRY            111
AI    7090  F2     RS   L   T D $ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION         58
AI    7090  F2     RS P      B $ BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION       108
AI    7090  F2     RS P      B $ SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY        52
AI    7090  F2     RS P      D $ AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS            55
AI    7090  F2     RS P      G $ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD              47
AI    7090  F2     RS P      J $ GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY          45
AI    7090  F2     RS P      J $ GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM        46
AI    7090  F2     RS P      J $ RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY         141
AI    7090  F2     RS P    T C $ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE       28
AI    7090  F2     RS PL   T A $ ARES2, RESONANCE INTEGRAL X-SECTION CALC            89
AI    7090  F2     RS PL   T B $ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC          51
AI    7090  F2     RS PLX  T C $ DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC          151
AI    7094  F+FAP  RS   L   T M $ MOMUS, X-SECTION LIBRARY UTILITY PROGRAM           159
AI    7094  F+FAP  RS P      J $ SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC         157
AI    7094  F+FAP  RS P    T G $ AISITE2, PARAMETRIC SITE REQUIREMENT STUDY         172
AI    7094  F+FAP  RS P    T H $ HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER     198
AI    7094  F+FAP  RS PL   T B $ AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES     147
AI    7094  F+FAP  RS PL   T B $ GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS       162
AI    7094  F+FAP  RS PL   T B $ TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC      149
AI    7094  F+FAP  RS PL   T G $ CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE     196
AI    7094  F+MAP  RS P      A $ CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA     215
AI    7094  F+MAP  RS P    T E $ AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK       163
AI    7094  F+MAP  RS P    T F $ TSN, SPATIALLY-DEPENDENT REACTOR KINETICS          309
AI    7094  F+MAP  RS PLX  T A $ TRIX1, RESONANCE INTEGRAL X-SECTION CALC           208
AI    7094  F2     RS P      H $ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW         246
AI    7094  F2     RS P    T A $ 2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS      254
AI    7094  F2     RS P    T G $ TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER     268
AI    7094  F2     RS PL   T I $ CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS             244
AI    7600  F4     RS PLX T C $ VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS        510
AI-A   360  F4     RSBPL CT C $ VIM1X, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS       510
AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES AI    360  F4     RS PLX T B $      147
AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES AI   7094  F+FAP RS PL  T B $       147
AIM AND FOG CODES   AI    7090  F2     RS        C $ PERT, 1-D PERTURBATION FOR     30
AIM AND FOG CODES   BHSC   360  F4     RS P      C $ PERT, 1-D PERTURBATION FOR     30
AIM AND FOG CODES   CDC   1604  F63    RS        C $ PERT, 1-D PERTURBATION FOR     30
AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS         AI    7090  F2     RS P      D $  55
AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE      AI    7090  F+FAP RS PL  T C $   29
AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE      CDC   1604  F63    RS PL  T C $   29
AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE      OSUC   370  F4     RS PL CT C $   29
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK     AEB    360  F4     RS P      E $ 121
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK     AI    7090  F2     RS        E $ 121
AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK     CDC   1604  F63    RS P      E $ 121
AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK      AI    7094  F+MAP RS P    T E $ 163
AIROS2A, SIMULATION OF REACTOR DYNAMICS           AI     360  F+BAL RS P    T E $ 326
AISITE2, PARAMETRIC SITE REQUIREMENT STUDY        AI     360  F4     RS P    T G $ 172
AISITE2, PARAMETRIC SITE REQUIREMENT STUDY        AI    7094  F+FAP RS P    T G $ 172
ALGEBRAIC EQN SOLN CURVE PLOT  KAPL 6600  F+ASC RS P    T P $ SNEQ, NONLINEAR     364
ALLOCATION PROJECT PLANNING MLMC  360  F+C+R RSBP   T M $ RALCRTPH, RESOURCE      603
ALOO  360  COBOL RS P      M $ AEC-ALO FAU, RADIO FREQUENCY MANAGEMENT SYSTEM     587
ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA          ORNL   360  F4     RS P      O $ 413
AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E     ANL    360  F+P+A RS      T P $ 562
AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F        ANL    360  F+BAL RS      T P $ 563
AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z     ANL    360  F+P+A RS      T P $ 564
ANALYZER GAMMA-RAY SPECTRA GGA  1108  F+BAL RS P    T O $ TOAC, PROCESSING OF     333
ANC   360  BAL   RSB     T P $ NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM        519
ANC   360  F+BAL RSBP    CT G $ CONTEMPT-LT/022, PRESSURE-TEMPERATURE RESPONSE     433
ANC   360  F+BAL RSBPL CT G $ PARET, WATER-COOLED CORE TRANSIENT ANALYSIS          555
ANC   360  F4    RS P    T H $ ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM       580
ANC   360  F4    RS P    CT W $ MACS LATTICE VIBRATION NEUTRON SCATTRING CODES     574
ANC   360  F4    RS PL CT B $ INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS          565
```

```
ANC   360  F4     RS PL CT M $ ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS          518
ANC   360  F4     RS PL XCT B $ PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC     520
ANC   360  F4     RSBP  CT C $ MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH     582
ANC   360  F4     RSBP  CT D $ DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM     579
ANC   360  F4     RSBP  CT G $ RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM        265
ANC   360  F4     RSBP  CT I $ FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL     584
ANC   360  F4     RSBP  CT I $ STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS       539
ANC   360  F4     RSBP  CT J $ VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS    569
ANC   360  F4     RSBP  CT K $ PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES     528
ANC   360  F4     RSBP X T G $ THETA1-B, FUEL ROD THERMAL RESPONSE LOCA          512
ANC   360  F4     RSBP XCT G $ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS     369
ANC   360  F4     RSBP XCT H $ MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC         551
ANC   360  F4     RSBP XCT W $ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)      605
ANC   360  PL1    RS P   T P $ PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360    516
ANC   360E F+BAL  RS P  XCT D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION     275
ANC  1108  F4     RS P   T G $ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS     369
ANC  1108  F4     RS P   T H $ MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC         551
ANC  1108  F4     RS P   T K $ PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES     528
ANC  6600  F4     RS P   T G $ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS     369
ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE ANL   360  F4     RS P   T E $    486
ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE LASL 6600  F4     RS P   T E $    486
ANGULAR DIST  GGA  7044  F4     RS P X   A $ LEGCOEF3, LEGENDRE COEF CALC FOR   217
ANGULAR DIST DATA AI   7094  F+MAP RS P     A $ CHAD, LEGENDRE COEF CALC FOR    215
ANGULAR DISTRIBUTION LEGENDRE FITTING     KAPL 6600  F4     RS P     A $ CLEM,  531
ANISN X-SEC FORMAT WAPD 6600  F4     RS PL  T B $ ETOG1, ENDF/B TO MUFT, GAM,  437
ANISN X-SEC FORMAT WAPD 7600  F4     RS P   T B $ ETOG3, ENDF/B TO MUFT, GAM,  538
ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC     AI    360  F4     RSBPLX T C $   151
ANL   360  F+ASM RSB   CT P $ WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG      541
ANL   360  F+BAL R B L  T P $ TSO-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSO       593
ANL   360  F+BAL RS     T P $ AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F        563
ANL   360  F+BAL RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM      209
ANL   360  F+BAL RS P  CT M $ ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES        522
ANL   360  F+P+A RS     T P $ AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E     562
ANL   360  F+P+A RS     T P $ AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z     564
ANL   360  F4    RS       M $ MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE      472
ANL   360  F4    RS      T M $ RIGEL, ENDF/B V3 DATA PROCESSING CODE             571
ANL   360  F4    RS P      E $ R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS      255
ANL   360  F4    RS P      E $ R102, SPACE-INDEPENDENT INVERSE KINETICS CALC     168
ANL   360  F4    RS P      F $ TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION            338
ANL   360  F4    RS P      G $ SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS         521
ANL   360  F4    RS P      O $ DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION      464
ANL   360  F4    RS P      X $ TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY    561
ANL   360  F4    RS P    T B $ CLUP77, SQUARE CELL COLLISION PROBABILITY CALC    526
ANL   360  F4    RS P    T F $ ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE    486
ANL   360  F4    RS P    T F $ SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS     400
ANL   360  F4    RS P    T I $ LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR         460
ANL   360  F4    RS P    T M $ CRECT,CHECKER, ENDF/B V2 PROCESSING CODES         475
ANL   360  F4    RS P    T N $ PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780       544
ANL   360  F4    RS P   CT B $ MC**2, ENDF MULTIGROUP X-SECTION CALCULATION      355
ANL   360  F4    RS P   CT D $ 3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS     567
ANL   360  F4    RS P   CT F $ REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION     550
ANL   360  F4    RS P   CT M $ ETOE, ENDF/B TO MC**2 DATA CONVERSION             350
ANL   360  F4    RS P   CT W $ MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC      575
ANL   360  F4    RS P X T F $ FORE2, FAST REACTOR EXCURSION CALCULATIONS         174
ANL   360  F4    RS P X T P $ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....     610
ANL   360  F4    RS P XCT F $ VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY       511
ANL   360  F4    RS PL CT F $ QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE     474
ANL   360  F4    RSB   XCT P $ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE    534
ANL   360  F4    RSBP  CT L $ ARC-NUI002, BCD INPUT DATA PROCESSING MODULE       533
ANL   360  F4    RSBPL CT L $ ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION      554
ANL   635  F4    RS    X T P $ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE    534
ANL  GETS  F     R         R $ PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE     591
ANL  1108  F4    RS    X T P $ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE    534
ANL  1108  F5    RS P X T P $ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....     610
```

```
ANL  1604  F63   RS P      H $ M0899,HOH, STEAM TABLES 14.5-2538 PSIA                 294
ANL  3600  F36    SBP      I $ BOW2, DEFLECTION CALCULATION PARALLEL BEAMS            365
ANL  3600  F36   RS P    T B $ MC**2, ENDF MULTIGROUP X-SECTION CALCULATION           355
ANL  3600  F36   RS P    T C $ SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC         288
ANL  3600  F36   RS P    T I $ SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS         357
ANL  3600  F36   RS P X T C $ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE          262
ANL  3600  F36   RS P XCT C $ TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT            513
ANL  3600  F36   RSBP      A $ MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS        214
ANL  3600  F36   RSBP      G $ CHEMLCC2, CORE HEATING CLADDING-STEAM REACTION        366
ANL  3600  F36   RSBP      I $ SWELL2, FUEL ELEMENT LIFETIME ANALYSIS                353
ANL  3600  F36   RSBP  X T B $ RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL          281
ANL  3600  F36   RSBP  X T B $ RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL         213
ANL  3600  F4    RSBP    T D $ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION           325
ANL  3600  F63   RS  LX T B $ CAM1, FAST NEUTRON SPECTRUM X-SECTION CALC              33
ANL  3600  F63   RSBP      A $ NEARREX, COMPOUND NUCLEUS X-SECTION CALC              171
ANL  3600  F63   RSBP      E $ R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS          255
ANL  3600  F63   RSBP      E $ R102, SPACE-INDEPENDENT INVERSE KINETICS CALC         168
ANL  3600  F63   RSBP      O $ COINC, COINCIDENCE COUNTING DATA REDUCTION            248
ANL  3600  F63   RSBP    T A $ 2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS         254
ANL  3600  F63   RSBP    T E $ TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS         135
ANL  3600  F63   RSBP    T G $ R153, PARAMETRIC SITE REQUIREMENT STUDY               172
ANL  3600  F63   RSBP    T H $ ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER            152
ANL  3600  F63   RSBP    T M $ XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE             181
ANL  3600  F63   RSBP XCT B $ THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC          184
ANL  3600  F63   RSBPL   T J $ MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY           143
ANL  3600  36F   RS PL CT F $ QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE         474
ANL  3600  36F   RSBP    T M $ MERMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES          472
ANL  6600  F4    RS    X T P $ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE        534
ANL  6600  F4    RS P    T F $ SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS         400
ANL  6600  F4    RS P X T P $ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....         610
ANL), THERMAL SPECTRUM X-SECTION CALC   ANL  3600  F63   RSBP XCT B $ THERMOS(       184
ANNULAR VOID X-SECTION CALCULATION      GEC   625  F4    RS P      B $ AVOID,        276
ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS DUCC  635  F4    RS        G $        529
APDA 3600  ASAF4 RS P    T M $ ETOE, ENDF/B TO MC**2 DATA CONVERSION                 350
APDA 7094  F2    RS P      F $ WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS         145
APDA 7094  F4    RS P      F $ MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY          293
APRF 6600  F4    RS        B $ APRFX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING         466
APRFX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING   APRF 6600  F4    RS        B $       466
ARC-NUI002, BCD INPUT DATA PROCESSING MODULE    ANL   360  F4    RSBP   CT L $       533
ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES      ANL   360  F+BAL RS P   CT M $       522
ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION   ANL   360  F4    RSBPL CT L $        594
AREA CALCULATION     SLA  6600  F4    RS P      P $ PLOTR, 2D CONTOUR PLOTS &        578
ARES2, RESONANCE INTEGRAL X-SECTION CALC        AI   7090  F2    RS PL   T A $        89
ARES2, RESONANCE INTEGRAL X-SECTION CALC        CDC  1604  F63   PS PL   T A $        89
ARGONNE SUBROUTINE LIBRARY CAT. A-E   ANL   360  F+P+A RS     T P $ AMDLIBAE,        562
ARGONNE SUBROUTINE LIBRARY CAT. F     ANL   360  F+BAL RS     T P $ AMDLIBF,         563
ARGONNE SUBROUTINE LIBRARY CAT. G-Z   ANL   360  F+P+A RS     T P $ AMDLIBGZ,        564
ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER      ANL  3600  F63   RSBP   T H $        152
ASAF4 RS P    T M $ ETOE, ENDF/B TO MC**2 DATA CONVERSION          APDA 3600         350
ASME STEAM AND WATER PROPERTIES BG&E  360  F4    RS     T H $ STEAM-67, 1967          487
ASPIS, GAMMA RAY SOURCE BUILDUP FACTOR CALC     BAPL 6600  F+ASC RS P   T J $        429
ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE  ORNL 7090  F+FAP RS P   T D $        240
ASSEMBLER FOR FLOCO2 INSTRUCTION SET      PW    1604  F+CDP RS P   T P $ LAG,        186
ASSEMBLER FOR THE PDP-11 ON 360 ANC   360  PL1   RS P   T P $ PTAC11, 2-PASS         516
ASSEMBLY ANALYSIS   AI   7600  F4    RS PLX T C $ VIM1, MONTE CARLO CRITICAL         510
ASSEMBLY ANALYSIS  AI-A  360  F4    RSBPL CT C $ VIM1X, MONTE CARLO CRITICAL         510
ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES    GGA  1108  BIN   R   L  T Z $ ZPR-III        356
ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM   ANC   360  F4    RS P   T H $        580
ATHENA4, INELASTIC SCATTERING FORM FACTORS      ORNL  360  F4    RS P   T A $        417
ATOM SPECTRA ENDF/B DATA  ORNL  360  F4    RS P   T B $ RICE, PRIMARY RECOIL         453
ATTENUATION CYL SPHERE GEOM  AI   7090  F2    RS P      J $ GRACE2, GAMMA-RAY         46
ATTENUATION CYL SPHERE GEOM  CDC  1604  F63   RS P      J $ GRACE2, GAMMA-RAY         46
ATTENUATION SLAB GEOMETRY    AI   7090  F2    RS P      J $ GRACE1, GAMMA-RAY         45
ATTENUATION SLAB GEOMETRY    CDC  1604  F63   RS P      J $ GRACE1, GAMMA-RAY         45
```

```
AUTO- AND CROSS-SPECTRAL DENSITIES      BNW  1108  F5    RS P X T F $ NOISY1,     488
AUTO- AND CROSS-SPECTRAL DENSITIES      BNW  7090  F4    RS P   T F $ NOISY1,     488
AVERAGE X-SEC CALC  BNL  6600  F4    RS P     A $ AVERAGE, UNRESOLVED REGION     376
AVERAGE X-SEC CALC  BNL  7094  F4    RS P     A $ AVERAGE, UNRESOLVED REGION     376
AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC  BNL  6600  F4    RS P     A $     376
AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC  BNL  7094  F4    RS P     A $     376
AVERAGING    GGA  7044  F4    RS P     L $ GAVER, ENERGY INTERVAL X-SECTION     218
AVOID, ANNULAR VOID X-SECTION CALCULATION      GEC   625  F4    RS P     B $     276
AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH   PW   1604  F63   RS P     F $     191
AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES  LASL 7094  F2    RSBP     H $     182
AXISYM LOAD  BAPL 6600  F4    RS P   T I $ SEALSHELL2, SHELL STRESS ANALYSIS     282
AXISYM LOAD  SR    360  F4    RS P   T I $ SEALSHELL2, SHELL STRESS ANALYSIS     282
AXISYM LOAD  WTSC 6600B F4    RS P   T I $ SEAL SHELL, SHELL STRESS ANALYSIS     282
AXISYMMETRIC & PLANE ELASTIC-PLASTIC BAPL 6600  F+COM RS P   T I $ DUZ2, 2-D     503
AXISYMMETRIC LOAD   GGA  7044  F4    RSBP   CT I $ SAFE-PCRS, STRESS ANALYSIS    250
AXISYMMETRIC LOAD GGA  7044  F4    RS P   T I $ SAFE-AXISYM, STRESS ANALYSIS     251
AXISYMMETRIC STRESS ANALYSIS  GGA  1108  F4    RS P   I $ SAFE-2D, PLANE &       379
AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES  LASL 7094  F2    RSBP     H $     183
AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE   CDC   3600  F63   RSBP     F $     102
B-W MULTI-LEVEL CONVOLUTION   PPCC 7040  F+MAP RS P     A $ COMBCO, COMBINED      203
B-W PARAMETERS    GGA  1108  F5    RS P   CT A $ FSDP3, POINTWISE XSECS. FROM     216
B-W RESONANCE PARAMETERS  WANL 7094  F2    RS P     A $ EXT, X-SECTIONS FROM      238
B-W X-SEC CALC    BNL  6600  F4    RS P     A $ SIGPLOT, RESOLVED MULTILEVEL      377
BAL  RSB    T P $ NRTS-RJE, OS/360 MVT REMOTE JOB ENTRY SYSTEM  ANC   360         519
BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION  AI   7090  F2    RS P     B $     108
BAPL 6600  F+ASC RS P   T J $ ASPIS, GAMMA RAY SOURCE BUILDUP FACTOR CALC         429
BAPL 6600  F+ASC RS P X T B $ RESQ2,RESQ0,DBF1, RESONANCE INTEGRAL HEX CELL       285
BAPL 6600  F+COM RS P     H $ HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION          560
BAPL 6600  F+COM RS P   T I $ DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC     503
BAPL 6600  F+COM RS P   T I $ GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY     397
BAPL 6600  F+COM RS P X T B $ PAX03, HARMONY-PDQ X-SECTION GENERATION CODE       426
BAPL 6600  F+COM RS P X T I $ MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS         597
BAPL 6600  F4    RS     T B $ M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS     280
BAPL 6600  F4    RS     T C $ M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN        342
BAPL 6600  F4    RS     T H $ WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF     267
BAPL 6600  F4    RS     T I $ CYGR02, STRESS ANALYSIS CYL FUEL ELEMENT           266
BAPL 6600  F4    RS P     A $ GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES     470
BAPL 6600  F4    RS P     D $ CINDER,M0102, POINT DEPLETION FISSION PRODUCT      313
BAPL 6600  F4    RS P     I $ STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING     570
BAPL 6600  F4    RS P     I $ TCB01, CREEP-BUCKLING OF TUBES UNDER PRESSURE      604
BAPL 6600  F4    RS P     P $ RFL01, RELIABILITY FOR A SINGLE FAILURE MODE       497
BAPL 6600  F4    RS P   T A $ PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS         359
BAPL 6600  F4    RS P   T A $ SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION         399
BAPL 6600  F4    RS P   T B $ EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA       461
BAPL 6600  F4    RS P   T C $ BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY       398
BAPL 6600  F4    RS P   T F $ NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK       371
BAPL 6600  F4    RS P   T F $ TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK       338
BAPL 6600  F4    RS P   T F $ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM         274
BAPL 6600  F4    RS P   T G $ FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS           295
BAPL 6600  F4    RS P   T G $ FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION         448
BAPL 6600  F4    RS P   T G $ M0555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS       284
BAPL 6600  F4    RS P   T H $ CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS      473
BAPL 6600  F4    RS P   T H $ FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY         272
BAPL 6600  F4    RS P   T H $ FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS            331
BAPL 6600  F4    RS P   T H $ GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS           424
BAPL 6600  F4    RS P   T H $ HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM         286
BAPL 6600  F4    RS P   T H $ M0899,HOH, STEAM TABLES 14.5-2538 PSIA              294
BAPL 6600  F4    RS P   T H $ TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS      348
BAPL 6600  F4    RS P   T H $ WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES      396
BAPL 6600  F4    RS P   T I $ BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION       468
BAPL 6600  F4    RS P   T I $ BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS         481
BAPL 6600  F4    RS P   T I $ CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION         449
BAPL 6600  F4    RS P   T I $ FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES       537
BAPL 6600  F4    RS P   T I $ M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS           383
```

```
BAPL 6600   F4     RS P    T I $ M0457,PIPE, ELASTIC STRESS OF PIPING SYSTEM          329
BAPL 6600   F4     RS P    T I $ M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS       283
BAPL 6600   F4     RS P    T I $ PELEN, FUEL PELLET TEMPERATURE & DEFORMATION         598
BAPL 6600   F4     RS P    T I $ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD        282
BAPL 6600   F4     RS P    T J $ M0756,LETO, 1-D SLAB GAMMA-RAY TRANSPORT             343
BAPL 6600   F4     RS P    T L $ BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES         373
BAPL 6600   F4     RS P    T M $ SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS          557
BAPL 6600   F4     RS P    T O $ BETTY, ENTRAINED PARTICLES SAMPLING STUDY            545
BAPL 6600   F4     RS P    T O $ JITER, FLUCTUATION EXPERIMENT ANALYSIS               394
BAPL 6600   F4     RS P    T O $ REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS       425
BAPL 6600   F4     RS P    T P $ DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA        327
BAPL 6600   F4     RS P    T P $ M0661,M0657,M0626, POLYNOMIAL CURVE FITTING          411
BAPL 6600A F+ASC RS        T P $ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.       478
BAPL 6600A F+ASC RS P      T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION          275
BAPL 6600B F+ASC RS P      T J $ SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE         462
BAPL 6600B F4      RS P    T I $ MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION         412
BAPL 6600C F+ASC RS P      T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION          275
BASIC R          M $ MAPPER, PREDICTING MANUFACTURING REQUIREMENTS  GEPI GETS         595
BC     625  F+MAP RS P     T C $ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM         209
BC     625  F4    RS       T C $ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM        156
BC     625  F4    RS       T C $ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE        28
BC     625  F4    RS PLX T B $ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV            185
BCD    R   L  T Z $ ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2    WAPD 6600          447
BCD    R   LX T Z $ LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS    LASL 6600         532
BCD    R   LX T Z $ THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS      DP    360         543
BCD INPUT DATA PROCESSING MODULE   ANL   360  F4    RSBP  CT L $ ARC-NUI002,          533
BCL  6400   F4     RS P       G $ FRCRL2, LOCA FISSION PRODUCT RELEASE ANALYSIS       500
BCL  6400   F4     RS P       G $ MIRAB,MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL      499
BCL  6400   F4     RS P     T F $ ADEP, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS       494
BCL  6400   F4     RS P     T G $ ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING         330
BCL  6400   F4     RS P     T G $ NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS        328
BCL  6400   F4     RS P  X T G $ MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC         508
BCS  6600D F+ASC R B       T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION         275
BEAMS    ANL  3600  F36    SBP      I $ BOW2, DEFLECTION CALCULATION PARALLEL         365
BEAMS   KAPL 6600  F4     RS P      I $ STEM, MATRIX GENERATION FOR A SYSTEM OF       337
BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS   SLA   360  COBOL RSBP  CT M $           589
BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS   SLA  1108  COBOL RS P     M $           589
BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT GESV  635  F4    RS P  CT I $           568
BEHAVIOR       ANL   360  F4     RS P    T I $ LIFE1, FAST REACTOR FUEL ELEMENT        460
BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC   BNL  6600  F4    RS P      A $          524
BETTIS ENVIRNMNTL LIB SCOPE2.0 CDC  7600  F4    RS       T P $ MODEL, MODIFIED          478
BETTIS ENVIRNMNTL LIB SCOPE3.2 CDC  6600C F+COM RS       T P $ MODEL, MODIFIED          478
BETTIS ENVIRNMNTL LIB SCOPE3.3 CDC  6600D F+COM RS       T P $ MODEL, MODIFIED          478
BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. BAPL 6600A F+ASC RS      T P $          478
BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. BW   6600B F+ASC RS       T P $         478
BETTY, ENTRAINED PARTICLES SAMPLING STUDY      BAPL 6600  F4    RS P    T O $          545
BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY  BAPL 6600  F4    RS P    T C $          398
BG&E  360  F4     RS       T H $ STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES          487
BHSC  360  F4     RS P       C $ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES             30
BHSC  360  F4     RS P     T C $ FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE         120
BHSC  360  F4     RS PL    T B $ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS           50
BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC    CRNL 1604  F2    RS P      H $          549
BIN    R   L  T Z $ ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES   GGA  1108          356
BINARY LIBRARY TAPE MAINTENANCE  ANL   360  F4    RS       M $ MERMC2, MC**2          472
BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS   GEES 1108  F5    RS P    T O $ CAGE,        476
BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC   NED   635  F4    RS PL   T C $          287
BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC   NED  1108  F4    RS P    T C $          287
BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY AEB   360  F4    RS P      E $          363
BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER GGA  7044  F+MAP RS P    T H $          205
BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER   GGA  1108  F+BAL RS P    T E $          303
BLOWDOWN  PPCO  360  F4     RS P X    G $ BURST1, HYDRODYNAMIC ANALYSIS DURING         435
BLOWDOWN - EXCURSION ANALYSIS  ANC   360  F4     RSBP XCT G $ RELAP3, REACTOR          369
BLOWDOWN - EXCURSION ANALYSIS  ANC  1108  F4     RS P    T G $ RELAP3, REACTOR         369
BLOWDOWN - EXCURSION ANALYSIS  ANC  6600  F4     RS P    T G $ RELAP3, REACTOR         369
```

```
BLOWDOWN ANALYSIS LOFT     KE    7094  F+MAP RSBP   T G $ SATURATED BLOWDOWN2,     200
BLOWDOWN ANALYSIS LOFT     UGA    360  F4     RS P     G $ WATER-HAMMER, LIQUID     278
BLOWDOWN PRESSURE TEMPERATURE HISTORY     KE    7094  F2     RSBP   T H $ PTH1,    155
BLOWDOWN2, BLOWDOWN ANALYSIS LOFT    KE    7094  F+MAP RSBP   T G $ SATURATED      200
BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES   BAPL 6600  F4    RS P   T L $        373
BNL  6600  F4    RS      T M $ CHECK3,RIGEL3, ENDF/B V3,V4 PROCESSING CODES         571
BNL  6600  F4    RS P      A $ AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC        376
BNL  6600  F4    RS P      A $ BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC         524
BNL  6600  F4    RS P      A $ RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS        492
BNL  6600  F4    RS P      A $ SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC          377
BNL  6600  F4    RS P      A $ THRESH, STATISTICAL MODEL REACTION X-SECTIONS        504
BNL  6600  F4    RS P    T F $ NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK       405
BNL  6600  F4    RS P    T I $ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES        252
BNL  6600B F4    RS      T M $ CHECKER,CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC       384
BNL  6600B F4    RS      T M $ CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC        475
BNL  6600B F4    RS P    T A $ RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES        465
BNL  7090  F+FAP RS P    T M $ DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES          236
BNL  7094  F4    RS P      A $ AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC        376
BNW   360C F4    RS P    T H $ COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS       432
BNW  1107  F4    RS P    T C $ HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE          241
BNW  1107  F4    RS PL   T B $ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV          185
BNW  1108  F4    RS P      C $ PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY        304
BNW  1108  F4    RS P    T B $ FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC       306
BNW  1108  F4    RS P    T D $ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION          325
BNW  1108  F4    RS P X T B $ 1DX, 1-D DIFFUSION FAST X-SECTION GENERATION          374
BNW  1108  F4    RS PLX T B $ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS        467
BNW  1108  F5    RS P    T H $ REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN         483
BNW  1108  F5    RS P X T F $ NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES            488
BNW  1108  F5    RS PLX T B $ BRT1, THERMAL SPECTRUM X-SECTION CALC                 184
BNW  1108  F5    RSBPL   T D $ ISOGEN, RADIONUCLIDE GENERATION AND DECAY            367
BNW  1108C F4    RS P    T H $ COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS       432
BNW  6600C F4    RS P    T H $ COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS       432
BNW  7090  F+FAP RS PL   T B $ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV          185
BNW  7090  FLOCO RSBP    T C $ GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX           75
BNW  7090  F2    RSBPL   T J $ MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY          143
BNW  7090  F4    RS P    T F $ NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES           488
BNWL 1108  F+BAL RS P    T O $ GSSLRN1B, LEAST SQUARES PHOTOPEAK SPECTRA CODE       457
BNWL 1108  F5    RS P    T D $ DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS        456
BODIES  BNL  6600  F4    RS P    T I $ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D       252
BODIES  GGA  1108  F4    RS P      I $ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D       252
BOILING FLOW STEAM     GGA  1108  F4    RS P    T H $ DYNAM, DYNAMIC ANALYSIS      440
BORATION-DILUTION TABLES FOR PWR CPN   CPPD 6400  F4     S P     H $ PWR-PPM,       552
BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT    AGC  7090  F2     RS P     B $       237
BOW2, DEFLECTION CALCULATION PARALLEL BEAMS    ANL  3600  F36    SBP      I $       365
BREEDERS     NED   635  F4    RS P     D $ RAPFU, FUEL CYCLE PARAMETERS FAST        372
BRT1, THERMAL SPECTRUM X-SECTION CALC          BNW  1108  F5     RS PLX T B $       184
BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION  BAPL 6600  F4     RS P    T I $      468
BUCKLING COLLAPSE ANALYSIS     BAPL 6600  F4    RS P    T I $ BUSHL, CYL SHELL     481
BUCKLING CYL FUEL ELEMENTS     AEB   360  F4    RS P      B $ WELWING, MATERIAL    362
BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH  GGA  1108  F+BAL RS P    T D $      439
BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ GGA  1108  F+BAL RS P    T D $      438
BUILDUP FACTOR CALC    BAPL 6600  F+ASC RS P    T J $ ASPIS, GAMMA RAY SOURCE      429
BUNDLE     NED   635  F4    RS P    T H $ VELVET2, TURBULENT FLOW IN LMFBR ROD     458
BUNDLE CHF DATA ANALYSIS       ANC   360  F4    RS PL CT M $ ERREST, LOCA ROD       518
BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW  360C F4    RS P    T H $ COBRA3C, ROD         432
BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW  1108C F4    RS P    T H $ COBRA3C, ROD         432
BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW  6600C F4    RS P    T H $ COBRA3C, ROD         432
BUNDLES  LASL 7094  F2    RSBP      H $ AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE        182
BUNDLES  LASL 7094  F2    RSBP      H $ AXTHRM, HEAT TRANSFER SOLID FUEL TUBE        183
BURNUP & MANAGEMENT  NED   635  F4    RS P    T D $ FUMBLE, FAST REACTOR FUEL    480
BURNUP ANALYSIS  ANL   360  F4    RS P  CT D $ 3DB, 3-D MULTIGROUP DIFFUSION         567
BURNUP ANALYSIS  HEDL 1108  F4    RS P    T D $ 3DB, 3-D MULTIGROUP DIFFUSION        567
BURNUP ANALYSIS NED   635  F4    RS P    T C $ BURNUP, HEAVY ELEMENT ISOTOPIC       311
BURNUP CYL LATTICE   TVA   360  F4    RSBPLXCT B $ LASER, SPECTRUM CALC WITH       249
```

```
BURNUP CYL LATTICE   WAPD 7094  F+MAP RS PLX T B $ LASER, SPECTRUM CALC WITH     249
BURNUP POWER DISTRIBUTION SEARCH    GGA  1108  F4     RS P   T C $ GASP7, 1-D     319
BURNUP REFUELING HISTORY  LASL 6600  F4     RS P   T D $ PHENIX, 2D DIFFUSION    454
BURNUP RZ GEOMETRY   GGA  7090  F+FAP RSBP   T D $ DDB, 2-D FEW-GP DIFFUSION      99
BURNUP XY, RZ GGA  1108  F+BAL RS P   T D $ BUG2, 2-D MULTIGROUP DIFFUSION &     438
BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS NEC   635  F4     RS P   T O $     311
BURP1, DETECTOR EFFICIENCY POINT SOURCE          UM   7090  MAD    RSB      O $  164
BURP2, DETECTOR EFFICIENCY DISK SOURCE           UM   7090  MAD    RSB      O $  165
BURP3, DETECTOR EFFICIENCY POINT SOURCE          UM   7090  MAD    RSB      O $  166
BURP4, GAMMA-RAY PHOTOFRACTION SOLID CRYSTAL     UM   7090  MAD    RSB      O $  169
BURP5, GAMMA-RAY PHOTOFRACTION WELL CRYSTAL      UM   7090  MAD    RSB      O $  170
BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN    PPCO 360   F4     RS P X   G $  435
BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS      BAPL 6600  F4     RS P   T I $  481
BW   2000  F4    RS        A $ STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION   305
BW   6600  F+COM RS P X T D $ FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY     427
BW   6600B F+ASC RS      T P $ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.   478
BW   6600B F+ASC RS P    T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION      275
BWR FUEL ELEMENT HEAT TRANSFER CALC       ANC   360  F4     RSBP XCT H $ MOXY,   551
BWR FUEL ELEMENT HEAT TRANSFER CALC       ANC  1108  F4     RS P   T H $ MOXY,   551
BWR GASEOUS RELEASE  ORNL  360  F4     RS P  C  G $ STEFEG, ANALYSIS OF PWR &    583
CAESAR4,LIBLST, 1-D MULTI-GP DIFFUSION + LIB     AI    360  F4     RSBPLX T C $  270
CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS     GEES 1108  F5     RS P   T O $  476
CALCOMP PLOTTING ROUTINES        KAPL 6600  F+COM RS      T P $ KAPLPLOT, KAPL   496
CALCOMP780    ANL   360  F4     RS P   T N $ PLOT-3D, 3-D PLOTS ON IBM2280 OR    544
CAPITAL COST ESTIMATING     ORNL  360  F4     RS P   T D $ ORCOST, POWER PLANT   588
CARD INPUT PROCESSOR         LASL  360  F4     RS P     L $ GENRD, FREE-FORMAT   530
CARD INPUT PROCESSOR         LASL 6600  F4     RS P     L $ GENRD, FREE-FORMAT   530
CASCADE, COMPOUND NUCLEUS REACTION       AI    360  F+BAL RS P   T A $ COMNUC,   482
CASCADE,CLUSTER, RADIATION DAMAGE IN METALS      GEC   635  F+FAP RSBP   T Q $  419
CAT. A-E  ANL   360  F+P+A RS      T P $ AMDLIBAE, ARGONNE SUBROUTINE LIBRARY    562
CAT. F    ANL   360  F+BAL RS      T P $ AMDLIBF, ARGONNE SUBROUTINE LIBRARY     563
CAT. G-Z  ANL   360  F+P+A RS      T P $ AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY    564
CAVITY GEOM GGA  1108  F4     RS P   T J $ MUSCAT, VIEW FACTOR SHIELDING CODE    259
CDC  1604  F63   RS        C $ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES      30
CDC  1604  F63   RS  L   T D $ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION        58
CDC  1604  F63   RS P      A $ HAFEVER, HAUSER-FESHBACH INELASTIC SCATTERING     14
CDC  1604  F63   RS P      B $ SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY     52
CDC  1604  F63   RS P      B $ S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION       53
CDC  1604  F63   RS P      E $ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK    121
CDC  1604  F63   RS P      G $ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD           47
CDC  1604  F63   RS P      J $ GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY       45
CDC  1604  F63   RS P      J $ GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM     46
CDC  1604  F63   RS P    T C $ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB     87
CDC  1604  F63   RS P    T C $ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE    28
CDC  1604  F63   RS P    T C $ WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY     32
CDC  1604  F63   RS P    T C $ 2DGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER    40
CDC  1604  F63   RS PL   T A $ ARES2, RESONANCE INTEGRAL X-SECTION CALC          89
CDC  1604  F63   RS PL   T B $ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC        51
CDC  1604  F63   RS PL   T B $ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS     50
CDC  1604  F63   RS PL   T C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE      29
CDC  1604  F63   RS PLX  T B $ GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC        33
CDC  1604  F63   RS PLX  T C $ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE     120
CDC  3600  F63   RSBP      F $ AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE     102
CDC  3600  F63   RSBP    T C $ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION     167
CDC  6600C F+COM RS      T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2   478
CDC  6600D F+COM RS      T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3   478
CDC  7600  F4    RS      T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0   478
CE   6600  F4    RS P    T C $ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM    156
CEBUG, STEAM GENERATOR SODIUM-WATER REACTION     CEND 7600  F4     RS P   T G $  548
CELL   ANL  3600  F36    RSBP X T B $ RABBLE,WLIB,FLAT, RESONANCE ABSORPTION,   281
CELL  ANL  3600  F36    RSBP X T B $ RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG  213
CELL  BAPL 6600  F+ASC RS P X T B $ RESQ2,RESQO,DBF1, RESONANCE INTEGRAL HEX   285
CELL CALCULATION   AI    360  F+BAL RS P X T B $ HWOCR-SAFE, 2-D MONTE CARLO    307
CELL CODE AND TEMPEST COMBINATION  AI    7090  F2     RS P     B $ BAM, S4 CYL    108
```

CELL CCDE, 1-D 1-GP S4 APPROXIMATION AI 7090 F2 RS B $ S4 CYL 53
CELL CODE, 1-D 1-GP S4 APPROXIMATION CDC 1604 F63 RS P B $ S4 CYL 53
CELL COLLISION PROBABILITY CALC ANL 360 F4 RS P T B $ CLUP77, SQUARE 526
CELL COLLISION PROBABILITY CALC JAER 230 F4 RS P T B $ CLUP77, SQUARE 526
CEND 360 F4 RS P X T F $ CEXE,INCEXE, 1-GP 3-D XYZ XENON OSCILLATION 415
CEND 7600 F4 RS P T G $ CEBUG, STEAM GENERATOR SODIUM-WATER REACTION 548
CENTRIFUGAL PUMP IMPELLER DESIGN STUDY PW 1604 F63 RS P T I $ PIP, 187
CEXE,INCEXE, 1-GP 3-D XYZ XENON OSCILLATION CEND 360 F4 RS P X T F $ 415
CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA AI 7094 F+MAP RS P A $ 215
CHAIN ANALYSIS ORNL 1604 F63 RS P D $ ISOCRUNCH, REACTION DECAY 180
CHAIN ANALYSIS ORNL 7090 F2 RSBP D $ ISOCRUNCH, REACTION DECAY 180
CHAIN EQUATIONS ORNL 7090 F2 RSBP D $ NUCY, SOLUTION OF NUCLIDE 134
CHAINS GEC 635 F4 RSBP D $ CHAINS, ANALYSIS OF RADIOACTIVE DECAY 418
CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS GEC 635 F4 RSBP D $ 418
CHANNEL ANALYSIS ECC BCL 6400 F4 RS P X T G $ MUCHA1,MUCHA2, MULTIPLE 508
CHANNEL X-SEC EVALUATION ENEA 360 F4 RS P CT A $ JUPITOR1, COUPLED 308
CHECKER, ENDF/B V2 PROCESSING CODES ANL 360 F4 RS P T M $ CRECT, 475
CHECKER,CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC BNL 6600B F4 RS T M $ 384
CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC BNL 6600B F4 RS T M $ CRECT, 475
CHECK3,RIGEL3, ENDF/B V3,V4 PROCESSING CODES BNL 6600 F4 RS T M $ 571
CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION ANL 3600 F36 RSBP G $ 366
CHF DATA ANALYSIS ANC 360 F4 RS PL CT M $ ERREST, LOCA ROD BUNDLE 518
CHI 1108 F4 RS P T H $ LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM 299
CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS BAPL 6600 F4 RS P T H $ 473
CHORD DIST FUNCT AEG 7090 F2 RS B $ DANCOFF JR, MODERATOR SPACE 150
CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS CWF 360 F4 RS P T D $ 354
CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS WAPD 6600 F4 RS P T D $ 354
CINDER,M0102, POINT DEPLETION FISSION PRODUCT BAPL 6600 F4 RS P D $ 313
CINDER,M0102, POINT DEPLETION FISSION PRODUCT DP 360 F+BAL RS P T D $ 313
CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP ORNL 360G F4 RS P T K $ 387
CLAD STRAIN & PELLET CRACKING BAPL 6600 F4 RS P I $ STRIPE, FUEL ROD 570
CLADDING-STEAM REACTION ANL 3600 F36 RSBP G $ CHEMLOC2, CORE HEATING 366
CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING KAPL 6600 F4 RS P A $ 531
CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE AI 360 F4 RSB L T M $ 271
CLOTHO, NUCLEAR POWER PLANT COST CODE HEDL 1108 F5 RS P X T D $ PACTOLUS, 540
CLOUD AI 7090 F2 RS P G $ CLCUD, GAMMA-RAY DOSE RATE FROM A 47
CLOUD CDC 1604 F63 RS P G $ CLOUD, GAMMA-RAY DOSE RATE FROM A 47
CLOUD DP 360 F4 RS P G $ CLOUD, GAMMA-RAY DOSE RATE FROM A 47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD AI 7090 F2 RS P G $ 47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD CDC 1604 F63 RS P G $ 47
CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD DP 360 F4 RS P G $ 47
CLUP77, SQUARE CELL COLLISION PROBABILITY CALC ANL 360 F4 RS P T B $ 526
CLUP77, SQUARE CELL COLLISION PROBABILITY CALC JAER 230 F4 RS P T B $ 526
CLUSTER, RADIATION DAMAGE IN METALS GEC 635 F+FAP RSBP T Q $ CASCADE, 419
CMPXMAT, TRANSFER FUNCTION EVALUATION PW 1604 F63 RS P E $ 188
CNEA 360 F4 RS P E $ TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS 489
COAGULATION OF HETEROGENEOUS AEROSOLS AI 360 F4 RS P T G $ HAA3, 443
COBCL RS P M $ AEC-ALC FAU, RADIO FREQUENCY MANAGEMENT SYSTEM ALOO 360 587
COBOL RS P M $ BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS SLA 1108 589
COBCL RSBP CT M $ BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS SLA 360 589
COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW 360C F4 RS P T H $ 432
COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW 1108C F4 RS P T H $ 432
COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW 6600C F4 RS P T H $ 432
CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA UILL 360 F4 RS P A $ 347
COEF CALC GGA 7044 F4 RS P T C $ TEMCO, 1-D FEW-GP DIFFUSION TEMP 225
COEF CALC FOR ANGULAR DIST GGA 7044 F4 RS P X A $ LEGCOEF3, LEGENDRE 217
COEF CALC FOR ANGULAR DIST DATA AI 7094 F+MAP RS P A $ CHAD, LEGENDRE 215
COEFFICIENT CALCULATION GGA 1108 F4 RS P T C $ TEMCO7, TEMPERATURE 320
COEFFICIENTS LRL 7090 F+FAP RS P T B $ SOPHISTI/2/5, MULTI-GP TRANSFER 160
COHBE, COHERENT INELASTIC SCATTERING LAW CALC GGA 1108 F4 RS P X A $ COHBE, 385
COHERENT INELASTIC SCATTERING LAW CALC GGA 1108 F4 RS P X A $ COHBE, 385
COINC, COINCIDENCE COUNTING DATA REDUCTION ANL 3600 F63 RSBP O $ 248
COINCIDENCE COUNTING DATA REDUCTION ANL 3600 F63 RSBP O $ COINC, 248
COLLAPSE ANALYSIS BAPL 6600 F4 RS P T I $ BUSHL, CYL SHELL BUCKLING 481

COLLAPSING TRW 6500 F4 RS P B $ PARTI, OPTIMAL GROUP OR MESH 416
COLLAPSING APRF 6600 F4 RS B $ APRFX1, 99-GP DLC-2B LIBRARY GROUP 466
COLLISION PROBABILITIES MC ORNL 360 F+BAL RS P T B $ RAFFLE, 1ST FLIGHT 392
COLLISION PROBABILITIES MC ORNL 7090 F+FAP RS P T B $ RAFFLE, 1ST FLIGHT 392
COLLISION PROBABILITY CALC ANL 360 F4 RS P T B $ CLUP77, SQUARE CELL 526
COLLISION PROBABILITY CALC JAER 230 F4 RS P T B $ CLUP77, SQUARE CELL 526
COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION PPCO 7040 F+MAP RS P A $ 203
COMNUC,CASCADE, COMPOUND NUCLEUS REACTION AI 360 F+BAL RS P T A $ 482
COMPLEMENTARY ERROR FUNCTION SLA 6600 F4 RS P P $ ERF,ERFC, ERROR & 601
COMPLEX GAMMA-RAY SPECTRA ANALYSIS KAPL 6600 F4 RS T O $ GASPAN, 485
COMPLEX GAMMA-RAY SPECTRA KSUN 360 F4 RS P O $ CORGAM, UNFOLDING OF 390
COMPOSITE STRUCTURE STRESS STUDY GGA 1108 F4 RS P T I $ SAFE-3D, 3-D 332
COMPOSITE STRUCTURE STRESS STUDY ORNL 360 F+BAL RS P T I $ SAFE-3D, 3-D 332
COMPOSITION-DEPENDENT X-SECS GESV 635 F+GMP RS P XCT L $ TDOWN, SPATIAL & 505
COMPOUND NUCLEUS REACTION AI 360 F+BAL RS P T A $ COMNUC,CASCADE, 482
COMPOUND NUCLEUS X-SECTION CALC ANL 3600 F63 RSBP A $ NEARREX, 171
COMPUTER-PRODUCED WIRING LISTS UHTREX LASL 7090 F+FAP RS P I $ WIREX, 315
CONCEPTUAL COST ESTIMATE ORNL 360B F4 RS P XCT D $ CONCEPT2, POWER PLANT 498
CONCEPT2, POWER PLANT CONCEPTUAL COST ESTIMATE ORNL 360B F4 RS P XCT D $ 498
CONCRETE GGA 1108 F4 RS P I $ SAFE-CREEP, VISCOELASTIC ANALYSIS 300
CONCRETE GGA 1108 F5 RS P T I $ SAFE-CRACK, VISCOELASTIC ANALYSIS OF 451
CONDUCTION PPCO 7044 F+MAP RS P T H $ TOODEE, 2-D TIME-DEPENDENT HEAT 349
CONDUCTION ORNL 360 F4 RS P X T H $ ORTHIS,ORTHAT, 2-DIMENSIONAL HEAT 525
CONDUCTION LUMPED MASS LASL 7030 F4 RS T H $ RATH, 2- OR 3-D HEAT 242
CONDUCTION LUMPED MASS LASL 7094 FAP RS P T H $ RATH, 2- OR 3-D HEAT 242
CONDUCTION PROGRAM BAPL 6600 F4 RS P T H $ HOT2, 2-D TRANSIENT HEAT 286
CONDUCTION PROGRAM ORNL 360 F4 RS P T H $ HEATING3, 1,2, OR 3-D HEAT 517
CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE LRL 7090 F2 RS P F $ 129
CONFIGURATION FUEL TEMPERATURE CODE GGA 7044 F4 RS I $ CORE, CORE 233
CONSTANT & FAST SPECTRA CALC ANC 360 F4 RS PLXCT B $ PHROG, MULTI-GP 520
CONSTANT CALC AGC 7090 F+FAP RSBPLX T B $ AGN-GAM, FAST SPECTRUM MULTI-GP 204
CONSTANT CALC FROM TOR OUTPUT DATA LASL 6600 F4 RS P T B $ GLEN, GROUP 361
CONSTANT CALC 0 TO 10 MEV BC 625 F4 RS PLX T B $ GAMTEC2, MULTI-GP 185
CONSTANT CALC 0 TO 10 MEV BNW 1107 F4 RS PL T B $ GAMTEC2, MULTI-GP 185
CONSTANT CALC 0 TO 10 MEV BNW 7090 F+FAP RS PL T B $ GAMTEC2, MULTI-GP 185
CONSTANT CALC 0 TO 10 MEV UVA 6400 F4 RS PLX T B $ GAMTEC2, MULTI-GP 185
CONSTANTS ANC 360 F4 RS PL CT B $ INCITE, THERMAL SPECTRA & MULTI-GP 565
CONSTANTS ORNL 360 F4 RS PLX T B $ XSDRN, DISCRETE ORDINATE MULTIGROUP 393
CONSTANTS BNW 1108 F4 RS PLX T B $ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP 467
CONSTANTS FOR DSN TDC PW 1604 F63 RS P L $ SNC, CALCULATION OF SN 189
CONSTANTS FROM ENDF/B DATA GESV 635 F+GMP RS P XCT B $ ENDRUN2, MULTIGROUP 501
CONSTANTS FROM ENDF/B FOR 1DX HEDL 1108B F4 RS P X T B $ ETOX3, MULTI-GP 388
CONSTANTS GENERATION ORNL 360 F4 RS P T B $ SUPERTOG, ENDF/B FINE-GP 431
CONSTANTS TVA 360 F4 RS PLX T B $ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP 467
CONTAINMENT PRESSURE POST RUPTURE GGA 7044 F4 RS X T G $ PRECON, HTGR 228
CONTAINMENT SYSTEM IODINE REMOVAL BCL 6400 F4 RS P G $ MIRAB,MIRAP, 499
CONTEMPT-LT/022, PRESSURE-TEMPERATURE RESPONSE ANC 360 F+BAL RSBP CT G $ 433
CONTOUR PLOTS & AREA CALCULATION SLA 6600 F4 RS P P $ PLOTR, 2D 578
CONVERSION ANL 360 F4 RS P CT M $ ETOE, ENDF/B TO MC**2 DATA 350
CONVERSION APDA 3600 ASAF4 RS P T M $ ETOE, ENDF/B TO MC**2 DATA 350
CONVOLUTION PPCO 7040 F+MAP RS P A $ COMBCO, COMBINED B-W MULTI-LEVEL 203
COOLANT INLET PLENUM DP 360 F4 RS P H $ PLENUM, FLOW DIST. IN CYL 586
COOLING BCL 6400 F4 RS P T G $ ECCSA4, LOSS-OF-COOLANT & EMERGENCY 330
CORE ACCIDENT ANALYSIS NED 635 F4 RS P T G $ FREADM1, FAST REACTOR 479
CORE CONFIGURATION FUEL TEMPERATURE CODE GGA 7044 F4 RS I $ CORE, 233
CORE HEATING CLADDING-STEAM REACTION ANL 3600 F36 RSBP G $ CHEMLOC2, 366
CORE SUPPORT STRESS ANALYSIS ANL 3600 F36 RS P T I $ SUPORAN, REACTOR 357
CORE THERMAL DESIGN STUDY GGA 7044 F4 RS P I $ GAZELLE5, GAS-COOLED 232
CORE TRANSIENT ANALYSIS ANC 360 F+BAL RSBPL CT G $ PARET, WATER-COOLED 555
CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE GGA 7044 F4 RS I $ 233
CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA KSUN 360 F4 RS P O $ 390
CORRECTION CALC AI 360 F4 RS P T Q $ RESPOND, DISSIMILAR MEDIA TLD 566
COST ANALYSIS AI 7090 F2 RS P D $ AIMFIRE, URANIUM FUEL CYCLE 55
COST AND ECONOMICS CWE 360 F4 RS P T D $ CINCAS, NUCLEAR FUEL CYCLE 354

```
COST AND ECONOMICS  WAPD 6600  F4    RS P   T D $ CINCAS, NUCLEAR FUEL CYCLE    354
COST CALCULATION    GGA  1108  F4    RS P   T D $ PWCOST, REACTOR FUEL CYCLE    441
COST CODE HEDL 1108  F5    RS P X T D $ PACTOLUS,CLOTHC, NUCLEAR POWER PLANT    540
COST ESTIMATE ORNL  360B F4    RS P XCT D $ CONCEPT2, POWER PLANT CONCEPTUAL    498
COST ESTIMATING     ORNL  360  F4    RS P   T D $ ORCOST, POWER PLANT CAPITAL    588
COSTS     ORNL 1604  F63   RS P     D $ POWERCO, NUCLEAR STATION ELECTRICITY    340
COSTS     UEC  6600  F4    RS P     D $ POWERCO, NUCLEAR STATION ELECTRICITY    340
COSTS  GGA  7044  F4    RS P   T D $ STMGEN, STEAM GENERATOR DESIGN CRITERIA    227
COSTS PERFORMANCE DATA      KE   7090  F2    RSBP     D $ NPRFCCP, FUEL CYCLE    146
COSTS PERFORMANCE DATA      UEC  6600  F4    RS P     D $ NPRFCCP, FUEL CYCLE    146
COSTS PERFORMANCE STUDY     GGA  7044  F4    RS P     D $ WAMPUM, FUEL CYCLE     224
COSTS PERFORMANCE STUDY     UEC  6600  F4    RS P     D $ WAMPUM, FUEL CYCLE     224
COUNTING DATA REDUCTION     ANL  3600  F63   RSBP     O $ COINC, COINCIDENCE     248
COUPLED CHANNEL X-SEC EVALUATION     ENEA  360  F4    RS P  CT A $ JUPITOR1,     308
COUPLED NEUTRON-HYDRODYNAMICS  APDA 7094  F2    RS P     F $ WEAK EXPLOSION,    145
COUPLED NEUTRONICS-HYDRODYNAMICS CODE AGC  7090  F2    RSB      F $ HATCHET,     153
COUPLED NEUTRONICS-HYDRODYNAMICS SPH   PW   1604  F63   RS P     F $ AX-TNT,      191
COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE   CDC  3600  F63   RSBP     F $ AX1,      102
COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE LRL  7090  F2    RS P     F $ CONEC,      129
COUPLED-CHANNEL SCATTERING X-SEC CALC   KAPL 6600  F4    RS P   T A $ JP1XR,      506
COUPLED-CHANNEL X-SEC EVALUATION     ORNL 1604  F63   RS P   T A $ JUPITOR1,      308
CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES   WANL 7094  F+FAP RSBPL  T N $     239
CRACKING BAPL 6600  F4    RS P     I $ STRIPE, FUEL ROD CLAD STRAIN & PELLET     570
CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM   AAEC  360  F+BAL RS P   T C $      103
CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM   UK-R 7090  F+FAP RSBPL  T C $      103
CRECT,CHECKER, ENDF/B V2 PROCESSING CODES      ANL  360  F4    RS P   T M $      475
CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC  BNL  6600B F4    RS     T M $      475
CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC BNL  6600B F4    RS     T M $ CHECKER,     384
CREEP-BUCKLING OF TUBES UNDER PRESSURE  BAPL 6600  F4    RS P     I $ TCB01,      604
CRITERIA COSTS  GGA  7044  F4    RS P   T D $ STMGEN, STEAM GENERATOR DESIGN      227
CRITICAL ANALYSIS SYSTEM    DP   360  F+BAL RS P XCT B $ HAMMER,LITHE,HELP,       277
CRITICAL ASSEMBLY ANALYSIS  AI   7600  F4    RS PLX T C $ VIM1, MONTE CARLO       510
CRITICAL ASSEMBLY ANALYSIS  AI-A  360  F4    RSBPL CT C $ VIM1X, MONTE CARLO      510
CRITICALITY CODE  ORNL  360  F+BAL RSBPL CT C $ KENO, MONTE CARLO MULTIGROUP      450
CRITICALITY CODE RFD  6600  F+COM RS P   T C $ KENO2, MONTE CARLO MULTIGROUP      450
CRNL 6600  F4    RS P     P $ FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS        514
CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION   AI   7090  F2    RS       I $      112
CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS    AGC  7090  F2    RS P     O $      154
CROSS SECTIONS   LASL 6600  F4    RS P     N $ LARCA, FLUX-WEIGHTING OF DTF4     409
CROSS-SPECTRAL DENSITIES    BNW  1108  F5    RS P X T F $ NOISY1, AUTO- AND        488
CROSS-SPECTRAL DENSITIES    BNW  7090  F4    RS P   T F $ NOISY1, AUTO- AND        488
CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES   GGA  7044  F+SPS RSBP   T N $      207
CRYSTAL   UM   7090  MAD  RSB     O $ BURP5, GAMMA-RAY PHOTOFRACTION WELL          170
CRYSTAL   UM   7090  MAD  RSB     O $ BURP4, GAMMA-RAY PHOTOFRACTION SOLID         169
CRYSTALLINE MATERIALS  LASL 6600  F4    RS P   T A $ TOR, THERMAL SCATTERING       360
CRYSTALLINE SCATTERING KERNEL CALC     GGA  7090  F2    RS     T A $ SUMMIT,       56
CSP1, SN X-SECTION LIBRARY TAPE PREPARATION    PW   1604  F63   RS       L $      194
CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION   PW   1604  F63   RS       L $      193
CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS KAPL 6600  F+ASC RS P   T P $       43
CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE AI   7094  F+FAP RS PL  T G $      196
CURVE FITTING      LASL 7094  F4    RS     T P $ LASL LEAST SQUARES, GENERAL      62
CURVE FITTING    BAPL 6600  F4    RS P   T P $ M0661,M0657,M0626, POLYNOMIAL      411
CURVE FITTING EXPERIMENTAL DATA POINTS KAPL 6600  F+ASC RS P   T P $ CURFIT,       43
CURVE PLOT  KAPL 6600  F+ASC RS P   T P $ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN      364
CURVES LRL  7094  F2    RS P     P $ EXPALS, LEAST SQUARES EXPONENTIAL DECAY      321
CWE  360  F4    RS P   T D $ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS        354
CYCLE ANALYSIS          AI   7094  F2    RS PL  T I $ CYCLOPS1, THERMODYNAMIC      244
CYCLE ANALYSIS PARTIAL REFUEL   GGA  7044  F4    RS P   T D $ GARGOYLE, FUEL       260
CYCLE ANALYSIS W/REFUELING   GGA  7044  F4    RS P   T D $ REVISED-GAD, FUEL      223
CYCLE CALCULATION       GGA  1108  F4    S      T D $ GAFFE, EQUILIBRIUM FUEL     302
CYCLE COST ANALYSIS     AI   7090  F2    RS P     D $ AIMFIRE, URANIUM FUEL        55
CYCLE COST AND ECONOMICS  CWE  360  F4    RS P   T D $ CINCAS, NUCLEAR FUEL        354
CYCLE COST AND ECONOMICS  WAPD 6600  F4    RS P   T D $ CINCAS, NUCLEAR FUEL        354
CYCLE CCST CALCULATION    GGA  1108  F4    RS P   T D $ PWCOST, REACTOR FUEL        441
```

```
CYCLE                                                                    DATA

CYCLE COSTS PERFORMANCE DATA      KE   7090  F2     RSBP      C $ NPRFCCP, FUEL     146
CYCLE COSTS PERFORMANCE DATA      UEC  6600  F4     RS P      D $ NPRFCCP, FUEL     146
CYCLE COSTS PERFORMANCE STUDY      GGA  7044  F4     RS P      D $ WAMPUM, FUEL     224
CYCLE COSTS PERFORMANCE STUDY      UFC  6600  F4     RS P      D $ WAMPUM, FUEL     224
CYCLE ECONOMICS  UICS  360  F4     RS P  CT D $ GEM, ANALYSIS OF NUCLEAR FUEL     576
CYCLE PARAMETERS FAST BREEDERS      NED   635  F4     RS P      D $ RAPFU, FUEL     372
CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS          AI   7094  F2     RS PL   T I $     244
CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT        BAPL 6600  F4     RS      T I $     266
CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION     BAPL 6600  F4     RS P    T I $     449
CYL      CRNL 7090  F2     RS P   T C $ EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB      39
CYL CELL CODE AND TEMPEST COMBINATION  AI   7090  F2     RS P      B $ BAM, S4     108
CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION     AI   7090  F2     RS        B $ S4       53
CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION     CDC  1604  F63    RS P      B $ S4       53
CYL COOLANT INLET PLENUM DP     360  F4     RS P      H $ PLENUM, FLOW DIST. IN     586
CYL FUEL ELEMENT        BAPL 6600  F4     RS      T I $ CYGRO2, STRESS ANALYSIS     266
CYL FUEL ELEMENTS   AEB   360  F4     RS P      B $ WELWING, MATERIAL BUCKLING     362
CYL GGA  1108  F+BAL RS P   T C $ GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH,       430
CYL LATTICE   TVA   360  F4     RSBPLXCT B $ LASER, SPECTRUM CALC WITH BURNUP      249
CYL LATTICE   WAPD 7094  F+MAP RS PLX T B $ LASER, SPECTRUM CALC WITH BURNUP       249
CYL PW   1604  F63   RS     T C $ 2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM       192
CYL SHELL BUCKLING COLLAPSE ANALYSIS     BAPL 6600  F4     RS P    T I $ BUSHL,    481
CYL SPHERE     BNW  1107  F4     RS P    T C $ HFN, 1-D MULTI-GP DIFFUSION SLAB   241
CYL SPHERE   AI    7090  F+FAP RS  L   T C $ FAIM, 1-D MULTI-GP DIFFUSION SLAB     120
CYL SPHERE   AI    7090  F+FAP RS PL   T C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB      29
CYL SPHERE   CDC   1604  F63   RS PL   T C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB      29
CYL SPHERE   CDC   1604  F63   RS PLX T C $ FAIM, 1-D MULTI-GP DIFFUSION SLAB      120
CYL SPHERE   OSUC  370   F4     RS PL CT C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB      29
CYL SPHERE  AI    7090  F+FAP RS  L   T C $ ULCER, 1-D MULTI-GP DIFFUSION SLAB     118
CYL SPHERE  ANL   3600  F36    RS P  X T C $ MACH1, 1-D MULTI-GP DIFFUSION SLAB     262
CYL SPHERE  PURD 6500  F4     RS PLX T C $ MACH1, 1-D MULTI-GP DIFFUSION SLAB      262
CYL SPHERE  PW    1604  LAG1  RS P      C $ MGDSN, 1-D MULTI-GP SN APPROX SLAB      211
CYL SPHERE  UK-W 7090  F2     RS P    T C $ W-DSN, 1-D MULTI-GP SN APPROX SLAB     132
CYL SPHERE BHSC   360  F4     RS P    T C $ FAIMOS, 1-D MULTI-GP DIFFUSION SLAB    120
CYL SPHERE GEOM  AI    7090  F2     RS P      J $ GRACE2, GAMMA-RAY ATTENUATION     46
CYL SPHERE GEOM  CDC   1604  F63    RS P      J $ GRACE2, GAMMA-RAY ATTENUATION     46
CYL, SPH  ANC    360  F4     RSBP  CT C $ MCNA, 1-D MULTIGROUP DIFFUSION SLAB,     582
CYLINDER      ANL   3600  F63    RSBP    T H $ ARGUS, TRANSIENT TEMPERATURE CALC   152
CYLINDER      PPCO 7040  F4     RS P    T C $ TOPIC, 1-D FEW-GP SN APPROXIMATION  148
CYLINDER      PPCO 7090  F2     RS P    T C $ TOPIC, 1-D FEW-GP SN APPROXIMATION  148
CYLINDER CDC  1604  F63    RS P    T C $ 2DGRAND, 2-D FEW-GROUP DIFFUSION SLAB   40
CYLINDER ORNL 7090  F2     RS P    T C $ 2DGRAND, 2-D FEW-GROUP DIFFUSION SLAB   40
CYLINDER SLAB  CDC  1604  F63    RS P    T C $ EQUIPOISE3A, 2-D 2-GP DIFFUSION  87
CYLINDER SLAB  ORNL 7090  F2     RS P    T C $ EQUIPOISE3A, 2-D 2-GP DIFFUSION  87
CYLINDER SPHERE  AEB   360  F4     RS  L   T C $ FIRE5, 1-D AGE-DIFFUSION SLAB    9
CYLINDER SPHERE AI    7090  F2     RS P    T C $ FOG, 1-D FEW-GP DIFFUSION SLAB   28
CYLINDER SPHERE BC     625  F4     RS      T C $ FOG, 1-D FEW-GP DIFFUSION SLAB   28
CYLINDER SPHERE CDC   1604  F63    RS P    T C $ FOG, 1-D FEW-GP DIFFUSION SLAB   28
CYLINDRICAL PINS ANC   360  F4     RSBP    CT J $ VIEWPIN, VIEW FACTOR CALC FOR   569
DAC  7090  F2     RSBP      J $ LIPRECAN1, MC NEUTRON PENETRATION CALCULATION    123
DAC1, SN PERTURBATION CODE USING DTF4 FLUXES    LASL 6600  F4     RS P      N $  455
DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA   BAPL 6600  F4     RS P    T P $  327
DAMAGE IN METALS     GEC   635  F+FAP RSBP    T Q $ CASCADE,CLUSTER, RADIATION  419
DAMMET,PLOTFB,... ENDF/B V1 PROC BNL  6600B F4     RS      T M $ CHECKER,CRECT,  384
DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT    AEG  7090  F2     RS        B $  150
DATA       WAPD 7600  F4     RS P    T B $ ETOT2, THERMAL LIBRARIES FROM ENDF/B 509
DATA      KE   7090  F2     RSBP      D $ NPRFCCP, FUEL CYCLE COSTS PERFORMANCE  146
DATA      UEC  6600  F4     RS P      D $ NPRFCCP, FUEL CYCLE COSTS PERFORMANCE  146
DATA    NED   635  F4     RS P    T O $ EXPN, ANALYSIS OF PULSED NEUTRON SOURCE  258
DATA  BAPL 6600  F4     RS P    T B $ EPOCH, NEUTRON AGE CALCULATION OF ENDF/B 461
DATA  BAPL 6600  F4     RS P    T P $ DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE 327
DATA  DP    360  F4     RS P XCT A $ FLANGE2(71-1), ENDF/B THERMAL SCATTERING  368
DATA  ORNL  360  F4     RS P    T B $ RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B 453
DATA AI   7094  F+MAP RS P      A $ CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST  215
DATA ANALYSIS       ANC   360  F4     RS PL CT M $ ERREST. LOCA ROD BUNDLE CHF  518
```

```
DATA ANALYSIS   CNEA  360  F4     RS P     E $ TRIFIDO, PULSED NEUTRON SOURCE      489
DATA ANALYSIS   GEES 1108  F5     RS P     T C $ CAGE,BIRD,SPEC, TIME-OF-FLIGHT    476
DATA CONVERSION          ANL    360  F4    RS P  CT M $ ETOE, ENDF/B TO MC**2      350
DATA CONVERSION          APDA 3600  ASAF4 RS P   T M $ ETOE, ENDF/B TO MC**2       350
DATA FILE SERVICE ROUTINES ENDF TAPES     BNL   7090  F+FAP RS P   T M $ DFSR,     236
DATA GESV  635  F+GMP RS P XCT B $ ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B       501
DATA HEAT TRANSFER STUDY SLL  6600  F4     RS P     N $ HEATMESH, GEOMETRICAL       434
DATA LASL 6600  F4    RS P    T B $ GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT      361
DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2     WAPD 6600  BCD    R   L   T Z $ ETOG1    447
DATA LIBRARY       LRL   7094  F+FAP RS PL  T M $ ECSIL, EXPERIMENTAL NEUTRON       351
DATA MANAGEMENT, EDITING, & ANALYSIS     BAPL 6600  F4     RS P    T M $ SHLOG,    557
DATA POINTS KAPL 6600  F+ASC RS P   T P $ CURFIT, CURVE FITTING EXPERIMENTAL         43
DATA PREPARATION FOR 2-D DESIGN PROGRAMS  LASL 7090  F+FAP RS P   T L $ CPC,        234
DATA PROCESSING CODE            ANL    360  F4    RS      T M $ RIGEL, ENDF/B V3    571
DATA PROCESSING MODULE   ANL    360  F4     RSBP   CT L $ ARC-NUI002, BCD INPUT     533
DATA REDUCTION     ANL   3600  F63   RSBP     O $ COINC, COINCIDENCE COUNTING       248
DATA STORAGE, RETRIEVAL, AND DISPLAY   DP     360  F+BAL  S     T M $ JOSHUA,       490
DATA SYSTEM  KAPL 6600  F+COM RSB    T M $ DATATRAN, MODULAR PROGRAMMING AND       386
DATA TAPES   GGA  1108  BIN   R   L  T Z $ ZPR-III ASSEMBLY 48 GAFGAR ENDF/B         356
DATA UILL  360  F4    RS P     A $ CODILLI, LEAST SQUARES ANALYSIS RESONANCE        347
DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING   KAPL 6600  F+ASC RS P   T P $        407
DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT KAPL 6600  F+ASC RS P   T L $        406
DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM  KAPL 6600  F+COM RSB    T M $        386
DBF1, RESONANCE INTEGRAL HEX CELL  BAPL 6600  F+ASC RS P X T B $ RESQ2,RESQO,        285
DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS  BNWL 1108  F5    RS P    T D $        456
DDB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY   GGA  7090  F+FAP RSBP   T D $         99
DECAY      BNW  1108  F5     RSBPL  T D $ ISOGEN, RADIONUCLIDE GENERATION AND        367
DECAY CHAIN ANALYSIS        ORNL 1604  F63    RS P     D $ ISOCRUNCH, REACTION       180
DECAY CHAIN ANALYSIS        ORNL 7090  F2     RSBP     D $ ISOCRUNCH, REACTION       180
DECAY CHAINS   GEC   635  F4     RSBP     D $ CHAINS, ANALYSIS OF RADIOACTIVE         418
DECAY CURVES LRL  7094  F2    RS P     P $ EXPALS, LEAST SQUARES EXPONENTIAL         321
DECAY ORNL 1604  F63   RS P     D $ ISOTOPES, MAXIMUM YIELD FROM REACTION OR          179
DEFLECTION CALCULATION PARALLEL BEAMS     ANL   3600  F36    SBP      I $ BOW2,       365
DEFLECTION STRESS STUDY BAPL 6600  F+COM RS P   T I $ GAPL3, INELASTIC LARGE          397
DEFORMATION     BAPL 6600  F4     RS P   T I $ CYGRO3, OXIDE FUEL ROD STRESS &        449
DEFORMATION    BAPL 6600  F4     RS P   T I $ PELEN, FUEL PELLET TEMPERATURE &        598
DENSITIES      BNW  1108  F5     RS P X T F $ NOISY1, AUTO- AND CROSS-SPECTRAL        488
DENSITIES      BNW  7090  F4     RS P   T F $ NOISY1, AUTO- AND CROSS-SPECTRAL        488
DENSITY CALC   AI   7094  F+FAP RS PL  T B $ TYCHE3, MONTE CARLO SLOWING-DOWN         149
DEPLETION      AI    360  F4     RSBP X T D $ SIZZLE, 1-D MULTIGROUP DIFFUSION         58
DEPLETION      AI   7090  F2     RS  L  T D $ SIZZLE, 1-D MULTIGROUP DIFFUSION         58
DEPLETION      CDC  1604  F63    RS  L  T D $ SIZZLE, 1-D MULTIGROUP DIFFUSION         58
DEPLETION      KAPL 6600  F4     RS P   T D $ 3DXT,DEP3, 3-D XENON TRANSIENT &        477
DEPLETION      LASL 7030  F4     RS P   T D $ DTF-BURN, 1-D MULTI-GP DTF4 WITH        269
DEPLETION      ANC   360E F+BAL RS P XCT D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION       275
DEPLETION      ANL  3600  F4     RSBP   T D $ 2DB, 2-D MULTIGROUP DIFFUSION AND       325
DEPLETION      BAPL 6600A F+ASC RS P    T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION      275
DEPLETION      BAPL 6600C F+ASC RS P    T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION      275
DEPLETION      BCS  6600D F+ASC R B     T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION      275
DEPLETION      BNW  1108  F4     RS P   T D $ 2DB, 2-D MULTIGROUP DIFFUSION AND       325
DEPLETION      BW   6600B F+ASC RS P    T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION      275
DEPLETION      IBM   360A F+BAL RS P    T D $ PDQ5, 2-D FEW-GROUP DIFFUSION AND      336
DEPLETION      JNC  1108  F5     RS  LX T B $ LEOPARD, SPECTRA CALCULATION WITH       279
DEPLETION      LASL 6600  F4     RS P   T D $ 2DB, 2-D MULTIGROUP DIFFUSION AND       325
DEPLETION      MIT   360B F+BAL RSBP    T D $ PDQ5, 2-D FEW-GROUP DIFFUSION AND      336
DEPLETION      WAPD  360  F4     RS PLX T B $ LEOPARD, SPECTRA CALCULATION WITH       279
DEPLETION   GGA  7044  F4     RS P   T D $ RELCAD-FEVER, 1-D FEW-GP DIFFUSION       221
DEPLETION CODE ORNL 7090  F+FAP RS P    T C $ ASSAULT, 2-D MULTI-GP DIFFUSION        240
DEPLETION FISSION PRODUCT  BAPL 6600  F4     RS P     D $ CINDER,MO102, POINT        313
DEPLETION FISSION PRODUCT  DP     360  F+BAL RS P   T D $ CINDER,MO102, POINT         313
DEPLETION GGA  1108  F4     RS P   T D $ FEVER7, 1-D MULTIGROUP DIFFUSION AND         318
DEPLETION GGA  1108  F4     RS P   T D $ GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION         339
DEPLETION MULTIGP  ORNL  360G F4     RS P   T K $ CITATION, 1,2,3-D DIFFUSION         387
DEPLETION NED   635  F+GMP RS P   T D $ SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP          455
```

```
CEPLETICN PROGRAM  ANC   360  F4    RSBP  CT D $ DWARF, 1-D FEW-GP DIFFUSION     579
DEPLETICN PROGRAM  GGA  7090  F2    RSB    T D $ FEVER, 1-D FEW-GP DIFFUSION     117
CEP3, 3-D XENON TRANSIENT & DEPLETION     KAPL 6600  F4    RS P   T D $ 3DXT,   477
DESIGN   BNW  1108  F5    RS P   T H $ REPP, THERMAL-HYDRAULIC WATER REACTOR     483
DESIGN & SURVEY STUDY  BW   6600  F+COM RS P X T D $ FARED, 1-D FAST REACTOR     427
CESIGN CRITERIA COSTS  GGA  7044  F4    RS P   T D $ STMGEN, STEAM GENERATOR     227
DESIGN MULTIGROUP SLAB GECMETRY    ANL  3600  F63   RSBPL  T J $ MAC, SHIELD     143
CESIGN MULTIGROUP SLAB GEOMETRY    BNW  7050  F2    RSBPL  T J $ MAC, SHIELD     143
CESIGN OPTIMIZATION   AI   7090  F2    RS        I $ CROCK, SPACE POWER PLANT   112
DESIGN OPTIMIZATION   AI   7090  F2    RS        I $ SHOCK, SPACE POWER PLANT   114
CESIGN PROGRAMS  LASL 7090  F+FAP RS P   T L $ DPC, DATA PREPARATION FCR 2-D    234
DESIGN STUDY    PW   1604  F63   RS P   T I $ PIP, CENTRIFUGAL PUMP IMPELLER    187
DESIGN STUDY GGA  7044  F4    RS P    I $ GAZELLE5, GAS-COOLEC CORE THERMAL    232
CESIGN SYSTEM    AI   360  F4    RSBP   T K $ THREDES, 1-D FEW-GP CIFFUSION     273
DESIGN SYSTEM LASL 6600  F+CCM RS P   T P $ LENSCES, NONLINEAR LEAST SQ LENS    602
DESK CALCULATOR FORM SHEET DP PACKAGE   KAPL 6600  F+ASC RS P   T P $ DOGGY,    428
DETECTOR EFFICIENCY DISK SOURCE         UM   7090  MAD   RSB      O $ BURP2,    165
DETECTOR EFFICIENCY POINT SOURCE        UM   7090  MAD   RSB      O $ BURP1,    164
CETECTOR EFFICIENCY POINT SOURCE        UM   7090  MAD   RSB      O $ BURP3,    166
DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES    BNL  7090  F+FAP RS P   T M $    236
CIELECTRICS SLA  6600  F4    RS P     V $ FFEARS, LAPLACE EQUATION ISOTROPIC    577
CIFF & 1GP DEPLETION NED   635  F+GMP RS P   T D $ SYN, 2D SYNTHESIS MULTIGP    495
DIFF EQNS   CRNL 6600  F4    RS P     P $ FCRSIM, SOLN OF SYSTEM OF ORDINARY    514
CIFFERENTIAL EQN SYSTEM SOLVER  LLL  6600  F4    RS P     P $ GEAR, ORDINARY    592
DIFFERENTIAL EQNS. SOLUTION  KAPL 6600  F+ASC RS P   T P $ LIZARD, NONLINEAR    445
DIFFRACTION MODEL ELASTIC SCAT X-SEC   BNL  6600  F4    RS P     A $ BESFIT,   524
CIFFRACTION POWDER PATTERN INDEXING LASL 6600  F+COM RS P   T Q $ INDX, XRAY    609
DIFFUSION         ANL  360  F4    RS P     F $ TWIGGLE, 2-D 2-GP SPACE-TIME    338
DIFFUSION     UMCC  360  F4    RS P   T C $ VARI-QUIR, TIME-DEP 2-D MULTI-GP    212
DIFFUSICN     WANL 6600  F4    RS P   T C $ VARI-QUIR, TIME-DEP 2-D MULTI-GP    212
DIFFUSION + LIB   AI   360  F4    RSBPLX T C $ CAESAR4,LIBLST, 1-D MULTI-GP     270
DIFFUSION & BURNUP XY, RZ GGA  1108  F+BAL RS P   T D $ BUG2, 2-D MULTIGROUP    438
DIFFUSICN & SN THEORY   NED   635  F4    RS P   T C $ COT2DB, 2-D MULTIGROUP    459
CIFFUSION ABSORPTION REMOVAL X-SECS BAPL 6600  F4    RS      T B $ MO807, 2-D   280
CIFFUSION AND DEPLETION    ANL  3600  F4    RSBP   T D $ 2DB, 2-D MULTIGROUP   325
DIFFUSION AND DEPLETION    BNW  1108  F4    RS P   T D $ 2DB, 2-D MULTIGROUP   325
CIFFUSION AND DEPLETION    IBM   360A F+BAL RS P   T D $ PDQ5, 2-D FEW-GROUP   336
DIFFUSICN AND DEPLETION    LASL 6600  F4    RS P   T D $ 2DB, 2-D MULTIGROUP   325
DIFFUSION AND DEPLETION    MIT   360B F+BAL RSBP   T D $ PDQ5, 2-D FEW-GROUP   336
CIFFUSION AND DEPLETION GGA  1108  F4    RS P   T D $ FEVER7, 1-D MULTIGROUP   318
DIFFUSION BURNUP ANALYSIS  ANL   360  F4    RS P   CT D $ 3DB, 3-D MULTIGROUP  567
CIFFUSION BURNUP ANALYSIS  HEDL 1108  F4    RS P   T D $ 3DB, 3-D MULTIGROUP   567
DIFFUSICN BURNUP REFUELING HISTORY  LASL 6600  F4    RS P   T D $ PHENIX, 2D   454
DIFFUSION BURNUP RZ GECMETRY   GGA  7090  F+FAP RSBP   T D $ DDB, 2-D FEW-GP   SS
CIFFUSION CALC    KAPL 6600  F4    RS P     F $ RAUMZEIT, 1-D TIMF-DEPENDENT  352
DIFFUSICN CALC HEX-Z MESH     GGA  1108  F4    RS P   T C $ GATT, 3-D FEW-GP   380
CIFFUSION CYLINDER SLAB  CDC  1604  F63   RS P   T C $ EQUIPOISE3A, 2-D 2-GP   87
CIFFUSION CYLINDER SLAB  ORNL 7090  F2    RS P   T C $ EQUIPOISE3A, 2-D 2-GP   87
CIFFUSION DEPLETION      AI   360  F4    RSBP X T D $ SIZZLE, 1-D MULTIGROUP  58
CIFFUSION DEPLETION      AI   7090  F2    RS  L  T D $ SIZZLE, 1-D MULTIGROUP  58
DIFFUSICN DEPLETION      CDC  1604  F63   RS  L  T D $ SIZZLE, 1-D MULTIGROUP  58
CIFFUSION DEPLETION     ANC   360E F+BAL RS P XCT D $ PDQ7, 1,2 OR 3-D FEW-GP 275
CIFFUSION DEPLETION     BAPL 6600A F+ASC RS P   T D $ PDQ7, 1,2 OR 3-D FEW-GP 275
DIFFUSION DEPLETION     BAPL 6600C F+ASC RS P   T D $ PDQ7, 1,2 OR 3-D FEW-GP 275
CIFFUSION DEPLETION     BCS  6600D F+ASC R B    T D $ PDQ7, 1,2 OR 3-D FEW-GP 275
DIFFUSION DEPLETION     BW   6600B F+ASC RS P   T D $ PDQ7, 1,2 OR 3-D FEW-GP 275
CIFFUSION DEPLETION   GGA  7044  F4    RS P   T D $ RELCAD-FEVER, 1-D FEW-GP 221
CIFFUSION DEPLETION CODE ORNL 7050  F+FAP RS P   T D $ ASSAULT, 2-D MULTI-GP  240
CIFFUSICN DEPLETION GGA  1108  F4    RS P   T D $ GAUGE, 2-D FEW-GP HEX GEOM  339
CIFFUSION DEPLETION MULTIGP  ORNL  360G F4    RS P   T K $ CITATION, 1,2,3-D  387
CIFFUSION DEPLETION PROGRAM  ANC   360  F4    RSBP   CT D $ DWARF, 1-D FEW-GP 579
DIFFUSION DEPLETION PROGRAM  GGA  7090  F2    RSB    T D $ FEVER, 1-D FEW-GP   117
CIFFUSION DESIGN SYSTEM    AI   360  F4    RSBP   T K $ THREDES, 1-D FEW-GP  273
DIFFUSION FAST X-SECTION GENERATION   BNW  1108  F4    RS P X T B $ 1DX, 1-D  374
```

```
DIFFUSION FEEDBACK  BAPL 6600  F4    RS P   T F $ TWIGL, 2-D 2-GP SPACE-TIME     338
DIFFUSION FEEDBACK BNL  6600  F4    RS P   T F $ NOAH, 1-D ONE-GP SPACE-TIME     405
DIFFUSION GGA  1108  F4    RS P   T F $ GAKIN, 1-D MULTIGROUP TIME-DEPENDENT     310
DIFFUSION POWER DIST SEARCH  GGA  7044  F4    RS P   T C $ GASP2, 1-D FEW-GP     220
DIFFUSION PROGRAM    AAEC  360  F+BAL RS P   T C $ CRAM, 1-D AND 2-D MULTI-GP     103
DIFFUSION PROGRAM    ORNL  7090  F+FAP RS P   T C $ EXTERMINATOR, 2-D MULTI-GP     156
DIFFUSION PROGRAM    UK-R 7090  F+FAP RSBPL  T C $ CRAM, 1-D AND 2-D MULTI-GP     103
DIFFUSION PROGRAM  BC    625  F4    RS     T C $ EXTERMINATOR2, 2-D MULTI-GP     156
DIFFUSION PROGRAM  CE    6600  F4    RS P   T C $ EXTERMINATOR2, 2-D MULTI-GP     156
DIFFUSION PROGRAM  ORNL  360  F4    RS P   T C $ EXTERMINATOR2, 2-D MULTI-GP     156
DIFFUSION SLAB CYL     ORNL 7090  F2    RS P   T C $ EQUIPOISE3, 2-D 2-GROUP     39
DIFFUSION SLAB CYL SPHERE    BNW  1107  F4    RS P   T C $ HFN, 1-D MULTI-GP     241
DIFFUSION SLAB CYL SPHERE    AI   7090  F+FAP RS  L  T C $ FAIM, 1-D MULTI-GP     120
DIFFUSION SLAB CYL SPHERE    AI   7090  F+FAP RS PL  T C $ AIM6, 1-D MULTI-GP     29
DIFFUSION SLAB CYL SPHERE    CDC  1604  F63   RS PL  T C $ AIM6, 1-D MULTI-GP     29
DIFFUSION SLAB CYL SPHERE    CDC  1604  F63   RS PLX T C $ FAIM, 1-D MULTI-GP     120
DIFFUSION SLAB CYL SPHERE    OSUC  370  F4    RS PL CT C $ AIM6, 1-D MULTI-GP     29
DIFFUSION SLAB CYL SPHERE  AI   7090  F+FAP RS  L  T C $ ULCER, 1-D MULTI-GP     118
DIFFUSION SLAB CYL SPHERE  ANL  3600  F36   RS P X T C $ MACH1, 1-D MULTI-GP     262
DIFFUSION SLAB CYL SPHERE  PURD 6500  F4    RS PLX T C $ MACH1, 1-D MULTI-GP     262
DIFFUSION SLAB CYL SPHERE BHSC  360  F4    RS P   T C $ FAIMOS, 1-D MULTI-GP     120
DIFFUSION SLAB CYLINDER CDC  1604  F63   RS P   T C $ 2DGRAND, 2-D FEW-GROUP     40
DIFFUSION SLAB CYLINDER CRNL 7090  F2    RS P   T C $ 2DGRAND, 2-D FEW-GROUP     40
DIFFUSION SLAB CYLINDER SPHERE AI   7090  F2    RS P   T C $ FOG, 1-D FEW-GP     28
DIFFUSION SLAB CYLINDER SPHERE BC    625  F4    RS     T C $ FOG, 1-D FEW-GP     28
DIFFUSION SLAB CYLINDER SPHERE CDC  1604  F63   RS P   T C $ FOG, 1-D FEW-GP     28
DIFFUSION SLAB, CYL, SPH  ANC  360  F4    RSBP  CT C $ MONA, 1-D MULTIGROUP     582
DIFFUSION SLAB, SPH, CYL GGA  1108  F+BAL RS P   T C $ GAZE2, 1-D MULTIGROUP     430
DIFFUSION SYNTHESIS CALC    NED  635  F4    RS PL  T C $ BISYN, 2-D MULTI-GP     287
DIFFUSION SYNTHESIS CALC    NED  1108  F4    RS P   T C $ BISYN, 2-D MULTI-GP     287
DIFFUSION TEMP COEF CALC     GGA  7044  F4    RS P   T C $ TEMCO, 1-D FEW-GP     225
DIFFUSION TRIANGULAR MESH  GGA  1108  F+BAL RS P   T C $ GAMTRI, 2-D MULTIGP     401
DIFFUSION XY RZ GEOMETRY GGA  1108  F+BAL RS P   T C $ GAMBLE5, 2-D MULTI-GP     222
DIFFUSION XY RZ GEOMETRY GGA  7044  F+MAP RSBP  T C $ GAMBLE4, 2-D MULTI-GP     222
DIFFUSION XY RZ RTH   WANL 7094  F4    RS P X T C $ VARI-QUIR3, 2-D MULTI-GP     264
DIFFUSION XYZ GEOMETRY  CDC  1604  F63   RS P   T C $ WHIRLAWAY, 3-D 2-GROUP     32
DIFFUSION XYZ GEOMETRY  ORNL 7090  F2    RS P   T C $ WHIRLAWAY, 3-D 2-GROUP     32
DIFFUSION XYZ R-THETA-Z   LASL 6600  F4    RS P   T C* $ 3DDT, 3-D MULTIGROUP     463
DIFFUSION 3-GEOM    BAPL 6600  F4    RS P   T F $ WIGL2, 1-D 2-GP SPACE-TIME     274
DIFFUSION 3-GEOM    GGA  1108  F4    RS P   T F $ WIGL2, 1-D 2-GP SPACE-TIME     274
DIFFUSION+BURNUP TRI-MESH  GGA  1108  F+BAL RS P   T D $ BUGTRI, 2-D MULTIGP     439
DISASSEMBLY  ANL  360  F4    RS P XCT F $ VENUS, 2-D LMFBR POWER EXCURSION     511
DISCHARGE STUDY   HEDL 1108  F5    RS P   T R $ TCPLYR2, POWER PLANT THERMAL     599
DISCRETE ORDINATE CALC      AI   7090  F2    RS PLX T C $ DTF2, 1-D MULTI-GP     151
DISCRETE ORDINATE CALC      AI   360  F4    RSBPLX T C $ ANISN, 1-D MULTI-GP     151
DISCRETE ORDINATE CALC      UNC  1604  F63   RS PL  T C $ DTF, 1-D MULTIGROUP     144
DISCRETE ORDINATE CALC  ANL  3600  F36   RS P   T C $ SNARG-1D, 1-D MULTI-GP     288
DISCRETE ORDINATE CODE      GGA  1108  F5    RS P   T C $ 2DF, 2-D MULTI-GP     173
DISCRETE ORDINATE CODE      UNC  1604  F63   RS     C $ 2DF, 2-D MULTI-GP     173
DISCRETE ORDINATE MULTIGROUP CONSTANTS  CRNL  360  F4    RS PLX T B $ XSDRN,     393
DISCRETE ORDINATE PROGRAM   ANL  360  F+BAL RS P   T C $ DTF4, 1-D MULTI-GP     209
DISCRETE ORDINATE PROGRAM   BC   625  F+MAP RS P   T C $ DTF4, 1-D MULTI-GP     209
DISCRETE ORDINATE PROGRAM   LASL 6600  F4    RS P   T C $ DTF4, 1-D MULTI-GP     209
DISCRETE ORDINATE PROGRAM   LASL 7030  F4    RS P   T C $ DTF4, 1-D MULTI-GP     209
DISCRETE ORDINATE PROGRAM   LER  7094  F4    RS P   T C $ DTF4, 1-D MULTI-GP     209
DISCRETE ORDINATE PROGRAM LER  7090  F+MAP RS P   T C $ TDSN, 2-D MULTIGROUP     312
DISCRETE ORDINATES SLAB GEOMETRY  BAPL 6600  F4    RS P   T C $ BF21, FEW-GP     398
DISCRETE-ELEMENT ANALYSIS THIN SHELLS  MIT  360  F4    RS P   T I $ SABOR4,     402
DISK SOURCE          UM   7090  MAD   RSB     O $ BURP2, DETECTOR EFFICIENCY     165
DISPER, AEROSOL PARTICLE TRANSPORT STUDY      RFD  3600  F36   RS P     G $     554
DISPLAY   DP   360  F+BAL  S    T M $ JOSHUA, DATA STORAGE, RETRIEVAL, AND     490
DISSIMILAR MEDIA TLD CORRECTION CALC  AI   360  F4    RS P   T Q $ RESPOND,     566
DLC-2B LIBRARY GROUP COLLAPSING  APRF 6600  F4    RS       B $ APRFX1, 99-GP     466
DOCUMENT INFORMATION SYSTEM   KAPL 6600  F    R B   T M $ TIGIR2, MODULAR     403
```

DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE KAPL 6600 F+ASC RS P T P $ 428
DOPIE, RESOLVED RESONANCE X-SECTION CALC NED 2000 F2 RS P A $ 177
DOPPLER EFFECTS NED 2000 F2 RS P B $ SPARTA, SPATIALLY-AVERAGED 178
DOS-MFT REMOTE WORKSTATION PKG ANL 360 F+ASM RSB CT P $ WSP-HASP/DOS, 541
DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION GEC 635 F4 RSBP D $ 423
DOSE PGE 360 F4 RS P CT G $ EMERALD, PWR PLANT RADIATION RELEASE & 546
DOSE AI 7094 F+FAP RS PL T G $ CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL 196
DOSE CALC AI 7094 F+FAP RS P J $ SHOE, SHIELD WEIGHT OPTIMIZATION 197
DOSE CALC GGA 1108 F4 RS T G $ GADOSE,DOSET, HTGR ACCIDENT ANALYSIS 261
DOSE INTEGRALS DP 360 F4 RS P G $ EGAD, CALC OF EXTERNAL GAMMA 600
DOSE RATE CALCULATION SNAP GEOMETRY AI 7090 F2 RS P J $ RATRAP, 141
DOSE RATE CALCULATION SNAP GEOMETRY AI 7090 F2 RS J $ MORTIMER, 142
DOSE RATE FROM A CLOUD AI 7090 F2 RS P G $ CLOUD, GAMMA-RAY 47
DOSE RATE FROM A CLOUD CDC 1604 F63 RS P G $ CLOUD, GAMMA-RAY 47
DOSE RATE FROM A CLOUD DP 360 F4 RS P G $ CLOUD, GAMMA-RAY 47
DOSE RATE FROM SNAP SHIELD LEAKAGE AI 7090 F2 RS J $ FARSE1A, 91
DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE AI 7094 F+FAP RS PL T G $ CURIE, 196
DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC GGA 1108 F4 RS T G $ GADOSE, 261
DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY NED 635 F4 RS P T C $ 459
DOUBLE SN APPROX BNW 7090 FLOCO RSBP T C $ GE-HAPO-S13, 1-D MULTI-GP 75
DOUBLE SN APPROX SLAB GEOM PPCC 7090 F2 RS P C $ MIST, 1-D FEW-GP SN 59
DP 360 BCD R LX T Z $ THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS 543
DP 360 F+BAL S T M $ JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY 490
DP 360 F+BAL S X T B $ RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES 536
DP 360 F+BAL RS P T D $ CINDER,M0102, POINT DEPLETION FISSION PRODUCT 313
DP 360 F+BAL RS P XCT B $ HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM 277
DP 360 F4 RS P G $ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD 47
DP 360 F4 RS P G $ EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS 600
DP 360 F4 RS P G $ INTEG,INSPEC, MARKOV SIMULATION OF REACTOR OPN 590
DP 360 F4 RS P H $ PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM 586
DP 360 F4 RS P XCT A $ FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA 368
DP 360B F4 RSBP CT C $ HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION 136
DP PACKAGE KAPL 6600 F+ASC RS P T P $ DOGGY, DESK CALCULATOR FORM SHEET 428
DP PURCHASE VERSUS LEASE ANALYSIS SLA 360 COPOL RSBP CT M $ BECOM, AEC 589
DP PURCHASE VERSUS LEASE ANALYSIS SLA 1108 COPOL RS P M $ BECOM, AEC 589
DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS LASL 7090 F+FAP RS P T L $ 234
DRAFTING TOOL TO PLOT PLANE STRUCTURES BAPL 6600 F4 RS P T L $ BL47, 373
DSN OUTPUT PW 1604 LAG1 RS P N $ DTX, EFFECTIVE X-SECTION CALC FROM 210
DSN TDC PW 1604 F63 RS P L $ SNC, CALCULATION OF SN CONSTANTS FOR 189
DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION LASL 7030 F4 RS P T D $ 269
DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC UNC 1604 F63 RS PL T C $ 144
DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC AI 7090 F2 RS PLX T C $ 151
DTF4 CROSS SECTIONS LASL 6600 F4 RS P N $ LARCA, FLUX-WEIGHTING OF 409
DTF4 FLUXES LASL 6600 F4 RS P N $ DAC1, SN PERTURBATION CODE USING 455
DTF4 WITH DEPLETION LASL 7030 F4 RS P T C $ DTF-BURN, 1-D MULTI-GP 269
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM ANL 360 F+BAL RS P T C $ 209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM BC 625 F+MAP RS P T C $ 209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM LASL 6600 F4 RS P T C $ 209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM LASL 7030 F4 RS P T C $ 209
DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM LER 7094 F4 RS P T C $ 209
DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT PW 1604 LAG1 RS P N $ 210
DUCO 635 F4 RS G $ ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS 529
DUKE POWER MCGUIRE UNITS DUCO 635 F4 RS G $ ANVENT, LOCA ANALYSIS 529
DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC BAPL 6600 F+COM RS P T I $ 503
DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM ANC 360 F4 RSBP CT D $ 579
DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM GGA 1108 F4 RS P T H $ 440
DYNAMIC ANALYSIS BOILING FLOW STEAM GGA 1108 F4 RS P T H $ DYNAM, 440
DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS BAPL 6600 F4 RS P T I $ M0552, 283
DYNAMIC ANALYSIS OF THIN SHELLS SLA 6600 F4 RS P T I $ SLADE-D, 581
DYNAMIC RESPONSE OF ELASTIC STRUCTURES BAPL 6600 F4 RS P T I $ FUGIT, 537
DYNAMIC STRUCTURAL ANALYSIS ANC 360 F4 RSBP CT I $ STRAP, STATIC & 539
DYNAMICS AI 360 F+BAL RS P T E $ AIROS2A, SIMULATION OF REACTOR 326
DYNAMICS BAPL 6600 F4 RS P T I $ M0266, LINEAR ELASTIC STRUCTURAL 383
DYNC1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION ANL 360 F4 RS P O $ 464

```
DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTICN   KAPL 6600  F4     RS P     O $    464
ECC   BCL  6400  F4    RS P X T G $ MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS    508
ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING    BCL  6400  F4    RS P   T G $    330
ECONOMICS  CWE   360  F4    RS P   T D $ CINCAS, NUCLEAR FUEL CYCLE COST AND    354
ECONOMICS  UICS  360  F4    RS P  CT D $ GEM, ANALYSIS OF NUCLEAR FUEL CYCLE    576
ECONOMICS  WAPD 6600  F4    RS P   T D $ CINCAS, NUCLEAR FUEL CYCLE COST AND    354
ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY       LRL  7094  F+FAP RS PL  T M $    351
EDIT KAPL 6600  F+ASC RS P   T L $ DATATRAN 2-D GEOMETRY INPUT, PREPARATION,    406
EDIT REACTION RATES     UK-W 7090  F2     RS       N $ WED, W-DSN OUTPUT TAPE    133
EDITING     ORNL  360B F4    RS P   T M $ EDITOR, ENDF/B TAPE PROCESSING AND    502
EDITING     ORNL 6600  F4    RS P   T M $ EDITOR, ENDF/B TAPE PROCESSING AND    502
EDITING, & ANALYSIS    BAPL 6600  F4    RS P   T M $ SHLOG, DATA MANAGEMENT,    557
EDITOR, ENDF/B TAPE PROCESSING AND EDITING     ORNL  360B F4    RS P   T M $    502
EDITOR, ENDF/B TAPE PROCESSING AND EDITING     ORNL 6600  F4    RS P   T M $    502
EFFECTIVE X-SECTION CALC FROM DSN OUTPUT  PW   1604  LAG1  RS P     N $ DTX,    210
EFFICIENCY DISK SOURCE          UM   7090  MAD   RSB       O $ BURP2, DETECTOR    165
EFFICIENCY POINT SOURCE         UM   7090  MAD   RSB       O $ BURP1, DETECTOR    164
EFFICIENCY POINT SOURCE         UM   7090  MAD   RSB       O $ BURP3, DETECTCR    166
EGAD, CALC OF EXTERNAL GAMMA DCSE INTEGRALS    DP    360  F4    RS P     G $    600
EIGENVALUE EIGENVECTOR PACKAGE ANL   360  F4    RSB  XCT P $ EISPACK, MATRIX    534
EIGENVALUE EIGENVECTOR PACKAGE ANL   635  F4    RS   X T P $ EISPACK, MATRIX    534
EIGENVALUE EIGENVECTOR PACKAGE ANL  1108  F4    RS   X T P $ EISPACK, MATRIX    534
EIGENVALUE EIGENVECTOR PACKAGE ANL  6600  F4    RS   X T P $ EISPACK, MATRIX    534
EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS  KAPL 6600  F+ASC RS P   T I $ GEM,    344
EIGENVECTOR PACKAGE ANL   360  F4    RSB  XCT P $ EISPACK, MATRIX EIGENVALUE    534
EIGENVECTOR PACKAGE ANL   635  F4    RS   X T P $ EISPACK, MATRIX EIGENVALUE    534
EIGENVECTOR PACKAGE ANL  1108  F4    RS   X T P $ EISPACK, MATRIX EIGENVALUE    534
EIGENVECTOR PACKAGE ANL  6600  F4    RS   X T P $ EISPACK, MATRIX EIGENVALUE    534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL   360  F4    RSB  XCT P $    534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL   635  F4    RS   X T P $    534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL  1108  F4    RS   X T P $    534
EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL  6600  F4    RS   X T P $    534
ELASTIC ANALYSIS     BAPL 6600  F+COM RS P X T I $ MATUS, 3-D FINITE ELEMENT    597
ELASTIC SCAT RESONANCES AI    360  F4    RS PLX T B $ AILMOE, X-SECTION CALC    147
ELASTIC SCAT RESONANCES AI   7094  F+FAP RS PL  T B $ AILMOE, X-SECTION CALC    147
ELASTIC SCAT X-SEC   BNL  6600  F4    RS P     A $ BESFIT, DIFFRACTION MODEL    524
ELASTIC SCAT X-SECTIONS HEX LATTICE   GGA  1108  F4    RS       B $ HEXSCAT,    291
ELASTIC SCATTERING PHASE-SHIFT ANALYSIS CRNL 1604  F63*  RS P     A $ PEGGY,    334
ELASTIC STRESS OF PIPING SYSTEM    BAPL 6600  F4    RS P   T I $ MO457,PIPE,    329
ELASTIC STRUCTURAL DYNAMICS       BAPL 6600  F4    RS P   T I $ MO266, LINEAR    383
ELASTIC STRUCTURES  BAPL 6600  F4    RS P   T I $ FUGIT, DYNAMIC RESPONSE OF    537
ELASTIC SYSTEMS BAPL 6600  F4    RS P   T I $ MO552, DYNAMIC ANALYSIS LINEAR    283
ELASTIC-PLASTIC BAPL 6600  F+COM RS P   T I $ DUZ2, 2-D AXISYMMETRIC & PLANE    503
ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY      GGA  7044  F4    RS P   T G $    229
ELECTRICITY COSTS     ORNL 1604  F63   RS P     D $ POWERCO, NUCLEAR STATION    340
ELECTRICITY COSTS     UEC  6600  F4    RS P     D $ POWERCO, NUCLEAR STATION    340
ELECTRON DISTRIBUTION   ANL   360  F4    RS P     O $ DYNO1, PHOTOMULTIPLIER    464
ELECTRON DISTRIBUTION   KAPL 6600  F4    RS P     C $ DYNO1, PHOTOMULTIPLIER    464
EMERALD, PWR PLANT RADIATION RELEASE & DOSE    PGE   360  F4    RS P  CT G $    546
EMERGENCY COOLING    BCL  6400  F4    RS P   T G $ ECCSA4, LOSS-OF-COOLANT &    330
ENDF MULTIGROUP X-SECTION CALCULATION   ANL   360  F4    RS P  CT B $ MC**2,    355
ENDF MULTIGROUP X-SECTION CALCULATION   ANL  3600  F36   RS P   T B $ MC**2,    355
ENDF TAPES    BNL  7090  F+FAP RS P   T M $ DFSR, DATA FILE SERVICF ROUTINES    236
ENDF/B  ORNL  360  F4    RSBP XCT B $ XLACS, XSDRN MULTIGROUP LIBRARIES FROM    572
ENDF/B DATA      WAPD 7600  F4    RS P   T B $ ETOT2, THERMAL LIBRARIES FROM    509
ENDF/B DATA  BAPL 6600  F4    RS P   T B $ EPOCH, NEUTRON AGE CALCULATION OF    461
ENDF/B DATA  ORNL  360  F4    RS P   T B $ RICE, PRIMARY RECOIL ATOM SPECTRA    453
ENDF/B DATA GESV  635  F+GMP RS P XCT B $ ENDRUN2, MULTIGROUP CONSTANTS FROM    501
ENDF/B DATA TAPES   GGA  1108 BIN   R   L  T Z $ ZPR-III ASSEMBLY 48 GAFGAR    356
ENDF/B FINE-GP CONSTANTS GENERATION  ORNL  360  F4    RS P   T B $ SUPERTOG,    431
ENDF/B FOR 1DX  HEDL 1108B F4    RS P X T B $ ETCX3, MULTI-GP CONSTANTS FROM    388
ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS WAPD 6600  F4    RS P   T B $ ETOM1,    436
ENDF/B GRAPHIC X-SEC EVALUATION AI    360  F+BAL RSB L CT M $ SCORE3, SCISRS    375
ENDF/B RESONANCE XSECTION CODES  BNL  6600B F4    RS P   T A $ RESEND,ADLER,    465
```

```
ENDF/B SCAT KERNELS      DP    360  BCD    R   LX T Z $ THERMOS LIBRARY, 30-GP    543
ENDF/B TAPE PROCESSING AND EDITING      ORNL  360B F4     RS P   T M $ EDITOR,    502
ENDF/B TAPE PROCESSING AND EDITING      ORNL 6600  F4     RS P   T M $ EDITOR,    502
ENDF/B THERMAL SCATTERING DATA  DP    360  F4     RS P XCT A $ FLANGE2(71-1),     368
ENDF/B TO GAFGAR X-SECTIONS GGA  1108  F5     RS P    T B $ ENDFB2,GAND2,GFE2,    596
ENDF/B TO MC**2 DATA CONVERSION           ANL    360  F4     RS P  CT M $ ETOE,    350
ENDF/B TO MC**2 DATA CONVERSION           APDA 3600  ASAF4 RS P    T M $ ETOE,    350
ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT WAPD 6600  F4     RS PL  T B $ ETOG1,    437
ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT WAPD 7600  F4     RS P   T B $ ETOG3,    538
ENDF/B V1 PROC BNL  6600B F4     RS      T M $ CHECKER,CRECT,DAMMET,PLOTFB,...   384
ENDF/B V2 PROC  BNL  6600B F4     RS      T M $ CRECT,CHECKER,RIGEL,PLOTFB,...    475
ENDF/B V2 PROCESSING CODES      ANL    360  F4     RS P   T M $ CRECT,CHECKER,     475
ENDF/B V3 DATA PROCESSING CODE            ANL    360  F4     RS     T M $ RIGEL,     571
ENDF/B V3,V4 PROCESSING CODES   BNL  6600  F4     RS      T M $ CHECK3,RIGEL3,    571
ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS GGA  1108  F5     RS P   T B $    596
ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA GESV  635  F+GMP RS P XCT B $     501
ENEA  360  F4     RS P     A $ PSEUDO, STATISTICAL RESONANCE PARAMETER CALC       292
ENEA  360  F4     RS P  CT A $ JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION         308
ENERGY INTERVAL X-SECTION AVERAGING     GGA  7044  F4     RS P     L $ GAVER,     218
ENTRAINED PARTICLES SAMPLING STUDY      BAPL 6600  F4     RS P   T O $ BETTY,     545
ENTRY SYSTEM   ANC   360  BAL    RSB    T P $ NRTS-RJE, OS/360 MVT REMOTE JOB    519
ENVIRNMNTL LIB SCOPE2.0 CDC  7600  F4     RS      T P $ MODEL, MODIFIED BETTIS    478
ENVIRNMNTL LIB SCOPE3.2 CDC  6600C F+COM RS      T P $ MODEL, MODIFIED BETTIS    478
ENVIRNMNTL LIB SCOPE3.3 CDC  6600D F+COM RS      T P $ MODEL, MODIFIED BETTIS    478
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.  NED   635  F+GMP RS      T P $ GENED    515
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. BAPL 6600A F+ASC RS      T P $ BETTIS    478
ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. BW   6600B F+ASC RS      T P $ BETTIS    478
EPITHERMAL X-SECTIONS NED   635  F4     RS P   T B $ REAX, RESOLVED RESONANCE    257
EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION NED  7094  F+FAP RS P   T B $     201
EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA  BAPL 6600  F4     RS P   T B $     461
EQN SOLN CURVE PLOT  KAPL 6600  F+ASC RS P   T P $ SNEQ, NONLINEAR ALGEBRAIC     364
EQN SYSTEM SOLVER  LLL  6600  F4     RS P     P $ GEAR, ORDINARY DIFFERENTIAL    592
EQUILIBRIUM FUEL CYCLE CALCULATION      GGA  1108  F4      S      T D $ GAFFE,     302
EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL      ORNL 7090  F2     RS P   T C $      39
EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB  CDC  1604  F63    RS P   T C $      87
EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB  ORNL 7090  F2     RS P   T C $      87
ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION SLA  6600  F4     RS P     P $     601
ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION SLA  6600  F4     RS P     P $ ERF,     601
ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS       ANC   360  F4     RS PL CT M $     518
ERROR & COMPLEMENTARY ERROR FUNCTION SLA  6600  F4     RS P     P $ ERF,ERFC,     601
ERROR FUNCTION SLA  6600  F4     RS P     P $ ERF,ERFC, ERROR & COMPLEMENTARY     601
ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION  ORNL  360  F+BAL RSRPL CT C $     523
ESTIMATE ORNL  360B F4     RS P XCT D $ CONCEPT2, POWER PLANT CONCEPTUAL COST      498
ESTIMATING     ORNL  360  F4     RS P   T D $ ORCOST, POWER PLANT CAPITAL COST    588
ETOE, ENDF/B TO MC**2 DATA CONVERSION           ANL   360  F4     RS P  CT M $     350
ETOE, ENDF/B TO MC**2 DATA CONVERSION           APDA 3600  ASAF4 RS P    T M $     350
ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2     WAPD 6600  BCD    R   L   T Z $     447
ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT WAPD 6600  F4     RS PL  T B $     437
ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT WAPD 7600  F4     RS P   T B $     538
ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS WAPD 6600  F4     RS P   T B $     436
ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA       WAPD 7600  F4     RS P   T B $     509
ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX  HEDL 1108B F4     RS P X T B $     388
EXCHANGER STRESS ANALYSIS     KAPL 6600  F4     RS P     I $ TUBE, U-TUBE HEAT    378
EXCURSION  ANL   360  F4     RS P  CT F $ REXCO-H, 2-D HYDRODYNAM RESPONSE TO      550
EXCURSION ANALYSIS  ANC   360  F4     RSBP XCT G $ RELAP3, REACTOR BLOWDOWN -      369
EXCURSION ANALYSIS  ANC  1108  F4     RS P   T G $ RELAP3, REACTOR BLOWDOWN -      369
EXCURSION ANALYSIS  ANC  6600  F4     RS P   T G $ RELAP3, REACTOR BLOWDOWN -      369
EXCURSION CALCULATION R-Z GEOMETRY   APDA 7094  F4     RS P     F $ MARS, 2-D      293
EXCURSION CALCULATIONS       NED  2000  F4     RS P   T F $ FORE, FAST REACTOR     174
EXCURSION CALCULATIONS       ANL   360  F4     RS P X T F $ FORE2, FAST REACTOR     174
EXCURSION CALCULATIONS       NED   635  F4     RS P X T F $ FORE2, FAST REACTOR     174
EXCURSION DISASSEMBLY  ANL   360  F4     RS P XCT F $ VENUS, 2-D LMFBR POWER     511
EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES LPL  7094  F2     RS P     P $     321
EXPERIMENT     UCND  360B F+BAL RS P     C $ PMS1, FAST NEUTRON POLARIZATION     469
```

```
EXPERIMENT ANALYSIS          BAPL 6600  F4    RS P   T O $ JITER, FLUCTUATION     394
EXPERIMENT ANALYSIS    AGC  7090  F2    RS P     O $ CROC90, ML-1 FLUID FLOW     154
EXPERIMENT ANALYSIS BAPL 6600  F4    RS P   T O $ REDUX, REACTOR FLUCTUATION     425
EXPERIMENTAL DATA POINTS KAPL 6600  F+ASC RS P   T P $ CURFIT, CURVE FITTING      43
EXPERIMENTAL NEUTRON DATA LIBRARY          LRL  7094  F+FAP RS PL  T M $ ECSIL,   351
EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS  APDA 7094  F2    RS P     F $ WEAK      145
EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA   NEC   635  F4    RS P   T O $      258
EXPONENTIAL DECAY CURVES LRL  7094  F2    RS P     P $ EXPALS, LEAST SQUARES     321
EXPONENTIALS MIT  7090  F2    RS P     P $ FRANTIC, LEAST SQUARES FIT SUM OF     324
EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS  WANL 7094  F2    RS P     A $      238
EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM   ORNL 7090  F+FAP RS P   T C $      156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM  BC    625  F4    RS     T C $      156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM  CE   6600  F4    RS P   T C $      156
EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM  ORNL  360  F4    RS P   T C $      156
EXTERNAL GAMMA DOSE INTEGRALS    DP    360  F4    RS P     G $ EGAD, CALC OF     600
EXTERNAL+INTERNAL DOSE AI   7094  F+FAP RS PL  T G $ CURIE,DOSE,THUNDERHEAD,      196
F+ASC R B    T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BCS  6600D     275
F+ASC RS       P $ SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE     KAPL 6600      442
F+ASC RS     T P $ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. BAPL 6600A     478
F+ASC RS     T P $ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. BW   6600B     478
F+ASC RS P   T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BAPL 6600A     275
F+ASC RS P   T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BAPL 6600C     275
F+ASC RS P   T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BW   6600B     275
F+ASC RS P   T H $ LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM    KAPL 6600      299
F+ASC RS P   T I $ GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS  KAPL 6600      344
F+ASC RS P   T J $ ASPIS, GAMMA RAY SOURCE BUILDUP FACTOR CALC    BAPL 6600      429
F+ASC RS P   T J $ SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE   BAPL 6600B     462
F+ASC RS P   T L $ DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT KAPL 6600      406
F+ASC RS P   T P $ CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS KAPL 6600       43
F+ASC RS P   T P $ DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING   KAPL 6600      407
F+ASC RS P   T P $ DOGGY, DESK CALCULATOR FORM SHEET DP PACKAGE   KAPL 6600      428
F+ASC RS P   T P $ LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION  KAPL 6600      445
F+ASC RS P   T P $ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT  KAPL 6600      364
F+ASC RS P X T B $ RESQ2,RESQO,DBF1, RESONANCE INTEGRAL HEX CELL  BAPL 6600      285
F+ASM RSB   CT P $ WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG   ANL   360      541
F+BAL  S     T M $ JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY   DP    360      490
F+BAL  S   X T B $ RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES   DP    360      536
F+BAL R B L  T P $ TSO-SPEAKEASY, LANGUAGE PROCESSOR*UNDER TSO    ANL   360      593
F+BAL RS     T P $ AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F     ANL   360      563
F+BAL RS     T P $ FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES AI    360      484
F+BAL RS P     D $ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC ORNL  360      322
F+BAL RS P     O $ PMS1, FAST NEUTRON POLARIZATION EXPERIMENT     UCND 360B     469
F+BAL RS P   T A $ COMNUC,CASCADE, COMPOUND NUCLEUS REACTION      AI    360      482
F+BAL RS P   T B $ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC  ORNL  360      392
F+BAL RS P   T C $ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM   AAEC  360      103
F+BAL RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM   ANL   360      209
F+BAL RS P   T C $ GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY GGA  1108      222
F+BAL RS P   T C $ GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH  GGA  1108      401
F+BAL RS P   T C $ GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL GGA  1108      430
F+BAL RS P   T D $ BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH  GGA  1108      439
F+BAL RS P   T D $ BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ GGA  1108      438
F+BAL RS P   T D $ CINDER,MO102, POINT DEPLETION FISSION PRODUCT  DP    360      313
F+BAL RS P   T D $ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION    IBM  360A      336
F+BAL RS P   T E $ AIROS2A, SIMULATION OF REACTOR DYNAMICS        AI    360      326
F+BAL RS P   T E $ BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER   GGA  1108      303
F+BAL RS P   T I $ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY  ORNL 360      332
F+BAL RS P   T O $ GSSLRN1B, LEAST SQUARES PHOTOPEAK SPECTRA CODE BNWL 1108      457
F+BAL RS P   T O $ TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA GGA  1108      333
F+BAL RS P   CT B $ U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES AI    360      553
F+BAL RS P   CT M $ ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES    ANL   360      522
F+BAL RS P X T B $ HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION   AI    360      307
F+BAL RS P XCT B $ HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM    DP    360      277
F+BAL RS P XCT D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    ANC  360E      275
F+BAL RSB L CT M $ SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION AI    360      375
```

F+BAL F+MAP

F+BAL	RSBP		T	D	$	PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETICN	MIT	360B	336
F+BAL	RSBP		T	M	$	SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL	SLA	1108	607
F+BAL	RSBP	CT	G		$	CONTEMPT-LT/022, PRESSURE-TEMPERATURE RESPONSE	ANC	360	433
F+BAL	RSBPL	CT	C		$	ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	360	523
F+BAL	RSBPL	CT	C		$	KENO, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	360	450
F+BAL	RSBPL	CT	G		$	PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	360	555
F+C+R	RSBP		T	M	$	RALCRTPH, RESOURCE ALLCCATION PROJECT PLANNING	MLMO	360	603
F+CDP	RS	P	T	P	$	LAG, ASSEMBLER FOR FLOCC2 INSTRUCTICN SET	PW	1604	186
F+CDP	RS	P X	T	B	$	FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES	PW	1604	195
F+COM	RS		T	P	$	KAPLPLCT, KAPL CALCCMP PLCTTING ROUTINES	KAPL	6600	496
F+COM	RS		T	P	$	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCCPE3.2	CDC	6600C	478
F+CCM	RS		T	P	$	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3	CDC	6600D	478
F+COM	RS	P		H	$	HYMAS, HYDRCDYNAMIC MASS MATRIX GENERATION	BAPL	6600	560
F+COM	RS	P	T	C	$	KENO2, MONTE CARLO MULTIGROUP CRITICALITY CCDE	RFD	6600	450
F+COM	RS	P	T	I	$	DUZ2, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	6600	503
F+COM	RS	P	T	I	$	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	6600	397
F+CCM	RS	P	T	P	$	LENSDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	6600	602
F+COM	RS	P	T	Q	$	INDX, XRAY DIFFRACTICN PCWDER PATTERN INDEXING	LASL	6600	609
F+CCM	RS	P X	T	B	$	PAXO3, HARMONY-PDQ X-SECTION GENERATICN CCDE	BAPL	6600	426
F+CCM	RS	P X	T	D	$	FARED, 1-D FAST REACTOR CESIGN & SURVEY STUCY	BW	6600	427
F+COM	RS	P x	T	I	$	MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS	BAPL	6600	597
F+COM	RSB		T	M	$	DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	6600	386
F+FAP	RS		T	I	$	4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC	AI	7090	109
F+FAP	RS	L	T	B	$	QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS	AI	7090	119
F+FAP	RS	L	T	C	$	FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	120
F+FAP	RS	L	T	C	$	ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	118
F+FAP	RS	L	T	M	$	MOMUS, X-SECTION LIBRARY UTILITY PROGRAM	AI	7094	159
F+FAP	RS	P		I	$	WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX	LASL	7090	315
F+FAP	RS	P		J	$	SHOE, SHIELD WEIGHT CPTIMIZATICN DOSE CALC	AI	7094	197
F+FAP	RS	P	T	B	$	EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION	NFD	7094	201
F+FAP	RS	P	T	B	$	RAFFLE, 1ST FLIGHT COLLISICN PRCBABILITIES MC	ORNL	7090	392
F+FAP	RS	P	T	B	$	SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS	LRL	7090	160
F+FAP	RS	P	T	C	$	EXTERMINATOR, 2-C MULTI-GP DIFFUSION PROGRAM	ORNL	7090	156
F+FAP	RS	P	T	D	$	ASSAULT, 2-D MULTI-GP DIFFUSICN DEPLETION CCDE	ORNL	7090	240
F+FAP	RS	P	T	G	$	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	7094	172
F+FAP	RS	P	T	H	$	HEATING2, TRANSIENT STEACY-STATE HEAT TRANSFER	AI	7094	198
F+FAP	RS	P	T	L	$	DPC, DATA PREPARATION FCR 2-D CESIGN PROGRAMS	LASL	7090	234
F+FAP	RS	P	T	M	$	DFSR, DATA FILE SERVICE ROUTINES ENDF TAPES	BNL	7090	236
F+FAP	RS	PL	T	B	$	AILMDE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	7094	147
F+FAP	RS	PL	T	B	$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	7090	185
F+FAP	RS	PL	T	B	$	GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS	AI	7094	162
F+FAP	RS	PL	T	B	$	TEMPEST2, THERMAL NEUTRCN SPECTRUM X-SECTICNS	AI	7090	50
F+FAP	RS	PL	T	B	$	TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC	AI	7094	149
F+FAP	RS	PL	T	C	$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	7090	29
F+FAP	RS	PL	T	C	$	CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE	AI	7094	196
F+FAP	RS	PL	T	M	$	ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY	LRL	7094	351
F+FAP	RSB		T	A	$	TUZ, UNRESOLVED REGICN RESCNANCE INTEGRAL CALC	GGA	7090	42
F+FAP	RSB		T	A	$	ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	7090	41
F+FAP	RSBP		T	D	$	DDB, 2-D FEW-GP DIFFUSICN BURNUP RZ GEOMETRY	GGA	7090	99
F+FAP	RSBP		T	Q	$	CASCADE,CLUSTER, RADIATICN DAMAGE IN METALS	GEC	635	419
F+FAP	RSBPL		T	C	$	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	7090	103
F+FAP	RSBPL		T	N	$	CPS, SC4020 PLOTS FROM SCISRS X-SECTICN TAPES	WANL	7094	239
F+FAP	RSBPLX		T	B	$	AGN-GAM, FAST SPECTRUM MLLTI-GP CONSTANT CALC	AGC	7090	204
F+GMP	RS		T	P	$	GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.	NED	635	515
F+GMP	RS	P	T	D	$	SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION	NED	635	495
F+GMP	RS	P XCT	B		$	ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA	GESV	635	501
F+GMP	RS	P XCT	L		$	TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS	GESV	635	505
F+GMP	RSBP		T	H	$	THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM	GEC	635	346
F+MAP	RS	P		A	$	CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA	AI	7094	215
F+MAP	RS	P		A	$	COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION	PPCO	7040	203
F+MAP	RS	P	T	B	$	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	GGA	7044	219
F+MAP	RS	P	T	B	$	GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS	LER	7094	219
F+MAP	RS	P	T	C	$	DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	BC	625	209
F+MAP	RS	P	T	C	$	TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	7090	312

```
F+MAP RS P   T D $ OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY  GGA  7044    226
F+MAP RS P   T E $ AIROS, SPACE-INDEPENDENT KINETICS W/FEEDBACK   AI   7094    163
F+MAP RS P   T F $ TSN, SPATIALLY-DEPENDENT REACTOR KINETICS      AI   7094    309
F+MAP RS P   T H $ BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER GGA  7044    205
F+MAP RS P   T H $ TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION     PPCC 7044    349
F+MAP RS PLX T A $ TRIX1, RESONANCE INTEGRAL X-SECTION CALC       AI   7094    208
F+MAP RS PLX T B $ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE   WAPD 7094    249
F+MAP RSBP     M $ UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE   GGA  7044    206
F+MAP RSBP   T C $ GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY GGA  7044    222
F+MAP RSBP   T G $ SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT     KE   7094    200
F+P+A RS     T P $ AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E  ANL  360     562
F+P+A RS     T P $ AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z  ANL  360     564
F+SL  RS P XCT R $ HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS HEDL 1108    527
F+SPS RSBP   T N $ CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES   GGA  7044    207
FACTOR CALC    BAPL 6600  F+ASC RS P   T J $ ASPIS, GAMMA RAY SOURCE BUILDUP   429
FACTOR CALC FOR CYLINDRICAL PINS ANC   360  F4    RSBP  CT J $ VIEWPIN, VIEW   569
FACTOR SHIELDING CODE CAVITY GEOM GGA  1108  F4    RS P   T J $ MUSCAT, VIEW   259
FACTORS      CRNL  360  F4    RS P   T A $ ATHENA4, INELASTIC SCATTERING FORM  417
FAILURE MODE   BAPL 6600  F4    RS P    P $ RELO1, RELIABILITY FOR A SINGLE  497
FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE   AI   7090  F+FAP RS  L  T C $   120
FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE   CDC  1604  F63   RS PLX T C $   120
FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE BHSC  360  F4    RS P   T C $   120
FAP   RS P   T H $ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS     LASL 7094    242
FAP   RSBP X T Q $ SPECTRA, MC CALCULATION IRRADIATED MATERIAL     GEC  7090    422
FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY  BW   6600  F+CCM RS P X T D $    427
FARSEIA, DOSE RATE FROM SNAP SHIELD LEAKAGE    AI   7090  F2    RS       J $     91
FAST + INTERMEDIATE POWER TRANSIENTS BAPL 6600  F4    RS P   T H $ CHIC-KIN,   473
FAST BREEDERS     NED  635  F4    RS P     D $ RAPFU, FUEL CYCLE PARAMETERS   372
FAST NEUTRON POLARIZATION EXPERIMENT     UCND  360F F+BAL RS P     O $ PMS1,   469
FAST NEUTRON SPECTRUM X-SECTION CALC     AI   7090  F2    RS PL  T B $ FORM,    51
FAST NEUTRON SPECTRUM X-SECTION CALC     ANL  3600  F63   RS  LX T B $ GAM1,    33
FAST NEUTRON SPECTRUM X-SECTION CALC     CDC  1604  F63   RS PL  T B $ FORM,    51
FAST NEUTRON SPECTRUM X-SECTION CALC     CDC  1604  F63   RS PLX T B $ GAM1,    33
FAST NEUTRON SPECTRUM X-SECTION CALC     GGA  7090  F2    RS PLX T B $ GAM1,    33
FAST NEUTRON SPECTRUM X-SECTION CALC     OSUC  370  F4    RS PLXCT B $ FORM,    51
FAST REACTOR CORE ACCIDENT ANALYSIS   NED  635  F4    RS P   T G $ FREADM1,    479
FAST REACTOR DESIGN & SURVEY STUDY  BW   6600  F+CCM RS P X T D $ FARED, 1-D   427
FAST REACTOR EXCURSION CALCULATIONS      NED  2000  F4    RS P   T F $ FORF,    174
FAST REACTOR EXCURSION CALCULATIONS      ANL  360  F4    RS P X T F $ FORE2,   174
FAST REACTOR EXCURSION CALCULATIONS      NED  635  F4    RS P X T F $ FORE2,   174
FAST REACTOR FUEL BURNUP & MANAGEMENT  NED  635  F4    RS P   T D $ FUMBLE,   480
FAST REACTOR FUEL ELEMENT BEHAVIOR       ANL  360  F4    RS P   T I $ LIFE1,   460
FAST REACTOR POWER AND FLOW TRANSIENTS   ANL  360  F4    RS P   T F $ SAS1A,   400
FAST REACTOR POWER AND FLOW TRANSIENTS   ANL  6600  F4    RS P   T F $ SAS1A,   400
FAST REACTOR X-SEC CALC BNW  1108  F4    RS P   T B $ FCC4, FUNDAMENTAL MODE   306
FAST SPECTRA CALC   ANC  360  F4    RS PLXCT B $ PHROG, MULTI-GP CONSTANT &   520
FAST SPECTRUM MULTI-GP CONSTANT CALC  AGC  7090  F+FAP RSBPLX T B $ AGN-GAM,   204
FAST THERMAL SPECTRA GGA  1108  F4    RS PLX T B $ GGC4, MULTI-GP X-SECTIONS  298
FAST THERMAL SPECTRA GGA  6600  F4    RS  L  T B $ GGC4, MULTI-GP X-SECTIONS  298
FAST X-SECTION GENERATION   BNW  1108  F4    RS P X T B $ 1DX, 1-D DIFFUSION  374
FATIGUE     KAPL 6600  F4    RS       I $ SORSDB, PRESSURE VESSEL STRESS AND  391
FAU, RADIO FREQUENCY MANAGEMENT SYSTEM ALOO  360  COBOL RS P     M $ AEC-ALO   587
FAULT TREE EVALUATION CODES  ANC  360  F4    RSBP  CT K $ PREP,KITT, SYSTEM   528
FAULT TREE EVALUATION CODES  ANC  1108  F4    RS P   T K $ PREP,KITT, SYSTEM   528
FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC BNW  1108  F4    RS P   T B $   306
FEEDBACK  BAPL 6600  F4    RS P   T F $ NOWIG, 1-D 2-GP KINETICS TEMPERATURE  371
FEEDBACK  BAPL 6600  F4    RS P   T F $ TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION  338
FEEDBACK BNL  6600  F4    RS P   T F $ NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION  405
FEEDBACK GGA  1108  F4    RS P   T F $ GAKIT, 1-D MULTIGP KINETICS WITH TEMP  370
FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM  GGA  7090  F2    RSB    T D $   117
FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION GGA  1108  F4    RS P   T D $   318
FEW-GP DIFFUSION BURNUP RZ GEOMETRY   GGA  7090  F+FAP RSBP   T D $ DDB, 2-D   99
FEW-GP DIFFUSION CALC HEX-Z MESH     GGA  1108  F4    RS P   T C $ GATT, 3-D   380
FEW-GP DIFFUSION DEPLETION     ANC  360F F+BAL RS P XCT D $ PDQ7, 1,2 OR 3-D   275
```

```
FEW-GP DIFFUSION DEPLETICN     BAPL 6600A F+ASC RS P   T D $ PDQ7, 1,2 OR 3-D     275
FEW-GP DIFFUSION DEPLETION     BAPL 6600C F+ASC RS P   T D $ PDQ7, 1,2 OR 3-D     275
FEW-GP DIFFUSION DEPLETION     BCS  6600D F+ASC R B    T D $ PDQ7, 1,2 OR 3-D     275
FEW-GP DIFFUSION DEPLETION     BW   6600B F+ASC RS P   T D $ PDQ7, 1,2 OR 3-D     275
FEW-GP DIFFUSION DEPLETION   GGA  7044  F4    RS P   T D $ RELCAD-FEVER, 1-D     221
FEW-GP DIFFUSION DEPLETICN PROGRAM  ANC   360  F4    RSBP   CT D $ DWARF, 1-D     579
FEW-GP DIFFUSION DEPLETION PROGRAM  GGA  7090  F2    RSB    T D $ FEVER, 1-D     117
FEW-GP CIFFUSION DESIGN SYSTEM    AI    360  F4    RSBP   T K $ THREDES, 1-D     273
FEW-GP DIFFUSION POWER DIST SEARCH  GGA  7044  F4    RS P   T C $ GASP2, 1-D     220
FEW-GP DIFFUSION SLAB CYLINDER SPHERE AI   7090  F2    RS P   T C $ FOG, 1-D       28
FEW-GP DIFFUSION SLAB CYLINDER SPHERE BC    625  F4    RS     T C $ FOG, 1-D       28
FEW-GP DIFFUSION SLAB CYLINDER SPHERE CDC  1604  F63   RS P   T C $ FOG, 1-D       28
FEW-GP CIFFUSION TEMP COEF CALC     GGA  7044  F4    RS P   T C $ TEMCO, 1-D     225
FEW-GP DISCRETE ORDINATES SLAB GECMETRY  EAPL 6600  F4    RS P   T C $ BE21,      398
FEW-GP HEX GEOM DIFFUSION DEPLETION GGA  1108  F4    RS P   T C $ GAUGE, 2-D     339
FEW-GP SN APPROXIMATION CYLINDER    PPCO 7040  F4    RS P   T C $ TOPIC, 1-D     148
FEW-GP SN APPROXIMATION CYLINDER    PPCC 7090  F2    RS P   T C $ TOPIC, 1-D     148
FEW-GP SN COUBLE SN APPROX SLAB GEOM PPCO 7090  F2    RS P     C $ MIST, 1-D      59
FEW-GP S4 APPROXIMATION RZ GECMETRY  LRL   709  F2    RS       C $ FIRN, 2-D       7
FEW-GROUP DIFFUSION AND DEPLETION    IBM   360A F+BAL RS P   T D $ PDQ5, 2-D     336
FEW-GROUP DIFFUSION AND CEPLETION    MIT   360B F+BAL RSBP   T D $ PDQ5, 2-D     336
FEW-GROUP CIFFUSION SLAB CYLINDER CDC  1604  F63   RS P   T C $ 20GRAND, 2-D      40
FEW-GROUP CIFFUSION SLAB CYLINDER ORNL 7090  F2    RS P   T C $ 20GRANC, 2-D     40
FEW-GROUP SPACE-TIME KINETICS  BCL  6400  F4    RS P   T F $ ADEP, 1D AND 2D    494
FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS SLA  6600  F4    RS P     V $     577
FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY    BAPL 6600  F4    RS P   T H $     272
FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES AI    360  F+BAL RS     T P $     484
FILE SERVICE ROUTINES ENDF TAPES     BNL  7090  F+FAP RS P   T M $ DFSR, DATA    236
FINDING RCCTS OF A POLYNOMIAL             KAPL 6600  F4    RS P     P $ ROPE,     444
FINE-GP CONSTANTS GENERATION  ORNL  360  F4    RS P   T B $ SUPERTOG, ENDF/B     431
FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES   KAPL 6600  F4    RS P X   I $     404
FINITE ELEMENT ELASTIC ANALYSIS      BAPL 6600  F+CCM RS P X T I $ MATUS, 3-D    557
FINITE-ELEMENT GESV  635  F4    RS P  CT I $ BEHAVE2, CXIDE FUEL PERFCRMANCE    568
FINITE-ELEMENT STUDY 2,3-C STRUCTURES    KAPL 6600  F4    RS P X   I $ FINEL,     404
FINS SNAP GEOM   AI   7090  F2    RS       J $ SCARF2, SCATTER FROM RADIATOR    110
FIRE 1- & 2-CELL ANALYSIS AI    360  F4    RS P   T G $ SOFIRE2, SCCIUM POOL     559
FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE  AFB   360  F4    RS  L  T C $       9
FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GECMETRY  LRL   709  F2    RS       C $       7
FISSILE NUCLIDE DATA  BAPL 6600  F4    RS P   T P $ DAFT1, LEAST SQUARES FIT   327
FISSILE NUCLIDE X-SECTION EVALUATICN    ORNL 7090  F4    RSBP     A $ MUFFLE,    323
FISSICN PRODUCT  BAPL 6600  F4    RS P     D $ CINDER,M0102, PCINT CEPLETION    313
FISSICN PRCCUCT  DP   360  F+BAL RS P   T D $ CINDER,M0102, POINT DEPLETION     313
FISSION PRODUCT ACTIVITY DIST STUDY GGA  7044  F4    RS P     C $ RAD2, HTGR     231
FISSICN PRODUCT FUEL MODEL  ANC   360  F4    RSBP  CT I $ FPEM, STEADY-STATE     584
FISSION PRCCUCT RELEASE ANALYSIS  BCL  6400  F4    RS P     G $ FRCRL2, LOCA    500
FISSION PRODUCT RELEASE GGA  1108  F4    RS P     D $ FREVAP6, HTGR METALLIC    301
FIT FISSILE NUCLIDE DATA  BAPL 6600  F4    RS P   T P $ DAFT1, LEAST SQUARES    327
FIT SUM OF EXPONENTIALS MIT  7090  F2    RS P     P $ FRANTIC, LEAST SQUARES   324
FITTING      LASL 7094  F4    RS     T P $ LASL LEAST SQUARES, GENERAL CURVE     62
FITTING    BAPL 6600  F4    RS P   T P $ M0661,M0657,M0626, POLYNOMIAL CURVE    411
FITTING    KAPL 6600  F4    RS P     A $ CLEM, ANGULAR DISTRIBUTICN LEGENDRE   531
FITTING EXPERIMENTAL DATA POINTS KAPL 6600  F+ASC RS P   T P $ CURFIT, CURVE     43
FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION GGA  1108  F5    RS P     H $     355
FLANGE1, SCATTERING LAW X-SECTION CALCULATION  GGA  1108  F5    RS P     A $     247
FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA  DP   360  F4    RS P XCT A $     368
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTICN   CDC  3600  F63   RSBP   T C $     167
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTICN   MSS   360  F4    RS P  CT C $     167
FLARE, 3-D REACTIVITY AND POWER DISTRIBUTICN   NEC   635  F4    RS P   T C $     167
FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS      BAPL 6600  F4    RS P   T G $     295
FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATICN    BAPL 6600  F4    RS P   T G $     448
FLAT, RESONANCE ABSORPTION, CELL   ANL  3600  F36   RSBP X T B $ RABBLE,WLIB,     281
FLIGHT COLLISION PROBABILITIES MC  ORNL  360  F+BAL RS P   T B $ RAFFLE, 1ST     392
FLIGHT COLLISION PROBABILITIES MC  ORNL 7090  F+FAP RS P   T B $ RAFFLE, 1ST     392
FLOCO RS P     B $ MCS, MONTE CARLC NEUTRCN PENETRATION STUDY     LASL 7090      202
```

```
FLOCC RS P      B $ ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS   LASL 7090      113
FLOCO RSBP      C $ 2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM    AGC  7090       18
FLOCO RSBP   T C $ GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX      BNW  7090       75
FLOCC2 INSTRUCTION SET      PW   1604  F+CDP RS P   T P $ LAG, ASSEMBLER FOR      186
FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS        BAPL 6600  F4     RS P   T H $    331
FLOW      AI   7094  F2     RS P      H $ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE   246
FLOW      MSS   360  F4     RS P      H $ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE   246
FLOW AND HEAT TRANSFER AI   7094  F2     RS P   T G $ TRANS-FUGUE1, TRANSIENT     268
FLOW DIST. IN CYL COOLANT INLET PLENUM DP     360  F4     RS P      H $ PLENUM,    586
FLOW EXPERIMENT ANALYSIS    AGC  7090  F2     RS P      C $ CROC90, ML-1 FLUID   154
FLOW IN LMFBR ROD BUNDLE    NED   635  F4     RS P   T H $ VELVET2, TURBULENT     458
FLOW STEAM      GGA  1108  F4     RS P   T H $ DYNAM, DYNAMIC ANALYSIS BOILING    440
FLOW STUDY STEAM-WATER MIX KAPL 6600  F4     RS P      H $ RAPP, HIGH-VELOCITY   382
FLOW TRANSIENT ANALYSIS         BAPL 6600  F4     RS P   T H $ FLOT1,M0219, PWR   331
FLOW TRANSIENTS  ANL   360  F4     RS P   T F $ SAS1A, FAST REACTOR POWER AND    400
FLOW TRANSIENTS  ANL  6600  F4     RS P   T F $ SAS1A, FAST REACTOR POWER AND    400
FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW      AI   7094  F2     RS P      H $   246
FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW      MSS   360  F4     RS P      H $   246
FLOW, PRESSURE DISTRIBUTION GGA  1108  F5     RS P      H $ FLAC, STEADY-STATE    395
FLUCTUATION EXPERIMENT ANALYSIS         BAPL 6600  F4     RS P   T D $ JITER,     394
FLUCTUATION EXPERIMENT ANALYSIS BAPL 6600  F4     RS P   T D $ REDUX, REACTOR     425
FLUID FLOW EXPERIMENT ANALYSIS    AGC  7090  F2     RS P      D $ CROC90, ML-1      154
FLUX DIST IN MULTI-PIN FUEL ELEMENT    AGC  7090  F2     RS P      B $ BOUNCE,     237
FLUX INPUT   PW   1604  F63    RS       C $ TDP, 2-D PERTURBATION TDC OR 2DXY     199
FLUX SETS    GESV H600  F4     RS P   CT C $ TRIAL, 3-D REACTION RATES FROM 2-D  585
FLUX SYNTHESIS PROGRAM CYL PW   1604  F63    RS       T C $ 2DXYL, 3-D MULTI-GP   192
FLUX-DOSIMETER ACTIVITY RELATION  GEC   635  F4     RSBP      D $ DOS, NEUTRON    423
FLUX-WEIGHTING OF DTF4 CROSS SECTIONS   LASL 6600  F4     RS P      N $ LARCA,      409
FLUX, X-SEC CALC ORNL  360  F+BAL RS P      D $ ISOSEARCH, ISOTOPE PRODUCTION     322
FLUX, X-SEC CALC ORNL 1604  F63    RS P      D $ ISOSEARCH, ISOTOPE PRODUCTION     322
FLUXES   LASL 6600  F4     RS P      N $ DAC1, SN PERTURBATION CODE USING DTF4     455
FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES    PW   1604  F+CDP RS P  X T B $ FMC-N,    195
FMC-N, MONTE CARLO CALC NEUTRON HISTORIES       GGA  7044  F4     RS P   T B $    195
FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES    PW   1604  F+CDP RS P  X T B $   195
FOG CODES   AI   7090  F2     RS       C $ PERT, 1-D PERTURBATION FOR AIM AND     30
FOG CODES   BHSC  360  F4     RS P     C $ PERT, 1-D PERTURBATION FOR AIM AND     30
FOG CODES   CDC  1604  F63    RS       C $ PERT, 1-D PERTURBATION FOR AIM AND     30
FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE AI   7090  F2     RS P   T C $     28
FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE BC    625  F4     RS     T C $     28
FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE CDC  1604  F63    RS P   T C $     28
FORE, FAST REACTOR EXCURSION CALCULATIONS       NED  2000  F4     RS P   T F $    174
FORE2, FAST REACTOR EXCURSION CALCULATIONS      ANL   360  F4     RS P X T F $    174
FORE2, FAST REACTOR EXCURSION CALCULATIONS      NED   635  F4     RS P X T F $    174
FORM FACTORS     ORNL  360  F4     RS P   T A $ ATHENA4, INELASTIC SCATTERING    417
FORM OR THREDES LIBRARY UTILITY ROUTINE  AI    360  F4     RSB L  T M $ CLIP,      271
FORM SHEET DP PACKAGE   KAPL 6600  F+ASC RS P   T P $ DOGGY, DESK CALCULATOR      428
FORM, FAST NEUTRON SPECTRUM X-SECTION CALC      AI   7090  F2     RS PL  T B $     51
FORM, FAST NEUTRON SPECTRUM X-SECTION CALC      CDC  1604  F63    RS PL  T B $     51
FORM, FAST NEUTRON SPECTRUM X-SECTION CALC      OSUC  370  F4     RS PLXCT B $     51
FORMAT TO MUFT FORMAT X-SECTIONS WAPD 6600  F4     RS P   T B $ ETOM1, ENDF/B    436
FORMAT WAPD 6600  F4     RS PL  T B $ ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC  437
FORMAT WAPD 7600  F4     RS P   T B $ ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC  538
FORMAT X-SECTIONS WAPD 6600  F4     RS P   T B $ ETOM1, ENDF/B FORMAT TO MUFT     436
FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS    CRNL 6600  F4     RS P      P $   514
FORTRAN GRAPHICS SUBROUTINES AI    360  F+BAL RS      T P $ FIGS, IBM360&2250    484
FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ  PW   1604  F63    RS P   T C $     161
FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL  ANC   360  F4     RSBP   CT I $    584
FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS MIT  7090  F2     RS P      P $   324
FRCRL2, LOCA FISSION PRODUCT RELEASE ANALYSIS  BCL  6400  F4     RS P      G $   500
FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS   NED   635  F4     RS P   T G $     479
FREE-FORMAT CARD INPUT PROCESSOR        LASL  360  F4     RS P      L $ GENRD,    530
FREE-FORMAT CARD INPUT PROCESSOR        LASL 6600  F4     RS P      L $ GENRD,    530
FREQUENCY MANAGEMENT SYSTEM ALOO  360  COBOL RS P      M $ AEC-ALO FAU, RADIO    587
FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE GGA  1108  F4     RS P      D $   301
```

```
FSDF3, POINTWISE XSECS. FROM B-W PARAMETERS     GGA  1108  F5     RS P  CT A $     216
FUEL BURNUP & MANAGEMENT  NED   635  F4     RS P   T D $ FUMBLE, FAST REACTOR     480
FUEL CYCLE ANALYSIS PARTIAL REFUEL   GGA  7044  F4     RS P   T D $ GARGOYLE,     260
FUEL CYCLE ANALYSIS W/REFUEL INC   GGA  7044  F4     RS P   T D $ REVISED-GAD,    223
FUEL CYCLE CALCULATION       GGA  1108  F4     S     T D $ GAFFE, EQUILIBRIUM     302
FUEL CYCLE COST ANALYSIS       AI   7090  F2     RS P     D $ AIMFIRE, URANIUM      55
FUEL CYCLE COST AND ECONOMICS  CWE   360  F4     RS P   T D $ CINCAS, NUCLEAR     354
FUEL CYCLE COST AND ECONOMICS  WAPD 6600  F4     RS P   T D $ CINCAS, NUCLEAR     354
FUEL CYCLE COST CALCULATION    GGA  1108  F4     RS P   T D $ PWCOST, REACTOR     441
FUEL CYCLE COSTS PERFORMANCE DATA     KE   7090  F2     RSBP     D $ NPRFCCP,     146
FUEL CYCLE COSTS PERFORMANCE DATA     UEC  6600  F4     RS P     D $ NPRFCCP,     146
FUEL CYCLE COSTS PERFORMANCE STUDY     GGA  7044  F4     RS P     D $ WAMPUM,      224
FUEL CYCLE COSTS PERFORMANCE STUDY     UEC  6600  F4     RS P     D $ WAMPUM,      224
FUEL CYCLE ECONOMICS  UICS  360  F4     RS P  CT D $ GEM, ANALYSIS OF NUCLEAR     576
FUEL CYCLE PARAMETERS FAST BREEDERS     NEC   635  F4     RS P     D $ RAPFU,       372
FUEL ELEMENT       BAPL 6600  F4     RS     T I $ CYGRO2, STRESS ANALYSIS CYL     266
FUEL ELEMENT    AGC  7090  F2     RS P     B $ BOUNCE, FLUX DIST IN MULTI-PIN     237
FUEL ELEMENT ANALYSIS       BAPL 6600  F4     RS P   T H $ GLUB1, WATER-LOGGED     424
FUEL ELEMENT BEHAVIOR       ANL   360  F4     RS P   T I $ LIFE1, FAST REACTOR     460
FUEL ELEMENT HEAT TRANSFER CALC       ANC   360  F4     RSBP XCT H $ MOXY, BWR       551
FUEL ELEMENT HEAT TRANSFER CALC       ANC  1108  F4     RS P   T H $ MOXY, BWR       551
FUEL ELEMENT LIFETIME ANALYSIS          ANL  3600  F36    RSBP     I $ SWELL2,      353
FUEL ELEMENT STRESS ANALYSIS STUDY       GGA  7044  F4     RS P   T G $ ELBOW,       229
FUEL ELEMENTS   AEB   360  F4     RS P     B $ WELWING, MATERIAL BUCKLING CYL     362
FUEL MODEL  ANC   360  F4     RSBP  CT I $ FPFM, STEADY-STATE FISSION PRODUCT     584
FUEL PELLET TEMPERATURE & DEFORMATION  BAPL 6600  F4     RS P   T I $ PELEN,       598
FUEL PERFORMANCE FINITE-ELEMENT GESV  635  F4     RS P  CT I $ BEHAVE2, OXIDE     568
FUEL ROD CLAD STRAIN & PELLET CRACKING BAPL 6600  F4     RS P     I $ STRIPE,      570
FUEL ROD STRESS & DEFORMATION    BAPL 6600  F4     RS P   T I $ CYGRO3, OXIDE     449
FUEL ROD THERMAL RESPONSE LOCA       ANC   360  F4     RSBP X T G $ THETA1-B,       512
FUEL SWELLING & GAS RELEASE SIMULATION  BAPL 6600  F4     RS P   T I $ BUBL1,       468
FUEL SWELLING TEMPERATURE STUDY    BAPL 6600  F4     RS P   T H $ FIGRO, LWBR     272
FUEL TEMPERATURE CODE GGA  7044  F4     RS     I $ CORE, CORE CONFIGURATION     233
FUEL TUBE BUNDLES  LASL 7094  F2     RSBP     H $ AXFLU, HEAT TRANSFER MOLTEN     182
FUEL TUBE BUNDLES  LASL 7094  F2     RSBP     H $ AXTHRM, HEAT TRANSFER SOLID     183
FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES  BAPL 6600  F4     RS P   T I $       537
FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION  AI   7090  F2     RS     I $        48
FULL-TEXT STORAGE, SEARCH & RETRIEVAL  SLA  1108  F+BAL RSBP   T M $ SPIRAL,       607
FULLY-IMPLICIT TRANSIENT SIMULATION    BAPL 6600  F4     RS P   T G $ FLASH4,      448
FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT  NED   635  F4     RS P   T D $       480
FUNDAMENTAL MODE FAST REACTOR X-SEC CALC BNW  1108  F4     RS P   T B $ FCC4,       306
FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,.... ANL   360  F4     RS P X T P $       610
FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,.... ANL  1108  F5     RS P X T P $       610
FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,.... ANL  6600  F4     RS P X T P $       610
FUSION REACTOR STUDY ANL   360  F4     RS P     X $ TOKMINA/TOKMINA2, TOKAMAK     561
F2     RS        A $ LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION ORNL 7090     381
F2     RS        B $ DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT   AEG 7090     150
F2     RS        B $ S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION    AI  7090      53
F2     RS        C $ FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY  LRL  709       7
F2     RS        C $ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES   AI  7090      30
F2     RS        E $ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK  AI  7090     121
F2     RS        E $ SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY   AI  7090     122
F2     RS        I $ CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION   AI  7090     112
F2     RS        I $ FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION  AI  7090      48
F2     RS        I $ SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION   AI  7090     114
F2     RS        J $ FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE    AI  7090      91
F2     RS        J $ MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY  AI  7090     142
F2     RS        J $ SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM   AI  7090     110
F2     RS        J $ SCAR1, SCATTER FROM A RING SNAP GEOMETRY       AI  7090     111
F2     RS        N $ WED, W-DSN OUTPUT TAPE EDIT REACTION RATES     UK-W 7090    133
F2     RS      T A $ SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC     GGA 7090      56
F2     RS  L   T D $ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION    AI  7090      58
F2     RS P      A $ DOPIE, RESOLVED RESONANCE X-SECTION CALC       NED 2000     177
F2     RS P      A $ EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS  WANL 7094    238
```

F2 F4

F2	RS P		A	$	RAPTURE, RESONANCE INTEGRAL X-SECTION CALC	NED	2000	176
F2	RS P		B	$	BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	7090	108
F2	RS P		B	$	BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	7090	237
F2	RS P		B	$	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	7090	52
F2	RS P		B	$	SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS	NED	2000	178
F2	RS P		C	$	MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCO	7090	59
F2	RS P		D	$	AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	AI	7090	55
F2	RS P		F	$	CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LRL	7090	129
F2	RS P		F	$	WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS	APDA	7094	145
F2	RS P		G	$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	7090	47
F2	RS P		H	$	BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC	ORNL	1604	549
F2	RS P		H	$	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	AI	7094	246
F2	RS P		J	$	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	7090	45
F2	RS P		J	$	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	7090	46
F2	RS P		J	$	RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY	AI	7090	141
F2	RS P		O	$	CROC90, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	7090	154
F2	RS P		P	$	EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES	LRL	7094	321
F2	RS P		P	$	FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	7090	324
F2	RS P	T	A	$	2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS	AI	7094	254
F2	RS P	T	B	$	AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	7090	243
F2	RS P	T	C	$	EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	7090	39
F2	RS P	T	C	$	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	7090	87
F2	RS P	T	C	$	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	7090	28
F2	RS P	T	C	$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7090	148
F2	RS P	T	C	$	W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	7090	132
F2	RS P	T	C	$	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	7090	32
F2	RS P	T	C	$	2DGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	7090	40
F2	RS P	T	G	$	TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER	AI	7094	268
F2	RS PL	T	A	$	ARES2, RESONANCE INTEGRAL X-SECTION CALC	AI	7090	89
F2	RS PL	T	B	$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	7090	51
F2	RS PL	T	I	$	CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS	AI	7094	244
F2	RS PLX	T	B	$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	7090	33
F2	RS PLX	T	C	$	DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	7090	151
F2	RSB		F	$	HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	7090	153
F2	RSB	T	D	$	FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	7090	117
F2	RSBP		D	$	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	7090	180
F2	RSBP		D	$	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	7090	146
F2	RSBP		D	$	NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	ORNL	7090	134
F2	RSBP		H	$	AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES	LASL	7094	182
F2	RSBP		H	$	AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES	LASL	7094	183
F2	RSBP		J	$	LIPRECAN1, MC NEUTRON PENETRATION CALCULATION	DAC	7090	123
F2	RSBP	T	H	$	PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY	KE	7094	155
F2	RSBPL	T	J	$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	7090	143
F36	SBP		I	$	BOW2, DEFLECTION CALCULATION PARALLEL BEAMS	ANL	3600	365
F36	RS P		G	$	DISPER, AEROSOL PARTICLE TRANSPORT STUDY	RFD	3600	554
F36	RS P	T	B	$	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	3600	355
F36	RS P	T	C	$	SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC	ANL	3600	288
F36	RS P	T	I	$	SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS	ANL	3600	357
F36	RS P X	T	C	$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	ANL	3600	262
F36	RS P X	CT	C	$	TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT	ANL	3600	513
F36	RSBP		A	$	MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS	ANL	3600	214
F36	RSBP		G	$	CHEMLOC2, CORE HEATING CLADDING-STEAM REACTION	ANL	3600	366
F36	RSBP		G	$	WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS	KE	3600B	278
F36	RSBP		I	$	SWELL2, FUEL ELEMENT LIFETIME ANALYSIS	ANL	3600	353
F36	RSBP X	T	B	$	RABBLE,WLIP,FLAT, RESONANCE ABSORPTION, CELL	ANL	3600	281
F36	RSBP X	T	B	$	RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL	ANL	3600	213
F4	S	T	D	$	GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION	GGA	1108	302
F4	S P		H	$	PWR-PPM, BORATION-DILUTION TABLES FOR PWR OPN	OPPD	6400	552
F4	RS		A	$	STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION	BW	2000	305
F4	RS		B	$	APREX1, 99-GP DLC-2B LIBRARY GROUP COLLAPSING	APRF	6600	466
F4	RS		B	$	HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE	GGA	1108	291
F4	RS		E	$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	WANL	7094	168
F4	RS		G	$	ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS	DUCO	635	529
F4	RS		I	$	CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE	GGA	7044	233

F4	RS			I	$	SORSDB, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	6600		391
F4	RS			M	$	MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	360		472
F4	RS		T	B	$	M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	6600		280
F4	RS		T	C	$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	BC	625		156
F4	RS		T	C	$	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	BC	625		28
F4	RS		T	C	$	M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	6600		342
F4	RS		T	G	$	GADOSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC	GGA	1108		261
F4	RS		T	H	$	RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS	LASL	7030		242
F4	RS		T	H	$	STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	BG&E	360		487
F4	RS		T	H	$	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	6600		267
F4	RS		T	I	$	CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	6600		266
F4	RS		T	M	$	CHECKER,CRECT,DAMMET,PLCTFB,... ENDF/B V1 PROC	BNL	6600B		384
F4	RS		T	M	$	CHECK3,RIGEL3, ENDF/B V3,V4 PROCESSING CODES	BNL	6600		571
F4	RS		T	M	$	CRECT,CHECKER,RIGEL,PLCTFB,... ENDF/B V2 PROC	BNL	6600B		475
F4	RS		T	M	$	RIGEL, ENDF/B V3 DATA PROCESSING CODE	ANL	360		571
F4	RS		T	O	$	GASPAN, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	6600		485
F4	RS		T	P	$	LASL LEAST SQUARES, GENERAL CURVE FITTING	LASL	7094		62
F4	RS		T	P	$	MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0	CDC	7600		478
F4	RS	X	T	G	$	PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE	GGA	7044		228
F4	RS	X	T	P	$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	635		534
F4	RS	X	T	P	$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	1108		534
F4	RS	X	T	P	$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	6600		534
F4	RS	L	T	B	$	GAMB1T, X-SEC GENERATION FOR TRANSPORT CODES	WANL	6600		547
F4	RS	L	T	B	$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	6600		258
F4	RS	L	T	C	$	FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	360		9
F4	RS	P		A	$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	6600		376
F4	RS	P		A	$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	7094		376
F4	RS	P		A	$	BESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	6600		524
F4	RS	P		A	$	CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	6600		531
F4	RS	P		A	$	CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	360		347
F4	RS	P		A	$	GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR	GGA	1108		289
F4	RS	P		A	$	GANDY, UNRESOLVED RESONANCE X-SECTION CALC	GGA	1108		341
F4	RS	P		A	$	GASKET, THERMAL SCATTERING LAW CALCULATION	GGA	1108		263
F4	RS	P		A	$	GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	6600		470
F4	RS	P		A	$	MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	6600		535
F4	RS	P		A	$	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	ENEA	360		292
F4	RS	P		A	$	PSEUDO, STATISTICAL RESONANCE PARAMETER CALC	GGA	1108		292
F4	RS	P		A	$	RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL	6600		492
F4	RS	P		A	$	SIGPLOT, RESOLVED MULTILEVEL R-W X-SEC CALC	BNL	6600		377
F4	RS	P		A	$	THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	6600		504
F4	RS	P		B	$	AVOID, ANNULAR VOID X-SECTION CALCULATION	GEC	625		276
F4	RS	P		B	$	GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS	GEC	7094		235
F4	RS	P		B	$	PARTI, OPTIMAL GROUP OR MESH COLLAPSING	TRW	6500		416
F4	RS	P		B	$	WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	360		362
F4	RS	P		C	$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC	360		30
F4	RS	P		C	$	PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY	BNW	1108		304
F4	RS	P		D	$	CINDER,M0102, POINT DEPLETION FISSION PRODUCT	BAPL	6600		313
F4	RS	P		D	$	FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE	GGA	1108		301
F4	RS	P		D	$	NPRECOP, FUEL CYCLE COSTS PERFORMANCE DATA	UEC	6600		146
F4	RS	P		D	$	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	UEC	6600		340
F4	RS	P		D	$	RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY	GGA	7044		231
F4	RS	P		D	$	RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS	NED	635		372
F4	RS	P		D	$	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	GGA	7044		224
F4	RS	P		D	$	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	6600		224
F4	RS	P		E	$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	360		121
F4	RS	P		E	$	BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB	360		363
F4	RS	P		E	$	GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS	GGA	1108		317
F4	RS	P		E	$	GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS	GGA	1108		290
F4	RS	P		E	$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	360		255
F4	RS	P		E	$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	WANL	7094		255
F4	RS	P		E	$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	360		168
F4	RS	P		E	$	TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	360		489
F4	RS	P		F	$	MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY	APDA	7094		293
F4	RS	P		F	$	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	6600		352

F4	RS P	F	$	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	6600	389
F4	RS P	F	$	TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	360	338
F4	RS P	G	$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	360	47
F4	RS P	G	$	EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	DP	360	600
F4	RS P	G	$	FRCRL2, LOCA FISSION PRODUCT RELEASE ANALYSIS	BCL	6400	500
F4	RS P	G	$	INTEG,INSPEC, MARKOV SIMULATION OF REACTOR OPN	DP	360	590
F4	RS P	G	$	MIRAB,MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL	BCL	6400	499
F4	RS P	G	$	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	360	521
F4	RS P	G	$	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	HEDL	1108	521
F4	RS P	G	$	WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	UGA	360	278
F4	RS P	H	$	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	360	246
F4	RS P	H	$	PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	DP	360	586
F4	RS P	H	$	RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	6600	382
F4	RS P	I	$	GAZELLES, GAS-COOLED CORE THERMAL DESIGN STUDY	GGA	7044	232
F4	RS P	I	$	SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE	GGA	1108	300
F4	RS P	I	$	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	GGA	1108	252
F4	RS P	I	$	SAFE-SHELL, STRESS ANALYSIS THIN SHELLS	GGA	1108	253
F4	RS P	I	$	SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS	GGA	1108	379
F4	RS P	I	$	STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	6600	337
F4	RS P	I	$	STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING	BAPL	6600	570
F4	RS P	I	$	TCB01, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	6600	604
F4	RS P	I	$	TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	6600	378
F4	RS P	L	$	GAVER, ENERGY INTERVAL X-SECTION AVERAGING	GGA	7044	218
F4	RS P	L	$	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	360	530
F4	RS P	L	$	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	6600	530
F4	RS P	L	$	GRDWRK, GRID GENERATION FOR SAFE PROGRAMS	GGA	1108	296
F4	RS P	N	$	DAC1, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	6600	455
F4	RS P	N	$	HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	6600	434
F4	RS P	N	$	LARC4, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS	LASL	6600	409
F4	RS P	O	$	ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA	ORNL	360	413
F4	RS P	O	$	CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	360	390
F4	RS P	O	$	DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	360	464
F4	RS P	O	$	DYNC1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	KAPL	6600	464
F4	RS P	P	$	ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION	SLA	6600	601
F4	RS P	P	$	FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS	ORNL	6600	514
F4	RS P	P	$	GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER	LLL	6600	592
F4	RS P	P	$	KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	ORNL	360	556
F4	RS P	P	$	MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME	KAPL	6600	446
F4	RS P	P	$	PLOTR, 2D CONTOUR PLOTS & AREA CALCULATION	SLA	6600	578
F4	RS P	P	$	RELO1, RELIABILITY FOR A SINGLE FAILURE MODE	BAPL	6600	457
F4	RS P	P	$	ROPE, FINDING ROOTS OF A POLYNOMIAL	KAPL	6600	444
F4	RS P	V	$	FFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS	SLA	6600	577
F4	RS P	X	$	TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	360	561
F4	RS P	T A	$	ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL	360	417
F4	RS P	T A	$	JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC	KAPL	6600	506
F4	RS P	T A	$	PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC	KAPL	6600	507
F4	RS P	T A	$	PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS	BAPL	6600	359
F4	RS P	T A	$	RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES	BNL	6600B	465
F4	RS P	T A	$	SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION	BAPL	6600	399
F4	RS P	T A	$	TACAS1, ANALYSIS OF RESONANCE MEASUREMENTS	GGA	1108	410
F4	RS P	T A	$	TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS	LASL	6600	360
F4	RS P	T B	$	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	360	526
F4	RS P	T B	$	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	JAER	230	526
F4	RS P	T B	$	EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA	BAPL	6600	461
F4	RS P	T B	$	ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	7600	538
F4	RS P	T B	$	ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS	WAPD	6600	436
F4	RS P	T B	$	ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA	WAPD	7600	509
F4	RS P	T B	$	FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC	BNW	1108	306
F4	RS P	T B	$	FMC-N, MONTE CARLO CALC NEUTRON HISTORIES	GGA	7044	155
F4	RS P	T B	$	GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA	LASL	6600	361
F4	RS P	T B	$	REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS	NED	635	257
F4	RS P	T B	$	RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	360	453
F4	RS P	T B	$	SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	ORNL	360	431
F4	RS P	T C	$	BE21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY	BAPL	6600	398

F4	RS P	T C	$ BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	1108	287
F4	RS P	T C	$ DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY	NED	635	459
F4	RS P	T C	$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	6600	209
F4	RS P	T C	$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LASL	7030	209
F4	RS P	T C	$ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM	LER	7094	209
F4	RS P	T C	$ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	CE	6600	156
F4	RS P	T C	$ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	360	156
F4	RS P	T C	$ FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BHSC	360	120
F4	RS P	T C	$ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	NED	635	167
F4	RS P	T C	$ GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH	GGA	7044	220
F4	RS P	T C	$ GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH	GGA	1108	319
F4	RS P	T C	$ GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH	GGA	1108	380
F4	RS P	T C	$ HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BNW	1107	241
F4	RS P	T C	$ TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC	GGA	7044	225
F4	RS P	T C	$ TEMCO7, TEMPERATURE COEFFICIENT CALCULATION	GGA	1108	320
F4	RS P	T C	$ TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	7040	148
F4	RS P	T C	$ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	6600	608
F4	RS P	T C	$ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	7600	608
F4	RS P	T C	$ TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH	LASL	7600	573
F4	RS P	T C	$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	6600B	358
F4	RS P	T C	$ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	7600B	358
F4	RS P	T C	$ VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	360	212
F4	RS P	T C	$ VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	WANL	6600	212
F4	RS P	T C	$ 3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z	LASL	6600	463
F4	RS P	T D	$ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	360	354
F4	RS P	T D	$ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	WAPD	6600	354
F4	RS P	T D	$ DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION	LASL	7030	269
F4	RS P	T D	$ FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION	GGA	1108	318
F4	RS P	T D	$ FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT	NED	635	480
F4	RS P	T D	$ GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL	GGA	7044	260
F4	RS P	T D	$ GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION	GGA	1108	339
F4	RS P	T D	$ ORCOST, POWER PLANT CAPITAL COST ESTIMATING	ORNL	360	588
F4	RS P	T D	$ PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY	LASL	6600	454
F4	RS P	T D	$ PWCOST, REACTOR FUEL CYCLE COST CALCULATION	GGA	1108	441
F4	RS P	T D	$ RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION	GGA	7044	221
F4	RS P	T D	$ REVISED-GAD, FUEL CYCLE ANALYSIS W/REFUELING	GGA	7044	223
F4	RS P	T D	$ STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS	GGA	7044	227
F4	RS P	T D	$ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	BNW	1108	325
F4	RS P	T D	$ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	LASL	6600	325
F4	RS P	T D	$ 3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	HEDL	1108	567
F4	RS P	T D	$ 3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION	KAPL	6600	477
F4	RS P	T E	$ ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	360	486
F4	RS P	T E	$ ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	LASL	6600	486
F4	RS P	T F	$ ADEP, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS	BCL	6400	494
F4	RS P	T F	$ FORE, FAST REACTOR EXCURSION CALCULATIONS	NED	2000	174
F4	RS P	T F	$ GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION	GGA	1108	310
F4	RS P	T F	$ GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK	GGA	1108	370
F4	RS P	T F	$ NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK	BNL	6600	405
F4	RS P	T F	$ NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	7090	488
F4	RS P	T F	$ NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK	BAPL	6600	371
F4	RS P	T F	$ SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	360	400
F4	RS P	T F	$ SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	6600	400
F4	RS P	T F	$ TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	360	309
F4	RS P	T F	$ TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK	BAPL	6600	338
F4	RS P	T F	$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	BAPL	6600	274
F4	RS P	T F	$ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM	GGA	1108	274
F4	RS P	T G	$ AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	360	172
F4	RS P	T G	$ CEBUG, STEAM GENERATOR SODIUM-WATER REACTION	CEND	7600	548
F4	RS P	T G	$ ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL	6400	330
F4	RS P	T G	$ ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY	GGA	7044	229
F4	RS P	T G	$ FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	295
F4	RS P	T G	$ FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION	BAPL	6600	448
F4	RS P	T G	$ FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS	NED	635	479
F4	RS P	T G	$ HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS	AI	360	443

F4	RS	P	T G	$	M0555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS	BAPL	6600	284
F4	RS	P	T G	$	NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	6400	328
F4	RS	P	T G	$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	1108	369
F4	RS	P	T G	$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	6600	369
F4	RS	P	T G	$	SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	360	559
F4	RS	P	T H	$	ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	360	580
F4	RS	P	T H	$	CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS	BAPL	6600	473
F4	RS	P	T H	$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	360C	432
F4	RS	P	T H	$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	1108C	432
F4	RS	P	T H	$	COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS	BNW	6600C	432
F4	RS	P	T H	$	DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM	GGA	1108	440
F4	RS	P	T H	$	FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY	BAPL	6600	272
F4	RS	P	T H	$	FLOT1,M0219, PWR FLOW TRANSIENT ANALYSIS	BAPL	6600	331
F4	RS	P	T H	$	GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS	BAPL	6600	424
F4	RS	P	T H	$	HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	ORNL	360	517
F4	RS	P	T H	$	HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM	BAPL	6600	286
F4	RS	P	T H	$	LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	CHI	1108	299
F4	RS	P	T H	$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	NED	635	256
F4	RS	P	T H	$	MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS	WARD	6600	256
F4	RS	P	T H	$	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	1108	551
F4	RS	P	T H	$	M0899,HOH, STEAM TABLES 14.5-2538 PSIA	BAPL	6600	294
F4	RS	P	T H	$	TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS	BAPL	6600	348
F4	RS	P	T H	$	VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE	NED	635	458
F4	RS	P	T H	$	WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES	BAPL	6600	396
F4	RS	P	T I	$	BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION	BAPL	6600	468
F4	RS	P	T I	$	BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS	BAPL	6600	481
F4	RS	P	T I	$	CYGRO3, OXIDE FUEL ROD STRESS & DEFORMATION	BAPL	6600	449
F4	RS	P	T I	$	FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES	BAPL	6600	537
F4	RS	P	T I	$	LIFEL, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	360	460
F4	RS	P	T I	$	MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION	BAPL	6600B	412
F4	RS	P	T I	$	M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS	BAPL	6600	383
F4	RS	P	T I	$	M0457,PIPE, ELASTIC STRESS OF PIPING SYSTEM	BAPL	6600	329
F4	RS	P	T I	$	M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS	BAPL	6600	283
F4	RS	P	T I	$	PELEN, FUEL PELLET TEMPERATURE & DEFORMATION	BAPL	6600	598
F4	RS	P	T I	$	SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	360	402
F4	RS	P	T I	$	SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	251
F4	RS	P	T I	$	SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES	BNL	6600	252
F4	RS	P	T I	$	SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY	GGA	1108	332
F4	RS	P	T I	$	SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD	WTSC	6600B	282
F4	RS	P	T I	$	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	BAPL	6600	282
F4	RS	P	T I	$	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	360	282
F4	RS	P	T I	$	SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS	SLA	6600	581
F4	RS	P	T I	$	SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION	KAPL	6600C	80
F4	RS	P	T J	$	MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM	GGA	1108	259
F4	RS	P	T J	$	M0756,LETC, 1-D SLAB GAMMA-RAY TRANSPORT	BAPL	6600	343
F4	RS	P	T K	$	CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP	ORNL	360G	387
F4	RS	P	T K	$	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	1108	528
F4	RS	P	T L	$	BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES	BAPL	6600	373
F4	RS	P	T M	$	CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	360	475
F4	RS	P	T M	$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	360B	502
F4	RS	P	T M	$	EDITOR, ENDF/B TAPE PROCESSING AND EDITING	ORNL	6600	502
F4	RS	P	T M	$	SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS	BAPL	6600	557
F4	RS	P	T M	$	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	635	493
F4	RS	P	T N	$	PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	360	544
F4	RS	P	T O	$	BETTY, ENTRAINED PARTICLES SAMPLING STUDY	BAPL	6600	545
F4	RS	P	T O	$	BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS	NED	635	311
F4	RS	P	T O	$	EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA	NED	635	258
F4	RS	P	T O	$	JITER, FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	394
F4	RS	P	T O	$	REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS	BAPL	6600	425
F4	RS	P	T P	$	DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA	BAPL	6600	327
F4	RS	P	T P	$	M0661,M0657,M0626, POLYNOMIAL CURVE FITTING	BAPL	6600	411
F4	RS	P	T Q	$	RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC	AI	360	566
F4	RS	P	C G	$	STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	ORNL	360	583
F4	RS	P	CT A	$	JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	360	308

F4	RS	P	CT	B	$	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	360		355
F4	RS	P	CT	C	$	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	360		167
F4	RS	P	CT	C	$	TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS	GESV	H600		585
F4	RS	P	CT	C	$	TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA	LASL	360B		358
F4	RS	P	CT	D	$	GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS	360		576
F4	RS	P	CT	D	$	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	360		567
F4	RS	P	CT	F	$	REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	360		550
F4	RS	P	CT	G	$	EMERALD, PWR PLANT RADIATION RELEASE & DOSE	PGE	360		546
F4	RS	P	CT	I	$	BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT	GESV	635		568
F4	RS	P	CT	I	$	PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM	AI	360		542
F4	RS	P	CT	M	$	ETOE, ENDF/B TO MC**2 DATA CONVERSION	ANL	360		350
F4	RS	P	CT	W	$	MACS LATTICE VIBRATION NEUTRON SCATTRING CODES	ANC	360		574
F4	RS	P	CT	W	$	MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC	ANL	360		575
F4	RS	P	X	A	$	COHBE, COHERENT INELASTIC SCATTERING LAW CALC	GGA	1108		385
F4	RS	P	X	A	$	LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST	GGA	7044		217
F4	RS	P	X	G	$	BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN	PPCO	360		435
F4	RS	P	X	I	$	FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES	KAPL	6600		404
F4	RS	P	X	T	B	$ ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX	HEDL	1108B		388
F4	RS	P	X	T	B	$ GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC	GGA	1108		316
F4	RS	P	X	T	B	$ 1DX, 1-D DIFFUSION FAST X-SECTION GENERATION	BNW	1108		374
F4	RS	P	X	T	C	$ VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH	WANL	7094		264
F4	RS	P	X	T	E	$ MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN	NPGS	360		491
F4	RS	P	X	T	F	$ CEXE,INCEXE, 1-GP 3-D XYZ XENON OSCILLATION	CEND	360		415
F4	RS	P	X	T	F	$ FORE2, FAST REACTOR EXCURSION CALCULATIONS	ANL	360		174
F4	RS	P	X	T	F	$ FORE2, FAST REACTOR EXCURSION CALCULATIONS	NED	635		174
F4	RS	P	X	T	G	$ MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	6400		508
F4	RS	P	X	T	H	$ ORTHIS,ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION	ORNL	360		525
F4	RS	P	X	T	L	$ GAND, GAFGAR X-SECTION LIBRARY PREPARATION	GGA	1108		345
F4	RS	P	X	T	P	$ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	360		610
F4	RS	P	X	T	P	$ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	6600		610
F4	RS	P	XCT	A	$	FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA	DP	360		368
F4	RS	P	XCT	C	$	GAPER1D, 1-D TRANSPORT PERTURBATION THEORY	GGA	1108		606
F4	RS	P	XCT	D	$	CONCEPT2, POWER PLANT CONCEPTUAL COST ESTIMATE	ORNL	360B		458
F4	RS	P	XCT	F	$	TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM	ORNL	360		558
F4	RS	P	XCT	F	$	VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY	ANL	360		511
F4	RS	PL	T	B	$	ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT	WAPD	6600		437
F4	RS	PL	T	B	$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	1107		185
F4	RS	PL	T	B	$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	BHSC	360		50
F4	RS	PL	T	C	$	BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC	NED	635		287
F4	RS	PL	CT	B	$	INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS	ANC	360		565
F4	RS	PL	CT	C	$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	OSUC	370		29
F4	RS	PL	CT	F	$	QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE	ANL	360		474
F4	RS	PL	CT	M	$	ERREST, LOCA ROD BUNDLE CHF DATA ANALYSIS	ANC	360		518
F4	RS	PLX	T	B	$	AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES	AI	360		147
F4	RS	PLX	T	B	$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BC	625		185
F4	RS	PLX	T	B	$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVA	6400		185
F4	RS	PLX	T	B	$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	1108		298
F4	RS	PLX	T	B	$	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	BNW	1108		467
F4	RS	PLX	T	B	$	HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS	TVA	360		467
F4	RS	PLX	T	B	$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	WAPD	360		279
F4	RS	PLX	T	B	$	XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS	ORNL	360		393
F4	RS	PLX	T	C	$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	6500		262
F4	RS	PLX	T	C	$	VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI	7600		510
F4	RS	PLXCT	B		$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	OSUC	370		51
F4	RS	PLXCT	B		$	PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC	ANC	360		520
F4	RSB	XCT	P		$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	360		534
F4	RSB	L	T	M	$	CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE	AI	360		271
F4	RSBP			A	$	MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	ORNL	7090		323
F4	RSBP			D	$	CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS	GEC	635		418
F4	RSBP			D	$	DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION	GEC	635		423
F4	RSBP			O	$	MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS	GEC	635		421
F4	RSBP		T	B	$	GROUSE, SPACE-DEPENDENT X-SECTION GENERATION	GEC	635		420
F4	RSBP		T	D	$	2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION	ANL	3600		325
F4	RSBP		T	K	$	THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM	AI	360		273

F4	RSBP CT C	$	HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION	DP	3608	136
F4	RSBP CT C	$	MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH	ANC	360	582
F4	RSBP CT C	$	TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM	LASL	360	608
F4	RSBP CT D	$	DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	ANC	360	579
F4	RSBP CT G	$	RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM	ANC	360	265
F4	RSBP CT I	$	FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL	ANC	360	584
F4	RSBP CT I	$	SAFE-PCFS, STRESS ANALYSIS AXISYMMETRIC LOAD	GGA	7044	250
F4	RSBP CT I	$	STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS	ANC	360	539
F4	RSBP CT J	$	VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS	ANC	360	569
F4	RSBP CT K	$	PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES	ANC	360	528
F4	RSBP CT L	$	ARC-NUI002, BCD INPUT DATA PROCESSING MODULE	ANL	360	533
F4	RSBP X T D	$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	360	58
F4	RSBP X T G	$	THETA1-B, FUEL ROD THERMAL RESPONSE LOCA	ANC	360	512
F4	RSBP XCT B	$	XLACS, XSORN MULTIGROUP LIBRARIES FROM ENDF/B	ORNL	360	572
F4	RSBP XCT G	$	RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS	ANC	360	369
F4	RSBP XCT H	$	MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC	ANC	360	551
F4	RSBP XCT W	$	GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)	ANC	360	605
F4	RSBPL CT C	$	VIMIX, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS	AI-A	360	510
F4	RSBPL CT L	$	ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION	ANL	360	594
F4	RSBPLX T C	$	ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	360	151
F4	RSBPLX T C	$	CAESAR4,LIBLST, 1-D MULTI-GP DIFFUSION + LIB	AI	360	270
F4	RSBPLX T D	$	NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY	IITR	7094	314
F4	RSBPLXCT B	$	LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE	TVA	360	249
F5	RS LX T B	$	LEOPARD, SPECTRA CALCULATION WITH DEPLETION	JNC	1108	279
F5	RS P A	$	FLANGE1, SCATTERING LAW X-SECTION CALCULATION	GGA	1108	247
F5	RS P H	$	FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION	GGA	1108	395
F5	RS P T B	$	ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS	GGA	1108	596
F5	RS P T C	$	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	GGA	1108	173
F5	RS P T D	$	DBUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS	BNWL	1108	456
F5	RS P T H	$	REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN	BNW	1108	483
F5	RS P T H	$	TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC	GGA	1108	408
F5	RS P T H	$	TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM	GGA	1108	414
F5	RS P T I	$	SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE	GGA	1108	451
F5	RS P T I	$	SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS	GGA	1108	452
F5	RS P T M	$	TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE	NED	1108	493
F5	RS P T N	$	GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT	GGA	1108	471
F5	RS P T O	$	CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS	GEES	1108	476
F5	RS P T R	$	TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY	HEDL	1108	599
F5	RS P CT A	$	FSDP3, POINTWISE XSECS. FROM R-W PARAMETERS	GGA	1108	216
F5	RS P X T D	$	PACTOLUS,CLOTHO, NUCLEAR POWER PLANT COST CODE	HEDL	1108	540
F5	RS P X T F	$	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	1108	488
F5	RS P X T P	$	FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,....	ANL	1108	610
F5	RS PLX T B	$	BRT1, THERMAL SPECTRUM X-SECTION CALC	BNW	1108	184
F5	RSBPL T D	$	ISOGEN, RADIONUCLIDE GENERATION AND DECAY	BNW	1108	367
F63	RS C	$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	CDC	1604	30
F63	RS C	$	TOP, 2-D PERTURBATION TOC OR 2DXY FLUX INPUT	PW	1604	199
F63	RS C	$	2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE	UNC	1604	173
F63	RS I	$	WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY	PW	1604	190
F63	RS L	$	CSP1, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	194
F63	RS L	$	CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION	PW	1604	193
F63	RS T C	$	2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL	PW	1604	192
F63	RS L T D	$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	CDC	1604	58
F63	RS LX T B	$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	ANL	3600	33
F63	RS P A	$	HAFEVER, HAUSER-FESHBACH INELASTIC SCATTERING	CDC	1604	14
F63	RS P A	$	PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS	ORNL	1604	334
F63	RS P A	$	RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS	ORNL	1604	335
F63	RS P B	$	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	CDC	1604	52
F63	RS P B	$	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	CDC	1604	53
F63	RS P D	$	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	1604	180
F63	RS P D	$	ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC	ORNL	1604	322
F63	RS P D	$	ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY	ORNL	1604	179
F63	RS P D	$	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	ORNL	1604	340
F63	RS P E	$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	CDC	1604	121
F63	RS P E	$	CMPXMAT, TRANSFER FUNCTION EVALUATION	PW	1604	188

```
F63   RS P      F $ AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH    PW   1604    191
F63   RS P      G $ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD        CDC  1604     47
F63   RS P      H $ MO899,HOH, STEAM TABLES 14.5-2538 PSIA         ANL  1604    294
F63   RS P      J $ GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY    CDC  1604     45
F63   RS P      J $ GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM  CDC  1604     46
F63   RS P      L $ SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC   PW   1604    189
F63   RS P    T A $ JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION     ORNL 1604    308
F63   RS P    T C $ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB  CDC  1604     87
F63   RS P    T C $ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE CDC  1604     28
F63   RS P    T C $ FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ  PW   1604    161
F63   RS P    T C $ WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY  CDC  1604     32
F63   RS P    T C $ 20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER CDC  1604     40
F63   RS P    T I $ PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY    PW   1604    187
F63   RS PL   T A $ ARES2, RESONANCE INTEGRAL X-SECTION CALC       CDC  1604     89
F63   RS PL   T B $ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC     CDC  1604     51
F63   RS PL   T B $ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS  CDC  1604     50
F63   RS PL   T C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE   CDC  1604     29
F63   RS PL   T C $ DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC     UNC  1604    144
F63   RS PLX  T B $ GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC     CDC  1604     33
F63   RS PLX  T C $ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE   CDC  1604    120
F63   RSBP      A $ NEARREX, COMPOUND NUCLEUS X-SECTION CALC       ANL  3600    171
F63   RSBP      E $ R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS   ANL  3600    255
F63   RSBP      E $ R102, SPACE-INDEPENDENT INVERSE KINETICS CALC  ANL  3600    168
F63   RSBP      F $ AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE   CDC  3600    102
F63   RSBP      O $ COINC, COINCIDENCE COUNTING DATA REDUCTION     ANL  3600    248
F63   RSBP    T A $ 2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS  ANL  3600    254
F63   RSBP    T C $ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION   CDC  3600    167
F63   RSBP    T E $ TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS  ANL  3600    135
F63   RSBP    T G $ R153, PARAMETRIC SITE REQUIREMENT STUDY        ANL  3600    172
F63   RSBP    T H $ ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER     ANL  3600    152
F63   RSBP    T M $ XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE      ANL  3600    181
F63   RSBP XCT B $ THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC   ANL  3600    184
F63   RSBPL   T J $ MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY    ANL  3600    143
G-Z  ANL   360  F+P+A RS      T P $ AMCLIBCZ, ARGONNE SUBROUTINE LIBRARY CAT.  564
GADOSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC GGA  1108  F4     RS      T G $  261
GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC GGA  1108  F4     RS P X T B $  316
GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION      GGA  1108  F4     S       T D $  302
GAFGAR ENDF/B DATA TAPES   GGA  1108  BIN   R   L   T Z $ ZPR-III ASSEMBLY 48  356
GAFGAR X-SECTION LIBRARY PREPARATION     GGA  1108  F4     RS P X T L $ GAND,  345
GAFGAR X-SECTIONS GGA  1108  F5     RS P   T B $ ENDFB2,GAND2,GFE2, ENDF/B TO  596
GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR GGA  1108  F4     RS P     A $  289
GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION GGA  1108  F4     RS P   T F $  310
GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK GGA  1108  F4     RS P   T F $  370
GAM, ANISN X-SEC FORMAT WAPD 6600  F4     RS PL  T P $ ETOG1, ENDF/B TO MUFT,  437
GAM, ANISN X-SEC FORMAT WAPD 7600  F4     RS P   T P $ ETOG3, ENDF/B TO MUFT,  538
GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY GGA  7044  F+MAP RSBP   T C $  222
GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY GGA  1108  F+BAL RS P   T C $  222
GAMB1T, X-SEC GENERATION FOR TRANSPORT CODES   WANL 6600  F4     RS  L   T B $  547
GAMMA DOSE INTEGRALS     DP    360  F4     RS P     G $ EGAD, CALC OF EXTERNAL  600
GAMMA RAY SOURCE BUILDUP FACTOR CALC     BAPL 6600  F+ASC RS P   T J $ ASPIS,  429
GAMMA RAY SPECTRA        ORNL  360  F4     RS P     O $ ALPHA-M, RESOLUTION OF  413
GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS  GEC  7094  F4     RS P     B $  235
GAMMA-RAY ATTENUATION CYL SPHERE GEOM  AI   7090  F2     RS P     J $ GRACE2,   46
GAMMA-RAY ATTENUATION CYL SPHERE GEOM  CDC  1604  F63    RS P     J $ GRACE2,   46
GAMMA-RAY ATTENUATION SLAB GEOMETRY    AI   7090  F2     RS P     J $ GRACE1,   45
GAMMA-RAY ATTENUATION SLAB GEOMETRY    CDC  1604  F63    RS P     J $ GRACE1,   45
GAMMA-RAY DOSE RATE FROM A CLOUD       AI   7090  F2     RS P     G $ CLOUD,    47
GAMMA-RAY DOSE RATE FROM A CLOUD       CDC  1604  F63    RS P     G $ CLOUD,    47
GAMMA-RAY DOSE RATE FROM A CLOUD       DP   360   F4     RS P     G $ CLOUD,    47
GAMMA-RAY HISTORIES   PW   1604  F+CDP RS P X T B $ FMC-N,FMC-G, MC NEUTRON,  195
GAMMA-RAY PHOTOFRACTION SOLID CRYSTAL  UM   7090  MAD    RSB      O $ BURP4,   169
GAMMA-RAY PHOTOFRACTION WELL CRYSTAL   UM   7090  MAD    RSB      O $ BURP5,   170
GAMMA-RAY RADIOACTIVITY   IITR 7094  F4     RSBPLX T D $ NAP, NEUTRON-INDUCED  314
GAMMA-RAY SPECTRA ANALYSIS     KAPL 6600  F4     RS      T O $ GASPAN, COMPLEX  485
```

```
GAMMA-RAY SPECTRA GE(LI)    ANC    360  F4     RSBP XCT W $ GAUSS5, ANALYSIS OF     605
GAMMA-RAY SPECTRA GGA  1108  F+BAL RS P    T O $ TCAD, PROCESSING OF ANALYZER     333
GAMMA-RAY SPECTRA KSUN  360  F4     RS P    O $ CORGAM, UNFOLDING OF COMPLEX      390
GAMMA-RAY TRANSPORT        BAPL 6600  F4     RS P    T J $ M0756,LETO, 1-D SLAB    343
GAMMA-RAYS  GEC  7094  F4     RS P     B $ GAMMA-P, PRODUCTION X-SECTIONS FOR     235
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV     BC    625  F4     RS PLX T B $     185
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV     BNW  1107  F4     RS PL  T B $     185
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV     BNW  7090  F+FAP RS PL  T B $      185
GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV     UVA  6400  F4     RS PLX T B $     185
GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH  GGA  1108  F+BAL RS P    T C $     401
GAM1 OR 2    WAPD 6600  BCD    R   L  T Z $ ETOG1 DATA LIBRARIES, MUFT4 OR 5,      447
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC      ANL  3600  F63    RS  LX T B $      33
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC      CDC  1604  F63    RS PLX T B $      33
GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC      GCA  7090  F2     RS PLX T B $      33
GAND, GAFGAR X-SECTION LIBRARY PREPARATION      GGA  1108  F4     RS P X T L $     345
GANDY, UNRESOLVED RESONANCE X-SECTION CALC      GGA  1108  F4     RS P     A $     341
GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS GGA  1108  F5     RS P    T B $ ENDFB2,     596
GAPER1D, 1-D TRANSPORT PERTURBATION THEORY      GGA  1108  F4     RS P XCT C $     606
GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT GGA  1108  F5     RS P    T N $     471
GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY BAPL 6600  F+CCM RS P    T I $     397
GAPCTKIN, SPACE-INDEPENDENT REACTOR KINETICS    GGA  1108  F4     RS P     E $     317
GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC GGA  1108  F4     RS P X T B $ GAF,      316
GARGCYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL    GGA  7044  F4     RS P    T D $     260
GARCL, RESONANCE OVERLAP AND LATTICE EFFECTS    GGA  7044  F+MAP RS P    T B $     219
GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS    LER  7094  F+MAP RS P    T B $     219
GAS RELEASE SIMULATION  BAPL 6600  F4     RS P    T I $ BUBL1, FUEL SWELLING &      468
GAS-COOLED CORE THERMAL DESIGN STUDY GGA  7044  F4     RS P      I $ GAZELLE5,    232
GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS GGA  1108  F4     RS P     E $     290
GASECUS RELEASE  ORNL  360  F4     RS P  C  G $ STEFEG, ANALYSIS OF PWR & BWR      583
GASKET, THERMAL SCATTERING LAW CALCULATION      GGA  1108  F4     RS P     A $     263
GASPAN, COMPLEX GAMMA-RAY SPECTRA ANALYSIS      KAPL 6600  F4     RS      T O $     485
GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH   GGA  7044  F4     RS P    T C $     220
GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH     GGA  1108  F4     RS P    T C $     319
GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH      GGA  1108  F4     RS P    T C $     380
GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION  GGA  1108  F4     RS P    T D $     339
GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)    ANC   360  F4     RSBP XCT W $      605
GAVER, ENERGY INTERVAL X-SECTION AVERAGING      GGA  7044  F4     RS P     L $     218
GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY GGA  7044  F4     RS P     I $     232
GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL  GGA  1108  F+BAL RS P    T C $     430
GE(LI)   ANC   360  F4     RSBP XCT W $ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA      605
GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX      BNW  7090  FLCCC RSBP    T C $      75
GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER   LLL  6600  F4     RS P     P $     592
GEC   625  F4     RS P     B $ AVOID, ANNULAR VOID X-SECTION CALCULATION          276
GEC   635  F+FAP RSBP    T Q $ CASCADE,CLUSTER, RADIATION DAMAGE IN METALS       419
GEC   635  F+GMP RSBP    T H $ THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM         346
GEC   635  F4     RSBP     D $ CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS       418
GEC   635  F4     RSBP     D $ DOS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION      423
GEC   635  F4     RSBP     D $ MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS         421
GEC   635  F4     RSBP     T B $ GROUSE, SPACE-DEPENDENT X-SECTION GENERATION     420
GEC  7090  FAP    RSBP X T Q $ SPECTRA, MC CALCULATION IRRADIATED MATERIAL        422
GEC  7094  F4     RS P     B $ GAMMA-P, PRODUCTION X-SECTIONS FOR GAMMA-RAYS      235
GEES 1108  F5     RS P    T O $ CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS      476
GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS   UICS  360  F4     RS P  CT D $     576
GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS   KAPL 6600  F+ASC RS P    T I $     344
GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.   NED   635  F+GMP RS      T P $     515
GENERATOR DESIGN CRITERIA COSTS  GGA  7044  F4     RS P    T D $ STMGEN, STEAM     227
GENERATOR SODIUM-WATER REACTION   CEND 7600  F4     RS P    T G $ CERUG, STEAM      548
GENRD, FREE-FORMAT CARD INPUT PROCESSOR         LASL  360  F4     RS P     L $     530
GENRD, FREE-FORMAT CARD INPUT PROCESSOR         LASL 6600  F4     RS P     L $     530
GEOMETRICAL DATA HEAT TRANSFER STUDY SLL  6600  F4     RS P      N $ HEATMESH,    434
GEPI GETS  BASIC R          M $ MAPPER, PREDICTING MANUFACTURING REQUIREMENTS      595
GESV  635  F+GMP RS P XCT B $ ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA       501
GESV  635  F+GMP RS P XCT L $ TCOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS        505
GESV  635  F4     RS P  CT I $ BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT     568
```

```
GESV H600  F4     RS P  CT C $ TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS      585
GETS  BASIC R         M $ MAPPER, PREDICTING MANUFACTURING REQUIREMENTS  GEPI   595
GETS  F     R         R $ PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE  ANL    591
GFE2, ENDF/B TO GAFGAR X-SECTIONS GGA  1108  F5     RS P   T B $ ENDFB2,GAND2,   596
GGA  1108  BIN    R   L   T Z $ ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES     356
GGA  1108  F+BAL  RS P    T C $ GAMBLE5, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY   222
GGA  1108  F+BAL  RS P    T C $ GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH    401
GGA  1108  F+BAL  RS P    T C $ GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL   430
GGA  1108  F+BAL  RS P    T D $ BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH    439
GGA  1108  F+BAL  RS P    T D $ BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ   438
GGA  1108  F+BAL  RS P    T E $ BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER     303
GGA  1108  F+BAL  RS P    T C $ TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA   333
GGA  1108  F4      S      T D $ GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION        302
GGA  1108  F4     RS         B $ HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE    291
GGA  1108  F4     RS       T G $ GADOSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC  261
GGA  1108  F4     RS P       A $ GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR  289
GGA  1108  F4     RS P       A $ GANDY, UNRESOLVED RESONANCE X-SECTION CALC      341
GGA  1108  F4     RS P       A $ GASKET, THERMAL SCATTERING LAW CALCULATION      263
GGA  1108  F4     RS P       A $ PSEUDO, STATISTICAL RESONANCE PARAMETER CALC    292
GGA  1108  F4     RS P       D $ FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE  301
GGA  1108  F4     RS P       E $ GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS    317
GGA  1108  F4     RS P       E $ GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS  290
GGA  1108  F4     RS P       I $ SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE      300
GGA  1108  F4     RS P       I $ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES   252
GGA  1108  F4     RS P       I $ SAFE-SHELL, STRESS ANALYSIS THIN SHELLS         253
GGA  1108  F4     RS P       I $ SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS   379
GGA  1108  F4     RS P       L $ GROWRK, GRID GENERATION FOR SAFE PROGRAMS       296
GGA  1108  F4     RS P     T A $ TACASI, ANALYSIS OF RESONANCE MEASUREMENTS      410
GGA  1108  F4     RS P     T C $ GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH     319
GGA  1108  F4     RS P     T C $ GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH      380
GGA  1108  F4     RS P     T C $ TEMCO7, TEMPERATURE COEFFICIENT CALCULATION     320
GGA  1108  F4     RS P     T D $ FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION  318
GGA  1108  F4     RS P     T D $ GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION  339
GGA  1108  F4     RS P     T D $ PWCOST, REACTOR FUEL CYCLE COST CALCULATION     441
GGA  1108  F4     RS P     T F $ GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION  310
GGA  1108  F4     RS P     T F $ GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK  370
GGA  1108  F4     RS P     T F $ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM     274
GGA  1108  F4     RS P     T H $ DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM      440
GGA  1108  F4     RS P     T I $ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY   332
GGA  1108  F4     RS P     T J $ MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM  259
GGA  1108  F4     RS P X     A $ COHRE, COHERENT INELASTIC SCATTERING LAW CALC   385
GGA  1108  F4     RS P X T B $ GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC   316
GGA  1108  F4     RS P X T L $ GAND, GAFGAR X-SECTION LIBRARY PREPARATION       345
GGA  1108  F4     RS P XCT C $ GAPER1D, 1-D TRANSPORT PERTURBATION THEORY       606
GGA  1108  F4     RS PLX T B $ GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA   298
GGA  1108  F5     RS P       A $ FLANGE1, SCATTERING LAW X-SECTION CALCULATION  247
GGA  1108  F5     RS P       H $ FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION 395
GGA  1108  F5     RS P     T P $ ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR X-SECTIONS 596
GGA  1108  F5     RS P     T C $ 2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE        173
GGA  1108  F5     RS P     T H $ TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC     408
GGA  1108  F5     RS P     T H $ TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM      414
GGA  1108  F5     RS P     T I $ SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE   451
GGA  1108  F5     RS P     T I $ SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS      452
GGA  1108  F5     RS P     T N $ GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT  471
GGA  1108  F5     RS P   CT A $ FSDP3, POINTWISE XSECS. FROM B-W PARAMETERS     216
GGA  6600  F4     RS   L   T B $ GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA  298
GGA  7044  F+MAP  RS P     T B $ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS    219
GGA  7044  F+MAP  RS P     T D $ OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY   226
GGA  7044  F+MAP  RS P     T H $ BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER  205
GGA  7044  F+MAP  RSBP       M $ UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE    206
GGA  7044  F+MAP  RSBP     T C $ GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY  222
GGA  7044  F+SPS  RSBP     T N $ CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES    207
GGA  7044  F4     RS         I $ CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE  233
GGA  7044  F4     RS     X T G $ PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE  228
```

```
GGA  7044  F4     RS P      D $ RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY    231
GGA  7044  F4     RS P      D $ WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY        224
GGA  7044  F4     RS P      I $ GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY    232
GGA  7044  F4     RS P      L $ GAVER, ENERGY INTERVAL X-SECTION AVERAGING        218
GGA  7044  F4     RS P    T B $ FMC-N, MONTE CARLO CALC NEUTRON HISTORIES         195
GGA  7044  F4     RS P    T C $ GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH     220
GGA  7044  F4     RS P    T C $ TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC        225
GGA  7044  F4     RS P    T D $ GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL      260
GGA  7044  F4     RS P    T D $ RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION      221
GGA  7044  F4     RS P    T D $ REVISED-GAC, FUEL CYCLE ANALYSIS W/REFUELING      223
GGA  7044  F4     RS P    T D $ STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS     227
GGA  7044  F4     RS P    T G $ ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY         229
GGA  7044  F4     RS P    T I $ SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD    251
GGA  7044  F4     RS P X    A $ LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST     217
GGA  7044  F4     RSBP   CT I $ SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD      250
GGA  7090  F+FAP  RSB      T A $ TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC    42
GGA  7090  F+FAP  RSB      T A $ ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC      41
GGA  7090  F+FAP  RSBP     T D $ DDB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY      99
GGA  7090  F2     RS       T A $ SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC        56
GGA  7090  F2     RS PLX T B $ CAM1, FAST NEUTRON SPECTRUM X-SECTION CALC          33
GGA  7090  F2     RSB      T D $ FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM    117
GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA GGA  1108  F4     RS PLX T B $     258
GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA GGA  6600  F4     RS  L  T B $     258
GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA LASL 6600  F4     RS P   T B $     361
GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS      BAPL 6600  F4     RS P   T H $     424
GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY    AI   7090  F2     RS P     J $      45
GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY    CDC  1604  F63    RS P     J $      45
GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM  AI   7090  F2     RS P     J $      46
GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM  CDC  1604  F63    RS P     J $      46
GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES BAPL 6600  F4     RS P     A $     470
GRAPHIC X-SEC EVALUATION AI     360  F+BAL RSB L CT M $ SCORE3, SCISRS ENDF/B     375
GRAPHICS SUBROUTINES AI     360  F+BAL RS      T P $ FIGS, IBM360&2250 FORTRAN     484
GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS   AI   7094  F+FAP RS PL  T B $      162
GRDWRK, GRID GENERATION FOR SAFE PROGRAMS      GGA  1108  F4     RS P     L $      296
GRID GENERATION FOR SAFE PROGRAMS      GGA  1108  F4     RS P     L $ GRDWRK,      296
GROUP COLLAPSING  APRF 6600  F4     RS         B $ APRFX1, 99-GP CLC-2B LIBRARY    466
GROUP CONSTANT CALC FROM TOR OUTPUT DATA LASL 6600  F4     RS P   T B $ GLEN,      361
GROUP OR MESH COLLAPSING       TRW  6500  F4     RS P     B $ PARTI, OPTIMAL      416
GROUP-AVERAGED X-SEC CALC GGA  1108  F4     RS P X T B $ GAF,GAR, SPECTRA AND      316
GROUP-AVERAGING X-SECTIONS PARAMETERS   AI   7094  F+FAP RS PL  T B $ GRAVE,       162
GROUP-COLLAPSING OF MULTI-GP X-SECTIONS   LASL 7090  FLOCO RS P     B $ ZOT,       113
GROUSE, SPACE-DEPENDENT X-SECTION GENERATION   GEC   635  F4     RSBP   T B $      420
GSSLRN18, LEAST SQUARES PHOTOPEAK SPECTRA CODE BNWL 1108  F+BAL RS P   T O $      457
HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS    AI   360  F4     RS P   T G $      443
HAFEVER, HAUSER-FESHBACH INELASTIC SCATTERING  CDC  1604  F63    RS P     A $       14
HAMMER,LITHE,HELP, CRITICAL ANALYSIS SYSTEM    DP   360  F+BAL RS P XCT B $      277
HARMONY-PDQ X-SECTION GENERATION CODE   BAPL 6600  F+COM RS P X T B $ PAX03,      426
HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE AGC  7090  F2     RSB      F $      153
HAUSER-FESHBACH INELASTIC SCATTERING  CDC  1604  F63    RS P     A $ HAFEVER,      14
HEAT CONDUCTION      PPCO 7044  F+MAP RS P   T H $ TOODEE, 2-D TIME-DEPENDENT     349
HEAT CONDUCTION   ORNL  360  F4     RS P X T H $ ORTHIS,ORTHAT, 2-DIMENSIONAL     525
HEAT CONDUCTION LUMPED MASS    LASL 7030  F4     RS     T H $ RATH, 2- OR 3-D      242
HEAT CONDUCTION LUMPED MASS    LASL 7094  FAP    RS P   T H $ RATH, 2- OR 3-D      242
HEAT CONDUCTION PROGRAM     BAPL 6600  F4     RS P   T H $ HOT2, 2-D TRANSIENT    286
HEAT CONDUCTION PROGRAM  ORNL  360  F4     RS P   T H $ HEATING3, 1,2, OR 3-D     517
HEAT EXCHANGER STRESS ANALYSIS     KAPL 6600  F4     RS P     I $ TUBE, U-TUBE    378
HEAT TRANSFER   GGA  1108  F+BAL RS P   T E $ BLOCST6, COMBINED KINETICS 2-D     303
HEAT TRANSFER AI   7094  F+FAP RS P   T H $ HEATING2, TRANSIENT STEADY-STATE      198
HEAT TRANSFER AI   7094  F2     RS P   T G $ TRANS-FUGUE1, TRANSIENT FLOW AND     268
HEAT TRANSFER CALC       ANC  360  F4     RSBP XCT H $ MOXY, BWR FUEL ELEMENT    551
HEAT TRANSFER CALC       ANC  1108  F4     RS P   T H $ MOXY, BWR FUEL ELEMENT    551
HEAT TRANSFER GGA  7044  F+MAP RS P   T H $ BLOCST5, POINT-KINETICS WITH 2-D     205
HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES  LASL 7094  F2     RSBP     H $ AXFLU,     182
HEAT TRANSFER PROGRAM       GEC   635  F+GMP RSBP   T H $ THTE, 3-D TRANSIENT    346
```

```
HEAT TRANSFER PROGRAM      GGA  1108  F5     RS P    T H $ TAC3D, TRANSIENT 3-D     414
HEAT TRANSFER SOLID FUEL TUBE BUNDLES  LASL 7094  F2     RSBP      H $ AXTHRM,     183
HEAT TRANSFER STUDY SLL  6600  F4     RS P     N $ HEATMESH, GEOMETRICAL DATA     434
HEATING CLADDING-STEAM REACTION ANL  3600  F36   RSBP      G $ CHEMLCC2, CORE     366
HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER AI    7094  F+FAP RS P    T H $     198
HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM  ORNL  360  F4     RS P    T H $     517
HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY SLL  6600  F4     RS P      N $     434
HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS NEC   635  F4     RS P    T D $ BURNUP,     311
HEDL 1108  F+SL  RS P XCT R $ HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS       527
HEDL 1108  F4     RS P     G $ SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS           521
HEDL 1108  F4     RS P    T D $ 3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS      567
HEDL 1108  F5     RS P    T R $ TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY       599
HEDL 1108  F5     RS P X T D $ PACTOLUS,CLOTHO, NUCLEAR POWER PLANT COST CODE      540
HEDL 1108B F4     RS P X T B $ ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX       388
HELP, CRITICAL ANALYSIS SYSTEM     DP     360  F+BAL RS P XCT B $ HAMMER,LITHE,    277
HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION DP    360B F4     RSBP  CT C $      136
HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS HEDL 1108  F+SL  RS P XCT R $      527
HETEROGENEOUS AEROSOLS     AI     360  F4     RS P    T G $ HAA3, COAGULATION OF    443
HETEROGENEOUS REACTOR CALCULATION DP    360B F4     RSBP  CT C $ HERESY3, 2-D        136
HEX CELL  BAPL 6600  F+ASC RS P X T B $ RESQ2,RESQO,DBF1, RESONANCE INTEGRAL       285
HEX GEOM DIFFUSION DEPLETION GGA  1108  F4     RS P    T C $ GAUGE, 2-D FEW-GP      339
HEX LATTICE    GGA  1108  F4     RS        B $ HEXSCAT, ELASTIC SCAT X-SECTIONS    291
HEX-Z MESH     GGA  1108  F4     RS P    T C $ GATT, 3-D FEW-GP DIFFUSION CALC     380
HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE    GGA  1108  F4     RS        B $     291
HFN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE    BNW  1107  F4     RS P    T C $     241
HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX KAPL 6600  F4     RS P      H $ RAPP,       382
HISTORIES      GGA  7044  F4     RS P    T B $ FMC-N, MONTE CARLO CALC NEUTRON     195
HISTORIES      PW   1604  F+COP RS P X T B $ FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY    195
HISTORY    KE   7094  F2     RSBP    T H $ PTH1, BLOWDOWN PRESSURE TEMPERATURE     155
HISTORY  LASL 6600  F4     RS P    T D $ PHENIX, 2D DIFFUSION BURNUP REFUELING     454
HOH, STEAM TABLES 14.5-2538 PSIA          ANL  1604  F63    RS P      H $ MO899,    294
HOH, STEAM TABLES 14.5-2538 PSIA          BAPL 6600  F4     RS P    T H $ MO899,    294
HOMOGENEOUS ANL  3600  F36   RSBP      A $ MISH-MASH, RESONANCE INTEGRAL CALC      214
HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM    BAPL 6600  F4     RS P    T H $     286
HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS BNW  1108  F4     RS PLX T B $      467
HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS TVA   360  F4     RS PLX T B $      467
HTGR ACCIDENT ANALYSIS DOSE CALC GGA  1108  F4     RS       T G $ GADOSE,DOSET,      261
HTGR CONTAINMENT PRESSURE POST RUPTURE GGA  7044  F4     RS    X T G $ PRECON,     228
HTGR FISSION PRODUCT ACTIVITY DIST STUDY GGA  7044  F4     RS P      D $ RAD2,       231
HTGR METALLIC FISSION PRODUCT RELEASE GGA  1108  F4     RS P      D $ FREVAP6,    301
HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION    AI     360  F+BAL RS P X T B $      307
HYDRODYNAM RESPONSE TO EXCURSION ANL  360  F4     RS P  CT F $ REXCO-H, 2-D        550
HYDRODYNAMIC ANALYSIS DURING BLOWDOWN  PPCO 360  F4     RS P X    G $ BURST1,     435
HYDRODYNAMIC MASS MATRIX GENERATION     BAPL 6600  F+COM RS P      H $ HYMAS,      560
HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION     BAPL 6600  F+COM RS P      H $      560
H600  F4     RS P  CT C $ TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS   GESV      585
IBM    360A F+BAL RS P    T D $ PD05, 2-D FEW-GROUP DIFFUSION AND DEPLETION       336
IBM2280 OR CALCOMP780    ANL   360  F4     RS P    T N $ PLOT-3D, 3-D PLOTS ON    544
IBM360&2250 FORTRAN GRAPHICS SUBROUTINES AI     360  F+BAL RS       T P $ FIGS,     484
IITR 7094  F4     RSBPLX T D $ NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY        314
IMPELLER DESIGN STUDY    PW   1604  F63    RS P    T I $ PIP, CENTRIFUGAL PUMP      187
INCEXE, 1-GP 3-D XYZ XENON OSCILLATION    CENO 360  F4     RS P X T F $ CEXE,      415
INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS   ANC   360  F4     RS PL CT B $      565
INDEXING LASL 6600  F+COM RS P    T Q $ INDX, XRAY DIFFRACTION POWDER PATTERN      609
INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING LASL 6600  F+COM RS P    T Q $      609
INELASTIC LARGE DEFLECTION STRESS STUDY BAPL 6600  F+COM RS P    T I $ GAPL3,     397
INELASTIC SCAT X-SECTION CALC MODERATOR GGA  1108  F4     RS P      A $ GAKEP,      289
INELASTIC SCATTERING  CDC  1604  F63    RS P      A $ HAFEVER, HAUSER-FESHBACH     14
INELASTIC SCATTERING FORM FACTORS     ORNL  360  F4     RS P    T A $ ATHENA4,    417
INELASTIC SCATTERING LAW CALC  GGA  1108  F4     RS P X    A $ COHBE, COHERENT      385
INFINITE MEDIUM SPECTRUM X-SECTIONS    AI    7090  F+FAP RS  L  T B $ QUICKIE,      119
INFORMATION SYSTEM     KAPL 6600  F     R B    T M $ TIGIR2, MODULAR DOCUMENT      403
INLET PLENUM DP    360  F4     RS P      H $ PLENUM, FLOW DIST. IN CYL COOLANT     586
INPUT    PW   1604  F63    RS        C $ TDP, 2-D PERTURBATION TDC OR 2DXY FLUX     199
```

INPUT KAPL

```
INPUT DATA PROCESSING MODULE   ANL   360  F4     RSBP  CT L $ ARC-NUI002, BCD     533
INPUT PROCESSOR          LASL  360  F4     RS P     L $ GENRD, FREE-FORMAT CARD  530
INPUT PROCESSOR          LASL 6600  F4     RS P     L $ GENRD, FREE-FORMAT CARD  530
INPUT, PREPARATION, EDIT KAPL 6600  F+ASC RS P   T L $ DATATRAN 2-D GEOMETRY     406
INSPEC, MARKOV SIMULATION OF REACTOR OPN DP    360  F4     RS P     G $ INTEG,   590
INSTRUCTION SET      PW   1604  F+CDP RS P   T P $ LAG, ASSEMBLER FOR FLOCO2     186
INTEG,INSPEC, MARKOV SIMULATION OF REACTOR CPN DP    360  F4     RS P     G $   590
INTERACTION ANALYSIS       ANL   360  F4     RS P     G $ SOCOOL2, SODIUM-FUEL     521
INTERACTION ANALYSIS       HEDL 1108  F4     RS P     G $ SOCOOL2, SODIUM-FUEL     521
INTERMEDIATE POWER TRANSIENTS BAPL 6600  F4     RS P   T H $ CHIC-KIN, FAST +     473
INTERVAL X-SECTION AVERAGING      GGA  7044  F4     RS P     L $ GAVER, ENERGY    218
INVERSE KINETICS CALC  ANL   360  F4     RS P     E $ R102, SPACE-INDEPENDENT  168
INVERSE KINETICS CALC  ANL  3600  F63    RSBP     E $ R102, SPACE-INDEPENDENT  168
INVERSE KINETICS CALC  WANL 7094  F4     RS       E $ R102, SPACE-INDEPENDENT  168
IODINE REMOVAL BCL  6400  F4     RS P     G $ MIRAB,MIRAP, CONTAINMENT SYSTEM  499
IRRADIATED MATERIAL    GEC  7090  FAP    RSBP X T Q $ SPECTRA, MC CALCULATION  422
ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS        ORNL 1604  F63   RS P     D $  180
ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS        ORNL 7090  F2    RSBP     D $  180
ISOGEN, RADIONUCLIDE GENERATION AND DECAY       BNW  1108  F5    RSBPL  T D $  367
ISOPLETH-AREA CALC FROM SINGLE SOURCE  ANL  GETS  F      R        R $ PLETHS,  591
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC ORNL  360  F+BAL RS P     D $  322
ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC ORNL 1604  F63   RS P     D $  322
ISOTOPE PRODUCTION FLUX, X-SEC CALC ORNL  360  F+BAL RS P     D $ ISOSEARCH,  322
ISOTOPE PRODUCTION FLUX, X-SEC CALC ORNL 1604  F63   RS P     D $ ISOSEARCH,  322
ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY ORNL 1604  F63   RS P     D $  179
ISOTOPIC BURNUP ANALYSIS NED   635  F4     RS P   T O $ BURNUP, HEAVY ELEMENT  311
ISOTROPIC DIELECTRICS SLA  6600  F4     RS P     V $ FFEARS, LAPLACE EQUATION 577
JAER  230  F4     RS P   T B $ CLUP77, SQUARE CELL COLLISION PROBABILITY CALC  526
JITER, FLUCTUATION EXPERIMENT ANALYSIS          BAPL 6600  F4    RS P   T O $  394
JNC  1108  F5     RS  LX T B $ LEOPARD, SPECTRA CALCULATION WITH DEPLETION     279
JOB ENTRY SYSTEM   ANC   360  BAL   RSB    T P $ NRTS-RJE, OS/360 MVT REMOTE  519
JOSHUA SYSTEM LATTICE PHYSICS MODULES   DP    360  F+BAL  S   X T B $ RAHAB,   536
JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY   DP    360  F+BAL  S     T M $  490
JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC   KAPL 6600  F4    RS P   T A $  506
JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION     ENEA  360  F4    RS P   CT A $  308
JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION     ORNL 1604  F63   RS P   T A $  308
KAPL CALCOMP PLOTTING ROUTINES        KAPL 6600  F+COM RS     T P $ KAPLPLOT,  496
KAPL 6600  F      R B     T M $ TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM    403
KAPL 6600  F+ASC RS         P $ SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE     442
KAPL 6600  F+ASC RS P   T H $ LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM      299
KAPL 6600  F+ASC RS P   T I $ GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS    344
KAPL 6600  F+ASC RS P   T L $ DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT   406
KAPL 6600  F+ASC RS P   T P $ CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS    43
KAPL 6600  F+ASC RS P   T P $ DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING     407
KAPL 6600  F+ASC RS P   T P $ DOGGY, DESK CALCULATOR FORM SHEET OP PACKAGE     428
KAPL 6600  F+ASC RS P   T P $ LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION    445
KAPL 6600  F+ASC RS P   T P $ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT    364
KAPL 6600  F+COM RS         P $ KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES       496
KAPL 6600  F+COM RSB    T M $ DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM    386
KAPL 6600  F4    RS         I $ SCRSDB, PRESSURE VESSEL STRESS AND FATIGUE     391
KAPL 6600  F4    RS      T O $ GASPAN, COMPLEX GAMMA-RAY SPECTRA ANALYSIS      485
KAPL 6600  F4    RS P       A $ CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING    531
KAPL 6600  F4    RS P       A $ MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC  535
KAPL 6600  F4    RS P       F $ RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC    352
KAPL 6600  F4    RS P       F $ STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS    389
KAPL 6600  F4    RS P       H $ RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX 382
KAPL 6600  F4    RS P       I $ STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS  337
KAPL 6600  F4    RS P       I $ TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS    378
KAPL 6600  F4    RS P       O $ DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION   464
KAPL 6600  F4    RS P       P $ MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME   446
KAPL 6600  F4    RS P       P $ ROPE, FINDING ROOTS OF A POLYNOMIAL            444
KAPL 6600  F4    RS P   T A $ JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC    506
KAPL 6600  F4    RS P   T A $ PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC   507
KAPL 6600  F4    RS P   T D $ 3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION      477
```

```
KAPL 6600  F4     RS P X    I $ FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES      404
KAPL 6600C F4     RS P    T I $ SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION       80
KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES        KAPL 6600  F+COM RS      T P $  496
KE    3600B F36    RSBP      G $ WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS      278
KE    7090  F2     RSBP      D $ NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA      146
KE    7094  F+MAP RSBP    T G $ SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT     200
KE    7094  F2     RSBP    T H $ PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY     155
KEELE, LINEARLY-CONSTRAINED OPTIMIZATION        ORNL  360  F4     RS P      P $  556
KENO, MONTE CARLO MULTIGROUP CRITICALITY CODE  ORNL  360  F+BAL RSBPL CT C $  450
KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE RFD  6600  F+COM RS P    T C $  450
KERNEL CALC      GGA  7090  F2     RS      T A $ SUMMIT, CRYSTALLINE SCATTERING   56
KERNELS      DP     360  BCD    R    LX T Z $ THERMOS LIBRARY, 30-GP ENDF/B SCAT  543
KEX OPTIONS    ANL    360  F4     RS P      E $ R101, SPACE-INDEPENDENT KINETICS  255
KEX OPTIONS    ANL  3600  F63    RSBP       E $ R101, SPACE-INDEPENDENT KINETICS  255
KEX OPTIONS    WANL 7094  F4     RS P      E $ R101, SPACE-INDEPENDENT KINETICS  255
KINETICS       AI     360  F4     RS P    T F $ TSN, SPATIALLY-DEPENDENT REACTOR  309
KINETICS       AI    7094  F+MAP RS P    T F $ TSN, SPATIALLY-DEPENDENT REACTOR  309
KINETICS    GGA  1108  F4     RS P      E $ GAPOTKIN, SPACE-INDEPENDENT REACTOR 317
KINETICS   BCL  6400  F4     RS P    T F $ ADEP, 1D AND 2D FEW-GROUP SPACE-TIME  494
KINETICS CALC  ANL    360  F4     RS P      E $ R102, SPACE-INDEPENDENT INVERSE   168
KINETICS CALC  ANL  3600  F63    RSBP       E $ R102, SPACE-INDEPENDENT INVERSE   168
KINETICS CALC  WANL 7094  F4     RS        E $ R102, SPACE-INDEPENDENT INVERSE   168
KINETICS CODE ANL    360  F4     RS P    T E $ ANCON, SPACE-INDEPENDENT REACTOR  486
KINETICS CODE ANL    360  F4     RS PL CT F $ QX1, QUASISTATIC SPATIAL REACTOR   474
KINETICS CODE ANL  3600  36F     RS PL CT F $ QX1, QUASISTATIC SPATIAL REACTOR   474
KINETICS CODE LASL 6600  F4     RS P    T E $ ANCON, SPACE-INDEPENDENT REACTOR  486
KINETICS EQNS GGA  1108  F4     RS P      E $ GASA, STABILITY ANALYSIS REACTOR  290
KINETICS KEX OPTIONS    ANL    360  F4     RS P      E $ R101, SPACE-INDEPENDENT  255
KINETICS KEX OPTIONS    ANL  3600  F63    RSBP       E $ R101, SPACE-INDEPENDENT  255
KINETICS KEX OPTIONS    WANL 7094  F4     RS P      E $ R101, SPACE-INDEPENDENT  255
KINETICS PROGRAM  ORNL  360  F4     RS P XCT F $ TASK, 1-D MULTIGROUP REACTOR     558
KINETICS SNAP GEOMETRY   AI    7090  F2     RS        E $ SNAPKIN5/5A, 1-REGION   122
KINETICS TEMPERATURE DIST STUDY AEB    360  F4     RS P      E $ BLAST, REACTOR  363
KINETICS TEMPERATURE FEEDBACK  BAPL 6600  F4     RS P    T F $ NOWIG, 1-D 2-GP   371
KINETICS W/FEEDBACK    AI    7094  F+MAP RS P    T F $ AIROS, SPACE-INDEPENDENT  163
KINETICS W/FEEDBACK  AEB    360  F4     RS P      E $ AIREK3, SPACE-INDEPENDENT  121
KINETICS W/FEEDBACK  AI    7090  F2     RS        E $ AIREK3, SPACE-INDEPENDENT  121
KINETICS W/FEEDBACK  CDC   1604  F63    RS P      E $ AIREK3, SPACE-INDEPENDENT  121
KINETICS WITH TEMP FEEDBACK GGA  1108  F4     RS P    T F $ GAKIT, 1-D MULTIGP    370
KINETICS 2-D HEAT TRANSFER   GGA  1108  F+BAL RS P    T E $ BLOOST6, COMBINED     303
KITT, SYSTEM FAULT TREE EVALUATION CODES  ANC    360  F4     RSBP    CT K $ PREP,  528
KITT, SYSTEM FAULT TREE EVALUATION CODES  ANC  1108  F4     RS P    T K $ PREP,   528
KSUN  360  F4     RS P      O $ CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA    390
LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET       PW   1604  F+CDP RS P    T P $  186
LAG1  RS P      C $ MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE  PW   1604    211
LAG1  RS P      N $ DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT  PW   1604    210
LANGUAGE      KAPL 6600  F+ASC RS       P $ SIMPLE1, TIME-SHARING PROGRAMMING   442
LANGUAGE PROCESSOR UNDER TSO     ANL    360  F+BAL R B L  T P $ TSO-SPEAKEASY,    593
LAPLACE EQUATION ISOTROPIC DIELECTRICS SLA  6600  F4     RS P      V $ FFEARS,   577
LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS    LASL 6600  F4     RS P      N $  409
LARGE DEFLECTION STRESS STUDY BAPL 6600  F+COM RS P    T I $ GAPL3, INELASTIC  397
LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE   TVA    360  F4     RSRPLXCT B $  249
LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE   WAPD 7094  F+MAP RS PLX T B $  249
LASL  360  F4     RS P      L $ GENRD, FREE-FORMAT CARD INPUT PROCESSOR         530
LASL  360  F4     RSBP  CT C $ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM  608
LASL  360B F4     RS P  CT C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA   358
LASL LEAST SQUARES, GENERAL CURVE FITTING       LASL 7094  F4     RS      T P $   62
LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS    LASL 6600  BCD    R    LX T Z $ 532
LASL 6600  BCD    R    LX T Z $ LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS    532
LASL 6600  F+COM RS P    T P $ LENSDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM    602
LASL 6600  F+COM RS P    T Q $ INDX, XRAY DIFFRACTION POWDER PATTERN INDEXING    609
LASL 6600  F4     RS P      L $ GENRD, FREE-FORMAT CARD INPUT PROCESSOR         530
LASL 6600  F4     RS P      N $ DAC1, SN PERTURBATION CODE USING DTF4 FLUXES    455
LASL 6600  F4     RS P      N $ LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS    409
```

```
LASL 6600  F4    RS P   T A $ TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS     360
LASL 6600  F4    RS P   T B $ GLEN, GROUP CONSTANT CALC FROM TOR OUTPUT DATA    361
LASL 6600  F4    RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM      209
LASL 6600  F4    RS P   T C $ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM    608
LASL 6600  F4    RS P   T C $ 3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z      463
LASL 6600  F4    RS P   T D $ PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY     454
LASL 6600  F4    RS P   T D $ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION       325
LASL 6600  F4    RS P   T E $ ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE    486
LASL 6600B F4    RS P   T C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA     358
LASL 7030  F4    RS     T H $ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS       242
LASL 7030  F4    RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM      209
LASL 7030  F4    RS P   T D $ DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION        265
LASL 7090  F+FAP RS P     I $ WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX      315
LASL 7090  F+FAP RS P   T L $ DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS     234
LASL 7090  FLOCO RS P     B $ MCS, MONTE CARLO NEUTRON PENETRATION STUDY        202
LASL 7090  FLOCO RS P     R $ ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS      113
LASL 7094  FAP   RS P   T H $ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS       242
LASL 7094  F2    RSBP     H $ AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES     182
LASL 7094  F2    RSBP     H $ AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES     183
LASL 7094  F4    RS     T P $ LASL LEAST SQUARES, GENERAL CURVE FITTING          62
LASL 7600  F4    RS P   T C $ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM    608
LASL 7600  F4    RS P   T C $ TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH    573
LASL 7600B F4    RS P   T C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA     358
LATTICE   GGA  1108  F4    RS        B $ HEXSCAT, ELASTIC SCAT X-SECTIONS HEX  291
LATTICE   TVA   360  F4    RSBPLXCT B $ LASER, SPECTRUM CALC WITH BURNUP CYL    249
LATTICE   WAPD 7094  F+MAP RS PLX T B $ LASER, SPECTRUM CALC WITH BURNUP CYL    249
LATTICE EFFECTS   GGA  7044  F+MAP RS P   T B $ GAROL, RESONANCE OVERLAP AND    219
LATTICE EFFECTS   LER  7094  F+MAP RS P   T B $ GAROL, RESONANCE OVERLAP AND    219
LATTICE PHYSICS MODULES   DP    360  F+BAL  S   X T B $ RAHAB, JOSHUA SYSTEM    536
LATTICE VIBRATION NEUTRON SCATTRING CODES ANC   360  F4    RS P  CT W $ MACS    574
LEAKAGE   AI   7090  F2    RS        J $ FARSEIA, DOSE RATE FROM SNAP SHIELD     91
LEASE ANALYSIS   SLA   360  COBOL RSBP  CT M $ BECOM, AEC DP PURCHASE VERSUS    589
LEASE ANALYSIS   SLA  1108  COBOL RS P     M $ BECOM, AEC DP PURCHASE VERSUS    589
LEAST SQ LENS DESIGN SYSTEM LASL 6600  F+CCM RS P   T P $ LENSDES, NONLINEAR    602
LEAST SQUARES ANALYSIS RESONANCE DATA UILL  360  F4    RS P     A $ CODILLI,    347
LEAST SQUARES EXPONENTIAL DECAY CURVES LRL  7094  F2    RS P     P $ EXPALS,     321
LEAST SQUARES FIT FISSILE NUCLIDE DATA  BAPL 6600  F4    RS P   T P $ DAFT1,     327
LEAST SQUARES FIT SUM OF EXPONENTIALS MIT  7090  F2    RS P     P $ FRANTIC,    324
LEAST SQUARES PHOTOPEAK SPECTRA CODE BNWL 1108  F+BAL RS P   T O $ GSSLRN1B,     457
LEAST SQUARES TRANSMUTATION ANALYSIS  BNWL 1108  F5    RS P   T D $ DBUFIT1,    456
LEAST SQUARES, GENERAL CURVE FITTING      LASL 7094  F4    RS     T P $ LASL     62
LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST  GGA  7044  F4    RS P X   A $     217
LEGENDRE COEF CALC FOR ANGULAR DIST  GGA  7044  F4    RS P X   A $ LEGCOEF3,    217
LEGENDRE COEF CALC FOR ANGULAR DIST DATA AI   7094  F+MAP RS P     A $ CHAD,     215
LEGENDRE FITTING    KAPL 6600  F4    RS P     A $ CLEM, ANGULAR DISTRIBUTION   531
LENS DESIGN SYSTEM LASL 6600  F+CCM RS P   T P $ LENSDES, NONLINEAR LEAST SQ    602
LENSDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM LASL 6600  F+CCM RS P   T P $    602
LEOPARD, SPECTRA CALCULATION WITH DEPLETION    JNC  1108  F5    RS  LX T B $    279
LEOPARD, SPECTRA CALCULATION WITH DEPLETION    WAPD  360  F4    RS PLX T B $    279
LER  7090  F+MAP RS P   T C $ TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM    312
LER  7094  F+MAP RS P   T B $ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS      219
LER  7094  F4    RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM      209
LETC, 1-D SLAB GAMMA-RAY TRANSPORT        BAPL 6600  F4    RS P   T J $ MO756,  343
LI)  ANC   360  F4    RSBP XCT W $ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(    605
LIB  AI    360  F4    RSBPLX T C $ CAESAR4,LIBLST, 1-D MULTI-GP DIFFUSION +     270
LIB SCOPE2.0 CDC  7600  F4    RS     T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL    478
LIB SCOPE3.2 CDC  6600C F+COM RS     T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL    478
LIB SCOPE3.3 CDC  6600D F+COM RS     T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL    478
LIB.  NED  635  F+GMP RS     T P $ GENED ENVIRONMENTAL ROUTINES, SUBROUTINE     515
LIB. BAPL 6600A F+ASC RS     T P $ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE    478
LIB. BW   6600B F+ASC RS     T P $ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE    478
LIBLST, 1-D MULTI-GP DIFFUSION + LIB   AI    360  F4    RSBPLX T C $ CAESAR4,    270
LIBRARIES FROM ENDF/B  ORNL  360  F4    RSBP XCT B $ XLACS, XSDRN MULTIGROUP     572
LIBRARIES FROM ENDF/B DATA      WAPD 7600  F4    RS P   T B $ ETOT2, THERMAL     509
```

```
LIBRARIES, MUFT4 OR 5, GAM1 OR 2     WAPD 6600  BCD    R    L   T Z $ ETCG1 DATA     447
LIBRARY        LRL   7094   F+FAP RS PL   T M $ ECSIL, EXPERIMENTAL NEUTRON DATA     351
LIBRARY CAT. A-E   ANL    360   F+P+A RS      T P $ AMDLIBAE, ARGONNE SUBROUTINE     562
LIBRARY CAT. F     ANL    360   F+BAL RS      T P $ AMDLIBF, ARGONNE SUBROUTINE      563
LIBRARY CAT. G-Z   ANL    360   F+P+A RS      T P $ AMDLIBGZ, ARGONNE SUBROUTINE     564
LIBRARY GROUP COLLAPSING   APRF 6600   F4     RS        B $ APRFX1, 99-GP DLC-2B     466
LIBRARY MAINTENANCE NED    635   F4     RS P    T M $ TROUT, MUG MULTIGROUP XSEC     493
LIBRARY MAINTENANCE NED   1108   F5     RS P    T M $ TROUT, MUG MULTIGROUP XSEC     493
LIBRARY PREPARATION      GGA   1108   F4     RS P  X T L $ GAND, GAFGAR X-SECTION    345
LIBRARY SERVICE ROUTINES    ANL    3600   36F    RSBP    T M $ MERMC2,MAGIC, MC**2    472
LIBRARY TAPE MAINTENANCE   ANL    360   F4     RS        M $ MERMC2, MC**2 BINARY     472
LIBRARY TAPE PREPARATION     PW    1604   F63    RS        L $ CSP1, SN X-SECTION     194
LIBRARY TAPE PREPARATION     PW    1604   F63    RS        L $ CSP2A, SN X-SECTION    193
LIBRARY UTILITY PROGRAM        AI    7094   F+FAP RS   L   T M $ MCMUS, X-SECTION      159
LIBRARY UTILITY ROUTINE       ANL   3600   F63    RSBP    T M $ XLIBIT, X-SECTION    181
LIBRARY UTILITY ROUTINE   AI    360   F4     RSB L   T M $ CLIP, FORM OR THREDES      271
LIBRARY, 30-GP ENDF/B SCAT KERNELS     DP    360   BCD    R    LX T Z $ THERMOS        543
LIFETIME ANALYSIS          ANL   3600   F36    RSBP    I $ SWELL2, FUEL ELEMENT     353
LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR      ANL    360   F4     RS P    T I $      460
LINEAR ELASTIC STRUCTURAL DYNAMICS       BAPL 6600   F4     RS P    T I $ MO266,      383
LINEAR ELASTIC SYSTEMS BAPL 6600   F4     RS P    T I $ MO552, DYNAMIC ANALYSIS      283
LINEARLY-CONSTRAINED OPTIMIZATION        ORNL   360   F4     RS P      P $ KEELE,      556
LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM    CHI   1108   F4     RS P    T H $      299
LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM    KAPL 6600   F+ASC RS P    T H $      299
LIPRECAN1, MC NEUTRON PENETRATION CALCULATION  DAC   7090   F2     RSBP      J $      123
LIQUID BLOWDOWN ANALYSIS LOFT    UGA    360   F4     RS P      G $ WATER-HAMMER,      278
LIQUID-FILLED PIPING SYSTEM ANALYSIS     KE    3600B F36    RSBP      G $ WHAM,        278
LISTS UHTREX   LASL 7090   F+FAP RS P      I $ WIREX, COMPUTER-PRODUCED WIRING        315
LITHE,HELP, CRITICAL ANALYSIS SYSTEM     DP    360   F+BAL RS P XCT B $ HAMMER,        277
LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION  KAPL 6600   F+ASC RS P    T P $      445
LLL  6600   F4     RS P      P $ GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER        592
LMFBR POWER EXCURSION DISASSEMBLY   ANL    360   F4     RS P XCT F $ VENUS, 2-D      511
LMFBR ROD BUNDLE     NED    635   F4     RS P    T H $ VELVET2, TURBULENT FLOW IN   458
LOAD   GGA   7044   F4     RSBP   CT I $ SAFE-PORS, STRESS ANALYSIS AXISYMMETRIC      250
LOAD   BAPL 6600   F4     RS P    T I $ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM     282
LOAD   SR    360   F4     RS P    T I $ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM     282
LOAD   WTSC 6600B F4     RS P    T I $ SEAL SHELL, SHELL STRESS ANALYSIS AXISYM     282
LOAD GGA   7044   F4     RS P    T I $ SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC    251
LOCA         ANC    360   F4     RSBP X T G $ THETA1-B, FUEL ROD THERMAL RESPONSE    512
LOCA ANALYSIS DUKE POWER MCGUIRE UNITS DUCO   635   F4     RS        G $ ANVENT,      529
LOCA FISSION PRODUCT RELEASE ANALYSIS   BCL   6400   F4     RS P      G $ FRCRL2,      500
LOCA ROD BUNDLE CHF DATA ANALYSIS        ANC    360   F4     RS PL CT M $ ERREST,     518
LOFT    KE    7094   F+MAP RSBP    T G $ SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS       200
LOFT    UGA   360   *F4     RS P      G $ WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS       278
LOSS-OF-COOLANT & EMERGENCY COOLING      BCL   6400   F4     RS P    T G $ ECCSA4,    330
LOSS-OF-COOLANT ACCIDENT ANALYSIS        BAPL 6600   F4     RS P    T G $ FLASH3,    295
LOSS-OF-COOLANT ACCIDENT ANALYSIS   BAPL 6600   F4     RS P    T G $ MO555,ACT1,        284
LOSS-OF-COOLANT THERMAL ANALYSIS   BCL   6400   F4     RS P    T G $ NURLOC-1.0,        328
LRL   709   F2     RS        C $ FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY          7
LRL   7090   F+FAP RS P    T B $ SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS         160
LRL   7090   F2     RS P      F $ CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE       129
LRL   7094   F+FAP RS PL   T M $ ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY              351
LRL   7094   F2     RS P      P $ EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES       321
LUMPED MASS    LASL 7030   F4     RS      T H $ RATH, 2- OR 3-D HEAT CONDUCTION       242
LUMPED MASS    LASL 7094   FAP    RS P    T H $ RATH, 2- OR 3-D HEAT CONDUCTION       242
LWBR FUEL SWELLING TEMPERATURE STUDY     BAPL 6600   F4     RS P    T H $ FIGRO,     272
LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION ORNL 7090   F2     RS        A $      381
MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY    ANL   3600   F63    RSBPL   T J $      143
MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY    BNW   7090   F2     RSBPL   T J $      143
MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE  ANL   3600   F36    RS P X T C $      262
MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE  PURD 6500   F4     RS PLX T C $      262
MACS LATTICE VIBRATION NEUTRON SCATTRING CODES ANC    360   F4     RS P   CT W $     574
MAD   RSB      O $ BURP1, DETECTOR EFFICIENCY POINT SOURCE        UM    7090          164
MAD   RSB      O $ BURP2, DETECTOR EFFICIENCY DISK SOURCE         UM    7090          165
```

MAD RSB O $ BURP3, DETECTOR EFFICIENCY POINT SOURCE UM 7090 166
MAD RSB O $ BURP4, GAMMA-RAY PHOTOFRACTION SOLID CRYSTAL UM 7090 169
MAD RSB O $ BURP5, GAMMA-RAY PHOTOFRACTION WELL CRYSTAL UM 7090 170
MAGIC, MC**2 LIBRARY SERVICE ROUTINES ANL 3600 36F RSBP T M $ MERMC2, 472
MAGNETIC NETWORK SOLUTION BAPL 6600B F4 RS P T I $ MANE1, RECTANGULAR 412
MAINTENANCE ANL 360 F4 RS M $ MERMC2, MC**2 BINARY LIBRARY TAPE 472
MAINTENANCE NED 635 F4 RS P T M $ TROUT, MUG MULTIGROUP XSEC LIBRARY 493
MAINTENANCE NED 1108 F5 RS P T M $ TROUT, MUG MULTIGROUP XSEC LIBRARY 493
MANAGEMENT NED 635 F4 RS P T D $ FUMBLE, FAST REACTOR FUEL BURNUP & 480
MANAGEMENT SYSTEM ALOO 360 COBOL RS P M $ AEC-ALO FAU, RADIO FREQUENCY 587
MANAGEMENT, EDITING, & ANALYSIS BAPL 6600 F4 RS P T M $ SHLOG, DATA 557
MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION BAPL 6600B F4 RS P T I $ 412
MANIPULATION ANL 360 F4 RSBPL CT L $ ARC-XSEC1, MICROSCOPIC X-SECTION 594
MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS NEC 635 F4 RS P T H $ 256
MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS WARD 6600 F4 RS P T H $ 256
MANUFACTURING REQUIREMENTS GEPI GETS BASIC R M $ MAPPER, PREDICTING 595
MAPPER, PREDICTING MANUFACTURING REQUIREMENTS GEPI GETS BASIC R M $ 595
MARKOV SIMULATION OF REACTOR OPN DP 360 F4 RS P G $ INTEG,INSPEC, 590
MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY APDA 7094 F4 RS P F $ 293
MASS LASL 7030 F4 RS T H $ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED 242
MASS LASL 7094 FAP RS P T H $ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED 242
MASS MATRIX GENERATION BAPL 6600 F+COM RS P H $ HYMAS, HYDRODYNAMIC 560
MATERIAL GEC 7090 FAP RSBP X T Q $ SPECTRA, MC CALCULATION IRRADIATED 422
MATERIAL BUCKLING CYL FUEL ELEMENTS AEB 360 F4 RS P B $ WELWING, 362
MATERIALS LASL 6600 F4 RS P T A $ TOR, THERMAL SCATTERING CRYSTALLINE 360
MATRICES AGC 7090 F2 RS P T B $ AGN-SIGMA, CALC OF MULTI-GP TRANSFER 243
MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 360 F4 RSB XCT P $ EISPACK, 534
MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 635 F4 RS X T P $ EISPACK, 534
MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 1108 F4 RS X T P $ EISPACK, 534
MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL 6600 F4 RS X T P $ EISPACK, 534
MATRIX GENERATION BAPL 6600 F+COM RS P H $ HYMAS, HYDRODYNAMIC MASS 560
MATRIX GENERATION FOR A SYSTEM OF BEAMS KAPL 6600 F4 RS P I $ STEM, 337
MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS BAPL 6600 F+COM RS P X T I $ 597
MAXIMUM MOMENT CALC AI 7090 F+FAP RS T I $ 4RESTRAINT PIPE STRESS, 109
MAXIMUM YIELD FROM REACTION OR DECAY ORNL 1604 F63 RS P D $ ISOTOPES, 179
MC ORNL 360 F+BAL RS P T B $ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES 392
MC ORNL 7090 F+FAP RS P T B $ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES 392
MC CALCULATION IRRADIATED MATERIAL GEC 7090 FAP RSBP X T Q $ SPECTRA, 422
MC NEUTRON PENETRATION CALCULATION DAC 7090 F2 RSPP J $ LIPRECAN1, 123
MC NEUTRON, GAMMA-RAY HISTORIES PW 1604 F+COP RS P X T B $ FMC-N,FMC-G, 155
MC**2 BINARY LIBRARY TAPE MAINTENANCE ANL 360 F4 RS M $ MERMC2, 472
MC**2 DATA CONVERSION ANL 360 F4 RS P CT M $ ETOE, ENDF/B TO 350
MC**2 DATA CONVERSION APDA 3600 ASAF4 RS P T M $ ETOE, ENDF/B TO 350
MC**2 LIBRARY SERVICE ROUTINES ANL 3600 36F RSBP T M $ MERMC2,MAGIC, 472
MC**2, ENDF MULTIGROUP X-SECTION CALCULATION ANL 360 F4 RS P CT B $ 355
MC**2, ENDF MULTIGROUP X-SECTION CALCULATION ANL 3600 F36 RS P T B $ 355
MCGUIRE UNITS DUCO 635 F4 RS G $ ANVENT, LOCA ANALYSIS DUKE POWER 529
MCS, MONTE CARLO NEUTRON PENETRATION STUDY LASL 7090 FLOCO RS P B $ 202
MEASUREMENT ANALYSIS GEC 635 F4 RSBP O $ MICHRD, MICROHARDNESS 421
MEASUREMENTS GGA 1108 F4 RS P T A $ TACASI, ANALYSIS OF RESONANCE 410
MEDIA TLD CORRECTION CALC AI 360 F4 RS P T Q $ RESPOND, DISSIMILAR 566
MEDIUM SPECTRUM X-SECTIONS AI 7090 F+FAP RS L T B $ QUICKIE, INFINITE 119
MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE ANL 360 F4 RS M $ 472
MERMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES ANL 3600 36F RSBP T M $ 472
MESH GGA 1108 F4 RS P T C $ GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z 380
MESH GGA 1108 F+BAL RS P T C $ GANTRI, 2-D MULTIGP DIFFUSION TRIANGULAR 401
MESH COLLAPSING TRW 6500 F4 RS P R $ PARTI, OPTIMAL GROUP OR 416
MESH TRANSPORT PROGRAM LASL 360 F4 RSBP CT C $ TRIPLET, 2-D TRIANGULAR 608
MESH TRANSPORT PROGRAM LASL 6600 F4 RS P T C $ TRIPLET, 2-D TRIANGULAR 608
MESH TRANSPORT PROGRAM LASL 7600 F4 RS P T C $ TRIPLET, 2-D TRIANGULAR 608
METALLIC FISSION PRODUCT RELEASE GGA 1108 F4 RS P D $ FREVAP6, HTGR 301
METALS GEC 635 F+FAP RSBP T Q $ CASCADE,CLUSTER, RADIATION DAMAGE IN 419
MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE PW 1604 LAG1 RS P C $ 211
MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS GEC 635 F4 RSBP O $ 421

```
MICROHARDNESS MEASUREMENT ANALYSIS      GEC   635  F4     RSBP      O $ MICHRD,     421
MICROSCOPIC X-SECTION MANIPULATION  ANL   360  F4     RSBPL CT L $ ARC-XSEC1,     594
MIRAB,MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL BCL  6400  F4     RS P      G $ MIRAB,  499
MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL BCL  6400  F4     RS P      G $ MIRAB,  499
MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS ANL  3600  F36    RSBP      A $     214
MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM PDCO 7090  F2     RS P      C $      59
MIT   360  F4     RS P     T I $ SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS     402
MIT   360B F+BAL RSBP     T D $ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION       336
MIT  7090  F2     RS P      P $ FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS     324
MIX KAPL 6600  F4     RS P      H $ RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER     382
ML-1 FLUID FLOW EXPERIMENT ANALYSIS     AGC  7090  F2     RS P      O $ CROC90,     154
MLMO  360  F+C+R RSBP     T M $ RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING    603
MODE   BAPL 6600  F4     RS P      P $ REL01, RELIABILITY FOR A SINGLE FAILURE     497
MODE FAST REACTOR X-SEC CALC BNW  1108  F4     RS P     T B $ FCC4, FUNDAMENTAL     306
MODERATOR GGA  1108  F4     RS P      A $ GAKER, INELASTIC SCAT X-SECTION CALC      289
MODERATOR SPACE CHORD DIST FUNCT    AEG  7090  F2     RS        B $ DANCOFF JR,     150
MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0 CDC  7600  F4     RS      T P $ MODEL,      478
MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2 CDC  6600C F+COM RS      T P $ MODEL,      478
MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3 CDC  6600D F+COM RS      T P $ MODEL,      478
MODULAR DOCUMENT INFORMATION SYSTEM     KAPL 6600  F      R B    T M $ TIGIR2,     403
MODULAR PROGRAMMING AND DATA SYSTEM  KAPL 6600  F+COM RSB     T M $ DATATRAN,     386
MODULE    ANL   360  F4     RSBP  CT L $ ARC-NUI002, BCD INPUT DATA PROCESSING      533
MODULES     ANL   360  F+BAL RS P  CT M $ ARC-SYSTEM, SYSTEM SUBPROGRAMS AND        522
MODULES   DP    360  F+BAL  S    X T B $ RAHAB, JOSHUA SYSTEM LATTICE PHYSICS       536
MODULES, 2-D + 3-D PLOTTING   KAPL 6600  F+ASC RS P    T P $ DATATRAN UTILITY      407
MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN NPGS  360  F4     RS P X T E $      491
MOLTEN FUEL TUBE BUNDLES  LASL 7094  F2     RSBP      H $ AXFLU, HEAT TRANSFER      182
MOMENT CALC    AI   7090  F+FAP RS      T I $ 4RESTRAINT PIPE STRESS, MAXIMUM       109
MOMUS, X-SECTION LIBRARY UTILITY PROGRAM        AI   7094  F+FAP RS  L   T M $      159
MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH  ANC   360  F4     RSBP  CT C $        582
MONTE CARLO CALC NEUTRON HISTORIES      GGA  7044  F4     RS P    T B $ FMC-N,      195
MONTE CARLO CELL CALCULATION   AI    360  F+BAL RS P X T B $ HWOCR-SAFE, 2-D         307
MONTE CARLO CRITICAL ASSEMBLY ANALYSIS   AI   7600  F4     RS PLX T C $ VIM1,        510
MONTE CARLO CRITICAL ASSEMBLY ANALYSIS  AI-A  360  F4     RSBPL CT C $ VIM1X,       510
MONTE CARLO MULTIGROUP CRITICALITY CODE  CRNL  360  F+BAL RSBPL CT C $ KENO,        450
MONTE CARLO MULTIGROUP CRITICALITY CODE RFD  6600  F+COM RS P    T C $ KENO2,      450
MONTE CARLO NEUTRON PENETRATION STUDY     LASL 7090  FLOCO RS P      B $ MCS,       202
MONTE CARLO REACTOR ANALYSIS CALCULATION  CRNL  360  F+BAL RSBPL CT C $ ESP,        523
MONTE CARLO SLOWING-DOWN DENSITY CALC  AI   7094  F+FAP RS PL  T B $ TYCHE3,        149
MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY  AI   7090  F2     RS        J $      142
MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME   KAPL 6600  F4     RS P      P $      446
MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC       ANC   360  F4     RSBP XCT H $      551
MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC       ANC  1108  F4     RS P    T H $     551
MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC    ANL   360  F4     RS P  CT W $      575
MSS   360  F4     RS P      H $ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW          246
MSS   360  F4     RS P  CT C $ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION        167
MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC   BCL  6400  F4     RS P X T G $      508
MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC   BCL  6400  F4     RS P X T G $ MUCHA1,      508
MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION    CRNL 7090  F4     RSBP      A $     323
MUFT FORMAT X-SECTIONS WAPD 6600  F4     RS P    T B $ ETOM1, ENDF/B FORMAT TO     436
MUFT, GAM, ANISN X-SEC FORMAT WAPD 6600  F4     RS PL   T B $ ETOG1, ENDF/B TO    437
MUFT, GAM, ANISN X-SEC FORMAT WAPD 7600  F4     RS P    T B $ ETOG3, ENDF/B TO    538
MUFT4 OR 5, GAM1 OR 2    WAPD 6600  BCD   R   L  T Z $ ETOG1 DATA LIBRARIES,       447
MUG MULTIGROUP XSEC LIBRARY MAINTENANCE NED   635  F4     RS P    T M $ TROUT,      493
MUG MULTIGROUP XSEC LIBRARY MAINTENANCE NEC  1108  F5     RS P    T M $ TROUT,      493
MULTI-CHANNEL 2-D 2-PHASE FLOW     AI   7094  F2     RS P      H $ FLOW-MODEL,       246
MULTI-CHANNEL 2-D 2-PHASE FLOW     MSS   360  F4     RS P      H $ FLOW-MODEL,       246
MULTI-GP CONSTANT & FAST SPECTRA CALC   ANC   360  F4     RS PLXCT B $ PHROG,       520
MULTI-GP CONSTANT CALC  AGC  7090  F+FAP RSBPLX T B $ AGN-GAM, FAST SPECTRUM        204
MULTI-GP CONSTANT CALC 0 TO 10 MEV     BC    625  F4     RS PLX T B $ GAMTEC2,     185
MULTI-GP CONSTANT CALC 0 TO 10 MEV     BNW  1107  F4     RS PL   T B $ GAMTEC2,    185
MULTI-GP CONSTANT CALC 0 TO 10 MEV     BNW  7090  F+FAP RS PL  T B $ GAMTEC2,       185
MULTI-GP CONSTANT CALC 0 TO 10 MEV     UVA  6400  F4     RS PLX T B $ GAMTEC2,     185
MULTI-GP CONSTANTS   ANC   360  F4     RS PL CT B $ INCITE, THERMAL SPECTRA &      565
```

```
MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX  HECL 1108B F4    RS P X T B $ ETOX3,     388
MULTI-GP DIFFUSION     UMCC  360  F4     RS P   T C $ VARI-QUIR, TIME-DEP 2-D   212
MULTI-GP DIFFUSION     WANL 6600  F4     RS P   T C $ VARI-QUIR, TIME-DEP 2-D   212
MULTI-GP DIFFUSION + LIB   AI    360  F4     RSBPLX T C $ CAESAR4,LIBLST, 1-D   270
MULTI-GP DIFFUSION DEPLETION CODE CRNL 7090  F+FAP RS P   T C $ ASSAULT, 2-D    240
MULTI-GP DIFFUSION PROGRAM   AAEC  360  F+BAL RS P   T C $ CRAM, 1-D AND 2-D    103
MULTI-GP DIFFUSION PROGRAM   CRNL 7090  F+FAP RS P   T C $ EXTERMINATOR, 2-D    156
MULTI-GP DIFFUSION PROGRAM   UK-R 7090  F+FAP RSBPL  T C $ CRAM, 1-D AND 2-D    103
MULTI-GP DIFFUSION PROGRAM   BC    625  F4     RS      T C $ EXTERMINATOR2, 2-D  156
MULTI-GP DIFFUSION PROGRAM   CF   6600  F4     RS P   T C $ EXTERMINATOR2, 2-D   156
MULTI-GP DIFFUSION PROGRAM   ORNL  360  F4     RS P   T C $ EXTERMINATOR2, 2-D   156
MULTI-GP DIFFUSION SLAB CYL SPHERE    BNW  1107  F4     RS P   T C $ HFN, 1-D     241
MULTI-GP DIFFUSION SLAB CYL SPHERE    AI   7090  F+FAP RS  L  T C $ FAIM, 1-D     120
MULTI-GP DIFFUSION SLAB CYL SPHERE    AI   7090  F+FAP RS PL  T C $ AIM6, 1-D      29
MULTI-GP DIFFUSION SLAB CYL SPHERE    CDC  1604  F63   RS PL  T C $ AIM6, 1-D      29
MULTI-GP DIFFUSION SLAB CYL SPHERE    CDC  1604  F63   RS PLX T C $ FAIM, 1-D     120
MULTI-GP DIFFUSION SLAB CYL SPHERE    OSUC  370  F4    RS PL CT C $ AIM6, 1-D      29
MULTI-GP DIFFUSION SLAB CYL SPHERE  AI   7090  F+FAP RS  L  T C $ ULCER, 1-D     118
MULTI-GP DIFFUSION SLAB CYL SPHERE  ANL  3600  F36   RS P X T C $ MACH1, 1-D     262
MULTI-GP DIFFUSION SLAB CYL SPHERE  PURD 6500  F4    RS PLX T C $ MACH1, 1-D     262
MULTI-GP DIFFUSION SLAB CYL SPHERE BHSC  360  F4    RS P   T C $ FAIMCS, 1-D     120
MULTI-GP DIFFUSION SYNTHESIS CALC   NED   635  F4    RS PL  T C $ BISYN, 2-D     287
MULTI-GP DIFFUSION SYNTHESIS CALC   NED  1108  F4    RS P   T C $ BISYN, 2-D     287
MULTI-GP DIFFUSION XY RZ GEOMETRY GGA  1108  F+BAL RS P   T C $ GAMBLE5, 2-D     222
MULTI-GP DIFFUSION XY RZ GEOMETRY GGA  7044  F+MAP RSBP   T C $ GAMBLE4, 2-D     222
MULTI-GP DIFFUSION XY RZ RTH   WANL 7094  F4    RS P X T C $ VARI-QUIR3, 2-D     264
MULTI-GP DISCRETE ORDINATE CALC       AI   7090  F2    RS PLX T C $ DTF2, 1-D     151
MULTI-GP DISCRETE ORDINATE CALC       AI    360  F4    RSBPLX T C $ ANISN, 1-D    151
MULTI-GP DISCRETE ORDINATE CALC  ANL  360C  F36   RS P   T C $ SNARG-1D, 1-D     288
MULTI-GP DISCRETE ORDINATE CODE        GGA  1108  F5    RS P   T C $ 2DF, 2-D      173
MULTI-GP DISCRETE ORDINATE CODE        UNC  1604  F63   RS      C $ 2DF, 2-D      173
MULTI-GP DISCRETE ORDINATE PROGRAM    ANL   360  F+BAL RS P   T C $ DTF4, 1-D     209
MULTI-GP DISCRETE ORDINATE PROGRAM    BC    625  F+MAP RS P   T C $ DTF4, 1-D     209
MULTI-GP DISCRETE ORDINATE PROGRAM    LASL 6600  F4    RS P   T C $ DTF4, 1-D     209
MULTI-GP DISCRETE ORDINATE PROGRAM    LASL 7030  F4    RS P   T C $ DTF4, 1-D     209
MULTI-GP DISCRETE ORDINATE PROGRAM    LER  7094  F4    RS P   T C $ DTF4, 1-D     209
MULTI-GP DOUBLE SN APPROX      BNW  7090  FLOCO RSBP   T C $ GE-HAPO-S13, 1-D     75
MULTI-GP DTF4 WITH DEPLETION      LASL 7030  F4    RS P   T D $ DTF-BURN, 1-D     269
MULTI-GP FLUX SYNTHESIS PROGRAM CYL PW   1604  F63   RS      T C $ 2DXYL, 3-D     192
MULTI-GP SN APPROX SLAB CYL SPHERE  PW   1604  LAG1  RS P     C $ MGDSN, 1-D     211
MULTI-GP SN APPROX SLAB CYL SPHERE  UK-W 7090  F2    RS P   T C $ W-DSN, 1-D     132
MULTI-GP SN APPROXIMATION RZ  PW   1604  F63   RS P   T C $ FORTRAN TOC, 2-D     161
MULTI-GP SN APPROXIMATION XY GEOM     AGC  7090  FLOCO RSBP     C $ 2DXY, 2-D      18
MULTI-GP TRANSFER COEFFICIENTS   LRL  7090  F+FAP RS P   T B $ SOPHIST1/2/5,     160
MULTI-GP TRANSFER MATRICES  AGC  7090  F2    RS P   T B $ AGN-SIGMA, CALC OF     243
MULTI-GP TRANSPORT XY RZ RTHETA  LASL  360B F4    RS P   CT C $ TWOTRAN2, 2-D     358
MULTI-GP TRANSPORT XY RZ RTHETA  LASL 660CB F4    RS P   T C $ TWOTRAN2, 2-D      358
MULTI-GP TRANSPORT XY RZ RTHETA  LASL 7600B F4    RS P   T C $ TWOTRAN2, 2-D      358
MULTI-GP X-SECTIONS   LASL 7090  FLOCO RS P     B $ ZOT, GROUP-COLLAPSING OF     113
MULTI-GP X-SECTIONS FAST THERMAL SPECTRA GGA  1108  F4    RS PLX T B $ GGC4,      298
MULTI-GP X-SECTIONS FAST THERMAL SPECTRA GGA  6600  F4    RS  L  T B $ GGC4,      298
MULTI-LEVEL CONVOLUTION   PPCO 7040  F+MAF RS P     A $ COMBCC, COMBINED B-W      203
MULTI-LEVEL RESONANCE THEORY XSEC CALC  KAPL 6600  F4    RS P     A $ MULTI,      535
MULTI-PIN FUEL ELEMENT    AGC  7090  F2    RS P     B $ BOUNCE, FLUX DIST IN      237
MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC  KAPL 6600  F4    RS P     A $      535
MULTIANCHOR PIPE SYSTEM  AI    360  F4    RS P  CT I $ PSA2, STRESS ANALYSIS     542
MULTIDIMENSIONAL OPTIMIZATION SCHEME   KAPL 6600  F4    RS P     P $ MOST, A     446
MULTIGP  CRNL  360G F4    RS P   T K $ CITATION, 1,2,3-D DIFFUSION DEPLETION     387
MULTIGP CONSTANTS BNW  1108  F4    RS PLX T B $ HRG3, SLOWING-DOWN SPECTRUM,      467
MULTIGP CONSTANTS TVA  360  F4    RS PLX T B $ HRG3, SLOWING-DOWN SPECTRUM,      467
MULTIGP DIFF & 1GP DEPLETION NED  635  F+GMP RS P   T D $ SYN, 2D SYNTHESIS      495
MULTIGP DIFFUSION TRIANGULAR MESH  GGA  1108  F+BAL RS P   T C $ GAMTRI, 2-D     401
MULTIGP DIFFUSION+BURNUP TRI-MESH  GGA  1108  F+BAL RS P   T D $ BUGTRI, 2-D     439
MULTIGP KINETICS WITH TEMP FEEDBACK GGA  1108  F4    RS P   T F $ GAKIT, 1-D     370
```

```
MULTIGROUP                                                                    NED

MULTIGROUP CONSTANTS  ORNL  360  F4    RS PLX T B $ XSDRN, DISCRETE ORDINATE    393
MULTIGROUP CONSTANTS FROM ENDF/B DATA GESV  635  F+GMP RS P XCT B $ ENDRUN2,    501
MULTIGROUP CRITICALITY CODE  ORNL  360  F+BAL RSBPL CT C $ KENO, MONTE CARLO   450
MULTIGROUP CRITICALITY CODE RFD  6600  F+COM RS P   T C $ KENO2, MONTE CARLO   450
MULTIGROUP DIFFUSION & BURNUP XY, RZ GGA  1108  F+BAL RS P   T D $ BUG2, 2-D   438
MULTIGROUP DIFFUSION & SN THEORY   NED   635  F4    RS P   T C $ DOT2DB, 2-D   459
MULTIGROUP DIFFUSION AND DEPLETION    ANL  3600  F4    RSBP   T D $ 2DB, 2-D   325
MULTIGROUP DIFFUSION AND DEPLETION    BNW  1108  F4    RS P   T D $ 2DB, 2-D   325
MULTIGROUP DIFFUSION AND DEPLETION    LASL 6600  F4    RS P   T D $ 2DB, 2-D   325
MULTIGROUP DIFFUSION AND DEPLETION GGA  1108  F4    RS P   T D $ FEVER7, 1-D   318
MULTIGROUP DIFFUSION BURNUP ANALYSIS  ANL   360  F4    RS P   CT D $ 3DB, 3-D   567
MULTIGROUP DIFFUSION BURNUP ANALYSIS  HEDL 1108  F4    RS P   T D $ 3DB, 3-D   567
MULTIGROUP DIFFUSION DEPLETION     AI    360  F4    RSBP X T D $ SIZZLE, 1-D    58
MULTIGROUP DIFFUSION DEPLETION     AI    7090  F2    RS  L  T D $ SIZZLE, 1-D    58
MULTIGROUP DIFFUSION DEPLETION     CDC  1604  F63   RS  L  T D $ SIZZLE, 1-D    58
MULTIGROUP DIFFUSION SLAB, CYL, SPH  ANC   360  F4    RSBP  CT C $ MONA, 1-D   582
MULTIGROUP DIFFUSION SLAB, SPH, CYL GGA  1108  F+BAL RS P   T C $ GAZE2, 1-D   430
MULTIGROUP DIFFUSION XYZ R-THETA-Z   LASL 6600  F4    RS P   T C $ 3DDT, 3-D   463
MULTIGROUP DISCRETE ORDINATE CALC     UNC  1604  F63   RS PL  T C $ DTF, 1-D   144
MULTIGROUP DISCRETE ORDINATE PROGRAM LER  7090  F+MAP RS P   T C $ TDSN, 2-D   312
MULTIGROUP LIBRARIES FROM ENDF/B  ORNL  360  F4    RSBP XCT B $ XLACS, XSDRN   572
MULTIGROUP REACTOR KINETICS PROGRAM  ORNL  360  F4    RS P XCT F $ TASK, 1-D   558
MULTIGROUP SLAB GEOMETRY    ANL  3600  F63   RSBPL  T J $ MAC, SHIELD DESIGN   143
MULTIGROUP SLAB GEOMETRY    BNW  7090  F2    RSBPL  T J $ MAC, SHIELD DESIGN   143
MULTIGROUP TIME-DEPENDENT DIFFUSION GGA  1108  F4    RS P   T F $ GAKIN, 1-D   310
MULTIGROUP X-SECTION CALCULATION   ANL   360  F4    RS P  CT B $ MC**2, ENDF   355
MULTIGROUP X-SECTION CALCULATION   ANL  3600  F36   RS P   T B $ MC**2, ENDF   355
MULTIGROUP XSEC LIBRARY MAINTENANCE NED   635  F4    RS P   T M $ TROUT, MUG   493
MULTIGROUP XSEC LIBRARY MAINTENANCE NED  1108  F5    RS P   T M $ TROUT, MUG   493
MULTILEVEL B-W X-SEC CALC    BNL  6600  F4    RS P     A $ SIGPLOT, RESOLVED   377
MULTIPLE CHANNEL ANALYSIS ECC   BCL  6400  F4    RS P X T G $ MUCHA1,MUCHA2,   508
MULTIPLE SCATTERING CALC    ANL   360  F4    RS P  CT W $ MSCAT, SLOW NEUTRON 575
MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM GGA  1108  F4    RS P   T J $   259
MVT REMOTE JOB ENTRY SYSTEM   ANC   360  BAL   RSB   T P $ NRTS-RJE, OS/360   519
M0102, POINT DEPLETION FISSION PRODUCT  BAPL 6600  F4    RS P     D $ CINDER,  313
M0102, POINT DEPLETION FISSION PRODUCT  CP   360  F+BAL RS P   T D $ CINDER,   313
M0219, PWR FLOW TRANSIENT ANALYSIS        BAPL 6600  F4    RS P   T H $ FLOT1,  331
M0266, LINEAR ELASTIC STRUCTURAL DYNAMICS      BAPL 6600  F4    RS P   T I $   383
M0457,PIPE, ELASTIC STRESS OF PIPING SYSTEM    BAPL 6600  F4    RS P   T I $   329
M0552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS BAPL 6600  F4    RS P   T I $   283
M0555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS  BAPL 6600  F4    RS P   T G $   284
M0626, POLYNOMIAL CURVE FITTING    BAPL 6600  F4    RS P   T P $ M0661,M0657,  411
M0648, 1-D SLAB TRANSPORT WITH SLOWING DOWN    BAPL 6600  F4    RS     T C $   342
M0657,M0626, POLYNOMIAL CURVE FITTING    BAPL 6600  F4    RS P   T P $ M0661,  411
M0661,M0657,M0626, POLYNOMIAL CURVE FITTING    BAPL 6600  F4    RS P   T P $   411
M0756,LETC, 1-D SLAB GAMMA-RAY TRANSPORT       BAPL 6600  F4    RS P   T J $   343
M0807, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS BAPL 6600  F4    RS     T B $   280
M0899,HOH, STEAM TABLES 14.5-2538 PSIA         ANL  1604  F63   RS P     H $   294
M0899,HOH, STEAM TABLES 14.5-2538 PSIA         BAPL 6600  F4    RS P   T H $   294
NAP, NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY   ITTR 7094  F4    RSBPLX T D $   314
NEARREX, COMPOUND NUCLEUS X-SECTION CALC       ANL  3600  F63   RSBP      A $   171
NED   635  F+GMP RS      T P $ GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.   515
NED   635  F+GMP RS P    T D $ SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION  495
NED   635  F4    RS P      D $ RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS      372
NED   635  F4    RS P    T B $ REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS  257
NED   635  F4    RS P    T C $ DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY    459
NED   635  F4    RS P    T C $ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION    167
NED   635  F4    RS P    T D $ FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT   480
NED   635  F4    RS P    T G $ FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS    479
NED   635  F4    RS P    T H $ MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS  256
NED   635  F4    RS P    T H $ VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE     458
NED   635  F4    RS P    T M $ TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE  493
NED   635  F4    RS P    T O $ BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS  311
NED   635  F4    RS P    T O $ EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA    258
```

```
NED   635  F4     RS P  X T F $ FORE2, FAST REACTOR EXCURSION CALCULATIONS          174
NED   635  F4     RS PL   T C $ BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC        287
NED  1108  F4     RS P    T C $ BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC        287
NED  1108  F5     RS P    T M $ TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE      493
NED  2000  F2     RS P      A $ COPIE, RESOLVED RESONANCE X-SECTION CALC            177
NED  2000  F2     RS P      A $ RAPTURE, RESONANCE INTEGRAL X-SECTION CALC          176
NED  2000  F2     RS P      B $ SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS          178
NED  2000  F4     RS P    T F $ FORE, FAST REACTOR EXCURSION CALCULATIONS           174
NED  7094  F+FAP  RS P    T B $ EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION      201
NETWORK SOLUTION    BAPL 6600B F4     RS P    T I $ MANE1, RECTANGULAR MAGNETIC     412
NEUTRON AGE CALCULATION OF ENDF/B DATA  BAPL 6600  F4     RS P    T B $ EPOCH,      461
NEUTRON DATA LIBRARY        LRL   7094  F+FAP RS PL   T M $ ECSIL, EXPERIMENTAL      351
NEUTRON FLUX-DOSIMETER ACTIVITY RELATION  GEC   635  F4     RSBP      D $ DOS,       423
NEUTRON HISTORIES       GGA  7044  F4     RS P    T B $ FMC-N, MONTE CARLO CALC     195
NEUTRON MULTIPLE SCATTERING CALC   ANL   360  F4     RS P   CT W $ MSCAT, SLOW       575
NEUTRON PENETRATION CALCULATION  DAC  7090  F2     RSBP      J $ LIPRECAN1, MC       123
NEUTRON PENETRATION STUDY     LASL 7090  FLOCO RS P     B $ MCS, MONTE CARLO          202
NEUTRON POLARIZATION EXPERIMENT     UCND  360B F+BAL RS P     O $ PMS1, FAST          469
NEUTRON SCATTRING CODES ANC   360  F4     RS P   CT W $ MACS LATTICE VIBRATION      574
NEUTRON SLOWING-DOWN NPGS  360  F4     RS P  X T E $ MOD5, STOCHASTIC MODEL OF       491
NEUTRON SOURCE DATA   NED   635  F4     RS P    T O $ EXPN, ANALYSIS OF PULSED        258
NEUTRON SOURCE DATA ANALYSIS   CNEA  360  F4     RS P      E $ TRIFIDC, PULSED     489
NEUTRON SPECTRUM X-SECTION CALC     AI   7090  F2     RS PL   T B $ FORM, FAST          51
NEUTRON SPECTRUM X-SECTION CALC     ANL  3600  F63    RS  LX T B $ GAM1, FAST           33
NEUTRON SPECTRUM X-SECTION CALC     CDC  1604  F63    RS PL   T B $ FORM, FAST          51
NEUTRON SPECTRUM X-SECTION CALC     CDC  1604  F63    RS PLX T B $ GAM1, FAST           33
NEUTRON SPECTRUM X-SECTION CALC     GGA  7090  F2     RS PLX T B $ GAM1, FAST           33
NEUTRON SPECTRUM X-SECTION CALC     OSUC  370  F4     RS PLXCT B $ FORM, FAST           51
NEUTRON SPECTRUM X-SECTIONS  AI   7090  F+FAP RS PL   T B $ TEMPEST2, THERMAL          50
NEUTRON SPECTRUM X-SECTIONS  BHSC  360  F4     RS PL   T B $ TEMPEST2, THERMAL          50
NEUTRON SPECTRUM X-SECTIONS  CDC  1604  F63    RS PL   T B $ TEMPEST2, THERMAL          50
NEUTRON X-SECTION CALCULATION    BAPL 660C  F4     RS P    T A $ SUMCR, S-WAVE       399
NEUTRON-HYDRODYNAMICS  APCA 7094  F2     RS P      F $ WEAK EXPLOSION, COUPLED     145
NEUTRON-INDUCED GAMMA-RAY RADIOACTIVITY    IITR 7094  F4     RSBPLX T D $ NAP,       314
NEUTRON, GAMMA-RAY HISTORIES   PW   1604  F+CDP RS P X T B $ FMC-N,FMC-G, MC         195
NEUTRONICS-HYDRODYNAMICS CODE AGC  7090  F2     RSB       F $ HATCHET, COUPLED        153
NEUTRONICS-HYDRODYNAMICS SPH   PW   1604  F63    RS B      F $ AX-TNT, COUPLED         191
NEUTRONICS-HYDRODYNAMICS SPHERE   CDC  3600  F63    RSBP      F $ AX1, COUPLED        102
NEUTRONICS-HYDRODYNAMICS SPHERE LRL  7090  F2     RS P      F $ CONEC, COUPLED          129
NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK BNL  6600  F4     RS P    T F $         405
NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES     BNW  1108  F5     RS P  X T F $         488
NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES     BNW  7090  F4     RS P    T F $         488
NON-SPHERICAL OPTICAL MODEL X-SECTIONS  AI   7094  F2     RS P    T A $ 2PLUS,        254
NON-SPHERICAL OPTICAL MODEL X-SECTIONS  ANL  3600  F63    RSBP    T A $ 2PLUS,        254
NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT  KAPL 6600  F+ASC RS P    T P $ SNEQ,         364
NONLINEAR DIFFERENTIAL EQNS. SOLUTION  KAPL 6600  F+ASC RS P    T P $ LIZARD,       445
NONLINEAR LEAST SQ LENS DESIGN SYSTEM LASL 6600  F+COM RS P    T P $ LENSDES,      602
NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK  BAPL 6600  F4     RS P    T F $         371
NPGS  360  F4     RS P X T E $ MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN        491
NPREFCOP, FUEL CYCLE COSTS PERFORMANCE DATA     KE   7090  F2     RSBP      D $         146
NPREFCOP, FUEL CYCLE COSTS PERFORMANCE DATA     UEC  6600  F4     RS P      D $         146
NRTS-RJE, CS/360 MVT REMOTE JOB ENTRY SYSTEM   ANC   360  BAL    RSB     T P $         519
NUCLEAR FUEL CYCLE COST AND ECONOMICS  CWE   360  F4     RS P    T C $ CINCAS,       354
NUCLEAR FUEL CYCLE COST AND ECONOMICS  WAPD 6600  F4     RS P    T D $ CINCAS,       354
NUCLEAR FUEL CYCLE ECONOMICS  UICS 360  F4     RS P   CT D $ GEM, ANALYSIS OF        576
NUCLEAR POWER PLANT COST CODE HEDL 1108  F5     RS P X T D $ PACTOLUS,CLOTHC,       540
NUCLEAR STATION ELECTRICITY COSTS     ORNL 1604  F63    RS P      D $ POWERCO,        340
NUCLEAR STATION ELECTRICITY COSTS     UEC  6600  F4     RS P      D $ POWERCO,        340
NUCLEUS REACTION      AI    360  F+BAL RS P    T A $ COMNUC,CASCADE, COMPOUND        482
NUCLEUS X-SECTION CALC      ANL  3600  F63    RSBP      A $ NEARREX, COMPOUND       171
NUCLIDE CHAIN EQUATIONS     ORNL 7090  F2     RSBP      D $ NUCY, SOLUTION OF       134
NUCLIDE DATA  BAPL 6600  F4     RS P    T P $ DAFT1, LEAST SQUARES FIT FISSILE      327
NUCLIDE X-SECTION EVALUATION   ORNL 7090  F4     RSBP      A $ MUFFLE, FISSILE         323
NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS     ORNL 7090  F2     RSBP      D $         134
```

```
NURLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS   BCL  6400  F4    RS P   T G $    328
CNE-GP SPACE-TIME DIFFUSION FEEDBACK BNL  6600  F4    RS P   T F $ NOAH, 1-D   405
OPN  OPPD 6400  F4     S P     H $ PWR-PPM, BORATION-DILUTION TABLES FOR PWR   552
OPN DP    360  F4    RS P     G $ INTEG,INSPEC, MARKOV SIMULATION OF REACTOR   590
OPPD 6400  F4     S P     H $ PWR-PPM, BORATION-DILUTION TABLES FOR PWR CPN   552
OPTICAL MODEL X-SECTIONS  AI   7094  F2    RS P   T A $ 2PLUS, NON-SPHERICAL   254
OPTICAL MODEL X-SECTIONS  ANL  3600  F63   RSBP   T A $ 2PLUS, NON-SPHERICAL   254
OPTIMAL GROUP OR MESH COLLAPSING        TRW  6500  F4    RS P     B $ PARTI,   416
OPTIMIZATION       ORNL  360  F4    RS P     P $ KEELE, LINEARLY-CONSTRAINED   556
OPTIMIZATION   AI   7090  F2    RS       I $ CROCK, SPACE POWER PLANT DESIGN   112
OPTIMIZATION   AI   7090  F2    RS       I $ SHOCK, SPACE POWER PLANT DESIGN   114
OPTIMIZATION DOSE CALC     AI   7094  F+FAP RS P     J $ SHOE, SHIELD WEIGHT   197
OPTIMIZATION SCHEME   KAPL 6600  F4    RS P     P $ MOST, A MULTIDIMENSIONAL   446
OPTIMIZATION STUDY    PW   1604  F63   RS       I $ WOPEXPRT, REACTOR WEIGHT   190
OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY  GGA  7044  F+MAP RS P   T D $   226
ORCOST, POWER PLANT CAPITAL COST ESTIMATING    ORNL  360  F4    RS P   T D $   588
ORDINARY DIFF EQNS   CRNL 6600  F4    RS P     P $ FORSIM, SOLN OF SYSTEM OF   514
ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER  LLL  6600  F4    RS P     P $ GEAR,   592
ORDINATE CALC      AI   7090  F2    RS PLX T C $ DTF2, 1-D MULTI-GP DISCRETE   151
ORDINATE CALC      AI    360  F4    RSBPLX T C $ ANISN, 1-D MULTI-GP DISCRETE   151
ORDINATE CALC      UNC  1604  F63   RS PL  T C $ DTF, 1-D MULTIGROUP DISCRETE   144
ORDINATE CALC  ANL  3600  F36    RS P   T C $ SNARG-1D, 1-D MULTI-GP DISCRETE   288
ORDINATE CODE      GGA  1108  F5    RS P   T C $ 2DF, 2-D MULTI-GP DISCRETE   173
ORDINATE CODE      UNC  1604  F63   RS       C $ 2DF, 2-D MULTI-GP DISCRETE   173
ORDINATE MULTIGROUP CONSTANTS  ORNL  360  F4    RS PLX T B $ XSDRN, DISCRETE   393
ORDINATE PROGRAM   ANL   360  F+BAL RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE   209
ORDINATE PROGRAM   BC    625  F+MAP RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE   209
ORDINATE PROGRAM   LASL 6600  F4    RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE   209
ORDINATE PROGRAM   LASL 7030  F4    RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE   209
ORDINATE PROGRAM   LER  7094  F4    RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE   209
ORDINATE PROGRAM LER  7090  F+MAP RS P   T C $ TDSN, 2-D MULTIGROUP DISCRETE   312
ORDINATES SLAB GEOMETRY  BAPL 6600  F4    RS P   T C $ BE21, FEW-GP DISCRETE   398
ORNL  360  F+BAL RS P     D $ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC   322
ORNL  360  F+BAL RS P   T B $ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC   392
ORNL  360  F+BAL RS P   T I $ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY   332
ORNL  360  F+BAL RSBPL CT C $ ESP, MONTE CARLO REACTOR ANALYSIS CALCULATION   523
ORNL  360  F+BAL RSBPL CT C $ KENO, MONTE CARLO MULTIGROUP CRITICALITY CODE   450
ORNL  360  F4    RS P     D $ ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA   413
ORNL  360  F4    RS P     P $ KEELE, LINEARLY-CONSTRAINED OPTIMIZATION   556
ORNL  360  F4    RS P   T A $ ATHENA4, INELASTIC SCATTERING FORM FACTORS   417
ORNL  360  F4    RS P   T B $ RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA   453
ORNL  360  F4    RS P   T B $ SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION   421
ORNL  360  F4    RS P   T C $ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM   156
ORNL  360  F4    RS P   T D $ ORCOST, POWER PLANT CAPITAL COST ESTIMATING   588
ORNL  360  F4    RS P   T H $ HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM   517
ORNL  360  F4    RS P  C  G $ STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE   583
ORNL  360  F4    RS P X T H $ ORTHIS,ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION   525
ORNL  360  F4    RS P XCT F $ TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM   558
ORNL  360  F4    RS PLX T B $ XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS   393
ORNL  360  F4    RSBP XCT B $ XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B   572
ORNL  360B F4    RS P   T M $ EDITOR, ENDF/B TAPE PROCESSING AND EDITING   502
ORNL  360B F4    RS P XCT D $ CONCEPT2, POWER PLANT CONCEPTUAL COST ESTIMATE   498
ORNL  360G F4    RS P   T K $ CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP   387
ORNL 1604  F2    RS P     H $ BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC   549
ORNL 1604  F63   RS P     A $ PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS   334
ORNL 1604  F63   RS P     A $ RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS   335
ORNL 1604  F63   RS P     D $ ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS   180
ORNL 1604  F63   RS P     D $ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC   322
ORNL 1604  F63   RS P     D $ ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY   179
ORNL 1604  F63   RS P     D $ POWERCO, NUCLEAR STATION ELECTRICITY COSTS   340
ORNL 1604  F63   RS P   T A $ JUPITOR1, COUPLED-CHANNEL X-SEC EVALUATION   308
ORNL 6600  F4    RS P   T M $ EDITOR, ENDF/B TAPE PROCESSING AND EDITING   502
ORNL 7090  F+FAP RS P   T B $ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC   392
ORNL 7090  F+FAP RS P   T C $ EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM   156
```

```
ORNL 7090  F+FAP RS P   T D $ ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE     240
ORNL 7090  F2    RS       A $ LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION     381
ORNL 7090  F2    RS P   T C $ EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL          39
ORNL 7090  F2    RS P   T C $ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB       87
ORNL 7090  F2    RS P   T C $ WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY       32
ORNL 7090  F2    RS P   T C $ 20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER      40
ORNL 7090  F2    RSBP     D $ ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS          180
ORNL 7090  F2    RSBP     D $ NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS         134
ORNL 7090  F4    RSBP     A $ MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION      323
ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION   ORNL  360  F4    RS P X T H $ ORTHIS,   525
ORTHIS,ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION   ORNL  360  F4    RS P X T H $    525
OS/360 MVT REMOTE JOB ENTRY SYSTEM   ANC   360  BAL   RSB    T P $ NRTS-RJE,     519
OSCILLATION    CEND  360  F4    RS P X T F $ CEXF,INCEXE, 1-GP 3-D XYZ XENON     415
OSUC  370  F4    RS PL CT C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE       29
OSUC  370  F4    RS PLXCT B $ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC         51
OUTPUT  PW   1604  LAG1  RS P     N $ DTX, EFFECTIVE X-SECTION CALC FROM DSN    210
OUTPUT DATA LASL 6600  F4    RS P   T B $ GLEN, GROUP CONSTANT CALC FROM TOR     361
OUTPUT GGA  1108  F5    RS P   T N $ GAPER2D, 2-D PERTURBATION CALC FROM 2DF    471
OUTPUT TAPE EDIT REACTION RATES     UK-W 7090  F2    RS       N $ WED, W-DSN     133
OVERLAP AND LATTICE EFFECTS   GGA  7044  F+MAP RS P   T B $ GAROL, RESONANCE     219
OVERLAP AND LATTICE EFFECTS   LER  7094  F+MAP RS P   T B $ GAROL, RESONANCE     219
OXIDE FUEL PERFORMANCE FINITE-ELEMENT GESV  635  F4    RS P  CT I $ BEHAVE2,     568
OXIDE FUEL ROD STRESS & DEFORMATION    BAPL 6600  F4    RS P   T I $ CYGRO3,    449
PACTCLUS,CLCTHO, NUCLEAR POWER PLANT COST CODE HEDL 1108  F5    RS P X T D $    540
PARALLEL BEAMS    ANL  3600  F36    SBP     I $ PCW2, DEFLECTION CALCULATION    365
PARET, WATER-COOLED CORE TRANSIENT ANALYSIS    ANC   360  F+BAL RSBPL CT G $    555
PARTI, OPTIMAL GROUP OR MESH COLLAPSING        TPW  6500  F4    RS P     B $    416
PARTIAL REFUEL   GGA  7044  F4    RS P   T D $ GARGOYLE, FUEL CYCLE ANALYSIS     260
PARTICLE TRANSPORT STUDY       RFD  3600  F36   RS P     G $ DISPER, AEROSOL    554
PARTICLE TRANSPORT XY RZ RTH LASL 7600  F4    RS P   T C $ TWOTRAN-PNVW, 2-D     573
PARTICLE WAVE FUNCTION RADIAL INTEGRALS ORNL 1604  F63   RS P     A $ RAMES,    335
PARTICLES SAMPLING STUDY       BAPL 6600  F4    RS P   T O $ BETTY, ENTRAINED   545
PATTERN INDEXING LASL 6600  F+COM RS P   T Q $ INDX, XRAY DIFFRACTION POWDER   609
PAX03, HARMONY-PDQ X-SECTION GENERATION CODE   BAPL 6600  F+COM RS P X T B $    426
PDP-11 ON 360 ANC   360  PL1   RS P   T P $ PTAC11, 2-PASS ASSEMBLER FOR THE    516
PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION    IBM   360A F+BAL RS P   T D $   336
PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION    MIT   360B F+BAL RSBP   T D $   336
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    ANC   360E F+BAL RS P XCT D $   275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BAPL 6600A F+ASC RS P   T D $   275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BAPL 6600C F+ASC RS P   T D $   275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BCS  6600D F+ASC R B    T D $   275
PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BW   6600B F+ASC RS P   T D $   275
PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS ORNL 1604  F63   RS P     A $    334
PELEN, FUEL PELLET TEMPERATURE & DEFORMATION   BAPL 6600  F4    RS P   T I $    598
PELLET CRACKING BAPL 6600  F4    RS P     I $ STRIPE, FUEL ROD CLAD STRAIN &    570
PELLET TEMPERATURE & DEFORMATION   BAPL 6600  F4    RS P   T I $ PELEN, FUEL     598
PENETRATION CALCULATION  DAC  7090  F2    RSBP     J $ LIPRECAN1, MC NEUTRON    123
PENETRATION STUDY     LASL 7090  FLCCC RS P     B $ MCS, MONTE CARLO NEUTRON    202
PERFORMANCE AND PRICE STUDY  GGA  7044  F+MAP RS P   T D $ OPUS, POWER PLANT    226
PERFORMANCE DATA     KE   7090  F2    RSBP     D $ NPRFCCP, FUEL CYCLE COSTS   146
PERFORMANCE DATA     UEC  6600  F4    RS P     D $ NPRFCCP, FUEL CYCLE COSTS   146
PERFORMANCE FINITE-ELEMENT GESV  635  F4    RS P  CT I $ BEHAVE2, OXIDE FUEL     568
PERFORMANCE STUDY     GGA  7044  F4    RS P     D $ WAMPUM, FUEL CYCLE COSTS    224
PERFORMANCE STUDY     UEC  6600  F4    RS P     D $ WAMPUM, FUEL CYCLE COSTS    224
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES   AI   7090  F2    RS       C $     30
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES   BHSC  360  F4    RS P     C $     30
PERT, 1-D PERTURBATION FOR AIM AND FOG CODES   CDC  1604  F63   RS       C $     30
PERTURBATION CALC FROM 2DF OUTPUT GGA  1108  F5    RS P   T N $ GAPER2D, 2-D    471
PERTURBATION CODE USING DTF4 FLUXES   LASL 6600  F4    RS P     N $ DAC1, SN   455
PERTURBATION FOR AIM AND FOG CODES   AI   7090  F2    RS       C $ PERT, 1-D     30
PERTURBATION FOR AIM AND FOG CODES   BHSC  360  F4    RS P     C $ PERT, 1-D     30
PERTURBATION FOR AIM AND FOG CODES   CDC  1604  F63   RS       C $ PERT, 1-D     30
PERTURBATION TDC OR 2DXY FLUX INPUT   PW   1604  F63   RS       C $ TDP, 2-D     159
PERTURBATION THEORY    GGA  1108  F4    RS P XCT C $ GAPER1D, 1-D TRANSPORT    606
```

PERTURBATION XY RZ RTHETA GEOMETRY BNW 1108 F4 RS P C $ PERT4, 2-D 304
PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY BNW 1108 F4 RS P C $ 304
PGE 360 F4 RS P CT G $ EMERALD, PWR PLANT RADIATION RELEASE & DOSE 546
PHASE SHIFT X-SEC & POLARIZATION CALC KAPL 6600 F4 RS P T A $ PHASER, 507
PHASE-SHIFT ANALYSIS ORNL 1604 F63 RS P A $ PEGGY, ELASTIC SCATTERING 334
PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC KAPL 6600 F4 RS P T A $ 507
PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY LASL 6600 F4 RS P T D $ 454
PHOTOFRACTION SOLID CRYSTAL UM 7090 MAD RSB O $ BURP4, GAMMA-RAY 169
PHOTOFRACTION WELL CRYSTAL UM 7090 MAD RSB O $ BURP5, GAMMA-RAY 170
PHOTOMULTIPLIER ELECTRON DISTRIBUTION ANL 360 F4 RS P O $ DYNO1, 464
PHOTOMULTIPLIER ELECTRON DISTRIBUTION KAPL 6600 F4 RS P O $ DYNO1, 464
PHOTOPEAK SPECTRA CODE BNWL 1108 F+BAL RS P T C $ GSSLRN1B, LEAST SQUARES 457
PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC ANC 360 F4 RS PLXCT B $ 520
PHYSICS MODULES DP 360 F+BAL S X T B $ RAHAB, JOSHUA SYSTEM LATTICE 536
PINS ANC 360 F4 RSBP CT J $ VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL 569
PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY PW 1604 F63 RS P T I $ 187
PIPE STRESS, MAXIMUM MOMENT CALC AI 7090 F+FAP RS T I $ 4RESTRAINT 109
PIPE SYSTEM AI 360 F4 RS P CT I $ PSA2, STRESS ANALYSIS MULTIANCHOR 542
PIPE, ELASTIC STRESS OF PIPING SYSTEM BAPL 6600 F4 RS P T I $ M0457 329
PIPING SYSTEM BAPL 6600 F4 RS P T I $ M0457,PIPE, ELASTIC STRESS OF 329
PIPING SYSTEM ANALYSIS KE 3600B F36 RSBP G $ WHAM, LIQUID-FILLED 278
PKG ANL 360 F+ASM RSB CT P $ WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION 541
PLANE & AXISYMMETRIC STRESS ANALYSIS GGA 1108 F4 RS P I $ SAFE-2D, 379
PLANE ELASTIC-PLASTIC BAPL 6600 F+COM RS P T I $ DUZ2, 2-D AXISYMMETRIC & 503
PLANE STRESS ANALYSIS, 2-D BODIES BNL 6600 F4 RS P T I $ SAFE-PLANE, 252
PLANE STRESS ANALYSIS, 2-D BODIES GGA 1108 F4 RS P I $ SAFE-PLANE, 252
PLANE STRUCTURES BAPL 6600 F4 RS P T L $ BL47, DRAFTING TOOL TO PLOT 373
PLANNING MLMO 360 F+C+R RSBP T M $ RALCRTPH, RESOURCE ALLOCATION PROJECT 603
PLANT CAPITAL COST ESTIMATING ORNL 360 F4 RS P T D $ CRCOST, POWER 588
PLANT CONCEPTUAL COST ESTIMATE ORNL 360B F4 RS P XCT D $ CONCEPT2, POWER 498
PLANT COST CODE HEDL 1108 F5 RS P X T D $ PACTOLUS,CLOTHC, NUCLEAR POWER 540
PLANT DESIGN OPTIMIZATION AI 7090 F2 RS I $ CROCK, SPACE POWER 112
PLANT DESIGN OPTIMIZATION AI 7090 F2 RS I $ SHOCK, SPACE POWER 114
PLANT PERFORMANCE AND PRICE STUDY GGA 7044 F+MAP RS P T D $ CPUS, POWER 226
PLANT RADIATION RELEASE & DOSE PGE 360 F4 RS P CT G $ EMERALD, PWR 546
PLANT THERMAL DISCHARGE STUDY HEDL 1108 F5 RS P T F $ TOPLYR2, POWER 599
PLENUM DP 360 F4 RS P H $ PLENUM, FLOW DIST. IN CYL COOLANT INLET 586
PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM DP 360 F4 RS P H $ 586
PLETHS, ISOPLETH-AREA CALC FROM SINGLE SOURCE ANL GETS F P R $ 591
PLOT KAPL 6600 F+ASC RS P T P $ SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE 364
PLOT PLANE STRUCTURES BAPL 6600 F4 RS P T L $ BL47, DRAFTING TOOL TO 373
PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780 ANL 360 F4 RS P T N $ 544
PLOTFB,... ENDF/B V1 PROC BNL 6600B F4 RS T M $ CHECKER,CRECT,DAMMET, 384
PLOTFB,... ENDF/B V2 PROC BNL 6600B F4 RS T M $ CRECT,CHECKER,RIGEL, 475
PLOTR, 2D CONTOUR PLOTS & AREA CALCULATION SLA 6600 F4 RS P P $ 578
PLOTS & AREA CALCULATION SLA 6600 F4 RS P P $ PLOTR, 2D CONTOUR 578
PLOTS FROM SCISRS X-SECTION TAPES WANL 7094 F+FAP RSBPL T N $ CPS, SC4020 239
PLOTS FROM X-SECTION TAPES GGA 7044 F+SPS RSBP T N $ CROSSPLOT, SC4020 207
PLOTS ON IBM2280 OR CALCOMP780 ANL 360 F4 RS P T N $ PLOT-3D, 3-D 544
PLOTTING KAPL 6600 F+ASC RS P T P $ DATATRAN UTILITY MODULES, 2-D + 3-D 407
PLOTTING ROUTINES KAPL 6600 F+COM RS T P $ KAPLPLOT, KAPL CALCOMP 496
PL1 RS P T P $ PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360 ANC 360 516
PMS1, FAST NEUTRON POLARIZATION EXPERIMENT UCND 360B F+BAL RS P O $ 469
POINT DEPLETION FISSION PRODUCT BAPL 6600 F4 RS P D $ CINDER,M0102, 313
POINT DEPLETION FISSION PRODUCT DP 360 F+BAL RS P T D $ CINDER,M0102, 313
POINT SOURCE UM 7090 MAD RSB O $ BURP1, DETECTOR EFFICIENCY 164
POINT SOURCE UM 7090 MAD RSB O $ BURP3, DETECTOR EFFICIENCY 166
POINT-KERNEL SHIELD EVALUATION CODE BAPL 6600B F+ASC RS P T J $ SPAN4, A 462
POINT-KINETICS WITH 2-D HEAT TRANSFER GGA 7044 F+MAP RS P T H $ BLOOST5, 205
POINTS KAPL 6600 F+ASC RS P T P $ CURFIT, CURVE FITTING EXPERIMENTAL DATA 43
POINTWISE XSECS. FROM B-W PARAMETERS GGA 1108 F5 RS P CT A $ FSDP3, 216
POLARIZATION CALC KAPL 6600 F4 RS P T A $ PHASER, PHASE SHIFT X-SEC & 507
POLARIZATION EXPERIMENT UCND 360B F+BAL RS P O $ PMS1, FAST NEUTRON 469
POLYNOMIAL KAPL 6600 F4 RS P P $ ROPE, FINDING ROOTS OF A 444

```
POLYNOMIAL CURVE FITTING    BAPL 6600  F4    RS P   T P $ M0661,M0657,M0626,    411
POOL FIRE 1- & 2-CELL ANALYSIS AI    360  F4    RS P   T G $ SOFIRE2, SODIUM    559
POST RUPTURE GGA  7044  F4    RS    X T G $ PRECON, HTGR CONTAINMENT PRESSURE   228
POTENTIAL SHAPE CALCULATION ORNL 7090  F2    RS        A $ LYNNE, WOODS-SAXON   381
POWDER PATTERN INDEXING LASL 6600  F+CCM RS P   T Q $ INDX, XRAY DIFFRACTION   609
POWER AND FLOW TRANSIENTS  ANL   360  F4    RS P   T F $ SAS1A, FAST REACTOR   400
POWER AND FLOW TRANSIENTS  ANL   6600  F4    RS P   T F $ SAS1A, FAST REACTOR   400
POWER DIST SEARCH  GGA  7044  F4    RS P   T C $ GASP2, 1-D FEW-GP DIFFUSION   220
POWER DISTRIBUTION   CDC  3600  F63   RSBP   T C $ FLARE, 3-D REACTIVITY AND   167
POWER DISTRIBUTION   MSS  360  F4    RS P  CT C $ FLARE, 3-D REACTIVITY AND    167
POWER DISTRIBUTION   NED  635  F4    RS P   T C $ FLARE, 3-D REACTIVITY AND    167
POWER DISTRIBUTION SEARCH    GGA  1108  F4    RS P   T C $ GASP7, 1-D BURNUP   319
POWER EXCURSION DISASSEMBLY   ANL  360  F4    RS P XCT F $ VENUS, 2-D LMFBR    511
POWER MCGUIRE UNITS DUCO  635  F4    RS        G $ ANVENT, LOCA ANALYSIS DUKE  529
POWER PLANT CAPITAL COST ESTIMATING    ORNL  360  F4    RS P   T D $ ORCOST,   588
POWER PLANT CONCEPTUAL COST ESTIMATE ORNL  360B F4    RS P XCT D $ CONCEPT2,   498
POWER PLANT COST CODE HEDL 1108  F5    RS P X T D $ PACTOLUS,CLOTHO, NUCLEAR   540
POWER PLANT DESIGN OPTIMIZATION   AI   7090  F2    RS        I $ CROCK, SPACE   112
POWER PLANT DESIGN OPTIMIZATION   AI   7090  F2    RS        I $ SHOCK, SPACE   114
POWER PLANT PERFORMANCE AND PRICE STUDY  GGA  7044  F+MAP RS P   T D $ OPUS,   226
POWER PLANT THERMAL DISCHARGE STUDY   HEDL 1108  F5    RS P   T R $ TOPLYR2,   599
POWER TRANSIENTS BAPL 6600  F4    RS P   T H $ CHIC-KIN, FAST + INTERMEDIATE  473
POWERCO, NUCLEAR STATION ELECTRICITY COSTS    ORNL 1604  F63   RS P     D $   340
POWERCO, NUCLEAR STATION ELECTRICITY COSTS    UEC  6600  F4    RS P     D $   340
PPCC 7040  F+MAP RS P      A $ COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION   203
PPCO 7040  F4    RS P   T C $ TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER     148
PPCC 7044  F+MAP RS P   T H $ TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION      349
PPCC 7090  F2    RS P      C $ MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM   59
PPCO 7090  F2    RS P   T C $ TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER     148
PPCO  360  F4    RS P X    G $ BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN  435
PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE GGA  7044  F4    RS   X T G $   228
PREDICTING MANUFACTURING REQUIREMENTS  GEPI GETS  BASIC R        M $ MAPPER,   595
PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES  ANC   360  F4    RSBP  CT K $   528
PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES  ANC  1108  F4    RS P   T K $   528
PREPARATION     GGA  1108  F4    RS P X T L $ GAND, GAFGAR X-SECTION LIBRARY  345
PREPARATION    PW   1604  F63   RS        L $ CSP1, SN X-SECTION LIBRARY TAPE 194
PREPARATION    PW   1604  F63   RS        L $ CSP2A, SN X-SECTION LIBRARY TAPE 193
PREPARATION FOR 2-D DESIGN PROGRAMS  LASL  7090  F+FAP*RS P   T L $ DPC, DATA  234
PREPARATION, EDIT KAPL 6600  F+ASC RS P   T L $ DATATRAN 2-D GEOMETRY INPUT,  406
PRESSURE  BAPL 6600  F4    RS P      I $ TCB01, CREEP-BUCKLING OF TUBES UNDER 604
PRESSURE DISTRIBUTION GGA  1108  F5    RS P      H $ FLAC, STEADY-STATE FLOW,  395
PRESSURE POST RUPTURE GGA  7044  F4    RS    X T G $ PRECON, HTGR CONTAINMENT 228
PRESSURE TEMPERATURE HISTORY    KE   7094  F2    RSBP   T H $ PTH1, BLOWDOWN  155
PRESSURE VESSEL STRESS AND FATIGUE     KAPL 6600  F4    RS        I $ SORSDB,  391
PRESSURE-TEMPERATURE RESPONSE ANC   360  F+BAL RSBP  CT G $ CONTEMPT-LT/022,   433
PRESSURIZERS BAPL 6600  F4    RS P   T H $ TOPS, TRANSIENT THERMODYNAMICS OF  348
PRICE STUDY  GGA  7044  F+MAP RS P   T D $ CPUS, POWER PLANT PERFORMANCE AND  226
PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA  ORNL  360  F4    RS P   T B $ RICE,   453
PROBABILITIES MC  ORNL  360  F+BAL RS P   T B $ RAFFLE, 1ST FLIGHT COLLISION 392
PROBABILITIES MC  ORNL 7090  F+FAP RS P   T B $ RAFFLE, 1ST FLIGHT COLLISION 392
PROBABILITY CALC ANL   360  F4    RS P   T B $ CLUP77, SQUARE CELL COLLISION  526
PROBABILITY CALC JAER  230  F4    RS P   T B $ CLUP77, SQUARE CELL COLLISION  526
PROBABILITY TABLES AI    360  F+BAL RS P  CT B $ L3R, UNRESOL RESONANCE XSEC  553
PROC  BNL  6600B F4    RS      T M $ CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 475
PROC BNL  6600B F4    RS      T M $ CHECKER,CRECT,CAMMFT,PLOTFB,... ENDF/B V1 384
PROCESSING AND EDITING      ORNL  360B F4    RS P   T M $ EDITOR, ENDF/B TAPE 502
PROCESSING AND EDITING      ORNL 6600  F4    RS P   T M $ EDITOR, ENDF/B TAPE 502
PROCESSING CODE          ANL   360  F4    RS      T M $ RIGEL, ENDF/B V3 DATA 571
PROCESSING CODES       ANL   360  F4    RS P   T M $ CRECT,CHECKER, ENDF/B V2 475
PROCESSING CODES   BNL  6600  F4    RS      T M $ CHECK3,RIGEL3, ENDF/B V3,V4 571
PROCESSING MODULE   ANL   360  F4    RSBP  CT L $ ARC-NUI002, BCD INPUT DATA 533
PROCESSING OF ANALYZER GAMMA-RAY SPECTRA GGA  1108  F+BAL RS P   T O $ TOAD, 333
PROCESSOR        LASL  360  F4    RS P      L $ GENRD, FREE-FORMAT CARD INPUT 530
PROCESSOR        LASL 6600  F4    RS P      L $ GENRD, FREE-FORMAT CARD INPUT 530
```

PROCESSOR UNDER TSO ANL 360 F+BAL R B L T P $ TSO-SPEAKEASY, LANGUAGE 593
PROGRAMMING AND DATA SYSTEM KAPL 6600 F+COM RSB T M $ DATATRAN, MODULAR 386
PROGRAMMING LANGUAGE KAPL 6600 F+ASC RS P $ SIMPLE1, TIME-SHARING 442
PROJECT PLANNING MLMO 360 F+C+R RSBP T M $ RALCRTPH, RESOURCE ALLOCATION 603
PROPERTIES BAPL 6600 F4 RS P T H $ WASP, WATER AND STEAM THERMODYNAMIC 396
PROPERTIES BG&E 360 F4 RS T H $ STEAM-67, 1967 ASME STEAM AND WATER 487
PROPERTIES WATER & STEAM ANC 360 F4 RS P T H $ ASTEM, THERMODYNAMIC 580
PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM AI 360 F4 RS P CT I $ 542
PSEUDO, STATISTICAL RESONANCE PARAMETER CALC ENEA 360 F4 RS P A $ 292
PSEUDC, STATISTICAL RESONANCE PARAMETER CALC GGA 1108 F4 RS P A $ 292
PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360 ANC 360 PL1 RS P T P $ 516
PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY KE 7094 F2 RSBP T H $ 155
PULSED NEUTRON SOURCE DATA NED 635 F4 RS P T O $ EXPN, ANALYSIS OF 258
PULSED NEUTRON SOURCE DATA ANALYSIS CNEA 360 F4 RS P E $ TRIFIDO, 489
PUMP IMPELLER DESIGN STUDY PW 1604 F63 RS P T I $ PIP, CENTRIFUGAL 187
PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS BAPL 6600 F4 RS P T A $ 359
PURCHASE VERSUS LEASE ANALYSIS SLA 360 COBOL RSBP CT M $ BECOM, AEC DP 589
PURCHASE VERSUS LEASE ANALYSIS SLA 1108 COBOL RS P M $ BECOM, AEC DP 589
PURD 6500 F4 RS PLX T C $ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE 262
PW 1604 F+CDP RS P T P $ LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET 186
PW 1604 F+CDP RS P X T B $ FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES 155
PW 1604 F63 RS C $ TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT 199
PW 1604 F63 RS I $ WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY 190
PW 1604 F63 RS L $ CSP1, SN X-SECTION LIBRARY TAPE PREPARATION 194
PW 1604 F63 RS L $ CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION 193
PW 1604 F63 RS T C $ 2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL 192
PW 1604 F63 RS P E $ CMPXMAT, TRANSFER FUNCTION EVALUATION 188
PW 1604 F63 RS P F $ AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH 191
PW 1604 F63 RS P L $ SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC 189
PW 1604 F63 RS P T C $ FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ 161
PW 1604 F63 RS P T I $ PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY 187
PW 1604 LAG1 RS P C $ MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE 211
PW 1604 LAG1 RS P N $ DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT 210
PWCOST, REACTOR FUEL CYCLE COST CALCULATION GGA 1108 F4 RS P T D $ 441
PWR & BWR GASEOUS RELEASE ORNL 360 F4 RS P C G $ STEFEG, ANALYSIS OF 583
PWR FLOW TRANSIENT ANALYSIS BAPL 6600 F4 RS P T H $ FLOT1,M0219, 331
PWR OPN OPPD 6400 F4 S P H $ PWR-PPM, BORATION-DILUTION TABLES FOR 552
PWR PLANT RADIATION RELEASE & DOSE PGE 360 F4 RS P CT G $ EMERALD, 546
PWR-PPM, BORATION-DILUTION TABLES FOR PWR OPN OPPD 6400 F4 S P H $ 552
QUASISTATIC SPATIAL REACTOR KINETICS CODE ANL 360 F4 RS PL CT F $ QX1, 474
QUASISTATIC SPATIAL REACTOR KINETICS CODE ANL 3600 36F RS PL CT F $ QX1, 474
QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS AI 7090 F+FAP RS L T B $ 119
QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE ANL 360 F4 RS PL CT F $ 474
QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE ANL 3600 36F RS PL CT F $ 474
R-M PARAMETERS OF UNRESOLVED RESONANCES BAPL 6600 F4 RS P A $ GRAMP, 470
R-THETA-Z LASL 6600 F4 RS P T C $ 3DDT, 3-D MULTIGROUP DIFFUSION XYZ 463
R-Z GEOMETRY APDA 7094 F4 RS P F $ MARS, 2-D EXCURSION CALCULATION 293
RABBLE,WLIR,FLAT, RESONANCE ABSORPTION, CELL ANL 3600 F36 RSBP X T B $ 281
RADIAL INTEGRALS ORNL 1604 F63 RS P A $ RAMES, PARTICLE WAVE FUNCTION 335
RADIATION DAMAGE IN METALS GEC 635 F+FAP RSPP T Q $ CASCADE,CLUSTER, 419
RADIATION RELEASE & DOSE PGE 360 F4 RS P CT G $ EMERALD, PWR PLANT 546
RADIATOR FINS SNAP GEOM AI 7090 F2 RS J $ SCARF2, SCATTER FROM 110
RADIO FREQUENCY MANAGEMENT SYSTEM ALOC 360 COBOL RS P M $ AEC-ALC FAU, 587
RADIOACTIVE DECAY CHAINS GEC 635 F4 RSBP D $ CHAINS, ANALYSIS OF 418
RADIOACTIVITY IITR 7094 F4 RSBPLX T C $ NAP, NEUTRON-INDUCED GAMMA-RAY 314
RADIOLOGICAL EFFECTS ANALYSIS HEDL 1108 F+SL RS P XCT R $ HERMES, REGIONAL 527
RADIOLOGICAL SAFETY ANALYSIS PROGRAM ANC 360 F4 RSBP CT G $ RSAC, 265
RADIONUCLIDE GENERATION AND DECAY BNW 1108 F5 RSBPL T C $ ISOGEN, 367
RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY GGA 7044 F4 RS P D $ 231
RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC ORNL 360 F+BAL RS P T B $ 392
RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC ORNL 7090 F+FAP RS P T B $ 392
RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES DP 360 F+BAL S X T B $ 536
RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING MLMO 360 F+C+R RSBP T M $ 603
RAMES, PARTICLE WAVE FUNCTION RADIAL INTEGRALS ORNL 1604 F63 RS P A $ 335

RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS BNL 6600 F4 RS P A $ 492
RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS NED 635 F4 RS P D $ 372
RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX KAPL 6600 F4 RS P H $ 382
RAPTURE, RESONANCE INTEGRAL X-SECTION CALC NEC 2000 F2 RS P A $ 176
RATES UK-W 7090 F2 RS N $ WED, W-DSN OUTPUT TAPE EDIT REACTION 133
RATES FROM 2-D FLUX SETS GFSV H600 F4 RS P CT C $ TRIAL, 3-D REACTION 585
RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS LASL 7030 F4 RS T H $ 242
RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS LASL 7094 FAP RS P T H $ 242
RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY AI 7090 F2 RS P J $ 141
RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC KAPL 6600 F4 RS P F $ 352
RAY SOURCE BUILDUP FACTOR CALC RAPL 6600 F+ASC RS P T J $ ASPIS, GAMMA 429
RAY SPECTRA ORNL 360 F4 RS P O $ ALPHA-M, RESOLUTION OF GAMMA 413
REACTION AI 360 F+RAL RS P T A $ COMNUC,CASCADE, COMPOUND NUCLEUS 482
REACTION CEND 7600 F4 RS P T G $ CEBUG, STEAM GENERATOR SODIUM-WATER 548
REACTION ANL 3600 F36 RSBP G $ CHEMLOC2, CORE HEATING CLADDING-STEAM 366
REACTION DECAY CHAIN ANALYSIS ORNL 1604 F63 RS P C $ ISOCRUNCH, 180
REACTION DECAY CHAIN ANALYSIS ORNL 7090 F2 RSBP C $ ISOCRUNCH, 180
REACTION OR DECAY ORNL 1604 F63 RS P D $ ISOTOPES, MAXIMUM YIELD FROM 179
REACTION RATES UK-W 7090 F2 RS N $ WED, W-DSN OUTPUT TAPE EDIT 133
REACTION RATES FROM 2-D FLUX SETS GFSV H600 F4 RS P CT C $ TRIAL, 3-D 585
REACTION X-SECTIONS BNL 6600 F4 RS P A $ THRESH, STATISTICAL MODEL 504
REACTIVITY AND POWER DISTRIBUTION CDC 3600 F63 RSBP T C $ FLARE, 3-D 167
REACTIVITY AND POWER DISTRIBUTION MSS 360 F4 RS P CT C $ FLARE, 3-D 167
REACTIVITY AND POWER DISTRIBUTION NED 635 F4 RS P T C $ FLARE, 3-D 167
REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS NED 635 F4 RS P T B $ 257
RECCIL ATOM SPECTRA ENDF/B DATA ORNL 360 F4 RS P T B $ RICE, PRIMARY 453
RECTANGULAR MAGNETIC NETWORK SOLUTION BAPL 6600B F4 RS P T I $ MANE1, 412
REDUCTION ANL 3600 F63 RSBP O $ COINC, COINCIDENCE COUNTING DATA 248
REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS BAPL 6600 F4 RS P T O $ 425
REFUEL GGA 7044 F4 RS P T D $ GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL 260
REFUELING HISTORY LASL 6600 F4 RS P T D $ PHENIX, 2D DIFFUSION BURNUP 454
REGIONAL RADIOLOGICAL EFFECTS ANALYSIS HEDL 1108 F+SL RS P XCT R $ HERMES, 527
REICH-MOORE RESOLVED REGION X-SECTIONS BNL 6600 F4 RS P A $ RAMP1, 492
RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC 360 F4 RSBP XCT G $ 369
RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC 1108 F4 RS P T G $ 369
RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC 6600 F4 RS P T G $ 369
RELATION GEC 635 F4 RSBP D $ DCS, NEUTRON FLUX-DOSIMETER ACTIVITY 423
RELEASE ORNL 360 F4 RS P C G $ STEFEG, ANALYSIS OF PWR & BWR GASEOUS 583
RELEASE & DOSE PGE 360 F4 RS P CT G $ EMERALD, PWR PLANT RADIATION 546
RELEASE ANALYSIS BCL 6400 F4 RS P G $ FRCRL2, LOCA FISSION PRODUCT 500
RELEASE GGA 1108 F4 RS P D $ FREVAP6, HTGR METALLIC FISSION PRODUCT 301
RELEASE SIMULATION BAPL 6600 F4 RS P T I $ BUBL1, FUEL SWELLING & GAS 468
RELIABILITY FOR A SINGLE FAILURE MODE BAPL 6600 F4 RS P P $ RELO1, 497
RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION GGA 7044 F4 RS P T D $ 221
RELO1, RELIABILITY FOR A SINGLE FAILURE MODE BAPL 6600 F4 RS P P $ 497
REMOTE JOB ENTRY SYSTEM ANC 360 BAL RSB T P $ NRTS-RJE, CS/360 MVT 519
REMOTE WORKSTATION PKG ANL 360 F+ASM RSB CT P $ WSP-HASP/DOS, DOS-MFT 541
REMOVAL BCL 6400 F4 RS P G $ MIRAB,MIRAP, CONTAINMENT SYSTEM IODINE 499
REMOVAL X-SECS BAPL 6600 F4 RS T B $ M0807, 2-D DIFFUSION ABSORPTION 280
REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN BNW 1108 F5 RS P T H $ 483
RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES BNL 6600B F4 RS P T A $ 465
RESOLUTION OF GAMMA RAY SPECTRA ORNL 360 F4 RS P O $ ALPHA-M, 413
RESOLVED MULTILEVEL B-W X-SEC CALC BNL 6600 F4 RS P A $ SIGPLOT, 377
RESOLVED REGION RESONANCE INTEGRAL CALC GGA 7090 F+FAP RSB T A $ ZUT, 41
RESOLVED REGION X-SECTIONS BNL 6600 F4 RS P A $ RAMP1, REICH-MOORE 492
RESOLVED RESONANCE EPITHERMAL X-SECTIONS NED 635 F4 RS P T B $ REAX, 257
RESOLVED RESONANCE INTEGRAL CALCULATION BW 2000 F4 RS A $ STRIP, 305
RESOLVED RESONANCE X-SECTION CALC NEC 2000 F2 RS P A $ COPIE, 177
RESONANCE ABSORPTION, CELL ANL 3600 F36 RSBP X T B $ RABBLE,WLIB,FLAT, 281
RESONANCE DATA UILL 360 F4 RS P A $ CODILLI, LEAST SQUARES ANALYSIS 347
RESONANCE EPITHERMAL X-SECTIONS NED 635 F4 RS P T B $ REAX, RESOLVED 257
RESONANCE INTEGRAL CALC GGA 7090 F+FAP RSB T A $ ZUT, RESOLVED REGION 41
RESONANCE INTEGRAL CALC GGA 7090 F+FAP RSB T A $ TUZ, UNRESOLVED REGION 42
RESONANCE INTEGRAL CALC HOMOGENEOUS ANL 3600 F36 RSBP A $ MISH-MASH, 214

RESONANCE INTEGRAL CALC 2-REG CELL ANL 3600 F36 RSBP X T B $ RIFF-RAFF, 213
RESONANCE INTEGRAL CALCULATION BW 2000 F4 RS A $ STRIP, RESOLVED 305
RESONANCE INTEGRAL HEX CELL BAPL 6600 F+ASC RS P X T B $ RESQ2,RESQO,DBF1, 285
RESONANCE INTEGRAL X-SECTION CALC AI 7090 F2 RS PL T A $ ARES2, 89
RESONANCE INTEGRAL X-SECTION CALC AI 7094 F+MAP RS PLX T A $ TRIX1, 208
RESONANCE INTEGRAL X-SECTION CALC CDC 1604 F63 RS PL T A $ ARES2, 89
RESONANCE INTEGRAL X-SECTION CALC NED 2000 F2 RS P A $ RAPTURE, 176
RESONANCE INTEGRALS X-SECS BAPL 6600 F4 RS P T A $ PUN1, UNRESOLVED 359
RESONANCE MEASUREMENTS GGA 1108 F4 RS P T A $ TACASI, ANALYSIS OF 410
RESONANCE OVERLAP AND LATTICE EFFECTS GGA 7044 F+MAP RS P T B $ GAROL, 219
RESONANCE OVERLAP AND LATTICE EFFECTS LER 7094 F+MAP RS P T B $ GAROL, 219
RESONANCE PARAMETER CALC ENEA 360 F4 RS P A $ PSEUDO, STATISTICAL 292
RESONANCE PARAMETER CALC GGA 1108 F4 RS P A $ PSEUDO, STATISTICAL 292
RESONANCE PARAMETERS WANL 7094 F2 RS P A $ EXT, X-SECTIONS FROM B-W 238
RESONANCE THEORY XSEC CALC KAPL 6600 F4 RS P A $ MULTI, MULTI-LEVEL 535
RESONANCE X-SECTION CALC NED 2000 F2 RS P A $ DOPIE, RESOLVED 177
RESONANCE X-SECTION CALC GGA 1108 F4 RS P A $ GANDY, UNRESOLVED 341
RESONANCE XSEC PROBABILITY TABLES AI 360 F+BAL RS P CT B $ U3R, UNRESOL 553
RESONANCE XSECTION CODES BNL 6600B F4 RS P T A $ RESEND,ADLER, ENDF/B 465
RESONANCES AI 360 F4 RS PLX T B $ AILMOE, X-SECTION CALC ELASTIC SCAT 147
RESONANCES AI 7094 F+FAP RS PL T B $ AILMOE, X-SECTION CALC ELASTIC SCAT 147
RESONANCES BAPL 6600 F4 RS P A $ CRAMP, R-M PARAMETERS OF UNRESOLVED 470
RESOURCE ALLOCATION PROJECT PLANNING MLMO 360 F+C+R RSBP T M $ RALCRTPH, 603
RESPOND, DISSIMILAR MEDIA TLC CORRECTION CALC AI 360 F4 RS P T Q $ 566
RESPONSE ANC 360 F+BAL RSBP CT G $ CONTEMPT-LT/022, PRESSURE-TEMPERATURE 433
RESPONSE LOCA ANC 360 F4 RSBP X T G $ THETA1-B, FUEL ROD THERMAL 512
RESPONSE OF ELASTIC STRUCTURES BAPL 6600 F4 RS P T I $ FUGIT, DYNAMIC 537
RESPONSE TO EXCURSION ANL 360 F4 RS P CT F $ REXCO-H, 2-D HYDRODYNAM 550
RESQO,DBF1, RESONANCE INTEGRAL HEX CELL BAPL 6600 F+ASC RS P X T B $ RESQ2, 285
RESQ2,RESQO,DBF1, RESONANCE INTEGRAL HEX CELL BAPL 6600 F+ASC RS P X T B $ 285
RETRIEVAL SLA 1108 F+BAL RSBP T M $ SPIRAL, FULL-TEXT STORAGE, SEARCH & 607
RETRIEVAL FROM SCISRS X-SECTION TAPE GGA 7044 F+MAP RSBP M $ UNPACK, 206
RETRIEVAL, AND DISPLAY DP 360 F+BAL S T M $ JOSHUA, DATA STORAGE, 490
REVISED-GAD, FUEL CYCLE ANALYSIS W/REFUELING GGA 7044 F4 RS P T D $ 223
REVOLUTION KAPL 6600C F4 RS P T I $ SOR3, STRESS ANALYSIS SHELLS OF 80
REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION ANL 360 F4 RS P CT F $ 550
RFD 3600 F36 RS P G $ CISPER, AEROSOL PARTICLE TRANSPORT STUDY 554
RFD 6600 F+COM RS P T C $ KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE 450
RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA ORNL 360 F4 RS P T B $ 453
RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL ANL 3600 F36 RSBP X T B $ 213
RIGEL, ENDF/B V3 DATA PROCESSING CODE ANL 360 F4 RS T M $ 571
RIGEL,PLOTFB,... ENDF/B V2 PROC BNL 660CB F4 PS T M $ CRECT,CHECKER, 475
RIGEL3, ENDF/B V3,V4 PROCESSING CODES BNL 6600 F4 RS T M $ CHECK3, 571
RING SNAP GEOMETRY AI 7090 F2 RS J $ SCAR1, SCATTER FROM A 111
ROD BUNDLE NED 635 F4 RS P T H $ VELVET2, TURBULENT FLOW IN LMFBR 458
ROD BUNDLE CHF DATA ANALYSIS ANC 360 F4 RS PL CT M $ ERREST, LOCA 518
ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW 360C F4 RS P T H $ COBRA3C, 432
ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW 1108C F4 RS P T H $ COBRA3C, 432
ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW 6600C F4 RS P T H $ COBRA3C, 432
ROD CLAD STRAIN & PELLET CRACKING BAPL 6600 F4 RS P I $ STRIPE, FUEL 570
ROD STRESS & DEFORMATION BAPL 6600 F4 RS P T I $ CYGRO3, OXIDE FUEL 449
ROD THERMAL RESPONSE LOCA ANC 360 F4 RSBP X T G $ THETA1-B, FUEL 512
ROOTS OF A POLYNOMIAL KAPL 6600 F4 RS P P $ ROPE, FINDING 444
ROPE, FINDING ROOTS OF A POLYNOMIAL KAPL 6600 F4 RS P P $ 444
RSAC, RADIOLOGICAL SAFETY ANALYSIS PROGRAM ANC 360 F4 RSBP CT G $ 265
RTH WANL 7094 F4 RS P X T C $ VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ 264
RTH LASL 7600 F4 RS P T C $ TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ 573
RTHETA LASL 3608 F4 RS P CT C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ 358
RTHETA LASL 6600B F4 RS P T C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ 358
RTHETA LASL 7600B F4 RS P T C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ 358
RTHETA GEOMETRY BNW 1108 F4 RS P C $ PERT4, 2-D PERTURBATION XY RZ 304
RUPTURE GGA 7044 F4 RS X T G $ PRECON, HTGR CONTAINMENT PRESSURE POST 228
RZ PW 1604 F63 RS P T C $ FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION 161
RZ GEOMETRY GGA 7090 F+FAP RSBP T D $ DDB, 2-D FEW-GP DIFFUSION BURNUP 99

```
RZ GEOMETRY  LRL   709  F2    RS          C $ FIRN, 2-D FEW-GP S4 APPROXIMATION     7
RZ GEOMETRY GGA  1108  F+BAL RS P   T C $ GAMBLE5, 2-D MULTI-GP DIFFUSION XY      222
RZ GEOMETRY GGA  7044  F+MAP RSBP   T C $ GAMBLE4, 2-D MULTI-GP DIFFUSION XY      222
RZ GGA  1108  F+BAL RS P   T D $ BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY,      438
RZ RTH   WANL 7094  F4    RS P X T C $ VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY      264
RZ RTH LASL 7600  F4    RS P   T C $ TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY      573
RZ RTHETA  LASL  3608 F4    RS P  CT C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY      358
RZ RTHETA  LASL 6600B F4    RS P   T C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY      358
RZ RTHETA  LASL 7600B F4    RS P   T C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY      358
RZ RTHETA GEOMETRY  BNW  1108  F4    RS P     C $ PERT4, 2-D PERTURBATION XY      304
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS   ANL   360  F4    RS P     E $      255
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS   ANL  3600  F63   RSBP     E $      255
R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS   WANL 7094  F4    RS P     E $      255
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC  ANL   360  F4    RS P     E $      168
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC  ANL  3600  F63   RSBP     E $      168
R102, SPACE-INDEPENDENT INVERSE KINETICS CALC  WANL 7094  F4    RS       E $      168
R153, PARAMETRIC SITE REQUIREMENT STUDY        ANL  3600  F63   RSBP   T G $      172
S-WAVE NEUTRON X-SECTION CALCULATION    BAPL 6600  F4    RS P   T A $ SUMOR,      399
SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS  MIT   360  F4    RS P   T I $      402
SAFE PROGRAMS      GGA  1108  F4    RS P     L $ CROWRK, GRID GENERATION FOR      296
SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD GGA  7044  F4    RS P   T I $      251
SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE  GGA  1108  F5    RS P   T I $      451
SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE     GGA  1108  F4    RS P     I $      300
SAFE-PORS, STRESS ANALYSIS AXISYMMETRIC LOAD   GGA  7044  F4    RSBP  CT I $      250
SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES  BNL  6600  F4    RS P   T I $      252
SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES  GGA  1108  F4    RS P     I $      252
SAFE-SHELL, STRESS ANALYSIS THIN SHELLS        GGA  1108  F4    RS P     I $      253
SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS  GGA  1108  F4    RS P     I $      379
SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY  GGA  1108  F4    RS P   T I $      332
SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY  ORNL  360  F+BAL RS P   T I $      332
SAFETY ANALYSIS PROGRAM      ANC   360  F4    RSBP  CT G $ RSAC, RADIOLOGICAL      265
SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY  AI   7090  F2    RS P     B $       52
SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY  CDC  1604  F63   RS P     B $       52
SAMPLING STUDY       BAPL 6600  F4    RS P   T D $ BETTY, ENTRAINED PARTICLES      545
SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS  ANL   360  F4    RS P   T F $      400
SASIA, FAST REACTOR POWER AND FLOW TRANSIENTS  ANL  6600  F4    RS P   T F $      400
SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT    KE   7094  F+MAP RSBP   T G $      200
SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM   AI   7090  F2    RS       J $      110
SCAR1, SCATTER FROM A RING SNAP GEOMETRY       AI   7090  F2    RS       J $      111
SCAT KERNELS      DP    360  RCC   R   LX T Z $ THERMOS LIBRARY, 30-GP ENDF/B      540
SCAT RESONANCES AI    360  F4    RS PLX T P $ AILMOE, X-SECTION CALC ELASTIC      147
SCAT RESONANCES AI   7094  F+FAP RS PL  T B $ AILMOE, X-SECTION CALC ELASTIC      147
SCAT X-SEC   BNL  6600  F4    RS P     A $ BESFIT, DIFFRACTION MODEL ELASTIC      524
SCAT X-SECTION CALC MODERATOR GGA  1108  F4    RS P     A $ GAKER, INELASTIC      289
SCAT X-SECTIONS HEX LATTICE    GGA  1108  F4    RS       B $ HEXSCAT, ELASTIC      291
SCATTER FROM A RING SNAP GEOMETRY      AI   7090  F2    RS       J $ SCAR1,        111
SCATTER FROM RADIATOR FINS SNAP GEOM   AI   7090  F2    RS       J $ SCARF2,       110
SCATTERING  CDC  1604  F63   RS P     A $ FAFEVER, HAUSER-FESHBACH INELASTIC       14
SCATTERING CALC   ANL   360  F4    RS P  CT W $ MSCAT, SLOW NEUTRON MULTIPLE      575
SCATTERING CRYSTALLINE MATERIALS  LASL 6600  F4    RS P   T A $ TOR, THERMAL      360
SCATTERING DATA  DP    360  F4    RS P XCT A $ FLANGE2(71-1), ENDF/B THERMAL      368
SCATTERING FORM FACTORS      ORNL  360  F4    RS P   T A $ ATHENA4, INELASTIC      417
SCATTERING KERNEL CALC      GGA  7090  F2    RS       T A $ SUMMIT, CRYSTALLINE       56
SCATTERING LAW CALC  GGA  1108  F4    RS P X   A $ COHBE, COHERENT INELASTIC      385
SCATTERING LAW CALCULATION     GGA  1108  F4    RS P     A $ GASKET, THERMAL      263
SCATTERING LAW X-SECTION CALCULATION  GGA  1108  F5    RS P     A $ PEGGY, ELASTIC      334
SCATTERING PHASE-SHIFT ANALYSIS ORNL 1604  F63   RS P     A $ JP1XR, COUPLED-CHANNEL      506
SCATTERING X-SEC CALC   KAPL 6600  F4    RS P   T A $ JP1XR, COUPLED-CHANNEL      574
SCATTRING CODES ANC   360  F4    RS P  CT W $ MACS LATTICE VIBRATION NEUTRON      446
SCHEME   KAPL 6600  F4    RS P     P $ MOST, A MULTIDIMENSIONAL OPTIMIZATION      375
SCISRS ENDF/B GRAPHIC X-SEC EVALUATION AI    360  F+BAL RSB L CT M $ SCORE3,       206
SCISRS X-SECTION TAPE   GGA  7044  F+MAP RSBP     M $ UNPACK, RETRIEVAL FROM      239
SCISRS X-SECTION TAPES  WANL 7094  F+FAP RSBPL  T A $ CPS, SC4020 PLOTS FROM      478
SCOPE2.0 CDC  7600  F4    FS       T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB
```

```
SCOPE3.2 CDC  6600C F+COM RS      T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB     478
SCOPE3.3 CDC  6600D F+COM RS      T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB     478
SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION AI    360  F+BAL RSB L CT M $     375
SC4020 PLOTS FROM SCISRS X-SECTION TAPES  WANL 7094  F+FAP RSBPL  T N $ CPS,      239
SC4020 PLOTS FROM X-SECTION TAPES    GGA  7044  F+SPS RSBP   T N $ CROSSPLOT,     207
SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD  WTSC 6600B F4    RS P    T I $     282
SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD  BAPL 6600  F4    RS P    T I $     282
SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD  SR    360  F4    RS P    T I $     282
SEARCH    GGA  1108  F4    RS P    T C $ GASP7, 1-D BURNUP POWER DISTRIBUTION     319
SEARCH  GGA  7044  F4    RS P    T C $ GASP2, 1-D FEW-GP DIFFUSION POWER DIST    220
SEARCH & RETRIEVAL  SLA  1108  F+BAL RSBP   T M $ SPIRAL, FULL-TEXT STORAGE,       607
SECTIONS   LASL 6600  F4    RS P     N $ LARCA, FLUX-WEIGHTING OF DTF4 CROSS      409
SERVICE ROUTINES  ANL  3600  36F    RSBP    T M $ MERMC2,MAGIC, MC**2 LIBRARY     472
SERVICE ROUTINES ENDF TAPES    BNL  7090  F+FAP RS P    T M $ DFSR, DATA FILE      236
SETS   GESV H600  F4    RS P  CT C $ TRIAL, 3-D REACTION RATES FROM 2-D FLUX      585
SETS   LASL 6600  BCD   R   LX T Z $ LASL XSEC SETS, SN 18- 24- AND 25-GROUP       532
SETS, SN 18- 24- AND 25-GROUP SETS   LASL 6600  BCD   R   LX T Z $ LASL XSEC      532
SHAPE CALCULATION ORNL 7090  F2     RS        A $ LYNNE, WOODS-SAXON POTENTIAL     381
SHEET OP PACKAGE   KAPL 6600  F+ASC RS P    T P $ DOGGY, DESK CALCULATOR FORM     428
SHELL BUCKLING COLLAPSE ANALYSIS    BAPL 6600  F4    RS P    T I $ BUSHL, CYL      481
SHELL STRESS ANALYSIS AXISYM LOAD  BAPL 6600  F4    RS P    T I $ SEALSHELL2,     282
SHELL STRESS ANALYSIS AXISYM LOAD  SR    360  F4    RS P    T I $ SEALSHELL2,     282
SHELL STRESS ANALYSIS AXISYM LOAD  WTSC 6600B F4    RS P    T I $ SEAL SHELL,     282
SHELL 3-D STRUCTURAL ANALYSIS     GGA  1108  F5    RS P    T I $ SHELL5, THIN     452
SHELL, SHELL STRESS ANALYSIS AXISYM LOAD  WTSC 6600B F4    RS P    T I $ SEAL     282
SHELLS         GGA  1108  F4    RS P    I $ SAFE-SHELL, STRESS ANALYSIS THIN      253
SHELLS         SLA  6600  F4    RS P    T I $ SLADE-D, DYNAMIC ANALYSIS OF THIN   581
SHELLS  MIT   360  F4    RS P    T I $ SARCR4, DISCRETE-ELEMENT ANALYSIS THIN    402
SHELLS OF REVOLUTION    KAPL 6600C F4    RS P    T I $ SOR3, STRESS ANALYSIS      80
SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS     GGA  1108  F5    RS P    T I $     452
SHIELD DESIGN MULTIGROUP SLAB GEOMETRY    ANL  3600  F63   RSRPL  T J $ MAC,      143
SHIELD DESIGN MULTIGROUP SLAB GEOMETRY    BNW  7090  F2    RSBPL  T J $ MAC,      143
SHIELD EVALUATION CODE   BAPL 6600P F+ASC RS P    T J $ SPAN4, A POINT-KERNEL    462
SHIELD LEAKAGE    AI   7090  F2    RS        J $ FARSE1A, DOSE RATE FROM SNAP      91
SHIELD WEIGHT OPTIMIZATION DOSE CALC     AI   7094  F+FAP RS P    J $ SHOE,       197
SHIELDING CODE CAVITY GEOM GGA  1108  F4    RS P    T J $ MUSCAT, VIEW FACTOR     259
SHIFT X-SEC & POLARIZATION CALC  KAPL 6600  F4    RS P    T A $ PHASER, PHASE     507
SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS    BAPL 6600  F4    RS P    T M $     557
SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION   AI   7090  F2    RS        I $     114
SHOE, SHIELD WEIGHT OPTIMIZATION DOSE CALC     AI   7094  F+FAP RS P    J $       197
SIGPLOT, RESOLVED MULTILEVEL R-W X-SEC CALC    BNL  6600  F4    RS P    A $       377
SIMPLE1, TIME-SHARING PROGRAMMING LANGUAGE     KAPL 6600  F+ASC RS      P $       442
SIMULATION    BAPL 6600  F4    RS P    T G $ FLASH4, FULLY-IMPLICIT TRANSIENT    448
SIMULATION  BAPL 6600  F4    RS P    T I $ BURL1, FUEL SWELLING & GAS RELEASE  468
SIMULATION OF REACTOR DYNAMICS         AI   360  F+BAL RS P    T E $ AIRCS2A,    326
SIMULATION OF REACTOR OPN OP    360  F4    RS P    G $ INTEG,INSPEC, MARKOV      590
SINGLE FAILURE MODE   BAPL 6600  F4    RS P    F $ RELO1, RELIABILITY FOR A      497
SINGLE SOURCE  ANL  GETS  F     R         R $ PLETHS, ISOPLETH-AREA CALC FROM    591
SINGLE-CHANNEL SPACE-TIME SYNTHESIS    KAPL 6600  F4    RS P    F $ STINT3,       389
SITE REQUIREMENT STUDY         ANL  3600  F63   RSRP   T G $ R153, PARAMETRIC    172
SITE REQUIREMENT STUDY     AI   360  F4    RS P    T G $ AISITE2, PARAMETRIC     172
SITE REQUIREMENT STUDY     AI   7094  F+FAP RS P    T G $ AISITE2, PARAMETRIC     172
SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION     AI   360  F4    RSRP X T D $       58
SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION     AI   7090  F2    RS  L  T D $       58
SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION     CDC  1604  F63   RS  L  T D $       58
SLA   360  COBOL RSBP  CT M $ BECOM, AEC OP PURCHASE VERSUS LEASE ANALYSIS       589
SLA  1108  COBOL RS P     M $ BECOM, AEC OP PURCHASE VERSUS LEASE ANALYSIS       589
SLA  1108  F+BAL RSBP   T M $ SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL      607
SLA  6600  F4    RS P     P $ ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION     601
SLA  6600  F4    RS P     P $ PLOTR, 2D CONTOUR PLOTS & AREA CALCULATION         578
SLA  6600  F4    RS P     V $ EFEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS     577
SLA  6600  F4    RS P   T I $ SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS           581
SLAB  CDC  1604  F63   RS P    T C $ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER    87
SLAB  ORNL 7090  F2    RS P    T C $ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER    87
```

```
SLAB AND SPHERE GEOM SN TRANSPORT    ANL   3600  F36   RS P XCT C $ TESS, 1-D      513
SLAB CYL      ORNL 7090  F2    RS P    T C $ EQUIPOISE3, 2-D 2-GROUP DIFFUSION     39
SLAB CYL SPHERE     BNW  1107  F4    RS P    T C $ FFN, 1-D MULTI-GP DIFFUSION   241
SLAB CYL SPHERE    AI    7090  F+FAP RS  L   T C $ FAIM, 1-D MULTI-GP DIFFUSION   120
SLAB CYL SPHERE    AI    7090  F+FAP RS PL   T C $ AIM6, 1-D MULTI-GP DIFFUSION    29
SLAB CYL SPHERE    CDC   1604  F63   RS PL   T C $ AIM6, 1-D MULTI-GP DIFFUSION    29
SLAB CYL SPHERE    CDC   1604  F63   RS PLX T C $ FAIM, 1-D MULTI-GP DIFFUSION   120
SLAB CYL SPHERE    OSUC  370   F4    RS PL CT C $ AIM6, 1-D MULTI-GP DIFFUSION    29
SLAB CYL SPHERE   AI    7090  F+FAP RS  L   T C $ ULCER, 1-D MULTI-GP DIFFUSION   118
SLAB CYL SPHERE   ANL   3600  F36   RS P X T C $ MACH1, 1-D MULTI-GP DIFFUSION   262
SLAB CYL SPHERE   PURD  6500  F4    RS PLX T C $ MACH1, 1-D MULTI-GP DIFFUSION   262
SLAB CYL SPHERE   PW    1604  LAG1  RS P      C $ MGDSN, 1-D MULTI-GP SN APPROX   211
SLAB CYL SPHERE   UK-W  7090  F2    RS P    T C $ W-DSN, 1-D MULTI-GP SN APPROX   132
SLAB CYL SPHERE BHSC  360  F4    RS P    T C $ FAIMDS, 1-D MULTI-GP DIFFUSION   120
SLAB CYLINDER CDC  1604  F63   RS P    T C $ 20GRAND, 2-D FEW-GROUP DIFFUSION     40
SLAB CYLINDER ORNL 7090  F2    RS P    T C $ 20GRAND, 2-D FEW-GROUP DIFFUSION     40
SLAB CYLINDER SPHERE  AER   360  F4    RS  L   T C $ FIRE5, 1-D AGE-DIFFUSION      9
SLAB CYLINDER SPHERE AI    7090  F2    RS P    T C $ FOG, 1-D FEW-GP DIFFUSION     28
SLAB CYLINDER SPHERE BC     625  F4    RS      T C $ FOG, 1-D FEW-GP DIFFUSION     28
SLAB CYLINDER SPHERE CDC   1604  F63   RS P    T C $ FOG, 1-D FEW-GP DIFFUSION     28
SLAB GAMMA-RAY TRANSPORT        BAPL 6600  F4    RS P    T J $ MO756,LETO, 1-D     343
SLAB GEOM PPCO 7090  F2    RS P      C $ MIST, 1-D FEW-GP SN DOUBLE SN APPROX     59
SLAB GEOMETRY     AI    7090  F2    RS P      J $ GRACE1, GAMMA-RAY ATTENUATION    45
SLAB GEOMETRY     ANL   3600  F63   RSPPL   T J $ MAC, SHIELD DESIGN MULTIGROUP   143
SLAB GEOMETRY     BNW   7090  F2    RSPPL   T J $ MAC, SHIELD DESIGN MULTIGROUP   143
SLAB GEOMETRY     CDC   1604  F63   RS P      J $ GRACE1, GAMMA-RAY ATTENUATION    45
SLAB GEOMETRY  AI    7090  F2    RS P      B $ SAIL, 1-D 1-GP SN APPROXIMATION    52
SLAB GEOMETRY  BAPL 6600  F4    RS P    T C $ BE21, FEW-GP DISCRETE ORDINATES    358
SLAB GEOMETRY  CDC  1604  F63   RS P      B $ SAIL, 1-D 1-GP SN APPROXIMATION    52
SLAB TRANSPORT WITH SLOWING DOWN     BAPL 6600  F4    RS      T C $ MO648, 1-D     342
SLAB, CYL, SPH  ANC   360  F4    RSBP  CT C $ MONA, 1-D MULTIGROUP DIFFUSION     582
SLAB, SPH, CYL GGA  1108  F+BAL RS P    T C $ GAZE2, 1-D MULTIGROUP DIFFUSION   430
SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS        SLA  6600  F4    RS P    T I $   581
SLL  6600  F4    RS P      N $ HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY    434
SLOW NEUTRON MULTIPLE SCATTERING CALC   ANL   360  F4    RS P  CT W $ MSCAT,     575
SLOWING DOWN    BAPL 6600  F4    RS      T C $ MO64P, 1-D SLAB TRANSPORT WITH    342
SLOWING-DOWN DENSITY CALC  AI    7094  F+FAP RS PL   T B $ TYCHE3, MONTE CARLO    149
SLOWING-DOWN NPGS  360  F4    RS P X T E $ MOD5, STOCHASTIC MODEL OF NEUTRON      491
SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS BNW  1108  F4    RS PLX T B $ HRG3,      467
SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS TVA  360  F4    RS PLX T B $ HRG3,      467
SN APPROX     BNW  7090  FLCCO RSBP   T C $ GF-HAPO-S13, 1-D MULTI-GP DOUBLE      75
SN APPROX SLAB CYL SPHERE  PW   1604  LAG1  RS P      C $ MGDSN, 1-D MULTI-GP     211
SN APPROX SLAB CYL SPHERE  UK-W 7090  F2    RS P    T C $ W-DSN, 1-D MULTI-GP     132
SN APPROX SLAB GEOM PPCO 7090  F2    RS P      C $ MIST, 1-D FEW-GP SN DOUBLE      59
SN APPROXIMATION CYLINDER     PPCO 7040  F4    RS P    T C $ TOPIC, 1-D FEW-GP     148
SN APPROXIMATION CYLINDER     PPCO 7090  F2    RS P    T C $ TOPIC, 1-D FEW-GP     148
SN APPROXIMATION RZ  PW   1604  F63   RS P    T C $ FORTRAN TDC, 2-D MULTI-GP     161
SN APPROXIMATION SLAB GEOMETRY  AI   7090  F2    RS P      B $ SAIL, 1-D 1-GP      52
SN APPROXIMATION SLAB GEOMETRY  CDC  1604  F63   RS P      B $ SAIL, 1-D 1-GP      52
SN APPROXIMATION XY GEOM    AGC  7090  FLCCO RSBP      C $ 2DXY, 2-D MULTI-GP      18
SN CONSTANTS FOR DSN TDC   PW   1604  F63   RS P      L $ SNC, CALCULATION OF     189
SN DOUBLE SN APPROX SLAB GEOM PPCO 7090  F2    RS P      C $ MIST, 1-D FEW-GP        59
SN PERTURBATION CODE USING DTF4 FLUXES    LASL 6600  F4    RS P      N $ DAC1,       455
SN THEORY   NED   635  F4    RS P    T C $ DOT2DB, 2-D MULTIGROUP DIFFUSION &      459
SN TRANSPORT    ANL  3600  F36   RS P XCT C $ TESS, 1-D SLAB AND SPHERE GEOM        513
SN X-SECTION LIBRARY TAPE PREPARATION     PW   1604  F63   RS      L $ CSP1,       194
SN X-SECTION LIBRARY TAPE PREPARATION   PW   1604  F63   RS      L $ CSP2A,      193
SN 18- 24- AND 25-GROUP SETS   LASL 6600  BCD   P   LX T Z $ LASL XSEC SETS,      532
SNAP GEOM   AI   7090  F2    RS      J $ SCARF2, SCATTER FROM RADIATOR FINS      110
SNAP GEOMETRY      AI   7090  F2    RS      J $ SCAR1, SCATTER FROM A RING      111
SNAP GEOMETRY     AI   7090  F2    RS P      J $ RATRAP, DOSE RATE CALCULATION   141
SNAP GEOMETRY    AI   7090  F2    RS      E $ SNAPKIN5/5A, 1-REGION KINETICS   122
SNAP GEOMETRY  AI   7090  F2    RS      J $ MORTIMER, DOSE RATE CALCULATION     142
SNAP SHIELD LEAKAGE    AI   7090  F2    RS      J $ FARSE1A, DOSE RATE FROM      91
```

```
SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY   AI   7090  F2    RS        E $    122
SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC  ANL  3600  F36   RS P   T C $    288
SNC, CALCULATION OF SN CONSTANTS FOR DSN TDC   PW   1604  F63   RS P     L $    189
SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT  KAPL 6600  F+ASC RS P   T P $    364
SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS      ANL   360  F4    RS P     G $    521
SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS      HEDL 1108  F4    RS P     G $    521
SODIUM POOL FIRE 1- & 2-CELL ANALYSIS AI    360  F4    RS P   T G $ SOFIRE2,    559
SODIUM-FUEL INTERACTION ANALYSIS       ANL   360  F4    RS P     G $ SOCOOL2,    521
SODIUM-FUEL INTERACTION ANALYSIS       HEDL 1108  F4    RS P     G $ SOCOOL2,    521
SODIUM-WATER REACTION   CEND 7600  F4    RS P   T G $ CEBUC, STEAM GENERATOR      548
SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS AI    360  F4    RS P   T G $      559
SOLID CRYSTAL   UM   7090  MAD   RSP      C $ BURF4, GAMMA-RAY PHOTOREACTION      169
SOLID FUEL TUBE BUNDLES   LASL 7094  F2    RSBP     H $ AXTHRM, HEAT TRANSFER      183
SOLVER  LLL  6600  F4    RS P     P $ GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM      592
SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS   LRL  7090  F+FAP RS P   T B $      160
SORSOB, PRESSURE VESSEL STRESS AND FATIGUE     KAPL 6600  F4    RS       I $      351
SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION     KAPL 6600C F4    RS P   T I $       80
SOURCE          UM   7090  MAD   RSP      D $ BURP2, DETECTOR EFFICIENCY DISK     165
SOURCE          UM   7090  MAD   RSP      C $ BURP1, DETECTOR EFFICIENCY POINT    164
SOURCE          UM   7090  MAD   RSP      D $ BURP3, DETECTOR EFFICIENCY POINT    166
SOURCE  ANL  GETS  F     P        R $ PLETHS, ISOPLETH-AREA CALC FROM SINGLE      591
SOURCE BUILDUP FACTOR CALC     BAPL 6600  F+ASC RS P   T J $ ASPIS, GAMMA RAY    429
SOURCE DATA   NED   635  F4    RS P   T D $ EXPN, ANALYSIS OF PULSED NEUTRON     258
SOURCE DATA ANALYSIS   CNEA  360  F4    RS P     E $ TRIFIDO, PULSED NEUTRON     489
SPACE CHORD DIST FUNCT   AEG  7090  F2    RS       B $ DANCOFF JR, MODERATOR      150
SPACE POWER PLANT DESIGN OPTIMIZATION   AI   7090  F2    RS       I $ CROCK,      112
SPACE POWER PLANT DESIGN OPTIMIZATION   AI   7090  F2    RS       I $ SHOCK,      114
SPACE-DEPENDENT X-SECTION GENERATION   GEC   635  F4    RSBP   T B $ GROUSE,     420
SPACE-INDEPENDENT INVERSE KINETICS CALC  ANL   360  F4    RS P     E $ R102,     168
SPACE-INDEPENDENT INVERSE KINETICS CALC  ANL  3600  F63   RSBP     E $ R102,     168
SPACE-INDEPENDENT INVERSE KINETICS CALC  WANL 7094  F4    RS       E $ R102,     168
SPACE-INDEPENDENT KINETICS KEX OPTIONS   ANL   360  F4    RS P     E $ R101,     255
SPACE-INDEPENDENT KINETICS KEX OPTIONS   ANL  3600  F63   RSBP     E $ R101,     255
SPACE-INDEPENDENT KINETICS KEX OPTIONS   WANL 7094  F4    RS P     E $ R101,     255
SPACE-INDEPENDENT KINETICS W/FEEDBACK    AI   7094  F+MAP RS P   T E $ AIROS,    163
SPACE-INDEPENDENT KINETICS W/FEEDBACK  AEB   360  F4    RS P     E $ AIREK3,     121
SPACE-INDEPENDENT KINETICS W/FEEDBACK  AI   7090  F2    RS       E $ AIREK3,     121
SPACE-INDEPENDENT KINETICS W/FEEDBACK  CDC  1604  F63   RS P     E $ AIREK3,     121
SPACE-INDEPENDENT REACTOR KINETICS   GGA  1108  F4    RS P     E $ GAPOTKIN,     317
SPACE-INDEPENDENT REACTOR KINETICS CODE ANL   360  F4    RS P   T E $ ANCON,      486
SPACE-INDEPENDENT REACTOR KINETICS CODE LASL 6600  F4    RS P   T E $ ANCON,      486
SPACE-TIME DIFFUSION           ANL   360  F4    RS P     E $ TWIGGLE, 2-D 2-GP   338
SPACE-TIME DIFFUSION FEEDBACK  BAPL 6600  F4    RS P   T E $ TWIGL, 2-D 2-GP     338
SPACE-TIME DIFFUSION FEEDBACK BNL  6600  F4    RS P   T E $ NOAH, 1-D ONE-GP     405
SPACE-TIME DIFFUSION 3-GEOM    BAPL 6600  F4    RS P   T E $ WIGL2, 1-D 2-GP     274
SPACE-TIME DIFFUSION 3-GEOM    GGA  1108  F4    RS P   T E $ WIGL2, 1-D 2-GP     274
SPACE-TIME KINETICS  BCL  6400  F4    RS P   T E $ ADEP, 1D AND 2D FEW-GROUP    494
SPACE-TIME SYNTHESIS    KAPL 6600  F4    RS P     E $ STINT3, SINGLE-CHANNEL      389
SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE   BAPL 6600B F+ASC RS P   T J $     462
SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS     NED  2000  F2    RS P     B $      178
SPATIAL & COMPOSITION-DEPENDENT X-SECS  GESV  635  F+GMP RS P XCT L $ TOCWN,      505
SPATIAL REACTOR KINETICS CODE ANL   360  F4    RS PL CT E $ QX1, QUASISTATIC     474
SPATIAL REACTOR KINETICS CODE ANL  3600  36F   RS PL CT E $ QX1, QUASISTATIC     474
SPATIALLY-AVERAGED DOPPLER EFFECTS     NED  2000  F2    RS P     B $ SPARTA,      178
SPATIALLY-DEPENDENT REACTOR KINETICS     AI   360  F4    RS P   T E $ TSN,        309
SPATIALLY-DEPENDENT REACTOR KINETICS     AI  7094  F+MAP RS P   T E $ TSN,        309
SPEC, TIME-OF-FLIGHT DATA ANALYSIS   GEES 1108  F5    RS P   T D $ CAGE,BIRD,     476
SPECIAL FUNCTION ROUTINES-EI,K,E,.... ANL   360  F4    RS P X T P $ FUNPACK,     610
SPECIAL FUNCTION ROUTINES-EI,K,E,.... ANL  1108  F5    RS P X T P $ FUNPACK,     610
SPECIAL FUNCTION ROUTINES-EI,K,E,.... ANL  6600  F4    RS P X T P $ FUNPACK,     610
SPECTRA         ORNL  360  F4    RS P     C $ ALPHA-M, RESOLUTION OF GAMMA RAY    413
SPECTRA & MULTI-GP CONSTANTS   ANC   360  F4    RS PL CT B $ INCITE, THERMAL      565
SPECTRA ANALYSIS     KAPL 6600  F4    RS       T D $ GASPAN, COMPLEX GAMMA-RAY   485
SPECTRA AND GROUP-AVERAGED X-SEC CALC GGA  1108  F4    RS P X T B $ GAF,GAR,     316
```

```
SPECTRA CALC   ANC   360  F4     RS PLXCT B $ PHROG, MULTI-GP CONSTANT & FAST    520
SPECTRA CALCULATION WITH DEPLETION     JNC  1108  F5     RS  LX T B $ LEOPARD,   279
SPECTRA CALCULATION WITH DEPLETION     WAPD  360  F4     RS PLX T B $ LEOPARD,   279
SPECTRA CODE BNWL 1108  F+BAL RS P   T C $ GSSLRN1B, LEAST SQUARES PHOTOPEAK   457
SPECTRA ENDF/B DATA  ORNL  360  F4     RS P    T B $ RICE, PRIMARY RECOIL ATOM  453
SPECTRA GE(LI)   ANC   360  F4     RSBP XCT W $ GAUSS5, ANALYSIS OF GAMMA-RAY   605
SPECTRA GGA  1108  F+BAL RS P   T C $ TOAD, PROCESSING OF ANALYZER GAMMA-RAY   333
SPECTRA GGA  1108  F4     RS PLX T B $ GGC4, MULTI-GP X-SECTIONS FAST THERMAL   298
SPECTRA GGA  6600  F4     RS  L  T B $ GGC4, MULTI-GP X-SECTIONS FAST THERMAL   298
SPECTRA KSUN  360  F4     RS P     D $ CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY   390
SPECTRA, MC CALCULATION IRRADIATED MATERIAL    GEC  7090  FAP    RSBP X T Q $   422
SPECTRUM AND X-SECTION CALCULATION NED  7094  F+FAP RS P    T B $ EPITHERMOS,   201
SPECTRUM CALC WITH BURNUP CYL LATTICE    TVA   360  F4     RSBPLXCT B $ LASER,   249
SPECTRUM CALC WITH BURNUP CYL LATTICE    WAPD 7094  F+MAP RS PLX T B $ LASER,   249
SPECTRUM MULTI-GP CONSTANT CALC  AGC  7090  F+FAP RSBPLX T B $ AGN-GAM, FAST   204
SPECTRUM X-SECTION CALC          BNW  1108  F5     RS PLX T B $ BRT1, THERMAL   184
SPECTRUM X-SECTION CALC      AI   7090  F2     RS PL  T B $ FORM, FAST NEUTRON   51
SPECTRUM X-SECTION CALC      ANL  3600  F63    RS  LX T B $ GAM1, FAST NEUTRON   33
SPECTRUM X-SECTION CALC      CDC  1604  F63    RS PL  T B $ FORM, FAST NEUTRON   51
SPECTRUM X-SECTION CALC      CDC  1604  F63    RS PLX T B $ GAM1, FAST NEUTRON   33
SPECTRUM X-SECTION CALC      GGA  7090  F2     RS PLX T B $ GAM1, FAST NEUTRON   33
SPECTRUM X-SECTION CALC      OSUC  370  F4     RS PLXCT B $ FORM, FAST NEUTRON   51
SPECTRUM X-SECTION CALC  ANL  3600  F63   RSBP XCT B $ THERMOS(ANL), THERMAL   184
SPECTRUM X-SECTIONS   AI   7090  F+FAP RS  L  T B $ QUICKIE, INFINITE MEDIUM   119
SPECTRUM X-SECTIONS  AI   7090  F+FAP RS PL  T B $ TEMPEST2, THERMAL NEUTRON    50
SPECTRUM X-SECTIONS  BHSC  360  F4     RS PL  T B $ TEMPEST2, THERMAL NEUTRON    50
SPECTRUM X-SECTIONS  CDC  1604  F63    RS PL  T B $ TEMPEST2, THERMAL NEUTRON    50
SPECTRUM, MULTIGP CONSTANTS BNW  1108  F4     RS PLX T B $ HFG3, SLOWING-DOWN   467
SPECTRUM, MULTIGP CONSTANTS TVA   360  F4     RS PLX T B $ HFG3, SLOWING-DOWN   467
SPENT YANKEE-FUEL TEMPERATURE CALC     ORNL 1604  F2     RS P     H $ BIGDEAL,   549
SPH   PW   1604  F63   RS P     F $ AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS   191
SPH  ANC   360  F4     RSBP  CT C $ MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL,   582
SPH, CYL GGA  1108  F+BAL RS P   T C $ GAZE2, 1-D MULTIGROUP DIFFUSION SLAB,   430
SPHERE    BNW  1107  F4     RS P    T C $ HFN, 1-D MULTI-GP DIFFUSION SLAB CYL   241
SPHERE   AI   7090  F+FAP RS  L  T C $ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL   120
SPHERE   AI   7090  F+FAP RS PL  T C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL    29
SPHERE   CDC  1604  F63   RS PL  T C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL    29
SPHERE   CDC  1604  F63   RS PLX T C $ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL   120
SPHERE   CDC  3600  F63   RSBP     F $ AX1, COUPLED NEUTRONICS-HYDRODYNAMICS   102
SPHERE   OSUC  370  F4    RS PL CT C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL    29
SPHERE  AER   360  F4    RS  L  T C $ FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER     9
SPHERE  AI   7090  F+FAP RS  L  T C $ ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL   118
SPHERE  ANL  3600  F36   RS P X T C $ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL   262
SPHERE  PURD 6500  F4    RS PLX T C $ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL   262
SPHERE  PW   1604  LAG1  RS P     C $ MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL   211
SPHERE  UK-W 7090  F2    RS P   T C $ W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL   132
SPHERE AI   7090  F2    RS P   T C $ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER    28
SPHERE BC   625  F4    RS    T C $ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER    28
SPHERE BHSC  360  F4    RS P   T C $ FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL   120
SPHERE CDC  1604  F63   RS P   T C $ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER    28
SPHERE GEOM  AI   7090  F2    RS P     J $ GRACE2, GAMMA-RAY ATTENUATION CYL    46
SPHERE GEOM  CDC  1604  F63   RS P     J $ GRACE2, GAMMA-RAY ATTENUATION CYL    46
SPHERE GEOM SN TRANSPORT    ANL  3600  F36   RS P XCT C $ TESS, 1-D SLAB AND   513
SPHERE LRL  7090  F2    RS P     F $ CONFC, COUPLED NEUTRONICS-HYDRODYNAMICS   129
SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL  SLA  1108  F+BAL RSBP   T M $   607
SQ LENS DESIGN SYSTEM LASL 6600  F+CCM RS P   T P $ LENSCES, NONLINEAR LEAST   602
SQUARE CELL COLLISION PROBABILITY CALC ANL   360  F4     RS P   T B $ CLUP77,   526
SQUARE CELL COLLISION PROBABILITY CALC JAER  230  F4     RS P   T B $ CLUP77,   526
SR   360  F4    RS P   T I $ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD     282
STABILITY ANALYSIS REACTOR KINETICS EQNS GGA  1108  F4    RS P     E $ GASA,   290
STATIC & DYNAMIC STRUCTURAL ANALYSIS    ANC  360  F4     RSBP  CT I $ STRAP,   539
STATION ELECTRICITY COSTS     ORNL 1604  F63   RS P     D $ POWERCO, NUCLEAR   340
STATION ELECTRICITY COSTS     UEC  6600  F4    RS P     D $ POWERCO, NUCLEAR   340
STATISTICAL MODEL REACTION X-SECTIONS  BNL  6600  F4    RS P     A $ THRESH,   504
```

```
STATISTICAL RESONANCE PARAMETER CALC   ENEA  360  F4    RS P     A $ PSEUDO,    292
STATISTICAL RESONANCE PARAMETER CALC   GGA  1108  F4    RS P     A $ PSEUDO,    292
STEADY-STATE AND TRANSIENT TEMP CALC   GGA  1108  F5    RS P   T H $ TAC2D,    408
STEADY-STATE FISSION PRODUCT FUEL MODEL  ANC   360  F4    RSBP  CT I $ FPFM,    584
STEADY-STATE FLOW, PRESSURE DISTRIBUTION GGA  1108  F5    RS P     H $ FLAC,    395
STEADY-STATE HEAT TRANSFER AI   7094  F+FAP RS P   T H $ HEATING2, TRANSIENT    198
STEADY-STATE TEMPERATURE VOID FRACTION  AI   7090  F2    RS       I $ FUGUE,     48
STEADY-STATE THERMAL-HYDRAULIC ANALYSIS NED   635  F4    RS P   T H $ MANTA,    256
STEADY-STATE THERMAL-HYDRAULIC ANALYSIS WARD 6600  F4    RS P   T H $ MANTA,    256
STEAM     GGA  1108  F4    RS P   T H $ DYNAM, DYNAMIC ANALYSIS BOILING FLOW    440
STEAM  ANC   360  F4    RS P   T H $ ASTEM, THERMODYNAMIC PROPERTIES WATER &    580
STEAM AND WATER PROPERTIES BG&E  360  F4    RS     T H $ STEAM-67, 1967 ASME    487
STEAM GENERATOR DESIGN CRITERIA COSTS  GGA  7044  F4    RS P   T D $ STMGEN,    227
STEAM GENERATOR SODIUM-WATER REACTION  CEND 7600  F4    RS P   T G $ CEBUG,    548
STEAM TABLES 14.5-14,500PSIA 32-472DEGF BAPL 6600  F4    RS     T H $ WATER,    267
STEAM TABLES 14.5-2538 PSIA          ANL  1604  F63   RS P     H $ MO899,HOH,    294
STEAM TABLES 14.5-2538 PSIA          BAPL 6600  F4    RS P   T H $ MO899,HOH,    294
STEAM THERMODYNAMIC PROPERTIES BAPL 6600  F4    RS P   T H $ WASP, WATER AND    396
STEAM-WATER MIX KAPL 6600  F4    RS P     H $ RAPP, HIGH-VELOCITY FLOW STUDY    382
STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES BG&E  360  F4    RS     T H $    487
STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE  ORNL  360  F4    RS P   C  G $    583
STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS  KAPL 6600  F4    RS P     I $    337
STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS    KAPL 6600  F4    RS P     F $    389
STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS  GGA  7044  F4    RS P   T D $    227
STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN NPGS  360  F4    RS P X T E $ MOD5,    451
STORAGE, RETRIEVAL, AND DISPLAY  DP    360  F+BAL  S     T M $ JOSHUA, DATA    490
STORAGE, SEARCH & RETRIEVAL  SLA  1108  F+BAL RSBP   T M $ SPIRAL, FULL-TEXT    607
STRAIN & PELLET CRACKING BAPL 6600  F4    RS P     I $ STRIPE, FUEL ROD CLAD    570
STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS    ANC   360  F4    RSBP  CT I $    539
STRESS & DEFORMATION    BAPL 6600  F4    RS P   T I $ CYGRO3, OXIDE FUEL ROD    449
STRESS ANALYSIS    KAPL 6600  F4    RS P     I $ TUBE, U-TUBE HEAT EXCHANGER    378
STRESS ANALYSIS  ANL  3600  F36   RS P   T I $ SUPORAN, REACTOR CORE SUPPORT    357
STRESS ANALYSIS  GGA  1108  F4    RS P     I $ SAFE-2D, PLANE & AXISYMMETRIC    379
STRESS ANALYSIS AXISYM LOAD  BAPL 6600  F4    RS P   T I $ SEALSHELL2, SHELL    282
STRESS ANALYSIS AXISYM LOAD  SR    360  F4    RS P   T I $ SEALSHELL2, SHELL    282
STRESS ANALYSIS AXISYM LOAD  WTSC 6600B F4    RS P   T I $ SEAL SHELL, SHELL    282
STRESS ANALYSIS AXISYMMETRIC LOAD  GGA  7044  F4    RSBP  CT I $ SAFE-PORS,    250
STRESS ANALYSIS AXISYMMETRIC LOAD GGA  7044  F4    RS P   T I $ SAFE-AXISYM,    251
STRESS ANALYSIS CYL FUEL ELEMENT       BAPL 6600  F4    RS     T I $ CYGRO2,    266
STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM  AI   360  F4    RS P  CT I $ PSA2,    542
STRESS ANALYSIS SHELLS OF REVOLUTION    KAPL 6600C F4    RS P   T I $ SOR3,     80
STRESS ANALYSIS STUDY      GGA  7044  F4    RS P   T G $ ELBOW, FUEL ELEMENT    229
STRESS ANALYSIS THIN SHELLS          GGA  1108  F4    RS P     I $ SAFE-SHELL,    253
STRESS ANALYSIS, 2-D BODIES  BNL  6600  F4    RS P   T I $ SAFE-PLANE, PLANE    252
STRESS ANALYSIS, 2-D BODIES  GGA  1108  F4    RS P     I $ SAFE-PLANE, PLANE    252
STRESS AND FATIGUE    KAPL 6600  F4    RS       I $ SCRSPR, PRESSURE VESSEL    391
STRESS OF PIPING SYSTEM    BAPL 6600  F4    RS P   T I $ MO457,PIPE, ELASTIC    329
STRESS STUDY  GGA  1108  F4    RS P   T I $ SAFE-3D, 3-D COMPOSITE STRUCTURE    332
STRESS STUDY  ORNL  360  F+BAL RS P   T I $ SAFE-3D, 3-D COMPOSITE STRUCTURE    332
STRESS STUDY BAPL 6600  F+COM RS P   T I $ GAPL3, INELASTIC LARGE DEFLECTION    397
STRESS, MAXIMUM MOMENT CALC    AI   7090  F+FAP RS     T I $ 4RESTRAINT PIPE    109
STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION BW   2000  F4    RS       A $    305
STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING BAPL 6600  F4    RS P     I $    570
STRUCTURAL ANALYSIS     GGA  1108  F5    RS P   T I $ SHELL5, THIN SHELL 3-D    452
STRUCTURAL ANALYSIS    ANC   360  F4    RSBP  CT I $ STRAP, STATIC & DYNAMIC    539
STRUCTURAL DYNAMICS     BAPL 6600  F4    RS P   T I $ MO266, LINEAR ELASTIC    383
STRUCTURE STRESS STUDY  GGA  1108  F4    RS P   T I $ SAFE-3D, 3-D COMPOSITE    332
STRUCTURE STRESS STUDY  ORNL  360  F+BAL RS P   T I $ SAFE-3D, 3-D COMPOSITE    332
STRUCTURES   BAPL 6600  F4    RS P   T L $ BL47, DRAFTING TOOL TO PLOT PLANE    373
STRUCTURES   KAPL 6600  F4    RS P X   I $ FINEL, FINITE-ELEMENT STUDY 2,3-D    404
STRUCTURES  BAPL 6600  F4    RS P   T I $ FUGIT, DYNAMIC RESPONSE OF ELASTIC    537
SUBPROGRAMS AND MODULES     ANL   360  F+BAL RS P  CT M $ ARC-SYSTEM, SYSTEM    522
SUBROUTINE LIB.  NED   635  F+GMP RS     T P $ GENED ENVIRONMENTAL ROUTINES,    515
SUBROUTINE LIB.  BAPL 6600A F+ASC RS     T P $ BETTIS ENVIRONMENTAL ROUTINES,    478
```

SUBROUTINE LIB. BW 6600P F+ASC RS T P $ BETTIS ENVIRONMENTAL ROUTINES, 478
SUBROUTINE LIBRARY CAT. A-E ANL 360 F+P+A RS T P $ AMDLIBAE, ARGONNE 562
SUBROUTINE LIBRARY CAT. F ANL 360 F+BAL RS T P $ AMDLIBF, ARGONNE 563
SUBROUTINE LIBRARY CAT. G-Z ANL 360 F+P+A RS T P $ AMDLIBGZ, ARGONNE 564
SUBROUTINES AI 360 F+BAL RS T P $ FIGS, IBM360 62250 FORTRAN GRAPHICS 484
SUM OF EXPONENTIALS MIT 7090 F2 RS P P $ FRANTIC, LEAST SQUARES FIT 324
SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC GGA 7090 F2 RS T A $ 56
SUMOP, S-WAVE NEUTRON X-SECTION CALCULATION BAPL 6600 F4 RS P T A $ 399
SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION ORNL 360 F4 RS P T B $ 431
SUPORAN, REACTOR CORE SUPPORT STRESS ANALYSIS ANL 3600 F36 RS P T I $ 357
SUPPORT STRESS ANALYSIS ANL 3600 F36 RS P T I $ SUPORAN, REACTOR CORE 357
SURVEY STUDY BW 6600 F+COM RS P X T D $ FARED, 1-D FAST REACTOR DESIGN & 427
SWELLING & GAS RELEASE SIMULATION BAPL 6600 F4 RS P T I $ BUBL1, FUEL 468
SWELLING TEMPERATURE STUDY BAPL 6600 F4 RS P T H $ FIGRO, LWBR FUEL 272
SWELL2, FUEL ELEMENT LIFETIME ANALYSIS ANL 3600 F36 RSBP I $ 353
SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION NED 635 F+GMP RS P T D $ 495
SYNTHESIS KAPL 6600 F4 RS P F $ STINT3, SINGLE-CHANNEL SPACE-TIME 389
SYNTHESIS ANL 3600 F63 RSBP T E $ TRAFICORPORATION, TRANSFER FUNCTION 135
SYNTHESIS CALC NED 635 F4 RS PL T C $ BISYN, 2-D MULTI-GP DIFFUSION 287
SYNTHESIS CALC NED 1108 F4 RS P T C $ BISYN, 2-D MULTI-GP DIFFUSION 287
SYNTHESIS MULTIGP DIFF & 1GP DEPLETION NED 635 F+GMP RS P T D $ SYN, 2D 495
SYNTHESIS PROGRAM CYL PW 1604 F63 RS T C $ 2DXYL, 3-D MULTI-GP FLUX 192
S4 APPROXIMATION AI 7090 F2 RS B $ S4 CYL CELL CODE, 1-D 1-GP 53
S4 APPROXIMATION CDC 1604 F63 RS P B $ S4 CYL CELL CODE, 1-D 1-GP 53
S4 APPROXIMATION RZ GEOMETRY LRL 709 F2 RS C $ FIRN, 2-D FEW-GP 7
S4 CYL CELL CODE AND TEMPEST COMBINATION AI 7090 F2 RS P B $ BAM, 108
S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION AI 7090 F2 RS B $ 53
S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION CDC 1604 F63 RS P B $ 53
TABLES AI 360 F+BAL RS P CT B $ U3R, UNRESOL RESONANCE XSEC PROBABILITY 553
TABLES FOR PWR OPN OPPD 6400 F4 S P H $ PWR-PPM, BORATION-DILUTION 552
TABLES 14.5-14,500PSIA 32-472DEGF BAPL 6600 F4 RS T H $ WATER, STEAM 267
TABLES 14.5-2538 PSIA ANL 1604 F63 RS P H $ MOBBB,HCH, STEAM 294
TABLES 14.5-2538 PSIA BAPL 6600 F4 RS P T H $ MOBBB,HOH, STEAM 294
TACAST, ANALYSIS OF RESONANCE MEASUREMENTS GGA 1108 F4 RS P T A $ 410
TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC GGA 1108 F5 RS P T H $ 408
TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM GGA 1108 F5 RS P T H $ 414
TAPE GGA 7044 F+MAP RSBP M $ UNPACK, RETRIEVAL FROM SCISRS X-SECTION 206
TAPE EDIT REACTION RATES UK-W 7090 F2 RS N $ WED, W-DSN OUTPUT 133
TAPE MAINTENANCE ANL 360 F4 RS M $ MERMC2, MC**2 BINARY LIBRARY 472
TAPE PREPARATION PW 1604 F63 RS L $ CSP1, SN X-SECTION LIBRARY 194
TAPE PREPARATION PW 1604 F63 RS L $ CSP2A, SN X-SECTION LIBRARY 193
TAPE PROCESSING AND EDITING ORNL 360B F4 RS P T M $ EDITOR, ENDF/B 502
TAPE PROCESSING AND EDITING ORNL 6600 F4 RS P T M $ EDITOR, ENDF/B 502
TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM ORNL 360 F4 RS P XCT F $ 558
TCB01, CREEP-BUCKLING OF TUBES UNDER PRESSURE BAPL 6600 F4 RS P I $ 604
TDC PW 1604 F63 RS P L $ SNC, CALCULATION OF SN CONSTANTS FOR DSN 189
TDC OR 2DXY FLUX INPUT PW 1604 F63 RS C $ TDP, 2-D PERTURBATION 199
TDC, 2-D MULTI-GP SN APPROXIMATION RZ PW 1604 F63 RS P T C $ FORTRAN 161
TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS GESV 635 F+GMP RS P XCT L $ 505
TDP, 2-D PERTURBATION TDC OR 2DXY FLUX INPUT PW 1604 F63 RS C $ 199
TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM LER 7090 F+MAP RS P T C $ 312
TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC GGA 7044 F4 RS P T C $ 225
TEMCO7, TEMPERATURE COEFFICIENT CALCULATION GGA 1108 F4 RS P T C $ 320
TEMP CALC GGA 1108 F5 RS P T H $ TAC2D, STEADY-STATE AND TRANSIENT 408
TEMP COEF CALC GGA 7044 F4 RS P T C $ TEMCO, 1-D FEW-GP DIFFUSION 225
TEMP FEEDBACK GGA 1108 F4 RS P T F $ GAKIT, 1-D MULTIGP KINETICS WITH 370
TEMPERATURE & DEFORMATION BAPL 6600 F4 RS P T I $ PELEN, FUEL PELLET 598
TEMPERATURE CALC ORNL 1604 F2 RS P H $ BIGDEAL, SPENT YANKEE-FUEL 549
TEMPERATURE CALC CYLINDER ANL 3600 F63 RSBP T H $ ARGUS, TRANSIENT 152
TEMPERATURE CODE GGA 7044 F4 RS I $ CORE, CORE CONFIGURATION FUEL 233
TEMPERATURE COEFFICIENT CALCULATION GGA 1108 F4 RS P T C $ TEMCO7, 320
TEMPERATURE DIST STUDY AEB 360 F4 RS P E $ BLAST, REACTOR KINETICS 363
TEMPERATURE DISTRIBUTION PROGRAM CHI 1108 F4 RS P T H $ LION4, 3-D 299
TEMPERATURE DISTRIBUTION PROGRAM KAPL 6600 F+ASC RS P T H $ LION4, 3-D 299

```
TEMPERATURE FEEDBACK  BAPL 6600  F4     RS P    T F $ NOWIG, 1-D 2-GP KINETICS     371
TEMPERATURE HISTORY    KF    7094  F2     RSBP    T H $ PTH1, BLOWDOWN PRESSURE     155
TEMPERATURE STUDY    BAPL 6600  F4     RS P    T H $ FIGRO, LWBR FUEL SWELLING     272
TEMPERATURE VOID FRACTION  AI    7090  F2     RS        I $ FUGUE, STEADY-STATE      48
TEMPEST COMBINATION  AI    7090  F2     RS P      B $ BAM, S4 CYL CELL CODE AND     108
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS  AI    7090  F+FAP RS PL  T B $      50
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS  BHSC  360  F4     RS PL  T B $      50
TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS  CDC  1604  F63    RS PL  T B $      50
TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT    ANL  3600  F36    RS P XCT C $     513
THEORY     GGA  1108  F4     RS P XCT C $ GAPER1D, 1-D TRANSPORT PERTURBATION     606
THEORY    NED   635  F4     RS P    T C $ DCT2DB, 2-D MULTIGROUP DIFFUSION & SN     459
THEORY XSEC CALC   KAPL 6600  F4     RS P      A $ MULTI, MULTI-LEVEL RESONANCE     535
THERMAL ANALYSIS   BCL  6400  F4     RS P    T G $ NURLOC-1.0, LOSS-OF-COOLANT     328
THERMAL DESIGN STUDY GGA  7044  F4     RS P      I $ GAZELLE5, GAS-COOLED CORE     232
THERMAL DISCHARGE STUDY   HEDL 1108  F5     RS P    T R $ TOPLYP2, POWER PLANT     599
THERMAL LIBRARIES FROM ENDF/B DATA       WARD 7600  F4     RS P    T B $ ETOT2,     509
THERMAL NEUTRON SPECTRUM X-SECTIONS  AI    7090  F+FAP RS PL  T B $ TEMPEST2,      50
THERMAL NEUTRON SPECTRUM X-SECTIONS  BHSC  360  F4     RS PL  T B $ TEMPEST2,      50
THERMAL NEUTRON SPECTRUM X-SECTIONS  CDC  1604  F63    RS PL  T B $ TEMPEST2,      50
THERMAL RESPONSE LOCA        ANC   360  F4     RSBP X T G $ THETA1-B, FUEL ROD     512
THERMAL SCATTERING CRYSTALLINE MATERIALS  LASL 6600  F4     RS P    T A $ TOR,     360
THERMAL SCATTERING DATA  DP    360  F4     RS P XCT A $ FLANGE2(71-1), ENDF/B     368
THERMAL SCATTERING LAW CALCULATION     GGA  1108  F4     RS P      A $ GASKET,     263
THERMAL SPECTRA & MULTI-GP CONSTANTS    ANC   360  F4     RS PL CT B $ INCITE,     565
THERMAL SPECTRA GGA  1108  F4     RS PLX T B $ GGC4, MULTI-GP X-SECTIONS FAST     298
THERMAL SPECTRA GGA  6600  F4     RS  L  T B $ GGC4, MULTI-GP X-SECTIONS FAST     298
THERMAL SPECTRUM X-SECTION CALC          BNW  1108  F5     RS PLX T B $ BRT1,     184
THERMAL SPECTRUM X-SECTION CALC  ANL  3600  F63    RSBP XCT B $ THERMOS(ANL),     184
THERMAL-HYDRAULIC ANALYSIS BNW   3600  F4     RS P    T H $ COBRA3C, ROD BUNDLE     432
THERMAL-HYDRAULIC ANALYSIS BNW  1108C  F4     RS P    T H $ COBRA3C, ROD BUNDLE     432
THERMAL-HYDRAULIC ANALYSIS BNW  6600C  F4     RS P    T H $ COBRA3C, ROD BUNDLE     432
THERMAL-HYDRAULIC ANALYSIS NED   635  F4     RS P    T H $ MANTA, STEADY-STATE     256
THERMAL-HYDRAULIC ANALYSIS WARD 6600  F4     RS P    T H $ MANTA, STEADY-STATE     256
THERMAL-HYDRAULIC WATER REACTOR DESIGN   BNW  1108  F5     RS P    T H $ REPP,     483
THERMODYNAMIC CYCLE ANALYSIS          AI    7094  F2     RS PL  T I $ CYCLOPS1,     244
THERMODYNAMIC PROPERTIES BAPL 6600  F4     RS P    T H $ WASP, WATER AND STEAM     396
THERMODYNAMIC PROPERTIES WATER & STEAM  ANC   360  F4     RS P    T H $ ASTEM,     580
THERMODYNAMICS OF PRESSURIZERS BAPL 6600  F4     RS P    T H $ TOPS, TRANSIENT     348
THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS     DP    360  BCD    R    LX T Z $     543
THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC  ANL  3600  F63    RSBP XCT B $     184
THETA1-B, FUEL ROD THERMAL RESPONSE LOCA       ANC   360  F4     RSBP X T G $     512
THIN SHELL 3-D STRUCTURAL ANALYSIS     GGA  1108  F5     RS P    T I $ SHELL5,     452
THIN SHELLS        GGA  1108  F4     RS P      I $ SAFE-SHELL, STRESS ANALYSIS     253
THIN SHELLS        SLA  6600  F4     RS P    T I $ SLADE-D, DYNAMIC ANALYSIS OF     581
THIN SHELLS  MIT   360  F4     RS P    T I $ SABCR4, DISCRETE-ELEMENT ANALYSIS     402
THREDES LIBRARY UTILITY ROUTINE  AI    360  F4     RSB L  T M $ CLIP, FORM CR     271
THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM    AI    360  F4     RSBP    T K $     273
THRESH, STATISTICAL MODEL REACTION X-SECTIONS  BNL  6600  F4     RS P      A $     504
THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM      GEC   635  F+GMP RSBP    T H $     346
THUNDERHEAD, EXTERNAL+INTERNAL DOSE AI    7094  F+FAP RS PL  T G $ CURIE,DOSE,     196
TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM    KAPL 6600  F     R B    T M $     403
TIME-DEP 2-D MULTI-GP DIFFUSION     UMCC  360  F4     RS P    T C $ VARI-QUIR,     212
TIME-DEP 2-D MULTI-GP DIFFUSION     WANL 6600  F4     RS P    T C $ VARI-QUIR,     212
TIME-DEPENDENT DIFFUSION CALC    KAPL 6600  F4     RS P      F $ RAUMZEIT, 1-D     352
TIME-DEPENDENT DIFFUSION GGA  1108  F4     RS P    T F $ GAKIN, 1-D MULTIGROUP     310
TIME-DEPENDENT HEAT CONDUCTION      PPCO 7044  F+MAP RS P    T H $ TOODEE, 2-D     349
TIME-OF-FLIGHT DATA ANALYSIS   GEES 1108  F5     RS P    T O $ CAGE,BIRD,SPEC,     476
TIME-SHARING PROGRAMMING LANGUAGE      KAPL 6600  F+ASC RS        P $ SIMPLE1,     442
TLC CORRECTION CALC  AI    360  F4     RS P    T Q $ RESPOND, DISSIMILAR MEDIA     566
TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA GGA  1108  F+BAL RS P    T O $     333
TOKAMAK FUSION REACTOR STUDY ANL   360  F4     RS P      X $ TOKMINA/TOKMINA2,     561
TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY ANL   360  F4     RS P      X $     561
TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION     PPCO 7044  F+MAP RS P    T H $     349
TOOL TO PLOT PLANE STRUCTURES   BAPL 6600  F4     RS P    T I $ PL47, DRAFTING     373
```

TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER PPCO 7040 F4 RS P T C $ 148
TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER PPCO 7090 F2 RS P T C $ 148
TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY HEDL 1108 F5 RS P T R $ 599
TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS BAPL 6600 F4 RS P T H $ 348
TOR OUTPUT DATA LASL 6600 F4 RS P T B $ GLEN, GROUP CONSTANT CALC FROM 361
TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS LASL 6600 F4 RS P T A $ 360
TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS ANL 3600 F63 RSBP T E $ 135
TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER AI 7094 F2 RS P T G $ 268
TRANSFER GGA 1108 F+BAL RS P T E $ BLOOST6, COMBINED KINETICS 2-D HEAT 303
TRANSFER AI 7094 F+FAP RS P T H $ HEATING2, TRANSIENT STEADY-STATE HEAT 198
TRANSFER AI 7094 F2 RS P T G $ TRANS-FUGUE1, TRANSIENT FLOW AND HEAT 268
TRANSFER CALC ANC 360 F4 RSBP XCT H $ MOXY, BWR FUEL ELEMENT HEAT 551
TRANSFER CALC ANC 1108 F4 RS P T H $ MOXY, BWR FUEL ELEMENT HEAT 551
TRANSFER COEFFICIENTS LRL 7090 F+FAP RS P T B $ SOPHIST1/2/5, MULTI-GP 160
TRANSFER FUNCTION EVALUATION PW 1604 F63 RS P E $ CMPXMAT, 188
TRANSFER FUNCTION SYNTHESIS ANL 3600 F63 RSBP T E $ TRAFICORPORATION, 135
TRANSFER GGA 7044 F+MAP RS P T H $ BLOOST5, POINT-KINETICS WITH 2-D HEAT 205
TRANSFER MATRICES AGC 7090 F2 RS P T B $ AGN-SIGMA, CALC OF MULTI-GP 243
TRANSFER MOLTEN FUEL TUBE BUNDLES LASL 7094 F2 RSBP H $ AXFLU, HEAT 182
TRANSFER PROGRAM GEC 635 F+GMP RSBP T H $ THTE, 3-D TRANSIENT HEAT 346
TRANSFER PROGRAM GGA 1108 F5 RS P T H $ TAC3D, TRANSIENT 3-D HEAT 414
TRANSFER SOLID FUEL TUBE BUNDLES LASL 7094 F2 RSBP H $ AXTHRM, HEAT 183
TRANSFER STUDY SLL 6600 F4 RS P N $ HEATMESH, GEOMETRICAL DATA HEAT 434
TRANSIENT & DEPLETION KAPL 6600 F4 RS P T D $ 3DXT,DEP3, 3-D XENON 477
TRANSIENT ANALYSIS BAPL 6600 F4 RS P T H $ FLOT1,MO219, PWR FLOW 331
TRANSIENT ANALYSIS ANC 360 F+BAL RSBPL CT G $ PARET, WATER-COOLED CORE 555
TRANSIENT FLOW AND HEAT TRANSFER AI 7094 F2 RS P T G $ TRANS-FUGUE1, 268
TRANSIENT HEAT CONDUCTION PROGRAM BAPL 6600 F4 RS P T H $ HOT2, 2-D 286
TRANSIENT HEAT TRANSFER PROGRAM GEC 635 F+GMP RSBP T H $ THTE, 3-D 346
TRANSIENT SIMULATION BAPL 6600 F4 RS P T G $ FLASH4, FULLY-IMPLICIT 448
TRANSIENT STEADY-STATE HEAT TRANSFER AI 7094 F+FAP RS P T H $ HEATING2, 198
TRANSIENT TEMP CALC GGA 1108 F5 RS P T H $ TAC2D, STEADY-STATE AND 408
TRANSIENT TEMPERATURE CALC CYLINDER ANL 3600 F63 RSBP T H $ ARGUS, 152
TRANSIENT THERMODYNAMICS OF PRESSURIZERS BAPL 6600 F4 RS P T H $ TOPS, 348
TRANSIENT 3-D HEAT TRANSFER PROGRAM GGA 1108 F5 RS P T H $ TAC3D, 414
TRANSIENTS ANL 360 F4 RS P T F $ SAS1A, FAST REACTOR POWER AND FLOW 400
TRANSIENTS ANL 6600 F4 RS P T F $ SAS1A, FAST REACTOR POWER AND FLOW 400
TRANSIENTS BAPL 6600 F4 RS P T H $ CHIC-KIN, FAST + INTERMEDIATE POWER 473
TRANSMUTATION ANALYSIS BNWL 1108 F5 RS P T D $ DBUFIT1, LEAST SQUARES 456
TRANSPORT BAPL 6600 F4 RS P T J $ MO756,LETO, 1-D SLAB GAMMA-RAY 343
TRANSPORT ANL 3600 F36 RS P XCT C $ TESS, 1-D SLAB AND SPHERE GEOM SN 513
TRANSPORT CODES WANL 6600 F4 RS L T B $ GAMB1T, X-SEC GENERATION FOR 547
TRANSPORT PERTURBATION THEORY GGA 1108 F4 RS P XCT C $ GAPER1D, 1-D 606
TRANSPORT PROGRAM LASL 360 F4 RSBP CT C $ TRIPLET, 2-D TRIANGULAR MESH 608
TRANSPORT PROGRAM LASL 6600 F4 RS P T C $ TRIPLET, 2-D TRIANGULAR MESH 608
TRANSPORT PROGRAM LASL 7600 F4 RS P T C $ TRIPLET, 2-D TRIANGULAR MESH 608
TRANSPORT STUDY REC 3600 F36 RS P G $ DISPER, AEROSOL PARTICLE 554
TRANSPORT WITH SLOWING DOWN BAPL 6600 F4 RS T C $ MO648, 1-D SLAB 342
TRANSPORT XY RZ RTH LASL 7600 F4 RS P T C $ TWOTRAN-PNVW, 2-D PARTICLE 573
TRANSPORT XY RZ RTHETA LASL 360B F4 RS P CT C $ TWOTRAN2, 2-D MULTI-GP 358
TRANSPORT XY RZ RTHETA LASL 6600B F4 RS P T C $ TWOTRAN2, 2-D MULTI-GP 358
TRANSPORT XY RZ RTHETA LASL 7600B F4 RS P T C $ TWOTRAN2, 2-D MULTI-GP 358
TREE EVALUATION CODES ANC 360 F4 RSBP CT K $ PREP,KITT, SYSTEM FAULT 528
TREE EVALUATION CODES ANC 1108 F4 RS P T K $ PREP,KITT, SYSTEM FAULT 528
TRI-MESH GGA 1108 F+BAL RS P T D $ BUGTRI, 2-D MULTIGP DIFFUSION+BURNUP 439
TRIAL, 3-D REACTION RATES FROM 2-D FLUX SETS GESV H600 F4 RS P CT C $ 585
TRIANGULAR MESH GGA 1108 F+BAL RS P T C $ GAMTRI, 2-D MULTIGP DIFFUSION 401
TRIANGULAR MESH TRANSPORT PROGRAM LASL 360 F4 RSBP CT C $ TRIPLET, 2-D 608
TRIANGULAR MESH TRANSPORT PROGRAM LASL 6600 F4 RS P T C $ TRIPLET, 2-D 608
TRIANGULAR MESH TRANSPORT PROGRAM LASL 7600 F4 RS P T C $ TRIPLET, 2-D 608
TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS CNEA 360 F4 RS P E $ 489
TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM LASL 360 F4 RSBP CT C $ 608
TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM LASL 6600 F4 RS P T C $ 608
TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM LASL 7600 F4 RS P T C $ 608

```
TRIX1, RESCNANCE INTEGRAL X-SECTION CALC        AI   7094  F+MAP RS PLX T A $     208
TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE NED   635  F4    RS P   T M $     493
TRCUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE NED  1108  F5    RS P   T M $     493
TRW  6500  F4    RS P     B $ PARTI, OPTIMAL GROUP OR MESH COLLAPSING             416
TSN, SPATIALLY-DEPENDENT REACTOR KINETICS       AI    360  F4    RS P   T F $     309
TSN, SPATIALLY-DEPENDENT REACTOR KINETICS       AI   7094  F+MAP RS P   T F $     309
TSO    ANL   360  F+BAL R B L  T P $ TSO-SPEAKEASY, LANGUAGE PROCESSOR UNDER       593
TSO-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSO     ANL   360  F+BAL R B L  T P $     593
TUBE BUNDLES  LASL 7094  F2    RSBP     H $ AXFLU, HEAT TRANSFER MOLTEN FUEL       182
TUBE BUNDLES  LASL 7094  F2    RSBP     H $ AXTHRM, HEAT TRANSFER SOLID FUEL       183
TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS     KAPL 6600  F4    RS P     I $     378
TUBES UNDER PRESSURE  BAPL 6600  F4    RS P     I $ TCB01, CREEP-BUCKLING OF       604
TURBULENT FLOW IN LMFBR ROD BUNDLE    NED   635  F4    RS P   T H $ VELVET2,      458
TUZ, UNRESCLVED REGION RESONANCE INTEGRAL CALC GGA  7090  F+FAP RSB    T A $       42
TVA   360  F4    RS PLX T B $ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS       467
TVA   360  F4    RSBPLXCT B $ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE         249
TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION          ANL   360  F4    RS P     F $     338
TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK  BAPL 6600  F4    RS P   T F $       338
TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT XY RZ RTH LASL 7600  F4    RS P   T C $       573
TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA  LASL  360B F4    RS P  CT C $       358
TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA  LASL 6600B F4    RS P   T C $       358
TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA  LASL 7600B F4    RS P   T C $       358
TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC  AI   7094  F+FAP RS PL  T B $       149
U-TUBE HEAT EXCHANGER STRESS ANALYSIS    KAPL 6600  F4    RS P     I $ TUBE,       378
UCND  360B F+BAL RS P     C $ PMS1, FAST NEUTRON POLARIZATION EXPERIMENT           469
UEC  6600  F4    RS P     D $ NPREFCP, FUEL CYCLE COSTS PERFORMANCE DATA           146
UEC  6600  F4    RS P     D $ POWERCO, NUCLEAR STATION ELECTRICITY COSTS           340
UEC  6600  F4    RS P     D $ WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY           224
UGA   360  F4    RS P     G $ WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT          278
UHTREX   LASL 7090  F+FAP RS P     I $ WIREX, COMPUTER-PRODUCED WIRING LISTS        315
UICS  360  F4    RS P  CT D $ GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS         576
UILL  360  F4    RS P     A $ CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA       347
UK-R 7090  F+FAP RSBPL   T C $ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM        103
UK-W 7090  F2    RS       N $ WED, W-DSN OUTPUT TAPE EDIT REACTION RATES           133
UK-W 7090  F2    RS P   T C $ W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE        132
ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE  AI   7090  F+FAP RS  L  T C $       118
UM   7090  MAD   RSB      O $ BURP1, DETECTOR EFFICIENCY POINT SOURCE              164
UM   7090  MAD   RSB      O $ BURP2, DETECTOR EFFICIENCY DISK SOURCE               165
UM   7090  MAD   RSB      O $ BURP3, DETECTOR EFFICIENCY POINT SOURCE              166
UM   7090  MAD   RSB      O $ BURP4, GAMMA-RAY PHOTOFRACTION SOLID CRYSTAL         165
UM   7090  MAD   RSB      O $ BURP5, GAMMA-RAY PHOTOFRACTION WELL CRYSTAL          170
UMCC  360  F4    RS P   T C $ VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION            212
UNC  1604  F63   RS       C $ 2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE             173
UNC  1604  F63   RS PL  T C $ DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC            144
UNDER PRESSURE  BAPL 6600  F4    RS P     I $ TCB01, CREEP-BUCKLING OF TUBES       604
UNDER TSO    ANL   360  F+BAL R B L  T P $ TSC-SPEAKEASY, LANGUAGE PROCESSOR        593
UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA KSUN  360  F4    RS P     C $ CORGAM,       390
UNITS DUCC  635  F4    RS       G $ ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE       529
UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE   GGA  7044  F+MAP RSBP     M $       206
UNRESCL RESCNANCE XSEC PROBABILITY TABLES AI    360  F+BAL RS P  CT B $ U3R,       553
UNRESOLVED REGION AVERAGE X-SEC CALC  BNL  6600  F4    RS P     A $ AVERAGE,      376
UNRESCLVED REGION AVERAGE X-SEC CALC  BNL  7094  F4    RS P     A $ AVERAGE,      376
UNRESCLVED REGION RESONANCE INTEGRAL CALC GGA  7090  F+FAP RSB    T A $ TUZ,        42
UNRESOLVED RESONANCE INTEGRALS X-SECS    BAPL 6600  F4    RS P   T A $ PUN1,       359
UNRESOLVED RESONANCE X-SECTION CALC     GGA  1108  F4    RS P     A $ GANDY,       341
UNRESOLVED RESONANCES BAPL 6600  F4    RS P     A $ GRAMP, R-M PARAMETERS OF       470
URANIUM FUEL CYCLE COST ANALYSIS      AI   7090  F2    RS P     D $ AIMFIRE,      55
USING DTF4 FLUXES   LASL 6600  F4    RS P     N $ DAC1, SN PERTURBATION CODE       455
UTILITY MODULES, 2-D + 3-D PLOTTING   KAPL 6600  F+ASC RS P   T P $ DATATRAN       407
UTILITY PROGRAM        AI   7094  F+FAP RS  L  T M $ MOMUS, X-SECTION LIBRARY      159
UTILITY ROUTINE      ANL  3600  F63   RSBP   T M $ XLIBIT, X-SECTION LIBRARY       181
UTILITY ROUTINE  AI    360  F4    RSB L  T M $ CLIP, FORM OR THREDES LIBRARY       271
UVA  6400  F4    RS PLX T B $ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV          185
U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES AI    360  F+BAL RS P  CT B $       553
```

```
VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION      UMCC  360  F4     RS P    T C $     212
VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION      WANL 6600  F4     RS P    T C $     212
VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH    WANL 7094  F4     RS P X T C $      264
VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE     NED   635  F4     RS P    T H $     458
VENUS, 2-D LMFBR POWER EXCURSION DISASSEMBLY    ANL   360  F4     RS P XCT F $      511
VERSUS LEASE ANALYSIS   SLA   360  COBOL RSBP  CT M $ BECOM, AEC DP PURCHASE       589
VERSUS LEASE ANALYSIS   SLA  1108  COBOL RS P      M $ BECOM, AEC DP PURCHASE       589
VESSEL STRESS AND FATIGUE       KAPL 6600  F4     RS       I $ SCRSDB, PRESSURE     391
VIBRATING SYSTEMS  KAPL 6600  F+ASC RS P    T I $ GEM, EIGENVALUE PROBLEM FOR      344
VIBRATION NEUTRON SCATTRING CODES ANC   360  F4     RS P  CT W $ MACS LATTICE        574
VIEW FACTOR CALC FOR CYLINDRICAL PINS ANC   360  F4     RSBP  CT J $ VIEWPIN,        569
VIEW FACTOR SHIELDING CODE CAVITY GEOM GGA  1108  F4     RS P    T J $ MUSCAT,      259
VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS ANC   360  F4     RSBP  CT J $        569
VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS    AI   7600  F4     RS PLX T C $      510
VIM1X, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS   AI-A  360  F4     RSBPL CT C $      510
VISCOELASTIC ANALYSIS CONCRETE      GGA  1108  F4     RS P      I $ SAFE-CREEP,     300
VISCOELASTIC ANALYSIS OF CONCRETE   GGA  1108  F5     RS P    T I $ SAFE-CRACK,     451
VOID FRACTION  AI    7090  F2     RS       I $ FUGUE, STEADY-STATE TEMPERATURE      48
VOID X-SECTION CALCULATION      GEC   625  F4     RS P      B $ AVOID, ANNULAR      276
V1 PROC BNL  66008 F4     RS      T M $ CHECKER,CRECT,DAMMET,PLOTER,... ENDF/B      384
V2 PROC  BNL  66008 F4    RS      T M $ CRECT,CHECKER,RIGEL,PLOTER,... ENDF/B       475
V2 PROCESSING CODES       ANL   360  F4     RS P    T M $ CRECT,CHECKER, ENDF/B       475
V3 DATA PROCESSING CODE         ANL   360  F4     RS      T M $ RIGEL, ENDF/B       571
V3,V4 PROCESSING CODES    BNL  6600  F4     RS      T M $ CHECK3,RIGEL3, ENDF/B       571
V4 PROCESSING CODES   BNL  6600  F4     RS      T M $ CHECK3,RIGEL3, ENDF/B V3,   571
W-DSN OUTPUT TAPE EDIT REACTION RATES     UK-W 7090  F2     RS       N $ WED,         133
W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE   UK-W 7090  F2     RS P    T C $     132
WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY      GGA  7044  F4     RS P      D $     224
WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY      UEC  6600  F4     RS P      D $     224
WANL 6600  F4     RS  L  T B $ CAMBIT, X-SEC GENERATION FOR TRANSPORT CODES          547
WANL 6600  F4     RS P    T C $ VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION          212
WANL 7094  F+FAP RSBPL    T N $ CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES       239
WANL 7094  F2     RS P      A $ EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS       238
WANL 7094  F4     RS        E $ R102, SPACE-INDEPENDENT INVERSE KINETICS CALC       168
WANL 7094  F4     RS P      E $ R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS        255
WANL 7094  F4     RS P X T C $ VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH          264
WAPD  360  F4     RS PLX T B $ LEOPARD, SPECTRA CALCULATION WITH DEPLETION          279
WAPD 6600  PCD    R   L   T Z $ ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2          447
WAPD 6600  F4     RS P    T B $ ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS      436
WAPD 6600  F4     RS P    T D $ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS       354
WAPD 6600  F4     RS PL   T B $ ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT      437
WAPD 7094  F+MAP RS PLX T B $ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE          249
WAPD 7600  F4     RS P    T B $ ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT      538
WAPD 7600  F4     RS P    T B $ ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA           509
WARD 6600  F4     RS P    T H $ MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS      256
WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES BAPL 6600  F4     RS P    T H $     356
WATER & STEAM  ANC   360  F4     RS P    T H $ ASTEM, THERMODYNAMIC PROPERTIES     580
WATER AND STEAM THERMODYNAMIC PROPERTIES BAPL 6600  F4     RS P    T H $ WASP,       356
WATER PROPERTIES BG&E  360  F4     RS      T H $ STEAM-67, 1967 ASME STEAM AND       487
WATER REACTOR DESIGN   BNW  1108  F5     RS P    T H $ REPP, THERMAL-HYDRAULIC     483
WATER-COOLED CORE TRANSIENT ANALYSIS    ANC   360  F+BAL RSBPL CT G $ PARET,        555
WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT     UGA   360  F4     RS P      G $     278
WATER-LOGGED FUEL ELEMENT ANALYSIS      BAPL 6600  F4     RS P    T H $ GLUB1,      424
WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF BAPL 6600  F4     RS      T H $     267
WAVE FUNCTION RADIAL INTEGRALS ORNL 1604  F63    RS P      A $ RAMES, PARTICLE       335
WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS   APDA 7094  F2     RS P      F $     145
WED, W-DSN OUTPUT TAPE EDIT REACTION RATES      UK-W 7090  F2     RS       N $      133
WEIGHT OPTIMIZATION DOSE CALC     AI    7094  F+FAP RS P      J $ SHOE, SHIELD      197
WEIGHT OPTIMIZATION STUDY    PW   1604  F63    RS       I $ WOPEXPRT, REACTOR     190
WELL CRYSTAL    UM   7090  MAD   RSB      C $ BURP5, GAMMA-RAY PHOTOFRACTION        170
WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS    AEB   360  F4     RS P      B $     362
WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS      KE   3600B F36    RSBP      G $     278
WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY   CDC   1604  F63    RS P    T C $      32
WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY   ORNL 7090  F2     RS P    T C $      32
```

```
WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM    BAPL 6600  F4    RS P   T F $    274
WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM    GGA  1108  F4    RS P   T F $    274
WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX   LASL 7090  F+FAP RS P     I $    315
WIRING LISTS UHTREX   LASL 7090  F+FAP RS P     I $ WIREX, COMPUTER-PRODUCED    315
WLIB,FLAT, RESONANCE ABSORPTION, CELL   ANL  3600  F36   RSBP X T B $ RABBLE,  281
WOODS-SAXON POTENTIAL SHAPE CALCULATION ORNL 7090  F2    RS        A $ LYNNE,    381
WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY    PW   1604  F63   RS        I $    190
WORKSTATION PKG   ANL  360  F+ASM PSB   CT P $ WSP-HASP/DOS, DOS-MFT REMOTE     541
WSP-HASP/DOS, DOS-MFT REMOTE WORKSTATION PKG   ANL  360  F+ASM PSB   CT P $     541
WTSC 6600B F4    RS P   T I $ SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD     282
X-SEC   BNL  6600  F4    RS P     A $ BESFIT, DIFFRACTION MODEL ELASTIC SCAT    524
X-SEC & POLARIZATION CALC  KAPL 6600  F4    RS P   T A $ PHASER, PHASE SHIFT    507
X-SEC CALC    BNL  6600  F4    RS P     A $ SIGPLOT, RESOLVED MULTILEVEL B-W    377
X-SEC CALC   KAPL 6600  F4    RS P   T A $ JP1XR, COUPLED-CHANNEL SCATTERING  506
X-SEC CALC  BNL  6600  F4    RS P     A $ AVERAGE, UNRESOLVED REGION AVERAGE  376
X-SEC CALC  BNL  7094  F4    RS P     A $ AVERAGE, UNRESOLVED REGION AVERAGE  376
X-SEC CALC BNW  1108  F4    RS P   T B $ FCC4, FUNDAMENTAL MODE FAST REACTOR  306
X-SEC CALC GGA  1108  F4    RS P X T B $ GAF,GAR, SPECTRA AND GROUP-AVERAGED  316
X-SEC CALC ORNL  360  F+BAL RS P     D $ ISOSEARCH, ISOTOPE PRODUCTION FLUX,   322
X-SEC CALC ORNL 1604  F63   RS P     D $ ISOSEARCH, ISOTOPE PRODUCTION FLUX,   322
X-SEC EVALUATION     ENEA  360  F4    RS P   CT A $ JUPITOR1, COUPLED CHANNEL  308
X-SEC EVALUATION     ORNL 1604  F63   RS P   T A $ JUPITOR1, COUPLED-CHANNEL   308
X-SEC EVALUATION AI    360  F+BAL RSB L CT M $ SCORE3, SCISRS ENDF/B GRAPHIC   375
X-SEC FORMAT WAPD 6600  F4    RS PL  T B $ ETOG1, ENDF/B TO MUFT, GAM, ANISN  437
X-SEC FORMAT WAPD 7600  F4    RS P   T B $ ETOG3, ENDF/B TO MUFT, GAM, ANISN  538
X-SEC GENERATION FOR TRANSPORT CODES   WANL 6600  F4    RS  L  T B $ GAMBIT,   547
X-SECS    BAPL 6600  F4    RS P   T A $ PUN1, UNRESOLVED RESONANCE INTEGRALS  359
X-SECS  GESV  635  F+GMP RS P XCT L $ TDOWN, SPATIAL & COMPOSITION-DEPENDENT  505
X-SECS BAPL 6600  F4    RS      T B $ MO807, 2-D DIFFUSION ABSORPTION REMOVAL 280
X-SECTION AVERAGING     GGA  7044  F4    RS P     L $ GAVER, ENERGY INTERVAL  218
X-SECTION CALC          BNW  1108  F5    RS PLX T B $ BRT1, THERMAL SPECTRUM  184
X-SECTION CALC       AI   7090  F2    RS PL  T A $ ARES2, RESONANCE INTEGRAL   89
X-SECTION CALC       AI   7094  F+MAP RS PLX T A $ TRIX1, RESONANCE INTEGRAL  208
X-SECTION CALC       ANL  3600  F63   RSBP    A $ NEARREX, COMPOUND NUCLEUS   171
X-SECTION CALC       CDC  1604  F63   RS PL  T A $ ARES2, RESONANCE INTEGRAL   89
X-SECTION CALC       NED  2000  F2    RS P     A $ COPIE, RESOLVED RESONANCE  177
X-SECTION CALC     AI   7090  F2    RS PL  T B $ FORM, FAST NEUTRON SPECTRUM    51
X-SECTION CALC     ANL  3600  F63   RS  LX T B $ GAM1, FAST NEUTRON SPECTRUM    33
X-SECTION CALC     CDC  1604  F63   RS PL  T B $ FORM, FAST NEUTRON SPECTRUM    51
X-SECTION CALC     CDC  1604  F63   RS PLX T B $ GAM1, FAST NEUTRON SPECTRUM    33
X-SECTION CALC     GGA  1108  F4    RS P     A $ GANDY, UNRESOLVED RESONANCE  341
X-SECTION CALC     GGA  7090  F2    RS PLX T B $ GAM1, FAST NEUTRON SPECTRUM    33
X-SECTION CALC     NED  2000  F2    RS P     A $ RAPTURE, RESONANCE INTEGRAL  176
X-SECTION CALC     OSUC  370  F4    RS PLXCT B $ FORM, FAST NEUTRON SPECTRUM    51
X-SECTION CALC  ANL  3600  F63   RSBP XCT B $ THERMOS(ANL), THERMAL SPECTRUM  184
X-SECTION CALC ELASTIC SCAT RESONANCES AI    360  F4    RS PLX T B $ AILMOE,  147
X-SECTION CALC ELASTIC SCAT RESONANCES AI   7094  F+FAP RS PL  T B $ AILMOE,  147
X-SECTION CALC FROM DSN OUTPUT  PW   1604  LAG1  RS P     N $ DTX, EFFECTIVE  210
X-SECTION CALC MODERATOR GGA  1108  F4    RS P     A $ GAKER, INELASTIC SCAT  289
X-SECTION CALCULATION      GEC   635  F4    RS P     B $ AVOID, ANNULAR VOID  276
X-SECTION CALCULATION     BAPL 6600  F4    RS P   T A $ SUMOR, S-WAVE NEUTRON 399
X-SECTION CALCULATION    ANL   360  F4    RS P  CT B $ MC**2, ENDF MULTIGROUP 355
X-SECTION CALCULATION    ANL  3600  F36   RS P   T B $ MC**2, ENDF MULTIGROUP 355
X-SECTION CALCULATION  GGA  1108  F5    RS P     A $ FLANGE1, SCATTERING LAW 247
X-SECTION CALCULATION NED  7094  F+FAP RS P   T B $ EPITHERMOS, SPECTRUM AND 201
X-SECTION EVALUATION   ORNL 7090  F4    RSBP     A $ MUFFLE, FISSILE NUCLIDE 323
X-SECTION GENERATION   BNW  1108  F4    RS P X T B $ 1DX, 1-D DIFFUSION FAST 374
X-SECTION GENERATION   GEC   635  F4    RSBP   T B $ GROUSE, SPACE-DEPENDENT 420
X-SECTION GENERATION CODE   BAPL 6600  F+COM RS P X T B $ PAX03, HARMONY-PDQ 426
X-SECTION LIBRARY PREPARATION     GGA  1108  F4    RS P X T L $ GAND, GAFGAR 345
X-SECTION LIBRARY TAPE PREPARATION    PW   1604  F63   RS        L $ CSP1, SN 194
X-SECTION LIBRARY TAPE PREPARATION   PW   1604  F63   RS        L $ CSP2A, SN 193
X-SECTION LIBRARY UTILITY PROGRAM       AI   7094  F+FAP RS  L  T M $ MOMUS,  159
X-SECTION LIBRARY UTILITY ROUTINE       ANL  3600  F63   RSBP   T M $ XLIBIT,  181
```

X-SECTION MANIPULATION ANL 360 F4 RSBPL CT L $ ARC-XSEC1, MICROSCOPIC 594
X-SECTION TAPE GGA 7044 F+MAP RSBP M $ UNPACK, RETRIEVAL FROM SCISRS 206
X-SECTION TAPES GGA 7044 F+SPS RSBP T N $ CROSSPLOT, SC4020 PLOTS FROM 207
X-SECTION TAPES WANL 7094 F+FAP RSBPL T N $ CPS, SC4020 PLOTS FROM SCISRS 239
X-SECTIONS AI 7090 F+FAP RS L T B $ QUICKIE, INFINITE MEDIUM SPECTRUM 119
X-SECTIONS LASL 7090 FLOCO RS P B $ ZOT, GROUP-COLLAPSING OF MULTI-GP 113
X-SECTIONS AI 7090 F+FAP RS PL T B $ TEMPEST2, THERMAL NEUTRON SPECTRUM 50
X-SECTIONS AI 7094 F2 RS P T A $ 2PLUS, NON-SPHERICAL OPTICAL MODEL 254
X-SECTIONS ANL 3600 F63 RSBP T A $ 2PLUS, NON-SPHERICAL OPTICAL MODEL 254
X-SECTIONS BHSC 360 F4 RS PL T B $ TEMPEST2, THERMAL NEUTRON SPECTRUM 50
X-SECTIONS BNL 6600 F4 RS P A $ RAMP1, REICH-MOOPE RESOLVED REGION 492
X-SECTIONS BNL 6600 F4 RS P A $ THRESH, STATISTICAL MODEL REACTION 504
X-SECTIONS CDC 1604 F63 RS PL T B $ TEMPEST2, THERMAL NEUTRON SPECTRUM 50
X-SECTIONS FAST THERMAL SPECTRA GGA 1108 F4 RS PLX T B $ GGC4, MULTI-GP 298
X-SECTIONS FAST THERMAL SPECTRA GGA 6600 F4 RS L T B $ GGC4, MULTI-GP 298
X-SECTIONS FOR GAMMA-RAYS GEC 7094 F4 RS P B $ GAMMA-P, PRODUCTION 235
X-SECTIONS FROM B-W RESONANCE PARAMETERS WANL 7094 F2 RS P A $ EXT, 238
X-SECTIONS GGA 1108 F5 RS P T B $ ENDFB2,GAND2,GFE2, ENDF/B TO GAFGAR 596
X-SECTIONS HEX LATTICE GGA 1108 F4 RS B $ HEXSCAT, ELASTIC SCAT 291
X-SECTIONS NED 635 F4 RS P T B $ REAX, RESOLVED RESONANCE EPITHERMAL 257
X-SECTIONS PARAMETERS AI 7094 F+FAP RS PL T B $ GRAVE, GROUP-AVERAGING 162
X-SECTIONS WAPD 6600 F4 RS P T B $ ETCM1, ENDF/B FORMAT TO MUFT FORMAT 436
XENON OSCILLATION CEND 360 F4 RS P X T F $ CEXE,INCEXE, 1-GP 3-D XYZ 415
XENON TRANSIENT & DEPLETION KAPL 6600 F4 RS P T D $ 3DXT,DEP3, 3-D 477
XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B ORNL 360 F4 RSBP XCT B $ 572
XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE ANL 3600 F63 RSBP T M $ 181
XRAY DIFFRACTION POWDER PATTERN INDEXING LASL 6600 F+COM RS P T Q $ INDX, 609
XSDRN MULTIGROUP LIBRARIES FROM ENDF/B ORNL 360 F4 RSBP XCT B $ XLACS, 572
XSDRN, DISCRETE ORDINATE MULTIGROUP CONSTANTS ORNL 360 F4 RS PLX T B $ 393
XSEC CALC KAPL 6600 F4 RS P A $ MULTI, MULTI-LEVEL RESONANCE THEORY 535
XSEC LIBRARY MAINTENANCE NED 635 F4 RS P T M $ TROUT, MUG MULTIGROUP 493
XSEC LIBRARY MAINTENANCE NED 1108 F5 RS P T M $ TROUT, MUG MULTIGROUP 493
XSEC PROBABILITY TABLES AI 360 F+BAL RS P CT B $ U3R, UNRESOL RESONANCE 553
XSEC SETS, SN 18- 24- AND 25-GROUP SETS LASL 6600 BCD R LX T Z $ LASL 532
XSECS. FROM B-W PARAMETERS GGA 1108 F5 RS P CT A $ FSDP3, POINTWISE 216
XSECTION CODES BNL 6600B F4 RS P T A $ RESEND,ADLER, ENDF/B RESONANCE 465
XY GEOM AGC 7090 FLOCO RSBP C $ 2DXY, 2-D MULTI-GP SN APPROXIMATION 18
XY RZ GEOMETRY GGA 1108 F+BAL RS P T C $ GAMBLE5, 2-D MULTI-GP DIFFUSION 222
XY RZ GEOMETRY GGA 7044 F+MAP RSBP T C $ GAMBLE4, 2-D MULTI-GP DIFFUSION 222
XY RZ RTH WANL 7094 F4 RS P X T C $ VARI-QUIP3, 2-D MULTI-GP DIFFUSION 264
XY RZ RTH LASL 7600 F4 RS P T C $ TWOTRAN-PNVW, 2-D PARTICLE TRANSPORT 573
XY RZ RTHETA LASL 3608 F4 RS P CT C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT 358
XY RZ RTHETA LASL 6600B F4 RS P T C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT 358
XY RZ RTHETA LASL 7600B F4 RS P T C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT 358
XY RZ RTHETA GEOMETRY BNW 1108 F4 RS P C $ PERT4, 2-D PERTURBATION 304
XY, RZ GGA 1108 F+BAL RS P T D $ BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP 438
XYZ GEOMETRY CDC 1604 F63 RS P T C $ WHIRLAWAY, 3-D 2-GROUP DIFFUSION 32
XYZ GEOMETRY ORNL 7090 F2 RS P T C $ WHIRLAWAY, 3-D 2-GROUP DIFFUSION 32
XYZ R-THETA-Z LASL 6600 F4 RS P T C $ 3DDT, 3-D MULTIGROUP DIFFUSION 463
XYZ XENON OSCILLATION CEND 360 F4 RS P X T F $ CEXE,INCEXE, 1-GP 3-D 415
YANKEE-FUEL TEMPERATURE CALC ORNL 1604 F2 RS P H $ BIGDEAL, SPENT 549
YIELD FROM REACTION OR DECAY ORNL 1604 F63 RS P D $ ISOTOPES, MAXIMUM 179
ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS LASL 7090 FLOCO RS P B $ 113
ZPR-III ASSEMBLY 48 GAFGAR ENDF/B DATA TAPES GGA 1108 BIN R L T Z $ 356
ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC GGA 7090 F+FAP RSB T A $ 41
1- & 2-CELL ANALYSIS AI 360 F4 RS P T G $ SOFIRE2, SODIUM POOL FIRE 559
1-D AGE-DIFFUSION SLAB CYLINDER SPHERE AEB 360 F4 RS L T C $ FIRE5, 9
1-D AND 2-D MULTI-GP DIFFUSION PROGRAM AAEC 360 F+BAL RS P T C $ CRAM, 103
1-D AND 2-D MULTI-GP DIFFUSION PROGRAM UK-R 7090 F+FAP RSBPL T C $ CRAM, 103
1-D AND 2-D MULTI-GP DIFFUSION SEARCH GGA 1108 F4 RS P T C $ GASP7, 319
1-D BURNUP POWER DISTRIBUTION SEARCH BNW 1108 F4 RS P X T B $ 1DX, 374
1-D DIFFUSION FAST X-SECTION GENERATION BW 6600 F+COM RS P X T D $ FARED, 427
1-D FAST REACTOR DESIGN & SURVEY STUDY GGA 7044 F4 RS P T D $ RELOAD-FEVER, 221
1-D FEW-GP DIFFUSION DEPLETION GGA 7044 F4 RS P CT D $ DWARF, 579
1-D FEW-GP DIFFUSION DEPLETION PROGRAM ANC 360 F4 RSBP CT D $ DWARF, 579

```
1-D                                                                                  1-GP
1-D FEW-GP DIFFUSION DEPLETION PROGRAM  GGA  7090  F2    RSB    T D $ FEVER,     117
1-D FEW-GP DIFFUSION DESIGN SYSTEM    AI    360  F4    RSBP   T K $ THREDES,   273
1-D FEW-GP DIFFUSION POWER DIST SEARCH  GGA  7044  F4    RS P   T C $ GASP2,   220
1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE AI   7090  F2    RS P   T C $ FOG,     28
1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE BC    625  F4    RS     T C $ FOG,     28
1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE CDC  1604  F63   RS P   T C $ FOG,     28
1-D FEW-GP DIFFUSION TEMP COEF CALC     GGA  7044  F4    RS P   T C $ TEMCO,   225
1-D FEW-GP SN APPROXIMATION CYLINDER    PPCO 7040  F4    RS P   T C $ TOPIC,   148
1-D FEW-GP SN APPROXIMATION CYLINDER    PPCO 7090  F2    RS P   T C $ TOPIC,   148
1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM PPCO 7090  F2    RS P     C $ MIST,    59
1-D MULTI-GP DIFFUSION + LIB   AI    360  F4    RSBPLX T C $ CAESAR4,LIBLST,  270
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE    BNW  1107  F4    PS P   T C $ HFN,     241
1-C MULTI-GP DIFFUSION SLAB CYL SPHERE    AI   7090  F+FAP RS  L  T C $ FAIM,    120
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE    AI   7090  F+FAP RS PL  T C $ AIM6,    29
1-C MULTI-GP DIFFUSION SLAB CYL SPHERE    CDC  1604  F63   RS PL  T C $ AIM6,    29
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE    CDC  1604  F63   RS PLX T C $ FAIM,    120
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE    CSUC  370  F4    RS PL CT C $ AIM6,    29
1-C MULTI-GP DIFFUSION SLAB CYL SPHERE   AI   7090  F+FAP RS  L  T C $ ULCER,    118
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE   ANL  3600  F36   RS P X T C $ MACH1,    262
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE  PURD 6500  F4    RS PLX T C $ MACH1,    262
1-D MULTI-GP DIFFUSION SLAB CYL SPHERE BHSC  360  F4    RS P   T C $ FAIMOS,    120
1-D MULTI-GP DISCRETE ORDINATE CALC       AI   7090  F2    RS PLX T C $ DTF2,    151
1-D MULTI-GP DISCRETE ORDINATE CALC      AI    360  F4    RSBPLX T C $ ANISN,   151
1-D MULTI-GP DISCRETE ORDINATE CALC  ANL  3600  F36   RS P   T C $ SNARG-1D,    288
1-C MULTI-GP DISCRETE ORDINATE PROGRAM    ANL   360  F+BAL RS P   T C $ DTF4,    209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM    BC    625  F+MAP RS P   T C $ DTF4,    209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM    LASL 6600  F4    RS P   T C $ DTF4,    209
1-C MULTI-GP DISCRETE ORDINATE PROGRAM    LASL 7030  F4    RS P   T C $ DTF4,    209
1-D MULTI-GP DISCRETE ORDINATE PROGRAM    LER  7094  F4    RS P   T C $ DTF4,    209
1-C MULTI-GP DOUBLE SN APPROX      BNW  7090  FLCCC RSBP   T C $ GE-HAPO-S13,    75
1-C MULTI-GP DTF4 WITH DEPLETION      LASL 7030  F4    RS P   T D $ DTF-BURN,   269
1-D MULTI-GP SN APPROX SLAB CYL SPHERE  PW   1604  LAG1  RS P     C $ MGDSN,    211
1-D MULTI-GP SN APPROX SLAB CYL SPHERE  UK-W 7090  F2    RS P   T C $ W-DSN,    132
1-C MULTIGP KINETICS WITH TEMP FEEDBACK GGA  1108  F4    RS P   T F $ GAKIT,    370
1-D MULTIGROUP DIFFUSION AND DEPLETION GGA  1108  F4    RS P   T D $ FEVER7,    318
1-D MULTIGROUP DIFFUSION DEPLETION      AI   360  F4    RSBP X T D $ SIZZLE,    58
1-D MULTIGROUP DIFFUSION DEPLETION      AI   7090  F2    RS  L  T D $ SIZZLE,    58
1-C MULTIGROUP DIFFUSION DEPLETION      CDC  1604  F63   RS  L  T D $ SIZZLE,    58
1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH  ANC   360  F4    RSBP  CT C $ MONA,     582
1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL GGA  1108  F+BAL RS P   T C $ GAZE2,    430
1-D MULTIGROUP DISCRETE ORDINATE CALC     UNC  1604  F63   RS PL  T C $ DTF,     144
1-D MULTIGROUP REACTOR KINETICS PROGRAM  CRNL  360  F4    RS P XCT F $ TASK,    558
1-D MULTIGROUP TIME-DEPENDENT DIFFUSION GGA  1108  F4    RS P   T F $ GAKIN,    310
1-C ONE-GP SPACE-TIME DIFFUSION FEEDBACK BNL  6600  F4    RS P   T F $ NOAH,     405
1-D PERTURBATION FOR AIM AND FOG CODES    AI   7090  F2    RS       C $ PERT,     30
1-D PERTURBATION FOR AIM AND FOG CODES    BHSC  360  F4    RS P     C $ PERT,     30
1-D PERTURBATION FOR AIM AND FOG CODES    CDC  1604  F63   RS       C $ PERT,     30
1-D SLAB AND SPHERE GEOM SN TRANSPORT     ANL  3600  F36   RS P XCT C $ TESS,    513
1-D SLAB GAMMA-RAY TRANSPORT        BAPL 6600  F4    RS P   T J $ MO756,LETO,  343
1-D SLAB TRANSPORT WITH SLOWING DOWN     BAPL 6600  F4    RS       T C $ MO648,  342
1-D TIME-DEPENDENT DIFFUSION CALC     KAPL 6600  F4    RS P     F $ RAUMZEIT,   352
1-D TRANSPORT PERTURBATION THEORY      GGA  1108  F4    RS P XCT C $ GAPER1D,   606
1-D 1-GP SN APPROXIMATION SLAB GEOMETRY  AI   7090  F2    RS P     B $ SAIL,     52
1-D 1-GP SN APPROXIMATION SLAB GEOMETRY  CDC  1604  F63   RS P     B $ SAIL,     52
1-D 1-GP S4 APPROXIMATION     AI   7090  F2    RS       B $ S4 CYL CELL CODE,    53
1-D 1-GP S4 APPROXIMATION     CDC  1604  F63   RS P     B $ S4 CYL CELL CODE,    53
1-C 2-GP KINETICS TEMPERATURE FEEDBACK  BAPL 6600  F4    RS P   T F $ NOWIG,    371
1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM    BAPL 6600  F4    RS P   T F $ WIGL2,    274
1-C 2-GP SPACE-TIME DIFFUSION 3-GEOM    GGA  1108  F4    RS P   T F $ WIGL2,    274
1-GP SN APPROXIMATION SLAB GEOMETRY  AI   7090  F2    RS P     B $ SAIL, 1-D    52
1-GP SN APPROXIMATION SLAB GEOMETRY  CDC  1604  F63   RS P     B $ SAIL, 1-D    52
1-GP S4 APPROXIMATION     AI   7090  F2    RS       B $ S4 CYL CELL CODE, 1-D    53
1-GP S4 APPROXIMATION     CDC  1604  F63   RS P     B $ S4 CYL CELL CODE, 1-D    53
1-GP 3-D XYZ XENON OSCILLATION    CEND  360  F4    RS P X T F $ CEXE,INCEXE,     415
```

```
1-REGION                                                                    1108

1-REGION KINETICS SNAP GEOMETRY   AI   7090  F2    RS        E $ SNAPKIN5/5A,    122
1D AND 2D FEW-GROUP SPACE-TIME KINETICS  BCL  6400  F4    RS P   T F $ ADEP,    494
1DX  HEDL 1108B F4    RS P X T B $ ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR    388
1DX, 1-D DIFFUSION FAST X-SECTION GENERATION   BNW  1108  F4    RS P X T B $    374
1GP DEPLETION NED   635  F+GMP RS P   T D $ SYN, 2D SYNTHESIS MULTIGP DIFF &    495
1ST FLIGHT COLLISION PROBABILITIES MC  ORNL  360  F+BAL RS P   T B $ RAFFLE,    392
1ST FLIGHT COLLISION PROBABILITIES MC  ORNL 7090  F+FAP RS P   T B $ RAFFLE,    392
10 MEV    BC    625  F4    RS PLX T B $ GAMTEC2, MULTI-GP CONSTANT CALC O TO     185
10 MEV    BNW  1107  F4    RS PL  T B $ GAMTEC2, MULTI-GP CONSTANT CALC O TO     185
10 MEV    BNW  7090  F+FAP RS PL  T B $ GAMTEC2, MULTI-GP CONSTANT CALC O TO     185
10 MEV    UVA  6400  F4    RS PLX T B $ GAMTEC2, MULTI-GP CONSTANT CALC O TO     185
1107  F4    RS P   T C $ HEN, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE    BNW    241
1107  F4    RS PL  T B $ GAMTEC2, MULTI-GP CONSTANT CALC O TO 10 MEV    BNW    185
1108  BIN   R   L  T Z $ ZPR-III ASSEMBLY 48 GAPGAP ENDF/B DATA TAPES  GGA    356
1108  COBOL RS P     M $ BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS  SLA    589
1108  F+BAL RS P   T C $ GAMBLES, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY GGA    222
1108  F+BAL RS P   T C $ GAMTRI, 2-D MULTIGP DIFFUSION TRIANGULAR MESH GGA    401
1108  F+BAL RS P   T C $ GAZE2, 1-D MULTIGROUP DIFFUSION SLAB, SPH, CYL GGA    430
1108  F+BAL RS P   T D $ BUCTRI, 2-D MULTIGP DIFFUSION+BURNUP TRI-MESH  GGA    439
1108  F+BAL RS P   T D $ BUG2, 2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ GGA    438
1108  F+BAL RS P   T E $ BLOOST6, COMBINED KINETICS 2-D HEAT TRANSFER   GGA    303
1108  F+BAL RS P   T O $ GSSLPN1B, LEAST SQUARES PHOTOPEAK SPECTRA CODE BNWL   457
1108  F+BAL RS P   T O $ TOAD, PROCESSING OF ANALYZER GAMMA-RAY SPECTRA GGA    333
1108  F+BAL RSBP    T M $ SPIRAL, FULL-TEXT STORAGE, SEARCH & RETRIEVAL SLA    607
1108  F+SL  RS P XCT R $ HERMES, REGIONAL RADIOLOGICAL EFFECTS ANALYSIS HEDL   527
1108  F4    S      T D $ GAFFE, EQUILIBRIUM FUEL CYCLE CALCULATION      GGA    302
1108  F4    RS       B $ HEXSCAT, ELASTIC SCAT X-SECTIONS HEX LATTICE   GGA    291
1108  F4    RS     T G $ GADOSE,DOSET, HTGR ACCIDENT ANALYSIS DOSE CALC GGA    261
1108  F4    RS   X T P $ FISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL    534
1108  F4    RS P     A $ GAKER, INELASTIC SCAT X-SECTION CALC MODERATOR GGA    289
1108  F4    RS P     A $ GANDY, UNRESOLVED RESONANCE X-SECTION CALC     GGA    341
1108  F4    RS P     A $ GASKET, THERMAL SCATTERING LAW CALCULATION     GGA    263
1108  F4    RS P     A $ PSEUDO, STATISTICAL RESONANCE PARAMETER CALC   GGA    292
1108  F4    RS P     C $ PERT4, 2-D PERTURBATION XY RZ RTHETA GEOMETRY  BNW    304
1108  F4    RS P     D $ FREVAP6, HTGR METALLIC FISSION PRODUCT RELEASE GGA    301
1108  F4    RS P     E $ GAPOTKIN, SPACE-INDEPENDENT REACTOR KINETICS   GGA    317
1108  F4    RS P     E $ GASA, STABILITY ANALYSIS REACTOR KINETICS EQNS GGA    290
1108  F4    RS P     G $ SODCOL2, SODIUM-FUEL INTERACTION ANALYSIS      HEDL   521
1108  F4    RS P     I $ SAFE-CREEP, VISCOELASTIC ANALYSIS CONCRETE     GGA    300
1108  F4    RS P     I $ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES  GGA    252
1108  F4    RS P     I $ SAFE-SHELL, STRESS ANALYSIS THIN SHELLS        GGA    253
1108  F4    RS P     I $ SAFE-2D, PLANE & AXISYMMETRIC STRESS ANALYSIS  GGA    379
1108  F4    RS P     L $ GRDWRK, GRID GENERATION FOR SAFE PROGRAMS      GGA    296
1108  F4    RS P   T A $ TACASI, ANALYSIS OF RESONANCE MEASUREMENTS     GGA    410
1108  F4    RS P   T B $ FCC4, FUNDAMENTAL MODE FAST REACTOR X-SEC CALC BNW    306
1108  F4    RS P   T C $ BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC   NED    287
1108  F4    RS P   T C $ GASP7, 1-D BURNUP POWER DISTRIBUTION SEARCH    GGA    319
1108  F4    RS P   T C $ GATT, 3-D FEW-GP DIFFUSION CALC HEX-Z MESH     GGA    380
1108  F4    RS P   T C $ TEMCO7, TEMPERATURE COEFFICIENT CALCULATION    GGA    320
1108  F4    RS P   T D $ FEVER7, 1-D MULTIGROUP DIFFUSION AND DEPLETION GGA    318
1108  F4    RS P   T D $ GAUGE, 2-D FEW-GP HEX GEOM DIFFUSION DEPLETION GGA    339
1108  F4    RS P   T D $ PWCOST, REACTOR FUEL CYCLE COST CALCULATION    GGA    441
1108  F4    RS P   T D $ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION    BNW    325
1108  F4    RS P   T D $ 3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS  HEDL   567
1108  F4    RS P   T F $ GAKIN, 1-D MULTIGROUP TIME-DEPENDENT DIFFUSION GGA    310
1108  F4    RS P   T F $ GAKIT, 1-D MULTIGP KINETICS WITH TEMP FEEDBACK GGA    370
1108  F4    RS P   T F $ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM    GGA    274
1108  F4    RS P   T G $ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC    369
1108  F4    RS P   T H $ DYNAM, DYNAMIC ANALYSIS BOILING FLOW STEAM     GGA    440
1108  F4    RS P   T H $ LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM    CHI    299
1108  F4    RS P   T H $ MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC      ANC    551
1108  F4    RS P   T H $ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY  GGA    332
1108  F4    RS P   T I $ MUSCAT, VIEW FACTOR SHIELDING CODE CAVITY GEOM GGA    259
1108  F4    RS P   T J $ PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES ANC    528
```

```
1108                                                                                    1604

1108  F4     RS P X    A $ COHRE, COHERENT INELASTIC SCATTERING LAW CALC   GGA     385
1108  F4     RS P X T B $ GAF,GAR, SPECTRA AND GROUP-AVERAGED X-SEC CALC  GGA     316
1108  F4     RS P X T B $ 1DX, 1-D DIFFUSION FAST X-SECTION GENERATION    BNW     374
1108  F4     RS P X T L $ GAND, GAFGAR X-SECTION LIBRARY PREPARATION     GGA     345
1108  F4     RS P XCT C $ GAPER1D, 1-D TRANSPORT PERTURBATION THEORY     GGA     606
1108  F4     RS PLX T B $ GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA GGA     298
1108  F4     RS PLX T B $ HRG3, SLOWING-DOWN SPECTRUM, MULTIGP CONSTANTS BNW     467
1108  F5     RS  LX T B $ LEOPARD, SPECTRA CALCULATION WITH DEPLETION    JNC     279
1108  F5     RS P      A $ FLANGE1, SCATTERING LAW X-SECTION CALCULATION GGA     247
1108  F5     RS P      H $ FLAC, STEADY-STATE FLOW, PRESSURE DISTRIBUTION GGA     395
1108  F5     RS P    T B $ ENDFB2,GAND2,GFF2, ENDF/B TO GAFGAR X-SECTIONS GGA     596
1108  F5     RS P    T C $ 2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE      GGA     173
1108  F5     RS P    T D $ DRUFIT1, LEAST SQUARES TRANSMUTATION ANALYSIS BNWL    456
1108  F5     RS P    T H $ REPP, THERMAL-HYDRAULIC WATER REACTOR DESIGN  BNW     483
1108  F5     RS P    T H $ TAC2D, STEADY-STATE AND TRANSIENT TEMP CALC   GGA     408
1108  F5     RS P    T H $ TAC3D, TRANSIENT 3-D HEAT TRANSFER PROGRAM    GGA     414
1108  F5     RS P    T I $ SAFE-CRACK, VISCOELASTIC ANALYSIS OF CONCRETE GGA     451
1108  F5     RS P    T I $ SHELL5, THIN SHELL 3-D STRUCTURAL ANALYSIS    GGA     452
1108  F5     RS P    T M $ TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE NEC     493
1108  F5     RS P    T N $ GAPER2D, 2-D PERTURBATION CALC FROM 2DF OUTPUT GGA     471
1108  F5     RS P    T O $ CAGE,BIRD,SPEC, TIME-OF-FLIGHT DATA ANALYSIS  GEES    476
1108  F5     RS P    T R $ TOPLYR2, POWER PLANT THERMAL DISCHARGE STUDY  HEDL    599
1108  F5     RS P   CT A $ FSDF3, POINTWISE XSECS. FROM B-W PARAMETERS   GGA     216
1108  F5     RS P  X T D $ PACTOLUS,CLOTHO, NUCLEAR POWER PLANT COST CODE HEDL    540
1108  F5     RS P  X T F $ NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES    BNW     488
1108  F5     RS P  X T P $ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,.... ANL     610
1108  F5     RS PLX T B $ BRT1, THERMAL SPECTRUM X-SECTION CALC          BNW     184
1108  F5     RSBPL   T D $ ISOGEN, RADIONUCLIDE GENERATION AND DECAY     BNW     367
1108B F4     RS P  X T B $ ETOX3, MULTI-GP CONSTANTS FROM ENDF/B FOR 1DX HEDL    388
1108C F4     RS P    T H $ COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW     432
14.5-14,500PSIA 32-472DEGF BAPL 6600  F4     RS      T H $ WATER, STEAM TABLES 267
14.5-2538 PSIA          ANL  1604  F63    RS P      H $ MO899,HOH, STEAM TABLES 294
14.5-2538 PSIA          BAPL 6600  F4     RS P    T H $ MO899,HOH, STEAM TABLES 294
1604  F+CDP RS P    T P $ LAG, ASSEMBLER FOR FLOCO2 INSTRUCTION SET     PW      186
1604  F+CDP RS P  X T B $ FMC-N,FMC-G, MC NEUTRON, GAMMA-RAY HISTORIES  PW      195
1604  F2    RS P      H $ BIGDEAL, SPENT YANKEE-FUEL TEMPERATURE CALC   ORNL    549
1604  F63   RS        C $ PERT, 1-D PERTURBATION FOR AIM AND FOG CODES   CDC      30
1604  F63   RS        C $ TDP, 2-D PERTURBATION TOO OR 2DXY FLUX INPUT   PW      199
1604  F63   RS        C $ 2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE       UNC     173
1604  F63   RS        I $ WOPEXPRT, REACTOR WEIGHT OPTIMIZATION STUDY    PW      190
1604  F63   RS        L $ CSP1, SN X-SECTION LIBRARY TAPE PREPARATION    PW      194
1604  F63   RS        L $ CSP2A, SN X-SECTION LIBRARY TAPE PREPARATION   PW      193
1604  F63   RS      T C $ 2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL PW      192
1604  F63   RS  L   T D $ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION     CDC      58
1604  F63   RS P      A $ HAFEVER, HAUSER-FESHBACH INELASTIC SCATTERING  CDC      14
1604  F63   RS P      A $ PEGGY, ELASTIC SCATTERING PHASE-SHIFT ANALYSIS ORNL    334
1604  F63   RS P      A $ RAMFS, PARTICLE WAVE FUNCTION RADIAL INTEGRALS ORNL    335
1604  F63   RS P      B $ SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY  CDC      52
1604  F63   RS P      B $ S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION    CDC      53
1604  F63   RS P      D $ ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS       CRNL    180
1604  F63   RS P      D $ ISOSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC ORNL    322
1604  F63   RS P      D $ ISOTOPES, MAXIMUM YIELD FROM REACTION OR DECAY ORNL    179
1604  F63   RS P      D $ POWERCO, NUCLEAR STATION ELECTRICITY COSTS     ORNL    340
1604  F63   RS P      E $ AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK  CDC     121
1604  F63   RS P      E $ CMPXMAT, TRANSFER FUNCTION EVALUATION          PW      188
1604  F63   RS P      F $ AX-TNT, COUPLED NEUTRONICS-HYDRODYNAMICS SPH   PW      191
1604  F63   RS P      G $ CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD        CDC      47
1604  F63   RS P      H $ MO899,HOH, STEAM TABLES 14.5-2538 PSIA         ANL     294
1604  F63   RS P      J $ GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY    CDC      45
1604  F63   RS P      J $ GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM  CDC      46
1604  F63   RS P      L $ SNC, CALCULATION OF SN CONSTANTS FOR DSN TOC   PW      189
1604  F63   RS P    T A $ JUPITCR1, COUPLED-CHANNEL X-SEC EVALUATION     ORNL    308
1604  F63   RS P    T C $ EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB  CDC      87
1604  F63   RS P    T C $ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE CDC      28
```

```
1604  F63   RS P   T C $ FORTRAN TDC, 2-D MULTI-GP SN APPROXIMATION RZ  PW      161
1604  F63   RS P   T C $ WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY  CDC      32
1604  F63   RS P   T C $ 20GRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER CDC      40
1604  F63   RS P   T I $ PIP, CENTRIFUGAL PUMP IMPELLER DESIGN STUDY    PW      187
1604  F63   RS PL  T A $ ARES2, RESONANCE INTEGRAL X-SECTION CALC       CDC      89
1604  F63   RS PL  T B $ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC     CDC      51
1604  F63   RS PL  T B $ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS  CDC      50
1604  F63   RS PL  T C $ AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE   CDC      29
1604  F63   RS PL  T C $ DTF, 1-D MULTIGROUP DISCRETE ORDINATE CALC     UNC     144
1604  F63   RS PLX T B $ GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC     CDC      33
1604  F63   RS PLX T C $ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE   CDC     120
1604  LAG1  RS P     C $ MGDSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE  PW      211
1604  LAG1  RS P     N $ DTX, EFFECTIVE X-SECTION CALC FROM DSN OUTPUT  PW      210
18- 24- AND 25-GROUP SETS   LASL 6600  BCD   R   LX T Z $ LASL XSEC SETS, SN     532
1967 ASME STEAM AND WATER PROPERTIES BG&E   360  F4    RS      T H $ STEAM-67,   487
2- OR 3-D HEAT CONDUCTION LUMPED MASS     LASL 7030  F4    RS      T H $ RATH,   242
2- OR 3-D HEAT CONDUCTION LUMPED MASS     LASL 7094  FAP   RS P    T H $ RATH,   242
2-CELL ANALYSIS AI     360  F4    RS P   T G $ SOFIRE2, SODIUM POOL FIRE 1- &    559
2-D + 3-D PLOTTING   KAPL 6600  F+ASC RS F   T P $ DATATRAN UTILITY MODULES,    407
2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC BAPL 6600  F+COM RS P   T I $ DUZ2,    503
2-D BODIES  BNL  6600  F4    RS P   T I $ SAFE-PLANE, PLANE STRESS ANALYSIS,    252
2-D BODIES  GGA  1108  F4    RS P     I $ SAFE-PLANE, PLANE STRESS ANALYSIS,    252
2-D DESIGN PROGRAMS  LASL 7090  F+FAP RS P   T L $ DPC, DATA PREPARATION FOR    234
2-D DIFFUSION ABSORPTION REMOVAL X-SECS BAPL 6600  F4    RS      T R $ MO807,  280
2-D EXCURSION CALCULATION R-Z GEOMETRY   APDA 7094  F4    RS P     F $ MARS,   293
2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY   GGA  7090  F+FAP RSBP   T D $ DDB,    99
2-D FEW-GP HEX GEOM DIFFUSION DEPLETION GGA  1108  F4    RS P   T D $ GAUGE,   339
2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY  LRL   709  F2    RS      C $ FIRN,     7
2-D FEW-GROUP DIFFUSION AND DEPLETION    IBM   360A F+BAL RS P   T D $ PDQ5,   336
2-D FEW-GROUP DIFFUSION AND DEPLETION    MIT   360B F+BAL RSBP   T D $ PDQ5,   336
2-D FEW-GROUP DIFFUSION SLAB CYLINDER CDC  1604  F63   RS P   T C $ 20GRAND,    40
2-D FEW-GROUP DIFFUSION SLAB CYLINDER CRNL 7090  F2    RS P   T C $ 20GRAND,    40
2-D FLUX SETS   GESV H600  F4    RS P  CT C $ TRIAL, 3-D REACTION RATES FROM    585
2-D GEOMETRY INPUT, PREPARATION, EDIT KAPL 6600  F+ASC RS P   T L $ DATATRAN    406
2-D HEAT TRANSFER   GGA  1108  F+BAL RS P   T E $ BLOOST6, COMBINED KINETICS    303
2-D HEAT TRANSFER GGA  7044  F+MAP RS P   T H $ BLOOST5, POINT-KINETICS WITH    205
2-D HETEROGENEOUS REACTOR CALCULATION DP    360B F4    RSBP  CT C $ HERESY3,    136
2-D HYDRODYNAM RESPONSE TO EXCURSION  ANL   360  F4    RS P  CT E $ REXCO-H,    550
2-D LMFBR POWER EXCURSION DISASSEMBLY   ANL   360  F4    RS P XCT E $ VENUS,     511
2-D MONTE CARLO CELL CALCULATION   AI     360  F+BAL RS P X T B $ HWCCR-SAFE,    307
2-D MULTI-GP DIFFUSION     UMCC  360  F4    RS P   T C $ VARI-QUIR, TIME-DEP    212
2-D MULTI-GP DIFFUSION     WANL 6600  F4    RS P   T C $ VARI-QUIR, TIME-DEP    212
2-D MULTI-GP DIFFUSION DEPLETION CODE ORNL 7090  F+FAP RS P   T D $ ASSAULT,    240
2-D MULTI-GP DIFFUSION PROGRAM   AAEC  360  F+BAL RS P   T C $ CRAM, 1-D AND    103
2-D MULTI-GP DIFFUSION PROGRAM   ORNL 7090  F+FAP RS P   T C $ EXTERMINATOR,    156
2-D MULTI-GP DIFFUSION PROGRAM   UK-R 7090  F+FAP RSBPL  T C $ CRAM, 1-D AND    103
2-D MULTI-GP DIFFUSION PROGRAM  BC    625  F4    RS      T C $ EXTERMINATOR2,    156
2-D MULTI-GP DIFFUSION PROGRAM  CE    6600  F4    RS P   T C $ EXTERMINATOR2,    156
2-D MULTI-GP DIFFUSION PROGRAM  ORNL  360  F4    RS P   T C $ EXTERMINATOR2,    156
2-D MULTI-GP DIFFUSION SYNTHESIS CALC   NED   635  F4    RS PL  T C $ BISYN,    287
2-D MULTI-GP DIFFUSION SYNTHESIS CALC   NED  1108  F4    RS P   T C $ BISYN,    287
2-D MULTI-GP DIFFUSION XY RZ GEOMETRY GGA  1108  F+BAL RS P   T C $ GAMBLE5,    222
2-D MULTI-GP DIFFUSION XY RZ GEOMETRY GGA  7044  F+MAP RSBP   T C $ GAMBLE4,    222
2-D MULTI-GP DIFFUSION XY RZ RTH    WANL 7094  F4    RS P X T C $ VARI-QUIR3,    264
2-D MULTI-GP DISCRETE ORDINATE CODE        GGA  1108  F5    RS P   T C $ 2DF,    173
2-D MULTI-GP DISCRETE ORDINATE CODE        UNC  1604  F63   RS      C $ 2DF,    173
2-D MULTI-GP SN APPROXIMATION RZ  PW  1604  F63   RS P   T C $ FORTRAN TDC,    161
2-D MULTI-GP SN APPROXIMATION XY GEOM     AGC  7090  FLECO RSBP     C $ 2DXY,     18
2-D MULTI-GP TRANSPORT XY RZ RTHETA  LASL  360B F4    RS P  CT C $ TWOTRAN2,    358
2-D MULTI-GP TRANSPORT XY RZ RTHETA  LASL 6600B F4    RS P   T C $ TWOTRAN2,    358
2-D MULTI-GP TRANSPORT XY RZ RTHETA  LASL 7600B F4    RS P   T C $ TWOTRAN2,    358
2-D MULTIGP DIFFUSION TRIANGULAR MESH  GGA  1108  F+BAL RS P   T C $ GAMTRI,    401
2-D MULTIGP DIFFUSION+BURNUP TRI-MESH  GGA  1108  F+BAL RS P   T D $ BUGTRI,    439
2-D MULTIGROUP DIFFUSION & BURNUP XY, RZ GGA  1108  F+BAL RS P   T D $ BUG2,    438
```

```
2-D                                                                                    3-D
2-D MULTIGROUP DIFFUSION & SN THEORY    NEC   635  F4     RS P   T C $ DOT2DB,     459
2-D MULTIGROUP DIFFUSION AND DEPLETION     ANL  3600  F4     RSBP   T D $ 2DB,     325
2-D MULTIGROUP DIFFUSION AND DEPLETION     BNW  1108  F4     RS P   T D $ 2DB,     325
2-D MULTIGROUP DIFFUSION AND DEPLETION     LASL 6600  F4     RS P   T D $ 2DB,     325
2-D MULTIGROUP DISCRETE ORDINATE PROGRAM LER  7090  F+MAP RS P   T C $ TDSN,     312
2-D PARTICLE TRANSPORT XY RZ RTH LASL 7600  F4     RS P   T C $ TWOTRAN-PNVW,     573
2-D PERTURBATION CALC FROM 2DF OUTPUT GGA  1108  F5     RS P   T N $ GAPER2D,     471
2-D PERTURBATION TDC OR 2DXY FLUX INPUT    PW   1604  F63    RS       C $ TDP,     199
2-D PERTURBATION XY RZ RTHETA GEOMETRY  BNW  1108  F4     RS P   C $ PERT4,     304
2-D TIME-DEPENDENT HEAT CONDUCTION      PPCO 7044  F+MAP RS P   T H $ TCODEE,     349
2-D TRANSIENT HEAT CONDUCTION PROGRAM    BAPL 6600  F4     RS P   T H $ HOT2,     286
2-D TRIANGULAR MESH TRANSPORT PROGRAM LASL  360  F4     RSBP  CT C $ TRIPLET,     608
2-D TRIANGULAR MESH TRANSPORT PROGRAM LASL 6600  F4     RS P   T C $ TRIPLET,     608
2-D TRIANGULAR MESH TRANSPORT PROGRAM LASL 7600  F4     RS P   T C $ TRIPLET,     608
2-D 2-GP DIFFUSION CYLINDER SLAB  CDC  1604  F63   RS P   T C $ EQUIPOISE3A,      87
2-D 2-GP DIFFUSION CYLINDER SLAB  ORNL 7090  F2    RS P   T C $ EQUIPOISE3A,      87
2-D 2-GP SPACE-TIME DIFFUSION          ANL   360  F4     RS P     F $ TWIGGLE,     338
2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK  BAPL 6600  F4     RS P   T F $ TWIGL,     338
2-D 2-GROUP DIFFUSION SLAB CYL      ORNL 7090  F2     RS P   T C $ EQUIPOISE3,      39
2-D 2-PHASE FLOW      AI    7094  F2     RS P     H $ FLOW-MODEL, MULTI-CHANNEL     246
2-D 2-PHASE FLOW      MSS   360  F4     RS P     H $ FLOW-MODEL, MULTI-CHANNEL     246
2-DIMENSIONAL HEAT CONDUCTION   ORNL 360  F4     RS P X T H $ ORTHIS,ORTHAT,     525
2-GP DIFFUSION CYLINDER SLAB  CDC  1604  F63   RS P   T C $ EQUIPOISE3A, 2-D      87
2-GP DIFFUSION CYLINDER SLAB  ORNL 7090  F2    RS P   T C $ EQUIPOISE3A, 2-D      87
2-GP KINETICS TEMPERATURE FEEDBACK  BAPL 6600  F4     RS P   T F $ NCWIG, 1-D     371
2-GP SPACE-TIME DIFFUSION          ANL   360  F4     RS P     F $ TWIGGLE, 2-D     338
2-GP SPACE-TIME DIFFUSION FEEDBACK  BAPL 6600  F4     RS P   T F $ TWIGL, 2-D     338
2-GP SPACE-TIME DIFFUSION 3-GEOM    BAPL 6600  F4     RS P   T F $ WIGL2, 1-D     274
2-GP SPACE-TIME DIFFUSION 3-GEOM    GGA  1108  F4     RS P   T F $ WIGL2, 1-D     274
2-GROUP DIFFUSION SLAB CYL      ORNL 7090  F2     RS P   T C $ EQUIPOISE3, 2-D      39
2-GROUP DIFFUSION XYZ GEOMETRY  CDC  1604  F63   RS P   T C $ WHIRLAWAY, 3-D      32
2-GROUP DIFFUSION XYZ GEOMETRY  ORNL 7090  F2    RS P   T C $ WHIRLAWAY, 3-D      32
2-PASS ASSEMBLER FOR THE PDP-11 ON 360 AND   360  PL1    RS P   T P $ PTAC11,     516
2-PHASE FLOW      AI    7094  F2     RS P     H $ FLOW-MODEL, MULTI-CHANNEL 2-D     246
2-PHASE FLOW      MSS   360  F4     RS P     H $ FLOW-MODEL, MULTI-CHANNEL 2-D     246
2-REG CELL  ANL  3600  F36   RSBP X T B $ RIFF-RAFF, RESONANCE INTEGRAL CALC     213
2D CONTOUR PLOTS & AREA CALCULATION     SLA  6600  F4     RS P     P $ PLOTR,     578
2D DIFFUSION BURNUP REFUELING HISTORY  LASL 6600  F4     RS P   T D $ PHENIX,     454
2D FEW-GROUP SPACE-TIME KINETICS  BCL  6400  F4     RS P   T F $ ADEP, 1D AND     494
2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION NED   635  F+GMP RS P   T D $ SYN,     495
2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION     ANL  3600  F4     RSBP   T D $     325
2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION     BNW  1108  F4     RS P   T D $     325
2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION     LASL 6600  F4     RS P   T D $     325
2DF OUTPUT GGA  1108  F5     RS P   T N $ GAPER2D, 2-D PERTURBATION CALC FROM     471
2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE        GGA  1108  F5     RS P   T C $     173
2DF, 2-D MULTI-GP DISCRETE ORDINATE CODE        UNC  1604  F63    RS       C $     173
2DXY FLUX INPUT    PW   1604  F63    RS       C $ TDP, 2-D PERTURBATION TDC OR     199
2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM     ACC  7090  FLCCC RSBP       C $      18
2DXYL, 3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL PW   1604  F63    RS       T C $     192
2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS   AI   7094  F2     RS P   T A $     254
2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS   ANL  3600  F63   RSBP   T A $     254
2DGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER CDC  1604  F63   RS P   T C $      40
2DGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER ORNL 7090  F2    RS P   T C $      40
2000  F2     RS P      A $ DOPIE, RESOLVED RESONANCE X-SECTION CALC        NED     177
2000  F2     RS P      A $ RAPTURE, RESONANCE INTEGRAL X-SECTION CALC      NED     176
2000  F2     RS P      B $ SPARTA, SPATIALLY-AVERAGED DOPPLER EFFECTS      NED     178
2000  F4     RS        A $ STRIP, RESOLVED RESONANCE INTEGRAL CALCULATION BW     305
2000  F4     RS P   T F $ FORE, FAST REACTOR EXCURSION CALCULATIONS       NED     174
230  F4     RS P   T B $ CLUP77, SQUARE CELL COLLISION PROBABILITY CALC JAER     526
24- AND 25-GROUP SETS   LASL 6600  BCD   R   LX T Z $ LASL XSEC SETS, SN 18-     532
25-GROUP SETS   LASL 6600  BCD   R   LX T Z $ LASL XSEC SETS, SN 18- 24- AND     532
3-D COMPOSITE STRUCTURE STRESS STUDY  GGA  1108  F4     RS P   T I $ SAFE-3D,     332
3-D COMPOSITE STRUCTURE STRESS STUDY  ORNL 360  F+BAL RS P   T I $ SAFE-3D,     332
3-D DIFFUSION DEPLETION MULTIGP  ORNL 3600 F4     RS P   T K $ CITATION, 1,2,     387
```

```
3-D FEW-GP DIFFUSION CALC HEX-Z MESH      GGA  1108  F4     RS P    T C $ GATT,     380
3-D FEW-GP DIFFUSION DEPLETION     ANC    360F F+BAL RS P XCT D $ PDQ7, 1,2 CR     275
3-D FEW-GP DIFFUSION DEPLETION     BAPL 660CA F+ASC RS P    T D $ PDQ7, 1,2 CR     275
3-D FEW-GP DIFFUSION DEPLETION     BAPL 6600C F+ASC RS P    T D $ PDQ7, 1,2 CR     275
3-D FEW-GP DIFFUSION DEPLETION     BCS  6600D F+ASC R B     T D $ PDQ7, 1,2 CR     275
3-D FEW-GP DIFFUSION DEPLETION     BW   660CB F+ASC RS P    T D $ PDQ7, 1,2 CR     275
3-D FINITE ELEMENT ELASTIC ANALYSIS      BAPL 6600  F+CCM RS P X T I $ MATUS,      597
3-D HEAT CONDUCTION LUMPED MASS     LASL 7030  F4     RS     T H $ RATH, 2- CR      242
3-D HEAT CONDUCTION LUMPED MASS     LASL 7094  FAP    RS P   T H $ RATH, 2- CR      242
3-D HEAT CONDUCTION PROGRAM  ORNL  360  F4     RS P    T H $ HEATING3, 1,2, CR       517
3-D HEAT TRANSFER PROGRAM      GGA  1108  F5     RS P    T H $ TAC3D, TRANSIENT        414
3-D MULTI-GP FLUX SYNTHESIS PROGRAM CYL PW   1604  F63    RS     T C $ 2DXYL,          152
3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS  ANL   360  F4     RS P   CT D $ 3DB,          567
3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS  HEDL 1108  F4     RS P    T D $ 3DB,          567
3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z   LASL 6600  F4     RS P    T C $ 3DDT,         463
3-D PLOTS ON IBM2280 OR CALCOMP780    ANL   360  F4     RS P    T N $ PLOT-3D,      544
3-D PLOTTING   KAPL 6600  F+ASC RS P    T P $ DATATRAN UTILITY MODULES, 2-D +       407
3-D REACTION RATES FROM 2-D FLUX SETS   GESV H600  F4     RS P   CT C $ TRIAL,        585
3-D REACTIVITY AND POWER DISTRIBUTION   CDC  3600  F63    RSBP    T C $ FLARE,        167
3-D REACTIVITY AND POWER DISTRIBUTION   MSS   360  F4     RS P   CT C $ FLARE,        167
3-D REACTIVITY AND POWER DISTRIBUTION   NED   635  F4     RS P    T C $ FLARE,        167
3-D STRUCTURAL ANALYSIS      GGA  1108  F5     RS P    T I $ SHELL5, THIN SHELL      452
3-D STRUCTURES   KAPL 6600  F4     RS P X   I $ FINEL, FINITE-ELEMENT STUDY 2,        404
3-D TEMPERATURE DISTRIBUTION PROGRAM    CHI  1108  F4     RS P    T H $ LION4,        299
3-D TEMPERATURE DISTRIBUTION PROGRAM    KAPL 6600  F+ASC RS P    T H $ LION4,        299
3-D TRANSIENT HEAT TRANSFER PROGRAM      GEC   635  F+GMP RSBP   T H $ THTE,          346
3-D XENON TRANSIENT & DEPLETION     KAPL 6600  F4     RS P    T D $ 3DXT,DEP3,    477
3-D XYZ XENON OSCILLATION    CEND  360  F4     RS P X T F $ CEXE,INCEXE, 1-GP      415
3-D 2-GROUP DIFFUSION XYZ GEOMETRY  CDC  1604  F63    RS P    T C $ WHIRLAWAY,     32
3-D 2-GROUP DIFFUSION XYZ GEOMETRY  ORNL 7090  F2     RS P    T C $ WHIRLAWAY,     32
3-GEOM     BAPL 6600  F4     RS P    T F $ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION     274
3-GECM     GGA  1108  F4     RS P    T F $ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION     274
3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS  ANL   360  F4     RS P   CT D $        567
3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS  HEDL 1108  F4     RS P    T D $        567
3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z   LASL 6600  F4     RS P    T C $        463
3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION     KAPL 6600  F4     RS P    T D $        477
30-GP ENDF/B SCAT KERNELS      DP    360  BCD    R   LX T Z $ THERMOS LIBRARY,       543
32-472DEGC BAPL 6600  F4     RS     T H $ WATER, STEAM TABLES 14.5-14,500PSIA      267
36F   RS PL CT F $ QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE ANL  3600          474
36F   RSBP   T M $ MERMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES   ANL  3600          472
360  BAL   RSB    T P $ NRTS-RJE, CS/360 MVT REMOTE JOB ENTRY SYSTEM    ANC          519
360  BCD   R   LX T Z $ THERMOS LIBRARY, 30-GP ENDF/B SCAT KERNELS      DP           543
360  COBOL RS P      M $ AEC-ALC FAU, RADIC FREQUENCY MANAGEMENT SYSTEM ALOO         587
360  COBOL RSBP   CT M $ BECOM, AEC DP PURCHASE VERSUS LEASE ANALYSIS   SLA          589
360  F+ASM RSB    CT P $ WSP-HASP/COS, DOS-MFT REMOTE WORKSTATION PKG   ANL          541
360  F+BAL  S     T M $ JOSHUA, DATA STORAGE, RETRIEVAL, AND DISPLAY    DP           490
360  F+BAL  S   X T B $ RAHAB, JOSHUA SYSTEM LATTICE PHYSICS MODULES    DP           536
360  F+BAL R B L  T P $ TSC-SPEAKEASY, LANGUAGE PROCESSOR UNDER TSO     ANL          553
360  F+BAL RS     T P $ AMDLIBF, ARGONNE SUBROUTINE LIBRARY CAT. F      ANL          563
360  F+BAL PS     T P $ FIGS, IBM360&2250 FORTRAN GRAPHICS SUBROUTINES  AI           484
360  F+BAL RS P      D $ ISCSEARCH, ISOTOPE PRODUCTION FLUX, X-SEC CALC ORNL         322
360  F+BAL RS P   T A $ COMNUC,CASCADE, COMPOUND NUCLEUS REACTION       AI           482
360  F+BAL RS P   T B $ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC   ORNL         392
360  F+BAL RS P   T C $ CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM    AAEC         103
360  F+BAL RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM    ANL          209
360  F+BAL RS P   T D $ CINDER,MO102, POINT DEPLETION FISSION PRODUCT   DP           313
360  F+BAL RS P   T E $ AIPOS2A, SIMULATION OF REACTOR DYNAMICS         AI           326
360  F+BAL RS P   T I $ SAFE-3D, 3-D COMPOSITE STRUCTURE STRESS STUDY   ORNL         332
360  F+BAL RS P  CT B $ U3R, UNRESOL RESONANCE XSEC PROBABILITY TABLES  AI           553
360  F+BAL RS P  CT M $ ARC-SYSTEM, SYSTEM SUBPROGRAMS AND MODULES      ANL          522
360  F+BAL RS P X T B $ HWOCR-SAFE, 2-D MONTE CARLO CELL CALCULATION    AI           307
360  F+BAL RS P XCT B $ HAMMER,LITHE,HELF, CRITICAL ANALYSIS SYSTEM     DP           277
360  F+BAL RSB L CT M $ SCORE3, SCISRS ENDF/B GRAPHIC X-SEC EVALUATION  AI           375
360  F+BAL RSBP   CT G $ CONTEMPT-LT/022, PRESSURE-TEMPERATURE RESPONSE ANC          433
```

360 360

360	F+BAL	RSBPL	CT	C	$	FSP, MONTE CARLO REACTOR ANALYSIS CALCULATION	ORNL	523
360	F+BAL	RSBPL	CT	C	$	KENO, MONTE CARLO MULTIGROUP CRITICALITY CODE	ORNL	450
360	F+BAL	RSBPL	CT	G	$	PARET, WATER-COOLED CORE TRANSIENT ANALYSIS	ANC	555
360	F+C+R	RSBP	T	M	$	RALCRTPH, RESOURCE ALLOCATION PROJECT PLANNING	MLMO	603
360	F+P+A	RS	T	P	$	AMDLIBAE, ARGONNE SUBROUTINE LIBRARY CAT. A-E	ANL	562
360	F+P+A	RS	T	P	$	AMDLIBGZ, ARGONNE SUBROUTINE LIBRARY CAT. G-Z	ANL	564
360	F4	RS		M	$	MERMC2, MC**2 BINARY LIBRARY TAPE MAINTENANCE	ANL	472
360	F4	RS	T	H	$	STEAM-67, 1967 ASME STEAM AND WATER PROPERTIES	RG&E	487
360	F4	RS	T	M	$	RIGEL, ENDF/B V3 DATA PROCESSING CODE	ANL	571
360	F4	RS L	T	C	$	FIRE5, 1-D AGE-DIFFUSION SLAB CYLINDER SPHERE	AEB	9
360	F4	RS P		A	$	CODILLI, LEAST SQUARES ANALYSIS RESONANCE DATA	UILL	347
360	F4	RS P		A	$	PSFUDO, STATISTICAL RESONANCE PARAMETER CALC	ENEA	292
360	F4	RS P		B	$	WELWING, MATERIAL BUCKLING CYL FUEL ELEMENTS	AEB	362
360	F4	RS P		C	$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	BHSC	30
360	F4	RS P		E	$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AEB	121
360	F4	RS P		E	$	BLAST, REACTOR KINETICS TEMPERATURE DIST STUDY	AEB	363
360	F4	RS P		E	$	R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS	ANL	255
360	F4	RS P		E	$	R102, SPACE-INDEPENDENT INVERSE KINETICS CALC	ANL	168
360	F4	RS P		E	$	TRIFIDO, PULSED NEUTRON SOURCE DATA ANALYSIS	CNEA	489
360	F4	RS P		F	$	TWIGGLE, 2-D 2-GP SPACE-TIME DIFFUSION	ANL	338
360	F4	RS P		G	$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	DP	47
360	F4	RS P		G	$	EGAD, CALC OF EXTERNAL GAMMA DOSE INTEGRALS	DP	600
360	F4	RS P		G	$	INTEG,INSPEC, MARKOV SIMULATION OF REACTOR OPN	DP	590
360	F4	RS P		G	$	SOCOOL2, SODIUM-FUEL INTERACTION ANALYSIS	ANL	521
360	F4	RS P		G	$	WATER-HAMMER, LIQUID BLOWDOWN ANALYSIS LOFT	UGA	278
360	F4	RS P		H	$	FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW	MSS	246
360	F4	RS P		H	$	PLENUM, FLOW DIST. IN CYL COOLANT INLET PLENUM	DP	586
360	F4	RS P		L	$	GENRO, FREE-FORMAT CARD INPUT PROCESSOR	LASL	530
360	F4	RS P		O	$	ALPHA-M, RESOLUTION OF GAMMA RAY SPECTRA	ORNL	413
360	F4	RS P		O	$	CORGAM, UNFOLDING OF COMPLEX GAMMA-RAY SPECTRA	KSUN	390
360	F4	RS P		O	$	DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION	ANL	464
360	F4	RS P		P	$	KEELE, LINEARLY-CONSTRAINED OPTIMIZATION	ORNL	556
360	F4	RS P		X	$	TOKMINA/TOKMINA2, TOKAMAK FUSION REACTOR STUDY	ANL	561
360	F4	RS P	T	A	$	ATHENA4, INELASTIC SCATTERING FORM FACTORS	ORNL	417
360	F4	RS P	T	B	$	CLUP77, SQUARE CELL COLLISION PROBABILITY CALC	ANL	526
360	F4	RS P	T	B	$	RICE, PRIMARY RECOIL ATOM SPECTRA ENDF/B DATA	ORNL	453
360	F4	RS P	T	B	$	SUPERTOG, ENDF/B FINE-GP CONSTANTS GENERATION	ORNL	431
360	F4	RS P	T	C	$	EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM	ORNL	156
360	F4	RS P	T	C	$	FAIMOS, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	BHSC	120
360	F4	RS P	T	C	$	VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION	UMCC	212
360	F4	RS P	T	D	$	CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS	CWE	354
360	F4	RS P	T	D	$	ORCOST, POWER PLANT CAPITAL COST ESTIMATING	ORNL	588
360	F4	RS P	T	E	$	ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE	ANL	486
360	F4	RS P	T	F	$	SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS	ANL	400
360	F4	RS P	T	F	$	TSN, SPATIALLY-DEPENDENT REACTOR KINETICS	AI	309
360	F4	RS P	T	G	$	AISITE2, PARAMETRIC SITE REQUIREMENT STUDY	AI	172
360	F4	RS P	T	G	$	HAA3, COAGULATION OF HETEROGENEOUS AEROSOLS	AI	443
360	F4	RS P	T	G	$	SOFIRE2, SODIUM POOL FIRE 1- & 2-CELL ANALYSIS	AI	559
360	F4	RS P	T	H	$	ASTEM, THERMODYNAMIC PROPERTIES WATER & STEAM	ANC	580
360	F4	RS P	T	H	$	HEATING3, 1,2, OR 3-D HEAT CONDUCTION PROGRAM	ORNL	517
360	F4	RS P	T	I	$	LIFE1, FAST REACTOR FUEL ELEMENT BEHAVIOR	ANL	460
360	F4	RS P	T	I	$	SABOR4, DISCRETE-ELEMENT ANALYSIS THIN SHELLS	MIT	402
360	F4	RS P	T	I	$	SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD	SR	282
360	F4	RS P	T	M	$	CRECT,CHECKER, ENDF/B V2 PROCESSING CODES	ANL	475
360	F4	RS P	T	N	$	PLOT-3D, 3-D PLOTS ON IBM2280 OR CALCOMP780	ANL	544
360	F4	RS P	T	Q	$	RESPOND, DISSIMILAR MEDIA TLD CORRECTION CALC	AI	566
360	F4	RS P	C	G	$	STEFEG, ANALYSIS OF PWR & BWR GASEOUS RELEASE	ORNL	583
360	F4	RS P	CT	A	$	JUPITOR1, COUPLED CHANNEL X-SEC EVALUATION	ENEA	308
360	F4	RS P	CT	B	$	MC**2, ENDF MULTIGROUP X-SECTION CALCULATION	ANL	355
360	F4	RS P	CT	C	$	FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION	MSS	167
360	F4	RS P	CT	D	$	GEM, ANALYSIS OF NUCLEAR FUEL CYCLE ECONOMICS	UICS	576
360	F4	RS P	CT	D	$	3DB, 3-D MULTIGROUP DIFFUSION BURNUP ANALYSIS	ANL	567
360	F4	RS P	CT	F	$	REXCO-H, 2-D HYDRODYNAM RESPONSE TO EXCURSION	ANL	550
360	F4	RS P	CT	G	$	EMERALD, PWR PLANT RADIATION RELEASE & DOSE	RGE	546

360 3600

```
360  F4     RS P  CT I $ PSA2, STRESS ANALYSIS MULTIANCHOR PIPE SYSTEM  AI     542
360  F4     RS P  CT M $ ETOE, ENDF/B TO MC**2 DATA CONVERSION         ANL    350
360  F4     RS P  CT W $ MACS LATTICE VIBRATION NEUTRON SCATTRING CODES ANC    574
360  F4     RS P  CT W $ MSCAT, SLOW NEUTRON MULTIPLE SCATTERING CALC  ANL    575
360  F4     RS P X   G $ BURST1, HYDRODYNAMIC ANALYSIS DURING BLOWDOWN PPCO   435
360  F4     RS P X T E $ MOD5, STOCHASTIC MODEL OF NEUTRON SLOWING-DOWN NPGS   491
360  F4     RS P X T F $ CEXE,INCEXE, 1-GP 3-D XYZ XENON OSCILLATION    CEND   415
360  F4     RS P X T F $ FCRE2, FAST REACTOR EXCURSION CALCULATIONS    ANL    174
360  F4     RS P X T H $ ORTHIS,ORTHAT, 2-DIMENSIONAL HEAT CONDUCTION  CRNL   525
360  F4     RS P X T P $ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,F,.... ANL    610
360  F4     RS P XCT A $ FLANGE2(71-1), ENDF/B THERMAL SCATTERING DATA DP     368
360  F4     RS P XCT F $ TASK, 1-D MULTIGROUP REACTOR KINETICS PROGRAM  CRNL   558
360  F4     RS P XCT F $ VENUS, 2-D LMFBR FCWER EXCURSION DISASSEMBLY   ANL    511
360  F4     RS PL   T B $ TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS BHSC   50
360  F4     RS PL CT B $ INCITE, THERMAL SPECTRA & MULTI-GP CONSTANTS   ANC    565
360  F4     RS PL CT F $ QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE ANL    474
360  F4     RS PL CT M $ ERPEST, LOCA ROD BUNDLE CHF DATA ANALYSIS      ANC    518
360  F4     RS PLX T B $ AILMOE, X-SECTION CALC ELASTIC SCAT RESONANCES AI     147
360  F4     RS PLX T B $ HRG3, SLOWING-DCWN SPECTRUM, MULTIGP CONSTANTS TVA    467
360  F4     RS PLX T B $ LEOPARD, SPECTRA CALCULATION WITH DEPLETION    WAPD   279
360  F4     RS PLX T B $ XSDRN, DISCRETE CRDINATE MULTIGROUP CONSTANTS  ORNL   393
360  F4     RS PLXCT B $ PHROG, MULTI-GP CONSTANT & FAST SPECTRA CALC  ANC    520
360  F4     RSB  XCT P $ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL    534
360  F4     RSB L   T M $ CLIP, FORM OR THREDES LIBRARY UTILITY ROUTINE AI     271
360  F4     RSBP    T K $ THREDES, 1-D FEW-GP DIFFUSION DESIGN SYSTEM   AI     273
360  F4     RSBP  CT C $ MONA, 1-D MULTIGROUP DIFFUSION SLAB, CYL, SPH  ANC    582
360  F4     RSBP  CT C $ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM LASL   608
360  F4     RSBP  CT D $ DWARF, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM  ANC    579
360  F4     RSBP  CT G $ RSAC, RADICLCGICAL SAFETY ANALYSIS PROGRAM     ANC    265
360  F4     RSBP  CT I $ FPFM, STEADY-STATE FISSION PRODUCT FUEL MODEL  ANC    584
360  F4     RSBP  CT I $ STRAP, STATIC & DYNAMIC STRUCTURAL ANALYSIS    ANC    539
360  F4     RSBP  CT J $ VIEWPIN, VIEW FACTOR CALC FOR CYLINDRICAL PINS ANC    569
360  F4     RSBP  CT K $ PREP,KITT, SYSTEM FAULT TREE EVALUATION CODES  ANC    528
360  F4     RSBP  CT L $ ARC-NU1002, ROD INPUT DATA PROCESSING MODULE   ANL    533
360  F4     RSBP X T D $ SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION     AI     58
360  F4     RSBP X T G $ THETA1-P, FUEL ROD THERMAL RESPONSE LOCA       ANC    512
360  F4     RSBP XCT B $ XLACS, XSDRN MULTIGROUP LIBRARIES FROM ENDF/B  ORNL   572
360  F4     RSBP XCT G $ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS ANC    369
360  F4     RSBP XCT H $ MOXY, BWR FUEL ELEMENT HEAT TRANSFER CALC      ANC    551
360  F4     RSBP XCT W $ GAUSS5, ANALYSIS OF GAMMA-RAY SPECTRA GE(LI)   ANC    605
360  F4     RSBPL CT C $ VIM1X, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS  AI-A   510
360  F4     RSBPL CT L $ ARC-XSEC1, MICROSCOPIC X-SECTION MANIPULATION  ANL    554
360  F4     RSBPLX T C $ ANISN, 1-D MULTI-GP DISCRETE ORDINATE CALC     AI     151
360  F4     RSBPLX T C $ CAESAR4,LIBLST, 1-D MULTI-GP DIFFUSION + LIB   AI     270
360  F4     RSBPLXCT B $ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE   TVA    249
360  PL1    RS P    T P $ PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON 360 ANC   516
360 ANC   360  PL1    RS P    T P $ PTAC11, 2-PASS ASSEMBLER FOR THE PDP-11 ON   516
360A F+BAL RS P    T D $ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION   IBM    336
360B F+BAL RS P      J $ PMS1, FAST NEUTRON POLARIZATION EXPERIMENT    UCND   469
360B F+BAL RSBP    T D $ PDQ5, 2-D FEW-GROUP DIFFUSION AND DEPLETION   MIT    336
360B F4    RS P    T M $ EDITOR, ENDF/B TAPE PROCESSING AND EDITING    CRNL   502
360B F4    RS P  CT C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA  LASL   358
360B F4    RS P XCT D $ CONCEPT2, POWER PLANT CONCEPTUAL COST ESTIMATE ORNL   458
360B F4    RSBP  CT C $ HERESY3, 2-D HETEROGENEOUS REACTOR CALCULATION DP     136
360C F4    RS P    T H $ CORRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW    432
360E F+BAL RS P XCT D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    ANC    275
360G F4    RS P    T K $ CITATION, 1,2,3-D DIFFUSION DEPLETION MULTIGP ORNL   387
3600  ASAF4 RS P    T M $ ETOE, ENDF/B TO MC**2 DATA CONVERSION         APDA   350
3600  F36    SBP      I $ BOW2, DEFLECTION CALCULATION PARALLEL BEAMS    ANL    365
3600  F36    RS P      G $ DISPER, AEROSOL PARTICLE TRANSPORT STUDY      RFD    554
3600  F36    RS P    T B $ MC**2, ENDF MULTIGROUP X-SECTION CALCULATION  ANL    355
3600  F36    RS P    T C $ SNARG-1D, 1-D MULTI-GP DISCRETE ORDINATE CALC ANL    288
3600  F36    RS P    T I $ SUPDRAN, REACTOR CORE SUPPORT STRESS ANALYSIS ANL    357
3600  F36    RS P  X T C $ MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE ANL    262
```

```
3600                                                                                    6400

3600  F36   RS P XCT C $ TESS, 1-D SLAB AND SPHERE GEOM SN TRANSPORT      ANL      513
3600  F36   RSBP      A $ MISH-MASH, RESONANCE INTEGRAL CALC HOMOGENEOUS ANL      214
3600  F36   RSBP      G $ CHEMLCC2, CORE HEATING CLADDING-STEAM REACTION ANL      366
3600  F36   RSBP      I $ SWELL2, FUEL ELEMENT LIFETIME ANALYSIS         ANL      353
3600  F36   RSBP X T B $ RABBLE,WLIB,FLAT, RESONANCE ABSORPTION, CELL    ANL      281
3600  F36   RSBP X T B $ RIFF-RAFF, RESONANCE INTEGRAL CALC 2-REG CELL   ANL      213
3600  F4    RSBP   T D $ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION     ANL      325
3600  F63   RS  LX T B $ GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC      ANL       33
3600  F63   RSBP      A $ NFARREX, COMPOUND NUCLEUS X-SECTION CALC       ANL      171
3600  F63   RSBP      E $ R101, SPACE-INDEPENDENT KINETICS KEX OPTIONS   ANL      255
3600  F63   RSBP      E $ R102, SPACE-INDEPENDENT INVERSE KINETICS CALC  ANL      168
3600  F63   RSBP      F $ AX1, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE   CDC      102
3600  F63   RSBP      D $ COINC, COINCIDENCE COUNTING DATA REDUCTION     ANL      248
3600  F63   RSBP   T A $ 2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS   ANL      254
3600  F63   RSBP   T C $ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION    CDC      167
3600  F63   RSBP   T E $ TRAFICORPORATION, TRANSFER FUNCTION SYNTHESIS   ANL      135
3600  F63   RSBP   T G $ R153, PARAMETRIC SITE REQUIREMENT STUDY         ANL      172
3600  F63   RSBP   T H $ ARGUS, TRANSIENT TEMPERATURE CALC CYLINDER      ANL      152
3600  F63   RSBP   T M $ XLIBIT, X-SECTION LIBRARY UTILITY ROUTINE       ANL      181
3600  F63   RSBP XCT B $ THERMOS(ANL), THERMAL SPECTRUM X-SECTION CALC   ANL      184
3600  F63   RSBPL  T J $ MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY     ANL      143
3600  36F   RS PL CT F $ QX1, QUASISTATIC SPATIAL REACTOR KINETICS CODE  ANL      474
3600  36F   RSBP   T M $ MERMC2,MAGIC, MC**2 LIBRARY SERVICE ROUTINES    ANL      472
3600B F36   RSBP      G $ WHAM, LIQUID-FILLED PIPING SYSTEM ANALYSIS     KE       278
370   F4    RS PL CT C $ ATM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE    CSUC      29
370   F4    RS PLXCT B $ FORM, FAST NEUTRON SPECTRUM X-SECTION CALC      CSUC      51
4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC     AI   7090  F+FAP RS      T I $     109
48 CAFGAP ENDF/B DATA TAPES   GGA  1108  BIN   R   L  T Z $ ZPR-III ASSEMBLY     356
500PSIA 32-472DEGF BAPL 6600  F4    PS      T H $ WATER, STEAM TABLES 14.5-14,   267
625   F+MAP RS P   T C $ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM    BC       209
625   F4    RS     T C $ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM   BC       156
625   F4    RS     T C $ FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE  BC        28
625   F4    RS P      B $ AVOID, ANNULAR VOID X-SECTION CALCULATION      GEC      276
625   F4    RS PLX T B $ GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV     BC       185
635   F+FAP RSBP   T Q $ CASCADE,CLUSTER, RADIATION DAMAGE IN METALS     GEC      419
635   F+GMP RS     T P $ GENED ENVIRONMENTAL ROUTINES, SUBROUTINE LIB.   NED      515
635   F+GMP RS P   T D $ SYN, 2D SYNTHESIS MULTIGP DIFF & 1GP DEPLETION  NED      455
635   F+GMP RS P XCT B $ ENDRUN2, MULTIGROUP CONSTANTS FROM ENDF/B DATA  GESV     501
635   F+GMP RS P XCT L $ TDOWN, SPATIAL & COMPOSITION-DEPENDENT X-SECS   GESV     505
635   F+GMP RSBP   T H $ THTE, 3-D TRANSIENT HEAT TRANSFER PROGRAM       GEC      346
635   F4    RS       G $ ANVENT, LOCA ANALYSIS DUKE POWER MCGUIRE UNITS  DUCC     529
635   F4    RS    X T P $ EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE ANL      534
635   F4    RS P     D $ RAPFU, FUEL CYCLE PARAMETERS FAST BREEDERS      NED      372
635   F4    RS P   T B $ REAX, RESOLVED RESONANCE EPITHERMAL X-SECTIONS  NED      257
635   F4    RS P   T C $ DOT2DB, 2-D MULTIGROUP DIFFUSION & SN THEORY    NED      459
635   F4    RS P   T C $ FLARE, 3-D REACTIVITY AND POWER DISTRIBUTION    NED      167
635   F4    RS P   T D $ FUMBLE, FAST REACTOR FUEL BURNUP & MANAGEMENT   NED      480
635   F4    RS P   T G $ FREADM1, FAST REACTOR CORE ACCIDENT ANALYSIS    NED      479
635   F4    RS P   T H $ MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS  NED      256
635   F4    RS P   T H $ VELVET2, TURBULENT FLOW IN LMFBR ROD BUNDLE     NED      458
635   F4    RS P   T M $ TROUT, MUG MULTIGROUP XSEC LIBRARY MAINTENANCE  NED      493
635   F4    RS P   T O $ BURNUP, HEAVY ELEMENT ISOTOPIC BURNUP ANALYSIS  NED      311
635   F4    RS P   T O $ EXPN, ANALYSIS OF PULSED NEUTRON SOURCE DATA    NED      258
635   F4    RS P  CT I $ BEHAVE2, OXIDE FUEL PERFORMANCE FINITE-ELEMENT  GESV     568
635   F4    RS P X T F $ FORE2, FAST REACTOR EXCURSION CALCULATIONS      NED      174
635   F4    RS PL  T C $ BISYN, 2-D MULTI-GP DIFFUSION SYNTHESIS CALC    NED      287
635   F4    RSBP      D $ CHAINS, ANALYSIS OF RADIOACTIVE DECAY CHAINS   GEC      418
635   F4    RSBP      D $ DCS, NEUTRON FLUX-DOSIMETER ACTIVITY RELATION  GEC      423
635   F4    RSBP      D $ MICHRD, MICROHARDNESS MEASUREMENT ANALYSIS     GEC      421
635   F4    RSBP   T B $ GROUSE, SPACE-DEPENDENT X-SECTION GENERATION    GEC      420
6400  F4       S P      H $ PWR-PPM, BORATION-DILUTION TABLES FOR PWR OPN  OPED     552
6400  F4    RS P      G $ FRORL2, LOCA FISSION PRODUCT RELEASE ANALYSIS  BCL      500
6400  F4    RS P      G $ MIRAB,MIRAP, CONTAINMENT SYSTEM IODINE REMOVAL BCL      499
6400  F4    RS P   T F $ ADEP, 1D AND 2D FEW-GROUP SPACE-TIME KINETICS   BCL      494
```

6400 6600

6400	F4	RS	P		T	G	$	ECCSA4, LOSS-OF-COOLANT & EMERGENCY COOLING	BCL	330
6400	F4	RS	P		T	G	$	NUFLOC-1.0, LOSS-OF-COOLANT THERMAL ANALYSIS	BCL	328
6400	F4	RS	P	X	T	G	$	MUCHA1,MUCHA2, MULTIPLE CHANNEL ANALYSIS ECC	BCL	508
6400	F4	RS	PLX		T	B	$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	UVA	185
6500	F4	RS	P			B	$	PARTI, OPTIMAL GROUP OR MESH COLLAPSING	TRW	416
6500	F4	RS	PLX		T	C	$	MACH1, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	PURD	262
6600	BCD	R	L		T	Z	$	ETOG1 DATA LIBRARIES, MUFT4 OR 5, GAM1 OR 2	WAPD	447
6600	BCD	R	LX		T	Z	$	LASL XSEC SETS, SN 18- 24- AND 25-GROUP SETS	LASL	532
6600	F	R B			T	M	$	TIGIR2, MODULAR DOCUMENT INFORMATION SYSTEM	KAPL	403
6600	F+ASC	RS				P	$	SIMPLEF1, TIME-SHARING PROGRAMMING LANGUAGE	KAPL	442
6600	F+ASC	RS	P		T	H	$	LION4, 3-D TEMPERATURE DISTRIBUTION PROGRAM	KAPL	299
6600	F+ASC	RS	P		T	I	$	GEM, EIGENVALUE PROBLEM FOR VIBRATING SYSTEMS	KAPL	344
6600	F+ASC	RS	P		T	J	$	ASPIS, GAMMA RAY SOURCE BUILDUP FACTOR CALC	BAPL	429
6600	F+ASC	RS	P		T	L	$	DATATRAN 2-D GEOMETRY INPUT, PREPARATION, EDIT	KAPL	406
6600	F+ASC	RS	P		T	P	$	CURFIT, CURVE FITTING EXPERIMENTAL DATA POINTS	KAPL	43
6600	F+ASC	RS	P		T	P	$	DATATRAN UTILITY MODULES, 2-D + 3-D PLOTTING	KAPL	407
6600	F+ASC	RS	P		T	P	$	DOGGY, DESK CALCULATOR FORM SHEET OP PACKAGE	KAPL	428
6600	F+ASC	RS	P		T	P	$	LIZARD, NONLINEAR DIFFERENTIAL EQNS. SOLUTION	KAPL	445
6600	F+ASC	RS	P		T	P	$	SNEQ, NONLINEAR ALGEBRAIC EQN SOLN CURVE PLOT	KAPL	364
6600	F+ASC	RS	P	X	T	B	$	RESQ2,RESCO,DBF1, RESONANCE INTEGRAL HEX CELL	BAPL	285
6600	F+COM	RS			T	P	$	KAPLPLOT, KAPL CALCOMP PLOTTING ROUTINES	KAPL	496
6600	F+COM	RS	P			H	$	HYMAS, HYDRODYNAMIC MASS MATRIX GENERATION	BAPL	560
6600	F+COM	RS	P		T	C	$	KENO2, MONTE CARLO MULTIGROUP CRITICALITY CODE	RFD	450
6600	F+COM	RS	P		T	I	$	DU72, 2-D AXISYMMETRIC & PLANE ELASTIC-PLASTIC	BAPL	503
6600	F+COM	RS	P		T	I	$	GAPL3, INELASTIC LARGE DEFLECTION STRESS STUDY	BAPL	357
6600	F+COM	RS	P		T	P	$	LENSDES, NONLINEAR LEAST SQ LENS DESIGN SYSTEM	LASL	602
6600	F+COM	RS	P		T	Q	$	INCX, XRAY DIFFRACTION POWDER PATTERN INDEXING	LASL	609
6600	F+COM	RS	P	X	T	B	$	PAX03, HARMONY-PDQ X-SECTION GENERATION CODE	BAPL	426
6600	F+COM	RS	P	X	T	D	$	FARED, 1-D FAST REACTOR DESIGN & SURVEY STUDY	BW	427
6600	F+COM	RS	P	X	T	I	$	MATUS, 3-D FINITE ELEMENT ELASTIC ANALYSIS	BAPL	557
6600	F+COM	RSB			T	M	$	DATATRAN, MODULAR PROGRAMMING AND DATA SYSTEM	KAPL	386
6600	F4	RS				B	$	APREX1, 99-GP DLC-28 LIBRARY GROUP COLLAPSING	APRF	466
6600	F4	RS				I	$	SORSOR, PRESSURE VESSEL STRESS AND FATIGUE	KAPL	351
6600	F4	RS			T	B	$	MOBO7, 2-D DIFFUSION ABSORPTION REMOVAL X-SECS	BAPL	280
6600	F4	RS			T	C	$	MO648, 1-D SLAB TRANSPORT WITH SLOWING DOWN	BAPL	342
6600	F4	RS			T	H	$	WATER, STEAM TABLES 14.5-14,500PSIA 32-472DEGF	BAPL	267
6600	F4	RS			T	I	$	CYGRO2, STRESS ANALYSIS CYL FUEL ELEMENT	BAPL	266
6600	F4	RS			T	M	$	CHECK3,RIGEL3, ENDF/B V3,W4 PROCESSING CODES	BNL	571
6600	F4	RS			T	O	$	GASPAN, COMPLEX GAMMA-RAY SPECTRA ANALYSIS	KAPL	485
6600	F4	RS		X	T	P	$	EISPACK, MATRIX EIGENVALUE EIGENVECTOR PACKAGE	ANL	534
6600	F4	RS	L		T	B	$	GAMBIT, X-SEC GENERATION FOR TRANSPORT CODES	WANL	547
6600	F4	RS	L		T	B	$	GGC4, MULTI-GP X-SECTIONS FAST THERMAL SPECTRA	GGA	298
6600	F4	RS	P			A	$	AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC	BNL	376
6600	F4	RS	P			A	$	RESFIT, DIFFRACTION MODEL ELASTIC SCAT X-SEC	BNL	524
6600	F4	RS	P			A	$	CLEM, ANGULAR DISTRIBUTION LEGENDRE FITTING	KAPL	531
6600	F4	RS	P			A	$	GRAMP, R-M PARAMETERS OF UNRESOLVED RESONANCES	BAPL	470
6600	F4	RS	P			A	$	MULTI, MULTI-LEVEL RESONANCE THEORY XSEC CALC	KAPL	535
6600	F4	RS	P			A	$	RAMP1, REICH-MOORE RESOLVED REGION X-SECTIONS	BNL	492
6600	F4	RS	P			A	$	SIGPLOT, RESOLVED MULTILEVEL B-W X-SEC CALC	BNL	377
6600	F4	RS	P			A	$	THRESH, STATISTICAL MODEL REACTION X-SECTIONS	BNL	504
6600	F4	RS	P			D	$	CINDER,M0102, POINT DEPLETION FISSION PRODUCT	BAPL	313
6600	F4	RS	P			D	$	NPRFCCP, FUEL CYCLE COSTS PERFORMANCE DATA	UEC	146
6600	F4	RS	P			D	$	POWERCO, NUCLEAR STATION ELECTRICITY COSTS	UEC	340
6600	F4	RS	P			D	$	WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY	UEC	224
6600	F4	RS	P			F	$	RAUMZEIT, 1-D TIME-DEPENDENT DIFFUSION CALC	KAPL	352
6600	F4	RS	P			F	$	STINT3, SINGLE-CHANNEL SPACE-TIME SYNTHESIS	KAPL	369
6600	F4	RS	P			H	$	RAPP, HIGH-VELOCITY FLOW STUDY STEAM-WATER MIX	KAPL	382
6600	F4	RS	P			I	$	STEM, MATRIX GENERATION FOR A SYSTEM OF BEAMS	KAPL	337
6600	F4	RS	P			I	$	STRIPE, FUEL ROD CLAD STRAIN & PELLET CRACKING	BAPL	570
6600	F4	RS	P			I	$	TCR01, CREEP-BUCKLING OF TUBES UNDER PRESSURE	BAPL	604
6600	F4	RS	P			I	$	TUBE, U-TUBE HEAT EXCHANGER STRESS ANALYSIS	KAPL	378
6600	F4	RS	P			L	$	GENRD, FREE-FORMAT CARD INPUT PROCESSOR	LASL	530
6600	F4	RS	P			N	$	DAC1, SN PERTURBATION CODE USING DTF4 FLUXES	LASL	455
6600	F4	RS	P			N	$	HEATMESH, GEOMETRICAL DATA HEAT TRANSFER STUDY	SLL	434

```
6600                                                                    6600

6600  F4    RS P      N $ LARCA, FLUX-WEIGHTING OF DTF4 CROSS SECTIONS   LASL  409
6600  F4    RS P      O $ DYNO1, PHOTOMULTIPLIER ELECTRON DISTRIBUTION   KAPL  464
6600  F4    RS P      P $ ERF,ERFC, ERROR & COMPLEMENTARY ERROR FUNCTION SLA   601
6600  F4    RS P      P $ FORSIM, SOLN OF SYSTEM OF ORDINARY DIFF EQNS   ORNL  514
6600  F4    RS P      P $ GEAR, ORDINARY DIFFERENTIAL EQN SYSTEM SOLVER  LLL   592
6600  F4    RS P      P $ MOST, A MULTIDIMENSIONAL OPTIMIZATION SCHEME   KAPL  446
6600  F4    RS P      P $ PLOTR, 2D CONTOUR PLOTS & AREA CALCULATION     SLA   578
6600  F4    RS P      P $ RELO1, RELIABILITY FOR A SINGLE FAILURE MODE   BAPL  497
6600  F4    RS P      P $ ROPE, FINDING ROOTS OF A POLYNOMIAL            KAPL  444
6600  F4    RS P      V $ FEEARS, LAPLACE EQUATION ISOTROPIC DIELECTRICS SLA   577
6600  F4    RS P    T A $ JP1XR, COUPLED-CHANNEL SCATTERING X-SEC CALC   KAPL  506
6600  F4    RS P    T A $ PHASER, PHASE SHIFT X-SEC & POLARIZATION CALC  KAPL  507
6600  F4    RS P    T A $ PUN1, UNRESOLVED RESONANCE INTEGRALS X-SECS    BAPL  359
6600  F4    RS P    T A $ SUMOR, S-WAVE NEUTRON X-SECTION CALCULATION    BAPL  399
6600  F4    RS P    T A $ TOR, THERMAL SCATTERING CRYSTALLINE MATERIALS  LASL  360
6600  F4    RS P    T B $ EPOCH, NEUTRON AGE CALCULATION OF ENDF/B DATA  BAPL  461
6600  F4    RS P    T B $ ETOM1, ENDF/B FORMAT TO MUFT FORMAT X-SECTIONS WAPD  436
6600  F4    RS P    T B $ GLEN, GROUP CONSTANT CALC FROM TOF OUTPUT DATA LASL  361
6600  F4    RS P    T C $ BF21, FEW-GP DISCRETE ORDINATES SLAB GEOMETRY  BAPL  398
6600  F4    RS P    T C $ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM   LASL  209
6600  F4    RS P    T C $ EXTERMINATOR2, 2-D MULTI-GP DIFFUSION PROGRAM  CE    156
6600  F4    RS P    T C $ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM LASL  608
6600  F4    RS P    T C $ VARI-QUIR, TIME-DEP 2-D MULTI-GP DIFFUSION     WANL  212
6600  F4    RS P    T C $ 3DDT, 3-D MULTIGROUP DIFFUSION XYZ R-THETA-Z   LASL  463
6600  F4    RS P    T D $ CINCAS, NUCLEAR FUEL CYCLE COST AND ECONOMICS  WAPD  354
6600  F4    RS P    T D $ PHENIX, 2D DIFFUSION BURNUP REFUELING HISTORY  LASL  454
6600  F4    RS P    T D $ 2DB, 2-D MULTIGROUP DIFFUSION AND DEPLETION    LASL  325
6600  F4    RS P    T D $ 3DXT,DEP3, 3-D XENON TRANSIENT & DEPLETION     KAPL  477
6600  F4    RS P    T E $ ANCON, SPACE-INDEPENDENT REACTOR KINETICS CODE LASL  486
6600  F4    RS P    T F $ NOAH, 1-D ONE-GP SPACE-TIME DIFFUSION FEEDBACK BNL   405
6600  F4    RS P    T F $ NOWIG, 1-D 2-GP KINETICS TEMPERATURE FEEDBACK  BAPL  371
6600  F4    RS P    T F $ SAS1A, FAST REACTOR POWER AND FLOW TRANSIENTS  ANL   400
6600  F4    RS P    T F $ TWIGL, 2-D 2-GP SPACE-TIME DIFFUSION FEEDBACK  BAPL  338
6600  F4    RS P    T F $ WIGL2, 1-D 2-GP SPACE-TIME DIFFUSION 3-GEOM    BAPL  274
6600  F4    RS P    T G $ FLASH3, LOSS-OF-COOLANT ACCIDENT ANALYSIS      BAPL  295
6600  F4    RS P    T G $ FLASH4, FULLY-IMPLICIT TRANSIENT SIMULATION    BAPL  448
6600  F4    RS P    T G $ MO555,ACT1, LOSS-OF-COOLANT ACCIDENT ANALYSIS  BAPL  284
6600  F4    RS P    T G $ RELAP3, REACTOR BLOWDOWN - EXCURSION ANALYSIS  ANC   369
6600  F4    RS P    T H $ CHIC-KIN, FAST + INTERMEDIATE POWER TRANSIENTS BAPL  473
6600  F4    RS P    T H $ FIGRO, LWBR FUEL SWELLING TEMPERATURE STUDY    BAPL  272
6600  F4    RS P    T H $ FLOT1,MO219, PWR FLOW TRANSIENT ANALYSIS       BAPL  331
6600  F4    RS P    T H $ GLUB1, WATER-LOGGED FUEL ELEMENT ANALYSIS      BAPL  424
6600  F4    RS P    T H $ HOT2, 2-D TRANSIENT HEAT CONDUCTION PROGRAM    BAPL  286
6600  F4    RS P    T H $ MANTA, STEADY-STATE THERMAL-HYDRAULIC ANALYSIS WAPD  256
6600  F4    RS P    T H $ MO899,HOH, STEAM TABLES 14.5-2538 PSIA         BAPL  294
6600  F4    RS P    T H $ TOPS, TRANSIENT THERMODYNAMICS OF PRESSURIZERS BAPL  348
6600  F4    RS P    T H $ WASP, WATER AND STEAM THERMODYNAMIC PROPERTIES BAPL  396
6600  F4    RS P    T I $ BUBL1, FUEL SWELLING & GAS RELEASE SIMULATION  BAPL  468
6600  F4    RS P    T I $ BUSHL, CYL SHELL BUCKLING COLLAPSE ANALYSIS    BAPL  481
6600  F4    RS P    T I $ CYGR03, OXIDE FUEL ROD STRESS & DEFORMATION    BAPL  449
6600  F4    RS P    T I $ FUGIT, DYNAMIC RESPONSE OF ELASTIC STRUCTURES  BAPL  537
6600  F4    RS P    T I $ MO266, LINEAR ELASTIC STRUCTURAL DYNAMICS      BAPL  383
6600  F4    RS P    T I $ MO457,PIPE, ELASTIC STRESS OF PIPING SYSTEM    BAPL  329
6600  F4    RS P    T I $ MO552, DYNAMIC ANALYSIS LINEAR ELASTIC SYSTEMS BAPL  283
6600  F4    RS P    T I $ PELEN, FUEL PELLET TEMPERATURE & DEFORMATION   BAPL  598
6600  F4    RS P    T I $ SAFE-PLANE, PLANE STRESS ANALYSIS, 2-D BODIES  BNL   252
6600  F4    RS P    T I $ SEALSHELL2, SHELL STRESS ANALYSIS AXISYM LOAD  BAPL  282
6600  F4    RS P    T I $ SLADE-D, DYNAMIC ANALYSIS OF THIN SHELLS       SLA   581
6600  F4    RS P    T J $ MO756,LETO, 1-D SLAB GAMMA-RAY TRANSPORT       BAPL  343
6600  F4    RS P    T L $ BL47, DRAFTING TOOL TO PLOT PLANE STRUCTURES   BAPL  373
6600  F4    RS P    T M $ EDITOR, ENDF/B TAPE PROCESSING AND EDITING     ORNL  502
6600  F4    RS P    T M $ SHLOG, DATA MANAGEMENT, EDITING, & ANALYSIS    BAPL  557
6600  F4    RS P    T O $ BETTY, ENTRAINED PARTICLES SAMPLING STUDY      BAPL  545
6600  F4    RS P    T O $ JITER, FLUCTUATION EXPERIMENT ANALYSIS         BAPL  354
```

6600 7090

```
6600   F4     RS P    T D $ REDUX, REACTOR FLUCTUATION EXPERIMENT ANALYSIS BAPL   425
6600   F4     RS P    T P $ DAFT1, LEAST SQUARES FIT FISSILE NUCLIDE DATA  BAPL   327
6600   F4     RS P    T P $ M0661,M0657,M0626, POLYNOMIAL CURVE FITTING    BAPL   411
6600   F4     RS P X    I $ FINEL, FINITE-ELEMENT STUDY 2,3-D STRUCTURES   KAPL   404
6600   F4     RS P X T P $ FUNPACK, SPECIAL FUNCTION ROUTINES-EI,K,E,.... ANL    610
6600   F4     RS PL   T B $ ETOG1, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT WAPD   437
6600A  F+ASC  RS      T P $ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. BAPL  478
6600A  F+ASC  RS P    T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BAPL   275
6600B  F+ASC  RS      T P $ BETTIS ENVIRONMENTAL ROUTINES, SUBROUTINE LIB. BW    478
6600B  F+ASC  RS P    T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BW     275
6600B  F+ASC  RS P    T J $ SPAN4, A POINT-KERNEL SHIELD EVALUATION CODE   BAPL   462
6600B  F4     RS      T M $ CHECKER,CRECT,DAMMET,PLOTFB,... ENDF/B V1 PROC BNL    384
6600B  F4     RS      T M $ CRECT,CHECKER,RIGEL,PLOTFB,... ENDF/B V2 PROC  BNL    475
6600B  F4     RS P    T A $ RESEND,ADLER, ENDF/B RESONANCE XSECTION CODES  BNL    465
6600B  F4     RS P    T C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA  LASL   358
6600B  F4     RS P    T I $ MANE1, RECTANGULAR MAGNETIC NETWORK SOLUTION   BAPL   412
6600B  F4     RS P    T I $ SEAL SHELL, SHELL STRESS ANALYSIS AXISYM LOAD  WTSC   282
6600C  F+ASC  RS P    T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BAPL   275
6600C  F+COM  RS      T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.2 CDC    478
6600C  F4     RS P    T H $ COBRA3C, ROD BUNDLE THERMAL-HYDRAULIC ANALYSIS BNW    432
6600C  F4     RS P    T I $ SOR3, STRESS ANALYSIS SHELLS OF REVOLUTION     KAPL   80
6600D  F+ASC  R B     T D $ PDQ7, 1,2 OR 3-D FEW-GP DIFFUSION DEPLETION    BCS    275
6600D  F+COM  RS      T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE3.3 CDC    478
7030   F4     RS      T H $ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS    LASL   242
7030   F4     RS P    T C $ DTF4, 1-D MULTI-GP DISCRETE ORDINATE PROGRAM   LASL   209
7030   F4     RS P    T D $ DTF-BURN, 1-D MULTI-GP DTF4 WITH DEPLETION     LASL   269
7040   F+MAP  RS P      A $ COMBCO, COMBINED B-W MULTI-LEVEL CONVOLUTION   PPCO   203
7040   F4     RS P    T C $ TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER    PPCO   148
7044   F+MAP  RS P    T B $ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS   GGA    219
7044   F+MAP  RS P    T D $ OPUS, POWER PLANT PERFORMANCE AND PRICE STUDY  GGA    226
7044   F+MAP  RS P    T H $ BLOOST5, POINT-KINETICS WITH 2-D HEAT TRANSFER GGA    205
7044   F+MAP  RS P    T H $ TOODEE, 2-D TIME-DEPENDENT HEAT CONDUCTION     PPCO   349
7044   F+MAP  RSBP      M $ UNPACK, RETRIEVAL FROM SCISRS X-SECTION TAPE   GGA    206
7044   F+MAP  RSBP    T C $ GAMBLE4, 2-D MULTI-GP DIFFUSION XY RZ GEOMETRY GGA    222
7044   F+SPS  RSBP    T N $ CROSSPLOT, SC4020 PLOTS FROM X-SECTION TAPES   GGA    207
7044   F4     RS        I $ CORE, CORE CONFIGURATION FUEL TEMPERATURE CODE GGA    233
7044   F4     RS     X T G $ PRECON, HTGR CONTAINMENT PRESSURE POST RUPTURE GGA    228
7044   F4     RS P      D $ RAD2, HTGR FISSION PRODUCT ACTIVITY DIST STUDY GGA    231
7044   F4     RS P      D $ WAMPUM, FUEL CYCLE COSTS PERFORMANCE STUDY      GGA    224
7044   F4     RS P      I $ GAZELLE5, GAS-COOLED CORE THERMAL DESIGN STUDY GGA    232
7044   F4     RS P      L $ GAVER, ENERGY INTERVAL X-SECTION AVERAGING      GGA    218
7044   F4     RS P    T B $ FMC-N, MONTE CARLO CALC NEUTRON HISTORIES      GGA    195
7044   F4     RS P    T C $ GASP2, 1-D FEW-GP DIFFUSION POWER DIST SEARCH  GGA    220
7044   F4     RS P    T C $ TEMCO, 1-D FEW-GP DIFFUSION TEMP COEF CALC     GGA    225
7044   F4     RS P    T D $ GARGOYLE, FUEL CYCLE ANALYSIS PARTIAL REFUEL   GGA    260
7044   F4     RS P    T D $ RELOAD-FEVER, 1-D FEW-GP DIFFUSION DEPLETION   GGA    221
7044   F4     RS P    T D $ REVISEC-GAD, FUEL CYCLE ANALYSIS W/REFUELING   GGA    223
7044   F4     RS P    T D $ STMGEN, STEAM GENERATOR DESIGN CRITERIA COSTS  GGA    227
7044   F4     RS P    T G $ ELBOW, FUEL ELEMENT STRESS ANALYSIS STUDY      GGA    229
7044   F4     RS P    T I $ SAFE-AXISYM, STRESS ANALYSIS AXISYMMETRIC LOAD GGA    251
7044   F4     RS P X    A $ LEGCOEF3, LEGENDRE COEF CALC FOR ANGULAR DIST  GGA    217
7044   F4     RSBP   CT I $ SAFE-PCRS, STRESS ANALYSIS AXISYMMETRIC LOAD   GGA    250
709    F2     RS       C $ FIRN, 2-D FEW-GP S4 APPROXIMATION RZ GEOMETRY   LRL      7
7090   F+FAP  RS      T I $ 4RESTRAINT PIPE STRESS, MAXIMUM MOMENT CALC    AI     109
7090   F+FAP  RS  L   T B $ QUICKIE, INFINITE MEDIUM SPECTRUM X-SECTIONS   AI     115
7090   F+FAP  RS  L   T C $ FAIM, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE   AI     120
7090   F+FAP  RS  L   T C $ ULCER, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE  AI     118
7090   F+FAP  RS P      I $ WIREX, COMPUTER-PRODUCED WIRING LISTS UHTREX   LASL   315
7090   F+FAP  RS P    T B $ RAFFLE, 1ST FLIGHT COLLISION PROBABILITIES MC CRNL   392
7090   F+FAP  RS P    T B $ SOPHIST1/2/5, MULTI-GP TRANSFER COEFFICIENTS   LRL    160
7090   F+FAP  RS P    T C $ EXTERMINATOR, 2-D MULTI-GP DIFFUSION PROGRAM   CRNL   156
7090   F+FAP  RS P    T D $ ASSAULT, 2-D MULTI-GP DIFFUSION DEPLETION CODE CRNL   240
7090   F+FAP  RS P    T L $ DPC, DATA PREPARATION FOR 2-D DESIGN PROGRAMS  LASL   234
7090   F+FAP  RS P    T M $ DESR, DATA FILE SERVICE ROUTINES ENDF TAPES    BNL    236
```

7090	F+FAP	RS PL		T	B	$	GAMTEC2, MULTI-GP CONSTANT CALC 0 TO 10 MEV	BNW	185
7090	F+FAP	RS PL		T	B	$	TEMPEST2, THERMAL NEUTRON SPECTRUM X-SECTIONS	AI	50
7090	F+FAP	RS PL		T	C	$	AIM6, 1-D MULTI-GP DIFFUSION SLAB CYL SPHERE	AI	29
7090	F+FAP	RSB		T	A	$	TUZ, UNRESOLVED REGION RESONANCE INTEGRAL CALC	GGA	42
7090	F+FAP	RSB		T	A	$	ZUT, RESOLVED REGION RESONANCE INTEGRAL CALC	GGA	41
7090	F+FAP	RSBP		T	D	$	DDB, 2-D FEW-GP DIFFUSION BURNUP RZ GEOMETRY	GGA	99
7090	F+FAP	RSBPL		T	C	$	CRAM, 1-D AND 2-D MULTI-GP DIFFUSION PROGRAM	UK-R	103
7090	F+FAP	RSBPLX		T	B	$	AGN-GAM, FAST SPECTRUM MULTI-GP CONSTANT CALC	AGC	204
7090	F+MAP	RS P		T	C	$	TDSN, 2-D MULTIGROUP DISCRETE ORDINATE PROGRAM	LER	312
7090	FAP	RSBP	X	T	Q	$	SPECTRA, MC CALCULATION IRRADIATED MATERIAL	GEC	422
7090	FLCCC	RS P			B	$	MCS, MONTE CARLO NEUTRON PENETRATION STUDY	LASL	202
7090	FLOCO	RS P			B	$	ZOT, GROUP-COLLAPSING OF MULTI-GP X-SECTIONS	LASL	113
7090	FLCCC	RSBP			C	$	2DXY, 2-D MULTI-GP SN APPROXIMATION XY GEOM	AGC	18
7090	FLOCO	RSBP		T	C	$	GE-HAPO-S13, 1-D MULTI-GP DOUBLE SN APPROX	BNW	75
7090	F2	RS			A	$	LYNNE, WOODS-SAXON POTENTIAL SHAPE CALCULATION	ORNL	381
7090	F2	RS			B	$	DANCOFF JR, MODERATOR SPACE CHORD DIST FUNCT	AEG	150
7090	F2	RS			B	$	S4 CYL CELL CODE, 1-D 1-GP S4 APPROXIMATION	AI	53
7090	F2	RS			C	$	PERT, 1-D PERTURBATION FOR AIM AND FOG CODES	AI	30
7090	F2	RS			E	$	AIREK3, SPACE-INDEPENDENT KINETICS W/FEEDBACK	AI	121
7090	F2	RS			E	$	SNAPKIN5/5A, 1-REGION KINETICS SNAP GEOMETRY	AI	122
7090	F2	RS			I	$	CROCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	112
7090	F2	RS			I	$	FUGUE, STEADY-STATE TEMPERATURE VOID FRACTION	AI	48
7090	F2	RS			I	$	SHOCK, SPACE POWER PLANT DESIGN OPTIMIZATION	AI	114
7090	F2	RS			J	$	FARSE1A, DOSE RATE FROM SNAP SHIELD LEAKAGE	AI	91
7090	F2	RS			J	$	MORTIMER, DOSE RATE CALCULATION SNAP GEOMETRY	AI	142
7090	F2	RS			J	$	SCARF2, SCATTER FROM RADIATOR FINS SNAP GEOM	AI	110
7090	F2	RS			J	$	SCAR1, SCATTER FROM A RING SNAP GEOMETRY	AI	111
7090	F2	RS			N	$	WED, W-DSN OUTPUT TAPE EDIT REACTION RATES	UK-W	133
7090	F2	RS		T	A	$	SUMMIT, CRYSTALLINE SCATTERING KERNEL CALC	GGA	56
7090	F2	RS	L	T	D	$	SIZZLE, 1-D MULTIGROUP DIFFUSION DEPLETION	AI	58
7090	F2	RS P			B	$	BAM, S4 CYL CELL CODE AND TEMPEST COMBINATION	AI	108
7090	F2	RS P			B	$	BOUNCE, FLUX DIST IN MULTI-PIN FUEL ELEMENT	AGC	237
7090	F2	RS P			B	$	SAIL, 1-D 1-GP SN APPROXIMATION SLAB GEOMETRY	AI	52
7090	F2	RS P			C	$	MIST, 1-D FEW-GP SN DOUBLE SN APPROX SLAB GEOM	PPCO	59
7090	F2	RS P			D	$	AIMFIRE, URANIUM FUEL CYCLE COST ANALYSIS	AI	55
7090	F2	RS P			F	$	CONEC, COUPLED NEUTRONICS-HYDRODYNAMICS SPHERE	LRL	129
7090	F2	RS P			G	$	CLOUD, GAMMA-RAY DOSE RATE FROM A CLOUD	AI	47
7090	F2	RS P			J	$	GRACE1, GAMMA-RAY ATTENUATION SLAB GEOMETRY	AI	45
7090	F2	RS P			J	$	GRACE2, GAMMA-RAY ATTENUATION CYL SPHERE GEOM	AI	46
7090	F2	RS P			J	$	RATRAP, DOSE RATE CALCULATION SNAP GEOMETRY	AI	141
7090	F2	RS P			O	$	CROCSO, ML-1 FLUID FLOW EXPERIMENT ANALYSIS	AGC	154
7090	F2	RS P			P	$	FRANTIC, LEAST SQUARES FIT SUM OF EXPONENTIALS	MIT	324
7090	F2	RS P		T	B	$	AGN-SIGMA, CALC OF MULTI-GP TRANSFER MATRICES	AGC	243
7090	F2	RS P		T	C	$	EQUIPOISE3, 2-D 2-GROUP DIFFUSION SLAB CYL	ORNL	39
7090	F2	RS P		T	C	$	EQUIPOISE3A, 2-D 2-GP DIFFUSION CYLINDER SLAB	ORNL	87
7090	F2	RS P		T	C	$	FOG, 1-D FEW-GP DIFFUSION SLAB CYLINDER SPHERE	AI	28
7090	F2	RS P		T	C	$	TOPIC, 1-D FEW-GP SN APPROXIMATION CYLINDER	PPCO	148
7090	F2	RS P		T	C	$	W-DSN, 1-D MULTI-GP SN APPROX SLAB CYL SPHERE	UK-W	132
7090	F2	RS P		T	C	$	WHIRLAWAY, 3-D 2-GROUP DIFFUSION XYZ GEOMETRY	ORNL	32
7090	F2	RS P		T	C	$	2DGRAND, 2-D FEW-GROUP DIFFUSION SLAB CYLINDER	ORNL	40
7090	F2	RS PL		T	A	$	ARES2, RESONANCE INTEGRAL X-SECTION CALC	AI	89
7090	F2	RS PL		T	B	$	FORM, FAST NEUTRON SPECTRUM X-SECTION CALC	AI	51
7090	F2	RS PLX		T	B	$	GAM1, FAST NEUTRON SPECTRUM X-SECTION CALC	GGA	33
7090	F2	RS PLX		T	C	$	DTF2, 1-D MULTI-GP DISCRETE ORDINATE CALC	AI	151
7090	F2	RSB			F	$	HATCHET, COUPLED NEUTRONICS-HYDRODYNAMICS CODE	AGC	153
7090	F2	RSB		T	D	$	FEVER, 1-D FEW-GP DIFFUSION DEPLETION PROGRAM	GGA	117
7090	F2	RSBP			D	$	ISOCRUNCH, REACTION DECAY CHAIN ANALYSIS	ORNL	180
7090	F2	RSBP			D	$	NPRECOP, FUEL CYCLE COSTS PERFORMANCE DATA	KE	146
7090	F2	RSBP			D	$	NUCY, SOLUTION OF NUCLIDE CHAIN EQUATIONS	ORNL	134
7090	F2	RSBP			J	$	LIPRECAN1, MC NEUTRON PENETRATION CALCULATION	DAC	123
7090	F2	RSBPL		T	J	$	MAC, SHIELD DESIGN MULTIGROUP SLAB GEOMETRY	BNW	143
7090	F4	RS P		T	F	$	NOISY1, AUTO- AND CROSS-SPECTRAL DENSITIES	BNW	488
7090	F4	RSBP			A	$	MUFFLE, FISSILE NUCLIDE X-SECTION EVALUATION	ORNL	323
7090	MAD	RSB			O	$	BURP1, DETECTOR EFFICIENCY POINT SOURCE	UM	164

```
7090  MAD   RSB       O $ BURP2, DETECTOR EFFICIENCY DISK SOURCE          UM      165
7090  MAD   RSB       O $ BURP3, DETECTOR EFFICIENCY POINT SOURCE         UM      166
7090  MAD   RSB       O $ BURP4, GAMMA-RAY PHOTOFRACTION SOLID CRYSTAL    UM      169
7090  MAD   RSB       O $ BURP5, GAMMA-RAY PHOTOFRACTION WELL CRYSTAL     UM      170
7094  F+FAP RS  L   T M $ MOMUS, X-SECTION LIBRARY UTILITY PROGRAM        AI      159
7094  F+FAP RS P      J $ SHOF, SHIELD WEIGHT OPTIMIZATION DOSE CALC      AI      197
7094  F+FAP RS P    T B $ EPITHERMOS, SPECTRUM AND X-SECTION CALCULATION NED      201
7094  F+FAP RS P    T G $ AISITE2, PARAMETRIC SITE REQUIREMENT STUDY      AI      172
7094  F+FAP RS P    T H $ HEATING2, TRANSIENT STEADY-STATE HEAT TRANSFER AI      198
7094  F+FAP RS PL   T B $ AILMOF, X-SECTION CALC ELASTIC SCAT RESONANCES AI      147
7094  F+FAP RS PL   T B $ GRAVE, GROUP-AVERAGING X-SECTIONS PARAMETERS   AI      162
7094  F+FAP RS PL   T B $ TYCHE3, MONTE CARLO SLOWING-DOWN DENSITY CALC  AI      149
7094  F+FAP RS PL   T G $ CURIE,DOSE,THUNDERHEAD, EXTERNAL+INTERNAL DOSE AI      196
7094  F+FAP RS PL   T M $ ECSIL, EXPERIMENTAL NEUTRON DATA LIBRARY       LRL     351
7094  F+FAP RSBPL   T N $ CPS, SC4020 PLOTS FROM SCISRS X-SECTION TAPES  WANL    239
7094  F+MAP RS P      A $ CHAD, LEGENDRE COEF CALC FOR ANGULAR DIST DATA AI      215
7094  F+MAP RS P    T B $ GAROL, RESONANCE OVERLAP AND LATTICE EFFECTS   LER     219
7094  F+MAP RS P    T E $ AIPOS, SPACE-INDEPENDENT KINETICS W/FEEDBACK   AI      163
7094  F+MAP RS P    T F $ TSN, SPATIALLY-DEPENDENT REACTOR KINETICS      AI      309
7094  F+MAP RS PLX  T A $ TRIX1, RESONANCE INTEGRAL X-SECTION CALC       AI      208
7094  F+MAP RS PLX  T B $ LASER, SPECTRUM CALC WITH BURNUP CYL LATTICE   WAPD    249
7094  F+MAP RSBP    T G $ SATURATED BLOWDOWN2, BLOWDOWN ANALYSIS LOFT    KE      200
7094  FAP   RS P    T H $ RATH, 2- OR 3-D HEAT CONDUCTION LUMPED MASS    LASL    242
7094  F2    RS P      A $ EXT, X-SECTIONS FROM B-W RESONANCE PARAMETERS  WANL    238
7094  F2    RS P      F $ WEAK EXPLOSION, COUPLED NEUTRON-HYDRODYNAMICS  APDA    145
7094  F2    RS P      H $ FLOW-MODEL, MULTI-CHANNEL 2-D 2-PHASE FLOW     AI      246
7094  F2    RS P      P $ EXPALS, LEAST SQUARES EXPONENTIAL DECAY CURVES LRL     321
7094  F2    RS P    T A $ 2PLUS, NON-SPHERICAL OPTICAL MODEL X-SECTIONS  AI      254
7094  F2    RS P    T G $ TRANS-FUGUE1, TRANSIENT FLOW AND HEAT TRANSFER AI      268
7094  F2    RS PL   T I $ CYCLOPS1, THERMODYNAMIC CYCLE ANALYSIS         AI      244
7094  F2    RSBP      H $ AXFLU, HEAT TRANSFER MOLTEN FUEL TUBE BUNDLES  LASL    182
7094  F2    RSBP      H $ AXTHRM, HEAT TRANSFER SOLID FUEL TUBE BUNDLES  LASL    183
7094  F2    RSBP    T H $ PTH1, BLOWDOWN PRESSURE TEMPERATURE HISTORY    KE      155
7094  F4    RS        E $ R102, SPACE-INDEPENDENT INVERSE KINETICS CALC  WANL    168
7094  F4    RS      T P $ LASL LEAST SQUARES, GENERAL CURVE FITTING      LASL     62
7094  F4    RS P      A $ AVERAGE, UNRESOLVED REGION AVERAGE X-SEC CALC  BNL     376
7094  F4    RS P      F $ MARS, 2-D EXCURSION CALCULATION R-Z GEOMETRY   APDA    293
7094  F4    RS P X T  C $ VARI-QUIR3, 2-D MULTI-GP DIFFUSION XY RZ RTH   WANL    264
71-1), ENDF/B THERMAL SCATTERING DATA  DP    360  F4    RS P XCT A $ FLANGE2(    368
7600  F4    RS      T P $ MODEL, MODIFIED BETTIS ENVIRNMNTL LIB SCOPE2.0 CDC     478
7600  F4    RS P    T B $ ETOG3, ENDF/B TO MUFT, GAM, ANISN X-SEC FORMAT WAPD    538
7600  F4    RS P    T B $ ETOT2, THERMAL LIBRARIES FROM ENDF/B DATA      WAPD    509
7600  F4    RS P    T C $ TRIPLET, 2-D TRIANGULAR MESH TRANSPORT PROGRAM LASL    608
7600  F4    RS P    T G $ CERUG, STEAM GENERATOR SODIUM-WATER REACTION   CEND    548
7600  F4    RS PLX  T C $ VIM1, MONTE CARLO CRITICAL ASSEMBLY ANALYSIS   AI      510
7600B F4    RS P    T C $ TWOTRAN2, 2-D MULTI-GP TRANSPORT XY RZ RTHETA  LASL    358
99-GP DLC-2B LIBRARY GROUP COLLAPSING  APRF 6600  F4    RS        B $ APREX1,    466
```

REFERENCES

1. Radkowsky, A., and R. Brodsky, *A Bibliography of Available Digital Computer Codes for Nuclear Reactor Problems*, AECU-3078 (Oct 1955).

2. *Nuclear Codes Group Newsletters*, No. 1 (Sept 25, 1956); No. 2 (Dec 1, 1956); No. 3 (Mar 1, 1957); No. 4 (June 1, 1957); No. 5 (Sept 1, 1957); No. 6 (Dec 1, 1957); No. 7 (June 1, 1958); No. 8 (Dec 8, 1958); No. 9 (Sept 1, 1959); No. 10 (Dec 1, 1959); AEC Computing and Applied Mathematics Center, Institute of Mathematical Sciences, New York University, New York, N.Y.

3. Nather, V., and W. Sangren, *Reactor Code Abstracts*, Commun. Assoc. Computing Mach. *2*(1) (Jan 1959).

4. Nather, V., and W. Sangren, *Reactor Code Abstracts*, Commun. Assoc. Computing Mach. *3*(1) (Jan 1960).

5. Argonne Code Center, *Reactor Code Abstracts*, Distribution 1-12 (1961-April 24, 1967).

6. American Nuclear Society Standard ANS-STD.2-1967, *A Code of Good Practices for the Documentation of Digital Computer Programs*.

7. European Atomic Energy Community, *EURATOM-Thesaurus*, EUR 500.e (Second Edition) (1966).

ARGONNE NATIONAL LAB WEST
3 4444 00023926 9