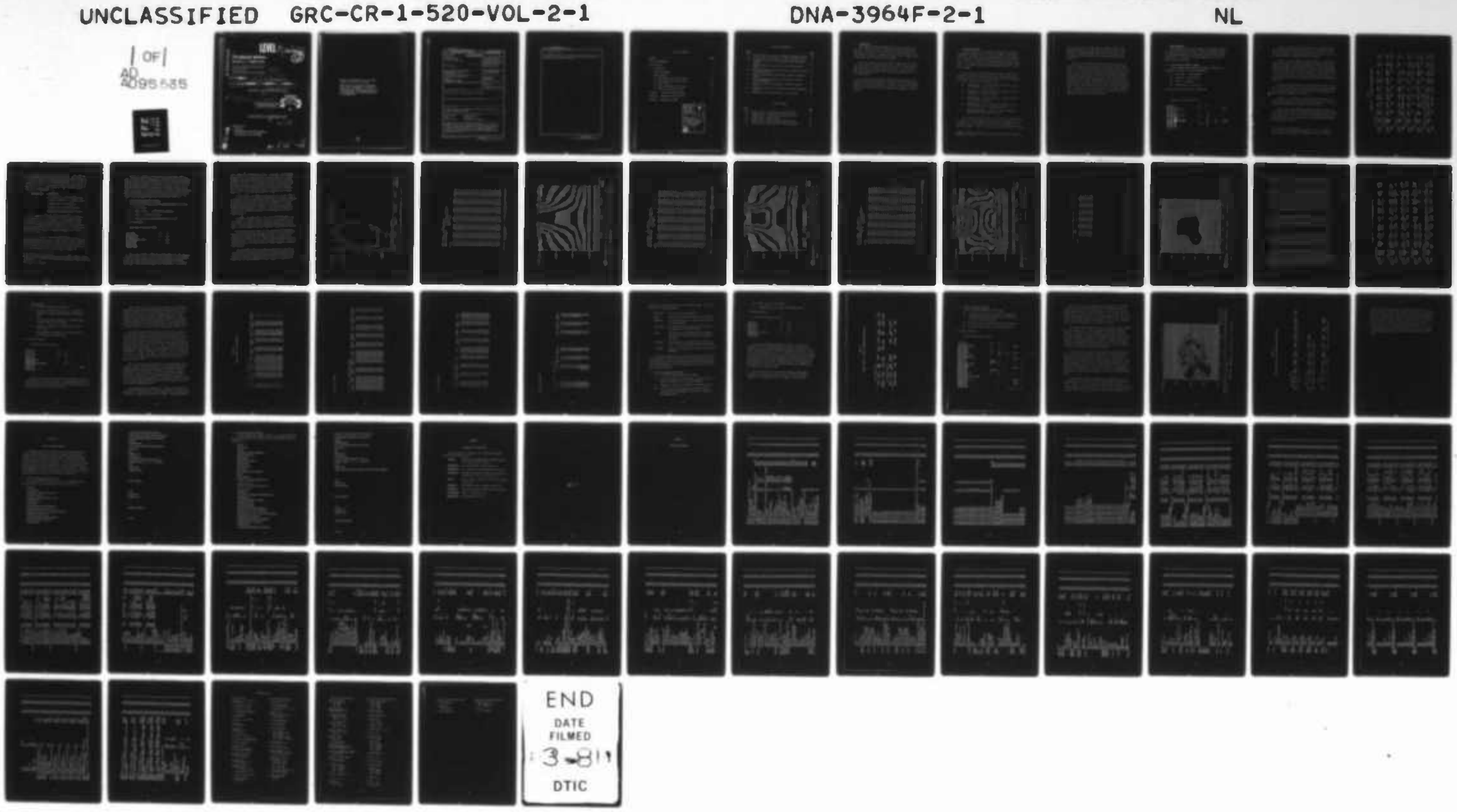
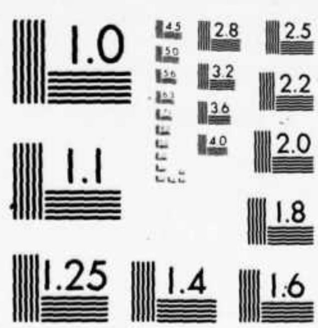
AD-A095 535 GENERAL RESEARCH CORP SANTA BARBARA CA F/G 9/2
THE ROSCOE MANUAL. VOLUME 2-1. SAMPLE CASE.(U)
MAR 80 J R GARGARINO DNA001-80-C-0075
UNCLASSIFIED GRC-CR-1-520-VOL-2-1 DNA-3964F-2-1 NL

1 OF 1
AD
A095535



955



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

AD A095535

LEVEL III

DNA 3964F-2-1

THE ROSCOE MANUAL.

Volume 2-1. Sample Case.

General Research Corporation
P.O. Box 6770
Santa Barbara, California 93111

72

1 Mar [redacted] 80

J. R. Gargarino

Final Report, [redacted] 12 Dec [redacted] 79–1 Mar [redacted] 80,

CONTRACT No. DNA 001-80-C-0075

GRC-CR-1-520-VOL-2-1

THIS WORK SPONSORED BY THE DEFENSE NUCLEAR AGENCY
UNDER RDT&E RMSS CODE B322080464 S99QAXHC30105 H2590D.

C3P1

Prepared for
Director
DEFENSE NUCLEAR AGENCY
Washington, D. C. 20305

402754

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: DNA 3964F2-1	2. GOVT ACCESSION NO.: AD-A095 535
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): THE ROSCOE MANUAL Volume 2-1: Sample Case	5. TYPE OF REPORT & PERIOD COVERED: Final Report for period 12 Dec 79—1 Mar 80
	6. PERFORMING ORG. REPORT NUMBER: CR-1-520, Vol. 2-1
7. AUTHOR(s): J. R. Garbarino	8. CONTRACT OR GRANT NUMBER(s): DNA 001-80-C-0075
9. PERFORMING ORGANIZATION NAME AND ADDRESS: General Research Corporation, P.O. Box 6770, Santa Barbara, California 93111	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: Subtask S99QAXHC301-05
11. CONTROLLING OFFICE NAME AND ADDRESS: Director, Defense Nuclear Agency, Washington, D.C. 20305	12. REPORT DATE: 1 March 1980
	13. NUMBER OF PAGES: 72
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION DOWNGRADING SCHEDULE: N/A

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

This work sponsored by the Defense Nuclear Agency under RDT&E RMSS Code B322080464 S99QAXHC30105 H2590D.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Nuclear Effects	Computer Program
Radar	Simulation
Optical Sensors	Ballistic Missile Defense

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The ROSCOE computer code is designed specifically to be the "laboratory standard" for evaluating nuclear effects on radar and optical systems. The program provides a means for (1) evaluating sensor acquisition, discrimination, and tracking performance in a nuclear environment, (2) measuring various propagation error sources, and (3) computing specific phenomenological data.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

20. ABSTRACT (Continued)

This volume, Vol. 2-1, presents a description of sample problems utilizing the new ROSCOE data deck. Input and output options are discussed, and sample job control streams are provided.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

1 INTRODUCTION

This volume contains five ROSCOE sample cases, two environment runs (low- and high-altitude), and three system problems (radar, communication, and optics). For each example the inputs required to run the problem are described. These are followed by a small sample of the output tables and plots that the code produces.

The sample cases were generated using the sample data deck shown in Volume 1-1 with a few minor changes in each case. The structure of this input deck is briefly described in Section 2. Section 3 follows with a description of specific inputs and the resulting outputs for each sample problem.

Job control streams using the sample data deck are provided in Appendix A, and brief descriptions of permanent files used during ROSCOE execution are presented in Appendix B. Finally, a listing of the sample data deck is taken from Volume 1-1 and repeated in Appendix C for easy reference.

2 DATA DECK STRUCTURE

The sample data deck is stored as a permanent file (file name ROSCOEDATA) in UPDATE[1] library form (deck name DATA), and contains a sample setup for almost any type of ROSCOE problem the user wishes to run. To execute a particular problem, the user simply changes a few of the stored input variables via an UPDATE command (examples are shown below). A working knowledge of FLEXRED and DSA (described in Volume 1-1) is assumed.

The data deck, as currently structured, allows the user to run environment, radar surveillance and tracking, satellite communication, and optical surveillance and tracking problems. The input variables in the sample data deck are grouped as follows:

- General Inputs. Include event list, option flags, reference locations, output formats, etc.
- Radar Inputs. Variables required to simulate radar surveillance or tracking performance.
- Sat-Com Inputs. Variables required to simulate a satellite communication problem.
- Optics Inputs. Variables required to simulate optical sensor surveillance or tracking performance.
- Phenomenology Inputs. Variables required to simulate a burst and print environment outputs.

To run a specific problem, the user creates a set of changes to the data deck. The change package starts with a card to identify the deck to be charged (in this case DATA). The card should read *COMPILE DATA, starting in column 1. This card is followed by the change cards themselves.

---

[1]UPDATE is a Control Data Corporation program which provides a means for editing text files.

For each change, the user must prepare an UPDATE edit card (e.g., *D DATA.XXX deletes card number XXX from the deck) and the card(s) replacing the deleted statement (inserts can also be made). The replacement cards must conform to the FLEXRED format described in Volume 1-1.

The event list contained in the general input section is the single most important set of input data. This list drives the simulation. In the sample deck, eleven events have been inserted in the event list. Two of the events (the attack generation event which performs initialization functions, and the stop event which terminates program execution) are mandatory, while the other nine are optional. The optional events (radar, communications, optics, and burst events) have been given very large event times so that the program (which processes events in time order) will hit the stop event before executing them. To turn on any one of these events, the user should change the event time relative to the stop event time. The user can also add additional events as described in Volume 1-1.

3 SAMPLE PROBLEMS

This section describes sample problems which illustrate some of the available ROSCOE input and output options. As mentioned earlier, two environment problems (low- and high-altitude) and three system problems (radar surveillance, satellite communication, and optical surveillance) are presented.

3.1 LOW-ALTITUDE ENVIRONMENT PROBLEM

To run a simple low-altitude burst problem, consisting of a single burst and with the following assumptions:

- Burst time = 94.76 seconds
- Altitude = 8.8 kilometers
- Yield = 5 kilotons
- Output every 1 to 96 seconds

The user would input the following change deck:

[Cards read from bottom to top]

```
STOP TIME                                  97.0      SEC
*D DATA.1194
GRID OUTPUT DATASET                        1.0                           ZEROS
*D DATA.1185
DELTA PRINT TIME                           1.0       SEC
*D DATA.1181
ENVIRONMENT OUTPUT TIME                    95.0      SEC
*D DATA.1178
          YIELD                            5.        KT
*D DATA.1074
          BURST POSITION                   0.        0.        8.8       LOCXYZ
*D DATA.1005
BURST TIME                                 94.76     SEC
*D DATA.1004
*COMPILE DATA
```

In this example the Burst Event Dataset-1 and Environment Output Event times have been changed relative to the Stop Event time so that they will be process·d. The grid output dataset is "zeroed," since it is only appropriate for high-altitude bursts (>90 km).

The output for this example is shown in Table 3.1. There are six tabular output lists provided, including burst parameters; three sets of fireball parameters; a set of debris parameters; and a set which shows some point properties (electron density, reflection coefficient) within or near the fireball. For the burst parameters, a single line of output is provided for each burst. For the other outputs, separate lines of output are printed at the calculation times requested in the environment output event.

The Burst Parameter headings are self-explanatory, with the exception of the last two variables. These are used in the chemistry routine to flag the approximate time after burst when the fireball temperature drops to 3000°K and 2000°K, respectively.

Fireball Set-1 provides the fireball radii,[1] altitude, rise rate, expansion rate, density, temperature, and time since burst (or time since merge for merged bursts) at a series of calculation times.

Fireball Set-2 gives minimum and maximum altitudes at which the ellipsoidal fireball region is truncated, the orientation of the fireball axis in terms of the tilt from vertical and rotation CCW from east, the vortex radii,[2] the vortex volume, and a characteristic time to describe when merges have occurred.

---

[1]The fireball radial dimensions are defined in Fig. 2.8 of Volume 1.
[2]The vortex radial dimensions are defigned in Fig. 2.8 of Volume 1.

TABLE 3.1

EXAMPLE OUTPUT: LOW-ALTITUDE ENVIRONMENT PROBLEM

BURST PARAMETERS

TIME OF OUTPUT SEC	TOTAL ENERGY (ERGS)	FISSION ENERGY (ERGS)	BURST ALTITUDE KM	BURST PT. DENSITY (GM/CC)	SCALE HEIGHT KM	BURST PT. TEMP (DEG K)	INITIAL RADIUS KM	TIME TO REACH 3000K	TIME TO REACH 2000K
94.760	2.00784E+20	1.00392E+20	8.822	4.7745E-04	7.849	230.818	.057	11.049	19.979

FIREBALL SET-2

TIME OF OUTPUT SEC	FIREBALL INDEX NUMBER	MINIMUM ALTITUDE KM	MAXIMUM ALTITUDE KM	TILT FROM VERTICAL DEG	AXIS ROTATION DEG	HOR VORTEX RADIUS KM	VRT VORTEX RADIUS KM	VORTEX VOLUME (CM3)	CHARACT. TIME SEC
95.000	1	8.674	8.974	0.000	0.000	.195	.187	3.0728E+13	94.760
96.000	1	8.665	9.015	0.000	0.000	.246	.217	5.6096E+13	94.760

FIREBALL SET-3

TIME OF OUTPUT SEC	FIREBALL INDEX NUMBER	X-COORDINATE (CM)	Y-COORDINATE (CM)	Z-COORDINATE (CM)	OVAL OF CASSINI PARAMETER	OVAL ARM RADIUS KM	VORTEX TEMP (DEG-K)	FIREBALL KIND	MERGE TO INDEX
95.000	1	-1.1502E+08	-4.6359E+08	4.2357E+08	.051	0.000	448.560	1	0
96.000	1	-1.1502E+08	-4.6359E+08	4.2357E+08	.412	0.000	394.045	1	0

FIREBALL SET-1

TIME OF OUTPUT SEC	FIREBALL INDEX NUMBER	HORIZONTAL RADIUS KM	VERTICAL RADIUS KM	CENTER ALTITUDE KM	RISE RATE KM	EXPANSION RATE KM	FIREBALL DENSITY (GM/CC)	FIREBALL TEMP (DEG-K)	TIME SINCE BURST SEC
95.000	1	.122	.120	8.824	.008	.300	2.7071E-05	7015.752	.240
96.000	1	.158	.140	8.840	.040	.062	2.1217E-05	5303.715	1.240

DEBRIS PARAMETERS

TIME OF OUTPUT SEC	FIREBALL INDEX NUMBER	DEBRIS INDEX NUMBER	TOTAL ENERGY (ERGS)	DEBRIS ALTITUDE KM	HORIZONTAL RADIUS KM	VERTICAL RADIUS KM	DEBRIS DISTRIB. PARAMETER	EQUIVALENT SPH. RAD. KM	DEBRIS VOLUME (CM3)
95.000	1	1	1.00392E+20	8.826	.053	.053	8.000	.053	6.1427E+11
96.000	1	1	1.00392E+20	8.851	.086	.086	8.000	.086	3.3033E+12

DETAILED CHEMISTRY, REFLECTIVITY, AND ABSORPTION DATA

TIME OF OUTPUT SEC	FIREBALL INDEX NUMBER	ALTITUDE OF POINT KM	RANGE FROM FB CENTER KM	LOCATION OF POINT	ELECTRON DENSITY (CM-3)	TEMP AT POINT (DEG-K)	GRADIENT REGION WIDTH (CM)	REFLECTION COEFF. (NO ABS)	REFLECTION COEFF. (WITH ABS)
95.000	1	8.824	0.000	FIREBALL	3.9469E+15	7015.752	7321.352	1.0148-236	9.6865-237
96.000	1	8.840	0.000	FIREBALL	7.1747E+14	5303.715	1793.766	8.7311E-78	[illegible]

Fireball Set-3 shows the fireball's earth-centered Cartesian coordinates, a shape parameter (oval of Cassini parameter) which describes the transition of the fireball from ellipsoid to a torus,[1] the oval arm radius,[2] the vortex boundary temperature, and two indices to provide merging information. The first index, "fireball kind," can have the following values:

Fireball Kind	Definition
1-2	Fireball prior to torus formation (above 100 km: 1 = spheroid, 2 = skewed spheroid)
3	Fireball after torus formation
4	Fireball has radiation-merged with new one
5	Fireball has hydromerged with another one

The second parameter, "merge ID index," describes where a merged fireball region has gone. For example, for radiation-merged fireballs (fireball kind = 4), the index number of the new merged fireball is given; for hydromerged fireballs (fireball kind = 5), two numbers are given (written consecutively to form the index), the first giving the index of the other fireball involved in the merge. and the second the new fireball index.

The table of Debris Parameters provides physical data for the debris region, including: total energy, altitude, radius, volume, and a "debris distribution parameter," which describes the distribution of fission debris as a function of the horizontal distance from the field line passing through the center of the region (see RANC IV).

---

[1]When the Oval of Cassini parameter is 1.0, the fireball begins to look like a torus (a hole forms). The larger the parameter, the more toroidal the shape.

[2]See Fig. 2.8 of Volume 1.

Finally, at the bottom of the table the Detailed Point Data are shown. Electron density, temperature, the width of the steep temperature gradient region just outside the fireball, and the reflection coefficient with and without absorption are printed as a function of time. In this example, properties for only one point at the fireball center are computed at each time. The user can increase the number of points calculated inside and outside the fireball region by changing the appropriate parameters in the environment output event dataset (see Volume 1-1).

3.2 HIGH-ALTITUDE ENVIRONMENT PROBLEM

To run a high-altitude environment problem assuming the following,

- Burst time = 0
- Burst altitude = 200 kilometers (default)
- Yield = 1 megaton (default)
- Output every 30 seconds (default) from 0 to 180

the user would input:

[Cards read from bottom to top]

```
STOP TIME                         181.      SEC
*D DATA.1194
END PRINT TIME                    180.      SEC
*D DATA.1182
ENVIRONMENT OUTPUT TIME           0.        SEC
*D DATA.1178
BURST TIME                        0.        SEC
*D DATA.1004
*COMPILE DATA
```

When a high-altitude (>90 km) burst is simulated, the code produces a series of printer plots, as well as tabular outputs at items specified by the Environment Output Event input variables (DATA.1177 through DATA.1184). The Grid Output Dataset sets up these plots. The variable "type" defines the location where the grid cut is made: type FIREBALL indicates that a cut through the center of the fireball will be made; otherwise, the second variable "index" is used to define the index of the cell in the X- or Y- or Z-direction to be used. the "kind of input desired" can be RHO for mass density plots, NE for electron density plots, STRI for striation fraction plots, TE for electron temperature plots, ALL for all of the above (default), or NONE for none of them.

In this example, the default values are used for the grid output, so printer plots for all the quantities mentioned are produced by taking a cut through the grid parallel to the Y-axis (normal to the field), through the fireball center. The grid size is defined in the Heave Coordinate Dataset (DATA.522 - DATA.540). The dataset values specify a 6×6 grid (36 columns) with each cell 0.02 radians on a side, and 17 vertical cells.

A sample of the grid output at 90. s after burst is shown in Figs. 3.1 through 3.9. The plots include a picture of the fireball and beta tube region, followed by tabular and graphic representations of mass density, electron density, electron temperature, and striation fraction.

The fireball plots are made in a plane aligned with the magnetic field to show the field line convergence and dip. The burst point is denoted by the symbol "+BP," the fireball region is denoted by the asterisks, and the beta tube by the dotted lines which emanate from the contained debris. The dashed lines in the figure represent altitudes of 60 and 85 km.

The next figure (Fig. 3.2) shows mass densities as a function of altitude and cell numbers within the grid. The mass densities in equal altitude increments are derived by interpolating the stored grid data. These data are then interpolated further to produce the contour plot

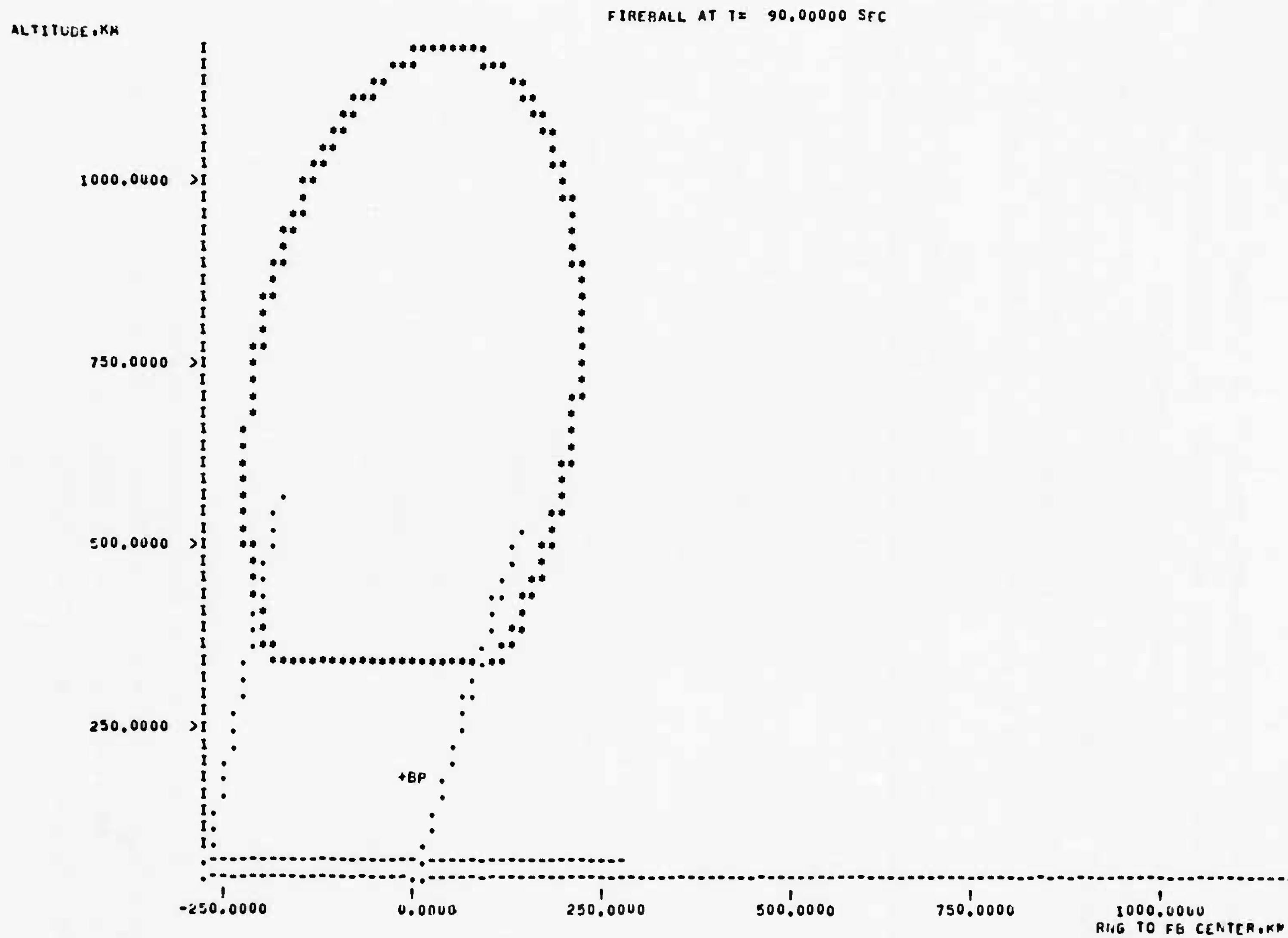


Figure 3.1. Fireball Shape at 90 seconds for Sample Environment Problem

TIME= 90.00000 X-CELL NUMBER= 3

MASS DENSITIES,GM/CC WITHIN THE ORIGINAL GRID

ALT,KM	Y-CELL NUMBER 1	2	3	4	5	6
797.00	.2217E-16	.2775E-16	.3216E-13	.3078E-13	.2769E-16	.2215E-16
759.79	.3593E-16	.4881E-16	.4191E-13	.4008E-13	.4866E-16	.3589E-16
722.58	.5861E-16	.9985E-16	.5447E-13	.5216E-13	.9918E-16	.5853E-16
685.37	.9913E-16	.2297E-15	.6721E-13	.6483E-13	.2271E-15	.9896E-16
648.16	.1677E-15	.6046E-15	.8289E-13	.7999E-13	.5922E-15	.1673E-15
610.95	.2948E-15	.1658E-14	.1022E-12	.9870E-13	.1622E-14	.2939E-15
573.74	.5311E-15	.3243E-14	.1262E-12	.1218E-12	.3166E-14	.5293E-15
536.53	.9535E-15	.5920E-14	.1560E-12	.1518E-12	.5815E-14	.9498E-15
499.32	.1652E-14	.9257E-14	.1930E-12	.1891E-12	.9104E-14	.1645E-14
462.11	.2864E-14	.1447E-13	.2387E-12	.2356E-12	.1425E-13	.2850E-14
424.69	.6735E-14	.2710E-13	.3495E-12	.3388E-12	.2663E-13	.6691E-14
387.68	.2484E-13	.5077E-13	.5364E-12	.5281E-12	.5010E-13	.2492E-13
350.47	.8042E-13	.1865E-12	.8798E-12	.8610E-12	.1842E-12	.8041E-13
313.26	.1665E-12	.8194E-12	.1704E-11	.1676E-11	.8056E-12	.1680E-12
276.05	.1173E-11	.1349E-11	.3561E-11	.3492E-11	.1342E-11	.1171E-11
238.84	.5042E-11	.4897E-11	.7356E-11	.7322E-11	.4875E-11	.5036E-11
201.63	.2689E-10	.2634E-10	.2010E-10	.2009E-10	.2635E-10	.2686E-10
164.42	.8017E-10	.7940E-10	.6918E-10	.6945E-10	.7941E-10	.8008E-10
127.21	.2082E-09	.2081E-09	.2025E-09	.2026E-09	.2081E-09	.2080E-09
90.00	.3565E-08	.3565E-08	.3565E-08	.3565E-08	.3565E-08	.3565E-08

Figure 3.2. Mass Densities at 90 seconds for Sample Environment Problem

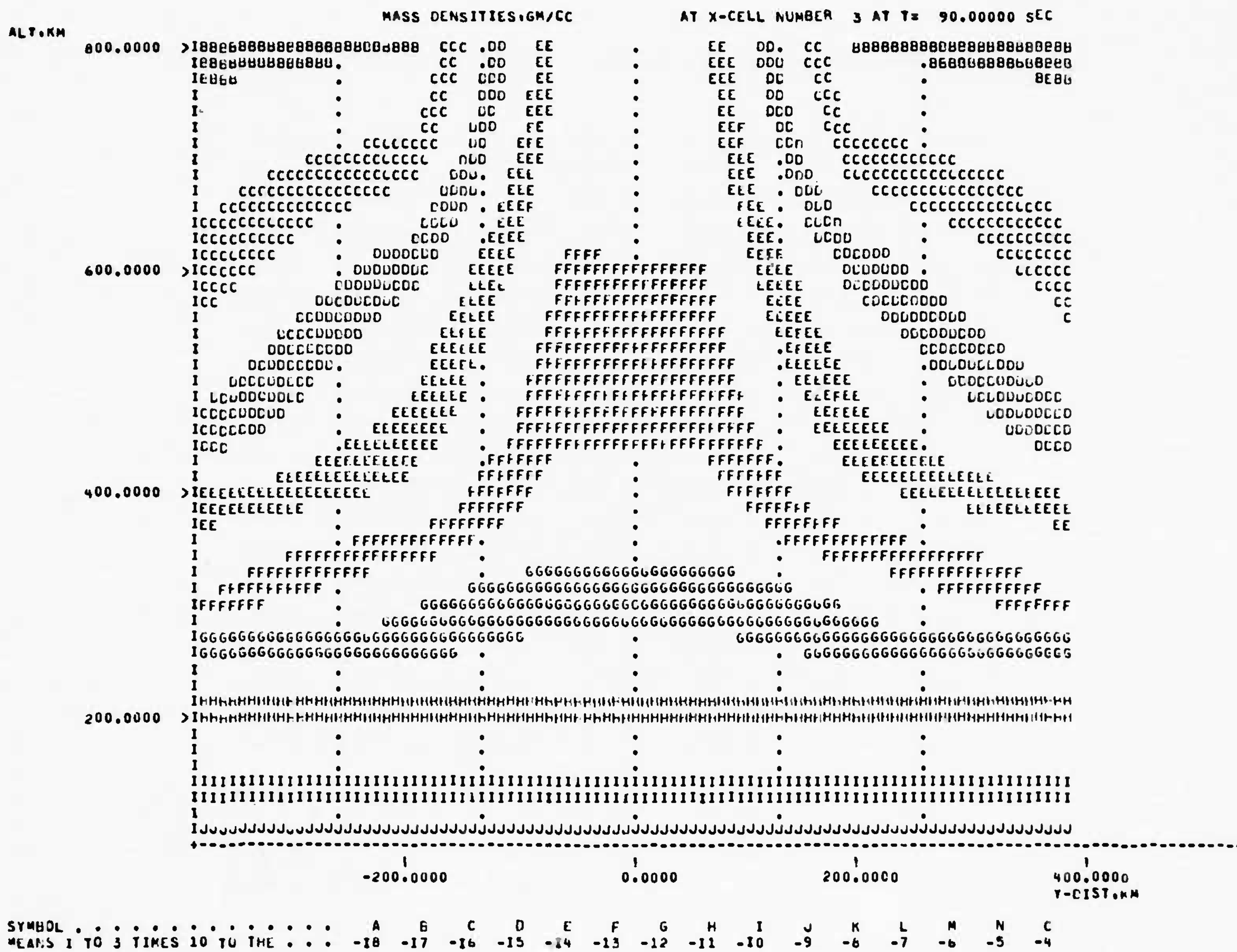


Figure 3.3. Mass Density Contours at 90 seconds for Sample Environment Problem

TIME= 90.00000 X-CELL NUMBER= 3

ELECTRON DENSITIES,CM-3 WITHIN THE ORIGINAL GRID

ALT,KM	Y-CELL NUMBER 1	2	3	4	5	6
797.00	.6771E+05	.8359E+05	.2598E+09	.2534E+09	.8341E+05	.6766E+05
759.79	.9357E+05	.1252E+06	.2898E+09	.2831E+09	.1248E+06	.9347E+05
722.58	.1297E+06	.2163E+06	.3236E+09	.3162E+09	.2149E+06	.1296E+06
685.37	.1836E+06	.4173E+06	.3684E+09	.3540E+09	.4128E+06	.1833E+06
648.16	.2598E+06	.1018E+07	.4193E+09	.3964E+09	.9942E+06	.2592E+06
610.95	.4007E+06	.2773E+07	.4773E+09	.4439E+09	.2689E+07	.3992E+06
573.74	.6524E+06	.6020E+07	.4208E+09	.4851E+09	.5833E+07	.6493E+06
536.53	.1063E+07	.1170E+08	.1242E+09	.1446E+09	.1145E+08	.1057E+07
499.32	.1751E+07	.1771E+08	.3649E+08	.4289E+08	.1734E+08	.1738E+07
462.11	.2863E+07	.2682E+08	.1072E+08	.1272E+08	.2627E+08	.2858E+07
424.89	.5924E+07	.2866E+08	.6907E+07	.7015E+07	.2838E+08	.5866E+07
387.68	.1687E+08	.3058E+08	.5537E+07	.5492E+07	.3025E+08	.1606E+08
350.47	.2068E+08	.1267E+08	.4344E+07	.4254E+07	.1288E+08	.2065E+08
313.26	.5765E+07	.3702E+07	.3223E+07	.3153E+07	.3668E+07	.5760E+07
276.05	.1504E+07	.3276E+06	.1073E+07	.1061E+07	.3282E+06	.1509E+07
238.84	.3248E+06	.1898E+06	.2045E+06	.2058E+06	.1896E+06	.3253E+06
201.63	.1222E+06	.1180E+06	.7184E+05	.7224E+05	.1180E+06	.1223E+06
164.42	.5240E+05	.5169E+05	.5123E+05	.5138E+05	.5169E+05	.5243E+05
127.21	.3140E+05	.3157E+05	.3307E+05	.3307E+05	.3156E+05	.3142E+05
90.00	.1353E+05	.1000E+03	.1353E+05	.1353E+05	.1000E+03	.1000E+03

Figure 3.4. Electron Densities at 90 seconds for Sample Environment Problem

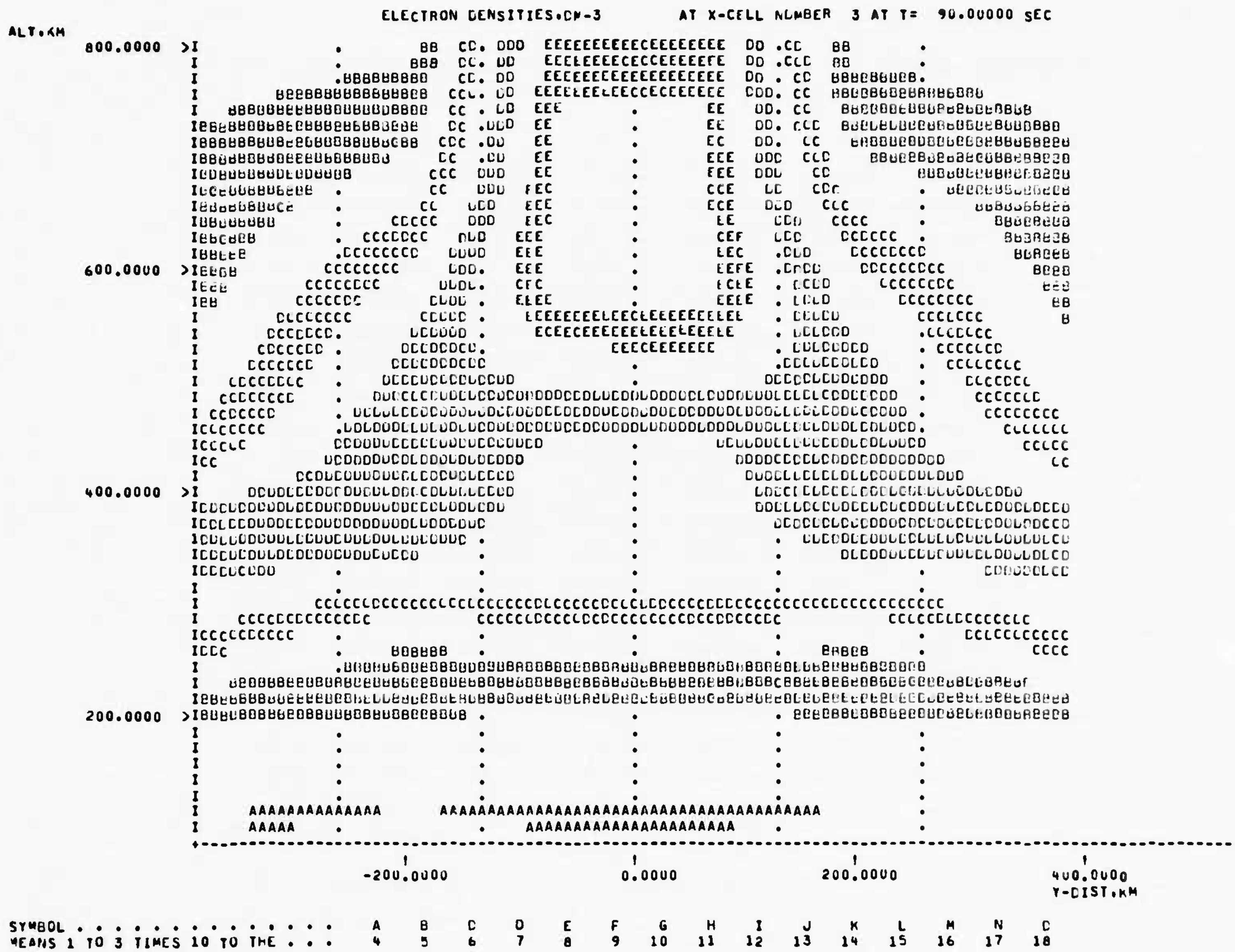


Figure 3.5. Electron Density Contours at 90 seconds for Sample Environment Problem

TIME= 90.00000 X-CELL NUMBER= 3

ELECTRON TEMPERATURES,DEG. K WITHIN THE ORIGINAL GRID

ALT,KM	Y-CELL NUMBER 1	2	3	4	5	6
797.00	.5001E+04	.4935E+04	.1180E+05	.1183E+05	.4935E+04	.5000E+04
759.79	.4613E+04	.4522E+04	.1124E+05	.1126E+05	.4522E+04	.4612E+04
722.58	.4246E+04	.4190E+04	.1065E+05	.1069E+05	.4190E+04	.4245E+04
685.37	.4000E+04	.3921E+04	.9601E+04	.9723E+04	.3922E+04	.3999E+04
648.16	.3753E+04	.4207E+04	.8547E+04	.8701E+04	.4187E+04	.3752E+04
610.95	.3573E+04	.4795E+04	.7493E+04	.7679E+04	.4755E+04	.3571E+04
573.74	.3434E+04	.5235E+04	.6535E+04	.6665E+04	.5196E+04	.3433E+04
536.53	.3314E+04	.5541E+04	.5986E+04	.6086E+04	.5516E+04	.3312E+04
499.32	.3377E+04	.5546E+04	.5436E+04	.5505E+04	.5528E+04	.3374E+04
462.11	.3440E+04	.5552E+04	.4805E+04	.4925E+04	.5541E+04	.3436E+04
424.89	.3687E+04	.5406E+04	.4340E+04	.4362E+04	.5404E+04	.3679E+04
387.68	.4204E+04	.5260E+04	.3798E+04	.3811E+04	.5262E+04	.4196E+04
350.47	.4263E+04	.5841E+04	.3333E+04	.3316E+04	.5841E+04	.4251E+04
313.26	.3481E+04	.4091E+04	.3060E+04	.3041E+04	.4103E+04	.3470E+04
276.05	.2441E+04	.2434E+04	.2252E+04	.2273E+04	.2440E+04	.2439E+04
238.84	.1547E+04	.1622E+04	.1612E+04	.1607E+04	.1626E+04	.1547E+04
201.63	.1005E+04	.1037E+04	.1225E+04	.1218E+04	.1037E+04	.1005E+04
164.42	.1000E+04	.1000E+04	.1000E+04	.1000E+04	.1000E+04	.9999E+03
127.21	.1000E+04	.1000E+04	.1000E+04	.1000E+04	.1000E+04	.9999E+03
90.00	.1826E+03	.1826E+03	.1026E+03	.1826E+03	.1826E+03	.1826E+03

Figure 3.6. Electron Temperatures at 90 seconds for Sample Environment Problem

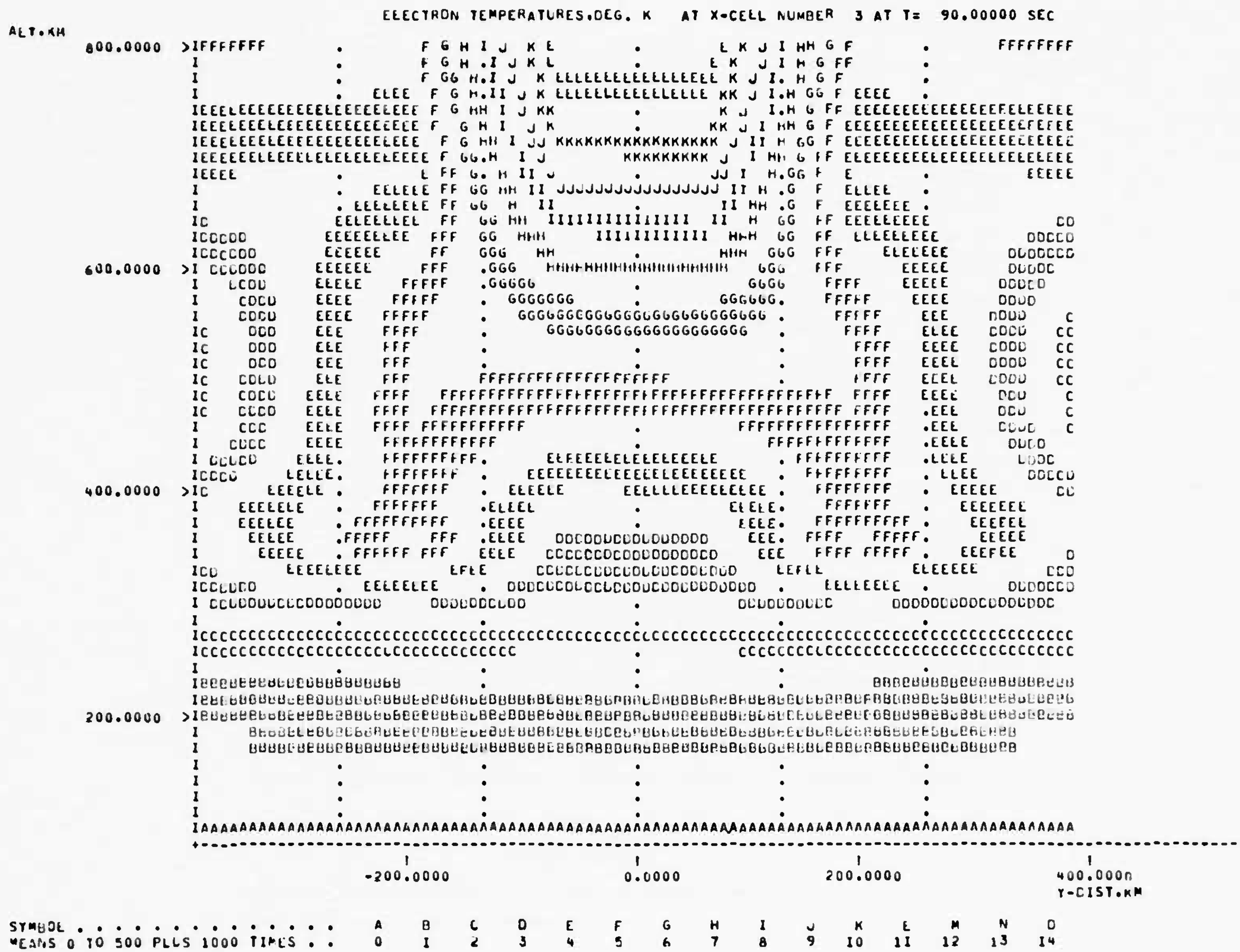


Figure 3.7. Electron Temperature Contours at 90 seconds for Sample Environment Problem

STRIATION FRACTION AT CELL CENTERS VS Z1,Z2 CELL NUMBER

Z2-CELL	Z1-CELL 1	2	3	4	5	6
6	.001012	.001156	.001203	.001224	.001031	.001003
5	.001383	.001806	.001728	.001727	.001135	.001004
4	.001006	.001053	.002626	.002869	.001084	.001011
3	.001058	.003440	.002095	.002245	.001704	.001116
2	.001033	.001077	.001013	.001000	.001196	.001026
1	.001000	.001000	.001000	.001000	.001000	.001000

Figure 3.8. Striation Fraction at 90 seconds for Sample Environment Problem

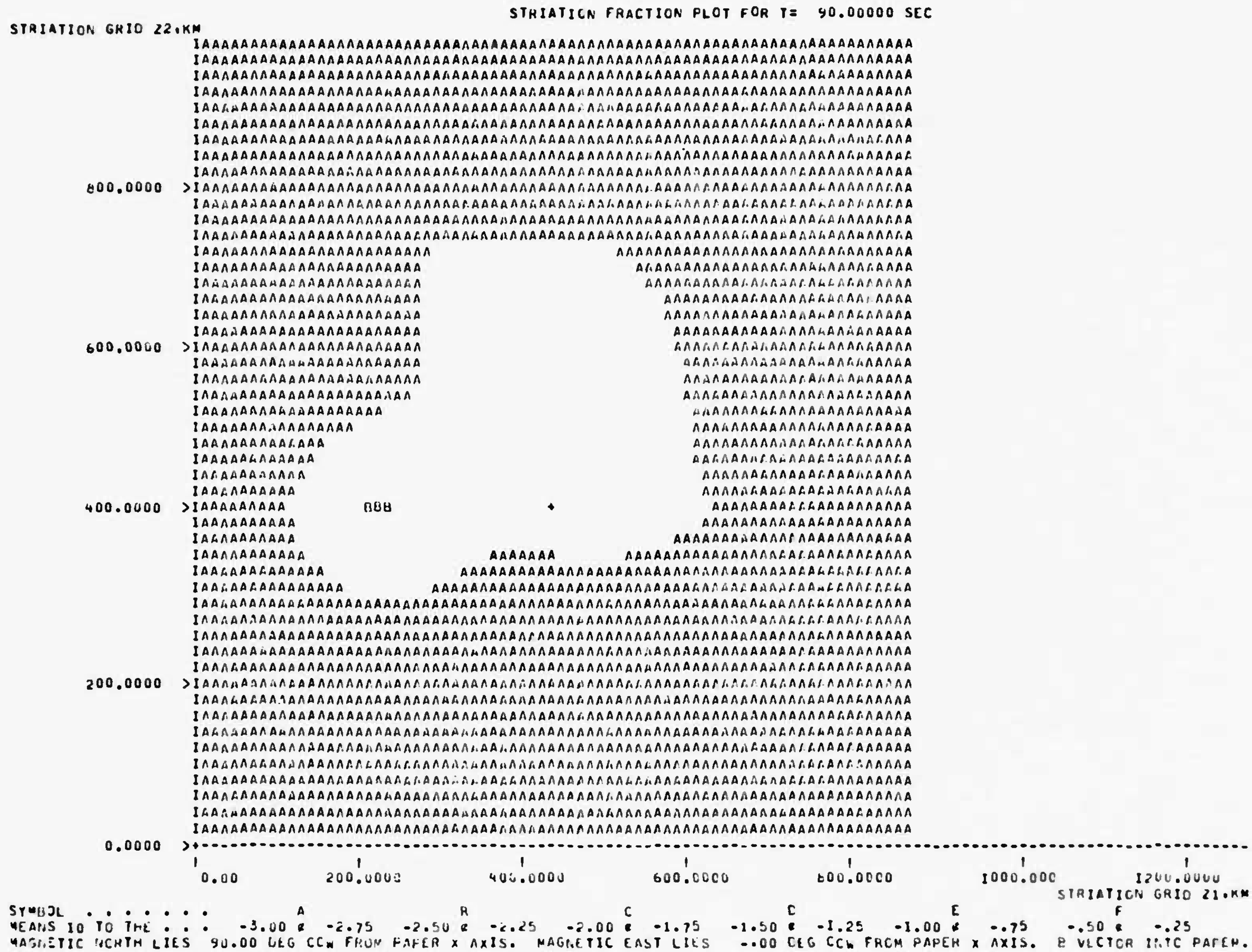


Figure 3.9. Striation Fraction Plot at 90 seconds for Sample Environment Problem

shown in Fig. 3.3. Note that at 90 seconds the air has begun to "heave" upward above the burst region. Similar tables and plots for electron density and electron temperature are shown in Figs. 3.4 through 3.7.

Tabular data and a contour plot of the striation function are shown in Figs. 3.8 and 3.9. Although the format is somewhat similar to the above output, these data are specified in a plane normal to the magnetic field, and the contour plot represents a view looking down the magnetic field from above. The axis of this magnetic grid plane may be rotated about the magnetic field direction, since it is oriented to maximize the information content used in the ion heave calculations which are used to produce the striation fractions. The rotation angle of this plane from magnetic north is printed at the bottom of the figure.

In addition to the above data, tabular outputs for burst parameters, fireball parameters, and beta tube parameters are produced when a high-altitude burst is simulated. These are shown in Table 3.2. Note that for high-altitude bursts, Fireball Set-4 (instead of Set-3) is printed out, and a list of Beta-Tube Parameters replaces the table of Debris Parameters.

Fireball Set-4 provides the earth-centered Cartesian coordinates of the fireball, the grid cell indices of the location of the bottom of the fireball, the position of this point from the cell bottom as a fraction of the cell dimension, and the "fireball kind" index as described in the low-altitude environment problem.

The Beta-Tube Parameters list shows the beta tube shape (straight, or kinked at 85-km altitude), the initial dip angle of the magnetic field at the burst point, the kink angle from horizontal of the beta tube above 85 km (if the tube is straight, this angle will be the same as the dip), the horizontal distance from a point directly below the burst point at 85 km to the center of the beta tube at 85 km, and the N-S and E-W radii of the tube at 85 km and 60 km.

TABLE 3.2

EXAMPLE OUTPUT: HIGH-ALTITUDE ENVIRONMENT PROBLEM

BURST PARAMETERS

TIME OF OUTPUT SEC	TOTAL ENERGY (ERGS)	FISSION ENERGY (ERGS)	BURST ALTITUDE KM	BURST PT. DENSITY (GM/CC)	SCALE HEIGHT KM	BURST PT. TEMP (DEG K)	INITIAL RADIUS KM	TIME TO REACH 3000K	TIME TO REACH 2000K
0.000	.4183E+23	.2091E+23	200.000	.3229E-12	31.082	12826.627	155.029	0.000	0.000

FIREBALL SET-1

TIME OF OUTPUT SEC	FIREBALL INDEX NUMBER	HORIZONTAL RADIUS KM	VERTICAL RADIUS KM	CENTER ALTITUDE KM	RISE RATE KM	EXPANSION RATE KM	FIREBALL DENSITY (GM/CC)	FIREBALL TEMP (DEG-K)	TIME SINCE BURST SEC
0.000	1	216.145	216.145	350.615	0.000	3.354	.7100E-11	5970.075	0.000
30.000	1	216.145	273.209	433.085	3.156	0.000	.1632E-12	4797.064	30.000

FIREBALL SET-2

TIME OF OUTPUT SEC	FIREBALL INDEX NUMBER	MINIMUM ALTITUDE KM	MAXIMUM ALTITUDE KM	TILT FROM VERTICAL DEG	AXIS ROTATION DEG	HOR VORTEX RADIUS KM	VRT VORTEX RADIUS KM	VORTEX VOLUME (CM3)	CHARACT. TIME SEC
0.000	1	134.469	566.760	0.000	0.000	216.145	216.145	.4230E+23	0.000
30.000	1	183.886	706.163	2.899	0.000	216.145	273.209	.5347E+23	0.000

FIREBALL SET-4

TIME OF OUTPUT SEC	FIREBALL INDEX NUMBER	X-COORDINATE (CM)	Y-COORDINATE (CM)	Z-COORDINATE (CM)	GRID CELL INDEX (X-DIR.)	GRID CELL INDEX (Y-DIR.)	GRID CELL INDEX (Z-DIR.)	FIREBALL REL. POS. IN CELL	FIREBALL KIND
0.000	1	.8373E+08	-.4444E+09	.4979E+09	3	3	10	.306	1
30.000	1	.8476E+08	-.4499E+09	.5040E+09	3	3	10	.306	2

BETA TUBE PARAMETERS

TIME OF OUTPUT SEC	FIREBALL INDEX NUMBER	BETATUBE SHAPE	INITIAL DIP ANGLE DEG	KINK ANGLE FROM HORIZ DEG	KINK-BURST DISTANCE KM	N-S RADIUS AT 85KM KM	E-W RADIUS AT 85KM KM	N-S RADIUS AT 60KM KM	E-W RADIUS AT 60KM KM
0.000	1	KINK	76.306	76.306	28.022	111.227	109.249	110.532	108.826
30.000	1	KINK	76.306	81.797	28.467	149.190	150.431	148.259	149.849

3.3 RADAR PROBLEM

To run a radar surveillance problem, where:

- The radar is located in the center of a local three-dimensional coordinate system (defined in the sample deck)
- The radar is the type provided for in the sample deck and has a frame time of 10 seconds
- A burst, as specified in the sample deck, occurs at 1620 seconds
- The launch point, target point, and object parameters are as defined in the sample deck

the user would input:

[Cards read from bottom to top]

```
STOP TIME                                  1700.    SEC
*D DATA.1194
BURST TIME                                 1620.    SEC
*D DATA.1004
FRAME TIME                                 10.      SEC
*D DATA.693
NUMBER ON TARGET                           1.       INT
*D DATA.506
NUMBER OF OBJECTS LAUNCHED                 1.       INT
*D DATA.494
RADAR LIST                                                            REFER
*D DATA.41
*COMPILE DATA
```

The event list in this case contains two events which will be processed before the stop event is reached: the attack generation event and a burst event. Radar surveillance events will be created internally when the object comes into the radar field of view.

Output tables of the object trajectory parameters, track measurement errors, tracking errors as output from the filter (only for a radar tracking problem), and two lists of propagation errors, and fireball position data relative to the radar. In this example, the tracking errors and fireball position data have not been generated. They can be enabled by changing the search flag (DATA.708) in the Search Mode Parameters Dataset from 1.0 to 0.0 and the flag "Do you want FB data relative to radar" (DATA.55) in the Basic Dataset from NO to YES, respectively.

The radar problem output list is shown in Table 3.3. It begins with the Trajectory Output for the object-and-radar pair specified in the sample deck. This list gives the actual object trajectory (altitude, range, azimuth, elevation, and velocity) data at each radar look time, plus the signal-to-noise ratio and the number of images seen by the radar. The event type is displayed in column 1. While only "SEARCH" pulses have been generated in this example, in a track simulation the event type would show "SEARCH," "VERIFY," "TRACK IN," and "TRACK" as track is initiated on the object. In column 9, the number of targets can be zero if the target is lost, one if a single target has been located, or more than one if multipath effects occur.

The Trajectory Output is followed by the Track Measurement, which contains a list of the radar-measured target coordinates and pulse-by-pulse measurement errors in each coordinate. The predicted position (colums 2-4) is either equivalent to the actual position for search pulses (as in this case), or is the position predicted by the track filter once track has been initialized. The measured coordinates (columns 5-7) are those generated during the current look, and include all refraction and radar measurement errors.

The Propagation Output is shown next. Included in this table are measures of the absorption, noise, clutter, dispersion, and Faraday rotation losses as computed along each line of sight. A Hollerith message is

TABLE 3.3

EXAMPLE OUTPUT: RADAR PROBLEM

RADAR LAUNCH 1 TRAJECTORY OUTPUT

TYPE OF EVENT	TIME OF OUTPUT SEC	POSITION ALTITUDE M	DATA FOR RANGE M	OBJECT AT AZIMUTH DEG	SPECIFIED ELEVATION DEG	TIME...... VELOCITY M	.... SIGNAL TO NOISE (DB)	NUMBER OF TARGETS
SEARCH	1465.999	945026.461	3304651.765	85.600	2.681	6124.174	24.253	1
SEARCH	1475.999	931289.151	3250511.198	85.567	3.009	6139.263	24.681	1
SEARCH	1485.999	918690.280	3191907.282	85.535	3.338	6154.679	25.189	1
SEARCH	1495.999	905847.705	3133040.481	85.504	3.666	6170.423	25.713	1
SEARCH	1505.999	892745.784	3073907.888	85.472	3.995	6186.495	26.205	1
SEARCH	1515.999	877384.080	3014508.594	85.441	4.325	6202.898	26.677	1
SEARCH	1525.999	865788.758	2954841.304	85.409	4.655	6219.631	27.117	1
SEARCH	1535.999	851497.758	2894704.629	85.378	4.985	6236.697	27.550	1
SEARCH	1545.999	837771.063	2834097.194	85.348	5.315	6254.096	27.932	1
SEARCH	1555.999	823380.904	2774217.612	85.317	5.646	6271.830	28.340	1
SEARCH	1565.999	808750.680	2713184.487	85.287	5.978	6289.900	28.687	1
SEARCH	1575.999	793850.981	2652436.415	85.257	6.310	6308.307	29.009	1
SEARCH	1585.999	778707.600	2591131.983	85.227	6.642	6327.053	29.344	1
SEARCH	1595.999	765302.683	2529549.786	85.197	6.975	6346.139	29.638	1
SEARCH	1605.999	747042.060	2467688.335	85.168	7.308	6365.567	29.895	1
SEARCH	1615.999	731725.858	2405546.249	85.139	7.642	6385.337	30.169	1
SEARCH	1625.999	715554.125	2343122.054	85.110	7.976	6405.452	29.964	1
SEARCH	1635.999	699126.975	2280414.310	85.081	8.311	6425.912	30.988	1
SEARCH	1645.999	682444.414	2217421.538	85.052	8.646	6446.721	31.559	1
SEARCH	1655.999	665506.559	2154142.271	85.024	8.982	6467.879	32.344	1
SEARCH	1665.999	648315.460	2090575.031	84.996	9.318	6489.387	33.035	1
SEARCH	1675.999	630865.166	2026718.194	84.968	9.655	6511.249	33.735	1
SEARCH	1685.999	613161.816	1962570.539	84.940	9.993	6533.464	34.382	1
SEARCH	1695.999	595203.653	1898130.434	84.913	10.331	6556.036	34.754	1

Table 3.3 (continued)

RADAR LAUNCH 1 TRACK MEASUREMENT ERRORS

TIME OF OUTPUT SEC	PREDICTED RANGE M	PREDICTED AZIMUTH DEG	PREDICTED ELEVATION DEG	MEASURED RANGE M	MEASURED AZIMUTH DEG	MEASURED ELEVATION DEG	RANDOM RANGE M	ERRORS--IN AZIMUTH DEG	RAE COORDS ELEVATION DEG
1465.999	3308651.785	85.600	2.681	3308795.013	85.557	2.565	-56.772	0.000	0.000
1475.999	3250511.108	85.567	3.009	3250701.067	85.769	3.142	189.960	0.000	0.000
1485.949	3191907.702	85.535	3.338	3191894.405	85.673	3.026	-13.377	0.000	0.000
1495.999	3133040.481	85.504	3.666	3132991.506	85.665	3.538	-48.975	0.000	0.000
1505.999	3073997.868	85.472	3.995	3073030.605	85.533	3.945	22.737	0.000	0.000
1515.999	3014508.594	85.441	4.325	3014680.766	85.231	4.399	172.172	0.000	0.000
1525.999	2954841.304	85.409	4.655	2954711.127	85.639	4.541	-130.177	0.000	0.000
1535.999	2894904.829	85.378	4.985	2894882.814	85.233	4.764	-21.015	0.000	0.000
1545.999	2834697.194	85.348	5.315	2834527.679	85.177	5.066	-169.515	0.000	0.000
1555.999	2774217.612	85.317	5.646	2774126.073	85.617	5.821	-91.538	0.000	0.000
1565.999	2713464.487	85.287	5.978	2713345.639	85.186	6.006	-118.846	0.000	0.000
1575.999	2652436.415	85.257	6.310	2652568.645	85.176	6.020	132.229	0.000	0.000
1585.999	2591131.903	85.227	6.642	2591186.702	85.518	6.730	54.760	0.000	0.000
1595.999	2529549.766	85.197	6.975	2529509.400	85.176	7.043	-40.361	0.000	0.000
1605.999	2467088.335	85.168	7.308	2467107.474	85.143	7.081	19.139	0.000	0.000
1615.999	2405546.249	85.139	7.642	2405368.295	85.366	7.901	-177.954	0.000	0.000
1625.999	2343122.059	85.110	7.976	2343176.923	85.459	7.889	54.357	0.000	0.000
1635.999	2280414.310	85.081	8.311	2280340.389	85.124	8.182	-74.116	0.000	0.000
1645.999	2217421.536	85.052	8.648	2217565.605	85.059	8.663	145.759	0.000	0.000
1655.999	2154142.271	85.024	8.982	2154191.129	85.102	9.020	49.310	0.000	0.000
1665.999	2090575.031	84.996	9.318	2090500.139	84.771	9.275	-191.504	0.000	0.000
1675.999	2026718.194	84.968	9.655	2026891.207	85.057	9.902	52.256	0.000	0.000
1685.999	1962570.539	84.940	9.993	1962924.405	84.871	10.175	235.550	0.000	0.000
1695.999	1898130.434	84.913	10.331	1898102.774	84.912	10.333	-144.016	0.000	0.000

Table 3.3 (continued)

RADAR LAUNCH 1 PROPAGATION OUTPUT

TIME OF OUTPUT SEC	ABSORPTION FROM ALL SOURCES	THRESHOLD ABSORPTION	NOISE TEMP.	NOISE POWER	CLUTTER-TO-NOISE RATIO (DB)	DISPERSIVE LOSS	FARADAY ROTATION LOSS	FAILURE MODE
1465.999	0.000	7.564	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1475.999	0.000	7.758	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1485.999	0.000	7.882	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1495.999	0.000	8.059	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1505.999	0.000	8.235	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1515.999	0.000	8.410	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1525.999	0.000	8.586	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1535.999	0.000	8.778	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1545.999	0.000	8.970	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1555.999	0.000	9.179	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1565.999	0.000	9.374	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1575.999	0.000	9.572	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1585.999	0.000	9.765	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1595.999	0.000	10.010	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1605.999	0.000	10.256	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1615.999	0.000	10.488	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1625.999	.304	10.607	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1635.999	.143	10.947	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1645.999	.205	11.101	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1655.999	.148	11.451	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1665.999	.125	11.714	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1675.999	.100	11.909	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1685.999	.084	12.283	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE
1695.999	.197	12.576	0.000	.2485E-09	0.000	1.000	1.000	NO FAILURE

Table 3.3 (concluded)

[illegible] LANCHG 1 PROPAGATION OUTPUT

TIME OF OUTPUT SEC	BIAS RANGE M	REFRACTION AZIMUTH DEG	ERRORS ELEVATION DEG	RANDOM RANGE M	REFRACTION AZIMUTH DEG	ERRORS ELEVATION DEG
1465.999	0.000	0.000	0.000	0.000	0.000	0.000
1475.999	0.000	0.000	0.000	0.000	0.000	0.000
1485.999	0.000	0.000	0.000	0.000	0.000	0.000
1495.999	0.000	0.000	0.000	0.000	0.000	0.000
1505.999	0.000	0.000	0.000	0.000	0.000	0.000
1515.999	0.000	0.000	0.000	0.000	0.000	0.000
1525.999	0.000	0.000	0.000	0.000	0.000	0.000
1535.999	0.000	0.000	0.000	0.000	0.000	0.000
1545.999	0.000	0.000	0.000	0.000	0.000	0.000
1555.999	0.000	0.000	0.000	0.000	0.000	0.000
1565.999	0.000	0.000	0.000	0.000	0.000	0.000
1575.999	0.000	0.000	0.000	0.000	0.000	0.000
1585.999	0.000	0.000	0.000	0.000	0.000	0.000
1595.999	0.000	0.000	0.000	0.000	0.000	0.000
1605.999	0.000	0.000	0.000	0.000	0.000	0.000
1615.999	0.000	0.000	0.000	0.000	0.000	0.000
1625.999	130.517	.000	.018	.000	.000	.000
1635.999	130.166	.000	.016	.000	.000	.000
1645.999	128.346	.000	.016	.000	.000	.000
1655.999	126.548	.000	.015	.000	.000	.000
1665.999	124.691	.000	.019	.000	.000	.000
1675.999	120.867	.000	.023	.000	.000	.000
1685.999	116.686	.000	.021	.000	.000	.000
1695.999	116.366	.000	.020	.000	.000	.000

also printed to describe the quality of each received pulse. This flag can have the following messages:

NO FAILURE	S/N received is above threshold.
RANGE	The radar is range(power)-limited for this target.
ABSORPTION	The absorption due to all sources has reduced the S/N below threshold.
ABS + NOISE	The combination of absorption and fireball noise has reduced the S/N below threshold.
TOTAL	The combination of absorption, noise, dispersion, and Faraday rotation has dropped the S/N below threshold.
LOW SIGNAL	The combination of the above effects and refraction or clutter has dropped the S/N below threshold.
NO TARGET	There are no targets within the range gate and 3 dB beamwidth.

The second propagation table gives refraction errors for both bias and random errors. The bias errors are due to the bending of radar beam due to smooth gradients in electron density, while the random errors are produced when striations in the electron density field occur (since these are treated statistically).

3.4 SATELLITE COMMUNICATIONS PROBLEM

To run a satellite communications problem, where:

- The ground transmitter and receiver are co-located directly beneath the satellite (as in the sample problem.
- Communication links are as defined in the sample data deck.
- A nuclear burst with the sample deck yield and altitude centered along the transmitter-receiver line of sight (as in the sample deck).

- Burst occurs at zero seconds.
- Communications events occur at 100 and 200 seconds.

the user would input:

[Cards read from bottom to top]

```
STOP TIME                                201.     SEC
*D DATA.1194
BURST TIME                               0.       SEC
*D DATA.1004
TIME STEP                                100.     SEC
*D DATA.767
COMMUNICATIONS EVENT TIME                100.     SEC
*D DATA.763
*COMPILE DATA
```

The Satellite-Communication output consists of propagation and probability of bit error data and satellite position coordinates with respect to the ground sensor (transmitter and receiver) positions. These output lists are shown in Table 3.4. In the first output list, the uplink and downlink loss factors are the losses due to absorption from all sources (dimensionless) and the uplink and downlink scintillation values refer to the standard deviation in phase in radians due to scintillation effects. The probability of bit error on the uplink, downlink, and combined path are shown in the last three columns.

The second output list shows the range, azimuth, and elevation coordinates of the satellite with respect to the ground transmitter (columns 2-4) and the ground receiver (columns 5-7), respectively.

TABLE 3.4

EXAMPLE OUTPUT: SATELLITE COMMUNICATIONS PROBLEM

COMMUNICATIONS OUTPUT -1

TYPE OF OUTPUT	TIME OF OUTPUT SEC	UPLINK LOSS FACTOR	UPLINK SCINT	DOWNLINK LOSS FACTOR	DOWNLINK SCINT	PROB. OF ERROR SATELLITE	PROB. OF ERROR GROUND	PROB. OF ERROR
CCM-RECEVD	100.000	1.048	10893.	1.057	13230.	.39898	.50726E-04	.39899
CCM-RECEVD	200.000	1.011	1880.0	1.013	2166.8	.40437	.37777E-04	.40438

COMMUNICATIONS OUTPUT -2

TIME OF OUTPUT SEC	RANGE S-FROM-T KM	AZIMUTH S-FROM-T DEG	ELEVATION S-FROM-T DEG	RANGE S-FROM-R KM	AZIMUTH S-FROM-R DEG	ELEVATION S-FROM-R DEG
100.000	35787.000	-.000	89.998	35787.000	-.000	89.998
200.000	35787.000	-.000	89.998	35787.000	-.000	89.998

3.5 OPTICAL SURVEILLANCE PROBLEM

To run an optical surveillance problem, where:

- The sensor is located on a satellite at synchronous altitude (default) and is pointed at a reference location near a low-altitude burst.
- The sensor type is as provided for in the sample deck.
- The sensor event occurs at 10 seconds after burst.

the user would input:

[Cards read from bottom to top]

STOP TIME			11.0	SEC		
*D DATA.1194						
GRID OUTPUT DATASET			1.0			ZEROS
*D DATA.1185						
BURST YIELD			100.	KT		
*D DATA.1034						
BURST POSITION			70.	-79.33	47.75	GEOGR
BURST TIME			0.	SEC		
*D DATA.1004,.1005						
SPIRE COMPUTATION LIST						REFER
*D DATA.946						
SCAN TYPE			LINEAR			
MODEL TYPE			GENERAL			
SIMULATE OPTICS TIME			10.	SEC		
*D DATA.942,.944						
OPTICS OPTIONS						REFER
*D DATA.885						
OPTICS TYPE			SURVEILNCE			
*D DATA.878						
OPTICS LOOK TIME			10.	SEC		
*D DATA.846						
REF POS FOR POINTING SENSOR						
*D DATA.576						
OPTICAL SENSOR LIST						REFER
*D DATA.58						
OBJECT LIST						REFER
*D DATA.40						
*COMPILE DATA						

Output for the optical sensor surveillance problem described above consists of printer plots and tabular lists. If desired, the user can generate printer plots of relative radiance at the focal plane for each object and/or a composite plot of all objects. As an example, Fig. 3.10 depicts a composite contour plot of relative radiance in the sensor focal plane for the example problem described above. The plot shows a fireball region and beta tube region at ten seconds after burst.

The output lists created for the optical sensor surveillance problem are shown in Table 3.5. An Optical Measurements dataset is produced whenever a simulated optics event (DATA.940) is specified (DATA.937). Measurement data will be computed and output whenever the optics calculation type (DATA.879) is designated as "POINTS"; otherwise only zeros will appear in the measurement columns as shown in the example. The actual, measured, and estimated coordinates referred to in the list are measured in angular units relative to the sensor boresight.

The next output list shows Integrated Path Data for each path in the field of view that is simulated. The path is identified by the azimuth and elevation off-boresight (columns 3 and 4). Column 5 is the radiance along the path due to all emission and scattering sources. The integrated radiance in column 6 is just the radiance integrated over all band intervals (the sum of the values shown in column 5 for each band interval), and the sigma due to structure (column 7) is the deviation in the integrated radiance due to striated (or structured) regions along the path.

The last tabular output is produced when a simulated optics event is specified, and the optics calculation type (DATA.879) is designated as "FOV" or "LOCAL," so that a scan of the field of view is produced. The optical samples represent the output at the detector(s) as the sensor scans along the field of view. Thus, separate rows of output are produced as a

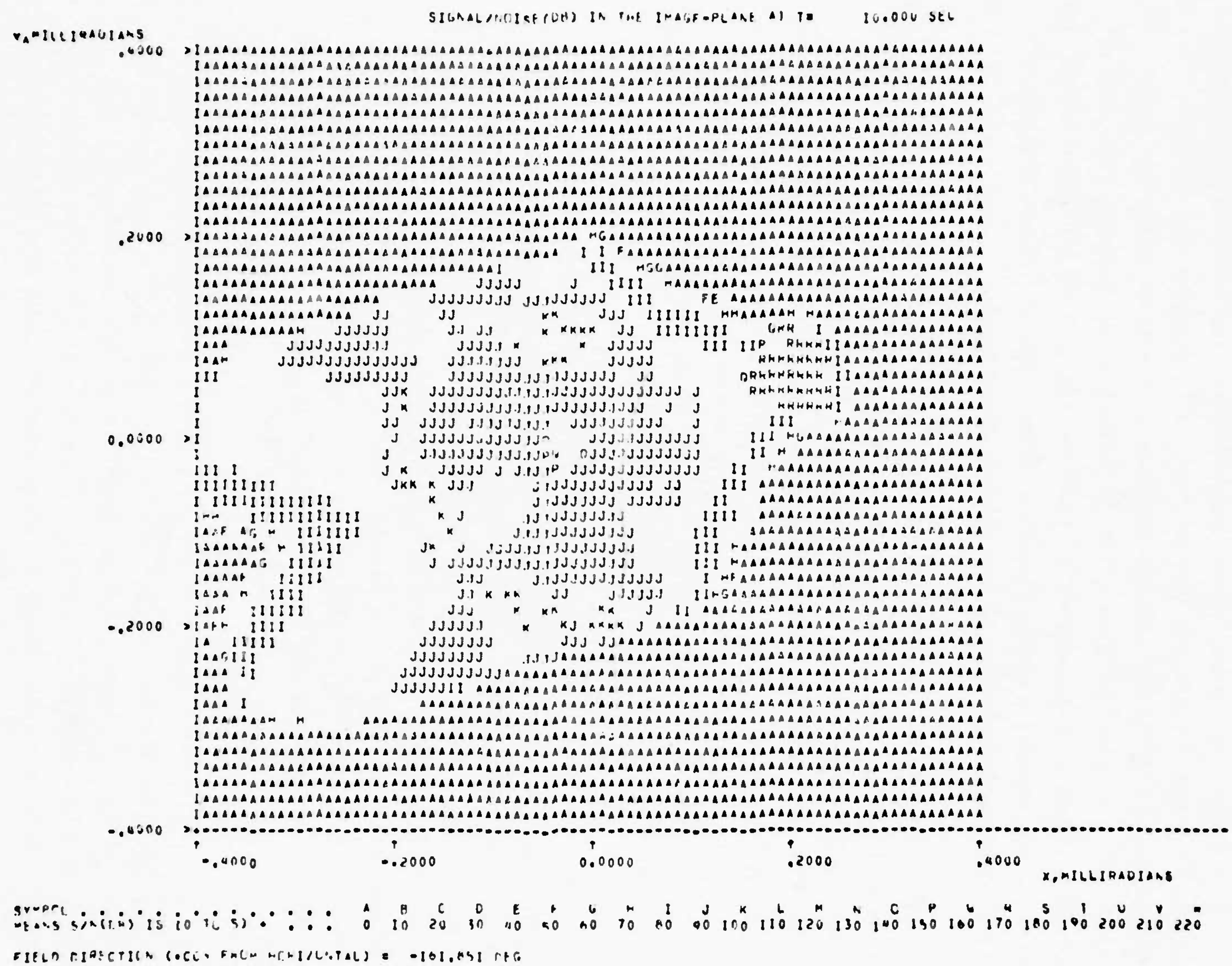


Figure 3.10. Signal/Noise in the Image Plane at T = 10 Seconds

TABLE 3.5

EXAMPLE OUTPUT: OPTICAL SENSOR SURVEILLANCE PATTERN

OPTICAL MEASUREMENTS

TIME OUTPUT SEC	CENTRAL WAVELENGTH M	ACTUAL AZIMUTH (RADIANS)	ACCURACY ELEVATION (RADIANS)	MEASURED AZIMUTH (RADIANS)	MEASURED ELEVATION (RADIANS)	ESTIMATED AZIMUTH (RADIANS)	ESTIMATED ELEVATION (RADIANS)	IRRADIANCE AT SENSOR (W/CM2)	SIGNAL-TO-NOISE (DB)
10.000	.2556E-05	0.	0.	0.	0.	0.	0.	0.	0.

INTEGRATED PATH DATA

TIME OF OUTPUT SEC	CENTRAL WAVELENGTH M	AZIMUTH OFF-BORE (RADIANS)	ELEVATION OFF-BORE (RADIANS)	RADIANCE (PHOTONS/ S-SR-CM2)	INTEGRATED RADIANCE	SIGMA DUE TO STRCTR
10.000	.2556E-05	-.2000E-03	-.2000E-03	.3667E+12	.3667E+12	0.
10.000	.2556E-05	-.2000E-03	.2000E-03	.3663E+12	.3663E+12	0.

OPTICAL SAMPLES

TIME OF OUTPUT SEC	DETECTOR NUMBER	CENTRAL WAVELENGTH M	AZIMUTH OFF-BORE (RADIANS)	ELEVATION OFF-BORE (RADIANS)	SCANNED SIGNAL OUTPUT	NORMALIZED SIGNAL OUTPUT	FINAL SIGNAL OUTPUT	TARGET DETECTION FLAG
[illegible]	1.000	.2556E-05	-.4000E-03	0.	.5429E-08	.2096E-01	-.4488E-02	BKGRND
[illegible]	1.000	.2556E-05	-.3965E-03	0.	.2670E-07	.1308	-.3401E-01	BKGRND

function of time, detector number, and the central wavelength of the band. The position of the detector relative to the center of the field of view is shown in azimuth and elevation coordinates in columns 4 and 5. The last four columns show: (1) the scanned signal output (irradiance at the detector), (2) the normalized signal output (the irradiance normalized to the sensor NEFD), (3) the final signal output (after all other processing such as differencing has been completed), and (4) the target detection flag which signifies whether the final signal exceeds a pre-set threshold designating the point a "TARGET" versus a "BKGND" point.

APPENDIX A

SAMPLE JOB CONTROL STREAMS

The ROSCOE program is most easily used by attaching the program in its binary form and making the appropriate changes to the data deck. However, at times it is useful to make changes to the ROSCOE subroutines or ROSCOE overlay structure before execution. The new data deck can be utilized in either of these execution modes. This section describes sample job control streams for executing ROSCOE in its binary form and also for making changes to the ROSCOE subroutines or overlay structure. Familiarity with the permanent files used in the sample job control streams is assumed. Brief descriptions of these files are provided in Appendix B.

A.1 ROSCOE EXECUTION USING BINARY FILES

To execute ROSCOE in its binary form with no program changes the user would utilize a job stream similar to the one shown below:

```
JOB CARD
ACCOUNT CARD
ATTACH(XX1,OBINARY,ID=GRCXJJB,CY=1)
COPYBR(XX1,XX0,240)
ATTACH(XX2,OBINARY,ID=GRCXJJB,CY=2)
COPYBF(XX2,XX0)
REWIND(XX0)
ATTACH(STRUCT,OSTRUCT,ID=GRCXJJB)
UPDATE(P=STRUCT,F,D,8,C=TAPE1,L=1)
BCPYL(TAPE1,OBIN,LFILE,,,READ,REWIND,ERRORS)
RETURN(TAPE1,TAPE4,BCPYL)
ATTACH(DATDEK,ROSCOEDATA,ID=GRCXJJB)
UPDATA(P=DATDEK,Q,C=INDATA,D)
RETURN(DATDEK)
```

```
ATTACH(RLIBE,RLIBEROSCOE,ID=GRCXJJB)
RETURN(TAPE1,TAPE2,TAPE3,TAPE4,TAPE5,TAPE6)
ATTACH(AMALGM8,AMALGM8ROSCOE,ID=GRCXJJB)
AMALGM8.
RETURN(AMALGM8)
LDSET(LIB=RLIBE,PRESET=ZERO,FILES=TAPE1)
LOAD(FILE)
NOGO.
RETURN(LFILE)
RETURN(RLIBE)
ATTACH(TAPE3,NEWDATROSCOE,ID=GRCXJJB)
SENSER(PL=10000,,,,,,,,,,,,,,NPR,NFLX)
7/8/9
*IDENT QCHG
*COMPILE STRUCT
.
.
.
OSTRUCT CHANGES
.
.
.
7/8/9
*IDENT QCHG
*COMPILE DATA
.
.
.
ROSCOEDATA CHANGES
.
.
.
6/7/8/9
```

A.2 ROSCOE EXECUTION WITH UPDATES

To execute ROSCOE with temporary changes to the ROSCOE subroutines and overlay structure the user would use a job stream similar to the one shown below:

```
JOB CARD
ACCOUNT CARD
MAP(OFF)
ATTACH(V3,ALLDECKS,ID=WDNA14X3)
COPYCR(INPUT,UPDIR)
REWIND(UPDIR)
COPYSBF(UPDIR,OUTPUT)
REWIND(UPDIR)
UPDATE(V3,UPDIR)
RFL(100000)
FTN(I=COMPILE,LCM=I,B=MODPR,R)
REDUCE.
RETURN(COMPILE)
ATTACH(XX1,OBINARY,ID=GRCXJJB,CY=1)
COPYBR(XX1,XX0,240)
ATTACH(XX2,OBINARY,ID=GRCXJJB,CY=2)
COPYBF(XX2,XX0)
REWIND(XX0)
ATTACH(BCPYL,BCPYLROSCOE,ID=GRCXJJB,CY=3)
REWIND(MODPR)
BCPYL(XX0,MODPR,OBIN,,,APPEND)
RETURN(XX1,XX2,XX0)
RETURN(TAPE4,MODPR)
ATTACH(STRUCT,OSTRUCT,ID=GRCXJJB)
UPDATE(P=STRUCT,F,D,8,C=TAPE1,L=1)
BCYPL(TAPE1,OBIN,LFILE,,,READ1,REWIND,ERRORS)
RETURN(TAPE1,TAPE4,BCPYL)
ATTACH(DATDEK,ROSCOEDATA,ID=GRCXJJB)
UPDATE(P=DATDEK,Q,C=INDATA,D)
RETURN(DATDEK)
ATTACH(RLIBE,RLIBEROSCOE,ID=GRCXJJB)
```

```
RETURN(TAPE1,TAPE2,TAPE3,TAPE4,TAPE5,TAPE6)
ATTACH(AMALGM8,AMALGM8ROSCOE,ID=GRCXJJB)
AMALGM8.
RETURN(AMALGM8)
LDSET(LIB=RLIBE,PRESET=ZERO,FILES=TAPE1)
LOAD(LFILE)
NOGO.
RETURN(LFILE)
RETURN(RLIBE)
ATTACH(TAPE3,NEWDATROSCOE,ID=GRCXJJB)
SENSER(PL=10000,,,,,,,,,,,,,,NPR,NFLX)
7/8/9
*IDENT QCHG
PROGRAM CHANGES(*COMPILE CARDS FOR ALL DECKS BEING CHANGED)
.
.
.
7/8/9
*IDENT QCHG
*COMPILE STRUCT
.
.
.
OSTRUCT CHANGES
.
.
.
7/8/9
*IDENT QCHG
*COMPILE DATA
.
.
.ROSCOEDATA CHANGES
.
.
.
6/7/8/9
```

APPENDIX B

PERMANENT FILE DESCRIPTIONS

Brief descriptions of permanent files utilized during ROSCOE executions are provided below:

ALLDECKS	- UPDATE library containing basic ROSCOE routines with dataset comdecks inserted.
OBINARY,CY=1	- First 240 routines of optics binaries.
OBINARY,CY=2	- All routines of optics binaries after first 240.
BCPYLROSCOE	- Program to manipulate relocatable binary files in preparation for use by the system loader.
OSTRUCT	- Optics version of overlay structure file in UPDATE library form.
ROSCOEDATA	- New ROSCOE data deck in UPDATE library form.
RLIBEROSCOE	- Binary file containing ROSCOE auxiliary routines.
AMALGM8ROSCOE	- Program to merge data files.
NEWDATROSCOE	- Auxiliary optics data file.

Blank

APPENDIX C

ROSCOE DATA PACKAGE

```
*DECK DATA                                                                          DATA       1    A
ROSCOE**  NEW VERSION OF NUCLEAR PHENOMENOLOGY CODE*                                DATA       2    A
02 TEST RUN FOR ROSCOE PROGRAM                                                      DATA       3    A
IS EARTH ROTATING FOR THIS RUN           YES                                        DATA       4    A
STARTING RANDOM NUMBER                   2.7192                                     DATA       5    A
*   SCALE FACTORS USED IN ROSCOE DATA (STANDARD UNITS ARE CGS)          BOX PAGE    DATA       6    A
*  SCALE FACTOR CHANGES TO CONVERT INTO CGS SYSTEM                      PRINT       DATA       7    A
CONVERSION TO MHZ                        MHZ       1000000.             SCALE       DATA       8    A
CONVERSION TO KHZ                        KHZ       1000.                SCALE       DATA       9    A
FRACTIONAL HOURS                         HRS       1.0                  SCALE       DATA      10    A
KILOGRAM INPUTS                          KG        1000.0               SCALE       DATA      11    A
GRAM INPUTS                              GM        1.0                  SCALE       DATA      12    A
CENTIMETER INPUTS                        CM        1.0                  SCALE       DATA      13    A
*  HERE WE REDEFINE THE APPROPRIATE SCALE FACTORS BUILT INTO FLEXRED    PRINT       DATA      14    A
FEET TO CENTIMETERS                      FT        30.48006             SCALE       DATA      15    A
PSF TO GM/CM**2                          PSF       .4882405             SCALE       DATA      16    A
KILOMETERS TO CENTIMETERS                KM        100000.0             SCALE       DATA      17    A
NAUTICAL MILES TO CENTIMETERS            NMI       185325.0             SCALE       DATA      18    A
POUNDS TO GRAMS                          LB        453.592              SCALE       DATA      19    A
ACCELERATION UNITS                       G         980.665              SCALE       DATA      20    A
METERS TO CENTIMETERS                    M         100.0                SCALE       DATA      21    A
METERS**2 TO CENTIMETERS**2              MSQ       10000.0              SCALE       DATA      22    A
KILOFEET TO CENTIMETERS                  KFT       30480.06             SCALE       DATA      23    A
MEGATON - THE FUNDAMENTAL YIELD UNIT     MT        1.0                  SCALE       DATA      24    A
NAUTICAL MILES TO CENTIMETERS            NM        1.85E+05             SCALE       DATA      25    A
KILOTONS TO MEGATONS                     KT        .001                 SCALE       DATA      26    A
KILOMETERS ON SQUARE METERS              KMSQM     10000.0              SCALE       DATA      27    A
NAUTICAL MILES RANGE ON 1 SQ. METER      NMSQM     1.85E4               SCALE       DATA      28    A
KILOFEET ON SQUARE METERS                KFSQM     3048.006             SCALE       DATA      29    A
WATTS TO ERGS/SEC                        WATTS     10000000.            SCALE       DATA      30    A
INCHES**2 TO CM**2                       INSQ      6.4516               SCALE       DATA      31    A
FT**2 TO CM**2                           FTSQ      929.0304             SCALE       DATA      32    A
*   THIS IS THE BASIC DATASET FOR ROSCOE                                BOX PAGE    DATA      33    A
ROSCOE BASIC DATA SET                                                   BASIC       DATA      34    A
ROSCOE BASIC DATA SET                                                   BEG SET     DATA      35    A
EVENT LIST                                                              REFER       DATA      36    A
OUTPUT SUMMARY DATASET                                                  REFER       DATA      37    A
OVERLAY STRUCTURE DATASET                                               REFER       DATA      38    A
INSTRUCTIONS FOR INTERNAL OUTPUTS                                       REFER       DATA      39    A
         SPACE FOR OBJECT LIST           1.0                            ZEROS       DATA      40    A
         SPACE FOR RADAR LIST            1.0                            ZEROS       DATA      41    A
AD HOC DATA SET FOR TRACKER INITIALIZATION                              REFER       DATA      42    A
SPACE FOR THE BURST LIST                 1.0                            ZEROS       DATA      43    A
SPACE FOR FIREBALL LIST                  1.0                            ZEROS       DATA      44    A
SPACE FOR *CONST*                        0.0                                        DATA      45    A
SPACE FOR *FRLIS* (LAMB)                 0.0                                        DATA      46    A
SPACE FOR *FHLIS*  (HEAVE)               0.0                                        DATA      47    A
SPACE FOR OFSET                          1.0                            ZEROS       DATA      48    A
SPACE FOR MAGNETIC FIELD DATASET         1.0                            ZEROS       DATA      49    A
HEAVE COORDINATE DATASET                                                REFER       DATA      50    A
SHOULD WE TURN ON HYDRO FOR LA FBS       NO                                         DATA      51    A
DO YOU WANT STRIATION CALCULATIONS       YES                                        DATA      52    A
```

```
DO YOU WANT PRINTER PLOTS OF HAFB-S     YES                              DATA       53     A
SPACE FOR INTERNAL USE                  2.0                 ZEROS        DATA       54     A
DO YOU WANT FB DATA RELATIVE TO RADAR   NO                               DATA       55     A
        SENSOR NETTING                  NO                               DATA       56     A
DO YOU WANT TIME INTERPULATION          NO                               DATA       57     A
SPACE FOR OPTICAL SENSOR LIST           1.0                 ZEROS        DATA       58     A
SPACE FOR OPTICAL MEASUREMENTS          1.0                 ZEROS        DATA       59     A
BASIC CLOUD DATASET                     1.0                 ZEROS        DATA       60     A
        OPTICS CALC SPEED OPTION        SLOW                             DATA       61     A
        EVPROC OUTPUT SUPPRESS FLAG     1.        INT                    DATA       62     A
        OVERLAY SEP. FILE FLAG          1.0       INT                    DATA       63     A
*   FLAGS FOR TURNING ON DEBUG PRINTOUT BY OVERLAY          BOX PAGE     DATA       64     A
INSTRUCTIONS FOR INTERNAL OUTPUTS                           BEG SET      DATA       65     A
EVENT 1 OUTPUT                          NO                               DATA       66     A
EVENT 2 OUTPUT                          NO                               DATA       67     A
EVENT 3 OUTPUT                          NO                               DATA       68     A
EVENT 4 OUTPUT                          NO                               DATA       69     A
EVENT 5 OUTPUT                          NO                               DATA       70     A
EVENT 6 OUTPUT                          NO                               DATA       71     A
EVENT 7 OUTPUT                          NO                               DATA       72     A
EVENT 8 OUTPUT                          NO                               DATA       73     A
EVENT 9 OUTPUT                          NO                               DATA       74     A
EVENT 10 OUTPUT                         NO                               DATA       75     A
EVENT 11 OUTPUT                         NO                               DATA       76     A
EVENT 12 OUTPUT                         NO                               DATA       77     A
EVENT 13 OUTPUT                         NO                               DATA       78     A
EVENT 14 OUTPUT                         NO                               DATA       79     A
EVENT 15 OUTPUT                         NO                               DATA       80     A
EVENT 16 OUTPUT                         NO                               DATA       81     A
EVENT 17 OUTPUT                         NO                               DATA       82     A
EVENT 18 OUTPUT                         NO                               DATA       83     A
EVENT 19 OUTPUT                         NO                               DATA       84     A
EVENT 20 OUTPUT                         NO                               DATA       85     A
EVENT 21 OUTPUT                         NO                               DATA       86     A
EVENT 22 OUTPUT                         NO                               DATA       87     A
EVENT 23 OUTPUT                         NO                               DATA       88     A
EVENT 24 OUTPUT                         NO                               DATA       89     A
EVENT 25 OUTPUT                         NO                               DATA       90     A
EVENT 26 OUTPUT                         NO                               DATA       91     A
EVENT 27 OUTPUT                         NO                               DATA       92     A
EVENT 28 OUTPUT                         NO                               DATA       93     A
EVENT 29 OUTPUT                         NO                               DATA       94     A
EVENT 30 OUTPUT                         NO                               DATA       95     A
EVENT 31 OUTPUT                         NO                               DATA       96     A
EVENT 32 OUTPUT                         NO                               DATA       97     A
*   OVERLAY CALLING STRUCTURE (ALTERNATE OVERLAYS CAN BE CALLED HERE) BOX PAGE  DATA  98  A
OVERLAY STRUCTURE DATASET                                   BEG SET      DATA       99     A
EVENT 1 CALLS OVERLAY                   1.0       INT                    DATA      100     A
EVENT 2 CALLS OVERLAY                   2.0       INT                    DATA      101     A
EVENT 3 CALLS OVERLAY                   3.0       INT                    DATA      102     A
EVENT 4 CALLS OVERLAY                   4.0       INT                    DATA      103     A
EVENT 5 CALLS OVERLAY                   5.0       INT                    DATA      104     A
```

EVENT 6 CALLS OVERLAY	6.0	INT		DATA	105	A
EVENT 7 CALLS OVERLAY	7.0	INT		DATA	106	A
EVENT 8 CALLS OVERLAY	8.0	INT		DATA	107	A
EVENT 9 CALLS OVERLAY	9.0	INT		DATA	108	A
EVENT 10 CALLS OVERLAY	10.0	INT		DATA	109	A
EVENT 11 CALLS OVERLAY	11.0	INT		DATA	110	A
EVENT 12 CALLS OVERLAY	12.	INT		DATA	111	A
EVENT 13 CALLS OVERLAY	13.	INT		DATA	112	A
EVENT 14 CALLS OVERLAY	14.0	INT		DATA	113	A
EVENT 15 CALLS OVERLAY	15.0	INT		DATA	114	A
EVENT 16 CALLS OVERLAY	16.0	INT		DATA	115	A
EVENT 17 CALLS OVERLAY	17.0	INT		DATA	116	A
EVENT 18 CALLS OVERLAY	18.0	INT		DATA	117	A
EVENT 19 CALLS OVERLAY	19.0	INT		DATA	118	A
EVENT 20 CALLS OVERLAY	20.0	INT		DATA	119	A
EVENT 21 CALLS OVERLAY	21.0	INT		DATA	120	A
EVENT 22 CALLS OVERLAY	22.0	INT		DATA	121	A
EVENT 23 CALLS OVERLAY	23.0	INT		DATA	122	A
EVENT 24 CALLS OVERLAY	24.0	INT		DATA	123	A
EVENT 25 CALLS OVERLAY	25.	INT		DATA	124	A
EVENT 26 CALLS OVERLAY	26.	INT		DATA	125	A
EVENT 27 CALLS OVERLAY	27.	INT		DATA	126	A
EVENT 28 CALLS OVERLAY	28.	INT		DATA	127	A
EVENT 29 CALLS OVERLAY	29.	INT		DATA	128	A
EVENT 30 CALLS OVERLAY	30.	INT		DATA	129	A
EVENT 31 CALLS OVERLAY	31.	INT		DATA	130	A
EVENT 32 CALLS OVERLAY	32.	INT		DATA	131	A
* OUTPUT DATASETS AND FORMATS (MAY BE CHANGED BY USER)			BOX PAGE	DATA	132	A
OUTPUT SUMMARY DATASET			BEG SET	DATA	133	A
SYSTEM OUTPUT LIST			REFER	DATA	134	A
TRAJECTORY OUTPUT FORMAT LIST			REFER	DATA	135	A
TRACK MEAS. ERRORS FORMAT LIST			REFER	DATA	136	A
TRACK FILE OUTPUT FORMAT LIST			REFER	DATA	137	A
PROPAGATION OUTPUT FORMAT LIST			REFER	DATA	138	A
DISCRIMINATION OUTPUT FORMAT LIST			REFER	DATA	139	A
FIREBALL POSITION OUTPUT FORMAT LIST			REFER	DATA	140	A
BO OUTPUT LIST	1.0		ZEROS	DATA	141	A
F1 OUTPUT LIST	1.0		ZEROS	DATA	142	A
F2 OUTPUT LIST	1.0		ZEROS	DATA	143	A
F3 OUTPUT LIST	1.0		ZEROS	DATA	144	A
F4 OUTPUT LIST	1.0		ZEROS	DATA	145	A
D1 OUTPUT LIST	1.0		ZEROS	DATA	146	A
BE OUTPUT LIST	1.0		ZEROS	DATA	147	A
CO OUTPUT LIST	1.0		ZEROS	DATA	148	A
OM OUTPUT LIST	1.0		ZEROS	DATA	149	A
OS OUTPUT LIST	1.0		ZEROS	DATA	150	A
OP OUTPUT LIST	1.0		ZEROS	DATA	151	A
OC OUTPUT LIST	1.0		ZEROS	DATA	152	A
BO OUTPUT FORMAT LIST			REFER	DATA	153	A
F1 OUTPUT FORMAT LIST			REFER	DATA	154	A
F2 OUTPUT FORMAT LIST			REFER	DATA	155	A
F3 OUTPUT FORMAT LIST			REFER	DATA	156	A

```
F4 OUTPUT FORMAT LIST                                        REFER      DATA      157      A
D1 OUTPUT FORMAT LIST                                        REFER      DATA      158      A
BE OUTPUT FORMAT LIST                                        REFER      DATA      159      A
CO OUTPUT FORMAT LIST                                        REFER      DATA      160      A
OM OUTPUT FORMAT LIST                                        REFER      DATA      161      A
OS OUTPUT FORMAT LIST                                        REFER      DATA      162      A
OP OUTPUT FORMAT LIST                                        REFER      DATA      163      A
OC OUTPUT FORMAT LIST                                        REFER      DATA      164      A
TRAJECTORY OUTPUT FORMAT LIST                                BEG LIST   DATA      165      A
TRAJECTORY OUTPUT FORMAT                                     REFER      DATA      166      A
TRACK MEAS, ERRORS FORMAT LIST                               BEG LIST   DATA      167      A
TRACK MEASUREMENT ERRORS FORMAT                              REFER      DATA      168      A
TRACK FILE OUTPUT FORMAT LIST                                BEG LIST   DATA      169      A
TRACK FILE OUTPUT FORMAT                                     REFER      DATA      170      A
PROPAGATION OUTPUT FORMAT LIST                               BEG LIST   DATA      171      A
PROPAGATION OUTPUT FORMAT                                    REFER      DATA      172      A
DISCRIMINATION OUTPUT FORMAT LIST                            BEG LIST   DATA      173      A
DISCRIMINATION OUTPUT FORMAT                                 REFER      DATA      174      A
FIREBALL POSITION OUTPUT FORMAT LIST                         BEG LIST   DATA      175      A
FIREBALL POSITION OUTPUT FORMAT                              REFER      DATA      176      A
BO OUTPUT FORMAT LIST                                        BEG LIST   DATA      177      A
BO OUTPUT FORMAT DATASET                                     REFER      DATA      178      A
F1 OUTPUT FORMAT LIST                                        BEG LIST   DATA      179      A
F1 OUTPUT FORMAT DATASET                                     REFER      DATA      180      A
F2 OUTPUT FORMAT LIST                                        BEG LIST   DATA      181      A
F2 OUTPUT FORMAT DATASET                                     REFER      DATA      182      A
F3 OUTPUT FORMAT LIST                                        BEG LIST   DATA      183      A
F3 OUTPUT FORMAT DATASET                                     REFER      DATA      184      A
F4 OUTPUT FORMAT LIST                                        BEG LIST   DATA      185      A
F4 OUTPUT FORMAT DATASET                                     REFER      DATA      186      A
D1 OUTPUT FORMAT LIST                                        BEG LIST   DATA      187      A
D1 OUTPUT FORMAT DATASET                                     REFER      DATA      188      A
BE OUTPUT FORMAT LIST                                        BEG LIST   DATA      189      A
BE OUTPUT FORMAT DATASET                                     REFER      DATA      190      A
CO OUTPUT FORMAT LIST                                        BEG LIST   DATA      191      A
CO OUTPUT FORMAT DATASET                                     REFER      DATA      192      A
OC OUTPUT FORMAT LIST                                        BEG LIST   DATA      193      A
OC OUTPUT FORMAT DATASET                                     REFER      DATA      194      A
OM OUTPUT FORMAT LIST                                        BEG LIST   DATA      195      A
OM OUTPUT FORMAT DATASET                                     REFER      DATA      196      A
OS OUTPUT FORMAT LIST                                        BEG LIST   DATA      197      A
OS OUTPUT FORMAT DATASET                                     REFER      DATA      198      A
OP OUTPUT FORMAT LIST                                        BEG LIST   DATA      199      A
OP OUTPUT FORMAT DATASET                                     REFER      DATA      200      A
*  AND NOW FOR THE INDIVIDUAL OUTPUT INSTRUCTIONS            PRINT      DATA      201      A
TRACK FILE OUTPUT FORMAT                                     BEG SET    DATA      202      A
TYPE OF OUTPUT REQUESTED              OUTCOL                            DATA      203      A
                     TRACKING ERRORS                         TITLE      DATA      204      A
TIME COLUMN                 01014,0    TIME   OF OUTPUT SEC  OUTCOL     DATA      205      A
POSITION ERRORS            004024   ERRORS IN  ALONG V  M    OUTCOL     DATA      206      A
POSITION ERRORS            03034    POSITION--PERP TO V M    OUTCOL     DATA      207      A
POSITION ERRORS            02044    ---------- ACROSS V M    OUTCOL     DATA      208      A
```

```
VELOCITY ERRORS             07054    ERRORS  IN ALONG V  M          OUTCOL    DATA      209    A
VELOCITY ERRORS             06064    VELOCITY-- PERP TO VM          OUTCOL    DATA      210    A
VELOCITY ERRORS             05074    ---------- CROSS V  M          OUTCOL    DATA      211    A
TARGET POSITION             08084     APPARENT  RANGE    M          OUTCOL    DATA      212    A
TARGET POSITION             09094     TARGET    AZIMUTH  DEG        OUTCOL    DATA      213    A
TARGET POSITION             10004    POSITION  ELEVATION DEG        OUTCOL    DATA      214    A
TRAJECTORY OUTPUT FORMAT                                            BEG SET   DATA      215    A
TYPE OF OUTPUT REQUESTED             OUTCOL                                   DATA      216    A
                 TRAJECTORY OUTPUT                                  TITLE     DATA      217    A
EVENT TYPE                  01019      TYPE    OF EVENT             OUTCOL    DATA      218    A
TIME OF OUTPUT              02024      TIME    OF OUTPUT SEC        OUTCOL    DATA      219    A
ALTITUDE                    03034     POSITION ALTITUDE M           OUTCOL    DATA      220    A
RANGE                       04044     DATA FOR   RANGE   M          OUTCOL    DATA      221    A
AZIMUTH                     05054    OBJECT AT  AZIMUTH DEG         OUTCOL    DATA      222    A
ELEVATION                   06064    SPECIFIED ELEVATION DEG        OUTCOL    DATA      223    A
VELOCITY                    07074    TIME------ VELOCITY M          OUTCOL    DATA      224    A
SIGNAL TO NOISE             08084    ----------SIGNAL TO NOISE (DB)OUTCOL     DATA      225    A
NUMBER OF TARGETS           09096    NUMBER OF  TARGETS             OUTCOL    DATA      226    A
TRACK MEASUREMENT ERRORS FORMAT                                     BEG SET   DATA      227    A
TYPE OF OUTPUT REQUESTED             OUTCOL                                   DATA      228    A
                 TRACK MEASUREMENT ERRORS                           TITLE     DATA      229    A
TIME OF OUTPUT              01014      TIME    OF OUTPUT SEC        OUTCOL    DATA      230    A
PREDICTED RANGE             02024    PREDICTED   RANGE   M          OUTCOL    DATA      231    A
PREDICTED AZIMUTH           03034    PREDICTED  AZIMUTH  DEG        OUTCOL    DATA      232    A
PREDICTD ELEVATION          04044    PREDICTED ELEVATION DEG        OUTCOL    DATA      233    A
MEASURED RANGE              05054     MEASURED   RANGE   M          OUTCOL    DATA      234    A
MEASURED AZIMUTH            06064     MEASURED  AZIMUTH  DEG        OUTCOL    DATA      235    A
MEASURED ELEVATION          07074     MEASURED ELEVATION DEG        OUTCOL    DATA      236    A
RANDOM ERRORS               08084        RANDOM  RANGE   M          OUTCOL    DATA      237    A
RANDOM ERRORS               09094    ERRORS--IN AZIMUTH  DEG        OUTCOL    DATA      238    A
RANDOM ERRORS               10004    RAE COORDSELEVATION DEG        OUTCOL    DATA      239    A
PROPAGATION OUTPUT FORMAT                                           BEG SET   DATA      240    A
TYPE OF OUTPUT REQUESTED             OUTCOL                                   DATA      241    A
                 PROPAGATION OUTPUT                                 TITLE     DATA      242    A
TIME OF OUTPUT              01014      TIME    OF OUTPUT SEC        OUTCOL    DATA      243    A
ABSORPTION FROM ALL SOURCES 02024    ABSORPTION FROM ALL  SOURCES   OUTCOL    DATA      244    A
THRESHOLD ABSORPTION        03034    THRESHOLD ABSORPTION           OUTCOL    DATA      245    A
NOISE TEMPERATURE           04044     NOISE      TEMP.              OUTCOL    DATA      246    A
NOISE POWER                 05052     NOISE      POWER              OUTCOL    DATA      247    A
CLUTTER POWER               06062     CLUTTER    POWER              OUTCOL    DATA      248    A
CLUTTER-TO-NOISE RATIO      06064     CLUTTER-  TO-NOISE RATIO (DB)OUTCOL     DATA      249    A
DISPERSIVE LOSS             13074    DISPERSIVE   LOSS              OUTCOL    DATA      250    A
FARADARY ROTATION LOSS      14084     FARADAY   ROTATION     LOSS   OUTCOL    DATA      251    A
FAILURE MODE                15099     FAILURE     MODE              OUTCOL    DATA      252    A
TIME OF OUTPUT              01114      TIME    OF OUTPUT SEC        OUTCOL    DATA      253    A
REFRACTION                  07134        BIAS  RANGE   M            OUTCOL    DATA      254    A
REFRACTION                  08144    REFRACTION AZIMUTH  DEG        OUTCOL    DATA      255    A
REFRACTION                  09154    ERRORS     ELEVATIONDEG        OUTCOL    DATA      256    A
REFRACTION                  10174        RANDOM  RANGE   M          OUTCOL    DATA      257    A
REFRACTION                  11184    REFRACTION AZIMUTH  DEG        OUTCOL    DATA      258    A
REFRACTION                  12194    ERRORS     ELEVATIONDEG        OUTCOL    DATA      259    A
DISCRIMINATION OUTPUT FORMAT                                        BEG SET   DATA      260    A
```

```
TYPE CF CUTPUT REQUESTED                      OUTCOL                                        DATA        261     A
                   DISCRIMINATION CUTPUT                                     TITLE          DATA        262     A
TYPE                            01019       TYPE   OF DISCRIM                OUTCOL         DATA        263     A
TIME OF CUTPUT                  02024       TIME   OF OUTPUT SEC             OUTCOL         DATA        264     A
ESTIMATED LENGTH                03034     ESTIMATED  LENGTH  M               OUTCOL         DATA        265     A
DEVIATION IN LENGTH             04044     DEVIATION IN LENGTH M              OUTCOL         DATA        266     A
MEASUREMENT TYPE                05059        MEAS      TYPE                  OUTCOL         DATA        267     A
MINIMUM RCS                     06061      MINIMUM     RCS    MSQ            OUTCOL         DATA        268     A
ONE-WAY ATTENUATION             07071      ONE-WAY    ATTEN         DB       OUTCOL         DATA        269     A
FIREBALL POSITION OUTPUT FORMAT                                              BEG SET        DATA        270     A
TYPE OF CUTPUT                                OUTCOL                                        DATA        271     A
                   FB COORDINATES RELATIVE TO RADAR                          TITLE          DATA        272     A
TIME OF CUTPUT                  01014       TIME   OF OUTPUT SEC             OUTCOL         DATA        273     A
FIREBALL INDEX                  02026      FIREBALL   INDEX                  OUTCOL         DATA        274     A
FB RANGE                        03034      FIREBALL   RANGE   M              OUTCOL         DATA        275     A
FB AZIMUTH                      04044      FIREBALL  AZIMUTH  DEG            OUTCOL         DATA        276     A
FB ELEVATION                    05054      FIREBALL ELEVATION DEG            OUTCOL         DATA        277     A
FB ANGULAR EXTENT               06064     FB ANGULAR  EXTENT  DEG            OUTCOL         DATA        278     A
FB RANGE EXTENT                 07074      FB RANGE   EXTENT  M              OUTCOL         DATA        279     A
RANGE CELL                      08084       RANGE      CELL   M              OUTCOL         DATA        280     A
CLUTTER TO NOISE                09094      CLUTTER-  TO-NOISE RATIO (DB)OUTCOL              DATA        281     A
INCREMENTAL ABSORPTION          10002     ABSORPTION GRADIENT  (DB/KM)       OUTCOL         DATA        282     A
BO OUTPUT FORMAT DATASET                                                     BEG SET        DATA        283     A
         TYPE OF OUTPUT                       OUTCOL                                        DATA        284     A
         BURST PARAMETERS                                                    TITLE          DATA        285     A
         TIME OF OUTPUT         01014       TIME   OF OUTPUT SEC             OUTCOL         DATA        286     A
         TOTAL ENERGY           02022       TOTAL     ENERGY    (ERGS)       OUTCOL         DATA        287     A
         FISSION ENERGY         03032      FISSION    ENERGY    (ERGS)       OUTCOL         DATA        288     A
         BURST ALTITUDE         04044       BURST    ALTITUDE KM             OUTCOL         DATA        289     A
         BURST POINT DENSITY    05052     BURST PT.  DENSITY   (GM/CC)       OUTCOL         DATA        290     A
         BURST SCALE HEIGHT     06064       SCALE     HEIGHT  KM             OUTCOL         DATA        291     A
         BURST POINT TEMP       07074     BURST PT.    TEMP    (DEG K)       OUTCOL         DATA        292     A
         INITIAL FB RADIUS      08084      INITIAL    RADIUS  KM             OUTCOL         DATA        293     A
         TIME TO REACH 3000K    09094       TIME     TO REACH   3000K        OUTCOL         DATA        294     A
         TIME TO REACH 2000K    10004       TIME     TO REACH   2000K        OUTCOL         DATA        295     A
F1 OUTPUT FORMAT DATASET                                                     BEG SET        DATA        296     A
         TYPE OF OUTPUT                       OUTCOL                                        DATA        297     A
         FIREBALL SET-1                                                      TITLE          DATA        298     A
         TIME OF OUTPUT         01014       TIME   OF OUTPUT SEC             OUTCOL         DATA        299     A
         FIREBALL INDEX         02026      FIREBALL   INDEX      NUMBER      OUTCOL         DATA        300     A
         HORIZONTAL RADIUS      03034     HORIZONTAL  RADIUS  KM             OUTCOL         DATA        301     A
         VERTICAL RADIUS        04044      VERTICAL   RADIUS  KM             OUTCOL         DATA        302     A
         ALTITUDE               05054       CENTER   ALTITUDE KM             OUTCOL         DATA        303     A
         RISE RATE              06064        RISE      RATE   KM             OUTCOL         DATA        304     A
         EXPANSION RATE         07074     EXPANSION    RATE   KM             OUTCOL         DATA        305     A
         FIREBALL DENSITY       08082      FIREBALL  DENSITY   (GM/CC)       OUTCOL         DATA        306     A
         FIREBALL TEMP          09094      FIREBALL    TEMP    (DEG-K)       OUTCOL         DATA        307     A
         TIME SINCE BURST       10004     TIME SINCE  BURST   SEC            OUTCOL         DATA        308     A
F2 OUTPUT FORMAT DATASET                                                     BEG SET        DATA        309     A
         TYPE OF OUTPUT                       OUTCOL                                        DATA        310     A
         FIREBALL SET-2                                                      TITLE          DATA        311     A
         TIME OF OUTPUT         01014       TIME   OF OUTPUT SEC             OUTCOL         DATA        312     A
```

```
            FIREBALL INDEX         02026     FIREBALL   INDEX     NUMBER  OUTCOL      DATA        313    A
            MINIMUM ALTITUDE       03034     MINIMUM   ALTITUDE KM        OUTCOL      DATA        314    A
            MAXIMUM ALTITUDE       04044     MAXIMUM   ALTITUDE KM        OUTCOL      DATA        315    A
            TILT FROM VERTICAL     05054    TILT FROM  VERTICAL DEG       OUTCOL      DATA        316    A
            AXIS ROTATION (CW-N)   06064      AXIS     ROTATION DEG       OUTCOL      DATA        317    A
            HOR VORTEX RADIUS      07074    HOR VORTEX  RADIUS  KM        OUTCOL      DATA        318    A
            VRT VORTEX RADIUS      08084    VRT VORTEX  RADIUS  KM        OUTCOL      DATA        319    A
            VORTEX VOLUME          09092      VORTEX    VOLUME    (CM3)   OUTCOL      DATA        320    A
            CHARACTERISTIC TIME    10004     CHARACT.    TIME   SEC       OUTCOL      DATA        321    A
F3 OUTPUT FORMAT DATASET                                                  BEG SET     DATA        322    A
            TYPE OF OUTPUT                  OUTCOL                                    DATA        323    A
            FIREBALL SET-3                                                TITLE       DATA        324    A
            TIME OF OUTPUT         01014       TIME    OF OUTPUT SEC      OUTCOL      DATA        325    A
            FIREBALL INDEX         02026     FIREBALL   INDEX     NUMBER  OUTCOL      DATA        326    A
            X-COORDINATE           03032        X-     COORDINATE   (CM)  OUTCOL      DATA        327    A
            Y-COORDINATE           04042        Y-     COORDINATE   (CM)  OUTCOL      DATA        328    A
            Z-COORDINATE           05052        Z-     COORDINATE   (CM)  OUTCOL      DATA        329    A
            CVAL OF CASSINI TERM   06064     OVAL OF    CASSINI  PARAMETER OUTCOL     DATA        330    A
            CVAL ARM RADIUS        07074     OVAL ARM    RADIUS  KM       OUTCOL      DATA        331    A
            VORTEX TEMP            08084      VORTEX      TEMP    (DEG-K) OUTCOL      DATA        332    A
            FIREBALL KIND          09096     FIREBALL     KIND            OUTCOL      DATA        333    A
            MERGE ID INDEX         10006      MERGE        ID      INDEX  OUTCOL      DATA        334    A
F4 OUTPUT FORMAT DATASET                                                  BEG SET     DATA        335    A
            TYPE OF OUTPUT                  OUTCOL                                    DATA        336    A
            FIREBALL SET-4                                                TITLE       DATA        337    A
            TIME OF OUTPUT         01014       TIME    OF OUTPUT SEC      OUTCOL      DATA        338    A
            FIREBALL INDEX         02026     FIREBALL   INDEX     NUMBER  OUTCOL      DATA        339    A
            X-COORDINATE           03032        X-     COORDINATE   (CM)  OUTCOL      DATA        340    A
            Y-COORDINATE           04042        Y-     COORDINATE   (CM)  OUTCOL      DATA        341    A
            Z-COORDINATE           05052        Z-     COORDINATE   (CM)  OUTCOL      DATA        342    A
            CELL INDEX (X-DIR.)    06066    GRID CELL   INDEX   (X-DIR.)  OUTCOL      DATA        343    A
            CELL INDEX (Y-DIR.)    07076    GRID CELL   INDEX   (Y-DIR.)  OUTCOL      DATA        344    A
            CELL INDEX (Z-DIR.)    08086    GRID CELL   INDEX   (Z-DIR.)  OUTCOL      DATA        345    A
            FB REL. POS. IN CELL   09094     FIREBALL  REL. POS. IN CELL  OUTCOL      DATA        346    A
            FIREBALL KIND          10006     FIREBALL     KIND            OUTCOL      DATA        347    A
D1 OUTPUT FORMAT DATASET                                                  BEG SET     DATA        348    A
            TYPE OF OUTPUT                  OUTCOL                                    DATA        349    A
            DEBRIS PARAMETERS                                             TITLE       DATA        350    A
            TIME OF OUTPUT         01014       TIME    OF OUTPUT SEC      OUTCOL      DATA        351    A
            FIREBALL INDEX         02026     FIREBALL   INDEX     NUMBER  OUTCOL      DATA        352    A
            DEBRIS INDEX NUMBER    03036      DEBRIS    INDEX     NUMBER  OUTCOL      DATA        353    A
            TOTAL ENERGY           04042      TOTAL     ENERGY    (ERGS)  OUTCOL      DATA        354    A
            DEBRIS ALTITUDE        05054      DEBRIS   ALTITUDE KM        OUTCOL      DATA        355    A
            HORIZONTAL RADIUS      06064    HORIZONTAL  RADIUS  KM        OUTCOL      DATA        356    A
            VERTICAL RADIUS        07074     VERTICAL   RADIUS  KM        OUTCOL      DATA        357    A
            DEBRIS DISTRIBUTION    08084      DEBRIS   DISTRIB. PARAMETER OUTCOL      DATA        358    A
            EQUIVALENT SPH. RAD.   09094    EQUIVALENTSPH. RAD. KM        OUTCOL      DATA        359    A
            DEBRIS VOLUME          10002      DEBRIS    VOLUME    (CM3)   OUTCOL      DATA        360    A
BE OUTPUT FORMAT DATASET                                                  BEG SET     DATA        361    A
            TYPE OF OUTPUT                  OUTCOL                                    DATA        362    A
            BETA TUBE PARAMETERS                                          TITLE       DATA        363    A
            TIME OF OUTPUT         01014       TIME    OF OUTPUT SEC      OUTCOL      DATA        364    A
```

```
         FIREBALL INDEX NUMBER02026      FIREBALL   INDEX     NUMBER OUTCOL     DATA       365      A
         BETATURE SHAPE       03039      BETATURE   SHAPE            OUTCOL     DATA       366      A
         INITIAL DIP ANGLE    04044      INITIAL  DIP ANGLE DEG      OUTCOL     DATA       367      A
         KINK ANGLE           05054     KINK ANGLEFROM HORIZDEG      OUTCOL     DATA       368      A
         KINK-BURST DISTANCE  06064     KINK-BURST DISTANCE KM       OUTCOL     DATA       369      A
         N-S RADIUS AT 85KM   07074     N-S RADIUS AT 85KM  KM       OUTCOL     DATA       370      A
         E-W RADIUS AT 85KM   08084     E-W RADIUS AT 85KM  KM       OUTCOL     DATA       371      A
         N-S RADIUS AT 60KM   09094     N-S RADIUS AT 60KM  KM       OUTCOL     DATA       372      A
         E-W RADIUS AT 60KM   10004     E-W RADIUS AT 60KM  KM       OUTCOL     DATA       373      A
CO OUTPUT FORMAT DATASET                                             BEG SET    DATA       374      A
         TYPE OF OUTPUT                 OUTCOI                                  DATA       375      A
         DETAILED CHEMISTRY, REFLECTIVITY, AND ABSORPTION DATA       TITLE      DATA       376      A
         TIME OF OUTPUT       01014       TIME    OF OUTPUT SEC      OUTCOL     DATA       377      A
         FIREBALL INDEX       02026      FIREBALL   INDEX     NUMBER OUTCOL     DATA       378      A
         ALTITUDE OF POINT    03034      ALTITUDE   OF POINT KM      OUTCOL     DATA       379      A
         RANGE FROM FB CENTER 04044     RANGE FROMFB CENTER KM       OUTCOL     DATA       380      A
         LOCATION OF POINT    05059      LOCATION   OF POINT         OUTCOL     DATA       381      A
         ELECTRON DENSITY     06062      ELECTRON   DENSITY   (CM-3) OUTCOL     DATA       382      A
         POSITIVE ION DENSITY 07072      POSITIVE   ION DENS. (CM-3) OUTCOL     DATA       383      A
         TEMPERATURE AT POINT 08084        TEMP     AT POINT  (DEG-K) OUTCOL    DATA       384      A
         DENSITY AT POINT     09092      DENSITY    AT POINT  (GM/CC) OUTCOL    DATA       385      A
         ABSORPTION GRADIENT  10002     ABSORPTION GRADIENT   (DB/KM) OUTCOL    DATA       386      A
OC OUTPUT FORMAT DATASET                                             BEG SET    DATA       387      A
         TYPE OF OUTPUT                 OUTCOI                                  DATA       388      A
         COMMUNICATIONS OUTPUT                                       TITLE      DATA       389      A
         TYPE OF OUTPUT       01019       TYPE    OF OUTPUT          OUTCOL     DATA       390      A
         TIME OF OUTPUT       02024       TIME    OF OUTPUT SEC      OUTCOL     DATA       391      A
         UPLINK LOSS FACTOR   04034      UPLINK     LOSS      FACTOR OUTCOL     DATA       392      A
         UPLINK SCINT.        07041      UPLINK     SCINT            OUTCOL     DATA       393      A
         DOWNLINK LOSS FACTOR 09054      DOWNLINK   LOSS      FACTOR OUTCOL     DATA       394      A
         DOWNLINK SCINT.      12061      DOWNLINK   SCINT            OUTCOL     DATA       395      A
         PROB ERROR-SATELLITE 14071       PROB.   OF ERROR SATELLITE OUTCOL     DATA       396      A
         PROB ERROR-GROUND    15081       PROB.   OF ERROR    GROUND OUTCOL     DATA       397      A
         PROBABILITY OF ERROR 16091       PROB.   OF ERROR           OUTCOL     DATA       398      A
         TIME OF OUTPUT       02114      TIME OF    OUTPUT   SEC     OUTCOL     DATA       399      A
         RANGE S-FROM-T       19124       RANGE     S-FROM-T KM      OUTCOL     DATA       400      A
         AZM S-FROM-T         20134      AZIMUTH    S-FROM-T DEG     OUTCOL     DATA       401      A
         ELV S-FROM-T         21144     ELEVATION   S-FROM-T DEG     OUTCOL     DATA       402      A
         RANGE S-FROM-R       22164       RANGE     S-FROM-R KM      OUTCOL     DATA       403      A
         AZM S-FROM-R         23174      AZIMUTH    S-FROM-R DEG     OUTCOL     DATA       404      A
         ELV S-FROM-R         24184     ELEVATION   S-FROM-R DEG     OUTCOL     DATA       405      A
OM OUTPUT FORMAT DATASET                                             BEG SET    DATA       406      A
         TYPE OF OUTPUT                 OUTCOI                                  DATA       407      A
         OPTICAL MEASUREMENTS                                        TITLE      DATA       408      A
         TIME OF OUTPUT       02014       TIME    OF OUTPUT SEC      OUTCOL     DATA       409      A
         WAVELENGTH           04022      CENTRAL  WAVELENGTHM        OUTCOL     DATA       410      A
         AZIMUTH              10032       ACTUAL    AZIMUTH  (RADIANS)OUTCOL    DATA       411      A
         ELEVATION            11042      --COORDS  ELEVATION (RADIANS)OUTCOL    DATA       412      A
         MEAS AZ              06052      MEASURED   AZIMUTH  (RADIANS)OUTCOL    DATA       413      A
         MEAS EL              07062      --COORDS  ELEVATION (RADIANS)OUTCOL    DATA       414      A
         EST AZ               08072      ESTIMATED  AZIMUTH  (RADIANS)OUTCOL    DATA       415      A
         EST EL               09082      --COORDS  ELEVATION (RADIANS)OUTCOL    DATA       416      A
```

```
        IRRADIANCE            15092   IRRADIANCEAT SENSOR  (W/CM2)  OUTCOL    DATA     417   A
        SIGNAL-TO-NOISE       19002    SIGNAL-   TO-NOISE    (DB)   OUTCOL    DATA     418   A
OS OUTPUT FORMAT DATASET                                            BEG SET   DATA     419   A
        TYPE OF OUTPUT                OUTCOL                                  DATA     420   A
        OPTICAL SAMPLES                                             TITLE     DATA     421   A
        TIME OF OUTPUT        01013      TIME   OF OUTPUT SEC       OUTCOL    DATA     422   A
        DETECTOR              02024    DETECTOR   NUMBER            OUTCOL    DATA     423   A
        WAVELENGTH            03032    CENTRAL  WAVELENGTHM         OUTCOL    DATA     424   A
        AZIMUTH               04042    AZIMUTH   OFF-BORE (RADIANS) OUTCOL    DATA     425   A
        ELEVATION             05052   ELEVATION  OFF-BORE (RADIANS) OUTCOL    DATA     426   A
        IRRADIANCE            06062    SCANNED    SIGNAL    OUTPUT  OUTCOL    DATA     427   A
        NORMALIZED SIGNAL     07072   NORMALIZED  SIGNAL    OUTPUT  OUTCOL    DATA     428   A
        FINAL SIGNAL          09082     FINAL     SIGNAL    OUTPUT  OUTCOL    DATA     429   A
        TARGET FLAG           10099     TARGET   DETECTION   FLAG   OUTCOL    DATA     430   A
OP OUTPUT FORMAT DATASET                                            BEG SET   DATA     431   A
        TYPE OF OUTPUT                OUTCOL                                  DATA     432   A
        INTEGRATED PATH DATA                                        TITLE     DATA     433   A
        TIME                  01014      TIME   OF OUTPUT SEC       OUTCOL    DATA     434   A
        WAVELENGTH            02022    CENTRAL  WAVELENGTHM         OUTCOL    DATA     435   A
        AZIMUTH               03032    AZIMUTH   OFF-BORE (RADIANS) OUTCOL    DATA     436   A
        ELEVATION             04042   ELEVATION  OFF-BORE (RADIANS) OUTCOL    DATA     437   A
        RADIANCE              05052    RADIANCE (PHOTONS/ S-SR-CM2) OUTCOL    DATA     438   A
        INTEGRATED RADIANCE   07062   INTEGRATED RADIANCE           OUTCOL    DATA     439   A
        SIGMA DUE TO STRCTR   08072   SIGMA DUE TO STRCTR           OUTCOL    DATA     440   A
*  THE EVENT LIST INCLUDING--                                       BOX PAGE  DATA     441   A
*       ATTACK GENERATION                                           BOX       DATA     442   A
*       RADAR                                                       BOX       DATA     443   A
*       COMMUNICATION                                               BOX       DATA     444   A
*       OPTICS                                                      BOX       DATA     445   A
*       BURSTS                                                      BOX       DATA     446   A
*       ENVIRONMENT OUTPUT                                          BOX       DATA     447   A
EVENT LIST                                                          BEG LIST  DATA     448   A
ATTACK GENERATION DATASET                                           REFER     DATA     449   A
RADAR EVENT                                                         REFER     DATA     450   A
COMMUNICATIONS EVENT DATASET                                        REFER     DATA     451   A
OPTICS LOCK EVENT                                                   REFER     DATA     452   A
BURST EVENT DATASET-1                                               REFER     DATA     453   A
BURST EVENT DATASET-2                                               REFER     DATA     454   A
BURST EVENT DATASET-3                                               REFER     DATA     455   A
BURST EVENT DATASET-4                                               REFER     DATA     456   A
BURST EVENT DATASET-5                                               REFER     DATA     457   A
ENVIRONMENT OUTPUT EVENT                                            REFER     DATA     458   A
STOP EVENT                                                          REFER     DATA     459   A
*   THE ATTACK GENERATION EVENT INCLUDING INITIALIZATION --         BOX PAGE  DATA     460   A
ATTACK GENERATION DATASET                                           BEG SET   DATA     461   A
     TYPE OF EVENT                    1.0       INT                           DATA     462   A
     TIME OF EVENT (DUMMY)            -5000.0   SEC                           DATA     463   A
ATTACK TYPE DATASET                                                 REFER     DATA     464   A
LAUNCH POINT LIST                                                   REFER     DATA     465   A
TARGET POINT LIST                                                   REFER     DATA     466   A
*  ATTACK TYPE DATASET                                              BOX       DATA     467   A
ATTACK TYPE DATASET                                                 BEG SET   DATA     468   A
```

```
TYPE CF ATTACK TO BE GENERATED              UNIFORM                                        DATA   469   A
  IS IT DAY OR NIGHT FOR B.O. CALCULS.      DAY                                            DATA   470   A
DAY OF ATTACK                               23        INT                                  DATA   471   A
MONTH CF ATTACK                             9         INT                                  DATA   472   A
YEAR OF ATTACK      (1900 AND-----          73        INT                                  DATA   473   A
TIME OF DAY                                 15.45     HRS                                  DATA   474   A
         REF ALT                            200.      KM                                   DATA   475   A
         REF LAT                            47.75     DEG                                  DATA   476   A
         REF LONG                           -79.33    DEG                                  DATA   477   A
INITIALIZATION FLAG                         0.        INT                                  DATA   478   A
          REGION TYPE (1=RURAL)             1.        INT                                  DATA   479   A
          VISABILTITY (1=50KM)              1.        INT                                  DATA   480   A
          HSM                               1.        INT                                  DATA   481   A
          DD                                .01                                            DATA   482   A
* THE LAUNCH POINTS                                                             BOX        DATA   483   A
LAUNCH POINT LIST                                                               BEG LIST   DATA   484   A
THE LANCHCU LAUNCHERY                                                           REFER      DATA   485   A
*  HEREWITH THE INDIVIDUAL LAUNCH POINTS THEMSELVES ----------------            PRINT      DATA   486   A
REFERENCE FOR LAUNCH POINT                                                      BEG SET    DATA   487   A
COORD CENTER                                0.        -79.33    47.75           GEUGR      DATA   488   A
THE LANCHCU LAUNCHERY                                                           BEG SET    DATA   489   A
  NAME CF LAUNCH POINT                      LANCHOU                                        DATA   490   A
         LAUNCH PT                          0.        105.      36.             GEUGR      DATA   491   A
BOOSTER TYPE NO.1                                                               REFER      DATA   492   A
OBJECT TYPE A                                                                   REFER      DATA   493   A
         NUMBER OBJECTS                     0.        INT                                  DATA   494   A
  (INTERNALLY USED)                         0.0                                            DATA   495   A
* THE TARGET POINTS                                                             BOX        DATA   496   A
TARGET POINT LIST                                                               BEG LIST   DATA   497   A
  BUFFALO,NEW YORK                                                              REFER      DATA   498   A
* THE INDIVIDUAL TARGET POINTS FOLLOW                 ----------------------    PRINT      DATA   499   A
REFERENCE FOR TARGET POINT                                                      BEG SET    DATA   500   A
COORD CENTER                                0.        -79.33    47.75           GEUGR      DATA   501   A
  BUFFALO,NEW YORK                                                              BEG SET    DATA   502   A
  TARGET POINT NAME                         BUFFALO                                        DATA   503   A
         TARGET PT                          0.        0.        0.              LOCXYZ     DATA   504   A
         NUMBER OBJECTS                     0.        INT                                  DATA   505   A
         IMPACT TIME OF 1ST                 2000.     SEC                                  DATA   506   A
         DELTA TIME BETWEEN OBJECTS         20.       SEC                                  DATA   507   A
  SIGMA CF ARRIVAL TIMES                    0.0                                            DATA   508   A
  C.E.P. CF IMPACT LOCATION                 0.0                                            DATA   509   A
  MODE INDICATOR (SEE RURB2 IN TRAID)       4.0       INT                                  DATA   510   A
         REENTRY ANGLE                      20.       DEG                                  DATA   511   A
SPACE FOR POINTER TO TARGET OUTPUT ARRAY1.0                                     ZEROS      DATA   512   A
SYSTEM OUTPUT LIST                                                              BEG LIST   DATA   513   A
SYSTEM CUTPUT DATASET                                                           REFER      DATA   514   A
SYSTEM OUTPUT DATASET                                                           BEG SET    DATA   515   A
         OBJECT NAME                        OBJECT 1                                       DATA   516   A
         RADAR NAME                         RAD/8                                          DATA   517   A
         SPACES                             6.0                                 ZEROS      DATA   518   A
*        SET UP HEAVE GRID                                                      BOX        DATA   519   A
REFERENCE FOR HEAVE CENTER                                                      BEG SET    DATA   520   A
```

```
COORD CENTER                           0.        -79.33    47.75    GEOGR     DATA        521    A
HEAVE COORDINATE DATASET                                            BEG SET   DATA        522    A
         ALTITUDE OF BOTTOM            90.       KM                           DATA        523    A
         HEAVE CENTER                  0.        0.        90.      LOCXYZ    DATA        524    A
         ANGULAR CELL SIZE IN X        .02                                    DATA        525    A
         ANGULAR CELL SIZE IN Y        .02                                    DATA        526    A
         NO VERTICAL CELLS             17.       INT                          DATA        527    A
         NUMBER OF CELLS IN POS. X-DIR. 3.       INT                          DATA        528    A
         NUMBER OF CELLS IN NEG. X-DIR. 3.       INT                          DATA        529    A
         NUMBER OF CELLS IN POS. Y-DIR. 3.       INT                          DATA        530    A
         NUMBER OF CELLS IN NEG. Y-DIR. 3.       INT                          DATA        531    A
         AZIMUTH OF GRID ALIGNMENT     MAGNETIC                               DATA        532    A
         NUMBER OF CELLS IN MAG. GRID  36.       INT                          DATA        533    A
         TIME AT LAST CALCULATION      -5000.    SEC                          DATA        534    A
         TIME AT NEW CALCULATION       0.        SEC                          DATA        535    A
         BURST FLAG (IXPLD)            0.        INT                          DATA        536    A
         ENERGY CHECK FLAG (IENCHK)    0.        INT                          DATA        537    A
         REZONE FLAG (IRZN)            0.        INT                          DATA        538    A
         SPACE FOR CELL HEIGHTS        20.                          ZEROS     DATA        539    A
         MAXIMUM ALTITUDE BEFORE REZONE 750.     KM                           DATA        540    A
*  OBJECT DEPENDENT DATA                                            BOX PAGE  DATA        541    A
*                                                                   PRINT     DATA        542    A
OBJECT LIST                                                         BEG LIST  DATA        543    A
REF-OBJECT                                                          REFER     DATA        544    A
OBJECT-1                                                            BEG SET   DATA        545    A
         NAME                          OBJECT 1                               DATA        546    A
OBJECT TYPE A                                                       REFER     DATA        547    A
OBJECT POSITION                                                     REFER     DATA        548    A
         KFLG                          ALIVE                                  DATA        549    A
RADAR CROSS SECTION DATASET                                         REFER     DATA        550    A
BODY AXIS ALONG VELOCITY TUMBLING MODEL                             REFER     DATA        551    A
         FILE                          1.0                          ZEROS     DATA        552    A
REFERENCE FOR OBJECT POSITION                                       BEG SET   DATA        553    A
COORD CENTER                           0.        -79.33    47.75    GEOGR     DATA        554    A
OBJECT POSITION                                                     BEG SET   DATA        555    A
                                       10.                          ZEROS     DATA        556    A
                                       -10000.   SEC                          DATA        557    A
         STATE TIME                    99999.    SEC                          DATA        558    A
         STATE POSITION                0.        50.       50.      LOCXYZ    DATA        559    A
         STATE VELOCITY                7.        -90.      -45.     POLAR     DATA        560    A
         STATE ACCEL.                  0.        0.        0.       LOCXYZ    DATA        561    A
COLUMBUS BOOSTER BETA TABLE                                         REFER     DATA        562    A
BETA MULTIPLIER                        0.                                     DATA        563    A
REF-OBJECT                                                          BEG SET   DATA        564    A
         NAME                          REF                                    DATA        565    A
OBJECT TYPE A                                                       REFER     DATA        566    A
REF OBJECT POSITION                                                 REFER     DATA        567    A
         KFLG                          ALIVE                                  DATA        568    A
         SPACES                        4.0                          ZEROS     DATA        569    A
REF. POSITION COORD. FOR LOCAL AXES                                 BEG SET   DATA        570    A
COORD. CENTER                          0.        -79.33    47.75    GEOGR     DATA        571    A
REF OBJECT POSITION                                                 BEG SET   DATA        572    A
```

```
                                             10.                          ZEROS      DATA      573     A
                                             -10000.    SEC                          DATA      574     A
         STATE TIME                          0.         SEC                          DATA      575     A
         POSITION                            0.         -79.33    47.75   GEOGR      DATA      576     A
         VELOCITY                            3.0                          ZEROS      DATA      577     A
         ACCELERATION                        3.0                          ZEROS      DATA      578     A
         SPACES                              2.0                          ZEROS      DATA      579     A
*        BOOSTER TYPE DATA                                                BOX        DATA      580     A
BOOSTER TYPE NO.1                                                         BEG SET    DATA      581     A
         NAME                                PLUME                                   DATA      582     A
THE LANCHCU LAUNCHERY                                                     REFER      DATA      583     A
BOOSTER STAGE LIST                                                        REFER      DATA      584     A
BOOSTER STAGE LIST                                                        BEG LIST   DATA      585     A
STAGE 1                                                                   REFER      DATA      586     A
STAGE 2                                                                   REFER      DATA      587     A
STAGE 2                                                                   BEG SET    DATA      588     A
         FUEL TYPE                           LIQUID                                  DATA      589     A
         THRUST                              135000.    LB                           DATA      590     A
         WTI                                 20000.     LB                           DATA      591     A
         WTF                                 8000.      LB                           DATA      592     A
         NOZA                                2000.      INSQ                         DATA      593     A
         TBURN                               0.         SEC                          DATA      594     A
         TSTEP                               5.         SEC                          DATA      595     A
         REFA                                35.        FTSQ                         DATA      596     A
         CX-M PAIR1               .03                   .5                TABLE      DATA      597     A
          CX-M PAIR2              .136                  1.0               TABLE      DATA      598     A
         CX-M PAIR3               .068                  3.0               TABLE      DATA      599     A
STAGE 1                                                                   BEG SET    DATA      600     A
         FUEL TYPE                           LIQUID                                  DATA      601     A
         THRUST                              1100000.   LB                           DATA      602     A
         WTI                                 70000.     LB                           DATA      603     A
         WTF                                 35000.     LB                           DATA      604     A
         NOZA                                3000.      INSQ                         DATA      605     A
         TBURN                               0.         SEC                          DATA      606     A
         TSTEP                               1.         SEC                          DATA      607     A
         REFA                                35.        FTSQ                         DATA      608     A
         CX-M PAIR1               .10                   .5                TABLE      DATA      609     A
         CX-M PAIR2               .19                   1.0               TABLE      DATA      610     A
         CX-M PAIR3               .11                   3.0               TABLE      DATA      611     A
*        OBJECT TYPE DATA                                                 BOX        DATA      612     A
OBJECT TYPE A                                                             BEG SET    DATA      613     A
  NAME OF OBJECT TYPE                        OVERSHOE                                DATA      614     A
COLUMBUS BOOSTER BETA TABLE                                               REFER      DATA      615     A
  RE-ENTRY ALTITUDE (WHERE DRAG STARTS)      100.0      KM                           DATA      616     A
RADAR CROSS SECTION DATASET                                               REFER      DATA      617     A
SPACE FOR BOMB                               1.0                          ZEROS      DATA      618     A
BODY AXIS ALONG VELOCITY TUMBLING MODEL                                   REFER      DATA      619     A
*  OBJECT TABULATED BETA                                                  BOX        DATA      620     A
COLUMBUS BOOSTER BETA TABLE                                               BEG SET    DATA      621     A
         MODEL TYPE                          1.0        INT                          DATA      622     A
         BETA                                1500.      PSF                          DATA      623     A
*   THE RADAR EVENT AND RADAR DATASETS **                                 BOX PAGE   DATA      624     A
```

```
RADAR EVENT                                                     BEG SET   DATA     625   A
        KTYPE                           4.0      INT                      DATA     626   A
        TIME                            99999    SEC                      DATA     627   A
RADAR B                                                         REFER     DATA     628   A
OBJECT-1                                                        REFER     DATA     629   A
        KTRACK                          1.0                     ZEROS     DATA     630   A
        KFLAG                           INITIAL                           DATA     631   A
        SPACE                           2.0                     ZEROS     DATA     632   A
SYSTEM OUTPUT DATASET                                           REFER     DATA     633   A
        SPACE                           6.0                     ZEROS     DATA     634   A
*       RADAR DATA                                              BOX       DATA     635   A
RADAR LIST                                                      BEG LIST  DATA     636   A
RADAR B                                                         REFER     DATA     637   A
RADAR B                                                         BEG SET   DATA     638   A
         NAME                           RAD/B                             DATA     639   A
PLATFORM FOR RADAR                                              REFER     DATA     640   A
BORESIGHT FOR RADAR B                                           REFER     DATA     641   A
RADAR TYPE DATA                                                 REFER     DATA     642   A
RADAR ERRORS                                                    REFER     DATA     643   A
DISCRIMINATION INPUT DATASET                                    REFER     DATA     644   A
SPACE FOR TRACK FILE LIST HERE          1.0                     ZEROS     DATA     645   A
GEOGRAPHICAL CENTER FOR LOCAL COORDINATE SYSTEM                 BEG SET   DATA     646   A
COORD CENTER                            0.       -79.33   47.75 GEOGR     DATA     647   A
* BORESIGHT ARRAY FOR PRECEDING RADAR -------------------------- PRINT     DATA     648   A
BORESIGHT FOR RADAR B                                           BEG SET   DATA     649   A
         MAY FACE 1 ACQUIRE             YES                               DATA     650   A
        BORESIGHT                       1.0E-3   90.      25.   POLAR     DATA     651   A
BORESIGHT FOR RADAR B                                           END SET   DATA     652   A
*  RADAR ERROR LIST                                             BOX       DATA     653   A
RADAR ERRORS                                                    BEG SET   DATA     654   A
        FIXED ERRORS, R                 500.     FT                       DATA     655   A
        FIXED ERRORS, A                 .5       MRAD                     DATA     656   A
        FIXED ERRORS, E                 .8       MRAD                     DATA     657   A
        S/N DEP. ERRORS, R              2400.    FT                       DATA     658   A
        S/N DEP. ERRORS, A              15.      MRAD                     DATA     659   A
        S/N DEP. ERRORS, E              15.      MRAD                     DATA     660   A
         (SPACE FOR BIAS VALUES)        3.0                     ZEROS     DATA     661   A
*  DISCRIMINATION TYPE DATA                                     BOX       DATA     662   A
DISCRIMINATION INPUT DATASET                                    BEG SET   DATA     663   A
         DISCRIMINANT                   FFL                               DATA     664   A
         MAX FREQUENCY                  575.0    MHZ                      DATA     665   A
         MIN FREQUENCY                  450.0    MHZ                      DATA     666   A
         LENGTH                         6.       FT                       DATA     667   A
         TIME INTERVAL                  1.0      SEC                      DATA     668   A
         MFF                            100.     KM                       DATA     669   A
TOTAL DISCRIMINATION TIME               10.      SEC                      DATA     670   A
RANGE LIMIT FOR DISCRIMINATION          100.     KM                       DATA     671   A
         NOISE BANDWIDTH                100.0    MHZ                      DATA     672   A
        SPACE FOR STATE VECTOR          10.                     ZEROS     DATA     673   A
*  RADAR TYPE DATA                                              BOX       DATA     674   A
RADAR TYPE DATA                                                 BEG SET   DATA     675   A
NAME                                    MOLEST                            DATA     676   A
```

```
FLAG FOR BEAM STACKING                  NONSTACKED                                      DATA   677   A
RADAR ERRORS                                                                  REFER     DATA   678   A
TRANSMIT BEAM SHAPE MODEL                                                     REFER     DATA   679   A
RECEIVE BEAM SHAPE MODEL                                                      REFER     DATA   680   A
SEARCH MODE PARAMETERS DATASET                                                REFER     DATA   681   A
TRACK MODE PARAMETERS DATASET                                                 REFER     DATA   682   A
         FREQUENCY                      450.       MHZ                                  DATA   683   A
          SYSTEM TEMPERATURE            720.0                                           DATA   684   A
         HORIZON LIMIT                  2.         DEG                                  DATA   685   A
          OFF BORESIGHT LIMIT           60.        DEG                                  DATA   686   A
ANTENNA POLARIZATION                    NONLINEAR                                       DATA   687   A
*                                                                             PRINT     DATA   688   A
*                                                                             PRINT     DATA   689   A
SEARCH MODE PARAMETERS DATASET                                                BEG SET   DATA   690   A
         RANGE ON 1SQ-M                 2500.      NMSQM                                DATA   691   A
         THRESHOLD DET+VERIF            20.        DB                                   DATA   692   A
          DELAY FROM ACQ TO TRACK       .1         SEC                                  DATA   693   A
          FRAME RANDOMIZATION           NONRANDOM                                       DATA   694   A
         MAX DET ALT                    1800.      NM                                   DATA   695   A
         MIN DET ALT                    1.         KM                                   DATA   696   A
         MAX DET RANGE                  1800.      NM                                   DATA   697   A
         MIN DET RANGE                  1.         KM                                   DATA   698   A
         FRAME TIME                     1.0        SEC                                  DATA   699   A
         VERIFY PULSE                   1.0        SEC                                  DATA   700   A
         MIN ELEV                       2.         DEG                                  DATA   701   A
          UPPER ELEVATION               85.        DEG                                  DATA   702   A
          SIDE HALF AZIMUTH             55.        DEG                                  DATA   703   A
         NOISE BANDWIDTH                2.5        KHZ                                  DATA   704   A
         SIGNAL BANDWIDTH               2.5        KHZ                                  DATA   705   A
         PULSE COMPRESSION              1.0                                             DATA   706   A
          RANGE SIDELOBE LEVEL          -30.       DB                                   DATA   707   A
         SEARCH FLAG                    1.0        INT                                  DATA   708   A
REFERECNCE FOR RADAR                                                          BEG SET   DATA   709   A
COORD CENTER                            0.         -79.33      47.75          GEOGR     DATA   710   A
PLATFORM FOR RADAR                                                            BEG SET   DATA   711   A
TYPE                                    FIXED                                           DATA   712   A
         RADAR LOCATION                 0.         0.          0.             LOCXYZ    DATA   713   A
*                                                                             PRINT     DATA   714   A
AD HOC DATA SET FOR TRACKER INITIALIZATION                                    BEG SET   DATA   715   A
          BETA MULTIPLIER               0.0                                             DATA   716   A
          DECAY TIMES       TAU1        99999.                                          DATA   717   A
                            TAU2        99999.                                          DATA   718   A
                            H TAU       0.0                                             DATA   719   A
          BETA MULTIPLIER SIGMA START   500.0                                           DATA   720   A
          BETA DOT                      30.0                                            DATA   721   A
GUESSED BETA TABLE                                                            REFER     DATA   722   A
GUESSED BETA TABLE                                                            BEG SET   DATA   723   A
TYPE                                    2.0        INT                                  DATA   724   A
NUMBER OF TABULAR ENTRIES               2.0        INT                                  DATA   725   A
N-POINT INTERPOLATION FOR N=            2.0        INT                                  DATA   726   A
TABULAR VALUES FOLLOW          10.0     KM         1500.0      PSF            TABLE     DATA   727   A
                               50.0     KM         1500.0      PSF            TABLE     DATA   728   A
```

```
*                                                                  PRINT     DATA   729   A
TRANSMIT BEAM SHAPE MODEL                                          BEG SET   DATA   730   A
NAME                                    CONSTANT                             DATA   731   A
SHAPE                                   CIRCULAR                             DATA   732   A
        BEAMWIDTH                       1.5        DEG                       DATA   733   A
        HALF BEAM SINE SPACE            0.                                   DATA   734   A
ELLIPTICAL HALF V VALUE                 0.0                                  DATA   735   A
        NEAR-IN ANGULAR SIDELOBE LEVEL  -30.       DB                        DATA   736   A
        INTERNAL STORAGE                1.0                        ZEROS     DATA   737   A
*                                                                  PRINT     DATA   738   A
TRACK MODE PARAMETERS DATASET                                      BEG SET   DATA   739   A
        S/N THRESHOLD                   15.        DB                        DATA   740   A
        MIN TRACK RANGE                 1.         KM                        DATA   741   A
        RANGE GATE PARM, K1             .5         KM                        DATA   742   A
                             K2         2.0                                  DATA   743   A
         TOTAL TIME BEFORE DROP TRACK   10.        SEC                       DATA   744   A
        TRACK INT                       1.         SEC                       DATA   745   A
        RANGE ON 1 SQ-M                 2500.      NMSQM                     DATA   746   A
        RANGE GATE                      1.         KM                        DATA   747   A
        NOISE BANDWIDTH                 2.5        KHZ                       DATA   748   A
        SIGNAL BANDWIDTH                .3         MHZ                       DATA   749   A
        PULSE COMPRESSION               120.                                 DATA   750   A
RANGE SIDELOBE LEVEL                    -30.       DB                        DATA   751   A
RADAR CROSS SECTION DATASET                                        BEG SET   DATA   752   A
        MODEL TYPE                      1.0        INT                       DATA   753   A
        RCS                             1.0        MSQ                       DATA   754   A
BODY AXIS ALONG VELOCITY TUMBLING MODEL                            BEG SET   DATA   755   A
MODEL TYPE                              1.0        INT                       DATA   756   A
RECEIVE BEAM SHAPE MODEL                                           BEG SET   DATA   757   A
TRANSMIT BEAM SHAPE MODEL                                          INSERT    DATA   758   A
RECEIVE BEAM SHAPE MODEL                                           END SET   DATA   759   A
*   THE COMMUNICATIONS EVENT DATASETS --                           BOX PAGE  DATA   760   A
COMMUNICATIONS EVENT DATASET                                       BEG SET   DATA   761   A
        EVENT TYPE                      22.        INT                       DATA   762   A
        EVENT TIME                      99999.     SEC                       DATA   763   A
        TRANSMITTER PLATFORM DATASET                               REFER     DATA   764   A
        SATELLITE PLATFORM DATASET                                 REFER     DATA   765   A
        RECEIVER PLATFORM DATASET                                  REFER     DATA   766   A
        TIME STEP                       30.        SEC                       DATA   767   A
        TYPE MOD.                       DPSK                                 DATA   768   A
        REGEN.                          YES                                  DATA   769   A
        COHERENT FSK                    NO                                   DATA   770   A
        FULLY DET.                      YES                                  DATA   771   A
        CONSTANT ZETA                   .707                                 DATA   772   A
        ORDER PLL                       FIRST                                DATA   773   A
        UPLINK DATASET                                             REFER     DATA   774   A
        DOWNLINK DATASET                                           REFER     DATA   775   A
SPACE FOR INTERNAL CALCULATIONS         6.0                        ZEROS     DATA   776   A
INITIAL VALUE FOR T1                    -10.       SEC                       DATA   777   A
INITIAL VALUE FOR T2                    -10.       SEC                       DATA   778   A
SPACE FOR INTERNAL CALCULATIONS         9.                         ZEROS     DATA   779   A
*       UPLINK,DOWNLINK DATA                                       BOX       DATA   780   A
```

```
          UPLINK DATASET                                                  BEG SET    DATA       781      A
          POWER                         100.       WATTS                             DATA       782      A
          FREQ                          8000.      MHZ                               DATA       783      A
          TRANS. GAIN                   61.        DB                                DATA       784      A
          REC. GAIN                     16.8       DB                                DATA       785      A
TRANSMITTER LOSS FACTOR                 2.5        DB                                DATA       786      A
SYSTEM LINE LOSS FACTOR                 0.5        DB                                DATA       787      A
          PHASED ARRAY TRANSMITTER      NO                                           DATA       788      A
          UPLINK XMTR AZIM ERROR        0.         DEG                               DATA       789      A
          UPLINK XMTR ELEV ERROR        0.         DEG                               DATA       790      A
SPACE FOR BORESIGHT VECTOR              3.                                ZEROS      DATA       791      A
          PHASED ARRAY RECEIVER         NO                                           DATA       792      A
          UPLINK RCVR AZIM ERROR        0.         DEG                               DATA       793      A
          UPLINK RCVR ELEV ERROR        0.         DEG                               DATA       794      A
SPACE FOR BORESIGHT VECTOR              3.                                ZEROS      DATA       795      A
          BIT PERIOD                    1.0E-8     SEC                               DATA       796      A
          IF BANDWIDTH                  125.       MHZ                               DATA       797      A
          BANDWIDTH FOR PLL             125.       MHZ                               DATA       798      A
          BEAMWIDTH                     1.5        DEG                               DATA       799      A
          S/N THRESHOLD                 15.        DB                                DATA       800      A
SIDELOBE LEVEL                          30.        DB                                DATA       801      A
          SPACE FOR BIT ERROR,PHASE ERROR2.0                              ZEROS      DATA       802      A
          RECEIVER NOISE TEMPERATURE    720.                                         DATA       803      A
          SPACE FOR NOISE FIGURE,TEMP   2.0                               ZEROS      DATA       804      A
SPACES FOR INTERNAL CALCULATIONS        32.                               ZEROS      DATA       805      A
          DOWNLINK DATASET                                                BEG SET    DATA       806      A
          POWER                         20.        WATTS                             DATA       807      A
          FREQ                          7400.      MHZ                               DATA       808      A
          TRANS. GAIN                   33.2       DB                                DATA       809      A
          REC. GAIN                     61.        DB                                DATA       810      A
TRANSMITTER LOSS FACTOR                 3.2        DB                                DATA       811      A
SYSTEM LOSS FACTOR                      0.5        DB                                DATA       812      A
          PHASE ARRAY TRANSMITTER       NO                                           DATA       813      A
          DNLINK XMTR AZIM ERROR        0.         DEG                               DATA       814      A
          DNLINK XMTR ELEV ERROR        0.         DEG                               DATA       815      A
SPACE FOR BORESIGHT VECTOR              3.                                ZEROS      DATA       816      A
          PHASED ARRAY RECEIVER         NO                                           DATA       817      A
          DNLINK RCVR AZIM ERROR        0.         DEG                               DATA       818      A
          DNLINK RCVR ELEV ERROR        0.         DEG                               DATA       819      A
SPACE FOR BORESIGHT VECTOR              3.                                ZEROS      DATA       820      A
          BIT PERIOD                    1.0E-8     SEC                               DATA       821      A
          IF BANDWIDTH                  125.       MHZ                               DATA       822      A
          BANDWIDTH PLL                 125.       MHZ                               DATA       823      A
          BEAMWIDTH                     1.5        DEG                               DATA       824      A
          S/N THRESHOLD                 15.        DB                                DATA       825      A
SIDELOBE LEVEL                          30.        DB                                DATA       826      A
          SPACE FOR BIT ERROR,PHASE ERROR2.0                              ZEROS      DATA       827      A
RECEIVER NOISE TEMPERATURE              200.                                         DATA       828      A
          SPACE FOR NOISE FIGURE,TEMP   2.0                               ZEROS      DATA       829      A
SPACES FOR INTERNAL CALCULATIONS        32.                               ZEROS      DATA       830      A
*         GROUND XMITTER,GROUND RECEIVER, AND SATELLITE POSITIONS         BOX        DATA       831      A
REF. POS. FOR COMMUNICATIONS                                              BEG SET    DATA       832      A
```

```
REFERENCE POSITION                           0.        -79.33    47.75     GEOGR      DATA      833    A
          TRANSMITTER PLATFORM DATASET                                     BEG SET    DATA      834    A
          TYPE OF PLATFORM                   FIXED                                    DATA      835    A
          TRANS. POSITION                    0.        0.        0.        LOCXYZ     DATA      836    A
          RECEIVER PLATFORM DATASET                                        BEG SET    DATA      837    A
          TYPE                               FIXED                                    DATA      838    A
          REC. POSITION                      0.        0.        0.        LOCXYZ     DATA      839    A
          SATELLITE PLATFORM DATASET                                       BEG SET    DATA      840    A
          TYPE                               FIXED                                    DATA      841    A
          SAT. POSITION                      0.        0.        35787.    LOCXYZ     DATA      842    A
*    THE OPTICAL SENSOR EVENT AND OPTICS DATA --                           BOX PAGE   DATA      843    A
OPTICS LOCK EVENT                                                          BEG SET    DATA      844    A
          TYPE                               25.       INT                            DATA      845    A
          TIME                               99999.    SEC                            DATA      846    A
OPTICAL SENSOR                                                             REFER      DATA      847    A
REF-OBJECT                                                                 REFER      DATA      848    A
SPACE                                        1.0                           ZEROS      DATA      849    A
          KFLAG                              SET-UP                                   DATA      850    A
SPACE                                        1.0                           ZEROS      DATA      851    A
*         CLOUD DATA                                                       BOX        DATA      852    A
BASIC CLOUD DATASET                                                        BEG SET    DATA      853    A
          MODEL TYPE                         1.        INT                            DATA      854    A
          NUMBER OF CLOUDS                   1.        INT                            DATA      855    A
CLOUD LIST                                   1.                            ZEROS      DATA      856    A
STATISTICAL CLOUD DATASET                                                  REFER      DATA      857    A
STATISTICAL CLOUD DATASET                                                  BEG SET    DATA      858    A
          MODEL NUMBER                       1.        INT                            DATA      859    A
          LAYER PARAMETER                    0.        INT                            DATA      860    A
          SPACES                             90.                           ZEROS      DATA      861    A
CLOUD LIST                                                                 BEG LIST   DATA      862    A
CLOUD A                                                                    REFER      DATA      863    A
CLOUD A                                                                    BEG SET    DATA      864    A
          OBJECT TYPE                        CLOUD                                    DATA      865    A
          CLOUD INDEX                        1.0       INT                            DATA      866    A
          CLOUD TYPE                         1.0       INT                            DATA      867    A
          POSITION                           6.        82.75     51.32     GEOGR      DATA      868    A
          SEMI-MAJOR HORIZ. AXIS (A)         4.        KM                             DATA      869    A
          SEMI-MINOR HORIZ. AXIS (B)         4.        KM                             DATA      870    A
          SEMI-MAJOR VERT. AXIS (C)          4.        KM                             DATA      871    A
          ORIENTATION (A +CCW FROM EAST)     0.        DEG                            DATA      872    A
*         OPTICAL SENSOR DATA                                              BOX        DATA      873    A
OPTICAL SENSOR LIST                                                        BEG LIST   DATA      874    A
OPTICAL SENSOR                                                             REFER      DATA      875    A
OPTICAL SENSOR                                                             BEG SET    DATA      876    A
          NAME                               SCOPE                                    DATA      877    A
          OPTICS TYPE                        TRACK                                    DATA      878    A
          OPTICS CALC TYPE                   FOV                                      DATA      879    A
          OBJECT TYPES                       ALL                                      DATA      880    A
BORESIGHT                                                                  REFER      DATA      881    A
PLATFORM                                                                   REFER      DATA      882    A
OPTICS TYPE                                                                REFER      DATA      883    A
OPTICS NOISE                                                               REFER      DATA      884    A
```

```
OPTICS OPTIONS                            1.0                              ZEROS      DATA   865   A
TRACK FILE                                1.0                              ZEROS      DATA   886   A
OPTICS GRID                                                                REFER      DATA   887   A
LIST OF PATHS                             1.0                              ZEROS      DATA   888   A
OPTICS NOISE                                                               BEG SET    DATA   889   A
         FIXED ERRORS, AZM                .01       MRAD                              DATA   890   A
         FIXED ERRORS, ELV                .01       MRAD                              DATA   891   A
         S/N DEP. ERRORS, AZM             1.        MRAD                              DATA   892   A
         S/N DEP. ERRORS, ELV             1.        MRAD                              DATA   893   A
SPACE FOR BIAS ERRORS                     2.0                              ZEROS      DATA   894   A
BORESIGHT                                                                  BEG SET    DATA   895   A
ACQUISITION ALLOWED                       YES                                         DATA   896   A
         BORESIGHT                        3.0                              ZEROS      DATA   897   A
         SIGMA                            0.                                          DATA   896   A
DUMMY REF. POS. FOR OPTICS SENSOR                                          BEG SET    DATA   899   A
REF. POS. FOR OPTICS SENSOR               35787     -79.33      47.75      GEOGR      DATA   900   A
PLATFORM                                                                   BEG SET    DATA   901   A
         TYPE                             FIXED                                       DATA   902   A
         SENSOR POSITON                   35787     -79.33      47.75      GEOGR      DATA   903   A
*        OPTICS TYPE DATA                                                  BOX        DATA   904   A
OPTICS TYPE                                                                BEG SET    DATA   905   A
         NAME                             STANDARD                                    DATA   906   A
         NUMBER OF DETECTORS              1.        INT                               DATA   907   A
         DIAMETER                         2.7E-5                                      DATA   908   A
         BLUR DIAMETER                    2.7E-5                                      DATA   909   A
         NEFD                             .5E-16                                      DATA   910   A
         NEFD BAND WIDTH                  6000.                                       DATA   911   A
         SPACE                            1.0                              ZEROS      DATA   912   A
         FRAME TIME                       10.       SEC                               DATA   913   A
         RANDOM                           NO                                          DATA   914   A
         MIN UPDATE TIME                  10.       SEC                               DATA   915   A
         MAX UPDATE TIME                  10.       SEC                               DATA   916   A
WAVELENGTH BAND LIST                                                       REFER      DATA   917   A
FIELD-OF-VIEW                                                              REFER      DATA   918   A
WAVELENGTH BAND LIST                                                       BEG LIST   DATA   919   A
WAVELENGTH BAND A                                                          REFER      DATA   920   A
WAVELENGTH BAND A                                                          BEG SET    DATA   921   A
         LOW END                          2.5E-6    M                                 DATA   922   A
         HIGH END                         2.6E-6    M                                 DATA   923   A
         SPACES                           3.0                              ZEROS      DATA   924   A
WAVELENGTH BAND B                                                          BEG SET    DATA   925   A
          LOW END                         2.6E-6    M                                 DATA   926   A
         HIGH END                         2.7E-6    M                                 DATA   927   A
         SPACES                           3.0                              ZEROS      DATA   928   A
FIELD-OF-VIEW                                                              BEG SET    DATA   929   A
         TYPE                             SQUARE                                      DATA   930   A
         AZIMUTH EXTENT                   .8E-3                                       DATA   931   A
         ELEVATION EXTENT                 .8E-3                                       DATA   932   A
         HBAF                             60.       KM                                DATA   933   A
         ABAF                             -999.                                       DATA   934   A
*        OPTICS CALCULATIONS                                               BOX        DATA   935   A
OPTICS OPTIONS                                                             BEG SET    DATA   936   A
```

```
SIMULATE OPTICS                                                    REFER     DATA   937   A
TRACK SIMULATION EVENT               1.0                           ZEROS     DATA   938   A
SPACES                               3.0                           ZEROS     DATA   939   A
SIMULATE OPTICS                                                    BEG SET   DATA   940   A
        KTYPE                        27.          INT                        DATA   941   A
        TIME                         99999.       SEC                        DATA   942   A
        MODEL TYPE                   SURVEIL-01                              DATA   943   A
        SCAN TYPE                    CIRCULAR                                DATA   944   A
OPTICAL SENSOR                                                     REFER     DATA   945   A
        PLOTS                        OBJECTS                                 DATA   946   A
        SPACE FOR IFP DATA           1.0                           ZEROS     DATA   947   A
        SPIRE LIST                   1.0                           ZEROS     DATA   948   A
        SPACE FOR MEASUREMENT DATA   1.0                           ZEROS     DATA   949   A
SPACE FOR LIST HEADER                1.0                           ZEROS     DATA   950   A
OPTICS GRID                                                        BEG SET   DATA   951   A
        IFLAG                        0.           INT                        DATA   952   A
        DELTA AZIMUTH                .4E-3                                   DATA   953   A
        DELTA ELEVATION              .4E-3                                   DATA   954   A
OPTICAL TRACK SIMULATION                                           BEG SET   DATA   955   A
        KTYPE                        28.          INT                        DATA   956   A
        OPTICAL TRACK TIME           99999.       SEC                        DATA   957   A
SPACE FOR SENSOR,OBJECT,TRACK FILE   3.0                           ZEROS     DATA   958   A
        TRACK INT                    1.           SEC                        DATA   959   A
BORESIGHT                                                          REFER     DATA   960   A
        CAN THE SENSOR ACQUIRE       YES                                     DATA   961   A
        INITAL RANGE ERROR           1.0          KM                         DATA   962   A
*       SPIRE SENSOR PROCESSING BLOCKS                             BOX       DATA   963   A
SPIRE COMPUTATION LIST                                             BEG LIST  DATA   964   A
BLOCK 2                                                            REFER     DATA   965   A
BLOCK 3                                                            REFER     DATA   966   A
BLOCK 4                                                            REFER     DATA   967   A
BLOCK 5                                                            REFER     DATA   968   A
BLOCK 6                                                            REFER     DATA   969   A
BLOCK 7                                                            REFER     DATA   970   A
BLOCK 2                                                            BEG SET   DATA   971   A
        BLOCK TYPE (SCAN)            4.                                      DATA   972   A
        FIRST BRANCH                 1.                                      DATA   973   A
        BRANCH INTERVAL              1.                                      DATA   974   A
        PERIOD                       1.27E-3                                 DATA   975   A
        SCAN LENGTH                  .8E-3                                   DATA   976   A
BLOCK 3                                                            BEG SET   DATA   977   A
        BLOCK TYPE (DETECTOR NOISE)  5.                                      DATA   978   A
        BRANCH                       1.                                      DATA   979   A
BLOCK 4                                                            BEG SET   DATA   980   A
        BLOCK TYPE (GAUSSMO)         6.                                      DATA   981   A
        BRANCH                       1.                                      DATA   982   A
        BANDPASS                     15000.                                  DATA   983   A
        4 SIGMA                      0.                                      DATA   984   A
BLOCK 5                                                            BEG SET   DATA   985   A
        BLOCK TYPE (GAIN)            19.                                     DATA   986   A
        BRANCH                       1.                                      DATA   987   A
        GAIN                         1.                                      DATA   988   A
```

```
BLOCK 6                                                            BEG SET    DATA     989    A
          BLOCK TYPE (GAIN)            17.                                    DATA     990    A
          BRANCH                       1.                                     DATA     991    A
          GAIN                         1.                                     DATA     992    A
BLOCK 7                                                            BEG SET    DATA     993    A
          BLOCK TYPE                   26.                                    DATA     994    A
          BRANCH                       1.                                     DATA     995    A
          X-POSITION AT SCAN START     -.4E-3                                 DATA     996    A
          Y-POSITION AT SCAN START     0.                                     DATA     997    A
          THRESHOLD                    100.                                   DATA     998    A
*  BURST DATA                                                      BOX PAGE   DATA     999    A
BURST COORDINATE CENTER                                            BEG SET    DATA    1000    A
COORD CENTER                           0.        -79.33   47.75    GEOGR      DATA    1001    A
BURST EVENT DATASET-1                                              BEG SET    DATA    1002    A
           EVENT TYPE                  8.        INT                          DATA    1003    A
          TIME                         99999.    SEC                          DATA    1004    A
          POSITION                     0.        0.       200.     LOCXYZ     DATA    1005    A
BOMB-1                                                             REFER      DATA    1006    A
BURST EVENT DATASET-1                                              END SET    DATA    1007    A
BURST EVENT DATASET-2                                              BEG SET    DATA    1008    A
           EVENT TYPE                  8.0       INT                          DATA    1009    A
          TIME                         99999.    SEC                          DATA    1010    A
          POSITION                     0.        0.       200.     LOCXYZ     DATA    1011    A
BOMB-2                                                             REFER      DATA    1012    A
BURST EVENT DATASET-2                                              END SET    DATA    1013    A
BURST EVENT DATASET-3                                              BEG SET    DATA    1014    A
           EVENT TYPE                  8.0       INT                          DATA    1015    A
          TIME                         99999.    SEC                          DATA    1016    A
          POSITION                     0.        0.       200.     LOCXYZ     DATA    1017    A
BOMB-3                                                             REFER      DATA    1018    A
BURST EVENT DATASET-3                                              END SET    DATA    1019    A
BURST EVENT DATASET-4                                              BEG SET    DATA    1020    A
          TYPE                         8.        INT                          DATA    1021    A
          TIME                         99999.    SEC                          DATA    1022    A
          POSITION                     0.        0.       200.     LOCXYZ     DATA    1023    A
BOMB-4                                                             REFER      DATA    1024    A
BURST EVENT DATASET-5                                              BEG SET    DATA    1025    A
          TYPE                         8.        INT                          DATA    1026    A
          TIME                         99999.    SEC                          DATA    1027    A
          POSITION                     0.        0.       200.     LOCXYZ     DATA    1028    A
BOMB-5                                                             REFER      DATA    1029    A
*  WEAPON TYPE DATA                                                BOX        DATA    1030    A
*                                                                  PRINT      DATA    1031    A
BOMB-1                                                             BEG SET    DATA    1032    A
          NAME                         BOMB-1                                 DATA    1033    A
          YIELD                        1.0       MT                           DATA    1034    A
          FFRAC                        .50                                    DATA    1035    A
          HFRAC                        .24                                    DATA    1036    A
          NFRAC                        .01                                    DATA    1037    A
          XFRAC                        .75                                    DATA    1038    A
          THRML NFRAC                  .50                                    DATA    1039    A
          GFRAC                        .001                                   DATA    1040    A
```

```
        WMASS                                   1.5E6     GM                       DATA      1041      A
        FRACTION ALUMINUM                       0.05                               DATA      1042      A
        SPACES                                  2.0                      ZEROS     DATA      1043      A
        FRACTION URANIUM                        0.45                               DATA      1044      A
DEVICE DEPENDENT ENERGY SPECTRUM DATA =1                                 REFER     DATA      1045      A
SPACE FOR ENERGY SPECTRUM DATA                  1.0                      ZEROS     DATA      1046      A
BOMB=2                                                                   BEG SET   DATA      1047      A
        NAME                                    BOMB=2                             DATA      1048      A
        YIELD                                   1.0       MT                       DATA      1049      A
        FFRAC                                   .10                                DATA      1050      A
        HFRAC                                   .24                                DATA      1051      A
        NFRAC                                   .01                                DATA      1052      A
        XFRAC                                   .75                                DATA      1053      A
        THRML NFRAC                             .50                                DATA      1054      A
        GFRAC                                   .001                               DATA      1055      A
        WMASS                                   1.5E6     GM                       DATA      1056      A
        FRACTION ALUMINUM                       0.05                               DATA      1057      A
        SPACES                                  2.0                      ZEROS     DATA      1058      A
        FRACTION URANIUM                        0.45                               DATA      1059      A
DEVICE DEPENDENT ENERGY SPECTRUM DATA =2                                 REFER     DATA      1060      A
SPACE FOR ENERGY SPECTRUM DATA                  1.0                      ZEROS     DATA      1061      A
BOMB=3                                                                   BEG SET   DATA      1062      A
        NAME                                    BOMB=3                             DATA      1063      A
        YIELD                                   1.0       MT                       DATA      1064      A
        FFRAC                                   .10                                DATA      1065      A
        HFRAC                                   .24                                DATA      1066      A
        NFRAC                                   .01                                DATA      1067      A
        XFRAC                                   .75                                DATA      1068      A
        THRML NFRAC                             .50                                DATA      1069      A
        GFRAC                                   .001                               DATA      1070      A
        WMASS                                   1.5E6     GM                       DATA      1071      A
        FRACTION ALUMINUM                       0.05                               DATA      1072      A
        SPACES                                  2.0                      ZEROS     DATA      1073      A
        FRACTION URANIUM                        0.45                               DATA      1074      A
DEVICE DEPENDENT ENERGY SPECTRUM DATA =3                                 REFER     DATA      1075      A
SPACE FOR ENERGY SPECTRUM DATA                  1.0                      ZEROS     DATA      1076      A
BOMB=4                                                                   BEG SET   DATA      1077      A
        NAME                                    BOMB=4                             DATA      1078      A
        YIELD                                   1.0       MT                       DATA      1079      A
        FFRAC                                   .10                                DATA      1080      A
        HFRAC                                   .24                                DATA      1081      A
        NFRAC                                   .01                                DATA      1082      A
        XFRAC                                   .75                                DATA      1083      A
        THRML NFRAC                             .50                                DATA      1084      A
        GFRAC                                   .001                               DATA      1085      A
        WMASS                                   1.5E6     GM                       DATA      1086      A
        FRACTION ALUMINUM                       0.05                               DATA      1087      A
        SPACES                                  2.0                      ZEROS     DATA      1088      A
        FRACTION URANIUM                        0.45                               DATA      1089      A
DEVICE DEPENDENT ENERGY SPECTRUM DATA =4                                 REFER     DATA      1090      A
SPACE FOR ENERGY SPECTRUM DATA                  1.0                      ZEROS     DATA      1091      A
BOMB=5                                                                   BEG SET   DATA      1092      A
```

```
      NAME                          BOMB-5                                        DATA   1093   A
      YIELD                         1.0      MT                                   DATA   1094   A
      FFRAC                         .10                                           DATA   1095   A
      HFRAC                         .24                                           DATA   1096   A
      NFRAC                         .01                                           DATA   1097   A
      XFRAC                         .75                                           DATA   1098   A
      THRML NFRAC                   .50                                           DATA   1099   A
      GFRAC                         .001                                          DATA   1100   A
      WMASS                         1.5E6    GM                                   DATA   1101   A
      FRACTION ALUMINUM             0.05                                          DATA   1102   A
      SPACES                        2.0                                ZEROS      DATA   1103   A
      FRACTION URANIUM              0.45                                          DATA   1104   A
DEVICE DEPENDENT ENERGY SPECTRUM DATA -5                               REFER      DATA   1105   A
SPACE FOR ENERGY SPECTRUM DATA      1.0                                ZEROS      DATA   1106   A
DEVICE DEPENDENT ENERGY SPECTRUM DATA -1                               BEG SET    DATA   1107   A
FLAG FOR INITIALIZATION             START                                         DATA   1108   A
NEUTRON WEAPON DEPENDENT DATA                                          REFER      DATA   1109   A
GAMMA WEAPON DEPENDENT DATA                                            REFER      DATA   1110   A
X-RAY WEAPON DEPENDENT DATASET1.0                                      REFER      DATA   1111   A
   SPACE FOR X-DATA                 1.0                                ZEROS      DATA   1112   A
   SPACE FOR N-DATA                 1.0                                ZEROS      DATA   1113   A
   SPACE FOR G-DATA                 1.0                                ZEROS      DATA   1114   A
DEVICE DEPENDENT ENERGY SPECTRUM DATA -2                               BEG SET    DATA   1115   A
      FLAG                          START                                         DATA   1116   A
NEUTRON WEAPON DEPENDENT DATA                                          REFER      DATA   1117   A
GAMMA WEAPON DEPENDENT DATA                                            REFER      DATA   1118   A
X-RAY WEAPON DEPENDENT DATASET1.0                                      REFER      DATA   1119   A
      SPACES                        3.0                                ZEROS      DATA   1120   A
DEVICE DEPENDENT ENERGY SPECTRUM DATA -3                               BEG SET    DATA   1121   A
      FLAG                          START                                         DATA   1122   A
NEUTRON WEAPON DEPENDENT DATA                                          REFER      DATA   1123   A
GAMMA WEAPON DEPENDENT DATA                                            REFER      DATA   1124   A
X-RAY WEAPON DEPENDENT DATASET1.0                                      REFER      DATA   1125   A
      SPACES                        3.0                                ZEROS      DATA   1126   A
DEVICE DEPENDENT ENERGY SPECTRUM DATA -4                               BEG SET    DATA   1127   A
      FLAG                          START                                         DATA   1128   A
NEUTRON WEAPON DEPENDENT DATA                                          REFER      DATA   1129   A
GAMMA WEAPON DEPENDENT DATA                                            REFER      DATA   1130   A
X-RAY WEAPON DEPENDENT DATASET1.0                                      REFER      DATA   1131   A
      SPACES                        3.0                                ZEROS      DATA   1132   A
DEVICE DEPENDENT ENERGY SPECTRUM DATA -5                               BEG SET    DATA   1133   A
      FLAG                          START                                         DATA   1134   A
NEUTRON WEAPON DEPENDENT DATA                                          REFER      DATA   1135   A
GAMMA WEAPON DEPENDENT DATA                                            REFER      DATA   1136   A
X-RAY WEAPON DEPENDENT DATASET1.0                                      REFER      DATA   1137   A
      SPACES                        3.0                                ZEROS      DATA   1138   A
*WEAPON DEPENDENT DATA FOR DEPOSITION CALCULATIONS                     BOX PAGE   DATA   1139   A
X-RAY WEAPON DEPENDENT DATASET0.5                                      BEG SET    DATA   1140   A
SPECX           3.0        18.0       (7(E9.3,2X))                     FORMAT     DATA   1141   A
2.820E-03, 1.640E-02, 9.100E-02, 1.740E-01, 4.710E-01, 2.360E-01, 9.640E-03,      DATA   1142   A
2.960E-06                                                                         DATA   1143   A
                                                                                  DATA   1144   A
```

```
END DATA                                                                                      DATA    1145    A
X-RAY WEAPON DEPENDENT DATASET1.0                                                    BEG SET  DATA    1146    A
SPECX                3.0        18.0       (7(E9.3,2X))                              FORMAT   DATA    1147    A
3.810E-04, 2.440E-03. 1.640E-02, 4.170E-02, 2.230E-01, 4.710E-01, 2.360E-01,                  DATA    1148    A
9.350E-03, 1.920E-04                                                                          DATA    1149    A
                                                                                              DATA    1150    A
END DATA                                                                                      DATA    1151    A
X-RAY WEAPON DEPENDENT DATASET2.0                                                    BEG SET  DATA    1152    A
SPECX                3.0        18.0       (7(E9.3,2X))                              FORMAT   DATA    1153    A
4.940E-05, 3.310E-04, 2.440E-03, 7.020E-03, 5.110E-02, 2.230E-01, 4.710E-01,                  DATA    1154    A
1.910E-01. 4.510E-02, 8.110E-03, 1.240E-03, 1.710E-04                                         DATA    1155    A
                                                                                              DATA    1156    A
END DATA                                                                                      DATA    1157    A
NEUTRON WEAPON DEPENDENT DATA                                                        BEG SET  DATA    1158    A
SPECN                3.0        18.0       (8(E8.2,2X))                              FORMAT   DATA    1159    A
0.01E-02, 2.00E-03, 2.40E-02, 1.22E-01, 3.65E-01, 1.02E-01, 8.50E-02, 6.20E-02,              DATA    1160    A
2.80E-02, 5.00E-03, 1.90E-02, 2.60E-02, 1.70E-02, 1.80E-02, 1.47E-02, 1.41E-02,              DATA    1161    A
2.56E-02, 7.06E-02                                                                            DATA    1162    A
END DATA                                                                                      DATA    1163    A
GAMMA WEAPON DEPENDENT DATA                                                          BEG SET  DATA    1164    A
SPECG                3.0        18.0       (8(E8.2,2X))                              FORMAT   DATA    1165    A
3.08E-02, 1.36E-02, 8.16E-02, 6.87E-02, 8.67E-02, 1.77E-01, 1.40E-01, 1.00E-01,              DATA    1166    A
1.07E-01, 6.18E-02, 3.94E-02, 3.76E-02, 2.23E-02, 2.12E-02, 7.48E-03, 3.23E-03,              DATA    1167    A
6.79E-04, 1.58E-04                                                                            DATA    1168    A
END DATA                                                                                      DATA    1169    A
SPECD                3.0        18.0       (8(E8.2,2X))                              FORMAT   DATA    1170    A
1.11E-03, 3.80E-03, 1.40E-02, 2.09E-02, 2.62E-02, 6.35E-02, 7.13E-02, 7.36E-02,              DATA    1171    A
1.17E-01, 1.05E-01, 9.14E-02, 1.04E-01, 7.34E-02, 8.19E-02, 3.51E-02, 1.70E-02,              DATA    1172    A
4.12E-02, 9.94E-04                                                                            DATA    1173    A
END DATA                                                                                      DATA    1174    A
*   THE ENVIRONMENT OUTPUT AND STOP EVENTS --                                       BOX PAGE  DATA    1175    A
ENVIRONMENT OUTPUT EVENT                                                             BEG SET  DATA    1176    A
         TYPE OF EVENT                       11.0       INT                                   DATA    1177    A
         OUTPUT TIME                         99999.     SEC                                   DATA    1178    A
         TYPE                                NONE                                             DATA    1179    A
         NPTS                                1.0        INT                                   DATA    1180    A
         OUTPUT TIME INT                     30.        SEC                                   DATA    1181    A
         END PRINT TIME                      1731.      SEC                                   DATA    1182    A
         FREQUENCY                           450.       MHZ                                   DATA    1183    A
         EVENT INITIALIZATION FLAG           1.0        INT                                   DATA    1184    A
GRID OUTPUT DATASET                                                                  REFER    DATA    1185    A
SPACE FOR INTERNAL STORAGE                   1.0                                     ZEROS    DATA    1186    A
GRID OUTPUT DATASET                                                                  BEG SET  DATA    1187    A
         TYPE                                FIREBALL                                         DATA    1188    A
         INDEX                               1.         INT                                   DATA    1189    A
         PLOT PARALLEL TO                    Y-AXIS                                           DATA    1190    A
         KIND OF OUTPUT DESIRED              ALL                                              DATA    1191    A
STOP EVENT                                                                           BEG SET  DATA    1192    A
     TYPE OF EVENT                           10.        INT                                   DATA    1193    A
         STOP TIME                           0.         SEC                                   DATA    1194    A
```

DISTRIBUTION LIST

DEPARTMENT OF DEFENSE

Assistant to the Secretary of Defense
Atomic Energy
ATTN: Executive Assistant

Defense Advanced Rsch Proj Agency
ATTN: TIO
ATTN: STO, S. Zakanycz

Defense Communications Engineer Center
ATTN: Code R410, J. McLean

Defense Nuclear Agency
ATTN: RAAE
4 cy ATTN: TITL

Defense Technical Information Center
12 cy ATTN: DD

Field Command
Defense Nuclear Agency
ATTN: FCPR

Field Command
Defense Nuclear Agency
Livermore Branch
ATTN: FCPRL

National Security Agency
ATTN: R-52, J. Skillman

Undersecretary of Def for Rsch & Engrg
ATTN: Strategic & Space Systems (OS)

WWMCCS System Engineering Org
ATTN: R. Crawford

DEPARTMENT OF THE ARMY

Atmospheric Sciences Laboratory
U.S. Army Electronics R&D Command
ATTN: DELAS-EO, F. Niles

BMD Advanced Technology Center
Department of the Army
ATTN: ATC-T, M. Capps
ATTN: ATC-O, W. Davies

BMD Systems Command
Department of the Army
ATTN: BMDSC-HW, R. Dekalb

Harry Diamond Laboratories
Department of the Army
ATTN: DELHD-I-TL
ATTN: DELHD-N-P, F. Wimenitz

U.S. Army Foreign Science & Tech Ctr
ATTN: DRXST-SD

U.S. Army Missile Intelligence Agency
ATTN: J. Gamble

U.S. Army Missile R&D Command
ATTN: DRDMI-XS
ATTN: RSIC

DEPARTMENT OF THE ARMY (Continued)

U.S. Army Nuclear & Chemical Agency
ATTN: Library

U.S. Army Satellite Comm Agency
ATTN: Document Control

U.S. Army TRADOC Systems Analysis Activity
ATTN: ATAA-PL

DEPARTMENT OF THE NAVY

Naval Electronic Systems Command
ATTN: Code 5D1A
ATTN: PME 117-20

Naval Intelligence Support Ctr
ATTN: Document Control

Naval Ocean Systems Center
ATTN: Code 532

Naval Postgraduate School
ATTN: Code 1424 Library

Naval Research Laboratory
ATTN: Code 4709, W. Ali
ATTN: Code 47D1, J. Brown
ATTN: Code 2627
ATTN: Code 47B0, S. Ossakow
ATTN: Code 47DD, T. Coffey
ATTN: Code 4780, P. Palmadesso

Officer-in-Charge
Naval Surface Weapons Center
ATTN: Code X211

Naval Surface Weapons Center
ATTN: Code F-14, R. Butler

Strategic Systems Project Office
Department of the Navy
ATTN: NSP-2722, F. Wimberly
ATTN: NSSP-2722, M. Meserole

DEPARTMENT OF THE AIR FORCE

Air Force Geophysics Laboratory
ATTN: SULL
ATTN: LKB, K. Champion
ATTN: OPR, A. Stair
ATTN: OPR, H. Gardiner

Air Force Systems Command
ATTN: Technical Library

Air Force Technical Applications Center
ATTN: Technical Library
ATTN: TFR, C. Meneely

Air Force Weapons Laboratory
Air Force Systems Command
ATTN: SUL
ATTN: DYC

DEPARTMENT OF THE AIR FORCE (Continued)

Ballistic Missile Office
Air Force Systems Command
ATTN: MNRC
ATTN: MNRTE
ATTN: MNX

Deputy Chief of Staff
Research, Development, & Acq
Department of the Air Force
ATTN: AFRDS

Headquarters Space Division
Air Force Systems Command
ATTN: SKA, M. Clavin
ATTN: SKX
ATTN: SZJ, P. Kelley

Rome Air Development Center
Air Force Systems Center
ATTN: TSLD
ATTN: DCSA, J. Simons
ATTN: DCS, V. Coyne

Strategic Air Command
Department of the Air Force
ATTN: XPFS, B. Stephan
ATTN: NRT

DEPARTMENT OF ENERGY

Department of Energy
ATTN: DMA

OTHER GOVERNMENT AGENCIES

Department of Commerce
National Oceanic & Atmospheric Admin
Environmental Research Laboratories
ATTN: F. Fehsenfeld

Institute for Telecommunications Sciences
National Telecommunications & Info Admin
ATTN: G. Falcon
ATTN: W. Utlaut

DEPARTMENT OF DEFENSE CONTRACTORS

Aerojet Electro-Systems Co
ATTN: J. Graham

Aerospace Corp
ATTN: N. Stockwell
ATTN: V. Josephson
ATTN: N. Cohen
ATTN: J. Reinheimer
ATTN: J. Strauss
ATTN: I. Garfunkel

Berkeley Research Associates, Inc
ATTN: J. Workman

ESL, Inc
ATTN: J. Marshall

General Electric Co
Space Division
ATTN: M. Bortner
ATTN: T. Baurer

DEPARTMENT OF DEFENSE CONTRACTORS (Continued)

General Electric Company—TEMPO
ATTN: J. Jordano
ATTN: DASIAC
ATTN: M. Stanton
ATTN: T. Stevens
ATTN: W. Knapp

General Research Corp
ATTN: J. Garbarino
ATTN: J. Ise, Jr

Jamieson Science & Engineering
ATTN: J. Jamieson

Kaman Sciences Corp
ATTN: D. Perio
ATTN: P. Tracy
ATTN: N. Beauchamp

Lockheed Missiles & Space Co., Inc
ATTN: D. Divis

Lockheed Missiles & Space Co., Inc
ATTN: M. Walt

M.I.T. Lincoln Lab
ATTN: D. Towle

McDonnell Douglas Corp
ATTN: H. Spitzer
ATTN: R. Halprin

Mission Research Corp
ATTN: R. Kilb
ATTN: D. Archer
ATTN: D. Sappenfield
ATTN: R. Hendrick
ATTN: M. Scheibe
ATTN: F. Fajen
ATTN: R. Bogusch

Nichols Research Corp., Inc
ATTN: N. Byrn

Photometrics, Inc
ATTN: I. Kofsky

Physical Research, Inc
ATTN: R. Deliberis

University of Pittsburgh
ATTN: F. Kaufman

R & D Associates
ATTN: B. Gabbard
ATTN: F. Gilmore
ATTN: R. Turco
ATTN: R. Lelevier
ATTN: P. Haas

R & D Associates
ATTN: B. Yoon

Rand Corp
ATTN: C. Crain

Science Applications, Inc
ATTN: D. Hamlin

DEPARTMENT OF DEFENSE CONTRACTORS (Continued)

Science Applications, Inc
ATTN: W. Mendes

SRI International
ATTN: W. Jaye
ATTN: W. Chesnut

Pacific-Sierra Research Corp
ATTN: H. Brode

DEPARTMENT OF DEFENSE CONTRACTORS (Continued)

TeleDyne Brown Engineering
ATTN: J. Cato
ATTN: Technical Library
ATTN: G. Harney

VisiDyne, Inc
ATTN: J. Carpenter
ATTN: C. Humphrey

ATE
LMED
8