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DYNAMIC SAM ENDGAME MODEL, VOLUME 2. USER'S MANUAL.(U)
SEP 77 M A DLOOGATCH, R H ROSE, D S KLUK N62269-76-C-0386
UNCLASSIFIED CSD-77-200-VOL-2 NL

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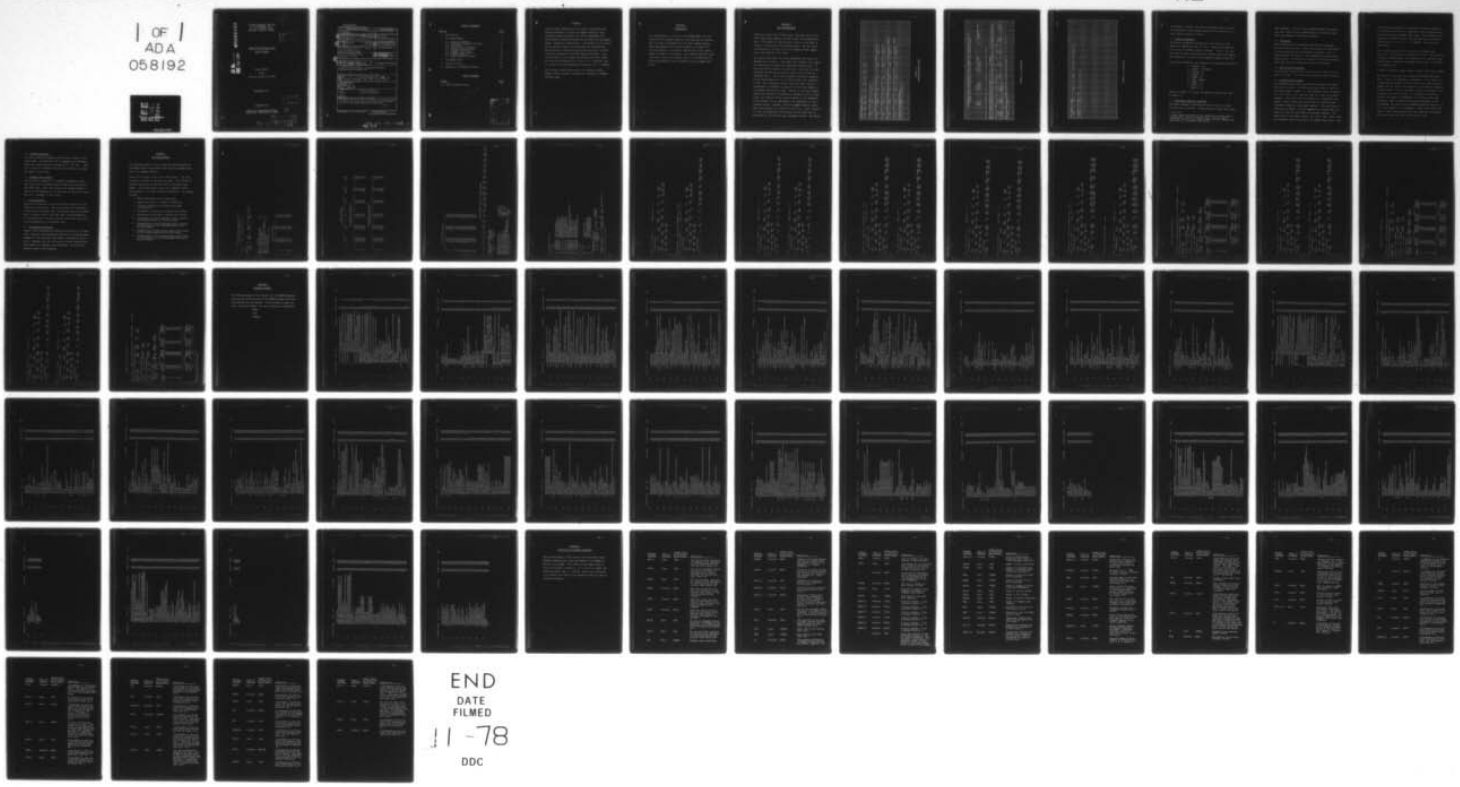

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CAYWOOD-SCHILLER DIVISION
A. T. KEARNEY, INC.
100 South Wacker Drive
Chicago, Illinois 60606

DYNAMIC SAM ENDGAME MODEL

USER'S MANUAL

FINAL REPORT

Under

Contract N62269-76-C-0386

SEPTEMBER 1977

Prepared for

NAVAL AIR DEVELOPMENT CENTER
WARMINSTER, PENNSYLVANIA 18974

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FOREWORD

The activities described in this report in modifying the Dynamic SAM Model to include an endgame capability were performed during the period July 1976 to September 1977 under Contract N62269-76-C-0386 for the Naval Air Development Center, Warminster, Pennsylvania. The purpose of this effort was to develop a means for evaluating kill probabilities associated with trajectories and missile/aircraft intercept conditions generated by the NADC Dynamic SAM Model. This is the second of two volumes constituting the final report. The work was performed by R. H. Rose, M. A. Dloogatch, and D. S. Kluk of the Caywood-Schiller Division of A. T. Kearney.

This volume includes instructions for preparing inputs, sample outputs, program listings and a glossary of FORTRAN variable names.

SECTION 1

INTRODUCTION

As a prerequisite to the use of the DSAMAM model with the addition of an endgame capability the user must be familiar with the input requirements for the basic DSAMAM program. These requriements are covered in detail in Volume II of the Final Report on the Dynamic SAM-Aircraft Study, Report Number C9-2336/120, Autonetics, North American Rockwell Corp. This User's Guide will confine itself to the additional operating requirements which accompany the new endgame capability.

SECTION 2

DATA REQUIREMENTS

There are twelve sets of input cards, each made up of one or more cards, which comprise the new inputs to the DSAMAM program. The format for these inputs is shown on the forms in Figure 2-1 and each set is discussed below. The new inputs are inserted in the data for the old DSAMAM program immediately following the title cards.

All inputs other than the control parameters are read in as FORTRAN real variables. This means that normally they should be entered with an explicitly designated decimal point. If they are entered without a decimal point, they must be right-justified and the implied decimal point will be after the rightmost digit. All of the Cartesian coordinates requested on the input forms are to be in the aircraft body coordinate system. This coordinate system, under the name "stability coordinates," is defined on page 3-22 of the Final Report on the Dynamic SAM-Aircraft Study. Because in the basic DSAMAM program the aircraft is essentially considered to be a single point, the location of the origin relative to the components of the aircraft is not specified in the definition of the coordinate system. However, since the endgame addition represents the aircraft in a variety of ways (e.g., a set of points or a set of ellispoids) the location of the origin must be specified for the aircraft body coordinate system. The choice

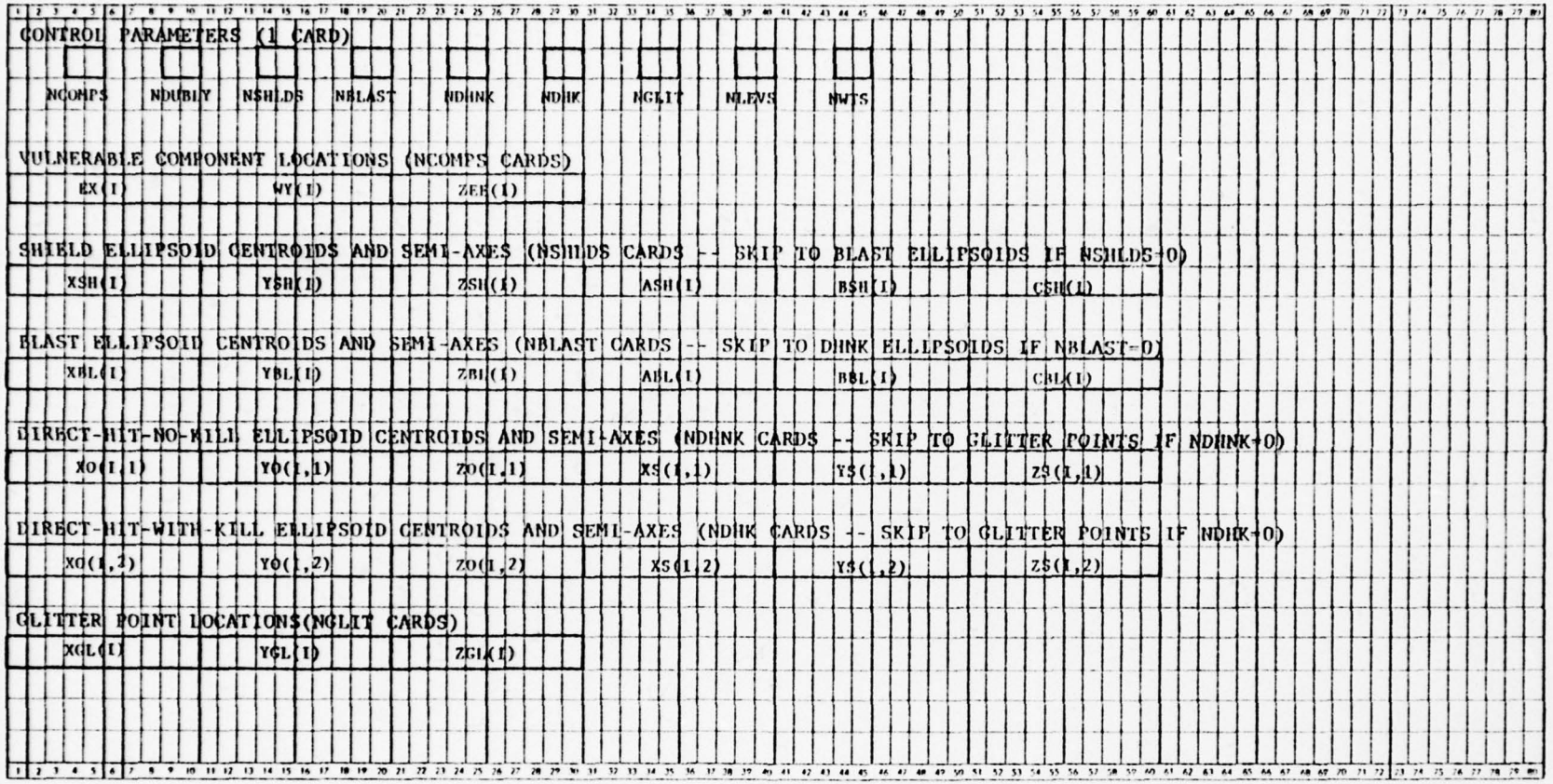

FIGURE 2-1

DSAMAM ENDGAME INPUTS

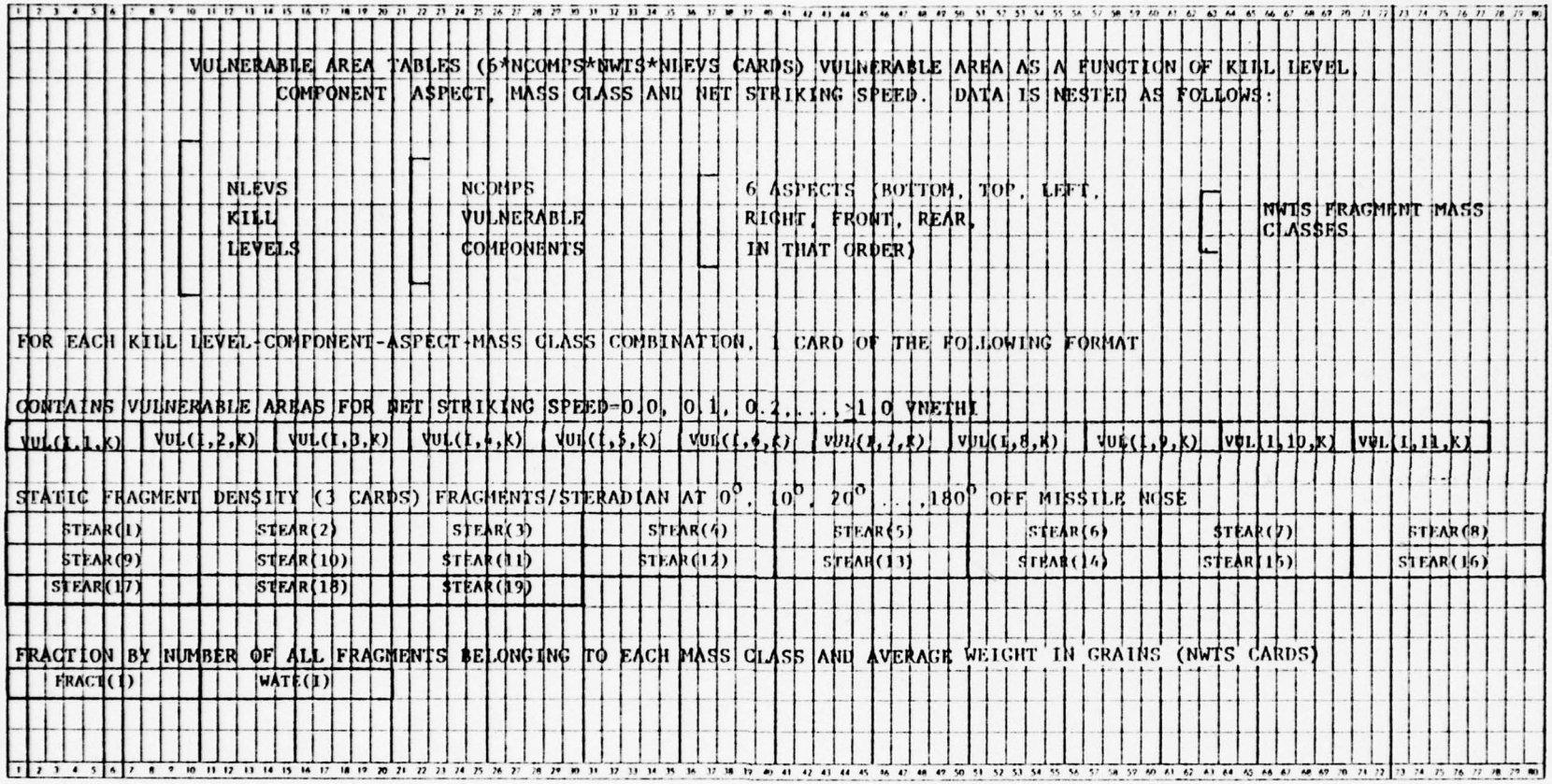

FIGURE 2-1 (continued)

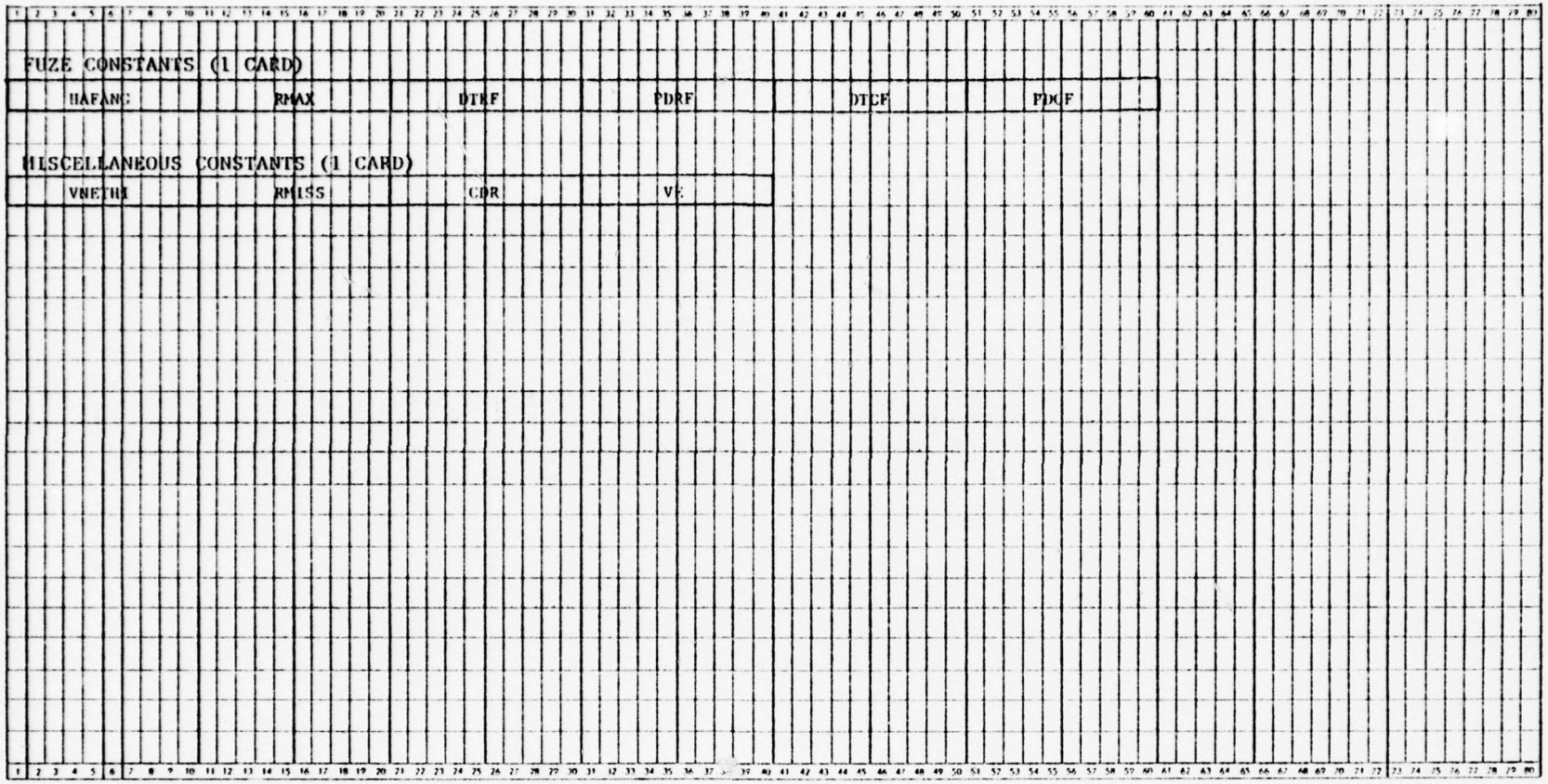

FIGURE 2-1 (continued)

is arbitrary; however, the user will probably wish the point to correspond to some natural feature of the aircraft (e.g., nose, center of gravity, pilot).

2.1 Control Parameters

The control parameters are read in on the first card and define the number of cards to follow. These nine parameters are read in as FORTRAN integer variables. That is, the numbers must be right-justified and no decimal points may appear. The definitions of each of the parameters appear in Section 5.

The control parameters are limited by the following constraints:

$$1 \leq NCOMPS \leq 25^*$$
$$0 \leq NDUBLY \leq [NCOMPS/2]$$
$$0 \leq NSHLDS \leq 25$$
$$0 \leq NBLAST \leq 25$$
$$0 \leq NDHNK \leq 25$$
$$0 \leq NDHK \leq NDHNK$$
$$1 \leq NGLIT \leq 25$$
$$1 \leq NLEVS \leq 4^*$$
$$1 \leq NWTS \leq 10^*$$

where the symbol [] is read "the greatest integer less than or equal to."

2.2 Vulnerable Component Locations

Vulnerable component locations are read in, one to a card, with the units to be feet. There must be at least one vulner-

---

* These limits are based on the assumption of being able to utilize 300K (octal) of computer core. If less core is available, one or more of these numbers must be reduced (see discussion of vulnerable area inputs).

able component. If the control parameter NDUBLY is greater than zero, then the first NDUBLY pairs of vulnerable components are assumed to be doubly vulnerable.

2.3 Ellipsoids

There are four sets of ellipsoid centroids and semi-axes. The units are to be feet. Each card contains the coordinates of one centroid and the corresponding semi-axes. Any of these sets may be omitted if the corresponding control parameter is zero. If there are no direct-hit-no-kill-ellipsoids, then there can be no direct-hit-with-kill-ellipsoids.

2.4 Glitter Point Locations

Glitter point locations are read in, one to a card, with the units to be feet. At least one glitter point must be present.

2.5 Vulnerable Area Tables

The vulnerable area tables are the most extensive and complicated set of inputs. The nesting of these cards is shown on the second page of Figure 2-1. The outermost level of nesting is by kill level. All cards for each kill level are grouped together. The second level of nesting is by vulnerable component. Within a particular kill level all cards for each vulnerable component are grouped together. The third level of nesting is by aspect. For any component at a particular kill level the cards for each aspect are grouped together. The aspects are in the order: bottom, top, left, right, front, rear. The innermost level of nesting is by fragment mass class. Thus,

for a particular aspect of a particular vulnerable component at a particular kill level, there must be one vulnerable area input card for each fragment mass class. Each individual card contains 11 vulnerable areas, one for each value of striking speed from 0.0, 0.1, 0.2,..., $\geq$1.0·VNETHI. The units are square feet.

The vulnerable area data is read into the FORTRAN array VUL(I,J,K). The subscript I denotes kill level. The subscript J denotes striking speed. The subscript K is a composite combining aspect, component and fragment mass class. The formula for computing K is:

K = NWTS·(6·component number +aspect number-7)+mass class number.

The array VUL requires core storage of 66·NCOMPS·NWTS·NLEVS words. Thus, to accommodate 25 components, 4 kill levels and 10 mass classes requires 66,000 words for VUL alone and thus demands the full 98,304 word capacity of the CDC 6600 computer system at NADC. Since it requires a special arrangement to be allowed to use this much core, it is normally desirable to restrict the number of components, kill levels and/or mass classes in order to reduce the storage requirements of VUL. For example, the listing of the DSAMAM program in Section 4 is for a case limited to 12 components, 1 mass class, and 2 kill levels. Thus, VUL requires only 1,584 words and the program can be run using less than 40,000 words of core.

2.6 Fragment Densities

The static explosion fragment density data is read in from three cards. The densities are in fragments per steradian. There are values read in for angles of 0°, 10°, 20°,...,180° for a total of 19 entries (8 on each of the first two cards and three on the third).

2.7 Fragment Mass Classes

The fraction by number of all fragments belonging to each mass class and the average weight of each class are read in from NWTS cards. Each card contains the average weight in grains of the fragments in one class and the fraction by number of all fragments in that class.

2.8 Fuze Parameters

There is one card used to read in various constants for the radar and contact fuzes. This card contains the half-angle of the cone of the radar fuze, the maximum range of the radar fuze, the delay time of the radar fuze, the dud probability for the radar fuze, the delay time of the contact fuze, and the dud probability of the contact fuze.

2.9 Miscellaneous Constants

Finally, four miscellaneous constants are read in on one data card. These are the normalizing value for the striking speed argument in the vulnerable area tables, the range at which a miss is assumed given that the point of closest approach has been passed, the fragment drag coefficient, and the static emission speed of the fragments.

SECTION 3

NEW DSAMAM OUTPUT

The following pages of this section show those portions of the DSAMAM output which differ from the basic DSAMAM output due to the endgame addition.

There are two types of new output which appear. The first is simply a listing of the new input data. This listing is complete except for the omission of the vulnerable area tables. The second output type is the "summary of kill" which appears at the time of missile detonation. The summary includes:

1. Time of detonation due to radar fuze.
2. Range from missile to target at detonation.
3. Inertial coordinates of missile and target at detonation.
4. Coordinates of missile in aircraft body system.
5. Coordinates of aircraft in missile body system.
6. Probabilities of each component having survived this single missile at all kill levels.
7. Probabilities of each component having survived all missiles up to and including this one at all kill levels.
8. Probabilities of the aircraft having been killed by this single missile at all kill levels.
9. Probabilities of the aircraft having been killed by all missiles up to and including this one at all kill levels.

```
*       TEST CASE
*               DEMONSTRATE AIR CRAFT TRAJ GENERATION
*               AND NEW MISSILE GUIDANCE MODE

ST FLIGHT        THIS IS REGULAR TITLE-SAMPLE RUN


INPUT DATA
TSTART =   0.00    TOTAL =    60.00    HP=  .0625  DTPO =  2.00
    IGUIDE =  2    IAC =  1   IPLOT =  0   DPLOT =   1.00
    IACIN =  0   IACOUT =  1   IEDIT =  0   ISTOR =  1
    IMODE =  1



NUMBER OF COMPONENTS                          = 12
NUMBER OF DOUBLY VULNERABLE PAIRS             =  0
NUMBER OF SHIELDING ELLIPSOIDS                =  0
NUMBER OF BLAST ELLIPSOIDS                    =  1
NUMBER OF DIRECT-HIT-NO-KILL ELLIPSOIDS       =  8
NUMBER OF DIRECT-HIT-WITH-KILL ELLIPSOIDS     =  8
NUMBER OF GLITTER POINTS                      = 23
NUMBER OF KILL LEVELS                         =  2
NUMBER OF FRAGMENT WEIGHT CLASSES             =  1

                COMPONENT LOCATIONS
                    X                Y                Z
    ==========================================================
   1            -8.70             0.00             4.70
   2           -34.10             0.00             1.80
   3           -20.30             0.00             1.40
   4           -17.90             1.90             3.50
   5           -17.90            -1.90             3.50
   6           -23.50             1.90             3.60
   7           -23.50            -1.90             3.60
   8           -28.20             0.00             3.10
   9           -23.20             4.60             5.60
  10           -23.20            -4.60             5.60
  11           -35.30             0.00             3.70
  12           -32.30             0.00             3.70
```

BLAST ELLIPSOIDS
CENTROIDS AND SEMI-AXES

	X	Y	Z	A	B	C
1	-23.40	0.00	5.00	35.64	40.09	35.64

DIRECT-HIT-NO-KILL ELLIPSOIDS
CENTROIDS AND SEMI-AXES

	X	Y	Z	A	B	C
1	-23.10	0.00	5.00	23.10	3.00	4.00
2	-41.60	0.00	11.10	3.80	.20	3.80
3	-44.40	0.00	15.30	2.80	.13	2.80
4	-25.50	6.80	5.40	4.70	4.70	.50
5	-25.50	-6.80	5.40	4.70	4.70	.50
6	-29.30	15.30	5.40	4.00	4.00	.30
7	-29.30	-15.30	5.40	4.00	4.00	.30
8	-40.80	0.00	3.30	4.30	8.33	.20

DIRECT-HIT-WITH-KILL ELLIPSOIDS
CENTROIDS AND SEMI-AXES

	X	Y	Z	A	B	C
1	-23.10	0.00	5.00	23.10	3.00	4.00
2	-41.60	0.00	11.10	3.80	.20	3.80
3	-44.40	0.00	15.30	2.80	.13	2.80
4	-25.50	6.80	5.40	4.70	4.70	.50
5	-25.50	-6.80	5.40	4.70	4.70	.50
6	-29.30	15.30	5.40	4.00	4.00	.30
7	-29.30	-15.30	5.40	4.00	4.00	.30
8	-40.80	0.00	3.30	4.30	8.33	.20

GLITTER POINT LOCATIONS

	X	Y	Z
1	-3.33	1.70	2.50
2	-3.33	-1.70	2.50
3	-45.00	0.00	6.30
4	-31.50	19.60	7.60
5	-31.50	-19.60	7.60
6	-15.90	2.33	7.20
7	-15.90	-2.33	7.20
8	-30.10	2.20	7.60
9	-30.10	-2.20	7.60
10	-32.80	0.00	9.70
11	-44.20	0.00	7.50
12	-43.40	0.00	18.06
13	-40.50	8.83	6.20
14	-40.50	-8.83	6.20
15	-36.30	2.33	5.30
16	-36.30	-2.33	5.30
17	-43.70	2.00	5.30
18	-43.70	-2.00	5.30
19	-3.20	0.00	6.50
20	-10.00	0.00	8.60
21	-.83	0.00	5.00
22	-19.00	0.00	1.60
23	-32.80	0.00	2.10

STATIC FRAGMENT DENSITY BY 10 DEGREE INTERVALS

0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0.	0.	0.	0.	0.	0.	0.	0.	1244.	1228.	1244.	0.	0.	0.	0.	0.	0.	0.	0.

FRAGMENT DISTRIBUTION BY WEIGHT

AVERAGE WEIGHT IN GRAINS	FRACTION OF ALL FRAGMENTS
145.0	1.00

HALF-ANGLE OF RADAR FUZE	= 72.0 DEGREES
MAXIMUM RANGE OF RADAR FUZE	= 200. FEET
DELAY TIME OF RADAR FUZE	= 0.000 SECONDS
DUD PROBABILITY OF RADAR FUZE	= 0.000
DELAY TIME OF CONTACT FUZE	= 0.000 SECONDS
DUD PROBABILITY OF CONTACT FUZE	= 0.000
NORMALIZING SPEED FOR VULNERABLE AREA TABLE	= 5000. FPS.
MISS ASSUMED AFTER FAILURE TO FUZE WHEN RANGE	= 800. FEET
FRAGMENT DRAG COEFFICIENT	= .01200
FRAGMENT EJECTION SPEED	= 8200. FPS.

```
*****MISSILE TYPE 2*****

LIST OF EXTR

 J     EXTR(J)
 1   1.0000000E+03   NEVER BEGIN MANEUVER
24   5.0000000E+00   TIME BETWEEN MISSILES (SEC)
25   1.0000000E+03   NEVER FIRE SECOND SALVO
41   1.0000000E+05   MAXIMUM LAUNCH RANGE (FT)
42   0.              MINIMUM LAUNCH RANGE (FT)
43   5.0000000E+04   MAX ALTITUDE FOR LAUNCH (FT)
44   0.              MIN TARGET ALTITUDE (FT)
48   9.0000000E+01   MAX LAUNCH ELEVATION (DEG)
49   0.              MIN TARGET ELEVATION (DEG)
53   1.2000000E+04   GUIDANCE GAIN
54   1.5000000E+04   RANGE FROM MISSILE TO A/C BEGIN HOMING (FT)
55   6.0000000E+01   FRONT VULNERABLE AREA (SQ FT)
56   6.0000000E+02   REAR VUL AREA (SQ FT)
57   1.8000000E+02   SIDE VUL AREA (SQ FT)
58   6.0250000E+03   BOTTOM VUL AREA (SQ FT)
59   5.0000000E-03   TRACKING ERROR (RAD)
60   2.0000000E+01   ERROR FOR HOMING GUIDANCE (FT)

LIST OF IEXTR

 J   IEXTR(J)
11        1          = MISSILES IN SALVO
12        2          = SALVOS
17        1          DO NOT DETECT OR ACQUIRE
20       20          = MISSILES ALLOWED IN AIR
26        0          SUPPRESS ANGULAR RATE TEST
27        0          SUPPRESS SRP & CLOSING TEST

INITIAL AIRCRAFT STATE VECTOR
    POSITION  -2.5000000E+04   0.              5.0000000E+03
              2.5495100E+04   3.1415930E+00   1.0973956E-01
    VELOCITY   5.0000000E+02   0.              0.
               5.0000000E+02   0.              0.

ALTITUDE OF SAM SITE      0. FT.  STRUCTURE LIMIT 2.0 G'S  THROTTLE SETTING  .30
    NUMBER OF TIME LAGS   1      TIME LAGS IN SEC.     .100

*****F-4J IS A/C AERO TABLES*****
```

TIME= 0.010 A/C FLAGS- 1 1 1 SAMSITE FLAGS- 1 1 1

AIRCRAFT VARIABLES

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-25000.0	0.0	5000.0	25495.	500.	0.	0.0	500.0

MACH	ALPHA	GEORGE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.49	0.00	0.00	0.	.30	0.	0.	0.000	0.000	0.000

ACOM	AOUTA	AOUTD	AOUT	VDOT
0.0	0.0	0.0	0.0	0.0

*****MISSILE NO. 1 (BODY NO. 11 IS LAUNCHED AT TIME = 0.000

TIME= 0.000 A/C FLAGS- 1 1 1 SAMSITE FLAGS- 4 0 0

AIRCRAFT VARIABLES

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-25000.0	0.0	5000.0	25495.	500.	0.	0.0	500.0

MACH	ALPHA	GEORGE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.49	0.00	0.00	0.	.30	0.	0.	0.000	0.000	0.000

ACOM	AOUTA	AOUTD	AOUT	VDOT
0.0	0.0	0.0	0.0	0.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
1	0.	0.	0.	-9.1	-.0	4.2	10.0	0.00	25495.	0.0	0.00	0.00	0.000	0.000

TIME= 2.000 A/C FLAGS- 2 1 1 SAMSITE FLAGS- 5 1 0

AIRCRAFT VARIABLES STRELT

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-23999.9	0.0	5000.0	24515.	500.	0.	0.0	500.1

MACH	ALPHA	GEORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.30	1.00	5493.	.30	40004.	5429.	.294	.040	.970

AGOM	AOUTA	AOUTO	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
1	-759.	-0.	259.	-797.0	-.0	237.2	831.5	.72	23710.	1318.3	0.00	0.00	0.000	0.000

TIME= 4.000 A/C FLAGS- 2 1 1 SAMSITE FLAGS- 5 1 0

AIRCRAFT VARIABLES STRELT

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-22999.7	0.0	5000.0	23537.	500.	0.	0.0	500.1

MACH	ALPHA	GEORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.30	1.00	5494.	.30	40004.	5429.	.294	.040	.970

AGOM	AOUTA	AOUTO	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
1	-3258.	-0.	917.	-1704.9	-.0	416.2	1755.0	1.55	20159.	2243.7	0.00	0.00	0.000	0.000

*****MISSILE NO. 2 (BODY NO. 2) IS LAUNCHED AT TIME =   5.000

TIME=   5.000   A/C FLAGS- 2 1 1   SAMSITE FLAGS- 4 1 0

AIRCRAFT VARIABLES STRELT

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-22499.6	0.0	5000.0	23048.	500.	0.	0.0	500.2

MACH	ALPHA	GFORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.30	1.00	5494.	.30	40004.	5430.	.294	.040	.970

ACOM	AOUTA	AOUTD	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
1	-5103.	-0.	1351.	-1882.1	-.0	426.7	1929.9	1.74	17775.	2419.2	0.00	0.00	0.000	0.000
2	0.	0.	0.	-9.0	-.0	4.4	10.0	0.00	23048.	0.0	0.00	0.00	0.000	0.000

TIME=   6.000   A/C FLAGS- 2 1 1   SAMSITE FLAGS- 5 2 0

AIRCRAFT VARIABLES STRELT

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-21999.4	0.0	5000.0	22569.	500.	0.	0.0	500.2

MACH	ALPHA	GFORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.30	1.00	5494.	.30	40004.	5430.	.294	.040	.970

ACOM	AOUTA	AOUTD	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
1	-6956.	-0.	1764.	-1903.3	-.0	399.2	1944.7	1.75	15349.	2433.6	0.00	0.00	0.000	0.000
2	-182.	-0.	75.	-374.8	-.0	140.3	400.4	.34	22366.	884.5	0.00	0.00	0.000	0.000

TIME= 8.000 A/C FLAGS- 2 1 1 SAMSITE FLAGS- 5 2 0

AIRCRAFT VARIABLES SIREL1

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-20999.0	0.0	5000.0	21586.	500.	0.	0.0	500.3

MACH	ALPHA	GFORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.31	1.00	5494.	.30	40004.	5430.	.294	.040	.970

ACOM	AOUTA	AOUTB	AOUT	VDOT
1.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
1	-10843.	0.	2528.	-1940.0	.0	375.6	1976.0	1.78	10455.	2459.7	240.32	.00	-.641	-.000
2	-1773.	-0.	578.	-1233.4	-.0	554.6	1283.3	1.13	19728.	1769.0	0.00	0.00	0.000	0.000

TIME= 10.700 A/C FLAGS- 2 1 1 SAMSITE FLAGS- 5 2 0

AIRCRAFT VARIABLES SIREL1

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-19998.4	0.0	5000.0	20614.	500.	0.	0.0	500.3

MACH	ALPHA	GFORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.29	1.00	5494.	.30	40004.	5431.	.294	.040	.970

ACOM	AOUTA	AOUTB	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMEDAE	LAMBDAA	DELE	DELA
1	-14741.	0.	3328.	-1952.5	.0	453.9	2004.6	1.82	5516.	2475.0	654.86	.00	-1.707	-.000
2	-5068.	-0.	1451.	-1870.6	-.0	464.0	1927.3	1.73	15346.	2414.0	0.00	0.00	0.000	0.000

*****MISSILE NO. 3 (BODY NO. 3) IS LAUNCHED AT TIME = 10.000

TIME= 10.000 A/C FLAGS- 2 1 1 SAMSITE FLAGS- 4 2 0

AIRCRAFT VARIABLES STRFLT

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-19598.4	0.0	5000.0	20614.	500.	0.	0.0	500.3

MACH	ALPHA	GEORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.29	1.00	5494.	.30	40004.	5431.	.294	.040	.970

ACCM	AOUTA	AOUTD	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
1	-14741.	0.	3328.	-1952.5	.0	453.9	2004.6	1.82	5516.	2475.0	654.86	.00	-1.707	-.000
2	-5068.	-0.	1451.	-1870.6	-.0	464.0	1927.3	1.73	15346.	2414.0	0.00	0.00	0.000	0.000
3	0.	0.	0.	-8.9	-.0	4.6	10.0	0.00	20614.	0.0	0.00	0.00	0.000	0.000

LAST MISSILE IN SALVO FIRED AT TIME = 10.000

TIME= 12.000 A/C FLAGS- 2 1 1 SAMSITE FLAGS- 6 3 0

AIRCRAFT VARIABLES STRFLT

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-18997.7	0.0	5000.0	19645.	500.	0.	0.0	500.4

MACH	ALPHA	GEORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.29	1.00	5494.	.30	40004.	5431.	.294	.040	.970

ACCM	AOUTA	AOUTD	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
1	-18525.	0.	4569.	-1675.1	-.0	935.9	1918.8	1.76	639.	2238.2	10846.87	.00	-10.000	-.000
2	-8852.	-0.	2325.	-1913.8	-.0	409.7	1957.2	1.77	10492.	2438.8	242.96	-.00	0.000	0.000
3	-754.	-0.	291.	-783.2	-.0	271.7	829.0	.72	18841.	1310.7	0.00	0.00	0.000	0.000

SUMMARY OF KILL DUE TO MISSILE NO. 1

****MISSILE NO. 1 BURSTS DUE TO RADAR FUZE AT TIME= 12.270 AND RANGE= 191.0 FEET

STATE VECTORS IN INERTIAL COORDINATES AT BURST

	X	Y	Z	VX	VY	VZ
AIRCRAFT	-19462.	0.	5000.	500.4	0.0	0.0
MISSILE	-19963.	0.	4838.	-1547.5	-.0	1069.9

MISSILE IN A/C BODY COORDINATES

X	Y	Z	ELEVATION	AZIMUTH
-115.16	.00	-152.42	-52.93	180.00

A/C IN MISSILE BODY COORDINATES

X	Y	Z	ELEVATION	AZIMUTH
96.46	-.00	-182.50	72.61	.00

MISSILE STATUS AT BURST

OMEG	AM1	ANY	DEL	AB
3.724E-10	-7.430E+02	-5.528E+02	-1.000E+01	1.431E+01
7.859E-01	6.190E-07	-8.773E-08	-5.757E-09	2.092E-09
-3.428E-10	8.660E+02			

COMPONENT NUMBER	KILL LEVEL 1 SINGLE-SHOT SURVIVAL PROBABILITY	KILL LEVEL 1 CUMULATIVE SURVIVAL PROBABILITY	KILL LEVEL 2 SINGLE-SHOT SURVIVAL PROBABILITY	KILL LEVEL 2 CUMULATIVE SURVIVAL PROBABILITY
1	.996	.996	.989	.989
2	1.000	1.000	.999	.999
3	1.000	1.000	.995	.995
4	1.000	1.000	.950	.950
5	1.000	1.000	.950	.950
6	1.000	1.000	.967	.967
7	1.000	1.000	.967	.967
8	1.000	1.000	.903	.903
9	1.000	1.000	.966	.966
10	1.000	1.000	.966	.966
11	1.000	1.000	.996	.996
12	1.000	1.000	.994	.994

KILL LEVEL 1 AIRCRAFT SINGLE-SHOT KILL PROBABILITY	KILL LEVEL 1 AIRCRAFT CUMULATIVE KILL PROBABILITY	KILL LEVEL 2 AIRCRAFT SINGLE-SHOT KILL PROBABILITY	KILL LEVEL 2 AIRCRAFT CUMULATIVE KILL PROBABILITY
.004	.004	.336	.336

TIME= 14.000 A/C FLAGS- 2 1 1 SAMSITE FLAGS- 6 3 0

AIRCRAFT VARIABLES STEELT

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-17995.9	0.0	5000.0	18679.	500.	0.	0.0	500.4

MACH	ALPHA	GFORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.29	1.00	5494.	.30	40604.	5432.	.294	.040	.970

ACOM	AOUTA	AOUTO	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
2	-12097.	0.	3199.	-1922.8	.0	490.4	1984.4	1.80	5598.	2452.2	656.01	.00	-1.819	-.000
3	-3265.	-0.	1059.	-1679.7	-.0	491.4	1750.1	1.55	15308.	2233.1	0.00	0.00	0.000	0.000

TIME= 16.000 A/C FLAGS- 2 1 1 SAMSITE FLAGS- 6 3 0

AIRCRAFT VARIABLES STEELT

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-16995.9	0.0	5000.0	17716.	501.	0.	0.0	500.5

MACH	ALPHA	GFORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.29	1.00	5494.	.30	40304.	5432.	.294	.040	.970

ACOM	AOUTA	AOUTO	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
2	-11416.	0.	4539.	-1648.9	-.0	955.4	1905.7	1.75	760.	2257.6	8289.33	.00	-10.000	-.000
3	-6888.	-0.	2071.	-1876.8	-.0	483.6	1938.1	1.75	10523.	2418.0	0.00	0.00	0.000	0.000

SUMMARY OF KILL DUE TO MISSILE NO. 2

****MISSILE NO. 2 BURSTS DUE TO RADAR FUZE AT TIME= 16.730 AND RANGE= 187.8 FEET

STATE VECTORS IN INERTIAL COORDINATES AT BURST

	X	Y	Z	VX	VY	VZ
AIRCRAFT	-16831.	0.	5000.	560.5	0.0	0.0
MISSILE	-16938.	0.	4845.	-1495.1	-.0	1106.4

MISSILE IN A/C BODY COORDINATES

X	Y	Z	ELEVATION	AZIMUTH
-120.46	.00	-144.10	-50.11	180.00

A/C IN MISSILE BODY COORDINATES

X	Y	Z	ELEVATION	AZIMUTH
99.20	-.00	-179.52	72.91	.00

MISSILE STATUS AT BURST

OMEG	AM1	ANY	DEL	AB
3.753E-10	-3.790E+02	-5.771E+02	-1.000E+01	1.519E+01
8.198E-01	5.796E-07	-8.150E-08	-5.615E-09	1.975E-09
-1.00E-10	8.84E+02			

COMPONENT NUMBER	KILL LEVEL 1 SINGLE-SHOT SURVIVAL PROBABILITY	KILL LEVEL 1 CUMULATIVE SURVIVAL PROBABILITY	KILL LEVEL 2 SINGLE-SHOT SURVIVAL PROBABILITY	KILL LEVEL 2 CUMULATIVE SURVIVAL PROBABILITY
1	.992	.988	.974	.963
2	1.000	1.000	.997	.996
3	1.000	1.000	.889	.849
4	1.000	1.000	.881	.837
5	1.000	1.000	.879	.835
6	1.000	1.000	.917	.887
7	1.000	1.000	.915	.885
8	1.000	1.000	.752	.679
9	1.000	1.000	.914	.883
10	1.000	1.000	.914	.883
11	1.000	1.000	.987	.983
12	1.000	1.000	.981	.975

KILL LEVEL 1 AIRCRAFT SINGLE-SHOT KILL PROBABILITY	KILL LEVEL 1 AIRCRAFT CUMULATIVE KILL PROBABILITY	KILL LEVEL 2 AIRCRAFT SINGLE-SHOT KILL PROBABILITY	KILL LEVEL 2 AIRCRAFT CUMULATIVE KILL PROBABILITY
.008	.012	.458	.777

TIME= 18.000 A/C FLAGS- 2 1 1 SAMSITE FLAGS- 6 3 0

AIRCRAFT VARIABLES STRELT

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-15994.8	0.0	5000.0	16758.	501.	0.	0.0	500.6

MACH	ALPHA	GEORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.29	1.00	5494.	.30	40005.	5432.	.294	.040	.970

ACOM	AOUTA	AOUTD	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
3	-10578.	0.	3021.	-1894.7	.0	519.1	1964.5	1.78	5675.	2425.9	716.02	.00	-1.950	-.000

TIME= 20.000 A/C FLAGS- 2 1 1 SAMSITE FLAGS- 6 3 0

AIRCRAFT VARIABLES STRELT

RX	RY	RZ	RMAG	VX	VY	VZ	VMAG
-14993.6	0.0	5000.0	15805.	501.	0.	0.0	500.6

MACH	ALPHA	GEORCE	THRUST	THROTL	LIFT	DRAG	CL	CD	CLMX
.46	5.29	1.00	5494.	.30	40005.	5433.	.294	.040	.970

ACOM	AOUTA	AOUTD	AOUT	VDOT
0.0	0.0	0.0	0.0	.0

MISSILE OUTPUT

NO.	X	Y	Z	VX	VY	VZ	VMAG	MACH	RREL	RDOT	LAMBDAE	LAMBDAA	DELE	DELA
3	-14316.	0.	4469.	-1597.8	.0	932.7	1881.1	1.72	900.	2234.1	7014.66	.00	-10.000	-.000

SUMMARY OF KILL DUE TO MISSILE NO. 3

****MISSILE NO. 3 BURSTS DUE TO RADAR FUZE AT TIME= 20.402 AND RANGE= 209.2 FEET

STATE VECTORS IN INERTIAL COORDINATES AT BURST

	X	Y	Z	VX	VY	VZ
AIRCRAFT	-14792.	0.	5000.	500.6	0.0	0.0
MISSILE	-14928.	0.	4839.	-1416.4	-.0	1154.8

MISSILE IN A/C BODY COORDINATES

X	Y	Z	ELEVATION	AZIMUTH
-147.66	.00	-148.14	-45.09	180.00

A/C IN MISSILE BODY COORDINATES

X	Y	Z	ELEVATION	AZIMUTH
59.84	-.00	-209.43	73.38	.00

MISSILE STATUS AT BURST

OMEG	AM1	ANY	DEL	AB
2.956E-11	-7.669E+02	-6.408E+02	-1.000E+01	1.705E+01
6.832E-01	4.034E-07	-6.365E-08	-4.530E-09	1.523E-09
-2.00E-10	6.03E+02			

COMPONENT NUMBER	KILL LEVEL 1 SINGLE-SHOT SURVIVAL PROBABILITY	KILL LEVEL 1 CUMULATIVE SURVIVAL PROBABILITY	KILL LEVEL 2 SINGLE-SHOT SURVIVAL PROBABILITY	KILL LEVEL 2 CUMULATIVE SURVIVAL PROBABILITY
1	.989	.977	.966	.931
2	1.000	1.000	.996	.992
3	1.000	1.000	.837	.711
4	1.000	1.000	.836	.699
5	1.000	1.000	.834	.697
6	1.000	1.000	.881	.781
7	1.000	1.000	.880	.779
8	1.000	1.000	.642	.436
9	1.000	1.000	.881	.778
10	1.000	1.000	.881	.778
11	1.000	1.000	.979	.962
12	1.000	1.000	.970	.945

	KILL LEVEL 1 AIRCRAFT SINGLE-SHOT KILL PROBABILITY	KILL LEVEL 1 AIRCRAFT CUMULATIVE KILL PROBABILITY	KILL LEVEL 2 AIRCRAFT SINGLE-SHOT KILL PROBABILITY	KILL LEVEL 2 AIRCRAFT CUMULATIVE KILL PROBABILITY
	.011	.023	.794	.953

SALVO NO. 1 COMPLETE AT TIME = 20.438
NEXT SALVO BEGINS AT TIME =1020.438

SECTION 4

PROGRAM LISTINGS

The following pages of this section are the FORTRAN program listings for those portions of the DSAMAM program which have been modified for the endgame. This includes the main program, subroutine MISSILE, and the following new subroutines:

- SPRAY
- STAB
- CONFUZE

```
      PROGRAM DYNSAM(INPUT,OUTPUT=/137,TAPE1,TAPE2,TAPE3,TAPE10,          SAM1      1
     1               TAPE5=INPUT,TAPE6=OUTPUT)                            SAM       3
      COMMON/DRIVE/TIME,HM,TSTART,TOTAL,EXTR(60),IEXTR(30),TITLE(18),      SAM       4
     1             DEG,G,PI,RAD                                           SAM       5
      COMMON/FLAGS/JPOL,KPOL,LPOL,JSAM,KSAM,LSAM,NMIN,ISTOP,IAC,IEDIT,     SAM       6
     1             IGUIDE,IMODE,MFLAG(20),JV                              SAM       7
      COMMON/ATMOF/PA(6),VA(6),ACOMA,ACOMD,ACOM,AOUTA,AOUTD,AOUT,VOUT,     SAM       8
     1             UNITV(3),A(3),D(3),UNITT(3),A1(3),D1(3),MACH,QA,       SAM       9
     2             ALPHA,LIFT,DRAG,GFORCE,UNITL(3),CL,CD,CLMX,SA,CA,      SAM      10
     3             THRUST,THROTL,ASMAX,ACTION,PASMX,DUMPL,DUMCL,ITAU,     SAM      11
     4             TAU(2),AUD(2,2)                                        SAM      12
      COMMON/ACDATA/TBLTR(13,21),CDC(21),CDCCL2(21),MACHMX(13),ALPHAO(21)  SAM      13
     1             ,DALPCL(21),CLMAX(21),AREA,WEIGHT                      SAM      14
      COMMON/MISSL/PM(6,20),VM(6,20),MACHM(20),QAM(20),SSA,AREAM,          SAM      15
     1             VV(2,20),DSL(2,20),AB(2,20),MN(20),RAM(20),RAMD(20)    SAM      16
      COMMON/ACINC/X(3,481),BC(9,481),RUNID(2),NPTS,NDUM1(6),DR(3)         SAM      17
      COMMON/PRINJ/IJ,IJX                                                  SAM      18
      COMMON /ONE/ NCOMPS,NLEVS,NWTS,NSHLDS,NBLAST,NGLIT,THA,RCHA,VE,      SAM1      2
     1DELT,XCM,YCM,ZCM,VNETNI,I                                            SAM1      3
      COMMON /TWO/ XGL(25),YGL(25),ZGL(25),XSH(25),YSH(25),ZSH(25),        SAM1      4
     1ASH(25),BSH(25),CSH(25),XBL(25),YBL(25),ZBL(25),ABL(25),BBL(25),     SAM1      5
     2CBL(25),XCMCLD(20),YCMOLD(20),ZCMOLD(20),EX(25),WY(25),ZEL(25),      SAM1      6
     3TAM(9),TMI(9)                                                        SAM1      7
      COMMON /THREE/ NDUBLY,NDHNK,NDHK,HAFANG,RMAX,DTRF,PDRF,DTCF,PDCF,    SAM1      8
     1RMISS,CDF                                                            SAM1      9
      COMMON /FOUR/ XO(25,2),YO(25,2),ZO(25,2),XS(25,2),YS(25,2),          SAM1     10
     1ZS(25,2),WATE(10)                                                    SAM1     11
      COMMON /FIVE/ VUL(2,11,72),STEAR(13),FRACT(10),SLOW(10)              SAM1     12
      COMMON /SIX/ CPS(4,25)                                               SAM1     13
      DIMENSION IHED(19)                                                   SAM1     14
      REAL    LIFT,MACH,MACHM,MACHMX                                       SAM      19
      INTEGER     AFLAGS(6)                                                SAM      20
      EQUIVALENCE (AFLAGS(1),JPOL)                                         SAM      21
      REAL    SVST(12),VPARM(3,20)                                         SAM      22
      REAL XAIR1(6),XAIR2(387)                                             SAM      23
      EQUIVALENCE (XAIR1(1),TBLTR(1,1)),  (XAIR2(1),TBLTR(7,1))           SAM      24
      INTEGER   JX(3),IGOORD(2)                                            SAM      25
      REAL    PARMNM(3,3),ONAME(6),ZWORD(4)                                SAM      26
      INTEGER   IPARM(3),JPARM(3)                                          SAM      27
      LOGICAL   IMU(8)                                                     SAM      28
      EQUIVALENCE (JX(1),J1),(JX(2),J2),(JX(3),J3),(ZWORD(1),ACTION)       SAM      29
      DATA BLANK/1H /                                                      SAM      30
      DATA CO/1H*/                                                         SAM      31
      DATA END/4H*END/, ACNM/4H*END/                                       SAM      32
      NAMELIST/INPUT/TOTAL,HM,TSTART,DTPO,IGOORD,IGUIDE,IPRINT,IAC,        SAM      33
     1               IPLOT,DPLOT,IACIN,IACOUT,IEDIT,ISTOR,IMODE            SAM      34
C*****INITIALIZE CONSTANTS                                                 SAM      35
      DEG=57.29578                                                         SAM      36
      G=32.174                                                             SAM      37
      PI=ATAN2(0.0,-1.0)                                                   SAM1     15
      RAD=1.745329E-02                                                     SAM      39
      A(3)=0.                                                              SAM      40
C*****ZERO EXTRA VARIABLES                                                 SAM      41
```

```
      DO 50  J=1,30                                                    SAM        42
      EXTR(J)=0.                                                       SAM        43
      EXTR(J+30)=0.                                                    SAM        44
   50 IEXTR(J)=0                                                       SAM        45
C*****INITIALIZE NAMELIST FLAGS                                        SAM        46
      IPLOT=0                                                          SAM        47
      ISTART=0.                                                        SAM        48
      IACIN=0                                                          SAM        49
      ISTOR=0                                                          SAM        50
      IACOUT=0                                                         SAM        51
      IEDIT=0                                                          SAM        52
      IPRINT=1                                                         SAM        53
      IAC=1                                                            SAM        54
      IGUIDE=1                                                         SAM        55
      IMODE=1                                                          SAM        56
      ICOORD(1)=1                                                      SAM        57
      ICOORD(2)=1                                                      SAM        58
C*****READ NAMLIST, COMMENT, AND TITLE                                 SAM        59
  100 READ(5,INPUT)                                                    SAM        60
      IF(TOTAL.LT.0.) GO TO 1000                                       SAM        61
C*****SET STORAGE FLAG IF TRAJECTORY OUTPUT IS DESIRED                 SAM        62
      IF(IACOUT .GT. 0) ISTOR=1                                        SAM        63
      WRITE(6,600)                                                     SAM        64
  600 FORMAT(1H1)                                                      SAM        65
  101 READ(5,500) TITLE                                                SAM        66
  500 FORMAT (18A4)                                                    SAM        67
      IF(TITLE(1) .NE. 60 ) GO TO 103                                  SAM        68
      WRITE(6,601) TITLE                                               SAM        69
  601 FORMAT(1X,18A4)                                                  SAM        70
      GO TO 101                                                        SAM        71
  103 WRITE(6,602) TITLE                                               SAM        72
  602 FORMAT (1H0,18A4//)                                              SAM        73
      WRITE(6,603) ISTART,TOTAL,HM,DTPO,IGUIDE,IAC,IPLOT,DPLOT,IACIN,  SAM        74
     1             IACOUT,IEDIT,ISTOR,IMODE                            SAM        75
  603 FORMAT(11H0INPUT DATA/9H ISTART =,F7.2,10H   TOTAL =,F9.2,3X,    SAM        76
     1       5HHM=,F7.4,2X,6HDTPO =,F6.2/5X,8HIGUIDE =,I3,3X,          SAM        77
     2       5HIAC =,I3,3X,7HIPLOT =,I3,3X,7HDPLOT =,F7.2,/5X,         SAM        78
     3       7HIACIN =,I3,3X,8HIACOUT =,I3,3X,7HIEDIT =,I3,3X,         SAM        79
     4       7HISTOR =,I3/5X,7HIMODE =,I3)                             SAM        80
C*****READ CONTROL PARAMETERS                                          SAM1       16
      READ(5,2000)NCOMPS,NDUBLY,NSHLDS,NBLAST,NDHNK,NDHK,NGLIT,NLEVS,  SAM1       17
     1NWTS                                                             SAM1       18
 2000 FORMAT(9(3X,I2))                                                 SAM1       19
      WRITE(6,3000)NCOMPS,NDUBLY,NSHLDS,NBLAST,NDHNK,NDHK,NGLIT,NLEVS,  SAM1       20
     1NWTS                                                             SAM1       21
 3000 FORMAT(////" NUMBER OF COMPONENTS",22X,"=",I3/                   SAM1       22
     1" NUMBER OF DOUBLY VULNERABLE PAIRS",9X,"=",I3/                  SAM1       23
     2" NUMBER OF SHIELDING ELLIPSOIDS",12X,"=",I3/                    SAM1       24
     3" NUMBER OF BLAST ELLIPSOIDS",16X,"=",I3/                        SAM1       25
     4" NUMBER OF DIRECT-HIT-NO-KILL ELLIPSOIDS   =",I3/               SAM1       26
     5" NUMBER OF DIRECT-HIT-WITH-KILL ELLIPSOIDS =",I3/               SAM1       27
     6" NUMBER OF GLITTER POINTS",16X,"=",I3/                          SAM1       28
     7" NUMBER OF KILL LEVELS",21X,"=",I3/                             SAM1       29
```

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     9" NUMBER OF FRAGMENT WEIGHT CLASSES",9X,"=",I3)                    SAM1   30
C*****READ COMPONENT LOCATIONS                                           SAM1   31
      READ(5,2001)(EX(K),WY(K),ZEE(K),K=1,NCOMPS)                        SAM1   32
110    2001 FORMAT(3F10.0)                                               SAM1   33
      WRITE(6,3001)                                                      SAM1   34
     3001 FORMAT(//16X,"COMPONENT LOCATIONS")                            SAM1   35
      WRITE(6,3002)(K,EX(K),WY(K),ZEE(K),K=1,NCOMPS)                     SAM1   36
     3002 FORMAT(19X,"X",14X,"Y",14X,"Z"/5X,45("=")/(I5,3F15.2))         SAM1   37
115  C*****READ SHIELD ELLIPSOID LOCATIONS AND SEMIAXES                  SAM1   38
      IF(NSHLDS.LT.1) GO TO 800                                          SAM1   39
      READ(5,2002)(XSH(K),YSH(K),ZSH(K),ASH(K),BSH(K),CSH(K),K=1,NSHLDS) SAM1   40
     2002 FORMAT(6F10.0)                                                 SAM1   41
      WRITE(6,3003)                                                      SAM1   42
120   3003 FORMAT("1",33X,"FRAGMENT SHIELDING ELLIPSOIDS")               SAM1   43
      WRITE(6,3004)(K,XSH(K),YSH(K),ZSH(K),ASH(K),BSH(K),CSH(K),         SAM1   44
     1K=1,NSHLDS)                                                        SAM1   45
     3004 FORMAT(37X,"CENTROIDS AND SEMI-AXES"/19X,"X",14X,"Y",14X,"Z",16X, SAM1 46
     1"A",14X,"B",14X,"C"/5X,45("="),2X,45("=")/(I5,3F15.2,2X,3F15.2))   SAM1   47
125  C*****READ BLAST ELLIPSOID LOCATIONS AND SEMIAXES                   SAM1   48
      800 IF(NBLAST.LT.1) GO TO 801                                      SAM1   49
      READ(5,2002)(XBL(K),YBL(K),ZBL(K),ABL(K),BBL(K),CBL(K),K=1,NBLAST) SAM1   50
      WRITE(6,3005)                                                      SAM1   51
     3005 FORMAT("1",39X,"BLAST ELLIPSOIDS")                             SAM1   52
130   WRITE(6,3004)(K,XBL(K),YBL(K),ZBL(K),ABL(K),BBL(K),CBL(K),         SAM1   53
     1K=1,NBLAST)                                                        SAM1   54
C*****READ DIRECT-HIT-NO-KILL ELLIPSOID LOCATIONS AND SEMIAXES           SAM1   55
      801 IF(NDHNK.LT.1) GO TO 802                                       SAM1   56
      READ(5,2002)(XO(K,1),YO(K,1),ZO(K,1),XS(K,1),YS(K,1),ZS(K,1),      SAM1   57
135  1K=1,NDHNK)                                                         SAM1   58
      WRITE(6,3006)                                                      SAM1   59
     3006 FORMAT(//34X,"DIRECT-HIT-NO-KILL ELLIPSOIDS")                  SAM1   60
      WRITE(6,3004)(K,XO(K,1),YO(K,1),ZO(K,1),XS(K,1),YS(K,1),ZS(K,1),   SAM1   61
     1K=1,NDHNK)                                                         SAM1   62
140  C*****READ DIRECT-HIT-WITH-KILL ELLIPSOID LOCATIONS AND SEMIAXES    SAM1   63
      IF(NDHK.LT.1) GO TO 802                                            SAM1   64
      READ(5,2002)(XO(K,2),YO(K,2),ZO(K,2),XS(K,2),YS(K,2),ZS(K,2),      SAM1   65
     1K=1,NDHK)                                                          SAM1   66
      WRITE(6,3007)                                                      SAM1   67
145   3007 FORMAT(//33X,"DIRECT-HIT-WITH-KILL ELLIPSOIDS")               SAM1   68
      WRITE(6,3004)(K,XO(K,2),YO(K,2),ZO(K,2),XS(K,2),YS(K,2),ZS(K,2),   SAM1   69
     1K=1,NDHK)                                                          SAM1   70
C*****READ GLITTER POINT LOCATIONS                                       SAM1   71
      802 READ(5,2001)(XGL(K),YGL(K),ZGL(K),K=1,NGLIT)                   SAM1   72
150   WRITE(6,3008)                                                      SAM1   73
     3008 FORMAT("1",13X,"GLITTER POINT LOCATIONS")                      SAM1   74
      WRITE(6,3002)(K,XGL(K),YGL(K),ZGL(K),K=1,NGLIT)                    SAM1   75
C*****READ VULNERABLE AREA TABLES                                        SAM1   76
      KIND=6*NCOMPS*NWTS                                                 SAM1   77
155   DO 803 LEV=1,NLEVS                                                 SAM1   78
      DO 803 K=1,KIND                                                    SAM1   79
      803 READ(5,2003)(VUL(LEV,J,K),J=1,11)                              SAM1   80
     2003 FORMAT(11F7.0)                                                 SAM1   81
C*****READ STATIC FRAGMENT DENSITY BY 10 DEGREE INTERVALS                SAM1   82
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150                READ(5,2004)STEAR                                          SAM1       83
                 2004 FORMAT(8F10.0)                                          SAM1       84
                      DO 804 I=1,19                                           SAM1       85
                  804 IHED(I)=10*(I-1)                                        SAM1       86
                      WRITE(6,3009)IHED,STEAR                                 SAM1       87
165                3009 FORMAT(//44X,"STATIC FRAGMENT DENSITY BY 10 DEGREE INTERVALS"/   SAM1       88
                     1"0",19I7/1X,1X3("=")/1X,19F7.0)                          SAM1       89
                   C*****READ FOR EACH MASS CLASS THE FRACTION OF ALL FRAGMENTS BELONGING  SAM1       90
                   C      TO THE CLASS AND THE AVERAGE MASS IN GRAINS          SAM1       91
                          READ(5,2005)(FRACT(KWT),WATE(KWT),KWT=1,NWTS)       SAM1       92
170                2005 FORMAT(2F10.0)                                         SAM1       93
                        WRITE(6,3010)(WATE(KWT),FRACT(KWT),KWT=1,NWTS)        SAM1       94
                    3010 FORMAT(//" FRAGMENT DISTRIBUTION BY WEIGHT"/         SAM1       95
                        1" AVERAGE WEIGHT     FRACTION OF"/                   SAM1       96
                        2"   IN GRAINS       ALL FRAGMENTS"/1X,32("=")/(F10.1,F17.2))  SAM1       97
175                C*****READ FUZE CONSTANTS                                  SAM1       98
                        READ(5,2004)HAFANG,RMAX,DTRF,PDRF,DTCF,PDCF           SAM1       99
                        WRITE(6,3011)HAFANG,RMAX,DTRF,PDRF,DTCF,PDCF          SAM1      100
                    3011 FORMAT(//" HALF-ANGLE OF RADAR FUZE",22X,"=",F6.1," DEGREES"/  SAM1      101
                        1" MAXIMUM RANGE OF RADAR FUZE",19X,"=",F5.0," FEET"/ SAM1      102
180                     2" DELAY TIME OF RADAR FUZE",22X,"=",F6.3," SECONDS"/ SAM1      103
                        3" DUD PROBABILITY OF RADAR FUZE",17X,"=",F6.3/       SAM1      104
                        4" DELAY TIME OF CONTACT FUZE",20X,"=",F6.3," SECONDS"/  SAM1      105
                        5" DUD PROBABILITY OF CONTACT FUZE",15X,"=",F6.3)     SAM1      106
                        HAFANG=HAFANG*RAD                                     SAM1      107
185                C*****READ MISCELLANY                                      SAM1      108
                        READ(5,2004)VNETHI,RMISS,COR,VE                       SAM1      109
                        WRITE(6,3012)VNETHI,RMISS,COR,VE                      SAM1      110
                    3012 FORMAT(" NORMALIZING SPEED FOR VULNERABLE AREA TABLE    =",F7.0,  SAM1      111
                        1" FPS."/                                             SAM1      112
190                     2" MISS ASSUMED AFTER FAILURE TO FUZE WHEN RANGE =",F5.0," FEET"/  SAM1      113
                        3" FRAGMENT DRAG COEFFICIENT",21X,"=",F8.5/           SAM1      114
                        5" FRAGMENT EMISSION SPEED",23X,"=",F7.0," FPS."/"1")  SAM1      115
                   C*****COMPUTE CONVENIENT CONSTANTS                         SAM1      116
                        THA=TAN(HAFANG)                                       SAM1      117
195                     RCHA=RMAX*ABS(COS(HAFANG))                            SAM1      118
                   C*****INITIALIZE CUMULATIVE COMPONENT SURVIVAL PROBABILITIES  SAM1      119
                        DO 75 LEV=1,NLEVS                                     SAM1      120
                        DO 75 K=1,NCOMPS                                      SAM1      121
                     75 CPS(LEV,K)=1.0                                        SAM1      122
200                C*****INITIALIZE MISSILE                                   SAM       81
                        CALL MISINT(KCUM)                                     SAM       82
                   C*****READ AND PRINT VARIABLE PARAMETERS                   SAM       83
                        DO 105 I = 1, 9                                       SAM       84
                        NPARM=I-1                                             SAM       85
205                     READ(5,503) ENDTST,JL,JPARM(I),(PARMNM(J,I),J=1,3),(VPARM(I,J),  SAM       86
                     1              J=1,JL)                                   SAM       87
                   503 FORMAT(A4,2I4,3A8,9F12.7/(6F12.7))                     SAM       88
                   C*****TEST FOR END OF VARIABLE PARAMETER DATA               SAM       89
                        IF(ENDTST .EQ. END) GO TO 106                         SAM       90
210                     JPARM(I)=JL                                           SAM       91
                     105 WRITE(6,605)I,(PARMNM(J,I),J=1,3),JL,JPARM(I),(VPARM(I,J),J=1,JL)  SAM       92
                     605 FORMAT(9HPARAM NO.,I2,2X,3A8,5X,14HNO. OF VALUES=,I3,5X,  SAM       93
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     1            $HLOCATION=,I3/(5X,4E16.7))                          SAM      94
      NPARM=3                                                          SAM      95
C*****READ AND PRINT EXTR                                              SAM      96
  106 DO 107 J = 1, 60                                                 SAM      97
      READ(5,505) ENDTST,K,Z,DNAME                                     SAM      98
  505 FORMAT(A4,I4,E12.7,6A8)                                          SAM      99
C*****TEST FOR END OF REAL EXTRA VARIABLE DATA                         SAM     100
      IF(ENDTST .EQ. END) GO TO 108                                    SAM     101
C*****IF THERE IS EXTRA DATA WRITE PRINTOUT HEADER FIRST TIME ONLY      SAM     102
      IF(J .EQ. 1) WRITE(6,607)                                        SAM     103
  607 FORMAT(13HOLIST OF EXTR//14H  J     EXTR(J))                     SAM     104
      EXTR(K)=Z                                                        SAM     105
  107 WRITE(6,608) K,Z,DNAME                                           SAM     106
  608 FORMAT(I3,1X,1PE14.7,3X,6A8)                                     SAM     107
C*****READ AND PRINT IEXTR                                             SAM     108
  108 DO 109 J = 1, 30                                                 SAM     109
      READ(5,508) ENDTST,K,IZ,DNAME                                    SAM     110
  508 FORMAT(A4,2I4,6A8)                                               SAM     111
C*****TEST FOR END OF INTEGER EXTRA VARIABLE DATA                      SAM     112
      IF(ENDTST .EQ. END) GO TO 110                                    SAM     113
C*****IF THERE IS IEXTRA DATA WRITE PRINTOUT HEADER FIRST TIME ONLY     SAM     114
      IF(J .EQ. 1) WRITE(6,609)                                        SAM     115
  609 FORMAT(14HOLIST OF IEXTR//13H  J  IEXTR(J))                      SAM     116
      IEXTR(K)=IZ                                                      SAM     117
  109 WRITE(6,610) K,IZ,DNAME                                          SAM     118
  610 FORMAT(I3,I7,11X,6A8)                                            SAM     119
C*****TEST TO SEE IF A/C TRAJECTORY IS GENERATED                       SAM     120
  110 IF(IAC .EQ. 2) GO TO 120                                         SAM     121
C*****READ AND PRINT STORED STATE VECTOR                               SAM     122
      JA=3*ICOORD(1)-2                                                 SAM     123
      JAA=JA+2                                                         SAM     124
      JB=3*ICOORD(2)+4                                                 SAM     125
      JBB=JB+2                                                         SAM     126
      READ(5,510) (SVST(J),J=JA,JAA),(SVST(J),J=JB,JBB)                SAM     127
  510 FORMAT (6E12.6)                                                  SAM     128
C*****CHANGE DEGREES TO RADIANS IF DATA IS IN SPHERICAL COORDINATES     SAM     129
      DO 113 I = 1,2                                                   SAM     130
      IF(ICCORD(I) .EQ. 1) GO TO 113                                   SAM     131
      K1=6*I-1                                                         SAM     132
      K2=K1+1                                                          SAM     133
      DO 112 J = K1,K2                                                 SAM     134
  112 SVST(J)=SVST(J)*RAD                                              SAM     135
  113 CONTINUE                                                         SAM     136
      IF(NPARM.EQ.0) JPARM(1)=0                                        SAM     137
      DO 10 I=1,NPARM                                                  SAM     138
      IF(JPARM(I).LT.0) GO TO 30                                       SAM     139
   10 CONTINUE                                                         SAM     140
    5 CALL COORD(SVST(1),ICOORD(1))                                    SAM     141
      CALL COORD(SVST(7),ICOORD(2))                                    SAM     142
      WRITE (6,612)                                                    SAM     143
  612 FORMAT (30HOINITIAL AIRCRAFT STATE VECTOR)                       SAM     144
      WRITE(6,613)  SVST                                               SAM     145
  613 FORMAT(5X,8HPOSITION,1P3E15.6/17X,1P3E15.6/5X,8HVELOCITY,        SAM     146
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     11P3E15.6/13X,1P3E15.6)
      DO 20 I=1,NPARM
      IF(JPARM(I).GE.0) GO TO 20
      DO 15 K=1,12
   15 FA(K)=SVST(K)
      GO TO 152
   20 CONTINUE
   30 READ(5,511) SSA,ASMAX,THROTS,ITAU,TAU
  511 FORMAT(3F6.0,I1,2F6.0)
      WRITE(6,615) SSA,ASMAX,THROTS,ITAU,(TAU(L),L=1,ITAU)
  615 FORMAT(21H0ALTITUDE OF SAM SITE,F7.0,4H FT.,2X,15HSTRUCTURE LIMIT,
     1              F4.1,4H G"S,2X,16HTHROTTLE SETTING,F5.2/5X,
     2            19HNUMBER OF TIME LAGS,I3,5X,17HTIME LAGS IN SEC.,2F8.3)
C*****TEST FOR READING OF A/C AERODYNAMIC DATA
      IF(IAC .EQ. 0) GO TO 115
      READ(5,512) XAIR1,ACNM,XAIR2
  512 FORMAT(6E12.5,A6/(6E12.5))
C*****TEST TO SEE IF A/C DATA IS PROPERLY LOADED AND IS NEEDED
  115 IF(ACNM .NE. END ) GO TO 117
C*****A/C DATA IS NOT LOADED WRITE MESSAGE + READ NEW DATA
      WRITE(6,620)
  620 FORMAT(51H0*****A/C AERODYNAMIC TABLES ARE NOT LOADED AND ARE,
     1            14H REQUIRED*****/15X,17HGOING TO NEXT RUN  )
      GO TO 100
C*****PRINT OUT TYPE OF A/C TABLES BEING USED
  117 WRITE(6,622) ACNM
  622 FORMAT(6H0*****,A4,24H IS A/C AERO TABLES*****)
      GO TO 125
C*****READ A/C TRAJECTORY DISPLACEMENT AND SAM ALTITUDE AND PRINT THEM
  120 READ(5,515) DR,SSA
  515 FORMAT(4F12.7)
      WRITE(6,625) DR,SSA
  625 FORMAT(46H0A/C TRAJECTORY IS READ IN AND IS DISPLACED BY/1P3E15.5/
     1            21H0ALTITUDE OF SAM SITE ,F7.0)
C*****READ A/C TRAJECTORY IF NEEDED
      IF(IACIN .GT. 0) READ(IACIN,700) RUNID,NPTS,
     1            ((X(IK,IL),IK=1,3),(BC(IK,IL),IK=1,9),IL=1,NPTS)
  700 FORMAT(2A4,I4/(6E13.6))
C*****PRINT TITLE OF NEW A/C DATA
      WRITE(6,627) IACIN,NPTS,RUNID
  627 FORMAT(42H0AIRCRAFT TRAJECTORY HAS BEEN READ ON UNIT,I3,5X,
     1            9HTHERE ARE ,I4,19H POINTS IN THE DATA/5X,
     2            16HTHE DATA ID IS    ,2A4)
C*****TEST FOR PARAMETER VARIATION
  125 IF(NPARM .GT. 0 ) GO TO 128
C*****WRITE TITLE FOR EDITOR IF NEEDED
      IF(IEDIT .LE. 0) GO TO 140
      WRITE(IEDIT,701) TITLE
  701 FORMAT(4H 1  ,18A4)
      JV=0
      GO TO 140
C*****INITIALIZE PARAMETER VARIATION
  128 IF(NPARM .EQ. 4 ) GO TO  130
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                JS=NPARM+1                                                      SAM     200
320             DO 129 J=JS,3                                                   SAM     201
              129 IPARM(J)=0                                                    SAM     202
              130 J1=0                                                          SAM     203
                  J2=1                                                          SAM     204
                  J3=1                                                          SAM     205
325               JV=0                                                          SAM     206
                  GO TO 136                                                     SAM     207
              135 IF(NPARM .EQ. 0) GO TO 365                                    SAM     208
              136 JV=JV+1                                                       SAM     209
            C*****WRITE TITLE FOR RUN IF NEEDED                                 SAM     210
330               IF(IEDIT .GT. 0) WRITE(IEDIT,702) JV,TITLE                    SAM     211
              702 FORMAT(2H 1,I2,18A4)                                          SAM     212
            C*****INCREMENT PARAMETER INDICES                                   SAM     213
                  J1=J1+1                                                       SAM     214
                  IF(J1 .LE. IPARM(1)) GO TO 140                                SAM     215
335               J1=1                                                          SAM     216
                  J2=J2+1                                                       SAM     217
                  IF(J2 .LE. IPARM(2)) GO TO 140                                SAM     218
                  J2=1                                                          SAM     219
                  J3=J3+1                                                       SAM     220
340               IF(J3 .GT. IPARM(3)) GO TO 360                                SAM     221
              140 CONTINUE                                                      SAM     222
            C*****INITIALIZE MAIN DRIVE                                         SAM     223
                  TPO=DTPO                                                      SAM     224
                  TPLOT=0.0                                                     SAM     225
345               ISTOP=0                                                       SAM     226
                  KMIN=0                                                        SAM     227
            C*****INITIALIZE FLAGS                                              SAM     228
                  DO 142 J=1,6                                                  SAM     229
                  IMU(J)=.FALSE.                                                SAM     230
350               AFLAGS(J)=1                                                   SAM     231
                  DO 143 J = 1, 20                                              SAM     232
              143 MFLAG(J)=0                                                    SAM     233
                  IPLOTL=0                                                      SAM     234
            C*****BRANCH TO INITIALIZE A/C                                      SAM     235
355               IF(IAC .EQ. 2) GO TO 147                                      SAM     236
            C*****INITIALIZE A/C + MAIN DRIVE                                   SAM     237
                  THROTL=THROTS                                                 SAM     238
                  TIME=0.                                                       SAM     239
                  IJ=1                                                          SAM     240
360               IJX=0                                                         SAM     241
            C*****LOAD STATES                                                   SAM     242
                  DO 145 J=1,12                                                 SAM     243
              145 RA(J)=SVST(J)                                                 SAM     244
                  GO TO 147                                                     SAM     245
365         C*****LOAD PARAMETERS IF NECESSARY                                  SAM     246
              147 IF ( NPARM .EQ. 0) GO TO 152                                  SAM     247
                  WRITE(6,630)                                                  SAM     248
              630 FORMAT(19H1LIST OF PARAMETERS)                                SAM     249
                  DO 150 J=1,NPARM                                              SAM     250
370               WRITE(6,632) (PARNAM(K,J),K=1,3),VPARM(J,JX(J))               SAM     251
              632 FORMAT(1H0,3A8,5X,1PE15.6)                                    SAM     252
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                IF(JPARM(J) .LT. 0) GO TO 148                                   SAM     253
                EXTR(JPARM(J))=VPARM(J,JX(J))                                   SAM     254
                GO TO 150                                                       SAM     255
      148       IF(IAC .EQ. 2) GO TO 149                                        SAM     256
                GX=1.                                                           SAM     257
                IF(MOD(-(JPARM(J)+1),6).GE. 4) GX=RAD                           SAM     258
                RA(-JPARM(J))=VPARM(J,JX(J))*GX                                 SAM     259
                GO TO 150                                                       SAM     260
      149       RR(-JPARM(J))=VPARM(J,JX(J))                                    SAM     261
      150       CONTINUE                                                        SAM     262
                DO 40 I=1,12                                                    SAM     263
       40       SVS(I)=RA(I)                                                    SAM     264
                DO 45 I=1,NPARM                                                 SAM     265
                IF(JPARM(I).LT.0) GO TO 5                                       SAM     266
       45       CONTINUE                                                        SAM     267
      152       CONTINUE                                                        SAM     268
C*****BRANCH AROUND A/C INIT IF TABLES ARE USED                                 SAM     269
                IF(IAC .EQ. 2) GO TO 153                                        SAM     270
C*****INITIALIZE A/C AERODYNAMICS                                               SAM     271
                CALL INAERO                                                     SAM     272
C*****INITIALIZE A/C STABILITY COORDINATES                                      SAM     273
                CALL AD(VA)                                                     SAM     274
C*****INITIALIZE TRAJECTORY STORING POINTER, TIME, AND TITLE IF NEEDED          SAM     275
                IF(ISTOR .LE. 0) GO TO 153                                      SAM     276
                RUNID(1)=TITLE(1)                                               SAM     277
                RUNID(2)=TITLE(2)                                               SAM     278
                NPTS=0                                                          SAM     279
                TSTOR=TIME                                                      SAM     280
C*****BLANK OUT PRINT WORDS                                                     SAM     281
      153       DO 154 KK=1,4                                                   SAM     282
      154       ZWORD(KK)=BLANK                                                 SAM     283
C*****INITIALIZE TRAJECTORY INTERPOLATION IF NEEDED                             SAM     284
                IF(IAC .EQ. 2) CALL INTIN                                       SAM     285
                CALL OUTPUT                                                     SAM     286
                GO TO 310                                                       SAM     287
C*****MAIN DRIVE ITERATION                                                      SAM     288
      300       CALL SAMDOC                                                     SAM     289
C*****BRANCH TO CALL POLICY FOR A/C TRAJ. TO BE GENERATED                       SAM     290
C*****OR INTERPOLATION IF NOT                                                   SAM     291
                IF(IAC .EQ. 2) GO TO 304                                        SAM     292
                CALL POLICY                                                     SAM     293
                GO TO 303                                                       SAM     294
      304       CALL INTAS                                                      SAM     295
      303       CONTINUE                                                        SAM     296
                IF ( RMIN .GT. 0) CALL MISSIL(KOUM)                             SAM     297
                TIME=TIME+HM                                                    SAM     298
C*****STORE A/C TRAJECTORY IF NEEDED                                            SAM     299
      310       IF(ISTOR .LE. 0 .OR. TIME .LT. TSTOR) GO TO 315                 SAM     300
C*****UPDATE POINTER AND TIME TO STORE                                          SAM     301
                NPTS=NPTS+1                                                     SAM     302
                TSTOR=TSTOR+.25                                                 SAM     303
                DO 311 J = 1, 3                                                 SAM     304
      311       X(J,NPTS)=RA(J)                                                 SAM     305
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                  DO 312 J = 1, 3                                                  SAM       306
                312 MC(J,NPTS)=UNITT(J)                                            SAM       307
               C*****TURN OFF STORAGE IF NO MORE ROOM                              SAM       308
                  IF(NPTS .EQ. 481) ISTOR=0                                        SAM       309
               C*****WRITE DATA SET FOR PLOT IF DESIRED                            SAM       310
               315 IF(IPLOT.EQ. 0 .OR. TIME .LT. TPLOT) GO TO 322                  SAM       311
                  TPLOT=TPLOT+DPLOT                                                SAM       312
                  IPLOTL=IPLOTL+1                                                  SAM       313
                  DO 320 J=1,4                                                     SAM       314
                  IF(MFLAG(J) .LE. 0 ) GO TO 318                                   SAM       315
                  IMU(J)=.TRUE.                                                    SAM       316
                  GO TO 320                                                        SAM       317
                318 RM(3,J)=-1.                                                    SAM       318
                320 CONTINUE                                                       SAM       319
                  WRITE (10,501) (RA(J),J=1,3),((RM(J,K),J=1,3),K=1,4)             SAM       320
                501 FORMAT(1P8E10.3)                                               SAM       321
                322 CONTINUE                                                       SAM       322
                  IF(TIME .GE. TOTAL .OR. ISTOP .EQ. 1) GO TO 330                  SAM       323
                  IF(TIME .LT. TPO) GO TO 300                                      SAM       324
                  TPO=TIME+DTPO                                                    SAM       325
                  CALL OUTPUT                                                      SAM       326
                  GO TO 300                                                        SAM       327
               C*****END OF ENCOUNTER                                              SAM       328
                330 WRITE(6,640) IJ                                                SAM       329
                640 FORMAT(I1,16HEND OF ENCOUNTER)                                 SAM       330
                  IJ=0                                                             SAM       331
                  CALL OUTPUT                                                      SAM       332
               C*****WRITE OUT A/C TRAJECTORY IF NEED BE                           SAM       333
                  IF(IACOUT .GT. 0) WRITE(IACOUT,700) RUNID,NPTS,                  SAM       334
                 1          ((X(IK,IL),IK=1,3),(BC(IK,IL),IK=1,9),IL=1,NPTS)     SAM       335
               C*****WRITE CONTROL DATA SET FOR PLOT IF NECESSARY                  SAM       336
                  IF(IPLOT .EQ. 0 ) GO TO 135                                      SAM       337
                  NVEH=1                                                           SAM       338
                  DO 351 J=1,4                                                     SAM       339
                  IF(IMU(J)) NVEH=NVEH+1                                           SAM       340
                351 CONTINUE                                                       SAM       341
                  WRITE(9,705) TITLE,IPLOTL,NVEH,DPLOT                             SAM       342
                705 FORMAT(18A4/I3,I1,5HA1234,F6.2)                                SAM       343
                  GO TO 135                                                        SAM       344
               C*****END OF TASK                                                   SAM       345
                360 WRITE (6,641)                                                  SAM       346
                641 FORMAT(15HOTASK COMPLETED)                                     SAM       347
                  GO TO 100                                                        SAM       348
               1000 STOP                                                           SAM       349
                  END                                                              SAM       350
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      SUBROUTINE MISSIL(KA)                                                  SAM       904
      COMMON/DRIVE/TIME,HH,ISTART,TOTAL,EXTR(60),IEXTR(30),TITLE(18),        SAM       905
     1            DEG,G,PI,RAD                                              SAM       906
      COMMON/FLAGS/JPOL,KPOL,LPOL,JSAM,KSAM,LSAM,NMIN,ISTOP,IAC,IEDIT,       SAM       907
     1            IGUIDE,IMODE,MFLAG(20),JV                                 SAM       908
      COMMON/AIRCF/RA(6),VA(6),ACOMA,ACOMD,ACOM,AOUTA,AOUTD,AOUT,VOUT,       SAM       909
     1            UNITV(3),A(3),D(3),UNITT(3),A1(3),D1(3),MACH,QA,          SAM       910
     2            ALPHA,LIFT,DRAG,GFORCE,UNITL(3),CL,CD,CLMX,SA,CA,         SAM       911
     3            THRUST,THROTL,ASMAX,ACTION,DASMX,DUMPL,DUMCL,ITAU,        SAM       912
     4            TAU(2),ADD(2,2)                                           SAM       913
      COMMON/ADATA/TBLTP(13,21),CDO(21),DCDCL2(21),MACHMX(13),ALPHAO(21)     SAM       914
     1            ,DALDCL(21),CLMAX(21),AREA,WEIGHT                         SAM       915
      COMMON/MISSL/RM(6,20),VM(6,20),MACHM(20),QAM(20),SSA,AREAM,            SAM       916
     1            VV(2,20),DEL(2,20),AB(2,20),MN(20),RAM(20),RAMO(20)       SAM       917
      COMMON/PRINJ/IJ,IJX                                                    SAM       918
      REAL    LIFT,MACH,MACHM,MACHMX                                         SAM       919
      REAL    ANU(2),LX1(2,2,20),LX2(2,2,20),LY1(2,2,20),LY2(2,2,20),        SAM       920
     1            TXX1(2),TXX2(2),RTT1(2),RTT2(2),AM1S(3,20),CC6(2,20),     SAM       921
     2            CD1(2,20),CCX(2),CCY(2),CD2(2,20),CD3(2,20),QD(2),        SAM       922
     3            QDS(2,20),QE2(2,2,20),GD1(4),GD2(4,2),QE2(2),             SAM       923
     4            ANY(2,20),CNY(2),CNM(2),TL(20),V11(3,20),                 SAM       924
     5            AM1(3),OMEG(3,20),X18(20),X19(20),SX19(20),CX19(20),      SAM       925
     6            RX1(3),RX2(3),RX3(3),VX2(3),SZS(20),CZS(20),              SAM       926
     7            VMS(3,20),SP1S(20),TX1(2),TX2(2),OMES(3),TF(4)            SAM       927
      COMMON /ONE/ NCOMPS,NLEVS,NWTS,NSHLDS,NOLAST,NGLIT,TMA,RCHA,VE,        SAM1      123
     1DELT,XGM,YGM,ZGM,VNEINI,I                                             SAM1      124
      COMMON /TWO/ XGL(25),YGL(25),ZGL(25),XSH(25),YSH(25),ZSH(25),          SAM1      125
     1ASH(25),BSH(25),CSH(25),XBL(25),YBL(25),ZBL(25),ABL(25),BBL(25),      SAM1      126
     2CBL(25),XGMOLD(20),YGMOLD(20),ZGMOLD(20),EX(25),WY(25),ZLE(25),       SAM1      127
     3TAM(9),TMI(9)                                                         SAM1      128
      COMMON /THREE/ NDUBLY,NGHNK,NCHK,HAFANG,RMAX,DTRF,PORF,DTCF,PJCF,      SAM1      129
     1RMISS,CDP                                                             SAM1      130
      COMMON /FOUR/ XO(25,2),YO(25,2),ZO(25,2),XS(25,2),YS(25,2),            SAM1      131
     1ZS(25,2),WATE(10)                                                     SAM1      132
      COMMON /FIVE/ VOL(2,11,72),STEAR(19),FRACT(10),SLOW(10)                SAM1      133
      COMMON /SIX/ OPS(4,25)                                                 SAM1      134
      EQUIVALENCE (TIA(1),UNITT(1))                                          SAM1      135
      REAL TIA(9),PS(4,25),PSCF(4,25),PSRF(4,25),OPST(4,25),PKAC(4),         SAM1      136
     1CFKAC(4),KLEV(2,4),HEAD1(3),HEAD2(3),HEAD3(3),HEAD4(3),HEAD5(3),       SAM1      137
     2HEAD6(3)                                                              SAM1      138
      LOGICAL RADFUZE                                                        SAM1      139
      EQUIVALENCE(CCX(1),CC1),(CCX(2),CC2),(CCY(1),CC7),(CCY(2),CC8)         SAM       928
      DATA KLEV,HEAD1,HEAD2,HEAD3,HEAD4/"KILL LEVEL"," 1","KILL LEVEL",      SAM1      140
     1" 2","KILL LEVEL"," 3","KILL LEVEL"," 4","  SINGLE-S",                SAM1      141
     2"HOT       ","CUMULATIVE","    SURVIV","AL         "," SURVIVAL ",     SAM1      142
     3"  PROBABIL","ITY      P","ROBABILITY","  ========","==========",     SAM1      143
     4"==========="/                                                        SAM1      144
      DATA HEAD5,HEAD6/"    AIRCRA","FT        "," AIRCRAFT ",             SAM1      145
     1"      KILL","          "," KILL   "/                                 SAM1      146
      DATA IF     / 4.3, 7., 47.3, 60./                                      SAM       929
      DATA   PI2 / 6.283186 /                                                SAM       930
      DATA   HHS /0.0/                                                       SAM       931
      SHO=RA(1)**2+RA(2)**2                                                  SAM       932
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                SPR=SQRT(RHO)*RA(4)                                              SAM      933
5               DD1(1)=(VA(3)*RHO-RA(3)*(RA(1)*VA(1)+RA(2)*VA(2)))/              SAM      934
               1(SPR*RA(4))                                                      SAM      935
                DD1(2)=(RA(1)*VA(2)-RA(2)*VA(1))/SPR                             SAM      936
                DD1(3)=RA(6)                                                     SAM      937
                DD1(4)=RA(5)                                                     SAM      938
6               IF(KFILL .EQ. 0) GO TO 2                                         SAM      939
                DO 1 J = 1,2                                                     SAM      940
                DO 1 I = 1,4                                                     SAM      941
              1 DD2(I,J)=DD1(I)                                                  SAM      942
                KFILL=0                                                          SAM      943
5               GO TO 4                                                          SAM      944
              2 DO 3 J = 1,2                                                     SAM      945
                DO 3 I = 1,4                                                     SAM      946
                DD1(I)=(DD2(I,J)-DD1(I))*TT1+DD1(I)                              SAM      947
              3 DD2(I,J)=DD1(I)                                                  SAM      948
7             4 IF(IMODE .EQ. 2) GO TO 5                                         SAM      949
                DD3=(DD3-RA(4))*TT2+RA(4)                                        SAM      950
                DD3D=(DD3-DD3S)/HM                                               SAM      951
                DD3S=DD3                                                         SAM      952
              5 DO 1000  I=1,20                                                  SAM      953
8               IF( MFLAG(I) .LE. 0 ) GO TO 1000                                 SAM      954
                TM=(TIME-TL(I))                                                  SAM      955
                IF(TM .LT. TF(MFLAG(I))) GO TO 6                                 SAM      956
                MFLAG(I)=MFLAG(I)+1                                              SAM      957
                IF (MFLAG(I) .LT. 5)  GO TO 6                                    SAM      958
8               WRITE (6,2000) IJ,MN(I),TIME                                     SAM      959
           2000 FORMAT(I1,15H****MISSILE NO.,I3,25H SELF DESTRUCTS AT TIME =,F8.3) SAM      960
                IF(IEDIT .GT. 0) WRITE(IEDIT,5000) JV,(TITLE(J),J=1,2),I,MN(I),  SAM      961
               1              TIME,(RM(J,I),J=1,3),(PA(J),J=1,3)                 SAM      962
           5000 FORMAT(2H 2,I2,2A4,2H 4,2I2,7A4)                                 SAM      963
8               IJX=IJ                                                           SAM      964
                IJ=0                                                             SAM      965
                CALL OUTPUT                                                      SAM      966
                MFLAG(I)=0                                                       SAMI     147
                NMIN=NMIN-1                                                      SAMI     148
9               GO TO 1000                                                       SAMI     149
              6 IF (TM .LT. 6. ) GO TO 23                                        SAM      968
                IF(IGUIDE .EQ. 1) GO TO 806                                      SAM      969
                IF(RAM(I) .LE. EXTR(54) ) GO TO 822                              SAM      970
            806 IF (MFLAG(I) .LT. 3) GO TO 7                                     SAM      971
9               SPO=RA(5)-PM(5,I)                                                SAM      972
                IF(ABS(SPO) .GE. PI )  SPO=SPO-SIGN(PI2,SPO)                     SAM      973
                IF (ABS(SPO) .LE. .0871    .AND. ABS(RA(6)-RM(6,I)) .LE.         SAM      974
               1.0871) GO TO 7                                                   SAM      975
                WRITE(6,2001) IJ,MN(I),TIME                                      SAM      976
          10    2001 FORMAT(I1,15H****MISSILE NO.,I3,22H BREAKS LOCK AT TIME =,F8.3) SAM      977
                IF(IEDIT .GT. 0) WRITE(IEDIT,5001) JV,(TITLE(J),J=1,2),I,MN(I),  SAM      978
               1              TIME,(RM(J,I),J=1,3),(RA(J),J=1,3)                 SAM      979
           5001 FORMAT(2H 2,I2,2A4,4H 3,2I2,7A4)                                 SAM      980
                IJX=IJ                                                           SAM      981
          10    IJ=0                                                             SAM      982
                CALL OUTPUT                                                      SAM      983
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                  MFLAG(I)=0                                                    SAM1    150
                  NMIN=NMIN-1                                                   SAM1    151
                  GO TO 1000                                                    SAM1    152
          110     7 IF(TM .GT. 14. ) GO TO 8                                    SAM     985
                  ZZ1=1E400.                                                    SAM     986
                  GO TO 10                                                      SAM     987
                  8 IF(TM .GT. 55. ) GO TO 9                                    SAM     988
                  ZZ1=2461.*TM-18054.                                           SAM     989
          115     GO TO 10                                                      SAM     990
                  9 ZZ1=117301.                                                 SAM     991
                 10 DO 12 J = 1,2                                               SAM     992
                  ANZ=RM(7-J,I)                                                 SAM     993
                  DO 11 K = 1,2                                                 SAM     994
          120     DE2(J,K,I)=(DE2(J,K,I)-ANZ)*TT1+ANZ                           SAM     995
                 11 ANZ=DE2(J,K,I)                                              SAM     996
                 12 DE2(J)=DE2(J,2,I)                                           SAM     997
                  IF(IMODE .EQ. 2) GO TO  13                                    SAM     998
                  ZZ2=(RM(1,I)*VM(1,I)+RM(2,I)*VM(2,I)+RM(3,I)*VM(3,I))/RM(4,I) SAM     999
          125     ZZ3=DD3-RM(4,I)                                               SAM    1000
                  ZZ4=ZZ2-DD3C                                                  SAM    1001
                  ZZ5=ZZ3*(1.-ZZ3/196200.)                                      SAM    1002
                  ZZ6=ZZ4                                                       SAM    1003
                  IF( ZZ6 .LT. 2295.) ZZ6=2295.                                 SAM    1004
          130     IF( ZZ6 .GT. 4920.) ZZ6=4920.                                 SAM    1005
                  ZZ7=.5*ZZ5/ZZ6                                                SAM    1006
                  CC1=ZZ7*DD1(1)                                                SAM    1007
                  CC2=ZZ7*DD1(2)                                                SAM    1008
                  ZX=1310.+16.2*TM                                              SAM    1009
          135     GO TO 15                                                      SAM    1010
                 13 CC1=0.                                                      SAM    1011
                  CC2=0.                                                        SAM    1012
                  IF (TM  .GE. 14.) GO TO 14                                    SAM    1013
                  ZX=4920.+48.2*TM                                              SAM    1014
          140     GO TO 15                                                      SAM    1015
                 14 ZX=12467.                                                   SAM    1016
                 15 IF (RA(3) .GT. 3280. ) GO TO 19                             SAM    1017
                  CC5=0.                                                        SAM    1018
                  CC3=0.                                                        SAM    1019
          145     IF (IMODE .EQ. 2) GO TO 16                                    SAM    1020
                  CC1=ZZ1*(DD1(3)-DE2(1)+.1*ZZ7)                                SAM    1021
                  GO TO 20                                                      SAM    1022
                 16 IF (TM .GT. 19.71) GO TO 17                                 SAM    1023
                  FSV=75.44                                                     SAM    1024
          150     GO TO 18                                                      SAM    1025
                 17 FSV=957.76*EXP(-.2*(TM-7.))                                 SAM    1026
                 18 CC1=ZZ1*(DD1(3)-DE2(1))+FSV                                 SAM    1027
                  GO TO 20                                                      SAM    1028
                 19 CC1=ZZ1*(DD1(3)-DE2(1)+CC1)                                 SAM    1029
          155     CC3=ZX*DD1(1)                                                 SAM    1030
                  CC5=100.*COS(DD1(3))                                          SAM    1031
                 20 SPQ=DE1(4)-DE2(2)                                           SAM    1032
                  CC2=ZZ1*(SPQ+CC2)                                             SAM    1033
                  IF(ABS(SPQ) .GT. PI) SPQ=SPQ-SIGN(6.2,SPQ)                    SAM    1034
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      CC4=ZX*CD1(2)                                                     SAM   1035
      DO 21 J = 1,2                                                     SAM   1036
      X33=2.*(CCX(J)-CD1(J,I))/HM                                       SAM   1037
      CC6(J,I)=(CC6(J,I)-X33)*TT3+X33                                   SAM   1038
      CD1(J,I)=CCX(J)                                                   SAM   1039
      IF(ABS(CCX(J)).GT. 558.) CCX(J)=.166667*CCX(J)+SIGN(465.,CCX(J))  SAM   1040
   21 CONTINUE                                                          SAM   1041
      CC7=CC1+CC6(1,I)+CC3+CC5                                          SAM   1042
      CC8=CC2+CC6(2,I)+CC4                                              SAM   1043
      DO 22 J = 1,2                                                     SAM   1044
      CD2(J,I)=(CD2(J,I)-CCY(J))*TT4+CCY(J)                             SAM   1045
      VVS=VV(J,I)                                                       SAM   1046
      VV(J,I)=CD2(J,I)+1.2*(CD2(J,I)-CD3(J,I))/HM                       SAM   1047
      ANU(J)=(VV(J,I)-VVS)/HM                                           SAM   1048
   22 CD3(J,I)=CD2(J,I)                                                 SAM   1049
      GO TO 23                                                          SAM   1050
  822 RRR2=RAM(I)**2                                                    SAM   1051
      OMES(1)=((RA(2)-RM(2,I))*(VA(3)-VM(3,I))-(RA(3)-RM(3,I))*         SAM   1052
     1               (VA(2)-VM(2,I)))/RRR2                              SAM   1053
      OMES(2)=((RA(3)-RM(3,I))*(VA(1)-VM(1,I))-(RA(1)-RM(1,I))*         SAM   1054
     1               (VA(3)-VM(3,I)))/RRR2                              SAM   1055
      OMES(3)=((RA(1)-RM(1,I))*(VA(2)-VM(2,I))-(RA(2)-RM(2,I))*         SAM   1056
     1               (VA(1)-VM(1,I)))/RRR2                              SAM   1057
      CR=SQRT(VM(1,I)**2+VM(2,I)**2)                                    SAM   1058
      CX=-VM(3,I)/(VM(4,I)*CR)                                          SAM   1059
      VVS=VV(1,I)                                                       SAM   1060
      VV(1,I)=(OMES(1)*VM(2,I)-OMES(2)*VM(1,I))/CR*EXTR(53)             SAM   1061
      ANU(1)=(VV(1,I)-VVS)/HM                                           SAM   1062
      VVS=VV(2,I)                                                       SAM   1063
      VV(2,I)=(CX*(OMES(1)*VM(1,I)+OMES(2)*VM(2,I))+VM(4,I)/CR*OMES(3)) SAM   1064
     1               *EXTR(53)                                          SAM   1065
      ANU(2)=(VV(2,I)-VVS)/HM                                           SAM   1066
   23 CALL ATMOS(I)                                                     SAM   1067
      MXZ=MFLAG(I)                                                      SAM   1068
      GO TO (24,25,25,26), MXZ                                          SAM   1069
   24 WM=4760.-281.*TM                                                  SAM   1070
      TZ=60000.                                                         SAM   1071
      GO TO 27                                                          SAM   1072
   25 WM=2623.-28.4*TM                                                  SAM   1073
      TZ=6000.                                                          SAM   1074
      GO TO 27                                                          SAM   1075
   26 WM=1376.                                                          SAM   1076
      TZ=0.0                                                            SAM   1077
   27 ZMS=WM/G                                                          SAM   1078
      IF(MXZ .EQ. 1) GO TO 46                                           SAM   1079
      IF (MXZ .EQ. 2) GO TO 48                                          SAM   1080
      Z11=MACHM(I)                                                      SAM   1081
      ZI=1./Z11**2                                                      SAM   1082
      SR2=-.578*.0122*TM                                                SAM   1083
      IF(Z11 .GT. 2.) GO TO 28                                          SAM   1084
      CF=-.256+1.093*Z11                                                SAM   1085
      CX1=-.256+.089*Z11                                                SAM   1086
      CX2=-.04565+.05289*Z11                                            SAM   1087
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                  CX3=-.02+.135*Z11                                                  SAM    1088
                  GO TO 29                                                           SAM    1089
215               28 CF=-1.334+1.577*Z11                                             SAM    1090
                  CX1=-.79+1.156*Z11                                                 SAM    1091
                  CX2=-.00515+.0329*Z11                                              SAM    1092
                  CX3=.04+.085*Z11                                                   SAM    1093
                  29 IF(TM .LE. 47.) GO TO 31                                        SAM    1094
220               SP2=0.0                                                            SAM    1095
                  IF (Z11 .GT. 2.75) GO TO 30                                        SAM    1096
                  CF=CF-.0475+.15*Z11                                                SAM    1097
                  GO TO 31                                                           SAM    1098
                  30 CF=CF+.207+.057*Z11                                             SAM    1099
225               31 CF=CF*ZT+.75E-06*(SSA+RM(3,I))                                  SAM    1100
                  IF(Z11 .GT. 1.6) GO TO 32                                          SAM    1101
                  CY1=.601-.468*Z11                                                  SAM    1102
                  GO TO 35                                                           SAM    1103
                  32 IF(Z11 .GT. 2.25) GO TO 33                                      SAM    1104
230               CY1=.315-.291*Z11                                                  SAM    1105
                  GO TO 35                                                           SAM    1106
                  33 IF(Z11 .GT. 2.75)  GO TO 34                                     SAM    1107
                  CY1=-.34                                                           SAM    1108
                  GO TO 35                                                           SAM    1109
235               34 CY1=-6.92+.128*Z11                                              SAM    1110
                  35 IF(Z11 .GT. 3.12) GO TO 36                                      SAM    1111
                  CY2=-.0143-.05865*Z11                                              SAM    1112
                  GO TO 37                                                           SAM    1113
                  36 CY2=-.0805-.628*Z11                                             SAM    1114
240               37 CY3=-5.*CX3                                                     SAM    1115
                  SP3=QAM(I)/(1140.-3.6*TM)                                          SAM    1116
                  IF (MFLAG(I) .GT.3) SP3=QAM(I)/370.                                SAM    1117
                  IF(QAM(I) .LE. 3444.) GO TO 38                                     SAM    1118
                  IF(QAM(I) .GE. 9030.) GO TO 39                                     SAM    1119
245               SP1=10.55556-.0016582*QAM(I)                                       SAM    1120
                  GO TO 40                                                           SAM    1121
                  38 SP1=6.911                                                       SAM    1122
                  GO TO 40                                                           SAM    1123
                  39 SP1=1.                                                          SAM    1124
250               40 SLOPE=(SP1-SP1S(I))/HM                                          SAM    1125
                  IF(TM .LT. 7.05) SLOPE=-.625E-03                                   SAM    1126
                  SP1S(I)=SP1                                                        SAM    1127
                  DO 45  JDUM1 = 1, 8                                                SAM    1128
                  SP4=SP1+SLOPE*GM*FLOAT(JDUM1-1)                                    SAM    1129
255               DO 42 J = 1,2                                                      SAM    1130
                  ANZ=ANY(J,I)                                                       SAM    1131
                  ANUU=-VV(J,I)+FLOAT(8     -JDUM1)*ANU(J)*GM                        SAM    1132
                  DO 41 K = 1,2                                                      SAM    1133
                   LX1(J,K,I)=TX1(K)*LX1(J,K,I)+TXX1(K)*(LY1(J,K,I)-(ANUU-           SAM    1134
260               1LY1(J,K,I))*FTT1(K))+ANUU-LY1(J,K,I)                              SAM    1135
                  LY1(J,K,I)=ANUU                                                    SAM    1136
                  ANUU=LX1(J,K,I)                                                    SAM    1137
                  LX2(J,K,I)=TX2(K)*LX2(J,K,I)+TXX2(K)*(LY2(J,K,I)-(ANZ-LY2(J,K,I))  SAM    1138
                 1*FTT2(K))+ANZ-LY2(J,K,I)                                           SAM    1139
265               LY2(J,K,I)=ANZ                                                     SAM    1140
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                41 ANZ=LX2(J,K,I)                                                    SAM     1141
                   DEL(J,I)=SP4*(.00517  *LX1(J,2,I)-.016     *LX2(J,2,I)+FLOAT(3-2*J) SAM     1142
                  1*OMEG(J+1,I)*4.16)                                                SAM     1143
                42 IF(ABS(DEL(J,I)) .GT. 10.) DEL(J,I)=SIGN(10.,DEL(J,I))            SAM     1144
270                CNY(1)=(AB(1,I)*(CX1+CX2*ABS(AB(2,I)))+CX3*DEL(1,I))*ZI           SAM     1145
                   CNY(2)=(-AB(2,I)*(CX1+CX2*ABS(AB(1,I)))-CX3*DEL(2,I))*ZI          SAM     1146
                   CNM(1)=(AB(1,I)*(CY1+CY2*ABS(AB(2,I)))+CY3*DEL(1,I))*ZI+SP2*CNY(1) SAM     1147
                   CNM(2)=(-AB(2,I)*(CY1+CY2*ABS(AB(1,I)))-CY3*DEL(2,I))*ZI+SP2*     SAM     1148
                  1CNY(2)                                                            SAM     1149
275                ANY(1,I)=-CAM(I)*CNY(1)/ZMS                                      SAM     1150
                   ANY(2,I)=QAM(I)*CNY(2)/ZMS                                       SAM     1151
                   AM1(1)=(TZ-CAM(I)*CF)/ZMS-G*SX19(I)-OMEG(2,I)*V11(3,I)+OMEG(3,I)* SAM     1152
                  1V11(2,I)                                                          SAM     1153
                   AM1(2)=ANY(2,I)-OMEG(3,I)*V11(1,I)+OMEG(1,I)*V11(3,I)            SAM     1154
280                AM1(3)=G*CX19(I)+ANY(1,I)-OMEG(1,I)*V11(2,I)+OMEG(2,I)*V11(1,I)  SAM     1155
                   OD(1)=SP3*CNM(1)+.9825*OMEG(2,I)*OMEG(1,I)                       SAM     1156
                   OD(2)=SP3*CNM(2)-.9825*OMEG(3,I)*OMEG(1,I)                       SAM     1157
                   DO 43 J = 1,2                                                    SAM     1158
                   OMEG(J+1,I)=OMEG(J+1,I)+.5*GM*(OD(J)+ODS(J,I))                   SAM     1159
285             43 ODS(J,I)=OD(J)                                                   SAM     1160
                   SPQ=OMEG(3,I)/CX19(I)                                            SAM     1161
                   OMEG(1,I)=-SPQ*SX19(I)                                           SAM     1162
                   X18(I)=X18(I)+GM*SPQ                                             SAM     1163
                   X19(I)=X19(I)+GM*OMEG(2,I)                                       SAM     1164
290                CX19(I)=COS(X19(I))                                              SAM     1165
                   SX19(I)=SIN(X19(I))                                              SAM     1166
                   DO 44 J= 1,3                                                     SAM     1167
                   V11(J,I)=V11(J,I)+.5*GM*(AM1(J)+AMIS(J,I))                       SAM     1168
                44 AMIS(J,I)=AM1(J)                                                 SAM     1169
295                AB(1,I)=ATAN(V11(3,I)/V11(1,I))*DEG                              SAM     1170
                45 AB(2,I)=ATAN(V11(2,I)/V11(1,I))*DEG                              SAM     1171
                   IF((AB(1,I)**2+AB(2,I)**2) .LT. 900.) GO TO 9850                 SAM     1172
                   WRITE(6,6005) IJ,MN(I),TIME                                      SAM     1173
             6005 FORMAT(1I,15H****MISSILE NO.,I3,24H GOES UNSTABLE AT TIME =,F8.3) SAM     1174
300                IF(IEDIT .GT. 0) WRITE(IEDIT,5004) JV,(TITLE(J),J=1,2),I,MN(I),  SAM     1175
                  1              TIME,(RM(J,I),J=1,3),(RA(J),J=1,3)                 SAM     1176
             5004 FORMAT(2H 2,I2,24A,2H 5,2I2,7A4)                                  SAM     1177
                   IJX=IJ                                                           SAM     1178
                   IJ=0                                                             SAM     1179
305                CALL OUTPUT                                                      SAM     1180
                   MFLAG(I)=0                                                       SAM1     153
                   NMIN=NMIN-1                                                      SAM1     154
                   GO TO 1000                                                       SAM1     155
             9850  CONTINUE                                                        SAM     1182
310                SZ=SIN(X18(I))                                                   SAM     1183
                   CZ=COS(X18(I))                                                   SAM     1184
                   VM(1,I)=CZ*(CX19(I)*V11(1,I)+SX19(I)*V11(3,I))-SZ*V11(2,I)       SAM     1185
                   VM(2,I)=-SZ*(CX19(I)*V11(1,I)+SX19(I)*V11(3,I))-CZ*V11(2,I)      SAM     1186
                   VM(3,I)=SX19(I)*V11(1,I)-CX19(I)*V11(3,I)                        SAM     1187
315                GO TO 51                                                         SAM     1188
                46 IF(MACHM(I) .GT. .75 ) GO TO 47                                  SAM     1189
                   CF=.24/MACHM(I)                                                  SAM     1190
                   GO TO 50                                                         SAM     1191
```

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      47 CF=(-1.2+1.84*MACHM(I))/MACHM(I)**2                          SAM      1192
320      GO TO 50                                                      SAM      1193
      48 IF (MACHM(I) .GT. 2.) GO TO 49                               SAM      1194
         CF=(-.366+1.093*MACHM(I))/MACHM(I)**2                        SAM      1195
         GO TO 50                                                     SAM      1196
      49 CF=(-1.334+1.577*MACHM(I))/MACHM(I)**2                       SAM      1197
325   50 AM1(1)=(TZ-QAM(I)*CF)/ZMS-G*SX19(I)                          SAM      1198
         V11(1,I)=V11(1,I)+.5*HM*(AM1(1)+AM1S(1,I))                   SAM      1199
         AM1S(1,I)=AM1(1)                                             SAM      1200
         OMEG(2,I)=-G*CX19(I)/V11(1,I)                                SAM      1201
         IF(HM .LT. .19    ) OMEG(2,I)=0.                             SAM      1202
330      X19(I)=X19(I)+HM*OMEG(2,I)                                   SAM      1203
         CX19(I)=COS(X19(I))                                          SAM      1204
         SX19(I)=SIN(X19(I))                                          SAM      1205
         VM(1,I)=CX19(I)*CZS(I)*V11(1,I)                              SAM      1206
         VM(2,I)=-CX19(I)*SZS(I)*V11(1,I)                             SAM      1207
335      VM(3,I)=SX19(I)*V11(1,I)                                     SAM      1208
      51 CALL COORD(VM (1,I),1)                                       SAM      1209
         DO 52 J = 1,3                                                SAM      1210
         RM(J,I)=RM(J,I)+HM*.5*(VM(J,I)+VMS(J,I))                     SAM      1211
      52 VMS(J,I)=VM(J,I)                                             SAM      1212
340      CALL COORD(RM(1,I),1)                                        SAM1      156
         XCG=RA(1)-RM(1,I)                                            SAM1      157
         YCG=RA(2)-RM(2,I)                                            SAM1      158
         ZCG=RA(3)-RM(3,I)                                            SAM1      159
         VX=VA(1)-VM(1,I)                                             SAM1      160
345      VY=VA(2)-VM(2,I)                                             SAM1      161
         VZ=VA(3)-VM(3,I)                                             SAM1      162
         XCM=-TIA(1)*XCG-TIA(2)*YCG-TIA(3)*ZCG                        SAM1      163
         YCM=-TIA(4)*XCG-TIA(5)*YCG-TIA(6)*ZCG                        SAM1      164
         ZCM=-TIA(7)*XCG-TIA(8)*YCG-TIA(9)*ZCG                        SAM1      165
350      RAM(I)=SQRT(XCG**2+YCG**2+ZCG**2)                            SAM1      166
         RAMD(I)=-(XCG*VX+YCG*VY+ZCG*VZ)/RAM(I)                       SAM1      167
         IF(MFLAG(I).LE.2)GO TO 999                                   SAM1      168
         IF(MAPANG.NE.PI/2.0) GO TO 53                                SAM1      169
         IF(RAMD(I).GT.0.0) GO TO 54                                  SAM1      170
355      DEX=-RAMD(I)*RAM(I)/(VX**2+VY**2+VZ**2)                      SAM1      171
         DELT=1.0-DEX/HM                                              SAM1      172
         GO TO 54                                                     SAM1      173
      53 TMI(1)=CZ*CX19(I)                                            SAM1      174
         TMI(2)=-SZ                                                   SAM1      175
360      TMI(3)=CZ*SX19(I)                                            SAM1      176
         TMI(4)=-SZ*CX19(I)                                           SAM1      177
         TMI(5)=-CZ                                                   SAM1      178
         TMI(6)=-SZ*SX19(I)                                           SAM1      179
         TMI(7)=SX19(I)                                               SAM1      180
365      TMI(8)=0.0                                                   SAM1      181
         TMI(9)=-CX19(I)                                              SAM1      182
         TAM(1)=TMI(1)*TIA(1)+TMI(4)*TIA(2)+TMI(7)*TIA(3)             SAM1      183
         TAM(2)=TMI(1)*TIA(4)+TMI(4)*TIA(5)+TMI(7)*TIA(6)             SAM1      184
         TAM(3)=TMI(1)*TIA(7)+TMI(4)*TIA(8)+TMI(7)*TIA(9)             SAM1      185
370      TAM(4)=TMI(2)*TIA(1)+TMI(5)*TIA(2)+TMI(8)*TIA(3)             SAM1      186
         TAM(5)=TMI(2)*TIA(4)+TMI(5)*TIA(5)+TMI(8)*TIA(6)             SAM1      187
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      TAM(6)=TMI(2)*TIA(7)+TMI(5)*TIA(8)+TMI(8)*TIA(9)                  SAM1   188
      TAM(7)=TMI(3)*TIA(1)+TMI(6)*TIA(2)+TMI(9)*TIA(3)                  SAM1   189
      TAM(8)=TMI(3)*TIA(4)+TMI(6)*TIA(5)+TMI(9)*TIA(6)                  SAM1   190
375   TAM(9)=TMI(3)*TIA(7)+TMI(6)*TIA(8)+TMI(9)*TIA(9)                  SAM1   191
      CALL CONFUZE                                                      SAM1   192
   54 DO 100 KWT=1,NWTS                                                 SAM1   193
  100 SLOW(KWT)=CDR*2.0*QA/(AREA*VA(4)**2*WATE(KWT)**(1.0/3.0))         SAM1   194
      IF(DELT.LE.1.0) GO TO 65                                          SAM1   195
380   CALL STAB(XO,YO,ZO,XS,YS,ZS,NOHNK,T1)                             SAM1   196
      IF(T1.LE.1.0) GO TO 57                                            SAM1   197
      IF(RAMO(I).GT.0.0) GO TO 999                                      SAM1   198
      IF(RAM(I).LT.RMISS) GO TO 999                                     SAM1   199
   55 DO 56 K=1,NCOMPS                                                  SAM1   200
385   DO 56 LEV=1,NLEVS                                                 SAM1   201
   56 PS(LEV,K)=1.0                                                     SAM1   202
      RADFUZE=.FALSE.                                                   SAM1   203
      GO TO 83                                                          SAM1   204
   57 TBCF=T1+DTCF/HM                                                   SAM1   205
390   CALL STAB(XO(1,2),YO(1,2),ZO(1,2),XS(1,2),YS(1,2),ZS(1,2),NOHNK,T2) SAM1   206
      IF(T2.LE.1.0) GO TO 60                                            SAM1   207
   58 IF(PDCF.GE.1.0) GO TO 55                                          SAM1   208
      CALL SPRAY(TBCF,PSCF)                                             SAM1   209
      DO 59 K=1,NCOMPS                                                  SAM1   210
395   DO 59 LEV=1,NLEVS                                                 SAM1   211
   59 PS(LEV,K)=PDCF+(1.0-PDCF)*PSCF(LEV,K)                             SAM1   212
      RADFUZE=.FALSE.                                                   SAM1   213
      GO TO 83                                                          SAM1   214
   60 IF(T2.GE.TBCF) GO TO 63                                           SAM1   215
400   61 DO 62 K=1,NCOMPS                                               SAM1   216
      DO 62 LEV=1,NLEVS                                                 SAM1   217
   62 PS(LEV,K)=0.0                                                     SAM1   218
      RADFUZE=.FALSE.                                                   SAM1   219
      GO TO 83                                                          SAM1   220
405   63 IF(PDCF.GE.1.0) GO TO 61                                       SAM1   221
      CALL SPRAY(TBCF,PSCF)                                             SAM1   222
      DO 64 K=1,NCOMPS                                                  SAM1   223
      DO 64 LEV=1,NLEVS                                                 SAM1   224
   64 PS(LEV,K)=(1.0-PDCF)*PSCF(LEV,K)                                  SAM1   225
410   RADFUZE=.FALSE.                                                   SAM1   226
      GO TO 83                                                          SAM1   227
   65 TBRF=DELT+DTRF/HM                                                 SAM1   228
      CALL STAB(XO,YO,ZO,XS,YS,ZS,NOHNK,T1)                             SAM1   229
      IF(T1.LE.1.0) GO TO 68                                            SAM1   230
415   CALL SPRAY(TBRF,PSRF)                                             SAM1   231
   66 DO 67 K=1,NCOMPS                                                  SAM1   232
      DO 67 LEV=1,NLEVS                                                 SAM1   233
   67 PS(LEV,K)=PDRF+(1.0-PDRF)*PSRF(LEV,K)                             SAM1   234
      RADFUZE=.TRUE.                                                    SAM1   235
420   GO TO 83                                                          SAM1   236
   68 TBCF=T1+DTCF/HM                                                   SAM1   237
      CALL STAB(XO(1,2),YO(1,2),ZO(1,2),XS(1,2),YS(1,2),ZS(1,2),NOHNK,T2) SAM1   238
      IF(T2.LE.1.0) GO TO 74                                            SAM1   239
      IF(DELT.GE.T1) GO TO 58                                           SAM1   240
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                  CALL SPRAY(TBRF,PSRF)                                  SAM1   241
                  IF(PDCF.GE.1.0) GO TO 66                               SAM1   242
                  IF(TBRF.EQ.TBCF) GO TO 72                              SAM1   243
                  CALL SPRAY(TBCF,PSCF)                                  SAM1   244
                  IF(TBRF.GT.TBCF) GO TO 70                              SAM1   245
                  DO 69 K=1,NCOMPS                                       SAM1   246
                  DO 69 LEV=1,NLEVS                                      SAM1   247
               69 PS(LEV,K)=PDRF*PDCF*(1.0-PDRF)*PSRF(LEV,K)+PDRF*(1.0-PDCF)*  SAM1   248
                 1PSCF(LEV,K)                                            SAM1   249
                  RADFUZE=.TRUE.                                         SAM1   250
                  GO TO 83                                               SAM1   251
               70 DO 71 K=1,NCOMPS                                       SAM1   252
                  DO 71 LEV=1,NLEVS                                      SAM1   253
               71 PS(LEV,K)=PDRF*PDCF*(1.0-PDCF)*PSCF(LEV,K)+PDCF*(1.0-PDRF)*  SAM1   254
                 1PSRF(LEV,K)                                            SAM1   255
                  RADFUZE=.TRUE.                                         SAM1   256
                  GO TO 83                                               SAM1   257
               72 DO 73 K=1,NCOMPS                                       SAM1   258
                  DO 73 LEV=1,NLEVS                                      SAM1   259
               73 PS(LEV,K)=PDRF*PDCF+(1.0-PDRF*PDCF)*PSRF(LEV,K)        SAM1   260
                  RADFUZE=.TRUE.                                         SAM1   261
                  GO TO 83                                               SAM1   262
               74 IF(T2.GT.TBCF) GO TO 77                                SAM1   263
                  IF(T2.LE.TBRF) GO TO 61                                SAM1   264
                  CALL SPRAY(TBRF,PSRF)                                  SAM1   265
               75 DO 76 K=1,NCOMPS                                       SAM1   266
                  DO 76 LEV=1,NLEVS                                      SAM1   267
               76 PS(LEV,K)=(1.0-PDRF)*PSRF(LEV,K)                       SAM1   268
                  RADFUZE=.TRUE.                                         SAM1   269
                  GO TO 83                                               SAM1   270
               77 IF(T2.LE.TBRF) GO TO 63                                SAM1   271
                  IF(DELT.GE.T1) GO TO 63                                SAM1   272
                  CALL SPRAY(TBRF,PSRF)                                  SAM1   273
                  IF(PDCF.GE.1.0) GO TO 75                               SAM1   274
                  IF(TBRF.EQ.TBCF) GO TO 81                              SAM1   275
                  CALL SPRAY(TBCF,PSCF)                                  SAM1   276
                  IF(TBRF.GT.TBCF) GO TO 79                              SAM1   277
                  DO 78 K=1,NCOMPS                                       SAM1   278
                  DO 78 LEV=1,NLEVS                                      SAM1   279
               78 PS(LEV,K)=(1.0-PDRF)*PSRF(LEV,K)+PDRF*(1.0-PDCF)*PSCF(LEV,K)  SAM1   280
                  RADFUZE=.TRUE.                                         SAM1   281
                  GO TO 83                                               SAM1   282
               79 DO 80 K=1,NCOMPS                                       SAM1   283
                  DO 80 LEV=1,NLEVS                                      SAM1   284
               80 PS(LEV,K)=(1.0-PDCF)*PSCF(LEV,K)+PDCF*(1.0-PDRF)*PSRF(LEV,K)  SAM1   285
                  RADFUZE=.TRUE.                                         SAM1   286
                  GO TO 83                                               SAM1   287
               81 DO 82 K=1,NCOMPS                                       SAM1   288
                  DO 82 LEV=1,NLEVS                                      SAM1   289
               82 PS(LEV,K)=(1.0-PDCF*PDRF)*PSRF(LEV,K)                  SAM1   290
                  RADFUZE=.TRUE.                                         SAM1   291
               83 DFX=HP*(1.0-DELT)                                      SAM1   292
                  T34=T1MF*HM-DFX                                        SAM1   293
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                DO 84 J=1,3                                                    SAM1   294
                RX1(J)=RA(J)-DEX*VA(J)                                         SAM1   295
480             RX2(J)=RM(J,I)-DEX*VM(J,I)                                     SAM1   296
             84 RX3(J)=RX2(J)-RX1(J)                                           SAM1   297
                IF(IAC.EQ.2) CALL INBD                                         SAM1   298
                CALL DOT(UNITT,RX3,X)                                          SAM1   299
                CALL DOT(A1,RX3,Y)                                             SAM1   300
485             CALL DOT(D1,RX3,Z)                                             SAM1   301
                XB0=SQRT(RX3(1)**2+RX3(2)**2+RX3(3)**2)                        SAM1   302
                XB1=ATAN2(Y,X)*DEG                                             SAM1   303
                XB2=ASIN(Z/XB0)*DEG                                            SAM1   304
                XX=-TMI(1)*RX3(1)-TMI(4)*RX3(2)-TMI(7)*RX3(3)                  SAM1   305
490             YY=-TMI(2)*RX3(1)-TMI(5)*RX3(2)-TMI(8)*RX3(3)                  SAM1   306
                ZZ=-TMI(3)*RX3(1)-TMI(6)*RX3(2)-TMI(9)*RX3(3)                  SAM1   307
                XXB1=ATAN2(-YY,XX)*DEG                                         SAM1   308
                XXB2=ASIN(-ZZ/XB0)*DEG                                         SAM1   309
                WRITE(6,4000)MN(I)                                             SAM1   310
495          4000 FORMAT("1",10X,"SUMMARY OF KILL DUE TO MISSILE NO.",I3///)   SAM1   311
                IF(RADFUZE) WRITE(6,2002)MN(I),TSM,XB0,RX1,(VA(J),J=1,3),RX2,  SAM1   312
               1(VM(J,I),J=1,3),X,Y,Z,XB2,XB1,XX,YY,ZZ,XXB2,XXB1               SAM1   313
             2002 FORMAT(" ****MISSILE NO.",I3," BURSTS DUE TO RADAR FUZE AT TIME=",  SAM1   314
               1F8.3," AND RANGE=",F10.1," FEET"/                              SAM1   315
500            2"0STATE VECTORS IN INERTIAL COORDINATES AT BURST"/13X,"X",     SAM1   316
               39X,"Y",9X,"Z",9X,"VX",8X,"VY",8X,"VZ"/" AIRCRAFT",F8.0,        SAM1   317
               42F10.0,3F10.1/" MISSILE",F9.0,2F10.0,3F10.1/                   SAM1   318
               5"0MISSILE IN A/C BODY COORDINATES"/6X,"X",8X,"Y",8X,"Z",       SAM1   319
               65X,"ELEVATION    AZIMUTH"/3F9.2,F10.2,F12.2/                   SAM1   320
505            7"0A/C IN MISSILE BODY COORDINATES"/6X,"X",8X,"Y",8X,"Z",       SAM1   321
               85X,"ELEVATION    AZIMUTH"/3F9.2,F10.2,F12.2)                   SAM1   322
                IF(RADFUZE) WRITE(6,2003)(OMEG(J,I),AM1(J),ANY(J,I),DEL(J,I),  SAM1   323
               1AB(J,I),J=1,2),OMEG(3,I),AM1(3)                                SAM1   324
             2003 FORMAT("0MISSILE STATUS AT BURST"/4X,"OMEG",9X,"AM1",9X,"ANY",  SAM1   325
510            19X,"DEL",9X,"AB"/2(1P5E12.3/),1P2E12.2)                        SAM1   326
                IJ=0                                                           SAM1   327
                IF(.NOT.RADFUZE) CALL OUTPUT                                   SAM1   328
                WRITE(6,4001)((KLEV(J,LEV),J=1,2),LEV=1,NLEVS)                 SAM1   329
             4001 FORMAT("0  ",4(19X,A1L,A2))                                  SAM1   330
515             WRITE(6,4002)((HEAD1(J),J=1,3),LEV=1,NLEVS)                    SAM1   331
             4002 FORMAT(10X,4(1X,3A10))                                       SAM1   332
                WRITE(6,4003)((HEAD2(J),J=1,3),LEV=1,NLEVS)                    SAM1   333
             4003 FORMAT(" COMPONENT",4(1X,3A10))                              SAM1   334
                WRITE(6,4004)((HEAD3(J),J=1,3),LEV=1,NLEVS)                    SAM1   335
520          4004 FORMAT("   NUMBER ",4(1X,3A10))                              SAM1   336
                WRITE(6,4005)((HEAD4(J),J=1,3),LEV=1,NLEVS)                    SAM1   337
             4005 FORMAT(" ==========",4(1X,3A10))                             SAM1   338
                DO 86 K=1,NCOMPS                                               SAM1   339
                DO 85 LEV=1,NLEVS                                              SAM1   340
525             CPS(LEV,K)=CPS(LEV,K)*PS(LEV,K)                                SAM1   341
             85 CPST(LEV,K)=CPS(LEV,K)                                         SAM1   342
             86 WRITE(6,4006)K,(PS(LEV,K),CPS(LEV,K),LEV=1,NLEVS)              SAM1   343
             4006 FORMAT(4X,I2,1X,4(F14.3,F17.3))                              SAM1   344
                IF(NDUBLY.LE.0) GO TO 89                                       SAM1   345
530             LONG=2*NDUPLY-1                                                SAM1   346
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                DO 87 LEV=1,NLEVS                                                  SAM1   347
                DO 87 L=1,LEND                                                     SAM1   348
                PS(LEV,L)=PS(LEV,L)*PS(LEV,L+1)-PS(LEV,L)*PS(LEV,L+1)              SAM1   349
                PS(LEV,L+1)=1.0                                                    SAM1   350
  535           CPST(LEV,L)=CPST(LEV,L)*CPST(LEV,L+1)-CPST(LEV,L)*CPST(LEV,L+1)    SAM1   351
             87 CPST(LEV,L+1)=1.0                                                  SAM1   352
             88 DO 89 LEV=1,NLEVS                                                  SAM1   353
                PSAC=1.0                                                           SAM1   354
                CPSAC=1.0                                                          SAM1   355
  540           DO 89 K=1,NCOMPS                                                  SAM1   356
                PSAC=PSAC*PS(LEV,K)                                                SAM1   357
                CPSAC=CPSAC*CPST(LEV,K)                                            SAM1   358
                PKAC(LEV)=1.0-PSAC                                                 SAM1   359
             89 CPKAC(LEV)=1.0-CPSAC                                               SAM1   360
  545           WRITE(6,4005)((HEAD4(J),J=1,3),LEV=1,NLEVS)                       SAM1   361
                WRITE(6,4001)((KLEV(J,LEV),J=1,2),LEV=1,NLEVS)                     SAM1   362
                WRITE(6,4002)((HEAD5(J),J=1,3),LEV=1,NLEVS)                        SAM1   363
                WRITE(6,4002)((HEAD1(J),J=1,3),LEV=1,NLEVS)                        SAM1   364
                WRITE(6,4002)((HEAD6(J),J=1,3),LEV=1,NLEVS)                        SAM1   365
  550           WRITE(6,4002)((HEAD3(J),J=1,3),LEV=1,NLEVS)                        SAM1   366
                WRITE(6,4002)((HEAD4(J),J=1,3),LEV=1,NLEVS)                        SAM1   367
                WRITE(6,4007)(PKAC(LEV),CPKAC(LEV),LEV=1,NLEVS)                    SAM1   368
            4007 FORMAT(8X,4(F14.3,F17.3))                                         SAM1   369
                WRITE(6,4002)((HEAD4(J),J=1,3),LEV=1,NLEVS)                        SAM1   370
  555           IJ=1                                                              SAM1   371
                IJX=0                                                              SAM1   372
                MFLAG(I)=0.0                                                       SAM1   373
                NMIN=NMIN-1                                                        SAM1   374
                IF(IEDIT.GT.0) WRITE(IEDIT,5002)JV,(TITLE(J),J=1,2),I,MN(I),       SAM1   375
  560          1ISM,RX2,RX1,XP0,XD1,XD2,PKAC                                       SAM1   376
            5002 FORMAT(" 2",I2,2A4," 2",2I2,14A4)                                 SAM1   377
             999 XCMOLD(I)=XCM                                                     SAM1   378
                 YCMOLD(I)=YCM                                                     SAM1   379
                 ZCMOLD(I)=ZCM                                                     SAM1   380
  565        1000 CONTINUE                                                        SAM1   381
                 RETURN                                                          SAM    1265
                 ENTRY MISINT                                                    SAM    1266
                 WRITE(6,3000)                                                   SAM    1267
            3000 FORMAT(25H0*****MISSILE TYPE 2*****)                            SAM    1268
  570            IF(HM .EQ. HMS) RETURN                                          SAM    1269
                 NX5=0                                                           SAM    1270
                 AREAM=2.01                                                      SAM    1271
                 TT1=EXP(-HM*10.)                                                SAM    1272
                 TT2=EXP(-HM*2.0                                                 SAM    1273
  575            TT3=EXP(-HM/.22)                                                SAM    1274
                 TT4=EXP(-HM)                                                    SAM    1275
                 GM=HM*.125                                                      SAM    1276
                 TX1(1)=EXP(-GM*10.)                                             SAM    1277
                 TX1(2)=TX1(1)                                                   SAM    1278
  580            TX2(1)=EXP(-GM/.18)                                             SAM    1279
                 TX2(2)=TX1(1)                                                   SAM    1280
                 TXX1(1)=1.-TX1(1)                                               SAM    1281
                 TXX1(2)=TXX1(1)                                                 SAM    1282
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                RTT1(1)=.1/GM                                                   SAM     1283
                RTT1(2)=RTT1(1)                                                 SAM     1284
                TXX2(1)=1.-TX2(1)                                               SAM     1285
                TXX2(2)=TXX1(1)                                                 SAM     1286
                RTT2(1)=.10/GM                                                  SAM     1287
                RTT2(2)=RTT1(2)                                                 SAM     1288
                HMS=HP                                                          SAM     1289
                RETURN                                                          SAM     1290
                ENTRY LAUNCH                                                    SAM     1291
                DO 1500 J = 1, 20                                               SAM     1292
                IF (MFLAG(J) .LE.0 ) GO TO 1501                                 SAM     1293
          1500 CONTINUE                                                         SAM     1294
                KA=0                                                            SAM     1295
                RETURN                                                          SAM     1296
          1501 K=J                                                              SAM     1297
                DO 1502  L=1,6                                                  SAM     1298
          1502 RM(L,K)=0.                                                       SAM     1299
                VM(4,K)=10.                                                     SAM     1300
                V11(1,K)=10.                                                    SAM     1301
                V11(2,K)=0.                                                     SAM     1302
                V11(3,K)=0.                                                     SAM     1303
                MACHM(K)=0.0                                                    SAM     1304
                RHO=RA(1)**2+RA(2)**2                                           SAM     1305
                VM(5,K)=RA(5)+7.*(RA(1)*VA(2)-RA(2)*VA(1))/RHO                  SAM     1306
                VM(6,K)=.262+.892*(RA(6)+7.*(VA(3)*PHO-RA(3)*(RA(1)*VA(1)+RA(2)*VA SAM     1307
               1(2)))/(PHO*RA(4)**2))                                           SAM     1308
                IF(ABS(VM(5,K)) .GT. PI)  VM(5,K)=VM(5,K)-SIGN(2.*PI,VM(5,K))  SAM     1309
                CALL COORD(VM(1,K),2)                                           SAM     1310
                MFLAG(K)=1                                                      SAM     1311
                RAM(K)=RA(4)                                                    SAM     1312
                RAMD(K)=0.                                                      SAM     1313
                NMIN=NMIN+1                                                     SAM     1314
                NX5=NX5+1                                                       SAM     1315
                MN(K)=NX5                                                       SAM     1316
                IF(IECIT .GT. 0) WRITE(IEDIT,5003) JV,(TITLE(J),J=1,2),I,MN(I), SAM     1317
               1            TIME,(RA(J),J=1,3)                                  SAM     1318
          5003 FORMAT(2H 2,I2,2A4,2H 1,2I2,4A4)                                 SAM     1319
                X18(K)=-VM(5,K)                                                 SAM     1320
                X19(K)=VM(6,K)                                                  SAM     1321
                SX19(K)=SIN(X19(K))                                             SAM     1322
                CX19(K)=COS(X19(K))                                             SAM     1323
                SZS(K)=SIN(X18(K))                                              SAM     1324
                CZS(K)=COS(X18(K))                                              SAM     1325
                DO 1503  J1=1,2                                                 SAM     1326
                DEL(J1,K)=0.0                                                   SAM     1327
                VV(J1,K)=0.0                                                    SAM     1328
                AHY(J1,K)=0.                                                    SAM     1329
                CD1(J1,K)=0.                                                    SAM     1330
                CD2(J1,K)=0.                                                    SAM     1331
                CD3(J1,K)=0.                                                    SAM     1332
                AB(J1,K)=0.0                                                    SAM     1333
                DDS(J1,K)=0.0                                                   SAM     1334
                CDS(J1,K)=0.                                                    SAM     1335
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                CD2(J1,K)=0.                                        SAM    1336
                DO 1503  J2=1,2                                     SAM    1337
                DF2(J1,J2,K)=VM(7-J1,K)                             SAM    1338
640             LY1(J1,J2,K)=0.0                                    SAM    1339
                LY2(J1,J2,K)=0.0                                    SAM    1340
                LX1(J1,J2,K)=0.                                     SAM    1341
           1503 LX2(J1,J2,K)=0.                                     SAM    1342
                TL(K)=TIME                                          SAM    1343
645             DO 1504 J = 1,3                                     SAM    1344
                VMS(J,K)=VM(J,K)                                    SAM    1345
                AM1S(J,K)=0.                                        SAM    1346
           1504 OMEG(J,K)=0.                                        SAM    1347
                KA=K                                                SAM    1348
650             IF(NMIN .GT. 1) RETURN                              SAM    1349
                CD3=PA(4)                                           SAM    1350
                DD3S=CD3                                            SAM    1351
                KFILL=1                                             SAM    1352
                RETURN                                              SAM    1353
65C             END                                                 SAM    1354
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      SUBROUTINE SPRAY(ELT,PSC)                                          SAM     1941
      COMMON /DRIVE/ TIME,NM,ISTART,TOTAL,EXTR(60),IEXTR(30),TITLE(18),  SAM1    382
     1DEG,G,PI,RAD                                                       SAM1    383
      COMMON /MISSL/ RM(6,20),VM(6,20),MACHM(20),QAM(20),SSA,AREAM,      SAM     1942
     1VV(2,20),DEL(2,20),AB(2,20),MN(20),RAM(20),RAMD(20)                SAM     1943
      COMMON /FLAGS/ JEOL,KEOL,JSAM,KSAM,LSAM,NMIN,ISTOP,IAC,IEDIT,      SAM     1944
     1IGUIDE,IMODE,MFLAG(20),JV                                          SAM     1945
      COMMON /AIRCF/ RA(6),VA(6),DUM(16),TIA(9)                          SAM1    384
      COMMON /ONE/ NCOMPS,NLEVS,NWTS,NSHLDS,NBLAST,NGLIT,THA,RCHA,VE,    SAM     1947
     1DELT,XCM,YCM,ZCM,VNETHI,I                                          SAM1    385
      COMMON /TWO/ XGL(25),YGL(25),ZGL(25),XSH(25),YSH(25),ZSH(25),      SAM     1949
     1ASH(25),BSH(25),CSH(25),XBL(25),YBL(25),ZBL(25),ABL(25),BBL(25),   SAM     1950
     2CBL(25),XCMOLD(20),YCMOLD(20),ZCMOLD(20),EX(25),WY(25),ZEE(25),    SAM     1951
     3TAM(9),TMI(9)                                                      SAM     1952
      COMMON /FIVE/ VOL(2,11,72),SIEAR(19),FRACT(10),SLOW(10)            SAM1    386
      DIMENSION PSC(4,25),SUM(4),VT(3),VS(3)                             SAM     1953
      DELTA=0.5/VA(4)                                                    SAM1    387
      XSTAR=XCMOLD(I)+DLT*(XCM-XCMOLD(I))                                SAM     1954
      YSTAR=YCMOLD(I)+DLT*(YCM-YCMOLD(I))                                SAM     1955
      ZSTAR=ZCMOLD(I)+DLT*(ZCM-ZCMOLD(I))                                SAM     1956
      IF(NBLAST.LT.1) GO TO 102                                          SAM1    388
      DO 101 M=1,NBLAST                                                  SAM     1957
      IF(((XSTAR-XBL(M))/ABL(M))**2+((YSTAR-YBL(M))/BBL(M))**2+          SAM     1958
     1((ZSTAR-ZBL(M))/CBL(M))**2.GT.1.0) GO TO 101                       SAM     1959
      DO 100 K=1,NCOMPS                                                  SAM     1960
      DO 100 LEV=1,NLEVS                                                 SAM     1961
  100 PSC(LEV,K)=0.0                                                     SAM     1962
      RETURN                                                             SAM     1963
  101 CONTINUE                                                           SAM     1964
  102 VT(1)=TIA(1)*VA(1)+TIA(2)*VA(2)+TIA(3)*VA(3)                       SAM1    389
      VT(2)=TIA(4)*VA(1)+TIA(5)*VA(2)+TIA(6)*VA(3)                       SAM     1966
      VT(3)=TIA(7)*VA(1)+TIA(8)*VA(2)+TIA(9)*VA(3)                       SAM     1967
      VS(1)=TIA(1)*VM(1,I)+TIA(2)*VM(2,I)+TIA(3)*VM(3,I)                 SAM     1968
      VS(2)=TIA(4)*VM(1,I)+TIA(5)*VM(2,I)+TIA(6)*VM(3,I)                 SAM     1969
      VS(3)=TIA(7)*VM(1,I)+TIA(8)*VM(2,I)+TIA(9)*VM(3,I)                 SAM     1970
      VTVS=VT(1)*VS(1)+VT(2)*VS(2)+VT(3)*VS(3)                           SAM     1971
      A=VA(4)**2+VM(4,I)**2-VE**2-2.0*VTVS                               SAM     1972
      VRAT=VE/VM(4,I)                                                    SAM1    390
      VRAT2=VRAT**2                                                      SAM1    391
      DO 31 K=1,NCOMPS                                                   SAM     1973
      DX=EX(K)-XSTAR                                                     SAM     1974
      DY=WY(K)-YSTAR                                                     SAM     1975
      DZ=ZEE(K)-ZSTAR                                                    SAM     1976
      B=2.0*(DX*(VT(1)-VS(1))+DY*(VT(2)-VS(2))+DZ*(VT(3)-VS(3)))         SAM     1979
      C=DX**2+DY**2+DZ**2                                                SAM     1980
      D=B*B-4.0*A*C                                                      SAM     1981
      IF(D.GE.0.0) GO TO 3                                               SAM     1982
    1 DO 2 LEV=1,NLEVS                                                   SAM     1983
    2 PSC(LEV,K)=1.0                                                     SAM     1984
      GO TO 31                                                           SAM     1985
    3 T1=(-B+SQRT(D))/(2.0*A)                                            SAM     1986
      T2=(-B-SQRT(D))/(2.0*A)                                            SAM     1987
      IF(T1.GE.0.0) GO TO 4                                              SAM     1988
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                IF(T2.LT.0.0) GO TO 1                                   SAM     1989
55              TEST=T2                                                 SAM     1990
                GO TO 6                                                 SAM     1991
              4 IF(T2.GT.0.0) GO TO 5                                   SAM     1992
                TEST=T1                                                 SAM     1993
                GO TO 6                                                 SAM     1994
60            5 TEST=AMIN1(T1,T2)                                       SAM     1995
              6 DO 7 LEV=1,NLEVS                                        SAM     1996
              7 SUM(LEV)=0.0                                            SAM     1997
                DO 28 KWT=1,NWTS                                        SAM     1998
                KOUNT=0                                                 SAM     1999
65            8 ELX=DX+VT(1)*TEST                                       SAM     2000
                ELY=DY+VT(2)*TEST                                       SAM     2001
                ELZ=DZ+VT(3)*TEST                                       SAM     2002
                EL=SQRT(ELX**2+ELY**2+ELZ**2)                           SAM     2003
                KOUNT=KOUNT+1                                           SAM     2004
70              BETAX=ELX/EL                                            SAM     2005
                BETAY=ELY/EL                                            SAM     2006
                BETAZ=ELZ/EL                                            SAM     2007
                ELDOT=BETAX*VT(1)+BETAY*VT(2)+BETAZ*VT(3)               SAM     2008
                COSGAM=(BETAZ*VS(1)+BETAY*VS(2)+BETAZ*VS(3))/VM(4,I)    SAM     2009
75              VZERO=VM(4,I)*COSGAM+SQRT((VM(4,I)*COSGAM)**2+VE**2-VM(4,I)**2)  SAM     2010
                F=SLOW(KWT)*EL-ALOG(1.0+SLOW(KWT)*VZERO*TEST)           SAM     2011
                VDOOT=VZERO*(VTVS-ELDOT*VM(4,I)*COSGAM)/                SAM     2012
               1(EL*(VZERO-VM(4,I)*COSGAM))                             SAM     2013
                FPRIME=SLOW(KWT)*(ELDOT-(VZERO+VDOOT*TEST)/             SAM     2014
80             1(1.0+SLOW(KWT)*VZERO*TEST))                             SAM     2015
                IF(FPRIME.GE.0.0) GO TO 28                              SAM     2016
                TNEW=TEST-F/FPRIME                                      SAM     2017
                IF(TNEW.LT.0.0) GO TO 28                                SAM     2018
                IF(ABS(TNEW-TEST).LE.DELTA) GO TO 10                    SAM     2019
85              IF(KOUNT.GT.10) GO TO 28                                SAM     2020
              9 TEST=TNEW                                               SAM     2021
                GO TO 8                                                 SAM     2022
             10 SDOWN=EXP(-SLOW(KWT)*EL)                                SAM     2023
                COSTHT=(VZERO*COSGAM-VM(4,I))/VE                        SAM     2024
90              IF(ABS(COSTHT).GT.1.0) COSTHT=SIGN(1.0,COSTHT)          SAM     2025
                XTG=VT(1)*TEST                                          SAM     2026
                YTG=VT(2)*TEST                                          SAM     2027
                ZTG=VT(3)*TEST                                          SAM     2028
                IF(NSHLDS.LT.1) GO TO 15                                SAM1     392
95              IF(BETAX.EQ.0.0) GO TO 9                                SAM     2030
                DO 14 L=1,NSHLDS                                        SAM     2031
                IF(EX(K).NE.XSH(L)) GO TO 11                            SAM     2032
                IF(WY(K).NE.YSH(L)) GO TO 11                            SAM     2033
                IF(ZEE(K).EQ.ZSH(L)) GO TO 14                           SAM     2034
100            11 DX=(XSH(L)+XTG-XSTAR)/ASH(L)                          SAM     2035
                DY=(YSH(L)+YTG-YSTAR)/BSH(L)                            SAM     2036
                DZ=(ZSH(L)+ZTG-ZSTAR)/CSH(L)                            SAM     2037
                TXY=(BETAY*ASH(L))/(BETAX*BSH(L))                       SAM     2038
                TXZ=(BETAZ*ASH(L))/(BETAX*CSH(L))                       SAM     2039
105             A=1.0+TXY**2+TXZ**2                                     SAM     2040
                B=-2.0*(DX+TXY*DY+TXZ*DZ)                               SAM     2041
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                C=DX**2+DY**2+DZ**2-1.0                                          SAM     2042
                D=B*B-4.0*A*C                                                    SAM     2043
                IF(D.LE.0.0) GO TO 14                                            SAM     2044
110             C=SQRT(D)                                                        SAM     2045
                DO 13 LL=1,2                                                     SAM     2046
                XDIM=(-B+D*(-1.0**LL))/(2.0*A)                                   SAM     2047
                XPUNCH=XSTAR+XDIM*ASH(L)                                         SAM     2048
                IF(XPUNCH.LE.XSTAR) GO TO 12                                     SAM     2049
115             IF(EX(K)+XTG-XSTAR.GT.XPUNCH) GO TO 28                           SAM     2050
                GO TO 13                                                         SAM     2051
             12 IF(EX(K)+XTG-XSTAR.LT.XPUNCH) GO TO 28                           SAM     2052
             13 CONTINUE                                                         SAM     2053
             14 CONTINUE                                                         SAM     2054
120          15 THETA=ATAN2(SQRT(1.0-COSTHT**2),COSTHT)                          SAM     2055
                KANG=18.0*THETA/PI+1.0                                           SAM     2056
                IF(KANG.NE.19) GO TO 16                                          SAM     2057
                STIR=STEAR(19)                                                   SAM     2058
                GO TO 17                                                         SAM     2059
125          16 STIR=STEAR(KANG)+(STEAR(KANG+1)-STEAR(KANG))*                    SAM     2060
               1(18.0*THETA/PI+1.0-KANG)                                         SAM     2061
             17 VHIT=VZERO*SDOWN                                                 SAM     2062
                VNET=SQRT((VHIT*BETAX-VT(1))**2+(VHIT*BETAY-VT(2))**2+          SAM     2063
               1(VHIT*BETAZ-VT(3))**2)                                           SAM     2064
130             KV=10.0*VNET/VNETHI+1.0                                          SAM     2065
                SPREAD=VRAT2*ABS(VRAT+COSTHT)/(VRAT2+2.0*VRAT*COSTHT+1.0)**1.5   SAM     2066
                DO 27 IXYZ=1,3                                                   SAM     2067
                IF(IXYZ-2)18,20,22                                               SAM     2068
             18 SHAD=ABS(BETAX)                                                  SAM     2069
135             IF(BETAX.GE.0.0) GO TO 19                                        SAM     2070
                IFACE=1                                                          SAM     2071
                GO TO 24                                                         SAM     2072
             19 IFACE=0                                                          SAM     2073
                GO TO 24                                                         SAM     2074
140          20 SHAD=ABS(BETAY)                                                  SAM     2075
                IF(BETAY.GE.0.0) GO TO 21                                        SAM     2076
                IFACE=3                                                          SAM     2077
                GO TO 24                                                         SAM     2078
             21 IFACE=2                                                          SAM     2079
145             GO TO 24                                                         SAM     2080
             22 SHAD=ABS(BETAZ)                                                  SAM     2081
                IF(BETAZ.GE.0.0) GO TO 23                                        SAM     2082
                IFACE=4                                                          SAM     2083
                GO TO 24                                                         SAM     2084
150          23 IFACE=5                                                          SAM     2085
             24 KFACE=6*K-IFACE                                                  SAM     2086
                JINDEX=NWTS*(KFACE-1)+KWT                                        SAM     2087
                DO 26 LEV=1,NLEVS                                                SAM     2088
                IF(KV.LT.11) GO TO 25                                            SAM     2089
155             VAREA=VUL(LEV,11,JINDEX)                                         SAM     2090
                GO TO 26                                                         SAM     2091
             25 VAREA=VUL(LEV,KV,JINDEX)+(10.0*VNET/VNETHI+1.0-KV)*              SAM     2092
               1(VUL(LEV,KV+1,JINDEX)-VUL(LEV,KV,JINDEX))                        SAM     2093
             26 SUM(LEV)=SUM(LEV)+STIR*FRACT(KWT)*VAREA*SHAD/(SPREAD*EL**2)      SAM     2094
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160               27 CONTINUE                                          SAM    2095
                  28 CONTINUE                                          SAM    2096
                     DO 30 LEV=1,NLEVS                                 SAM    2097
                     IF(SUM(LEV).LT.9.0) GO TO 29                      SAM    2098
                     PSC(LEV,K)=0.0                                    SAM    2099
165                  GO TO 30                                          SAM    2100
                  29 PSC(LEV,K)=EXP(-SUM(LEV))                         SAM    2101
                  30 CONTINUE                                          SAM    2102
                  31 CONTINUE                                          SAM    2103
                     RETURN                                            SAM    2104
170                  END                                               SAM    2105
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      SUBROUTINE STAB(XO,YO,ZO,XS,YS,ZS,N,DLT)                          SAM    2106
      COMMON /MISSL/ RM(6,20),VM(6,20),MACHM(20),QAM(20),SSA,AREAM,     SAM    2107
     1VV(2,20),DEL(2,20),AE(2,20),MN(20),RAM(20),RAMD(20)               SAM    2108
      COMMON /FLAGS/ JPOL,KPOL,JSAM,KSAM,LSAM,NMIN,ISTOP,IAC,IEDIT,     SAM    2109
     1IGUIDE,IMODE,MFLAG(20),JV                                         SAM    2110
      COMMON /AIRCF/ DUM(28),TIA(9)                                     SAM    2111
      COMMON /ONE/ NCOMPS,NLEVS,NWTS,NSHLDS,NBLAST,NGLIT,THA,RCHA,VE,   SAM    2112
     1DELT,XCM,YCM,ZCM,VNETHI,I                                         SAM1    393
      COMMON /TWO/ XGL(25),YGL(25),ZGL(25),XSH(25),YSH(25),ZSH(25),     SAM    2114
     1ASH(25),BSH(25),CSH(25),XBL(25),YBL(25),ZBL(25),ABL(25),BBL(25),  SAM    2115
     2CBL(25),XCMOLD(20),YCMOLD(20),ZCMOLD(20),EX(25),WY(25),ZEE(25),   SAM    2116
     3TAM(9),TMI(9)                                                     SAM    2117
      DIMENSION XO(25),YO(25),ZO(25),XS(25),YS(25),ZS(25)               SAM    2118
      DLT=2.0                                                           SAM    2119
      IF(N.LT.1) RETURN                                                 SAM    2120
      DX=XCMOLD(I)-XCM                                                  SAM    2121
      DY=YCMOLD(I)-YCM                                                  SAM    2122
      DZ=ZCMOLD(I)-ZCM                                                  SAM    2123
      DO 4 J=1,N                                                        SAM    2124
      IF(DZ.EQ.0.0) GO TO 1                                             SAM    2125
      XY2=(XS(J)*YS(J))**2                                              SAM    2126
      XZ2=(XS(J)*ZS(J))**2                                              SAM    2127
      YZ2=(YS(J)*ZS(J))**2                                              SAM    2128
      TYZ=XCM*ZCMOLD(I)-XCMOLD(I)*ZCM+XO(J)*DZ                          SAM    2129
      TYZ=YCM*ZCMOLD(I)-YCMOLD(I)*ZCM+YO(J)*DZ                          SAM    2130
      A=XY2*DZ**2+XZ2*DY**2+YZ2*DX**2                                   SAM    2131
      B=-2.0*(DX*YZ2*TXZ+DY*XZ2*TYZ+DZ**2*XY2*ZO(J))                    SAM    2132
      C=XZ2*TYZ**2+YZ2*TXZ**2+XY2*DZ**2*(ZO(J)**2-ZS(J)**2)             SAM    2133
      D=B*B-4.0*A*C                                                     SAM    2134
      IF(D.LT.0.0) GO TO 4                                              SAM    2135
      D=SQRT(D)                                                         SAM    2136
      Z3=(-B+SIGN(D,DZ))/(2.0*A)                                        SAM    2137
      DELL=(ZCMOLD(I)-Z3)/DZ                                            SAM    2138
      GO TO 3                                                           SAM    2139
    1 IF(DY.EQ.0.0) GO TO 2                                             SAM    2140
      A=(YS(J)*DX)**2+(XS(J)*DY)**2                                     SAM    2141
      TXY=XCM*YCMOLD(I)-XCMOLD(I)*YCM+XO(J)*DY                          SAM    2142
      XY2=(XS(J)*DY)**2                                                 SAM    2143
      B=2.0*(YS(J)**2*DX*TXY-XY2*YO(J))                                 SAM    2144
      C=(YS(J)*TXY)**2+XY2*(YO(J)**2+YS(J)**2)*                         SAM    2145
     1(((ZCM-ZO(J))/ZS(J))**2-1.0)                                      SAM    2146
      D=B*B-4.0*A*C                                                     SAM    2147
      IF(D.LT.0.0) GO TO 4                                              SAM    2148
      D=SQRT(D)                                                         SAM    2149
      Y3=(-B+SIGN(D,DY))/(2.0*A)                                        SAM    2150
      DELL=(YCMOLD(I)-Y3)/DY                                            SAM    2151
      GO TO 3                                                           SAM    2152
    2 IF(DX.EQ.0.0) RETURN                                              SAM    2153
      TYZ=1.0-((ZCM-ZO(J))/ZS(J))**2-((YCM-YO(J))/YS(J))**2             SAM    2154
      IF(TYZ.LT.0.0) GO TO 4                                            SAM    2155
      TYZ=SQRT(TYZ)                                                     SAM    2156
      X3=XO(J)+XS(J)*SIGN(TYZ,DX)                                       SAM    2157
      DELL=(XCMOLD(I)-X3)/DX                                            SAM    2158
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                3 IF(DELL.LT.0.0) GO TO 4                                SAM     2159
55                IF(DELL.LT.DLT) DLT=DELL                               SAM     2160
                4 CONTINUE                                               SAM     2161
                  RETURN                                                 SAM     2162
                  END                                                    SAM     2163
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      SUBROUTINE CONFUZE                                                SAM     2164
      COMMON /MISSL/ RM(6,20),VM(6,20),MACHM(20),QAM(20),SSA,AREAM,     SAM     2165
     1VV(2,20),DEL(2,20),AB(2,20),MN(20),RAM(20),RAMD(20)               SAM     2166
      COMMON /FLAGS/ JPOL,KPOL,JSAM,KSAM,LSAM,NMIN,ISTOP,IAC,IEDIT,     SAM     2167
     1IGUIDE,TMODE,MFLAG(20),JV                                         SAM     2168
      COMMON /AIRCF/ DUM(28),TIA(9)                                     SAM     2169
      COMMON /ONE/ NCOMPS,NLEVS,NWTS,NSHLOS,NBLAST,NGLIT,THA,RCHA,VE,   SAM     2170
     1DELT,XCM,YCM,ZCM,VNETNI,I                                         SAM1     394
      COMMON /TWO/ XGL(25),YGL(25),ZGL(25),XSH(25),YSH(25),ZSH(25),     SAM     2172
     1ASH(25),BSH(25),CSH(25),XBL(25),YBL(25),ZBL(25),ABL(25),BBL(25),  SAM     2173
     2CBL(25),XCMOLD(20),YCMOLD(20),ZCMOLD(20),EX(25),HY(25),ZEE(25),   SAM     2174
     3TAM(9),TMI(9)                                                     SAM     2175
      REAL XG(2),YG(2),ZG(2)                                            SAM     2176
      DELT=2.0                                                          SAM     2177
      DO 10 IGL=1,NGLIT                                                 SAM     2178
      T1=XGL(IGL)-XCMOLD(I)                                             SAM     2179
      T2=YGL(IGL)-YCMOLD(I)                                             SAM     2180
      T3=ZGL(IGL)-ZCMOLD(I)                                             SAM     2181
      XG(1)=TAM(1)*T1+TAM(2)*T2+TAM(3)*T3                               SAM     2182
      YG(1)=TAM(4)*T1+TAM(5)*T2+TAM(6)*T3                               SAM     2183
      ZG(1)=TAM(7)*T1+TAM(8)*T2+TAM(9)*T3                               SAM     2184
      T1=XGL(IGL)-XCM                                                   SAM     2185
      T2=YGL(IGL)-YCM                                                   SAM     2186
      T3=XGL(IGL)-ZCM                                                   SAM     2187
      XG(2)=TAM(1)*T1+TAM(2)*T2+TAM(3)*T3                               SAM     2188
      YG(2)=TAM(4)*T1+TAM(5)*T2+TAM(6)*T3                               SAM     2189
      ZG(2)=TAM(7)*T1+TAM(8)*T2+TAM(9)*T3                               SAM     2190
      IF(THA.GT.0.0) GO TO 1                                            SAM     2191
      XG(1)=-XG(1)                                                      SAM     2192
      XG(2)=-XG(2)                                                      SAM     2193
    1 DX=XG(1)-XG(2)                                                    SAM     2194
      DY=YG(1)-YG(2)                                                    SAM     2195
      DZ=ZG(1)-ZG(2)                                                    SAM     2196
      IF(DX.NE.0.0) GO TO 4                                             SAM     2197
      IF(XG(1).LT.0.0) GO TO 10                                         SAM     2198
      IF(XG(1).GT.RCHA) GO TO 10                                        SAM     2199
      IF(DZ.NE.0.0) GO TO 2                                             SAM     2200
      IF(DY.EQ.0.0) GO TO 10                                            SAM     2201
      Y3=(XG(1)*THA)**2-ZG(1)**2                                        SAM     2202
      IF(Y3.LT.0.0) GO TO 10                                            SAM     2203
      Y3=SIGN(SQRT(Y3),DY)                                              SAM     2204
      DELTT=(YG(1)-Y3)/DY                                               SAM     2205
      IF(DELTT.GT.1.0) GO TO 10                                         SAM     2206
      IF(DELTT.GE.0.0) GO TO 9                                          SAM     2207
      DELTT=(YG(1)+Y3)/DY                                               SAM     2208
      GO TO 7                                                           SAM     2209
    2 A=DY**2+DZ**2                                                     SAM     2210
      TEMP=YG(1)*ZG(2)-YG(2)*ZG(1)                                      SAM     2211
      B=-2.0*TEMP*DY                                                    SAM     2212
      C=TEMP**2-(XG(1)*THA*DZ)**2                                       SAM     2213
      D=B*B-4.0*A*C                                                     SAM     2214
      IF(D.LT.0.0) GO TO 10                                             SAM     2215
      D=SQRT(D)                                                         SAM     2216
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                Z3=(-B+SIGN(D,DZ))/(2.0*A)                                SAM   2217
5               DELTT=(ZG(1)-Z3)/DZ                                       SAM   2218
                IF(DELTT.LT.0.0) GO TO 3                                  SAM   2219
                IF(DELTT.GT.1.0) 10,9                                     SAM   2220
              3 Z3=(-B-SIGN(D,DZ))/(2.0*A)                                SAM   2221
                DELTT=(ZG(1)-Z3)/DZ                                       SAM   2222
60              GO TO 7                                                   SAM   2223
              4 A=DY**2+DZ**2-(DX*THA)**2                                 SAM   2224
                T1=YG(2)*XG(1)-YG(1)*XG(2)                                SAM   2225
                T2=ZG(2)*XG(1)-ZG(1)*XG(2)                                SAM   2226
                B=2.0*(T1*DY+T2*DZ)                                       SAM   2227
65              C=T1**2+T2**2                                             SAM   2228
                IF(A.NE.0.0) GO TO 5                                      SAM   2229
                IF(B.GE.0.0) GO TO 10                                     SAM   2230
                X3=-C/B                                                   SAM   2231
                IF(X3.GT.RCHA) GO TO 10                                   SAM   2232
70              DELTT=(XG(1)-X3)/DX                                       SAM   2233
                GO TO 7                                                   SAM   2234
              5 D=B*B-4.0*A*C                                             SAM   2235
                IF(D.LT.0.0) GO TO 10                                     SAM   2236
                D=SQRT(D)                                                 SAM   2237
75              X3=(-B+SIGN(D,A*DX))/(2.0*A)                              SAM   2238
                IF(X3.LT.0.0) GO TO 10                                    SAM   2239
                IF(X3.GT.RCHA) GO TO 6                                    SAM   2240
                DELTT=(XG(1)-X3)/DX                                       SAM   2241
                IF(DELTT.GE.0.0) GO TO 8                                  SAM   2242
80            6 X3=(-B-SIGN(D,A*DX))/(2.0*A)                              SAM   2243
                IF(X3.LT.0.0) GO TO 10                                    SAM   2244
                IF(X3.GT.RCHA) GO TO 10                                   SAM   2245
                DELTT=(XG(1)-X3)/DX                                       SAM   2246
              7 IF(DELTT.LT.0.0) GO TO 10                                 SAM   2247
85            8 IF(DELTT.GT.1.0) GO TO 10                                 SAM   2248
              9 IF(DELTT.LT.DELT) DELT=DELTT                              SAM   2249
             10 CONTINUE                                                  SAM   2250
                RETURN                                                    SAM   2251
                END                                                       SAM   2252
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SECTION 5

DEFINITION OF FORTRAN VARIABLES

The following pages of this section list and define those FORTRAN variables which have been added to the DSAMAM program for the endgame. Also shown is the common block in which the variable is found or, if it is not in common, the subroutine which uses it. Finally, there is an indication at to whether the value of the variable is read as input or computed internally.

FORTRAN Variable	Input or Internal	Common Block or Subroutine Where Found	Definition
ABL(I)	Input	/TWO/	For the Ith blast ellipsoid, the length of the semi-axis in the X-direction of the aircraft body system (ft)
ASH(I)	Input	/TWO/	For the Ith fragment shield ellipsoid, the length of the semi-axis in the X-direction of the aircraft body system (ft)
BBL(I)	Input	/TWO/	For the Ith blast ellipsoid, the length of the semi-axis in the Y-direction of the aircraft body system (ft)
BETAX	Internal	SPRAY	Direction cosine with respect to the X-axis of the aircraft body system of the line traversed by the fragment
BETAY	Internal	SPRAY	Direction cosine with respect to the Y-axis of the aircraft body system of the line traversed by the fragment
BETAZ	Internal	SPRAY	Direction cosine with respect to the Z-axis of the aircraft body system of the line traversed by the fragment
BSH(I)	Input	/TWO/	For the Ith fragment shield ellipsoid, the length of the semi-axis in the Y-direction of the aircraft body system (ft)
CBL(I)	Input	/TWO/	For the Ith blast ellipsoid, the length of the semi-axis in the Z-direction of the aircraft body system (ft)
CDR	Input	/THREE/	Fragment drag coefficient

FORTRAN Variable	Input or Internal	Common Block or Subroutine Where Found	Definition
COSGAM	Internal	SPRAY	Cosine of the angle between the missile velocity and the velocity vector of the fragment in a dynamic explosion
COSTHT	Internal	SPRAY	Cosine of the angle between the missile velocity vector and the velocity vector of the fragment in a static explosion
CPS(I,J)	Internal	/SIX/	Cumulative survival probability for component J at kill level I
CPKAC(I)	Internal	MISSIL	Cumulative overall aircraft kill probability at kill level I
CPST(I,J)	Internal	MISSIL	Cumulative survival probability for component J at kill level I adjusted for doubly vulnerable pairs in order to calculate overall aircraft kill probability
CSH(I)	Input	/TWO/	For the Ith fragment shield ellipsoid, the length of the semi-axis in the Z-direction of the aircraft body system (ft)
DELT	Internal	/ONE/	That fraction of the time increment between two integration points at which radar fuzing occurs
DTCF	Input	/THREE/	Delay time of the contact fuze (sec.)
DTRF	Input	/THREE/	Delay time of the radar fuze (sec.)
EL	Internal	SPRAY	The distance traveled by a fragment before hitting an aircraft component (ft)

FORTRAN Variable	Input or Internal	Common Block or Subroutine Where Found	Definition
ELDOT	Internal	SPRAY	Rate of change of EL with respect to time (ft/sec).
EX(I)	Input	/TWO/	X-coordinate in the aircraft body system of the center of gravity of the Ith vulnerable component (ft).
F	Internal	SPRAY	A function of time whose roots represent solutions for the intersection of the fragment and an aircraft component.
FPRIME	Internal	SPRAY	The rate of change of F with respect to time.
FRACT(I)	Input	/FIVE/	Fraction by number of all fragments belonging to fragment mass class I.
HAFANG	Input	/THREE/	Half-angle of the radar fuze (degrees).
HEAD1(I)	Internal	MISSIL	Printout heading. I has a maximum value of 3.
HEAD2(I)	Internal	MISSIL	Printout heading. I has a maximum value of 3.
HEAD3(I)	Internal	MISSIL	Printout heading. I has a maximum value of 3.
HEAD4(I)	Internal	MISSIL	Printout heading. I has a maximum value of 3.
HEAD5(I)	Internal	MISSIL	Printout heading. I has a maximum value of 3.
HEAD6(I)	Internal	MISSIL	Printout heading. I has a maximum value of 3.
I	Internal	/ONE/	Index which points to the particular missile in the air being considered. This variable is also used as a temporary index in other parts of the program which do not relate to the endgame.

FORTRAN Variable	Input or Internal	Common Block of Subroutine Where Found	Definition
KLEV(I,J)	Internal	MISSIL	Printout heading which designates kill level J. I has a maximum value of 2.
NBLAST	Input	/ONE/	Number of blast ellipsoids.
NCOMPS	Input	/ONE/	Number of vulnerable components (including doubly vulnerable components).
NDHK	Input	/THREE/	Number of direct-hit-with-kill ellipsoids.
NDHNK	Input	/THREE/	Number of direct-hit-no-kill ellipsoids.
NDUBLY	Input	/THREE/	Number of pairs of doubly vulnerable components.
NGLIT	Input	/ONE/	Number of glitter points.
NLEVS	Input	/ONE/	Number of kill levels.
NSHLDS	Input	/ONE/	Number of shield ellipsoids.
NWTS	Input	/ONE/	Number of fragment mass classes.
PDCF	Input	/THREE/	Probability that the contact fuze is a dud.
PDRF	Input	/THREE/	Probability that the radar fuze is a dud.
PKAC(I)	Internal	MISSIL	Single-shot overall aircraft kill probability at kill level I.
PS(I,J)	Internal	MISSIL	Single-shot survival probability for component J at kill level I.
PSCF(I,J)	Internal	MISSIL	Single-shot survival probability for component J at kill level I due to detonation initiated by contact fuze.

FORTRAN Variable	Input or Internal	Common Block of Subroutine Where Found	Definition
PSRF(I,J)	Internal	MISSIL	Single-shot survival probability for component J at kill level I due to detonation initiated by radar fuze.
RADFUZE	Internal	MISSIL	Indicator set to .TRUE. if radar fuze is activated - otherwise .FALSE.
RCHA	Internal	/ONE/	Maximum range of the radar fuze multiplied by the cosine of the radar fuze half-angle (ft).
RMISS	Input	/THREE/	Range outside of which the missile is considered to have missed after having passed the point of closest approach to the target (ft).
SDOWN	Internal	SPRAY	The fraction of its initial velocity to which a fragment slows down after traveling a distance EL.
SLOW(I)	Internal	/FIVE/	Slowdown constant for fragments of mass class I (ft^{-1}).
SPREAD	Internal	SPRAY	Factor which when multiplied by the dynamic fragment density gives the fragment density for a static explosion.
STEAR(I)	Input	/FIVE/	Static fragment density (fragments/steradian). The index I represents 19 points from 0^{o} to 180^{o} off the nose at 10^{o} intervals.
SUM(I)	Internal	SPRAY	Expected number of hits capable of producing kill level I on a component.

FORTRAN Variable	Input or Internal	Common Block of Subroutine Where Found	Definition
TAM(I)	Internal	/TWO/	Transformation matrix between the aircraft body coordinate system and the missile body coordinate system. The index I runs from 1 to 9 starting at the upper left of the matrix and proceeding left to right across the three rows of the matrix.
THA	Internal	/ONE/	Tangent of the radar fuze half-angle.
THETA	Internal	SPRAY	Angle between the missile velocity vector and the fragment velocity vector in a static explosion (radians).
TIA(I)	Internal	/AIRCF/	Transformation matrix between the aircraft body coordinate system and the inertial coordinate system. The index I runs from 1 to 9 starting at the upper left of the matrix and proceeding left to right across the three rows of the matrix.
TMI(I)	Internal	/TWO/	Transformation matrix between the missile body coordinate system and the inertial coordinate system. The index I runs from 1 to 9 starting at the upper left of the matrix and proceeding left to right across the three rows of the matrix.
VE	Input	/THREE/	Fragment static emission speed (ft/sec).
VHIT	Internal	SPRAY	The speed of the striking fragment (ft/sec).

FORTRAN Variable	Input or Internal	Common Block of Subroutine Where Found	Definition
VNET	Internal	SPRAY	The net striking speed of the fragment (i.e., the magnitude of the relative velocity vector between the fragment and the aircraft) (ft/sec).
VNETHI	Input	/ONE/	Normalizing velocity for vulnerable area inputs. Values are read for each of the 11 net striking velocities corresponding to 0, 0.1, 0.2,...1.0 times VNETHI (ft/sec).
VODOT	Internal	SPRAY	Rate of change of VZERO with respect to time (ft/sec^2).
VS(I)	Internal	SPRAY	Missile velocity vector in the aircraft body system (ft/sec).
VT(I)	Internal	SPRAY	Aircraft velocity vector in the aircraft body system (ft/sec).
VUL(I,J,K)	Input	/FIVE/	Vulnerable area (ft^2). The index I represents kill level. The index J represents 11 levels of net striking speed. The index K combines aspect, fragment mass class, and component.
VX	Internal	MISSIL	X-component in the inertial coordinate system of the relative velocity vector of the aircraft with respect to the missile (ft/sec).

FORTRAN Variable	Input or Internal	Common Block of Subroutine Where Found	Definition
VY	Internal	MISSIL	Y-component in the inertial coordinate system of the relative velocity vector of the aircraft with respect to the missile (ft/sec).
VZ	Internal	MISSIL	Z-component in the inertial coordinate system of the relative velocity vector of the aircraft with respect to the missile (ft/sec).
VZERO	Internal	SPRAY	Magnitude of the dynamic velocity vector of the fragment (ft/sec).
WATE(I)	Input	/FOUR/	Average weight of fragments in mass class I (grains).
WY(I)	Input	/TWO/	Y-coordinate in the aircraft body system of the center of gravity of the Ith vulnerable component (ft.).
XBL(I)	Input	/TWO/	X-coordinate in the aircraft body system of the center of the Ith blast ellipsoid (ft.).
XCG	Internal	MISSIL	X-coordinate in the inertial system of the center of gravity of the aircraft relative to the missile (ft.).
XCM	Internal	/ONE/	X-coordinate in the aircraft body system of the missile currently being considered (ft.).
XCMOLD(I)	Internal	/TWO/	X-coordinate in the aircraft body system of missile I at the previous time step (ft.).

FORTRAN Variable	Input or Internal	Common Block of Subroutine Where Found	Definition
XG(I)	Internal	CONFUZE	X-coordinate in the missile body system of the glitter point. The index I is 1 for the previous time pulse and 2 for the current time pulse.
XGL(I)	Input	/TWO/	X-coordinate in the aircraft body system of the Ith glitter point (ft.).
XO(I,J)	Input	/FOUR/	X-coordinate in the aircraft body system of the center of the Ith direct-hit ellipsoid of type J (ft.). The type, J, specifies direct-hit-without kill (J=1) or direct-hit-with-kill (j=2).
XS(I,J)	Input	/FOUR/	For the Ith direct-hit ellipsoid of type J, the length of the semi-axis in the X-direction of the aircraft body system (ft.). The type, J, specifies direct-hit-without-kill (J=1) or direct-hit-with-kill (J=2).
XSH(I)	Input	/TWO/	X-coordinate in the aircraft body system of the center of the Ith fragment shield ellipsoid (ft.).
XSTAR	Internal	SPRAY	X-coordinate in the aircraft body system of the explosion point (ft.).
YBL(I)	Input	/TWO/	Y-coordinate in the aircraft body system of the center of the Ith blast ellipsoid (ft.).

FORTRAN Variable	Input or Internal	Common Block of Subroutine Where Found	Definition
YCG	Internal	MISSIL	Y-coordinate in the inertial system of the center of gravity of the aircraft relative to the missile (ft.).
YCM	Internal	/ONE/	Y-coordinate in the aircraft body system of the missile currently being considered (ft.).
YCMOLD(I)	Internal	/TWO/	Y-coordinate in the aircraft body system of missile I at the previous time step (ft.).
YG(I)	Internal	CONFUZE	Y-coordinate in the missile body system of the glitter point. The index I is 1 for the previous time pulse and 2 for the current time pulse.
YGL(I)	Input	/TWO/	Y-coordinate in the aircraft body system of the Ith glitter point (ft.).
YO(I,J)	Input	/FOUR/	Y-coordinate in the aircraft body system of the center of the Ith direct-hit ellipsoid of type J (ft.). The type, J, specifies direct-hit-without-kill (J=1) or direct-hit-with-kill (J=2).
YS(I,J)	Input	/FOUR/	For the Ith direct-hit ellipsoid of type J, the length of the semi-axis in the Y-direction of the aircraft body system (ft.). The type, J, specifies direct-hit-without-kill (J=1) or direct-hit-with-kill (J=2).

FORTRAN Variable	Input or Internal	Common Block of Subroutine Where Found	Definition
YSH(I)	Input	/TWO/	Y-coordinate in the aircraft body system of the center of the Ith fragment shield ellipsoid (ft.).
YSTAR	Internal	SPRAY	Y-coordinate in the aircraft body system of the explosion point (ft.).
ZBL(I)	Input	/TWO/	Z-coordinate in the aircraft body system of the center of the Ith blast ellipsoid (ft.).
ZCG	Internal	MISSIL	Z-coordinate in the inertial system of the center of gravity of the aircraft relative to the missile (ft.).
ZCM	Internal	/ONE/	Z-coordinate in the aircraft body system of the missile currently being considered (ft.).
ZCMOLD(I)	Internal	/TWO/	Z-coordinate in the aircraft body system of missile I at the previous time step.
ZEE(I)	Input	/TWO/	Z-coordinate in the aircraft body system of the center of gravity of the Ith vulnerable component (ft.).
ZG(I)	Internal	CONFUZE	Z-coordinate in the missile body system of the glitter point. The index I is 1 for the previous time pulse and 2 for the current time pulse.
ZGL(I)	Input	/TWO/	Z-coordinate in the aircraft body system of the Ith glitter point (ft.).

FORTRAN Variable	Input or Internal	Common Block of Subroutine Where Found	Definition
ZO(I,J)	Input	/FOUR/	Z-coordinate in the aircraft body system of the center of the Ith direct-hit ellipsoid of type J (ft.). The type, J, specifies direct-hit-without-kill (J=1) or direct-hit-with-kill (J=2).
ZS(I,J)	Input	/FOUR/	For the Ith direct-hit ellipsoid of type J, the length of the semi-axis in the Z-direction of the aircraft body system (ft.). The type, J, specifies direct-hit-without-kill (J=1) or direct-hit-with-kill (J=2).
ZSH(I)	Input	/TWO/	Z-coordinate in the aircraft body system of the center of the Ith fragment shield ellipsoid (ft.).
ZSTAR	Internal	SPRAY	Z-coordinate in the aircraft body system of the explosion point (ft.).