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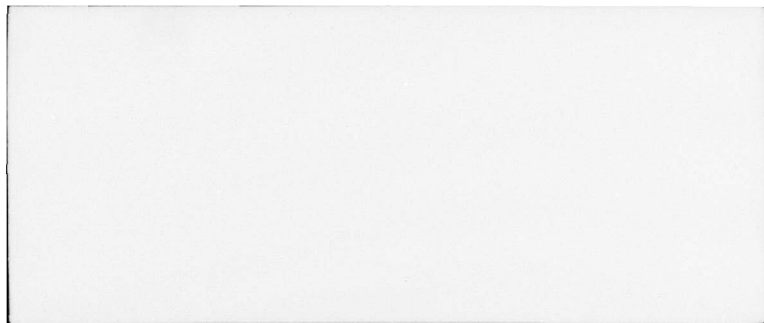
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I. INTRODUCTION

I. INTRODUCTION

↙ This report contains selected documentation of the MICOM real-time STINGER simulation. Sections II and III describe the MAIN program which serves as a driver for pre- and post-real-time computation, respectively. Other codes which support these computations are presented in Sections VI, VII, VIII, IX. The real-time computations are performed by Subroutines FLIGHT and REALT which are documented in Section IV. The interconnection of various computation elements is described in Section V which is titled Real-Time I/O.

In Appendix A the aforementioned code is presented. Then, in Appendix B a restructured version is given. The restructured documentation can be of considerable value. However, this value will only be realized from future development.

↖

II. PROGRAM MAIN (PRE-REAL-TIME)

II. PROGRAM MAIN (Pre-Real-Time)

Program MAIN provides both pre- and post-real-time functions. However, for purpose of documentation, program MAIN will be treated as two separate pieces of code dealing with pre- and post-real-time functions. In this section, pre-real-time computations performed by program MAIN are documented. Portions of program MAIN not included in this section are discussed in the next section.

Functionally, program MAIN serves to connect on a macroscopic level several physically separateable modules of code. In some cases however, computer implementation does not lead to a strictly modular code. Therefore, some portions of program MAIN involve the micro-codes which are, in concept, portions of other major modules.

Non-real time data input to the STINGER digital computer program is organized into three distinct levels. These three levels of data input are related to frequency of data change during normal simulation activities. Specifically, data can be input to the program in the following ways.

- Data card or DDS commands
- Block Data
- Inline computer code

Data input via block data or inline computer code requires careful attention to the particular code affected. Pre-programmed diagnostics and informative printout will not generally reveal errors in such modifications.

More information concerning pre-real time data processing is contained in the Sections titled SUBROUTINE KSCALE, INIT, and GUID.

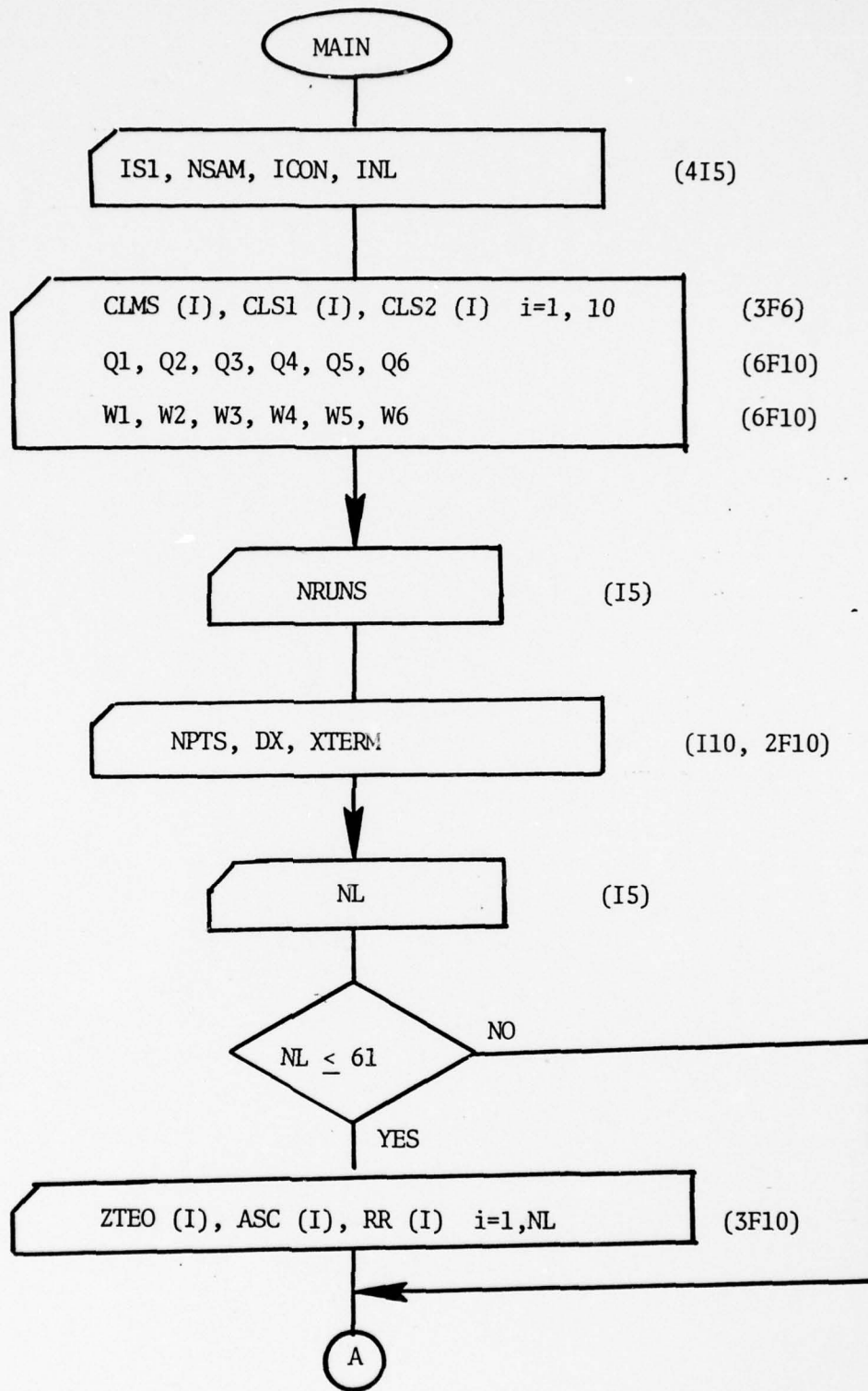
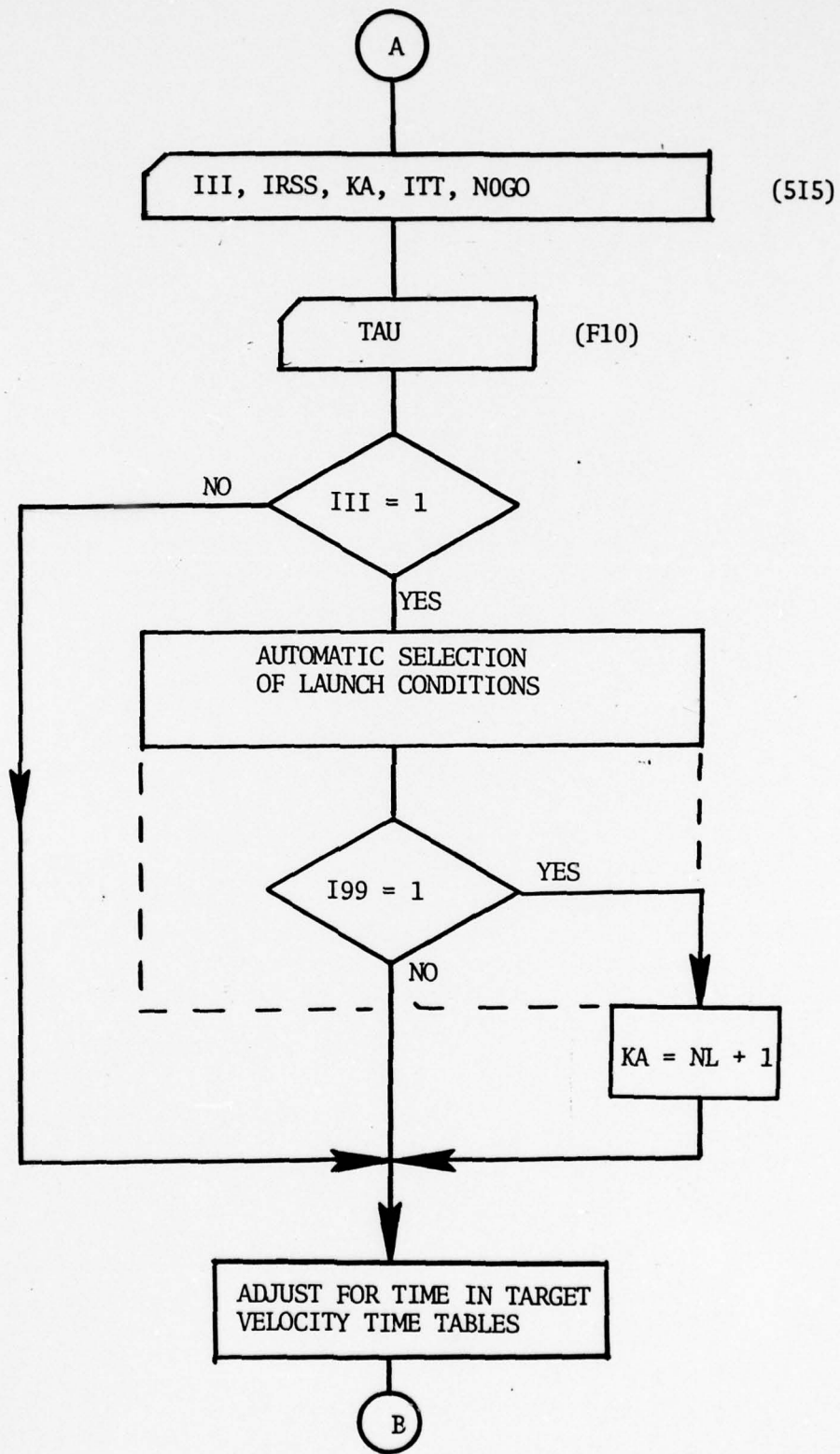
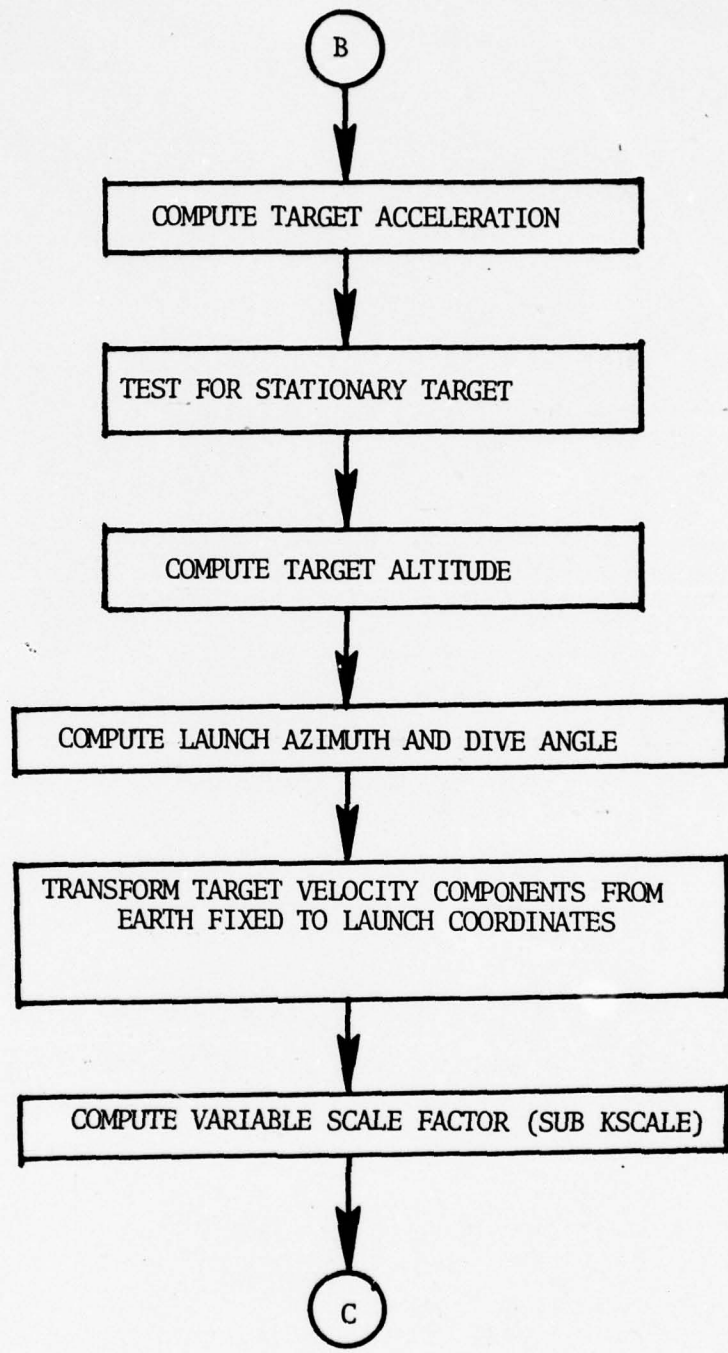
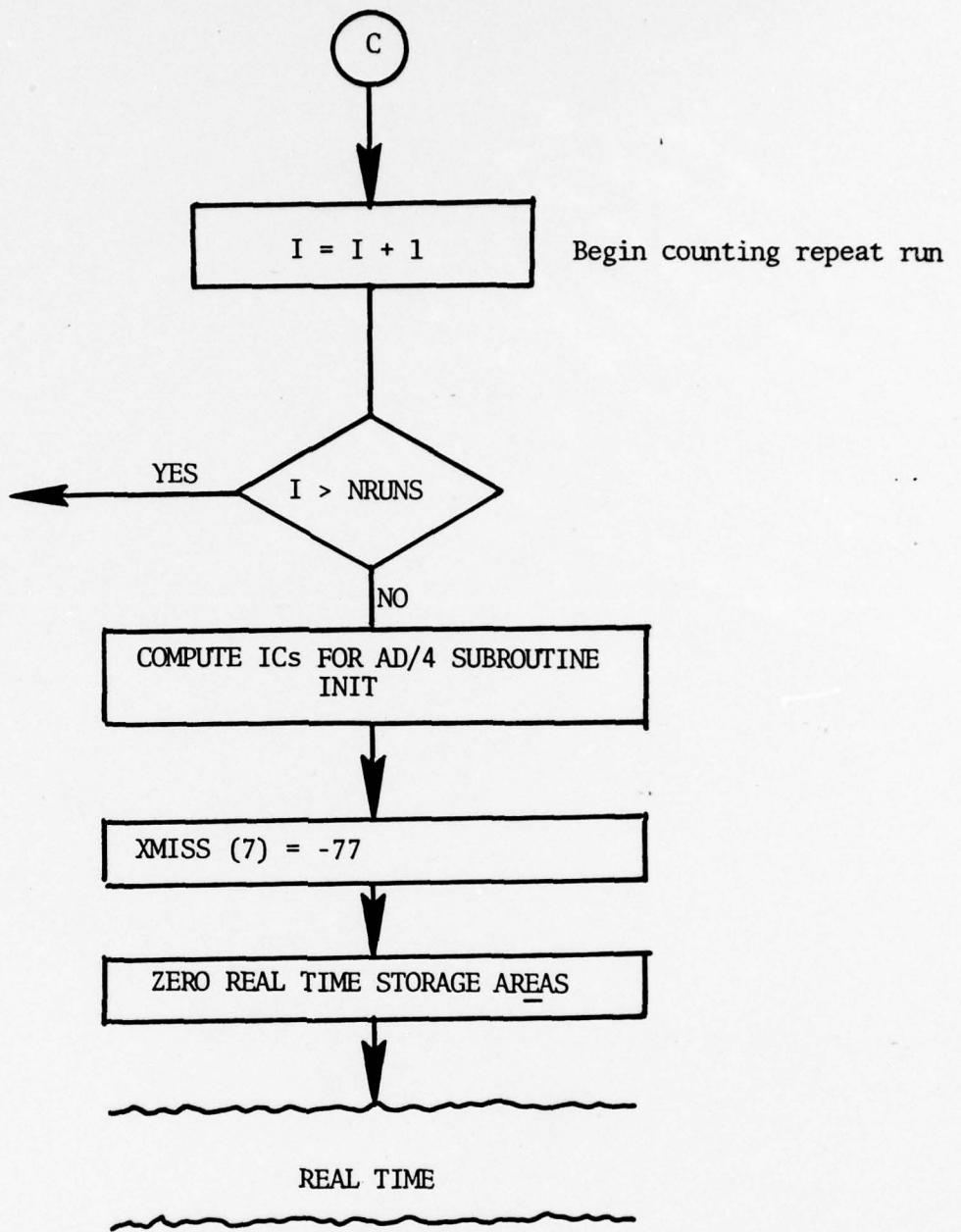


FIGURE 2.1 DATA CARD OR DDS DATA INPUT







TARGET ACCELERATION

$$\ddot{X}_{TE}(i) = \dot{X}_{TE}(i+1) - \dot{X}_{TE}(i), i = 1, 27$$

$$\ddot{Y}_{TE}(i) = \dot{Y}_{TE}(i+1) - \dot{Y}_{TE}(i), i = 1, 27$$

$$\ddot{Z}_{TE}(i) = \dot{Z}_{TE}(i+1) - \dot{Z}_{TE}(i), i = 1, 27$$

NOTE: ΔT , the time between samples in the target velocity tables, is assumed to be one second.

TEST FOR STATIONARY TARGETS

$$WVV = \sqrt{\dot{X}_{TE}^2(0) + \dot{Y}_{TE}^2(0) + \dot{Z}_{TE}^2(0)}$$

$WVV > 338$ FT/SEC \rightarrow moving target

$WVV < 338$ FT/SEC \rightarrow stationary target

TARGET ALTITUDE

$$h_{asL} = h + \Delta h$$

where Δh is altitude of launch point above sea level

ADJUSTMENT FOR TIME IN TARGET VELOCITY - TIME MANEUVER TABLES

Target velocity-time maneuver tables are shifted in time by the parameter TAU. Setting TAU to a positive real value causes the target trajectory time = TAU and real time = 0 to coincide. Therefore the portion of the target maneuver tables between time = 0 and time = TAU is disregarded. The end of the target maneuver tables is filled with a constant velocity maneuver, i.e., the portion of the trajectory between time = 27-TAU and time = 27 seconds. For TAU = 0 there is no shift in the target velocity - time maneuver tables.

EXAMPLE: TAU = 2.5

TM(I)	XDEM(J,ITT)	TMA(I)	XDM(I)	
0	XDEM(1,ITT)	-.5	XDEM(3,ITT)	← t = 0
1	XDEM(2,ITT)	.5	XDEM(4,ITT)	
2	XDEM(3,ITT)	1.5	XDEM(5,ITT)	
.	.	.	.	
.	.	.	.	
.	.	.	.	
23	XDEM(23,ITT)	22.5	XDEM(26,ITT)	
24	XDEM(24,ITT)	23.5	XDEM(26,ITT)	
25	XDEM(25,ITT)	25.0	XDEM(26,ITT)	
26	XDEM(26,ITT)	26.0	XDEM(26,ITT)	

LAUNCH AZIMUTH AND DIVE ANGLE

Calculation of launch angle and dive angle are based upon the following definitions and conventions:

- \bar{V} - Projection of target initial velocity vector on to the $X_E - Y_E$ plane
- \bar{W} - Projection of initial \bar{L}_{OS} vector in the $X_E - Y_E$ plane
- β - Angle from positive X_E axis to \bar{V} (positive clockwise)
- Σ_0 - Crossing angle = angle from \bar{V} to \bar{W} (positive clockwise)
- ψ_L - The angle from positive X_E axis to the vector from the origin to target (note this is just $-\bar{W}$)

From the above definitions $\Sigma_0 + \beta$ is the angle from positive X_E axis to vector \bar{W} . Then, since $-\bar{W}$ is in opposite direction from \bar{W} , the angle ψ_L differs from $\Sigma_0 + \beta$ by 180 degrees. Therefore

$$\psi_L = \Sigma_0 + \beta \pm 180^\circ$$

Here ψ_L is chosen based on whichever sign yields a positive value.

Based upon the value of $X_{TE}(0)$ and $Y_{TE}(0)$ the value of $\psi_L(0)$ is determined via four special computational rules. Note that the case $X_{TE}(0) \neq 0$ and $Y_{TE}(0) = 0$ is excluded from consideration and should not appear in candidate trajectories. The four computational rules as they are categorized in the computer code are:

CASE 1

$$\beta = \tan^{-1} \left(\frac{\dot{X}_{TE}(0)}{0} / \frac{\dot{Y}_{TE}(0)}{>0} \right)$$

$$\psi_L = \Sigma_0 + \beta - 180^\circ, \psi_L(0) \text{ is determined by whichever } \Sigma_0 + \beta + 180^\circ \text{ quantity is positive}$$

SEO = (see computation in Subroutine INIT)

CASE 2

$$\begin{array}{c|c} \dot{x}_{TE}(0) & \dot{y}_{TE}(0) \\ \hline 0 & >0 \end{array}$$

$$\beta = 90^\circ$$

$$\psi_L(0) = \Sigma_0 + \beta - 180^\circ, \psi_L(0) \text{ is determined by whichever}$$
$$\Sigma_0 + \beta + 180^\circ \text{ quantity is positive}$$

SEO = (see computation in Subroutine INIT)

CASE 3

$$\begin{array}{c|c} \dot{x}_{TE}(0) & \dot{y}_{TE}(0) \\ \hline >0 & >0 \\ >0 & <0 \\ <0 & >0 \\ <0 & <0 \end{array}$$

}Computer implementation does not take care of this case

$$\beta = 270^\circ$$

$$\psi_L(0) = \Sigma_0 + \beta - 180^\circ \quad \psi_L(0) \text{ is determined by whichever}$$
$$\Sigma_0 + \beta + 180^\circ \text{ quantity is positive}$$

SEO = (see computation in Subroutine INIT)

CASE 4

$$\begin{array}{c|c} \dot{x}_{TE}(0) & \dot{y}_{TE}(0) \text{ and } z_{TE}(0) = 0 \\ \hline 0 & 0 \\ >0 & 0 \\ >0 & 0 \end{array}$$

}Computer implementation does not take care of these two cases

$$\psi_L(0) = 0$$

$$\text{SEO} = 0$$

For stationary target crossing angle is not applicable, program sets KKK = 1

CASE 4b

$\dot{x}_{TE}(0)$	$\dot{y}_{TE}(0)$
0	0
>0	0} Computer implementation does not
<0	0} take care of these two cases

$$\psi_L(0) = 0$$

$$SEO = 90^\circ$$

For vertical target trajectory crossing angle is not applicable, program sets KKK = 1

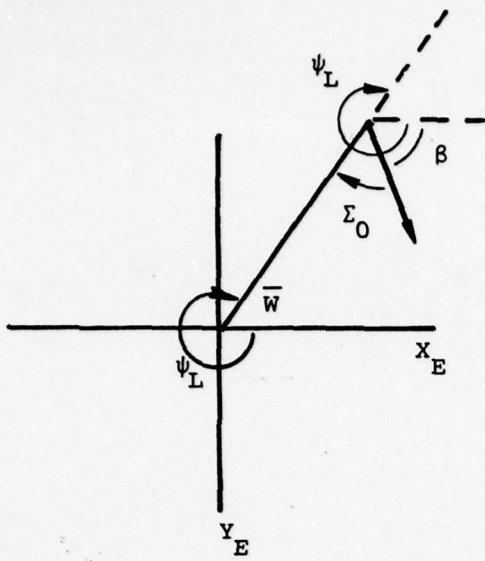
CASE 4c

$\dot{x}_{TE}(0)$	$\dot{y}_{TE}(0)$ and $Z_{TE} < 0$
0	0
>0	0} Computer implementation does not
<0	0} take care of these two cases

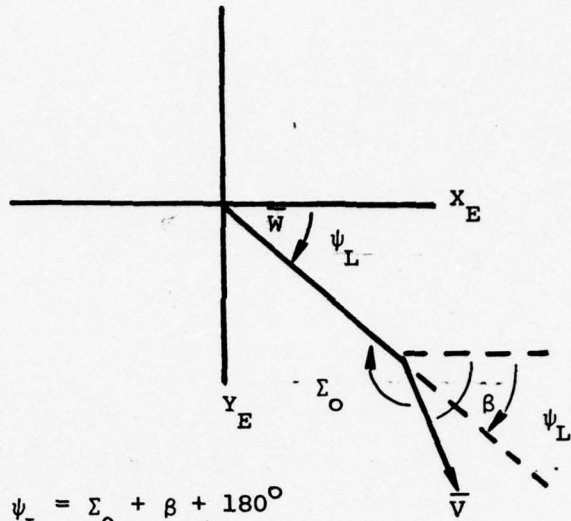
$$\psi_L(0) = 0$$

$$SEO = -90^\circ$$

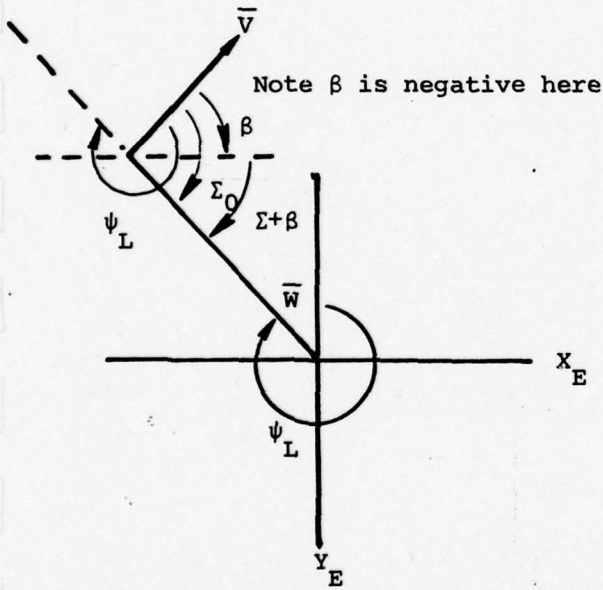
For vertical target trajectory crossing angle is not applicable, program sets KKK = 1



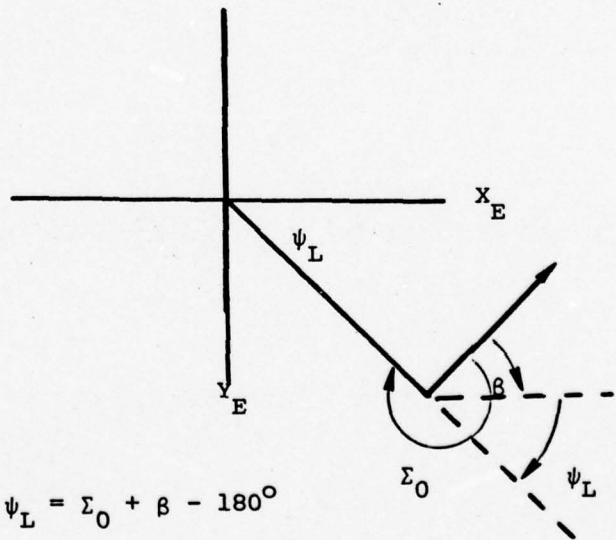
$$\psi_L = \Sigma_0 + \beta + 180^\circ$$



$$\psi_L = \Sigma_0 + \beta + 180^\circ$$



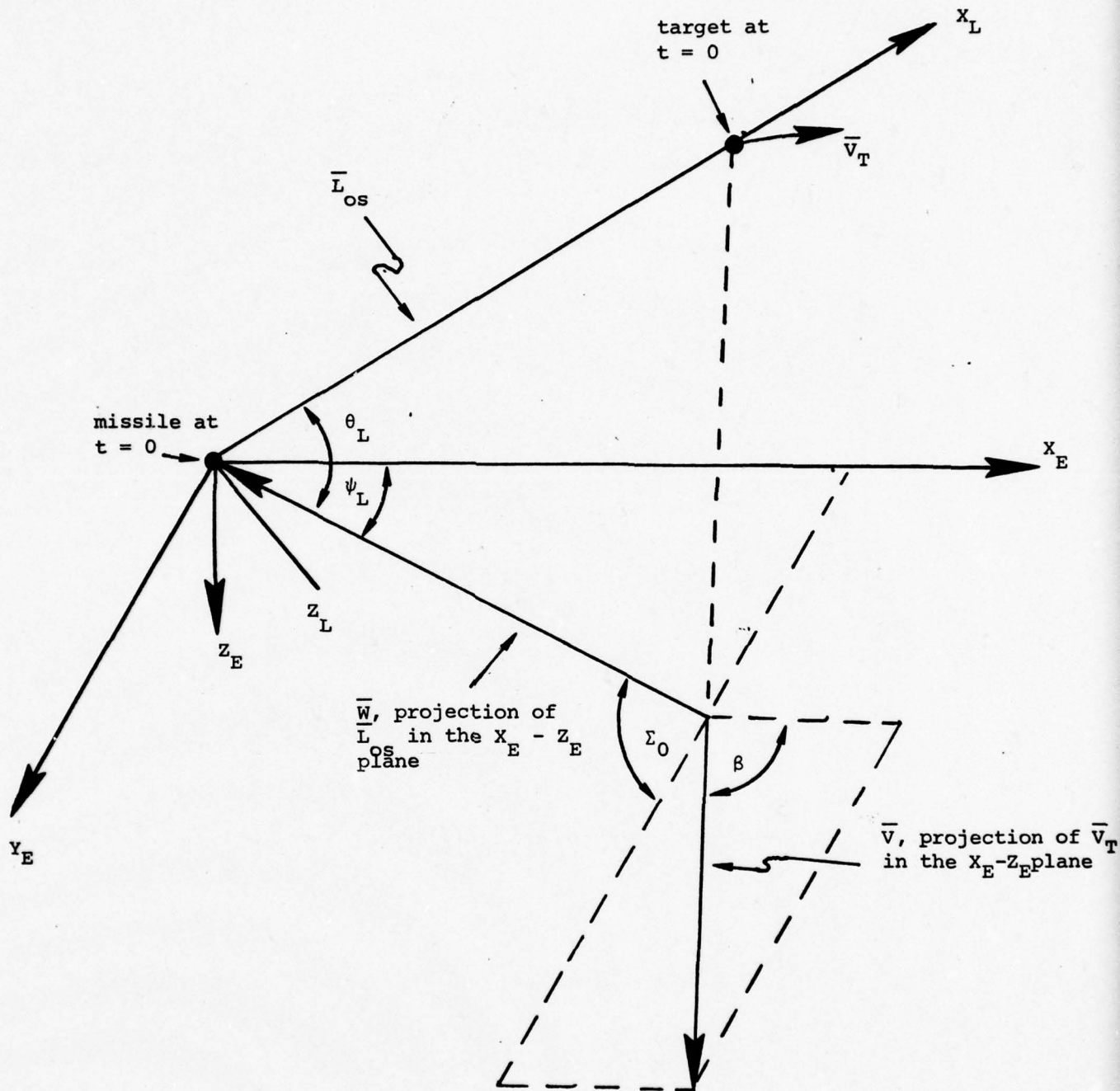
$$\psi_L = \Sigma_0 + \beta + 180^\circ$$



$$\psi_L = \Sigma_0 + \beta - 180^\circ$$

SOME POSSIBLE CONFIGURATIONS OF \bar{v} AND \bar{w}

FIGURE 2.2



RELATIONSHIP OF \bar{V} AND \bar{W} TO \bar{V}_T AND \bar{L}_{os}

FIGURE 2.3

TRANSFORMATION OF TARGET VELOCITY COMPONENTS FROM EARTH FIXED TO LAUNCH COORDINATES

$$\begin{bmatrix} X_{TL}(0) \\ Y_{TL}(0) \\ Z_{TL}(0) \end{bmatrix} = \begin{bmatrix} \cos \theta_L \cos \psi_L & \cos \theta_L \sin \psi_L & -\sin \theta_L \\ -\sin \psi_L & \cos \psi_L & 0 \\ \sin \theta_L \cos \psi_L & \sin \theta_L \sin \psi_L & \cos \theta_L \end{bmatrix} \begin{bmatrix} X_{TE}(0) \\ Y_{TE}(0) \\ Z_{TE}(0) \end{bmatrix}$$

where $\theta_L = \theta_L(0)$

$\psi_L = \psi_L(0)$

This transformation is performed in Subroutine GUID

RANGE TABLE GENERATION

The range-table is generated for use as a data collection tool during real time simulation. The range table is a set of relative missile minus target positions along the X_L axis at which data collection should be performed. Generation of the range table follows from specification of

XTERM, the last data point to be collected

DX, the distance between data points

NPTS, number of data points desired

Provided analog scaling permits the collection of NPTS points, this is done. Otherwise, the program automatically reduces the value of NPTS until analog scaling requirements are satisfied. The new value of NPTS is stored for later usage as NADJ.

The rule for reducing NPTS to a final value of NADJ is given below

$$\begin{aligned} \text{NADJ} &= \text{NPTS}, \text{ if } \text{DIF} > 0 \\ &\text{NPTS} - \text{truncated value of } (\text{DIF}/\text{DX}) - 1, \text{ if } \text{DIF} \leq 0 \end{aligned}$$

Here DIF is defined as the difference between the data collection distance commanded and the largest data collection distance possible with the analog scaling given. DIF can be computed as follows

$$\text{DIF} = \{ \text{XTERM} + (\text{NPTS} - 1)\text{DX} \} - \left\{ \frac{(\text{Analog Scale Factor}) (\text{Largest Voltage})}{1 + \gamma} \right\}$$

TABLE 2.1 DESCRIPTION OF MAIN PROGRAM SYMBOLS (Pre-Real-Time)

PROGRAM SYMBOL	VARIABLE	DESCRIPTION
IS1*	-----	Print flag, IS1 ≠ 1 indicates print is desired.
NSAM*	-----	Quality control test case sample size 2 ≤ NSAM ≤ 11
ICON*	-----	Automatic or manual launch set selection (ICON = 1 implies automatic, ICON = 2 implies manual)
INL*	-----	Number of first launch set desired in automatic mode, 1 ≤ INL ≤ 60
CLMS(I)*	-----	} Used in computation of quality control limits. For further information see SUBROUTINE QCLIM
CLS1(I)*	-----	
CLS2(I)*	-----	
Q1, Q2, ...Q6*	-----	
W1, W2, ...W6*	-----	
NRUNS*	-----	
NPTS*	-----	Number of data points to be collected in real time
DX*	-----	Distance between real-time data collection points (FT)
XTERM*	-----	Distance between target and missile at last data collection point (FT)
NL*	-----	NL + 1 is number of launch sets to be read from data cards, if NL ≥ 61
ZTEO(I)*	-----	Launch set target altitude in earth fixed coordinates (FT) (Note: printout shows - ZTEO(I))
ASC(I)*	Σ_0	Launch set target crossing angle table, measured positive clockwise from \bar{V} to \bar{W} (DEG)

*Data input from card reader

PROGRAM SYMBOL	VARIABLE	DESCRIPTION
RR(I)*	R_i	Launch set target initial range table (FT) (distance measured along the line of sight)
III*	-----	Flag for automatic selection of target trajectory III = 1, for manual selection set III \neq 1.
IRSS*	-----	Flag, IRSS simulation requires IRSS = 1, for MICOM Hybrid set IRSS \neq 1.
KA*	-----	Index of target launch set. This is used in manual mode, i.e., III = 1
ITT*	-----	Trajectory number, ITT = 1 selects a stationary target. In general $1 \leq ITT \leq 45$
NOGO*	-----	
TAU*	τ	A parameter which selects a portion of the target velocity-time maneuver table for use in the simulation. This parameter shifts time forward TAU seconds and disregards all maneuver information between time = 0 and time = TAU. Note: $0 < TAU < 27$. With TAU = 0 the maneuver tables are unchanged. (SEC)
ZABOVE	Δh	Altitude of missile above sea level at $t = 0$
RTD	-----	Conversion factor for radians to degrees
DTR	-----	Conversion factor for degrees to radians
RLBK	L/B	L/B, actual plume ratio of length to breadth
NT	-----	Length of the trajectory time and velocity tables (currently NT = 27)
TMAS(K)	-----	Adjusted target time, see definition of τ

* Data input from card reader

PROGRAM SYMBOL	VARIABLE	DESCRIPTION
I99	-----	Flag, if the current launch set number is a multiple of five or if this is the first launch set then I99 = 1. Otherwise I99 = 0
I88	-----	Flag, if this is last launch set in automatic selection sequence I88 = 1, otherwise I88 = 0
XE(I)	\ddot{x}_{TE}	Target acceleration tables, derived from target velocity tables.
YE(I)	\ddot{y}_{TE}	
ZE(I)	\ddot{z}_{TE}	
Z	$Z_{TE}(0), h$	Specific launch altitude (from launch set table ZTEO)
ZZZ, ZALT	h_{asL}	Specific target altitude in earth fixed coordinates + altitude of missile launch site above sea level (FT)
AS	ϵ_0	Specific launch crossing angle (from launch set table ASC(I))
R	R_i	Specific launch initial range (from launch set table RR(I))
XD	$\dot{x}_{TE}(0)$	Initial target velocities in earth fixed coordinate system
YD	$\dot{y}_{TE}(0)$	
ZD	$\dot{z}_{TE}(0)$	
ASCO	ψ_L	Angle from positive X_E - axis to the vector from origin to target (note this is just $-W$)
SCO	ψ_L	ψ_L in DEG
SO	θ_L	Initial elevation angle of target (RAD)
ASO	θ_L	θ_L in DEG

PROGRAM SYMBOL	VARIABLE	DESCRIPTION
X	$X_{TE}(0)$	X and Y components of \bar{L}_{OS} in earth fixed coordinate system
Y	$Y_{TE}(0)$	
SINSO	$\sin(\theta_L)$	
COSSO	$\cos(\theta_L)$	
SINSCO	$\sin(\psi_L)$	
COSSCO	$\cos(\psi_L)$	
S2	$\cos(\theta_L)\cos(\psi_L)$	
S3	$\sin(\theta_L)\cos(\psi_L)$	
S4	$\cos(\theta_L)\sin(\psi_L)$	
S5	$\sin(\theta_L)\sin(\psi_L)$	
SPL	$\sin(\psi_L)$	
CTL	$\cos(\theta_L)$	
CPL	$\cos(\psi_L)$	
STL	-----	$\sin(\theta_L)$
KKK	-----	$KKK = 0$, if $\dot{Y}_{TE}(0) \neq 0$ 1 , if $\dot{Y}_{TE}(0) = 0$
VVV	$V_T(0)$	Initial velocity of target
XDTGO	$\dot{X}_{TL}(0)$	Components of target velocity in launch coordinates
YDTGO	$\dot{Y}_{TL}(0)$	
ZDTGO	$\dot{Z}_{TL}(0)$	
SEO	-----	Dive angle (Note: some cases are computed in SUBROUTINE INIT)

III. PROGRAM MAIN (POST-REAL-TIME)

III. PROGRAM MAIN (Post-Real-Time)

The post-real-time portion of the STINGER code provides an estimate of miss distance, lethality and simulation quality. In addition, the post-real-time code contains portions of the repeat run (rep-op) logic.

In general, the analysis in post-real-time data will contain the following events:

- If nonstationary target, calculate Euler angles for transformation from launch-to-target fixed coordinates
- Calculate the least square missile approach trajectory from collected A/D data and project miss distance information
- If the target is a high speed jet, perform a lethality test with the probability-of-kill model
- Repeat the simulated flight 20 times and obtain average PK, mean, and standard deviation of miss distance information
- Give control to pre-real time part for next simulation

More information concerning post-real-time data processing is contained in the Section titled SUBROUTINE MISCOM.

TIME CRITICAL DATA COLLECTION TEST

This test is performed to verify that each value of $X_{ML} - X_{TL}$ collected in real-time corresponds to a value in the range-to-go tables. The test is performed by testing each point collected as

$$XX_i \leq (X_{ML} - X_{TL})_i \leq XX_i + DX, i = 1, NADJ$$

where XX_i is the i'th entry in the pre-computed range-to-go table and $(X_{ML} - X_{TL})_i$ is the actual data point collected.

If time critical data collection failure is detected a diagnostic message is printed.

TABLE 3.1 DESCRIPTION OF MAIN PROGRAM SYMBOLS (Post-Real-Time)

PROGRAM SYMBOL	VARIABLE	DESCRIPTION
NADJ	-----	The actual number of data collection points in real-time
XMISS(7)	-----	
PPX(I)	$X_{ML} - X_{TL}$	
PPY(I)	$Y_{ML} - Y_{TL}$	
PPZ(I)	$Z_{ML} - Z_{TL}$	
TIME(I)	t	Real time data collection points
VMX(I)	$\dot{X}_{ML} - \dot{X}_{TL}$	
VMY(I)	$\dot{Y}_{ML} - \dot{Y}_{TL}$	
VMZ(I)	$\dot{Z}_{ML} - \dot{Z}_{TL}$	
XX(I)	-----	Range-data collection table generated by SUBROUTINE INIT
LEVEL	-----	Status of maneuver, -7 implies not in real-time, 0 implies in real-time, +7 implies target trajectory table exceeded
ITT	-----	Target trajectory number, note: ITT = 1 is a stationary target
VVV	$V_T(0)$	Initial target velocity
IS1	-----	Print flag, IS1 \neq 1 indicates print is desired
XMAN(1,I)	t	Target maneuver velocity and time tables at range table data collection point (See MAN(J,I) in SUBROUTINE REALT)
XMAN(2,I)	\dot{X}_{TL}	
XMAN(3,I)	\dot{Y}_{TL}	
XMAN(4,I)	\dot{Z}_{TL}	

PROGRAM SYMBOL	VARIABLE	DESCRIPTION
$XM(1), YM(1), ZM(1)$	-----	Missile trajectory piercing point in $Y'_F - Z'_F$ plane
$XM(2), YM(2), ZM(2)$	-----	Missile trajectory piercing point in $X'_F - Y'_F$ plane
$XM(3), YM(3), ZM(3)$	-----	Missile trajectory piercing point in $X'_F - Z'_F$ plane
$RM(1)$	-----	Nearest approach of missile trajectory to origin in the $Y'_F - Z'_F$ plane
$RM(2)$	-----	Nearest approach of missile trajectory to origin in the $X'_F - Y'_F$ plane
$RM(3)$	-----	Nearest approach of missile trajectory to origin in the $X'_F - Z'_F$ plane
$AXM(ICN)$	-----	Storage arrays for ICN'th repeat run, where ICN varies from 1 to NRUNS. The computer variables correspond to $XM(1), YM(1), ZM(1)$ and $RM(1)$ respectively
$AYM(ICN)$	-----	
$AZM(ICN)$	-----	
$ARM(ICN)$	-----	
$AXB(ICN)$	-----	Storage arrays for ICN'th repeat run, where ICN varies from 1 to NRUNS. The computer variables correspond to $XM(2), YM(2), ZM(2)$ and $RM(2)$ respectively
$AYB(ICN)$	-----	
$AZB(ICN)$	-----	
$ARB(ICN)$	-----	
$AXC(ICN)$	-----	Storage arrays for ICN'th repeat run, where ICN varies from 1 to NRUNS. The computer variables correspond to $XM(3), YM(3), ZM(3)$ and $RM(3)$ respectively
$AYC(ICN)$	-----	
$AZC(ICN)$	-----	
$ARC(ICN)$	-----	

PROGRAM SYMBOL	VARIABLE	DESCRIPTION
YA	a_1	See equations in SUBROUTINE MISCOM
ZA	a_2	See equations in SUBROUTINE MISCOM

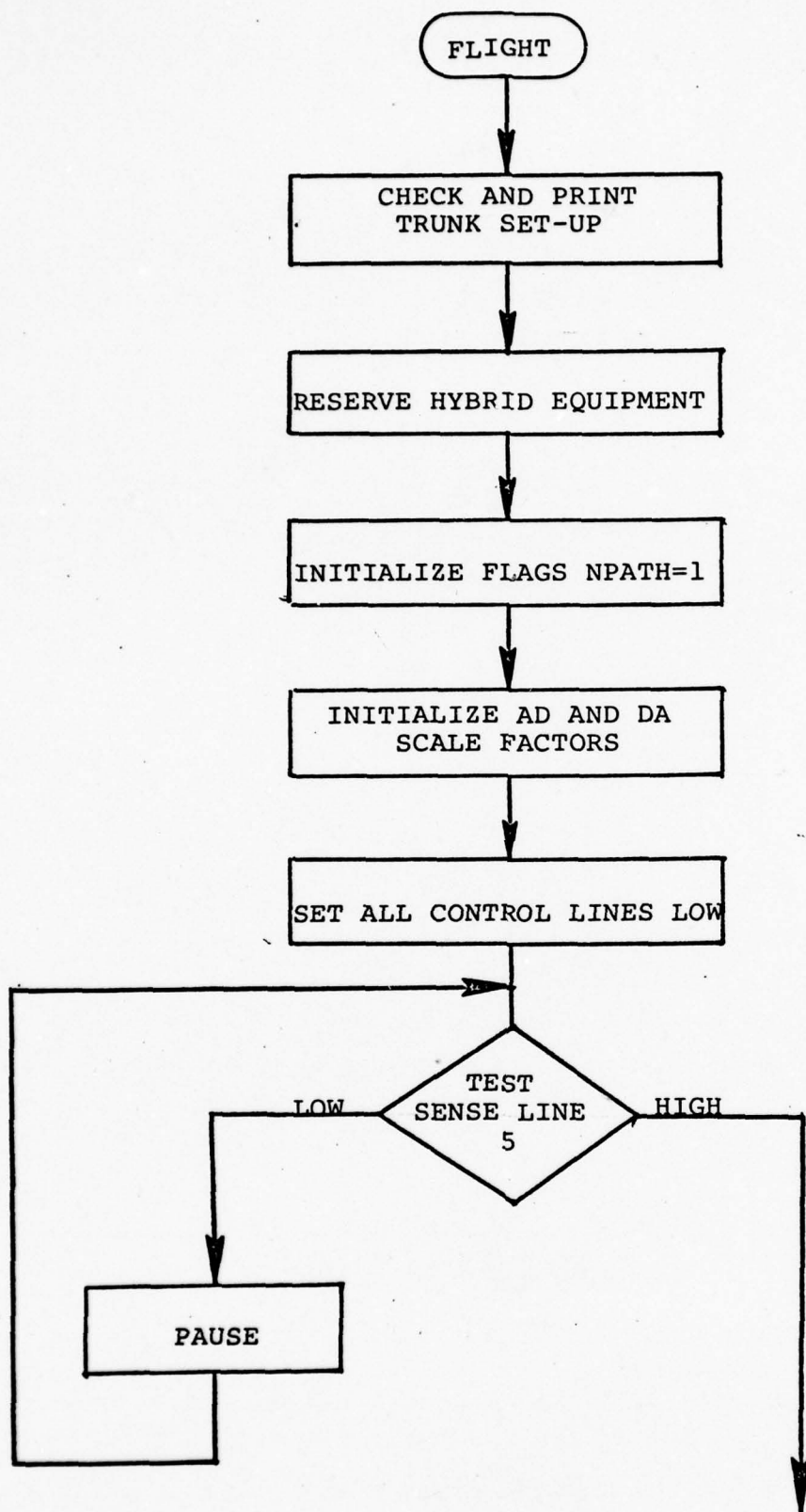
IV. SUBROUTINE FLIGHT AND REALT

IV. SUBROUTINE FLIGHT AND REALT (Real-Time)

This section contains a description of Subroutines required during real-time operation of the MICOM Hybrid STINGER simulation. The documentation is provided in three parts:

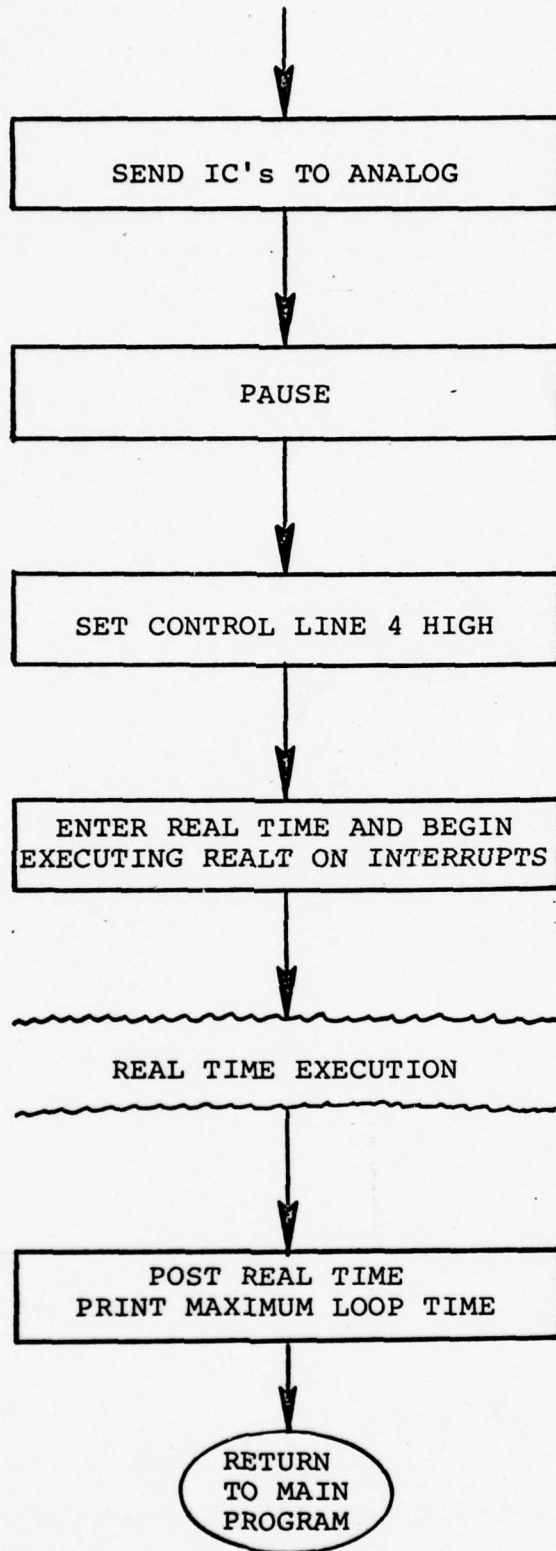
- Flow charts
- Equations
- Description of Symbols

The flow chart given in Figure 4.1 only to the digital program. However, the equations and description of symbols are given for both analog and digital implementations.

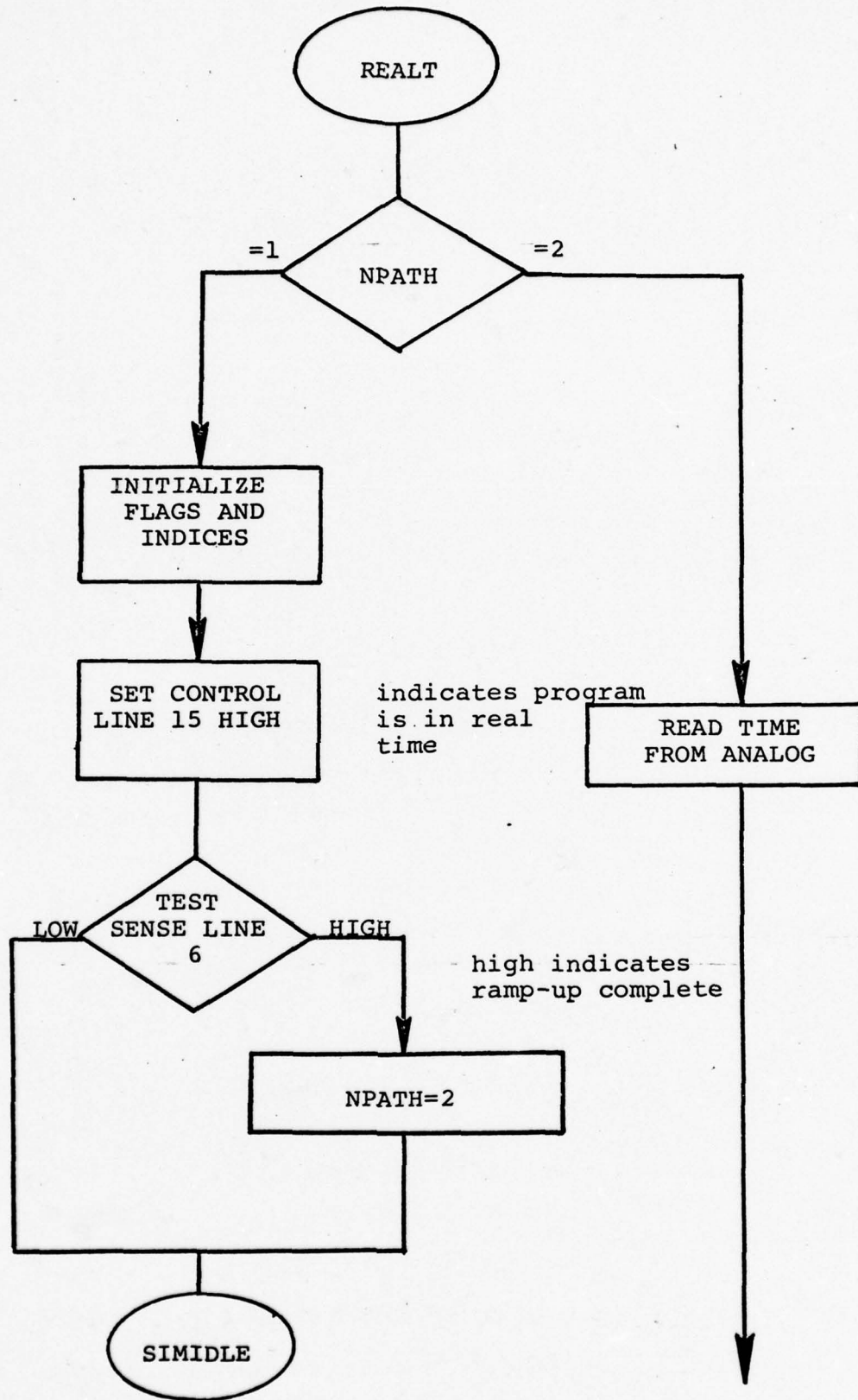


sense line 5 high indicates static test complete on analog

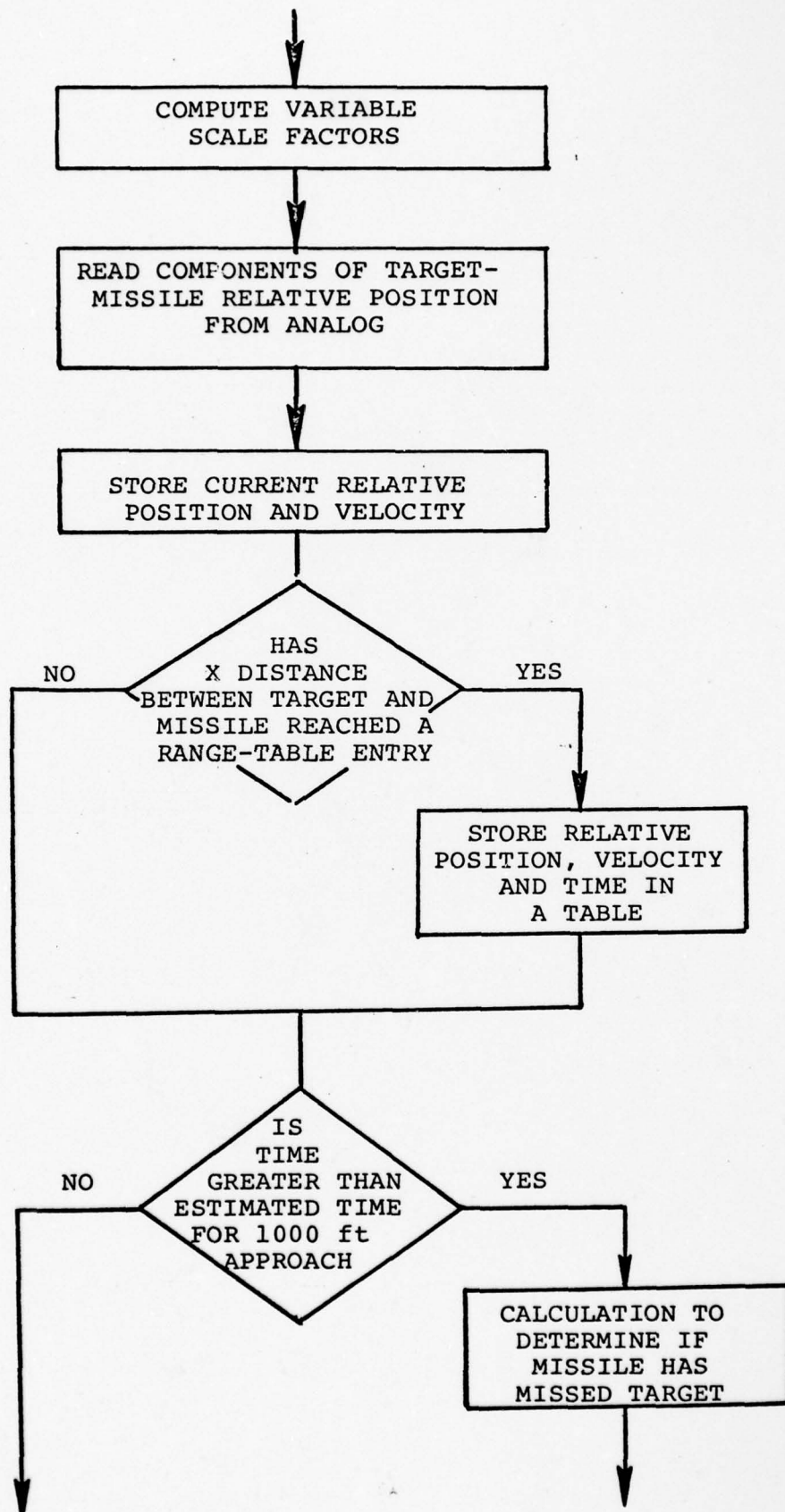
FLOW CHART FOR SUBROUTINE FLIGHT
FIGURE 4.1

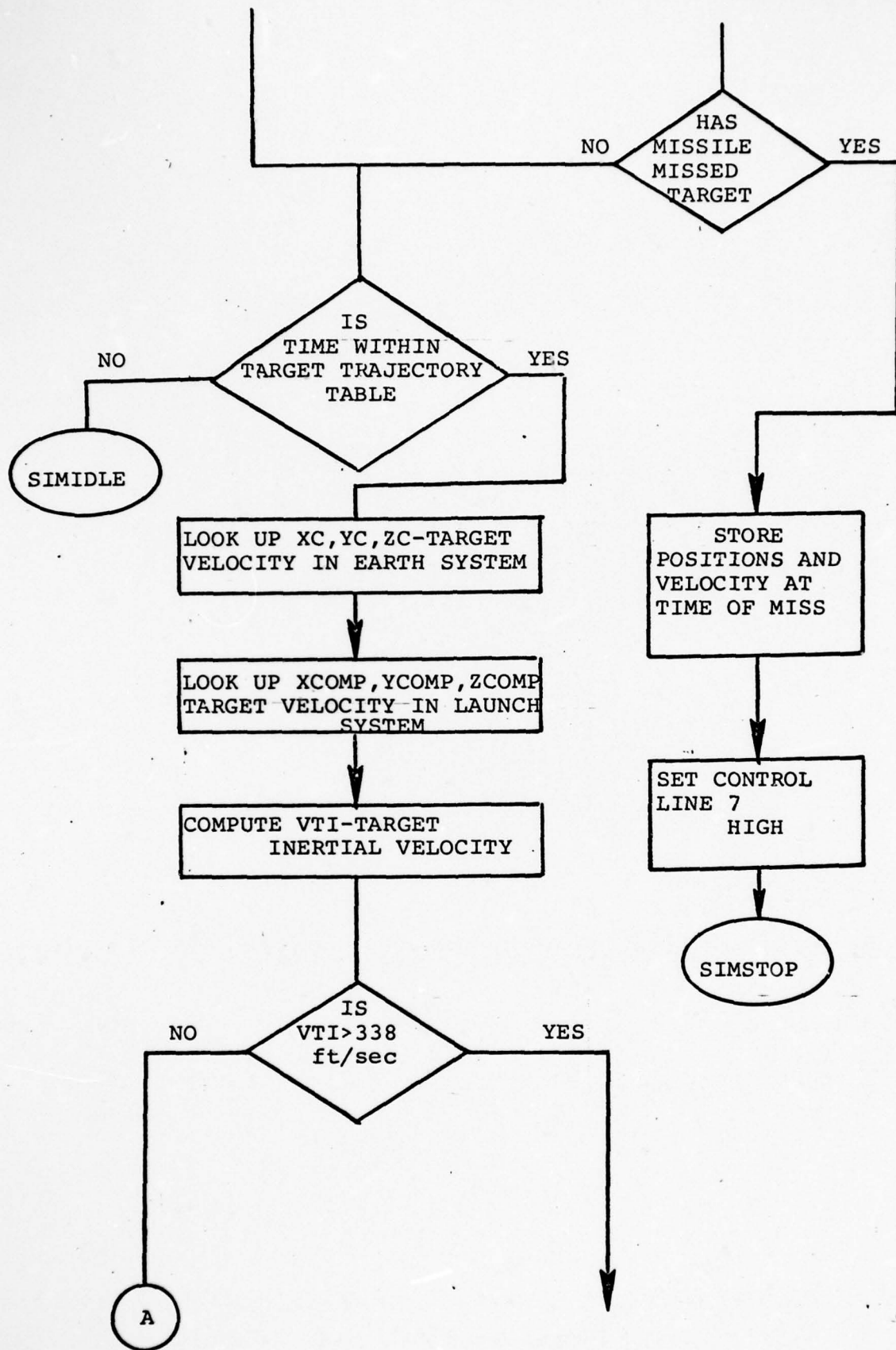


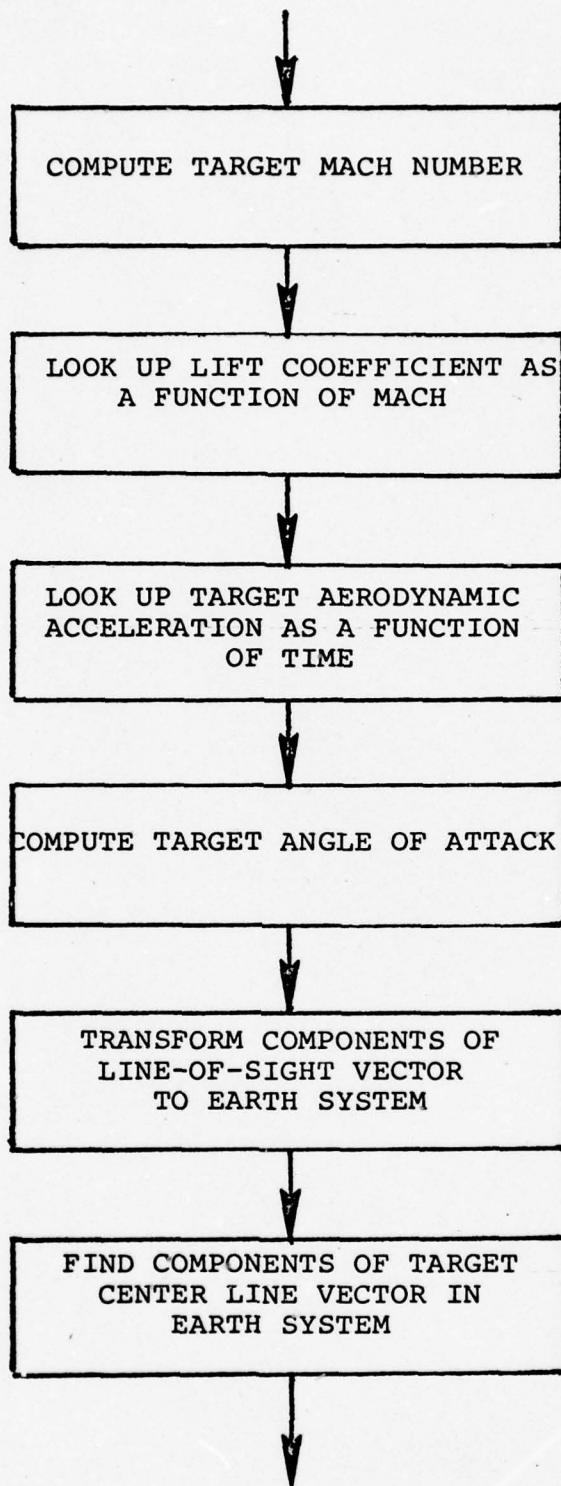
{ indicates IC's
have been sent

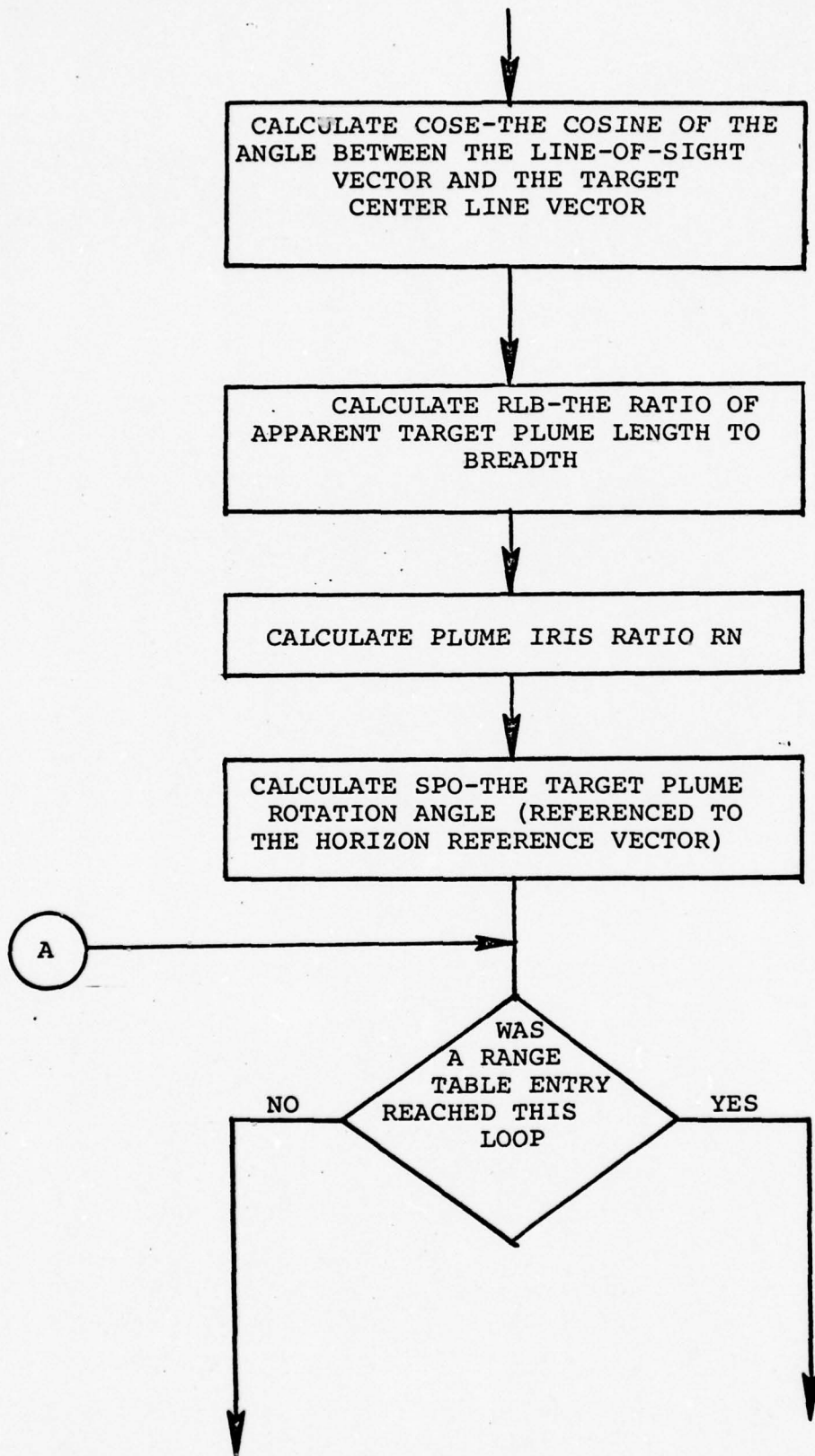


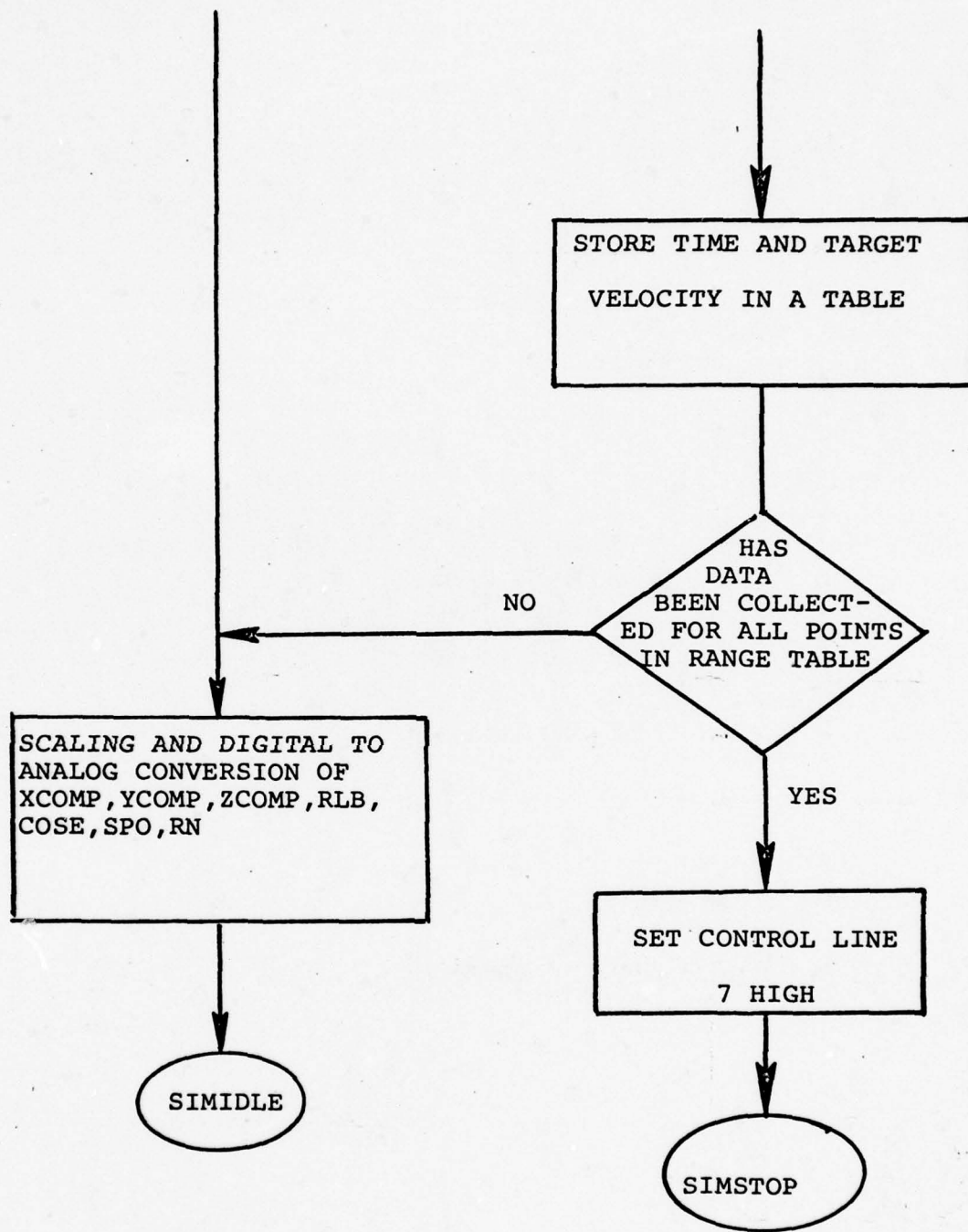
FLOW CHART FOR SUBROUTINE REALT
FIGURE 4,2











PLUME SHAPE

$$|\bar{L}_{OS}| = \sqrt{(X_{ML} - X_{TL})^2 + (Y_{ML} - Y_{TL})^2 + (Z_{ML} - Z_{TL})^2}$$

$$P_1 = 2 \tan^{-1} \left(\frac{B/2}{\ell} \right) \quad (\text{DEG})$$

$$P_2 \text{ INCH}^\dagger = \frac{(f)(\ell)}{|\bar{L}_{OS}|} \quad (\text{IN})$$

$$P_2 \text{ RAD}^\dagger = \tan^{-1} (\ell / |\bar{L}_{OS}|) \quad (\text{RAD})$$

$$P_2 \text{ RAD}^\dagger = \ell / |\bar{L}_{OS}| \quad (\text{RAD})$$

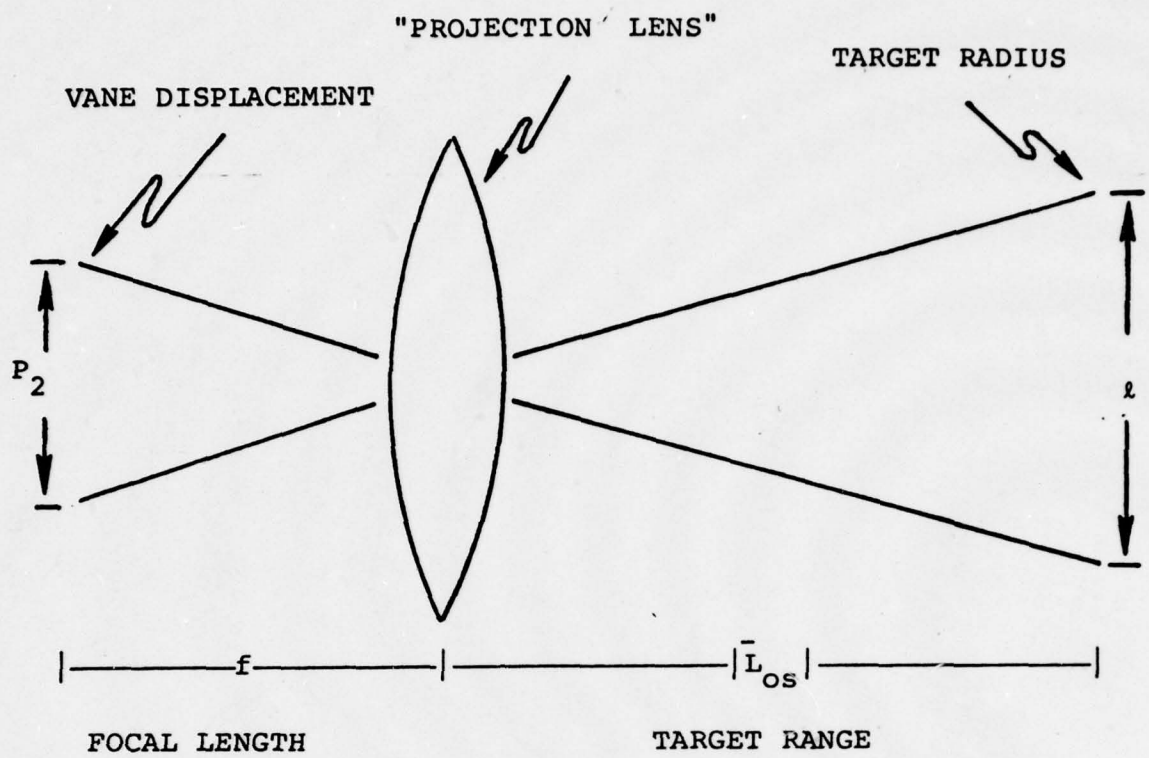


FIGURE 4.3
PLUME TRANSPARENCY

PLUME AZIMUTH AND ELEVATION

$$\psi_7 = \psi_4 - P_2 \cos (T_{RP}) \quad (\text{DEG})$$

$$\dot{\psi}_7 = \dot{\psi}_4 \quad (\text{DEG/SEC})$$

$$\theta_7 = \theta_4 - P_2 \sin (T_{RP}) \quad (\text{DEG})$$

$$\dot{\theta}_7 = \dot{\theta}_4 \quad (\text{DEG/SEC})$$

PLUME LENGTH TO BREADTH RATIO AND ASPECT ANGLE

$$l \approx L \sin (\epsilon) \quad \text{if } B < L, B=3.0$$

$$l = L \sqrt{1 - \cos^2 (\epsilon)}$$

$$l/B = \frac{L}{B} \sqrt{1 - \cos^2 (\epsilon)}$$

$$\cos (\epsilon) = \frac{\bar{L}_{os} \cdot \bar{C}_L}{|\bar{L}_{os}| |\bar{C}_L|}$$

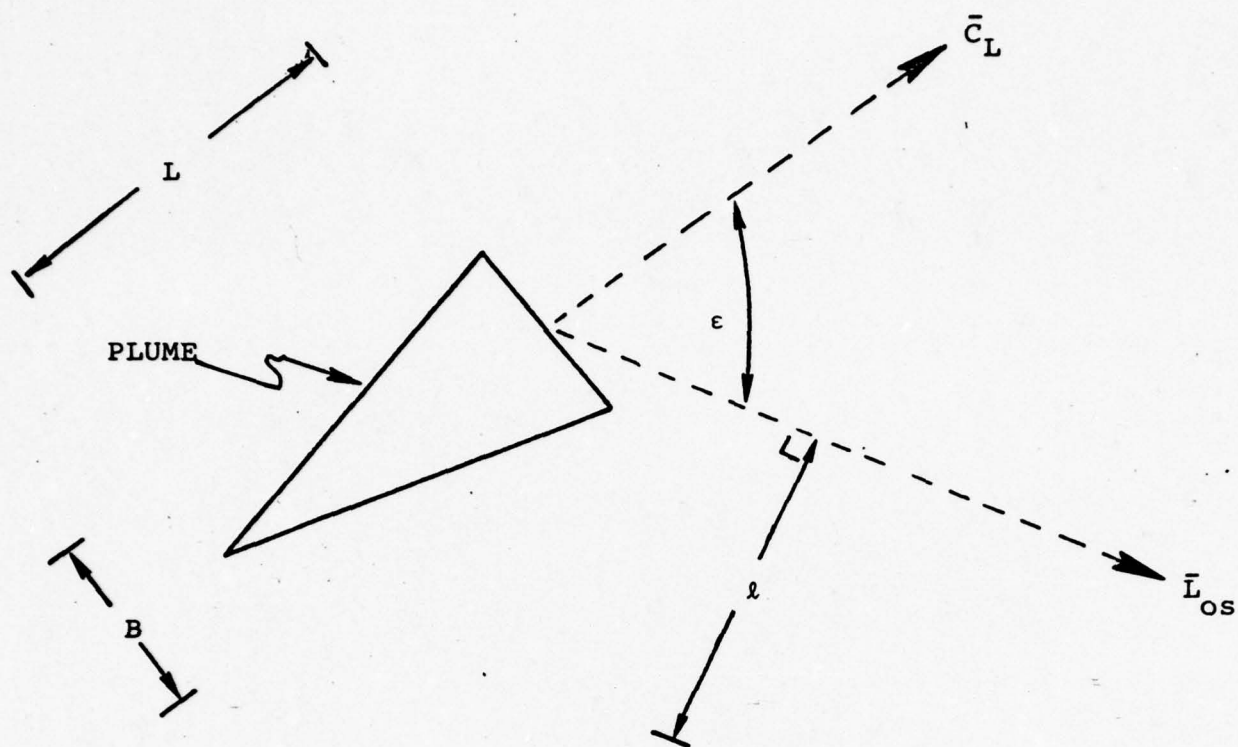


FIGURE 4.4
 PLUME APPARENT LENGTH AND ASPECT ANGLE

PLUME IRIS RATIO

$$H_{c7} = \left(\frac{R}{7000} \right)^{-2.341} \left(H \left| \begin{array}{l} R=7000 \\ \epsilon \end{array} \right. \right) \quad (W/CM^2)$$

$$A_{t7} = \frac{P_2^2 \text{ INCH SIN}(P_1)}{2 \text{ COS}^2 (P_1/2)} \quad (IN^2)$$

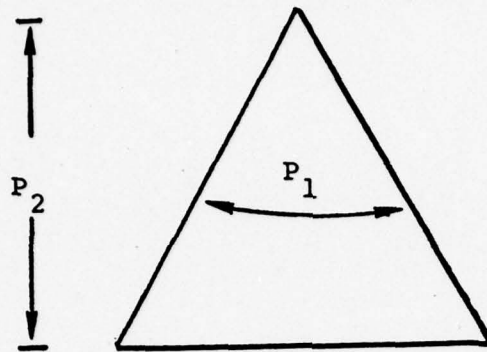
$$J_{tu7} = K_2 A_{t7}^{K_3}, \quad K_2 = .1, \quad K_3 = 1.003258 \quad (W/STER)$$

From IRSS Calibration
curve fit

$$I_{r7} = \frac{\frac{H_{c7} f^2}{T_{f,plume}}}{J_{tu}}$$

$$i_7 = i_7 (I_{r7})$$

From IRSS Calibration limits



$$\text{AREA} = P_2^2 \tan (P_1/2)$$

OR

$$\text{AREA} = \frac{P_2^2 \sin P_1}{2 \cos^2 (P_1/2)}$$

FIGURE 4.5
AREA OF PLUME TRANSPARENCY

PLUME ROTATION ANGLE

$$\beta = \cos^{-1} \left(\frac{L_X}{\sqrt{L_X^2 + L_Y^2}} \right)$$

$$C_X = -\cos \beta$$

$$C_Y = \begin{cases} +\sin \beta & \text{if } L_X > 0 \\ -\sin \beta & \text{if } L_X < 0 \end{cases}$$

$$D_X = L_Y \cdot C_{LZ} - L_Z \cdot C_{LY}$$

$$D_Y = L_Z \cdot C_{LY} - L_X \cdot C_{LZ}$$

$$D_Z = L_X \cdot C_{LY} - L_Y \cdot C_{LX}$$

$$\cos \theta = \frac{(\bar{L}_{OS} \times \bar{C}_L) \cdot \bar{C}}{|\bar{L}_{OS} \times \bar{C}_L| \cdot |\bar{C}|}, \text{ or } \theta = \cos^{-1} \left(\frac{(D_X \cdot C_X + D_Y \cdot C_Y)}{\sqrt{D_X^2 + D_Y^2 + D_Z^2}} \right)$$

$$T_{RP} = \begin{cases} \pi/2 - \theta & \text{if } D_Z < 0 \\ \pi/2 + \theta & \text{if } D_Z > 0 \text{ and } \theta < \pi/2 \\ \theta - 3\pi/2 & \text{if } D_Z > 0 \text{ and } \theta > \pi/2 \end{cases}$$

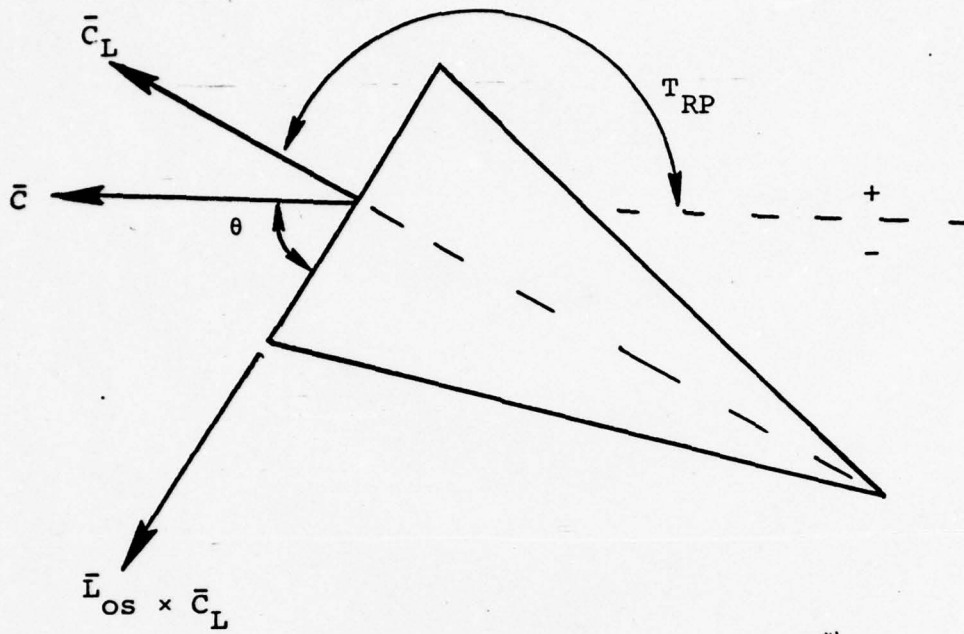


FIGURE 4.6

APPARENT TARGET PLUME AS SEEN FROM THE MISSILE SEEKER
 (THE PLANE OF THE PAPER IS PERPENDICULAR TO THE \bar{L}_{os} VECTOR)

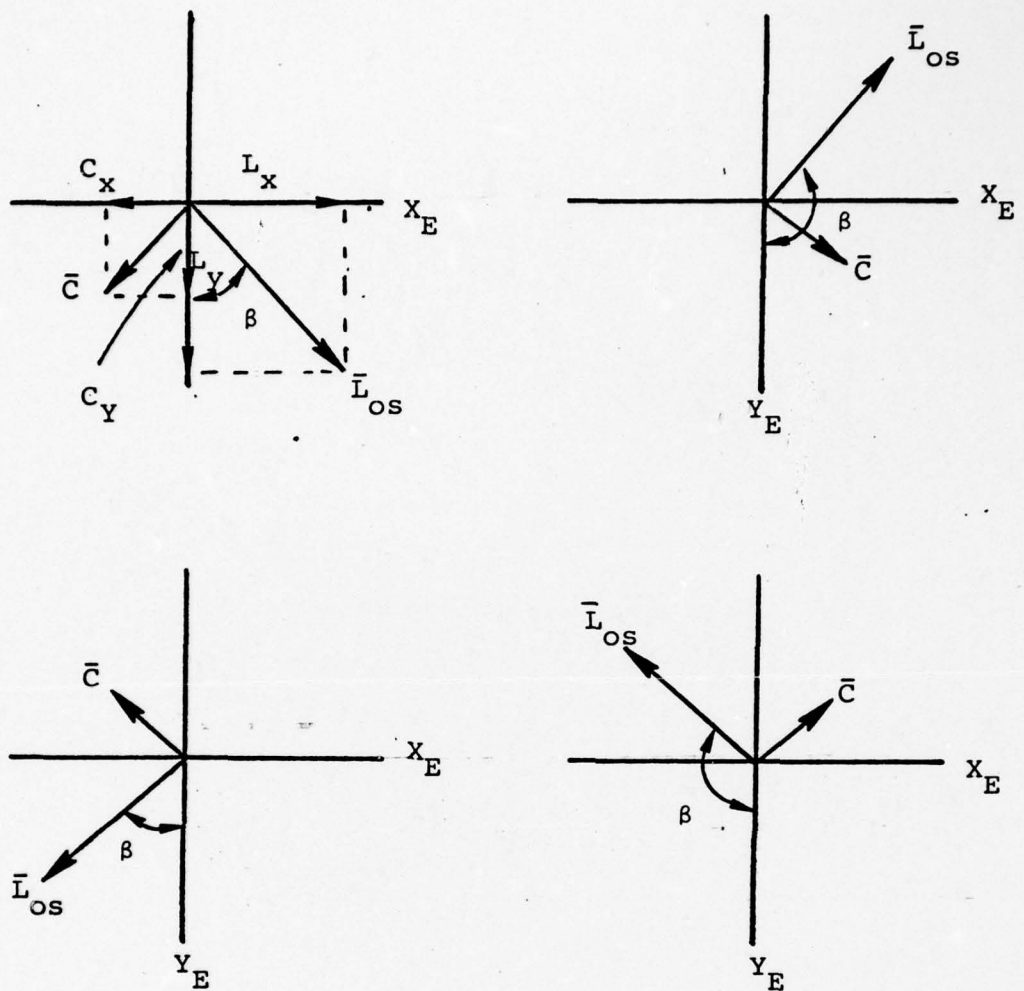


FIGURE 4.7

EXHAUSTION OF GENERAL CONFIGURATIONS FOR \bar{L}_{OS} AND \bar{C}

TARGET ANGLE OF ATTACK AND MACH NUMBER

$$\rho = .00237692 e^{-.00003h_{aSL}} \quad (\text{SLUGS/FT}^3)$$

$$V_T = \sqrt{\dot{X}_{TE}^2 + \dot{Y}_{TE}^2 + \dot{Z}_{TE}^2} \quad (\text{FT/SEC})$$

$$C_{L\alpha_T} = CLAA \Big|_{Q_M}$$

$$a_s = 1116.89 - .003894 h_{aSL} \quad (\text{FT/SEC})$$

$$Q_M = V_T / a_s$$

$$h_{aSL} = \sqrt{X_{ML}^2 + Z_{ML}^2} \sin \left[\tan^{-1} \left(\frac{-Z_{ML}}{X_{ML}} \right) + \theta_L \right] + \Delta h^* \quad (\text{FT})$$

ΔL = Altitude of launch site above sea level (FT)

$$\alpha = \frac{2W_T}{\rho V_T^2 C_{L\alpha_T} S_T g} \left(\sqrt{X_{TE}^2 + Y_{TE}^2 + Z_{TE}^2} \right) \quad (\text{RAD})$$

*THIS MODEL IS NOT CURRENTLY INCORPORATED IN THE MICOM REAL TIME SIMULATIONS.

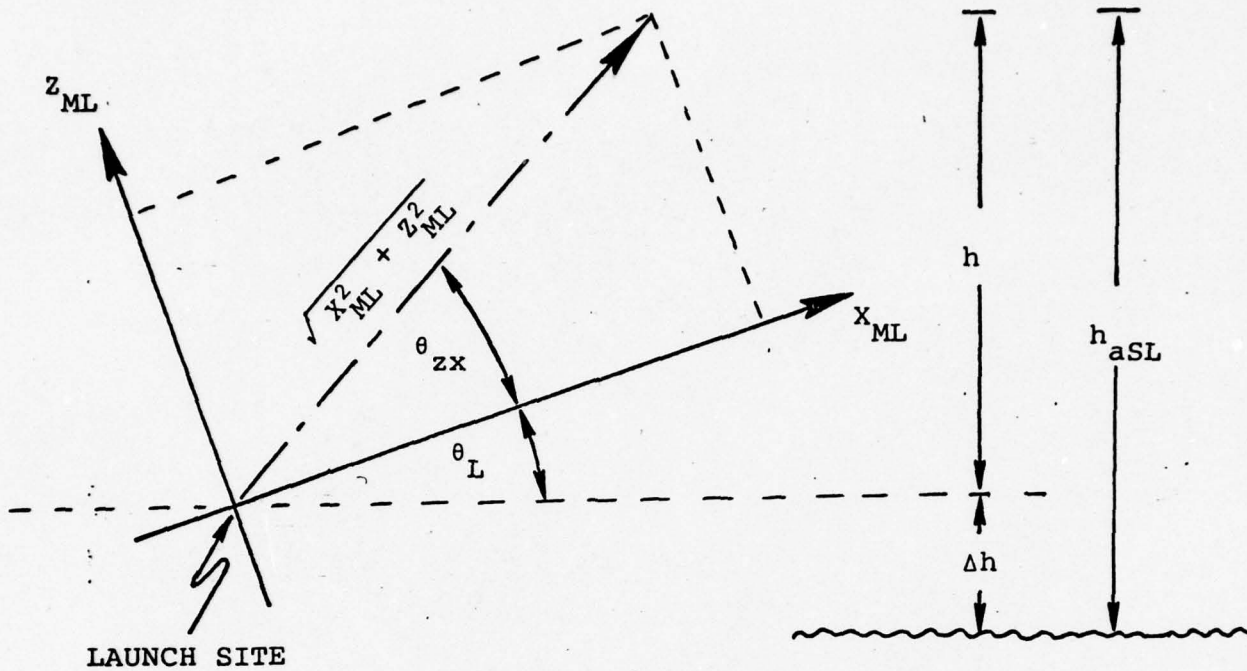


FIGURE 4.8

ALTITUDE OF TARGET ABOVE SEA LEVEL

FLARE TRANSPARENCY RADIUS AND IRIS RATIO

$$J_{tu2} = J_{tu2}(t_{FD}) \quad (W/STER), DFG$$

$$R_F = \sqrt{(X_{ML} - X_{2L})^2 + (Y_{ML} - Y_{2L})^2 + (Z_{ML} - Z_{2L})^2}$$

$$H_{c2} = J_{tu2} / R_F^2 \quad (W/CM^2), DFG$$

$$t_2 = t_2(H_{c2}) \quad (RAD), DFG$$

$$i_2 = i_2(H_{c2}) \quad (RAD), DFG \text{ based on IRSS calibration limits.}$$

FLARE AZIMUTH AND ELEVATION

$$\sigma_{Y2} = \frac{Y_{ML} - Y_{2L}}{X_{ML} - X_{2L}} \quad (\text{RAD})$$

$$\psi_{24REL} = \begin{cases} 57.3 (\sigma_{Y4} - \sigma_{Y2}), & t \geq t_{EJECT} \\ 0, & t < t_{EJECT} \end{cases} \quad (\text{DEG.})$$

$$\dot{\psi}_{24REL} = 57.3 \left\{ \left[\frac{(\dot{Y}_{ML} - \dot{Y}_{4L}) - \sigma_{Y4} (\dot{X}_{ML} - \dot{X}_{4L})}{X_{ML} - X_{4L}} \right] - \left[\frac{(\dot{Y}_{ML} - \dot{Y}_{2L}) - \sigma_{Y2} (\dot{X}_{ML} - \dot{X}_{2L})}{X_{ML} - X_{2L}} \right] \right\} \quad (\text{DEG/SEC})$$

$$\psi_2 = \psi_4 - \psi_{24REL} \quad (\text{DEG})$$

$$\dot{\psi}_2 = \dot{\psi}_4 - \dot{\psi}_{24REL} \quad (\text{DEG/SEC})$$

$$\theta_{24REL} = \begin{cases} -57.3 (\sigma_{Z4} - \sigma_{Z2}), & t > t_{EJECT} \\ 0, & t < t_{EJECT} \end{cases} \quad (\text{DEG})$$

$$\dot{\theta}_{24REL} = -57.3 \left\{ \left[\frac{(\dot{Z}_{ML} - \dot{Z}_{4L}) - \sigma_{Z4} (\dot{X}_{ML} - \dot{X}_{4L})}{(X_{ML} - X_{4L})} \right] - \left[\frac{(\dot{Z}_{ML} - \dot{Z}_{2L}) - \sigma_{Z2} (\dot{X}_{ML} - \dot{X}_{2L})}{(X_{ML} - X_{2L})} \right] \right\} \quad (\text{DEG/SEC})$$

FLARE DYNAMICS

$$\ddot{x}_{2L} = \frac{-\rho C_{D2} S_2 V_2}{2M_2} x_{2L} - g \sin \theta_L, \quad t > t_{EJECT}$$

$$\ddot{y}_{2L} = \frac{-\rho C_{D2} S_2 V_2}{2M_2} y_{2L}, \quad t > t_{EJECT}$$

$$\ddot{z}_{2L} = \frac{-\rho C_{D2} S_2 V_2}{2M_2} z_{2L} + g \cos \theta_L, \quad t > t_{EJECT} \quad (\text{FT/SEC}^2)$$

$$x_{2L} = x_{4L}$$

$$y_{2L} = y_{4L}$$

$$z_{2L} = z_{4L}$$

$$\dot{x}_{2L} = \dot{x}_{4L}$$

$$\dot{y}_{2L} = \dot{y}_{4L}$$

$$\dot{z}_{2L} = \dot{z}_{4L}$$

$t < t_{EJECT}$

(FT)

TAILPIPE AZIMUTH AND ELEVATION

$$\sigma_{Y4} = \frac{Y_{ML} - Y_{4L}}{X_{ML} - X_{4L}} \quad (\text{RAD})$$

$$\psi_4 = 57.3 \sigma_{Y4} \quad (\text{DEG})$$

$$\dot{\psi}_4 = 57.3 \left[\frac{(\dot{Y}_{ML} - \dot{Y}_{4L}) - \sigma_{Y4} (\dot{X}_{ML} - \dot{X}_{4L})}{(X_{ML} - X_{4L})} \right] \quad (\text{DEG/SEC})$$

$$\sigma_{Z4} = \frac{Z_{ML} - Z_{4L}}{X_{ML} - X_{4L}} \quad (\text{RAD})$$

$$\theta_4 = -57.3 \sigma_{Z4} \quad (\text{DEG})$$

$$\dot{\theta}_4 = -57.3 \left[\frac{(\dot{Z}_{ML} - \dot{Z}_{4L}) - \sigma_{Z4} (\dot{X}_{ML} - \dot{X}_{4L})}{(X_{ML} - X_{4L})} \right] \quad (\text{DEG/SEC})$$

PITCH, YAW AND ROLL POSITIONS

$$P = 57.29 \int q' dt \quad (\text{DEG})$$

$$Y = 57.29 \int r' dt \quad (\text{DEG})$$

$$R = R(p') \quad (\text{DEG})$$

TRANSFORMATION OF \bar{C}_L AND \bar{L}_{OS} FROM LAUNCH TO EARTH COORDINATES

$$\begin{aligned} \bar{C}_L = \bar{i}_E & \left\{ \frac{X_{TE}}{V_T} \cos(\alpha) + \frac{X_{TE} Z_{TE} \sin(\alpha)}{V_T \sqrt{X_{TE}^2 + Y_{TE}^2}} \right\} \\ & + \bar{j}_E \left\{ \frac{Y_{TE}}{V_T} \cos(\alpha) + \frac{Y_{TE} Z_{TE} \sin(\alpha)}{V_T \sqrt{X_{TE}^2 + Y_{TE}^2}} \right\} \\ & + \bar{k}_E \left\{ \frac{Z_{TE} \cos(\alpha)}{V_T} - \frac{\sqrt{X_{TE}^2 + Y_{TE}^2} \sin(\alpha)}{V_T} \right\} \end{aligned}$$

$$\begin{aligned} \bar{L}_{OS} = \bar{i}_E & (X_G \cos \theta_L \cos \psi_L - Y_G \sin \psi_L + Z_G \sin \theta_L \cos \psi_L) \\ & + \bar{j}_E (X_G \cos \theta_L \sin \psi_L + Y_G \cos \psi_L + Z_G \sin \theta_L \sin \psi_L) \\ & + \bar{k}_E (-X_G \sin \theta_L + Z_G \cos \theta_L) \end{aligned}$$

$$X_G = X_{ML} - X_{TL}$$

$$Y_G = Y_{ML} - Y_{TL}$$

$$Z_G = Z_{ML} - Z_{TL}$$

VARIABLE SCALE FACTOR

$$K = \begin{cases} 1 + \frac{\gamma t}{t'}, & t < t' \\ 1 + \gamma & t > t' \end{cases}$$

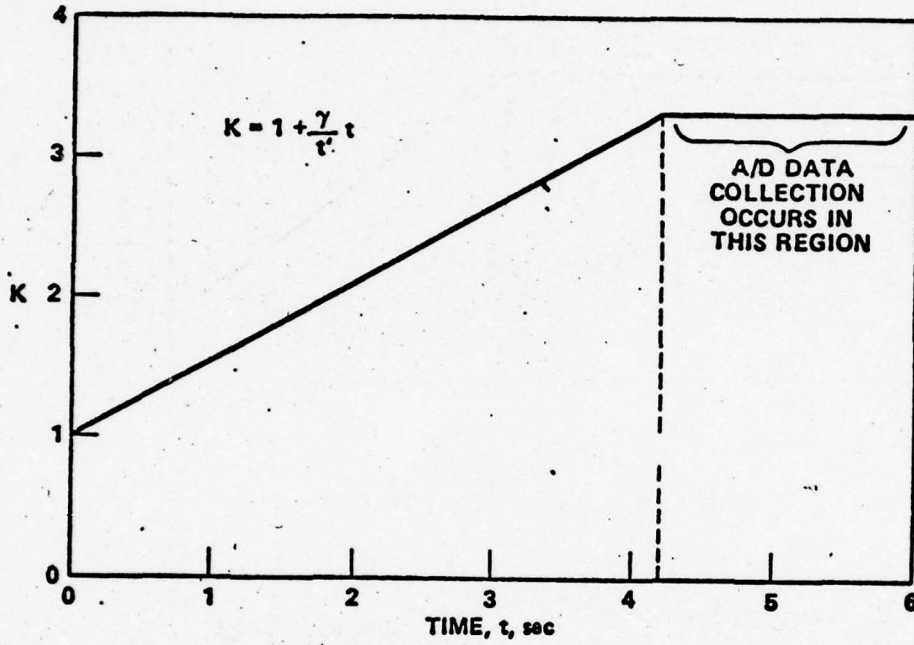


FIGURE 4.9
VARIABLE ANALOG SCALE FACTOR

TABLE 4.1

DESCRIPTION OF PROGRAM SYMBOLS
FOR SUBROUTINE FLIGHT AND REALT

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
_____	SPO	Scaled plume rotation angle
T_{RP}	TRP	Plume rotation angle (RAD.)
θ_L	THETAL	Elevation angle of target (DEG.)
t	DT	Real time (SEC.)
g	_____	Gravitational constant
x_E	XE	Target aerodynamic acceleration table in earth fixed coordinates (Note ZE includes an added factor of 32.174 FT/SEC/SEC)
y_E	YE	
z_E	ZE	
α	Al	Target angle of attack (RAD.)
t'	G,GAM	Time at approximately 1000 feet to go
$C_{L\alpha_T}$	CLA	Aerodynamic lift coefficient of target due to angle of attack
\bar{V}_{TI}	VTI	Target inertial velocity
l/B	RLB	Apparent plume length to breadth ratio
E	_____	Subscript which denotes earth fixed coordinates
ψ_L	_____	Azimuth angle of target (DEG.)

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
F	_____	Subscript which denotes target fixed coordinates
L	_____	Subscript which denotes launch coordinates
R _i	RI	Initial range (FT.)
R _{FT}	RFEET	Range (FT)
_____	EDOT	Scaled γ/t'
ρ	PHO	Air density (SLUGS/FT ³)
γ_{min}	GGG	Minima of the overload function
K	SKK	Variable scale factor, $K = \begin{cases} 1 + \frac{\gamma t}{t'} & , t \leq t' \\ 1 + \gamma & , t > t' \end{cases}$
_____	XX	Range table for data collection
_____	XXS	Scaled range table (XX)

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
I_{r7}	RN	For MICOM Hybrid, a uniform random number, $RN \in (-1,1)$ For IRSS, iris ratio number 7
$\text{Cos}(\epsilon)$	COSE	Cosine of angle between LOS and center line of target
$x_{ML} - x_{TL}$	DX	Scaled XXX, YYY, ZZZ (NOTE: these variables may overload on the AD/4 until time = t')
$y_{ML} - y_{TL}$	DY	
$z_{ML} - z_{TL}$	DZ	
t	DT	Real time
$x_{ML} - x_{TL}$	XXX	x-Missile minus x-target position (FT.)
$y_{ML} - y_{TL}$	YYY	y-Missile minus y-target position (FT.)
$z_{ML} - z_{TL}$	ZZZ	z-Missile minus z-target position (FT.)
$\dot{x}_{ML} - \dot{x}_{TL}$	XDOT	x-Missile minus x-target velocity (FT./SEC.)
$\dot{y}_{ML} - \dot{y}_{TL}$	YDOT	y-Missile minus y-target velocity (FT./SEC.)
$\dot{z}_{ML} - \dot{z}_{TL}$	ZDOT	z-Missile minus z-target velocity (FT./SEC.)

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
\dot{x}_{TL}	XDTGMS	Tables of target velocity components in launch system
\dot{y}_{TL}	YDTGMS	
\dot{z}_{TL}	ZDTGMS	
β	_____	$\text{Cos}^{-1} (L_y / \sqrt{L_x^2 + L_y^2})$
h	ZALT	Altitude of missile above sea level (FT.)
_____	XCOMP	Interpolated value of XDTGMS
_____	YCOMP	Interpolated value of YDTGMS
_____	ZCOMP	Interpolated value of ZDTGMS
\dot{x}_{TE}	XC	Interpolated value of XDM
\dot{y}_{TE}	YC	Interpolated value of YDM
\dot{z}_{TE}	ZC	Interpolated value of ZDM

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
_____	XDM	Tables of target velocity components in earth system
_____	YDM	
_____	ZDM	
_____	TIME	Storage for missile position, velocity and time in the region of pre-specified range table entries
_____	PPX	
_____	PPY	
_____	PPZ	
_____	VMX	
_____	VMY	
_____	VMZ	
_____	IPTS	
_____	MISSED	An array of values representing miss conditions
_____	Tlll	Angle between $(\overline{LOS} \times \overline{C}_L)$ and horizon reference vector

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
x_G	—	x-Missile minus x-target (in launch coordinates)
y_G	—	y-Missile minus y-target (in launch coordinates)
z_G	—	z-Missile minus z-target (in launch coordinates)
VT	VTI	Target inertial velocity
—	XTA	Interpolated target accelerations in earth fixed coordinate system
—	YTA	
—	ZTA	
\bar{C}_L	—	Longitudinal center line of target
C_{Lx}	G1	Components of \bar{C}_L in earth fixed coordinates
C_{Ly}	G2	
C_{Lz}	G3	
\bar{L}_{os}	—	Line of sight vector

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
L_x	F1	Components of \bar{L}_{Os} in earth fixed coordinates
L_y	F2	
L_z	F3	
x_{ML}	_____	x-Missile position in launch coordinates
y_{ML}	_____	y-Missile position in launch coordinates
z_{ML}	_____	z-Missile position in launch coordinates
x_{TL}	_____	x-target position in launch coordinates
y_{TL}	_____	y-target position in launch coordinates
z_{TL}	_____	z-target position in launch coordinates
x_{TE}	_____	x-position of target in inertial coordinates
y_{TE}	_____	y-position of target in inertial coordinates
z_{TE}	_____	z-position of target in inertial coordinates

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
_____	XDTGO	} Initial values of XDTGMS, YDTGMS, ZDTGMS
_____	YDTGO	
_____	ZDTGO	
H_{c7}	_____	Commanded irradiance for plume
f	19.5	Focal length of projection lens (CM)
$H \left \begin{array}{l} R=7000 \\ \epsilon \end{array} \right.$	HR7E	Irradiance at 7000 meters (W/CM ²)
P_1	P1IRSS	Vertex angle of plume transparency (DEG)
P_2	P2IRSS	Length of plume transparency (IN.)
A_{t7}	AT7	Area of plume transparency (IN ²)
J_{tu7}	PJTU1	Available radiant intensity of target as function of plume transparency area taken from calibration in IRSS (W/STER)
$T_{f,plume}$	0.3	Neutral density transmission factor for plume

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
W_T	WT	Weight of target
S_T	ST	Reference surface area of target
\bar{C}	_____	Horizon reference vector
Q_M	QM	Mach number of target
a_s	AAA	Speed of sound
V_2	_____	Speed of flare
R_F	_____	Range to go between missile and flare
H_{i2}, H_{c2}	_____	Irradiance of flare W/CM ² (Note, letter c denotes calibration)
\dot{X}_{FL}	_____	Velocity of flare in launch coordinates (FT/SEC)
\dot{Y}_{FL}	_____	
\dot{Z}_{FL}	_____	
σ_{Y4}	_____	Approximate ψ_4 (RAD)
σ_{Z4}	_____	Approximate θ_4 (RAD)
σ_{Y2}	σ_{YT}	Approximate ψ_2 (RAD)

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
σ_{Z2}	σ_{ZT}	Approximate θ_2 (RAD)
_____	J_{tu2}	Available radiant intensity of flare
_____	T_{FD}	Time of flare drop (SEG)
$ L_{os} $	R	Norm of line of sight (FT)
t_{FD}	t_{FD}, t_{fd}	Time associated with flare drop
δ	_____	Missile wing deflection
ψ_2	ψ_{F2}	Flare azimuth (DEG)
ψ_4	ψ_{T4}	Tail pipe azimuth (DEG)
ψ_7	ψ_{T7}	Plume azimuth (DEG)
ψ_{24}	ψ_{T2REL}	
θ_2	θ_{T2}	Flare elevation (DEG)
θ_4		Tail pipe elevation (DEG)
θ_7	θ_{T7}	Plume elevation (DEG)
θ_{24}		
$\dot{\psi}_2$	$\dot{\psi}_{F2}$	Flare azimuth rate (DEG/SEC)
$\dot{\psi}_4$	$\dot{\psi}_{T4}$	Tail pipe azimuth rate (DEG/SEC)

VARIABLE	PROGRAM SYMBOL	DESCRIPTION
$\dot{\psi}_7$	$\dot{\psi}_{T7}$	Plume azimuth rate (DEG/SEC)
$\dot{\psi}_{24}$	$\dot{\psi}_{T2REL}$	
$\dot{\theta}_2$	$\dot{\theta}_{T2}$	Flare elevation rate (DEG/SEC)
$\dot{\theta}_4$	$\dot{\theta}_{T4}$	Tail pipe elevation rate (DEG/SEC)
$\dot{\theta}_7$	$\dot{\theta}_{T7}$	Plume elevation rate (DEG/SEC)
$\dot{\theta}_{24}$	$\dot{\theta}_{T2REL}$	
t_2	_____	Transparency radius for flare
t_4	_____	Transparency radius for tailpipe
		} used to command true size
P	θ	GUM pitch angle (DEG)
Y	ψ	GUM yaw angle (DEG)
R	ϕ	GUM roll angle (DEG)
r'	_____	GUM Yaw rate (DEG/SEC)
q'	_____	GUM pitch rate (DEG/SEC)
p'	_____	GUM roll rate (DEG/SEC)

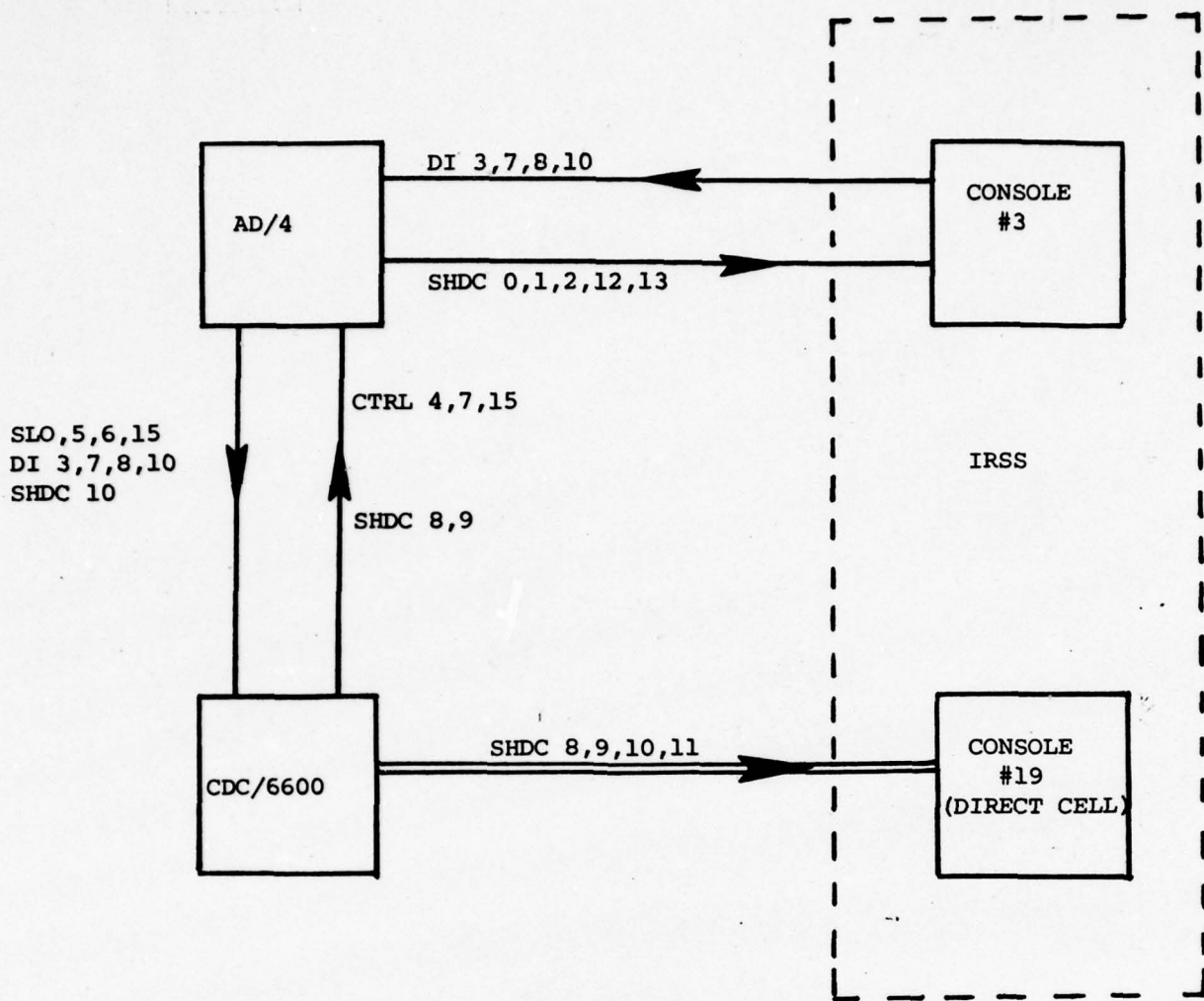
VARIABLE	PROGRAM SYMBOL	DESCRIPTION
_____	NPATH	Flag to control entrance into computation loop of real-time code.
_____	LOOP1	Loop counter for real-time interrupts prior to sense line 6 coming high
_____	LOOP2	Loop counter for real-time interrupts after sense line 6 comes high
_____	INFLRT	Flag to signal entrance into real time, INFLRT = -1 indicates batch and INFLRT = +1 indicates entrance into real-time
_____	LTF	Clock time at beginning of real-time loop. This value is used later to compute specific loop time for each loop
_____	NSEG	Segment number of real-time code which is to be entered.
_____	IT1	
_____	INDEX	Index for storing real-time data for post real-time analysis
_____	LEVEL	Status of maneuver -7 → not in real-time 0 → in real-time +7 → target trajectory table exceeded
_____	IT1, IT2	Index used in interpolation of target trajectory time
_____	NT	Length for target trajectory tables

VARIABLE	PROGRAM SYMBOL	DESCRIPTION	
_____	DXG	Dummy storage location for current value of DX, DY, DZ, XDOT, YDOT and ZDOT respectively. These variables are returned to the main program for diagnostic purposes	
_____	DYG		
_____	DZG		
_____	XDO		
_____	YDO		
_____	ZDO		
L	PL	Actual plume length (FT)	
B	PB	Actual plume breadth at base (FT)	
ℓ	PLA	Apparent plume length	
_____	t	MAN(1,I)	
_____	\dot{X}_{TL}	MAN(2,I)	
_____	\dot{Y}_{TL}	MAN(3,I)	Target time and velocity at each range table data collection point
_____	\dot{Z}_{TL}	MAN(4,I)	

V. REAL-TIME I/O

V. REAL-TIME I/O

This Section contains a description of real-time input output requirements of the MICOM Hybrid STINGER Simulation. The tables and figures included in this section describe the flow of analog and discrete information between an AD/4 analog computer, a CDC/6600 digital computer and the IRSS.



NOTE: The CTRL and SL word are also used to transmit SHDCS and DIs, the specific usage is:

- | | |
|---------------------|-----------------|
| ○ SHDC 8 = CTRL 8 | ○ DI 3 = SL 3 |
| ○ SHDC 9 = CTRL 9 | ○ DI 7 = SL 7 |
| ○ SHDC 10 = SL 11 | ○ DI 8 = SL 8 |
| ○ SHDC 11 = CTRL 11 | ○ DI 10 = SL 10 |

FIGURE 5.1
DISCRETE CIRCULATION

	V60	V61	V60	V61	V62	V63	V62	V63
00	10	20	30	40	50	60	70	
01	11	21	31	41	51	61	71	
02	12	22	32	42	52	62	72	
03	13	23	33	43	53	63	73	
04	14	24	34	44	54	64	74	
05	15	25	35	45	55	65	75	
06	16	26	36	46	56	66	76	
07	17	27	37	47	57	67	77	

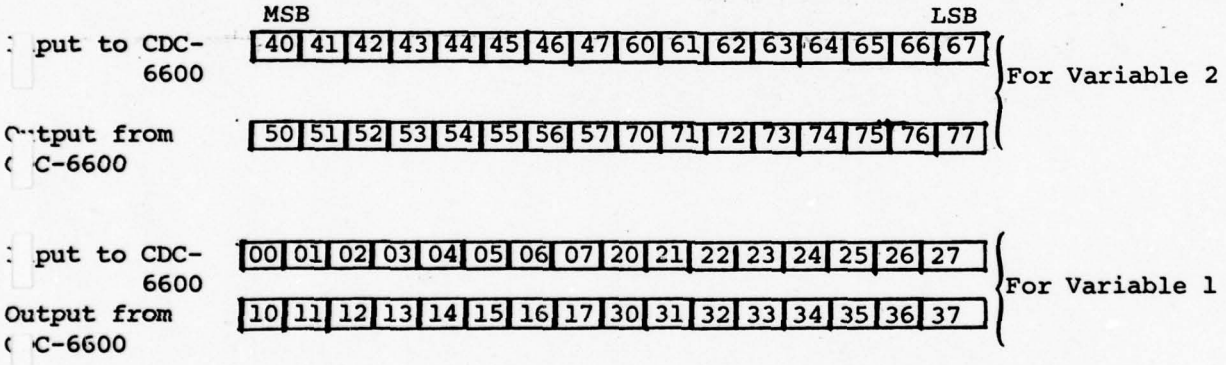


FIGURE 5.2

AD/4 DISCRETE TRUNK LINE CONNECTIONS

TABLE 5.1
DISCRETE SIGNALS FROM AD/4 TO CDC/6600

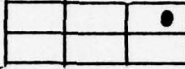
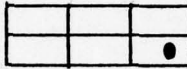
AD/4 PATCH	CDC/6600 BIT	DESCRIPTION	ORIGIN	ULTIMATE DESTINA- TION
TR4	SL11	NORMAL TERMINATION (SHDC10), SIGNALS RAMP DOWN COMPLETE	AD/4	IRSS/19
TR27	SL0	LOOP TO BATCH, RETRANSMITTS ICs WHEN SET LOW	AD/4	6600
TR22	SL5	STATIC TEST OK, SIGNALS AD/4 READY TO RECEIVE IC 	AD/4	6600
TR21	SL6	RAMP UP READY, SET HIGH BY OPERATE SWITCH IN MICOM HYBRID,  THIS STARTS REAL TIME LOOPING	AD/4	6600
TR00	SL15	6600 ABNORMAL ABORT, USED TO EXIT REAL TIME LOOPING	AD/4	6600
TR24	SL3	IRSS READY (DI3)	IRSS	6600
TR20	SL7	END OF PROBLEM (DI7)	IRSS	AD/4 6600
TR7	SL8	EMERGENCY SHUTDOWN (DI8)	IRSS	AD/4 6600
TR5	SL10	INITIAL FIELD REQUEST (DI10)	IRSS	6600

TABLE 5.2 DISCRETE SIGNALS FROM AD/4 TO IRSS


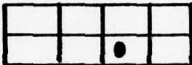
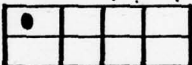
AD/4 PATCH	IRSS BIT	DESCRIPTION	ORIGIN	ULTIMATE DESTINA- TION
T46	SHDC0	<u>SHUTTER #2 COMMAND</u>	AD/4	IRSS/3
T61	SHDC1	<u>SHUTTER #4 COMMAND</u>	AD/4	IRSS/3
T63	SHDC2	<u>SHUTTER #7 COMMAND</u>	AD/4	IRSS/3
-----	SHDC8	<u>SIMULATION RUNNING</u> , (THIS PATH NOT USED SEE CTRL8)	-----	-----
-----	SHDC9	<u>FIELD TRANSMITTED</u> , (THIS PATH NOT USED SEE CTRL9)	-----	-----
-----	SHDC10	<u>NORMAL TERMINATION</u> , (THIS PATH NOT USED SEE SL11)	-----	-----
T43	SHDC12	<u>TARGET AQUIRED</u>	AD/4	IRSS/3
T40	SHDC13	<u>DISCRETE #5</u> , SWITCH SEEKER FROM EXTERNAL TO INTERNAL POWER	AD/4	IRSS/3

NOTE: IRSS/3 IS IRSS CONSOLE 3 AND IRSS/19 IS IRSS CONSOLE 19, THE DIRECT
CELL DATA LINK

TABLE 5.3 DISCRETE SIGNALS FROM IRSS TO AD/4

AD/4 PATCH	IRSS BIT	DESCRIPTION	ORIGIN	ULTIMATE DESTINA- TION
T72	DI3	IRSS READY, NOT SENT UNTIL TARGET ACQUIRED SIGNAL IS RECEIVED	IRSS	6600
T56	DI7	END OF PROBLEM, SIGNALS EQUIPMENT SHUT DOWN IN IRSS	IRSS	AD/4 6600
T55	DI8	EMERGENCY SHUT DOWN, SIGNALS EXCESSIVE ACCELERATION IN GUM	IRSS	AD/4 6600
T53	DI10	INITIAL FIELD REQUEST	IRSS	6600

TABLE 5.4 DISCRETE SIGNALS FROM CDC/6600 TO AD/4 OR IRSS

AD/4 PATCH	CDC/6600 BIT	DESCRIPTION	ORIGIN	ULTIMATE DESTINA- TION
TR33	CTRL4	<u>ICs SENT</u> , 	6600	AD/4
TR30	CTRL7	<u>INTECEPT DETECTED</u> , SET HIGH BY INTERCEPT OR MISS CONDITION 	6600	AD/4
TR10	CTRL15	<u>REAL TIME LOOPING</u> , SIGNALS CDC/6600 WAIT- ING FOR SL6 HIGH 	6600	AD/4
TR16	CTRL9	<u>FIELD TRANSMITTED</u> (SHDC9) SIGNAL TO GEPAC THAT FIRST FRAME OF DATA IS AVAILABLE. THIS OCCURS AFTER THE 6600 HAS RECEIVED INITIAL FIELD REQUEST, DI10	6600	IRSS/19 AD/4
TR17	CTRL8	<u>SIMULATION RUNNING</u> (SHDC8) TURNS ON INDI- CATOR LIGHTS ONLY. SENT WITH SHDC11	6600	IRSS/19 AD/4
-----	CTRL11	<u>START SIMULATION</u> (SHDC11) IN CLOSED-LOOP GEPAC RESPONDS BY SENDING FIRST CLOCK PULSE. SENT WITH SHDC8	6600	IRSS/19

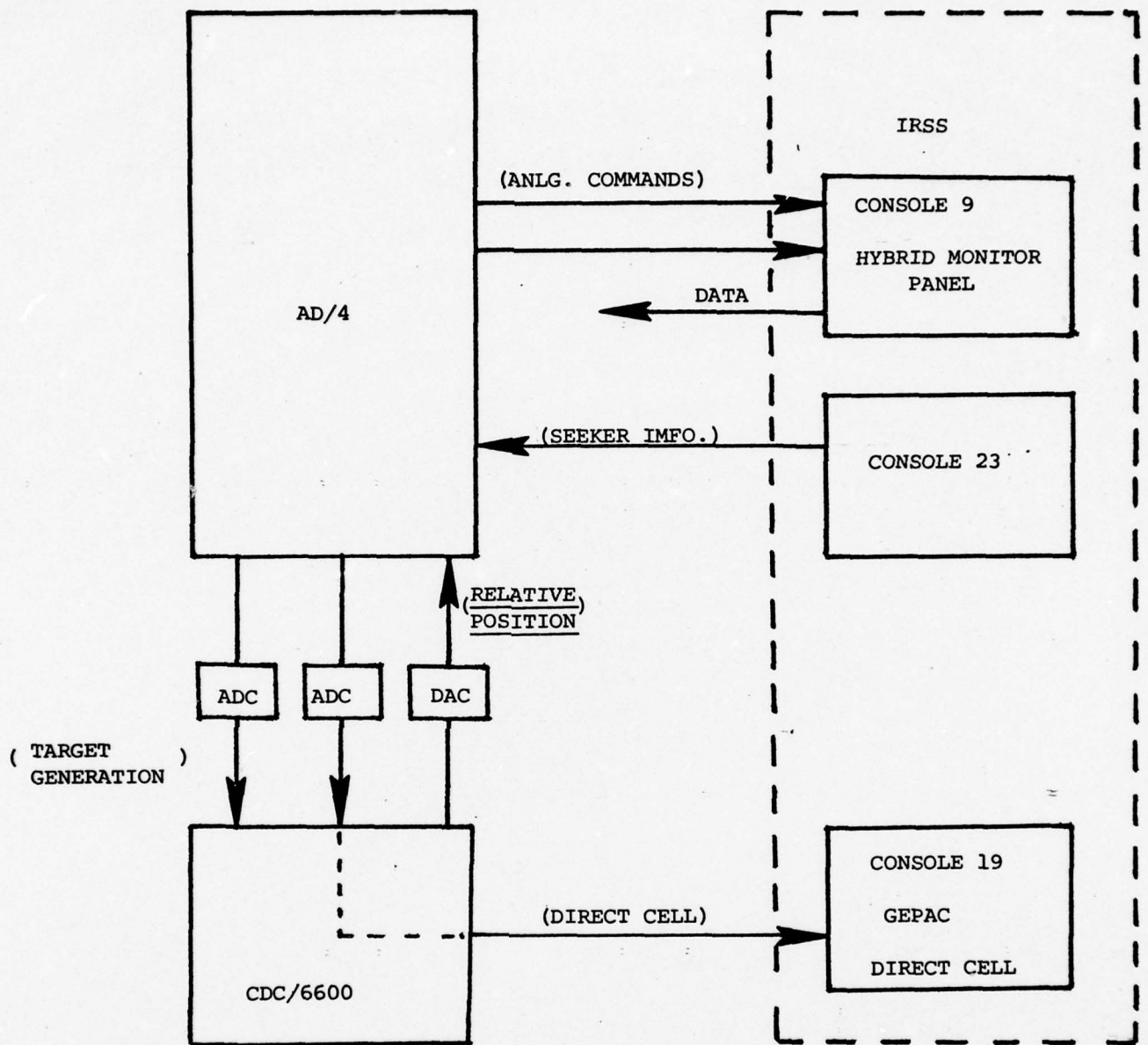


FIGURE 5.3 ANALOG SIGNAL CIRCULATION

SEEKER DATA TO AD/4

10	30	50	70
11	31	51	71
12	32	52	72
13	33	53	73
14	34	54	74
15	35	55	75
16	36	56	76
17	37	57	77

TO 231R

0	1
2	3

ADCS TO GEPAC

10	30	50	70
11	31	51	71
12	32	52	72
13	33	53	73
14	34	54	74
15	35	55	75
16	36	56	76
17	37	57	77

ADCS TO 6600

AD/4 COMMANDS TO IRSS/9

10	30	50	70
11	31	51	71
12	32	52	72
13	33	53	73
14	34	54	74
15	35	55	75
16	36	56	76
17	37	57	77

DACS TO 6600

10	30	50	70
11	31	51	71
12	32	52	72
13	33	53	73
14	34	54	74
15	35	55	75
16	36	56	76
17	37	57	77

TO 231R

AD/4 COMMANDS TO IRSS/9

FIGURE 1.4 AD/4 TRACKER ANTENNA

TABLE 5.5 AD/4 - CDC/6600 ADC ASSIGNMENT (V13 →)

ANALOG VARIABLE NAME	AD/4 ANLG. VOLTAGE -100 < V < +100	DIGITAL FRACTION -1 < N < +1	RELATIVE ADC ASSIGN.	AD/4 TRUNK LINE ASSIGNMENT
DX	$\frac{K(X_{ML} - X_{TL})}{20}$	$\frac{K(X_{ML} - X_{TL})}{(20)(100)}$	2	151
DY	$\frac{K(Y_{ML} - Y_{TL})}{20}$	$\frac{K(Y_{ML} - Y_{TL})}{(20)(100)}$	3	152
DZ	$\frac{K(Z_{ML} - Z_{TL})}{20}$	$\frac{K(Z_{ML} - Z_{TL})}{(20)(100)}$	4	153
DT	10t	$\frac{10t}{(100)}$	5	154
XDOT	$\frac{\dot{X}_{ML} - \dot{X}_{TL}}{200}$	$\frac{\dot{X}_{ML} - \dot{X}_{TL}}{(200)(100)}$	6	155
YDOT	$\frac{\dot{Y}_{ML} - \dot{Y}_{TL}}{200}$	$\frac{\dot{Y}_{ML} - \dot{Y}_{TL}}{(200)(100)}$	7	156
ZDOT	$\frac{\dot{Z}_{ML} - \dot{Z}_{TL}}{200}$	$\frac{\dot{Z}_{ML} - \dot{Z}_{TL}}{(200)(100)}$	8	157

(ADC ASSIGNMENT CONTINUED)

ANALOG VARIABLE NAME	AD/4 ANLG. VOLTAGE -100 < V < +100	DIGITAL FRACTION -1 < N < +1	RELATIVE ADC ASSIGNMENT	AD/4 TRUNK LINE ASSIGNMENT
XXX	$\frac{K(X_{ML} - X_{TL})}{200}$	$\frac{K(X_{ML} - X_{TL})}{(200)(100)}$	9	170
YYY	$\frac{K(Y_{ML} - Y_{TL})}{200}$	$\frac{K(Y_{ML} - Y_{TL})}{(200)(100)}$	10	171
ZZZ	$\frac{K(Z_{ML} - Z_{TL})}{200}$	$\frac{K(Z_{ML} - Z_{TL})}{(200)(100)}$	12	173

TABLE 5.6 AD/4 - CDC/6600 DAC ASSIGNMENT (V15 +)

DIGITAL VARIABLE NAME	DIGITAL FRACTION -1 < N < +1	AD/4 ANLG. VOLTAGE -10 < V < +10	RELATIVE DAC ASSIGNMENT	AD/4 TRUNK LINE ASSIGNMENT
XDTGO, XCOMP	$\frac{\dot{x}_{TL}}{(200)(10)}$	$\frac{\dot{x}_{TL}}{200}$	1	250
YDTGO, YCOMP	$\frac{\dot{y}_{TL}}{(200)(10)}$	$\frac{\dot{y}_{TL}}{200}$	2	251
ZDTGO, ZCOMP	$\frac{\dot{z}_{TL}}{(200)(10)}$	$\frac{\dot{z}_{TL}}{200}$	3	252
RLB	$\frac{(\epsilon/B)}{(10)}$	ϵ/B	4	253
COSE	$\frac{10 \cos(\epsilon)}{10}$	$10 \cos(\epsilon)$	5	254
SPO	$\frac{T_{RP}}{10}$	T_{RP}	6	255
RI	$\frac{R_i}{(2000)(10)}$	$\frac{R_i}{2000}$	7	256

(DAC ASSIGNMENT CONTINUED)

DIGITAL VARIABLE NAME	DIGITAL FRACTION -1 N +1	AD/4 ANLG. VOLTAGE -10 V +10	DAC ASSIGNMENT	AD/4 TRUNK LINE ASSIGNMENT
GAM	$\frac{t'}{10}$	t'	8	257
EDOT	$\frac{(y/t')}{(.6)(10)}$	$\frac{5(y/t')}{3}$	9	270
THETAL	$\frac{\theta_L}{(10)(10)}$	$\frac{\theta_L}{10}$	10	271
RN	$\frac{10.741 i_7}{10}$	$10.741 i_7$	12	273
RN*	$\frac{R_n}{10}$	R_n	12	273

* FOR MICOM HYBRID APPLICATIONS

TABLE 5.7 COMMANDS TO IRSS/9
U01+W9X28A

ANALOG VARIABLE NAME	AD/4 ANALOG VOLTAGE	RELATIVE TRUNK ASSIGNMENTS	AD/4 TRUNK LINE ASSIGNMENTS
θ_7	$-.875 \theta_7$	14	235
ψ_7	$-.875 \psi_7$	7	216
θ_2	$-.875 \theta_2$	9	230
ψ_4	$+.875 \psi_4$	4	213
θ_4	$-.875 \theta_4$	11	232
ψ_2	$-.875 \psi_2$	2	211

TABLE 5.8 COMMANDS TO IRSS/9

V17 - U02+W9X28A

ANALOG VARIABLE NAME	AD/4 ANALOG VOLTAGE	RELATIVE TRUNK ASSIGNMENTS	AD/4 TRUNK LINE ASSIGNMENTS
r' (YAW RATE)	1.0 r'	5	354
q' (PITCH RATE)	1.0 q'	6	355
p' (ROLL RATE)	$13.8 \times 10^{-3} p'$	7	356
T_{RP}	.5555 T_{RP}	2	351

TABLE 5.9 IRSS/23 TO AD/4 (seeker outputs)
V14-400+W23X28C

ANALOG VARIABLE NAME	AD/4 ANALOG VOLTAGE	RELATIVE TRUNK ASSIGNMENT	AD/4 TRUNK LINE ASSIGNMENT
$\delta_{\omega i}$.5435 $\delta_{\omega i}$	6	015
Guid. Comd.	-----	7	016
TAG	-----	8	017
TAB	-----	9	030
Sync Filt	-----	10	031
Acquisition	-----	11	032

TABLE 5.10 AD/4 TO CDC/6600
(sent to IRSS via direct cell)

V12+

ANALOG VARIABLE NAME	AD/4 ANALOG VOLTAGE	RELATIVE ADC ASSIGNMENT	AD/4 TRUNK LINE ASSIGNMENT
t_2	$9.53 \times 10^3 t_2^2$	1	110
t_4	$9.534 \times 10^3 t_4$	2	111
P_2	$9.896 \times 10^2 P_2$	3	112
R	.5555 R	4	113
P_1	1.7255 P_1	5	114
i_2	10.742 i_2	6	115
i_4	10.742 i_4	7	116
i_7	10.741 i_7	8	117
ψ_2	1.1111 ψ_2	9	130
θ_2	3.333 θ_2	10	131
ψ_4	1.111 ψ_4	11	132
θ_4	3.333 θ_4	12	133
ψ_7	1.111 ψ_7	13	134
θ_7	3.333 θ_7	14	135
P	1.25 P	15	136
Y	1.111 Y	16	137

VI. SUBROUTINE KSCALE

VI. SUBROUTINE KSCALE

This subroutine estimates t' , the time at 1000 feet-to-go for target missile intercept and computes the overload function for real-time variable scale factors. The estimates are based on a simplified model involving a constant bearing course and a nomial missile/target trajectory.

In addition, the program computes γ_{\min} - the minimal of the overload function, $t_{\gamma \min}$ - the time at which γ_{\min} occurs and the smallest bit ADC resolution for relative missile positions.

EQUATIONS:

$$\bullet \theta_2 = \tan^{-1} \left(\frac{t' y_{TL}(0)^2 + Z_{TL}(0)^2}{R_i - 1000 + t' x_{TL}(0)} \right)$$

$$\bullet R_i - \Delta R \cos(\theta_2) - 1000 + t' x_{TL}(0) = 0$$

(Note, the interative solution of this equation yields t')

$$\bullet K_p = -x_{L1m}/R_i = +20,000/R_i \rightarrow K_p R_i = 20,000$$

$$\bullet K_p R_i = \left(1 + \frac{\gamma_{\min} t_{\gamma \min}}{t'} \right) \left(R_i + x_{TL}(0) t_{\gamma \min} - \Delta R_{\min} \cos \theta_2 \right)$$

or

$$\gamma_{\min} = \frac{1}{t_{\gamma \min}} \left(\frac{20,000 t'}{(R_i + x_{TL}(0) t_{\gamma \min} - \Delta R_{\min} \cos \theta_2)} - t' \right)$$

$$\bullet \frac{d\gamma_{\min}}{t_{\gamma \min}} = At^2_{\gamma \min} + Bt_{\gamma \min} + C = 0$$

(Note, the interative solution of this equation yields $t_{\gamma \min}$)

$$\bullet A = \dot{x}_{TL}^2(0)$$

$$\bullet B = 2 \dot{x}_{TL}(0) (20,000 - R + \Delta R_{\min} \cos \theta_2) - 20,000 V_m \cos(\theta_2)$$

$$\bullet C = (R - \Delta R_{\min} \cos \theta_2) (20,000 - R + \Delta R_{\min} \cos \theta_2)$$

- $\gamma_{\min} = - \left(\frac{20,000}{R_i + X_{TL}(0) t \gamma_{\min} - \Delta R \cos \theta_2} + 1 \right) \left(\frac{t'}{t \gamma_{\min}} \right)$

- $A_2 = \frac{(\Delta \text{Voltage}) (\text{Analog Scale Factor for DX})}{1 + \gamma_{\min}}$

Here Δ Voltage is the analog voltage change resulting from a smallest bit change in the associated DAC.

$\Delta V = .024$	} Typical Values
Analog Scale Factor = 20	

AD-A052 676

B-K DYNAMICS INC ROCKVILLE MD
SUMMARY REPORT OF STINGER CONVERSION ACTIVITIES.(U)
JUL 76

F/6 9/2

DAAH01-75-C-0194

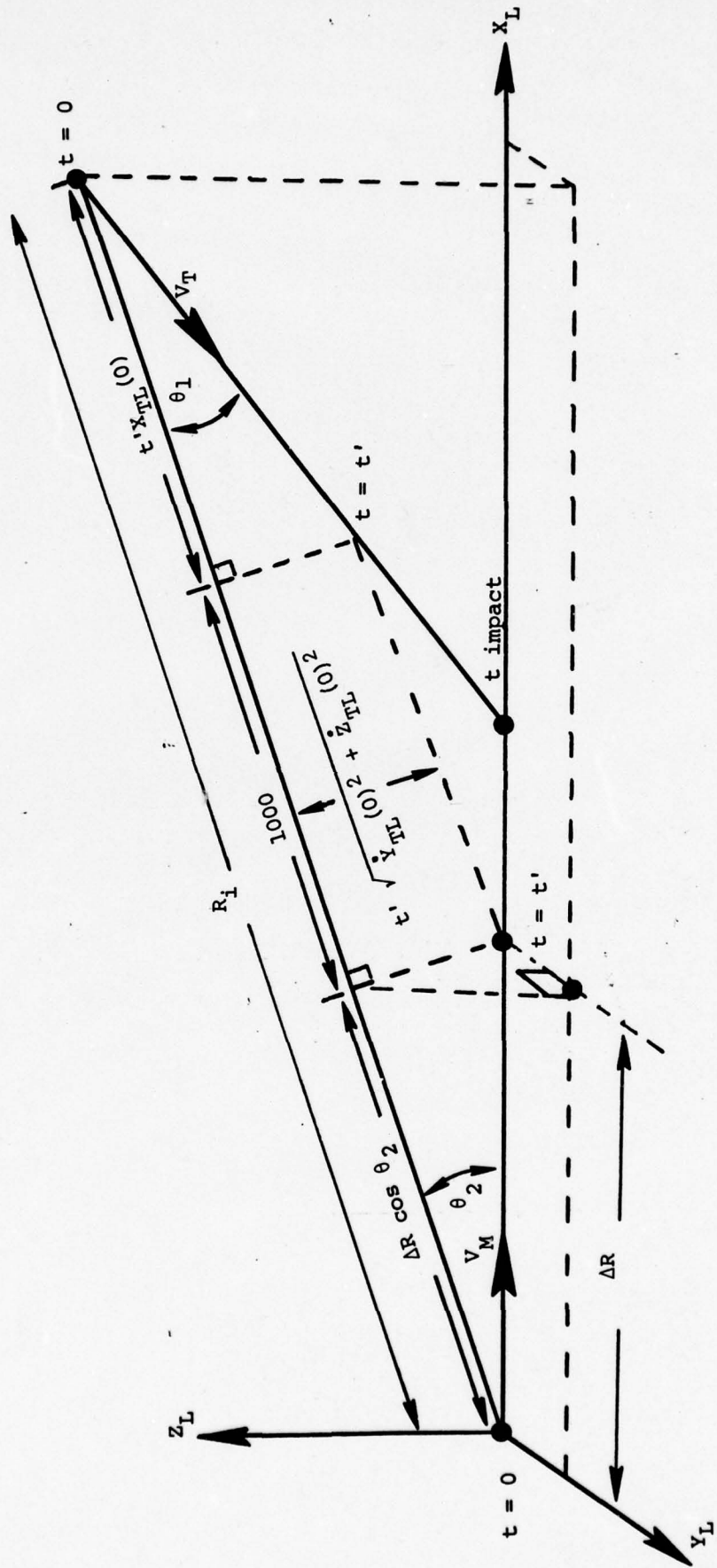
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2 of 4
AD
A052 676





SIMPLIFIED GEOMETRY FOR ESTIMATING TARGET-MISSILE Intercept

FIGURE 6.1

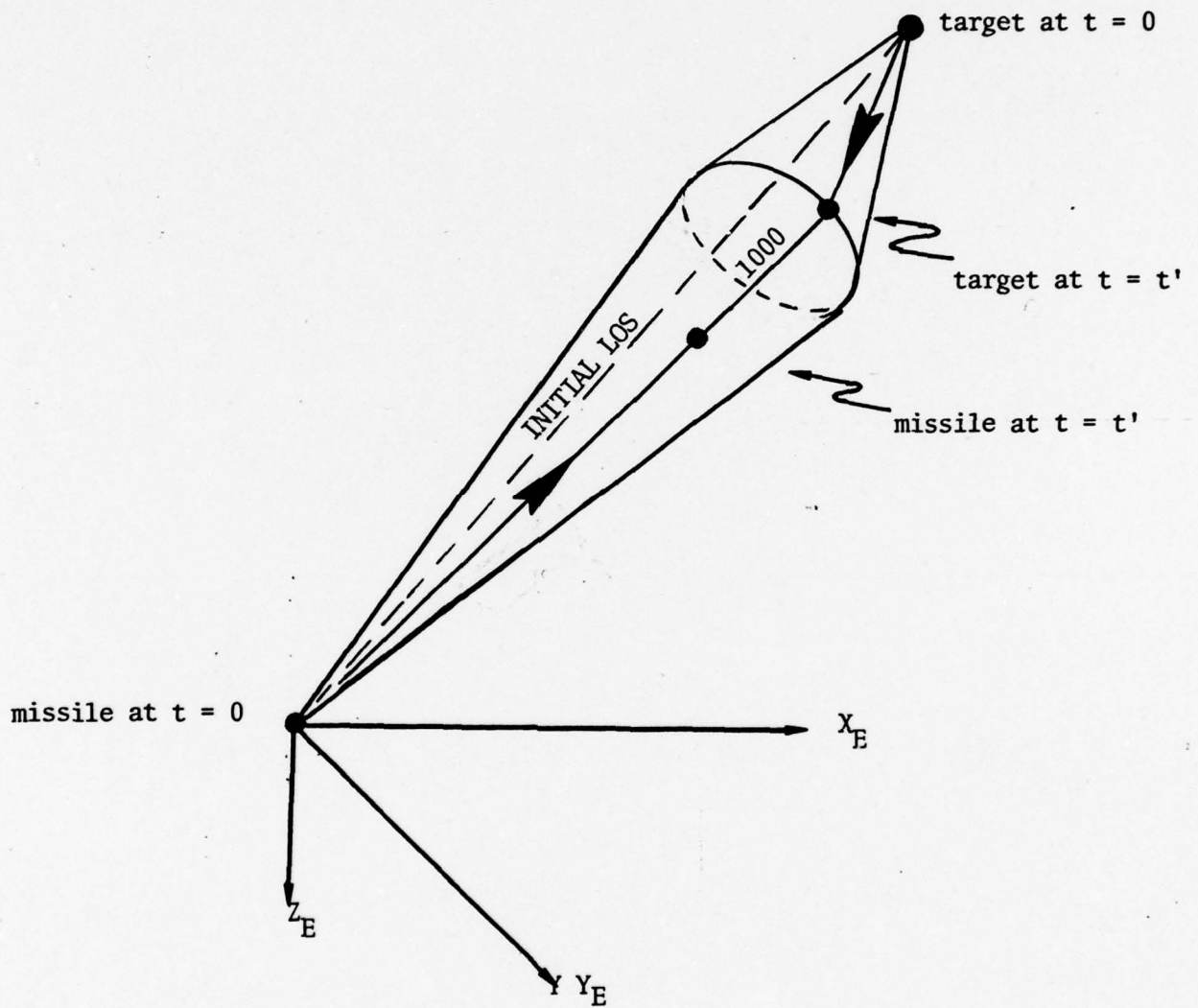


FIGURE 6.2 TYPICAL TARGET/MISSILE POSITION AT TIME $t = t_0$ and $t = t'$

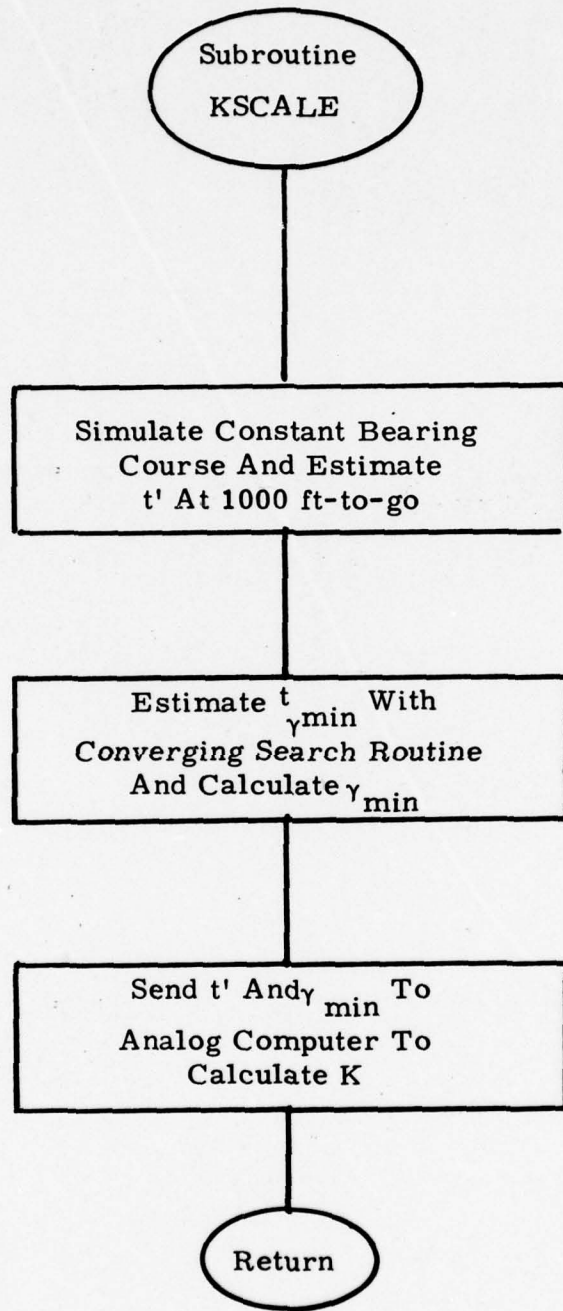


FIGURE 6.3
OVERVIEW OF SUBROUTINE KSCALE

RANGE

VOLTAGE

γ - SELECTION

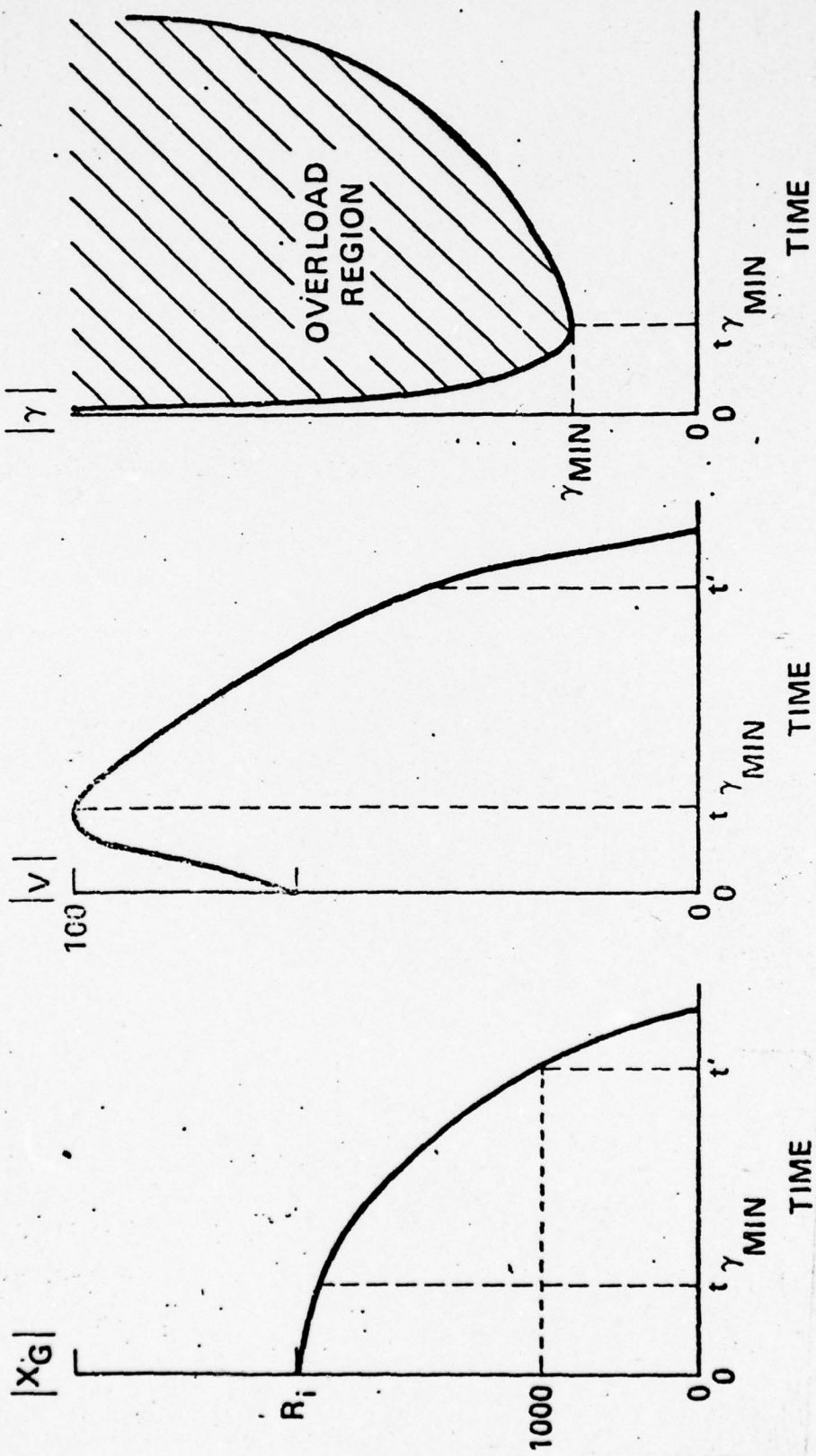
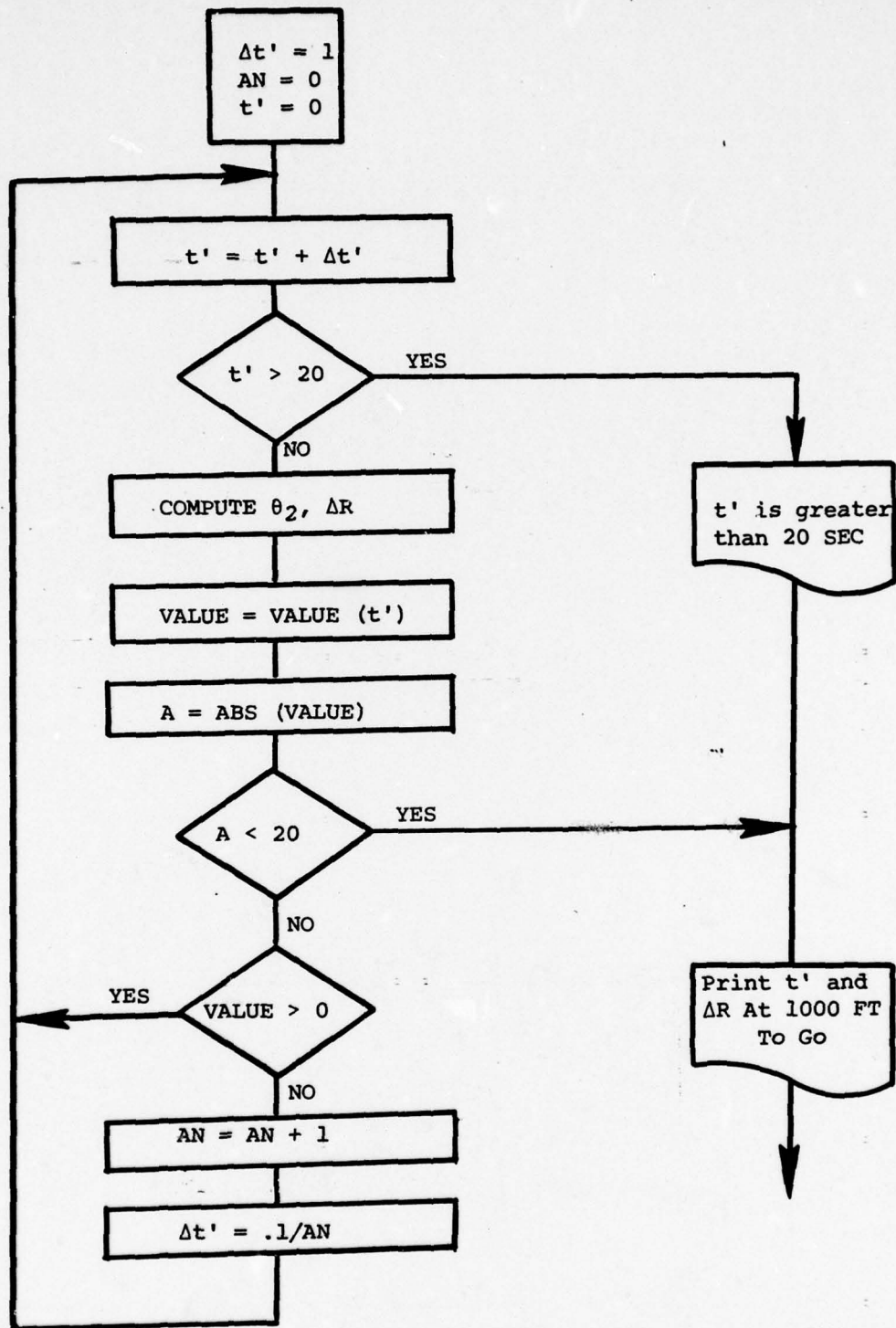


FIGURE 6.4
SELECTION CRITERIA



CONVERGING SEARCH FOR t' AT 1000 FT TO GO

FIGURE 6.5

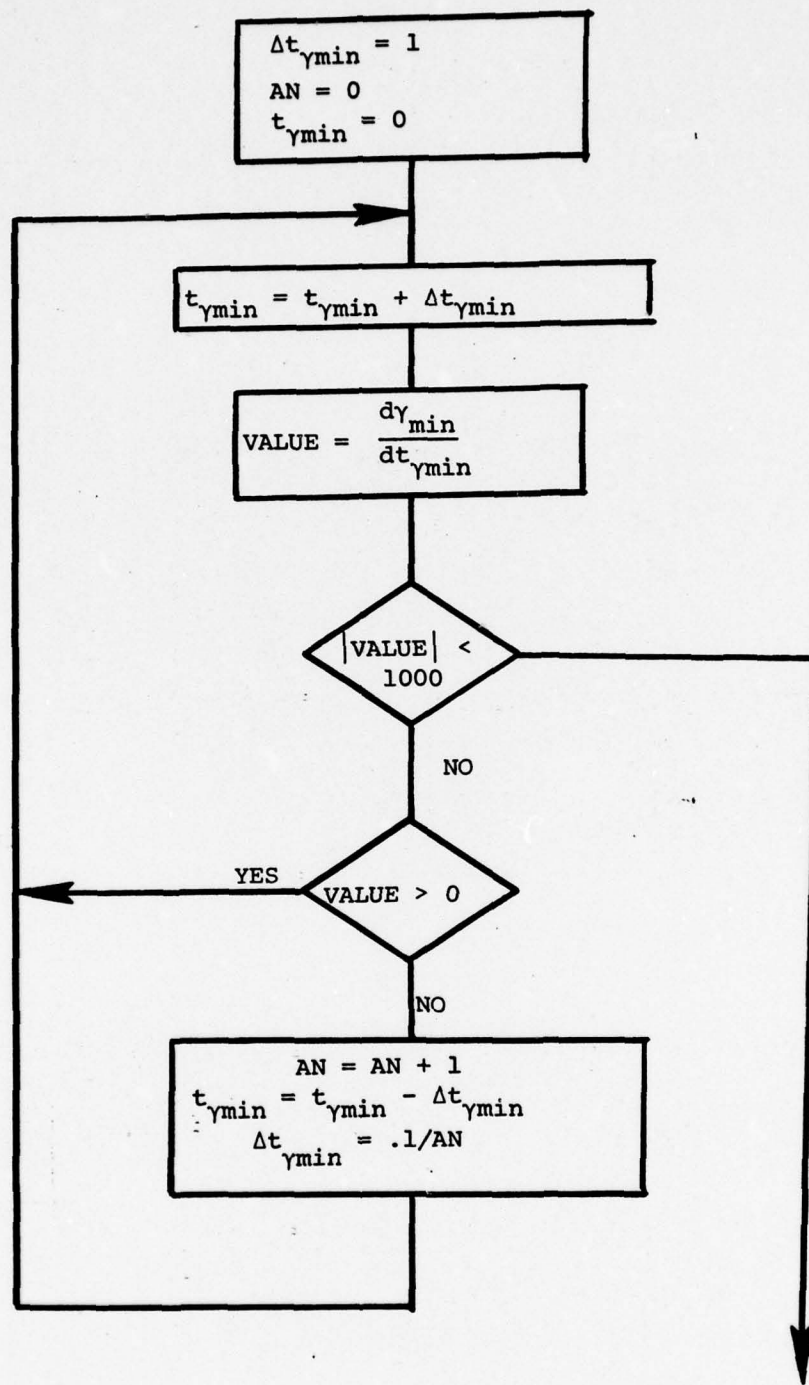
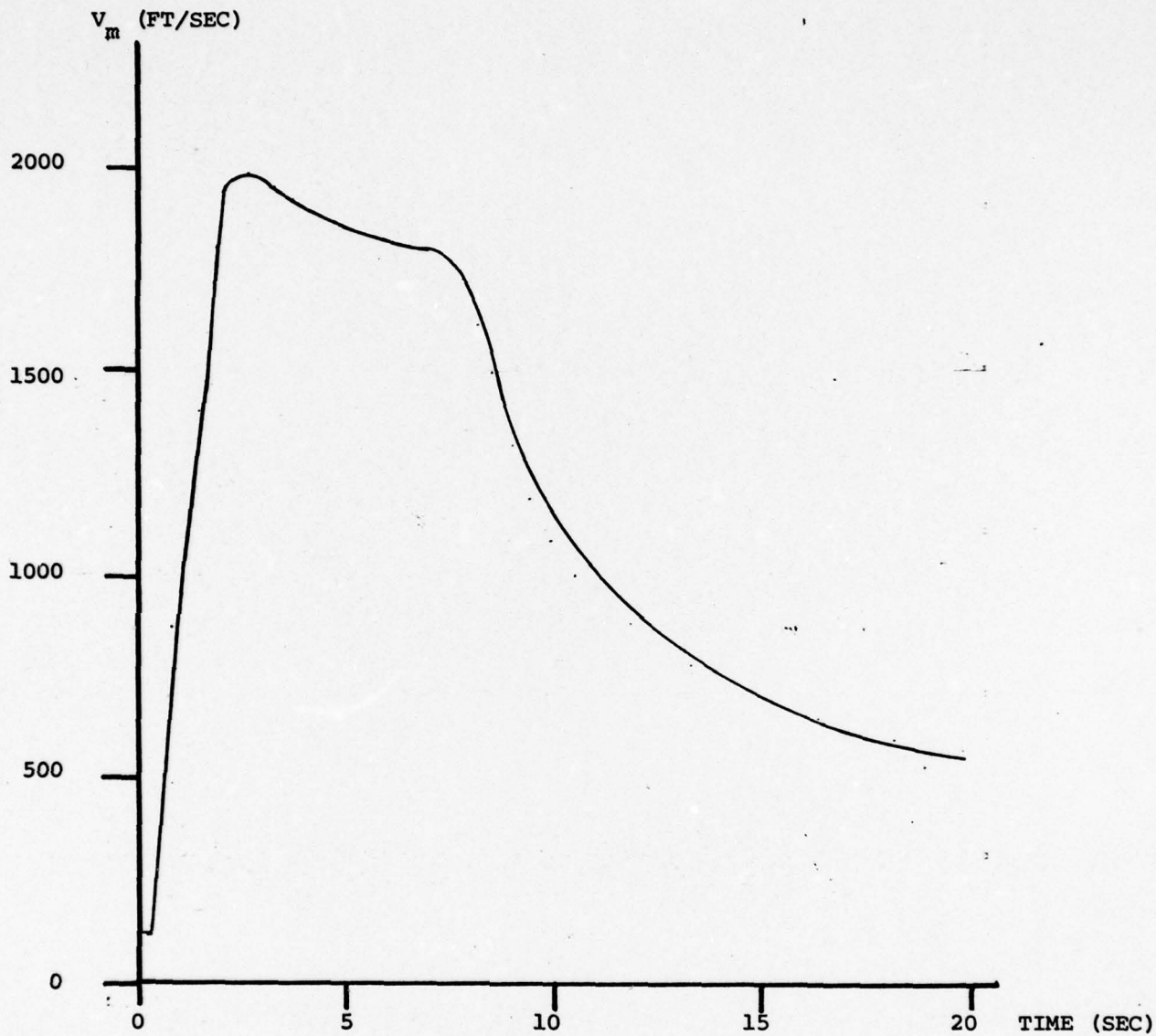


FIGURE 6.6
CONVERGING SEARCH FOR γ_{\min}



VELOCITY VS TIME FOR
NOMINAL STINGER TRAJECTORY

FIGURE 6.7

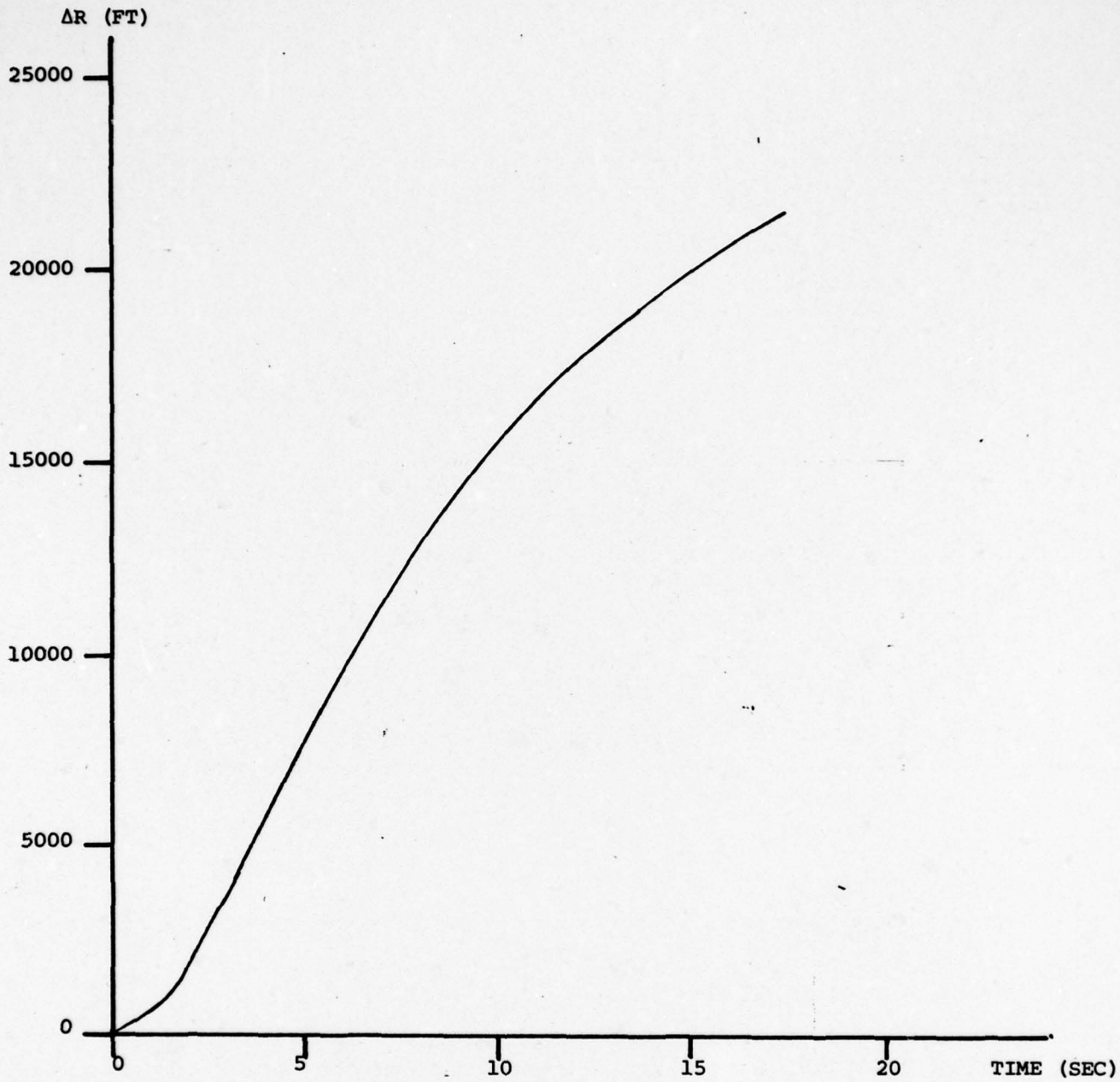


FIGURE 6.8
DISTANCE VS TIME FOR
NOMINAL STINGER TRAJECTORY

TABLE 6.1 DESCRIPTION OF SYMBOLS FOR SUBROUTINE KSCALE

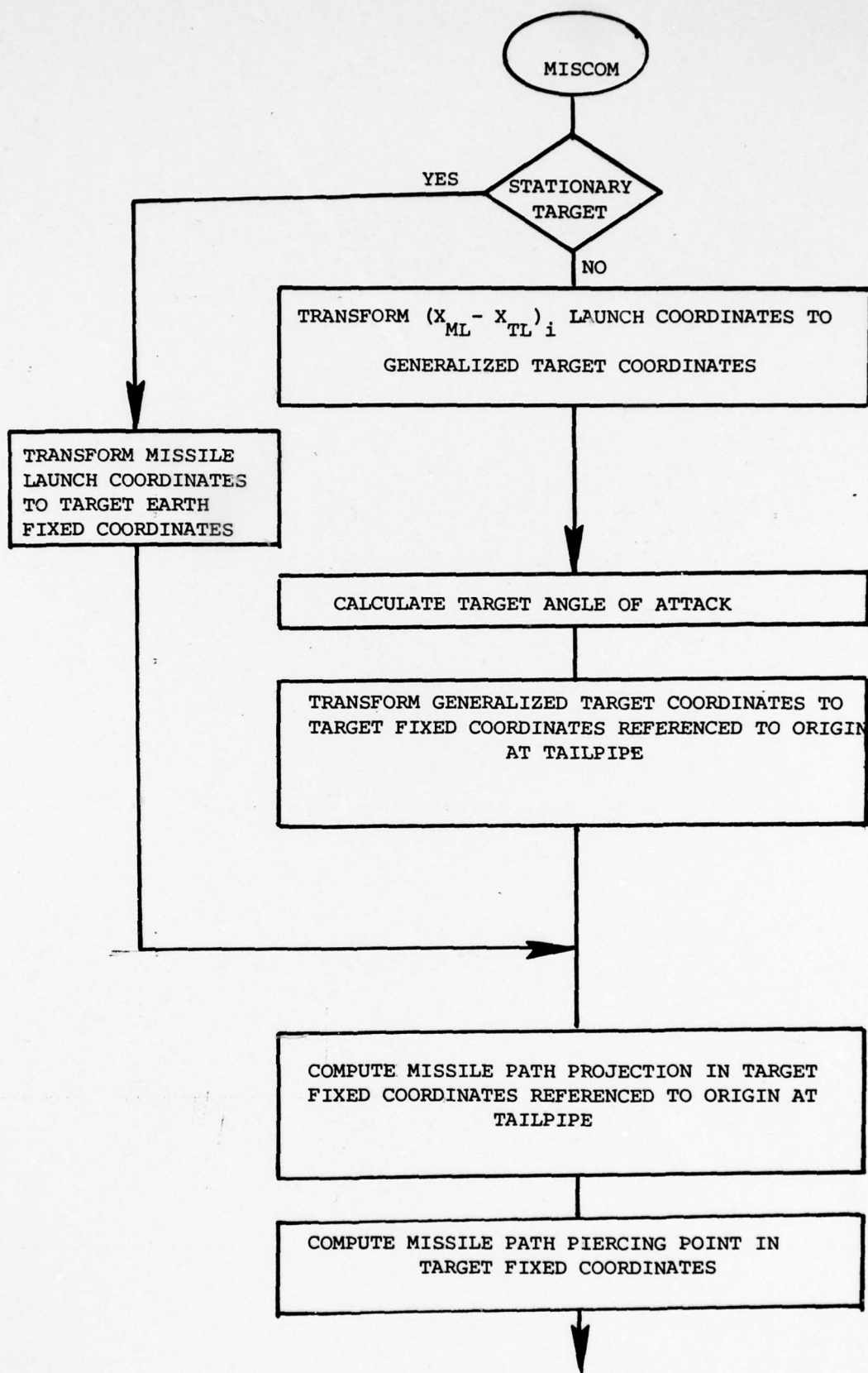
PROGRAM VARIABLE	SYMBOL	DESCRIPTION
EDOT	γ/t'	γ/t'
RI	R_i	Initial range (FT)
G	t'	Time at approximately 1000 feet to go
GG	$t_{\gamma\min}$	
GGG	γ_{\min}	Minima of the overload function, obtained by iterative solution
IS1		Print flag, IS1 \neq 1 indicates print is desired
THETA1	θ_1	
THETA2	θ_2	See Figure titled Simplified Geometry for Estimating Target-Missile intercept.
XDTGO	$\dot{x}_{TL}(0)$	
YDTGO	$\dot{y}_{TL}(0)$	Initial components of target velocity in launch coordinates
ZDTGO	$\dot{z}_{TL}(0)$	
DG	$\Delta t', \Delta t_{\gamma\min}$	Time increment in t' search
AN	-----	Scale factor for decrementing Δt as the search is refined
DELTAR(I)	$\Delta R(t_m)$	Distance missile has flown along nominal trajectory
VM(I)	$V_m(t_m)$	Velocity of missile for a nominal trajectory
TAMA(I)	t_m	Time table for the above nominal trajectories
	k_p	Maximum analog voltage = 100v
NB	-----	Length of nominal trajectory tables TAMA, VM and DELTAR
-----	X_{L1m}	Maximum value expected for X_{ML} (used to estimate scale factors, $X_{L1m} = 20,000$ FT)

PROGRAM VARIABLE	SYMBOL	DESCRIPTION
<p>-----</p> <p>A2</p>	<p>k_p</p> <p>-----</p>	<p>Maximum analog voltage ($k_p = 100v$)</p> <p>Smallest bit ADC resolution in feet</p>

VII. SUBROUTINE MISCOM

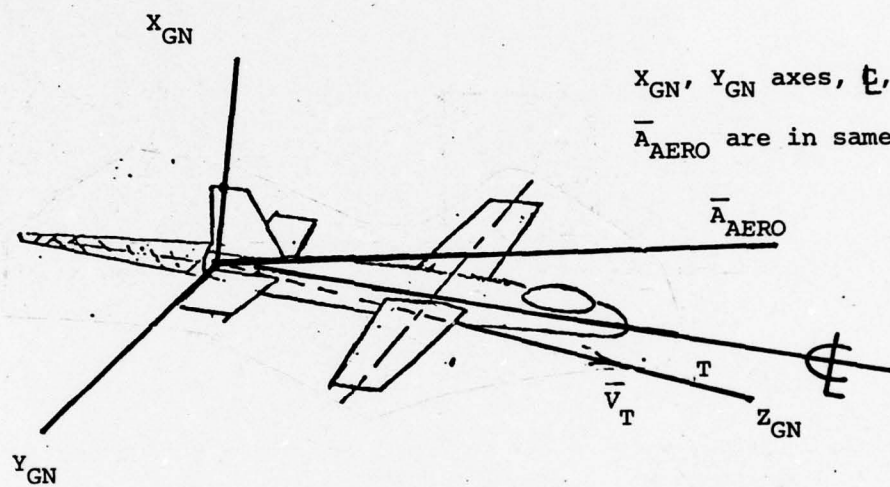
VII. SUBROUTINE MISC0M

Subroutine MISC0M transforms the relative missile minus target location in launch coordinates to target fixed coordinates referenced to the target tailpipe. The missile path projection is then computed by a least square straight line approximation of real time data. Nearest approach miss distance is computed in each plane of the target fixed coordinate system (referenced to tailpipe origin).



OVERVIEW OF SUBROUTINE MISCOM

FIGURE 7.1



X_{GN} , Y_{GN} axes, \bar{e} , \bar{V}_T and \bar{A}_{AERO} are in same plane.

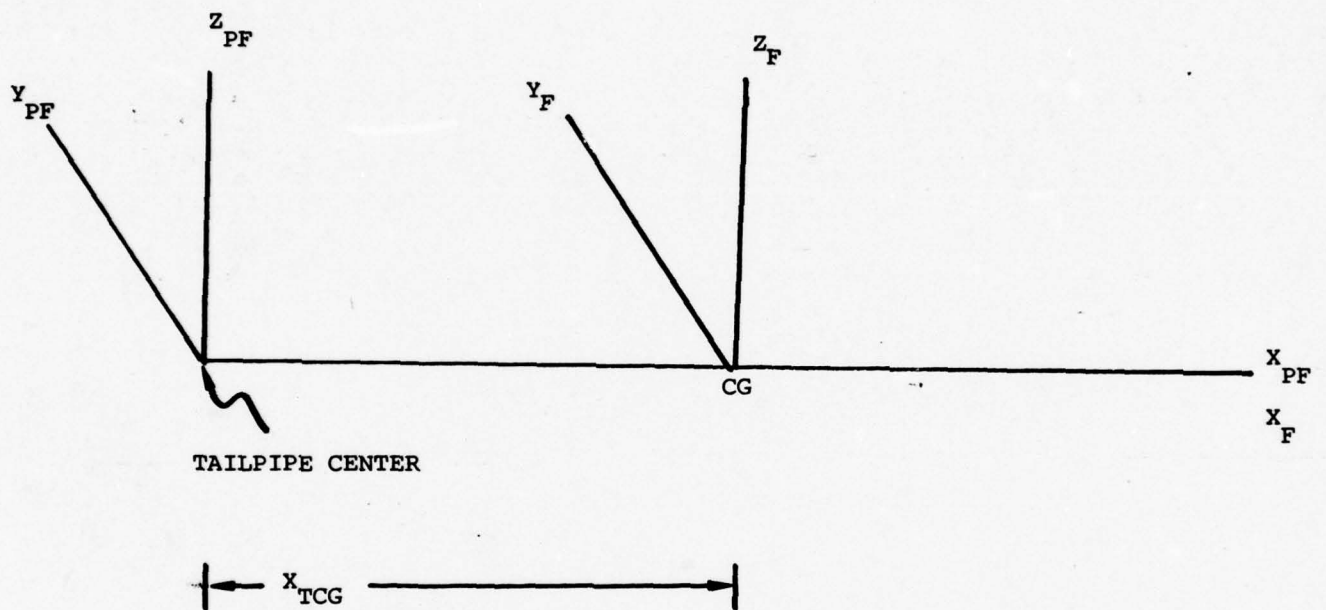
GENERALIZED TARGET COORDINATE SYSTEM
FIGURE 7.2

Transformation of Generalized Target Coordinates to Tailpipe Fixed Coordinates

$$\begin{bmatrix} X_{PF} \\ Y_{PF} \\ Z_{PF} \end{bmatrix} = \begin{bmatrix} \sin \alpha_T & 0 & \cos \alpha_T \\ 0 & -1 & 0 \\ \cos \alpha_T & 0 & -\sin \alpha_T \end{bmatrix} \begin{bmatrix} X_{GN} \\ Y_{GN} \\ Z_{GN} \end{bmatrix}$$

Transformation of Tailpipe Fixed Coordinates to Origin at Target CG

$$\begin{bmatrix} X_F \\ Y_F \\ Z_F \end{bmatrix} = \begin{bmatrix} \frac{1 - X_{TCG}}{X_{PF}} & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} X_{PF} \\ Y_{PF} \\ Z_{PF} \end{bmatrix}$$



TAILPIPE TARGET FIXED AND TARGET FIXED COORDINATE SYSTEM RELATIONSHIP

FIGURE 7.3

MISSILE PATH PROJECTION

The missile path projection is computed in target fixed coordinates referenced to the target tailpipe. This projection is based upon a linear curve fit of real time relative-position-data.

For a least squares approximate linear curve fit, the projection equations are

$$Y_F = a_1 X_F + b_1$$

$$Z_F = a_2 X_F + b_2$$

The least square approximate fit for a_1 and b_1 is obtained from the simultaneous solution of the following equations.

$$a_1 \sum_{i=1}^n X_{Fi}^2 + b_1 \sum_{i=1}^n X_{Fi} = \sum_{i=1}^n X_{Fi} Y_{Fi}$$

$$a_1 \sum_{i=1}^n X_{Fi} + b_1 n = \sum_{i=1}^n Y_{Fi}$$

Then, a_2 and b_2 can be solved similarly

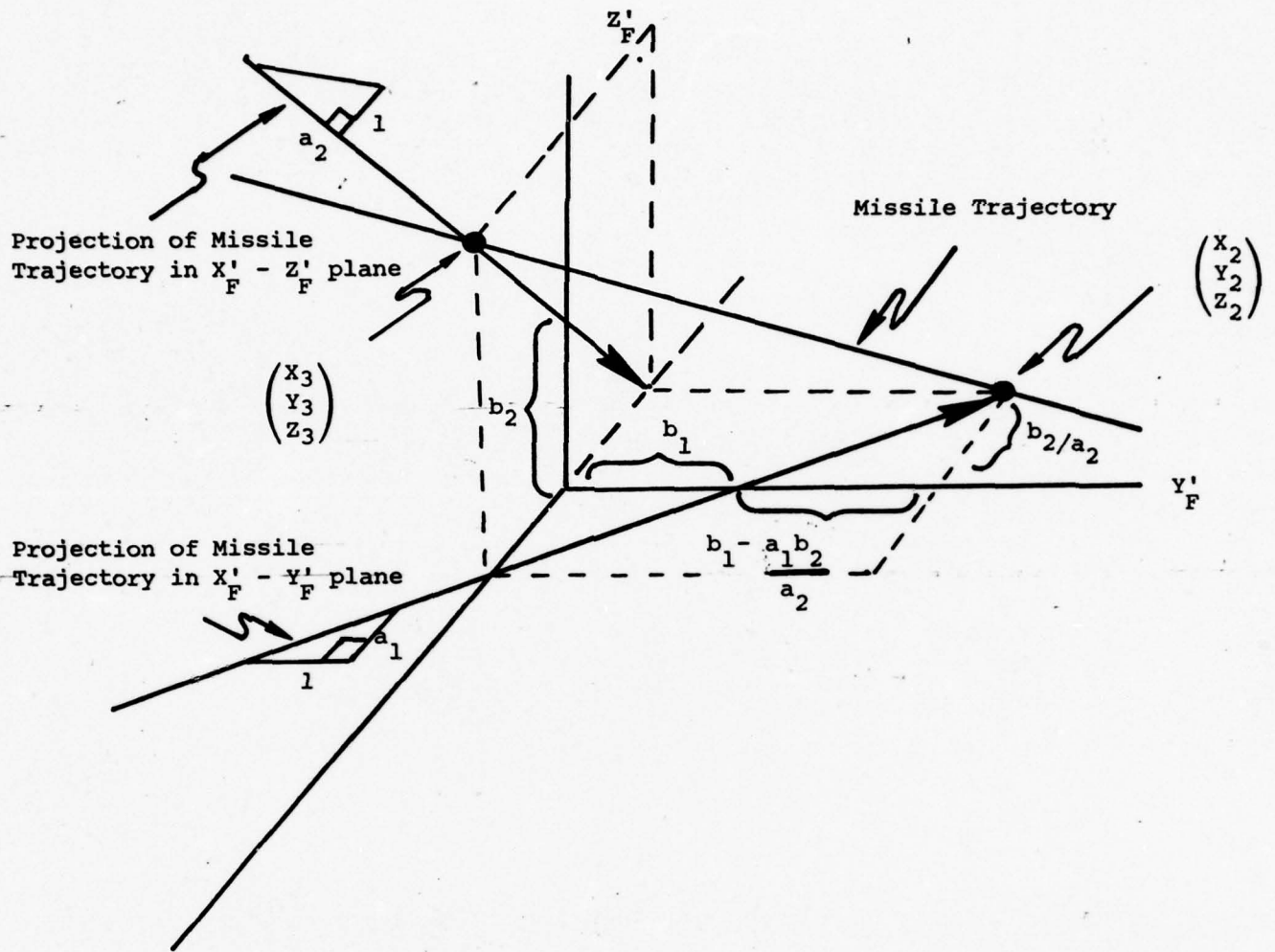
$$a_2 \sum_{i=1}^n X_{Fi}^2 + b_2 \sum_{i=1}^n X_{Fi} = \sum_{i=1}^n X_{Fi} Z_{Fi}$$

$$a_2 \sum_{i=1}^n X_{Fi} + b_2 n = \sum_{i=1}^n Z_{Fi}$$

where n is the number of real time data collection points.

Then, the piercing points of the missile trajectory into the $X_F' - Y_F'$ plane, $X_F' - Z_F'$ plane and the $Y_F' - Z_F'$ plane is computed. These values are printed as:

XM(1), YM(1), ZM(1) - the piercing point in the $Y_F' - Z_F'$ plane



Projections of Missile Trajectory onto $X'_F - Y'_F$ plane
and $X'_F - Z'_F$ plane

FIGURE 7.4

$X_M(2), Y_M(2), Z_M(2)$ - the piercing point in the $X'_F - Y'_F$ plane, and

$X_M(3), Y_M(3), Z_M(3)$ - the piercing point in the $X'_F - Z'_F$ plane

The above piercing point are deduced from geometry as

$$\begin{bmatrix} X'_{F1} \\ Y'_{F1} \\ Z'_{F1} \end{bmatrix} = \begin{bmatrix} 0 \\ b_1 \\ b_2 \end{bmatrix} = \begin{bmatrix} X_M(1) \\ Y_M(1) \\ Z_M(1) \end{bmatrix}$$

$$\begin{bmatrix} X'_{F2} \\ Y'_{F2} \\ Z'_{F2} \end{bmatrix} = \begin{bmatrix} -b_2/a_2 \\ b_1 - \frac{a_1 b_2}{a_2} \\ 0 \end{bmatrix} = \begin{bmatrix} X_M(2) \\ Y_M(2) \\ Z_M(2) \end{bmatrix}$$

$$\begin{bmatrix} X'_{F3} \\ Y'_{F3} \\ Z'_{F3} \end{bmatrix} = \begin{bmatrix} -b/a \\ 0 \\ b_2 - \frac{a_2 b_1}{a_1} \end{bmatrix} = \begin{bmatrix} X_M(3) \\ Y_M(3) \\ Z_M(3) \end{bmatrix}$$

Then, the nearest approach of the missile trajectory to origin is computed in the $Y'_F - Z'_F$ plane, $X'_F - Y'_F$ plane and the $X'_F - Z'_F$ plane respectively as:

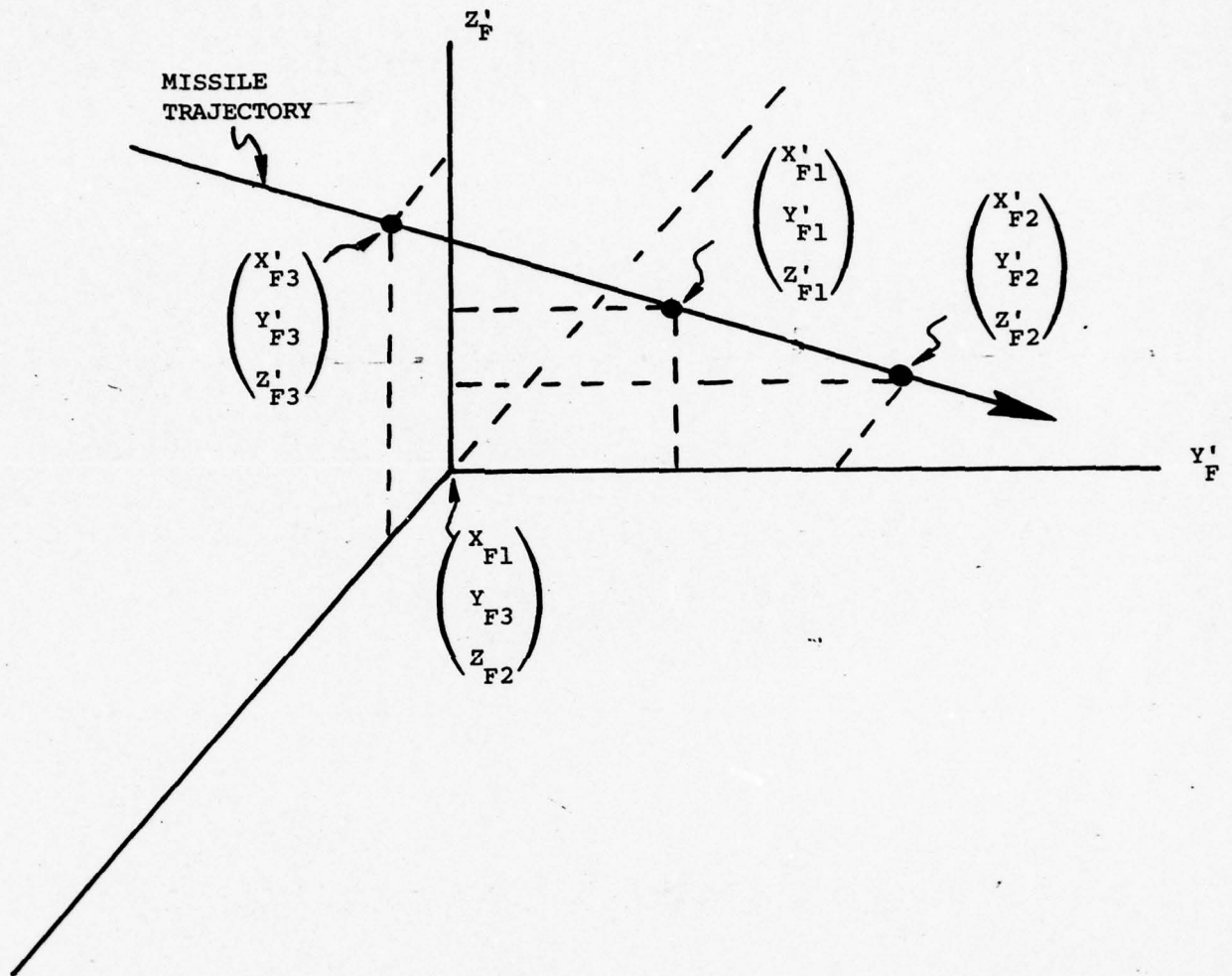
$$RM(1) = \sqrt{X'^2_{F1} + Y'^2_{F1} + Z'^2_{F1}}$$

$$RM(2) = \sqrt{X'^2_{F2} + Y'^2_{F2} + Z'^2_{F2}}$$

$$RM(3) = \sqrt{X'^2_{F3} + Y'^2_{F3} + Z'^2_{F3}}$$

Here the origin of the $X'_F - Y'_F - Z'_F$ system is

$$\begin{bmatrix} X'_{F1} \\ Y'_{F3} \\ Z'_{F2} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$



ISOMETRIC PROJECTION OF MISSILE TRAJECTORY PIERCING POINTS IN TARGET FIXED COORDINATES

FIGURE 7.5,

TABLE 7.1 DESCRIPTION OF VARIABLES IN SUBROUTINE MISCOM

COMPUTER VARIABLE	PHYSICAL VARIABLE	DESCRIPTION
FXA FYA FZA		Elements of the matrix transformation from launch coordinates to generalized target coordinates
FXB FYB FZB		
FXC FYC FZC		
DX DY DZ	$X_{ML} - X_{TL}$ $Y_{ML} - Y_{TL}$ $Z_{ML} - Z_{TL}$	Data collected during real time range table search (see PPX(I) PPY(I) and PPZ(I) in Subroutine REALT)
XT YT ZT	$X_{MGN} - X_{TGN}$ $Y_{MGN} - Y_{TGN}$ $Z_{MGN} - Z_{TGN}$	
AAA	a_s	Speed of sound in air
ZZZ	h_{asl}	Target altitude in earth fixed coordinate + altitude of launch site above sea level
VT	V_T	Velocity of target
XDEF YDEF ZDEF	X_{TE} Y_{TE} Z_{TE}	Target maneuver velocity at time of first real time data collection point
QM	Q_m	Mach number of target
CLA	$C_{L\alpha_T}$	Aerodynamic lift coefficient of target due to angle of attack
WT	W_T	Weight of target
ST	S_T	Reference surface area of target
AT	α_T	Angle of attack of target
XS YS ZS	$X_{MGN} - X_{TGN}$ $Y_{MGN} - Y_{TGN}$ $Z_{MGN} - Z_{TGN}$	The last real time data point collected, expressed in generalized launch coordinates
	X_{TCG}	Distance from tailpipe center to CG measured along target centerline
	X_{PF}	

COMPUTER VARIABLE	PHYSICAL VARIABLE	DESCRIPTION
S2	$\cos(\theta_L) \cos(\psi_L)$	Elements of coordinate transformation launch coordinates to earth fixed coordinates
SPL		
S3	$\sin(\theta_L) \cos(\psi_L)$	
S4	$\cos(\theta_L) \sin(\psi_L)$	
CPL	$\cos(\psi_L)$	
S5	$\sin(\theta_L) \sin(\psi_L)$	
STL	$\sin(\theta_L)$	
CTL	$\cos(\theta_L)$	
N	-----	The number of data points collected during real time data collection
VVVV	$V_T(0)$	Speed of target at time = 0
XM(1), YM(1), ZM(1)	$X'_{F1}, Y'_{F1}, Z'_{F1}$	Missile trajectory piercing point in $Y'_F - Z'_F$ plane
XM(2), YM(2), ZM(2)	$X'_{F2}, Y'_{F2}, Z'_{F2}$	Missile trajectory piercing point in $X'_F - Y'_F$ plane
XM(3), YM(3) ZM(3)	$X'_{F3}, Y'_{F3}, Z'_{F3}$	Missile trajectory piercing point in $X'_F - Z'_F$ plane
RM(1), RM(2), RM(3)	-----	Distance of each piercing point from origin of $X'_F - Y'_F - Z'_F$ system
YA	a_1	See equations
ZA	a_2	See equations

VIII. SUBROUTINE GUID

VIII. SUBROUTINE GUID

(Coordinate transformation from earth fixed to launch coordinates)

$$\begin{bmatrix} X_L \\ Y_L \\ Z_L \end{bmatrix} = \begin{bmatrix} \cos\theta_L \cos\psi_L & \cos\theta_L \sin\psi_L & -\sin\theta_L \\ -\sin\psi_L & \cos\psi_L & 0 \\ \sin\theta_L \cos\psi_L & \sin\theta_L \sin\psi_L & \cos\theta_L \end{bmatrix} \begin{bmatrix} X_E \\ Y_E \\ Z_E \end{bmatrix}$$

TABLE 8.1 DESCRIPTION OF SYMBOLS FOR SUBROUTINE GUID

PROGRAM VARIABLE	SYMBOL	DESCRIPTION
XD	-----	Components in earth fixed coordinate system
YD	-----	
ZD	-----	
XDTG	-----	Components in launch coordinate system
YDTG	-----	
ZDTG	-----	
COSSO	-----	+ $\cos\theta_L$
COSSCO	-----	+ $\cos\psi_L$
SINSCO	-----	+ $\sin\psi_L$
SINSO	-----	+ $\sin\theta_L$

IX. SUBROUTINE INIT

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DYNAMICS, INC.

IX. SUBROUTINE INIT

This subroutine computes the range table for real-time data collection and the initial conditions for the analog computer. More detail concerning the equations, given here, can be obtained in the section dealing with real-time digital computation.

Initial Velocity of Target in Launch Coordinate System

$$\begin{bmatrix} \dot{X}_{TL}(0) \\ \dot{Y}_{TL}(0) \\ \dot{Z}_{TL}(0) \end{bmatrix} = \begin{bmatrix} \cos\theta_L \cos\psi_L & \cos\theta_L \sin\psi_L & -\sin\theta_L \\ -\sin\psi_L & \cos\psi_L & 0 \\ \sin\theta_L \cos\psi_L & \sin\theta_L \sin\psi_L & \cos\theta_L \end{bmatrix} \begin{bmatrix} \dot{X}_{TE}(0) \\ \dot{Y}_{TE}(0) \\ \dot{Z}_{TE}(0) \end{bmatrix}$$

$$\text{where } \theta_L = \theta_L(0)$$

$$\psi_L = \psi_L(0)$$

This transformation is performed in SUBROUTINE GUID

NOTE: The transformation is orthonormal therefore $A^{-1} = A^T$

Dive Angle

$$SEO = \tan^{-1} \frac{\dot{Z}_{TE}(0)}{\sqrt{\dot{X}_{TE}^2(0) + \dot{Y}_{TE}^2(0)}} \quad , \text{ if } \dot{Y}_{TE}(0) \neq 0$$

NOTE: For all other cases see computations performed in program MAIN

Initial Angle of Attack

$$a = 1116.89 + .003894 h_{asL} \quad (\text{SLUGS/FT}^3)$$

$$\rho = .00237692 e^{.00003hasL} \quad (\text{FT/SEC})$$

$$Q_m = V_T/a_s$$

$$C_{L_{\alpha_T}} = \text{CLAA} \Big|_{Q_m}$$

$$\alpha = \frac{2W_T}{\rho V_T^2 C_{L_{\alpha_T}} S_T g} \sqrt{\dot{X}_{TE}^2(0) + \dot{Y}_{TE}^2(0) + \dot{Z}_{TE}^2(0)}$$

Initial cos(ε)

$$\begin{aligned} \cos(\epsilon) = & \{ (\sin\theta_L) (\dot{Z}_{TE}(0) \cos\alpha - \sqrt{\dot{X}_{TE}^2(0) + \dot{Y}_{TE}^2(0)} \sin\alpha) \\ & - (\cos\alpha + \dot{Z}_{TE}(0) \sin\alpha / \sqrt{\dot{X}_{TE}^2(0) + \dot{Y}_{TE}^2(0)}) \\ & (\dot{X}_{TE}(0) \cos\theta_L \cos\psi_L + \dot{Y}_{TE}(0) \cos\theta_L \sin\psi_L) \} / V_T \end{aligned}$$

Initial Apparent Plume Length to Breadth Ratio

$$l/B = (L/B) \sqrt{1 - \cos^2(\epsilon)}$$

Initial \bar{L}_{OS}

$$L_x = -R_i \cos\theta_L \cos\psi_L$$

$$L_y = -R_i \cos\theta_L \sin\psi_L$$

$$L_z = R \sin\theta_L$$

Initial Horizon Reference Vector

$$\beta = \cos^{-1} \frac{L_y}{\sqrt{L_x^2 + L_y^2}}$$

$$C_x = -\cos(\beta)$$

$$C_y = \begin{cases} -\sin(\beta), & \text{if } X_{\text{Los}} < 0 \\ +\sin(\beta), & \text{if } X_{\text{Los}} \geq 0 \end{cases}$$

Initial Target Centerline Vector

$$C_{L_x} = \frac{\dot{X}_{\text{TE}}(0) (\cos\alpha + \dot{Z}_{\text{TE}}(0) \sin\alpha)}{\sqrt{\dot{X}_{\text{TE}}^2(0) + \dot{Y}_{\text{TE}}^2(0)}}$$

$$C_{L_y} = \frac{\dot{Y}_{\text{TE}}(0) (\cos\alpha + \dot{Z}_{\text{TE}}(0) \sin\alpha)}{\sqrt{\dot{X}_{\text{TE}}^2(0) + \dot{Y}_{\text{TE}}^2(0)}}$$

$$C_{L_z} = \frac{\dot{Z}_{\text{TE}}(0) \cos\alpha - \sqrt{\dot{X}_{\text{TE}}^2(0) + \dot{Y}_{\text{TE}}^2(0)} \sin\alpha}{V_T}$$

Initial Plume Rotation Angle

$$\theta = \cos^{-1} \frac{C_x (L_y C_{Lz} - L_z C_y) + C_y (L_z C_x - L_x C_z)}{\sqrt{(L_y C_{Lz} - L_z C_y)^2 + (L_z C_x - L_x C_z)^2 + (L_x C_y - L_y C_{Lx})^2}}$$

$$D_z = L_x C_{L_y} - L_y C_{L_x}$$

$$T_{rp} = \pi/2 - \theta, \text{ if } D_z < 0$$

$$\pi/2 + \theta, \text{ if } D_z > 0 \text{ and } \theta < \pi/2$$

$$\theta - 3\pi/2, \text{ if } D_z > 0 \text{ and } \theta > \pi/2$$

Initial Plume Iris Ratio

$$H_{c7} = 1209.675 H \Big|_{R=7000}^{\epsilon} e^{-2.341(\ln(R_i/22965.831))} \quad (\text{w/cm}^2)$$

$$P_1 = 2 \tan^{-1} \left(\frac{B/2}{\ell} \right) \quad (\text{DEG})$$

$$P = \frac{(f)(\ell)}{|\bar{L}_{os}|} \quad (\text{IN})$$

$$A_{t7} = \frac{P_2^2 \sin(P_1)}{2 \cos^2(P_1/2)} \quad (\text{IN})^2$$

$$J_{tu7} = e^{1.003258(\ln A_{t7}/10)} \quad (\text{W/STER})$$

$$I_{r7} = \frac{H_{c7}}{\frac{T_{fplume}}{J_{tu}}}$$

$$i_7 = i_7(I_{r7}) \quad (\text{table look up})$$

TABLE 9.1 DESCRIPTION OF SYMBOLS FOR SUBROUTINE INIT

PROGRAM VARIABLE	SYMBOL	DESCRIPTION
NPTS	-----	Number of real-time data collection points
XTERM	-----	Distance between target and missile at last data collection point
DX	-----	Distance between real-time data collection points
GGG	γ_{\min}	Minima of the overload function (see SUBROUTINE KSCALE)
DIF	-----	The difference between the data collection distance commanded and the largest data collection distance possible with the analog scaling given.
NADJ	-----	New value for NPTS if NPTS is too large
XD, XDX	$\dot{X}_{TE}(0)$	Target initial velocity in earth coordinates
YD, YDY	$\dot{Y}_{TE}(0)$	
ZD, ZDZ	$\dot{Z}_{TE}(0)$	
XDTG	$\dot{X}_{TL}(0)$	Target initial velocity in launch coordinates
YDTG	$\dot{Y}_{TL}(0)$	
ZDTG	$\dot{Z}_{TL}(0)$	
KKK	-----	$\text{KKK} = 0 \text{ if } \dot{Y}_{TE}(0) \neq 0$ $1 \text{ if } \dot{Y}_{TE}(0) = 0$
SEO	-----	Dive angle (Note, some cases are computed in MAIN)

PROGRAM VARIABLE	SYMBOL	DESCRIPTION
XDTGM(I)	\dot{X}_{TL}	Target velocity tables in launch coordinates
YDTGM(I)	\dot{Y}_{TL}	
ZDTGM(I)	\dot{Z}_{TL}	
IS1	-----	Print flag, IS1 \neq 1 indicates print desired
AAA	a_s	Speed of sound
ZZZ	$h_{a_{sL}}$	Specific target altitude in earth fixed coordinates + altitude of missile launch site above sea level (FT)
PHO	ρ	Air density (SLUGS/FT ³)
QM	Q_m	Mach number of target
VVV	V_T	Velocity of target (Computed in MAIN)
CLA	$C_{L_{\alpha_T}}$	Aerodynamic lift coefficient of target due to angle of attack
CLAA	-----	Table containing CLA as a function of mach number
WT	W_T	Weight of target
ST	S_T	Reference surface area of target
XEU	$\ddot{X}_{TE}(0)$	Initial acceleration of target in earth fixed coordinates
YEU	$\ddot{Y}_{TE}(0)$	
ZEU	$\ddot{Z}_{TE}(0)$	
AT	α	Initial target angle of attack
STL	-----	$\sin(\theta_L)$

PROGRAM VARIABLE	SYMBOL	DESCRIPTION
C1	-----	$\cos (\alpha)$
S9	-----	$\sqrt{X_{TE}^2(0) + Y_{TE}^2(0)}$
S1	-----	$\sin (\alpha)$
S2	-----	$\cos (\theta_L) \cos (\psi_L)$
S4	-----	$\cos (\theta_L) \sin (\psi_L)$
RLB	l/B	Apparent ratio of plume length to breadth
RLBK	L/B	Actual ratio of plume length to breadth
XLOS	L_x	Initial components of Γ_{os} in earth fixed coordinates
YLOS	L_y	
ZLOS	L_z	
R	R_i	Initial range of target (FT)
BET	β	$\cos^{-1} (L_y / \sqrt{L_x^2 + L_y^2})$
L_x	L_x	Components of Horizon Reference vector in earth fixed coordinates
L_y	L_y	
CLX	C_{L_x}	Components of target center line vector in earth fixed coordinates
CLY	C_{L_y}	
CLZ	C_{L_z}	
TRP	T_{rp}	Initial plume rotation angle

PROGRAM VARIABLE	SYMBOL	DESCRIPTION
THE	θ	-----
HC7FT	H_{c7}	Commanded irradiance for plume
P1IRSS	P_1	Vertex angle of plume transparency (DEG)
P2IRSS	P_2	Length of plume transparency (IN)
AT7	A_{t7}	Area of plume transparency
RN	i_7	Iris ratio number 7
-----	f	Focal length of projection lens
-----	l	Apparent length of plume

APPENDIX A. STINGER CODE

APPENDIX A

This Appendix contains a proposed, structured version of the MICOM Hybrid STINGER program. Usage would require the following changes:

1. Under "Manual Selection of Launch Conditions" where the variables KA, ITT, TAU, IRSS are read from a card - the program should be altered to read these variables from the terminal.
2. In order to integrate the new FLIGHT and REALT programs into the structured STINGER package, a few changes in the common blocks and variables in FLIGHT and REALT will be necessary.
3. In the structured version of STINGER only the programs MAIN and INIT have been essentially altered. Some cleaning up and alteration may be necessary in the subroutines which perform the post real-time calculations.
4. There are now two interpolation routines - INTERP and LINTRP. LINTRP is much faster and INTERP should probably be removed unless higher order interpolation than linear is desired.

x

INPUTS TO STRUCTURED STINGER PROGRAM

IS1 PRINT FLAG
IS1 = 0 for limited printout
IS1 = 1 for full printout
format I5

NRUNS DESIRED NUMBER OF RUNS PER FLIGHT CONDITION
1 NRUNS 20
format I5

NPTS, DX, XTERM
NPTS = NUMBER OF DATA POINTS TO BE COLLECTED
1 NPTS 50

DX = DELTA RANGE BETWEEN COLLECTED DATA POINTS

XTERM = X SEPARATION AT WHICH REAL TIME IS TERMINATED
format I10, 2F10.0

NL NUMBER OF SETS OF LAUNCH CONDITIONS
1 NL 61
format I5

(ZTEO(I), ASC(I), RR(I), I = 1, NL)

THESE ARE THE NL SETS OF LAUNCH CONDITIONS

ZTEO(I) IS THE I-TH INITIAL ALTITUDE

ASC(I) IS THE I-TH CROSSING ANGLE

RR(I) IS THE I-TH INITIAL RANGE
format 3F10.2

III LAUNCH SELECTION FLAG
III = 0 for manual selection
III = 1 for automatic selection
format I5

NOTE: FROM THIS POINT ON, THE INPUTS TO BE SUPPLIED DEPEND
ON THE VALUE OF III CHOSEN ABOVE.

THE FOLLOWING INPUTS ARE READ ONLY IF III = 0 (MANUAL SELECTION)
OR AFTER A FULL SET OF AUTOMATIC RUNS IS COMPLETED.

KA = NUMBER OF LAUNCH SET TO BE USED
ITT = NUMBER OF TARGET TRAJECTORY TO BE USED
TAU = TIME POINT ON THE TARGET TRAJECTORY AT WHICH
THE MISSILE IS LAUNCHED
IRSS IS THE IRSS FLAG
IRSS = 0 NOT AN IRSS RUN
IRSS = 1, IRSS RUN
format 2I5, F5.1, I5

AFTER A MANUAL RUN IS COMPLETED, THE PROGRAM WILL CYCLE
AND READ NEW VALUES OF KA, ITT, TAU, IRSS

THERE ARE TWO SPECIAL CONVENTIONS ON KA.

KA negative - restart program at very beginning
KA > 61 - terminate program

THE FOLLOWING INPUTS ARE READ ONLY IF III = 1 (AUTOMATIC SELECTION)

NSAM QUALITY CONTROL TEST CASE SAMPLE SIZE

$2 \leq \text{NSAM} \leq 11$
format I5

ICON CONTINUATION FLAG

ICON = 1 continue after quality control failure
ICON = 2 rerun previous runs after quality control failure
format I5

INL INITIAL LAUNCH SET NUMBER

$1 \leq \text{INL} \leq \text{NL}$
format I5

(CLMS(1), CLS1(I), CLS2(I), I = 1, 10)

DATA FOR COMPUTING CONTROL LIMITS
format 3 F6.3

Q1, Q2, Q3, Q4, Q5, Q6

DATA FOR COMPUTING CONTROL LIMITS
format 6F10.4

W1, W2, W3, W4, W5, W6

DATA FOR COMPUTING CONTROL LIMITS
format 6F10.4

VARIABLE REFERENCE LIST

VARIABLE	COMMON BLOCK	USE
AAA		Speed of sound
AARUNS		} Averages related to kill probabilities
AASUM		
ABRUNS		
ABSUM		
ADSF(10)		
ARB(20)	COMM	Array of analog-to-digital scale factors Array for storing miss distances relative to tailpipe
ARBT(20)		Array for storing miss distances relative to CG
ARC(20)		See ARB
ARCT(20)		See ARBT
ARM(20)		See ARB
ARMT(20)		See ARBT
AS	EXTRA	Target crossing angle
ASC(61)		Table of target crossing angles
ASEO		Target dive angle (degrees)
AT	GTARG	Initial target angle of attack
AXB(20)		See ARB
AXB(20)		See ARBT
AXC(20)		See ARB
AXCT(20)		See ARBT
AXM(20)		See ARB
AXMT(20)		See ARBT
AYB(20)		See ARB
AYBT(20)		See ARBT
AYC(20)		See ARB
AYCT(20)		See ARBT
AYM(20)		See ARB
AYMT(20)		See ARBT
AZB(20)		See ARB
AZBT(20)		See ARBT
AZC(20)		See ARB
AZCT(20)		See ARBT
AZM(20)		See ARB
AZMT(20)		See ARBT
A1		Target angle of attack (RADIANS)
A1P1	COMP	} Control limits
A1P2	COMP	
A1P3	COMP	
A1P4	COMP	

VARIABLE REFERENCE LIST (Con't)

VARIABLE	COMMON BLOCK	USE
A1P5	COMP	Control limits
A1P6	COMP	
A2P1	COMP	
A2P2	COMP	
A2P3	COMP	
A2P4	COMP	
A2P5	COMP	
A2P6	COMP	Tables related to lethality
BDHX(22)	PK	
BDHY(22)	PK	
BDHZ(22)	PK	Cosine of target angle of attack
CA		
CLA		Target lift coefficient
CLAA(10)	RTCOM	Target lift coefficient table (function of mach)
CLMS(10)	COMP	Data for calculating control limits
CLS1(10)	COMP	
CLS2(10)	COMP	
CLX		Components of initial target center line vector
CLY		
CLZ		
COSE		
COSEI	RTCOM	Cosine of the angle between the line of sight and the target center line
COSMU1	MU	Initial value of cose
COSMU2	MU	Terms of a transformation matrix (see subroutine PRIME)
COSMU3	MU	
COSSCO	ANG	
COSSO	ANG	Cosine of PSILR
CPL	RTCOM	Cosine of THETLR
CTL	RTCOM	= COSSCO
CX		= COSSO
CY		Components of initial horizon reference vector
C1		Cosine of AT
DAOUT1	*DAC1	Variables which are converted from digital to analog
DAOUT2	*DAC1	
DAOUT3	*DAC1	
DAOUT4	*DAC1	
DAOUT5	*DAC1	
DAOUT6	*DAC1	

VARIABLE REFERENCE LIST (Con't.)

VARIABLE	COMMON BLOCK	USE
DAOUT7	*DAC1	Variables which are converted from digital to analog
DAOUT8	*DAC1	
DAOUT9	*DAC1	
DAOUT10	*DAC1	
DAOUT11	*DAC1	
DASF(11)	COMM	
DELTAR(30)	MISL	Target range table (function of time)
DT		Current time in real time
DTF	RTCOM	Value of DT at termination of real time
DTR		Conversion factor-degrees to RADIANS
DX	EXTRA	Delta range between collected data points
DX		X separation between target and missile
DXG	RTCOM	Value of DX at termination of real time
DY		Y separation between target and missile
DYG	RTCOM	Value of DY at termination of real time
DZ		Z separation between target and missile
DZG	RTCOM	Value of DZ at termination of real time
ECOS(17)	RTCOM	Table used in calculating IRIS ratio 7
EDOT	RTCOM	GGG/G
FCI7(9)	RTCOM	Table used in calculating IRIS ratio 7
FI7T(9)	RTCOM	Table used in calculating IRIS ratio 7
FXA	GTARG	Terms of a transformation matrix (see subroutine MISCOM)
FXB	GTARG	
FXC	GTARG	
FYA	GTARG	
FYB	GTARG	
FYC	GTARG	
FZA	GTARG	
FZB	GTARG	
FZC	GTARG	
G	RTCOM	Estimated time at 1000 feet to go
GGG	RTCOM	Parameter used in variable analog scale factor
HR7EE(17)	RTCOM	Table used in calculating IRIS ratio 7
IADIN1	*ADC1	Values resulting from analog to digital conversion
IADIN2	*ADC1	
IADIN3	*ADC1	
IADIN4	*ADC1	
IADIN5	*ADC1	
IADIN6	*ADC1	

VARIABLE REFERENCE LIST (Con't.)

VARIABLE	COMMON BLOCK	USE
IADIN7	*ADC1	} Values resulting from analog to digital conversion
IADIN8	*ADC1	
IADIN9	*ADC1	
IADIN10	*ADC1	
ICN	MISD	Number of the current real time run (1 ICN NR)
ICON		Flag to indicate continuation after quality control failure
IERR		Error flag for equipment reservation
IFT	COMP	Flag for quality control failure
III	MANEUV	Flag to indicate manual or automatic launch selection
IIN	*IDIS2	Input discrete word
INFLRT	COMM	Flag to indicate first pass through real time code
INL		Launch set number (automatic selection)
IOUT	*ODIS2	Output discrete word
IPASS		Flag to indicate first pass through main program
IPLANE	COMP	Parameter used in quality control test
IPTS	RTCOM	Number of data points to be collected before intercept
IQC1		Flag to indicate first launch set (automatic sel.)
IRSS		Flag to indicate IRSS run
IS1	PRNT	Flag to indicate full or partial printout
ITAU(60)	MANEUV	Table of launch times (see TAU)
ITRAJ(60)	MANEUV	Table of target trajectory numbers
ITT	MANEUV	Number of current target trajectory
I88		Flag to indicate last launch set (automatic selection)
I99	COMP	Flag to indicate test case is due
KA		Number of current launch conditions
KILL(22)	PK	Table related to lethality
LEVEL	RTCOM	Flag to indicate target maneuver in progress
LOOP1	COMM	Counters for the two loops in the real time code
LOOP2	COMM	
LTMAX	COMM	Maximum execution time of real time loop
NADJ	MANEUV	Number of entries in range table (see XXS)
NERR		Error flag for subroutine INTERP
NL		Number of sets of launch conditions

VARIABLE REFERENCE LIST (Con't.)

VARIABLE	COMMON BLOCK	USE
NPATH	COMM	Flag to indicate which loop to execute in real time code
NPTS	EXTRA	Desired number of data points
NPX		Number of data points used in interpolation (NPX = 2 is linear interpolation)
NR		Number of flights to be performed in current run
NRUNS	COMP	Desired number of runs per flight condition
NSAM		Quality control test case sample size (2 NSAM 11)
NT	RTCOM	Number of points in target trajectory tables
NX		Argument for subroutine interp-number of points in tables
PH0		Air density
PI		3.14159265
PIO2		PI/2.
PPX(50)	RTCOM	Arrays for storing DX, DY, and DZ respectively at points corresponding to range table entries (see XXS)
PPY(50)	RTCOM	
PPZ(50)	RTCOM	PSI launch-one of the two euler angles in the transformation from earth to launch coordinate system (degrees)
PSIL		
PSILR		PSIL converted to RADIANS
QM		Target mach number
QMM(10)	RTCOM	Table of mach numbers (goes with CLAA(10))
Q1	COMP	} Data for calculating control limits
Q2	COMP	
Q3	COMP	
Q4	COMP	
Q5	COMP	
Q6	COMP	
RI	RTCOM	Initial range-missile to target
RLB		Apparent plume length to breadth ratio
RLBI	RTCOM	Initial value of RLB
RLBK	RTCOM	Actual plume length to breadth ratio
RM(3)	MISD	MISS distance array
RN		IRIS ratio 7
RNI	RTCOM	Initial value of RN

VARIABLE REFERENCE LIST (Con't.)

VARIABLE	COMMON BLOCK	USE
RR(61)		Table of target initial ranges
RTD		Conversion factor-radians to degrees
SA		Sine of target angle of attack
SEO		Target dive angle (RADIANS)
SINMU1	MU	Terms of a transformation matrix (see subroutine PRIME)
SINMU2	MU	
SINMU3	MU	
SINSCO	ANG	Sine of PSILR
SINSO	ANG	Sine of THETLR
SL0		Sense line zero
SL5		Sense line five
SL6		Sense line six
SL15		Sense line fifteen
SPHG	PK	Variables related to kill probabilities
SPHS	PK	
SPK	PK	
SPL	RTCOM	= SINSCO
SPM	PK	See SPHG
SPO		Plume rotation angle
SPOI	RTCOM	Initial value of SPO
STL	RTCOM	= SINSO
S1		Sine of AT
S1P1	COMP	Control limits
S1P2	COMP	
S1P3	COMP	
S1P4	COMP	
S1P5	COMP	
S1P6	COMP	
S2	RTCOM	Term of earth-to-launch transformation matrix
S2P1	COMP	Control limits
S2P2	COMP	
S2P3	COMP	
S2P4	COMP	
S2P5	COMP	
S2P6	COMP	
S3	RTCOM	See S2
S4	RTCOM	
S5	RTCOM	

VARIABLE REFERENCE LIST (Con't.)

VARIABLE	COMMON BLOCK	USE
TAMA(30)	MISL	Table of times-goes with DELTAR (30) and VM (30)
TAU		Time point on target trajectory at which missile is launched
THETAL	RTCOM	THETA launch - see PSIL (degrees)
THETLR		THETAL converted to RADIANS
TIME(50)	RTCOM	Array for storing DT at points corresponding to range table entries (See XXS)
TM(30)		Table of times-goes with XDEM, YDEM, ZDEM
TMA(30)	RTCOM	Table of times-goes with XDM, YDM, ZDM = SPO
TRP		
VM(30)	MISL	Target velocity table (function of time)
VMX(50)	RTCOM	Arrays for storing XDOT, YDOT and ZDOT
VMY(50)	RTCOM	Respectively at points corresponding
VMZ(50)	RTCOM	To range table entries (see XXS)
VT	GTARG	Target velocity (in subroutine MISCOM)
VTI		Target velocity in real time
VVVV	EXTRA	Initial target velocity
W1	COMP	Data for calculating control limits
W2	COMP	
W3	COMP	
W4	COMP	
W5	COMP	
W6	COMP	
X		Initial target X coordinate in earth system
XC		Target velocity X component-earth system
XCOMP		Target velocity X component-launch system
XD	COMB	Used in earth-to-launch transformation (subroutine GUID)
XDDE	COMB	Target acceleration over data collection range-X component
XDEF	COMB	Target velocity at first range table entry-X component
XDEM(30, 45)	MANEUV	Array of 45 target velocity tables in earth system-X components
XDH(22)	PK	Table related to lethality
XDM(30)	RTCOM	Current target velocity table in earth system-X component
XDO	RTCOM	Value of XDOT at termination of real time

VARIABLE REFERENCE LIST (Con't.)

VARIABLE	COMMON BLOCK	USE
XDOT		Target-missile relative velocity-X component
XDTG	COMB	See XD
XDTGMS(30)	RTCOM	Current target velocity table in launch system-X component
XDTGO	RTCOM	Target initial velocity in launch system-X component
XE(30)	RTCOM	Target acceleration table-X component
XLOS		Missile to target line of sight-X component
XM(3)	MISD	MISS distance array
XMAN(4, 50)	RTCOM	Array for storing DT, XCOMP, YCOMP, ZCOMP at range table entries
XMISS(7)	RTCOM	Array for storing DX, DY, DZ, XDOT, YDOT, ZDOT and XMISSC if missile misses target
XMISSC		Variable which indicates a miss
XTERM	EXTRA	X separation between missile and target at which real time is terminated
XXS(50)	RTCOM	Range table for data collection-NADJ points separated by DX and ending with XTERM
XXX		X separation between target and missile-comes from an analog value which is scaled ten times smaller than DX
Y		Initial target Y coordinate in earth system
YA	COMD	Related to MISS distance
YC		Target velocity Y component-earth system
YCOMP		Target velocity Y component-launch system
YD	COMB	See XD
YDDE	COMB	See XDDE-Y component
YDEF	COMB	See XDEF-Y component
YDEM(30, 45)	MANEUV	See XDEM-Y components
YDH(22)	PK	See XDH
YDM(30)	RTCOM	See XDM-Y component
YDO	RTCOM	Value of YDOT at termination of real time
YDOT		See XDOT-Y component
YDTG	COMB	See XD
YDTGMS(30)	RTCOM	See XDTGMS-Y component
YDTGO	RTCOM	See XDTGO-Y component
YE(30)	RTCOM	See XE-Y component

VARIABLE REFERENCE LIST (Con't.)

VARIABLE	COMMON BLOCK	USE
YLOS		See XLOS-Y component
YM(3)	MISD	MISS distance array
YYY		See XXX-Y component
Z		Initial target Z coordinate in earth system
ZA	COMD	See YA
ZABOVE		Altitude of launch site (negative)
ZALT	RTCOM	Target altitude (negative)
ZC		Target velocity Z component-earth system
ZCOMP		Target velocity Z component-launch system
ZD	COMB	See XD
ZDDE	COMB	See XDDE-Z component
ZDEF	COMB	See XDEF-Z component
ZDEM(30, 45)	MANEUV	See XDEM-Z component
ZDH(22)	PK	See XDH
ZDM(30)	RTCOM	See XDM-Z component
ZDO	RTCOM	Value of ZDOT at termination of real time
ZDOT		See XDOT-Z component
ZDTG	COMB	See XD
ZDTGMS(30)	RTCOM	See XDTGMS-Z component
ZDTGO	RTCOM	See XDTGO-Z component
ZE(30)	RTCOM	See XE-Z component
ZLOS		See XLOS-Z component
ZM(3)	MISD	MISS distance array
ZTE(61)		Table of target initial altitudes
ZZZ		See XXX-Z component

COMMON BLOCK CROSS-REFERENCE TABLE

	ANG	COMB	COMD	COMM	COMP	EXTRA	GTARG	MANEUV	MISD	MISL	MU	PK	PRNT	RTCOM
MAIN	X		X		X	X		X	X			X	X	X
BLOCK DATA								X		X		X		X
FLIGHT				X										X
GUID	X	X												
HWFLOT														
INIT		X				X		X						X
INTERP														
KSCALE										X			X	X
LETH			X				X	X	X			X	X	X
LINTRP														
MEAN					X									
MISCOM		X	X			X	X	X	X		X		X	X
PRIME		X						X	X		X		X	X
QCLIM					X									
REALT				X										X

COMMON/ANG/

COSSCO

COSSO

SINSCO

SINSO

COMMON/COMB/

XD

XDDE

XDEF

XDTG

YD

YDDE

YDEF

YDTG

ZD

ZDDE

ZDEF

ZDTG

COMMON/COMD/

YA

ZA

COMMON/COMM/

ADSF (10)

DASF (11)

INFLRT

LOOP1

LOOP2

LTMAX

NPATH

COMMON/COMP/

A1P1	S1P3
A1P2	S1P4
A1P3	S1P5
A1P4	S1P6
A1P5	S2P1
A1P6	S2P2
A2P1	S2P3
A2P2	S2P4
A2P3	S2P5
A2P4	S2P6
A2P5	W1
A2P6	W2
CLMS (10)	W3
CLS1(10)	W4
CLS2(10)	W5
IFT	W6
IPLANE	
I99	
NSAM	
Q1	
Q2	
Q3	
Q4	
Q5	
Q6	
S1P1	
S1P2	

COMMON/EXTRA/

AS

DX

NPTS

VVVV

XTERM

COMMON/GTARG/

AT

FXA

FXB

FXC

FYA

FYB

FYC

FZA

FZB

FZC

VT

COMMON/MANEUV/

III

ITAU(60)

ITRAJ(60)

ITT

NADJ

XDEM(30, 45)

YDEM(30, 45)

ZDEM(30, 45)

COMMON/MISD/

ICN

RM(3)

XM(3)

YM(3)

ZM(3)

COMMON/MISL/

DELTAR(30)

TAMA(30)

VM(30)

COMMON/MU/

COSMU1

COSMU2

COSMU3

SINMU1

SINMU2

SINMU3

COMMON/PK/

BDHX(22)

BDHY(22)

BDHZ(22)

KILL(22)

SPHG

SPHS

SPK

SPM

XDH(22)

YDH(22)

ZDH(22)

COMMON/PRNT/

IS1

COMMON/RTCOM/

CLAA(10)	RLBI
COSEI	RLBK
CPL	RNI
CTL	SPL
DTF	SPOI
DXG	STL
DYG	S2
DZG	S3
ECOS(17)	S4
EDOT	S5
FCI77(9)	THETAL
FI7T(9)	TIME(50)
G	TMA(30)
GGG	VMX(50)
HR7EE(17)	VMY(50)
IPTS	VMZ(50)
LEVEL	XDM(30)
NT	XDO
PPX(50)	XDTGMS(30)
PPY(50)	XDTGO
PPZ(50)	XE(30)
	XMAN(4, 50)
RI	XMISS(7)

COMMON/RTCOM/ (Con't)

XXS(50)

YDM(30)

YDO

YDTGMS(30)

YDTGO

YE(30)

ZALT

ZDM(30)

ZDO

ZDTGMS(30)

ZDTGO

ZE(30)

EXPLANATION OF FLOW DIAGRAMS

The flow diagrams included here are hierarchical in nature with a top-down structure. In the first-level flow diagram, the program is broken down into its major modules, numbered I., II., III., etc., and the relationships among these modules are shown.

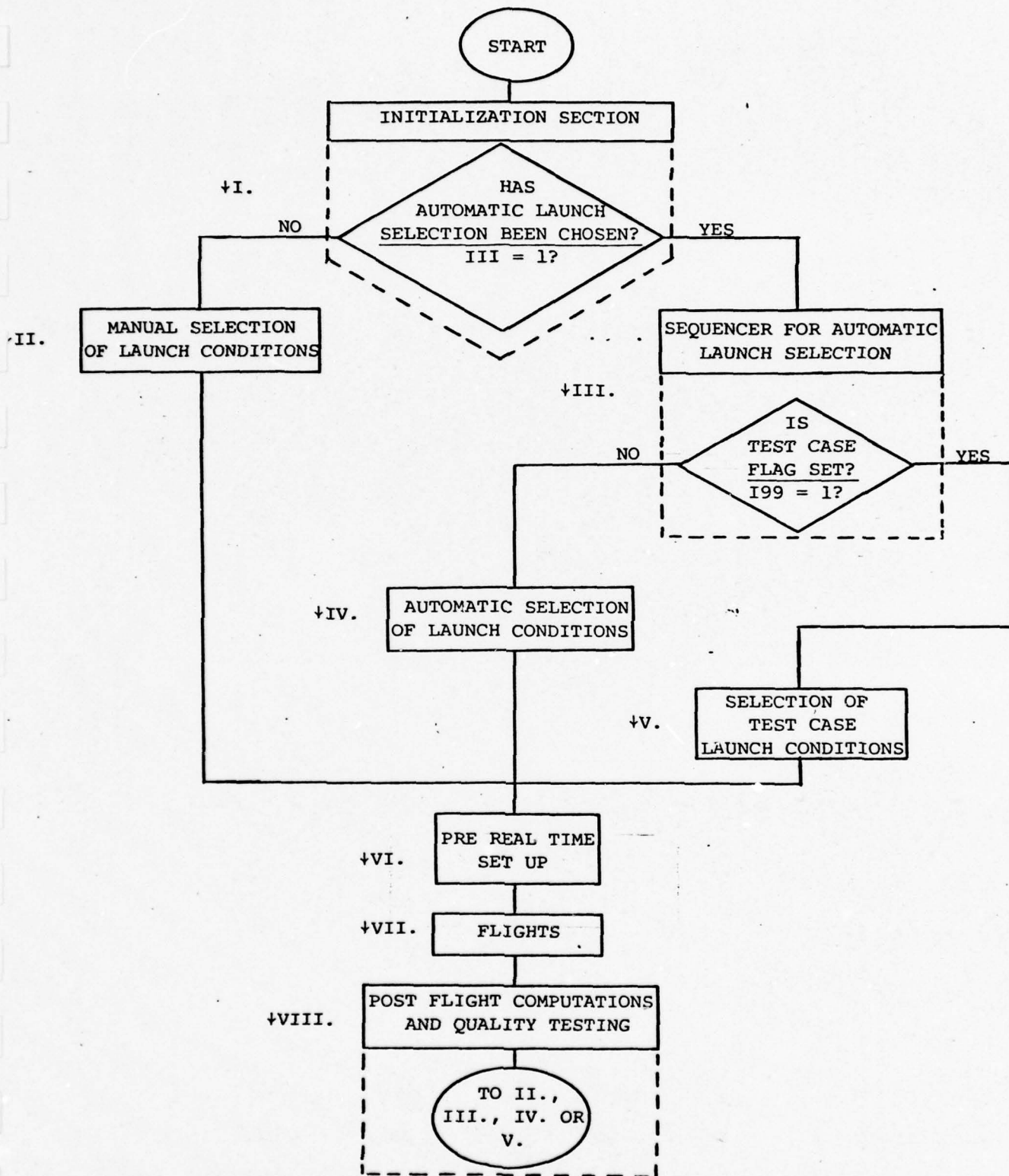
Each module in the first-level diagram is analyzed in more detail in a second-level flow diagram. For example, module III. in the first-level diagram is broken down into submodules numbered III. A., III. B., III. C., etc.

Some of the second-level modules are broken down further in third-level diagrams. For example, module III. K. in the second-level diagram devoted to module III. is broken down in a third-level diagram into blocks numbered III. K. 1., III. K. 2., etc.

The symbol + appearing before a block number indicates that there is a lower-level diagram devoted to that block.

MAIN PROGRAM
STINGER HYBRID SIMULATION
FIRST-LEVEL FLOW DIAGRAM

MAIN PROGRAM
STINGER HYBRID SIMULATION



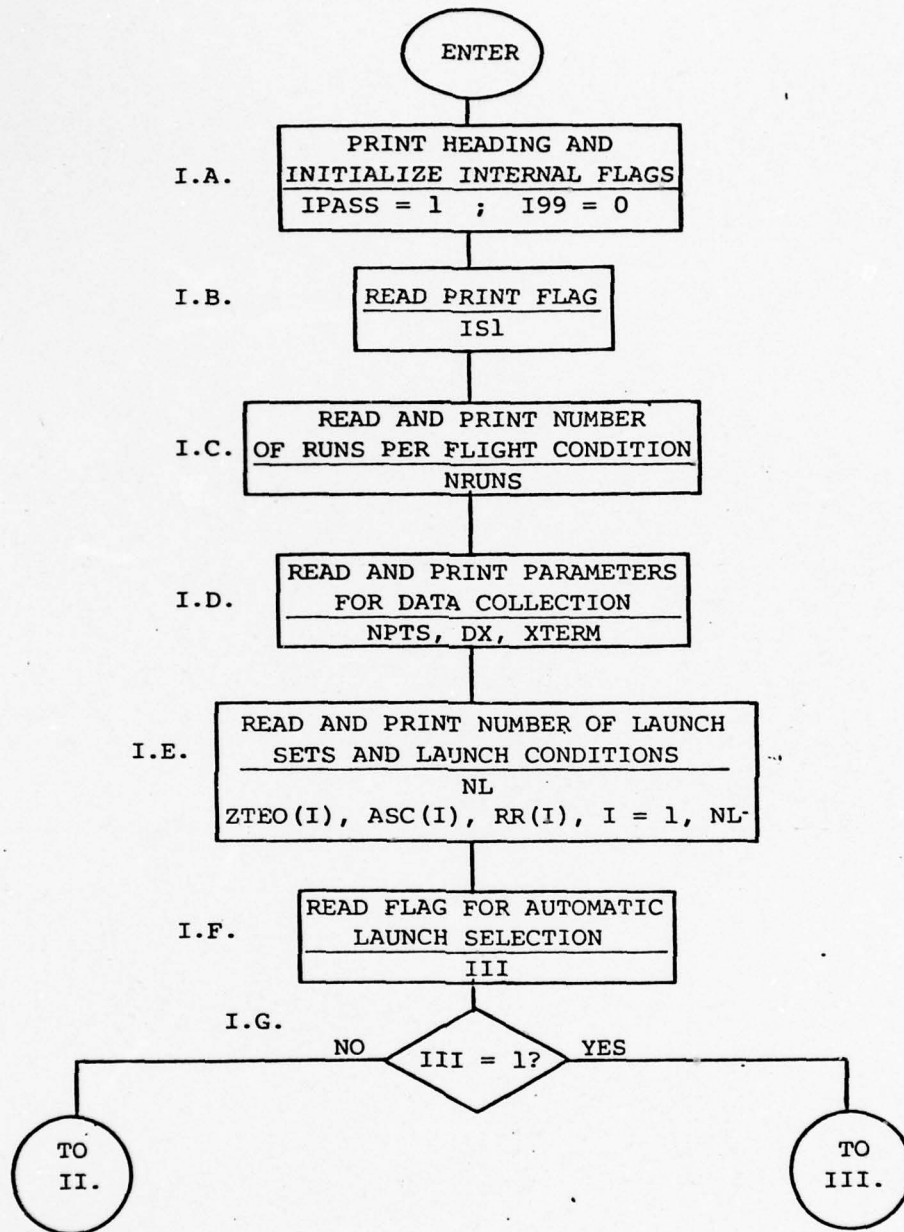
MAIN PROGRAM

STINGER HYBRID SIMULATION

SECOND-LEVEL FLOW DIAGRAMS

I.

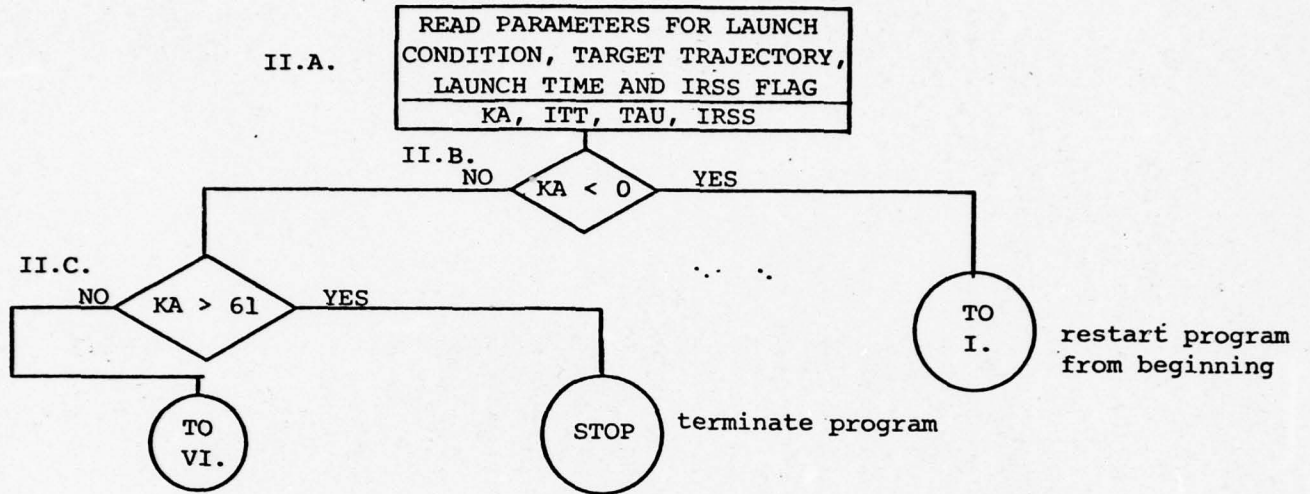
INITIALIZATION SECTION



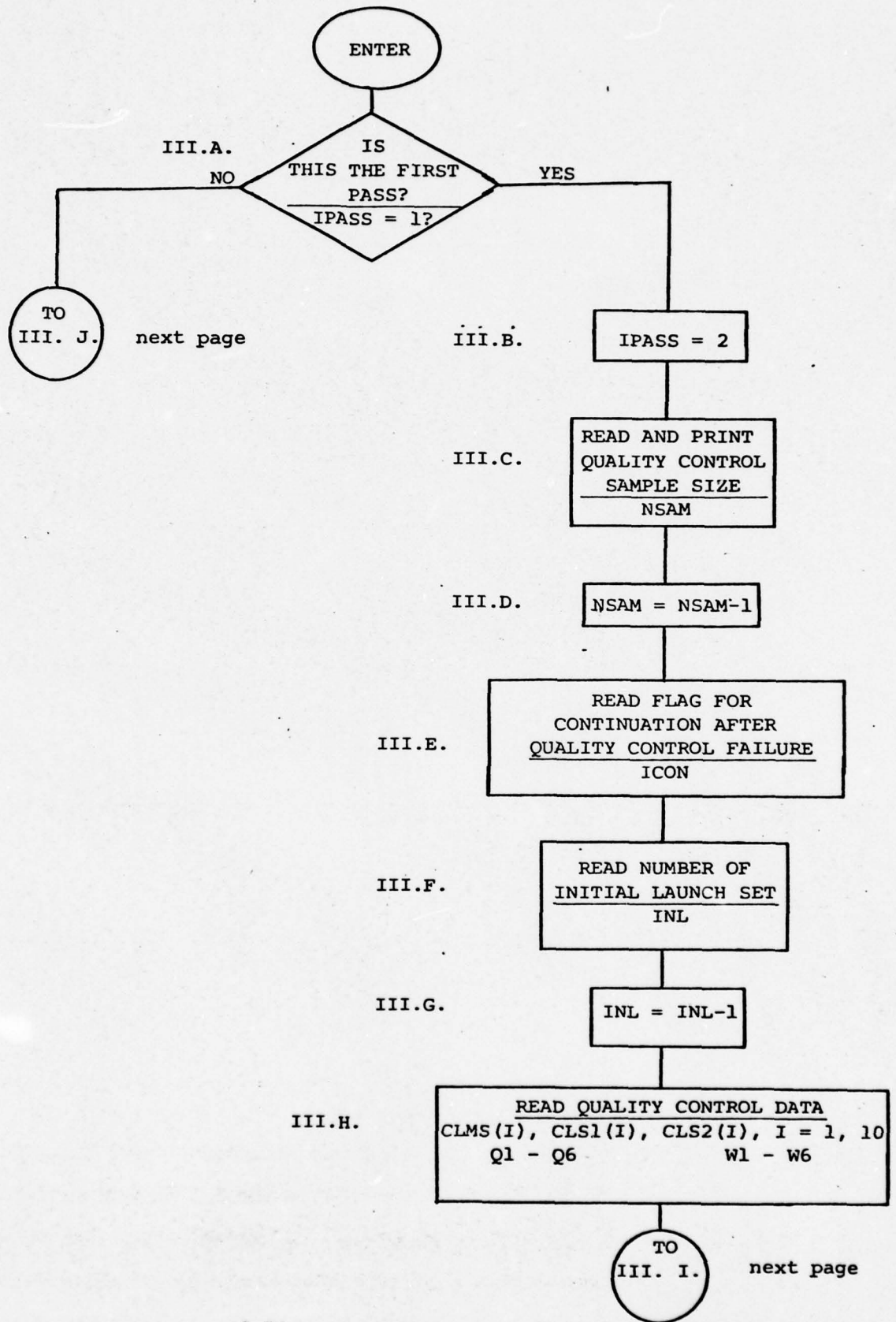
II.

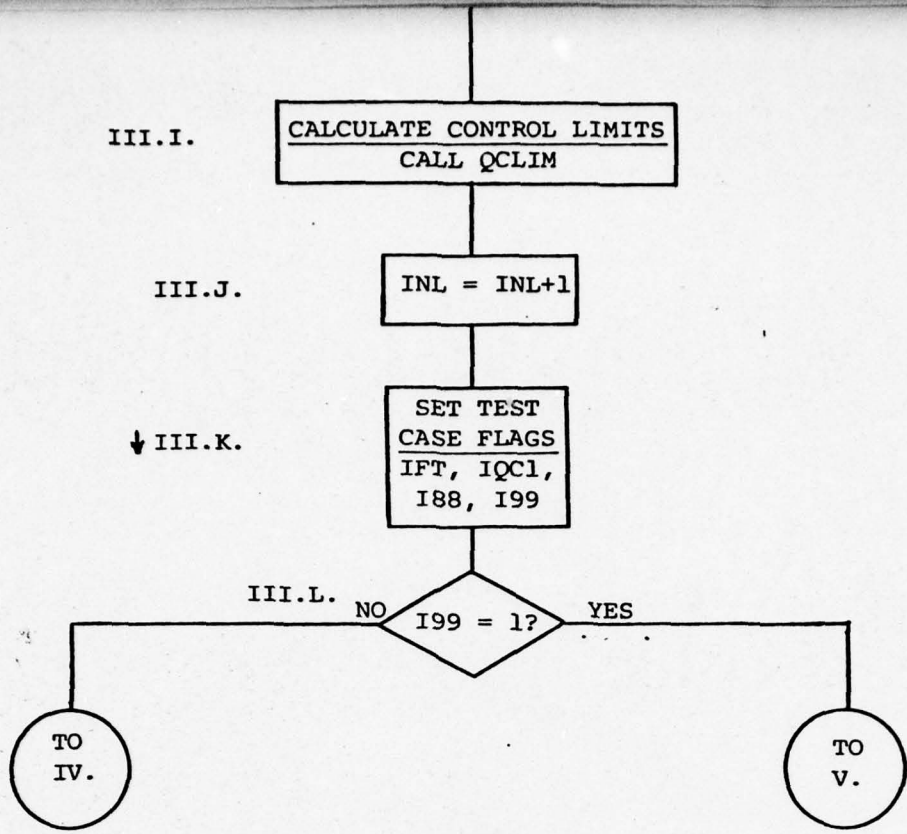
MANUAL SELECTION OF
LAUNCH CONDITIONS

ENTER



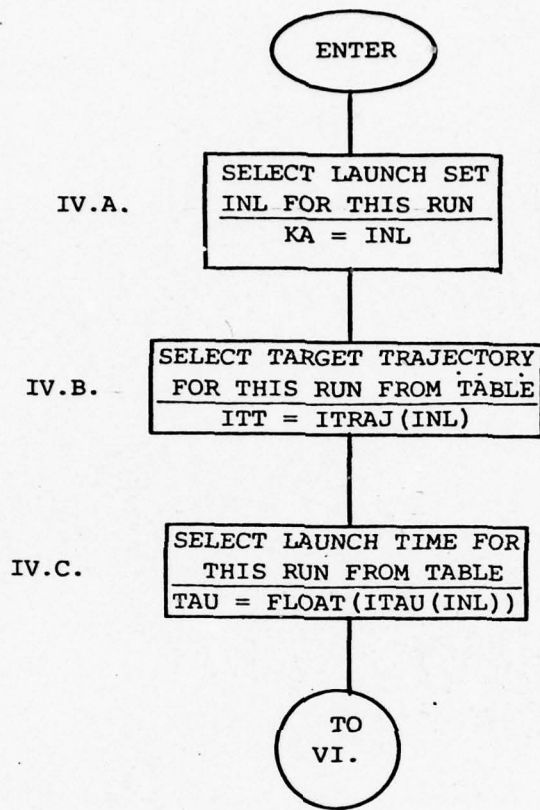
III.
SEQUENCER FOR AUTOMATIC
LAUNCH SELECTION



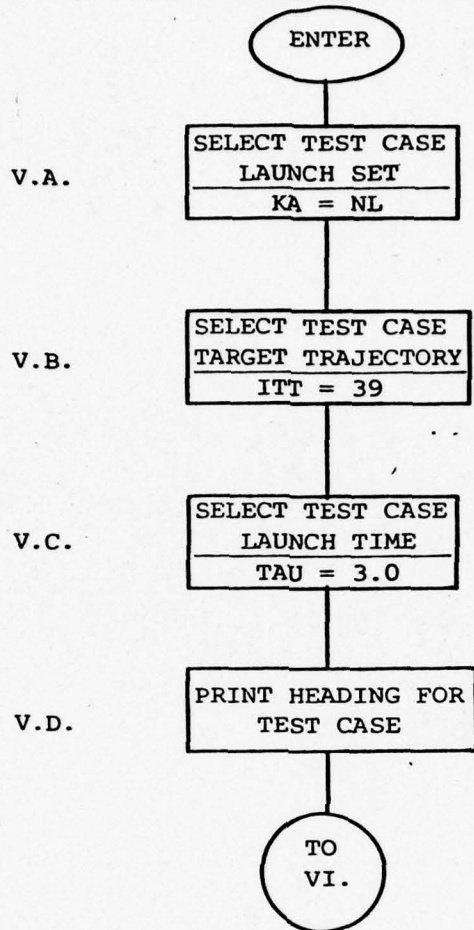


AUTOMATIC

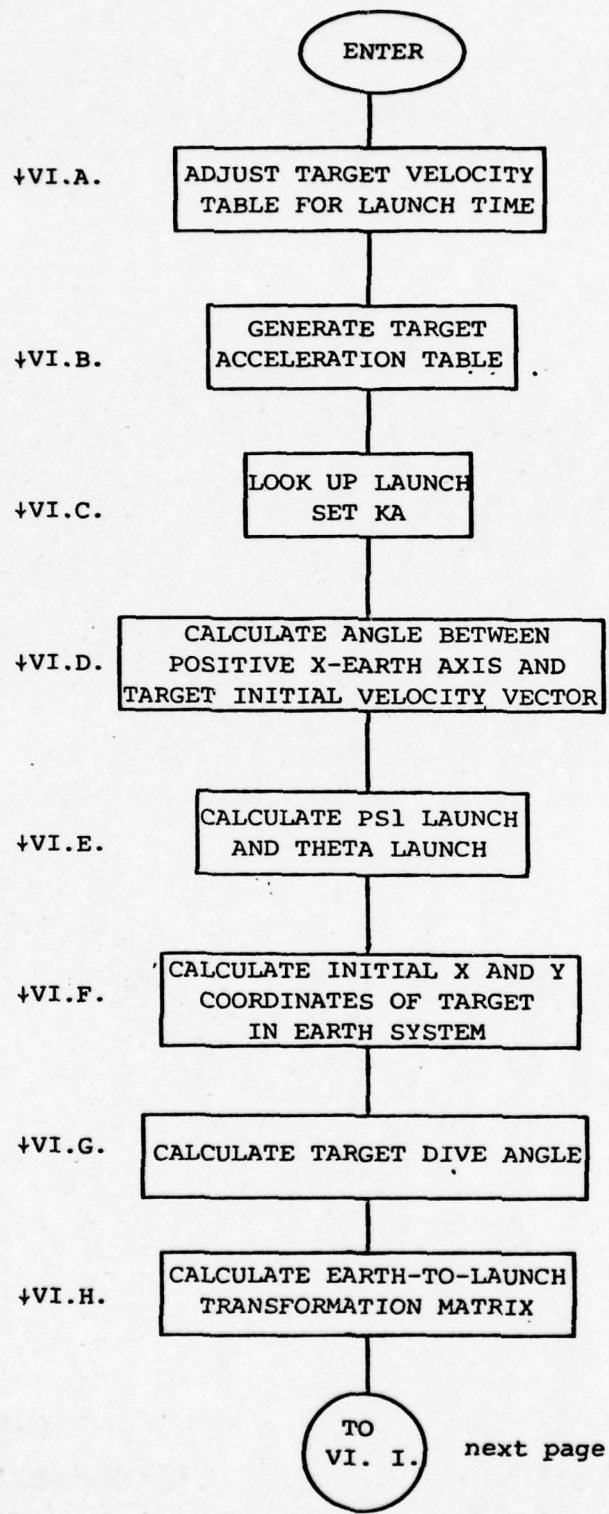
IV.
AUTOMATIC SELECTION
OF LAUNCH CONDITIONS



V.
SELECTION OF TEST
CASE LAUNCH CONDITIONS



VI.
PRE REAL TIME
SET UP



VI.I.

CALCULATE OTHER
INITIAL CONDITIONS
CALL INIT

VI.J.

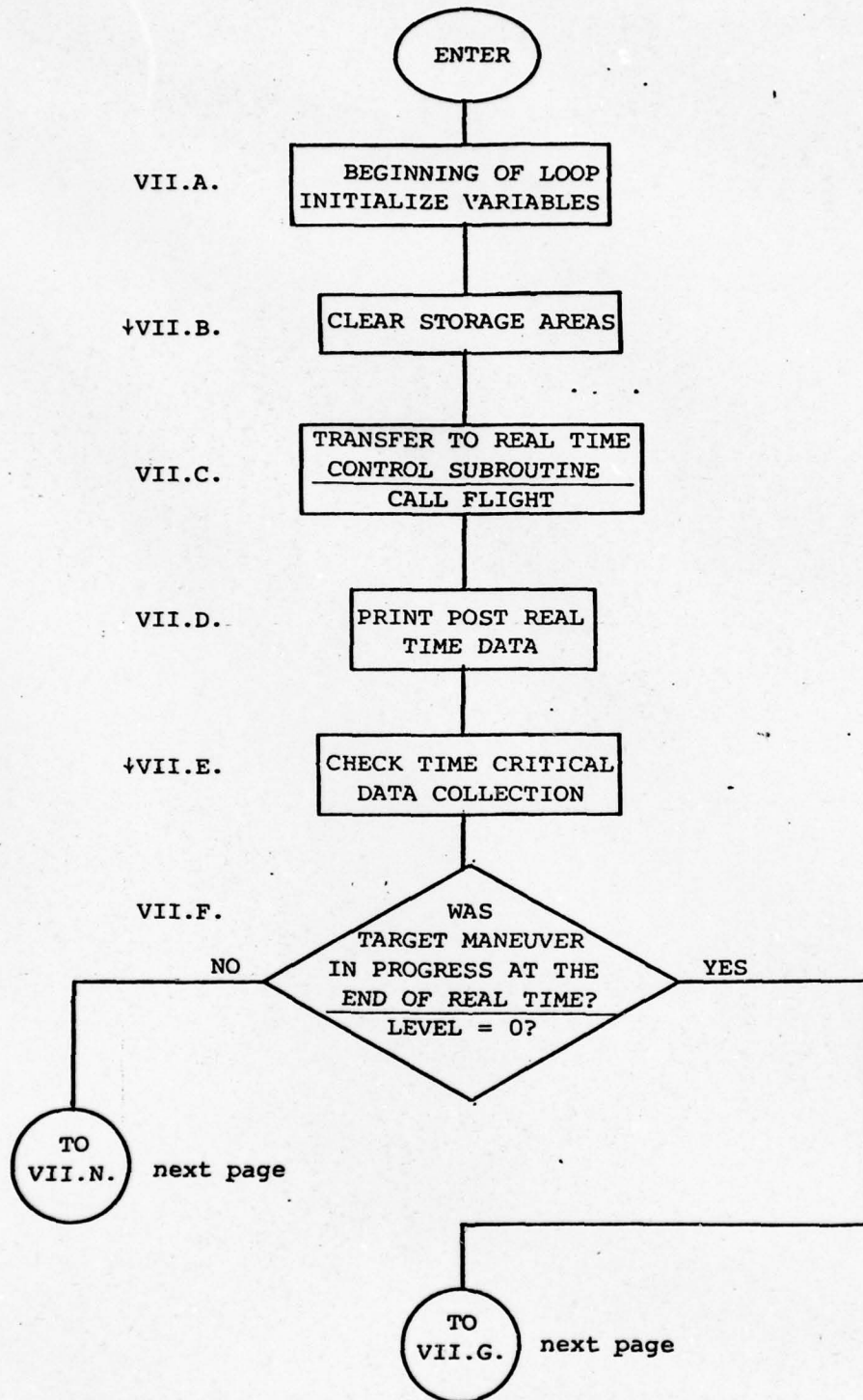
PRINT FLIGHT
CONDITIONS

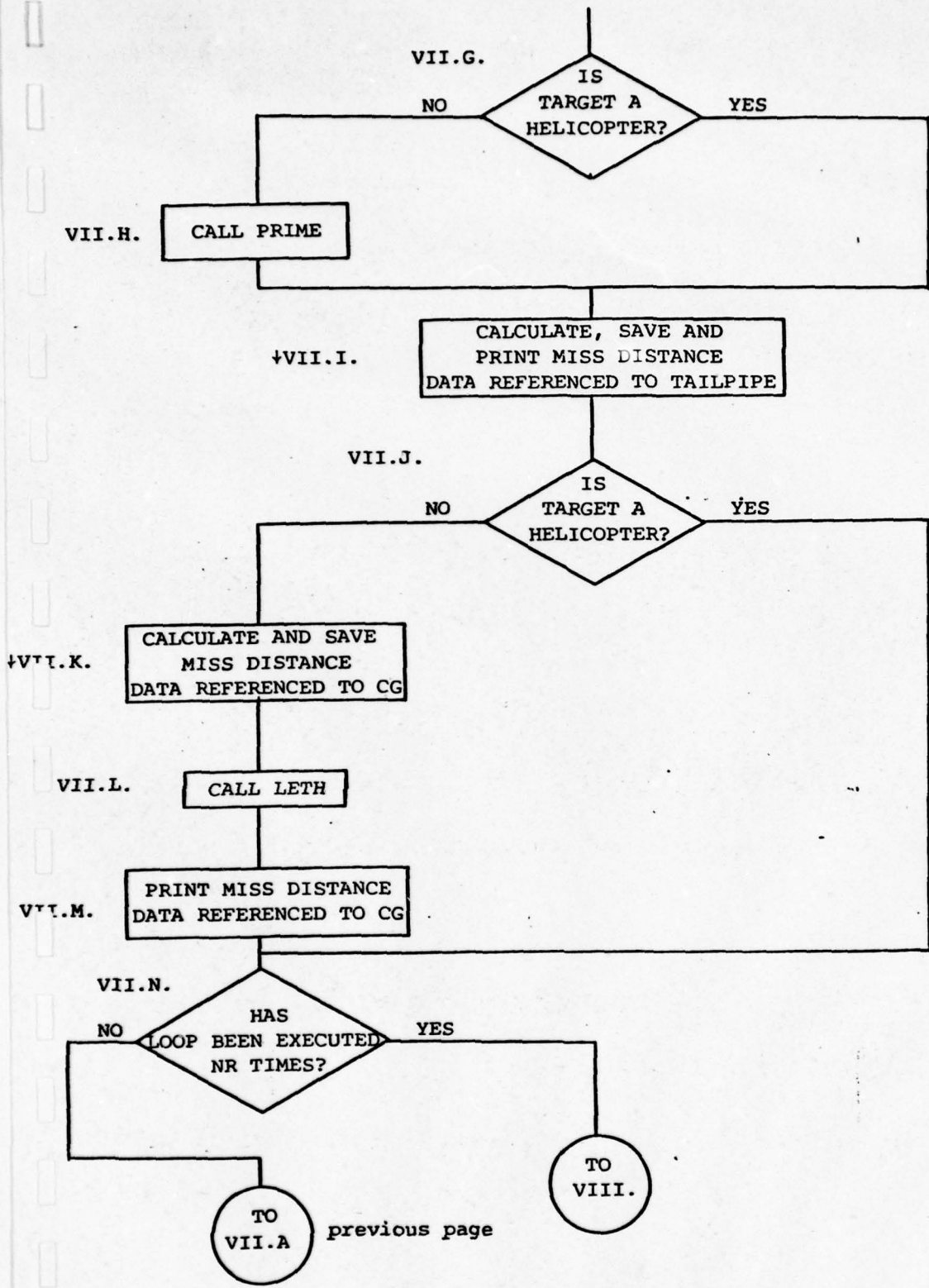
VI.K.

PREPARE TO
MAKE FLIGHTS

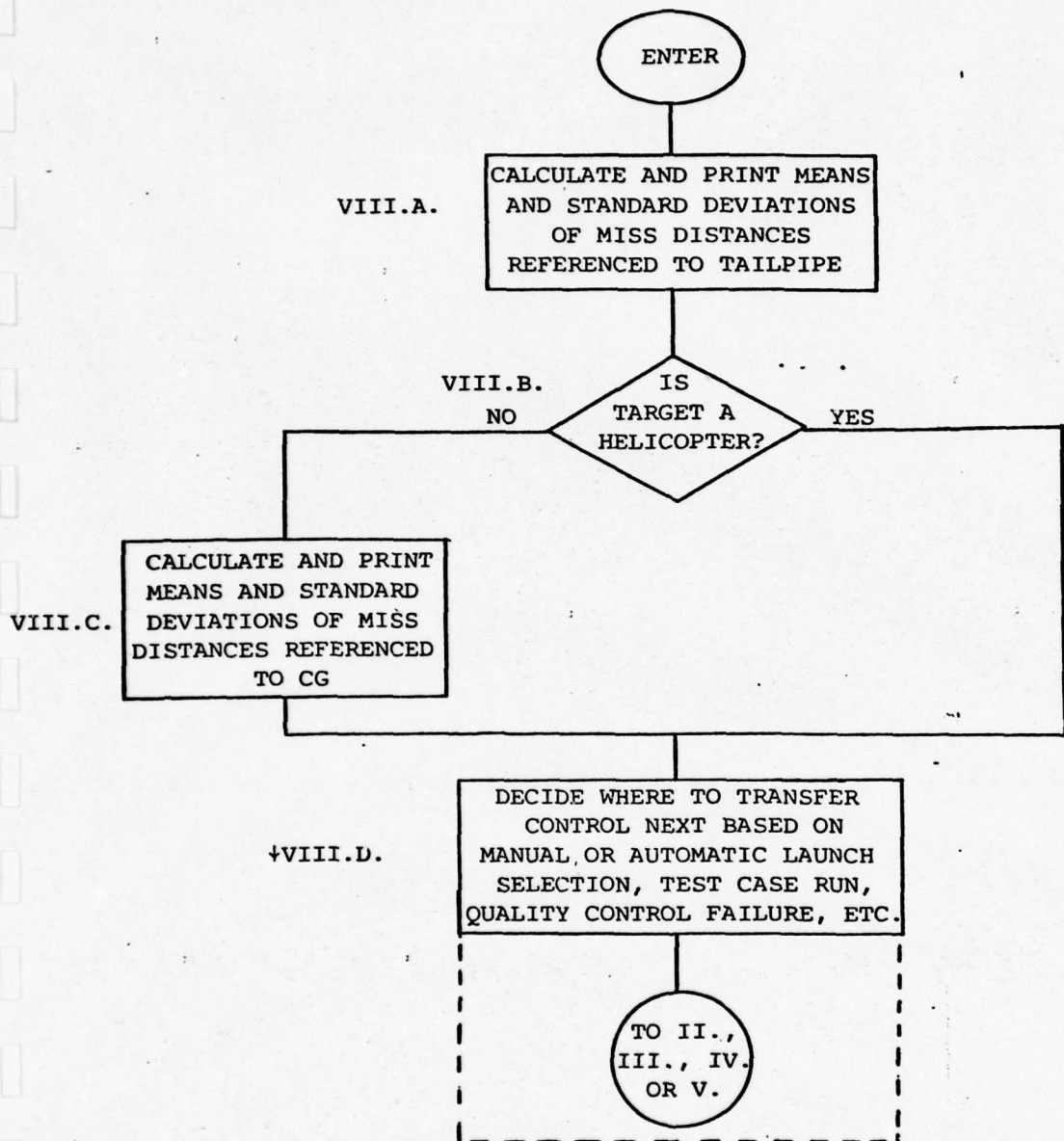
TO
VII.

VII.
FLIGHTS





VIII.
POST FLIGHT COMPUTATIONS
AND QUALITY TESTING

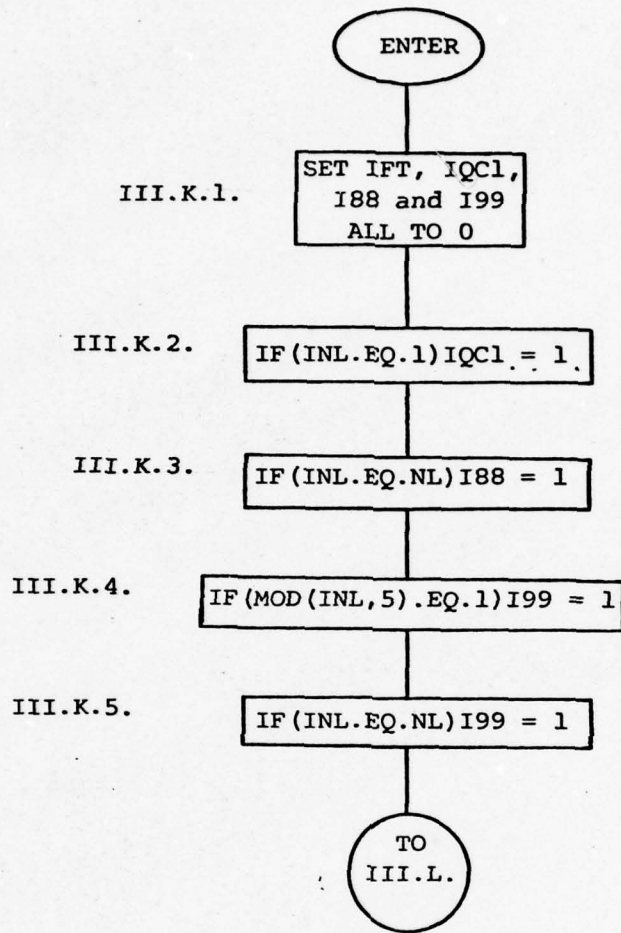


MAIN PROGRAM

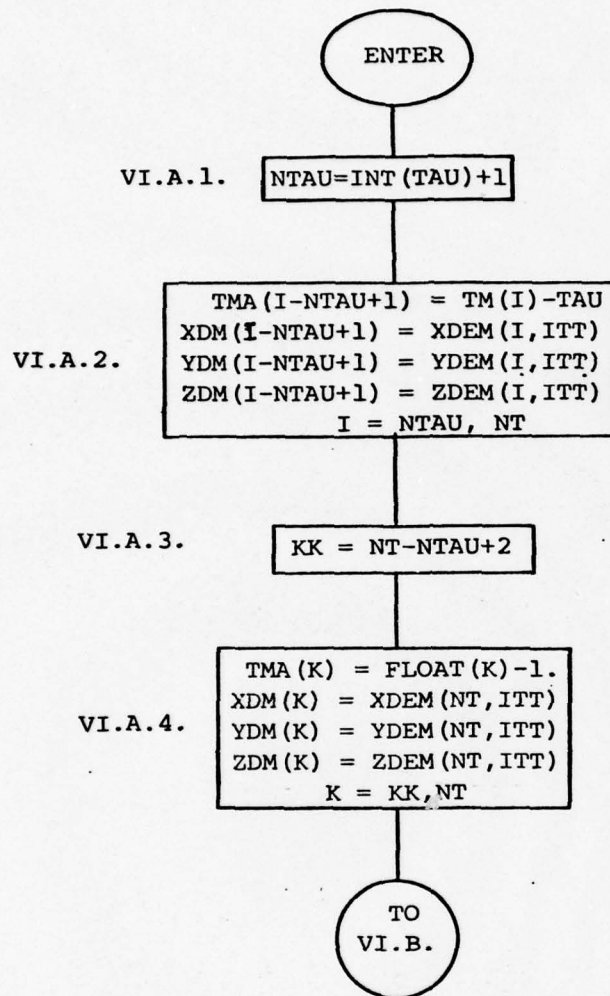
STINGER HYBRID SIMULATION

THIRD LEVEL FLOW DIAGRAMS

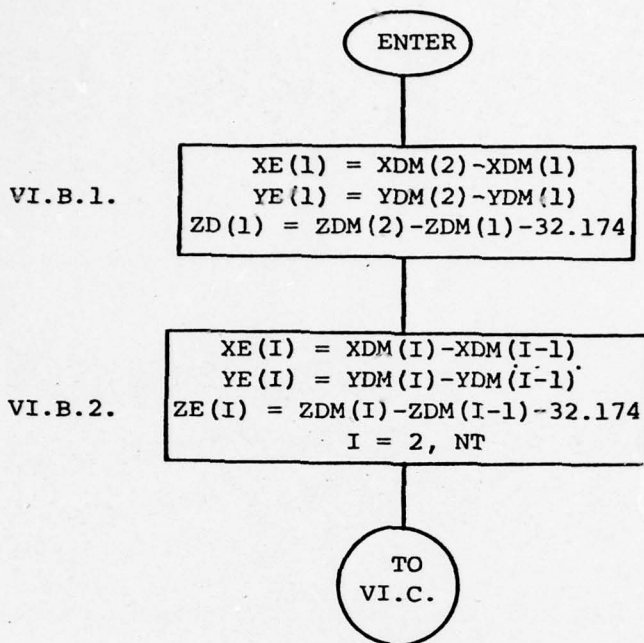
III.K.
SET TEST
CASE FLAGS



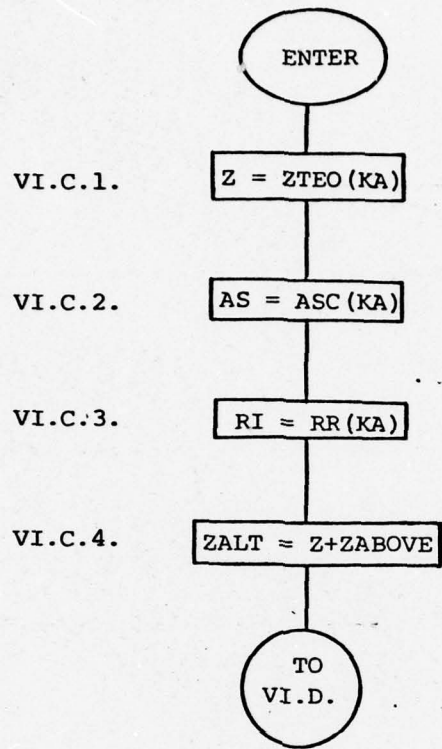
VI.A.
ADJUST TARGET VELOCITY
TABLE FOR LAUNCH TIME



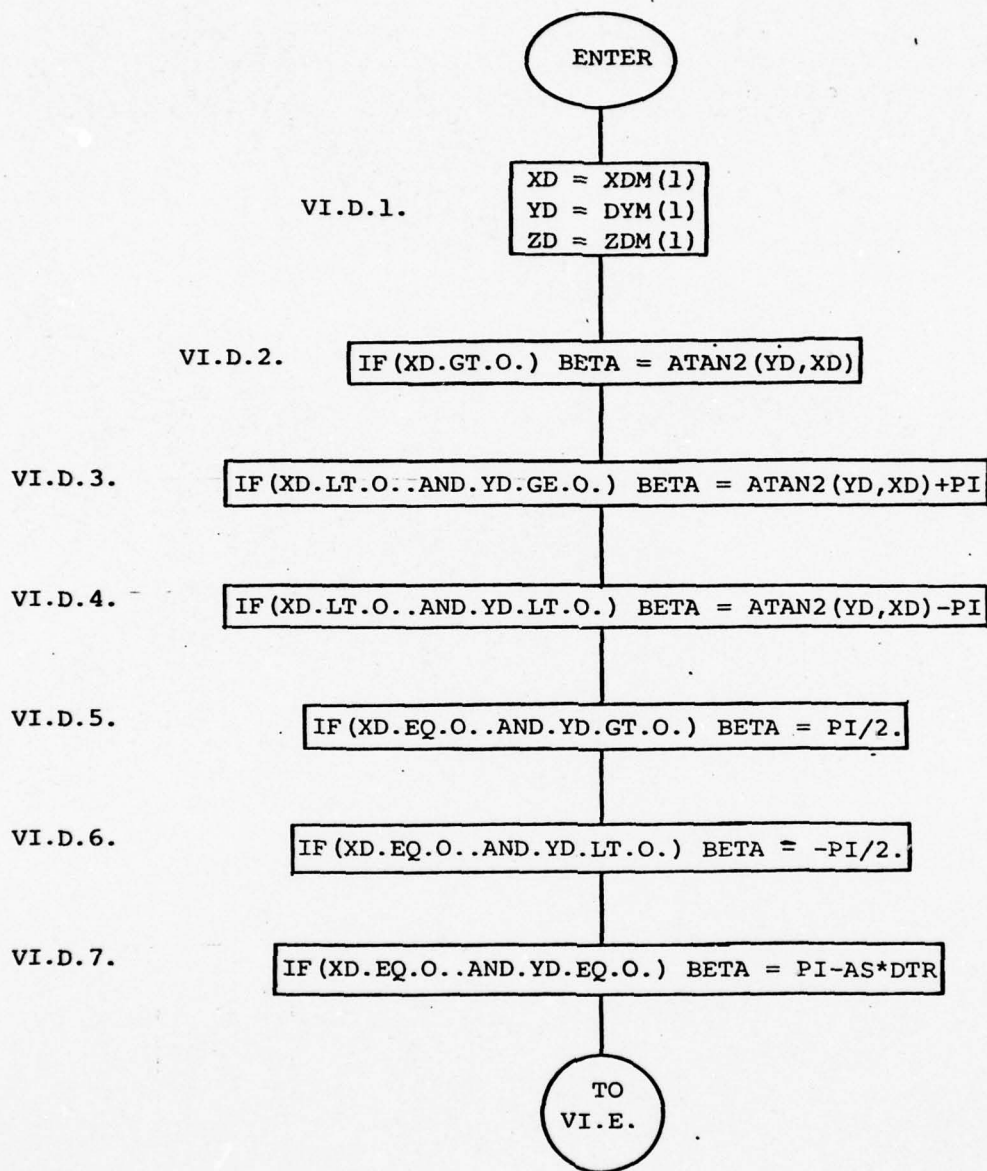
VI.B.
GENERATE TARGET
ACCELERATION TABLE



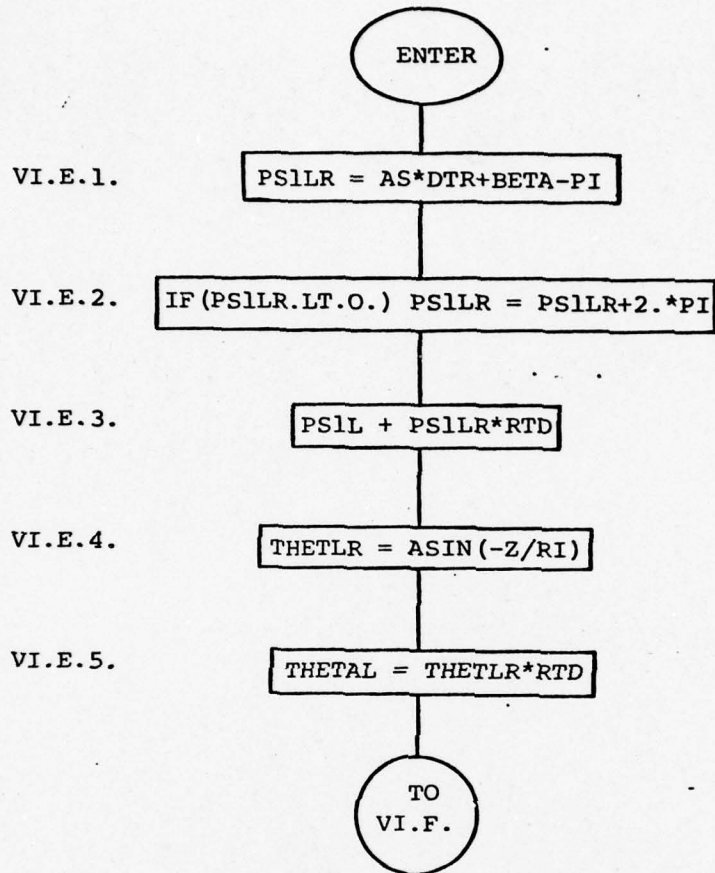
VI.C.
LOOK UP LAUNCH
SET KA



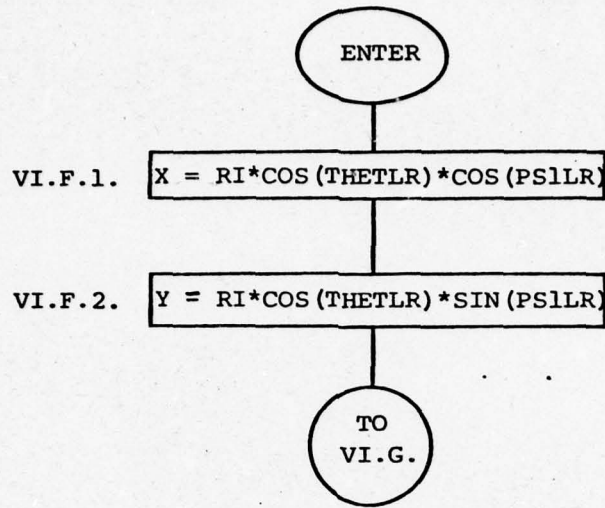
VI.D.
CALCULATE ANGLE BETWEEN
POSITIVE X-EARTH AXIS AND
TARGET INITIAL VELOCITY VECTOR



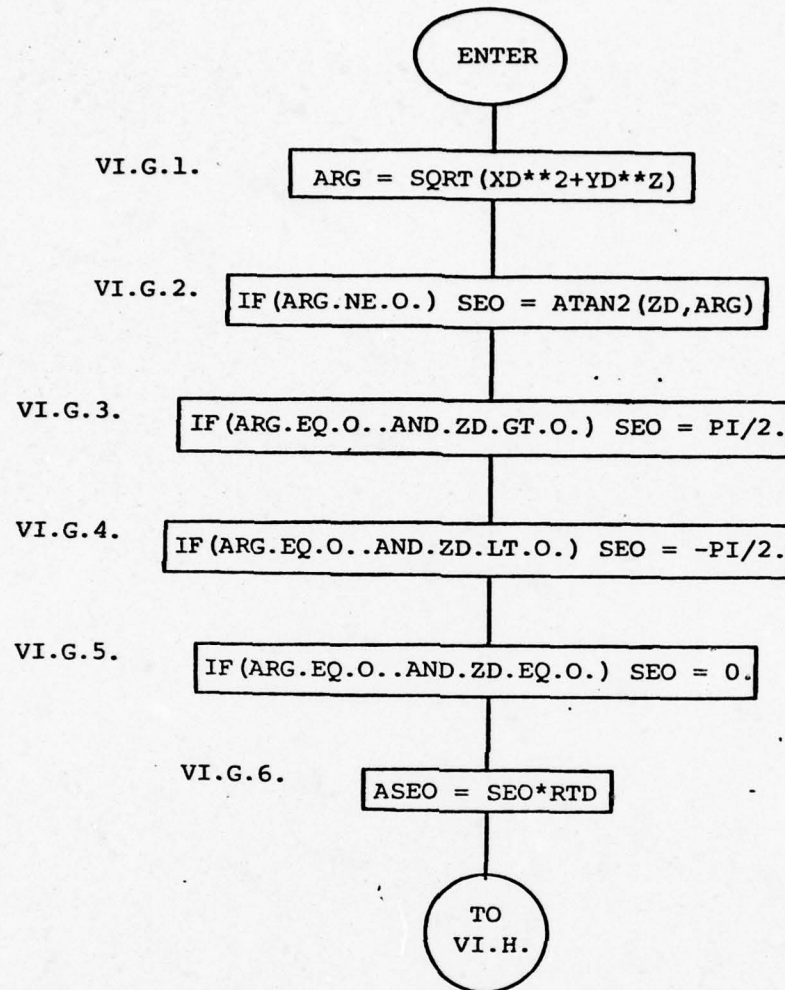
VI.E.
CALCULATE PSI LAUNCH
AND THETA LAUNCH



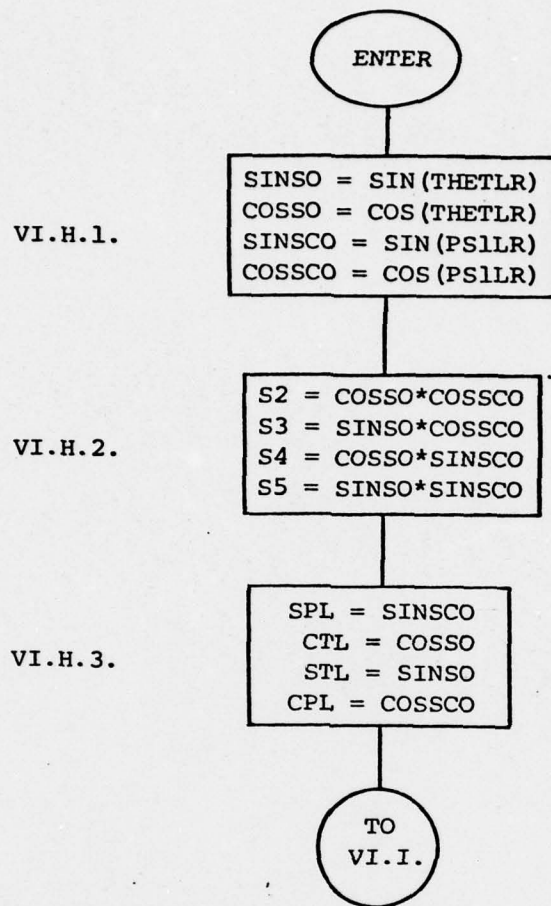
VI.F.
CALCULATE INITIAL X AND Y
COORDINATES OF TARGET
IN EARTH SYSTEM



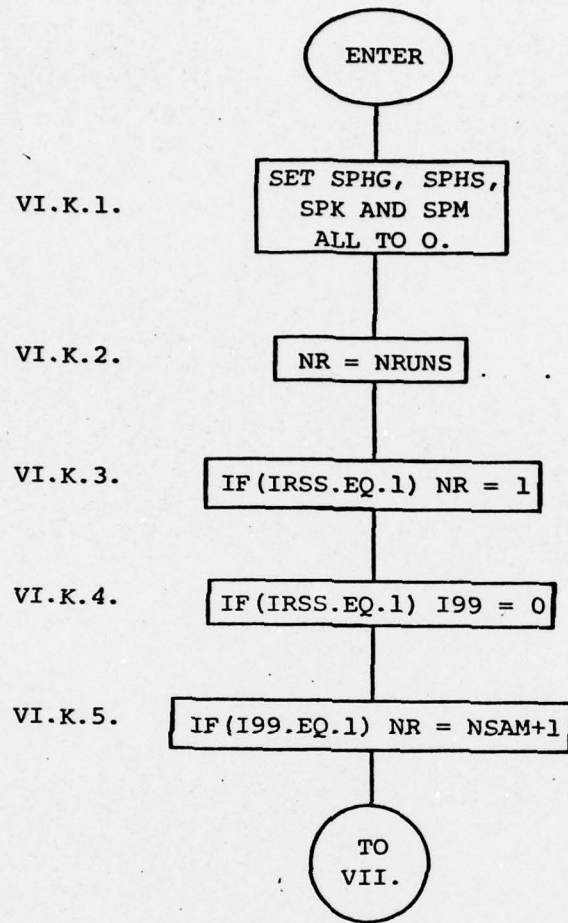
VI.G.
CALCULATE TARGET
DIVE ANGLE



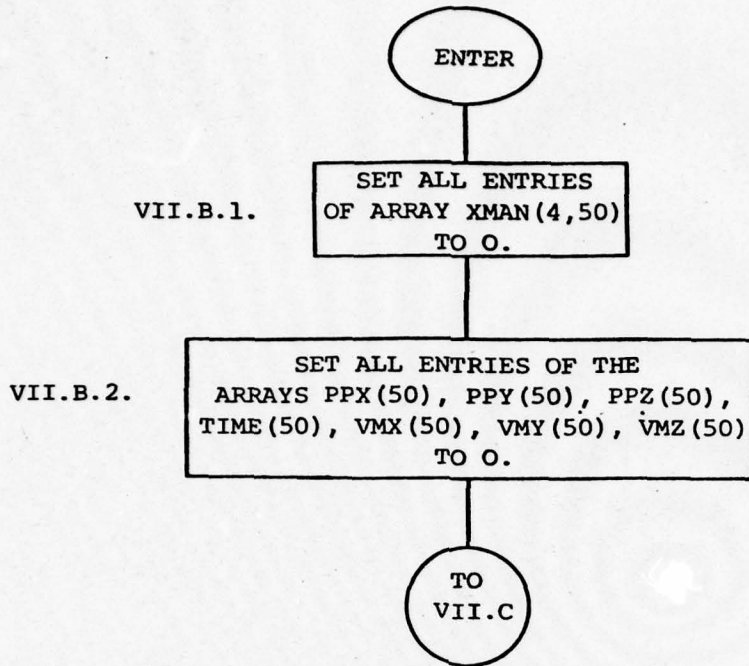
VI.H.
CALCULATE EARTH-TO-LAUNCH
TRANSFORMATION MATRIX



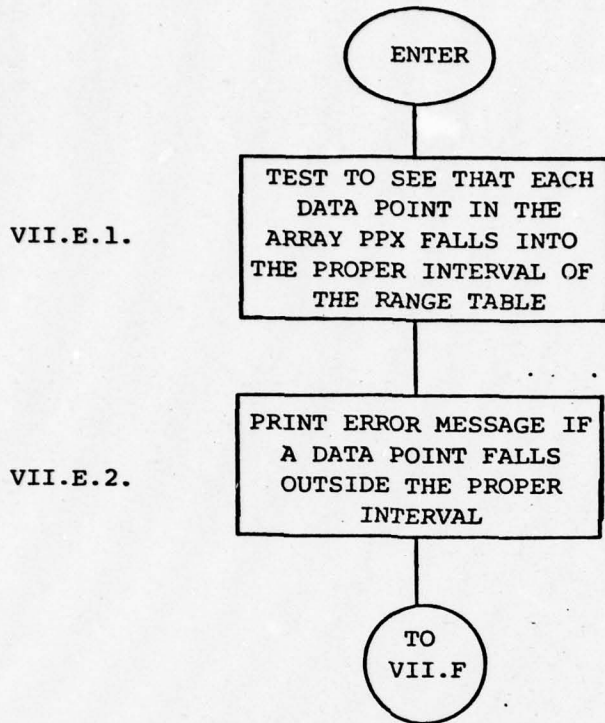
VI.K.
PREPARE TO
MAKE FLIGHTS



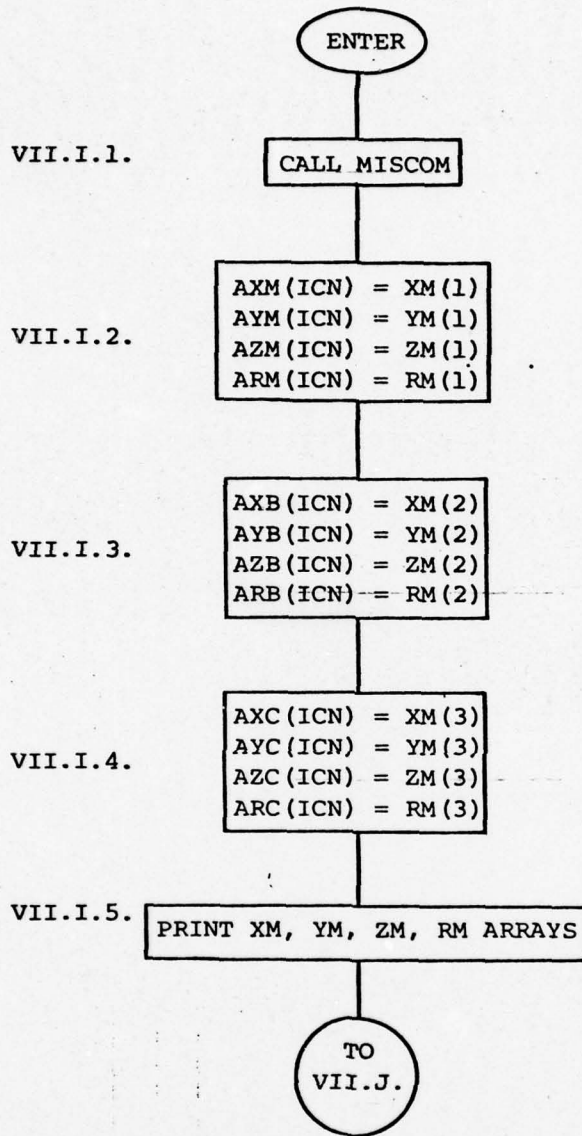
VII.B.
CLEAR STORAGE AREAS



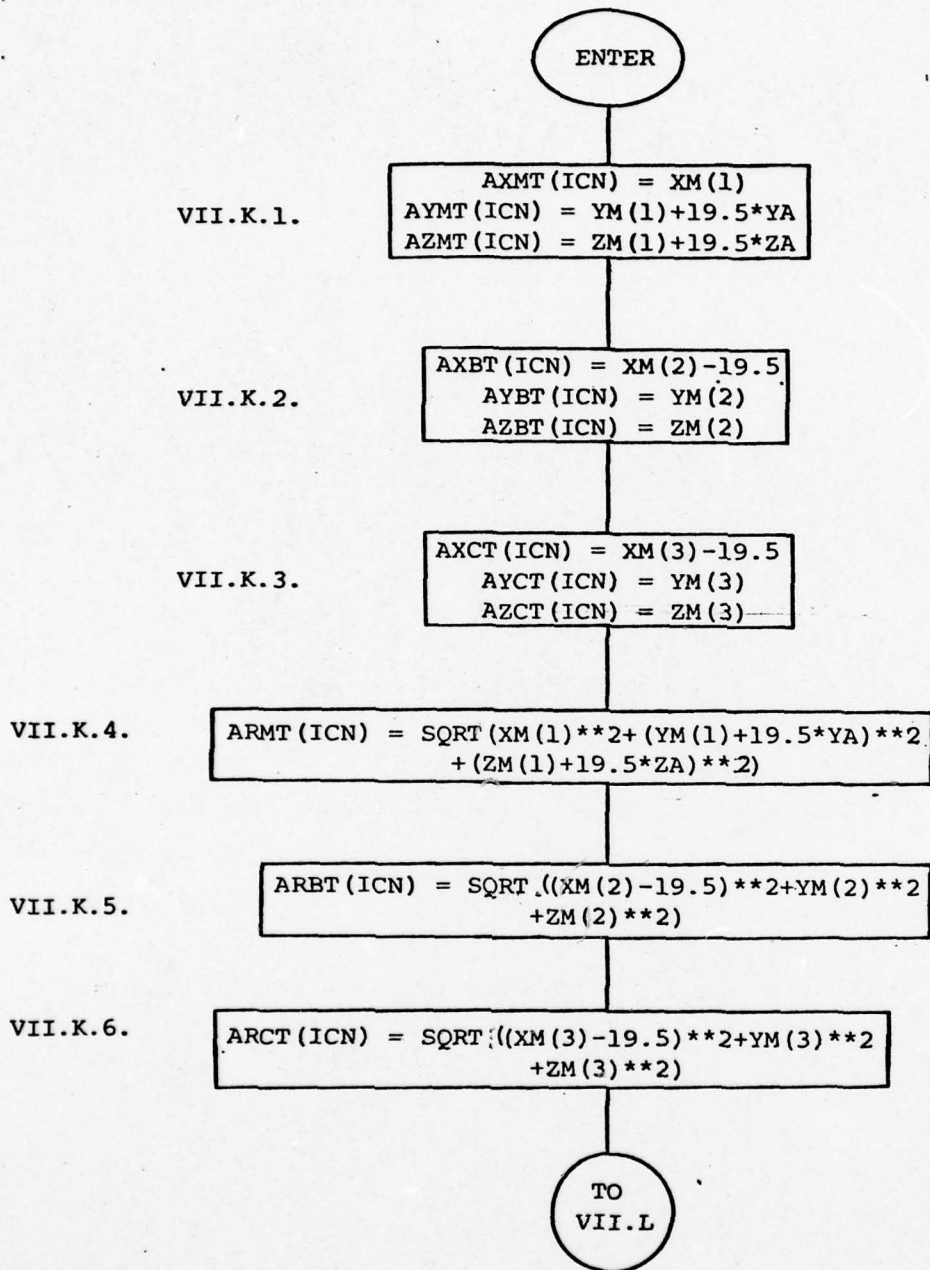
VII.E.
CHECK TIME CRITICAL
DATA COLLECTION



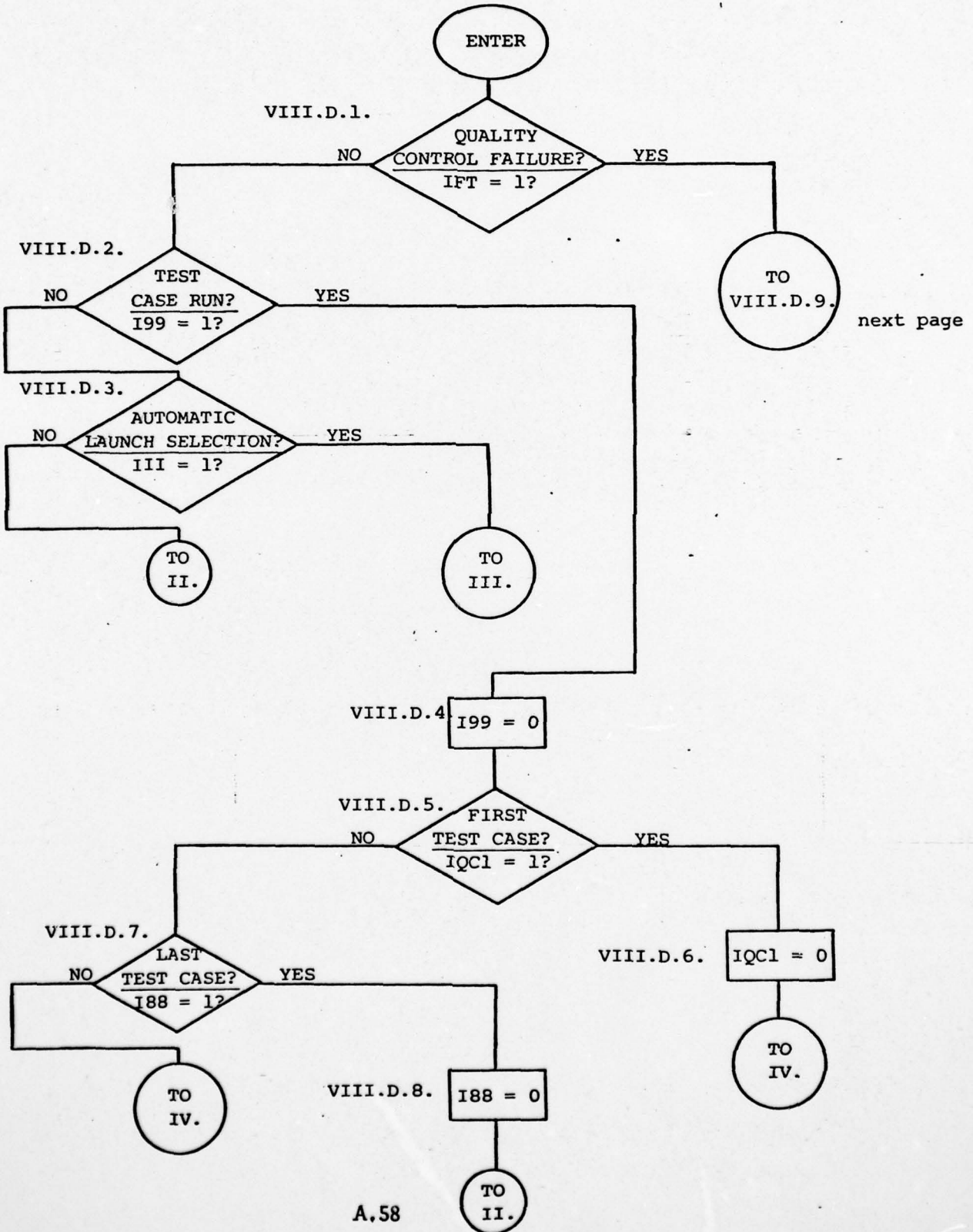
VII.I.
CALCULATE, SAVE AND PRINT MISS
DISTANCE DATA REFERENCED TO TAILPIPE



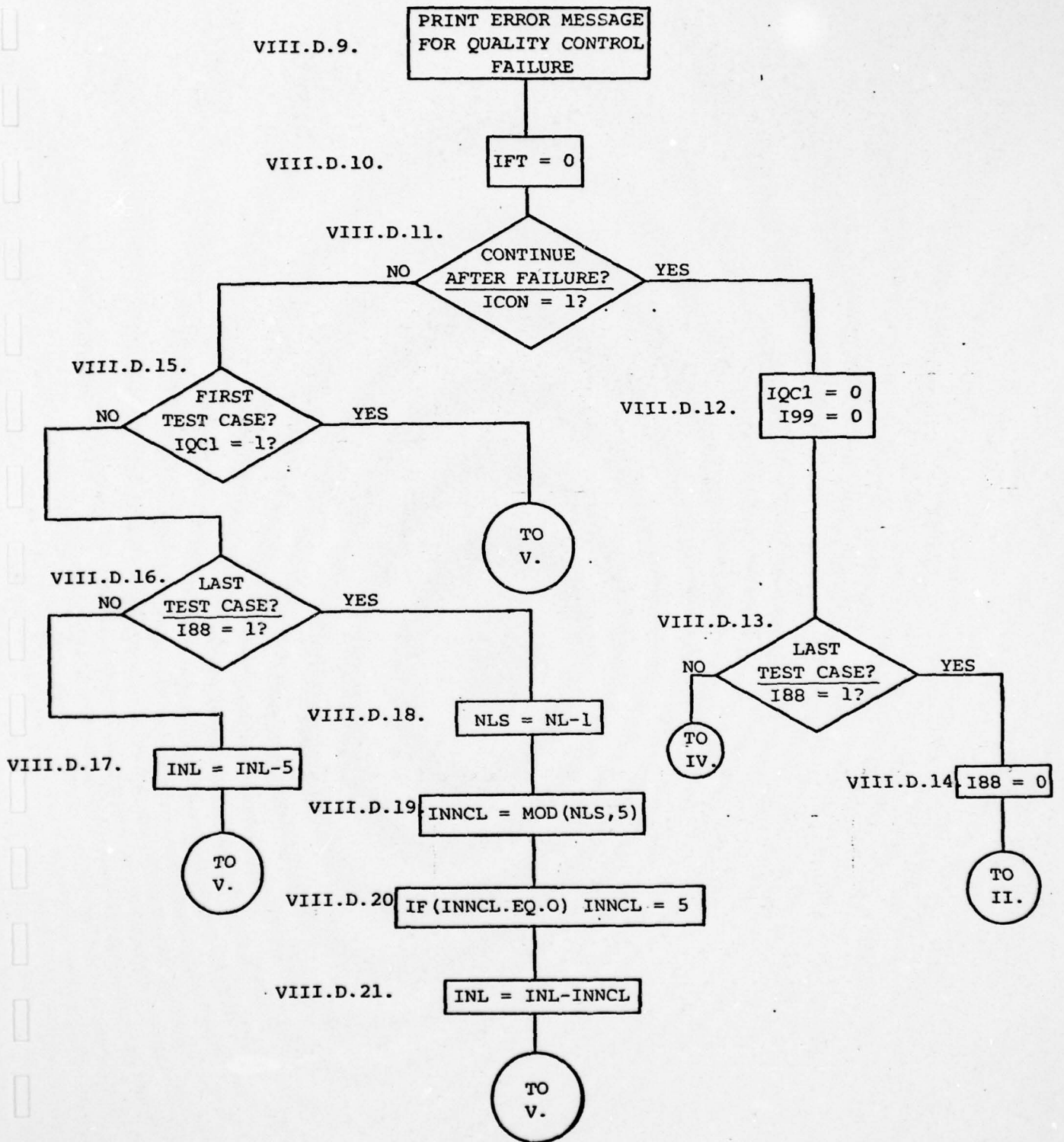
VII.K.
CALCULATE AND SAVE MISS DISTANCE
DATA REFERENCED TO CG



VIII.D.
 DECIDE WHERE TO TRANSFER CONTROL
 NEXT BASED ON MANUAL OR AUTOMATIC
 LAUNCH SELECTION, TEST CASE RUN, QUALITY
 CONTROL FAILURE, ETC.



VIII.D. (Continued)



AD-A052 676

B-K DYNAMICS INC ROCKVILLE MD
SUMMARY REPORT OF STINGER CONVERSION ACTIVITIES. (U)
JUL 76

F/G 9/2

DAAH01-75-C-0194

UNCLASSIFIED

BKD-TR-3-206

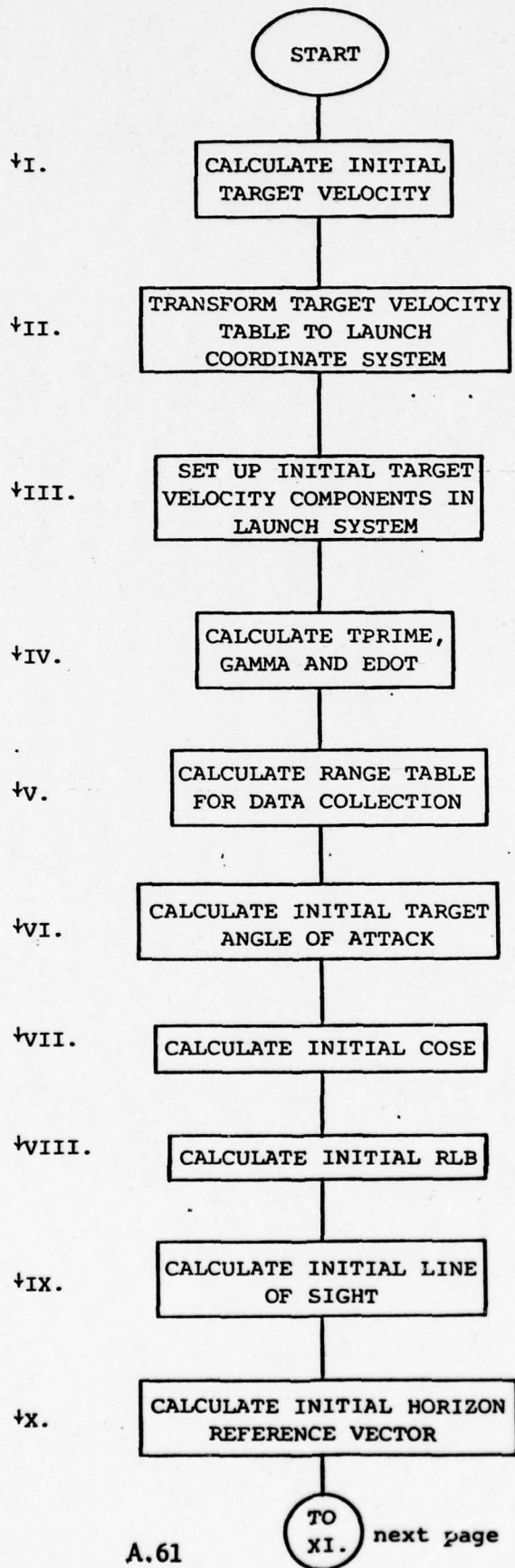
NL

3 of 4
AD
A052 676



SUBROUTINE INIT
FIRST LEVEL FLOW DIAGRAM

SUBROUTINE INIT



SUBROUTINE INIT (Continued)

↓XI.

CALCULATE INITIAL TARGET
CENTER LINE VECTOR

↓XII.

CALCULATE INITIAL PLUME
ROTATION ANGLE

↓XIII.

CALCULATE INITIAL
IRIS RATIO 7

RETURN

SUBROUTINE INIT
SECOND LEVEL FLOW DIAGRAMS

I.
CALCULATE INITIAL
TARGET VELOCITY

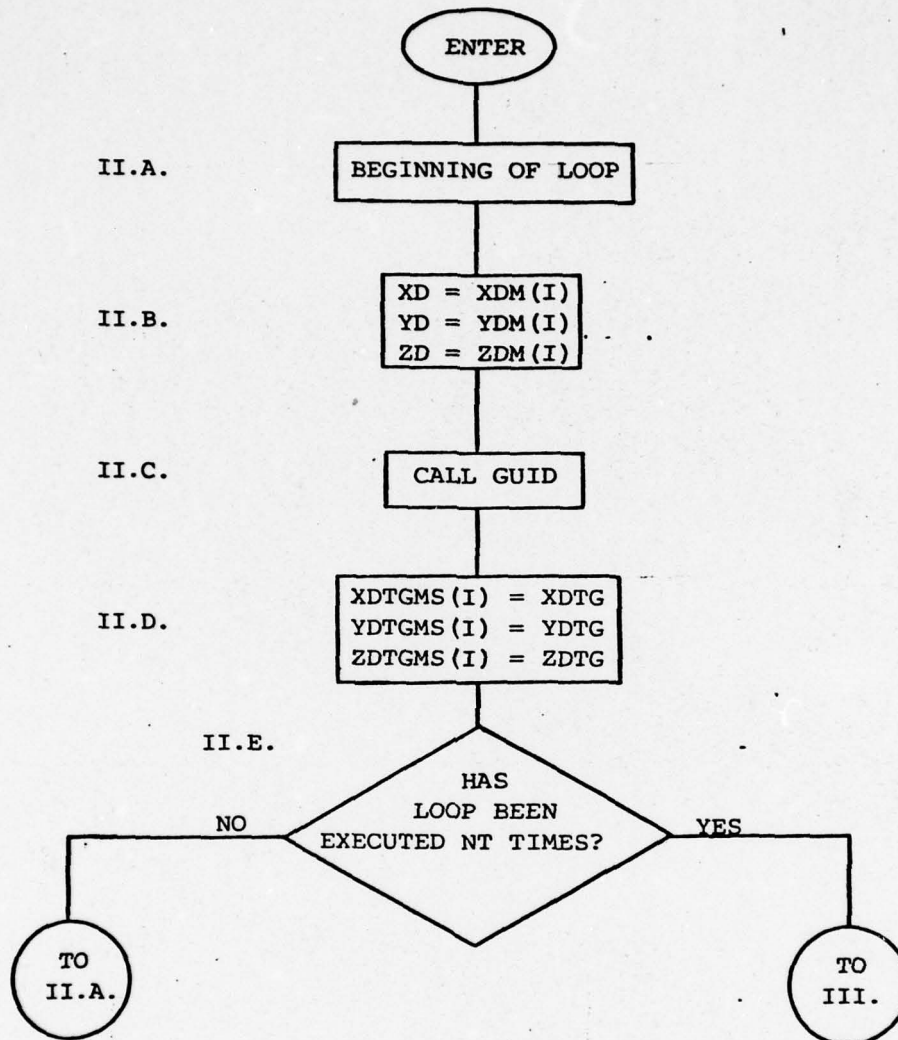
ENTER

I.A.

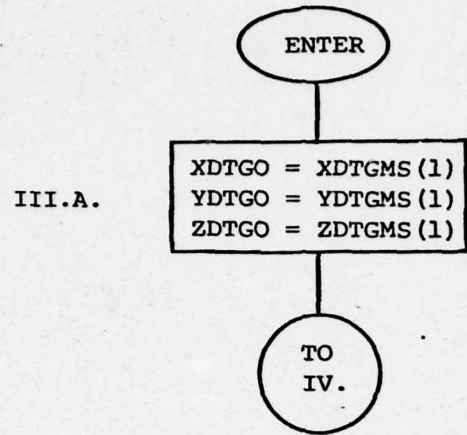
$$VVVV = \text{SQRT}(XDM(1)**2 + YDM(1)**2 + ZDM(1)**2)$$

TO
II.

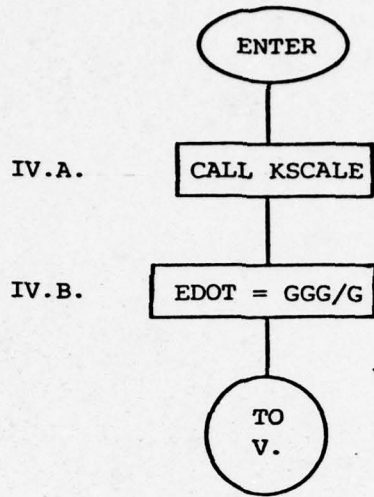
II.
TRANSFORM TARGET VELOCITY
TABLE TO LAUNCH
COORDINATE SYSTEM



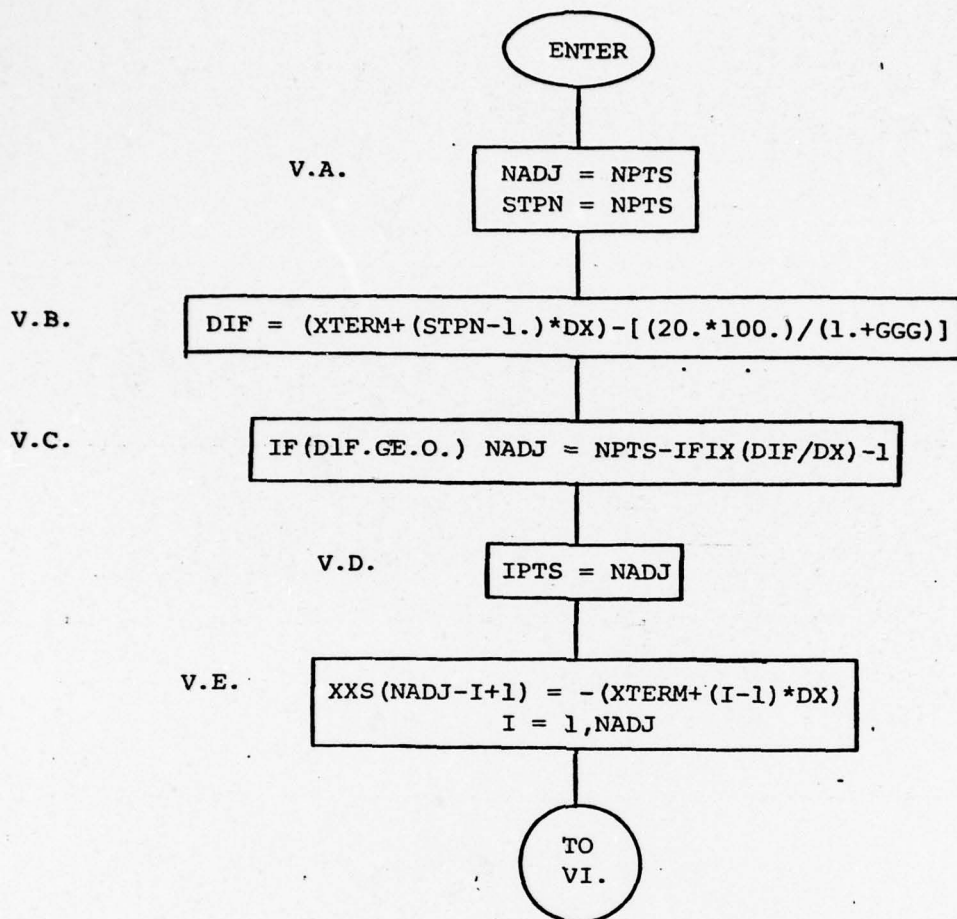
III.
SET UP INITIAL TARGET
VELOCITY COMPONENTS
IN LAUNCH SYSTEM



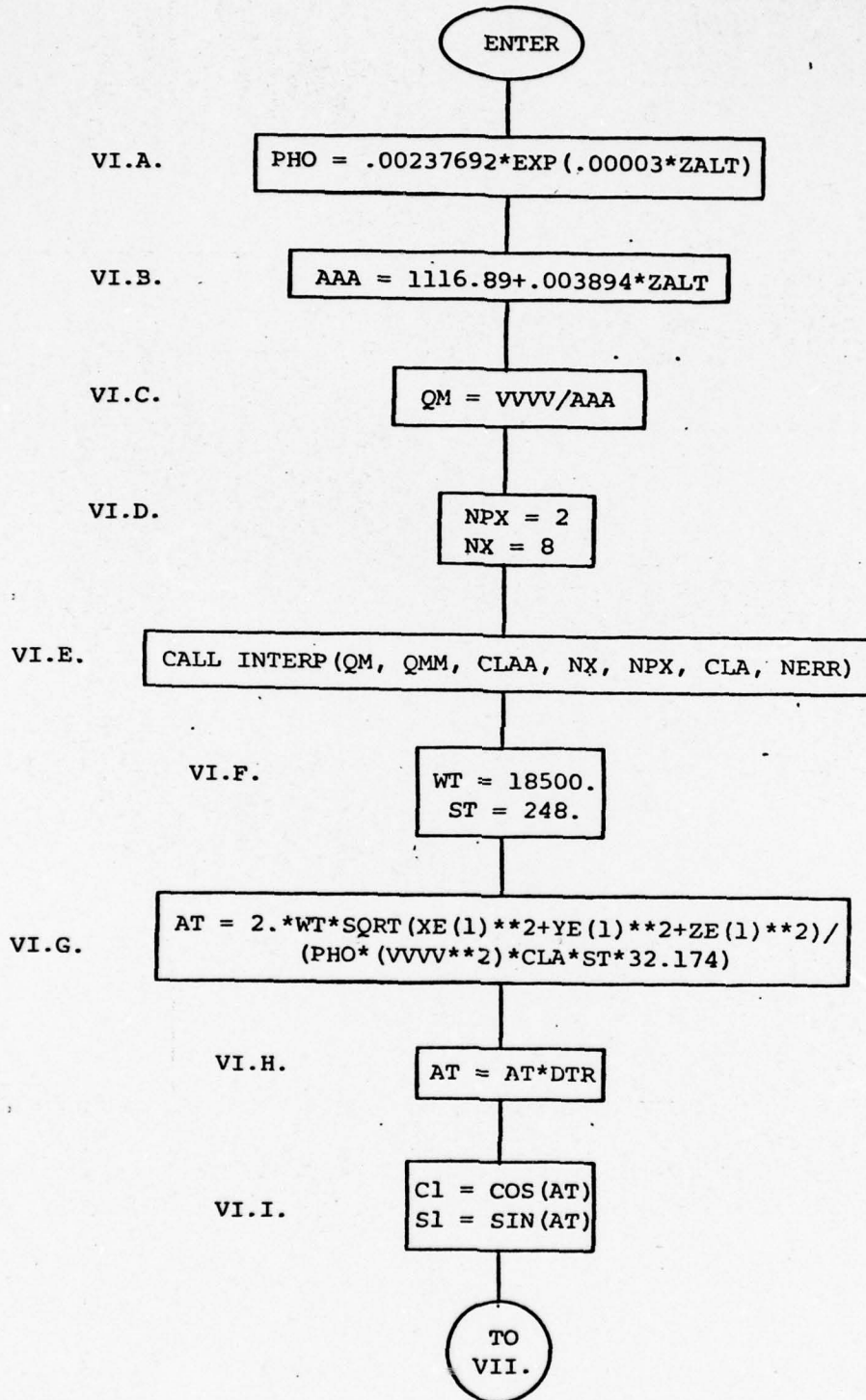
IV.
CALCULATE TPRIME,
GAMMA AND EDOT



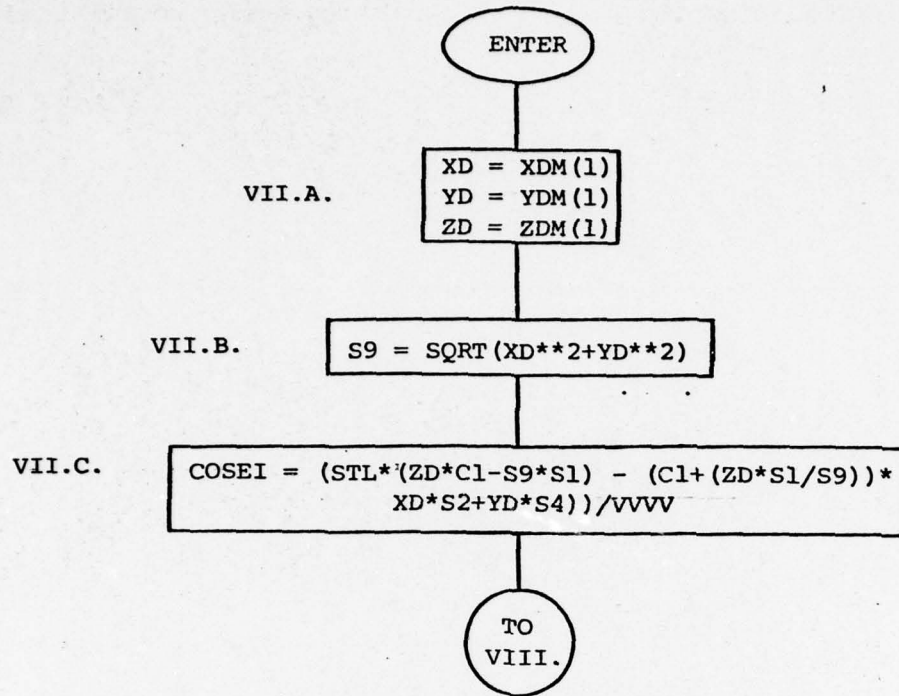
V.
CALCULATE RANGE TABLE
FOR DATA COLLECTION



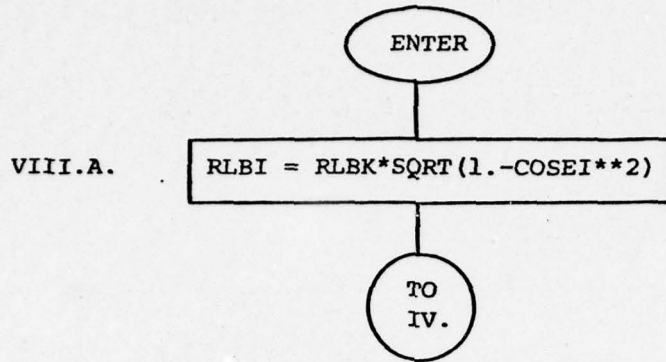
VI.
CALCULATE INITIAL TARGET
ANGLE OF ATTACK



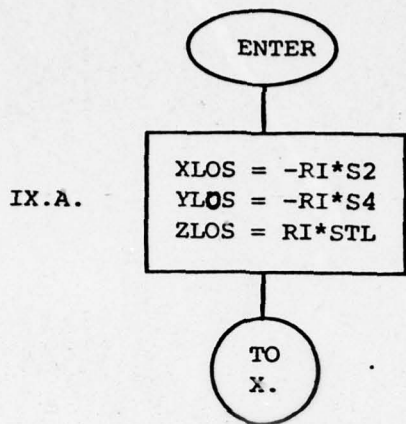
VII.
CALCULATE INITIAL COSE



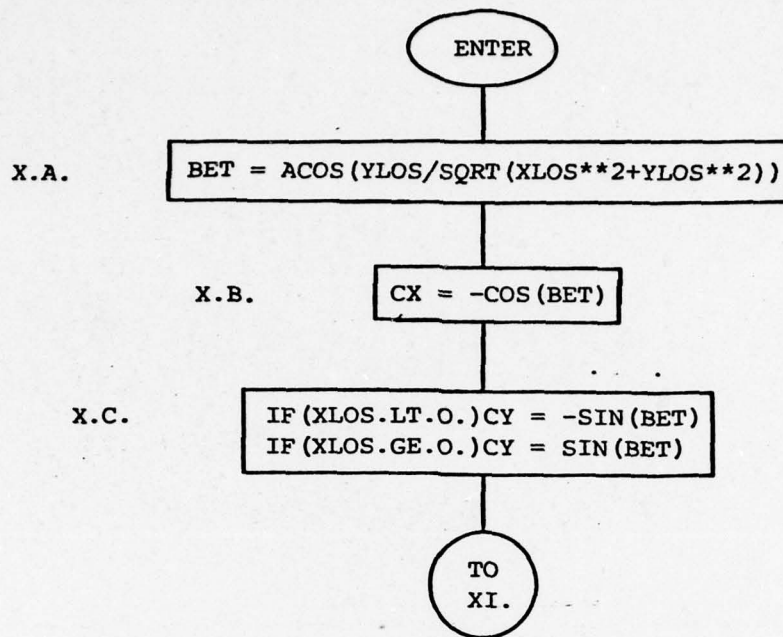
VIII.
CALCULATE INITIAL RLB



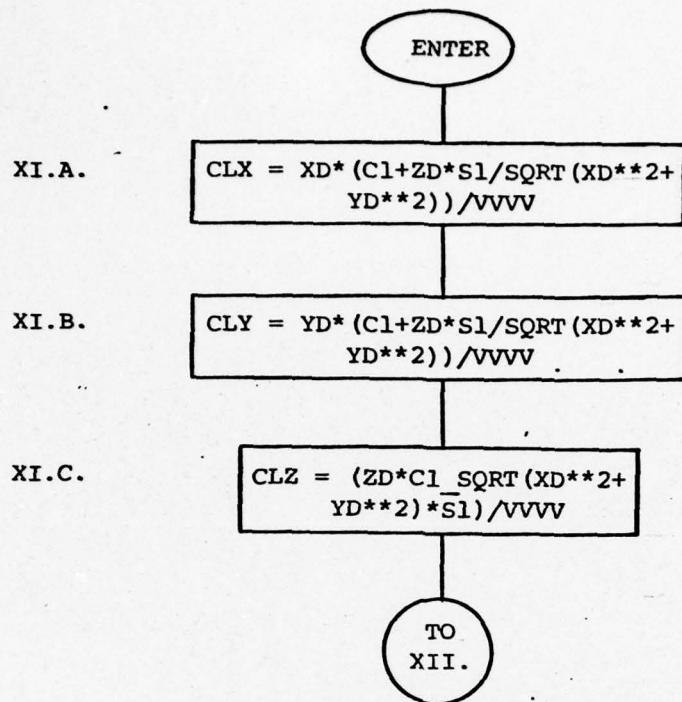
IX.
CALCULATE INITIAL
LINE OF SIGHT



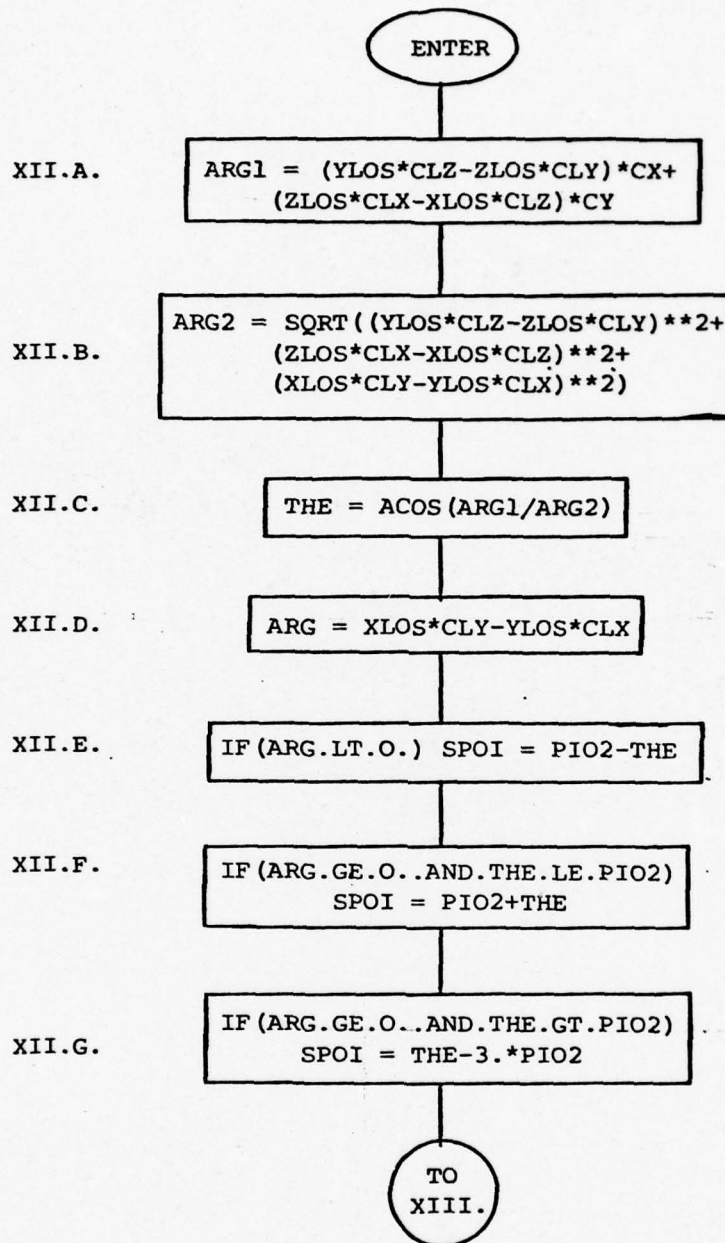
X.
CALCULATE INITIAL HORIZON
REFERENCE VECTOR



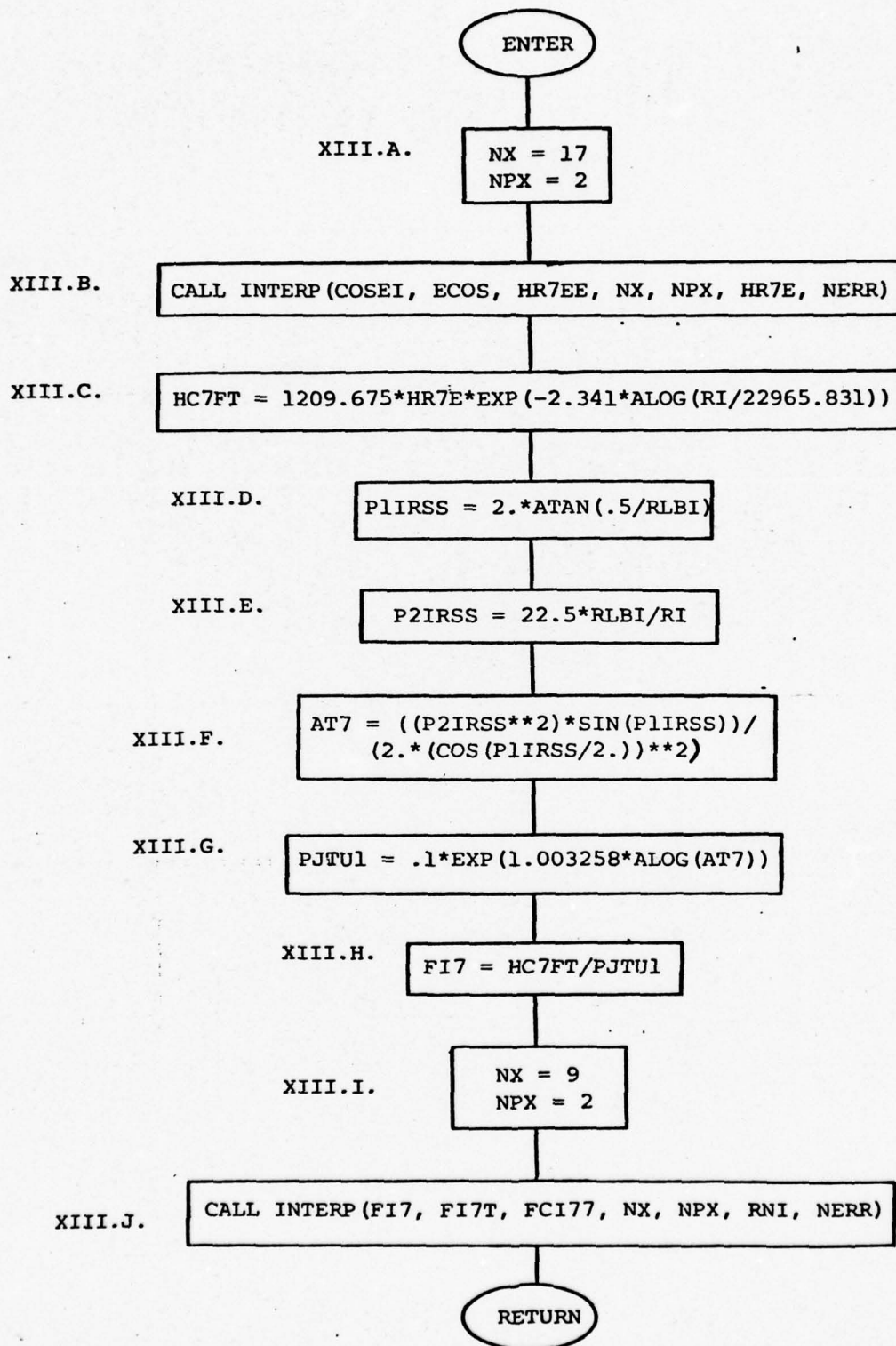
XI.
CALCULATE INITIAL TARGET
CENTER LINE VECTOR



XII.
CALCULATE INITIAL PLUME
ROTATION ANGLE



XIII.
CALCULATE INITIAL
IRIS RATIO 7



APPENDIX B. STRUCTURED MAIN AND SUBROUTINE INIT

*DAOUT7,DAOUT9,DAOUT9,DAOUT10,DAOUT11
COMMON/ODIS2/IOUT

C***
C*** NEXT CARJ IS TAPE SPECIFIC FOR LAUNCH AT WSMR

DATA ZADOVE/-3999.7

DATA RTD-DTR/57.2957795,0.017453297

DATA T(I),I=1,27/0.,1.,2.,3.,4.,5.,6.,7.,8.,9.,10.,11.,12.,

13.,14.,15.,16.,17.,18.,19.,20.,21.,22.,23.,24.,25.,26.,/

SCALE = 102.375

SCALE1 = 102.375 / 10.

SCALE2 = 200. * 102.375

SCALE3 = 20. * 102.375

SCALE4 = 6. * 1.02375

SCALE5 = 20. * 102.375

KASEO

RUK=3.3333

10 CONTINUE

READ(5,2000) ISI,NSAM,ICON,INL

PRINT 2012

PRINT 800

PRINT 2002, ISI,NSAM,ICON,INL

PRINT 300

DO 11 I=1,10

READ(5,620) CLM5(I),CLM1(I),CLM2(I)

PRINT 2005, CLM5(I), CLM1(I),CLM2(I)

11 CONTINUE

READ(5,621) Q1,Q2,Q3,Q4,Q5,Q6

PRINT 800

PRINT 2006, Q1,Q2,Q3,Q4,Q5,Q6

READ(5,621) M1,M2,M3,M4,M5,M6

PRINT 800

PRINT 2007, M1,M2,M3,M4,M5,M6

CALL SCLTM

READ(5,902) NRUNS

PRINT 800

PRINT 2010, NRUNS

NR=NR*3

IF (NR*3.LE.20) GO TO 15

PRINT 302, NRUNS

NRUNS = 20

15 CONTINUE

READ(5,903) NPTS,DX,XTERM

PRINT 800

PRINT 2008, NPTS,DX,XTERM

READ(5,902) NL

PRINT 800

PRINT 2014, NL

IF (NL.LE.61) GO TO 30

PRINT 823, NL

GO TO 3

30 CONTINUE

PRINT 800

IF (ISI.NE.1) PRINT 833

C*** READ AND PRINT LOADED LAUNCH CONDITION SETS.

NL=NL*1

```

115 PRINT 800
DO 40 I=1,NLL
READ (5,904) ZIEO(I),ASC(I),RR(I)
ZIE = -ZIEO(I)
IF (IS1.NE.1) PRINT 835, I,ZIE,ASC(I),RR(I)
40 CONTINUE
3 CONTINUE
PRINT 800
NT=27
IQCIF0
GO TO 42
C*** AUTOMATIC SELECTION OF LAUNCH CONDITIONS.
41 INL=INL+1
IFT=0
130 C INDEX FOR AUTO TEST CASE CHECK
63 I99=0
U77=FLOAT(INL)
U75=(U77-1.)/.75.
I77=IFIX(U75)
U79=FLOAT(I77)
U80=U78-U79
135 C TEST FOR EVERY FIFTH LAUNCH SET
IF (U80.LT.0.01) I99=1
C TEST FOR FIRST LAUNCH SET
IF (INL.EQ.1) I99=1
140 IF (INL.EQ.1) IQC1=1
C INDEX FOR OTHER RUNS
I88=7
145 C TEST FOR LAST TEST CASE CHECK
IF (INL.GT.NL) I88=1
C TEST CASE CHECK REQUIRED AFTER LAST LAUNCH SET
IF (INL.GT.NL) I99=1
IF (I99.EQ.1) GO TO 62
828 *** E PHL
KA=KASE
PRINT 918, KA
ITT=ITRAJ(INL)
PRINT 915,ITT
IT1=ITAU(INL)
PRINT 917,ITT
TAU=FLOAT(ITT)
GO TO 51
42 READ(5,2000) III,IRSS,KA,ITT,NOGO
PRINT 800
PRINT 2003, III,IRSS,KA,ITT,NOGO
READ(5,2001) TAU
PRINT 800
PRINT 2004,TAU
IF (III.EQ.1) GO TO 41
5 CONTINUE
5 PRINT 800
23 CONTINUE
C*** LAUNCH CONDITIONS HAVE BEEN SELECTED.
62 CONTINUE
PRINT 925
TAU=3.0

```

C INDEX FOR TEST CASE DATA CARD OF LAUNCH CONDITIONS
 KA=NL+1
 C INDEX FOR TEST CASE TARGET MANEUVER
 C*** NEXT CARD IS TAPE SPECIFIC FOR ITT=39 FOR TEST CASE MANEUVER

ITT=39
 C*** ADJUST FOR TAU AND SCALE TARGET VELOCITY-TIME MANEUVER TABLE.
 51 NTAU = INT(TAU) + 1
 DO 25 I = NTAU, NT
 K = I - NTAU + 1

180 TMA(K)=TMI(I)-TAJ
 TMA(K)=TMA(K)
 XOM(K)=XOEM(I, ITT)
 YOM(K)=YOEM(I, ITT)
 ZOM(K)=ZDEM(I, ITT)
 185 25 CONTINUE
 KK=INT(TAU)*I
 DO 26 K=KK, NT

190 TMA(K)=FLOAT(K)-I.
 XOM(K)=XDEM(K, ITT)
 YOM(K)=YDEM(K, ITT)
 ZOM(K)=ZDEM(K, ITT)
 25 CONTINUE TARGET AERODYNAMIC ACCELERATION TABLE

195 C*** GENERATE TARGET AERODYNAMIC ACCELERATION TABLE
 XE(I)=XOH(2)-XOH(I)
 YE(I)=YOH(2)-YOH(I)
 ZE(I)=ZOH(2)-ZOH(I)-32.174
 DO 31 I=2, NT
 IV=I-1
 XE(I)=XOH(I)-XOH(IV)
 YE(I)=YOH(I)-YOH(IV)
 ZE(I)=ZOH(I)-ZOH(IV)-32.174

200 31 CONTINUE
 KASE=KA
 ZET=ZOH(KASE)
 ZZZ=ZTAJ+ZOVE
 ZALT=ZZZ
 AS=ASC(KASE)
 ZRR(KASE)
 XO=XOM(I)
 YO=YOM(I)
 ZO=ZOM(I)

210 ZD=ZOM(I)
 C CHECK FOR HELICOPTER
 VVV=SQRT(XO*XO+YO*YO+ZO*ZO)
 IF(VVV.LT.338.0) PRINT 199

215 C***
 KK=ZU
 IF(XD.NE.0.0.AND.YD.NE.0.0) GO TO 55
 IF(YD.EQ.0.0.AND.ZD.EQ.0.0) GO TO 53
 IF(XD.EQ.0.0.AND.YD.LT.0.0) GO TO 54
 KK=Z1

220 SCC=0.0
 KSC=0.0
 IF(ZD.EQ.0.0) GO TO 52
 IF(ZD.GT.0.0) SEC=90.*DTR
 PRINT 913
 GO TO 50

225

```

230 52 PRINT 914
    SED=0.0
    GO TO 60
235 53 BETA=90.
    50 TO 55
    54 BETA=270.
    GO TO 56
    55 BETA=ATAN2(YU,XOI)*RTD
    56 ASCO=AS*BETA-180.
    IF ASCO.GT.0.UF GO TO 60
    ASCO=360.+ASCO
240 60 CONTINUE
    SCO=ASCO*DIR
    50=ASIN(ARG)
    THETA=30*RTD
    ASO=SO*RTD
    X=R*COS(SO)*COS(SCO)
    Y=R*COS(SO)*SIN(SCO)
    PRINT 305, ASCO,ASO,R
    PRINT 912,X,Y,Z
245 C*** CALCULATE CONSTANTS FOR COORDINATE TRANSFORMATION
    SINSO=SIN(SO)
    COSCO=COS(SO)
    SINSO=SIN(SCO)
    COSCO=COS(SCO)
    S2=CJ30*COS3CO
    S3=SIN30*COSSCO
    S4=COS30*SINSO
    S5=SIN30*SINSCO
    PL=CJ30
    JL=JL30
    CPE=COSSCO
250 C*** MAKE EARTH TO GUIDANCE TRANSFORMATION
    CALL GUID
    XDTG = XDTG
    YDTG = YDTG
    ZDTG = ZDTG
255 C*** CALCULATE SCALE FACTOR EQUATION
    91-R
    CALL KSCALE,RETURNS1501
    FDOT=GG/G
    SPK=0.
    SPHG=J.
    SPMS=0.
    SPNEJ.
    H11=H0J15
    IF (IRSS.EQ.1) NRUNS=IRSS
    IF (IRSS.EQ.1) NK=IRSS
    IF (IRSS.EQ.1) I99=0
    IF (I99.EQ.1) NRUNS=NSAM+1
    IF (I99.EQ.1) NR=NRUNS
    DO 150 I=1,NRUNS
    CALL INIT
    IF (I51.EQ.1) PRINT 77,RN
260 245
265
270
275

```

```

ICN = 1
XMISS(7) = -77
C*** ZERO STORAGES AREA
DO 85 J=1,150
  DO 85 K=1,4
    XMAN(K,J) = 0.
85 CONTINUE
DO 90 J=1,150
  PPX(J) = 0.0
  PPZ(J) = 0.0
  TIME(J) = 0.0
  VMX(J) = 0.0
  VMY(J) = 0.0
  VMZ(J) = 0.0
90 CONTINUE
IPYS=NAOJ
LEVEL=-7
CALL FLIGHT
PRINT 2312
IF (ISL.EQ.1) GO TO 91
PRINT 999R(I,GAM,EDDT,XUTG0,YDTG0,ZDTG0,RN,RLB,SP0
PRINT 993XCOMP,YCOMP,ZCOMP,G,G6G,XDO,YDO,ZDO,DXG,DYG
PRINT 939DZG,S2,S3,S4,S5,RLBK,SCALEP,COSE,F1,F2
PRINT 939F3,G1,G2,G3,XG,YG,ZG,S1,R2R,S3
PRINT 939SPL,ACTL,STL,CPL,A1,VT1,ZALY,CLA,PH0,ARG
PRINT 939AAA,SCALET,TREAL,XTA,YTA,ZTA,SCALEV,QM,SA,CA
PRINT 939TRP,XLOS,YLOS,ZLOS,CO,CX,CY,CLZ,CLZ,VVVV
PRINT 939ACI,AS,SEO,SS,ASEO,R,SCALEL,THE TAL,THE
91 CONTINUE
NOPT = NADJ
C*** SCALE AND WRITE THE POSITION POINTS
IF (ISL.EQ.1) PRINT 898
IF (XMISS(7).GE.0.) PRINT 908, XMISS
IF (ISL.EQ.1) PRINT 809,ICN
IF (ISL.NC.1) PRINT 810,ICN
95 IF ((IPYS.EQ.0) GO TO 150
DO 110 J=1,NAOJ
  PPXS(J)=PPX(J)
  PPYS(J)=PPY(J)
  PPZS(J)=PPZ(J)
  TIMES(J)=TIME(J)
  VMXS(J)=VMX(J)
  VMYS(J)=VMY(J)
  VMZS(J)=VMZ(J)
IF (ISL.EQ.1) GO TO 110
PRINT ALL, PPXS(J),PPYS(J),PPZS(J),TIMES(J)
110 CONTINUE
C CHECK DIGITAL TIME CRITICAL DATA COLLECTION
NOA=NAOJ-1
JJ=330+YEI*NOX
XC0M1=-XXIM)
XC00K=-KX(M+1)
IF (XC0M1.LT.XCOLL-AND:XC0LL.LT.XC0JX) GO TO 330
GO TO 329

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```

330 CONTINUE
    XCOMH=-XXINADJ
    XCOLL=PPXS(NADJ)
345   XCDX=-XXINADJ*DX
    IF (XCOMH.LT.XCOLL.AND.XCOLL.LT.XCOOX) GO TO 83
329 DO 331 M=1,20
331 PRINT 332
    83 CONTINUE
    IF (LEVEL.LI.0) GO TO 116
    C*** SCALE AND WRITE THE MANEUVER DATA
    IF (ISL.EI.1) GO TO 111
    PRINT 907
355   111 CONTINUE
    DO 114 J=1,NADJ
    IF (ISL.EI.1) GO TO 114
    PRINT 908, (XMAN(K),J),K=1,4)
    114 CONTINUE
    IF (ISL.NE.1) PRINT 919,X00,Y00,Z00
360   116 CONTINUE
    C*** NEXT CARU IS TAPE SPECIFIC FOR ITT-I FOR STATIONARY TARGET
    IF (ITT.NE.1.AND.LEVEL.EQ.0.AND.VVVV.GE.338.0) CALL PRIME
    IF (LEVEL.NE.0) GO TO 150
365   C*** CALCULATE THE MISS-DISTANCE
    CALL MISSCOM
    PRINT 815
    PRINT 813
    DO 120 K=1,3
    PRINT 814, XH(K),YH(K),ZH(K),RH(K)
    120 CONTINUE
    C*** SAVE THE MISS-DISTANCE DATA
    AXH(ICN) = XH(1)
    AYH(ICN) = YH(1)
    AZH(ICN) = ZH(1)
    ARH(ICN) = RH(1)
    AXH(ICN) = XH(2)
    AYH(ICN) = YH(2)
    AZH(ICN) = ZH(2)
    ARH(ICN) = RH(2)
    AXH(ICN) = XH(3)
    AYH(ICN) = YH(3)
    AZH(ICN) = ZH(3)
    ARH(ICN) = RH(3)
    IF (VVVV.LI.338.0) GO TO 150
    XH(1)=XH(1)+19.5*YA
    ZH(1)=ZH(1)+19.5*ZA
380   XH(2)=XH(2)-19.5
    YH(2)=YH(2)
    ZH(2)=ZH(2)
    XH(3)=XH(3)-19.5
    YH(3)=YH(3)
    ZH(3)=ZH(3)
    AXH(ICN)=XH(1)
    AYH(ICN)=YH(1)
395   AZH(ICN)=ZH(1)
    AXH(ICN)=XH(2)
    AYH(ICN)=YH(2)
    AZH(ICN)=ZH(2)
    AXH(ICN)=XH(3)
    AYH(ICN)=YH(3)

```

```

400 AZBT(ICN)=ZMT(2)
    AXCT(ICN)=XMT(3)
    AYCT(ICN)=YMT(3)
    AZCT(ICN)=ZMT(3)
    DO 121 K=1,3
405 121 RMT(K)=SORT(XMT(K)**2+YMT(K)**2+ZMT(K)**2)
    PRINT 800
    ARMT(ICN)=RMT(1)
    ARCT(ICN)=RMT(2)
    AZCT(ICN)=RMT(3)
    PRINT 815
    PRINT 813
    DO 122 K=1,3
    PRINT 814, XMT(K), YMT(K), ZMT(K), RMT(K)
122 CONTINUE
    CALL LEYH
415 C*** GO BACK FOR THE NEXT FLIGHT
    150 CONTINUE
    C*** AFTER FLIGHTS HAVE BEEN COMPLETED, CALCULATE MEAN AND STD DEV
    PRINT 815
    IPCANEED
    CALL MEAN (AXM,AYM,AZM,ARM,NRUNS,XY(1),YM(1),ZM(1),RM(1))
    PRINT 831
    CALL MEAN (AXB,AYB,AZB,ARB,NRUNS,XY(2),YM(2),ZM(2),RM(2))
    PRINT 832
    CALL MEAN (AXC,AYC,AZC,ARC,NRUNS,XY(3),YM(3),ZM(3),RM(3))
    C*** GO BACK FOR THE NEXT SET OF FLIGHT CONDITIONS
    IF(VVVV.LT.338.0) GO TO 197
    PRINT 800
    PRINT 816
    PRINT 830
    IF(I99.EQ.1) IPLANE = 1
    CALL MEAN (AXMT,AYMT,AZMT,ARMT,NRUNS,XMT(1),YMT(1),ZMT(1),RMT(1))
    PRINT 831
    IF(I99.EQ.1) IPLANE = 2
    CALL MEAN (AXBT,AYBT,AZBT,ARBT,NRUNS,XMT(2),YMT(2),ZMT(2),RMT(2))
    PRINT 832
    IF(I99.EQ.1) IPLANE = 3
    CALL MEAN (AXCT,AYCT,AZCT,ARCT,NRUNS,XMT(3),YMT(3),ZMT(3),RMT(3))
    AASUM=SPHG/NR
    ABRUNS=SPH/NR
    PRINT 102,ABRUNS,ABSUM,AASUM,AARUNS
445 NRUNS = N111
    RT = N111
    IF(IFT.NE.1) GO TO 602
    DO 530 I=1,10
    PRINT 601
    IFT=3
    IF(ICOR.EQ.1) GO TO 635
    503 CONTINUE
    IF(I101.EQ.1) GO TO 62
    IF(I88.EQ.1) GO TO 240
    INL=INL+4

```

```

GO TO 62
240 INCL=INC
241 INCL=INNCL-5
650 IF (INNCL.GT.5) GO TO 241
    I88=0
    IHL=IHL-INNCL
    GO TO 62
602 IF (I99.NE.1) GO TO 627
    IF (IQ1.EQ.1) GO TO 626
    IF (I88.EQ.1) GO TO 50
    GO TO 633
626 IQ1=0
    GO TO 633
627 IF (IRSS.NE.1) GO TO 50
    GO TO 41
635 IQ1=0
    IF (I88.EQ.1) GO TO 50
635 IQ1=0
    GO TO 623
198 GO TO 50
200 CONTINUE
IF (INDG.EQ.0) GO TO 300
    GO TO 3
201 PRINT=840
77 FORMAT(140,10X,17H RANDOM NUMBER IS,E15.8)
102 FORMAT(140,8H =,F6.4,3X,8H =,F6.4,3X,3H =,F6.4,
    *3X,8H =,F6.4)
193 FORMAT(10X,37H TARGET IS ASSUMED TO BE A HELICOPTER)
332 FORMAT(33H TIME CRITICAL DATA COLLECTION FAILURE.)
500 FORMAT(10X,51H IF AUTOMATIC MODE SELECTION IS PLANNED, SELECT THE
    * 45H DESIRED STARTING LAUNCH SET NUMBER WITH SENSE
    * 10H SWITCHES./
    * 10X,52H IF MANUAL MODE SELECTION IS PLANNED, SENSE SWITCHES
    * 31H WILL BE IGNORED AT THIS POINT./
    * 10X,12H PUSH START./
    * 10X,12H PUSH START./)
641 FORMAT(10X,49H TEST BASE OUT OF LIMITS./)
605 FORMAT(10X,49H IF COMPLETE PRINTOUT IS DESIRED, SELECT 1 WITH
    * 16H SENSE SWITCHES./
    * 10X,51H IF ONLY ESSENTIAL PRINTOUT IS DESIRED, SELECT 0
    * 23H WITH SENSE SWITCHES./
    * 10X,12H PUSH START./)
620 FORMAT(3F6.3)
621 FORMAT(6F10.4)
622 FORMAT(10X,49H SELECT THE QUALITY CONTROL TEST CASE SAMPLE SIZE
    * 21H WITH SENSE SWITCHES./
    * 10X,43H SAMPLE SIZE MUST BE IN RANGE 2 THROUGH 11.)
623 FORMAT(10X,50H IF AUTOMATIC MODE SELECTION IS PLANNED, AND IT IS
    * 49H DESIRED TO CONTINUE IF A QUALITY CONTROL FAILURE
    * 8H OCCURS./
    * 10X,48H THEN SELECT 1 WITH SENSE SWITCHES. OTHERWISE,
    * 13H SELECT 2
    * 13H SELECT 2)
625 FORMAT(10X,16H TEST CASE :...../)
640 FORMAT(10X,45H IF THIS IS A MICOM HYBRID/IRSS RUN, SELECT
    * 23H 1 WITH SENSE SWITCHES./
    * 10X,44H IF IT IS NOT, SELECT 2 WITH SENSE SWITCHES./
    * 10X,12H PUSH START.)
710 FORMAT(10X,46H SELECT TARGET TRAJECTORY WITH SENSE SWITCHES./

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* 10X,18H THEN PRESS START.)
715 FORMAT(10X,20H TARGET TRAJECTORY #12,15H WAS SELECTED./
* 10X,32H IF THIS IS CORRECT, PUSH START./
* 10X,36H IF THIS IS WRONG, TURN SWITCHES OFF
* 16H AND PUSH START.)
720 FORMAT(10X,49H SELECT POINT TAU ON TARGET TRAJECTORY AT TIME OF
* 15H MISSILE LAUNCH./10X,20H USE SENSE SWITCHES.)
725 FORMAT(10X,64H TAJ = #12,39H WAS SELECTED. TO CONTINUE, SELECT 1
* 41H WITH SENSE SWITCH IF TAU=0 WAS SELECTED./
* 10X,52H IF TAU=0 WAS NOT SELECTED, LEAVE SENSE SWITCHES AS
* 3HTHEY ARE./
* 10X,12H PUSH START.)
800 FORMAT (140)
801 FORMAT(10X 50H SELECT THE LAUNCH CONDITIONS WITH SENSE SWITCHES./
* 10X 18H THEN PRESS START./
* 10X 50H TO END RUN, TURN ALL SWITCHES ON AND PRESS START )
802 FORMAT (10X 15, 39H IS TOO MANY RUNS. IT IS CHANGED TO 20 )
803 FORMAT(10X,18H LAUNCH CONDITIONS,15,4X,10H WERE SET./
* 10X 32H IF THIS IS CORRECT, PUSH START. /
* 10X 36H IF THIS IS WRONG, TURN SWITCHES OFF
* 16H AND PUSH START.)
805 FORMAT(10X,13H PSI LAUNCH = #7,2,4H DEG,5X,15H THETA LAUNCH = #6,2,
* 4H DEG,5X,16H INITIAL RANGE = #9,2,3H FT)
809 FORMAT(10X,11H FLIGHT NO. 15)
810 FORMAT (5X 11H FLIGHT NO. 15,20X 14X 19X 14Y 19X 14Z 10X 5H TIME)
811 FORMAT(20X 4(5X F15.4))
813 FORMAT (10X 14H 8X 3H XM 12X 3H YM 12X 3H ZM
* 12X 3H 3H )
814 FORMAT (24X 3(5X F10.2),615.8)
815 FORMAT(10X,23H REFERENCED TO TAILPIPE)
816 FORMAT(10X,17H REFERENCED TO CG)
823 FORMAT (5X 15,5X 20H FOR NL IS TOO LARGE )
830 FORMAT (140 10X 20H Y-Z PLANE . . . . .)
831 FORMAT (140 10X 20H X-Y PLANE . . . . .)
832 FORMAT (140 10X 20H X-Z PLANE . . . . .)
833 FORMAT (10X 27H TABLE OF LAUNCH CONDITIONS:777)
835 FORMAT(10X,5H SET 12,5X,11H ALTITUDE = #9,2,2X,3H FT,2X,
* 17H CROSSING ANGLE = #7,2,2X,4H DEG,2X,15H INITIAL RANGE = #10,2,
* 2X,3H FT)
840 FORMAT (10X 26H END OF RUN. SIGNING OFF. )
902 FORMAT(15)
903 FORMAT(10,2F10.0)
904 FORMAT(3F10.2)
907 FORMAT (140 4X 35H TIME XD MANEUVER YD MANEUVER
* 15H ZD MANEUVER)
908 FORMAT(1X F10.4, 3(3X F8.2,6X))
909 FORMAT (5H X = F7,4,2X 5H Y = F7,4,2X 5H Z = F7,4,2X 8H XDOT =
F7,4,2X 8H YDOT = F7,4,2X 8H ZDOT = F7,4,8H MISS = E10.3)
912 FORMAT(10X,7H XICD = #10,2,3H F1,5X,7H YICD = #10,2,3H F1,5X,
* 7H ZICD = #10,2,3H FT)
913 FORMAT(10X,62H VERTICAL TARGET TRAJECTORY. CROSSING ANGLE IS NOT A
* PPLICABLE.)
914 FORMAT(10X,53H STATIONARY TARGET. CROSSING ANGLE IS NOT APPLICABLE
* )
915 FORMAT(10X,94H PUSH ALL SENSE SWITCHES ON FOR AUTOMATIC OPERATION
* OR ELSE MANUAL OPERATION WILL BE SELECTED:710X,12H PUSH START.)
916 FORMAT(10X,13H TARGET TRAJECTORY #12)

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917 FORMAT(1JX,7M TAU = ,I2)
918 FORMAT(7//10X,5H SET ,I2)
919 FORMAT(10X,5HX00 = ,F10.4,5X,5HY00 = ,F10.4,5X,5HZ00 = ,F10.4)
995 FORMAT(6I5)
999 FORMAT(10(1X,E11.4))
2000 FORMAT(6I5)
2001 FORMAT(F10.0)
2002 FORMAT (5X,6HISI = ,I5,5X,7HNSAM = ,I5,5X,7HICON = ,I5,5X,6HINL = ,I5)
2003 FORMAT (5X,6HIII = ,I5,5X,7HIKSS = ,I5,5X,5HKA = ,I5,5X,6HIII = ,I5,5X,7HJGO = ,I5)
2004 FORMAT (5X,6HTAU = ,F10.5)
2005 FORMAT (5X,7HCLMS = ,F10.5,5X,7HCLS1 = ,F10.5,5X,7HCLS2 = ,F10.5)
2006 FORMAT (5X,5HQ1 = ,F10.5,5X,5HQ2 = ,F10.5,5X,5HQ3 = ,F10.5,5X,5HQ4 = ,F10.5)
1 = ,F10.5,5X,5HQ5 = ,F10.5,5X,5HQ6 = ,F10.5)
2007 FORMAT (5X,5HMI = ,F10.5,5X,5HM2 = ,F10.5,5X,5HM3 = ,F10.5,5X,5HM4 = ,F10.5,5X,5HM5 = ,F10.5,5X,5HM6 = ,F10.5)
2008 FORMAT (5X,7HNPIS = ,I5,5X,5HDX = ,F10.5,5X,6HXTERM = ,F10.5)
2009 FORMAT (5X,7HZTEC = ,F10.5,5X,6HASC = ,F10.5,5X,5HRR = ,F10.5)
590 2010 FORMAT (5X,6HRRUNS = ,I5)
2011 FORMAT (5X,5HNL = ,I5)
2012 FORMAT(1H)
300 STOP
END

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SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
4347 MAIN

VARIABLES	SN	TYPE	RELOCATION	COMA
1621 AAA	10106	REAL	AARUNS	REAL
10107 AASUM	10111	REAL	AGRUNS	REAL
10110 JUSUM	10463	REAL	ARB	ARRAY
11253 ARBT	10603	REAL	ARC	ARRAY
11373 ARCT	1620	REAL	ARG	COMA
10343 ARN	11133	REAL	ARMT	ARRAY
4 AS	10627	REAL	ASC	ARRAY
10671 ASCO	7	REAL	ASEO	EXTRA
10674 ASO	11	REAL	AT	REAL
13257 AXB	11157	REAL	AX3T	REAL
13297 AXC	11277	REAL	AXCT	REAL
10247 AXH	11037	REAL	AXHT	REAL
10413 AYD	11203	REAL	AYBT	REAL
13533 AVC	11323	REAL	AVCT	REAL
10273 AYH	11063	REAL	AVMT	REAL
10457 AZB	11227	REAL	AZBT	REAL
10557 AZC	11347	REAL	AZCT	REAL
10317 AZH	11107	REAL	AZMT	REAL
1446 A1	64	REAL	A1P1	COMA
70 A1P2	74	REAL	A1P3	COMA
100 A1P4	104	REAL	A1P5	COMA
110 A1P6	53	REAL	A2P1	COMA
67 A2P2	73	REAL	A2P3	COMA
77 A2P4	103	REAL	A2P5	COMA
107 A2P6	102	REAL	BDHX	COMA
130 BDHY	156	REAL	BDHZ	COMA
10072 BETA	1702	REAL	CA	COMA
1507 CLA	1605	REAL	CLAA	COMA
27 CLB	45	REAL	CLSL	COMA
23 CLZ	23	REAL	CLY	COMA
0 COSA	17	REAL	CO	COMA
70 COSE	1	REAL	CO3B	COMA
1443 SPL	2	REAL	CO3G	COMA
20 CX	1441	REAL	JTL	COMA
13 J1	21	REAL	CY	COMA
502171 JAOUT1J	502160	REAL	JAOUT1	COMA
502151 JAOUT2	502172	REAL	JAOUT1I	COMA
502153 JAOUT4	502162	REAL	JAOUT3	COMA
502165 JAOUT6	502164	REAL	JAOUT5	COMA
502167 JAOUT8	502166	REAL	JAOUT7	COMA
116J DELTA4	502173	REAL	JAOUT9	COMA
1 JX	6144	REAL	OTR	COMA
1252 JY6	1261	REAL	DXG	COMA
2131 COS	1263	REAL	OZG	COMA
2204 FC177	74	REAL	EDOT	COMA
0 FXA	2173	REAL	F171	COMA
6 FXC	3	REAL	FXB	COMA
5 FYD	1	REAL	FYC	COMA
2 FZA	5	REAL	FZD	COMA

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
4567 MAIN

VARIABLES	SN	TYPE	RELOCATION	COMA	REAL	REAL	REAL
1621	AAA	REAL			10106	ARRUNS	REAL
10107	AASJH	REAL			10111	ARRUNS	REAL
10110	AUSUM	REAL			10463	ARB	ARRAY
11253	A5BT	REAL	ARRAY		10603	ARC	ARRAY
11373	A5CT	REAL	ARRAY				COMA
10343	A5M	REAL	ARRAY		11133	ARM	ARRAY
4	AS	REAL		EXTRA	10627	ASC	ARRAY
10671	A5CO	REAL			7	A5EO	EXTRA
10074	A5O	REAL			11	A1	GTARG
10357	A5B	REAL	ARRAY		11157	A5X3T	ARRAY
10507	A5G	REAL	ARRAY		11277	A5XT	ARRAY
10247	A5H	REAL	ARRAY		11037	A5MT	ARRAY
10413	A5B	REAL	ARRAY		11203	A5OT	ARRAY
10533	A5C	REAL	ARRAY		11323	A5CT	ARRAY
10273	A5M	REAL	ARRAY		11063	A5MT	ARRAY
10437	A5Z	REAL	ARRAY		11227	A5ZT	ARRAY
10557	A5C	REAL	ARRAY		11347	A5CT	ARRAY
10317	A5M	REAL	ARRAY		11107	A5MT	ARRAY
1444	A1	REAL	COMA		64	A1P1	COMP
70	A1P2	REAL	COMP		74	A1P3	COMP
100	A1P4	REAL	COMP		104	A1P5	COMP
110	A1P5	REAL	COMP		63	A2P1	COMP
67	A2P2	REAL	COMP		73	A2P3	COMP
77	A2P5	REAL	COMP		103	A2P5	COMP
107	A2P6	REAL	COMP		102	B0HX	PK
133	B0HY	REAL	ARRAY		156	B0HZ	PK
10072	BETA	REAL			1702	CA	COMA
1632	CLA	REAL	COMA		1605	CLAA	ARRAY
27	CLM3	REAL	ARRAY		19	DL91	ARRAY
27	CLM2	REAL	ARRAY		22	BLV	ARRAY
23	CLZ	REAL	EXTRA		17	CD	EXTRA
0	CO5A	REAL	COMD		1	CO5B	COMD
70	CO5E	REAL	COMA		2	CO5G	COMD
3	CO55OC	REAL	ANG		1	CO55O	ANG
1443	CPL	REAL	COMA		1441	CTL	COMA
20	CX	REAL	EXTRA		21	CY	EXTRA
13	21	REAL	EXTRA		502160	DAOUT1	REAL
502171	JAOUT10	REAL	EXTRA		502172	DAOUT11	REAL
502161	JAOUT2	REAL	EXTRA		502162	DAOUT3	REAL
502153	JAOUT4	REAL	EXTRA		502164	JAOUT5	REAL
502165	JAOUT6	REAL	EXTRA		502166	JAOUT7	REAL
502167	JAOUT3	REAL	EXTRA		502170	JAOUT9	REAL
1150	DELTA	REAL	ARRAY		6144	DTR	REAL
1	JX	REAL	EXTRA		1261	DXC	REAL
1432	JYG	REAL	COMA		1263	DZG	REAL
2137	CO5	REAL	COMA		74	E0OT	COMA
2264	FC177	REAL	ARRAY		2473	F17T	ARRAY
0	FX1	REAL	GTARG		3	F2B	GTARG
6	FXC	REAL	GTARG		1	FYA	GTARG
5	FYJ	REAL	GTARG		7	FYC	GTARG
2	FZA	REAL	GTARG		5	FZB	GTARG

VARIABLES	SN	TYPE	RELOCATION	1424	F1	REAL	COMA
10 FZC		REAL	GTARG	1425	F3	REAL	COMA
1254 G		REAL	COMA	73	GAM	REAL	COMA
1255 JGG		REAL	COMA	1427	G1	REAL	COMA
1430 G2		REAL	COMA	1431	G3	REAL	COMA
2152 H7EE		REAL	ARRAY	10043	I	INTEGER	
504001 IAJIN1		INTEGER		504012	IADIN10	INTEGER	
504002 IAJIN2		INTEGER		504003	IADIN3	INTEGER	
504004 IAJIN4		INTEGER		504005	IADIN5	INTEGER	
504006 IAJIN6		INTEGER		504007	IADIN7	INTEGER	
504010 IAJIN8		INTEGER		504011	IADIN9	INTEGER	
15 IC4		INTEGER	MISD	60	ICON	INTEGER	COMP
56 IFT		INTEGER	COMP	10332	III	INTEGER	MANEUV
514000 IIN		INTEGER		10042	INL	INTEGER	
10112 IN13L		INTEGER		516100	IOUT	INTEGER	
57 IPLANE		INTEGER	COMP	1	IPTS	INTEGER	COMA
10050 IOJ1		INTEGER		10061	IRSS	INTEGER	
0 ISI		INTEGER	COMP	10236	ITAU	INTEGER	ARRAY
10142 IT-AJ		INTEGER	ARRAY	0	ITT	INTEGER	MANEUV
10057 IT1		INTEGER		10066	IV	INTEGER	
10053 I77		INTEGER		2	I88	INTEGER	COMP
1 I93		INTEGER	COMP	10100	J	INTEGER	
10054 K		INTEGER		10056	KA	INTEGER	
10041 K43E		INTEGER		208	KILL	INTEGER	ARRAY
10055 KK		INTEGER		3	KKK	INTEGER	PK
0 LEVEL		INTEGER		10102	V	INTEGER	EXTRA
10333 MAJ1		INTEGER	COMA	1601	NERR	INTEGER	COMA
10045 M		INTEGER	MANEUV	10045	NLL	INTEGER	
10052 M053		INTEGER		10101	NOK	INTEGER	
14 M0PT		INTEGER	MISD	0	NPTS	INTEGER	EXTRA
1603 MPX		INTEGER	COMA	10035	NR	REAL	
10044 MRJNS		INTEGER		41	NSAM	INTEGER	COMP
1116 NT		INTEGER	COMA	10063	NTAU	INTEGER	
1504 N		INTEGER	COMA	10077	N111	REAL	
272 NPX		REAL	ARRAY	1917	NH0	REAL	COMA
161 PPY		REAL	COMA	8	PPXS	REAL	DEL
243 PPZ		REAL	ARRAY	62	PPYS	REAL	ARRAY
1700 QM		REAL	COMA	144	PPZS	REAL	DEL
42 Q1		REAL	COMA	1665	QMM	REAL	ARRAY
44 Q3		REAL	COMP	03	Q2	REAL	COMP
46 Q5		REAL	COMP	45	Q4	REAL	COMP
10 R		REAL	EXTRA	67	Q6	REAL	COMP
67 RL3		REAL	COMA	72	RI	REAL	COMA
11 RM		REAL	MISD	1422	RLBK	REAL	COMA
76 RM		REAL	ARRAY	11034	RMT	REAL	ARRAY
1436 RRR		REAL	COMA	10725	RS	REAL	ARRAY
1701 SA		REAL	COMA	6143	RTD	REAL	
10036 SCALE		REAL	COMA	6	SC	REAL	EXTRA
11 SCALEL		REAL	EXTRA	10040	SCALE0	REAL	
162 SCALET		REAL	COMA	1423	SCALEP	REAL	COMA
10037 SCALEZ		REAL	COMA	1665	SCALEV	REAL	COMA
5 SEC		REAL	EXTRA	10073	SCO	REAL	ANG
0 SIH30		REAL	ANG	2	SINSCO	REAL	
237 SP4G		REAL	PK	10073	SO	REAL	PK
236 SP4K		REAL	PK	240	SPHS	REAL	COMA
241 SP4		REAL	PK	1440	SPL	REAL	COMA
				71	SPO	REAL	

VARIABLES	SN	TYPE	RELOCATION	1442	STL	REAL	COMA
1437 SR	62	REAL	COMA	1442	STL	REAL	COMA
1438 SI	62	REAL	COMA	72	SIPI	REAL	COMP
1439 S2	72	REAL	COMP	72	SIP3	REAL	COMP
66 SIP2	102	REAL	COMP	102	SIP5	REAL	COMP
76 SIP4	1284	REAL	COMP	1284	S2	REAL	COMA
105 SIP6	65	REAL	COMP	65	S2P2	REAL	COMP
61 S2P1	75	REAL	COMP	75	S2P4	REAL	COMP
71 S2P3	105	REAL	COMP	105	S2P6	REAL	COMP
101 S2P5	1266	REAL	COMP	1266	S4	REAL	COMA
1265 S3	1122	REAL	COMA	1122	TAMA	REAL	COMA
10060 TAU	107	REAL	COMA	107	THE	REAL	EXTRA
75 THEAL	325	REAL	COMA	325	TIME	REAL	EXTRA
10060 TIMES	10211	REAL	COMA	10211	TM	REAL	COMA
1524 THA	407	REAL	COMA	407	THAS	REAL	COMA
1623 TREAL	24	REAL	COMA	24	TRP	REAL	COMA
10051 U77	10052	REAL	COMA	10052	U78	REAL	EXTRA
10054 U73	10055	REAL	COMA	10055	J80	REAL	EXTRA
1216 VH	1703	REAL	COMA	1703	VMX	REAL	COMA
226 VMXS	1765	REAL	DEL	1765	VMY	REAL	COMA
310 VMS	2047	REAL	DEL	2047	VMZ	REAL	COMA
372 VMS	12	REAL	DEL	12	VT	REAL	COMA
1445 VTI	12	REAL	COMA	12	VVVV	REAL	EXTRA
50 W1	51	REAL	COMP	51	W2	REAL	COMP
52 W3	53	REAL	COMP	53	W4	REAL	COMP
54 W5	55	REAL	COMP	55	W6	REAL	COMP
10075 X	1432	REAL	COMP	1432	XC	REAL	COMA
10105 XCOJX	10104	REAL	XCOLL	10104	XCOLL	REAL	COMA
10103 XCOYM	1117	REAL	XCOMP	1117	XCOMP	REAL	COMA
0 XD	12	REAL	XDE	12	XDE	REAL	COMA
6 XDEF	1	REAL	XDEM	1	XDEM	REAL	COMA
0 XDH	1270	REAL	XDH	1270	XDH	REAL	COMA
1256 XDJ	3	REAL	XDTG	3	XDTG	REAL	COMA
723 XDTGM	1445	REAL	XDTGMS	1445	XDTGMS	REAL	COMA
54 XDTGJ	1445	REAL	XE	1445	XE	REAL	COMA
14 XLOS	0	REAL	XM	0	XM	REAL	MISO
577 XMSY	1107	REAL	XMISS	1107	XMISS	REAL	COMA
11023 XMT	10055	REAL	XPRIME	10055	XPRIME	REAL	COMA
1652 XTA	2	REAL	XTERM	2	XTERM	REAL	EXTRA
25 XX	2	REAL	XXS	2	XXS	REAL	COMA
10076 Y	3	REAL	YA	3	YA	REAL	COMA
1433 YC	1120	REAL	YCOMP	1120	YCOMP	REAL	COMA
1 YD	13	REAL	YDDE	13	YDDE	REAL	COMA
7 YDEF	2507	REAL	YDEN	2507	YDEN	REAL	COMA
26 YDH	1326	REAL	YDH	1326	YDH	REAL	COMA
1257 YDJ	4	REAL	YDTG	4	YDTG	REAL	COMA
7761 YDTJH	503	REAL	YDTGHS	503	YDTGHS	REAL	COMA
65 YDTGO	1504	REAL	YE	1504	YE	REAL	COMA
15 YLDS	3	REAL	YH	3	YH	REAL	MISO
11025 YMT	10056	REAL	YPRIME	10056	YPRIME	REAL	COMA
1653 YTA	10067	REAL	Z	10067	Z	REAL	COMA
4 ZA	6142	REAL	ZADOVE	6142	ZADOVE	REAL	COMA
1603 ZALT	1436	REAL	ZC	1436	ZC	REAL	COMA
1121 ZCMP	2	REAL	ZD	2	ZD	REAL	COMA
14 ZDJE	10	REAL	ZDEF	10	ZDEF	REAL	COMA
5215 ZDEM	54	REAL	ZDH	54	ZDH	REAL	COMA
1364 ZSY	1260	REAL	ZDH	1260	ZDH	REAL	COMA
5 ZLIG	10017	REAL	ZDTGM	10017	ZDTGM	REAL	COMA

VARIABLES	SN	TYPE	RELOCATION	65	ZDTGO	REAL	COMA
541	ZDIGMS	REAL	ARRAY COMA	15	ZLOS	REAL	EXTRA
1542	ZE	REAL	ARRAY COMA	11031	ZMT	REAL	ARRAY
6	ZM	REAL	ARRAY MISD	1554	ZIA	REAL	COMA
10037	ZPTIME	REAL	MANEUV	10113	ZTEO	REAL	ARRAY
10047	ZTE	REAL					
11	ZZZ	REAL	COMB				

FILE NAMES	MODE	0	INPUT	2041	OUTPJT	FMT	0	TAPES	FMT
4102	HFILE								
2041	TAPE6								

EXTERNALS	TYPE	ARGS	ATAN2	REAL	2	LIBRARY
ASIN	REAL	1	FLIGHT		0	
COS	REAL	1	INIT		0	
GUID		0				
XSCALE		0	LETR		0	
NEAR		9	MISCOM		0	
PRIME		0	DECLM		0	
SIN	REAL	1	SQRT	REAL	1	LIBRARY

INLINE FUNCTIONS	TYPE	ARGS	IFIX	INTEGER	1	INTRIN
FLCAT	REAL	1				
INT	INTEGER	1				

STATEMENT LABELS	0	5	INACTIVE	0	10	INACTIVE
4723	3	4645		0	23	
0	11	0		0	23	
0	25	0		4666	30	
0	31	0		4730	41	
5002	42	5020		5031	51	
5157	52	5173		5175	54	
5177	55	5203		5211	60	
5502	83	0		7050	77	FMT
5377	31	0		7095	102	FMT
5449	111	9507		5920	114	
5526	116	0		0	121	
0	122	5676		9762	197	
0	198	7065		0	200	INACTIVE
0	ZGT	6004	FMT	6006	241	
5040	300	5474		5463	330	
0	331	7073	FMT	7101	600	FMT NO REFS
7132	601	6013		7137	603	FMT NO REFS
0	659	7162	FMT	7164	621	FMT
7156	622	7205	FMT NO REFS	7232	625	FMT
6021	626	6023		4764	628	
0	630	6031		6026	635	
7236	640	7255	FMT NO REFS	7267	715	FMT NO REFS
7307	720	7323	FMT NO REFS	7350	800	FMT
7352	801	7371	FMT	7377	803	FMT NO REFS
7417	805	7432	FMT	7436	810	FMT
7444	811	7447	FMT	7456	814	FMT
7461	815	7466	FMT	7472	823	FMT
7477	830	7504	FMT	7511	832	FMT
7516	833	7523	FMT	7540	840	FMT
7545	902	7547	FMT	7552	904	FMT
7554	907	7554	FMT	7570	909	FMT

STATEMENT LABELS

7604	912	FMT	7614	913	FMT	7624	914	FMT
7634	915	FMT NO REFS	7652	916	FMT	7656	917	FMT
7681	918	FMT	7664	919	FMT	7672	996	FMT
7674	999	FMT	7677	2000	FMT	7701	2001	FMT
7703	2002	FMT	7712	2003	FMT	7722	2004	FMT
7725	2005	FMT	7734	2006	FMT	7747	2007	FMT
7752	2008	FMT	7770	2009	FMT NO REFS	7776	2010	FMT
10001	2011	FMT	10004	2012	FMT			

COMMON BLOCKS LENGTH

COMA	1165
COMB	13
MAREUV	4316
GTARG	11
COMP	73
EXTRA	72
ANG	4
PK	162
MISO	14
DELT	300
COMU	5

STATISTICS

PROGRAM LENGTH	46378	2679
BUFFER LENGTH	45408	2400
CM LABELED COMMON LENGTH	137678	5135

BEST AVAILABLE COPY

BLOCK DATA ONE

CONV/MANEUV/IT,XDEM(30,55),YDEM(30,45),ZDEM(30,45),
XTCM(30),YTCM(30),ZTCM(30),XPRIME,YPRIME,
ZPRIME,XTIME(50),ITRAJ(50),ITAU(50),ITII,NADJ

5 DATA(ITRAJ(1),I=1,59)/3.4,5.3,6.7,8.9,10.1,11.12,2*13,14,2*15,16, SERIES 2
*17,2*18,12,19,20,21,22,23,24,25,21,26,27,28,29,30,31,21,32,33,34, SERIES 2
*35,36,37,38,39,40,41,39,42,38,43,34,44,5*45/
DATA(ITAU(1),I=1,59)/59*0/
DATA(XDEM(I,1),I=1,27)/27*0.0/
DATA(YDEM(I,1),I=1,27)/27*0.0/
DATA(ZDEM(I,1),I=1,27)/27*0.0/
DATA(XDEM(I,2),I=1,27)/27*168.9/
DATA(YDEM(I,2),I=1,27)/27*0.0/
DATA(ZDEM(I,2),I=1,27)/27*0.0/
DATA(XDEM(I,3),I=1,27)/27*0.0/
DATA(YDEM(I,3),I=1,27)/27*337.8/
DATA(ZDEM(I,3),I=1,27)/27*0.0/
DATA(XDEM(I,4),I=1,27)/27*0.0/
DATA(YDEM(I,4),I=1,27)/27*506.7/
DATA(ZDEM(I,4),I=1,27)/27*0.0/
DATA(XDEM(I,5),I=1,27)/0.0,127.9,251.2,365.4,466.4,550.5,614.7, A
*556.5,574.8,568.5,538.2,504.7,510.4,16.9,308.7,189.4,63.2,2*85.3,
*191.5,310.7,418.7,511.5,585.8,638.3,568.9,674.7,656.1/
DATA(YDEM(I,5),I=1,27)/675.5,653.4,627.1,568.2,488.8,391.6,280.3,
*158.8,31.6,96.7,221.6,338.4,443.5,531.6,600.9,648.5,672.8,
*672.4,647.9,599.9,530.2,441.3,336.5,219.5,94.6,33.8,161.7
DATA(ZDEM(I,5),I=1,27)/27*0.0/
DATA(XDEM(I,6),I=1,27)/27*0.0/
DATA(YDEM(I,6),I=1,27)/27*675.6/
DATA(ZDEM(I,6),I=1,27)/27*0.0/
DATA(XDEM(I,7),I=1,27)/0.0,221.1,417.8,568.5,656.6,672.5, B
*614.2,488.4,308.7,95.1,129.3,33.9,511.5,627.9,674.9,647.7,
*549.2,390.3,186.3,34.4,253.2,444.3,536.3,653.9,668.3,599.1,
*464.7
DATA(YDEM(I,7),I=1,27)/634.8,499.9,498.9,489.8,449.8,448.9,264.3,
*349.8,254.8,238.5,228.2,214.7,234.6,28.7,180.4,
*369.7,518.2,609.7,634.5,588.5,478.3,315.3,117.7,92.9,293.3,
*461.4/
DATA(ZDEM(I,7),I=1,27)/231.1,218.3,131.6,124.8,54.3,22.2,96.2,
*159.7,205.4,228.8,226.8,199.9,151.5,85.4,10.4,65.7,134.5,
*184.0,211.9,230.9,214.2,174.1,114.9,42.8,33.8,106.8,167.9/
DATA(XDEM(I,8),I=1,27)/0.0,127.9,251.2,365.4,466.4,550.5, C
*614.7,656.6,674.8,668.6,638.2,584.7,510.4,16.9,308.7,
*189.4,63.2,65.3,191.5,310.7,418.7,511.5,585.8,638.3,568.9,674.7,
*656.1/
DATA(YDEM(I,8),I=1,27)/759.6,663.4,627.1,569.2,498.8,439.1,672.3,
*158.8,31.6,96.7,221.6,338.4,443.5,531.6,600.9,648.5,672.8,
*672.4,647.9,599.9,530.2,441.3,336.5,219.5,94.6,33.8,161.7
DATA(ZDEM(I,8),I=1,27)/27*0.0/
DATA(XDEM(I,9),I=1,27)/27*634.8/
DATA(YDEM(I,9),I=1,27)/27*534.8/
DATA(ZDEM(I,9),I=1,27)/27*231.1/
DATA(XDEM(I,10),I=1,27)/27*0.0/
DATA(YDEM(I,10),I=1,27)/27*714.2/
DATA(ZDEM(I,10),I=1,27)/27*259.9/
DATA(XDEM(I,11),I=1,27)/27*0.0/
DATA(YDEM(I,11),I=1,27)/844.5,822.5,757.7,693.5,515.4,350.4,167.1, D

II

JJ

KK

LL

MM

NN

OO

PP

QQ

RR

SS

TT

UU

VV

WW

XX

YY

ZZ

60
 *24.8,-215.4,-394.9,-553.8,-683.8,-778.3,-832.3,-843.-809.8,
 *734.5,-621.-473.2,-300.6,-118.2,74.6,263.4,338.1,590.3,711.8,
 *795.2/
 DATAZDEM(I,11)I=1,271/70.-191.4,-372.6,-536.8,-669.-768.4,
 *827.8,-844.1,-816.5,-746.4,-637.6,-495.5,-327.6,-142.7,49.6,
 *239.4,416.6,572.3,698.1,787.6,836.2,861.2,802.4,722.6,603.9,454.4,
 *331.3/
 DATAZDEM(I,12)I=1,271/27*0.0/
 DATAZDEM(I,12)I=1,271/815.7,844.8,828.4,769.7,670.9,537.3,375.7,
 *134.5,3.2,-188.4,-359.9,-532.3,-667.-757.-827.4,-844.2,-817.3,
 *748.-639.7,-498.1,-330.6,-145.9,46.4,236.3,413.8,589.9,696.3/
 DATAZDEM(I,12)I=1,271/218.6,28.4,-16.-347.4,-512.8,-651.5,
 *726.3,-821.3,-844.5,-823.2,-759.2,-655.6,-517.9,-353.3,-170.3,
 *21.6,212.3,392.5,551.3,681.9,777.1,831.8,843.2,810.7,736.1,623.2,
 *677.8/

65
 DATAZDEM(I,13)I=1,271/70.-159.9,314.4,565.8,583.5,681.7,668.4,
 *820.8,843.5,835.8,737.9,730.9,637.6,521.2,385.9,236.7,78.9,-81.7,
 *239.4,-388.4,-523.3,-639.4,-732.2,-798.6,-836.2,-843.4,-820.2/
 DATAZDEM(I,13)I=1,271/84.5,829.2,783.9,710.3,610.9,489.5,350.4,
 *198.5,39.5,-120.9,-277.-423.-553.8,-664.5,-751.1,-810.6,-840.6,
 *840.5,-809.8,-749.9,-662.8,-551.7,-420.6,-274.4,-118.2,42.3,
 *201.2/

70
 DATAZDEM(I,14)I=1,271/793.5,791.2,784.3,772.9,757.7,735.5,712.7,
 *583.3,650.6,601.4,1.5,74.1,530.7,684.3,435.3,383.2,339.2,273.3,215.8,
 *157.9,7.4,37.1,-23.3,-83.6,-14.5,-202.5,-260.3,-316.6/
 DATAZDEM(I,14)I=1,271/298.8,288.5,281.3,275.5,268.1,259.2,
 *246.7,236.8,223.5,209.1,193.2,176.3,158.3,139.5,119.8,99.5,78.5,
 *57.2,35.6,13.5,-8.5,-30.4,-52.2,-73.7,-94.7,-115.2/
 DATAZDEM(I,15)I=1,271/27*0.0/
 DATAZDEM(I,15)I=1,271/94.5,814.9,787.2,698.8,407.8,108.9,-24.8,
 *246.4,-458.6,-322.9,751.1,-826.3,-843.0,-800.1,-700.7,-551.7,
 *363.7,-150.7,44.4,293.4,491.7,655.3,772.5,835.1,838.6,782.9,671.8/
 DATAZDEM(I,15)I=1,271/0.-222.6,-429.4,-605.8,-739.5,-820.8,
 *844.1,-807.7,-714.2,-570.2,-385.9,-174.3,49.6,270.8,471.6,639.4,
 *762.1,331.8,41.2,791.9,686.5,532.7,341.1,125.5,-99.7,-316.6,-511.7/
 DATAZDEM(I,16)I=1,271/0.64,3,128.2,191.4,253.4,314.3,372.8,
 *629.4,483.5,534.8,583.3,-627.8,669.3,705.3,739.5,768.4,792.8,812.6,
 *827.8,833.1,843.5,844.1,839.8,830.6,816.5,797.8,774.4/
 DATAZDEM(I,16)I=1,271/793.5,791.2,784.3,772.9,757.7,735.5,712.7,
 *683.3,650.6,614.1,574.1,530.7,484.3,435.3,383.2,339.2,273.3,215.8,
 *157.9,7.4,37.1,-23.3,-83.6,-14.5,-202.5,-260.3,-316.6/
 DATAZDEM(I,16)I=1,271/288.8,298.8,295.5,281.3,275.5,268.1,259.2,
 *248.7,236.8,223.5,209.1,193.2,176.3,158.3,139.5,119.8,99.5,78.5,
 *57.2,35.6,13.5,-8.5,-30.4,-52.2,-73.7,-94.7,-115.5/
 DATAZDEM(I,17)I=1,271/27*0.0/
 DATAZDEM(I,17)I=1,271/44.5,839.3,22.5,795.3,757.7,710.3,653.5,
 *331.3,512.4,435.7,350.4,262.4,157.1,71.6,-24.8,-120.9,-215.5,
 *372.2,-394.3,-477.4,-553.8,-622.9,-583.3,-735.9,-778.3,-810.6,
 *832.3/

75
 DATAZDEM(I,17)I=1,271/0.-96.3,-191.4,-283.9,-372.8,-456.8,
 *534.8,-605.3,-659.8,-723.4,-760.4,-803.3,-827.8,-841.4,-844.1,
 *835.3,-816.5,-786.6,-746.5,-696.5,-637.6,-570.2,-495.5,-416.3,

80
 DATAZDEM(I,18)I=1,271/70.-191.4,-372.6,-536.8,-669.-768.4,
 *827.8,-844.1,-816.5,-746.4,-637.6,-495.5,-327.6,-142.7,49.6,
 *239.4,416.6,572.3,698.1,787.6,836.2,861.2,802.4,722.6,603.9,454.4,
 *331.3/
 DATAZDEM(I,18)I=1,271/815.7,844.8,828.4,769.7,670.9,537.3,375.7,
 *134.5,3.2,-188.4,-359.9,-532.3,-667.-757.-827.4,-844.2,-817.3,
 *748.-639.7,-498.1,-330.6,-145.9,46.4,236.3,413.8,589.9,696.3/
 DATAZDEM(I,18)I=1,271/218.6,28.4,-16.-347.4,-512.8,-651.5,
 *726.3,-821.3,-844.5,-823.2,-759.2,-655.6,-517.9,-353.3,-170.3,
 *21.6,212.3,392.5,551.3,681.9,777.1,831.8,843.2,810.7,736.1,623.2,
 *677.8/

85
 DATAZDEM(I,19)I=1,271/793.5,791.2,784.3,772.9,757.7,735.5,712.7,
 *583.3,650.6,601.4,1.5,74.1,530.7,684.3,435.3,383.2,339.2,273.3,215.8,
 *157.9,7.4,37.1,-23.3,-83.6,-14.5,-202.5,-260.3,-316.6/
 DATAZDEM(I,19)I=1,271/298.8,288.5,281.3,275.5,268.1,259.2,
 *246.7,236.8,223.5,209.1,193.2,176.3,158.3,139.5,119.8,99.5,78.5,
 *57.2,35.6,13.5,-8.5,-30.4,-52.2,-73.7,-94.7,-115.2/
 DATAZDEM(I,20)I=1,271/27*0.0/
 DATAZDEM(I,20)I=1,271/94.5,814.9,787.2,698.8,407.8,108.9,-24.8,
 *246.4,-458.6,-322.9,751.1,-826.3,-843.0,-800.1,-700.7,-551.7,
 *363.7,-150.7,44.4,293.4,491.7,655.3,772.5,835.1,838.6,782.9,671.8/
 DATAZDEM(I,20)I=1,271/0.-222.6,-429.4,-605.8,-739.5,-820.8,
 *844.1,-807.7,-714.2,-570.2,-385.9,-174.3,49.6,270.8,471.6,639.4,
 *762.1,331.8,41.2,791.9,686.5,532.7,341.1,125.5,-99.7,-316.6,-511.7/
 DATAZDEM(I,21)I=1,271/0.64,3,128.2,191.4,253.4,314.3,372.8,
 *629.4,483.5,534.8,583.3,-627.8,669.3,705.3,739.5,768.4,792.8,812.6,
 *827.8,833.1,843.5,844.1,839.8,830.6,816.5,797.8,774.4/
 DATAZDEM(I,21)I=1,271/793.5,791.2,784.3,772.9,757.7,735.5,712.7,
 *683.3,650.6,614.1,574.1,530.7,484.3,435.3,383.2,339.2,273.3,215.8,
 *157.9,7.4,37.1,-23.3,-83.6,-14.5,-202.5,-260.3,-316.6/
 DATAZDEM(I,21)I=1,271/288.8,298.8,295.5,281.3,275.5,268.1,259.2,
 *248.7,236.8,223.5,209.1,193.2,176.3,158.3,139.5,119.8,99.5,78.5,
 *57.2,35.6,13.5,-8.5,-30.4,-52.2,-73.7,-94.7,-115.5/
 DATAZDEM(I,22)I=1,271/27*0.0/
 DATAZDEM(I,22)I=1,271/44.5,839.3,22.5,795.3,757.7,710.3,653.5,
 *331.3,512.4,435.7,350.4,262.4,157.1,71.6,-24.8,-120.9,-215.5,
 *372.2,-394.3,-477.4,-553.8,-622.9,-583.3,-735.9,-778.3,-810.6,
 *832.3/

90
 DATAZDEM(I,22)I=1,271/0.-96.3,-191.4,-283.9,-372.8,-456.8,
 *534.8,-605.3,-659.8,-723.4,-760.4,-803.3,-827.8,-841.4,-844.1,
 *835.3,-816.5,-786.6,-746.5,-696.5,-637.6,-570.2,-495.5,-416.3,

95
 DATAZDEM(I,23)I=1,271/70.-159.9,314.4,565.8,583.5,681.7,668.4,
 *820.8,843.5,835.8,737.9,730.9,637.6,521.2,385.9,236.7,78.9,-81.7,
 *239.4,-388.4,-523.3,-639.4,-732.2,-798.6,-836.2,-843.4,-820.2/
 DATAZDEM(I,23)I=1,271/84.5,829.2,783.9,710.3,610.9,489.5,350.4,
 *198.5,39.5,-120.9,-277.-423.-553.8,-664.5,-751.1,-810.6,-840.6,
 *840.5,-809.8,-749.9,-662.8,-551.7,-420.6,-274.4,-118.2,42.3,
 *201.2/

100
 DATAZDEM(I,24)I=1,271/793.5,791.2,784.3,772.9,757.7,735.5,712.7,
 *583.3,650.6,601.4,1.5,74.1,530.7,684.3,435.3,383.2,339.2,273.3,215.8,
 *157.9,7.4,37.1,-23.3,-83.6,-14.5,-202.5,-260.3,-316.6/
 DATAZDEM(I,24)I=1,271/298.8,288.5,281.3,275.5,268.1,259.2,
 *246.7,236.8,223.5,209.1,193.2,176.3,158.3,139.5,119.8,99.5,78.5,
 *57.2,35.6,13.5,-8.5,-30.4,-52.2,-73.7,-94.7,-115.2/
 DATAZDEM(I,25)I=1,271/27*0.0/
 DATAZDEM(I,25)I=1,271/94.5,814.9,787.2,698.8,407.8,108.9,-24.8,
 *246.4,-458.6,-322.9,751.1,-826.3,-843.0,-800.1,-700.7,-551.7,
 *363.7,-150.7,44.4,293.4,491.7,655.3,772.5,835.1,838.6,782.9,671.8/
 DATAZDEM(I,25)I=1,271/0.-222.6,-429.4,-605.8,-739.5,-820.8,
 *844.1,-807.7,-714.2,-570.2,-385.9,-174.3,49.6,270.8,471.6,639.4,
 *762.1,331.8,41.2,791.9,686.5,532.7,341.1,125.5,-99.7,-316.6,-511.7/
 DATAZDEM(I,26)I=1,271/0.64,3,128.2,191.4,253.4,314.3,372.8,
 *629.4,483.5,534.8,583.3,-627.8,669.3,705.3,739.5,768.4,792.8,812.6,
 *827.8,833.1,843.5,844.1,839.8,830.6,816.5,797.8,774.4/
 DATAZDEM(I,26)I=1,271/793.5,791.2,784.3,772.9,757.7,735.5,712.7,
 *683.3,650.6,614.1,574.1,530.7,484.3,435.3,383.2,339.2,273.3,215.8,
 *157.9,7.4,37.1,-23.3,-83.6,-14.5,-202.5,-260.3,-316.6/
 DATAZDEM(I,26)I=1,271/288.8,298.8,295.5,281.3,275.5,268.1,259.2,
 *248.7,236.8,223.5,209.1,193.2,176.3,158.3,139.5,119.8,99.5,78.5,
 *57.2,35.6,13.5,-8.5,-30.4,-52.2,-73.7,-94.7,-115.5/
 DATAZDEM(I,27)I=1,271/27*0.0/
 DATAZDEM(I,27)I=1,271/44.5,839.3,22.5,795.3,757.7,710.3,653.5,
 *331.3,512.4,435.7,350.4,262.4,157.1,71.6,-24.8,-120.9,-215.5,
 *372.2,-394.3,-477.4,-553.8,-622.9,-583.3,-735.9,-778.3,-810.6,
 *832.3/

105
 DATAZDEM(I,27)I=1,271/0.-96.3,-191.4,-283.9,-372.8,-456.8,
 *534.8,-605.3,-659.8,-723.4,-760.4,-803.3,-827.8,-841.4,-844.1,
 *835.3,-816.5,-786.6,-746.5,-696.5,-637.6,-570.2,-495.5,-416.3,

110
 DATAZDEM(I,28)I=1,271/70.-159.9,314.4,565.8,583.5,681.7,668.4,
 *820.8,843.5,835.8,737.9,730.9,637.6,521.2,385.9,236.7,78.9,-81.7,
 *239.4,-388.4,-523.3,-639.4,-732.2,-798.6,-836.2,-843.4,-820.2/
 DATAZDEM(I,28)I=1,271/84.5,829.2,783.9,710.3,610.9,489.5,350.4,
 *198.5,39.5,-120.9,-277.-423.-553.8,-664.5,-751.1,-810.6,-840.6,
 *840.5,-809.8,-749.9,-662.8,-551.7,-420.6,-274.4,-118.2,42.3,
 *201.2/

115 *327.6,-236.7,-142.7/
 DATAIDEM(I,18)I=1,27170,-158.9,-318,-456,-6,-283,-688.1,
 *768.4,-920.8,-843.5,-835.8,-797.8,-730.9,-637.6,-521.2,-385.9,
 *236.7,-78.3,781.7,239.4,388.4,523.3,639.4,732.2,798.6,836.2,843.4,
 *20.2/
 DATAIDEM(I,18)I=1,271784,5,829.2,783.9,710.3,610.9,489.5,350.4,
 *193.5,39.5,-120.3,-277.4,-423.5,-553.8,-664.5,-751.1,-810.6,-840.8,
 *840.5,-809.8,-749.3,-662.8,-551.7,-420.6,-276.4,-118.2,42.3,
 *201.2/
 DATAIDEM(I,18)I=1,271727*0.0/
 DATAIDEM(I,19)I=1,27170,-128.3,254.1,375.1,488.8,593.2,686.3, R
 *765.2,831.3,880.5,913.9,927.9,925.9,904.4,856.4,811.9,741.8,657.5,
 *50.5,452.9,336.5,213.7,86.8,-41.7,-159.5,-294.5,-412.9/
 DATAIDEM(I,19)I=1,2717872.9,864.5,839.6,798.5,742.3,671.7,588.3,
 *693.5,380.4,277.8,160.9,40.8,-80.8,-199.2,-314.7,-424.1,-525.4,
 *615.6,-596.1,-752.1,-813.6,-849.5,-859.1,-972.1,-858.2,-828.2,
 *781.9/
 DATAIDEM(I,19)I=1,2717317.7,314.7,305.6,290.7,270.2,244.5,214.1,
 *179.7,141.7,101.1,58.6,14.9,-29.1,-72.5,-114.5,-154.4,-191.2,
 *227.4,-253.3,-277.8,-296.1,-309.2,-316.3,-317.4,-312.4,-301.4,
 *284.6/
 DATAIDEM(I,20)I=1,27170,-96.3,-191.6,-284.9,-375.1,-461.2, K
 *542.3,-617.6,-686.3,-747.5,-800.7,-845.2,-880.6,-906.5,-922.7,
 *928.8,-925,-911.2,-887.6,-854.3,-811.9,-760.7,-701.3,-634.3,
 *560.5,-480.7,-395.6/
 DATAIDEM(I,20)I=1,271728.9,923.9,908.9,884.1,849.8,806.3,754.2,
 *593.8,626,551.5,471.3,385.4,295.6,202.7,107.6,11.3,-85.1,-180.6,
 *274.1,-364.7,-451.3,-533.1,-609.1,-678.6,-740.7,-794.9,-840.4/
 DATAIDEM(I,20)I=1,271727*0.0/
 END

BLOCK DATA ONE 74774 OPT=1 FTNH 4.2+75348 01/12/76 14.30.25. PAGE 4

SYMBOLIC REFERENCE MAP (R=1)

VARIABLES	SN	TYPE	RELOCATION				
1332	III	INTEGER	MANEUV	10236	ITAD	INTEGER	ARRAY
10142	ITPAJ	INTEGER	MANEUV	0	ITT	INTEGER	MANEUV
10333	HAJJ	INTEGER	MANEUV	10060	TIMES	REAL	MANEUV
1	KUCH	REAL	MANEUV	7723	XDTCH	REAL	MANEUV
10055	XPRIME	REAL	MANEUV	2507	YDCH	REAL	MANEUV
7751	YD13M	REAL	MANEUV	10056	YPRIME	REAL	MANEUV
5215	Z13M	REAL	MANEUV	10017	ZDTCH	REAL	MANEUV
13057	ZPRIME	REAL	MANEUV				

COMMON BLOCKS LENGTH
MANEUV 4316

STATISTICS
PROGRAM LENGTH 0
CM LABELED COMMON LENGTH 103348 4316

BLOCK DATA TWO
COMMON/MANEDV/IT,XDEM30,451,YOEM(30,451),ZDEM(30,451),
XOTGM(30),YOTGM(30),ZOTGM(30),XPRIME,YPRIME,
ZPRIME,TIMES(50),TITRAJ(60),TIAUT(60),TII,NADJ

5 DATA(XOEM(I,21),I=1,271)/27*0.0/ S
DATA(YOEM(I,21),I=1,271)/928.9,901.7,821.5,693.8,525.3,326.1,107.5,
*-117.1,-334.9,-533.1,-700.2,-826.2,-904.-928.9,-899.4,-817.3,
*-687.5,-517.4,-317.-98.1,126.5,343.8,540.9,706.4,830.6,906.1,
*928.7/

10 DATA(ZOEM(I,21),I=1,271)/70.-223.-433.-517.5,-765.2,-859.8,
*-922.7,-321.5,-856.4,-760.7,-610.5,-424.5,-213.7,-9.6,232.3,3441.4,
*524.7,771.5,873.2,923.7,920.3,863.7,755.2,460.3,2,416,204.4,-19.1/
DATA(XOEM(I,22),I=1,271)/0.160,1,315.3,461.2,593.2,707.5,800.7, T
*869.8,913.,928.8,916.3,877.5,811.9,722.6,610.5,480.7,336.5,182.3,
*22.6,137.7,-294.-441.4,-575.6,-692.7,-789.-861.6,-908.5/
DATA(YOEM(I,22),I=1,271)/928.9,915,873.8,806.3,714.8,601.9,447.1,
*326.-171.2,11.3,-148.9,-304.7,-451.3,-594.5,-700.2,-794.9,-865.8,
*-910.3,-328.6,-918.6,-881.2,-817.3,-729.-618.9,-490.3,-347.,
*-133.4/
DATA(ZOEM(I,22),I=1,271)/27*0.0/

20 DATA(XOEM(I,23),I=1,271)/0.-96.3,-191.7,-284.9,-375.1,-461.2, U
*542.3,-517.5,-686.3,-747.5,-800.7,-845.2,-880.6,-906.5,-922.7,
*-328.8,-925.-911.2,-897.6,-854.3,-811.9,-760.7,-701.3,-634.3,
*-560.5,-480.7,-335.6/
DATA(YOEM(I,23),I=1,271)/804.5,800.1,787.2,765.7,736.6,698.3,653.1,
*300.9,542.2,477.6,407.3,333.8,256.1,175.6,93.2,9.8,-73.7,-156.4,
*-237.4,-315.8,-390.9,-461.7,-527.5,-587.7,-641.5,-688.4,-727.8/
DATA(ZOEM(I,23),I=1,271)/568.5,452.4,456.5,442.1,424.9,403.2,377.21,
*346.9,313.,275.7,235.5,192.7,147.8,101.4,53.8,5.7,-42.5,-90.3,
*-137.1,-182.3,-225.7,-265.6,-304.6,-339.3,-370.4,-397.4,-420.2/
DATA(XOEM(I,24),I=1,271)/0.-223.-433.-517.5,-765.2,-859.8, V
*-922.7,-921.5,-866.4,-760.7,-610.5,-424.5,-213.7,-9.6,232.3,3441.4,
*624.7,771.5,873.2,923.7,920.2,863.7,755.2,460.3,2,416,204.4,-19.1/
DATA(YOEM(I,24),I=1,271)/928.9,901.7,821.5,693.8,525.3,326.1,107.5,
*-117.1,-334.9,-533.1,-700.2,-826.2,-904.-928.9,-899.4,-817.3,
*-687.5,-517.4,-317.-98.1,126.5,343.8,540.9,706.4,830.6,906.1,
*928.7/

30 DATA(ZOEM(I,24),I=1,271)/27*0.0/

35 DATA(XOEM(I,25),I=1,271)/0.-191.6,-375.1,-542.3,-686.3,-800.7, L
*380.6,-922.7,925.-887.6,-811.7,-701.3,-560.5,-395.6,-213.7,
*-22.6,169.5,354.3,523.8,670.8,789.8,873.2,919.8,925.8,894.,822.6,
*715.9/
DATA(YOEM(I,25),I=1,271)/928.9,908.9,849.8,754.2,626.4,471.,295.6,
*107.6,-89.1,-274.1,-451.3,-609.1,-740.7,-840.4,-904.,-928.6,
*-913.3,-858.7,-757.1,-642.6,-490.3,-315.-130.6,252.4,431.4,
*591.7/
DATA(ZOEM(I,25),I=1,271)/27*0.0/

45 DATA(XOEM(I,26),I=1,271)/0.223,433,517.5,765.2,859.8,922.7, M
*921.5,866.4,760.7,610.5,424.5,213.7,-9.6,-232.3,-441.4,-624.7,
*771.5,-873.2,-923.7,-920.2,-863.7,-755.2,-603.2,-416.-204.4,-19.1/
DATA(YOEM(I,26),I=1,271)/928.9,901.7,821.5,693.8,525.3,326.1,107.5,
*-117.1,-334.9,-533.1,-700.2,-826.2,-904.-928.9,-899.4,-817.3,
*-587.4,-517.4,-317.-98.1,126.5,343.8,540.9,706.4,830.6,906.1,
*928.7/

50 DATA(ZOEM(I,26),I=1,271)/27*0.0/

55 DATA(XOEM(I,27),I=1,271)/0.191,6,375.1,542.3,686.3,800.7,800.6, N
*222.7,925.,887.6,811.9,701.3,560.5,395.6,213.7,22.6,-169.5,-354.3,

```

*523.8,-870.8,-789.9,-873.2,-919.8,-926.8,-694.4,-822.6,-715.9/
DATAVDEMI(1,27)I=1,27I/27*0.0/
*107.6,-83.1,-278.1,-451.3,-609.1,-740.7,-840.4,-904.4,-928.6,
*913.3,-858.7,-757.1,-642.6,-490.3,-317.1,-130.62,5252.4,
*31.4,591.9/
DATAZDEMI(1,27)I=1,27I/27*0.0/
DATAVDEMI(28)I=1,27I/27*0.0/
DATAZDEMI(28)I=1,27I/27*0.0/
DATAVDEMI(29)I=1,27I/27*0.0/
DATAZDEMI(29)I=1,27I/27*0.0/
*107.0,-85.1,-278.1,-451.3,-609.1,-740.7,-840.4,-904.4,-928.6,
*913.3,-858.7,-757.1,-642.6,-490.3,-317.1,-130.62,5252.4,431.4,
*591.9/
DATAZDEMI(1,29)I=1,27I/27*0.0,-191.7,-375.1,-542.3,-686.3,-800.7,
*880.6,-922.7,-925.5,-887.6,-811.9,-701.3,-560.5,-395.6,-213.7,
*22.0,-169.5,-354.3,-523.8,-670.8,-789.8,-873.2,-919.8,-926.8,-694.4,-822.6,
*715.9/
DATAVDEMI(30)I=1,27I/27*0.0,-96.3,-191.7,-286.9,-375.1,-461.2,-542.3,
*617.0,-685.3,-747.5,-800.7,-845.2,-880.6,-906.5,-922.7,-928.8,-925.5,-911.2,
*887.0,-854.3,-811.9,-760.7,-701.3,-634.3,-560.5,-480.7,-395.6/
DATAVDEMI(30)I=1,27I/27*0.0,-96.3,-191.7,-286.9,-375.1,-461.2,-542.3,
*617.0,-685.3,-747.5,-800.7,-845.2,-880.6,-906.5,-922.7,-928.8,-925.5,-911.2,
*887.0,-854.3,-811.9,-760.7,-701.3,-634.3,-560.5,-480.7,-395.6/
*800.9,-542.2,-477.6,-407.9,-333.8,-256.1,-175.5,-93.2,-9.8,-73.7,-156.4,
*237.4,-315.8,-390.9,-461.7,-527.5,-587.7,-641.5,-688.4,-727.8/
DATAZDEMI(1,30)I=1,27I/27*0.0,-454.2,-442.1,-424.9,-403.2,-377.1,
*345.9,-313.3,-275.7,-235.5,-192.7,-147.8,-101.4,-53.9,-5.7,-42.5,-90.3,
*137.1,-182.3,-225.7,-266.6,-304.6,-339.3,-370.4,-397.4,-420.2/
DATAVDEMI(31)I=1,27I/27*0.0,-160.1,-845.3,-461.2,-542.3,-686.3,-800.7,
*880.6,-922.7,-925.5,-887.6,-811.9,-701.3,-560.5,-395.6,-213.7,
*480.7,-336.5,-182.3,-22.6,-137.7,-294.4,-441.4,-575.6,-692.7,-789.9,
*861.6,-908.6/
DATAVDEMI(31)I=1,27I/27*0.0,-160.1,-845.3,-461.2,-542.3,-686.3,-800.7,
*880.6,-922.7,-925.5,-887.6,-811.9,-701.3,-560.5,-395.6,-213.7,
*480.7,-336.5,-182.3,-22.6,-137.7,-294.4,-441.4,-575.6,-692.7,-789.9,
*861.6,-908.6/
*326.1,-171.2,-11.3,-140.9,-306.7,-451.3,-584.5,-700.2,-794.9,-865.8,
*910.8,-928.6,-918.5,-881.2,-817.3,-729.1,-618.9,-490.3,-347.7,
*193.4/
DATAZDEMI(1,31)I=1,27I/27*0.0/
DATAVDEMI(32)I=1,27I/27*0.0,-128.3,-254.1,-375.1,-488.8,-593.2,
*586.3,-766.2,-851.3,-880.6,-913.3,-927.9,-925.5,-904.4,-866.4,
*911.9,-741.8,-577.5,-560.5,-452.9,-336.5,-213.7,-86.8,-41.7,-169.5,
*294.4,-12.9/
DATAVDEMI(32)I=1,27I/27*0.0,-128.3,-254.1,-375.1,-488.8,-593.2,
*586.3,-766.2,-851.3,-880.6,-913.3,-927.9,-925.5,-904.4,-866.4,
*911.9,-741.8,-577.5,-560.5,-452.9,-336.5,-213.7,-86.8,-41.7,-169.5,
*294.4,-12.9/
*493.5,-389.4,-277.8,-160.9,-40.8,-80.1,-199.2,-314.7,-426.1,-525.4,
*616.0,-636.1,-762.1,-813.6,-869.5,-859.1,-872.2,-858.2,-828.2,-781.9/
DATAZDEMI(1,32)I=1,27I/27*0.0,-314.7,-314.7,-314.7,-314.7,-314.7,-314.7,-314.7,-314.7,-314.7,
*179.7,-141.7,-101.1,-58.6,-14.9,-29.1,-72.5,-114.5,-154.4,-191.2,
*226.6,-253.3,-277.6,-296.1,-309.2,-316.3,-317.4,-312.4,-301.4,
*284.6/
DATAVDEMI(33)I=1,27I/27*0.0/
DATAZDEMI(1,33)I=1,27I/27*0.0,-1011.3,-1005.2,-995.5,-980.9,-962.7,
*745.7,-319.8,-885.4,-852.3,-315.8,-776.1,-1587.3,-638.6,-587.4,-533.8,
*748.1,-420.4,-361.1,-300.3,-230.2,-175.2,-111.0,-47.4,-16.9,-81.2/
DATAZDEMI(1,33)I=1,27I/27*0.0,-1011.3,-1005.2,-995.5,-980.9,-962.7,
*745.7,-319.8,-885.4,-852.3,-315.8,-776.1,-1587.3,-638.6,-587.4,-533.8,
*748.1,-420.4,-361.1,-300.3,-230.2,-175.2,-111.0,-47.4,-16.9,-81.2/
*376.8,-435.7,-492.9,-548.1,-601.1,-651.7,-699.6,-744.7,-786.8,
*825.9,-861.4,-893.5,-922.1,-946.9,-967.9,-995.5,-998.1,-1007.2,
*1012.3,-1013.2,-1010.1/
DATAVDEMI(34)I=1,27I/27*0.0/
DATAZDEMI(1,34)I=1,27I/27*0.0/

```

115 DATAZOE(MI,34),I=1,271/27*262.3/
 DATAZOE(MI,35),I=1,271/27*0.0/
 DATAZOE(MI,35),I=1,271/1013.4,988.4,914.9,796.3,538.6,449.5,
 *238.2,15.3,-208.7,-21.9,-514.6,-777.1,-901.4,-981.3,-1012.9,
 *994.7,-927.6,-814.9,-662.1,-476.6,-267.8,-45.8,178.5,394.5,590.1,
 *757.2,687.7
 DATAZOE(MI,35),I=1,271/0.0,-223.4,-435.7,-626.7,-786.8,-908.2,
 *985.1,-1013.2,-991.7,-921.4,-805.7,-650.4,-463.1,-273.9,-30.5,
 *193.5,408.8,602.4,767.2,894.3,977.3,1012.3,997.5,933.6,823.8,
 *873.5,749.0,7
 AA
 DATAZOE(MI,36),I=1,271/27*0.0/
 DATAZOE(MI,36),I=1,271/1013.4,1008.8,995.9,972.3,940.7,900.6,
 *952.3,794.3,733.1,663.3,587.4,506.2,420.4,330.8,238.2,143.5,
 *47.4,-49.1,-145.1,-239.8,-332.6,-421.9,-507.6,-588.7,-664.5,
 *734.3,-797.4/
 DATAZOE(MI,36),I=1,271/0.0,128.4,254.6,376.8,492.9,601.1,699.6,
 *786.3,861.4,922.9,967.9,998.1,1012.2,1010.1,991.7,957.3,907.5,
 *631.7,651.5,574.7,573.5,453.1,345.2,221.8,94.7,-33.8,-161.8/
 DATAZOE(MI,37),I=1,271/1013.4,1005.2,980.8,940.7,885.4,815.8,
 *733.1,633.6,533.8,420.4,300.2,175.2,47.4,-81.2,-208.4,-332.4,
 *451.1,-562.3,-654.5,-756.1,-835.4,-901.4,-952.8,-988.8,-1008.9,
 *1012.9,-1000.4/
 BB
 DATAZOE(MI,37),I=1,271/27*0.0/
 DATAZOE(MI,38),I=1,271/27*0.0/
 DATAZOE(MI,38),I=1,271/1013.4,995.9,940.7,852.3,733.1,587.4,420.4,
 *238.2,47.4,-145.1,-332.4,-507.6,-634.5,-797.4,-901.4,-972.7,
 *1005.9,-1005.6,-971.8,-899.8,-795.3,-662.1,-504.8,-329.3,-141.8,
 *50.7,241.4/
 DATAZOE(MI,38),I=1,271/0.0,-191.9,-376.8,-548.1,-599.6,-825.8,
 *922.1,935.1,-1012.3,-1002.9,-957.3,-877.1,-765.1,-625.4,-483.1,
 *284.1,-34.7,98.7,287.2,466.6,688.1,787.8,847.7,894.5,1003.4,1012.1,
 *844.27
 CC
 DATAZOE(MI,39),I=1,271/27*0.0/
 DATAZOE(MI,39),I=1,271/27*1013.4/
 DATAZOE(MI,39),I=1,271/27*0.0/
 DATAZOE(MI,40),I=1,271/0.0,-64.3,-128.4,-191.9,-254.6,-316.7,-386.8,
 *376.3,-435.7,-432.9,-548.1,-601.1,-651.7,-699.6,-744.7,-786.8,
 *325.8,-361.4,-893.5,-922.8,-946.9,-967.3,-985.1,-998.1,-1007.2,
 *1012.3,-1010.1/
 DATAZOE(MI,40),I=1,271/787.6,875.4,870.5,861.7,849.4,833.7,814.7,
 *792.3,765.8,738.1,706.5,672.1,643.9,595.2,553.1,508.7,462.3,414.0,
 *364.1,312.7,260.7,205.3,151.3,96.6,41.1,-1.6,-70.3/
 DATAZOE(MI,40),I=1,271/506.7,505.7,502.6,497.5,490.4,481.4,470.4,
 *210.2,180.5,150.1,119.1,87.6,55.8,23.7,-8.5,-40.6/
 DATAZOE(MI,41),I=1,271/0.0,128.4,191.9,254.6,316.7,376.8,
 *435.7,494.8,548.1,601.1,651.7,699.6,744.7,786.8,825.8,861.4,893.5,
 *922.1,935.1,957.3,998.1,1007.2,1012.3,1010.1,991.7,957.3,907.5,
 *732.3,756.8,738.1,706.5,672.1,634.3,595.2,553.1,508.7,462.3,414.0,
 *364.1,312.7,260.7,205.3,151.4,96.6,41.1,-1.4,-6.6,-70.3/
 DATAZOE(MI,41),I=1,271/506.7,505.7,502.6,497.5,490.4,481.4,470.4,
 *457.4,442.7,426.2,407.9,388.8,366.6,343.6,319.3,293.7,266.9,239.9,

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BLOCK DATA TWO 74774 OPT1 FTNH 4.275348 01/12/76 14.30.35. PAGE 1

*210.2.180.5.150.1.119.1.07.6.55.0.23.7.8.5.-40.6/
END

BUCK DATA TRU 7976 OPT#1 FTNR 42879348 01/12/76 14.30.35. PAGE 3

SYMBOLIC REFERENCE MAP (R=1)

VARIABLES	SN	TYPE	RELOCATION				
10332	111	INTEGER	MANEUV	10236	ITAU	INTEGER	MANEUV
10142	ITRAJ	INTEGER	ARRAY	0	ITT	INTEGER	MANEUV
10333	MADJ	INTEGER	MANEUV	10060	TIMES	REAL	MANEUV
1	XDEM	REAL	MANEUV	7723	XDTCH	REAL	MANEUV
10055	XPRIME	REAL	MANEUV	2507	YDEM	REAL	MANEUV
7761	YDTCH	REAL	ARRAY	10056	YPRIME	REAL	MANEUV
5215	ZDEM	REAL	ARRAY	10017	ZDTCH	REAL	MANEUV
10057	ZPRIME	REAL	MANEUV				

COMMON BLOCKS LENGTH 4316
MANEUV

STATISTICS

PROGRAM LENGTH 08
CH LABELED COMMON LENGTH 103348 4316

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BLOCK DATA THREE
COMMON/COMMON/LEVEL, IPTS, XXS(50), XDTG0, YDTG0, ZDTG0, RLB, COSE, SPO, RI,
*GAM, EDOT, THETA, RN,
* PZ(50), PZY(50), PZZ(50), TIME(50), THAS(30), XDTGHS(30)
* YDTGHS(30), ZDTGHS(30), XMAN(50), XMISS(7), NT
* XCOMP, YCOMP, ZCOMP, TANA(30), DELTA(30), VH(30), G, TGG6
* XDO, YDO, ZDO, DXG, DYG, ZDG, S2, S3, S4, S5, XDM(30), YDM(30), ZDM(30),
* SLBK, SCALEP, F1, F2, F3, G1, G2, G3, XC, YC, ZC, SL, RRR, SR, SPL, CTL, STL,
* CPL, AI, VII, XI(30), YE(30), ZE(30), ZALT, MERR, CLA, NPA, NX, CLAA(10),
* PHOTO, ARG, AAA, SCALET, TREAL, TMA(30), XTA, YTA, ZTA, SCALEV, QMH(10), QM
* SA, CA, VHX(50), VHY(50), VMZ(50)
* ECOS(17), HR7EE(17), FI7T(9), FC177(19)
COMMON/PK/XDH(22), YDH(22), ZDH(22), BUDHX(22), BUDHY(22), BUDHZ(22)
* KILL(22), P14, SPK, SPHG, SPHS, SPH
COMMON/MANEUV/IIT, XDEM(30,45), YDEM(30,45), ZDEM(30,45),
* XDTG(30), YDTG(30), ZDTG(30), XPRIME, YPRIME,
* ZPRIME, I, IINES(50), I, ITRAJ(60), I, IAU(60), I, I, I, MADJ
DATA(XDEM(I,42), I=1,27)/0.0,-160.2,-316.4,-456.6,-601.1,-722.5, FF
*-825.8,-908.2,-967.9,-1003.2,-1013.2,-997.8,-957.3,-892.7,-805.7,
*-698.4,-573.5,-434.2,-284.0,-126.7,33.8,193.5,346.3,494.4,628.4,
*745.8,844.9/
DATA(YDEM(I,42), I=1,27)/103.4,1000.6,962.7,300.6,815.8,710.6,
*387.4,443.9,308.2,143.5,-16.9,-176.9,-332.4,-479.5,-614.6,-734.3,
*-835.4,-915.0,972.7,-1005.4,-1012.8,-994.7,-951.6,-884.6,-795.3,
*-686.0,-559.5/
DATA(ZDEM(I,42), I=1,27)/27*0.0/
DATA(XDEM(I,43), I=1,27)/0.0,191.9,376.8,548.1,699.6,825.8,922.0,985.66
*1012.3,1002.9,957.3,877.7,765.1,653.4,453.1,284.1,94.7,-98.8,-287.2/
*-466.0,-528.7,-567.2,-678.7,-958.4,-1003.4,-1012.1,-984.2/
DATA(YDEM(I,43), I=1,27)/97.8,95.1,90.8,82.3,70.8,56.7,4,406.1,
*230.1,45.8,-140.2,-321.1,-490.3,-641.9,-770.2,-870.6,-939.6,-974.5
*974.2,-938.7,-969.2,-768.2,-639.5,-487.6,-318.0,-137.9,-233.2/
DATA(ZDEM(I,43), I=1,27)/262.3,257.5,243.5,220.6,189.7,152.4,108.8,
*51.7,122.3,-37.6,-86.0,-131.4,-172.0,-206.4,-233.3,-251.8,-261.1,
*261.1,-231.9,-218.9,209.8,171.8,138.6,-88.2,-30.7,13.1,62.5/
DATA(XDEM(I,44), I=1,27)/27*0.0/
DATA(YDEM(I,44), I=1,27)/952.3,1005.2,1008.8,962.7,869.2,733.0,
*560.7,360.9,143.3,81.4,-302.0,-509.8,-638.6,-835.5,-941.4,-1000.9,
*-1014.2,-971.8,-884.5,-753.7,-585.9,-389.2,-173.6,50.9,272.7,
*831.2,603.9/
DATA(ZDEM(I,44), I=1,27)/346.6,128.2,-96.6,-316.5,-520.9,-699.7,
*844.1,-346.9,-1003.2,-1010.1,-967.3,-877.7,-743.5,-573.4,-375.1,
*-158.4,60.1,287.4,434.5,677.3,826.8,935.5,998.4,1012.1,976.0,891.9,
*763.9/
DATA(XDEM(I,45), I=1,27)/27*0.0/
DATA(YDEM(I,45), I=1,27)/727*12.87
DATA(ZDEM(I,45), I=1,27)/27*0.0/
DATA (CLAA(I), I=1,8)/0.043,0.0435,0.0455,0.0485,0.0515,0.0559,
* 0.3477,0.033/
DATA (ZMH(I), I=1,8)/0.0,0.3,0.6,0.8,0.9,1.05,1.5,2.2/
DATA(ITAN(I), I=1,28)/0.0,2.5,1.1,1.7,2.2,2.5,3.4,4.5,5.6,7.0,
* 7.5,9.9,9.5,10.1,11.5,12.1,13.1,14.1,15.1,17.1,18.1,19.0,
* 20.0/
DATA(DELTA(I), I=1,28)/0.0,31.2,44.5,6,14,18,16,19,78,1,2958,1,3945.6,
* 3870.6,6405.6,7728.1,9559.1,11368.1,12263.1,13115.1,14580.0,
* 15198.0,15738.0,16753.0,17218.0,17660.0,18505.0,19295.0,20038.0,
* 20745.0,21420.0,22060.0,22665.0,23240.0/
SS

SYMBOLIC REFERENCE MAP (R=1)

VARIABLES	SN	TYPE	RELOCATION						
1621	AAA	REAL	COVA	1620	ARG	REAL	COVA		
1444	A1	REAL	COVA	102	3DHX	REAL	ARRAY	ARRAY	PK
130	B0HY	REAL	PK	156	3DMZ	REAL	ARRAY	ARRAY	PK
1732	CA	REAL	COVA	1602	CLA	REAL	COVA		
1605	CLAA	REAL	COVA	70	COSE	REAL	COVA		
1443	CPL	REAL	COVA	1441	CTL	REAL	COVA		
1150	JELIAR	REAL	COVA	1261	JXG	REAL	COVA		
1652	JYG	REAL	COVA	1264	JZG	REAL	COVA		
2131	EC03	REAL	ARRAY	74	ED0T	REAL	COVA		
2254	FC177	REAL	ARRAY	2173	F17T	REAL	ARRAY	ARRAY	
1424	F1	REAL	COVA	1425	F2	REAL	COVA		
1426	F3	REAL	COVA	1254	G	REAL	COVA		
73	J44	REAL	COVA	1255	GG5	REAL	COVA		
1427	G1	REAL	COVA	1430	H2	REAL	COVA		
1431	G3	REAL	COVA	2152	IR7EE	REAL	ARRAY	ARRAY	COVA
10332	III	INTEGER	MANEUV	1	IPTS	INTEGER	COVA	COVA	MANEUV
10335	IIIJ	INTEGER	ARRAY	10142	ITRAJ	INTEGER	ARRAY	ARRAY	MANEUV
9	ITT	INTEGER	MANEUV	204	KILL	INTEGER	ARRAY	ARRAY	PK
J	LEVEL	INTEGER	COVA	10333	NADJ	INTEGER	COVA		MANEUV
1601	NE02	INTEGER	COVA	1603	NPX	INTEGER	COVA		COVA
1116	NT	INTEGER	COVA	1604	NK	INTEGER	COVA		COVA
232	P	REAL	PK	1617	PHO	REAL	COVA		COVA
77	PPX	REAL	ARRAY	161	PPY	REAL	ARRAY	ARRAY	COVA
243	PPZ	REAL	ARRAY	1700	3H	REAL	COVA		COVA
1655	QY1	REAL	ARRAY	72	2I	REAL	COVA		COVA
57	RL3	REAL	COVA	1422	RL8K	REAL	COVA		COVA
76	R4	REAL	COVA	1435	RRR	REAL	COVA		COVA
1701	SA	REAL	COVA	1423	SCALEP	REAL	COVA		COVA
1622	SCALET	REAL	COVA	1665	SCALEV	REAL	COVA		COVA
837	SP4G	REAL	PK	849	SPH9	REAL	PK		PK
536	SPK	REAL	PK	1448	SPL	REAL	COVA		COVA
241	SPH	REAL	PK	71	SPO	REAL	COVA		COVA
1437	SR	REAL	COVA	1442	STL	REAL	COVA		COVA
1435	S1	REAL	COVA	1264	S2	REAL	COVA		COVA
1255	S3	REAL	COVA	1266	S4	REAL	COVA		COVA
1257	S5	REAL	COVA	1122	TAMA	REAL	ARRAY	ARRAY	COVA
75	THETAL	REAL	COVA	325	TINE	REAL	COVA		COVA
10050	T1'S	REAL	MANEUV	1624	TMA	REAL	ARRAY	ARRAY	COVA
407	T1'S	REAL	ARRAY	1623	TREAL	REAL	COVA		COVA
1216	VM	REAL	COVA	1703	VMX	REAL	ARRAY	ARRAY	COVA
1755	VNY	REAL	ARRAY	2047	VNZ	REAL	ARRAY	ARRAY	COVA
1445	VTI	REAL	COVA	1432	KC	REAL	COVA		COVA
1117	XC0VP	REAL	COVA	1	XDEH	REAL	ARRAY	ARRAY	MANEUV
0	X0H	REAL	PK	1270	XDM	REAL	ARRAY	ARRAY	COVA
1255	X0J	REAL	COVA	7723	XDTGM	REAL	ARRAY	ARRAY	MANEUV
443	XDTGMS	REAL	COVA	64	XDTGO	REAL	COVA		COVA
1446	XE	REAL	ARRAY	577	XHAN	REAL	ARRAY	ARRAY	COVA
1107	XMISS	REAL	ARRAY	10055	XPRINS	REAL	ARRAY	ARRAY	MANEUV
1652	XTR	REAL	COVA	2	XXS	REAL	ARRAY	ARRAY	COVA
1433	YC	REAL	COVA	1120	YCOMP	REAL	COVA		COVA
2537	YCEM	REAL	ARRAY	26	YDH	REAL	ARRAY	ARRAY	PK
1326	YOM	REAL	ARRAY	1257	YOO	REAL	COVA		COVA
7751	YDTGM	REAL	ARRAY	1503	YDTGMS	REAL	ARRAY	ARRAY	COVA
55	YUT50	REAL	COVA	1504	YE	REAL	ARRAY	ARRAY	COVA

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VARIABLES	SN	TYPE	RELOCATION
10056 YPRIME	REAL	MANEUV	
1600 ZALT	REAL	COMA	1663 YTA
1121 ZCOMP	REAL	COMA	1434 ZC
56 ZCH	REAL	ARRAY	5215 ZDM
1250 ZOO	REAL	PK	1359 ZDM
541 ZDTGMS	REAL	COMA	10017 ZDTGM
1542 ZE	REAL	ARRAY	66 ZDTGO
1664 ZTA	REAL	COMA	10057 ZPRIME

COMMON BLOCKS	LENGTH
COMA	1165
PK	152
MANEUV	4316

STATISTICS	DB	U
PROGRAM LENGTH	132138	5643
CM LABELLED COMMON LENGTH		

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SUBROUTINE INIT
COMMON/EXTRA/NPTS,DX,XTERM,KKK,AS,SEO,SC,ASEO,R,SCALEL,VVVV,C1,
*XLCS,YLOS,ZLOS,CJ,CY,CLY,CLZ,TRP,XX(50),THE
COMMON/COMA/LEVEL,IPTS,XXS(50),XDY,90,YDTG,ZDTG,0,RLB,C0SE,SPO,RI,
*GAN,EDOT,THEVAL,RN,
*PPX(50),PPY(50),PPZ(50),TIME(50),THAS(30),XDTGMS(30)
*YDTGMS(30),ZDTGMS(30),XMAN(4,50),XMISS(7),NI
*XCMP,VCOMP,ZCOMP,TAYA(30),DELTA(30),VH(30),G:GGG
*XJO,YJO,ZJO,DXG,DYG,DZG,S2,S3,S4,S5,XDM(30),YDM(30),ZDM(30),
*RLK,SCALEP,FI,FZ,FG,FI1,FG2,FG3,XG,YG,ZG,SI,RRR,SR,SPL,CIL,STL,
*CPL,AI,VII,XE(30),YE(30),ZE(30),ZALT,NERR,CLANPX,NX,CLAA(10),
*PHO,ARG,AAA,SCALET,REAL,TMA(30),XTA,YTA,ZTA,SCALEV,QHM(10),QH
*SA,CA,VXX(50),VXY(50),VHZ(50)
*ECSS(17),HR7EE(17),FI7I(9),FCI77(9)
COMMON /COMB/XD,YD,ZD,XDTG,ZDTG,XDEF,YDEF,ZDEF,ZZZ
*XDDE,YDDE,ZDDE
COMMON/COMP/IS1,I99,I88,CLMS(10),CLS1(10),CLS2(10),NSAM,Q1,Q2,Q3,
*24,Q5,Q6,H1,H2,H3,H4,H5,H6,IET,IPLANE,ICON,S2P1,S1P1,A2P1,A1P1,
*S2P2,S1P2,A2P2,A1P2,S2P3,S1P3,A2P3,A1P3,S2P4,S1P4,A2P4,A1P4,S2P5,
*S1P5,A2P5,A1P5,S2P6,S1P6,A2P6,A1P6
COMMON/MANEUV/ITT,XDEM(30,45),YDEM(30,45),ZDEM(30,45),
*XDTG(30),YDTG(30),ZDTG(30),ITRAJ(60),ITAU(60),III,NADJ,
*ZPRIME,TTIMES(50),ITRAJ(60),ITAU(60),III,NADJ,
COMMON/GTARG/FX,FY,FZ,FXG,FXG,FXG,FYB,FYB,FYB,FZC,FZC,FZC,AT,V1
DATA RTD,DTR/57.,2957795,0.01745323/
C*** GENERATE THE DISTANCE TABLE FOR COLLECTING DATA POINTS
SCALEP=20.*(102.375)/(1.+GGG)
STOP/NPTS
DIF=(XTERM*(STPN-1.+DX)-(20.*100.)/
1(1.+GGG)
IF(IJF.GE.0.) GO TO 47
NADJ=NPTS
GO TO 48
47 TR=RT/24
48 NADJ=NPTS-IFX(ARC)-1
58 CONTINUE
JO 20 I=1,NADJ
INDEX=NADJ-I+1
XI = I - 1
XX(INDEX) = XTERM + (XI*DX)
XAS(INDEX) = XX(INDEX)
20 CONTINUE
C*** WRITE OUT RANGE TABLE
IF(IIS.NE.I) PRINT 820, NPTS,DX,XTERM
IF(IIS.EQ.1) GO TO 21
PRINT 800
PRINT 700
PRINT 800
PRINT 705
PRINT 800
PRINT 820, (XX(I),XAS(I),I=1,NADJ)
PRINT 800
21 CONTINUE
XD=XDM(I)
YD=YDM(I)
ZD=ZDM(I)
XUX=XU

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YDY=YO
ZDZ=ZO
CALL GUID
60 XJTG=XDTG
YJTG=YDTG
ZJTG=ZDTG
PRINT 856,XD,YD,ZD,XDTG,YDTG,ZDTG
ARG = SQRT (XD**2 + YD**2)
IF (KKK.EQ.1) GO TO 65
65 SC=AS*DIR
ASEO = SEO * R10
IF (IT.NE.1) PRINT 807,AS,ASEO
70 C*** SCALE INITIAL LAUNCH CONDITIONS
RFEET = R1
PIER
GAMEG
75 C*** TRANSFORM MANEUVER VECTORS TO LAUNCH COORDINATES AND SCALE THEM
IF (ISL.EQ.1) GO TO 56
PRINT 802
PRINT 913
PRINT 800
PRINT 907
80 C*** CONTINUE
DO 70 I = 1,NT
XO=XOM(I)
YO=YOM(I)
ZO=ZOM(I)
CALL GUID
XDTG(I) = XDTG
YDTG(I) = YDTG
ZDTG(I) = ZDTG
XDTGS(I)=XDTG(I)
YDTGS(I)=YDTG(I)
ZDTGS(I)=ZDTG(I)
IF (ISL.NE.1) PRINT 908, THA(I),XDM(I),YDM(I),ZDM(I)
95 C*** CONTINUE
XO=XDX
YO=YDY
ZO=ZDZ
IF (ISL.EQ.1) GO TO 76
PRINT 911
PRINT 800
PRINT 907
PRINT 900
DO 75 I=1,NT
PRINT 908, THA(I),XDTG(I),YDTG(I),ZDTG(I)
75 CONTINUE
76 CALCULATE INITIAL TARGET ANGLE OF ATTACK
AAA=115.89*0.00389*ZZZ
ARGEO.00003*ZZZ
PHO=0.00237692*EXP(ARG)
OM=VVVV/AAA
MPX=Z
MX=8
CALL INTERP (OM,3MH,CLAA,NX,NPX,CLA,NERR)

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115 AT=13500.0
    ST=248.0
    XEU=XE(1)
    YEU=YE(1)
    ZEUS=ZE(1)
120 ATZ=HT*SQRT(XEU**2+YEU**2+ZEU**2)/(PHO*(VVVV**2)*ST*CLA*32.174)
    C CALCULATE INITIAL COSE
    CI=COS(AT)
    SI=SIN(AT)
    S9=SQRT(XD*XD+YD*YD)
    COSE=(SI*(ZD*CI-S9*SI)-(CI*(ZD*SI/S9))* (XD*S2+YD*S4))/VVVV
    S11=COSE
    COS=COSL**2
130 C CALCULATE INITIAL APPARENT PLUME LENGTH-TO-BREADTH RATIO
    PLB=CLX*SQRT(1.-CO)
    C CALCULATE INITIAL LOS
    XLOS=-R*S2
    YLOS=-R*S4
    ZLOS=R*STL
135 C CALCULATE HORIZON REFERENCE VECTOR
    ARG=YCG/ZSORT(XLOS**2+YLOS**2)
    BET=ACOS(ARG)
    IF(XLOS.LT.0.0) CY=-SIN(BET)
    IF(XLOS.GE.0.0) CY=SIN(BET)
    CX=-COS(BET)
140 C CALCULATE INITIAL TARGET CENTERLINE UNIT VECTOR
    CLX=XD*(CI*ZD*SI/ZSORT(XD*XD+YD*YD))/
    1VVVV
    CLY=YD*(CI*ZD*SI/ZSORT(XD*XD+YD*YD))/
    1VVVV
    CLZ=(ZD*CI-S2RT(XD*XD+YD*YD))*SI/7VVVV
    C CALCULATE INITIAL PLUME ROTATION ANGLE
    ARG1=(YCG*ZD*ST*CLX*CLY)/(XLOS*CLZ)
    ARG2=SQRT((YLOS*CLZ-ZLOS*CLY)**2+(XLOS*CLX-XLOS*CLZ)**2)
    150 ARG=ARG1/ARG2
    THE=ACOS(ARG)
    ARG=XLOS*CLY-YLOS*CLX
    IF(ARG.LT.0) GO TO 80
    IF(TH.LE.1.570796326) GO TO 65
    TRP=THE-4.7123889
    GO TO 90
    80 TRP=1.570796326-TH
    85 TRP=1.570796326+TH
    90 SP=TRP
    NX=17
    MPX=2
    CALL INTFRP(E111,ECGS,HRTEE,NX,NPX,HRZE,HERZ)
    HCF1=1.09.675*HRTE*EXP(-2.341*ALOG(RFEET/22965.8311))
    155 PIRSSZ=ATAN(C57RLO)
    P2IRSS=22.5*RLO/RFEET
    AT7=((P2IRSS**2)*SIN(PIRSS))/((Z.0*(COS(PIRSS/Z.0))**2)
    PJTU=0.1*EXP(1.003258*ALOG(AT7))
    170 FIT=HC7F/PJTUI
    NX=9

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IIPX=2
CALL INTERP (F17,F17T,FCI77,NX,NPX,FCI7,NERR)
RN=FCI7
175 700 FORMAT(10X,35H RANGE=10-GO TABLE FOR DATA COLLECTION)
705 FORMAT(22X,9H RANGE,FT,5X,13H SCALED RANGE)
800 FORMAT (11H0)
806 FORMAT(16X,6H XOTEO =F10.2,7H FT/SEC,5X,8H YOTEO =F10.2,7H FT/SEC,
*5X,8H ZJFEO =F10.2,7H FT/SEC,10X,9H XDTLO =F10.2,7H FT/SEC,5X,
*8H YDTLO =F10.2,7H FT/SEC,5X,8H ZDTLO =F10.2,7H FT/SEC)
807 FORMAT(13X,17H "CROSSING" ANGLE =F7.2,4H DEG,5X,13H DIVE ANGLE =
*F7.2,4H DEG)
820 FORMAT(10X,7H NPTS =I3.4X,5H DX =F6.2,3H FT,4X,8H XTERM =F7.2,
*3H FT)
822 FORMAT (20X F10.2,5X E15.8)
907 FORMAT (11H 4X 35H TIME .15H 20-MANUEVER) YU MANEJVER
908 FORMAT(1X F10.4, 3(3X F8.2,4X))
910 FORMAT(10X,24H "EARTH-FIXED COORDINATES)
911 FORMAT(10X,19H LAUNCH COORDINATES)
912 FORMAT(9E14.8)
RETURN
END

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SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
I INIT

VARIBLES	SN	TYPE	RELOCATION	ARG	REAL	COMA	EXTRA	COMA
1621 AAA	REAL	COMA		1620 ARG	REAL			COMA
1021 ARG1	REAL			1027 ARG2	REAL			EXTRA
4 AS	REAL	EXTRA		7 ASE0	REAL			
11 AT	REAL	GTARG		1027 AT7	REAL			
144 A1	REAL	COMA		64 A1P1	REAL			COMP
70 A1P2	REAL	COMP		74 A1P3	REAL			COMP
100 A1P4	REAL	COMP		104 A1P5	REAL			COMP
110 A1P6	REAL	COMP		83 A2P1	REAL			COMP
67 A2P2	REAL	COMP		73 A2P3	REAL			COMP
77 A2P4	REAL	COMP		103 A2P5	REAL			COMP
107 A2P5	REAL	COMP		1017 BET	REAL			
1702 CA	REAL	COMA		1602 CLA	REAL			COMA
1605 CLAA	REAL	ARRAY		3 CLMS	REAL	ARRAY		COMP
15 CLS1	REAL	ARRAY		27 CLS2	REAL	ARRAY		COMP
1020 CLX	REAL	COMP		22 CLY	REAL			EXTRA
73 CLZ	REAL	EXTRA		17 CO	REAL			EXTRA
70 COSE	REAL	COMA		1443 CPL	REAL			COMA
1441 CTL	REAL	COMA		20 CX	REAL			EXTRA
21 CY	REAL	EXTRA		13 CI	REAL			EXTRA
1150 DELTAR	REAL	ARRAY		1000 DIF	REAL			EXTRA
515 DIR	REAL	REAL		1 DX	REAL			EXTRA
1251 DYG	REAL	COMA		1262 DYG	REAL			COMA
1263 DZG	REAL	COMA		2131 E00S	REAL	ARRAY		COMA
74 E00T	REAL	COMA		1016 E111	REAL			
1032 FCI7	REAL	REAL		2204 FCI77	REAL	ARRAY		COMA
1031 FI7	REAL	REAL		2173 FI77	REAL	ARRAY		COMA
0 FXA	REAL	GTARG		3 FXB	REAL			GTARG
5 FXC	REAL	GTARG		1 FYA	REAL			GTARG
4 FYB	REAL	GTARG		7 FYB	REAL			GTARG
2 FYA	REAL	GTARG		5 F7B	REAL			GTARG
10 FZC	REAL	GTARG		1424 F1	REAL			COMA
1425 FZ	REAL	COMA		1426 F3	REAL			COMA
1254 G	REAL	COMA		73 G4H	REAL			COMA
1255 GGG	REAL	COMA		1427 G1	REAL			COMA
1430 G2	REAL	COMA		1431 G3	REAL			COMA
1024 HC7FT	REAL	REAL		1023 HR7E	REAL			
2152 HR7EE	REAL	ARRAY		1001 I	INTEGER			COMP
60 ICCN	INTEGER	COMP		56 IFT	INTEGER			INTEGER
10332 III	INTEGER	MANEUV		1002 INDEX	INTEGER			INTEGER
57 IPLANE	INTEGER	COMP		1 IPTS	INTEGER			INTEGER
0 ISI	INTEGER	COMP		1 ITAU	INTEGER	ARRAY		COMA
10142 ITRAJ	INTEGER	ARRAY		10236 ITAU	INTEGER	ARRAY		MANEUV
2 IAB	INTEGER	COMP		0 ITT	INTEGER			COMP
3 KKK	INTEGER	EXTRA		1 I99	INTEGER			COMA
13333 M00J	INTEGER	MANEUV		0 LEVEL	INTEGER			COMA
0 NPT5	INTEGER	EXTRA		1601 MERR	INTEGER			COMA
41 NS44	INTEGER	EXTRA		1603 NPX	INTEGER			COMA
1006 'X	INTEGER	COMP		1116 NI	INTEGER			COMA
1030 PJTUI	REAL	COMA		1617 PHO	REAL			COMA
151 PPY	REAL	ARRAY		.77 PPK	REAL	ARRAY		COMA
1025 P11R35	REAL	REAL		243 PPT	REAL	ARRAY		COMA
				1026 P21RS5	REAL			

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VARIABLES	SN	TYPE	RELOCATION	REAL	ARRAY	COMA	COMP	COMB	COMA
1700 QM	REAL	COMA							
42 Q2	REAL	COMP		1666 2MM	ARRAY	COMA	COMP		
44 Q3	REAL	COMP		43 Q2			COMP		
46 Q5	REAL	COMP		45 Q4			COMP		
10 R	REAL	EXTRA		1007 2FEET			COMP		
72 RI	REAL	COMA		67 RLB			COMA		
1422 RLK	REAL	COMA		76 RN			COMA		
1436 RRR	REAL	COMA		514 RTD			COMA		
1701 SA	REAL	COMA		6 SC			EXTRA		
11 SCALEL	REAL	EXTRA		1423 SCALEP			COMA		
1622 SCALEY	REAL	COMA		1665 SCALEV			COMA		
5 SEJ	REAL	EXTRA		1440 SPL			COMA		
71 SPJ	REAL	COMA		1437 SR			COMA		
1011 ST	REAL	REAL		1442 STL			COMA		
777 STP4	REAL	REAL		1435 S1			COMA		
62 S1P1	REAL	COMP		66 S1P2			COMP		
72 S1P3	REAL	COMP		78 S1P4			COMP		
102 S1P5	REAL	COMP		105 S1P6			COMP		
1264 S2	REAL	COMA		61 S2P1			COMP		
55 S2P2	REAL	COMP		71 S2P3			COMP		
75 S2P4	REAL	COMP		101 S2P5			COMP		
105 S2P6	REAL	COMP		1265 S3			COMA		
1256 S4	REAL	COMA		1267 S5			COMA		
1015 S9	REAL	COMA		1122 TAMA	ARRAY	COMA	COMA		
107 THE	REAL	EXTRA		75 THETA			COMA		
325 TIME	REAL	COMA		10060 TIMES	ARRAY	MANEUV	COMA		
1624 TMA	REAL	ARRAY		407 TMAS	ARRAY	COMA	COMA		
1623 TREAL	REAL	COMA		24 TRP			EXTRA		
1216 VM	REAL	COMA		1703 VMX	ARRAY	COMA	COMA		
1755 VHY	REAL	ARRAY		2047 VMZ	ARRAY	COMA	COMA		
12 VI	REAL	GTARG		1445 VTI			COMA		
12 VVVV	REAL	EXTRA		1010 W1			COMA		
50 W1	REAL	COMP		51 W2			COMP		
92 W3	REAL	COMP		93 W4			COMP		
54 W5	REAL	COMP		55 W6			COMP		
1432 XC	REAL	COMA		1117 XCOMP			COMA		
0 X0	REAL	COMB		12 XODE			COMB		
6 XDEF	REAL	COMB		1 XODEM	ARRAY	MANEUV	COMA		
1270 XOM	REAL	ARRAY		1256 XOO			COMA		
3 XOTG	REAL	COMB		7723 XDTGM	ARRAY	MANEUV	COMA		
445 XOTGMS	REAL	ARRAY		64 XDTGO			COMA		
1004 XDX	REAL	REAL		1446 XE	ARRAY	COMA	COMA		
1012 XEU	REAL	REAL		1001 XI			COMA		
14 XLOS	REAL	EXTRA		577 XHAN	ARRAY	COMA	COMA		
1107 XMISS	REAL	COMA		10055 XPRIME	REAL	MANEUV	COMA		
1662 XTA	REAL	COMA		2 XTERM	REAL	EXTRA	COMA		
25 XX	REAL	EXTRA		2 XXS	ARRAY	COMA	COMA		
1433 YC	REAL	COMA		1120 YCOMP			COMA		
1 YD	REAL	COMB		13 YODE	REAL	COMB	COMB		
7 YDEF	REAL	COMB		2507 YDEM	REAL	ARRAY	MANEUV		
1320 YC1	REAL	ARRAY		1257 YOO	REAL	COMA	COMA		
4 YDTG	REAL	COMB		7761 YDTGM	REAL	ARRAY	MANEUV		
503 YDTGMS	REAL	COMA		65 YDTGO	REAL	COMA	COMA		
1005 YDY	REAL	REAL		1504 YE	REAL	ARRAY	COMA		
1013 YEJ	REAL	REAL		15 YLOS	REAL	EXTRA	COMA		
10055 YPRIME	REAL	MANEUV		1663 YTA	REAL	COMA	COMA		
1600 ZALT	REAL	COMA		1434 ZC	REAL	COMA	COMA		

VARIABLES	SN	TYPE	RELOCATION
1121	ZCOMP	REAL	COMA
14	ZODE	REAL	COMB
5215	ZDEM	REAL	COMB
1260	ZDO	REAL	ARRAY
10017	ZDTGM	REAL	MANEUV
56	ZDTGO	REAL	COMA
1542	ZE	REAL	COMA
16	ZLOS	REAL	EXTRA
1654	ZTA	REAL	COMA
	ZD	REAL	2
	ZDEF	REAL	10
	ZDM	REAL	1364
	ZDTG	REAL	5
	ZDTGMS	REAL	541
	ZDZ	REAL	1006
	ZEU	REAL	1014
	ZPRIME	REAL	10057
	ZZZ	REAL	11
		REAL	MANEUV
		REAL	COMB

FILE NAMES	MODE
OUTPUT	FMT

EXTERNALS	TYPE	ARGS
ACOS	REAL	1 LIBRARY
ATAN	REAL	1 LIBRARY
COS	REAL	1 LIBRARY
GOJ	0	
SIN	REAL	1 LIBRARY
	REAL	ALOG
	REAL	ATANZ
	REAL	EXP
	REAL	INTERP
	REAL	SQRT
	REAL	1 LIBRARY

INLINE FUNCTIONS	TYPE	ARGS
IFIX	INTEGER	1
INTRIN		

STATEMENT LABELS				
0	20	73	21	16
22	48	120	65	47
0	70	0	75	144
411	80	414	85	66
641	700	647	705	230
556	305	700	207	76
717	922	722	907	516
736	910	743	911	90
				654
				800
				FMT
				710
				820
				FMT
				732
				908
				FMT
				747
				912
				FMT
				ND REFS

COMMON BLOCKS	LENGTH
EXTRA	72
COMA	1165
COMB	13
COMP	73
MANEUV	4316
STAR	11

STATISTICS		
PROGRAM LENGTH	10338	539
CM-LABELED COMMON LENGTH	130228	5650

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SUBROUTINE LETH
COMMON/PK7XDHI(ZZ),YDHI(ZZ),ZDHI(ZZ),BDHX(ZZ),BDHY(ZZ),BDHZ(ZZ)
* KILL (Z),P(4),SPK,SPHG,SPHS,SPH
COMMON/MSD/XM(J),YM(J),ZM(J),RM(J),NOPT,IGN
COMMON/MAHEUV/III,XDEN(30,45),YDEM(30,45),ZDEM(30,45),
* XDTCH(30),YDTCH(30),ZDTCH(30),XPRIME,YPRIME,
* ZPRIME,TIMES(50),ITRAJ(60),ITAU(60),III,NADJ
COMMON/ZDEL/PPXS(50),PPYS(50),PPZS(50),VMXS(50),VMYS(50),VMZS(50)
COMMON/CORB/COSB,COSB,COSB,YA,ZA
COMMON/COMP/ISI,I88,I88,CLMS(10),CLS(10),CLS2(10),NSAM,Q1,Q2,Q3,
* Q4,Q5,Q6,M2,M3,M4,M5,M6,IFT,IPLANE,ICON,S2P1,S1P1,A2P1,A1P1,
* S2P2,S1P2,A2P2,A1P2,S2P3,S1P3,A2P3,A1P3,S2P4,S1P4,A2P4,A1P4,S2P5,
* S1P5,A2P5,A1P5,S2P6,S1P6,A2P6,A1P6
* COSA=(I./ZA)/SQRT((I./ZA)**2+(YA/ZA)**2+1.)
* COSB=(YA/ZA)/SQRT((I./ZA)**2+(YA/ZA)**2+1.)
* COSC=1./SQRT((I./ZA)**2+(YA/ZA)**2+1.)
SSX=0.0
SSY=0.0
SSZ=0.0
JJ=4
JJ=J=1,NADJ
SSX=SSX+VMXST(J)
SSY=SSY+VMYS(J)
SSZ=SSZ+VMZS(J)
4 CONTINUE
ADJ=FLAG(NADJ)
C*** AVERAGE LAUNCH COORDINATES OF RELATIVE VELOCITY VECTORS OVER DATA
C COLLECTION RANGE
COUL5=(SSX/ADJ)
COUL7=(SSZ/ADJ)
C*** GENERALIZED TARGET COORDINATES OF AVERAGE RELATIVE VELOCITY VECTOR
C REFERENCED TO ORIGIN AT TAILPIPE
CUUL5=FXA*COUL5+FYA*COUL5+FZA*COUL5
CUUL7=FKC*COUL5+FYC*COUL5+FZC*COUL5
C1=COS(AT)
S1=SIGN(AT)
C*** TARGET FIXED COORDINATES OF AVERAGE RELATIVE VELOCITY VECTOR
C REFERENCED TO ORIGIN AT TAILPIPE
CARL5=CUUL7*C1+CUUL5*S1
CARL7=CUUL5*C1-CUUL7*S1
C*** TARGET FIXED COORDINATES OF AVERAGE INERTIAL MISSILE VELOCITY
C VECTOR
VMI=(CUUL7*VT)*C1+CUUL5*S1
VM2=-CUUL6
VM3=CUUL5*C1-(CUUL7*VT)*S1
C*** GENERALIZED TARGET COORDINATES OF POSITION VECTOR OF LAST DATA
C POINT
C REFERENCED TO ORIGIN AT TAILPIPE
XAI=FXA*PPXS(NADJ)+FYA*PPYS(NADJ)+FZA*PPZS(NADJ)
ZAI=FXC*PPXS(NADJ)+FYC*PPYS(NADJ)+FZC*PPZS(NADJ)
YAI=FXJ*PPXS(NADJ)+FYB*PPYS(NADJ)+FZB*PPZS(NADJ)
C*** TARGET FIXED COORDINATES OF POSITION VECTOR OF LAST DATA POINT
C REFERENCED TO ORIGIN AT TAILPIPE

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```

XAIMU=ZAI*C1+XAI*S1
YAIMU=YAI
60 C*** DISTANCE BETWEEN LAST DATA POINT AND XF-YF PLANE PIERCING POINT
C REFERENCE TO ORIGIN AT TAILPIPE
DI=SRIT((XAIMU-ZM(1)/ZA)**2+(YAIMU-YM(1)+(YA/ZA)*ZH(1))**2)
**ZAI*DI**2)
55 C*** COMPONENTS OF UNIT VECTOR IN DIRECTION FROM XF-YF PLANE PIERCING
C POINT TO POSITION OF LAST DATA POINT
C REFERENCED TO ORIGIN AT TAILPIPE
AA=(XAIMU-ZM(1)/ZA)/DI
BB=(YAIMU-YM(1)+(YA/ZA)*ZH(1))/DI
CC=ZAIMU/DI
70 IF (COS(A/ABS(COSA))-NE,AA/ABS(AA)) COSA=-COSA
IF (COS(B/ABS(COSB))-NE,BB/ABS(BB)) COSB=-COSB
IF (COS(C/ABS(COSG))-NE,CC/ABS(CC)) COSG=-COSG
C*** COSINE OF THETA
75 COST=AA*COSA+BB*COSB+CC*COSG
C*** DISTANCE BETWEEN PK MODEL AIM POINT AND XF-YF PLANE PIERCING POINT
C REFERENCED TO ORIGIN AT TAILPIPE
DZ=DI*COST
80 C*** TARGET FIXED COORDINATES OF PK MODEL AIM POINT
C REFERENCED TO ORIGIN AT CG
XAIM=DZ*COSA-ZH(1)/ZA-19.5
YAIM=DZ*COSB+YM(1)-(YA/ZA)*ZH(1)
ZAIM=DZ*COSG
IF (ISI.E.1) GO TO 30C
PRINT 333,XAIMU,YAIMU,ZAIMU,DI,AA,BB,CC,COST,DZ
85 PRINT 999,COSA,COSB,COSG
300 CONTINUE
NELIPS=22
VSHELL=SQRT(VM1**2+VM2**2+VM3**2)
90 BUX=VMI/VSHELL
BUTE=VMZ/VSHELL
BUEV=VMY/VSHELL
IF (ISI.EQ.1) GO TO 30I
PRINT 999,COOL5,COOL6,COOL7,CUUL5,CUUL6,CUUL7,C1,S1
95 PRINT 999,CARL5,CARL6,CARL7,VM1,VM2,VM3,XAI,YAI,ZAI
PRINT 999,XAIM,YAIM,ZAIM,VSHELL,BUX,BUY,BUZ
30I CONTINUE
701 CONTINUE
TSTAO=10J.
MPEN=0
100 UO 444 M=1,NELIPS
CAY1=(XAIM-XJR(CH7)/BDHX(H))
CAY3=(YAIM-YOH(M))/BDHY(H)
CAY5=(ZAIM-ZDH(M))/BDHZ(H)
105 CAY2=CARL5/BDHX(M)
CAY4=CARL6/BDHY(H)
CAY6=CARL7/BDHZ(H)
CAY7=CAY2**2+CAY3**2+CAY5**2+CAY6**2
CAY8=Z.*(CAY1**2+CAY3**2+CAY5**2+CAY6**2)
110 CAY9=CAY1**2+CAY3**2+CAY5**2+I.
TEMP1=(CAY8*U.5)/CAY7
TEMP2=CAY9/CAY7
DISKI=TEMP1**2-TEMP2
IF (DISKI)444,545,645
TRIAL=-TEMP1-SRT(ABS(DISKI))

```

115 IF ((IRIAL-ISTAB)466.444.444

446 ISTAR=ITPIAL
MPEN=M

444 CONTINUE

DO 460 M=1,4

460 P(M)=0.

IF (MPEN) 461,461,462

461 P(1)=1.

GO TO 500

462 IF (KILLC*MPEN) 471,471,472

471 P(2)=1.

GO TO 500

472 III=ISTAB

MPEN

XS=XAIM+CARL5*III

YS=YAIM+CARL6*III

ZS=ZAIM+CARL7*III

AM=2.*(XS-XDH(M))/ (BDHX(M)**2)

BM=2.*(YS-YDH(M))/ (BDHY(M)**2)

CM=2.*(ZS-ZDH(M))/ (BDHZ(M)**2)

CSANG=(-AN*BUX-CN*BUZ)/SQRT(AN**2+BN**2+CN**2)

IF (CSANG<-.174) 481,481,482

481 P(3)=1.

GO TO 500

482 P(4)=1.

500 CONTINUE

PRINT 101, P(1), P(2), P(3), P(4)

SPK=SPK*P(4)

SPHG=SPHG*P(3)

SPHS=SPHS*P(2)

SPM=SPM*P(1)

101 FORMAT(1H:7H ,F6.4,3X,7H ,F6.4,3X,16H ,F6.4,3X,7H ,F6.4)

RETURN

END

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SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
I LETH

VARIABLES	SN	TYPE	RELOCATION	524	ADJ	REAL	GTARG
532 AA		REAL		11	AT	REAL	GTARG
613 AN		REAL		70	AIP2	REAL	COMP
84 AIP1		REAL	COMP	100	AIP4	REAL	COMP
74 AIP3		REAL	COMP	110	AIP6	REAL	COMP
104 AIP5		REAL	COMP	67	A2P2	REAL	COMP
53 A2P1		REAL	COMP	77	A2P4	REAL	COMP
73 A2P3		REAL	COMP	107	A2P6	REAL	COMP
103 A2P5		REAL	COMP	102	BDHK	REAL	PK
553 B3		REAL	ARRAY	156	BDHZ	REAL	ARRAY
130 3C-Y		REAL	PK	564	BUX	REAL	PK
614 JN		REAL		566	BUZ	REAL	
535 BUY		REAL		536	CARL6	REAL	
535 CARL5		REAL		572	CAY1	REAL	
537 CARL7		REAL		573	CAY3	REAL	
575 CAY2		REAL		574	CAY5	REAL	
576 CAY4		REAL		600	CAY7	REAL	
577 CAY5		REAL		602	CAY9	REAL	
601 CAY8		REAL		3	CLNS	REAL	ARRAY
554 CC		REAL	ARRAY	27	CLS2	REAL	ARRAY
15 CLS1		REAL	COMP	525	COOL5	REAL	COMP
615 CN		REAL		527	COOL7	REAL	
526 COOL6		REAL		1	COSB	REAL	COMP
9 COSA		REAL	COMP	555	COST	REAL	
2 COSJ		REAL	COMP	530	COUL5	REAL	
616 CSANG		REAL		532	COUL7	REAL	
531 COUL6		REAL		605	DISCRI	REAL	
533 C1		REAL		556	J2	REAL	
531 J1		REAL		3	FXB	REAL	GTARG
9 FAA		REAL	GTARG	1	FYA	REAL	GTARG
6 FXC		REAL	GTARG	7	FYC	REAL	GTARG
4 FYB		REAL	GTARG	5	FZB	REAL	GTARG
2 FZA		REAL	GTARG	15	ICN	INTEGER	MISD
10 FZC		REAL	GTARG	58	IFT	INTEGER	COMP
80 ICCV		INTEGER	COMP	57	IPLANE	INTEGER	COMP
10332 III		INTEGER	MANEUV	10236	ITAU	INTEGER	MANEUV
0 ISI		INTEGER	COMP	0	ITT	INTEGER	MANEUV
10142 ITRAJ		INTEGER	ARRAY	1	I99	INTEGER	MANEUV
2 I88		INTEGER	COMP	204	KILL	INTEGER	COMP
523 J		INTEGER		570	MPEN	INTEGER	PK
571 M		INTEGER		562	NELIPS	INTEGER	
10333 MAJJ		INTEGER	MANEUV	41	NSAH	INTEGER	COMP
14 NOPT		INTEGER	MISD	0	PPXS	REAL	DEL
232 P		REAL	PK	144	PPZ5	REAL	DEL
62 PPS3		REAL	ARRAY	43	32	REAL	COMP
42 Q1		REAL	COMP	45	34	REAL	COMP
44 J3		REAL	COMP	47	36	REAL	COMP
65 J5		REAL	COMP	237	SPHG	REAL	PK
11 RM		REAL	ARRAY	236	SPK	REAL	PK
240 SP-15		REAL	PK	520	SSX	REAL	PK
241 SP-16		REAL	PK	522	SSZ	REAL	PK
521 J37		REAL					

VARIABLES	SN	TYPE	RELOCATION	62	S1P1	REAL	COMP
534 S1		REAL		72	S1P3	REAL	COMP
56 S1P2		REAL	COMP	102	S1P5	REAL	COMP
76 S1P4		REAL	COMP	61	S2P1	REAL	COMP
109 S1P5		REAL	COMP	71	S2P3	REAL	COMP
65 S2P2		REAL	COMP	101	S2P5	REAL	COMP
75 S2P4		REAL	COMP	603	TEMP1	REAL	COMP
105 S2P6		REAL	COMP	10060	TIMES	REAL	MANEUV
604 TEM2		REAL		606	TTRIAL	REAL	
557 TSTAB		REAL		226	VMXS	REAL	ARRAY
507 TTT		REAL	ARRAY	372	VMZS	REAL	ARRAY
310 VMYS		REAL	DELT	541	VM2	REAL	DELT
540 VMI		REAL		563	VSHELL	REAL	DELT
542 VM3		REAL		50	M1	REAL	COMP
12 VT		REAL	GTARG	52	M3	REAL	COMP
51 M2		REAL	COMP	54	M5	REAL	COMP
53 M4		REAL	COMP	543	KAI	REAL	COMP
55 M6		REAL	COMP	546	XAIMD	REAL	COMP
557 XAIM		REAL		0	XDH	REAL	ARRAY
1 XDM		REAL	MANEUV	0	XM	REAL	PK
7723 XDTJM		REAL	ARRAY	0	XS	REAL	ARRAY
10055 XP-IME		REAL	MANEUV	610	XS	REAL	ARRAY
10055 XP-IME		REAL	COND	545	YAI	REAL	MISO
3 YA		REAL		547	YAIMD	REAL	
550 YAIM		REAL		26	YDH	REAL	PK
2507 YDEM		REAL	MANEUV	3	YN	REAL	ARRAY
7751 YDTGH		REAL	ARRAY	611	YS	REAL	ARRAY
10055 YP-IME		REAL	MANEUV	544	ZAI	REAL	MISO
4 ZA		REAL	COND	550	ZAIMD	REAL	
561 ZAIY		REAL		54	ZDH	REAL	PK
5215 ZDEM		REAL	MANEUV	6	ZM	REAL	ARRAY
10017 ZDTGM		REAL	ARRAY	612	ZS	REAL	ARRAY
10057 ZP-IME		REAL	MANEUV				MISO

FILE NAMES OUTPUT MODE

EXTERNALS	TYPE	APPS	SIN	REAL	REAL	1	LIBRARY
605	REAL	1	LIBRARY				
507	REAL	1	LIBRARY				

INLINE FUNCTIONS	TYPE	ARGS	INTRIN	INTRIN	INTRIN
ABS	REAL	1	INTRIN		
ARG	REAL	1	INTRIN		

STATEMENT LABELS	475	101	FMT	215	300
0 4					
236 301	INACTIVE	306	444	0	445
0 446		0	450	0	461
317 462		0	471	324	472
0 481	INACTIVE	367	482	371	500
507 999	FMT				

COMMON BLOCKS	LENGTH
PK	152
MISO	14
MANEUV	6316
DELT	300
STARC	11
COMJ	5

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SUBROUTINE LETH 7474 OPT=1 FTNH 4.2+75348 01/12/76 14.30.55. PAGE 6

COMMON BLOCKS LENGTH
COMP 73

STATISTICS
PROGRAM LENGTH 6178 399
CM LABELED COMMON LENGTH 114218 4881

```

SUBROUTINE QCLIN
COMMON/COMP/ISI199,I86,CLMS(ID),CLSI(ID),CLSZ(ID),NSAM,Q1,Q2,Q3,
*J4,J5,Q6,M1,M2,M3,M4,M5,M6,IFT,IPLANE,ICON,S2P1,SIP1,A2P1,AIP1,
*S2P2,SIP2,A2P2,AIP2,S2P3,SIP3,A2P3,AIP3,S2P4,SIP4,A2P4,AIP4,S2P5,
*SIP5,A2P5,AIP5,S2P6,SIP6,A2P6,AIP6

```

C CALCULATE CONTROL LIMITS

- S2P1=M1*CLSZ(NSAM)
- SIP1=M1*CLSI(NSAM)
- A2P1=J1+M1*CLMS(NSAM)
- AIP1=J1+M1*CLMS(NSAM)
- S2P2=M2*CLSZ(NSAM)
- SIP2=M2*CLSI(NSAM)
- A2P2=Q2+M2*CLMS(NSAM)
- AIP2=Q2+M2*CLMS(NSAM)
- S2P3=M3*CLSZ(NSAM)
- SIP3=M3*CLSI(NSAM)
- A2P3=Q3+M3*CLMS(NSAM)
- AIP3=Q3+M3*CLMS(NSAM)
- J2P4=M4*CLSZ(NSAM)
- SIP4=M4*CLSI(NSAM)
- A2P4=J4+M4*CLMS(NSAM)
- AIP4=J4+M4*CLMS(NSAM)
- S2P5=M5*CLSZ(NSAM)
- SIP5=M5*CLSI(NSAM)
- A2P5=J5+M5*CLMS(NSAM)
- AIP5=J5+M5*CLMS(NSAM)
- S2P6=M6*CLSZ(NSAM)
- SIP6=M6*CLSI(NSAM)
- A2P6=Q6+M6*CLMS(NSAM)
- AIP6=Q6+M6*CLMS(NSAM)

RETURN
END

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 QCLIN

VARIABLES	SN	TYPE	RELOCATION					
64 A1P1		REAL	COMP	70 A1P2	REAL		COMP	
74 A1P3		REAL	COMP	100 A1P4	REAL		COMP	
106 A1P5		REAL	COMP	110 A1P6	REAL		COMP	
63 A2P1		REAL	COMP	67 A2P2	REAL		COMP	
73 A2P3		REAL	COMP	77 A2P4	REAL		COMP	
103 A2P5		REAL	COMP	107 A2P6	REAL		COMP	
3 CLMS		REAL	ARRAY	15 CLS1	REAL		ARRAY	
27 CLS2		REAL	ARRAY	60 LOON	INTEGER		COMP	
56 IFT		INTEGER	COMP	57 IPLANE	INTEGER		COMP	
0 ISI		INTEGER	COMP	2 I88	INTEGER		COMP	
1 I99		INTEGER	COMP	41- NSAM	INTEGER		COMP	
42 Q1		REAL	COMP	43 I2	REAL		COMP	
44 Q3		REAL	COMP	45 I4	REAL		COMP	
66 Q5		REAL	COMP	47 I6	REAL		COMP	
62 S1P1		REAL	COMP	66 S1P2	REAL		COMP	
72 S1P3		REAL	COMP	76 S1P4	REAL		COMP	
102 S1P5		REAL	COMP	106 S1P6	REAL		COMP	
51 S2P1		REAL	COMP	63 S2P2	REAL		COMP	
71 S2P3		REAL	COMP	73 S2P4	REAL		COMP	
101 S2P5		REAL	COMP	105 S2P6	REAL		COMP	
50 W1		REAL	COMP	51 W2	REAL		COMP	
52 W3		REAL	COMP	53 W4	REAL		COMP	
54 W5		REAL	COMP	55 W6	REAL		COMP	

COMMON BLOCKS LENGTH 73

STATISTICS
PROGRAM LENGTH 568 66
COMMON LABELLED COMMON LENGTH 1118 73

SUBROUTINE GUID
C** THIS SUBROUTINE TRANSFORMS EARTH FIXED TO LAUNCH COORDINATES.

COMMON /ANG/SINCO,COSSO,SINSCO,COSSCO
COMMON /COMB/XD,YD,ZD,XDTG,YDTG,ZDTG,XDEF,YDEF,ZDEF,ZZZ

*XDOE,YDOE,ZDOE
C***

XDTG = XD * COSSO * COSSCO + YD * COSSO * SINSCO - ZD * SINCO
YDTG = -XD * SINSCO + YD * COSSCO
ZDTG = XD * SINCO * COSSCO + YD * SINCO * SINSCO + ZD * COSSCO

C***
RETURN
END

SUBROUTINE GUID 74774 OPT=1 FTNH 4-2-75348 01/12/76 14-31-06 PAGE 2

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
1 GUID

VARIABLES	SN	TYPE	RELOCATION
3	COSSO	REAL	ANG
2	SINSD	REAL	ANG
0	XU	REAL	COMB
6	XDEF	REAL	COMB
1	YD	REAL	COMB
7	YDEF	REAL	COMB
2	ZU	REAL	COMB
10	ZDEF	REAL	COMB
11	ZZZ	REAL	COMB
1	COSSO	REAL	ANG
0	SINSD	REAL	ANG
12	XDDE	REAL	COMB
3	XDTG	REAL	COMB
13	YDDE	REAL	COMB
4	YDTG	REAL	COMB
14	ZDDE	REAL	COMB
5	ZDTG	REAL	COMB

COMMON BLOCKS LENGTH
ANG 4
COMB 13

STATISTICS
PROGRAM LENGTH 218 17
CM LABELED COMMON LENGTH 218 17

```

SUBROUTINE KSCALE, RETURNS(ZI)
C*** THIS ROUTINE GIVES THE ESTIMATED TIME AT 1000 FT-T0-GO (T-PRIME)
C*** AND THE VALUE OF GAMMA THAT WILL NOT ALLOW ANALOG OVERLOAD (GAMA).
C*** THEY DETERMINE THE VARIABLE SCALE FACTOR EQUATION. THE RETURNED
C*** VALUES ARE G FOR T-PRIME AND GGG FOR GAMA.
COMMON/COMMON/LEVEL, IPTS, XXS(50), XDTG0, YDTG0, ZDTG0, RLB, COSE, SPO, RI,
* GAN, EDOOT, THETA, SN,
* PAX(50), PPY(50), PPZ(50), TIME(50), THAS(30), XDTGMS(30)
* YDTGMS(30), ZDTGMS(30), XMAN(4,50), XMISS(7), NT
* XCOMP, YCOMP, ZCOMP, TANA(30), DELTAR(30), VM(30), G+GGG
* X00, Y00, Z00, DXG, DYG, DZG, S2, S3, S4, S5, XDM(30), YDM(30), ZDM(30),
* RLDK, SCALEP, F1, F2, F3, G1, G2, G3, XG, YG, ZG, S1, RRR, SR, SPL, CTL, STL,
* CPL, A1, V11, XE(30), YE(30), ZE(30), ZALT, NERR, CLA, NPX, NX, CLAA(10),
* PHO, ARG, AAA, SCALE1, THEAL, TMA(30), XTA, YTA, ZTA, SCALEV, QNM(10), QM
* SA, CA, VAX(50), VAY(50), VMZ(50)
* ECOS(17), HRTEC(17), FI(19), FCI(77(19))
COMMON/COMP/IS1, I99, I88, CLMS(10), CLS1(10), NSAM, Q1, Q2, Q3,
* T5, T3, Q5, M1, M2, A3, M4, M5, M6, IFT, IFLANE, ICON, S2P1, S1P1, A2P1, A1P1,
* S2P2, S1P2, A2P2, A1P2, S2P3, S1P3, A2P3, A1P3, S2P4, S1P4, A2P4, A1P4, S2P5,
* S1P5, A2P5, A1P5, S2P6, S1P6, A2P6, A1P6

```

```

20 C
C*** BEGIN CONVERGING SEARCH FOR T-PRIME AT 1000 FT-T0-GO.

```

```

25 R=RI
DC=1.
AN=0.
G=0.

```

```

30 10 G=G+JG
ARG1=C*SRT(YDTG0**2+ZDTG0**2)
ARG2=R+G*XDTG0-1000.
THETA2=ATAN2(ARG1,ARG2)
NPX=2

```

```

35 IF (G<GT+20) GO TO 20
CALL INTERP(G, TANA, DELTAR, NS, NPX, OX, NERR)
VALUE=R-DR*COS(THETA2)+G*XDTG0-1000.
A=ABS(VALUE)

```

```

40 IF (A.LT.20.) GO TO 40
IF (VALUE<GT-0.) GO TO 10
AN=AN+1.
G=G-UC

```

```

45 DC=.1/AN
GO TO 10
20 PRINT 30

```

```

30 FORMAT(IUX,35H T-PRIME IS GREATER THAN 20 SECONDS)
RETURN ZI

```

```

60 CONTINUE

```

```

50 IF (IS1.NE.1) PRINT 5J, G, DR
50 FORMAT(IUX,10H T-PRIME =F10.4,4H SEC,5X,26H DELTAR AT 1000 FT TO G
* C =F10.2,3H FT)

```

```

C*** BEGIN CONVERGING SEARCH FOR GAMA.

```

```

55 DC=1.
AN=0.

```

```

GG=0.
50 SG=GG*F05
   AS=XDTGO*XDTGO
   CALL INTERP(GG,YAMA,DELTA,R,NB,NPX,DR,NERR)
   CALL INTERP(GG,YAMA,VM,NB,NPX,V,NERR)
   G=2.*XDTGO*(20000.-3*DR* $\cos(\text{THETA2})$ )-20000.*V* $\cos(\text{THETA2})$ 
   C=IR-DR* $\cos(\text{THETA2})$ *(20000.-R*DR* $\cos(\text{THETA2})$ )
   VALUE=A*GG*G3+B*GG+C
   AA=ABS(VALUE)
   IF(TA.LT.10000.) GO TO 70
   IF (VALUE.GT.0.) GO TO 60
   AN=AA*1.
   GG=GG-JG
   JG=.1/AN
   GO TO 60
70 CONTINUE
   IF (ISI.NE.1) PRINT 80,GG
   IF (ISI.NE.1) PRINT 80,GG
   IF (ISI.NE.1) PRINT 90,DR
   IF (ISI.NE.1) PRINT 90,DR
   90 FORMAT(1X,30H DELTA AT GAMA MIN OVERLOAD =F10.1,3H FT)
   IF (ISI.NE.1) PRINT 95,V
   95 FORMAT(1X,26H VM AT GAMA MIN OVERLOAD =F10.1,7H FT/SEC)
   A1=20000./((DR* $\cos(\text{THETA2})$ )-R*XDTGO*GG)
   GGG=-((1.+A1)*G/G3
   IF (ISI.NE.1) PRINT 96,GGG
   96 FORMAT(1X,8H GAMA = F10.4)
   A2=0.487/(1.+GGG)
   PRINT 97,A2
   97 FORMAT(1X,31H SMALLEST BIT A/D RESOLUTION = F10.6,2X,3H FT)
RETURN
END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 KSCALE

VARIABLES	SN	TYPE	RELOCATION	360	AA	REAL
353 A		REAL		344 AN		REAL
1621 AAA		REAL	COMA	345 ARG1		REAL
1620 ARG		REAL	COMA	1944 A1		REAL
345 ARG2		REAL	COMP	70 A1P2		REAL
54 A1P1		REAL	COMP	100 A1P4		REAL
74 A1P3		REAL	COMP	110 A1P6		REAL
104 A1P5		REAL	COMP	63 A2P1		REAL
351 A2		REAL	COMP	73 A2P3		REAL
57 A2P2		REAL	COMP	103 A2P5		REAL
77 A2P4		REAL	COMP	356 B		REAL
107 A2P5		REAL	COMP	1702 CA		REAL
357 C		REAL	COMA	1505 CLAA		REAL
1602 CLA		REAL	ARRAY	15 CLS1		REAL
3 CLMS		REAL	ARRAY	70 COSE		REAL
27 CLS2		REAL	ARRAY	1441 CTL		REAL
1443 CPL		REAL	COMA	343 JG		REAL
1150 DELTAR		REAL	ARRAY	1261 JXG		REAL
351 DR		REAL	COMA	1263 JZG		REAL
1262 DYG		REAL	COMA	74 E00T		REAL
2131 ECOS		REAL	ARRAY	2173 FI7T		REAL
2204 FC177		REAL	ARRAY	1425 F2		REAL
1424 FI		REAL	COMA	1254 J		REAL
1426 F3		REAL	COMA	354 GG		REAL
73 GA4		REAL	COMA	1427 S1		REAL
1255 GGG		REAL	COMA	1431 G3		REAL
1430 G2		REAL	COMA	60 ICON		REAL
2152 HR7EE		REAL	ARRAY	57 IPLANE		REAL
56 IFT		INTEGER	COMP	0 I91		INTEGER
1 IPTS		INTEGER	COMA	1 I99		INTEGER
2 I88		INTEGER	COMA	350 NB		INTEGER
0 LEVEL		INTEGER	COMA	1503 NPX		INTEGER
1601 MEQR		INTEGER	COMA	1116 NT		INTEGER
41 NS44		INTEGER	COMP	1617 PHO		INTEGER
1606 NX		INTEGER	COMA	161 PPY		REAL
77 PPX		REAL	ARRAY	1700 QM		REAL
243 PPZ		REAL	ARRAY	42 Q1		REAL
1666 QM		REAL	ARRAY	44 Q3		REAL
43 Q2		REAL	COMP	46 Q5		REAL
45 Q4		REAL	COMP	342 R		REAL
47 Q5		REAL	COMP	67 RLB		REAL
72 RI		REAL	COMA	76 RN		REAL
1422 RLK		REAL	COMA	1701 SA		REAL
1436 RFP		REAL	COMA	1622 SCALET		REAL
1423 SC-LEP		REAL	COMA	1440 SPL		REAL
1653 SC-LEV		REAL	COMA	1437 SR		REAL
71 SPJ		REAL	COMA	1435 S1		REAL
1442 STL		REAL	COMA	66 S1P2		REAL
52 S1P1		REAL	COMP	76 S1P4		REAL
72 S1P3		REAL	COMP	106 S1P6		REAL
102 S1P5		REAL	COMP	61 S2P1		REAL
1254 S2		REAL	COMA			REAL

VARIABLES	SN	TYPE	RELOCATION	71	S2P3	REAL	COMP
65	S2P2	REAL	COMP	71	S2P3	REAL	COMP
75	S2P4	REAL	COMP	101	S2P5	REAL	COMP
105	S2P6	REAL	COMP	1265	S3	REAL	COMA
1266	S4	REAL	COMP	1267	S5	REAL	COMA
1172	TANA	REAL	COMA	75	THETAL	REAL	COMA
37	THETAZ	REAL	ARRAY	325	TIME	REAL	COMA
1824	THA	REAL	ARRAY	407	THAS	REAL	COMA
1623	TREAL	REAL	COMA	355	V	REAL	COMA
352	VALUE	REAL	REAL	1216	VH	REAL	ARRAY
1703	VHX	REAL	COMA	1765	VHY	REAL	COMA
2087	VMZ	REAL	ARRAY	1445	VIT	REAL	COMA
50	W1	REAL	COMP	51	W2	REAL	COMP
52	W3	REAL	COMP	53	W4	REAL	COMP
54	W5	REAL	COMP	55	W6	REAL	COMP
1432	XC	REAL	COMA	1117	KCOMP	REAL	COMA
1270	XDM	REAL	ARRAY	1256	XDO	REAL	COMA
445	XDTGMS	REAL	ARRAY	64	XDTGO	REAL	COMA
1446	XE	REAL	ARRAY	577	XMAN	REAL	ARRAY
1107	XMISS	REAL	COMA	1662	XTA	REAL	COMA
2	XN3	REAL	ARRAY	1433	YC	REAL	COMA
1123	YCJMP	REAL	COMA	1326	YOM	REAL	ARRAY
1257	YOO	REAL	COMA	503	YDTGMS	REAL	COMA
65	YDIGO	REAL	COMA	1504	YE	REAL	ARRAY
1653	YTA	REAL	COMA	1600	ZALT	REAL	COMA
1434	ZC	REAL	COMA	1121	ZCOMP	REAL	COMA
1364	ZDH	REAL	ARRAY	1260	ZOO	REAL	COMA
54	ZDTGMS	REAL	ARRAY	66	ZDTGO	REAL	COMA
1542	ZI	REAL	ARRAY	1554	ZTA	REAL	COMA
J	ZI	REAL	RETURNS				

FILE NAMES MODE
OUTPUT FMT

EXTERNALS
ATAYZ TYPE ARGUS 7 009 REAL 1 LIBRARY
INTERP REAL SORT 1 LIBRARY

INLINE FUNCTIONS TYPE ARGUS 1 INTRIN

STATEMENT LABELS

11	10	52	20	225	30	FMT
56	40	241	50	65	60	FMT
133	70	256	80	270	90	FMT
302	95	314	96	323	97	FMT

COMMON BLOCKS LENGTH
COMA 1165
COMP 73

STATISTICS
PROGRAM LENGTH 3628 242
COMMON LENGTH 23268 1238

SUBROUTINE PRIME
COMMON/COMAZ/LEVEL,IPTS,XXS(50),XUTG0,YDTG0,ZDTG0,RLB,COSE,SP0,RI,
*GAM,ED01,THETA,RN,
PPX(50),PPY(50),PPZ(50),TIME(50),TMS(30),XUTGHS(30)

*YDTGHS(30),ZDTGHS(30),XMAN(4,50),XMISS(7),NT
*XCOMP,YCOMP,ZCOMP,TAY(30),DELTAR(30),VM(30),G,GGG
*X00,Y00,Z00,DXG,DYG,DZG,S2,S3,S4,S5,XDH(30),YDH(30),ZDH(30),
*LDB,SCALEP,F1,F2,F3,C1,C2,C3,XC,YC,ZC,S1,RRR,SR,SPL,CIL,STL,
*CPL,A1,VI,XE(30),YE(30),ZE(30),ZAL,NER2,CLA,NPX,NX,CLAA(10),
*P1C,ARG,ARR,SCALET,TREAL,TYAT(30),XTA,YTA,ZTA,SCALEV,QHH(10),QH
*SA,CA,VMX(50),VMY(50),VMZ(50)
*ECOS(17),HR7EE(17),FI7T(9),FCI77(9)
COMMON/MANEUV/III,XDEM(30,45),YDEM(30,45),ZDEM(30,45),
*XTCM(30),YTCM(30),ZTCM(30),XPRIME,YPRIME,
*ZPRIME,IMES(50),ITRAJ(60),ITAU(60),III,NADJ

15 COMMON/RANG/ SIN50,COS50,SIN30,COS30
COMMON/DEL/PPXS(50),PPYS(50),PPZS(50),VMXS(50),VMYS(50),VMZS(50)
COMMON/CCMB/XD,YD,ZD,XDTG,YDTG,ZDTG,XDEF,YDEF,ZDEF,ZZZ
*X0UE,Y0UE,Z0UE

20 COMMON/IMU/ COSMJ1,SINHJ1,COSMU2,SINMU2,COSMU3,SINMU3
COMMON/ISD/XH(3),YH(3),ZH(3),RH(3),NOPI,ICN
COMMON/COMP/TS1,T99,IB8,CLMS(10),CLSI(10),CLSZ(10),NSAF,DI,TZ,OS,
*Z4,OS,OB,M1,M2,M3,M4,M5,M6,IFT,IPLANE,ICGN,S2P1,S1P1,A2P1,A1P1,
*S2P2,S1P2,A2P2,A1P2,S2P3,S1P3,A2P3,A1P3,S2P4,S1P4,A2P4,A1P4,S2P5,
*S1P5,A2P5,A1P5,S2P6,S1P6,A2P6,A1P6
REAL MU1,MU2,MU3

25 DATA RTD,OTR/57.8957795,0.01745329/
50 CONTINUE

30 TLAST = IMES(NADJ)
IFIRST = IMES(1)
ISPAN = TLAST - IFIRST
THALF = (IFIRST + ISPAN) / 2.

35 C*** INTERP RETURNS THESE VALUES FROM TAU ADJUSTED TARGET VELOCITY=TIME
C*** MANEUVER TABLE IN EARTH FIXED COORDINATES:
CALL INTERP (LAST,THA,NT,NPX,NDEL,NERR)
CALL INTERP (FIRST,THA,NT,NPX,NDEL,NERR)
XDEL = (XDEL - XDEF) / ISPAN
CALL INTERP (TLAST,THA,YDN,NT,NPX,YDEL,NERR)
CALL INTERP (IFIRST,THA,YDN,NT,NPX,YDEL,NERR)
YDEL = (YDEL - YDEF) / ISPAN
CALL INTERP (TLAST,THA,ZDN,NT,NPX,ZDEL,NERR)
CALL INTERP (IFIRST,THA,ZDN,NT,NPX,ZDEL,NERR)
ZUDE = (ZDEL - ZDEF) / ISPAN - 32.174

40 C*** COMPONENTS OF AERODYNAMIC ACCELERATION IN EARTH FIXED COORDINATES
X0 = X0DE
Y0 = Y0DE
Z0 = Z0DE

45 C*** TRANSFORM THESE TO LAUNCH COORDINATES
CALL GUID
X0TC = X0TC
Y0TC = Y0TC
Z0TC = Z0TC

50 C*** COMPONENTS OF AERODYNAMIC ACCELERATION IN LAUNCH COORDINATES
X0TC = X0TC
Y0TC = Y0TC
Z0TC = Z0TC

55 C*** OFFINE X-Y- AND ZDTG
CALL INTERP (THALF,THA,XUTG,NT,NPX,XDTG5,NERR)
C*** INTERP RETURNS THESE VALUES FROM TAU ADJUSTED TARGET VELOCITY=TIME
C*** MANEUVER TABLE IN LAUNCH COORDINATES.

```

CALL INTERP (THALF,TMA,YDTGM,NT,NPX,YDTG5,NERR)
CALL INTERP (THALF,TMA,ZDTGM,NT,NPX,ZDTG5,NERR)
60 C*** CALCULATE THE ANGLES USED FOR THE T-MATRIX
51 IF(ZDTG5.EQ.0.0) MU1=ATAN2(YDTG5,ZDTG5)
IF(ZDTG5.EQ.0.0.AND.YDTG5.EQ.0.0) MU1=0.0
IF(ZDTG5.EQ.0.0.AND.YDTG5.LT.0.0) MU1=90.*DIR
IF(ZDTG5.EQ.0.0.AND.YDTG5.LT.0.0) MU1=270.*DIR
65 IF(XDTG5.GT.0.0) GO TO 53
IF(XDTG5.LT.0.0) GO TO 54
50 TO 55
53 IF(YDTG5.EQ.0.0.AND.ZDTG5.EQ.0.0) MU2=270.*DIR
ARG=SQR(YDTG5**2+ZDTG5**2)
IF(YDTG5.NE.0.0) MU2=360.*DIR-ATAN2(XDTG5,ARG)
50 TO 55
54 IF(YDTG5.EQ.0.0.AND.ZDTG5.EQ.0.0) MU2=90.*DIR
ARG=SQR(YDTG5**2+ZDTG5**2)
IF(YDTG5.NE.0.0) MU2=ATAN2(XDTG5,ARG)
75 C*** DEFINE THE VALUES USED IN THE T-MATRIX
COSMU1 = COS(MU1)
SINMU1 = SIN(MU1)
COSMU2 = COS(MU2)
SINMU2 = SIN(MU2)
ARG1=ZDGTG*SINMU1-YDGTG*COSMU1
ARG2=XDGTG*COSMU2+YDGTG*SINMU1+SINMU2*ZDGTG-COSMU2*SINMU2
MU3=ATAN2(ARG1,ARG2)
COSMU3 = COS(MU3)
SINMU3 = SIN(MU3)
IF(ICR.NE.1.AND.III.EQ.1) GO TO 70
IF(III.EQ.1) GO TO 70
PRINT 92,LEVEL,XDGTG,YDGTG,ZDGTG,XDTG5,YDTG5,ZDTG5
90 C*** CHANGE RADIAN TO DEGREES FOR PRINT OUT
MU1 = MU1 * RTD
MU2 = MU2 * RTD
MU3 = MU3 * RTD
95 IF(III.EQ.1) GO TO 90
IF(ICR.EQ.1.OR.III.NE.1) PRINT 901,MU1,MU2,MU3
90 CONTINUE
62 FORMAT(10X,53H MANUEVER WAS IN PROGRESS AT TIME OF DATA COLLECTION
*//10X,8H LEVEL =,F10.5X,8H XDGTG =,F10.4X,8H YDGTG =,F10.4X,
*3H ZDGTG =,F10.4X,8H XDTG5 =,F10.4X,8H YDTG5 =,F10.4X,
*3H ZDTG5 =,F10.4X)
901 FORMAT(1H0,10X,6H MU1 = F8.2,5X,6H MU2 = F8.2,5X,6H MU3 = F8.2)
RETURN
END

```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
I PRIVE

VARIABLES	SN	TYPE	RELOCATION	1620	ARG	REAL	COMA
1621 AAA		REAL	COMA	1620	ARG	REAL	COMA
1433 ARG1		REAL		434	ARG2	REAL	
1444 A1		REAL	C04A	64	A1P1	REAL	COMP
170 A1P2		REAL	COMP	74	A1P3	REAL	COMP
100 A1P4		REAL	COMP	104	A1P5	REAL	COMP
110 A1P6		REAL	COMP	63	A2P1	REAL	COMP
67 A2P2		REAL	COMP	73	A2P3	REAL	COMP
77 A2P4		REAL	COMP	103	A2P5	REAL	COMP
107 A2P5		REAL	COMP	1702	CA	REAL	COMA
1662 CL1		REAL	C04A	1605	CLRA	REAL	COMA
3 CLMS		REAL	ARRAY	15	CLS1	REAL	COMA
27 CLS2		REAL	ARRAY	70	COSE	REAL	COMA
0 COS4U1		REAL	HJ	2	COSMU2	REAL	MU
1 COS4U3		REAL	HJ	3	COSMUC3	REAL	ANG
1 C1		REAL	ANG	1443	CPL	REAL	COMA
1541 CTL		REAL	C04A	1160	DELTA	REAL	COMA
333 DTR		REAL		1261	DXG	REAL	COMA
1252 DYG		REAL	C04A	1263	DJG	REAL	COMA
2131 ECOS		REAL	ARRAY	74	E00T	REAL	COMA
2204 FC177		REAL	ARRAY	2173	F177	REAL	COMA
1424 F1		REAL	C04A	1425	F2	REAL	COMA
1426 F3		REAL	C04A	1254	F3	REAL	COMA
1427 G1		REAL	C04A	1255	G6G	REAL	COMA
1431 G3		REAL	C04A	1430	G2	REAL	COMA
15 ICH		INTEGER	MISD	2152	HRTÉE	REAL	COMA
56 IFT		INTEGER	COMP	60	ICON	INTEGER	COMP
97 IFLAME		INTEGER	COMP	10332	I11	INTEGER	MANEUV
0 ISI		INTEGER	COMP	1	IPTS	INTEGER	COMA
10142 ITRAJ		INTEGER	MANEUV	10236	ITAU	INTEGER	MANEUV
2 I88		INTEGER	COMP	0	I11	INTEGER	MANEUV
0 LEVEL		INTEGER	COMP	1	I99	INTEGER	COMP
414 MU2		REAL	COMA	413	YU1	REAL	
10333 REDJ		INTEGER	MANEUV	415	MU3	REAL	COMA
14 NOPI		INTEGER	MISD	1601	NERR	INTEGER	COMA
41 NSAH		INTEGER	COMP	1603	NPX	INTEGER	COMA
1604 HX		INTEGER	C04A	1116	NT	INTEGER	COMA
161 PPX		REAL	ARRAY	1617	PHO	REAL	COMA
161 PPY		REAL	COMP	0	PPXS	REAL	DEL
243 PPZ		REAL	COMP	62	PPYS	REAL	DEL
1700 QM		REAL	ARRAY	144	PPZS	REAL	DEL
42 Q1		REAL	COMP	1666	3NH	REAL	COMA
44 Q3		REAL	C04P	43	12	REAL	COMP
46 Q5		REAL	C04P	45	24	REAL	COMP
72 R1		REAL	C04P	47	26	REAL	COMP
1422 R3K		REAL	COMA	11	3M	REAL	COMA
76 RN		REAL	COMA	1436	RRR	REAL	MISD
332 RTO		REAL	REAL	1701	SA	REAL	COMA
1423 SCALEP		REAL	COMA	1622	SCALET	REAL	COMA
1455 SCALEV		REAL	COMA	1	SINMU1	REAL	MU
3 SI4J2		REAL	MU	5	SINMU3	REAL	MU

VARIABLES	SN	TYPE	RELOCATION	0	SINCO	REAL	ARRAY	MANEUV	COMB	ANG	COMA	COMP
2	SINSCO	REAL	ANG	0	SINCO	REAL				ANG	COMA	COMP
1440	SPL	REAL	COMA	71	SPO	REAL				COMA	COMA	
1437	SR	REAL	COMA	1442	STL	REAL				COMA	COMA	
1435	SI	REAL	COMA	52	SIPI	REAL				COMP	COMP	
56	SIP2	REAL	COMP	72	SIP3	REAL				COMP	COMP	
76	SIP6	REAL	COMP	102	SIP5	REAL				COMP	COMP	
106	SIP9	REAL	COMP	1264	32	REAL				COMA	COMA	
51	S2P1	REAL	COMP	55	S2P2	REAL				COMP	COMP	
71	S2P3	REAL	COMP	75	S2P4	REAL				COMP	COMP	
101	S2P5	REAL	COMP	105	S2P6	REAL				COMP	COMP	
1265	S3	REAL	COMA	1266	34	REAL		ARRAY		COMA	COMA	
1267	S5	REAL	COMA	1122	TAMA	REAL				COMA	COMA	
417	FIRST	REAL	COMA	421	TALF	REAL				COMA	COMA	
75	TETAL	REAL	COMA	325	TIME	REAL		ARRAY		COMA	COMA	
10050	TIMES	REAL	ARRAY	416	TLAST	REAL		ARRAY		COMA	COMA	
1524	THA	REAL	ARRAY	407	THAS	REAL				COMA	COMA	
1623	TPEAL	REAL	COMA	420	TSPAN	REAL				COMA	COMA	
1216	VM	REAL	COMA	1703	VMX	REAL		ARRAY		COMA	COMA	
226	VMS	REAL	DEL	1765	VMY	REAL		ARRAY		COMA	COMA	
310	VMS	REAL	DEL	2047	VMZ	REAL		ARRAY		COMA	COMA	
372	VMS	REAL	DEL	1445	VTI	REAL				COMA	COMA	
50	M1	REAL	COMP	51	42	REAL				COMP	COMP	
52	M3	REAL	COMP	53	44	REAL				COMP	COMP	
54	M5	REAL	COMP	55	46	REAL				COMP	COMP	
1432	XC	REAL	COMB	1117	XCOMP	REAL				COMA	COMA	
0	XD	REAL	COMB	12	XDDE	REAL				COMB	COMB	
425	XDOTG	REAL	REAL	6	XDEF	REAL		ARRAY		MANEUV	MANEUV	
422	XDEL	REAL	REAL	1	XDEM	REAL				COMA	COMA	
1270	XDM	REAL	ARRAY	1236	XDO	REAL				COMA	COMA	
3	XDTG	REAL	COMB	7723	XDTGM	REAL		ARRAY		MANEUV	MANEUV	
445	XDTGMS	REAL	COMA	54	XDTGO	REAL				COMA	COMA	
430	XDTG5	REAL	COMA	1445	XE	REAL		ARRAY		COMA	COMA	
0	XM	REAL	MISD	577	XMAN	REAL		ARRAY		COMA	COMA	
1107	XMISS	REAL	COMA	10059	XPRIME	REAL				MANEUV	MANEUV	
1698	XTA	REAL	COMA	8	XMS	REAL		ARRAY		COMA	COMA	
1433	46	REAL	COMA	1120	VCOMP	REAL				COMA	COMA	
1	YD	REAL	COMB	13	YODE	REAL				COMB	COMB	
426	YDOTG	REAL	REAL	7	YDEF	REAL				COMB	COMB	
423	YDEL	REAL	REAL	2507	YDEM	REAL		ARRAY		MANEUV	MANEUV	
1326	YDM	REAL	ARRAY	1257	YDO	REAL				COMA	COMA	
4	YDTG	REAL	COMB	7761	YDTGM	REAL		ARRAY		MANEUV	MANEUV	
503	YDTGMS	REAL	COMA	65	YDTGO	REAL				COMA	COMA	
431	YDTG5	REAL	COMA	1504	YE	REAL		ARRAY		COMA	COMA	
3	YH	REAL	MISD	10096	YPRIME	REAL				MANEUV	MANEUV	
1653	YTA	REAL	COMA	1600	ZALT	REAL				COMA	COMA	
1434	ZC	REAL	COMA	1121	ZCOMP	REAL				COMA	COMA	
2	ZD	REAL	COMB	14	ZDDE	REAL				COMB	COMB	
427	ZDOTG	REAL	REAL	10	ZDEF	REAL				COMB	COMB	
424	ZDEL	REAL	COMA	5215	ZDEM	REAL		ARRAY		MANEUV	MANEUV	
1354	ZDI	REAL	COMA	1260	ZDO	REAL				COMA	COMA	
5	ZDTG	REAL	COMB	10017	ZDTGM	REAL		ARRAY		MANEUV	MANEUV	
541	ZDTGMS	REAL	COMA	66	ZDTGO	REAL				COMA	COMA	
432	ZDTG5	REAL	COMA	1542	ZE	REAL		ARRAY		COMA	COMA	
6	ZI	REAL	MISD	10057	ZPRIME	REAL				MANEUV	MANEUV	
1664	ZTA	REAL	COMA	11	ZZZ	REAL				COMB	COMB	

SUBROUTINE PRIME 7476 OPT1 FINN 6.2475368 U1712776 16.3117. PAGE 5

FILE NAMES MODE
OUTPUT FMT

EXTERNALS TYPE ARGS
STANZ REAL 2 LIBRARY 1 LIBRARY
GUID 0 INTERP 7
SIN REAL 1 LIBRARY 1 LIBRARY

STATEMENT LABELS
0 50 INACTIVE 0 51 INACTIVE 0 52 INACTIVE
106 53 131 56 131 57
206 70 221 90 354 862 FMT
403 301 FMT

COMMON BLOCKS LENGTH
COMA 1165
MAREUV 4316
ANG 4
DELT 300
COMU 13
HU 6
MISO 14
COMP 73

STATISTICS
PROGRAM LENGTH 4358 285
CM LABELED COMMON LENGTH 134038 5891

SUBROUTINE MISCOM

C THIS SUBROUTINE CALCULATES THE MISS DISTANCES IN THE TARGET COORDINATE SYSTEM

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5      COMMON/MISD/XM(3),YM(3),ZM(3),RM(3),N,ICN
      COMMON/DELTA/X(50),Y(50),Z(50),VMXS(50),VMYS(50),VMZS(50)
      COMMON /RHU/ COSMUI,SINMUI,COSMU2,SINMU2,COSMU3,SINMU3
      COMMON /COMB/XO,YO,ZO,XDTG,YDTG,ZDTG,XDEF,YDEF,ZDEF,ZZZ
10      *XODE,ZODE,ZODE
      COMMON/RANE/DU/ITT,XDEM(30,45),YDEM(30,45),ZDEM(30,45),
      *XDTG(30),YDTG(30),ZDTG(30),ZDTGH(30),XPRIME,YPRIME,
      *ZPRIME,TIMES(50),ITRAJ(60),ITAU(60),III,NADJ
15      *COMMON/COMA/LEVEL,PPTS,XXS(50),XDTGO,YDTGO,ZDTGO,RLB,COSE,SPO,RI,
      *GAM,EDOT,THETA,RN,
      *PPX(50),PPY(50),PPZ(50),TIME(50),THAS(30),XDTGHS(30)
      *YJGHS(30),ZDTGHS(30),XMAN(4,50),XMISS(7),NT
      *XCMP,YCOMP,ZCOMP,TAHA(30),DELTA(30),VM(30),G,GGG
20      *XOO,YOO,ZOO,DXG,DYG,DZG,S2,S3,S4,SS,XDM(30),YDM(30),ZDM(30),
      *ZLBK,SCALEP,F1,F2,F3,G1,G2,G3,XC,YC,ZC,S1,RRR,SR,SP,CL,STL,
      *SPL,AI,VTI,XE(30),YE(30),ZE(30),ZALT,NERX,CLA,NPX,NX,CLAA(10),
      *PHJTRG,AKA,SCALETTREAL,THA(30),XTA,YTA,ZTA,SCALEV,QHH(10),QM
      *SA,CA,VMX(50),VMY(50),VMZ(50)
      *EGOS(17),HR7EE(17),FIT(9),FCI77(3)
25      COMMON/STAR/FAA,FYA,FZA,FAB,FYB,FZB,FXC,FYC,FZC,AT,VT
      COMMON/COMO/COSA,COSB,COSG,AYA,YAZA
      *K,25,25,MI,22,H3,H4,H5,H6,TFI,IPKNE,ICN,S2PI,S1PI,A2PI,A1PI,
      *S2P2,S1P2,ACP2,A1P2,S2P3,S1P3,A2P3,A1P3,S2P4,S1P4,A2P4,A1P4,S2P5,
      *S1P5,A2P5,A1P5,S2P6,S1P6,A2P6,A1P6
30      COMMON/EXTRA/NPTS,OK,XTERM,KKK,AS,SEO,SC,ASEO,R,SCALEL,VVVV,C1,
      *XLOS,YLOS,ZLOS,CX,CY,CLZ,TRP,XX(50),THE
      DIMENSION T(50),XT(50),YT(50),ZT(50)
45      DTREO,01745329
      UG#DU
      II=0
      XN=FLOAT(IN)
      SMX=0.
      SMX2=0.
50      C*** NEXT CARD IS TAPE SPECIFIC FOR ITT=1 FOR STATIONARY TARGET
      IF (ITT.EQ.1) GO TO 19
      FX = COSMU2 * COSMU3
      FY = SINMU1 * SINMU2 * COSMU3 - COSMUI * SINMU3
      FZ = SINMU1 * SINMU3 + COSMU1 * SINMU2 * COSMU3
      FXA = FX
      FYA = FY
      FZA = FZ
      FX = COSMU2 * SINMU3
      FY = COSMUI * COSMU3 + SINMU1 * SINMU2 * SINMU3
      FZ = COSMUI * SINMU2 * SINMU3 - SINMU1 * COSMU3
      FXR = FX
      FYR = FY
      FZR = FZ
      FX = -SINMU2
      FY = SINMU1 * COSMU2
      FZ = COSMUI * COSMU2

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SUBROUTINE MISCOM

C THIS SUBROUTINE CALCULATES THE MISS DISTANCES IN THE TARGET
 C COORDINATE SYSTEM

```

5
C
COMMON/HISD/XN(3),YH(3),ZH(3),RN(3),N,ICN
COMMON/DELTA(X(50),Y(50),Z(50),VHX(50),VHY(50),VHZ(50),VHXZ(50),
COMMON /HU/ COSHU1,SINHU1,COSHU2,SINHU2,COSHU3,SINHU3
COMMON /COMB/XD,YD,ZD,XDTG,YDTG,ZDTG,XDEF,YDEF,ZDEF,ZZZ
* XDEF,YDEF,ZDEF
COMMON/HANEUV/ITT,XDEM(30,45),YDEM(30,45),ZDEM(30,45),
XDTG(30),YDTG(30),ZDTG(30),XPRIME,YPRIME,
ZPRIME,TINES(50),ITRAJ(60),ITAU(60),III,NADJ
COMMON/COMA/LEVEL,IPFS,XXS(50),XDTGO,YDTGO,ZDTGO,RLB,COSEF,SPG,RI,
*GAP,EDOT,THETAL,RN,
*PPX(50),PPY(50),PPZ(50),TINE(50),THAS(30),XDTGMS(30)
*YDTGMS(30),ZDTGMS(30),XMAN(4,50),XMISS(7),NT
*XCMP,YCOMP,ZCOMP,TAMA(30),DELTA(30),VM(30),G:GG6
*YD0,YD0,ZD0,DXG,DYG,DZG,S2,S3,S4,SS,XDM(30),YDM(30),ZDM(30),
*RLJK,SCALEP,FI,F2,F3,G1,G2,G3,XG,YG,ZG,SI,RRR,SRS,SPL,OTL,STL,
*CP,AL,VTI,XE(30),YE(30),ZE(30),ZALT,NER3,CLA,NPX,NX,CLAA(10),
*PHJ,ARG,AAA,SCALET,TREAL,THA(30),XTA,YTA,ZTA,SCALEV,QHH(10),QR
*SA,CA,VHX(50),VHY(50),VMZ(50)
*LCSS(17),HR7EE(17),FI7(19),FC177(19)
COMMON/GTARG/FXA,FYA,FZA,FXB,FYB,FZB,FXC,FYC,FZC,AT,VT
COMMON/COMD/COSA,COSB,C35G,YA,ZA
COMMON/COMP/IS1,I99,I88,CLMS(10),CLS2(10),NSAM,Q1,Q2,Q3,
*Z4,Z5,Z6,NI,WZ,R3,W4,R5,W6,IFT,IPLANE,ICON,S2P1,S1P1,A1P1,
*ZP2,S1P2,A2P2,A1P2,S2P3,S1P3,A2P3,A1P3,S2P4,S1P4,A2P4,A1P4,S2P5,
*S1P5,A2P5,A1P5,S2P6,S1P6,A2P6,A1P6
COMMON/EXTRA/NPTS,DX,XTERM,KKK,AS,SEO,SC,ASEO,R,SCALEL,VVVV,C1,
*VLS,YLOS,ZLOS,C0,C4,CY,CY,CLZ,TRP,XX(50),THE
DIMENSION T(50),XT(50),YT(50),ZT(50)
DATA 0,51749329
DATA 0,0
NN=FLOOR(IN)
SMX=0.
SMX2=0.
C
C*** NEXT CARD IS TAPE SPECIFIC FOR ITT=1 FOR STATIONARY TARGET
IF(ITT.EQ.1) GO TO 19
FX = COSHU2 * COSHU3
FY = SINHU1 * SINHU2 * COSHU3 * COSHU1 * SINHU3
FZ = SINHU1 * SINHU3 * COSHU1 * SINHU2 * COSHU3
FXA = FX
FYA = FY
FZA = FZ
FX = COSHU2 * SINHU3
FY = COSHU1 * COSHU3 * SINHU1 * SINHU2 * SINHU3
FZ = COSHU1 * SINHU2 * SINHU3 * SINHU1 * COSHU3
FX1 = FX
FY1 = FY
FZ1 = FZ
FX = SINHU2
FY = SINHU1 * COSHU2
FZ = COSHU1 * COSHU2
    
```

```

FXC = FX
FYC = FY
FZC = FZ
60      19 CONTINUE
      IF (IIT.EQ.1.OR.VVVV.LT.336.0).AND.IS1.NE.1) PRINT 67
      IF (IIT.NE.1.OR.VVVV.GE.336.0).AND.IS1.NE.1) PRINT 66
      DO 1 I=1,N
      UX = X(I)
      UY = Y(I)
      UZ = Z(I)
      C*** NEXT CARD IS TAPE SPECIFIC FOR IIT=1 FOR STATIONARY TARGET
      IF (IIT.EQ.1) GO TO 30
      IF (VVV.LT.336.0) GO TO 30
      C TRANSFORM (MISSILE MINUS TARGET) LAUNCH COORDINATES TO GENERALIZED
      C TARGET COORDINATES
      C REFERENCED TO ORIGIN AT TAILPIPE
      X(I) = FXA*DX + FYA*DY + FZA*DZ
      Y(I) = FXB*DX + FVB*DY + FZB*DZ
      Z(I) = FXC*DX + FYC*DY + FZC*DZ
      C CALCULATE TARGET ANGLE OF ATTACK
      AAA=1116.89+0.003694*ZZZ
      VT=SQRT(XDEF**2+YDEF**2+ZDEF**2)
      ARG=0.00003*ZZZ
      PHO=0.00237692*EXP(ARG)
      CHEV1/AAA
      HPA*Z2
      NX=8
      AT=18500.0
      ST=248.0
      AT=2.*MT*SQRT(XDDE**2+YDDE**2+ZDDE**2)/(PHO*VT*ST*CLA*32.174)
      IF (IS1.EQ.1) GO TO 5
      IF (ICN.EQ.1.AND.I.EQ.1) PRINT 25,AT
      C CONTINUE
      AT=4*PHR
      XS=X(I)
      YS=Y(I)
      ZS=Z(I)
      C TRANSFORM GENERALIZED TARGET COORDINATES TO TARGET FIXED COORDINATES
      C REFERENCED TO ORIGIN AT TAILPIPE
      X(I)=ZS*COS(AT)+XS*SIN(AT)
      Y(I)=-YS
      Z(I)=XS*COS(AT)-ZS*SIN(AT)
      GO TO 4
      C TRANSFORM MISSILE LAUNCH COORDINATES TO TARGET EARTH FIXED
      C COORDINATES. TARGET IS STATIONARY OR MOVING AT LESS THAN 336 FT/SEC
      30 X(I)=UX*S2-DY*SPL+DZ*S3
      Y(I)=UY*S4+DY*CPL+DZ*S5
      Z(I)=-JX*STL+DZ*GTL
      C CONTINUE
      4 CONTINUE
      IF (IS1.NE.1) PRINT 15,X(I),Y(I),Z(I)
      15 FORMAT(3X,E11.4)
      SHX=SHX+AT(I)
      1 SMX2=SMX2+X(I)*X(I)
      C
      DO 20 I=1,N
      T(I) = Y(I)

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115      20 CONTINUE
      C CALCULATE COEFFICIENTS FOR MISSILE PATH PROJECTIONS IN TARGET FIXED
      C COORDINATES
      C REFERENCED TO ORIGIN AT TAILPIPE
      21 SMT=0.0
      SMT=0.
      DO 2 I=1,N
      SMT=SMT+T(I)
      2 SMT=SMT+T(I)*T(I)
      D=YN*SMX2-SMX*SNX
      U=(SMT*SMX2-SMX*SNX)/D
      A=(XN*SMX-SMT*SNX)/D
      C
      II= II + 1
      C
      99 GO TO(IU,II),II
      C YF-AXIS INTERCEPT AND SLOPE OF PATH PROJECTION IN XF-YF PLANE
      C REFERENCED TO ORIGIN AT TAILPIPE
      10 Y4(I)= B
      YA= A
      C
      102 DO 3 I=1,N
      T(I)= ZI(I)
      3 CONTINUE
      GO TO 21
      C ZF-AXIS INTERCEPT AND SLOPE OF PATH PROJECTION IN XF-ZF PLANE
      C REFERENCED TO ORIGIN AT TAILPIPE
      11 ZH(I)= B
      ZA= A
      C
      C XF-AXIS COORDINATE OF PATH PIERCING POINT IN XF-YF PLANE
      C REFERENCED TO ORIGIN AT TAILPIPE
      XM(2)= -ZH(I)/ZA
      C
      C YF-AXIS COORDINATE OF PATH PIERCING POINT IN XF-YF PLANE
      C REFERENCED TO ORIGIN AT TAILPIPE
      YH(2)= YH(I)/YA
      C
      C XF-AXIS COORDINATE OF PATH PIERCING POINT IN XF-ZF PLANE
      C REFERENCED TO ORIGIN AT TAILPIPE
      ZH(3)= ZH(I) + ZA*XM(3)
      C
      XM(1)= 0.
      ZH(2)= 0.
      YH(3)= 0.
      C CALCULATE NEAREST APPROACH TO ORIGIN IN YF-ZF, XF-YF AND XF-ZF PLANES
      C REFERENCED TO ORIGIN AT TAILPIPE
      DO 15 I=1,3
      155 PH(I)= SQRT(XH(I)*XH(I) + YH(I)*YH(I) + ZH(I)*ZH(I))
      DX=DXH
      C
      25 FORMAT(IX,25H TARGET ANGLE OF ATTACK =,F5.2,3X,3H DEGI
      56 FORMAT(//10X,50H TARGET FIXED COORDINATES OF MISSILE REFERENCED TO
      10H TAILPIPE,/)
      67 FORMAT(//10X,43H TARGET EARTH FIXED COORDINATES OF MISSILE,/)
  
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SUBROUTINE MISC0H 7474 OPT=1 FINH 4.2875308 01/12/76 14.31.22. PAGE 6

RETURN
END

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
I MISCON

VARIABLES	SN	TYPE	RELOCATION	1621	AAA	REAL	COMA
462 A		REAL		4	AS	REAL	EXTRA
1520 ARG		REAL	COYA			REAL	GTARG
7 ASEO		REAL	EXTRA	11	AT	REAL	COMP
1445 A1		REAL	COYA	64	A1P1	REAL	COMP
70 A1P2		REAL	COMP	74	A1P3	REAL	COMP
100 A1P4		REAL	COMP	104	A1P5	REAL	COMP
110 A1P6		REAL	COMP	63	A2P1	REAL	COMP
57 A2P2		REAL	COMP	73	A2P3	REAL	COMP
77 A2P4		REAL	COMP	103	A2P5	REAL	COMP
107 A2P5		REAL	COMP	661	3	REAL	COMP
1702 CA		REAL	COYA	1602	CLA	REAL	COMA
1605 CLA3		REAL	ARRAY	3	CLMS	REAL	COMP
15 CLS1		REAL	ARRAY	27	CLS2	REAL	COMP
22 CLY		REAL	EXTRA	23	CLZ	REAL	EXTRA
17 CO		REAL	EXTRA	0	COSA	REAL	CORD
1 COSB		REAL	COYO	70	COSE	REAL	COMA
2 COSG		REAL	COMD	0	COSMU1	REAL	MU
2 COSMU2		REAL	MU	4	COSMU3	REAL	MU
1443 CPL		REAL	COYA	1441	CTL	REAL	COMA
20 CX		REAL	EXTRA	21	CY	REAL	EXTRA
13 CI		REAL	EXTRA	460	J	REAL	REAL
436 JDX		REAL		1160	DELTA	REAL	COMA
435 DIR		REAL		1	DX	REAL	EXTRA
1251 DAG		REAL	COMA	447	DY	REAL	REAL
1252 JYG		REAL	COYA	450	DZ	REAL	REAL
1263 JZG		REAL	COYA	2131	ECOS	REAL	COMA
74 EDO1		REAL	COYA	2204	FC177	REAL	COMA
2173 F177		REAL	ARRAY	443	FX	REAL	REAL
0 FXA		REAL	GTARB	3	FXH	REAL	GTARG
6 FXB		REAL	GTARB	444	FY	REAL	REAL
1 FYA		REAL	GTARG	4	FYB	REAL	GTARG
7 FYC		REAL	GTARG	545	FZ	REAL	GTARG
2 FZA		REAL	GTARG	5	FZB	REAL	GTARG
10 FZC		REAL	GTARG	1424	FI	REAL	COMA
1425 F2		REAL	COYA	1426	F3	REAL	COMA
1256 G		REAL	COMA	73	GAM	REAL	COMA
1255 GGG		REAL	COMA	1427	G1	REAL	COMA
1430 G2		REAL	COMA	1431	G3	REAL	COMA
2152 HR7EE		REAL	ARRAY	446	I	REAL	COMA
15 ION		INTEGER	MISO	60	ICON	INTEGER	COMP
56 IFT		INTEGER	COMP	437	II	INTEGER	INTEGER
10332 III		INTEGER	MANEUV	57	IPLANE	INTEGER	COMP
1 IPTS		INTEGER	COMA	0	ISI	INTEGER	COMP
10236 ITAU		INTEGER	ARRAY	10142	ITRAJ	INTEGER	MANEUV
0 ITT		INTEGER	MANEUV	2	I88	INTEGER	COMP
1 I93		INTEGER	COMP	3	KKK	INTEGER	EXTRA
0 LEVEL		INTEGER	COMA	14	N	INTEGER	MISO
10333 MADJ		INTEGER	MANEUV	1601	NERR	INTEGER	COMA
0 APTS		INTEGER	EXTRA	1603	VPK	INTEGER	COMA
41 NSAM		INTEGER	COMP	1116	NT	INTEGER	COMA
1604 NX		INTEGER	COMA	1617	PHO	REAL	COMA

VARIABLES	SN	TYPE	RELOCATION	PPY	REAL	ARRAY	COMA
77 PPX	REAL	COMA	161	PPY	REAL	ARRAY	COMA
243 PPZ	REAL	COMA	1700	IM	REAL	ARRAY	COMA
1665 QMH	REAL	COMA	42	J1	REAL	ARRAY	COMA
43 QZ	REAL	COMP	46	J3	REAL	ARRAY	COMP
45 Q4	REAL	COMP	46	J5	REAL	ARRAY	COMP
47 Q6	REAL	COMP	10	R	REAL	ARRAY	COMP
72 Q1	REAL	COMA	67	RLB	REAL	ARRAY	COMA
1422 RL3K	REAL	COMA	11	RM	REAL	ARRAY	MISD
76 RN	REAL	COMA	1436	RRR	REAL	ARRAY	COMA
1701 S1	REAL	COMA	6	SC	REAL	ARRAY	EXTRA
11 SCALEL	REAL	EXTRA	1423	SCALEP	REAL	ARRAY	COMA
1622 SC1LET	REAL	COMA	1665	SCALEV	REAL	ARRAY	COMA
5 SE0	REAL	EXTRA	1	SINMU1	REAL	ARRAY	MU
3 SINMU2	REAL	MU	5	SINMU3	REAL	ARRAY	MU
455 SMT	REAL	REAL	441	SMX	REAL	ARRAY	REAL
477 SMT	REAL	REAL	442	SMX2	REAL	ARRAY	REAL
1440 SPL	REAL	COMA	71	SPO	REAL	ARRAY	COMA
1437 SR	REAL	COMA	452	ST	REAL	ARRAY	COMA
1442 STL	REAL	COMA	1435	S1	REAL	ARRAY	COMA
52 S1P1	REAL	COMP	66	S1P2	REAL	ARRAY	COMP
72 S1P3	REAL	COMP	76	S1P4	REAL	ARRAY	COMP
102 S1P5	REAL	COMP	106	S1P6	REAL	ARRAY	COMP
1254 S2	REAL	COMA	61	S2P1	REAL	ARRAY	COMP
65 S2P2	REAL	COMP	71	S2P3	REAL	ARRAY	COMP
75 S2P4	REAL	COMP	101	S2P5	REAL	ARRAY	COMP
105 S2P6	REAL	COMP	1265	S3	REAL	ARRAY	COMP
1255 S4	REAL	COMA	1267	S5	REAL	ARRAY	COMA
463 T	REAL	ARRAY	1122	TAMA	REAL	ARRAY	COMA
107 THE	REAL	EXTRA	75	TETAL	REAL	ARRAY	COMA
325 TIME	REAL	COMA	10060	TINES	REAL	ARRAY	MANEUV
1624 THA	REAL	COMA	407	TMAS	REAL	ARRAY	COMA
1623 T6-AL	REAL	COMA	24	TRP	REAL	ARRAY	EXTRA
1216 VH	REAL	COMA	1703	VHX	REAL	ARRAY	COMA
328 VHS	REAL	DELT	1789	VHY	REAL	ARRAY	COMA
318 VHS	REAL	DELT	2847	VHZ	REAL	ARRAY	COMA
372 VHS	REAL	DELT	12	VT	REAL	ARRAY	STARO
1445 VTI	REAL	COMA	12	VVVV	REAL	ARRAY	EXTRA
451 W	REAL	REAL	50	W1	REAL	ARRAY	COMP
51 W2	REAL	COMP	52	W3	REAL	ARRAY	COMP
55 W6	REAL	COMP	54	W5	REAL	ARRAY	COMP
1432 XC	REAL	COMA	0	X	REAL	ARRAY	DELT
0 XD	REAL	COMB	1117	XCOMP	REAL	ARRAY	COMA
6 XDEF	REAL	COMB	12	XDEE	REAL	ARRAY	COMB
1270 XDM	REAL	COMB	1	XDCM	REAL	ARRAY	MANEUV
3 XDTG	REAL	COMB	1256	XDO	REAL	ARRAY	COMA
445 XDTGHS	REAL	COMB	7723	XDTGM	REAL	ARRAY	MANEUV
1446 XE	REAL	COMA	64	XDTGO	REAL	ARRAY	COMA
0 XM	REAL	COMA	14	XLOS	REAL	ARRAY	EXTRA
1137 XN1JS	REAL	COMA	577	XMAN	REAL	ARRAY	COMA
1035 XN2IME	REAL	COMA	440	XN	REAL	ARRAY	COMA
545 XT	REAL	MANEUV	453	XS	REAL	ARRAY	REAL
2 XTFRM	REAL	EXTRA	1562	XTA	REAL	ARRAY	COMA
2 XYS	REAL	COMA	25	XX	REAL	ARRAY	EXTRA
3 YA	REAL	COMA	62	Y	REAL	ARRAY	DELT
1123 YCOMP	REAL	COMA	1433	YC	REAL	ARRAY	COMA
13 YDE	REAL	COMB	1	YD	REAL	ARRAY	COMB
			7	YDEF	REAL	ARRAY	COMB

VARIABLES	SN	TYPE	RELOCATION	1326	YDM	REAL	ARRAY	COMA
2507 YDCM	REAL	MANEUV	REAL	4	YDTG	REAL	ARRAY	COMB
1257 YJO	REAL	COMA	REAL	503	YDTGMS	REAL	ARRAY	COMA
7761 YDTGM	REAL	MANEUV	REAL	1504	YE	REAL	ARRAY	COMA
55 YDTGO	REAL	COMA	REAL	3	YM	REAL	ARRAY	MISD
15 YLOS	REAL	EXTRA	REAL	454	YS	REAL	ARRAY	COMA
10056 YPOIME	REAL	MANEUV	REAL	1663	YTA	REAL	ARRAY	COMA
627 YT	REAL	ARRAY	REAL	4	ZA	REAL	ARRAY	COMA
144 Z	REAL	DELT	REAL	1434	ZC	REAL	ARRAY	COMA
1600 ZALT	REAL	COMA	REAL	2	ZU	REAL	ARRAY	COMB
1121 ZCOMP	REAL	COMA	REAL	10	ZDEF	REAL	ARRAY	COMB
14 ZD3C	REAL	COMB	REAL	1364	ZDM	REAL	ARRAY	COMA
5215 ZDEM	REAL	MANEUV	REAL	5	ZDTG	REAL	ARRAY	COMB
1260 ZDO	REAL	COMA	REAL	541	ZDTGMS	REAL	ARRAY	COMA
10017 ZDTJM	REAL	MANEUV	REAL	1562	ZE	REAL	ARRAY	COMA
56 ZDTJO	REAL	COMA	REAL	6	ZM	REAL	ARRAY	HISD
16 ZLOS	REAL	EXTRA	REAL	455	ZS	REAL	ARRAY	COMA
10057 ZPRIME	REAL	MANEUV	REAL	1666	ZTA	REAL	ARRAY	COMA
711 ZT	REAL	ARRAY	REAL			REAL		
11 ZZZ	REAL	COMB	REAL			REAL		

FILE NAMES MODE OUTPUT FMT

EXTERNALS	TYPE	ARGS	EXP	SIN	REAL	REAL	1 LIBRARY	1 LIBRARY
COS	REAL	1			REAL	REAL	1	LIBRARY
INTERP	REAL	7			REAL	REAL	1	LIBRARY
SORT	REAL	1			REAL	REAL	1	LIBRARY

INLINE FUNCTIONS TYPE ARGS

FLGAT	REAL	INTRIN
0	1	
0	1	
230	4	0 2
514	11	165 5
0	20	372 15
213	30	256 21
0	99	403 66
		0 102

STATEMENT LABELS

COMMON BLOCKS	LENGTH	INACTIVE	FMT	INACTIVE	FMT	INACTIVE	FMT
HISJ	14						
DELT	300						
MU	6						
COMB	13						
MANEUV	4516						
COMA	1165						
GTARG	11						
COMB	5						
COMP	73						
EXTRA	72						

STATISTICS

PROGRAM LENGTH	7738	507
CM LABELED COMMON LENGTH	135278	5975

5 C SUBROUTINE MEAN(AXM,AYM,AZM,ARM,NR, SX,SY,SZ,SS)
C THIS SUBROUTINE CALCULATES THE MEAN AND STANDARD DEVIATION
C OF THE MISS DISTANCES

6 C COM=H7COMPZTSI,T99,T88,CLMST(10),CLSI(10),CLSZ(10),NSAM,Q1,Q2,Q3,
*24,Q5,Q6,H1,H2,H3,H4,H5,H6,IET,IPLANE,ICON,S2P1,SIP1,A2P1,AIP1,
*S2P2,SIP2,A2P2,AIP2,S2P3,SIP3,A2P3,AIP3,S2P4,SIP4,A2P4,AIP4,S2P5,
*SIP5,A2P5,AIP5,S2P6,SIP6,A2P6,AIP6

7 C DIMENSION AX(20),AY(20),AZ(20),ARM(20)
XNR=FLOAT(NR)
XNN=SQRT(XNR/(XNR-1.))
J=0

8 C 9 SS=0.
SVS=0.
J=J+1

9 C 10 I=1,NR
GO TO (11,12,13,14),J

11 C 11 DUM=AXM(I)
GO TO 15

12 C 12 DUM=AYM(I)
GO TO 15

13 C 13 DUM=AZM(I)
GO TO 15

14 C 14 DUM=ARM(I)
15 SS=SS+DUM

16 C 16 SVS=SVS + DUM*DUM
C MEAN
C

17 C 17 SS=SS/XNR
SVS=SVS/XNR

18 C 18 STANDARD DEVIATION
DOU=SVS-SS*SS
DODO=ABS(DODO)
SVS=SQRT(DODO)*XNN

19 C 19 GO TO (21,22,23,24),J
21 C 21 SX=SS
SVX=SVS
GO TO 9

22 C 22 SY=SS
SVY=SVS
GO TO 9

23 C 23 SZ=SS
SVZ=SVS
GO TO 9

24 C 24 PRINT 34
PRINT 35, SX,SY,SZ,SS

25 C 25 PRINT 36, SVX,SVY,SVZ,SVS
IF(I99.NE.1) GO TO 45
IF(IPLANE.EQ.0) GO TO 45
IF(IPLANE.EQ.1) GO TO 40
IF(IPLANE.EQ.2) GO TO 41

SUBROUTINE MEAN 74774 QH=1

```
IF (IPLANE.EQ.3) GO TO 42
40 IF (SVY.GT.S2P1.OR.SVY.LT.S1P1) IFT=1
IF (SVZ.GT.S2P2.OR.SVZ.LT.S1P2) IFT=1
IF (SV.GT.A2P1.OR.SV.LT.A1P1) IFT=1
IF (SZ.GT.A2P2.OR.SZ.LT.A1P2) IFT=1
GO TO 45
41 IF (SVX.GT.S2P3.OR.SVX.LT.S1P3) IFT=1
IF (SVY.GT.S2P4.OR.SVY.LT.S1P4) IFT=1
IF (SX.GT.A2P3.OR.SX.LT.A1P3) IFT=1
IF (SV.GT.A2P4.OR.SV.LT.A1P4) IFT=1
GO TO 45
42 IF (SVZ.GT.S2P5.OR.SVZ.LT.S1P5) IFT=1
IF (SVZ.GT.S2P6.OR.SVZ.LT.S1P6) IFT=1
IF (SX.GT.A2P5.OR.SX.LT.A1P5) IFT=1
IF (SZ.GT.A2P6.OR.SZ.LT.A1P6) IFT=1
45 CONTINUE
RETURN
```

```
34 FORMAT(15X2HT6X2HT6X2HT6X2HRH)
35 FORMAT(75X4RMEANCF10.3)
36 FORMAT(3X6HST DEV4F10.4)
END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 MEAN

VARIABLES	SN	TYPE	RELOCATION	F.P.	0 AXH	REAL	ARRAY	ARRAY	F.P.
0 ARM		REAL	ARRAY	F.P.	0 AZM	REAL	ARRAY	ARRAY	F.P.
0 AYH		REAL	ARRAY	F.P.	70 A1P2	REAL			F.P.
64 A1P1		REAL	COMP	COMP	100 A1P4	REAL			COMP
74 A1P3		REAL	COMP	COMP	110 A1P6	REAL			COMP
104 A1P5		REAL	COMP	COMP	67 A2P2	REAL			COMP
53 A2P1		REAL	COMP	COMP	77 A2P4	REAL			COMP
73 A2P3		REAL	COMP	COMP	107 A2P6	REAL			COMP
103 A2P5		REAL	COMP	COMP	45 CLS1	REAL	ARRAY	ARRAY	COMP
3 CLMS		REAL	ARRAY	COMP	272 D00	REAL			COMP
27 CLS2		REAL	ARRAY	COMP	271 D0H	REAL			COMP
273 D000		REAL	COMP	COMP	50 ICON	REAL			COMP
270 I		INTEGER	COMP	COMP	57 IPLANE	INTEGER			COMP
56 IFT		INTEGER	COMP	COMP	2 L08	INTEGER			COMP
0 ISI		INTEGER	COMP	COMP	266 J	INTEGER			COMP
1 I99		INTEGER	COMP	COMP	41 NSAM	INTEGER			COMP
0 NR		INTEGER	F.P.	COMP	43 Q2	REAL			COMP
42 Q1		REAL	COMP	COMP	45 Q4	REAL			COMP
44 Q3		REAL	COMP	COMP	47 Q6	REAL			COMP
46 Q5		REAL	COMP	COMP	267 SVS	REAL			COMP
0 SS		REAL	F.P.	COMP	275 SVY	REAL			COMP
274 SVX		REAL	COMP	COMP	0 SX	REAL			F.P.
276 SVZ		REAL	COMP	COMP	0 SZ	REAL			F.P.
0 SY		REAL	COMP	COMP	66 S1P2	REAL			COMP
52 S1P1		REAL	COMP	COMP	76 S1P4	REAL			COMP
72 S1P3		REAL	COMP	COMP	106 S1P6	REAL			COMP
102 S1P5		REAL	COMP	COMP	65 S2P2	REAL			COMP
61 S2P1		REAL	COMP	COMP	75 S2P4	REAL			COMP
71 S2P3		REAL	COMP	COMP	105 S2P6	REAL			COMP
101 S2P5		REAL	COMP	COMP	51 M2	REAL			COMP
50 W1		REAL	COMP	COMP	53 M4	REAL			COMP
52 W3		REAL	COMP	COMP	55 M6	REAL			COMP
54 W5		REAL	COMP	COMP	264 XNR	REAL			COMP
265 XNH		REAL	COMP	COMP					

FILE NAMES MODE
OUTPUT FMT

EXTERNALS TYPE ARGS
SORT REAL 1 LIBRARY

INLINE FUNCTIONS TYPE ARGS
ROS REAL 1 INTRIN

STATEMENT LABELS

23 9	43 11	45 12
47 13	51 14	52 15
0 18	77 21	103 22
107 23	113 24	251 34
255 35	260 36	130 40
155 41	202 42	228 43

SUBROUTINE MEAN 74774 OPT=1

COMMON BLOCKS LENGTH 73
COMP

STATISTICS

PROGRAM LENGTH 3218 209
CM LABELED COMMON LENGTH 1118 73

SUBROUTINE INTERP(X,XT,YT,NX,NPX,Y,NERR)
 DESCRIPTION

C THIS ROUTINE USES THE LAGRANGE INTERPOLATION FORMULA TO
 C CALCULATE THE VALUE Y(TX) FROM THE FUNCTION TABLE Y(TI)
 C F(X(TI)). THE TABLE OF INDEPENDENT VARIABLES MUST BE IN
 C INCREASING ORDER BUT DO NOT HAVE TO BE EVENLY SPACED. IF THE
 C DESIRED ARGUMENT X IS NOT IN THE INDEPENDENT VARIABLE TABLE,
 C THE ROUTINE WILL EXTRAPOLATE USING THE NEAREST POINTS TO THE
 C UNKNOWN VALUE. THE DEGREE OF THE INTERPOLATION FORMULA IS A
 C VARIABLE AND MAY BE SELECTED BY THE USER.

C INPUT
 C 1 X THE INDEPENDENT VARIABLE X
 C 2 XT TABLE OF INDEPENDENT X VALUES. MUST BE IN
 C INCREASING ORDER.

C 3 YT TABLE OF DEPENDENT Y VALUES. Y(I)=F(X(T(I)))
 C 4 NX NUMBER OF POINTS IN XT.
 C 5 NPX NUMBER OF POINTS USED IN THE INTERPOLATING FORMULA
 C WITH XT AS THE INDEPENDENT VARIABLE TABLE. (NPX-2)
 C IS THE DEGREE OF THE INTERPOLATION FORMULA USED.

C OUTPUT
 C 1 Y THE INTERPOLATED DEPENDENT VALUE. Y=F(X)
 C 2 NERR NERR=0 IF XT(I) .LE. X .LE. XT(NX)
 C NERR = 1 IF X .LT. XT(1)
 C NERR = 2 IF X .GT. XT(NX)

DIMENSION XT(I),YT(I)

NERR = 0

NP=NPX

IF (NX .LT. NP) NP = NX

NS = (NX+169)/26

IH = NP/2

I = 1

IF (XT(I) - X)30,20,10

GO TO 70

12 NERR = 1

13 NERR = 2

GO TO 70

20 Y = YT(I)

GO TO 399

30 I = NX

IF (XT(I) - X)13,20,30

GO TO 58

19 = NS+L

IF (NX-IS)58,58,52

52 DO 54 I=1,NX,NS

IF (XT(I) - X)154,20,56

54 L = I

GO TO 58

56 L = I - IS

58 DO 50 I=L,NX

IF (XT(I) - X)160,20,70

60 CONTINUE

70 K = I - IH

Y = K + NP - 1

Y = 0.0

IF (H - NX)90,90,80

```
60 N = NX  
K = NX-NP+1  
90 DO 120 J=K,N  
P = 1.0  
00 110 I=K,N  
IF (I-J)100,110,100  
100 P = P * (X - XT(I)) / (XT(J) - XT(I))  
110 CONTINUE  
120 Y = Y + YT(J)*P  
999 RETURN  
END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
J INTERP

VARIABLES	SN	TYPE	RELOCATION
154 I	153	INTEGER	IH
156 JS	161	INTEGER	J
157 K	155	INTEGER	L
158 N	0	INTEGER	VERR
151 NP	0	INTEGER	NPX
152 NS	0	INTEGER	NX
162 P	0	REAL	X
0 XT	0	REAL	Y
0 YT	0	REAL	Y
		ARRAY	F.P.
		ARRAY	F.P.

STATEMENT LABELS

0 10	INACTIVE	0 12	INACTIVE	37 13
41 20		45 30		0 50
0 52	INACTIVE	0 54		72 56
74 56		0 60		106 70
0 80	INACTIVE	117 90		0 100
135 110		0 120		145 999

STATISTICS

PROGRAM LENGTH 2048 132

```

SUBROUTINE FLIGHT
INTEGER PIN(4),POUT(4),SL5,SL0
REAL MAR,MISS,MISSED
COMMON/CONA7/LEVEL,IPTS,XXS(50),XDTG0,YDTG0,ZDTG0,RLB,COSE,SPO,
*RI,GAM,EJOT,THETA, RN,PPX(50),PPY(50),TIME(50),PPZ(50),TIME(50),TS(30),
COMMON/ZCONP7/LEVEL,IPTS,XXS(50),XDTG0,YDTG0,ZDTG0,RLB,COSE,SPO,
*YOTGMS(30),YDTGMS(30),ZDTGMS(30),MAN(4,50),MISSED(7),NT,XCOMP,
*YCOMP,ZCOMP,TAMA(30),DELTA(30),VM(30),G(6,6),XDD,YDD,ZDD,DXG,DYG,
*DZG,SZ,SS,S4,S5,XDH(30),YDH(30),ZDH(30),RLBK,SCALEP,FI,F2,F3,G1,
*G2,G3,XC,YC,ZC,S1,RRR,SR,SPL,CTL,STL,CPL,A1,VII,XE(30),YE(30),
*ZE(30),ZALT,NERR,CLA,NPX,NX,CLAA(10),PHO,ARG,AAA,SCALEY,TREAL,
*THA(30),XTA,YTA,ZTA,SCALEV,AMM(10),QM,SA,CA,VHX(50),VMY(50),
*VNZ(50),ECOS(17),HRTEE(17),FI7(9),FCI7(9)
COMMON/CONM/MPATH,LOOP1,LOOP2,DASF(11),ADSF(10),INFLRT,LTHAX
COMMON/ADCL12
COMMON/ADCL12
*IADIR1,IADIR2,IADIR3,IADIR4,IADIR5,IADIR6,
*IADIR7,IADIR8,IADIR9,IADIR10
COMMON/DOIS2/II
JAN,ON
COMMON/DAAC1/49
*DAOUT1,DAOUT2,DAOUT3,DAOUT4,DAOUT5,DAOUT6,
*DAOUT7,DAOUT8,DAOUT9,DAOUT10,DAOUT11
COMMON/DOIS2/IOBT
JAN,OFF
NAMELIST/TEST/LEVEL,IPTS,XXS,XDTG0,YDTG0,ZDTG0,RLB,COSE,SPO,
*RI,GAM,EJOT,THETA, RN,PPX,PPY,PPZ,TIME(7),
XDTGMS,YDTGMS,ZDTGMS,MAN,MISSED,NT,XCOMP,
YCOMP,ZCOMP,TAMA,DELTA,VM,G,GGG,XDD,YDD,ZDD,DXG,DYG,
DZG,SZ,SS,S4,S5,XDH,YDH,ZDH,RLBK,S,ALEP,FI,F2,F3,G1,
G2,G3,XC,YC,ZC,S1,RRR,SR,SPL,CTL,STL,CPL,A1,VII,XE,YE,
ZALT,NERR,CLA,NPX,NX,CLAA,PHO,ARG,AAA,SCALEY,TREAL,
THA,XTA,YTA,ZTA,SCALEV,AMM,QM,SA,CA,VHX,VMY,
VNZ,ECOS,HRTEE,FI7,FCI7,
MPATH,LOOP1,LOOP2,DASF,ADSF,INFLRT,LTHAX
CHECK AND PRINT TRUNK SET=UP
PIN(1)=3RV13
PIN(2)=3RV15
PIN(3)=3RV60
PIN(4)=5RV61
LEN=4
CALL PATSTAT(PIN,POUT,LEN)
WRITE(6,1000) (PTR(I),POUT(I),I=1,4)
SAVE INITIAL CONDITIONS FOR RESTARTING PROGRAM
SAVE1=XDTG0
SAVE2=YDTG0
SAVE3=ZDTG0
SAVE4=RLB
SAVE5=COSE
SAVE6= SPO
SAVE7=RI
SAVE8=GAM
SAVE9=FOOT
SAVE10=THETA

```

SAVE11=RN

RESERVE HYBRID EQUIPMENT

5 PAUSE "GO TO RESERVE HYBRID EQUIPMENT"

CALL RESERVE(IERR)

WRITE(6,2000) IERR

IF(IERR.NE.0)GO TO 5

PRE REAL TIME INITIALIZATION

NPATH=1

LOOP1=0

LOOP2=0

INPLRT=-1

LTMAX=0

LEVEL=-7

XDTG0=SAVE1

YDTG0=SAVE2

ZDTG0=SAVE3

RLB =SAVE4

COSE =SAVE5

SPO =SAVE6

RI =SAVE7

GAM =SAVE8

ROOT =SAVE9

THETA1=SAVE10

RN=SAVE11

INITIALIZATION OF DIGITAL TO ANALOG SCALE FACTORS

DASF (1)=1./20000.

DASF (2)=1./20000.

DASF (3)=1./20000.

DASF (4)=1./100.

DASF (5)=1./10.

DASF (6)=1./100.

DASF (7)=1./200000.

DASF (8)=1./100.

DASF (9)=1./60.

DASF (10)=1./1000.

DASF (11)=1./1000.

INITIALIZATION OF ANALOG TO DIGITAL SCALE FACTORS

ADSF (1)=2000.

ADSF (2)=2000.

ADSF (3)=2000.

ADSF (4)=10.

ADSF (5)=20000.

ADSF (6)=20000.

ADSF (7)=20000.

ADSF (8)=20000.

ADSF (9)=20000.

ADSF (10)=20000.

```

115 C C JAH-ALL CONTROL LINES LOW
C C IOUT=0
C C DO NOT PROCEED UNTIL SENSE LINE 5 IS HIGH
120 C LARA=1
C 10 CALL INTCNVY(LARA,1)
C SL5=IIN.AND.32
C IF(SL5.EQ.0) GO TO 20
125 C PAUSE "WAIT FOR SENSE LINE 5 HIGH"
C 50 TO 10
C C INITIAL CONDITIONS TO ANALOG
C C
130 C 20 DAOUT1=XDTCG*DASF(1)
C DAOUT2=YDTCG*DASF(2)
C DAOUT3=ZDTCG*DASF(3)
C DAOUT4=RLB*DASF(4)
C DAOUT5=COSF*DASF(5)
135 C DAOUT6=SPO*DASF(5)
C DAOUT7=RI*DASF(7)
C DAOUT8=GAM*DASF(8)
C DAOUT9=EDOT*DASF(9)
C DAOUT10=HETAL*DASF(10)
140 C DAOUT11=RR*DASF(11)
C C SET CONTROL LINE 4 HIGH
C C PAUSE UNTIL TIME TO ENTER REAL TIME
C C
145 C IOUT=16
C PAUSE "GO TO ENTER REAL TIME"
C CALL SHRUN(ISTAT)
C WRITE(6,3000) ISTAT
150 C WRITE(6,TEST)
C CALL SHOLD
C WRITE(6,TEST)
C C SET SENSE LINE 0 LOW TO RESTART A BAD RUN
C C
155 C LARA=1
C PAUSE "SET SENSE LINE 0 LOW TO RESTART A BAD RUN"
C CALL INTCNVY(LARA,1)
C SL0=IIN.AND.1
C IF(SL0.EQ.0) GO TO 5
160 C C RETURN TO MAIN PROGRAM WHEN FLIGHT IS OVER
C C
165 C WRITE(5,4000) LOOP1
C WRITE(6,5000) LOOP2
C LTMAX=10*LTMX
C WRITE(6,I1000) LTRAX
C RETURN
C C
170 C C FORMAT STATEMENTS
C C
1000 FORMAT(1H1,////,*, TRUNK LINE PATCHING IS *4(/,10X,R3,* TO *,R3))

```

2000 FORMAT(/,*, RESERVATION ERROR CODE = *,J20)
3000 FORMAT(/,*, REAL TIME STATUS = *,J20)
4000 FORMAT(/,*, WAIT LOOP EXECUTED *,I8,*, TIMES *)
5000 FORMAT(/,*, REAL TIME LOOP EXECUTED *,I8,*, TIMES *)
11000 FORMAT(/,*, MAXIMUM LOOP TIME = *,I5,*, MICROSECONDS *)
END

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
I FLIGHT

VARIABLES	SN	TYPE	RELOCATION	REAL	ARRAY	COMH
1621 AAA	16	REAL	ASDF	REAL	ARRAY	COMH
1620 APG	672	REAL	ASDF	REAL		
1444 A1	1702	REAL	CA	REAL		COMH
1602 CLA	1605	REAL	CLAA	REAL	ARRAY	COMH
70 CGSE	1443	REAL	CPL	REAL		COMH
1441 CTL	502160	REAL	DAOUT1	REAL		
502171 JAOUT10	502172	REAL	DAOUT11	REAL		
502151 JAOUT2	502162	REAL	DAOUT3	REAL		
502163 JAOUT4	502164	REAL	JAOUT5	REAL		
502155 JAOUT6	502166	REAL	DAOUT7	REAL		
502167 JAOUT8	502170	REAL	JAOUT9	REAL		
3 JASF	1160	REAL	DELTA	REAL	ARRAY	COMH
1251 JXS	1262	REAL	JYG	REAL		COMH
1253 JZS	2131	REAL	ECOS	REAL	ARRAY	COMH
74 EOOT	2204	REAL	FCI77	REAL	ARRAY	COMH
2173 F177	1424	REAL	F1	REAL		COMH
1425 F2	1426	REAL	F3	REAL		COMH
1254 G	73	REAL	GAM	REAL		COMH
1255 GGG	1427	REAL	G1	REAL		COMH
1430 G2	1431	REAL	G3	REAL		COMH
2152 H27EE	574	REAL	I	INTEGER		COMH
504001 IADINI	504012	INTEGER	IADINI1	INTEGER		
504002 IADIN2	504003	INTEGER	IADIN3	INTEGER		
504004 IADIN4	504005	INTEGER	IADIN5	INTEGER		
504006 IADIN6	504007	INTEGER	IADIN7	INTEGER		
504010 IADIN8	504011	INTEGER	IADIN9	INTEGER		
710 IERR	514000	INTEGER	IEN	INTEGER		
39 IMPERT	515100	INTEGER	IOUT	INTEGER		
1 IPI	743	INTEGER	ISTAT	INTEGER		
712 LARA	573	INTEGER	LEN	INTEGER		
0 LEVEL	1	INTEGER	LOOP1	INTEGER		COMH
2 LCOF2	31	INTEGER	LTHAX	INTEGER		COMH
577 M3H	671	REAL	MISS	REAL		
1107 NISSEU	1601	REAL	NERR	REAL	*UNDEF	
0 NPATH	1603	REAL	NPX	REAL		COMH
1116 N1	1604	REAL	NX	REAL		COMH
1617 PHO	714	REAL	PIN	REAL	INTEGER	
161 PPY	77	REAL	PPX	REAL	ARRAY	COMH
1700 Q1	243	REAL	PPZ	REAL	ARRAY	COMH
72 R1	1656	REAL	RNH	REAL	ARRAY	COMH
1422 R3BK	67	REAL	RLB	REAL	ARRAY	COMH
1436 R2	76	REAL	RN	REAL		COMH
575 SAVE1	1701	REAL	SA	REAL		COMH
707 SAVE11	706	REAL	SAVE1U	REAL		
577 SAVE3	675	REAL	SAVE2	REAL		
701 SAVE5	700	REAL	SAVE4	REAL		
703 SAVE7	702	REAL	SAVE6	REAL		
1522 SCALET	704	REAL	SAVE8	REAL		
570 SLO	1423	REAL	SCALEP	REAL		COMH
	1665	REAL	SCALEV	REAL		COMH
	667	REAL	SLS	REAL	INTEGER	

VARIABLES	SN	TYPE	RELOCATION
1440 SPL	71	REAL	3PO
1437 SR	1442	REAL	3TL
1435 S1	1264	REAL	32
1263 S3	1266	REAL	34
1267 S5	1122	REAL	TAMA
75 THEVAL	325	REAL	TIME
1624 TMA	1623	REAL	TREAL
407 TS	1216	REAL	VH
1703 VMX	1765	REAL	VHY
2047 VMZ	1445	REAL	VTI
1432 XC	1117	REAL	XCOMP
1270 XDM	1256	REAL	XOO
445 XDTGMS	64	REAL	XDTGO
1446 XE	1662	REAL	XTA
2 XXS	1433	REAL	YC
1120 YCOMP	1328	REAL	YDM
1257 YOO	903	REAL	YDTGMS
65 YDTGO	1504	REAL	YE
1663 YTA	1600	REAL	ZALT
1934 ZC	1121	REAL	ZCOMP
1364 ZDM	1260	REAL	ZOO
541 ZDTGMS	86	REAL	ZDTGO
1542 ZE	1664	REAL	ZTA
711 ZTDGO		REAL	

FILE NAMES MODE
TAPE6 MIXED

EXTERNALS	TYPE	ARGS
BHOLD		0
PATSTAT		3
SIMRUN		1
INTCHVT		2
RESERVE		1

NAMELISTS
TEST

STATEMENT LABELS	LENGTH
44-9	125 10
611 1000	620 2000 FMT
632 4000	640 5000 FMT
	134 20 FMT
	625 3000 FMT
	646 11000 FMT

COMMON BLOCKS
COHA 1165
COMM 28

STATISTICS
PROGRAM LENGTH 7468 485
CH LABELED COMMON LENGTH 22478 1191

```

SUBROUTINE REAL
  INTEGER IMAN,SIG
  REAL MM,MISS,MISSEJ
  COMMON/COMA/LEVEL,IPIS,XXS150T,XDT50,YDT50,ZDTG0,XLB,C0SE,SP0,
  *RI,CAM,EDOT,THEAL,RN,PPX(50),PPY(50),PPZ(50),TIME(50),ATS(30),
  *XDTGMS(30),YDTGMS(30),ZDTGMS(30),MAN(4,50),MISSE0(7),NT,XCOMP,
  *YCOMP,ZCOMP,TAMA(30),BELIAR(30),WH(30),G,GGG,XDO,YDO,ZDO,DAG,DYG,
  *JZG,SZS3,S4,S5,XOM(30),YOH(30),ZD4(30),KLBK,SCALEP,FI,FZ,F3,G1,
  *G2,G3,XC,YC,ZC,S1,RRR,SR,SPL,CTL,STL,CPL,A1,VTI,XE(30),YE(30),
  *ZE(30),ZAL,HEER,CLA,MPX,IK,CLAA(10),PHO,ARG,AAA,SCALEP,TREAL,
  *TMA(30),XTA,YTA,ZTA,SCALEV,QMH(10),QH,SA,CA,VMX(50),VMY(50),
  *VHZ(50),ECOS(17),HRZEE(17),FI7(19),FCI7(19)
  COMMON/COMH/NPATH,LOOP1,LOOP2,DASF(11),ADSF(10),INFLRT,LTMAX
  COMMON/* ADC172
  * IADIN1,IADIN2,IADIN3,IADIN4,IADIN5,IADIN6,
  * IADIN7,IADIN8,IADIN9,IADIN10
  COMMON/* IOISZ/IIY
  JAH,ON
  COMMON/* DAC1/49,
  * DAOUT1,DAOUT2,DAOUT3,DAOUT4,DAOUT5,DAOUT6,
  * DAOUT7,DAOUT8,DAOUT9,DAOUT10,DAOUT11
  COMMON/* ODISZ/IOOT
  JAH,OFF
  DATA HASK/377777B/

25 C C ABNORMAL ABORT IF SENSE LINE 15 IS HIGH
C C
C SL15=IIN.AND.2**15
  IF(SL15.NE.0)GO TO 100

30 C C NPATH=1 -- WAITING FOR SENSE LINE 6 TO COME HIGH
C C NPATH=2 -- FLIGHT IN PROGRESS
C C
C GO TO (10,20),NPATH

35 C C INITIALIZATION OF FLAGS AND INDICES
C C
10 IF(INFLRT.GT.0) GO TO 15
  INFLRT=1
  IIT=1
  INDEX=1
  KGR=1
  ADSF1=ADSF(1)
  ADSF2=ADSF(2)
  ADSF3=ADSF(3)
  ADSF8=ADSF(8)
  ADSF9=ADSF(9)
  ADSF10=ADSF(10)
  NL1=0
  NL2=0
  NL3=0
  NL4=0
  NL5=0
  NL6=0
  NL6=0
  IOUT=2**15+2**4

55 C C BEGIN FLIGHT IF SENSE LINE 6 IS HIGH

```

AD-A052 676

B-K DYNAMICS INC ROCKVILLE MD
SUMMARY REPORT OF STINGER CONVERSION ACTIVITIES. (U)
JUL 76

F/6 9/2

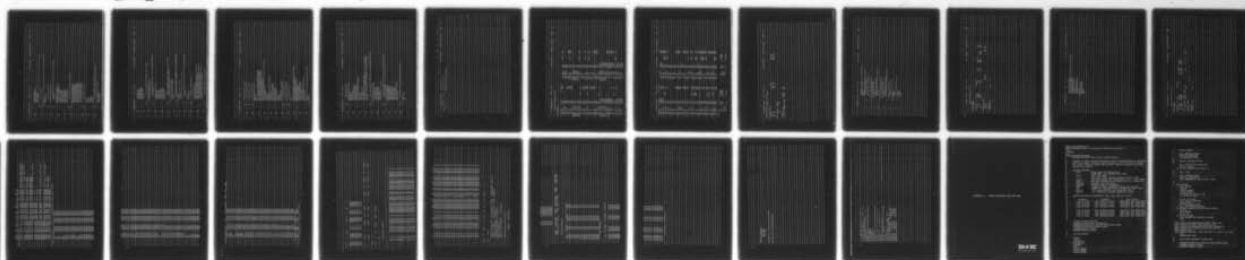
DAAH01-75-C-0194

UNCLASSIFIED

BKD-TR-3-206

NL

4 OF 4
AD
A052 676



END
DATE
FILMED
5-78

DDC

```

C      15  SL6=IN.AND.54
          IF (SL6.NE.0) NPATH=2
          LOOPI=LOOPI+1
          CALL SIMOLE
          *****
          C
          C      REAL TIME LOOP
          C
          C      20  MNAN=0
          C      LOOP2=LOOP2+1
          C
          C      READ TIME FROM ANALOG
          C
          C      DT=HMFL0T(IADIN1)*ADSF(4)
          C
          C      COMPUTE VARIABLE SCALE FACTORS UNLESS THEY HAVE REACHED
          C      CONSTANCY
          C
          IF (KCK.GT.0) GO TO 30
          IF (DT.LE.0) SKK=GG*DT/6*1.
          IF (DT.GT.0) SKK=GG*1.
          IF (DT.GT.0) KCK=1
          ADSF(1)=ADSF1/SKK
          ADSF(2)=ADSF2/SKK
          ADSF(3)=ADSF3/SKK
          ADSF(8)=ADSF8/SKK
          ADSF(9)=ADSF9/SKK
          ADSF(10)=ADSF10/SKK
          C
          C      READ REMAINING VARIABLES FROM ANALOG
          C
          C      30  DX=HMFL0T(IADIN1)*ADSF(1)
          C      DY=HMFL0T(IADIN2)*ADSF(2)
          C      DZ=HMFL0T(IADIN3)*ADSF(3)
          C      XDOT=HMFL0T(IADIN5)*ADSF(5)
          C      YDOT=HMFL0T(IADIN6)*ADSF(6)
          C      ZDOT=HMFL0T(IADIN7)*ADSF(7)
          C      XXX=HMFL0T(IADIN8)*ADSF(8)
          C      YYY=HMFL0T(IADIN9)*ADSF(9)
          C      ZZZ=HMFL0T(IADIN10)*ADSF(10)
          C
          C      STORE POSITION AND RATE
          C
          C      DXS=DX
          C      UYG=UY
          C      UZC=UZ
          C      X00=XDOT
          C      Y00=YDOT
          C      Z00=ZDOT
          C
          C      IF DX HAS REACHED A RANGE TABLE ENTRY, STORE DATA
          C
          IF (DX.LT.XXS(INDEX)) GO TO 40
          PPX(INDEX)=DX
          PPY(INDEX)=DY
  
```

```

115 PPZ(INDEX)=DZ
    TIME(INDEX)=DT
    VMX(INDEX)=XDOT
    VMY(INDEX)=YDOT
    VMZ(INDEX)=ZDOT
    AMAN=7
120 C
    C IF TIME IS GREATER THAN TPRIME, CHECK FOR MISS
    C
125 60 IF(DY-LE.G) GO TO 50
    MISS=XDOT*DX+YDOT*DY+ZDOT*DZ
    C
    C IF MISSILE HAS MISSED TARGET, STORE THE ASSOCIATED VALUES
    C AND TERMINATE
    C
130 IF(MISS.LE.0) GO TO 50
    MISSED(1)=DX
    MISSED(2)=DY
    MISSED(3)=DZ
    MISSED(4)=XDOT
    MISSED(5)=YDOT
    MISSED(6)=ZDOT
    MISSED(7)=MISS
    GO TO 100
140 C
    C IF TARGET TRAJECTORY TABLE HAS BEEN EXCEEDED OR TARGET
    C MANEUVER HAS NOT YET BEGUN, END LOOP
    C
145 50 IF(LEVEL.GT.0) CALL SIMIDLE
    IF(DT.LT.TS(1)) CALL SIMIDLE
    LEVEL=0
    C
    C FEHB POSITION IN TARGET TRAJECTORY TABLE FOR INTERPOLATION
    C
150 60 IT2=IT1+1
    IF(DT.LT.TS(IT2)) GO TO 70
    IT1=IT1+1
    IF((IT1.LT.NT).AND.(IT1.LT.30)) GO TO 60
    C
155 C SET INDICATOR FOR TARGET TRAJECTORY TABLE EXCEEDED AND END
    C THIS LOOP
    C
    LEVEL=7
    CALL SIMIDLE
160 C
    C INTERPOLATE TARGET MANEUVER
    C
165 70 LIV=TS(IT2)-TS(IT1)
    XATIO=(JT-TS(IT1))/DIV
    XC0MP=XDOTGMS(IT1)+RATIO*(XDOTGMS(IT2)-XDOTGMS(IT1))
    XC0DM=XDM(IT1)+RATIO*(XDM(IT2)-XDM(IT1))
    YC0MP=YDOTGMS(IT1)+RATIO*(YDOTGMS(IT2)-YDOTGMS(IT1))
    YC0DM=YDM(IT1)+RATIO*(YDM(IT2)-YDM(IT1))
    ZC0MP=ZDOTGMS(IT1)+RATIO*(ZDOTGMS(IT2)-ZDOTGMS(IT1))
    ZC0DM=ZDM(IT1)+RATIO*(ZDM(IT2)-ZDM(IT1))
170 C
    C COMPUTATION OF TARGET INERTIAL VELOCITY
    
```

C VTISQRT(XC*XC*YC*YC+ZC*ZC)

C CHECK FOR HELICOPTER

C IF(VTI.LT.338.0) GO TO 80

C COMPUTATION OF COSE

C ARR=003398*ZALT+1116.89

C JM=VTI/AAA

C NX=8

C CALL LINTRP(QM,3MM,CLAA,NX,NL1,RA1,CLA,NER1)

C CALL LINTRP(OT,1MA,XE,NT,NL2,RA2,XTA,NER2)

C CALL LINTRP(OT,1MA,YE,NT,NL3,RA3,YTA,NER3)

C CALL LINTRP(OT,1MA,ZE,NT,NL4,RA4,ZTA,NER4)

C PH05=.00237692*EXP(1.00003*ZALT)

C TEMPN=.01745329*4.637084262*SQRT(KGA*XTA*YTA*ZTA*ZTA)

C TEMPD=PH0*VTI*VJI*CLA

C A1=TEMPD/TEMP

C SA=JNIAL1

C CR=COS(A1)

C RFEET=SQRT(KXX*XXX*YYY*ZZZ*ZZZ)

C RR=VTI*RFEET

C F1=S2*XXX-SPL*YYY+S3*ZZZ

C F2=S4*XXX+CPL*YYY+S5*ZZZ

C F3=CTL*ZZZ-STL*XXX

C SRESQRT(XC*XC+YC*YC)

C S1=CA+(SA/SR)*ZC

C G1=S1*XC

C G2=S1*YC

C G3=CA*ZC-SA*SR

C COSE=(F1*G1+F2*G2+F3*G3)/RRR

C COMPUTATION OF RLB

C RLB=RLJK*SQRT(1.-COSE*COSE)

C COMPUTATION OF RN

C GO TO 75

C NX=17

C CALL LINTRP(COSE,ECOS,HRTEE,NX,NL5,RA5,HR7E,NER5)

C TEMP=2-341*ALOG(RFEET/22965.831)

C HC7FT=1209.675*EXP(TEMP)*HR7E

C P1=SS-2*ATANT*57RLB

C P2=RSS-2.5*RLB/RFEET

C TEMPN=CINIP1RSS)*P2IRSS**2

C TEMPD=C*COS(P1RSS/2.))*2

C A7=TEMPD/TEMP

C PJTUI=EXP(1.003258*ALOG(AT7)/10.

C F17=HC7FT/PJTUI

C NX=9

C CALL LINTRP(F17,F17T,FC177,NX,NL6,RA6,FC17,NER6)

C KN=FC17

C 75 CONTINUE

```

230 C COMPUTATION OF SPO
      RC1=F2/SQRT(F1*F1+F2*F2)
      PCN=ACOS(RC1)
      RCX=-RC1
      RCY=SIGN(PCN)
      IF(F1.GE.0) RCY=-RCY
      F11=(F2*G3-F3*G2)/VTI
      F22=(F3*G1-F1*G3)/VTI
      F33=(F1*G2-F2*G1)/VTI
      FCF=SQRT(F11*F11+F22*F22+F33*F33)
      G11=F1*RCX
      G22=F2*RCY
      G111=(G11+G22)/FCR
      T111=ACOS(G111)
      IF(F33.LT.0.) TRP=1.570796326-T111
      IF(F33.GE.0.) AND.(T111.LE.1.570796326) TRP=1.570796326+T111
      IF(F33*GE.0.) AND.(T111.GT.1.570796326) TRP=T111-4.71238898
      SPO=TRP
C
C STORE TARGET DATA IF A RANGE TABLE ENTRY HAS REACHED THIS LOOP
250 C
      80 IF(*MAG.EQ.0) GO TO 90
      IF(I*AJEX.GT.50) 50 TO 90
      MARI(I,INDEX)=0
      MARI2,INDEX=XCOMP
      MARI3,INDEX=YCOMP
      MARI4,INDEX=ZCOMP
      INDEX=INDEX+1
      IF(INDEX.GT.IPTS) GO TO 100
C
C IF DATA COLLECTION IS NOT COMPLETE, SEND VARIABLES TO ANALOG
260 C
      90 DAOUT1=XCOMP*DA5F(1)
      DAOUT2=YCOMP*DA5F(2)
      DAOUT3=ZCOMP*DA5F(3)
      DAOUT4=RLB*DA5F(4)
      DAOUT5=COS*DA5F(5)
      DAOUT6=SPO*DA5F(5)
      DAOUT11=XH*DA5F(11)
      LTC=200-STAT(MASK)
      IF(LTC.GT.LTMAX) LTMAX=LTC
      CALL SINTDLE
C
C SET CONTROL LINE 7 HIGH AND TERMINATE REAL TIME
275 C
      100 IOUT=128
      CALL SIMSTOP
      END

```

7474 OPT-1

SUBROUTINE REACT

CARD NR. SEVERITY DETAILS DIAGNOSIS OF PROBLEM

213 I THERE IS NO PATH TO THIS STATEMENT.

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
I REAL

VARIABLES	SN	TYPE	RELOCATION	16	ADSF	REAL	ARRAY	COMM
1621 AAA	REAL	COMA		727	ADSF10	REAL		
722 ADSF1	REAL			724	ADSF3	REAL		
723 ADSF2	REAL			726	ADSF9	REAL		
725 ACSF8	REAL			776	AT7	REAL		
1620 ARG	REAL	COMA		1702	CA	REAL		COMA
1444 AL	REAL	COMA		1605	CLAA	REAL		COMA
1602 CLA	REAL	COMA		1443	CPL	REAL		COMA
70 COS2	REAL	COMA		1016	C111	REAL		
1441 CTL	REAL	COMA		502171	JAOUT10	REAL		
502150 DAJUT1	REAL			502161	DAOUT12	REAL		
502172 JAJUT11	REAL			502163	JAOUT14	REAL		
502162 JAJUT3	REAL			502165	JAOUT15	REAL		
502154 DAJUT5	REAL			502167	DAOUT8	REAL		
502156 DAJUT7	REAL			3	DASF	REAL		COMA
502170 JAJUT4	REAL			752	DLV	REAL		COMA
1153 DELTAR	REAL	COMA		740	DX	REAL		
736 DT	REAL			741	JY	REAL		
1261 JXG	REAL	COMA		742	JZ	REAL		
1252 UYG	REAL	COMA		2131	EGOS	REAL		COMA
1253 DZ5	REAL	COMA		1002	FC17	REAL		
74 E0JT	REAL	COMA		1013	FCR	REAL		
2204 FC177	REAL	COMA		2173	FI7T	REAL		COMA
1000 FI7	REAL			1010	F11	REAL		
1424 F1	REAL	COMA		1011	F22	REAL		
1425 F2	REAL	COMA		1012	F33	REAL		
1425 F3	REAL	COMA		73	GAM	REAL		COMA
1254 G	REAL	COMA		1427	G1	REAL		COMA
1255 G55	REAL	COMA		1430	G2	REAL		COMA
1814 G11	REAL			1431	G3	REAL		COMA
1015 G22	REAL			770	HR7E	REAL		
773 HC7FT	REAL	COMA		504001	IADINI	INTEGER		
2152 HR7EE	REAL	COMA		504002	IADIN2	INTEGER		
504012 IADIN10	INTEGER			504004	IADIN6	INTEGER		
504003 IADIN5	INTEGER			504006	IADIN6	INTEGER		
504005 IADIN5	INTEGER			504010	IADIN3	INTEGER		
504037 IADIN7	INTEGER			514000	IIN	INTEGER		
504011 IAJIN9	INTEGER			30	INFLRT	INTEGER		COMA
720 INJEX	INTEGER			1	IPTS	INTEGER		COMA
516100 IOU1	INTEGER			751	IT2	INTEGER		
717 IY1	INTEGER			0	LEVEL	INTEGER		COMA
721 KCK	INTEGER	COMA		2	LOOP2	INTEGER		COMA
I LCCPI	INTEGER			31	LTMAX	INTEGER		COMA
1021 LTC	INTEGER			667	MASK	INTEGER		COMA
577 M21	REAL	COMA		1107	MI35E0	REAL		COMA
715 M22	REAL			755	MER1	REAL		COMA
1651 M23	REAL	COMA		761	MER3	REAL		COMA
757 M24	REAL			771	MER5	REAL		COMA
753 NE2	INTEGER			730	NL1	INTEGER		COMA
1033 NE25	INTEGER			732	NL3	INTEGER		COMA
731 NL2	INTEGER			734	NL5	INTEGER		COMA
733 NL4	INTEGER							

VARIABLES	SN	TYPE	RELOCATION	D	NPATH	INTEGER	COMA
735 HL6		INTEGER		1115	NT	INTEGER	COMA
1603 HFX		INTEGER	COMA	1617	PHO	REAL	COMA
1604 NX		INTEGER	COMA	77	PPX	REAL	COMA
777 PJT01		REAL	ARRAY	243	PPZ	REAL	COMA
151 PPY		REAL	ARRAY	775	P2IRSS	REAL	COMA
774 P1R55		REAL	COMA	1666	JMH	REAL	COMA
1700 JH		REAL	COMA	754	ZAI	REAL	COMA
753 RATIO		REAL	COMA	760	ZR3	REAL	COMA
756 R42		REAL	COMA	787	ZR5	REAL	COMA
752 R24		REAL	COMA	1005	RC3	REAL	COMA
1001 R45		REAL	COMA	1007	RCY	REAL	COMA
1006 RCX		REAL	COMA	766	RFEET	REAL	COMA
1004 R21		REAL	COMA	67	ZLB	REAL	COMA
72 RI		REAL	COMA	76	RN	REAL	COMA
1422 RL3K		REAL	COMA	1701	SA	REAL	COMA
1435 R55		REAL	COMA	1622	SCALET	REAL	COMA
1423 SCALEP		REAL	COMA	737	SXK	REAL	COMA
1655 SCALEV		REAL	COMA	714	SL6	REAL	COMA
716 SL15		REAL	COMA	71	SPO	REAL	COMA
1440 SPL		REAL	COMA	1442	STL	REAL	COMA
1437 SR		REAL	COMA	1264	S2	REAL	COMA
1435 SI		REAL	COMA	1266	S4	REAL	COMA
1265 S3		REAL	COMA	1122	TAMA	REAL	COMA
1267 S5		REAL	COMA	765	TEMPD	REAL	COMA
772 TE4P		REAL	COMA	75	THETA	REAL	COMA
754 TEMPN		REAL	COMA	1624	TMA	REAL	COMA
325 TIME		REAL	ARRAY	1020	TRP	REAL	COMA
1523 TR3AL		REAL	COMA	1017	T111	REAL	COMA
407 TS		REAL	ARRAY	1703	VHX	REAL	COMA
1215 VM		REAL	ARRAY	2047	VHZ	REAL	COMA
1755 VMY		REAL	ARRAY	713	VHAN	REAL	COMA
1445 VTI		REAL	COMA	1117	XCOMP	REAL	COMA
1432 XC		REAL	COMA	1256	XDD	REAL	COMA
1273 X01		REAL	ARRAY	1445	XE	REAL	COMA
743 X02		REAL	COMA	2	XXS	REAL	COMA
84 XH160		REAL	COMA	1433	YC	REAL	COMA
1652 XTA		REAL	COMA	1326	YDM	REAL	COMA
746 XXX		REAL	COMA	744	YDOT	REAL	COMA
1120 YCOMP		REAL	COMA	65	YDTGO	REAL	COMA
1257 YD0		REAL	ARRAY	1663	YTA	REAL	COMA
503 YDTJMS		REAL	ARRAY	1600	ZALT	REAL	COMA
1504 YE		REAL	ARRAY	1121	ZCOMP	REAL	COMA
747 YYY		REAL	COMA	1260	ZOO	REAL	COMA
1434 ZC		REAL	ARRAY	541	ZDTGMS	REAL	COMA
1354 ZDM		REAL	COMA	1542	ZE	REAL	COMA
745 ZD0T		REAL	COMA	750	ZZZ	REAL	COMA
66 ZDTGO		REAL	COMA				
1654 ZTA		REAL	COMA				

EXTENDALS	TYPE	ARGS
AC33	REAL	1 LIBRARY
AT33	REAL	1 LIBRARY
EXP	REAL	1 LIBRARY
LINTRP	REAL	8 SIMIOLE
SI*STOP	REAL	0
SGPT	REAL	1 LIBRARY
ALOG	REAL	1 LIBRARY
COS	REAL	1 LIBRARY
HNFL0T	REAL	1
SIN	REAL	1 LIBRARY

INLINE FUNCTIONS TYPE ARGS
STAT NO TYPE 1 INTRIN

STATEMENT LABELS				
14 10	37	15	46	20
102 30	164	40	205	50
214 60	225	70	430	75
513 80	525	90	552	100

COMMON BLOCKS LENGTH
C004 1165
C014 26

STATISTICS
PROGRAM LENGTH 10228 530
CY LABELED COMMON LENGTH 22478 1191

SUBROUTINE LINTRP(X,XT,YT,NX,NL,RA,Y,NERR)
DIMENSION XT(1),YT(1)

NERR=0
IF((NL.EQ.1).AND.(NL.LT.NX)) GO TO 10
INITIALIZE NL AND RA

NL=1
RA=(YT(2)-YT(1))/(XT(2)-XT(1))

10 C 10 IF (X.GE.XT(NL)) GO TO 30
NL IS TOO LARGE

20 C 20 IF (NL.EQ.1) GO TO 50
NL=NL+1

15 C IF (X.LT.XT(NL)) GO TO 20
RA=(YT(NL+1)-YT(NL))/(XT(NL+1)-XT(NL))
GO TO 50

30 C 30 IF (X.LE.XT(NL+1)) GO TO 50
NL IS TOO SMALL

40 C 40 IF (NL.EQ.NX-1) GO TO 70
NL=NL+1

20 C IF (X.GT.XT(NL+1)) GO TO 40
RA=(YT(NL+1)-YT(NL))/(XT(NL+1)-XT(NL))

25 C 50 Y=YT(NL)+RA*(X-XT(NL))
RETURN

60 NERR=1
X IS LESS THAN XT(1)
Y=YT(1)
RETURN

30 C 70 NERR=2
X IS GREATER THAN XT(NX)
Y=YT(NX)
RETURN
END

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
3 LINTRP

VARIABLES	SN	TYPE	RELOCATION			
0 MEPR		INTEGER	F.P.			
0 NX		INTEGER	F.P.	0	NL	INTEGER
0 X		REAL	F.P.	0	RA	REAL
0 Y		REAL	F.P.	0	XT	REAL
			F.P.	0	YY	REAL
						ARRAY
						ARRAY
						F.P.
						F.P.

STATEMENT LABELS

20	10	24	20	37	30
53	50	56	50	59	58
71	70				

STATISTICS

PROGRAM LENGTH 768 62

```
FUNCTION HMFLOI(INPJT)  
DATA IVLMSK/37778/,CONVRT/.00006103881/,ISNSK/4000087  
INTER=AND(IVLMSK,INPJT)  
ISGN=NOT(ISNSK*INPUT)  
IF (ISGN.EQ.0)GO TO 10  
ISGN=#1  
INTER=COMPL(INTER)  
INTER=AND(IVLMSK*INTER)  
GO TO 20  
10 ISGN=#1  
20 REAL=INTER*CONVRT  
HMFLOI=REAL*ISGN  
RETURN  
END
```

SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
4 HMFL0T

VARIABLES	SN	TYPE	RELOCATION	25	HMFL0T	REAL
23	CONVRT	REAL		25	HMFL0T	REAL
0	IMPJT	INTEGER	F.P.	26	INTER	INTEGER
27	ISGN	INTEGER		24	ISMASK	INTEGER
22	IVLSK	INTEGER		30	REAL	REAL

INLINE FUNCTIONS TYPE ARGS
AND NO TYPE 2 INTRIN COMPL NO TYPE 1 INTRIN

STATEMENT LABELS
14 10 15 20

STATISTICS
PROGRAM LENGTH 318 25

RTSEE MAIN(0).REALT(1)
GLOBAL COMA,COMM
END

```

? REALY
CHAIN
READING FILE LGO
PROGRAM HAIN L=011417 BLOKS COMA CH002215 COMB CH000015 MANEUV CH010334 - GTARG CH000013
BLOKS COMP CH000111 EXTRA CH000110 ANG CH000004 PK CH000242
BLOKS HISD CH000016 DELT CH000056 COMD CH000005
PROGRAM ONE L=000030 BLOKS MANEUV CH010334
PROGRAM TWO L=000030 BLOKS COMA CH010334
PROGRAM THREE L=000030 BLOKS COMA CH010334
PROGRAM INIT L=001033 BLOKS EXTRA CH000110 COMA CH002215 COMB CH000013 COMP CH000111
PROGRAM LEIH L=000517 BLOKS PK CH000242 HISD CH000015 MANEUV CH010334 DELT CH000056
BLOKS GTARG CH000013 COMD CH000005
PROGRAM QCLIM L=000056 BLOKS COMP CH000111
PROGRAM GUID L=000021 BLOKS ANG CH000004 COMB CH000015
PROGRAM KSALE L=000362 BLOKS COMA CH002215 COMP CH000111
PROGRAM PRIME L=000435 BLOKS COMA CH002215 MANEUV CH010334 ANG CH000004 DELT CH000056
PROGRAM MISCOM L=000773 BLOKS COMD CH000015 HU CH000006 HISD CH000016 COMP CH000111
BLOKS HISD CH000016 DELT CH000056 HU CH000005 COMB CH000015
BLOKS COMP CH000111 EXTRA CH000110 COMD CH000005
PROGRAM MEAN L=000321 BLOKS COMP CH000111
PROGRAM INTERP L=000204
PROGRAM FLIGHT L=000756 BLOKS COMA CH002215 COMB CH000032
PROGRAM REALT L=001032 BLOKS COMA CH002215 COMB CH000032
PROGRAM LINTRP L=000078
PROGRAM HFLOUT L=000031
CONSULTING LIBRARY FORTRAN
PROGRAM F03SYS L=000645 BLOKS Q8.I0. CH0000134
PROGRAM SINCOSE L=000071
PROGRAM ACOSIN L=000113
PROGRAM ATAN2 L=000110
PROGRAM SORT L=000044
PROGRAM OUTG L=000155 BLOKS IOCON. CH000042 Q8.I0. CH0000134
PROGRAM INPG L=000104 BLOKS IOCON. CH000042 Q8.I0. CH0000134
PROGRAM SINSTJP L=000086
PROGRAM AFAN L=000059
PROGRAM ALOC L=000073
PROGRAM EXP L=000076
PROGRAM SINGLE L=000011
PROGRAM GOFJER L=000014
PROGRAM ITQJ L=000016
PROGRAM HJUL L=000011
PROGRAM MAOUT L=000000 BLOKS IOBUF. CH0000227
PROGRAM INTCNV L=000010
PROGRAM RESERVE L=000012
PROGRAM PAUSE L=000025
PROGRAM PAYSTAT L=000023
PROGRAM SYSAID L=000031
PROGRAM SYSAID L=000053
PROGRAM FMTAPE L=000045
PROGRAM GETFIT L=000034
PROGRAM SIMERR L=000015
PROGRAM GETHF L=000015
PROGRAM COMIO L=000062 BLOKS Q8.I0. CH0000134 IOCON. CH000042
PROGRAM KOJER L=000045 BLOKS IOCON. CH000042 Q8.I0. CH0000134
PROGRAM KRAKER L=000044 BLOKS IOCON. CH000042 Q8.I0. CH0000134
PROGRAM OUTCOM L=000141 BLOKS Q8.I0. CH0000134 IOCON. CH000042

```

PROG	FLI	L=01	BL	09.	CM0	IC	CM	CM
PROGRAM	INCOM=	L=00252	BLOCKS	09.10.	CM000134	IC0000	CM000042	CM000002
PROGRAM	FLITH=	L=003153	BLOCKS	08.10.	CM000134	IC0000	CM000042	CM000002
CONSULTING LIBRARY SYS10								
PROGRAM	OPEN=ST	L=003260	BLOCKS	A03.RM	CM000010	CON.RM	CM000006	JMPS.RM CM000011 OPEN.FO CM000007
PROGRAM	OPEN=RY	L=002235	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	JMPS.RM CM000011 HENC.RM CM000003
PROGRAM	OPEN=FO	L=003000	BLOCKS	OPEN.FO	CM000007	CON.RM	CM000006	JMPS.RM CM000011
PROGRAM	PJT.SJ	L=003127	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	PUT.FO CM000007 JMPS.RM CM000011
PROGRAM	CLSF.RM	L=003023	BLOCKS	CLSF.FO	CM000007	CON.RM	CM000006	GET.RT CM000011
PROGRAM	Z.SQ	L=003101	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	SAFL.FO CM000007
PROGRAM	SKFL.SQ	L=003047	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	SAFL.FO CM000007
PROGRAM	YS.RM	L=000051	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	SAFL.FO CM000007
PROGRAM	LXK.SJ	L=003210	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	JMPS.RM CM000011
PROGRAM	BTRI.SJ	L=000114	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	BTRI.SQ	L=000777	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.FO CM000005
PROGRAM	GET.RT	L=000011	BLOCKS	GET.RT	CM000011	CON.RM	CM000006	GET.BT CM000005
PROGRAM	CHRS.ST	L=000007	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	CIO.RM	L=000042	BLOCKS	CON.RM	CM000006	CON.RM	CM000006	GET.BT CM000005
PROGRAM	EXC.RM	L=000400	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	MCI.RM	L=000233	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	OSUB.RM	L=000067	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	CLSV.SQ	L=000131	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	LBUF.SQ	L=000133	BLOCKS	JMPS.RM	CM000011	CON.RM	CM000006	GET.BT CM000005
PROGRAM	RTREL	L=000030	BLOCKS	JMPS.RM	CM000011	CON.RM	CM000006	GET.BT CM000005
PROGRAM	OPEX.SJ	L=003015	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	CLSF.SJ	L=000131	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	MOVE.RM	L=000064	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	LEG.RM	L=000042	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	FSU.SQ	L=000110	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005
PROGRAM	WAR.SQ	L=000256	BLOCKS	A08.RM	CM000010	CON.RM	CM000006	GET.BT CM000005

```

>>>>>>> SEGMENT MAIN FMA = +001104 EXEC.FMA= +001104 LMA+1= +050731
*** BLOCK NAME...TYPE...FMA...LENGTH
MAIN PROGRAM +001104 0011417
ONE PROGRAM +012523 0000000
THO PROGRAM +012523 0000000
THREE PROGRAM +012523 0000000
INIT PROGRAM +012523 0001033
LETH PROGRAM +013556 0000617
QLLH PROGRAM +014375 0000056
GUID PROGRAM +014453 0000021
KSCALE PROGRAM +014474 0003362
PRTE PROGRAM +015056 0000435
MISCOM PROGRAM +015513 0000773
MEAN PROGRAM +016506 0000321
INTERP PROGRAM +017027 0000204
FLIGHT PROGRAM +017233 0000746
FOKSYS= PROGRAM +020201 0000645
SINCOS= PROGRAM +021046 0000071
ACOSIN= PROGRAM +021137 0000113
ATAN2 PROGRAM +021252 0000100
SQRT PROGRAM +021352 0000044
UTIC= PROGRAM +021416 0000165
INPC= PROGRAM +021603 0000164
DMOLD PROGRAM +021767 0000011
HANDOUT= PROGRAM +022080 0000500
SIRUM PROGRAM +022600 0000016
INTCNVTI PROGRAM +022616 0000010
RESERVE PROGRAM +022626 0000012
PAUSE= PROGRAM +022640 0000025
PRSTATI PROGRAM +022665 0000023
SYSID= PROGRAM +022710 0000001
SYS=AIO PROGRAM +022711 0000053
FMTAP= PROGRAM +022764 0000345
GETFIT= PROGRAM +023351 0000036
GETHF PROGRAM +023365 0000015

```

COMIOF	PROGRAM	+02340Z	000000Z
KODER	PROGRAM	+023454	0000460
ARAKER	PROGRAM	+024144	0000414
OUTCOM	PROGRAM	+024560	0000141
PLTOUT	PROGRAM	+024721	0000310
INCOME	PROGRAM	+025231	0000262
FLTIME	PROGRAM	+025313	0000153
OPEN.SI	PROGRAM	+025666	0000260
OPEN.RM	PROGRAM	+026146	0000235
PUT.SQ	PROGRAM	+026403	0001227
CLSF.RM	PROGRAM	+027632	0000023
Z.SQ	PROGRAM	+027655	0000101
SKFL.SI	PROGRAM	+027756	0000047
SYS.RH	PROGRAM	+030025	0000051
LKER.SI	PROGRAM	+030076	0000210
BRT.SI	PROGRAM	+030306	0000114
GET.SQ	PROGRAM	+030422	0000777
CHWR.SQ	PROGRAM	+031421	0000007
CTO.RH	PROGRAM	+031430	0000042
ERR.RH	PROGRAM	+031472	0000400
MCT.RH	PROGRAM	+032072	0000233
OSUB.RM	PROGRAM	+032325	0000067
CLSV.SI	PROGRAM	+032414	0000131
LBUF.SI	PROGRAM	+032545	0000133
YRCL	PROGRAM	+032700	0000030
OPCX.SI	PROGRAM	+032740	0000015
CLSF.SQ	PROGRAM	+032745	0000131
MOVE.RM	PROGRAM	+033076	0000054
RLEI.RM	PROGRAM	+033162	0000042
FSU.SQ	PROGRAM	+033224	0000110
PAR.SQ	PROGRAM	+033334	0000256
ATAN	PROGRAM	+033612	0000065
ALQG	PROGRAM	+033677	0000073
EXP	PROGRAM	+033772	0000075
COLTER	PROGRAM	+034070	0000014
SIMERR	PROGRAM	+034104	0000015
PUT.RI	COMMON	+034121	0000011
CLSV.FO	COMMON	+034132	0000007
GET.FO	COMMON	+034141	0000007
GET.BI	COMMON	+034150	0000005
SKFL.FO	COMMON	+034155	0000007
GET.RI	COMMON	+034164	0000011
CLSF.FO	COMMON	+034175	0000007
PUT.FO	COMMON	+034204	0000007
JPE.SFO	COMMON	+034213	0000001
MEMC.RM	COMMON	+034214	0000003
OPEN.FO	COMMON	+034217	0000007
JMPS.RM	COMMON	+034226	0000011
CON.RM	COMMON	+034237	0000005
AGR.RH	COMMON	+034245	0000010
IO.BUF	COMMON	+034255	0000227
LOCON	COMMON	+034304	0000042
2R.IO	COMMON	+034346	0000134
MU	COMMON	+034702	0000006
UCMD	COMMON	+034710	0000005
DELT	COMMON	+034715	0000454
HISJ	COMMON	+035371	0000015
PK	COMMON	+035407	0000242
ARG	COMMON	+035551	0000004
EXTRA	COMMON	+035555	0000110
CORP	COMMON	+035765	0000111
GTARG	COMMON	+036076	0000013
MANEUV	COMMON	+036111	0010334
COMB	COMMON	+046445	0000015
COMM	GLOBAL	+046462	0000032
COMA	GLOBAL	+046514	0002215

050731 EXEC.FMA= +050731 LWA+1= +062053

SEGMENT REALT FMA#FMA#.....LENGTH

SEGMENT	REALT	FMA#	FMA#	LENGTH
REALT	PROGRAM	+050731		0001022
LINTRP	PROGRAM	+051753		0000676
MFLOT	PROGRAM	+052051		0000031
SIMSTOP	PROGRAM	+052102		0000066
ATAY	PROGRAM	+052110		0000065
ALOG	PROGRAM	+052175		0000073
EXP	PROGRAM	+052270		0000076
SIMIDLE	PROGRAM	+052366		0000011
GOTOER	PROGRAM	+052377		0000014
ITCJE	PROGRAM	+052413		0000019
SIMERR	PROGRAM	+052431		0000015
ACOSINH	PROGRAM	+052446		0000113
SINCOSE	PROGRAM	+052561		0000071
SORT	PROGRAM	+052652		0000044
SYS.RM	PROGRAM	+052716		0000051
YSRATD	PROGRAM	+052767		0000053
FORYSJ	PROGRAM	+053042		0000545
YSATD	PROGRAM	+053707		0000001
OPEN.SQ	PROGRAM	+053710		0000260
OPEN.RM	PROGRAM	+054170		0000235
PUT.SQ	PROGRAM	+054425		0001227
CLSF.RM	PROGRAM	+055554		0000023
Z.SJ	PROGRAM	+055677		0000101
SKFL.SQ	PROGRAM	+056000		0000047
LXR.SQ	PROGRAM	+056047		0000210
TRT.SQ	PROGRAM	+056257		0000114
ERR.RM	PROGRAM	+056373		0000400
CTD.RM	PROGRAM	+056773		0000092
CLSF.SQ	PROGRAM	+057035		0000131
OPEX.SQ	PROGRAM	+057166		0000015
CHR.SJ	PROGRAM	+057203		0000007
OSJ.RM	PROGRAM	+057212		0000067
MCI.RM	PROGRAM	+057301		0000233
KTR.L	PROGRAM	+057534		0000030
CLSV.SQ	PROGRAM	+057554		0000131
MCVE.RM	PROGRAM	+057715		0000064
RLC.RM	PROGRAM	+060001		0000042
WAR.SJ	PROGRAM	+060043		0000256
GET.SJ	PROGRAM	+060321		0000777
LBJS.SJ	PROGRAM	+061320		0000133
FSU.SQ	PROGRAM	+061453		0000110
SET.FO	COMMON	+061563		0000007
PUT.RT	COMMON	+061572		0000011
CLSV.FO	COMMON	+061603		0000007
GET.BI	COMMON	+061612		0000005
SKFL.FO	COMMON	+061617		0000007
GET.RT	COMMON	+061626		0000011
CLSF.FO	COMMON	+061637		0000007
PUT.FO	COMMON	+061646		0000007
OPE.SF	COMMON	+061655		0000001
HEHC.RM	COMMON	+061656		0000003
OPE.FO	COMMON	+061661		0000007
JMP.SRM	COMMON	+061670		0000011
COM.RM	COMMON	+061701		0000006
AOS.RM	COMMON	+061707		0000010
08.10	COMMON	+061717		0000134
*** FN.GLOBAL..SEGMENT...SAFETY...FMA				
COMA MAIN SAFE +046562				
COMA MAIN SAFE +046514				
***** CH BLANK COMMON FMA# +062853 LWA+1= +062053				

ISI = 0 NSAM = 2 ICON = 2 INL = 2

CLMS = 3.75000 CLSI = 0.00000 CLS2 = 3.26700
 CLMS = 2.39400 CLSI = 0.00000 CLS2 = 2.56600
 CLMS = 1.88000 CLSI = 0.00000 CLS2 = 2.26600
 CLMS = 1.59600 CLSI = 0.00000 CLS2 = 2.08900
 CLMS = 1.81000 CLSI = 0.00000 CLS2 = 1.97000
 CLMS = 1.27700 CLSI = .11800 CLS2 = 1.88200
 CLMS = 1.17500 CLSI = .13500 CLS2 = 1.81500
 CLMS = 1.09400 CLSI = .23900 CLS2 = 1.76100
 CLMS = 1.02800 CLSI = .28400 CLS2 = 1.71600
 CLMS = .97300 CLSI = .32200 CLS2 = 1.67800

Q1 = 0.00000 Q2 = 0.00000 Q3 = 0.00000 Q4 = 0.00000 Q5 = 0.00000 Q6 = 0.00000

M1 = 0.00000 M2 = 0.00000 M3 = 0.00000 M4 = 0.00000 M5 = 0.00000 M6 = 0.00000

NRUNS = 1

NPTS = 10 DX = 20.00000 XTERM = 100.00000

INL = 39

TABLE OF LAUNCH CONDITIONS

SET #	ALTITUDE	FT	CROSSING ANGLE	DEC	INITIAL RANGE	FT
SET 1	1442.90	FT	323.00	DEC	13123.40	FT
SET 2	2624.70	FT	285.00	DEC	2952.80	FT
SET 3	1482.90	FT	38.00	DEC	13123.40	FT
SET 4	1312.30	FT	338.00	DEC	6561.70	FT
SET 5	3280.60	FT	315.00	DEC	8202.10	FT
SET 6	3280.80	FT	300.00	DEC	9842.50	FT
SET 7	3280.80	FT	60.00	DEC	9842.50	FT
SET 8	2296.50	FT	65.00	DEC	4921.30	FT
SET 9	1312.30	FT	23.00	DEC	3608.90	FT
SET 10	1312.30	FT	10.00	DEC	3608.90	FT
SET 11	1312.30	FT	350.00	DEC	3937.00	FT
SET 12	2296.50	FT	0.00	DEC	6233.60	FT
SET 13	1968.50	FT	355.00	DEC	7545.90	FT
SET 14	1640.40	FT	345.00	DEC	9842.50	FT
SET 15	1640.40	FT	339.00	DEC	4921.30	FT
SET 16	2236.60	FT	210.00	DEC	2624.70	FT
SET 17	328.10	FT	195.00	DEC	2624.70	FT
SET 18	328.10	FT	165.00	DEC	2624.70	FT
SET 19	2296.60	FT	150.00	DEC	2624.70	FT
SET 20	196.80	FT	39.00	DEC	4921.30	FT
SET 21	1640.40	FT	23.00	DEC	4921.30	FT

SET	ALTITUDE	154F	FT	CROSSING	ANGLE	5.00	DEG	INITIAL	RANGE	E	FT
SET 22	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 350.00	5.00	DEG	INITIAL	RANGE = 9843.00	E = 7217.80	FT
SET 24	ALTITUDE = 984.20		FT	CROSSING	ANGLE = 330.00	3.00	DEG	INITIAL	RANGE = 4921.50	E = 4921.50	FT
SET 25	ALTITUDE = 492.10		FT	CROSSING	ANGLE = 330.00	3.00	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 26	ALTITUDE = 1312.30		FT	CROSSING	ANGLE = 330.00	3.00	DEG	INITIAL	RANGE = 6561.70	E = 6561.70	FT
SET 27	ALTITUDE = 1643.40		FT	CROSSING	ANGLE = 330.00	3.00	DEG	INITIAL	RANGE = 11482.90	E = 11482.90	FT
SET 28	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 330.00	3.00	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 29	ALTITUDE = 492.10		FT	CROSSING	ANGLE = 225.00	2.25	DEG	INITIAL	RANGE = 2624.70	E = 2624.70	FT
SET 30	ALTITUDE = 492.10		FT	CROSSING	ANGLE = 240.00	2.40	DEG	INITIAL	RANGE = 2624.70	E = 2624.70	FT
SET 31	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 180.00	1.80	DEG	INITIAL	RANGE = 2624.70	E = 2624.70	FT
SET 32	ALTITUDE = 1643.40		FT	CROSSING	ANGLE = 180.00	1.80	DEG	INITIAL	RANGE = 2624.70	E = 2624.70	FT
SET 33	ALTITUDE = 492.10		FT	CROSSING	ANGLE = 135.00	1.35	DEG	INITIAL	RANGE = 2624.70	E = 2624.70	FT
SET 34	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 75.00	0.75	DEG	INITIAL	RANGE = 11482.90	E = 11482.90	FT
SET 35	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 30.00	0.30	DEG	INITIAL	RANGE = 5905.50	E = 5905.50	FT
SET 36	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 30.00	0.30	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 37	ALTITUDE = 1640.40		FT	CROSSING	ANGLE = 30.00	0.30	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 38	ALTITUDE = 1312.30		FT	CROSSING	ANGLE = 30.00	0.30	DEG	INITIAL	RANGE = 6561.70	E = 6561.70	FT
SET 39	ALTITUDE = 984.20		FT	CROSSING	ANGLE = 10.00	0.10	DEG	INITIAL	RANGE = 4265.10	E = 4265.10	FT
SET 40	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 345.00	3.45	DEG	INITIAL	RANGE = 4921.50	E = 4921.50	FT
SET 41	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 330.00	3.30	DEG	INITIAL	RANGE = 4921.50	E = 4921.50	FT
SET 42	ALTITUDE = 492.10		FT	CROSSING	ANGLE = 323.00	3.23	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 43	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 323.00	3.23	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 44	ALTITUDE = 1312.30		FT	CROSSING	ANGLE = 315.00	3.15	DEG	INITIAL	RANGE = 6561.70	E = 6561.70	FT
SET 45	ALTITUDE = 328.10		FT	CROSSING	ANGLE = 315.00	3.15	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 46	ALTITUDE = 2296.50		FT	CROSSING	ANGLE = 270.00	2.70	DEG	INITIAL	RANGE = 9843.00	E = 9843.00	FT
SET 47	ALTITUDE = 1640.40		FT	CROSSING	ANGLE = 195.00	1.95	DEG	INITIAL	RANGE = 2624.70	E = 2624.70	FT
SET 48	ALTITUDE = 1640.40		FT	CROSSING	ANGLE = 165.00	1.65	DEG	INITIAL	RANGE = 6561.70	E = 6561.70	FT
SET 49	ALTITUDE = 1640.40		FT	CROSSING	ANGLE = 90.00	0.90	DEG	INITIAL	RANGE = 4921.50	E = 4921.50	FT
SET 50	ALTITUDE = 1312.30		FT	CROSSING	ANGLE = 45.00	0.45	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 51	ALTITUDE = 328.10		FT	CROSSING	ANGLE = 45.00	0.45	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 52	ALTITUDE = 2296.50		FT	CROSSING	ANGLE = 30.00	0.30	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 53	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 23.00	0.23	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 54	ALTITUDE = 1968.50		FT	CROSSING	ANGLE = 15.00	0.15	DEG	INITIAL	RANGE = 4921.50	E = 4921.50	FT
SET 55	ALTITUDE = 328.10		FT	CROSSING	ANGLE = 0.00	0.00	DEG	INITIAL	RANGE = 6561.70	E = 6561.70	FT
SET 56	ALTITUDE = 492.10		FT	CROSSING	ANGLE = 330.00	3.30	DEG	INITIAL	RANGE = 5577.40	E = 5577.40	FT
SET 57	ALTITUDE = 328.10		FT	CROSSING	ANGLE = 180.00	1.80	DEG	INITIAL	RANGE = 2624.70	E = 2624.70	FT
SET 58	ALTITUDE = 492.10		FT	CROSSING	ANGLE = 180.00	1.80	DEG	INITIAL	RANGE = 4921.50	E = 4921.50	FT
SET 59	ALTITUDE = 3437.90		FT	CROSSING	ANGLE = 53.06	0.53	DEG	INITIAL	RANGE = 8635.00	E = 8635.00	FT
SET 60	ALTITUDE = 3281.00		FT	CROSSING	ANGLE = 45.00	0.45	DEG	INITIAL	RANGE = 9843.00	E = 9843.00	FT

III = 0 IRSS = 1 KA = 60 ITT = 39 NOGO = 1

TAU = 0.0000

PSI LAUNCH = 315.00 DEG THETA LAUNCH = 19.47 DEG INITIAL RANGE = 9843.00 FT
 XTEO = 6551.99 FT YTEO = 5552.01 FT ZTEO = 3281.00 FT
 I-PRIME = 4.4760 SEC DELTAR AT 1000 FT TO GO = 6749.50 FT
 I-AT-GAMA MIN OVERLOAD = 1.9452 SEC
 DELTAR AT GAMA MIN OVERLOAD = 1875.8 FT
 VN-AT-GAMA MIN OVERLOAD = 1906.2 FT/SEC
 GAMA = 4.3570
 SMALLEST BIT A/D RESOLUTION = .0896 FT
 MPIS = 10 DX = 20.00 FT XTERM = 100.00 FT

RANGE-TO-GO TABLE FOR DATA COLLECTION

RANGE*FT SCALED RANGE

286.00 --28000000E+03
 260.00 --26000000E+03
 240.00 --24000000E+03
 220.00 --22000000E+03
 200.00 --20000000E+03
 180.00 --18000000E+03
 160.00 --16000000E+03
 140.00 --14000000E+03
 120.00 --12000000E+03
 100.00 --10000000E+03

XOTE0 = 0.00 FT/SEC YOTE5 = 1013.40 FT/SEC ZOTE0 = 0.00 FT/SEC
 XOTL0 = -675.60 FT/SEC YOTL0 = 716.58 FT/SEC ZOTLQ = -238.86 FT/SEC
 CROSSING ANGLE = 45.00 DEG DIVE ANGLE = 0.00 DEG

EARTH FIXED COORDINATES

TIME	XD MANEUVER	YD MANEUVER	ZD MANEUVER
0.0000	0.00	1013.40	0.00
1.0000	0.00	1013.40	0.00
2.0000	0.00	1013.40	0.00
3.0000	0.00	1013.40	0.00
4.0000	0.00	1013.40	0.00
5.0000	0.00	1013.40	0.00
6.0000	0.00	1013.40	0.00
7.0000	0.30	1013.40	0.00
8.0000	0.00	1013.40	0.00
9.0000	0.00	1013.40	0.00
10.0000	0.00	1013.40	0.00
11.0000	0.00	1013.40	0.00
12.0000	0.00	1013.40	0.00
13.0000	0.00	1013.40	0.00
14.0000	0.00	1013.40	0.00
15.0000	0.00	1013.40	0.00
16.0000	0.00	1013.40	0.00
17.0000	0.00	1013.40	0.00
18.0000	0.00	1013.40	0.00
19.0000	0.00	1013.40	0.00
20.0000	0.00	1013.40	0.00
21.0000	0.00	1013.40	0.00
22.0000	0.00	1013.40	0.00
23.0000	0.00	1013.40	0.00
24.0000	0.00	1013.40	0.00
25.0000	0.00	1013.40	0.00
26.0000	0.00	1013.40	0.00

LAUNCH COORDINATES

TIME	XD MANEUVER	YD MANEUVER	ZD MANEUVER
0.0000	-675.60	716.58	-238.86
1.0000	-675.60	716.58	-238.86
2.0000	-675.60	716.58	-238.86
3.0000	-675.60	716.58	-238.86
4.0000	-675.60	716.58	-238.86
5.0000	-675.60	716.58	-238.86
6.0000	-675.60	716.58	-238.86
7.0000	-675.60	716.58	-238.86
8.0000	-675.60	716.58	-238.86
9.0000	-675.60	716.58	-238.86

11.0000	-675.60	716.58	-238.86
12.0000	-675.60	716.58	-238.86
13.0000	-675.60	716.58	-238.86
14.0000	-675.60	716.58	-238.86
15.0000	-675.60	716.58	-238.86
16.0000	-675.60	716.58	-238.86
17.0000	-675.60	716.58	-238.86
18.0000	-675.60	716.58	-238.86
19.0000	-675.60	716.58	-238.86
20.0000	-675.60	716.58	-238.86
21.0000	-675.60	716.58	-238.86
22.0000	-675.60	716.58	-238.86
23.0000	-675.60	716.58	-238.86
24.0000	-675.60	716.58	-238.86
25.0000	-675.60	716.58	-238.86
26.0000	-675.60	716.58	-238.86

RANDOM NUMBER IS .33689963E01

TRUNK LINE PATCHING IS

V13 TO M00

V15 TO M13

V60 TO M50

V61 TO M50

RESERVATION ERROR CODE = 00000000000000000000

*REAL TIME STATUS = 000000000000000000000000

HICOM SCOPE 3.5.2 HY SM 68 MAX LEVEL 7C
14.29.51.RLPOS07 FROM /G2
14.29.53.1P 0010496 WORDS -5 FILE INPUT , DC 00
14.29.57.RLPGS.1100.CM140000.RI.
14.29.58.74.3761300 7300 AJ PARKERL J003
14.30.09.4FTM.
14.31.51. 19.125 CP SECONDS COMPILATION TIME
14.31.53.SEGLOAU.
14.31.53.LOAD(ILGO)
14.31.53.NOGO.
14.33.24.RFL:65000.
14.33.24.ABS.
14.33.32. PAUSE GO TO RESERVE HYBRID EQUIPMENT
14.33.40.GO
14.33.41. PAUSE WAIT FOR SENSE LINE 5 HIGH
14.34.05. PAUSE GO TO ENTER REAL TIME
14.34.34.GO
14.34.39.J003 OIJ ENTRY REAL TIME
14.34.51. PAUSE SET SEVSE LINE 0 LOW TO RESTAR
14.36.51.T A 030 RUN
14.36.34.GO
14.36.35.ERROR NOJE - 4. ADDRESS = 016975
14.36.45.INT 090-ET00000315326U
14.36.45.CJP J0036992 WORDS - FILE OUTPUT , DC 77
14.36.45.MS 28672 WORDS (114688 MAX USED)
14.36.45.CPA 25.579 SEC. 23.023 ADJ.
14.36.45.I0 11.433 SEC. 6.496 ADJ.
14.36.45.CM 930.224 KWS. 9.661 ADJ.
14.36.45.PP 59.975 SEC. DATE 01/12/76
14.36.45.EJ END OF JOB, 02

APPENDIX C. CODE FOR TESTING ADCS AND DACS


```

PIN(4)=3RV53
C
CALL RESERVE(IERR)
WRITE(6,1000)IERR
IF(IERR.NE.0)STOP
C
CHECK PATCHING STATUS
C
CALL PATSTAT(PIN,POUT,LEN)
DO 10 I=1,LEN
10 WRITE(6,8000)PIN(I),POUT(I)
C
REAL TIME
C
CALL SIMRUN(ISTAT)
WRITE(6,2000)ISTAT
CALL REMARK(17H JOB IN REAL TIME)
C
25 CONTINUE
CALL BHOLD
LINE=0
WRITE(6,5000)
IPAGE=IPAGE+1
IF(IPAGE.EQ.10)GO TO 20
I1=IOUT-MAXLINE+1
C
DO 30 I=I1,IOUT
CALL BITS(I,IBITOUT)
LINE=LINE+1
IDUMY=ISAVEIN(LINE)
CALL BITS(IDUMY,IBITIN)
30 WRITE(6,4000)I,IBITOUT,IDUMY,IBITIN
LINE=0
CALL SIMGO
GO TO 25
20 WRITE(6,3000)
CALL REMARK(15H RETURN TO MAIN)
STOP
C
1000 FORMAT(24H1RESERVATION ERROR CODE=,020)
2000 FORMAT(18H REAL TIME STATUS=,020)
3000 FORMAT(1H0,*PROGRAM TERMINATED NORMALLY*)
4000 FORMAT(10X,I10,5X,I6I1,5X,I10,5X,I6I1)
5000 FORMAT(1H1)
8000 FORMAT(/#0TRUNK LINE PATCHING IS *,R3,* TO *,R3)
END
SUBROUTINE SUB1
C
REAL TIME INTERRUPT SUBROUTINE
C
COMMON/INTCOM/IOUT,LINE,MAXLINE,ISAVEIN(100)
COMMON/*IDIS2/1,IIDIS
COMMON/*ODIS2/1,IODIS

```



```

WRITE(6,1000)IERR
IF(IERR.NE.0)STOP

C
C
C   REAL TIME

CALL SIMRUN(ISTAT)
WRITE(6,2000)ISTAT
CALL REMARK(17H JOB IN REAL TIME)
WRITE(6,5000)
25 CONTINUE
CALL BHOLD
LINE=LINE+1
IF(LINE.GT.MAXLINE)GO TO 50
TIMELFT=STATUS.A.3777777B
WRITE(6,4000)OUT,BACK,LOOP
WRITE(6,6000)DIFF
OUT=OUT+0.01
IF(OUT.GT.1.50)OUT=0.0
LOOP=0
CALL SIMGO
GO TO 25
50 WRITE(6,3000)
STOP

1000 FORMAT(24HRESERVATION ERROR CODE=,020)
2000 FORMAT(18H REAL TIME STATUS=,020)
3000 FORMAT(1H0,*PROGRAM TERMINATED ON MAX LINE*)
4000 FORMAT(1X,17F7.4,I3)
5000 FORMAT(1H1)
6000 FORMAT(8X,16F7.4)
END
SUBROUTINE SUB1

C
C
C   REAL TIME INTERRUPT SUBROUTINE

COMMON/INTCOM/OUT,LOOP,BACK(16),BIGDIFF,DIFF(16),STATUS,J
COMMON/*ADC1/ 1,ADC(16)
COMMON/*DAC1/ 1,DAC(16)
IERR=0
DO 1 I=1,16
DAC(I)=OUT
1 BACK(I)=ADC(I)
C   COMPUTE DIFFERENCE IN ADC AND DAC VALUES
C
DO 2 I=1,16
DIFF(I)=ABS(OUT)-ABS(BACK(I))
IF(ABS(DIFF(I)).GT.BIGDIFF)IERR=1
2 CONTINUE
IF(IERR.EQ.0)CALL SIMHOLD
STATUS=STAT(J)
LOOP=LOOP+1
STATUS=STAT(J)
IF(LOOP.EQ.10)CALL SIMHOLD
CALL SIMIDLE
END
000000000000000000000000
RTREE TRALG10(0),SUB1(1)
GLOBAL INTCOM
END
000000000000000000000000
000000000000000000000000
000000000000000000000000

```