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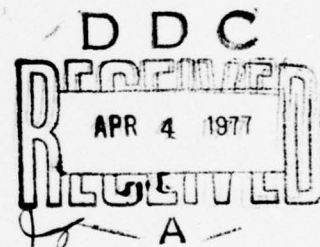


LOW-SPEED V/STOL STABILITY AND CONTROL PREDICTION -
VOLUME II: COMPUTER PROGRAM AND USER MANUAL

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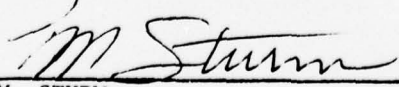
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S U M M A R Y

A unified prediction method has been developed to support V/STOL Stability and Control analyses. The method is geared to a preliminary design environment and is documented in Volume I of this report. The method has been programmed for the CDC 6600 and this volume constitutes a User Manual for that program.

Input data requirements are listed and the necessary information for interpretation of the program output is presented. General guidance for using the program is provided in this volume but the user is directed to Volume I of this report for in-depth discussion of the required configuration data and methods of determining it.

Input to the program may be either in English or Metric units. However, all program output is in Metric units as described in reference (a). Listings of the Fortran code and sample input and output are presented in Appendices.

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I N T R O D U C T I O N

This report provides the necessary user information for applying the NADC VSAC (V/STOL Stability and Control) computer program. The program computes the stability and control characteristics (both static and dynamic) of a V/STOL aircraft configuration based on geometric and basic aerodynamic inputs. The program flow and computational options are described herein as our input data requirements and output formats.

The majority of the program development was based on calculations using the standard English system of units (slug-foot-second). Recent emphasis on conversion to Metric units (kilogram-metre-second) necessitated conversion of input and output to this system. The capability of accepting input data in English units (in addition to Metric units) has been retained but all output is presented in Metric units. All calculations performed internal to the program were left in English units as originally developed.

A complete listing of the Fortran code is contained in Appendix A and sample input and output lists for a test case are presented in Appendix B. The basic program structure is patterned after that of a similar program for helicopters and stoppable rotor aircraft developed by Bell Helicopter Company (reference (b)) and some of the subroutines are taken directly from that source or modified for use here.

P R O G R A M D E S C R I P T I O N

The total configuration forces and moments are calculated using the models described in Volume I of this report. This force and moment formulation is used throughout the remainder of the program calculations described below.

The user has the option of selecting from 1 to 6 different analyses to be performed for a given set of configuration data. The six options are as follows:

1. Nonlinear trim iteration;
2. Stability derivative estimation;
3. Small perturbation stability analysis;
4. Maneuver time history calculation;
5. Least squares time history parameter vector analysis;
6. Time history parameter plotting.

The program flow through each of these options is presented in Figure 1. Figures 2, 3, and 4 present the program flow through the trim, stability, and time history portions of the program, respectively.

The total program consists of a main driving routine and 55 subroutines. A brief description of the main and each subroutine (listed in alphabetical order) follows.

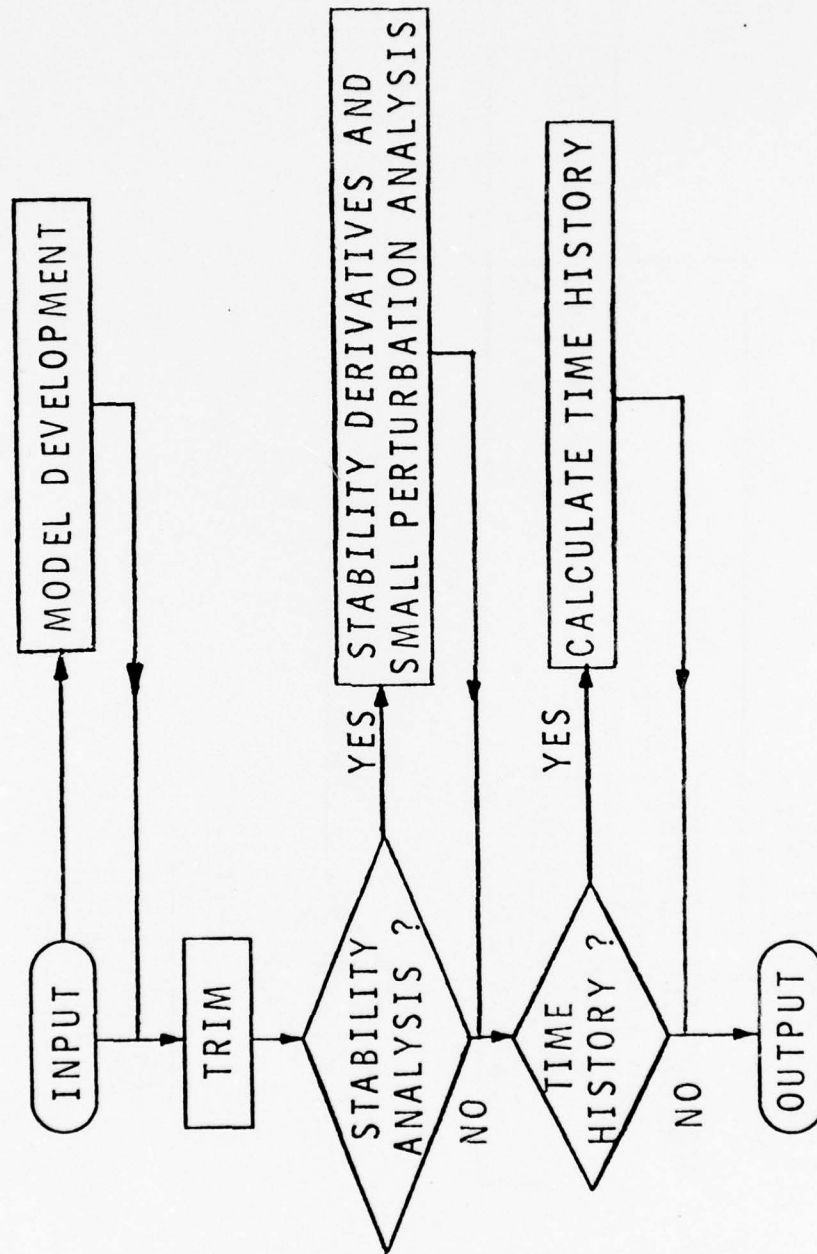


FIGURE 1: TOTAL PROGRAM FLOWCHART

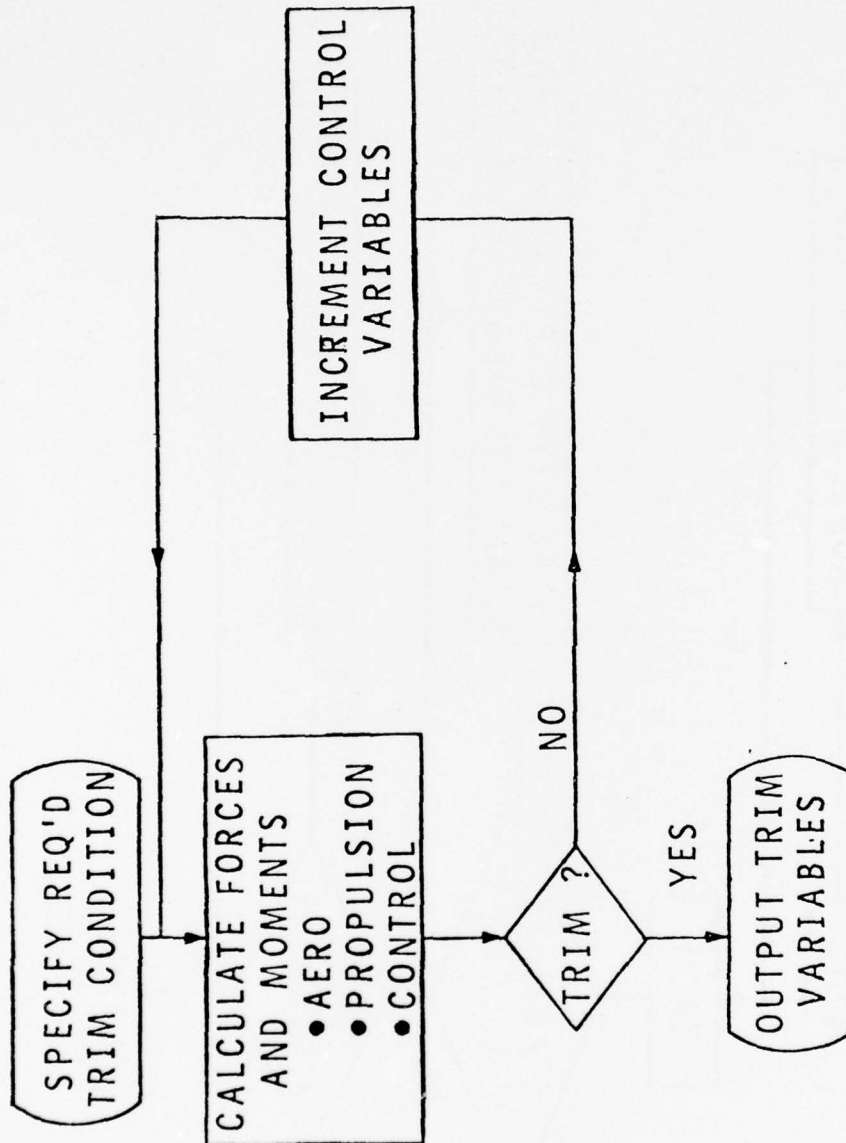


FIGURE 2: TRIM CALCULATION FLOWCHART

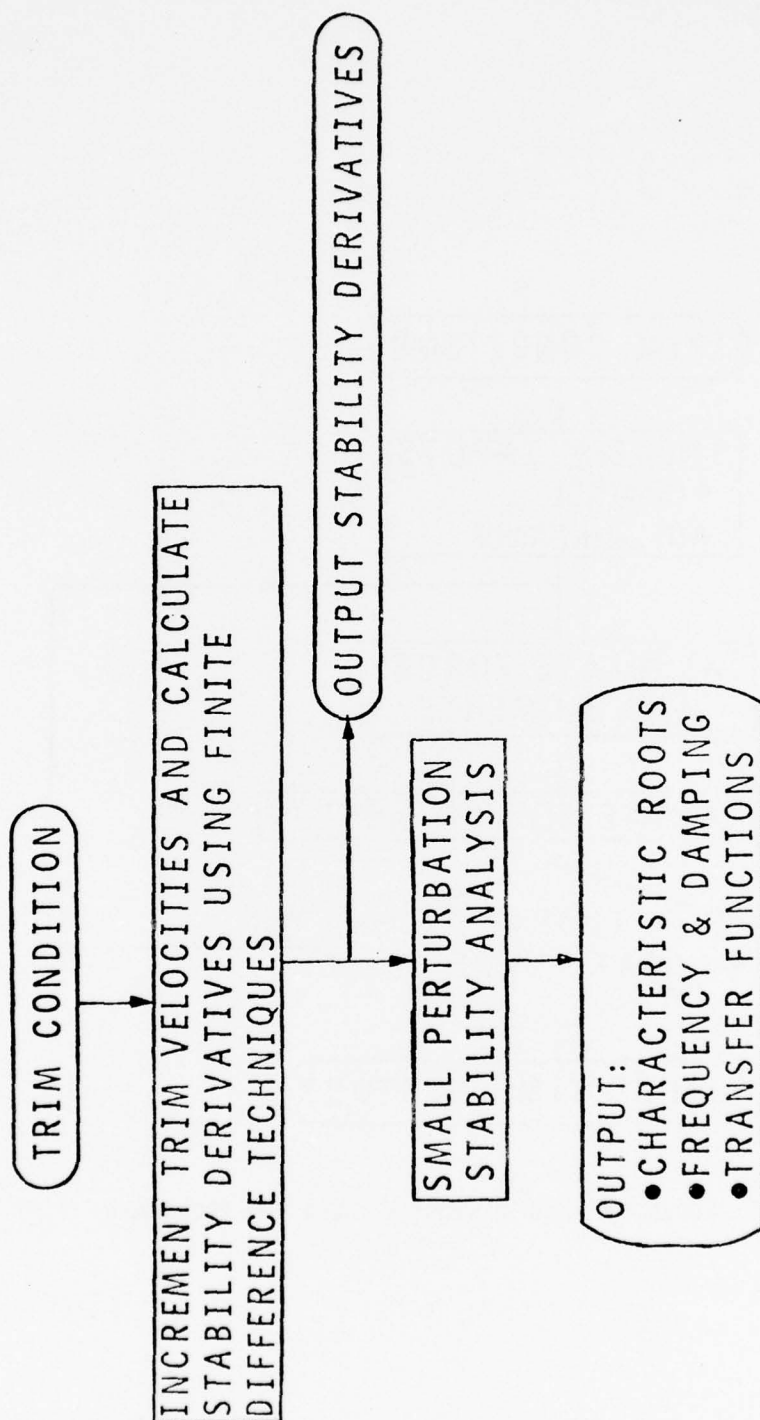


FIGURE 3: STABILITY ANALYSIS FLOWCHART

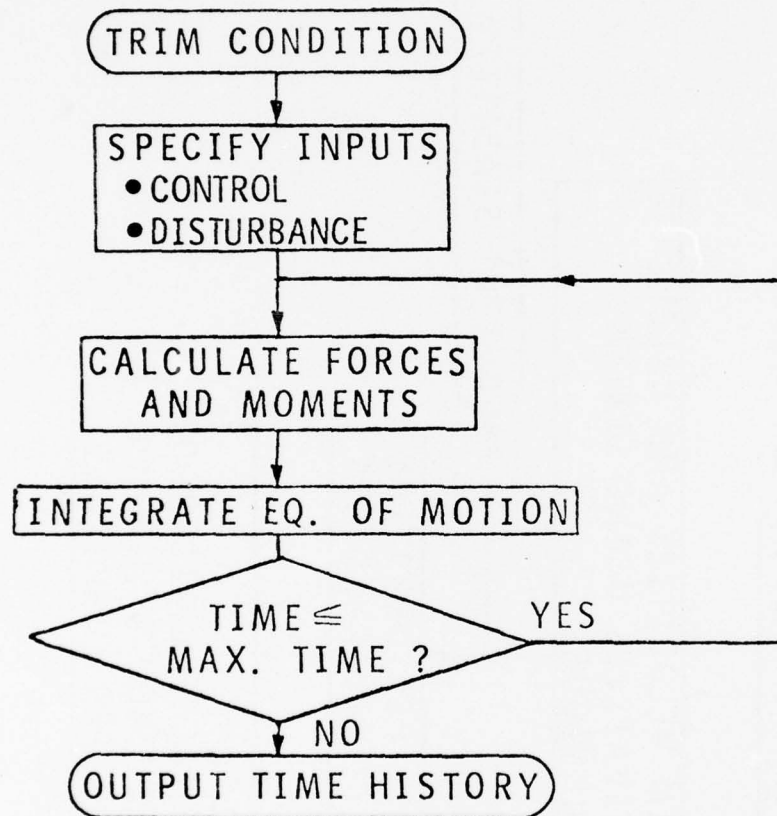


FIGURE 4: TIME HISTORY CALCULATION FLOWCHART

VSTOL is the main driving routine. It reads the first data card and determines the program path to be taken depending on the value of the variable NPART.

AJACOB controls the finite difference calculations of partial derivatives for both the trim Jacobian and the final control derivatives.

ANAL is the main model formulation subroutine. It is here that all model component forces and moments are calculated and summed. The output of this subroutine consists of the vehicle total forces and moments.

CLCD calculates the lift and drag of each of the aerodynamic lifting surfaces based on geometry and inputs from ANAL and YFIX.

COMSOL calculates the solution of a set of simultaneous equations with complex coefficients. It is required by the small perturbation stability analysis portion of the program.

CONTRL represents the formulation of the vehicle control system. The current code is applicable to conventional mechanical control systems. More complex control laws may be programmed as needed. Comment cards are provided within CONTRL to assist the user in such an effort and the XS input array is available for additional input requirements.

CONV converts input data from Metric units to English equivalents for use within the program.

CONVI converts time history input data from Metric units to English equivalents.

CON1 calculates the gearing relationships for the primary controllers.

CPLT controls CALCOMP plotting of the time history variables. This routine uses in-house NADC plotting routines and would require reprogramming for use on other computing facilities.

CURVET performs a least squares curve fit analysis on selected time history variables. Both amplitude and phase are computed and may be normalized by the corresponding parameters for a reference variable.

DAMPER reduces control variable increments as a trim solution is approached to improve the convergence of the trim iteration. Both the increment used to compute the Jacobian and the maximum trim variable increments are reduced as the trim errors are reduced.

DATA is a Block Data Subroutine which contains required literal data for output formats.

DET computes the value of an n^{th} order determinant.

ELEC calculates time constants, damping ratios and gains in support of the stability analysis portion of the program.

GUST determines the gust velocity at the center of pressure of each component of the aircraft. This routine is called only when a gust format is specified as a time history input.

INIT controls printing of the time history outputs.

ITRIM performs the trim iteration calculations and determines when the trim requirements are satisfied.

IVAR initializes required parameters for any time history input functions.

JACOBI calculates the Jacobian for use in the trim iteration. An additional entry point, BJACOB, is used to calculate the final control derivative matrix.

JETINT calculates the inlet momentum and propulsion-induced aero forces and moments acting on the vehicle.

LAMODE calculates the lateral/directional characteristic roots and transfer functions.

LIFJET calculates the forces and moments produced by the vectorable nozzle engines. Included in this subroutine is the calculation of gyroscopic moments due to engine angular momentum.

LMODE calculates the longitudinal characteristic roots and transfer functions.

MANU is the main routine of the time history calculation. It controls the calculation of forces and moments due to control and disturbance inputs and integrates the equations of motion.

MATRIX calculates the elements of the Euler angle transformation matrix.

MNEM performs required initialization prior to problem solution.

MODE controls calculation of transfer function numerator roots and gains.

OFFTRM computes the required trim forces and moments for a specified trim condition.

PARA prints output message indicating whether or not the aircraft has been trimmed at the specified condition.

PLOT controls on-line printer plotting of time history variables.

RANG computes the Euler angles between two sets of axes whose orientations are specified.

RATI limits trim control variable increments to preselected maxima during the trim iteration.

REACT computes the forces and moments produced by the RCS nozzles.

READIN, as the name implies, reads the input data in both standard and namelist format.

RIEMAN integrates a second order differential equation. It is used to calculate RCS thrust when a second order lag is present and may be used in the programming of higher order control system models.

ROOA calculates the roots of the characteristic matrix in the stability analysis portion of the program. A call to ROOA sets initial conditions and a call to ROOB (an entry point) calculates the roots.

SLTE substitutes the proper control vector into the proper location in the characteristic matrix for transfer function calculation.

SLTT performs the inverse operation to that of SLTE.

SOLVE solves a system of linear equations by Gaussian elimination. It is used during the trim iteration process.

SRT is the main routine controlling the solution for the characteristic roots.

STAB is the driving routine for the stability analysis section of the program.

START performs initializations, transformations, etc. to begin each problem solution.

STLJES integrates a first order differential equation. It is used to calculate RCS thrust when a first order lag is present and may be used in control system programming.

TIMEX determines computer usage times for output purposes.

TINIT augments the initialization performed in MNEM.

TRIM is the driving routine for the trim section of the program.

TURN calculates vehicle forces and moments required for trim in a coordinated turn.

VARI implements the input forcing functions for time history calculations.

VR2D performs the standard two-dimensional vector transformation.

VR3D performs the standard three-dimensional vector transformation.

WRFM prints the vehicle component forces and moments.

WROT1 prints the heading for output pages.

WRVP prints the partial derivative matrix for each trim iteration. A call to the entry point, WRVP1, prints the complete control derivative matrix after a trim solution has been obtained.

XPRO calculates the standard vector cross product.

YFIX augments CLCD in the calculation of lift and drag coefficients.

Program operation, including input and output formats, are described in the following section.

P R O G R A M O P E R A T I O N

Guidance in program operation may be logically divided into two major topics; input data requirements and format and output data content and format. Each will now be described.

INPUT DATA REQUIREMENTS AND FORMAT

The input data deck for one run of the program consists of from 1 to 104 cards depending on the mode of analysis selected. Each card, its content and format, is described with additional information where required.

Card 1: Mode Control Card

Variables: NPART, NPRINT, NSCALE, NVARA, AL(1), AH(1), NVARB, AL(2), AH(2), NVARC, AL(3), AH(3).

Format: I2, 2I4, 3(I5, 5X, 2F5.0).

The value of NPART determines the mode of analysis to be performed. Some or all of the remaining variables on Card 1 are required depending on the value of NPART. The allowable values for NPART and required additional variables are listed below.

NPART = 1: Trim only (card 83 is the last data card).

NPART = 2: Trim, stability analysis and time history (cards 1 through 84 and at least one card 85 is required).

NPRINT: Print frequency for time history output (output at $t=0$ and every NPRINTth point thereafter).

NPART = 3: Print-plot time history data.

NPRINT: Frequency of points to be plotted.

NSCALE: Control of plot scale factors.

- = 0, no effect
- = 1, multiply first scale by 1000
- = 2, multiply second scale by 1000
- = 3, multiply first and second scale by 1000
- = 4, multiply third scale by 1000
- = 5, multiply first and third scale by 1000
- = 6, multiply second and third scale by 1000
- = 7, multiply all scales by 1000

NVARA, NVARB, NVARC: Indices of variables to be plotted (= 0: no plot).
Table I lists the available variables and their associated indices.

AL(I), I = 1, 2, 3: Lower scale limit for Ith variable.

AH(I), I = 1, 2, 3: Upper scale limit for Ith variable.

NPART = 4: CALCOMP plots of time history data.

NPRINT: Frequency of points to be plotted.

NSCALE: Controls plot size - 100(%) produces 8 1/2" x 11",
50(%) produces 4 1/4" x 5 1/2", etc.

NVARA, NVARB, NVARC: (same as NPART = 3).

When NPART = 4, the next two cards contain the desired plot title
(8A10/6A10).

NPART = 6: Revise input data and rerun time history.

NPRINT: Print frequency of time history output. Print every NPRINTth
output point.

NSCALE: = 0, no change in cards 5 through 83.

= 1, change selected data from cards 5 through 83 using
NAMELIST format as follows:

Col 2-8	\$CHANGE
Col 9	blank
Col 10 . . .	XW(5) = 1., XT(1) = 50., . . .

The last variable is followed by a blank and \$.

Cards 84 and 85 are input in either case.

NPART = 7: Trim plus small perturbation stability analysis (card 83
is last data card).

NPART = 9: Revise input data and rerun trim.

NVARA: = 0, trim.

= 1, trim plus stability analysis.

Data from cards 5 through 83 are revised using NAMELIST format as
described for NPART = 6.

NPART = 10: Same as NPART = 9 with the exception that XT(5) through
XT(11) and XT(15) through XT(18) assume initial values corresponding to the
previous trim condition.

TABLE I
PLOT VARIABLE INDICES

INDEX	VARIABLE	INDEX	VARIABLE
1	LIFT THRUST 1, N	79	Z, M
2	LIFT THRUST 2, N	80	ALTITUDE, M
3	LIFT THRUST 3, N	81	GROUND SPEED, KTS
4	LIFT THRUST 4, N	82	FLT PATH ANGLE, DEG
5	LIFT THRUST 5, N	83	U-DOT, MPSS
6	LIFT THRUST 6, N	84	V-DOT, MPSS
7	LIFT ANGLE 1, DEG	85	W-DOT, MPSS
8	LIFT ANGLE 2, DEG	86	P-DOT, DPSS
9	LIFT ANGLE 3, DEG	87	Q-DOT, DPSS
10	LIFT ANGLE 4, DEG	88	R-DOT, DPSS
11	LIFT ANGLE 5, DEG		
12	LIFT ANGLE 6, DEG	90	U, MPS
13	REACT THRUST 1, N	91	V, MPS
14	REACT THRUST 2, N	92	W, MPS
15	REACT THRUST 3, N	93	P, DPS
16	REACT THRUST 4, N	94	Q, DPS
17	REACT THRUST 5, N	95	R, DPS
18	REACT THRUST 6, N		
19	REACT THRUST 7, N	97	PSI-DOT, DPS
20	REACT THRUST 8, N	98	THETA-DOT, DPS
21	REACT THRUST 9, N	99	PHI-DOT, DPS
22	REACT THRUST 10, N	100	PSI, DEG
23	LONG STICK, CM	101	THETA, DEG
24	STAB DEFL, DEG	102	PHI, DEG
25	LAT STICK, CM	103	FIX ENG THROT, PCT
26	AILERON DEFL, DEG	104	LONG STICK, PCT
27	FWD RCS THRUST, PCT	105	ALPHA (L WING), DEG
28	FWD RCS ANGLE, DEG	106	ALPHA (R WING), DEG
29	SPOILER DEFL, DEG	107	ALPHA (STAB), DEG
30	AFT RCS THRUST, PCT	108	ALPHA (FIN), DEG
31	AFT RCS ANGLE, DEG	109	YAW ALPHA (FUS), DEG
32	RUD PEDAL DEFL, CM	110	FS CG, CM
33	RUDDER DEFL, DEG	111	U (GUST), MPS
34	LAT RCS THRUST, PCT	112	N-X, G'S
		113	LAT STICK, PCT
70	FLAP DEFL, DEG	114	CL (L WING)
71	X-DOT, MPS	115	CL (R WING)
72	Y-DOT, MPS	116	CL (STAB)
73	Z-DOT, MPS	117	CL (FIN)
74	HORIZONTAL DIST, M	118	ALPHA (FUS), DEG
75	AIRSPEED, KTS	119	BL CG, CM
76	HEADING ANGLE, DEG	120	V (GUST), MPS
77	X, M	121	N-Y, G'S
78	Y, M	122	RUD PEDAL, PCT

TABLE I (Continued)

PLOT VARIABLE INDICES

INDEX	VARIABLE	INDEX	VARIABLE
123	CD (L WING)	167	FZ-LIFT JETS, N
124	CD (R WING)	168	FZ-INLET, N
125	CD (STAB)	169	FZ-WEIGHT, N
126	CD (FIN)	170	FZ-INTERFERENCE, N
127	WL CG, CM	171	RM-TOTAL, N.M
128	W (GUST), MPS	172	RM-R WING, N.M
129	N-Z, G'S	173	RM-L WING, N.M
130	LIFT THROT 1, PCT	174	RM-STAB, N.M
131	LIFT THROT 2, PCT	175	RM-FUS, N.M
132	ANGLE LEVER 1, PCT	176	RM-RT JET, N.M
133	RT JET THRUST, N	177	RM-LEFT JET, N.M
134	ANGLE LEVER 2, PCT	178	RM-REACT JTS, N.M
135	LEFT JET THRUST, N	179	RM-LIFT JETS, N.M
136	FX-TOTAL, N	180	RM-INLET, N.M
137	FX-RT WING, N	181	RM-FIN, N.M
138	FX-L WING, N	182	RM-GYRO, N.M
139	FX-STAB, N	183	RM-INTERFERE, N.M
140	FX-FUS, N	184	PM-TOTAL, N.M
141	FX-RT JET, N	185	PM-R WING, N.M
142	FX-LEFT JET, N	186	PM-L WING, N.M
143	FX-REACT JETS, N	187	PM-STAB, N.M
144	FX-LIFT JETS, N	188	PM-FUS, N.M
145	FX-INLET, N	189	PM-RT JET, N.M
146	FX-FIN, N	190	PM-LEFT JET, N.M
147	FX-WEIGHT, N	191	PM-REACT JTS, N.M
148	FX-INTERFERENCE, N	192	PM-LIFT JETS, N.M
149	FY-TOTAL, N	193	PM-INLET, N.M
150	FY-FUS, N	194	PM-FIN, N.M
151	FY-RT JET, N	195	PM-GYRO, N.M
152	FY-LEFT JET, N	196	PM-INTERFERE, N.M
153	FY-REACT JETS, N	197	YM-TOTAL, N.M
154	FY-LIFT JETS, N	198	YM-R WING, N.M
155	FY-INLET, N	199	YM-L WING, N.M
156	FY-FIN, N	200	YM-STAB, N.M
157	FY-WEIGHT, N	201	YM-FUS, N.M
158	FY-INTERFERENCE, N	202	YM-RT JET, N.M
159	FZ-TOTAL, N	203	YM-LEFT JET, N.M
160	FZ-RT WING, N	204	YM-REACT JTS, N.M
161	FZ-L WING, N	205	YM-LIFT JETS, N.M
162	FZ-STAB, N	206	YM-INLET, N.M
163	FZ-FUS, N	207	YM-FIN, N.M
164	FZ-RT JET, N	208	YM-GYRO, N.M
165	FZ-LEFT JET, N	209	YM-INTERFERE, N.M
166	FZ-REACT JETS, N		

NPART = 11: Least squares curve fit of time history data (used primarily for sinusoidal input). Available variables are listed in Table I.

NVARA: Number of curves to be fit.

AL(1): Assumed frequency, ω (Hz).

NVARB: Number of reference variables to be used for amplitude ratio and phase angle differences.

AL(2): Number of curves to be expressed as linear combinations of two other curves.

NVARC: Number of data points to be skipped before curve fit begins.

The following cards, which are necessary when NPART = 11, are coded in a 14I5 format.

Next card(s): Indices (from Table I) of variables to be fit.

Next card (s): Cols 1 - 5: Number of variables to be compared to reference variable; cols 6-10: Reference variable index; cols 11 . . . : Indices of variables to compared to reference variables. There are NVARB sets of cards of this format.

Next card(s): Indices of variables to be expressed as linear combinations of other variables in the form:

$$A = k_1 B + k_2 C + k_3$$

Cols 1-5: Index for variable A;

Cols 6-10: Index for variable B;

Cols 11-15: Index for variable C.

There are AL(2) cards of this type.

Cards 2-4: Run Number and Title

Variables: IPSN, ICOM (200 characters max)

Format: 2X, I8, 6A10/7A10/7A10. If IPSN is negative, all input data are in English units. If IPSN is positive, input is in Metric units.

Cards 5-83: Main Data Package

Variables: (Listed and defined in Table II).

Format: 7F10.0 per card. These cards are required for NPART = 1, 2, and 7.

Card 84: Time History Data

Variables: (Listed and defined in Table II).

Format: 6F10.0 This card is required for NPART = 2 and 6.

TABLE II
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
5	XB(1)	W	Aircraft gross weight	N (lbs)
		2	FS _F	cm (in)
		3	BL _F	cm (in)
		4	WL _F	cm (in)
		5	FS _{CG}	cm (in)
		6	BL _{CG}	cm (in)
		7	WL _{CG}	cm (in)
6	XB(8)	I _x	Roll inertia	kg·m ² (slug·ft ²)
		9	I _y	kg·m ² (slug·ft ²)
		10	I _z	kg·m ² (slug·ft ²)
		11	I _{xz}	kg·m ² (slug·ft ²)
		12-14	---	(not used)
7	XB(15)	α ₀		deg
		16	(N/q ₀) _{max}	m ² (ft ²)
		17	n ₃	
		18	(A/q ₀) ₀	m ² (ft ²)
		19	---	
		20	n ₁	
		21	(S/q ₀) _{max}	m ² (ft ²)
8	XB(22)	n ₂	Coefficients in fuselage force and moment approximations	
		23		deg
		24		m ³ (ft ³)
		25		
		26		m ³ (ft ³)
		27		
		n ₅		

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
	28	α_2		deg
9	XB(29)	$(N/q_o)_{\max_1}$		$m^3(ft^3)$
	30	n_6		
	31	$(N/q_o)_{\max_2}$		$m^3(ft^3)$
	32	n_7		
	33	FS_{RAM}	Inlet momentum application point	cm (in)
	34	WL_{RAM}		cm (in)
	35	w_a	Inlet air weight flow	N/sec(lbs/sec)
10	XW(1)	S_W	Wing planform area	$m^2(ft^2)$
	2	FS_{RW}	Center of pressure location for right wing ($FS_{LW}=FS_{RW}$, $BL_{LW}=-BL_{RW}$, $WL_{LW}=WL_{RW}$)	cm (in)
	3	BL_{RW}		cm (in)
	4	WL_{RW}		cm (in)
	5	i_W	Geometric incidence of wing	deg
	6-7	---	(not used)	
11	XW(8)	---	(not used)	
	9	ϵ/C_{LW}	Downwash coefficient	deg
	10-11	---	(not used)	
	12	$C_{l_{\beta_o}}$		1/rad
	13	$\Delta C_{l_{\beta}}/C_L$		1/rad
	14	$\Delta C_{l_r}/C_L$		1/rad
12	XW(15)	C_{lp}		1/rad
	16	$C_{n_{\beta_o}}$	Coefficients in wing lateral/directional aerodynamic model	1/rad
	17	$\Delta C_{n_{\beta}}/C_L^2$		1/rad
	18	$\Delta C_{n_r}/C_L^2$		1/rad

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
13	YW(1)	$\Delta C_{n_r}/C_D$	Coefficients in wing lateral/ direction aerodynamic model	1/rad
		$\Delta C_{n_p}/C_L$		1/rad
		$\Delta C_{n_p}/C_{D_\alpha}$		
		$\Lambda_{1/4}$	Sweep angle of wing quarter- chord	deg
		α_b	Angle of attack at $C_{L_{max}}$ and $C_{L_{max}}$ for $\alpha < 90^\circ$	deg
		$C_{L_{max}}$		
		S_e	Exposed wing planform area	$m^2(ft^2)$
		d/b	Body diameter to wing span ratio	
		α_b	Angle of attack at $C_{L_{max}}$ and $C_{L_{max}}$ for $\alpha < 90^\circ$	deg
		$C_{L_{max}}$		
14	YW(8)	λ	Wing taper ratio	
		λ_e	Taper ratio of exposed planform	
		$\bar{c}$	Wing MAC	m(ft)
		$\Delta C_{D_0}/\delta_f$	Zero-lift drag per flap deflection	1/deg
		C_{D_0}	Coefficients in wing drag equation	
		C_{D_α}		1/deg
		$C_{D_{\alpha^2}}$		1/deg ²
15	YW(15)	C_{m_0}	Wing zero-lift moment coefficient	
		AR_e	Aspect ratio of exposed planform	
		a_0	Wing 2-D lift curve slope	1/deg
		AR	Wing aspect ratio	
		C_{L_0}/δ_f	Wing flap effects	1/deg
		$\Delta C_{L_{max}}/\delta_f$		1/deg
		$C_{m_{\delta_f}}$		1/deg
16	XE(1)	S_H	Horizontal stab. planform area	$m^2 (ft^2)$

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
	2	FS _H	Center of pressure location for horizontal stabilizer	cm (in)
	3	BL _H		cm (in)
	4	WL _H		cm (in)
	5	i _H	Geometric incidence of horizontal stabilizer	deg
	6-7	---	(not used)	
17	XE(8-14)	---	(not used)	
18	YE(1-7)	---	(same as YW(1-7) for horizontal stabilizer)	
19	YE(8-14)	---	(same as YW(8-14) for horizontal stabilizer; YE(11) not used)	
20	YE(15-18)	---	(same as YW(15-18) for horizontal stabilizer)	
	(19-21)	---	(not used)	
21	XF(1)	S _V	Vertical stabilizer planform area	m ² (ft ²)
	2	FS _V	Center of pressure location for vertical stabilizer	cm (in)
	3	BL _V		cm (in)
	4	WL _V		cm (in)
	5	i _V	Geometric incidence of vertical stabilizer	deg
	6	---	(not used)	
	7	K _V	Sidewash coefficient	
22	YF(1-7)	---	(same as YE(1-21) for vertical stabilizer)	
23	YF(8-14)	---		
24	YF(15-21)	---		
25	XJ(1)	n _{FJ}	Number of fixed nozzles (2 max)	
	2-3	---	(not used)	
	4	FS _{FJ}	Location of right (or center) nozzle (if n _{FJ} = 2, left jet	cm (in)
	5	BL _{FJ}	is assumed to be symmetrically located)	cm (in)
	6	WL _{FJ}		cm (in)
	7	---	(not used)	

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
26	XJ(8)	ψ_{FJ}	Thrust vector orientation relative to x-axis (right or center jet)	deg
	9	θ_{FJ}		deg
	10	$(H_{FJ})_R$	Angular momentum of right and left engines at max thrust	$\text{kg}\cdot\text{m}^2/\text{sec}$ ($\text{slug}\cdot\text{ft}^2/\text{sec}$)
	11	$(H_{FJ})_L$		$\text{kg}\cdot\text{m}^2/\text{sec}$ ($\text{slug}\cdot\text{ft}^2/\text{sec}$)
	12-14	---	(not used)	
	12-14	---	(not used)	
27	XC(1)	$(\delta_T)_{TOT}$	Range of fixed nozzle engine throttle	cm (in)
	2	T_{FJ}/δ_T	Thrust per throttle deflection	N/cm (lbs/in)
	3	$(\delta_{T1})_{TOT}$	Throttle range	cm (in)
	4	$(\delta_{\theta 1})_{TOT}$	Angle lever range	cm (in)
	5	T_J/δ_{T1}	Thrust per throttle	N/cm (lbs/in)
	6	$\Delta\theta_J/\delta_{T1}$	Angle per throttle	deg/cm (deg/in)
	7	$\Delta\theta_J/\delta_{\theta 1}$	Angle per angle lever (=0 if XC (36-47) are used)	deg/cm (deg/in)
28	XC(8-12) (13-14)	---	(same as XC(3-7) for vectorable nozzle control set 2)	
29	XC(15)		Number of control set used for control of vectorable nozzles 1 through 6. If no control, set to zero.	
	16			
	17			
	18			
	19	A_T		%
30		B_T	Coefficients linking δ_{T1} to δ_{T2}	
	20	C_T		1/%
	21			
	XC(22)	A_θ		%
	23	B_θ	Coefficients linking $\delta_{\theta 1}$ to $\delta_{\theta 2}$	
	24	C_θ		1/%

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
	25	$(\delta_S)_{TOT}$	Longitudinal stick range	cm (in)
	26	Δ_S	Coefficients describing horizontal stabilizer gearing ($+\delta_S$ yields $+i_S$)	cm (in)
	27	$(i_S/\delta_S)_1$		deg/cm (deg/in)
	28	$(i_S/\delta_S)_2$		deg/cm (deg/in)
31	XC(29)	$(\delta_Y)_{TOT}$	Lateral stick range	cm (in)
	30	$(\delta_Y)_{LEFT}$	Max left stick deflection (neg. value)	cm (in)
	31	δ_a/δ_Y	Aileron gearing ($+\delta_Y$ yields $+\delta_a$)	deg/cm (deg/in)
	32	$(\delta_R)_{TOT}$	Rudder pedal range	cm (in)
	33	$(\delta_R)_{max}$	Max t.e. right rudder deflection (neg. value)	deg
	34	$(\delta_R)_{TOT}$	Range of rudder deflection	deg
	35	η_{link}	= 0 if XC(6, 7, 11, 12) are used for θ_J vs δ_θ ; $\neq 0$ if XC(36-47) are used	
32	XC(36)	$(\delta_{\theta_1})_1$	Coordinates which define piecewise linear functions for $\Delta\theta_J$ vs δ_{θ_1} and $\Delta\theta_J$ vs δ_{θ_2}	cm (in)
	37	$(\Delta\theta_J)_1$		deg
	38	$(\delta_{\theta_1})_2$		cm (in)
	39	$(\Delta\theta_J)_2$		deg
	40	$(\delta_{\theta_1})_3$		cm (in)
	41	$(\Delta\theta_J)_3$		deg
	42	$(\delta_{\theta_2})_1$	If $\delta_\theta \leq (\delta_\theta)_1$, $\Delta\theta_J = \frac{(\Delta\theta_J)_1}{(\delta_\theta)_1} \delta_\theta$	cm (in)

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
33	XC(43)	$(\Delta\theta_J)_1$	If $\delta_\theta \geq (\delta_\theta)_3$, $\Delta\theta_J = (\Delta\theta_J)_3$	deg
	44	$(\delta_\theta)_2$		cm (in)
	45	$(\Delta\theta_J)_2$		deg
	46	$(\delta_\theta)_3$		cm (in)
	47	$(\Delta\theta_J)_3$		deg
	48-49	---	(not used)	
34	XC(50)	A ₁	Propulsion induced aerodynamic interference coefficients.	
	51	B ₁		1/kt
	52	C ₁		1/kt ²
	53	D ₁		1/kt ³
	54	A ₂		1/kt
	55	B ₂		1/kt ²
	56	A ₄		m (ft)
35	XC(57)	B ₄		m/kt (ft/kt)
	58	C ₄		m/kt ² (ft/kt ²)
	59	D ₄		m/kt ³ (ft/kt ³)
	60	A ₃		m/kt (ft/kt)
	61	B ₃		m/kt ² (ft/kt ²)
	62-63	---	(not used)	
36	XT(1)	$\dot{x}_T$	Inertial trim velocity (+North)	kts
	2	$\dot{y}_T$	Inertial trim velocity (+East)	kts

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
	3	$\dot{h}_T$	Trim rate of climb (+up)	m/sec (ft/sec)
	4	h_T	Trim altitude	m (ft)
	5	ψ_T	Trim yaw angle ($\psi = 0^\circ$ is North)	deg
	6	θ_T	Trim pitch angle (+nose up)	deg
	7	ϕ_T	Trim roll angle (+rt. wing down)	deg
37	XT(8)	δ_T	Initial trim control guess	%
	9	δ_S		%
	10	δ_Y		%
	11	δ_R		%
	12	n_z	Load factor	g 's
	13	ϕ_{TURN}	Bank angle	deg
	14	R	Turn radius	m (ft)
38	XT(15)	δ_{T1}	Initial trim control guess	%
	16	δ_{T2}		%
	17	$\delta_{\theta 1}$		%
	18	$\delta_{\theta 2}$		%
	19	δ_f	Wing flap deflection	deg
	20	---	(not used)	
	21	η_{TRIM}	Trim indicator if $n_z \neq 1$; = 0 for coordinated turn, = 1 for pull up or push over	

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
39	XT(22)	---	(not used)	
	23	$\ddot{x}_T$	Inertial accerleration (+North)	m/sec ² (ft/sec ²)
	24	$\ddot{y}_T$	Inertial acceleration (+East)	m/sec ² (ft/sec ²)
	25	$\ddot{z}_T$	Inertial acceleration (+down)	m/sec ² (ft/sec ²)
	26	---	(not used)	
	27	c	Speed of sound	m/sec (ft/sec)
	28	σ	Local atm. density ratio	
40	XD(1)		X	N (lbs)
	2		Allowable errors in trim values of: Y	N (lbs)
	3		Z	N (lbs)
	4		M and N	N·m (ft.lbs)
	5		L	N·m (ft.lbs)
	6-7	---	(not used)	
41	XI(1)	$n_{\max}$	Max number of trim iterations	
	2-3	---	(not used)	
	4	Δ_1	Linear velocity derivative increment	m/sec (ft/sec)
	5		(set equal to 1.0)	
	6	Δ_2	Angular velocity derivative increment	rad/sec
	7	---	(not used)	
42	XI(8-11)	---	(not used)	
	12	Δx_i	Initial trim variable correction increment limit	deg or cm (in)
	13	$\Delta x_{i\min}$	Minimum trim variable correction increment	deg or cm (in)

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
	14	$\Delta_{\max}$	Max force or moment error for correction increment limit halving	N (lbs) or N·m (ft.lbs)
<u>Trim Correction Limit Halving:</u> At each trim iteration, corrections, Δx_i, are calculated for each control variable. If any of the corrections is greater than the limit, all are ratioed down such that the largest is equal to the limit. Additionally, if after any iteration the force and moment errors are all less than XI (14), the correction limit is halved but never decreased to a value less than XI (13). This process enhances the convergence to a trim solution.				
43	XI(15)	x_1	Control variables used for trim $= 1:\delta_T \quad = 5:\psi \quad = 9:\delta_{T_2}$ $= 2:\delta_S \quad = 6:\theta \quad = 10:\delta_{\theta_1}$ $= 3:\delta_Y \quad = 7:\phi \quad = 11:\delta_{\theta_2}$ $= 4:\delta_R \quad = 8:\delta_{T_1}$	
	16	x_2		
	17	x_3		
	18	x_4		
	19	x_5		
	20	x_6		
	21	---	(not used)	
44	TS(1-7)		Specified times during a maneuver at which stability analyses are to be performed	sec
45	TS(8-14)			sec
46	YR(1)	η_{RJ}	Number of reaction jets (10 max)	
	2	---	(not used)	
	3	A	Coefficients relating RCS thrust available vs engine thrust	$\%/10^3 \text{ N (lbs)}$
	4	B		$\%/10^6 \text{ N}^2 (\text{lbs}^2)$
	5	η_{RCS}	First η_{RCS} vectorable nozzle thrusts effect available RCS thrust	
	6-7	---	(not used)	

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
The next 20 cards consist of 10 groups of 2 cards each to describe each reaction control jet nozzle. If fewer than 10 nozzles are simulated, only $2\eta_{RJ}$ of these cards are necessary.				
47+	XR(14	FS _{RJ}	Location and orientation of η^{th} RCS nozzle ($\eta \leq \eta_{RJ}$)	cm (in)
2($\eta-1$)	($\eta-1$)+1)			
	2	BL _{RJ}		cm (in)
	3	WL _{RJ}		cm (in)
	4	ψ_{RJ}		deg
	5	θ_{RJ}		deg
	6		Controller for η^{th} nozzle (= 1: δ_S , = 2: δ_Y , = 3: δ_R)	
	7	δ_O	Constants used to describe T_R vs δ	cm (in)
48+	XR(14	δ_D		cm (in)
2($\eta-1$)	($\eta-1$)+8)			
	9	δ_{RAMP}		cm (in)
	10	$T_{\max 1}$		N (lbs)
	11	$T_{\max 2}$		N (lbs)
	12	τ_1	RCS thrust response time constants	sec
	13	τ_2		sec
	14	---	(not used)	
67	YL(1)	η_J	Number of vectorable jet nozzles (6 max)	
	2-7	---	(not used)	

TABLE II (Continued)
INPUT DATA VARIABLE LIST

The next 12 cards consist of 6 groups of 2 cards each to describe each vectorable nozzle jet associated with a lift or lift/cruise engine. If fewer than 6 nozzles are simulated, only $2n_J$ of these cards are necessary.

Card	FORTTRAN	Variable	Description	Units
68+ $2(n-1)$	XL(14 $(n-1)+1)$	FS _J	Location of n^{th} vectorable nozzle	cm (in)
	2	BL _J		cm (in)
	3	WL _J		cm (in)
	4	θ_J	Orientation of n^{th} nozzle (if $J = 0$, ϕ and θ are used; if $J \neq 0$, ψ and θ are used)	deg
	5	ϕ_J		deg
	6	ψ_J		deg
	7	J	Orientation indicator	
69+ $2(n-1)$	XL(14 $(n-1)+8)$	H _J	Angular momentum at max thrust (per nozzle)	$\text{kg}\cdot\text{m}^2/\text{sec}$ (slug·ft ² /sec)
	9	ψ_H	Orientation of angular momentum vector	deg
	10	θ_H		deg
	11	A	Coefficients for H _J vs T _J	%
	12	B		%/N (lbs)
	13	C		%/N ² (lbs ²)
	14	---	(not used)	
80	XS(1)	$\Delta\alpha_H/i_s$	Control effectiveness parameters	
	2	$\Delta\alpha_W/\delta_a$		
	3	$\Delta\alpha_V/\delta_r$		
	4-7	---	(not used)	
81	8-14	---	(not used)	

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTTRAN	Variable	Description	Units
82	15-21	---	(not used)	
83	22-28	---	(not used)	
84	TZERO	t_0	Initial time	sec
	ZDELT1	Δt_1	Integration interval for $t_0 \leq t \leq t_1$ and $t_2 \leq t \leq t_3$	sec
	ZMAX1	t_1	End of first time interval	sec
	ZDELT2	Δt_2	Integration interval for $t_1 < t < t_2$	sec
	ZMAX2	t_2	End of second time interval	sec
	ZMAX3	t_3	End of third time interval	sec

Card(s) 85: Time History Control and Disturbance Inputs

Variables: NEXT, J, XCIT(1), . . . , XCIT(6)

Format: 11, I4, 5X, 6F10.0

NEXT is a test word which may be either 0 or 1. Up to 20 cards of this type may be used for a given run. All except the last of these cards should have NEXT = 1; the last card should have NEXT = 0. The allowable values of J and corresponding definitions of XCIT(I) are listed in Table III.

OUTPUT DESCRIPTION

Program output is categorized into seven sections. The first three sections are concerned with input data and the trim calculation and are always printed. The fourth section is printed following a stability analysis. The fifth section contains time history output data and the sixth and seventh sections are outputs of the print plot and curve fit options, respectively. Output for a sample run is presented in Appendix B and is referenced in the following discussion.

Input Data

All input data for a given case is grouped and printed as shown in figures B-3 and B-4. This provides a convenient reference for each computer run.

Trim Iteration Data

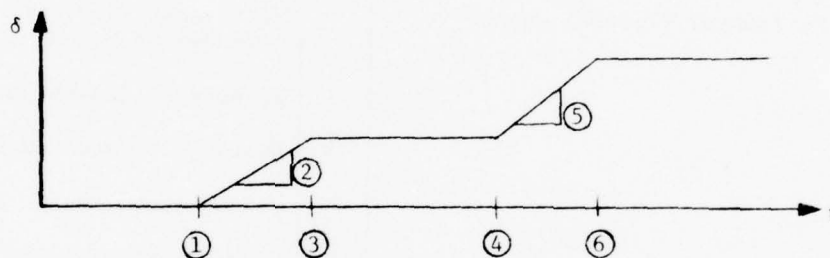
Figure B-5 is an example of the output produced for each trim iteration. The first line of data lists the current values for each of the six trim control variables, VAR(I). The units are percent or degrees as applicable. The next grouping of data presents the total vehicle forces and moments in body axes as well as a breakdown of the contributions of each major component: right wing, left wing, horizontal stabilizer, fuselage, right and left fixed nozzles, RCS, vectorable nozzles, inlet momentum, vertical stabilizer, weight, engine angular momentum and propulsion induced aerodynamics. Units for this matrix are newtons and newton-meters. Immediately following this matrix is the normalized Jacobian. This matrix provides an indication of relative forces and moments produced by motion of each of the trim controls. The last two lines on this page of output show the correction ratios applied to the predicted control increments if any of them have exceeded the specified maximum, Δx_i .

Trim Output Summary

Once a trim solution has been reached, all pertinent parameters are summarized on one page of output (figure B-7). All data on this page are in standard units (newtons, metres, degrees, seconds) as applicable unless otherwise noted.

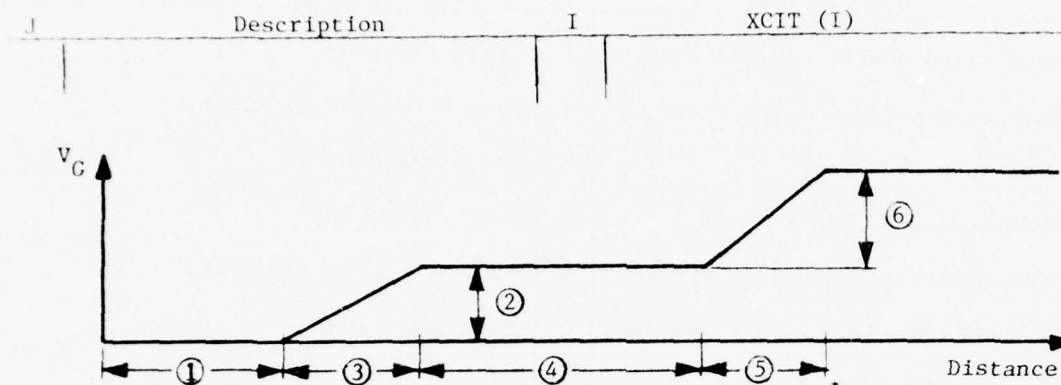
TABLE III
CONTROL AND DISTURBANCE INPUT DEFINITIONS

J	Description	I	XCIT (I)
1	Move fixed nozzle engine throttle	1	Start time, sec
2	Move longitudinal stick	2	Rate 1, cm/sec (in/sec)
3	Move lateral stick	3	Stop time, sec
4	Move rudder pedals	4	Start time, sec
5	Move vectorable nozzle throttle 1	5	Rate 2, cm/sec (in/sec)
6	Move vectorable nozzle throttle 2	6	Stop time, sec
7	Move angle lever 1		
8	Move angle lever 2		



9	Vertical ramp gust	1	Distance to start of gust, m (ft)
11	Horizontal ramp gust	2	Max gust velocity, m/sec (ft/sec), (+ down or North)
		3	First ramp length, m (ft)
		4	Distance gust is steady, m (ft)
		5	Second ramp length, m (ft)
		6	Incremental gust velocity, m/sec (ft/sec)

TABLE III (Continued)
 CONTROL AND DISTURBANCE INPUT DEFINITIONS



- 10 Vertical $(1-\cos^2)$ gust
 12 Horizontal $(1-\cos^2)$ gust

- 1 Distance to start of gust, m (ft)
 2 First gust velocity, m/sec (ft/sec),
 (+down or North)
 3 First gust length, m (ft)
 4 Distance between gusts, m (ft)
 5 Second gust length, m (ft)
 6 Second gust velocity, m/sec (ft/sec)

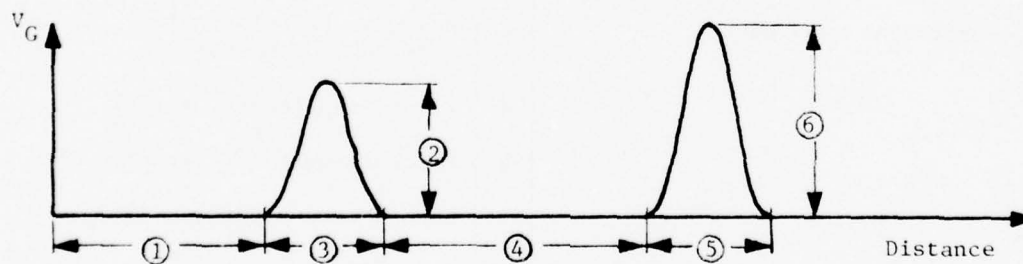


TABLE III (Continued)
CONTROL AND DISTURBANCE INPUT DEFINITIONS

J	Description	I	XCIT (I)
13	Change wing flap deflection	1	Start time, sec
		2	Rate 1, deg/sec
		3	Stop time, sec
		4	Start time, sec
		5	Rate 2, deg/sec
		6	Stop time, sec
14	Vary fixed nozzle engine thrust	1	Start time, sec
		2	Index (see 4 and 5)
		3	Rate, N/sec (lb/sec)
		4	Stop time, sec (index = 0)
		5	Final thrust value, N (lbs), (index $\neq$ 0)
		6	= 1: left jet, = 2: right jet
15	Vectorable nozzle engine thrust failure	1	Start time, sec
		2	Stop time, sec (thrust = 0)
		3	Nozzle number (1 to 6)
		4-6	(not used)
17	Yaw damper	1	Start time, sec
		2	Yaw rate gain, K_r , cm/deg/sec, (in/deg/sec)
		3	Stop time, sec
		4	Time lag, τ , sec
		5-6	(not used)
18	Roll damper and attitude hold ($\phi = 0$)	1	Start time, sec
		2	Attitude gain, K_ϕ , cm/deg (in/deg)
		3	Rate gain, K_p , cm/deg/sec (in/deg/sec)

TABLE III (Continued)
 CONTROL AND DISTURBANCE INPUT DEFINITIONS

J	Description	I	XCIT (I)
19	Pitch damper and attitude hold ($\theta = \theta_0$)	4	Stop time, sec
		5	Time lag for both feedbacks, τ , sec
		6	(not used)
		1	Start time, sec
		2	Attitude gain, K_θ , cm/deg (in/deg)
		3	Rate gain, K_q , cm/deg/sec (in/deg/sec)
		4	Reference attitude, θ_0 , deg
		5	Stop time, sec
		6	Time lag for both feedbacks, τ , sec
20	Sinusoidal control movement	1	Start time, sec
		2	Frequency, Hz
		3	Amplitude, cm (in)
		4	Stop time, sec
		5	Control to be moved
			1: δ_T 5: δ_{T_1}
			2: δ_S 6: δ_{T_2}
			3: δ_Y 7: δ_{θ_1}
			4: δ_R 8: δ_{θ_2}
		6	(not used)
31	Change time history output print frequency	1	Time, sec
		2	New NPRINT
		3	Time, sec

TABLE III (Continued)
CONTROL AND DISTURBANCE INPUT DEFINITIONS

J	Description	I	XCIT (I)
		4	New NPRINT
		5	Time, sec
		6	New NPRINT

Stability Analysis Output

If a stability analysis is requested, the force and moment derivatives for each of the eight control variables and three vehicle attitudes are printed as shown in figure B-8. The first matrix is in units of newtons or newton-metres per centimetre of control or radian of angle. The elements of the second matrix are normalized by vehicle mass for the force derivatives and vehicle moment of inertia for each of the moment derivatives.

Results of the finite difference calculations for the stability derivatives are printed as shown in figures B-9 through B-11. Here the values of VAR(I) are u, w, q, v, p, and r each of which is incremented in turn. The resulting forces and moments (both total and incremental) are printed in units of newtons and newton-metres. The stability derivatives are calculated by dividing each incremental force and moment by the appropriate velocity increment. The results are summarized as shown in figure B-12. Again the second matrix has been normalized by mass and inertia.

The small perturbation stability analysis output is presented on two pages: longitudinal characteristics (figure B-13) and lateral/directional characteristics (figure B-14). The output format for both is identical with the coefficients of the small perturbation equations printed first. Following this are the roots of the characteristic equations and their associated periods, natural frequencies, damping and times to halve or double. The last set of data is the roots and gains of the major transfer function numerators. The gains are in units of metres/second, radians and radians/second per centimetre of control deflection.

Time History Output

During a time history calculation, at the specified print-out interval, the aircraft state is summarized as it was for trim (figure B-15).

Time History Plotting

Figure B-16 is a portion of a sample time history print plot output. Up to three dependent variables are presented versus time with symbol notation and scaling as indicated on the plot. Time in seconds is scaled down the left margin.

Curve Fit Output

Typical output from the least squares curve fit option is presented in figures B-17 and B-18. The output is self-explanatory with the possible exception of "COEF OF CORR" which gives an indication of the accuracy of the particular curve fit (a value of one represents an exact fit).

40

REFERENCES

- (a) Anonymous, "Metric Practice Guide," ASTM E 380-74, 24 February 1975.
- (b) Livingston, Charles L., "A Stability and Control Prediction Method for Helicopters and Stoppable Rotor Aircraft," Air Force Flight Dynamics Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, AFFDL-TR-69-123, Volumes 1 through 4, February 1970.

NADC-76313-30

A P P E N D I X A

Program Listing

NADC-76313-30

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C      PROGRAM VSTOL (INPUT,OUTPUT,TAPE3,TAPE5=INPUT,TAPE6=OUTPUT,TAPE1) VSTL0001
C      N.A.D.C. VSAC PROGRAM VSTL0002
C      JET-LIFT VSTOL STABILITY AND CONTROL ANALYSIS VSTL0003
C      PROGRAM CONTROL SECTION VSTL0004
C      THIS PROGRAM DEPENDS UPON THE VALUE OF NPART FIRST TO DETERMINE VSTL0005
C      ITS EXECUTION PROCESS. VSTL0006
C      WHEN TWO VALUES OF NPART USE THE SAME SUBROUTINES THE PATHS TAKEN VSTL0007
C      IN THE SUBROUTINES ARE DIFFERENT DEPENDING UPON THE VALUES OF VSTL0008
C      THE OTHER VARIABLES IN THE PROBLEM. VSTL0009
C      NPART = 1 - TRIM ONLY VSTL0010
C      2 - TRIM, STABILITY ANALYSIS AND TIME HISTORY VSTL0011
C      3 - PRINTER PLOTS VSTL0012
C      4 - CALCOMP PLOTS VSTL0013
C      5 - NOT USED VSTL0014
C      6 - REVISE DATA AND RUN AS FOR NPART=2 VSTL0015
C      7 - TRIM AND STABILITY ANALYSIS VSTL0016
C      8 - NOT USED VSTL0017
C      9 - REVISE DATA AND RUN TRIM AND STABILITY ANALYSIS VSTL0018
C      10 - SAME AS NPART=9 USING PREVIOUS TRIM AS START VALUES VSTL0019
C      11 - LEAST SQUARES CURVE FIT OF TIME HISTORY VSTL0020
C      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN, VSTL0021
C      NPART,NVARA,NVARB,NVARC,NSCALE VSTL0022
C      ,NVAR5,NPRINT,NTIME VSTL0023
C *THE FOLLOWING SET SIZE ALLOCATIONS FOR COMMON BLOCKS* VSTL0024
C      COMMON /CONTR/ CON(44) VSTL0025
C      COMMON /FORCE/ FOR(74) VSTL0026
C      COMMON /FOFY/ FOFY(600) VSTL0027
C      COMMON /KVARTR/ KVA(74) VSTL0028
C      COMMON /LJETS/ XLJE(130) VSTL0029
C      COMMON /MANAL/ XMANA(47) VSTL0030
C      COMMON /MANARO/ XMAN(43) VSTL0031
C      COMMON /PLOTD/ PLO(420) VSTL0032
C      COMMON /RJETS/ RJE(124) VSTL0033
C      COMMON /ROMAN/ ROM(23) VSTL0034
C      COMMON /STAMAN/ STAM(30) VSTL0035
C      COMMON /STANRO/ STA(13) VSTL0036
C      COMMON /STARAN/ STAR(145) VSTL0037
C      COMMON /STRD/ STR(48) VSTL0038
C      COMMON /STRIAH/ STRH(784) VSTL0039
C      COMMON /STRIMAX/ STRI(202) VSTL0040
C      COMMON /TRONIC/ TRON(94) VSTL0041
C      DIMENSION IDUM(260) VSTL0042
C      WRITE(5,230) VSTL0043
C      CALL WROT1 VSTL0044
C      NPLOT=0 VSTL0045
C      NVARS=0 VSTL0046
C      EXIT=2. VSTL0047
C      AH(2)=0. VSTL0048
C      13 CONTINUE VSTL0049
C      READ (5,220) NPART,NPRINT,NSCALE,NVARA,AL(1),AH(1), VSTL0050
C      1 NVARB,AL(2),AH(2),NVARC,AL(3),AH(3) VSTL0051

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IF(EOF(5))190,20	VSTL0057
20 IF(NPART.GT.11.OR.NPART.LT.1) GO TO 180	VSTL0058
IF(EXIT.NF.0..AND.NPART.EQ.10) GO TO 190	VSTL0059
NTIME=-1	VSTL0060
IF(NPRINT.LE.0) NPRINT=1	VSTL0061
EXIT=0.	VSTL0062
GO TO (30,40,120,130,180,140,150,180,160,160,170),NPART	VSTL0063
30 CONTINUE	VSTL0064
CALL START	VSTL0065
IF(EXIT.NF.0.) GO TO 13	VSTL0066
CALL TRIM	VSTL0067
IF(EXIT.NF.0.) GO TO 13	VSTL0068
CALL INIT	VSTL0069
GO TO 13	VSTL0070
40 CONTINUE	VSTL0071
CALL START	VSTL0072
IF(EXIT.NF.0.) GO TO 60	VSTL0073
CALL TRIM	VSTL0074
IF(EXIT.NF.0.) GO TO 60	VSTL0075
50 CONTINUE	VSTL0076
CALL MANU	VSTL0077
IF(EXIT.NF.0..OR.NVARS.EQ.0) GO TO 13	VSTL0078
CALL STAR	VSTL0079
IF(EXIT.EQ.0.) GO TO 50	VSTL0080
A4=99999999.	VSTL0081
WRITE (3) IPSN,A4,IDUM	VSTL0082
GO TO 13	VSTL0083
60 CONTINUE	VSTL0084
READ (5,220)	VSTL0085
1 NPART,NPRINT,NSCALE,NVARA,AL(1),AH(1),	VSTL0086
NVARB,AL(2),AH(2),NVARC,AL(3),AH(3)	VSTL0087
IF(EOF(5))190,70	VSTL0088
70 CONTINUE	VSTL0089
IF(NPART.EQ.3.OR.NPART.EQ.8) GO TO 60	VSTL0090
IF(NPART.EQ.10) GO TO 190	VSTL0091
IF(NPART.EQ.11) GO TO 80	VSTL0092
GO TO 20	VSTL0093
80 READ (5,200) (IDUM(II),II=1,NVARA)	VSTL0094
IF(NVARB.EQ.0) GO TO 100	VSTL0095
DO 90 IJ=1,NVARB	VSTL0096
READ (5,200) NNUM,ND,(IDUM(II),II=1,NNUM)	VSTL0097
90 CONTINUE	VSTL0098
100 CONTINUE	VSTL0099
ND=AL(2)*.1	VSTL0100
IF(ND.EQ.0) GO TO 60	VSTL0101
DO 110 IJ=1,ND	VSTL0102
READ (5,200) (IDUM(II),II=1,3)	VSTL0103
110 CONTINUE	VSTL0104
GO TO 60	VSTL0105
120 CONTINUE	VSTL0106
REWIND 3	VSTL0107
CALL PLOT	VSTL0108
GO TO 13	VSTL0109
130 CONTINUE	VSTL0110
REWIND 3	VSTL0111
CALL CPLOT(NPLOT)	

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      GOTO 13
140 CONTINUE
      NVAR=0
      GOTO 40
150 CONTINUE
      CALL START
      IF (EXIT.NE.0.) GO TO 13
      CALL THIM
      CALL INIT
      CALL STAH
      GO TO 13
160 CONTINUE
      CALL START
      IF (EXIT.NE.0.) GO TO 190
      CALL THIM
      IF (EXIT.NE.0.) GO TO 190
      CALL INIT
      IF (NVAR.NE.0) CALL STAR
      IF (EXIT.NE.0.) GO TO 190
      GO TO 13
170 CONTINUE
      REWIND 3
      CALL CURVFT
      GO TO 13
180 WRITE (6,210) NPART
190 IF (NPLOT.NE.0) CALL PLOT(10.,10.,999)
      STOP
200 FORMAT (14I5)
210 FORMAT (1H1,46X,*V/STOL-AIRCRAFT RIGID BODY DYNAMIC ANALYSIS*////
2      23H DATA ERROR .. NPART = ,I5)
220 FORMAT (12,2I4,      3(I5,5X,2F5.0))
230 FORMAT (1H1)
      END

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VSTL0112
VSTL0113
VSTL0114
VSTL0115
VSTL0116
VSTL0117
VSTL0118
VSTL0119
VSTL0120
VSTL0121
VSTL0122
VSTL0123
VSTL0124
VSTL0125
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VSTL0138
VSTL0139
VSTL0140
VSTL0141
VSTL0142
VSTL0143
VSTL0144

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*****
SUBROUTINE AJACOR
COMMON /FORCF/ XF,T1(12),YF,T2(9),ZF,T3(11),
1             QL,T4(12),QM,T5(12),QN
COMMON /STRIAH/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,
1             PD(6,7),DTR,EPD,ERR(6),KML,RHO,R12,SPD(6,6,1),
2             T6(230),XCON(63)
COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,
1             COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),
2             TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA,
3             T7(28),ALGE3
COMMON /MANAL/ Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,
1             ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CORWG,CLELE,
2             CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL,
3             TB(15),ALECR1,ALGFPD
COMMON /ROMAN/ PI,ZZ,ALT,T,APDU,ARDD,AYDD,DTRR,GMAXV,RATE1
COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,
1             YGUSTF,GFWD,GLAT,GVERT,VXB,VZR,APD,VYB,ARD,AYD,

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AJAC0001
AJAC0002
AJAC0003
AJAC0004
AJAC0005
AJAC0006
AJAC0007
AJAC0008
AJAC0009
AJAC0010
AJAC0011
AJAC0012
AJAC0013
AJAC0014
AJAC0015
AJAC0016
AJAC0017

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2          COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE          AJAC0018
COMMON /STANRO/ J,W,LINK,GELE,VSND,YFIN(2),ZFEL(2),COND1,SWING, AJAC0019
1          PILGH2,PWGEL1          AJAC0020
COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN          AJAC0021
COMMON /RJFTS/  NJETR,XSTK(3),XU(10),XD(10),XR(10),TPOS(10)          AJAC0022
COMMON /CONTR/  ADISP(3),APATE(3),DELTA(4),THR(2),RPCT(3),XSYS(28) AJAC0023
1          ,NTRIM          AJAC0024
DIMENSION VAR(11)          AJAC0025
EQUIVALENCE (VAR(1),COLSTK)          AJAC0026
CYCR1=CYSTK1*CYCF(3)+CYCF(2)          AJAC0027
CYCH2=CYSTK2*CYCL(3)+CYCL(2)          AJAC0028
PED= PEDAL*PEDA(3)+PEDA(2)          AJAC0029
WGCOL=AGW          AJAC0030
XSTK(1)=CYCR1*OTRR          AJAC0031
XSTK(2)=CYCR2*OTRR          AJAC0032
XSTK(3)=PED*PEUA(1)/(PEDA(3)*100.)          AJAC0033
ALGE3=XCON(26)/(OTRR*2.)          AJAC0034
ADISP(1)=AYE*OTRR          AJAC0035
ADISP(2)=APE*OTRR          AJAC0036
ADISP(3)=ARE*OTRR          AJAC0037
ARATE(1)=AYD*OTRR          AJAC0038
ARATE(2)=APD*OTRR          AJAC0039
ARATE(3)=APD*OTRR          AJAC0040
NTRIM1=NTRIM          AJAC0041
IF(LINK.EQ.3) NTRIM1=1          AJAC0042
CALL CONTRL(NTRIM1)          AJAC0043
10 NTRIM=NTRIM1          AJAC0044
IF(LINK.EQ.3) NTRIM =2          AJAC0045
DELALE=DELTA(1)*XSYS(1)          AJAC0046
ALECR1=ALGE2*DELALE          AJAC0047
DELA1L=DELTA(2)*XSYS(2)          AJAC0048
ALCYP=DELA1L          AJAC0049
DELRUD=DELTA(3)*XSYS(3)          AJAC0050
ALGFPD=ALGF*DELRUD          AJAC0051
CALL VR3D (XX0,YY0,ZZ0,AYE,APE,ARE,VXB,VYB,VZB,-1)          AJAC0052
IF(LINK.EQ.2) CALL OFFTRM          AJAC0053
C          AJAC0054
CALL ANAL          AJAC0055
C          AJAC0056
IF(EXIT.NF.0.) RETURN          AJAC0057
F(1) = XF - DX          AJAC0058
F(2) = YF - DY          AJAC0059
F(3) = ZF - DZ          AJAC0060
F(4) = ON - DN          AJAC0061
F(5) = OM - DM          AJAC0062
F(6) = OL - DL          AJAC0063
IF(COND1.LE.1.5.AND.J.NE.1) RETURN          AJAC0064
IF(COND1.LE.1.5.AND.LINK.EQ.3) RETURN          AJAC0065
IF(COND1.EQ.0.) RETURN          AJAC0066
CALL WRVP (I,VAR,KM1,PD,TAXL,TAXR)          AJAC0067
CALL WRFM          AJAC0068
RETURN          AJAC0069
END          AJAC0070

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SUBROUTINE ANAL                                ANAL0001
COMMON /FORCE/ XF,XFRWG,XFLWG,XFELE,XFFUS,XFRJET,XFLJET,XFRJ, ANAL0002
1 XFLJ,XFGUN,XFFIN,XFW,XADD, ANAL0003
2 YF,YFFUS,YFRJET,YFLJET,YFRJ,YFLJ,YFGUN,YFFIN,YFW, ANAL0004
3 YADD, ANAL0005
4 ZF,ZFRWG,ZFLWG,ZFELE,ZFFUS,ZFRJET,ZFLJET,ZFRJ, ANAL0006
5 ZFLJ,ZFGUN,ZF,XADD, ANAL0007
6 QL,LRWG,LLWG,LELE,LFUS,LRJET,LLJET,MRJ,PLJ,LGUN, ANAL0008
A LFIN,RGYRO,RMADU, ANAL0009
6 OM,MRWG,MLWG,MELE,MFUS,MRJET,MLJET,PMRJ,PLJ,MGUN, ANAL0010
8 MFIN,PGYRO,PMADU, ANAL0011
7 QN,NRWG,NLWG,NFELE,NFUS,NRJET,NLJET,YMRJ,YMLJ,NGUN, ANAL0012
C NFIN,YGYRO,YMADU, ANAL0013
COMMON /MANAL/ Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP, ANAL0014
1 ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CORWG,CLELE, ANAL0015
2 CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL, ANAL0016
3 XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS, ANAL0017
4 YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET, ANAL0018
5 ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1, ANAL0019
COMMON /MANARO/ I,V,NWAG,TDLT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW, ANAL0020
1 YGUSTF,GFWD,GLAT,GVEHT,VXH,VZR,APD,VYH,ARD,AYD, ANAL0021
2 COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE, ANAL0022
3 TLSTK(2),THLSTK(2),DUM(6),DFLAP1, ANAL0023
COMMON /STANRO/ J,W,LINK,QELE,VEND,YFIN(2),ZFEL(2),COND1,SWING, ANAL0024
1 PILGH2,PWGEL1, ANAL0025
COMMON /STARAN/ C3,C4,RW,CLP,CLR,DCD,DQL,DQN,CLRO,CNRO,ETAQ,NJET, ANAL0026
1 QFIN,CLBCL,YFS(14),CNACL,CNPCL,CNRCD,CNRCL,COLKS, ANAL0027
2 D3ELE,FNSWC,LWING,RPST,YAERO(31,3),APBJET,ARQJET, ANAL0028
3 AYBJET,CNPCD1,CNPCD2,COLJET,DXWGL,DZWGL,ETAQMX, ANAL0029
4 PWGK1,RCWING,SWINGH,ANGR,ANGL,DFLAP, ANAL0030
COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN, ANAL0031
1 NPART,NVARA,NVARB,NVARC,NSCALE, ANAL0032
1 NVAR5,NPRINT,NTIME, ANAL0033
COMMON /FORY/ Y(4,150), ANAL0034
COMMON /RJETS/ NJETR,XSTK(3),XU(10),XD(10),XR(10),TPOS(10), ANAL0035
1 TNEG(10),XAJETR(10),YAJETR(10),ZAJETR(10), ANAL0036
2 AYBJTR(10),APBJTR(10),JTRCON(10), ANAL0037
3 XACT,TPCTA,TPCTB, ANAL0038
COMMON /LJETS/ NJETL,XAJETL(6),YAJETL(6),ZAJETL(6),APBJTL(6), ANAL0039
1 ARBJTL(6),CONLJ(2,5),NCONL(6),XLT(2),XLTH(2), ANAL0040
2 AYBJTL(6),ATT(6),ANG(6),PSIANG(6),THEANG(6), ANAL0041
3 ANGA(6),ANGH(6),TLJET(6),ANGC(6), ANAL0042
COMMON /STRIAR/ TEMP(240),XFS(35),TEMP1(49),YWG(21),YEL(21), ANAL0043
1 YFN(21), ANAL0044
COMMON /STAMAN/ XX,YY,AY1,PIY,APBG,APBG,ASEP,AYBG,CGR1,DPIX,DPIZ, ANAL0045
1 R550,AYDMX,DELT2,DPIXZ,HDELT,HGUST,KTCR,RMASS, ANAL0046
2 TWOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELT2R, ANAL0047
3 POLDTR,RDELT1,RDELT2, ANAL0048
PEAL LELE,LFIN,LGUN,LLJET,LLWG,LRJET,LRWG,LFUS, ANAL0049
1 MELE,MFIN,MGUN,MLJET,MLWG,MRJET,MRWG,MFUS,MFFUS, ANAL0050
2 NELE,NFIN,NGUN,NLJET,NLWG,NRJET,NRWG,NFUS,NFFUS, ANAL0051
D5=10./57.295H, ANAL0052
DFLAP=DFLAP1, ANAL0053
WP=W*COS(APE), ANAL0054
XFW=-W*SIN(APE), ANAL0055

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	YFW=WP*SIN(ARE)	ANAL0056
	ZFW=WP*COS(ARE)	ANAL0057
10	XMAC=V*VSND	ANAL0058
	AP=0.	ANAL0059
	APDOT=0.	ANAL0060
	VXZHSQ=VX**2+VZ**2	ANAL0061
	IF(VXZHSQ.FG.0.) GO TO 20	ANAL0062
	AP=ATAN2(VZH,VXH)	ANAL0063
	APDOT=(VXH*Y(1,78)-VZH*Y(1,76))/VXZBSQ	ANAL0064
C	WING EQUATIONS	ANAL0065
20	CONTINUE	ANAL0066
	ANGE=0.	ANAL0067
	IF(OWG.LT.0) GO TO 50	ANAL0068
	XXW=VXB-HGUSTW*APD*ZAWG	ANAL0069
	ST1=VZH-VGUSTW*APD*XAWG	ANAL0070
	ANGRW=0.	ANAL0071
	IF(XXW.NE.0..OR.ST1.NE.0.) ANGRW=ATAN2(ST1,XXW)	ANAL0072
	ALGEO=ANGRW*WGCOL	ANAL0073
	ALRWG=ALGEO*ALCYP	ANAL0074
	CALL CLCD (ALRWG,CLRWG,CDRWG,XMAC,EXIT,1)	ANAL0075
	IF(EXIT.NE.0.) GO TO 150	ANAL0076
	CD=C3	ANAL0077
	CL=C4	ANAL0078
	DCDR=UCD	ANAL0079
	VELSQ=XXW**2+ST1**2	ANAL0080
	QRW=OWG*VELSQ	ANAL0081
	CALL VR2D (-CDRWG,-CLRWG,ANGRW,C1,C2,1)	ANAL0082
	XFRWG=C1*QRW	ANAL0083
	ZFRWG=C2*QRW	ANAL0084
	CALL XPPG (XAWG,YARWG,ZAWG,XFRWG,0.,ZFRWG,LRWG,MRWG,NRWG)	ANAL0085
	MRWG=MRWG+YWG(21)*DFLAP*QRW*YAERO(10,1)+YWG(15)*QRW*YAERO(10,1)	ANAL0086
	ALLWG=ALGEO*ALCYP	ANAL0087
	CALL CLCD (ALLWG,CLLWG,CDLWG,XMAC,EXIT,1)	ANAL0088
	IF(EXIT.NE.0.) GO TO 150	ANAL0089
	CD=.5*(C3+CD)	ANAL0090
	CLWG=.5*(C4+CL)	ANAL0091
	ALWG=.5*(ALRWG+ALLWG)	ANAL0092
	DCD=.5*(DCDR+DCD)	ANAL0093
	CALL VR2D (-CDLWG,-CLLWG,ANGRW,C1,C2,1)	ANAL0094
	XFLWG=C1*QRW	ANAL0095
	ZFLWG=C2*QRW	ANAL0096
	CALL XPHG (XAWG,YALWG,ZAWG,XFLWG,0.,ZFLWG,LLWG,MLWG,NLWG)	ANAL0097
	MLWG=MLWG+YWG(21)*DFLAP*QRW*YAERO(10,1)+YWG(15)*QRW*YAERO(10,1)	ANAL0098
	TS=0.	ANAL0099
	IF(VELSQ.NE.0.) TS=SINHG/SQRT(VELSQ)	ANAL0100
	FF=QRW*SINHG	ANAL0101
	YAW=0.	ANAL0102
	XZW=SQRT(VELSQ)	ANAL0103
	IF(VYH-YGUSTW.NE.0..OR.XZW.NE.0.) YAW=ATAN2(VYH-YGUSTW,XZW)	ANAL0104
C	DQL AND DQN ARE CONTRIBUTION OF EACH WING, NOT TOTAL	ANAL0105
	DQL=FF*(YAW*(CLBO*CLACL*CLWG)+TS*(AYD*CLR*CLWG*ARD*CLP))	ANAL0106
	DQN=FF*(YAW*(CNHO*CNHCL*CLWG**2)+TS*(AYD*(CNHCL*CLWG**2+CNHCD*CD)	ANAL0107
1	+ARD*(CNHCL*CLWG*CNHCD*DCD))	ANAL0108
	CALL VR2D (DQL,DQN,ANGRW,DQL,DQN,1)	ANAL0109
	LRWG=LRWG+DQL	ANAL0109

LLWG=LLWG+DQL	ANAL0110
NRWG=NRWG+DQN	ANAL0111
NLWG=NLWG+DQN	ANAL0112
ANGE=-PWGWK1*CLWG	ANAL0113
IF (ABS(ALWG).GT.1.5780) ANGE=0.	ANAL0114
ANG1=0.	ANAL0115
IF (VXH.GE.50.) ANG1=APDOT*XAELE*PWGEL1/VXB	ANAL0116
IF (ALWG.EQ.0.) GO TO 30	ANAL0117
ANGE=ANGE-ANG1*(CLWG-YWG(19)*DFLAP)/ALWG	ANAL0118
GO TO 40	ANAL0119
30 CONTINUE	ANAL0120
ANGE=ANGE-ANG1*YAERO(17,1)	ANAL0121
40 CONTINUE	ANAL0122
AWAKE=PWGWK1*CLWG	ANAL0123
XA=DX*GEL	ANAL0124
AWGEL=ATAN2(DZWGEL,XA)	ANAL0125
DWGEL=SQRT(XA**2+DZWGEL**2)*RCWING	ANAL0126
ANGLE=AWAKE-AP*AWGEL	ANAL0127
DIS=DWGEL*ARS(SIN(ANGLE))	ANAL0128
XI=DWGEL*ARS(COS(ANGLE))	ANAL0129
HWAKE=.68*SQRT(CD*(XI+.15))	ANAL0130
ETAQ=0.	ANAL0131
IF (DIS.LT.HWAKE.AND.ABS(ANGLE).LT.HALFPI)	ANAL0132
1 ETAQ=ETAQMX*SQRT(CD)/(XI+.3)*(COS(DIS*HALFPI/HWAKE))**2	ANAL0133
C ELEVATOR EQUATIONS	ANAL0134
50 IF (QELE.LT.0) GO TO 60	ANAL0135
ST1=VZB+APD*YAELE-APD*XAELE-VGUSTE	ANAL0136
XXE=VXB+APD*YAELE-AYD*YAELE-HGUSTE	ANAL0137
VELSQ=XXE**2+ST1**2	ANAL0138
IF (VELSQ.NE.0.) ANGF=ATAN2(ST1,XXE)+ANGE	ANAL0139
ALEL=ALECR1+ANGE	ANAL0140
CALL CLCD (ALEL,CLELF,CDELE,XMAC,EXIT,2)	ANAL0141
IF (EXIT.NE.0.) GO TO 150	ANAL0142
QE=QELE*VELSQ*(1.-ETAQ)	ANAL0143
CALL VR2D (-CDELE,-CLELE,ANGE,C1,C2,1)	ANAL0144
XFELE=C1*QE	ANAL0145
ZFELE=C2*QE	ANAL0146
CALL XPRO (XAELE,YAELE,ZAELE,XFELE,0.,ZFELE,LELE,MELE,NELE)	ANAL0147
MELE=MELE+YEL(15)*QE*YAERO(10,2)	ANAL0148
C FIN EQUATIONS	ANAL0149
60 IF (QFIN.LT.0) GO TO 70	ANAL0150
ST1=ARD*ZAFIN-AYD*XAFIN-VYH*FNSWC+YGUSTF	ANAL0151
XXFN=VXH+APD*ZAFIN-AYD*YAFIN-HGUSTF	ANAL0152
QF=QFIN*(XXFN*XXFN+ST1*ST1)	ANAL0153
ANGF=0.	ANAL0154
IF (QF.NE.0.) ANGF=ATAN2(ST1,XXFN)	ANAL0155
ALFIN=ANGF+ALGFPD	ANAL0156
CALL CLCD (ALFIN,CLFIN,CDFIN,XMAC,EXIT,3)	ANAL0157
IF (EXIT.NE.0.) GO TO 150	ANAL0158
CALL VR2D (-CDFIN,CLFIN,ANGF,C1,C2,-1)	ANAL0159
XFFIN=C1*QF	ANAL0160
YFFIN=C2*QF	ANAL0161
CALL XPRO (XAFIN,YAFIN,ZAFIN,XXFIN,YFFIN,0.,LFIN,MFIN,NFIN)	ANAL0162
NFIN=NFIN+YFN(15)*QF*YAERO(10,3)	ANAL0163
C FUSELAGE EQUATIONS	ANAL0164


```

70 XXF=VXB-HGUST
   ST1=VZH-VGUST
   ANG1=0.
   QVXZH=Q*(XXF*XXF+ST1*ST1)
   IF (QVXZH.NF.0.) ANG1=ATAN2(ST1,XXF)
   AP=ANG1
   S1=SIN(ANG1-YFS(1))
   FSLIFT=QVXZH*(XFS(16)*SIGN(1.,S1)*ABS(S1)**XFS(17))
   ST2=YGUST-VYB
   QVXYB=Q*(XXF*XXF+ST2*ST2)
   ANG2=0.
   IF (QVXYB.NF.0.) ANG2=ATAN2(ST2,XXF)
   S1=SIN(ANG2)
   YFFS=QVXYB*(XFS(21)*SIGN(1.,S1)*ABS(S1)**XFS(22))
   ANG3=0.
   QVXYZ=Q*(XXF**2+ST2**2+ST1**2)
   IF (QVXYZ.NF.0.) ANG3=ATAN2(SQRT(ST1**2+ST2**2),XXF)
   S1=COS(ANG3)
   DF=QVXYZ*(XFS(18)*SIGN(1.,S1)*ABS(S1)**XFS(20))
   ZFFUS=-FSLIFT
   YFFUS=YFFS
   XFFUS=-DF
   CALL XPRO (XAFUS,YAFUS,ZAFUS,XFFUS,YFFUS,ZFFUS,LFUS,MFFUS,NFFUS)
   IF (ABS(ANG1-YFS(1)).GT.YFS(2)) GOTO 90
   S1=SIN(3.14159*(ANG1-YFS(1))/(YFS(2)-YFS(1)))
   IF (((ANG1-YFS(1)-D5).GT.0.).OR.((ANG1-YFS(1)+D5).LT.0.)) GOTO 80
   S1=SIN(3.14159*D5/(YFS(2)-YFS(1)))
   MF1=QVXZH*XFS(24)*(ABS(S1)**XFS(25))
   MFUS=2.*MF1*(ANG1-YFS(1)+D5)/(2.*D5)-MF1*MFFUS
   GOTO 100
80 MFUS=QVXZH*(XFS(24)*SIGN(1.,SIN(ANG1-YFS(1)))*ABS(S1)**XFS(25))
   1
   *MFFUS
   GOTO 100
90 S1=SIN(3.14159*(ABS(ANG1-YFS(1))-YFS(2)+YFS(1))/(3.14159+YFS(1)
   -YFS(2)))
   MFUS=QVXZH*(XFS(26)*SIGN(1.,SIN(ANG1-YFS(1)))*ABS(S1)**XFS(27))
   1
   *MFFUS
100 IF (ABS(ANG2).GT.YFS(3)) GOTO 120
   S1=SIN(3.14159*ANG2/YFS(3))
   IF (((ANG2-D5).GT.0.).OR.((ANG2+D5).LT.0.)) GOTO 110
   S1=SIN(3.14159*D5/YFS(3))
   NF1=QVXYB*XFS(29)*(ABS(S1)**XFS(30))
   NFUS=2.*NF1*(ANG2+D5)/(2.*D5)-NF1*NFFUS
   GOTO 130
110 NFUS=QVXYB*(XFS(29)*SIGN(1.,S1)*ABS(S1)**XFS(30))+NFFUS
   GOTO 130
120 S1=SIN(3.14159*(ABS(ANG2)-YFS(3))/(3.14159-YFS(3)))
   NFUS=QVXYB*(XFS(31)*SIGN(1.,SIN(ANG2))*ABS(S1)**XFS(32))+NFFUS
130 CONTINUE
C   JET THRUST EQUATIONS
   IF (COLJET.FO.0.) GO TO 140
   DCOL=COLJET*(COLSTK-COLKS)
   COLKS=COLSTK
   TAXP=TAXP+DCOL
   IF (NJET.EQ.1) GO TO 140

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ANAL0165
ANAL0166
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ANAL0200
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ANAL0210
ANAL0211
ANAL0212
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ANAL0215
ANAL0216
ANAL0217
ANAL0218
ANAL0219

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TAXL=TAXL+DCOL
140 CONTINUE
ANGH1=COLSTK*ANGR/100.
CALL VR3D (ANGH1,0.,0.,AYHJET,APHJET,ARBJET,TV1,TV2,TV3,1)
CALL XPRD (ARD,ARD,AYD,TV1,TV2,TV3,MGR,PGH,YGH)
ANGL1=COLSTK*ANGL/100.
CALL VR3D (ANGL1,0.,0.,-AYHJET,APHJET,ARBJET,TV1,TV2,TV3,1)
CALL XPRD (ARD,ARD,AYD,TV1,TV2,TV3,RGL,PGL,YGL)
CALL VR3D (TAXH,0.,0.,AYHJET,APHJET,ARBJET,XFHJET,YFRJET,ZFRJET,1)
CALL XPRD (XAJET,YARJET,ZAJET,XFHJET,YFRJET,ZFRJET,LRJET,MRJET,
1 NRJET)
CALL VR3D (TAXL,0.,0.,-AYHJET,APHJET,ARBJET,XFLJET,YFLJET,ZFLJET,1)
CALL XPRD (XAJET,YALJET,ZAJET,XFLJET,YFLJET,ZFLJET,LLJET,MLJET,
1 NLJET)
CALL LIFJET
CALL HEACT
CALL JETINT
RGYRO=RGYRD-RGR-RGL
PGYRO=PGYRD-PGR-PGL
YGYRO=YGYRD-YGR-YGL
C FORCE EQUATIONS
XF=XFRWG+XFLWG+XFELE+XFFUS+XFRJET+XFLJET+XFGUN+XFFIN+XFW+XFRJ+XFLJ
1 +XADD
YF= YFFUS+YFRJET+YFLJET+YFGUN+YFFIN+YFW+YFRJ+YFLJ
1 +YADD
ZF=ZFRWG+ZFLWG+ZFELE+ZFFUS+ZFRJET+ZFLJET+ZFGUN +ZFW+ZFRJ+ZFLJ
1 +ZADD
C MOMENT EQUATIONS
QL=LRWG+LLWG+LELE+LFHS+LRJET+LLJET+LGUN+LFIN+PMRJ+PMLJ
1 +RGYRD+PMADD
QM=MRWG+MLWG+MELE+MFHS+MRJET+MLJET+MGUN+MFIN+PMRJ+PMLJ
1 +PGYRD+PMADD
QN=NRWG+NLWG+NELE+NFHS+NRJET+NLJET+NGUN+NFIN+YMRJ+YMLJ
1 +YGYRD+YMAADD
GFWD=(XFW-XF)*RW
GLAT=(YFW-YF)*RW
GVEPT=(ZFW-ZF)*RW
150 RETURN
END

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SUBROUTINE CLCD (ALP,CL,CD,XMAC,EXIT,N)
COMMON /STARAN/ C3,C4,RW,CLP,CLR,DCD,DQL,DQN,CLBO,CNBO,ETAQ,NJET,
1 QFIN,CLHCL,YFS(14),CNHCL,CNPCL,CNRCO,CNRCL,COLKS,
2 D3ELE,FNSWC,LWING,RPIS,YAERO(31,3),APHJET,ARBJET,
3 AYHJET,CNPD1,CNPD2,COLJET,DXGEL,DZGEL,ETAQMX,
4 PWGWL,PCWING,SWINGH,ANGR,ANGL,OFLAP
COMMON /STANRO/ DUM(2),LINK
COMMON /STRIAH/ TEMP(324),YWG(21)
DIMENSION HEAD(3)
LOGICAL STALL
DATA DTHR,PI,TWOPI/ 57.29578,3.141593,6.283185/

```

DATA HALFPI/1.570796/	CLCD0012
DATA HEAD/	CLCD0013
1 10H WING .10H ELEVATOR .10H FIN /	CLCD0014
STALL=.FALSE.	CLCD0015
ALF=ALP	CLCD0016
10 SG=1.	CLCD0017
IF (ALF.LT.0.) SG=-1.	CLCD0018
AMG=SG*ALF	CLCD0019
IF (20.LE.AMG) GO TO 20	CLCD0020
IF (PI.GE.AMG) GO TO 30	CLCD0021
AMG=AMG-TWOPI	CLCD0022
ALF=AMG*SG	CLCD0023
GO TO 10	CLCD0024
20 WRITE (6,130) N	CLCD0025
EXIT=1.	CLCD0026
RETURN	CLCD0027
30 CONTINUE	CLCD0028
40 SMAC=1./SQRT(ABS(1.-XMAC**2))	CLCD0029
ALI=0.	CLCD0030
CLA=YAERO(22,N)	CLCD0031
XK=YAERO(23,N)	CLCD0032
COZ=YAERO(12,N)	CLCD0033
CD1 = YAERO(13,N)	CLCD0034
CD2 = YAERO(14,N)	CLCD0035
ALD=ALP*DTDR	CLCD0036
IF ((HALFPI).GE.AMG) GO TO 50	CLCD0037
AMG=PI-AMG	CLCD0038
SG=-SG	CLCD0039
AMX=YAERO(6,N)	CLCD0040
TAMX=TAN(AMX)	CLCD0041
CNAR=YAERO(26,N)	CLCD0042
CLZ=YAERO(7,N)	CLCD0043
GO TO 60	CLCD0044
50 CLZ=YAERO(3,N)	CLCD0045
AMX=YAERO(2,N)	CLCD0046
TAMX=TAN(AMX) \$ CNAR=YAERO(24,N)	CLCD0047
60 DCX=0.	CLCD0048
IF (N.EQ.1) DCX=YWG(20)*DFLAP*SG	CLCD0049
IF (N.EQ.1) DCO=YWG(19)*DFLAP*SG	CLCD0050
IF (AMG.GT.AMX) GOTO 70	CLCD0051
TA=TAN(AMG)	CLCD0052
DCNA=XK* (COS(TA/TAMX*PI/2.))**2.4	CLCD0053
CNA=CNAR*DCNA	CLCD0054
GOTO 80	CLCD0055
70 TA=TAN(AMG)	CLCD0056
X1=TAMX/TA	CLCD0057
D=-1.55*SIN((1.-.6*X1-.4*X1**2)*PI)	CLCD0058
CNA=CNAR*(1.16-CNAR)*(1.-X1)*D*CLA/2.3	CLCD0059
80 SA=SIN(AMG)	CLCD0060
CA=COS(AMG)	CLCD0061
S2A=SIN(2.*AMG)	CLCD0062
CL=CLA*S2A*CA/2.+CNA*SA**2*CA	CLCD0063
IF (N.NE.1) GOTO 90	CLCD0064
DCL=0.	CLCD0065
IF (AMG.LE.AMX) DCL=DCO*(DCX-DCO)*AMG/AMX	CLCD0066

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      IF (AMX.LT.AMG.AND.AMG.LE.(AMX+.0873))
1      DCL=DCX*(1.-(AMG-AMX)/.0873)
      CL=CL+DCL
90     CONTINUE
      CL=CL*SG
      IF (AMG.GT.AMX) STALL=.TRUE.
      CDZ=CDZ*SMAC
      IF (AMX.LT.AMG) GOTO 100
      C6=AMG*CD2
      C7=CD1 + C6
      CD=CDZ+AMG*C7
      DCD=C6+C7
      GO TO 110
100    CONTINUE
      CDX=CDZ+AMX*(CD1+AMX*CD2)
      C5=AMG-HALFPI
      C6=C5*(CDX-1.2)/(AMX-HALFPI)**2
      CD=C5*C6+1.2
      DCD=C6+C6
110    CONTINUE
      E=.527*YAERO(18,N)*(.1494-.01429*YAERO(18,N))
      ALI=(CL/(PI*YAERO(18,N)*E))
      IF (STALL.AND.LINK.NF.4) WRITE (6,120) HEAD(N)
      C3=CD
      IF (N.EQ.1.AND.AMX.GE.AMG) C3=CD*YWG(11)*DFLAP
      IF (N.EQ.1.AND.AMX.LT.AMG.AND.AMG.LE.(AMX+.0873))
1      C3=CD*YWG(11)*DFLAP*(1.-(AMG-AMX)/.0873)
      C4=CL
      NSGG = -1
      CALL VR2D (C3,C4,ALI,CD,CL,NSGG)
      RETURN
120    FORMAT (1H0,A10,*STALLED AT *,F7.3,* DEGREES CL = *,F6.3,* CD = *,
1          F6.3)
130    FORMAT (*0 EXCESSIVE ANGLE OF ATTACK FOR N = *,I2)
      END

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      SUBROUTINE COMSOL(CDEF,REPRT1,ZPRT1,REPRT2,ZPRT2)
C      SOLUTION OF SIMULTANEOUS EQUATIONS
C      WITH COMPLEX COEFFICIENTS
C      N = ORDER OF MATRIX
      DIMENSION COEF(2,3),A(2,5),
      COMPLEX A,TEMP,DET,COEF
      N=2
      NP1 = 3
      DO 10J = 1,NP1
      DO 10I = 1,N
      A(I,J) = COEF(I,J)
10     CONTINUE
      DET = (1.0,0.0)
C      COLUMNAR REARRANGEMENT OF MATRIX
      NM1=N-1

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DO 60 I=1,NM1
JJ=I+1
IMAX=I
C      N = ORDER OF MATRIX
AMAXT = REAL(A(JJ,I))**2 + AIMAG(A(JJ,I))**2
DO 30 J=JJ,N
ATEST1 = REAL(A(J,I))**2 + AIMAG(A(J,I))**2
ATEST2 = REAL(A(IMAX,I))**2 + AIMAG(A(IMAX,I))**2
IF (ATEST1-ATEST2) 30,30,20
20 IF (ATEST1.LE.AMAXT) GO TO 30
AMAXT = ATEST1
IMAX = J
30 CONTINUE
IF (IMAX-I) 60,60,40
40 DET=-DET
DO 50 K=1,NP1
TEMP=A(I,K)
A(I,K)=A(IMAX,K)
A(IMAX,K)=TEMP
50 CONTINUE
60 CONTINUE
C      AUGMENT INPUT MATRIX WITH THE IDENTITY MATRIX
NP2 = 4
N2P1 = 5
DO 80 I=1,N
DO 70 J =NP2,N2P1
A(I,J) = 0.0
70 CONTINUE
80 CONTINUE
DO 90 I = 1,N
J = I + NP1
A(I,J) = 1.0
90 CONTINUE
C      SOLUTION
DO 150 I=1,N
IPI = I+1
TTEST = REAL(A(I,I))**2 + AIMAG(A(I,I))**2
IF (TTEST.LE.0.000001) GO TO 170
100 DO 110 J = IPI,N2P1
A(I,J) = A(I,J)/A(I,I)
110 CONTINUE
DO 140 K = 1,N
IF (K-I) 120,140,120
120 DO 130 J = IPI,N2P1
A(K,J) = A(K,J) - A(K,I)*A(I,J)
130 CONTINUE
140 CONTINUE
150 CONTINUE
C      DETERMINANT EVALUATION
DO 160 I = 1,N
DET = DET * A(I,I)
160 CONTINUE
REPT1 = REAL(A(1,3))
ZPT1 = AIMAG(A(1,3))
REPT2 = REAL(A(2,3))

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COMS0016
COMS0017
COMS0018
COMS0019
COMS0020
COMS0021
COMS0022
COMS0023
COMS0024
COMS0025
COMS0026
COMS0027
COMS0028
COMS0029
COMS0030
COMS0031
COMS0032
COMS0033
COMS0034
COMS0035
COMS0036
COMS0037
COMS0038
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COMS0058
COMS0059
COMS0060
COMS0061
COMS0062
COMS0063
COMS0064
COMS0065
COMS0066
COMS0067
COMS0068
COMS0069
COMS0070


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      ZPRT2 = AIMAG(A(2,3))
      RETURN
C     SINGULAR MATRIX
170  PRINT 180,1,I,A(I,I)
180  FORMAT (1/3H A(1,12,1H,,12,4H) = ,2F10.8 )
190  FORMAT (7E12.4)
      RETURN
      END

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COMS0071
COMS0072
COMS0073
COMS0074
COMS0075
COMS0076
COMS0077
COMS0078

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      SUBROUTINE CONTRL (NTRIM)
      COMMON /CONTR/ ADISP(3),ARATE(3),DELTA(4),THR(2),RPCT(3),XSYS(28)
      COMMON /RJETS/ NJ,XSTK(3)
      COMMON /MANAL/ ATEM(2),PED,BTEM(19),CYCR1,CYCR2
      COMMON /STRIMA/ CTEM(170),ALGE1,ALGE2,DTEM(25),CYPWIC,RUDIND,
1     ETEM(2),ALGE3
      COMMON /ROMAN/ FTEM(3),TIME
      COMMON /MANARO/ GTEM(3),DT,HTEM(16),CYSTK1
C
C     XSYS(15) EQ 0 : CONVENTIONAL MECH. CONTROL USED
C
      XLIM(X1,X2,X3) = AMAX1(X1,AMIN1(X2,X3))
      XSTKF(X,X1,X2,X3) = (AMIN1(ABS(X),X3)*X1+AMAX1((ABS(X)-X3),0.)*X2)
1     *SIGN(1.,X)
      IF(XSYS(15).EQ.0.) GOTO 10
      IF (NTRIM.EQ. 2) GO TO 30
      IF (NTRIM.EQ. 1) GO TO 20
10  XA=0.
C  NTRIM=0 -- INITIALIZATION HERE
      X0=0.
      NTRIM=1
20  DX1=ALGE3*57.3
C  NTRIM=1 -- TRIM CONTROL LAWS ARE INSERTED HERE
      XA=XSTKF(XSTK(1),ALGE1,ALGE2,DX1)*X0
      IF(XSYS(15).EQ.0.) GOTO 40
30  CONTINUE
C  NTRIM=2 -- TIME HISTORY CONTROL LAWS ARE INSERTED HERE
40  DELTA(1) = XA
50  DELTA(2) = CYPWIC*CYCR2
      DELTA(3) = RUDIND*PED
      DELTA(4) = 0.
      DELTA(1)=DELTA(1)/57.3
      RETURN
60  FORMAT (1H0,5X,2E15.5)
      END

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CONT0001
CONT0002
CONT0003
CONT0004
CONT0005
CONT0006
CONT0007
CONT0008
CONT0009
CONT0010
CONT0011
CONT0012
CONT0013
CONT0014
CONT0015
CONT0016
CONT0017
CONT0018
CONT0019
CONT0020
CONT0021
CONT0022
CONT0023
CONT0024
CONT0025
CONT0026
CONT0027
CONT0028
CONT0029
CONT0030
CONT0031
CONT0032
CONT0033
CONT0034
CONT0035

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      SUBROUTINE CONV (IMET)
      COMMON /STRIBAB/ T1(184),XEL(14),XER(7),XFC(28),XFN(7),XFS(35),

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CONV0001
CONV0002

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NAOC-76313-30

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1          XGN(7),XIT(21),XWG(21),YWG(21),YEL(21),YFN(21), CONV0003
2          T2(27),XCON(63),XJET(14),T3(52),XRJT(140),YRJT(7), CONV0004
3          XLJT(H4),YLJT(7) CONV0005
COMMON /STRIMA/ T4(140),TSTAB(14) CONV0006
COMMON /CONTR/ TS(15),XSYS(28) CONV0007
COMMON /MET1/  XH(35),XW(21),YW(21),XE(14),YE(21),XF(7),YF(21), CONV0008
1          XJ(14),XC(63),YR(7),XR(140),XT(28),XD(7),XI(21), CONV0009
2          YL(7),XL(84),XS(28),TS(14),XCM(20,6) CONV0010
DATA F1,F2,F3,F4,F5,F6,F7,F8,F9/.224809,.393701,.737562,10.76391, CONV0011
1          35.31466,.571015,.737562,.050539,3.28084/ CONV0012
DO 10 I=1,7 CONV0013
XER(I)=XD(I) CONV0014
YRJT(I)=YR(I) CONV0015
YLJT(I)=YL(I) CONV0016
XFN(I)=XF(I) CONV0017
10 XGN(I)=0. CONV0018
DO 20 I=1,14 CONV0019
TSTAB(I)=TS(I) CONV0020
XEL(I)=XE(I) CONV0021
20 XJET(I)=XJ(I) CONV0022
DO 30 I=1,21 CONV0023
XIT(I)=XI(I) CONV0024
XWG(I)=XW(I) CONV0025
YWG(I)=YW(I) CONV0026
YEL(I)=YE(I) CONV0027
30 YFN(I)=YF(I) CONV0028
DO 40 I=1,28 CONV0029
XFC(I)=XT(I) CONV0030
40 XSYS(I)=XS(I) CONV0031
DO 50 I=1,35 CONV0032
XFS(I)=XH(I) CONV0033
50 XFS(I)=XH(I) CONV0033
DO 60 I=1,63 CONV0034
XCON(I)=XC(I) CONV0035
60 XCON(I)=XC(I) CONV0036
DO 70 I=1,84 CONV0037
XLJT(I)=XL(I) CONV0038
70 XLJT(I)=XL(I) CONV0038
DO 80 I=1,140 CONV0039
XRJT(I)=XR(I) CONV0039
IF(IMET.NE.0) RETURN CONV0040
NR=YR(1) CONV0041
NL=YL(1) CONV0042
XFS(1)=XH(1)*F1 CONV0043
XFS(35)=XR(35)*F1 CONV0044
DO 90 I=1,3 CONV0045
90 XER(I)=XD(I)*F1 CONV0046
YRJT(3)=YR(3)/F1 CONV0047
YRJT(4)=YR(4)/F1 CONV0048
DO 100 I=2,7 CONV0049
XCON(I+54)=XC(I+54)*F9 CONV0050
100 XFS(I)=XH(I)*F2 CONV0051
XFS(33)=XR(33)*F2 CONV0052
XFS(34)=XR(34)*F2 CONV0053
DO 110 I=2,4 CONV0054
XWG(I)=XW(I)*F2 CONV0055
XEL(I)=XE(I)*F2 CONV0056
XFN(I)=XF(I)*F2 CONV0057

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	XJET(I*2)=YJ(I*2)*F2	CONV0058
110	XFC(I*21)=XT(I*21)*F9	CONV0059
	XCON(2)=XC(1)*F2	CONV0060
	DO 120 I=1,2	CONV0061
	XCON(I*2)=XC(I*2)*F2	CONV0062
	XCON(I*5)=XC(I*5)/F2	CONV0063
	XCON(I*7)=XC(I*7)*F2	CONV0064
	XCON(I*10)=XC(I*10)/F2	CONV0065
	XCON(I*24)=XC(I*24)*F2	CONV0066
	XCON(I*26)=XC(I*26)/F2	CONV0067
	XCON(I*28)=XC(I*28)*F2	CONV0068
	XIT(I*11)=YI(I*11)*F2	CONV0069
	XFS(2*I+14)=XH(2*I+14)*F4	CONV0070
	XFS(10*I+11)=XH(10*I+11)*F4	CONV0071
	XFS(2*I+22)=XH(2*I+22)*F5	CONV0072
	XCON(3*I-1)=XC(3*I-1)*F6	CONV0073
	XER(I*3)=XD(I*3)*F7	CONV0074
120	XFC(I*2)=XT(I*2)*F9	CONV0075
	XCON(31)=XC(31)/F2	CONV0076
	XCON(32)=XC(32)*F2	CONV0077
	DO 130 I=36,46,2	CONV0078
130	XCON(I)=XC(I)*F2	CONV0079
	DO 140 I=A,11	CONV0080
140	XFS(I)=XH(I)*F3	CONV0081
	XJET(10)=XJ(10)*F3	CONV0082
	XWG(1)=XW(1)*F4	CONV0083
	YWG(4)=YW(4)*F4	CONV0084
	XEL(1)=XE(1)*F4	CONV0085
	YEL(4)=YE(4)*F4	CONV0086
	XFN(1)=XF(1)*F4	CONV0087
	YFN(4)=YF(4)*F4	CONV0088
	XFS(29)=XR(29)*F5	CONV0089
	XCON(10)=XC(10)*F6	CONV0090
	XIT(14)=XI(14)*F7	CONV0091
	YWG(10)=YW(10)*F9	CONV0092
	YEL(10)=YF(10)*F9	CONV0093
	YFN(10)=YF(10)*F9	CONV0094
	XFC(14)=XT(14)*F9	CONV0095
	XFC(27)=XT(27)*F9	CONV0096
	XIT(4)=XI(4)*F9	CONV0097
	DO 160 N=1,NR	CONV0098
	XRJT(14*(N-1)+10)=XR(14*(N-1)+10)*F1	CONV0099
	XRJT(14*(N-1)+11)=XR(14*(N-1)+11)*F1	CONV0100
	DO 150 I=1,3	CONV0101
	XRJT(14*(N-1)+I)=XR(14*(N-1)+I)*F2	CONV0102
150	XRJT(14*(N-1)+6+I)=XR(14*(N-1)+6+I)*F2	CONV0103
160	CONTINUE	CONV0104
	DO 180 N=1,NL	CONV0105
	XLJT(14*(N-1)+ 8)=XL(14*(N-1)+ 8)*F3	CONV0106
	XLJT(14*(N-1)+12)=XL(14*(N-1)+12)/F1	CONV0107
	XLJT(14*(N-1)+13)=XL(14*(N-1)+13)/F8	CONV0108
	DO 170 I=1,3	CONV0109
170	XLJT(14*(N-1)+I)=XL(14*(N-1)+I)*F2	CONV0110
180	CONTINUE	CONV0111
	RETURN	CONV0112

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END

CONV0113

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SUBROUTINE CONV1 (J,Y,I)	CNV10001
COMMON /MET1/ T1(503),Y(20,6)	CNV10001
DIMENSION X(20,6)	CNV10002
DATA F1,F2,F3,F4,F5,F6,F7,F8,F9/.224809,.343701,.737562,10.76391,	CNV10003
1 35.31466,.571015,.737562,.050539,3.28084/	CNV10004
DO 1 I1=1,6	CNV10004
1 X(I,I1)=Y(I,I1)	CNV10004
IF(J.GT.20) RETURN	CNV10005
GO TO (10,10,10,10,10,10,10,10,20,20,20,20,80,40,80,80,50,60,60,	CNV10006
1 70),J	CNV10007
10 X(I,2)=Y(I,2)*F2	CNV10008
X(I,5)=Y(I,5)*F2	CNV10009
RETURN	CNV10010
20 DO 30 K=1,6	CNV10011
30 X(I,K)=Y(I,K)*F9	CNV10012
40 X(I,3)=Y(I,3)*F1	CNV10013
X(I,5)=Y(I,5)*F1	CNV10014
RETURN	CNV10015
50 X(I,2)=Y(I,2)*F2	CNV10016
RETURN	CNV10017
60 X(I,2)=Y(I,2)*F2	CNV10018
X(I,3)=Y(I,3)*F2	CNV10019
RETURN	CNV10020
70 X(I,3)=Y(I,3)*F2	CNV10021
80 RETURN	CNV10022
END	CNV10023

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SUBROUTINE CON1 (XCON,COLJET)	CON10001
COMMON /STRIMA/ AY,VH,AGW,IXZ,XAD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,	CON10002
1 COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),	CON10003
2 TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA,	CON10004
3 CPWIC,DIXIZ,DIYIX,DIZIY,FTKTS,KREAD,PIU30,	CON10005
4 TSTAR(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RUDIND,	CON10006
5 ZDELT1,ZDELT2	CON10007
COMMON /MANAL/ Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,	CON10008
1 ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CDRWG,CLELE,	CON10009
2 CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL,	CON10010
3 XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,	CON10011
4 YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,	CON10012
5 ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1	CON10013
DIMENSION XCON(63)	CON10014
DATA DTR,POIDTR/.1745329E-01,.1745329E-03/	CON10015
C SET UP VALUES FOR MAIN THROTTLE	CON10016
COLL(1)=XCON(1)	CON10017
IF(COLL(1).EQ.0.) COLL(1)=100.	CON10018

	RANGE=COLL(1)*P01DTR	CON10019
	COLJET=XCON(2)*COLL(1)/100.	CON10020
C	SET UP VALUES FOR LONG STICK	CON10021
	CYCF(1)=XCON(25)	CON10022
	IF(CYCF(1).EQ.0.) CYCF(1)=100.	CON10023
	CYCF(2)=-.5*XCON(25)*DTR	CON10024
	IF(CYCF(2).EQ.0.) CYCF(2)=-.8726646	CON10025
	CYCF(3)=XCON(25)*P01DTR	CON10026
	IF(CYCF(3).EQ.0.) CYCF(3)=DTR	CON10027
	ALGE1=XCON(27)	CON10028
	ALGE2=XCON(28)	CON10029
C	SET UP VALUES FOR LAT STICK	CON10030
	CYCL(1)=XCON(24)	CON10031
	IF(CYCL(1).EQ.0.) CYCL(1)=100.	CON10032
	CYCL(2)=XCON(30)*DTR	CON10033
	IF(CYCL(2).EQ.0.) CYCL(2)=-.8726646	CON10034
	CYCL(3)=XCON(24)*P01DTR	CON10035
	IF(CYCL(3).EQ.0.) CYCL(3)=DTR	CON10036
	CYPWIC=XCON(31)	CON10037
C	SET UP VALUES FOR PEDAL	CON10038
	PEDA(1)=XCON(32)	CON10039
	IF(PEDA(1).EQ.0.) PEDA(1)=100.	CON10040
	PEDA(2)=XCON(33)*DTR	CON10041
	IF(PEDA(2).EQ.0.) PEDA(2)=-.8726646	CON10042
	PEDA(3)=XCON(34)*P01DTR	CON10043
	IF(PEDA(3).EQ.0.) PEDA(3)=DTR	CON10044
	RUDIND=1.	CON10045
	RETURN	CON10046
	END	CON10047

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	SUBROUTINE CPLOT(NPLOT)	CPL00001
	COMMON /TOPLOT/ ADUM(28),NPART,NVARA,NVARB,NVARC,NSCALE,NVARS,	CPL00002
	1 NPRINT,NTIME	CPL00003
	COMMON /PLOT/ HEAD(2,210)	CPL00004
	INTEGER HEAD	CPL00005
	DIMENSION A(204)	CPL00006
	DIMENSION X(200),Y1(200),Y2(200),Y3(200)	CPL00007
	DIMENSION LAHY(2),LAFX(2),LARTL(14),NPTS(2),LABVAL(2),VLABL(2)	CPL00008
	DATA LAFX /10HTIME, SECO,3HNDS/	CPL00009
	READ 10, LARTL	CPL00010
10	FORMAT(8A10/6A10)	CPL00011
	FAC=NSCALE/100.	CPL00012
	NPTS(2)=0	CPL00013
	NPT=0	CPL00014
20	READ(3) IP,T,A	CPL00015
	IF(T.GT.1000.) GOTO 30	CPL00016
	NTIME=NTIME+1	CPL00017
	IF(NTIME.EQ.NPRINT) NTIME=0	CPL00018
	IF(NTIME.NE.0) GOTO 20	CPL00019
	NPT=NPT+1	CPL00020
	X(NPT)=T	CPL00021

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Y1(NPT)=A(NVARA)	CPL00022
Y2(NPT)=A(NVARH)	CPL00023
Y3(NPT)=A(NVARC)	CPL00024
IF(NPT.GE.200) GOTO 30 \$ GOTO 20	CPL00025
30 IF(NVARA.EQ.0) GOTO 70	CPL00026
NPTS(1)=NPT	CPL00027
DO 40 I=1,2	CPL00028
40 LABY(I)=HEAD(I,NVARA)	CPL00029
CALL GPPR (NPLOT,LABY,2,LABX,2,LABTL,14,X,Y1,NPTS,LABVAL,0,	CPL00030
1 VLABL,0,3,1,FAC)	CPL00031
IF(NVARH.EQ.0) GOTO 70	CPL00032
DO 50 I=1,2	CPL00033
50 LABY(I)=HEAD(I,NVARA)	CPL00034
CALL GPPR (NPLOT,LABY,2,LABX,2,LABTL,14,X,Y2,NPTS,LABVAL,0,	CPL00035
1 VLABL,0,3,1,FAC)	CPL00036
IF(NVARC.EQ.0) GOTO 70	CPL00037
DO 60 I=1,2	CPL00038
60 LABY(I)=HEAD(I,NVARC)	CPL00039
CALL GPPR (NPLOT,LABY,2,LABX,2,LABTL,14,X,Y3,NPTS,LABVAL,0,	CPL00040
1 VLABL,0,3,1,FAC)	CPL00041
70 RETURN	CPL00042
END	CPL00043

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SUBROUTINE CURVET	CURV0001
COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,	CURV0002
1 NPART,NVARA,NVARH,NVARC,NSCALE	CURV0003
1 ,NVAR5,NPRINT,NTIME	CURV0004
COMMON /PLOTD/ HEAD(2,210)	CURV0005
1 DIMENSION A(209),NC(209),AMP(209),PHI(209),C(209),SUM1(209),	CURV0006
1 SUM2(209),SUM3(209),SUM4(209),COEF(209),NUMC(209)	CURV0007
CALL TIMEY (TUSED,TOTLT,TLEFT)	CURV0008
DTR=.174532925E-01	CURV0009
DTRR=57.2957745	CURV0010
TWOPI=6.283185307	CURV0011
C INITIALIZE VARIABLE SUMS	CURV0012
DO 10 I=1,209	CURV0013
NC(I)=0	CURV0014
SUM1(I)=0.	CURV0015
SUM2(I)=0.	CURV0016
SUM3(I)=0.	CURV0017
SUM4(I)=0.	CURV0018
10 CONTINUE	CURV0019
C READ CODES FOR VARIABLES TO BE FIT	CURV0020
READ (5,140) (NC(I),I=1,NVARA)	CURV0021
C SKIP TRANSIENT POINTS	CURV0022
DO 20 I=1,NVARC	CURV0023
READ (3) IPSN,T,A	CURV0024
20 CONTINUE	CURV0025
C CHANGE INPUT CPS TO RAD/SEC AND INITIALIZE TIME SUMS	CURV0026
OMEGA=AL(1)*TWOPI	CURV0027
S1=0.	CURV0028


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S2=0.
S3=0.
S4=0.
S5=0.
KOUNT=0
30 READ (J) JPSN,T,A
IF (EOF(3)) 60,40
40 CONTINUE
IF (KOUNT.EQ.0) TSTART=T
IF (T.GT.9.E+07) GO TO 60
OT=OMEGA*T
X=SIN(OT)
Y=COS(OT)
C COMPUTE SUMS WHICH ARE CONSTANT WRT VARIABLES AND COUNT POINTS
S1=S1+X
S2=S2+Y
S3=S3+X*X
S4=S4+Y*Y
S5=S5+X*Y
KOUNT=KOUNT+1
C COMPUTE SUMS DEPENDENT UPON EACH VARIABLE
DO 50 J=1,NVARA
I=NC(J)
B=A(I)
SUM1(I)=SUM1(I)+B
SUM2(I)=SUM2(I)+B*X
SUM3(I)=SUM3(I)+B*Y
SUM4(I)=SUM4(I)+B*B
50 CONTINUE
GO TO 30
C COMPUTE INTERMEDIATE VARIABLES
60 DIFF1=KOUNT*S3-S1**2
DIFF2=KOUNT*S4-S2**2
DIFF3=KOUNT*S5-S1*S2
DENOM=DIFF1*DIFF2-DIFF3**2
CALL WROT
WRITE (6,150) TSTART,AL(1)
C COMPUTE AMPLITUDE, PHASE ANGLE, CONSTANT, AND RESIDUE
DO 70 J=1,NVARA
I=NC(J)
DIFF5=KOUNT*SUM2(I)-S1*SUM1(I)
DIFF6=KOUNT*SUM3(I)-S2*SUM1(I)
CON1=(DIFF5*DIFF2-DIFF6*DIFF3)/DENOM
CON2=(DIFF1*DIFF6-DIFF5*DIFF3)/DENOM
AMP(I)= SQRT(CON1**2+CON2**2)
PHI(I)= ATAN2(CON2,CON1)*DTRR
CON3=(SUM1(I)-CON1*S1-CON2*S2)/KOUNT
DIFF7 =CON1*(CON1*S3-2.*SUM2(I)+2.*CON2*S5+2.*CON3*S1)
1 +CON2*(CON2*S4-2.*SUM3(I)+2.*CON3*S2)
2 +CON3*(KOUNT*CON3-2.*SUM1(I))*SUM4(I)
C(I)=CON3
COEF(I)= SQRT(1.-DIFF7/(SUM4(I)-SUM1(I)**2/KOUNT))
WRITE (6,160) (HEAD(K,I),K=1,2),AMP(I),PHI(I),C(I),COEF(I)
70 CONTINUE
IF (NVARB.EQ.0) GO TO 100

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CURV0029
CURV0030
CURV0031
CURV0032
CURV0033
CURV0034
CURV0035
CURV0036
CURV0037
CURV0038
CURV0039
CURV0040
CURV0041
CURV0042
CURV0043
CURV0044
CURV0045
CURV0046
CURV0047
CURV0048
CURV0049
CURV0050
CURV0051
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CURV0055
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CURV0057
CURV0058
CURV0059
CURV0060
CURV0061
CURV0062
CURV0063
CURV0064
CURV0065
CURV0066
CURV0067
CURV0068
CURV0069
CURV0070
CURV0071
CURV0072
CURV0073
CURV0074
CURV0075
CURV0076
CURV0077
CURV0078
CURV0079
CURV0080
CURV0081
CURV0082
CURV0083


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      CALL WROT
      WRITE (6,170)
C      AMPLITUDE AND PHASE ANGLE COMPARISONS
      DO 90 I=1,NVARB
      READ (5,140) NNUM,ND,(NUMC(J),J=1,NNUM)
      Q1=1./AMP(ND)
      Q2=PHI(ND)
      DO 80 K=1,NNUM
      J=NUMC(K)
      RATIO=AMP(J)*Q1
      DIFF=PHI(J)-Q2
      WRITE (6,180) (HEAD(L,J),L=1,2),(HEAD(L,ND),L=1,2),RATIO,DIFF
      80 CONTINUE
      90 CONTINUE
      100 KLIN=AL(2)+.1
      IF (KLIN.EQ.0) GO TO 130
      CALL WROT
      WRITE (6,220)
      DO 120 J=1,KLIN
      READ (5,140) NDEP,NIN1,NIN2
      SIN2=SIN((PHI(NIN1)-PHI(NIN2))*DTR)
      IF (ABS(SIN2).LT..0001) GO TO 110
      SIN1=SIN((PHI(NIN1)-PHI(NDEP))*DTR)
      SIN3=SIN((PHI(NDEP)-PHI(NIN2))*DTR)
      XK1=AMP(NDEP)/SIN2
      XK2=XK1*SIN3
      XK3=XK1*SIN1
      BK=XK2/AMP(NIN1)
      CK=XK3/AMP(NIN2)
      DK=C(NDEP)-BK*C(NIN1)-CK*C(NIN2)
      WRITE (6,200) (HEAD(K,NDEP),K=1,2),(HEAD(K,NIN1),K=1,2),BK,
      1 (HEAD(K,NIN2),K=1,2),CK,DK
      GO TO 120
      110 WRITE (6,210) (HEAD(K,NIN1),K=1,2),(HEAD(K,NIN2),K=1,2)
      120 CONTINUE
      130 CALL TIMEX (TUSED,TOELT,TLEFT)
      WRITE (6,190) TOELT,TUSED
      RETURN
      140 FORMAT (14I5)
      150 FORMAT(1H0//1H .32X.3HLEAST SQUARES CURVE FIT STARTING AFTER,
      1 F7.3,22H SECONDS MANEUVER TIME,//1H .23X,
      1 54HF(7) = AMPLITUDE*SIN(OMEGA*T + PHASE ANGLE) + CONSTANT
      2 10X.12HWITH OMEGA =.F6.3,4H CPS//1H .14X,
      3 8HVAR[ABLE,17X.9HAMPLITUDE,6X.21HPHASE ANGLE (DEGREES),7X,
      4 8HCONSTANT,11X.12HCOEF. OF CORR)
      160 FORMAT(1H0,6X,2A10,4(6X,G15.5))
      170 FORMAT(1H0//1H .48X.37HAMPLITUDE AND PHASE ANGLE COMPARISONS//
      1 1H .27X.4HVAR[ABLES,27X.1SHAMPLITUDE RATIO,3X,
      2 23HPHASE ANGLE DIFFERENCE )
      180 FORMAT(1H0,7X,2A10,1H/,2A10,2(7X,G15.5))
      190 FORMAT(1H0,10X,F10.3,31H MINUTES USED IN CURVE FITTING,
      1 F10.3,30H MINUTES TOTAL COMPUTING TIME )
      200 FORMAT(1H0,30X,1HA,10X,2A10/
      1 1H .30X,1HB,10X,2A10,10X,G15.5/
      2 1H .30X,1HC,10X,2A10,10X,G15.5/

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CURV0084
CURV0085
CURV0086
CURV0087
CURV0088
CURV0089
CURV0090
CURV0091
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CURV0093
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CURV0095
CURV0096
CURV0097
CURV0098
CURV0099
CURV0100
CURV0101
CURV0102
CURV0103
CURV0104
CURV0105
CURV0106
CURV0107
CURV0108
CURV0109
CURV0110
CURV0111
CURV0112
CURV0113
CURV0114
CURV0115
CURV0116
CURV0117
CURV0118
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CURV0120
CURV0121
CURV0122
CURV0123
CURV0124
CURV0125
CURV0126
CURV0127
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CURV0131
CURV0132
CURV0133
CURV0134
CURV0135
CURV0136
CURV0137
CURV0138

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3      1H .6XX.8HCONSTANT .10X.015.5) CURV0139
210 FORMAT(1H0.10X.35HTHE PHASE ANGLE DIFFERENCE BETWEEN .2A10. CURV0140
1      5H AND .2A10/1H .10X. 49HIS A MULTIPLE OF 180 DEGREES. THEREFOCURV0141
2RE. NO VARIABLE CAN BE EXPRESSED AS A LINEAR FUNCTION OF THEM.) CURV0142
220 FORMAT(1H0//1H .35X. 62HVARIAHLE 'A' AS A LINEAR COMBINATION OF VACURV0143
1PIAHLES 'R' AND 'C'//1H .56X.21H A = KB°B + KC°C + KD//1H . CURV0144
2      27X.6HVARIABLE.16X.4HNAME.2CX.11HCOEFFICIENT// CURV0145
END CURV0146

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SUBROUTINE DAMPER CURV0001
COMMON /STRIAB/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ, DAMP0002
1      PD(6,7),DTR,EPD,EPR(6),KMI,RHO,R12,SPD(6,6,1), DAMP0003
2      XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7), DAMP0004
3      XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),HLCG, DAMP0005
4      DAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63), DAMP0006
5      XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7), DAMP0007
6      STACG,TZERO,DTRHS),MXPASS,XLIMIT,XRJT(140),YRJT(7) DAMP0008
7      ,XLJT(84),YLJT(7) DAMP0009
      XLIMIT=.5*XLIMIT DAMP0010
      &F(XLIMIT,LT,XMIN) XLIMIT=XMIN DAMP0011
      EPD=.5*XLIMIT DAMP0012
      IF(EPD.LT..1745329E-03) EPD=.1745329E-03 DAMP0013
      DO 10 I=1,11 DAMP0014
      DEPD(I)=EPD*EPDX(I) DAMP0015
10 CONTINUE DAMP0016
      RETURN DAMP0017
      END DAMP0018

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BLOCK DATA DATA0001
COMMON /PLOT0/ PLOT2(2,10),PLOT3(2,10),PLOT4(2,10),PLOT5(2,10), DATA0002
U      PLOT10(2,20),PLOT11(2,10),PLOT1A(2,10),PLOT1B(2,10), DATA0003
1      PLOT1C(2,10),PLOT1D(2,10),PLOT1E(2,10),PLOT1F(2,10), DATA0004
2      PLOT1G(2,10),PLOT1H(2,10),PLOT1I(2,10),PLOT1J(2,10), DATA0005
3      PLOT1K(2,10),PLOT1L(2,10),PLOT1M(2,10),PLOT1N(2,10) DATA0006
      DATA PLOT10/ 40*10H / DATA0007
      DATA PLOT2 / 10HLIFT THRU.8HT 1. N .10HLIFT THRU.8HT 2. N . DATA0008
1 10HLIFT THRU.8HT 3. N .10HLIFT THRU.8HT 4. N .10HLIFT THRU. DATA0009
2 8HT 5. N .10HLIFT THRU.8HT 6. N .10HLIFT ANGLE.7H 1. DEG. DATA0010
3 10HLIFT ANGLE.7H 2. DEG.10HLIFT ANGLE.7H 3. DEG.10HLIFT ANGLE. DATA0011
4 7H 4. DEG/ DATA0012
      DATA PLOT3 / 10HLIFT ANGLE.7H 5. DEG.10HLIFT ANGLE.7H 6. DEG. DATA0013
1 10HREACT THRU.9HST 1. N .10HREACT THRU.9HST 2. N .10HREACT THRU. DATA0014
2.9HST 3. N .10HREACT THRU.9HST 4. N .10HREACT THRU.9HST 5. N . DATA0015
3 10HREACT THRU.9HST 6. N .10HREACT THRU.9HST 7. N .10HREACT THRU. DATA0016
4.9HST 8. N / DATA0017
      DATA PLOT4 / 10HREACT THRU.9HST 9. N .10HREACT THRU.10HST 10. N DATA0018
1.10HLONG STICK.4H. CM.10HSTAR DEFL.4H DEG.10HLAT STICK.3H CM. DATA0019

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2 10HAILERON DE.7HFL. DEG.10HFWD RCS TH.9HRUST. PCT.10HFWD RCS AN. DATA0020
 3 8HGLE. DEG.10HSPOILER DE.7HFL. DEG.10HAFT RCS TH.9HRUST. PCT/ DATA0021
 DATA PLOTS / 10HAFT RCS AN.8HGLE. DEG.9HRUD PEDAL.8HDEFL. CM. DATA0022
 1 10HRUUDER DEF.6HL. DEG.10HLAT RCS TH.9HRUST. PCT.12°1H / DATA0023
 DATA PLOT1 / 10°1H.10HFLAP DEFL.°4H DEG/ DATA0024
 DATA PLOT2 / 10HX-DOT. MPS.1H.10HY-DOT. MPS.1H.10HZ-DOT. MPS. DATA0025
 1 1H.10HHORIZONTAL.4H DIST. M.9HAIRSPED.°3HKT. 10HHEADING AN. DATA0026
 2 8HGLE. DEG.5HX. M.7.1H.5HY. M.1H.5HZ. M.1H.9HALTITUDE.°2HM / DATA0027
 DATA PLOT3 / 10HGROUND SPE.7HED. KTS.10HFLT PATH A.4HNGLE. DEG. DATA0028
 1 10HU-DOT. MPS.1HS.10HV-DOT. MPS.1HS.10HW-DOT. MPS.1HS. DATA0029
 2 10HP-DOT. DPS.1HS.10HQ-DOT. DPS.1HS.10HR-DOT. DPS.1HS.2°1H. DATA0030
 3 6HU. MPS.1H / DATA0031
 DATA PLOT4 / 6HV. MPS.1H.6HW. MPS.1H.6HP. DPS.1H.6HQ. DPS.1H. DATA0032
 1 6HR. DPS.1H.2°1H.10HPSI-DOT. D.2HPS.10HTheta-DOT.°4H DPS. DATA0033
 2 10HPHI-DOT. D.2HPS.2HPSI. DEG.1H / DATA0034
 DATA PLOT5 / 10HTheta. DEG.1H.6PHI. DEG.1H.10HFIX ENG TH. DATA0035
 1 4HROT. PCT.10HLONG STICK.5H. PCT.10HALPHA (L W.9HING). DEG. DATA0036
 2 10HALPHA (R W.9HING). DEG.10HALPHA (STA.7HB). DEG.10HALPHA (FIN. DATA0037
 3 6H). DEG.9HYAW ALPHA.10H(FUS). DEG.9HFS CG. CM.1H / DATA0038
 DATA PLOT6 / 9HU (GUST).°3HMPS.8HN-X. G'S.1H.10HLAT STICK.°4H PCT/ DATA0039
 1.10HCL (L WING.1H).10HCL (R WING.1H).9HCL (STAR).1H.8HCL (FIN). DATA0040
 2 1H.10HALPHA (FUS.6H). DEG.9HBL CG. CM.1H.9HV (GUST).°3HMPS/ DATA0041
 DATA PLOT7 / 8HN-Y. G'S.1H.10HRUD PEDAL.°4H PCT.10HCD (L WING. DATA0042
 1 1H).10HCD (R WING.1H).9HCD (STAR).1H.8HCD (FIN).1H.9HWL CG. CM. DATA0043
 2 1H.9HW (GUST).°3HMPS.8HN-Z. G'S.1H.10HLIFT THROT.7H 1. PCT/ DATA0044
 DATA PLOT8 / 10HLIFT THROT.7H 2. PCT.10HANGLE LEVE.8HR 1. PCT. DATA0045
 1 10HRT JET THR.8HUST. N.10HANGLE LEVE.8HR 2. PCT.10HLEFT JET T. DATA0046
 2 10HHRUST. N.9HFX-TOTAL.°3HN.10HFX-RT WING.5H. N. DATA0047
 3 10HFX-L WING.°4H N.10HFX-STAB. N.2H.10HFX-FUS. N.1H / DATA0048
 DATA PLOT9 / 10HFX-PT JET.°4H N.10HFX-LEFT JE.6HT. N. DATA0049
 1 10HFX-REACT J.8HETS. N.10HFX-LIFT JE.7HTS. N.10HFX-INLET. DATA0050
 2 1HN.10HFX-FIN. N.1H.10HFX-WEIGHT.°4H N.10HFX-INTERFE. DATA0051
 3 10HRENCE. N.9HFX-TOTAL.°3HN.10HFX-FUS. N.1H / DATA0052
 DATA PLOT10 / 10HFX-RT JET.°4H N.10HFX-LEFT JE.6HT. N. DATA0053
 1 10HFX-REACT J.8HETS. N.10HFX-LIFT JE.7HTS. N.10HFX-INLET. DATA0054
 2 1HN.10HFX-FIN. N.1H.10HFX-WEIGHT.°4H N.10HFX-INTERFE. DATA0055
 3 10HRENCE. N.9HFZ-TOTAL.°3HN.10HFZ-RT WING.5H. N. / DATA0056
 DATA PLOT11 / 10HFZ-L WING.°4H N.10HFZ-STAB. N.2H.10HFZ-FUS. N. DATA0057
 1.1H.10HFZ-RT JET.°4H N.10HFZ-LEFT JE.6HT. N.10HFZ-REACT J. DATA0058
 2 8HETS. N.10HFZ-LIFT JE.7HTS. N.10HFZ-INLET. 1HN. DATA0059
 3 10HFZ-WEIGHT.°4H N.10HFZ-INTERFE.10HRENCE. N. / DATA0060
 DATA PLOT12 / 9HRM-TOTAL.°6HN.M.10HRM-R WING.°7H N.M. DATA0061
 1 10HRM-L WING.°7H N.M.10HRM-STAR. N.5H.M.10HRM-FUS. N. DATA0062
 2 4HM.10HRM-RT JET.°7H N.M.10HRM-LEFT JE.9HT. N.M. DATA0063
 3 10HRM-REACT J.10HTS. N.M.10HRM-LIFT JE.10HTS. N.M. DATA0064
 4 10HRM-INLET. °4HN.M / DATA0065
 DATA PLOT13 / 10HRM-FIN. N.°4HM.10HRM-GYRO. N.5H.M. DATA0066
 1 10HRM-INTERFE.10HRE. N.M.9HPM-TOTAL.°6HN.M.10HPM-R WING. DATA0067
 2 7H N.M.10HPM-L WING.°7H N.M.10HPM-STAB. N.5H.M. DATA0068
 3 10HPM-FUS. N.°4HM.10HPM-RT JET.°7H N.M.10HPM-LEFT JE. DATA0069
 4 9HT. N.M. / DATA0070
 DATA PLOT14 / 10HPM-REACT J.10HTS. N.M.10HPM-LIFT JE. DATA0071
 1 10HTS. N.M.10HPM-INLET. °4HN.M.10HPM-FIN. N.°4HM. DATA0072
 2 10HPM-GYRO. N.5H.M.10HPM-INTERFE.10HRE. N.M.9HY4-TOTAL. DATA0073
 3 6HN.M.10HYM-R WING.°7H N.M.10HYM-L WING.°7H N.M. DATA0074

4 10HYM-STAR, N.5H.M /	DATA00075
DATA PLOTN / 10HYM-FINS, N.,4HM .10HYM-RT JET.,.7H N.M .	DATA00076
1 10HYM-LEFT JE.9HT, N.M .10HYM-REACT J.10HTS. N.M .	DATA00077
2 10HYM-LIFT JE.10HTS, N.M .10HYM-INLET, .4HN.M .10HYM-FIN, N.,	DATA00078
3 4HM .10HYM-GYRO, N.5H.M .10HYM-INTERFE.10HRE, N.M .2*1H /	DATA00079
END	DATA00080

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SUBROUTINE DET	DET00001
COMMON /STRD/ UX,UY,UO,VO,T,A(9,2),N,NS,G(6,2),SLIM,ID,IL	DET00002
N1=N-1	DET00003
K=0	DET00004
UD=1.	DET00005
VO=0.	DET00006
DO 240 L=1,N1	DET00007
J=K+L	DET00008
JN=J+N	DET00009
J1=J+1	DET00010
K=K+N	DET00011
IF (UY.NE.0.) GO TO 110	DET00012
IF (A(J,1))50,10,50	DET00013
10 DO 20 I=J1,K	DET00014
IF (A(I,1))30,20,30	DET00015
20 CONTINUE	DET00016
GO TO 250	DET00017
30 UD=-UD	DET00018
IM=I-J	DET00019
DO 40 I=J,NS,N	DET00020
IMM=I+IM	DET00021
B=1(I,1)	DET00022
A(I,1)=A(IMM,1)	DET00023
40 A(IMM,1)=B	DET00024
50 UD=UD*A(J,1)	DET00025
XD=-1./A(J,1)	DET00026
DO 60 I=J1,K	DET00027
IF (A(I,1).NE.0.) A(I,1) = A(I,1)*XD	DET00028
60 CONTINUE	DET00029
DO 100 M=JN,NS,N	DET00030
IF (A(M,1))70,100,70	DET00031
70 MJ=M-J	DET00032
DO 90 I=J1,K	DET00033
&F(A(I,1))80,90,80	DET00034
80 IC=MJ+I	DET00035
A(IC,1)= A(IC,1)+A(I,1)*A(M,1)	DET00036
90 CONTINUE	DET00037
100 CONTINUE	DET00038
GO TO 240	DET00039
110 IF (A(J,1). NE. 0..OR. A(J,2). NE. 0.) GO TO 150	DET00040
DO 120 I=J1,K	DET00041
&F(A(I,1). NE. 0..OR. A(I,2).NE. 0.) GO TO 130	DET00042
120 CONTINUE	DET00043
GO TO 250	DET00044

130 UD=-UD	DET00045
VD=-VD	DET00046
AM=9-J	DET00047
DO 140 I=J,NS,N	DET00048
IMM=I+IM	DET00049
DO 140 M=1,2	DET00050
E=1(I,M)	DET00051
AE(I,M)=A(IMM,M)	DET00052
140 AE(IMM,M)=A	DET00053
150 C=UD*A(J,1)-VD*A(J,2)	DET00054
VD=UD*A(J,2)+VD*A(J,1)	DET00055
UD=C	DET00056
&F(A(J,1))170,160,170	DET00057
160 XD=0.	DET00058
YD=1./A(J,2)	DET00059
GO TO 180	DET00060
170 X=-1(J,2)/A(J,1)	DET00061
XM=(1.+XR*XR)*A(J,1)	DET00062
XD=-1./XM	DET00063
YD=XR/XM	DET00064
180 DO 210 I=J1,K	DET00065
190 H=XD*A(I,1)-YD*A(I,2)	DET00066
AE(I,2)=XD*A(I,2)+YD*A(I,1)	DET00067
200 A(I,1)=H	DET00068
210 CONTINUE	DET00069
DO 230 M=JN,NS,N	DET00070
IF(A(M,1).EQ.0..AND.A(M,2).EQ.0.)GO TO 230	DET00071
MJ=M-J	DET00072
DO 220 I=J1,K	DET00073
IF(A(I,1).EQ.0..AND.A(I,2).EQ.0.)GO TO 220	DET00074
&C=MJ+1	DET00075
A(IC,1)=A(IC,1)+A(I,1)*A(M,1)-A(I,2)*A(M,2)	DET00076
A(IC,2)=A(IC,2)+A(I,1)*A(M,2)+A(I,2)*A(M,1)	DET00077
220 CONTINUE	DET00078
230 CONTINUE	DET00079
240 CONTINUE	DET00080
&F(UY)280,260,280	DET00081
250 UD=0.	DET00082
260 UD=UD*A(NS,1)	DET00083
270 VD=0.	DET00084
RETURN	DET00085
280 UD=UD*A(NS,1)-VD*A(NS,2)	DET00086
VD=UD*A(NS,2)+VD*A(NS,1)	DET00087
RETURN	DET00088
END	DET00089

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SUBROUTINE ELEC (GAIN)	ELEC0001
COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NUMRTS,GAINB,	ELEC0002
1 INDEX,STGAIN(6),TSTAR,COELTD,SLOT(3,9)	ELEC0003
GAIN=1.	ELEC0004
IX=INDEX*3	ELEC0005

DO 40 I=1,NUMRTS	ELEC0006
IX=IX+1	ELEC0007
U=UU(I)	ELEC0008
V=VV(I)	ELEC0009
IF(V.EQ.0.) GO TO 10	ELEC0010
IF(V.NE.-VV(I+1)) GO TO 20	ELEC0011
Z=1./(U**2+V**2)	ELEC0012
TAU(IX)=Z	ELEC0013
DAMP(IX)=-2.*Z*U	ELEC0014
GAIN=GAIN/Z	ELEC0015
GO TO 40	ELEC0016
10 CONTINUE	ELEC0017
IF(U.EQ.0.) GO TO 20	ELEC0018
DAMP(IX)=-1./U	ELEC0019
GAIN=-GAIN*U	ELEC0020
GO TO 30	ELEC0021
20 CONTINUE	ELEC0022
DAMP(IX)=0.	ELEC0023
30 CONTINUE	ELEC0024
TAU(IX)=0.	ELEC0025
40 CONTINUE	ELEC0026
IF(NUMRTS.GE.3) RETURN	ELEC0027
IX=IX+1	ELEC0028
TAU(IX)=0.	ELEC0029
DAMP(IX)=0.	ELEC0030
UU(3)=0.	ELEC0031
VV(3)=0.	ELEC0032
RETURN	ELEC0033
END	ELEC0034

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SUBROUTINE GUST (J)	GUS00001
COMMON /STAMAN/	XX,YY,AY1,RY,APBG,ARBG,ASEP,AYBG,CGHL,DPIX,DP1Z,
1	R550,AYDMX,DELTA,DPIXZ,HDELTA,HGUST,KTCR,RMASS,
2	TWOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELTA2R,
3	POIDTR,RDELTA1,RDELTA2
COMMON /MANAL/	Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,
1	ALFIN,ALLWG,ALRWG,CUELE,CDFIN,CDLWG,CDRWG,CLLEF,
2	CLFIN,CLLWG,CLRWG,CWING,CYCRI,CYCR2,RANGE,WGCOL,
3	XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,
4	YAELE,YAFUS,YALWG,YARWG,YAJET,YARJET,ZAJET,
5	ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1
COMMON /ROMAN/	PI,ZZ,ALT,T,APDD,ARDD,AYDD,DTRR,GMAXV,RATE1,
1	RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP,
2	LNTH1,PILGH1,START2
COMMON /MANARO/	I,V,NWAG,TDELTA,HGUSTE,HGUSTF,HGUSTW,VGUSTF,VGUSTW,
1	YGUSTF,GFWO,GLAT,GVERT,VXH,VZH,APD,VYH,ARD,AYD,
2	COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE
COMMON /STANRO/	J1,W,LINK,DELE,VEND,YFIN(2),ZFEL(2),COND1,SWING,
1	PILGH2,PWGEL1
REAL LNTH1	
DIMENSION XSTA(7),AGUST(7)	


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XSTA(1)=SQRT((XX**2+YY**2))-XGUST
CALL VR3D (XAFIN,YAFIN,ZAFIN,AYE,APE,ARE,STA,BL,TV,1)
XSTA(2)=SQRT((XX+STA)**2+(YY+HL)**2)-XGUST
CALL VR3D (XAELE,0.,ZAELE,AYE,APE,ARE,STA,BL,TV,1)
XSTA(3)=SQRT((XX+STA)**2+(YY+HL)**2)-XGUST
CALL VR3D (XAWG,0.,ZAWG,AYE,APE,ARE,STA,BL,TV,1)
XSTAW=SQRT((XX+STA)**2+(YY+HL)**2)-XGUST
K=7
IF(QWG.LT.0) K=4
DO 10 M=1,4
  AGUST(M)=0.
  AGUST(M+3)=0.
  BILL=M
  &FEQG.LT.0) BILL=2.
10 XSTA(M+3)=XSTAW*(.5-.25*BILL)*CWIN
  GUSTY=J
  IF(J.EQ.10.OR.J.EQ.12) GO TO 60
  DO 50 M=1,K
  IF(XSTA(M).GE.LNGTH1) GO TO 20
  &F(XSTA(M).LE.0.) GO TO 50
  AGUST(M)=XSTA(M)*RATE1
  GO TO 50
20 IF(XSTA(M).GE.STOP2) GO TO 30
  IF(XSTA(M).LE.START2) GO TO 40
  AGUST(M)=GMAXV3*XSTA(M)*RATE2
  GO TO 50
30 AGUST(M)=GMAXV
  GO TO 50
40 AGUST(M)=GMAXV1
50 CONTINUE
  GO TO 80
60 DO 70 M=1,K
  IF(XSTA(M).GT.0.0.AND.XSTA(M).LT.LNGTH1)
    1 AGUST(M)=GMAXV1*(SIN(XSTA(M)*PILGH1))**2
  IF(XSTA(M).GT.START2.AND.XSTA(M).LT.STOP2)
    1 AGUST(M)=GMAXV2*(SIN((XSTA(M)-START2)*PILGH2))**2
70 CONTINUE
80 HGUSTW=AGUST(4)
  IF(K.EQ.7) HGUSTW=.25*(AGUST(4)+AGUST(5)+AGUST(6)+AGUST(7))
  IF(J.GT.10) GO TO 90
  CALL VR3D (0.,0.,HGUSTW,AYE,APE,ARE,HGUSTW,YGUSTW,VGUSTW,-1)
  CALL VR3D (0.,0.,AGUST(3),AYE,APE,ARE,HGUSTW,TV,VGUSTW,-1)
  CALL VR3D (0.,0.,AGUST(2),AYE,APE,ARE,HGUSTW,YGUSTW,TV,-1)
  CALL VR3D (0.,0.,AGUST(1),AYE,APE,ARE,HGUSTW,YGUSTW,VGUSTW,-1)
  RETURN
90 CALL VR3D (HGUSTW,0.,0.,AYE,APE,ARE,HGUSTW,YGUSTW,VGUSTW,-1)
  CALL VR3D (AGUST(3),0.,0.,AYE,APE,ARE,HGUSTW,TV,VGUSTW,-1)
  CALL VR3D (AGUST(2),0.,0.,AYE,APE,ARE,HGUSTW,YGUSTW,TV,-1)
  CALL VR3D (AGUST(1),0.,0.,AYE,APE,ARE,HGUSTW,YGUSTW,VGUSTW,-1)
  RETURN
END

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GUS00022
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SUBROUTINE INIT
COMMON /FORCE/ A(74)
COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,
1 COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PFDA(3),
2 TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA,
3 CPWIC,DIXIZ,DIYIX,DIZIY,FTKTS,KKREAD,PII30,
4 TSTAR(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RJIND,
5 ZDELT1,ZDELT2
COMMON /STAMAN/ XX,YY,AY1,RIY,APBG,ARBG,ASEP,AYBG,CGBL,DPIX,DPIZ,
1 R550,AYDMX,DELT2,DPIX,Z,DELT,HGUST,KTCR,RMASS,
2 TWOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELT2R,
3 P010TR,DELT1,DELT2
COMMON /MANAL/ Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,
1 ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CDRWG,CLELE,
2 CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL,
3 XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,
4 YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,
5 ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1
COMMON /ROMAN/ PI,Z7,ALT,T,APDU,ARUD,AYDD,OTRR,GMAXV,RATE1,
1 RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP,
2 LENGTH1,PILGH1,START2
COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTF,
1 YGUSTF,GFWG,GLAT,GVERT,VXH,VZB,APD,VYB,ARD,AYD,
2 COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE
3 TLSTK(2),THLSTK(2),DUM(6),DFLAP1
COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,
1 NPART,NVAPA,NVARB,NVARC,NSCALE
2 NVARS,NPRINT,NTIME
COMMON /FORV/ Y(4,150)
COMMON /LJETS/ NJETL,ATEM(92),TLJET(6),BTEM(25),DPRJTL(6)
COMMON /RJETS/ NJETR,XSTK(3),CTEM(114),TJETR(10)
COMMON /CONTR/ ADISP(3),ARATE(3),DELTA(4),THR(2),RPCT(3)
DIMENSION PAR(135),A1(74)
DATA DTHR1/57.2957795/
DATA LR,LW/5.6/
DATA XNP,F4,XIC,FPM/4.4482,.3048,2.54,1.3558/
DO 10 J=1,3
JJ=4-J
PAR(J*70)=Y(1,J*89)*FM
PAR(J*76)=Y(1,J*14)*FM
PAR(J*82)=Y(1,J*75)*FM
PAR(J*85)=Y(1,JJ*76)*DTRR1
PAR(J*89)=Y(1,JJ)*FM
PAR(J*92)=Y(1,JJ*3)*DTRR1
PAR(J*96)=Y(1,J*84)*DTRR1
PAR(J*99)=Y(1,J* 9)*DTRR1
10 CONTINUE
DO 20 J=1,6
PAR(J)=TLJET(J)*XNP
20 PAR(J*6)=DPRJTL(J)*57.2957795
DO 30 J=1,10
30 PAR(12*J)=TJETR(J)*XNP
PAR(23)=XSTK(1)*XIC
PAR(24)=DFLTA(1)*DTRR1
PAR(25)=XSTK(2)*XIC
INIT0001
INIT0002
INIT0003
INIT0004
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INIT0055

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PAR(26)=DFLTA(2)*DTRR1	INIT0056
PAR(27)=PPCT(1)*100.	INIT0057
PAR(28)=THR(1)*DTRR1	INIT0058
PAR(29)=DFLTA(4)*DTRR1	INIT0059
PAR(30)=PPCT(2)*100.	INIT0060
PAR(31)=THR(2)*DTRR1	INIT0061
PAR(32)=XSTK(3)*XIC	INIT0062
PAR(33)=DFLTA(3)*DTRR1	INIT0063
PAR(34)=PPCT(3)*100.	INIT0064
PAR(70)=DFLAP1	INIT0065
PAR(74)=DIST*FM	INIT0066
PAR(75)=V*FTKTS	INIT0067
PAR(76)=AVFP*DTRR	INIT0068
PAR(80)=-PAR(74)	INIT0069
PAR(81)=V*FTKTS	INIT0070
PAR(82)=AVFP*DTRR	INIT0071
PAR(84)=Y(1.64)*DTRR1	INIT0072
PAR(86)=Y(1.14)*DTRR1	INIT0073
PAR(103)=COLSTK	INIT0074
PAR(104)=CYSTK1	INIT0075
PAR(105)=ALLWG*DTRR	INIT0076
PAR(106)=ALRWG*DTRR	INIT0077
PAR(107)=ALEL*DTRR	INIT0078
PAR(108)=ALFIN*DTRR	INIT0079
PAR(109)=AY*DTRR	INIT0080
PAR(110)=CGSTA*XIC	INIT0081
PAR(111)=HGUST	INIT0082
PAR(112)=-GFWD	INIT0083
PAR(113)=CYSTK2	INIT0084
PAR(114)=CLLWG	INIT0085
PAR(115)=CLRWG	INIT0086
PAR(116)=CLFLE	INIT0087
PAR(117)=CLFIN	INIT0088
PAR(118)=AP*DTRR	INIT0089
PAR(119)=CGHL*XIC	INIT0090
PAR(120)=YGUST	INIT0091
PAR(121)=-GLAT	INIT0092
PAR(122)=PFDAL	INIT0093
PAR(123)=COLWG	INIT0094
PAR(124)=CDRWG	INIT0095
PAR(125)=CDELE	INIT0096
PAR(126)=CDFIN	INIT0097
PAR(127)=CGWL*XIC	INIT0098
PAR(128)=VGUST	INIT0099
PAR(129)=GVERT	INIT0100
PAR(130)=TLSTK(1)	INIT0101
PAR(131)=TLSTK(2)	INIT0102
PAR(132)=THLSTK(1)	INIT0103
PAR(133)=TAXR*XNP	INIT0104
PAR(134)=THLSTK(2)	INIT0105
PAR(135)=TAXL*XNP	INIT0106
DO 40 K=1.35	INIT0107
40 A1(K)=A(K)*XNP	INIT0108
DO 50 K=36.74	INIT0109
50 A1(K)=A(K)*FPNM	INIT0110

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IF(NPART.EQ.1.OR.NPART.EQ.7.OR.NPART.EQ.10.OR.NPART.EQ.9) GO TO 60 INIT0111
WRITE(3) JPSN,T,PAR,41 INIT0112
TIME, 135 PAR-S, 74 A-S INIT0113
NTIME=NTIME+1 INIT0114
&F(NTIME,GF,NPRINT) NTIME=0 INIT0115
IF(NTIME.NF.0) RETURN INIT0116
60 CONTINUE INIT0117
CALL TIMEX(TUSED,DTIME,TLEFT) INIT0118
WRITE(LW,70) T,TUSED INIT0119
WRITE(LW,80) (PAR(J),J=71,82) INIT0120
WRITE(LW,90) (PAR(J),J=83,102) INIT0121
WRITE(LW,100) (PAR(J),J=103,129) INIT0122
WRITE(LW,110) (PAR(J),J=130,135),DFLAP1 INIT0123
CALL WRFM INIT0124
WRITE(LW,120) (PAR(J),J=1,22) INIT0125
WRITE(LW,130) (PAR(J),J=23,34) INIT0126
RETURN INIT0127
70 FORMAT (1H1,10X,F8.3,3X,21HSECONDS MANEUVER TIME,10X, INIT0128
1 F8.3,3X,30HMINUTES ELAPSED COMPUTING TIME,5X, INIT0129
2 28HNEWTONS,METRES,DEG,SEC UNITS) INIT0130
80 FORMAT (1H0,50X,16HGROUND REFERENCE,/ INIT0131
1 38X,1HX,9X,1HY,9X,1HZ,24X,28HSPEED (KTS) FLT PATH ANGLES/ INIT0132
2 22X,10HVELOCITY ,3F10.3,11H DISTANCE ,F8.1, INIT0133
3 6H AIR ,F7.2,10H HEADING ,F8.3/ INIT0134
4 22X,10HLOCATION ,3F10.3,11H ALTITUDE ,F8.1, INIT0135
5 6H GND ,F7.2,10H CLIMB ,F8.3) INIT0136
90 FORMAT (1H0,57X,18HFUSELAGE REFERENCE,/ INIT0137
1 20X,1HU,9X,1HV,9X,1HW,9X,1HP,9X,1HQ,9X,1HR, INIT0138
2 17X,24HEULER ANGLES FROM GROUND,/ INIT0139
3 5X,5HACCEL,5X,7F10.3,18X,3HPSI,6X,5HTHETA,6X,3HPHI,/ INIT0140
4 5X,10HVELOCITY ,7F10.3,3X,10HVELOCITY ,3F10.3,/ INIT0141
5 88X,10HLOCATION ,3F10.3) INIT0142
100 FORMAT (1H0,6X,13HCONTROL (PCT),/ INIT0143
1 7X,8HTHRITTLE,3X,F7.2,8X,16HL WING R. WING, INIT0144
2 4X,5HHSTAB,4X,15HVSTAB FUSELAGE,7X,13HC.G. LOC (CM), INIT0145
3 6X,15HGUST (CG) G-S,/ INIT0146
4 7X,11HLONG STICK ,F7.2,6H ATK ,4F9.3, INIT0147
5 7H ATKY ,F8.3,12H STA. LINE ,F7.2, INIT0148
6 7H FWD ,F5.1,7H FWD ,F5.2,/ INIT0149
7 7X,11HLAT STICK ,F7.2,6H CL ,4F9.3, INIT0150
8 7H ATKP ,F8.3,12H B. LINE ,F7.2, INIT0151
9 7H LAT ,F5.1,7H LAT ,F5.2,/ INIT0152
A 7X,5HPEDAL,6X,F7.2,6H CD ,4F9.3,17X,10HW. LINE ,F7.2, INIT0153
B 7H VERT ,F5.1,7H VERT ,F5.2) INIT0154
110 FORMAT (7X,11HL THROT 1 ,F7.2,7X,11HL THROT 2 ,F7.2,10X,6HFIXED INIT0155
1 ,10HJET THRUST/7X,11HL ANGLE 1 ,F7.2,10X,12HRIGHT/CENTER, INIT0156
2 F8.1,/7X,11HL ANGLE 2 ,F7.2,10X,4HLEFT,8X,F8.1, INIT0157
3 10X,16HFLAP DEFL. (DEG),F8.1) INIT0158
120 FORMAT (1H0,57X,19HMOVABLE JET SUMMARY,/1H ,10H NOZZLE ,4X,1H1, INIT0159
1 8X,1H2,8X,1H3,8X,1H4,8X,1H5,8X,1H6,11H THRUST , INIT0160
2 6F9.1/11H THETA-J ,6F9.1//1H0,56X, INIT0161
3 20HREACTION JET SUMMARY/11H NOZZLE ,4X,1H1,8X,1H2,8X, INIT0162
4 1H3,8X,1H4,8X,1H5,8X,1H6,8X,1H7,8X,1H8,8X,1H9,8X,2H10/ INIT0163
5 11H THRUST ,10F9.1) INIT0164
130 FORMAT (1H0,59X,15HCONTROL SUMMARY/27H CONTROL DEFLECTIONS (CM),INIT0165

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1      9X,25HSURFACE DEFLECTIONS (DEG),27X,8HRCS DATA, //      INIT0166
2      17H LONG STICK      ,F6.2,12X,10HSTABILIZER,7X,F6.2,27X,  INIT0167
3      20HPCT      THETA (DEG)/17H LAT STICK      ,F6.2,12X,  INIT0168
4      8HAILERONS,9X,F6.2,17X,JHFTD,6X,F5.1,HX,F5.2/35X,  INIT0169
5      8HSPILERS,9X,F6.2,17X,JHAFT,6X,F5.1,6X,F5.2/34 PEDALS,  INIT0170
6      9X,F6.2,12X,6HRUDDER,11X,F6.2,17X,4HLEFT/RT ,F5.1)  INIT0171
      END      INIT0172

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SUBROUTINE ITRIM(LPASS)      ITRI0001
COMMON /STRIAH/ E(74),F(6),X(6),T1(9),PD(6,7),T2(2),ERR(6),KML,  ITRI0002
1      T3(242),DAMP,T4(12),EPOX(11),T5(83),NPASS,  ITRI0003
2      POPHI(6,7),T6(3),MXPASS,XLIMIT  ITRI0004
COMMON /MANAL/ T7(5),TAXL,TAXR,T8(36),HALFPI  ITRI0005
COMMON /MANAWO/ T9(13),VXB,VZR,APD,VYB,ARD,AYD,  ITRI0006
2      COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE  ITRI0007
3      ,TLSTK(2),THLSTK(2),AT,BT,CT,ATH,BTH,CTH  ITRI0008
COMMON /STANRO/ J,w,T10(7),COND1  ITRI0009
COMMON /TOPLOT/ AH(3),AL(3),EXIT  ITRI0010
COMMON /FORY/ Y(4,150)  ITRI0011
DIMENSION VAR(11),PM(6,7)  ITRI0012
EQUIVALENCE (VAR(1),COLSTK)  ITRI0013
KOUNT=7  ITRI0014
KML=KOUNT-1  ITRI0015
NPASS=0  ITRI0016
KPASS=-1  ITRI0017
CALL TIMEX (TUSED,DTIME,TLEFT)  ITRI0018
10 NPASS=NPASS+1  ITRI0019
KPASS=KPASS+1  ITRI0020
IF (KPASS.EQ.LPASS) KPASS=0  ITRI0021
IF (COND1.NE.0.) WRITE (6,150) NPASS  ITRI0022
J=1  ITRI0023
CALL AJACOP  ITRI0024
IF (EXIT.NE.0.) GO TO 110  ITRI0025
DO 20 K=1,KML  ITRI0026
20 PD(K,KOUNT)=-F(K)  ITRI0027
DO 30 K=1,KML  ITRI0028
IF (ABS(F(K)).GT.DAMP) GO TO 40  ITRI0029
30 CONTINUE  ITRI0030
CALL DAMPER  ITRI0031
40 CONTINUE  ITRI0032
DO 50 K=1,KML  ITRI0033
IF (ABS(F(K)).GT.ERR(K)) GO TO 60  ITRI0034
50 CONTINUE  ITRI0035
GO TO 120  ITRI0036
60 CONTINUE  ITRI0037
IF (KPASS.GT.0) GO TO 80  ITRI0038
J=2  ITRI0039
CALL JACORI  ITRI0040
IF (EXIT.NE.0.) GO TO 110  ITRI0041
IF (KOUNT.EQ.7)  ITRI0042
1 CALL VR3D (Y(1,90),Y(1,91),Y(1,92),AYE,APE,ARE,VXB,VYB,VZB,-1) ITRI0043

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DO 70 I=1,6
F1=4.44622
IF(I.GT.3) F1=1.35582
DO 70 J=1,7
70 PM(I,J)=PD(I,J)*F1
IF(COND1.NE.0.) CALL WRVP (2,VAR,KM1,PM,TAXL,TAXR)
80 CONTINUE
DO 90 J=1,KOUNT
DO 90 I=1,KM1
90 PDPHI(I,J)=PD(I,J)
CALL SOLVE
IF(EXIT.NE.0.) GO TO 130
CALL RATI (X,EPDX,XLIMIT,VAR,AT,BT,CT,ATH,BTH,CTH)
DO 100 I=6,7
IF(ABS(VAR(I)).GT.HALFPI) GO TO 110
100 CONTINUE
IF(NPASS.LT.MXPASS)GO TO 10
110 EXIT=1.
120 CONTINUE
CALL PARA (W,COND1)
RETURN
130 CONTINUE
WRITE (6,140)
RETURN
140 FORMAT (1H0.41HTHE PARTIAL DERIVATIVE MATRIX IS SINGULAR./
152H THIS IS PROBABLY DUE TO A CONTROL BEING UNCONNECTED)
150 FORMAT (1H1/1H ,50X,25H***** START OF ITERATION ,I3,6H ***** )
END

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ITRI0044
ITRI0045
ITRI0046
ITRI0047
ITRI0048
ITRI0049
ITRI0050
ITRI0051
ITRI0052
ITRI0053
ITRI0054
ITRI0055
ITRI0056
ITRI0057
ITRI0058
ITRI0059
ITRI0060
ITRI0061
ITRI0062
ITRI0063
ITRI0064
ITRI0065
ITRI0066
ITRI0067
ITRI0068
ITRI0069
ITRI0070
ITRI0071

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SUBROUTINE IVAR (EXIT,LINK,TAXL,TAXR,PILGH2)
COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,
1 COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),
2 TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA,
3 CPWIC,DIXIZ,DIYIX,DIZIY,FTKTS,KHEAD,PIU30,
4 TSTAR(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RUDIND,
5 ZDELT1,ZDELT2
COMMON /ROMAN/ PI,ZZ,ALT,T,APDD,ARDD,AYDD,DTRR,GMAXV,RATE1,
1 RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP,
2 LENGTH1,PILGH1,START2,DDA1,DDA2,DDA3
COMMON /LJETS/ NJETL,XAJETL(6),YAJETL(6),ZAJETL(6),APBJTL(6),
1 ARBJTL(6),CONLJ(2,5),NCONL(6)
COMMON /MFT1/ T1(553),XCM(20,6)
REAL LENGTH1,LENGTH2
DIMENSION TAX(2)
DATA DTH,TWOPI/.1745329E-01,6.283185/
XDELIM(X1,X2,X3)=AMAX1(X1,AMIN1(X2,X3))
TAX(1)=TAXL
TAX(2)=TAXR
DO 2H0 L=1,KREAD
J=KCIT(L)
IF(J.LT.1.OR.J.GT.31) GO TO 290

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IVAR0001
IVAR0002
IVAR0003
IVAR0004
IVAR0005
IVAR0006
IVAR0007
IVAR0008
IVAR0009
IVAR0010
IVAR0011
IVAR0012
IVAR0012
IVAR0013
IVAR0014
IVAR0015
IVAR0016
IVAR0017
IVAR0018
IVAR0019
IVAR0020
IVAR0021
IVAR0021

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IF(LINK.EQ.1) GO TO 10	IVAR0022
IF(J.EQ.14) GO TO 140	IVAR0023
IF(J.EQ.21) GO TO 290	IVAR0024
IF(J.EQ.22) GO TO 290	IVAR0025
GO TO 280	IVAR0026
10 CONTINUE	IVAR0027
WRITE (6,300) J,(XCM (L,K),K=1,6)	IVAR0028
IF(J.GT.8) GO TO 110	IVAR0029
GO TO (20,30,40,50,60,70,80,90),J	IVAR0030
20 DA=100./COLL(1)	IVAR0031
GO TO 100	IVAR0032
30 DA=100./CYCF(1)	IVAR0033
GO TO 100	IVAR0034
40 DA=100./CYCL(1)	IVAR0035
GO TO 100	IVAR0036
50 DA=100./PENA(1)	IVAR0037
GO TO 100	IVAR0038
60 DA=100./CONLJ(1,1)	IVAR0039
GO TO 100	IVAR0040
70 DA=100./CONLJ(2,1)	IVAR0041
GO TO 100	IVAR0042
80 DA=100./CONLJ(1,2)	IVAR0043
GO TO 100	IVAR0044
90 DA=100./CONLJ(2,2)	IVAR0045
100 XCIT(L,2)=XCIT(L,2)*DA	IVAR0046
XCIT(L,5)=XCIT(L,5)*DA	IVAR0047
IF(XCIT(L,3).EQ.0.) GO TO 280	IVAR0048
IF(XCIT(L,4).GE.XCIT(L,3).AND.XCIT(L,6).GE.XCIT(L,4)) GO TO 280	IVAR0049
XCIT(L,4)=9999.	IVAR0050
XCIT(L,6)=9999.	IVAR0051
GO TO 280	IVAR0052
110 IF(J.GT.12) GO TO 130	IVAR0053
XGUST=XCIT(L,1)	IVAR0054
GMAXV1=XCIT(L,2)	IVAR0055
LNTH1=XCIT(L,3)	IVAR0056
START2=XCIT(L,4)*LNTH1	IVAR0057
LNTH2=XCIT(L,5)	IVAR0058
GMAXV2=XCIT(L,6)	IVAR0059
STOP2=START2*LNTH2	IVAR0060
IF(J.EQ.10.OR.J.EQ.12) GO TO 120	IVAR0061
RATE1=0.	IVAR0062
IF(LNTH1.NE.0.) RATE1=GMAXV1/LNTH1	IVAR0063
RATE2=0.	IVAR0064
IF(LNTH2.NE.0.) RATE2=GMAXV2/LNTH2	IVAR0065
GMAXV=GMAXV1+GMAXV2	IVAR0066
GMAXV3=GMAXV1-START2*RATE2	IVAR0067
GO TO 280	IVAR0068
120 PILGH1=0.	IVAR0069
IF(LNTH1.NE.0.) PILGH1=PI/LNTH1	IVAR0070
PILGH2=0.	IVAR0071
IF(LNTH2.NE.0.) PILGH2=PI/LNTH2	IVAR0072
GO TO 280	IVAR0073
130 K=J-12	IVAR0074
GO TO (280,280,280,280,150,160,170,180,290,280,290,280,280,	IVAR0075
1 280,290,290,290,290,190)*K	IVAR0076

140	INDIC=XCIT(L,2)*.01	IVAR007
	IF(INDIC.NF.2) GO TO 280	IVAR007
	INDIC=XCIT(L,6)*.01	IVAR007
	IF(INDIC.LT.1.OR.INDIC.GT.2) GO TO 290	IVAR008
	XCIT(L,5)=TAX(INDIC)	IVAR008
	XCIT(L,2)=1.	IVAR008
	GO TO 280	IVAR008
150	XCIT(L,2)= XCIT(L,2)*100./(PEDA(1)*DTR)	IVAR008
	DDA3=0.	IVAR008
	GO TO 280	IVAR008
160	XCIT(L,2)=XCIT(L,2)/CYCL(3)	IVAR008
	XCIT(L,3)=XCIT(L,3)/CYCL(3)	IVAR008
	DDA2=0.	IVAR008
	GO TO 280	IVAR009
170	CONTINUE	IVAR009
	XCIT(L,2)=XCIT(L,2)/CYCF(3)	IVAR009
	XCIT(L,3)=XCIT(L,3)/CYCF(3)	IVAR009
	XCIT(L,4)=XCIT(L,4)*DTR	IVAR009
	DDA1=0.	IVAR009
	GO TO 280	IVAR009
180	XCIT(L,2)=XCIT(L,2)*TWOPI	IVAR009
	XCIT(L,3)=XCIT(L,3)*XCIT(L,2)	IVAR009
	K=XCIT(L,5)*.1	IVAR009
	IF(K.LT.1.OR.K.GT.8) GO TO 290	IVAR010
	GO TO (200,210,220,230,240,250,260,270),K	IVAR010
190	CONTINUE	IVAR010
	IF(XCIT(L,3).LE.XCIT(L,1)) XCIT(L,3)=9999.	IVAR010
	IF(XCIT(L,5).LE.XCIT(L,3)) XCIT(L,5)=99999.	IVAR010
	GO TO 280	IVAR010
200	CONTINUE	IVAR010
	XCIT(L,3)=XCIT(L,3)*100./COLL(1)	IVAR010
	GO TO 280	IVAR010
210	XCIT(L,3)=XCIT(L,3)*100./CYCF(1)	IVAR010
	GO TO 280	IVAR011
220	XCIT(L,3)=XCIT(L,3)*100./CYCL(1)	IVAR011
	GO TO 280	IVAR011
230	XCIT(L,3)=XCIT(L,3)*100./PEDA(1)	IVAR011
	GO TO 280	IVAR011
240	XCIT(L,3)=XCIT(L,3)*100./CONLJ(1,1)	IVAR011
	GO TO 280	IVAR011
250	XCIT(L,3)=XCIT(L,3)*100./CONLJ(2,1)	IVAR011
	GO TO 280	IVAR011
260	XCIT(L,3)=XCIT(L,3)*100./CONLJ(1,2)	IVAR011
	GO TO 280	IVAR012
270	XCIT(L,3)=XCIT(L,3)*100./CONLJ(2,2)	IVAR012
280	CONTINUE	IVAR012
	RETURN	IVAR012
290	WRITE (6,310) L,J	IVAR012
	EXIT=1.	IVAR012
	RETURN	IVAR012
300	FORMAT (1H,25X,I10,6F10.3)	IVAR012
310	FORMAT (24H0CHECK PART 2 DATA CARD ,I2,11H J CODE IS ,I2)	IVAR012
	END	IVAR012

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SUBROUTINE JACOR1
COMMON /STRIAD/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,
1 PD(6,7),OTR,EPD,ERR(6),KMI,KMO,R12,SPD(6,6,1),
2 XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),
3 XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),RLCG,
4 DAMP,DEPD(11),EPUS,EPUX(11),MASS,WLCG,XCON(63),
5 XJET(14),XMIN,AYEFP,CNPGD,GUESS,NPASS,PDPHI(6,7),
6 STACG,TZERO,DTRRSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)
7 XLTJ(84),YLTJ(7)
COMMON /MANARD/ I,V,NWAG,TDELTH,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,
1 YGUSTF,GFWD,GLAT,GVERT,VXH,VZH,APD,VYH,ARD,AYD,
2 COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE
3 TLSTK(2),THLSTK(2),AT,BT,CT,ATH,BTH,CTH
COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,
1 NPART,NVARA,NVARB,NVARC,NSCALE
COMMON /KVARTR/ KVAR(6),PD1
DIMENSION VAR(11),PD1(6,12)
EQUIVALENCE (VAR(1),COLSTK)
DO 20 L=1,KMI
IF(L.GT.1) VAR(KVAR(L-1))=VAR(KVAR(L-1))-DEPD(KVAR(L-1))
IF(KVAR(L-1).EQ.8.AND.(AT.NE.0..OR.BT.NE.0..OR.CT.NE.0.))
1 VAR(9)=AT*(BT+CT*VAR(8))*VAR(8)
IF(KVAR(L-1).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))
1 VAR(11)=ATH*(BTH+CTH*VAR(10))*VAR(10)
VAR(KVAR(L))=VAR(KVAR(L))+DEPD(KVAR(L))
IF(KVAR(L).EQ.8.AND.(AT.NE.0..OR.BT.NE.0..OR.CT.NE.0.))
1 VAR(9)=AT*(BT+CT*VAR(8))*VAR(8)
IF(KVAR(L).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))
1 VAR(11)=ATH*(BTH+CTH*VAR(10))*VAR(10)
CALL AJACOR
IF(EXIT.NE.0.) RETURN
DO 10 K=1,KMI
10 PD(K,L)=(F(K)+PD(K,KMI+1))/EPD
20 CONTINUE
VAR(KVAR(KMI))=VAR(KVAR(KMI))-DEPD(KVAR(KMI))
IF(KVAR(KMI).EQ.8.AND.(AT.NE.0..OR.BT.NE.0..OR.CT.NE.0.))
1 VAR(9)=AT*(BT+CT*VAR(8))*VAR(8)
IF(KVAR(KMI).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))
1 VAR(11)=ATH*(BTH+CTH*VAR(10))*VAR(10)
RETURN
ENTRY BJACOR
DO 40 L=1,11
IF(L.GT.1) VAR(L-1)=VAR(L-1)-DEPD(L-1)
IF( (L-1).EQ.8.AND.(AT.NE.0..OR.BT.NE.0..OR.CT.NE.0.))
1 VAR(9)=AT*(BT+CT*VAR(8))*VAR(8)
IF( (L-1).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))
1 VAR(11)=ATH*(BTH+CTH*VAR(10))*VAR(10)
VAR(L)=VAR(L)-DEPD(L)
IF( (L).EQ.8.AND.(AT.NE.0..OR.BT.NE.0..OR.CT.NE.0.))
1 VAR(9)=AT*(BT+CT*VAR(8))*VAR(8)
IF( (L).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))
1 VAR(11)=ATH*(BTH+CTH*VAR(10))*VAR(10)
CALL AJACOR
IF(EXIT.NE.0.) RETURN
DO 30 K=1,KMI

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30 PD1(K,L)=(F(K)*PD1(K,12))/EPD
40 CONTINUE
   VAR(11)=VAR(11)-DEPD(11)
   RETURN
   END

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JAC00056
JAC00057
JAC00058
JAC00059
JAC00060

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SUBROUTINE JETINT
COMMON /STPIAH/ CTEM(414),XCON(63),ETEM(304),XRAM,ZRAM,RRMM
COMMON /MANARO/ ITEM,V,VTEM(11),VXB,VZR,APD,VYH
COMMON /LJETS/ NJETL,ATEM(18),APBJET(6),RTEMP(68),TLJET(6),
1      DTEM(6),THLJET(6)
COMMON /FORCE/ XT(9),XIN,XT1(2),XADD,YT(6),YIN,YT1(2),YADD,
1      ZT(9),ZIN,ZT1,ZADD,RMT(9),RMIN,RMT1(2),RYADD,
2      PMT(9),PMT1(2),PMADD,YMT(9),YMIN,YMT1(2),
3      YMADD
COMMON /MANAL/ Q,AP
TTOT=0.
THTOT=0.
DRX=0.
DRY=0.
DRZ=0.
DO 10 J1=1,NJETL
TTOT=TTOT+TLJET(J1)
10 THTOT=THTOT+THLJET(J1)-APBJET(J1)
THAVE=1.5708*SIN(THTOT/NJETL)
VKX=V*.5925
VKY=VYH*.5925
VKZ=VYB*.5925
DELL=TTOT*(XCON(50)+(XCON(51)*VKX+XCON(52)*VKY**2+
1      XCON(53)*VKZ**3)*THAVE/(1.5708))
DELD=TTOT*(XCON(54)+XCON(55)*VKX)*VKX
DELRM=TTOT*(XCON(60)+XCON(61)*VKY)*VKY
DELM=TTOT*(XCON(56)+(XCON(57)*VKX+XCON(58)*VKY**2+
1      XCON(59)*VKZ**3)*THAVE/(1.5708))
CALL VR2D (-DELD,-DELL,AP,XADD,ZADD,1)
IF(TTOT.LT.1000.) GOTO 20
DRX=RRMM*VXB
DRY=RRMM*VYH
DRZ=RRMM*VZR
20 YADD=0.
PMADD=DELRM
PMADD=DELM
YMADD=0.
XIN=-DRX
YIN=-DRY
ZIN=-DRZ
RMIN=-DRY*ZRAM
PMT1=DRX*ZRAM+DRZ*XRAM
YMT1=-DRY*XRAM
RETURN
END

```

JETI0001
JETI0002
JETI0003
JETI0004
JETI0005
JETI0006
JETI0007
JETI0008
JETI0009
JETI0010
JETI0011
JETI0012
JETI0013
JETI0014
JETI0015
JETI0016
JETI0017
JETI0018
JETI0019
JETI0020
JETI0021
JETI0022
JETI0023
JETI0024
JETI0025
JETI0026
JETI0027
JETI0028
JETI0029
JETI0030
JETI0031
JETI0032
JETI0033
JETI0034
JETI0035
JETI0036
JETI0037
JETI0038
JETI0039
JETI0040
JETI0041
JETI0042
JETI0043
JETI0044
JETI0045

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SUBROUTINE LAMODE (V,ZWG,ZFW,SWING)
COMMON /STRIA/ E(74),F(6),X(6),UL,DM,ON,DX,DY,DZ,IX,IY,IZ,
1 PD(6,7),DTR,EPD,ERR(6),KML,HMO,R12,SPD(6,6,1),
2 XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),
3 XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),PLCG,
4 XDAMP,DEPD(11),EPUS,EPDX(11),MASS,XLCG,XCON(63),
5 XJET(14),XMIN,AYEFP,CNPPCD,GUESS,NPASS,PDPHI(6,7),
6 STAG,IZERON,DTRHSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)
7 XLJT(84),YLJT(7)
COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NUMRTS,GAINR,
1 INDEX,STGAIN(6),TSTAR,COELTD,SLOT(3,9)
COMMON /ANAL/ Q,ALFA
DIMENSION PLMODE(6),FLMODE(6),THLFDB(6),IZERON(6),SM(3,9),DMODE(6)
1 FANG2(6),ROOTT(2,3), ZLNT1(6),FANG1(6),ZLNT2(6)
REAL IX, IZ,MASS
COMPLEX ROOTT
WRITE (6,150)
S1=SIN(ALFA)
C1=COS(ALFA)
S2=S1**2
C2=C1**2
S1C1=S1*C1
DO 10 J=1,3
DO 10 I=1,9
10 SLOT(J,I)=0.0
DO 20 I=1,4
PLMODE(I)=.0
FLMODE(I)=.0
THLFDB(I)=.0
IZERON(I)=0
20 CONTINUE
SLOT(1,2)=MASS
SLOT(1,3)=-SPD(4,4,1)
SLOT(1,5)=-((SPD(5,4,1)*C1+SPD(6,4,1)*S1)/V
SLOT(1,6)=-ZFW/V
SLOT(1,9)=MASS-((SPD(6,4,1)*C1-SPD(5,4,1)*S1)/V
SLOT(2,3)=-((SPD(4,5,1)*C1+SPD(4,6,1)*S1)
SLOT(2,4)=(IX*C2+IZ*S2-2.*XFS(11)*S1C1)/V
SLOT(2,5)=-((SPD(5,5,1)*C2+(SPD(6,5,1)+SPD(5,6,1))*S1C1
1 *SPD(4,6,1)*S2)/V
SLOT(2,8)=-((XFS(11)*C2-2.*(IX-IZ)*S2)/V
SLOT(2,9)=-((SPD(6,5,1)*C2+(SPD(6,6,1)-SPD(5,5,1))*S1C1
1 -SPD(5,6,1)*S2)/V
SLOT(3,3)=-((SPD(4,6,1)*C1-SPD(4,5,1)*S1)
SLOT(3,4)=SLOT(2,8)
SLOT(3,5)=-((SPD(5,6,1)*C2+(SPD(6,6,1)-SPD(5,5,1))*S1C1
1 -SPD(6,5,1)*S2)/V
SLOT(3,8)=(IX*S2+IZ*C2-2.*XFS(11)*S1C1)/V
SLOT(3,9)=-((SPD(6,6,1)*C2-(SPD(6,5,1)+SPD(5,6,1))*S1C1
1 +SPD(5,5,1)*S2)/V
DO 30 I=1,3
X1=14.5939
IF(I,GT,1) X1=4.44822
DO 30 J=1,9
30 SM(I,J)=SLOT(I,J)*X1

```


WRITE (6,160)	LAM00056
WRITE(6,170)((SM(I,J),J=1,9),I=1,3)	LAM00057
WRITE(6,130)	LAM00058
CALL SRT	LAM00059
INDEX=6	LAM00060
CALL ELEC (GAINB)	LAM00061
DO 60 I=1,NUMRTS	LAM00062
IF(UU(I).EQ..0.AND.VV(I).EQ..0) GO TO 50	LAM00063
IF(VV(I).EQ..0)GO TO 40	LAM00064
PLMODE(I)=6.2832/AHS(VV(I))	LAM00065
40 IF(UU(I).EQ..0) GO TO 50	LAM00066
FLMODE(I)=SQRT(UU(I)**2+VV(I)**2)	LAM00067
DMODE(I)=-UU(I)/FLMODE(I)	LAM00068
THLFD8(I)=.69315/ABS(UU(I))	LAM00069
GO TO 60	LAM00070
50 IZERON(I)=1	LAM00071
60 CONTINUE	LAM00072
DO 110 I=1,NUMRTS	LAM00073
IF(IZERON(I).NE.0) GO TO 110	LAM00074
RELX=UU(I)*SLOT(1,2) +SLOT(1,3)	LAM00075
ZPRT=VV(I)*SLOT(1,2)	LAM00076
ROOOT(1,1)=CMPLX(RELP,ZPRT)	LAM00077
ROOOT(1,2)=CMPLX(SLOT(1,9),.0)	LAM00078
RELX = -(UU(I)*SLOT(1,5) +SLOT(1,6)	LAM00079
ZPRT= -VV(I)*SLOT(1,5)	LAM00080
ROOOT(1,3)=CMPLX(RELP,ZPRT)	LAM00081
ROOOT(2,1)= CMPLX(SLOT(2,3),.0)	LAM00082
RELX = UU(I)*SLOT(2,8) +SLOT(2,9)	LAM00083
ZPRT = VV(I)*SLOT(2,8)	LAM00084
ROOOT(2,2)=CMPLX(RELP,ZPRT)	LAM00085
RELX =-(UU(I)**2 -VV(I)**2)*SLOT(2,4) +UU(I)*SLOT(2,5))	LAM00086
ZPRT =-(2.*UU(I)*VV(I)*SLOT(2,4) +VV(I)*SLOT(2,5))	LAM00087
ROOOT(2,3)=CMPLX(RELP,ZPRT)	LAM00088
CALL COMSOL (ROOOT,RPRT1,ZPT1,RPRT2,ZPT2)	LAM00089
ZLNT1(I)=SQRT(RPRT1*RPRT1+ZPT1*ZPT1)	LAM00090
IF(RPRT1.EQ..0) GO TO 70	LAM00091
FANG1(I)=57.3*ATAN2(ZPT1,RPRT1)	LAM00092
GO TO 80	LAM00093
70 FANG1(I)=90.	LAM00094
80 ZLNT2(I)= SQRT((RPRT2*UU(I)+ZPT2*VV(I))**2 +(ZPT2*UU(I)-RPRT2*	LAM00095
1VV(I))**2)/(UU(I)**2+VV(I)**2)	LAM00096
IF(RPRT2.EQ..0) GO TO 90	LAM00097
FANG2(I)=57.3*ATAN2((ZPT2*UU(I)-RPRT2*VV(I)),(RPRT2*UU(I)+ZPT2*VV(I)))	LAM00098
GO TO 100	LAM00099
90 FANG2(I)=90.	LAM00100
100 CONTINUE	LAM00101
110 CONTINUE	LAM00102
DO 120 I=1,NUMRTS	LAM00103
IF(VV(I).LT..0) GO TO 120	LAM00104
IF(IZERON(I).NE.0) GO TO 120	LAM00105
WRITE(6,140)UU(I),VV(I),PLMODE(I),FLMODE(I),DMODE(I),THLFD8(I)	LAM00106
120 CONTINUE	LAM00107
I=1	LAM00108
CALL MODE (PD,V,I)	LAM00109
	LAM00110

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      RETURN
130 FORMAT(1H0,55X,20HCONTROLS FIXED ROOTS/25X,4HREAL,8X,5HIMAG.,
1    8X,6HPERIOD,5X,9HNAT.FREQ.,5X,7HDAMPING,5X,10HT*HALF-DRL)
140 FORMAT(21X,6G13.5)
150 FORMAT(1H1,60X,12HLATERAL MODE)
160 FORMAT(1H0,4HX,40HCOEFFICIENTS OF CHARACTERISTIC EQUATIONS/
1    11X,17HEETA-S**2 HETA-S,6X,4HETA,9X,17HPhi-S**2 PHI-S,
2    9X,3HPhi,8X,6HR-S**2,6X,3HR-S,11X,1HR)
170 FORMAT(1H0,10X,9G12.5)
      END

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LAM00111
LAM00112
LAM00113
LAM00114
LAM00115
LAM00116
LAM00117
LAM00118
LAM00119
LAM00120

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SUBROUTINE LIFJET
COMMON /FORCE/ T1(8),XFLJ,T2(9),YFLJ,T3(12),ZFLJ,T4(11),RMLJ,
1    T5(2),RGYRO,T6(9),PMLJ,T7(2),PGYRO,T8(9),YMLJ,
2    T9(2),YGYRO
COMMON /MANARO/ T10(15),APD,T11,ARO,AYD,T12(7),TLSTK(2),THLSTK(2),
1    T13(7),FAIL(6)
COMMON /LJETS/ NJETL,XAJETL(6),YAJETL(6),ZAJETL(6),APBJTL(6),
1    ARBJTL(6),CONLJ(2,5),NCONL(6),XLT(2),XLTH(2)
2    ,AYBJTL(6),ATT(6),ANG(6),PSIANG(6),THEANG(6)
3    ,ANGA(6),ANGB(6),TLJET(6),ANGC(6),THLJET(6)
4    ,TL(2,6),NLINK,DPBJTL(6)
DIMENSION ANGL(6)
YL(X,A*B,C,D,E,F)=(D/A)*AMIN1(AMAX1(X,0.),A)+(E-D)/(H-A)*
1    AMIN1(AMAX1((X-A),0.), (B-A))+(F-E)/(C-H)*AMIN1(AMAX1((X-R)
2    ,0.), (C-H))
XFLJ=0.
YFLJ=0.
ZFLJ=0.
RMLJ=0.
PMLJ=0.
YMLJ=0.
RGYRO=0.
PGYRO=0.
YGYRO=0.
DO 10 J=1,6
  ANGL(J)=0.
  DPHJTL(J)=0.
  TLJET(J)=0.
10 THLJET(J)=0.
  DO 40 J=1,NJETL
    J1=NCONL(J)
    IF(J1.LT.1.OR.J1.GT.2) GO TO 40
    XLT(J1)=TLSTK(J1)*CONLJ(J1,1)/100.
    XLTH(J1)=THLSTK(J1)*CONLJ(J1,2)/100.
    TLJET(J)=CONLJ(J1,3)*XLT(J1)*FAIL(J)
    IF(NLINK.NE.0) GO TO 20
    DPBJTL(J)=CONLJ(J1,4)*XLT(J1)+CONLJ(J1,5)*XLTH(J1)
    GO TO 30
20 DPHJTL(J)=YL(XLTH(J1),TL(J1,1),TL(J1,3),TL(J1,5),
1    TL(J1,2),TL(J1,4),TL(J1,6))

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LIFJ0001
LIFJ0002
LIFJ0003
LIFJ0004
LIFJ0005
LIFJ0006
LIFJ0007
LIFJ0008
LIFJ0009
LIFJ0010
LIFJ0011
LIFJ0012
LIFJ0013
LIFJ0014
LIFJ0015
LIFJ0016
LIFJ0017
LIFJ0018
LIFJ0019
LIFJ0020
LIFJ0021
LIFJ0022
LIFJ0023
LIFJ0024
LIFJ0025
LIFJ0026
LIFJ0027
LIFJ0028
LIFJ0029
LIFJ0030
LIFJ0031
LIFJ0032
LIFJ0033
LIFJ0034
LIFJ0035
LIFJ0036
LIFJ0037
LIFJ0038
LIFJ0039
LIFJ0040

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30 DPHJTL(J)=DPHJTL(J)/57.2957795
   THLJET(J)=DPHJTL(J)*APHJTL(J)
   ANGI(J)=ANG(J)*(ANGA(J)+ANGB(J)*TLJET(J)+ANGC(J)*TLJET(J)**2)
   ANGI(J)=ANGI(J)*FAIL(J)
40 CONTINUE
   DO 70 J=1,NJETL
   TV1=-THLJET(J)
   TV2=-ARHJTL(J)
   IF(ATT(J).EQ.0.) GO TO 50
   TV1=THLJET(J)
   TV2=AYHJTL(J)
   CALL VR3D (0.,0.,-TLJET(J),TV2,TV1,0.,XF,YF,ZF,1)
   GO TO 60
50 CONTINUE
   CALL VR3D (0.,0.,-TLJET(J),0.,TV1,TV2,XF,YF,ZF,-1)
60 CONTINUE
   CALL XPRO (XAJETL(J),YAJETL(J),ZAJETL(J),XF,YF,ZF,PM,PM,YM)
   XFLJ=XFLJ+XF
   YFLJ=YFLJ+YF
   ZFLJ=ZFLJ+ZF
   RMLJ=RMLJ+PM
   PMLJ=PMLJ+PM
   YMLJ=YMLJ+YM
   CALL VR3D (ANGI(J),0.,0.,PSIANG(J),THEANG(J),0.,XANG,YANG,ZANG,1)
   CALL XPRO (APU,APU,AYD,XANG,YANG,ZANG,RG,PG,YG)
   RGYRO=RGYRO+RG
   PGYRO=PGYRO+PG
   YGYRO=YGYRO+YG
70 CONTINUE
   RETURN
   END

```

LIFJ0041
LIFJ0042
LIFJ0043
LIFJ0044
LIFJ0045
LIFJ0046
LIFJ0047
LIFJ0048
LIFJ0049
LIFJ0050
LIFJ0051
LIFJ0052
LIFJ0053
LIFJ0054
LIFJ0055
LIFJ0056
LIFJ0057
LIFJ0058
LIFJ0059
LIFJ0060
LIFJ0061
LIFJ0062
LIFJ0063
LIFJ0064
LIFJ0065
LIFJ0066
LIFJ0067
LIFJ0068
LIFJ0069
LIFJ0070
LIFJ0071

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SUBROUTINE LMODE (V,QWG,XFW,ZFW,CWING,XAELE)
COMMON /STRIAB/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,
1 PD(6,7),DTH,EPD,ERR(6),KMI,RHO,R12,SPD(6,6,1),
2 XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),
3 XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),BLCG,
4 XDAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63),
5 XJET(14),XMIN,AYEFP,CNPGD,GUESS,NPASS,PDPHI(6,7),
6 STACG,TZERO,DTRKSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)
7 ,XLJT(84),YLJT(7)
COMMON /STANRO/ J,W,LINK,GELE,VSNQ,YFIN(2),ZFEL(2),COND1,SWING,
1 PILGH2,PWGELI
COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NUMRTS,GAINB,
1 INDEX,STGAIN(6),TSTAR,COELTD,SLOT(3,9)
COMMON /MANAL/ Q,ALFA
DIMENSION PLMODE(6),FLMODE(6),THLFDB(6),IZERON(6),SM(3,9),DMODE(6)
1 ,FANG2(6),RROOT(2,3), ZLNT1(6),FANG1(6),ZLNT2(6)
REAL IY,MASS
COMPLEX RROOT
WRITE (6,150)

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LMOD0001
LMOD0002
LMOD0003
LMOD0004
LMOD0005
LMOD0006
LMOD0007
LMOD0008
LMOD0009
LMOD0010
LMOD0011
LMOD0012
LMOD0013
LMOD0014
LMOD0015
LMOD0016
LMOD0017
LMOD0018
LMOD0019

```

S1=SIN(ALFA)
C1=COS(ALFA)
S2=S1**2
C2=C1**2
S1C1=S1*C1
DO 10 I=1,4
  PLMODE(I)=.0
  FLMODE(I)=.0
  THLFDB(I)=.0
  IZERON(I)=0
10 CONTINUE
DO 20 I=1,3
  DO 20 J=1,9
    SLOT(I,J)=.0
20 CONTINUE
  SLOT(1,2) = MASS
  SLOT(1,3)=- (SPD(1,1,1)*C2+(SPD(2,1,1)+SPD(1,2,1))*S1C1
1    +SPD(2,2,1)*S2)
  SLOT(1,6)=- (SPD(2,1,1)*C2-(SPD(1,1,1)-SPD(2,2,1))*S1C1
1    -SPD(1,2,1)*S2)
  SLOT(1,8)=- (SPD(3,1,1)*C1+SPD(3,2,1)*S1)/V
  SLOT(1,9)=ZFW/V
  SLOT(2,3)=- (SPD(1,2,1)*C2+(SPD(2,2,1)-SPD(1,1,1))*S1C1
1    -SPD(2,1,1)*S2)
  CZADE=YEL(17)*WELE*XAELE*YWG(17)*PWGEL1*YWG(18)*YEL(18)*DTRRSQ/
1    ((3.+YWG(18))*(3.+YEL(18))*(1.-(V*VSND)**2))
  SLOT(2,5)=MASS-CZADE
  SLOT(2,6)=- (SPD(2,2,1)*C2-(SPD(1,2,1)+SPD(2,1,1))*S1C1
1    +SPD(1,1,1)*S2)
  SLOT(2,8)=- (MASS*(SPD(3,2,1)*C1-SPD(3,1,1)*S1)/V)
  SLOT(2,9)=-XFW/V
  SLOT(3,3)=- (SPD(1,3,1)*C1+SPD(2,3,1)*S1)
  SLOT(3,5)=CZADE*XAELE
  SLOT(3,6)=- (SPD(2,3,1)*C1-SPD(1,3,1)*S1)
  SLOT(3,7)=IY/V
  SLOT(3,8)=-SPD(3,3,1)/V
  DO 30 I=1,3
    X1=14.5939
    IF(I.GT.2) X1=4.44822
    DO 30 J=1,9
      SM(I,J)=SLOT(I,J)*X1
      WRITE(6,160)
      WRITE(6,170)((SM(I,J),J=1,9),I=1,3)
      WRITE(6,130)
      CALL SRT
      INDEX=6
      CALL ELEC (GAINR)
      DO 60 I=1,NUMWTS
        IF(UU(I).EQ..0.AND.VV(I).EQ..0) GO TO 50
        IF(VV(I).EQ..0)GO TO 40
        PLMODE(I)=6.2832/ABS(VV(I))
40    IF(UU(I).EQ..0) GO TO 50
        FLMODE(I)=SQRT(UU(I)**2+VV(I)**2)
        DMODE(I)=-UU(I)/FLMODE(I)
        THLFDB(I)=.69315/ABS(UU(I))

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LM000020
LM000021
LM000022
LM000023
LM000024
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LM000066
LM000067
LM000068
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LM000071
LM000072
LM000073
LM000074

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GO TO 60
50 IZERON(I)=1
60 CONTINUE
DO 110 I=1,NUMRTS
IF(IZERON(I).NE.0) GO TO 110
ROOT(1,1)=CMPLX(SLOT(2,3),.0)
RELP=UU(I)*SLOT(2,5)+SLOT(2,6)
ZPRT=VV(I)*SLOT(2,5)
ROOT(1,2)=CMPLX(RELP,ZPRT)
RELP=SLOT(2,7)*(VV(I)+UU(I))*(VV(I)-UU(I))-SLOT(2,8)*UU(I)
1 -SLOT(2,4)
ZPRT=-(2.*UU(I)*VV(I)*SLOT(2,7)+VV(I)*SLOT(2,8))
ROOT(1,3)=CMPLX(RELP,ZPRT)
ROOT(2,1)=CMPLX(SLOT(3,3),.0)
RELP=SLOT(3,5)*UU(I)+SLOT(3,6)
ZPRT=VV(I)*SLOT(3,5)
ROOT(2,2)=CMPLX(RELP,ZPRT)
RELP=-(SLOT(3,7)*(UU(I)*UU(I)-VV(I)*VV(I))+SLOT(3,8)*UU(I))
ZPRT=-(SLOT(3,7)*2.*UU(I)*VV(I)+SLOT(3,8)*VV(I))
ROOT(2,3)=CMPLX(RELP,ZPRT)
CALL COMSOL (ROOT,RPRT1,ZPT1,RPRT2,ZPT2)
ZLNT1(I)=SQRT(RPRT1**2+ZPT1**2)
IF(RPRT1.EQ..0) GO TO 70
FANG1(I)=ATAN2(ZPT1,RPRT1)/DTR
GO TO 80
70 FANG1(I)=-90.
80 ZLNT2(I)=SQRT(RPRT2**2+ZPT2**2)
IF(RPRT2.EQ..0) GO TO 90
FANG2(I)=ATAN2(ZPT2,RPRT2)/DTR
GO TO 100
90 FANG2(I)=FANG1(I)+90.
100 CONTINUE
110 CONTINUE
DO 120 I=1,NUMRTS
IF(VV(I).LT..0) GO TO 120
IF(IZERON(I).NE.0) GO TO 120
WRITE(6,140) UU(I),VV(I),PLMODE(I),FLMODE(I),DMODE(I),THLFOR(I)
120 CONTINUE
I=2
CALL MODE (PD,V,I)
RETURN
130 FORMAT(1H0,55X,20HCONTROLS FIXED ROOTS/25X,4HREAL,8X,5HIMAG.,
1 8X,6HPERIOD,5X,9H NAT.FREQ.,5X,7HDAMPING,5X,10HT*HALF-OBL)
140 FORMAT(21X,6G13.5)
150 FORMAT(1H1,57X,17HLONGITUDINAL MODE)
160 FORMAT(1H0,48X,40HCOEFFICIENTS OF CHARACTERISTIC EQUATIONS/
1 13X,14HU-S**2 U-S,11X,1HU,6X,21HALPHA-S**2 ALPHA-S,
2 6X,29HALPHA THETA-S**2 THETA-S,7X,5H THETA)
170 FORMAT(1H0,10X,9G12.5)
END

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LM000075
LM000076
LM000077
LM000078
LM000079
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LM000081
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LM000123
LM000124

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COMMON /FORCE/ XF,T1(12),YF,T2(9),ZF,T3(11),
1 OL,T4(12),QM,T5(12),QN
COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,
1 T6(12),DIST,T7(23),TIME,TMAX,T8(120),ALGEZ,T9(4),
2 DIXI7,DIYIX,DI7IY,T10(3),TSTAR(14),ZMAX2,ZMAX3,
3 T11(3),ZDELTA1,ZDELTA2
COMMON /STAMAN/ XX,YY,AY1,RIY,APBG,ARRG,ASEP,AYBG,CGBL,DPIX,DPIZ,
1 Q550,AYOMX,DELTA2,DPIXZ,HDELTA,HGUST,KTCR,RMASS,
2 TWOP1,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELTA2R,
3 POLDTR,ROELT1,ROELT2
COMMON /MANAL/ T12(4),ALCYP,T13(31),ALECRI,ALGFPD
COMMON /ROMAN/ PI,ZZ,ALT,T,APDU,ARDD,AYDD,DTRW
COMMON /MANARO/ I,V,NWAG,TOELT,T14(9),VXB,VZB,APD,VYB,ARD,AYD,
1 T15(4),AYE,APE,ARE
COMMON /TOPLOT/ T16(4),EXIT,ICOM(20),IPSN,T17(5),NVAR5
COMMON /COPY/ Y(4,150)
COMMON /STANRO/ J,W,LINK
COMMON /CONTR/ ADISP(3),ARATE(3),DELTA(4),THR(2),RPCT(3),XSYS(28)
REAL LP,NP,IXZ
DIMENSION A(204)
EQUIVALENCE (A(1),Y(1,1))
XDELIM(X1,X2,X3)=AMAX1(X1,AMIN1(X2,X3))

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MANU0002

MANU0003

MANU0004

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MANU0045

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MANU0055

MANU0056

PART 3. SIX DEGREE OF FREEDOM MANEUVER SECTION

SYMBOL IDENTIFICATION

Y(1, 1)	VXR	VELOCITY	X-COMPONENT	BODY REFERENCE
Y(1, 2)	VYR	VELOCITY	Y-COMPONENT	BODY REFERENCE
Y(1, 3)	VZR	VELOCITY	Z-COMPONENT	BODY REFERENCE
Y(1, 4)	AYD	VELOCITY	YAW-COMPONENT	BODY REFERENCE
Y(1, 5)	APD	VELOCITY	PITCH-COMPONENT	BODY REFERENCE
Y(1, 6)	ARD	VELOCITY	ROLL-COMPONENT	BODY REFERENCE
Y(1,10)	AYE	EULER ANGLE	YAW-COMPONENT	FIXED TO BODY
Y(1,11)	APE	EULER ANGLE	PITCH-COMPONENT	FIXED TO BODY
Y(1,12)	ARE	EULER ANGLE	ROLL-COMPONENT	FIXED TO BODY
Y(1,15)	XX	DISPLACEMENT	X-COMPONENT	FIXED REFERENCE
Y(1,16)	YY	DISPLACEMENT	Y-COMPONENT	FIXED REFERENCE
Y(1,17)	ZZ	DISPLACEMENT	Z-COMPONENT	FIXED REFERENCE
Y(1,76)	VXRD	ACCELERATION	X-COMPONENT	BODY REFERENCE
Y(1,77)	VYRD	ACCELERATION	Y-COMPONENT	BODY REFERENCE
Y(1,78)	VZRD	ACCELERATION	Z-COMPONENT	BODY REFERENCE
Y(1,79)	AYDD	ACCELERATION	YAW-COMPONENT	BODY REFERENCE
Y(1,80)	APDD	ACCELERATION	PITCH-COMPONENT	BODY REFERENCE
Y(1,81)	ARDD	ACCELERATION	ROLL-COMPONENT	BODY REFERENCE
Y(1,85)	AYFD	EUL.ANG.VEL.	YAW-COMPONENT	FIXED TO BODY
Y(1,86)	APFD	EUL.ANG.VEL.	PITCH-COMPONENT	FIXED TO BODY
Y(1,87)	ARFD	EUL.ANG.VEL.	ROLL-COMPONENT	FIXED TO BODY
Y(1,90)	XXD	VELOCITY	X-COMPONENT	FIXED REFERENCE
Y(1,91)	YYD	VELOCITY	Y-COMPONENT	FIXED REFERENCE
Y(1,92)	ZZD	VELOCITY	Z-COMPONENT	FIXED REFERENCE

IF (NVAR5.NE.0) GO TO 20

I=1

IND=0

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LINK=4
10 HDELT=.5*TDDEL
  RDEL1=1./TDDEL
  RDEL2=2.*RDEL1
  IF(KTCTR.EQ.0) GO TO 50
20 CONTINUE
  NVAR=0
  IF(TIME.LT.TMAX) GO TO 60
  KTCTR=KTCTR+1
  GO TO (30,40,170), KTCTR
30 TDDEL=ZDEL2
  TMAX=ZMAX2
  GO TO 10
40 TDDEL=ZDEL1
  TMAX=ZMAX3
  GO TO 10
C      ****      TIME LOOP      ****      ****
C
50 CONTINUE
  ALY=AY
  ZFLWG1=ZFLWG
  ZFRWG1=ZFRWG
  IF(ISTOP.NE.1) ISTOP=0
  CALL INIT
  TIME=TIME+TDDEL
  DIST=DIST+V*TDDEL
  IF(TSTAB(1).GT.TIME) GO TO 20
  NVAR=1
  I=1
  GO TO 120
C      ***RUNGE-KUTTA***
60 I=2
70 GO TO (170,80,100,90), I
80 DELT2=HDEL1
  DELT2H=RDEL2
  QUAD1=RDEL1
  GO TO 100
90 DELT2=TDDEL
  DELT2H=RDEL1
  QUAD1=RDEL2
100 DO 110 K=1,75
  Y(I,K)=Y(I,K)+Y(I-1,K*.75)*DELT2
110 CONTINUE
120 VXB=Y(I,1)
  VYB=Y(I,2)
  VZB=Y(I,3)
  AYD=Y(I,4)
  APD=Y(I,5)
  ARD=Y(I,6)
  AYE=Y(I,10)
  APE=Y(I,11)
  ARE=Y(I,12)
  XX=Y(I,15)
  YY=Y(I,16)
  ZZ=Y(I,17)

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CALL VR3D(VXR,VYB,VZB,AYE,APE,ARE,XXD,YYD,ZZD,1)
VHSQ=XXD**2+YYD**2
VH=SQRT(VHSQ)
V=SQRT(VHSQ+ZZD**2)
AY=0.
AYFP=0.
APFP=0.
TV1=YGUST-VYH
TV2=VXH-HGUST
IF((TV1**2+TV2**2).NE.0.) AY=ATAN2(TV1,TV2)
IF(VH.NE.0.) AYFP=ATAN2(YYD,XXD)
IF(V.NE.0.) APFP=ATAN2(-ZZD,VH)
IF(NVARS.NE.0) RETURN
IF(I.EQ.3.OR.IND.EQ.1) GO TO 130
*** VARIATIONS DUE TO INPUTS ***
ADISP(1)=AYE*OTRR
ADISP(2)=APE*OTRR
ADISP(3)=ARE*OTRR
ARATE(1)=AYD*OTRR
ARATE(2)=APD*OTRR
ARATE(3)=ARD*OTRR
CALL VARI
IF(EXIT.NE.0.) GO TO 170
CALL CONTRL(2)
DELALE=DELTA(1)*XSYS(1)
ALECP1=ALGEZ*DELALE
DELA1L=DELTA(2)*XSYS(2)
ALCYP=DELATL
DELRUD=DELTA(3)*XSYS(3)
ALGFPD=ALGF*DELRUD
130 CALL ANAL
IF(EXIT.NE.0.) GO TO 170
LP=QL-APD*(AYD*DIYIY-ARD*IXZ)
NP=QN-APD*(ARD*DIYIX+AYD*IXZ)
Y(I,76)= XF*PMASS- APD*VZB + AYD*VYB
Y(I,77)= YF*PMASS- AYD*VXB + ARD*VZB
Y(I,78)= ZF*PMASS- ARD*VYB + APD*VXB
AYDD=LP*DP1XZ+NP*DP1X
APDD=(QM-AYD*ARD*DIYIZ*(AYD+ARD)*(AYD-ARD)*IXZ)*RIY
ARDD=LP*DP1Z+NP*DP1XZ
Y(I,79)=AYDD
Y(I,80)=APDD
Y(I,81)=ARDD
CAPE=COS(APE)
SARE=SIN(APE)
CARE=COS(APE)
IF(AHS(CAPE).LT.0.001) GO TO 170
Y(I,85)= (APD*SARE + AYD*CARE)/CAPE
Y(I,86)= APD*CARE - AYD*SARE
Y(I,87)=ARD*Y(I,85)*SIN(APE)
Y(I,90)= XXD
Y(I,91)= YYD
Y(I,92)= ZZD
IF(IND.NE.0) GO TO 150
I=I+1

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 MANU0115
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 MANU0123
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IF(I.LE.4) GO TO 70
DO 140 I=1.75
K=I.75
Y(4,K)=(Y(1,K)+2.*(Y(2,K)+Y(3,K))+Y(4,K)).*1666667
140 Y(4,I)=Y(1,I)+TDELT*Y(4,K)
IND=1
I=4
GO TO 120
150 DO 160 I=1.150
160 Y(1,I)=Y(4,I)
T=T+TDELT
IND=0
I=1
GO TO 50
170 A4=99999999.
WRITE (3) IPSN,A4,A
RETURN
END

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SUBROUTINE MATRIX (A1,A2,A3,A,N1)
DIMENSION A(9)
C      COMPUTE EULER ANGLE MATRIX A FROM EULER ANGLES A1,A2,A3
C      N1=1 IS FOR USUAL MATRIX
C      N1=-1 IS FOR INVERSE OF USUAL MATRIX
SA1=SIN(A1)
SA2=SIN(A2)
SA3=SIN(A3)
CA1=COS(A1)
CA2=COS(A2)
CA3=COS(A3)
S1C3=SA1*CA3
S1S3=SA1*SA3
C1C3=CA1*CA3
C1S3=CA1*SA3
A(1)=CA1*CA2
A(3-N1)=C1S3*SA2-S1C3
A(5-2*N1)=C1C3*SA2+S1S3
A(3+N1)=SA1*CA2
A(5)=S1S3*SA2+C1C3
A(7+N1)=CA2*SA3
A(5+2*N1)=-SA2
A(7-N1)=S1C3*SA2-C1S3
A(9)=CA2*CA3
RETURN
END

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MATR0001
MATR0002
MATR0003
MATR0004
MATR0005
MATR0006
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MATR0020
MATR0021
MATR0022
MATR0023
MATR0024
MATR0025
MATR0026

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SUBROUTINE MNEM MNEM0001

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COMMON /FORCE/ XF,XFRWG,XFLWG,XFELE,XFFUS,XFRJET,XFLJET,XFRJ, MNE00002
1 XFLJ,XFGUN,XFFIN,XFW,XADD, MNE00003
2 YF,YFFUS,YFRJET,YFLJET,YFRJ,YFLJ,YFGUN,YFFIN,YFW, MNE00004
0 YADD, MNE00005
3 ZF,ZFRWG,ZFLWG,ZFELE,ZFFUS,ZFRJET,ZFLJET,ZFRJ, MNE00006
4 ZFLJ,ZFGUN,ZFW,ZADD, MNE00007
5 QL,LPG,LLAG,LELE,LFUS,LHJET,LLJET,XMRJ,RMLJ,LGUN, MNE00008
A LFIN,PGYRO,RMADD, MNE00009
6 QM,MRWG,MLWG,MELE,MFUS,MRJET,MLJET,PMRJ,PMLJ,MGUN, MNE00010
8 MFIN,PGYRO,PMADD, MNE00011
7 QN,NRWG,NLWG,NELE,NFUS,NRJET,NLJET,YMRJ,YMLJ,NGUN, MNE00012
C NFIN,YGYRO,YMADD, MNE00013
COMMON /STRIAB/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ, MNE00014
1 PD(6,7),DTP,EPD,ERR(6),KML,NHO,R12,SPD(6,6,1), MNE00015
2 XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7), MNE00016
3 XIT(21),XWG(21),YWG(21),YFL(21),YFN(21),ALCG, MNE00017
4 DAMP,DEPD(11),EPUS,EPDX(11),MASS,WLCG,XCON(63), MNE00018
5 XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7), MNE00019
6 STACG,TZERO,DTHSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7) MNE00020
7 XLJT(84),YLJT(7) MNE00021
COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL, MNE00022
1 COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3), MNE00023
2 TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA, MNE00024
3 CPWIC,DIXIZ,DYIX,DIZIY,FTKTS,KREAD,PIU30, MNE00025
4 TSTAR(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RUDIND, MNE00026
5 ZDELT1,ZDELT2 MNE00027
COMMON /STAMAN/ XX,YY,AY1,HIY,APBG,ARBG,ASEP,AYBG,CGBL,DPIX,DPIZ, MNE00028
1 R550,AYDMX,DELT2,DPIXZ,HDELT,HGUST,KTCR,RMASS, MNE00029
2 TNOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELT2R, MNE00030
3 POIDTR,DELT1,DELT2 MNE00031
COMMON /MANAL/ QAP,PED,QWG,ALCL,TAXL,TAXR,XAWG,ZAWG,ALCYP, MNE00032
1 ALFIN,ALLWG,ALRWG,COELE,COFIN,CULWG,CDRWG,CLELE, MNE00033
2 CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL, MNE00034
3 XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS, MNE00035
4 YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET, MNE00036
5 ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1 MNE00037
COMMON /ROMAN/ PI,ZZ,ALT,T,APDD,ARDD,AYDD,DTRR,GMAXV,RATE1, MNE00038
1 RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP, MNE00039
2 LNGTH1,PILGH1,START2 MNE00040
COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW, MNE00041
1 YGUSTF,GFWD,GLAT,GVERT,VXB,VZB,APD,VYB,ARD,AYD, MNE00042
2 COLSTK,CYSTK1,CYSTK2,PEUAL,AYE,APE,AHE MNE00043
COMMON /STANRO/ J,W,LINK,RELE,VSN0,YFIN(2),ZFEL(2),COND1,SWING, MNE00044
1 PILGH2,PWGELL MNE00045
COMMON /STARAN/ C3,C4,RW,CLP,CLR,DCD,DQL,DQN,CLB0,CNB0,ETAQ,NJET, MNE00046
1 QFIN,CLRCL,YFS(14),CNHCL,CNPCL,CNRCD,CNPCL,COLKS, MNE00047
2 D3ELF,FNSWC,LWING,RPIST,YAERO(31,3),APHJET,ARRJET, MNE00048
3 AYBJET,CNPCD1,CNPCD2,COLJET,DXWGEL,DZWGEL,ETAQMX, MNE00049
4 PWGWL1,PCWING,SWINGH MNE00050
COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN, MNE00051
1 NPART,NVARA,NVAHB,NVARC,NSCALE MNE00052
1 NVAR5,NPRINT,NTIME MNE00053
COMMON /FORV/ Y(4,150) MNE00054
COMMON /RJETS/ NJETR,XSTK(3),X0(10),X0(10),XR(10),TPOS(10), MNE00055
1 TNEG(10),XAJETR(10),YAJETR(10),ZAJETR(10), MNE00056

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2          AYBJTR(10),APRJTH(10),JTRCON(10)      MNEM00
REAL IX,IY,IZ,IXZ,MASS,ITORS,LLJET,LRJET,MLJET,MRJET,NLJET,NRJET MNEM00
DIMENSION FOR(74)                                MNEM00
EQUIVALENCE (XF,FOR(1))                          MNEM00
IF(NVARC.NE.2) GO TO 10                          MNEM00
NVARC=0                                           MNEM00
GO TO 20                                          MNEM00
10 CONTINUE                                       MNEM00
IF(NVARC.NE.0) NVARC=1                          MNEM00
20 CONTINUE                                       MNEM00
CALL TINIT                                       MNEM00
ALEL=0.                                           MNEM00
ALFIN=0.                                          MNEM00
ALLWG=0.                                          MNEM00
ALRWG=0.                                          MNEM00
APD=0.                                            MNEM00
APDD=0.                                           MNEM00
ARBJET=0.                                         MNEM00
ARD=0.                                             MNEM00
ARDD=0.                                           MNEM00
AYD=0.                                            MNEM00
AYDD=0.                                           MNEM00
COLWG = 0.                                       MNEM00
CORWG = 0.                                       MNEM00
CDELF = 0.                                       MNEM00
CDFIN = 0.                                       MNEM00
CLLWG = 0.                                       MNEM00
CLRWG = 0.                                       MNEM00
CLELE = 0.                                       MNEM00
CLFIN = 0.                                       MNEM00
DQL=0.                                           MNEM00
DQN=0.                                           MNEM00
ETAQ=0.                                           MNEM00
EXIT=0.                                           MNEM00
GUSTYP=0.                                         MNEM00
HGUSTE=0.                                         MNEM00
HGUSTF=0.                                         MNEM00
HGUSTW=0.                                         MNEM00
IND=1                                             MNEM00
NWAG=0                                            MNEM00
VGUSTE=0.                                         MNEM00
VGUSTW=0.                                         MNEM00
YGUSTF=0.                                         MNEM00
YGUSTW=0.                                         MNEM01
XFLJ=0.0                                          MNEM01
YFLJ=0.0                                          MNEM01
ZFLJ=0.0                                          MNEM01
RMLJ=0.0                                          MNEM01
PMLJ=0.0                                          MNEM01
YMLJ=0.0                                          MNEM01
XFRJ=0.0                                          MNEM01
YFRJ=0.0                                          MNEM01
ZFRJ=0.0                                          MNEM01
RMRJ=0.0                                          MNEM01
PMRJ=0.0                                          MNEM01

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YMRJ=0.0	MNEM0112
XADD=0.	MNEM0113
YADD=0.	MNEM0114
ZADD=0.	MNEM0115
PMADD=0.	MNEM0116
PMADD=0.	MNEM0117
YMADD=0.	MNEM0118
DO 30 I=1.74	MNEM0119
FOR(I)=0.	MNEM0120
30 CONTINUE	MNEM0121
DO 40 J=1.150	MNEM0122
DO 40 I=1.4	MNEM0123
Y(I,J)=0.	MNEM0124
40 CONTINUE	MNEM0125
DIZIY=IZ-IX	MNEM0126
DIXIZ=IX-IZ	MNEM0127
DIYIX=IX-IX	MNEM0128
IF(XMIN.LT..8726645F-03) XMIN=DTR	MNEM0129
IF(XMIN.GT.DTR) XMIN=DTR	MNEM0130
IF(XLIMIT.LT.(.5*DTR).OR.XLIMIT.GT..1745329) XLIMIT=DTR	MNEM0131
IF(DAMP.LT.(40.*ERR(1))) DAMP=40.*ERR(1)	MNEM0132
YALWG=-YARWG	MNEM0133
YALJET=-YARJET	MNEM0134
CALL VR3D (XX0,YY0,ZZ0,AYE,APE,ARE,VXB,VYB,VZB,-1)	MNEM0135
V=SQRT(XX0**2+YY0**2+ZZ0**2)	MNEM0136
CALL TURN (XFC,V,ARE)	MNEM0137
PW=1./W	MNEM0138
MASS=W/32.17	MNEM0139
IF(EPDS.EQ.0.) EPDS=.5	MNEM0140
ARWING=YWG(1R)	MNEM0141
IF(ARWING.EQ.0.) ARWING=10.	MNEM0142
SWING=SQRT(XWG(1)*ARWING)	MNEM0143
CWING=SWING/ARWING	MNEM0144
PCWING = 0.	MNEM0145
IF(CWING.NE.0.) PCWING = 1./CWING	MNEM0146
CAGW=COS(AGW)	MNEM0147
CWG6=.6*CWING	MNEM0148
YAERO(14,1)=YAERO(3,1)/YAERO(17,1)	MNEM0149
DXWGL=XAWG-XAELE-CWG6*CAGW	MNEM0150
DZWGL=ZAWG-7AELE*SIN(AGW)*CWG6	MNEM0151
SWINGH=.5*SWING	MNEM0152
CNPCI=CNPCD	MNEM0153
IF(INJET.EQ.0) COLJET=0.	MNEM0154
CALL VR3D (TAXL,0.,0.,-AYRJET,APBJET,ARBJET,XFLJET,YFLJET,ZFLJET,1)	MNEM0155
CALL XPRO (XAJET,YALJET,ZAJET,XFLJET,YFLJET,ZFLJET,LLJET,MLJET,	MNEM0156
1 NLJET)	MNEM0157
CALL VR3D (TAXR,0.,0.,AYRJET,APBJET,ARBJET,XFRJET,YFRJET,ZFRJET,1)	MNEM0158
CALL XPRO (XAJET,YARJET,ZAJET,XFRJET,YFRJET,ZFRJET,LRJET,MRJET,	MNEM0159
1 NRJET)	MNEM0160
CYCR1=CYSTK1*CYCF(3)+CYCF(2)	MNEM0161
CYCR2=CYSTK2*CYCL(3)+CYCL(2)	MNEM0162
PED=PEUAL*PEDA(3)+PEDA(2)	MNEM0163
COLKS=COLSTK	MNEM0164
XSTK(1)=CYCR1*DTRR	MNEM0165
XSTK(2)=CYCR2*DTRR	MNEM0166

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XSTK(3)=PFD*PEDA(1)/(PEDA(3)*100.)
CALL VR3D (XFC(23),XFC(24),XFC(25),AYE,APR,ARE,Y(1,76),Y(1,77),
1      Y(1,78),-1)
Y(1,90)=XND
Y(1,91)=YND
Y(1,92)=ZND
LINK=1
IF(NPART.NE.2) GO TO 60
50 WRITE (6,90) TZERO,ZDELTA1,TMAX,ZDELTA2,ZMAX2,ZMAX3
CALL IVAR (EXIT,LINK,TAXL,TAXR,PILGH2)
60 CONTINUE
Y(1,17)=Z7
IF(NPART.NE.2) RETURN
C INITIALIZE VARIABLES ONLY IF A MANEUVER IS CALLED FOR.
LWING=0
RMASS=1./MASS
RIY=1./IY
DP = IX*17 - IXZ*IXZ
IF(DP.EQ.0.) GO TO 70
DPIXZ=IXZ/DP
DPIX=IX/DP
DPIZ=IZ/DP
RETURN
70 CONTINUE
EXIT=1.
WRITE (6,80)
RETURN
80 FORMAT ( 109H0 CHECK FUSELAGE INERTIAS. THE NUMBERS INPUT ARE PHYSICALLY IMPOSSIBLE AND CANNOT BE HANDLED BY THIS PROGRAM.)
90 FORMAT (1H0,54X,23HINPUT DATA FOR MANEUVER/35X, 55HSTART
1T1 MAX1 DELTA2 MAX2 MAX3 /35X, 55H(SEC)
2 (SEC) (SEC) (SEC) (SEC) (SEC) /1H,29X,6F10.3
3 //35X, 61HJ XCIT(J,1) (J,2) (J,3) (J,4)
4J,5) (J,6))
END

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.....

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SUBROUTINE MODE (PD,V,IMODE)
COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NUMRTS,GAINB,
1      INDEX,STGAIN(6),TSTAR,COELTD,SLOT(3,9)
COMMON /KVARTR/ KVAR(6),POL(6,12)
DIMENSION PD(6,7),SLT(3,9),ISLOT(6,2)
DIMENSION HEAD(6,2),HEAD1(3,2)
DATA HEAD/9H1AT STICK,5HPEDAL,1H ,1H ,1H ,1H ,10HLONG STICK,
1 8HTHROTTLE,9HL THROT 1,9HL THROT 2,9HL ANGLE 1,9HL ANGLE 2/
DATA HEAD1/
1 10HSD SLP ANG,10HROLL ANGLE,8HYAW RATE,7HFWV VEL,10HANG OF ATK,
2 9HPITCH ANG/
DATA ISLOT /3,4,0,0,0,0,2,1,8,9,10,11/
COLD=COELTD
WRITE (6,30)
ISLTD=0

```

```

INDEX=0
KSLTT=-2
DO 20 I=1,3
KSLTT=KSLTT+3
CALL SLTT (SLT,SLOT,KSLTT)
ISLTE=ISLTE+3
J1=4*IMODE-2
DO 10 J=1,J1
JSLTE=ISLOT(J,IMODE)
CALL SLTE (PD1,ISLTE,JSLTE,IMODE)
COELTD=COELTD/COLD*.3937
IF (I.EQ.1.AND.IMODE.FQ.2) COELTD=COELTD*.3048
INDEX=INDEX+1
WRITE(6,50) HEAD1(I,IMODE),HEAD(J,IMODE),
1 (UU(L),VV(L),L=1,3),COELTD
10 CONTINUE
CALL SLTT (SLOT,SLT,KSLTT)
20 CONTINUE
WRITE(6,40)
RETURN
30 FORMAT(1H0, 57X,15HNUMERATOR ROOTS/1X,117HDEPEND.VAR. INDEP.
1 VAR. REAL1 IMAG1 REAL2 IMAG2
2REAL3 IMAG3 GAIN)
40 FORMAT(/// 34H ALL TIMES ARE IN UNITS OF SECONDS/
1 81H ALL GAINS ARE IN UNITS OF M/SEC, RAD OR RAD/SEC PER CM. OF COM
2NTROLLER DEFLECTION)
50 FORMAT(1H ,A10,5X,A10,7G14.6)
END

```

```

SUBROUTINE OFFTRM
COMMON /STRIAB/ T1(86),DL,DM,DN,DX,DY,DZ,T2(113),XFC(28),
1 T3(179),MASS
COMMON /STRIAM/ T4(3),IXZ,T5(170),DIXIZ,DIYIX,DIZIY
COMMON /MANARO/ I,V,T6(11),VXR,VZB,APD,VYB,ARD,AYD,T7(4),
1 AYE,APE,ARE
COMMON /FORY/ Y(4,150)
REAL MASS,IXZ
IF (Y(1,85).EQ.0.) GO TO 10
ARD=-Y(1,85)*SIN(APE)
CAPE=Y(1,85)*COS(APE)
APD=CAPE*SIN(AWE)
AYD=CAPE*COS(ARE)
GO TO 20
10 CONTINUE
IF (Y(2,86).EQ.1.) GO TO 20
APED=32.17*(Y(2,86)-COS(APE)*COS(ARE))/V
APD=APED
20 CONTINUE
CALL VR3D (XFC(23),XFC(24),XFC(25),AYE,APE,ARE,Y(1,76),Y(1,77),
1 Y(1,78),-1)
DX = MASS*(Y(1,76)+APD*VZB-AYD*VYB)

```

OY = MASS*(Y(1,77)+AYD*VXB-ARD*VZB)	OFFT0023
DZ = MASS*(Y(1,78)+ARD*VYB-APD*VXB)	OFFT0024
DL = APD*(AYD*DIZIY-ARD*IXZ)	OFFT0025
DM = ARD*AYD*DIXIZ+(ARD+AYD)*(ARD-AYD)*IXZ	OFFT0026
DN = APD*(ARD*DIXIX+AYD*IXZ)	OFFT0027
30 CONTINUE	OFFT0028
RETURN	OFFT0029
END	OFFT0030

.....

SUBROUTINE PARA (W,COND1)	PARA0001
COMMON /STRIAB/ T1(95),PD(6,7),T2(8),KM1,T3(349),NPASS	PARA0002
COMMON /MANAL/ T4(5),TAXL,TAXR	PARA0003
COMMON /MANARO/ T5(19),COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE,	PARA0004
1 TLSTK(2),THLSTK(2)	PARA0005
COMMON /TOPLOT/ T6(6),EXIT	PARA0006
DIMENSION VAR(11)	PARA0007
EQUIVALENCE (VAR(1),COLSTK)	PARA0008
IF(COND1.NE.0.) GO TO 10	PARA0009
CALL WRFM	PARA0010
CALL WRPV (3,VAR,KM1,PD,TAXL,TAXR)	PARA0011
10 IF(EXIT.NE.0.) GO TO 20	PARA0012
WRITE(6,60)	PARA0013
GO TO 30	PARA0014
20 WRITE(6,50) NPASS	PARA0015
30 CONTINUE	PARA0016
CALL TIME* (TUSED,DTIME,TLEFT)	PARA0017
WRITE (6,70) NPASS,TUSED	PARA0018
40 RETURN	PARA0019
50 FORMAT (36H1AIRCRAFT IS ***NOT*** TRIMMED AFTER,15,	PARA0020
1 12H ITERATIONS./13X,9H*****)	PARA0021
60 FORMAT (21H-AIRCRAFT, IS TRIMMED.)	PARA0022
70 FORMAT (5X6HPART 1,16X13,12H ITERATIONS,20X10,3,	PARA0023
1 35H MINUTES ELAPSED COMPUTING TIME)	PARA0024
END	PARA0025

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SUBROUTINE PLOT	PPL00001
COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,	PPL00002
1 NPART,NVARA,NVARB,NVARC,NSCALE	PPL00003
1 ,NVAR,NPRINT,NTIME	PPL00004
COMMON /PLOT/ HEAD(2,210)	PPL00005
DIMENSION A(209)	PPL00006
DIMENSION AC(3),AD(3),NVAR(3),RATE(3)	PPL00007
DIMENSION LINE(101)	PPL00008
EQUIVALENCE (NVAR(1),NVARA)	PPL00009
DATA 11/1H1/,12/1H2/,13/1H3/,14/1H4/,15/1H5/,16/1H6/,17/1H7/,	PPL00010
1 1H/1H /	PPL00011
C WRITE HEADING FOR PLOT	PPL00012

CALL WROT	PPL00013
C CHANGE PROPER PLOT SCALES	PPL00014
IF(NSCALE.LT.4) GO TO 10	PPL00015
NSCALE=NSCALE-4	PPL00016
AH(3)=AH(3)*1000.	PPL00017
AL(3)=AL(3)*1000.	PPL00018
10 IF(NSCALE.LT.2) GO TO 20	PPL00019
NSCALE=NSCALE-2	PPL00020
AH(2)=AH(2)*1000.	PPL00021
AL(2)=AL(2)*1000.	PPL00022
20 IF(NSCALE.LT.1) GO TO 30	PPL00023
NSCALE=NSCALE-1	PPL00024
AH(1)=AH(1)*1000.	PPL00025
AL(1)=AL(1)*1000.	PPL00026
30 DO 60 N=1,3	PPL00027
L=NVAR(N)	PPL00028
IF(AH(N).NE.AL(N)) GO TO 40	PPL00029
AL(N)=0.	PPL00030
AH(N)=10.	PPL00031
40 CONTINUE	PPL00032
IF(N.EQ.1) M=11	PPL00033
IF(N.EQ.2) M=12	PPL00034
IF(N.EQ.3) M=14	PPL00035
IF(L.GT.0.AND.L.LT.210) GOTO 50	PPL00036
WRITE(6,180) M,(HEAD(K,210),K=1,2)	PPL00037
AH(N)=-1000.	PPL00038
AL(N)=-2000.	PPL00039
GO TO 60	PPL00040
50 WRITE(6,180) M,(HEAD(K,L),K=1,2)	PPL00041
60 CONTINUE	PPL00042
C COMPUTE SCALING CONSTANTS	PPL00043
DO 70 I=1,3	PPL00044
RATE(I)=(AH(I)-AL(I))/10.	PPL00045
AC(I)=10./RATE(I)	PPL00046
70 AD(I)=1.5-AL(I)*AC(I)	PPL00047
C WRITE SYMBOL AND SCALE HEADING	PPL00048
WRITE(6,160) I1, AL(1),AH(1),RATE(1),I3,I1,I2	PPL00049
WRITE(6,160) I2, AL(2),AH(2),RATE(2),I5,I1,I4	PPL00050
WRITE(6,160) I4, AL(3),AH(3),RATE(3),I6,I2,I4	PPL00051
WRITE(6,170) I7,I1,I2,I4	PPL00052
C INITIALIZE LINE TO BLANKS	PPL00053
DO 80 I=1,101	PPL00054
80 LINE(I)=IH	PPL00055
CALL TIMEX (TUSED,TDELT,TLEFT)	PPL00056
90 READ(3) IPSN,T,A	PPL00057
IF(T.GT.9999.E+04) GO TO 150	PPL00058
NTIME=NTIME+1	PPL00059
IF(NTIME.EQ.NPRINT) NTIME=0	PPL00060
IF(NTIME.NE.0) GO TO 90	PPL00061
C SCALE DATA TO FIXED POINT POSITION ON SCALE	PPL00062
KB=A(NVARA)*AC(1)+AD(1)	PPL00063
KX=A(NVARH)*AC(2)+AD(2)	PPL00064
KY=A(NVARC)*AC(3)+AD(3)	PPL00065
C CHECK FOR EQUALITY OF VARIABLES	PPL00066
IF(KB.EQ.KX) GO TO 100	PPL00067

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IF(KR.EQ.KY) GO TO 110
IF(KX.EQ.KY) GO TO 120
C      CHECK TO SEE IF VARIABLES FALL ON SCALE
IF(KB.GE.1.AND.KR.LE.101) LINE(KB)=I1
IF(KX.GE.1.AND.KX.LE.101) LINE(KX)=I2
IF(KY.GE.1.AND.KY.LE.101) LINE(KY)=I4
GO TO 140
100 IF(KH.EQ.KY) GO TO 130
C      FIRST AND SECOND VARIABLES ARE IN SAME POSITION
IF(KR.GE.1.AND.KR.LE.101) LINE(KB)=I3
IF(KY.GE.1.AND.KY.LE.101) LINE(KY)=I4
GO TO 140
C      FIRST AND THIRD VARIABLES ARE IN SAME POSITION
110 IF(KR.GE.1.AND.KR.LE.101) LINE(KB)=I5
IF(KX.GE.1.AND.KX.LE.101) LINE(KX)=I2
GO TO 140
C      SECOND AND THIRD VARIABLES ARE IN SAME POSITION
120 IF(KR.GE.1.AND.KR.LE.101) LINE(KB)=I1
IF(KX.GE.1.AND.KX.LE.101) LINE(KX)=I6
GO TO 140
C      ALL THREE VARIABLES ARE IN SAME POSITION
130 IF(KB.GE.1.AND.KB.LE.101) LINE(KB)=I7
140 WRITE (6,190) T,LINE
C      RESET LINE TO BLANKS
IF(KH.GE.1.AND.KR.LE.101) LINE(KB)=I8
IF(KX.GE.1.AND.KX.LE.101) LINE(KX)=I8
IF(KY.GE.1.AND.KY.LE.101) LINE(KY)=I8
GO TO 90
150 CONTINUE
CALL TIMEX (TUSED,TDELT,TLEFT)
WRITE (6,200) TDELT
RETURN
160 FORMAT (1H ,10X,9HSCALE ,A1,8H FROM,F11.3,4H TO,F11.3,
1 10H 1 INCH =,F9.3,12X,A1,5H FOR ,A1,3H + ,A1,4X,
2 19H ON SAME PRINT POS.)
170 FORMAT (86X,A1,5H FOR ,A1,3H + ,A1,3H + ,A1,19H ON SAME PRINT POS.
1 //67X,6HINCHES,/T20,1H0,T30,1H1,T40,1H2,T50,1H3,T60,1H4,
2 T70,1H5,T80,1H6,T90,1H7,T100,1H8,T110,1H9,T119,2H10/
3 T20,1H0,T30,1H0,T40,1H0,T50,1H0,T60,1H0,T70,1H0,T80,1H0,
4 T90,1H0,T100,1H0,T110,1H0,T120,1H0)
180 FORMAT (78X,8H SYMBOL ,A1,2H =,2A10)
190 FORMAT (1H ,5X,F9.2,4X,101A1)
200 FORMAT (1H0,F15.5)
END

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SUBROUTINE RANG (A1,A2,A3,B1,H2,B3,C1,C2,C3,N1,N2)
C
C      A IS THE MATRIX OF THE A SET OF EULER ANGLES
C      B IS THE MATRIX OF THE B SET OF EULER ANGLES
C      C IS THE MATRIX OF THE C SET OF EULER ANGLES
C

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C      N1= 1, N2= 1 IS FOR H*A                                RANG0007
C      N1=-1, N2= 1 IS FOR H*A(TRANSP0SE)                   RANG0008
C      N1= 1, N2=-1 IS FOR H(TRANSP0SE)*A                   RANG0009
C      N1=-1, N2=-1 IS FOR H(TRANSP0SE)*A(TRANSP0SE)       RANG0010
C                                                                RANG0011
C      DIMENSION A(3,3),H(3,3),C(3,3)                       RANG0012
C      COMPUTE A AND H MATRICES                               RANG0013
C      CALL MATRIX (A1,A2,A3,A,N1)                           RANG0014
C      CALL MATRIX (H1,H2,H3,H,N2)                           RANG0015
C      COMPUTE C MATRIX                                       RANG0016
C      DO 10 I=1,3                                           RANG0017
C      DO 10 J=1,3                                           RANG0018
C      C(I,J)=0.                                             RANG0019
C      DO 10 L=1,3                                           RANG0020
C      C(I,J)=C(I,J)+H(L,J)*A(I,L)                         RANG0021
10  CONTINUE                                                RANG0022
C      CHECK TO SEE IF PITCH ANGLE IS 90 DEGREES            RANG0023
C      IF(C(1,1).EQ.0..AND.C(1,2).EQ.0.) GO TO 40          RANG0024
C      C1=ATAN2(C(1,2),C(1,1))                               RANG0025
C      C3=ATAN2(C(2,3),C(3,3))                               RANG0026
C      CC3=COS(C3)                                           RANG0027
C      IF(ABS(CC3).LE.0.001) GO TO 20                       RANG0028
C      C2=ATAN2((-C(1,3)*CC3),C(3,3))                       RANG0029
C      GO TO 30                                              RANG0030
20  CONTINUE                                                RANG0031
C      C2=ATAN2(-C(1,3),(C(2,3)*SIN(C3)))                  RANG0032
30  CONTINUE                                                RANG0033
C      CHECK TO SEE IF C1,C2,C3 ARE IN WRONG QUADRANT       RANG0034
C      IF(COS(C2).GE.0.) RETURN                              RANG0035
C      RECOMPUTE C1,C2,C3 IN CORRECT QUADRANT               RANG0036
C      C1=ATAN2(-C(1,2),-C(1,1))                             RANG0037
C      C3=ATAN2(-C(2,3),-C(3,3))                             RANG0038
C      IF(ABS(CC3).LE.0.001) RETURN                          RANG0039
C      C2=ATAN2((-C(1,3)*COS(C3))+C(3,3))                   RANG0040
C      RETURN                                                RANG0041
C      RESOLVE INDETERMINACY CAUSED BY PITCH ANGLE BY USING OLD RANG0042
C      YAW ANGLE                                             RANG0043
40  CONTINUE                                                RANG0044
C      C2 = -SIGN(1.570796,C(1,3))                          RANG0045
C      C3=(ATAN2(-C(2,1),(-C(1,3)*C(3,1)))-C1)*C(1,3)      RANG0046
C      RETURN                                                RANG0047
C      END                                                    RANG0048

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      SUBROUTINE RATI (X,EPDX,XLIMIT,VAR,AT,BT,CT,ATH,BTH,CTH)  RATI0001
      COMMON /KVARTR/ KVAR(6)                                RATI0002
      DIMENSION VAR(11),X(6),EPDX(11)                       RATI0003
      RATIO=1.                                                 RATI0004
      RATIO1=1.                                                 RATI0005
      DO 10 I=1,6                                              RATI0006
C      CHECK TO SEE IF ANY CORRECTION EXCEEDS LIMITS        RATI0007
      IF(ABS(X(I)).GT.XLIMIT) RATIO1=ABS(XLIMIT/X(I))        RATI0008

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AD-A037 689

NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA AIR VEHICL--ETC F/G 20/4
LOW-SPEED V/STOL STABILITY AND CONTROL PREDICTION. VOLUME II: C--ETC(U)
JAN 77 J W CLARK

UNCLASSIFIED

NADC-76313-30

NL

2 OF 2

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END

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C      CHOOSE RATIO SO THAT LARGEST CORRECTION = LIMIT
      IF(RATIO.LE.RATIO1) GO TO 10
      RATIO=RATIO1
      II=I
10 CONTINUE
C      MAKE CORRECTIONS
      DO 20 I=1,6
      VAR(KVAR(I))=VAR(KVAR(I))*X(I)*RATIO*EPDX(KVAR(I))
      IF(KVAR(I).EQ.8.AND.(AT.NE.0..OR.BT.NE.0..OR.CT.NE.0.))
1      VAR(9)=AT+(BT*CT*VAR(8))*VAR(8)
      IF(KVAR(I).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))
1      VAR(11)=ATH+(BTH*CTH*VAR(10))*VAR(10)
20 CONTINUE
      IF(RATIO.NE.1.) WRITE (6,40) X,RATIO,II
30 RETURN
40 FORMAT (1H0// 12H CORRECTIONS ,2X,6F11.7,
1      / 39H0RATIO APPLIED TO CORRECTION VECTOR IS ,F10.7,
2      17H FROM COMPONENT ,I3)
      END

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SUBROUTINE REACT
COMMON /FORCE/ T1(7),XFRJ,T2(9),YFRJ,T3(12),ZFRJ,
1 T4(11),PMRJ,T5(12),PMRJ,T6(12),YMRJ
COMMON /RJETS/ NJETR,XSTK(3),X0(10),XD(10),XR(10),TPOS(10),
1 TNEG(10),XAJETR(10),YAJETR(10),ZAJETR(10),
2 AYBJTR(10),APHJTR(10),JTCON(10)
3 XACT,TPCTA,TPCTB,NRCS,TJETR(10)
COMMON /LJETS/ T7(93),TLJET(6)
COMMON /MANARO/ T8(3),TDELT
COMMON /CONTR/ ADISP(3),ARATE(3),DELTA(4),THR(2),RPCT(3),XSYS(28)
COMMON /STANRO/ J,W,LINK
COMMON /STRIAB/ ADUM(543),XRJT(140)
DIMENSION Y(10),Y1(10),Y2(10),NP(10),YC(10),Y1C(10),Y1L(10),
1 Y2L(10),TJETC(10)
1 RAMP(X,X1,X2)=(ABS(X-X1)-ABS(X2-X)+X2-X1)/(2.*(X2-X1))
TRAMP(X,X0,XD,XR,TP,TN)=TN*(RAMP(X,X0-XD-XR,X0-XD)-1.)
1 *TP*RAMP(X,X0-XD,X0-XD-XR)
XFRJ=0.
YFRJ=0.
ZFRJ=0.
PMRJ=0.
YMRJ=0.
SUMT=0.
XPCT=1.
DO 10 I=1,10
10 TJETP(I)=0.
DO 20 JJ=1,NRCS
IF((TLJET(JJ).LT.100.)AND.(NRCS.NE.0)) XPCT=XPCT-1./NRCS
20 SUMT=SUMT+TLJET(JJ)/1000.
TPCTA=0.

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TPCTH1=0.
IF (XPCT.GT..05) TPCTA1=TPCTA/XPCT
IF (XPCT.GT..05) TPCTH1=TPCTB/(XPCT**2)
30 DO 60 N=1,NJFTR
  IF (XR(N).LE.0.) XR(N)=.001
  TJETC(N)=TDAMP(XSTK(JTRCON(N)),X0(N),XD(N),XR(N),TPOS(N),TNEG(N))
  IF (LINK.NF.4) GOTO 50
  TAU1=XRJT(14*(N-1)+12)
  TAU2=XHJT(14*(N-1)+13)
  IF (TAU1.EQ.0..AND.TAU2.EQ.0.) GOTO 50
  IF (TAU2.EQ.0.) GOTO 40
C ** SECOND ORDER
  Y2(N)=(TJETC(N)-Y(N)-(TAU1+TAU2)*Y1(N))/(TAU1+TAU2)
  CALL RIEMAN (Y(N),Y1(N),Y2(N),TDELTA/4.,NP(N),YIC(N),YC(N),Y2L(N))
  GO TO 60
C ** FIRST ORDER
40 Y1(N)=(TJETC(N)-Y(N))/TAU1
  CALL STLJES (Y(N),Y1(N),TDELTA/4.,NP(N),YC(N),Y1L(N))
  GO TO 60
C ** ZERO ORDER
50 YC(N)=TJETC(N)
60 TJETR(N)=YC(N)
  IF (LINK.NF.2) GOTO 80
  DO 70 I=1,10
    NP(I)=0
    Y(I)=TJETR(I)
70 Y1(I)=0.
80 CONTINUE
90 DO 100 N=1,NJETR
  IF ((TPCTA1+TPCTH1).NE.0.) TJETR(N)=TJETR(N)*(TPCTA1+TPCTH1*SUNT)
  1 *SUNT/100.
  TJETR(N)=TJETR(N)*XPCT
  CALL VR3D (TJETR(N),0.,0.,AYBJTR(N),APBJTR(N),0.,XF,YF,ZF,1)
  CALL XPHO (XAJETR(N),YAJETR(N),ZAJETR(N),XF,YF,ZF,PM,PM,YM)
  XFRJ=XF+XFRJ
  YFRJ=YF+YFRJ
  ZFRJ=ZF+ZFRJ
  RMRJ=RM+RMRJ
  PMRJ=PM+PMRJ
  YMRJ=YM+YMRJ
100 CONTINUE
  RETURN
  END

```

REAC0032
 REAC0033
 REAC0034
 REAC0045
 REAC0046
 REAC0047
 REAC0048
 REAC0049
 REAC0050
 REAC0051
 REAC0052
 REAC0053
 REAC0054
 REAC0055
 REAC0056
 REAC0057
 REAC0058
 REAC0059
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 REAC0079
 REAC0080
 REAC0081
 REAC0082
 REAC0083
 REAC0084

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SUBROUTINE READIN (T)
COMMON /STPIAB/ T1(184),
2 XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),
3 XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),T2(27),
4 XCON(63),XJET(14),T3(3),GUESS,T4(44),TZERO,
5 T5(3),XRJT(140),YRJT(7),XLJT(84),YLJT(7)
COMMON /STRIMA/ T6(24),KCIT(20),T7(4),TMAX,XCIT(20,6),T8(9),

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READ0001
 READ0002
 READ0003
 READ0004
 READ0005
 READ0006
 READ0007


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1          KREAD,T9,TSTAR(14),ZMAX2,ZMAX3,T10(3),ZDELT1, READ0008
2          ZDELT2 READ0009
COMMON /TOPLOT/ T11(7),ICOM(20),IPSN,NPART,T12(3),NSCALE READ0010
COMMON /CONTR/ ADISP(3),ARATE(3),DELTA(4),THR(2),RPCT(3),XSYS(28) READ0011
COMMON /MET1/ XH(35),XW(21),YW(21),XE(14),YE(21),XF(7),YF(21), READ0012
1          XJ(14),XC(63),YR(7),XR(140),XT(28),XD(7),XI(21), READ0013
2          YL(7),XL(64),XS(28),TS(14),XCM(20,6) READ0014
DATA IMET/0/ READ0015
C • • NAMELIST DICTIONARY READ0016
NAMELIST /CHANGE/ XH,XW,YW,XE,YE,XF,YF,XJ,XC,YR,XR,XT,XD,XI, READ0017
1          YL,XL,XS,TS READ0018
IF (NPART.EQ.6) GOTO 20 READ0019
IF (NPART.NE.9.AND.NPART.NE.10) GO TO 10 READ0020
READ (5,CHANGE) READ0021
CALL CONV(IMET) READ0022
GUESS = 2. READ0023
IF (NPART.EQ.9) GUESS=0. READ0024
RETURN READ0025
10 CONTINUE READ0026
READ (5,70) IPSN ,ICOM READ0027
IF (IPSN.LT.0) IMET=1 READ0028
IPSN=IAHS(IPSN) READ0029
READ(5,60) XR,XW,YW,XE,YE,XF,YF,XJ,XC,XT,XD,XI,TS READ0030
READ(5,60) YR READ0031
NJ14=YR(1)*14+.5 READ0032
READ(5,60) (XR(I),I=1,NJ14) READ0033
READ(5,60) YL READ0034
NJ14=YL(1)*14+.5 READ0035
READ(5,60) (XL(I),I=1,NJ14) READ0036
READ(5,60) XS READ0037
T=0. READ0038
CALL CONV(IMET) READ0039
IF (NPART.EQ.1.OR.NPART.EQ.7) RETURN READ0040
GOTO 40 READ0041
20 NPART=2 READ0042
DO 30 I=1,14 READ0043
30 TSTAR(I)=0. READ0044
IF (NSCALE.EQ.0) GOTO 40 READ0045
READ(5,CHANGE) READ0046
CALL CONV(IMET) READ0047
GUESS=0. READ0048
40 CONTINUE READ0049
READ(5,60) TZERO,ZDELT1,ZMAX1,ZDELT2,ZMAX2,ZMAX3 READ0050
T = TZERO READ0051
IF (ZDELT1.EQ.0.) ZDELT1 = 0.1 READ0052
IF (ZDELT2.EQ.0.) ZDELT2=ZDELT1 READ0053
TMAX = ZMAX1 READ0054
DO 50 I=1,20 READ0055
READ (5,80) NEXT, J ,(XCM (I,K),K=1,6) READ0056
KCIT(I) = J READ0057
KREAD = I READ0058
IF (IMET.EQ.0) CALL CONV1(J,XCIT,I) READ0059
IF (NEXT.EQ.0) RETURN READ0060
50 CONTINUE READ0061
RETURN READ0062

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60	FORMAT(7F10.0)	READ0063
70	FORMAT(2X,[H.6A10/7A10/7A10])	READ0064
80	FORMAT(11,14,5X,6F10.0)	READ0065
	END	READ0066

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	SUBROUTINE RIEMAN (Y,Y1,Y2,DT,NPASS,Y1C,YC,Y2L)	RIEM0001
	IF(NPASS)20,10,20	RIEM0002
10	Y2L=Y2	RIEM0003
	Y1C=Y1	RIEM0004
	YC=Y	RIEM0005
	NPASS=1	RIEM0006
	GOTO 30	RIEM0007
20	YC=YC+Y1C*DT*(Y2+2.*Y2L)/6.*DT**2	RIEM0008
	Y1C=Y1C+DT*(Y2+Y2L)/2.	RIEM0009
30	Y=YC+Y1C*DT+DT**2*(4.*Y2-Y2L)/6.	RIEM0010
	Y1=Y1C+DT*(3.*Y2-Y2L)/2.	RIEM0011
	Y2L=Y2	RIEM0012
	RETURN	RIEM0013
	END	RIEM0014

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	SUBROUTINE ROOA	ROOA0001
	COMMON /STRD/ X,Y,U,V,T,A(9,2),IY,IYS,G(6,2),SLIM,IO,IO	ROOA0002
	DIMENSION RS(6),DF(6),CS(6),UNP(11),EVL(2,2)	ROOA0003
	EQUIVALENCE (DF(1),HIN), (DF(2),VN), (DF(3),DUN), (DF(4),DVN), (DF	ROOA0004
	1(5), DUN1), (DF(6),DVN1), (UNP(11),YS), (UNP(1),U1), (UNP(2),U2),	ROOA0005
	2(UNP(3),U3), (UNP(4),U4), (UNP(5),U5), (UNP(6),U6), (UNP(7),U7),	ROOA0006
	3(UNP(8),US1), (UNP(9),US2), (UNP(10),US3)	ROOA0007
	DATA FA,FR /1H,1H/	ROOA0008
	IFT=1	ROOA0009
	IR=0	ROOA0010
	IS=0	ROOA0011
	IH=0	ROOA0012
	ITF=0	ROOA0013
	DO 10 I=1, IO	ROOA0014
10	RS(I)=0.	ROOA0015
	DS=.0005	ROOA0016
	TST=0.	ROOA0017
	UNPV=0.	ROOA0018
	SLIM2=SLIM*SLIM	ROOA0019
	X = 5.272	ROOA0020
	Y=0.	ROOA0021
	GO TO 210	ROOA0022
	ENTRY ROOR	ROOA0023
	IF (IFT-3) 20, 70, 220	ROOA0024
20	EVL(1,IFT)=X	ROOA0025
	EVL(2,IFT)=U	ROOA0026
	GO TO (30,50),IFT	ROOA0027

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30 X=10.53
40 IFT=IFT+1
   GO TO 210
50 X=0.
   IF ( EVL(2,1).NE. 0.,OR. EVL(2,2). NE. 0. ) GO TO 40
   WRITE (6,40)
60 FORMAT(43H FUNCTION VALUE IS ZERO FOR ALL VALUES OF X)
   GO TO 590
70 IFT=4
   IF(U.EQ.0..AND.V.EQ.0.) IH=1
80 ICT=0
   FM=FA
   IF( ABS(G(IR+1,1))* ABS(G(IR+1,2)))100,100,90
90 IF((X-G(IR+1,1))*2+(Y-G(IR+1,2))*2-.05*TST)150,150,160
100 IF(IH)110,110,390
110 IF(IFT)120,120,140
120 OS=.01
   ITF=1
130 X = -.1274396
   Y=X
   GO TO 170
140 IF(G(IR,1).EQ.0..AND.G(IR,2).EQ.0.) GO TO 130
150 G(IR+1,1)=X
   G(IR+1,2)=Y
160 X= G(IR+1,1)*.999
   Y=AMAX1( ABS(G(IR+1,2)*.999 ), ABS(1.E-3*G(IR+1,1)))
170 DO 180 I=1,11
180 UNP(I)=0.
   GO TO 210
190 DXN1=DX
   DYN1=DY
   DXSP=UXS
200 DX=OS*X
   DY=OS*Y
   DXS=DX*DX+DY*DY
   X=X+DX
   Y=Y+DY
210 RETURN
220 ICT=ICT+1
   IF(U. EQ. 0..AND. V. EQ. 0. ) GO TO 500
   IF( IR)270,270,230
230 CONTINUE
   DO 260 J=1,IS
   XI=X-CS(J)
   YI=Y
   TS4=V/U
   IF(RS(J))250,250,240
240 YI=(Y+YI)*YI
   XI=(XI-YI)*(XI+YI)+BS(J)
250 TS2=U/(XI*XI+YI*YI)
   U=(XI+YI*TS4)*TS2
260 V=(TS4*XI-YI)*TS2
270 US= ABS(U)+ ABS(V)
   U7=U7+US-.153
   U6=U4

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R00A0028
 R00A0029
 R00A0030
 R00A0031
 R00A0032
 R00A0033
 R00A0034
 R00A0035
 R00A0036
 R00A0037
 R00A0038
 R00A0039
 R00A0040
 R00A0041
 R00A0042
 R00A0043
 R00A0044
 R00A0045
 R00A0046
 R00A0047
 R00A0048
 R00A0049
 R00A0050
 R00A0051
 R00A0052
 R00A0053
 R00A0054
 R00A0055
 R00A0056
 R00A0057
 R00A0058
 R00A0059
 R00A0060
 R00A0061
 R00A0062
 R00A0063
 R00A0064
 R00A0065
 R00A0066
 R00A0067
 R00A0068
 R00A0069
 R00A0070
 R00A0071
 R00A0072
 R00A0073
 R00A0074
 R00A0075
 R00A0076
 R00A0077
 R00A0078
 R00A0079
 R00A0080
 R00A0081
 R00A0082

US=U3	ROOA0083
U4=V-U2	ROOA0084
U3=U-U1	ROOA0085
U2=V	ROOA0086
U1=U	ROOA0087
US3=US2	ROOA0088
US2=US1	ROOA0089
US1=US	ROOA0090
IF (ICT-2) 200,190,280	ROOA0091
280 AVG=3./U7	ROOA0092
DO 290 I=1,6	ROOA0093
290 OF(I)=UNP(I)*AVG	ROOA0094
IF (DY) 320,300,320	ROOA0095
300 DRN=DX/DXN1	ROOA0096
TS3=(DUN-DRN*DUN1)*DRN	ROOA0097
TS=1.*DRN	ROOA0098
TS1=TS*DUN+TS3	ROOA0099
TS5=-2.*UN*TS	ROOA0100
TS7=TS1*TS1+2.*TS3*TS5	ROOA0101
310 DXN1=DX	ROOA0102
DX=TS5*DX/(TS1+SIGN(SQRT(ABS(TS7)),TS1))	ROOA0103
GO TO 370	ROOA0104
320 DRN=(DX*DXN1+DY*DYN1)/DXSP	ROOA0105
DIN=(DY*DXN1-DX*DYN1)/DXSP	ROOA0106
TS1=DUN-DRN*DUN1+DIN*DVN1	ROOA0107
TS2=OVN-DIN*DUN1-DRN*DVN1	ROOA0108
TS3=DRN*TS1-DIN*TS2	ROOA0109
TS4=DRN*TS2+DIN*TS1	ROOA0110
TS=1.*DRN	ROOA0111
TS1=TS*DUN-DRN*DIN*TS3	ROOA0112
TS2=TS*DVN+DIN*DIN*TS4	ROOA0113
TS5=2.*(VN*DIN-UN*TS)	ROOA0114
TS6=-2.*(VN*TS+UN*DIN)	ROOA0115
TS7=(TS1-TS2)*(TS1+TS2)+2.*(TS5*TS3-TS4*TS6)	ROOA0116
TS8=2.*(TS1*TS2+TS4*TS5+TS3*TS6)	ROOA0117
TS9=ABS(TS7)*SQRT(1.+(TS8/TS7)**2)	ROOA0118
TS3=SQRT(.5*ABS(TS9+TS7))	ROOA0119
TS4=SIGN(SQRT(.5*ABS(TS9-TS7)),TS8)	ROOA0120
330 IF (TS1*TS3+TS2*TS4) 340,350,350	ROOA0121
340 TS4=-TS4	ROOA0122
TS3=-TS3	ROOA0123
350 TS7=TS1+TS3	ROOA0124
TS8=TS2+TS4	ROOA0125
TS3=TS7**2+TS8**2	ROOA0126
TS1=(TS5*TS7+TS6*TS8)/TS3	ROOA0127
TS2=(TS6*TS7-TS5*TS8)/TS3	ROOA0128
DXN1=DX	ROOA0129
DYN1=DY	ROOA0130
DX=TS1*DXN1-TS2*DYN1	ROOA0131
DY=TS2*DXN1+TS1*DYN1	ROOA0132
DXSP=UXS	ROOA0133
Y=Y*DY	ROOA0134
IF (ABS(Y) .GT. 1.E-5 .AND. ABS(Y/X) .GT. 5.E-4) GO TO 360	ROOA0135
Y=0.	ROOA0136
DY=0.	ROOA0137

360	YS=Y*Y	R00A0138
370	X=X*DX	R00A0139
	TST=X*X+YS	R00A0140
	IF (TST-1.E-15) 380,380,410	R00A0141
380	FM=FM	R00A0142
390	IM=0	R00A0143
400	X=0.	R00A0144
	Y=0.	R00A0145
	YS=0.	R00A0146
	GO TO 500	R00A0147
410	DXS=DX*DX+DY*DY	R00A0148
	AT=DXS/TST	R00A0149
	IF (AT .LE. 1.E-15) GO TO 510	R00A0150
	IF (ICT -21) 470,450,420	R00A0151
420	IF (AT-ATX) 450,460,460	R00A0152
430	AT=ATX	R00A0153
	X=XX	R00A0154
	Y=YX	R00A0155
	YS=YSX	R00A0156
440	FM=FM	R00A0157
	GO TO 510	R00A0158
450	ATX=AT	R00A0159
	XX=X	R00A0160
	YX=Y	R00A0161
	YSX=YS	R00A0162
460	IF (ICT .LT. 25) GO TO 470	R00A0163
	IF (AT .NE. ATX) GO TO 430	R00A0164
	IF (ICT.GE. 40) GO TO 440	R00A0165
470	IF (TST-SLIM ²) 210,210,550	R00A0166
480	Y=-Y	R00A0167
	BS(IS)=YS	R00A0168
	IS=IS-1	R00A0169
490	ICT=0	R00A0170
500	AT=0.	R00A0171
510	CONTINUE	R00A0172
	IF (IR.EQ.6) GO TO 530	R00A0173
	IR=IR+1	R00A0174
	IS=IS+1	R00A0175
	CS(IS)=X	R00A0176
	G(IR,1)=X	R00A0177
	G(IR,2)=Y	R00A0178
	IF (Y.NE.0. .AND. ICT.GT.0) GO TO 480	R00A0179
	DO 520 I=1,2	R00A0180
	TS2=EVL(1,I)-X	R00A0181
	IF (YS.GT.0.) TS2=TS2+YS	R00A0182
520	EVL(2,I)=EVL(2,I)/TS2	R00A0183
	D1=(EVL(2,1)+EVL(2,2))*0.5	R00A0184
	UNPT=D1*Y	R00A0185
	IF (ABS(EVL(2,1)-EVL(2,2)) . LE. 1.E-4* ABS(D1)) GO TO 590	R00A0186
	IF (IR.LT. 10) GO TO 80	R00A0187
530	CONTINUE	R00A0188
	WRITE (6,540)	R00A0189
540	FORMAT(41H SOLUTION EXCEEDS MAXIMUM NUMBER OF ROOTS)	R00A0190
	GO TO 570	R00A0191
550	WRITE (6,560) SLIM	R00A0192

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560 FORMAT (23H NEXT ROOT GREATER THAN, F10.1, 8H RADIANS)	R00A0193
570 WRITE (6, 580)	R00A0194
580 FORMAT (44H INCOMPLETE FUNCTION RESIDUE F(S) REMAINING.)	R00A0195
590 ID= 0	R00A0196
IO=IP	R00A0197
X=UNPT	R00A0198
RETURN	R00A0199
END	R00A0200

SUBROUTINE SLTE (PD, J, L, M)	SLTE0001
COMMON /TRONIC/ UU(6), VV(6), TAU(22), DAMP(22), NUMRTS, GAINR,	SLTE0002
1 INDEX, STGAIN(6), TSTAR, COELTD, SLOT(3, 9)	SLTE0003
DIMENSION PD(6, 12), K(3, 2)	SLTE0004
DATA K /2.6, 4.1, 3.5/	SLTE0005
DO 10 I=1, 3	SLTE0006
SLOT(I, J)=PD(K(I, M), L)	SLTE0007
10 CONTINUE	SLTE0008
CALL SRT	SLTE0009
RETURN	SLTE0010
END	SLTE0011

SUBROUTINE SLTT (A, B, K)	SLTT0001
DIMENSION A(3, 9), B(3, 9)	SLTT0002
L=K+2	SLTT0003
DO 10 I=1, 3	SLTT0004
DO 10 J=K, L	SLTT0005
A(I, J)=B(I, J)	SLTT0006
B(I, J)=0.	SLTT0007
10 CONTINUE	SLTT0008
RETURN	SLTT0009
END	SLTT0010

SUBROUTINE SOLVE	SOLV0001
COMMON /STRIAB/ T1(80), X(6), T2(59), KM1, T3(350), PDPHI(6, 7)	SOLV0002
COMMON /TOPLOT/ T4(6), EXIT	SOLV0003
C SOLUTION OF KM1 LINEAR EQUATIONS IN KM1 VARIABLES	SOLV0004
N1 = 1 + KM1	SOLV0005
NM1=KM1-1	SOLV0006
DO 60M = 1, KM1	SOLV0007
K = M + 1	SOLV0008
C CHECK FOR ZERO ON DIAGONAL	SOLV0009
IF (ABS(PDPHI(M, M)) .GE. 1.E-05) GO TO 40	SOLV0010
DO 10 I=K, KM1	SOLV0011

IF (ABS(PDPHI(I,M)).GE.1.E-05) GO TO 20	SOLV0012
10 CONTINUE	SOLV0013
SINGULAR MATRIX NO SOLUTION	SOLV0014
EXIT=1.	SOLV0015
RETURN	SOLV0016
20 DO 30 III=1,N1	SOLV0017
E=PDPHI(I,III)	SOLV0018
PDPHI(I,III)=PDPHI(M,III)	SOLV0019
30 PDPHI(M,III)=E	SOLV0020
40 DO 50 J = K, N1	SOLV0021
50 PDPHI(M,J)=PDPHI(M,J)/PDPHI(M,M)	SOLV0022
IF (KML.LT.K) GO TO 70	SOLV0023
DO 60 MP = K, KML	SOLV0024
DO 60 J = K, N1	SOLV0025
60 PDPHI(MP,J)=PDPHI(MP,J)-PDPHI(MP,M)*PDPHI(M,J)	SOLV0026
70 DO 80 M = 1, KML	SOLV0027
80 X(M)=PDPHI(M,N1)	SOLV0028
DO 90 K1 = 1, NM1	SOLV0029
J = N1 - K1	SOLV0030
K = J - 1	SOLV0031
DO 90 M = 1, K	SOLV0032
90 X(M)=X(M)-PDPHI(M,J)*X(J)	SOLV0033
RETURN	SOLV0034
END	SOLV0035

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SUBROUTINE SRT	SRT00001
COMMON /STRD/ UX,UY,U,V,T,A(9,2),I0,I02,G(6,2),SLIM,I0,IL	SRT00002
COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NR,GAINB,	SRT00003
1 INDEX,STGAIN(6),TSTAR,COL,SLOT(3,9)	SRT00004
DO 10 I=1,6	SRT00005
DO 10 J=1,2	SRT00006
10 G(I,J) = 0.	SRT00007
I0=6	SRT00008
I0=3	SRT00009
I02=9	SRT00010
IL=1	SRT00011
SLIM=10000.	SRT00012
T=1.	SRT00013
CALL ROOA	SRT00014
20 UR = (UX-UY)*(UX+UY)	SRT00015
UI= 2.*UX*UY	SRT00016
DO 30 L=1,3	SRT00017
M= 3*L-3	SRT00018
DO 30 I=1,3	SRT00019
N=M+1	SRT00020
K=3*I-2	SRT00021
A(N,1) = SLOT(L,K+2)*SLOT(L,K+1)*UX + SLOT (L, K) *UR	SRT00022
30 A(N,2) = SLOT(L,K+1) *UY +SLOT (L,K) *UI	SRT00023
40 CALL DET	SRT00024
CALL MOOR	SRT00025
IF (IL)20,50,20	SRT00026

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50 NR=ID	SRT00027
IF (NR.GT.4) NR=4	SRT00028
COL=UX	SRT00029
DO 60 J=1,6	SRT00030
UU(J)=0.	SRT00031
60 VV(J)=0.	SRT00032
DO 70 J=1,10	SRT00033
UU(J)=G(J,1)	SRT00034
70 VV(J)=G(J,2)	SRT00035
RETURN	SRT00036
END	SRT00037

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SUBROUTINE STAB
COMMON /FORCE/ XF,XFRWG,XFLWG,XFELE,XFFUS,XFRJET,XFLJET,XFRJ,
1 XFLJ,XFGUN,XFFIN,XFW,XADD,
2 YF,YFFUS,YFRJET,YFLJET,YFRJ,YFLJ,YFGUN,YFFIN,YFW,
3 YADD,
4 ZF,ZFRWG,ZFLWG,ZFELE,ZFFUS,ZFRJET,ZFLJET,ZFRJ,
5 ZFLJ,ZFGUN,ZFW,ZADD,
6 QL,LRWG,LLWG,LELE,LFUS,LRJET,LLJET,RMRJ,RMLJ,LGUN,
7 LFIN,PGYRO,RMADD,
8 QM,MRWG,MLWG,MELE,MFUS,MRJET,MLJET,PMRJ,PMLJ,MGUN,
9 MFIN,PGYRO,PMADD,
10 QN,NRWG,NLWG,NELE,NFUS,NRJET,NLJET,YMRJ,YMLJ,NGUN,
11 NFIN,YGYRO,YMADD
COMMON /STPIAR/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,
1 PD(6,7),DTR,EPD,ERR(6),KML,RHO,R12,SPD(6,6,1),
2 XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),
3 XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),HLCG,
4 DAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63),
5 XJET(14),XMIN,AYEFP,CNPGD,GUESS,NPASS,PDPHI(6,7),
6 STACG,TZERO,DTRKSG,MXPASS,XLIMIT,XRJT(140),YRJT(7)
7 XLJT(84),YLJT(7)
COMMON /STRIMA/ AY,VH,AGW,IXZ,XXU,YYD,ZZD,ALGF,APFP,AYFP,COWL,
1 COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),
2 TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA,
3 CPWIC,DIXIZ,DIYIX,DIZIY,FTKTS,KREAD,PIU30,
4 TSTAR(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RUDIND,
5 ZDELT1,ZDELT2
COMMON /MANAL/ Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,
1 ALFIN,ALLWG,ALRWG,COELE,COFIN,COLWG,CORWG,CLELE,
2 CLFIN,CLLWG,CLRWG,CWING,CYCH1,CYCH2,RANGE,WGCOL,
3 XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,
4 YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,
5 ALECR1,ALGFPD,HAFPI,YGUSTW,ZFLWG1,ZFRWG1
COMMON /HOMAN/ PI,ZZ,ALT,T,APDU,ARDD,AYUD,DTRR,GMAXV,RATE1,
1 RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP,
2 LGTH1,PILGH1,START2
COMMON /MANARO/ I,V,NWAG,TOELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,
1 YGUSTF,GFWD,GLAT,GVERT,VXH,VZB,APD,VYR,ARD,AYD,
2 COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE

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3      ,TLSTK(2),THLSTK(2)                                STA00040
COMMON /STANRO/ J,W,LINK,QELE,VSND,YFIN(2),ZFEL(2),COND1,SWING, STA00041
1      PILGH2,PWGEL1                                       STA00042
COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,           STA00043
1      NPART,NVARA,NVAHH,NVANC,NSCALE                     STA00044
1      ,NVAR5,NPRINT,NTIME                                 STA00045
COMMON /KVARTR/ KVAR(6),PO1                                STA00046
DIMENSION VAR(5),EPDD(5),A(74),KS(6),VAR1(11),VARSV(11)   STA00047
DIMENSION PD1(6,12),KS1(6),PDN1(6,6),D(6),VARM(6),PDT(6,12) STA00048
EQUIVALENCE (VAR(1),VXH),(A(1),XF),(VAR1(1),COLSTK)       STA00049
REAL IX,IY,IZ,MASS                                         STA00050
DATA F1,F2,F3,F4,F5,F6,F7,F8,F9/.224809,.393701,.737562,10.76391, STA00051
1      35.31466,.571015,.737562,.050539,3.28064/          STA00052
DATA KS/13.23,35.48,61.74/                                STA00053
DATA KS1/1,14,24,62,49,36/                                STA00054
LINK=3                                                       STA00055
DO 10 N=1,11                                                STA00056
VARSV(N)=VAR1(N)                                           STA00057
10 CONTINUE                                                 STA00058
J=2                                                         STA00059
KML=6                                                       STA00060
DO 20 LL=1,74                                               STA00061
20 E(LL)=A(LL)                                              STA00062
DO 30 LL=1,6                                                 STA00063
30 PD1(LL,12)=-A(KS1(LL))                                  STA00064
CALL BJACOR                                                 STA00065
KOUNTS=0                                                    STA00066
DCOL=0.                                                     STA00067
COLS=COLSTK                                                STA00068
UNIT(1)=100.*RANGE/COLL(1)                                  STA00069
UNIT(2)=100.*CYCF(3)/CYCF(1)                               STA00070
UNIT(3)=100.*CYCL(3)/CYCL(1)                               STA00071
UNIT(4)=100.*PEDA(3)/PEDA(1)                               STA00072
DO 40 LL=8,11                                              STA00073
40 UNIT(LL)=DTP                                             STA00074
CALL VR3D (XXD,YYD,ZZD,AYE,APE,ARE,VXB,VYB,VZB,-1)       STA00075
DO 50 J=1,4                                                 STA00076
DO 50 I=1,6                                                 STA00077
PD1(I,J)=PD1(I,J)*UNIT(J)                                  STA00078
PD(I,J)=PD1(I,J)                                           STA00079
50 CONTINUE                                                 STA00080
DO 60 J=8,11                                               STA00081
DO 60 I=1,6                                                 STA00082
PD1(I,J)=PD1(I,J)*UNIT(J)                                  STA00083
60 CONTINUE                                                 STA00084
DO 90 J=1,11                                               STA00085
FM=F2                                                       STA00086
IF (J.GT.4.AND.J.LT.8) FM=1.                               STA00087
DO 70 I=1,6                                                 STA00088
PDT(I,J)=PD1(I,J)                                           STA00089
70 CONTINUE                                                 STA00090
DO 80 I=1,3                                                 STA00091
PD1(I,J)=PD1(I,J)*FM/F1                                     STA00092
60 PD1(I+3,J)=PD1(I+3,J)*FM/F7                             STA00093
90 CONTINUE                                                 STA00094

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WRITE (6,390)	STAR0095
CALL WRVP1 (1,VAR,KM1,PD,TAXL,TAXR)	STAR0096
DO 100 I=1,3	STAR0097
100 D(1)=MASS*14.5439	STAR0098
D(4)=IZ/F3	STAR0099
D(5)=IY/F3	STAR0100
D(6)=IX/F3	STAR0101
DO 120 J=1,11	STAR0102
DO 110 I=1,6	STAR0103
110 P01(I,J)=P01(I,J)/D(I)	STAR0104
120 CONTINUE	STAR0105
WRITE (6,390)	STAR0106
CALL WRVP1 (1,VAR,KM1,PD,TAXL,TAXR)	STAR0107
CALL VR3D (0.,0.,W,AYE,APE,ARE,XFW,YFW,ZFW,-1)	STAR0108
DO 130 I=1,6	STAR0109
DO 130 J=1,11	STAR0110
130 P01(I,J)=P01(I,J)	STAR0111
EPDD(1)=XIT(4)	STAR0112
EPDD(2)=XIT(4)	STAR0113
EPDD(3)=XIT(6)	STAR0114
EPDD(4)=XIT(4)	STAR0115
EPDD(5)=XIT(6)	STAR0116
EPDD(6)=XIT(6)	STAR0117
DO 140 I=1,6	STAR0118
140 KVAR(I)=I	STAR0119
DO 210 J=1,6	STAR0120
VAR(J)=VAR(J)*EPDD(J)	STAR0121
IF (J.EQ.1) GO TO 150	STAR0122
VAR(J-1)=VAR(J-1)-EPDD(J-1)	STAR0123
150 CONTINUE	STAR0124
CALL ANAL	STAR0125
IF (EXIT.NF.0.) RETURN	STAR0126
GO TO (160,170,160,170,160,170),J	STAR0127
160 WRITE (6,360)	STAR0128
170 TV=VAR(3)	STAR0129
DO 180 I=1,6	STAR0130
FM=F9	STAR0131
IF (I.EQ.3.OR.I.GT.4) FM=1.	STAR0132
180 VARM(I)=VAR(I)/FM	STAR0133
VARM(3)=VARM(3)*DTRP	STAR0134
CALL WRVP1 (1,VARM,KM1,PD,TAXL,TAXR)	STAR0135
VAR(3)=TV	STAR0136
CALL WRFM	STAR0137
SPD(J,1,1)=XF-E(1)	STAR0138
SPD(J,2,1)=ZF-E(24)	STAR0139
SPD(J,3,1)=QM-E(49)	STAR0140
SPD(J,4,1)=YF-E(14)	STAR0141
SPD(J,5,1)=QL-E(36)	STAR0142
SPD(J,6,1)=QN-E(62)	STAR0143
DO 190 K=1,6	STAR0144
SPD(J,K,1)=SPD(J,K,1)/EPDD(J)	STAR0145
190 CONTINUE	STAR0146
DO 200 K=1,74	STAR0147
A(K)=A(K)-E(K)	STAR0148
200 CONTINUE	STAR0149

WRITE (6,370)	STAR0150
CALL WRFM	STAR0151
L=1	STAR0152
210 CONTINUE	STAR0153
VAR(6)=VAR(6)-EPDD(6)	STAR0154
DO 220 I=1,6	STAR0155
DO 220 J=1,6	STAR0156
FN=F9	STAR0157
FD=F1	STAR0158
IF (I.EQ.3.OR.I.GT.4) FN=1.	STAR0159
IF (J.EQ.3.OR.J.GT.4) FD=F7	STAR0160
220 PDN1(I,J)=SPD(I,J,1)*FN/FD	STAR0161
WRITE (6,330)	STAR0162
WRITE (6,350) ((PDN1(I,J),I=1,6),J=1,6)	STAR0163
D(4)=D(3)	STAR0164
D(3)=D(5)	STAR0165
D(5)=D(6)	STAR0166
D(6)=IZ/F3	STAR0167
DO 230 I=1,6	STAR0168
DO 230 J=1,6	STAR0169
230 PDN1(I,J)=PDN1(I,J)/D(J)	STAR0170
WRITE (6,340)	STAR0171
WRITE (6,350) ((PDN1(I,J),I=1,6),J=1,6)	STAR0172
IF (V.LE.0.) GO TO 290	STAR0173
XAEW=XAEF-XAWG	STAR0174
IF (QWG.GE..5*Q) GO TO 240	STAR0175
QWG=.5*Q	STAR0176
CWING=1.	STAR0177
SWING=1.	STAR0178
240 CONTINUE	STAR0179
DO 260 J=1,4	STAR0180
DO 250 I=1,6	STAR0181
PD(I,J)=PD(I,J)/V	STAR0182
PD1(I,J)=PD1(I,J)/V	STAR0183
PD1(I,J+7)=PD1(I,J+7)/V	STAR0184
250 CONTINUE	STAR0185
260 CONTINUE	STAR0186
DO 261 J=1,11	STAR0186
CALL VR2D(PD1(1,J),PD1(3,J),AP,PD1(1,J),PD1(3,J),-1)	STAR0186
261 CALL VR2D(PD1(6,J),PD1(4,J),AP,PD1(6,J),PD1(4,J),-1)	STAR0186
CALL LMODE (V,QWG,0.,W,CWING,XAEW)	STAR0187
CALL LAMODF (V,QWG,W,SWING)	STAR0188
LINK=4	STAR0189
DO 270 J=1,13	STAR0190
TSTAB(J)=TSTAB(J+1)	STAR0191
270 CONTINUE	STAR0192
TSTAR(14)=9999.	STAR0193
DO 280 J=1,11	STAR0194
VAR1(J)=VAPSV(J)	STAR0195
280 CONTINUE	STAR0196
CALL TIMEX (TUSED,OTIME,TLEFT)	STAR0197
WRITE (6,320) OTIME,TUSED	STAR0198
RETURN	STAR0199
290 WRITE (6,300) V	STAR0200
300 FORMAT (//10H **** V = ,F10.2,61H LINEARIZED, NON-DIMENSIONAL ST	STAR0201

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IBILITY ANALYSIS SKIPPED ****)
LINK=4
DO 310 J=1,13
TSTAR(J)=TSTAR(J+1)
310 CONTINUE
TSTAR(14)=9999.
RETURN
320 FORMAT (1H0,10X,F7.3,22H MINUTES USED IN STAB ,5X,F8.3,
1 23H MINUTES TOTAL RUN TIME)
330 FORMAT (1H1,51X,29HSTABILITY DERIVATIVE MATRICES///
120X,83HTHE FOLLOWING MATRIX HAS UNITS OF NEWTONS OR NEWTON.METRES
2PER METRE/SEC OR RAD/SEC//)
340 FORMAT (1//30X,65HTHE FOLLOWING MATRIX HAS UNITS OF 1/SEC. METRE/SE
1C OR 1/METRE.SEC//)
350 FORMAT (1H0,30X,1HU,17X,1HW,17X,1HQ,17X,1HV,17X,1HP,17X,1HR/140,
1 4X,16HX-FORCE ,6G18.7/
2 5X,16H7-FORCE ,6G18.7/
3 5X,16HPITCH MOMENT ,6G18.7/
4 /5X,16HY-FORCE ,6G18.7/
5 5X,16HROLL MOMENT ,6G18.7/
6 5X,16HYAW MOMENT ,6G18.7/)
360 FORMAT (1H1)
370 FORMAT (1H ,63X,5HDELTA)
380 FORMAT(1//.13X, 97HTHE FOLLOWING MATRIX HAS UNITS OF METRES/SEC**2
1 OR RAD/SEC**2 PER CM. OF CONTROL OR RAD. OF ANGLE)
390 FORMAT(1H1,15X, 94HTHE FOLLOWING MATRIX HAS UNITS OF NEWTONS OR NE
1WTON.METRES PER CM. OF CONTROL OR RAD. OF ANGLE)
END

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STAR0202
 STAR0203
 STAR0204
 STAR0205
 STAR0206
 STAR0207
 STAR0208
 STAR0209
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 STAR0221
 STAR0222
 STAR0223
 STAR0224
 STAR0225
 STAR0226
 STAR0227
 STAR0228
 STAR0229

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SUBROUTINE START
COMMON /STRIAH/ T1(92),IX,IY,IZ,T2(42),DTR,T3,ERR(6),T4,RHO,R12,
1 T5(36),XEL(14),XER(7),XFC(28),XFN(7),XFS(35),T6(7),
3 XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),BLCG,
4 DAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63),
5 XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7),
6 STAG,TZERO,DTRKSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7),
7 XLJT(84),YLJT(7),XRAM,ZRAM,RRAM
COMMON /STRIMA/ T7(2),AGW,IXZ,XXD,YYD,ZZD,ALGF,T8(2),CGWL,T9(158),
1 ALGEZ,T10(2),CGSTA,T11(6),PIU30,TSTAR(14)
COMMON /STAMAN/ T12(8),CGBL,T13(10),TWOPI,T14(7),POLDTR
COMMON /MANAL/ Q,T15(2),QWG,T16,TAXL,TAXR,XAWG,ZAWG,T17(17),
3 XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,
4 YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,
5 ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1
COMMON /ROMAN/ PI,Z7,ALT,T,T18(3),DTRR
COMMON /MANARO/ T19(19),
2 COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE
3 ,TLSTK(2),THLSTK(2),AT,BT,CT,ATH,BTH,CTH
4 ,DFLAP1,FAIL(6)
COMMON /STANRO/ J,W,LINK,GELE,VSNQ,T20(4),COND1
COMMON /STARAN/ C3,C4,RW,CLP,CLR,DCD,DQL,DQN,CLBO,CNBO,ETAQ,NJET,

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STAR0001
 STAR0002
 STAR0003
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 STAR0016
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 STAR0019
 STAR0020
 STAR0021
 STAR0022

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1      QFIN,CLRCL,YFS(14),CNHCL,CNPCL,CNRCD,CNRCL,COLKS, STAR0023
2      D3ELF,FNSWC,LWING,RPIST,YAFRO(31,3),APHJET,AHJET, STAR0024
3      AYBJFT,CNPCD1,CNPCD2,COLJET,DXWGEL,DZWGEL,ETAQMX, STAR0025
4      PWGK1,PCWING,SWINGH,ANGR,ANGL,OFLAP, STAR0026
COMMON /KVARTR/ KVAR(6) STAR0027
COMMON /RJETS/  NJETP,XSTK(3),X0(10),X0(10),XR(10),TPOS(10),
1      TNEG(10),XAJETR(10),YAJETR(10),ZAJETR(10), STAR0028
2      AYBJTR(10),APHJTR(10),JTRCON(10) STAR0029
3      ,XACT,TPCTA,TPCTB,NHCS STAR0030
COMMON /LJETS/  NJETL,XAJETL(6),YAJETL(6),ZAJETL(6),APHJTL(6),
1      ARBJTL(6),CONLJ(2,5),NCONL(6),XLT(2),XLTH(2) STAR0031
2      ,AYBJTL(6),ATT(6),ANG(6),PSIANG(6),THEANG(6) STAR0032
3      ,ANGA(6),ANGH(6),TLJET(6),ANGC(6) STAR0033
4      ,THLJET(6),TL(2,6),NLINK STAR0034
COMMON /CONTR/ DIJMI(15),XSYS(28),NTRIM STAR0035
COMMON /MET1/  XR(35),XW(21),YW(21),XE(14),YE(21),XF(7),YF(21),
1      XJ(14),XC(63),YR(7),XA(140),XT(28),XG(7),XI(21), STAR0036
2      YL(7),XL(64),XS(28),TS(14) STAR0037
DIMENSION HEAD(2,14) STAR0038
REAL IX,IY,IZ,IXZ STAR0039
DATA LR,LW/5,6/ STAR0040
DATA HEAD/ STAR0041
1 1H,10H FUSELAGE,10H RE,10H ACTION JET,1H,10H LIFT JET, STAR0042
2 1H,10H WING,1H,10H ELEVATOR,1H,10H FIN/RUDDER,1H, STAR0043
3 10H JET,3*1H,10H CONTROLS,10H FLIGHT,10H CONSTANTS, STAR0044
4 10H ALLOW,10H ABLE ERROR,1H,10H ITERATION,1H,10H STAB TIMES, STAR0045
5 2*1H / STAR0046
GUESS=0. STAR0047
NTRIM=0 STAR0048
C READ IN DATA THRU SUBROUTINE READIN. STAR0049
CALL READIN (T) STAR0050
C CALCULATE PHYSICAL CONSTANTS. STAR0051
DTH=.174532925E-01 STAR0052
RHO=.002378*XFC(28) STAR0053
Q=.5*RHO STAR0054
PIU30=.5492965H STAR0055
DTRRSQ=3282.60635 STAR0056
DTRR=.57.2957795 STAR0057
R12=1./12. STAR0058
PI=3.1415926536 STAR0059
P01DTH=.174532925E-03 STAR0060
HALFPI=1.570796327 STAR0061
TWOPI=6.283185307 STAR0062
C WRITE OUT HEADINGS. STAR0063
CALL WROT STAR0064
WRITE (LW,90) STAR0065
WRITE (LW,100) (HEAD(I,1),I=1,2),XB STAR0066
C CALCULATE CONSTANTS FOR FUSELAGE - SEE INPUT FORMAT GUIDE FOR STAR0067
C DESCRIPTION OF CONSTANTS. STAR0068
W=XFS(1) STAR0069
STACG=XFS(5)*R12 STAR0070
BLCG=XFS(6)*R12 STAR0071
WLCG=XFS(7)*R12 STAR0072
CGSTA=XFS(5) STAR0073
CGRL=XFS(6) STAR0074
STAR0075
STAR0076
STAR0077

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	CGWL=XFS(7)	STAR0078
	XAFUS=STACG-XFS(2)*R12	STAR0079
	YAFUS=XFS(3)*W12-BLCG	STAR0080
	ZAFUS=WLCG-XFS(4)*R12	STAR0081
	IX=XFS(8)	STAR0082
	IY=XFS(9)	STAR0083
	IZ=XFS(10)	STAR0084
	IXZ=XFS(11)	STAR0085
	YFS(1)=XFS(15)*DTR	STAR0086
	YFS(2)=XFS(23)*DTR	STAR0087
	YFS(3)=XFS(24)*DTR	STAR0088
	XRAM=STACG-XFS(33)*R12	STAR0089
	ZRAM=XFS(34)*R12-WLCG	STAR0090
	RAMM=XFS(35)/32.17	STAR0091
	WRITE (LW,100) (HEAD(I,4),I=1,2)*XW ,YW	STAR0092
C	CALCULATE CONSTANTS FOR WING - SEE INPUT FORMAT GUIDE FOR	STAR0093
C	DESCRIPTION OF CONSTANTS.	STAR0094
	QWG=.5*Q*XWG(1)	STAR0095
	XWG=STACG-XWG(2)*R12	STAR0096
	YRWG=XWG(3)*R12-BLCG	STAR0097
	ZAWG=WLCG-XWG(4)*R12	STAR0098
	AGW=XWG(5)*DTR	STAR0099
	PWGWL=XWG(9)*DTR	STAR0100
	ETAQMX=2.42	STAR0101
	CLB0=XWG(12)	STAR0102
	CLBCL=XWG(13)	STAR0103
	CLP=XWG(14)	STAR0104
	CLP=XWG(15)	STAR0105
	CNBO=XWG(16)	STAR0106
	CNACL=XWG(17)	STAR0107
	CNACL=XWG(18)	STAR0108
	CNRCO=XWG(19)*DTR	STAR0109
	CNPCL=XWG(20)	STAR0110
	CNPCO=XWG(21)	STAR0111
	DFLAP=XFC(19)	STAR0112
	DFLAP1=DFLAP	STAR0113
	WRITE (LW,100) (HEAD(I,5),I=1,2)*XE ,YE	STAR0114
C	CALCULATE CONSTANTS FOR ELEVATOR - SEE INPUT FORMAT GUIDE FOR	STAR0115
C	DESCRIPTION OF CONSTANTS.	STAR0116
	QELE=Q*XEL(1)	STAR0117
	XAELE=STACG-XEL(2)*R12	STAR0118
	YAELE=XEL(3)*R12-BLCG	STAR0119
	ZAELE=WLCG-XEL(4)*R12	STAR0120
	ALGEZ=XEL(5)*DTR	STAR0121
	WRITE (LW,100) (HEAD(I,6),I=1,2)*XF ,YF	STAR0122
C	CALCULATE CONSTANTS FOR FIN/RUDDER - SEE INPUT FORMAT GUIDE FOR	STAR0123
C	DESCRIPTION OF CONSTANTS.	STAR0124
	QFIN=Q*XFN(1)	STAR0125
	XAFIN=STACG-XFN(2)*R12	STAR0126
	YAFIN=XFN(3)*R12-BLCG	STAR0127
	ZAFIN=WLCG-XFN(4)*R12	STAR0128
	ALGF=XFN(5)*DTR	STAR0129
	FNSWC=1.-XFN(7)	STAR0130
	WRITE (LW,100) (HEAD(I,7),I=1,2)*XJ	STAR0131
C	CALCULATE CONSTANTS FOR JET - SEE INPUT FORMAT GUIDE FOR	STAR0132

C	DESCRIPTION OF CONSTANTS.	STAR0133
	NJET=XJET(1)	STAR0134
	XAJET=STACG-XJET(4)*P12	STAR0135
	YAJET=XJET(5)*P12-BLCG	STAR0136
	ZAJET=WLCG-XJET(6)*P12	STAR0137
	AYHJET=XJET(8)*DTR	STAR0138
	APBJET=XJET(9)*DTR	STAR0139
	ANGH=XJET(10)	STAR0140
	ANGL=XJET(11)	STAR0141
	NJETR=YHJT(1)*.5	STAR0142
	NJ14=NJETR*14	STAR0143
	XACT=YHJT(2)	STAR0144
	TPCTA=YHJT(3)	STAR0145
	TPCTH=YHJT(4)	STAR0146
	NRCS=YHJT(5)*.1	STAR0147
	WRITE(LW,100) (HEAD(I,2),I=1,2),YR, (XA (II),II=1,NJ14)	STAR0148
C	CALCULATE CONSTANTS FOR REACTION JETS - SEE INPUT FORMAT GUIDE FOR	STAR0149
C	DESCRIPTION OF CONSTANTS.	STAR0150
	DO 10 I=1,NJETR	STAR0151
	XAJETR(I)=STACG-XRJT(14*I-13)*R12	STAR0152
	YAJETR(I)=XRJT(14*I-12)*P12-BLCG	STAR0153
	ZAJETR(I)=WLCG-XRJT(14*I-11)*R12	STAR0154
	AYBJTR(I)=XRJT(14*I-10)*DTR	STAR0155
	APBJTR(I)=XRJT(14*I-9)*DTR	STAR0156
	JTRCON(I)=XRJT(14*I-8)*.5	STAR0157
	X0(I)=XRJT(14*I-7)	STAR0158
	XD(I)=XRJT(14*I-6)	STAR0159
	XR(I)=XRJT(14*I-5)	STAR0160
	IF(XP(I).LE.0.0) XR(I)=0.01	STAR0161
	TPDS(I)=XRJT(14*I-4)	STAR0162
	TNEG(I)=XRJT(14*I-3)	STAR0163
10	CONTINUE	STAR0164
	NJETL=YLJT(1)*.5	STAR0165
	NJ14=NJETL*14	STAR0166
	WRITE(LW,100) (HEAD(I,3),I=1,2),YL, (XL (II),II=1,NJ14)	STAR0167
C	CALCULATE CONSTANTS FOR LIFT JETS - SEE INPUT FORMAT GUIDE FOR	STAR0168
C	DESCRIPTION OF CONSTANTS	STAR0169
	DO 20 I=1,NJETL	STAR0170
	XAJETL(I)=STACG-XLJT(14*I-13)*R12	STAR0171
	YAJETL(I)=YLJT(14*I-12)*P12-BLCG	STAR0172
	ZAJETL(I)=WLCG-XLJT(14*I-11)*R12	STAR0173
	APBJTL(I)=XLJT(14*I-10)*DTR	STAR0174
	ARRJTL(I)=XLJT(14*I-9)*DTR	STAR0175
	AYBJTL(I)=XLJT(14*I-8)*DTR	STAR0176
	ATT(I)=XLJT(14*I-7)	STAR0177
	ANG(I)=XLJT(14*I-6)	STAR0178
	PSTANG(I)=XLJT(14*I-5)*DTR	STAR0179
	THEANG(I)=XLJT(14*I-4)*DTR	STAR0180
	ANGA(I)=XLJT(14*I-3)/100.	STAR0181
	ANGH(I)=XLJT(14*I-2)/100.	STAR0182
	ANGC(I)=XLJT(14*I-1)/100.	STAR0183
20	CONTINUE	STAR0184
	DO 30 I=1,6	STAR0185
	FAIL(I)=1.	STAR0186
30	NCONL(I)=XCON(12*I)*.5	STAR0187

DO 40 I=1,2	STAR0188
DO 40 J=1,5	STAR0189
CONLJ(I,J)=XCON(5*I+J-3)	STAR0190
40 CONTINUE	STAR0191
AT=XCON(19)	STAR0192
BT=XCON(20)	STAR0193
CT=XCON(21)	STAR0194
ATH=XCON(22)	STAR0195
BTH=XCON(23)	STAR0196
CTH=XCON(24)	STAR0197
NLINK=XCON(35)*.5	STAR0198
DO 50 I=1,2	STAR0199
DO 50 II=1,6	STAR0200
TL(I,II)=XCON(29+6*I+II)	STAR0201
50 CONTINUE	STAR0202
WRITE (LW,100) (HEAD(I,9),I=1,2),(XC (I),I=1,49)	STAR0203
WRITE (LW,110) (XC (I),I=50,63)	STAR0204
CALL CON1 (XCON,COLJET)	STAR0205
WRITE (LW,100) (HEAD(I,10),I=1,2),XT	STAR0206
XXD=XFC(1)*1.6578	STAR0207
YYD=XFC(2)*1.6578	STAR0208
ZZD=-XFC(3)	STAR0209
ZZ=-XFC(4)	STAR0210
IF(GUESS.F0,2.) GO TO 60	STAR0211
AVE=XFC(5)*DTR	STAR0212
ARE=XFC(7)*DTR	STAR0213
APE=XFC(6)*DTR	STAR0214
COLSTK=XFC(8)	STAR0215
CYSTK1=XFC(9)	STAR0216
CYSTK2=XFC(10)	STAR0217
PEDAL=XFC(11)	STAR0218
TLSTK(1)=XFC(15)	STAR0219
TLSTK(2)=XFC(16)	STAR0220
IF(AT.NE.0..OR.BT.NE.0..OR.CT.NE.0.) TLSTK(2)=AT*(BT*CT*TLSTK(1))*	STAR0221
1 TLSTK(1)	STAR0222
THLSTK(1)=XFC(17)	STAR0223
THLSTK(2)=XFC(18)	STAR0224
IF(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.) THLSTK(2)=ATH*(BTH*CTH*	STAR0225
1 THLSTK(1))*THLSTK(1)	STAR0226
GUESS=2.	STAR0227
60 CONTINUE	STAR0228
DO 70 K=1,6	STAR0229
70 KVAR(K)=XIT(14*K)	STAR0230
TAXR=COLJET*COLSTK	STAR0231
IF (NJET.LE.0) TAXR=0.	STAR0232
TAXL=COLJET*COLSTK	STAR0233
IF (NJET.LE.1) TAXL=0.	STAR0234
80 CONTINUE	STAR0235
VSND=1./XFC(27)	STAR0236
WRITE (LW,100) (HEAD(I,11),I=1,2),XG	STAR0237
C CALCULATE ALLOWABLE ERRORS.	STAR0238
ERR(1)=XER(1)	STAR0239
ERR(2)=XER(2)	STAR0240
ERR(3)=XER(3)	STAR0241
ERR(4)=XER(4)	STAR0242

```

ERR(5)=XER(4)
ERR(6)=XER(5)
WRITE (LW,100) (HEAD(I,12),I=1,2),XI
XPASS=XIT(1)
COND1=XIT(5)
XLIMIT=2.0*TH*XIT(12)
XMIN=XIT(13)*DTR
DAMP=XIT(14)
WRITE (LW,100) (HEAD(I,13),I=1,2),TS
WRITE (LW,120) XS
C   CALCULATE CONSTANTS FOR SUBROUTINE CLCD.
CALL YFIX (YWG,YAERO)
CALL MNEM
RETURN
90 FORMAT (1H0//1H ,61X,10HINPUT DATA/)
100 FORMAT (1H0,55X,2A10.6H GROUP/(1H ,3X,7G18.7))
110 FORMAT (1H0,54X,18HINTERFERENCE GROUP/(1H ,3X,7G18.7))
120 FORMAT (1H0,57X,20HCONTROL SYSTEM GROUP/( 4X,7G18.7))
END

```

STAR0243
STAR0244
STAR0245
STAR0246
STAR0247
STAR0248
STAR0249
STAR0250
STAR0251
STAR0252
STAR0253
STAR0254
STAR0255
STAR0256
STAR0257
STAR0258
STAR0259
STAR0260
STAR0261

```

SUBROUTINE STLJES (X,X1,DTX,NPASSX,XC,X1L)
IF (NPASSX) 20,10,20
10 X1L=X1
XC=X
NPASSX=1
GOTO 30
20 XC=XC+DTX*(X1+X1L)/2.
30 X=XC+DTX*(3.*X1-X1L)/2.
X1L=X1
RETURN
END

```

STLJ0001
STLJ0002
STLJ0003
STLJ0004
STLJ0005
STLJ0006
STLJ0007
STLJ0008
STLJ0009
STLJ0010
STLJ0011

```

SUBROUTINE TIMEX (TUSED,DTIME,TLEFT)
REAL NEW,NOW
DATA NOW/0./
NEW=SECOND(T)
TUSED=NEW/60.
DTIME=(NEW-NOW)/60.
NOW=NEW
TLEFT=10.-TUSED
RETURN
END

```

TIME0001
TIME0002
TIME0003
TIME0004
TIME0005
TIME0006
TIME0007
TIME0008
TIME0009
TIME0010

```

SUBROUTINE TINIT

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TINI0001

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COMMON /STRIMA/ AY,VH,T1(2),XXD,YYD,ZZD,T2,APFP,AYFP,T3(167),
1 FTKTS,T4(2),TSTAB(14),T5(2),ASECOL
COMMON /STAMAN/ T6(5),APFG,ASEP,T7(4),R550,AYDMX,T8(3),HGUST,
1 KTCTR,T9(2),VGUST,ISTOP,T10(2),YGUST
  ARHG=0.
  ASECOL=0.
  AYDMX=0.
  HGUST=0.
  ISTOP=0.
  VGUST=0.
  ASEP=0.
  KTCTR = 0
  FTKTS=.5425
  P550=.1618181818E-02
  YGUST=0.
  VH=SQR(XXD**2+YYD**2)
  AYFP=0.
  APFP=0.
  IF(VH.NE.0.) AYFP=ATAN2(YYD,XXD)
  IF(VH.NE.0..OR.ZZD.NE.0.) APFP=ATAN2(-ZZD,VH)
  DO 10 I=2,14
  IF(TSTAB(I).EQ.0.) TSTAB(I)=9999.
10 CONTINUE
  RETURN
  END

```

TINI0002
TINI0003
TINI0004
TINI0005
TINI0006
TINI0007
TINI0008
TINI0009
TINI0010
TINI0011
TINI0012
TINI0013
TINI0014
TINI0015
TINI0016
TINI0017
TINI0018
TINI0019
TINI0020
TINI0021
TINI0022
TINI0023
TINI0024
TINI0025
TINI0026

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SUBROUTINE TRIM
COMMON /FORCE/ T1(20),YFFIN,T2(5),ZFELE
COMMON /STRIAB/ T3(40),X(6),DL,DM,DN,DX,DY,DZ,T4(3),PD(6,7),
1 T5(145),XIT(21),T6(98),EPDX(11),MASS,T7(79),AYEFP,
2 T8(3),PDPHI(6,7),T13,TZERO
COMMON /STRIMA/ AY,VH,AGW,IXZ,XXU,YYD,ZZD,ALGF,APFP,AYFP,CGWL,
1 COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),
2 TIME,T9(151),ZDELT1
COMMON /MANAL/ T10(5),TAXL,TAXR,T11(17),RANGE
COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,
1 YGUSTF,GFWD,GLAT,GVERT,VXH,VZH,APD,VYH,ARD,AYD,
2 COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE
COMMON /STANRO/ J,W,LINK,QELE,VSND,YFIN(2),ZFEL(2),COND1,SWING,
1 PILGH2,PWGEL1
COMMON /TOPLOT/ AM(3),AL(3),EXIT,ICOM(20),IPSN,
1 NPART,NVARA,NVARB,NVARC,NSCALE
COMMON /FORV/ Y(4,150)
COMMON /LJFTS/ T12(31),CONLJ(2,5)
DIMENSION VAR(11),HFA02(2,11)
EQUIVALENCE (VAR(1),COLSTK)
LOGICAL AYEFP
REAL MASS,IXZ
DATA HFA02/
1 1H,10H THROTTLE,1H,10H LONG STICK,1H,10H LAT STICK,1H,
2 10H PEDAL,10H POS EXCEE,10H DS STOPS,10H PERCENT F,

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TRIM0001
TRIM0002
TRIM0003
TRIM0004
TRIM0005
TRIM0006
TRIM0007
TRIM0008
TRIM0009
TRIM0010
TRIM0011
TRIM0012
TRIM0013
TRIM0014
TRIM0015
TRIM0016
TRIM0017
TRIM0018
TRIM0019
TRIM0020
TRIM0021
TRIM0022
TRIM0023
TRIM0024
TRIM0025

3 10HULL THROW ,10HCOMPUTED) ,2*1H ,10HL THROT 1 ,1H ,	TRIM0026
4 10HL THROT 2 ,1H ,9HL ANGLE 1,1H ,9HL ANGLE 2/	TRIM0027
DATA P01DTR/.1745329E-03/	TRIM0028
AYEFP=.TRUE.	TRIM0029
IF(ABS(AYE-AYFP).LE..01.AND.Y(1,85).EQ.0.) AYEFP=.FALSE.	TRIM0030
LPASS=5	TRIM0031
IF(XIT(3).EQ.0.) LPASS=1	TRIM0032
EPDX(1)=1./RANGE	TRIM0033
EPDX(2)=1./CYCF(3)	TRIM0034
EPDX(3)=1./CYCL(3)	TRIM0035
EPDX(4)=1./PEDA(3)	TRIM0036
DO 10 I=8,11	TRIM0037
10 EPDX(I)=1.	TRIM0038
IF (CONLJ(1,1).NE.0.) EPDX(8)=1./(CONLJ(1,1)*P01DTR)	TRIM0039
IF (CONLJ(2,1).NE.0.) EPDX(9)=1./(CONLJ(2,1)*P01DTR)	TRIM0040
IF (CONLJ(1,2).NE.0.) EPDX(10)=1./(CONLJ(1,2)*P01DTR)	TRIM0041
IF (CONLJ(2,2).NE.0.) EPDX(11)=1./(CONLJ(2,2)*P01DTR)	TRIM0042
C EPDX IS IN UNITS OF PERCENT PER RADIAN	TRIM0043
DX=0.	TRIM0044
DY=0.	TRIM0045
DZ=0.	TRIM0046
DL=0.	TRIM0047
DM=0.	TRIM0048
DN=0.	TRIM0049
DO 20 I=5,7	TRIM0050
EPDX(I)=1.	TRIM0051
20 CONTINUE	TRIM0052
CALL DAMPER	TRIM0053
DO 30 K=1,6	TRIM0054
X(K)=0.	TRIM0055
DO 30 L=1,7	TRIM0056
PD(K,L)=0.	TRIM0057
PDPHI(K,L)=0.	TRIM0058
30 CONTINUE	TRIM0059
LINK=2	TRIM0060
CALL ITRIM(LPASS)	TRIM0061
DO 40 I=1,11	TRIM0062
IF(I.GT.4.AND.I.LT.8) GO TO 40	TRIM0063
IF(VAR(I).GE.0.0.AND.VAR(I).LE.100.) GO TO 40	TRIM0064
WRITE (6,50) (HEAD2(J,I),J=1,2),(HEAD2(J,5),J=1,2),	TRIM0065
1 VAR(I),(HEAD2(J,6),J=1,2),(HEAD2(J,7),J=1,2)	TRIM0066
40 CONTINUE	TRIM0067
DL=0.	TRIM0068
DM=0.	TRIM0069
DN=0.	TRIM0070
DX=0.	TRIM0071
DY=0.	TRIM0072
DZ=0.	TRIM0073
Y(1,1)=VXR	TRIM0074
Y(1,2)=VYR	TRIM0075
Y(1,3)=VZR	TRIM0076
Y(1,4)=AYD	TRIM0077
Y(1,5)=APD	TRIM0078
Y(1,6)=APD	TRIM0079
Y(1,10)=AYE	TRIM0080

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Y(1,11)=APF	TRIM0081
Y(1,12)=ARE	TRIM0082
DIST= TZERO*V	TRIM0083
AY=0.	TRIM0084
IF (VXH.NE.0.0.OR .VYR.NE.0.) AY=ATAN2(-VYH,VXB)	TRIM0085
IF (NPART.NE.2.OR.EXIT.NE.0.) RETURN	TRIM0086
IND=0	TRIM0087
TDELTA=ZDELTA	TRIM0088
TIME=TZERO-.95*TDELTA	TRIM0089
CALL IVAR (EXIT,LINK,TAXL,TAXR,PILGH2)	TRIM0090
CALL CONTP(2)	TRIM0091
ZFEL(1)=ZFFLE	TRIM0092
YFIN(1)=YFFIN	TRIM0093
REWIND 3	TRIM0094
RETURN	TRIM0095
50 FORMAT (1H0,4A10,F7.1,4A10)	TRIM0096
END	TRIM0097

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SUBROUTINE TURN (XFC,V,ARE)	TURN0001
COMMON /COPY/ Y(4,150)	TURN0002
DIMENSION XFC(28)	TURN0003
DATA G/32.17/.DTR/.1745329E-01/	TURN0004
Y(2,66)=1.	TURN0005
IF (XFC(21).NE.0.) GO TO 60	TURN0006
DO 10 I=12,14	TURN0007
IF (XFC(I).EQ.0.) GO TO 10	TURN0008
J=I-11	TURN0009
GO TO (20,30,40),J	TURN0010
10 CONTINUE	TURN0011
RETURN	TURN0012
20 CONTINUE	TURN0013
GLEVEL=XFC(12)	TURN0014
IF (GLEVEL.LE.1.) GO TO 60	TURN0015
ARE= ACOS(1./GLEVEL)	TURN0016
ARED=ARE/DTR	TURN0017
TRAD=V**2/(G*TAN(ARE))	TURN0018
GO TO 50	TURN0019
30 CONTINUE	TURN0020
ARED=XFC(13)	TURN0021
ARE=ARED*DTR	TURN0022
GLEVEL=1./COS(ARE)	TURN0023
TRAD=V**2/(G*TAN(ARE))	TURN0024
GO TO 50	TURN0025
40 CONTINUE	TURN0026
TRAD=XFC(14)	TURN0027
ARE=ATAN2(V**2,G*TRAD)	TURN0028
ARED=ARE/DTR	TURN0029
GLEVEL=1./COS(ARE)	TURN0030
50 CONTINUE	TURN0031
Y(1,85)=V/TRAD	TURN0032
PSID=Y(1,85)/DTR	TURN0033


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      TURN=360./ARS(PSID)
      TRAD=ARS(TRAQ)
      WRITE (6,100) GLEVEL,ARED,TRAQ,PSID,TURN
      RETURN
60  CONTINUE
      Y(2,85)=XFC(12)
      IF(XFC(12)-1.) 70,80,90
70  CONTINUE
      WRITE (6,110) XFC(12)
80  CONTINUE
      RETURN
90  WRITE (6,120) XFC(12)
      RETURN
100 FORMAT(//15H G-LEVEL      = G12.5,10X,14H BANK ANGLE = G12.5//,
1      15H TURN RADIUS = G12.5,10X,14H YAW RATE   = G12.5//,
2      41H TIME USED TO COMPLETE 360 DEGREE TURN = G12.5)
110 FORMAT(//24H PUSH-OVER WITH G-LEVEL = G12.5)
120 FORMAT(//24H PULL-UP WITH G-LEVEL = G12.5)
      END

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TURN0034
TURN0035
TURN0036
TURN0037
TURN0038
TURN0039
TURN0040
TURN0041
TURN0042
TURN0043
TURN0044
TURN0045
TURN0046
TURN0047
TURN0048
TURN0049
TURN0050
TURN0051
TURN0052

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SUBROUTINE VARI
COMMON /FORCE/ XF,XFRWG,XFLWG,XFELE,XFFUS,XFRJET,XFLJET,XFRJ,
1              XFLJ,XFGUN,XFFIN,XFW,XADD,
2              YF,YFFUS,YFRJET,YFLJET,YFRJ,YFLJ,YFGUN,YFFIN,YFW,
3              YADD,
4              ZF,ZFRWG,ZFLWG,ZFELE,ZFFUS,ZFRJET,ZFLJET,ZFRJ,
5              ZFLJ,ZFGUN,ZFW,ZADD,
6              QL,LRWG,LLWG,LELE,LFUS,LRJET,LLJET,RMRJ,RMLJ,LGUN,
7              LFIN,PGYRO,RMADD,
8              QM,MRWG,MLWG,MELE,MFUS,MRJET,MLJET,PMRJ,PMLJ,MGUN,
9              MFIN,PGYRO,PMADD,
10             QN,NPWG,NLWG,NFELE,NFUS,NRJET,NLJET,YMRJ,YMLJ,NGUN,
11             NFIN,YGYRO,YMADD
COMMON /STRIAB/ E(74),F(6),X(6),UL,DM,DN,DX,DY,DZ,IX,IY,IZ,
1              PD(6,7),DTR,EPD,ERR(6),KM1,RH0,K12,SPD(6,6,1),
2              XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),
3              XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),BLCG,
4              DAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63),
5              XJET(14),XMIN,AYEFP,CNPGD,GUESS,NPASS,PDPHI(6,7),
6              STAG,TZERO,DTRHSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)
COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,
1              COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),
2              TIME,TMAX,XCIT(20,6),ALGE7,ALGE1,ALGE2,CGSTA,
3              CPWIC,DIXI7,DYIYI,DIZIY,FTKTS,KREAD,PIU30,
4              TSTAR(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,MUIND,
5              ZDELT1,ZDELT2
COMMON /STAMAN/ XX,YY,AYI,RIY,APBG,ARBG,ASEP,AYHG,CGHL,DPIX,DPIZ,
1              R550,AYOMX,DELTA2,DPIX2,HDELT,HGUST,KTCTR,RMASS,
2              TWOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELTA2R,
3              POLDTR,DELTA1,DELTA2

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VARI0001
VARI0002
VARI0003
VARI0004
VARI0005
VARI0006
VARI0007
VARI0008
VARI0009
VARI0010
VARI0011
VARI0012
VARI0013
VARI0014
VARI0015
VARI0016
VARI0017
VARI0018
VARI0019
VARI0020
VARI0021
VARI0022
VARI0023
VARI0024
VARI0025
VARI0026
VARI0027
VARI0028
VARI0029
VARI0030
VARI0031

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COMMON /MANAL/ Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP, VARI0032
1 ALFIN,ALLWG,ALRWG,CUELE,COFIN,CDLWG,CORWG,CLELE, VARI0033
2 CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,WANGE,WGCOL, VARI0034
3 XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS, VARI0035
4 YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET, VARI0036
5 ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1, VARI0037
COMMON /ROMAN/ PI,27,ALT,T,APDU,AHDD,AYUD,OTRH,GMAXV,RATE1, VARI0038
1 RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP, VARI0039
2 LENGTH1,PILGH1,START2,DUA1,DDA2,DDA3, VARI0040
COMMON /MANARU/ I,V,NWAG,TDELT,HGUSTF,HGUSTF,HGUSTW,VGUSTE,VGUSTW, VARI0041
1 YGUSTF,GFWO,GLAT,GVERT,VXB,VZH,APD,VYB,ARD,AYD, VARI0042
2 COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE, VARI0043
3 ,TLSTK(2),THLSTK(2),AT,BT,CT,ATH,BTH,CTH, VARI0044
4 ,DFLAP1,FAIL(6), VARI0045
COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN, VARI0046
1 NPART,NVARA,NVARB,NVARC,NSCALE, VARI0047
1 ,NVAPS,NPRINT,NTIME, VARI0048
COMMON /FORV/ Y(4,150), VARI0049
COMMON /RJETS/ NJETR,XSTK(3),XU(10),XD(10),XR(10),TPOS(10), VARI0050
1 TNEG(10),XAJETR(10),YAJETR(10),ZAJETR(10), VARI0051
2 AYBJTR(10),APBJTR(10),JTRCON(10), VARI0052
REAL LGUN,MGUN,NGUN, VARI0053
DIMENSION TAX(2), VARI0054
EQUIVALENCE (TAX(1),TAXL), VARI0055
XDELIM(X1,X2,X3)=AMAX1(X1,AMIN1(X2,X3)) VARI0056
10 DO 230 L=1,KREAD, VARI0057
J=XCIT(L), VARI0058
IF(J.EQ.31) GO TO 210, VARI0059
IF(J.GT.23) GO TO 230, VARI0060
IF(J.LT.9.OR.J.GT.12) GO TO 20, VARI0061
CALL GUST(J), VARI0062
GO TO 230, VARI0063
20 CONTINUE, VARI0064
IF(TIME.LT.XCIT(L,1)) GO TO 230, VARI0065
IF(J.GT.12) GO TO 110, VARI0066
RATE=XCIT(L,2), VARI0067
IF(TIME.GT.XCIT(L,3)) RATE=0., VARI0068
IF(TIME.GE.XCIT(L,4)) RATE =+XCIT(L,5), VARI0069
IF(TIME.GT.XCIT(L,6)) RATE=0., VARI0070
DA=RATE*HDELT, VARI0071
IF(RATE.EQ.0.) GO TO 230, VARI0072
GO TO (30,40,50,60,70,80,90,100),J, VARI0073
30 CONTINUE, VARI0074
COLSTK=XDFLIM(0.,100.,COLSTK+DA), VARI0075
WGCOL=AGW, VARI0076
GO TO 230, VARI0077
40 CONTINUE, VARI0078
CYSTK1=XDFLIM(0.,100.,CYSTK1+DA), VARI0079
CYCR1=CYSTK1*CYCF(3)+CYCF(2), VARI0080
ALGE3=XCON(26)/(2.*OTRR), VARI0081
XSTK(1)=CYCR1*OTRR, VARI0082
GO TO 230, VARI0083
50 CONTINUE, VARI0084
CYSTK2=XDFLIM(0.,100.,CYSTK2+DA), VARI0085
CYCR2=CYSTK2*CYCL(3)+CYCL(2), VARI0086

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XSTK(2)=CYCR2*OTRR	VARI0087
GO TO 230	VARI0088
60 CONTINUE	VARI0089
PEDAL=XDELIM(0.,100.,PEDAL*DA)	VARI0090
PEN=PEDAL*PEDA(3)*PEDA(2)	VARI0091
XSTK(3)=PEN*PEDA(1)/(PEDA(3)*100.)	VARI0092
GO TO 230	VARI0093
70 CONTINUE	VARI0094
TLSTK(1)=XDELIM(0.,100.,TLSTK(1)*DA)	VARI0095
IF(AT.NE.0..OR.HT.NE.0..OR.CT.NE.0.)	VARI0096
1 TLSTK(2)=AT+(HT+CT*TLSTK(1))*TLSTK(1)	VARI0097
GO TO 230	VARI0098
80 CONTINUE	VARI0099
TLSTK(2)=XDELIM(0.,100.,TLSTK(2)*DA)	VARI0100
GO TO 230	VARI0101
90 CONTINUE	VARI0102
THLSTK(1)=XDELIM(0.,100.,THLSTK(1)*DA)	VARI0103
IF(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.)	VARI0104
1 THLSTK(2)=ATH+(BTH+CTH*THLSTK(1))*THLSTK(1)	VARI0105
GO TO 230	VARI0106
100 CONTINUE	VARI0107
THLSTK(2)=XDELIM(0.,100.,THLSTK(2)*DA)	VARI0108
GO TO 230	VARI0109
110 CONTINUE	VARI0110
K=J-12	VARI0111
GO TO (120,130,150,230,170,180,190,200,230,230,230).K	VARI0112
120 FRATE=0.	VARI0113
IF((TIME.GT.XCIT(L,1)).AND.(TIME.LT.XCIT(L,3)))	VARI0114
FRATE=XCIT(L,2)	VARI0115
IF((TIME.GT.XCIT(L,4)).AND.(TIME.LT.XCIT(L,6)))	VARI0116
FRATE=XCIT(L,5)	VARI0117
DFLAP1=DFLAP1+FRATE*HDELT	VARI0118
GOTO 230	VARI0119
130 IF(TIME.LT.XCIT(L,1)) GO TO 230	VARI0120
DA=XCIT(L,3)*HDELT	VARI0121
N=XCIT(L,6)+.01	VARI0122
IF(XCIT(L,2).EQ.0.) GO TO 160	VARI0123
TAX(N)=TAX(N)+DA	VARI0124
IF(SIGN(1.,DA).EQ.SIGN(1.,(XCIT(L,5)-TAX(N))))	VARI0125
GO TO 230	VARI0126
TAX(N)=XCIT(L,5)	VARI0127
140 XCIT(L,1)=9999.	VARI0128
GO TO 230	VARI0129
150 IF(TIME.LT.XCIT(L,1)) GOTO 230	VARI0130
DA=1./(XCIT(L,2)-XCIT(L,1))	VARI0131
N=XCIT(L,3)+.01	VARI0132
FAIL(N)=FAIL(N)-DA*HDELT	VARI0133
IF(TIME.GT.XCIT(L,2)) FAIL(N)=0.	VARI0134
GOTO 230	VARI0135
160 IF(TIME.GT.XCIT(L,4)) GO TO 140	VARI0136
TAX(N)=TAX(N)+DA	VARI0137
GO TO 230	VARI0138
170 IF(XCIT(L,3).LT.TIME) GOTO 230	VARI0139
T2=XCIT(L,4)/HDELT	VARI0140
IF(T2.EQ.0.) T2=1.	VARI0141
DA=(XCIT(L,2)*AYD-DDA3)/T2	
DDA3=DDA3+DA	
IF((PEDAL*DA).LT.0.) DDA3=DDA3-PEDAL-DA	

	IF((PEDAL+DA).GT.100.) DDA3=DDA3-PEDAL-DA+100.	VARI0142
	GOTO 60	VARI0143
180	IF(XCIT(L,4).LT.TIME) GOTO 230	VARI0144
	T2=XCIT(L,5)/HDELT	VARI0145
	IF(T2.EQ.0.) T2=1.	VARI0146
	DA=(-(XCIT(L,3)*ARD+XCIT(L,2)*ARE)-DDA2)/T2	VARI0147
	DDA2=DDA2+DA	VARI0148
	IF((CYSTK2+DA).LT.0.) DDA2=DDA2-CYSTK2-DA	VARI0149
	IF((CYSTK2+DA).GT.100.) DDA2=DDA2-CYSTK2-DA+100.	VARI0150
	GOTO 50	VARI0151
190	IF(XCIT(L,5).LT.TIME) GOTO 230	VARI0152
	T2=XCIT(L,6)/HDELT	VARI0153
	IF(T2.EQ.0.) T2=1.	VARI0154
	DA=(XCIT(L,3)*APD+XCIT(L,2)*(APE-XCIT(L,4))-DDA1)/T2	VARI0155
	DDA1=DDA1+DA	VARI0156
	IF((CYSTK1+DA).LT.0.) DDA1=DDA1-CYSTK1-DA	VARI0157
	IF((CYSTK1+DA).GT.100.) DDA1=DDA1-CYSTK1-DA+100.	VARI0158
	GO TO 40	VARI0159
200	IF(TIME.GT.XCIT(L,4)) GO TO 230	VARI0160
	OT1=XCIT(L,2)*(T-XCIT(L,1))	VARI0161
	OT2=XCIT(L,2)*(T+TDELT-XCIT(L,1))	VARI0162
	RATE=XCIT(L,3)*RDELT/XCIT(L,2)*(SIN(OT2)-SIN(OT1))	VARI0163
	DA=RATE*HDELT	VARI0164
	K=XCIT(L,5)*.1	VARI0165
	GO TO (30,40,50,60,70,80,90,100),K	VARI0166
210	CONTINUE	VARI0167
	DO 220 K=1,5,2	VARI0168
	IF(TIME.GE.XCIT(L,K)) NPRINT=XCIT(L,K+1)	VARI0169
220	CONTINUE	VARI0170
	IF(NPRINT.LE.0) NPRINT=1	VARI0171
	GO TO 230	VARI0172
230	CONTINUE	VARI0173
	RETURN	VARI0174
	END	VARI0175

.....

	SUBROUTINE VR2D (X ,Y ,A,X2,Y2,N1)	VR2D0001
C	TWO DIMENSIONAL VECTOR TRANSFORMATION	VR2D0002
C	N1=1 IS FOR USUAL	VR2D0003
	X1=X	VR2D0004
	Y1=Y	VR2D0004
C	N1=-1 IS FOR INVERSE	VR2D0004
	S=SIN(A)*N1	VR2D0005
	C=COS(A)	VR2D0006
	X2=X1*C-Y1*S	VR2D0007
	Y2=X1*S+Y1*C	VR2D0008
	RETURN	VR2D0009
	END	VR2D0010


```

SUBROUTINE VR3D (X1,Y1,Z1,A1,A2,A3,X2,Y2,Z2,N1)
DIMENSION A(9)
C      THREE DIMENSIONAL VECTOR TRANSFORMATION
C      N1=1 FOR USUAL
C      N1=-1 FOR INVERSE
CALL MATRIX (A1,A2,A3,A,N1)
X2=X1*A(1)+Y1*A(2)+Z1*A(3)
Y2=X1*A(4)+Y1*A(5)+Z1*A(6)
Z2=X1*A(7)+Y1*A(8)+Z1*A(9)
RETURN
END

```

VR3D0001
VR3D0002
VR3D0003
VR3D0004
VR3D0005
VR3D0006
VR3D0007
VR3D0008
VR3D0009
VR3D0010
VR3D0011

```

SUBROUTINE WRFM
COMMON /FORCE/ A1(74)
DIMENSION A(74)
DO 10 I=1,35
10 A(I)=A1(I)*4.4482
DO 20 I=36,74
20 A(I)=A1(I)*1.3558
WRITE (6,30) A
RETURN
30 FORMAT (1H0,54X,24HFORCE AND MOMENT SUMMARY,/,
1      1H .15X,41HTOTAL .R.WING L.WING HSTAB FUS,4X,
2      50HREFIXED JETS,L R/JETS L/JETS INLET VSTAB,
3      1X,17H W/GYRO P.I.E.,/,
4      12H X-FORCE ,13F9.1/,
5      12H Y-FORCE ,F9.1,27X,9F9.1/,
6      12H Z-FORCE ,10F9.1,9X,2F9.1/,
7      12H ROLL ,13F9.1/,
8      12H PITCH ,13F9.1/,
9      12H YAW ,13F9.1/)
END

```

WRFM0001
WRFM0002
WRFM0003
WRFM0004
WRFM0005
WRFM0006
WRFM0007
WRFM0008
WRFM0009
WRFM0010
WRFM0011
WRFM0012
WRFM0013
WRFM0014
WRFM0015
WRFM0016
WRFM0017
WRFM0018
WRFM0019
WRFM0020

```

SUBROUTINE WROT1
COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,
1      NPART,NVARA,NVARE,NVARE,NSCALE
1      ,NVAR,NPRINT,NTIME
CALL DATE (NDATE)
RETURN
ENTRY WROT
WRITE (6,10) NDATE,NPART,IPSN,ICOM
RETURN
10 FORMAT
1      (1H1,4HX,40HV/STOL AIRCRAFT DYNAMIC ANALYSIS PROGRAM/,
2      55X,28HNAVAL AIR DEVELOPMENT CENTER/,
3      58X,18HCOMPILED JULY 1976/,
4      57X,10HCOMPUTED ,A10//

```

WROT0001
WROT0002
WROT0003
WROT0004
WROT0005
WROT0006
WROT0007
WROT0008
WROT0009
WROT0010
WROT0011
WROT0012
WROT0013
WROT0014

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4 1H0,18X,14,4X,19,5X,6A10/1H ,32X,7A10,/1H ,32X,7A10) WR0T0015
END WRCT0016

```

.....

SUBROUTINE WRVP (N,VAR,KM1,PD,TAXL,TAXR) WRVP0001
C THE ACTION TAKEN IN THIS SUBROUTINE DEPENDS ENTIRELY UPON N: WRVP0002
C IF N=1 - WRITE VARIABLES INDICATED IN TRIM AND STAB AND ROTOR WRVP0003
C DATA ONLY WRVP0004
C IF N=2 - WRITE PARTIAL DERIVATIVES ONLY WRVP0005
C IF N=3 - DO BOTH WRVP0006
COMMON /MANAR0/ I,V,NWAG,TDLT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,WRVP0007
1 YGUSTF,GFWD,GLAT,GVERT,VXB,VZB,APD,VYB,ARD,AYD, WRVP0008
2 COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE WRVP0009
COMMON /KVARTR/ KVAR(6),P01 WRVP0010
C N DETERMINES WHICH TYPE OF OUTPUT WRVP0011
C KM1 = RANK OF PARTIAL DERIVATIVE MATRIX WRVP0012
DIMENSION VAR(11),PD(6,7),HEAD(18) ,VARD(11) WRVP0013
DIMENSION P01(6,12) WRVP0014
DATA DTRR/ 57.2457795/ WRVP0015
DATA HEAD/ WRVP0016
1 7HX-FORCE,7HY-FORCE,7HZ-FORCE,7HYAW MOM,9HPITCH MOM,8HROLL MOM, WRVP0017
2 8HTHROTTLE,8HLONG STK,7HLAT STK,5HPEDAL,3HYAW,5HPITCH,4HROLL, WRVP0018
3 9HL THROT 1,9HL THROT 2,9HL ANGLE 1,9HL ANGLE 2,6H-ERROR/ WRVP0019
IF(N.EQ.2) GO TO 20 WRVP0020
DO 10 L=1,11 WRVP0021
DA=L. WRVP0022
IF(L.GT.4.AND.L.LT.8) DA=DTRR WRVP0023
VARD(L)=VAR(L)*DA WRVP0024
10 CONTINUE WRVP0025
WRITE (6,50) (VARD(KVAR(L)),L=1,KM1) WRVP0026
IF(N.EQ.1) RETURN WRVP0027
20 WRITE(6,60) (HEAD(J),J=1,KM1) WRVP0028
DO 30 J=1,KM1 WRVP0029
WRITE(6,70) HEAD(KVAR(J)+6),(PD(I,J),I=1,KM1) WRVP0030
30 CONTINUE WRVP0031
WRITE(6,70) HEAD(18),(PD(I,KM1+1),I=1,KM1) WRVP0032
RETURN WRVP0033
ENTRY WRVP1 WRVP0034
WRITE(6,60) (HEAD(J),J=1,6) WRVP0035
DO 40 J=1,11 WRVP0036
WRITE(6,70) HEAD(J*6),(P01(I,J),I=1,6) WRVP0037
40 CONTINUE WRVP0038
RETURN WRVP0039
50 FORMAT (1H0,11X,10HVAR(I) ,10F10.5) WRVP0040
60 FORMAT (1H0,53X,25HPARTIAL DERIVATIVE MATRIX/1H0,11X,10(2X,A10)/) WRVP0041
70 FORMAT (1H ,A10,2X,10G12.5) WRVP0042
END WRVP0043

.....

SUBROUTINE XPRO (RX,RY,RZ,FX,FY,FZ,ROLL,PITCH,YAW) XPRO0001

```

```

C      COMPUTE VECTOR CROSS PRODUCT  L = R X F
ROLL=RY*FZ-RZ*FY
PITCH=RZ*FX-RX*FZ
YAW=RX*FY-RY*FX
RETURN
END

```

XPR00002
XPR00003
XPR00004
XPR00005
XPR00006
XPR00007

.....

```

SUBROUTINE YFIX (YIN, YAERO)
COMMON /STRIAH/ ADUM(184), XEL(14), BDUM(35), XFN(7), CDUM(63), XWG(21)
DIMENSION HEAD(5), YIN(21,3), YAERO(31,3)
DIMENSION S(3)
DATA HEAD/
1 4H*ING,3H*LE,3H*IN,6H*NORMAL,4H*REVERSED/
DATA DTRR,PI,DTRRSQ /57.29578,3.14159,3282.806/
DO 20 I=1,18
DD=1.
IF(I.LE.2.OR.I.EQ.6) DD=1./DTRR
IF(I.EQ.13.OR.I.EQ.17) DD=DTRR
IF(I.EQ.14) DD=DTRRSQ
DO 10 J=1,3
YAERO(I,J)=YIN(I,J)*DD
10 CONTINUE
20 CONTINUE
S(1)=XWG(1)
S(2)=XEL(1)
S(3)=XFN(1)
DO 40 I=1,3
IF(YAERO(17,I).EQ.0.) GO TO 40
TLH=TAN(YAERO(1,I))-1./YAERO(18,I)*(1.-YAERO(8,I))/(1.+YAERO(8,I))
CLAE=2.*PI*YAERO(16,I)/(2.*SQRT((2.*PI*YAERO(16,I)/YAERO(17,I))**2
1  *(1.+TLH**2)+4.))
XKWB=.527*(1.+YAERO(5,I))*1.534+.473
YAERO(22,I)=XKWB*CLAE*YAERO(4,I)/S(1)
I1=-2
I2=-1
DO 30 IW=24,26,2
I1=I1+4  I2=I2+4
YAERO(IW,I)=(YAERO(I2,I)/COS(YAERO(I1,I))-YAERO(22,I)
1  *SIN(2.*YAERO(I1,I))/2.)/(SIN(YAERO(I1,I)))**2
30 CONTINUE
ALMLE=ATAN(TAN(YAERO(1,I))/1./YAERO(18,I)*(1.-YAERO(8,I))
1  /(1.+YAERO(8,I)))
XL=YAERO(4,I)
C1=4.47*XL**3-8.125*XL**2+3.712*XL-.029
C2=2.943*XL**3-7.208*XL**2+5.199*XL-.113
XJ=.3*(1.+C1)*YAERO(18,I)*COS(ALMLE)*((1.+C1)*(1.+C2)
1  -((1.+C2)*YAERO(18,I)*TAN(ALMLE)/7.))**3
YAERO(23,I)=.22*XJ
IF(XJ.GT.0.) YAERO(23,I)=SQRT(2.65*XJ)
40 CONTINUE
RETURN

```

YFIX0001
YFIX0002
YFIX0003
YFIX0004
YFIX0005
YFIX0006
YFIX0007
YFIX0008
YFIX0009
YFIX0010
YFIX0011
YFIX0012
YFIX0013
YFIX0014
YFIX0015
YFIX0016
YFIX0017
YFIX0018
YFIX0019
YFIX0020
YFIX0021
YFIX0022
YFIX0023
YFIX0024
YFIX0025
YFIX0026
YFIX0027
YFIX0028
YFIX0029
YFIX0030
YFIX0031
YFIX0032
YFIX0033
YFIX0034
YFIX0035
YFIX0036
YFIX0037
YFIX0038
YFIX0039
YFIX0040
YFIX0041
YFIX0042
YFIX0043
YFIX0044

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END

YFIX0045

.....

A-86

A P P E N D I X B

SAMPLE PROGRAM INPUT AND OUTPUT

02	50	1000	CHECK RUN FOR CDC PROGRAM VERSION			1
			XV-6A KESTREL DATA			2
			TRIM + STABILITY			3
53378.6	571.78	0.	223.52	556.77	0.	4
5016.5	30370.3	32946.4	0.			5
2.	17.122	1.7583	0.1229		1.8519	6
1.7676	85.	9.585	.8046	-6.533	.3468	7
8.104	.7983	-9.099	.6081	261.2	70.	8
17.317	626.4	195.6	280.9	1.75	1780.	9
	14.07			.06		10
-211	0.	.055	-.03	-.42	-.13	11
34.	23.	.87	12.272	.23	18.	12
.4	.459	2.643	.00078	.0073	.87	13
-.0065	2.342	.106	2.797	.0058		14
4.413	1120.1	0.	295.4		-.0005	15
			0.			16
32.9	24.3	.98	3.90	.16	.98	17
.201	.222	1.180	0.	.0091		18
0.	4.08	.109	4.277			19
3.32	1079.2	0.	400.6			20
40.2	33.4	1.08	2.40	.163	1.08	21
.23	.268	1.550	0.	.0099		22
0.	2.45	.110	2.73		33.4	23
						24
0.	0.	25.40	25.40	581.42	0.	25
					3.74	26
					1.	27
						28
						29
						30
					0.853	31
					0.	32
						33
						34
						35
						36
						37
						38
						39

FIGURE B-1

[illegible]

FIGURE B-2

V/STOL AIRCRAFT DYNAMIC ANALYSIS PROGRAM
NAVAL AIR DEVELOPMENT CENTER
COMPILED JULY 1976
COMPUTED 04/13/76.

CHECK RUN FOR CDC PROGRAM VERSION
XV-6A KESTREL DATA
TRIM + STABILITY

INPUT DATA

	2	1000							
53378.60	571.7800	32946.40	223.5200	556.7700	251.0300				
5016.500	30370.30	1.758300	.0	-.0	-.0				
2.000000	17.12200	9.545000	.1229000	-.0	1.851900				
1.767600	85.000000	-.9.099000	-.8046000	-6.533000	3.468000				
8.104000	.7983000		.6081000	261.2000	1780.000				
17.31700	626.4000	195.6000	280.9000	1.750000	-.0				
-.0	14.07000	-.0	-.0	.6000000E-01	-.1300000				
-.2210000	.0	.5500000E-01	-.3000000E-01	-.4200000	18.00000				
34.00000	23.00000	.8700000	12.27200	.2300000	8700000				
.4000000	.4590000	2.643000	.7800000E-03	.7300000E-02	-.0				
-.6500000E-02	2.342000	.1060000	2.797000	.5800000E-02	-.5000000E-03				
4.413000	1120.100	.0	295.4000	-.0	-.0				
-.0	-.0	-.0	.0	-.0	-.0				
32.40000	24.30000	.9800000	3.900000	.1600000	24.30000				
.2010000	.2220000	1.180000	.0	.9100000E-02	-.0				
.0	4.080000	.1090000	4.277000	-.0	-.0				
3.320000	1079.200	.0	400.6000	-.0	-.0				
40.20000	33.40000	1.080000	2.400000	.1630000	33.40000				
.2300000	.2680000	1.550000	.0	.9900000E-02	-.0				
.0	2.450000	.1100000	2.730000	-.0	-.0				
-.0	-.0	-.0	-.0	-.0	-.0				
-.0	-.0	-.0	-.0	-.0	-.0				
5.000000	.0	2.392900	REACTION JET GROUP	4.000000	-.0				
35.56000	.0	188.9800	-.1187000E-01	97.63000	3.810000				
.0	9.400000	.0	-.0	-.0	-.0				
1218.400	.0	3603.000	-.3603.000	82.00000	3.810000				
.0	9.650000	.0	.0	-.0	-.0				
1205.700	.0	301.2000	.0	90.00000	-.0				
.0	3.560000	6539.000	.0	.0	-.0				
701.3000	339.3000	301.2000	2224.000	-.0	-.0				
.0	9.400000	236.2000	90.00000	75.00000	-.0				
701.3000	-339.3000	236.2000	-3114.000	75.00000	-.0				
.0	9.400000	3114.000	.0	-.0	-.0				
4.000000	103.8000	246.4000	LIFT JET GROUP	-.0	-.0				
465.2000	-.0	-.0	-.0	-.0	1.000000				
					-.0				

FIGURE B-3

FIGURE B-4

```

***** START OF ITERATION 1 *****
VAR(1) 50.00000 50.00000 50.00000 80.00000 90.00000
FORCE AND MOMENT SUMMARY
TOTAL X-FORCE -3348.1 Y-FORCE -0.0 Z-FORCE 4731.3 ROLL -0.0 PITCH 9380.8 YAW 0.0
R.WING -22.2 L.WING -22.2 HSTAB -0.9
R.WING -308.7 L.WING -308.7 HSTAB 48.8
R.WING -603.8 L.WING -603.8 HSTAB 275.2
R.WING -255.1 L.WING -255.1 HSTAB 0.0
R.WING 43.5 L.WING 43.5 HSTAB 0.0
FUS -7.9 R*FIXED JETS*L 0.0 R/JETS -207.7 L/JETS 3659.7 INLET -1860.6 VSTAB -2.1 W/GYRO -4652.2 P.I.E. -231.8
FUS 0.0 R*FIXED JETS*L 0.0 R/JETS -0.0 L/JETS -0.0 INLET 0.0 VSTAB 0.0 W/GYRO 0.0 P.I.E. 0.0
FUS -6.2 R*FIXED JETS*L 0.0 R/JETS -0.0 L/JETS -0.0 INLET 0.0 VSTAB 0.0 W/GYRO 53175.2 P.I.E. 955.9
FUS 0.0 R*FIXED JETS*L 0.0 R/JETS -0.0 L/JETS -0.0 INLET 0.0 VSTAB 0.0 W/GYRO 0.0 P.I.E. 0.0
FUS 80.3 R*FIXED JETS*L 0.0 R/JETS 7952.6 L/JETS -1738.2 INLET 395.0 VSTAB 3.2 W/GYRO 0.0 P.I.E. 2922.8
FUS -0.0 R*FIXED JETS*L 0.0 R/JETS 0.0 L/JETS 0.0 INLET 0.0 VSTAB 0.0 W/GYRO 0.0 P.I.E. 0.0

```

PARTIAL DERIVATIVE MATRIX

```

X-FORCE Y-FORCE Z-FORCE YAW MOM PITCH MOM ROLL MOM
LONG STK 7903.0 0.0 57826.0 0.0 -31165E+06 0.0
LAT STK -40901 -13367.0 -49885.0 19241.0 -72100.0 17248E+06
PEDAL -62789 9420.2 0.0 -60713.0 93915 5054.3
ROLL 22611 52968.0 -220.92 -378.58 -91608 -65.707
L THROT 1 23151.0 -43210E-10 -34102E+06 43257E-09 62075.0 -42331E-09
L ANGLE 1 -44232E+06 32940E-23 -16744.0 -64258E-22 -32531.0 64258E-22
-ERROR 3348.1 0.0 4731.3 -64769E-10 -9380.9 63690E-10

```

```

CORRECTIONS .0347105 .0000000 .0000000 .0000000 .0200498 -.0058999

```

```

RATIO APPLIED TO CORRECTION VECTOR IS .5028247 FROM COMPONENT 1

```

FIGURE B-5

***** START OF ITERATION 4 *****

VAR(I) 63.45170 50.00000 50.00000 .00000 90.90328 86.97463

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	MSTAB	FUS	R*FIXED	JETSOL	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.5	-22.2	-22.2	-2.1	-7.9	.0	.0	33.0	6800.4	-1860.6	-2.1	-4652.2	-263.5
Y-FORCE	-.0				-.0	.0	.0	-.0	.0	-.0	-.0	.0	.0
Z-FORCE	-3.3	-306.7	-306.7	9.4	-6.2	.0	.0	-235.1	-53253.9	-162.8	-.0	53175.2	1087.5
ROLL	-.0	-603.8	603.8	.0	.0	.0	.0	-.0	.0	.0	-.0	.0	.0
PITCH	-21.4	-255.1	-255.1	53.9	80.3	.0	.0	-1572.3	-1762.4	395.0	3.2	.0	3291.1
YAW	.0	43.5	-43.5	.0	-.0	.0	.0	.0	.0	-.0	.0	.0	.0

AIRCRAFT IS TRIMMED.
PART 1

4 ITERATIONS

.007

MINUTES ELAPSED COMPUTING TIME

FIGURE B-6

.000 SECONDS MANEUVER TIME										.007 MINUTES ELAPSED COMPUTING TIME										NEWTONS, METRES, DEG, SEC UNITS									
GROUND REFERENCE										SPEED (KTS)										FLT PATH ANGLES									
Z										.0 AIR										20.00 HEADING									
X										61.0 GND										20.00 CLIMB									
Y										.000 DISTANCE										.000									
V										.000 ALTITUDE										.000									
U										.000										.000									
V										.000										.000									
W										.000										.000									
P										.000										.000									
Q										.000										.000									
R										.000										.000									
PSI										.000										.000									
THETA										.000										.000									
PHI										.000										.000									
CONTROL (PCT)										C.G. LOC (CM)										GUST (CG)									
THROTTLE										.000										.000									
LONG STICK										.000										.000									
LAT STICK										.000										.000									
PEDAL										.000										.000									
L THROT 1										.000										.000									
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THE FOLLOWING MATRIX HAS UNITS OF NEWTONS OR NEWTON-METRES PER CM. OF CONTROL OR RAD. OF ANGLE

PARTIAL DERIVATIVE MATRIX						
	X-FORCE	Y-FORCE	Z-FORCE	YAW MOM	PITCH MOM	ROLL MOM
THROTTLE	.13698E-09	.36215E-24	-.63711E-10	.0	-.49713E-09	.0
LONG STK	.113-51	-.36215E-24	-.820-15	.0	-.5474-0	.0
LAT STK	-.69981E-03	-.103-58	-.386-55	.149-16	-.558-68	.1335-4
PEDAL	-.111430E-01	.778-84	-.88261E-09	-.5023-6	.17097E-01	.414-78
YAW	.3-3287	.2375-1	.77898	.4338-3	-.7-0333	.753-64
PITCH	-.53617	-.17747E-07	-.10140-	.11448E-06	.2048-6	-.91785E-08
ROLL	.68250E-01	.52469-	-.57-481	-.378-79	-.24785	-.65-735
L THROT 1	.284-45	-.12490E-09	-.2268-9	.80790E-09	.2-5078	-.74873E-10
L THROT 2	.14016E-09	-.12237E-09	.75179E-09	.78991E-09	.14914E-08	-.70839E-10
L ANGLE 1	-.3432-6	-.12237E-09	-.415-87	.78991E-09	-.233-93	-.70839E-10
L ANGLE 2	.14016E-09	-.12237E-09	.75179E-09	.78991E-09	.14914E-08	-.70839E-10

B-10

THE FOLLOWING MATRIX HAS UNITS OF METRES/SEC**2 OR RAD/SEC**2 PER CM. OF CONTROL OR RAD. OF ANGLE

PARTIAL DERIVATIVE MATRIX						
	X-FORCE	Y-FORCE	Z-FORCE	YAW MOM	PITCH MOM	ROLL MOM
THROTTLE	.25162E-13	.66524E-28	-.11703E-13	.0	-.16369E-13	.0
LONG STK	.20852E-01	.66524E-28	-.115066	.0	-.18024	.0
LAT STK	-.12855E-06	-.19024E-01	-.71007E-01	.45274E-02	-.18396E-01	.26621
PEDAL	-.20996E-05	.14307	-.12534E-12	-.15248	.56246E-06	.82683E-01
YAW	.61148E-03	.43620	.14310E-03	.13168	-.23159E-03	.15023
PITCH	-.9-8492	-.32637E-11	-.1-8718	.34870E-11	.67455E-01	-.18297E-11
ROLL	.12537E-04	.9-7302	-.105559E-01	-.11497E-01	-.81609E-05	-.13104E-01
L THROT 1	.52253E-01	-.22950E-13	-.41678	.24522E-13	.82575E-04	-.14925E-13
L THROT 2	.25747E-13	-.22479E-13	.13810E-12	.23976E-13	.49107E-13	-.14121E-13
L ANGLE 1	-.63055	-.22479E-13	-.76344E-01	.23976E-13	-.77026E-02	-.14121E-13
L ANGLE 2	.25747E-13	-.22479E-13	.13810E-12	.23976E-13	.49107E-13	-.14121E-13

FIGURE B-8

VAR(I)	10.44968	.89673	.00000	.00000	.00000	.00000	.00000	.00000	.00000
	FORCE AND MOMENT SUMMARY								
	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET
X-FORCE	-45.1	-23.5	-23.5	-2.1	-8.2	.0	33.0	6800.4	-1896.9
Y-FORCE	-7.7	-318.5	-318.5	10.6	-6.1	.0	-235.1	-53253.9	-162.8
Z-FORCE	-7.7	-318.5	-318.5	10.6	-6.1	.0	-235.1	-53253.9	-162.8
ROLL	-7.7	-318.5	-318.5	10.6	-6.1	.0	-235.1	-53253.9	-162.8
PITCH	83.9	-263.3	-263.3	60.4	80.7	.0	-1572.3	-1762.4	393.3
YAW	.0	45.9	-45.9	.0	-2.0	.0	.0	.0	-2.0
	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET
X-FORCE	-45.6	-1.3	-1.3	-2.0	-3.3	.0	.0	.0	-36.3
Y-FORCE	-4.4	-9.8	-9.8	1.1	.1	.0	.0	.0	.0
Z-FORCE	-4.4	-9.8	-9.8	1.1	.1	.0	.0	.0	.0
ROLL	-4.4	-9.8	-9.8	1.1	.1	.0	.0	.0	.0
PITCH	165.3	-8.3	-8.3	6.5	.4	.0	.0	.0	-1.7
YAW	.0	2.5	-2.5	.0	.0	.0	.0	.0	.0
	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET
X-FORCE	-11.5	-17.6	-17.6	-2.4	-7.9	.0	33.0	6800.4	-1860.6
Y-FORCE	-11.1	-335.2	-335.2	.8	-10.8	.0	-235.1	-53253.9	-196.1
Z-FORCE	-11.1	-335.2	-335.2	.8	-10.8	.0	-235.1	-53253.9	-196.1
ROLL	-11.1	-335.2	-335.2	.8	-10.8	.0	-235.1	-53253.9	-196.1
PITCH	28.3	-275.1	-275.1	5.7	110.9	.0	-1572.3	-1762.4	502.3
YAW	.0	34.3	-34.3	.0	-2.0	.0	.0	.0	-2.0
	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET
X-FORCE	-12.0	4.7	4.7	-2.3	-2.0	.0	.0	.0	.0
Y-FORCE	-107.8	-26.5	-26.5	-8.6	-4.6	.0	.0	.0	-36.3
Z-FORCE	-107.8	-26.5	-26.5	-8.6	-4.6	.0	.0	.0	-36.3
ROLL	-107.8	-26.5	-26.5	-8.6	-4.6	.0	.0	.0	-36.3
PITCH	49.7	-20.0	-20.0	-48.3	30.6	.0	.0	.0	107.3
YAW	.0	-9.1	9.1	.0	.0	.0	.0	.0	.0

VAR(I)	10.24968	.89673	1.71887	.00000	.00000	.00000	
	FORCE AND MOMENT SUMMARY						
TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETSL	R/JETS	L/JETS
X-FORCE	-21.7	-21.7	-2.7	-7.9	.0	.0	33.0
Y-FORCE	-311.0	-311.0	-6.2	-6.2	.0	.0	6800.4
Z-FORCE	-608.4	-608.4	.0	.0	.0	.0	-235.1
ROLL	-258.8	-258.8	-33.7	80.3	.0	.0	-53253.9
PITCH	42.5	-42.5	.0	-0.3	.0	.0	-1762.4
YAW	.0	.0	.0	.0	.0	.0	.0
TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETSL	R/JETS	L/JETS
X-FORCE	.5	.5	-6	.0	.0	.0	.0
Y-FORCE	-2.3	-2.3	-15.6	.0	.0	.0	.0
Z-FORCE	-4.6	-4.6	.0	.0	.0	.0	.0
ROLL	-1.7	-1.7	-87.6	.0	.0	.0	.0
PITCH	-1.0	1.0	.0	.0	.0	.0	.0
YAW	.0	.0	.0	.0	.0	.0	.0
TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETSL	R/JETS	L/JETS
X-FORCE	-22.2	-22.2	-2.1	-7.9	.0	.0	33.0
Y-FORCE	-308.7	-308.7	9.4	-1.1	.0	.0	6800.4
Z-FORCE	-604.8	-604.8	.0	-6.2	.0	.0	-235.1
ROLL	-255.1	-255.1	53.9	80.3	.0	.0	-53253.9
PITCH	44.7	-42.3	.0	-29.7	.0	.0	-1762.4
YAW	.0	.0	.0	.0	.0	.0	.0
TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETSL	R/JETS	L/JETS
X-FORCE	.0	.0	.0	-0.0	.0	.0	.0
Y-FORCE	.0	.0	.0	-1.1	.0	.0	.0
Z-FORCE	-1.0	-1.0	.0	.0	.0	.0	.0
ROLL	1.2	1.2	.0	.3	.0	.0	.0
PITCH	.0	.0	.0	-0.0	.0	.0	.0
YAW	.0	.0	.0	-29.7	.0	.0	.0

DELTA

DELTA

FIGURE B-10

[illegible]

STABILITY DERIVATIVE MATRICES

THE FOLLOWING MATRIX HAS UNITS OF NEWTONS OR NEWTON-METRES PER METRE/SEC OR RAD/SEC

	U	W	Q	V	P	R
X-FORCE	-227.7516	-59.92139	13.27643	.6368648	.2120590	2.605113
Z-FORCE	-21.75444	-539.0107	-675.8477	.1173234E-08	.7821557E-08	.7821557E-08
PITCH MOMENT	526.4452	248.3193	-3035.437	-.9545205	-.3771769	-.3.896472
Y-FORCE	-.1944102E-09	-.1942660E-09	-.1294598E-08	-236.3292	-72.41961	256.3683
ROLL MOMENT	-.1129722E-09	-.1001263E-09	-.6667474E-09	-73.57192	-646.3906	718.2675
YAW MOMENT	.1255788E-08	.1253219E-08	.8352134E-08	-415.5515	127.2317	-1334.961

THE FOLLOWING MATRIX HAS UNITS OF 1/SEC, METRE/SEC OR 1/METRE-SEC

	U	W	Q	V	P	R
X-FORCE	-.4183497E-01	-.1100730E-01	.2436821E-02	.1169893E-03	.3895430E-04	-.4785479E-03
Z-FORCE	-.3996196E-02	-.9901391E-01	-.1241503	.2155179E-12	.1436786E-11	.1436786E-11
PITCH MOMENT	.1733421E-01	.8176387E-02	-.9994754E-01	-.3142941E-04	-.1044365E-04	-.1282988E-03
Y-FORCE	-.3574905E-13	-.3568582E-13	-.2378120E-12	-.4341265E-01	-.1330317E-01	-.4709373E-01
ROLL MOMENT	-.2252013E-13	-.1995939E-13	-.1329104E-12	-.1466599E-01	-.1288529	.1431810
YAW MOMENT	.3811609E-13	.3803811E-13	.2535067E-12	-.1261296E-01	.3861780E-02	-.44051919E-01

FIGURE B-12

LONGITUDINAL MODE									
COEFFICIENTS OF CHARACTERISTIC EQUATIONS									
U-S*2	U-S	U	ALPHA-S*2	ALPHA-S	ALPHA	THETA-S*2	THETA-S	THETA	
.0	5443.8	237.21	.0	.0	86.326	.0	4.4396	5188.0	
.0	.0	48.159	.0	5443.8	529.55	.0	-5378.2	.0	
.0	.0	-546.08	.0	.0	-201.49	2951.8	295.02	.0	
CONTROLS FIXED ROOTS									
T*HALF-DBL									
DEPEND. VAR.	REAL	IMAG.	PERIOD	NAT. FREQ.	DAMPING	REAL3	IMAG3	GAIN	
FWD VEL	-90876E-01	.0	.0	.90876E-01	1.0000	-304566	15.3271	.764154E-02	
FWD VEL	.25581	.45856	13.702	.52508	-.48717	-549137E-01	-2.59113	.240465E-13	
FWD VEL	-.66154	.0	.0	.66154	1.0000	-1.46835	.0	.157291E-01	
THROTTLE						3.60487	.0	.376856E-13	
L THROT 1	.423996	.0				.375966	.0	.63480	
L THROT 2	-.113112	.0				3.60487	.0	.376856E-13	
L ANGLE 1	-.731885E-01	.0				-12.1643	.0	-.147638E-01	
L ANGLE 2	-.113112	.0				-12.1553	.0	-.134630E-14	
LONG STICK	-.204716E-01	-.150121				-61.3756	.0	-.407463E-01	
THROTTLE	-.778709E-02	.481210				-3.78703	.0	.131531E-13	
L THROT 1	.235951	.233272				-1.77129	-1.53439	-.205534E-02	
L THROT 2	-.212619E-01	.153439				-3.78703	.0	.131531E-13	
L ANGLE 1	.378573E-01	.0				.0	.0	-.160240	
L ANGLE 2	-.212619E-01	-.233272				.0	.0	-.163688E-13	
LONG STICK	-.104555	.0				.0	.0	.825744E-04	
THROTTLE	-.104574	.0				.0	.0	.491065E-13	
L THROT 1	.101492E-01	.0				.0	.0	-.770261E-02	
L THROT 2	-.131963	.0				.0	.0	.491065E-13	
L ANGLE 1	-.974331E-01	.0				.0	.0		
L ANGLE 2	-.131963	.0				.0	.0		

ALL TIMES ARE IN UNITS OF SECONDS
ALL GAINS ARE IN UNITS OF M/SEC. RAD OR RAD/SEC PER CM. OF CONTROLLER DEFLECTION

FIGURE B-13

LATERAL MODE									
COEFFICIENTS OF CHARACTERISTIC EQUATIONS									
BETA-S**2		BETA-S	BETA	PHI-S**2	PHI-S	PHI	R-S**2	R-S	R
.0	5443.8	236.33	.0	4.8402	-5188.0	.0	.0	.0	5418.4
.0	.0	109.51	508.19	56.198	.0	.0	.0	-10.310	-63.376
.0	.0	407.56	-10.310	-5.9312	.0	.0	.0	3131.5	136.38
CONTROLS FIXED ROOTS									
PERIOD		NAT. FREQ.	DAMPING		T*HALF-DBL				
.0		.11545	1.0000		6.0041				
13.860		.54740	-.56050		2.2591				
.0		.69462	1.0000		.99788				
NUMERATOR ROOTS									
IMAG1		REAL1	IMAG2		REAL3		IMAG3	GAIN	
.0		10.9062	.0		-12.1170		.0	-.184922E-02	
.0		.311606	.0		-11.1046		.0	.139053E-01	
.0		.311590	.0		.0		.0	.256955	
-1.47580		-1.45356	1.47580		.0		.0	-.783576E-02	
-2.22932		-1.45803	2.22932		2.41793		.0	-.181648E-02	
-.506234		.238880	.506234		-.643433		.0	-.154011	
DEPEND. VAR.									
SD SLP ANG		LAT STICK		-.434285E-01		.0			
SD SLP ANG		PEDAL		-.384376		.0			
ROLL ANGLE		LAT STICK		-.399911		.0			
ROLL ANGLE		PEDAL		-1.45356		.0			
YAW RATE		LAT STICK		-1.45803		-2.22932			
YAW RATE		PEDAL		.238880		-.506234			

ALL TIMES ARE IN UNITS OF SECONDS
 ALL GAINS ARE IN UNITS OF M/SEC, RAD OR RAD/SEC PER CM. OF CONTROLLER DEFLECTION

.005 MINUTES USED IN STAB .013 MINUTES TOTAL RUN TIME

FIGURE B-14

3.000 SECONDS MANEUVER TIME

.065 MINUTES ELAPSED COMPUTING TIME

NEWTONS, METRES, DEG, SEC UNITS

GROUND REFERENCE
 Z
 SPEED (KTS) FLT PATH ANGLES
 30.9 AIR 20.07 HEADING -0.00
 61.0 GND 20.07 CLIMB .186

FUSELAGE REFERENCE
 Q R
 EULER ANGLES FROM GROUND
 PSI THETA PHI
 -.021 .000 .-105
 -.105 .000 .-105
 .000 .000 4.818
 .000 .000 -0.000

CONTROL (PCT)
 THROTTLE .00
 LONG STICK 63.45 ATK
 LAT STICK 50.00 CL
 PEDAL 50.00 CD
 L THROT 1 89.71
 L THROT 2 .00
 L THROT 1 86.97
 L THROT 2 .00
 L THROT 1 86.97
 L THROT 2 .00

WING R. WING
 L. WING R. WING
 6.375 6.375
 .529 .529
 .085 .085
 .085 .085

FIXED JET THRUST
 RIGHT/CENTER
 LEFT

FLAP DEFL. (DEG) 50.0

FORCE AND MOMENT SUMMARY

TOTAL R. WING L. WING M. STAB FUS R. FIXED JETS L. R. JETS L. JETS INLET V. STAB W. GYRO P. I. E.

X-FORCE 77.7 -23.8 -1.9 -8.0 .0 32.6 6711.2 -1867.9 -2.1 -4483.8 -254.8
 Y-FORCE -0.0 -302.1 13.3 -5.0 .0 -232.2 -52555.0 -151.3 .0 .0 .0
 Z-FORCE 732.8 -590.9 590.9 .0 .0 -232.2 -52555.0 -151.3 .0 .0 .0
 ROLL .0 -590.9 590.9 .0 .0 -232.2 -52555.0 -151.3 .0 .0 .0
 PITCH -10.9 -250.3 -250.3 70.9 .0 -1553.0 -1739.3 360.9 .0 .0 .0
 YAW .0 46.6 -46.6 .0 .0 .0 .0 .0 .0 .0 .0

MOVABLE JET SUMMARY

NOZZLE 1 2 3 4 5 6
 THRUST 13248.4 13248.4 13248.4 13248.4
 THETA-J 82.6 82.6 82.6 82.6

NOZZLE 1 2 3 4 5 6 7 8 9 10
 THRUST 234.5 .0 .0 .0 .0 .0 .0 .0 .0 .0

CONTROL DEFLECTIONS (CM) SURFACE DEFLECTIONS (DEG) RCS DATA

LONG STICK 4.10 STABILIZER 2.42
 LAT STICK -0.00 AILERONS -0.00
 PEDALS -0.00 SPOTLERS -0.00
 PUDDER -0.00

PCT THETA (DEG)
 FWD .0
 AFT .0
 LEFT/RT .0

V/STOL AIRCRAFT DYNAMIC ANALYSIS PROGRAM
 NAVAL AIR DEVELOPMENT CENTER
 COMPILED JULY 1976
 COMPUTED 09/13/76.

3 1000
 CHECK RUN FOR CDC PROGRAM VERSION
 XV-6A KESTREL DATA
 TRIM - STABILITY

SYMBOL 1 = LIFT THROT 1. PCT
 SYMBOL 2 = THETA, DEG
 SYMBOL 3 = ALPHA (FUS), DEG
 3 FOR 1 + 2 ON SAME PRINT POS.
 5 FOR 1 + 4 ON SAME PRINT POS.
 6 FOR 2 + 4 ON SAME PRINT POS.
 7 FOR 1 + 2 + 4 ON SAME PRINT POS.

SCALE 1 FROM 50.000 TO 100.000 1 INCH = 5.000
 SCALE 2 FROM -10.000 TO 10.000 1 INCH = 2.000
 SCALE 4 FROM .000 TO 10.000 1 INCH = 1.000

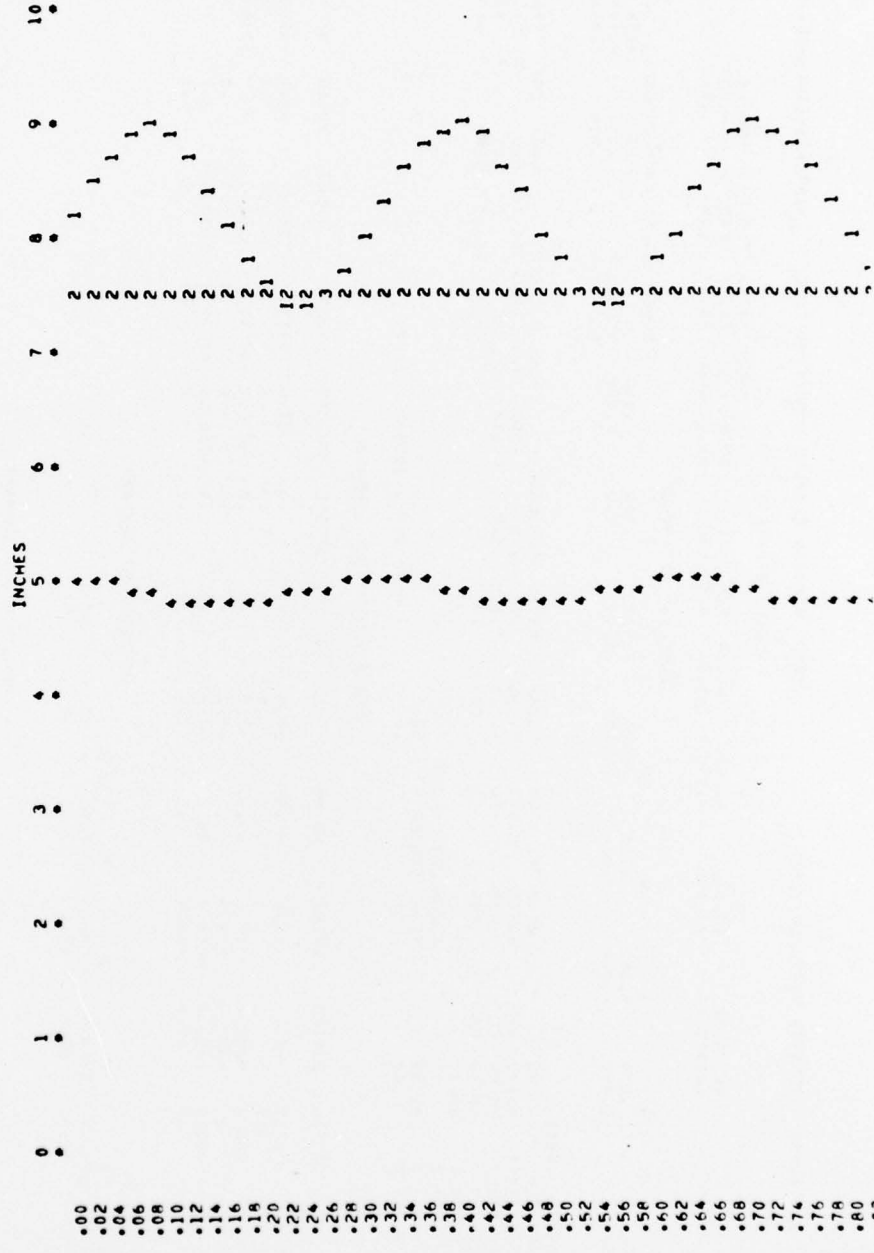


FIGURE B-16

V/STOL AIRCRAFT DYNAMIC ANALYSIS PROGRAM
 NAVAL AIR DEVELOPMENT CENTER
 COMPILED JULY 1976
 COMPUTED 09/13/76.

CHECK RUN FOR CDC PROGRAM VERSION
 XV-6A MESTREL DATA
 TRIM + STABILITY

1000

11

LEAST SQUARES CURVE FIT STARTING AFTER 1.000 SECONDS MANEUVER TIME

$F(t) = \text{AMPLITUDE} \cdot \sin(\text{OMEGA} \cdot t + \text{PHASE ANGLE}) + \text{CONSTANT}$

VARIABLE	AMPLITUDE	PHASE ANGLE (DEGREES)	CONSTANT	COEF OF CORR
LIFT THROT 1, PCT	3.9370	-.11331E-03	90.903	1.00000
THETA, DEG	.17756E-02	-167.86	4.9084	.26550E-01
ALPHA (FUS), DEG	.11483	90.978	4.8144	.90380

WITH OMEGA = 3.183 CPS

FIGURE B-17

V/STOL AIRCRAFT DYNAMIC ANALYSIS PROGRAM
 NAVAL AIR DEVELOPMENT CENTER
 COMPILED JULY 1976
 COMPUTED 09/13/76.

CHECK RUN FOR CDC PROGRAM VERSION
 XV-6A KESTREL DATA
 TRIM & STABILITY

11 1000

AMPLITUDE AND PHASE ANGLE COMPARISONS

VARIABLES		AMPLITUDE RATIO	PHASE ANGLE DIFFERENCE
THETA, DEG	/LIFT THROT 1.0 PCT	.45101E-03	-167.86
ALPHA (FUS), DEG	/LIFT THROT 1.0 PCT	.29168E-01	90.978
.004 MINUTES USED IN CURVE FITTING		.079 MINUTES TOTAL COMPUTING TIME	

FIGURE B-18

D I S T R I B U T I O N L I S T (Cont'd)

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