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(B. Hill)

A MATHEMATICAL MODEL FOR VERTICAL ATTITUDE TAKEOFF AND LANDING (VATOL) AIRCRAFT SIMULATION

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VOLUME III USERS' MANUAL FOR VATOL SIMULATION PROGRAM

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FOREWORD

This document is part of a three volume report prepared under NASA Ames Contract NAS2-10294, Mathematical Modeling for Vertical Attitude Take-Off and Landing (VATOL) Simulation. Volume I: Model Description and Application provides background and details of a generic mathematical model for simulation of VATOL aircraft concepts. A six-degree-of-freedom off-line (non-piloted) digital simulation program incorporating this model was developed and applied to the Vought SF-121 VATOL concept. Volume I gives results of this application which included development and demonstration of a control system for terminal VATOL operations. Volume II: Model Equations and Base Aircraft Data gives all the model equations and SF-121 aircraft data in a simulation data package format. This volume facilitated the development of a piloted VATOL simulation at NASA Ames. Volume III: Users Manual for VATOL Simulation Program provides a description of the six-degree-of-freedom off-line digital simulation program, instructions for its application, and examples of setup decks and output for several of the SF-121 application runs.

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1.0 INTRODUCTION

The objective of this document is to provide a description of and instructions for using VATLAS (Vertical Attitude Takeoff and Landing Aircraft Simulation), the digital simulation program for application to vertical attitude takeoff and landing (VATOL) aircraft developed for installation on the NASA Ames CDC 7600 computer system. Details of the VATLAS mathematical models are provided in Volumes I and II of the contract documentation and will not be discussed here. The framework for VATLAS is supplied by Vought's OLSIM (Off-Line Simulation) routine depicted in figure 1-1.

OLSIM is a multi-purpose digital computer program which is used for stability and control analysis and flight control system design analysis in addition to off-line flight simulation. It provides a flexible framework and standardized modules which facilitate the developement of off-line aircraft simulations. OLSIM runs under the control of VTOLTH, the main program, which calls the proper modules for executing user-specified options. These options include trim, stability derivative calculation, time history generation, and various input-output options. Standardized modules include TRIM which has a six DOF nonlinear trim capability, RUNGE which performs 4th order Runge-Kutta integration, and various table lookup and matrix computation routines. User supplied aircraft specific modules include FORCES for calculating forces and moments on the airplane, SYSEQS for control system equations and aircraft kinematics, and DERIVS which perturbs the aircraft about trim to generate stability derivatives. VATLAS is the OLSIM routine with the FORCES, SYSEQS, and DERIVS modules specialized to VATOL aircraft.

The aerodynamic model programmed in VATLAS is a modified version of the aerodynamic model described in reference (a). It calculates aerodynamic force and moment coefficients using DATCOM-type relations for all angles of attack and sideslip. To review the aerodynamic coefficients generated by this model, a special wind tunnel option is included in VATLAS. This option provides for the calculation of nondimensional aerodynamic coefficients as functions of angle of attack and sideslip.

This users manual continues in Section 2.0 with brief descriptions of VATLAS program modules. Section 3.0 provides a discussion of COMMON array segmenting which is the key to both understanding VATLAS input-output options and developing other aircraft simulations with the Vought OLSIM framework. The basic VATLAS program load and program options are detailed in Section 4.0. Examples of four commonly used VATLAS run setups are provided in Section 5.0. The examples cover a multi-trim run, a time history run, a wind tunnel run, and a plot run. Appendix A contains a definition of COMMON parameters (by convention, the phase "COMMON parameters" encompasses program variables and constants) arranged in order by segment, while Appendix B contains listings of all VATLAS subroutines. Note that the program has been heavily commented to facilitate location of specific groups of equations or options.

One final note of advice to the prospective user: Because of its flexibility, VATLAS is not a simple program to learn, but once mastered it provides the familiar user with a powerful analytical tool. Careful study of the examples in Section 5.0 should ease this learning process.

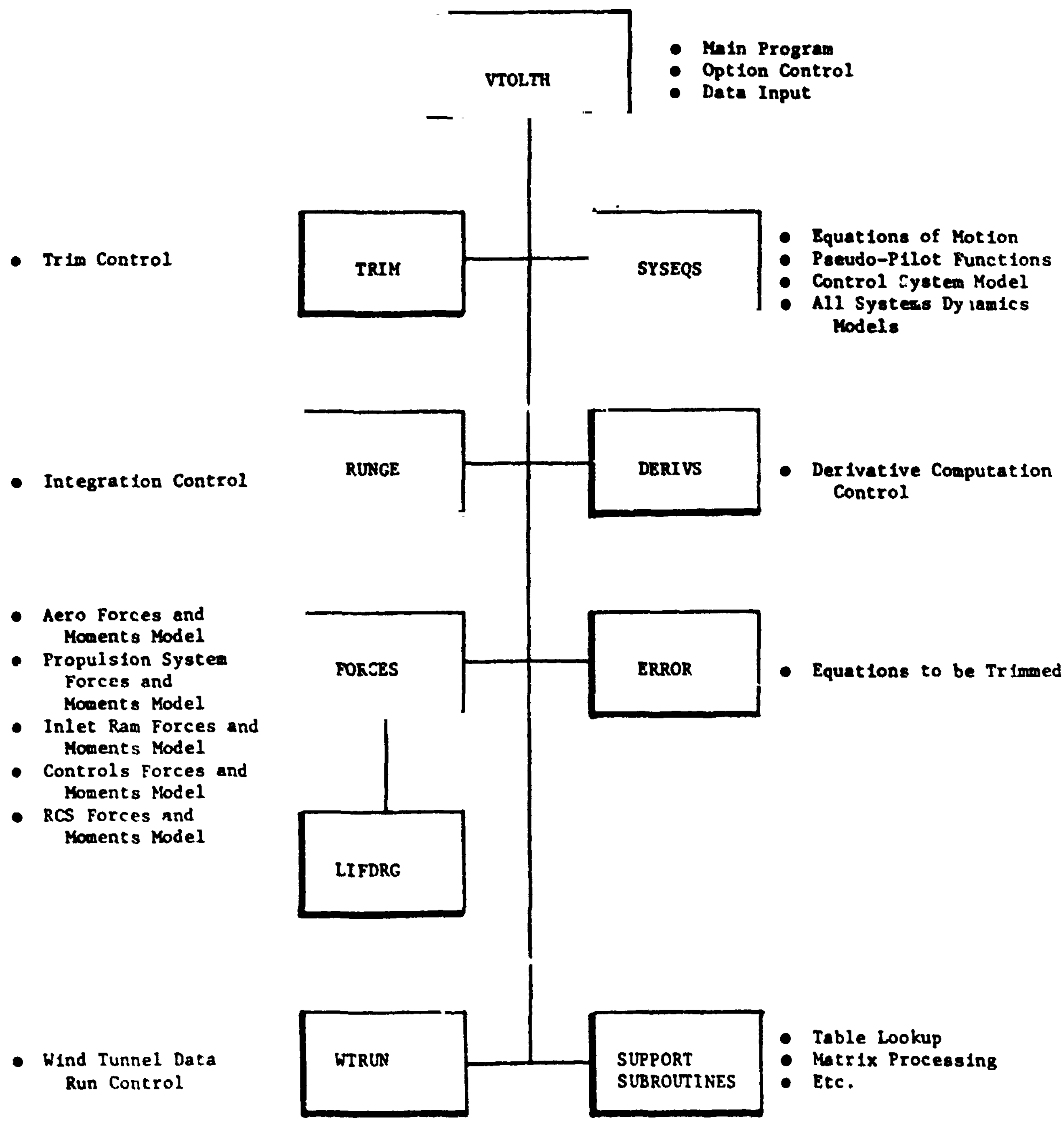

Figure 1-1. Framework of CLSIM Routine

2.0 VATLAS PROGRAM MODULES

The functions of the various VATLAS program modules are described in this section. VATLAS exists as an UPDATE* source file. This facilitates user interaction to modify VATLAS modules (i.e., "decks" in UPDATE terminology by the use of UPDATE directives. A summary of VATLAS decks, their type and purpose, and their relative frequency of modification, as well as reasons for modification, are given in Table 2-1. Note that many of the decks are designated as "never" modified for VATLAS application. Users not knowledgeable in the application of UPDATE or equivalent utilities are referred to the UPDATE Reference Manual (Reference (b)).

2.1 The Main Program

VTOLTH is the main program module for VATLAS. It controls most of the input and output and all the calculations of the program based upon sequences of program options selected by the user from a group of twelve which are currently available. These options provide for loading or reading data in the COMMON array, specifying trim variables or variables for stability derivative calculations, directing a trim solution or a time history calculation, storing a list of variables for input or output, directing wind tunnel-type calculations with the aerodynamic model, and storing and printing summaries of a series of trim solutions. Specific loading instructions for each of these options and the Basic Data Load (BDL) are given in Section 4.0.

2.2 The Aircraft-Specific Program Modules

The VATOL aircraft-specific program modules include DERIVS, ERROR, FORCES, SYSEQS, LIFDRG, WTRUN, and NAMES. Should the user wish to apply the Vought OLSIM structure to an aircraft other than a VATOL, he would have to develop, as a minimum, the DERIVS, ERROR, FORCES, SYSEQS, and NAMES modules. LIFDRG and WTRUN were specially developed for VATLAS.

2.2.1 FORCES

Subroutine FORCES calculates the forces and moments applied to a VATOL aircraft by aerodynamics, propulsion system, inlet ram, Coriolis effects, and reaction control system (RCS). There is no reason to modify existing FORCES coding for application to any current VATOL concept. Future modifications might include the addition of a capability to calculate aerodynamic forces and moments from tabularized data as an alternative to the current DATCOM-type calculations and the addition of propulsion-induced aerodynamics.

The FORCES aerodynamics model calculates contributions for an aircraft with three lifting surfaces - wing, horizontal stabilizing surface, and vertical stabilizing surface - and a fuselage. Each lifting surface can have trailing and leading edge flaps whose effects are modeled with changes in C_m, C_L, and C_D per unit flap deflection and/or control surface whose

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*UPDATE is the CDC utility which creates an easily referenceable source program and provides easily applied directives for modifying this program with a minimum of input. Equivalent utilities are available for other computer systems.

Table 2-1 Summary of Decks in VATLAS UPDATE Source File

UPDATE DECK NAME	DECK TYPE	PURPOSE	RELATIVE FREQ. OF MODIFICATIONS	REASONS TO MODIFY
VTOLTH	Main Program	Option and input/output control	Infrequently	Add/delete program options; input/output mods
TRIM	Subroutine	Controls trim solution	Never	---
RUNGE	Subroutine	Controls integration	Never	---
SETUP*	Entry point in RUNGE	Initializes integrators	Never	---
BATAN2	SUBROUTINE	Determines universe tangent in range Angle	Never	---
SIMQ	Subroutine	Solves system of equations by Gaussian elimination	Never	---
ATMOS	Subroutine	Provides standard and tropical day atmospheric data	Never	---
PCACT	Subroutine	General actuator model with position and rate limiting	Never	---
DERIVS	Subroutine	Stability derivative calculation	Infrequently	When derivatives are required for a variable not available in the 22 provided with the program

* Not an UPDATE deck; contained in the deck immediately above the dashed line.

Table 2-1 (continued) Summary of Decks in VATLAS UPDATE Source File

UPDATE DECK NAME	DECK TYPE	PURPOSE	RELATIVE FREQ. OF MODIFICATIONS	REASONS TO MODIFY
ERROR	Subroutine	Contains force, moment, and kinematic relations to be trimmed	Infrequently	Different trim logic or to add/delete relations to be trimmed.
FORCES	Subroutine	Calculates forces and moments applied to aircraft	Infrequently	Add/delete/modify force and moment calculations. Must be rewritten if new type aircraft other than VATOL is to be modeled.
SYSEQS	Subroutine	Calculates actuation and control system dynamics and aircraft kinematics. Also contains pseudo-pilot functions.	Frequently	Add/delete/modify control system, actuation system, or pseudo pilot functions.
DEQU*	Entry point in SYSEQS	Contains all system differential equations. Called only during time history run.	Frequently	Same as for SYSEQS.
LIFDRG	Subroutine	Generalized lift-drag calculations for lifting surface	Infrequently	Add/delete/modify aerodynamic lift-drag calculations common to all lifting surfaces.

* Not on UPDATE deck; contained in the deck immediately above the dashed line.

Table 2-1 (Completed) Summary of Decks in VATLAS UPDATE Source File

UPDATE DECK NAME	DECK TYPE	PURPOSE	RELATIVE FREQ. OF MODIFICATION	REASONS TO MODIFY
WTRUN	Subroutine	Controls calculation of wind tunnel type program output	Infrequently	Add independent variables other than angle of attack or sideslip.
NAMES	Common deck used in DERIVS, ERROR, FORCES, SYSEQS, WTRUN	Segments and names blank program COMMON	Frequently	Each time a variable or constant is added or deleted from the program.
Plotting package containing PLOTER, AXIS BNBCDV, DASLIN, DASPLT, SCALNG	All are subroutines	Controls generation of plots by CALCOMP routines.	Never if local computer system supports CALCOMP routines	If local computer system does not support CALCOMP routines (Required in NASA Ames installation of VATLAS)
Table look-up and interpolation package containing DTLU, STLU, INTRP, INTRP2, INTRP3, INTRP4, SEARCH	All are subroutines	Controls table look-up and interpolation	Never	---

effects are modeled with a change in angle of attack of the lifting surface per unit control deflection. The FORCES propulsion system can have one or two jet engines. Each engine has an inlet, thrust vectoring in two directions, and an independent throttle control. The FORCES RCS can have up to ten individually controlled jets located anywhere on the aircraft and oriented in any direction. Each jet can be specified as demand or continuous bleed. FORCES also models the RCS-propulsion system interactions (figure 2-1) appropriate to continuous and demand bleeding. The FORCES inlet ram model provides for changes in inlet ram magnitude, direction, and application point as functions of angles of attack and sideslip, airspeed, inlet mass flow rate and aircraft rotation rates. The FORCES Coriolis model provides for changes in forces and moments as functions of mass flow rate through the engine ducts and aircraft rotation rates

2.2.2 SYSEQS

Subroutine SYSEQS contains the equations for the aircraft kinematics, flight control system, actuation system and pseudo-pilot functions. SYSEQS will require modification more frequently than any other subroutine primarily because of the great variety of possible control systems and control system/actuation system interfaces. The user should not shy away from exercising his individuality and modifying SYSEQS to his requirements; VATLAS was designed to be easily modified.

The aircraft kinematics in SYSEQS use direction cosines to orient aircraft body axes to inertial space; this avoids the singularity at $\theta = 90$ deg in the standard Euler rate equations. The Euler rate equations are available and integrated in SYSEQS for application as required but are not fed into the kinematics. The integration of the Euler roll and yaw rate equations is suspended when θ is in the range 90 ± 0.00006 deg; this suspension introduces an error each time the appropriate range is encountered.

The flight control system provided in SYSEQS includes the generic roll, pitch, yaw and heave control systems depicted in figures 2-2 through 2-5. Feedback possibilities for moment control include stability and body axis angular rates, Euler angles and integrals of body axis angular rates; for heave control the only feedback is inertial axis heave rate ($\dot{z}_e$). Inputs from cockpit controllers can be shaped by combinations of gains and integrators to provide rate command, attitude command, or rate command-attitude hold type systems. Forward loop control can be proportional or proportional plus integral. The flight control system includes a switch programmed as a function of airspeed which can be used to change control laws or cockpit controller function as the aircraft enters the hover regime. System gains can be programmed as functions of airspeed or pitch angle. (Airspeed programming is indicated on the control system diagrams.) As shown in Figures 2-2 and 2-4, the control system switch reverses the conventional roles of pedals and lateral stick deflection for hover. In hover the pedals command body axis roll while the lateral stick commands body axis yaw. This role switching is required in a VATOL in which the cockpit is rotated 90 degrees to be parallel to the ground in hover. This is the first concept to be studied in the NASA-Ames piloted VATOL simulations.

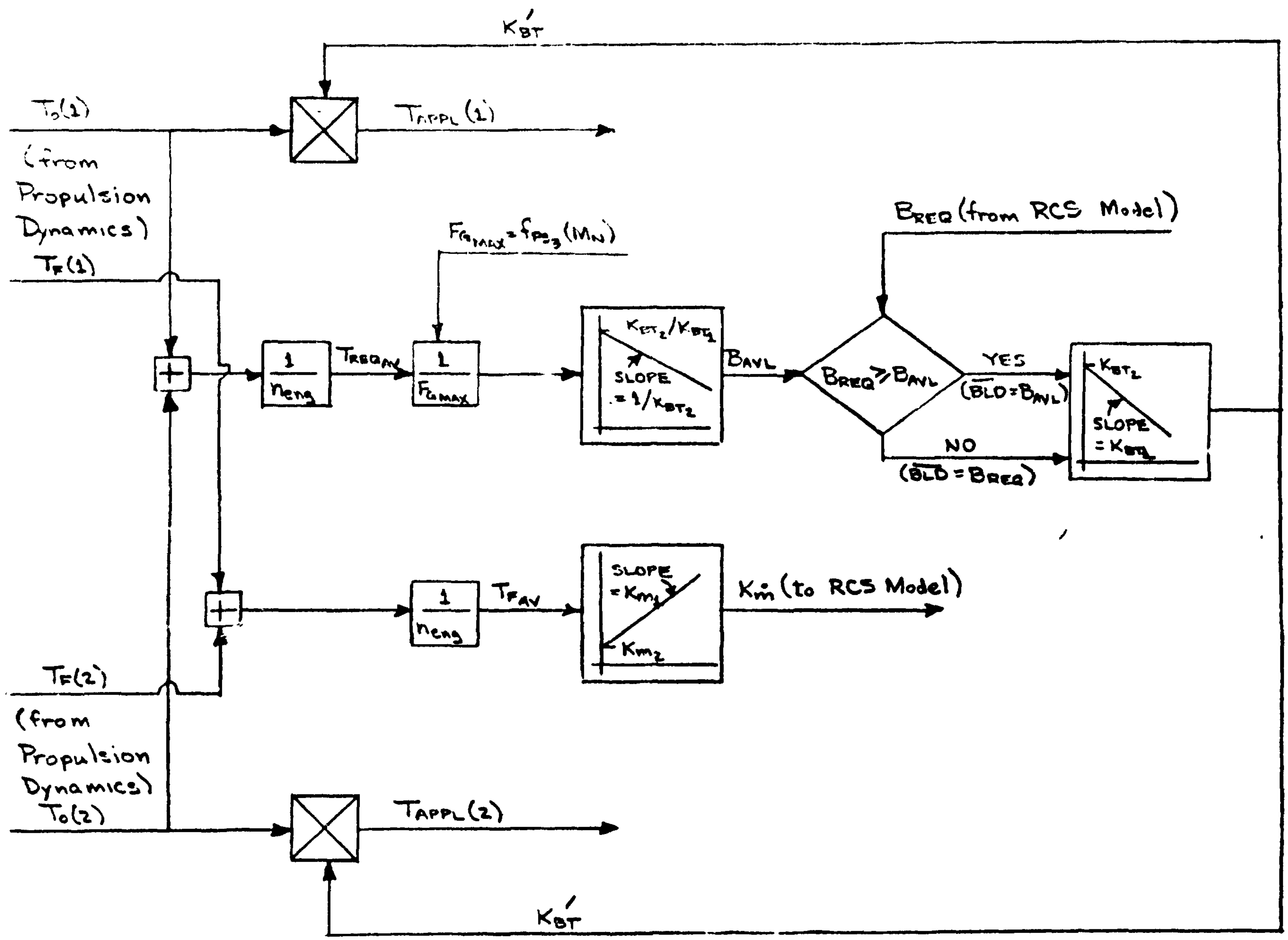


Figure 2-1. RCS-Propulsion System Interactions Model

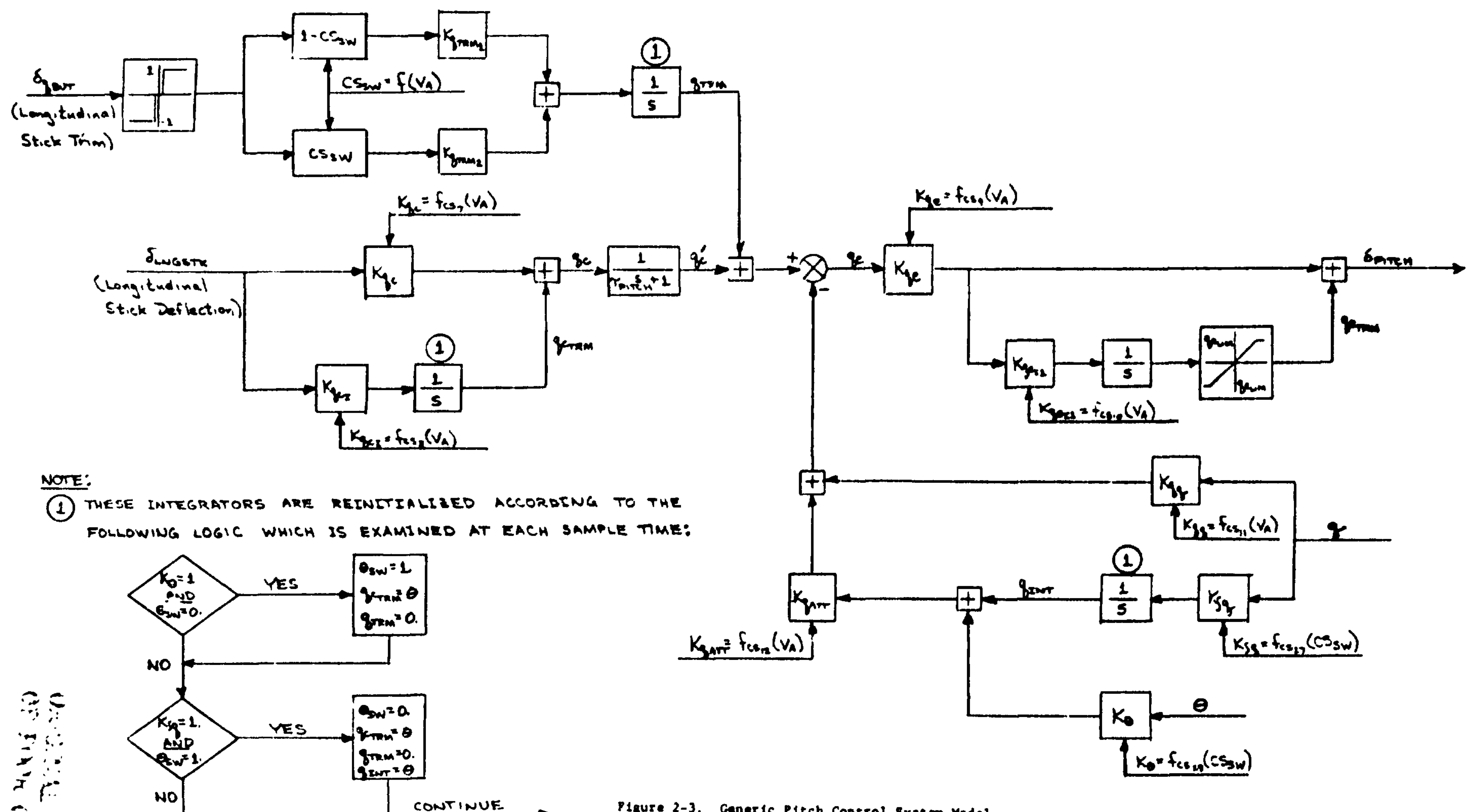


Figure 2-3. Generic Pitch Control System Model

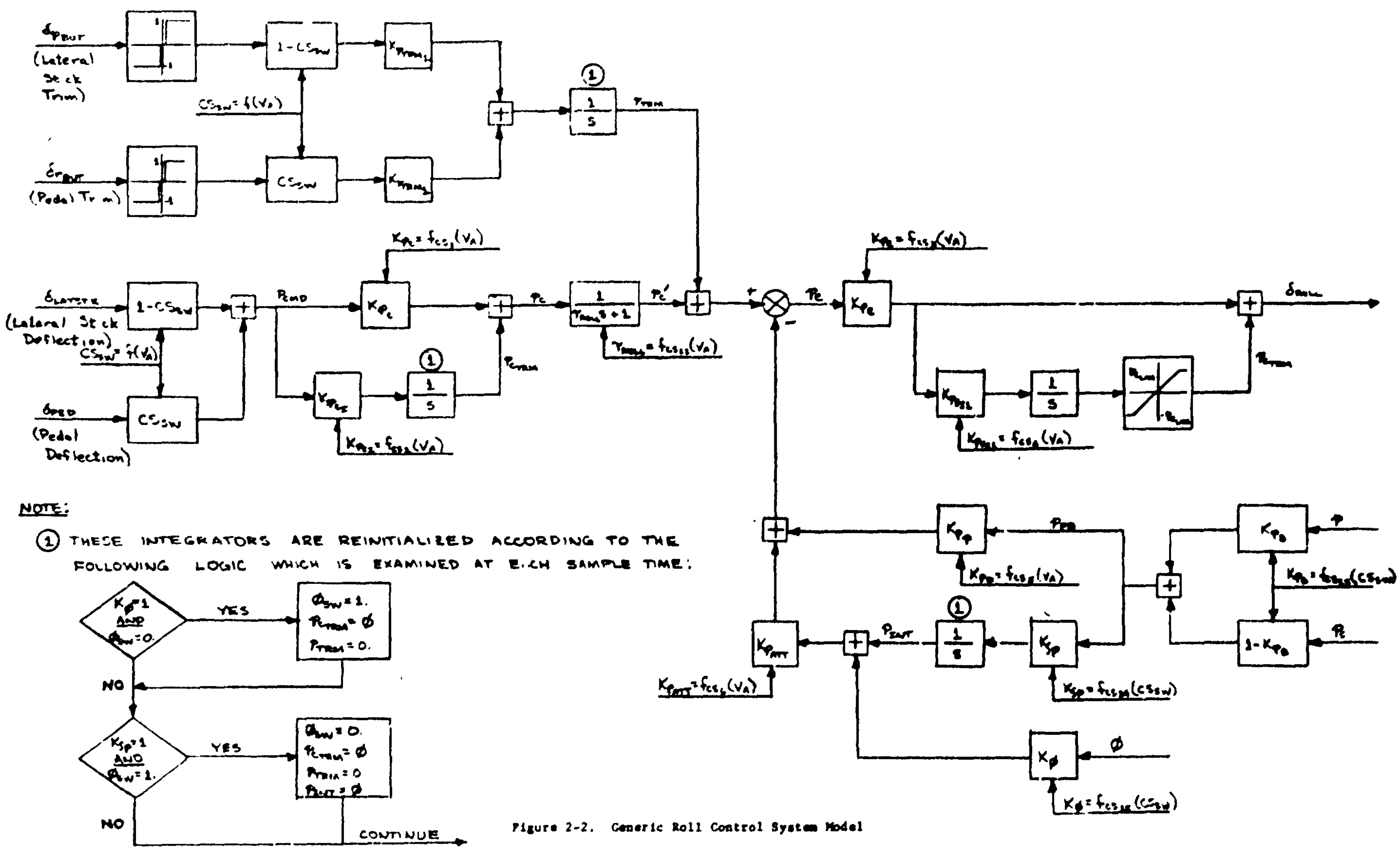


Figure 2-2. Generic Roll Control System Model

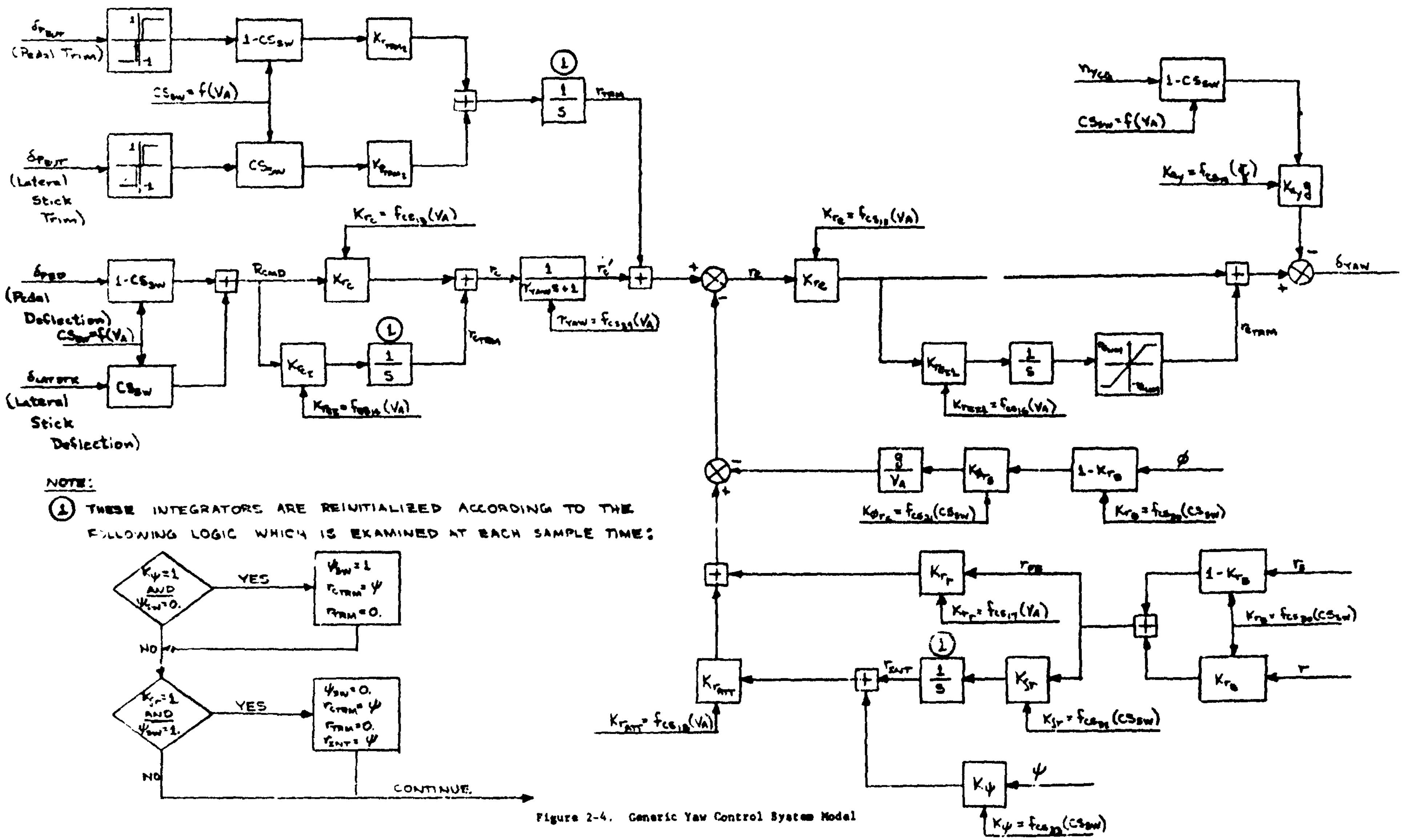


Figure 2-4. Generic Yaw Control System Model

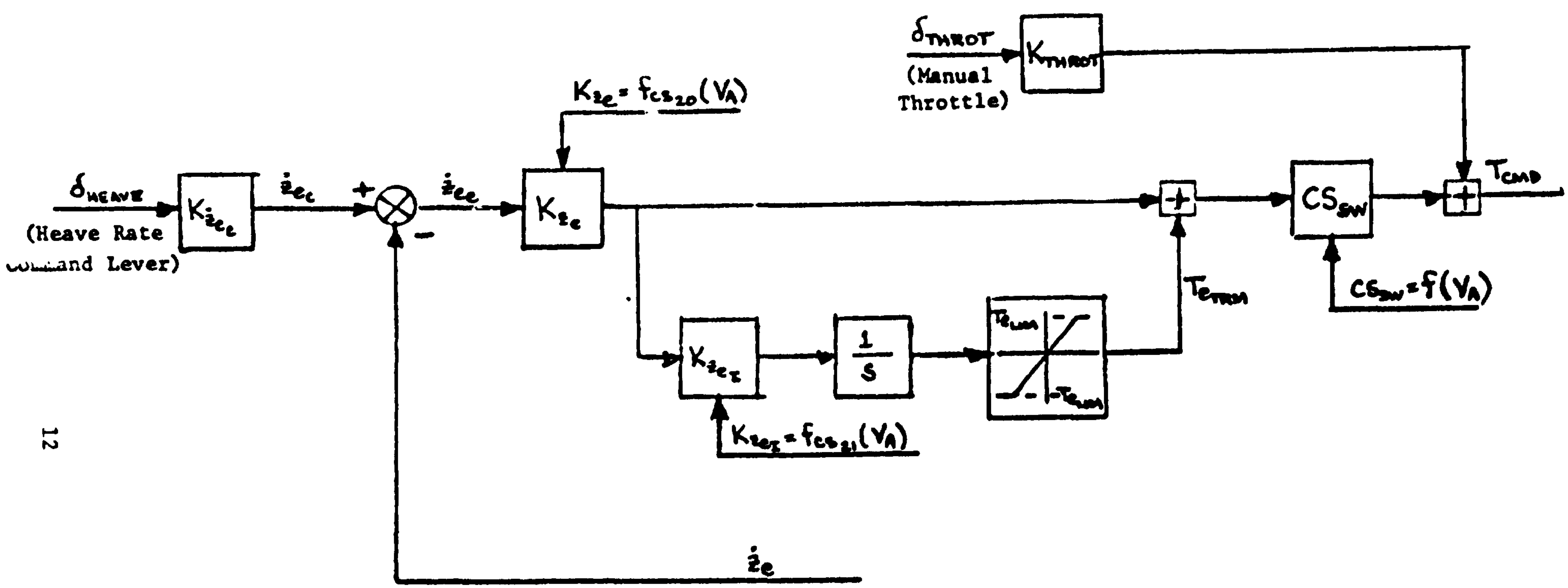


Figure 2-5. Generic Heave Control System Model

The flight control system/actuation system interface provided in SYSEQS is depicted in Figure 2-6. The programmed aircraft can be controlled via pitch and yaw thrust deflection, thrust modulation, elevons which combine elevator and aileron functions, rudder, leading edge wing flaps, trailing edge horizontal stabilizer (canard) flaps, and RCS. In addition to providing roll control as indicated in Figure 2-6, the RCS will accept pitch, yaw, side force, and normal force commands.

With the exception of thrust commands, all the actuation system commands defined in Figure 2-6 are processed by the generic rate and position limited actuator model shown in Figure 2-7. This actuator model is programmed as subroutine PCACT. The thrust commands are processed by the thrust dynamics model depicted in Figure 2-8.

Subroutine SYSEQS has two sections of equations. One section, entered by a call to SYSEQS, is used only for trim and derivative calculations. The other section, entered by a call to DEQU, is used only during time history calculations and contains most of the differential equations in the simulation. As may be inferred many of the control system statics and control system/actuation interface equations are common to both sections while aircraft kinematics and control system and actuation system dynamics equations appear only in the DEQU section.

2.2.3 DERIVS

Subroutine DERIVS generates aircraft body axis stability derivatives about trim. It is called automatically during the trim program option. Changes in body axis forces and moments (X, Y, Z, L, M, N) are calculated for unit changes in the following variables: body axis airspeed components (u_{AS}, v_{AS}, w_{AS}); body axis rotation rates (p, q, r); elevator; aileron; rudder; wing leading edge flap; horizontal stabilizing surface (canard) trailing edge flap; RCS roll, pitch, yaw, normal force, and side force commands; thrust of each engine; pitch thrust deflection; and yaw thrust deflection. Since these variables encompass a wide range of control concepts, subroutine DERIVS should not require modification during any application of VATLAS. Total derivatives and the contributions to these derivatives from the wing, horizontal and vertical stabilizers, thrust, inlet ram, and RCS are calculated and printed by DERIVS.

2.2.4 ERROR

Subroutine ERROR contains the fifteen equations which must be balanced to attain a six DOF trim solution. These equations include balances between applied forces and linear accelerations, applied moments and angular accelerations, inertial and body axis translation accelerations and rates, and Euler angle rates and body axis rotation rates. ERROR also contains user-selected logic for trimming with or without ambient winds and in turns. ERROR is called only during trimming. To generate the data required for the fifteen trim balances ERROR cycles through FORCES and SYSEQS. ERROR is a fairly general routine and should not have to be modified for any application of VATLAS.

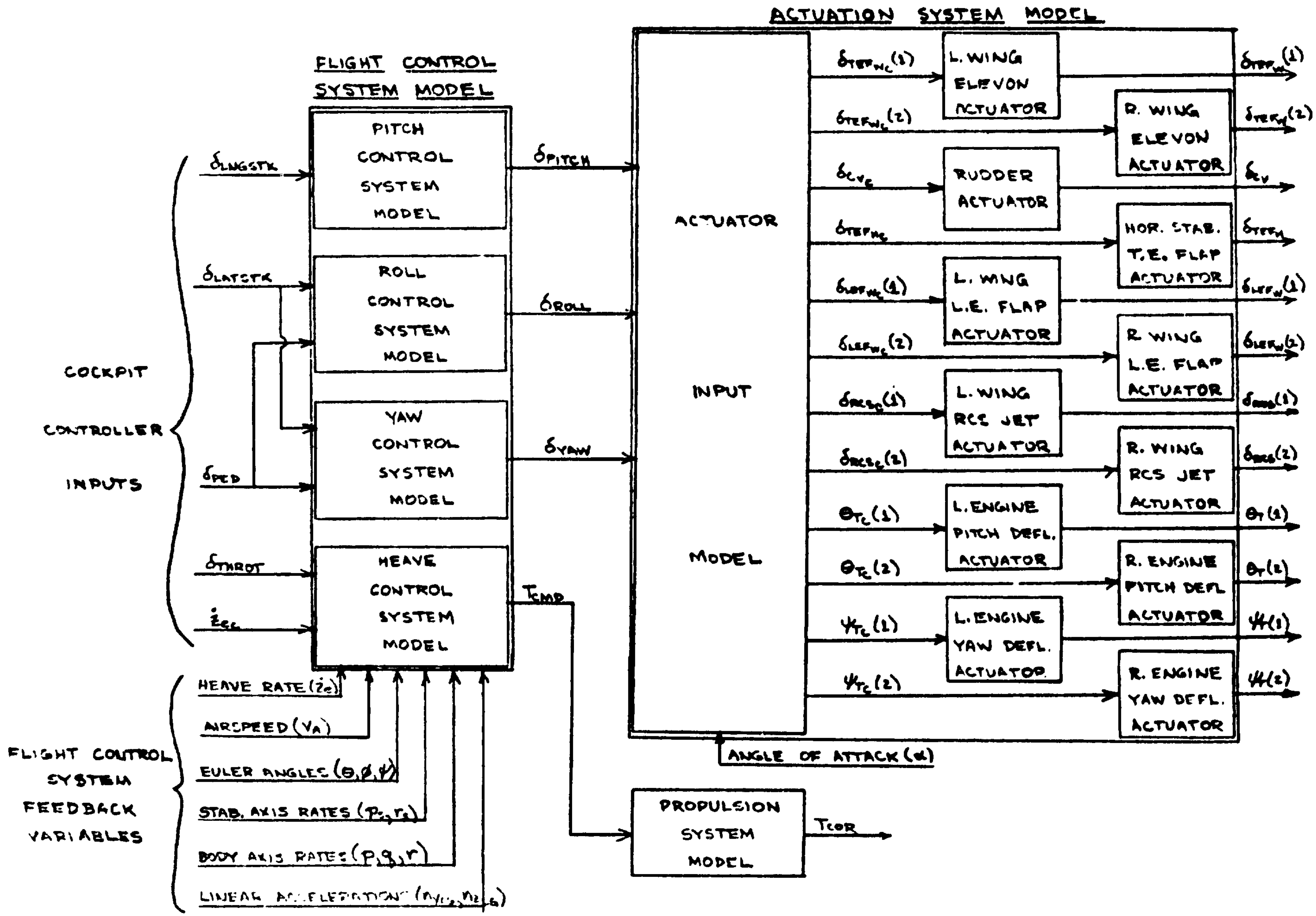


Figure 2-6. Interface of Flight Control System and Actuation System Model

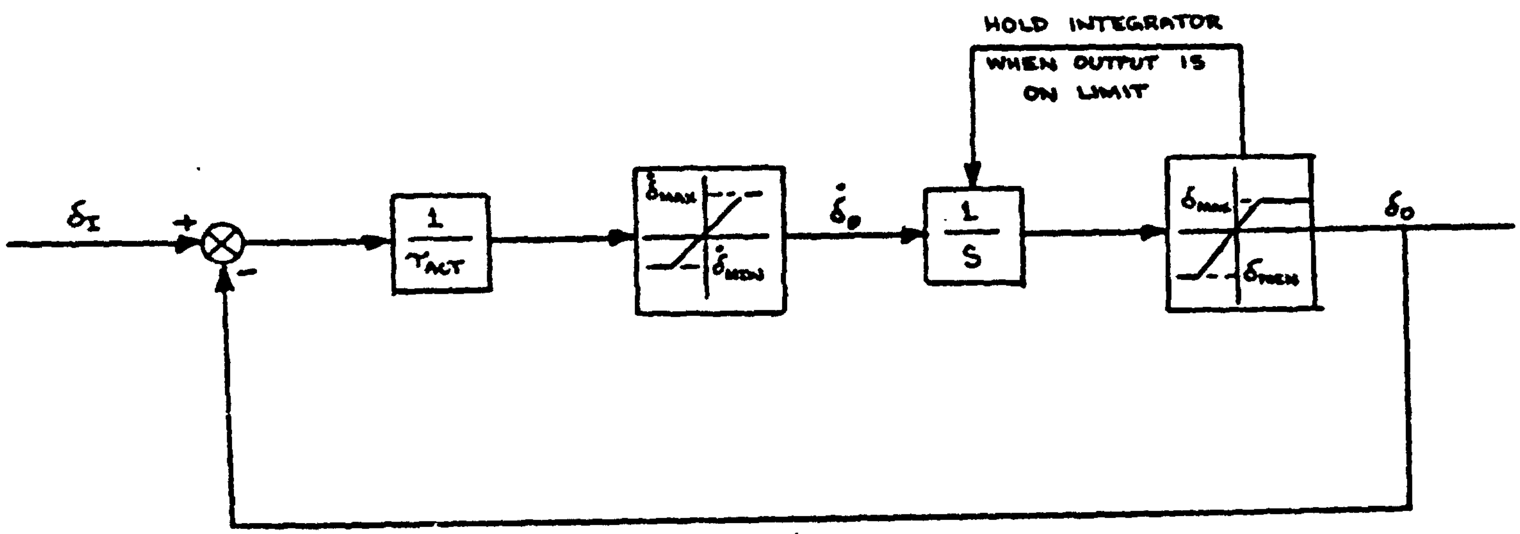
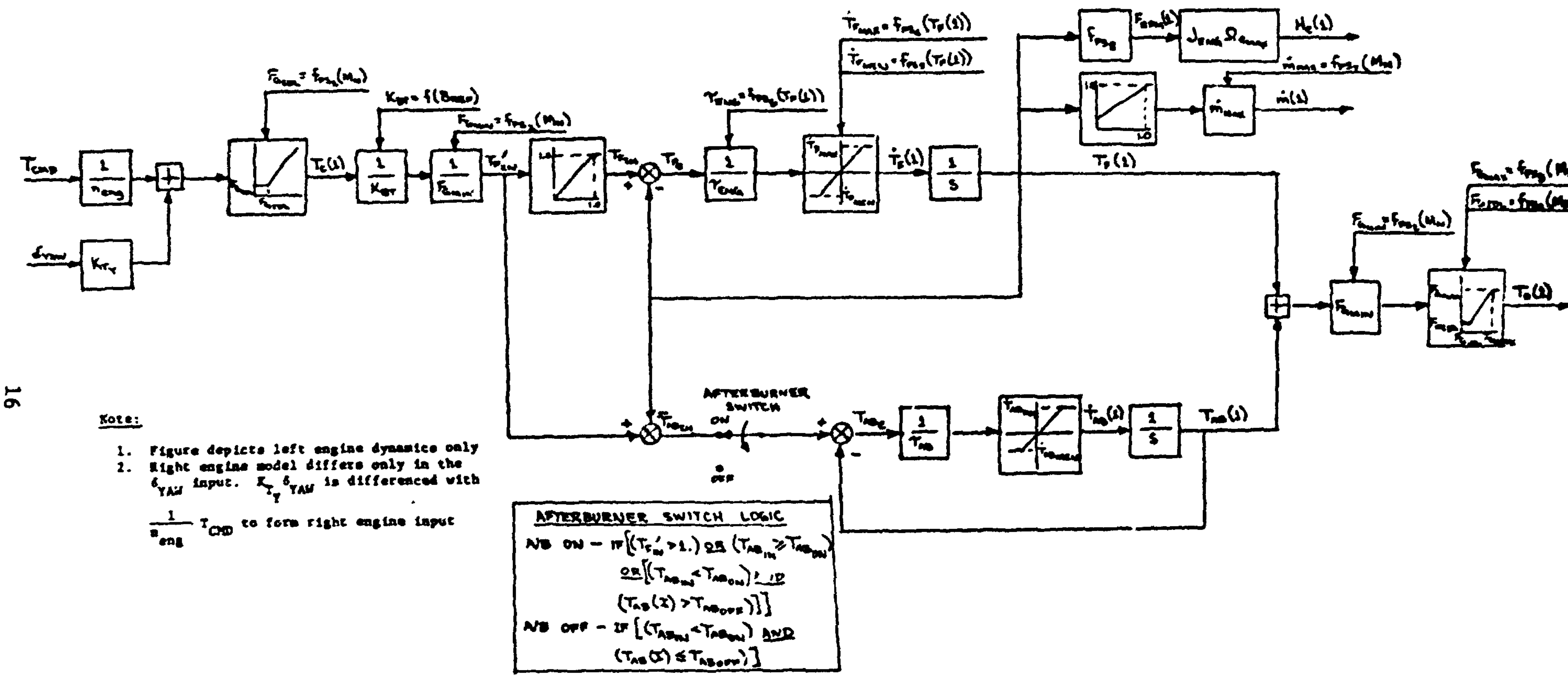


Figure 2-7. Generic Actuator Model



Note:

1. Figure depicts left engine dynamics only
2. Right engine model differs only in the δ_{YAW} input. $K_{T_Y}\delta_{YAW}$ is differenced with $\frac{1}{n_{eng}} T_{CMD}$ to form right engine input

Figure 2-8. Propulsion System Dynamics and Performance Model

2.2.5 LIFDRG

Subroutine LIFDRG contains the generalized equations for calculating the lift, drag, moment, and center of pressure shift of the aero lifting surfaces. LIFDRG req·'res the surface angle of attack, leading and trailing edge flap deflections, and a series of aero constants to perform these calculations. The module should not have to be modified for any application of VATLAS.

2.2.6 WTRUN

Subroutine WTRUN controls the application of the aerodynamic model equations to generate wind tunnel-type data. Inputs for WTRUN specify the type of sweep to be run, angle of attack (α) or sideslip (β); initial and final angles in the sweep; and the incremental angle between data points. At each data point, total and component (due to wing, fuselage, horizontal stabilizer, and vertical stabilizer) nondimensional stability axis aero coefficients are calculated and printed out. Initial values may be placed on any variables which appear in the aero model so that dynamic derivatives and aero characteristics as functions of α and β can be generated. For example, Cmq as a function of α might be generated as follows: Run sweeps with pitch rate (q) = 0 and 0.05 or 0.1 rad/sec then calculate

$$C_{m_q}(\alpha) = \frac{C_m(\alpha)\big|_{q_0=0.05 \text{ or } 0.10} - C_m(\alpha)\big|_{q_0=0.}}{\left[\dfrac{(0.05 \text{ or } 0.10)\, c_w}{2V_A}\right]}$$

where

$C_m(\alpha)\big|_{q_o = A}$ is the pitch moment coefficient at α with $q_o = A$

c_w = mean aerodynamic chord of the wing

V_A = reference airspeed (for convenience V_A = 100 ft/sec can be used)

WTRUN should not have to be modified for any application of VATLAS unless the user wants other than α or β sweeps.

2.2.7 NAMES

In UPDATE terminology, NAMES is a COMDECK (common deck). During a FORTRAN compile of the VATLAS UPDATE source file, NAMES is inserted in subroutines DERIVS, FORCES, SYSEQS, ERROR, and WTRUN. NAMES is simply a series of COMMON statements which order VATLAS variables and constants in the blank COMMON reserved by VTOLTH, the main program. As indicated in Appendix B, NAMES is heavily commented to clearly identify COMMON segments. The importance of COMMON segmenting to VATLAS applications will become evident in subsequent sections. Variables and constants listed in NAMES, which constitute over 95% of those used in VATLAS, are available for program input and output under the control of VTOLTH.

2.3 Standard Program Modules

The standardized program modules include TRIM, RUNGE, BATAN2, SIMQ, ATMOS, PCACT, and the table lookup and interpolation package. These modules have withstood the severe testing environment of extensive, critical use at Vought and should not be blamed for VATLAS failures to produce results; the message is "DON'T MODIFY THE STANDARDIZED MODULES." Since several of the modules are available to the user in developing program modifications, the formal parameters in their calling statements are defined below.

The VATLAS plotting package is a standardized module provided the user's computing facility supports the CALCOMP plotting utilities. The NASA-Ames CDC 7600 computing facility does not support CALCOMP, thus modifications to the Vought-supplied plotting module are required. Since the Vought routines have simplified the input data required to generate plots, it is recommended that the Vought input format be retained during these modifications. A description of this format is given in Section 4.0 when VATLAS Program Options 5 and 10 are discussed. An example of a plot deck and the resulting plot is included in Section 5.0.

2.3.1 TRIM

Subroutine TRIM controls the search for trim conditions. It has a six degree-of-freedom trim algorithm based on Newton's method of solving systems of non-linear equations. Instructions for trimming the aircraft in various standard trim conditions (e.g. 1g wings level, constant heading sideslip, coordinated turn, etc.) are provided in the discussion of Program Option 6 in Section 4.0. TRIM is not a user specified module; it is called automatically by Program Option 8.

2.3.2 RUNGE

Subroutine RUNGE controls and applies a 4th order Runge-Kutta algorithm for integration of the VATLAS differential equations during time history runs. Entry point SETUP in RUNGE is called once at the beginning of a time history to initialize all the integrators. RUNGE is not a user specified module; it is called automatically by Program Option 4.

2.3.3 BATAN2

BATAN2 is a function subroutine which determines the inverse tangent of Y/X in the range $-\pi < \tan^{-1}(Y/X) \leq \pi$. It avoids the problems of infinite or indeterminate operands when X = 0 or X = Y = 0. BATAN2 is a user specified subroutine whose application is demonstrated in the following example:

ANGLE = BATAN2 (Y,X)

where ANGLE = $\tan^{-1}(Y/X)$ in rad

2.3.4 SIMQ

Subroutine SIMQ solves a system of linear equations using a Gauss elimination algorithm. It is not a user specified module; it is called automatically during trim calculations.

2.3.5 ATMOS

Subroutine ATMOS provides air density, ambient temperature and pressure, temperature and pressure ratios, and speed of sound as functions of pressure altitude for standard and tropical day conditions. The atmosphere model is the U.S. Standard Atmosphere. ATMOS is user specified with the following statement:

CALL ATMØS (ALT, KATMØS, RHØ, TAMB, PRESS, TRATIØ, PRATIØ, VSØUND)

where

ALT = pressure altitude, ft

KATMØS = 1 for standard day, 2 for tropical day

RHØ = air density, slugs/ft^3

TAMB = ambient temperature, deg R

PRESS = ambient pressure, lb/ft^2

TRATIØ - temperature ratio

PRATIØ = pressure ratio

VSØUND = speed of sound, ft/sec

ALT and KATMØS must be defined before ATMØS is called.

2.3.6 PCACT

Subroutine PCACT implements the generic rate and position limited actuator depicted in figure 2-7. It is a user specified module and is called as follows:

CALL PCACT (DIN, DØUT, RLP, RLN, PLP, PLN, TAU, ITRIM, DØUTD)

where

DIN - actuator input

DØUT = actuator output

RLP = upper rate limit

RLN = lower rate limit

PLP = upper position limit

PLN = lower position limit

TAU = actuator time constant, sec

DØUTD = rate of change of actuator output

ITRIM indicates whether program is trimming or calculating a time history and is automatically controlled by ' ' program.

DIN, RLP, RLN, PLP, PLN, and TAU must be defined before PCACT is cal

2.3.7 Table Lookup and Interpolation Package

The table lookup and interpolation module contains seven subroutines; STLU, DTLU, INTRP, INTRP2, INTRP3, INTRP4, SEARCH. Only STLU and DTLU are available for user specification; the other subroutines are called as required during applications of STLU or DTLU. STLU performs single table lookup and interpolation to determine y = f(x) while DTLU performs double table lookup and interpolation to determine z = f(x,y). The call to STLU is as follows:

CALL STLU (X, FX, L, XARG, U, KØDE)

where

X is the table of independent variable values.

FX is the table of dependent variable values.

L is a fixed point constant equal to the number of entries in the X and FX tables. L is the minimum dimension of the X and FX arrays.

XARG is the current value of the independent variable.

U is the current value of the dependent variable.

KØDE specifies the type of interpolation to be used; 2 for two point (linear) interpolation, 3 for three point (quadratic) interpolation, 4 for four point (cubic) interpolation. KØDE = 2 for calls to STLU currently in VATLAS.

The X array should be loaded in order from smallest to largest value. Furthermore, to avoid indeterminate or infinite operands, two successive X array entries should not be equal.

The call to DTLU is as follows:

```
CALL DTLU (X, Y, FXY, L, M, XARG, U, KX, KY)
```

where

X is the table of the independent variable 1 values.

Y is the table of the independent variable 2 values

FXY is the table of the dependent variable values

L is a fixed point constant equal to the number of entries in the X table. L is the minimum dimension of the X array.

M is a fixed point constant equal to the number of entries in the Y table. M is the minimum dimension of the Y array. FXY must have a minimum of L times M entries.

XARG is the current value of independent variable 1.

YARG is the current value of independent variable 2.

U is the current value of the dependent variable.

KX and KY take on the same values as KØDE in STLU and describe the type of interpolation to be applied along the independent variable 1 and 2 axes, respectively.

As for STLU, the X and Y arrays must be loaded in order from smallest to largest value. Similarly, two successive X or Y array entries should not be equal. The FXY table is loaded in the order: $f(X_1,Y_1)$ to $f(X_L,Y_1)$, $f(X_1,Y_2)$ to $f(X_L,Y_2)$, etc to $f(X_1,Y_M)$ to $f(X_L,Y_M)$.

3.0 VATLAS COMMON ARRAY

VTOLTH reserves 12000 words of blank COMMON in a single array called R. The purpose of the NAMES module is to label and arrange the R array with variables and constants used in subroutines DERIVS, FORCES, SYSEQS, ERROR, and WTRUN. These parameters are arranged in logical groupings called segments where, for example, one segment contains all the inlet ram related variables while another contains all the control system variables. A reference to the NAMES portion of the subroutine FORCES listing in Appendix B indicates that the VATLAS COMMON currently has forty five segments which consume approximately 3600 words of the R array.

When developing a new simulation within the OLSIM framework, the user is free to establish as many segments as he desires so long as the number of COMMON parameters does not exceed the 12000 allocated in the R array. With a few exceptions, COMMON segments can be arranged and numbered at will; the exceptions are as follows:

1. Segment 1 always has the same seven parameters which are in order: T, TO, DT, TMAX, DTPRNT, DTPLØT, TI. These COMMON parameters are defined in Appendix A along with all other parameters of the VATLAS COMMON.

2. Segment 2 contains all the variables to be integrated. At present a maximum of seventy are allowed. VATLAS uses sixty nine of this allocation.

3. Segment 3 contains the integrals of the Segment 2 variables aligned in the same order. Thus there are an equal number of Segment 2 and 3 variables and the first variable in Segment 3 is the integral of the first variable in Segment 2, etc.

4. Segment 5 contains the ranges or tolerances to which each component of the error vector in subroutine ERROR must be driven to achieve trim. These are constants which must be specified in the VATLAS Basic Load. VATLAS allocates nineteen locations for trim tolerances even though only fifteen are required in the trim solution.

For COMMON input and output as occurs in the Basic Load and many of the Program Options, the COMMON parameters are designated by segment number and location within that segment. For example, T is element 1 in segment 1, TMAX is element 4 in segment 1.

4.0 VATLAS BASIC LOAD AND PROGRAM OPTIONS

This section provides loading instructions and descriptions of the Basic Load for VATLAS and each of the program options. Parameters such as NTAP, NTAPD, NTAPW, etc. which refer to input or output file numbers required by VATLAS appear many times in this report section. The only file numbers currently available for use when quantifying these parameters are 1, 2, 3, 4, and 8 through 17. File numbers 5, 6, and 7 have prespecified purposes: file 5 is the INPUT file which contains input data on cards, file 6 is the OUTPUT file which contains data for the output printer, and file 7 is the PUNCH file which contains data to be punched on cards. To make other file numbers available to VATLAS, the first statement in VTOLTH (Appendix B) is modified to include TAPE XX, where XX is the new file number, in its list of formal parameters.

4.1 The Basic Data Load

The Basic Data Load (BDL) specifies how the R or COMMON array is to be segmented, a list of desired output parameters for use with Options 4 or 12, and many of those program constants designated as type N parameters in COMMON (see Appendix A). Data for Option 9 which specifies the variables to be used for stability derivative determination could also be considered in the BDL since these variables are not normally changed in the course of a VATLAS application. The list of output parameters will vary according to the type of run; two separate lists have been developed for VATLAS applications, one for summarizing data from a series of trim cases (Example 1 in Section 5.0) and one for specifying the variables to be stored during a time history run (Example 2 in Section 5.0). Only non-zero type N COMMON parameters require specification since standard run procedure is to initialize computer storage to zero.

The first two cards in the BDL are as follows:

Card	Format			
1	1I5	1 - 5	6 - 80	
		NEQS	Blank	
2	2I5	1 - 5	6 - 10	11 - 80
		NTAP	NTAPW	Blank

where

NEQS is the number (≤ 70) of differential equations in the problem = 69 for VATLAS

NTAP is the number of the file which contains the BDL. NTAP = 5 if the BDL is card input. If NTAP $\neq$ 5, the appropriate file must be ATTACHed in the Control Card stream before entering VATLAS.

NTAPW is the number of the file where the BDL is to be copied. This allows the BDL to be stored on a file and thus eliminate a significant number of cards in the data deck. If NTAPW = 0 the BDL is not stored. If NTAPW ≠ 0, file NTAPW must be ATTACHed before entering VATLAS, then CATALOGed before ending the Control Card stream to insure that the data will be saved.

These two cards will always be required even though the BDL is stored on a file.

The next few cards in the BDL specify the number of segments in the R array and the number of storage locations in each segment:

Card	Format					
3	16I5	1 - 5	6 - 10	11 - 15	. . .	76 - 80
		NSEG	LENGTH(1)	LENGTH(2)	. . .	LENGTH(15)
4	16I5	1 - 5	6 - 10	11 - 15	. . .	76 - 80
		LENGTH(16)	. . .	. . .	. . .	LENGTH(31)
.				.		
.				.		
.				.		
2+NS	16I5	1 - 5	6 - 10	11 - 15	. . .	76 - 80
		. . .	. . .	. . .	LENGTH(NSEG)	

where

NSEG is the number (≤ 200) of segments in the R array.
= 45 for VATLAS

LENGTH(I) is the number of storage locations in segment I.

NS = $\frac{NSEG+1}{16}$ rounded to next highest integer value. NS = $\frac{45+1}{16}$ = 2.875 = 3 for VATLAS

The next subset of BDL cards specify the list of desired output parameters for Option 4 (Time history) or 12 (Trim data summary):

Card	Format						
NS+1	2I5,E10.3, 2A5,12A4	1 - 5	6 - 10	11 - 20	21 - 25	26 - 30	31 - 78
.		I	J	SCAL(1)	LBL(1)	LBL(2)	LABEL
.					.		
.					.		
					.		

NS+K	2I5,E10.3	
.	2A5,12A4	
.		
.		

1 - 5	6 - 10	11 - 20	21 - 25	26 - 30	31 - 78
I	J	SCAL(K)	LBL(2*K-1)	LBL(2*K)	LABEL

.
.
.

Card	Format
NS+NØUT	2I5,E10.3, 2A5,12A4

1 - 5	6 - 10	11 - 20	21 - 25	26 - 30	31 - 78
I	J	SCAL(NØUT)	LBL(2*NØUT -1)	LBL(2*NØUT)	LABEL

NS+NØUT+1	--	

1 - 80
Blank Card

where

NØUT is the number ($\leq$120) output parameters

I is the segment number of the Kth output parameter

J is the element number of the Kth output parameter

SCAL(K) is the constant which scales the Kth parameter before it is output. An example of the use of SCAL(K) follows: most angles in the computer are in radian measure; it is desirable that these angles be output in degrees, therefore SCAL(K) for an angle parameter would be 57.296. In most cases, SCAL(K) will equal 1. since the computer variable has its normal units.

LBL(2*K-1) and LBL(2*K) contain the first five and second five alphanumerics, respectively, in the output parameter name. This name is not constrained to be the same as the coded name of the parameter given in Appendix A.

LABEL is an optional field and is used to further identify an output parameter on the computer printout. LABEL is not stored in the computer but is simply passed from input to output.

The list of output parameters is ended by a blank card. Even if no output parameters are desired (i.e., NØUT = 0), the blank card is required for the program to continue.

The final and usually longest subset of BDL cards directs the loading of the program constants. As noted above these are generally the type N parameters in COMMON. This subset and, equivalently, the BDL is ended by a blank card. The form for loading program constants is as follows:

Card **Format**

NS+NØUT+2 (An input/output specification card) — 4I5,12A4, 2X,F10.6

1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	67 - 70	71 - 80
I	J	K	L	LABEL	Blank	SCALE

NS+NØUT+3 (A parameter value card) — 7E10.3

1 - 10	11 - 20	. . .	71 - 80
Value of COMMON parameter in Segment I Element J	Value of COMMON parameter in Segment I Element J+1	. . .	Blank

.
.
.

NS+NØUT+2 +NCARD (A parameter value card) — 7E10.3

1 - 10	11 - 20	. . .	71 - 80
. . .	. . .	Value of COMMON parameter in Segment K Element L	Blank

NS+NØUT+3 +NCARD — 4I5,12A4 2X,F10.6

1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	69 - 70	71 - 80
I	J	K	L	LABEL	Blank	SCALE

.
.
.

Last Card of BDL — --

1 - 80
Blank Card

where

I, J, K, L specifies that the data contained on the next NCARD cards will fill all the locations in COMMON from Segment I, Element J to Segment K, Element L. Thus NLOC pieces of data must be contained on the NCARD cards.

NLØC is the number of COMMON locations from Segment I, Element J to Segment K, Element L.

NCARD = $\frac{NLØC}{7}$ rounded to next larger whole number. (i.e., to load 40 (=NLØC) locations requires 6(=NCARD) cards.

LABEL allows the user to define what data are being loaded. This will appear on the computer printout and will help identify what the data are. LABEL is simply passed from input to output and is lost when the next LABEL specification is loaded.

SCALE specifies the constant which scales the data on the next NCARD cards before they are loaded into COMMON. For example, aircraft fuselage stations, buttlines, and waterlines are generally given in inches; the computer finds it more convenient to work in feet. Thus SCALE would be 0.0833 and the card data would be in inches for aircraft locations.

Note that if the user does not care to identify his data input other than it is COMMON data, he can load all of COMMON with one specification card where, for VATLAS, I = J = 1, K = 45, L = 170. This would be followed by 513 $\left(\text{NCARD} = \frac{\text{3585 locations (NLØC) in VATLAS COMMON}}{7} = 513\right)$ data cards and a final blank card to end the BDL.

A copy of BDL cards for the VATLAS application to the Vought SF-121 airplane is given in Appendix C. The playback of this information during a computer run is shown in the printouts for Examples 1, 2 and 3 contained in Appendices D, E, and F, respectively.

4.2 Program Options

VATLAS has 12 options for managing program execution, input, and output. These are listed and described briefly below; their use and loading are detailed in subsequent paragraphs:

Option	Function
1	Create a file of input or output data specifications
2	Read data into COMMON array
3	Write data from COMMON array
4	Calculate a time history
5	Plot a time history
6	Set up trim unknowns
7	Load variable formats for trim summary or wind tunnel runs
8	Calculate trim
9	Specify variables for stability derivative calculations
10	Plot a time history stored on a binary file during a previous run
11	Calculate wind tunnel data
12	Print trim data summary

The data cards for each option form independent input modules. These modules are placed after the BDL in the order desired for program execution. Since some options depend on information supplied by other options this module ordering must adhere to certain guidelines. For example, options 4, 5, 8, 11 and 12 cannot be used alone; their application is governed by the following rules:

1. Options 6 and 9 must be placed before Option 8 which means that the aircraft cannot be trimmed until the trim and stability derivative variables have been specified.

2. Option 8 must be placed before Option 4; the aircraft must be trimmed before a time history can be calculated.

3. Option 4 must be placed before Option 5; the time history must be available before it can be plotted.

4. Options 7 and 8 must be placed before Option 12; the aircraft must be trimmed and the formats for printing a data summary must be available before a trim summary can be printed.

5. Option 7 must be placed before Option 11; the formats for printing wind tunnel data must be available before the data can be printed.

Options 1, 2 and 3 can be used alone and can be placed almost anywhere in the sequence of options. The use of Option 10 requires only that a previously calculated and stored time history is available. It does not require a full BDL and frequently constitutes an entire computer run (i.e. a plot run).

4.2.1 Option 1 - Store Lists of Input or Output Parameters

Option 1 causes a list of input or output parameters to be stored on a local file. This Option is convenient when a series of trims or time histories are produced on a single computer run and the same set of parameters are to be input or output for each trim or time history. The format for Option 1 data cards except the first two and the last is that of an input/output specification card which was described in the section:

Card	Format	1 - 5	6 - 80
1	1I5	NØPT	Blank
2	1I5	NTAP	Blank

Card	Format							
All others except last card (Input/ output specification cards)	4I5, 12A4, 2X,F10.6	1 - 5	6 - 10	11- 15	16 - 20	21 - 68	69 - 70	71 - 80
		I	J	K	L	LABEL	Blank	SCALE
.				.				
.				.				
.				.				
Last card	--	1 - 80						
		Blank Card						

where

NØPT is the option number which is equal to 1 in this case.

NTAP is the number of the local file where the input or output list is stored.

The parameters I, J, K, L LABEL, and SCALE were described in Section 4.1. When Option 1 is applied, it must be placed before the trim (Option 8) or time history (Option 4) options.

4.2.2 Option 2 - Read Data Into COMMON Array

Option 2 allows data to be read into the COMMON array under the direction of either a stored (by Option 1) list of input specifications or input specification cards in the input card stream. If a stored list is used then only the parameter value cards need to occur in the input data stream. If a stored list is not used then the parameter value cards are separated by input specification cards in exactly the same way that constants are loaded in the BDL. Option 2 is ordinarily used to initialize aircraft state and control variables; set up pseudo-pilot, control system, or aircraft configuration options; or change aircraft or control system constants before entering a trim, wind tunnel, or time history run. The sequence for Option 2 cards is as follows:

Card	Format		
1	1I5	1 - 5	6 - 80
		NØPT	Blank
2	1I5	1 - 5	6 - 80
		NTAP	Blank

Card	Format							
3(NTAP=5) (An input specification card)	4I5,12A4, 2X,F10.6	1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	69 - 70	71 - 80
		I	J	K	L	LABEL	Blank	SCALE

Card	Format				
3(NTAP≠5)	7E10.3	1 - 10	11 - 20	. . .	71 - 80
		Value of first COMMON parameter specified by first input specification in file NTAP	Value of second...	. . .	Blank

If NTAP = 5, alternately load input specification cards and parameter value cards as required until last card.

If NTAP ≠ 5, load parameter value cards until last card; insure that the parameter value for the first parameter in each input specification on NTAP begins a new card.

Card	Format	
Last card	---	1 - 80
		Blank card

where

NØPT = 2 indicating Option 2

NTAP is the number of the local file where the input specifications are found. NTAP = 5 is the INPUT file. NTAP ≠ 5 specifies the file where Option 1 stored the input specification list. The parameters I, J, K, L, LABEL and SCALE were described in Section 4.1.

4.2.3 Option 3 - Write Data from COMMON Array

Option 3 allows data to be written to OUTPUT from the COMMON array under the direction of either a stored (by Option 1) list of output specifications or output specification cards in the input card stream. If a stored list is used then only the first two cards in the Option 3 load are required. If a stored list is not used, then the Option 3 load must include the appropriate output specification cards. Direct use of Option 3 through the NØPT route is rare in normal applications of VATLAS; instead automatic transfer to Option 3 capabilities is provided in Options 4 and 8 for printing out initial conditions for a time history or trim data at the end of an individual trim case. The sequence for Option 3 cards is as follows:

Card	Format		
1	1I5	1 - 5: NØPT	6 - 80: Blank
2	1I5	1 - 5: NTAP	6 - 80: Blank

If NTAP ≠ 5, the output specifications are found on the NTAP file and no more cards are required.

Card	Format	1 - 5	6 - 10	11 - 15	16 - 20	21 - 68	69 - 70	71 - 80
3 (NTAP=5) (An input/output specification card)	4I5,12A4 2X,F10.6	I	J	K	L	LABEL	Blank	SCALE
. . .				. . .				
Last Card (NTAP=5)	--	1 - 80: Blank Card						

where

NØPT = 3 indicating Option 3

NTAP is the number of the local file where the output specifications are found. NTAP = 5 is the INPUT file. NTAP ≠ 5 specifies the file where Option 1 stored the output specification list.

The parameters I, J, K, L, LABEL, and SCALE were described in Section 4.1 except in this instance SCALE is the constant which scales the COMMON array data specified by I, J, K, L before they are printed.

4.2.4 Option 4 - Time History Calculation

Option 4 controls the calculation of one time history. Multiple time histories during the same computer run require multiple sets of Option 4 input cards. The sequence for one set of Option 4 input cards is as follows:

Card	Format						
1	1I5	1 - 5	6 - 80				
		NØPT	Blank				
2	5I5	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 80
		NTAPE(1)	NTAPE(2)	NTAPE(3)	NTAPE(4)	NTAPE(5)	Blank

If (NTAPE(4) = 5), cards 3 to 7 are

Card	Format	
3	8A10	1 - 80
		FMT1
4	8A10	1 - 80
		FMT2
5	8A10	1 - 80
		FMT3
6	8A10	1 - 80
		FMT4
7	20A4	1 - 80
		TITLE

If (NTAPE(4) ≠ 5), card 3 is

Card	Format	
3	20A4	1 - 80
		TITLE

where

NØPT = 4 indicating Option 4

NTAPE(1) specifies where input specifications are found when Option 4 automatically transfers to Option 2.

NTAPE(2) specifies where output specifications are found when Option 4 automatically transfers to Option 3.

NTAPE(3) specifies the local file where time history calculations are to be stored for plotting

NTAPE(4) specifies where the variable formats (FMT1, FMT2, etc.) are found. If NTAPE(4) = 5, the formats are found in the input card stream. If NTAPE(4) ≠ 5, the formats are found on local file NTAPE(4).

NTAPE(5) specifies where the variable formats are to be stored for future use during multiple time history runs. This parameter eliminates the requirements for cards 3 through 6 in all but the first of several time histories. NTAPE(5) would be nonzero only for the first time history. For subsequent time histories, NTAPE(5) would be zero and NTAPE(4) would be set to the nonzero NTAPE(5) value used in the first time history.

FMT1 is the format used to label the columns of the time history output. This format was the same for all VATLAS applications to date: (7X, 11(2A5))

FMT2 is the format of the data in the columns of the first page of the time history output. This format was also the same for all VATLAS applications to date: (5X, 11F10.3)

FMT3 is the format of the data in the columns of the second and subsequent pages of the time history output. This format was also the same for all VATLAS applications to date and is the same as FMT2: (5X, 11F10.3)

FMT4 is not currently used.

TITLE is the title which will appear at appropriate places in the computer printout.

An automatic transfer to Option 2 occurs after cards 3 or 7 (depending on NTAPE(4)) of the Option 4 load. In this transfer NTAP in Option 2 is set equal to NTAPE(1). This transfer provides for COMMON array changes before the integrators are initialized. The program now expects to see input data equivalent to that beginning at card 3 in the Option 2 load and continuing to the blank last card. If the user does not want to make R array changes he must load a blank card as card 4 or 8 (depending on NTAPE(4)) in the Option 4 card sequence.

The transfer to Option 2 is followed by an automatic call to SETUP to initialize the integrators and then an automatic transfer to Option 3 where NTAP in Option 3 is set equal to NTAPE(2). This transfer provides for printing out any COMMON array parameters before the time history calculations are initiated. The program expects to see input data equivalent to that beginning at card 3 in the Option 3 load and continuing to the blank last card. These data will be found either in the Option 4 input card stream (NTAPE(2) = 5) or in a local file (NTAPE(2) ≠ 5). If the user has not stored an appropriate output specification list and does not want to printout any COMMON array parameters he must load a blank card in the Option 4 card sequence.

Note that the time history output variables which are printed out and stored on local file NTAPE(3) (if NTAPE(3) $\neq$ 0) are those specified in the output parameter specification section of the BDL.

4.2.5 Option 5 - Time History Plotting

Option 5 controls the plotting of a single series of plots from a single time history run; it must be invoked for each series of plots to be generated. The subroutines which support Option 5 have standardized and simplified the interface with CALCOMP routines. (VATLAS will have to be modified if the user's computer facility does not support CALCOMP utilities.) Option 5 can be invoked in a computer run after a local time history data file has been created by an application of Option 4. When the time history data file is stored on one computer run and then plotted during a subsequent computer run, the Option 5 support subroutines are entered from Option 10. A sample data set and series of plots are provided in Example 4 in Section 5.0 to illustrate the generalized Option 5 inputs described below:

Card 1, Format 1I5

1 - 5	6 - 80
NØPT	Blank

Card 2, Format 8A10

1 - 40	41 - 80
TITLE1	TITLE 2

Card 3, Format 2F10.3, 4I10

1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 80
XI	YI	NVAR	NØREAD	IØP	ICL	Blank

.
.
.

Card 3+I, Format 3I3,1X, 2A10, 2F10.2, 4F5.1, 2I5

1 - 3	4 - 6	7 - 9	10	11 - 20	21 - 30	31 - 40
NØ(I)	ISYM(I)	IPT(I)	Blank	HEAD(1,I)	HEAD(2,I)	SV(I)

41 - 50	51 - 55	56 - 60	61 - 65	66 - 70	71 - 75
SDV(I)	B(I)	C(I)	YAØ(I)	X2SHIFT(I)	ITIME(I)

76 - 80
NTITLE(I)

.
.
.

Card	Format	1 - 3	4 - 6	7 - 9	10	11 - 20	21 - 30
3+NVAR	3I3,1X, 2A10, 2F10.2, 4F5.1, 2I5	NØ(NVAR)	ISYM(NVAR)	IPT(NVAR)	Blank	HEAD(1,NVAR)	HEAD(2,NVAR)

31 - 40	41 - 50	51 - 55	56 - 60	61 - 65	66 - 70
SV(NVAR)	SDV(NVAR)	B(NVAR)	C(NVAR)	YAØ(NVAR)	X2SHFT(NVAR)

71 - 75	76 - 80
ITIME(NVAR)	NTITLE(NVAR)

where

NØPT = 5 indicating Option 5

TITLE1 is the first line of the plot title

TITLE2 is the second line of the plot title

XI directs plotter pen to move from its reference to the left hand side of the first plot in the series. (A single "plot" consists of a suitably labeled and scaled ordinate axis and one or two time history traces. The time (or abscissa) axis may or may not be present.) Positive XI (in inches) moves pen to the right.

YI directs plotter pen to move from its reference to the top of the first plot in the series. Positive YI (in inches) moves pen down the page. The reference point for XI and YI (XI = YI = 0) is generally at the upper left corner of the grid.

NVAR is the number of variables (≤30) to be plotted. Time must be included as a variable in this count; for example a plot of elevator deflection versus time requires NVAR = 2.

NØREAD ≠ 0 means that the next NVAR cards in the Option 5 card sequence should be read; i.e. read cards 3+I to 3+NVAR. NØREAD = 0 means that the current series of plots is to be plotted according to the same instructions as the previous series and cards 3+I to 3+NVAR are eliminated from the Option 5 card sequence.

IØP = 1 for first series of plots, = 0 for all other plot series.

ICL = 1 for last series of plots, = 0 for all other plot series.

NØ(I) is the number of the variable to be plotted as determined from its position in the output specification list of the BDL. The first variable in the NØ(I) array must be time.

ISYM(I) is the number of the CALCOMP symbol to be placed every IPT(I) data point along the time history trace. The fourteen symbols available and their identification numbers are given in Table 4.1. If a symbol is not desired, then ISYM(I) = -1.

IPT(I) is the spacing in terms of data points between the symbols on the time history trace. If ISYM(I) = -1, IPT(I) is ignored.

HEAD(1,I) and HEAD(2,I) define the labeling for the plot axis.

SV(I) is the value of the plotted variable at the lower end of its axis.

SDV(I) is the scale factor of the plotted variable in units/inch If SV(I) and SDV(I) are left blank, their values are determined by the CALCOMP automatic scaling option.

B(I) is the length of the axis to be drawn for variable NØ(I) in inches.

C(I) is the distance in inches down the page between the lower left hand corner of the axis of the plot of variable NØ(I) to the upper left hand corner of the axis of the plot for variable NØ(I+1). C(I) is positive down the page.

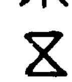
YAØ(I) is the distance in inches across the page between XI and the ordinate axis of variable NØ(I). YAØ is positive to the right.

X2SHFT(I) is the distance in inches across the page between the first point of variable NØ(I) (i.e. the value of NØ(I) at initial time) and the first point of variable NØ(I+1). X2SHFT(I) is positive to the right.

ITIME(I) specifies whether the time axis is to be plotted on the plot for variable NØ(I). If ITIME(I) = 1, the time axis is plotted, = 0, the time axis is not plotted.

NTITLE(I) specifies whether TITLE1 and TITLE2 are to be printed at the bottom of the plot for variable NØ(I).

Table 4-1 - Symbols Available for VATLAS Time History Plots

ISYM(I)	SYMBOL	ISYM(I)	SYMBOL
0		7	
1		8	
2		9	
3		10	
4		11	
5		12	
6		13	

Two variables can be plotted on the same axis system. This is automatically assumed by the program when the vertical scales for two successive variables are placed at exactly the same place (i.e. C(I) = C(I+1) and YAØ(I) = YAØ(I+1)). The second variable, the (I+1)th, will be plotted as a dashed line.

4.2.6 <u>Option 6 - Set Up Trim Unknowns</u>

Option 6 is applied to specify the fifteen independent variables which are to be perturbed to find a trim solution for the fifteen error equations in subroutine ERROR. Several standard sets of trim variables are specified by trim type in Table 4-2. These sets span a wide range of potential VATLAS applications. They do not begin, however, to exhaust all the variable sets which could be developed to trim the aircraft. Applications of two of the standard sets are demonstrated in Examples 1 (Transition Trim Variables) and 2 (Trim in a Wind Variables) in Section 5.0. The input card sequence for Option 6 is as follows:

Card	Format	Card layout (columns: contents)
1	1I5	1 - 5: NØPT; 6 - 80: Blank
2	1I5	1 - 5: NEQU; 6 - 80: Blank
3	4I5,12A4	1 - 5: I; 6 - 10: J; 11 - 15: K; 16 - 20: L; 21 - 68: LABEL; 69 - 80: Blank
4	7E10.3	1 - 10: DZ(1); 11 - 20: DZ(2); . . . ; 71 - 80: Blank
4+NCARD	7E10.3	1 - 10: DZ(8); . . . DZ(NLØC); 71 - 80: Blank
4+NCARD +1	4I5, 12A4	1 - 5: I; 6 - 10: J; 11 - 15: K; 16 - 20: L; 21 - 68: LABEL; 69 - 80: Blank
4+NCARD +2	7E10.3	1 - 10: DZ(NLØC+1); 11 - 20: DZ(NLØC+2); . . . ; 71 - 80: Blank
. . .		. . .
Last Card	--	1 - 80: Blank Card

Table 4-2 Standard Trim Variable Sets for VATLAS Applications

A. Transition Trim Variables

Variable Name	COMMON Location Segment	COMMON Location Element
ALPH	29	13
BETA	29	14
P	3	4
Q	3	5
R	3	6
DRØLL	28	20
DYAW	28	29
DPITCH	28	38
XEDØT	2	16
YEDØT	2	17
NXCG	29	54
NYCG	29	55
NZCG	29	56
THETA	3	64
TCMD	28	58

These variables will trim the aircraft to a user-specified airspeed (VA) and inertial heave rate (ZEDOT) and generate a standard longitudinal trim condition.

B. Trim in a Turn Variables

Variable Name	COMMON Location Segment	COMMON Location Element
ALPH	29	13
BETA	29	14
P	3	4
Q	3	5
R	3	6
DRØLL	28	20
DYAW	28	29
DPITCH	28	38
XEDØT	2	16
YEDØT	2	17
NXCG	29	54
NZCG	29	56
THETA	3	64
PHI	3	65
TCMD	28	58

Note that with the exception of PHI replacing NYCG these variables are the same as the transition trim variables. To trim in a turn the user must specify, as a minimum, airspeed (VA) and turn radius (TURNRAD) and set TRMTURN $\neq$ 0. By additionally specifying lateral acceleration (NYCG), the aircraft will be trimmed in a non-coordinated turn; rate of change of airspeed (VADØT), the aircraft will be trimmed in a turn while decelerating or accelerating and/or flight path angle (GAMMA), the aircraft will be trimmed in a climbing or diving turn.

C. Trim in a Wind Variables

Variable Name	COMMON Location Segment	COMMON Location Element
U	3	1
V	3	2
W	3	3
P	3	4
Q	3	5
R	3	6
DRØLL	28	20
DYAW	28	29
DPITCH	28	38
PSI	3	66
THETA	3	64
NXCG	29	54
NYCG	29	55
NZCG	29	56
TCMD	28	58

These variables will trim the aircraft in a hover in an ambient wind from any direction. The user must specify wind direction (PSIWIND) and speed (VWIND) and set AWIND $\neq$ 0. A head wind is PSIWIND $= \pi$ rad = 180 deg.

where

NØPT = 6 indicating Option 6

NEQU = 15 - number of error equations in subroutine ERRØR

I, J, K, L specifies that all the COMMON variables from Segment I Element J to Segment K Element L are to be trim variables.

LABEL allows the user to identify these variables for printout. LABEL is not stored in the computer and is lost when the next LABEL specification is loaded.

DZ(I) specifies the perturbation to be applied to trim variable I when trim matrix sensitvities to trim variables are calculated. The trim variables are numbered 1 to 15 in the order they are loaded; for example, trim variable 1 is the variable which is specified by card 3 to be Element J in Segment I.

NLØC is the number of COMMON locations from Segment I, Element J to Segment K, Element K

$$\text{NCARD} = \frac{\text{NLØC}}{7}$$ rounded to next larger whole number.

4.2.7 Option 7 - Load Variable Formats

The formats for printing the wind tunnel option (Option 11) outputs and the trim summary (Option 12) are loaded by Option 7. These sets of formats have been standardized for VATLAS applications and are given in Examples 1 (trim summary formats) and 3 (wind tunnel option formats) in Section 5.0. The input card sequence for Option 7 is as follows:

Card	Format				
1	1I5	1 - 5	6 - 80		
		NØPT	Blank		
2	8A10	1 - 10	11 - 20	. . .	71 - 80
		FMTS(1,1)	FMTS(1,2)	. . .	FMTS(1,8)
.			.		
.			.		
.			.		
13	8A10	1 - 10	11 - 20	. . .	71 - 80
		FMTS(12,1)	FMTS(12,2)	. . .	FMTS(12,8)

where

NØPT = 7 indicating Option 7

FMTS(I,1), FMTS(I,2),...FMTS(I,8) specifies Ith variable format

There must be 13 cards in the Option 7 load. If less than twelve formats are required, load blank cards to maintain the total equal to 13.

4.2.8 Option 8 - Trim Calculation

Option 8 controls the calculation of trims. The sequence for Option 8 input cards is as follows:

Card	Format								
1	1I5	1 - 5	6 - 80						
		NØPT	Blank						
2	8I5	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	
		NTAPE(1)	NTAPE(2)	NTAPE(3)	NTAPE(4)	NCASES	NTAPD	IPUNCH	
		36 - 40	41 - 80						
		IWRITE	Blank						
3	20A4	1 - 80							
		TITLE							

where

NØPT = 8 indicating Option 8

NTAPE(1) specifies where input specifications are found when Option 8 automatically transfers to Option 2.

NTAPE(2) specifies where output specifications are found when Option 8 automatically transfers to Option 3.

NTAPE(3) specifies where the data for the trim summary option (Option 12) are to be stored.

NTAPE(4) is not used.

NCASES is the number of trims to be calculated.

NTAPD specified where the variables for stability derivative calculations are stored by Option 9.

IPUNCH ≠ 0 causes stability derivatives and initial conditions to be punched out for offline linear analyses. IPUNCH = 0 suppresses punched output. The list of data output by this directive are detailed in Table 4-3. This list was developed specifically for the SF-121 airplane application. The list is contained in DERIVS and can be easily altered by UPDATE directives.

IWRITE ≠ 0 causes intermediate trim calculations to be printed out as an aid to debugging the program. IWRITE = 0 suppresses the intermediate trim calculations.

TITLE is the title which will appear at appropriate places in the computer printout.

An automatic transfer to Option 2 occurs after the program has read card 3 of the Option 8 load. In this transfer NTAP in Option 2 is set equal to NTAPE(1). This transfer provides for COMMON array changes prior to trimming. The program now expects to see input data equivalent to that beginning at card 3 in the Option 2 load and continuing to the blank last card. If the user does not want to make COMMON array changes he must load a blank card as card 4 in the Option 8 card sequence.

Option 8 next transfers control to the trim routines. When a trim has been found an automatic transfer to Option 3 occurs. In this transfer NTAP in Option 3 is set equal to NTAPE(2). This transfer provides for printing out the trim results. The program expects to see input data equivalent to that beginning at card 3 in the Option 3 load and continuing to the blank last card. These Option 3 data will be found either in the Option 8 input card stream (NTAPE(2) = 5) or in a local file (NTAPE(2) ≠ 5). If the user has not stored an appropriate output specification list and does not want to print out any COMMON array parameters he must load a blank card in the Option 8 card sequence.

Also at the end of each trim, the program automatically loads NTAPE(3) (if it is ≠ 0) with the values of those parameters specified in the list of output parameters in the BDL. If NTAPE(3) = 0, this procedure is bypassed since the user does not intend to print a trim data summary later in the computer run using Option 12.

The automatic transfer to Option 2 occurs before each trim case specified by the NCASES parameter. Similarly the transfer to Option 3 and loading NTAPE(3) occurs after each trim has been determined.

4.2.9 Option 9 - Set Up Stability Derivative Variables

Option 9 specifies the variables to be perturbed to generate stability derivatives. Since subroutine DERIVS, which controls stability derivative calculations, is fairly general and is based on a specific set of variables,

Table 4-3 List of Punched Output Data from Option 8 (Trim Calculation)

CARD \ COLUMN	1-10	11-20	21-30	31-40	41-50	51-60	61-70
1	UAS	WAS	Q	THETA	THETD	ALPH	VA
2	IX	IY	IZ	IXZ	WT	JENG	—
3	X/U	X/W	X/Q	X/DE	X/DFW	X/DFC	X/THT1
4	X/THT2	X/T1	X/T2	—	—	—	—
5	Z/U	Z/W	Z/Q	Z/DE	Z/DFW	Z/DFC	Z/THT1
6	Z/THT2	Z/T1	Z/T2	—	—	—	—
7	M/U	M/W	M/Q	M/DE	M/DFW	M/DFC	M/THT1
8	M/THT2	M/T1	M/T2	—	—	—	—
9	Y/V	Y/P	Y/R	Y/DA	Y/DR	Y/PSIT1	Y/PSIT2
10	Y/T1	Y/T2	Y/DRCSR	—	—	—	—
11	L/V	L/P	L/R	L/DA	L/DR	L/PSIT1	L/PSIT2
12	L/T1	L/T2	L/DRCSR	—	—	—	—
13	N/V	N/P	N/R	N/DA	N/DR	N/PSIT1	N/PSIT2
14	N/T1	N/T2	N/DRCSR	—	—	—	—

where:

UAS,WAS = trim airspeed components along X and Z body axes (ft/sec)
Q,THETD = trim pitch rate (rad/sec)
THETA = trim pitch angle (rad)
ALPH = trim pitch angle of attack (rad)
VA = trim airspeed (ft/sec)
IX,IY,IZ,IXZ = aircraft moments of inertia (slug ft^2)
WT = aircraft weight (lb)
JENG = engine rotational moment of inertia (slug ft^2)
I/J = change in I acceleration per unit change in J variable where:
I = X,Y,Z,L,M, or N and J = U,W,Q,DE,DFW,DFC,THT1,THT2,T1,T2,V,P,R,DA, DR, PSIT1,PSIT2. or DRCSR
X,Y,Z = translational accelerations along the X, Y, and Z body axes (ft/sec^2)
L,M,N = angular accelerations about the X,Y, and Z body axes (rad/sec^2)
U,V,W = airspeed components along X,Y, and Z body axes (ft/sec)
P,Q,R = angular rates about X,Y, and Z body axes (rad/sec)
DE = aerodynamic pitch control deflection (rad)
DFW = wing leading edge flap deflection (rad)
DFC = canard or horizontal stabilizer trailing edge flap deflection (rad)
THT1,THT2 = pitch thrust deflection of left and right engines (rad)
T1,T2 = thrust of left and right engines (lb)
DA = aerodynamic roll control deflection (rad)
DR = aerodynamic yaw control deflection (rad)
PSIT1,PSIT2 = yaw thrust deflection of left and right engines (rad)
DRCSR = roll RCS normalized deflection

there should be no reason to ever change that set for any VATLAS applications. Option 9 could be considered, therefore as a part of the BDL. The VATLAS Option 9 data cards are given in the examples of Section 5.0 and are formatted as described below:

Card	Format	Columns / Contents			
1	1I5	1 - 5	6 - 80		
		NØPT	Blank		
2	1I5	1 - 5	6 - 80		
		NTAPD	Blank		
3	3I5	1 - 5	6 - 10	11 - 15	16 - 80
		I	J	NRD = 1	Blank
.			.		
.			.		
.			.		
3+NVAR	3I5	1 - 5	6 - 10	11 - 15	16 - 80
		I	J	NRD=NVAR	Blank
3+NVAR +1	--	1 - 80			
		Blank Card			

where

NØPT = 9 indicating Option 9

NTAPD is the local file where the variable list is to be stored

I is the segment number of the NRDth variable

J is the element number of the NRDth variable

NRD is the variable number within the list of variables. Normally the variables are loaded in order with NRD beginning at 1.

NVAR is the number of variables to be perturbed to generate stability derivatives. NVAR = 22 for VATLAS.

4.2.10 Option 10 - Plot a Previously Stored Time History

Option 10 controls the plotting of variables from a time history generated and stored during a previous computer run. Its input differs for that of Option 5 only in its first two cards:

Card	Format		
1	1I5	1 - 5	6 - 80
		NØPT	Blank

Card	Format				
2	3I5	1 - 5	6 - 10	11 - 15	16 - 80
		NPTS	NØUT	NTAP	Blank

where

NØPT = 10 indicating Option 10

NPTS is the number of time samples in the time history ($\leq$ 302)

NØUT is the number of output variables recorded at each time sample ($\leq$ 120)

NTAP is the local file containing the time history data.

Starting with card 3, Option 10 input is identical to the Option 5 input which begins at card 2. In fact Option 10 transfers to Option 5 as soon as the above two cards are read.

Note that if the only purpose of a computer run is to plot a previously stored time history using Option 10, the output parameter list and the loading of program constants portions of the BDL can be deleted and replaced by two blank cards following that portion of the BDL which defines COMMON segments.

4.2.11 Option 11 - Wind Tunnel Calculations

Option 11 controls the application of the VATLAS aerodynamic model to calculate nondimensional coefficients in stability axes. Before Option 11 can be invoked, the variable formats required to print the wind tunnel calculations must be loaded by Option 7. The standard formats adopted for VATLAS application are given in Example 3 of Section 5.0. The input card sequence for Option 11 is as follows:

Card	Format		
1	1I5	1 - 5	6 - 80
		NØPT	Blank

Card	Format				
2	3I5	1 - 5	6 - 10	11 - 15	16 - 80
		IPITCH	IYAW	NTAP2	Blank

Card	Format								
3	7E10.3	1 - 10	11-20	21-30	31-40	41-50	51-60	61-70	71-80
		AØAØ	DAØA	AØAMAX	PSIØ	DPSI	PSIMAX	VWIND	Blank

where

NØPT = 11 indicating Option 11

IPITCH ≠ 0 indicates that an angle of attack sweep is to be simulated. IPITCH = 0 indicates angle of attack is to remain constant for the run.

IYAW ≠ 0 indicates that a yaw sweep is to be simulated. IYAW = 0 indicates yaw (sideslip) angle is to remain constant for the run.

NTAP2 is the local file for storing the calculations for later printing.

AØAØ is the initial angle of attack in degrees for an angle of attack sweep run.

DAØA is the angle of attack increment in degrees for the angle of attack sweep.

AØAMAX is the maximum angle of attack in degrees for an angle of attack sweep run.

PSIØ is the initial yaw angle in degrees for a yaw sweep run.

DPSI is the yaw angle increment in degrees for the yaw sweep.

PSIMAX is the maximum yaw angle in degrees for a yaw sweep run.

VWIND is the wind speed in ft/sec. Since the aerodynamics are incompressible and the coefficients are nondimensional VWIND can be set at any nonzero value.

Note that on one application of Option 11, either a yaw sweep or an angle of attack sweep, not both, can be run.

4.2.12 Option 12 - Trim Data Summary

Option 12 controls the printing of appropriate data from a series of trim conditions. The data to be included are designated by the list of output parameters in the BDL and are found on the local file specified as NTAPE(3) in the Option 8 input data. The formats for printing the data on each page (a maximum of 12 pages is allowed) of the data summary are loaded by Option 7. The format for the headings on each page is specified in the Option 12 input. The two cards required to initiate Option 12 are as follows:

Card	Format	1 - 5	6 - 80
1	1I5	NØPT	Blank

Card	Format	
2	8A10	1 - 80 FMT1

where

NOPT = 12 indicating Option 12

FMT1 is the format for printing the page headings for the trim data summary. For VATLAS applications to date FMT1 has been set at (7X, 11(2A5)).

5.0 EXAMPLES OF VATLAS APPLICATIONS

This section presents four examples which demonstrate the application of most of the VATLAS options. Discussions of the examples emphasize the input card deck arrangement and the format of the subsequent printed output and plots. Discussion of the example outputs as they relate to the SF-121 baseline flight control system development is provided in Volume I. The four examples and the Options they apply are as follows:

- Example 1 - Transition Trim Run (Basic Data Load plus Options 1, 2, 6, 7, 8, 9, and 12)
- Example 2 - Stationkeeping Time History Run (Basic Data Load plus Options 1, 2, 4, 6, 8, and 9)
- Example 3 - Wind Tunnel Data Run (Basic Data Load plus Options 2, 7, and 11)
- Example 4 - Stationkeeping Plot Run (Options 5 - called implicitly by Option 10 - and 10)

An annotated listing of the Basic Data Load cards for the application of VATLAS to the SF-121 airplane is provided in Appendix C. Only the cards which follow the Basic Data Load in the example input decks will be presented in the example discussions.

5.1 Example 1 - Transition Trim Run

The transition trim run demonstrates the application of VATLAS to calculate a series of trim points along a wings level, constant altitude transition of the SF-121 airplane. The trims are at four airspeeds - 200 kt, 180 kt, 160 kt, and 140 kt - in that order. An annotated listing of the input deck is shown in Figure 5-1. Observe that Options 6 and 9 must precede Option 9 and that Options 7 and 8 must precede Option 12 in the input sequence. Also note the use of the SCALE parameter in the cards for Options 1 and 2 to load or print the data in units different from those used in the program. Finally note the placement of Option 2 before Option 8 to establish starting values for the trim at 200 kt. If these values are too far from the actual trim, a trim may not be obtained and the program will abort. In a multiple trim run the starting point for all cases after the first is the immediately preceding trim point. Therefore large steps between two adjacent trim cases should be avoided. For example, the program would likely abort if it is required to step from the 200 kt trim to a 60 kt trim. The user will have to experiment to find starting values and trim increments which are appropriate for his application.

A copy of the output of Example 1 is provided in Appendix D. Items of interest include the playback of the input data for the Basic Data Load and each Option, the stability derivative listing by components, and the trim summary table.

LISTING OF EXAMPLE 1 INPUT DATA DECK WITHOUT BASIC DATA LOAD

```
  1 OPTION 1-LOAD A LIST OF OUTPUT VARIABLES FOR PRINTING TRIM RESULTS
  2                 NTAP-ST ORE AN  OUTPUT LIST ON FILE TAPE2
  4   1   4   1 WEIGHT-POUNDS
  4   1   4   1 WEIGHT-NEWTONS                                      4.448
  4   2   4   5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2
  4   2   4   5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-KG-M**2             1.355
 14  18  14  18 JENG(ENGINE INERTIA)-SLUG-FT**2
 14  18  14  18 JENG(ENGINE INERTIA)-KG-M**2                        1.355
 29  45  29  45 ALTITUDE-FT
 29  45  29  45 ALTITUDE-METERS                                     .3049
 29  18  29  18 TRUE AIRSPEED-KNOTS
 29   9  29   9 TRUE AIRSPEED-FT/SEC
 29   9  29   9 TRUE AIRSPEED-M/SEC                                 .3048
 29  12  29  12 QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2
 29  11  29  11 MACH NUMBER
 29  12  29  12 QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2                  47.88
 29   4  29   4 RHO(AIR DENSITY)-SLUGS/FT**3
 29   4  29   4 RHO(AIR DENSITY)-KG/M**3                            515.38
 29  57  29  59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)KT        .5902
 29  57  29  59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)FT/S
 29  57  29  59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)M/S       .3008
  2  16   2  18  XEDOT,YEDOT,ZEDOT(FT/S)
  2  16   2  18  XEDOT,YEDOT,ZEDOT(M/S)                             .3049
 41   4  41   6  XE2D,YE2D,ZE2D-FT/SEC**2
 41   4  41   6  XE2D,YE2D,ZE2D-G                                   .031056
 41   4  41   6  XE2D,YE2D,ZE2D-M/SEC**2                            .3048
  2   1   2   3 UDOT,VDOT,WDOT-FT/SEC**2
  2   1   2   3 UDOT,VDOT,WDOT-G                                    .031056
  2   1   2   3 UDOT,VDOT,WDOT-M/SEC**2                             .3049
  3   1   3   3 U,V,W (INER. SPEED COMPONENTS)FT/SEC
  3   1   3   3 U,V,W (INER. SPEED COMPONENTS)M/SEC                 .3048
 29   1  29   3 UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC
 29   1  29   3 UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC               .3048
 29  54  29  56 NXCG,NYCG,NZCG(BODY AXIS ACCEL.)-GEES
  3   4   3   6 P,Q,R(BODY AXIS RATES)-DEG/SEC                      57.29578
  3  64   3  66 THETA,PHI,PSI(EULER ANGLES)-DEG                     57.29578
 29  13  29  14 ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG       57.29578
  2  18   2  18 ZD(RATE OF SINK)-FT/MIN                             60.000
  2  18   2  18 ZD(RATE OF SINK)-FT/SEC
  2  18   2  18 ZD(RATE OF SINK)-M/SEC                              .3049
 28  20  28  20  NORM. ROLL CONTROL
 28  29  28  29  NORM. YAW CONTROL
 28  38  28  38  NORM. PITCH CONTROL
  3  26   3  27 THT1,THT2(THRUST DEFLECTION PITCH ANGLES)-DEG       57.29578
  3  24   3  25 PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG     57.29578
  3  19   3  19 LEFT ELEVON DEFLECTION-DEG                          57.29578
  3  20   3  20 RIGHT ELEVON DEFLECTION-DEG                         57.29578
 28  50  28  50 ELEVATOR COMMAND DEFLECTION-DEG                     57.29578
 28  51  28  51 AILERON COMMAND DEFLECTION-DEG                      57.29578
  3  28   3  29 DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)
 28  58  28  58 TCMD(THRUST COMMAND)-POUNDS
 28  58  28  58 TCMD(THRUST COMMAND)-NEWTONS                        4.448
 23   9  23  18 TCOR1,TCOR2(THRUST APPL. TO A/C)-POUNDS
```

NOTE USE OF SCALE PARAMETER TO CONTROL OUTPUT DATA UNITS

Figure 5-1. Listing of Example 1 Input Data Deck Without Basic Data Load (Sheet 1 of 5)

```
23    9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS            4.449
 3   21    3   21 RUDDER DEFLECTION-DEG                                57.29578
26   20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS
26   20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS           4.449
26    1   26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC
26    1   26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC          .454
15    3   15    3 BLOREF(REFERENCE RCS BLEED)-PER CENT
26    7   26    7  BLDAVL
27   72   27   72 BLO(ACTUAL RCS BLEED)-PER CENT
 3   38    3   39 FRCS1,FRCS2(RCS JET FORCES)-POUNDS
 3   38    3   39 FRCS1,FRCS2(RCS JET FORCES)-NEWTONS                  4.448
11    7   11    7 SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG           57.29578
19   44   19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-FT-LB
19   44   19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M       1.355
19   37   19   38 XW1,XW2(WING X FORCE)-POUNDS
19   37   19   38 XW1,XW2(WING X FORCE)-NEWTONS                        4.448
19   39   19   40 ZW1,ZW2(WING Z FORCE)-POUNDS
19   39   19   40 ZW1,ZW2(WING Z FORCE)-NEWTONS                        4.448
19   19   19   20 CLW1,CLW2(WING LIFT COEFFICIENT)
 3   48    3   48  DFLAPH(CANARD TE FLAP DEFLECTION)-DEG               57.29578
 3   49    3   49  DFLAPW(WING LE FLAP DEFLECTION)-DEG                 57.29578
19    1   19    3 DXW,DYW,DZW(WING AERO FORCES)-POUNDS
19    1   19    3 DXW,DYW,DZW(WING AERO FORCES)-NEWTONS                4.408
19    4   19    6 DLW,DMW,DNW(WING AERO MOMENTS)-FT-POUNDS
19    4   19    6 DLW,DMW,DNW(WING AERO MOMENTS)-NEWTON-M              1.355
20    1   20    3 DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS
20    1   20    3 DXH,DYH,DZH(CANARD AERO FORCES)-NEWTONS              4.448
20    4   20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-FT-POUNDS
20    4   20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-NEWTON-M            1.355
21    1   21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS          4.448
21    1   21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS
21    4   21    6  DLV,DMV,DNV(VERT TAIL AERO MOMENTS)-FT POUNDS
21    4   21    6 DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-NEWTON-M        1.355
22    1   22    3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS
22    1   22    3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS            4.448
22    4   22    6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS
22    4   22    6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M          1.355
29   20   29   22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS
29   20   29   22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS         4.448
29   23   29   25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS
29   23   29   25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M       1.355
23    1   23    3 DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS
23    1   23    3 DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS            4.448
23    4   23    6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-FT-POUNDS
23    4   23    6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-NEWTON-M          1.355
26   23   26   24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC
26   23   26   24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC         1.355
24    1   24    3 DXR,DYR,DZR(RAM FORCES)-POUNDS
24    1   24    3 DXR,DYR,DZR(RAM FORCES)-NEWTONS                      4.448
24    4   24    6 DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS
24    4   24    6 DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M                    1.355
26    3   26    4 RPM1,RPM2(ENGINE ROT. SPEED)-RPM
27    1   27    3 DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS
27    1   27    3 DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS                4.448
27    4   27    6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-FT-POUNDS
27    4   27    6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-NEWTON-M              1.355
25    1   25    3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS
```

Figure 5-1. Listing of Example 1 Input Data Deck Without Basic Data Load (Sheet 2 of 5)

```
 25   1  25   3 DXCOR,DYCOR,DZCOR(CORIOLIS FOFCES)-NEWTONS        4.449
 25   4  25   6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS
 25   4  25   6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M       1.355
 29  26  29  28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS
 29  26  29  28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS           4.448
 29  29  29  31 SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS
 29  29  29  31 SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M            1.355
 29  51  29  53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS
 29  51  29  53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M    1.355
                          BLANK CARD - END OF OPTION 1 LOAD
  9  OPTION 9 LOAD DERIVATIVE QUANTITIES
  9 STORE ON TAPE 9
 29   1   1               UAS
 29   3   2               WAS
  3   5   3               Q
 28  50   4               DEC
  3  49   5               DFLAPW
  3  48   6               DFLAPH
 28  54   7               DRCSP
 28  57   8               DRCSNF
 26  34   9               TO(1)
 26  35  10               TO(2)
  3  26  11               THT(1)
  3  27  12               THT(2)
 29   2  13               VAS
  3   4  14               P
  3   6  15               R
  3  21  16               DR
 28  52  17               DAC
 28  53  18               DRCSR
  8  55  19                DRCSY
 28  56  20               DRCSSF
  3  24  21               PSIT(1)
  3  25  22               PSIT(2)
                          BLANK CARD - END OF OPTION 9 LOAD
  6 OPTION 6-SET UP TRANSITION TRIM VARIABLES
 15                 NECU-NUMBER OF TRIM UNKNOWNS
 29  13  29  14 ALPHA,BETA
.01745     .01745
  3   4   3   6 P,Q,R
.1       .1       .1
 28  20  28  20 DROLL
.05
 28  29  28  29 DYAW
.05
 28  38  28  38 DPITCH
.05
  2  16   2  17 XEDOT,YEDOT
2.      2.
 29  54  29  54 NXCG
.1
 29  55  29  55 NYCG
.1
 29  56  29  56 NZCG
.1
  3  64   3  64 THETA
.01745
```

DERIVATIVES ARE TAKEN WITH RESPECT TO THESE VARIABLES

Figure 5-1. Listing of Example 1 Input Data Deck Without Basic Data Load (Sheet 3 of 5)

```
  20   58   20   58  TCMD
10.
                         BLANK CARD - END OF OPTION 6 LOAD
   2 OPTION 2-LOAD INITIAL CONDITIONS AND RUN CONTROL VARIABLES
   5                  NTAP - FIND OPTION 2 DATA ON FILE TAPES-INPUT
  41    4   41    5  XE2D,YE2D                                  32.2
0.      0.
  41    6   41    6  ZE2D                                       32.2
0.
   2   16    2   17  XEDOT,YEDOT
330.    0.
   2   18    2   18  ZEDOT
0.
   3   18    3   18  ZE
-100.
   2   65    2   66  PHID,PSID
0.      0.
   3   65    3   66PHI,PSI                                      .01745
0.      0.
   3   64    3   64  THETA                                      .01745
9.5
  28   28   28   28  DRCLL
0.
  28   29   28   29  DYAW
0.
  28   30   28   30  DPITCH
0.
  29   54   29   56  NXCG,NYCG,NZCG
0.      0.        1.
  28   58   28   58  TCMD
4000.
  29    9   29    9  VA                                         1.689
200.
  29   13   29   13  ALPH                                       .01745
9.5
   1    3    1    7  DT,TMAX,DTPRINT,DTPLOT,TI
.025    0.       .05      .05
  41    1   41    1  AWIND
0.
  41    2   41    2  VWIND                                      1.689
0.
  41    7   41    7  TRMTURN
0.
  41   10   41   10  TURNRAD
2640.
  41    8   41    9  GAMMA,VADOT
       -3.22
  43    7   43    7  ASKEEP
0.
  16    7   16   12  AKU,AKV,AKW,AKXES,AKYES,AKZES
        5.        5.        2.        .005       -.005
  43  129   43  129  ATRANS
0.
  43    6   43    6  ATIME
0.
  43  132   43  139  THROTT(10)
.546    .553      .53       .443      .173       .0033      .067
```

THESE DATA PROVIDE STARTING VALUES FOR THE TRIM SOLUTION

THE REMAINDER OF THE DATA IN THIS CALL TO OPTION 2 CONTROL THE TYPE OF RUN AND SPECIFY CONTROL INPUTS

Figure 5-1. Listing of Example 1 Input Data Deck Without Basic Data Load (Sheet 4 of 5)

```
.067
   43  142   43  149  VAT(10)                                                   1.689
0.         20.        40.        60.        80.        100.       120.
200.
   43  152   43  159  THETGT(10)                                                .01745
102.       96.5       85.5       66.89      36.65      22.72      16.3
8.24
   43    1   43    5  ACMD(I)
1.         2.
   43    9   43   16 CMDT1(I)-DLNGSTK INPUT TABLE                                   .01745
0.         0.         10.        10.        0.         0.         0.
0.
   43   29   43   36 CMDT2(I)-DLATSTK INPUT TABLE                                   .01745
0.         0.         10.        10.        0.         0.         0.
0.
   43   49   43   56 CMDT3(I)-DPED INPUT TABLE                                      .01745
0.         0.         20.        20.        20.        20.        20.
20.
   43   69   43   76 CMDT4(I)-ZEDTC INPUT TABLE
0.         0.         -10.       -10.       10.        10.        0.
0.
   43   89   43   96 CMDT5(I)-THROTTLE INPUT TABLE
0.         0.         0.         0.         0.         0.         0.
0.
   43  109   43  116 TIMET(I)-INPUT CONTROL TIME TABLE
           .3         .31        1.         1.01       1.7        1.71
40.
                                 BLANK CARD - END OF OPTION 2 LOAD
   1 OPTION 1-LOAD PRIMARY TRIM PARAMETERS
   1                 NTAP-STORE OPTION DATA LIST ON FILE TAPE1
   29     9   29     9  VA   AIRSPEED (IN KT) IS THE PRIMARY TRIM PARAMETER 1.688
                                 BLANK CARD - END OF OPTION 1 LOAD
   8   TRIM OPTION               TRIM SUMMARY DATA STORED ON TAPE 8
                                 NCASES
   (1)  (2)  (8)        (4)   (9)   DERIVATIVE VARIABLES       CONVERTS INPUT
   EXAMPLE 1 - TRANSITION TRIM RUN   ON TAPE 9                FROM KT TO FT/SEC
200.             TRIM OUTPUT DATA SPECIFICATIONS ON TAPE 2
180.        VA INPUT SPECIFICATION ON TAPE 1
160.   NCASES=4, THEREFORE 4 TRIM AIRSPEEDS SPECIFIED
140.
   7   OPTION 7-LOAD FORMATS FOR PRINTING TRIM SUMMARY
(4X,F8.0,2X,10F10.2)
(4X,F8.0,2X,10F10.2)
(4X,F8.0,2X,10F10.2)
(4X,F8.0,2X,10F10.2)
(4X,F8.0,2X,10F10.2)
(4X,F8.0,2X,2F10.2,8E10.3)
(4X,F8.0,2X,10E10.3)
(4X,F8.0,2X,10E10.3)
(4X,F8.0,2X,10E10.3)
(4X,F8.0,2X,10E10.3)
(4X,F8.0,2X,10E10.3)
(4X,F8.0,2X,10E10.3)
   12  OPTION 12-TRIM DATA SUMMARY PRINTOUT
(7X,11(2A5))
```


Figure 5-1. Listing of Example 1 Input Data Deck Without Basic Data Load (Sheet 5 of 5)

5.2 Example 2 - Stationkeeping Time History Run

The stationkeeping time history run demonstrates the application of VATLAS to calculate the time history of a pseudo-pilot-controlled turn over a spot while hovering in a 35 kt wind. An annotated listing of the input deck is shown in Figure 5-2. The following items should be observed:

1. Options 6 and 9 must precede Option 8 in the input data deck and all three Options must precede Option 4.

2. The run uses pseudo-pilot-controlled stationkeeping logic thus the parameters AKU, AKV, AKW, AKXES, AKYES, and AKZES (Segment 16, elements 7-12) and ASKEEP (Segment 43, element 7) must be specified in the input deck before Option 4. Note that several of these parameters were specified in the Example 1 input deck (Figure 5-1); they were ignored, however, since the example did not include a time history.

3. An open-loop psuedo-pilot input to the pedal is used to rotate the airplane, thus the parameter ACMD(1) (Segment 43, element 1) and the entries in tables CMDT3 and TIMET (also in Segment 43) must also be specified before Option 4. Note that these parameters also had values but were ignored in Example 1 (Figure 5-1).

4. Example 2 requires a trim in a wind, thus the appropriate set of trim variables (Table 4-2) are introduced by Option 6. Furthermore, the parameters AWIND, VWIND, and PSIWIND (Segment 41, elements 1-3) must be specified before or with Option 8.

5. Since Example 2 is a time history, appropriate values for the integration control parameters in COMMON Segment 1 must be specified before invoking Option 4. These parameters had values in Example 1 (Figure 5-1) but were not required and thus ignored.

A copy of output of Example 2 is provided in Appendix E. The information is similar to that of Example 1 with the notable addition of the time history printout. The time history data were stored during the Example 2 run on local file TAPE4. This file was CATALOGed as a permanent file by the control cards for the run. The file was ATTACHed in Example 4 to demonstrate the use of the VATLAS plotting capability.

5.3 Example 3 - Wind Tunnel Data Run

The wind tunnel data run demonstrates the application of VATLAS to calculate six degrees of freedom stability axis wind tunnel data for the SF-121 airplane. Example 3 directs the execution of four wind tunnel runs: two on each of two different airplane configurations. For each configuration an angle of attack sweep from 0 to 90 deg in 5 deg increments at zero yaw angle and a yaw sweep from 0 to 90 deg in 5 deg increments at zero angle of attack are made; these runs require separate calls to Option 11. The configuration was set up by application of Option 2: the first configuration allows for the determination of pitch control effectiveness at symmetrical

LISTING OF EXAMPLE 2 INPUT DATA DECK WITHOUT BASIC DATA LOAD

```
  1  OPTION 1-LOAD A LIST OF OUTPUT VARIABLES FOR PRINTING TRIM RESULTS
  2              NTAP-ST ORE AN  OUTPUT LIST ON FILE TAPE2
  4   1   4   1 WEIGHT-POUNDS
  4   1   4   1 WEIGHT-NEWTONS                                         4.448
  4   2   4   5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2
  4   2   4   5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-KG-M**2                1.355
 14  10  14  10 JENG(ENGINE INERTIA)-SLUG-FT**2
 14  10  14  10 JENG(ENGINE INERTIA)-KG-M**2                           1.355
 29  45  29  45 ALTITUDE-FT
 29  45  29  45 ALTITUDE-METERS                                        .3048
 29  10  29  10 TRUE AIRSPEED-KNOTS
 29   9  29   9 TRUE AIRSPEED-FT/SEC
 29   9  29   9 TRUE AIRSPEED-M/SEC                                    .3048
 29  12  29  12 QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2
 29  11  29  11 MACH NUMBER
 29  12  29  12 QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2                    47.88
 29   4  29   4 RHO(AIR DENSITY)-SLUGS/FT**3
 29   4  29   4 RHO(AIR DENSITY)-KG/M**3                               515.38
 29  57  29  59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)KT           .5902
 29  57  29  59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)FT/S
 29  57  29  59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)M/S         .3048
  2  16   2  18  XEDOT,YEDOT,ZEDOT(FT/S)
  2  16   2  18  XEDOT,YEDOT,ZEDOT(M/S)                                .3048
 41   4  41   6  XE2D,YE2D,ZE2D-FT/SEC**2
 41   4  41   6  XE2D,YE2D,ZE2D-G                                      .031056
 41   4  41   6  XE2D,YE2D,ZE2D-M/SEC**2                               .3048
  2   1   2   3 UDOT,VDOT,WDOT-FT/SEC**2
  2   1   2   3 UDOT,VDOT,WDOT-G                                       .031056
  2   1   2   3 UDOT,VDOT,WDOT-M/SEC**2                                .3048
  3   1   3   3 U,V,W (INER. SPEED COMPONENTS)FT/SEC
  3   1   3   3 U,V,W (INER. SPEED COMPONENTS)M/SEC                    .3048
 29   1  29   3 UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC
 29   1  29   3 UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC                  .3048
 29  54  29  56 NXCG,NYCG,NZCG(BODY AXIS ACCEL.)-GEES
  3   4   3   6 P,Q,R(BODY AXIS RATES)-DEG/SEC                         57.29578
  3  64   3  66 THETA,PHI,PSI(EULER ANGLES)-DEG                        57.29578
 29  13  29  14 ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG          57.29578
  2  10   2  10 ZD(RATE OF SINK)-FT/MIN                                60.000
  2  10   2  10 ZD(RATE OF SINK)-FT/SEC
  2  10   2  10 ZD(RATE OF SINK)-M/SEC                                 .3048
 28  28  28  28  NORM. ROLL CONTROL
 28  29  28  29  NORM. YAW CONTROL
 28  30  28  30  NORM. PITCH CONTROL
  3  26   3  27 THT1,THT2(THRUST DEFLECTION PITCH ANGLES)-DEG          57.29578
  3  24   3  25 PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG        57.29578
  3  19   3  19 LEFT ELEVON DEFLECTION-DEG                             57.29578
  3  20   3  20 RIGHT ELEVON DEFLECTION-DEG                            57.29578
 28  50  28  50 ELEVATOR COMMAND DEFLECTION-DEG                        57.29578
 28  51  28  51 AILERON COMMAND DEFLECTION-DEG                         57.29578
  3  28   3  29 DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)
 28  58  28  58 TCMD(THRUST COMMAND)-POUNDS
 28  58  28  58 TCMD(THRUST COMMAND)-NEWTONS                           4.445
 23   9  23  10 TCOR1,TCOR2(THRUST APPL. TO A/C)-POUNDS
```

NOTE USE OF SCALE PARAMETER TO CONTROL OUTPUT DATA UNITS

Figure 5-2. Listing of Example 2 Input Data Deck Without Basic Data Load (Sheet 1 of 5)

```
23   9  23  10 TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS            4.449
 3  21   3  21 RUDDER DEFLECTION-DEG                               57.29578
26  20  26  20 TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS
26  20  26  20 TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS          4.448
26   1  26   2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC
26   1  26   2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC         .454
15   3  15   3 BLDREF(REFERENCE RCS BLEED)-PER CENT
26   7  26   7  BLDAVL
27  72  27  72 BLD(ACTUAL RCS BLEED)-PER CENT
 3  38   3  39 FRCS1,FRCS2(RCS JET FORCES)-POUNDS
 3  38   3  39 FRCS1,FRCS2(RCS JET FORCES)-NEWTONS                 4.448
11   7  11   7 SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG          57.29578
19  44  19  46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-FT-LB
19  44  19  46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M      1.355
19  37  19  38 XW1,XW2(WING X FORCE)-POUNDS
19  37  19  38 XW1,XW2(WING X FORCE)-NEWTONS                       4.448
19  39  19  40 ZW1,ZW2(WING Z FORCE)-POUNDS
19  39  19  40 ZW1,ZW2(WING Z FORCE)-NEWTONS                       4.448
19  19  19  20 CLW1,CLW2(WING LIFT COEFFICIENT)
 3  48   3  48  DFLAPH(CANARD TE FLAP DEFLECTION)-DEG              57.29578
 3  49   3  49  DFLAPH(WING LE FLAP DEFLECTION)-DEG                57.29578
19   1  19   3 DXW,DYW,DZW(WING AERO FORCES)-POUNDS
19   1  19   3 DXW,DYW,DZW(WING AERO FORCES)-NEWTONS               4.448
19   4  19   6 DLW,DMW,DNW(WING AERO MOMENTS)-FT-POUNDS
19   4  19   6 DLW,DMW,DNW(WING AERO MOMENTS)-NEWTON-M             1.355
20   1  20   3 DXM,DYM,DZM(CANARD AERO FORCES)-POUNDS
20   1  20   3 DXM,DYM,DZM(CANARD AERO FORCES)-NEWTONS             4.448
20   4  20   6 DLM,DMM,DNM(CANARD AERO MOMENTS)-FT-POUNDS
20   4  20   6 DLM,DMM,DNM(CANARD AERO MOMENTS)-NEWTON-M           1.355
21   1  21   3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS         4.448
21   1  21   3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS
21   4  21   6  DLV,DMV,DNV(VERT TAIL AERO MOMENTS)-FT POUNDS
21   4  21   6 DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-NEWTON-M       1.355
22   1  22   3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS
22   1  22   3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS           4.448
22   4  22   6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS
22   4  22   6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M         1.355
29  20  29  22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS
29  20  29  22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS        4.448
29  23  29  25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS
29  23  29  25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M      1.355
23   1  23   3 DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS
23   1  23   3 DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS           4.448
23   4  23   6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-FT-POUNDS
23   4  23   6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-NEWTON-M         1.355
26  23  26  24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC
26  23  26  24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC        1.355
24   1  24   3 DXR,DYR,DZR(RAM FORCES)-POUNDS
24   1  24   3 DXR,DYR,DZR(RAM FORCES)-NEWTONS                     4.448
24   4  24   6 DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS
24   4  24   6 DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M                   1.355
26   3  26   4 RPM1,RPM2(ENGINE ROT. SPEED)-RPM
27   1  27   3 DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS
27   1  27   3 DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS               4.448
27   4  27   6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-FT-POUNDS
27   4  27   6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-NEWTON-M             1.355
25   1  25   3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS
```

Figure 5-2. Listing of Example 2 Input Data Deck Without Basic Data Load (Sheet 2 of 5)

```
   25    1   25    3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS         4.448
   25    4   25    6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS
   25    4   25    6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M        1.355
   29   26   29   28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS
   29   26   29   28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS            4.448
   29   29   29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS
   29   29   29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M             1.355
   29   51   29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS
   29   51   29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M     1.355
                              BLANK CARD - END OF OPTION 1 LOAD
    9  OPTION 9 LOAD DERIVATIVE QUANTITIES
    9  STORE ON TAPE 9
   29    1    1               UAS
   29    3    2               WAS
    3    5    3               Q
   28   58    4               DEC
    3   49    5               DFLAPW
    3   48    6               DFLAPW
   28   54    7               DRCSP
   28   57    8               DRCSNF
   26   34    9               TO(1)
   26   35   10               TO(2)
    3   26   11               THT(1)
    3   27   12               THT(2)
   29    2   13               VAS
    3    4   14               P
    3    6   15               R
    3   21   16               DR
   26   52   17               DAC
   28   53   18               DRCSR
    8   55   19                DRCSY
   28   56   20               DRCSSF
    3   24   21               PSIT(1)
    3   25   22               PSIT(2)
                              BLANK CARD - END OF OPTION 9 LOAD
    6  OPTION 6-SET UP TRIM IN A WIND VARIAB''S
   15              NEQU-NUMBER OF TRIM UNKNOWNS
    3    1    3    3 U,V,W
 2.        2.        2.
    3    4    3    6 P,Q,R
 .1        .1        .1
   28   28   28   28  DROLL
 .05
   28   29   28   29  DYAW
 .05
   28   38   28   38  DPITCH
 .05
    3   66    3   66  PSI
 .01745
   29   54   29   56  NXCG,NYCG,NZCG
 .1        .1        .1
    3   64    3   64  THETA
 .01745
   28   58   28   58 TCMD
 10.
                              BLANK CARD - END OF OPTION 6 LOAD
    2 OPTION 2-LOAD INITIAL CONDITIONS AND RUN CONTROL VARIABLES
```

DERIVATIVES ARE TAKEN WITH RESPECT TO THESE VARIABLES

Figure 5-2. Listing of Example 2 Input Data Deck Without Basic Data Load (Sheet 3 of 5)

```
     5              NTAP - FIND OPTION 2 DATA ON FILE TAPE5-INPUT
    41    4   41    5  XE20,YE20                                  32.2
 0.        0.
    41    6   41    6  ZE20                                       32.2
 0.
     2   16    2   17  XEDOT,YEDOT
 0.        0.
     2   18    2   18  ZEDOT
 0.
     3   10    3   10  ZE
 -100.
     2   65    2   66  PHID,PSID
 0.        0.
     3   65    3   66PHI,PSI                                      .01745
 0.        0.
     3   64    3   64  THETA                                      .01745
 70.
    28   28   28   28  DROLL
 0.
    28   29   28   29  DYAW
 0.
    28   30   28   30  DPITCH
 -.1
    29   54   29   56  NXCG,NYCG,NZCG
 .98       0.        .195
    28   50   28   50  TCMD
 1 900.
    29    9   29    9  VA                                         1.689
 35.
    29   13   29   13  ALPH                                       .01745
 70.
     1    3    1    7  DT,TMAX,DTPRINT,DTPLOT,TI
 .025      20.       .1        .1
    41    1   41    1  AWIND
 1.
    41    2   41    2  VWIND                                      1.689
 35.
    41    7   41    7  TRMTURN
 0.
    41   10   41   10  TURNRAD
 2640.
    41    8   41    9  GAMMA,VADOT
           -3.22
    43    7   43    7  ASKEEP
 1.
    16    7   16   12  AKU,AKV,AKH,AKXES,AKYES,AKZES
           5.        5.        2.        .005      -.005
    43  129   43  129  ATRANS
 0.
    43    6   43    6 ATIME
 0.
    43  132   43  139  THROTT(10)
 .546      .553      .53       .443      .173      .0833     .067
 .067
    43  142   43  149  VAT(10)                                    1.689
 0.        20.       40.       60.       80.       100.      120.
 200.
```

THESE DATA PROVIDE STARTING VALUES FOR THE TRIM SOLUTION

THESE SPECIFY THAT INTEGRATION PROCEEDS IN 0.025 SEC INTERVALS FOR 20. SEC. DATA ARE PRINTED AND PLOTTED EVERY 0.1 SEC

THESE SPECIFY THAT AIRPLANE IS TO BE TRIMMED IN A 35 KT WIND.

THESE SPECIFY:
A) THAT PSEUDO-PILOT IS TO STATIONKEEP
B) THE GAINS HE IS TO USE

THIS SPECIFIES NUMBER OF ENTRIES IN CHOTS AND TIMET TABLES

Figure 5-2. Listing of Example 2 Input Data Deck Without Basic Data Load (Sheet 4 of 5)

```
    43  152   43  159  THETCT(10)                                             .01745
 102.       96.5       45.5       66.89      36.65      22.72      16.3
 0.24
    43    1   43    5  ACMD(I)
 3.
    43    9   43   16  CMDT1(I)-DLNGSTK INPUT TABLE                           .01745
 0.         0.         10.        10.        0.         0.         0.
 0.
    43   29   43   36  CMDT2(I)-DLATSTK INPUT TABLE                           .01745
 0.         0.         10.        10.        0.         0.         0.
 0.
    43   49   43   56  CMDT3(I)-DPED INPUT TABLE                              .01745
 0.         0.         20.        20.        20.        20.        20.
 20.
    43   69   43   76  CMDT4(I)-ZEDTC INPUT TABLE
 0.         0.        -10.       -10.        10.        10.        0.
 0.
    43   89   43   96  CMDT5(I)-THROTTLE INPUT TABLE
 0.         0.         0.         0.         0.         0.         0.
 0.
    43  109   43  116  TIMET(I)-INPUT CONTROL TIME TABLE
            .3         .31        1.         1.01       1.7        1.71
 40.
                                 BLANK CARD - END OF OPTION 2 LOAD
     1 OPTION 1-LOAD PRIMARY TRIM PARAMETERS
     1                  NTAP-STORE OPTION DATA LIST ON FILE TAPE1
    41    3   41    3  PSIWIND                                                .01745
                                 BLANK CARD - END OF OPTION 1 LOAD
     0  TRIM OPTION
     1     2     0
        EXAMPLE 2 - STATIONKEEPING TIME HISTORY
 180.
     4  OPTION 4 TIME HISTORY
     5     5
   (7X,11(2A5))
   (5X,11F10.3)
   (5X,11F10.3)
        EXAMPLE 2 - STATIONKEEPING TIME HISTORY
                     BLANK CARD-NO TRANSFER TO OPTION 2 FOR MORE DATA
                    BLANK CARD-NO TRANSFER TO OPTION 3 FOR DATA OUTPUT
```

THIS SPECIFIES AN OPEN LOOP PSEUDO-PILOT PEDAL INPUT

THESE TABLES SPECIFY THE TIME HISTORY OF THE PEDAL INPUT

1 9

DERIVATIVE VARIABLES ON TAPE5

NCASES

THESE IN COMBINATION SPECIFY THAT THE 35KT WIND IS A HEADWIND (PSIWIND = 180 DEG)

4 5

VARIABLE FORMATS FOR PRINTING TIME HISTORY FOUND ON INPUT (TAPE5)

TIME HISTORY CALCS STORED ON TAPE4 FOR FUTURE PLOTS

Figure 5-2. Listing of Example 2 Input Data Deck Without Basic Data Load (Sheet 5 of 5)

10 deg trailing edge up (TEU) elevon deflections with the canard trailing edge flap set at 25 deg and the wing leading edge flap at 30 deg. The second configuration maintains the same canard and wing flap settings but allows for the determination of roll control effectiveness at differential elevon deflections of 10 deg TEU on the left wing and 10 deg trailing edge down (TED) on the right wing.

The input data deck (minus the Basic Data Load) for Example 3 is listed with explanatory marginal notes on Figure 5-3. Note that Option 7 must precede Option 11 and that the Option 7 variable formats should be considered unchangeable for most wind tunnel applications of VATLAS. The order of the six events directed by Example 3 is as follows:

1. Set up pitch control effectiveness configuration (Configuration 1) with Option 2.

2. Run angle of attack sweep on Configuration 1 with Option 11.

3. Run yaw sweep on Configuration 1 with Option 11.

4. Set up roll control effectiveness configuration (Configuration 2) with Option 2.

5. Run angle of attack sweep on Configuration 2 with Option 11.

6. Run yaw sweep on Configuration 2 with Option 11.

The airspeed parameter on the third Option 11 card must be given a positive non-zero value for the Option to work. Since the Option generates non-dimensional aerodynamic coefficients and because the VATLAS aerodynamic model is not a function of airspeed, the selected airspeed value is not critical; Example 3 used a value of 100 ft/sec.

The output generated by VATLAS for Example 3 is listed in Appendix F. Note that the time history output specifications were inadvertantly left in the Basic Data Load for Example 3. These constitute extraneous input cards and could have been replaced by one blank card (i.e., a time history was not generated by Example 3).

5.4 Example 4 - Stationkeeping Plot Run

The plot run demonstrates the application of VATLAS Option 10 and, by implication, Option 5 to plot a time history which was created in a previous run (Example 2). The input data deck to produce the plot is listed with explanatory notes on Figure 5-4. Two features of this deck which warrant special emphasis are the following:

1. Since Options 10 and 5 are the only VATLAS options used in Example 4, the COMMON variables are not addressed during the run. Thus only five cards are required for the Basic Data Load. VATLAS requires that at least one COMMON segment be set up by the Basic Data Load thus the COMMON storage allocation card for Example 4 designates one segment with one element (any number of elements could have been designated).

LISTING OF EXAMPLE 3 INPUT DATA DECK WITHOUT BASIC DATA LOAD

```
  7 OPTION 7 - LOAD VARIABLE FORMATS FOR PRINTING WIND TUNNEL DATA
 (   10X,32HDRAG COEFFICIENT BUILDUP          )
 (   10X,32HSIDE FORCE COEFFICIENT BUILDUP    )
 (   10X,32HLIFT COEFFICIENT BUILDUP          )
 (   10X,32HROLL MOMENT COEFFICIENT BUILDUP   )
 (   10X,32HPITCH MOMENT COEFFICIENT BUILDUP)
 (   10X,32HYAW MOMENT COEFFICIENT BUILDUP    )
 (   10X,32HSUMMARY OF TOTAL COEFFICIENTS     )
(14X,5HALPHA,10X5HBETA ,10X5HWING ,10X5HH.T. ,10X5HV.T. ,10X5HFUS  ,10X5HTOTAL)
 (   5X,7F14.6)
(14X,5HALPHA,10X4HBETA,11X2HCD,13X2HCY,13X2HCL,13X2HCR,13X2HCM,13X2HCN)
 (   5X,8F14.6)
 (   5X,9F14.6)
  2 OPTION 2 - LOAD CONTROL SETTINGS AND STATE VARIABLES FOR 1ST WT CONFIG.
  5    NTAP - FIND OPTION 2 DATA ON TAPE5=INPUT
  3   48   3   49   DFLAPH,DFLAPW                                     .01745
25.      30.
   19   47   19   48 DA1,DA2                                          .01745
-10.     -10.        (SYMMETRICAL 10 DEG TEU ELEVON DEFLECTION)
                    BLANK CARD-END OPTION 2 LOAD FOR 1ST WT  CONFIG.
 11 OPTION 11-1ST WT CONFIGURATION,AOA SWEEP FROM 0 TO 90 DEG IN 5 DG INCRE.
  1    0    4   AOA SWEEP WITH DATA STORED ON TAPE4
0.      5.      90.      0.      0.      0.      100.
 11 OPTION 11-1ST WT CONFIGURATION,YAW SWEEP FROM 0 TO 90 DEG IN 5 DG INCRE.
  0    1    4   YAW SWEEP WITH DATA STORED ON TAPE4
0.      0.      0.       0.      5.      90.     100.
  2 OPTION 2 - LOAD CONTROL SETTINGS AND STATE VARIABLES FOR 2ND WT CONFIG.
  5    NTAP - FIND OPTION 2 DATA ON TAPE5=INPUT
   19   47   19   48  DA1,DA2                                         .01745
-10.      10.        (10 DEG DIFFERENTIAL ELEVON DEFLECTION)
                    BLANK CARD-END OPTION 2 LOAD FOR SECOND WT CONFIG
 11 OPTION 11-2ND WT CONFIGURATION,AOA SWEEP FROM 0 TO 90 DEG IN 5 DG INCRE
  1    0    4   AOA SWEEP WITH DATA STORED ON TAPE4
0.      5.      90.      0.      0.      0.      100.
 11 OPTION 11-2ND WT CONFIGURATION,YAW SWEEP FROM 0 TO 90 DEG IN 5 DG INCRE
  0    1    4   YAW SWEEP WITH DATA STORED ON TAPE4
0.      0.      0.       0.      5.      90.     100.
```

THESE ARE THE VARIABLE FORMATS FOR PRINTING WT DATA. THEY ARE COMPATIBLE WITH THE GENERIC AERO MODEL IN VATLAS AND SHOULD NOT HAVE TO CHANGE FOR ANY APPLICATION OF THE MODEL TO PRODUCE WIND TUNNEL DATA

ESTABLISHES CONTROL SETTINGS FOR 1ST TWO WT RUNS:
CANARD TEF DEFL.(DFLAPH) = 25°
WING LEF DEFL (DFLAPW) = 30°
RIGHT (DA1) ELEVN DEFL.
LEFT (DA2) ELEVN DEFL. = -10°

SPECIFIES AOA SWEEP AT $\psi = 0°$

SPECIFIES YAW SWEEP AT AOA = 0°

ESTABLISHES CONTROL SETTINGS FOR 2ND TWO WT RUNS: DFLAPH AND DFLAPW NOT SPEC. THEREFORE ARE SAME AS 1ST CONFIG.

SPECIFIES AOA SWEEP AT $\psi = 0°$

SPECIFIES YAW SWEEP AT AOA = 0°

AIRSPEED IN FT/SEC. SINCE AERO DATA ARE NOT A FUNCTION OF AIRSPEED, THIS PARAMETER CAN BE LOADED AT ANY NON ZERO VALUE

Figure 5-3. Listing of Example 3 Input Data Deck Without Basic Data Load

LISTING OF EXAMPLE 4 INPUT DATA DECK

```
 69                         NEGS
  5                         NTAP,NTAPW
  1     1                   THIS IS ALL THAT IS REQUIRED FOR COMMON STORAGE SETUP
                                  BLANK CARD-THIS SKIPS OUTPUT SPECS SECTION OF BDL
                                  BLANK CARD-THIS SKIPS COMMON LOAD SECTION OF BDL
    1    OPTION 10 PLOT PREVIOUSLY STORED TIME HISTORY
                            82 VAP WITH 202 PTS EA STORED IN TIME HIST. ON TAPE4
PSEUDO-PILOT FLOWN TURN OVER A SPOT         WHILE HOVERING IN A 35 KT WIND
2.      2.                                  1          1         1
  1 -1             TIME-SEC                 2.5        8.    0.    0.    0.        0    0
  5 -1        BODY ROLL RATE                10.        2.    .5    0.    0.        0    0
 17 -1             PHI-DEG                  200.       2.    .5    0.    0.        0    0
 44 -1       NORM. ROLL CNTRL.              .5         2.    .5    0.    0.        0    0
 38 -1          AIRSPEED-KT        30.      5.         2.    .5    0.    0.        0    0
 73 -1       PEDAL COMMAND-DG/S             10.        2.    5.0   0.    0.        1    1
  6 -1    BODY PITCH RATE-DG/S-4.           4.         2.    .5    0.    0.        0    0
 16 -1          THETA-DEG          60.      10.        2.    .5    0.    0.        0    0
 46 -1      NORM. PITCH CNTRL.     -.4      .4         2.    .5    0.    0.        0    0
 74 -1    LONG. STK. CMD.-DEG      -10.     10.        2.    .5    0.    0.        0    0
 39 -1          ALPHA-DEG          -100.    100.       2.    5.0   0.    0.        1    1
  7 -1     BODY YAW RATE-DG/S      -4.      2.         2.    .5    0.    0.        0    0
 18 -1           PSI-DEG           -20.     20.        2.    .5    0.    0.        0    0
 45 -1       NORM. YAW CNTRL.      -.2      .2         2.    .5    0.    0.        0    0
 72 -1     LAT. STK. CMD.-DEG      -20.     10.        2.    .5    0.    0.        0    0
 40 -1          BETA-DEG           -100.    100.       2.    4.0   0.    0.        1    1
 10 -1        XEDOT-FT/SEC         -10.     10.        2.    .5    0.    0.        0    0
 13 -1            XE-FT            -30.     20.        2.    .5    0.    0.        0    0
 11 -1        YEDOT-FT/SEC         -10.     10.        2.    .5    0.    0.        0    0
 14 -1            YE-FT            -40.     40.        2.    .5    0.    0.        0    0
 43 -1           NZCG-G            -.4      .4         2.    .5    0.    0.        0    0
 42 -1           NYCG-G            -.2      .2         2.    2.5   0.    0.        1    1
 75 -1     HEAVE RATE CMD-FT/S-3.           2.         2.    .5    0.    0.        0    0
 47 -1     THRUST COMMAND-LB      14000.    2000.      2.    .5    0.    0.        0    0
 48 -1   TRST B4 RCS CORRECT.8000.          1000.      2.    .5    0.    0.        0    0
 41 -1           NXCG-G            .5       .5         2.    .5    0.    0.        0    0
 15 -1            ZE-FT            -102.    2.         2.    .5    0.    0.        0    0
 12 -1        ZEDOT-FT/SEC         -2.      2.         2.    4.5   0.    0.        1    1
```

NPTS 202 — NOUT 62 — NTAP 4

24 — NVAR - THE OPTION READS NVAR MORE CARDS

FOR A RUN WHICH ONLY GENERATES PLOTS (i.e. USES OPTION 10 ONLY) THE BDL REDUCES TO FIVE CARDS

WHEN THESE TWO CARDS ARE READ THE PROGRAM AUTOMATICALLY INVOKES OPTION 5

THESE ARE CARDS 2 THROUGH 3+NVAR OF THE OPTION 5 INPUT DECK

Figure 5-4. Listing of Example 4 Input Data Deck

2. Not all of the variables stored during the time history run need be plotted. In Example 4, only 28 of the 82 available variables are plotted. The ordering in the variable list for Option 5 (10) is that the first variable is the independent variable and all remaining variables are plotted as functions of that variable. In Example 4, therefore, 27 variables are plotted versus time.

Although not indicated in the input data deck, the dimensioning and spacing of plots for Example 4 were keyed to 11 x 17 in. blank CALCOMP paper. This choice of paper is indigenous to VATLAS. Should the user desire different paper he must indicate this to the computer operator by a PAUSE card in the control cards for the run. Also not indicated in the input data deck is the process of making the standard CALCOMP subroutines available for the VATLAS plot routines. This is controlled by the control cards for the run. The control cards used to produce Example 4 on the Vought CDC 6600 Computer Facility are listed below:

CONTROL CARD	EXPLANATORY NOTES
FORTEN, TIOO.	Job Card
PROJECT, 1234xxxx9101, 253010, S1128*FORTENBAUGH.	Project Card
ATTACH, TAPE4, STATIONKEEPING, ID=FORTENBGH, MR=1.	Attach previously run time history
ATTACH, ONE, BINARYVATLAS, ID=FORTENBGH, MR=1.	Attach binary version of VATLAS
LIBRARY (CALCOMP)	Make CALCOMP routines available to VATLAS
LOAD (ONE)	Load the binary version of VATLAS preparatory to executing the program.
EXECUTE.	Execute the program and create the plot.
7 8 9	End of control card file.

The user is cautioned against indiscriminate application of these control cards to attempt to reproduce the Example 4 results since control card formats vary slightly from facility to facility.

The plotted results of Example 4 are shown in Figure 5-5. These are photo-reduced copies of the original 11 x 17 output plots. To learn how to use the VATLAS plotting capability, the user is urged to study carefully the relations between plot spacing, dimensioning and labelling on Figure 5-5; the Option 5 instructions in Section 4.2.5; and the Example 4 input data

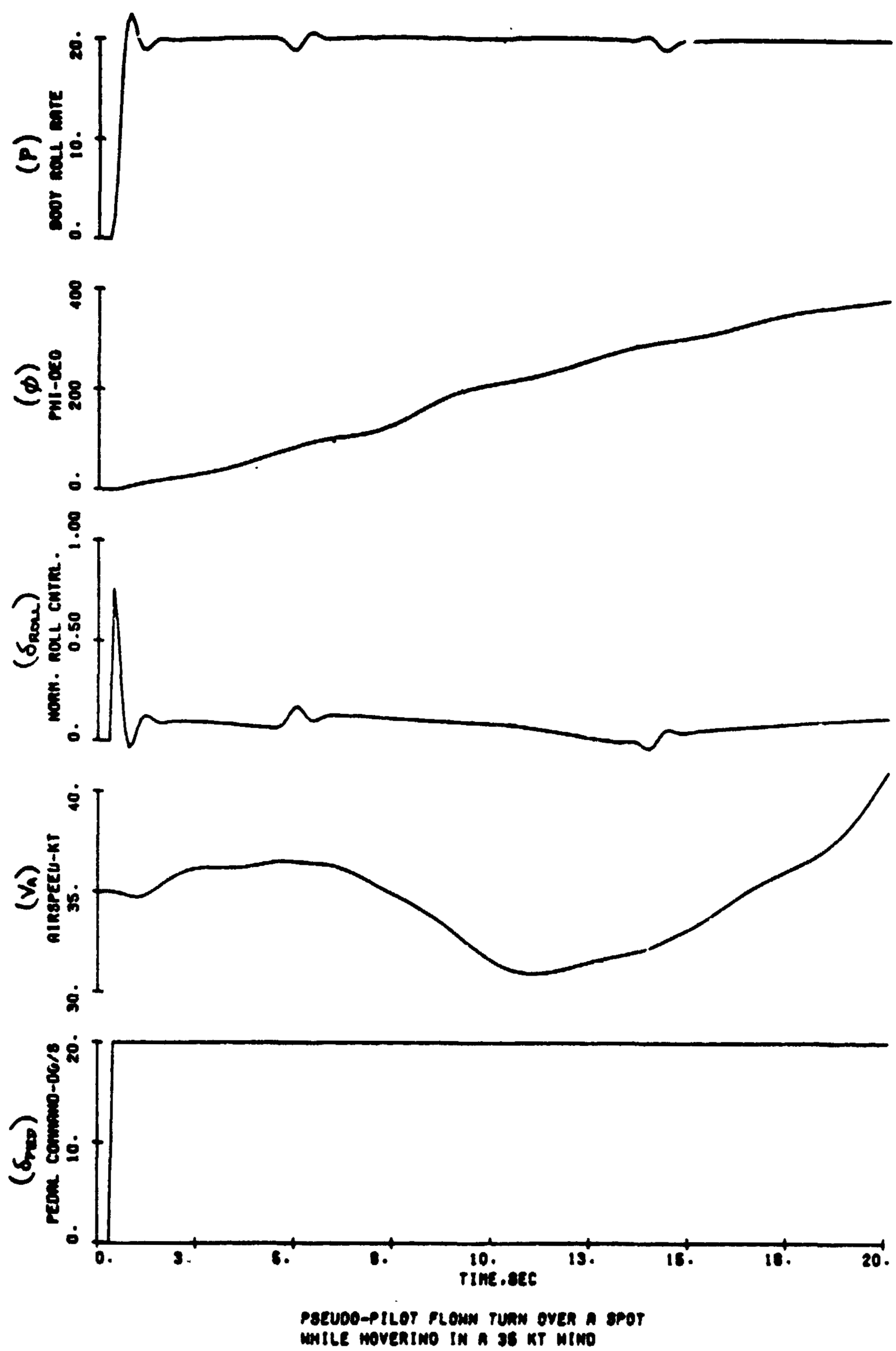


Figure 5-5. Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind" (Sheet 1 of 5)

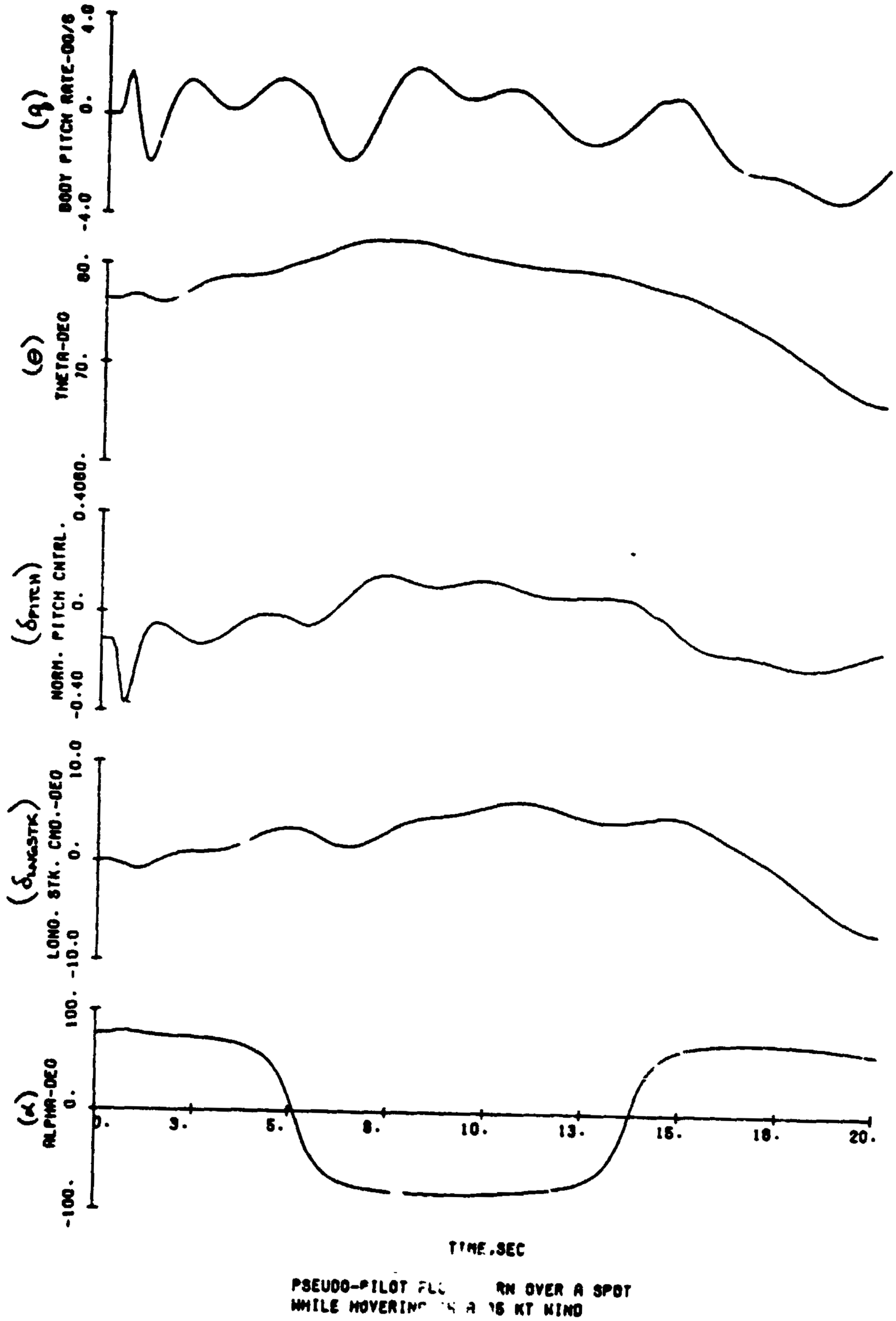


Figure 5-5. Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind" (Sheet 2 of 5)

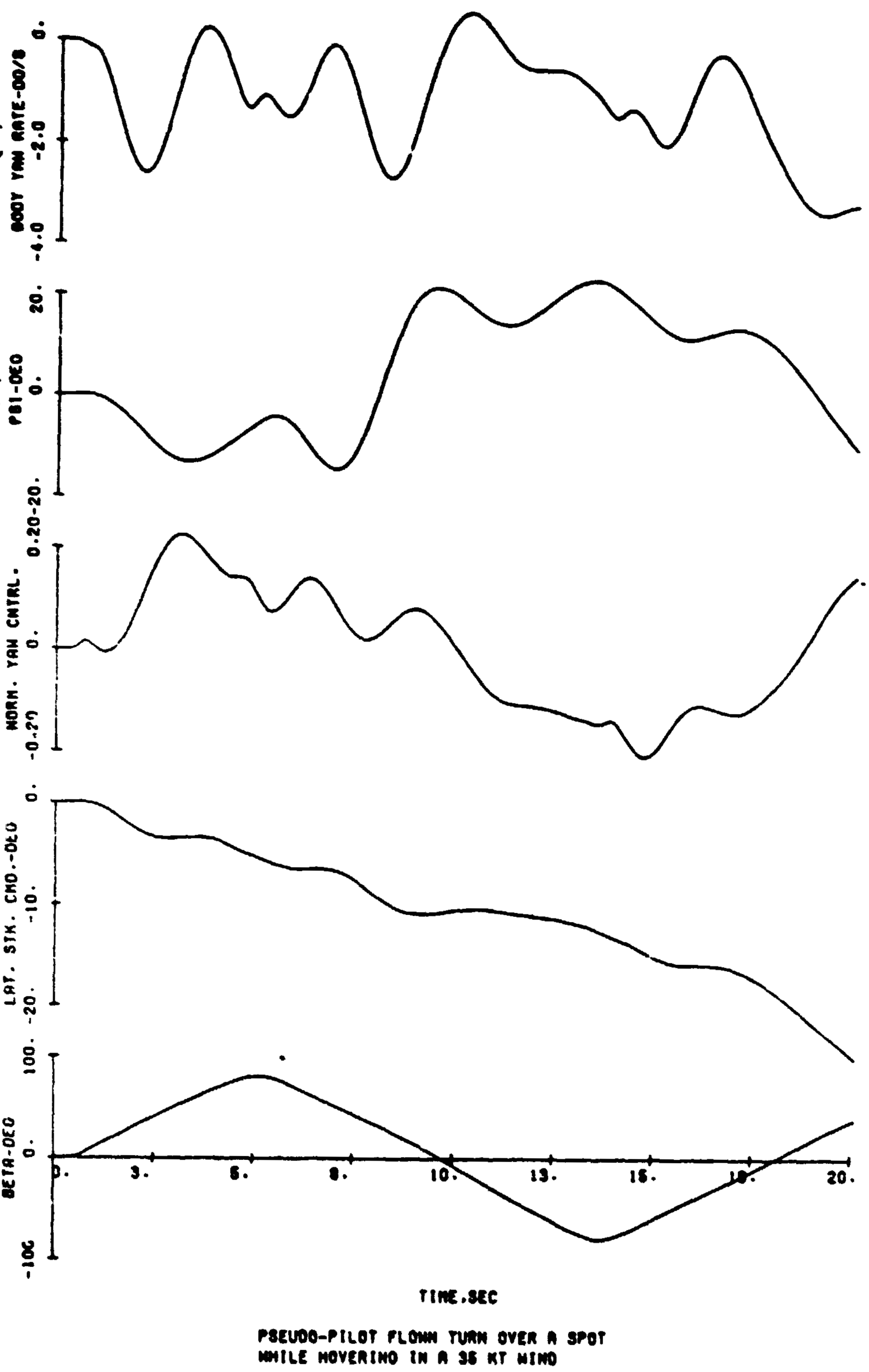


Figure 5-5. Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind" (Sheet 3 of 5)

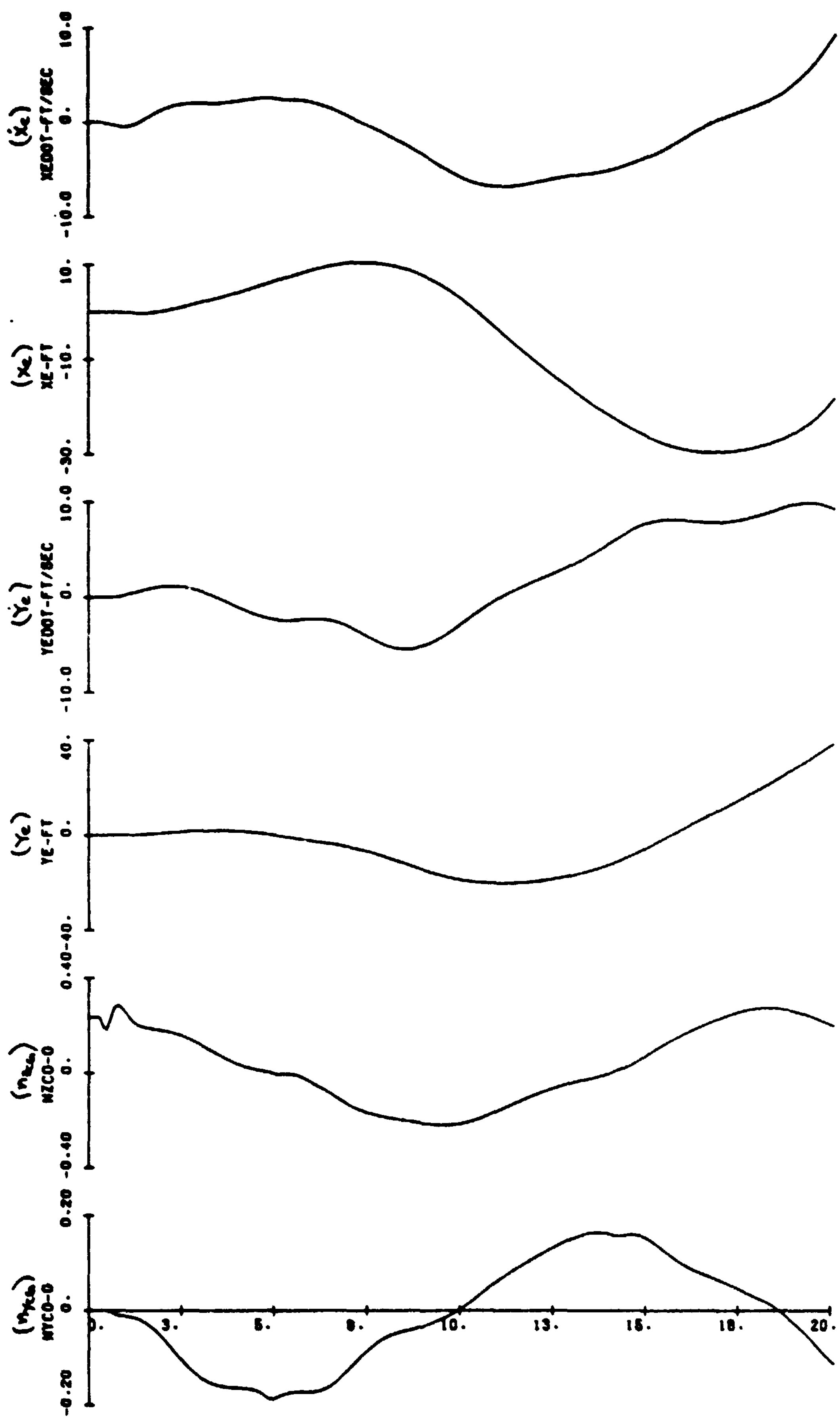
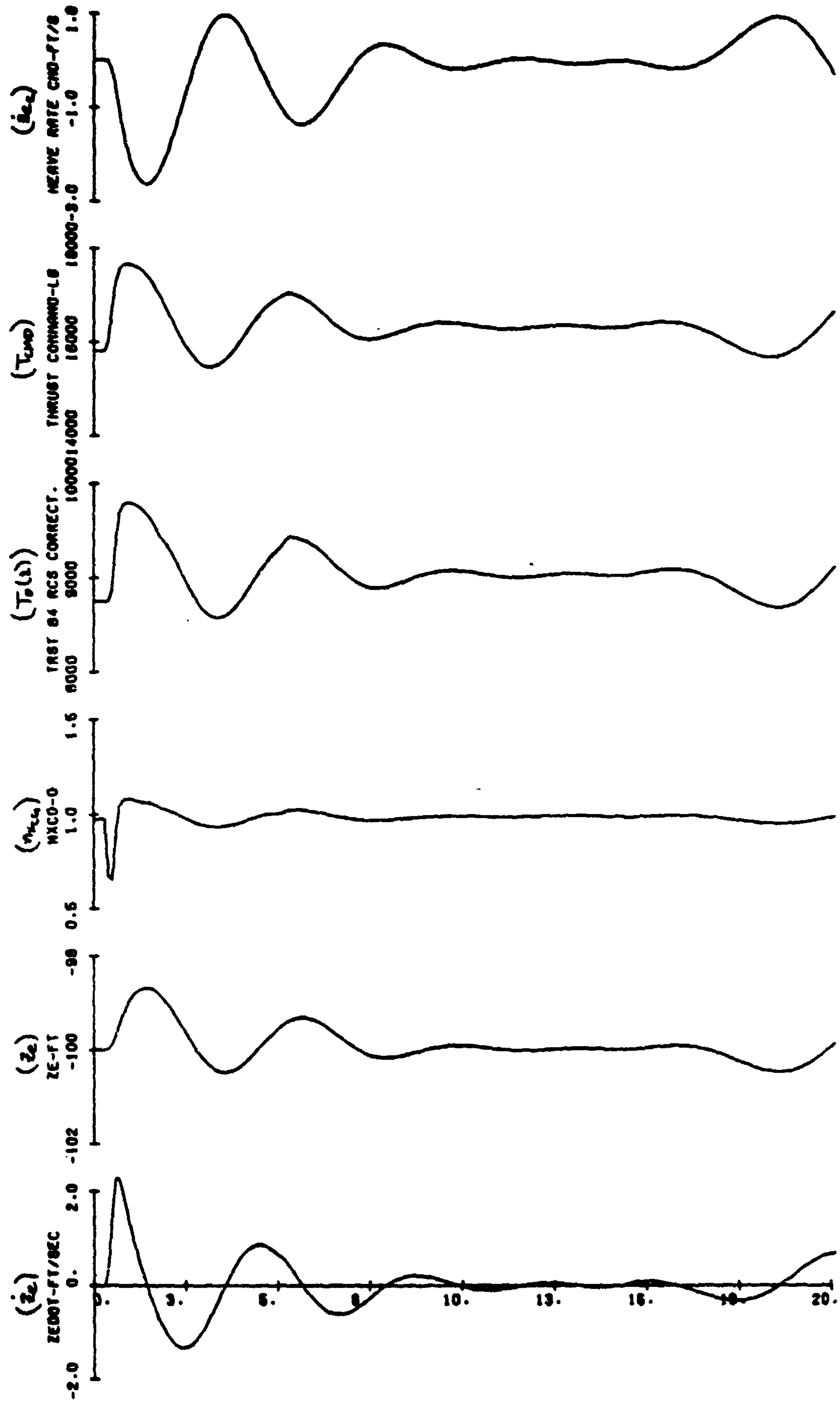


Figure 5-5. Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind" (Sheet 4 of 5)



igure 5-5. Plot Generated by Example 4 of "Pseudo-Pilot Flown Turn Over a Spot in a 35 kt Wind" (Sheet 5 of 5)

deck. For reference scaling in this comparison, the ordinate axes of the original plots are 2.0 in. long and the abscissa (time) axes are 8.0 in. long.

6.0 REFERENCES

(a) Clark, Jr. J. W., Low-Speed V/STOL Stability and Control Prediction - Volume I: Model Description and Validation, NADC Report 76323-30, 11 January 1977

(b) Anonymous, UPDATE Reference Manual, Manual 60342400C, Control Data Corporation, June 1975 Revision

APPENDIX A

DEFINITION AND LOCATION OF COMMON PARAMETERS FOR THE VATLAS PROGRAM

A.1 Introduction

This Appendix provides a listing by coded name and defintion of all VATLAS COMMON parameters arranged in order by segment and element designation. Each parameter is indicated as type C or N where C means the parameter is calculated by the program and does not need to be quantified by program input and N means the parameter is not calculated and must be quantified by program input. Many of the parameters in COMMON are also used in Volume II of this report which describes the model equations and base aircraft data for VATOL simulation. The Volume II symbology for these parameters is included in parentheses following the definitions. Note that every parameter in COMMON is a REAL program variable; therefore all non zero input data to COMMON must have a decimal point.

A.2 Segment 1 - Time, Print and Plot Control Parameters

Segment	Element	Type	Coded Name	Units	Definition
1	1	C	T	sec	Time which is updated every DT seconds (t)
1	2	C	TO	sec	Time controlled by RUNGE which takes on three intermediate values between T and T+DT. Since 4th order Runge - Kutta integration is used, the basic integration interval must be divided in four parts.
1	3	N	DT	sec	Basic integration interval for RUNGE
1	4	N	TMAX	sec	Maximum value of T for a time history
1	5	N	DTPRNT	sec	Interval between times of printed output
1	6	N	DTPLØT	sec	Interval between times of plotted output
1	7	N	TI	sec	Initial time for time history; normally taken to be zero

A.3 Segment 2 - Variables to be Integrated

Segment	Element	Type	Coded Name	Units	Definition
2	1	C	UDØT	ft/sec^2	X body axis component of inertial acceleration ($\dot{u}$)
2	2	C	VDØT	ft/sec^2	Y body axis component of inertial acceleration ($\dot{v}$)
2	3	C	WDØT	ft/sec^2	Z body axis component of inertial acceleration ($\dot{w}$)
2	4	C	PDØT	rad/sec^2	Body axis roll acceleration ($\dot{p}$)
2	5	C	QDØT	rad/sec^2	Body axis pitch acceleration ($\dot{q}$)
2	6	C	RDØT	rad/sec^2	Body axis yaw acceleration ($\dot{r}$)
2	7	C	D11D	1/sec	Rate of change of d_{11} direction cosine ($\dot{d}_{11}$)
2	8	C	D12D	1/sec	Rate of change of d_{12} direction cosine ($\dot{d}_{12}$)
2	9	C	D13D	1/sec	Rate of change of d_{13} direction cosine ($\dot{d}_{13}$)
2	10	C	D21D	1/sec	Rate of change of d_{21} direction cosine ($\dot{d}_{21}$)
2	11	C	D22D	1/sec	Rate of change of d_{22} direction cosine ($\dot{d}_{22}$)
2	12	C	D23D	1/sec	Rate of change of d_{23} direction cosine ($\dot{d}_{23}$)
2	13	C	D31D	1/sec	Rate of change of d_{31} direction cosine ($\dot{d}_{31}$)
2	14	C	D32D	1/sec	Rate of change of d_{32} direction cosine ($\dot{d}_{32}$)
2	15	C	D33D	1/sec	Rate of change of d_{33} direction cosine ($\dot{d}_{33}$)
2	16	C	XEDØT	ft/sec	X inertial axis component of inertial velocity ($\dot{x}_e$)
2	17	C	YEDØT	ft/sec	Y inertial axis component of inertial velocity ($\dot{y}_e$)

Segment	Element	Type	Coded Name	Units	Definition
2	18	C	ZEDØT	ft/sec	Z inertial axis component of inertial velocity ($\dot{z}_e$)
2	19	C	LELEVND	rad/sec	Left elevon deflection rate ($\dot{\delta}_{TEF_W}(1)$)
2	20	C	RELEVND	rad/sec	Right elevon deflection rate ($\dot{\delta}_{TEF_W}(2)$)
2	21	C	DRD	rad/sec	Rudder deflection rate ($\dot{\delta}_r$)
2	22-23	C	TABD(I)	1/sec	Normalized rate of change of afterburner thrust; I=1 for left engine, =2 for right engine ($\dot{T}_{AB}(I)$)
2	24-25	C	PSITD(I)	rad/sec	Yaw thrust deflection rate; I=1 for left engine, =2 for right engine ($\dot{\Psi}_T(I)$)
2	26-27	C	THTD(I)	rad/sec	Pitch thrust deflection rate; I=1 for left engine, =2 for right engine ($\dot{\theta}_T(I)$)
2	28-37	C	DRCSD(I)	1/sec	Normalized area deflection rate of Ith RCS jet; space for 10 RCS jets, only 2 used for VATLAS ($\dot{\delta}_{RCS}(I)$)
2	38-47	C	FRCSAD(I)	lb/sec	Rate of change of force of Ith RCS jet; space for 10 RCS jets, only 2 used for VATLAS ($\dot{F}_{RCS_A}(I)$)
2	48	C	DFLAPHD	rad/sec	Canard trailing edge flap deflection rate ($\dot{\delta}_{TEF_H}$)
2	49	C	DFLAPWD	rad/sec	Wing leading edge flap deflection rate ($\dot{\delta}_{LEF_W}$)
2	50-51	C	TFRACD(I)	1/sec	Normalized rate of change of non-afterburning thrust; I=1 for left engine, =2 for right engine ($\dot{T}_F(I)$)
2	52	C	PCTRMD	rad/sec	Rate of change of roll command path integrator output (figure 2.2) ($\dot{p}_{C_{TRM}}$)
2	53	C	PINTD	rad/sec	Body axis roll rate; also coded as P in program (p)

Segment	Element	Type	Coded Name	Units	Definition
2	54	C	PETRMD	rad/sec	Rate of change of roll forward path integrator output (figure 2.2) $(\dot{p}_{e_{TRM}})$
2	55	C	RCTRMD	rad/sec	Rate of change of yaw command path integrator output (figure 2.4) $(\dot{r}_{c_{TRM}})$
2	56	C	RINTD	rad/sec	Body axis yaw rate; also coded as R in program (r)
2	57	C	RETRMD	rad/sec	Rate of change of yaw forward path integrator output (figure 2.4) $(\dot{r}_{e_{TRM}})$
2	58	C	YTRMD	rad/sec	Rate of change of yaw trim input (figure 2.4) $(\dot{r}_{TRM})$
2	59	C	QCTRMD	rad/sec	Rate of change of pitch command path integrator output (figure 2.3) $(\dot{q}_{c_{TRM}})$
2	60	C	QINTD	rad/sec	Body axis pitch rate; also coded as Q in program (q)
2	61	C	QETRMD	rad/sec	Rate of change of pitch forward path integrator output (figure 2.3) $(\dot{q}_{e_{TRM}})$
2	62	C	PTRMD	rad/sec	Rate of change of pitch trim input (figure 2.3) $(\dot{q}_{TRM})$
2	63	C	ZEDTRMD	lb/sec	Rate of change of heave forward path integrator output (figure 2.5) $(\dot{T}_{e_{TRM}})$
2	64	C	THETD	rad/sec	Rate of change of pitch angle $(\dot{\theta})$
2	65	C	PHID	rad/sec	Rate of change of roll angle $(\dot{\phi})$
2	66	C	PSID	rad/sec	Rate of change of yaw angle $(\dot{\psi})$
2	67	C	LNGSTKD	1/sec	Rate of change of pitch input shaping filter output $(\dot{q}_c')$
2	68	C	ROLLCD	1/sec	Rate of change of roll input shaping filter output $(\dot{p}_c')$
2	69	C	YAWCD	1/sec	Rate of change of yaw input shaping filter output $(\dot{r}_c')$

A.4 Segment 3 - Integrated Variables

Segment	Element	Type	Coded Name	Units	Definition
3	1	C	U	ft/sec	X body axis component of inertial velocity (u)
3	2	C	V	ft/sec	Y body axis component of inertial velocity (v)
3	3	C	W	ft/sec	Z body axis component of inertial velocity (w)
3	4	C	P	rad/sec	Body axis roll rate (p)
3	5	C	Q	rad/sec	Body axis pitch rate (q)
3	6	C	R	rad/sec	Body axis yaw rate (r)
3	7	C	D11	—	d_{11} direction cosine (d_{11})
3	8	C	D12	—	d_{12} direction cosine (d_{12})
3	9	C	D13	—	d_{13} direction cosine (d_{13})
3	10	C	D21	—	d_{21} direction cosine (d_{21})
3	11	C	D22	—	d_{22} direction cosine (d_{22})
3	12	C	D23	—	d_{23} direction cosine (d_{23})
3	13	C	D31	—	d_{31} direction cosine (d_{31})
3	14	C	D32	—	d_{32} direction cosine (d_{32})
3	15	C	D33	—	d_{33} direction cosine (d_{33})
3	16	C	XE	ft	X position of cg in inertial coordinates (x_e)
3	17	C	YE	ft	Y position of cg in inertial coordinates (y_e)
3	18	C	ZE	ft	Z position of cg in inertial coordinates (z_e)
3	19	C	LELEVN	rad	Left elevon deflection ($\delta_{TEF_W}(1)$)
3	20	C	RELEVN	rad	Right elevon deflection ($\delta_{TEF_W}(2)$)
3	21	C	DR	rad	Rudder deflection (δ_r)

Segment	Element	Type	Coded Name	Units	Definition
3	22-23	C	TAB(I)	—	Normalized afterburner thrust; I = 1 for left engine, =2 for right engine ($T_{AB}(I)$)
3	24-25	C	PSIT(I)	rad	Yaw thrust deflection; I=1 for left engine, =2 for right engine ($\Psi_T(I)$)
3	26-27	C	THT(I)	rad	Pitch thrust deflection; I=1 for left engine, =2 for right engine ($\theta_T(I)$)
3	28-37	C	DRCS(I)	—	Normalized area of Ith RCS jet; space for 10 RCS jets, only 2 used for VATLAS ($\delta_{RCS}(I)$)
3	38-47	C	FRCSA(I)	lb	Force of Ith RCS jet; space for 10 RCS jets, only 2 used for VATLAS (F_{RCS_A})
3	48	C	DFLAPH	rad	Canard trailing edge flap deflection (δ_{TEF_H})
3	49	C	DFLAPW	rad	Wing leading edge flap deflection (δ_{LEF_W})
3	50-51	C	TFRAC(I)	--	Normalized non-afterburning thrust; I=1 for left engine,=2 for right engine (T_F)
3	52	C	PCTRM	rad	Roll command path integrator output (figure 2.2) ($p_{c_{TRM}}$)
3	53	C	PINT	rad	Integral of body axis roll rate (figure 2.2) (p_{INT})
3	54	C	PETRM	rad	Roll forward path integrator output (figure 2.2) ($p_{e_{TRM}}$)
3	55	C	RCTRM	rad	Yaw command path integrator output (figure 2.4) ($r_{c_{TRM}}$)
3	56	C	RINT	rad	Integral of body axis yaw rate (figure 2.4) (r_{INT})
3	57	C	RETRM	rad	Yaw forward path integrator output (figure 2.4) ($r_{e_{TRM}}$)
3	58	C	YTRM	rad	Yaw trim input (figure 2.4) (r_{TRM})
3	59	C	QCTRM	rad	Pitch command path integrator output (figure 2.3) ($q_{c_{TRM}}$)

Segment	Element	Type	Coded Name	Units	Definition
3	61	C	QETRM	rad	Pitch forward path integrator output (figure 2.3) ($q_{e_{TRM}}$)
3	62	C	PTRM	rad	Pitch trim input (figure 2.3) (q_{TRM})
3	63	C	ZEDTRM	lb	Heave forward path integrator output (figure 2.5) ($T_{e_{TRM}}$)
3	64	C	THETA	rad	Pitch Angle (θ)
3	65	C	PHI	rad	Roll Angle (ϕ)
3	66	C	PSI	rad	Yaw angle (ψ)
3	67	C	LNGSTK	——	Output of pitch input shaping filter (q_c')
3	68	C	ROLLC	——	Output of roll input shaping filter (p_c')
3	69	C	YAWC	——	Output of yaw input shaping filter (r_c')

A.5 Segment 4 - Aircraft Mass, Geometry and Inertia Constants

Segment	Element	Type	Coded Name	Units	Definition
4	1	N	WT	lb	Aircraft weight (W)
4	2	N	IX	slug ft^2	Aircraft roll body axis inertia (I_x)
4	3	N	IY	slug ft^2	Aircraft pitch body axis inertia (I_y)
4	4	N	IZ	slug ft^2	Aircraft yaw body axis inertia (I_z)
4	5	N	IXZ	slug ft^2	Aircraft cross product of inertia (I_{xz})
4	6	N	FSCG	ft	Fuselage station of reference cg (FS_{CG})
4	7	N	BLCG	ft.	Buttline of reference cg (BL_{CG})
4	8	N	WLCG	ft.	Waterline of reference cg (WL_{CG})
4	9	N	GC	ft/sec^2	Acceleration due to gravity (g)
4	10	C	EAC	--	Inertia ratio = (IZ - IY)/IX
4	11	C	FAC	--	Inertia ratio = (IY - IX)/IZ
4	12	C	GAC	--	Inertia ratio = (IZ - IX)/IY
4	13	C	JX	--	Cross Product of inertia ratio = - IXZ/IX

Segment	Element	Type	Coded Name	Units	Definition
4	14	C	JY	—	Cross Product of inertia ratio = - IXZ/IY
4	15	C	JZ	—	Cross Product of inertia ratio = - IXZ/IZ
4	16	C	MASS	slug	Aircraft mass (m)
4	17	C	ØMJXJZ	--	1 - JX*JZ

A.6 Segment 5- Tolerances for Errors in Trim Solutions

Segment	Element	Type	Coded Name	Units	Definition
5	1-19	N	TØL(I)	Varies	Specifies the acceptable tolerance on the trim solution of the Ith trim equation. The trim equations are given in Subroutine ERROR.

A-7 Segment 6 - Aero Lift and Drag Constants

Segment	Element	Type	Coded Name	Units	Definition
6	1	N	AAERØ	--	Specifies whether aero data are to be calculated (AAERØ = 0) or are stored in table format (AAERØ ≠ 0).
	Note: For all subscripted constants in Segment 6; I = 1 correspo to wing data, I = 2 to horizontal stabilizer (includes forw... canard-and aft-conventional-locations), I = 3 to vertical stabilizer.				
6	2,25,48	N	AERØ(1,I)	--	Geometric or reference aspect ratio of Ith lifting surface (AR)
6	3,26,49	N	AERØ(2,I)	--	Aspect ratio of exposed area of Ith lifting surface (ARe)
6	4,27,50	N	AERØ(3,I)	ft^2	Geometric or reference area of Ith lifting surface (S)
6	5,28,51	N	AERØ(4,I)	ft^2	Exposed area of Ith lifting surface (S_e)
6	6,29,52	N	AERØ(5,I)	rad	Sweep of geometric or reference quarter chord of Ith lifting surface ($\Lambda_{1/4}$)
6	7,30,53		AERØ(6,I)	rad	Sweep of leading edge of Ith lifting surface (Λ_{LE})
6	8,31,54	N	AERØ(7,I)	—	Reference taper ratio of Ith lifting surface (λ)

Segment	Element	Type	Coded Name	Units	Definition
6	9,32,55	N	AERØ(8,I)	—	Maximum lift coefficient of Ith lifting surface ($C_{L_{MAX}}$)
6	10,33,56	N	AERØ(9,I)	rad	Angle of attack for maximum lift coefficient of Ith lifting surface (α_b)
6	11,34,57	N	AERØ(10,I)	1/rad	Sectional lift curve slope of Ith lift surface (a_o)
6	12,35,58	N	AERØ(11,I)	—	Zero lift drag coefficient of Ith lifting surface (C_{D_O})
6	13,36,59	N	AERØ(12,I)	—	Ratio of fuselage width at lifting surface intersection to lifting surface span for Ith lifting surface (d/b)
6	14,37,60	N	AERØ(13,I)	1/rad	Change in lift coefficient at zero angle of attack per unit trailing edge flap deflection for Ith lifting surface ($\Delta C_{L_O}/\delta_{TEF}$)
6	15,38,61	N	AERØ(14,I)	1/rad	Change in lift coefficient at angle of attack for maximum lift per unit trailing edge flap deflection for Ith lifting surface. ($\Delta C_{L_{MAX}}/\delta_{TEF}$)
6	16,39,62	N	AERØ(15,I)	1/rad	Change in drag coefficient per unit trailing edge flap deflection for Ith lifting surface ($\Delta C_D/\delta_{TEF}$)
6	17,40,63	N	AERØ(16,I)	1/rad	Change in pitching moment coefficient per unit trailing edge flap deflection for Ith lifting surface ($\Delta C_m/\delta_{TEF}$)
6	18,41,64	N	AERØ(17,I)	—	Change in angle of attack for maximum lift per unit leading edge flap deflection for Ith lifting surface ($\Delta\alpha_{MAX}/\delta_{LEF}$)
6	19,42,65	N	AERØ(18,I)	1/rad	Change in lift coefficient at zero angle of attack per unit leading edge flap deflection for Ith lifting surface ($\Delta C_{L_O}/\delta_{LEF}$)
6	20,43,66	N	AERØ(19,I)	1/rad	Change in lift coefficient at angle of attack for maximum lift per unit leading edge flap deflection for Ith lifting surface ($\Delta C_{L_{MAX}}/\delta_{LEF}$)

Segment	Element	Type	Coded Name	Units	Definition
6	21,44,67	N	AERØ(20,I)	1/rad	Change in drag coefficient per unit leading edge flap deflection for Ith lifting surface ($\Delta C_D/\delta_{LEF}$)
6	22,45,68	N	AERØ(21,I)	1/rad	Change in pitching moment coefficient per unit leading edge flap deflection for Ith lifting surface ($\Delta C_m/\delta_{LEF}$)
6	23,46,69	N	AERØ(22,I)	rad	Difference between angle of attack for zero leading edge flap effectiveness and angle of attack for maximum lift, i.e. when (ALFA.GE. (AERO(22,I) + AERO(9,I)) the leading edge flap effectiveness equals zero ($\Delta\alpha_{LEF}$)
6	24,47,70	N	AERØ(23,I)	rad	Difference between angle of attack for zero trailing edge flap effectiveness and angle of attack for maximum lift, i.e. when (ALFA.GE. (AERO(23,I) + AERO(9,I)) the trailing edge flap effectiveness equals zero ($\Delta\alpha_{TEF}$)
6	71,74,77	N	SURFCP(1,I)	--	Normalized (to Ith lifting surface mean aerodynamic chord) constant for calculating center of pressure shift of Ith lifting surface as a function of angle of attack. Appears as multiplier of cosine terms in the equations (CP_1)
6	72,75,78	N	SURFCP(2,I)	--	Normalized (to Ith lifting surface mean aerodynamic chord) constant for calculating center of pressure shift of Ith lifting surface as a function of angle of attack. Appears as multiplier of sine terms in the equations (CP_2)
6	73,76,79	N	SURFCP(3,I)	--	Normalized (to Ith lifting surface mean aerodynamic chord) constant for calculating center of pressure shift of Ith lifting surface as a function of angle of attack. Appears only in the high angle of attack equation for center of pressure shift (CP_3)
6	80-82	C	CNAAO(I)	1/rad	Constant calculated by Subroutine FORCES for use by Subroutine LIFDRG to generate nonlinear Ith lifting surface lift coefficient($C_{N\alpha\alpha_0}$)

Segment	Element	Type	Coded Name	Units	Definition
6	83-85	C	AERØK(I)	1/rad	Constant calculated by Subroutine FORCES for use by Subroutine LIFDRG to generate nonlinear Ith lifting surface lift coefficient (K).
6	86-88	C	EØS(I)	—	Oswald efficiency factor for Ith lifting surface calculated in Subroutine FORCES (e)
6	89-91	C	CLA(I)	1/rad	Linear lift curve slope of Ith lifting surface calculated in Subroutine FORCES ($C_{L_{\alpha_e}}$)

A.8 Segment 7 - Wing Aero Constants

Segment	Element	Type	Coded Name	Units	Definition
7	1	N	FSW	ft	Fuselage station of wing reference center of pressure (FS_W)
7	2	N	BLW1	ft	Buttline of reference center of pressure of left wing ($BL_W(1)$)
7	3	N	BLW2	ft	Buttline of reference center of pressure of right wing ($BL_W(2)$)
7	4	N	WLW	ft	Waterline of wing reference center of pressure (WL_W)
7	5	N	CW	ft	Mean aerodynamic chord of wing (c_W)
7	6	N	BW	ft	Reference wing span (b_W)
7	7	N	EKDA1	—	Change in left wing angle of attack per unit deflection of left wing control surface ($K_{\delta_c}(1)$)
7	8	N	EKDA2	—	Change in right wing angle of attack per unit deflection of right wing control surface ($K_{\delta_c}(2)$)
7	9	N	EIW	rad	Wing incidence angle
7	10	N	CLBOW	1/rad	Basic C_{l_β} of wing ($C_{l_{\beta_o}}$)
7	11	N	CLBCLW	1/rad	Change in wing C_{l_β} per unit of wing lift coefficient ($C_{l_{\beta_{C_L}}}$)

Segment	Element	Type	Coded Name	Units	Definition
7	12	N	CLRCLW	1/rad	Change in wing C_{ℓ_r} per unit of wing lift coefficient ($C_{\ell_{r_{C_L}}}$)
7	13	N	CLPW	1/rad	Wing C_{ℓ_p} ($C_{\ell_{p_W}}$)
7	14	N	CNBOW	1/rad	Basic C_{n_β} of wing ($C_{n_{\beta_o}}$)
7	15	N	CNBCL2W	1/rad	Change in wing C_{n_β} per unit of wing lift coefficient squared. ($C_{n_{\beta_{C_L}2}}$)
7	16	N	CNRCL2W	1/rad	Change in wing C_{n_r} per unit of wing lift coefficienc squared ($C_{n_{r_{C_L}2}}$)
7	17	N	CNRCDW	1/rad	Change in wing C_{n_r} per unit of wing drag coefficient ($C_{n_{r_{C_D}}}$)
7	18	N	CNPCLW	1/rad	Change in wing C_{n_p} per unit of wing lift coefficient ($C_{n_{p_{C_L}}}$)
7	19	N	CNPCDAW	—	Not used
7	20	N	CMOW	—	Zero lift pitching moment coefficient of wing ($C_{m_{o_W}}$)
7	21	N	CMDFW	—	Nct used
7	22	N	AEKEL	—	Number of entries in elevon effectiveness table (≤ 7)
7	23	N	CYBCL2W	1/rad	Change in wing C_{Y_β} per unit of wing lift coefficient squared ($C_{Y_{\beta_{C_L}2}}$)
7	24	C	XWING1	ft	X body axis distance between aircraft reference cg and left wing reference center of pressure ($X_{WING}(1)$)
7	25	C	XWING2	ft	X body axis distance between aircraft reference cg and right wing reference center of pressure ($X_{WING}(2)$)
7	26	C	YWING1	ft	Y body axis distance between aircraft reference cg and left wing reference center of pressure ($Y_{WING}(1)$)

Segment	Element	Type	Coded Name	Units	Definition
7	27	C	YWING2	ft	Y body axis distance between aircraft reference cg and right wing reference center of pressure ($Y_{WING}(2)$)
7	28	C	ZWING1	ft	Z body axis distance between aircraft reference cg and left wing reference center of pressure ($Z_{WING}(1)$)
7	29	C	ZWING2	ft	Z body axis distance between aircraft reference cg and right wing reference center of pressure ($Z_{WING}(2)$)

A.9 Segment 8 - Horizontal Stabilizer Aero Constants

Segment	Element	Type	Coded Name	Units	Definition
8	1	N	FSH	ft	Fuselage station of horizontal stabilizer reference center of pressure (FS_H)
8	2	N	BLH	ft	Buttline of horizontal stabilizer reference center of pressure (BL_H)
8	3	N	WLH	ft	Waterline of horizontal stabilizer reference center of pressure (WL_H)
8	4	N	CH	ft	Mean aerodynamic chord of horizontal stabilizer (c_H)
8	5	N	BH	ft	Reference span of horizontal stabilizer (b_H)
8	6	N	EKADE	—	Change in horizontal stabilizer angle of attack per unit deflection of horizontal stabilizer control surface ($K_{\alpha\delta_e}$)
8	7	C or N	EIH	rad	Horizontal stabilizer incidence angle (i_H)
8	8	N	EØCLW	rad	Change in downwash angle per unit of wing lift coefficient (ϵ/C_{LW})
8	9	N	CMDFH	--	Not used
8	10	N	CMOH	--	Zero lift pitching moment coefficient of horizontal stabilizer ($C_{m_{o_H}}$)
8	11	N	DXHTO	—	Not used

Segment	Element	Type	Coded Name	Units	Definition
8	12	C	XH	ft	X body axis distance between aircraft cg and horizontal stabilizer reference center of pressure (X_H)
8	13	C	YH	ft	Y body axis distance between aircraft cg and horizontal stabilizer reference center of pressure (Y_H)
8	14	C	ZH	ft	Z body axis distance between aircraft cg and horizontal stabilizer reference center of pressure (Z_H)
8	15	C	XWEL	ft	Constants related to relative wing-horizontal stabilizer location and which are used to calculate dynamic pressure at the horizontal stabilizer (X_{WEL}, Z_{WEL}, A_{WEL}, D_{WEL})
8	16	C	ZWEL	ft	
8	17	C	AWEL	rad	
8	18	C	DWEL	—	

A.10 Segment 9 - Vertical Stabilizer Aero Constants

Segment	Element	Type	Coded Name	Units	Definition
9	1	N	FSV	ft	Fuselage station of vertical stabilizer reference center of pressure (FS_V)
9	2	N	BLV	ft	Buttline of vertical stabilizer reference center of pressure (BL_V)
9	3	N	WLV	ft	Waterline of vertical stabilizer reference center of pressure (WL_V)
9	4	N	CV	ft	Mean aerodynamic chord of vertical stabilizer (c_V)
9	5	N	BV	ft	Reference span of vertical stabilizer (b_V)
9	6	N	EKADR	--	Change in vertical stabilizer angle of attack per unit deflection of vertical stabilizer control surface ($K_{\alpha\delta_r}$)
9	7	C or N	EIV	rad	Vertical stabilizer incidence angle (i_V)
9	8	N	EKV	--	Sidewash coefficient (K_V)
9	9	N	CNOV	--	Zero side force yawing moment coefficient of vertical stabilizer ($C_{n_{o_V}}$)

Segment	Element	Type	Coded Name	Units	Definition
9	10	N	AEKRUD	—	Number of entries in rudder effectiveness table (≤ 7)
9	11-20	N	TALFA(I)	rad	Angles of attack for entires in vertical stabilizer effectiveness table (I=1 to AALFA)
9	21	N	AALFA	—	Number of entries in vertical stabilizer effectiveness table (≤ 10)
9	22-31	N	TVTEFF(I)	—	Vertical stabilizer effectiveness table entries (I = 1 to AALFA) ($f_{3_{AERO}}(\alpha)$)
9	32	C	XV	ft	X body axis distance between aircraft cg and vertical stabilizer reference center of pressure (X_V)
9	33	C	YV	ft	Y body axis distance between aircraft cg and vertical stabilizer reference center of pressure (Y_V)
9	34	C	ZV	ft	Z body axis distance between aircraft cg and vertical stabilizer reference center of pressure (Z_V)

A.11 Segment 10 - Fuselage Aero Constants

Segment	Element	Type	Coded Name	Units	Definition
10	1	N	FSF	ft	Fuselage station of fuselage reference center of pressure (FS_F)
10	2	N	BLF	ft	Buttline of fuselage reference center of pressure (BL_F)
10	3	N	WLF	ft	Waterline of fuselage reference center of pressure (WL_F)
10	4	N	AØQO	ft^2	Maximum fuselage axial force normalized to dynamic pressure($(A/q)_{MAX}$)
10	5	N	SØQM	ft^2	Maximum fuselage side force normalized to dynamic pressure($(S/q)_{MAX}$)
10	6	N	NFØQM	ft^2	Maximum fuselage normal force normalized to dynamic pressure ($(N_F/q)_{MAX}$)
10	7	N	MØQMX1	ft^3	Maximum fuselage pitch moment in region ($\pi/18 + A0F) \leq \alpha \leq$ A1F - normalized to dynamic pressure ($(M/q)_{MAX_1}$)

Segment	Element	Type	Coded Name	Units	Definition
10	8	N	MØQMX2	ft^3	Maximum fuselage pitch moment in region - $A1F < \alpha \leq \pi$ - normalized to dynamic pressure $((M/q)_{MAX_2})$
10	9	N	NØQMX1	ft^3	Maximum fuselage yaw moment in region - $\pi/18 \leq \alpha_{FY} \leq A2F$ - normalized to dynamic pressure where α_{FY} = fuselage sideslip angle $((N/q)_{MAX_1})$
10	10	N	NØQMX2	ft^3	Maximum fuselage yaw moment in region - $A2F < \alpha_{FY} \leq \pi$ - normalized to dynamic pressure $((N/q)_{MAX_2})$
10	11	N	AOF	rad	Angle of attack where fuselage normal force equals zero (α_{0_F})
10	12	N	A1F	rad	Angle of attack where fuselage pitch moment equals zero (α_{1_F})
10	13	N	A2F	rad	Fuselage sideslip angle where fuselage yaw moment equals zero (α_{2_F})
10	14	N	EN1	--	Exponent of cosine shaping function for fuselage axial force (n_1)
10	15	N	EN2	--	Exponent of sine shaping function for fuselage side force (n_2)
10	16	N	EN3	--	Exponent of sine shaping function for fuselage normal force (n_3)
10	17	N	EN4	--	Exponent of sine shaping function for fuselage pitch moment in the region ($\pi/18$ + AOF) $\leq \alpha$ [illegible] A1F (n_4)
10	18	N	EN5	—	Exponent of sine shaping function for fuselage pitch moment in the region $A1F < \alpha \leq \pi$ (n_5)
10	19	N	EN6	--	Exponent of sine shaping function for fuselage yaw moment in the region $\pi/18 \leq \alpha_{FY} \leq$ A2F (n_6)
10	20	N	EN7	—	Exponent of sine shaping function for fuselage yaw moment in the region A2F $\leq \alpha_{FY} \leq \pi$ (n_7)
10	21	N	DFSFO	ft	Maximum aft shift of fuselage center of pressure with angle of attack (ΔFS_{F_0})

Segment	Element	Type	Coded Name	Units	Definition
10	22	N	ADFSF1	rad	Angle of attack where fuselage center of pressure begins to shift aft (A_{FS_1})
10	23	N	ADFSF2	rad	Angle of attack where fuselage center of pressure shift equals DFSFO (A_{FS_2})
10	24	N	XKYF	--	Constant to control fuselage side force contribution to fuselage yaw moment (K_{Y_F})
10	25	C	XF	ft	X body axis distance between aircraft cg and fuselage reference center of pressure (X_F)
10	26	C	YF	ft	Y body axis distance between aircraft cg and fuselage reference center of pressure (Y_F)
10	27	C	ZF	ft	Z body axis distance between aircraft cg and fuselage reference center of pressure (Z_F)

A.12 Segment 11 - Direct Thrust Force and Moment Constants

Segment	Element	Type	Coded Name	Units	Definition
11	1-2	N	FSSW(I)	ft	Fuselage station of engine nozzle swivel point; I = 1 for left engine, = 2 for right engine ($FS_{SW}(I)$)
11	3-4	N	BLSW(I)	ft	Buttline of engine nozzle swivel point; I = 1 for left engine, = 2 for right engine ($BL_{SW}(I)$)
11	5-6	N	WLSW(I)	ft	Waterline of engine nozzle swivel point; I = 1 for left engine, = 2 for right engine ($WL_{SW}(I)$)
11	7	N	SIGY	rad	Inclination of engine centerline to fuselage reference line (σ_Y)
11	8	N	ELN	ft	Length of engine nozzle (l_{NOZ})
11	9	N	KAFT1	1/rad	Change of engine nozzle thrust efficiency per unit thrust turning angle (K_{AFT_1})

Segment	Element	Type	Coded Name	Units	Definition
11	10	N	KAFT2	--	Engine nozzle thrust efficiency at zero thrust turning angle (K_{AFT_2})
11	11	N	AENG	--	Number of engines ($\leq$ 2) (n_{eng})
11	12	C	CSIGY	--	cos (σ_Y)
11	13	C	SSIGY	--	sin (σ_Y)
11	14-15	C	XT(I)	ft	X body axis distance between aircraft cg and nozzle swivel point; I = 1 for left engine, = 2 for right engine (X_T(I))
11	16-17	C	YT(I)	ft	Y body axis distance between aircraft cg and nozzle swivel point; I = 1 for left engine, = 2 for right engine (Y_T(I))
11	18-19	C	ZT(I)	ft	Z body axis distance between aircraft cg and nozzle swivel point; I = 1 for left engine, = 2 for right engine (Z_T(I))

A.13 Segment 12 - Inlet Ram Force and Moment Constants

Segment	Element	Type	Coded Name	Units	Definition
12	1-2	N	FSIN(I)	ft	Fuselage station of engine inlet force; I = 1 for left engine, = 2 for right engine (FS_{IN}(I))
12	3-4	N	BLIN(I)	ft	Buttline of engine centerline at inlet face; I = 1 for left engine, = 2 for right engine (BL_{IN}(I))
12	5-6	N	WLIN(I)	ft	Waterline of engine centerline at inlet face; I = 1 for left engine = 2 for right engire (WL_{IN}(I))
12	7	N	RINLET	ft	Equivalent inlet radius (r_{IN})
12	8	N	AVVI	--	Number of entries in V/V_I table ($\leq$ 5)
12	9	N	AATURN	--	Number of entries in ram moment arm, ram efficiency and incremental turning angle tables ($\leq$ 8)

Segment	Element	Type	Coded Name	Units	Definition
12	10-11	C	XIN(I)	ft	X body axis distance between aircraft cg and engine inlet; I = 1 for left engine, = 2 for right engine ($X_{IN}(I)$)
12	12-13	C	YIN(I)	ft	Y body axis distance between aircraft cg and engine inlet; I = 1 for left engine, = 2 for right engine ($Y_{IN}(I)$)
12	14-15	C	ZIN(I)	ft	Z body axis distance between aircraft cg and engine inlet; I = 1 for left engine, = 2 for right engine ($Z_{IN}(I)$)

A.14 Segment 13 - Coriolis Force and Moment Constants

Segment	Element	Type	Coded Name	Units	Definition
13	1	N	ELDUCT	ft	Length of engine duct (l_{DUCT})

A.15 Segment 14 - Propulsion System Constants

Segment	Element	Type	Coded Name	Units	Definition
14	1	N	AMACH	--	Number of entries in Mach number table (≤ 4)
14	2	N	KBT1	1/%	Fractional change in thrust per percent bleed (K_{BT_1})
14	3	N	KBT2	—	Fractional thrust at zero bleed (K_{BT_2})
14	4	N	KM1	—	Fractional change in inlet mass flow rate per fractional change in thrust (K_{m_1})
14	5	N	KM2	—	Fractional inlet mass flow rate at zero fractional thrust (K_{m_2})
14	6	N	ØMEGMX	rad/sec	Maximum engine rotational speed in rad/sec ($\Omega_{e_{MAX}}$)
14	7	N	RPMMX	rpm	Maximum engine rotational speed in revolutions per minute
14	8	N	RCS	—	Indicates whether reaction control system is active; RCS $\neq$ 0, RCS is active; = 0, RCS not active

Segment	Element	Type	Coded Name	Units	Definition
14	9	N	AFRAT	--	Number of entries in fractional thrust table for determining engine rotational speed ($\leq$ 6)
14	10	N	JENG	slug ft^2	Engine rotational inertia per engine (J_{ENG})
14	11	N	AFRAC	--	Number of entries in fractional thrust table for engine dynamics parameters ($\leq$ 10)
14	12	N	TAUAB	sec	Time constant for afterburner thrust dynamics (τ_{AB})
14	13	N	ABACCEL	1/sec	Acceleration limit of afterburner thrust ($\dot{T}_{AB_{MAX}}$)
14	14	N	ABDECEL	1/sec	Deceleration limit of afterburner thrust ($\dot{T}_{AB_{MIN}}$)
14	15	N	TABØN	--	Level of TABIN when afterburner is lit ($T_{AB_{ON}}$)
14	16	N	TABOFF	—	Level of TAB(I) when afterburner is turned off ($T_{AB_{OFF}}$)
14	17	C	KBT	--	Fractional thrust level at reference bleed (K_{BT})

A.16 Segment 15 - RCS Force and Moment Constants

Segment	Element	Type	Coded Name	Units	Definition
15	1	N	ARCSJET	--	Number of RCS jets ($\leq$ 10)
15	2	N	ABLDR	—	Number of entries in bleed tables ($\leq$6)
15	3	N	BLDREF	%	Reference bleed (B_{REF})
15	4-13	N	FRCSMX(I)	lb	Maximum force of Ith jet ($F_{RCS_{MX}}$(I))
15	14-23	N	DEMAND(I)	--	Indicates whether jet I is demand bleed; DEMAND(I) = 1, jet I is demand; = 0, jet I is continuous bleed ($\overline{DMD}$(I))
15	24-33	N	BLDMØR(I)	--	Indicates whether jet I requests additional bleed; BLDMOR(I)=1, jet I requests additional bleed; = 0, jet I <u>must</u> operate with available bleed ($\overline{BLDM}$(I))

Segment	Element	Type	Coded Name	Units	Definition
15	34-83	N	RCSL(I,J)	—	Defines whether Jth control drives Ith jet; RCSL(I,J) $\neq$ 0, Jth control drives Ith jet; = 0, Jth control does not drive Ith jet. J = 1 roll control; J = 2, pitch control; J = 3 yaw control; J = 4, side force control; J = 5, normal force control
15	84-93	N	FSRCS(I)	ft	Fuselage station of Ith jet ($FS_{JET}(I)$)
15	94-103	N	BLRCS(I)	ft	Buttline of Ith jet ($BL_{JET}(I)$)
15	104-113	N	WLRCS(I)	ft	Waterline of Ith jet ($WL_{JET}(I)$)
15	114-123	N	THTRCS(I)	rad	Pitch orientation of jet thrust line ($\theta_{JET}(I)$)
15	124-133	N	PSIRCS(I)	rad	Yaw orientation of jet thrust line ($\psi_{JET}(I)$)
15	134	C	FRCSMXR	--	Not used
15	135	C	FRCSMXO	lb	Total RCS force produced at reference conditions (reference bleed and zero control inputs); if all jets are demand bleed, then FRCSMXO = 0 ($F_{RCS_{MX_0}}$)
15	136	C	FRCSMX1	--	Not used
15	137-146	C	CTHTRCS(I)	—	cos ($\theta_{JET}(I)$)
15	147-156	C	STHTRCS(I)	--	sin ($\theta_{JET}(I)$)
15	157-166	C	CPSIRCS(I)	—	cos ($\psi_{JET}(I)$)
15	167-176	C	SPSIRCS(I)	—	sin ($\psi_{JET}(I)$)
15	177-186	C	XJET(I)	ft	X body axis distance between aircraft cg and Ith jet ($X_{JET}(I)$)
15	187-196	C	YJET(I)	ft	Y body axis distance between aircraft cg and Ith jet ($Y_{JET}(I)$)
15	197-206	C	ZJET(I)	ft	Z body axis distance between aircraft cg and Ith jet ($Z_{JET}(I)$)

A.17 Segment 16 - Control System Constants

Segment	Element	Type	Coded Name	Units	Definition
16	1	N	DUM	—	Not used
16	2	N	AKZED	—	Not used in final version of program.
16	3	N	AKZEE1	—	Not used in final version of program.
16	4	N	AKZEE2	—	Not used in final version of program.
16	5	N	AKYED	—	Not used in final version of program.
16	6	N	AKYEE	—	Not used in final version of program.
16	7	N	AKU	sec	Pilot gain on ZEDOT feedback for stationkeeping option
16	8	N	AKV	sec	Pilot gain on YEDOT and XEDOT feedback in lateral position loop for stationkeeping option
16	9	N	AKW	sec	Pilot gain on XEDOT and YEDOT feedback in longitudinal position loop for stationkeeping option.
16	10	N	AKXES	1/sec	Pilot heave rate controller gain for stationkeeping option
16	11	N	AKYES	rad/ft	Pilot lateral stick gain for stationkeeping option
16	12	N	AKZES	rad/ft	Pilot longitudinal stick gain for stationkeeping option
16	13	N	CSV	—	Not used in final version of program.
16	14	N	VASW	ft/sec	Control system function switch speed ($V_{A_{SW}}$)
16	15	N	CS1	—	Not used in final version of program.
16	16	N	THETSW	—	Not used in final version of program.
16	17-24	N	TAKPC(I)	rad	Roll control system input gain table if the gain is a function of pitch angle.
16	25-32	N	TTHETA(I)	rad	Pitch angle table for determining control system gains.
16	33-40	N	TAKPE(I)	1/rad	Roll control system error gain table if the gain is a function of pitch angle.
16	41-48	N	TKPCI1(I)	rad/sec	Roll control system input integrator gain table if the gain is a function of pitch angle.

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Segment	Element	Type	Coded Name	Units	Definition
16	49	N	ATHETA	—	Number of entries in control system gains pitch angle table (≤ 8)
16	50-57	N	TKPEI1(I)	rad/sec/rad	Roll control system error integrator gain table*
16	58-65	N	TKP(I)	rad/rad/sec	Roll control system roll rate feedback gain table*
16	66	N	PELIM	--	Output limit on roll control system error integrator ($p_{e_{LIM}}$)
16	67	N	AKDYDR	rad	Roll control to yaw control interconnect gain ($K_{\delta_y \delta_r}$)
16	68	N	KTHTR	rad	Pitch thrust deflection to roll control gain ($K_{\theta_T \delta_r}$)
16	69	N	KDA	rad	Differential wing trailing edge flap (elevon) deflection to roll control gain (K_{δ_a})
16	70-77	N	TAKRC(I)	rad	Yaw control system input gain table*
16	78-85	N	TAKRE(I)	1/rad	Yaw control system error gain table*
16	86-93	N	TKRCI1(I)	rad/sec	Yaw control system input integrator gain table*
16	94-101	N	TKREI1(I)	rad/sec/rad	Yaw control system error integrator gain table*
16	102-109	N	TKR(I)	rad/rad/sec	Yaw control system yaw rate feedback gain table*
16	110	N	RELIM	—	Output limit on yaw control system error integrator ($r_{e_{LIM}}$)
16	111	N	AKYTRM	rad/sec	Yaw control system trimmer gain
16	112	N	KPSIT	rad	Yaw thrust deflection to yaw control gain ($K_{\psi_T \delta_y}$)
16	113	N	KDR	rad	Rudder deflection to yaw control gain (K_{δ_r})
16	114-121	N	TAKAY(I)	rad/ft/sec^2	Lateral acceleration feedback gain table; loaded as a function of TQBAR(I)

*Provided the gain is a function of pitch angle.

Segment	Element	Type	Coded Name	Units	Definition
16	122	N	KTY	lb	Thrust command to yaw control gain (K_{T_Y})
16	123-130	N	TAKQC(I)	rad	Pitch control system input gain table*
16	131-138	N	TAKQE(I)	rad/sec	Pitch control system error gain table*
16	139-146	N	TKQCI1(I)	rad/sec	Pitch control system input integration gain table*
16	147-154	N	TKQEI1(I)	rad/sec/ rad	Pitch control system error integrator gain table*
16	155-162	N	TKQ(I)	rad/rad/ sec	Pitch control system pitch rate feed-back gain table*
16	163	N	QELIM	—	Output limit on pitch control system error integrator ($q_{e_{LIM}}$)
16	164	N	AKPTRM	rad/sec	Pitch control system trimmer gain
16	165	N	DSTK	—	When the absolute value of longitudinal stick deflection is greater than DSTK, automatic pitch trimming is activated
16	166	N	KDE	rad	Symmetrical wing trailing edge flap (elevon) deflection to pitch control gain (K_{δ_e})
16	167	N	KTHTP	rad	Pitch thrust deflection to pitch control gain ($K_{\theta_T \delta_p}$)
16	168-175	N	TAKZE(I)	lb/ft/sec	Heave control system error gain table*
16	176-183	N	TKZEI1(I)	lb/sec/ ft/sec	Heave control system error integrator gain table*
16	184	N	AKTHRØT	lb	Thrust command to manual throttle input gain (K_{THROT})
16	185	N	ZELIM	lb	Output limit on heave control system error integrator ($T_{e_{LIM}}$)
16	186	N	ELEVNRF	rad	Reference elevon deflection ($\delta_{TEF_{W_R}}$)
16	187-188	N	PSITRF(I)	rad	Reference yaw thrust deflection; I = 1 for left engine, =2 for right engine ($\psi_{T_{REF}}(I)$)
16	189	N	KHFLAP1	—	Change in horizontal stabilizer trailing edge flap deflection per unit change in angle of attack ($K_{TEF_{H1}}$)

*Provided the gain is a function of pitch angle.

Segment	Element	Type	Coded Name	Units	Definition
16	190	N	KHFLAP2	rad	Horizontal stabilizer trailing edge flap deflection at zero angle of attack ($K_{TEF_{H2}}$)
16	191	N	KWFLAP1	—	Change in wing leading edge flap deflection per unit change in angle of attack ($K_{LEF_{W1}}$)
16	192	N	KWFLAP2	rad	Wing leading edge flap deflection at zero angle of attack ($K_{LEF_{W2}}$)
16	193	N	AQBAR	—	Number of entries in dynamic pressure table for lateral acceleration feedback gain ($\leq$ 8)
16	194–201	N	TQBAR(I)	lb/ft^2	Dynamic pressure table for lateral acceleration feedback gain
16	202–209	N	TTPITCH(I)	sec	Pitch input shaping filter time constant table if the time constant is a function of pitch angle
16	210–217	N	TTROLL(I)	sec	Roll input shaping filter time constant table if the time constant is a function of pitch angle
16	218–225	N	TTYAW(I)	sec	Yaw input shaping filter time constant table if the time constant is a function of pitch angle

A.18 Segment 17 - Actuation System Constants

Segment	Element	Type	Coded Name	Units	Definition
17	1	N	LEURATL	rad/sec	Left wing trailing edge flap (elevon)
17	2	N	LELRATL	rad/sec	actuator constants in order from
17	3	N	LEUPØSL	rad	element 1 to element 5: upper rate
17	4	N	LELPØSL	rad	limit, lower rate limit, upper
17	5	N	TLEL	sec	position limit, lower position limit, time constant
17	6	N	REURATL	rad/sec	Right wing trailing edge flap (elevon)
17	7	N	RELRATL	rad/sec	actuator constants in order from
17	8	N	REUPØSL	rad	element 6 to element 10: upper rate
17	9	N	RELPØSL	rad	limit, lower rate limit, upper position
17	10	N	TREL	sec	limit, lower position limit, time constant
17	11	N	DRURATL	rad/sec	Vertical stabilizer control surface
17	12	N	DRLRATL	rad/sec	(Rudder) actuator constants in order
17	13	N	DRUPØSL	rad	from element 11 to element 15: upper
17	14	N	DRLPØSL	rad	rate limit, lower rate limit, upper
17	15	N	TDR	sec	position limit, lower position limit, time constant

Segment	Element	Type	Coded Name	Units	Definition
17	16	N	HFURATL	rad/sec	Horizontal stabilizer trailing edge
17	17	N	HFLRATL	rad/sec	flap actuator constants in order from
17	18	N	HFLAPMX	rad	element 16 to element 20: upper rate
17	19	N	HFLAPMN	rad	limit, lower rate limit, upper
17	20	N	THF	sec	position limit, lower position limit,
					time constant
17	21	N	WFURATL	rad/sec	Wing leading edge flap actuator
17	22	N	WFLRATL	rad/sec	constants in order from element 21
17	23	N	WFLAPMX	rad	to element 25: upper rate limit,
17	24	N	WFLAPMN	rad	lower rate limit, upper position
17	25	N	TWF	sec	limit, lower position limit, time
					constant
17	26-27	N	THTURL(I)	rad/sec	Pitch thrust deflection actuator
17	28-29	N	THTLRL(I)	rad/sec	constants in order (two elements per
17	30-31	N	THRUPL(I)	rad	constant where I = 1 is left engine
17	32-33	N	THTLPL(I)	rad	and I = 2 is right engine) from
17	34-35	N	TTHT(I)	sec	element 26 to element 35: upper
					rate limit, lower rate limit, upper
					position limit, lower position limit,
					time constant
17	36-37	N	PSIURL(I)	rad/sec	Yaw thrust deflection actuator
17	38-39	N	PSILRL(I)	rad/sec	constants in order (two elements per
17	40-41	N	PSIUPL(I)	rad	constant where I = 1 is left engine
17	42-43	N	PSILPL(I)	rad	and I = 2 is right engine) from
17	44-45	N	TPSIT(I)	sec	element 36 to element 45: upper
					rate limit, lower rate limit, upper
					position limit, lower position limit,
					time constant
17	46-55	N	RCSURL(I)	--	RCS area actuator constants in order
17	56-65	N	RCSLRL(I)	--	by groups of ten (up to ten RCS jets
17	66-75	N	RCSUPL(I)	--	can be specified) from element 46 to
17	76-85	N	RCSLPL(I)	--	element 95: upper rate limit (elements
17	86-95	N	TAURCS(I)	sec	46 to 55), lower rate limit (elements
					56 to 65),upper position limit (elements
					66 to 75), lower position limit
					(elements 76 to 85), time constants
					(elements 86 to 95)

Segment	Element	Type	Coded Name	Units	Definition
17	96-105	N	FRCSURL(I)	lb/sec	RCS force dynamics constants in order by groups of ten (up to ten RCS jets can be specified) from element 96 to element 145: upper rate limit (elements 96 to 105), lower rate limit (elements 106 to 115), upper position limit (elements 116 to 125), lower position limit (elements 126 to 135), time constant (elements 136 to 145)
17	106-115	N	FRCSLRL(I)	lb/sec	
17	116-125	N	FRCSUPL(I)	lb	
17	126-135	N	FRCSLPL(I)	lb	
17	136-145	N	TAUFRCS(I)	sec	
17	146	N	DELIM	rad	Maximum commanded symmetrical wing trailing edge flap (elevon) deflection ($\delta_{e_{LIM}}$)
17	147	N	DALIM	rad	Maximum commanded differential wing trailing edge flap (elevon) deflection ($\delta_{a_{LIM}}$)
17	148	N	DRLIM	rad	Maximum commanded vertical stabilizer control surface (rudder) deflection ($\delta_{r_{LIM}}$)

A.19 Segment 18 - Lift-Drag Variables

Segment	Element	Type	Coded Name	Units	Definition
18	1	C	LAMB1	—	Miscellaneous intermediate parameters associated with calculation of CNAAO(I), AEROK(I), EOS(I), and CLA(I). In Volume II symbology, these parameters are in order: $\tan\Lambda_{1/2}$, $C_{L_{\alpha_e}}$, $K_{W(B)}$, C_1, C_2 and J
18	2	C	CLAE	1/rad	
18	3	C	EKWB	—	
18	4	C	C1	—	
18	5	C	C2	—	
18	6	C	EJ	—	

A.20 Segment 19 - Wing Aero Variables

Segment	Element	Type	Coded Name	Units	Definition
19	1	C	DXW	lb	X body axis wing aerodynamic force (ΔX_W)
19	2	C	DYW	lb	Y body axis wing aerodynamic force (ΔY_W)
19	3	C	DZW	lb	Z body axis wing aerodynamic force (ΔZ_W)

Segment	Element	Type	Coded Name	Units	Definition
19	4	C	DLW	ft lb	Wing aerodynamic body axis roll moment (ΔL_W)
19	5	C	DMW	ft lb	Wing aerodynamic body axis pitch moment (ΔM_W)
19	6	C	DNW	ft lb	Wing aerodynamic body axis yaw moment (ΔN_W)
19	7	C	CLW	—	Total wing lift coefficient ($C_{L_{W_T}}$)
19	8	C	ALFW	rad	Average local angle of attack of wing (α_{W_T})
19	9	C	CDW	—	Total wing drag coefficient ($C_{D_{W_T}}$)
19	10	C	UW	ft/sec	X body axis airspeed at wing center of pressure (u_W)
19	11	C	WW	ft/sec	Z body axis airspeed at wing center of pressure (w_W)
19	12	C	VXZ1	ft/sec	Total airspeed sensed by left wing in an X-Z body axis plane at the left wing center of pressure ($V_{XZ}(1)$)
19	13	C	VXZ2	ft/sec	Total airspeed sensed by right wing in an X-Z body axis plane at the right wing center of pressure ($V_{XZ}(2)$)
19	14	C	VXZ	ft/sec	Average total airspeed sensed by left and right wing halves ($V_{XZ_T} = 0.5\ (V_{XZ}(1) + V_{XZ}(2))$)
19	15	C	DADA1	rad	Change in angle of attack of left wing due to left wing control surface deflection ($\Delta\alpha_{\delta_{CW}}(1)$)
19	16	C	DADA2	rad	Change in angle of attack of right wing due to right wing control surface deflection ($\Delta\alpha_{\delta_{CW}}(2)$)
19	17	C	ALFW1	rad	Local angle of attack of left wing ($\alpha'_W(1)$)
19	18	C	ALFW2	rad	Local angle of attack of right wing ($\alpha'_W(2)$)
19	19	C	CLW1	--	Lift coefficient of left wing ($C_{L_W}(1)$)
19	20	C	CLW2	--	Lift coefficient of right wing ($C_{L_W}(2)$)

Segment	Element	Type	Coded Name	Units	Definition
19	21	C	CDW1	—	Drag coefficient of left wing ($C_{D_W}(1)$)
19	22	C	CDW2	—	Drag coefficient of right wing ($C_{D_W}(2)$)
19	23	C	CDA	—	Not used
19	24	C	BETW	rad	Wing sideslip angle (β_W)
19	25	C	QWS	lb/ft^2	Dynamic pressure based on VXZ($\bar{q}_W$)
19	26	C	QWSB	lb/ft	QWS*BW
19	27	C	BOV	sec	0.5 BW/VXZ(b/V)
19	28	C	LWP	ft lb	Wing stability axis roll moment (L_{W_S})
19	29	C	NWP	ft lb	Wing stability axis yaw moment (N_{W_S})
19	30	C	YWP	lb	Wing side force (Y_{W_S})
19	31	C	ALF1	rad	Left wing angle of attack ($\alpha_W(1)$)
19	32	C	SALF1	—	sin (ALF1)
19	33	C	CALF1	—	cos (ALF1)
19	34	C	ALF2	rad	Right wing angle of attack ($\alpha_W(2)$)
19	35	C	SALF2	—	sin (ALF2)
19	36	C	CALF2	—	cos (ALF2)
19	37	C	XW1	lb	X body axis left wing aerodynamic force ($X_W(1)$)
19	38	C	XW2	lb	X body axis right wing aerodynamic force ($X_W(2)$)
19	39	C	ZW1	lb	Z body axis left wing aerodynamic force ($Z_W(1)$)
19	40	C	ZW2	lb	Z body axis right wing aerodynamic force ($Z_W(2)$)
19	41	C	ALF	rad	Wing angle of attack (α')
19	42	C	SALF	—	sin (ALF)
19	43	C	CALF	—	cos (ALF)

Segment	Element	Type	Coded Name	Units	Definition
19	44	C	MW	ft lb	Wing aerodynamic pitch moment due to flaps and zero lift pitch (M_{W_B})
19	45	C	LW	ft lb	Wing body axis roll moment without asymmetric lift effects (L_{W_B})
19	46	C	NW	ft lb	Wing body axis yaw moment without asymmetric drag effects (N_{W_B})
19	47	C	DA1	rad	Left wing trailing edge flap deflection (elevon) corrected for large deflection effects ($\delta'_{TEF_W}(1)$)
19	48	C	DA2	rad	Right wing trailing edge flap deflection (elevon) corrected for large deflection effects ($\delta'_{TEF_W}(2)$)
19	49	C	EKELEL	—	Large deflection correction factor for left wing elevon ($K_{TEF_W}(1)$)
19	50	C	EKELER	—	Large deflection correction factor for right wing elevon ($K_{TEF_W}(2)$)
19	51	C	CMW1	—	Left wing pitch moment coefficient due to flaps and zero lift pitch ($C_{m_W}(1)$)
19	52	C	CMW2	—	Right wing pitch moment coefficient due to flaps and zero lift pitch ($C_{m_W}(2)$)
19	53	C	DXWING1	—	Normalized (to CW) shift of left wing center of pressure as a function of angle of attack ($\Delta X_{WING}(1)$)
19	54	C	DXWING2	—	Normalized (to CW) shift of right wing center of pressure as a function of angle of attack ($\Delta X_{WING}(2)$)

A.21 Segment 20 - Horizontal Stabilizer Aero Variables

Segment	Element	Type	Coded Name	Units	Definition
20	1	C	DXH	lb	X body axis horizontal stabilizer aerodynamic force (ΔX_H)
20	2	C	DYH	lb	Y body axis horizontal stabilizer aerodynamic force (ΔY_H)

Segment	Element	Type	Coded Name	Units	Definition
20	3	C	DZH	lb	Z body axis horizontal stabilizer aerodynamic force (ΔZ_H)
20	4	C	DLH	ft lb	Horizontal stabilizer body axis roll moment (ΔL_H)
20	5	C	DMH	ft lb	Horizontal stabilizer body axis pitch moment (ΔM_H)
20	6	C	DNH	ft lb	Horizontal stabilizer body axis yaw moment (ΔN_H)
20	7	C	UH	ft/sec	X body axis airspeed at horizontal stabilizer center of pressure (u_H)
20	8	C	WH	ft/sec	Z body axis airspeed at horizontal stabilizer center of pressure (w_H)
20	9	C	ALFG	rad	Aircraft angle of attack (α), also coded as ALPH in segment 29
20	10	C	EPS	rad	Downwash angle (ϵ)
20	11	C	DALFW	rad	Incremented angle of attack for hacking angle of attack rate effects ($\Delta\alpha_1$ or $\Delta\alpha_2$)
20	12	C	CL1	--	Wing lift coefficient at DALFW where a positive α increment is used (C_{L_1})
20	13	C	CL2	--	Wing lift coefficient at DALFW where a negative α increment is used (C_{L_2})
20	14	C	CD1	--	Wing drag coefficient at DALFW where a positive α increment is used (C_{D_1})
20	15	C	CD2	--	Wing drag coefficient at DALFW where a negative α increment is used (C_{D_2})
20	16	C	DADE	rad	Change in horizontal stabilizer angle of attack due to horizontal stabilizer control surface deflection ($\Delta\alpha_{\delta_e}$)
20	17	C	ALFH	rad	Horizontal stabilizer local angle of attack (α_H)
20	18	C	CLH	--	Horizontal stabilizer lift coefficient (C_{L_H})

Segment	Element	Type	Coded Name	Units	Definition
20	19	C	CDH	--	Horizontal stabilizer drag coefficient (C_{D_H})
20	20	C	ANG	rad	Variables related to relative wing-horizontal stabilizer location and which are used to calculate dyn[illegible] pressure at the stabilizer (Λ[illegible], D_{H_S}, D_{H_C}, $\tilde{Z}$)
20	21	C	DIS	--	
20	22	C	XI	--	
20	23	C	ZW	--	
20	24	C	DQOQO	--	Normalized dynamic pressure loss at horizontal stabilizer center of pressure ($\Delta \bar{q}/\bar{q}_0$)
20	25	C	ALFH1	rad	Horizontal stabilizer angle of attack (= $\tan^{-1}$ (WH/UH)) (α_{H_1})
20	26	C	SALFH1	--	sin (ALFH1)
20	27	C	CALFH1	--	cos (ALFH1)
20	28	C	DAH	rad	Change in horizontal stabilizer angle of attack due to angle of attack rate ($\Delta\alpha_H$)
20	29	C	DE	rad	Horizontal stabilizer control surface (i.e. elevator) deflection (δ_e)
20	30	C	QEFF	lb/ft^2	Effective dynamic pressure at horizontal stabilizer ($\bar{q}_{EFF}$)
20	31	C	DAVG	rad	Average deflection of left and right wing trailing edge flaps (δ_{TEF_A})
20	32	C	CMH	--	Horizontal stabilizer pitch moment coefficient due to flaps (C_{m_H})
20	33	C	DXHT	--	Normalized (to CE) shift of horizontal stabilizer center of pressure as a function of angle of attack (ΔX_{HT})

A.22 Segment 21 - Vertical Stabilizer Aero Variables

Segment	Element	Type	Coded Name	Units	Definition
21	1	C	DXV	lb	X body axis vertical stabilizer aerodynamic force (ΔX_V)
21	2	C	DYV	lb	Y body axis vertical stabilizer aerodynamic force (ΔY_V)

Segment	Element	Type	Coded Name	Units	Definition
21	3	C	DZV	lb	Z body axis vertical stabilizer aerodynamic force (ΔZ_V)
21	4	C	DLV	ft lb	Vertical stabilizer body axis roll moment (ΔL_V)
21	5	C	DMV	ft lb	Vertical stabilizer body axis pitch moment (ΔM_V)
21	6	C	DNV	ft lb	Vertical stabilizer body axis yaw moment (ΔN_V)
21	7	C	UV	ft/sec	X body axis airspeed at vertical stabilizer center of pressure (u_V)
21	8	C	VV	ft/sec	Y body axis airspeed at vertical stabilizer center of pressure (v_V)
21	9	C	DADR	rad	Change in vertical stabilizer angle of attack due to vertical stabilizer control surface deflection ($\Delta\alpha\delta_r$)
21	10	C	ALFV	rad	Vertical stabilizer local angle of attack (α_V)
21	11	C	CLV	--	Vertical stabilizer lift coefficient (C_{L_V})
21	12	C	CDV	--	Vertical stabilizer drag coefficient (C_{D_V})
21	13	C	ALFV1	rad	Vertical stabilizer angle of attack (= $\tan^{-1}$ (VV/UV))(α_{V_1})
21	14	C	CALFV1	--	cos (ALFV1)
21	15	C	SALFV1	--	sin (ALFV1)
21	16	C	QOV	lb/ft^2	Effective dynamic pressure at vertical stabilizer ($\bar{q}_V$)
21	17	C	DRP	rad	Rudder deflection corrected for large deflection effects (δ_r)
21	18	C	EKRUD	--	Large deflection correction factor for rudder (K_{EFF_r})
21	19	C	CMV	--	Vertical stabilizer pitch moment coefficient due to flaps (C_{m_V})

Segment	Element	Type	Coded Name	Units	Definition
21	20	C	DXVT	--	Normalized (to CV) shift of vertical stabilizer center of pressure as a function of angle of attack (ΔX_{VT})
21	21	C	VTEFF	--	Vertical tail effectiveness factor ($V_{T_{EFF}}$)

A.23 Segment 22 - Fuselage Aero Variables

Segment	Element	Type	Coded Name	Units	Definition
22	1	C	DXF	lb	X body axis fuselage aerodynamic force (ΔX_F)
22	2	C	DYF	lb	Y body axis fuselage aerodynamic force (ΔY_F)
22	3	C	DZF	lb	Z body axis fuselage aerodynamic force (ΔZ_F)
22	4	C	DLF	ft lb	Fuselage body axis roll moment (ΔL_F)
22	5	C	DMF	ft lb	Fuselage body axis pitch moment (ΔM_F)
22	6	C	DNF	ft lb	Fuselage body axis yaw moment (ΔN_F)
22	7	C	ALFF	rad	Aircraft angle of attack (α), also coded as ALPH in segment 29 and ALFG in segment 20
22	8	C	ALFYF	rad	Fuselage yaw angle of attack (α_{F_Y})
22	9	C	ALFTF	rad	Fuselage total angle of attack ($= \tan^{-1} (\sqrt{VAS^2 + WAS^2}/UAS))(\alpha_{F_T})$
22	10	C	QXY	lb/ft^2	Dynamic pressure based on UAS and VAS ($= 1/2\ \rho (UAS^2 + VAS^2))(\bar{q}_{xy})$
22	11	C	QO	lb/ft^2	Total dynamic pressure ($\bar{q}$), also coded as QBAR in segment 29

Segment	Element	Type	Coded Name	Units	Definition
22	12	C	QXZ	lb/ft^2	Dynamic pressure based on UAS and WAS (= 1/2 ρ(UAS^2 + WAS^2))($\bar{q}_{xz}$)
22	13	C	AØQ	ft^2	Fuselage axial force coefficient (A/q)
22	14	C	AS	lb	Fuselage axial force (A_F)
22	15	C	SAF	—	sin (AF) - AF is element 17 in Segment 22
22	16	C	SØQ	ft^2	Fuselage side force coefficient (S/q)
22	17	C	AF	rad	Angle redefined man, times while calculating fuselage aero forces and moments
22	18	C	NFØQ	ft^2	Fuselage normal force coefficient (N_F/q)
22	19	C	MØQ	ft^3	Fuselage pitch moment coefficient (M/q)
22	20	C	MØQ1	ft^3	Fuselage pitch moment coefficient when AF = π^2/(18(A1F - A0F))
22	21	C	S	lb	Fuselage side force (S_F)
22	22	C	NF	lb	Fuselage normal force (N_F)
22	23	C	PITCHF	ft lb	Fuselage pitch moment about reference cg (M)
22	24	C	ALFYFD	—	Not used
22	25	C	NØQ	ft^3	Fuselage yaw moment coefficient (N/q)
22	26	C	NØQ1	ft^3	Fuselage yaw moment when AF = π^2/(18(A2F))
22	27	C	YAWF	ft lb	Fuselage yaw moment about reference cg (N)
22	28	C	DFSF	ft	Shift of fuselage center of pressure as a function of angle of attack (ΔFS_F)

A.24 Segment 23 - Direct Thrust Force and Moment Variables

NOTE: For all subscripted variables in segment 23, I=1 indicates left engine and I=2 indicates right engine

Segment	Element	Type	Coded Name	Units	Definition
23	1	C	DXT	lb	X body axis direct thrust force (X_{TRST})
23	2	C	DYT	lb	Y body axis direct thrust force (Y_{TRST})
23	3	C	DZT	lb	Z body axis direct thrust force (Z_{TRST})
23	4	C	DLT	ft/lb	Direct thrust body axis roll moment (L_{TRST})
23	5	C	DMT	ft/lb	Direct thrust body axis pitch moment (M_{TRST})
23	6	C	DNT	ft/lb	Direct thrust body axis yaw moment (N_{TRST})
23	7-8	C	AFT(I)	rad	Flow turning angle of exhaust (A_{FT}(I))
23	9-10	C	TCØR(I)	lb	Net thrust applied to aircraft after correction for flow turning losses (T_{COR}(I))
23	11-12	C	DX(I)	lb	X body axis force applied by Ith engine (ΔX(I))
23	13-14	C	DY(I)	lb	Y body axis force applied by Ith engine (ΔY(I))
23	15-16	C	DZ(I)	lb	Z body axis force applied by Ith engine (ΔZ(I))
23	17-18	C	DFSSW(I)	ft	X body axis distance between nozzle swivel point and exit plane (ΔFS_{SW}(I))
23	19-20	C	DBLSW(I)	ft	Y body axis distance between nozzle swivel point and exit plane (ΔBL_{SW}(I))
23	21-22	C	DWLSW(I)	ft	Z body axis distance between nozzle swivel point and exit plane (ΔWL_{SW}(I))
23	23-24	C	SPSIT(I)	-	sin (PSIT(I))-PSIT(I) located in segment 3, elements 24 and 25
23	25-26	C	CPSIT(I)	-	cos (PSIT(I))-PSIT(I) located in segment 3, elements 24 and 25
23	27-28	C	STHT(I)	-	sin (THT(I)) THT(I) located in segment 3, elements 26 and 27
23	29-30	C	CTHT(I)	-	cos (THT(I))-THT(I) located in segment 3, elements 26 and 27
23	31	C	KAFT	-	Flow turning correction factor (K_{AFT})

A.25 Segment 24 - Inlet Ram Force and Moment Variables

NOTE: For all subscripted variables in segment 24, I=1 indicates left engine, I=2 indicates right engine.

Segment	Element	Type	Coded Name	Units	Definition
24	1	C	DXR	lb	X body axis inlet ram force (X_{RAM})
24	2	C	DYR	lb	Y body axis inlet ram force (Y_{RAM})
24	3	C	DZR	lb	Z body axis inlet ram force (Z_{RAM})
24	4	C	DLR	ft lb	Inlet ram body axis roll moment (L_{RAM})
24	5	C	DMR	ft lb	Inlet ram body axis pitch moment (M_{RAM})
24	6	C	DNR	ft lb	Inlet ram body axis yaw moment (N_{RAM})
24	7	C	VO	ft/sec	True airspeed (V_A), also coded as VA in segment 29
24	8	C	ATURNO	rad	Geometric inlet flow turning angle in X-Z inlet plane (A_{TURN_O})
24	9	C	BTURN	rad	Geometric inlet flow turning angle in X-Y inlet plane (B_{TURN})
24	10	C	CBTURN	-	cos (BTURN)
24	11	C	SBTURN	-	sin (BTURN)
24	12	C	VIN	ft/sec	Inlet flow velocity (V_{IN})
24	13-14	C	VØVI(I)	-	Ratio of true airspeed to inlet flow velocity ($VOV_{IN}(I)$)
24	15-16	C	ATURN(I)	rad	Actual inlet flow turning angle in X-Z inlet plane ($A_{TURN}(I)$)
24	17-18	C	ELRAM(I)	-	Inlet ram moment arm normalized to equivalent inlet diameter ($L_{RAM}(I)$)
24	19-20	C	DATURN(I)	rad	Difference between actual and geometric inlet flow turning angles ($\Delta A_{TURN}(I)$)
24	21-22	C	ETAR(I)	-	Ratio of actual to theoretical inlet ram force magnitude ($\eta_R(I)$)
24	23-24	C	FRAM(I)	lb	Actual inlet ram force magnitude ($F_{RAM}(I)$)
24	25	C	ELR	ft	Inlet ram force moment arm (distance along engine centerline from inlet face to inlet ram force application point)
24	26	C	WLRAM	ft	Waterline of inlet ram force application point (WL_{RAM})

Segment	Element	Type	Coded Name	Units	Definition
24	27	C	FSRAM	ft	Fuselage station of inlet ram force application point (FS_{RAM})
24	28	C	SATURN	-	Used to represent sin (ATURN(I)) for all values of I
24	29	C	CATURN	-	Used to represent cos (ATURN(I)) for all values of I
24	30-31	C	DXRO(I)	lb	X body axis inlet ram force due to freestream air flow ($\Delta X_{R_O}(I)$)
24	32-33	C	YRO(I)	lb	Y body axis inlet ram force due to freestream air flow ($\Delta Y_{R_O}(I)$)
24	34-35	C	DZRO(I)	lb	Z body axis inlet ram force due to freestream air flow ($\Delta Z_{R_O}(I)$)
24	36-37	C	DXRI(I)	lb	X body axis inlet ram force due inlet flow velocity induced by aircraft rotation rates ($\Delta X_{RI}(I)$)
24	38-39	C	DYRI(I)	lb	Y body axis inlet ram force due inlet flow velocity induced by aircraft rotation rates ($\Delta Y_{RI}(I)$)
24	40-41	C	DZRI(I)	lb	.. body axis inlet ram force due inlet flow velocity induced by aircraft rotation rates ($\Delta Z_{RI}(I)$)
24	42	C	UI	ft/sec	X body axis inlet flow velocity induced by aircraft rotation rates (u_I)
24	43	C	VI	ft/sec	Y body axis i et flow velocity induced by aircraft rotation rates (v_I)
24	44	C	WI	ft/sec	Z body axis inlet flow velocity induced by aircraft rotation rates (w_I)

A.26 Segment 25 - Coriolis Force and Moment Variables

Segment	Element	Type	Coded Name	Units	Definition
25	1	C	DXCØR	lb	X body axis Coriolis force (X_{COR})
25	2	C	DYCØR	lb	Y body axis Coriolis force (Y_{COR})
25	3	C	DZCØR	lb	Z body axis Coriolis force (Z_{COR})
25	4	C	DLCØR	ft/lb	Coriolis body axis roll moment (L_{COR})
25	5	C	DMCØR	ft/lb	Coriolis body axis pitch moment M_{COR})
25	6	C	DNCØR	ft/lb	Coriolis body axis yaw moment (N_{COR})

Segment	Element	Type	Coded Name	Units	Definition
25	7	C	ELCØR	ft	X distance from aircraft cg to engine inlet face measured along engine centerline.
25	8	C	EACØR	ft	Z distance from aircraft cg to engine centerline measured parallel to engine inlet face.
25	9	C	DLCØRD	ft/lb	Coriolis roll moment about engine centerline (L_{COR})
25	10	C	DMCØRD	ft/lb	Coriolis body axis pitch moment; same as DMCOR (M_{COR})
25	11	C	DNCØRD	ft/lb	Coriolis yaw moment perpendicular to plane defined by engine centerline and Y body axis (N_{COR})

A.27 Segment 26 - Propulsion System Variables

NOTE: For all subscripted variables in this segment, I=1 indicates left engine, I=2 indicates right engine.

Segment	Element	Type	Coded Name	Units	Definition
26	1-2	C	MDOT(I)	lbm/sec	Inlet mass flow rate ($\dot{m}$(I))
26	3-4	C	RPM(I)	rev/min	Engine rpm
26	5-6	C	TRST(I)	lb	Engine thrust corrected for RCS bleed (T_{APPL}(I))
26	7	C	BLDAVL	%	Bleed available (B_{AVL})
26	8	C	FGMAX	lb	Maximum afterburning thrust ($F_{G_{MAX}}$)
26	9	C	FGMIN	lb	Maximum non-afterburning thrust ($F_{G_{MIN}}$). Also minimum afterburning thrust.
26	10	C	FGIDL	lb	Idle thrust ($F_{G_{IDL}}$)
26	11	C	MDTMX	lbm/sec	Maximum inlet mass flow rate ($\dot{m}_{MAX}$)
26	12	C	TRCSREF	-	Not used
26	13	C	TREQAV	lb	Average uncorrected (for RCS and flow turning effects) thrust ($T_{REQ_{AV}}$)
26	14-15	C	TREQ(I)	lb	Uncorrected (for RCS and flow turning effects) thrust of Ith engine (T_o(I))
26	16	C	FRATIO	-	Ratio of uncorrected thrust to maximum non-afterburning thrust
26	17	C	FRPM	-	Fractional rpm (F_{RPM})

Segment	Element	Type	Coded Name	Units	Definition
26	18	C	KMDT	-	Fractional inlet mass flow rate.
26	19	C	KBTP	-	Thrust correction factor for RCS coupling (K_{BT})
26	20	C	TRCS	lb	Thrust loss due to RCS coupling (T_{RCS})
26	21-22	C	TC(I)	lb	Commanded thrust corrected for RCS reference bleed ($T_C(I)/K_{BT}$)
26	23-24	C	HE(I)	lb ft sec	Engine angular momentum ($H_e(I)$)
26	25-26	C	TFRACC(I)	-	Ratio of TC(I) to maximum non-afterburning thrust ($T_{F_{IN}}$)
26	27	C	TFRACIN	-	Used to represent TFRACC(I) for all values of I ($T_{F_{IN}}$)
26	28	C	FRACL	-	Ratio of maximum non-afterburning thrust to idle thrust ($F_{G_{IDL}}/F_{G_{MIN}}$)
26	29	C	TENG	sec	Engine time constant ($T_{ENG}(I)$)
26	30	C	TFRACE	-	Non-afterburning thrust dynamics loop error (T_{F_E})
26	31	C	TABIN	-	Input to afterburning thrust dynamics loop ($T_{AB_{IN}}$)
26	32	C	BLOT3	-	Not used.
26	33	C	TABE	-	Afterburning thrust dynamics loop error (T_{AB_e})
26	34-35	C	TØ(I)	lb	Same as TREQ(I) ($T_o(I)$)

A.28 Segment 27 - RCS Force and Moment Variables

Segment	Element	Type	Coded Name	Units	Definition
27	1	C	DXRCS	lb	X body axis RCS force (X_{RCS})
27	2	C	DYRCS	lb	Y body axis RCS force (Y_{RCS})
27	3	C	DZRCS	lb	Z body axis RCS force (Z_{RCS})
27	4	C	DLRCS	ft/lb	RCS body axis roll moment (L_{RCS})
27	5	C	DMRCS	ft/lb	RCS body axis pitch moment (M_{RCS})
27	6	C	DNRCS	ft/lb	RCS body axis yaw moment (N_{RCS})
27	7	C	DFRCSDB	lb	RCS force produced by those demand jets which require additional bleed ($\Delta F_{RCS_{DMD}}$)
27	8	C	DFRCSD	-	Not used.
27	9-18	C	FRCS(I)	lb	Uncorrected RCS force produced at Ith jet ($F_{RCS}(I)$)

Segment	Element	Type	Coded Name	Units	Definition
27	19	C	BLDREQ	%	Bleed required by RCS (B_{REQ})
27	20	C	FRCSAL	lb	Total RCS force available within bleed limits ($F_{RCS_{AL}}$)
27	21	C	FRCSLU	lb	Total RCS force desired ($F_{RCS_{LU}}$)
27	22-31	C	FRCSC(I)	lb	Commanded RCS force at Ith jet corrected for bleed available and mass flow rate
27	32-41	C	DXRC(I)	lb	X body axis force produced by Ith jet ($\Delta X_{RCS}(I)$)
27	42-51	C	DYRC(I)	lb	Y body axis force produced by Ith jet ($\Delta Y_{RCS}(I)$)
27	52-61	C	DZRC(I)	lb	Z body axis force produced by Ith jet ($\Delta Z_{RCS}(I)$)
27	62-71	C	DRCSC(I)	-	Commanded normalized area of Ith RCS jet ($\delta_{RCS_C}(I)$)
27	72	C	BLD	%	Bleed actually used by RCS ($\overline{BLD}$)
27	73	C	FRCSDB	-	Not used.

A.29 Segment 28 - Control System Variables

Segment	Element	Type	Coded Name	Units	Definition
28	1	C	ZEE	-	Not used.
28	2	C	ZEIC	ft	Initial value of ZE
28	3	C	YEE	ft	Error in pseudo-pilot closed zero lateral drift loop
28	4	C	YEIC	ft	Initial value of YE
28	5-8	C	ḊXE,DYE, DZE,XES	-	Not used
28	9	C	YES	ft	Y body axis position error in pseudo-pilot stationkeeping option
28	10	C	ZES	ft	Z body axis position error in pseudo-pilot stationkeeping option
28	11	C	CSSW	-	Control system function switch gain (CS_{SW})
28	12	C	RØLLCMD	rad or rad/sec	Cockpit input to roll control system; combines lateral stick and pedal inputs in accordance with control system function switching (P_{CMD})
28	13	C	DLATSTK	rad or rad/sec	Lateral stick deflection (δ_{LATSTK})
28	14	C	AKPC	rad	Roll control system input gain(K_{p_C})

Segment	Element	Type	Coded Name	Units	Definition
28	15	C	AKPCI	---	Roll input integrator selector gain ($K_{p_{c_I}}$)
28	16	C	PCMD	rad	Shaped input to roll control system (p_c)
28	17	C	AKPE	1/rad	Roll control system error gain (K_{p_e})
28	18	C	AKPEI	---	Roll error integrator selector gain for roll control system ($K_{p_{e_I}}$)
28	19	C	PE	rad	Roll control system error (p_e)
28	20	C	DROLL	-	Normalized roll control (δ_{ROLL})
28	21	C	YAWCMD	rad or rad/sec	Cockpit input to yaw control system; combines lateral stick and pedal inputs in accordance with control system function switching (R_{CMD})
28	22	C	DPED	rad or rad/sec	Pedal deflection (δ_{PED})
28	23	C	AKRC	rad	Yaw control system input gain (K_{r_c})
28	24	C	AKRCI	---	Yaw input integrator selector gain ($K_{r_{c_I}}$)
28	25	C	YTRMBUT	-	Yaw control system trim input ($\delta_{r_{BUT}}$)
28	26	C	RE	rad	Yaw control system error (r_e)
28	27	C	AKRE	1/rad	Yaw control system error gain (K_{r_e})
28	28	C	AKREI	---	Yaw error integrator selector gain for yaw control system ($K_{r_{e_I}}$)
28	29	C	DYAW	-	Normalized yaw control (δ_{YAW})
28	30	C	AKAY	rad/ft/sec^2	Lateral acceleration feedback gain (K_{a_y})
28	31	C	DLNGSTK	rad or rad/sec	Longitudinal stick deflection (δ_{LNGSTK})
28	32	C	AKQC	rad	Pitch control system input gain (K_{q_c})
28	33	C	AKQCI	---	Pitch input integrator selector gain ($K_{q_{c_I}}$)
28	34	C	PTRMBUT	-	Pitch control system trim input ($\delta_{q_{BUT}}$)
28	35	C	QE	rad	Pitch control system error (q_e)
28	36	C	AKQE	1/rad	Pitch control system error gain (K_{q_e})

Segment	Element	Type	Coded Name	Units	Definition
28	39	C	AKQEI	—	Pitch error integrator selector gain for pitch control system ($K_{q_{e_I}}$
28	38	C	DPITCH	—	Normalized pitch control (δ_{PITCH})
28	39	C	ZEDTC	ft/sec	Heave control system input ($\dot{z}_{e_C}$)
28	40	C	ZEDTE	ft/sec	Heave control system error ($\dot{z}_{e_e}$)
28	41	C	AKZE	lb/ft/sec	Heave control system error gain (K_{z_e})
28	42	C	AKZEI	lb/sec/ft/sec	Heave control system error integrator gain ($K_{z_{eI1}} K_{z_e}$)
28	43	C	DTHRØT	—	Manual throttle input (δ_{THROT})
28	44	C	DSIDEF	—	Normalized side force control
28	45	C	[illegible]	—	Normalized normal force control
28	46-47	C	PSITC(I)	rad	Commanded yaw thrust deflection for Ith engine I = 1 for left engine, I = 2 for right engine (ψ_{T_C} (I))
28	48-49	C	THTC(I)	rad	Commanded pitch thrust deflection for Ith engine; I = 1 for left engine, I = 2 for right engine (θ_{T_C} (I))
28	50	C	DEC	rad	Commanded symmetrical elevon deflection (δ_{e_C})
28	51	C	DRC	rad	Commanded rudder deflection (δ_{r_C})
28	52	C	DAC	rad	Commanded differential elevon deflection (δ_{a_C})
28	53	C	DRCSR	—	Normalized command for RCS roll control
28	54	C	DRCSP	—	Normalized command for RCS pitch control
28	55	C	DRCSY	—	Normalized command for RCS yaw control
28	56	C	DRCSSF	—	Normalized command for RCS side force control
28	57	C	DRCSNF	—	Normalized command for RCS normal force control
28	58	C	TCMD	lb	Commanded thrust (T_{CMD})
28	59	C	HFLAPC	rad	Commanded canard trailing edge flap deflection ($\delta_{TEF_{H_C}}$)

Segment	Element	Type	Coded Name	Units	Definition
28	60	C	WFLAPC	rad	Commanded wing leading edge flap deflection ($\delta_{LEF_{H_C}}$)
28	61	C	LELEVNC	rad	Commanded left elevon deflection ($\delta_{TEF_{W_C}}$ (1))
28	62	C	RELEVNC	rad	Commanded right elevon deflection ($\delta_{TEF_{W_C}}$ (2))
28	63	C	AKPCI1	rad/sec	Roll control system input integrator gain ($K_{p_{eI1}}$)
28	64	C	AKPEI1	1/sec	Multiplies roll control system error gain to form error integrator gain ($K_{p_{eI1}}$)
28	65	C	AKP	rad/rad/sec	Roll control system roll rate feedback gain (K_{p_p})
28	66	C	AKRCI1	rad/sec	Yaw control system input integrator ($K_{r_{cI1}}$)
28	67	C	AKREI1	1/sec	Multiplies yaw control system error gain to form error integrator gain ($K_{r_{eI1}}$)
28	68	C	AKR	rad/rad/sec	Yaw control system yaw rate feedback gain (K_{r_r})
28	69	C	AKQCI1	rad/sec	Pitch control system input integrator gain ($K_{q_{cII}}$)
28	70	C	AKQEI1	1/sec	Multiplies pitch control system error gain to form error integrator gain ($K_{q_{eI1}}$)
28	71	C	AKQ	rad/rad/sec	Pitch control system pitch rate feedback gain (K_{q_q})
28	72	C	AKZEI1	1/sec	Multiplies heave control system error gain to form error integrator gain ($K_{z_{eI1}}$)
28	73	N	CSVSW	--	Not used in final version of program.
28	74	C	TPITCH	sec	Pitch input shaping filter time constant
28	75	C	TROLL	sec	Roll input shaping filter time constant
28	76	C	TYAW	sec	Yaw input shaping filter time constant

A.30 Segment 29 - Miscellaneous Air Data, Force and Moment and Kinematic Variables

Segment	Element	Type	Coded Name	Units	Definition
29	1	C	UAS	ft/sec	X body axis component of airspeed (u_{AS})
29	2	C	VAS	ft/sec	Y body axis component of airspeed (v_{AS})
29	3	C	WAS	ft/sec	Z body axis component of airspeed (w_{AS})
29	4	C	RHØ	slug/ft^3	Air density (ρ)
29	5	C	TAMB	deg R	Ambient air temperature (Available but not used in program)
29	6	C	VSØUND	ft/sec	Speed of sound (V_{ss})
29	7	C	TRATIØ	--	Temperature ratio (Available but not used in program
29	8	C	PRATIØ	--	Pressure ratio (Available but not used in program)
29	9	C	VA	ft/sec	Total airspeed (V_A)
29	10	C	VK	kt	Total airspeed (V_A)
29	11	C	MN	--	Mach number (M_N)
29	12	C	QBAR	lb/ft^2	Dynamic pressure ($\bar{q}$)
29	13	C	ALPH	rad	Angle of attack (α)
29	14	C	BETA	rad	Sideslip angle (β)
29	15	C'	ALFAD	rad/sec	Rate of change of angle of attack ($\dot{\alpha}$)
29	16	C	SALPH	—	sin (α)
29	17	C	CALPH	—	cos (α)
29	18	C	SBETA	—	sin (β)
29	19	C	CBETA	--	cos (β)
29	20	C	XAERØ	lb	Total X body axis aerodynamic force (X_{AERO})
29	21	C	YAERØ	lb	Total Y body axis aerodynamic force (Y_{AERO})
29	22	C	ZAERØ	lb	Total Z body axis aerodynamic force (Z_{AERO})
29	23	C	LAERØ	ft lb	Total aerodynamic body axis roll moment (L_{AERO})

Segment	Element	Type	Coded Name	Units	Definition
29	24	C	MAERØ	ft lb	Total aerodynamic body axis pitch moment (M_{AERO})
29	25	C	NAERØ	ft lb	Total aerodynamic body axis yaw moment (N_{AERO})
29	26	C	SUMFX	lb	Total X body axis applied force (X_{TOT})
29	27	C	SUMFY	lb	Total Y body axis applied force (Y_{TOT})
29	28	C	SUMFZ	lb	Total Z body axis applied force (Z_{TOT})
29	29	C	SUML	ft lb	Total body axis applied roll moment (L_{TOT})
29	30	C	SUMM	ft lb	Total body axis applied pitch moment (M_{TOT})
29	31	C	SUMN	ft lb	Total body axis applied yaw moment (N_{TOT})
29	32	C	D11P	--	Corrected d_{11} direction cosine (d'_{11})
29	33	C	D12P	--	Corrected d_{12} direction cosine (d'_{12})
29	34	C	D13P	--	Corrected d_{13} direction cosine (d'_{13})
29	35	C	D21P	--	Corrected d_{21} direction cosine (d'_{21})
29	36	C	D22P	--	Corrected d_{22} direction cosine (d'_{22})
29	37	C	D23P	--	Corrected d_{23} direction cosine (d'_{23})
29	38	C	D31P	--	Corrected d_{31} direction cosine (d'_{31})
29	39	C	D32P	--	Corrected d_{32} direction cosine (d'_{32})
29	40	C	D33P	--	Corrected d_{33} direction cosine (d'_{33})
29	41	C	DCMAG	--	Determinant of direction cosine matrix
29	42	C	UAIR	ft/sec	X body axis component of airmass velocity (u_{AIR})
29	43	C	VAIR	ft/sec	Y body axis component of airmass velocity (v_{AIR})
29	44	C	WAIR	ft/sec	Z body axis component of airmass velocity (w_{AIR})

Segment	Element	Type	Coded Name	Units	Definition
29	45	C	ALT	ft	Altitude ($= -z_e$)
29	46	C	RS	rad/sec	Stability axis yaw rate (r_s)
29	47	C	PS	rad/sec	Stability axis roll rate (p_s)
29	48-50	C	BLØT1(3)	--	Not used
29	51	C	GYRØL	ft lb	Gyroscopic body axis roll moment (L_{GYRO})
29	52	C	GYRØM	ft lb	Gyroscopic body axis pitch moment (M_{GYRO})
29	53	C	GYRØN	ft lb	Gyroscopic body yaw moment (N_{GYRO})
29	54	C	NXCG	g	X body axis load factor ($n_{X_{CG}}$)
29	55	C	NYCG	g	Y body axis load factor ($n_{Y_{CG}}$)
29	56	C	NZCG	g	Z body axis load factor ($n_{Z_{CG}}$)
29	57	C	XDW	ft/sec	X inertial axis airmass velocity component
29	58	C	YDW	ft/sec	Y inertial axis airmass velocity component
29	59	C	ZDW	ft/sec	Z inertial axis airmass velocity component
[illegible]	60-62	C	BLØT2(3)	--	Not used
29	63	C	LPRIME	rad/sec^2	Body axis roll moment adjusted to include cross product of inertia coupling of yaw moment. LPRIME equals PDOT at time zero with zero initial conditions on angular rates.
29	64	C	NPRIME	rad/sec^2	Body axis yaw moment adjusted to include cross product of inertia coupling of roll moment. NPRIME equals RDOT at time zero with zero initial conditions on angular rates.

Segment	Element	Type	Coded Name	Units	Definition
29	65	C	VE	ft/sec	Magnitude of inertial speed ($= \sqrt{U^2 + V^2 + W^2}$)
29	66	C	VEDT	ft/sec^2	Rate of change of magnitude of inertial speed.
29	67	C	VEEST	ft/sec	Predicted magnitude of inertial speed (VEEST = VEDT*DT + VE)

A.31 Segment 30 - Inlet Ram Forces and Moments Tables

Segment	Element	Type	Coded Name	Units	Definition
30	1-5	N	VØVIT(I)	--	Table entries for independent variable VOVI used to determine ram drag parameters (I is defined by AVOVI and must be ≤ 5)
30	6-13	N	ATURNT(J)	rad	Table entries for independent variable ATURN used to determine inlet ram parameters (J is defined by AATURN and must be ≤ 8)
30	14-53	N	ELRAMT(I,J)	--	Table entries for normalized (to equivalent inlet diameter) inlet ram moment arm. Table is addressed by defining values for VOVI and ATURN. ELRAMT(I,J) is the value of ELRAM when VOVI = VOVIT(I) and ATURN = ATURNT(J)
30	54-93	N	DATURNT(I,J)	rad	Table entries for difference between actual and geometric inlet flow turning angles. Table is addressed by defining values for VOVI and ATURN. DATURNT(I,J) is the value of DATURN when VOVI = VOVIT(I) and ATURN = ATURNT(J)
30	94-133	N	ETART(I,J)	--	Table entries for ratio of actual to theoretical inlet ram force magnitude. Table is addressed by defining values for VOVI and ATURN. ETART (I,J) is the value of ETAR when VOVI = VOVIT(I) and ATURN = ATURNT(J)

A.32 Segment 31 - RCS Forces and Moments Tables

Segment	Element	Type	Coded Name	Units	Definition
31	1-6	N	FRCST(I)	lb	Entries for RCS force table. Table is used with BLDRT to determine RCS force as a function of bleed or vice versa. I is defined by ABLDR and must be ≤ 6.
31	7-12	N	BLDRT(I)	%	Entries for bleed table. Table is used with FRCST to determine bleed as a function of RCS force or vice versa. I is defined by ABLDR and must be ≤ 6. BLDRT (I) equals bleed when RCS force equals FRCST(I).

A.33 Segment 32 - Thrust Related Tables

Segment	Element	Type	Coded Name	Units	Definition
32	1-4	N	MNT(I)		Entries in Mach number table. Table used with TFGMAX, TFGMIN, TFGIDL and TMDT to obtain maximum and minimum afterburning thrust, idle thrust and maximum inlet mass flow rate as functions of Mach number. I is defined by AMACH and must be ≤ 4.
32	5-8	N	TFGMAX(I)	lb	Entries in maximum afterburning thrust table. I must be ≤ 4. TFGMAX(I) equals FGMAX at MN=MNT(I).
32	9-12	N	TFGMIN(I)	lb	Entries in minimum afterburning thrust table. I must be ≤ 4. TFGMIN(I) equals FGMIN at MN=MNT(I).
32	13-16	N	TFGIDL(I)	lb	Entries in idle thrust table. I must be ≤ 4. TFGIDL(I) equals FGIDL at MN=MNT(I).
32	17-20	N	TMDT(I)	lbm/sec	Entries in maximum inlet mass flow rate table. I must be ≤ 4. TMDT(I) equals MDTMX at MN=MNT (I).

Segment	Element	Type	Coded Name	Units	Definition
32	21-26	N	TFRAT(I)	—	Entries in fractional non-afterburning thrust table. Table used with TRPM to obtain fractional engine rpm. I is defined by AFRAT and must be ≤ 6.
32	27-32	N	TRPM(I)	—	Entries in fractional rpm table. I must be ≤ 6. TRPM(I) equals FRPM at FRATIO=TFRAT(I).
32	33-42	N	TFRACT(I)	—	Entries in fractional non-afterburning thrust table. Table used with TACCEL, TDECEL, and TTENG to obtain engine acceleration and deceleration limits and time constant. I is defined by AFRAC and must be ≤ 10.
32	43-52	N	TACCEL(I)	1/sec	Entries in acceleration limit table. I must be ≤ 10. TACCEL (I) equals acceleration limit at TFRAC=TFRACT(I).
32	53-62	N	TDECEL(I)	1/sec	Entries in deceleration limit table. I must be ≤ 10. TDECEL (I) equals deceleration limit at TFRAC=TFRACT(I).
32	63-72	N	TTENG(I)	sec	Entries in engine time constant table. I must be ≤ 10. TTENG (I) equals TENG at TFRAC=TFRACT(I).

A.34 Segments 33 through 39 - Stability Derivative Arrays and Control Parameters

X, Y and Z force and roll, pitch and yaw moment stability derivatives are stored in that order in segments 33 through 38, i.e., X force derivatives are contained in segment 33, Y force derivatives in segment 34, etc. to yaw moment derivatives in segment 38. Stored within each segment are the total derivatives along with the contributions to those derivatives from each source of applied forces and moments.

Derivative contributions from wing, horizontal stabilizer, vertical stabilizer, fuselage, total aero, direct thrust, ram drag, Coriolis, and RCS are included. Derivatives are calculated for perturbations in 22 (space for 25 is available) state and/or control variables. These variables designated by I in the segment listing below are as follows:

I	Perturbed Variable	Segment	Element	Units
1	VAS	29	1	ft/sec
2	WAS	29	3	ft/sec
3	Q	3	5	rad/sec
4	DEC	28	50	rad
5	DFLAPW	3	49	rad
6	DFLAPH	3	48	rad
7	DRCSP	28	54	-
8	DRCSNF	28	57	-
9	TØ(1)	26	34	lb
10	TØ(2)	26	35	lb
11	THT(1)	3	26	rad
12	THT(2)	3	27	rad
13	VAS	29	2	ft/sec
14	P	3	4	rad/sec
15	R	3	6	rad/sec
16	DR	3	21	rad
17	DAC	28	52	rad
18	DRCSR	28	53	-
19	DRCSY	28	55	-
20	DRCSSF	28	56	-
21	PSIT(1)	3	24	rad
22	PSIT(2)	3	25	rad

Note in the segment listing that PUPIIV was adopted as a shorthand notation for "per unit perturbation in Ith variable"

Segment	Element	Type	Coded Name	Units	Definition
33	1-25	C	DXWG(I)	ft/sec^2/ units of I	Change in wing X body axis force PUPIIV (per unit perturbation in Ith variable).
33	26-50	C	DXHS(I)	ft/sec^2/ units of I	Change in horizontal stabilizer X body axis force PUPIIV.
33	51-75	C	DXVS(I)	ft/sec^2/ units of I	Change in vertical stabilizer X body axis force PUPIIV.
33	76-100	C	DXFS(I)	ft/sec^2/ units of I	Change in fuselage X body axis force PUPIIV.
33	101-125	C	DXAER(I)	ft/sec^2/ units of I	Change in aerodynamic X body axis force PUPIIV.
33	126-150	C	DXTS(I)	ft/sec^2/ units of I	Change in direct thrust X body axis force PUPIIV.
33	151-175	C	DXRAM(I)	ft/sec^2/ units of I	Change in inlet ram X body axis force PUPIIV.

Segment	Element	Type	Coded Name	Units	Definition
33	176-200	C	DXCLS(I)	ft/sec^2/ units of I	Change in Coriolis X body axis force PUPIIV.
33	201-225	C	DXRCSF(I)	ft/sec^2/ units of I	Change in RCS X body axis force PUPIIV.
33	226-250	C	X(I)	ft/sec^2/ units of I	Change in total X body axis force PUPIIV.
34	1-25	C	DYWG(I)	ft/sec^2/ units of I	Change in wing Y body axis force per PUPIIV.
34	26-50	C	DYHS(I)	ft/sec^2/ units of I	Change in horizontal stabilizer Y body axis force PUPIIV.
34	51-75	C	DYVS(I)	ft/sec^2/ units of I	Change in vertical stabilizer Y body axis force PUPIIV.
34	76-100	C	DYFS(I)	ft/sec^2/ units of I	Change in fuselage Y body axis force PUPIIV.
34	101-125	C	DYAER(I)	ft/sec^2/ units of I	Change in aerodynamic Y body axis force PUPIIV.
34	126-150	C	DYTS(I)	ft/sec^2/ units of I	Change in direct thrust Y body axis force PUPIIV.
34	151-175	C	DYRAM(I)	ft/sec^2/ units of I	Change in inlet ram Y body axis force PUPIIV.
34	176-200	C	DYCLS(I)	ft/sec^2/ units of I	Change in Coriolis Y body axis force PUPIIV.
34	201-225	C	DYRCSF(I)	ft/sec^2/ units of I	Change in RCS Y body axis force PUPIIV.
34	226-250	C	Y(I)	ft/sec^2/ units of I	Change in total Y body axis force PUPIIV.
35	1-25	C	DZWG(I)	ft/sec^2/ units of I	Change in wing Z body axis force PUPIIV.
35	26-50	C	DZHS(I)	ft/sec^2/ units of I	Change in horizontal stabilizer Z body axis force PUPIIV.
35	51-75	C	DZYS(I)	ft/sec^2/ units of I	Change in vertical stabilizer Z body axis force PUPIIV.
35	76-100	C	DZFS(I)	ft/sec^2/ units of I	Change in fuselage Z body axis force PUPIIV.

Segment	Element	Type	Coded Name	Units	Definition
35	101-125	C	DZAER(I)	ft/sec^2/ units of I	Change in aerodynamic Z body axis force PUPIIV.
35	125-150	C	DZTS(I)	ft/sec^2/ units of I	Change in direct thrust Z body axis force PUPIIV.
35	151-175	C	DZRAM(I)	ft/sec^2/ units of I	Change in inlet ram Z body axis force PUPIIV.
35	176-200	C	DZCLS(I)	ft/sec^2/ units of I	Change in Coriolis Z body axis force PUPIIV.
35	201-225	C	DZRCSF(I)	ft/sec^2/ units of I	Change in RCS Z body axis force PUPIIV.
35	226-250	C	Z(I)	ft/sec^2/ units of I	Change in total Z body axis force PUPIIV.
36	1-25	C	DLWG(I)	rad/sec^2/ units of I	Change in wing body axis roll moment PUPIIV.
36	26-50	C	DLHS(I)	rad/sec^2/ units of I	Change in horizontal stabilizer body axis roll moment PUPIIV.
36	51-75	C	DLVS(I)	rad/sec^2/ units of I	Change in vertical stabilizer body axis roll moment PUPIIV.
36	76-100	C	DLFS(I)	rad/sec^2/ units of I	Change in fuselage body axis roll moment PUPIIV.
36	101-125	C	DLAER(I)	rad/sec^2/ units of I	Change in aerodynamic body axis roll moment PUPIIV.
36	126-150	C	DLTS(I)	rad/sec^2/ units of I	Change in direct thrust body axis roll moment PUPIIV.
36	151-175	C	DLRAM(I)	rad/sec^2/ units of I	Change in inlet ram body axis roll moment PUPIIV.
36	176-200	C	DLCLS(I)	rad/sec^2/ units of I	Change in Coriolis body axis roll moment PUPIIV.
36	201-225	C	DLRCSF(I)	rad/sec^2/ units of I	Change in RCS body axis roll moment PUPIIV.
36	226-250	C	AL(I)	rad/sec^2/ units of I	Change in total body axis roll moment PUPIIV.

Segment	Element	Type	Coded Name	Units	Definition
37	1-25	C	DMWG(I)	rad/sec^2/ units of I	Change in wing body axis pitch moment PUPIIV.
37	26-50	C	DMHS(I)	rad/sec^2/ units of I	Change in horizontal stabilizer body axis pitch moment PUPIIV.
37	51-75	C	DMVS(I)	rad/sec^2/ units of I	Change in vertical stabilizer body axis pitch moment PUPIIV.
37	76-100	C	DMFS(I)	rad/sec^2/ units of I	Change in fuselage body axis pitch moment PUPIIV.
37	101-125	C	DMAER(I)	rad/sec^2/ units of I	Change in aerodynamic body axis pitch moment PUPIIV.
37	126-150	C	DMTS(I)	rad/sec^2/ units of I	Change in direct thrust body axis pitch moment PUPIIV.
37	151-175	C	DMRAM(I)	rad/sec^2/ units of I	Change in inlet ram body axis pitch moment PUPIIV.
37	176-200	C	DMCLS(I)	rad/sec^2/ units of I	Change in Coriolis body axis pitch moment PUPIIV.
37	201-225	C	DMRCSF(I)	rad/sec^2/ units of I	Change in RCS body axis pitch moment PUPIIV.
37	226-250	C	AM(I)	rad/sec^2/ units of I	Change in total body axis pitch moment PUPIIV.
38	1-25	C	DNWG(I)	rad/sec^2/ units of I	Change in wing body axis yaw moment PUPIIV.
38	26-50	C	DNHS(I)	rad/sec^2/ units of I	Change in horizontal stabilizer body axis yaw moment PUPIIV.
38	51-75	C	DNVS(I)	rad/sec^2/ units of I	Change in vertical stabilizer body axis yaw moment PUPIIV.
38	76-100	C	DNFS(I)	rad/sec^2/ units of I	Change in fuselage body axis yaw moment PUPIIV.
38	101-125	C	DNAER(I)	rad/sec^2/ units of I	Change in aerodynamic body axis yaw moment PUPIIV.
38	126-150	C	DNTS(I)	rad/sec^2/ units of I	Change in direct thrust body axis yaw moment PUPIIV.
38	151-175	C	DNRAM(I)	rad/sec^2/ units of I	Change in inlet ram body axis yaw moment PUPIIV.
38	176-200	C	DNCLS(I)	rad/sec^2/ units of I	Change in Coriolis body axis yaw moment PUPIIV.

Segment	Element	Type	Coded Name	Units	Definition
38	201-225	C	DNRCSF(I)	rad/sec²/ units of I	Change in RCS body axis yaw moment PUPIIV.
38	226-250	C	AN(I)	rad/sec²/ units of I	Change in total body axis yaw moment PUPIIV.

Segment 39 stores information regarding the number of variables to be perturbed to form stability derivatives and the size of these perturbations.

Segment	Element	Type	Coded Name	Units	Definition
39	1	N	ADER	-	Number of variables to be perturbed to form stability derivatives ($\leq$ 25). In current program set-up, ADER= 22.
39	2-26	N	DELV(I)	Varies	Size of perturbation in Ith variable to be used in computing stability derivatives.

A.35 Segment 40 - Scratch COMMON

Fifty locations labeled WORK have been set aside as segment 40 for use in making temporary program changes or for further program development. The WORK array is not used in the current program set-up.

A.36 Segment 41 - Miscellaneous Constants

Segment	Element	Type	Coded Name	Units	Definition
41	1	N	AWIND	-	AWIND not equal to zero indicates a moving airmass and that the trim in a wind option is to be invoked.
41	2	N	VWIND	ft/sec	Magnitude of airmass velocity (VWIND)
41	3	N	PSIWIND	rad	Direction of airmass velocity. For headwind, PSIWIND=180 deg= 3.14159 rad. (ΨWIND)
41	4	N	XE2D	ft/sec²	Initial value of aircraft inertial acceleration along X inertial axis

Segment	Element	Type	Coded Name	Units	Definition
41	5	N	YE2D	ft/sec^2	Initial value of aircraft inertial acceleration along Y inertial axis
41	6	N	ZE2D	ft/sec^2	Initial value of aircraft inertial acceleration along Z inertial axis
41	7	N	TRMTURN	--	TRMTURN not equal to zero indicates that airplane is to be trimmed in a steady turn. GAMMA, VADOT, and TURNRAD must be specified if TRMTURN $\neq 0$.
41	8	N	GAMMA	rad	Airplane flight path angle
41	9	N	VADOT	ft/sec^2	Airplane deceleration along flight path
41	10	N	TURNRAD	ft	Radius of turn

A.37 Segment 42 - Aero Surface Effectiveness Tables

Segment	Element	Type	Coded Name	Units	Definition
42	1-7	N	ELEVT(I)	rad	Entries in elevon table. Table used with EKELET to obtain elevon effectiveness as a function of elevon deflection. I is defined by AEKEL and must be $\leq$ 7.
42	8-14	N	EKELET(I)	-	Entries in elevon effectiveness table. I must be $\leq$ 7. EKELET (I) equals elevon effectiveness at ABS (LELEVN) or ABS (RELEVN)=(ELEVT(I).
42	15-21	N	RUDT(I)	rad	Entries in rudder table. Table used with EKRUDT to obtain rudder effectiveness as a function of rudder deflection. I is defined by AEKRUD and must be $\leq$ 7.
42	22-28	N	EKRUDT(I)	-	Entries in rudder effectiveness table. I must be $\leq$ 7. EKRUDT (I) equals rudder effectiveness at ABS(DR)=RUDT(I).

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A.38 **Segment 43 - Pseudo-Pilot Input Control Data**

Segment	Element	Type	Coded Name	Units	Definition
43	1-5	N	ACMD(I)	--	Each nonzero ACMD(I) specifies a cockpit control input time history which is to be imposed on the aircraft. ACMD(I) = 1. indicates DLNGSTK input, = 2. indicates DLATSTK input, = 3. indicates DPED input, = 4. indicates ZEDTC input, = 5. indicates THROT input. For example, if ACMD(1) = 3. and ACMD(2) = 1., simultaneous DPED and DLNGSTK inputs are imposed on the aircraft.
43	6	N	ATIME	--	Number of entries in the cockpit control time history tables and must be $\leq$ 20
43	7	N	ASKEEP	--	ASKEEP not equal to zero activates pseudo-pilot stationkeeping loops.
43	8	N	AYEHLD	--	Not used in final versi n of program.
43	9-28	N	CMDTI(I)	varies	Entries in DLNGSTK input time history table. CMDT1(I) equals DLNGSTK when T(time) = TIMET(I).
43	29-48	N	CMDT2(I)	varies	Entries in DLATSTK input time history table. CMDT2(I) equals DLATSTK when T(time) = TIMET(I).
43	49-68	N	CMDT3(I)	varies	Entries in DPED input time history table. CMDT3(I) equals DPED when T(time) = TIMET(I)
43	69-88	N	CMDT4(I)	ft/sec	Entries in ZEDTC input time history table. CMDT4(I) equals ZEDTC when T(time) = TIMET(I)
43	89-108	N	CMDT5(I)	fractional throttle deflection	Entries in THROT input time history table. CMDT5(I) equals THROT when T(time) = TIMET(I).
43	109-128	N	TIMET(I)	sec	Entries in time table. Table used with CMDT1, CMDT2, CMDT3, CMDT4, and CMDT5. I is defined by ATIME and must be $\leq$ 20.
43	129	N	ATRANS	--	ATRANS not equal to zero activates a pseudo-pilot flown transition.
43	130	N	AVAT	--	Number of entries in transition tables (THROTT, VAT, and THETCT). Must be $\leq$ 10.
43	131	N	TTRANS	sec	Time at which transition is initiated.

Segment	Element	Type	Coded Name	Units	Definition
43	132-141	N	THROTT(I)	fractional throttle deflection	Entries in transition throttle table. THROTT(I) equals manual throttle setting when VE or VEEST = VAT(I)
43	142-151	N	VAT(I)	ft/sec	Entries in transition speed table. Table used with THROTT and THETCT to obtain throttle setting and pitch angle as a function of inertial speed during transition.
43	152-161	N	THETCT(I)	rad	Entries in transition pitch angle table. THETCT(I) equals desired pitch angle when VE or VEEST = VAT(I)

A.39 Segment 44 - Tables, Constants, and Variables for Varying Feedback Control Laws

Segment	Element	Type	Coded Name	Units	Definition
44	1	N	ACSSW	--	Number of entries in control system variable selector tables. Must be ≤ 5.
44	2-6	N	TCSSW1(I)	--	Entries in CSSW table. Table entered with CSSW and usjd with all other tables in this COMMON segment.
44	7-11	N	TAKQS(I)	--	Entries in pitch rate selector table. TAKQS(I)≠0. specifies that Q is fed-back in pitch control system.
44	12-16	N	TKPINT(I)	--	Entries in integral of roll rate selector table. TKPINT(I)≠0. specifies that PINT is fedback in roll control system when CSSW=TCSSW1(I).
44	22-26	N	TKPB(I)	--	Entries in roll rate selector table TKPB(I) ≠0. specifies P is fedback in roll control system when CSSW= TCSSW1(I). TKPB(I)=0. specifies PS feedback when CSSW=TCSSW1(I).
44	27-31	N	TKPS(I)	--	Not used in final version of program.
44	32-36	N	TKQINT(I)	--	Entries in integral of pitch rate selector table. TKQINT≠0. specifies that QINT is fedback in pitch control system when CSSW=TCSSW1(I).

Segment	Element	Type	Coded Name	Units	Definition
44	37-41	N	TKTHETA(I)	--	Entries in pitch angle selector table. TKTHETA(I)≠0. specifies that THETA is fedback in pitch control system when CSSW=TCSSW1(I).
44	42-46	N	TKRINT(I)	--	Entries in integral of yaw rate selector table. TKRINT≠0. specifies that RINT is fedback in yaw control system when CSSW=TCSSW1(I).
44	47-51	N	TKPSI(I)	--	Entries in yaw angle selector table. TKPSI(I)≠0. specifies that PSI is fedback in yaw control system when CSSW=TCSSW1(I).
44	52-56	N	TKRB(I)	--	Entries in yaw rate selector table. TKRB(I)≠0. specifies that R is fedback in yaw control system when CSSW=TCSSW(I). TKRB(I)=0. specifies RS feedback when CSSW=TCSSW1(I).
44	57-61	N	TAKPCI(I)	--	Entries in roll input integrator selector table. TAKPCI(I)≠0. activates roll input integrator when CSSW=TCSSW1(I).
44	62-66	N	TAKPEI(I)	--	Entries in roll error integrator selector table. TAKPEI(I)≠ 0. **Activitates roll error integration in roll control system when CSSW TCSSW1(I)**
44	67-71	N	TAKRCI(I)	--	Entries in yaw input integrator selector table. TAKRCI(I)≠0. activates yaw input integrator when CSSW=TCSSW1(I).
44	72-76	N	TAKREI(I)	--	Entries in yaw error integrator selector table. TAKREI(I)≠0 activates yaw error integrator in yaw control system when CSSW=TCSSW1(I).
44	77-81	N	TAKQCI(I)	--	Entries in pitch input integrator selector table. TAKQCI(I)≠0. activates pitch input integrator when CSSW= TCSSW1(I).
44	82-86	N	TAKQEI(I)	--	Entries in pitch error integrator selector table. TAKQEI(I)≠0. activates pitch error integrator in pitch control system when CSSW=TCSSW1(I).
44	87-91	N	TKRS(I)	--	Not used in final version of program.
44	92	N	AKPHIRS	varies	AKPHIRS≠0. specifies (GC/VA)* PHI feedback in yaw control system ($K_{\phi_{r_s}}$).

Segment	Element	Type	Coded Name	Units	Definition
44	93	C	AKPINT	--	Integral of roll rate feedback selector gain for roll control system ($K_{\int p}$)
44	94	C	AKPHI	--	Roll angle feedback selector gain for roll control system. (K_{ϕ})
44	95	C	AKPB	--	Roll rate feedback selector gain for roll control system. AKPB=0. selects PS; AKPB=1. selects P; AKPB≠0. or 1. mixes P and PS. (K_{p_B})
44	96	C	AKPS	--	Not used in final version of program.
44	97	C	AKQINT	--	Integral of pitch rate feedback selector gain for pitch control system ($K_{\int q}$)
44	98	C	AKTHETA	--	Pitch angle feedback selector gain for pitch control system (K_{θ})
44	99	C	AKRINT	--	Integral of yaw rate feedback selector gain for yaw control system ($K_{\int r}$).
44	100	C	AKPSI	--	Yaw angle feedback selector gain for yaw control system (K_{ψ})
44	101	C	AKRB	--	Yaw rate feedback selector gain for yaw control system. AKRB=0. selects RS; AKRB=1. selects R; AKRB≠0. or 1. mixes R and RS. (K_{r_B})
44	102	C	AKRS	--	Not used in final version of program
44	103	C	AKQS	--	Pitch rate feedback selector gain for pitch control system.

A.40 Segment 45 - Tables and Constants for Control System Gains which Vary as Functions of Airspeed

Segment	Element	Type	Coded Name	Units	Definition
45	1	N	VELGATN	--	VELGAIN≠0. specifies that control system gains are functions of airspeed. VELGAIN=0. implies that control system gains are functions of pitch angle

Segment	Element	Type	Coded Name	Units	Definition
45	2	N	AVEL	--	Number of entries in control system gains airspeed table (≤8).
45	3-10	N	TVEL(I)	ft/sec	Airspeed table for determining control system gains
45	11-18	N	VAKPC(I)	rad	Roll control system input gain table if the gain is a function of airspeed.
45	19-26	N	VKPCI1(I)	rad/sec	Roll control system input integrator gain table if the gain is a function of airspeed.
45	27-34	N	VKPEI1(I)	rad/sec/rad	Roll control system error integrator gain table if the gain is a function of airspeed.
45	35-42	N	VKP(I)	rad/rad/sec	Roll control system roll rate feedback gain table if the gain is a function of airspeed
45	43-50	N	VAKPE(I)	1/rad	Roll control system error gain table if the gain is a function of airspeed
45	51-58	N	VAKRC(I)	rad	Yaw control system input gain table if the gain is a function of airspeed
45	59-66	N	VKRCI1(I)	rad/sec	Yaw control system input integrator gain table if the gain is a function of airspeed.
45	67-74	N	VKREI1(I)	rad/sec/rad	Yaw control system error integrator gain table if the gain is a function of airspeed
45	75-82	N	VKR(I)	rad/rad/sec	Yaw control system yaw rate feedback gain table if the gain is a function of airspeed.
45	83-90	N	VAKRE(I)	1/rad	Yaw control system error gain table if the gain is a function of airspeed
45	91-98	N	VAKQC(I)	rad	Pitch control system input gain table if the gain is a function of airspeed
45	99-106	N	VKQCI1(I)	rad/sec	Pitch control system input integrator gain table if the gain is a function of airspeed.

Segment	Element	Type	Coded Name	Units	Definition
45	107-114	N	VKQEI1(I)	rad/sec/	Pitch control system error integrator gain table if the gain is a function of airspeed.
45	115-122	N	VKQ(I)	rad/rad/ sec	Pitch control system pitch rate feedback gain table if the gain is a function of airspeed.
45	123-130	N	VAKQE(I)	1/rad	Pitch control system error gain table if the gain is a function of airspeed
45	131-138	N	VAKZE(I)	lb/ft/sec	Heave control system error gain table if the gain is a function of airspeed
45	139-146	N	VKZEI1(I)	lb/sec/ ft/sec	Heave control system error integrator gain table if the gain is a function of airspeed
45	147-154	N	VTPITCH(I)	sec	Pitch input shaping filter time constant table if the time constant is a function of airspeed
45	155-162	N	VTROLL(I)	sec	Roll input shaping filter time constant table if the time constant is a function of airspeed
45	163-170	N	VTYAW(I)	sec	Yaw input shaping filter time constant table if the time constant is a function of airspeed.

APPENDIX B

VATLAS PROGRAM LISTINGS

```
      PROGRAM VTOLTH(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,
     1 TAPE1,TAPE2,TAPE3,TAPE4,PUNCH,TAPE7=PUNCH,TAPE8,TAPE9,
     2 TAPE10,TAPE11,TAPE12,TAPE13,TAPE14,TAPE15,TAPE16,TAPE17)
C
      DIMENSION DZ(19),IN(20)
      DIMENSION NR(200),KK(200 ,SCAL(200),LBL(400),LABEL(12),OUT(2,200),
     1  NTAPE(5),LENGTH(200),T TLE(20),FMT1(8),FMT2(8),FMT3(8),
     2  FMT4(8),FMTI(4),FMTO(4)
      DIMENSION TEMP(400)
      DIMENSION FMTS(12,8),IFMT(8)
      INTEGER FMTS
      INTEGER TITLE,FMT1,FMT2,FMT3,FMTI,FMTO
      INTEGER FMT4
      COMMON/INTRIM/ ITRIM
      COMMON NEQS,R(12000)
      COMMON/RSEG/NR1,NR2,NR3,NR4,NR5,NR6,NR7,NR8,NR9,NR10,NR11
      EQUIVALENCE  (NR(1),NR1)
      EQUIVALENCE (R(1),T),(R(2),T0),(R(3),DT),(R(4),TMAX),(R(5),DTPRNT)
     1  ,(R(6),DTPLOT),(R(7),TI)
      DATA ITRIM,JFLAG,IFLG,IRUN/ 0,0,0,0/
       READ(5,31006) NEQS
      WRITE(6,31051)NEQS
      DO 50 I=1,60
   50 LBL(I)=4H
C
C  R-ARRAY DIVISION INFO,OUTPUT SPECIFICATIONS, AND FIXED
C  TABLES ARE READ FROM NTAP AND WRITTEN ON NTAPW(WHEN NTAPW .NE. 0)
C  NTAP=5 DENOTES CARD INPUT
      READ(5,31001) NTAP,NTAPW
      WRITE(6,31052)NTAP,NTAPW
C
C  DIVISION OF R-ARRAY
      WRITE(6,31002)
      IF(NTAP.EQ.5) READ(NTAP,31001) NSEG,(LENGTH(I),I=1,NSEG)
      IF(NTAP.NE.5) READ(NTAP) NSEG,(LENGTH(I),I=1,NSEG)
      IF(NTAPW.NE.0) WRITE(NTAPW) NSEG,(LENGTH(I),I=1,NSEG)
      NR(1)=0
      DO 1 I=2,NSEG
    1 NR(I)=NR(I-1)+LENGTH(I-1)
      WRITE(6,31003)
      DO 3 I=1,NSEG
    3 WRITE(6,31004) I,NR(I),LENGTH(I)
C
C  OUTPUT SPECIFICATIONS
      WRITE(6,31005)
      NOUT=1
   10 N2=2*NOUT
      N1=N2-1
      IF(NTAP.EQ.5) READ(5,31006) I,J,SCAL(NOUT),LBL(N1),LBL(N2),
     1  LABEL
      IF(NTAP.NE.5) READ(NTAP) I,J,SCAL(NOUT),LBL(N1),LBL(N2),LABEL
      WRITE(6,31007) I,J,SCAL(NOUT),LBL(N1  ),LBL(N2),LABEL
      IF(NTAPW.NE.0)WRITE(NTAPW) I,J,SCAL(NOUT),LBL(N1),LBL(N2),
     1  LABEL
      IF(I) 15,15,11
   11 KK(NOUT)=NR(I)+J
      NOUT=NOUT+1
```

```
      GO TO 10
   15 NOUT=NOUT-1
31049 FORMAT(4X,5HNOUT=,I5)
      WRITE(6,31049) NOUT
C
C  STORE FIXED TABLES
      WRITE(5,31023)
   20 CONTINUE
      IF(NTAP.EQ.5) READ(5,31008) I,J,K,L,LABEL,SCALE
      IF(NTAP.NE.5) READ(NTAP) I,J,K,L,LABEL,SCALE
      WRITE(6,31009) I,J,K,L,LABEL,SCALE
      IF(NTAPW.NE.0) WRITE(NTAPW) I,J,K,L,LABEL,SCALE
      IF(I) 25,25,21
   21 K1=NR(I)+J
      K2=NR(I)+L
      IF(NTAP .EQ. 5) READ(5,31024) (R(I),I=K1,K2)
      IF(NTAP .NE. 5) READ(NTAP) (R(I),I=K1,K2)
      WRITE(6,31011) (R(I),I=K1,K2)
      IF(NTAPW .NE. 0) WRITE(NTAPW) (R(I),I=K1,K2)
      IF(SCALE) 22,20,22
   22 DO 23 I=K1,K2
   23 R(I)=R(I)*SCALE
      GO TO 20
   25 CONTINUE
  100 READ(5,31001) NOPT
       IF(EOF(5))101,102
  101 STOP
  102 CONTINUE
       GO TO (30001,30002,30003,30004,30005,30006,30007,30008,30009,
     1 30010,30011,30012),NOPT
C
C  NOPT=1 STORE EQUIVALENT OFI/O LISTS
30001 READ(5,31001) NTAP
      WRITE(6,31012) NTAP
  200 READ(5,31008) I,J,K,L,LABEL,SCALE
      WRITE(6,31009) I,J,K,L,LABEL,SCALE
      WRITE(NTAP,31008)I,J,K,L,LABEL,SCALE
      IF(I) 100,100,200
C
C  NOPT=2 READ R
30002 READ(5,31001)NTAP
  300 WRITE(6,31013) NTAP
  302 IF(NTAP.NE.5) REWIND NTAP
      FMTI(1)= 10H(7E10.3)
      FMTO(1)= 10H(8F14.5)
  301 READ(NTAP,31008) I,J,K,L,LABEL,SCALE
      IF(I.LT.0) READ(NTAP,31031) FMTI,FMTO
      IF(I.LT.0) WRITE(6,31031) FMTI,FMTO
      I=IABS(I)
      IF(I .NE. 0) GO TO 606
      IF(NOPT .EQ. 2) GO TO 100
      IF(NOPT .EQ. 4) GO TO 501
      IF(NOPT .EQ. 8) GO TO 602
  606 WRITE(6,31009) I,J,K,L,LABEL,SCALE
      K1=NR(I)+J
      K2=NR(K)+L
      READ(5,FMTI ) (R(I),I=K1,K2)
```

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          WRITE(6,FMTO ) (R(I),I=K1,K2)                              VTOLTH    116
          IF(SCALE) 303,301,303                                      VTOLTH    117
   303    DO 304 I=K1,K2                                             VTOLTH    118
   304    R(I)=R(I)*SCALE                                            VTOLTH    119
          GO TO 301                                                  VTOLTH    120
C                                                                    VTOLTH    121
C  NOPT=3 WRITE R                                                    VTOLTH    122
 30003 READ(5,31001) NTAP                                            VTOLTH    123
   400    WRITE(6,31014) NTAP                                        VTOLTH    124
   402    IF(NTAP.NE.5) REWIND NTAP                                  VTOLTH    125
   401    READ(NTAP,31008) I,J,K,L,LABEL,SCALE                       VTOLTH    126
          IF(I .NE. 0) GO TO 607                                     VTOLTH    127
          IF(NOPT .EQ. 3) GO TO 100                                  VTOLTH    128
          IF(NOPT .EQ. 4) GO TO 502                                  VTOLTH    129
          IF(NOPT.EQ.8.AND.IFLG.EQ.0)GO TO 604                       VTOLTH    130
          IF(NOPT.EQ.8.AND.IFLG.EQ.1)GO TO 602                       VTOLTH    131
   607 WRITE(6,31009) I,J,K,L,LABEL,SCALE                            VTOLTH    132
          K1=NR(I)+J                                                 VTOLTH    133
          K2=NR(K)+L                                                 VTOLTH    134
          IF(SCALE) 403,404,403                                      VTOLTH    135
   403    DO 405 I=K1,K2                                             VTOLTH    136
   405    R(I)=R(I)*SCALE                                            VTOLTH    137
          WRITE(6,31011) (R(I),I=K1,K2)                              VTOLTH    138
          DO 406 I=K1,K2                                             VTOLTH    139
   406    R(I)=R(I)/SCALE                                            VTOLTH    140
          GO TO 401                                                  VTOLTH    141
   404    WRITE(6,31011) (R(I),I=K1,K2)                              VTOLTH    142
          GO TO 401                                                  VTOLTH    143
C                                                                    VTOLTH    144
C  NOPT=4 TIME HISTORY                                               VTOLTH    145
 30004 WRITE(6,31015)                                                VTOLTH    146
C                                                                    VTOLTH    147
C  INITIALIZE                                                        VTOLTH    148
          N1=NR(2)+1                                                 VTOLTH    149
          N2=NR(3)                                                   VTOLTH    150
          DO 500 I=N1,N2                                             VTOLTH    151
   500    R(I)=0.0                                                   VTOLTH    152
           IF(JFLAG.EQ.0) GO TO 511                                  VTOLTH    153
           J=0                                                       VTOLTH    154
           N1=NR(3)+1                                                VTOLTH    155
           N2=NR(4)+4                                                VTOLTH    156
           DO 510 I=N1,N2                                            VTOLTH    157
           J=J+1                                                     VTOLTH    158
   510     R(I)=TEMP(J)                                              VTOLTH    159
          N3=NR(28)+1                                                VTOLTH    160
          N4=NR(30)                                                  VTOLTH    161
          DO 513 I=N3,N4                                             VTOLTH    162
          J=J+1                                                      VTOLTH    163
   513    R(I)=TEMP(J)                                               VTOLTH    164
   511     CONTINUE                                                  VTOLTH    165
          T0=TI                                                      VTOLTH    166
C                                                                    VTOLTH    167
C  READ DEVICE NUMBERS                                               VTOLTH    168
C  NTAPE(1) CONTAINS EQUIVALENT OF INPUT LIST                        VTOLTH    169
C  NTAPE(2) CONTAINS EQUIVALENT OF OUTPUT LIST DIMENSIONAL DERIVATIVES E VTOLTH 170
C  NTAPE(3) STORAGE FOR TIME HISTORY                                 VTOLTH    171
          READ(5,31001)(NTAPE(I),I=1,5)                              VTOLTH    172
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```
      NTAPE4=NTAPE(4)                                               VTOLTH     173
      IF(NTAPE4.EQ.5)5010,5020                                      VTOLTH     174
 5010 READ(5,31031)FMT1,FMT2,FMT3,FMT4                              VTOLTH     175
      GO TO 5030                                                    VTOLTH     176
 5020 REWIND NTAPE4                                                 VTOLTH     177
      READ(NTAPE4)FMT1,FMT2,FMT3,FMT4                               VTOLTH     178
 5030 CONTINUE                                                      VTOLTH     179
      READ(5,31017) TITLE                                           VTOLTH     180
      WRITE(6,31018) TITLE                                          VTOLTH     181
      WRITE(6,31016) (NTAPE(I),I=1,3)                               VTOLTH     182
      WRITE(6,31057)FMT1,FMT2,FMT3,FMT4                             VTOLTH     183
      NTAPE5=NTAPE(5)                                               VTOLTH     184
      IF(NTAPE5.NE.0)WRITE(NTAPE5)FMT1,FMT2,FMT3,FMT4               VTOLTH     185
      NTAP=NTAPE(1)                                                 VTOLTH     186
      GO TO 302                                                     VTOLTH     187
  501 CALL SETUP                                                    VTOLTH     188
      NTAP=NTAPE(2)                                                 VTOLTH     189
      GO TO 402                                                     VTOLTH     190
C                                                                   VTOLTH     191
C  GENERATE,STORE ON BINARY FILE AND PRINT TIME HISTORIES           VTOLTH     192
  502 NTAP=NTAPE(3)                                                 VTOLTH     193
      REWIND NTAP                                                   VTOLTH     194
      IF(DTPLOT.GT.DTPRNT) DTPLOT = DTPRNT                          VTOLTH     195
      NPLOT=IFIX(DTPLOT/DT+.001)                                    VTOLTH     196
      NPRINT=IFIX(DTPRNT/DTPLOT+.001)                               VTOLTH     197
      WRITE(6,31019)                                                VTOLTH     198
      WRITE(5,31018) TITLE                                          VTOLTH     199
      WRITE(6,FMT1 ) (LBL(I),I=1,22)                                VTOLTH     200
      N=1                                                           VTOLTH     201
      NPTS=0                                                        VTOLTH     202
      GO TO 505                                                     VTOLTH     203
  503 DO 504 J=1,NPLOT                                              VTOLTH     204
  504 CALL RUNGE                                                    VTOLTH     205
  505 DO 506 J=1,NOUT                                               VTOLTH     206
      K=KK(J)                                                       VTOLTH     207
  506 OUT(N,J)=R(K)*SCAL(J)                                         VTOLTH     208
      NPTS=NPTS+1                                                   VTOLTH     209
       JIM=0                                                        VTOLTH     210
      IF(JIM .EQ. 1) GO TO 507                                      VTOLTH     211
C     IF(N.EQ.40 .OR. TO .GT. TMAX) GO TO 507                       VTOLTH     212
      IF(N.EQ.1.OR.TO.GT.TMAX)GO TO 507                             VTOLTH     213
      N=N+1                                                         VTOLTH     214
      GO TO 503                                                     VTOLTH     215
  507 WRITE(NTAP) ((OUT(I,J),J=1,NOUT),I=1,N)                       VTOLTH     216
      WRITE(6,FMT2 ) ((OUT(I,J),J=1,11),I=1,N,NPRINT)               VTOLTH     217
      IF(JIM .EQ. 1) GO TO 508                                      VTOLTH     218
      IF(TO .GT. TMAX) GO TO 508                                    VTOLTH     219
      N=1                                                           VTOLTH     220
      GO TO 503                                                     VTOLTH     221
  508 MARGIN=11                                                     VTOLTH     222
 8508  IF(NOUT.LE.MARGIN) GO TO 512                                 VTOLTH     223
      REWIND NTAP                                                   VTOLTH     224
      JSOUT=MARGIN+1                                                VTOLTH     225
      KSOUT=JSOUT+9                                                 VTOLTH     226
      IF(KSOUT.GT.NOUT) KSOUT=NOUT                                  VTOLTH     227
      WRITE (6,31019)                                               VTOLTH     228
      LSOUT=2*JSOUT-1                                               VTOLTH     229
```

```
      MSOUT=2*KSOUT
      WRITE (6,FMT1)(LBL(I),I=1,2),(LBL(I),I=LSOUT,MSOUT)
      NBUF=NPTS
      NN=1
      DO 509 L=1,NBUF
      IF (L.EQ.NBUF) NN=N
      READ (NTAP)((OUT(I,J),J=1,NOUT),I=1,NN)
  509 WRITE (6,FMT3)(OUT(I,1),(OUT(I,J),J= JSOUT,KSOUT),I=1,NN,NPRINT)
      MARGIN=MARGIN+10
      GO TO 8908
  512  WRITE(6,31002) NPTS,NOUT,NTAP
       GO TO 100
C
C  NOPT=5 PLOT
30005 CALL PLOTER(OUT,NPTS,NOUT,NTAP)
      GO TO 100
C
C  NOPT=6           SET UP TRIM UNKNOWNS
30006 CONTINUE
      READ(5,31001) NEQU
      WRITE(6,31034)  NEQU
      M=1
      L1=1
  611 READ(5,31008) I,J,K,L,LABEL
      IF(I.EQ.0) GO TO 100
      WRITE(6,31009) I,J,K,L,LABEL
      N=NR(I)+J
      N2=NR(K)+L
      L2=L1+N2-N
      READ(5,31010)  (DZ(I),I=L1,L2)
      WRITE(6,31011)  (DZ(I),I=L1,L2)
      L1=L2+1
  612 IN(M)=N
      N=N+1
      M=M+1
      IF(N.GT.N2) GO TO 611
      GO TO 612
C
C   NOPT=7  LOAD VARIABLE FORMATS FOR TRIM SUMMARY(OPTION12) AND
C              WIND TUNNEL RUNS(OPTION 11)
30007 CONTINUE
      WRITE(6,31020)
      READ(5,31031)((FMTS(I,J),J=1,8),I=1,12)
      WRITE(6,31050)((FMTS(I,J),J=1,8),I=1,12)
      GO TO 100
C
C  NOPT=9  SIX DEGREES OF FREEDOM TRIM
30008 WRITE(6,31025)
C  NTAPE(1) CONTAINS EQUIVALENT OF INPUT LIST
C  NTAPE(2) CONTAINS EQUIVALENT OF OUTPUT LIST
C  NTAPE(3) IS OUTPUT FILE FOR TABBING BY OPTION 12
C  NTAPE(4) IS NOT USED.
C  NCASES IS THE NUMBER OF TRIM CASES DESIRED
C  NTAPD IS THE FILE SETUP BY OPTION 9 WHICH CONTAINS THE LIST
C  OF TERMS TO USE FOR DERIVATIVE HACK.
C  IPUNCH IS A FLAG.  IPUNCH=1 CAUSES DERIVATIVE OUTPUT TO
C  BE PUNCHED.  IPUNCH=0 IS NO PUNCHED OUTPUT.
```

```
C  IWRITE .NE.0 CAUSES THE TRIM ROUTINE TO PRINT OUT DE-
C  BUGGING INFO.  NORMALLY IWRITE EQUALS 0.
C  TAB OUTPUT IS SETUP IN THE CANNED INPUT STREAM AS IF
C  IT WERE A TIME HISTORY.
C  VARIABLES TO BE TRIMMED FOR MUST BE SPECIFIED IN OPT 6
C  BEFORE CALLING THIS OPTION.
C
      ITRIM=1
      NCASE=0
      READ(5,31001)(NTAPE(I),I=1,4),NCASES,NTAPD,IPUNCH,IWRITE
      IF(NCASES.EQ.0) NCASES= 1
      WRITE(6,31033)(NTAPE(I),I=1,4),NCASES,NTAPD,IPUNCH,IWRITE
      READ(5,31017) TITLE
      NTAP2= NTAPE(3)
      IF(NTAP2.NE.0) REWIND NTAP2
  601 CONTINUE
      WRITE (6,31018) TITLE
      NTAP=NTAPE(1)
      WRITE(6,31046) NTAP
      GO TO 302
  602 CONTINUE
      CALL TRIM(R,DZ,R(NR5),IN,IWRITE,NEQU),RETURNS(1102,603)
      IFLG=0
      NTAP=NTAPE(2)
      WRITE(6,31047)
      GO TO 402
  603 CONTINUE
      NTAP=NTAPE(2)
      WRITE(6,31047)
      IFLG=1
      GO TO 402
  604 CONTINUE
      WRITE(6,31048)
      IF(NTAPD.EQ.0) GO TO 672
      IFLAG=0
      IF(NTAPD.NE.0) REWIND NTAPD
  670 READ(NTAPD) I,J,NRD
      IF(I.EQ.0) GO TO 671
      K1= NR(I)+J
      CALL DERIVS(K1,NRD,IFLAG,0,IPUNCH)
      GO TO 670
  671 WRITE(6,31018)  TITLE
      IF(IPUNCH.NE.0) WRITE(7,31017) TITLE
      CALL DERIVS(K1,NRD,IFLAG,1,IPUNCH)
  672 CONTINUE
       N2=NEQS+4
       DO 605 I=1,N2
       N1=NR(3)+I
  605  TEMP(I)=R(N1)
      N3=NR(30)-NR(28)
      DO 620 I=1,N3
      N4=NR(28)+I
  620 TEMP(N2+I)=R(N4)
      IF(NTAP2.EQ.0) GO TO 1102
C   STORE DESIRED OUTPUT FOR TABBING BY OPTION 12.
      DO 1101  I=1,NOUT
      K=KK(I)
```

```
      SCALE=SCAL(I)
      IF(SCALE.EQ.0.) SCALE=1.
 1101 OUT(1,I)= R(K) * SCALE
      WRITE(NTAP2)  (OUT(1,I),I=1,NOUT)
 1102 CONTINUE
      NCASE= NCASE + 1
       IF(NCASE.LT.NCASES) GO TO 601
       JFLAG=1
      ITRIM=0
      IF(NTAP2.NE.0) REWIND NTAP2
      GO TO 100
C
C   NOPT=9
C
C  STORE INSTRUCTIONS FOR DERIVATIVE HACK
30009 READ(5,31001) NTAPD
      WRITE(6,31030)
      IF(NTAPD.EQ.0) GO TO 100
      REWIND NTAPD
  700 READ(5,31001) I,J,NRO
      WRITE(6,31004) I,J,NRO
      WRITE(NTAPD) I,J,NRO
      IF(I.EQ.0) GO TO 701
      GO TO 700
  701 REWIND NTAPD
      GO TO 100
C  NOPT=10  PLOT A TIME HISTORY STORED ON BINARY FILE DURING A PREVIOUS
C          RUN
30010  READ(5,31001) NPTS, NOUT, NTAP
C
C  NPTS = NUMBER OF TIME HACKS
C  NOUT = NUMBER OF DEPENDENT VARIABLES
C  NTAP = SCRATCH FILE NUMBER THAT CONTAINS DATA
C
       GO TO 30005
C
30011 CONTINUE
C   NOPT=11  SIMULATED WIND TUNNEL RUNS
C     PRESET CONFIGURATION VARIABLES IN OPTION 2. INPUT IPITCH.NE.0 FOR
C     PITCH RUN, IYAW.NE.0 FOR YAW RUN. INPUT ANGLE VALUES IN DEGREES
C     FOR INITIAL VALUES (AOAO,PSIO), INCREMENTS (DAOA,DPSI), AND MAX
C     VALUES (AOAMAX,PSIMAX) FOR DESIRED RUN. INPUT ABSOLUTE (POSITIVE)
C     VALUE FOR VWIND IN FT/SEC. OUTPUT IS STORED ON NTAP2.
C     OUTPUT IS NONDIM COEFFS IN STABILITY AXES.
      WRITE(6,31053)
      READ(5,31006) IPITCH,IYAW,NTAP2
      READ(5,31010) AOAO,DAOA,AOAMAX,PSIO,DPSI,PSIMAX,VWIND
      VWIND=-VWIND
      REWIND NTAP2
      CALL WTRUN (IPITCH,IYAW,NTAP2,AOAO,DAOA,AOAMAX,PSIO,DPSI,PSIMAX,
     1     VWIND,NOUT)
      REWIND NTAP2
C     PUT OUTPUT DATA INTO R-ARRAY FOR PRINT MANIPULATIONS
      KK=NR(NSEG)+LENGTH(NSEG)+1
      LL=KK+32*NOUT-1
      J1=KK
  811 CONTINUE
```

```
      J2=J1+31                                                   VTOLTH   401
      READ(NTAP2)(R(J),J=J1,J2)                                  VTOLTH   402
      J1=J2+1                                                    VTOLTH   403
      IF(J1.GT.LL)812,811                                        VTOLTH   404
  812 CONTINUE                                                   VTOLTH   405
      DO 810 IPAGE=1,7                                           VTOLTH   406
      J1=KX                                                      VTOLTH   407
      WRITE(6,31019)                                             VTOLTH   408
      DO 804 I=1,8                                               VTOLTH   409
      FMT1(I)=FMTS(IPAGE,I)                                      VTOLTH   410
      J=8                                                        VTOLTH   411
      IF(IPAGE.EQ.7) J=10                                        VTOLTH   412
      FMT2(I)=FMTS(J,I)                                          VTOLTH   413
      J=9                                                        VTOLTH   414
      IF(IPAGE.EQ.7) J=11                                        VTOLTH   415
  804 FMT3(I)= FMTS(J,I)                                         VTOLTH   416
      WRITE(6,FMT1)                                              VTOLTH   417
      WRITE(5,FMT2)                                              VTOLTH   418
      DO 805 I=1,NOUT                                            VTOLTH   419
       IF(IPAGE.EQ.7)GO TO 806                                   VTOLTH   420
      WRITE(6,FMT3) R(J1),R(J1+1),(R(J1+K+IPAGE),K=1,38,6)       VTOLTH   421
       GO TO 807                                                 VTOLTH   422
  806 WRITE(5,FMT3) R(J1),R(J1+1),(R(J1+25+K),K=1,6)             VTOLTH   423
  807 CONTINUE                                                   VTOLTH   424
      J1=J1+32                                                   VTOLTH   425
  805 CONTINUE                                                   VTOLTH   426
  810 CONTINUE                                                   VTOLTH   427
      GO TO 100                                                  VTOLTH   428
C  NOPT=12  PRINT DATA SUMMARY FROM TRIM.                        VTOLTH   429
30012 CONTINUE                                                   VTOLTH   430
      WRITE(6,31054)                                             VTOLTH   431
      READ(5,31031)FMT1                                          VTOLTH   432
      IFG=1                                                      VTOLTH   433
      L=2                                                        VTOLTH   434
      IRUN= NCASES                                               VTOLTH   435
      K=JVAR=NOUT                                                VTOLTH   436
      IF(JVAR.GT.11)K=11                                         VTOLTH   437
      FMT=2.                                                     VTOLTH   438
 1201 WRITE(6,31019)                                             VTOLTH   439
      WRITE(5,31018)TITLE                                        VTOLTH   440
      DO 1204 I=1,8                                              VTOLTH   441
 1204 IFMT(I)=FMTS(IPG,I)                                        VTOLTH   442
      REWIND NTAP2                                               VTOLTH   443
      LOUT= 2*L-1                                                VTOLTH   444
      KOUT= 2*K                                                  VTOLTH   445
      WRITE(6,FMT1) LBL(1),LBL(2),(LBL(I),I=LOUT,KOUT)           VTOLTH   446
      DO 1202 I=1,IRUN                                           VTOLTH   447
      READ (NTAP2) (OUT(1,J),J=1,JVAR)                           VTOLTH   448
      WRITE(6,IFMT) OUT(1,1),(OUT(1,J),J=L,K)                    VTOLTH   449
 1202 CONTINUE                                                   VTOLTH   450
      IF(K.EQ.JVAR) GO TO 1203                                   VTOLTH   451
      IPG=IPG+1                                                  VTOLTH   452
      L=L+10                                                     VTOLTH   453
      K=K+10                                                     VTOLTH   454
      IF(K.GT.JVAR) K=JVAR                                       VTOLTH   455
      IF(K.EQ.JVAR) FMT=3.                                       VTOLTH   456
      IF(IPG.GE.13) GO TO 1203                                   VTOLTH   457
```

```
      GO TO 1201
 1203 IRUN= 0
      GO TO 100
C
C
C
31001 FORMAT(16I5)
31002 FORMAT(1H1///5X19HDIVISION OF R-ARRAY//)
31003 FORMAT(13X1HI,8X5HNR(I),3X9HLENGTH(I)/)
31004 FORMAT(5X,3I10)
31005 FORMAT(///5X21HOUTPUT SPECIFICATIONS/)
31006 FORMAT(2I5,E10.3,2A5,12A4)
31007 FORMAT(5X,2I5,F13.5,5X,2A5,12A4)
31008 FORMAT(4I5,12A4,2X,F10.6)
31009 FORMAT(5X,4I5,12A4,2X,F13.5)
31010 FORMAT(7E10.3)
31011 FORMAT(8F14.5)
31012 FORMAT(///5X,28HNOPT=1 STORE READ/WRITE INFO//,5X,5HNTAP=,I2/)
31013 FORMAT(///5X,13HNOPT=2 READ R//,5X,5HNTAP=,I2/)
31014 FORMAT(///5X,14HNOPT=3 WRITE R//,5X,5HNTAP=,I2)
31015 FORMAT(1H1/////5X19HNOPT=4 TIME HISTORY/)
31017 FORMAT(20A4)
31018 FORMAT(5X,20A4/)
31016 FORMAT(5X9HNTAPE(1)=,I2/5X9HNTAPE(2)=,I2/5X9HNTAPE(3)=,I2/
    1  5X6HITRIM=,I2)
31019 FORMAT(1H1///)
31020 FORMAT(///5X,35HNOPT=7 READ VARIABLE OUTPUT FORMATS/)
31023 FORMAT(///5X23HSTORE FIXED TABLES ETC./)
31024 FORMAT(7E10.3)
31025 FORMAT(///5X24HNOPT=8 LONGITUDINAL TRIM/)
31026 FORMAT(20A4)
31028 FORMAT(A4)
31029 FORMAT(5X,A4)
31030  FORMAT(///5X30HNOPT=9 DIMENSIONAL DERIVATIVES//5X22HPERTURBATION
    1VARIABLES/)
31031 FORMAT(4A10,4A10)
31032  FORMAT(///10X,5HNPTS=,I5/10X,5HNOUT=,I5/10X,5HNTAP=,I5/)
31033 FORMAT(5X9HNTAPE(1)=,I2/5X9HNTAPE(2)=,I2/5X9HNTAPE(3)=,I2/5X,9HNTA
    1PE(4)=,I2/5X7HNCASES=,I3,5X6HNTAPD=,I2,5X7HNPUNCH=,I2/
    2  5X,7HIWRITE=,I2)
31034 FORMAT(//5X,28HNOPT=6 SET UP TRIM UNKNOWNS ,
    1     / 10X, 6H NEQU=,I2 )
31040 FORMAT(16A5)
31041 FORMAT(5X,16A5)
31045 FORMAT(5X,10HTRIM FOR  , 4(A5,2X) )
31046 FORMAT(/  5X,26HCASE INPUT (READ FROM FILE ,I2,1H), / )
31047 FORMAT(1H1,5X,15HRESULTS OF TRIM  ,/)
31048 FORMAT(//)
31050 FORMAT(5X,8A10)
31051 FORMAT(1X,I5,* NEQS *,//)
31052 FORMAT(1X,2I5,* NTAP,NTAPW *,//)
31053 FORMAT(//5X,34HNOPT=11 SIMULATED WIND TUNNEL RUNS/)
31054 FORMAT(//5X,36HNOPT=12 PRINT DATA SUMMARY FROM TRIM/)
      END
```

```
      SUBROUTINE ATMOSX(HALT,KATMOS,RHO,TAMB,PRESS,TRATIO,PRATIO,A)      ATMOSX    2
C     SUBROUTINE ATMOS(HALT,IALT,KATMOS,DTEMP,RHO,T,    PRESS,H,A,KERR)  ATMOSX    3
C* HALT IS INPUT VALUE OF ALTITUDE, IN PRESSURE ALT IF IALT=1,TRUE       ATMOSX    4
C*  ALTITUDE IF IALT=0                                                   ATMOSX    5
C*  H IS OUTPUT VALUE OF PRESSURE ALTITUDE                               ATMOSX    6
C*  KATMOS=1 IS STD DAY,  KATMOS=2 IS TROPICAL DAY                       ATMOSX    7
      POLY(A,B,C,D,E,F,G,X)=((((((A*X+B)*X+C)*X+D)*X+E)*X+F)*X+G         ATMOSX    8
      RHOBF(C1,C4,C5,C6,H)=C1*(C4*H+C5)**C6                              ATMOSX    9
      IALT=1                                                             ATMOSX   10
      DTEMP=0.                                                           ATMOSX   11
      IF(KATMOS-1)2,2,22                                                 ATMOSX   12
    2 IF(IALT)3,3,4                                                      ATMOSX   13
    4 H=HALT                                                             ATMOSX   14
      GO TO 5                                                            ATMOSX   15
    3 H=2085549.E01*HALT/(2085549.E01+HALT)                              ATMOSX   16
    5 IF(H-36089.)6,6,7                                                  ATMOSX   17
    6 T=518.688-3.5662E-03*H+DTEMP                                       ATMOSX   18
      GO TO 300                                                          ATMOSX   19
    7 IF(H-82021.)8,8,9                                                  ATMOSX   20
    8 T=389.988+DTEMP                                                    ATMOSX   21
      GO TO 301                                                          ATMOSX   22
    9 IF(H-154199.)10,10,201                                             ATMOSX   23
   10 T=254.988+1.6459E-03*H+DTEMP                                       ATMOSX   24
      GO TO 302                                                          ATMOSX   25
  300 PRESS=2116.216*(1.0-6.87535E-06*H)**5.2561                         ATMOSX   26
      GO TO 303                                                          ATMOSX   27
  301 PRESS=472.679* EXP(-4.80634E-05*(H-36089.))                        ATMOSX   28
      GO TO 303                                                          ATMOSX   29
  201 KERR=1                                                             ATMOSX   30
  302 RHO=RHOBF(7.7644E-5,4.2200E-6,.65384,-12.38 3,H)                   ATMOSX   31
      TT=254.988+1.6459E-03*H                                            ATMOSX   32
      PRESS=1716.500*RHO*TT                                              ATMOSX   33
  303 RHO=PRESS/(1716.5*T)                                               ATMOSX   34
      A=49.02167*SQRT(T)                                                 ATMOSX   35
      TRATIO=T/518.688                                                   ATMOSX   36
      PRATIO=PRESS/2116.216                                              ATMOSX   37
  200 RETURN                                                             ATMOSX   38
  500 IF(H-100000.)501,501,201                                           ATMOSX   39
  501 IF(H-36089.)300,301,502                                            ATMOSX   40
  502 IF(H-82021.)301,302,302                                            ATMOSX   41
   22 H=HALT                                                             ATMOSX   42
      IF(IALT)55,55,560                                                  ATMOSX   43
   55 HTRUE=HALT                                                         ATMOSX   44
      IF(HTRUE-38047.)57,58,58                                           ATMOSX   45
   57 H=POLY(0.0,0.0,4.012238E-18,1.1145123231 48E-14,1.31286914434 14E-07 ATMOSX   46
     1,9.44833622E-01,2.258686E-02,HTRUE)                                ATMOSX   47
      GO TO 56                                                           ATMOSX   48
   58 IF(HTRUE-59000.)59,60,60                                           ATMOSX   49
   59 H=POLY(6.0690704 65225E-24,-1.3808738282E-18,1.24218469297E-13,    ATMOSX   50
     1-5.4435518721E-09,1.1565803963E-04,-4.578132E-03,92.124,HTRUE)     ATMOSX   51
      GO TO 56                                                           ATMOSX   52
   60 IF(HTRUE-70000.)61,62,62                                           ATMOSX   53
   61 H=POLY(0.0,-1.744354766E-20,5.835479E-15,-7.673314467E-10,         ATMOSX   54
     14.52659E-05,-1.876056113E-02,48.7217,HTRUE)                        ATMOSX   55
      GO TO 56                                                           ATMOSX   56
   62 IF(HTRUE-82450.)63,64,64                                           ATMOSX   57
   63 H=POLY(0.0,-2.2516894E-20,7.1628962 48E-15,-8.7467296698E-10,      ATMOSX   58
```

```
           14.84318645E-05,-2.264859264658E-02,-3.9455,HTRUE)           ATMOSX     59
            GO TO 56                                                    ATMOSX     60
      64    H=POLY(1.930951309634E-25,-8.7377368313961E-20,1.5700252579571E-14  ATMOSX  61
           1,-1.394093541854E-09,6.07826086912215E-05,-3.3633961E-2,-.8,HTRUE)  ATMOSX  62
      56    H=2085549.E01*H/(2085549.E01+H)                             ATMOSX     63
      560   IF(H-36500.)31,31,32                                        ATMOSX     64
      31    T=5.49485E2-3.88357E-3*H+4.10173E-10*H*H+DTEMP              ATMOSX     65
            GO TO 500                                                   ATMOSX     66
      32    IF(H-45000.)33,33,34                                        ATMOSX     67
      33    T=5.69777E2-5.02206E-3*H+1.63672E-8*H*H+DTEMP               ATMOSX     68
            GO TO 500                                                   ATMOSX     69
      34    IF(H-53595.)35,35,36                                        ATMOSX     70
      35    T=5.67652E2-4.93846E-3*H+1.55644E-8*H*H+DTEMP               ATMOSX     71
            GO TO 500                                                   ATMOSX     72
      36    IF(H-69620.)37,37,38                                        ATMOSX     73
      37    T=2.54887E2+1.33744E-3*H+7.36894E-9*H*H+DTEMP               ATMOSX     74
            GO TO 500                                                   ATMOSX     75
      38    T=2.926E2+1.28409E-3*H+  32372E-10*H*H+DTEMP                ATMOSX     76
            GO TO 500                                                   ATMOSX     77
            END                                                         ATMOSX     78
```

```
      SUBROUTINE AXIS(XPAGE,YPAGE,IBCD,NCHAR,AXLEN,ANGLE,FIRSTV,DELTAV) AXIS   2
C      J500353                                                          AXIS   3
      DIMENSION IBCD(1),BCDWD(2)                                        AXIS   4
C  DRAWING AND LABELING 'N AXIS FOR THE CALCOMP PLOTTER.                AXIS   5
      AXL = 0.                                                          AXIS   6
      SINA = SIN(ANGLE/57.29578)                                        AXIS   7
      COSA = COS(ANGLE/57.29578)                                        AXIS   8
      XP = XPAGE                                                        AXIS   9
      YP = YPAGE                                                        AXIS  10
      CALL PLOT(XP,YP,3)                                                AXIS  11
      DELN = .2                                                         AXIS  12
      IF(NCHAR.LT.0)DELN = -.2                                          AXIS  13
      FPN = ABS(FIRSTV + DELTAV*AXLEN)                                  AXIS  14
      IF(ABS(FIRSTV).GT.FPN)FPN = ABS(FIRSTV)                           AXIS  15
      CALL BNBCDV(FPN,BCDWD,NDEC)                                       AXIS  16
      NDEC=2-NDEC                                                       AXIS  17
      DEL = -FLOAT((NDEC+1)/2)*.1                                       AXIS  18
      IF(NDEC.LT.2)DEL=-.2                                              AXIS  19
      IF(NDEC.GT.5)NDEC = 8                                             AXIS  20
      IF(NDEC.LT.0)NDEC = -1                                            AXIS  21
      FPN = FIRSTV                                                      AXIS  22
    1 CALL SYMBOL(XP,YP,.1,13,ANGLE,-1)                                 AXIS  23
      IF(ABS(FPN)-1.0E-07) 10,10,15                                     AXIS  24
   10 CALL NUMBER(XP-DELN*SINA,YP+DELN*COSA,.1,FPN,ANGLE,0)             AXIS  25
      GO TO 20                                                          AXIS  26
   15 CALL NUMBER(XP+DEL*COSA-DELN*SINA,YP+DEL*SINA+DELN*COSA,          AXIS  27
     1 .1,FPN,ANGLE,NDEC)                                               AXIS  28
   20 AXL = AXL +1.                                                     AXIS  29
      IF(AXL-AXLEN)2,2,100                                              AXIS  30
    2 CALL PLOT(XP,YP,3)                                                AXIS  31
      XP = XP + COSA                                                    AXIS  32
      YP = YP + SINA                                                    AXIS  33
      CALL PLOT(XP,YP,2)                                                AXIS  34
      FPN = FPN + DELTAV                                                AXIS  35
      GO TO 1                                                           AXIS  36
  100 CONTINUE                                                          AXIS  37
C  WRITE LABEL                                                          AXIS  38
      DEL = .05*FLOAT(NCHAR)                                            AXIS  39
      DEL = .5*AXLEN-ABS(DEL)                                           AXIS  40
      DELN = .4                                                         AXIS  41
      IF(NCHAR.LT.0)DELN = -.4                                          AXIS  42
      CALL SYMBOL(       DEL*COSA-DELN*SINA,      DEL*SINA+DELN*COSA,   AXIS  43
     1 .1,IBCD,ANGLE,IABS(NCHAR))                                       AXIS  44
      RETURN                                                            AXIS  45
      END                                                               AXIS  46
```

ORIGINAL PAGE
OF POOR QUALITY

```
      FUNCTION BATAN2(Y,X)
C
C  HACK THE ARC TAN OF Y/X
C
      PI= 3.141592654
C
      IF(Y.EQ.0. .AND. X.EQ.0.) GO TO 11
      IF(Y.EQ.0. .AND. X.GT.0.) GO TO 12
      IF(Y.EQ.0. .AND. X.LT.0.) GO TO 13
      IF(Y.GT.0. .AND. X.EQ.0.) GO TO 14
      IF(Y.LT.0. .AND. X.EQ.0.) GO TO 15
      BATAN2= ATAN2(Y,X)
      RETURN
C
   11 BATAN2= 0.
      RETURN
C
   12 BATAN2= 0.
      RETURN
C
   13 BATAN2= PI
      RETURN
C
   14 BATAN2= PI/2.
      RETURN
C
   15 BATAN2=-PI/2.
      RETURN
      END
```

```
              SUBROUTINE BNBCDV(D,BCDWD,NDS)                    BNBCDV   2
C               J50039                                          BNBCDV   3
              DIMENSION BCDWD(2)                                BNBCDV   4
              C = ABS(D)                                        BNBCDV   5
              NDS = 0                                           BNBCDV   6
              IF(C)250,250,10                                   BNBCDV   7
           10 IF(C-1.)1,250,2                                   BNBCD    8
            1 DO 100 I = 1,36                                   BNBCD    9
              NDS = NDS-1                                       BNBCDV  10
              IF(C-10.**NDS)100,150,150                         BNBCDV  11
          100 CONTINUE                                          BNBCDV  12
          150 NDS = NDS+1                                       BNBCDV  13
          250 BCDWD(1) = C*10.**(-NDS)                          BNBCDV  14
              RETURN                                            BNBCDV  15
            2 DO 200 I = 1,36                                   BNBCDV  16
              NDS = NDS+1                                       BNBCDV  17
              IF(10.**NDS-C)200,250,250                         BNBCDV  18
          200 CONTINUE                                          BNBCDV  19
              GO TO 250                                         BNBCDV  20
              END                                               BNBCDV  21
```

```
      SUBROUTINE DASLIN(X,Y,N,K,J,L,DASH  ,ISTYLE)
C
C     SUBROUTINE LINE(X,Y,N,H,J,L)
C   THIS *LINE* ALLOWS THE PROGRAMMER TO SELECT THE SIZE OF
C   THE PLOT SYMBOLS PLACED ON HIS PLOTS.
C   USE OF THE ROUTINE IS THE SAME AS THE CALCOMP LINE.
C  N = NUMBER OF POINTS TO BE PLOTTED
C  K = 1 SYMBOLS PLOTTED AT 0 DEG ANGLE   -   K = 2  SYMBOLS PLOTTED AT 9
C  J CORESPONDS TO SYSTEM ROUTINE  INTYP
C  L CORESPONDS TO SYSTEM ROUTINE INTEQ
C  DASH = LENGTH O  SMALL DASHES AND SPACES WHICH COMBINE TO FORM LINE S
C  ISTYLE = INTEGER WHOSE 16 LOWER ORDER BITS DEFINE THE LINE STYLE
C   DASH LINE CAPABILITY ADDED 3-2-72
C
      DIMENSION X(1),Y(1)
      INTEGER STYMAX
      DATA(STYMAX=177777B)
C     H = .05
      H = .06
      IF(K.EQ.1) AN=0.
      IF(K.EQ.2) AN=90.
      DX = (X(1)-X(N+1))/X(N+2)
      DY = (Y(1)-Y(N+1))/Y(N+2)
      JJ=IABS(J)
      IF(JJ .EQ. 0)  JJ=1
      IJ = JJ + 1
      DO 4 I=1,N
      IF(I.GT.1) GO TO 3
      CALL PLOT(DX,DY,3)
      IF(J.NE.0) CALL SYMBOL(DX,DY,H,L,AN,-1)
      XOLD = X(N+1)
      YOLD = Y(N+1)
      GO TO 4
    3 CONTINUE
      DX = (X(I)-XOLD)/X(N+2)
      DY = (Y(I)-YOLD)/Y(N+2)
      IF(J.GE.0) GO TO 8
      CALL PLOT(DX,DY,3)
      GO TO 10
    8 IF(ISTYLE.GE.STYMAX.OR.ISTYLE.LE.0) GO TO 9
      CALL DASPLT(DX,DY,DASH,ISTYLE)
      GO TO 10
    9 CALL PLOT(DX,DY,2)
   10 CONTINUE
      IF(IJ.NE.I) GO TO 4
      IF(J.NE.0) CALL SYMBOL(DX,DY,H,L,AN,-1)
      IJ = IJ + JJ
    4 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE DASPLT(XPAGE,YPAGE,DASH,ISTYLE)                        DASPLT   2
      INTEGER PNTEST,SHIFT                                              DASPLT   3
      DATA(PNTEST=100000B),(SHIFT=177777B)                              DASPLT   4
    1 SIZE=DASH                                                         DASPLT   5
      IF(SIZE) 5,10,20                                                  DASPLT   6
    5 DASH = -SIZE                                                      DASPLT   7
      JSTYLE=0                                                          DASPLT   8
      GO TO 1                                                           DASPLT   9
   10 SIZE=.1                                                           DASPLT  10
   20 IF(ISTYLE-JSTYLE) 30,40,30                                        DASPLT  11
   30 JSTYLE=ISTYLE                                                     DASPLT  12
      GO TO 50                                                          DASPLT  13
   40 IF(RESIDU ) 60,50,60                                              DASPLT  14
   50 RESIDU =SIZE                                                      DASPLT  15
   60 CALL WHERE(X,Y,XDIFF)                                             DASPLT  16
      XDIFF=XPAGE-X                                                     DASPLT  17
      YDIFF=YPAGE-Y                                                     DASPLT  18
      TOTAL=SQRT(XDIFF*XDIFF+YDIFF*YDIFF)                               DASPLT  19
      IF(TOTAL) 180,180,70                                              DASPLT  20
   70 COSINE=XDIFF/TOTAL                                                DASPLT  21
      SINE=YDIFF/TOTAL                                                  DASPLT  22
      DELX=SIZE*COSINE                                                  DASPLT  23
      DELY=SIZE*SINE                                                    DASPLT  24
   80  CONTINUE                                                         DASPLT  25
      IPEN = 3                                                          DASPLT  26
      IF(JSTYLE.GE.PNTEST) IPEN = 2                                     DASPLT  27
  110 IF(RESIDU -TOTAL) 120,160,170                                     DASPLT  28
  120 IF(RESIDU -SIZE) 130,140,140                                      DASPLT  29
  130 X=X+RESIDU *COSINE                                                DASPLT  30
      Y=Y+RESIDU *SINE                                                  DASPLT  31
      TOTAL=TOTAL-RESIDU                                                DASPLT  32
      RESIDU =SIZE                                                      DASPLT  33
      GO TO 150                                                         DASPLT  34
  140 X=X+DELX                                                          DASPLT  35
      Y=Y+DELY                                                          DASPLT  36
      TOTAL=TOTAL-RESIDU                                                DASPLT  37
  150 JSTYLE = JSTYLE * 2                                               DASPLT  38
      IF(JSTYLE.GT.SHIFT ) JSTYLE = JSTYLE - SHIFT                      DASPLT  39
      CALL PLOT(X,Y,IPEN)                                               DASPLT  40
      GO TO 80                                                          DASPLT  41
  160 JSTYLE = JSTYLE * 2                                               DASPLT  42
      IF(JSTYLE.GT.SHIFT ) JSTYLE = JSTYLE - SHIFT                      DASPLT  43
  170 RESIDU =RESIDU -TOTAL                                             DASPLT  44
      CALL PLOT(XPAGE,YPAGE,IPEN  )                                     DASPLT  45
      ISTYLE=JSTYLE                                                     DASPLT  46
  180 RETURN                                                            DASPLT  47
      END                                                               DASPLT  48
```

```
      SUBROUTINE DERIVS(K1,NRD,IFLAG,IPRINT,IPUNCH)                   DERIVS     2
C                                                                     DERIVS     3
C  LABELED COMMON TO PROVIDE A FLAG TO SYSEQS TO SAY CALL IS FROM     DERIVS     4
C  DERIV FOR PERTURBATION CALCULATIONS.                               DERIVS     5
      COMMON/INDPIV/NDRIV                                             NAMES      2
      COMMON/INTRIM/ITRIM                                             NAMES      3
      COMMON NEQS                                                     NAMES      4
C                                                                     NAMES      5
C************************  SEGMENT 1 ********************************** NAMES      6
C         TIME,PRINT,AND PLOT CONTROL PARAMETERS,INPUT                NAMES      7
C                                                                     NAMES      8
      COMMON T,T0,DT,TMAX,DTPRNT,DTPLOT,TI                            NAMES      9
C                                                                     NAMES     10
C************************  SEGMENT 2 ********************************** NAMES     11
C         VARIABLES TO BE INTEGRATED IN TIME                          NAMES     12
C                                                                     NAMES     13
      COMMON UDOT,VDOT,WDOT,PDOT,QDOT,RDOT,D11D,D12D,D13D,D21D,D22D,  NAME'     14
     1    D23D,D31D,D32D,D33D,XEDOT,YEDOT,ZEDOT,LELEVND,RELEVND,DRD,  NAMES     15
     2    TADD(2),PSITD(2),THTD(2),DRCSD(10),FRCSAD(10),DFLAPHD,DFLAPAD, NAMES  16
     3    TFRACD(2)                                                   NAMES     17
C                                                                     NAMES     18
C    CONTROL SYSTEM VARIABLES TO BE INTEGRATED                        NAMES     19
C                                                                     NAMES     20
      COMMON PCTRMD,PINTD,PETRMD,RCTRMD,RINTD,RETRMD,YTRMD,QCTRMD,QINTD, NAMES  21
     1      QETRMD,PTRMD,ZEDTRMD                                      NAMES     22
C                                                                     NAMES     23
C   EULER ANGLE RATES TO BE INTEGRATED                                NAMES     24
C                                                                     NAMES     25
      COMMON THETD,PHID,PSID                                          NAMES     26
C                                                                     NAMES     27
C    STICK AND PEDAL FILTER VARIABLES TO BE INTEGRATED                NAMES     28
C                                                                     NAMES     29
      COMMON LNGSTKD,ROLLCD,YAWCD                                     NAMES     30
C                                                                     NAMES     31
C************************  SEGMENT 3 ********************************** NAMES     32
C         INTEGRATED VARIABLES                                        NAMES     33
C                                                                     NAMES     34
      COMMON U,V,W,P,Q,R,D11,D12,D13,D21,D22,                         NAMES     35
     1    D23,D31,D32,D33,XE,YE,ZE,LELEVN,RELEVN,DR,                  NAMES     36
     2    TAB(2),PSIT(2),THT(2),DRCS(10),FRCSA(10),DFLAPH,DFLAPH,     NAMES     37
     3    TFRAC(2)                                                    NAMES     38
C                                                                     NAMES     39
C   INTEGRATED CONTROL SYSTEM VARIABLES                               NAMES     40
C                                                                     NAMES     41
      COMMON PCTRM,PINT,PETRM,RCTRM,RINT,RETRM,YTRM,QCTRM,QINT,       NAMES     42
     1      QETRM,PTRM,ZEDTRM                                         NAMES     43
C                                                                     NAMES     44
C    EULER ANGLES                                                     NAMES     45
C                                                                     NAMES     46
      COMMON THETA,PHI,PSI                                            NAMES     47
C                                                                     NAMES     48
C    INTEGRATED STICK AND PEDAL FILTER VARIABLES                      NAMES     49
C                                                                     NAMES     50
      COMMON LNGSTK,ROLLC,YAWC                                        NAMES     51
C                                                                     NAMES     52
C************************  SEGMENT 4  ********************************* NAMES     53
C    BASIC AIRCRAFT MASS,INERTIA,AND GEOMETRY CONSTANTS               NAMES     54
```

```
C                                                                       NAMES      55
      COMMON WT,IX,IY,IZ,IXZ,FSCG,BLCG,WLCG,GC                          NAMES      56
C                                                                       NAMES      57
C    COMPUTED AIRCRAFT CONSTANTS                                        NAMES      58
C                                                                       NAMES      59
      COMMON EAC,FAC,GAC,JX,JY,JZ,MASS,OMJXJZ                           NAMES      60
C                                                                       NAMES      61
C***********************  SEGMENT 5  ********************************* NAMES      62
C    ERRORS AND TOLERANCES FOR TRIM SOLUTION                            NAMES      63
C                                                                       NAMES      64
      COMMON TOL(19)                                                    NAMES      65
C***********************  SEGMENT 6  ********************************* NAMES      66
C    AERO LIFT AND DRAG CONSTANTS AND TABLES,INPUT                      NAMES      67
C                                                                       NAMES      68
      COMMON AAERO,AERO(23,3),SURFCP(3,3)                               NAMES      69
C                                                                       NAMES      70
C EQUIVALENCE IN THE AERO ARRAY - THE CONSTANTS ARE ARRANGED FOR EACH   NAMES      71
C SURFACE IN THE FOLLOWING ORDER  AR,EXPOSED AR,AREA,EXPOSED AREA,      NAMES      72
C LAMBDA1/4,LAMBDALE,TAPER RATIO,CLMAX,ALFAB,A0,CD0,D/B,CL0/DF,CLMAX/DF, NAMES     73
C CD0/DF. SURFACE 1 IS WING, 2 IS HOR. STAB, 3 IS VERT. STAB.           NAMES      74
C                                                                       NAMES      75
C    COMPUTED AERO LIFT AND DRAG CONSTANTS                              NAMES      76
C                                                                       NAMES      77
      COMMON CNAA0(3),AEROK(3),EOS(3),CLA(3)                            NAMES      78
C                                                                       NAMES      79
C***********************  SEGMENT 7  ********************************* NAMES      80
C    WING AERO CONSTANTS,INPUT                                          NAMES      81
C                                                                       NAMES      82
      COMMON FSW,BLW1,BLW2,WLW,CW,BW,EKDA1,EKDA2,EIW,CLBOW,CLBCLW,CLRCLW NAMES     83
     1  ,CLPW,CNBOW,CNBCL2W,CNRCL2W,CNRCDW,CNPCLW,CNPCDAW,CMOW,CMOFW   NAMES      84
     2     ,AEKEL,CYBCL2W                                               NAMES      85
C                                                                       NAMES      86
C    COMPUTED WING AERO CONSTANTS                                       NAMES      87
C                                                                       NAMES      88
      COMMON XWING1,XWING2,YWING1,YWING2,ZWING1,ZWING2                  NAMES      89
C                                                                       NAMES      90
C***********************  SEGMENT 8  ********************************* NAMES      91
C    HORIZONTAL  STABILIZER AERO CONSTANTS                              NAMES      92
C                                                                       NAMES      93
      COMMON FSH,BLH,WLH,CH,BH,EKADE,EIH,EOCLH,CMOFH,CMOH               NAMES      94
     1     ,DXHTO                                                       NAMES      95
C                                                                       NAMES      96
C    COMPUTED HORIZONTAL STABILIZER CONSTANTS                           NAMES      97
C                                                                       NAMES      98
      COMMON XH,YH,ZH,XWEL,ZWEL,AWEL,DWEL                               NAMES      99
C                                                                       NAMES     100
C***********************  SEGMENT 9  ********************************* NAMES     101
C    VERTICAL STABILIZER AERO CONSTANTS                                 NAMES     102
C                                                                       NAMES     103
      COMMON FSV,BLV,WLV,CV,BV,EKADR,EIV,EKV,CNOV                       NAMES     104
     2     ,AEKRJD,TALFA(10),AALFA,TVTEFF(10)                           NAMES     105
C                                                                       NAMES     106
C    COMPUTED VERTICAL STABILIZER CONSTANTS                             NAMES     107
C                                                                       NAMES     108
      COMMON XV,YV,ZV                                                   NAMES     109
C                                                                       NAMES     110
C*********************** SEGMENT 10 ********************************** NAMES     111
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C     FUSELAGE AERO CONSTANTS
C
       COMMON FSF,BLF,WLF,AOQ0,SOQMX,NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2,
      1    AOF,A1F,A2F,EN1,EN2,EN3,EN4,EN5,EN6,EN7
      2   ,DFSF0,ADFSF1,ADFSF2,XKYF
C
C     COMPUTED FUSELAGE AERO CONSTANTS
C
       COMMON XF,YF,ZF
C
C************************ SEGMENT 11 **********************************
C     DIRECT THRUST FORCE AND MOMENT CONSTANTS
C
       COMMON FSSW(2),BLSW(2),WLSW(2),SIGY,ELN,KAFT1,KAFT2,AENG
C
C     COMPUTED DIRECT THRUST CONSTANTS
C
       COMMON CSIGY,SSIGY,XT(2),YT(2),ZT(2)
C
C************************ SEGMENT 12 **********************************
C     RAM FORCE AND MOMENT CONSTANTS
C
       COMMON FSIN(2),BLIN(2),WLIN(2),RINLET,AVOVI,AATURN
C
C     COMPUTED RAM CONSTANTS
C
       COMMON XIN(2),YIN(2),ZIN(2)
C
C************************ SEGMENT 13 **********************************
C     CORIOLIS FORCE AND MOMENT CONSTANTS
C
       COMMON ELDUCT
C
C************************ SEGMENT 14 **********************************
C     PROPULSION SYSTEM CONSTANTS
C
       COMMON AMACH,KBT1,KBT2,KM1,KM2,OMEGMX,RPMMX,RCS,AFRAT
      1   ,JENG,AFPAC,TAUAB,ABACCEL,ABDECEL,TABON
      2   ,TABOFF
C
C     COMPUTED PROPULSION SYSTEM CONSTANTS
C
       COMMON KBT
C
C************************ SEGMENT 15 **********************************
C     RCS FORCE AND MOMENT CONSTANTS
C
       COMMON ARCSJET,ABLDR,BLDREF,FRCSMX(10),DEMAND(10),BLDMOR(10),
      1    RCS( 10,5),FSRCS(10),BLRCS(10),WLRCS(10),THTRCS(10),PSIRCS(10)
C
C     COMPUTED RCS CONSTANTS
C
       COMMON FRCSMXR,FRCSMX0,FRCSMX1,CTHTRCS(10),STHTRCS(10),CPSIRCS(10)
      1   ,SPSIRCS(10),XJET(10),YJET(10),ZJET(10)
C
C************************ SEGMENT 16 **********************************
C     CONTROL SYSTEM CONSTANTS
```

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C                                                                         NAMES 169
C                                                                         NAMES 170
C     PSEUDO-PILOT CONTROL SYSTEM CONSTANTS                               NAMES 171
C                                                                         NAMES 172
      COMMON DUM,AKZED,AKZEE1,AKZEE2,AKYED,AKYEE,                         NAMES 173
     1    AKJ,AKV,AKW,AKXES,AKYES,AKZES                                   NAMES 174
C                                                                         NAMES 175
C     CONTROL SYSTEM FUNCTION SWITCH CONSTANTS                            NAMES 176
C                                                                         NAMES 177
      COMMON CSV,VASW,CS1,THETSW                                          NAMES 178
C                                                                         NAMES 179
C     ROLL CONTROL SYSTEM CONSTANTS                                       NAMES 180
C                                                                         NAMES 181
      COMMON TAKPC(8),TTHETA(8),TAKPE(8),TKPCI1(8),ATHETA,TKPEI1(8),      NAMES 182
     1     TKP(8),PELIM,AKDYDR,KTHTR,KDA                                  NAMES 183
C                                                                         NAMES 184
C     YAW CONTROL SYSTEM CONSTANTS                                        NAMES 185
C                                                                         NAMES 186
      COMMON TAKRC(8),TAKRE(8),TKRCI1(8),TKREI1(8),TKR(8),RELIM,          NAMES 187
     1    AKYTRM,KPSIT,KDR,TAKAY(8),KTY                                   NAMES 188
C                                                                         NAMES 189
C     PITCH CONTROL SYSTEM CONSTANTS                                      NAMES 190
C                                                                         NAMES 191
      COMMON TAKQC(8),TAKQE(8),TKQCI1(8),TKQEI1(8),TKQ(8),QELIM,          NAMES 192
     1    AKPTRM,DSTK,KJE,KTHTP                                           NAMES 193
C                                                                         NAMES 194
C     HEAVE CONTROL SYSTEM CONSTANTS                                      NAMES 195
C                                                                         NAMES 196
      COMMON TAKZE(8),TKZEI1(8),AKTHDOT,ZELIM                             NAMES 197
C                                                                         NAMES 198
C     CONSTANTS ASSOCIATED WITH ACTUATION SYSTEM INPUTS                   NAMES 199
C                                                                         NAMES 200
      COMMON ELEVNRF,PSITRF(2)                                            NAMES 201
C                                                                         NAMES 202
C     FLAP CONTROL SYSTEM CONSTANTS                                       NAMES 203
C                                                                         NAMES 204
      COMMON KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                              NAMES 205
C                                                                         NAMES 206
C     DYNAMIC PRESSURE TABLE FOR CONTROL SYSTEM GAINS                     NAMES 207
C                                                                         NAMES 208
      COMMON AQBAR,TQBAR(8)                                               NAMES 209
C                                                                         NAMES 210
C     STICK AND PEDAL FILTER TIME CONSTANT TABLES                         NAMES 211
C                                                                         NAMES 212
      COMMON TTPITCH(8),TTROLL(8),TTYAW(8)                                NAMES 213
C                                                                         NAMES 214
C************************ SEGMENT 17 ************************************ NAMES 215
C     ACTUATION CONSTANTS                                                 NAMES 216
C                                                                         NAMES 217
      COMMON LEJRATL,LELRATL,LEUPOSL,LELPOSL,TLEL,                        NAMES 218
     1       REJRATL,RELRATL,REUPOSL,RELPOSL,TREL,                        NAMES 219
     2       DRJRATL,DRLRATL,DRUPOSL,DRLPOSL,TDR,                         NAMES 220
     3       HFJRATL,HFLRATL,HFLAPMX,HFLAPMN,THF,                         NAMES 221
     4       WFJRATL,WFLRATL,WFLAPMX,WFLAPMN,TWF,                         NAMES 222
     5       THTUPL(2),THTLRL(2),THTUPL(2),THTLPL(2),TTHT(2),             NAMES 223
     6       PSIURL(2),PSILRL(2),PSIUPL(2),PSILPL(2),TPSIT(2),            NAMES 224
     7       RCSURL(10),RCSLRL(10),RCSUPL(10),RCSLPL(10),TAJRCS(10)       NAMES 225
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      8     ,FRCSURL(10),FRCSLRL(10),FRCSUPL(10),FRCSLPL(10),TAUFRCS(10)  NAMES
      9     ,DELIM,DALIM,DRLIM                                            NAMES
C                                                                         NAMES
C************************ SEGMENT 18 ************************************ NAMES
C     LIFT-DRAG VARIABLES                                                 NAMES
C                                                                         NAMES
       COMMON LAMB1,CLAE,EKWB,C1,C2,EJ                                    NAMES
C                                                                         NAMES
C************************ SEGMENT 19 ************************************ NAMES
C     WING AERO VARIABLES                                                 NAMES
C                                                                         NAMES
       COMMON DXW,DYW,DZW,DLW,DMW,DNW,CLW,ALFW,CDW,UW,WW,VXZ1,VXZ2,VXZ,   NAMES
      1     DADA1,DADA2,ALFW1,ALFW2,CLW1,CLW2,CDW1,CDW2,CDA,BETW,QWS,QWSB, NAMES
      2     BOV,LWP,NWP,YWP,ALF1,SALF1,CALF1,ALF2,SALF2,CALF2,XW1,XW2,    NAMES
      3     ZW1,ZW2,ALF,SALF,CALF,MW,LW,NW,DA1,DA2,EKELEL,EKELER,CMW1,    NAMES
      4     CMW2,DXWING1,DXWING2                                          NAMES
C                                                                         NAMES
C************************ SEGMENT 20 ************************************ NAMES
C     HORIZONTAL STABILIZER AERO VARIABLES                                NAMES
C                                                                         NAMES
       COMMON DXH,DYH,DZH,DLH,DMH,DNH,UH,WH,ALFG,EPS,DALFH,CL1,CL2,CD1,   NAMES
      1     CD2,DADE,ALFH,CLH,CDH,ANG,DIS,XI,ZH,DDBQD,ALFH1,SALFH1,CALFH1 NAMES
      2     ,DAH,DE,QEFF,DAVG,CMH,DXHT                                    NAMES
C                                                                         NAMES
C************************ SEGMENT 21 ************************************ NAMES
C     VERTICAL STABILIZER AERO VARIABLES                                  NAMES
C                                                                         NAMES
       COMMON DXV,DYV,DZV,DLV,DMV,DNV,UV,VV,DADR,ALFV,CLV,CDV,ALFV1,      NAMES
      1     CALFV1,SALFV1,QDV,DRP,EKRUD,CMV,DXVT,VTEFF                    NAMES
C                                                                         NAMES
C************************ SEGMENT 22 ************************************ NAMES
C     FUSELAGE AERO VARIABLES                                             NAMES
C                                                                         NAMES
       COMMON DXF,DYF,DZF,DLF,DMF,DNF,ALFF,ALFYF,ALFTF,QKY,QO,QXZ,AOQ,AS, NAMES
      1     SAF,SDQ,AF,NFOQ,MOQ,MOQ1,S,NF,PITCHF,ALFYFD,NOQ,NOQ1,YAWF     NAMES
      2     ,DFSF                                                         NAMES
C                                                                         NAMES
C************************ SEGMENT 23 ************************************ NAMES
C     DIRECT THRUST FORCE AND MOMENT VARIABLES                            NAMES
C                                                                         NAMES
       COMMON DXT,DYT,DZT,DLT,DMT,DNT,AFT(2),TDOR(2),DX(2),DY(2),DZ(2),   NAMES
      1     DFSSW(2),DBLSW(2),DALSW(2),SPSIT(2),CPSIT(2),STHT(2),CTHT(2)  NAMES
      2     ,KAFT                                                         NAMES
C                                                                         NAMES
C************************ SEGMENT 24 ************************************ NAMES
C     RAM FORCE AND MOMENT VARIABLES                                      NAMES
C                                                                         NAMES
       COMMON DXR,DYR,DZR,DLR,DMR,DNR,VO,ATURNO,BTURN,DBTURN,SBTURN,VIN,  NAMES
      1     VOVI(2),ATURN(2),ELRAM(2),DATURN(2),ETAR(2),FRAM(2),ELR,      NAMES
      2     WLRAM,FSRAM,SATURN,CATURN,DXRO(2),DYRO(2),DZRO(2),DXRI(2),    NAMES
      3     DYRI(2),DZRI(2),UI,VI,WI                                      NAMES
C                                                                         NAMES
C************************ SEGMENT 25 ************************************ NAMES
C     CORIOLIS FORCE AND MOMENT VARIABLES                                 NAMES
C                                                                         NAMES
       COMMON DXCOR,DYCOR,DZCOR,DLCOR,DMCOR,DNCOR,ELCOR,EACOR,DLCORD,     NAMES
      1     DMCORD,DNCORD                                                 NAMES
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C
C************************* SEGMENT 26 *************************************
C     PROPULSION SYSTEM VARIABLES
C
      COMMON HDOT(2),RPM(2),TRST(2),BLDAVL,FGMAX,FGMIN,FGIDL,HDTMK,
     1    TRCJKC(2),TRFQAV,TREQ(2),FRATIO,FRPM,KHDT,KBTP,TRCS,TC(2)
     2   ,HE(2),TFPACC(2),TFRACIN,FRACL,TENG,TFRACE,TABIN,BLOT3,TABE
     3   ,TO(2)
C
C************************* SEGMENT 27 *************************************
C     RCS FORCE AND MOMENT VARIABLES
C
      COMMON DXRCS,DYRCS,DZRCS,DLRCS,DMRCS,DNRCS,DFRCSDB,DFRCSD,FRCS(10)
     1   ,BLDREQ,FRCSAL,FRCSLU,FRCSC(10),DXRC(10),DYRC(10),DZRC(10),
     2    DRCSC(10),BLD,FRCSDB
C
C************************* SEGMENT 28 *************************************
C     CONTROL SYSTEM VARIABLES
C
C
C   PSEUDO-PILOT CONTROL SYSTEM VARIABLES
C
      COMMON ZEE,ZEIC,YEE,YEIC,DXE,DYE,DZE,XES,YES,ZES
C
C   CONTROL SYSTEM FUNCTION SWITCH VARIABLES
C
      COMMON CSSW
C
C    ROLL CONTROL SYSTEM VARIABLES
C
      COMMON ROLLCMD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL
C
C   YAW CONTROL SYSTEM VARIABLES
C
      COMMON YAWCMD,DPED,AKRC,AKRCI,YTRMBUT,RE,AKRE,AKREI,DYAW,AKAY
C
C   PITCH CONTROL SYSTEM VARIABLES
C
      COMMON DLNGSTK,AKQC,AKQCI,PTRMBUT,QE,AKQE,AKQEI,DPITCH
C
C   HEAVE CONTROL SYSTEM VARIABLES
C
      COMMON ZEDTC,ZEDTE,AKZE,AKZEI,DTHROT
C
C   ACTUATION SYSTEM INPUT VARIABLES
C
      COMMON DSIDEF,DNORMF,PSITC(2),THTC(2),DEC,DRC,DAC,DRCSR,DRCSP,
     1    DRCSY,DRCSSF,DRCSNF,TCMD,HFLAPC,WFLAPC,LELEVNC,RELEVNC
C
C   ADDITIONAL CONTROL SYSTEM VARIABLES
C
      COMMON AKPCI1,AKPEI1,AKP,AKRCI1,AKREI1,AKR,AKQCI1,AKQEI1,AKQ,
     1  AKZEI1,CSVSW,TPITCH,TROLL,TYAW
C
C************************* SEGMENT 29 *************************************
C     AIR DATA VARIABLES
C
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      COMMON UAS,VAS,WAS,RHO,TAMB,VSOUND,TRATIO,PRATIO,VA,VK,MN,QBAR,   NAMES    340
     1    ALPH,BETA,ALFAD,SALPH,CALPH,SBETA,CBETA                       NAMES    341
C                                                                       NAMES    342
C     TOTAL AERO FORCE AND MOMENT VARIABLES                             NAMES    343
C                                                                       NAMES    344
      COMMON XAERO,YAERO,ZAERO,LAERO,MAERO,NAERO                        NAMES    345
C                                                                       NAMES    346
C     TOTAL FORCE AND MOMENT VARIABLES                                  NAMES    347
C                                                                       NAMES    348
      COMMON SUMFX,SUMFY,SUMFZ,SUML,SUMM,SUMN                           NAMES    349
C                                                                       NAMES    350
C     CORRECTED DIRECTIONAL COSINES                                     NAMES    351
C                                                                       NAMES    352
      COMMON D11P,D12P,D13P,D21P,D22P,D23P,D31P,D32P,D33P,DCMAG         NAMES    353
C                                                                       NAMES    354
C     MISCELLANEOUS VARIABLES                                           NAMES    355
C                                                                       NAMES    356
      COMMON UAIR,VAIR,WAIR,ALT,RS,PS,BLOT1(3)                          NAMES    357
     1    ,GYROL,GYROM,GYRON,NXCG,NYCG,NZCG                             NAMES    358
     2    ,XDW,YDW,ZDW,BLOT2(3),LPRIME,NPRIME                           NAMES    359
     3    ,VE,VEDT,VEEST                                                NAMES    360
C                                                                       NAMES    361
C************************ SEGMENT 30 ********************************** NAMES    362
C     TABLES FOR RAM FORCES AND MOMENTS                                 NAMES    363
C                                                                       NAMES    364
      COMMON VOVIT(5),ATJRNT(8),ELPAMT(5,8),DATJRNT(5,8),ETART(5,8)     NAMES    365
C                                                                       NAMES    366
C************************ SEGMENT 31 ********************************** NAMES    367
C     TABLES FOR RCS FORCES AND MOMENTS                                 NAMES    368
C                                                                       NAMES    369
      COMMON FRST(6),BLDRT(6)                                           NAMES    370
C                                                                       NAMES    371
C************************ SEGMENT 32 ********************************** NAMES    372
C     THRUST TABLES                                                     NAMES    373
C                                                                       NAMES    374
      COMMON MNT(4),TFGMAX(4),TFGMIN(4),TFGIDL(4),TMDT(4),TFRAT(6),     NAMES    375
     1     TRPM(5),TFRACT(10),TACCEL(10),TDECEL(10),TTENG(10)           NAMES    376
C                                                                       NAMES    377
C                                                                       NAMES    378
C************************ SEGMENTS 33 THRU 38 ************************* NAMES    379
C     STABILITY DERIVATIVES                                             NAMES    380
C                                                                       NAMES    381
C     SEGMENT 33                                                        NAMES    382
      COMMON DXWG(25),DXHS(25),DXVS(25),DXFS(25),DXAER(25),DXTS(25),    NAMES    383
     1       DXRAM(25),DXCLS(25),DXRCSF(25),X(25)                       NAMES    384
C     SEGMENT 34                                                        NAMES    385
      COMMON DYWG(25),DYHS(25),DYVS(25),DYFS(25),DYAER(25),DYTS(25),    NAMES    386
     1       DYRAM(25),DYCLS(25),DYRCSF(25),Y(25)                       NAMES    387
C     SEGMENT 35                                                        NAMES    388
      COMMON DZWG(25),DZHS(25),DZVS(25),DZFS(25),DZAER(25),DZTS(25),    NAMES    389
     1       DZRAM(25),DZCLS(25),DZRCSF(25),Z(25)                       NAMES    390
C     SEGMENT 36                                                        NAMES    391
      COMMON DLWG(25),DLHS(25),DLVS(25),DLFS(25),DLAER(25),DLTS(25),    NAMES    392
     1       DLRAM(25),DLCLS(25),DLRCSF(25),AL(25)                      NAMES    393
C     SEGMENT 37                                                        NAMES    394
      COMMON DMWG(25),DMHS(25),DMVS(25),DMFS(25),DMAER(25),DMTS(25),    NAMES    395
     1       DMRAM(25),DMCLS(25),DMRCSF(25),AM(25)                      NAMES    396
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C     SEGMENT 38                                                       NAMES    397
       COMMON DNWG(25),DNHS(25),DNVS(25),DNFS(25),DNAER(25),DNTS(25),  NAMES    398
     1        DNRAM(25),DNCLS(25),DNRCSF(25),AN(25)                    NAMES    399
C                                                                      NAMES    400
C                                                                      NAMES    401
C************************ SEGMENT 39 ********************************** NAMES    402
C     DERIVATIVE CONTROL                                               NAMES    403
C                                                                      NAMES    404
       COMMON ADER,DELV(25)                                            NAMES    405
C                                                                      NAMES    406
C************************ SEGMENT 40 ********************************** NAMES    407
C     SCRATCH COMMON                                                   NAMES    408
       COMMON WORK(50)                                                 NAMES    409
C                                                                      NAMES    410
C************************ SEGMENT 41 ********************************** NAMES    411
C     MISCELLANEOUS CONSTANTS                                          NAMES    412
C                                                                      NAMES    413
       COMMON AWIND,VWIND,PSIWIND,XE2D,YE2D,ZE2D                       NAMES    414
     1    ,TRMTURN,GAMMA,VADOT,TURNRAD                                 NAMES    415
C                                                                      NAMES    416
C************************ SEGMENT 42 ********************************** NAMES    417
C    AERO SURFACE EFFECTIVENESS TABLES                                 NAMES    418
C                                                                      NAMES    419
       COMMON ELEVT(7),EKELET(7),RUDT(7),EKRUDT(7)                     NAMES    420
C                                                                      NAMES    421
C************************ SEGMENT 43 ********************************** NAMES    422
C            PILOT INPUT CONTROL DATA                                  NAMES    423
C                                                                      NAMES    424
       COMMON ACMD(5),ATIME,ASKEEP,AYEHLD,CMDT1(20),CMDT2(20),         NAMES    425
     1        CMDT3(20),CMDT4(20),CMDT5(20),TIMET(20),ATRANS,AVAT,TTRANS, NAMES 426
     2         THROTT(10),VAT(10),THETCT(10)                           NAMES    427
C                                                                      NAMES    428
C*********************** SEGMENT 44 *********************************** NAMES    429
C     TABLES,CONSTANTS,AND VARIABLES FOR VARYING FEEDBACK CONTROL LAWS NAMES    430
C                                                                      NAMES    431
       COMMON ACSSW,TCSSW1(5),TAKQS(5), TKPINT(5),TKPHI(5),TKPB(5),    NAMES    432
     1        TKPS(5),TKQINT(5),TKTHETA(5),TKRINT(5),TKPSI(5),TKRB(5), NAMES    433
     2        TAKPCI(5),TAKPEI(5),TAKRCI(5),TAKREI(5),TAKQCI(5),TAKQEI(5), NAMES 434
     3        TKRS(5),AKPHIRS,AKPINT,AKPHI,AKPB,AKPS,AKQINT,AKTHETA,AKRINT, NAMES 435
     4        AKPSI,AKRB,AKRS,AKQS                                     NAMES    436
C                                                                      NAMES    437
C*********************** SEGMENT 45 *********************************** NAMES    438
C     TABLES,CONSTANTS,AND VARIABLES FOR CONTROL SYSTEM GAINS WHICH    NAMES    439
C         VARY AS FUNCTIONS OF AIRSPEED                                NAMES    440
C                                                                      NAMES    441
       COMMON VELGAIN,AVEL,TVEL(8),VAKPC(8),VKPCI1(8),VKPEI1(8),VKP(8), NAMES   442
     1        VAKPE(8),VAKRC(8),VKRCI1(8),VKREI1(8),VKR(8),VAKRE(8),VAKQC(8) NAMES 443
     2    ,VKQCI1(8),VKQEI1(8),VKQ(8),VAKQE(8),VAKZE(8),VKZEI1(8)      NAMES    444
     3     ,VTPITCH(8),VTROLL(8),VTYAW(8)                              NAMES    445
       REAL LAMB1                                                      NAMES    446
       REAL LNGSTK,LNGSTKD                                             NAMES    447
       REAL IX,IY,IZ,IXZ,JX, JY, JZ,MASS                               NAMES    448
       REAL NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2                          NAMES    449
       REAL KBT1,KBT2,KM1,KM2,KBT                                      NAMES    450
       REAL KPSIT,KTHTP,KTHTR,KDE,KDR,KDA,KTY                          NAMES    451
       REAL LWP,WWP,NW,LW,MW                                           NAMES    452
       REAL NFOQ,MOQ,MOQ1,NOQ,NOQ1                                     NAMES    453
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      REAL KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                        NAMES     454
      REAL MDOT,MDTMX,KMJT,KBTP                                   NAMES     455
      REAL KAFT1,KAFT2,KAFT                                       NAMES     456
      REAL LAERO,MAERO,NAERO                                      NAMES     457
      REAL LELPOSL,LELRATL,LEUPOSL,LEURATL,LPRIME,NPRIME          NAMES     458
      REAL LELEVND,LELEVN,LELEVNC,MNT,NF,MN                       NAMES     459
      REAL JENG                                                   NAMES     460
      REAL NXCG,NYCG,NZCG                                         NAMES     461
      DIMENSION NAME1(8),NAME2(25),A(500)                         DERIVS      7
C                                                                 DERIVS      8
C       NAME1    LIST OF DEPENDENT VARIABLES                      DERIVS      9
C       NAME2    LIST OF INDEPENDENT VARIABLES                    DERIVS     10
C                                                                 DERIVS     11
      EQUIVALENCE (A,T)                                           DERIVS     12
      DATA NAME1/ 5H    X/, 5H    Y/, 5H    Z/, 5H    L/, 5H    M/, 5H    N/ / DERIVS     13
      DATA NAME2/ 5HU    ,5HW    ,5HQ    ,5HDE   ,5HFLAPW,5HFLAPH,    DERIVS     14
     1  5HDRCSP,5HDRCSN,5HTO1  ,5HTO2  ,5HTHT1 ,5HTHT2 ,5HV    ,5HP     DERIVS     15
     2 ,5HR    ,5HDR   ,5HDA   ,5HDRCSR,5HDRCSY,5HDRCSS,5HPSIT1,5HPSIT2 DERIVS     16
     3 /                                                          DERIVS     17
      DATA ASTRIK,BLANK/ 1H*,1H /                                 DERIVS     18
      IF(IPRINT.EQ.1)GO TO 100                                    DERIVS     19
      IF(IFLAG.NE.0)GO TO 1                                       DERIVS     20
C                                                                 DERIVS     21
C     INITIALIZATION                                              DERIVS     22
      CALL SYSEQS                                                 DERIVS     23
      CALL FORCES(0.)                                             DERIVS     24
      NDER=IFIX(A ER)                                             DERIVS     25
      DXWREF=DXW                                                  DERIVS     26
      DYWREF=DYW                                                  DERIVS     27
      DZWREF=DZW                                                  DERIVS     28
      DLWREF=DLW                                                  DERIVS     29
      DMWREF=DMW                                                  DERIVS     30
      DNWREF=DNW                                                  DERIVS     31
      DXHREF=DXH                                                  DERIVS     32
      DYHREF=DYH                                                  DERIVS     33
      DZHREF=DZH                                                  DERIVS     34
      DLHREF=DLH                                                  DERIVS     35
      DMHREF=DMH                                                  DERIVS     36
      DNHREF=DNH                                                  DERIVS     37
      DXVREF=DXV                                                  DERIVS     38
      DYVREF=DYV                                                  DERIVS     39
      DZVREF=DZV                                                  DERIVS     40
      DLVREF=DLV                                                  DERIVS     41
      DMVREF=DMV                                                  DERIVS     42
      DNVREF=DNV                                                  DERIVS     43
      DXFREF=DXF                                                  DERIVS     44
      D   EF=DYF                                                  DERIVS     45
      DZFREF=DZF                                                  DERIVS     46
      DLFREF=DLF                                                  DERIVS     47
      DMFREF=DMF                                                  DERIVS     48
      DNFREF=DNF                                                  DERIVS     49
      DXAERF=XAERO                                                DERIVS     50
      DYAERF=YAERO                                                DERIVS     51
      DZAERF=ZAERO                                                DERIVS     52
      DLAERF=LAERO                                                DERIVS     53
      DMAERF=MAERO                                                DERIVS     54
      DNAERF=NAERO                                                DERIVS     55
```

```
      DXTREF=DXT
      DYTREF=DYT
      DZTREF=DZT
      DLTREF=DLT
      DMTREF=DMT
      DNTREF=DNT
      DXRREF=DXR
      DYRREF=DYR
      DZRREF=DZR
      DLRREF=DLR
      DMRREF=DMR
      DNRREF=DNR
      DXCREF=DXCOR
      DYCREF=DYCOR
      DZCREF=DZCOR
      DLCREF=DLCOR
      DMCREF=DMCOR
      DNCREF=DNCOR
      DXRCSR=DXRCS
      DYRCSR=DYRCS
      DZRCSR=DZRCS
      DLRCSR=DLRCS
      DMRCSR=DMRCS
      DNRCSR=DNRCS
      XREF=SUMFX
      YREF=SUMFY
      ZREF=SUMFZ
      ALREF=SUML
      AMREF=SUMM
      ANREF=SUMN
      IFLAG=1
    1 CONTINUE
C     PERTURBATION
      NDRIV=1
      DVAR=DELV(NRD)
      A(K1)=A(K1)+DVAR
      CALL SYSEQS
      CALL FORCES(0.)
      AMDV=MASS*DVAR
      DIY=IY*DVAR
      DIX=IX*DVAR
      DIZ=IZ*DVAR
      XWA=(DXW-DXWREF)/AMDV
      YWA=(DYW-DYWREF)/AMDV
      ZWA=(DZW-DZWREF)/AMDV
      ALWA=(DLW-DLWREF)/DIX
      AMWA=(DMW-DMWREF)/DIY
      ANWA=(DNW-DNWREF)/DIZ
      XHA=(DXH-DXHREF)/AMDV
      YHA=(DYH-DYHREF)/AMDV
      ZHA=(DZH-DZHREF)/AMDV
      ALHA=(DLH-DLHREF)/DIX
      AMHA=(DMH-DMHREF)/DIY
      ANHA=(DNH-DNHREF)/DIZ
      XVA=(DXV-DXVREF)/AMDV
      YVA=(DYV-DYVREF)/AMDV
      ZVA=(DZV-DZVREF)/AMDV
```

```
      ALVA=(DLV-DLVREF)/DIX                                    DERIVS   113
      AMVA=(DMV-DMVREF)/DIY                                    DERIVS   114
      ANVA=(DNV-DNVREF)/DIZ                                    DERIVS   115
      XFA=(DXF-DXFREF)/AMDV                                    DERIVS   116
      YFA=(DYF-DYFREF)/AMDV                                    DERIVS   117
      ZFA=(DZF-DZFREF)/AMDV                                    DERIVS   118
      ALFAA=(DLF-DLFREF)/DIX                                   DERIVS   119
      AMFA=(DMF-DMFREF)/DIY                                    DERIVS   120
      ANFA=(DNF-DNFREF)/DIZ                                    DERIVS   121
      XAEROA=(XAERO-DXAERF)/AMDV                               DERIVS   122
      YAEROA=(YAERO DYAERF)/AMDV                               DERIVS   123
      ZAEROA=(ZAERO-DZAERF)/AMDV                               DERIVS   124
      ALAEROA=(LAERO-DLAERF)/DIX                               DERIVS   125
      AMAEROA=(MAERO-DMAERF)/DIY                               DERIVS   126
      ANAEROA=(NAERO-DNAERF)/DIZ                               DERIVS   127
      XTA=(DXT-DXTREF)/AMDV                                    DERIVS   128
      YTA=(DYT-DYTREF)/AMDV                                    DERIVS   129
      ZTA=(DZT-DZTREF)/AMDV                                    DERIVS   130
      ALTA=(DLT-DLTREF)/DIX                                    DERIVS   131
      AMTA=(DMT-DMTREF)/DIY                                    DERIVS   132
      ANTA=(DNT-DNTREF)/DIZ                                    DERIVS   133
      XRA=(DXR-DXRREF)/AMDV                                    DERIVS   134
      YRA=(DYR-DYRREF)/AMDV                                    DERIVS   135
      ZRA=(DZR-DZRREF)/AMDV                                    DERIVS   136
      ALRA=(DLR-DLRREF)/DIX                                    DERIVS   137
      AMRA=(DMR-DMRREF)/DIY                                    DERIVS   138
      ANRA=(DNR-DNRREF)/DIZ                                    DERIVS   139
      XCA=(DXCOR-DXCREF)/AMDV                                  DERIVS   140
      YCA=(DYCOR-DYCREF)/AMDV                                  DERIVS   141
      ZCA=(DZCOR-DZCREF)/AMDV                                  DERIVS   142
      ALCA=(DLCOR-DLCREF)/DIX                                  DERIVS   143
      AMCA=(DMCOR-DMCREF)/DIY                                  DERIVS   144
      ANCA=(DNCOR-DNCREF)/DIZ                                  DERIVS   145
      XRCSA=(DXRCS-DXRCSR)/AMDV                                DERIVS   146
      YRCSA=(DYRCS-DYRCSR)/AMDV                                DERIVS   147
      ZRCSA=(DZRCS-DZRCSR)/AMDV                                DERIVS   148
      ALRCSA=(DLRCS-DLRCSR)/DIX                                DERIVS   149
      AMRCSA=(DMRCS-DMRCSR)/DIY                                DERIVS   150
      ANRCSA=(DNRCS-DNRCSR)/DIZ                                DERIVS   151
      XA=(SUMFX-XREF)/AMDV                                     DERIVS   152
      YA=(SUMFY-YREF)/AMDV                                     DERIVS   153
      ZA=(SUMFZ-ZREF)/AMDV                                     DERIVS   154
      ALA=(SUML-ALREF)/DIX                                     DERIVS   155
      AMA=(SUMM-AMREF)/DIY                                     DERIVS   156
      ANA=(SUMN-ANREF)/DIZ                                     DERIVS   157
C                                                              DERIVS   158
      A(K1)=A(K1)-2.*DVAR                                      DERIVS   159
C                                                              DERIVS   160
      CALL SYSEQS                                              DERIVS   161
      CALL FORCES(0.)                                          DERIVS   162
      XWB=(DXWREF-DXW)/AMDV                                    DERIVS   163
      YWB=(DYWREF-DYW)/AMDV                                    DERIVS   164
      ZWB=(DZWREF-DZW)/AMDV                                    DERIVS   165
      ALWB=(DLWREF-DLW)/DIX                                    DERIVS   166
      AMWB=(DMWREF-DMW)/DIY                                    DERIVS   167
      ANWB=(DNWREF-DNW)/DIZ                                    DERIVS   168
      XHB=(DXHREF-DXH)/AMDV                                    DERIVS   169
```

```
      YHB=(DYHREF-DYH)/AMDV
      ZHB=(DZHREF-DZH)/AMDV
      ALHB=(DLHREF-DLH)/DIX
      AMHB=(DMHREF-DMH)/DIY
      ANHB=(DNHREF-DNH)/DIZ
      XVB=(DXVREF-DXV)/AMDV
      YVB=(DYVREF-DYV)/AMDV
      ZVB=(DZVREF-DZV)/AMDV
      ALVB=(DLVREF-DLV)/DIX
      AMVB=(DMVREF-DMV)/DIY
      ANVB=(DNVREF-DNV)/DIZ
      XFB=(DXFREF-DXF)/AMDV
      YFB=(DYFREF-DYF)/AMDV
      ZFB=(DZFREF-DZF)/AMDV
      ALFB=(DLFREF-DLF)/DIX
      AMFB=(DMFREF-DMF)/DIY
      ANFB=(DNFREF-DNF)/DIZ
      XAEROB=(DXAERF-XAERO)/AMDV
      YAEROB=(DYAERF-YAERO)/AMDV
      ZAEROB=(DZAERF-ZAERO)/AMDV
      ALAEROB=(DLAERF-LAERO)/DIX
      AMAEROB=(DMAERF-MAERO)/DIY
      ANAEROB=(DNAERF-NAERO)/DIZ
      XTB=(DXTREF-DXT)/AMDV
      YTB=(DYTREF-DYT)/AMDV
      ZTB=(DZTREF-DZT)/AMDV
      ALTB=(DLTREF-DLT)/DIX
      AMTB=(DMTREF-DMT)/DIY
      ANTB=(DNTREF-DNT)/DIZ
      XRB=(DXRREF-DXR)/AMDV
      YRB=(DYRREF-DYR)/AMDV
      ZRB=(DZRREF-DZR)/AMDV
      ALRB=(DLRREF-DLR)/DIX
      AMRB=(DMRREF-DMR)/DIY
      ANRB=(DNRREF-DNR)/DIZ
      XCB=(DXCREF DXCOR)/AMDV
      YCB=(DYCREF-DYCOR)/AMDV
      ZCB=(DZCREF-DZCOR)/AMDV
      ALCB=(DLCREF-DLCOR)/DIX
      AMCB=(DMCREF-DMCOR)/DIY
      ANCB=(DNCREF-DNCOR)/DIZ
      XRCSB=(DXRCSR-DXRCS)/AMDV
      YRCSB=(DYRCSR-DYRCS)/AMDV
      ZRCSB=(DZRCSR-DZRCS)/AMDV
      ALRCSB=(DLRCSR-DLRCS)/DIX
      AMRCSB=(DMRCSR-DMRCS)/DIY
      ANRCSB=(DNRCSR-DNRCS)/DIZ
      XB=(XREF-SUMFX)/AMDV
      YB=(YREF-SUMFY)/AMDV
      ZB=(ZREF-SUMFZ)/AMDV
      ALB=(ALREF-SUML)/DIX
      AMB=(AMREF-SUMM)/DIY
      ANB=(ANREF-SUMN)/DIZ
C
      A(K1)=A(K1)+DVAR
C
      IF(NRD.GE.13.AND.NRD.LE.22)GO TO 500
```

```
      DXWG(NRD)=(XWA+XWB)/2.
      DXHS(NRD)=(XHA+XHB)/2.
      DXVS(NRD)=(XVA+XVB)/2.
      DXFS(NRD)=(XFA+XFB)/2.
      DXAER(NRD)=(XAEROA+XAEROB)/2.
      DXTS(NRD)=(XTA+XTB)/2.
      DXRAM(NRD)=(XRA+XRB)/2.
      DXCLS(NRD)=(XCA+XCB)/2.
      DXRCSF(NRD)=(XRCSA+XRCSB)/2.
      DZWG(NRD)=(ZWA+ZWB)/2.
      DZHS(NRD)=(ZHA+ZHB)/2.
      DZVS(NRD)=(ZVA+ZVB)/2.
      DZFS(NRD)=(ZFA+ZFB)/2.
      DZAER(NRD)=(ZAEROA+ZAEROB)/2.
      DZTS(NRD)=(ZTA+ZTB)/2.
      DZRAM(NRD)=(ZRA+ZRB)/2.
      DZCLS(NRD)=(ZCA+ZCB)/2.
      DZRCSF(NRD)=(ZRCSA+ZRCSB)/2.
      X(NRD)=(XA+XB)/2.
      Z(NRD)=(ZA+ZB)/2.
      DMWG(NRD)=(AMWA+AMWB)/2.
      DMHS(NRD)=(AMHA+AMHB)/2.
      DMVS(NRD)=(AMVA+AMVB)/2.
      DMFS(NRD)=(AMFA+AMFB)/2.
      DMAER(NRD)=(AMAEROA+AMAEROB)/2.
      DMTS(NRD)=(AMTA+AMTB)/2.
      DMRAM(NRD)=(AMRA+AMRB)/2.
      DMCLS(NRD)=(AMCA+AMCB)/2.
      DMRCSF(NRD)=(AMRCSA+AMRCSB)/2.
      AM(NRD)=(AMA+AMB)/2.
      GO TO 499
C
  500 CONTINUE
C   SINGLE SIDED DERIVATIVES. LONG. FORCES AND MOMENTS W.R.T.
C   LATERAL-DIRECTIONAL PERTURBATIONS
C
      DXWG(NRD)=XWA
      DXHS(NRD)=XHA
      DXVS(NRD)=XVA
      DXFS(NRD)=XFA
      DXAER(NRD)=XAEROA
      DXTS(NRD)=XTA
      DXRAM(NRD)=XRA
      DXCLS(NRD)=XCA
      DXRCSF(NRD)=XRCSA
      X(NRD)=XA
      DZWG(NRD)=ZWA
      DZHS(NRD)=ZHA
      DZVS(NRD)=ZVA
      DZFS(NRD)=ZFA
      DZAER(NRD)=ZAEROA
      DZTS(NRD)=ZTA
      DZRAM(NRD)=ZRA
      DZCLS(NRD)=ZCA
      DZRCSF(NRD)=ZRCSA
      Z(NRD)=ZA
      DMWG(NRD)=AMWA
```

```
      DMHS(NRD)=AMHA                                                    DERIVS   284
      DMVS(NRD)=AMVA                                                    DERIVS   285
      DMFS(NRD)=AMFA                                                    DERIVS   286
      DMAER(NRD)=AMAEROA                                                DERIVS   287
      DMTS(NRD)=AMTA                                                    DERIVS   288
      DMRAM(NRD)= MRA                                                   DERIVS   289
      DMCLS(NRD)=AMCA                                                   DERIVS   290
      DMRCSF(NRD)=AMRCSA                                                DERIVS   291
      AM(NRD)=AMA                                                       DERIVS   292
C                                                                       DERIVS   293
  493 CONTINUE                                                          DERIVS   294
C                                                                       DERIVS   295
C    LATERAL DIRECTIONAL DERIVATIVE COMPUTATION                         DERIVS   296
C                                                                       DERIVS   297
C                                                                       DERIVS   298
C    LONGITUDINAL DERIVATIVE COMPUTATION                                DERIVS   299
C                                                                       DERIVS   300
      DYWG(NRD)=(YWA+YWB)/2.                                            DERIVS   301
      DYHS(NRD)=(YHA+YHB)/2.                                            DERIVS   302
      DYVS(NRD)=(YVA+YVB)/2.                                            DERIVS   303
      DYFS(NRD)=(YFA+YFB)/2.                                            DERIVS   304
      DYAER(NRD)=(YAEROA+YAEROB)/2.                                     DERIVS   305
      DYTS(NRD)=(YTA+YTB)/2.                                            DERIVS   306
      DYRAM(NRD)=(YRA+YRB)/2.                                           DERIVS   307
      DYCLS(NRD)=(YCA+YCB)/2.                                           DERIVS   308
      DYRCSF(NRD)=(YRCSA+YRCSB)/2.                                      DERIVS   309
      Y(NRD)=(YA+YB)/2.                                                 DERIVS   310
      DLWG(NRD)=(ALWA+ALWB)/2.                                          DERIVS   311
      DLHS(NRD)=(ALHA+ALHB)/2.                                          DERIVS   312
      DLVS(NRD)=(ALVA+ALVB)/2.                                          DERIVS   313
      DLFS(NRD)=(ALFAA+ALFB)/2.                                         DERIVS   314
      DLAER(NRD)=(ALAEROA+ALAEROB)/2.                                   DERIVS   315
      DLTS(NRD)=(ALTA+ALTB)/2.                                          DERIVS   316
      DLRAM(NRD)=(ALRA+ALRB)/2.                                         DERIVS   317
      DLCLS(NRD)=(ALCA+ALCB)/2.                                         DERIVS   318
      DLRCSF(NRD)=(ALRCSA+ALRCSB)/2.                                    DERIVS   319
      AL(NRD)=(ALA+ALB)/2.                                              DERIVS   320
      DNWG(NRD)=(ANWA+ANWB)/2.                                          DERIVS   321
      DNHS(NRD)=(ANHA+ANHB)/2.                                          DERIVS   322
      DNVS(NRD)=(ANVA+ANVB)/2.                                          DERIVS   323
      DNFS(NRD)=(ANFA+ANFB)/2.                                          DERIVS   324
      DNAER(NRD)=(ANAEROA+ANAEROB)/2.                                   DERIVS   325
      DNTS(NRD)=(ANTA+ANTB)/2.                                          DERIVS   326
      DNRAM(NRD)=(ANRA+ANRB)/2.                                         DERIVS   327
      DNCLS(NRD)=(ANCA+ANCB)/2.                                         DERIVS   328
      DNRCSF(NRD)=(ANRCSA+ANRCSB)/2.                                    DERIVS   329
      AN(NRD)=(ANA+ANB)/2.                                              DERIVS   330
      RETURN                                                            DERIVS   331
  100 CONTINUE                                                          DERIVS   332
      NDRIV=0                                                           DERIVS   333
      CALL SYSEQS                                                       DERIVS   334
      CALL FORCES(0.)                                                   DERIVS   335
C                                                                       DERIVS   336
C PUNCH DIMENSIONAL DERIVATIVES                                         DERIVS   337
C                                                                       DERIVS   338
      IF(IPUNCH.EQ.0)GO TO 400                                          DERIVS   339
      WRITE(7,2004)UAS,WAS,Q,THETA,THETD,ALPH,VA                        DERIVS   340
```

```
 2004 FORMAT(7E10.4)
      WRITE(7,2004)IX,IY,IZ,IXZ,WT,JENG
      WRITE(7,2004)(X(I),I=1,6),X(11),X(12),X(9),X(10)
      WRITE(7,2004)(Z(I),I=1,6),Z(11),Z(12),Z(9),Z(10)
      WRITE(7,2004)(AM(I),I=1,6),AM(11),AM(12),AM(9),AM(10)
      WRITE(7,2004)(Y(I),I=13,15),Y(17),Y(16),Y(21),Y(22),Y(9),Y(18),
     1  Y(19)
      WRITE(7,2004)(AL(I),I=13,15),AL(17),AL(15),AL(21),AL(22),AL(9),
     1    AL(10),AL(18)
      WRITE(7,2004)(AN(I),I=13,15),AN(17),AN(15),AN(21),AN(22),AN(9),
     1    AN(10),AN(18)
  400 CONTINUE
C
C     PRINT DIMENSIONAL DERIVATIVES
C
      WRITE(6,2000)
      WRITE(6,2001)
      DO 300 I=1,NDER
      PUNK=BLANK
      IF(I.GE.13.AND.I.LE.22)PUNK=ASTRIK
      WRITE(6,2002)
     1    NAME1(1),NAME2(I),DXWG(I),DXHS(I),DXVS(I),DXFS(I),DXAER(I),
     2      DXTS(I),DXRAM(I),DXCLS(I),DXRCSF(I),X(I),PUNK,
     3    NAME1(3),NAME2(I),DZWG(I),DZHS(I),DZVS(I),DZFS(I),DZAER(I),
     4      DZTS(I),DZRAM(I),DZCLS(I),DZRCSF(I),Z(I),PUNK,
     5    NAME1(5),NAME2(I),DMWG(I),DMHS(I),DMVS(I),DMFS(I),DMAER(I),
     6      DMTS(I),DMRAM(I),DMCLS(I),DMRCSF(I),AM(I),PUNK
  300 CONTINUE
      WRITE(6,2003)
      WRITE(6,2001)
      DO 310 I=1,NDER
      PUNK=BLANK
      WRITE(6,2002)
     1    NAME1(2),NAME2(I),DYWG(I),DYHS(I),DYVS(I),DYFS(I),DYAER(I),
     2      DYTS(I),DYRAM(I),DYCLS(I),DYRCSF(I),Y(I),PUNK,
     3    NAME1(4),NAME2(I),DLWG(I),DLHS(I),DLVS(I),DLFS(I),DLAER(I),
     4      DLTS(I),DLRAM(I),DLCLS(I),DLRCSF(I),AL(I),PUNK,
     5    NAME1(6),NAME2(I),DNWG(I),DNHS(I),DNVS(I),DNFS(I),DNAER(I),
     6      DNTS(I),DNRAM(I),DNCLS(I),DNRCSF(I),AN(I),PUNK
  310 CONTINUE
 2000 FORMAT(1H1,      ,34HLONGITUDINAL STABILITY DERIVATIVES///)
 2001 FORMAT(2X,1[illegible]RIVATIVE,5X,4HWING,4X,9HHOR.STAB.,1X,10HVERT.STAB.,
     1    3X,8HFUSELAGE,3X,8HTOT.AERO,4X,5HTHRUST,6X,3HRAM,6X,8HCORIOLIS
     2  ,5X,3HRCS,7X,5HTOTAL//)
 2002 FORMAT(3(1X,2A5,2X,10(E10.4,1X),A1,/))
 2003 FORMAT(1H1,//40X,41HLATERAL-DIRECTIONAL STABILITY DERIVATIVES///)
       RETURN
       END
```

```
      SUBROUTINE DTLU(X,Y,FXY,L,M,XARG,YARG,U,KX,KY)
C  DOUBLE TABLE LOCK-UP LAGRANGE INTERPOLATION U=F(X,Y)
C  X VARIES MOST RAPIDLY IN TABULATING FXY-ARRAY
      DIMENSION X(1),Y(1),FXY(1),A(4),B(4)
      DATA  LOCX,LOCY,OXARG,OYARG,KXO,KYO/0,0,0.,0.,0,0 /
CHECK FOR NECESSITY OF SEARCHING TABLES AND COMPUTING WEIGHTS
      KX= IABS(KX)
      KY= IABS(KY)
      IF( LOCF(X).EQ.LOCX .AND. XARG.EQ.OXARG .AND. KX.EQ.KXO) GO TO 1
      KXO=KX
       LOCX= LOCF( )
       OXARG= XARG
       CALL INTRP(X,L,XARG,I,A,IABS(KX))
    1 IF( LOCF(Y).EQ.LOCY .AND. YARG.EQ.OYARG .AND. KY.EQ.KYO ) GO TO 2
      KYO=KY
       LOCY= LOCF(Y)
       OYARG= YARG
       CALL INTRP(Y,M,YARG,J,B,IABS(KY))
    2 CONTINUE
      K=(J-4)*L+I
      U=0.
      DO 100 INDX=1,4
      K=K+L
  100 U=U+B(INDX)*(A(1)*FXY(K-2)+A(2)*FXY(K-1)+A(3)*FXY(K)+
     1  A(4)*FXY(K+1))
      RETURN
      END
```

```
      SUBROUTINE ERROR(E)                                               ERROR      2
C                                                                       ERROR      3
C  CALCULATES ERRORS FOR TRIM ROUTINE                                   ERROR      4
C                                                                       ERROR      5
C                                                                       ERROR      6
      COMMON/INDRIV/NDRIV                                               NAMES      2
      COMMON/INTRIM/ITRIM                                               NAMES      3
      COMMON NEQS                                                       NAMES      4
C                                                                       NAMES      5
C*********************** SEGMENT 1 ************************************ NAMES      6
C        TIME,PRINT,AND PLOT CONTROL PARAMETERS,INPUT                   NAMES      7
C                                                                       NAMES      8
      COMMON T,T0,DT,TMAX,DTPPNT,DTPLOT,TI                              NAMES      9
C                                                                       NAMES     10
C*********************** SEGMENT 2 ************************************ NAMES     11
C        VARIABLES TO BE INTEGRATED IN TIME                             NAMES     12
C                                                                       NAMES     13
      COMMON UDOT,VDOT,WDOT,PDOT,QDOT,RDOT,D11D,D12D,D13D,D21D,D22D,    NAMES     14
     1    D23D,D31D,D32D,D33D,XEDOT,YEDOT,ZEDOT,LELEVND,RELEVND,DRD,    NAMES     15
     2    TABD(2),PSITD(2),THTD(2),DRCSD(10),FRCSAD(10),DFLAPHD,DFLAP4D, NAMES    16
     3    TFRACD(2)                                                     NAMES     17
C                                                                       NAMES     18
C   CONTROL SYSTEM VARIABLES TO BE INTEGRATED                           NAMES     19
C                                                                       NAMES     20
      COMMON PCTRMD,PINTD,PETRMD,RCTRMD,RINTD,RETRMD,YTRMD,QCTRMD,QINTD, NAMES    21
     1      QETRMD,PTRMD,ZEDTRMD                                        NAMES     22
C                                                                       NAMES     23
C  EULER ANGLE RATES TO BE INTEGRATED                                   NAMES     24
C                                                                       NAMES     25
      COMMON THETD,PHID,PSID                                            NAMES     26
C                                                                       NAMES     27
C   STICK AND PEDAL FILTER VARIABLES TO BE INTEGRATED                   NAMES     28
C                                                                       NAMES     29
      COMMON LNGSTKD,ROLLCD,YAWCD                                       NAMES     30
C                                                                       NAMES     31
C*********************** SEGMENT 3 ************************************ NAMES     32
C        INTEGRATED VARIABLES                                           NAMES     33
C                                                                       NAMES     34
      COMMON U,V,W,P,Q,R,D11,D12,D13,D21,D22,                           NAMES     35
     1    D23,D31,D32,D33,XE,YE,ZE,LELEVN,RELEVN,DR,                    NAMES     36
     2    TAB(2),PSIT(2),THT(2),DRCS(10),FRCSA(10),DFLAPH,DFLAPN,       NAMES     37
     3    TFRAC(2)                                                      NAMES     38
C                                                                       NAMES     39
C  INTEGRATED CONTROL SYSTEM VARIABLES                                  NAMES     40
C                                                                       NAMES     41
      COMMON PCTRM,PINT,PETRM,RCTRM,RINT,RETRM,YTRM,QCTRM,QINT,         NAMES     42
     1      QETRM,PTPM,ZEDTRM                                           NAMES     43
C                                                                       NAMES     44
C   EULER ANGLES                                                        NAMES     45
C                                                                       NAMES     46
      COMMON THETA,PHI,PSI                                              NAMES     47
C                                                                       NAMES     48
C   INTEGRATED STICK AND PEDAL FILTER VARIABLES                         NAMES     49
C                                                                       NAMES     50
      COMMON LNGSTK,ROLLC,YAWC                                          NAMES     51
C                                                                       NAMES     52
C*********************** SEGMENT 4 ************************************ NAMES     53
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C     BASIC AIRCRAFT MASS,INERTIA,AND GEOMETRY CONSTANTS
C
       COMMON WT,IX,IY,IZ,IXZ,FSCG,BLCG,WLCG,GC
C
C     COMPUTED AIRCRAFT CONSTANTS
C
       COMMON EAC,FAC,GAC,JX,JY,JZ,MASS,OMJXJZ
C
C************************   SEGMENT 5  **********************************
C    ERRORS AND TOLERANCE  FOR TRIM SOLUTION
C
       COMMON TOL(19)
C************************   SEGMENT 6  **********************************
C    AERO LIFT AND DRAG CONSTANTS AND TABLES,INPJT
C
       COMMON AAERO,AERO(23,3),SURFCP(3,3)
C
C EQUIVALENCE IN THE AERO ARRAY - THE CONSTANTS ARE ARRANGED FOR EACH
C SURFACE IN THE FOLLOWING ORDER  AR,EXPOSED AR,AREA,EXPOSED AREA,
C LAMBDA1/4,LAMBDALF,TAPER RATIO,CLMAX,ALFAB,AD,CD0,D/B,CL0/DF,CLMAX/DF,
C CD0/DF. SURFACE 1 IS WING, 2 IS HOR. STAB, 3 IS VERT. STAB.
C
C    COMPUTED AERO LIFT AND DRAG CONSTANTS
C
       COMMON CNAA0(3),AEROK(3),EOS(3),CLA(3)
C
C************************   SEGMENT 7  **********************************
C     WING AERO CONSTANTS,INPJT
C
       COMMON FSW,BLW1,BLW2,WLW,CW,BW,EKDA1,EKDA2,EIW,CLB0W,CLBCLW,CLRCLW
     1  ,CLPW,CNB0W,CNBCL2W,CNRCL2W,CNRC0W,CNPCLW,CNPC0AW,CM0W,CMDFW
     2     ,AEKEL,CYBCL2W
C
C     COMPUTED WING AERO CONSTANTS
C
       COMMON XWING1,XWING2,YWING1,YWING2,ZWING1,ZWING2
C
C************************   SEGMENT 8  **********************************
C     HORIZONTAL  STABILIZER AERO CONSTANTS
C
       COMMON FSH,BLH,WLH,CH,BH,EKADE,EIH,EOCL4,CMDFH,CM0H
     1     ,DXHT0
C
C     COMPUTED HORIZONTAL STABILIZER CONSTANTS
C
       COMMON XH,YH,ZH,XWEL,ZWEL,AWEL,DWEL
C
C************************   SEGMENT 9  **********************************
C     VERTICAL STABILIZER AERO CONSTANTS
C
       COMMON FSV,BLV,WLV,CV,BV,EKADR,EIV,EKV,CN0V
     2     ,AEKRJD,TALFA(10),AALFA,TVTEFF(10)
C
C     COMPUTED VERTICAL STABILIZER CONSTANTS
C
       COMMON XV,YV,ZV
C
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      C************************ SEGMENT 10 ********************************** NAMES      111
      C     FUSELAGE AERO CONSTANTS                                            NAMES      112
      C                                                                        NAMES      113
            COMMON FSF,BLF,WLF,AOQ0,SUQMX,NFOQM,MOQMK1,MOQMK2,NOQMX1,NOQMX2,   NAMES      114
           1    AOF,A1F,A2F,EN1,EN2,EN3,EN4,EN5,EN6,EN7                        NAMES      115
           2    ,OFSF0,AOFSF1,AOFSF2,XKYF                                      NAMES      116
      C                                                                        NAMES      117
      C     COMPUTED FUSELAGE AERO CONSTANTS                                   NAMES      118
      C                                                                        NAMES      119
            COMMON XF,YF,ZF                                                    NAMES      120
      C                                                                        NAMES      121
      C************************ SEGMENT 11 ********************************** NAMES      122
      C     DIRECT THRUST FORCE AND MOMENT CONSTANTS                           NAMES      123
      C                                                                        NAMES      124
            COMMON FSSH(2),BLSH(2),WLSH(2),SIGY,ELN,KAFT1,KAFT2,AENG           NAMES      125
      C                                                                        NAMES      126
      C     COMPUTED DIRECT THRUST CONSTANTS                                   NAMES      127
      C                                                                        NAMES      128
            COMMON CSIGY,SSIGY,XT(2),YT(2),ZT(2)                               NAMES      129
      C                                                                        NAMES      130
      C************************ SEGMENT 12 ********************************** NAMES      131
      C     RAM FORCE AND MOMENT CONSTANTS                                     NAMES      132
      C                                                                        NAMES      133
            COMMON FSIN(2),BLIN(2),WLIN(2),RINLET,AVO/I,AATJRN                 NAMES      134
      C                                                                        NAMES      135
      C     COMPUTED RAM CONSTANTS                                             NAMES      136
      C                                                                        NAMES      137
            COMMON XIN(2),YIN(2),ZIN(2)                                        NAMES      138
      C                                                                        NAMES      139
      C************************ SEGMENT 13 ********************************** NAMES      140
      C     CORIOLIS FORCE AND MOMENT CONSTANTS                                NAMES      141
      C                                                                        NAMES      142
            COMMON ELDUCT                                                      NAMES      143
      C                                                                        NAMES      144
      C************************ SEGMENT 14 ********************************** NAMES      145
      C     PROPULSION SYSTEM CONSTANTS                                        NAMES      146
      C                                                                        NAMES      147
            COMMON AMACH,KBT1,KBT2,KM1,KM2,OMEGMX,RPMMX,RCS,AFRAT              NAMES      148
           1    ,JENG,AFRAC,TAUAB,ABACCEL,ABDECEL,TABON                        NAMES      149
           2    ,TABOFF                                                        NAMES      150
      C                                                                        NAMES      151
      C     COMPUTED PROPULSION SYSTEM CONSTANTS                               NAMES      152
      C                                                                        NAMES      153
            COMMON KBT                                                         NAMES      154
      C                                                                        NAMES      155
      C************************ SEGMENT 15 ********************************** NAMES      156
      C     RCS FORCE AND MOMENT CONSTANTS                                     NAMES      157
      C                                                                        NAMES      158
            COMMON ARCSJET,ABLDR,BLDREF,FRCSMX(10),DEMAND(10),BLDMOR(10),      NAMES      159
           1    RCSL(10,5),FSRCS(10),BLRCS(10),WLRCS(10),THTRCS(10),PSIRCS(10) NAMES      160
      C                                                                        NAMES      161
      C     COMPUTED RCS CONSTANTS                                             NAMES      162
      C                                                                        NAMES      163
            COMMON FRCSMXP,FRCSMX0,FRCSMX1,CTHTRCS(10),STHTRCS(10),CPSIRCS(10) NAMES      164
           1    ,SPSIRCS(10),XJET(10),YJET(10),ZJET(10)                        NAMES      165
      C                                                                        NAMES      166
      C************************ SEGMENT 16 ********************************** NAMES      167
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C     CONTROL SYSTEM CONSTANTS                                          NAMES    168
C                                                                       NAMES    169
C                                                                       NAMES    170
C   PSEUDO-PILOT CONTROL SYSTEM CONSTANTS                               NAMES    171
C                                                                       NAMES    172
      COMMON DUM,AKZED,AKZEE1,AKZEE2,AKYED,AKYEE,                       NAMES    173
     1    AKJ,AKV,AKW,AKXES,AKYES,AKZES                                 NAMES    174
C                                                                       NAMES    175
C   CONTROL SYSTEM FUNCTION SWITCH CONSTANTS                            NAMES    176
C                                                                       NAMES    177
      COMMON CSV,VASW,CS1,THETSW                                        NAMES    178
C                                                                       NAMES    179
C   ROLL CONTROL SYSTEM CONSTANTS                                       NAMES    180
C                                                                       NAMES    181
      COMMON TAKPC(8),TTHETA(8),TAKPE(8),TKPCI1(8),ATHETA,TKPEI1(8),    NAMES    182
     1      TKP(8),PELIM,AKDYDR,KTHTR,KDA                               NAMES    183
C                                                                       NAMES    184
C   YAW CONTROL SYSTEM CONSTANTS                                        NAMES    185
C                                                                       NAMES    186
      COMMON TAKRC(8),TAKRE(8),TKRCI1(8),TKREI1(8),TKR(8),RELIM,        NAMES    187
     1    AKYTRM,KPSIT,KDR,TAKAY(8),KTY                                 NAMES    188
C                                                                       NAMES    189
C     PITCH CONTROL SYSTEM CONSTANTS                                    NAMES    190
C                                                                       NAMES    191
      COMMON TAKQC(8),TAKQE(8),TKQCI1(8),TKQEI1(8),TKQ(8),QELIM,        NAMES    192
     1    AKPTRM,DSTK,KDE,KTHTP                                         NAMES    193
C                                                                       NAMES    194
C   HEAVE CONTROL SYSTEM CONSTANTS                                      NAMES    195
C                                                                       NAMES    196
      COMMON TAKZE(8),TKZEI1(8),AKTHROT,ZELIM                           NAMES    197
C                                                                       NAMES    198
C   CONSTANTS ASSOCIATED WITH ACTUATION SYSTEM INPUTS                   NAMES    199
C                                                                       NAMES    200
      COMMON ELEVNRF,PSITRF(2)                                          NAMES    201
C                                                                       NAMES    202
C   FLAP CONTROL SYSTEM CONSTANTS                                       NAMES    203
C                                                                       NAMES    204
      COMMON KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                            NAMES    205
C                                                                       NAMES    206
C    DYNAMIC PRESSURE TABLE FOR CONTROL SYSTEM GAINS                    NAMES    207
C                                                                       NAMES    208
      COMMON AQBAP,TQBAR(8)                                             NAMES    209
C                                                                       NAMES    210
C    STICK AND PEDAL FILTER TIME CONSTANT TABLES                        NAMES    211
C                                                                       NAMES    212
      COMMON TTPITCH(8),TTROLL(8),TTYAW(8)                              NAMES    213
C                                                                       NAMES    214
C************************ SEGMENT 17 ********************************  NAMES    215
C    ACTUATION CONSTANTS                                                NAMES    216
C                                                                       NAMES    217
      COMMON LEURATL,LELRATL,LEUPOSL,LELPOSL,TLEL,                      NAMES    218
     1         REURATL,RELRATL,REUPOSL,RELPOSL,TREL,                    NAMES    219
     2         DRURATL,DRLRATL,DRUPOSL,DRLPOSL,TDR,                     NAMES    220
     3         HFURATL,HFLRATL,HFLAPMX,HFLAPMN,THF,                     NAMES    221
     4         WFURATL,WFLRATL,WFLAPMX,WFLAPMN,TWF,                     NAMES    222
     5         THTUPL(2),THTLRL(2),THTUPL(2),THTLPL(2),TTHT(2),         NAMES    223
     6         PSIUPL(2),PSILRL(2),PSIUPL(2),PSILPL(2),TPSIT(2),        NAMES    224
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     7    RCSURL(10),RCSLRL(10),RCSUPL(10),RCSLPL(10),TAURCS(10)         NAMES    225
     8    ,FRCSURL(10),FRCSLRL(10),FRCSUPL(10),FRCSLPL(10),TAUFRCS(10)   NAMES    226
     9    ,DELIM,DALIM,DRLIM                                              NAMES    227
C                                                                         NAMES    228
C************************ SEGMENT 18 **********************************  NAMES    229
C    LIFT-DRAG VARIABLES                                                  NAMES    230
C                                                                         NAMES    231
      COMMON LAMB1,CLAE,EKAB,C1,C2,EJ                                     NAMES    232
C                                                                         NAMES    233
C************************ SEGMENT 19 **********************************  NAMES    234
C    WING AERO VARIABLES                                                  NAMES    235
C                                                                         NAMES    236
      COMMON DXW,DYW,DZW,DLW,DMW,DNW,CLW,ALFW,CDW,UW,WW,VXZ1,VXZ2,VXZ,    NAMES    237
     1    DADA1,DADA2,ALFW1,ALFW2,CLW1,CLW2,CDW1,CDW2,CDA,BETA,QWS,QWSB,  NAMES    238
     2    BOV,LWP,NWP,YWP,ALF1,SALF1,CALF1,ALF2,SALF2,CALF2,XW1,XW2,      NAMES    239
     3    ZW1,ZW2,ALF,SALF,CALF,MW,LW,NW,DA1,DA2,EKELEL,EKELER,CMW1,      NAMES    240
     4    CMW2,DXWING1,DXWING2                                            NAMES    241
C                                                                         NAMES    242
C************************ SEGMENT 20 **********************************  NAMES    243
C    HORIZONTAL STABILIZER AERO VARIABLES                                 NAMES    244
C                                                                         NAMES    245
      COMMON DXH,DYH,DZH,DLH,DMH,DNH,UH,WH,ALFS,EPS,DALFH,CL1,CL2,CD1,    NAMES    246
     1    CD2,DADE,ALFH,CLH,CDH,ANG,DIS,XI,ZH,DQDQB,ALFH1,SALFH1,CALFH1   NAMES    247
     2    ,DAH,DE,QEFF,DAVG,CMH,DXHT                                      NAMES    248
C                                                                         NAMES    249
C************************ SEGMENT 21 **********************************  NAMES    250
C    VERTICAL STABILIZER AERO VARIABLES                                   NAMES    251
C                                                                         NAMES    252
      COMMON DXV,DYV,DZV,DLV,DMV,DNV,UV,VV,DADR,ALFV,CLV,CDV,ALFV1,       NAMES    253
     1    CALFV1,SALFV1,QOV,DRP,EKRUD,CMV,DXVT,VTEFF                      NAMES    254
C                                                                         NAMES    255
C************************ SEGMENT 22 **********************************  NAMES    256
C    FUSELAGE AERO VARIABLES                                              NAMES    257
C                                                                         NAMES    258
      COMMON DXF,DYF,DZF,DLF,DMF,DNF,ALFF,ALFYF,ALFTF,QXY,Q0,QXZ,ADQ,AS,  NAMES    259
     1    SAF,SDQ,AF,NFOQ,MOQ,MOQ1,S,NF,PITCHF,ALFYFD,NOQ,NOQ1,YAWF        NAMES    260
     2    ,DFSF                                                           NAMES    261
C                                                                         NAMES    262
C************************ SEGMENT 23 **********************************  NAMES    263
C    DIRECT THRUST FORCE AND MOMENT VARIABLES                             NAMES    264
C                                                                         NAMES    265
      COMMON DXT,DYT,DZT,DLT,DMT,DNT,AFT(2),TCOR(2),DX(2),DY(2),DZ(2),    NAMES    266
     1    DFSSW(2),DBLSW(2),DWLSW(2),SPSIT(2),CPSIT(2),STHT(2),CTHT(2)    NAMES    267
     2    ,KAFT                                                           NAMES    268
C                                                                         NAMES    269
C************************ SEGMENT 24 **********************************  NAMES    270
C    RAM FORCE AND MOMENT VARIABLES                                       NAMES    271
C                                                                         NAMES    272
      COMMON DXR,DYR,DZR,DLR,DMR,DNR,V0,ATURNO,BTURN,CBTURN,SBTURN,VIN,   NAMES    273
     1    VOVI(2),ATURN(2),ELRAM(2),DATURN(2),ETAR(2),FRAM(2),ELR,        NAMES    274
     2    WLRAM,FSRAM,SATURN,CATURN,DXRO(2),DYRO(2),DZRO(2),DXRI(2),      NAMES    275
     3    DYRI(2),DZRI(2),UI,VI,WI                                        NAMES    276
C                                                                         NAMES    277
C************************ SEGMENT 25 **********************************  NAMES    278
C    CORIOLIS FORCE AND MOMENT VARIABLES                                  NAMES    279
C                                                                         NAMES    280
      COMMON DXCOR,DYCOR,DZCOR,DLCOR,DMCOR,DNCOR,ELCOR,EACOR,DLCORD,      NAMES    281
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     1   DMCOPD,DNCORD                                                   NAMES  282
C                                                                        NAMES  283
C************************ SEGMENT 26 *********************************** NAMES  284
C    PROPULSION SYSTEM VARIABLES                                         NAMES  285
C                                                                        NAMES  286
      COMMON MDOT(2),RPM(2),TRST(2),BLDAVL,FGMAX,FGMIN,FGIDL,MDTMX,      NAMES  287
     1    TRCSPEF,TREQAV,TREQ(2),FRATIO,FRPM,KMDT,KBTP,TRCS,TC(2)        NAMES  288
     2   ,ME(2),TFRACC(2),TFRACIN,FRACL,TENG,TFRACE,TABIN,BLOT3,TABE     NAMES  289
     3   ,TO(2)                                                          NAMES  290
C                                                                        NAMES  291
C************************ SEGMENT 27 *********************************** NAMES  292
C    RCS FORCE AND MOMENT VARIABLES                                      NAMES  293
C                                                                        NAMES  294
      COMMON DXRCS,DYRCS,DZRCS,DLRCS,DMRCS,DNRCS,DFRCSDB,DFRCSD,FRCS(10) NAMES  295
     1   ,BLDPEQ,FRCSAL,FRCSLU,FRCSC(10),DXRC(10),DYRC(10),DZRC(10),     NAMES  296
     2    DRCSC(10),BLU,FRCSDB                                           NAMES  297
C                                                                        NAMES  298
C************************ SEGMENT 28 *********************************** NAMES  299
C    CONTROL SYSTEM VARIABLES                                            NAMES  300
C                                                                        NAMES  301
C                                                                        NAMES  302
C   PSEUDO-PILOT CONTROL SYSTEM VARIABLES                                NAMES  303
C                                                                        NAMES  304
      COMMON ZEE,ZEIC,YEE,YEIC,DXE,DYE,DZE,XES,YES,ZES                   NAMES  305
C                                                                        NAMES  306
C   CONTROL SYSTEM FUNCTION SWITCH VARIABLES                             NAMES  307
C                                                                        NAMES  308
      COMMON CSSW                                                        NAMES  309
C                                                                        NAMES  310
C    ROLL CONTROL SYSTEM VARIABLES                                       NAMES  311
C                                                                        NAMES  312
      COMMON ROLLCMD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL         NAMES  313
C                                                                        NAMES  314
C   YAW CONTROL SYSTEM VARIABLES                                         NAMES  315
C                                                                        NAMES  316
      COMMON YAWCMD,DPED,AKRC,AKRCI,YTRMBUT,RE,AKRE,AKREI,DYAW,AKAY      NAMES  317
C                                                                        NAMES  318
C   PITCH CONTROL SYSTEM VARIABLES                                       NAMES  319
C                                                                        NAMES  320
      COMMON DLNGSTK,AKQC,AKQCI,PTRMBUT,QE,AKQE,AKQEI,DPITCH             NAMES  321
C                                                                        NAMES  322
C   HEAVE CONTROL SYSTEM VARIABLES                                       NAMES  323
C                                                                        NAMES  324
      COMMON ZEDTC,ZEDTE,AKZE,AKZEI,DTHROT                               NAMES  325
C                                                                        NAMES  326
C   ACTUATION SYSTEM INPUT VARIABLES                                     NAMES  327
C                                                                        NAMES  328
      COMMON DSIDFF,DNORMF,PSITC(2),THTC(2),DEC,DRC,DAC,DRCSR,DRCSP,     NAMES  329
     1    DRCSY,DRCSSF,DRCSNF,TCMD,HFLAPC,HFLAPS,LELEVNC,RELEVNC         NAMES  330
C                                                                        NAMES  331
C   ADDITIONAL CONTROL SYSTEM VARIABLES                                  NAMES  332
C                                                                        NAMES  333
      COMMON AKPCI1,AKPEI1,AKP,AKRCI1,AKREI1,AKR,AKQCI1,AKQEI1,AKQ,      NAMES  334
     1  AKZEI1,CSVSW,TPITCH,TROLL,TYAW                                   NAMES  335
C                                                                        NAMES  336
C************************ SEGMENT 29 *********************************** NAMES  337
C    AIR DATA VARIABLES                                                  NAMES  338
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C                                                                          NAMES   339
      COMMON UAS,VAS,WAS,RHO,TAMB,VSOUND,TRATIO,PRATIO,VA,VK,MN,QBAR,      NAMES   340
     1    ALPH,BETA,ALFAD,SALPH,CALPH,SBETA,CBETA                          NAMES   341
C                                                                          NAMES   342
C     TOTAL AERO FORCE AND MOMENT VARIABLES                                NAMES   343
C                                                                          NAMES   344
      COMMON XAERO,YAERO,ZAERO,LAERO,MAERO,NAERO                           NAMES   345
C                                                                          NAMES   346
C     TOTAL FORCE AND MOMENT VARIABLES                                     NAMES   347
C                                                                          NAMES   348
      COMMON SUMFX,SUMFY,SUMFZ,SUML,SUMM,SUMN                              NAMES   349
C                                                                          NAMES   350
C     CORRECTED DIRECTIONAL COSINES                                        NAMES   351
C                                                                          NAMES   352
      COMMON D11P,D12P,D13P,D21P,D22P,D23P,D31P,D32P,D33P,DCMAG            NAMES   353
C                                                                          NAMES   354
C     MISCELLANEOUS VARIABLES                                              NAMES   355
C                                                                          NAMES   356
      COMMON UAIR,VAIR,WAIR,ALT,RS,PS,BLOT1(3)                             NAMES   357
     1    ,GYROL,GYROM,GYRON,NXCG,NYCG,NZCG                                NAMES   358
     2    ,XDW,YDW,ZDW,BLOT2(3),LPRIME,NPRIME                              NAMES   359
     3    ,VE,VEDT,VEEST                                                   NAMES   360
C                                                                          NAMES   361
C*********************** SEGMENT 30 ********************************       NAMES   362
C     TABLES FOR RAM FORCES AND MOMENTS                                    NAMES   363
C                                                                          NAMES   364
      COMMON VOVIT(5),ATURNT(8),ELRAMT(5,8),DATURNT(5,8),ETART(5,8)        NAMES   365
C                                                                          NAMES   366
C*********************** SEGMENT 31 ********************************       NAMES   367
C     TABLES FOR RCS FORCES AND MOMENTS                                    NAMES   368
C                                                                          NAMES   369
      COMMON FPCST(6),BLDRT(6)                                             NAMES   370
C                                                                          NAMES   371
C*********************** SEGMENT 32 ********************************       NAMES   372
C     THRUST TABLES                                                        NAMES   373
C                                                                          NAMES   374
      COMMON MNT(4),TFGMAX(4),TFGMIN(4),TFGIDL(4),TMDT(4),TFRAT(6),        NAMES   375
     1    TRPM(6),TFRACT(10),TACCEL(10),TDECEL(10),TTENG(10)               NAMES   376
C                                                                          NAMES   377
C                                                                          NAMES   378
C*********************** SEGMENTS 33 THRU 38 ***********************       NAMES   379
C     STABILITY DERIVATIVES                                                NAMES   380
C                                                                          NAMES   381
C     SEGMENT 33                                                           NAMES   382
      COMMON DXWG(25),DXHS(25),DXVS(25),DXFS(25),DXAER(25),DXTS(25),       NAMES   383
     1       DXRAM(25),DXCLS(25),DXRCSF(25),X(25)                          NAMES   384
C     SEGMENT 34                                                           NAMES   385
      COMMON DYWG(25),DYHS(25),DYVS(25),DYFS(25),DYAER(25),DYTS(25),       NAMES   386
     1       DYRAM(25),DYCLS(25),DYRCSF(25),Y(25)                          NAMES   387
C     SEGMENT 35                                                           NAMES   388
      COMMON DZWG(25),DZHS(25),DZVS(25),DZFS(25),DZAER(25),DZTS(25),       NAMES   389
     1       DZRAM(25),DZCLS(25),DZRCSF(25),Z(25)                          NAMES   390
C     SEGMENT 36                                                           NAMES   391
      COMMON DLWG(25),DLHS(25),DLVS(25),DLFS(25),DLAER(25),DLTS(25),       NAMES   392
     1       DLRAM(25),DLCLS(25),DLRCSF(25),AL(25)                         NAMES   393
C     SEGMENT 37                                                           NAMES   394
      COMMON DMWG(25),DMHS(25),DMVS(25),DMFS(25),DMAER(25),DMTS(25),       NAMES   395
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      1    DMCOPD,DNCORD                                                  NAMES     282
C                                                                         NAMES     283
C************************ SEGMENT 26 ********************************    NAMES     284
C     PROPULSION SYSTEM VARIABLES                                         NAMES     285
C                                                                         NAMES     286
      COMMON MDOT(2),RPM(2),TRST(2),BLDAVL,FGMAX,FGMIN,FGIDL,MDTMX,       NAMES     287
     1    TRCSPEF,TREQAV,TREQ(2),FRATIO,FRPM,KMDT,KBTP,TRCS,TC(2)        NAMES     288
     2   ,ME(2),TFRACC(2),TFRACIN,FRACL,TENG,TFRACE,TABIN,BLOT3,TABE      NAMES     289
     3   ,TO(2)                                                           NAMES     290
C                                                                         NAMES     291
C************************ SEGMENT 27 ********************************    NAMES     292
C     RCS FORCE AND MOMENT VARIABLES                                      NAMES     293
C                                                                         NAMES     294
      COMMON DXRCS,DYRCS,DZRCS,DLRCS,DMRCS,DNRCS,DFRCSDB,DFRCSD,FRCS(10)  NAMES     295
     1    ,BLDPEQ,FRCSAL,FRCSLU,FRCSS(10),DXRC(10),DYRC(10),DZRC(10),     NAMES     296
     2    DRCSC(10),BLU,FRCSDB                                            NAMES     297
C                                                                         NAMES     298
C************************ SEGMENT 28 ********************************    NAMES     299
C     CONTROL SYSTEM VARIABLES                                            NAMES     300
C                                                                         NAMES     301
C                                                                         NAMES     302
C   PSEUDO-PILOT CONTROL SYSTEM VARIABLES                                 NAMES     303
C                                                                         NAMES     304
      COMMON ZEE,ZEIC,YEE,YEIC,DXE,DWE,DZE,XES,YES,ZES                    NAMES     305
C                                                                         NAMES     306
C   CONTROL SYSTEM FUNCTION SWITCH VARIABLES                              NAMES     307
C                                                                         NAMES     308
      COMMON CSSW                                                         NAMES     309
C                                                                         NAMES     310
C     ROLL CONTROL SYSTEM VARIABLES                                       NAMES     311
C                                                                         NAMES     312
      COMMON ROLLCMD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL          NAMES     313
C                                                                         NAMES     314
C   YAW CONTROL SYSTEM VARIABLES                                          NAMES     315
C                                                                         NAMES     316
      COMMON YAWCMD,DPED,AKRC,AKRCI,YTRMBUT,RE,AKRE,AKREI,DYAW,AKAY       NAMES     317
C                                                                         NAMES     318
C   PITCH CONTROL SYSTEM VARIABLES                                        NAMES     319
C                                                                         NAMES     320
      COMMON DLNGSTK,AKQC,AKQCI,PTRMBUT,QE,AKQE,AKQEI,DPITCH              NAMES     321
C                                                                         NAMES     322
C   HEAVE CONTROL SYSTEM VARIABLES                                        NAMES     323
C                                                                         NAMES     324
      COMMON ZEDTC,ZEDTE,AKZE,AKZEI,DTHROT                                NAMES     325
C                                                                         NAMES     326
C   ACTUATION SYSTEM INPUT VARIABLES                                      NAMES     327
C                                                                         NAMES     328
      COMMON DSIOFF,DNORMF,PSITC(2),THTC(2),DEC,DRC,DAC,DRCSR,DRCSP,      NAMES     329
     1    DRCSY,DRCSSF,DRCSNF,TCMD,HFLAPC,HFLAPS,LELEVNC,RELEVNC          NAMES     330
C                                                                         NAMES     331
C   ADDITIONAL CONTROL SYSTEM VARIABLES                                   NAMES     332
C                                                                         NAMES     333
      COMMON AKPCI1,AKPEI1,AKP,AKRCI1,AKREI1,AKR,AKQCI1,AKQEI1,AKQ,       NAMES     334
     1  AKZEI1,CSVSW,TPITCH,TROLL,TYAW                                    NAMES     335
C                                                                         NAMES     336
C************************ SEGMENT 29 ********************************    NAMES     337
C     AIR DATA VARIABLES                                                  NAMES     338
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C                                                                             NAMES    339
      COMMON UAS,VAS,WAS,RHO,TAMB,VSOUND,TRATIO,PRATIO,VA,VK,MN,QBAR,         NAMES    340
     1    ALPH,BETA,ALFAD,SALPH,CALPH,SBETA,CBETA                             NAMES    341
C                                                                             NAMES    342
C     TOTAL AERO FORCE AND MOMENT VARIABLES                                   NAMES    343
C                                                                             NAMES    344
      COMMON XAERO,YAERO,ZAERO,LAERO,MAERO,NAERO                              NAMES    345
C                                                                             NAMES    346
C     TOTAL FORCE AND MOMENT VARIABLES                                        NAMES    347
C                                                                             NAMES    348
      COMMON SUMFX,SUMFY,SUMFZ,SUML,SUMM,SUMN                                 NAMES    349
C                                                                             NAMES    350
C     CORRECTED DIRECTIONAL COSINES                                           NAMES    351
C                                                                             NAMES    352
      COMMON D11P,D12P,D13P,D21P,D22P,D23P,D31P,D32P,D33P,DCMAG               NAMES    353
C                                                                             NAMES    354
C     MISCELLANEOUS VARIABLES                                                 NAMES    355
C                                                                             NAMES    356
      COMMON UAIR,VAIR,WAIR,ALT,RS,PS,BLOT1(3)                                NAMES    357
     1    ,GYROL,GYROM,GYRON,NXCG,NYCG,NZCG                                   NAMES    358
     2    ,XDW,YDW,ZDW,BLOT2(3),LPRIME,NPRIME                                 NAMES    359
     3    ,VE,VEDT,VEEST                                                      NAMES    360
C                                                                             NAMES    361
C*********************** SEGMENT 30 ***********************************        NAMES    362
C     TABLES FOR RAM FORCES AND MOMENTS                                       NAMES    363
C                                                                             NAMES    364
      COMMON VOVIT(5),ATURNT(8),ELRAMT(5,8),DATURNT(5,8),ETART(5,8)           NAMES    365
C                                                                             NAMES    366
C*********************** SEGMENT 31 ***********************************        NAMES    367
C     TABLES FOR RCS FORCES AND MOMENTS                                       NAMES    368
C                                                                             NAMES    369
      COMMON FPCST(6),BLDRT(6)                                                NAMES    370
C                                                                             NAMES    371
C*********************** SEGMENT 32 ***********************************        NAMES    372
C     THRUST TABLES                                                           NAMES    373
C                                                                             NAMES    374
      COMMON MNT(4),TFGMAX(4),TFGMIN(4),TFGIDL(4),TMDT(4),TFRAT(6),           NAMES    375
     1    TRPM(6),TFRACT(10),TACCEL(10),TDECEL(10),TTENG(10)                  NAMES    376
C                                                                             NAMES    377
C                                                                             NAMES    378
C*********************** SEGMENTS 33 THRU 38 ***************************       NAMES    379
C     STABILITY DERIVATIVES                                                   NAMES    380
C                                                                             NAMES    381
C     SEGMENT 33                                                              NAMES    382
      COMMON DXWG(25),DXHS(25),DXVS(25),DXFS(25),DXAER(25),DXTS(25),          NAMES    383
     1        DXRAM(25),DXCLS(25),DXRCSF(25),X(25)                            NAMES    384
C     SEGMENT 34                                                              NAMES    385
      COMMON DYWG(25),DYHS(25),DYVS(25),DYFS(25),DYAER(25),DYTS(25),          NAMES    386
     1        DYRAM(25),DYCLS(25),DYRCSF(25),Y(25)                            NAMES    387
C     SEGMENT 35                                                              NAMES    388
      COMMON DZWG(25),DZHS(25),DZVS(25),DZFS(25),DZAER(25),DZTS(25),          NAMES    389
     1        DZRAM(25),DZCLS(25),DZRCSF(25),Z(25)                            NAMES    390
C     SEGMENT 36                                                              NAMES    391
      COMMON  DLWG(25),DLHS(25),DLVS(25),DLFS(25),DLAER(25),DLTS(25),         NAMES    392
     1        DLRAM(25),DLCLS(25),DLRCSF(25),AL(25)                           NAMES    393
C     SEGMENT 37                                                              NAMES    394
      COMMON DMWG(25),DMHS(25),DMVS(25),DMFS(25),DMAER(25),DMTS(25),          NAMES    395
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      1         DNRAM(25),DMCLS(25),DMRCSF(25),AM(25)                  NAMES   396
C     SEGMENT 38                                                        NAMES   397
       COMMON DNAG(25),DNHS(25),DNVS(25),DNFS(25),DNAER(25),DNTS(25),   NAMES   398
      1         DNRAM(25),DNCLS(25),DNRCSF(25),AN(25)                  NAMES   399
C                                                                       NAMES   400
C                                                                       NAMES   401
C************************ SEGMENT 39 ************************************NAMES   402
C     DERIVATIVE CONTROL                                                NAMES   403
C                                                                       NAMES   404
       COMMON ADER,DELV(25)                                             NAMES   405
C                                                                       NAMES   406
C************************ SEGMENT 40 ************************************NAMES   407
C     SCRATCH COMMON                                                    NAMES   408
       COMMON WORK(50)                                                  NAMES   409
C                                                                       NAMES   410
C************************ SEGMENT 41 ************************************NAMES   411
C     MISCELLANEOUS CONSTANTS                                           NAMES   412
C                                                                       NAMES   413
       COMMON AWIND,VWIND,PSIWIND,XE20,YE20,ZE20                        NAMES   414
      1     ,TRNTURN,GAMMA,VADOT,TURNRAD                                NAMES   415
C                                                                       NAMES   416
C************************ SEGMENT 42 ************************************NAMES   417
C   AERO SURFACE EFFECTIVENESS TABLES                                   NAMES   418
C                                                                       NAMES   419
       COMMON ELEVT(7),EKELET(7),RUD(7),EKRUDT(7)                       NAMES   420
C                                                                       NAMES   421
C************************ SEGMENT 43 ************************************NAMES   422
C           PILOT INPUT CONTROL DATA                                    NAMES   423
C                                                                       NAMES   424
       COMMON ACMD(5),ATIME,ASKEEP,AYEHLD,CMDT1(20),CMDT2(20),          NAMES   425
      1     CMDT3(20),CMDT4(20),CMDT5(20),TIMET(20),ATRANS,AVAT,TTRANS, NAMES   426
      2      THROTT(10),VAT(10),THETCT(10)                              NAMES   427
C                                                                       NAMES   428
C************************ SEGMENT 44 ************************************NAMES   429
C     TABLES,CONSTANTS,AND VARIABLES FOR VARYING FEEDBACK CONTROL LAWS  NAMES   430
C                                                                       NAMES   431
       COMMON ACSSW,TCSSW1(5),TAKQS(5), TKPINT(5),TKPHI(5),TKPB(5),     NAMES   432
      1     TKPS(5),TKQINT(5),TKTHETA(5),TKRINT(5),TKPSI(5),TKRB(5),    NAMES   433
      2     TAKPCI(5),TAKPEI(5),TAKRCI(5),TAKREI(5),TAKQCI(5),TAKQEI(5),NAMES   434
      3     TKRS(5),AKPHIRS,AKPINT,AKPHI,AKPB,AKPS,AKQINT,AKTHETA,AKRINT,NAMES  435
      4     AKPSI,AKRB,AKRS,AKIS                                        NAMES   436
C                                                                       NAMES   437
C************************ SEGMENT 45 ************************************NAMES   438
C     TABLES,CONSTANTS,AND VARIABLES FOR CONTROL SYSTEM GAINS WHICH     NAMES   439
C         VARY AS FUNCTIONS OF AIRSPEED                                 NAMES   440
C                                                                       NAMES   441
       COMMON VFLGAIN,AVFL,TVEL(8),VAKPC(8),VKPCI1(8),VKPEI1(8),VKP(8), NAMES   442
      1     VAKPE(8),VAKRC(8),VKRCI1(8),VKREI1(8),VKR(8),VAKRE(8),VAKQC(8) NAMES 443
      2   ,VKQCI1(8),VKQEI1(8),VKQ(8),VAKQE(8),VAKZE(8),VKZEI1(8)       NAMES   444
      3     ,VTPITCH(8),VTROLL(8),VTY    5)                             NAMES   445
       REAL LAMB1                                                       NAMES   446
       REAL LNGSTK,LNGSTKD                                              NAMES   447
       REAL IX,IY,IZ,IXZ,JX,JY,JZ,MASS                                  NAMES   448
       REAL NFOQM,MOQMX1,MOQMX2,NOQMX1,VOQMX2                           NAMES   449
       REAL KBT1,KBT2,KM1,KM2,KBT                                       NAMES   450
       REAL KPSIT,KTHTP,KTHTR,KJE,KDR,KDA,KTY                           NAMES   451
       REAL LWP,VWP,NW,LW,MW                                            NAMES   452
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      REAL NFOQ,MOQ,MOQ1,NOQ,NOQ1                                  NAMES    453
      REAL KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                         NAMES    454
      REAL MDOT,MDTMX,KMDT,K9TP                                    NAMES    455
      REAL KAFT1,K   T2,KAFT                                       NAMES    456
      REAL LAERO,MAERO,NAERO                                       NAMES    457
      REAL LELPOSL,LELRATL,LEUPOSL,LEURATL,LPRIME,NPRIME           NAMES    458
      REAL LELFVND,LELEVN,LELEVNC,MNT,NF,MN                        NAMES    459
      REAL JENG                                                    NAMES    460
      REAL NYCG,NYCG,NZCG                                          NAMES    461
C                                                                  ERROR      8
      DIMENSION  E(19)                                             ERROR      9
C                                                                  ERROR     10
C                                                                  ERROR     11
C                                                                  ERROR     12
C                                                                  ERROR     13
      GC = 32.174                                                  ERROR     14
      GG = GC                                                      ERROR     15
      MASS= WT/GG                                                  ERROR     16
C   DIRECTION COSINES                                              ERROR     17
      SINT=SIN(THETA)                                              ERROR     18
      COST=COS(THETA)                                              ERROR     19
      SPHI=SIN(PHI)                                                ERROR     20
      CPHI=COS(PHI)                                                ERROR     21
      SPSI=SIN(PSI)                                                ERROR     22
      CPSI=COS(PSI)                                                ERROR     23
      D11= COST*CPSI                                               ERROR     24
      D12= SPHI*SINT*CPSI-CPHI*SPSI                                ERROR     25
      D13= CPHI*SINT*CPSI+SPHI*SPSI                                ERROR     26
      D21= COST*SPSI                                               ERROR     27
      D22= CPHI*CPSI+SPHI*SINT*SPSI                                ERROR     28
      D23= CPHI*SINT*SPSI-SPHI*CPSI                                ERROR     29
      D31= -SINT                                                   ERROR     30
      D32= SPHI*COST                                               ERROR     31
      D33= CPHI*COST                                               ERROR     32
C   BODY AXIS COMPONENTS OF WIND VELOCITY                          ERROR     33
      XDW=VWIND*COS(PSIWIND)                                       ERROR     34
      YDW=VWIND*SIN(PSIWIND)                                       ERROR     35
      ZDW=0.0                                                      ERROR     36
      UAIR=D11*XDW+D21*YDW+D31*ZDW                                 ERROR     37
      VAIR=D12*XDW+D22*YDW+D32*ZDW                                 ERROR     38
      WAIR=D13*XDW+D23*YDW+D33*ZDW                                 ERROR     39
C    OPTION TO TRIM IN WIND                                        ERROR     40
      IWIND=IFIX(AWIND)                                            ERROR     41
      IF(IWIND.EQ.0)GO TO 10                                       ERROR     42
C    TRIM IN WIND                                                  ERROR     43
      IF(1.570779.LE.ABS(PSIWIND).AND.ABS(PSIWIND).LE.1.570813)50,60  ERROR  44
   50 PHI=-1.570796                                                ERROR     45
      GO TO 70                                                     ERROR     46
   60 PHI=ATAN2(TAN(PSIWIND),SINT)                                 ERROR     47
      IF(PSIWIND).LE.1.570796)PHI=PHI-3.141593                     ERROR     48
   70 CONTINUE                                                     ERROR     49
C    AIRSPEED COMPONENTS                                           ERROR     50
      UAS=U-UAIR                                                   ERROR     51
      VAS=V-VAIR                                                   ERROR     52
      WAS=W-WAIR                                                   ERROR     53
C   AIRSPEED,ALPHA,AND BETA                                        ERROR     54
      VA=SQRT(UAS*UAS+VAS*VAS+WAS*WAS)                             ERROR     55
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ORIGINAL PAGE IS
OF POOR QUALITY

```
      ALPH=BATAN2(WAS,UAS)
      IF(VA.LE.0.)30,40
   30 BETA=0.
      GO TO 20
   40 CONTINUE
      BETA=ASIN(V.S/VA)
      GO TO 20
   10 CONTINUE
C     TRIM WITH NO WIND
C     AIRSPEED
      UAS = VA*COS(ALPH)*COS(BETA)
      VAS = VA*SIN(BETA)
      WAS = VA*SIN(ALPH)*COS(BETA)
C
C     OPTION TO TRIM IN A TURN.  REQUIRES SPECIFICATION OF VA,VADOT,
C     ATURN,TURNRAD,AND GAMMA.  ATURN.NE.0. INVOKES THE OPTION.
C      ALSO SPECIFY PSI=0.
C
      IF(TRMTURN.EQ.0.)GO TO 100
      SING=SIN(GAMMA)
      COSG=COS(GAMMA)
      ZEDOT=-VA*SING
      XE2D=VADOT*COSG
      YE2D=(VA*COSG)**2/TURNRAD
      ZE2D=-VADOT*SING
      PSID=(VA*COSG)/TURNRAD
  100 CONTINUE
C     INERTIAL (GROUND) SPEED
      U=UAS+UAIR
      V=VAS+VAIR
      W=WAS+WAIR
   20 CONTINUE
      UDOT=GG*(+NXCG+D31)+R*V-Q*W
      VDOT=GG*(+NYCG+D32)+P*W-R*U
      WDOT=GG*(D33-NZCG)+Q*U-P*V
C     CONTROL SYSTEM
      CALL SYSEQS
C     FORCES AND MOMENTS  (THRUST AND AERO)
      CALL FORCES(0.)
C     ERROR EQUATIONS
      E(1)= MASS*(-UDOT+R*V-Q*W+D31*GG)+SUMFX
      E(2)= MASS*(-VDOT+P*W-R*U+D32*GG)+SUMFY
      E(3)= MASS*(-WDOT+Q*U-P*V+D33*GG)+SUMFZ
      E(4)=-IX*PDOT+(IY-IZ)*R*Q+IXZ*(RDOT+P*Q)+SUML-GYROL
      E(5)=-IY*QDOT+(IZ-IX)*P*R+IXZ*(R*R-P*P)+SUMM-GYROM
      E(6)=-IZ*RDOT+(IX-IY)*P*Q+IXZ*(PDOT-Q*R)+SUMN-GYRON
      E(7)=GG*(NZCG-D33)+D13*XE2D+D23*YE2D+D33*ZE2D
      E(8)= -XEDOT+D11*U+D12*V+D13*W
      E(9)= -YEDOT+D21*U+D22*V+D23*W
      E(10)= -ZEDOT+D31*U+D32*V+D33*W
      E(11)=PHID-PSID*SINT-P
      E(12)=THETD*CPHI+PSID*COST*SPHI-Q
      E(13)=-T  TD*SPHI+PSID*COST*CPHI-R
      E(14)=GG*(-NXCG-D31)+D11*XE2D+D21*YE2D+D31*ZE2D
      E(15)=GG*(-NYCG-D32)+D12*XE2D+D22*YE2D+D32*  2D
C
      RETURN
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      END                                                    ERROR     115
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      SUBROUTINE FORCES (FLAG)                                          FORCES      2
      COMMON/INDRIV/NDRIV                                               NAMES       2
      COMMON/INTRIM/ITRIM                                               NAMES       3
      COMMON NEQS                                                       NAMES       4
C                                                                       NAMES       5
C************************  SEGMENT 1  **********************************NAMES       6
C        TIME,PRINT,AND PLOT CONTROL PARAMETERS,INPUT                   NAMES       7
C                                                                       NAMES       8
      COMMON T,T0,DT,TMAX,DTPRNT,DTPLOT,TI                              NAMES       9
C                                                                       NAMES      10
C************************  SEGMENT 2  **********************************NAMES      11
C        VARIABLES TO BE INTEGRATED IN TIME                             NAMES      12
C                                                                       NAMES      13
      COMMON UDOT,VDOT,WDOT,PDOT,QDOT,RDOT,D11D,D12D,D13D,D21D,D22D,    NAMES      14
     1   D23D,D31D,D32D,D33D,XEDOT,YEDOT,ZEDOT,LELEVND,RELEVND,DRD,     NAMES      15
     2   TABD(2),PSITD(2),THTD(2),DRCSD(10),FRCSAD(10),DFLAPHD,DFLAP4D, NAMES      16
     3   TFRACD(2)                                                      NAMES      17
C                                                                       NAMES      18
C   CONTROL SYSTEM VARIABLES TO BE INTEGRATED                           NAMES      19
C                                                                       NAMES      20
      COMMON PCTRMD,PINTD,PETRMD,RCTRMD,RINTD,RETRMD,YTRMD,QCTRMD,QINTD, NAMES     21
     1     QETRMD,PTRMD,ZEDTRMD                                         NAMES      22
C                                                                       NAMES      23
C  EULER ANGLE RATES TO BE INTEGRATED                                   NAMES      24
C                                                                       NAMES      25
      COMMON THETD,PHID,PSID                                            NAMES      26
C                                                                       NAMES      27
C   STICK AND PEDAL FILTER VARIABLES TO BE INTEGRATED                   NAMES      28
C                                                                       NAMES      29
      COMMON LNGSTKD,ROLLCD,YAWCD                                       NAMES      30
C                                                                       NAMES      31
C************************  SEGMENT 3  **********************************NAMES      32
C        INTEGRATED VARIABLES                                           NAMES      33
C                                                                       NAMES      34
      COMMON U,V,W,P,Q,R,D11,D12,D13,D21,D22,                           NAMES      35
     1   D23,D31,D32,D33,XE,YE,ZE,LELEVN,RELEVN,DR,                     NAMES      36
     2   TAB(2),PSIT(2),THT(2),DRCS(10),FRCSA(10),DFLAPH,DFLAPH,        NAMES      37
     3   TFRAC(2)                                                       NAMES      38
C                                                                       NAMES      39
C  INTEGRATED CONTROL SYSTEM VARIABLES                                  NAMES      40
C                                                                       NAMES      41
      COMMON PCTRM,PINT,PETRM,RCTRM,RINT,RETRM,YTRM,QCTRM,QINT,         NAMES      42
     1     QETRM,PTRM,ZEDTRM                                            NAMES      43
C                                                                       NAMES      44
C  EULER ANGLES                                                         NAMES      45
C                                                                       NAMES      46
      COMMON THETA,PHI,PSI                                              NAMES      47
C                                                                       NAMES      48
C   INTEGRATED STICK AND PEDAL FILTER VARIABLES                         NAMES      49
C                                                                       NAMES      50
      COMMON LNGSTK,ROLLC,YAWC                                          NAMES      51
C                                                                       NAMES      52
C************************  SEGMENT 4  **********************************NAMES      53
C   BASIC AIRCRAFT MASS,INERTIA,AND GEOMETRY CONSTANTS                  NAMES      54
C                                                                       NAMES      55
      COMMON WT,IX,IY,IZ,IXZ,FSCG,BLCG,WLCG,GO                          NAMES      56
C                                                                       NAMES      57
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C     COMPUTED AIRCRAFT CONSTANTS                                       NAMES     58
C                                                                       NAMES     59
      COMMON EAC,FAC,GAC,JX,JY,JZ,MASS,OMJXJZ                           NAMES     60
C                                                                       NAMES     61
C************************ SEGMENT 5 ************************************NAMES     62
C    ERRORS AND TOLERANCES FOR TRIM SOLUTION                            NAMES     63
C                                                                       NAMES     64
      COMMON TOL(19)                                                    NAMES     65
C************************ SEGMENT 6 ************************************NAMES     66
C    AERO LIFT AND DRAG CONSTANTS AND TABLES,INPUT                      NAMES     67
C                                                                       NAMES     68
      COMMON AAERO,AERO(23,3),SURFCP(3,3)                               NAMES     69
C                                                                       NAMES     70
C EQUIVALENCE IN THE AERO ARRAY - THE CONSTANTS ARE ARRANGED FOR EACH   NAMES     71
C SURFACE IN THE FOLLOWING ORDER  AR,EXPOSED AR,AREA,EXPOSED AREA,      NAMES     72
C LAMDA1/4,LAMBDALE,TAPER RATIO,CLMAX,ALFAB,A0,CD0,D/3,CL0/DF,CLMAX/DF, NAMES     73
C CD0/DF. SURFACE 1 IS WING, 2 IS HOR. STAB. 3 IS VERT. STAB.           NAMES     74
C                                                                       NAMES     75
C    COMPUTED AERO LIFT AND DRAG CONSTANTS                              NAMES     76
C                                                                       NAMES     77
      COMMON CNAA0(3),AEROK(3),EOS(3),CLA(3)                            NAMES     78
C                                                                       NAMES     79
C************************ SEGMENT 7 ************************************NAMES     80
C     WING AERO CONSTANTS,INPUT                                         NAMES     81
C                                                                       NAMES     82
      COMMON FSW,BLW1,BLW2,WLW,CW,BW,EKDA1,EKDA2,EIW,CLB0W,CLBCL4,CLRCLW NAMES    83
     1  ,CLPW,CNB0W,CNBCL2W,CNRCL2W,CNRC0W,CNPCLW,CNPC0AW,CM04,CMDFW     NAMES    84
     2      ,AEKEL,CYBCL2W                                              NAMES     85
C                                                                       NAMES     86
C     COMPUTED WING AERO CONSTANTS                                      NAMES     87
C                                                                       NAMES     88
      COMMON XWING1,XWING2,YWING1,YWING2,ZWING1,ZWING2                  NAMES     89
C                                                                       NAMES     90
C************************ SEGMENT 8 ************************************NAMES     91
C     HORIZONTAL  STABILIZER AERO CONSTANTS                             NAMES     92
C                                                                       NAMES     93
      COMMON FSH,BLH,WLH,CH,BH,EKADE,EIH,EOCL4,CMDFH,CM0H               NAMES     94
     1      ,DXHTO                                                      NAMES     95
C                                                                       NAMES     96
C     COMPUTED HORIZONTAL STABILIZER CONSTANTS                          NAMES     97
C                                                                       NAMES     98
      COMMON XH,YH,ZH,XWEL,ZWEL,AWEL,DWEL                               NAMES     99
C                                                                       NAMES    100
C*************** ********* SEGMENT 9 ***********************************NAMES    101
C     VERTICAL STABILIZER AERO CONSTANTS                                NAMES    102
C                                                                       NAMES    103
      COMMON FSV,BLV,WLV,CV,BV,EKADR,EIV,EKV,CN0V                       NAMES    104
     2      ,AEKRUD,TALFA(10),AALFA,TVTEFF(10)                          NAMES    105
C                                                                       NAMES    106
C     COMPUTED VERTICAL STABILIZER CONSTANTS                            NAMES    107
C                                                                       NAMES    108
      COMMON XV,YV,ZV                                                   NAMES    109
C                                                                       NAMES    110
C************************ SEGMENT 10 ***********************************NAMES    111
C     FUSELAGE AERO CONSTANTS                                           NAMES    112
C                                                                       NAMES    113
      COMMON FSF,BLF,WLF,AOQ0,SOQMX,NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2,  NAMES    114
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      1    A0F,A1F,A2F,EN1,EN2,FN3,EN4,EN5,EN6,ENP                    NAMES    115
      2   ,DFSF0,ADFSF1,ADFSF2,XKYF                                    NAMES    116
C                                                                      NAMES    117
C     COMPUTED FUSELAGE AERO CONSTANTS                                 NAMES    118
C                                                                      NAMES    119
      COMMON XF,YF,ZF                                                  NAMES    120
C                                                                      NAMES    121
C****** ***************** SEGMENT 11 ********************************* NAMES    122
C     DIRECT THRUST FORC  AND MOMENT CONSTANTS                         NAMES    123
C                                                                      NAMES    124
      COMMON FSSW(2),BLSW(2),WLSW(2),SIGY,ELN,KAFT1,KAFT2,AENG         NAMES    125
C                                                                      NAMES    126
C     COMPUTED DIRECT THRUST CONSTANTS                                 NAMES    127
C                                                                      NAMES    128
      COMMON CSIGY,SSIGY,XT(2),YT(2),ZT(2)                             NAMES    129
C                                                                      NAMES    130
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C     RAM FORCE AND MOMENT CONSTANTS                                   NAMES    132
C                                                                      NAMES    133
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C                                                                      NAMES    135
C     COMPUTED RAM CONSTANTS                                           NAMES    136
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C                                                                      NAMES    139
C*********************** SEGMENT 13 ********************************* NAMES    140
C     CORIOLIS FORCE AND MOMENT CONSTANTS                              NAMES    141
C                                                                      NAMES    142
      COMMON ELDUCT                                                    NAMES    143
C                                                                      NAMES    144
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C     PROPULSION SYSTEM CONSTANTS                                      NAMES    146
C                                                                      NAMES    147
      COMMON AMACH,KBT1,KBT2,KM1,KM2,OMEGMX,RPMMX,RCS,AFRAT            NAMES    148
      1   ,JENG,AFRAC,TAUA8,ABACCEL,ABDECEL,TABON                      NAMES    149
      2   ,TABOFF                                                      NAMES    150
C                                                                      NAMES    151
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C                                                                      NAMES    153
      COMMON KBT                                                       NAMES    154
C                                                                      NAMES    155
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C                                                                      NAMES    158
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      1    RCSL(10,5),FSRCS(10),BLRCS(10),WLRCS(10),THTRCS(10),PSIRCS(10) NAMES 160
C                                                                      NAMES    161
C     COMPUTED RCS CONSTANTS                                           NAMES    162
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      COMMON FRCSMXP,FRCSMX0,FRCSMX1,CTHTRCS(10),STHTRCS(10),CPSIRCS(10) NAMES  164
      1   ,SPSIRCS(10),XJET(10),YJET(10),ZJET(10)                      NAMES    165
C                                                                      NAMES    166
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C     CONTROL SYSTEM CONSTANTS                                         NAMES    168
C                                                                      NAMES    169
C                                                                      NAMES    170
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      C                                                                NAMES    172
            COMMON DUM,AKZED,AKZEE1,AKZEE2,AKYED,AKYEE,                NAMES    173
           1   AKU,AKV,AKW,AKXES,AKYES,AKZES                           NAMES    174
      C                                                                NAMES    175
      C  CONTROL SYSTEM FUNCTION SWITCH CONSTANTS                      NAMES    176
      C                                                                NAMES    177
            COMMON CSV,VASW,CS1,THETSW                                 NAMES    178
      C                                                                NAMES    179
      C  ROLL CONTROL SYSTEM CONSTANTS                                 NAMES    180
      C                                                                NAMES    181
            COMMON TAKPC(8),TTHETA(8),TAKPE(8),TKPCI1(8),ATHETA,TKPEI1(8),  NAMES    182
           1    TKP(8),PELIM,AKOYOR,KTHTR,KDA                          NAMES    183
      C                                                                NAMES    184
      C  YAW CONTROL SYSTEM CONSTANTS                                  NAMES    185
      C                                                                NAMES    186
            COMMON TAKRC(8),TAKRE(8),TKRCI1(8),TKREI1(8),TKR(8),RELIM,  NAMES    187
           1   AKYTRM,KPSIT,KDR,TAKAY(8),KTY                           NAMES    188
      C                                                                NAMES    189
      C   PITCH CONTROL SYSTEM CONSTANTS                               NAMES    190
      C                                                                NAMES    191
            COMMON TAKQC(8),TAKQE(8),TKQCI1(8),TKQEI1(8),TKQ(8),QELIM,  NAMES    192
           1   AKPTRM,CSTK,KDE,KTHTP                                   NAMES    193
      C                                                                NAMES    194
      C  HEAVE CONTROL SYSTEM CONSTANTS                                NAMES    195
      C                                                                NAMES    196
            COMMON TAKZF(8),TKZEI1(8),AKTHROT,ZELIM                    NAMES    197
      C                                                                NAMES    198
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      C                                                                NAMES    200
            COMMON ELEVNRF,PSITRF(2)                                   NAMES    201
      C                                                                NAMES    202
      C  FLAP CONTROL SYSTEM CONSTANTS                                 NAMES    203
      C                                                                NAMES    204
            COMMON KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                     NAMES    205
      C                                                                NAMES    206
      C   DYNAMIC PRESSURE TABLE FOR CONTROL SYSTEM GAINS              NAMES    207
      C                                                                NAMES    208
            COMMON AQBAR,TQBAR(5)                                      NAMES    209
      C                                                                NAMES    210
      C   STICK AND PEDAL FILTER TIME CONSTANT TABLES                  NAMES    211
      C                                                                NAMES    212
            COMMON TTPITCH(8),TTROLL(8),TTYAW(8)                       NAMES    213
      C                                                                NAMES    214
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      C   ACTUATION CONSTANTS                                          NAMES    216
      C                                                                NAMES    217
            COMMON LEURATL,LELRATL,LEUPOSL,LELPOSL,TLEL,               NAMES    218
           1     REURATL,RELRATL,REUPOSL,RELPOSL,TREL,                 NAMES    219
           2     DRURATL,DRLRATL,DRUPOSL,DRLPOSL,TDR,                  NAMES    220
           3     HFURATL,HFLRATL,HFLAPMX,HFLAPMN,THF,                  NAMES    221
           4     WFURATL,WFLRATL,WFLAPMX,WFLAPMN,THF,                  NAMES    222
           5     THTUPL(2),THTLRL(2),THTUPL(2),THTLPL(2),TTHT(2),      NAMES    223
           6     PSIURL(2),PSILRL(2),PSIUPL(2),PSILPL(2),TPSIT(2),     NAMES    224
           7     RCSURL(10),RCSLRL(10),RCSUPL(10),RCSLPL(10),TAURCS(10)  NAMES    225
           8    ,FRCSURL(10),FRCSLRL(10),FRCSUPL(10),FRCSLPL(10),TAUFRCS(10)  NAMES    226
           9    ,DELIM,DALIM,DRLIM                                     NAMES    227
      C                                                                NAMES    228
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C************************ SEGMENT 18 *********************************** NAMES 229
C     LIFT-DRAG VARIABLES                                                    NAMES 230
C                                                                            NAMES 231
      COMMON LAMB1,CLAE,EKHB,C1,C2,EJ                                        NAMES 232
C                                                                            NAMES 233
C************************ SEGMENT 19 *********************************** NAMES 234
C     WING AERO VARIABLES                                                    NAMES 235
C                                                                            NAMES 236
      COMMON DXW,DYW,DZW,DLW,DMW,DNW,CLW,ALFW,CDW,UW,WW,VXZ1,VXZ2,VXZ,       NAMES 237
     1     DADA1,DADA2,ALFW1,ALFW2,CLW1,CLW2,CDW1,CDW2,CDA,BETA,QWS,QWSB,    NAMES 238
     2     BOV,LWP,NWP,YWP,ALF1,SALF1,CALF1,ALF2,SALF2,CALF2,XW1,XW2,        NAMES 239
     3     ZW1,ZW2,ALF,SALF,CALF,MW,LW,NW,DA1,DA2,EKELEL,EKELER,CMW1,        NAMES 240
     4     CMW2,DXWING1,DXWING2                                              NAMES 241
C                                                                            NAMES 242
C************************ SEGMENT 20 *********************************** NAMES 243
C     HORIZONTAL STABILIZER AERO VARIABLES                                   NAMES 244
C                                                                            NAMES 245
      COMMON DXH,DYH,DZH,DLH,DMH,DNH,UH,WH,ALFS,EPS,DALFH,CL1,CL2,CD1,       NAMES 246
     1     CD2,DADE,ALFH,CLH,CDH,ANG,DIS,XI,ZW,D2020,ALFH1,SALFH1,CALFH1     NAMES 247
     2     ,DAH,DL,QEFF,DAVG,DMH,DXHT                                        NAMES 248
C                                                                            NAMES 249
C************************ SEGMENT 21 *********************************** NAMES 250
C     VERTICAL STABILIZER AERO VARIABLES                                     NAMES 251
C                                                                            NAMES 252
      COMMON DXV,DYV,DZV,DLV,DMV,DNV,UV,VV,DADR,ALFV,CLV,CDV,ALFV1,          NAMES 253
     1     CALFV1,SALFV1,QOV,DRP,EKRUD,CMV,DXVT,VTEFF                        NAMES 254
C                                                                            NAMES 255
C************************ SEGMENT 22 *********************************** NAMES 256
C     FUSELAGE AERO VARIABLES                                                NAMES 257
C                                                                            NAMES 258
      COMMON DXF,DYF,DZF,DLF,DMF,DNF,ALFF,ALFYF,ALFTF,QKY,QQ,QXZ,AOQ,AS,     NAMES 259
     1     SAF,SOQ,AF,NFOQ,MOQ,MOQ1,S,NF,PITCHF,ALFYFD,NOQ,NOQ1,YAWF         NAMES 260
     2     ,DFSF                                                             NAMES 261
C                                                                            NAMES 262
C************************ SEGMENT 23 *********************************** NAMES 263
C     DIRECT THRUST FORCE AND MOMENT VARIABLES                               NAMES 264
C                                                                            NAMES 265
      COMMON DXT,DYT,DZT,DLT,DMT,DNT,AFT(2),TCOR(2),DX(2),DY(2),DZ(2),       NAMES 266
     1     DFSSW(2),DBLSW(2),DWLS(2),SPSIT(2),CPSIT(2),STHT(2),CTHT(2)       NAMES 267
     2     ,KAFT                                                             NAMES 268
C                                                                            NAMES 269
C************************ SEGMENT 24 *********************************** NAMES 270
C     RAM FORCE AND MOMENT VARIABLES                                         NAMES 271
C                                                                            NAMES 272
      COMMON DXR,DYR,DZR,DLR,DMR,DNR,VO,ATURNO,BTURN,CBTURN,SBTURN,VIN,      NAMES 273
     1     VOVI(2),ATURN(2),ELRAM(2),DATURN(2),ETAR(2),FRAM(2),ELR,          NAMES 274
     2     WLRAM,FSRAM,SATURN,CATURN,DXRO(2),DYRO(2),DZRO(2),DXRI(2),        NAMES 275
     3     DYRI(2),DZRI(2),UI,VI,WI                                          NAMES 276
C                                                                            NAMES 277
C************************ SEGMENT 25 *********************************** NAMES 278
C     CORIOLIS FORCE AND MOMENT VARIABLES                                    NAMES 279
C                                                                            NAMES 280
      COMMON DXCOR,DYCOR,DZCOR,DLCOR,DMCOR,DNCOR,ELCOR,EACOR,DLCORD,         NAMES 281
     1     DMCORD,DNCORD                                                     NAMES 282
C                                                                            NAMES 283
C************************ SEGMENT 26 *********************************** NAMES 284
C     PROPULSION SYSTEM VARIABLES                                            NAMES 285
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C
      COMMON MDOT(2),RPM(2),TRST(2),BLDAVL,FGMAX,FGMIN,FGIDL,MDTMX,
     1    TRSSPEF,TREQAV,TREQ(2),FRATIO,FRPM,KMOT,KBTP,TRCS,TC(2)
     2   ,ME(2),TFRACC(2),TFRACIN,FRACL,TENG,TFRACE,TABIN,BLOT3,TABE
     3     ,TO(2)
C
C************************ SEGMENT 27 **********************************
C    RCS FORCE AND MOMENT VARIABLES
C
      COMMON DXRCS,DYRCS,DZRCS,DLRCS,DMRCS,DNRCS,DFRCSDB,DFRCSD,FRCS(10)
     1     ,BLDREQ,FRCSAL,FRCSLU,FRCSC(10),DXRC(10),DYRC(10),DZRC(10),
     2     DRCSC(10),BLD,FRCSDB
C
C************************ SEGMENT 28 **********************************
C    CONTROL SYSTEM VARIABLES
C
C
C   PSEUDO-PILOT CONTROL SYSTEM VARIABLES
C
      COMMON ZEE,ZEIC,YEE,YEIC,DXE,DYE,DZE,XES,YES,ZES
C
C   CONTROL SYSTEM FUNCTION SWITCH VARIABLES
C
      COMMON CSSW
C
C    ROLL CONTROL SYSTEM VARIABLES
C
      COMMON ROLLCMD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL
C
C   YAW CONTROL SYSTEM VARIABLES
C
      COMMON YAWCMD,DPED,AKRC,AKRCI,YTRMBUT,RE,AKRE,AKREI,DYA4,AKAY
C
C   PITCH CONTROL SYSTEM VARIABLES
C
      COMMON DLNGSTK,AKQC,AKQCI,PTRMBUT,QE,AKQE,AKQEI,DPITCH
C
C   HEAVE CONTROL SYSTEM VARIABLES
C
      COMMON ZEDTC,ZEDTE,AKZE,AKZEI,DTHROT
C
C   ACTUATION SYSTEM INPUT VARIABLES
C
      COMMON DSIDEF,DNORMF,PSITC(2),THTC(2),DEC,DRC,DAC,DRCSR,DRCSP,
     1    DPCSY,DRCSSF,DRCSNF,TCMD,HFLAPC,WFLAPC,LELEVNC,RELEVNC
C
C   ADDITIONAL CONTROL SYSTEM VARIABLES
C
      COMMON AKPCI1,AKPEI1,AKP,AKRCI1,AKREI1,AKR,AKQCI1,AKQEI1,AKQ,
     1  AKZEI1,CSVSW,TPITCH,TROLL,TYAW
C
C************************ SEGMENT 29 **********************************
C    AIR DATA VARIABLES
C
      COMMON UAS,VAS,WAS,RHO,TAM3,VSOUND,TRATIO,PRATIO,VA,VK,MN,QBAR,
     1     ALPH,BETA,ALFAD,SALPH,CALPH,SBETA,CBETA
C
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      C     TOTAL AERO FORCE AND MOMENT VARIABLES                              NAMES      343
      C                                                                        NAMES      344
             COMMON XAERO,YAERO,ZAERO,LAERO,MAERO,NAERO                        NAMES      345
      C                                                                        NAMES      346
      C     TOTAL FORCE AND MOMENT VARIABLES                                   NAMES      347
      C                                                                        NAMES      348
             COMMON SUMFX,SUMFY,SUMFZ,SUML,SUMM,SUMN                           NAMES      349
      C                                                                        NAMES      350
      C     CORRECTED DIRECTIONAL COSINES                                      NAMES      351
      C                                                                        NAMES      352
             COMMON D11P,D12P,D13P,D21P,D22P,D23P,D31P,D32P,D33P,DCMAG         NAMES      353
      C                                                                        NAMES      354
      C     MISCELLANEOUS VARIABLES                                            NAMES      355
      C                                                                        NAMES      356
             COMMON UAIR,VAIR,WAIR,ALT,RS,PS,BLOT1(3)                          NAMES      357
           1     ,GYROL,GYROM,GYRON,NXCG,NYCG,NZCG                              NAMES      358
           2     ,XDM,YDM,ZDM,BLOT2(3),LPRIME,NPRIME                            NAMES      359
           3     ,VE,VEDT,VEEST                                                 NAMES      360
      C                                                                        NAMES      361
      C************************ SEGMENT 30 *********************************** NAMES      362
      C     TABLES FOR RAM FORCES AND MOMENTS                                  NAMES      363
      C                                                                        NAMES      364
             COMMON VOVIT(5),ATURNT(8),ELRAMT(5,8),DATURNT(5,8),ETART(5,8)     NAMES      365
      C                                                                        NAMES      366
      C************************ SEGMENT 31 *********************************** NAMES      367
      C     TABLES FOR RCS FORCES AND MOMENTS                                  NAMES      368
      C                                                                        NAMES      369
             COMMON FRCST(6),BLORT(6)                                          NAMES      370
      C                                                                        NAMES      371
      C************************ SEGMENT 32 *********************************** NAMES      372
      C     THRUST TABLES                                                      NAMES      373
      C                                                                        NAMES      374
             COMMON MNT(4),TFGMAX(4),TFGMIN(4),TFGIDL(4),TMOT(4),TFRAT(6),     NAMES      375
           1     TRPM(6),TFRACT(10),TACCEL(10),TDECEL(10),TTENG(10)              NAMES      376
      C                                                                        NAMES      377
      C                                                                        NAMES      378
      C************************ SEGMENTS 33 THRU 38 ************************** NAMES      379
      C     STABILITY DERIVATIVES                                              NAMES      380
      C                                                                        NAMES      381
      C     SEGMENT 33                                                         NAMES      382
             COMMON DXWG(25),DXHS(25),DXVS(25),DXFS(25),DXAER(25),DXTS(25),    NAMES      383
           1        DXRAM(25),DXCLS(25),DXRCSF(25),X(25)                       NAMES      384
      C     SEGMENT 34                                                         NAMES      385
             COMMON DYWG(25),DYHS(25),DYVS(25),DYFS(25),DYAER(25),DYTS(25),    NAMES      386
           1        DYRAM(25),DYCLS(25),DYRCSF(25),Y(25)                       NAMES      387
      C     SEGMENT 35                                                         NAMES      388
             COMMON DZWG(25),DZHS(25),DZVS(25),DZFS(25),DZAER(25),DZTS(25),    NAMES      389
           1        DZRAM(25),DZCLS(25),DZRCSF(25),Z(25)                       NAMES      390
      C     SEGMENT 36                                                         NAMES      391
             COMMON DLWG(25),DLHS(25),DLVS(25),DLFS(25),DLAER(25),DLTS(25),    NAMES      392
           1        DLRAM(25),DLCLS(25),DLRCSF(25),AL(25)                      NAMES      393
      C     SEGMENT 37                                                         NAMES      394
             COMMON DMWG(25),DMHS(25),DMVS(25),DMFS(25),DMAER(25),DMTS(25),    NAMES      395
           1        DMRAM(25),DMCLS(25),DMRCSF(25),AM(25)                      NAMES      396
      C     SEGMENT 38                                                         NAMES      397
             COMMON DNWG(25),DNHS(25),DNVS(25),DNFS(25),DNAER(25),DNTS(25),    NAMES      398
           1        DNRAM(25),DNCLS(25),DNRCSF(25),AN(25)                      NAMES      399
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      C                                                                          NAMES     400
      C                                                                          NAMES     401
      C************************ SEGMENT 39 ************************************  NAMES     402
      C   DERIVATIVE CONTROL                                                     NAMES     403
      C                                                                          NAMES     404
        COMMON ADER,DELV(25)                                                     NAMES     405
      C                                                                          NAMES     406
      C************************ SEGMENT 40 ************************************  NAMES     407
      C   SCRATCH COMMON                                                         NAMES     408
        COMMON WORK(50)                                                          NAMES     409
      C                                                                          NAMES     410
      C************************ SEGMENT 41 ************************************  NAMES     411
      C   MISCELLANEOUS CONSTANTS                                                NAMES     412
      C                                                                          NAMES     413
        COMMON AWIND,VWIND,PSIWIND,XE20,YE20,ZE20                                NAMES     414
     1    ,TRMTURN,GAMMA,VADOT,TURNRAD                                           NAMES     415
      C                                                                          NAMES     416
      C************************ SEGMENT 42 ************************************  NAMES     417
      C  AERO SURFACE EFFECTIVENESS TABLES                                       NAMES     418
      C                                                                          NAMES     419
        COMMON ELEVT(7),EKELET(7),RUDT(7),EKRUDT(7)                              NAMES     420
      C                                                                          NAMES     421
      C************************ SEGMENT 43 ************************************  NAMES     422
      C        PILOT INPUT CONTROL DATA                                          NAMES     423
      C                                                                          NAMES     424
        COMMON ACMD(5),ATIME,ASKEEP,AYEHLD,CMDT1(20),CMDT2(20),                  NAMES     425
     1    CMDT3(20),CMDT4(20),CMDT5(20),TIMET(20),ATRANS,AVAT,TTRANS,            NAMES     426
     2     THROTT(10),VAT(10),THETCT(10)                                         NAMES     427
      C                                                                          NAMES     428
      C*********************** SEGMENT 44 *************************************  NAMES     429
      C   TABLES,CONSTANTS,AND VARIABLES FOR VARYING FEEDBACK CONTROL LAWS       NAMES     430
      C                                                                          NAMES     431
        COMMON ACSSW,TCSSW1(5),TAKQS(5), TKPINT(5),TKPHI(5),TKPB(5),             NAMES     432
     1    TKPS(5),TKQINT(5),TKTHETA(5),TKRINT(5),TKPSI(5),TKRB(5),               NAMES     433
     2    TAKPCI(5),TAKPEI(5),TAKRCI(5),TAKREI(5),TAKQCI(5),TAKQEI(5),           NAMES     434
     3    TKRS(5),AKPHIRS,AKPINT,AKPHI,AKPB,AKPS,AKQINT,AKTHETA,AKRINT,          NAMES     435
     4    AKPSI,AKRB,AKRS,AKQS                                                   NAMES     436
      C                                                                          NAMES     437
      C*********************** SEGMENT 45 *************************************  NAMES     438
      C   TABLES,CONSTANTS,AND VARIABLES FOR CONTROL SYSTEM GAINS WHICH          NAMES     439
      C      VARY AS FUNCTIONS OF AIRSPEED                                       NAMES     440
      C                                                                          NAMES     441
        COMMON VELGAIN,AVEL,TVEL(8),VAKPC(8),VKPCI1(8),VKPEI1(8),VKP(8),         NAMES     442
     1    VAKPE(8),VAKRC(8),VKRCI1(8),VKREI1(8),VKR(8),VAKRE(8),VAKQC(8)         NAMES     443
     2   ,VKQCI1(8),VKQEI1(8),VKQ(8),VAKQE(8),VAKZE(8),VKZEI1(8)                 NAMES     444
     3    ,VTPITCH(8),VTROLL(8),VTYAW(8)                                         NAMES     445
        REAL LAM31                                                               NAMES     446
        REAL LNGSTK,LNGSTKO                                                      NAMES     447
        REAL IX,IY,IZ,IXZ,JX,JY,JZ,MASS                                          NAMES     448
        REAL NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2                                   NAMES     449
        REAL KBT1,KBT2,KM1,KM2,KBT                                               NAMES     450
        REAL KPSIT,KTHTP,KTHTR,KDE,KDR,KDA,KTY                                   NAMES     451
        REAL LWP,NWP,NW,LW,MW                                                    NAMES     452
        REAL NF.Q,MOQ,MOQ1,NOQ,NOQ1                                              NAMES     453
        REAL KHFLAP1,KHFLAP2 KAFLAP1,KAFLAP2                                     NAMES     454
        REAL MDOT,MDTMX,KMDT,KBTP                                                NAMES     455
        REAL KAFT1,KAFT2,KAFT                                                    NAMES     456
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      REAL LAERO,MAERO,NAERO                                         NAMES    457
      REAL LELPOSL,LELRATL,LEJFOSL,LEURATL,LPRIME,NPRIME            NAMES    458
      REAL LELEVNJ,LELEVN,LELEVNC,MNT,NF,MN                          NAMES    459
      REAL JENG                                                      NAMES    460
      REAL NXCG,NYCG,NZCG                                            NAMES    461
      EQUIVALENCE(CD0W,AERO(11,1)),(ABW,AERO(9,1)),(ARW,AERO(1,1)),  FORCES     4
     1   (SH,AERO(3,2)),(SW,AERO(3,1)),(SV,AERO(3,3))                FORCES     5
      IF(NCALC.NE.0)GO TO 1000                                       FORCES     6
C                                                                    FORCES     7
C      UNIVERSAL CONSTANTS                                           FORCES     8
C                                                                    FORCES     9
      PI=3.14159                                                     FORCES    10
      HALFPI=1.5708                                                  FORCES    11
      GC=32.174                                                      FORCES    12
      PI18=PI/18.                                                    FORCES    13
C                                                                    FORCES    14
C     CREATION OF FIXED POINT CONSTANTS FROM FLOATING POINT INPUT    FORCES    15
C                                                                    FORCES    16
      NAERO1=IFIX(AAERO)                                             FORCES    17
      NENG=IFIX(AENG)                                                FORCES    18
      NRCSJET=IFIX(ARCSJET)                                          FORCES    19
      NMACH=IFIX(AMACH)                                              FORCES    20
      NFRAT=IFIX(AFRAT)                                              FORCES    21
      NBLDR=IFIX(ABLDR)                                              FORCES    22
      NVOVI=IFIX(AVOVI)                                              FORCES    23
      NATURN=IFIX(AATURN)                                            FORCES    24
      NALFA=IFIX(AALFA)                                              FORCES    25
C                                                                    FORCES    26
C    ONE TIME ONLY CALCULATIONS FOR AERO LIFT-DRAG EQUATIONS         FORCES    27
C                                                                    FORCES    28
      IF(NAERO1.NE.0)GO TO 1001                                      FORCES    29
      DO 110 I=1,3                                                   FORCES    30
      LAMB1=TAN(AERO(5,I))-(4./AERO(1,I))*(0.25*(1.-AERO(7,I))/(1.+  FORCES    31
     1      AERO(7,I)))                                              FORCES    32
      CLAE=2.*PI*AERO(2,I)/(2.+SQRT((2.*PI*AERO(2,I)/AERO(18,I))**2*(1.  FORCES    33
     1     +LAMB1**2)+4.))                                           FORCES    34
      EKWB=0.527*(1.+AERO(12,I))**1.534+0.473                        FORCES    35
      CLA(I)=EKWB*CLAE*(AERO(4,I)/AERO(3,I))                         FORCES    36
      C1=-0.029+AERO(7,I)*(3.712+AERO(7,I)*(-8.125+AERO(7,I)*4.47))  FORCES    37
      C2=-0.113+AERO(7,I)*(5.199+AERO(7,I)*(-7.208+AERO(7,I)*2.943)) FORCES    38
      EJ=.3*(1.+C1)*AERO(1,I)*COS(AERO(6,I))*((1.+C1)*(1.+C2)-((1.+C2,*  FORCES    39
     1    AERO(1,I)*TAN(AERO(6,I))/7.)**3)                           FORCES    40
      AEROK(I)=1.528*SQRT(EJ)                                        FORCES    41
      IF(EJ.LT.0.)AEROK(I)=0.22*EJ                                   FORCES    42
      CNAA3(I)=((AERO(8,I)/COS(AERO(9,I))-CLA(I)*SIN(2. AERO(3,I))/2.))/ FORCES    43
     1    (SIN(AERO(9,I))*ABS(SIN(AERO(9,I))))                       FORCES    44
      EOS(I)=0.527+AERO(2,I)*(0.1494-.01429*AERO(2,I))               FORCES    45
  110 CONTINUE                                                       FORCES    46
C                                                                    FORCES    47
C      ONE TIME ONLY CALCULATIONS FOR WING AERO EQUATIONS            FORCES    48
C                                                                    FORCES    49
      ZWING1=WLCG-WLW                                                FORCES    50
      XWING1=FSCG-FSW                                                FORCES    51
      ZWING2=ZWING1                                                  FORCES    52
      XWING2=XWING1                                                  FORCES    53
      YWING1=BLW1-BLCG                                               FORCES    54
      YWING2=BLW2-BLCG                                               FORCES    55
```

```
      CNPCLW=-(AERO(1,1)+6.*(AERO(1,1)+COS(AERO(5,1)))*(XWING1*TAN(AERO(
     1    5,1))/(CW*AERO(1,1))+(TAN(AERO(5,1))**2)/12.))/(6.*(AERO(1,1)
     2    +4.*COS(AERO(5,1))))
C
C     ONE TIME ONLY CALCULATIONS FOR HORIZONTAL STABILIZER AERO EQUATIO
C
      XH=FSCG-FSH
      YH=BLH-BLCG
      ZH=WLCG-WLH
      XWEL=XWING1-XH-0.6*BW*COS(EIW)/ARW
      ZWEL=ZWING1-ZH+0.6*BW*SIN(EIW)/ARW
      AWEL=ATAN2(ZWEL,XWEL)
      DWEL=SQRT(XWEL**2+ZWEL**2)*ARW/BW
C
C     ONE TIME ONLY CALCULATIONS FOR VERTICAL STABILIZER AERO EQUATIONS
C
      XV=FSCG-FSV
      YV=BLV-BLCG
      ZV=WLCG-WLV
C
C     ONE TIME ONLY CALCULATIONS FOR FUSELAGE AERO EQUATIONS
C
      XF=FSCG-FSF
      YF=BLF-BLCG
      ZF=WLCG-WLF
 1801 CONTINUE
C
C     ONE TIME ONLY CALCULATIONS FOR DIRECT THRUST FORCES AND MOMENTS
C
      DO 1 I=1,NENG
      XT(I)=FSCG-FSSW(I)
      YT(I)=BLSW(I)-BLCG
      ZT(I)=WLCG-WLSW(I)
    1 CONTINUE
C
C     ONE TIME CALCULATIONS FOR RCS FORCES AND MOMENTS
C
      KBT=KBT1*BLDREF+KBT2
      CALL STLU(BLDRT,FRCST,NBLOR,BLDREF,FRCSMXR,2)
      FRCSMX0=0.
      DO 3 I=1,NRCSJET
      CTHTRCS(I)=COS(THTRCS(I))
      STHTRCS(I)=SIN(THTRCS(I))
      CPSIRCS(I)=COS(PSIRCS(I))
      SPSIRCS(I)=SIN(PSIRCS(I))
      XJET(I)=FSCG-FSRCS(I)
      YJET(I)=BLRCS(I)-BLCG
      ZJET(I)=WLCG-WLRCS(I)
      FRCSMX0=FRCSMX0+ABS(FRCSMX(I))*(1.-DEMAND(I))
    3 CONTINUE
C
C     ONE TIME ONLY CALCULATIONS FOR RAM FORCES AND MOMENTS
C
      DO 2 I=1,NENG
      XIN(I)=FSCG-FSIN(I)
      YIN(I)=BLIN(I)-BLCG
      ZIN(I)=WLCG-WLIN(I)
```

```
    2 CONTINUE
      NCALC=1
 1800 CONTINUE
C
C     ATMOSPHERE AND MACH NUMBER
C
      ALT=-ZE
      CALL ATMOSX(ALT,2,RHO,TAMB,PRESS,TRATIO,PRATIO,VSOUND)
      VA=SQRT(UAS*UAS+VAS*VAS+WAS*WAS)
      VK=VA/1.6889
      QBAR=0.5*RHO*VA*VA
      MN=VA/VSOUND
C
C     SIN AND COS OF ALPHA AND BETA. ALSO STAB. AXIS RATES
C
      CALPH=COS(ALPH)
      SALPH=SIN(ALPH)
      CBETA=COS(BETA)
      SBETA=SIN(BETA)
      PS=-P*SALPH+R*CALPH
      PS=P*CALPH+R*SALPH
      IF(NAERO1.NE.0)GO TO 1002
C
C     AERO FORCE AND MOMENT CALCULATIONS BASED ON DATCOM-TYPE METHODS
C
C
C     WING AERO FORCES AND MOMENTS
C
      UW=UAS+Q*ZWING1
      WW=WAS-Q*XWING1
      VXZ1=SQRT(UW**2+WW**2)
      DADA1=EKDA1*DA1
      ALFW1=BATAN2(WW,UW)+EIW      +DADA1
      CALL LIFDRAG(ALFW1,DA1,DFLAPW,CLW1,CDW1,CMW1,1,EOS,AEROK,CLA,CNAA0
     1     ,AERO,SURFCP,ALFS1,DXWING1)
      UW=UAS+Q*ZWING2
      WW=WAS-Q*XWING2
      VXZ2=SQRT(UW**2+WW**2)
      DADA2=EKDA2*DA2
      ALFW2=BATAN2(WW,UW)+EIW      +DADA2
      CALL LIFDRAG(ALFW2,DA2,DFLAPW,CLW2,CDW2,CMW2,1,EOS,AEROK,CLA,CNAA0
     1     ,AERO,SURFCP,ALFS2,DXWING2)
      CLW=0.5*(CLW1+CLW2)
      CDW=0.5*(CDW1+CDW2)
      ALFW=0.5*(ALFW1+ALFW2)
      VXZ=0.5*(VXZ1+VXZ2)
      DALFW=ALFW+.01745
      DAVG=0.5*(DA1+DA2)
      CALL LIFDRAG(DALFW,DAVG,DFLAPW,CL1,CD1,CM1,1,EOS,AEROK,CLA,CNAA0,
     1   AERO,SURFCP,ALFS3,DCP)
      DALFW=ALFW-.01745
      CALL LIFDRAG(DALFW,DAVG,DFLAPW,CL2,CD2,CM2,1,EOS,AEROK,CLA,CNAA0,
     1   AERO,SURFCP,ALFS4,DCP)
      BETW=BATAN2(VAS,VXZ)
      QWS=0.5*RHO*SW*VXZ**2
      QWSB=QWS*BW
      IF(VXZ.EQ.0.)11,12
```

C-3

```
   11 BOV=0.                                                               FORCES    170
      GO TO 13                                                             FORCES    171
   12 BOV=0.5*BW/VXZ                                                       FORCES    172
   13 CONTINUE                                                             FORCES    173
      LWP=QWSB*((CLBOW+CLBCLW*CLW)*BETW+BOV*(CLRCLW*CLW*RS+CLPW*PS))       FORCES    174
      NWP=QWSB*((CNBOW+CNBCL2W*CLW*CLW)*BETW+BOV*(CNRCL2W*CLW*CLW+         FORCES    175
     1    CNRCD *CDW)*RS+BOV*(CNPCLW*CLW)*PS)                              FORCES    176
      YWP=QWS*CYBCL2W*CLW*CLW*BETW                                         FORCES    177
      ALF1=ALFW1-EIW         -DADA1                                        FORCES    178
      SALF1=SIN(ALF1)                                                      FORCES    179
      CALF1=COS(ALF1)                                                      FORCES    180
      ALF2=ALFW2-EIW         -DADA2                                        FORCES    181
      SALF2=SIN(ALF2)                                                      FORCES    182
      CALF2=COS(ALF2)                                                      FORCES    183
      XW1=0.5*QWS*(CLW1*SALF1-CDW1*CALF1)                                  FORCES    184
      ZW1=0.5*QWS*(-CLW1*CALF1-CDW1*SALF1)                                 FORCES    185
      XW2=0.5*QWS*(CLW2*SALF2-CDW2*CALF2)                                  FORCES    186
      ZW2=0.5*QWS*(-CLW2*CALF1-CDW2*SALF2)                                 FORCES    187
      ALF=ALFW-EIW      -0.5*(DADA1+DADA2)                                 FORCES    188
      SALF=SIN(ALF)                                                        FORCES    189
      CALF=COS(ALF)                                                        FORCES    190
      MW=QWS*CW*(CMOW+0.5*(CMW1+CMW2))                                     FORCES    191
      LW =LWP*CALF-NWP*SALF                                                FORCES    192
      NW =LWP*SALF+NWP*CALF                                                FORCES    193
      DXW=XW1+XW2                                                          FORCES    194
      DYW=YWP                                                              FORCES    195
      DZW=ZW1+ZW2                                                          FORCES    196
      DLW=LW+ZW1*YWING1+ZW2*YWING2-0.5*YWP*(ZWING1+ZWING2)                 FORCES    197
      DMW=XW1*ZWING1-ZW1*(XWING1-DXWING1*CW)+XW2*ZWING2-ZW2*(XWING2-       FORCES    198
     1    DXWING2*CW)+MW                                                   FORCES    199
      DNW=NW-XW1*YWING1-XW2*YWING2+0.5*YWP*(XWING1+XWING2-CW*(DXWING1      FORCES    200
     1    +DXWING2))                                                       FORCES    201
C                                                                          FORCES    202
C     HORIZONTAL STABILIZER FORCES AND MOMENTS                             FORCES    203
C                                                                          FORCES    204
      UH=UAS    +Q*ZH-R*YH                                                 FORCES    205
      WH=WAS    +P*YH-Q*XH                                                 FORCES    206
      ALFG=BATAN2(WAS,UAS)                                                 FORCES    207
      EPS=EOCLW*CLW                                                        FORCES    208
      IF(ABS(UH).LE.5.)GO TO 38                                            FORCES    209
      DAH=EOCLW*(CL1-CL2)*ALFAD*(FSH-FSW)/(UH*.0349)                       FORCES    210
   38 CONTINUE                                                             FORCES    211
      DADE=EKADE*DE                                                        FORCES    212
      ALFH=BATAN2(WH,UH)-EPS+DAH+EIH        +DADE                          FORCES    213
      CALL LIFDRAG(ALFH,DFLAPH,0.,CLH,CDH,CMH,2,EDS,AEROK,CLA,CNAAB,       FORCES    214
     1    AERO,SURFCP,ALFSH,DXHT)                                          FORCES    215
      DXHT=DXHT*CH                                                         FORCES    216
      ANG=EPS-ALFG+AWEL                                                    FORCES    217
      DIS=DWEL*ABS(SIN(ANG))                                               FORCES    218
      XI=DWEL*ABS(COS(ANG))                                                FORCES    219
      ZW=0.68*SQRT(CDW*(XI+0.15))                                          FORCES    220
      DQ0Q0=0.                                                             FORCES    221
      IF(DIS.LT.ZW.AND.ABS(ANG).LT.HALFPI)DQ0Q0=2.42*SQRT(CDW)*(COS(DIS*   FORCES    222
     1       HALFPI/ZW))**2)/(XI+0.30)                                     FORCES    223
C                                                                          FORCES    224
C     FOR CANARD CONFIGURATION,DQ0Q0 ASSUMED = 0.                          FORCES    225
C                                                                          FORCES    226
```

```
      IF(XH.GE.0.)DQ0Q0=0.                                               FORCES   227
      QEFF=0.5*RHO*(1.-DQ0Q0)*(UH*UH+WH*WH)*SH                           FORCES   228
      ALFH1=ALFH-EIH        -DADE                                        FORCES   229
      SALFH1=SIN(ALFH1)                                                  FORCES   230
      CALFH1=COS(ALFH1)                                                  FORCES   231
      DXH=QEFF*(CLH*SALFH1-CDH*CALFH1)                                   FORCES   232
      DYH=0.                                                             FORCES   233
      DZH=QEFF*(-CLH*CALFH1-CDH*SALFH1)                                  FORCES   234
      DLH=DZH*YH                                                         FORCES   235
      DMH=QEFF*CH*(CM0H+CMH)+DXH*ZH-DZH*(XH-DXAT)                        FORCES   236
      DNH=-DXH*YH                                                        FORCES   237
C                                                                        FORCES   238
C     VERTICAL STABILIZER FORCES AND MOMENTS                             FORCES   239
C                                                                        FORCES   240
      UV=UAS+Q*ZV-R*YV                                                   FORCES   241
      VV=VAS*(1.-LKV)-P*ZV+R*XV                                          FORCES   242
      DADR=EKADR*DRP                                                     FORCES   243
      ALFV=BATAN2(-VV,UV)+DADR+EIV                                       FORCES   244
      CALL LIFDRAG(ALFV,0.,0.,CLV,CDV,CMV,3,EOS,AEROK,CLA,CNAA0,AERO,    FORCES   245
     1    SURFCP,ALFSV,DXVT)                                             FORCES   246
      DXVT=DXVT*CV                                                       FORCES   247
      ALFV1=ALFV-DADR-EIV                                                FORCES   248
      CALFV1=COS(ALFV1)                                                  FORCES   249
      SALFV1=SIN(ALFV1)                                                  FORCES   250
      CALL STLU(TALFA,TVTEFF,NALFA,ALPH,VTEFF,2)                         FORCES   251
      QOV=0.5*RHO*(UV**2+VV**2)*SV*VTEFF                                 FORCES   252
      DXV=QOV*(CLV*SALFV1-CDV*CALFV1)                                    FORCES   253
      DYV=QOV*(CLV*CALFV1+CDV*SALFV1)                                    FORCES   254
      DZV=0.                                                             FORCES   255
      DLV=-DYV*ZV                                                        FORCES   256
      DMV=DXV*ZV                                                         FORCES   257
      DNV=QOV*CV*(CN0V+CMV)+DYV*(XV-DXVT)-DXV*YV                         FORCES   258
C                                                                        FORCES   259
C     FUSELAGE FORCES AND MOMENTS                                        FORCES   260
C                                                                        FORCES   261
      ALFF=BATAN2(WAS,UAS)                                               FORCES   262
      ALFYF=BATAN2(-VAS,UAS)                                             FORCES   263
      ALFTF=BATAN2(SQRT(VAS**2+WAS**2),UAS)                              FORCES   264
      QXY=0.5*RHO*(UAS**2+VAS**2)                                        FORCES   265
      Q0=Q3AR                                                            FORCES   266
      QXZ=0.5*RHO*(UAS**2+WAS**2)                                        FORCES   267
      AOQ=AOQ0*SIGN(1.,COS(ALFTF))*ABS(COS(ALFTF))**EN1                  FORCES   268
      AS=Q0*AOQ                                                          FORCES   269
      IF(ABS(ALFYF).LE.PI18)31,32                                        FORCES   270
   31 SAF=SIN(PI19)                                                      FORCES   271
      SOQ=ALFYF*SOQMX*(ABS(SAF)**EN2)/PI19                               FORCES   272
      GO TO 33                                                           FORCES   273
   32 CONTINUE                                                           FORCES   274
      SAF=SIN(ALFYF)                                                     FORCES   275
      SOQ=SOQMX*SIGN(1.,SAF)*ABS(SAF)**EN2                               FORCES   276
   33 CONTINUE                                                           FORCES   277
      IF(ABS(ALFF).LE.(PI18+A0F))34,35                                   FORCES   278
   34 SAF=SIN(PI18)                                                      FORCES   279
      NFOQ=NFOQM*(ALFF-A0F)*(ABS(SAF)**EN3)/PI19                         FORCES   280
      GO TO 35                                                           FORCES   281
   35 CONTINUE                                                           FORCES   282
      AF=ALFF-A0F                                                        FORCES   283
```

```
      SAF=SIN(AF)
      NFOQ=NFOQM*SIGN(1.,SAF)*ABS(SAF)**EN3
   36 CONTINUE
      IF(((2.*A0F-A1F).LE.ALFF.AND.ALFF.LE.(-PI18+A0F)).OR.
     1   ((PI18+A0F).LE.ALFF.AND.ALFF.LE.A1F))10,20
   10 AF=PI*(ALFF-A0F)/(A1F-A0F)
      SAF=SIN(AF)
      MOQ=MOQMX1*SIGN(1.,SAF)*ABS(SAF)**EN4
      GO TO 50
   20 CONTINUE
      IF((-PI18+A0F).LT.ALFF.AND.ALFF.LT.(PI18+A0F))30,40
   30 AF=PI*PI18/(A1F-A0F)
      SAF=SIN(AF)
      MOQ1=MOQMX1*SIGN(1.,SAF)*ABS(SAF)**EN4
      MOQ=MOQ1*(ALFF-A0F)/PI18
      GO TO 50
   40 AF=PI*(ALFF-A1F)/(PI+A0F-A1F)
      SAF=SIN(AF)
      MOQ=MOQMX2*SIGN(1.,SAF)*ABS(SAF)**EN5
   50 CONTINUE
      S=QXY*SOQ
      NF=QXZ*NFOQ
      PITCHF=MOQ*QXZ
      IF((-A2F.LT.ALFYF.AND.ALFYF.LE.-PI18).OR.(PI18.LE.ALFYF.AND.
     1   ALFYF.LE.A2F))60,70
   60 AF=PI*ALFYF/A2F
      SAF=SIN(AF)
      NOQ=NOQMX1*SIGN(1.,SAF)*ABS(SAF)**EN6
      GO TO 100
   70 IF(-PI18.LT.ALFYF.AND.ALFYF.LT.PI18)80,90
   80 AF=PI*PI18/A2F
      SAF=SIN(AF)
      NOQ1=NOQMX1*SIGN(1.,SAF)*ABS(SAF)**EN6
      NOQ=NOQ1*ALFYF/PI18
      GO TO 100
   90 AF=PI*(ALFYF-A2F)/(PI-A2F)
      SAF=SIN(AF)
      NOQ=NOQMX2*SIGN(1.,SAF)*ABS(SAF)**EN7
  100 CONTINUE
      YAWF=NOQ*QXY
      DFSF=0.
      IF(ABS(ALFF).GT.ADFSF1)DFSF=(ABS(ALFF)-ADFSF1)*DFSF0/(ADFSF2
     1     -ADFSF1)
      IF(ABS(DFSF).GT.ABS(DFSF0))DFSF=DFSF0
      DXF=-AS
      DYF=S
      DZF=-NF
      DLF=DZF*YF-DYF*ZF
      DMF=PITCHF+DXF*ZF-DZF*(XF-DFSF)
      DNF=YAWF+XKYF*DYF*(XF-DFSF)-DXF*YF
C
C     TOTAL AERO FORCES AND MOMENTS
C
      XAERO=DXW+DXH+DXV+DXF
      YAERO=DYW+DYH+DYV+DYF
      ZAERO=DZW+DZH+DZV+DZF
      LAERO=DLW+DLH+DLV+DLF
```

```
      NAERO=DMW+DMH+DMV+DMF
      NAERO=DNW+DNH+DNV+DNF
      IF(FLAG.GT.1.) RETURN
 1002 CONTINUE
C
C     AERO FORCE AND MOMENT CALCULATIONS USING TABULARIZED DATA
C     (SECTION TO BE ADDED LATER)
C
C
C     DIRECT THRUST CALCULATIONS INCLUDING BLEED AVAIL,MASS FLOW RATES,
C         AND ENGINE RPM
C
      CALL STLU(MNT,TMDT,NMACH,MN,MDTMX,2)
      IF(ITRIM.NE.0)GO TO 580
      IF(TO(I).GT.FGMAX)TO(I)=FGMAX
      IF(TO(I).LT.FGIDL)TO(I)=FGIDL
  580 CONTINUE
      TREQAV=0.5*(TO(1)+TO(2))
      GYROL=0.
      GYROM=0.
      GYRON=0.
      DO 600 I=1,NENG
      TREQ(I)=TO(I)
      FRATIO=TFRAC(I)
      MDOT(I)=MDTMX*(KM1*FRATIO+KM2)
      CALL STLU(TFRAT,TRPM,NFRAT,FRATIO,FRPM,2)
      RPM(I)=FRPM*RPMMX
      HE(I)=JENG*FRPM*OMEGMX
C
C    GYRO MOMENT CALCULATIONS
C
      GYROL=GYROL-HE(I)*SSIGY*Q
      GYROM=GYROM+HE(I)*(R*CSIGY+P*SSIGY)
      GYRON=GYRON-HE(I)*CSIGY*Q
  600 CONTINUE
      IF(RCS.EQ.0.)GO TO 610
      KMDT=1.
      PLDAVL=0.
      IF(TREQAV.LT.FGMAX)BLDAVL=(TREQAV/FGMAX-KBT2)/KBT1
      IF(TREQAV.LT.FGMIN)KMDT=KM1*TREQAV/FGMIN+KM2
  610 CONTINUE
C
C     RCS FORCES AND MOMENTS
C
      DFRCSDB=0.
      SIGFRCS=0.
      DO 510 I=1,NRCSJET
      FRCS(I)=FRCSMX(I)*DRCS(I)
      IF(FRCS(I).LE.0)FRCS(I)=0.
      IF(DEMAND(I).EQ.0.)FRCS(I)=FRCSMX(I)*(1.+DRCS(I))
      SIGFRCS=SIGFRCS+FRCS(I)
      DFRCSDB=ABS(FRCS(1))*DEMAND(I)*BLDMOR(I)+DFRCSDB
C
C     IF DEMAND(I)=0. THEN RCS JET I IS CONTINUOUS BLEED
C     IF DEMAND(I)=1. THEN RCS JET I IS DEMAND BLEED
C     IF BLDMOR(I)=0. THEN RCS JET I DOES NOT COMMAND ADDITIONAL BLEED
C     IF BLDMOR(I)=1. THEN RCS JET I COMMANDS ADDITIONAL BLEED
```

```
C
  510 CONTINUE
      FRCSLU=(FRCSMX0+DFRCSOB)/AENG
      CALL STLU(FRCST,BLDRT,NBLDR,FRCSLU,BLDREQ,2)
      FRCSAL=FRCSLU
      IF(BLDREQ.LT.BLDREF)BLDREQ=BLDREF
      BLD=BLDREQ
      IF(ITRIM.NE.0.OR.NDRIV.NE.0) GO TO 560
      IF(BLDAVL.LT.BLDREQ)550,560
  550 CALL STLU(BLDRT,FRCST,NBLDR,BLDAVL,FRCSAL,2)
      BLD=BLDAVL
  560 CONTINUE
      DO 570 I=1,NRCSJET
      IF(SIGFRCS.EQ.0.)520,530
  520 FRCSC(I)=0.
      GO TO 540
  530 CONTINUE
      FRCSC(I)=FRCS(I)*KMJT*AENG*FRCSAL/SIGFRCS
  540 CONTINUE
      IF(ITRIM.NE.0.OR.NDRIV.NE.0)FRCSA(I)=FRCSC(I)
  570 CONTINUE
      DXRCS=0.
      DYRCS=0.
      DZRCS=0.
      DLRCS=0.
      DMRCS=0.
      DNRCS=0.
      DO 500 I=1,NRCSJET
      DXRC(I)=FRCSA(I)*CPSIRCS(I)*CTHTRCS(I)
      DYRC(I)=FRCSA(I)*SPSIRCS(I)*CTHTRCS(I)
      DZRC(I)=-FRCSA(I)*STHTRCS(I)
      DLRCS=DLRCS+DZRC(I)*YJET(I)-DYRC(I)*ZJET(I)
      DMRCS=DMRCS+DXRC(I)*ZJET(I)-DZRC(I)*XJET(I)
      DNRCS=DNRCS+DYRC(I)*XJET(I)-DXRC(I)*YJET(I)
      DXRCS=DXRCS+DXRC(I)
      DYRCS=DYRCS+DYRC(I)
      DZRCS=DZRCS+DZRC(I)
  500 CONTINUE
C
C     ADJUST THRUST TO ACCOUNT FOR RCS COUPLING
C
      KBTP=KBT1*BLD+KBT2
      IF(NDRIV.NE.0.OR.ITRIM.NE.0) KBTP=KBT
      DO 581 I=1,NENG
      TRST(I)=TO(I)*KBTP
  581 CONTINUE
      TRCS=AENG*TREQAV*(1.-KBTP)
C
C      THRUST VECTORING AND DIRECT THRUST FORCES AND MOMENTS
C
C      CALCULATE THRUST APPLICATION POINT WRT NOZZLE SWIVEL POINT
C
      CSIGY=COS(SIGY)
      SSIGY=SIN(SIGY)
      DO 200 I=1,NENG
      SPSIT(I)=SIN(PSIT(I))
      CPSIT(I)=COS(PSIT(I))
```

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      STHT(I)=SIN(THT(I))                                               FORCES   455
      CTHT(I)=COS(THT(I))                                               FORCES   456
      DFSSW(I)=ELN*(CPSIT(I)*CSIGY*CTHT(I)-STHT(I)*SSIGY)               FORCES   457
      DBLSW(I)=-ELN*SPSIT(I)*CTHT(I)                                    FORCES   458
      DWLSW(I)=-ELN*(CPSIT(I)*SSIGY*CTHT(I)+CSIGY*STHT(I))              FORCES   459
  200 CONTINUE                                                          FORCES   460
C                                                                       FORCES   461
C      FLOW TURNING ANGLE CORRECTION TO THRUST                          FORCES   462
C                                                                       FORCES   463
      DO 210 I=1,NENG                                                   FORCES   464
      AFT(I)=ACOS(CTHT(I)*CPSIT(I))                                     FORCES   465
      KAFT=KAFT1*AFT(I)+KAFT2                                           FORCES   466
      TCOR(I)=KAFT*TRST(I)                                              FORCES   467
  210 CONTINUE                                                          FORCES   468
C                                                                       FORCES   469
C     DIRECT THRUST FORCES AND MOMENTS CALCULATIONS                     FORCES   470
C                                                                       FORCES   471
      DXT=0.                                                            FORCES   472
      DYT=0.                                                            FORCES   473
      DZT=0.                                                            FORCES   474
      DLT=0.                                                            FORCES   475
      DMT=0.                                                            FORCES   476
      DNT=0.                                                            FORCES   477
      DO 220 I=1,NENG                                                   FORCES   478
      DX(I)=TCOR(I)*(CTHT(I)*CPSIT(I)*CSIGY-SSIGY*STHT(I))              FORCES   479
      DY(I)=TCOR(I)*(CTHT(I)*SPSIT(I))                                  FORCES   480
      DZ(I)=TCOR(I)*(-CTHT(I)*CPSIT(I)*SSIGY-CSIGY*STHT(I))             FORCES   481
      DLT=DLT+DZ(I)*(YT(I)+DBLSW(I))-DY(I)*(ZT(I)-DWLSW(I))             FORCES   482
      DMT=DMT+DX(I)*(ZT(I)-DWLSW(I))-DZ(I)*(XT(I)-DFSSW(I))             FORCES   483
      DNT=DNT+DY(I)*(XT(I)-DFSSW(I))-DX(I)*(YT(I)+DBLSW(I))             FORCES   484
      DXT=DXT+DX(I)                                                     FORCES   485
      DYT=DYT+DY(I)                                                     FORCES   486
      DZT=DZT+DZ(I)                                                     FORCES   487
  220 CONTINUE                                                          FORCES   488
C                                                                       FORCES   489
C     RAM FORCES AND MOMENTS                                            FORCES   490
C                                                                       FORCES   491
      V0=VA                                                             FORCES   492
      DXR=0.                                                            FORCES   493
      DYR=0.                                                            FORCES   494
      DZR=0.                                                            FORCES   495
      DLR=0.                                                            FORCES   496
      DMR=0.                                                            FORCES   497
      DNR=0.                                                            FORCES   498
C                                                                       FORCES   499
C     IF V0=0. SKIP CALCULATION OF BASIC RAM FORCES AND MOMENTS.        FORCES   500
C     CALCULATE RAM EFFECTS DUE TO P,Q,R ONLY                           FORCES   501
      IF(V0.EQ.0.)GO TO 300                                             FORCES   502
      ATURN0=ACOS((UAS*CSIGY-WAS*SSIGY)/V0)                             FORCES   503
      BTURN=BATAN2(VAS,(WAS*CSIGY+UAS*SSIGY))                           FORCES   504
      CBTURN=COS(BTURN)                                                 FORCES   505
      SBTURN=SIN(BTURN)                                                 FORCES   506
      DO 310 I=1,NENG                                                   FORCES   507
      VIN=MDOT(I)/(GC*PI*RHO*RINLET**2)                                 FORCES   508
      VOVI(I)=V0/VIN                                                    FORCES   509
      CALL DTLU(VOVIT,ATURNT,ELRAMT,NVOVI,NATURN,VOVI(I),ATURN0,ELRAM(I) FORCES   510
     1   ,2,2)                                                          FORCES   511
```

```
      CALL DTLU(VOVIT,ATURNT,DATURNT,NVOVI,NATURN,VOVI(I),ATURNO,       FORCES    512
     1   DATURN(I),2,2)                                                 FORCES    513
      CALL DTLU(VOVIT,ATURNT,ETART,NVOVI,NATURN,VOVI(I),ATURNO,ETAR(I), FORCES    514
     1   2,2)                                                           FORCES    515
      ATURN(I)=ATURNO+DATURN(I)                                         FORCES    516
      FRAM(I)=-MDOT(I)*V0*ETAR(I)/GC                                    FORCES    517
      ELR=RINLET*2.*ELRAM(I)                                            FORCES    518
      WLRAM=WLIN(I)+ELR*SSIGY                                           FORCES    519
      FSRAM=FSIN(I)-ELR*CSIGY                                           FORCES    520
      SATURN=SIN(ATURN(I))                                              FORCES    521
      CATURN=COS(ATURN(I))                                              FORCES    522
      DXRO(I)=  FRAM(I)*(CATURN*CSIGY+SSIGY*SATURN*CBTURN)              FORCES    523
      DYRO(I)=  FRAM(I)*SATURN*SBTURN                                   FORCES    524
      DZRO(I)=  FRAM(I)*(-CATURN*SSIGY+SATURN*CBTURN*CSIGY)             FORCES    525
      DLR=DLR+DZRO(I)*(YIN(I))-DYRO(I)*(WLCG-WLRAM)                     FORCES    526
      DMR=DMR+DXRO(I)*(WLCG-WLRAM)-DZRO(I)*(FSCG-FSRAM)                 FORCES    527
      DNR=DNR+DYRO(I)*(FSCG-FSRAM)-DXRO(I)*(YIN(I))                     FORCES    528
      DXR=DXR+DXRO(I)                                                   FORCES    529
      DYR=DYR+DYRO(I)                                                   FORCES    530
      DZR=DZR+DZRO(I)                                                   FORCES    531
  310 CONTINUE                                                          FORCES    532
  300 CONTINUE                                                          FORCES    533
C                                                                       FORCES    534
C   AIRCRAFT ANGULAR RATES(P,Q,R) INDUCE VELOCITY INCREMENTS IN THE     FORCES    535
C   ENGINE INLET FLOW. THESE LEAD TO CHANGES IN RAM FORCES AND MOMENTS. FORCES    536
C   THE INCREMENTAL FORCES ARE ASSUMED TO ACT AT THE INLET FACE.        FORCES    537
C                                                                       FORCES    538
      DO 320 I=1,NENG                                                   FORCES    539
      UI=Q*ZIN(I)-R*YIN(I)                                              FORCES    540
      VI=R*XIN(I)-P*ZIN(I)                                              FORCES    541
      WI=P*YIN(I)-Q*XIN(I)                                              FORCES    542
      DXRI(I)=-MDOT(I)*UI                                               FORCES    543
      DYRI(I)=-MDOT(I)*VI                                               FORCES    544
      DZRI(I)=-MDOT(I)*WI                                               FORCES    545
      DLR=DLR+DZRI(I)*YIN(I)-DYRI(I)*ZIN(I)                             FORCES    546
      DMR=DMR+DXRI(I)*ZIN(I)-DZRI(I)*XIN(I)                             FORCES    547
      DNR=DNR+DYRI(I)*XIN(I)-DXRI(I)*YIN(I)                             FORCES    548
      DXR=DXR+DXRI(I)                                                   FORCES    549
      DYR=DYR+DYRI(I)                                                   FORCES    550
      DZR=DZR+DZRI(I)                                                   FORCES    551
  320 CONTINUE                                                          FORCES    552
C                                                                       FORCES    553
C     CORIOLIS FORCES AND MOMENTS                                       FORCES    554
C                                                                       FORCES    555
      DXCOR=0.                                                          FORCES    556
      DYCOR=0.                                                          FORCES    557
      DZCOR=0.                                                          FORCES    558
      DLCORD=0.                                                         FORCES    559
      DMCORD=0.                                                         FORCES    560
      DNCORD=0.                                                         FORCES    561
      DO 400 I=1,NENG                                                   FORCES    562
      MDOT(I)=MDOT(I)/GC                                                FORCES    563
      ELCOR=XIN(I)*CSIGY-ZIN(I)*SSIGY                                   FORCES    564
      EACOR=-XIN(I)*SSIGY-ZIN(I)*CSIGY                                  FORCES    565
      DXCOR=DXCOR-2.*MDOT(I)*Q*ELDUCT*SSIGY                             FORCES    566
      DYCOR=DYCOR+2.*MDOT(I)*ELDUCT*(R*CSIGY+P*SSIGY)                   FORCES    567
      DZCOR=DZCOR-2.*MDOT(I)*Q*ELDUCT*CSIGY                             FORCES    568
```

```
      DLCORD=DLCORD-2.*MDOT(I)*ELDUCT*(YIN(I)*Q-EACOR*(R*CSIGY+P*SSIGY))
      DMCORD=DMCORD+MDOT(I)*Q*ELDUCT*(2.*ELCOR-ELDUCT)
      DNCORD=DNCORD+MDOT(I)*ELDUCT*(R*CSIGY+P*SSIGY)*(2.*ELCOR-ELDUCT)
      MDOT(I)=MDOT(I)*GC
  400 CONTINUE
      DLCOR=DLCORD*CSIGY+DNCORD*SSIGY
      DMCOR=DMCORD
      DNCOR=-DLCORD*SSIGY+DNCORD*CSIGY
C
C     TOTAL FORCES AND MOMENTS
C
      SUMFX=XAERO+DXT+DXRCS+DXR+DXCOR
      SUMFY=YAERO+DYT+DYRCS+DYR+DYCOR
      SUMFZ=ZAERO+DZT+DZRCS+DZR+DZCOR
      SUML=LAERO+DLT+DLRCS+DLR+DLCOR
      SUMM=MAERO+DMT+DMRCS+DMR+DMCOR
      SUMN=NAERO+DNT+DNRCS+DNR+DNCOR
      RETURN
      END
```

```
      SUBROUTINE INTRP(X,N,XARG,J,A,KODE)
C     THIS SUBROUTINE SEARCHS FOR THE LOCATION OF XARG IN THE ABSCISSA TABL
C     X(I) AND COMPUTES THE INTERPOLATION COEFFICIENTS A(1),A(2),A(3) AND
C       A(4)  WHICH ARE FUNCTIONS OF X
C     X......INDEPENDENT VARIABLE TABLE
C     N......NUMBER OF POINTS INDEPENDENT VARIABLE TABLE
C     XARG...VALUE OF X FOR WHICH THE DEPENDENT VARIABLE IS TO BE CALCULATE
C     J......INDEX OF THE FIRST POINT BEYOND XARG IN THE X-ARRAY
C     A(I)...INTERPOLATION COEFFICIENTS
C     KODE=2  TWO POINT INTERPOLATION (LINEAR)
C          =3  THREE POINT INTERPOLATION (QUADRATIC)
C          =4  FOUR POINT INTERPOLATION (BIQUADRATIC)
C          =-2,-3,-4  THE SEARCH AND CALCULATION OF INTERPOLATION
C     COEFFICIENTS IS SUPPRESSED
C     NOTE-FUNCTIONS THAT HAVE THE SAME INDEPENDENT VARIABLE TABLE HAVE THE
C     SAME INTERPOLATION COEFFICIENTS
      DIMENSION X(1),A(1)
      DO 1 I=1,4
    1 A(I)=0.
      IF(N .GT. 1) GO TO 2
      J=1
      A(3)=1.
      RETURN
    2 CONTINUE
      IF(KODE .GT. 2 .AND. N .GT. 2) GO TO 3
      CALL SEARCH(X,XARG,N,J)
      CALL INTRP2(X(J-1),XARG,A(2))
      RETURN
    3 SGN=1.
      IF(X(N) .LT. X(1)) SGN=-1.
      IF(XARG*SGN .GE. X(1)*SGN) GO TO 4
      J=3
      CALL INTRP2(X,XARG,A)
      RETURN
    4 IF(XARG*SGN .LE. X(N)*SGN) GO TO 5
      J=N-1
      CALL INTRP2(X(J),XARG,A(3))
      RETURN
    5 CALL SEARCH(X,XARG,N,J)
      IF(J .NE. 2) GO TO 6
      J=3
      CALL INTRP3(X,XARG,A)
      RETURN
    6 IF(J .NE. N) GO TO 7
      CALL INTRP3(X(J-2),XARG,A)
      RETURN
    7 IF(KODE .NE. 3) GO TO 8
      CALL INTRP3(X(J-2),XARG,A)
      RETURN
    8 CALL INTRP4(X(J-2),XARG,A)
      RETURN
      END
```

```
      SUBROUTINE INTRP2(X,XIN,A)                                        INTRP2   2
C  SUBROUTINE FOR GENERATING LAGRANGE INTERPOLATING                     INTRP2   3
C  COEFFICIENTS FOR TWO POINT INTERPOLATION                             INTRP2   4
      DIMENSION X(1),A(4)                                               INTRP2   5
      A(1) =(XIN-X(2))/(X(1)-X(2))                                      INTRP2   6
      A(2) =-(XIN-X(1))/(X(1)-X(2))                                     INTRP2   7
      RETURN                                                            INTRP2   8
      END                                                               INTRP2   9
```

```
      SUBROUTINE INTRP3(X,XIN,A)                                         INTRP3    2
C  SUBROUTINE FOR CALCULATING INTERPOLATION COEFFICIENTS FOR THREE POINT INTRP3    3
C   LAGPANGE INTERPOLATION                                               INTRP3    4
      DIMENSION X(1),A(4)                                                INTRP3    5
      A(1)=(XIN-X(2))*(XIN-X(3))/((X(1)-X(2))*(X(1)-X(3)))               INTRP3    6
      A(2)=(XIN-X(1))*(XIN-X(3))/((X(2)-X(1))*(X(2)-X(3)))               INTRP3    7
      A(3)=(XIN-X(1))*(XIN-X(2))/((X(3)-X(1))*(X(3)-X(2)))               INTRP3    8
      RETURN                                                             INTRP3    9
      END                                                                INTRP3   10
```

```
      SUBROUTINE INTRP4(X,XIN,A)                                       INTRP4    2
C  SUBROUTINE FOR CALCULATING INTERPOLATION COEFFICIENTS FOR FOUR POINT INTRP4    3
C  LAGRANGE INTERPOLATION                                              INTRP4    4
      DIMENSION X(4),B(4),C(4)                                         INTRP4    5
      CALL INTRP3(X,XIN,B)                                             INTRP4    6
      CALL INTRP3(X(2),XIN,C)                                          INTRP4    7
      TEMP1 = (XIN-X(3))/(X(2)-X(3))                                   INTRP4    8
      TEMP3 = (XIN-X(2))/(X(3)-X(2))                                   INTRP4    9
      A(1) = TEMP1  * B(1)                                             INTRP4   10
      A(2) =(TEMP1  * B(2))+(TEMP3  * C(1))                            INTRP4   11
      A(3) =(TEMP1  * B(3)) + (TEMP3  * C(2))                          INTRP4   12
      A(4) =(TEMP3  * C(3))                                            INTRP4   13
      RETURN                                                           INTRP4   14
      END                                                              INTRP4   15
```

```
      SUBROUTINE LIFORAG(ALFA,DFLAPTE,DFLAPLE,CL,CD,CM,N,EC,AEROKC,CLAC,
     1   CNAA0C,AERO,SURFCP,ALFS,DCP)
      DIMENSION AERO(23,3),CNAA0C(3),EC(3),AEROKC(3),CLAC(3)
      DIMENSION SURFCP(3,3)
      PI=3.14159
      HALFPI=1.5708
      IF(ALFA.LE.0.)270,280
  270 IF(ALFA.LT.-PI)250,260
  250 ALFA=ALFA+2.*PI
      GO TO 270
  280 IF(ALFA.GT.PI)290,260
  290 ALFA=ALFA-2.*PI
      GO TO 280
  260 CONTINUE
      ALFS=ALFA
      IF(ALFA.GE.HALFPI)ALFS=PI-ALFA
      IF(ALFA.LT.0.)ALFS=-ALFA
      IF(ALFA.LE.-HALFPI)ALFS=PI+ALFA
      CALFA=COS(ALFS)
      SALFA=SIN(ALFS)
      TANB=TAN(AERO(9,N))
      TANA=0.
      IF(ALFS.LT.HALFPI)TANA=TAN(ALFS)
      CNAA0=CNAA0C(N)
      E=EC(N)
      AEROK=AEROKC(N)
      CLA=CLAC(N)
      IF(ALFS.LE.AERO(9,N))10,20
   10 DCNAA=AEROK*(COS(HALFPI*TANA/TANB)**2.4)
      CDP=AERO(11,N)
      DCP=SURFCP(1,N)*(CALFA-1.)+SURFCP(2,N)*SALFA
      GO TO 30
   20 DCNAA=1.16-CNAA0
      IF(ALFS.LT.HALFPI)DCNAA=DCNAA*(1.-TANB/TANA)-1.55*SIN(PI*(1.-
     1      .6*TANB/TANA-.4*(TANB/TANA)**2))*CLA/2.3
      CDP=(ALFS-HALFPI)**2*(AERO(11,N)-1.2*AERO(4,N)/AERO(3,N))/((AERO
     1    (9,N)-HALFPI)**2)+1.2*AERO(4,N)/AERO(3,N)
      DCP=(ALFS-AERO(9,N))*(SURFCP(3,N)-SURFCP(1,N)*COS(AERO(9,N))
     1    -SURFCP(2,N)*SIN(AERO(9,N)))/(HALFPI-AERO(9,N))+SURFCP(1,N)*
     2   (COS(AERO(9,N))-1.)+SURFCP(2,N)*SIN(AERO(9,N))
   30 CONTINUE
      CLP=(CLA*CALFA+(CNAA0+DCNAA)*SALFA)*SALFA*CALFA
      AP=AERO(9,N)+AERO(23,N)
      IF(DFLAPTE.EQ.0.)190,200
  200 CONTINUE
      DFLAP=DFLAPTE
      IF(ALFS.LE.AERO(9,N))40,50
   40 DCL=AERO(13,N)*DFLAP+(AERO(14,N)-AERO(13,N))*DFLAP*ALFS/AERO(9,N)
      DCD=AERO(15,N)*DFLAP
      DCM=AERO(16,N)*DFLAP
      GO TO 80
   50 IF(ALFS.GE.AP)60,70
   60 DCL=0.
      DCD=0.
      DCM=0.
      GO TO 80
   70 ASHAPE=(1.-(ALFS-AERO(9,N))/AERO(23,N))
```

```
      DCL=AERO(14,N)*DFLAP*ASHAPE
      DCD=AERO(15,N)*DFLAP*ASHAPE
      DCM=AERO(16,N)*DFLAP*ASHAPE
   80 CONTINUE
      DCLTE=DCL
      DCDTE=ABS(DCD)
      DCMTE=DCM
      GO TO 210
  190 CONTINUE
      DCLTE=0.
      DCDTE=0.
      DCMTE=0.
  210 IF(DFLAPLE.EQ.0.)220,230
  230 CONTINUE
      DFLAP=DFLAPLE
      ALMAX=AERO(9,N)+AERO(17,N)*DFLAP
      AB=ALMAX+AERO(22,N)
      IF(ALFS.LE.ALMAX)140,150
  140 DCL=AERO(18,N)*DFLAP+(AERO(19,N)-AERO(18,N))*DFLAP*ALFS/ALMAX
      DCD=AERO(20,N)*DFLAP
      DCM=AERO(21,N)*DFLAP
      GO TO 180
  150 IF(ALFS.GE.AB)160,170
  160 DCL=0.
      DCD=0.
      DCM=0.
      GO TO 180
  170 ASHAPE=(1.-(ALFS-ALMAX)/AERO(22,N))
      DCL=AERO(19,N)*DFLAP*ASHAPE
      DCD=AERO(20,N)*DFLAP*ASHAPE
      DCM=AERO(21,N)*DFLAP*ASHAPE
  180 CONTINUE
      DCLLE=DCL
      DCDLE=ABS(DCD)
      DCMLE=DCM
      GO TO 240
  220 CONTINUE
      DCLLE=0.
      DCDLE=0.
      DCMLE=0.
  240 CONTINUE
      CLP=CLP+DCLTE+DCLLE
      CDP=CDP+DCDTE+DCDLE
      CM=DCMLE+DCMTE
      IF(ALFA.GE.HALFPI.OR.(ALFA.LE.0..AND.ALFA.GT.-HALFPI))CLP=-CLP+
     1  2.*(DCLLE+DCLTE)
      ALFI=CLP/(PI*AERO(2,N)*E)
      CALFI=COS(ALFI)
      SALFI=SIN(ALFI)
      CL=CLP*CALFI-CDP*SALFI
      CD=CLP*SALFI+CDP*CALFI
      CD=ABS(CD)
      RETURN
      END
```

```
      SUBROUTINE PCACT(DIN,DOUT,RLP,RLN,PLP,PLN,TAU,ITRIM,DOUTD)
C  SUBROUTINE PCACT CALCULATES THE COMMANDED RATE FOR A GENERAL
C  P C ACTUATOR.  THIS RATE IS INTEGRATED ALONG WITH THE EQUATIONS
C  OF MOTION TO OBTAIN OUTPUT DISPLACEMENT.
C
C   INPUTS.....
C         DIN        COMMANDED DISPLACEMENT
C         DOUT       INTEGRATED OUTPUT DISPLACEMENT
C         RLP        RATE LIMIT, POSITIVE
C         RLN        RATE LIMIT, NEGATIVE
C         PLP        POSITION LIMIT, POSITIVE
C         PLN        POSITION LIMIT, NEGATIVE
C         TAU        ACTUATOR TIME CONSTANT
C         ITRIM      A FLAG INDICATING MAIN ROUTINE IN TRIM OPTION
C                      =0  TIME HISTORY, ETC.
C                      =1  TRIMMING
C   OUTPUT.....
C         DOUTD      ACTUATOR OUTPUT RATE
C
      IF(ITRIM.EQ.1) GO TO 10
C
      IF(TAU.EQ.0.) GO TO 10
C  CALCULATE COMMAND RATE
      DOUTD= (1./TAU) * (DIN-DOUT)
C  CHECK RATE LIMITS
      IF(DOUTD.LT.RLN) DOUTD= RLN
      IF(DOUTD.GT.RLP) DOUTD= RLP
C  LIMIT OUTPUT POSITION
      IF(DOUT.GT.PLP) DOUT=PLP
      IF(DOUT.GE.PLP .AND. DOUTD.GT.0.) DOUTD=0.
      IF(DOUT.LT.PLN) DOUT=PLN
      IF(DOUT.LE.PLN .AND. DOUTD.LT.0.) DOUTD=0.
      RETURN
C
   10 DOUTD= 0.
      DOUT= DIN
C
      RETURN
      END
```

```
      SUBROUTINE PLOTER(A,IMAX,NOUT,NTAP)
CS    DEBUG
CS    STORES(NBUF,NLAST,N,IMAX,NOUT,NTAP)
CS    ARRAYS(A,ORD)
C CALCOMP PLOTTING ROUTINE
C           THE TIME HISTORIES ARE STORED ON AN EXTERNAL DEVICE AS A BLOCK
C           FOR EACH TIME POINT
C
C NTAP      EXTERNAL DEVICE WHERE TIME HISTORIES ARE STORED
C NOUT      NUMBER OF POINTS IN EACH BLOCK OF TIME HISTORY DATA. THESE POIN
C           WILL BE VALUES OF TIME,BETA,ALPHA,Q,R,THETA,ETC.
C NVAR      NUMBER OF VARIABLES TO BE PLOTTED COUNTING TIME. NVAR=2 FOR A P
C           ALPHA VS. TIME FOR EXAMPLE.
C A(I,J)    IS A BUFFER STORAGE ARRAY. FORTY BLOCKS OF TIME HISTORY DATA AR
C           READ FROM THE EXTERNAL DEVICE AND STORED IN THIS ARRAY. THE VAR
C           BEING PLOTTED IS STORED IN THE PLOTTING ARRAY ORD FOR THIS SEGM
C           OF TIME AND FORTY MORE BLOCKS ARE THEN BROUGHT INTO THE A ARRAY
C           THE EXTERNAL DEVICE
C  IMAX...NUMBER OF DATA POINTS
C TITLE1,TITLE2  LABEL OF PLOTS PRINTED IN TWO LINES
C  XI...MOVES PEN FROM LAST KNOWN POSITION TO LEFT HAND SIDE OF NEW PLOT
C  + RIGHT,INCHES
C  YI...MOVES PEN FROM LAST KNOWN POSITION TO TOP OF NEW PLOT SET + DOWN
C  NOREAD...WHEN NOREAD=1 PLOT CONTROL AND HEADING INFO ARE TO BE READ.
C   WHEN NOREAD=0 THIS INFO IS IDENTICAL TO PREVIOUS CASE AND IS NOT TO
C   BE READ
C  IOP = 1 FOR FIRST CALL TO SUBROUTINE, =0 FOR ALL OTHER CALLS
C  ICL = 1 FOR LAST CALL TO SUBROUTINE, =0 FOR ALL OTHER CALLS
C NO(I)     NUMBER OF THE VARIABLE TO BE PLOTTED AS DETERMINED BY ITS POSIT
C           IN THE OUTPUT SPECIFICATION (REFER TO A LISTING OF A TIME HISTO
C  ISYM(I)...ISYM(I)=-1 NO SYMBOL IS PLOTTED.
C   ISYM(I)=0 THROUGH 13 A SYMBOL FROM CALCOMP SYMBOL TABLE IS
C   PLOTTED (SEE MANUAL)
C  IPT(I)...NUMBER OF DATA POINTS BETWEEN SYMBOLS
C  SV(I)...VALUE OF PLOTTED VARIABLE AT LOWER END OF SCALE
C  SDV(I)...SCALE FACTOR OF PLOTTED VARIABLE, UNITS/INCH
C NOTE      IF SV(I) AND SDV(I) ARE LEFT BLANK THE AUTOMATIC SCALING OPTION
C           SUPPLY VALUES FOR THEM
C  B(I)...SCALE LENGTH, INCHES
C  C(I)...Y-DISTANCE FROM LOWER LEFT HAND CORNER THIS PLOT TO UPPER
C   LEFT HAND CORNER OF NEXT PLOT (+ DOWN), INCHES
C  YAO(I)...X-DISTANCE BETWEEN VERTICAL SCALE THIS PLOT AND VERTICAL
C   SCALE LAST PLOT (+ RIGHT), INCHES
C  X2SHFT(I)...X-DISTANCE BETWEEN LEFT SIDE OF THIS PLOT AND LEFT SIDE
C   OF LAST PLOT (+ RIGHT), INCHES
C  ITIME(I)...ITIME=1 TIME SCALE IS PLOTTED
C   ITIME=0 TIME SCALE IS NOT PLOTTED
C NTITLE(I)  NTITLE(I)=0 LABEL IS SUPPRESSED
C            NTITLE(I)=1 LABEL IS PRINTED
C  LINE2 IS A TEST FOR PLOTTING A SECOND VARIABLE ON THE SAME PLOT AS TH
C  VARIABLE PRECEDING IT.  THE ROUTINE WILL SET LINE2 EQUAL TO 1 WHENEVE
C  INPUT DATA INSTRUCTS THE ROUTINE TO PUT THE NEW VERTICAL SCALE IN EXA
C  SAME PLACE AS THE PRECEDING ONE.  WHEN LINE2 IS EQUAL TO 1 THE VARIAB
C  BE PLOTTED AS A DASHED LINE ON THE PRECEDING SET OF AXES.
      DIMENSION A(2,101 ),ORD(302),ABS(302),        HEAD(2,30),SV(30),
     1 SDV(30),B(30),C(30),NO(30),YAO(30),TITLA(2),IBCD(2),X2SHFT(30),
     2 ISYM(30),ITIME(30),IPT(30),IFLAG(30)
```

```
     3 ,NTITLE(30),TITLE1( 4),TITLE2( 4)
      INTEGER HEAD,TITLA,TITLE1,TITLE2
      DATA LINE2 /C/
      DATA BLAST,CLAST /G.,G./
 1001 FORMAT(3I3,1X,2A10,2F10.2,4F5.1,2I5)
 1002 FORMAT(2F10.3,4I10)
 1003 FORMAT (8A10)
 1004 FORMAT(23H          TIME,SEC          )
 1005 FORMAT(/////5X,8A10)
 1006 FORMAT(1X,2F10.2,4I10)
      IBCD(1)=10H          TI
      IBCD(2)=10HME,SEC
 1007 FORMAT(5X,3I3,1X,2A10,2F10.2,4F5.1,2I5)
      READ(5,1003) TITLE1,TITLE2
      WRITE(6,1005) TITLE1,TITLE2
      READ(5,1002)     XI,YI,NVAR   ,NOREAD,IOP,ICL
      WRITE(5,1006) XI,YI,NVAR,NOREAD,IOP,ICL
      IF(IOP .GT. 0) CALL PLOTS(5HCAL36,0,4HPLOT,MFRAME)
      IF(NOREAD .EQ. 0) GO TO 30
      DO 10 I=1,NVAR
      READ(5,1001) NO(I),ISYM(I),IPT(I),(HEAD(N,I),N=1,2),SV(I),
     1 SDV(I),B(I),C(I),YAO(I),X2SHFT(I),ITIME(I),NTITLE(I)
      WRITE(6,1007) NO(I),ISYM(I),IPT(I),(HEAD(N,I),N=1,2),SV(I),
     1  SDV(I),B(I),C(I),YAO(I),X2SHFT(I),ITIME(I),NTITLE(I)
      IFLAG(I)=0
      IF(SDV(I) .EQ. 0.) IFLAG(I)=1
   10 CONTINUE
   30 CALL PLOT(YI,XI,-3)
       NBUF=IMAX
       NLAST=0
      NBUF=NBUF+1
       N=1
      REWIND NTAP
      JJ=0
      DO 200 L=1,NBUF
      IF(L .EQ. NBUF) N=NLAST
      IF (N .EQ. 0) GO TO 200
      DO 1238 I=1,N
      READ (NTAP)(A(I,J),J=1,NOUT)
 1238 CONTINUE
      DO 201 I=1,N
      JJ=JJ+1
  201 ORD(JJ  )=A(I,1)
  200 CONTINUE
      IF(IFLAG(1)) 204,204,205
  204 ORD(IMAX+1)=SV(1)
      ORD(IMAX+2)=SDV(1)
      GO TO 206
  205 CALL SCALNG(ORD,B(1),IMAX+2)
      SV(1)=ORD(IMAX+1)
      SDV(1)=ORD(IMAX+2)
  206 CONTINUE
      DO 15 I=2,NVAR
      IF(ISYM(I) .GT. 13) ISYM(I) = 0
      N=NO(I)
      IF(N)15,15,14
   14 DO 16 KD = 1,2
```

```
   16 TTTLA(KD)=HEAD(KD,I)                                                PLOTER    116
      IF(X2SHFT(I) .EQ. 0.) GO TO 20                                      PLOTER    117
      CALL PLOT(0.,X2SHFT(I),-3)                                          PLOTER    118
   20 CALL PLOT (B(I),0.0,-3)                                             PLOTER    119
       M=1                                                                PLOTER    120
      REWIND NTAP                                                         PLOTER    121
      JJ=0                                                                PLOTER    122
      DO 300 L=1,NBUF                                                     PLOTER    123
      IF(L .EQ. NBUF) M=NLAST                                             PLOTER    124
      IF (M .EQ. 0) GO TO 300                                             PLOTER    125
      DO 1252 J=1.)                                                       PLOTER    126
      READ (NTAP) (A(J,K),K=1,NOUT)                                       PLOTER    127
 1252 CONTINJE                                                            PLOTER    128
      DO 301 J=1,M                                                        PLOTER    129
      JJ=JJ+1                                                             PLOTER    130
  301 ABS(JJ  )=A(J,N)                                                    PLOTER    131
  300 CONTINJE                                                            PLOTER    132
      IF(IFLAG(I)) 304,304,305                                            PLOTER    133
  304 ABS(IMAX+1)=SV(I)                                                   PLOTER    134
      ABS(IMAX+2)=-SDV(I)                                                 PLOTER    135
      GO TO 306                                                           PLOTER    136
  305 CALL SCALNG(ABS,B(I),IMAX+2)                                        PLOTER    137
      SV(I)=ABS(IMAX+1)                                                   PLOTER    138
      SDV(I)=ABS(IMAX+2)                                                  PLOTER    139
      ABS(IMAX+2)=-ABS(IMAX+2)                                            PLOTER    140
  306 CONTINJE                                                            PLOTER    141
C  TEST TO SEE IF A SECOND LINE WILL BE PUT ON PRECEDING PLOT.  IF SO, T PLOTER    142
C  WILL NOT BE RE-DRAWN.  THE SECOND LINE WILL BE PUT ON IN DASHED STYLE PLOTER    143
      IF (B(I) .EQ. BLAST .AND. B(I) .EQ. CLAST .AND. X2SHFT(I) .EQ. 0.) PLOTER    144
     1  LINE2=1                                                           PLOTER    145
      BLAST=B(I)                                                          PLOTER    146
      CLAST=C(I)*(-1.)                                                    PLOTER    147
      IF (LINE2 .EQ. 1) GO TO 1937                                        PLOTER    148
      CALL AXIS(0.0,YAO(I),TITLA,20,B(I),180.0,SV(I),SDV(I))              PLOTER    149
      IF(ISYM(I) .GE. 0) CALL SYMBOL(0.0,YAO(I)-.35,.07,ISYM(I),90.,-1)   PLOTER    150
 1937 CONTINUE                                                            PLOTER    151
      IF(ISYM(I) .LT. 0) IPT(I) = 0                                       PLOTER    152
      IF (LINE2) 1938,1938,1939                                           PLOTER    153
 1938 CONTINJE                                                            PLOTER    154
      CALL LINE(ABS,ORD,IMAX,1,IPT(I),ISYM(I))                            PLOTER    155
      GO TO 1940                                                          PLOTER    156
 1939 CALL DASLIN(ABS,ORD,IMAX,1,0.0,0.03,1778308)                        PLOTER    157
 1940 CONTINUE                                                            PLOTER    158
      IF(ITIME(I) .EQ. 0) GO TO 400                                       PLOTER    159
      YA=SV(I)/SDV(I)                                                     PLOTER    160
      AMAX=SV(I)+B(I)*SDV(I)                                              PLOTER    161
      IF(YA .GT. 0) YA=-YA                                                PLOTER    162
      IF(SV(I) .LT. 0 .AND. AMAX .LT. 0) YA=0.0                           PLOTER    163
      IF(SV(I) .GT. 0 .AND. AMAX .GT. 0) YA=0.0                           PLOTER    164
      IF (LINE2 .EQ. 1) GO TO 400                                         PLOTER    165
      CALL AXIS(YA,0.,4H    ,-4,B(1),90.,0.,SDV(1))                       PLOTER    166
      XLABL=B(1)/2.-1.1                                                   PLOTER    167
      CALL SYMBOL( .4,XLABL,.1,IBCD,90.,20)                               PLOTER    168
  400 CONTINJE                                                            PLOTER    169
      IF(NTITLE(I) .EQ. 0) GO TO 401                                      PLOTER    170
      IF (LINE2 .EQ. 1) GO TO 401                                         PLOTER    171
      XLABL=B(1)/2.-2.                                                    PLOTER    172
```

```
      CALL SYMBOL( .8,XLABL,.1,TITLE1,90.,40)                          PLOTER    173
      CALL SYMBOL( 1.,XLABL,.1,TITLE2,90.,40)                          PLOTER    174
  401 CONTINUE                                                         PLOTER    175
      CALL PLOT (C(I),8.0,-3)                                          PLOTER    176
      LINE2 = 0                                                        PLOTER    177
   15 CONTINUE                                                         PLOTER    178
  100 CONTINUE                                                         PLOTER    179
      IF(ICL .GT. 0) CALL PLOT(0.,0.,999)                              PLOTER    180
      RETURN                                                           PLOTER    181
      END                                                              PLOTER    182
```

```
      SUBROUTINE RUNGE
      COMMON N,RT(7),R(100)
      DIMENSION RTEMP(70),RI(70)
      DO 205 I=1,N
      RTEMP(I)=R(I+N)
  205 RI(I)=R(I+N)
      DO 200 IC=1,4
      TEMP=1.
      GO TO (10,20,20,30),IC
   20 TEMP=2.
   30 RT(1)=RT(2)+RT(3)/TEMP
      DO 150 I=1,N
  150 R(I+N)=RI(I)+R    (I)*RT(3)/TEMP
      CALL DEQU
   10 DO 152 I=1,N
  152 RTEMP(I)=RTEMP(I)+TEMP*R    (I)*RT(3)/6.
  200 CONTINUE
      RT(2)=RT(2)+RT(3)
      DO 300 I=1,N
      RI(I)=RTEMP(I)
  300 R(I+N)=RTEMP(I)
      CALL DEQU
      RETURN
      ENTRY SETUP
      CALL SYSEQS
      CALL DEQU
      DO 100 I=1,N
      RTEMP(I)=R(I+N)
  100 RI(I)=R(I+N)
      RT(1)=RT(2)
      RETURN
      END
```

```
      SUBROUTINE SCALNG (X,N,M)                                          SCALNG   2
C     THIS SUBROUTINE IS FOR USE IN SCALEING THE DATA TO BE PLOTTED WITH SCALNG   3
C     THE CALCOMP PLOTTER.  X IS THE ARRAY  OF POINTS, W IS THE LENGTH,  SCALNG   4
C     IN INCHES, OF THE AXIS TO BE USED, AND M IS THE NUMBER OF POINTS   SCALNG   5
C     PLUS 2. THE END PRODUCTS OF THIS ROUTINE ARE THE ADJUSTED MINIMUM, SCALNG   6
C     STORED IN X(M-1), AND THE INCREMENT PER INCH OF SCALE,STORED IN    SCALNG   7
C     X(M).                                                              SCALNG   8
      DIMENSION X(502)                                                   SCALNG   9
      N=M-2                                                              SCALNG  10
      DO 100 I=1,N                                                       SCALNG  11
      TEMP = X(I)                                                        SCALNG  12
      IF(I.GT.1) GO TO 50                                                SCALNG  13
      XMIN = TEMP                                                        SCALNG  14
      XMAX = TEMP                                                        SCALNG  15
      GO TO 100                                                          SCALNG  16
   50 IF(TEMP.LE.XMIN) XMIN= TEMP                                        SCALNG  17
      IF(TEMP.GE.XMAX) XMAX= TEMP                                        SCALNG  18
  100 CONTINUE                                                           SCALNG  19
      XW= ABS(XMAX-XMIN)                                                 SCALNG  20
      XICM=  XW/W                                                        SCALNG  21
      IF(XICM.EQ.0.) XICM = 1.                                           SCALNG  22
      IF(XICM.GT.1.)GO TO 105                                            SCALNG  23
      N=1                                                                SCALNG  24
      XICT= XICM*10.                                                     SCALNG  25
  133 IF(XICT.GT.1.)GO TO 132                                            SCALNG  26
      XICT = XICT*10.                                                    SCALNG  27
      N=N+1                                                              SCALNG  28
      GO TO 133                                                          SCALNG  29
  105 N=0                                                                SCALNG  30
      XICT= XICM                                                         SCALNG  31
  134 IF(XICT.LE.10.) GO TO 132                                          SCALNG  32
      N=N-1                                                              SCALNG  33
      XICT = XICT/10.                                                    SCALNG  34
      GO TO 134                                                          SCALNG  35
  132 IF(XICT.EQ.10.) GO TO 137                                          SCALNG  36
      IF(XICT.LE.4.) GO TO 138                                           SCALNG  37
  137 XIC = 10.                                                          SCALNG  38
      GO TO 200                                                          SCALNG  39
  138 IF(XICT.LE.2.) GO TO 139                                           SCALNG  40
      XIC = 4.                                                           SCALNG  41
      GO TO 200                                                          SCALNG  42
  139 XIC = 2.                                                           SCALNG  43
  200 XINC = XIC*10.**(-N)                                               SCALNG  44
      NXM=IFIX(XMIN/XINC)                                                SCALNG  45
      XMN=XMIN                                                           SCALNG  46
      XMIN= FLOAT(NXM)                                                   SCALNG  47
      IF( XMN.GE.0.) GO TO 210                                           SCALNG  48
      XMIN= XINC*(XMIN-1.)                                               SCALNG  49
      GO TO 220                                                          SCALNG  50
  210 XMIN= XMIN*XINC                                                    SCALNG  51
  220 AXMAX = XMIN + XINC*W + 0.25*XINC                                  SCALNG  52
      IF(AXMAX.GE.XMAX) GO TO 400                                        SCALNG  53
      IF(XIC.LT.10.) GO TO 230                                           SCALNG  54
      XINC = 20.*10.**(-N)                                               SCALNG  55
      GO TO 300                                                          SCALNG  56
  230 IF(XIC.LT.4.) GO TO 240                                            SCALNG  57
      XINC = 10.*10.**(-N)                                               SCALNG  58
```

```
          GO TO 300                                    SCALNG   59
      240 XINC = 4.*10.**(-N)                          SCALNG   60
      300 NXM = IFIX(XMN/XINC)                         SCALNG   61
          XMIN = FLOAT(NXM)                            SCALNG   62
          IF(XMN.GE.0.) GO TO 310                      SCALNG   63
          XMIN = XINC*(XMIN-1.)                        SCALNG   64
          GO TO 400                                    SCALNG   65
      310 XMIN = XMIN*XINC                             SCALNG   66
      400 X(M-1) = XMIN                                SCALNG   67
          X(M) = XINC                                  SCALNG   68
          RETURN                                       SCALNG   69
          END                                          SCALNG   70
```

```
      SUBROUTINE SEARCH(X,KARG,N,J)                                SEARCH   2
C  BINARY SEARCH TECHNIQUE,I.E. SEARCH INTERVAL REDUCED BY 1/2 AT EACH SEARCH   3
C   STEP                                                            SEARCH   4
      DIMENSION X(1)                                                SEARCH   5
      I=1                                                           SEARCH   6
      J=N                                                           SEARCH   7
      IF(J .EQ. 0 .OR. J .EQ. I .OR. J-I .EQ. 1) GO TO 7            SEARCH   8
      IF(X(2) .LT. X(1)) GO TO 4                                    SEARCH   9
    1 K=(I+J)/2                                                     SEARCH  10
      IF(XARG .GT. X(K)) GO TO 2                                    SEARCH  11
      J=K                                                           SEARCH  12
      GC TO 3                                                       SEARCH  13
    2 I=K                                                           SEARCH  14
    3 IF(J-I .E2. 1) GO TO 7                                        SEARCH  15
      GO TO 1                                                       SEARCH  16
    4 K=(I+J)/2                                                     SEARCH  17
      IF(XARG .LT. X(K)) GO TO 5                                    SEARCH  18
      J=K                                                           SEARCH  19
      GO TO 6                                                       SEARCH  20
    5 I=K                                                           SEARCH  21
    6 IF(J-I .EQ. 1) GO TO 7                                        SEARCH  22
      GO TO 4                                                       SEARCH  23
    7 RETURN                                                        SEARCH  24
      END                                                           SEARCH  25
```

```
      SUBROUTINE SIMQ(A,B,N,DET,NBIG)                                   SIMQ   2
C     NBIG - DIMENSION SIZE                                             SIMQ   3
      DIMENSION A(1),B(1)                                               SIMQ   4
C                                                                       SIMQ   5
C        FORWARD SOLUTION                                               SIMQ   6
C                                                                       SIMQ   7
      TOL=0.                                                            SIMQ   8
      DET=1.                                                            SIMQ   9
      JJ=-NBIG                                                          SIMQ  10
      DO 65 J=1,N                                                       SIMQ  11
      JY=J+1                                                            SIMQ  12
      JJ=JJ+NBIG                                                        SIMQ  13
      BIGA=0.                                                           SIMQ  14
      DO 30 I=J,N                                                       SIMQ  15
C                                                                       SIMQ  16
C        SEARCH FOR MAXIMUM COEFFICIENT IN COLUMN                       SIMQ  17
C                                                                       SIMQ  18
      IJ=JJ+I                                                           SIMQ  19
      IF(ABS(BIGA)-ABS(A(IJ))) 20,30,30                                 SIMQ  20
   20 BIGA=A(IJ)                                                        SIMQ  21
      IMAX=I                                                            SIMQ  22
   30 CONTINUE                                                          SIMQ  23
C                                                                       SIMQ  24
C        TEST FOR PIVOT LESS THAN TOLERANCE (SINGULAR MATRIX)           SIMQ  25
C                                                                       SIMQ  26
      IF( ABS(BIGA).GT.TOL)GO TO 40                                     SIMQ  27
      DET=0.                                                            SIMQ  28
      RETURN                                                            SIMQ  29
C                                                                       SIMQ  30
C        INTERCHANGE ROWS IF NECESSARY                                  SIMQ  31
C                                                                       SIMQ  32
   40 DET=DET*BIGA                                                      SIMQ  33
      I1=J+NBIG*(J-2)                                                   SIMQ  34
      IT=IMAX-J                                                         SIMQ  35
      IF(J.NE.IMAX) DET=-DET                                            SIMQ  36
      DO 50 K=J,N                                                       SIMQ  37
      I1=I1+NBIG                                                        SIMQ  38
      I2=I1+IT                                                          SIMQ  39
      SAVE=A(I1)                                                        SIMQ  40
      A(I1)=A(I2)                                                       SIMQ  41
      A(I2)=SAVE                                                        SIMQ  42
C                                                                       SIMQ  43
C        DIVIDE EQUATION BY LEADING COEFFICIENT                         SIMQ  44
C                                                                       SIMQ  45
   50 A(I1)=A(I1)/BIGA                                                  SIMQ  46
      SAVE=B(IMAX)                                                      SIMQ  47
      B(IMAX)=B(J)                                                      SIMQ  48
      B(J)=SAVE/BIGA                                                    SIMQ  49
C                                                                       SIMQ  50
C        ELIMINATE NEXT VARIABLE                                        SIMQ  51
C                                                                       SIMQ  52
      IF(J-N) 55,70,55                                                  SIMQ  53
   55 IQS=NBIG*(J-1)                                                    SIMQ  54
      DO 65 IX=JY,N                                                     SIMQ  55
      IXJ=IQS+IX                                                        SIMQ  56
      IT=J-IX                                                           SIMQ  57
      DO 50 JX=JY,N                                                     SIMQ  58
```

```
      IXJX=NBIG*(JX-1)+IX                                       SIMQ    59
      JJX=IXJX+IT                                               SIMQ    60
   60 A(IXJX)=A(IXJX)-A(I? J)*A(JJX)                            SIMQ    61
   65 B(IX)=B(IX)-B(J)*A(IXJ)                                   SIMQ    62
C                                                               SIMQ    63
C        BACK SOLUTION                                          SIMQ    64
C                                                               SIMQ    65
   70 NY=N-1                                                    SIMQ    66
      IT=N*(NBIG+1)                                             SIMQ    67
      DO 80 J=1,NY                                              SIMQ    68
      IA=IT-J                                                   SIMQ    69
      IB=N-J                                                    SIMQ    70
      IC=N                                                      SIMQ    71
      DO 80 K=1,J                                               SIMQ    72
      IA=IA-NBIG                                                SIMQ    73
      B(IB)=B(IB)-A(IA)*B(IC)                                   SIMQ    74
   80 IC=IC-1                                                   SIMQ    75
      RETURN                                                    SIMQ    76
      END                                                       SIMQ    77
```

```
      SUBROUTINE STLU(X,FX,L,XARG,U,KODE)                          STLU   2
C  SINGLE TABLE LOCK-UP LAGRANGE INTERPOLATION J=F(X)              STLU   3
      DIMENSION X(1),FX(1),A(4)                                    STLU   4
      DATA  LOCX,OXARG,KO/ 0,0.,0 /                                STLU   5
CHECK FOR NECESSITY OF SEARCHING TABLES AND COMPUTING WEIGHTS      STLU   6
      K=IABS(KODE)                                                 STLU   7
      IF( LOCF(X).EQ.LOCX .AND. XARG.EQ.OXARG .AND.K.EQ.KO) GO TO 1 STLU   8
       LOCX= LOCF(X)                                               STLU   9
      KO= IABS(KODE)                                               STLU  10
       OXARG= XARG                                                 STLU  11
       CALL INTRP(X,L,XARG,J,A,IABS(KODE))                         STLU  12
    1 CONTINUE                                                     STLU  13
      U=A(1)*FX(J-2)+A(2)*FX(J-1)+A(3)*FX(J)+A(4)*FX(J+1)          STLU  14
      RETURN                                                       STLU  15
      END                                                          STLU  16
```

```
      SUBROUTINE SYSEQS
      COMMON/INDRIV/NDRIV
      COMMON/INTRIM/ITRIM
      COMMON NEQS
C
C************************ SEGMENT 1 ***********************************
C        TIME,PRINT,AND PLOT CONTROL PARAMETERS,INPUT
C
      COMMON T,T0,DT,TMAX,DTPRNT,DTPLOT,TI
C
C************************ SEGMENT 2 ***********************************
C        VARIABLES TO BE INTEGRATED IN TIME
C
      COMMON UDOT,VDOT,WDOT,PDOT,QDOT,RDOT,D11D,D12D,D13D,D21D,D22D,
     1    D23D,D31D,D32D,D33D,XEDOT,YEDOT,ZEDOT,LELEVND,RELEVND,DRD,
     2    TABD(2),PSITD(2),THTD(2),DRCSD(10),FRCSAD(10),DFLAPHD,DFLAPMD,
     3    TFRACD(2)
C
C     CONTROL SYSTEM VARIABLES TO BE INTEGRATED
C
      COMMON PCTRMD,PINTD,PETRMD,RCTRMD,RINTD,RETRMD,YTRMD,QCTRMD,QINTD,
     1     QETRMD,PTRMD,ZEDTRMD
C
C    EULER ANGLE RATES TO BE INTEGRATED
C
      COMMON THETD,PHID,PSID
C
C     STICK AND PEDAL FILTER VARIABLES TO BE INTEGRATED
C
      COMMON LNGSTKD,ROLLCD,YAWCD
C
C************************ SEGMENT 3 ***********************************
C        INTEGRATED VARIABLES
C
      COMMON U,V,W,P,Q,R,D11,D12,D13,D21,D22,
     1    D23,D31,D32,D33,XE,YE,ZE,LELEVN,RELEVN,DR,
     2    TAB(2),PSIT(2),THT(2),DRCS(10),FRCSA(10),DFLAPH,DFLAPM,
     3    TFRAC(2)
C
C    INTEGRATED CONTROL SYSTEM VARIABLES
C
      COMMON PCTRM,PINT,PETRM,RCTRM,RINT,RETRM,YTRM,QCTRM,QINT,
     1     QETRM,PTRM,ZEDTRM
C
C     EULER ANGLES
C
      COMMON THETA,PHI,PSI
C
C     INTEGRATED STICK AND PEDAL FILTER VARIABLES
C
      COMMON LNGSTK,ROLLC,YAWC
C
C************************ SEGMENT 4 ***********************************
C     BASIC AIRCRAFT MASS,INERTIA,AND GEOMETRY CONSTANTS
C
      COMMON WT,IX,IY,IZ,IXZ,FSCG,BLCG,WLCG,GC
C
```

```
C    COMPUTED AIRCRAFT CONSTANTS                                          NAMES     58
C                                                                         NAMES     59
       COMMON EAC,FAC,GAC,JX,JY,JZ,MASS,OMJXJZ                            NAMES     60
C                                                                         NAMES     61
C************************  SEGMENT 5  ********************************** NAMES     62
C   ERRORS AND TOLERANCES FOR TRIM SOLUTION                               NAMES     63
C                                                                         NAMES     64
       COMMON TOL(19)                                                     NAMES     65
C************************  SEGMENT 6  ********************************** NAMES     66
C   AERO LIFT AND DRAG CONSTANTS AND TABLES,INPUT                         NAMES     67
C                                                                         NAMES     68
       COMMON AAERO,AERO(23,3),SURFCP(3,3)                                NAMES     69
C                                                                         NAMES     70
C EQUIVALENCE IN THE AERO ARRAY - THE CONSTANTS ARE ARRANGED FOR EACH    NAMES     71
C SURFACE IN THE FOLLOWING ORDER  AR,EXPOSED AR,AREA,EXPOSED AREA,       NAMES     72
C LAMBDA1/4,LAMBDALE,TAPER RATIO,CLMAX,ALFAB,AB,CD0,D/B,CLB/DF,CLMAX/DF, NAMES     73
C CD0/DF. SURFACE 1 IS WING, 2 IS HOR. STAB. 3 IS VERT. STAB.            NAMES     74
C                                                                         NAMES     75
C   COMPUTED AERO LIFT AND DRAG CONSTANTS                                 NAMES     76
C                                                                         NAMES     77
       COMMON CNAA0(3),AEROK(3),EOS(3),CLA(3)                             NAMES     78
C                                                                         NAMES     79
C************************  SEGMENT 7  ********************************** NAMES     80
C    WING AERO CONSTANTS,INPUT                                            NAMES     81
C                                                                         NAMES     82
       COMMON FSW,BLW1,BLW2,WLW,CW,BW,EKDA1,EKDA2,EIW,CLBBW,CLBCLW,CLRCLW NAMES     83
     1  ,CLPW,CNBDW,CNRCL2W,CNRCL2W,CNRCDW,CNPCLW,CNPCDAW,CMBW,CMOFW      NAMES     84
     2     ,AEKEL,CYBCL2W                                                 NAMES     85
C                                                                         NAMES     86
C    COMPUTED WING AERO CONSTANTS                                         NAMES     87
C                                                                         NAMES     88
       COMMON XWING1,XWING2,YWING1,YWING2,ZWING1,ZWING2                   NAMES     89
C                                                                         NAMES     90
C************************  SEGMENT 8  ********************************** NAMES     91
C    HORIZONTAL  STABILIZER AERO CONSTANTS                                NAMES     92
C                                                                         NAMES     93
       COMMON FSH,BLH,WLH,CH,BH,EKADE,EIH,EOCLW,CMOFH,CMOH                NAMES     94
     1     ,DXHTO                                                         NAMES     95
C                                                                         NAMES     96
C    COMPUTED HORIZONTAL STABILIZER CONSTANTS                             NAMES     97
C                                                                         NAMES     98
       COMMON XH,YH,ZH,XHEL,ZHEL,AHEL,DHEL                                NAMES     99
C                                                                         NAMES    100
C************************* SEGMENT 9 *********************************** NAMES    101
C    VERTICAL STABILIZER AERO CONSTANTS                                   NAMES    102
C                                                                         NAMES    103
       COMMON FSV,BLV,WLV,CV,BV,EKADR,EIV,EKV,CNBV                        NAMES    104
     2     ,AEKRUD,TALFA(10),AALFA,TVTEFF(10)                             NAMES    105
C                                                                         NAMES    106
C    COMPUTED VERTICAL STABILIZER CONSTANTS                               NAMES    107
C                                                                         NAMES    108
       COMMON XV,YV,ZV                                                    NAMES    109
C                                                                         NAMES    110
C************************ SEGMENT 10 *********************************** NAMES    111
C    FUSELAGE AERO CONSTANTS                                              NAMES    112
C                                                                         NAMES    113
       COMMON FSF,BLF,WLF,AOQ0,SOQMX,NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2,   NAMES    114
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         1    A0F,A1F,A2F,EN1,EN2,EN3,EN4,EN5,EN6,EN7                    NAMES  115
         2   ,DFSF0,ADFSF1,ADFSF2,XKYF                                   NAMES  116
      C                                                                  NAMES  117
      C    COMPUTED FUSELAGE AERO CONSTANTS                              NAMES  118
      C                                                                  NAMES  119
           COMMON XF,YF,ZF                                               NAMES  120
      C                                                                  NAMES  121
      C************************ SEGMENT 11 ******************************* NAMES  122
      C    DIRECT THRUST FORCE AND MOMENT CONSTANTS                      NAMES  123
      C                                                                  NAMES  124
           COMMON FSSH(2),BLSH(2),WLSH(2),SIGY,ELN,KAFT1,KAFT2,AENG      NAMES  125
      C                                                                  NAMES  126
      C    COMPUTED DIRECT THRUST CONSTANTS                              NAMES  127
      C                                                                  NAMES  128
           COMMON CSIGY,SSIGY,XT(2),YT(2),ZT(2)                          NAMES  129
      C                                                                  NAMES  130
      C************************ SEGMENT 12 ******************************* NAMES  131
      C    RAM FORCE AND MOMENT CONSTANTS                                NAMES  132
      C                                                                  NAMES  133
           COMMON FSIN(2),BLIN(2),WLIN(2),RINLET,AVOVI,AATJRN            NAMES  134
      C                                                                  NAMES  135
      C    COMPUTED RAM CONSTANTS                                        NAMES  136
      C                                                                  NAMES  137
           COMMON XIN(2),YIN(2),ZIN(2)                                   NAMES  138
      C                                                                  NAMES  139
      C************************ SEGMENT 13 ******************************* NAMES  140
      C    CORIOLIS FORCE AND MOMENT CONSTANTS                           NAMES  141
      C                                                                  NAMES  142
           COMMON ELDUCT                                                 NAMES  143
      C                                                                  NAMES  144
      C************************ SEGMENT 14 ******************************* NAMES  145
      C    PROPULSION SYSTEM CONSTANTS                                   NAMES  146
      C                                                                  NAMES  147
           COMMON AMACH,KBT1,KBT2,KM1,KM2,OMEGMX,RPMMX,RCS,AFRAT         NAMES  148
         1    ,JENG,AFRAC,TAUAB,ABACCEL,ABDECEL,TABON                    NAMES  149
         2    ,TABOFF                                                    NAMES  150
      C                                                                  NAMES  151
      C    COMPUTED PROPULSION SYSTEM CONSTANTS                          NAMES  152
      C                                                                  NAMES  153
           COMMON KBT                                                    NAMES  154
      C                                                                  NAMES  155
      C************************ SEGMENT 15 ******************************* NAMES  156
      C    RCS FORCE AND MOMENT CONSTANTS                                NAMES  157
      C                                                                  NAMES  158
           COMMON ARCSJET,ABLDR,BLDREF,FRCSMX(10),DEMAND(10),BLDMOR(10), NAMES  159
         1    RCSL(10,5),FSPCS(10),BLRCS(10),WLRCS(10),THTRCS(10),PSIRCS(10) NAMES  160
      C                                                                  NAMES  161
      C    COMPUTED RCS CONSTANTS                                        NAMES  162
      C                                                                  NAMES  163
           COMMON FRCSMXR,FRCSMX0,FRCSMX1,CTHTRCS(10),STHTRCS(10),CPSIRCS(10) NAMES  164
         1    ,SPSIRCS(10),XJET(10),YJET(10),ZJET(10)                    NAMES  165
      C                                                                  NAMES  166
      C************************ SEGMENT 16 ******************************* NAMES  167
      C    CONTROL SYSTEM CONSTANTS                                      NAMES  168
      C                                                                  NAMES  169
      C                                                                  NAMES  170
      C    PSEUDO-PILOT CONTROL SYSTEM CONSTANTS                         NAMES  171
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      C                                                                  NAMES    172
            COMMON DUM,AKZED,AKZEE1,AKZEE2,AKYED,AKYEE,                  NAMES    173
           1   AKJ,AKV,AKW,AKXES,AKYES,AKZES                             NAMES    174
      C                                                                  NAMES    175
      C    CONTROL SYSTEM FUNCTION SWITCH CONSTANTS                      NAMES    176
      C                                                                  NAMES    177
            COMMON CSV,VASW,CS1,THETSW                                   NAMES    178
      C                                                                  NAMES    179
      C    ROLL CONTROL SYSTEM CONSTANTS                                 NAMES    180
      C                                                                  NAMES    181
            COMMON TAKPC(8),TTHETA(8),TAKPE(8),TKPCI1(8),ATHETA,TKPEI1(8),  NAMES 182
           1    TKP(8),PELIM,AKOYDR,KTHTR,KDA                            NAMES    183
      C                                                                  NAMES    184
      C    YAW CONTROL SYSTEM CONSTANTS                                  NAMES    185
      C                                                                  NAMES    186
            COMMON TAKRC(8),TAKRE(8),TKRCI1(8),TKREI1(8),TKR(8),RELIM,   NAMES    187
           1    AKYTRM,KPSIT,KDR,TAKAY(8),KTY                            NAMES    188
      C                                                                  NAMES    189
      C     PITCH CONTROL SYSTEM CONSTANTS                               NAMES    190
      C                                                                  NAMES    191
            COMMON TAKQC(8),TAKQE(8),TKQCI1(8),TKQEI1(8),TKQ(8),QELIM,   NAMES    192
           1    AKPTRM,DSTK,KDE,KT4FP                                    NAMES    193
      C                                                                  NAMES    194
      C    HEAVE CONTROL SYSTEM CONSTANTS                                NAMES    195
      C                                                                  NAMES    196
            COMMON TAKZE(8),TKZEI1(8),AKTHROT,ZELIM                      NAMES    197
      C                                                                  NAMES    198
      C    CONSTANTS ASSOCIATED WITH ACTUATION SYSTEM INPUTS             NAMES    199
      C                                                                  NAMES    200
            COMMON ELEVNRF,PSITRF(2)                                     NAMES    201
      C                                                                  NAMES    202
      C    FLAP CONTROL SYSTEM CONSTANTS                                 NAMES    203
      C                                                                  NAMES    204
            COMMON KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                       NAMES    205
      C                                                                  NAMES    206
      C     DYNAMIC PRESSURE TABLE FOR CONTROL SYSTEM GAINS              NAMES    207
      C                                                                  NAMES    208
            COMMON AQBAR,TQBAR(8)                                        NAMES    209
      C                                                                  NAMES    210
      C     STICK AND PEDAL FILTER TIME CONSTANT TABLES                  NAMES    211
      C                                                                  NAMES    212
            COMMON TPITCH(8),TTROLL(8),TTYAW(8)                          NAMES    213
      C                                                                  NAMES    214
      C************************ SEGMENT 17 ****************************** NAMES    215
      C     ACTUATION CONSTANTS                                          NAMES    216
      C                                                                  NAMES    217
            COMMON LEJRATL,LELRATL,LEUPOSL,LELPOSL,TLEL,                 NAMES    218
           1      REJRATL,RELRATL,REUPOSL,RELPOSL,TREL,                  NAMES    219
           2      DRJRATL,DRLRATL,DRUPOSL,DRLPOSL,TDR,                   NAMES    220
           3      HFJRATL,HFLRATL,HFLAPMX,HFLAPMN,T4F,                   NAMES    221
           4      WFJRATL,WFLRATL,WFLAPMX,WFLAPMN,T4F,                   NAMES    222
           5      THTURL(2),THTLRL(2),THTJPL(2),THTLPL(2),TTHT(2),       NAMES    223
           6      PSIUPL(2),PSILRL(2),PSIUPL(2),PSILPL(2),TPSIT(2),      NAMES    224
           7      RCSURL(10),RCSLRL(10),RCSUPL(10),RCSLPL(10),TAJRCS(10) NAMES    225
           8    ,FRCSJRL(10),FRCSLRL(10),FRCSUPL(10),FRCSLPL(10),TAUFRCS(10)  NAMES 226
           9    ,DELIM,DALIM,DRLIM                                       NAMES    227
      C                                                                  NAMES    228
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      C*********************** SEGMENT 18 ******************************** NAMES 229
      C     LIFT-DRAG VARIABLES                                           NAMES 230
      C                                                                   NAMES 231
            COMMON LAMB1,CLAE,FKWB,C1,C2,EJ                               NAMES 232
      C                                                                   NAMES 233
      C*********************** SEGMENT 19 ******************************** NAMES 234
      C     WING AERO VARIABLES                                           NAMES 235
      C                                                                   NAMES 236
            COMMON DXW,DYW,DZW,DLW,DMW,DNW,CLW,ALFW,CDW,UW,WW,VXZ1,VXZ2,VXZ, NAMES 237
           1     DADA1,DADA2,ALFW1,ALFW2,CLW1,CLW2,CD41,CDW2,DDA,BETW,QWS,QWSB, NAMES 238
           2     BOV,LWP,NWP,YWP,ALF1,SALF1,CALF1,ALF2,SALF2,CALF2,XW1,XW2,  NAMES 239
           3     ZW1,ZW2,ALF,SALF,CALF,MW,LW,NW,DA1,DA2,EKELEL,EKELER,CMW1,  NAMES 240
           4     CMW2,DXWING1,DXWING2                                     NAMES 241
      C                                                                   NAMES 242
      C*********************** SEGMENT 20 ******************************** NAMES 243
      C     HORIZONTAL STABILIZER AERO VARIABLES                          NAMES 244
      C                                                                   NAMES 245
            COMMON DXH,DYH,DZH,DLH,DMH,DNH,UH,WH,ALFS,EPS,DALFH,CL1,CL2,CD1, NAMES 246
           1     CD2,DADE,ALFH,CLH,CDH,ANG,DIS,XI,ZW,DQ020,ALFH1,SALFH1,CALFH1 NAMES 247
           2     ,DAH,DE,QEFF,DAVG,CMH,DXHT                               NAMES 248
      C                                                                   NAMES 249
      C*********************** SEGMENT 21 ******************************** NAMES 250
      C     VERTICAL STABILIZER AERO VARIABLES                            NAMES 251
      C                                                                   NAMES 252
            COMMON DXV,DYV,DZV,DLV,DMV,DNV,UV,VV,DADR,ALFV,CLV,CDV,ALFV1,  NAMES 253
           1     CALFV1,SALFV1,QOV,DRP,EKRUD,CMV,DXVT,VTEFF               NAMES 254
      C                                                                   NAMES 255
      C*********************** SEGMENT 22 ******************************** NAMES 256
      C     FUSELAGE AERO VARIABLES                                       NAMES 257
      C                                                                   NAMES 258
            COMMON DXF,DYF,DZF,DLF,DMF,DNF,ALFF,ALFYF,ALFTF,QXY,Q0,QXZ,AOQ,AS, NAMES 259
           1     SAF,SOQ,AF,NFOQ,MOQ,NOQ1,S,NF,PITCHF,ALFYFD,NOQ,NOQ1,YAWF  NAMES 260
           2     ,DFSF                                                    NAMES 261
      C                                                                   NAMES 262
      C*********************** SEGMENT 23 ******************************** NAMES 263
      C     DIRECT THRUST FORCE AND MOMENT VARIABLES                      NAMES 264
      C                                                                   NAMES 265
            COMMON DXT,DYT,DZT,DLT,DMT,DNT,AFT(2),TCOR(2),DX(2),DY(2),DZ(2), NAMES 266
           1     DFSSW(2),DBLSW(2),DWLSW(2),SPSIT(2),CPSIT(2),STHT(2),CTHT(2) NAMES 267
           2     ,KAFT                                                    NAMES 268
      C                                                                   NAMES 269
      C*********************** SEGMENT 24 ******************************** NAMES 270
      C     RAM FORCE AND MOMENT VARIABLES                                NAMES 271
      C                                                                   NAMES 272
            COMMON DXR,DYR,DZR,DLR,DMR,DNR,V0,ATURNB,BTURN,CBTURN,SBTURN,VIN, NAMES 273
           1     VOVI(2),ATURN(2),ELRAM(2),DATURN(2),ETAR(2),FRAM(2),ELR, NAMES 274
           2     WLRAM,FSRAM,SATURN,CATURN,DXRO(2),DYRO(2),DZRO(2),DXRI(2), NAMES 275
           3     DYRI(2),DZRI(2),UI,VI,WI                                 NAMES 276
      C                                                                   NAMES 277
      C*********************** SEGMENT 25 ******************************** NAMES 278
      C     CORIOLIS FORCE AND MOMENT VARIABLES                           NAMES 279
      C                                                                   NAMES 280
            COMMON DXCOR,DYCOR,DZCOR,DLCOR,DMCOR,DNCOR,ELCOR,EACOR,DLCORD, NAMES 281
           1     DMCORD,DNCORD                                            NAMES 282
      C                                                                   NAMES 283
      C*********************** SEGMENT 26 ******************************** NAMES 284
      C     PROPULSION SYSTEM VARIABLES                                   NAMES 285
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C
      COMMON MDOT(2),RPM(2),TRST(2),BLDAVL,FGMAX,FGMIN,FGIDL,MOTMX,
     1 TRQSPEF,TREQAV,TREQ(2),FRATIO,FRPM,KNOT,KBTP,TRQS,TC(2)
     2 ,HE(2),TFRACC(2),TFRACIN,FRACL,TENG,TFRACE,TABIN,BLOFS,TABE
     3  ,TO(2)
C
C*********************** SEGMENT 27 ***********************************
C   RCS FORCE AND MOMENT VARIABLES
C
      COMMON DXRCS,DYRCS,DZRCS,DLRCS,DMRCS,DNRCS,DFRCSDB,DFRCSD,FRCS(10)
     1  ,BLDPEQ,FRCSAL,FRCSLU,FRCSC(10),DXRC(10),DYRC(10),DZRC(10),
     2  DRCSC(10),BLD,FRCSDB
C
C*********************** SEGMENT 28 ***********************************
C   CONTROL SYSTEM VARIABLES
C
C
C  PSEUDO-PILOT CONTROL SYSTEM VARIABLES
C
      COMMON ZEE,ZEIC,YEE,YEIC,DXE,DYE,DZE,XES,YES,ZES
C
C  CONTROL SYSTEM FUNCTION SWITCH VARIABLES
C
      COMMON CSSW
C
C   ROLL CONTROL SYSTEM VARIABLES
C
      COMMON ROLLCMD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL
C
C  YAW CONTROL SYSTEM VARIABLES
C
      COMMON YAWCMD,OPED,AKRC,AKRCI,YTRMBUT,RE,AKRE,AKREI,DYAW,AKAY
C
C  PITCH CONTROL SYSTEM VARIABLES
C
      COMMON DLNGSTK,AKQC,AKQCI,PTRMBUT,QE,AKQE,AKQEI,DPITCH
C
C  HEAVE CONTROL SYSTEM VARIABLES
C
      COMMON ZEDTC,ZEDTE,AKZE,AKZEI,DTHROT
C
C  ACTUATION SYSTEM INPUT VARIABLES
C
      COMMON DSIDEF,DNORMF,PSITC(2),THTC(2),DEC,DRC,DAC,DRCSR,DRCSP,
     1  DRCSY,DPCSSF,DRCSNF,TCMD,HFLAPC,HFLAPS,LELEVNC,RELEVNC
C
C  ADDITIONAL CONTROL SYSTEM VARIABLES
C
      COMMON AKPCI1,AKPEI1,AKP,AKRCI1,AKREI1,AKR,AKQCI1,AKQEI1,AKQ,
     1 AKZEI1,CSWSW,TPITCH,TROLL,TYAW
C
C*********************** SEGMENT 29 ***********************************
C   AIR DATA VARIABLES
C
      COMMON UAS,VAS,WAS,RHO,TAMB,VSOUND,TRATIO,PRATIO,VA,VK,MN,QBAR,
     1  ALPH,BETA,ALFAD,SALPH,CALPH,SBETA,CBETA
C
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C     TOTAL AERO FORCE AND MOMENT VARIABLES                               NAMES     343
C                                                                         NAMES     344
       COMMON XAERO,YAERO,ZAERO,LAERO,MAERO,NAERO                         NAMES     345
C                                                                         NAMES     346
C     TOTAL FORCE AND MOMENT VARIABLES                                    NAMES     347
C                                                                         NAMES     348
       COMMON SUMFX,SUMFY,SUMFZ,SUML,SUMM,SUMN                            NAMES     349
C                                                                         NAMES     350
C     CORRECTED DIRECTIONAL COSINES                                       NAMES     351
C                                                                         NAMES     352
       COMMON D11P,D12P,D13P,D21P,D22P,D23P,D31P,D32P,D33P,DCMAG          NAMES     353
C                                                                         NAMES     354
C     MISCELLANEOUS VARIABLES                                             NAMES     355
C                                                                         NAMES     356
       COMMON UAIR,VAIR,WAIR,ALT,RS,PS,BLOT1(3)                           NAMES     357
     1       ,GYROL,GYROM,GYRON,NXCG,NYCG,NZCG                            NAMES     358
     2       ,XDW,YDW,ZDW,BLOT2(3),LPRIME,NPRIME                          NAMES     359
     3       ,VE,VEDT,VEEST                                               NAMES     360
C                                                                         NAMES     361
C*********************** SEGMENT 30 ************************************  NAMES     362
C     TABLES FOR RAM FORCES AND MOMENTS                                   NAMES     363
C                                                                         NAMES     364
       COMMON VOVIT(5),ATURNT(8),ELRAMT(5,8),DATURNT(5,8),ETART(5,8)      NAMES     365
C                                                                         NAMES     366
C*********************** SEGMENT 31 ************************************  NAMES     367
C     TABLES FOR RCS FORCES AND MOMENTS                                   NAMES     368
C                                                                         NAMES     369
       COMMON FRCST(6),BLDRT(6)                                           NAMES     370
C                                                                         NAMES     371
C*********************** SEGMENT 32 ************************************  NAMES     372
C     THRUST TABLES                                                       NAMES     373
C                                                                         NAMES     374
       COMMON MNT(4),TFGMAX(4),TFGMIN(4),TFGIDL(4),TMDT(4),TFRAT(6),      NAMES     375
     1       TRPM(5),TFRACT(10),TACCEL(10),TDECEL(10),TTENG(10)           NAMES     376
C                                                                         NAMES     377
C                                                                         NAMES     378
C*********************** SEGMENTS 33 THRU 38 ***************************  NAMES     379
C     STABILITY DERIVATIVES                                               NAMES     380
C                                                                         NAMES     381
C     SEGMENT 33                                                          NAMES     382
       COMMON DXWG(25),DXHS(25),DXVS(25),DXFS(25),DXAER(25),DXTS(25),     NAMES     383
     1            DXRAM(25),DXCLS(25),DXRCSF(25),X(25)                    NAMES     384
C     SEGMENT 34                                                          NAMES     385
       COMMON DYWG(25),DYHS(25),DYVS(25),DYFS(25),DYAER(25),DYTS(25),     NAMES     386
     1            DYRAM(25),DYCLS(25),DYRCSF(25),Y(25)                    NAMES     387
C     SEGMENT 35                                                          NAMES     388
       COMMON DZWG(25),DZHS(25),DZVS(25),DZFS(25),DZAER(25),DZTS(25),     NAMES     389
     1            DZRAM(25),DZCLS(25),DZRCSF(25),Z(25)                    NAMES     390
C     SEGMENT 36                                                          NAMES     391
       COMMON DLWG(25),DLHS(25),DLVS(25),DLFS(25),DLAER(25),DLTS(25),     NAMES     392
     1            DLRAM(25),DLCLS(25),DLRCSF(25),AL(25)                   NAMES     393
C     SEGMENT 37                                                          NAMES     394
       COMMON DMWG(25),DMHS(25),DMVS(25),DMFS(25),DMAER(25),DMTS(25),     NAMES     395
     1            DMRAM(25),DMCLS(25),DMRCSF(25),AM(25)                   NAMES     396
C     SEGMENT 38                                                          NAMES     397
       COMMON DNWG(25),DNHS(25),DNVS(25),DNFS(25),DNAER(25),DNTS(25),     NAMES     398
     1            DNRAM(25),DNCLS(25),DNRCSF(25),AN(25)                   NAMES     399
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      C
      C
      C************************ SEGMENT 39 ********************************
      C    DERIVATIVE CONTROL
      C
           COMMON ADER,DELV(25)
      C
      C************************ SEGMENT 40 ********************************
      C    SCRATCH COMMON
           COMMON WORK(50)
      C
      C************************ SEGMENT 41 ********************************
      C    MISCELLANEOUS CONSTANTS
      C
           COMMON AWIND,VWIND,PSIWIND,XE2D,YE2D,ZE2D
          1    ,TRNTURN,GAMMA,VADOT,TURNRAD
      C
      C************************ SEGMENT 42 ********************************
      C   AERO SURFACE EFFECTIVENESS TABLES
      C
           COMMON ELEVT(7),EKELET(7),RUDT(7),EKRUDT(7)
      C
      C************************ SEGMENT 43 ********************************
      C          PILOT INPUT CONTROL DATA
      C
           COMMON ACMD(5),ATIME,ASKEEP,AYEHLD,CMDT1(20),CMDT2(20),
          1    CMDT3(20),CMDT4(20),CMDT5(20),TIMET(20),ATRANS,AVAT,TTRANS,
          2      THROTT(10),VAT(10),THETCT(10)
      C
      C*********************** SEGMENT 44 *********************************
      C    TABLES,CONSTANTS,AND VARIABLES FOR VARYING FEEDBACK CONTROL LAWS
      C
           COMMON ACSSW,TCSSW1(5),TAKQS(5), TKPINT(5),TKPHI(5),TKPB(5),
          1     TKPS(5),TKQINT(5),TKTHETA(5),TKRINT(5),TKPSI(5),TKRB(5),
          2     TAKPCI(5),TAKPEI(5),TAKRCI(5),TAKREI(5),TAKQCI(5),TAKQEI(5),
          3     TKRS(5),AKPHIRS,AKPINT,AKPHI,AKPB,AKPS,AKQINT,AKTHETA,AKRINT,
          4     AKPSI,AKRB,AKRS,AKQS
      C
      C*********************** SEGMENT 45 *********************************
      C    TABLES,CONSTANTS,AND VARIABLES FOR CONTROL SYSTEM GAINS WHICH
      C        VARY AS FUNCTIONS OF AIRSPEED
      C
           COMMON VELGAIN,AVEL,TVEL(8),VAKPC(8),VKPCI1(8),VKPEI1(8),VKP(8),
          1     VAKPE(8),VAKRC(8),VKRCI1(8),VKREI1(8),VKR(8),VAKRE(8),VAKQC(8)
          2    ,VKQCI1(8),VKQEI1(8),VKQ(8),VAKQE(8),VAKZE(8),VKZEI1(8)
          3     ,VTPITCH(8),VTROLL(8),VTYAW(8)
           REAL LAMB1
           REAL LNGSTK,LNGSTKD
           REAL IX,IY,IZ,IXZ,JX,JY,JZ,MASS
           REAL NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2
           REAL KBT1,KBT2,KM1,KM2,KBT
           REAL KPSIT,KTHTP,KTHTR,KDE,KDR,KDA,KTY
           REAL LWP,NWP,NW,LW,MW
           REAL NFOQ,MOQ,MOQ1,NOQ,NOQ1
           REAL KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2
           REAL MDOT,MDTMX,KMDT,KBTP
           REAL KAFT1,KAFT2,KAFT
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      REAL LAERO,MAERO,NAERO                                           NAMES    457
      REAL LELPOSL,LELRATL,LEUPOSL,LEURATL,LPRIME,NPRIME               NAMES    458
      REAL LELEVNO,LELEVN,LELEVNC,MNT,NF,MN                            NAMES    459
      REAL JENG                                                        NAMES    460
      REAL NXCG,NYCG,NZCG                                              NAMES    461
      DIMENSION DRCSN(5)                                               SYSEQS     4
      EQUIVALENCE (DRCSN(1),DRCSR)                                     SYSEQS     5
      IF(MCALC.NE.0)GO TO 1000                                         SYSEQS     6
C     ONE TIME ONLY CALCULATIONS FOR KINEMATICS                        SYSEQS     7
C                                                                      SYSEQS     8
      EAC=(IZ-IY)/IX                                                   SYSEQS     9
      FAC=(IY-IX)/IZ                                                   SYSEQS    10
      GAC=(IZ-IX)/IY                                                   SYSEQS    11
      JX=-IXZ/IX                                                       SYSEQS    12
      JY=-IXZ/IY                                                       SYSEQS    13
      JZ=-IXZ/IZ                                                       SYSEQS    14
      MASS=WT/G0                                                       SYSEQS    15
      OMJXJZ=1.-JX*JZ                                                  SYSEQS    16
      NRCSJET=IFIX(ARCSJET)                                            SYSEQS    17
      NEKEL=IFIX(AEKEL)                                                SYSEQS    18
      NEKRUD=IFIX(AEKRUD)                                              SYSEQS    19
      NFRAC=IFIX(AFRAC)                                                SYSEQS    20
      NWAT=IFIX(AVAT)                                                  SYSEQS    21
      NTHETA=IFIX(ATHETA)                                              SYSEQS    22
      NQBAR=IFIX(AQBAR)                                                SYSEQS    23
      NVEL=IFIX(AVEL)                                                  SYSEQS    24
      NCSSW=IFIX(ACSSW)                                                SYSEQS    25
      NENG=IFIX(AENG)                                                  SYSEQS    26
      NMACH=IFIX(AMACH)                                                SYSEQS    27
      KBT=KBT1*BLDREF+KBT2                                             SYSEQS    28
      NTIME=IFIX(ATIME)                                                SYSEQS    29
      MCALC=1                                                          SYSEQS    30
 1000 CONTINUE                                                         SYSEQS    31
      IF(ITRIM.EQ.0)GO TO 500                                          SYSEQS    32
C                                                                      SYSEQS    33
C     THRUST VECTORING COMMANDS                                        SYSEQS    34
C                                                                      SYSEQS    35
C     SINCE NO DYNAMICS SET ACTUATOR OUTPUTS EQUAL TO INPUTS           SYSEQS    36
C                                                                      SYSEQS    37
C                                                                      SYSEQS    38
      PSITC(1)=KPSIT*DYAW+AKDYDR*DROLL+PSITRF(1)                       SYSEQS    39
      PSITC(2)=KPSIT*DYAW+AKDYDR*DROLL+PSITRF(2)                       SYSEQS    40
      THTC(1)=KTHTP*DPITCH+KTHTR*DROLL                                 SYSEQS    41
      THTC(2)=KTHTP*DPITCH-KTHTR*DROLL                                 SYSEQS    42
      HFLAPC=KHFLAP1*ALPH+KHFLAP2                                      SYSEQS    43
      WFLAPC=KWFLAP1*ALPH+KWFLAP2                                      SYSEQS    44
      DRC=KDR*DYAW+AKDYDR*DROLL                                        SYSEQS    45
      TC(1)=TCMD/AENG+KTY*DYAW                                         SYSEQS    46
      TC(2)=TCMD/AENG-KTY*DYAW                                         SYSEQS    47
      TC(1)=TC(1)/KBT                                                  SYSEQS    48
      TC(2)=TC(2)/KBT                                                  SYSEQS    49
      IF(NOPIV.NE.0)GO TO 100                                          SYSEQS    50
      TO(1)=TC(1)                                                      SYSEQS    51
      TO(2)=TC(2)                                                      SYSEQS    52
      DRCSR=DROLL                                                      SYSEQS    53
      DRCSP=DPITCH                                                     SYSEQS    54
      DRCSY=DYAW                                                       SYSEQS    55
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      DRCSSF=OSIDEF                                               SYSEQS  56
      DPCSNF=DNORMF                                               SYSEQS  57
      DEC=KDE*DPITCH                                              SYSEQS  58
      DAC=KDA*DROLL                                               SYSEQS  59
      DR=DRC                                                      SYSEQS  60
      PSIT(1)=PSITC(1)                                            SYSEQS  61
      PSIT(2)=PSITC(1)                                            SYSEQS  62
      THT(1)=THTC(1)                                              SYSEQS  63
      THT(2)=THTC(2)                                              SYSEQS  64
      DFLAPH=HFLAPC                                               SYSEQS  65
      DFLAPW=WFLAPC                                               SYSEQS  66
      IF(DFLAPH.GE.HFLAPMX)DFLAPH=HFLAPMX                         SYSEQS  67
      IF(DFLAPH.LE.HFLAPMN)DFLAPH=HFLAPMN                         SYSEQS  68
      IF(DFLAPW.GE.WFLAPMX)DFLAPW=WFLAPMX                         SYSEQS  69
      IF(DFLAPW.LE.WFLAPMN)DFLAPW=WFLAPMN                         SYSEQS  70
  100 CONTINUE                                                    SYSEQS  71
      CALL STLU(RUDT,EKRUDT,NEKRUD,ABS(DR),EKRUD,2)               SYSEQS  72
      DRP=DR*EKRUD                                                SYSEQS  73
      DO 10 I=1,NRCSJET                                           SYSEQS  74
      DRCSC(I)=0.                                                 SYSEQS  75
      DO 10 J=1,5                                                 SYSEQS  76
      DRCSC(I)=RCSL(I,J)*DRCSN(J)+DRCSC(I)                        SYSEQS  77
   10 CONTINUE                                                    SYSEQS  78
      DO 20 I=1,NRCSJET                                           SYSEQS  79
      DRCS(I)=DRCSC(I)                                            SYSEQS  80
   20 CONTINUE                                                    SYSEQS  81
      LELEVNC=ELEVNRF+DEC-DAC                                     SYSEQS  82
      RELEVNC=ELEVNRF+DEC+DAC                                     SYSEQS  83
      LELEVN=LELEVNC                                              SYSEQS  84
      RELEVN=RELEVNC                                              SYSEQS  85
      CALL STLU(ELEVT,EKELET,NEKEL,ABS(LELEVN),EKELEL,2)          SYSEQS  86
      CALL STLU(ELEVT,EKELET,NEKEL,ABS(RELEVN),EKELER,2)          SYSEQS  87
      DA1=LELEVN*EKELEL                                           SYSEQS  88
      DA2=RELEVN*EKELER                                           SYSEQS  89
C                                                                 SYSEQS  90
C     PROPULSION SYSTEM INITIALIZATION                            SYSEQS  91
C                                                                 SYSEQS  92
      CALL STLU(MNT,TFGMAX,NMACH,MN,FGMAX,2)                      SYSEQS  93
      CALL STLU(MNT,TFGIDL,NMACH,MN,FGIDL,2)                      SYSEQS  94
      CALL STLU(MNT,TFGMIN,NMACH,MN,FGMIN,2)                      SYSEQS  95
      DO 213 I=1,NENG                                             SYSEQS  96
      TFRAC(I)=TO(I)/FGMIN                                        SYSEQS  97
      TAB(I)=0.                                                   SYSEQS  98
      IF(TFRAC(I).GE.1.)211,213                                   SYSEQS  99
  211 TAB(I)=TFRAC(I)-1.                                          SYSEQS 100
      TFRAC(I)=1.                                                 SYSEQS 101
  213 CONTINUE                                                    SYSEQS 102
C                                                                 SYSEQS 103
C     INITIALIZE CONTROL SYSTEM FUNCTION SWITCH                   SYSEQS 104
C                                                                 SYSEQS 105
      CSSW=0.                                                     SYSEQS 106
      IF((VA-VASW).LE.0.)CSSW=1.                                  SYSEQS 107
C                                                                 SYSEQS 108
C     INITIALIZE ROLL CONTROL SYSTEM                              SYSEQS 109
C                                                                 SYSEQS 110
      CALL STLU(TCSSW1,TKPINT,NCSSW,CSSW,AKPINT,2)                SYSEQS 111
      CALL STLU(TCSSW1,TKPHI,NCSSW,CSSW,AKPHI,2)                  SYSEQS 112
```

```
      PHISW=1.-CSSW
      IF(AKPHI.EQ.1.)261,262
  261 PHISW=1.
      PCTRM=PHI
  262 IF(AKPINT.EQ.1.)263,264
  263 PHISW=0.
      PCTRM=PHI
      PINT=PHI
  264 CONTINUE
      PETRM=DROLL
C
C  INITIALIZE YAW CONTROL SYSTEM
C
      CALL STLU(TCSSW1,TKRINT,NCSSW,CSSW,AKRINT,2)
      CALL STLU(TCSSW1,TKPSI,NCSSW,CSSW,AKPSI,2)
      PSISW=1.-CSSW
      IF(AKPSI.EQ.1.)271,272
  271 PSISW=1.
      PCTRM=PSI
  272 IF(AKPINT.EQ.1.)273,274
  273 PSISW=0.
      RCTRM=PSI
      RINT=PSI
  274 CONTINUE
      RETRM=DYAW
      YEIC=YE
C
C  INITIALIZE PITCH CONTROL SYSTEM
C
      CALL STLU(TCSSW1,TKQINT,NCSSW,CSSW,AKQINT,2)
      CALL STLU(TCSSW1,TKTHETA,NCSSW,CSSW,AKTHETA,2)
      THETASW=1.-CSSW
      IF(AKTHETA.EQ.1.)251,252
  251 THETASW=1.
      QCTRM=THETA
  252 IF(AKQINT.EQ.1.)253,254
  253 THETASW=0.
      QCTRM=THETA
      QINT=THETA
  254 CONTINUE
      QETRM=DPITCH
C
C  INIALIZE HEAVE CONTROL SYSTEM
C
      TTHROT=TCMD
      DTHROT=(1./AKTHROT)*TTHROT
      THROTIC=DTHROT
      ZEIC=ZE
  500 CONTINUE
      RETURN
C
C   WHEN CALCULATING TIME HISTORIES, SYSEQS IS ENTERED AT THIS POINT
C
      ENTRY DEQU
C
      DCMAG=D11*D22*D33+D12*D23*D31+D13*D32*D21-D11*D32*D23-D12*D21*D33
     1     -D13*D22*D31
```

```
      D11P=0.5*(D11+(D22*D33-D32*D23)/DCMAG)                              SYSEQS    170
      D21P=0.5*(D21+(D32*D13-D12*D33)/DCMAG)                              SYSEQS    171
      D31P=0.5*(D31+(D12*D23-D22*D13)/DCMAG)                              SYSEQS    172
      D12P=0.5*(D12+(D31*D23-D21*D33)/DCMAG)                              SYSEQS    173
      D22P=0.5*(D22+(D11*D33-D31*D13)/DCMAG)                              SYSEQS    174
      D32P=0.5*(D32+(D21*D13-D11*D23)/DCMAG)                              SYSEQS    175
      D13P=0.5*(D13+(D21*D32-D31*D22)/DCMAG)                              SYSEQS    176
      D23P=0.5*(D23+(D31*D12-D11*D32)/DCMAG)                              SYSEQS    177
      D33P=0.5*(D33+(D11*D22-D21*D12)/DCMAG)                              SYSEQS    178
C                                                                         SYSEQS    179
C     BODY AXIS COMPONENTS OF WIND VELOCITY                               SYSEQS    180
C                                                                         SYSEQS    181
      UAIR=D11P*XDW+D21P*YDW+D31P*ZDW                                     SYSEQS    182
      VAIR=D12P*XDW+D22P*YDW+D32P*ZDW                                     SYSEQS    183
      WAIR=U13P*XDW+D23P*YDW+D33P*ZDW                                     SYSEQS    184
C                                                                         SYSEQS    185
C     AIRSPEED COMPONENTS                                                 SYSEQS    186
C                                                                         SYSEQS    187
      UAS=U-UAIR                                                          SYSEQS    188
      VAS=V-VAIR                                                          SYSEQS    189
      WAS=W-WAIR                                                          SYSEQS    190
C                                                                         SYSEQS    191
C     AIRSPEED,ALPHA,AND BETA                                             SYSEQS    192
C                                                                         SYSEQS    193
      VA=SQRT(UAS*UAS+VAS*VAS+WAS*WAS)                                    SYSEQS    194
      ALPH=ATAN2(WAS,UAS)                                                 SYSEQS    195
      BETA=0.                                                             SYSEQS    196
      IF(VA.NE.0.)BETA=ASIN(VAS/VA)                                       SYSEQS    197
      ALFAD=0.                                                            SYSEQS    198
      U2PW2=UAS*UAS+WAS*WAS                                               SYSEQS    199
      IF(U2PW2.NE.0.)ALFAD=(UAS*WDOT-WAS*UDOT)/U2PW2                      SYSEQS    200
      CALL FORCES(0.)                                                     SYSEQS    201
C                                                                         SYSEQS    202
C    PSEUDO PILOT FUNCTION IMPLEMENTATION                                 SYSEQS    203
C                                                                         SYSEQS    204
C          ISKEEP=1 ACTIVATES STATIONKEEPING LOOPS                        SYSEQS    205
C                                                                         SYSEQS    206
C          ICMD=1 READS INPUT TIME HISTORY OF LONGITUDINAL STICK DEFLECT.  SYSEQS    207
C          ICMD=2 READS INPUT TIME HISTORY OF LATERAL STICK DEFLECTION    SYSEQS    208
C          ICMD=3 READS INPUT TIME HISTORY OF PEDAL DEFLECTION            SYSEQS    209
C          ICMD=4 READS INPUT TIME HISTORY OF HEAVE CONTROL DEFLECTION    SYSEQS    210
C          ICMD=5 READS INPUT TIME HISTORY OF THROTTLE DEFLECTION         SYSEQS    211
C                                                                         SYSEQS    212
C      ITRANS=1 ACTIVATES PSEUDO-PILOT FLOWN TRANSITION                   SYSEQS    213
C                                                                         SYSEQS    214
C                                                                         SYSEQS    215
C    PSEUDO-PILOT TRANSITION LOGIC                                        SYSEQS    216
C                                                                         SYSEQS    217
      ITRANS=IFIX(ATRANS)                                                 SYSEQS    218
      IF(ITRANS.EQ.0)GO TO 311                                            SYSEQS    219
      IF(T0.GE.TTRANS.AND.T0.EQ.T)310,311                                 SYSEQS    220
  310 CONTINUE                                                            SYSEQS    221
      VE=SQRT(U*U+V*V+W*W)                                                SYSEQS    222
      IF(VE.EQ.0.)312,313                                                 SYSEQS    223
  313 VEDT=(U*UDOT+V*VDOT+W*WDOT)/VE                                      SYSEQS    224
      GO TO 314                                                           SYSEQS    225
  312 VEDT=0.                                                             SYSEQS    226
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  314 CONTINUE
      VEEST=VE+VEDT*DT
      CALL STLU(VAT,THETCT,NVAT,VE,THETC1,2)
      CALL STLU(VAT,THETCT,NVAT,VEEST,THETC2,2)
      THETCDT=(THETC2-THETC1)/DT
      IF(THETC1.GE.1.5708)THETC1=1.5708
      DLNGSTK=(THETCDT          )*(1.-CSSW)+(THETC1-QCTRM )*CSSW
      CALL STLU(VAT,THROTT,NVAT,VE,DTHROT,2)
  311 CONTINUE
C
C   PSEUDO-PILOT STATIONKEEPING LOGIC
C
      ISKEEP=IFIX(ASKEEP)
      IF(ISKEEP)306,307
  306 CONTINUE
      ZES=-D13P*(XE+AKH*XEDOT)-D23P*(YE+AKH*YEDOT)
      YES=-D12P*(XE+AKV*XEDOT)-D22P*(YE+AKV*YEDOT)
      DLNGSTK=AKZES*ZES
      DLATSTK=AKYES*YES
      ZEDTC=AKXES*(ZEIC-ZE-AKU*ZEDOT)
  307 CONTINUE
C
C   PSEUDO-PILOT OPEN LOOP INPUTS
C
      DO 355 I=1,5
      ICMD=IFIX(ACMD(I))
      IF(ICMD.EQ.0)GO TO 355
      GO TO (350,351,352,353,354),ICMD
  350 CALL STLU(TIMET,CMDT1,NTIME,T,DLNGSTK,2)
      GO TO 355
  351 CALL STLU(TIMET,CMDT2,NTIME,T,DLATSTK,2)
      GO TO 355
  352 CALL STLU(TIMET,CMDT3,NTIME,T,DPED,2)
      GO TO 355
  353 CALL STLU(TIMET,CMDT4,NTIME,T,ZEDTC,2)
      GO TO 355
  354 CALL STLU(TIMET,CMDT5,NTIME,T,THROT,2)
      DTHROT=THROTIC+THROT
  355 CONTINUE
C
C   CONTROL SYSTEM FUNCTION SWITCH.  FUNCTION OF AIRSPEED.
C
      CSSW=0.
      IF((VA-VASW).LE.0.)CSSW=1.
C
C   VELGAIN.NE.0. INDICATES CONTROL SYSTEM GAINS ARE LOADED AS A
C      FUNCTION OF AIRSPEED
C
      IF(VELGAIN.NE.0.)400,401
  400 CONTINUE
      CALL STLU(TVEL,VAKPC,NVEL,VA,AKPC,2)
      CALL STLU(TVEL,VKPCI1,NVEL,VA,AKPCI1,2)
      CALL STLU(TVEL,VKPEI1,NVEL,VA,AKPEI1,2)
      CALL STLU(TVEL,VKP,NVEL,VA,AKP,2)
      CALL STLU(TVEL,VAKPE,NVEL,VA,AKPE,2)
      CALL STLU(TVEL,VAKRC,NVEL,VA,AKRC,2)
      CALL STLU(TVEL,VKRCI1, NVEL,VA,AKRCI1,2)
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      CALL STLU(TVEL,VKREI1, NVEL,VA,AKREI1,2)                         SYSEQS  284
      CALL STLU(TVEL,VKR,NVEL,VA,AKR,2)                                SYSEQS  285
      CALL STLU(TVEL,VAKRE,NVEL,VA,AKRE,2)                             SYSEQS  286
      CALL STLU(TVEL,VAKQC,NVEL,VA,AKQC,2)                             SYSEQS  287
      CALL STLU(TVEL,VKQCI1,NVEL,VA,AKQCI1,2)                          SYSEQS  288
      CALL STLU(TVEL,VKQEI1,NVEL,VA,AKQEI1,2)                          SYSEQS  289
      CALL STLU(TVEL,VKQ,NVEL,VA,AKQ,2)                                SYSEQS  290
      CALL STLU(TVEL,VAKQE,NVEL,VA,AKQE,2)                             SYSEQS  291
      CALL STLU(TVEL,VAKZE,NVEL,VA,AKZE,2)                             SYSEQS  292
      CALL STLU(TVEL,VKZEI1,NVEL,VA,AKZEI1,2)                          SYSEQS  293
      CALL STLU(TVEL,VTPITCH,NVEL,VA,TPITCH,2)                         SYSEQS  294
      CALL STLU(TVEL,VTROLL,NVEL,VA,TROLL,2)                           SYSEQS  295
      CALL STLU(TVEL,VTYAW,NVEL,VA,TYAW,2)                             SYSEQS  296
      GO TO 402                                                        SYSEQS  297
C                                                                      SYSEQS  298
C   PROGRAM TRANSFERS HERE IF VELGAIN=0. WHICH INDICATES CONTROL SYSTEM SYSEQS 299
C      GAINS ARE FUNCTIONS OF THETA                                    SYSEQS  300
C                                                                      SYSEQS  301
  401 CONTINUE                                                         SYSEQS  302
      CALL STLU(TTHETA,TAKPC ,NTHETA,THETA,AKPC  ,2)                   SYSEQS  303
      CALL STLU(TTHETA,TKPCI1,NTHETA,THETA,AKPCI1,2)                   SYSEQS  304
      CALL STLU(TTHETA,TKPEI1,NTHETA,THETA,AKPEI1,2)                   SYSEQS  305
      CALL STLU(TTHETA,TKP   ,NTHETA,THETA,AKP   ,2)                   SYSEQS  306
      CALL STLU(TTHETA,TAKPE ,NTHETA,THETA,AKPE  ,2)                   SYSEQS  307
      CALL STLU(TTHETA,TAKRC ,NTHETA,THETA,AKRC  ,2)                   SYSEQS  308
      CALL STLU(TTHETA,TKRCI1,NTHETA,THETA,AKRCI1,2)                   SYSEQS  309
      CALL STLU(TTHETA,TKREI1,NTHETA,THETA,AKREI1,2)                   SYSEQS  310
      CALL STLU(TTHETA,TKR   ,NTHETA,THETA,AKR   ,2)                   SYSEQS  311
      CALL STLU(TTHETA,TAKRE ,NTHETA,THETA,AKRE  ,2)                   SYSEQS  312
      CALL STLU(TTHETA,TAKQC ,NTHETA,THETA,AKQC  ,2)                   SYSEQS  313
      CALL STLU(TTHETA,TKQCI1,NTHETA,THETA,AKQCI1,2)                   SYSEQS  314
      CALL STLU(TTHETA,TKQEI1,NTHETA,THETA,AKQEI1,2)                   SYSEQS  315
      CALL STLU(TTHETA,TKQ   ,NTHETA,THETA,AKQ   ,2)                   SYSEQS  316
      CALL STLU(TTHETA,TAKQE ,NTHETA,THETA,AKQE  ,2)                   SYSEQS  317
      CALL STLU(TTHETA,TAKZE ,NTHETA,THETA,AKZE  ,2)                   SYSEQS  318
      CALL STLU(TTHETA,TKZEI1,NTHETA,THETA,AKZEI1,2)                   SYSEQS  319
  402 CONTINUE                                                         SYSEQS  320
C                                                                      SYSEQS  321
C  SPECIFICATION OF FEEDBACK VARIABLES AS A FUNCTION OF THE CONTROL    SYSEQS  322
C      SYSTEM FUNCTION SWITCH                                          SYSEQS  323
C                                                                      SYSEQS  324
      CALL STLU(TCSSW1,TKPINT ,NCSSW,CSSW,AKPINT ,2)                   SYSEQS  325
      CALL STLU(TCSSW1,TKPHI  ,NCSSW,CSSW,AKPHI  ,2)                   SYSEQS  326
      CALL STLU(TCSSW1,TKRINT ,NCSSW,CSSW,AKRINT ,2)                   SYSEQS  327
      CALL STLU(TCSSW1,TKPSI  ,NCSSW,CSSW,AKPSI  ,2)                   SYSEQS  328
      CALL STLU(TCSSW1,TKQINT ,NCSSW,CSSW,AKQINT ,2)                   SYSEQS  329
      CALL STLU(TCSSW1,TKTHETA,NCSSW,CSSW,AKTHETA,2)                   SYSEQS  330
      CALL STLU(TCSSW1,TKPB,NCSSW,CSSW,AKPB,2)                         SYSEQS  331
      CALL STLU(TCSSW1,TKPS,NCSSW,CSSW,AKPS,2)                         SYSEQS  332
      CALL STLU(TCSSW1,TKRB,NCSSW,CSSW,AKRB,2)                         SYSEQS  333
      CALL STLU(TCSSW1,TKRS,NCSSW,CSSW,AKRS,2)                         SYSEQS  334
      CALL STLU(TCSSW1,TAKPCI,NCSSW,CSSW,AKPCI,2)                      SYSEQS  335
      CALL STLU(TCSSW1,TAKPEI,NCSSW,CSSW,AKPEI,2)                      SYSEQS  336
      CALL STLU(TCSSW1,TAKRCI,NCSSW,CSSW,AKRCI,2)                      SYSEQS  337
      CALL STLU(TCSSW1,TAKREI,NCSSW,CSSW,AKREI,2)                      SYSEQS  338
      CALL STLU(TCSSW1,TAKQCI,NCSSW,CSSW,AKQCI,2)                      SYSEQS  339
      CALL STLU(TCSSW1,TAKQEI,NCSSW,CSSW,AKQEI,2)                      SYSEQS  340
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      CALL STLU(TCSSW1,TAKQS ,NCSSW,CSSW,AKQS ,2)
      CALL STLU(TTHETA,TTPITCH,NTHETA,THETA,TPITCH,2)
      CALL STLU(TTHETA,TTROLL,NTHETA,THETA,TROL.,2)
      CALL STLU(TTHETA,TTYAW,NTHETA,THETA,TYAW,2)
C
C    ROLL CONTROL SYSTEM
C
      ROLLCMD=(1.-CSSW)*DLATST+CSSW*OPED
      IF(TROLL.LE. 0.)450,451
  450 ROLLC=ROLLCMD
      GO TO 452
  451 ROLLCD=(ROLLCMD-ROLLC)/TROLL
  452 CONTINUE
      PCTRMD=AKPCI1*AKPCI*ROLLC
      IF(T.NE.T0)GO TO 269
      IF(AKPHI.EQ.1.)265,266
  265 IF(PHISW.EQ.0.)267,266
  267 PHISW=1.
      PCTRM=PHI
  266 IF(AKPINT.EQ.1.)268,269
  268 IF(PHISW.EQ.1.)270,269
  270 PHISW=0.
      PCTRM=PHI
      PINT=PHI
  269 CONTINUE
      PCMD=AKPC*ROLLC+PCTRM
      PINTD=P
      PE=PCMD-AKPINT*PINT-AKPHI*PHI-AKPB*AKP*P-(1.-AKPB)*AKP*PS
      PETRMD=AKPE*AKPEI1*AKPEI*PE
      IF(ABS(PETRM).GE.PELIM)PETRM=SIGN(PELIM,PETRM)
      DROLL=AKPE*PE+PETRM
C
C    YAW CONTROL SYSTEM
C
      YAWCMD=(1.-CSSW)*DPED+CSSW*DLATSTK
      IF(TYAW.LE..01)460,461
  460 YAWC=YAWCMD
      GO TO 462
  461 YAWCD=(YAWCMD-YAWC)/TYAW
  462 CONTINUE
      RCTRMD=AKRCI1*AKRCI*YAWC
      YTRMD=AKYTRM*CSSW*SIGN(1.,YTRMBUT)
      IF(ABS(YTRMBUT).LE..02)YTRMD=0.
      IF(T.NE.T0)GO TO 279
      IF(AKPSI.EQ.1.)275,276
  275 IF(PSISW.EQ.0.)277,276
  277 PSISW=1.
      RCTRM=PSI
  276 IF(AKRINT.EQ.1.)278,279
  278 IF(PSISW.EQ.1.)280,279
  280 PSISW=0.
      RCTRM=PSI
      RINT=PSI
  279 CONTINUE
      PE=AKPC*YAWC+RCTRM+YTRM-AKRINT*RINT-AKRB*AKR*R-(1.-AKRB)*(AKR*RS
     1   -AKPHIRS*(GC/VA)*PHI)
      RINTD=R
```

```
      RETRMD=AKREI*AKREI1*AKRE*RE
      IF(ABS(RETRM).GE.RELIM)RETRM=SIGN(RELIM,RETRM)
      CALL STLU(TCBAR,TAKAY,NOR,3,QBAR,AKAY,2)
      DYAW=AKRE*RE+RETRM-(1.-CSSW)*AKAY*NYCG*G3
C
C     PITCH TRIM BUTTON LOGIC
C
      PTRMBUT=0.
      IF((ABS(DLNGSTK).GE.DSTK).AND.(CSSW.NE.0.))PTRMBUT=SIGN(1.,
     1    DLNGSTK)
C
C     PITCH CONTROL SYSTEM
C
      IF(TPITCH.LE..01)470,471
  470 LNGSTK=DLNGSTK
      GO TO 472
  471 LNGSTKD=(DLNGSTK-LNGSTK)/TPITCH
  472 CONTINUE
      QCTRMD=AKQCI1*AKQCI*LNGSTK
      PTRMD=AKPTRM*CSSW*SIGN(1.,PTRMBUT)
      IF(ABS(PTRMBUT).LE..02)PTRMD=0.
      QINTD=Q
      IF(T.NE.T0)GO TO 259
      IF(AKTHETA.EQ.1.)255,256
  255 IF(THETASW.EQ.0.)257,256
  257 THETASW=1.
      QCTRM=THETA
  256 IF(AKQINT.EQ.1.)258,259
  258 IF(THETASW.EQ.1.)260,259
  260 THETASW=0.
      QCTRM =THETA
      QINT =THETA
  259 CONTINUE
      QE=AKQC*LNGSTK+PTRM+QCTRM-AKQ*AKQS*Q-AKQINT*QINT-AKTHETA*THETA
      QETRMD=AKQEI*AKQEI1*AKQE*QE
      IF(ABS(QETRM).GE.QELIM)QETRM=SIGN(QELIM,QETRM)
      DPITCH=AKQE*QE+QETRM
C
C     HEAVE CONTROL SYSTEM
C
      ZEDTE=(ZEDTC-ZEDOT)*CSSW
      AKZEI=AKZEI1*AKZE
      ZEDTRMD=AKZEI*ZEDTE
      IF(ABS(ZEDTRM).GE.ZELIM)ZEDTRM=SIGN(ZELIM,ZEDTRM)
      TCMD  =(AKZE*ZEDTE+ZEDTRM)*CSSW+DTHROT*AKTHROT
C
C      FORM ACTUATOR INPUTS
C
      PSITC(1)=KPSIT*DYAW+AKDYDR*DROLL+PSITRF(1)
      PSITC(2)=KPSIT*DYAW+AKDYDR*DROLL+PSITRF(2)
      THTC(1)=KTHTP*DPITCH+KTHTR*DROLL
      THTC(2)=KTHTP*DPITCH-KTHTR*DROLL
      HFLAPC=KHFLAP1*ALPH+KHFLAP2
      WFLAPC=KWFLAP1*ALPH+KWFLAP2
      TC(1)=TCMD/AENG+KTY*DYAW
      TC(2)=TCMD/AENG-KTY*DYAW
      TC(1)=TC(1)/KBT
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      TC(2)=TC(2)/KBT
      IF(TC(1).LE.FGIDL)TC(1)=FGIDL
      IF(TC(2).LE.FGIDL)TC(2)=FGIDL
      DRCSR=DROLL
      DRCSP=DPITCH
      DRCSY=DYAW
      CRCSSF=JSIDEF
      DRCSNF=DNDRMF
      DO 233 I=1,NRCSJET
      DRCSC(I)=0.
      DO 233 J=1,5
      DRCSC(I)=RCSL(I,J)*DRCSN(J)+DRCSC(I)
  233 CONTINUE
      DRC=KDR*DYAW+AKDYDR*DROLL
      DEC=KDE*DPITCH
      DAC=KDA*DROLL
      IF(ABS(DEC).GE.DELIM)DEC=SIGN(DELIM,DEC)
      IF(ABS(DAC).GE.DALIM)DAC=SIGN(DALIM,DAC)
      IF(ABS(DRC).GE.DRLIM)DRC=SIGN(DRLIM,DRC)
      LELEVNC=ELEVNRF+DEC-DAC
      RELEVNC=ELEVNRF+DEC+DAC
C
C   THRUST DYNAMICS CALCULATIONS
C
      CALL STLU(MNT,TFGMAX,NMACH,MN,FGMAX,2)
      CALL STLU(MNT,TFGIDL,NMACH,MN,FGIDL,2)
      CALL STLU(MNT,TFGMIN,NMACH,MN,FGMIN,2)
      FRACL=FGIDL/FGMIN
      DO 200 I=1,NENG
      TFRACC(I)=TC(I)/FGMIN
      TFRACIN=TFRACC(I)
      IF(TFRACIN.LE.FRACL)TFRACIN=FRACL
      IF(TFRACIN.GE.1.)TFRACIN=1.
      TFRACE=TFRACIN-TFRAC(I)
      CALL STLU(TFRACT,TACCEL,NFRAC,TFRAC(I),ACCEL,2)
      CALL STLU(TFRACT,TDECEL,NFRAC,TFRAC(I),DECEL,2)
      CALL STLU(TFRACT,TTENG,NFRAC,TFRAC(I),TENG,2)
      TFRACD(I)=TFRACE/TENG
      IF(TFRACD(I).GE.ACCEL)TFRACD(I)=ACCEL
      IF(TFRACD(I).LE.DECEL)TFRACD(I)=DECEL
      TABIN=TFRACC(I)-TFRAC(I)
      IF(TFRACC(I).GT.1..OR.TABIN.GE.TABON)GO TO 600
      IF(TABIN.LT.TABON.AND.TAB(I).LE.TABOFF)TABIN=0.
  600 CONTINUE
      TABE=TABIN-TAB(I)
      TABD(I)=TABE/TAUAB
      IF(TABD(I).GE.ABACCEL)TABD(I)=ABACCEL
      IF(TABD(I).LE.ABDECEL)TABD(I)=ABDECEL
      IF(TAB(I).LE.0.)TAB(I)=0.
      TO(I)=FGMIN*(TAB(I)+TFRAC(I))
  200 CONTINUE
C
C   ACTUATION SYSTEM DYNAMICS
C
C      LEFT ELEVON ACTUATOR
C
      CALL PCACT(LELEVNC,LELEVN,LEURATL,LELRATL,LEUPOSL,LELPOSL,TLEL,
```

```
      1     ITRIM,LELEVND)                                              SYSEQS     512
C                                                                       SYSEQS     513
C         RIGHT ELEVON ACTUATOR                                         SYSEQS     514
C                                                                       SYSEQS     515
      CALL  PCACT(RELEVNC,RELEVN,REURATL,RELRATL,REUPOSL,RELPOSL,TREL,  SYSEQS     516
     1     ITRIM,RELEVND)                                               SYSEQS     517
C                                                                       SYSEQS     518
C         RUDDER ACTUATOR                                               SYSEQS     519
C                                                                       SYSEQS     520
      CALL  PCACT(DRC,DR,DRURATL,DRLRATL,DRUPOSL,DRLPOSL,TDR,ITRIM,DRD)  SYSEQS     521
C                                                                       SYSEQS     522
C         CANARD FLAP ACTUATOR                                          SYSEQS     523
C                                                                       SYSEQS     524
      CALL  PCACT(HFLAPC,DFLAPH,HFURATL,HFLRATL,HFLAPMX,HFLAPMN,THF,    SYSEQS     525
     1     ITRIM,DFLAPHD)                                               SYSEQS     526
C                                                                       SYSEQS     527
C        WING FLAP ACTUATOR                                             SYSEQS     528
C                                                                       SYSEQS     529
      CALL  PCACT(WFLAPC,DFLAPW,WFURATL,WFLRATL,WFLAPMX,WFLAPMN,TWF,    SYSEQS     530
     1     ITRIM,DFLAPWD)                                               SYSEQS     531
C                                                                       SYSEQS     532
C        PITCH THRUST VECTOR ACTUATORS                                  SYSEQS     533
C                                                                       SYSEQS     534
      DO 220 I=1,NENG                                                   SYSEQS     535
      CALL  PCACT(THTC(I),THT(I),THTURL(I),THTLRL(I),THTUPL(I),THTLPL(I), SYSEQS   536
     1     TTHT(I),ITRIM,THTD(I))                                       SYSEQS     537
  220 CONTINUE                                                          SYSEQS     538
C                                                                       SYSEQS     539
C         YAW THRUST VECTOR ACTUATORS                                   SYSEQS     540
C                                                                       SYSEQS     541
      DO 221 I=1,NENG                                                   SYSEQS     542
      CALL  PCACT(PSITC(I),PSIT(I),PSIURL(I),PSYLRL(I),PSIUPL(I),PSILPL(I SYSEQS   543
     1     ),TPSIT(I),ITRIM,PSITD(I))                                   SYSEQS     544
  221 CONTINUE                                                          SYSEQS     545
C                                                                       SYSEQS     546
C     RCS NOZZLE AREA ACTUATORS                                         SYSEQS     547
C                                                                       SYSEQS     548
      DO 222 I=1,NRCSJET                                                SYSEQS     549
      CALL  PCACT(DRCSC(I),DRCS(I),RCSURL(I),RCSLRL(I),RCSUPL(I),RCSLPL(I SYSEQS   550
     1     ),TAURCS(I),ITRIM,DRCSD(I))                                  SYSEQS     551
      CALL  PCACT(FRCSC(I),FRCSA(I),FRCSURL(I),FRCSLRL(I),FRCSUPL(I),   SYSEQS     552
     1     FRCSLPL(I),TAUFRCS(I),ITRIM,FRCSAD(I))                       SYSEQS     553
  222 CONTINUE                                                          SYSEQS     554
C                                                                       SYSEQS     555
C    ADJUST AERODYNAMIC SURFACE EFFECTIVENESS FOR LARGE DEFLECTIONS     SYSEQS     556
C                                                                       SYSEQS     557
      CALL  STLU(RUDT,EKRUDT,NEKRUD,ABS(DR),EKRUD,2)                    SYSEQS     558
      CALL  STLU(ELEVT,EKELET,NEKEL,ABS(LELEVN),EKELEL,2)               SYSEQS     559
      CALL  STLU(ELEVT,EKELET,NEKEL,ABS(RELEVN),EKELER,2)               SYSEQS     560
      DRP=DR*EKRUD                                                      SYSEQS     561
      DA1=LELEVN*EKELEL                                                 SYSEQS     562
      DA2=RELEVN*EKELER                                                 SYSEQS     563
      D11D=D12P*R-D13P*Q                                                SYSEQS     564
      D12D=D13P*P-D11P*R                                                SYSEQS     565
      D13D=D11P*Q-D12P*P                                                SYSEQS     566
      D21D=D22P*R-D23P*Q                                                SYSEQS     567
      D22D=D23P*P-D21P*R                                                SYSEQS     568
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      D23D=D21P*Q-D22P*P
      D31D=D32P*R-D33P*Q
      D32D=D33P*P-D31P*R
      D33D=D31P*Q-D32P*P
C
C     CALCULATION OF THETA,PHI,AND PSI SIMPLY TO KEEP TRACK OF THEM.
C     THE CALCULATION AVOIDS THE SIGNULARITY AT THETA=90 DEG BY
C     SUSPENDING CALCULATION OF PHID AND PSID AT THETA=90 + OR -.000057
C     DEG
C
      CPHI =COS(PHI)
      SPHI =SIN(PHI)
      THETD=Q*CPHI-R*SPHI
      IF(ABS(COS(THETA)).LE..000001)GO TO 710
      PHID=P+TAN(THETA)*(Q*SPHI+R*CPHI)
      PSID=(R*CPHI+Q*SPHI)/COS(THETA)
  710 CONTINUE
C
C    EQUATIONS OF MOTION
C
      UDOT=-Q*W+R*V+GC*D31P+SUMFX/MASS
      VDOT=-R*U+P*W+GC*D32P+SUMFY/MASS
      WDOT=-P*V+Q*U+GC*D33P+SUMFZ/MASS
      LPRIME=((SUML-GYROL)/IX-JX*(SUMN-GYRON)/IZ)/OMJXJZ
      NPRIME=((SUMN-GYRON)/IZ-JZ*(SUML-GYROL)/IX)/OMJXJZ
      PDOT=Q*((JX*FAC-JX)*P-(JX*JZ+EAC)*R)/OMJXJZ+LPRIME
      QDOT=-JY*(R*R-P*P)+GAC*P*R+(SUMM-GYROM)/IY
      RDOT=Q*((JZ*EAC+JZ)*R+(JZ*JX-FAC)*P)/OMJXJZ+NPRIME
      XEDOT=U*D11P+V*D12P+W*D13P
      YEDOT=U*D21P+V*D22P+W*D23P
      ZEDOT=U*D31P+V*D32P+W*D33P
      NZCG=-(WDOT+P*V-Q*U)/GC+D33P
      NYCG=(VDOT+R*U-P*W)/GC-D32P
      NXCG=(UDOT+Q*W-R*V)/GC-D31P
      RETURN
      END
```

```
      SUBROUTINE TRIM(Z,DZ,TOL,NZ,IWRITE,NEQU),RETURNS(ITRIM,IFLG)
C  TRIMS THE AIRFRAME AND CONTROL SYSTEM USING AN N-SPACE NEWTON
C  RAPHSON ITERATION METHOD.
C  GAUSS ELIMINATION IS USED TO SOLVE SIMULTANEOUS LINEAR EQUATIONS.
C  E     ERRORS IN EQUATIONS TO BE SATISFIED
C  TOL   THE ITERATION WILL TERMINATE WHEN THE ERRORS(E) ARE LESS THAN TH
C        TOLERANCES(TOL)
C  Z     THE ERRORS(E) ARE FUNCTIONS OF Z,F(Z). CERTAIN OF THESE PARAMETE
C        SPECIFIED TO DEFINE A PARTICULAR MANUVER AND THE REMAINDER ARE
C        CALCULATED
C  DZ    STEP SIZE USED TO CALCULATE THE PARTIAL DERIVATIVES USED BY THE
C        ALGORITHM
C  NZ    LOCATION IN THE Z-ARRAY OF THE PARAMETERS TO BE CALCULATED (THE
C        REMAINING PARAMETERS MUST BE SPECIFIED)
C  NOTE THERE ARE 16 EQUATIONS SO ONLY 16 PARAMETERS CAN BE UNKNOWNS
C  Z(I)          UAS,VAS,WAS,P,Q,R,PHI,THETA,PSI,DA,DH,DR,DS,ALPHA,
C                BETA,NX,NY,NZ,XO,YO,ZO,VA,HP,UO,VO,WO,PO,QO,RO,PHID,
C                THETAD,PSID,T(6),THETAE(6),PSIE(6),THETAN(6),PSIN(6)
C  NOTE THE ABOVE LIST GIVES THE VARIABLES WHICH
C  APPEAR IN Z  (THE ORDER IS UNIMPORTANT)
C  WARNING.....WARNING.....
C     THE ORDER OF THE DZ(I) AND TOL(I) MUST BE COMPATABLE AND
C      MUST CORRESPOND TO THE ORDER(WHATEVER IT IS) ESTABLISHED
C      IN NOPT=6 AND STORED IN THE IN ARRAY.
      DIMENSION Z(1),DZ(1),TOL(1),NZ(1),A(19,19),
     1 E(19),ETEMP(19)
      DET=1.
      IF(IWRITE.LT.0)GO TO 144
      KOUNT=0
      IF (IWRITE .NE. 0) IWRITE=-IWRITE
    6 KOUNT=KOUNT+1
      CALL ERROR(E)
      IF(IWRITE .NE. 0) WRITE(6,30005)
      IF(IWRITE .NE. 0) WRITE(6,30002) E
      IF(KOUNT .GT. 15) GO TO 4
      DO 10 I = 1,NEQU
      IF(ABS(E(I)) .GE. TOL(I))GO TO 12
   10 CONTINUE
      RETURN
   12 DO 1 J=1,NEQU
      K=NZ(J)
      IF(IWRITE .NE. 0) WRITE(6,30002) Z(K),DZ(J)
      Z(K)=Z(K)+DZ(J)
      CALL ERROR(ETEMP)
      Z(K)=Z(K)-DZ(J)
      DO 20 I=1,NEQU
      A(I,J)=(ETEMP(I)-E(I))/DZ(J)
   20 CONTINUE
    1 CONTINUE
      IF(IWRITE .NE. 0) WRITE(6,30002) ((A(I,J),J=1,NEQU),I=1,NEQU)
      IF(DET .EQ. 0.) GO TO 22
      CALL SIMQ(A,E,NEQU,DET,19)
      IF(IWRITE .NE. 0) WRITE(6,30004) DET,(A(I,I),I=1,NEQU)
      IF(IWRITE .NE. 0) WRITE(6,30002) E
      IF(IWRITE.NE.0)RETURN IFLG
      IF (DET .NE. 0.) GO TO 144
      GO TO 6
```

```
   22            WRITE (6,20127)
      WRITE(6,30002)  ((A(JROW,JCOL),JCOL=1,NEQU),JROW=1,NEQU)
      WRITE(6,30003)
      WRITE (6,30002) E
      RETURN ITRIM
  144 DO 2 I=1,NE U
      K=NZ(I)
      ZTEMP=Z(K)
      Z(K)=Z(K)-E(I)
    2 IF(IWRITE .NE. 0) WRITE(6,30002) ZTEMP,Z(K)
      GO TO 6
    4 WRITE(6,30001)
      WRITE (6,30003)
      WRITE (6,30002) E
      RETURN ITRIM
20127 FORMAT(1X,85HCAUTION, SUBROUTINE SIMQ HAS RETURNED A ZERO DETERMIN
     1ANT.  MATRIX A FOLLOWS.                                     )
30001 FORMAT(//5X30HNOT CLOSED AFTER 15 ITERATIONS)
30002 FORMAT(1X,8G12.5/1X,7G12.5/)
30003 FORMAT(32H THE ERROR ARRAY IS AS FOLLOWS                     )
30004 FORMAT(1X,G12.5)
30005 FORMAT(/////)
      END
```

```
      SUBROUTINE WTRUN(IPITCH,IYAW,NTAP2,AOAO,DADA,AOAMAX,PSIO,DPSI,     WTRUN     2
     1 PSIMAX,TWIND,IMAX)                                                WTRUN     3
      COMMON/INDRIV/NDRIV                                                NAMES     2
      COMMON/INTKIM/ITRIM                                                NAMES     3
      COMMON NEQS                                                        NAMES     4
C                                                                        NAMES     5
C************************ SEGMENT 1 *********************************** NAMES     6
C        TIME,PRINT,AND PLOT CONTROL PARAMETERS,INPUT                    NAMES     7
C                                                                        NAMES     8
      COMMON T,TO,DT,TMAX,DTPRNT,DTPLOT,TI                               NAMES     9
C                                                                        NAMES    10
C************************ SEGMENT 2 *********************************** NAMES    11
C        VARIABLES TO BE INTEGRATED IN TIME                              NAMES    12
C                                                                        NAMES    13
      COMMON UDOT,VDOT,WDOT,PDOT,QDOT,RDOT,D11D,D12D,D13D,D21D,D22D,     NAMES    14
     1   D23D,D31D,D32D,D33D,XEDOT,YEDOT,ZEDOT,LELEVND,RELEVND,DRD,      NAMES    15
     2   TABD(2),PSITD(2),THTD(2),DRCSD(10),FRCSAD(10),DFLAPHD,DFLAPWD,  NAMES    16
     3   TFRACD(2)                                                       NAMES    17
C                                                                        NAMES    18
C     CONTROL SYSTEM VARIABLES TO BE INTEGRATED                          NAMES    19
C                                                                        NAMES    20
      COMMON PCTRMD,PINTD,PETRMD,RCTRMD,RINTD,RETRMD,YTRMD,QCTRMD,QINTD, NAMES    21
     1    QETRMD,PTRMD,ZEDTRMD                                           NAMES    22
C                                                                        NAMES    23
C    EULER ANGLE RATES TO BE INTEGRATED                                  NAMES    24
C                                                                        NAMES    25
      COMMON THETD,PHID,PSID                                             NAMES    26
C                                                                        NAMES    27
C     STICK AND PEDAL FILTER VARIABLES TO BE INTEGRATED                  NAMES    28
C                                                                        NAMES    29
      COMMON LNGSTKD,ROLLCD,YAWCD                                        NAMES    30
C                                                                        NAMES    31
C************************ SEGMENT 3 *********************************** NAMES    32
C        INTEGRATED VARIABLES                                            NAMES    33
C                                                                        NAMES    34
      COMMON U,V,W,P,Q,R,D11,D12,D13,D21,D22,                            NAMES    35
     1   D23,D31,D32,D33,XE,YE,ZE,LELEVN,RELEVN,DR,                      NAMES    36
     2   TAB(2),PSIT(2),THT(2),DRCS(10),FRCSA(10),DFLAPH,DFLAPW,         NAMES    37
     3   TFRAC(2)                                                        NAMES    38
C                                                                        NAMES    39
C    INTEGRATED CONTROL SYSTEM VARIABLES                                 NAMES    40
C                                                                        NAMES    41
      COMMON PCTRM,PINT,PETRM,RCTRM,RINT,RETRM,YTRM,QCTRM,QINT,          NAMES    42
     1    QETRM,PTRM,ZEDTRM                                              NAMES    43
C                                                                        NAMES    44
C     EULER ANGLES                                                       NAMES    45
C                                                                        NAMES    46
      COMMON THETA,PHI,PSI                                               NAMES    47
C                                                                        NAMES    48
C     INTEGRATED STICK AND PEDAL FILTER VARIABLES                        NAMES    49
C                                                                        NAMES    50
      COMMON LNGSTK,ROLLC,YAWC                                           NAMES    51
C                                                                        NAMES    52
C************************ SEGMENT 4 *********************************** NAMES    53
C     BASIC AIRCRAFT MASS,INERTIA,AND GEOMETRY CONSTANTS                 NAMES    54
C                                                                        NAMES    55
      COMMON WT,IX,IY,IZ,IXZ,FSCG,BLCG,WLCG,GO                           NAMES    56
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      C                                                                      NAMES    57
      C    COMPUTED AIRCRAFT CONSTANTS                                       NAMES    58
      C                                                                      NAMES    59
            COMMON EAC,FAC,GAC,JX,JY,JZ,MASS,OMJXJZ                          NAMES    60
      C                                                                      NAMES    61
      C************************ SEGMENT 5 **********************************  NAMES    62
      C   ERRORS AND TOLERANCES FOR TRIM SOLUTION                            NAMES    63
      C                                                                      NAMES    64
            COMMON TOL(19)                                                   NAMES    65
      C************************ SEGMENT 6 **********************************  NAMES    66
      C   AERO LIFT AND DRAG CONSTANTS AND TABLES,INPUT                      NAMES    67
      C                                                                      NAMES    68
            COMMON AAERO,AERO(23,3),SURFCP(3,3)                              NAMES    69
      C                                                                      NAMES    70
      C EQUIVALENCE IN THE AERO ARRAY - THE CONSTANTS ARE ARRANGED FOR EACH   NAMES    71
      C SURFACE IN THE FOLLOWING ORDER  AR,EXPOSED AR,AREA.EXPOSED AREA,     NAMES    72
      C LAMBDA1/4,LAMBDALE,TAPER RATIO,CLMAX,ALFAB,AO,CDO,D/B,CLB/DF,CLMAX/DF, NAMES  73
      C CDO/DF. SURFACE 1 IS WING, 2 IS HOR. STAB, 3 IS VERT. STAB.          NAMES    74
      C                                                                      NAMES    75
      C    COMPUTED AERO LIFT AND DRAG CONSTANTS                             NAMES    76
      C                                                                      NAMES    77
            COMMON CNAAD(3),AEROK(3),EOS(3),CLA(3)                           NAMES    78
      C                                                                      NAMES    79
      C************************ SEGMENT 7 **********************************  NAMES    80
      C    WING AERO CONSTANTS,INPUT                                         NAMES    81
      C                                                                      NAMES    82
            COMMON FSW,BLW1,BLW2,WLW,CW,BW,EKDA1,EKDA2,EIW,CLBDW,CLBCLW,CLRCLW NAMES  83
           1  ,CLPW,CYBDW,CNBCL2W,CNRCL2W,CNRCDW,CNPCLW,CNPCDAW,CMOW,CMDFW   NAMES    84
           2     ,AEKEL,CYBCL2W                                              NAMES    85
      C                                                                      NAMES    86
      C     COMPUTED WING AERO CONSTANTS                                     NAMES    87
      C                                                                      NAMES    88
            COMMON XWING1,XWING2,YWING1,YWING2,ZWING1,ZWING2                 NAMES    89
      C                                                                      NAMES    90
      C************************ SEGMENT 8 **********************************  NAMES    91
      C     HORIZONTAL  STABILIZER AERO CONSTANTS                            NAMES    92
      C                                                                      NAMES    93
            COMMON FSH,BLH,WLH,CH,BH,EKADE,EIH,EOCLW,CMDFH,CMOH              NAMES    94
           1     ,DXHTO                                                      NAMES    95
      C                                                                      NAMES    96
      C     COMPUTED HORIZONTAL STABILIZER CONSTANTS                         NAMES    97
      C                                                                      NAMES    98
            COMMON XH,YH,ZH,XHEL,ZHEL,AHEL,DHEL                              NAMES    99
      C                                                                      NAMES   100
      C************************ SEGMENT 9 **********************************  NAMES   101
      C     VERTICAL STABILIZER AERO CONSTANTS                               NAMES   102
      C                                                                      NAMES   103
            COMMON FSV,BLV,HLV,CV,BV,EKADR,EIV,EKV,CNOV                      NAMES   104
           2     ,AEKRJD,TALFA(10),AALFA,TVTEFF(10)                          NAMES   105
      C                                                                      NAMES   106
      C     COMPUTED VERTICAL STABILIZER CONSTANTS                           NAMES   107
      C                                                                      NAMES   108
            COMMON XV,YV,ZV                                                  NAMES   109
      C                                                                      NAMES   110
      C************************ SEGMENT 10 *********************************  NAMES   111
      C     FUSELAGE AERO CONSTANTS                                          NAMES   112
      C                                                                      NAMES   113
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      COMMON FSF,BLF,WLF,AOQ0,SOQMX,NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2,   NAMES    114
     1    AOF,A1F,A2F,EN1,EN2,EN3,EN4,EN5,EN6,EN7                          NAMES    115
     2   ,DFSF0,ADFSF1,ADFSF2,XKYF                                          NAMES    116
C                                                                          NAMES    117
C     COMPUTED FUSELAGE AERO CONSTANTS                                     NAMES    118
C                                                                          NAMES    119
      COMMON XF,YF,ZF                                                      NAMES    120
C                                                                          NAMES    121
C************************ SEGMENT 11 ********************************     NAMES    122
C     DIRECT THRUST FORCE AND MOMENT CONSTANTS                             NAMES    123
C                                                                          NAMES    124
      COMMON FSSW(2),BLSW(2),WLSW(2),SIGY,ELN,KAFT1,KAFT2,AENG             NAMES    125
C                                                                          NAMES    126
C     COMPUTED DIRECT THRUST CONSTANTS                                     NAMES    127
C                                                                          NAMES    128
      COMMON CSIGY,SSIGY,XT(2),YT(2),ZT(2)                                 NAMES    129
C                                                                          NAMES    130
C************************ SEGMENT 12 ********************************     NAMES    131
C     RAM FORCE AND MOMENT CONSTANTS                                       NAMES    132
C                                                                          NAMES    133
      COMMON FSIN(2),BLIN(2),WLIN(2),RINLET,AVOVI,AATURN                   NAMES    134
C                                                                          NAMES    135
C     COMPUTED RAM CONSTANTS                                               NAMES    136
C                                                                          NAMES    137
      COMMON XIN(2),YIN(2),ZIN(2)                                          NAMES    138
C                                                                          NAMES    139
C************************ SEGMENT 13 ********************************     NAMES    140
C     CORIOLIS FORCE AND MOMENT CONSTANTS                                  NAMES    141
C                                                                          NAMES    142
      COMMON ELDUCT                                                        NAMES    143
C                                                                          NAMES    144
C************************ SEGMENT 14 ********************************     NAMES    145
C     PROPULSION SYSTEM CONSTANTS                                          NAMES    146
C                                                                          NAMES    147
      COMMON AMBCH,KBT1,KBT2,KM1,KM2,OMEGMX,RPMMX,RCS,AFRAT                NAMES    148
     1   ,JENG,AFPAC,TAUAB,ABACCEL,ABDECEL,TABON                           NAMES    149
     2   ,TABOFF                                                           NAMES    150
C                                                                          NAMES    151
C     COMPUTED PROPULSION SYSTEM CONSTANTS                                 NAMES    152
C                                                                          NAMES    153
      COMMON KBT                                                           NAMES    154
C                                                                          NAMES    155
C************************ SEGMENT 15 ********************************     NAMES    156
C     RCS FORCE AND MOMENT CONSTANTS                                       NAMES    157
C                                                                          NAMES    158
      COMMON ARCSJET,ABLDR,BLDREF,FRCSMX(10),DEMAND(10),BLDMOR(10),        NAMES    159
     1    RCSL(10,5),FSRCS(10),BLRCS(10),WLRCS(10),THTRCS(10),PSIRCS(10)   NAMES    160
C                                                                          NAMES    161
C     COMPUTED RCS CONSTANTS                                               NAMES    162
C                                                                          NAMES    163
      COMMON FRCSMXR,FRCSMX0,FRCSMX1,CTHTRCS(10),STHTRCS(10),CPSIRCS(10)   NAMES    164
     1    ,SPSIRCS(10),XJET(10),YJET(10),ZJET(10)                          NAMES    165
C                                                                          NAMES    166
C************************ SEGMENT 16 ********************************     NAMES    167
C     CONTROL SYSTEM CONSTANTS                                             NAMES    168
C                                                                          NAMES    169
C                                                                          NAMES    170
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C   PSEUDO-PILOT CONTROL SYSTEM CONSTANTS                       NAMES   171
C                                                               NAMES   172
      COMMON DUM,AKZED,AKZEE1,AKZEE2,AKYED,AKYEE,               NAMES   173
     1    AKU,AKV,AKW,AKXES,AKYES,AKZES                         NAMES   174
C                                                               NAMES   175
C   CONTROL SYSTEM FUNCTION SWITCH CONSTANTS                    NAMES   176
C                                                               NAMES   177
      COMMON CSW,VASW,CS1,THETSW                                NAMES   178
C                                                               NAMES   179
C   ROLL CONTROL SYSTEM CONSTANTS                               NAMES   180
C                                                               NAMES   181
      COMMON TAKPC(8),TTHETA(8),TAKPE(8),TKPCI1(8),ATHETA,TKPEI1(8),  NAMES   182
     1     TKP(8),PELIM,AKDYDR,KTHTR,KDA                        NAMES   183
C                                                               NAMES   184
C   YAW CONTROL SYSTEM CONSTANTS                                NAMES   185
C                                                               NAMES   186
      COMMON TAKRC(8),TAKRE(8),TKRCI1(8),TKREI1(8),TKR(8),RELIM,  NAMES   187
     1    AKYTRM,KPSIT,KDR,TAKAY(8),KTY                         NAMES   188
C                                                               NAMES   189
C     PITCH CONTROL SYSTEM CONSTANTS                            NAMES   190
C                                                               NAMES   191
      COMMON TAKQC(8),TAKQE(8),TKQCI1(8),TKQEI1(8),TKQ(8),QELIM,  NAMES   192
     1    AKPTRM,DSTK,KDE,KTHTP                                 NAMES   193
C                                                               NAMES   194
C   HEAVE CONTROL SYSTEM CONSTANTS                              NAMES   195
C                                                               NAMES   196
      COMMON TAKZE(8),TKZEI1(8),AKTHROT,ZELIM                   NAMES   197
C                                                               NAMES   198
C   CONSTANTS ASSOCIATED WITH ACTUATION SYSTEM INPUTS           NAMES   199
C                                                               NAMES   200
      COMMON ELEVNRF,PSITRF(2)                                  NAMES   201
C                                                               NAMES   202
C   FLAP CONTROL SYSTEM CONSTANTS                               NAMES   203
C                                                               NAMES   204
      COMMON KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                    NAMES   205
C                                                               NAMES   206
C    DYNAMIC PRESSURE TABLE FOR CONTROL SYSTEM GAINS            NAMES   207
C                                                               NAMES   208
      COMMON AQBAR,TQBAR(8)                                     NAMES   209
C                                                               NAMES   210
C    STICK AND PEDAL FILTER TIME CONSTANT TABLES                NAMES   211
C                                                               NAMES   212
      COMMON TTPITCH(8),TTROLL(8),TTYAW(8)                      NAMES   213
C                                                               NAMES   214
C*********************** SEGMENT 17 ****************************** NAMES   215
C    ACTUATION CONSTANTS                                        NAMES   216
C                                                               NAMES   217
      COMMON LEURATL,LELRATL,LEUPOSL,LELPOSL,TLEL,              NAMES   218
     1       REURATL,RELRATL,REUPOSL,RELPOSL,TREL,              NAMES   219
     2       DRURATL,DRLRATL,DRUPOSL,DRLPOSL,TDR,               NAMES   220
     3       HFURATL,HFLRATL,HFLAPMX,HFLAPMN,THF,               NAMES   221
     4       WFURATL,WFLRATL,WFLAPMX,WFLAPMN,TWF,               NAMES   222
     5       THTUPL(2),THTLRL(2),THTUPL(2),THTLPL(2),TTHT(2),   NAMES   223
     6       PSIUPL(2),PSILPL(2),PSIUPL(2),PSILPL(2),TPSIT(2),  NAMES   224
     7       RCSUPL(10),RCSLRL(10),RCSUPL(10),RCSLPL(10),TAURCS(10)  NAMES   225
     8    ,FRCSURL(10),FRCSLRL(10),FRCSUPL(10),FRCSLPL(10),TAUFRCS(10)  NAMES   226
     9    ,DELIM,DALIM,DRLIM                                    NAMES   227
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      C                                                                         NAMES  228
      C************************ SEGMENT 18 *********************************** NAMES  229
      C     LIFT-DRAG VARIABLES                                                 NAMES  230
      C                                                                         NAMES  231
            COMMON LAMB1,CLAE,EKWB,C1,C2,EJ                                     NAMES  232
      C                                                                         NAMES  233
      C************************ SEGMENT 19 *********************************** NAMES  234
      C     WING AERO VARIABLES                                                 NAMES  235
      C                                                                         NAMES  236
            COMMON DXW,DYW,DZW,DLW,DMW,DNW,CLW,ALFW,CDW,UW,WW,VXZ1,VXZ2,VXZ,   NAMES  237
           1    DADA1,DADA2,ALFW1,ALFW2,CLW1,CLW2,CDW1,CDW2,CDA,BETW,QWS,QWSB,  NAMES  238
           2    ROV,LWP,NWP,YWP,ALF1,SALF1,CALF1,ALF2,SALF2,CALF2,XW1,XW2,      NAMES  239
           3    ZW1,ZW2,ALF,SALF,CALF,MW,LW,NW,DA1,DA2,EKELEL,EKELER,CMW1,      NAMES  240
           4    CMW2,DXWING1,DXWING2                                            NAMES  241
      C                                                                         NAMES  242
      C************************ SEG  NT 20 *********************************** NAMES  243
      C     HORIZONTAL STABILIZER AERO VARIABLES                                NAMES  244
      C                                                                         NAMES  245
            COMMON DXH,DYH,DZH,DLH,DMH,DNH,UH,WH,ALFG,EPS,DALFW,CL1,CL2,CD1,    NAMES  246
           1    CD2,DADE,ALFH,CLH,CDH,ANG,DIS,XI,ZW,DQ0Q0,ALFH1,SALFH1,CALFH1   NAMES  247
           2    ,DAH,DE,QEFF,DAVG,CMH,DXHT                                      NAMES  248
      C                                                                         NAMES  249
      C************************ SEGMENT 21 *********************************** NAMES  250
      C     VERTICAL STABILIZER AERO VARIABLES                                  NAMES  251
      C                                                                         NAMES  252
            COMMON DXV,DYV,DZV,DLV,DMV,DNV,UV,VV,DADR,ALFV,CLV,CDV,ALFV1,       NAMES  253
           1    CALFV1,SALFV1,QOV,DRP,EKRUD,CMV,DXVT,VTEFF                      NAMES  254
      C                                                                         NAMES  255
      C************************ SEGMENT 22 *********************************** NAMES  256
      C     FUSELAGE AERO VARIABLES                                             NAMES  257
      C                                                                         NAMES  258
            COMMON DXF,DYF,DZF,DLF,DMF,DNF,ALFF,ALFYF,ALFTF,QXY,QB,QXZ,AOQ,AS,  NAMES  259
           1    SAF,SOQ,AF,NFOQ,MOQ,MOQ1,S,NF,PITCHF,ALFYFD,NOQ,NOQ1,YAWF       NAMES  260
           2    ,DFSF                                                           NAMES  261
      C                                                                         NAMES  262
      C************************ SEGMENT 23 *********************************** NAMES  263
      C     DIRECT THRUST FORCE AND MOMENT VARIABLES                            NAMES  264
      C                                                                         NAMES  265
            COMMON DXT,DYT,DZT,DLT,DMT,DNT,AFT(2),TCOR(2),DX(2),DY(2),DZ(2),    NAMES  266
           1    DFSSW(2),DBLSW(2),DALSW(2),SPSIT(2),CPSIT(2),STHT(2),CTHT(2)    NAMES  267
           2   ,KAFT                                                            NAMES  268
      C                                                                         NAMES  269
      C************************ SEGMENT 24 *********************************** NAMES  270
      C     RAM FORCE AND MOMENT VARIABLES                                      NAMES  271
      C                                                                         NAMES  272
            COMMON DXR,DYR,DZR,DLR,DMR,DNR,VD,ATURNO,BTURN,CBTURN,SBTURN,VIN,   NAMES  273
           1    VOVI(2),ATURN(2),ELRAM(2),DATURN(2),ETAR(2),FRAM(2),ELR,        NAMES  274
           2    WLRAM,FSRAM,SATURN,CATURN,DXRO(2),DYRO(2),DZRO(2),DXRI(2),      NAMES  275
           3    DYRI(2),DZRI(2),UI,VI,WI                                        NAMES  276
      C                                                                         NAMES  277
      C************************ SEGMENT 25 *********************************** NAMES  278
      C     CORIOLIS FORCE AND MOMENT VARIABLES                                 NAMES  279
      C                                                                         NAMES  280
            COMMON DXCOR,DYCOR,DZCOR,DLCOR,DMCOR,DNCOR,ELCOR,EACOR,DLCORD,      NAMES  281
           1    DMCORD,DNCORD                                                   NAMES  282
      C                                                                         NAMES  283
      C************************ SEGMENT 26 *********************************** NAMES  284
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C     PROPULSION SYSTEM VARIABLES                                      NAMES 285
C                                                                      NAMES 286
       COMMON MDOT(2),RPM(2),TRST(2),BLDAVL,FGMAX,FGMIN,FGIDL,MDTMX,    NAMES 287
     1     TRCSPEF,TREQAV,TREQ(2),FRATIO,FRPM,KMDT,KBTP,TRCS,T3(2)      NAMES 288
     2    ,ME(2),TFRAC(2),TFRACIN,FRACL,TENG,TFRACE,TABIN,BLOT3,TABE   NAMES 289
     3     ,TO(2)                                                      NAMES 290
C                                                                      NAMES 291
C************************ SEGMENT 27 *********************************  NAMES 292
C     RCS FORCE AND MOMENT VARIABLES                                   NAMES 293
C                                                                      NAMES 294
       COMMON DXRCS,DYRCS,DZRCS,DLRCS,DMRCS,DNRCS,DFRCSDB,DFRCSD,FRCS(10)  NAMES 295
     1    ,BLDREQ,FRCSAL,FRCSLU,FRCSC(10),DXRC(10),DYRC(10),DZRC(10),  NAMES 296
     2     DRCSC(10),BLD,FRCSDB                                        NAMES 297
C                                                                      NAMES 298
C************************ SEGMENT 28 *********************************  NAMES 299
C     CONTROL SYSTEM VARIABLES                                         NAMES 300
C                                                                      NAMES 301
C                                                                      NAMES 302
C    PSEUDO-PILOT CONTROL SYSTEM VARIABLES                             NAMES 303
C                                                                      NAMES 304
       COMMON ZEE,ZEIC,YEE,YEIC,DXE,DYE,DZE,XES,YES,ZES                 NAMES 305
C                                                                      NAMES 306
C    CONTROL SYSTEM FUNCTION SWITCH VARIABLES                          NAMES 307
C                                                                      NAMES 308
       COMMON CSSW                                                      NAMES 309
C                                                                      NAMES 310
C     ROLL CONTROL SYSTEM VARIABLES                                    NAMES 311
C                                                                      NAMES 312
       COMMON ROLLCMD,DLATSTK,AKPC,AKPCI,PCMD,AKPE,AKPEI,PE,DROLL       NAMES 313
C                                                                      NAMES 314
C    YAW CONTROL SYSTEM VARIABLES                                      NAMES 315
C                                                                      NAMES 316
       COMMON YAWCMD,DPED,AKRC,AKRCI,YTRMBUT,RE,AKRE,AKREI,DYAW,AKAY    NAMES 317
C                                                                      NAMES 318
C    PITCH CONTROL SYSTEM VARIABLES                                    NAMES 319
C                                                                      NAMES 320
       COMMON DLNGSTK,AKQC,AKQCI,PTRMBUT,QE,AKQE,AKQEI,DPITCH           NAMES 321
C                                                                      NAMES 322
C    HEAVE CONTROL SYSTEM VARIABLES                                    NAMES 323
C                                                                      NAMES 324
       COMMON ZEDTC,ZEDTE,AKZE,AKZEI,DTHROT                             NAMES 325
C                                                                      NAMES 326
C    ACTUATION SYSTEM INPUT VARIABLES                                  NAMES 327
C                                                                      NAMES 328
       COMMON DSIDEF,DNORMF,PSITC(2),THTC(2),DEC,DRC,DAC,DRCSR,DRCSP,   NAMES 329
     1     DRCSY,DRCSSF,DRCSNF,TCMD,HFLAPC,WFLAPC,LELEVNC,RELEVNC       NAMES 330
C                                                                      NAMES 331
C    ADDITIONAL CONTROL SYSTEM VARIABLES                               NAMES 332
C                                                                      NAMES 333
       COMMON AKPCI1,AKPEI1,AKP,AKRCI1,AKREI1,AKR,AKQCI1,AKQEI1,AKQ,    NAMES 334
     1   AKZEI1,CSVSW,TPITCH,TROLL,TYAW                                NAMES 335
C                                                                      NAMES 336
C************************ SEGMENT 29 *********************************  NAMES 337
C     AIR DATA VARIABLES                                               NAMES 338
C                                                                      NAMES 339
       COMMON UAS,VAS,WAS,RHO,TAMB,VSOUND,TRATIO,PRATIO,VA,VK,MN,QBAR,  NAMES 340
     1     ALPH,BETA,ALFAD,SALPH,CALPH,SBETA,CBETA                     NAMES 341
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      C                                                                     NAMES    342
      C     TOTAL AERO FORCE AND MOMENT VARIABLES                           NAMES    343
      C                                                                     NAMES    344
            COMMON XAERO,YAERO,ZAERO,LAERO,MAERO,NAERO                      NAMES    345
      C                                                                     NAMES    346
      C     TOTAL FORCE AND MOMENT VARIABLES                                NAMES    347
      C                                                                     NAMES    348
            COMMON SUMFX,SUMFY,SUMFZ,SUML,SUMM,SUMN                         NAMES    349
      C                                                                     NAMES    350
      C     CORRECTED DIRECTIONAL COSINES                                   NAMES    351
      C                                                                     NAMES    352
            COMMON D11P,D12P,D13P,D21P,D22P,D23P,D31P,D32P,D33P,DCMAG       NAMES    353
      C                                                                     NAMES    354
      C     MISCELLANEOUS VARIABLES                                         NAMES    355
      C                                                                     NAMES    356
            COMMON UAIR,VAIR,WAIR,ALT,RS,PS,BLOT1(3)                        NAMES    357
           1     ,GYROL,GYROM,GYRON,NXCG,NYCG,NZCG                          NAMES    358
           2     ,XDW,YDW,ZDW,BLOT2(3),LPRIME,NPRIME                        NAMES    359
           3     ,VE,VEDT,VEEST                                             NAMES    360
      C                                                                     NAMES    361
      C************************ SEGMENT 30 **********************************NAMES    362
      C     TABLES FOR RAM FORCES AND MOMENTS                               NAMES    363
      C                                                                     NAMES    364
            COMMON VOWIT(5),ATURNT(8),ELRAMT(5,8),DATURNT(5,8),ETART(5,8)   NAMES    365
      C                                                                     NAMES    366
      C************************ SEGMENT 31 **********************************NAMES    367
      C     TABLES FOR RCS FORCES AND MOMENTS                               NAMES    368
      C                                                                     NAMES    369
            COMMON FRCST(6),BLDRT(6)                                        NAMES    370
      C                                                                     NAMES    371
      C************************ SEGMENT 32 **********************************NAMES    372
      C     THRUST TABLES                                                   NAMES    373
      C                                                                     NAMES    374
            COMMON MNT(4),TFGMAX(4),TFGMIN(4),TFGIDL(4),TMDT(4),TFRAT(6),   NAMES    375
           1     TRPM(6),TFRACT(10),TACCEL(10),TDECEL(10),TTENG(10)         NAMES    376
      C                                                                     NAMES    377
      C                                                                     NAMES    378
      C************************ SEGMENTS 33 THRU 38 *************************NAMES    379
      C     STABILITY DERIVATIVE                                            NAMES    380
      C                                                                     NAMES    381
      C     SEGMENT 33                                                      NAMES    382
            COMMON DXWG(25),DXHS(25),DXVS(25),DXFS(25),DXAER(25),DXTS(25),  NAMES    383
           1      DXRAM(25),DXCLS(25),DXRCSF(25),X(25)                      NAMES    384
      C     SEGMENT 34                                                      NAMES    385
            COMMON DYWG(25),DYHS(25),DYVS(25),DYFS(25),DYAER(25),DYTS(25),  NAMES    386
           1      DYRAM(25),DYCLS(25),DYRCSF(25),Y(25)                      NAMES    387
      C     SEGMENT 35                                                      NAMES    388
            COMMON DZWG(25),DZHS(25),DZVS(25),DZFS(25),DZAER(25),DZTS(25),  NAMES    389
           1      DZRAM(25),DZCLS(25),DZRCSF(25),Z(25)                      NAMES    390
      C     SEGMENT 36                                                      NAMES    391
            COMMON DLWG(25),DLHS(25),DLVS(25),DLFS(25),DLAER(25),DLTS(25),  NAMES    392
           1      DLRAM(25),DLCLS(25),DLRCSF(25),AL(25)                     NAMES    393
      C     SEGMENT 37                                                      NAMES    394
            COMMON DMWG(25),DMHS(25),DMVS(25),DMFS(25),DMAER(25),DMTS(25),  NAMES    395
           1      DMRAM(25),DMCLS(25),DMRCSF(25),AM(25)                     NAMES    396
      C     SEGMENT 38                                                      NAMES    397
            COMMON DNWG(25),DNHS(25),DNVS(25),DNFS(25),DNAER(25),DNTS(25),  NAMES    398
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     1      DNRAM(25),DNCLS(25),DNRCSF(25),AN(25)                        NAMES  399
C                                                                        NAMES  400
C                                                                        NAMES  401
C*********************** SEGMENT 39 ************************************ NAMES  402
C     DERIVATIVE CONTROL                                                 NAMES  403
C                                                                        NAMES  404
      COMMON ADER,DELV(25)                                               NAMES  405
C                                                                        NAMES  406
C*********************** SEGMENT 40 ************************************ NAMES  407
C     SCRATCH COMMON                                                     NAMES  408
      COMMON WORK(50)                                                    NAMES  409
C                                                                        NAMES  410
C*********************** SEGMENT 41 ************************************ NAMES  411
C     MISCELLANEOUS CONSTANTS                                            NAMES  412
C                                                                        NAMES  413
      COMMON AWIND,VWIND,PSIWIND,XE20,YE20,ZE20                          NAMES  414
     1    ,TRMTURN,GAMMA,VADOT,TURNRAD                                   NAMES  415
C                                                                        NAMES  416
C*********************** SEGMENT 42 ************************************ NAMES  417
C    AERO SURFACE  FFECTIVENESS TABLES                                   NAMES  418
C                                                                        NAMES  419
      COMMON ELEVT(7),EKELET(7),RUDT(7),EKRUDT(7)                        NAMES  420
C                                                                        NAMES  421
C*********************** SEGMENT 43 ************************************ NAMES  422
C          PILOT INPUT CONTROL DATA                                      NAMES  423
C                                                                        NAMES  424
      COMMON ACMD(5),ATIME,ASKEEP,AYEHLD,CMDT1(20),CMDT2(20),            NAMES  425
     1    CMDT3(20),CMDT4(20),CMDT5(20),TIMET(20),ATRANS,AVAT,TTRANS,    NAMES  426
     2     THROTT(10),VAT(10),THETCT(10)                                 NAMES  427
C                                                                        NAMES  428
C*********************** SEGMENT 44 ************************************ NAMES  429
C     TABLES,CONSTANTS,AND VARIABLES FOR VARYING FEEDBACK CONTROL LAWS   NAMES  430
C                                                                        NAMES  431
      COMMON ACSSW,TCSSW1(5),TAKQS(5), TKPINT(5),TKPHI(5),TKPB(5),       NAMES  432
     1    TKPS(5),TKQINT(5),TKTHETA(5),TKRINT(5),TKPSI(5),TKRB(5),       NAMES  433
     2    TAKPCI(5),TAKPEI(5),TAKRCI(5),TAKREI(5),TAKQCI(5),TAKQEI(5),   NAMES  434
     3    TKRS(5),AKPHIPS,AKPINT,AKPHI,AKPB,AKPS,AKQINT,AKTHETA,AKRINT,  NAMES  435
     4    AKPSI,AKRB,AKRS,AKQS                                           NAMES  436
C                                                                        NAMES  437
C*********************** SEGMENT 45 ************************************ NAMES  438
C     TABLES,CONSTANTS,AND VARIABLES FOR CONTROL SYSTEM GAINS WHICH      NAMES  439
C         VARY AS FUNCTIONS OF AIRSPEED                                  NAMES  440
C                                                                        NAMES  441
      COMMON VELGAIN,AVEL,TVEL(8),VAKPC(8),VKPCI1(8),VKPEI1(8),VKP(8),   NAMES  442
         VAKPE(8),VAKRC(8),VKRCI1(8),VKREI1(8),VKR(8),VAKRE(8),VAKQC(8)  NAMES  443
     2   ,VKQCI1(8),VKQEI1(8),VKQ(8),VAKQE(8),VAKZE(8),VKZEI1(8)         NAMES  444
     3    ,VTPITCH(8),VTROLL(8),VTYAW(8)                                 NAMES  445
      REAL LAMB1                                                         NAMES  446
      REAL LNGSTK,LNGSTKD                                                NAMES  447
      REAL IX,IY,IZ,IXZ,JX,JY,JZ,MASS                                    NAMES  448
      REAL NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2                             NAMES  449
      REAL KBT1,KBT2,KM1,KM2,KBT                                         NAMES  450
      REAL KPSIT,KTHTP,KTHTR,KDE,KDR,KDA,KTY                             NAMES  451
      REAL LWP,NWP,NW,LW,MW                                              NAMES  452
      REAL NFOO,MOO,MOQ1,NOQ,NOQ1                                        NAMES  453
      REAL KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                               NAMES  454
      REAL MDOT,MDTMX,KMDT,KBTP                                          NAMES  455
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      REAL  KAFT1,KAFT2,KAFT                                          NAMES     456
      REAL  LAERO,MAERO,NAERO                                         NAMES     457
      REAL  LELPOSL,LELRATL,LEUPOSL,LEURATL,LPRIME,NPRIME             NAMES     458
      REAL  LELEVND,LELEVN,LELEVNC,MNT,NF,MN                          NAMES     459
      REAL  JENG                                                      NAMES     460
      REAL  NXCG,NYCG,NZCG                                            NAMES     461
      DIMENSION RDUM(5,6),DUMW(6),DUMH(6),DUMV(6),DUMF(6),DUMT(6)     WTRUN       5
      EQUIVALENCE (DXW,DUMW(1)),(DXH,DUMH(1)),(DXV,DUMV(1)),(DXF,     WTRUN       6
     1 DUMF(1)),(XAERO,DUMT(1))                                       WTRUN       7
      SW=AERO(3,1)                                                    WTRUN       8
      RAD=57.2957795                                                  WTRUN       9
      U=0.0                                                           WTRUN      10
      V=0.0                                                           WTRUN      11
      W=0.0                                                           WTRUN      12
      IF(IPITCH.EQ.0) GO TO 20                                        WTRUN      13
C     PITCH RUN SETUP                                                 WTRUN      14
      IF(DAOA.EQ.0.0) RETURN                                          WTRUN      15
      DPSI=0.0                                                        WTRUN      16
      IMAX=(AOAMAX-AOAO)/DAOA+1.01                                    WTRUN      17
      GO TO 30                                                        WTRUN      18
C     YAW RUN SETUP                                                   WTRUN      19
   20 IF(DPSI.EQ.0.0)RETURN                                           WTRUN      20
      DAOA=0.0                                                        WTRUN      21
      IMAX=(PSIMAX-PSIO)/DPSI+1.01                                    WTRUN      22
   30 CONTINUE                                                        WTRUN      23
      AOA=AOAO/RAD                                                    WTRUN      24
      BETAW=-PSIO/RAD                                                 WTRUN      25
      DO 50 I=1,IMAX                                                  WTRUN      26
      CAOA=COS(AOA)                                                   WTRUN      27
      SAOA=SIN(AOA)                                                   WTRUN      28
      CBET=COS(BETAW)                                                 WTRUN      29
      SBET=SIN(BETAW)                                                 WTRUN      30
      UAIR= TWIND*CAOA*CBET                                           WTRUN      31
      VAIR= TWIND*SBET                                                WTRUN      32
      WAIR= TWIND*SAOA*CBET                                           WTRUN      33
      UAS=U-UAIR                                                      WTRUN      34
      VAS=V-VAIR                                                      WTRUN      35
      WAS=W-WAIR                                                      WTRUN      36
      ALPH=AOA                                                        WTRUN      37
      BETA=BETAW                                                      WTRUN      38
      CALL FORCES(10.)                                                WTRUN      39
      ADUM=SW*QBAR                                                    WTRUN      40
      DO 40 L=1,6                                                     WTRUN      41
      RDUM(1,L)=DUMW(L)                                               WTRUN      42
      RDUM(2,L)=DUMH(L)                                               WTRUN      43
      RDUM(3,L)=DUMV(L)                                               WTRUN      44
      RDUM(4,L)=DUMF(L)                                               WTRUN      45
   40 RDUM(5,L)=DUMT(L)                                               WTRUN      46
C     CONVERT AERO DATA FROM BODY TO STABILITY AXES                   WTRUN      47
      DO 47 K=1,5                                                     WTRUN      48
      XDUM=RDUM(K,1)                                                  WTRUN      49
      ZDUM=RDUM(K,3)                                                  WTRUN      50
      RDUM(K,1)=-ZDUM*SALPH-XDUM*CALPH                                WTRUN      51
      RDUM(K,3)= XDUM*SALPH-ZDUM*CALPH                                WTRUN      52
      XDUM=RDUM(K,4)                                                  WTRUN      53
      ZDUM=RDUM(K,6)                                                  WTRUN      54
      RDUM(K,4)=XDUM*CALPH+ZDUM*SALPH                                 WTRUN      55
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            RDUM(K,6)=ZDUM*CALPH-XDUM*SALPH                            WTRUN    56
C     CONVERT TO NONDIMENSIONAL COEFFICIENTS                            WTRUN    57
            DO 46 L=1,3                                                 WTRUN    58
         46 RDUM(K,L)=RDUM(K,L)/ADUM                                    WTRUN    59
            DO 47 L=4,6                                                 WTRUN    60
            RDUM(K,L)=RDUM(K,L)/ADUM/BW                                 WTRUN    61
            IF(L.EQ.5) RDUM(K,L)=RDUM(K,L)*BW/CW                        WTRUN    62
         47 CONTINUE                                                    WTRUN    63
C     STORE OUTPUT ON NTAP2                                             WTRUN    64
            A=ALPH*RAD                                                  WTRUN    65
            B=BETA*RAD                                                  WTRUN    66
            WRITE(NTAP2) A,B,((RDUM(K,L),L=1,6),K=1,5)                  WTRUN    67
C     DEFINE NEXT AOA AND BETA COMBINATION                              WTRUN    68
            AOA=AOA+DAOA/RAD                                            WTRUN    69
            BETAW=BETAW-DPSI/RAD                                        WTRUN    70
         50 CONTINUE                                                    WTRUN    71
            RETURN                                                      WTRUN    72
            END                                                         WTRUN    73
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APPENDIX C

LISTING OF BASIC DATA LOAD INPUT CARDS

FOR VATLAS APPLICATION TO

VOUGHT SF-121 AIRPLANE

LISTING OF BASIC DATA LOAD INPUT DATA DECK WITH TIME HISTORY OUTPUT SPECS

```
 69   NSEG               NEQS
  5                      NTAP,NTAPW
 65    7   69   69   17   19   91   29   18   34   27   19   15    1   17  286   COMMON SEGMENTS
225  148    6   56   33   21   28   31   46   11   35   73   76   67   33   12
 72  250  250  250  250  250  250   26   50   10   28  161  103  170              STORAGE ALLOCATION
  1    1 1.              TIME-SEC
  3    1 1.              U-FT/SEC
  3    2 1.              V-FT/SEC
  3    3 1.              W-FT/SEC
  3    4 57.2958         P-DEG/SEC
  3    5 57.2958         Q-DEG/SEC
  3    6 57.2958        R-DEG/SEC
 29   46 57.2958        RS-DEG/SEC
 29   47 57.2958        PS-DEG/SEC
  2   16 1.             XEDT-FT/S
  2   17 1.             YEDT-FT/S
  2   18 1.             ZEDT-FT/S
  3   16 1.              XE-FT
  3   17 1.              YE-FT
  3   18 1.              ZE-FT
  3   64 57.2958        THETA-DEG
  3   65 57.2958          PHI-DEG
  3   66 57.2958         PSI-DEG
 29   32 1.                D11
 29   33 1.                D12
 29   34 1.                D13
 29   35 1.                D21
 29   36 1.                D22      TIME HISTORY OUTPUT SPECIFICATIONS
 29   37 1.                D23
 29   38 1.                D31
 29   39 1.                D32
 29   40 1.                D33
 28   50 57.2958         DEC-DEG
 28   52 57.2958         DAC-DEG
  3   19 57.2958        L.ELEV-DEG
  3   20 57.2958        R.ELEV-DEG
  3   21 57.2958          DR-DEG
  3   24 57.2958        PSIT-DEG
  3   26 57.2958        THTT-DEG
  3   28 1.              RCS NORM.
  3   48 57.2958        CAN.FLP-DG
  3   49 57.2958        WNG.FLP-DG
 29    9 .592            VA-KT
 29   13 57.2958         ALPHA-DEG
 29   14 57.2958         BETA-DEG
 29   54 1.              NXCG-G
 29   55 1.              NYCG-G
 29   56 1.              NZCG-G
 28   20 1.               DROLL
 28   29 1.               DYAW
 28   38 1.               DPITCH
 28   58 1.              ICMD-LB
 26   34 1.              TOUT-LB
```

```
   26    1 1.          MDOT-LB/S
   26    3 1.          RPM-RAD/S
   26    7 1.          BLDAVL
   27   19 1.          BLDREQ
    3   52 57.2958   PHITRM-DEG
    3   53 57.2958   P.INTE-DEG
    3   54 1.        P.ERR.INT
    3   55 57.2958   PSITRM-DEG
    3   56 57.2958   R.INTE-DEG
    3   57 1.        R.ERR.INT
    3   58 57.2958   PSITRMBUT
    3   59 57.2958   THETRM-DEG
    3   60 57.2958   Q.INTE-DEG
    3   61 1.        Q.ERR.INT.
    3   62 57.2958   THETRMBUT
    3   63 1.        ZE.ERR.INT
   28   19 57.2958   P.ERR-DG/S
   28   26 57.2958   R.ERR-DG/S
   28   35 57.2958   C.ERR-DG/S
   28   40 1.        ZE.ERR-F/S.
   28   12 1.        ROLLCMD
   28   21 1.        YAWCMD
   28   11 1.        CON.SYS.SW
   28   13 57.2958   DLATSTK-DG
   28   22 57.2958   DPED-DG/S
   28   3157.2958    LNG.STK.
   28   39 1.        ZEDT.CMD.
   28   43 1.        THROTTLE
   28    1 1.        ZE.ERR-FT
   28    3 1.        YE.ERR-FT
   28    8 1.        XBODY.ER-F
   28    9 1.        YBODY.ER-F
   28   10 1.        ZBODY.ER-F
   26   20 1.        TRCS
                     BLANK CARD-END TIME HISTORY OUTPUT SPECIFICATIONS
    4    1    4    5 WT,IX,IY,IZ,IXZ
16375.   7959.   52609.   58337.   -202.4
    4    6    4    8 FSCG,BLCG,WLCG                              .08333
401.5                99.
    5    1    5   19 TOL(I)-TRIM TOLERANCES
.5       .5      .5       1.       1.       1.       .5
.1       .1      .1       .02      .02      .02      .5
.5
    6    1    6   20 AAERO,AERO(I,J)-AERO LIFT-DRAG CONSTANTS
         2.3     2.14     350.     217.2    .709     .873
.15      1.06    .593     6.045    .00394   .253     .974
.63      .172    -.343    .091     -.0859   .304     .00602
-.0191   .525    .873     2.25     .996     115.8    51.1
.934     1.047   .2       1.12     .515     6.045    .00281
.442     .1065   .1065    .0865    .432
                                   .525     2.       2.
60.      60.     .785     .925     .3       1.03     .471
6.045    .00431  .179
0.       0.      0.
    6   71    6   79 SURFCP(I,J)
.571     .175    .734     .495     .727     .8       .749
-.828    .976
```

TIME HISTORY OUTPUT SPECIFICATIONS (CONTINUED)

REMAINDER OF BASIC DATA LOAD DEVOTED TO ~~LOADING COMMON~~ TABLES AND CONSTANTS (BLANKS IN THE QUANTIFICATION OF COMMON ELEMENTS DESIGNATE ZERO VALUES)

```
       7    1    7    4  FSW,BLW1,BLW2,WLW                              .08333
440.       -70.         70.       99.
       7    5    7    9  CW,BW,EKDA1,EKDA2,EIW
14.58       28.38
       7   10    7   13  CLBOW,CLBCLW,CLRCLW,CLPW
           -.235        .275      -.192
       7   14    7   19  CNBOW,CNBCL2W,CNRCL2W,CNRCOW,CNPCLW,CNPCOAW
           -.132        -.166     -.453       -.185
       7   20    7   21  CM0W,CMOFW
           -.0191
       7   22    7   22  AEKEL
7.
       7   23    7   23 CYBCL2W
-.3
       8    1    8    3  FSH,BLH,WLH                                    .09333
312.5                   115.
       8    4    8    8  CH,BH,EKADE,EIH,EOCLW
6.42        16.13             -.0873    +.162
       8    9    8   10  CMOFH,CMOH
-.0573
       9    1    9    3  FSV,BLV,WLV                                    .08333
536.0                   157.
       9    4    9    9  CV,BV,EKADR,EIV,EKV,CNOV
8.49        7.75        .50
       9   10    9   10  AEKRUD
7.
       9   11    9   20 TALFA(I)                                        .01745
-180.       20.         30.        40.        50.        130.      140.
150.        160.        180.
       9   21    9   21  AALFA
10.
       9   22    9   31  IVTEFF(I)
1.          1.          .7         .25                             .25
.7          1.          1.
      10    1   10    3  FSF,BLF,WLF                                    .08333
174.                    99.
      10    4   10   10  AOQO,SOQMX,NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2
1.443       367.8       367.8      532.       -110.6     532.      -110.6
      10   11   10   13  AOF,A1F,A2F                                    .01745
2.          88.         90.
      10   14   10   20  EN1,EN2,EN3,EN4,EN5,EN6,EN7
2.          1.867       1.522      0.80       1.         .8        1.
      10   21   10   21  DFSFO
17.8
      10   22   10   23  AOFSF1,AOFSF2
.262        .803
      10   24   10   24  XKYF
0.
      11    1   11    6  FSSW1,FSSW2,BLSW1,BLSW2,WLSW1,WLSW2            .08333
551.        551.        -22.2      22.2       100.       100.
      11    7   11   11  SIGY ELN,KAFT1,KAFT2,AENG
            4.26        -.13       1.         2.
      12    1   12    6  FSIN1,FSIN2,BLIN1,BLIN2,WLIN1,WLIN2            .08333
266.        266.        -33.       33.        100.       100.
      12    7   12    9  RINLET,AVOVI,AATURN
1.31        5.          5.
      13    1   13    1  ELDUCT                                         .08333
```

```
335.
    14    1   14    5 AMACH,KBT  ,KBT2,KM1,KM2
4.         -.0276    1.        .565      .435
    14    6   14    6 OMEGMX,RPMMX,RCS
1863.8     10159.    1.
    14    9   14   10  AFRAT,JENG
6.0        3.14
    14   11   14   14  AFRAC,TAUAB,ABACCEL,ABDECEL
6.         .05       20.       -20.
    14   15   14   16  TABON,TABOFF
.1         .001
    15    1   15    3  ARCSJET,ABLOR,BLOREF,
2.         6.        3.5
    15    4   15    5  FRCSMX1,FRCSMX2
1500.      1500.
    15   14   15   15  DEMAND1,DEMAND2
1.         1.
    15   24   15   25  BLDMOR1,BLDMOR2
1.         1.
    15   34   15   35  RCSL(1,1),RCSL(2,1)
-1.        1.
    15   84   15   85  FSRCS1,FSRCS2                                               .08333
534.       534.
    15   94   15   95  BLRCS1,BLRCS2                                               .08333
-160.      160.
    15  104   15  105  WLRCS1,WLRCS2                                               .08333
180.       180.
    15  114   15  115  THTRCS1,THTRCS2                                             .01745
-90.       -90.
    15  124   15  125  PSIRCS1,PSIRCS2                                             .01745
0.         0.
    16   13   16   13  CSV
.286
    16   14   16   14  VASW                                                        1.689
68.
    16   66   16   69 PELIM,AKDYDR,KTHTR,KDA
1.         0.        0.        -.436
    16  110   16  113 RELIM,AKYTRM,KPSIT,KOP
1.         .349      -.262     -.436
    16  114   16  119 TAKAY(I)-LAT.ACCEL.FDBACK TABLE
                     .0825     .105      .08       .04       .04
    16  122   16  122 KTW
0.
    16  163   16  167 QELIM,AKPTRM,DSTK,KDE,KTHTP
1.         .349      10.       -.436     -.262
    16  184   16  184 AKTHROT
30000.
    16  185   16  185 ZELIM
30000.
    16  186   16  188  ELEVNRF,PSITRF(I)
0.         0.        0.
    16  189   16  192 KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2
5.56       -1.164    4.17      -.189
    16  193   16  193  AQBAR
7.
    16  194   16  199  TQBAR(I)-DYNAMIC PRESSURE TABLE
           9.95      10.       20.       46.       127.      200.
```

```
     17     1    17     4  LEURATL,LELRATL,LEUPOSL,LELPOSL                    .01745
 35.       -35.        60.        -60.
     17     5    17     5  TLEL
 .05
     17     6    17     9  REURATL,RELRATL,REUPOSL,RELPOSL                    .01745
 35.       -35.        60.        -60.
     17    10    17    10  TREL
 .05
     17    11    17    14  DRURATL,DRLPATL,DRUPOSL,DRLPOSL                    .01745
 100.      -100.       25.        -25.
     17    15    17    15  TDR
 .05
     17    16    17    19  HFURATL,HFLRATL,HFLAPMX,HFLAPMN                    .01745
 10.       -10.        25.        -12.
     17    20    17    20  THF
 .1
     17    21    17    24  WFURATL,WFLRATL,WFLAPMX,WFLAPMN                    .01745
 10.       -10.        30.        0.
     17    25    17    25  TWF
 .1
     17    26    17    33 THTURL(2),THTLRL(2),THTUPL(2),THTLPL(2)             .01745
 50.       50.       -50.       -50.       15.       15.       -15.
 -15.
     17    34    17    35 TTHT(2)
 .05       .05
     17    36    17    43 PSIURL(2),PSILRL(2),PSIUPL(2),PSILPL(2)             .01745
 50.       50.       -50.       -50.       15.       15.       -15.
 -15.
     17    44    17    45 TPSIT(2)
 .05       .05
     17    46    17    47  PCSURL(2)
 10.       10.
     17    56    17    57  RCSLRL(2)
 -10.      -10.
     17    66    17    67  RCSUPL(2)
 1.        1.
     17    76    17    77  RCSLPL(2)
 -1.       -1.
     17    86    17    87  TAURCS(2)
 .05       .05
     17    96    17    97  FRCSURL(2)
 15000.    15000.
     17   106    17   107  FRCSLRL(2)
 -15000.   -15000.
     17   116    17   117  FRCSUPL(2)
 1500.     1500.
     17   126    17   127  FRCSLPL(2)
 -1500.    -1500.
     17   136    17   137  TAUFRCS(2)
 .05       .05
     17   146    17   148  DELIM,DALIM,DRLIM                                  .01745
 25.       25.        25.
     30     1    30     5  VOVIT(I)-VOVI TABLE FOR RAM F + M
           .227       .298       .514       10.
     30     6    30    11 ATURNT(J)-ATURN TABLE FOR RAM F + M                 .01745
           20.        45.        70.        90.        180.
     30    14    30    43 ELRAMT(I,J)-MOMENT ARM TABLE FOR RAM F + M          .08333
```

```
                                                   1.78      .973
 .693      .234      .234      3.51      2.248     1.765     1.042
 1.842     4.54      3.433     2.996     2.437     2.437     4.87
 4.084     3.818     3.564     3.564     4.87      4.084     3.818
 3.564     3.564
    30    54    30    83 DATURNT(I,J)-DELTA ATURN TABLE FOR RAM F + M        .01745
                                                   12.91     12.91
 7.72      5.08      5.08      19.47     19.47     12.41     11.59
 11.59     15.65     15.65     12.11     11.59     11.59     8.44
  8.44      6.83      12.59     12.59     8.44      8.44     6.83
  12.59     12.59
    30    94    30   123 ETART(I,J)-RAM EFFIC. FACTOR TABLE
 1.        1.        1.        1.        1.        1.        1.
 1.        1.        1.        1.195     1.195     1.127     1.016
 1.016     1.372     1.372     1.234     1.092     1.092     1.402
 1.402     1.243     1.188     1.108     1.402     1.402     1.243
 1.188     1.188
    31     1    31     6 FPCST(I)-AVAIL. RCS FORCE TABLE
           .01       170.      365.      500.      875.
    31     7    31    12 BLORT(I)- RCS BLEED TABLE
           3.5       4.5       10.       15.       30.
    32     1    32     4 MNT(I)-MACH TABLE FOR PROPULSION SYSTEM
           .1        .2        .3
    32     5    32     8 TFGMAX(I)-MAX A/B THRUST TABLE
 15416.    15705.    16162.    16705.
    32     9    32    12 TFGMIN(I)-MIN A/B THRUST TABLE
 9323.     9491.     9772.     10105.
    32    13    32    16 TFGIDL(I)-IDLE THRUST TABLE
 629.      753.      1004.     1306.
    32    17    32    20 TMDT(I)-MAX. FLOW RATE TABLE
 138.2     140.1     143.1     146.5
    32    21    32    26 TFRAT(I) - FG/FGMIN TABLE
           .20       .4        .6        .8        1.
    32    27    32    32 TRPM(I) - FRAC. RPM TABLE
           .28       .49       .665      .835      1.
    32    33    32    38 TFRACT(I) - FRACTIONAL THRUST TABLE
           .1333     .20       .3333     .6667     1.0
    32    43    32    48 TACCEL(I)-ACCELERATION LIMIT TABLE
 .1        .4        .4        .4        .4        .4
    32    53    32    58 TDECEL(I) - DECELERATION LIMIT TABLE
 -.1       -.4       -.475     -.625     -1.       -1.
    32    63    32    68 TTENG(I)-ENGINE TIME CONSTANT
 1.        .5        .4        .3        .2        .2
    39     1    39    23  ADER,DELV(I)
 22.       5.        5.        .1        .01745    .01745    .01745
 .05       .05       100.      100.      .01745    .01745    5.
 .1        .1        .01745    .01745    .05       .05       .05
 .01745    .01745
    42     1    42     7 ELEVT(I)-ELEVON TABLE                               .01745
           10.       20.       30.       40.       60.       100.
    42     8    42    14 EKELET(I)-ELEVON EFFECTIVENESS TABLE
 1.        1.        .77       .59       .53       .45       .45
    42    15    42    21 RUDT(I)-RUDDER TABLE                                .01745
           10.       20.       30.       40.       60.       100.
    42    22    42    28 EKRUDT(I) -RUDDER EFFECTIVENESS TABLE
 1.        1.        .82       .62       .55       .47       .47
    44     1    44     3  ACSSW,TCSSW1
```

```
2.                 1.
    44    7   44    8 TAKQS
1.        1.
    44   12   44   13  TKPINT
0.        1.
    44   17   44   18  TKPHI
1.
    44   22   44   23  TKPB
0.        1.
    44   27   44   28  TKPS
1.
    44   32   44   33  TKQINT
          1.
    44   37   44   38  TKTHETA
1.
    44   42   44   43  TKRINT
0.        1.
    44   47   44   48  TKPSI
0.        0.
    44   52   44   53  TKRB
0.        1.
    44   57   44   58  TAKPCI
1.        1.
    44   62   44   63 TAKPEI
1.        1.
    44   67   44   68  TAKRCI
0.        0.
    44   72   04   73  TAKREI
1.        1.
    44   77   44   78  TAKQCI
1.        0.
    44   82   44   83  TAKQEI
1.        1.
    44   87   44   88  TKRS
1.        0.
    44   92   44   92  AKPHIRS
1.
    45    1   45    1 VELGAIN
1.
    45    2   45    2  AVEL
6.
    45    3   45    8  TVEL                                              1.688
0.        59.5       60.       80.        120.       200.
    45   11   45   16  VAKPC
.3        .3         .3        .3         .5         .5
    45   19   45   24  VKPCI1
1.        1.         1.        1.         1.         1.
    45   27   45   32  VKFEI1
.8        .8         .2        .2         .2         .2
    45   35   45   40  VKF
.5        .5         .5        .5         .5         .5
    45   43   45   48  VAKPE
6.        6.         2.        2.         4.         2.
    45   51   45   56  VAKRC
1.        1.         1.        1.         1.         1.
    45   59   45   64  VKRCI1
0.        0.         0.        0.         0.         0.
```

```
    45   67   45   72  VKREI1
 .8        .8        .2         .2         .2         .2
    45   75   45   80  VKF
 .5        .5        1.         1.         1.         1.
    45   83   45   88  VAKRE
 13.       13.       .3         1.1        1.1        1.1
    45   91   45   96  VAKQC
 1.        1.        .3         .3         .3         .3
    45   99   45  104  VKQCI1
                     1.         1.         1.         1.
    45  107   45  112  VKQEI1
 .2        .2        .2         .2         .2         .2
    45  115   45  120  VKQ
 .5        .5        .5         .5         .5         .5
    45  123   45  128  VAKQE
 10.       10.       15.        15.        8.         5.
    45  131   45  136  VAKZE
 -500.     -500.
    45  139   45  104 VKZEI1
 .2        .2
    45  147   45  152  VTPITCH
 .25       .25
    45  155   45  160  VTROLL
 0.        0.        0.         0.         0.         0.
    45  163   45  168  VTYAW
 .25       .25
                                BLANK CARD-END OF BASIC LOAD
```

LISTING OF TRIM SUMMARY OUTPUT SPECIFICATIONS FOR BASIC DATA LOAD

29	9	.592	AIRSPEED
2	1	1.	UDOT
2	2	1.	VDOT
2	3	1.	WDOT
3	1	1.	U
3	2	1.	V
3	3	1.	W
3	4	57.2958	P-D/S
3	5	57.2958	Q-D/S
3	6	57.2958	R-D/S
29	13	57.2958	ALPHA-DG
29	14	57.2958	BETA-DG
41	4	1.	XE2D-F/S2
41	5	1.	YE2D-F/S2
41	6	1.	ZE2D-F/S2
2	16	1.	XEDOT-F/S
2	17	1.	YEDOT-F/S
2	18	1.	ZEDOT-F/S
2	64	57.2958	THETD-D/S
2	65	57.2958	PHID-D/S
2	66	57.2958	PSID-D/S
3	64	57.2958	THETA-DG
3	65	57.2958	PHI-DEG
3	66	57.2958	PSI-DEG
28	52	57.2958	DA-DEG
28	50	57.2958	DE-DEG
3	21	57.2958	DR-DEG
28	20	1.	DROLL
28	38	1.	DPITCH
28	29	1.	DYAW
3	24	57.2958	PSIT(1)
3	26	57.2958	THT(1)
3	19	57.2958	L.ELEV-DG
3	20	57.2958	R.ELEV-DG
27	9	1.	FRCS1-LB
27	10	1.	FRCS2-LB
27	19	1.	BLDRFQ
26	7	1.	BLDAVL
3	26	1.	DRSC1
3	29	1.	DRSC2
28	58	1.	TCMD-LB
26	34	1.	TO1-LB
26	35	1.	TO2-LB
26	14	1.	TREQ1-LB
26	15	1.	TREQ2-LB
26	5	1.	TRST1-LB
26	6	1.	TRST2-LB
23	9	1.	TCOR1-LB
23	10	1.	TCOR2-LB
26	3	1.	RPM1
26	4	1.	RPM2
26	1	1.	MDOT1
26	2	1.	MDOT2

THESE CARDS REPLACE THE TIME HISTORY OUTPUT SPECIFICATION CARDS IN THE BASIC DATA LOAD WHEN A TRIM SUMMARY (OPTION 12) IS DESIRED. IF NEITHER OPTION 4 (TIME HISTORY) NOR OPTION 12 IS CALLED IN A RUN, THEN THE OUTPUT SPECIFICATION CARDS IN THE BDL CAN BE REPLACED BY ONE BLANK CARD. (i.e. THE OUTPUT SPECIFICATION CARDS ARE NOT REQUIRED BY ANY OTHER VATLAS OPTIONS)

```
33  226 1.        X/U
35  226 1.        Z/U
37  226 1.        M/U
33  227 1.        X/W
35  227 1.        Z/W
37  227 1.        M/W
33  228 1.        X/Q
35  228 1.        Z/Q
37  228 1.        M/Q
33  229 1.        X/DE
35  229 1.        Z/DE
37  229 1.        M/DE
33  230 1.        X/FLAPW
35  230 1.        Z/FLAPW
37  230 1.        M/FLAPW
33  231 1.        X/FLAPC
35  231 1.        Z/FLAPC
37  231 1.        M/FLAPC
33  234 1.        X/TO1
35  234 1.        Z/TO1
37  234 1.        M/TO1
33  235 1.        X/TO2
35  235 1.        Z/TO2
37  235 1.        M/TO2
33  236 1.        X/THT1
35  236 1.        Z/THT1
37  236 1.        M/THT1
33  237 1.        X/THT2
35  237 1.        Z/THT2
37  237 1.        M/THT2
34  238 1.        Y/V
36  238 1.        L/V
38  238 1.        N/V
34  239 1.        Y/P
36  239 1.        L/P
38  239 1.        N/P
34  240 1.        Y/R
36  240 1.        L/R
38  240 1.        N/R
34  241 1.        Y/DR
36  241 1.        L/DR
38  241 1.        N/DR
34  242 1.        Y/DA
36  242 1.        L/DA
38  242 1.        N/DA
34  243 1.        Y/DRCSR
36  243 1.        L/DRCSR
38  243 1.        N/DRCSR
34  246 1.        Y/PSIT1
36  246 1.        L/PSIT1
38  246 1.        N/PSIT1
34  247 1.        Y/PSIT2
36  247 1.        L/PSIT2
38  247 1.        N/PSIT2
                 BLANK CARD-END TRIM SUMMARY OUTPUT SPECIFICATIONS
```

APPENDIX D

EXAMPLE 1 (TRANSITION TRIM) OUTPUT

69 NEQS

5 8 NTAP,NTAPW

DIVISION OF R-ARRAY

I	NR(I)	LENGTH(I)
1	0	7
2	7	69
3	76	69
4	145	17
5	162	19
6	181	91
7	272	29
8	301	18
9	319	34
10	353	27
11	380	19
12	399	15
13	414	1
14	415	17
15	432	206
16	638	225
17	863	148
18	1011	6
19	1017	54
20	1071	33
21	1104	21
22	1125	28
23	1153	31
24	1184	44
25	1228	11
26	1239	35
27	1274	73
28	1347	76
29	1423	67
30	1490	133
31	1623	12
32	1635	72
33	1707	250
34	1957	250
35	2207	250
36	2457	250
37	2707	250
38	2957	250
39	3207	26
40	3233	50
41	3283	10
42	3293	28
43	3321	161
44	3482	103
45	3585	170

OUTPUT SPECIFICATIONS

29	9	.59280	AIRSPEED
2	1	1.00000	UDOT
2	2	1.00000	VDOT
2	3	1.00000	WDOT
3	1	1.00000	U
3	2	1.00000	V
3	3	1.00000	W
3	4	57.29580	P-D/S
3	5	57.29580	Q-D/S
3	6	57.29580	R-D/S
29	13	57.29580	ALPHA-DG
29	14	57.29580	BETA-DG
41	4	1.00000	XE2D-F/S2
41	5	1.00000	YE2D-F/S2
41	6	1.00000	ZE2D-F/S2
2	16	1.00000	XEDOT-F/S
2	17	1.00000	YEDOT-F/S
2	18	1.00000	ZEDOT-F/S
2	64	57.29580	THETD-D/S
2	65	57.29580	PHID-D/S
2	66	57.29580	PSID-D/S
3	64	57.29580	THETA-DG
3	65	57.29580	PHI-DEG
3	66	57.29580	PSI-DEG
28	52	57.29580	DA-DEG
28	50	57.29580	DE-DEG
3	21	57.29580	DR-DEG
28	28	1.00000	DROLL
28	30	1.00000	DPITCH
28	29	1.00000	DYAW
3	24	57.29580	PSIT(1)
3	26	57.29580	THT(1)
3	19	57.29580	L.ELEV-DG
3	20	57.29580	R.ELEV-DG
27	9	1.00000	FRCS1-LB
27	10	1.00000	FRCS2-LB
27	19	1.00000	BLDREQ
26	7	1.00000	BLDAVL
3	28	1.00000	DRSC1
3	29	1.00000	DRSC2
28	58	1.00000	TCMD-L
26	34	1.00000	TO1-L
26	35	1.00000	TO2-LB
26	14	1.00000	TREQ1-LB
26	15	1.00000	TREQ2-LB
26	5	1.00000	TRST1-LB
26	6	1.00000	TRST2-LB
23	9	1.00000	TCOR1-LB
23	10	1.00000	TCOR2-LB
26	3	1.00000	RPM1
26	4	1.00000	RPM2
26	1	1.00000	MDOT1
26	2	1.00000	MDOT2
33	226	1.00000	X/U
35	226	1.00000	Z/U
37	226	1.00000	H/U

```
33  227   1.00000   X/W
35  227   1.00000   Z/W
37  227   1.00000   M/W
33  228   1.00000   X/Q
35  228   1.00000   Z/Q
37  228   1.00000   M/Q
33  229   1.00000   X/DE
35  229   1.00000   Z/DE
37  229   1.00000   M/DE
33  230   1.00000   X/FLAPW
35  230   1.00000   Z/FLAPW
37  230   1.00000   M/FLAPW
33  231   1.00000   X/FLAPC
35  231   1.00000   Z/FLAPC
37  231   1.00000   M/FLAPC
33  234   1.00000   X/TO1
35  234   1.00000   Z/TO1
37  234   1.00000   M/TO1
33  235   1.00000   X/TO2
35  235   1.00000   Z/TO2
37  235   1.00000   M/TO2
33  236   1.00000   X/THT1
35  236   1.00000   Z/THT1
37  236   1.00000   M/THT1
33  237   1.00000   X/THT2
35  237   1.00000   Z/THT2
37  237   1.00000   M/THT2
34  238   1.00000   Y/V
36  238   1.00000   L/V
38  238   1.00000   N/V
34  239   1.00000   Y/P
36  239   1.00000   L/P
38  239   1.00000   N/P
34  240   1.00000   Y/R
36  240   1.00000   L/R
38  240   1.00000   N/R
34  241   1.00000   Y/DR
36  241   1.00000   L/DR
38  241   1.00000   N/DR
34  242   1.00000   Y/DA
36  242   1.00000   L/DA
38  242   1.00000   N/DA
34  243   1.00000   Y/DRCSR
36  243   1.00000   L/DRCSR
38  243   1.00000   N/DRCSR
34  246   1.00000   Y/PSIT1
36  246   1.00000   L/PSIT1
38  246   1.00000   N/PSIT1
34  247   1.00000   Y/PSIT2
36  247   1.00000   L/PSIT2
38  247   1.00000   N/PSIT2
 0    0   0.00000  BLANK CARD-END TRIM SUMMARY OUTPUT SPECIFICATIONS
NOUT=  107

STORE FIXED TABLES ETC.
```

```
      4    1    4    5 WT,IX,IY,IZ,IXZ                                              0.00000
 16375.00000  7959.00000  52609.00000  58337.00000   -202.40000
      4    6    4    8  FSCG,BLCG,WLCG                                               .08333
   401.50000     0.00000     99.00000
      5    1    5   19 TOL(I)-TRIM TOLERANCES                                       0.00000
      .50000      .50000      .50000     1.00000     1.00000     1.00000      .50000      .10000
      .10000      .10000      .02000      .02000      .02000      .50000      .50000     0.00000
     0.00000     0.00000     0.00000
      6    1    6   79 AAERO,AERO(I,J)-AERO LIFT-DRAG CONSTANTS                     0.00000
     0.00000     2.30000     2.14000   350.00000   217.20000      .70900      .87300      .15000
     1.06000      .59300     6.04500      .00394      .25300      .97400      .63000      .17200
     -.34300      .09100     -.00590      .30400      .00602     -.01910      .52500      .07300
     2.25000      .99600   115.00000    51.10000      .93400     1.04700      .25000     1.12000
      .51500     6.04500      .00281      .44200      .10650      .10650      .08650      .43200
     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000      .52500     2.00000
     2.00000    60.00000    60.00000      .78500      .92500      .30000     1.03000      .47100
     6.04500      .00431      .17900     0.00000     0.00000     0.00000     0.00000     0.00000
     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
      6   71    6   79 SURFCP(I,J)                                                  0.00000
      .57100      .17500      .73400      .49500      .72700      .80000      .74900     -.02000
      .97600
      7    1    7    4  FSW,BLW1,BLW2,WLW                                            .08333
   446.00000   -78.00000    78.00000    99.00000
      7    5    7    9  CW,BW,EKDA1,EKDA2,EIW                                       0.00000
    14.58000    28.30000     0.00000     0.00000     0.00000
      7   10    7   13  CLBOW,CLBCLW,CLRCLW,CLPW                                    0.00000
     0.00000     -.23500      .27500     -.19200
      7   14    7   19  CNBOW,CNBCL2W,CNRCL2W,CNRCOW,CNPCLW,CNPCDAW                 0.00000
     0.00000     -.13200     -.16600     -.45300     -.10500     0.00000
      7   20    7   21  CMOW,CMDFW                                                  0.00000
     0.00000     -.01910
      7   22    7   22  AEKEL                                                       0.00000
     7.00000
      7   23    7   23 CYBCL2W                                                      0.00000
     -.30000
      8    1    8    3  FSH,BLH,WLH                                                  .08333
   312.50000     0.00000   115.00000
      8    4    8    8  CH,BH,EKADE,EIH,EOCLW                                       0.00000
     6.42000    16.13000     0.00000     -.38730      .16200
      8    9    8   10  CMDFH,CMOH                                                  0.00000
     -.05730     0.00000
      9    1    9    3  FSV,BLV,WLV                                                  .08333
   536.00000     0.00000   157.00000
      9    4    9    9  CV,BV,EKADR,EIV,EKV,CNBV                                    0.00000
     8.49000     7.75000      .50000     0.00000     0.00000     0.00000
      9   10    9   10  AEKRUD                                                      0.00000
     7.00000
      9   11    9   20 TALFA(I)                                                      .01745
  -180.00000    20.00000    30.00000    40.00000    50.00000   130.00000   140.00000   150.00000
   160.00000   180.00000
      9   21    9   21 AALFA                                                        0.00000
    10.00000
      9   22    9   31  TVTEFF(I)                                                   0.00000
     1.00000     1.00000      .70000      .25000     0.00000     0.00000      .25000      .70000
     1.00000     1.00000
     10    1   10    3  FSF,BLF,WLF                                                  .08333
```

```
     174.00000       0.00000      99.00000
        10    4    10   10  AOQQ,SOQMX,NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2           0.00000
       1.44300     367.60000     367.80000     532.80000    -110.60000     532.00000   -110.60000
        10   11    10   13  ADF,A1F,A2F                                            .01745
       2.00000      80.00000      90.00000
        10   14    10   20  EN1,EN2,EN3,EN4,EN5,EN6,EN7                            0.00000
       2.00000       1.83700       1.52200        .80000       1.00000        .80000      1.00000
        10   21    10   21  DFSFQ                                                  0.00000
      17.60000
        10   22    10   23  ADFSF1,ADFSF2                                          0.00000
        .26200        .80300
        10   24    10   24  XKYF                                                   0.00000
       0.00000
        11    1    11    6  FSSW1,FSSW2,BLSW1,BLSW2,WLSW1,WLSW2                   .08333
     551.00000     551.00000     -22.20000      22.20000     100.00000     100.00000
        11    7    11   11  SIGY ELN,KAFT1,KAFT2,AENG                              0.00000
       0.00000       4.26000       -.13000       1.00000       2.00000
        12    1    12    6  FSIN1,FSIN2,BLIN1,BLIN2,WLIN1,WLIN2                   .08333
     266.00000     266.00000     -33.00000      33.00000     100.00000     100.00000
        12    7    12    9  RINLET,AVOVI,AATURN                                    0.00000
       1.31000       5.00000       5.00000
        13    1    13    1  ELDUCT                                                 .08333
     335.00000
        14    1    14    5  AMACH,KBT1,KBT2,KM1,KM2                                0.00000
       4.00000       -.02760       1.00000        .56500        .43500
        14    6    14    8  OMEGMX,RPMMX,RCS                                       0.00000
    1063.80000   10159.00000       1.00000
        14    9    14   10  AFRAT,JENG                                             0.00000
       6.00000       3.14000
        14   11    14   14  AFRAC,TAUAB,ABACCEL,ABDECEL                            0.00000
       6.00000        .05000      20.00000     -20.00000
        14   15    14   16  TABON,TABOFF                                           0.00000
        .10000        .00100
        15    1    15    3  ARCSJET,ABLDR,BLDREF,                                  0.00000
       2.00000       6.00000       3.50000
        15    4    15    5  FRCSMX1,FRCSMX2                                        0.00000
    1500.00000    1500.00000
        15   14    15   15  DEMAND1,DEMAND2                                        0.00000
       1.00000       1.00000
        15   24    15   25  BLDMOR1,BLDMOR2                                        0.00000
       1.00000       1.00000
        15   34    15   35  FCSL(1,1),RCSL(2,1)                                    0.00000
      -1.00000       1.00000
        15   84    15   85  FSRCS1,FSRCS2                                          .08333
     534.00000     534.00000
        15   94    15   95  BLRCS1,BLRCS2                                          .08333
    -160.00000     160.00000
        15  104    15  105  WLRCS1,WLRCS2                                          .08333
     100.00000     100.00000
        15  114    15  115  THTRCS1,THTRCS2                                        .01745
     -90.00000     -90.00000
        15  124    15  125  PSIRCS1,PSIRCS2                                        .01745
       0.00000       0.00000
        16   13    16   13  CSV                                                    0.00000
        .28600
        16   14    16   14  VASW                                                   1.68800
      60.00000
```

```
   1(   66    16    69 PELIM,AKDVDR,KTHTR,KDA                                          0.00000
 1.00000      0.00000      0.00000      -.43600
   16  118    16   113 RELIM,AKYTRM,KPSIT,KDR                                         0.00000
 1.00000       .34900      -.26200      -.43600
   16  114    16   119 TAKAY(I)-LAT.ACCEL.FDBACK TABLE                                0.00000
 0.00000      0.00000       .08250       .10500       .08000       .84000
   16  122    16   122 KTY                                                            0.00000
 0.00000
   16  163    16   167 QELIM,AKPTRM,DSTK,KBE,KTHTP                                     0.00000
 1.00000       .34900     10.00000      -.43600      -.26200
   16  184    16   184 AKTHROT                                                        0.00000
30000.00000
   16  185    16   185 ZELIM                                                          0.00000
30000.00000
   16  186    16   186  ELEVNRF,PSITRF(I)                                             0.00000
 0.00000      0.00000      0.00000
   16  189    16   192 KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                                0.00000
 5.56000     -1.16400      4.17000      -.10900
   16  193    16   193  AQBAR                                                         0.00000
 7.00000
   16  194    16   199  TQBAR(I)-DYNAMIC PRESSURE TABLE                               0.00000
 0.00000      9.95000     10.00000     20.00000     46.00000    127.00000
   17    1    17     4  LEURATL,LELRATL,LEUPOSL,LELPOSL                                .01745
35.00000    -35.00000     60.00000    -60.00000
   17    5    17     5  TLEL                                                          0.00000
  .05000
   17    6    17     9  REURATL,RELRATL,REUPOSL,RELPOSL                                .01745
35.00000    -35.00000     60.00000    -60.00000
   17   10    17    10  TREL                                                          0.00000
  .05000
   17   11    17    14  DRURATL,DRLRATL,DRUPOSL,DRLPOSL                                .01745
100.00000  -100.00000     25.00000    -25.00000
   17   15    17    15  TDR                                                           0.00000
  .05000
   17   16    17    19  HFURATL,HFLRATL,HFLAPMX,HFLAPMN                                .01745
10.00000    -10.00000     25.00000    -12.00000
   17   20    17    20  THF                                                           0.00000
  .10000
   17   21    17    24  WFURATL,WFLRATL,WFLAPMX,WFLAPMN                                .01745
10.00000    -10.00000     30.00000      0.00000
   17   25    17    25  TWF                                                           0.00000
  .10000
   17   26    17    33 THTURL(2),THTLRL(2),THTUPL(2),THTLPL(2)                         .01745
50.00000     50.00000    -50.00000    -50.00000     15.00000     15.00000    -15.00000    -15.00000
   17   34    17    35 TTHT(2)                                                        0.00000
  .05000       .05000
   17   36    17    43 PSIURL(2),PSILRL(2),PSIUPL(2),PSILPL(2)                         .01745
50.00000     50.00000    -50.00000    -50.00000     15.00000     15.00000    -15.00000    -15.00000
   17   44    17    45 TPSIT(2)                                                       0.00000
  .05000       .05000
   17   46    17    47  RCSURL(2)                                                     0.00000
10.00000     10.00000
   17   56    17    57  RCSLRL(2)                                                     0.00000
-10.00000   -10.00000
   17   66    17    67  RCSUPL(2)                                                     0.00000
 1.00000      1.00000
   17   76    17    77  RCSLPL(2)                                                     0.00000
```

```
   -1.00000      -1.00000
      17   86   17   87  TAURCS(2)                                             0.00000
     .05000        .05000
      17   96   17   97  FRCSURL(2)                                            0.00000
 15000.00000  15000.00000
      17  106   17  107  FRCSLRL(2)                                            0.00000
-15000.00000 -15000.00000
      17  116   17  117  FRCSUPL(2)                                            0.00000
  1500.00000   1500.00000
      17  126   17  127  FRCSLPL(2)                                            0.00000
 -1500.00000  -1500.00000
      17  136   17  137  TAUFRCS(2)                                            0.00000
     .05000        .05000
      17  146   17  148  DELIM,DALIM,DRLIM                                      .01745
    25.00000     25.00000     25.00000
      30    1   30    5  VOVIT(I)-VOVI TABLE FOR RAM F + M                     0.00000
     0.00000       .22700       .29800       .51400     10.00000
      30    6   30   11  ATURNT(J)-ATURN TABLE FOR RAM F + M                    .01745
     0.00000     20.00000     45.00000     70.00000     90.00000    180.00000
      30   14   30   43  ELRAMT(I,J)-MOMENT ARM TABLE FOR RAM F + M             .08333
     0.00000      0.00000      0.00000      0.00000      0.00000      1.76000       .97300       .69300
      .23400       .23400      3.51000      2.24800      1.76500      1.04200      1.04200      4.54000
     3.43300      2.99600      2.43700      2.43700      4.87000      4.08400      3.81800      3.56400
     3.56400      4.87000      4.08400      3.81600      3.56400      3.56400
      30   54   30   83  DATURNT(I,J)-DELTA ATURN TABLE FOR RAM F + M           .01745
     0.00000      0.00000      0.00000      0.00000      0.00000     12.91000     12.91000      7.72000
     5.08000      5.08000     19.47000     19.47000     12.41000     11.59000     11.59000     15.65000
    15.65000     12.11000     11.59000     11.59000      8.44000      8.44000      6.83000     12.59000
    12.59000      8.44000      8.44000      6.83000     12.59000     12.59000
      30   94   30  123  ETART(I,J)-RAM EFFIC. FACTOR TABLE                    0.00000
     1.00000      1.00000      1.00000      1.00000      1.00000      1.00000      1.00000      1.00000
     1.00000      1.00000      1.19500      1.19500      1.12700      1.01600      1.01600      1.37200
     1.37200      1.23400      1.09200      1.09200      1.40200      1.40200      1.24300      1.10800
     1.10800      1.40200      1.40200      1.24300      1.10800      1.10800
      31    1   31    6  FRCST(I)-AVAIL. RCS FORCE TABLE                       0.00000
     0.00000       .01000    170.00000    365.00000    500.00000    875.00000
      31    7   31   12  BLDRT(I)- RCS BLEED TABLE                             0.00000
     0.00000      3.50000      4.50000     10.00000     15.00000     30.00000
      32    1   32    4  MNT(I)-MACH TABLE FOR PROPULSION SYSTEM               0.00000
     0.60000       .10000       .20000       .30000
      32    5   32    8  TFGMAX(I)-MAX A/B THRUST TABLE                        0.00000
 15416.00000  15705.00000  16162.00000  16705.00000
      32    9   32   12  TFGMIN(I)-MIN A/B THRUST TABLE                        0.00000
  9323.00000   9491.00000   9772.00000  10105.00000
      32   13   32   16  TFGIDL(I)-IDLE THRUST TABLE                           0.00000
   629.00000    753.00000   1004.00000   1306.00000
      32   17   32   20  TMDT(I)-MAX. FLOW RATE TABLE                          0.00000
   138.20000    140.10000    143.10000    146.50000
      32   21   32   26  TFRAT(I) - FG/FGMIN TABLE                             0.00000
     0.00000       .20000       .40000       .60000       .80000      1.00000
      32   27   32   32  TRPM(I) - FRAC. RPM TABLE                             0.00000
     0.00000       .28000       .49000       .66500       .83500      1.00000
      32   33   32   38  TFRACT(I) - FRACTIONAL THRUST TABLE                   0.00000
     0.00000       .13330       .20000       .33330       .66670      1.00000
      32   43   32   48  TACCEL(I)-ACCELERATION LIMIT TABLE                    0.00000
      .10000       .40000       .40000       .40000       .40000       .40000
      32   53   32   58  TDECEL(I) - DECELERATION LIMIT TABLE                  0.00000
```

```
  -.10000     -.40000     -.47500     -.62500     -1.00000    -1.00000
   32   63    32   68 TTENG(I)-ENGINE TIME CONSTANT              0.00000
  1.00000      .50000      .40000      .30000      .20000      .20000
   39    1    39   23  ADER,DELV(I)                              0.00000
 22.00000     5.00000     5.00000      .10000      .01745      .01745      .01745      .05000
  .05000    100.00000   180.00000      .01745      .01745     5.00000      .10000      .10000
  .01745      .01745      .05000      .05000      .05000      .01745      .01745
   42    1    42    7 ELEVT(I)-ELEVON TABLE                       .01745
  0.00000    10.00000    20.00000    30.00000    40.00000    60.00000   100.00000
   42    8    42   14 EKELET(I)-ELEVON EFFECTIVENESS TABLE       0.00000
  1.00000     1.00000      .77000      .59000      .53000      .45000      .45000
   42   15    42   21 RUDT(I)-RUDDER TABLE                        .01745
  0.00000    10.00000    20.00000    30.00000    40.00000    60.00000   100.00000
   42   22    42   28 EKRUDT(I)-RUDDER EFFECTIVENESS TABLE       0.00000
  1.00000     1.00000      .82000      .62000      .55000      .47000      .47000
   44    1    44    3  ACSSN,TCSSN1                              0.00000
  2.00000     0.00000     1.00000
   44    7    44    8 TAKQS                                      0.00000
  1.00000     1.00000
   44   12    44   13  TKPINT                                    0.00000
  0.00000     1.00000
   44   17    44   18  TKPHI                                     0.00000
  1.00000     0.00000
   44   22    44   23  TKPB                                      0.00000
  0.00000     1.00000
   44   27    44   28  TKPS                                      0.00000
  1.00000     0.00000
   44   32    44   33  TKQINT                                    0.00000
  0.00000     1.00000
   44   37    44   38  TKTHETA                                   0.00000
  1.00000     0.00000
   44   42    44   43  TKRINT                                    0.00000
  0.00000     1.00000
   44   47    44   48  TKPSI                                     0.00000
  0.00000     0.00000
   44   52    44   53  TKRB                                      0.00000
  0.00000     1.00000
   44   57    44   58  TAKPCI                                    0.00000
  1.00000     1.00000
   44   62    44   63 TAKPEI                                     0.00000
  1.00000     1.00000
   44   67    44   68  TAKRCI                                    0.00000
  0.00000     0.00000
   44   72    44   73  TAKREI                                    0.00000
  1.00000     1.00000
   44   77    44   78  TAKQCI                                    0.00000
  1.00000     0.00000
   44   82    44   83  TAKQEI                                    0.00000
  1.00000     1.00000
   44   87    44   88  TKRS                                      0.00000
  1.00000     0.00000
   44   92    44   92  AKPHIRS                                   0.00000
  1.00000
   45    1    45    1 VELGAIN                                    0.00000
  1.00000
   45    2    45    2  AVEL                                      0.00000
  6.00000
```

```
      45    3   45    8  TVEL                                                          1.60000
   0.00000      59.50000     60.00000     80.00000    120.00000    200.00000
      45   11   45   16  VAKPC                                                         0.00000
    .30000       .30000       .30000       .30000       .50000       .50000
      45   19   45   24  VKPCI1                                                        0.00000
   1.00000      1.00000      1.00000      1.00000      1.00000      1.00000
      45   27   45   32  VKPEI1                                                        0.00000
    .80000       .80000       .20000       .20000       .20000       .20000
      45   35   05   40  VKP                                                           0.00000
    .50000       .50000       .50000       .50000       .50000       .50000
      45   43   45   48  VAKPE                                                         0.00000
   6.00000      6.00000      2.00000      2.00000      4.00000      2.00000
      45   51   45   56  VAKRC                                                         0.00000
   1.00000      1.00000      1.00000      1.00000      1.00000      1.00000
      45   59   45   64  VKRCI1                                                        0.00000
   0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
      45   67   45   72  VKREI1                                                        0.00000
    .80000       .80000       .20000       .20000       .20000       .20000
      45   75   45   80  VKR                                                           0.00000
    .50000       .50000      1.00000      1.00000      1.00000      1.00000
      45   83   45   88  VAKRE                                                         0.00000
  13.00000     13.00000       .30000      1.10000      1.10000      1.10000
      45   91   45   96  VAKQC                                                         0.00000
   1.00000      1.00000       .30000       .30000       .30000       .30000
      45   99   45  104  VKQCI1                                                        0.00000
   0.00000      0.00000      1.00000      1.00000      1.00000      1.00000
      45  107   45  112  VKQEI1                                                        0.00000
    .20000       .20000       .20000       .20000       .20000       .20000
      45  115   45  120  VKQ                                                           0.00000
    .50000       .50000       .50000       .50000       .50000       .50000
      45  123   45  128  VAKQE                                                         0.00000
  10.00000     10.00000     15.00000     15.00000      0.00000      5.00000
      45  131   45  136  VAKZE                                                         0.00000
-500.00000   -500.00000      0.00000      0.00000      0.00000      0.00000
      45  139   45  144  VKZEI1                                                        0.00000
    .20000       .20000      0.00000      0.00000      0.00000      0.00000
      45  147   05  152  VTPITCH                                                       0.00000
    .25000       .25000      0.00000      0.00000      0.00000      0.00000
      45  155   45  160  VTROLL                                                        0.00000
   0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
      45  163   45  168  VTYAW                                                         0.00000
    .25000       .25000      0.00000      0.00000      0.00000      0.00000
       0    0    0    0              BLANK CARD-END OF BASIC LOAD                      0.00000

  NOPT=1 STORE READ/WRITE INFO

  NTAP= 2

       4    1    4    1 WEIGHT-POUNDS                                                 0.00000
       4    1    4    1 WEIGHT-NEWTONS                                                4.44800
       4    2    4    5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2                    0.00000
       4    2    4    5 IX,IY,IZ,IYZ(AIRCRAFT INERTIAS)-KG-M**2                       1.35500
      14   10   14   10 JENG(ENGINE INERTIA)-SLUG-FT**2                               0.00000
      14   10   14   10 JENG(ENGINE INERTIA)-KG-M**2                                  1.35500
      29   45   29   45 ALTITUDE-FT                                                   0.00000
```

29	45	29	45	ALTITUDE-METERS	.30480
29	10	29	10	TRUE AIRSPEED-KNOTS	0.00000
29	9	29	9	TRUE AIRSPEED-FT/SEC	0.00000
29	9	29	9	TRUE AIRSPEED-M/SEC	.30480
29	12	29	12	QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2	0.00000
29	11	29	11	MACH NUMBER	0.00000
29	12	29	12	QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2	47.88000
29	4	29	4	RHO(AIR DENSITY)-SLUGS/FT**3	0.00000
29	4	29	4	RHO(AIR DENSITY)-KG/M**3	515.38000
29	57	29	59	XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)KT	.59020
29	57	29	59	XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)FT/S	0.00000
29	57	29	59	XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)M/S	.30480
2	16	2	18	XEDOT,YEDOT,ZEDOT(FT/S)	0.00000
2	16	2	18	XEDOT,YEDOT,ZEDOT(M/S)	.30480
41	4	41	6	XE2D,YE2D,ZE2D-FT/SEC**2	0.00000
41	4	41	6	XE2D,YE2D,ZE2D-G	.03106
41	4	41	6	XE2D,YE2D,ZE2D-M/SEC**2	.30480
2	1	2	3	UDOT,VDOT,WDOT-FT/SEC**2	0.00000
2	1	2	3	UDOT,VDOT,WDOT-G	.03106
2	1	2	3	UDOT,VDOT,WDOT-M/SEC**2	.30480
3	1	3	3	U,V,W (INER. SPEED COMPONENTS)FT/SEC	0.00000
3	1	3	3	U,V,W (INER. SPEED COMPONENTS)M/SEC	.30480
29	1	29	3	UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC	0.00000
29	1	29	3	UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC	.30480
29	54	29	56	NXCG,NYCG,NZCG(BODY AXIS ACCEL.)-GEES	0.00000
3	4	3	6	P,Q,R(BODY AXIS RATES)-DEG/SEC	57.29578
3	64	3	66	THETA,PHI,PSI(EULER ANGLES)-DEG	57.29578
29	13	29	15	ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG	57.29578
2	18	2	18	ZD(RATE OF SINK)-FT/MIN	60.00000
2	18	2	18	ZD(RATE OF SINK)-FT/SEC	0.00000
2	18	2	18	ZD(RATE OF SINK)-M/SEC	.30480
28	28	28	28	NORM. ROLL CONTROL	0.00000
28	29	28	29	NORM. YAW CONTROL	0.00000
28	38	28	38	NORM. PITCH CONTROL	0.00000
3	26	3	27	THT1,THT2(THRUST DEFLECTION PITCH ANGLES)-DEG	57.29578
3	24	3	25	PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG	57.29578
3	19	3	19	LEFT ELEVON DEFLECTION-DEG	57.29578
3	20	3	20	RIGHT ELEVON DEFLECTION-DEG	57.29578
28	50	28	50	ELEVATOR COMMAND DEFLECTION-DEG	57.29578
28	51	28	51	AILERON COMMAND DEFLECTION-DEG	57.29578
3	28	3	29	DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)	0.00000
28	58	28	58	TCMD(THRUST COMMAND)-POUNDS	0.00000
28	58	28	58	TCMD(THRUST COMMAND)-NEWTONS	4.44800
23	9	23	10	TCOR1,TCOR2(THRUST APPL. TO A/C)-POUNDS	0.00000
23	9	23	10	TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS	4.44800
3	21	3	21	RUDDER DEFLECTION-DEG	57.29578
26	20	26	20	TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS	0.00000
26	20	26	20	TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS	4.44800
26	1	26	2	MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC	0.00000
26	1	26	2	MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC	.45400
15	3	15	3	BLOREF(REFERENCE RCS BLEED)-PER CENT	0.00000
26	7	26	7	BLDAVL	0.00000
27	72	27	72	BLD(ACTUAL RCS BLEED)-PER CENT	0.00000
3	38	3	39	FRCS1,FRCS2(RCS JET FORCES)-POUNDS	0.00000
3	38	3	39	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS	4.44800
11	7	11	7	SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG	57.29578
19	44	19	46	MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-FT-LB	0.00000

19	44	19	46	MM,LM,NM(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M	1.35500
19	37	19	38	XW1,XW2(WING X FORCE)-POUNDS	0.00000
19	37	19	38	XW1,XW2(WING X FORCE)-NEWTONS	4.44800
19	39	19	40	ZW1,ZW2(WING Z FORCE)-POUNDS	0.00000
19	39	19	40	ZW1,ZW2(WING Z FORCE)-NEWTONS	4.44800
19	19	19	20	CLW1,CLW2(WING LIFT COEFFICIENT)	0.00000
3	48	3	48	DFLAPH(CANARD TE FLAP DEFLECTION)-DEG	57.29578
3	49	3	49	DFLAPW(WING LE FLAP DEFLECTION)-DEG	57.29578
19	1	19	3	DXW,DYW,DZW(WING AERO FORCES)-POUNDS	0.00000
19	1	19	3	DXW,DYW,DZW(WING AERO FORCES)-NEWTONS	4.44800
19	4	19	6	DLW,DMW,DNW(WING AERO MOMENTS)-FT-POUNDS	0.00000
19	4	19	6	DLW,DMW,DNW(WING AERO MOMENTS)-NEWTON-M	1.35500
20	1	20	3	DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS	0.00000
20	1	20	3	DXH,DYH,DZH(CANARD AERO FORCES)-NEWTONS	4.44800
20	4	20	6	DLH,DMH,DNH(CANARD AERO MOMENTS)-FT-POUNDS	0.00000
20	4	20	6	DLH,DMH,DNH(CANARD AERO MOMENTS)-NEWTON-M	1.35500
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS	4.44800
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS	0.00000
21	4	21	6	DLV,DMV,DNV(VERT TAIL AERO MOMENTS)-FT POUNDS	0.00000
21	4	21	6	DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-NEWTON-M	1.35500
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS	0.00000
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS	4.44800
22	4	22	6	DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS	0.00000
22	4	22	6	DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M	1.35500
29	20	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS	0.00000
29	20	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS	4.44800
29	23	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS	0.00000
29	23	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M	1.35500
23	1	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS	0.00000
23	1	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS	4.44800
23	4	23	6	DLT,DMT,DNT(DIRECT THRUST MOMENTS)-FT-POUNDS	0.00000
23	4	23	6	DLT,DMT,DNT(DIRECT THRUST MOMENTS)-NEWTON-M	1.35500
26	23	26	24	HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC	0.00000
26	23	26	24	HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC	1.35500
24	1	24	3	DXR,DYR,DZR(RAM FORCES)-POUNDS	0.00000
24	1	24	3	DXR,DYR,DZR(RAM FORCES)-NEWTONS	4.44800
24	4	24	6	DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS	0.00000
24	4	24	6	DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M	1.35500
26	3	26	4	RPM1,RPM2(ENGINE ROT. SPEED)-RPM	0.00000
27	1	27	3	DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS	0.00000
27	1	27	3	DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS	4.44800
27	4	27	6	DLRCS,DMRCS,DNRCS(RCS MOMENTS)-FT-POUNDS	0.00000
27	4	27	6	DLRCS,DMRCS,DNRCS(RCS MOMENTS)-NEWTON-M	1.35500
25	1	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS	0.00000
25	1	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS	4.44800
25	4	25	6	DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS	0.00000
25	4	25	6	DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M	1.35500
29	26	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS	0.00000
29	26	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS	4.44800
29	29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS	0.00000
29	29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M	1.35500
29	51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS	0.00000
29	51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M	1.35500
0	0	0	0	BLANK CARD - END OF OPTION 1 LOAD	0.00000

```
NOPT=9 DIMENSIONAL DERIVATIVES

PERTURBATION VARIABLES
           29         1         1
           29         3         2
            3         5         3
           28        50         4
            3        49         5
            3        48         6
           28        54         7
           28        57         8
           26        34         9
           26        35        10
            3        26        11
            3        27        12
           29         2        13
            3         4        14
            3         6        15
            3        21        16
           28        52        17
           28        53        18
            8        55        19
           28        56        20
            3        24        21
            3        25        22
            0         0         0

NOPT=6 SET JP TRIM UNKNOWNS
      NEQU=15
   29   13   29   14  ALPHA,BETA
   .01745        .01745
    3    4    3    6  P,Q,R
   .10000        .10000        .10000
   28   20   28   20  DROLL
   .0500
   28   29   28   29  DYAW
   .05000
   28   30   28   30  DPITCH
   .05000
    2   16    2   17  XEDOT,YEDOT
  2.00000       2.00600
   29   54   29   54  NXCG
   .10000
   29   55   29   55  NYCG
   .10000
   29   56   29   56  NZCG
   .10000
    3   64    3   64  THETA
   .01745
   28   58   28   58  TCMD
  10.00000

NOPT=2 READ R
```

```
NTAP= 5
   41    4   41    3  XE20,YE20                                              32.20000
  0.00000      0.00000
   41    6   41    6  ZE2D                                                   32.20000
  9.00000
    2   16    2   17  XEDOT,YEDOT                                             0.00000
330.00000      9.00000
    2   18    2   18  ZADCT                                                   0.00000
  0.00000
    3   18    3   18  ZE                                                      0.00000
-100.00000
       65    2   66  PHIL,PSID                                                0.00000
  6.000000     0.00000
    3   65    3   66  PHI,PSI                                                  .01745
  0.00000      0.00000
    3   64    3   64  THETA                                                    .01745
  5.50000
   28   20   28   20  DROLL                                                   0.00000
  0.00000
   28   29   28   29  DYAW                                                    0.00000
  0.00000
   28   30   28   30  UPITCH                                                  0.00000
  0.00000
   29   54   29   56  NXCG,NYCG,NZCG                                          0.00000
  0.00000      0.00000      1.00000
   28   58   28   58  TCMD                                                    0.00000
4000.00000
   29    9   29    9  VA                                                      1.68900
200.00000
   29   13   29   13  ALPH                                                     .01745
  9.50000
    1    3    1    7  DT,TMAX,DTPRINT,DTPLOT,TI                               0.00000
  .02500       0.00000      .05000      .05000      0.00000
   41    1   41    1  AWIND                                                   0.00000
  0.00000
   41    2   41    2  VWIND                                                   1.68900
  0.00000
   41    7   41    7  TRMTURN                                                 0.00000
  0.00000
   41   10   41   10  TURNRAD                                                 0.00000
2640.00000
   41    8   41    9  GAMMA,VADOT                                             0.00000
  0.00000     -3.22000
   43    7   43    7  ASKEEP                                                  0.00000
  0.00000
   16    7   16   12  AKU,AKV,AKW,AKXES,AKYES,AKZES                           0.00000
  0.00000      5.00000      5.00000     2.00000      .00500      -.00500
   43  129   43  129  ATRANS                                                  0.00000
  0.00000
   43    6   43    6 ATIME                                                    0.00000
  8.00000
   43  132   43  139  THROTT(10)                                              0.00000
  .54600       .55300       .53000      .44300      .17300       .08330      .06700      .06700
   43  142   43  149  VAT(10)                                                 1.68900
  6.00000     20.00000     40.00000    60.00000    80.00000    100.00000   120.00000   200.00000
```

ORIGINAL PAGE IS
OF POOR QUALITY

```
   43  152    43  159  THETCT(18)                                                     .01745
 102.00000      96.50000      85.50000      66.89000      36.65000      22.72000      16.38000      8.24000
   43    1    43    5  ACMD(I)                                                        0.00000
 1.00000       2.00000       0.00000       0.00000       0.00000
   43    9    43   16 CMDT1(I)-DLNGSTK INPUT TABLE                                    .01745
 0.00000       0.00000      10.00000      10.00000       0.00000       0.00000       0.00000       0.00000
   43   29    43   36 CMDT2(I)-D  TSTK INPUT TABLE                                    .01745
 0.00000       0.00000      10.00000      10.00000       0.00000       0.00000       0.00000       0.00000
   43   49    43   56 CMDT3(I)-DPED INPUT TABLE                                       .01745
 0.00000       0.30000      20.00000      20.00000      20.00000      20.00000      20.00000      20.00000
   43   69    43   76 CMDT4(I)-ZEDTC INPUT TABLE                                      0.00000
 0.00000       0.00000     -10.00000     -10.00000      10.00000      10.00000       0.00000       0.00000
   43   89    43   96 CMDT5(I)-THROTTLE INPUT TABLE                                   0.00000
 0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
   43  109    43  116 TIMET(I)-INPUT CONTROL TIME TABLE                               0.00000
 0.00000        .30000        .31000       1.00000       1.01000       1.70000       1.71000      40.00000

NOPT=1 STORE READ/WRITE INFO

NTAP= 1

   29    9   29    9  VA                                                              1.60000
    0    0    0    0              BLANK CARD - END OF OPTION 1 LOAD                   0.00000

NOPT=1 LONGITUDINAL TRIM

NTAPE(1)= 1
NTAPE(2)= 2
NTAPE(3)= 8
NTAPE(4)= 8
NCASES=  4      NTAPD= 9     NPUNCH= 0
IWRITE= 0
      EXAMPLE 1 - TRANSITION TRIM RUN

CASE INPUT (READ FROM FILE 1)

   29    9   29    9  VA                                                              1.60000
 280.00000
```

RESULTS OF TRIN

```
     4    1     4     1 WEIGHT-POUNDS                                          0.00000
16375.00000
     4    1     4     1 WEIGHT-NEWTONS                                         4.44800
72836.00000
     4    2     4     5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2              0.00000
 7959.00000   52609.00000   58337.00000    -202.40000
     4    2     4     5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-KG-M**2                 1.35500
10784.44500   71285.19500   79046.63500    -274.25200
    14   10    14    10 JENG(ENGINE INERTIA)-SLUG-FT**2                         0.00000
    3.14000
    14   10    14    10 JENG(ENGINE INERTIA)-KG-M**2                            1.35500
    4.25470
    29   45    29    45 ALTITUDE-FT                                             0.00000
  100.00000
    29   45    29    45 ALTITUDE-METERS                                          .30480
   30.48000
    29   10    29    10 TRUE AIRSPEED-KNOTS                                     0.00000
  199.89342
    29    9    29     9 TRUE AIRSPEED-FT/SEC                                    0.00000
  337.60000
    29    9    29     9 TRUE AIRSPEED-M/SEC                                      .30480
  102.90048
    29   12    29    12 QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2                     0.00000
  127.48868
    29   11    29    11 MACH NUMBER                                             0.00000
    .29389
    29   12    29    12 QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2                    47.88000
 6104.16752
    29    4    29     4 RHO(AIR DENSITY)-SLUGS/FT**3                            0.00000
    .00224
    29    4    29     4 RHO(AIR DENSITY)-KG/M**3                              515.38000
   1.15299
    29   57    29    59 XOW,YOW,ZOW(AMB.WIND COMPONENTS-EARTH AXES)KT            .59020
   0.00000      0.00000      0.00000
    29   57    29    59 XOW,YOW,ZOW(AMB.WIND COMPONENTS-EARTH AXES)FT/S         0.00000
   0.00000      0.00000      0.00000
    29   57    29    59 XOW,YOW,ZOW(AMB.WIND COMPONENTS-EARTH AXES)M/S           .30480
   0.00000      0.00000      0.00000
     2   16     2    18  XEDOT,YEDOT,ZEDOT(FT/S)                                0.00000
  337.60031     -.00000      0.00000
     2   16     2    18  XEDOT,YEDOT,ZEDOT(M/S)                                  .30480
  102.90057     -.00000      0.00000
    41    4    41     6  XE2D,YE2D,ZE2D-FT/SEC**2                               0.00000
   0.00000      0.00000      0.00000
    41    4    41     6  XE2D,YE2D,ZE2D-G                                        .03106
   0.00000      0.00000      0.00000
    41    4    41     6  XE2D,YE2D,ZE2D-M/SEC**2                                 .30480
   0.00000      0.00000      0.00000
     2    1     2     3 UDOT,VDOT WDOT-FT/SEC**2                                0.00000
    .00000       .00000      -.00001
     2    1     2     3 UDOT,VDOT,WDOT-G                                         .03106
    .00000       .00000      -.00000
     2    1     2     3 UDOT,VDOT,WDOT-M/SEC**2                                  .30480
    .00000       .00000      -.00000
     3    1     3     3 U,V,W (INER. SPEED COMPONENTS)FT/SEC                    0.00000
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334.11431        -.00000       48.38790
     3    1    3    3 U,V,W (INER. SPEED COMPONENTS)M/SEC                          .30480
101.83804        -.00000       14.74863
    29    1   29    3 UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC                      0.00000
334.11431        -.00000       48.38790
    29    1   29    3 UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC                        .30480
101.83804        -.00000       14.74863
    29   54   29   56 NXCG,NYCG,NZCG(BODY AXIS ACCEL.)-GEES                       0.00000
  .14333         0.00000         .98968
     3    4    3    6 P,Q,R(BODY AXIS RATES)-DEG/SEC                             57.29578
 -.00000         -.00000       -.00000
     3   64    3   66 THETA,PHI,PSI(EULER ANGLES)-DEG                            57.29578
 8.24053         0.00000        0.00000
    29   13   29   14 ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG              57.29578
 8.24053         -.00000
     2   18    2   18 ZD(RATE OF SINK)-FT/MIN                                    60.00000
 0.00000
     2   18    2   18 ZD(RATE OF SINK)-FT/SEC                                     0.00000
 0.00000
     2   18    2   18 ZD(RATE OF SINK)-M/SEC                                       .30480
 0.00000
    28   28   28   28  NORM. ROLL CONTROL                                         0.00000
 -.00000
    28   29   28   29  NORM. YAW CONTROL                                          0.00000
  .00000
    28   38   28   38  NORM. PITCH CON ROL                                        0.00000
  .03231
     3   26    3   27 THT1,THT2(THRUST DEFLECTION PITCH ANGLES)-DEG              57.29578
 -.48507         -.48507
     3   24    3   25 PSIT1,PSIT2(THRUST D.FLECTION PITCH ANGLES)-DEG            57.29578
 -.00000         -.00000
     3   19    3   19 LEFT ELEVON DEFLECTION-DEG                                 57.29578
 -.80722
     3   20    3   20 RIGHT ELEVON DEFLECTION-DEG                                57.29578
 -.80722
    28   50   28   50 ELEVATOR COMMAND DEFLECTION-DEG                            57.29578
 -.80722
    28   51   28   51 AILERON COMMAND DEFLECTION-DEG                             57.29578
 -.00000
     3   28    3   29 DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)                      0.00000
  .00000         -.00000
    28   58   28   58 TCMD(THRUST COMMAND)-POUNDS                                 0.00000
3778.75155
    28   58   28   58 TCMD(THRUST COMMAND)-NEWTONS                                4.44800
16807.886..
    23    9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-POUNDS                     0.00000
1887.29634       1887.29634
    23    9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS                    4.44800
8..34.69413      8394.69413
     3   21    3   21 RUDDER DEFLECTION-DEG                                      57.29578
 -.00000
    26   20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS                   0.00000
 404.05955
    26   20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS                   4.44800
1797.25689
    26    1   26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC                0.000.0
  80.77861       80.77861
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  26    1   26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC              .45400
 36.67349      36.67349
  15    3   15    3 BLDREF(REFERENCE RCS BLEED)-PER CENT                    0.00000
 3.50000
  26    7   26    7  BLDAVL                                                 0.00000
 31.58676
  27   72   27   72 BLD(ACTUAL RCS BLEED)-PER CENT                          0.00000
 3.50000
   3   38    3   39 FRCS1,FRCS2(RCS JET FORCES)-POUNDS                      0.00000
  .00000     0.00000
   3   38    3   39 FRCS1,FRCS2(RCS JET FORCES)-NEWTONS                     4.44800
  .00000     0.00000
  11    7   11    7 SIGV(ENGINE CENTER LINE ANGLE WRT FRL)-DEG             57.29578
 0.00000
  19   44   19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-FT-LB             0.00000
 -1960.10856      .00000      .00000
  19   44   19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M          1.35500
 -2655.94710      .00000      .00000
  19   37   19   38 XW1,XW2(WING X FORCE)-POUNDS                            0.00000
  393.15708    393.15708
  19   37   19   38 XW1,XW2(WING X FORCE)-NEWTONS                           4.44800
 1748.76270   1748.76270
  19   39   19   40 ZW1,ZW2(WING Z FORCE)-POUNDS                            0.00000
 -7061.56847  -7061.56847
  19   39   19   40 ZW1,ZW2(WING Z FORCE)-NEWTONS                           4.44800
-31409.85654 -31409.85654
  19   19   19   20 CLW1,CLW2(WING LIFT COEFFICIENT)                        0.00000
  .31577        .31577
   3   48    3   48  DFLAPH(CANARD TE FLAP DEFLECTION)-DEG                 57.29578
 -11.99774
   3   49    3   49  DFLAPH(WING LE FLAP DEFLECTION)-DEG                   57.29578
 23.53412
  19    1   19    3 DXW,DYW,DZW(WING AERO FORCES)-POUNDS                    0.00000
  786.31416       .00000  -14123.13693
  19    1   19    3 DXW,DYW,DZW(WING AERO FORCES)-NEWTONS                   4.44800
 3497.52540       .00000  -62819.71308
  19    4   19    6 DLW,DMW,DNW(WING AERO MOMENTS)-FT-POUNDS                0.00000
  .00000  -51220.93800       .00000
  19    4   19    6 DLW,DMW,DNW(WING AERO MOMENTS)-NEWTON-M                 1.35500
  .00000  -69404.37099       .00000
  20    1   20    3 DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS                  0.00000
 -333.49703     0.00000     226.77669
  20    1   20    3 DXH,DYH,DZH(CANARD AERO FORCES)-NEWTONS                 4.44800
 -1483.39480    0.00000    1008.70273
  20    4   20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-FT-POUNDS              0.00000
  0.00000   -9805.40041     0.00000
  20    4   20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-NEWTON-M               1.35500
  0.00000  -1.286.31756     0.00000
  21    1   21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS             0.40800
 -143.63189     -.00000     0.00000
  21    1   21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS              0.00000
 -32.29134      -.00000     0.00000
  21    4   21    6  DLV,DMV,DNV(VERT TAIL AERO MOMENTS)-FT POUNDS          0.00000
  -.00000    156.06858      .00000
  21    4   21    6 DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-NEWTON-M           1.35500
  -.00000    211.47292      .00000
  22    1   22    3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS                0.00000
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    -180.18719        .00000   -2037.55753
       22    1    22     3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS                  4.44800
    -801.47261        .00000   -9063.05589
       22    4    22     6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS               0.00000
      0.00000    57207.48296         .00000
       22    4    22     6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M                1.35500
      0.00000    77516.13944         .00000
       29   20    29    22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS                0.00000
     240.33860        .00000  -15933.91777
       29   20    29    22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS               0.44800
    1069.02611        .00000  -70874.06624
       29   23    29    25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS            0.00000
       .00000    -3662.78685         .00000
       29   23    29    25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M             1.35500
       .00000    -4963.87619         .00000
       23    1    23     3 DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS                   0.00000
    3774.45741       -.00000      31.95572
       23    1    23     3 DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS                  4.44800
   16788.78657       -.00000     142.13905
       23    4    23     6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-FT-POUNDS               0.00000
      -.00000       83.57357         .00000
       23    4    23     6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-NEWTON-M                1.35500
      -.00000      113.24219         .00000
       26   23    26    24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC            0.00000
     961.19377      961.19377
       26   23    26    24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC               1.35500
    1302.41756     1302.41756
       24    1    24     3 DXR,DYR,DZR(RAM FORCES)-POUNDS                             0.00000
   -1667.71450        .00000    -304.08635
       24    1    24     3 DXR,DYR,DZR(RAM FORCES)-NEWTONS                            4.44800
   -7417.99488        .00000   -1352.57610
       24    4    24     6 DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS                         0.00000
       .00000     3578.87715         .00000
       24    4    24     6 DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M                          1.35500
       .00000     4849.37854         .00000
       26    3    26     4 RPM1,RPM2(ENGINE ROT. SPEED)-RPM                           0.00000
    2923.29252     2923.29252
       27    1    27     3 DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS                       0.00000
       .00000      0.00000         .00000
       27    1    27     3 DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS                      4.44800
       .00000      0.00000         .00000
       27    4    27     6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-FT-POUNDS                   0.00000
      -.00000         .00000         .00000
       27    4    27     6 DLRCS,DM CS,DNRCS(RCS MOMENTS)-NEWTON-M                    1.35500
      -.00000         .00000         .00000
       25    1    25     3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS                  0.00000
      0.00000        -.00000         .00000
       25    1    25     3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS                 4.44800
      0.00000        -.00000         .00000
       25    4    25     6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS               0.00000
      -.00000         .00000         .00000
       25    4    25     6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M                1.35500
      -.00000         .00000         .00000
       29   26    29    28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS                     0.00000
    2347.08152        .00000  -16206.04840
       29   26    29    26 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS                    4.44800
   10439.81860        .00000  -72084.50329
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29   29    29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS          0.00000
 0.00          -.33613          .00000
     29    29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M           1.35500
 00            -.45545          .00000
     51    29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS  0.00000
 .00000        -.00000          .00000
 .9  51    29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M   1.35500
 0.00000       -.00000          .00000
```

EXAMPLE 1 - TRANSITION TRIM RUN

LONGITUDINAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
X/U	-.5099E-02	-.4413E-02	-.3798E-03	-.2119E-02	-.1281E-01	0.	-.1060E-01	0.	.3639E-23	-.2269E-01
Z/U	-.6066E-01	.8903E-02	0.	-.7868E-02	-.5963E-01	0.	-.1446E-03	.5343E-19	.1228E-19	-.5977E-01
M/U	-.21[illegible]4E-02	-.1540E-02	.1776E-04	.2137E-02	-.1499E-02	0.	.2407E-04	.1378E-20	.1312E-20	-.1475E-02
X/W	.9907E-01	.3413E-02	0.	0.	.1025E+00	0.	.5961E-03	0.	.4203E-23	.1031E+00
Z/W	-.7277E+00	-.4332E-01	0.	-.1112E+00	-.8822E+00	0.	-.1234E-01	.1480E-19	.1418E-19	-.8945E+00
M/W	-.2563E-01	.2930E-02	0.	.3019E-01	.7494E-02	0.	.1352E-02	.3818E-21	.1515E-20	.8846E-02
X/Q	.3178E+00	-.5283E-01	.1836E-02	0.	.2676E+00	0.	.2577E-01	0.	.2505E-22	.2934E+00
Z/Q	-.2336E+01	.6690E+00	0.	0.	-.1667E+01	0.	.3584E+01	-.5508E+00	.8455E-19	.1366E+01
M/Q	-.8228E-01	-.4538E-01	-.8583E-04	0.	-.1277E+00	0.	-.3915E+00	-.1421E-01	.9031E-20	-.5335E+00
X/DE	.1394E+02	-.[illegible]E+00	0.	0.	.1359E+02	0.	0.	0.	0.	.1359E+02
Z/DE	-.7704E+02	.3[illegible]E+01	0.	0.	-.7319E+02	0.	0.	0.	0.	-.7319E+02
M/DE	-.6841E+01	-.2738E+00	0.	0.	-.7115E+01	0.	0.	0.	0.	-.7115E+01
X/FLAPW	-.5304E+00	.1004E-02	0.	0.	-.5294E+00	0.	0.	0.	0.	-.5294E+00
Z/FLAPW	.1503E+00	-.1106E-01	0.	0.	.1392E+00	0.	0.	0.	0.	.1392E+00
M/FLAPW	-.2311E+00	.7865E-03	0.	0.	-.2303E+00	0.	0.	0.	0.	-.2303E+00
X/FLAPH	0.	.2831E+01	0.	0.	.2831E+01	0.	0.	0.	0.	.2831E+01
Z/FLAPH	0.	-.2786E+01	0.	0.	-.2786E+01	0.	0.	0.	0.	-.2786E+01
M/FLAPH	0.	.9410E+00	0.	0.	.9410E+00	0.	0.	0.	0.	.9410E+00
X/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/TO1	0.	0.	0.	0.	0.	.1773E-02	-.1662E-03	0.	.6125E-23	.1607E-02
Z/TO1	0.	0.	0.	0.	0.	.1501E-04	-.3031E-04	.1241E-19	.2067E-19	-.1530E-04
M/TO1	0.	0.	0.	0.	0.	.3798E-06	.3451E-05	.3201E-21	.2208E-20	.3831E-05
X/TO2	0.	0.	0.	0.	0.	.1773E-02	-.1662E-03	0.	.6125E-23	.1607E-02
Z/TO2	0.	0.	0.	0.	0.	.1511E-04	-.3031E-04	.1241E-19	.2067E-19	-.1530E-04
M/TO2	0.	0.	0.	0.	0.	.3798E-06	.3451E-05	.3201E-21	.2208E-20	.3831E-05
X/THT1	0.	0.	0.	0.	0.	.2655E+00	0.	0.	0.	.2655E+00
Z/THT1	0.	0.	0.	0.	0.	-.3702E+01	0.	0.	0.	-.3702E+01
M/THT1	0.	0.	0.	0.	0.	-.4463E+00	0.	0.	0.	-.4463E+00
X/THT2	0.	0.	0.	0.	0.	.2655E+00	0.	0.	0.	.2655E+00
Z/THT2	0.	0.	0.	0.	0.	-.3702E+01	0.	0.	0.	-.3702E+01
M THT2	0.	0.	0.	0.	0.	-.4463E+00	0.	0.	0.	-.4463E+00

X/V	.1430E-14	.7148E-15	.7752E-03	0.	.7752E-03	0.	.3669E-04	0.	0.	.8119E-03	*
Z/V	0.	-.7148E-15	0.	0.	0.	.8935E-16	.1597E-05	.2534E-17	0.	.1597E-05	*
M/V	.8851E-15	.2213E-15	-.3625E-04	0.	-.3625E-04	.1383E-16	-.7657E-07	.6538E-19	0.	-.3632E-04	*
X/P	.7148E-13	.3574E-13	.3634E-03	0.	.3634E-03	0.	.7400E-04	0.	-.2726E-23	.4374E-03	*
Z/P	0.	-.3574E-13	0.	0.	0.	.4467E-14	.1349E-04	.1267E-15	-.9201E-20	.1349E-04	*
M/P	.4426E-13	.1106E-13	-.1699E-04	0.	-.1699E-04	.6915E-15	-.1536E-05	.3268E-17	-.9828E-21	-.1853E-04	*
X/R	.7148E-13	.3574E-13	.1953E-02	0.	.1953E-02	0.	0.	0.	0.	.1953E-02	*
Z/R	0.	-.3574E-13	0.	0.	0.	.4467E-14	0.	.1267E-15	0.	0.	*
M/R	.4426E-13	.1106E-13	-.9132E-04	0.	-.9132E-04	.6915E-15	0.	.3269E-17	0.	-.9132E-04	*
X/DR	.4096E-12	.2048E-12	-.1019E+00	0.	-.1019E+00	0.	0.	0.	0.	-.1019E+00	*
Z/DR	0.	-.2048E-12	0.	0.	0.	.2560E-13	0.	.7261E-15	0.	0.	*
M/DR	.2536E-12	.6341E-13	.4764E-02	0.	.4764E-02	.3963E-14	0.	.1873E-16	0.	.4764E-02	*
X/DA	-.3122E+01	.7149E-03	0.	0.	-.3122E+01	0.	0.	0.	0.	-.3122E+01	*
Z/DA	-.2905E+00	-.7879E-02	0.	0.	-.2983E+00	.2560E-13	0.	.7261E-15	0.	-.2983E+00	*
M/DA	-.9801E-02	.5601E-03	0.	0.	-.9241E-02	.3963E-14	0.	.1873E-16	0.	-.9241E-02	*
X/DRCSR	.1430E-12	.7148E-13	0.	0.	.2859E-12	0.	0.	0.	.4822E-03	.4822E-03	*
Z/DRCSR	0.	-.7148E-13	0.	0.	0.	.8935E-14	0.	.2534E-15	.1627E+01	.1627E+01	*
M/DRCSR	.8851E-13	.2213E-13	0.	0.	.8851E-13	.1383E-14	0.	.6537E-17	.1738E+00	.1738E+00	*
X/DRCSY	.1430E-12	.7148E-13	0.	0.	.2859E-12	0.	0.	0.	-.2729E-18	.5718E-12	*
Z/DRCSY	0.	-.7148E-13	0.	0.	0.	.8935E-14	0.	.2534E-15	-.9210E-15	0.	*
M/DRCSY	.8851E-13	.2213E-13	0.	0.	.8851E-13	.1383E-14	0.	.6537E-17	-.9838E-16	.9485E-13	*
X/DRCSS	.1430E-12	.7148E-13	0.	0.	.2859E-12	0.	0.	0.	-.2729E-18	.5718E-12	*
Z/DRCSS	0.	-.7148E-13	0.	0.	0.	.8935E-14	0.	.2534E-15	-.9210E-15	0.	*
M/DRCSS	.8851E-13	.2213E-13	0.	0.	.8851E-13	.1383E-14	0.	.6537E-17	-.9838E-16	.9485E-13	*
X/PSIT1	.4096E-12	.2048E-12	0.	0.	.8193E-12	-.3345E+00	0.	0.	-.7820E-18	-.3345E+00	*
Z/PSIT1	0.	-.2048E-12	0.	0.	0.	-.2559E-02	0.	.7261E-15	-.2639E-14	-.2559E-02	*
M/PSIT1	.2536E-12	.6341E-13	0.	0.	.2536E-12	-.3870E-04	0.	.1873E-16	-.2819E-15	-.3870E-04	*
X/PSIT2	.4096E-12	.2048E-12	0.	0.	.8193E-12	-.3345E+00	0.	0.	-.7820E-18	-.3345E+00	*
Z/PSIT2	0.	-.2048E-12	0.	0.	0.	-.2559E-02	0.	.7261E-15	-.2639E-14	-.2559E-02	*
M/PSIT2	.2536E-12	.6341E-13	0.	0.	.2536E-12	-.3870E-04	0.	.1873E-16	-.2819E-15	-.3870E-04	*

LATERAL-DIRECTIONAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
Y/U	-.7873E-17	0.	-.7676E-16	.3618E-16	-.4765E-16	0.	.7002E-18	-.1314E-19	0.	-.4697E-16
L/U	0.	0.	-.2372E-16	0.	-.2372E-16	0.	.8149E-20	-.6999E-22	-.1047E-19	-.2373E-16
N/U	-.7483E-16	0.	.7506E-17	.5086E-17	-.6224E-16	0.	.3863E-19	.3056E-21	.4233E-24	-.6220E-16
Y/W	.8174E-16	0.	0.	0.	.8174E-16	0.	-.1885E-19	-.3639E-20	0.	.8171E-16
L/W	0.	0.	0.	0.	0.	0.	.2257E-20	-.1939E-22	-.1209E-19	-.9854E-20
N/W	.7483E-16	0.	0.	0.	.7483E-16	0.	.5135E-20	.8465E-22	.4889E-24	.7484E-16
Y/Q	.2624E-15	0.	.3710E-15	0.	.6334E-15	0.	.6042E-18	-.1183E-19	0.	.6340E-15
L/Q	0.	0.	.1147E-15	0.	.1147E-15	0.	0.	.2857E-15	-.7208E-19	.4003E-15
N/Q	.2494E-14	0.	-.3628E-16	0.	.2458E-14	0.	-.1214E-17	.2753E-21	.2914E-23	.2457E-14
Y/DE	.9012E-14	0.	0.	0.	.9012E-14	0.	0.	0.	0.	.9012E-14
L/DE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DE	.3574E-14	0.	0.	0.	.3574E-14	0.	0.	0.	0.	.3574E-14
Y/FLAPW	-.2589E-16	0.	0.	0.	-.2589E-16	0.	0.	0.	0.	-.2589E-16
L/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPW	.1429E-13	0.	0.	0.	.1429E-13	0.	0.	0.	0.	.1429E-13
Y/FL[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/TO1	0.	0.	0.	0.	0.	-.1330E-17	.1477E-18	-.2893E-20	0.	-.1186E-17
L/TO1	0.	0.	0.	0.	0.	-.1776E-05	.5330E-05	-.2198E-20	-.1762E-19	.3554E-05
N/TO1	0.	0.	0.	0.	0.	.2862E-04	-.3988E-05	.6730E-22	.7124E-24	.2463E-04
Y/TO2	0.	0.	0.	0.	0.	-.1330E-17	.1477E-18	-.2893E-20	0.	-.1186E-17
L/TO2	0.	0.	0.	0.	0.	.1776E-05	-.5330E-05	.2167E-20	-.1762E-19	-.3554E-05
N/TO2	0.	0.	0.	0.	0.	-.2862E-04	.3988E-05	.6730E-22	.7124E-24	-.2463E-04
Y/THT1	0.	0.	0.	0.	0.	-.1992E-15	0.	0.	0.	-.1992E-15
L/THT1	0.	0.	0.	0.	0.	.4379E+00	0.	0.	0.	.4379E+00
N/THT1	0.	0.	0.	0.	0.	.4284E-02	0.	0.	0.	.4284E-02
Y/THT2	0.	0.	0.	0.	0.	-.1992E-15	0.	0.	0.	-.1992E-15
L/THT2	0.	0.	0.	0.	0.	-.4379E+00	0.	0.	0.	-.4379E+00
N/THT2	0.	0.	0.	0.	0.	-.4284E-02	0.	0.	0.	-.4284E-02

Y/V	.7768E-02	0.	-.1226E+00	-.5890E-01	-.1893E+00	0.	-.1235E-01	-.1288E-22	0.	-.2016E+00
L/V	-.3372E-01	0.	-.3790E-01	0.	-.7162E-01	0.	-.6580E-04	-.6862E-25	-.7844E-22	-.7169E-01
N/V	-.1285E-02	0.	.1199E-01	-.8280E-02	.2421E-02	0.	-.1219E-02	.2996E-24	.3171E-26	.1203E-02
Y/P	0.	0.	-.5869E+00	0.	-.5869E+00	0.	-.2645E-01	.6439E-21	0.	-.6133E+00
L/P	-.1326E+01	0.	-.1814E+00	0.	-.1507E+01	0.	-.1536E+00	.3431E-23	.3922E-20	-.1661E+01
N/P	-.3961E-01	0.	.5738E-01	0.	.1777E-01	0.	-.2606E-02	-.1498E-22	-.1586E-24	.1516E-01
Y/R	0.	0.	.1363E+01	0.	.1363E+01	0.	-.3584E+01	.5508E+00	0.	-.1671E+01
L/R	.4170E+00	0.	.4212E+00	0.	.8382E+00	0.	-.1910E-01	.2935E-02	0.	.8220E+00
N/R	-.2091E-01	0.	-.1333E+00	0.	-.1542E+00	0.	-.3740E+00	-.1281E-01	0.	-.5410E+00
Y/DR	0.	0.	.2036F 02	0.	.2036E+02	0.	0.	0.	0.	.2036E+02
L/DR	0.	0.	.6293L+01	0.	.6293E+01	0.	0.	0.	0.	.6293E+01
N/DR	0.	0.	-.1991E+01	0.	-.1991E+01	0.	0.	0.	0.	-.1991E+01
Y/DA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DA	-.2874E+02	0.	0.	0.	-.2874E+02	0.	0.	0.	0.	-.2874E+02
N/DA	-.7093E+00	0.	0.	0.	-.7093E+00	0.	0.	0.	0.	-.7093E+00
Y/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	.1387E+01	.1387E+01
N/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	-.5609E-04	-.5609E-04
Y/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/PSIT1	0.	0.	0.	0.	0.	.3703E+01	0.	0.	0.	.3703E+01
L/PSIT1	0.	0.	0.	0.	0.	.1973E-01	0.	0.	0.	.1973E-01
N/PSIT1	0.	0.	0.	0.	0.	-.4024E+00	0.	0.	0.	-.4024E+00
W/PSIT2	0.	0.	0.	0.	0.	.3703E+01	0.	0.	0.	.3703E+01
L/PSIT2	0.	0.	0.	0.	0.	.1973E-01	0.	0.	0.	.1973E-01
N/PSIT2	0.	0.	0.	0.	0.	-.4024E+00	0.	0.	0.	-.4024E+00

EXAMPLE 1 - TRANSITION TRIM RUN

CASE I ?UT (READ FROM FILE 1)

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   29    9   29    9  VA                                   1.68800
180.00000
```

RESULTS OF TRIM

```
     4    1     4     1 WEIGHT-POUNDS                                            0.00000
 16375.00000
     4    1     4     1 WEIGHT-NEWTONS                                           4.44800
 72836.60000
     4    2     4     5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2               0.00000
  7959.00000  52609.00000   58331.00000    -202.40000
     4    2     4     5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-KG-M**2                  1.35500
 10784.44500  71285.19500   79046.63500    -274.25200
    14   10    14    10 JENG(ENGINE INERTIA)-SLUG-FT**2                          0.00000
     3.14000
    14   10    14    10 JENG(ENGINE INERTIA)-KG-M**2                             1.35500
     4.25470
    29   45    29    45 ALTITUDE-FT                                              0.00000
   100.00000
    29   45    29    45 ALTITUDE-METERS                                           .30480
    30.48000
    29   10    29    10 TRUE AIRSPEED-KNOTS                                      0.00000
   179.90408
    29    9    29     9 TRUE AIRSPEED-FT/SEC                                     0.00000
   303.84000
    29    9    29     9 TRUE AIRSPEED-M/SEC                                       .30480
    92.61043
    29   12    29    12 QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2                      0.00000
   103.26599
    29   11    29    11 MACH NUMBER                                              0.00000
     .26450
    29   12    29    12 QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2                     47.88000
  4944.37569
    29    4    29     4 RHO(AIR DENSITY)-SLUGS/FT**3                             0.00000
     .00224
    29    4    29     4 RHO(AIR DENSITY)-KG/M**3                               515.38000
     1.15299
    29   57    29    59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)KT             .59020
     0.00000      0.00000      0.00000
    29   57    29    59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)FT/S          0.00000
     0.00000      0.00000      0.00000
    29   57    29    59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)M/S            .30480
     0.00000      0.00000      0.00000
     2   16     2    18 XEDOT,YEDOT,ZEDOT(FT/S)                                  0.00000
   303.84001      -.00000      0.00000
     2   16     2    18 XEDOT,YEDOT,ZEDOT(M/S)                                    .30480
    92.61043      -.00...      0.00000
    41    4    41     6 XE2D,YE2D,ZE2D-FT/SEC**2                                 0.00000
     0.00000      0.00000      0.00000
    41    4    41     6 XE2D,YE2D,ZE2D-G                                          .03106
     0.00000      0.00000      0.00000
    41    4    41     6 XE2D,YE2D,ZE2D-M/SEC**2                                  30480
     0.00000      0.00000      0.00000
     2    1     2     3 UDOT,VDOT,WDOT-FT/SEC**2                                 0.00000
      .00000       .00000      -.00000
     2    1     2     3 UDOT,VDOT,WDOT-G                                          .03106
      .00000       .00000      -.00000
     2    1     2     3 UDOT,VDOT,WDOT-M/SEC**2                                   .30480
      .00000       .00000      -.00000
     3    1     3     3 U,V,W (INER. SPEED COMPONENTS)FT/SEC                     0.00000
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  299.64576      -.00000      50.31068
    3    1    3    3 U,V,W (INER. SPEED COMPONENTS)M/SEC                   .30480
   91.33203      -.00000      15.33469
   29    1   29    2 UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC               0.00000
  299.64576      -.00000      50.31068
   29    1   29    3 UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC                 .30480
   91.33203      -.00000      15.33469
   29   56   29   56 NXCG,NYCG,NZCG(BODY AXIS ACCEL.)-GEES                0.00000
    .16558      0.00000       .98620
    3    4    3    6 P,Q,R(BODY AXIS RATES)-DEG/SEC                      57.29578
   -.00000      -.00000      -.00000
    3   64    3   66 THETA,PHI,PSI(EULER ANGLES)-DEG                     57.29578
   9.53109      0.00000      0.00000
   29   13   29   14 ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG       57.29578
   9.53109      -.00000
    2   18    2   18 ZD(RATE OF SINK)-FT/MIN                             60.00000
   0.00000
    2   18    2   18 ZD(RATE OF SINK)-FT/SEC                              0.00000
   0.00000
    2   18    2   18 ZD(RATE OF SINK)-M/SEC                               .30480
   0.00000
   28   20   28   20  NORM. ROLL CONTROL                                  0.00000
   -.00000
   28   29   28   29  NORM. YAW CONTROL                                   0.00000
    .00000
   28   30   28   30  NORM. PITCH CONTROL                                 0.00000
    .01730
    3   26    3   27 THT1,THT2(THRUST DEFLECTION PITCH ANGLES)-DEG       57.29578
   -.25974      -.25974
    3   24    3   25 PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG     57.29578
   -.00000      -.00000
    3   19    3   19 LEFT ELEVON DEFLECTION-DEG                          57.29578
   -.43223
         28    3   20 RIGHT ELEVON DEFLECTION-DEG                         57.29578
   -.43223
   28   50   28   50 ELEVATOR COMMAND DEFLECTION-DEG                     57.29578
   -.43223
   28   51   28   51 AILERON COMMAND DEFLECTION-DEG                      57.29578
   -.00000
    3   28    3   29 DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)               0.00000
    .00000      -.00000
   28   58   28   58 TCMD(THRUST COMMAND)-POUNDS                          0.00000
 3617.79952
   28   58   28   58 TCMD(THRUST COMMAND)-NEWTONS                         4.44800
16091.97226
   23    9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-POUNDS              0.00000
 1807.83373   1807.83373
   23    9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS             4.44800
 8041.24442   8041.24442
    3   21    3   21 RUDDER DEFLECTION-DEG                               57.29578
   -.00000
   26   20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS            0.00000
  386.84905
   26   20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS           4.44800
 1720.70458
   26    1   26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC         0.00000
   79.66145     79.66145
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     26    1   26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC             .45400
  36.16630       36.16630
     15    3   15    3 BLDREF(REFERENCE RCS BLEED)-PER CENT                    0.00000
  3.50000
     26    7   26    7  BLDAVL                                                 0.00000
  31.83830
     27   72   27   72 BLD(ACTUAL RCS BLEED)-PER CENT                          0.00000
  3.50000
      3   38    3   39 FRCS1,FRCS2(RCS JET FORCES)-POUNDS                      0.00000
  .00000       0.00000
      3   38    3   39 FRCS1,FRCS2(RCS JET FORCES)-NEWTONS                     4.44800
  .00000       0.00000
     11    7   11    7 SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG              57.29578
  0.00000
     19   44   19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-FT-LB             0.00000
 -3716.02368       .00000       .00000
     19   44   19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M          1.35500
 -5035.21208       .00000       .00000
     19   37   19   38 XW1,XW2(WING X FORCE)-POUNDS                            0.00000
  497.85040     497.85040
     19   37   19   38 XW1,XW2(WING X FORCE)-NEWTONS                           4.44800
  2214.43859    2214.43859
     19   39   19   40 ZW1,ZW2(WING Z FORCE)-POUNDS                            0.00000
 -6956.04363   -6956.04363
     19   39   19   40 ZW1,ZW2(WING Z FORCE)-NEWTONS                           4.44800
 -30940.48207  -30940.48207
     19   19   19   20 CLW1,CLW2(WING LIFT COEFFICIENT)                        0.00000
  .38417        .38417
      3   48    3   48  DFLAPH(CANARD TE FLAP DEFLECTION)-DEG                  57.29578
 -11.99774
      3   49    3   49  DFLAPW(WING LE FLAP DEFLECTION)-DEG                    57.29578
  28.91575
     19    1   19    3 DXW,DYW,DZW(WING AERO FORCES)-POUNDS                    0.00000
  995.70081     .00000   -13912.08726
     19    1   19    3 DXW,DYW,DZW(WING AERO FORCES)-NEWTONS                   4.44800
  4428.47719    .00000   -61880.96416
     19    4   19    6 DLW,DMW,DNW(WING AERO MOMENTS)-FT-POUNDS                0.00000
  0.00000   -52627.69243      -.00000
     19    4   19    6 DLW,DMW,DNW(WING AERO MOMENTS)-NEWTON-M                 1.35500
  0.00000   -71310.52325      -.00000
     20    1   20    3 DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS                  0.00000
 -257.03433     0.00000       50.03508
     20    1   20    3 DXH,DYH,DZH(CANARD AERO FORCES)-NEWTONS                 4.44800
 -1143.28870    0.00000      222.55603
     20    4   20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-FT-POUNDS              0.000
  0.00000   -6969.30136       0.00000
     20    4   20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-NEWTON-M               1.355
  0.00000   -9443.40334       0.00000
     21    1   21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS             4.44800
 -115.52027     .00000        0.00000
     21    1   21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS              0.00000
 -25.97241      .00000        0.00000
     21    4   21    6  DLV,DMV,DNV(VERT TAIL AERO MOMENTS)-FT POUNDS          0.00000
  .00000      125.52828      -.00000
     21    4   21    6 DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-NEWTON-M           1.35500
  .00000      170.09083      -.00000
     22    1   22    3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS                0.00000
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 -144.92724        .00000   -1991.71256
     22    1    22     3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS                4.44800
 -644.63638        .00000   -8859.13748
     22    4    22     6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS             0.00000
    0.00000   55920.31680      .00000
     22    4    22     6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M              1.35500
    0.00000   75772.02927      .00000
     29   20    29    22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS              0.00000
  567.76683        .00000  -15853.76475
     29   20    29    22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS             4.44800
 2525.42685        .00000  -70517.54560
     29   23    29    25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS          0.00000
     .00000   -3551.14870     -.00000
     29   23    29    25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M           1.35500
     .00000   -4811.80649     -.00000
     23    1    23     3 DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS                 0.00000
 3615.63031       -.00000    16.39076
     23    1    23     3 DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS                0.44800
16082.32360       -.00000    72.90609
     23    4    23     6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-FT-POUNDS             0.00000
    -.00000     -97.09713     -.00000
     23    4    23     6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-NEWTON-M              1.35500
    -.00000    -131.56661     -.00000
     26   23    26    24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC          0.00000
  937.03650     937.03650
     26   23    26    24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC             1.35500
 1269.68446    1269.68446
     24    1    24     3 DXR,DYR,DZR(RAM FORCES)-POUNDS                           0.00000
-1471.97242        .00000    -311.58847
     24    1    24     3 DXR,DYR,DZR(RAM FORCES)-NEWTONS                          4.44800
-6547.33334        .00000   -1385.94552
     24    4    24     6 DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS                       0.00000
     .00000    3648.45932      .00000
     24    4    24     6 DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M                        1.35500
     .00000    4943.66237      .00000
     26    3    26     4 RPM1,RPM2(ENGINE ROT. SPEED)-RPM                         0.00000
 2849.82265    2849.82265
     27    1    27     3 DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS                     0.00000
     .00000       0.00000      .00000
     27    1    27     3 DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS                    4.44800
     .00000       0.00000      .00000
     27    4    27     6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-FT-POUNDS                 0.00000
    -.00000        .00000      .00000
     27    4    27     6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-NEWTON-M                  1.35500
    -.00000        .00000      .00000
     25    1    25     3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS                0.00000
    0.00000       -.00000      .00000
     25    1    25     3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS               4.44800
    0.00000       -.00000      .00000
     25    4    25     6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS             0.00000
    -.00000        .00000      .00000
     25    4    25     6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M              1.35500
    -.00000        .00000      .00000
     29   26    29    28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS                   0.00000
 2711.42471        .00000  -16148.96246
     29   26    29    28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS                  4.44800
12060.41710        .00000  -71830.58504
```

```
 29   29   29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS              0.08000
-.00080        .21348       -.00000
 29   29   29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M               1.35580
-.00000        .28976       -.00000
 29   51   29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS       0.08000
0.00000       -.00000        .00000
 29   51   29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M       1.35580
0.00000       -.00000        .00000
```

EXAMPLE 1 - TRANSITION TRIM RUN

LONGITUDINAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
X/U	-.4321E-02	-.4037E-02	-.3406E-03	-.1901E-02	-.1060E-01	0.	-.1047E-01	0.	.7209E-22	-.2107E-01
Z/U	-.6938E-01	.7897E-02	0.	-.9180E-02	-.7066E-01	0.	-.1517E-03	.2329E-19	.2433E-18	-.7081E-01
M/U	-.2654E-02	-.1367E-02	.1593E-04	.2493E-02	-.1512E-02	0.	.2458E-04	.6007E-21	.2598E-19	-.1487E-02
X/W	.1835E+00	.3971E-02	0.	-.1787E-15	.1075E+00	0.	.7174E-03	0.	.8496E-22	.1082E+00
Z/W	-.6730E+00	-.4316E-01	0.	-.1009E+00	-.8171E+00	0.	-.1215E-01	.6927E-20	.2067E-18	-.8293E+00
M/W	-.2394E-01	.2876E-02	0.	.2741E-01	.6348E-02	0.	.1332E-02	.1787E-21	.3062E-19	.7680E-02
X/Q	.3321E+00	-.6279E-01	.1646E-02	0.	.2709E+00	0.	.2548E-01	0.	.5767E-21	.2963E+00
Z/Q	-.2161E+01	.6802E+00	0.	0.	-.1480E+01	0.	.3535E+01	-.5432E+00	.1946E-17	.1511E+01
M/Q	-.7687E-01	-.4539E-01	-.7697E-04	0.	-.1223E+00	0.	-.3861E+00	-.1401E-01	.2079E-18	-.5225E+00
X/DE	.6470E+01	-.3598E+00	0.	0.	.6110E+01	0.	0.	0.	0.	.6110E+01
Z/DE	-.6186E+02	.3443E+01	0.	0.	-.5842E+02	0.	0.	0.	0.	-.5842E+02
M/DE	-.5540E+01	-.2404E+00	0.	0.	-.5780E+01	0.	0.	0.	0.	-.5780E+01
X/FLAPW	-.4142E+00	-.3207E-02	0.	0.	-.4174E+00	0.	0.	0.	0.	-.4174E+00
Z/FLAPW	-.6309E+00	.3669E-01	0.	0.	-.6002E+00	0.	0.	0.	0.	-.6002E+00
M/FLAPW	-.2128E+00	-.2143E-02	0.	0.	-.2149E+00	0.	0.	0.	0.	-.2149E+00
X/FLAPH	0.	.2294E+01	0.	0.	.2294E+01	0.	0.	0.	0.	.2294E+01
Z/FLAPH	0.	-.2244E+01	0.	0.	-.2244E+01	0.	0.	0.	0.	-.2244E+01
M/FLAPH	0.	.7602E+00	0.	0.	.7602E+00	0.	0.	0.	0.	.7602E+00
X/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/TO1	0.	0.	0.	0.	0.	.1774E-02	-.1492E-03	0.	.1259E-21	.1625E-02
Z/TO1	0.	0.	0.	0.	0.	.8042E-05	-.3159E-04	.1245E-19	.4249E-18	-.2354E-04
M/TO1	0.	0.	0.	0.	0.	-.4609E-06	.3578E-05	.3211E-21	.4539E-19	.3117E-05
X/TO2	0.	0.	0.	0.	0.	.1774E-02	-.1492E-03	0.	.1259E-21	.1625E-02
Z/TO2	0.	0.	0.	0.	0.	.8042E-05	-.3159E-04	.1245E-19	.4249E-18	-.2354E-04
M/TO2	0.	0.	0.	0.	0.	-.4609E-06	.3578E-05	.3211E-21	.4539E-19	.3117E-05
X/THT1	0.	0.	0.	0.	0.	.1361E+00	0.	0.	0.	.1361E+00
Z/THT1	0.	0.	0.	0.	0.	-.3545E+01	0.	0.	0.	-.3545E+01
M/THT1	0.	0.	0.	0.	0.	-.4274E+00	0.	0.	0.	-.4274E+00
X/THT2	0.	0.	0.	0.	0.	.1351E+00	0.	0.	0.	.1361E+00
Z/THT2	0.	0.	0.	0.	0.	-.3545E+01	0.	0.	0.	-.3545E+01
M/THT2	0.	0.	0.	0.	0.	-.4274E+00	0.	0.	0.	-.4274E+00

X/V	.4289E-14	0.	.7749E-03	.7148E-15	.7749E-03	-.5718E-14	.4065E-04	0.	0.	.8156E-03 *
Z/V	0.	-.5361E-15	0.	0.	0.	.4467E-16	.2123E-05	.2804E-16	0.	.2123E-05 *
M/V	0.	.3319E-15	-.3623E-04	0.	-.3623E-04	.6915E-17	-.1257E-06	.7232E-18	0.	-.3636E-04 *
X/P	.2144E-12	0.	.3634E-03	0.	.3634E-03	-.2859E-12	.7135E-04	0.	-.6821E-22	.4347E-03 *
Z/P	0.	-.2680E-13	0.	0.	0.	.2234E-14	.1510E-04	.1402E-14	-.2832E-18	.1510E-04 *
M/P	0.	.1660E-13	-.1699E-04	0.	-.1699E-04	.3458E-15	-.1711E-05	.3616E-16	-.2178E-19	-.1870E-04 *
X/R	.2144E-12	0.	.1953E-02	0.	.1953E-02	-.2859E-12	0.	0.	0.	.1953E-02 *
Z/R	0.	-.2680E-13	0.	0.	0.	.2234E-14	0.	.1402E-14	0.	0. *
M/R	0.	.1660E-13	-.9131E-04	0.	-.9131E-04	.3458E-15	0.	.3616E-16	0.	-.9131E-04 *
X/DR	.1229E-11	0.	-.8195E-01	0.	-.8195E-01	-.1639E-11	0.	0.	0.	-.8195E-01 *
Z/DR	0.	-.1536E-12	0.	0.	0.	.1280E-13	0.	.8033E-14	0.	0. *
M/DR	0.	.9511E-13	.3832E-02	0.	.3832E-02	.1981E-14	0.	.2072E-15	0.	.3832E-02 *
X/DA	-.7884E+01	.2976E-02	.2560E-13	0.	-.7881E+01	-.1639E-11	0.	0.	0.	-.7881E+01 *
Z/DA	-.6687E+00	-.2848E-01	0.	0.	-.6972E+00	.1280E-13	0.	.8033E-14	0.	-.6972E+00 *
M/DA	-.2275E-01	.1988E-02	-.1486E-14	0.	-.2076E-01	.1981E-14	0.	.2072E-15	0.	-.2076E-01 *
X/DRCSR	.4289E-12	0.	.8935E-14	0.	.4289E-12	-.5718E-12	0.	0.	.4788E-03	.4788E-03 *
Z/DRCSR	0.	-.5361E-13	0.	0.	0.	.4467E-14	0.	.2804E-14	.1616E+01	.1616E+01 *
M/DRCSR	0.	.3319E-13	-.5186E-15	0.	0.	.6915E-15	0.	.7232E-16	.1726E+00	.1726E+00 *
X/DRCSY	.4289E-12	0.	.8935E-14	0.	.4289E-12	-.5718E-12	0.	0.	.9863E-19	0. *
Z/DRCSY	0.	-.5361E-13	0.	0.	0.	.4467E-14	0.	.2804E-14	.3328E-15	0. *
M/DRCSY	0.	.3319E-13	-.5186E-15	0.	0.	.6915E-15	0.	.7232E-16	.3555E-16	.5604E-14 *
X/DRCSS	.4289E-12	0.	.8935E-14	0.	.4289E-12	-.5718E-12	0.	0.	.9863E-19	0. *
Z/DRCSS	0.	-.5361E-13	0.	0.	0.	.4467E-14	0.	.2804E-14	.3328E-15	0. *
M/DRCSS	0.	.3319E-13	-.5186E-15	0.	0.	.6915E-15	0.	.7232E-16	.3555E-16	.5604E-14 *
X/PSIT1	.1229E-11	0.	.2560E-13	0.	.1229E-11	-.3883E+00	0.	0.	.2826E-18	-.3883E+00 *
Z/PSIT1	0.	-.1536E-12	0.	0.	0.	-.1620E-02	0.	.8033E-14	.9537E-15	-.1620E-02 *
M/PSIT1	0.	.9511E-13	-.1486E-14	0.	0.	.1178E-03	0.	.2072E-15	.1019E-15	.1178E-03 *
X/PSIT2	.1229E-11	0.	.2560E-13	0.	.1229E-11	-.3883E+00	0.	0.	.2826E-18	-.3883E+00 *
Z/PSIT2	0.	-.1536E-12	0.	0.	0.	-.1620E-02	0.	.8033E-14	.9537E-15	-.1620E-02 *
M/PSIT2	0.	.9511E-13	-.1486E-14	0.	0.	.1178E-03	0.	.2072E-15	.1019E-15	.1178E-03 *

LATERAL-DIRECTIONAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
Y/U	-.4773E-17	0.	-.2418E-16	.1741E-16	-.1147E-16	0.	.5443E-18	-.3784E-19	0.	-.1096E-16
L/U	-.2925E-14	0.	-.7449E-17	0.	-.2933E-14	0.	.3317E-20	-.2016E-21	-.2074E-18	-.2933E-14
N/U	.2494E-16	0.	.2357E-17	.2447E-17	.2975E-16	0.	.1251E-16	.8883E-21	.8385E-23	.4226E-16
Y/W	.4868E-16	0.	0.	0.	.4868E-16	0.	.3133E-19	-.1126E-19	0.	.4870E-16
L/W	0.	0.	0.	0.	0.	0.	.9868E-21	-.5999E-22	-.2444E-18	-.2435E-18
N/W	0.	0.	0.	0.	0.	0.	.8070E-20	.2619E-21	.9882E-23	.8342E-20
Y/Q	.1563E-15	0.	.1165E-15	0.	.2728E-15	0.	.5368E-18	-.3881E-19	0.	.2733E-15
L/Q	0.	0.	.3600E-16	0.	.3600E-16	0.	.1714E-14	.2857E-15	-.1659E-17	.2034E-14
N/Q	-.4989E-14	0.	-.1139E-16	0.	-.5000E-14	0.	-.1206E-17	.9828E-21	.6788E-22	-.5002E-14
Y/DE	.4649E-14	0.	0.	0.	.4649E-14	0.	0.	0.	0.	.4649E-14
L/DE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DE	.7147E-13	0.	0.	0.	.7147E-13	0.	0.	0.	0.	.7147E-13
Y/FLAPW	.4147E-16	0.	0.	0.	.4147E-16	0.	0.	0.	0.	.4147E-16
L/FLAPW	-.8382E-12	0.	0.	0.	-.8382E-12	0.	0.	0.	0.	-.8382E-12
N/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/TO1	0.	0.	0.	0.	0.	-.5773E-18	.1172E-18	-.8473E-20	0.	-.4686E-18
L/TO1	0.	0.	0.	0.	0.	-.9513E-06	.5554E-05	-.2234E-20	-.3623E-18	.4603E-05
N/TO1	0.	0.	0.	0.	0.	.2863E-04	-.3588E-05	.1971E-21	.1465E-22	.2505E-04
Y/TO2	0.	0.	0.	0.	0.	-.5773E-18	.1172E-18	-.8473E-20	0.	-.4686E-18
L/TO2	0.	0.	0.	0.	0.	.9513E-06	-.5554E-05	.2143E-20	-.3623E-18	-.4603E-05
N/TO2	0.	0.	0.	0.	0.	-.2863E-04	.3588E-05	.1971E-21	.1465E-22	-.2505E-04
Y/THT1	0.	0.	0.	0.	0.	-.4429E-16	0.	0.	0.	-.4429E-16
L/THT1	0.	0.	0.	0.	0.	.4194E+00	0.	0.	0.	.4194E+00
N/THT1	0.	0.	0.	0.	0.	.2196E-02	0.	0.	0.	.2196E-02
Y/THT2	0.	0.	0.	0.	0.	-.4429E-16	0.	0.	0.	-.4429E-16
L/THT2	0.	0.	0.	0.	0.	-.4194E+00	0.	0.	0.	-.4194E+00
N/THT2	0.	0.	0.	0.	0.	-.2196E-02	0.	0.	0.	-.2196E-02

Y/V	-.1835E-01	0.	-.1101E+00	-.5283E-01	-.1733E+00	0.	-.1217E-01	-.4852E-22	0.	-.1895E+00
L/V	-.3639E-01	0.	-.3403E-01	0.	-.7842E-01	0.	-.6484E-04	-.2159E-24	-.1732E-28	-.7049E-01
N/V	-.1659E-02	0.	.1076E-01	-.7426E-02	.1677E-02	0.	-.1201E-02	.9426E-24	.7084E-25	.4757E-03
Y/P	0.	0.	-.5264E+00	0.	-.5264E+00	0.	-.2609E-01	.2826E-20	0.	-.5525E+00
L/P	-.1212E+01	0.	-.1627E+00	0.	-.1375E+01	0.	-.1515E+00	.1080E-22	.8662E-19	-.1526E+01
N/P	-.4181E-01	0.	.5147E-01	0.	.1046E-01	0.	-.2578E-02	-.4713E-22	-.3582E-23	.7889E-02
Y/R	0.	0.	.1223E+01	0.	.1223E+01	0.	-.3535E+01	.5432E+00	0.	-.1769E+01
L/R	.4739E+00	0.	.3779E+00	0.	.8517E+00	0.	-.1803E-01	.2895E-02	0.	.8358E+00
N/R	-.2604E-01	0.	-.1195E+00	0.	-.1456E+00	0.	-.3608E+00	-.1264E-01	0.	-.5271E+00
Y/DR	0.	0.	.1638E+02	0.	.1638E+02	0.	0.	0.	0.	.1638E+02
L/DR	0.	0.	.5061E+01	0.	.5061E+01	0.	0.	0.	0.	.5061E+01
N/DR	0.	0.	-.1601E+01	0.	-.1601E+01	0.	0.	0.	0.	-.1601E+01
Y/DA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DA	-.2308E+02	0.	0.	0.	-.2308E+02	0.	0.	0.	0.	-.2308E+02
N/DA	-.3292E+00	0.	0.	0.	-.3292E+00	0.	0.	0.	0.	-.3292E+00
Y/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	.1378E+01	.1378E+01
N/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	-.5570E-04	-.5570E-04
Y/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/PSIT1	0.	0.	0.	0.	0.	.3546E+01	0.	0.	0.	.3546E+01
L/PSIT1	0.	0.	0.	0.	0.	.1889E-01	0.	0.	0.	.1889E-01
N/PSIT1	0.	0.	0.	0.	0.	-.3854E+00	0.	0.	0.	-.3854E+00
Y/PSIT2	0.	0.	0.	0.	0.	.3546E+01	0.	0.	0.	.3546E+01
L/PSIT2	0.	0.	0.	0.	0.	.1889E-01	0.	0.	0.	.1889E-01
N/PSIT2	0.	0.	0.	0.	0.	-.3854E+00	0.	0.	0.	-.3854E+00

EXAMPLE 1 - TRANSITION TRIM RUN

CASE INPUT (READ FROM FILE 1)

```
   29    9   29    9  VA                                 1.60000
160.00000
```

RESULTS OF TRIM

```
      4     1     4     1 WEIGHT-POUNDS                                                   0.00000
16375.00000
      4     1     4     1 WEIGHT-NEWTONS                                                  4.44800
72836.00000
      4     2     4     5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2                      0.00000
  7959.00020    52609.00000    58337.00000    -262.40000
      4     2     4     5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-KG-M**2                         1.35500
10784.44500    71285.19500    79046.63500    -274.25200
     14    10    14    10 JENG(ENGINE INERTIA)-SLUG-FT**2                                 0.00000
    3.14000
     14    10    14    10 JENG(ENGINE INERTIA)-KG-M**2                                    1.35500
    4.25470
     29    45    29    45 ALTITUDE-FT                                                     0.00000
  100.00000
     29    45    29    45 ALTITUDE-METERS                                                  .30480
   30.48000
     29    10    29    10 TRUE AIRSPEED-KNOTS                                             0.00000
  159.91474
     29     9    29     9 TRUE AIRSPEED-FT/SEC                                            0.00000
  270.08080
     29     9    29     9 TRUE AIRSPEED-M/SEC                                              .30480
   82.32038
     29    12    29    12 QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2                             0.00000
   81.59208
     29    11    29    11 MACH NUMBER                                                     0.00000
    .23511
     29    12    29    12 QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2                            47.88000
 3906.66721
     29     4    29     4 RHO(AIR DENSITY)-SLUGS/FT**3                                    0.00000
    .00224
     29     4    29     4 RHO(AIR DENSITY)-KG/M**3                                      515.38000
    1.15299
     29    57    29    59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)KT                   .59020
    0.00000      0.00000      0.00000
     29    57    29    59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)FT/S                 0.00000
    0.00000      0.00000      0.00000
     29    57    29    59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)M/S                  .30480
    0.00000      0.00000      0.00000
      2    16     2    18  XEDOT,YEDOT,ZEDOT(FT/S)                                        0.00000
  270.08010     -.00000      0.00000
      2    16     2    18  XEDOT,YEDOT,ZEDOT(M/S)                                          .30480
   82.32041     -.00000      0.00000
     41     4    41     6  XE2D,YE2D,ZE2D-FT/SEC**2                                       0.00000
    0.00000      0.00000      0.00000
     41     4    41     6  XE2D,YE2D,ZE2D-G                                                .03106
    0.00000      0.00000      0.00000
     41     4    41     6  XE2D,YE2D,ZE2D-M/SEC**2                                         .30480
    0.00000      0.00000      0.00000
      2     1     2     3 UDOT,VDOT,WDOT-FT/SEC**2                                        0.00000
     .00000     -.00000      -.00001
      2     1     2     3 UDOT,VDOT,WDOT-G                                                 .03106
     .00000     -.00000      -.00000
      2     1     2     3 UDOT,VDOT,WDOT-M/SEC**2                                          .30480
     .00000     -.00000      -.00000
      3     1     3     3 U,V,W (INER. SPEED COMPONENTS)FT/SEC                            0.00000
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ORIGINAL PAGE IS
OF POOR QUALITY

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265.10090      -.00000     51.62091
   3    1    3    3 U,V,W (INER. SPEED COMPONENTS)M/SEC                       .30480
 80.80275      -.00000     15.73405
  29    1   29    3 UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC                   0.00000
265.10090      -.00000     51.62091
  29    1   29    3 UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC                     .30480
 80.80275      -.00000     15.73405
  29   54   29   56 NXCG,NYCG,NZCG(BODY AXIS ACCEL.)-GEES                   0.00000
  .19113       0.00000      .98156
   3    4    3    6 P,Q,R(BODY AXIS RATES)-DEG/SEC                         57.29578
 -.00000        .00000      .00000
   3   64    3   66 THETA,PHI,PSI(EULER ANGLES)-DEG                         57.29578
 11.01885      0.00000     0.00000
  29   13   29   14 ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG           57.29578
 11.01885      -.00000
   2   18    2   18 ZD(RATE OF SINK)-FT/MIN                                60.00000
 0.00000
   2   18    2   18 ZD(RATE OF SINK)-FT/SEC                                 0.00000
 0.00000
   2   18    2   18 ZD(RATE OF SINK)-M/SEC                                   .30480
 0.00000
  28   28   28   28  NORM. ROLL CONTROL                                     0.00000
  .00000
  28   29   28   29  NORM. YAW CONTROL                                      0.00000
  .00000
  28   30   28   30  NORM. PITCH CONTROL                                    0.00000
 -.03754
   3   26    3   27 THT1,THT2(THRUST DEFLECTION PITCH ANGLES)-DEG          57.29578
  .56349        .56349
   3   24    3   25 PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG        57.29578
 -.00000       -.00000
   3   19    3   19 LEFT ELEVON DEFLECTION-DEG                             57.29578
  .93772
   3   20    3   20 RIGHT ELEVON DEFLECTION-DEG                            57.29578
  .93772
  28   50   28   50 ELEVATOR COMMAND DEFLECTION-DEG                        57.29578
  .93772
  28   51   28   51 AILERON COMMAND DEFLECTION-DEG                         57.29578
 -.00000
   3   28    3   29 DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)                  0.00000
 -.00000        .00000
  28   58   28   58 TCMD(THRUST COMMAND)-POUNDS                             0.00000
3540.98855
  28   58   28   58 TCMD(THRUST COMMAND)-NEWTONS                            4.44800
15750.31707
  23    9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-POUNDS                 0.00000
1768.23066    1768.23066
  23    9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS                4.44800
7865.08999    7865.08999
   3   21    3   21 RUDDER DEFLECTION-DEG                                  57.29578
 -.00000
  26   20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS               0.00000
 378.63570
  26   20   20   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS              4.44800
1684.17161
  26    1   26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC            0.00000
 78.92488      78.92488
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      26    1    26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC           .45400
   35.83189      35.83189
      15    3    15    3 BLDREF(REFERENCE RCS BLEED)-PER CENT                  0.00000
    3.50000
      26    7    26    7  BLDAVL                                             0.00000
   31.88962
      27   72    27   72 BLD(ACTUAL RCS BLEED)-PER CENT                        0.00000
    3.50000
       3   38     3   39 FRCS1,FRCS2(RCS JET FORCES)-POUNDS                    0.00000
    0.00000        .00000
       3   38     3   39 FRCS1,FRCS2(RCS JET FORCES)-NEWTONS                   4.44800
    0.00000        .00000
      11    7    11    7 SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG           57.29578
    0.00000
      19   44    19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-FT-LB           0.00000
 -6500.54342       .00000        .00000
      19   44    19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M        1.35580
 -8808.23633       .00000        .00000
      19   37    19   38 XW1,XW2(WING X FORCE)-POUNDS                          0.00000
  549.82166     549.82166
      19   37    19   38 XW1,XW2(WING X FORCE)-NEWTONS                         4.44800
 2445.60674    2445.60674
      19   39    19   40 ZW1,ZW2(WING Z FORCE)-POUNDS                          0.00000
 -6830.27617   -6830.27617
      19   39    19   40 ZW1,ZW2(WING Z FORCE)-NEWTONS                         4.44800
-30381.06841  -30381.06841
      19   19    19   20 CLW1,CLW2(WING LIFT COEFFICIENT)                      0.00000
     .47689        .47689
       3   48     3   48  DFLAPW(CANARD TE FLAP DEFLECTION)-DEG               57.29578
   -5.42749
       3   49     3   49  DFLAPW(WING LE FLAP DEFLECTION)-DEG                 57.29578
   29.99434
      19    1    19    3 DXW,DYW,DZW(WING AERO FORCES)-POUNDS                  0.00000
 1899.64332        .00000  -13660.55234
      19    1    19    3 DYW,DYW,DZW(WING AERO FORCES)-NEWTONS                 4.44800
 4891.21349        .00000  -60762.13681
      19    4    19    6 DLW,DMW,DNW(WING AERO MOMENTS)-FT-POUNDS              0.00000
     .00000   -54891.65750      -.00000
      19    4    19    6 DLW,DMW,DNW(WING AERO MOMENTS)-NEWTON-M               1.35580
     .00000   -74378.19591      -.00000
      20    1    20    3 DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS                0.00000
  -85.66018      0.00000     -176.75421
      20    1    20    3 DXH,DYH,DZH(CANARD AERO FORCES)-NEWTONS               4.44800
 -381.01649      0.00000     -786.20274
      20    4    20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-FT-POUNDS            0.00000
    0.00000    -1079.90506      0.00000
      20    4    20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-NEWTON-M             1.35500
    0.00000    -1463.27135      0.00000
      21    1    21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS           4.44800
  -90.42388       -.00000       0.00000
      21    1    21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS            0.00000
  -20.32911       -.00000       0.00000
      21    4    21    6  DLV,DMV,DNV(VERT TAIL AERO MOMENTS)-FT POUNDS        0.00000
    -.00000      98.25343        .00000
      21    4    21    6 DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-NEWTON-M         1.35500
    -.00000     133.13340        .00000
      22    1    22    3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS              0.00000
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   -113.43737        .00000   -1864.56533
        22    1   22     3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS                4.44800
   -504.56944        .00000   -8382.54659
        22    4   22     6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS             0.00000
       0.00000   52911.99756       .00000
        22    4   22     6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M              1.35500
       0.00000   71695.75669       .00000
        29   28   29    22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS              0.00000
    880.21665        .00000  -15721.87188
        29   28   29    22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS             4.44800
   3915.20368        .00000  -69930.88613
        29   23   29    25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS          0.00000
        .00000   -2961.31157      -.00000
        29   23   29    25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M           1.35500
        .00000   -4012.57716      -.00000
        23    1   23     3 DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS                 0.00000
   3536.29030       -.00000     -34.77973
        23    1   23     3 DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS                4.44800
  15729.41925       -.00000    -154.76023
        23    4   23     6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-FT-POUNDS             0.00000
       -.00000    -727.95917      -.00000
        23    4   23     6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-NEWTON-M              1.35500
       -.00000    -986.38468      -.00000
        26   23   26    24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC          0.00000
    926.79293     926.79293
        26   23   26    24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC             1.35500
   1255.80442    1255.80442
        24    1   24     3 DXR,DYR,DZR(RAM FORCES)-POUNDS                           0.00000
  -1286.70116        .00000    -316.46412
        24    1   24     3 DXR,DYR,DZR(RAM FORCES)-NEWTONS                          4.44800
  -5723.24677        .00000   -1407.63241
        24    4   24     6 DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS                       0.00000
        .00000    3689.39427       .00000
        24    4   24     6 DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M                        1.35500
        .00000    4999.12924       .00000
        26    3   26     4 RPM1,RPM2(ENGINE ROT. SPEED)-RPM                         0.00000
   2818.66873    2818.66873
        27    1   27     3 DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS                     0.00000
        .00000      0.00000       .00000
        27    1   27     3 DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS                    4.44800
        .00000      0.00000       .00000
        27    4   27     6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-FT-POUNDS                 0.00000
        .00000       .00000      -.00000
        27    4   27     6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-NEWTON-M                  1.35500
        .00000       .00000      -.00000
        25    1   25     3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS                0.00000
       0.00000       .00000      -.00000
        25    1   25     3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS               4.44800
       0.00000       .00000      -.00000
        25    4   25     6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS             0.00000
        .00000      -.00000      -.00000
        25    4   25     6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M              1.35500
        .00000      -.00000      -.00000
        29   26   29    28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS                   0.00000
   3129.80579       -.00000  -16073.11573
        29   26   29    28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS                  4.44800
  13921.37615       -.00000  -71493.21877
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29   29   29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS              0.00000
.00000        .12353       -.00000
29   29   29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M               1.35500
.00000        .16738       -.00000
29   51   29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS      0.00000
0.00000       .00000       -.00000
29   51   29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M       1.35500
0.00000       .00000       -.00000
```

EXAMPLE 1 - TRANSITION TRIM RUN

LONGITUDINAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
X/U	-.4368E-02	-.2169E-02	-.3013E-03	-.1602E-02	-.8520E-02	0.	-.1032E-01	0.	.1608E-22	-.1884E-01
Z/U	-.8554E-01	.5775E-02	0.	-.1027E-01	-.9003E-01	0.	-.1597E-03	-.1190E-19	.5425E-19	-.9019E-01
M/U	-.3662E-02	-.7161E-03	.1409E-04	.2789E-02	-.1575E-02	0.	.2519E-04	-.3071E-21	.5795E-20	-.1550E-02
X/W	.1062E+00	.4623E-02	0.	-.8935E-16	.1108E+00	0.	.8558E-03	0.	.1939E-22	.1116E+00
Z/W	-.6032E+00	-.4316E-01	0.	-.9194E-01	-.7353E+00	0.	-.1201E-01	-.3854E-20	.6543E-19	-.7473E+00
M/W	-.2160E-01	.2885E-02	0.	.2482E-01	.6108E-02	0.	.1318E-02	-.9941E-22	.6989E-20	.7426E-02
X/Q	.3405E+00	-.7181E-01	.1456E-02	0.	.2702E+00	0.	.2515E-01	0.	.1494E-21	.2953E+00
Z/Q	-.1927E+01	.6672E+00	0.	0.	-.1260E+01	0.	.3502E+01	-.5382E+00	.5041E-18	.1704E+01
M/Q	-.6936E-01	-.4468E-01	-.6810E-04	0.	-.1141E+00	0.	-.3825E+00	-.1380E-01	.5305E-19	-.5105E+00
X/DE	-.8535E+01	-.3261E+00	0.	0.	-.8861E+01	0.	0.	0.	0.	-.8861E+01
Z/DE	-.4941E+02	.2863E+01	0.	0.	-.4655E+02	0.	0.	0.	0.	-.4655E+02
M/DE	-.4408E+01	-.1956E+00	0.	0.	-.4693E+01	0.	0.	0.	0.	-.4603E+01
X/FLAPW	-.3238E+00	-.8422E-02	0.	0.	-.3322E+00	0.	0.	0.	0.	-.3322E+00
Z/FLAPW	-.1296E+01	.7393E-01	0.	0.	-.1222E+01	0.	0.	0.	0.	-.1222E+01
M/FLAPW	-.1956E+00	-.5050E-02	0.	0.	-.2006E+00	0.	0.	0.	0.	-.2006E+00
X/FLAPH	0.	.1789E+01	0.	0.	.1789E+01	0.	0.	0.	0.	.1789E+01
Z/FLAPH	0.	-.1786E+01	0.	0.	-.1786E+01	0.	0.	0.	0.	-.1786E+01
M/FLAPH	0.	.6010E+00	0.	0.	.6010E+00	0.	0.	0.	0.	.6010E+00
X/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/TO1	0.	0.	0.	0.	0.	.1773E-02	-.1320E-03	0.	.2854E-22	.1641E-02
Z/TO1	0.	0.	0.	0.	0.	-.1743E-04	-.3248E-04	-.1248E-19	.9631E-19	-.4991E-04
M/TO1	0.	0.	0.	0.	0.	-.3530E-05	.3663E-05	-.3220E-21	.1029E-19	.1324E-06
X/TO2	0.	0.	0.	0.	0.	.1773E-02	-.1320E-03	0.	.2854E-22	.1641E-02
Z/TO2	0.	0.	0.	0.	0.	-.1743E-04	-.3248E-04	-.1248E-19	.9631E-19	-.4991E-04
M/TO2	0.	0.	0.	0.	0.	-.3530E-05	.3663E-05	-.3220E-21	.1029E-19	.1324E-06
X/THT1	0.	0.	0.	0.	0.	-.2890E+00	0.	0.	0.	-.2890E+00
Z/THT1	0.	0.	0.	0.	0.	-.3468E+01	0.	0.	0.	-.3468E+01
M/THT1	0.	0.	0.	0.	0.	-.4177E+00	0.	0.	0.	-.4177E+00
X/THT2	0.	0.	0.	0.	0.	-.2890E+00	0.	0.	0.	-.2890E+00
Z/THT2	0.	0.	0.	0.	0.	-.3468E+01	0.	0.	0.	-.3468E+01
M/THT2	0.	0.	0.	0.		-.4177E+00	0.	0.	0.	-.4177E+00

X/V	0.	.1787E-15	.7745E-03	0.	.7745E-03	-.5718E-10	.4579E-04	0.	0.	.8283E-03	*
Z/V	0.	-.3574E-15	0.	0.	0.	0.	.2851E-05	-.3748E-16	0.	.2861E-05	*
M/V	0.	.1106E-15	-.3621E-04	0.	-.3621E-04	0.	-.1956E-06	-.9669E-18	0.	-.3641E-04	*
X/P	0.	.8935E-14	.3633E-03	0.	.3633E-03	-.2859E-12	.7821E-04	0.	-.1517E-22	.4335E-03	*
Z/P	0.	-.1787E-13	0.	0.	0.	0.	.1727E-04	-.1074E-14	-.5121E-19	.1727E-04	*
M/P	0.	.5532E-14	-.1699E-04	0.	-.1699E-04	0.	-.1948E-05	-.4835E-16	-.5478E-20	-.1894E-04	*
X/R	0.	.8935E-14	.1953E-02	0.	.1953E-02	-.2859E-12	0.	0.	0.	.1953E-02	*
Z/R	0.	-.1787E-13	0.	0.	0.	0.	0.	-.1074E-14	0.	0.	*
M/R	0.	.5532E-14	-.9130E-04	0.	-.9130E-04	0.	-.2766E-14	-.4835E-16	0.	-.9130E-04	*
X/DR	0.	.5120E-13	-.6415E-01	0.	-.6415E-01	-.1639E-11	0.	0.	0.	-.6415E-01	*
Z/DR	0.	-.1024E-12	0.	0.	0.	0.	0.	-.1074E-13	0.	0.	*
M/DR	0.	.3178E-13	.2999E-02	0.	.2999E-02	0.	-.1585E-13	-.2771E-15	0.	.2999E-02	*
X/DA	-.7374E+00	.6920E-03	0.	0.	-.7367E+00	-.1639E-11	0.	0.	0.	-.7367E+00	*
Z/DA	-.4228E-01	-.6074E-02	0.	0.	-.4835E-01	0.	0.	-.1074E-13	0.	-.4835E-01	*
M/DA	-.1449E-02	.4149E-03	0.	0.	-.1034E-02	0.	-.1585E-13	-.2771E-15	0.	-.1034E-02	*
X/DRCSR	0.	.1787E-13	0.	0.	0.	-.5718E-12	0.	0.	.4777E-03	.4777E-03	*
Z/DRCSR	0.	-.3574E-13	0.	0.	0.	0.	0.	-.3748E-14	.1612E+01	.1612E+01	*
M/DRCSR	0.	.1106E-13	0.	0.	.8851E-13	0.	-.5532E-14	-.9669E-16	.1722E+00	.1722E+00	*
X/DRCSY	0.	.1787E-13	0.	0.	0.	-.5718E-12	0.	0.	-.3213E-18	0.	*
Z/DRCSY	0.	-.3574E-13	0.	0.	0.	0.	0.	-.3748E-14	-.1084E-14	0.	*
M/DRCSY	0.	.1106E-13	0.	0.	.8851E-13	0.	-.5532E-14	-.9669E-16	-.1158E-15	.8288E-13	*
X/DRCSS	0.	.1787E-13	0.	0.	0.	-.5718E-12	0.	0.	-.3213E-18	0.	*
Z/DRCSS	0.	-.3574E-13	0.	0.	0.	0.	0.	-.3748E-14	-.1084E-14	0.	*
M/DRCSS	0.	.1106E-13	0.	0.	.8851E-13	0.	-.5532E-14	-.9669E-16	-.1158E-15	.8288E-13	*
X/PSIT1	0.	.5120E-13	0.	0.	0.	-.2945E+00	0.	0.	-.9207E-18	-.2945E+00	*
Z/PSIT1	0.	-.1024E-12	0.	0.	0.	.2599E-02	0.	-.1074E-13	-.3107E-14	.2599E-02	*
M/PSIT1	0.	.3178E-13	0.	0.	.2536E-12	.5506E-03	-.1585E-13	-.2771E-15	-.3319E-15	.5506E-03	*
X/PSIT2	0.	.5120E-13	0.	0.	0.	-.2945E+00	0.	0.	-.9207E-18	-.2945E+00	*
Z/PSIT2	0.	-.1024E-12	0.	0.	0.	.2599E-02	0.	-.1074E-13	-.3107E-14	.2599E-02	*
M/PSIT2	0.	.3178E-13	0.	0.	.2536E-12	.5506E-03	-.1585E-13	-.2771E-15	-.3319E-15	.5506E-03	*

LATERAL-DIRECTIONAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
Y/U	-.1369E-17	0.	-.2276E-16	.3756E-17	-.2037E-16	0.	.1764E-19	.1172E-19	0.	-.2034E-16
L/U	0.	0.	-.7834E-17	0.	-.7834E-17	0.	.1622E-16	.6247E-22	.4625E-19	-.6026E-17
N/U	0.	0.	.2225E-17	.5279E-18	.2753E-17	0.	-.2063E-20	-.2728E-21	-.1070E-23	.2751E-17
Y/W	.1285E-16	0.	0.	0.	.1285E-16	0.	-.3090E-19	.5795E-20	0.	.1283E-16
L/W	0.	0.	0.	0.	0.	0.	.5252E-19	.2022E-22	.5579E-19	.1083E-18
N/W	0.	0.	0.	0.	0.	0.	-.1843E-20	-.8829E-22	-.2255E-23	-.1933E-20
Y/Q	.4131E-16	0.	.1108E-15	0.	.1513E-15	0.	.1295E-19	.1389E-19	0.	.1513E-15
L/Q	0.	0.	.3408E-16	0.	.3400E-16	0.	.1143E-14	0.	.4290E-18	.1177E-14
N/Q	-.3742E-14	0.	-.1076E-16	0.	-.3752E-14	0.	-.1221E-17	-.3232E-21	-.1738E-22	-.3754E-14
Y/DE	.1058E-14	0.	0.	0.	.1058E-14	0.	0.	0.	0.	.1058E-14
L/DE	.8382E-12	0.	0.	0.	.8382E-12	0.	0.	0.	0.	.8382E-12
N/DE	-.2144E-13	0.	0.	0.	-.2144E-13	0.	0.	0.	0.	-.2144E-13
Y/FLAPW	.2732E-16	0.	0.	0.	.2732E-16	0.	0.	0.	0.	.2732E-16
L/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPW	-.2144E-13	0.	0.	0.	-.2144E-13	0.	0.	0.	0.	-.2144E-13
Y/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/TO1	0.	0.	0.	0.	0.	-.4337E-18	.2474E-20	.2654E-20	0.	-.4285E-18
L/TO1	0.	0.	0.	0.	0.	.2062E-05	.5711E-05	.2209E-20	.8211E-19	.7773E-05
N/TO1	0.	0.	0.	0.	0.	.2861E-04	-.3168E-05	-.6174E-22	-.3320E-23	.2544E-04
Y/TO2	0.	0.	0.	0.	0.	-.4337E-18	.2474E-20	.2654E-20	0.	-.4285E-18
L/TO2	0.	0.	0.	0.	0.	-.2062E-05	-.5711E-05	-.2181E-20	.8211E-19	-.7773E-05
N/TO2	0.	0.	0.	0.	0.	-.2861E-04	.3168E-05	-.6174E-22	-.3320E-23	-.2544E-04
Y/THT1	0.	0.	0.	0.	0.	.7069E-16	0.	0.	0.	.7069E-16
L/THT1	0.	0.	0.	0.	0.	.4102E+00	0.	0.	0.	.4102E+00
N/THT1	0.	0.	0.	0.	0.	-.4664E-02	0.	0.	0.	-.4664E-02
Y/THT2	0.	0.	0.	0.	0.	.7069E-16	0.	0.	0.	.7069E-16
L/THT2	0.	0.	0.	0.	0.	-.4102E+00	0.	0.	0.	-.4102E+00
N/THT2	0.	0.	0.	0.	0.	.4664E-02	0.	0.	0.	.4664E-02

Y/V	-.1417E-01	0.	-.9757E-01	-.4674E-01	-.1585E+00	0.	-.1205E-01	.1411E-22	0.	-.1705E+00
L/V	-.3931E-01	0.	-.3015E-01	0.	-.6946E-01	0.	-.6418E-04	.7520E-25	.4366E-21	-.6953E-01
N/V	-.2179E-02	0.	.9935E-02	-.6578E-02	.7861E-03	0.	-.1190E-02	-.3283E-24	-.1765E-25	-.4035E-03
Y/P	0.	0.	-.4658E+00	0.	-.4658E+00	0.	-.2584E-01	-.7056E-21	0.	-.4916E+00
L/P	-.1105E+01	0.	-.1440E+00	0.	-.1249E+01	0.	-.1501E+00	-.3760E-23	-.2183E-19	-.1399E+01
N/P	-.4140E-01	0.	.4554E-01	0.	.4145E-02	0.	-.2546E-02	.1641E-22	.8826E-24	.1599E-02
Y/R	0.	0.	.1082E+01	0.	.1082E+01	0.	-.3502E+01	.5382E+00	0.	-.1882E+01
L/R	.5512E+00	0.	.3344E+00	0.	.8856E+00	0.	-.1866E-01	.2868E-02	0.	.8698E+00
N/R	-.3471E-01	0.	-.1058E+00	0.	-.1405E+00	0.	-.3654E+00	-.1252E-01	0.	-.5105E+00
Y/DR	0.	0.	.1282E+02	0.	.1282E+02	0.	0.	0.	0.	.1282E+02
L/DR	0.	0.	.3962E+01	0.	.3962E+01	0.	0.	0.	0.	.3962E+01
N/DR	0.	0.	-.1253E+01	0.	-.1253E+01	0.	0.	0.	0.	-.1253E+01
Y/DA	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DA	-.1843E+02	0.	0.	0.	-.1843E+02	0.	0.	0.	0.	-.1843E+02
N/DA	.4343E+00	0.	0.	0.	.4343E+00	0.	0.	0.	0.	.4343E+00
Y/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	.1374E+01	.1374E+01
N/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	-.5557E-04	-.5557E-04
Y/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DPCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/PSIT1	0.	0.	0.	0.	0.	.3469E+01	0.	0.	0.	.3469E+01
L/PSIT1	0.	0.	0.	0.	0.	.1849E-01	0.	0.	0.	.1849E-01
N/PSIT1	0.	0.	0.	0.	0.	-.3771E+00	0.	0.	0.	-.3771E+00
Y/PSIT2	0.	0.	0.	0.	0.	.3469E+01	0.	0.	0.	.3469E+01
L/PSIT2	0.	0.	0.	0.	0.	.1849E-01	0.	0.	0.	.1849E-01
N/PSIT2	0.	0.	0.	0.	0.	-.3771E+00	0.	0.	0.	-.3771E+00

EXAMPLE 1 - TRANSITION TRIM RUN

CASE INPUT (READ FROM FILE 1)

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   29    9   29    9  VA                                    1.68000
 140.00000
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RESULTS OF TRIM

      4    1    4    1 WEIGHT-POUNDS                                          0.00000
16375.00000
      4    1    4    1 WEIGHT-NEWTONS                                         4.44800
72836.00000
      4    2    4    5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2             0.00000
 7959.00000   52609.00000   55337.00000   -202.40000
      4    2    4    5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-KG-M**2                1.35580
10784.44500   71285.19500   79046.63500   -274.25200
     14   10   14   10 JENG(ENGINE INERTIA)-SLUG-FT**2                        0.00000
    3.14000
     14   10   14   10 JENG(ENGINE INERTIA)-KG-M**2                           1.35580
    4.25470
     29   45   29   45 ALTITUDE-FT                                            0.00000
  100.00000
     29   45   29   45 ALTITUDE-METERS                                         .30480
   30.48000
     29   10   29   10 TRUE AIRSPEED-KNOTS                                    0.00000
  139.92540
     29    9   29    9 TRUE AIRSPEED-FT/SEC                                   0.00000
  236.32000
     29    9   29    9 TRUE AIRSPEED-M/SEC                                     .30480
   72.03034
     29   12   29   12 QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2                    0.00000
   62.46955
     29   11   29   11 MACH NUMBER                                            0.00000
     .20573
     29   12   29   12 QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2                   47.88000
 2991.04200
     29    4   29    4 RHO(AIR DENSITY)-SLUGS/FT**3                           0.00000
     .00224
     29    4   29    4 RHO(AIR DENSITY)-KG/M**3                             515.38000
    1.15299
     29   57   29   59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)KT           .59020
    0.00000       0.00000       0.00000
     29   57   29   59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)FT/S        0.00000
    0.00000       0.00000       0.00000
     29   57   29   59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)M/S          .30480
    0.00000       0.00000       0.00000
      2   16    2   18  XEDOT,YEDOT,ZEDOT(FT/S)                               0.00000
  236.32007      -.00000       0.00000
      2   16    2   18  XEDOT,YEDOT,ZEDOT(M/S)                                 .30480
   72.03036      -.00000       0.00000
     41    4   41    6  XE2D,YE2D,ZE2D-FT/SEC**2                              0.00000
    0.00000       0.00000       0.00000
     41    4   41    6  XE2D,YE2D,ZE2D-G                                       .03106
    0.00000       0.00000       0.00000
     41    4   41    6  XE2D,YE2D,ZE2D-M/SEC**2                                .30480
    0.00000       0.00000       0.00000
      2    1    2    3 UDOT,VDOT,WDOT-FT/SEC**2                               0.00000
     .00000        .00000       -.00000
      2    1    2    3 UDOT,VDOT,WDOT-G                                        .03106
     .00000        .00000       -.00000
      2    1    2    3 UDOT,VDOT,WDOT-M/SEC**2                                 .30480
     .00000        .00000       -.00000
      3    1    3    3 U,V,W (INER. SPEED COMPONENTS)FT/SEC                   0.00000
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   230.31308       -.00800      52.94364
      3    1    3    7 U,V,W (INER. SPEED COMPONENTS)M/SEC                     .30480
    70.19943       -.00008      16.13722
     29    1   29    3 UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC                 0.00080
   230.31308       -.00000      52.94364
     29    1   29    3 UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC                   .30480
    70.19943       -.00080      16.13722
     29   54   29   56 NXCG,NYCG,NZCG(BODY AXIS ACCEL.)-GEES                  0.00800
     .22483        0.00000       .97458
      3    4    3    6 P,Q,R(BODY AXIS RATES)-DEG/SEC                        57.29578
    -.00000        -.00000      -.00000
      3   64    3   66 THETA,PHI,PSI(EULER ANGLES)-DEG                       57.29578
   12.94606        0.00000      0.00000
     29   13   29   14 ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG         57.29578
   12.94606        -.00080
      2   18    2   18 ZD(RATE OF SINK)-FT/MIN                               60.00000
    0.00008
      2   18    2   18 ZD(RATE OF SINK)-FT/SEC                                0.00008
    0.00080
      2   18    2   18 ZD(RATE OF SINK)-M/SEC                                  .30480
    0.00600
     28   20   28   20  NORM. ROLL CONTROL                                    0.00000
     .00008
     28   29   28   29  NORM. YAW CONTROL                                     0.00000
     .00080
     28   38   28   38  NORM. PITCH CONTROL                                   0.00000
    -.13563
      3   26    3   27 THT1,THT2(THRUST DEFLECTION PITCH ANGLES)-DEG         57.29578
    2.03604        2.03604
      3   24    3   25 PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG       57.29578
    -.00000        -.00000
      3   19    3   19 LEFT ELEVON DEFLECTION-DEG                            57.29578
    3.38822
      3   20    3   20 RIGHT ELEVON DEFLECTION-DEG                           57.29578
    3.38822
     28   50   28   50 ELEVATOR COMMAND DEFLECTION-DEG                       57.29578
    3.38822
     28   51   28   51 AILERON COMMAND DEFLECTION-DEG                        57.29578
    -.00000
      3   28    3   29 DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)                 0.00000
    -.00000         .00000
     28   58   28   58 TCMD(THRUST COMMAND)-POUNDS                            0.00000
  3870.07648
     28   58   28   58 TCMD(THRUST COMMAND)-NEWTONS                           4.44800
 17214.10018
     23    9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-POUNDS                0.00000
  1926.09909     1926.09909
     23    9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS               4.44800
  8567.28873     8567.28873
      3   21    3   21 RUDDER DEFLECTION-DEG                                 57.29578
    -.00000
     26   20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS              0.00000
   413.82487
     26   20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS             4.44800
  1840.69302
     26    1   26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC           0.00800
    80.04479       80.04479
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     26    1    26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC           .45400
  36.34033       36.34033
     15    3    15    3 BLDREF(REFERENCE RCS BLEED)-PER CENT                  0.00000
   3.5000
     26         26    7  BLDAVL                                               0.00000
  31.43929
     27   72    27   72 BLD(ACTUAL RCS BLEED)-PER CENT                        0.00000
   3.50000
      3   38     3   39 FRCS1,FRCS2(RCS JET FORCES)-POUNDS                    0.00000
   0.00000        .00000
      3   38     3    3  FRCS1,FRCS2(RCS JET FORCES)-NEWTONS                  4.44800
   0.00000        .00000
     11    7    11    7 ANGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG           57.29578
   0.00000
     19   44    19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-FT-LB           0.00000
 -9653.47017      .00000       .00000
     19   44    19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M        1.35580
-13080.45288      .00000       .00000
     19   37    19   38 XW1,XW2(WING X FORCE)-POUNDS                          0.00000
   543.36429      543.36429
     19   37    19   38 XW1,XW2(WING X FORCE)-NEWTONS                         4.44800
  2416.88438     2416.88438
     19   39    19   40 ZW1,ZW2(WING Z FORCE)-POUNDS                          0.00000
 -6633.13700    -6633.13700
     19   39    19   40 ZW1,ZW2(WING Z FORCE)-NEWTONS                         4.44800
-29504.19338  -29504.19338
     19   19    19   28 CLW1,CLW2(WING LIFT COEFFICIENT)                      0.00000
   .60247         .60247
      3   48     3   48  DFLAPH(CANARD TE FLAP DEFLECTION)-DEG               57.29578
   5.28702
      3   49     3   49  DFLAPW(WING LE FLAP DEFLECTION)-DEG                 57.29578
  29.99434
     19    1    19    3 DXW,DYW,DZW(WING AERO FORCES)-POUNDS                  0.00000
  1086.72859      .00000  -13266.27400
     19    1    19    3 DXW,DYW,DZW(WING AERO FORCES)-NEWTONS                 4.44800
  4833.76876      .00000  -59008.38677
     19    4    19    6 DLW,DMW,DNW(WING AERO MOMENTS)-FT-POUNDS              0.00000
   .00000  -56990.35545       .00000
     19    4    19    6 DLW,DMW,DNW(WING AERO MOMENTS)-NEWTON-M               1.35580
   .00000  -77221.93164       .00000
     20    1    20    3 DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS                0.00000
  -37.99326      0.00000     -393.89076
     20    1    20    3 DXH,DYH,DZH(CANARD AERO FORCES)-NEWTONS               4.44800
 -168.99400      0.00000    -1752.02609
     20    4    20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-FT-POUNDS            0.00000
   0.00000     4749.11073      0.00000
     20    4    20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-NEWTON-M             1.35580
   0.00000     6435.04584      0.00000
     21    1    21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS           4.44800
  -68.24926      -.00000       0.00000
     21    1    21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS            0.00000
  -15.34381      -.00000       0.00000
     21    4    21    6  DLV,DMV,DNV(VERT TAIL AERO MOMENTS)-FT POUNDS        0.00000
   -.00000      74.15877       .00000
     21    4    21    6 DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-NEWTON-M         1.35580
   -.00000     100.48513       .00000
     22    1    22    3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS              0.00000
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   -85.61916          .00000   -1833.00964
        22     1     22     3 UXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS                4.44800
  -380.83401          .00000   -8153.22686
        22     4     22     6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS             0.00000
     0.00000   50376.29394          .00000
        22     4     22     6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M              1.35500
     0.00000   68259.87829          .00000
        29    20     29    22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS              0.00000
   947.77237          .00000  -15493.17440
        29    20     29    22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS             4.44800
  4215.69148          .00000  -68913.63971
        29    23     29    25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS          0.00000
      .00000   -1790.79201          .00000
        29    23     29    25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M           1.35500
      .00000   -2426.52317          .00000
        23     1     23     3 DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS                 0.00000
  3849.76619         -.00000    -136.86131
        23     1     23     3 DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS                4.44800
 17123.76802         -.00000    -608.75911
        23     4     23     6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-FT-POUNDS             0.00000
     -.00000   -2025.79664         -.00000
        23     4     23     6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-NEWTON-M              1.35500
     -.00000   -2744.95445         -.00000
        26    23     26    24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC          0.00000
  1001.11129    1001.11129
        26    23     26    24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC             1.35500
  1356.50580    1356.50580
        24     1     24     3 DXR,DYR,DZR(RAM FORCES)-POUNDS                           0.00000
 -1128.98139          .00000    -328.73378
        24     1     24     3 DXR,DYR,DZR(RAM FORCES)-NEWTONS                          4.44800
 -5021.70923          .00000   -1462.20783
        24     4     24     6 DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS                       0.00000
      .00000    3816.75464          .00000
        24     4     24     6 DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M                        1.35500
      .00000    5171.70280          .00000
        26     3     26     4 RPM1,RPM2(ENGINE ROT. SPEED)-RPM                         0.00000
  3044.69424    3044.69424
        27     1     27     3 DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS                     0.00000
      .00000       0.00000          .00000
        27     1     27     3 DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS                    4.44800
      .00000       0.00000          .00000
        27     4     27     6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-FT-POUNDS                 0.00000
      .00000          .00000         -.00000
        27     4     27     6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-NEWTON-M                  1.35500
      .00000          .00000         -.00000
        25     1     25     3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS                0.00000
     0.00000         -.00000          .00000
        25     1     25     3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS               4.44800
     0.00000         -.00000          .00000
        25     4     25     6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS             0.00000
     -.00000          .00000          .00000
        25     4     25     6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M              1.35500
     -.00000          .00000          .00000
        29    26     29    28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS                   0.00000
  3668.55717          .00000  -15958.76348
        29    26     29    28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS                  4.44800
 16317.74228          .00000  -70984.60666
```

```
 29   29   29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS          0.00000
 .00000         .16619        .00000
 29   29   29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M           1.35580
 .00000         .22518        .00000
 29   51   29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS  0.00000
0.00000        -.00000        .00000
 29   51   29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M   1.35580
0.00000        -.00000        .00000
```

EXAMPLE 1 - TRANSITION TRIM RUN

LONGITUDINAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
X/U	-.6402E-02	-.1789E-02	-.2618E-03	-.1461E-02	-.9993E-02	0.	-.1043E-01	0.	.4783E-22	-.2043E-01
Z/U	-.1073E+00	.3465E-02	0.	-.2638E-02	-.1066E+00	0.	-.1773E-03	.4469E-19	.1587E-18	-.1068E+00
M/U	-.5868E-02	.8959E-04	.1224E-04	.1655E-02	-.3111E-02	0.	.2696E-04	.1153E-20	.1695E-19	-.3084E-02
X/W	.1889E+00	.4967E-02	0.	-.8935E-16	.1139E+00	0.	.1047E-02	0.	.5842E-22	.1149E+00
Z/W	-.5176E+00	-.4438E-01	0.	-.1199E+00	-.6819E+00	0.	-.1214E-01	.1646E-19	.1971E-18	-.6941E+00
M/W	-.1885E-01	.3024E-02	0.	.2757E-01	.1174E-01	0.	.1333E-02	.4247E-21	.2106E-19	.1307E-01
X/Q	.3492E+00	-.7338E-01	.1265E-02	0.	.2772E+00	0.	.2543E-01	0.	.5169E-21	.3026E+00
Z/Q	-.1562E+01	.6506E+00	0.	0.	-.1012E+01	0.	.3552E+01	-.5458E+00	.1744E-17	.1994E+01
M/Q	-.6057E-01	-.4424E-01	-.5916E-04	0.	-.1049E+00	0.	-.3880E+00	-.1408E-01	.1863E-18	-.5069E+00
X/DE	-.7549E+01	-.2880E+00	0.	0.	-.7829E+01	0.	0.	0.	0.	-.7829E+01
Z/DE	-.3715E+02	.2351E+01	0.	0.	-.3480E+02	0.	0.	0.	0.	-.3480E+02
M/DE	-.3361E+01	-.1563E+00	0.	0.	-.3517E+01	0.	0.	0.	0.	-.3517E+01
X/FLAPW	-.2671E+00	-.1385E-01	0.	0.	-.2809E+00	0.	0.	0.	0.	-.2809E+00
Z/FLAPW	-.1813E+01	.1163E+00	0.	0.	-.1696E+01	0.	0.	0.	0.	-.1696E+01
M/FLAPW	-.1783E+00	-.7732E-02	0.	0.	-.1860E+00	0.	0.	0.	0.	-.1860E+00
X/FLAPH	0.	-.1108E+01	0.	0.	-.1108E+01	0.	0.	0.	0.	-.1108E+01
Z/FLAPH	0.	-.1628E+01	0.	0.	-.1628E+01	0.	0.	0.	0.	-.1628E+01
M/FLAPH	0.	.5095E+00	0.	0.	.5095E+00	0.	0.	0.	0.	.5095E+00
X/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCSN	0.	0.	0.	0.		0.	0.	0.	0.	0.
Z/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/TO1	0.	0.	0.	0.	0.	.1766E-02	-.1146E-03	0.	.7617E-22	.1651E-02
Z/TO1	0.	0.	0.	0.	0.	-.6277E-04	-.3336E-04	.1252E-19	.2570E-18	-.9613E-04
M/TO1	0.	0.	0.	0.	0.	-.8989E-05	.3747E-05	.3230E-21	.2746E-19	-.5241E-05
X/TO2	0.	0.	0.	0.	0.	.1766E-02	-.1146E-03	0.	.7617E-22	.1651E-02
Z/TO2	0.	0.	0.	0.	0.	-.6277E-04	-.3336E-04	.1252E-19	.2570E-18	-.9613E-04
M/TO2	0.	0.	0.	0.	0.	-.8989E-05	.3747E-05	.3230E-21	.2746E-19	-.5241E-05
X/THT1	0.	0.	0.	0.	0.	-.6283E+00	0.	0.	0.	-.6283E+00
Z/THT1	0.	0.	0.	0.	0.	-.3764E+01	0.	0.	0.	-.3764E+01
M/THT1	0.	0.	0.	0.	0.	-.4532E+00	0.	0.	0.	-.4532E+00
X/THT2	0.	0.	0.	0.	0.	-.6283E+00	0.	0.	0.	-.6283E+00
Z/THT2	0.	0.	0.	0.	0.	-.3764E+01	0.	0.	0.	-.3764E+01
M/THT2	0.	0.	0.	0.	0.	-.4532E+00	0.	0.	0.	-.4532E+00

X/V	.2859E-14	.6254E-15	.7740E-03	.1787E-15	.7740E-03	0.	.5357E-04	0.	-.2480E-32	.8275E-03	*
Z/V	.2287E-13	-.4289E-14	0.	0.	0.	0.	.4059E-05	.1015E-16	-.5079E-29	.4059E-05	*
M/V	.8851E-15	.2213E-15	-.3619E-04	0.	-.3619E-04	0.	-.3102E-06	.2618E-18	-.7862E-30	-.3650E-04	*
X/P	.1430E-12	.3127E-13	.3633E-03	0.	.3633E-03	0.	.7686E-04	0.	-.5189E-22	.4482E-03	*
Z/P	.1144E-11	-.2144E-12	0.	0.	0.	0.	.2238E-04	.5073E-15	-.1724E-18	.2238E-04	*
M/P	.4426E-13	.1106E-13	-.1699E-04	0.	-.1699E-04	0.	-.2514E-05	.1309E-16	-.1042E-19	-.1958E-04	*
X/R	.1430E-12	.3127E-13	.1952E-02	0.	.1952E-02	0.	.1430E-12	0.	-.1240E-30	.1952E-02	*
Z/R	.1144E-11	-.2144E-12	0.	0.	0.	0.	.3574E-13	.5073E-15	-.2539E-27	0.	*
M/R	.4426E-13	.1106E-13	-.9129E-04	0.	-.9129E-04	0.	-.5532E-14	.1309E-16	-.3931E-28	-.9129E-04	*
X/DR	.8193E-12	.1792E-12	-.4842E-01	0.	-.4842E-01	0.	.8193E-12	0.	-.7106E-30	-.4842E-01	*
Z/DR	.6554E-11	-.1229E-11	0.	0.	0.	0.	.2048E-12	.2907E-14	-.1455E-26	0.	*
M/DR	.2536E-12	.6341E-13	.2264E-02	0.	.2264E-02	0.	-.3170E-13	.7500E-16	-.2253E-27	.2264E-02	*
X/DA	-.1035E+00	.3090E-03	0.	0.	-.1032E+00	0.	.8193E-12	0.	-.7106E-30	-.1032E+00	*
Z/DA	.1528E-01	-.2595E-02	0.	0.	.1269E-01	0.	.2048E-12	.2907E-14	-.1455E-26	.1269E-01	*
M/DA	.5275E-03	.1726E-03	0.	0.	.7001E-03	0.	-.3170E-13	.7500E-16	-.2253E-27	.7001E-03	*
X/DRCSR	.2859E-12	.6254E-13	0.	0.	.2859E-12	0.	.2859E-12	0.	.4079E-03	.4079E-03	*
Z/DRCSR	.2287E-11	-.4289E-12	0.	0.	0.	0.	.7148E-13	.1015E-14	.1646E+01	.1646E+01	*
M/DRCSR	.8851E-13	.2213E-13	0.	0.	.1770E-12	0.	-.1106E-13	.2617E-16	.1759E+00	.1759E+00	*
X/DRCSY	.2859E-12	.6254E-13	0.	0.	.2859E-12	0.	.2859E-12	0.	-.1328E-17	.2287E-11	*
Z/DRCSY	.2287E-11	-.4289E-12	0.	0.	0.	0.	.7148E-13	.1015E-14	-.4481E-14	0.	*
M/DRCSY	.8851E-13	.2213E-13	0.	0.	.1770E-12	0.	-.1106E-13	.2617E-16	-.4786E-15	.1660E-12	*
X/DRCSS	.2859E-12	.6254E-13	0.	0.	.2859E-12	0.	.2859E-12	0.	-.1328E-17	.2287E-11	*
Z/DRCSS	.2287E-11	-.4289E-12	0.	0.	0.	0.	.7148E-13	.1015E-14	-.4481E-14	0.	*
M/DRCSS	.8851E-13	.2213E-13	0.	0.	.1770E-12	0.	-.1106E-13	.2617E-16	-.4786E-15	.1660E-12	*
X/PSIT1	.8193E-12	.1792E-12	0.	0.	.8193E-12	-.1477E+00	.8193E-12	0.	-.3805E-17	-.1477E+00	*
Z/PSIT1	.6554E-11	-.1229E-11	0.	0.	0.	.4077E-02	.2048E-12	.2907E-14	-.1284E-13	.4077E-02	*
M/PSIT1	.2536E-12	.6341E-13	0.	0.	.5072E-12	.6104E-03	-.3170E-13	.7500E-16	-.1371E-14	.6104E-03	*
X/PSIT2	.8193E-12	.1792E-12	0.	0.	.8193E-12	-.1477E+00	.8193E-12	0.	-.3805E-17	-.1477E+00	*
Z/PSIT2	.6554E-11	-.1229E-11	0.	0.	0.	.4077E-02	.2048E-12	.2907E-14	-.1284E-13	.4077E-02	*
M/PSIT2	.2536E-12	.6341E-13	0.	0.	.5072E-12	.6104E-03	-.3170E-13	.7500E-16	-.1371E-14	.6104E-03	*

LATERAL-DIRECTIONAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
Y/U	-.4963E-17	0.	-.2747E-16	.1078E-16	-.2174E-16	0.	.4071E-18	-.3105E-19	0.	-.2136E-16
L/U	0.	0.	-.8490E-17	0.	-.8490E-17	0.	.1223E-19	-.1655E-21	.1353E-18	-.8343E-17
N/U	0.	0.	.2686E-17	.1504E-17	.4190E-17	0.	.3086E-19	.7224E-21	-.5471E-23	.4221E-17
Y/W	.4416E-16	0.	0.	0.	.4416E-16	0.	.5949E-20	-.1144E-19	0.	.4416E-16
L/W	-.5851E-14	0.	0.	0.	-.5851E-14	0.	.4503E-20	-.6095E-22	.1601E-18	-.5851E-14
N/W	.9978E-16	0.	0.	0.	.9978E-16	0.	.6368E-20	.2661E-21	-.6795E-23	.9978E-16
Y/Q	.1421E-15	0.	.1328E-15	0.	.2748E-15	0.	.5661E-18	-.4668E-19	0.	.2753E-15
L/Q	0.	0.	.4103E-16	0.	.4103E-16	0.	.1714E-14	.1428E-15	.1487E-17	.1899E-14
N/Q	-.1247E-14	0.	-.1298E-16	0.	-.1260E-14	0.	-.1203E-17	.1086E-20	-.6012E-22	-.1261E-14
Y/DE	.3203E-14	0.	0.	0.	.3203E-14	0.	0.	0.	0.	.3203E-14
L/DE	-.8382E-12	0.	0.	0.	-.8382E-12	0.	0.	0.	0.	-.8382E-12
N/DE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/FLAPW	.1584E-15	0.	0.	0.	.1584E-15	0.	0.	0.	0.	.1584E-15
L/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/TO1	0.	0.	0.	0.	0.	-.6235E-18	.8342E-19	-.6879E-20	0.	-.5478E-18
L/TO1	0.	0.	0.	0.	0.	.7426E-05	.5867E-05	-.2238E-28	.2191E-18	.1329E-04
N/TO1	0.	0.	0.	0.	0.	.2850E-04	-.2749E-05	.1600E-21	-.8868E-23	.2575E-04
Y/TO2	0.	0.	0.	0.	0.	-.6235E-18	.8342E-19	-.6879E-20	0.	-.5478E-18
L/TO2	0.	0.	0.	0.	0.	-.7426E-05	-.5867E-05	.2165E-20	.2191E-18	-.1329E-04
N/TO2	0.	0.	0.	0.	0.	-.2850E-04	.2749E-05	.1600E-21	-.8868E-23	-.2575E-04
Y/THT1	0.	0.	0.	0.	0.	.2219E-15	0.	0.	0.	.2219E-15
L/THT1	0.	0.	0.	0.	0.	.4453E+00	0.	0.	0.	.4453E+00
N/THT1	0.	0.	0.	0.	0.	-.1014E-01	0.	0.	0.	-.1014E-01
Y/THT2	0.	0.	0.	0.	0.	.2219E-15	0.	0.	0.	.2219E-15
L/THT2	0.	0.	0.	0.	0.	-.4453E+00	0.	0.	0.	-.4453E+00
N/THT2	0.	0.	0.	0.	0.	.1014E-01	0.	0.	0.	.1014E-01

Y/V	-.1979E-01	0.	-.8493E-01	-.4861E-01	-.1453E+00	0.	-.1220E-01	-.4614E-22	0.	-.1575E+00
L/V	-.4197E-01	0.	-.2625E-01	0.	-.6822E-01	0.	-.6501E-04	-.2459E-24	.1470E-20	-.6829E-01
N/V	-.2913E-02	0.	.8308E-02	-.5708E-02	-.3211E-03	0.	-.1205E-02	.1073E-23	-.5943E-25	-.1526E-02
Y/P	0.	0.	-.4047E+00	0.	-.4047E+00	0.	-.2621E-01	.2307E-20	0.	-.4309E+00
L/P	-.1810E+01	0.	-.1251E+00	0.	-.1135E+01	0.	-.1522E+00	.1229E-22	-.7359E-19	-.1287E+01
N/P	-.4086E-01	0.	.3957E-01	0.	-.4905E-03	0.	-.2582E-02	-.5367E-22	.2972E-23	-.3073E-02
Y/R	0.	0.	.9405E+00	0.	.9405E+00	0.	-.3552E+01	.5458E+00	0.	-.2065E+01
L/R	.6510E+00	0.	.2907E+00	0.	.9417E+00	0.	-.1893E-01	.2909E-02	0.	.9257E+00
N/R	-.4068E-01	0.	-.9195E-01	0.	-.1406E+00	0.	-.3706E+00	-.1270E-01	0.	-.5239E+00
Y/DR	0.	0.	.9675E+01	0.	.9675E+01	0.	0.	0.	0.	.9675E+01
L/DR	0.	0.	.2990E+01	0.	.2990E+01	0.	0.	0.	0.	.2990E+01
N/DR	0.	0.	-.9458E+00	0.	-.9458E+00	0.	0.	0.	0.	-.9458E+00
Y/DA	.5427E-27	0.	0.	0.	.6858E-27	0.	0.	0.	0.	.7068E-27
L/DA	-.1386E+02	0.	0.	0.	-.1386E+02	0.	0.	0.	0.	-.1386E+02
N/DA	.3842E+00	0.	0.	0.	.3842E+00	0.	0.	0.	0.	.3842E+00
Y/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	.1404E+01	.1404E+01
N/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	-.5675E-04	-.5675E-04
Y/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DFCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/PSIT1	0.	0.	0.	0.	0.	.3780E+01	0.	0.	0.	.3780E+01
L/PSIT1	0.	0.	0.	0.	0.	.2014E-01	0.	0.	0.	.2014E-01
N/PSIT1	0.	0.	0.	0.	0.	-.4108E+00	0.	0.	0.	-.4108E+00
Y/PSIT2	0.	0.	0.	0.	0.	.3780E+01	0.	0.	0.	.3780E+01
L/PSIT2	0.	0.	0.	0.	0.	.2014E-01	0.	0.	0.	.2014E-01
N/PSIT2	0.	0.	0.	0.	0.	-.4108E+00	0.	0.	0.	-.4108E+00

NOPT=7 READ VARIABLE OUTPUT FORMATS

```
(4X,F8.0,2X,10F10.2)
(4X,F8.0,2X,10F10.2)
(4X,F8.0,2X,10F10.2)
(4X,F8.0,2X,10F10.2)
(4X,F8.0,2X,10F10.2)
(4X,F8.0,2X,2F10.2,8E10.3)
(4X,F8.0,2X,10E10.3)
(4X,F8.0,2X,10E10.3)
(4X,F8.0,2X,10E10.3)
(4X,F8.0,2X,10E10.3)
(4X,F8.0,2X,10E10.3)
(4X,F8.0,2X,10E10.3)
```

NOPT=12 PRINT DATA SUMMARY FROM TRIM

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	UDOT	VDOT	WDOT	U	V	W	P-D/S	Q-D/S	R-D/S	ALPHA-DG
200.	.00	.00	[illegible]	334.11	-.00	48.39	-.00	-.00	-.00	8.24
180.	.00	.00	-.00	299.65	-.00	50.31	-.00	-.00	-.00	9.53
160.	.00	-.00	-.00	265.10	-.00	51.62	-.00	.00	.00	11.02
140.	.00	.00	-.00	230.31	-.00	52.94	-.00	-.00	-.00	12.95

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	BETA-DG	XE2D-F/S2	YE2D-F/S2	ZE2D-F/S2	XEDOT-F/S	YEDOT-F/S	ZEDOT-F/S	THETD-D/S	PHID-D/S	PSID-D/S
200.	-.00	0.00	0.00	0.00	337.60	-.00	0.00	0.00	0.00	0.00
180.	-.00	0.00	0.00	0.00	303.84	-.00	0.00	0.00	0.00	0.00
160.	-.00	0.00	0.00	0.00	270.08	-.00	0.00	0.00	0.00	0.00
140.	-.00	0.00	0.00	0.00	236.32	-.00	0.00	0.00	0.00	0.00

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	THETA-DG	PHI-DEG	PSI-DEG	DA-DEG	DE-DEG	DR-DEG	DROLL	DPITCH	DYAW	PSIT(1)
200.	8.24	0.00	0.00	.00	-.81	-.00	-.00	.03	.00	-.00
180.	9.53	0.00	0.00	[illegible]	-.43	-.00	-.00	.02	.00	-.00
160.	11.02	0.00	0.00	-.60	.94	-.00	.00	-.04	.00	-.00
140.	12.95	0.00	0.00	-.00	3.39	-.00	.00	-.14	.00	-.00

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	THT(1)	L.ELEV-DG	R.ELEV-DG	FRCS1-LB	FRCS2-LB	BLDREQ	BLDAVL	DRSC1	DRSC2	TCMD-LB
200.	-.49	-.81	-.81	.00	0.00	3.58	31.69	.00	-.00	3778.75
180.	-.26	-.43	-.43	.00	0.00	3.58	31.84	.00	-.00	3617.80
160.	.56	.94	.94	0.00	.00	3.50	31.89	-.0C	.00	3540.99
140.	2.04	3.39	3.39	0.00	.00	3.50	31.44	-.00	.02	3878.08

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	TO1-LB	TO2-LB	TREQ1-LB	TREQ2-LB	TRST1-LB	TRST2-LB	TCOR1-LB	TCOR2-LB	RPM1	RPM2
200.	2091.41	2091.41	2091.41	2091.41	1889.38	1889.38	1887.30	1887.30	2923.29	2923.29
180.	2002.32	2002.32	2002.32	2002.32	1808.90	1808.90	1807.83	1807.83	2849.82	2849.82
160.	1959.81	1959.81	1959.81	1959.81	1770.49	1770.49	1768.23	1768.23	2818.67	2818.67
140.	2141.95	2141.95	2141.95	2141.95	1935.04	1935.04	1926.10	1926.10	3044.69	3044.69

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	MDOT1	MDOT2	X/U	Z/U	M/U	X/W	Z/W	M/W	X/Q	Z/Q
200.	80.78	80.78	-.227E-01	-.598E-01	-.147E-02	.103E+00	-.895E+00	.985E-02	.293E+00	.137E+01
180.	79.66	79.66	-.211E-01	-.708E-01	-.149E-02	.108E+00	-.829E+00	.768E-02	.296E+00	.151E+01
160.	78.92	78.92	-.188E-01	-.902E-01	-.155E-02	.112E+00	-.747E+00	.743E-02	.295E+00	.170E+01
140.	80.04	80.04	-.204E-01	-.107E+00	-.308E-02	.115E+00	-.694E+00	.131E-01	.303E+00	.199E+01

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	M/Q	X/DE	Z/DE	M/DE	X/FLAPW	Z/FLAPW	M/FLAPW	X/FLAPC	Z/FLAPC	M/FLAPC
200.	-.533E+00	.136E+02	-.732E+02	-.712E+01	-.529E+00	.139E+00	-.220E+00	.283E+01	-.279E+01	.941E+00
180.	-.522E+00	.611E+01	-.584E+02	-.570E+01	-.417E+00	-.600E+00	-.215E+00	.229E+01	-.224E+01	.760E+00
160.	-.511E+00	-.886E+01	-.465E+02	-.460E+01	-.332E+00	-.122E+01	-.201E+00	.179E+01	-.179E+01	.601E+00
140.	-.507E+00	-.783E+01	-.348E+02	-.352E+01	-.281E+00	-.170E+01	-.186E+00	-.111E+01	-.163E+01	.509E+00

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	X/TO1	Z/TO1	M/TO1	X/TO2	Z/TO2	M/TO2	X/THT1	Z/THT1	M/THT1	X/THT2
200.	.161E-02	-.153E-04	.383E-05	.161E-02	-.153E-04	.383E-05	.265E+00	-.370E+01	-.446E+00	.265E+00
180.	.162E-02	-.235E-04	.312E-05	.162E-02	-.235E-04	.312E-05	.136E+00	-.355E+01	-.427E+00	.136E+00
160.	.164E-02	-.499E-04	.132E-06	.164E-02	-.499E-04	.132E-06	-.289E+00	-.347E+01	-.418E+00	-.289E+00
140.	.165E-02	-.961E-04	-.524E-05	.165E-02	-.961E-04	-.524E-05	-.628E+00	-.376E+01	-.453E+00	-.628E+00

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	Z/THT2	M/THT2	Y/V	L/V	N/V	Y/P	L/P	N/P	Y/R	L/R
200.	-.370E+01	-.446E+00	-.202E+00	-.717E-01	.120E-02	-.613E+00	-.166E+01	.152E-01	-.167E+01	.822E+00
180.	-.355E+01	-.427E+00	-.185E+00	-.705E-01	.476E-03	-.552E+00	-.153E+01	.789E-02	-.177E+01	.836E+00
160.	-.347E+01	-.418E+00	-.171E+00	-.695E-01	-.403E-03	-.492E+00	-.140E+01	.168E-02	-.188E+01	.870E+00
140.	-.376E+01	-.453E+00	-.158E+00	-.683E-01	-.153E-02	-.431E+00	-.129E+01	-.307E-02	-.207E+01	.926E+00

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	N/R	Y/DR	L/DR	N/DR	Y/DA	L/DA	N/DA	V/DRCSR	L/DRCSR	N/DRCSR
200.	-.541E+00	.204E+02	.629E+01	-.199E+01	0.	-.287E+02	-.709E+00	0.	.139E+01	-.561E-04
180.	-.527E+00	.164E+02	.506E+01	-.160E+01	0.	-.231E+02	-.329E+00	0.	.138E+01	-.557E-04
160.	-.510E+00	.128E+02	.396E+01	-.125E+01	0.	-.184E+02	.434E+00	0.	.137E+01	-.556E-04
140.	-.524E+00	.967E+01	.299E+01	-.946E+00	.707E-27	-.139E+02	.384E+00	0.	.140E+01	-.567E-04

EXAMPLE 1 - TRANSITION TRIM RUN

AIRSPEED	V/PSIT1	L/PSIT1	N/PSIT1	V/PSIT2	L/PSIT2	N/PSIT2
200.	.370E+01	.197E-01	-.402E+00	.370E+01	.197E-01	-.402E+00
180.	.355E+01	.189E-01	-.385E+00	.355E+01	.189E-01	-.385E+00
160.	.347E+01	.185E-01	-.377E+00	.347E+01	.185E-01	-.377E+00
140.	.378E+01	.201E-01	-.411E+00	.378E+01	.201E-01	-.411E+00

APPENDIX E

EXAMPLE 2 (STATIONKEEPING TIME HISTORY) OUTPUT

```
   69 NEQS
    5     0 NTAP,NTAPW
```

DIVISION OF R-ARRAY

I	NR(I)	LENGTH(I)
1	0	7
2	7	69
3	76	69
4	145	17
5	162	19
6	181	91
7	272	29
8	301	18
9	319	34
10	353	27
11	380	19
12	399	15
13	414	1
14	415	17
15	432	206
16	638	225
17	863	148
18	1011	6
19	1017	54
20	1071	33
21	1104	21
22	1125	28
23	1153	31
24	1184	44
25	1228	11
26	1239	35
27	1274	73
28	1347	76
29	1423	67
30	1490	133
31	1623	12
32	1635	72
33	1707	250
34	1957	250
35	2207	250
36	2457	250
37	2707	250
38	2957	250
39	3207	26
40	3233	50
41	3283	10
42	3293	28
43	3321	161
44	3482	103
45	3585	170

OUTPUT SPECIFICATIONS

1	1	1.00000	TIME-SEC
3	1	1.00000	U-FT/SEC
3	2	1.00000	V-FT/SEC
3	3	1.00000	W-FT/SEC
3	4	57.29580	P-DEG/SEC
3	5	57.29580	Q-DEG/SEC
3	6	57.29580	R-DEG/SEC
29	46	57.29580	RS-DEG/SEC
29	47	57.29580	PS-DEG/SEC
2	16	1.00000	XEDT-FT/S
2	17	1.00000	YEDT-FT/S
2	18	1.00000	ZEDT-FT/S
3	16	1.00000	XE-FT
3	17	1.00000	YE-FT
3	18	1.00000	ZE-FT
3	64	57.29580	THETA-DEG
3	65	57.29580	PHI-DEG
3	66	57.29580	PSI-DEG
29	32	1.00000	D11
29	33	1.00000	D12
29	34	1.00000	D13
29	35	1.00000	D21
29	36	1.00000	D22
29	37	1.00000	D23
29	38	1.00000	D31
29	39	1.00000	D32
29	40	1.00000	D33
28	50	57.29580	DEC-DEG
28	52	57.29580	DAC-DEG
3	19	57.29580	L.ELEV-DEG
3	20	57.29580	R.ELEV-DEG
3	21	57.29580	UR-DEG
3	24	57.29580	PSIT-DEG
3	26	57.29580	THIT-DEG
3	28	1.00000	RCS NORM.
3	48	57.29580	CAN.FLP-DG
3	49	57.29580	WNG.FLP-DG
29	9	.59200	VA-KT
29	13	57.29580	ALPHA-DEG
29	14	57.29580	BETA-DEG
29	54	1.00000	NXCG-G
29	55	1.00000	NYCG-G
29	56	1.00000	NZCG-G
28	20	1.00000	DROLL
28	29	1.00000	DYAW
28	38	1.00000	DPITCH
28	58	1.00000	TCMD-LB
26	34	1.00000	TOUT-LB
26	1	1.00000	MDOT-LB/S
26	3	1.00000	RFM-RAD/S
26	7	1.00000	BLDAVL
27	19	1.00000	BLDREQ
3	52	57.29580	PHITRM-DEG
3	53	57.29580	P.INTE-DEG
3	54	1.00000	P.ERR.INT
3	55	57.29580	PSITRM-DEG

```
   3   56     57.29580       R.INTE-DEG
   3   57      1.00000       R.ERR.INT
   3   58     57.29580       PSITRMBUT
   3   59     57.29580       THETRM-DEG
   3   60     57.29580       Q.INTE-DEG
   3   61      1.00000       Q.ERR.INT.
   3   62     57.29580       THETRMBUT
   3   63      1.00000       ZE.ERR.INT
  28   19     57.29580       P.ERR-DG/S
  28   26     57.29580       R.ERR-DG/S
  28   35     57.29580       Q.ERR-DG/S
  28   40      1.00000       ZE.ERR-F/S
  28   12      1.00000       ROLLCMD
  28   21      1.00000       YAWCMD
  28   11      1.00000       CON.SYS.SW
  28   13     57.29580       DLATSTK-DG
  28   22     57.29580       DPED-DG/S
  28   31     57.29580       LNG.STK.
  28   39      1.00000       ZEDT.CMD.
  28   43      1.00000       THROTTLE
  28    1      1.00000       ZE.ERR-FT
  28    3      1.00000       YE.ERR-FT
  28    8      1.00000       XBODY.ER-F
  28    9      1.00000       YBODY.ER-F
  28   10      1.00000       ZBODY.ER-F
  26   20      1.00000       IRCS
   0    0      0.00000       BLANK CARD-END TIME HISTORY OUTPUT SPECIFICATIONS
 NOUT=   82


  STORE FIXED TABLES ETC.

      4    1      4     5 WT,IX,IY,IZ,IXZ                                        0.00000
 16375.00000    7959.00000    52609.00000    58337.00000    -202.40000
      4    6      4     8  FSCG,BLCG,WLCG                                         .08333
   401.50000      0.00000      99.00000
      5    1      5    19 TOL(I)-TRIM TOLERANCES                                  0.00000
      .50000       .50000       .50000      1.00000      1.00000      1.00000       .50000       .10000
      .10000       .10000       .02000       .02000       .02000       .50000       .50000      0.00000
     0.00000      0.00000      0.00000
      6    1      6    70 AAERO.AERO(I,J)-AERO LIFT-DRAG CONSTANTS               0.00000
     0.00000      2.30000      2.14000    350.00000    217.20000       .70900       .87300       .15000
     1.06000       .59300      6.04500       .00394       .25300       .97400       .63000       .17200
     -.34300       .09100      -.08590       .30400       .00602      -.01910       .52500       .07300
     2.25000       .99600    115.80000     51.10000       .93400      1.04700       .25000      1.12000
      .51500      6.04500       .00281       .44200       .10630       .10650       .08650       .43200
     0.00000      0.00000      0.00000      0.00000      0.00000      0.00000       .52500      2.00000
     2.00000     60.00000     60.00000       .78500       .92500       .30000      1.03000       .47100
     6.04500       .00431       .17900      0.00000      0.00000      0.00000      0.00000      0.00000
     0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
      6   71      6    79 SURFCP(I,J)                                             0.00000
      .57100       .17500       .73400       .49500       .72700       .80000       .74900      -.02000
      .97600
      7    1      7     4  FSW,BLW1,BLW2,WLW                                      .08333
   440.00000    -70.00000     70.00000     99.00000
      7    5      7     9  CW,BW,EKOA1,EKOA2,EIW                                 0.00000
```

```
  14.58000     28.38000     0.00000     0.00000     0.00000
      7  10     7  13  CLBOW,CLBCLW,CLRCLW,CLPW                      0.00000
   0.00000     -.23500      .27500     -.19200
      7  14     7  19  CNBOW,CNBCL2W,CNRCL2W,CNFCDW,CNPCLW,CNPCDAW   0.00000
   0.00000     -.13200     -.16600     -.45300     -.18500     0.00000
      7  20     7  21  CMOW,CMDFW                                    0.00000
   0.00000     -.01910
      7  22     7  22  AEKEL                                         0.00000
   7.00000
      7  23     7  23  CYBCL2W                                       0.00000
   -.30000
      8   1     8   3  FSH,BLH,WLH                                    .08333
 312.50000     0.00000   115.00000
      8   4     8   8  CH,BH,EKADE,EIH,EOCLH                         0.00000
   6.42000    16.13000     0.00000     -.08730      .16200
      8   9     8  10  CMDFH,CMOH                                    0.00000
   -.05730     0.00000
      9   1     9   3  FSV,BLV,WLV                                    .08333
 536.00000     0.00000   157.0000
      9   4     9   9  CV,BV,EKADR,EIV,EKY,CNOV                      0.00000
   8.49000     7.75000      .50000     0.00000     0.00000     0.00000
      9  10     9  10  AEKRUD                                        0.00000
   7.00000
      9  11     9  20  TALFA(I)                                       .01745
-180.00000    20.00000    30.00000    40.00000    50.00000   130.00000   140.00000   150.00000
 160.00000   180.00000
      9  21     9  21  AALFA                                         0.00000
  10.00000
      5  22     9  31  TVTEFF(I)                                     0.00000
   1.50000     1.00000      .70000      .25000     0.00000     0.00000      .25000      .70000
   1.00000     1.00000
     10   1    10   3  FSF,BLF,WLF                                    .08333
 174.00000     0.00000    99.00000
     10   4    10  10  AOQ0,SOQMX,NFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMX2   0.00000
   1.44300   367.00000   367.00000   532.00000  -110.60000   532.00000  -110.60000
     10  11    10  13  AOF,A1F,A2F                                    .01745
   2.00000    88.00000    90.00000
     10  14    10  20  EN1,EN2,EN3,EN4,EN5,EN6,ENZ                   0.00000
   2.00000     1.86700     1.52200      .80000     1.00000      .80000     1.00000
     10  21    10  21  DFSF0                                         0.00000
  17.80000
     10  22    10  23  ADFSF1,ADFSF2                                 0.00000
    .26200      .80300
     10  24    10  24  XKYF                                          0.00000
   0.00000
     11   1    11   6  FSSW1,FSSW2,BLSW1,BLSW2,WLSW1,WLSW2            .08333
 551.00000   551.00000   -22.20000    22.20000   100.00000   100.00000
     11   7    11  11  SIGY ELN,KAFT1,KAFT2,AENG                     0.00000
   0.00000     4.26000     -.13000     1.00000     2.00000
     12   1    12   6  FSIN1,FSIN2,BLIN1,BLIN2,WLIN1,WLIN2            .08333
 266.00000   266.00000   -33.00000    33.00000   100.00000   100.00000
     12   7    12   9  RINLET,AVOVI,AATURN                           0.00000
   1.31000     5.00000     5.00000
     13   1    13   1  ELDUCT                                         .08333
 335.00000
     14   1    14   5  AMACH,KBT1,KBT2,KM1,KM2                       0.00000
   4.00000     -.02760     1.00000      .56500      .43500
```

```
    14   6   14    8 OMEGMX,RPMMX,RCS                                  0.00000
1063.00000  10159.00000    1.00000
    14   9   14   10  AFRAT,JENG                                       0.00000
  6.00000      3.14000
    14  11   14   14  AFRAC,TAUAB,ABACCEL,ABDECEL                      0.00000
  6.00000       .05000    20.00000    -20.00000
    14  15   14   16  TABON,TABOFF                                     0.00000
   .10000       .00100
    15   1   15    3  ARCSJET,ABLDR,BLDREF,                            0.00000
  2.00000      6.00000     3.50000
    15   4   15    5  FRCSMX1,FRCSMX2                                  0.00000
1500.00000  1500.00000
    15  14   15   15  DEMAND1,DEMAND2                                  0.00000
  1.00000      1.00000
    15  24   15   25  BLDMOR1,BLDMOR2                                  0.00000
  1.00000      1.00000
    15  34   15   35  RCSL(1,1),RCSL(2,1)                              0.00000
 -1.00000      1.00000
    15  84   15   85  FSRCS1,FSRCS2                                     .00333
 534.00000   534.00000
    15  94   15   95  BLRCS1,BLRCS2                                     .00333
-160.00000   160.00000
    15 104   15  105  WLRCS1,WLRCS2                                     .00333
 100.00000   100.00000
    15 114   15  115  THTRCS1,THTRCS2                                   .01745
 -90.00000   -90.00000
    15 124   15  125  PSIRCS1,PSIRCS2                                   .01745
  0.00000      0.00000
    16  13   16   13  CSV                                              0.00000
   .28600
    16  14   16   14  VASW                                             1.00000
  60.00000
    16  66   16   69 PELIM,AKDYDR,KTHTR,KOA                            0.00000
  1.00000      0.00000     0.00000     -.43600
    16 110   16  113 RELIM,AKYTRM,KPSIT,KDR                            0.00000
  1.00000       .34900     -.26200     -.43600
    16 114   16  119 TAKAY(I)-LAT.ACCEL.FDBACK TABLE                   0.00000
  0.00000      0.00000      .06250      .10500      .00000      .04000
    16 122   16  122 KTY                                               0.00000
  0.00000
    16 163   16  167 QELIM,AKPIRM,DSTK,KDE,KTHIP                       0.00000
  1.00000       .34900    10.00000     -.43600     -.26200
    16 184   16  184 AKTHROT                                           0.00000
30000.00000
    16 185   16  185 ZELIM                                             0.00000
30000.00000
    16 186   16  188  ELEVNRF,PSITRF(I)                                0.00000
  0.00000      0.00000     0.00000
    16 189   16  192 KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                   0.00000
  5.56000     -1.16400     4.17000     -.18900
    16 193   16  193  AQBAR                                            0.00000
  7.00000
    16 194   16  199  TQBAR(I)-DYNAMIC PRESSURE TABLE                  0.00000
  0.00000      9.95000    10.00000     20.00000    46.00000   127.00000
    17   1   17    4  LEURATL,LELRATL,LEUPOSL,LELPOSL                   .01745
 35.00000    -35.00000    60.00000    -60.00000
    17   5   17    5  TLEL                                             0.00000
```

```
      .05000
      17    6    17     9  REURATL,RELRATL,REUPOSL,RELPOSL                              .01745
   35.00000    -35.00000     60.00000     -60.00000
      17   10    17    10  TREL                                                        0.00000
      .05000
      17   11    17    14  DRURATL,DRLRATL,DRUPOSL,DRLPOSL                              .01745
  100.00000   -100.00000     25.00000     -25.00000
      17   15    17    15  TDR                                                         0.00000
      .05000
      17   16    17    19  HFURATL,HFLRATL,HFLAPMX,HFLAPMN                              .01745
   10.00000    -10.00000     25.00000     -12.00000
      17   20    17    20  THF                                                         0.00000
      .10000
      17   21    17    24  HFURATL,HFLRATL,HFLAPMX,HFLAPMN                              .01745
   10.00000    -10.00000     30.00000       0.00000
      17   25    17    25  THF                                                         0.00000
      .10000
      17   26    17    33 THTURL(2),THTLRL(2),THTUPL(2),THTLPL(2)                       .01745
   50.00000     50.00000    -50.00000     -50.00000     15.00000     15.00000    -15.00000    -15.00000
      17   34    17    35 TTHT(2)                                                      0.00000
      .05000       .05000
      17   36    17    43 PSIURL(2),PSILRL(2),PSIUPL(2),PSILPL(2)                       .01745
   50.00000     50.00000    -50.00000     -50.00000     15.00000     15.00000    -15.00000    -15.00000
      17   44    17    45 TPSIT(2)                                                     0.00000
      .05000       .05000
      17   46    17    47  RCSURL(2)                                                   0.00000
   10.00000     10.00000
      17   56    17    57  RCSLRL(2)                                                   0.00000
  -10.00000    -10.00000
      17   66    17    67  RCSUPL(2)                                                   0.00000
    1.00000      1.00000
      17   76    17    77  RCSLPL(2)                                                   0.00000
   -1.00000     -1.00000
      17   86    17    87  TAURCS(2)                                                   0.00000
      .05000       .05000
      17   96    17    97  FRCSURL(2)                                                  0.00000
 15000.00000  15000.00000
      17  106    17   107  FRCSLRL(2)                                                  0.00000
-15000.00000 -15000.00000
      17  116    17   117  FRCSUPL(2)                                                  0.00000
  1500.00000   1500.00000
      17  126    17   127  FRCSLPL(2)                                                  0.00000
 -1500.00000  -1500.00000
      17  136    17   137  TAUFRCS(2)                                                  0.00000
      .05000       .05000
      17  146    17   148  DELIM,DALIM,DRLIM                                            .01745
   25.00000     25.00000     25.00000
      30    1    30     5  VOVIT(I)-VOVI TABLE FOR RAM F + M                           0.00000
    0.00000       .22700       .29800        .51400     10.00000
      30    6    30    11 ATURNT(J)-ATURN TABLE FOR RAM F + M                           .01745
    0.00000     20.00000     45.00000      70.00000     90.00000    180.00000
      30   14    30    43 ELRAMT(I,J)-MOMENT ARM TABLE FOR RAM F + M                    .08333
    0.00000      0.00000      0.00000       0.00000      0.00000      1.78000       .97300       .69300
     .23400       .23400      3.51000       2.24400      1.76500      1.04200      1.04200      4.54000
    3.43300      2.99600      2.43700       2.43700      4.87000      4.08400      3.81800      3.56400
    3.56400      4.87000      4.08400       3.81600      3.56400      3.56400
      30   54    30    83 DATURNT(I,J)-DELTA ATURN TABLE FOR RAM F + M                  .01745
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   0.00000      0.00000      0.00000      0.00000      0.00000     12.91000     12.91000      7.72000
   5.08000      5.08000     19.47000     19.47000     12.41000     11.59000     11.59000     15.65000
  15.65000     12.11000     11.59000     11.59000      8.44000      8.44000      6.83000     12.59000
  12.59000      8.44000      8.44000      6.83000     12.59000     12.59000
    30   94    38   123 ETARI(I,J)-RAM EFFIC. FACTOR TABLE                 0.00000
   1.00000      1.00000      1.00000      1.60000      1.00000      1.00000      1.00000      1.00000
   1.00600      1.00000      1.19500      1.19500      1.12700      1.01600      1.01600      1.37200
   1.37200      1.23400      1.09200      1.09200      1.40200      1.40200      1.24300      1.10000
   1.10000      1.40200      1.40200      1.24300      1.10000      1.10000
    31    1    31     6 FRCST(I)-AVAIL. RCS FORCE TABLE                    0.00000
   0.00000       .01000    170.00000    365.00000    500.00000    875.00000
    31    7    31    12 BLDRT(I)- RCS BLEED TABLE                          0.00000
   0.00000      3.50000      4.50000     10.00000     15.00000     30.00000
    32    1    32     4 MNT(I)-MACH TABLE FOR PROPULSION SYSTEM            0.00000
   0.00000       .10000       .20000       .30000
    32    5    32     8 TFGMAX(I)-MAX A/B THRUST TABLE                     0.00000
15416.00000  15785.00000  16162.00000  16705.00000
    32    9    32    12 TFGMIN(I)-MIN A/B THRUST TABLE                     0.00000
 9323.00000   9491.00000   9772.00000  10105.00000
    32   13    32    16 TFGIDL(I)-IDLE THRUST TABLE                        0.00000
  629.00000    753.00000   1004.00000   1306.00000
    32   17    32    20 TMDT(I)-MAX. FLOW RATE TABLE                       0.00000
  138.20000    140.10000    143.10000    146.50000
    32   21    32    26 TFRAT(I) - FG/FGMIN TABLE                          0.00000
   0.00000       .20000       .40000       .60000       .80000      1.00000
    32   27    32    32 TRPM(I) - FRAC. RPM TABLE                          0.00000
   0.00000       .20000       .49000       .66500       .83500      1.00000
    32   33    32    38 TFRACT(I) - FRACTIONAL THRUST TABLE                0.00000
   0.00000       .13330       .20000       .33330       .66670      1.00000
    32   43    32    48 TACCEL(I)-ACCELERATION LIMIT TABLE                 0.00000
    .10000       .40000       .40000       .40000       .40000       .40000
    32   53    32    58 TDECEL(I) - DECELERATION LIMIT TABLE               0.00000
   -.10000      -.40000      -.47500      -.62500     -1.00000     -1.00000
    32   63    32    68 TTENG(I)-ENGINE TIME CONSTANT                      0.00000
   1.00000       .50000       .40000       .30000       .20000       .20000
    39    1    39    23  ADER,DELV(I)                                      0.00000
  22.00000      5.00000      5.00000       .10000       .01745       .01745       .01745       .05000
    .05000    100.00000    100.00000       .01745       .01745      5.00000       .10000       .10000
    .01745       .01745       .05000       .05000       .05000       .01745       .01745
    42    1    42     7 ELEVT(I)-ELEVON TABLE                               .01745
   0.00000     10.00000     20.00000     30.00000     40.00000     60.00000    100.00000
    42    8    42    14 EKELET(I)-ELEVON EFFECTIVENESS TABLE               0.00000
   1.00000      1.00000       .77000       .59000       .53000       .45000       .45000
    42   15    42    21 RUDT(I)-RUDDER TABLE                                .01745
   0.00000     10.00000     20.00000     30.00000     40.00000     60.00000    100.00000
    42   22    42    28 EKRUDT(I) -RUDDER EFFECTIVENESS TABLE              0.00000
   1.00000      1.00000       .82000       .62000       .55000       .47000       .47000
    44    1    44     3  ACSSW,TCSSW1                                      0.00000
   2.00000      0.00000      1.00000
    44    7    44     8 TAKUS                                              0.00000
   1.00000      1.00000
    44   12    44    13  TKPINT                                            0.00000
   0.00000      1.00000
    44   17    44    16  TKPHI                                             0.00000
   1.00000      0.00000
    44   22    44    23  TKPB                                              0.00000
   0.00000      1.00000
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  44   27    44   28  TKPS                                                         0.00000
1.00000        0.00000
  44   32    44   33  TKQINT                                                       0.00000
0.00000        1.00000
  44   37    44   38  TKTHETA                                                      0.00000
1.00000        0.00000
  44   42    44   43  TKRINT                                                       0.00000
0.00000        1.00000
  44   47    44   48  TKPSI                                                        0.00000
0.00000        0.00000
  44   52    44   53  TKRB                                                         0.00000
0.00000        1.00000
  44   57    44   58  TAKPCI                                                       0.00000
1.00000        1.00000
  44   62    44   63 TAKPEI                                                        0.00000
1.00000        1.00000
  44   67    44   68  TAKRCI                                                       0.00000
0.00000        0.00000
  44   72    44   73  TAKREI                                                       0.00000
1.00000        1.00000
  44   77    44   78  TAKQCI                                                       0.00000
1.00000        0.00000
  44   82    44   83  TAKQEI                                                       0.00000
1.00000        1.00000
  44   87    44   88  TKRS                                                         0.00000
1.00000        0.00000
  44   92    44   92  AKPHIRS                                                      0.00000
1.00000
  45    1    45    1  WELGAIN                                                      0.00000
1.00000
  45    2    45    2  AVEL                                                         0.00000
6.00000
  45    3    45    8  TVEL                                                         1.60000
0.00000       59.50000      60.00000      80.00000     120.00000     200.00000
  45   11    45   16  VAKPC                                                        0.00000
 .30000         .30000        .30000        .30000        .50000        .50000
  45   19    45   24  VKPCI1                                                       0.00000
1.00000        1.00000       1.00000       1.00000       1.00000       1.00000
  45   27    45   32  VKFEI1                                                       0.00000
 .80000         .80000        .20000        .20000        .20000        .20000
  45   35    45   40  VKP                                                          0.00000
 .50000         .50000        .50000        .50000        .50000        .50000
  45   43    45   48  VAKPE                                                        0.00000
6.00000        6.00000       2.00000       2.00000       4.00000       2.00000
  45   51    45   56  VAKRC                                                        0.00000
1.00000        1.00000       1.00000       1.00000       1.00000       1.00000
  45   59    45   64  VKRCI1                                                       0.00000
0.00000        0.00000       0.00000       0.00000       0.00000       0.00000
  45   67    45   72  VKREI1                                                       0.00000
 .80000         .80000        .20000        .20000        .20000        .20000
  45   75    45   80  VKR                                                          0.00000
 .50000         .50000       1.00000       1.00000       1.00000       1.00000
  45   83    45   88 VAKRE                                                         0.00000
13.00000      13.00000        .30000       1.10000       1.10000       1.10000
  45   91    45   96  VAKQC                                                        0.00000
1.00000        1.00000        .30000        .30000        .30000        .30000
  45   99    45  104 VKQCI1                                                        0.00000
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      0.00000       0.00000       1.00000       1.00000       1.00000       1.00000
       45  107   45  112  VKQEI1                                                  0.00000
       .20000        .20000        .20000        .20000        .20000        .20000
       45  115   45  120  VKQ                                                     0.00000
       .50000        .50000        .50000        .50000        .50000        .50000
       45  123   45  128  VAKQE                                                   0.00000
     10.00000      10.00000      15.00000      15.00000       0.00000       5.00000
       45  131   45  136  VAKZE                                                   0.00000
   -500.00000    -500.00000       0.00000       0.00000       0.00000       0.00000
       45  139   45  144  VKZEI1                                                  0.00000
       .20000        .20000       0.00000       0.00000       0.00000       0.00000
       45  147   45  152  VTPITCH                                                 0.00000
       .25000        .25000       0.00000       0.00000       0.00000       0.00000
       45  155   45  160  VTROLL                                                  0.00000
      0.00000       0.00000       0.00000       0.00000       0.00000       0.00000
       45  163   45  168  VTYAW                                                   0.00000
       .25000        .25000       0.00000       0.00000       0.00000       0.00000
        0    0    0    0          BLANK CARD-END OF BASIC LOAD                    0.00000


     NOPT=1 STORE READ/WRITE INFO

     NTAP= 2

        4    1    4    1 WEIGHT-POUNDS                                            0.00000
        4    1    4    1 WEIGHT-NEWTONS                                           4.44800
        4    2    4    5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2               0.00000
        4    2    4    5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-KG-M**2                  1.35500
       14   10   14   10 JENG(ENGINE INERTIA)-SLUG-FT**2                          0.00000
       14   10   14   10 JENG(ENGINE INERTIA)-KG-M**2                             1.35500
       29   45   29   45 ALTITUDE-FT                                              0.00000
       29   45   29   45 ALTITUDE-METERS                                           .30480
       29   10   29   10 TRUE AIRSPEED-KNOTS                                      0.00000
       29    9   29    9 TRUE AIRSPEED-FT/SEC                                     0.00000
       29    9   29    9 TRUE AIRSPEED-M/SEC                                       .30480
       29   12   29   12 QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2                      0.00000
       29   11   29   11 MACH NUMBER                                              0.00000
       29   12   29   12 QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2                     47.88000
       29    4   29    4 RHO(AIR DENSITY)-SLUGS/FT**3                             0.00000
       29    4   29    4 RHO(AIR DENSITY)-KG/M**3                               515.38000
       29   57   29   59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)KT             .59020
       29   57   29   59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)FT/S          0.00000
       29   57   29   59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)M/S            .30480
        2   16    2   18  XEDOT,YEDOT,ZEDOT(FT/S)                                 0.00000
        2   16    2   18  XEDOT,YEDOT,ZEDOT(M/S)                                   .30480
       41    4   41    6  XE2D,YE2D,ZE2D-FT/SEC**2                                0.00000
       41    4   41    6  XE2D,YE2D,ZE2D-G                                         .03106
       41    4   41    6  XE2D,YE2D,ZE2D-M/SEC**2                                  .30480
        2    1    2    3 UDOT,VDOT,WDOT-FT/SEC**2                                 0.00000
        2    1    2    3 UDOT,VDOT,WDOT-G                                          .03106
        2    1    2    3 UDOT,VDOT,WDOT-M/SEC**2                                   .30480
        3    1    3    3 U,V,W (INER. SPEED COMPONENTS)FT/SEC                     0.00000
        3    1    3    3 U,V,W (INER. SPEED COMPONENTS)M/SEC                       .30480
       29    1   29    3 UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC                   0.00000
       29    1   29    3 UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC                     .30480
       29   54   29   56 NXCG,NYCG,NZCG(BODY AXIS ACCEL.)-GEES                    0.00000
```

3	4	3	6	P,Q,R(BODY AXIS RATES)-DEG/SEC	57.29578
3	64	3	66	THETA,PHI,PSI(EULER ANGLES)-DEG	57.29578
29	13	29	14	ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG	57.29578
2	18	2	18	ZD(RATE OF SINK)-FT/MIN	60.00000
2	18	2	18	ZD(RATE OF SINK)-FT/SEC	0.00000
2	18	2	18	ZD(RATE OF SINK)-M/SEC	.30480
28	20	28	20	NORM. ROLL CONTROL	0.00000
28	29	28	29	NORM. YAW CONTROL	0.00000
28	38	28	38	NORM. PITCH CONTROL	0.00000
3	26	3	27	THT1,THT2(THRUST DEFLECTION PITCH ANGLES)-DEG	57.29578
3	24	3	25	PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG	57.29578
3	19	3	19	LEFT ELEVON DEFLECTION-DEG	57.29578
3	20	3	20	RIGHT ELEVON DEFLECTION-DEG	57.29578
28	50	28	50	ELEVATOR COMMAND DEFLECTION-DEG	57.29578
28	51	28	51	AILERON COMMAND DEFLECTION-DEG	57.29578
3	28	3	29	DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)	0.00000
28	58	28	58	TCMD(THRUST COMMAND)-POUNDS	0.00000
28	58	28	58	TCMD(THRUST COMMAND)-NEWTONS	4.44800
23	9	23	10	TCOR1,TCOR2(THRUST APPL. TO A/C)-POUNDS	0.00000
23	9	23	10	TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS	4.44800
3	21	3	21	RUDDER DEFLECTION-DEG	57.29578
26	20	26	20	TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS	0.00000
26	20	26	20	TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS	4.44800
26	1	26	2	MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC	0.00000
26	1	26	2	MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC	.45400
15	3	15	3	BLDREF(REFERENCE RCS BLEED)-PER CENT	0.00000
26	7	26	7	BLDAVL	0.00000
27	72	27	72	BLD(ACTUAL RCS BLEED)-PER CENT	0.00000
3	38	3	39	FRCS1,FRCS2(RCS JET FORCES)-POUNDS	0.00000
3	38	3	39	FRCS1,FRCS2(RCS JET FORCES)-NEWTONS	4.44800
11	7	11	7	SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG	57.29578
19	44	19	46	MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-FT-LB	0.00000
19	44	19	46	MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M	1.35500
19	37	19	38	XW1,XW2(WING X FORCE)-POUNDS	0.00000
19	37	19	38	XW1,XW2(WING X FORCE)-NEWTONS	4.44800
19	39	19	40	ZW1,ZW2(WING Z FORCE)-POUNDS	0.00000
19	39	19	40	ZW1,ZW2(WING Z FORCE)-NEWTONS	4.44800
19	19	19	20	CLW1,CLW2(WING LIFT COEFFICIENT)	0.00000
3	48	3	48	DFLAPH(CANARD TE FLAP DEFLECTION)-DEG	57.29578
3	49	3	49	DFLAPW(WING LE FLAP DEFLECTION)-DEG	57.29578
19	1	19	3	DXW,DYW,DZW(WING AERO FORCES)-POUNDS	0.00000
19	1	19	3	DXW,DYW,DZW(WING AERO FORCES)-NEWTONS	4.44800
19	4	19	6	DLW,DMW,DNW(WING AERO MOMENTS)-FT-POUNDS	0.00000
19	4	19	6	DLW,DMW,DNW(WING AERO MOMENTS)-NEWTON-M	1.35500
20	1	20	3	DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS	0.00000
20	1	20	3	DXH,DYH,DZH(CANARD AERO FORCES)-NEWTONS	4.44800
20	4	20	6	DLH,DMH,DNH(CANARD AERO MOMENTS)-FT-POUNDS	0.00000
20	4	20	6	DLH,DMH,DNH(CANARD AERO MOMENTS)-NEWTON-M	1.35500
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS	4.44800
21	1	21	3	DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS	0.00000
21	4	21	6	DLV,DMV,DNV(VERT TAIL AERO MOMENTS)-FT POUNDS	0.00000
21	4	21	6	DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-NEWTON-M	1.35500
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS	0.00000
22	1	22	3	DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS	4.44800
22	4	22	6	DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS	0.00000
22	4	22	6	DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M	1.35500
29	20	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS	0.00000

29	20	29	22	XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS	4.44800
29	23	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POUNDS	0.00000
29	23	29	25	LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M	1.35500
23	1	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS	0.00000
23	1	23	3	DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS	4.44800
23	4	23	6	DLT,DMT,DNT(DIRECT THRUST MOMENTS)-FT-POUNDS	0.00000
23	4	23	6	DLT,DMT,DNT(DIRECT THRUST MOMENTS)-NEWTON-M	1.35500
26	23	26	24	HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC	0.00000
26	23	26	24	HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC	1.35500
24	1	24	3	DXR,DYR,DZR(RAM FORCES)-POUNDS	0.00000
24	1	24	3	DXR,DYR,DZR(RAM FORCES)-NEWTONS	4.44800
24	4	24	6	DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS	0.00000
24	4	24	6	DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M	1.35500
26	3	26	4	RPM1,RPM2(ENGINE ROT. SPEED)-RPM	0.00000
27	1	27	3	DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS	0.00000
27	1	27	3	DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS	4.44800
27	4	27	6	DLRCS,DMRCS,DNRCS(RCS MOMENTS)-FT-POUNDS	0.00000
27	4	27	6	DLRCS,DMRCS,DNRCS(RCS MOMENTS)-NEWTON-M	1.35500
25	1	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS	0.00000
25	1	25	3	DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS	4.44800
25	4	25	6	DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS	0.00000
25	4	25	6	DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M	1.35500
29	26	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS	0.00000
29	26	29	28	SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS	4.44800
29	29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS	0.00000
29	29	29	31	SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M	1.35500
29	51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS	0.00000
29	51	29	53	GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M	1.35500
0	0	0	0	BLANK CARD - END OF OPTION 1 LOAD	0.00000

NOPT=9 DIMENSIONAL DERIVATIVES

PERTURBATION VARIABLES

29	1	1
29	3	2
3	5	3
28	50	4
3	49	5
3	48	6
28	54	7
28	57	8
26	34	9
26	35	10
3	26	11
3	27	12
29	2	13
3	4	14
3	6	15
3	21	16
28	52	17
28	53	18
8	55	19
28	56	20
3	24	21

```
            3         25         22
            0          0          0

      NOPT=6 SET UP TRIM UNKNOWNS
            NEQU=15
         3    1    3    3  U,V,W
       2.00000       2.00000       2.00000
         3    4    3    6  P,Q,R
        .10000        .10000        .10000
        28   20   28   20  DROLL
        .05000
        28   29   28   29  DYAW
        .05000
        28   38   28   38  DPITCH
        .05000
         3   66    3   66  PSI
        .01745
        29   54   29   56  NXCG,NYCG,NZCG
        .10000        .10000        .10000
         3   64    3   64  THETA
        .01745
        28   58   28   58  TCMD
      10.00000

      NOPT=2 READ R

      NTAP= 5

        41    4   41    5  XE2D,YE2D                                       32.20000
       0.00000       0.00000
        41    6   41    6  ZE2D                                            32.20000
       0.00000
         2   16    2   17  XEDOT,YEDOT                                      0.00000
       0.00000       0.00000
         2   18    2   18  ZEDOT                                            0.00000
       0.00000
         3   18    3   18  ZE                                               0.00000
    -100.00000
         2   65    2   66  PHID,PSID                                        0.00000
       0.00000       0.00000
         3   65    3   66PHI,PSI                                             .01745
       0.00000       0.00000
         3   64    3   64  THETA                                             .01745
      78.00000
        28   20   28   20  DROLL                                            0.00000
       0.00000
        28   29   28   29  DYAW                                             0.00000
       0.00000
        28   38   28   38  DPITCH                                           0.00000
       -.10000
        29   54   29   56  NXCG,NYCG,NZCG                                   0.00000
        .98000       0.00000        .19500
        28   58   28   58  TCMD                                             0.00000
   15900.00000
```

```
     29    9    29    9  VA                                                    1.68900
  35.00000
     29   13    29   13  ALPH                                                   .01745
  78.00000
      1    3     1    7  DT,IMAX,DTPRINT,DTPLOT,TI                              0.00000
    .02500     20.00000      .10000       .10000      8.00000
     41    1    41    1  AWIND                                                  0.00000
   1.00000
     41    2    41    2  VWIND                                                  1.68900
  35.00000
     41    7    41    7  TRMTURN                                                0.00000
   0.00000
     41   10    41   10  TURNRAD                                                0.00000
2640.00000
     41    8    41    9  GAMMA,VADOT                                            0.00000
   0.00000    -3.22000
     43    7    43    7  ASKEEP                                                 0.00000
   1.00000
     16    7    16   12  AKU,AKV,AKW,AKXES,AKYES,AKZES                          0.00000
   0.00000     5.00000      5.00000      2.00000       .00500      -.00500
     43  129    43  129  ATRANS                                                 0.00000
   0.00000
     43    6    43    6  ATIME                                                  0.00000
   8.00000
     43  132    43  139  THROTT(10)                                             0.00000
    .54600      .55300       .53000       .44300       .17300       .08338       .06700       .06700
     43  142    43  149  VAT(10)                                                1.68900
   0.00000    20.00000     40.00000     60.00000     80.00000    100.00000    120.00000    200.00000
     43  152    43  159  THETCI(10)                                              .01745
 102.00000    96.50000     85.50000     66.89000     36.65000     22.72000     16.30000      8.20000
     43    1    43    5  ACMD(I)                                                0.00000
   3.00000     0.00000      0.00000      0.00000      0.00000
     43    9    43   16 CMDT1(I)-DLNGSTK INPUT TABLE                             .01745
   0.00000     0.00000     10.00000     10.00000      0.00000      0.00000      0.00000      0.00000
     43   29    43   36 CMDT2(I)-DLATSTK INPUT TABLE                             .01745
   0.00000     0.00000     10.00000     10.00000      0.00000      0.00000      0.00000      0.00000
     43   49    43   56 CMDT3(I)-DPED INPUT TABLE                                .01745
   0.00000     0.00000     20.00000     20.00000     20.00000     20.00000     20.00000     20.00000
     43   69    43   76 CMDT4(I)-ZEDTC INPUT TABLE                              0.00000
   0.00000     0.00000    -10.00000    -10.00000     10.00000     10.00000      0.00000      0.00000
     43   89    43   96 CMDT5(I)-THROTTLE INPUT TABLE                           0.00000
   0.00000     0.00000      0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
     43  109    43  116 TIMET(I)-INPUT CONTROL TIME TABLE                       0.00000
   0.00000      .30000       .31000      1.00000      1.01000      1.70000      1.71000     40.00000


NOPT=1 STORE READ/WRITE INFO

NTAP= 1

     41    3    41    3  PSIWIND                                                .01745
      0    0     0    0          BLANK CARD - END OF OPTION 1 LOAD              0.00000


NOPT=8 LONGITUDINAL TRIM
```

```
NTAPE(1)= 1
NTAPE(2)= 2
NTAPE(3)= 8
NTAPE(4)= 0
NCASES=  1      NTAPD= 9     NPUNCH= 0
IWRITE= 0
        EXAMPLE 2 - STATIONKEEPING TIME HISTORY

CASE INPUT (READ FROM FILE 1)

    41    3   41    3  PSIWIND                                                            .01745
180.00000
```

RESULTS OF TRIM

```
     4    1    4    1 WEIGHT-POUNDS                                          0.00000
 16375.00000
     4    1    4    1 WEIGHT-NEWTONS                                         4.44800
 72836.00000
     4    2    4    5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-SLUG-FT**2             0.00000
  7959.00000   52609.80000   58337.00000    -202.40000
     4    2    4    5 IX,IY,IZ,IXZ(AIRCRAFT INERTIAS)-KG-M**2                1.35500
 10784.44500   71285.19500   79046.63500    -274.25200
    14   10   14   10 JENG(ENGINE INERTIA)-SLUG-FT**2                        0.00000
     3.14000
    14   10   14   10 JENG(ENGINE INERTIA)-KG-M**2                           1.35500
     4.25470
    29   45   29   45 ALTITUDE-FT                                            0.00000
   100.00000
    29   45   29   45 ALTITUDE-METERS                                         .30480
    30.48000
    29   10   29   10 TRUE AIRSPEED-KNOTS                                    0.00000
    35.00207
    29    9   29    9 TRUE AIRSPEED-FT/SEC                                   0.00000
    59.11500
    29    9   29    9 TRUE AIRSPEED-M/SEC                                     .30480
    18.01825
    29   12   29   12 QBAR(DYNAMIC PRESSURE)-POUNDS/FT**2                    0.00000
     3.90897
    29   11   29   11 MACH NUMBER                                            0.00000
      .05146
    29   12   29   12 QBAR(DYNAMIC PRESSURE)-NEWTONS/M**2                   47.88000
   187.16169
    29    4   29    4 RHO(AIR DENSITY)-SLUGS/FT**3                           0.00000
      .00224
    29    4   29    4 RHO(AIR DENSITY)-KG/M**3                             515.38000
     1.15299
    29   57   29   59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)KT           .59020
   -34.88967       .02068       0.00003
    29   57   29   59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)FT/S        0.00000
   -59.11499       .03503       0.00000
    29   57   29   59 XDW,YDW,ZDW(AMB.WIND COMPONENTS-EARTH AXES)M/S          .30480
   -18.01825       .01068       0.00000
     2   16    2   18  XEDOT,YEDOT,ZEDOT(FT/S)                               0.00000
     0.00000      0.00000       0.00000
     2   16    2   18  XEDOT,YEDOT,ZEDOT(M/S)                                 .30480
     0.00000      0.00000       0.00000
    41    4   41    6  XE2D,YE2D,ZE2D-FT/SEC**2                              0.00000
     0.00000      0.00000       0.00000
    41    4   41    6  XE2D,YE2D,ZE2D-G                                       .03106
     0.00000      0.00000       0.00000
    41    4   41    6  XE2D,YE2D,ZE2D-M/SEC**2                                .30480
     0.00000      0.00000       0.00000
     2    1    2    3 UDOT,VDOT,WDOT-FT/SEC**2                               0.00000
      .00000       .00001       -.00000
     2    1    2    3 UDOT,VDOT,WDOT-G                                        .03106
      .00000       .00000       -.00000
     2    1    2    3 UDOT,VDOT,WDOT-M/SEC**2                                 .30480
      .00000       .00000       -.00000
     3    1    3    3 U,V,W (INER. SPEED COMPONENTS)FT/SEC                   0.00000
```

```
  -.00000      -.00000      -.00000
   3    1    3    3 U,V,W (INER. SPEED COMPONENTS)M/SEC                   .30480
  -.00000      -.00006      -.00000
   29   1   29    5 UAS,VAS,WAS(AIRSPEED COMPONENTS)FT/SEC                0.00000
 13.88791      -.08009      57.46044
   29   1   29    3 UAS,VAS,WAS(AIRSPEED COMPONENTS)M/SEC                 .30480
  4.23304      -.02441      17.51394
   29  54   29   56 NXCG,NYCG,NZCG(BODY AXIS ACCEL.)-GEES                 0.00000
   .97201       .00014       .23493
   3    4    3    6 P,Q,R(BODY AXIS RATES)-DEG/SEC                       57.29578
  -.00000      -.00000      -.00000
   3   64    3   66 THETA,PHI,PSI(EULER ANGLES)-DEG                      57.29578
 76.41247      -.03493       .06971
   29  13   29   14 ALPHA,BETA(ANGLES OF ATTACK AND SIDESLIP)-DEG        57.29578
 76.41247      -.07762
   2   18    2   18 ZD(RATE OF SINK)-FT/MIN                              60.00000
  0.00000
   2   18    2   18 ZD(RATE OF SINK)-FT/SEC                               0.00000
  0.00000
   2   18    2   18 ZD(RATE OF SINK)-M/SEC                                .30480
  0.00000
   28  20   28   20  NORM. ROLL CONTROL                                   0.00000
  -.00003
   28  29   28   29  NORM. YAW CONTROL                                    0.00000
  -.00031
   28  38   28   38  NORM. PITCH CONTROL                                  0.00000
  -.11461
   3   26    3   27 THT1,THT2(THRUST DEFLECTION PITCH ANGLES)-DEG        57.29578
  1.72049      1.72049
   3   24    3   25 PSIT1,PSIT2(THRUST DEFLECTION PITCH ANGLES)-DEG      57.29578
   .00463       .00463
   3   19    3   19 LEFT ELEVON DEFLECTION-DEG                           57.29578
  2.86247
   3   20    3   20 RIGHT ELEVON DEFLECTION-DEG                          57.29578
  2.86375
   28  50   28   50 ELEVATOR COMMAND DEFLECTION-DEG                      57.29578
  2.86311
   28  51   28   51 AILERON COMMAND DEFLECTION-DEG                       57.29578
   .00771
   3   28    3   29 DRCS1,DRCS2(ROLL RCS NORM. DEFLECTION)                0.00000
   .00003      -.00003
   28  58   28   58 TCMD(THRUST COMMAND)-POUNDS                           0.00000
15801.11556
   28  58   28   58 TCMD(THRUST COMMAND)-NEWTONS                          4.44800
70283.36202
   23   9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-POUNDS               0.00000
 7869.71646   7869.71646
   23   9   23   10 TCOR1,TCOR2(THRUST APPL. TO A/C)-NEWTONS              4.44800
35004.49883  35004.49883
   3   21    3   21 RUDDER DEFLECTION-DEG                                57.29578
   .00771
   26  20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-POUNDS             0.00000
 1689.60346
   26  20   26   20 TRCS(THRUST LOSS DUE TO RCS BLEED)-NEWTONS            4.44800
 7515.35618
   26   1   26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-LBM/SEC          0.00000
  133.62788    133.62788
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OF POOR QUALITY

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   26    1   26    2 MDOT1,MDOT2(ENGINE INLET MASS FLOWS)-KG/SEC            .45400
 60.66706      60.66706
   15    3   15    3 BLDREF(REFERENCE RCS BLEED)-PER CENT                   0.00000
  3.90000
   26    7   26    7  BLDAVL                                                0.00000
 15.87426
   27   72   27   72 BLD(ACTUAL RCS BLEED)-PER CENT                         0.00000
  3.51085
    3   38    3   39 FRCS1,FRCS2(RCS JET FORCES)-POUNDS                     0.00000
   .03676     0.00000
    3   38    3   39 FRCS1,FRCS2(RCS JET FORCES)-NEWTONS                    4.44800
   .16351     0.00000
   11    7   11    7 SIGY(ENGINE CENTER LINE ANGLE WRT FRL)-DEG            57.29578
  0.00000
   19   44   19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-FT-LB           0.00000
 -51.83341      .30988        2.90718
   19   44   19   46 MW,LW,NW(WING PITCH,ROLL,YAW MOMENTS)-NEWTON-M        1.35500
 -70.23428      .41989        3.93923
   19   37   19   38 XW1,XW2(WING X FORCE)-POUNDS                          0.00000
  40.93089     40.93197
   19   37   19   38 XW1,XW2(WING X FORCE)-NEWTONS                         4.44800
 182.06062    182.06539
   19   39   19   40 ZW1,ZW2(WING Z FORCE)-POUNDS                          0.00000
 -513.41214   -513.41295
   19   39   19   40 ZW1,ZW2 (WING Z FORCE)-NEWTONS                        4.40800
 -2283.65718  -2283.66079
   19   19   19   20 CLW1,CLW2(WING LIFT COEFFICIENT)                      0.00000
   .23448       .23448
    3   48    3   48  DFLAPH(CANARD TE FLAP DEFLECTION)-DEG               57.29578
 24.99528
    3   49    3   49  DFLAPW(WING LE FLAP DEFLECTION)-DEG                 57.29578
 29.99434
   19    1   19    3 DXW,DYW,DZW(WING AERO FORCES)-POUNDS                  0.00000
 81.86286       .03057    -1026.82508
   19    1   19    3 DXW,DYW,DZW(WING AERO FORCES)-NEWTONS                 4.44800
 364.12601      .13599    -4567.31796
   19    4   19    6 DLW,DMW,DNW(WING AERO MOMENTS)-FT-POUNDS              0.00000
   .30515    -5195.66225      2.74777
   19    4   19    6 DLW,DMW,DNW(WING AERO MOMENTS)-NEWTON-M               1.35500
   .41348    -7040.12235      3.72323
   20    1   20    3 DXH,DYH,DZH(CANARD AERO FORCES)-POUNDS                0.00000
 1 .85516     0.00000    -311.20082
    1   20    3 DXH,DYH,DZH(CANARD AERO FORCES)-NEWTCNS                    4.  800
  84377       0.00000   -1384.22126
   20    4   20    6 DLH,DMH,DNH(CAN  D AERO MOMENTS)-FT-POUNDS            0.00000
  0.00000    1565.11 6        0.00000
   20    4   20    6 DLH,DMH,DNH(CANARD AERO MOMENTS)-NEWTON-M             1.35500
  0.00000    2120.73565       0.00000
   21    1   21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-NEWTONS           0.44800
  0.00000     0.00000         0.00000
   21    1   21    3 DXV,DYV,DZV(VERT. TAIL AERO FORCES)-POUNDS            0.00000
  0.00000     0.00000         0.00000
   21    4   21    6  DLV,DMV,DNV(VERT TAIL AERO MOMENTS)-FT POUNDS        0.00000
  0.00000     0.00000         0.00000
   21    4   21    6 DLV,DMV,DNV(VERT. TAIL AERO MOMENTS)-NEWTON-M         1.35500
  0.00000     0.00000         0.00000
   22    1   22    3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-POUNDS              0.00000
```

```
   -.31132        .09979   -1358.01908
    22    1   22    3 DXF,DYF,DZF(FUSELAGE AERO FORCES)-NEWTONS              4.44800
   -1.38475       .44386   -6040.46887
    22    4   22    6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-FT-POUNDS           0.00000
    0.00000    2591.64413      1.60776
    22    4   22    6 DLF,DMF,DNF(FUSELAGE AERO MOMENTS)-NEWTON-M            1.35500
    0.00000    3511.67780      2.17851
    29   20   29   22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-POUNDS            0.00000
  187.40671       .13036   -2696.04498
    29   20   29   22 XAERO,YAERO,ZAERO(TOTAL AERO FORCES)-NEWTONS           4.44800
  833.58502       .57985  -11992.00809
    29   23   29   25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-FT-POINDS        0.00000
     .30515  -1038.89956      4.35553
    29   23   29   25 LAERO,MAERO,NAERO(TOTAL AERO MOMENTS)-NEWTON-M         1.35500
     .41348  -1407.70890      5.90174
    23    1   23    3 DXT,DYT,DZT(DIRECT THRUST FORCES)-POUNDS               0.00000
15732.33731      1.27174   -472.55684
    23    1   23    3 DXT,DYT,DZT(DIRECT THRUST FORCES)-NEWTONS              4.44800
69977.43637      5.65669  -2101.93281
    23    4   23    6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-FT-POUNDS           0.00000
     .10597  -7198.01077    -15.84311
    23    4   23    6 DLT,DMT,DNT(DIRECT THRUST MOMENTS)-NEWTON-M            1.35500
     .14359  -9753.38460    -21.46741
    26   23   26   24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-SLUG-FT**2/SEC        0.00000
 3145.83622    3145.83622
    26   23   26   24 HE1,HE2(ENGINE ANGULAR MOMENTUM)-KG-M**2/SEC           1.35500
 4262.60803    4262.60808
    24    1   24    3 DXR,D R,DZR(RAM FORCES)-POUNDS                         0.00000
   -3.04237       .94560   -678.43762
    24    1   24    3 DXR,DYR,DZR(RAM FORCES)-NEWTONS                        4.44800
  -13.53245      4.20604  -3017.69052
    24    4   24    6 DLR,DMR,DNR(RAM MOMENTS)-FT-POUNDS                     0.00000
     .07888    8236.36120     11.47945
    24    4   24    6 DLR,DMR,DNR(RAM MOMENTS)-NEWTON-M                      1.35500
     .10677   11160.26943     15.55466
    26    3   26    4 RPM1,RPM2(ENGINE ROT. SPEED)-RPM                       0.00000
 9567.47719    9567.47719
    27    1   27    3 DXRCS,DYRCS,DZRCS(RCS FORCES)-POUNDS                   0.00000
     .00001       0.00000       .03676
    27    1   27    3 DXRCS,DYRCS,DZRCS(RCS FORCES)-NEWTONS                  4.44800
     .00005       0.00000       .16351
    27    4   27    6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-FT-POUNDS               0.00000
    -.49011       .40587        .00015
    27    4   27    6 DLRCS,DMRCS,DNRCS(RCS MOMENTS)-NEWTON-M                1.35500
    -.66410       .54996        .00020
    25    1   25    3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-POUNDS              0.00000
    0.00000      -.00000        .00000
    25    1   25    3 DXCOR,DYCOR,DZCOR(CORIOLIS FORCES)-NEWTONS             4.44800
    0.00000      -.00000        .00000
    25    4   25    6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-FT-POUNDS           0.00000
    -.00000       .00000        .00000
    25    4   25    6 DLCOR,DMCOR,DNCOR(CORIOLIS FORCES)-NEWTON-M            1.35500
    -.00000       .00000        .00000
    29   26   29   28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-POUNDS                 0.00000
15916.70166      2.34770  -3847.01268
    29   26   29   28 SUMFX,SUMFY,SUMFZ(TOTAL FORCES)-NEWTONS                4.44800
70797.48899     10.44259 -17111.46791
```

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 29   29   29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-FT-POUNDS          0.00000
-.00019        -.14325        -.00799
 29   29   29   31 SUML,SUMM,SUMN(TOTAL MOMENTS)-NEWTON-M           1.35580
-.00025        -.19411        -.01082
 29   51   29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-FT-POUNDS   0.00000
0.00000        -.00000        .00000
 29   51   29   53 GYROL,GYROM,GYRON(GYROSCOPIC MOMENTS)-NEWTON-M    1.35580
0.00000        -.00000        .00000

    EXAMPLE 2 - STATIONKEEPING TIME HISTORY
```

LONGITUDINAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
X/U	.9524E-02	.7206E-02	0.	-.8609E-04	.1664E-01	0.	-.1404E-01	0.	.2492E-12	.2596E-02
Z/U	-.1663E-01	-.2065E-01	0.	-.2551E-02	-.3983E-01	0.	-.3913E-02	.8590E-20	.8411E-09	-.4374E-01
M/U	-.1562E-03	.1010E-02	0.	.1379E-02	.2233E-02	0.	.3864E-03	.2206E-21	.8985E-10	.2620E-02
X/W	.3294E-02	.5461E-02	0.	0.	.8754E-02	0.	.3286E-02	0.	.1062E-11	.1204E-01
Z/W	-.6513E-01	-.1621E-01	0.	-.9225E-01	-.1746E+00	0.	-.2248E-01	.3577E-19	.3585E-08	-.1971E+00
M/W	-.3396E-02	.7873E-03	0.	.1384E-02	-.1225E-02	0.	.2621E-02	.9226E-21	.3829E-09	.1396E-02
X/Q	.1057E-01	-.5121E-01	0.	0.	-.4064E-01	0.	.4375E-01	0.	.4413E-18	.3114E-02
Z/Q	-.2122E+00	.1507E+00	0.	0.	-.6143E-01	0.	.5928E+01	-.9114E+00	.1489E-06	.4955E+01
M/Q	-.1089E-01	-.7332E-02	0.	0.	-.1823E-01	0.	-.6475E+00	-.2351E-01	.1591E-07	-.6892E+00
X/DE	.1895E+00	.3980E-02	0.	0.	.1935E+00	0.	0.	0.	0.	.1935E+00
Z/DE	-.1432E+00	-.1126E-01	0.	0.	-.1545E+00	0.	0.	0.	0.	-.1545E+00
M/DE	-.2666E-01	.5514E-03	0.	0.	-.2611E-01	0.	0.	0.	0.	-.2611E-01
X/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Z/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
M/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
X/TO1	0.	0.	0.	0.	0.	.1767E-02	-.1869E-06	0.	.6693E-12	.1767E-02
Z/TO1	0.	0.	0.	0.	0.	-.5308E-04	-.4168E-04	.1265E-19	.2259E-08	-.9477E-04
M/TO1	0.	0.	0.	0.	0.	-.7822E-05	.4962E-05	.3264E-21	.2412E-09	-.2860E-05
X/TO2	0.	0.	0.	0.	0.	.1767E-02	-.1869E-06	0.	.6693E-12	.1767E-02
Z/TO2	0.	0.	0.	0.	0.	-.5308E-04	-.4168E-04	.1265E-19	.2259E-08	-.9477E-04
M/TO2	0.	0.	0.	0.	0.	-.7822E-05	.4962E-05	.3264E-21	.2412E-09	-.2860E-05
X/THT1	0.	0.	0.	0.	0.	-.2481E+01	0.	0.	0.	-.2481E+01
Z/THT1	0.	0.	0.	0.	0.	-.1539E+02	0.	0.	0.	-.1539E+02
M/THT1	0.	0.	0.	0.	0.	-.1853E+01	0.	0.	0.	-.1853E+01
X/THT2	0.	0.	0.	0.	0.	-.2481E+01	0.	0.	0.	-.2481E+01
Z/THT2	0.	0.	0.	0.	0.	-.1539E+02	0.	0.	0.	-.1539E+02
M/THT2	0.	0.	0.	0.	0.	-.1853E+01	0.	0.	0.	-.1853E+01

X/V	0.	-.7148E-15	0.	.4886E-17	-.7148E-15	0.		.1382E-03	0.	0.	.1382E-03 *
Z/V	0.	.7148E-15	0.	-.2859E-14	0.	.7148E-15	.3266E-04	.3761E-16	0.		.3266E-04 *
M/V	0.	-.5532E-16	0.	-.1106E-15	-.2213E-15	.1105E-15	-.4644E-05	.9702E-18	0.		-.4644E-05 *
X/P	0.	-.3574E-13	0.	.4537E-15	-.3574E-13	0.		.1107E-05	0.	-.3963E-11	.1107E-05 *
Z/P	0.	.3574E-13	0.	-.1430E-12	0.	.3574E-13	.2468E-03	.1880E-14	-.1337E-07		.2468E-03 *
M/P	0.	-.2766E-14	0.	-.5532E-14	-.1106E-13	.5532E-14	-.2938E-04	.4851E-16	-.1429E-08		-.2939E-04 *
X/R	0.	-.3574E-13	0.	.4537E-15	-.3574E-13	0.	-.4467E-14	0.	0.	0.	*
Z/R	0.	.3574E-13	0.	-.1430E-12	0.	.3574E-13	0.	.1880E-14	0.	0.	*
M/R	0.	-.2766E-14	0.	-.5532E-14	-.1106E-13	.5532E-14	0.	.4851E-16	0.	.4862E-16	*
X/DR	0.	-.2048E-12	0.	.2600E-14	-.2048E-12	0.	0.	0.	0.	0.	*
Z/DR	0.	.2048E-12	0.	-.8193E-12	0.	.2048E-12	0.	.1078E-13	0.	0.	*
M/DR	0.	-.1585E-13	0.	-.3170E-13	-.6341E-13	.3170E-13	0.	.2780E-15	0.	.2786E-15	*
X/DA	-.4504E-04	-.5166E-06	0.	.2600E-14	-.4556E-04	0.	0.	0.	0.	-.4556E-04	*
Z/DA	-.6603E-04	.1462E-05	0.	-.8193E-12	-.6456E-04	.2048E-12	0.	.1078E-13	0.	-.6456E-04	*
M/DA	-.3200E-05	-.7156E-07	0.	-.3170E-13	-.3271E-05	.3170E-13	0.	.2780E-15	0.	-.3271E-05	*
X/DRCSP	0.	-.7148E-13	0.	.9075E-15	-.7148E-13	0.	0.	0.	.8377E-03	.8377E-03	*
Z/DRCSR	0.	.7148E-13	0.	-.2859E-12	0.	.7149E-13	0.	.3761E-14	.2827E+01	.2827E+01	*
M/DRCSR	0.	-.5532E-14	0.	-.1106E-13	-.2213E-13	.1106E-13	0.	.9702E-16	.3019E+00	.3019E+00	*
X/DRCSY	0.	-.7148E-13	0.	.9075E-15	-.7148E-13	0.	0.	0.	.8819E-18	0.	*
Z/DRCSY	0.	.7148E-13	0.	-.2859E-12	0.	.7148E-13	0.	.3761E-14	.2975E-14	0.	*
M/DRCSY	0.	-.5532E-14	0.	-.1106E-13	-.2213E-13	.1105E-13	0.	.9702E-16	.3174E-15	.9724E-16	*
X/DRCSS	0.	-.7148E-13	0.	.9075E-15	-.7148E-13	0.	0.	0.	.8819E-18	0.	*
Z/DRCSS	0.	.7148E-13	0.	-.2859E-12	0.	.7148E-13	0.	.3761E-14	.2975E-14	0.	*
M/DRCSS	0.	-.5532E-14	0.	-.1106E-13	-.2213E-13	.1105E-13	0.	.9702E-16	.3174E-15	.9724E-16	*
X/PSIT1	0.	-.2048E-12	0.	.2600E-14	-.2048E-12	-.6841E+00	0.	0.	.2527E-17	-.6841E+00	*
Z/PSIT1	0.	.2048E-12	0.	-.8193E-12	0.	.1646E-01	0.	.1078E-13	.8526E-14	.1646E-01	*
M/PSIT1	0.	-.1585E-13	0.	-.3170E-13	-.6341E-13	.2536E-02	0.	.2780E-15	.9094E-15	.2536E-02	*
X/PSIT2	0.	-.2048E-12	0.	.2600E-14	-.2048E-12	-.6841E+00	0.	0.	.2527E-17	-.6841E+00	*
Z/PSIT2	0.	.2048E-12	0.	-.8193E-12	0.	.1646E-01	0.	.1078E-13	.8526E-14	.1646E-01	*
M/PSIT2	0.	-.1585E-13	0.	-.3170E-13	-.6341E-13	.2535E-02	0.	.2780E-15	.9094E-15	.2536E-02	*

LATERAL-DIRECTIONAL STABILITY DERIVATIVES

DERIVATIVE	WING	HOR.STAB.	VERT.STAB.	FUSELAGE	TOT.AERO	THRUST	RAM	CORIOLIS	RCS	TOTAL
Y/U	.7642E-05	0.	0.	.1412E-04	.2176E-04	0.	.5454E-05	-.1778E-20	0.	.2721E-04
L/U	.5572E-05	0.	0.	0.	.5572E-05	0.	.2907E-07	-.9472E-23	-.7171E-09	.5608E-05
N/U	.3019E-05	0.	0.	.1984E-05	.5003E-05	0.	.4715E-06	.4135E-22	.2899E-13	.5475E-05
Y/W	-.8497E-06	0.	0.	0.	-.8497E-06	0.	-.1014E-05	-.7436E-20	0.	-.1064E-05
L/W	-.6963E-06	0.	0.	0.	-.6963E-06	0.	-.5405E-08	-.3962E-22	-.3056E-08	-.7040E-06
N/W	.8769E-07	0.	0.	0.	.8769E-07	0.	-.1280E-06	.1730E-21	.1236E-12	-.4030E-07
Y/Q	-.2723E-05	0.	0.	0.	-.2723E-05	0.	.3831E-05	-.9286E-19	0.	.1108E-05
L/Q	-.2217E-05	0.	0.	0.	-.2217E-05	0.	.2041E-07	.1428E-15	-.1270E-06	-.2323E-05
N/Q	.2780E-06	0.	0.	0.	.2780E-06	0.	.4113E-06	.2160E-20	.5133E-11	.6893E-06
Y/DE	.4152E-04	0.	0.	0.	.4152E-04	0.	0.	0.	0.	.4152E-04
L/DE	-.2689E-05	0.	0.	0.	-.2689E-05	0.	0.	0.	0.	-.2689E-05
N/DE	.1594E-04	0.	0.	0.	.1594E-04	0.	0.	0.	0.	.1594E-04
Y/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPW	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/FLAPH	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSP	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSN	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/TO1	0.	0.	0.	0.	0.	.1429E-06	.5810E-07	-.1408E-20	0.	.2010E-06
L/TO1	0.	0.	0.	0.	0.	.6281E-05	.7330E-05	-.2233E-20	-.1926E-08	.1361E-04
N/TO1	0.	0.	0.	0.	0.	.2851E-04	.1753E-08	.3276E-22	.7785E-13	.2851E-04
Y/TO2	0.	0.	0.	0.	0.	.1429E-06	.5810E-07	-.1408E-20	0.	.2010E-06
L/TO2	0.	0.	0.	0.	0.	-.6279E-05	-.7330E-05	.2218E-20	-.1926E-08	-.1361E-04
N/TO2	0.	0.	0.	0.	0.	-.2854E-04	.1072E-07	.3276E-22	.7785E-13	-.2853E-04
Y/THT1	0.	0.	0.	0.	0.	-.2006E-03	0.	0.	0.	-.2006E-03
L/THT1	0.	0.	0.	0.	0.	.1821E+01	0.	0.	0.	.1821E+01
N/THT1	0.	0.	0.	0.	0.	-.4002E-01	0.	0.	0.	-.4002E-01
Y/THT2	0.	0.	0.	0.	0.	-.2006E-03	0.	0.	0.	-.2006E-03
L/THT2	0.	0.	0.	0.	0.	-.1821E+01	0.	0.	0.	-.1821E+01
N/THT2	0.	0.	0.	0.	0.	.4006E-01	0.	0.	0.	.4006E-01

Y/V	-.7483E-03	0.	0.	-.4669E-02	-.5417E-02	0.	-.2320E-01	-.7100E-22	0.	-.2861E-01
L/V	-.4850E-03	0.	0.	0.	-.4850E-03	0.	-.1236E-03	-.3783E-24	-.1070E-09	-.6886E-03
N/V	-.5881E-03	0.	0.	-.3101E-03	-.8981E-03	0.	-.2457E-02	.1652E-23	.4324E-14	-.3355E-02
Y/P	0.	0.	0.	0.	0.	0.	-.4376E-01	.4170E-20	0.	-.4376E-01
L/P	-.3946E+00	0.	0.	0.	-.3946E+00	0.	-.2542E+00	.2222E-22	.5701E-08	-.6487E+00
N/P	-.4705E-02	0.	0.	0.	-.4705E-02	0.	-.4310E-02	-.9700E-22	-.2305E-12	-.9015E-02
Y/R	0.	0.	0.	0.	0.	0.	-.5929E+01	.9112E+00	0.	-.5018E+01
L/R	.5749E-01	0.	0.	0.	.5749E-01	0.	-.3159E-01	.4856E-02	0.	.3075E-01
N/R	-.3008E-01	0.	0.	0.	-.3008E-01	0.	-.6187E+00	-.2120E-01	0.	-.6700E+00
Y/DR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DA	-.6964E-11	0.	0.	0.	-.6864E-11	0.	0.	0.	0.	-.6864E-11
L/DA	-.5343E-01	0.	0.	0.	-.5343E-01	0.	0.	0.	0.	-.5343E-01
N/DA	-.9642E-02	0.	0.	0.	-.9642E-02	0.	0.	0.	0.	-.9642E-02
Y/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	.2413E+01	.2413E+01
N/DRCSR	0.	0.	0.	0.	0.	0.	0.	0.	-.9754E-04	-.9754E-04
Y/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
L/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
N/DRCSS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y/PSIT1	0.	0.	0.	0.	0.	.1545E+02	0.	0.	0.	.1545E+02
L/PSIT1	0.	0.	0.	0.	0.	.8229E-01	0.	0.	0.	.8229E-01
N/PSIT1	0.	0.	0.	0.	0.	-.1679E+01	0.	0.	0.	-.1679E+01
Y/PSIT2	0.	0.	0.	0.	0.	.1545E+02	0.	0.	0.	.1545E+02
L/PSIT2	0.	0.	0.	0.	0.	.8232E-01	0.	0.	0.	.8232E-01
N/PSIT2	0.	0.	0.	0.	0.	-.1679E+01	0.	0.	0.	-.1679E+01

```
NOPT=4 TIME HISTORY

      EXAMPLE 2 - STATIONKEEPING TIME HISTORY

NTAPE(1)= 5
NTAPE(2)= 5
NTAPE(3)= 4
ITRIM=
   (7X,11(2A5))
   (5X,11F10.3)
   (5X,11F10.3)
```

EXAMPLE 2 - STATIONKEEPING TIME HISTORY

TIME-SEC	U-FT/SEC	V-FT/SEC	W-FT/SEC	P-DEG/SEC	Q-DEG/SEC	R-DEG/SEC	RS-DEG/SEC	PS-DEG/SEC	XEDT-FT/S	YEDT-FT/S
0.000	-.000	-.000	-.000	-.000	-.000	-.000	.000	-.000	-.000	-.000
.100	-.000	.000	-.000	-.000	-.000	-.000	-.000	-.000	-.000	.000
.200	-.000	.000	-.000	-.000	-.000	-.000	-.000	-.000	-.000	.000
.300	-.000	.000	-.000	-.000	-.000	-.000	-.000	-.000	-.000	.000
.400	-.444	.000	.059	2.223	.368	-.006	-2.163	.499	-.047	.000
.500	-1.546	.004	.225	9.559	1.326	-.030	-9.357	1.955	-.142	.001
.600	-2.260	.019	.312	17.070	1.694	-.075	-16.764	3.221	-.217	.009
.700	-2.257	.048	.223	21.502	.953	-.119	-21.128	3.996	-.295	.033
.800	-1.985	.089	.041	22.459	-.243	-.153	-22.052	4.259	-.402	.085
.900	-1.659	.143	-.133	21.364	-1.254	-.205	-20.954	4.169	-.488	.162
1.000	-1.314	.213	-.251	19.885	-1.824	-.306	-19.488	3.966	-.507	.257
1.100	-.980	.303	-.301	18.937	-1.951	-.469	-18.616	3.814	-.452	.363
1.200	-.665	.411	-.286	18.867	-1.703	-.688	-18.502	3.757	-.329	.472
1.300	-.364	.535	-.226	19.195	-1.240	-.948	-18.848	3.756	-.153	.580
1.400	-.070	.673	-.144	19.607	-.707	-1.231	-19.286	3.743	.054	.685
1.500	.214	.821	-.053	19.880	-.191	-1.522	-19.596	3.677	.278	.787
1.600	.483	.975	.038	19.968	.264	-1.803	-19.731	3.557	.507	.883
1.700	.729	1.129	.123	19.939	.646	-2.062	-19.753	3.410	.732	.969
1.800	.944	1.280	.201	19.878	.949	-2.284	-19.739	3.272	.947	1.044
1.900	1.129	1.423	.269	19.842	1.169	-2.457	-19.740	3.173	1.148	1.104
2.0 0	1.291	1.553	.326	19.844	1.303	-2.572	-19.763	3.131	1.331	1.149
2.100	1.427	1.566	.371	[illegible]	1.356	-2.626	-19.794	3.149	1.493	1.177
2.200	1.532	1.762	.405	[illegible]	1.337	-2.617	-19.812	3.225	1.632	1.187
2.300	1.604	1.837	.431	19.926	1.259	-2.547	-19.806	3.356	1.746	1.180
2.400	1.643	1.891	.450	19.942	1.136	-2.420	-19.774	3.540	1.838	1.155
2.500	1.648	1.925	.466	19.953	.986	-2.243	-19.721	3.774	1.908	1.113
2.600	1.672	1.938	.483	19.963	.822	[illegible]	-19.651	4.056	1.958	1.054
2.700	1.565	1.934	.503	19.974	.660	-1.770	-19.569	4.378	1.991	.978
2.800	1.482	1.915	.530	19.987	.510	-1.494	-19.476	4.734	2.011	.886
2.900	1.376	1.884	.568	20.002	.382	-1.207	-19.375	5.115	2.020	.779
3.000	1.250	1.845	.617	20.016	.284	-.920	-19.265	5.512	2.023	.659
3.100	1.110	1.802	.679	20.030	.221	-.645	-19.147	5.916	2.022	.525
3.200	.959	1.759	.756	20.041	.196	-.393	-19.023	6.321	2.020	.379
3.300	.802	1.720	.847	20.051	.210	-.173	-18.893	6.718	2.020	.223
3.400	.643	1.689	.952	20.059	.261	.007	-18.759	7.104	2.024	.059
3.500	.487	1.669	1.069	20.065	.345	.139	-18.620	7.477	2.035	-.114
3.600	.336	1.662	1.197	20.069	.459	.220	-18.477	7.836	2.054	-.292
3.700	.194	1.670	1.332	20.072	.594	.247	-18.329	8.185	2.080	-.475
3.800	.065	1.695	1.473	20.072	.743	.220	-18.171	8.530	2.115	-.660
3.900	-.049	1.736	1.614	20.071	.898	.141	-17.999	8.882	2.158	-.845
4.000	-.147	1.793	1.753	20.068	1.049	.017	-17.806	9.256	2.208	-1.030
4.100	-.226	1.865	1.886	20.064	1.186	-.147	-17.578	9.674	2.262	-1.211
4.200	-.286	1.945	2.009	20.059	1.303	-.342	-17.300	10.159	2.319	-1.387
4.300	-.327	2.040	2.119	20.054	1.389	-.556	-16.943	10.743	2.377	-1.556
4.400	-.348	2.139	2.214	20.047	1.440	-.781	-16.467	11.459	2.433	-1.714
4.500	-.350	2.239	2.290	20.033	1.450	-1.005	-15.812	12.341	2.483	-1.861
4.600	-.334	2.334	2.346	19.932	1.417	-1.191	-14.821	13.381	2.522	-1.994
4.700	-.303	2.415	2.381	19.713	1.350	-1.319	-13.371	14.545	2.543	-2.112
4.800	-.263	2.473	2.397	19.328	1.254	-1.354	-11.322	15.723	2.538	-2.215
4.900	-.222	2.509	2.399	18.913	1.143	-1.277	-8.681	16.852	2.508	-2.303

5.000	-.182	2.534	2.390	18.757	1.029	-1.159	-5.570	17.948	2.466	-2.388
5.100	-.139	2.566	2.368	19.103	.903	-1.111	-2.038	19.026	2.428	-2.442
5.200	-.082	2.606	2.325	19.721	.726	-1.110	1.936	19.657	2.398	-2.486
5.300	.008	2.648	2.255	20.272	.462	-1.176	5.942	19.417	2.376	-2.506
5.400	.115	2.692	2.158	20.529	.112	-1.283	9.368	18.313	2.360	-2.502
5.500	.229	2.729	2.043	20.476	-.286	-1.395	11.899	16.723	2.344	-2.479
5.600	.339	2.757	1.917	20.261	-.675	-1.478	13.639	15.056	2.326	-2.445
5.700	.440	2.774	1.791	20.053	-1.022	-1.524	14.858	13.553	2.298	-2.408
5.800	.531	2.770	1.675	19.937	-1.311	-1.525	15.790	12.267	2.258	-2.375
5.900	.612	2.753	1.574	19.917	-1.534	-1.474	16.562	11.161	2.201	-2.351
6.000	.682	2.721	1.491	19.952	-1.688	-1.373	17.216	10.177	2.125	-2.337
6.100	.741	2.675	1.429	19.999	-1.776	-1.227	17.759	9.278	2.031	-2.336
6.200	.789	2.620	1.391	20.034	-1.798	-1.047	18.197	8.445	1.919	-2.348
6.300	.824	2.559	1.380	20.053	-1.755	-.848	18.544	7.679	1.791	-2.377
6.400	.846	2.499	1.396	20.063	-1.647	-.647	18.819	6.986	1.648	-2.423
6.500	.855	2.443	1.441	20.072	-1.478	-.460	19.038	6.373	1.492	-2.490
6.600	.851	2.398	1.515	20.082	-1.255	-.302	19.215	5.847	1.326	-2.577
6.700	.833	2.367	1.614	20.096	-.986	-.185	19.355	5.410	1.153	-2.685
6.800	.803	2.356	1.738	20.110	-.682	-.120	19.462	5.065	.973	-2.813
6.900	.762	2.367	1.881	20.123	-.355	-.111	19.539	4.811	.790	-2.962
7.000	.709	2.402	2.041	20.132	-.016	-.152	19.589	4.644	.604	-3.128
7.100	.646	2.462	2.213	20.137	.321	-.271	19.616	4.559	.417	-3.311
7.200	.574	2.547	2.393	20.139	.648	-.434	19.623	4.547	.230	-3.507
7.300	.493	2.655	2.576	20.138	.953	-.643	19.617	4.598	.042	-3.712
7.400	.405	2.784	2.758	20.136	1.227	-.889	19.600	4.699	-.149	-3.924
7.500	.311	2.931	2.934	20.132	1.464	-1.159	19.577	4.837	-.334	-4.138
7.600	.213	3.091	3.103	20.127	1.657	-1.441	19.550	4.998	-.522	-4.350
7.700	.111	3.260	3.260	20.121	1.803	-1.721	19.522	5.167	-.713	-4.555
7.800	.008	3.433	3.405	20.113	1.901	-1.988	19.496	5.331	-.905	-4.749
7.900	-.096	3.604	3.535	20.105	1.951	-2.228	19.472	5.477	-1.099	-4.928
8.000	-.198	3.770	3.651	20.096	1.956	-2.432	19.454	5.594	-1.297	-5.089
8.100	-.298	3.925	3.752	20.087	1.919	-2.598	19.442	5.674	-1.499	-5.227
8.200	-.394	4.067	3.839	20.077	1.846	-2.696	19.436	5.709	-1.705	-5.340
8.300	-.485	4.191	3.915	20.068	1.744	-2.746	19.438	5.696	-1.916	-5.425
8.400	-.570	4.295	3.981	20.059	1.621	-2.739	19.446	5.632	-2.133	-5.480
8.500	-.648	4.377	4.039	20.051	1.484	-2.675	19.461	5.520	-2.354	-5.506
8.600	-.720	4.437	4.092	20.044	1.342	-2.557	19.482	5.362	-2.581	-5.500
8.700	-.783	4.475	4.143	20.038	1.202	-2.392	19.508	5.164	-2.813	-5.463
8.800	-.839	4.492	4.193	20.032	1.072	-2.187	19.538	4.934	-3.050	-5.397
8.900	-.886	4.489	4.247	20.028	.957	-1.949	19.571	4.680	-3.290	-5.301
9.000	-.926	4.468	4.304	20.024	.862	-1.690	19.605	4.411	-3.534	-5.178
9.100	-.958	4.431	4.367	20.020	.791	-1.418	19.639	4.137	-3.781	-5.030
9.200	-.983	4.382	4.437	20.016	.745	-1.143	19.672	3.868	-4.028	-4.858
9.300	-1.002	4.323	4.514	20.013	.724	-.874	19.703	3.613	-4.276	-4.665
9.400	-1.015	4.256	4.598	20.009	.726	-.618	19.732	3.378	-4.521	-4.453
9.500	-1.024	4.183	4.689	20.004	.749	-.382	19.756	3.169	-4.763	-4.223
9.600	-1.029	4.107	4.785	19.997	.789	-.169	19.772	2.991	-5.000	-3.978
9.700	-1.031	4.030	4.886	19.986	.843	.019	19.782	2.844	-5.229	-3.719
9.800	-1.032	3.952	4.990	19.984	.905	.177	19.797	2.734	-5.449	-3.448
9.900	-1.032	3.877	5.095	19.992	.970	.304	19.817	2.662	-5.658	-3.168
10.000	-1.031	3.806	5.198	20.004	1.031	.402	19.835	2.626	-5.854	-2.882
10.100	-1.031	3.741	5.298	20.007	1.084	.473	19.840	2.621	-6.034	-2.592
10.200	-1.031	3.682	5.393	20.006	1.124	.515	19.837	2.649	-6.197	-2.301
10.300	-1.033	3.633	5.480	20.010	1.148	.528	19.833	2.712	-6.344	-2.012
10.400	-1.036	3.592	5.559	20.021	1.152	.513	19.830	2.808	-6.472	-1.728
10.500	-1.040	3.561	5.626	20.036	1.134	.472	19.826	2.935	-6.581	-1.449
10.600	-1.045	3.540	5.682	20.052	1.092	.408	19.817	3.088	-6.672	-1.178

10.700	-1.052	3.528	5.725	20.065	1.025	.325	19.801	3.265	-6.744	-.917
10.800	-1.059	3.524	5.754	20.076	.935	.228	19.777	3.458	-6.797	-.665
10.900	-1.066	3.527	5.770	20.083	.822	.122	19.747	3.665	-6.833	-.424
11.000	-1.073	3.536	5.773	20.089	.691	.011	19.710	3.880	-6.851	-.193
11.100	-1.080	3.550	5.764	20.093	.545	-.099	19.670	4.100	-6.854	.028
11.200	-1.086	3.567	5.743	20.095	.387	-.203	19.627	4.320	-6.842	.240
11.300	-1.090	3.585	5.712	20.097	.222	-.299	19.581	4.538	-6.817	.443
11.400	-1.093	3.605	5.672	20.098	.054	-.383	19.532	4.752	-6.779	.638
11.500	-1.093	3.624	5.625	20.099	-.112	-.453	19.481	4.963	-6.730	.826
11.600	-1.091	3.643	5.572	20.098	-.273	-.509	19.428	5.170	-6.671	1.008
11.700	-1.086	3.661	5.516	20.097	-.424	-.550	19.372	5.377	-6.604	1.185
11.800	-1.077	3.678	5.459	20.096	-.564	-.577	19.312	5.587	-6.530	1.357
11.900	-1.065	3.694	5.400	20.094	-.688	-.592	19.247	5.804	-6.451	1.526
12.000	-1.050	3.710	5.344	20.092	-.794	-.598	19.173	6.034	-6.368	1.692
12.100	-1.031	3.727	5.290	20.089	-.882	-.597	19.090	6.285	-6.284	1.857
12.200	-1.009	3.745	5.240	20.086	-.949	-.593	18.992	6.565	-6.198	2.020
12.300	-.984	3.765	5.195	20.082	-.995	-.588	18.875	6.883	-6.113	2.183
12.400	-.956	3.789	5.157	20.078	-1.020	-.585	18.733	7.249	-6.029	2.346
12.500	-.925	3.817	5.125	20.073	-1.025	-.587	18.557	7.675	-5.949	2.511
12.600	-.893	3.849	5.102	20.067	-1.010	-.597	18.336	8.175	-5.871	2.677
12.700	-.858	3.888	5.086	20.061	-.976	-.615	18.056	8.764	-5.798	2.847
12.800	-.823	3.933	5.079	20.053	-.925	-.643	17.694	9.458	-5.729	3.020
12.900	-.787	3.984	5.081	20.045	-.858	-.682	17.223	10.279	-5.664	3.198
13.000	-.750	4.043	5.091	20.036	-.777	-.730	16.600	11.244	-5.602	3.382
13.100	-.714	4.108	5.110	20.026	-.683	-.788	15.764	12.375	-5.545	3.572
13.200	-.679	4.181	5.139	20.010	-.578	-.852	14.632	13.676	-5.490	3.770
13.300	-.646	4.260	5.178	19.932	-.457	-.921	13.084	15.130	-5.437	3.977
13.400	-.615	4.348	5.229	19.926	-.331	-.933	10.980	16.657	-5.388	4.194
13.500	-.586	4.443	5.291	19.854	-.193	-1.072	8.205	18.111	-5.340	4.423
13.600	-.560	4.544	5.361	19.846	-.042	-1.177	4.747	19.306	-5.290	4.660
13.700	-.539	4.648	5.436	19.943	.117	-1.296	.757	19.971	-5.234	4.904
13.800	-.522	4.755	5.514	20.114	.277	-1.406	-3.405	19.874	-5.169	5.154
13.900	-.512	4.864	5.594	20.271	.434	-1.489	-7.253	18.988	-5.095	5.408
14.000	-.507	4.974	5.673	20.257	.583	-1.526	-10.358	17.476	-5.011	5.664
14.100	-.501	5.077	5.750	19.906	.709	-1.488	-12.457	15.598	-4.908	5.916
14.200	-.489	5.171	5.823	19.377	.787	-1.418	-13.719	13.758	-4.789	6.160
14.300	-.471	5.262	5.890	18.999	.806	-1.374	-14.584	12.253	-4.661	6.394
14.400	-.465	5.355	5.958	18.911	.831	-1.352	-15.365	11.108	-4.529	6.624
14.500	-.468	5.457	6.024	19.080	.878	-1.396	-16.172	10.220	-4.397	6.852
14.600	-.473	5.569	6.080	19.379	.913	-1.479	-16.973	9.468	-4.264	7.072
14.700	-.476	5.691	6.117	19.656	.903	-1.596	-17.666	8.764	-4.131	7.278
14.800	-.474	5.818	6.132	19.831	.830	-1.729	-18.191	8.084	-3.995	7.464
14.900	-.466	5.945	6.125	19.900	.699	-1.859	-18.548	7.446	-3.853	7.630
15.000	-.453	6.064	6.097	19.905	.520	-1.959	-18.782	6.878	-3.704	7.774
15.100	-.435	6.173	6.052	19.889	.310	-2.045	-18.940	6.406	-3.546	7.896
15.200	-.412	6.269	5.991	19.882	.081	-2.077	-19.056	6.039	-3.377	7.996
15.300	-.382	6.348	5.916	19.891	-.158	-2.061	-19.146	5.772	-3.195	8.076
15.400	-.344	6.410	5.830	19.911	-.401	-1.996	-19.212	5.598	-3.001	8.135
15.500	-.299	6.456	5.734	19.934	-.642	-1.887	-19.253	5.500	-2.796	8.175
15.600	-.246	6.485	5.631	19.954	-.876	-1.739	-19.269	5.467	-2.580	8.196
15.700	-.185	6.501	5.523	19.968	-1.096	-1.561	-19.263	5.485	-2.356	8.201
15.800	-.117	6.504	5.413	19.978	-1.299	-1.354	-19.243	5.540	-2.125	8.191
15.900	-.042	6.439	5.301	19.986	-1.480	-1.159	-19.215	5.621	-1.890	8.171
16.000	.039	6.488	5.191	19.994	-1.637	-.956	-19.184	5.714	-1.654	8.142
16.100	.124	6.474	5.083	20.002	-1.768	-.767	-19.155	5.808	-1.417	8.109
16.200	.214	6.462	4.977	20.009	-1.874	-.599	-19.131	5.893	-1.184	8.073
16.300	.305	6.454	4.875	20.015	-1.957	-.462	-19.113	5.960	-.954	8.037

16.400	.398	6.453	4.777	20.020	-2.019	-.359	-19.102	6.004	-.731	8.004
16.500	.491	6.462	4.681	20.023	-2.063	-.295	-19.099	6.020	-.515	7.976
16.600	.583	6.483	4.588	20.025	-2.093	-.270	-19.104	6.007	-.307	7.955
16.700	.672	6.517	4.496	20.025	-2.114	-.285	-19.118	5.965	-.108	7.942
16.800	.758	6.565	4.406	20.024	-2.123	-.338	-19.140	5.896	.083	7.938
16.900	.840	6.628	4.315	20.023	-2.141	-.424	-19.168	5.802	.264	7.944
17.000	.916	6.705	4.223	20.020	-2.155	-.540	-19.203	5.688	.437	7.960
17.100	.987	6.798	4.129	20.018	-2.174	-.680	-19.242	5.553	.602	7.986
17.200	1.052	6.904	4.033	20.015	-2.201	-.839	-19.285	5.420	.759	8.023
17.300	1.110	7.024	3.934	20.012	-2.237	-1.011	-19.330	5.276	.911	8.069
17.400	1.161	7.157	3.831	20.009	-2.282	-1.192	-19.376	5.133	1.058	8.125
17.500	1.206	7.301	3.724	20.006	-2.338	-1.375	-19.422	4.995	1.202	8.191
17.600	1.244	7.457	3.614	20.004	-2.403	-1.559	-19.466	4.865	1.344	8.265
17.700	1.276	7.622	3.502	20.002	-2.476	-1.738	-19.508	4.746	1.486	8.348
17.800	1.303	7.797	3.387	20.000	-2.556	-1.911	-19.548	4.642	1.631	8.440
17.900	1.324	7.982	3.271	19.999	-2.639	-2.077	-19.584	4.552	1.779	8.539
18.000	1.340	8.175	3.155	19.998	-2.724	-2.236	-19.618	4.477	1.935	8.647
18.100	1.352	8.378	3.040	19.998	-2.808	-2.388	-19.650	4.415	2.098	8.764
18.200	1.361	8.589	2.927	19.998	-2.889	-2.534	-19.679	4.367	2.273	8.888
18.300	1.368	8.809	2.817	19.998	-2.963	-2.675	-19.706	4.331	2.462	9.017
18.400	1.373	9.035	2.711	19.998	-3.029	-2.809	-19.729	4.309	2.667	9.151
18.500	1.378	9.266	2.612	19.998	-3.084	-2.933	-19.749	4.302	2.890	9.286
18.600	1.383	9.501	2.520	19.999	-3.127	-3.047	-19.765	4.312	3.133	9.419
18.700	1.391	9.739	2.436	19.999	-3.155	-3.148	-19.775	4.340	3.399	9.548
18.800	1.402	9.978	2.362	20.000	-3.165	-3.234	-19.779	4.388	3.689	9.669
18.900	1.417	10.217	2.299	20.001	-3.157	-3.304	-19.776	4.458	4.003	9.779
19.000	1.439	10.454	2.248	20.002	-3.129	-3.355	-19.765	4.549	4.342	9.875
19.100	1.468	10.690	2.209	20.004	-3.080	-3.389	-19.746	4.664	4.706	9.954
19.200	1.506	10.924	2.182	20.007	-3.011	-3.406	-19.719	4.799	5.095	10.014
19.300	1.554	11.156	2.167	20.009	-2.923	-3.408	-19.683	4.954	5.509	10.052
19.400	1.615	11.386	2.165	20.010	-2.818	-3.397	-19.639	5.127	5.946	10.068
19.500	1.687	11.613	2.176	20.013	-2.696	-3.376	-19.587	5.315	6.405	10.058
19.600	1.773	11.840	2.198	20.015	-2.561	-3.347	-19.529	5.517	6.885	10.022
19.700	1.873	12.066	2.231	20.019	-2.413	-3.315	-19.466	5.728	7.384	9.959
19.800	1.988	12.292	2.275	20.023	-2.255	-3.284	-19.399	5.948	7.902	9.868
19.900	2.117	12.519	2.328	20.027	-2.090	-3.255	-19.328	6.172	8.435	9.749
20.000	2.260	12.748	2.389	20.030	-1.921	-3.234	-19.254	6.399	8.981	9.601
20.100	2.417	12.979	2.457	20.034	-1.750	-3.222	-19.179	6.626	9.540	9.426

TIME-SEC	ZEDI-FT/S	XE-FT	YE-FT	ZE-FT	THETA-DEG	PHI-DEG	PSI-DEG	D11	D12	D13
0.000	.000	0.000	0.000	-100.000	76.413	-.035	.010	.235	-.001	.972
.100	.000	-.000	.000	-100.000	76.412	-.035	.010	.235	-.001	.972
.200	.000	-.000	.000	-100.000	76.412	-.035	.010	.235	-.001	.972
.300	.000	-.000	.000	-100.000	76.412	-.035	.010	.235	-.001	.972
.400	.445	-.001	.000	-99.987	76.423	.025	.009	.235	.000	.972
.500	1.556	-.011	.000	-99.887	76.508	.586	.004	.233	.010	.972
.600	2.271	-.029	.000	-99.690	76.668	1.927	-.004	.231	.033	.972
.700	2.249	-.054	.002	-99.459	76.808	3.874	-.017	.228	.066	.971
.800	1.944	-.089	.008	-99.248	76.845	6.050	.064	.228	.104	.968
.900	1.590	-.134	.020	-99.072	76.770	8.134	.185	.229	.141	.963
1.000	1.230	-.185	.041	-98.931	76.618	9.984	-.401	.231	.176	.957
1.100	.897	-.233	.072	-98.825	76.437	11.614	-.717	.235	.208	.950
1.200	.602	-.273	.114	-98.750	76.268	13.108	-1.122	.237	.239	.941
1.300	.333	-.297	.166	-98.703	76.144	14.543	-1.602	.239	.271	.932
1.400	.079	-.302	.229	-98.683	76.078	15.956	-2.145	.240	.303	.922
1.500	-.161	-.286	.303	-98.687	76.075	17.349	-2.746	.240	.335	.911
1.600	-.386	-.246	.387	-98.715	76.131	18.719	-3.398	.239	.367	.899
1.700	-.588	-.184	.479	-98.764	76.238	20.026	-4.098	.237	.399	.886
1.800	-.764	-.100	.580	-98.831	76.390	21.298	-4.838	.234	.430	.872
1.900	-.913	.005	.688	-98.915	76.578	22.533	-5.610	.231	.461	.8[illegible]7
2.000	-1.046	.129	.800	-99.013	76.791	23.744	-6.403	.227	.492	.8[illegible]1
2.100	-1.157	.270	.917	-99.124	77.020	24.947	-7.207	.223	.522	.824
2.200	-1.243	.426	1.035	-99.244	77.256	26.153	-8.010	.218	.551	.806
2.300	-1.300	.595	1.154	-99.371	77.488	27.375	-8.798	.214	.579	.786
2.400	-1.328	.775	1.271	-99.503	77.711	28.626	-9.559	.210	.607	.766
2.500	-1.326	.962	1.384	-99.636	77.918	29.917	-10.278	.206	.635	.745
2.600	-1.294	1.156	1.493	-99.767	78.104	31.263	-10.943	.202	.661	.723
2.700	-1.234	1.353	1.594	-99.894	78.268	32.677	-11.538	.199	.686	.699
2.800	-1.147	1.554	1.686	-100.013	78.406	34.170	-12.054	.197	.711	.675
2.900	-1.037	1.755	1.771	-100.123	78.520	35.752	-12.481	.194	.734	.650
3.000	-.907	1.957	1.843	-100.220	78.610	37.428	-12.812	.193	.757	.624
3.100	-.761	2.160	1.902	-100.304	78.678	39.202	-13.045	.191	.779	.598
3.200	-.603	2.362	1.948	-100.372	78.727	41.074	-13.179	.190	.799	.570
3.300	-.437	2.564	1.978	-100.424	78.760	43.041	-13.217	.190	.819	.542
3.400	-.268	2.766	1.992	-100.459	78.782	45.099	-13.164	.189	.837	.513
3.500	-.098	2.969	1.989	-100.477	78.798	47.241	-13.025	.189	.855	.483
3.600	.067	3.173	1.969	-100.479	78.810	49.461	-12.808	.189	.871	.453
3.700	.224	3.380	1.931	-100.464	78.825	51.749	-12.521	.189	.886	.423
3.800	.369	3.589	1.874	-100.435	78.846	54.099	-12.172	.189	.901	.392
3.900	.499	3.803	1.799	-100.391	78.878	56.502	-11.768	.189	.914	.360
4.000	.613	4.021	1.705	-100.335	78.923	58.952	-11.317	.188	.926	.328
4.100	.707	4.245	1.593	-100.269	78.984	61.440	-10.826	.188	.937	.296
4.200	.781	4.474	1.463	-100.195	79.063	63.960	-10.303	.187	.946	.263
4.300	.832	4.709	1.316	-100.114	79.160	66.505	-9.754	.185	.955	.231
4.400	.861	4.949	1.152	-100.029	79.275	69.057	-9.187	.184	.963	.197
4.500	.867	5.195	.973	-99.942	79.[illegible]08	71.637	-8.611	.182	.970	.164
4.600	.851	5.445	.781	-99.856	79.[illegible]56	74.202	-8.036	.179	.97[illegible]	.131
4.700	.816	5.699	.575	-99.773	79.713	76.746	-7.466	.177	.979	.097
4.800	.765	5.953	.359	-99.694	79.871	79.252	-6.904	.175	.983	.064
4.900	.709	6.206	.133	-99.620	80.022	81.706	-6.353	.172	.985	.032
5.000	.652	6.454	-.102	-99.552	80.156	84.117	-5.814	.170	.985	-.000
5.100	.594	6.699	-.343	-99.490	80.276	86.512	-5.300	.168	.985	-.032

5.200	.523	6.940	-.589	-99.434	80.309	88.908	-4.838	.166	.984	-.066
5.300	.421	7.179	-.839	-99.386	80.503	91.268	-4.474	.164	.981	-.100
5.400	.303	7.415	-1.090	-99.350	80.624	93.518	-4.264	.162	.977	-.135
5.500	.178	7.651	-1.339	-99.326	80.759	95.584	-4.251	.160	.972	-.170
5.600	.059	7.884	-1.585	-99.314	80.907	97.425	-4.450	.158	.966	-.204
5.700	-.053	8.116	-1.828	-99.314	81.068	99.044	-4.850	.155	.959	-.238
5.800	-.156	8.343	-2.067	-99.324	81.239	100.467	-5.433	.152	.950	-.272
5.900	-.250	8.567	-2.303	-99.345	81.414	101.731	-6.170	.148	.941	-.305
6.000	-.335	8.783	-2.538	-99.374	81.588	102.870	-7.033	.145	.930	-.338
6.100	-.411	8.991	-2.771	-99.411	81.755	103.919	-7.992	.142	.918	-.371
6.200	-.475	9.189	-3.005	-99.456	81.910	104.909	-9.014	.139	.905	-.403
6.300	-.528	9.374	-3.241	-99.506	82.049	105.872	-10.066	.136	.890	-.435
6.400	-.568	9.546	-3.481	-99.561	82.169	106.849	-11.105	.134	.875	-.466
6.500	-.594	9.703	-3.727	-99.619	82.268	107.881	-12.089	.132	.858	-.497
6.600	-.607	9.844	-3.980	-99.679	82.347	109.014	-12.972	.130	.840	-.527
6.700	-.607	9.968	-4.243	-99.740	82.408	110.291	-13.709	.128	.821	-.556
6.800	-.594	10.075	-4.517	-99.800	82.451	111.754	-14.262	.127	.801	-.585
6.900	-.569	10.163	-4.806	-99.859	82.481	113.434	-14.596	.127	.780	-.613
7.000	-.534	10.232	-5.110	-99.914	82.501	115.359	-14.685	.126	.758	-.640
7.100	-.489	10.284	-5.432	-99.965	82.513	117.548	-14.507	.126	.735	-.666
7.200	-.437	10.316	-5.773	-100.011	82.520	120.014	-14.052	.126	.711	-.691
7.300	-.380	10.330	-6.134	-100.052	82.524	122.762	-13.311	.127	.687	-.716
7.400	-.318	10.324	-6.516	-100.087	82.526	125.791	-12.287	.127	.661	-.739
7.500	-.253	10.300	-6.919	-100.116	82.525	129.095	-10.986	.128	.635	-.762
7.600	-.189	10.258	-7.343	-100.138	82.520	132.656	-9.424	.128	.608	-.783
7.700	-.125	10.196	-7.788	-100.153	82.511	136.454	-7.624	.129	.581	-.804
7.800	-.065	10.115	-8.254	-100.163	82.496	140.457	-5.615	.130	.553	-.823
7.900	-.009	10.015	-8.738	-100.167	82.471	144.627	-3.437	.131	.524	-.842
8.000	.041	9.895	-9.239	-100.165	82.435	148.920	-1.135	.132	.495	-.859
8.100	.085	9.755	-9.755	-100.159	82.386	153.285	1.243	.132	.465	-.875
8.200	.122	9.595	-10.283	-100.148	82.325	157.671	3.642	.133	.435	-.891
8.300	.153	9.414	-10.822	-100.134	82.250	162.025	6.010	.134	.404	-.905
8.400	.176	9.212	-11.367	-100.118	82.163	166.299	8.299	.135	.372	-.918
8.500	.193	8.987	-11.917	-100.099	82.065	170.448	10.463	.136	.341	-.930
8.600	.203	8.741	-12.467	-100.080	81.960	174.437	12.466	.137	.309	-.941
8.700	.208	8.471	-13.016	-100.059	81.849	178.237	14.280	.137	.276	-.951
8.800	.207	8.178	-13.559	-100.038	81.735	181.830	15.886	.138	.243	-.960
8.900	.201	7.861	-14.094	-100.018	81.621	185.203	17.271	.139	.210	-.968
9.000	.191	7.520	-14.6.8	-99.998	81.510	188.353	18.431	.140	.176	-.974
9.100	.177	7.154	-15.129	-99.980	81.402	191.282	19.368	.141	.143	-.980
9.200	.160	6.764	-15.624	-99.963	81.300	193.995	20.087	.142	.109	-.984
9.300	.141	6.348	-16.100	-99.948	81.202	196.503	20.600	.143	.075	-.987
9.400	.119	5.909	-16.556	-99.935	81.111	198.820	20.919	.144	.040	-.989
9.500	.095	5.444	-16.990	-99.924	81.025	200.959	21.060	.146	.006	-.989
9.600	.070	4.956	-17.400	-99.916	80.944	202.939	21.039	.147	-.029	-.989
9.700	.046	4.445	-17.785	-99.910	80.866	204.774	20.873	.148	-.063	-.987
9.800	.022	3.910	-18.143	-99.907	80.792	206.483	20.580	.150	-.097	-.984
9.900	-.001	3.355	-18.474	-99.906	80.720	208.085	20.178	.151	-.132	-.980
10.000	-.023	2.779	-18.777	-99.907	80.[illegible]	209.601	19.688	.153	-.166	-.974
10.100	-.042	2.185	-19.051	-99.910	80.[illegible]	211.049	19.128	.155	-.200	-.968
10.200	-.059	1.573	-19.295	-99.915	80.512	212.447	18.517	.156	-.234	-.960
10.300	-.073	.946	-19.511	-99.922	80.446	213.816	17.876	.158	-.267	-.951
10.400	-.034	.305	-19.698	-99.930	80.380	215.176	17.226	.160	-.300	-.940
10.500	-.092	-.348	-19.857	-99.938	80.316	216.549	16.587	.161	-.333	-.929
10.600	-.097	-1.011	-19.988	-99.948	80.254	217.954	15.979	.163	-.366	-.916
10.700	-.098	-1.581	-20.093	-99.958	80.194	219.409	15.419	.164	-.398	-.903
10.800	-.097	-2.359	-20.172	-99.967	80.137	220.928	14.924	.166	-.429	-.888

10.900	-.093	-3.040	-20.226	-99.977	80.083	222.526	10.507	.167	-.460	-.872
11.000	-.086	-3.725	-20.257	-99.986	80.033	224.210	14.17[illegible]	.168	-.498	-.855
11.100	-.077	-4.410	-20.265	-99.994	79.986	225.988	13.943	.169	-.520	-.837
11.200	-.065	-5.095	-20.252	-100.001	79.943	227.863	13.807	.170	-.549	-.818
11.300	-.053	-5.778	-20.218	-100.007	79.904	229.837	13.771	.170	-.577	-.799
11.400	-.039	-6.458	-20.163	-100.012	79.868	231.908	13.833	.171	-.605	-.778
11.500	-.024	-7.133	-20.090	-100.015	79.836	234.072	13.990	.171	-.632	-.756
11.600	-.009	-7.804	-19.999	-100.016	79.808	236.324	14.235	.172	-.658	-.734
11.700	.005	-8.467	-19.88	-100.017	79.782	238.656	14.563	.172	-.683	-.710
11.800	.018	-9.124	-19.762	-100.016	79.758	241.060	14.964	.172	-.707	-.686
11.900	.030	-9.773	-19.618	-100.013	79.735	243.527	15.429	.172	-.730	-.661
12.000	.040	-10.414	-19.457	-100.010	79.713	246.047	15.948	.172	-.753	-.635
12.100	.048	-11.047	-19.279	-100.005	79.690	248.609	16.510	.172	-.775	-.609
12.200	.054	-11.671	-19.085	-100.000	79.665	251.203	17.105	.171	-.795	-.581
12.300	.057	-12.286	-18.875	-99.995	79.638	253.817	17.720	.171	-.815	-.553
12.400	.057	-12.893	-18.649	-99.989	79.608	256.440	18.345	.171	-.834	-.525
12.500	.056	-13.492	-18.406	-99.983	79.572	259.060	18.968	.171	-.851	-.496
12.600	.051	-14.083	-18.146	-99.978	79.531	261.665	19.577	.171	-.868	-.466
12.700	.045	-14.667	-17.870	-99.973	79.483	264.245	20.159	.171	-.884	-.435
12.800	.036	-15.243	-17.577	-99.969	79.428	266.787	20.705	.172	-.898	-.405
12.900	.026	-15.813	-17.266	-99.966	79.365	269.280	21.202	.172	-.912	-.373
13.000	.015	-16.375	-16.937	-99.964	79.293	271.716	21.641	.173	-.924	-.341
13.100	.003	-16.933	-16.589	-99.963	79.214	274.083	22.012	.174	-.935	-.309
13.200	-.009	-17.485	-16.222	-99.963	79.127	276.375	22.307	.175	-.945	-.276
13.300	-.020	-18.031	-15.835	-99.965	79.032	278.581	22.517	.176	-.954	-.243
13.400	-.030	-18.572	-15.427	-99.967	78.931	280.695	22.637	.177	-.961	-.210
13.500	-.040	-19.109	-14.996	-99.971	78.825	282.708	22.662	.179	-.968	-.177
13.600	-.047	-19.640	-14.542	-99.975	78.713	284.617	22.585	.181	-.973	-.143
13.700	-.050	-20.167	-14.064	-99.980	78.595	286.422	22.399	.183	-.977	-.109
13.800	-.048	-20.687	-13.561	-99.985	78.472	288.135	22.102	.185	-.980	-.075
13.900	-.041	-21.200	-13.033	-99.989	78.346	289.761	21.701	.188	-.981	-.040
14.000	-.029	-21.706	-12.479	-99.993	78.222	291.304	21.204	.190	-.982	-.005
14.100	-.016	-22.202	-11.900	-99.995	78.106	292.757	20.634	.193	-.981	.029
14.200	-.009	-22.687	-11.296	-99.996	78.003	294.122	20.022	.195	-.979	.063
14.300	-.005	-23.159	-10.668	-99.997	77.910	295.424	19.394	.198	-.976	.096
14.400	.010	-23.619	-10.018	-99.997	77.823	296.698	18.760	.200	-.971	.129
14.500	.033	-24.065	-9.344	-99.995	77.740	297.954	18.104	.202	-.966	.161
14.600	.057	-24.498	-8.647	-99.990	77.657	29[illegible].200	17.411	.204	-.960	.194
14.700	.076	-24.918	-7.930	-99.984	77.570	300.444	16.686	.206	-.952	.226
14.800	.087	-25.324	-7.193	-99.975	77.472	301.695	15.944	.209	-.943	.259
14.900	.093	-25.717	-6.438	-99.966	77.362	302.951	15.205	.211	-.933	.292
15.000	.093	-26.095	-5.667	-99.957	77.236	304.254	14.490	.214	-.921	.325
15.100	.090	-26.457	-4.884	-99.948	77.095	305.589	13.818	.217	-.909	.357
15.200	.084	-26.804	-4.089	-99.939	76.940	306.978	13.203	.220	-.895	.388
15.300	.075	-27.132	-3.285	-99.931	76.774	308.436	12.659	.223	-.880	.419
15.400	.065	-27.442	-2.474	-99.924	76.599	309.975	12.195	.227	-.864	[illegible]
15.500	.051	-27.732	-1.659	-99.918	76.417	311.602	11.819	.230	-.847	.479
15.600	.036	-28.001	-.840	-99.914	76.232	313.323	11.538	.23[illegible]	-.830	.5[illegible]7
15.700	.018	-28.248	-.020	-99.911	76.045	315.[illegible]	11.352	.236	-.811	.536
15.800	-.001	-28.472	.800	-99.910	75.857	317.047	11.260	.240	-.791	.563
15.900	-.023	-28.673	1.618	-99.912	75.669	319.042	11.257	.243	-.770	.590
16.000	-.046	-28.850	2.434	-99.915	75.481	321.115	11.334	.246	-.749	.615
16.100	-.070	-29.003	3.246	-99.921	75.294	323.255	11.479	.249	-.727	.641
16.200	-.095	-29.133	4.055	-99.929	75.106	325.449	11.679	.252	-.703	.665
16.300	-.121	-29.240	4.861	-99.940	74.917	327.680	11.916	.255	-.680	.688
16.400	-.147	-29.324	5.663	-99.953	74.725	329.933	12.177	.258	-.655	.710
16.500	-.173	-29.387	6.462	-99.969	74.531	332.192	12.443	.260	-.630	.732

16.600	-.199	-29.428	7.258	-99.988	74.332	334.440	12.698	.263	-.604	.753
16.700	-.224	-29.448	8.053	-100.009	74.130	336.662	12.926	.267	-.577	.772
16.800	-.247	-29.450	8.847	-100.032	73.922	338.845	13.114	.270	-.549	.791
16.900	-.268	-29.432	9.641	-100.058	73.708	340.978	13.249	.273	-.521	.809
17.000	-.286	-29.397	0.436	-100.086	73.489	343.050	13.323	.277	-.492	.825
17.100	-.301	-29.345	11.233	-100.115	73.264	345.055	13.326	.280	-.463	.841
17.200	-.313	-29.277	12.034	-100.146	73.034	346.988	13.255	.284	-.433	.855
17.300	-.320	-29.193	12.838	-100.178	72.798	348.847	13.105	.288	-.402	.869
17.400	-.324	-29.095	13.648	-100.210	72.556	350.629	12.876	.292	-. 71	.881
17.500	-.323	-28.982	14.464	-100.242	72.308	352.337	12.569	.297	-.340	.893
17.600	-.316	-28.855	15.286	-100.274	2.056	353.972	12.185	.301	-.308	.903
17.700	-.307	-28.713	16.117	-100.306	71.798	355.538	11.728	.306	-.275	.911
17.800	-.292	-28.557	16.956	-100.336	71.535	357.037	11.200	.311	-.242	.919
17.900	-.272	-28.387	17.805	-100.364	71.268	358.475	10.607	.316	-.209	.926
18.000	-.246	-28.201	18.664	-100.390	70.997	359.855	9.952	.321	-.175	.931
18.100	-.216	-28.000	19.535	-100.413	70.722	361.182	9.240	.326	-.141	.935
18.200	-.181	-27.781	20.417	-100.433	70.445	362.458	8.472	.331	-.107	.937
18.300	-.141	-27.545	21.313	-100.449	70.167	363.687	7.654	.336	-.073	.939
18.400	-.097	-27.288	22.221	-100.461	69.889	364.873	6.788	.341	-.039	.939
18.500	-.048	-27.011	23.143	-100.468	69.611	366.019	5.878	.347	-.004	.938
18.600	.004	-26.710	24.078	-100.470	69.337	367.130	4.929	.352	.030	.936
18.700	.060	-26.383	25.026	-100.467	69.067	368.211	3.946	.356	.065	.932
18.800	. 17	-26.029	25.987	-100.458	68.803	369.267	2.934	.361	.099	.927
18.900	.177	-25.645	26.960	-100.444	68.547	370.304	1.900	.366	.134	.921
19.000	.237	-25.228	27.943	-100.423	68.300	371.328	.850	.370	.168	.914
19.100	.298	-24.776	28.934	-100.396	68.066	372.344	-.209	.374	.202	.905
19.200	.358	-24.286	29.933	-100.363	67.844	373.359	-1.273	.377	.236	.896
19.300	.415	-23.756	30.936	-100.325	67.638	374.378	-2.334	.380	.269	.885
19.400	.470	-23.183	31.942	-100.281	67.447	375.404	-3.388	.383	.302	.873
19.500	.520	-22.566	32.949	-100.231	67.275	376.443	-4.431	.385	.334	.860
19.600	.565	-21.902	33.953	-100.177	67.122	377.497	-5.458	.387	.366	.846
19.700	.604	-21.188	34.952	-100.118	66.988	378.569	-6.468	.388	.398	.831
19.800	.637	-20.424	35.944	-100.056	66.875	379.660	-7.459	.389	.429	.815
19.900	.662	-19.607	36.925	-99.991	66.784	380.770	-8.429	.390	.459	.798
20.000	.680	-18.737	37.893	-99.924	66.715	381.900	-9.380	.390	.489	.780
20.100	.6 1	-17.611	38.844	-99.855	66.669	383.048	-10.310	.390	.518	.761

TIME-SEC	D21	D22	D23	D31	D32	D33	DEC-DEG	DAC-DEG	L.ELEV-DEG	R.ELEV-DEG
0.000	.000	1.000	.001	-.972	-.000	.235	2.863	.001	2.862	2.864
.100	.000	1.000	.001	-.972	-.000	.235	2.863	.001	2.862	2.864
.200	.000	1.000	.001	-.972	-.000	.235	2.863	.001	2.862	2.864
.300	.000	1.000	.001	-.972	-.000	.235	2.863	.001	2.862	2.864
.400	.000	1.000	-.000	-.972	.000	.235	4.602	-18.971	6.216	-.498
.500	.000	1.000	-.010	-.972	.002	.233	7.102	-14.339	9.715	-3.989
.600	-.000	.999	-.034	-.973	.008	.230	9.183	-6.832	13.215	-2.403
.700	-.000	.998	-.068	-.974	.015	.228	8.817	-1.180	12.216	1.096
.800	-.000	.994	-.106	-.974	.024	.226	7.192	.913	8.717	4.596
.900	-.001	.989	-.145	-.973	.032	.227	5.355	.291	5.820	6.215
1.000	-.002	.984	-.180	-.973	.040	.228	3.751	-1.320	5.133	3.879
1.100	-.003	.977	-.213	-.972	.047	.230	2.549	-2.608	5.159	1.146
1.200	-.005	.969	-.245	-.971	.054	.231	1.808	-3.107	5.081	-.649
1.300	-.007	.961	-.277	-.971	.060	.232	1.426	-2.982	4.710	-1.353
1.400	-.009	.951	-.310	-.971	.066	.231	1.276	-2.617	4.208	-1.362
1.500	-.012	.940	-.342	-.971	.072	.230	1.273	-2.315	3.807	-1.109
1.600	-.014	.927	-.375	-.971	.077	.227	1.372	-2.190	3.647	-.856
1.700	-.017	.913	-.407	-.971	.081	.224	1.555	-2.213	3.739	-.671
1.800	-.020	.899	-.438	-.972	.085	.219	1.806	-2.297	4.006	-.512
1.900	-.023	.883	-.469	-.973	.089	.214	2.097	-2.370	4.351	-.321
2.000	-.025	.866	-.500	-.974	.092	.209	2.384	-2.402	4.684	-.088
2.100	-.028	.848	-.529	-.974	.095	.204	2.649	-2.400	4.969	.160
2.200	-.031	.829	-.558	-.975	.097	.198	2.877	-2.383	5.200	.418
2.300	-.033	.809	-.587	-.976	.100	.192	3.057	-2.365	5.382	.634
2.400	-.035	.788	-.615	-.977	.102	.187	3.182	-2.354	5.516	.797
2.500	-.037	.766	-.642	-.978	.104	.181	3.248	-2.345	5.598	.899
2.600	-.039	.743	-.668	-.979	.107	.176	3.253	-2.335	5.623	.942
2.700	-.041	.719	-.694	-.979	.110	.171	3.200	-2.320	5.586	.930
2.800	-.042	.694	-.719	-.980	.113	.166	3.090	-2.298	5.487	.869
2.900	-.043	.669	-.742	-.980	.116	.162	2.930	-2.270	5.330	.762
3.000	-.044	.642	-.765	-.980	.120	.157	2.727	-2.236	5.121	.615
3.100	-.044	.615	-.787	-.981	.124	.152	2.489	-2.199	4.869	.434
3.200	-.045	.587	-.808	-.981	.128	.147	2.227	-2.158	4.585	.228
3.300	-.045	.558	-.828	-.981	.133	.142	1.950	-2.115	4.278	.006
3.400	-.044	.529	-.847	-.981	.138	.137	1.668	-2.070	3.960	-.224
3.500	-.044	.499	-.865	-.981	.143	.132	1.393	-2.024	3.642	-.452
3.600	-.043	.469	-.882	-.981	.147	.126	1.134	-1.977	3.333	-.667
3.700	-.042	.437	-.898	-.981	.152	.120	.898	-1.928	3.042	-.864
3.800	-.041	.406	-.913	-.981	.157	.113	.692	-1.881	2.776	-1.033
3.900	-.039	.373	-.927	-.981	.161	.106	.522	-1.834	2.544	-1.171
4.000	-.038	.341	-.939	-.981	.165	.099	.390	-1.789	2.348	-1.275
4.100	-.036	.308	-.951	-.982	.168	.091	.297	-1.745	2.191	-1.344
4.200	-.034	.274	-.961	-.982	.170	.083	.240	-1.702	2.070	-1.377
4.300	-.032	.240	-.970	-.982	.172	.075	.218	-1.661	1.985	-1.377
4.400	-.030	.206	-.978	-.983	.174	.066	.225	-1.623	1.934	-1.349
4.500	-.028	.172	-.985	-.983	.174	.058	.257	-1.596	1.914	-1.302
4.600	-.025	.137	-.990	-.983	.174	.049	.312	-1.699	1.985	-1.300
4.700	-.023	.103	-.994	-.984	.174	.041	.404	-2.018	2.266	-1.447
4.800	-.021	.069	-.997	-.984	.173	.033	.521	-2.670	2.848	-1.835
4.900	-.019	.036	-.999	-.985	.171	.025	.659	-3.530	3.742	-2.488
5.000	-.017	.003	-1.000	-.985	.170	.018	.823	-4.188	4.657	-3.111
5.100	-.016	-.030	-.999	-.986	.169	.010	1.013	-4.179	5.133	-3.243

5.200	-.014	-.064	-.998	-.986	.167	.003	1.193	-3.646	5.028	-2.775
5.300	-.013	-.099	-.995	-.986	.165	-.004	1.295	-2.983	4.555	-2.043
5.400	-.012	-.134	-.991	-.987	.163	-.010	1.279	-2.546	4.041	-1.467
5.500	-.012	-.170	-.985	-.987	.160	-.016	1.153	-2.471	3.714	-1.303
5.600	-.012	-.205	-.979	-.987	.157	-.020	.968	-2.651	3.614	-1.522
5.700	-.013	-.239	-.971	-.988	.153	-.024	.736	-2.900	3.623	-1.943
5.800	-.014	-.273	-.962	-.988	.150	-.028	.457	-3.087	3.584	-2.409
5.900	-.016	-.306	-.952	-.989	.146	-.030	.144	-3.173	3.428	-2.832
6.000	-.018	-.339	-.941	-.989	.143	-.033	-.199	-3.185	3.155	-3.200
6.100	-.020	-.372	-.928	-.990	.139	-.034	-.566	-3.166	2.805	-3.543
6.200	-.022	-.404	-.914	-.930	.136	-.036	-.954	-3.147	2.419	-3.893
6.300	-.024	-.436	-.900	-.990	.133	-.038	-1.352	-3.138	2.023	-4.262
6.400	-.026	-.467	-.884	-.991	.130	-.039	-1.750	-3.135	1.630	-4.644
6.500	-.028	-.498	-.867	-.991	.128	-.041	-2.137	-3.130	1.245	-5.021
6.600	-.030	-.528	-.849	-.991	.126	-.043	-2.501	-3.117	.872	-5.375
6.700	-.031	-.557	-.830	-.991	.124	-.046	-2.832	-3.093	.516	-5.693
6.800	-.032	-.586	-.810	-.991	.122	-.049	-3.123	-3.061	.187	-5.967
6.900	-.033	-.614	-.789	-.991	.120	-.052	-3.368	-3.025	-.107	-6.192
7.000	-.033	-.641	-.766	-.991	.118	-.056	-3.564	-2.986	-.357	-6.368
7.100	-.033	-.668	-.743	-.991	.116	-.060	-3.709	-2.947	-.560	-6.494
7.200	-.032	-.694	-.720	-.991	.113	-.055	-3.802	-2.908	-.713	-6.569
7.300	-.030	-.719	-.695	-.991	.109	-.070	-3.845	-2.869	-.817	-6.595
7.400	-.028	-.743	-.669	-.992	.106	-.076	-3.841	-2.830	-.875	-6.574
7.500	-.025	-.766	-.643	-.992	.101	-.082	-3.797	-2.791	-.890	-6.510
7.600	-.021	-.788	-.616	-.991	.096	-.088	-3.718	-2.752	-.868	-6.410
7.700	-.017	-.809	-.588	-.991	.090	-.094	-3.611	-2.714	-.815	-6.281
7.800	-.013	-.829	-.559	-.991	.083	-.101	-3.486	-2.678	-.739	-6.131
7.900	-.008	-.848	-.529	-.991	.076	-.107	-3.349	-2.644	-.646	-5.958
8.000	-.003	-.866	-.499	-.991	.068	-.113	-3.211	-2.611	-.546	-5.801
8.100	.003	-.883	-.469	-.991	.060	-.118	-3.078	-2.580	-.446	-5.637
8.200	.008	-.899	-.437	-.991	.051	-.124	-2.958	-2.550	-.354	-5.484
8.300	.014	-.314	-.406	-.991	.042	-.128	-2.857	-2.522	-.275	-5.348
8.400	.020	-.928	-.373	-.991	.032	-.132	-2.779	-2.495	-.216	-5.234
8.500	.025	-.940	-.341	-.990	.023	-.136	-2.729	-2.469	-.181	-5.146
8.600	.030	-.951	-.307	-.990	.014	-.139	-2.706	-2.444	-.172	-5.085
8.700	.035	-.961	-.274	-.990	.004	-.142	-2.712	-2.419	-.190	-5.052
8.800	.039	-.970	-.240	-.990	-.005	-.144	-2.744	-2.394	-.233	-5.045
8.900	.043	-.978	-.206	-.989	-.013	-.145	-2.798	-2.369	-.301	-5.063
9.000	.047	-.984	-.172	-.989	-.021	-.146	-2.870	-2.344	-.387	-5.100
9.100	.050	-.989	-.137	-.989	-.029	-.147	-2.955	-2.320	-.489	-5.152
9.200	.052	-.993	-.102	-.988	-.037	-.147	-3.046	-2.296	-.598	-5.214
9.300	.054	-.996	-.067	-.989	-.043	-.147	-3.137	-2.273	-.711	-5.279
9.400	.055	-.998	-.033	-.988	-.050	-.146	-3.222	-2.251	-.820	-5.343
9.500	.056	-.998	.002	-.988	-.056	-.146	-3.298	-2.232	-.919	-5.401
9.600	.057	-.998	.037	-.988	-.061	-.145	-3.358	-2.219	-1.002	-5.452
9.700	.057	-.996	.072	-.987	-.067	-.144	-3.400	-2.213	-1.061	-5.494
9.800	.056	-.993	.107	-.987	-.071	-.143	-3.419	-2.199	-1.101	-5.514
9.900	.056	-.988	.142	-.987	-.076	-.142	-3.413	-2.170	-1.130	-5.499
10.000	.055	-.983	.176	-.987	-.080	-.141	-3.384	-2.133	-1.147	-5.449
10.100	.054	-.976	.210	-.987	-.084	-.140	-3.332	-2.104	-1.142	-5.378
10.200	.052	-.968	.244	-.986	-.088	-.139	-3.258	-2.080	-1.107	-5.292
10.300	.051	-.959	.278	-.986	-.092	-.138	-3.165	-2.049	-1.055	-5.185
10.400	.049	-.949	.312	-.986	-.096	-.137	-3.055	-2.006	[illegible]	-5.050
10.500	.048	-.937	.345	-.986	-.100	-.135	-2.933	-1.952	-.953	-4.890
10.600	.047	-.925	.377	-.986	-.104	-.133	-2.802	-1.890	-.869	-4.711
10.700	.045	-.311	.410	-.985	-.108	-.132	-2.668	-1.825	-.806	-4.521
10.800	.044	-.896	.441	-.985	-.112	-.129	-2.534	-1.758	-.743	-4.326

10.900	.043	-.830	.473	-.985	-.116	-.127	-2.405	-1.690	-.685	-4.133
11.000	.042	-.863	.503	-.985	-.121	-.124	-2.285	-1.621	-.635	-3.945
11.100	.042	-.845	.533	-.985	-.125	-.121	-2.174	-1.550	-.594	-3.765
11.200	.042	-.826	.562	-.985	-.129	-.117	-2.077	-1.477	-.567	-3.594
11.300	.042	-.806	.591	-.985	-.134	-.113	-1.993	-1.402	-.554	-3.433
11.400	.042	-.784	.619	-.984	-.138	-.109	-1.924	-1.326	-.557	-3.285
11.500	.043	-.762	.646	-.984	-.143	-.104	-1.871	-1.249	-.576	-3.150
11.600	.044	-.739	.672	-.984	-.147	-.098	-1.831	-1.170	-.609	-3.028
11.700	.045	-.715	.698	-.984	-.152	-.092	-1.806	-1.090	-.658	-2.917
11.800	.046	-.690	.722	-.984	-.156	-.086	-1.792	-1.009	-.719	-2.818
11.900	.047	-.664	.746	-.984	-.160	-.079	-1.790	-.927	-.793	-2.729
12.000	.049	-.637	.769	-.984	-.163	-.073	-1.796	-.844	-.876	-2.648
12.100	.051	-.610	.791	-.984	-.167	-.065	-1.809	-.761	-.968	-2.573
12.200	.053	.582	.812	-.984	-.170	-.058	-1.827	-.678	-1.065	-2.504
12.300	.055	-.553	.831	-.984	-.173	-.050	-1.847	-.594	-1.165	-2.437
12.400	.057	-.524	.850	-.984	-.175	-.042	-1.868	-.511	-1.266	-2.372
12.500	.059	-.493	.868	-.983	-.178	-.034	-1.888	-.429	-1.365	-2.306
12.600	.061	-.463	.884	-.983	-.180	-.026	-1.905	-.349	-1.461	-2.239
12.700	.063	-.431	.900	-.983	-.182	-.018	-1.917	-.270	-1.551	-2.170
12.800	.065	-.399	.914	-.983	-.183	-.010	-1.923	-.193	-1.634	-2.097
12.900	.067	-.367	.928	-.983	-.185	-.002	-1.921	-.119	-1.707	-2.019
13.000	.069	-.334	.940	-.983	-.186	.006	-1.911	-.048	-1.769	-1.936
13.100	.070	-.301	.951	-.982	-.187	.013	-1.892	.018	-1.818	-1.848
13.200	.072	-.268	.961	-.982	-.187	.021	-1.862	.078	-1.850	-1.758
13.300	.073	-.234	.970	-.982	-.188	.028	-1.818	.105	-1.850	-1.671
13.400	.074	-.200	.977	-.981	-.189	.036	-1.786	.085	-1.913	-1.621
13.500	.075	-.166	.983	-.981	-.189	.043	-1.751	.016	-1.725	-1.633
13.600	.075	-.131	.988	-.981	-.189	.049	-1.678	.013	-1.638	-1.609
13.700	.075	-.097	.992	-.980	-.190	.056	-1.551	.159	-1.600	-1.432
13.800	.075	-.062	.995	-.980	-.190	.062	-1.365	.454	-1.665	-1.046
13.900	.075	-.027	.997	-.979	-.190	.068	-1.119	.794	-1.766	-.507
14.000	.074	.009	.997	-.979	-.190	.074	-.812	.952	-1.749	.034
14.100	.073	.044	.996	-.979	-.190	.080	-.491	.606	-1.325	.241
14.200	.071	.078	.994	-.978	-.190	.085	-.227	-.146	-.468	-.034
14.300	.070	.112	.991	-.978	-.189	.090	-.060	-.888	.490	-.575
14.400	.068	.145	.987	-.978	-.188	.095	.118	-1.356	1.254	-1.000
14.500	.066	.177	.982	-.977	-.188	.100	.379	-1.495	1.776	-1.075
14.600	.064	.210	.976	-.977	-.187	.104	.716	-1.390	2.085	-.786
14.700	.062	.244	.968	-.977	-.186	.109	1.091	-1.217	2.298	-.296
14.800	.060	.277	.959	-.976	-.185	.114	1.466	-1.102	2.526	.213
14.900	.057	.310	.949	-.976	-.184	.119	1.818	-1.085	2.819	.633
15.000	.055	.343	.938	-.975	-.183	.124	2.136	-1.143	3.169	.938
15.100	.053	.376	.5	-.975	-.182	.130	2.420	-1.232	3.538	1.159
15.200	.052	.408	12	-.974	-.181	.136	2.673	-1.318	3.888	1.337
15.300	.050	.439	.897	-.973	-.179	.142	2.897	-1.383	4.198	1.496
15.400	.049	.470	.881	-.973	-.178	.149	3.093	-1.431	4.460	1.646
15.500	.048	.501	.864	-.972	-.176	.156	3.255	-1.469	4.680	1.781
15.600	.048	.531	.846	-.971	-.173	.163	3.395	-1.504	4.866	1.893
15.700	.047	.560	.827	-.970	-.170	.171	3.503	-1.542	5.023	1.978
15.800	.048	.589	.807	-.970	-.167	.179	3.587	-1.580	5.157	2.035
15.900	.048	.617	.786	-.963	-.162	.187	3.650	-1.619	5.269	2.069
16.000	.049	.644	.764	-.963	-.157	.195	3.697	-1.656	5.362	2.087
16.100	.051	.670	.741	-.967	-.152	.203	3.733	-1.689	5.439	2.094
16.200	.052	.696	.717	-.966	-.146	.212	3.762	-1.721	5.506	2.096
16.300	.054	.720	.692	-.966	-.139	.220	3.790	-1.751	5.567	2.096
16.400	.056	.744	.666	-.965	-.132	.228	3.820	-1.780	5.627	2.096
16.500	.057	.767	.639	-.964	-.124	.236	3.856	-1.810	5.691	2.101

16.600	.059	.789	.612	-.963	-.117	.244	3.900	-1.840	5.762	2.112
16.700	.061	.810	.584	-.962	-.108	.251	3.953	-1.871	5.843	2.132
16.800	.063	.830	.555	-.961	-.100	.258	4.018	-1.903	5.935	2.161
16.900	.064	.849	.525	-.960	-.091	.265	4.095	-1.936	6.039	2.200
17.000	.065	.866	.495	-.959	-.083	.272	4.182	-1.970	6.155	2.248
17.100	.066	.883	.464	-.958	-.074	.278	4.277	-2.005	6.280	2.306
17.200	.067	.899	.433	-.956	-.066	.284	4.380	-2.040	6.415	2.378
17.300	.067	.914	.401	-.955	-.057	.290	4.486	-2.077	6.555	2.438
17.400	.067	.927	.368	-.954	-.049	.296	4.593	-2.114	6.699	2.508
17.500	.066	.940	.336	-.953	-.041	.301	4.698	-2.152	6.842	2.576
17.600	.065	.951	.302	-.951	-.032	.306	4.797	-2.190	6.982	2.640
17.700	.063	.961	.269	-.950	-.024	.311	4.887	-2.228	7.116	2.697
17.800	.062	.970	.235	-.949	-.016	.316	4.966	-2.267	7.240	2.745
17.900	.059	.978	.200	-.947	-.009	.321	5.031	-2.305	7.352	2.780
18.000	.056	.985	.166	-.945	-.001	.326	5.082	-2.343	7.450	2.802
18.100	.053	.990	.131	-.944	.007	.330	5.116	-2.380	7.532	2.809
18.200	.049	.994	.096	-.942	.014	.334	5.132	-2.417	7.598	2.800
18.300	.045	.997	.061	-.941	.022	.339	5.132	-2.454	7.647	2.775
18.400	.041	.999	.026	-.939	.029	.343	5.113	-2.491	7.678	2.734
18.500	.036	.999	-.009	-.937	.037	.346	5.074	-2.527	7.691	2.673
18.600	.030	.999	-.044	-.936	.044	.350	5.016	-2.563	7.685	2.595
18.700	.025	.997	-.079	-.934	.051	.354	4.940	-2.599	7.661	2.499
18.800	.019	.993	-.114	-.932	.058	.357	4.849	-2.634	7.621	2.387
18.900	.012	.989	-.148	-.931	.065	.360	4.744	-2.669	7.565	2.262
19.000	.005	.983	-.183	-.929	.073	.363	4.629	-2.702	7.497	2.126
19.100	-.001	.976	-.217	-.928	.080	.365	4.507	-2.734	7.420	1.984
19.200	-.008	.968	-.251	-.926	.087	.367	4.381	-2.764	7.336	1.838
19.300	-.015	.959	-.285	-.925	.094	.369	4.251	-2.794	7.247	1.688
19.400	-.023	.948	-.318	-.924	.102	.370	4.117	-2.823	7.154	1.536
19.500	-.030	.936	-.351	-.922	.109	.371	3.984	-2.851	7.058	1.383
19.600	-.037	.923	-.383	-.921	.117	.371	3.851	-2.877	6.960	1.232
19.700	-.044	.909	-.415	-.920	.124	.371	3.720	-2.900	6.862	1.085
19.800	-.051	.894	-.446	-.920	.132	.370	3.594	-2.921	6.765	.944
19.900	-.058	.877	-.477	-.919	.140	.369	3.473	-2.940	6.669	.809
20.000	-.064	.860	-.507	-.919	.147	.367	3.358	-2.957	6.577	.681
20.100	-.071	.841	-.536	-.918	.155	.364	3.249	-2.972	6.489	.560

TIME-SEC	DR-DEG	PSIT-DEG	THTT-DEG	RCS NORM.	CAN.FLP-DG	WNG.FLP-DG	VA-KT	ALPHA-DEG	BETA-DEG	NXCG-G
0.000	.008	.005	1.720	.000	24.995	29.994	34.996	76.412	-.078	.972
.100	.008	.005	1.720	.000	24.995	29.994	34.996	76.412	-.078	.972
.200	.008	.005	1.720	.000	24.995	29.994	34.996	76.412	-.078	.972
.300	.008	.005	1.720	.000	24.995	29.994	34.996	76.412	-.078	.972
.400	.001	.001	1.974	-.626	24.995	29.994	34.969	76.855	-.018	.668
.500	-.051	-.031	3.373	-.652	24.995	29.994	34.924	78.019	.536	.652
.600	-.179	-.107	4.936	-.413	24.995	29.994	34.894	78.870	1.869	.876
.700	-.322	-.193	5.383	-.155	24.995	29.994	34.847	78.973	3.818	1.040
.800	-.365	-.219	4.756	-.005	24.995	29.994	34.777	78.678	6.046	1.073
.900	-.291	-.175	3.728	.022	24.995	29.994	34.720	78.199	8.272	1.077
1.000	-.154	-.092	2.723	-.023	24.995	29.994	34.704	77.616	10.374	1.080
1.100	-.016	-.010	1.897	-.080	24.995	29.994	34.733	77.009	12.362	1.073
1.200	.070	.042	1.333	-.115	24.995	29.994	34.804	76.432	14.304	1.067
1.300	.082	.049	1.009	-.121	24.995	29.994	34.907	75.902	16.257	1.063
1.400	.018	.011	.855	-.111	24.995	29.994	35.030	75.424	18.249	1.061
1.500	-.119	-.072	.811	-.098	24.995	29.994	35.164	74.996	20.273	1.057
1.600	-.325	-.195	.839	-.090	24.995	29.994	35.301	74.622	22.312	1.051
1.700	-.596	-.358	.922	-.088	24.995	29.994	35.436	74.301	24.349	1.044
1.800	-.932	-.560	1.050	-.090	24.995	29.994	35.565	74.034	26.375	1.034
1.900	-1.324	-.795	1.211	-.094	24.995	29.994	35.685	73.811	28.388	1.029
2.000	-1.754	-1.054	1.381	-.096	24.995	29.994	35.795	73.613	30.388	1.022
2.100	-2.207	-1.326	1.543	-.096	24.995	29.994	35.893	73.433	32.376	1.014
2.200	-2.672	-1.606	1.688	-.096	24.995	29.994	35.976	73.264	34.354	1.005
2.300	-3.137	-1.935	1.808	-.095	24.995	29.994	36.045	73.100	36.320	.996
2.400	-3.590	-2.157	1.897	-.094	24.995	29.994	36.099	72.931	38.271	.986
2.500	-4.019	-2.415	1.952	-.094	24.995	29.994	36.140	72.752	40.206	.976
2.600	-4.413	-2.652	1.972	-.094	24.995	29.994	36.168	72.552	42.124	.967
2.700	-4.762	-2.861	1.958	-.093	24.995	29.994	36.187	72.326	44.024	.959
2.800	-5.055	-3.037	1.910	-.092	24.995	29.994	36.196	72.064	45.906	.951
2.900	-5.285	-3.176	1.830	-.091	24.995	29.994	36.200	71.75[illegible]	47.769	.945
3.000	-5.446	-3.273	1.723	-.090	24.995	29.994	36.200	71.402	49.614	.940
3.100	-5.538	-3.328	1.593	-.089	24.995	29.994	36.197	70.984	51.441	.936
3.200	-5.560	-3.341	1.446	-.087	24.995	29.994	36.194	70.497	53.249	.933
3.300	-5.516	-3.315	1.287	-.086	24.995	29.994	36.193	69.932	55.040	.932
3.400	-5.413	-3.253	1.123	-.084	24.995	29.994	36.195	69.276	56.812	.932
3.500	-5.259	-3.160	.959	-.082	24.995	29.994	36.201	68.519	58.568	.933
3.600	-5.065	-3.044	.801	-.080	24.995	29.994	36.212	67.647	60.307	.936
3.700	-4.844	-2.911	.654	-.078	24.995	29.994	36.229	66.642	62.030	.939
3.800	-4.608	-2.769	.524	-.076	24.995	29.994	36.251	65.482	63.737	.944
3.900	-4.373	-2.628	.412	-.074	24.995	29.994	36.279	64.140	65.427	.949
4.000	-4.152	-2.495	.322	-.073	24.995	29.994	36.310	62.580	67.099	.955
4.100	-3.955	-2.376	.254	-.071	24.995	29.994	36.345	60.754	68.752	.962
4.200	-3.789	-2.277	.208	-.069	24.995	29.994	36.382	58.601	70.382	.968
4.300	-3.664	-2.201	.183	-.067	24.995	29.994	36.419	56.033	71.983	.975
4.400	-3.582	-2.153	.176	-.066	24.995	29.994	36.455	52.937	73.545	.982
4.500	-3.549	-2.133	.184	-.064	24.995	29.994	36.487	49.158	75.055	.989
4.600	-3.542	-2.128	.206	-.066	24.995	29.994	36.512	44.503	76.488	.995
4.700	-3.525	-2.118	.246	-.074	24.995	29.994	36.527	38.762	77.802	.999
4.800	-3.463	-2.081	.304	-.094	24.995	29.994	36.526	31.749	78.948	1.001
4.900	-3.266	-1.963	.377	-.125	24.995	29.994	36.509	23.391	79.866	1.001
5.000	-2.922	-1.756	.465	-.155	24.704	29.994	36.486	13.707	80.509	1.001
5.100	-2.549	-1.532	.568	-.168	23.704	29.429	36.465	2.818	80.831	1.003

5.200	-2.227	-1.338	.675	-.156	22.704	28.429	36.447	-8.845	80.774	1.012
5.300	-1.979	-1.189	.755	-.132	21.704	27.429	36.435	-20.336	80.291	1.020
5.400	-1.848	-1.111	.774	-.110	20.704	26.429	36.424	-30.668	79.418	1.023
5.500	-1.849	-1.111	.725	-.100	19.705	25.429	36.415	-39.331	78.240	1.024
5.600	-1.938	-1.165	.629	-.103	18.705	24.429	36.403	-46.346	76.855	1.022
5.700	-2.101	-1.263	.505	-.111	17.705	23.430	36.386	-51.976	75.334	1.019
5.800	-2.327	-1.398	.353	-.120	16.705	22.430	36.361	-56.529	73.721	1.016
5.900	-2.587	-1.555	.179	-.125	15.705	21.431	36.327	-60.258	72.040	1.013
6.000	-2.850	-1.713	-.014	-.127	14.706	20.430	36.282	-63.367	70.304	1.010
6.100	-3.086	-1.854	-.222	-.127	13.706	19.430	36.226	-65.928	68.527	1.007
6.200	-3.270	-1.965	-.443	-.126	12.706	18.431	36.161	-68.096	66.720	1.003
6.300	-3.386	-2.035	-.673	-.126	11.706	17.431	36.086	-69.928	64.894	.999
6.400	-3.425	-2.058	-.906	-.126	10.706	16.431	36.002	-71.481	63.059	.995
6.500	-3.384	-2.033	-1.134	-.125	9.707	15.431	35.912	-72.805	61.224	.991
6.600	-3.267	-1.963	-1.353	-.125	8.707	14.431	35.816	-73.937	59.392	.987
6.700	-3.061	-1.851	-1.555	-.124	7.707	13.432	35.717	-74.911	57.569	.983
6.800	-2.837	-1.705	-1.737	-.123	6.707	12.432	35.614	-75.753	55.757	.979
6.900	-2.550	-1.533	-1.893	-.122	5.707	11.432	35.510	-76.484	53.958	.976
7.000	-2.236	-1.344	-2.021	-.120	4.707	10.432	35.405	-77.124	52.172	.973
7.100	-1.912	-1.149	-2.119	-.119	3.708	9.432	35.300	-77.689	50.401	.971
7.200	-1.593	-.958	-2.188	-.117	2.708	8.433	35.196	-78.190	48.643	.969
7.300	-1.297	-.779	-2.227	-.116	1.708	7.433	35.092	-78.640	46.897	.967
7.400	-1.035	-.622	-2.238	-.114	.708	6.433	34.989	-79.046	45.159	.966
7.500	-.819	-.492	-2.223	-.112	-.292	5.433	34.887	-79.415	43.426	.966
7.600	-.656	-.394	-2.187	-.111	-1.291	4.433	34.784	-79.753	41.695	.966
7.700	-.551	-.331	-2.132	-.109	-2.291	3.433	34.681	-80.064	39.962	.966
7.800	-.504	-.303	-2.064	-.108	-3.291	2.434	34.577	-80.350	38.221	.966
7.900	-.513	-.309	-1.987	-.107	-4.291	1.434	34.471	-80.614	36.469	.967
8.000	-.575	-.346	-1.907	-.105	-5.291	.434	34.362	-80.856	34.700	.969
8.100	-.682	-.410	-1.828	-.104	-6.290	0.000	34.251	-81.078	32.912	.970
8.200	-.824	-.495	-1.754	-.103	-7.290	0.000	34.135	-81.280	31.101	.972
8.300	-.991	-.596	-1.630	-.102	-8.290	0.000	34.016	-81.461	29.263	.974
8.400	-1.171	-.704	-1.638	-.100	-9.290	0.000	33.891	-81.622	27.396	.975
8.500	-1.352	-.812	-1.600	-.099	-10.290	0.000	33.762	-81.762	25.498	.977
8.600	-1.521	-.914	-1.579	-.098	-11.290	0.000	33.628	-81.882	23.567	.978
8.700	-1.669	-1.003	-1.575	-.097	-11.998	0.000	33.490	-81.980	21.604	.980
8.800	-1.784	-1.072	-1.586	-.096	-11.998	0.000	33.346	-82.056	19.607	.981
8.900	-1.861	-1.118	-1.612	-.095	-11.998	0.000	33.199	-82.111	17.579	.983
9.000	-1.893	-1.138	-1.649	-.094	-11.998	0.000	33.048	-82.144	15.518	.984
9.100	-1.878	-1.129	-1.635	-.093	-11.998	0.080	32.895	-82.154	13.428	.985
9.200	-1.816	-1.091	-1.746	-.092	-11.998	0.000	32.740	-82.143	11.309	.986
9.300	-1.708	-1.026	-1.800	-.091	-11.998	0.000	32.584	-82.110	9.164	.987
9.400	-1.559	-.937	-1.852	-.091	-11.998	0.000	32.429	-82.055	6.994	.988
9.500	-1.374	-.826	-1.899	-.090	-11.998	0.000	32.275	-81.979	4.802	.989
9.600	-1.161	-.697	-1.939	-.089	-11.998	0.000	32.124	-81.883	2.589	.989
9.700	-.924	-.555	-1.969	-.089	-11.998	0.000	31.978	-81.767	.357	.989
9.800	-.674	-.405	-1.987	-.088	-11.998	0.000	31.437	-81.632	-1.891	.989
9.900	-.415	-.250	-1.992	-.087	-11.998	0.000	31.703	-81.47[illegible]	-4.153	.989
10.000	-.150	-.090	-1.982	-.086	-11.998	0.000	31.575	-81.308	-6.427	.989
10.100	.125	.075	-1.959	-.085	-11.998	0.000	31.463	-81.121	-8.710	.989
10.200	.407	.245	-1.923	-.084	-11.998	0.000	31.358	-80.918	-10.996	.988
10.300	.693	.416	-1.875	-.083	-11.998	0.000	31.264	-80.702	-13.283	.988
10.400	.976	.586	-1.817	-.081	-11.998	0.000	31.182	-80.473	-15.568	.987
10.500	1.250	.751	-1.750	-.079	-11.998	0.000	31.113	-80.231	-17.848	.987
10.600	1.510	.907	-1.677	-.077	-11.998	0.000	31.055	-79.977	-20.120	.986
10.700	1.752	1.053	-1.600	-.074	-11.998	0.000	31.009	-79.710	-22.383	.986
10.800	1.970	1.184	-1.523	-.072	-11.998	0.000	30.975	-79.431	-24.635	.985

10.900	2.162	1.299	-1.448	-.069	-11.998	0.000	30.952	-79.138	-26.873	.985
11.000	2.326	1.397	-1.375	-.066	-11.998	0.000	30.940	-78.831	-29.098	.985
11.100	2.461	1.479	-1.310	-.063	-11.998	0.000	30.938	-78.509	-31.308	.985
11.200	2.569	1.544	-1.250	-.061	-11.998	0.000	30.946	-78.167	-33.504	.985
11.300	2.652	1.594	-1.198	-.058	-11.998	0.000	30.962	-77.805	-35.686	.985
11.400	2.713	1.630	-1.155	-.055	-11.998	0.000	30.985	-77.417	-37.855	.985
11.500	2.756	1.656	-1.119	-.052	-11.998	0.000	31.016	-77.000	-40.010	.985
11.600	2.786	1.674	-1.093	-.048	-11.998	0.000	31.052	-76.547	-42.153	.986
11.700	2.806	1.686	-1.074	-.045	-11.998	0.000	31.094	-76.053	-44.283	.986
11.800	2.822	1.696	-1.063	-.042	-11.998	0.000	31.140	-75.510	-46.402	.987
11.900	2.837	1.705	-1.058	-.039	-11.998	0.000	31.190	-74.906	-48.510	.987
12.000	2.854	1.715	-1.059	-.035	-11.998	0.000	31.241	-74.236	-50.606	.988
12.100	2.877	1.729	-1.064	-.032	-11.998	0.000	31.295	-73.479	-52.691	.989
12.200	2.906	1.746	-1.072	-.029	-11.998	0.000	31.349	-72.622	-54.763	.990
12.300	2.943	1.769	-1.082	-.025	-11.998	0.000	31.403	-71.643	-56.822	.990
12.400	2.988	1.795	-1.093	-.022	-11.998	0.000	31.456	-70.515	-58.865	.991
12.500	3.039	1.826	-1.103	-.019	-11.998	0.000	31.509	-69.206	-60.892	.992
12.600	3.096	1.860	-1.112	-.016	-11.998	0.080	31.559	-67.675	-62.897	.992
12.700	3.156	1.897	-1.118	-.012	-11.998	0.000	31.608	-65.866	-64.876	.993
12.800	3.218	1.933	-1.121	-.009	-11.998	0.000	31.654	-63.711	-66.823	.993
12.900	3.278	1.970	-1.120	-.006	-11.998	0.000	31.699	-61.119	-68.726	.993
13.000	3.335	2.004	-1.113	-.003	-11.998	0.000	31.741	-57.974	-70.577	.993
13.100	3.389	2.036	-1.102	-.001	-11.998	0.080	31.783	-54.122	-72.350	.993
13.200	3.438	2.066	-1.084	.002	-11.998	0.000	31.823	-49.371	-74.022	.993
13.300	3.490	2.097	-1.058	.004	-11.998	0.000	31.863	-43.493	-75.553	.992
13.400	3.554	2.136	-1.032	.004	-11.998	0.000	31.902	-36.244	-76.830	.992
13.500	3.638	2.186	-1.009	.002	-11.998	0.000	31.940	-27.464	-77.962	.992
13.600	3.681	2.212	-.973	.000	-11.598	0.000	31.982	-17.210	-78.690	.991
13.700	3.652	2.195	-.911	.003	-11.998	0.000	32.027	-5.886	-79.002	.990
13.800	3.575	2.148	-.815	.012	-11.998	.291	32.079	5.724	-78.856	.988
13.900	3.505	2.107	-.683	.025	-11.348	1.291	32.137	16.703	-78.260	.987
14.000	3.510	2.109	-.515	.036	-10.348	2.291	32.203	26.348	-77.272	.986
14.100	3.670	2.205	-.326	.031	-9.348	3.291	32.279	34.339	-75.992	.988
14.200	3.962	2.381	-.151	.009	-8.349	4.291	32.365	40.732	-74.524	.990
14.300	4.267	2.564	-.025	-.021	-7.349	5.291	32.456	45.830	-72.943	.990
14.400	4.559	2.740	.076	-.045	-6.349	6.290	32.549	50.016	-71.280	.984
14.500	4.831	2.903	.211	-.057	-5.349	7.290	32.644	53.523	-69.536	.983
14.600	5.047	3.033	.390	-.057	-4.349	8.290	32.738	56.482	-67.710	.983
14.700	5.188	3.117	.602	-.052	-3.350	9.290	32.832	58.973	-65.816	.984
14.800	5.241	3.149	.823	-.046	-2.350	10.290	32.926	61.057	-63.871	.986
14.900	5.205	3.128	1.037	-.044	-1.350	11.289	33.023	62.793	-61.899	.987
15.000	5.085	3.056	1.234	-.045	-.350	12.289	33.121	64.237	-59.916	.988
15.100	4.896	2.942	1.411	-.048	.650	13.289	33.224	65.443	-57.933	.989
15.200	4.655	2.797	1.570	-.051	1.650	14.289	33.332	66.454	-55.958	.990
15.300	4.382	2.633	1.711	-.054	2.649	15.289	33.445	67.307	-53.993	.990
15.400	4.098	2.463	1.835	-.056	3.649	16.288	33.564	68.031	-52.042	.991
15.500	3.818	2.294	1.941	-.058	4.649	17.288	33.688	68.649	-50.106	.992
15.600	3.558	2.138	2.031	-.059	5.649	18.288	33.816	69.180	-48.185	.992
15.700	3.328	2.000	2.104	-.061	6.649	19.288	33.947	69.637	-46.280	.993
15.800	3.136	1.885	2.161	-.062	7.648	20.288	34.082	70.033	-44.390	.993
15.900	2.989	1.796	2.205	-.064	8.648	21.288	34.218	70.378	-42.514	.993
16.000	2.886	1.734	2.238	-.066	9.648	22.287	34.354	70.678	-40.649	.993
16.100	2.826	1.698	2.264	-.067	10.648	23.287	34.490	70.939	-38.791	.992
16.200	2.806	1.686	2.284	-.068	11.648	24.287	34.624	71.165	-36.938	.992
16.300	2.818	1.693	2.302	-.069	12.647	25.287	34.756	71.359	-35.085	.991
16.400	2.854	1.715	2.321	-.071	13.647	26.287	34.884	71.524	-33.231	.990
16.500	2.907	1.747	2.341	-.072	14.647	27.286	35.009	71.661	-31.372	.988

16.600	2.968	1.783	2.366	-.073	15.647	28.286	35.129	71.771	-29.505	.987
16.700	3.028	1.819	2.396	-.074	16.647	29.286	35.245	71.855	-27.628	.985
16.800	3.079	1.850	2.432	-.076	17.647	29.994	35.356	71.914	-25.741	.983
16.900	3.115	1.872	2.475	-.077	18.646	29.994	35.463	71.947	-23.841	.981
17.000	3.131	1.881	2.525	-.078	19.646	29.994	35.566	71.956	-21.927	.979
17.100	3.122	1.876	2.580	-.080	20.646	29.994	35.665	71.941	-20.000	.976
17.200	3.086	1.854	2.639	-.081	21.646	29.994	35.760	71.902	-18.058	.974
17.300	3.021	1.816	2.702	-.082	22.646	29.994	35.853	71.840	-16.102	.971
17.400	2.929	1.760	2.766	-.084	23.645	29.994	35.943	71.754	-14.133	.969
17.500	2.809	1.688	2.830	-.085	24.645	29.994	36.033	71.645	-12.150	.966
17.600	2.664	1.601	2.891	-.087	24.995	29.994	36.122	71.513	-10.155	.964
17.700	2.498	1.501	2.948	-.088	24.995	29.994	36.212	71.359	-8.147	.961
17.800	2.315	1.391	3.000	-.090	24.995	29.994	36.304	71.183	-6.128	.959
17.900	2.118	1.273	3.044	-.092	24.995	29.994	36.400	70.985	-4.099	.957
18.000	1.910	1.148	3.080	-.093	24.995	29.994	36.499	70.766	-2.059	.955
18.100	1.696	1.019	3.107	-.095	24.995	29.994	36.605	70.526	-.010	.953
18.200	1.475	.886	3.124	-.096	24.995	29.994	36.718	70.265	2.047	.952
18.300	1.246	.749	3.131	-.098	24.995	29.994	36.839	69.985	4.110	.951
18.400	1.005	.604	3.128	-.099	24.995	29.994	36.971	69.685	6.177	.950
18.500	.750	.451	3.114	-.100	24.995	29.994	37.113	69.367	8.245	.949
18.600	.478	.287	3.089	-.102	24.995	29.994	37.267	69.030	10.310	.949
18.700	.188	.113	3.053	-.103	24.995	29.994	37.434	68.677	12.369	.949
18.800	-.119	-.071	3.007	-.105	24.995	29.994	37.615	68.306	14.418	.950
18.900	-.438	-.263	2.953	-.106	24.995	29.994	37.808	67.918	16.453	.951
19.000	-.766	-.460	2.891	-.108	24.995	29.994	38.016	67.515	18.473	.952
19.100	-1.098	-.660	2.825	-.109	24.995	29.994	38.236	67.095	20.472	.954
19.200	-1.428	-.858	2.756	-.110	24.995	29.994	38.469	66.659	22.450	.956
19.300	-1.750	-1.052	2.685	-.111	24.995	29.994	38.715	66.206	24.402	.959
19.400	-2.062	-1.239	2.611	-.112	24.995	29.994	38.972	65.734	26.328	.962
19.500	-2.358	-1.417	2.536	-.114	24.995	29.994	39.240	65.244	28.226	.965
19.600	-2.634	-1.583	2.462	-.115	24.995	29.994	39.518	64.732	30.094	.969
19.700	-2.888	-1.735	2.388	-.116	24.995	29.994	39.805	64.198	31.932	.973
19.800	-3.118	-1.874	2.316	-.117	24.995	29.994	40.100	63.641	33.740	.977
19.900	-3.323	-1.997	2.247	-.117	24.995	29.994	40.403	63.057	35.517	.981
20.000	-3.505	-2.106	2.181	-.118	24.995	29.994	40.711	62.445	37.264	.985
20.100	-3.665	-2.202	2.118	-.119	24.995	29.994	41.024	61.802	38.982	.990

TIME-SEC	NYCG-G	NZCG-G	DROLL	DYAW	DPITCH	TCMD-LB	TOUT-LB	MDOT-LB/S	RPM-RAD/S	BLDAVL
0.000	.000	.235	-.000	-.000	-.115	15801.116	8745.360	133.628	9567.477	15.874
.100	.000	.235	-.000	-.000	-.115	15801.118	8745.360	133.628	9567.477	15.874
.200	.000	.235	-.000	-.000	-.115	15801.120	8745.360	133.628	9567.478	15.874
.300	.000	.235	-.000	-.000	-.115	15801.123	8745.361	133.628	9567.479	15.874
.400	-.000	.192	.759	.000	-.160	16036.297	8758.684	133.739	9579.401	15.839
.500	-.001	.183	.574	.004	-.284	16702.037	8872.978	134.694	9681.299	15.571
.600	-.003	.229	.273	.010	-.368	17279.599	9366.164	136.335	9856.304	14.405
.700	-.007	.274	.047	.014	-.353	17532.399	9682.313	137.451	9975.406	13.695
.800	-.010	.286	-.037	.013	-.288	17625.341	9770.787	138.127	10047.644	13.495
.900	-.012	.272	-.012	.008	-.214	17659.559	9794.708	138.536	10091.459	13.440
1.000	-.012	.254	.053	.001	-.150	17655.125	9794.551	138.785	10118.034	13.448
1.100	-.013	.232	.104	-.004	-.102	17628.267	9779.386	138.937	10134.153	13.475
1.200	-.014	.215	.124	-.007	-.072	17587.301	9756.673	139.031	10143.930	13.527
1.300	-.017	.203	.119	-.006	-.057	17529.565	9726.779	139.090	10149.859	13.597
1.400	-.020	.197	.105	-.002	-.051	17451.706	9687.577	139.127	10153.456	13.688
1.500	-.024	.192	.093	.005	-.051	17353.268	9637.638	139.151	10155.637	13.805
1.600	-.030	.189	.088	.014	-.055	17236.982	9577.337	139.167	10156.960	13.946
1.700	-.036	.186	.089	.026	-.062	17107.356	9508.527	139.178	10157.763	14.106
1.800	-.043	.183	.092	.041	-.072	16969.134	9433.033	139.180	10157.547	14.283
1.900	-.051	.180	.095	.058	-.084	16824.490	9388.415	138.993	10137.250	14.382
2.000	-.059	.178	.096	.077	-.095	16671.246	9340.627	138.607	10095.746	14.494
2.100	-.068	.174	.096	.096	-.106	16513.145	9278.120	138.087	10040.045	14.640
2.200	-.077	.171	.095	.115	-.115	16354.487	9205.519	137.481	9975.237	14.809
2.300	-.086	.167	.095	.134	-.122	16199.399	9127.066	136.826	9905.232	14.992
2.400	-.095	.162	.094	.152	-.127	16051.773	9046.286	136.151	9833.186	15.180
2.500	-.104	.157	.094	.169	-.130	15915.157	8966.145	135.482	9761.737	15.367
2.600	-.113	.150	.093	.185	-.130	15792.690	8889.173	134.839	9693.139	15.546
2.700	-.120	.143	.093	.198	-.128	15686.931	8817.532	134.240	9629.308	15.713
2.800	-.128	.136	.092	.209	-.124	15539.916	8753.032	133.701	9571.855	15.863
2.900	-.134	.128	.091	.217	-.117	15533.099	8697.154	133.234	9522.092	15.992
3.000	-.140	.120	.090	.222	-.109	15487.377	8651.048	132.849	9481.038	16.100
3.100	-.145	.111	.088	.225	-.100	15463.097	8615.543	132.552	9449.429	16.182
3.200	-.150	.102	.086	.224	-.089	15460.084	8591.159	132.348	9427.722	16.239
3.300	-.153	.093	.085	.221	-.078	15477.671	8578.113	132.239	9416.107	16.269
3.400	-.156	.084	.083	.216	-.067	15514.735	8576.337	132.225	9414.522	16.273
3.500	-.159	.076	.081	.209	-.056	15569.744	8585.496	132.301	9422.665	16.252
3.600	-.160	.067	.079	.200	-.045	15640.805	8605.005	132.464	9440.014	16.207
3.700	-.162	.059	.077	.190	-.036	15725.720	8634.060	132.707	9465.852	16.139
3.800	-.162	.051	.075	.181	-.028	15821.945	8671.653	133.022	9499.280	16.052
3.900	-.163	.044	.073	.171	-.021	15926.787	8716.589	133.397	9539.237	15.948
4.000	-.164	.037	.072	.162	-.016	16037.495	8767.549	133.823	9584.548	15.829
4.100	-.164	.031	.070	.155	-.012	16151.256	8823.121	134.288	9633.958	15.700
4.200	-.165	.025	.068	.149	-.010	16265.257	8881.830	134.779	9686.157	15.564
4.300	-.166	.021	.066	.144	-.009	16376.742	8942.171	135.283	9739.807	15.424
4.400	-.167	.016	.065	.142	-.009	16483.077	9002.642	135.789	9793.574	15.284
4.500	-.168	.013	.064	.141	-.010	16581.798	9061.771	136.283	9846.153	15.146
4.600	-.172	.010	.066	.141	-.012	16670.588	9118.138	136.755	9896.286	15.015
4.700	-.177	.007	.081	.141	-.016	16748.363	9173.483	137.192	9942.861	14.894
4.800	-.184	.004	.107	.137	-.021	16815.391	9217.945	137.589	9985.122	14.783
4.900	-.187	.000	.141	.126	-.026	16875.160	9260.402	137.943	10022.959	14.685
5.000	-.186	-.004	.168	.110	-.033	16930.168	9298.571	138.262	10056.995	14.596
5.100	-.182	-.007	.167	.096	-.041	16979.405	9333.109	138.551	10087.793	14.515

5.200	-.179	-.007	.146	.084	-.040	17019.989	[illegible]	[illegible]	[illegible].445	14.[illegible]
5.300	-.176	-.007	.119	.076	-.052	17029.441	9429.777	138.964	10131.976	14.292
5.400	-.174	-.007	.102	.073	-.051	17023.051	9431.230	139.064	10142.609	14.298
5.500	-.172	-.008	.099	.076	-.046	17000.582	9421.269	139.123	10148.993	14.313
5.600	-.171	-.011	.106	.081	-.039	16967.327	9405.183	139.123	10149.011	14.348
5.700	-.171	-.017	.116	.089	-.029	16925.510	9393.847	139.054	10141.627	14.374
5.800	-.171	-.024	.124	.099	-.018	16876.043	9378.281	138.927	101[illegible]8.183	14.410
5.900	-.171	-.032	.127	.110	-.006	16819.935	9357.376	138.752	10109.693	14.458
6.000	-.171	-.040	.128	.121	.008	16758.083	9331.722	138.538	10086.956	14.517
6.100	-.171	-.049	.127	.130	.023	16691.551	9302.034	138.289	10060.641	14.586
6.200	-.170	-.058	.126	.136	.038	16621.810	9269.034	138.013	10031.408	14.662
6.300	-.167	-.067	.126	.139	.054	16550.584	9233.523	137.716	9999.941	14.745
6.400	-.164	-.077	.126	.139	.070	16479.623	9196.369	137.404	9967.036	14.830
6.500	-.160	-.087	.125	.136	.086	16410.598	9158.473	137.087	9933.484	14.918
6.600	-.155	-.097	.125	.130	.100	16345.006	9120.733	136.771	9900.080	15.005
6.700	-.148	-.107	.124	.121	.113	16284.142	9083.996	136.463	9867.577	15.090
6.800	-.141	-.116	.123	.110	.125	16229.100	9049.037	136.170	9836.661	15.171
6.900	-.134	-.125	.121	.097	.135	16180.775	9016.543	135.898	9807.943	15.246
7.000	-.125	-.134	.120	.084	.143	16139.866	8987.103	135.651	9781.944	15.314
7.100	-.117	-.142	.118	.070	.148	16106.853	8961.201	135.434	9759.095	15.373
7.200	-.109	-.149	.116	.057	.152	16081.986	8939.211	135.249	9739.727	15.424
7.300	-.101	-.156	.115	.046	.154	16065.269	8921.384	135.100	9724.065	15.465
7.400	-.093	-.162	.113	.036	.154	16056.461	8907.846	134.986	9712.221	15.496
7.500	-.085	-.168	.112	.028	.152	16055.099	8898.592	134.908	9704.192	15.517
7.600	-.078	-.172	.110	.022	.149	16060.523	8893.496	134.864	9699.867	15.528
7.700	-.072	-.177	.109	.019	.145	16071.919	8892.318	134.854	9699.031	15.530
7.800	-.067	-.181	.107	.019	.140	16088.359	8894.719	134.873	9701.386	15.524
7.900	-.062	-.184	.106	.020	.134	16108.895	8900.284	134.919	9706.565	15.510
8.000	-.057	-.188	.105	.024	.129	16132.512	8908.546	134.987	9714.151	15.491
8.100	-.054	-.191	.103	.029	.123	16158.268	8919.008	135.073	9723.704	15.466
8.200	-.051	-.193	.102	.036	.118	16185.283	8931.166	135.174	9734.777	15.437
8.300	-.048	-.196	.101	.044	.114	16212.771	8944.533	135.285	9746.936	15.405
8.400	-.046	-.199	.100	.051	.111	16240.052	8958.654	135.402	9759.777	15.371
8.500	-.044	-.201	.099	.059	.109	16266.544	8973.113	135.522	9772.931	15.337
8.600	-.042	-.204	.098	.066	.108	16291.757	8987.544	135.642	9786.071	15.303
8.700	-.040	-.206	.097	.072	.109	16315.275	9001.626	135.758	9798.911	15.269
8.800	-.038	-.209	.096	.076	.110	16336.741	9015.081	135.870	9811.203	15.237
8.900	-.036	-.211	.095	.079	.112	16355.848	9027.669	135.974	9822.731	15.207
9.000	-.033	-.214	.094	.080	.115	16372.336	9039.184	136.069	9833.312	15.179
9.100	-.031	-.216	.093	.079	.118	16385.995	9049.458	136.153	9842.785	15.154
9.200	-.028	-.217	.092	.075	.122	16396.665	9058.320	136.226	9851.019	15.133
9.300	-.025	-.219	.091	.071	.126	16404.248	9065.678	136.287	9857.908	15.115
9.400	-.021	-.220	.090	.064	.129	16408.714	9071.440	136.334	9863.373	15.101
9.500	-.018	-.221	.089	.056	.132	16410.095	9075.556	136.367	9867.369	15.090
9.600	-.014	-.221	.089	.047	.134	16408.503	9078.011	136.386	9869.878	15.083
9.700	-.011	-.220	.089	.038	.136	16404.276	9078.841	136.392	9870.929	15.081
9.800	-.007	-.219	.088	.027	.137	16397.875	9078.166	136.386	9870.627	15.081
9.900	-.002	-.217	.087	.017	.137	16389.512	9076.133	136.368	9869.099	15.085
10.000	.003	-.215	.085	.006	.135	16379.361	9072.871	136.339	9866.457	15.092
10.100	.007	-.212	.084	-.005	.133	16367.876	9068.516	136.302	9862.819	15.102
10.200	.013	-.208	.083	-.017	.130	16355.597	9063.273	136.258	9858.367	15.113
10.300	.019	-.204	.082	-.028	.127	16342.950	9057.368	136.207	9853.301	15.127
10.400	.025	-.199	.080	-.040	.122	16330.309	9051.027	136.154	9847.821	15.141
10.500	.031	-.194	.078	-.051	.117	16318.006	9044.463	136.098	9842.117	15.156
10.600	.037	-.188	.076	-.061	.112	16306.364	9037.875	136.043	9836.365	15.171
10.700	.043	-.182	.073	-.070	.107	16295.699	9031.455	135.989	9830.737	15.185
10.800	.050	-.175	.070	-.079	.101	16286.315	9025.384	135.938	9825.396	15.199

10.900	.056	-.169	.068	-.086	.096	16278.481	9019.838	135.891	9820.499	15.212
11.000	.061	-.162	.065	-.092	.091	16272.416	9014.975	135.851	9816.188	15.223
11.100	.067	-.155	.062	-.097	.087	16268.269	9010.931	135.817	9812.586	15.233
11.200	.073	-.148	.059	-.101	.083	16266.115	9007.813	135.791	9809.791	15.240
11.300	.078	-.141	.056	-.104	.080	16265.955	9005.694	135.773	9807.868	15.245
11.400	.083	-.134	.053	-.106	.077	16267.717	9004.610	135.764	9806.851	15.248
11.500	.088	-.127	.050	-.107	.075	16271.264	9004.559	135.764	9806.741	15.248
11.600	.093	-.121	.047	-.108	.073	16276.402	9005.504	135.772	9807.507	15.246
11.700	.097	-.114	.044	-.109	.072	16282.883	9007.372	135.788	9809.085	15.242
11.800	.102	-.108	.040	-.110	.072	16290.418	9010.062	135.811	9811.386	15.236
11.900	.106	-.101	.037	-.110	.072	16298.687	9013.443	135.840	9814.296	15.228
12.000	.110	-.095	.034	-.111	.072	16307.345	9017.364	135.873	9817.682	15.219
12.100	.115	-.089	.030	-.112	.072	16316.041	9021.656	135.909	9821.396	15.210
12.200	.119	-.083	.027	-.113	.073	16324.427	9026.141	135.947	9825.280	15.200
12.300	.123	-.078	.024	-.115	.074	16332.169	9030.635	135.985	9829.172	15.190
12.400	.128	-.072	.020	-.117	.075	16338.961	9034.956	136.022	9832.912	15.180
12.500	.132	-.067	.017	-.119	.076	16344.539	9038.932	136.055	9836.346	15.171
12.600	.136	-.062	.014	-.122	.076	16348.653	9042.407	136.085	9839.337	15.163
12.700	.140	-.057	.011	-.125	.077	16351.232	9045.242	136.109	9841.762	15.157
12.800	.143	-.052	.008	-.127	.077	16352.082	9047.328	136.126	9843.523	15.152
12.900	.147	-.047	.005	-.130	.077	16351.183	9048.579	136.137	9844.544	15.149
13.000	.150	-.043	.002	-.132	.076	16348.535	9048.941	136.141	9844.776	15.149
13.100	.153	-.038	-.001	-.134	.076	16344.167	9048.383	136.136	9844.191	15.150
13.200	.156	-.035	-.003	-.136	.075	16338.437	9046.913	136.124	9842.795	15.154
13.300	.158	-.031	-.004	-.139	.073	16332.073	9044.688	136.106	9840.727	15.160
13.400	.161	-.029	-.003	-.142	.071	16324.866	9041.853	136.083	9838.118	15.166
13.500	.163	-.026	-.001	-.145	.070	16316.881	9038.447	136.054	9834.995	15.174
13.600	.164	-.022	-.001	-.146	.067	16309.295	9034.663	136.023	9831.539	15.184
13.700	.164	-.018	-.006	-.143	.062	16302.783	9030.811	135.991	9826.009	15.193
13.800	.164	-.014	-.018	-.140	.055	16298.467	9027.270	135.962	9824.742	15.201
13.900	.164	-.010	-.032	-.138	.045	16297.393	9024.525	135.939	9822.173	15.208
14.000	.162	-.005	-.038	-.140	.033	16299.756	9023.017	135.927	9820.690	15.212
14.100	.159	.002	-.024	-.150	.020	16303.858	9022.906	135.927	9820.431	15.213
14.200	.157	.009	.006	-.163	.009	16306.372	9023.652	135.934	9820.914	15.211
14.300	.157	.015	.036	-.175	.002	16307.370	9024.362	135.940	9821.354	15.210
14.400	.158	.018	.054	-.186	-.005	16315.241	9025.698	135.952	9822.347	15.208
14.500	.159	.024	.060	-.196	-.015	16329.131	9028.930	135.980	9825.029	15.201
14.600	.160	.031	.056	-.204	-.029	16346.016	9034.325	136.026	9829.638	15.188
14.700	.160	.040	.049	-.208	-.044	16363.012	9041.365	136.085	9835.713	15.173
14.800	.159	.050	.044	-.208	-.059	16378.379	9049.213	136.152	9842.507	15.155
14.900	.156	.060	.043	-.205	-.073	16391.567	9057.112	136.218	9849.343	15.137
15.000	.153	.070	.046	-.198	-.085	16402.720	9064.569	136.282	9855.779	15.120
15.100	.149	.080	.049	-.189	-.097	16412.127	9071.342	136.339	9861.596	15.105
15.200	.144	.090	.053	-.179	-.107	16419.859	9077.330	136.390	9866.704	15.092
15.300	.138	.099	.055	-.167	-.116	16425.761	9082.461	136.433	9871.035	15.081
15.400	.132	.108	.057	-.155	-.124	16429.556	9086.642	136.469	9874.509	15.072
15.500	.126	.117	.059	-.144	-.130	16430.945	9089.753	136.496	9877.017	15.065
15.600	.119	.126	.060	-.134	-.136	16429.678	9091.656	136.513	9878.441	15.061
15.700	.113	.135	.062	-.125	-.140	16425.571	9092.224	136.519	9878.666	15.061
15.800	.108	.143	.063	-.118	-.144	16418.483	9091.343	136.512	9877.595	15.064
15.900	.102	.151	.065	-.113	-.146	16408.295	9088.915	136.493	9875.143	15.070
16.000	.097	.159	.066	-.110	-.148	16394.892	9084.857	136.460	9871.238	15.080
16.100	.093	.166	.068	-.108	-.149	16378.176	9079.094	136.413	9865.816	15.095
16.200	.088	.174	.069	-.108	-.151	16358.084	9071.564	136.351	9858.823	15.113
16.300	.085	.181	.070	-.109	-.152	16334.609	9062.222	136.274	9850.222	15.135
16.400	.081	.188	.071	-.112	-.153	16307.817	9051.045	136.182	9839.995	15.162
16.500	.078	.195	.072	-.114	-.154	16277.856	9038.046	136.074	9828.152	15.193

16.600	.075	.201	.074	-.117	-.156	16244.952	9023.272	135.951	9814.739	15.228
16.700	.072	.208	.075	-.120	-.158	16209.410	9006.812	135.815	9799.833	15.267
16.800	.069	.214	.076	-.122	-.161	16171.599	8988.792	135.665	9783.550	15.310
16.900	.066	.221	.078	-.123	-.164	16131.944	8969.378	135.504	9766.035	15.356
17.000	.063	.227	.079	-.124	-.167	16090.918	8948.770	135.332	9747.466	15.404
17.100	.060	.233	.080	-.124	-.171	16049.032	8927.195	135.153	9728.046	15.455
17.200	.057	.239	.082	-.122	-.175	16006.825	8904.909	134.967	9708.000	15.507
17.300	.053	.244	.083	-.119	-.180	15964.565	8882.186	134.778	9687.572	15.561
17.400	.050	.249	.085	-.115	-.184	15923.733	8859.320	134.587	9667.022	15.614
17.500	.046	.254	.086	-.110	-.188	15884.029	8836.618	134.398	9646.621	15.668
17.600	.042	.258	.088	-.104	-.192	15846.358	8814.398	134.213	9626.651	15.720
17.700	.038	.262	.089	-.097	-.196	15811.335	8792.987	134.035	9607.400	15.770
17.800	.034	.266	.091	-.090	-.199	15779.573	8772.716	133.866	9589.161	15.818
17.900	.030	.269	.092	-.082	-.201	15751.581	8753.922	133.710	9572.232	15.862
18.000	.026	.271	.094	-.074	-.203	15728.258	8736.939	133.569	9556.906	15.902
18.100	.023	.273	.095	-.066	-.205	15709.887	8722.100	133.446	9543.478	15.937
18.200	.019	.274	.097	-.057	-.205	15697.123	8709.730	133.343	9532.236	15.967
18.300	.015	.274	.098	-.045	-.205	15690.471	8700.144	133.264	9523.455	15.989
18.400	.010	.274	.100	-.038	-.205	15690.398	8693.038	133.211	9517.395	16.005
18.500	.005	.274	.101	-.028	-.203	15697.323	8690.487	133.186	9514.361	16.013
18.600	.000	.272	.103	-.017	-.201	15711.540	8690.937	133.190	9514.388	16.013
18.700	-.006	.270	.104	-.005	-.198	15733.245	8695.190	133.227	9517.835	16.004
18.800	-.012	.268	.105	.008	-.194	15762.531	8703.398	133.297	9524.775	15.986
18.900	-.019	.265	.107	.021	-.190	15799.384	8715.663	133.401	9535.298	15.959
19.000	-.026	.261	.108	.034	-.185	15843.677	8732.029	133.540	9549.442	15.922
19.100	-.034	.257	.109	.047	-.180	15895.162	8752.481	133.712	9567.195	15.875
19.200	-.041	.252	.111	.061	-.175	15953.445	8776.943	133.918	9588.486	15.820
19.300	-.049	.248	.112	.073	-.170	16017.804	8805.243	134.157	9613.166	15.755
19.400	-.057	.243	.113	.086	-.165	16087.552	8837.119	134.425	9641.001	15.683
19.500	-.066	.237	.114	.097	-.159	16161.949	8872.257	134.721	9671.711	15.603
19.600	-.074	.231	.115	.108	-.154	16240.156	8910.293	135.040	9704.975	15.516
19.700	-.082	.225	.116	.118	-.149	16321.233	8950.812	135.381	9740.424	15.423
19.800	-.090	.219	.117	.126	-.144	16404.161	8993.348	135.739	9777.646	15.326
19.900	-.098	.213	.118	.134	-.139	16487.855	9037.365	136.109	9816.180	15.225
20.000	-.106	.206	.118	.141	-.134	16571.183	9082.371	136.487	9855.540	15.123
20.100	-.114	.199	.119	.147	-.130	16652.986	9127.717	136.868	9895.203	15.019

ORIGINAL PAGE IS
OF POOR QUALITY

TIME-SEC	BLDREQ	PHITRM-DEGP	INTE-DEGP	ERR.INT	PSITRM-DEGR	INTE-DEGR	ERR.INT	PSITRMBUT	THETRM-DEGQ	INTE-DEG
0.000	3.500	-.035	-.035	-.000	.010	.010	-.000	0.000	76.413	76.413
.100	3.500	-.035	-.035	-.000	.010	.010	-.000	0.000	76.413	76.412
.200	3.500	-.035	-.035	-.000	.010	.010	-.000	0.000	76.413	76.412
.300	3.500	-.035	-.035	-.000	.010	.010	-.000	0.000	76.413	76.412
.400	13.859	1.881	.026	.053	.010	.010	-.000	0.000	76.413	76.423
.500	14.593	3.881	.591	.102	.010	.008	-.000	0.000	76.413	76.508
.600	8.450	5.881	1.940	.126	.010	.003	.000	0.000	76.413	76.668
.700	4.184	7.880	3.900	.128	.010	-.007	.001	0.000	76.413	76.808
.800	3.522	9.880	6.122	.118	.010	-.021	.002	0.000	76.413	76.844
.900	3.596	11.879	8.323	.106	.010	-.038	.003	0.000	76.413	76.766
1.000	3.602	13.879	10.383	.100	.010	-.053	.003	0.000	76.413	76.608
1.100	3.853	15.879	12.321	.098	.010	-.102	.003	0.000	76.413	76.416
1.200	4.005	17.878	14.208	.100	.010	-.159	.003	0.000	76.413	76.231
1.300	4.035	19.878	16.109	.102	.010	-.240	.002	0.000	76.413	76.082
1.400	3.992	21.878	18.050	.102	.010	-.349	.002	0.000	76.413	75.985
1.500	3.934	23.877	20.026	.102	.010	-.487	.002	0.000	76.413	75.940
1.600	3.898	25.877	22.020	.101	.010	-.653	.003	0.000	76.413	75.944
1.700	3.889	27.876	24.016	.100	.010	-.847	.004	0.000	76.413	75.991
1.800	3.899	29.876	26.006	.099	.010	-1.064	.007	0.000	76.413	76.071
1.900	3.912	31.876	27.992	.099	.010	-1.302	.010	0.000	76.413	76.178
2.000	3.921	33.875	29.976	.099	.010	-1.554	.015	0.000	76.413	76.302
2.100	3.924	35.875	31.961	.098	.010	-1.814	.021	0.000	76.413	76.436
2.200	3.922	37.875	33.950	.098	.010	-2.077	.027	0.000	76.413	76.571
2.300	3.919	39.874	35.941	.098	.010	-2.335	.035	0.000	76.413	76.701
2.400	3.917	41.874	37.935	.098	.010	-2.584	.043	0.000	76.413	76.821
2.500	3.915	43.873	39.930	.097	.010	-2.818	.052	0.000	76.413	76.927
2.600	3.913	45.873	41.926	.097	.010	-3.031	.062	0.000	76.413	77.018
2.700	3.911	47.873	43.922	.097	.010	-3.221	.072	0.000	76.413	77.092
2.800	3.908	49.872	45.920	.096	.010	-3.385	.082	0.000	76.413	77.150
2.900	3.903	51.872	47.920	.096	.010	-3.520	.092	0.000	76.413	77.194
3.000	3.898	53.872	49.921	.096	.010	-3.626	.102	0.000	76.413	77.227
3.100	3.892	55.871	51.923	.095	.010	-3.714	.111	0.000	76.413	77.252
3.200	3.885	57.871	53.927	.095	.010	-3.756	.119	0.000	76.413	77.273
3.300	3.877	59.870	55.931	.094	.010	-3.784	.127	0.000	76.413	77.293
3.400	3.869	61.870	57.937	.093	.010	-3.792	.134	0.000	76.413	77.316
3.500	3.861	63.870	59.943	.092	.010	-3.784	.140	0.000	76.413	77.346
3.600	3.853	65.869	61.950	.091	.010	-3.766	.145	0.000	76.413	77.386
3.700	3.845	67.869	63.957	.090	.010	-3.742	.149	0.000	76.413	77.439
3.800	3.836	69.869	65.964	.089	.010	-3.718	.151	0.000	76.413	77.505
3.900	3.828	71.868	67.971	.088	.010	-3.699	.153	0.000	76.413	77.587
4.000	3.820	73.868	69.978	.087	.010	-3.691	.154	0.000	76.413	77.685
4.100	3.812	75.867	71.985	.086	.010	-3.697	.155	0.000	76.413	77.797
4.200	3.804	77.867	73.991	.084	.010	-3.722	.154	0.000	76.413	77.921
4.300	3.797	79.867	75.996	.083	.010	-3.766	.154	0.000	76.413	78.056
4.400	3.790	81.866	7[illegible].002	.082	.010	-3.833	.153	0.000	76.413	78.198
4.500	3.784	83.866	[illegible].006	.080	.010	-3.923	.152	0.000	76.413	78.343
4.600	3.790	85.866	[illegible].005	.079	.010	-4.033	.151	0.000	76.413	78.486
4.700	3.828	87.865	83.958	.079	.010	-4.159	.150	0.000	76.413	78.625
4.800	3.914	89.865	85.942	.080	.010	-4.293	.150	0.000	76.413	78.755
4.900	4.150	91.864	87.853	.083	.010	-4.426	.148	0.000	76.413	78.8[illegible]
5.000	[illegible]	93.864	89.732	.089	.010	-4.547	[illegible]	0.000	76.413	78.984
5.100	[illegible]	95.864	91.622	.095	.010	-4.660	.142	0.000	76.413	79.081

5.200	4.189	97.863	93.562	.100	.010	-4.770	.138	0.000	76.413	79.163
5.300	4.083	99.863	95.563	.102	.010	-4.884	.134	0.000	76.413	79.223
5.400	3.986	101.863	97.606	.103	.010	-5.006	.129	0.000	76.413	79.252
5.500	3.943	103.862	99.659	.103	.010	-5.140	.125	0.000	76.413	79.244
5.600	3.953	105.862	101.696	.103	.0 0	-5.284	.121	0.000	76.413	79.195
5.700	3.991	107.861	103.711	.103	.010	-5.435	.118	0.000	76.413	79.110
5.800	4.029	109.861	105.710	.105	.010	-5.598	.116	0.000	76.413	78.993
5.900	4.053	111.861	107.702	.106	.010	-5.738	.115	0.000	76.413	78.850
6.000	4.061	113.860	109.695	.108	.010	-5.881	.115	0.000	76.413	78.688
6.100	4.061	115.860	111.693	.109	.010	-6.011	.116	0.000	76.413	78.515
6.200	4.057	117.860	113.695	.111	.010	-6.125	.117	0.000	76.413	78.336
6.300	4.055	119.859	115.699	.112	.010	-6.220	.119	0.000	76.413	78.157
6.400	4.054	121.859	117.705	.113	.010	-6.295	.120	0.000	76.413	77.987
6.500	4.053	123.858	119.712	.114	.010	-6.350	.121	0.000	76.413	77.830
[illegible]	4.052	125.858	121.719	.115	.010	-6.388	.122	0.000	76.413	77.693
[illegible]	4.049	127.858	123.728	.115	.010	-6.412	.122	0.000	76.413	77.580
6.8[illegible]0	4.043	129.857	125.739	.116	.010	-6.[illegible]76	.122	0.000	76.413	77.497
6.900	4.037	131.857	127.750	.116	.010	-6.[illegible]	.120	0.000	76.413	77.445
7.000	4.031	133.857	129.763	.117	.010	-6.[illegible]	.118	0.000	76.413	77.426
7.100	4.024	135.856	131.776	.117	.010	-6.[illegible]	.115	0.000	76.413	77.441
7.200	4.017	137.856	133.790	.117	.010	-6.5[illegible]7	.111	0.000	76.413	77.490
7.300	4.010	139.855	135.804	.117	.010	-6.550	.106	0.000	76.413	77.570
7.400	4.003	141.855	137.818	.117	.010	-6.637	.101	0.000	76.413	77.679
7.500	3.996	143.855	139.831	.116	.010	-6.739	.096	0.000	76.413	77.814
7.600	3.989	145.854	141.844	.116	.010	-6.859	.090	0.000	76.413	77.971
7.700	3.983	147.854	143.857	.115	.010	-7.027	.085	0.000	76.413	78.144
7.800	3.976	149.854	145.868	.115	.010	-7.213	.080	0.000	76.413	78.330
[illegible].900	3.970	151.853	147.879	.114	.010	-7.424	.076	0.000	76.413	78.523
8.000	3.964	153.853	149.889	.113	.010	-7.557	.072	0.000	76.413	78.718
8.100	3.958	155.852	151.898	.113	.010	-7.908	.068	0.000	76.413	78.912
8.200	3.953	157.852	153.907	.112	.010	-8.173	.065	0.000	76.413	79.101
8.300	3.948	159.852	155.914	.111	.010	-8.446	.063	0.000	76.413	79.281
8.400	3.943	161.851	157.920	.110	.010	-8.720	.062	0.000	76.413	79.449
8.500	3.938	163.851	159.926	.109	.010	-8.992	.062	0.000	76.413	79.604
8.600	3.934	165.850	161.931	.109	.010	-9.254	.062	0.000	76.413	79.746
8.700	3.929	167.850	163.935	.108	.010	-9.501	.062	0.000	76.413	79.873
8.800	3.925	169.850	165.938	.107	.010	-9.731	.063	0.000	76.413	79.986
8.900	3.920	171.849	167.941	.106	.010	-9.938	.064	0.000	76.413	80.087
9.000	3.916	173.849	169.944	.105	.010	-10.120	.065	0.000	76.413	80.178
9.100	3.912	175.849	171.946	.104	.010	-10.275	.065	0.000	76.413	80.261
9.200	3.908	177.848	173.948	.103	.010	-10.403	.066	0.000	76.413	80.337
9.300	3.903	179.848	175.949	.102	.010	-10.504	.066	0.000	76.413	80.410
9.400	3.899	181.847	177.950	.101	.010	-10.579	.066	0.000	76.413	80.483
9.500	3.896	183.847	179.951	.101	.010	-10.628	.065	0.000	76.413	80.556
9.600	3.893	185.847	181.951	.100	.010	-10.656	.064	0.000	76.413	80.633
9.700	3.891	187.846	183.950	.099	.010	-10.663	.062	0.000	76.413	80.715
9.800	3.890	189.846	185.948	.098	.010	-10.653	.059	0.000	76.413	80.802
9.900	3.886	191.846	187.947	.097	.010	-10.629	.056	0.000	76.413	80.896
10.000	3.880	193.845	189.947	.096	.010	-10.593	.052	0.000	76.413	80.996
10.100	3.874	195.845	191.948	.095	.010	-10.550	.048	0.000	76.413	81.102
10.200	3.869	197.844	193.948	.095	.010	-10.500	.043	0.000	76.413	81.212
10.300	3.865	199.844	195.949	.094	.010	-10.448	.037	0.000	76.413	81.326
10.400	3.858	201.844	197.951	.09	.010	-10.395	.032	0.000	76.413	81.441
10.500	3.849	203.843	199.953	.092	.010	-10.346	.025	0.000	76.413	81.555
10.600	3.839	205.843	201.958	.091	.010	-10.302	.019	0.000	76.413	81.667
10.700	3.828	207.843	203.964	.089	.010	-10.265	.012	0.000	76.413	81.773
10.800	3.816	209.842	205.971	.088	.010	-10.237	.005	0.000	76.413	81.871

10.900	3.804	211.842	207.979	.086	.010	-10.220	-.002	0.000	76.413	81.959
11.000	3.792	213.841	209.987	.085	.010	-10.213	-.009	0.000	76.413	82.035
11.100	3.780	215.841	211.[illegible]36	.083	.010	-10.218	-.016	0.000	76.413	82.097
11.200	3.767	217.841	214.006	.082	.010	-10.233	-.022	0.000	76.413	82.144
11.300	3.754	219.840	216.015	.080	.010	-10.258	-.029	0.000	76.413	82.174
11.400	3.741	221.840	218.025	.078	.010	-10.292	-.035	0.000	76.413	82.188
11.500	3.727	223.840	220.035	.076	.010	-10.334	-.041	0.000	76.413	82.185
11.600	3.713	225.839	222.045	.074	.010	-10.382	-.046	0.000	76.413	82.166
11.700	3.699	227.839	224.055	.071	.010	-10.436	-.051	0.000	76.413	82.131
11.800	3.685	229.838	226.054	.069	.010	-10.492	-.056	0.000	76.413	82.081
11.900	3.671	231.838	228.074	.067	.010	-10.551	-.060	0.000	76.413	82.019
12.000	3.656	233.838	230.083	.064	.010	-10.610	-.064	0.000	76.413	81.944
12.100	3.642	235.837	232.092	.062	.010	-10.670	-.068	0.000	76.413	81.860
12.200	3.627	237.837	234.101	.059	.010	-10.730	-.072	0.000	76.413	81.769
12.300	3.612	239.837	236.109	.057	.010	-10.789	-.076	0.000	76.413	81.671
12.400	3.598	241.836	238.117	.054	.010	-10.847	-.079	0.000	76.413	81.570
12.500	3.583	243.836	240.125	.051	.010	-10.906	-.082	0.000	76.413	81.468
12.600	3.569	245.835	242.132	.049	.010	-10.965	-.085	0.000	76.413	81.366
12.700	3.555	247.835	244.138	.046	.010	-11.026	-.088	0.000	76.413	81.267
12.800	3.541	249.835	246.144	.043	.010	-11.088	-.092	0.000	76.413	81.171
12.900	3.527	251.834	248.149	.040	.010	-11.155	-.095	0.000	76.413	81.082
13.000	3.515	253.834	250.153	.037	.010	-11.225	-.098	0.000	76.413	81.000
13.100	3.503	255.834	252.156	.035	.010	-11.301	-.100	0.000	76.413	80.927
13.200	3.508	257.833	254.158	.032	.010	-11.383	-.103	0.000	76.413	80.864
13.300	3.516	259.833	256.158	.029	.010	-11.472	-.106	0.000	76.413	80.812
13.400	3.517	261.832	258.154	.026	.010	-11.567	-.109	0.000	76.413	80.772
13.500	3.508	263.832	260.142	.024	.010	-11.670	-.112	0.000	76.413	80.746
13.600	3.502	265.832	262.127	.022	.010	-11.783	-.114	0.000	76.413	80.734
13.700	3.515	267.831	264.115	.020	.010	-11.906	-.117	0.000	76.413	80.738
13.800	3.555	269.831	266.118	.017	.010	-12.042	-.119	0.000	76.413	80.758
13.900	3.611	271.831	268.137	.015	.010	-12.187	-.120	0.000	76.413	80.793
14.000	3.657	273.830	270.167	.011	.010	-12.338	-.122	0.000	76.413	80.844
14.100	3.638	275.830	272.177	.007	.010	-12.489	-.124	0.000	76.413	80.909
14.200	3.538	277.829	274.142	.006	.010	-12.635	-.126	0.000	76.413	80.984
14.300	3.594	279.829	276.058	.007	.010	-12.774	-.130	0.000	76.413	81.064
14.400	3.699	281.829	277.951	.010	.010	-12.910	-.134	0.000	76.413	81.146
14.500	3.752	283.828	279.849	.014	.010	-13.048	-.139	0.000	76.413	81.231
14.600	3.753	285.828	281.772	.017	.010	-13.191	-.143	0.000	76.413	81.321
14.700	3.729	287.828	283.724	.020	.010	-13.345	-.148	0.000	76.413	81.412
14.800	3.704	289.827	285.699	.022	.010	-13.511	-.153	0.000	76.413	81.499
14.900	3.693	291.827	287.687	.024	.010	-13.690	-.157	0.000	76.413	81.576
15.000	3.697	293.826	289.677	.025	.010	-13.882	-.161	0.000	76.413	81.638
15.100	3.710	295.826	291.667	.027	.010	-14.083	-.164	0.000	76.413	81.679
15.200	3.725	297.826	293.655	.029	.010	-14.290	-.165	0.000	76.413	81.699
15.300	3.739	299.825	295.644	.031	.010	-14.497	-.166	0.000	76.413	81.695
15.400	3.748	301.825	297.634	.033	.010	-14.700	-.166	0.000	76.413	81.667
15.500	3.756	303.825	299.626	.035	.010	-14.895	-.165	0.000	76.413	81.615
15.600	3.762	305.824	301.621	.037	.010	-15.076	-.163	0.000	76.413	81.539
15.700	3.769	307.824	303.617	.038	.010	-15.241	-.161	0.000	76.413	81.440
15.800	3.776	309.823	305.614	.040	.010	-15.388	-.158	0.000	76.413	81.320
15.900	3.782	311.823	307.612	.042	.010	-15.514	-.155	0.000	76.413	81.181
16.000	3.789	313.823	309.611	.044	.010	-15.620	-.152	0.000	76.413	81.025
16.100	3.795	315.822	311.611	.046	.010	-15.706	-.149	0.000	76.413	80.855
16.200	3.801	317.822	313.612	.047	.010	-15.774	-.146	0.000	76.413	80.672
16.300	3.807	319.821	315.613	.049	.010	-15.827	-.143	0.000	76.413	80.481
16.400	3.812	321.821	317.615	.051	.010	-15.867	-.141	0.000	76.413	80.282
16.500	3.817	323.821	319.617	.052	.010	-15.900	-.139	0.000	76.413	80.077

16.600	3.822	325.820	321.619	.054	.010	-15.928	-.138	0.000	76.413	79.869
16.700	3.828	327.820	323.622	.056	.010	-15.955	-.136	0.000	76.41[illegible]	79.659
16.800	3.833	329.820	325.624	.057	.010	-15.996	-.135	0.000	76.413	79.447
16.900	3.839	331.819	327.626	.059	.010	-16.024	-.135	0.000	76.413	79.233
17.000	3.845	333.819	329.629	.060	.010	-16.072	-.134	0.000	76.413	79.019
17.100	3.851	335.818	331.631	.062	.010	-16.133	-.133	0.000	76.413	78.802
17.200	3.857	337.818	333.632	.063	.010	-16.208	-.132	0.000	76.413	78.583
17.300	3.864	339.818	335.634	.065	.010	-16.301	-.132	0.000	76.413	78.362
[illegible]7.400	3.870	341.817	337.635	.066	.010	-16.411	-.130	0.000	76.413	78.136
17.5[illegible]0	3.877	343.817	339.635	.068	.010	-16.539	-.129	0.000	76.413	77.905
17[illegible]	3.883	345.817	341.636	.069	.010	-16.686	-.127	0.000	76.413	77.668
17.[illegible]	[illegible].890	347.816	343.636	.071	.010	-16.851	-.125	0.000	76.413	77.424
17.8[illegible]	3.897	349.316	345.636	.072	.01[illegible]	-17.033	-.123	0.000	76.413	77.172
17.900	3.904	351.815	347.636	.074	.010	-17.233	-.120	0.000	76.413	76.913
18.000	3.910	353.815	349.636	.075	.010	-17.448	-.116	0.[illegible]0	76.413	76.645
18.100	3.917	355.815	351.636	.077	.010	-17.680	-.113	0.000	76.413	76.368
18.200	3.924	357.814	353.635	.078	.010	-17.926	-.109	0.000	76.413	76.083
18.300	3.930	359.814	355.635	.080	.010	-18.186	-.104	0.000	76.413	75.790
18.400	3.937	361.814	357.635	.081	.010	-18.461	-.099	0.000	76.413	75.491
18.500	3.943	363.813	359.635	.083	.010	-18.748	-.094	0.000	76.413	75.185
18.600	3.949	365.813	361.635	.084	.010	-19.047	-.088	0.000	76.413	74.874
18.700	3.956	367.812	363.635	.085	.010	-19.357	-.082	0.000	76.413	74.560
18.800	3.962	369.812	365.635	.087	.010	-19.676	-.075	0.000	76.413	74.244
18.900	3.968	371.812	367.635	.088	.010	-20.003	-.068	0.000	76.413	73.927
19.000	3.974	373.811	369.635	.090	.010	-20.336	-.061	0.000	76.413	73.613
19.100	3.980	375.811	371.635	.091	.010	-20.673	-.053	0.000	76.413	73.302
19.200	3.986	377.811	373.636	.093	.010	-21.013	-.044	0.000	76.413	72.997
19.300	3.991	379.810	375.636	.094	.010	-21.354	-.035	0.000	76.413	72.708
19.400	3.996	381.810	377.637	.096	.010	-21.694	-.026	0.000	76.413	72.413
19.500	4.001	383.809	379.633	.097	.010	-22.033	-.017	0.000	76.413	72.137
19.600	4.006	385.809	381.640	.098	.010	-22.369	-.008	0.000	76.413	71.874
19.700	4.010	387.809	383.642	.100	.010	-22.712	.002	0.000	76.413	71.626
19.800	4.014	389.808	385.644	.101	.010	-23.032	.011	0.000	76.413	71.392
19.[illegible]0	4.017	391.808	387.646	.102	.010	-23.359	.021	0.000	76.413	71.175
20.000	4.021	393.808	389.649	.103	.010	-23.6[illegible]	.030	0.000	76.413	70.974
20.100	4.024	395.807	391.652	.105	.010	-24.006	.039	0.000	76.413	70.790

TIME-SEC	Q.ERR.INT.	THETRMBUT	ZE.ERR.INT	P.ERR-DG/S	R.ERR-DG/S	Q.ERR-DG/S	ZE.ERR-F/S	ROLLCMD	YAWCMD	CON.SYS.SW
0.000	-.115	0.000	0.000	.000	.000	.000	0.000	0.000	0.000	1.000
.100	-.115	0.000	.000	.000	-.000	.000	-.000	0.000	-.000	1.000
.200	-.115	0.000	.000	.000	-.000	.000	-.000	0.000	-.000	1.000
.300	-.115	0.000	.000	.000	-.000	.000	-.000	0.000	-.000	1.000
.400	-.115	0.000	1.063	6.744	.003	-.260	-.468	.349	-.000	1.000
.500	-.117	0.000	11.400	4.509	.017	-.959	-1.779	.349	.000	1.000
.600	-.121	0.000	34.815	1.405	.042	-1.412	-2.887	.349	-.000	1.000
.700	-.126	0.000	66.431	-.772	.057	-1.300	-3.330	.349	-.000	1.000
.800	-.130	0.000	100.656	-1.473	.047	-.905	-3.447	.349	-.001	1.000
.900	-.132	0.000	135.404	-1.126	.020	-.470	-3.446	.349	-.002	1.000
1.000	-.133	0.000	169.761	-.448	-.011	-.097	-3.368	.349	-.004	1.000
1.100	-.133	0.000	203.074	.058	-.033	.178	-3.244	.349	-.007	1.000
1.200	-.132	0.000	235.032	.235	-.042	.342	-3.102	.349	-.010	1.000
1.300	-.131	0.000	265.371	.170	-.036	.423	-2.926	.349	-.013	1.000
1.400	-.129	0.000	293.759	.023	-.018	.448	-2.714	.349	-.017	1.000
1.500	-.128	0.000	319.828	-.090	.011	.441	-2.465	.349	-.022	1.000
1.600	-.126	0.000	343.237	-.128	.050	.410	-2.185	.349	-.026	1.000
1.700	-.125	0.000	363.726	-.10[illegible]	.097	.360	-1.885	.349	-.031	1.000
1.800	-.124	0.000	381.132	-.070	.152	.296	-1.574	.349	-.036	1.000
1.900	-.12[illegible]	0.000	395.382	-.038	.211	.225	-1.256	.349	-.041	1.000
2.000	-.123	0.000	406.397	-.023	.271	.155	-.927	.349	-.045	1.000
2.100	-.122	0.000	414.070	-.023	.330	.092	-.596	.349	-.049	1.000
2.200	-.122	0.000	418.442	-.027	.385	.039	-.270	.349	-.053	1.000
2.300	-.122	0.000	419.597	-.031	.436	-.003	.043	.349	-.056	1.000
2.400	-.122	0.000	417.707	-.033	.480	-.031	.334	.349	-.058	1.000
2.500	-.122	0.000	413.017	-.034	.515	-.045	.598	.349	-.060	1.000
2.600	-.122	0.000	405.832	-.035	.541	-.045	.829	.349	-.061	1.000
2.700	-.123	0.000	396.508	-.038	.556	-.032	1.021	.349	-.062	1.000
2.800	-.123	0.000	3[illegible]5.443	-.043	.560	-.006	1.173	.349	-.063	1.000
2.900	-.123	0.000	373.059	-.050	.552	.030	1.282	.349	-.062	1.000
3.000	-.122	0.000	359.793	-.059	.532	.076	1.347	.349	-.062	1.000
3.100	-.122	0.000	346.088	-.068	.502	.129	1.368	.349	-.062	1.000
3.200	-.122	0.000	332.378	-.078	.462	.186	1.347	.349	-.061	1.000
3.300	-.121	0.000	319.082	-.088	.414	.245	1.285	.349	-.060	1.000
3.400	-.120	0.000	306.591	-.097	.360	.305	1.186	.349	-.060	1.000
3.500	-.119	0.000	295.263	-.107	.302	.361	1.053	.349	-.060	1.000
3.600	-.118	0.000	285.415	-.116	.243	.413	.891	.349	-.060	1.000
3.700	-.116	0.000	277.316	-.125	.184	.459	.705	.349	-.060	1.000
3.800	-.114	0.000	271.183	-.133	.128	.497	.501	.349	-.061	1.000
3.900	-.113	0.000	267.176	-.139	.078	.526	.283	.349	-.062	1.000
4.000	-.111	0.000	265.398	-.145	.035	.546	.058	.349	-.064	1.000
4.100	-.109	0.000	265.895	-.150	.001	.557	-.168	.349	-.066	1.000
4.200	-.107	0.000	268.655	-.155	-.025	.559	-.391	.349	-.069	1.000
4.300	-.105	0.000	273.610	-.158	-.042	.553	-.604	.349	-.071	1.000
4.400	-.103	0.000	280.642	-.160	-.049	.541	-.803	.349	-.075	1.000
4.500	-.102	0.000	289.582	-.157	-.047	.523	-.982	.349	-.078	1.000
4.600	-.100	0.000	300.219	-.107	-.044	.501	-1.139	.349	-.082	1.000
4.700	-.098	0.000	312.306	.019	-.044	.470	-1.270	.349	-.085	1.000
4.800	-.097	0.000	325.594	.259	-.056	.434	-1.377	.349	-.088	1.000
4.900	-.095	0.000	339.870	.554	-.098	.394	-1.469	.349	-.090	1.000
5.000	-.094	0.000	354.997	.752	-.157	.349	-1.[illegible]8	.349	-.092	1.000
5.100	-.093	0.000	370.865	.689	-.206	.300	-1.615	.349	-.095	1.000

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5.200	-.092	0.000	387.296	.440	-.240	.253	-1.655	.349	-.097	1.000
5.300	-.091	0.000	403.918	.163	-.256	.225	-1.649	.349	-.100	1.000
5.400	-.090	0.000	420.282	-.010	-.247	.224	-1.603	.349	-.103	1.000
5.500	-.089	0.000	436.032	-.036	-.218	.248	-1.527	.349	-.106	1.000
5.600	-.089	0.000	450.906	.034	-.178	.285	-1.431	.349	-.108	1.000
5.700	-.087	0.000	464.737	.122	-.130	.332	-1.319	.349	-.111	1.000
5.800	-.086	0.000	477.383	.181	-.075	.389	-1.195	.349	-.112	1.000
5.900	-.085	0.000	488.725	.199	-.022	.452	-1.060	.349	-.114	1.000
6.000	-.083	0.000	498.668	.188	.025	.521	-.917	.349	-.114	1.000
6.100	-.081	0.000	507.134	.167	.061	.594	-.767	.349	-.115	1.000
6.200	-.079	0.000	514.074	.147	.084	.671	-.613	.349	-.115	1.000
6.300	-.076	0.000	519.470	.132	.091	.748	-.460	.349	-.115	1.000
6.400	-.074	0.000	523.341	.121	.085	.824	-.310	.349	-.114	1.000
6.500	-.071	0.000	525.738	.110	.065	.896	-.167	.349	-.114	1.000
6.600	-.068	0.000	526.744	.096	.034	.961	-.034	.349	-.114	1.000
6.700	-.064	0.000	526.469	.080	-.007	1.017	.087	.349	-.114	1.000
6.800	-.061	0.000	525.042	.062	-.053	1.063	.194	.349	-.114	1.000
6.900	-.057	0.000	522.612	.044	-.101	1.099	.286	.349	-.115	1.000
7.000	-.053	0.000	519.339	.027	-.150	1.122	.361	.349	-.117	1.000
7.100	-.049	0.000	515.394	.010	-.195	1.133	.419	.349	-.119	1.000
7.200	-.045	0.000	510.949	-.005	-.234	1.132	.460	.349	-.122	1.000
7.300	-.042	0.000	506.177	-.019	-.266	1.120	.484	.349	-.125	1.000
7.400	-.038	0.000	501.246	-.032	-.288	1.09[illegible]	.492	.349	-.129	1.000
7.500	-.034	0.000	496.312	-.044	-.299	1.066	.485	.349	-.133	1.000
7.600	-.030	0.000	491.517	-.055	-.300	1.027	.464	.349	-.138	1.000
7.700	-.027	0.000	486.986	-.064	-.290	.983	.432	.349	-.143	1.000
7.300	-.024	0.000	482.824	-.[illegible]73	-.271	.936	.391	.349	-.148	1.000
7.900	-.021	0.000	479.115	-.080	-.243	.887	.343	.349	-.153	1.000
8.000	-.018	0.000	475.922	-.086	-.209	.838	.289	.349	-.159	1.000
8.100	-.015	0.000	473.256	-.090	-.170	.792	.232	.349	-.164	1.000
8.200	-.012	0.000	471.231	-.094	-.129	.749	.174	.349	-.169	1.000
8.300	-.010	0.000	469.762	-.097	-.087	.712	.116	.349	-.173	1.000
8.400	-.008	0.000	468.869	-.100	-.047	.680	.060	.349	-.177	1.000
8.500	-.005	0.000	468.532	-.102	-.011	.656	.006	.349	-.181	1.000
8.600	-.003	0.000	468.717	-.103	.020	.638	-.044	.349	-.184	1.000
8.700	-.001	0.000	469.386	-.105	.044	.627	-.090	.349	-.186	1.000
8.800	.001	0.000	470.491	-.106	.060	.622	-.130	.349	-.188	1.000
8.900	.003	0.000	471.979	-.107	.068	.623	-.166	.349	-.189	1.000
9.000	.005	0.000	473.793	-.108	.067	.627	-.195	.349	-.190	1.000
9.100	.008	0.000	475.872	-.108	.058	.634	-.218	.349	-.191	1.000
9.200	.010	0.000	478.152	-.109	.042	.643	-.235	.349	-.191	1.000
9.300	.012	0.000	480.570	-.109	.019	.651	-.245	.349	-.191	1.000
9.400	.014	0.000	483.061	-.108	-.009	.658	-.249	.349	-.190	1.000
9.500	.016	0.000	485.561	-.107	-.040	.663	-.247	.349	-.190	1.000
9.600	.01[illegible]	0.000	488.010	-.104	-.073	.654	-.239	.349	-.189	1.000
9.700	.021	0.000	490.351	-.098	-.107	.650	-.226	.349	-.188	1.000
9.800	.023	0.000	492.540	-.096	-.140	.652	-.208	.349	-.187	1.000
9.900	.025	0.000	494.538	-.099	-.172	.638	-.188	.349	-.186	1.000
10.000	.027	0.000	496.312	-.105	-.203	.619	-.164	.349	-.185	1.000
10.100	.029	0.000	497.834	-.107	-.233	.596	-.138	.349	-.184	1.000
10.200	.031	0.000	499.089	-.108	-.263	.567	-.111	.349	-.184	1.000
10.300	.033	0.000	500.069	-.111	-.290	.535	-.084	.349	-.183	1.000
10.400	.035	0.000	500.777	-.118	-.314	.500	-.057	.349	-.183	1.000
10.500	.037	0.000	501.221	-.129	-.335	.463	-.031	.349	-.182	1.000
10.600	.038	0.000	501.417	-.142	-.351	.424	-.005	.349	-.183	1.000
10.700	.039	0.000	501.386	-.155	-.362	.386	.014	.349	-.183	1.000
10.800	.041	0.000	501.155	-.163	-.368	.348	.032	.349	-.183	1.000

10.900	.042	0.000	500.756	-.180	-.370	.312	.047	.349	-.184	1.000
11.000	.043	0.000	500.225	-.191	-.366	.279	.058	.349	-.185	1.000
11.100	.044	0.000	499.602	-.203	-.357	.248	.065	.349	-.186	1.000
11.200	.044	0.000	498.927	-.214	-.345	.222	.068	.349	-.187	1.000
11.300	.045	0.000	498.243	-.225	-.330	.198	.067	.349	-.188	1.000
11.400	.046	0.000	497.587	-.236	-.312	.179	.062	.349	-.189	1.000
11.500	.046	0.000	496.997	-.246	-.293	.163	.054	.349	-.190	1.000
11.600	.047	0.000	496.505	-.256	-.273	.151	.042	.349	-.191	1.000
11.700	.047	0.000	496.138	-.266	-.254	.143	.029	.349	-.192	1.000
11.800	.048	0.000	495.919	-.275	-.236	.137	.013	.349	-.192	1.000
11.900	.048	0.000	495.862	-.284	-.219	.134	-.003	.349	-.193	1.000
12.000	.049	0.000	495.976	-.292	-.205	.133	-.021	.349	-.194	1.000
12.100	.049	0.000	496.261	-.301	-.193	.133	-.037	.349	-.195	1.000
12.200	.050	0.000	496.711	-.309	-.183	.135	-.053	.349	-.196	1.000
12.300	.050	0.000	497.314	-.315	-.175	.137	-.067	.349	-.197	1.000
12.400	.051	0.000	498.052	-.321	-.169	.139	-.080	.349	-.198	1.000
12.500	.051	0.000	498.899	-.327	-.165	.141	-.089	.349	-.199	1.000
12.600	.051	0.000	499.827	-.331	-.162	.142	-.095	.349	-.200	1.000
12.700	.052	0.000	500.805	-.335	-.159	.142	-.099	.349	-.201	1.000
12.800	.052	0.000	501.798	-.337	-.157	.141	-.098	.349	-.202	1.000
12.900	.053	0.000	502.772	-.339	-.155	.138	-.095	.349	-.204	1.000
13.000	.053	0.000	503.692	-.339	-.152	.133	-.087	.349	-.205	1.000
13.100	.054	0.000	504.525	-.337	-.149	.127	-.077	.349	-.207	1.000
13.200	.054	0.000	505.240	-.331	-.146	.118	-.064	.349	-.209	1.000
13.300	.054	0.000	505.820	-.317	-.144	.106	-.050	.349	-.211	1.000
13.400	.055	0.000	506.255	-.285	-.145	.097	-.035	.349	-.213	1.000
13.500	.055	0.000	506.528	-.238	-.148	.087	-.018	.349	-.216	1.000
13.600	.055	0.000	506.638	-.219	-.138	.059	-.003	.349	-.218	1.000
13.700	.055	0.000	506.604	-.256	-.116	.039	.010	.349	-.221	1.000
13.800	.055	0.000	506.458	-.345	-.091	-.003	.018	.349	-.224	1.000
13.900	.055	0.000	506.257	-.444	-.076	-.059	.020	.349	-.227	1.000
14.000	.055	0.000	506.070	-.466	-.080	-.127	.015	.349	-.230	1.000
14.100	.054	0.000	505.957	-.302	-.114	-.197	.006	.349	-.233	1.000
14.200	.053	0.000	505.919	-.002	-.159	-.252	.001	.349	-.236	1.000
14.300	.052	0.000	505.906	.270	-.197	-.285	-.001	.349	-.239	1.000
14.400	.051	0.000	505.970	.421	-.230	-.319	-.016	.349	-.241	1.000
14.500	.050	0.000	506.248	.438	-.255	-.372	-.044	.349	-.245	1.000
14.600	.048	0.000	506.831	.366	-.267	-.461	-.076	.349	-.248	1.000
14.700	.046	0.000	507.744	.274	-.262	-.517	-.108	.349	-.252	1.000
14.800	.044	0.000	508.965	.211	-.243	-.591	-.137	.349	-.255	1.000
14.900	.042	0.000	510.450	.189	-.209	-.659	-.160	.349	-.259	1.000
15.000	.040	0.000	512.148	.196	-.165	-.718	-.179	.349	-.263	1.000
15.100	.037	0.000	514.018	.214	-.113	-.758	-.194	.349	-.266	1.000
15.200	.034	0.000	516.022	.228	-.058	-.810	-.205	.349	-.269	1.000
15.300	.031	0.000	518.124	.235	-.003	-.844	-.213	.349	-.271	1.000
15.400	.028	0.000	520.281	.234	.048	-.872	-.216	.349	-.273	1.000
15.500	.025	0.000	522.449	.230	.093	-.892	-.215	.349	-.275	1.000
15.600	.022	0.000	524.577	.226	.130	-.905	-.208	.349	-.276	1.000
15.700	.019	0.000	526.612	.222	.158	-.912	-.196	.349	-.277	1.000
15.800	.016	0.000	528.496	.219	.177	-.912	-.178	.349	-.278	1.000
15.900	.012	0.000	530.173	.216	.186	-.908	-.154	.349	-.278	1.000
16.000	.009	0.000	531.584	.213	.187	-.901	-.124	.349	-.278	1.000
16.100	.006	0.000	532.670	.209	.180	-.891	-.089	.349	-.278	1.000
16.200	.003	0.000	533.371	.205	.167	-.880	-.047	.349	-.278	1.000
16.300	-.000	0.000	533.626	.200	.150	-.868	.000	.349	-.278	1.000
16.400	-.003	0.000	533.379	.195	.131	-.858	.053	.349	-.278	1.000
16.500	-.006	0.000	532.574	.191	.110	-.849	.112	.349	-.278	1.000

.600	-.009	0.000	531.162	.188	.091	-.842	.175	.349	-.279	1.000
.700	-.012	0.000	529.098	.185	.073	-.837	.242	.349	-.280	1.000
16.800	-.015	0.000	526.348	.182	.059	-.835	.312	.349	-.281	1.000
16.900	-.018	0.000	522.882	.180	.049	-.835	.384	.349	-.283	1.000
17.000	-.021	0.000	518.685	.179	.043	-.838	.458	.349	-.285	1.000
17.100	-.024	0.000	513 [illegible]46	.178	.042	-.843	.532	.349	-.287	1.000
17.200	-.027	0.000	508.[illegible]0	.177	.046	-.849	.605	.349	-.290	1.000
17.300	-.030	0.000	501.669	.177	.055	-.857	.676	.349	-.293	1.000
17.400	-.033	0.000	494.569	.177	.067	-.864	.744	.349	-.296	1.000
17.500	-.036	0.000	486.805	.177	.083	-.870	.808	.349	-.299	1.000
17.600	-.039	0.000	478.425	.178	.102	-.875	.866	.349	-.303	1.000
17.700	-.042	0.000	469.488	.178	.122	-.878	.919	.349	-.307	1.000
17.800	-.046	0.000	460.062	.179	.144	-.878	.963	.349	-.312	1.000
17.900	-.049	0.000	450.229	.179	.166	-.875	.999	.349	-.316	1.000
18.000	-.052	0.000	440.079	.179	.187	-.859	1.026	.349	-.321	1.000
18.100	-.055	0.000	429.711	.179	.208	-.859	1.042	.349	-.326	1.000
18.200	-.058	0.000	419.238	.179	.228	-.846	1.046	.349	-.331	1.000
18.300	-.061	0.000	408.776	.179	.249	-.829	1.039	.349	-.337	1.000
18.400	-.064	0.000	398.452	.178	.270	-.807	1.018	.349	-.342	1.000
18.500	-.067	0.000	388.397	.178	.292	-.782	.984	.349	-.348	1.000
18.600	-.069	0.000	378.748	.178	.316	-.753	.937	.349	-.354	1.000
18.700	-.072	0.000	369.644	.177	.341	-.721	.875	.349	-.360	1.000
18.800	-.074	0.000	361.224	.177	.367	-.685	.800	.349	-.365	1.000
18.900	-.077	0.000	353.625	.176	.393	-.648	.711	.349	-.371	1.000
19.000	-.079	0.000	345.980	.174	.418	-.608	.609	.349	-.377	1.000
19.100	-.081	0.000	341.416	.173	.441	-.568	.495	.349	-.383	1.000
19.200	-.083	0.000	337.051	.170	.462	-.527	.369	.349	-.389	1.000
19.300	-.085	0.000	333.990	.168	.479	-.487	.235	.349	-.394	1.000
19.400	-.087	0.000	332.320	.1[illegible]6	.494	-.[illegible]46	.092	.349	-.400	1.000
19.500	-.089	0.000	332.114	.164	.503	-.406	-.057	.349	-.405	1.000
19.600	-.090	0.000	333.429	.160	.509	-.367	-.211	.349	-.411	1.000
19.700	-.091	0.000	336.300	.157	.510	-.330	-.368	.349	-.416	1.000
19.800	-.093	0.000	340.744	.152	.507	-.293	-.525	.349	-.422	1.000
19.900	-.094	0.000	346.756	.147	.500	-.259	-.680	.349	-.428	1.000
20.000	-.095	0.000	354.310	.142	.489	-.227	-.832	.349	-.433	1.000
20.100	-.096	0.000	363.356	.137	.476	-.197	-.977	.349	-.439	1.000

TIME-SEC	DLATSTK-DG	DPED-DG/S	LNG.STK.	ZEDT.CMD.	THROTTLE	ZE.ERR-FT	YE.ERR-FT	XBODY.ER-F	YBODY.ER-F	ZBODY.ER-F
0.000	0.000	0.000	0.000	0.000	.527	0.000	0.000	0.000	0.000	0.000
.100	-.000	0.000	-.000	-.000	.527	0.000	0.000	0.000	-.008	.008
.200	-.000	0.000	-.000	-.000	.527	0.009	0.000	0.000	-.000	.000
.300	-.000	0.000	-.000	-.000	.527	0.000	0.000	0.000	-.000	.000
.400	-.000	19.996	-.065	-.026	.527	0.000	0.000	0.000	-.000	.228
.500	.000	19.996	-.201	-.225	.527	0.000	0.000	0.000	.001	.701
.600	-.002	19.996	-.309	-.620	.527	0.000	0.000	0.000	-.008	1.080
.700	-.019	19.996	-.428	-1.082	.527	0.000	0.000	0.000	-.068	1.495
.800	-.060	19.996	-.596	-1.503	.527	0.000	0.000	0.000	-.210	2.079
.900	-.131	19.996	-.744	-1.857	.527	0.000	0.000	0.000	-.456	2.599
1.000	-.237	19.996	-.813	-2.138	.527	0.000	0.000	0.000	-.826	2.839
1.100	-.379	19.996	-.794	-2.351	.527	0.000	0.000	0.000	-1.323	2.772
1.200	-.555	19.996	-.691	-2.500	.527	0.000	0.000	0.000	-1.936	2.411
1.300	-.761	19.996	-.528	-2.593	.527	0.000	0.000	0.000	-2.655	1.842
1.400	-.993	19.996	-.333	-2.634	.527	0.000	0.000	0.000	-3.466	1.161
1.500	-1.247	19.996	-.127	-2.626	.527	0.000	0.000	0.000	-4.351	.444
1.600	[illegible]	19.996	.074	-2.571	.527	0.000	0.000	0.000	-5.288	-.258
1.700	[illegible]	[illegible]	.261	-2.473	.527	0.000	0.000	0.000	-6.250	-.912
1.800	[illegible]	19.996	.429	-2.337	.527	0.000	0.000	0.000	-7.205	-1.499
1.900	[illegible]	19.996	.574	-2.169	.527	0.000	0.000	0.000	-8.129	-2.005
2.000	-2.578	19.996	.696	-1.973	.527	0.000	0.000	0.000	-9.000	-2.430
2.100	-2.807	19.996	.793	-1.752	.527	0.000	0.000	0.000	-9.798	-2.769
2.200	-3.009	19.996	.866	-1.512	.527	0.000	0.000	0.000	-10.505	-3.021
2.300	-3.183	19.996	.915	-1.257	.527	0.000	0.000	0.000	-11.110	-3.194
2.400	-3.324	19.996	.946	-.994	.527	0.000	0.000	0.000	-11.604	-3.301
2.500	-3.434	19.996	.963	-.728	.527	0.000	0.000	0.000	-11.986	-3.360
2.600	-3.511	19.996	.971	-.465	.527	0.000	0.000	0.000	-12.257	-3.390
2.700	-3.560	19.996	.977	-.212	.527	0.000	0.000	0.000	-12.425	-3.411
[illegible]	-3.581	19.996	.986	.026	.527	0.000	0.000	0.000	-12.501	-3.442
2.900	-3.581	13.996	1.003	.245	.527	0.000	0.000	0.000	-12.499	-3.502
3.000	-3.563	19.996	1.033	.440	.527	0.000	0.000	0.000	-12.438	-3.606
3.100	-3.534	19.996	1.079	.607	.527	0.000	0.000	0.000	-12.337	-3.767
3.200	-3.500	19.996	1.145	.744	.527	0.000	0.000	0.000	-12.216	-3.995
3.300	-3.466	19.996	1.231	.848	.527	0.000	0.000	0.000	-12.097	-4.297
3.400	-3.438	19.996	1.339	.918	.527	0.000	0.000	0.000	-12.000	-4.673
3.500	-3.422	19.996	1.468	.955	.527	0.000	0.000	0.000	-11.945	-5.124
3.600	-3.423	19.996	1.616	.958	.527	0.000	0.000	0.000	-11.947	-5.642
3.700	-3.444	19.996	1.782	.929	.527	0.000	0.000	0.000	-12.022	-6.221
3.800	-3.489	19.396	1.962	.869	.527	0.000	0.000	0.000	-12.179	-6.847
3.900	-3.560	19.996	2.150	.782	.527	0.000	0.000	0.000	-12.427	-7.505
4.000	-3.657	19.996	2.342	.671	.527	0.000	0.000	0.000	-12.766	-8.177
4.100	-3.780	19.996	2.534	.538	.527	0.000	0.000	0.000	-13.196	-8.845
4.200	-3.928	19.996	2.719	.389	.527	0.000	0.000	0.000	-13.710	-9.491
4.300	-4.096	19.996	2.892	.228	.527	0.000	0.000	0.000	-14.296	-10.093
4.400	-4.283	19.996	3.046	.058	.527	0.000	0.000	0.000	-14.949	-10.634
4.500	-4.482	19.996	3.178	-.115	.527	0.000	0.000	0.000	-15.644	-11.094
4.600	-4.682	19.996	3.283	-.287	.527	0.000	0.000	0.000	-16.343	-11.459
4.700	-4.872	19.996	3.358	-.454	.527	0.000	0.000	0.000	-17.066	-11.720
4.800	-5.036	19.996	3.404	-.613	.527	0.000	0.000	0.000	-17.579	-11.882
4.900	-5.171	19.996	3.429	-.760	.527	0.000	0.000	0.000	-18.052	-11.968
5.000	-5.293	19.936	3.435	-.896	.527	0.000	0.000	0.000	-18.476	-11.992
5.100	-5.426	19.936	3.419	-1.021	.527	0.000	0.000	0.000	-18.940	-11.935

5.200	-5.574	19.996	3.366	-1.133	.527	0.000	0.000	0.000	-19.459	-11.758
5.300	-5.737	19.996	3.266	-1.228	.527	0.000	0.000	0.000	-20.627	-11.401
5.400	-5.904	19.996	3.120	-1.300	.527	0.000	0.000	0.000	-20.610	-10.889
5.500	-6.065	19.996	2.936	-1.348	.527	0.000	0.000	0.000	-21.171	-10.250
5.600	-6.211	19.996	2.731	-1.372	.527	0.000	0.000	0.000	-21.681	-9.531
5.700	-6.336	19.996	2.519	-1.372	.527	0.000	0.000	0.000	-22.116	-8.792
5.800	-6.435	19.996	2.314	-1.351	.527	0.000	0.000	0.000	-22.462	-8.076
5.900	-6.507	19.996	2.123	-1.310	.527	0.000	0.000	0.000	-22.714	-7.411
6.000	-6.552	19.996	1.953	-1.252	.527	0.000	0.000	0.000	-22.872	-6.818
6.100	-6.573	19.996	1.809	-1.177	.527	0.000	0.000	0.000	-22.945	-6.314
6.200	-6.575	19.996	1.695	-1.088	.527	0.000	0.000	0.000	-22.950	-5.916
6.300	-6.562	19.996	1.616	-.988	.527	0.000	0.000	0.000	-22.906	-5.639
6.400	-6.543	19.996	1.575	-.878	.527	0.000	0.000	0.000	-22.839	-5.496
6.500	-6.525	19.996	1.574	-.762	.527	0.000	0.000	0.000	-22.775	-5.494
6.600	-6.515	19.996	1.614	-.641	.527	0.000	0.000	0.000	-22.740	-5.632
6.700	-6.520	19.996	1.692	-.520	.527	0.000	0.000	0.000	-22.761	-5.907
6.800	-6.549	19.996	1.807	-.399	.527	0.000	0.000	0.000	-22.859	-6.307
6.900	-6.604	19.996	1.953	-.283	.527	0.000	0.000	0.000	-23.053	-6.819
7.000	-6.691	19.996	2.127	-.172	.527	0.000	0.000	0.000	-23.358	-7.425
7.100	-6.812	19.996	2.322	-.070	.527	0.000	0.000	0.000	-23.780	-8.106
7.200	-6.968	19.996	2.533	.023	.527	0.000	0.000	0.000	-24.323	-8.843
7.300	-7.158	19.996	2.754	.105	.527	0.000	0.000	0.000	-24.984	-9.612
7.400	-7.378	19.996	2.978	.174	.527	0.000	0.000	0.000	-25.755	-10.394
7.500	-7.627	19.996	3.199	.231	.527	0.000	0.000	0.000	-26.623	-11.168
7.600	-7.898	19.996	3.414	.276	.527	0.000	0.000	0.000	-27.571	-11.916
7.700	-8.187	19.996	3.616	.307	.527	0.000	0.000	0.000	-28.579	-12.623
7.800	-8.487	19.996	3.803	.326	.527	0.000	0.000	0.000	-29.624	-13.276
7.900	-8.790	19.996	3.972	.333	.527	0.000	0.000	0.000	-30.684	-13.866
8.000	-9.091	19.996	4.122	.330	.527	0.000	0.000	0.000	-31.735	-14.388
8.100	-9.383	19.996	4.251	.317	.527	0.000	0.000	0.000	-32.754	-14.839
8.200	-9.660	19.996	4.361	.296	.527	0.000	0.000	0.000	-33.719	-15.222
8.300	-9.916	19.996	4.452	.269	.527	0.000	0.000	0.000	-34.612	-15.540
8.400	-10.147	19.996	4.527	.236	.527	0.000	0.000	0.000	-35.418	-15.804
8.500	-10.349	19.996	4.590	.199	.527	0.000	0.000	0.000	-36.126	-16.021
8.600	-10.522	19.996	4.642	.159	.527	0.000	0.000	0.000	-36.728	-16.204
8.700	-10.663	19.996	4.688	.118	.527	0.000	0.000	0.000	-37.222	-16.365
8.800	-10.774	19.996	4.732	.076	.527	0.000	0.000	0.000	-37.607	-16.518
8.900	-10.854	19.996	4.776	.036	.527	0.000	0.000	0.000	-37.889	-16.672
9.000	-10.907	19.996	4.824	-.004	.527	0.000	0.000	0.000	-38.074	-16.839
9.100	-10.936	19.996	4.878	-.041	.527	0.000	0.000	0.000	-38.174	-17.028
9.200	-10.943	19.996	4.940	-.074	.527	0.000	0.000	0.000	-38.198	-17.244
9.300	-10.932	19.996	5.011	-.105	.527	0.000	0.000	0.000	-38.159	-17.492
9.400	-10.906	19.996	5.092	-.131	.527	0.000	0.000	0.000	-38.069	-17.773
9.500	-10.869	19.996	5.181	-.152	.527	0.000	0.000	0.000	-37.940	-18.085
9.600	-10.823	19.996	5.279	-.168	.527	0.000	0.000	0.000	-37.779	-18.427
9.700	-10.771	19.996	5.384	-.180	.527	0.000	0.000	0.000	-37.597	-18.793
9.800	-10.715	19.996	5.494	-.187	.527	0.000	0.000	0.000	-37.402	-19.177
9.900	-10.659	19.996	5.606	-.189	.527	0.000	0.000	0.000	-37.206	-19.570
10.000	-10.605	19.996	5.718	-.186	.527	0.000	0.000	0.000	-37.019	-19.960
10.100	-10.556	19.996	5.827	-.180	.527	0.000	0.000	0.000	-36.848	-20.339
10.200	-10.515	19.996	5.929	-.170	.527	0.000	0.000	0.000	-36.704	-20.696
10.300	-10.483	19.996	6.023	-.157	.527	0.000	0.000	0.000	-36.593	-21.023
10.400	-10.463	19.996	6.105	-.141	.527	0.000	0.000	0.000	-36.521	-21.310
10.500	-10.454	19.996	6.173	-.123	.527	0.000	0.000	0.000	-36.492	-21.548
10.600	-10.456	19.996	6.225	-.104	.527	0.000	0.000	0.000	-36.506	-21.729
10.700	-10.474	19.996	6.259	-.085	.527	0.000	0.000	0.000	-36.562	-21.848
10.800	-10.502	19.996	6.274	-.065	.527	0.000	0.000	0.000	-36.657	-21.901

10.900	-10.538	19.996	6.270	-.046	.527	0.000	0.000	0.000	-36.786	-21.887
11.000	-10.583	19.996	6.247	-.028	.527	0.000	0.000	0.000	-36.942	-21.886
11.100	-10.634	19.996	6.205	-.012	.527	0.000	0.000	0.000	-37.120	-21.661
11.200	-10.689	19.996	6.146	.002	.527	0.000	0.000	0.000	-37.312	-21.454
11.300	-10.747	19.996	6.071	.014	.527	0.000	0.000	0.000	-37.514	-21.192
11.400	-10.805	19.996	5.982	.023	.527	0.000	0.000	0.000	-37.718	-20.880
11.500	-10.863	19.996	5.880	.030	.527	0.000	0.000	0.000	-37.920	-20.525
11.600	-10.920	19.996	5.768	.033	.527	0.000	0.000	0.000	-38.118	-20.135
11.700	-10.974	19.996	5.649	.033	.527	0.000	0.000	0.000	-38.307	-19.717
11.800	-11.026	19.996	5.524	.031	.527	0.000	0.000	0.000	-38.488	-19.282
11.900	-11.076	19.996	5.396	.026	.527	0.000	0.000	0.000	-38.662	-18.835
12.000	-11.124	19.996	5.267	.019	.527	0.000	0.000	0.000	-38.830	-18.386
12.100	-11.171	19.996	5.140	.011	.527	0.000	0.000	0.000	-38.994	-17.942
12.200	-11.218	19.996	5.016	.000	.527	0.000	0.000	0.000	-39.159	-17.511
12.300	-11.267	19.996	4.898	-.011	.527	0.000	0.000	0.000	-39.329	-17.098
12.400	-11.318	19.996	4.787	-.022	.527	0.000	0.000	0.000	-39.509	-16.709
12.500	-11.374	19.996	4.684	-.034	.527	0.000	0.000	0.000	-39.702	-16.350
12.600	-11.435	19.996	4.591	-.044	.527	0.000	0.000	0.000	-39.915	-16.025
12.700	-11.502	19.996	4.508	-.054	.527	0.000	0.000	0.000	-40.150	-15.737
12.800	-11.577	19.996	4.437	-.062	.527	0.000	0.000	0.000	-40.411	-15.489
12.900	-11.660	19.996	4.378	-.068	.527	0.000	0.000	0.000	-40.701	-15.284
13.000	-11.752	19.996	4.332	-.072	.527	0.000	0.000	0.000	-41.023	-15.123
13.100	-11.853	19.996	4.299	-.074	.527	0.000	0.000	0.000	-41.376	-15.007
13.200	-11.964	19.996	4.280	-.074	.527	0.000	0.000	0.000	-41.764	-14.940
13.300	-12.086	19.996	4.277	-.071	.527	0.000	0.000	0.000	-42.187	-14.928
13.400	-12.219	19.996	4.291	-.066	.527	0.000	0.000	0.000	-42.651	-14.979
13.500	-12.364	19.996	4.324	-.058	.527	0.000	0.000	0.000	-43.159	-15.095
13.600	-12.519	19.996	4.370	-.050	.527	0.000	0.000	0.000	-43.699	-15.254
13.700	-12.680	19.996	4.423	-.040	.527	0.000	0.000	0.000	-44.261	-15.440
13.800	-12.846	19.996	4.48	-.030	.527	0.000	0.000	0.000	-44.839	-15.639
13.900	-13.017	19.996	4.539	-.021	.527	0.000	0.000	0.006	-45.436	-15.844
14.000	-13.191	19.996	4.597	-.014	.527	0.000	0.000	0.000	-46.044	-16.045
14.100	-13.357	19.996	4.654	-.010	.527	0.000	0.000	0.000	-46.625	-16.246
14.200	-13.513	19.996	4.713	-.007	.527	0.000	0.000	0.000	-47.168	-16.451
14.300	-13.667	19.996	4.770	-.006	.527	0.000	0.000	0.000	-47.708	-16.650
14.400	-13.832	19.996	4.830	-.006	.527	0.000	0.000	0.000	-48.281	-16.859
14.500	-14.011	19.996	4.886	-.010	.527	0.000	0.000	0.000	-48.907	-17.055
14.600	-14.207	19.996	4.925	-.019	.527	0.000	0.000	0.000	-49.591	-17.190
14.700	-14.415	19.996	4.935	-.033	.527	0.000	0.000	0.000	-50.317	-17.225
14.800	-14.628	19.996	4.911	-.049	.527	0.000	0.000	0.000	-51.061	-17.142
14.900	-14.839	19.996	4.854	-.067	.527	0.000	0.000	0.000	-51.798	-16.944
15.000	-15.041	19.996	4.767	-.086	.527	0.000	0.000	0.000	-52.503	-16.642
15.100	-15.228	19.996	4.654	-.104	.527	0.000	0.000	0.000	-53.157	-16.246
15.200	-15.396	19.996	4.517	-.122	.527	0.000	0.000	0.000	-53.741	-15.769
15.300	-15.540	19.996	4.359	-.139	.527	0.000	0.000	0.000	-54.246	-15.217
15.400	-15.660	19.996	4.183	-.152	.527	0.000	0.000	0.000	-54.665	-14.600
15.500	-15.755	19.996	3.990	-.163	.527	0.000	0.000	0.000	-54.995	-13.926
15.600	-15.825	19.996	3.784	-.172	.527	0.000	0.000	0.000	-55.241	-13.208
15.700	-15.874	19.996	3.568	-.178	.527	0.000	0.000	0.000	-55.409	-12.455
15.800	-15.903	19.996	3.346	-.179	.527	0.000	0.000	0.000	-55.511	-11.680
15.900	-15.917	19.996	3.120	-.177	.527	0.000	0.000	0.000	-55.561	-10.892
16.000	-15.921	19.996	2.894	-.170	.527	0.000	0.000	0.000	-55.574	-10.100
16.100	-15.919	19.996	2.667	-.159	.527	0.000	0.000	0.000	-55.567	-9.311
16.200	-15.916	19.996	2.443	-.142	.527	0.000	0.000	0.000	-55.557	-8.528
16.300	-15.917	19.996	2.221	-.121	.527	0.000	0.000	0.000	-55.561	-7.754
16.400	-15.926	19.996	2.002	-.094	.527	0.000	0.000	0.000	-55.592	-6.988
16.500	-15.946	19.996	1.785	-.062	.527	0.000	0.000	0.000	-55.663	-6.230

16.600	-15.982	19.996	1.569	-.024	.527	0.000	0.000	0.000	-55.787	-5.476
16.700	-16.034	19.996	1.353	.018	.527	0.000	0.000	0.000	-55.970	-4.722
16.800	-16.105	19.996	1.135	.065	.527	0.000	0.000	0.000	-56.219	-3.964
16.900	-16.197	19.996	.915	.116	.527	0.000	0.000	0.000	-56.537	-3.195
17.000	-16.308	19.996	.690	.172	.527	0.000	0.000	0.000	-56.926	-2.410
17.100	-16.440	19.996	.459	.231	.527	0.000	0.000	0.000	-57.386	-1.603
17.200	-16.591	19.996	.221	.292	.527	0.000	0.000	0.000	-57.914	-.772
17.300	-16.761	19.996	-.026	.355	.527	0.000	0.000	0.000	-58.508	.089
17.400	-16.945	19.996	-.281	.420	.527	0.000	0.000	0.000	-59.163	.982
17.500	-17.153	19.996	-.546	.485	.527	0.000	0.000	0.000	-59.877	1.908
17.600	-17.373	19.996	-.821	.549	.527	0.000	0.000	0.000	-60.644	2.865
17.700	-17.607	19.996	-1.104	.611	.527	0.000	0.000	0.000	-61.461	3.855
17.800	-17.855	19.996	-1.396	.671	.527	0.000	0.000	0.000	-62.325	4.873
17.900	-18.1[illegible]5	19.996	-1.695	.728	.527	0.000	0.000	0.000	-63.235	5.916
18.000	-18.389	19.996	-1.[illegible]9	.780	.527	0.000	0.000	0.000	-64.190	6.979
18.100	-18.676	19.996	-2.308	.826	.527	0.000	0.000	0.000	-65.190	8.057
18.200	-18.975	19.996	-2.620	.866	.527	0.000	0.000	0.000	-66.234	9.145
18.300	-1[illegible]28[illegible]	19.996	-2.932	.898	.527	0.000	0.000	0.000	-67.318	10.235
18.400	-19.605	19.996	-3.244	.922	.527	0.000	0.000	0.000	-68.434	11.323
18.500	-19.932	19.996	-3.552	.936	.527	0.000	0.000	0.000	-69.576	12.399
18.600	-20.264	19.996	-3.855	.941	.527	0.000	0.000	0.000	-70.736	13.457
18.700	-20.600	19.995	-4.151	.934	.527	0.000	0.000	0.000	-71.906	14.490
18.800	-20.936	19.996	-4.437	.917	.527	0.000	0.000	0.000	-73.081	15.488
18.900	-21.272	19.996	-4.711	.887	.527	0.000	0.000	0.000	-74.253	16.446
19.000	-21.606	19.996	-4.972	.846	.527	0.000	0.000	0.000	-75.418	17.357
19.100	-21.937	19.996	-5.218	.792	.527	0.000	0.000	0.000	-76.574	18.215
19.200	-22.264	19.996	-5.448	.727	.527	0.000	0.000	0.000	-77.717	19.016
19.300	-22.588	19.996	-5.660	.650	.527	0.000	0.000	0.000	-78.848	19.757
19.400	-22.909	19.996	-5.854	.561	.527	0.000	0.000	0.000	-79.968	20.435
19.500	-23.227	19.996	-6.029	.462	.527	0.000	0.000	0.000	-81.078	21.047
19.600	-23.544	19.996	-6.186	.353	.527	0.000	0.000	0.000	-82.183	21.592
19.700	-23.860	19.996	-6.323	.236	.527	0.000	0.000	0.000	-83.286	22.071
19.800	-24.177	19.996	-6.442	.112	.527	0.000	0.000	0.000	-84.393	22.485
19.900	-24.497	19.996	-6.542	-.018	.527	0.000	0.000	0.000	-85.510	22.837
20.000	-24.821	19.996	-6.626	-.152	.527	0.000	0.000	0.000	-86.642	23.129
20.100	-25.151	19.996	-6.694	-.289	.527	0.000	0.000	0.000	-87.794	23.367

TIME-SEC	IRCS
0.000	1689.629
.100	1689.629
.200	1689.630
.300	1689.630
.400	6701.712
.500	7140.435
.600	4373.39[illegible]
.700	2235.692
.800	1898.791
.900	1943.157
1.000	1946.804
1.100	2079.196
1.200	2[illegible]56.396
1.300	2165.939
1.400	2133.973
1.500	2092.276
1.600	2059.965
1.700	2040.889
1.800	2029.641
1.900	2027.521
2.000	2621.833
2.100	2009.584
2.200	1992.986
2.300	1974.509
2.400	1955.797
2.500	1937.612
2.600	1920.197
2.700	1903.656
2.800	1888.161
2.900	1873.987
3.000	1861.449
3.100	1850.824
3.200	1842.311
3.300	1836.010
3.400	1831.947
3.500	1833.097
3.600	1830.344
3.700	1832.506
3.800	1836.412
3.900	1841.928
4.000	1848.789
4.100	1856.667
4.200	186[illegible]31
4.300	187[illegible]97
4.400	1883.371
4.500	1892.761
4.600	1907.593
4.700	1937.663
4.800	1991.287
4.900	2070.236
5.000	2145.540
5.100	2184.170

5.200	2172.871
5.300	2124.797
5.400	2074.983
5.500	2050.188
5.600	2052.444
5.700	2069.635
5.800	2085.795
5.900	2093.308
6.000	2091.903
6.100	2084.932
6.200	2075.902
6.300	2066.761
6.400	2057.954
6.500	2049.126
6.600	2039.841
6.700	2029.967
6.800	2019.710
6.900	2009.455
7.000	1999.609
7.100	1990.472
7.200	1982.201
7.300	1974.858
7.400	1968.460
7.500	1963.014
7.600	1958.515
7.700	1954.948
7.800	1952.272
7.900	1950.422
8.000	1949.307
8.100	1948.819
8.200	1948.841
8.300	1949.248
8.400	1949.920
8.500	1950.743
8.600	1951.613
8.700	1952.439
8.800	1953.146
8.900	1953.675
9.000	1953.981
9.100	1954.037
9.200	1953.825
9.300	1953.343
9.400	1952.603
9.500	1951.663
9.600	1950.732
9.700	1950.172
9.800	1949.144
9.900	1946.746
10.000	1943.094
10.100	1939.275
10.200	1935.864
10.300	1932.1[illegible]0
10.400	1927.512
10.500	1921.827
10.600	1915.339
10.700	1908.405
10.800	1901.309

10.900	1894.207
11.000	1887.150
11.100	1880.140
11.200	1873.175
11.300	1866.264
11.400	1859.422
11.500	1852.666
11.600	1846.001
11.700	1839.421
11.800	1832.908
11.900	1826.441
12.000	1820.001
12.100	1813.568
12.200	1807.131
12.300	1800.682
12.400	17[illegible]4.219
12.500	1787.744
12.600	1781.265
12.700	1774.790
12.800	1768.33[illegible]
12.900	1761.915
13.000	1755.579
13.100	1749.436
13.200	1751.864
13.300	1755.315
13.400	1755.349
13.500	1750.268
13.600	1746.424
13.700	1752.082
13.800	1771.314
13.900	1798.889
14.000	1821.639
14.100	1812.081
14.200	1762.460
14.[illegible]0	1790.344
14.[illegible]0	1842.911
14.500	1869.860
14.600	1871.8[illegible]3
14.700	1861.[illegible]08
14.800	1850.[illegible]7
14.900	1846.349
15.000	1849.815
15.100	1857.734
15.200	1866.6[illegible]3
15.300	1874.302
15.400	1880.150
15.500	1884.562
15.600	1888.214
15.700	1891.573
15.800	1894.770
15.900	1897.694
16.000	1900.169
16.100	1902.072
16.200	1903.378
16.300	1904.130
16.400	1904.407
16.500	1904.280

16.600	1903.807
16.700	1903.030
16.800	1901.986
16.900	1900.714
17.000	1899.257
17.100	1897.664
17.200	1895.987
17.300	1894.276
17.400	1892.585
17.500	1890.966
17.600	1889.474
17.700	1888.163
17.800	1887.091
17.900	1886.316
18.000	1885.901
18.100	1885.907
18.200	1886.403
18.300	1887.462
18.400	1889.159
18.500	1891.566
18.600	1894.741
18.700	1898.724
18.800	1903.539
18.900	1909.189
19.000	1915.662
19.100	1922.930
19.200	1930.955
19.300	1939.758
19.400	1949.326
19.500	1959.541
19.600	1970.258
19.700	1981.340
19.800	1992.677
19.900	2004.174
20.000	2015.734
20.100	2027.254

C-5

NPTS= 202
NOUT= 82
NTAP= 4

APPENDIX F

EXAMPLE 3 (WIND TUNNEL DATA) OUTPUT

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69 NEQS
 5    3 NTAP,NTAPW
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DIVISION OF R-ARRAY

I	NR(I)	LENGTH(I)
1	0	7
2	7	69
3	76	69
4	145	17
5	162	19
6	181	91
7	272	29
8	301	18
9	319	34
10	353	27
11	380	19
12	399	15
13	414	1
14	415	17
15	432	206
16	638	225
17	863	148
18	1011	6
19	1017	54
20	1071	33
21	1104	21
22	1125	28
23	1153	31
24	1184	44
25	1228	11
26	1239	35
27	1274	73
28	1347	76
29	1423	67
30	1490	133
31	1623	12
32	1635	72
33	1707	250
34	1957	250
35	2207	250
36	2457	250
37	2707	250
38	2957	250
39	3207	26
40	3233	50
41	3283	10
42	3293	28
43	3321	161
44	3482	103
45	3585	170

ORIGINAL PAGE IS OF POOR QUALITY

OUTPUT SPECIFICATIONS

1	1	1.00000	TIME-SEC
3	1	1.00000	U-FT/SEC
3	2	1.00000	V-FT/SEC
3	3	1.00000	W-FT/SEC
3	4	57.29580	P-DEG/SEC
3	5	57.29580	Q-DEG/SEC
3	6	57.29580	R-DEG/SEC
29	46	57.29580	RS-DEG/SEC
29	47	57.29580	PS-DEG/SEC
2	16	1.00000	XEDT-FT/S
2	17	1.00000	YEDT-FT/S
2	18	1.00000	ZEDT-FT/S
3	16	1.00000	XE-FT
3	17	1.00000	YE-FT
3	18	1.00000	ZE-FT
3	64	57.29580	THETA-DEG
3	65	57.29580	PHI-DEG
3	66	57.29580	PSI-DEG
29	32	1.00000	D11
29	33	1.00000	D12
29	34	1.00000	D13
29	35	1.00000	D21
29	36	1.00000	D22
29	37	1.00000	D23
29	38	1.00000	D31
29	39	1.00000	D32
29	40	1.00000	D33
29	50	57.29580	DEC-DEG
28	52	57.29580	DAC-DEG
3	19	57.29580	L.ELEV-DEG
3	20	57.29580	R.ELEV-DEG
3	21	57.29580	DR-DEG
3	24	57.29580	PSIT-DEG
3	26	57.29580	THTT-DEG
3	28	1.00000	RCS NORM.
3	48	57.29580	CAN.FLP-DG
3	49	57.29580	WNG.FLP-DG
29	9	.59200	VA-KT
29	13	57.29580	ALPHA-DEG
29	14	57.29580	BETA-DEG
29	54	1.00000	NXCG-G
29	55	1.00000	NYCG-G
29	56	1.00000	NZCG-G
28	20	1.00000	DROLL
28	29	1.00000	DYAW
28	38	1.00000	DPITCH
26	58	1.00000	TCMD-LB
26	34	1.00000	TOU -LB
25	1	1.00000	MDOT-LB/S
25	3	1.00000	RPM-RAD/S
25	7	1.00000	BLDAVL
27	19	1.00000	BLDFEQ
3	52	57.29580	PHITRM-DEG
3	53	57.29580	P.INTE-DEG
3	54	1.00000	P.ERR.INT
3	55	57.29580	PSITRM-DEG

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       3   56     57.29580     R.INTE-DEG
       3   57      1.00000     R.ERR.INT
       3   58     57.29580     PSITRMBUT
       3   59     57.29580     THETRM-DEG
       3   60     57.29580     Q.INTE-DEG
       3   61      1.00000     Q.ERR.INT.
       3   62     57.29580     THETRMBUT
       3   63      1.00000     ZE.ERR.INT
      28   19     57.29580     P.ERR-DG/S
      28   26     57.29580     R.ERR-DG/S
      28   35     57.29580     Q.ERR-DG/S
      28   40      1.00000     ZE.ERR-F/S
      28   12      1.00000     ROLLCMD
      28   21      1.00000     YAWCMD
      28   11      1.00000     CON.SYS.SW
      28   13     57.29580     DLATSTK-DG
      28   22     57.29580     DPED-DG/S
      28   31     57.29580     LNG.STK.
      28   39      1.00000     ZEDT.CMD.
      28   43      1.00000     THROTTLE
      28    1      1.00000     ZE.ERR-FT
      28    3      1.00000     YE.ERR-FT
      28    8      1.00000     XBODY.ER-F
      28    9      1.00000     YBODY.ER-F
      28   10      1.00000     ZBODY.ER-F
      26   20      1.00000     TRCS
       0    0      0.00000     BLANK CARD-END TIME HISTORY OUTPUT SPECIFICATIONS
  NOUT=   82

   STORE FIXED TABLES ETC.

       4    1    4    5 WT,IX,IY,IZ,IXZ                              0.00000
 16375.00000   7959.00000   52609.00000   58337.00000   -202.40000
       4    6    4    9  FSCG,BLCG,WLCG                              .08333
   401.50000      0.00000     99.00000
       5    1    5   19 TOL(I)-TRIM TOLERANCES                       0.00000
      .50000      .50000      .50000     1.00000     1.00000     1.00000      .50000      .10000
      .10000      .10000      .02000      .02000      .02000      .50000      .50000     0.00000
     0.00000     0.00000     0.00000
       6    1    6   70 AAERO,AERO(I,J)-AERO LIFT-DRAG CONSTANTS     0.00000
     0.00000     2.30000     2.14000   350.00000   217.20000      .78900      .87300      .15000
     1.06000      .59300     6.04500      .00394      .25300      .97400      .63000      .17200
    -.34300      .09100     -.08590      .30400      .00502     -.01910      .52500      .87300
     2.25000      .99600   115.80000    51.10000      .93400     1.04700      .25000     1.12000
      .51500     6.04500      .00281      .44200      .10650      .10550      .08650      .43200
     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000      .52500     2.00000
     2.00000    60.00000    60.00000      .78500      .92500      .30000     1.03000      .47100
     6.04500      .00431      .17900     0.00000     0.00000     0.00000     0.00000     0.00000
     0.00000     0.00000     0.00000     0.00000     0.00000     0.00000
       5   71    6   79 SURFCP(I,J)                                  0.00000
      .57100      .17500      .73400      .49500      .72700      .80000      .74900     -.02800
      .97600
       7    1    7    4  FSW,BLW1,BLW2,WLW                           .08   3
   440.00000    -70.00000    70.00000    99.00000
       7    5    7    9  CW,BW,EKDA1,EKDA2,EIW                       0.00000
```

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  14.58000      28.38000       0.00000       0.00000       0.00000
     7  10     7  13  CLBOW,CLBCLW,CLRCLW,CLPW                           0.00000
   0.00000     -.23500        .27500       -.19200
     7  14     7  19  CNBOW,CNBCL2W,CNRCL2W,CNRCOW,CNPCLW,CNPCOAW        0.00000
   0.00000     -.13200       -.16680       -.45500       -.18500      0.00000
     7  20     7  21  CMOW,CMDFW                                         0.00000
   0.00000     -.01910
     7  22     7  22  AEKEL                                              0.00000
   7.00000
     7  23     7  23  CYBCL2W                                            0.00000
   -.30000
     8   1     8   3  FSH,BLH,WLH                                         .08333
 312.50000      0.00000     115.00000
     8   4     8   8  CH,BH,EKADE,EIH,EOCLW                              0.00000
   6.42000      16.13000       0.00000       -.08730        .16200
     8   9     8  10  CMDFH,CMOH                                         0.00000
   -.05730      0.00000
     9   1     9   3  FSV,BLV,WLV                                         .08333
 536.00000      0.00000     157.00000
     9   4     9   9  CV,BV,EKADP,EIV,EKV,CNOV                           0.00000
   8.45300      7.75000       .50000       0.00000       0.00000      0.00000
     9  10     9  10  AEKRUD                                             0.00000
   7.00000
     9  11     9  20  TALFA(I)                                            .01745
-180.00000     20.00000      30.00000      40.00000      50.00000    130.00000     140.00000     150.00000
 160.00000    180.00000
     9  21     9  21  AALFA                                              0.00000
  10.00000
     9  22     9  31  TVTEFF(I)                                          0.00000
   1.00000      1.00000        .70000        .25000       0.00000      0.00000        .25000        .70000
   1.00000      1.00000
    10   1    10   3  FSF,BLF,WLF                                         .08333
 174.00000      0.00000      93.00000
    10   4    10  10  AOQO,SOQMX,WFOQM,MOQMX1,MOQMX2,NOQMX1,NOQMK2       0.00000
   1.44300    367.80000     367.80000     532.00000    -118.60000    532.00000    -118.60000
    10  11    10  13  ADF,A1F,A2F                                         .01745
   2.00000     40.00000      90.00000
    10  14    10  20  EN1,EN2,EN3,EN4,EN5,EN6,EN7                        0.00000
   2.00000      1.86700       1.52200        .80000       1.00000       .80000       1.00000
    10  21    10  21  DFSFO                                              0.00000
  17.80000
    10  22    10  23  ADFSF1,ADFSF2                                      0.00000
    .26200       .80300
    10  24    10  24  XKYF                                               0.00000
   0.00000
    11   1    11   6  FSSW1,FSSW2,BLSW1,BLSW2,WLSW1,WLSW2                 .08333
 551.00000    551.00000     -22.20000      22.20000     100.00000    100.00000
    11   7    11  11  SIGY ELN,KAFT1,KAFT2,AENG                          0.00000
   0.00000      4.26000       -.13000       1.00000       2.00000
    12   1    12   6  FSIN1,FSIN2,BLIN1,BLIN2,WLIN1,WLIN2                 .08333
 266.00000    266.00000     -33.00000      33.00000     100.00000    100.00000
    12   7    12   9  RINLET,AVOVI,ATURN                                 0.00000
   4.31000      5.00000       5.00000
    13   1    13   1  ELDUCT                                              .08333
 335.00000
    14   1    14   5  AMACH,KBT1,KBT2,KM1,KM2                            0.00000
   4.00000     -.02760       1.00000        .56500        .43500
```

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     14    6    14    8 OMEGMX,RPMMX,RCS                                        0.00000
 1063.50000  10159.00000     1.00000
     14    9    14   10  AFRAT,JENG                                             0.00000
    6.00000      3.14000
     14   11    14   14  AFRAC,TAJAB,ABACCEL,ABDECEL                            0.00000
    6.00000      .05000     20.00000    -20.00000
     14   15    14   16  TABON,TABOFF                                           0.00000
     .10000      .00100
     15    1    15    3  ARCSJET,ABLDR,BLDREF,                                  0.00000
    2.00000     6.00000      3.50000
     15    4    15    5  FRCSMX1,FRCSMX2                                        0.00000
 1500.00000  1500.00000
     15   14    15   15  DEMAND1,DEMAND2                                        0.00000
    1.00000     1.00000
     15   24    15   25  BLDMOR1,BLDMOR2                                        0.00000
    1.00000     1.00000
     15   34    15   35  RCSL(1,1),RCSL(2,1)                                    0.00000
   -1.00000     1.00000
     15   84    15   85  FSRCS1,FSRCS2                                           .08333
  534.00000   534.00000
     15   94    15   95  BLRCS1,BLRCS2                                           .08333
 -160.00000   160.00000
     15  104    15  105  WLRCS1,WLRCS2                                           .08333
  100.00000   100.00000
     15  114    15  115  THTRCS1,THTRCS2                                         .01745
  -90.00000   -90.00000
     15  124    15  125  PSIRCS1,PSIRCS2                                         .01745
    0.00000     0.00000
     16   13    16   13  CSV                                                    0.00000
     .28600
     16   14    16   14  VASW                                                   1.68000
   60.00000
     16   66    16   69 PELIM,AKDYDR,KTHTR,KOA                                  0.00000
    1.00000     0.00000     0.00000     -.43600
     16  110    16  113 PELIM,AKYTRM,KPSIT,KDR                                  0.00000
    1.00000      .34900     -.26200     -.43600
     16  114    16  119 TAKAY(I)-LAT.ACCEL.FDBACK TABLE                         0.00000
    0.00000     0.00000      .08250      .10500      .08000      .04000
     16  122    16  122 KTY                                                     0.00000
    0.00000
     16  163    16  167 QELIM,AKPTRM,DSTK,KDE,KTHTP                             0.00000
    1.00000      .34900     10.00000     -.43600     -.26200
     16  184    16  184 AKTHROT                                                 0.00000
30000.00000
     16  185    16  185 ZELIM                                                   0.00000
30000.00000
     16  186    16  188  ELEVNRF,PSITRF(I)                                      0.00000
    0.00000     0.00000     0.00000
     16  189    16  192 KHFLAP1,KHFLAP2,KWFLAP1,KWFLAP2                         0.00000
    5.56000    -1.10400      4.17000     -.18900
     16  193    16  193 Q2BAR                                                   0.00000
    7.00000
     16  194    16  199  TQBAR(I)-DYNAMIC PRESSURE TABLE                        0.00000
    0.00000     9.95000     10.00000     20.00000     46.00000    127.00000
     17    1    17    4  LEURATL,LELRATL,LEUPOSL,LELPOSL                         .01745
   35.00000   -35.00000     60.00000    -50.00000
     17    5    17    5  TLEL                                                   0.00000
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      .05000
      17     6     17     9  REURATL,RELRATL,REUPOSL,RELPOSL                              .01745
    35.00000      -35.00000       60.00000      -60.00000
      17    10     17    10  TREL                                                         0.00000
      .05000
      17    11     17    14  DRURATL,DRLRATL,DRUPOSL,DRLPOSL                              .01745
   100.00000     -100.00000       25.00000      -25.00000
      17    15     17    15  TDR                                                          0.00000
      .05000
      17    16     17    19  HFURATL,HFLRATL,HFLAPMX,HFLAPMN                              .01745
    10.00000      -10.00000       25.00000      -12.00000
      17    20     17    20  THF                                                          0.00000
      .10000
      17    21     17    24  WFJRATL,4FLRATL,WFLAPMX,WFLAPMN                              .01745
    10.00000      -10.00000       30.00000        0.00000
      17    25     17    25  TWF                                                          0.00000
      .10000
      17    26     17    33  THTURL(2),THTLRL(2),THTUPL(2),THTLPL(2)                      .01745
    50.00000       50.00000      -50.00000      -50.00000       15.00000       15.00000     -15.00000     -15.00000
      17    34     17    35  TTHT(2)                                                      0.00000
      .05000         .05000
      17    36     17    43  PSIURL(2),PSILRL(2),PSIUPL(2),PSILPL(2)                      .01745
    50.00000       50.00000      -50.00000      -50.00000       15.00000       15.00000     -15.00000     -15.00000
      17    44     17    45  TPSIT(2)                                                     0.00000
      .05000         .05000
      17    46     17    47  RCSURL(2)                                                    0.00000
    10.00000       10.00000
      17    56     17    57  RCSLRL(2)                                                    0.00000
   -10.00000      -10.00000
      17    66     17    67  RCSUPL(2)                                                    0.00000
     1.00000        1.00000
      17    76     17    77  RCSLPL(2)                                                    0.00000
    -1.00000       -1.00000
      17    86     17    87  TAURCS(2)                                                    0.00000
      .05000         .05000
      17    96     17    97  FRCSURL(2)                                                   0.00000
 15000.00000    15000.00000
      17   106     17   107  FRCSLRL(2)                                                   0.00000
-15000.00000   -15000.00000
      17   116     17   117  FRCSUPL(2)                                                   0.00000
  1500.00000     1500.00000
      17   126     17   127  FRCSLPL(2)                                                   0.00000
 -1500.00000    -1500.00000
      17   136     17   137  TAUFPCS(2)                                                   0.00000
      .05000         .05000
      17   146     17   148  DELIM,DALIM,DRLIM                                            .01745
    25.00000       25.00000       25.00000
      30     1     30     5  VOVIT(I)-VOVI TABLE FOR RAM F + M                            0.00000
     0.00000         .22700         .29400         .51400       10.00000
      30     6     30    11  ATURNT(J)-ATURN TABLE FOR RAM F + M                          .01745
     0.00000       20.00000       45.00000       70.00000       90.00000      180.00000
      30    14     30    43  ELRAMT(I,J)-MOMENT ARM TABLE FOR RAM F + M                   .08373
     0.00000        0.00000        0.00000        0.00000        0.00000        1.78000        .97300        .69300
      .23400         .23400        3.51000        2.24800        1.76500        1.84200       1.84200       4.54000
     3.43300        2.99600        2.43700        2.43700        4.87000        4.08400       3.81800       3.56400
     3.56400        4.47000        4.08400        3.81800        3.56400        3.56400
      30    54     30    83  DATURNT(I,J)-DELTA ATURN TABLE FOR RAM F + M                 .01745
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   0.00000      0.00000      0.00000      0.00000      0.00000     12.91000     12.91000      7.72000
   5.08000      5.08000     19.47000     19.47000     12.41000     11.59000     11.59000     15.65000
  15.65000     12.11000     11.59000     11.59000      8.44000      8.44000      6.83000     12.59000
  12.59000      8.44000      8.44000      6.83000     12.53000     12.59000
    30   94    30  123 ETART(I,J)-RAM EFFIC. FACTOR TABLE                       0.00000
   1.00000      1.00000      1.00000      1.00000      1.00000      1.00000      1.00000      1.00000
   1.00000      1.00000      1.19500      1.19500      1.12700      1.01600      1.01600      1.37200
   1.37200      1.23400      1.09200      1.09200      1.40200      1.40200      1.24300      1.10800
   1.10800      1.40200      1.40200      1.24300      1.10800      1.10800
    31    1    31    6 FRCST(I)-AVAIL. RCS FORCE TABLE                          0.00000
   0.00000       .01000    170.00000    365.00000    500.00000    875.00000
    31    7    31   12 BLDRT(I)- RCS BLEED TABLE                                0.00000
   0.00000      3.50000      4.50000     10.00000     15.00000     30.00000
    32    1    32    4 MNT(I)-MACH TABLE FOR PROPULSION SYSTEM                  0.00000
   0.00000       .10000       .20000       .30000
    32    5    32    8 TFGMAX(I)-MAX A/B THRUST TABLE                           0.00000
15416.00000  15705.00000  16162.00000  16705.00000
    32    9    32   12 TFGMIN(I)-MIN A/B THRUST TABLE                           0.00000
 9323.00000   9491.00000   9772.00000  10105.00000
    32   13    32   16 TFGIDL(I)-IDLE THRUST TABLE                              0.00000
  629.00000    753.00000   1004.00000   1306.00000
    32   17    32   20 TMOT(I)-MAX, FLOW RATE TABLE                             0.00000
  138.20000    140.10000    143.10300    146.50000
    32   21    32   26 TFRAT(I) - FG/FGMIN TABLE                                0.00000
   0.00000       .20000       .40000       .60000       .80000      1.00000
    32   27    32   32 TRPM(I) - FRAC. RPM TABLE                                0.00000
   0.00000       .28000       .49000       .66500       .83500      1.00000
    32   33    32   38 TFRACT(I) - FRACTIONAL THRUST TABLE                      0.00000
   0.00000       .13330       .20000       .33330       .66670      1.00000
    32   43    32   46 TACCEL(I)-ACCELERATION LIMIT TABLE                       0.00000
    .10000       .40000       .40000       .40000       .40000       .40000
    32   53    32   58 TDECEL(I) - DECELERATION LIMIT TABLE                     0.00000
   -.10000      -.40000      -.47500      -.62500     -1.00000     -1.00000
    32   63    32   68 TTENG(I)-ENGINE TIME CONSTANT                            0.00000
   1.00000       .50000       .40000       .38000       .20000       .20000
    39    1    39   23  ADER,DELV(I)                                            0.00000
  22.00000      5.00000      5.00000       .10000       .01745       .01745       .01745       .05000
    .05000    100.00000    100.00000       .01745       .01745      5.00000       .10000       .10000
    .01745       .01745       .05000       .05000       .05000       .01745       .01745
    42    1    42    7 ELEVT(I)-ELEVON TABLE                                     .01745
   0.00000     10.00000     20.00000     30.00000     40.00000     60.00000    100.00000
    42    8    42   14 EKELET(I)-ELEVON EFFECTIVENESS TABLE                     0.00000
   1.00000      1.00000       .77000       .59000       .53000       .45000       .45000
    42   15    42   21 RUDT(I)-RUDDER TABLE                                      .01745
   0.00000     10.00000     20.00000     30.00000     40.00000     60.00000    100.00000
    42   22    42   28 EKRUDT(I) -RUDDER EFFECTIVENESS TABLE                    0.00000
   1.00000      1.00000       .82000       .62000       .55000       .47000       .47000
    44    1    44    3  ACSSH,TCSS#1                                            0.00000
   2.00000      0.00000      1.00000
    44    7    44    8 TAKQS                                                    0.00000
   1.00000      1.00000
    44   12    44   13  TKPINT                                                  0.00000
   0.00000      1.00000
    44   17    44   18  TKPHI                                                   0.00000
   1.00000      0.00000
    44   22    44   23  TKPB                                                    0.00000
   0.00000      1.00000
```

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   44   27    44    28  TKPS                                                          0.00000
 1.00000        0.00000
   44   32    44    33  TKQINT                                                        0.00000
 0.00000        1.00000
   44   37    44    38  TKTHETA                                                       0.00000
 1.00000        0.00000
   44   42    44    43  TKRINT                                                        0.00000
 0.00000        1.00000
   44   47    44    48  TKPSI                                                         0.00000
 0.00000        0.00000
   44   52    44    53  TKRB                                                          0.00000
 0.00000        1.00000
   44   57    44    58  TAKPCI                                                        0.00000
 1.00000        1.00000
   44   62    44    63  TAKPEI                                                        0.00000
 1.00000        1.00000
   44   67    44    68  TAKRCI                                                        0.00000
 0.00000        0.00000
   44   72    44    73  TAKREI                                                        0.00000
 1.00000        1.00000
   44   77    44    78  TAKQCI                                                        0.00000
 1.00000        0.00000
   44   82    44    83  TAKQEI                                                        0.00000
 1.00000        1.00000
   44   87    44    88  TKRS                                                          0.00000
 1.00000        0.00000
   44   92    44    92  AKPHIRS                                                       0.00000
 1.00000
   45    1    45     1  VELGAIN                                                       0.00000
 1.00000
   45    2    45     2  AVEL                                                          0.00000
 6.00000
   45    3    45     8  TVEL                                                          1.60000
 0.00000       59.50000     60.00000     80.00000    120.00000    200.00000
   45   11    45    16  VAKPC                                                         0.00000
  .30000         .30000       .30000       .30000       .50000       .50000
   45   19    45    24  VKPCI1                                                        0.00000
 1.00000        1.00000      1.00000      1.00000      1.00000      1.00000
   45   27    45    32  VKPEI1                                                        0.00000
  .80000         .80000       .20000       .20000       .20000       .20000
   45   35    45    40  VKP                                                           0.00000
  .50000         .50000       .50000       .50000       .50000       .50000
   45   43    45    45  VAKPE                                                         0.00000
 6.00000        6.00000      2.00000      2.00000      4.00000      2.00000
   45   51    45    56  VAKRC                                                         0.00000
 1.00000        1.00000      1.00000      1.00000      1.00000      1.00000
   45   59    45    64  VKRC                                                          0.00000
 0.00000        0.00000      0.00000      0.00000      0.00000      0.00000
   45   67    45    72  VKREI1                                                        0.00000
  .80000         .80000       .20000       .20000       .20000       .20000
   45   75    45    80  VKR                                                           0.00000
  .50000         .50000      1.00000      1.00000      1.00000      1.00000
   45   83    45    88  VAKRE                                                         0.00000
13.00000       13.00000       .30000      1.10000      1.10000      1.10000
   45   91    45    96  VAKQC                                                         0.00000
 1.00000        1.00000       .30000       .30000       .30000       .30000
   45   99    45   104  VKQCI1                                                        0.00000
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```
  0.00000      0.00000      1.00000      1.00000      1.00000      1.00000
   45  107    45  112  VKQEI1                                            0.00000
   .20000       .20000       .20000       .20000       .20000       .20000
   45  115    45  120  VKQ                                               0.00000
   .50000       .50000       .50000       .50000       .50000       .50000
   45  123    45  128  VAKQE                                             0.00000
 10.00000     10.00000     15.00000     15.00000      8.00000      5.00000
   45  131    45  136  VAKZE                                             0.00000
-500.00000   -500.00000     0.00000      0.00000      0.00000      0.00000
   45  139    45  144 VKZEI1                                             0.00000
   .20000       .20000      0.00000      0.00000      0.00000      0.00000
   45  147    45  152  VTPITCH                                           0.00000
   .25000       .25000      0.00000      0.00000      0.00000      0.00000
   45  155    45  160  VTROLL                                            0.00000
  0.00000      0.00000      0.00000      0.00000      0.00000      0.00000
   45  163    45  168  VTYAW                                             0.00000
   .25000       .25000      0.00000      0.00000      0.00000      0.00000
    0     0     0     0     BLANK CARD-END OF BASIC LOAD                 0.00000


NOPT=7 READ VARIABLE OUTPUT FORMATS

    (    10X,32HDRAG COEFFICIENT BUILDUP              )
    (    10X,32HSIDE FORCE COEFFICIENT BUILDUP        )
    (    10X,32HLIFT COEFFICIENT BUILDUP              )
    (    10X,32HROLL MOMENT COEFFICIENT BUILDUP       )
    (    10X,32HPITCH MOMENT COEFFICIENT BUILDUP      )
    (    10X,32HYAW MOMENT COEFFICIENT BUILDUP        )
    (    10X,32HSUMMARY OF TOTAL COEFFICIENTS         )
(14X,5HALPHA,10X5HBETA ,10X5HWING ,10X5HH.T. ,10X5HV.T. ,10X5HFUS  ,10X5HTOTAL)
    (    5X,7F14.6)
(14X,5HALPHA,10X4HBETA,11X2HCD,13X2HCY,13X2HCL,13X2HCR,13X2HCM,13X2HCN)
    (    5X,8F14.6)
    (    5X,8F14.6)


NOPT=2 READ R

NTAP= 5

    3   48     3   49  DFLAPH,DFLAPW                                      .01745
 25.00000     30.00000
   19   47    19   48  DA1,DA2                                            .01745
-10.00000    -10.00000


NOPT=11 SIMULATED WIND TUNNEL RUNS
```

ORIGINAL PAGE IS
OF POOR QUALITY

DRAG COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	.045867	.013578	.000739	.004123	.064307
5.000000	0.000000	.037131	.013768	.000730	.005989	.057618
10.000000	0.000000	.050261	.016143	.000706	.014103	.081212
15.000000	0.000000	.086434	.022319	.000666	.031798	.141218
20.000000	0.000000	.135670	.035206	.000613	.063589	.235078
25.000000	0.000000	.184423	.058550	.000467	.109322	.352763
30.000000	0.000000	.227844	.094164	.000336	.168909	.491252
35.000000	0.000000	.273605	.144142	.000193	.241322	.659261
40.000000	0.000000	.319977	.225910	.000083	.324699	.870669
45.000000	0.000000	.380689	.261670	.000033	.416461	1.058852
50.000000	0.000000	.451840	.265543	0.000000	.513455	1.230838
55.000000	0.000000	.521969	.264654	0.000000	.612123	1.398746
60.000000	0.000000	.584472	.256842	0.000000	.708678	1.549991
65.000000	0.000000	.636194	.241733	0.000000	.799299	1.677227
70.000000	0.000000	.678552	.224094	0.000000	.880317	1.782963
75.000000	0.000000	.709965	.206798	0.000000	.948395	1.865157
80.000000	0.000000	.730041	.191[illegible]71	0.000000	1.000693	1.922805
85.000000	0.000000	.740634	.180622	0.000000	1.035009	1.956265
90.000000	0.000000	.744686	.175800	0.000000	1.049883	1.970369

SIDE FORCE COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
15.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
20.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
30.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
35.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
40.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
45.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
50.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
55.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
60.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
65.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
70.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
75.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
80.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	-.000000	-.000000

LIFT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.213234	-.003731	0.000000	-.014631	-.231595
5.000000	0.000000	.011461	.014511	-.000064	.021513	.047441
10.000000	0.000000	.261195	.030213	-.000124	.056954	.348237
15.000000	0.000000	.504316	.052954	-.000178	.103810	.660901
20.000000	0.000000	.710043	.084614	-.000223	.164064	.958497
25.000000	0.000000	.864622	.125020	-.000218	.226429	1.215853
30.000000	0.000000	.980331	.168531	-.000194	.286374	1.435043
35.000000	0.000000	1.023709	.213602	-.000135	.339820	1.576996
40.000000	0.000000	.813823	.274629	-.000070	.383198	1.471580
45.000000	0.000000	.647108	.277965	-.000033	.413546	1.338586
50.000000	0.000000	.538126	.260199	0.000000	.428616	1.226941
55.000000	0.000000	.464299	.242287	0.000000	.426957	1.133543
60.000000	0.000000	.404705	.222434	0.000000	.407965	1.035105
65.000000	0.000000	.344866	.198878	0.000000	.371907	.915643
70.000000	0.000000	.291322	.170719	0.000000	.319896	.781937
75.000000	0.000000	.234120	.138090	0.000000	.253836	.626046
80.000000	0.000000	.165759	.101548	0.000000	.176323	.443630
85.000000	0.000000	.087817	.063610	0.000000	.090520	.241948
90.000000	0.000000	-.000000	.027921	0.000000	-.000000	.027921

ROLL MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
15.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
20.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
30.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
35.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
40.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
45.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
50.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
55.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
60.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
65.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
70.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
75.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
80.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	.000000	.000000

PITCH MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	.096775	.026862	.000245	-.028174	.095708
5.000000	0.000000	.046434	.036548	.000243	.042275	.125500
10.000000	0.000000	-.014441	.044530	.000238	.112726	.143053
15.000000	0.000000	-.075421	.055495	.000229	.196834	.177137
20.000000	0.000000	-.125311	.070334	.000216	.264493	.209731
25.000000	0.000000	-.157350	.089186	.000171	.310361	.242368
30.000000	0.000000	-.172619	.110080	.000129	.327877	.265467
35.000000	0.000000	-.173692	.132783	.000078	.312518	.271687
40.000000	0.000000	-.153456	.154275	.000036	.261604	.272459
45.000000	0.000000	-.143988	.166892	.000015	.174162	.197081
50.000000	0.000000	-.149542	.155525	0.000000	.155960	.161943
55.000000	0.000000	-.164482	.142882	0.000000	.157954	.136353
60.000000	0.000000	-.183210	.127701	0.000000	.156755	.101246
65.000000	0.000000	-.202107	.109705	0.000000	.152325	.059923
70.000000	0.000000	-.222837	.093636	0.000000	.144639	.015438
75.000000	0.000000	-.242614	.081280	0.000000	.133648	-.027686
80.000000	0.000000	-.259918	.071287	0.000000	.119140	-.069490
85.000000	0.000000	-.274721	.065245	0.000000	.100163	-.109314
90.000000	0.000000	-.285245	.063332	0.000000	.081896	-.140018

// I MOMENT COEF. CIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FJS	TOTAL
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
15.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
20.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
30.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
35.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
40.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
45.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
50.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
55.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
60.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
65.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
70.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
75.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
80.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	-.000000	-.000000

SUMMARY OF TOTAL COEFFICIENTS

ALPHA	BETA	CD	CY	CL	CR	CM	CN
0.000000	0.000000	.064307	0.000000	-.231595	0.000000	.095787	0.000000
5.000000	0.000000	.057610	0.000000	.047441	0.000000	.125500	0.000000
10.000000	0.000000	.081212	0.000000	.348237	0.000000	.143051	0.000000
15.000000	0.000000	.141218	0.000000	.660901	0.000000	.177137	0.000000
20.000000	0.000000	.235078	0.000000	.958497	0.000000	.209731	0.000000
25.000000	0.000000	.352763	0.000000	1.215853	0.000000	.24[illegible]360	0.000000
30.000000	0.000000	.491252	0.000000	1.435043	0.000000	.265467	0.000000
35.000000	0.000000	.659261	0.000000	1.576996	0.000000	.271687	0.000000
40.000000	0.000000	.870669	0.000000	1.471580	0.000000	.272459	0.000000
45.000000	0.000000	1.058852	0.000000	1.338586	0.000000	.197081	0.000000
50.000000	0.000000	1.230838	0.000000	1.226941	0.000000	.161893	0.000000
55.000000	0.000000	1.398746	0.000000	1.133543	0.000000	.136353	0.000000
60.000000	0.000000	1.549991	0.000000	1.035185	0.000000	.101246	0.000000
65.000000	0.000000	1.677227	0.000000	.915643	0.000000	.059923	0.000000
70.000000	0.000000	1.782963	0.000000	.781937	0.000000	.015438	0.000000
75.000000	0.000000	1.865157	0.000000	.626046	0.000000	-.027686	0.000000
80.000000	0.000000	1.922005	0.000000	.443630	0.000000	-.069490	0.000000
85.000000	0.000000	1.956265	0.000000	.241948	0.000000	-.109314	0.000000
90.000000	0.000000	1.970369	-.000000	.027921	.000000	-.140818	-.000000

NOPT=11 SIMULATED WIND TUNNEL RUNS

DRAG COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	.045867	.013578	.000739	.004123	.064307
0.000000	-5.000000	.045519	.013475	-.000776	.004092	.062309
0.000000	-10.000000	.044484	.013169	-.005302	.003999	.056349
0.000000	-15.000000	.042794	.012669	-.013118	.003847	.046191
0.000000	-20.000000	.040502	.011990	-.024323	.003641	.031809
0.000000	-25.000000	.037675	.011153	-.038201	.003386	.014014
0.000000	-30.000000	.034400	.010184	-.032508	.003092	.015168
0.000000	-35.000000	.030777	.009111	-.011530	.002766	.031124
0.000000	-40.000000	.026916	.007968	.006172	.002419	.043475
0.000000	-45.000000	.022933	.006789	.018007	.002061	.049791
0.000000	-50.000000	.018951	.005610	.024125	.001703	.050390
0.000000	-55.000000	.015090	.004467	.025730	.001356	.046643
0.000000	-60.000000	.011467	.003395	.024236	.001031	.040128
0.000000	-65.000000	.008192	.002425	.020942	.000736	.032296
0.000000	-70.000000	.005365	.001588	.016870	.000482	.024307
0.000000	-75.000000	.003073	.000910	.012677	.000276	.016936
0.000000	-80.000000	.001383	.000409	.008607	.000124	.010524
0.000000	-85.000000	.000348	.000103	.004520	.000031	.005003
0.000000	-90.000000	-.000000	-.000000	-.000000	-.000000	-.000000

SIDE FORCE COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	-5.000000	.001181	0.000000	.043253	.019998	.064432
0.000000	-10.000000	.002309	0.000000	.086794	.039995	.129098
0.000000	-15.000000	.003332	0.000000	.123559	.084257	.211148
0.000000	-20.000000	.004204	0.000000	.149100	.141781	.295086
0.000000	-25.000000	.004889	0.000000	.165613	.210469	.380971
0.000000	-30.000000	.005357	0.000000	.153617	.288085	.447059
0.000000	-35.000000	.005591	0.000000	.135502	.372249	.513342
0.000000	-40.000000	.005588	0.000000	.133154	.460475	.599217
0.000000	-45.000000	.005357	0.000000	.141055	.550215	.696626
0.000000	-50.000000	.004918	0.000000	.153613	.638919	.797450
0.000000	-55.000000	.004308	0.000000	.167023	.724094	.895426
0.000000	-60.000000	.003571	0.000000	.179075	.803366	.986012
0.000000	-65.000000	.002764	0.000000	.188732	.874535	1.066031
0.000000	-70.000000	.001949	0.000000	.195731	.935639	1.133369
0.000000	-75.000000	.001196	0.000000	.200523	.984994	1.186713
0.000000	-80.000000	.000574	0.000000	.203485	1.021247	1.225306
0.000000	-85.000000	.000154	0.000000	.205145	1.043404	1.248702
0.000000	-90.000000	.000000	0.000000	.205714	1.050857	1.256571

LIFT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.213234	-.003731	0.000000	-.014631	-.231595
0.000000	-5.000000	-.211614	-.003702	0.000000	-.014520	-.229836
0.000000	-10.000000	-.206804	-.003618	0.000000	-.014190	-.224612
0.000000	-15.000000	-.198950	-.003481	0.000000	-.013651	-.216081
0.000000	-20.000000	-.188230	-.003234	0.000000	-.012919	-.204504
0.000000	-25.000000	-.175149	-.003064	0.000000	-.012018	-.190231
0.000000	-30.000000	-.159925	-.002798	0.000000	-.010973	-.173696
0.000000	-35.000000	-.143092	-.002503	0.000000	-.009817	-.155403
0.000000	-40.000000	-.125131	-.002189	0.000000	-.008586	-.135906
0.000000	-45.000000	-.106617	-.001865	0.000000	-.007315	-.115798
0.000000	-50.000000	-.088103	-.001541	0.000000	-.006045	-.095690
0.000000	-55.000000	-.070152	-.001227	0.000000	-.004813	-.076193
0.000000	-60.000000	-.053308	-.000933	0.000000	-.003658	-.057899
0.000000	-65.000000	-.038085	-.000666	0.000000	-.002613	-.041364
0.000000	-70.000000	-.024944	-.000436	0.000000	-.001711	-.027092
0.000000	-75.000000	-.014284	-.000250	0.000000	-.000980	-.015514
0.000000	-80.000000	-.006430	-.000112	0.000000	-.000441	-.006983
0.000000	-85.000000	-.001620	-.000028	0.000000	-.000111	-.001759
0.000000	-90.000000	.000000	.000000	0.000000	.000000	.000000

ORIGINAL PAGE IS
OF POOR QUALITY

ROLL MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	-5.000000	-.004340	0.000000	.007366	0.000000	.003026
0.000000	-10.000000	-.008482	0.000000	.014781	0.000000	.006299
0.000000	-15.000000	-.012240	0.000000	.021042	0.000000	.008802
0.000000	-20.000000	-.015446	0.000000	.025392	0.000000	.009946
0.000000	-25.000000	-.017959	0.000000	.028204	0.000000	.010245
0.000000	-30.000000	-.019678	0.000000	.026161	0.000000	.006483
0.000000	-35.000000	-.020540	0.000000	.023076	0.000000	.002536
0.000000	-40.000000	-.020529	0.000000	.022676	0.000000	.002147
0.000000	-45.000000	-.019678	0.000000	.024022	0.000000	.004344
0.000000	-50.000000	-.018068	0.000000	.026160	0.000000	.008093
0.000000	-55.000000	-.015825	0.000000	.028444	0.000000	.012619
0.000000	-60.000000	-.013119	0.000000	.030497	0.000000	.017378
0.000000	-65.000000	-.010153	0.000000	.032141	0.000000	.021988
0.000000	-70.000000	-.007161	0.000000	.033342	0.000000	.026180
0.000000	-75.000000	-.004394	0.000000	.034149	0.000000	.029755
0.000000	-80.000000	-.002110	0.000000	.034654	0.000000	.032544
0.000000	-85.000000	-.000565	0.000000	.034936	0.000000	.034372
0.000000	-90.000000	.000000	0.000000	.035033	0.000000	.035033

PITCH MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	.096775	.026862	.000245	-.028174	.095707
0.000000	-5.000000	.096040	.026658	-.000257	-.027960	.094480
0.000000	-10.000000	.093857	.026052	-.001758	-.027325	.090826
0.000000	-15.000000	.090292	.025062	-.004349	-.026287	.084719
0.000000	-20.000000	.085454	.023720	-.008063	-.024879	.076233
0.000000	-25.000000	.079490	.022064	-.012663	-.023142	.065749
0.000000	-30.000000	.072581	.020146	-.010776	-.021131	.060821
0.000000	-35.000000	.064937	.018025	-.003822	-.018905	.060234
0.000000	-40.000000	.056790	.015763	.002046	-.016533	.058065
0.000000	-45.000000	.048387	.013431	.005969	-.014087	.053700
0.000000	-50.000000	.039985	.011099	.007997	-.011641	.047440
0.000000	-55.000000	.031838	.008837	.008529	-.009269	.039935
0.000000	-60.000000	.024194	.006715	.008034	-.007044	.031900
0.000000	-65.000000	.017285	.004798	.006942	-.005032	.023992
0.000000	-70.000000	.011321	.003142	.005592	-.003296	.016759
0.000000	-75.000000	.006493	.001799	.004202	-.001887	.010597
0.000000	-80.000000	.002919	.000810	.002853	-.000850	.005732
0.000000	-85.000000	.000735	.000204	.001498	-.000214	.002224
0.000000	-90.000000	.000000	.000000	-.000000	-.000000	-.000000

ORIGINAL PAGE IS OF POOR QUALITY

YAW MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	-5.000000	.000386	0.000000	-.017013	.011353	-.005274
0.000000	-10.000000	.000755	0.000000	-.033855	.022706	-.010394
0.000000	-15.000000	.001089	0.000000	-.047585	.030766	-.015730
0.000000	-20.000000	.001375	0.000000	-.056441	.037613	-.017453
0.000000	-25.000000	.001598	0.000000	-.061341	.043279	-.016463
0.000000	-30.000000	.001751	0.000000	-.057041	.047741	-.007548
0.000000	-35.000000	.001828	0.000000	-.051348	.050962	.001442
0.000000	-40.000000	.001827	0.000000	-.051473	.052909	.003263
0.000000	-45.000000	.001751	0.000000	-.055603	.053559	-.000293
0.000000	-50.000000	.001608	0.000000	-.061725	.052904	-.007213
0.000000	-55.000000	.001408	0.000000	-.068388	.050954	-.016026
0.000000	-60.000000	.001168	0.000000	-.074688	.047728	-.025792
0.000000	-65.000000	.000904	0.000000	-.080154	.043262	-.035988
0.000000	-70.000000	.000637	0.000000	-.084641	.037592	-.046412
0.000000	-75.000000	.000391	0.000000	-.088221	.030741	-.057089
0.000000	-80.000000	.000188	0.000000	-.091075	.022676	-.068211
0.000000	-85.000000	.000050	0.000000	-.093383	.013166	-.080166
0.000000	-90.000000	-.000000	0.000000	-.095211	-.000007	-.095217

SUMMARY OF TOTAL COEFFICIENTS

ALPHA	BETA	CD	CY	CL	CR	CM	CN
0.000000	0.000000	.064307	0.000000	-.231595	0.000000	.095707	0.000000
0.000000	-5.000000	.062309	.064432	-.229836	.003026	.094480	-.005274
0.000000	-10.000000	.056349	.129098	-.224612	.006293	.090826	-.010394
0.000000	-15.000000	.046191	.211148	-.216081	.008802	.084719	-.015730
0.000000	-20.000000	.031809	.295086	-.204504	.009946	.076233	-.017453
0.000000	-25.000000	.01[illegible]014	.380971	-.190231	.010245	.065749	-.016463
0.000000	-30.000000	.015168	.447059	-.173636	.00[illegible]483	.060821	-.007548
0.000000	-35.000000	.031124	.513342	-.155403	.002536	.060234	.001442
0.000000	-40.000000	.043475	.599217	-.135906	.002147	.058065	.003263
0.000000	-45.000000	.049791	.696626	-.115738	.004344	.053700	-.000293
0.000000	-50.000000	.050330	.797450	-.095690	.009093	.047440	-.007213
0.000000	-55.000000	.046643	.895426	-.076133	.012619	.039935	-.016026
0.000000	-60.000000	.040128	.986012	-.057899	.017378	.031908	-.025792
0.000000	-65.000000	.032296	1.066031	-.041364	.021988	.023992	-.035988
0.000000	-70.000000	.024307	1.133369	-.027092	.026180	.016759	-.046412
0.000000	-75.000000	.016936	1.186713	-.0155[illegible]4	.029755	.010537	-.057089
0.000000	-80.000000	.010524	1.225306	-.006983	.032544	.005732	-.068211
0.000000	-85.000000	.005003	1.248702	-.001759	.034372	.002224	-.080166
0.000000	-90.000000	-.000000	1.256571	.000000	.035033	-.000000	-.095217

NOPT=2 READ 2

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NOPT=11 SIMULATED WIND TUNNEL RUNS

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DRAG COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	.042968	.014010	.000739	.004123	.061848
5.000000	0.000000	.047681	.013634	.000730	.005989	.068035
10.000000	0.000000	.074224	.015511	.000786	.014103	.104543
15.000000	0.000000	.121829	.020502	.000666	.031798	.174795
20.000000	0.000000	.179027	.031736	.000613	.063589	.274965
25.000000	0.000000	.231985	.053286	.0004[illegible]	.109322	.395861
30.000000	0.000000	.276902	.087589	.000336	.168909	.533736
35.000000	0.000000	.320318	.137013	.000193	.241322	.698846
40.000000	0.000000	.354018	.217840	.000083	.324699	.896640
45.000000	0.000000	.405161	.263752	.000033	.416461	1.085407
50.000000	0.000000	.469816	.267758	0.000000	.513455	1.251030
55.000000	0.000000	.535276	.267008	0.000000	.612123	1.414406
60.000000	0.000000	.594079	.259243	0.000000	.708678	1.562088
65.000000	0.000000	.642663	.243891	0.000000	.799299	1.685853
70.000000	0.000000	.682548	.225533	0.000000	.860317	1.768398
75.000000	0.000000	.712002	.207625	0.000000	.948395	1.868022
80.000000	0.000000	.730667	.191547	0.000000	1.000693	1.922907
85.000000	0.000000	.740634	.180622	0.000000	1.035809	1.956265
90.000000	0.000000	.744686	.175880	0.000000	1.049883	1.970369

SIDE FORCE COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
5.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
15.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
20.000000	0.000000	0.000000	0.000000	0.000000	0.00000	0.000000
25.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
30.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
35.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
40.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
45.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
50.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
55.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
60.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
65.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
70.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
75.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
80.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	-.000000	-.000000

LIFT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.044579	-.017539	0.000000	-.014631	-.076748
5.000000	0.000000	.171135	.005702	-.000864	.021513	.198286
10.000000	0.000000	.410925	.020522	-.000124	.056954	.488276
15.000000	0.000000	.643392	.040705	-.000178	.103810	.787729
20.000000	0.000000	.838338	.070853	-.000223	.164064	1.073032
25.000000	0.000000	.982580	.111132	-.000218	.226429	1.319923
30.000000	0.000000	1.088491	.155933	-.000194	.286374	1.530685
35.000000	0.000000	1.122209	.203027	-.000135	.339820	1.664921
40.000000	0.000000	.982435	.265789	-.000070	.383198	1.551352
45.000000	0.000000	.725276	.277408	-.000033	.413546	1.416198
50.000000	0.000000	.605579	.259587	0.000000	.428616	1.293782
55.000000	0.000000	.521154	.241841	0.000000	.426957	1.189952
60.000000	0.000000	.451237	.222334	0.000000	.407965	1.081536
65.000000	0.000000	.381367	.199148	0.000000	.371907	.952422
70.000000	0.000000	.318812	.171194	0.000000	.319896	.809101
75.000000	0.000000	.251191	.138564	0.000000	.253836	.643581
80.000000	0.000000	.173313	.101808	0.000000	.176323	.451444
85.000000	0.000000	.087817	.063610	0.000000	.090520	.241948
90.000000	0.000000	-.000000	.027921	0.000000	-.000008	.027921

ROLL MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.034665	0.000000	0.000000	0.000000	-.034665
5.000000	0.000000	-.032815	0.000000	0.000000	0.000000	-.032815
10.000000	0.000000	-.030775	0.000000	0.000000	0.000000	-.030775
15.000000	0.000000	-.028585	0.000000	0.000000	0.000000	-.028585
20.000000	0.000000	-.026369	0.000000	0.000000	0.000000	-.026369
25.000000	0.000000	-.024245	0.000000	0.000000	0.000000	-.024245
30.000000	0.000000	-.022231	0.000000	0.000000	0.000000	-.022231
35.000000	0.000000	-.020245	0.000000	0.000000	0.000000	-.020245
40.000000	0.000000	-.018213	0.000000	0.000000	0.000000	-.018213
45.000000	0.000000	-.016067	0.000000	0.000000	0.000000	-.016067
50.000000	0.000000	-.013864	0.000000	0.000000	0.000000	-.013864
55.000000	0.000000	-.011686	0.000000	0.000000	0.000000	-.011686
60.000000	0.000000	-.009564	0.000000	0.000000	0.000000	-.009564
65.000000	0.000000	-.007502	0.000000	0.000000	0.000000	-.007502
70.000000	0.000000	-.005486	0.000000	0.000000	0.000000	-.005486
75.000000	0.000000	-.003507	0.000000	0.000000	0.000000	-.003507
80.000000	0.000000	-.001553	0.000000	0.000000	0.000000	-.001553
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	.000000	.000000

PITCH MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.000190	.020253	.000245	-.028176	-.007866
5.000000	0.000000	-.050711	.032086	.000243	.042275	.023893
10.000000	0.000000	-.110949	.040027	.000238	.112726	.042048
15.000000	0.000000	-.170558	.050023	.000229	.196834	.076528
20.000000	0.000000	-.218397	.064375	.000216	.264493	.110687
25.000000	0.000000	-.247749	.083303	.000171	.310361	.146086
30.000000	0.000000	-.259781	.104825	.000129	.327877	.173050
35.000000	0.000000	-.256323	.128454	.000078	.312518	.184727
40.000000	0.000000	-.227451	.160535	.000036	.261604	.194725
45.000000	0.000000	-.200967	.168156	.000015	.174162	.133366
50.000000	0.000000	-.205518	.156792	0.000000	.155960	.107224
55.000000	0.000000	-.211423	.144167	0.000000	.157954	.090698
60.000000	0.000000	-.221270	.128990	0.000000	.156755	.064476
65.000000	0.000000	-.231446	.110865	0.000000	.152325	.031743
70.000000	0.000000	-.243771	.094216	0.000000	.144639	-.004916
75.000000	0.000000	-.255546	.081608	0.000000	.133648	-.040290
80.000000	0.000000	-.265342	.071389	0.000000	.119140	-.074853
85.000000	0.000000	-.274721	.065245	0.000000	.100163	-.109314
90.000000	0.000000	-.285245	.063332	0.000000	.081896	-.140018

YAW MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.000596	0.000000	0.000000	0.000000	-.000596
5.000000	0.000000	.002169	0.000000	0.000000	0.000000	.002169
10.000000	0.000000	.004925	0.000000	0.000000	0.000000	.004925
15.000000	0.000000	.007275	0.000000	0.000000	0.000000	.007275
20.000000	0.000000	.008911	0.000000	0.000000	0.000000	.008911
25.000000	0.000000	.009776	0.000000	0.000000	0.000000	.009776
30.000000	0.000000	.010063	0.000000	0.000000	0.000000	.010063
35.000000	0.000000	.009601	0.000000	0.000000	0.000000	.009601
40.000000	0.000000	.006997	0.000000	0.000000	0.000000	.006997
45.000000	0.000000	.005030	0.000000	0.000000	0.000000	.005030
50.000000	0.000000	.003695	0.000000	0.000000	0.000000	.003695
55.000000	0.000000	.002735	0.000000	0.000000	0.000000	.002735
60.000000	0.000000	.001975	0.000000	0.000000	0.000000	.001975
65.000000	0.000000	.001330	0.000000	0.000000	0.000000	.001330
70.000000	0.000000	.000821	0.000000	0.000000	0.000000	.000821
75.000000	0.000000	.000419	0.000000	0.000000	0.000000	.000419
80.000000	0.000000	.000129	0.000000	0.000000	0.000000	.000129
85.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
90.000000	0.000000	0.000000	0.000000	0.000000	-.000000	-.000000

SUMMARY OF TOTAL COEFFICIENTS

ALPHA	BETA	CD	CY	CL	CR	CM	CN
0.000000	0.000000	.061840	0.000000	-.076748	-.034665	-.007866	-.000596
5.000000	0.000000	.068035	0.000000	.198286	-.032815	.023093	.002169
10.000000	0.000000	.104543	0.000000	.480276	-.030775	.062040	.004925
15.000000	0.000000	.174795	0.000000	.787729	-.028585	.076528	.007275
20.000000	0.000000	.274965	0.000000	1.073032	-.026369	.110687	.008911
25.000000	0.000000	.395061	0.000000	1.319923	-.024249	.146086	.009776
30.000000	0.000000	.537736	0.000000	1.530605	-.022231	.173050	.010083
35.000000	0.000000	.698846	0.000000	1.664921	-.020245	.184727	.009601
40.000000	0.000000	.896640	0.000000	1.551352	-.018223	.194725	.006997
45.000000	0.000000	1.085407	0.000000	1.416198	-.016067	.133366	.005030
50.000000	0.000000	1.251030	0.000000	1.293782	-.013864	.107224	.003695
55.000000	0.000000	1.414406	0.000000	1.189952	-.011686	.090698	.002735
60.000000	0.000000	1.562000	0.000000	1.081536	-.009564	.064476	.001975
65.000000	0.000000	1.685053	0.000000	.952422	-.007502	.031743	.001330
70.000000	0.000000	1.786398	0.000000	.809101	-.005486	-.004916	.000821
75.000000	0.000000	1.868022	0.000000	.643581	-.003507	-.040290	.000419
80.000000	0.000000	1.922907	0.000000	.451464	-.001553	-.074853	.000129
85.000000	0.000000	1.956265	0.000000	.241948	0.000000	-.109314	0.000000
90.000000	0.000000	1.970369	-.000000	.027921	.000000	-.140018	-.000000

NOPT=11 SIMULATED WIND TUNNEL RUNS

DRAG COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	.042968	.014010	.000739	.004123	.061840
0.000000	-5.000000	.042642	.013904	-.000776	.004092	.059861
0.000000	-10.000000	.041672	.013588	-.005302	.003999	.053957
0.000000	-15.000000	.040090	.013072	-.013118	.003847	.043890
0.000000	-20.000000	.037342	.012371	-.024323	.003641	.029631
0.000000	-25.000000	.035294	.011508	-.039201	.003386	.011987
0.000000	-30.000000	.032226	.010509	-.032508	.003092	.013317
0.000000	-35.000000	.028832	.009401	-.011530	.002766	.029469
0.000000	-40.000000	.025215	.008221	.006172	.002419	.042027
0.000000	-45.000000	.021484	.007005	.018007	.002061	.048557
0.000000	-50.000000	.017753	.005789	.024125	.001703	.049371
0.000000	-55.000000	.014136	.004609	.025730	.001356	.045832
0.000000	-60.000000	.010742	.003503	.024236	.001031	.039512
0.000000	-65.000000	.007674	.002502	.020942	.000736	.031855
0.000000	-70.000000	.005026	.001639	.016870	.000482	.024018
0.000000	-75.000000	.002878	.000938	.012677	.000276	.016770
0.000000	-80.000000	.001296	.000422	.008607	.000124	.010450
0.000000	-85.000000	.000326	.000106	.004520	.000031	.004984
0.000000	-90.000000	-.000000	-.000000	-.000000	-.000000	-.000000

SIDE FORCE COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.000000	-5.000000	.000052	0.000000	.043253	.019998	.063302
0.000000	-10.000000	.000101	0.000000	.086794	.039995	.126898
0.000000	-15.000000	.000146	0.000000	.123539	.084257	.207962
0.000000	-20.000000	.000184	0.000000	.149188	.141781	.291065
0.000000	-25.000000	.000214	0.000000	.165613	.210469	.376296
0.000000	-30.000000	.000234	0.000000	.153617	.288085	.441936
0.000000	-35.000000	.000244	0.000000	.135502	.372243	.507936
0.000000	-40.000000	.000244	0.000000	.133154	.460475	.593873
0.000000	-45.000000	.000234	0.000000	.141055	.550215	.691303
0.000000	-50.000000	.000215	0.000000	.153613	.638919	.792747
0.000000	-55.000000	.000188	0.000000	.167023	.724096	.891306
0.000000	-60.000000	.000156	0.000000	.179075	.803366	.982597
0.000000	-65.000000	.000121	0.000000	.188732	.874535	1.063388
0.000000	-70.000000	.000085	0.000000	.195781	.935639	1.131504
0.000000	-75.000000	.000052	0.000000	.200523	.984994	1.185578
0.000000	-80.000000	.000025	0.000000	.203485	1.021247	1.224757
0.000000	-85.000000	.000007	0.000000	.205145	1.043404	1.248555
0.000000	-90.000000	.000000	0.000000	.205714	1.050857	1.256571

LIFT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.044579	-.017539	0.000000	-.014631	-.076748
0.000000	-5.000000	-.044240	-.017405	0.000000	-.014520	-.076165
0.000000	-10.000000	-.043235	-.017010	0.000000	-.014190	-.074434
0.000000	-15.000000	-.041593	-.016364	0.000000	-.013651	-.071607
0.000000	-20.000000	-.039364	-.015487	0.000000	-.012919	-.067771
0.000000	-25.000000	-.036617	-.014406	0.000000	-.012018	-.063041
0.000000	-30.000000	-.033434	-.013154	0.000000	-.010973	-.057561
0.000000	-35.000000	-.029913	-.011769	0.000000	-.009817	-.051499
0.000000	-40.000000	-.026160	-.010292	0.000000	-.008586	-.045038
0.000000	-45.000000	-.022289	-.008769	0.000000	-.007315	-.038374
0.000000	-50.000000	-.018419	-.007247	0.000000	-.006045	-.031711
0.000000	-55.000000	-.014666	-.005770	0.000000	-.004813	-.025249
0.000000	-60.000000	-.011145	-.004385	0.000000	-.003658	-.019187
0.000000	-65.000000	-.007962	-.003133	0.000000	-.002613	-.013708
0.000000	-70.000000	-.005215	-.002052	0.000000	-.001711	-.008978
0.000000	-75.000000	-.002986	-.001175	0.000000	-.000980	-.005141
0.000000	-80.000000	-.001344	-.000529	0.000000	-.000[illegible]1	-.002314
0.000000	-85.000000	-.000339	-.000133	0.000000	-.000111	-.000583
0.000000	-90.000000	.000000	.000000	0.000000	.000000	.000000

ROLL MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.034665	0.000000	0.000000	0.000000	-.034665
0.000000	-5.000000	-.035309	0.000000	.007366	0.000000	-.027943
0.000000	-10.000000	-.035393	0.000000	.014791	0.000000	-.020612
0.000000	-15.000000	-.034901	0.000000	.021042	0.000000	-.013859
0.000000	-20.000000	-.033839	0.000000	.025392	0.000000	-.008447
0.000000	-25.000000	-.032228	0.000000	.028204	0.000000	-.004024
0.000000	-30.000000	-.030112	0.000000	.026161	0.000000	-.003951
0.000000	-35.000000	-.027554	0.000000	.023076	0.000000	-.004478
0.000000	-40.000000	-.024634	0.000000	.022676	0.000000	-.001958
0.000000	-45.000000	-.021446	0.000000	.024022	0.000000	.002576
0.000000	-50.000000	-.018130	0.000000	.026160	0.000000	.008061
0.000000	-55.000000	-.014713	0.000000	.028444	0.000000	.013732
0.000000	-60.000000	-.011409	0.000000	.030497	0.000000	.019088
0.000000	-65.000000	-.008314	0.000000	.032141	0.000000	.023827
0.000000	-70.000000	-.005552	0.000000	.033342	0.000000	.027789
0.000000	-75.000000	-.003241	0.000000	.034149	0.000000	.030909
0.000000	-80.000000	-.001486	0.000000	.034654	0.000000	.033167
0.000000	-85.000000	-.000381	0.000000	.034936	0.000000	.034555
0.000000	-90.000000	.000000	0.000000	.035033	0.000000	.035033

PITCH MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.000190	.020253	.000245	-.028174	-.007866
0.000000	-5.000000	-.000188	.020099	-.000257	-.027960	-.008307
0.000000	-10.000000	-.000184	.019642	-.001758	-.027325	-.009624
0.000000	-15.000000	-.000177	.018896	-.004349	-.026287	-.011917
0.000000	-20.000000	-.000167	.017884	-.008063	-.024879	-.015225
0.000000	-25.000000	-.000156	.016635	-.012663	-.023142	-.019326
0.000000	-30.000000	-.000142	.015189	-.010776	-.021131	-.016860
0.000000	-35.000000	-.000127	.013598	-.003822	-.018905	-.009265
0.000000	-40.000000	-.000111	.011885	.002046	-.016533	-.002714
0.000000	-45.000000	-.000095	.010126	.005959	-.014087	.001913
0.000000	-50.000000	-.000078	.008368	.007997	-.011641	.004646
0.000000	-55.000000	-.000062	.006663	.008529	-.009269	.005861
0.000000	-60.000000	-.000047	.005063	.008034	-.007044	.006006
0.000000	-65.000000	-.000034	.003617	.006942	-.005032	.005493
0.000000	-70.000000	-.000022	.002369	.005592	-.003296	.004644
0.000000	-75.000000	-.000013	.001357	.004202	-.001887	.003659
0.000000	-80.000000	-.000006	.000611	.002853	-.000850	.002609
0.000000	-85.000000	-.000001	.000154	.001498	-.000214	.001437
0.000000	-90.000000	-.000000	.000000	-.000000	-.000000	-.000000

YAW MOMENT COEFFICIENT BUILDUP

ALPHA	BETA	WING	H.T.	V.T.	FUS	TOTAL
0.000000	0.000000	-.000596	0.000000	0.000000	0.000000	-.000596
0.000000	-5.000000	-.000574	0.000000	-.017813	.011353	-.006235
0.000000	-10.000000	-.000545	0.000000	-.033855	.022706	-.011694
0.000000	-15.000000	-.000508	0.000000	-.047585	.030766	-.017328
0.000000	-20.000000	-.000466	0.000000	-.056441	.037613	-.019294
0.000000	-25.000000	-.000420	0.000000	-.061341	.043279	-.018481
0.000000	-30.000000	-.000370	0.000000	-.057041	.047741	-.009670
0.000000	-35.000000	-.000320	0.000000	-.051348	.050962	-.000706
0.000000	-40.000000	-.000270	0.000000	-.051473	.052909	.001166
0.000000	-45.000000	-.000221	0.000000	-.055603	.053559	-.002266
0.000000	-50.000000	-.000176	0.000000	-.061725	.052904	-.008997
0.000000	-55.000000	-.000134	0.000000	-.068388	.050954	-.017568
0.000000	-60.000000	-.000098	0.000000	-.074688	.047728	-.027057
0.000000	-65.000000	-.000067	0.000000	-.080154	.043262	-.036959
0.000000	-70.000000	-.000042	0.000000	-.084641	.037592	-.047091
0.000000	-75.000000	-.000023	0.000000	-.088221	.030741	-.057503
0.000000	-80.000000	-.000010	0.000000	-.091075	.022676	-.068409
0.000000	-85.000000	-.000002	0.000000	-.093383	.013166	-.080218
0.000000	-90.000000	.000000	0.000000	-.095211	-.000007	-.095217

SUMMARY OF TOTAL COEFFICIENTS

ALPHA	BETA	CD	CY	CL	CR	CM	CN
0.000000	0.000000	.061840	0.000000	-.076748	-.034665	-.007866	-.000596
0.000000	-5.000000	.059861	.063302	-.076165	-.027943	-.008307	-.006235
0.000000	-10.000000	.053957	.126890	-.074434	-.020612	-.009624	-.011694
0.000000	-15.000000	.043890	.207962	-.071607	-.013859	-.011917	-.017320
0.000000	-20.000000	.029631	.291065	-.067771	-.008447	-.015225	-.019294
0.000000	-25.000000	.011987	.376296	-.0630[illegible]1	-.004824	-.019326	-.016401
0.000000	-30.000000	.013317	.441936	-.057561	-.003951	-.016060	-.009670
0.000000	-35.000000	.029469	.507996	-.051499	-.004478	-.009265	-.000706
0.000000	-40.000000	.042027	.593873	-.045038	-.001958	-.002714	.001166
0.000000	-45.000000	.048557	.691503	-.035374	.002576	.001913	-.002266
0.000000	-50.000000	.049371	.792747	-.031711	.008061	.004646	-.008997
0.000000	-55.000000	.045032	.891306	-.025249	.013732	.005851	-.017568
0.000000	-60.000000	.039512	.982597	-.019187	.019068	.006006	-.027057
0.000000	-65.000000	.031855	1.063388	-.013708	.023827	.005493	-.036959
0.000000	-70.000000	.024818	1.131504	-.008978	.027789	.004644	-.047891
0.000000	-75.000000	.016770	1.185570	-.005141	.030309	.003659	-.057503
0.000000	-80.000000	.010450	1.224757	-.002314	.033167	.002609	-.068409
0.000000	-85.000000	.004984	1.248555	-.000553	.034555	.001437	-.080218
C.000000	-90.000000	-.000000	1.256571	.000000	.035033	-.000000	-.095217

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