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DYNAMIC SYSTEM COUPLER PROGRAM (DYSCO 4.1)
VOLUME III - USER'S MANUAL SUPPLEMENT

Alex Berman, Shyi-Yuang Chen, Bruce Gustavson, Patricia Hurst

Kaman Aerospace Corporation
P.O. Box 2
Bloomfield, CT 06002-0002

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AVIATION APPLIED TECHNOLOGY DIRECTORATE POSITION STATEMENT

This report documents the work performed to enhance the Dynamic System Coupler (DYSCO) computer program through the addition of advanced modeling capabilities. These capabilities include rotor blade damage modeling, Eigen analysis development, general time history solution development, frequency domain solution development, general modal representation of three-dimensional structures, lifting surface modal representation, landing gear, general force, linear constraints, lifting surface aerodynamics, calculation of component interface and internal loads, and a nonlinear spring and damper system. While the improvements incorporated into DYSCO, as a result of this work, increase the analytical capabilities of the program, it still has limitations in several areas. More correlation with flight test data or with similar proven analytical tools is needed to validate program results. A new or improved trim algorithm is needed to eliminate deficiencies in the current DYSCO trim algorithm. Also, DYSCO should be converted to double precision to increase the accuracy of program results.

Mr. Robert A. Lindholm of the Aeronautical Technology Division served as the project engineer for this contract.

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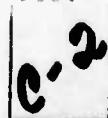
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TABLE OF CONTENTS

	<u>PAGE NO.</u>
1.0 DYSKO 4.0, 4.1 COMPARISON	1
1.1 DYSKO 4.0 COMPONENT TECHNOLOGY MODULES	1
1.1.1 CFM2 - Fuselage, Modal	1
1.1.2 CRR2 - Rotor, Rigid Blades	1
1.1.3 CRE3 - Rotor, Elastic Blades	1
1.1.4 CCE1 - Control System, Elastic Rods	1
1.1.5 CCEØ - Control System, Elastic Rods	2
1.1.6 CSF1 - Structure, Finite Element	2
1.1.7 CES1 - Elastic Stop (Nonlinear Spring)	2
1.1.8 CLC1 - Linear Constraints	2
1.2 DYSKO 4.1 COMPONENT TECHNOLOGY MODULES	3
1.2.1 CFM3 - Fuselage, Modal (3-d)	3
1.2.2 CRD3 - Rotor, Damaged (Nonidentical) Blades	3
1.2.3 CLC2 - Linear Constraints	3
1.2.4 CLCØ - Linear Constraints	3
1.2.5 CGF2 - General Force	4
1.2.6 CLG2 - Landing Gear	4
1.2.7 CLS2 - Modal Lifting Surface	4
1.2.8 CGLØ - Global Transformation	4
1.2.9 CSF3 - Nonlinear Spring, Damper System	5
1.2.10 Component Loads Modules	5
1.2.10.1 CSF1L	5
1.2.10.2 CES1L	5
1.2.10.3 CRE3L, CRD3L	6
1.3 DYSKO 4.0 SOLUTION TECHNOLOGY MODULES	6
1.3.1 SEA3 - Eigenanalysis	6
1.3.2 SEA4 - Eigenanalysis	6
1.3.3 STH3 - Time History	6
1.3.4 SSF3 - Stability Floquet	6
1.3.5 STR3 - Trim	7
1.4 DYSKO 4.1 SOLUTION TECHNOLOGY MODULES	7
1.4.1 SEA5 - Eigenanalysis	7
1.4.2 STH4 - Time History	7
1.4.3 SI13 - Component Interface and Internal Loads	8
1.4.4 SFD1 - Frequency Domain, Mobility	8
1.5 GLOBAL REFERENCE SYSTEM	9
1.6 USE OF TECHNOLOGY MODULES	9
2.0 DYSKO 4.1 OPERATION	10
2.1 PRELIMINARY PROCEDURES	10
2.1.1 Beginning Execution	10
2.1.2 File Assignments	10
2.1.3 The Data Base	12



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TABLE OF CONTENTS

	<u>PAGE</u>
2.2 COMPONENT DATA SETS	24
2.2.1 CFM2 - Fuselage Modal	24
2.2.1.1 CFM2 User Notes	24
2.2.1.2 CFM2 Sample Input	24
2.2.2 CRR2 - Rotor, Rigid Blades	33
2.2.2.1 CRR2 User Notes	33
2.2.2.2 CRR2 Sample Input	33
2.2.3 CRE3 - Rotor, Elastic Blades	39
2.2.3.1 CRE3 User Notes	39
2.2.3.2 CRE3 Sample Input	39
2.2.4 CCE1 - Control System, Elastic Rods	54
2.2.4.1 CCE1 User Notes	54
2.2.4.2 CCE1 Sample Input	54
2.2.5 CCEØ - Control System, Elastic Rods	58
2.2.5.1 CCEØ User Notes	58
2.2.5.2 CCEØ Sample Input	58
2.2.6 CSF1 - Structure, Finite Element	60
2.2.6.1 CSF1 User Notes	60
2.2.6.2 CSF1 Sample Input	60
2.2.7 CES1 - Elastic Stop (Nonlinear Spring)	64
2.2.7.1 CES1 User Notes	64
2.2.7.2 CES1 Sample Input	64
2.2.8 CLC1 - Linear Constraints	69
2.2.8.1 CLC1 User Notes	69
2.2.8.2 CLC1 Sample Input	69
2.2.9 CFM3 - Fuselage, Modal (3-d)	73
2.2.9.1 CFM3 User Notes	73
2.2.9.2 CFM3 Sample Input	73
2.2.10 CRD3 - Rotor, Damaged (Nonidentical) Blades	83
2.2.10.1 CRD3 User Notes	83
2.2.10.2 CRD3 Sample Input	83
2.2.11 CLC2 - Linear Constraints	93
2.2.11.1 CLC2 User Notes	93
2.2.11.2 CLC2 Sample Input	93

TABLE OF CONTENTS

	<u>PAGE</u>
2.2.12 CLCØ - Linear Constraints	96
2.2.12.1 CLCØ User Notes	96
2.2.12.2 CLCØ Sample Input	96
2.2.13 CGF2 - General Force.	98
2.2.13.1 CGF2 User Notes	98
2.2.13.2 CGF2 Sample Input	98
2.2.14 CLG2 - Landing Gear	106
2.2.14.1 CLG2 User Notes	106
2.2.14.2 CLG2 Sample Input	106
2.2.15 CLS2 - Modal Lifting Surface.	115
2.2.15.1 CLS2 User Notes	115
2.2.15.2 CLS2 Sample Input	115
2.2.16 CGLØ - Global Transformation.	125
2.2.16.1 CGLØ User Notes	125
2.2.16.2 CGLØ Sample Input	125
2.2.17 CSF3 - Nonlinear Spring, Damper System.	128
2.2.17.1 CSF3 User Notes	128
2.2.17.2 CSF3 Sample Input	128
2.3 FORCE DATA SETS	133
2.3.1 FSS1 - Sinusoidal Shaker	133
2.3.1.1 FSS1 User Notes	133
2.3.1.2 FSS1 Sample Input	133
2.3.2 FRAØ - Rotor Aerodynamics, Linear (2-d).	136
2.3.2.1 FRAØ User Notes	136
2.3.2.2 FRAØ Sample Input	136
2.3.3 FRA2 - Rotor Aerodynamics, Tabular (2-d)	141
2.3.3.1 FRA2 User Notes	141
2.3.3.2 FRA2 Sample Input	141
2.3.4 FRA3 - Rotor Aerodynamics, General	146
2.3.4.1 FRA3 User Notes	146
2.3.4.2 FRA3 Sample Input	146
2.3.5 FFAØ - Fuselage Aerodynamics, Flat Plate Drag.	153
2.3.5.1 FFAØ User Notes	153
2.3.5.2 FFAØ Sample Input	153

TABLE OF CONTENTS

	<u>PAGE</u>
2.3.6 FFC2 - Fuselage Aerodynamics, Linear (2-d)	155
2.3.6.1 FFC2 User Notes	155
2.3.6.2 FFC2 Sample Input	155
2.3.7 FLA2 - Lifting Surface Aerodynamics	168
2.3.7.1 FLA2 User Notes	168
2.3.7.2 FLA2 Sample Input	168
2.4 SOLUTIONS	173
2.4.1 SEA3 - Eigenanalysis	173
2.4.2 SEA4 - Eigenanalysis	178
2.4.3 SEA5 - Eigenanalysis	181
2.4.4 SSF3 - Stability Floquet	192
2.4.5 STH3 - Time History	199
2.4.6 STH4 - Time History	219
2.4.7 SII3 - Component Interface and Internal Loads	237
2.4.8 SFD1 - Frequency Domain Mobility	258
2.5 PLOT FILES	267
2.5.1 Time History Plot Files	267
2.5.1.1 Time History Plot File Format	267
2.5.1.2 Sample Time History Plot File	270
2.5.2 Frequency Domain Plot Files	289
2.5.2.1 Frequency Domain Plot File Format	289
2.5.2.2 Sample Frequency Domain Plot File	291
2.6 MODELING EXAMPLES	296
2.6.1 PACOSS Tower	296
2.6.2 ACAP Ground Resonance Simulation - Blade Damage	368
2.6.3 Time History Pitch Link Loads - Blade Damage	402
2.6.4 Trim - Global Reference System	428

LIST OF ILLUSTRATIONS

<u>FIGURE</u>		<u>PAGE</u>
1	Example File Assignments.	13
2	Example Complete Table of Contents (TOC).	14
3	Example Partial Table of Contents (TOC)	16
4	Example LIST 1.	17
5	Example LIST 2.	18
6	Example Model 1	22
7	Example Model 2	23
8	Spring-Mass-Damper.	60
9	Nonlinear Spring Force/Displacement Function.	64
10	Example Forcing Functions	99
11	Spring-Mass-Damper System	173
12	PACOSS Tower.	297
13	PACOSS Segment 1.	298
14	ACAP Fuselage and Landing Gear.	369
15	Coupled Main Landing Gear - Teetering Hydraulic System.	370
16	ACAP Ground Resonance Stability	371
17	In-Plane Blade Stiffnesses.	403
18	Out-of-Plane Blade Stiffnesses.	404
19	Torsion Blade Stiffnesses	405
20	Time History Pitch Link Loads	406

1.0 DYSKO 4.0, 4.1 COMPARISON

A brief description of the Component and Solution Technology Modules included in the previous implementation, DYSCO 4.0, and those added under the current implementation, DYSCO 4.1, is presented for comparison.

1.1 DYSCO 4.0 COMPONENT TECHNOLOGY MODULES

1.1.1 CFM2 - Fuselage, Modal. CFM2 is a modal, thin-beam representation which can be used to model a fuselage or similar structures. Special provision has been made to allow direct coupling with rotor hub degrees of freedom and, more generally, with other arbitrary implicit degrees of freedom (translation only) defined along the principal axis. Interpolation of the modal displacements and slopes is automatically performed to obtain the displacements of the implicit degrees of freedom with respect to the CFM2 coordinate system.

1.1.2 CRR2 - Rotor, Rigid Blades. CRR2 is a rotor system representation with rigid hinged blades having flap, lag, and pitch degrees of freedom defined in a rotating coordinate system and hub rigid body degrees of freedom defined in a fixed system.

1.1.3 CRE3 - Rotor, Elastic Blades. CRE3 is a rotor system representation with modal representations of elastic hinged blades which may include out-of-plane, in-plane, and torsion degrees of freedom defined in a rotating coordinate system. A rotor speed perturbation degree of freedom (angular displacement of the entire rotor about the shaft axis with respect to the rotating system) can also be defined. Hub rigid body degrees of freedom can be defined in a fixed coordinate system.

1.1.4 CCE1 - Control System, Elastic Rods. CCE1 represents a rotor control system consisting of damped elastic control rods which can be coupled directly to the blade pitch degrees of freedom of a rigid rotor system or to the blade torsion degrees of freedom of an elastic rotor system, through a rigid pitch

horn. Swashplate degrees of freedom can be defined with respect to the hub coordinate system.

1.1.5 CCE0 - Control System, Elastic Rods. CCE0 represents a rotor control system consisting of undamped elastic rods which can be coupled directly to the blade degrees of freedom of rigid or elastic rotors through a rigid pitch horn.

Transformation of time-varying coefficients from the rotating coordinate system to the fixed system is performed by the component Active Modules of CRR2, CRE3, CCE1, and CCE0 during time-integration type solutions.

1.1.6 CSF1 - Structure, Finite Element. CSF1 represents an arbitrary, linear, constant coefficient set of second-order differential equations:

$$\ddot{M}\dot{X} + C\dot{X} + KX = F$$

Through the explicit coupling mechanism, CSF1 can be used to couple components or modify the constant coefficients of a system.

1.1.7 CES1 - Elastic Stop (Nonlinear Spring). CES1 represents multiple spring-damper elements which can have zero damping and stiffness over specified displacement gaps. CES1 elements allow a degree of freedom to move freely through a specified distance before encountering the resistance of a spring or damper. These elements can be used in parallel to assemble piecewise-linear representations of nonlinear springs and dampers.

1.1.8 CLC1 - Linear Constraints. CLC1 is used to apply arbitrary linear constraints to the degrees of freedom of a system. The user formulates equations in which existing (implicit) degrees of freedom are set equal to and are replaced by functions of other arbitrary degrees of freedom. The coefficients of these functions are constants specified by the user. CLC1 allows the user to create rigid, pinned, or elastic couplings between components or to apply scale factors to degrees of freedom. A degree of freedom may be eliminated by setting it equal to zero.

1.2 DYSKO 4.1 COMPONENT TECHNOLOGY MODULES

1.2.1 CFM3 - Fuselage, Modal (3-d). CFM3 is a general modal representation for 3-dimensional elastic structures. Normal modes are specified at node points defined in a 3-dimensional coordinate system. Direct coupling with other components is only allowed at the node points, and no modal interpolation is performed, but up to three translational and three rotational implicit degrees of freedom can be defined locally at each node point. This implies that the user need only define the elastic modes at points of attachment to other components.

1.2.2 CRD3 - Rotor, Damaged (Nonidentical) Blades. CRD3 allows changes to be made to the physical and geometric properties of single or multiple blades of an existing elastic rotor component (CRE3) in a model. CRD3 allows the user to specify changes in blade properties without affecting or re-inputting the other rotor system data. By selecting blade numbers, the user specifies the blade degrees of freedom for which new coefficients will be calculated. These component matrices are combined in the system equations like those of any other component and do not replace the original CRE3 component matrices. Thus, the blade changes are additive.

1.2.3 CLC2 - Linear Constraints. CLC2 is used to apply arbitrary linear constraints to the degrees of freedom of a system. Instead of formulating a set of relationships between degrees of freedom and selecting and solving for the implicit degrees of freedom (CLC1), the user need only specify the given relationships and implicit degrees of freedom and CLC2 will automatically solve for the implicit degrees of freedom. Using the same set of relationships, the user can do modeling with different sets of implicit degrees of freedom without having to solve for each set of implicit coefficients.

1.2.4 CLC0 - Linear Constraints. CLC0 is a simplified version of CLC2 which can be used to eliminate degrees of freedom from a system. The implicit coefficients are automatically set to zero.

1.2.5 CGF2 - General Force. CGF2 is used to apply general periodic forces to component and system degrees of freedom. CGF2 is a component with null mass, damping, and stiffness matrices and a time-varying force vector which can be defined as a combination of polynomial, Fourier series, and tabular functions. Through the explicit coupling mechanism, CGF2 can be used to apply forces to the degrees of freedom of other components. The periodicity of the forces can be augmented or be reduced to single applications through specifications of start and end times.

1.2.6 CLG2 - Landing Gear. CLG2 is a general nonlinear representation of a landing gear strut and tire. Rigid body degrees of freedom are defined at a point designated as the point of attachment for other components. An elastic strut elongation degree of freedom is defined along the strut principal axis. Tire degrees of freedom and, optionally, tire scrubbing degrees of freedom are defined, allowing brakes on and off, tire scrubbing, and tire leaving the ground conditions to be modeled for time history investigations. The stiffness and damping coefficients for the strut and tire are defined as piecewise linear functions of the displacement and velocity of the strut elongation and tire degrees of freedom. Thus, preloaded systems can be modeled.

1.2.7 CLS2 - Modal Lifting Surface. CLS2 is a specialized modal representation for a planar lifting surface structure with a rigid hinged control surface. Rigid body degrees of freedom are defined at an arbitrary attachment point, and elastic modes are defined at stations along the principal (spanwise) axis. Implicit degrees of freedom may be defined at node points in the plane of the structure. In addition, a control surface rigid rotation degree of freedom may be defined. Finally, the user can automatically mirror the degrees of freedom and create a structure which is symmetric about its centerline, as in the case of a full wing structure.

1.2.8 CGLØ - Global Transformation. CGLØ is a model dependent component which forms the matrices used by time history and trim solutions to transform gravitational and centrifugal acceleration vectors from the global (model)

coordinate system to the individual component coordinate systems. Model sequence numbers identify the data sets for which transformation is required, and the transformation matrices are formulated from the direction cosines of the component X and Y coordinate axes with respect to the global coordinate system.

1.2.9 CSF3 - Nonlinear Spring, Damper System. CSF3 represents an arbitrary, constant coefficient set of second order differential equations of the form

$$\ddot{MX} + C\dot{X} + KX + C_2\dot{X}^2 + C_3\dot{X}^3 + K_2X^2 + K_3X^3 + D\ddot{X} + A\dot{X}^2 + BX^2\dot{X} = F$$

where M, C, K, C_2 , C_3 , K_2 , K_3 , D, A, and B are coefficient matrices. F is a constant force vector, and X is the displacement vector of the system degrees of freedom.

1.2.10 Component Loads Modules. A new component Technical Module, the Component Loads Module (C--L), has been implemented in conjunction with a new Solution Module, SII3, to compute and print out the time history internal loads acting on the component degrees of freedom. Internal loads are defined as the forces and moments due to the component stiffness and damping which act on a degree of freedom with a given displacement and velocity. C--L can be called by the Solution Active Module, SII3A, which processes the system state vectors saved from a time history solution.

The internal loads and other time history derived quantities computed by the currently installed Loads Modules are briefly described below.

1.2.10.1 CSF11 - The forces and moments exerted by the component springs and dampers are calculated. In addition, the associated strain energies and viscous damping energy dissipation rates are calculated.

1.2.10.2 CES11 - The forces and moments exerted by spring-damper elements are calculated. In addition, the associated strain energies and viscous damping energy dissipation rates are calculated.

1.2.10.3 CRE3L, CRD3L - The in-plane and out-of-plane bending moments and the twisting moments due to shear are calculated at blade stations selected by the user.

1.3 DYSCO 4.0 SOLUTION TECHNOLOGY MODULES

All Solution Input Technical Modules are now constructed in the input table format previously used only by Component and Force Input Modules and interact with the DYSCO Input Processor (DIP). This provides a consistent means of creating and retrieving the data required by a Solution Module. It provides for consistency in prompting the user for input, in validating the input, and in handling erroneous input and reduces the programmer effort required to construct a new Solution Module. Solution Modules created prior to the DYSCO 4.1 implementation were converted to the input table format.

1.3.1 SEA3 - Eigenanalysis. SEA3 computes the eigenvalues and the eigenvectors of the constant M and K matrices of a system using the power method. Solutions cannot be obtained for systems with rigid body modes, and only system eigenvectors can be output.

1.3.2 SEA4 - Eigenanalysis. SEA4 computes the eigenvalues and eigenvectors, including rigid body modes, of the constant M and K matrices of a system using the Householder method. Only system eigenvectors can be output.

1.3.3 STH3 - Time History. STH3 performs a Runge-Kutta integration of the system equations with generalized initial conditions and an optional error check. Helicopter rotor control parameters can be input and the computed aerodynamic forces and torque on the rotor hub can optionally be output. As part of the DYSCO 4.1 implementation, STH3 time history state vectors can optionally be saved for interface and internal loads calculations (SII3).

1.3.4 SSF3 - Stability Floquet. SSF3 uses periodic shooting to determine initial conditions for which a Runge-Kutta integration with optional error

check is performed on the general linear or nonlinear system equations. New initial conditions are determined and the integration is repeated to achieve the periodic equilibrium condition. Perturbation of the periodic equilibrium state is performed by the n-pass method in order to form the Floquet transition matrix, on which an eigenanalysis is performed and the stability of the system evaluated.

SSF3 is used primarily to determine the complex eigenvalues and eigenvectors and hence, the stability of systems that include periodic (time-varying) coefficients such as helicopter simulations, but is also useful for damped systems with constant coefficients. Helicopter rotor control parameters can also be input in the same manner as that for STH3.

1.3.5 STR3 - Trim. STR3 combines periodic shooting and the Newton-Raphson method, using an iterative scheme to find the periodic equilibrium state and the control settings for a specified helicopter (single rotor) flight condition. Optionally, immediately following the trim solution, a time history can be performed using the conditions from the last trim iteration as initial conditions. As part of the DYSCO 4.1 implementation, STR3 time history state vectors can optionally be saved for interface and internal loads calculations (SII3).

1.4 DYSCO 4.1 SOLUTION TECHNOLOGY MODULES

1.4.1 SEA5 - Eigenanalysis. SEA5 computes the complex eigenvalues and eigenvectors, including rigid body modes, of the constant M, C, and K matrices of a system using a generalized Householder algorithm. The user can select the component, as well as system degrees of freedom for which the eigenvectors will be output.

1.4.2 STH4 - Time History. STH4 performs the same Runge-Kutta integration of the system equations with the same basic solution options as STH3, but rotor controls input and rotor force output options are not available. However, the

user can select the component and system degrees of freedom for which the state vector or, separately, displacement or velocity, will be output at each time increment; time history output can optionally be written to an attached plot file which can be post processed for plotting or other purposes; and state vectors can optionally be saved for interface and internal loads calculations (SII3). In addition, provision has been made for coded flags to be issued automatically with the interactive output when specific dynamic conditions are encountered by or are in effect for a given component.

1.4.3 SII3 - Component Interface and Internal Loads. SII3 reads the system state vectors saved from a time history solution (STH3, STH4, STR3), derives the component state vectors from the system state vectors, and computes the interface loads (residual forces and moments) acting on component degrees of freedom using the component coefficient matrices. The time history interface loads can optionally be written to an attached plot file which can be post processed for plotting or other purposes. The user also has the option to compute the time history internal loads for certain components. When this option is elected, the component Loads Module, C---L, is called and calculates the internal forces acting on component degrees of freedom (see paragraph 1.2.7).

1.4.4 SFD1 - Frequency Domain, Mobility. SFD1 computes the complex displacement mobility matrix for the constant M, C, and K matrices of a system at specified frequencies. Under the DYSCO 4.0 implementation, the system mobility matrix was output in units of displacement per unit force. Under the DYSCO 4.1 implementation, the user can obtain component degree of freedom, as well as system degree of freedom mobilities as the response due to a unit force at some system degree(s) of freedom and has the option to have output expressed as either displacement/unit force (in./lb, rad/in.-lb) or acceleration/unit force (g/lb). In addition, the output mobilities can optionally be written to an attached plot file which can be post processed for plotting or other purposes.

1.5 GLOBAL REFERENCE SYSTEM

Under the DYSCO 4.1 implementation, a global coordinate system can be defined for a model. This allows gravitational and centrifugal force vectors to be specified for the model and applied in the individual component coordinate systems during time history and trim solutions. The gravitational and centrifugal acceleration vectors are specified in an inertial (fixed) coordinate system and are successively transformed to the global (model) coordinate system and component coordinate systems during a solution. Forces are computed as the products of the component masses and the transformed accelerations.

1.6 USE OF TECHNOLOGY MODULES

In this basic description of the Component and Solution Technology Modules currently included in DYSCO, the major points of difference between the present implementation and the previous one have been presented. Following sections include sample usages of DYSCO Technology Modules and modeling examples.

2.0 DYSCO 4.1 OPERATION

This section is intended as a supplement to the information presented in Sections 1, 2, and 3 of the DYSCO 4.1 User's Manual and is directed at the reader who has become familiarized with those sections. In this section, examples of DYSCO operation on the IBM 4341 computer under the CMS operating system will be presented. File assignment, examples of the use of the currently installed Technology Modules, and modeling examples and solutions will be presented and discussed.

2.1 PRELIMINARY PROCEDURES

2.1.1 Beginning Execution. On the IBM, the name of the EXEC file which will prompt the user for file information and execute DYSCO is specified at the CMS level. On a VAX, the program is executed using the VMS RUN command and specifying the program name assigned to DYSCO. File assignments are then requested from the user.

2.1.2 File Assignments. File assignments on the IBM are made by responding to the following JCL prompts. Although a different procedure is used to make file assignments on the VAX, the associated prompts are similar. Only required input (based on previous input) is requested.

NUMBER OF DIRECT ACCESS USER FILES?

(Enter the number of User Data Files which will be assigned)

-NAME- OF FILE UNIT Un?

(Enter the first part of the full file name of the nth User Data File; these files are referenced in DYSCO by the names U1, U2, etc., and can be files previously created by DYSCO or new files which will be initialized)

NUMBER OF SEQUENTIAL FILES?

(Enter the number of Sequential Files which will be assigned)

ENTER -NAME- -FILETYPE- -FILEMODE- OF Sn

(Enter the full file name of the nth Sequential File; these files are referenced in DYSCO by the names S1, S2, etc., and may contain airfoil or induced velocity tables in formats consistent with requirements given in Volume II)

NUMBER OF PLOT FILES?

(Enter the number of Plot Files which will be assigned)

-NAME- OF IPLOTn?

(Enter the first part of the full file name of the nth Plot File; these files are referenced in DYSCO by the names IPLOT1, IPLOT2, etc.)

LOAD FILE REQUIRED (Y/N)

(Enter Y [yes] if a Loads File is to be assigned, else N [no]; this file is referenced in DYSCO by the name ILOAD)

At this time, the Run Data File and the Utility File are also defined and the Run Data File is initialized. The Run Data File, the Loads File, and the Utility File are erased at the end of DYSCO execution.

After the file assignments have been made, program execution begins (IBM), and the user is given the option to initialize the User Data Files.

USER FILE Un TO BE INITIALIZED (Y OR N)

(The user can initialize new or previously created user files; all data on a previously created file is destroyed if the file is re-initialized)

DESCRIPTION (24 CHAR) OF Un

(If the nth User Data File is to be initialized, the user is asked to provide a 24-character description which will be used to label the file)

VERIFY Un TO BE INITIALIZED (Y OR N)

(The user is asked to reiterate that the nth User Data File is to be initialized - in case the user has inadvertently chosen to initialize an existing file)

If a new User Data File is not initialized, an error will result, and execution will be aborted.

Following file assignment and initialization, if necessary, the program issues a COMMAND prompt and the user may proceed. In the example in Figure 1, the file assignments are made for two previously created User Data Files. (R;) indicates CMS command level and DYSA is the EXEC file which contains the file assignment prompts. (MORE...) and (VM READ) are screen prompts from the CMS operating system.

2.1.3 The Data Base. Once the COMMAND level has been reached and if files created during previous DYSCO execution have been assigned, the user may wish to survey the current data base using the TOC (Table of Contents) command. The data base for the files assigned in the previous example are shown in Figure 2. TOC has been used to print the complete contents of the Run Data File (R) and the two User Data Files (U1, U2). Asterisks have been entered in response to the TOC prompts in order to search all files for all data sets and data members. The Run Data File remains empty unless the user adds data (ds/dm) to it. The user can also limit the search to a single ds/dm on a given file (Figure 3) or use * in combination with specific responses to perform specific searches.

Each component or force ds/dm has associated with it a sequentially numbered list of variables which have values. These values are specific to the particular component or force usage (ds/dm), but the variable list is part of the full list of variables which can exist for the data member. The LIST command allows the contents of a ds/dm to be listed. Two different usages of the same data member are shown in Figures 4 and 5.

A model ds/dm consists of a sequentially numbered list of component data sets. Within this model list, a component may have associated with it a force data set and any auxiliary ds/dm's (such as an airfoil table) which are required. When a component includes automatically assigned degree of freedom names, the

R;
DYS4

D Y S C O 4.1 - SETUP

NUMBER OF DIRECT ACCESS USER FILES ?

2

ALL REFERENCES TO THESE FILES ARE OF THE FORM

U1 U2 U3 U4

-NAME- OF FILE U1 ?

ATL2

-NAME- OF FILE U2 ?

PACOSS

NUMBER OF SEQUENTIAL FILES ?

0

NUMBER OF PLOT FILES?

MORE...

0

LOAD FILE REQUIRED? (Y/N)

N

EXECUTION BEGINS...

USER FILE U1 TO BE INITIALIZED (Y OR N)

N

USER FILE U2 TO BE INITIALIZED (Y OR N)

N

COMMAND

VM READ

Figure 1. Example File Assignments.

COMMAND
TOC
FILE (* FOR ALL)

*
DATA SET (* FOR ALL)
*
DATA MEMBER (* FOR ALL)
*

*****TABLE OF CONTENTS SEARCH FOR * /* *****
FILE R ON UNIT 13 RUN DATA FILE

NULL FILE

*****TABLE OF CONTENTS SEARCH FOR * /* *****
FILE U1 ON UNIT 1 BLADE DAMAGE

B2Z1T2 /CRE3	ELASTIC ROTOR WITH 2 OP, 1 IP, 2 TOR MODES
FCT1.65 /FRA3	GENERAL AERO, INDUCED VEL 1.65
MORE..	
8300-4 /CFM2	8300 LB AH1G, HUB (-.68, 96.485)
COUPLE /CLC1	TEETERING CONSTRAINT, CHANGE DEFLECTIONS FROM RADIAN TO INCHES
AH1G16.5/FFC2	AH1G, 16.5 SQ FT FLAT PLATE DRAG
AFD161 /AIRFOIL	B540/V0012 BELL DATA 50A/10MN
3000 /CCE0	CONTROL ROD STIFFNESS 3000 LB/IN
AH1GD /CRE3	ELASTIC ROTOR WITH 2 OP, 1 IP, 2 TOR MODES
AH1GDB /MODEL	AH1G TRIM WITH 1 LB REMOVED FROM BLADE TIPS
AH1GDA /MODEL	AH1G TRIM WITH 1 LB REMOVED FROM BLADE TIPS
DUMMY /CRD3	DUMMY COMPONENT
BASE /MODEL	
DUMMY /MODEL	
AH1GD /CRD3	REMOVE 1 LB FROM BLADE TIPS
AH1G-35A/MODEL	AH1G TRIM

*****TABLE OF CONTENTS SEARCH FOR * /* *****
FILE U2 ON UNIT 2 PACOSS STRUCTURE

VERT1 /CLC2	COUPLE VERTICAL AND HORIZONTAL MEMBERS
VERT2 /CLC2	COUPLE VERTICAL AND HORIZONTAL MEMBERS
MORE..	

Figure 2. Example Complete Table of Contents (TOC).

VERT3	/CLC2	COUPLE VERTICAL AND HORIZONTAL MEMBERS
VERT4	/CLC2	COUPLE VERTICAL AND HORIZONTAL MEMBERS
HORIZ	/CSF1	COUPLED DIAGONAL AND HORIZONTAL MEMBERS
MASS	/CSF1	LUMPED MASSES
VERT	/CFM2	1.5 X 1.5 ALUMINUM TUBE, 1/8 WALL, 240 LONG
PACOSS1	/MODEL	PACOSS STRUCTURE SEGMENT 1

COMMAND

Figure 2. Example Complete Table of Contents (TOC) (continued)

TOC
FILE (* FOR ALL)

U1

DATA SET (* FOR ALL)

8300-4

DATA MEMBER (* FOR ALL)

CFM2

*****TABLE OF CONTENTS SEARCH FOR 8300-4 /CFM2 *****
FILE U1 ON UNIT 1 BLADE DAMAGE

8300-4 /CFM2 8300 LB AH1G, HUB (-.68, 96.485)

COMMAND

Figure 3. Example Partial Table of Contents (TOC).

LIST
DATA SET
8300-4
DATA MEMBER
CFM2
8300-4 /CFM2 ON FILE U1

***** 8300-4 /CFM2 *****

8300 LB AH1G, HUB (-.68, 96.485)

INPUT FOR STRUCTURAL COMPONENT CFM2. MODAL FUSELAGE

1 RBM	- RIGID BODY MODES	=	YES
2 IXCG	- LONGITUDINAL	=	YES
3 IYCG	- LATERAL	=	NO
4 IZCG	- VERTICAL	=	YES
5 IROLL	- ROLL	=	YES
6 IPTCH	- PITCH	=	YES
7 IYAW	- YAW	=	NO
MORE..			
8 CG	- CG STATION (IN)	=	0.00000E+00
9 NMODE	- NO. OF ELASTIC MODES	=	0
10 NR	- NO. OF ROTORS	=	1
11 NROT	- ROTOR NUMBERS	=	1
12 XROT	- ROTOR STATIONS	=	-6.80000E-01
13 ZROT	- ROTOR VERTICAL HT	=	9.64850E+01
14 ASF	- FWD SHAFT ANGLE	=	0.00000E+00
15 ASL	- LAT SHAFT ANGLE	=	0.00000E+00
16 IX	- HUB TRAN DOF - LONG	=	YES
17 IY	- HUB TRAN DOF - LAT	=	NO
18 IZ	- HUB TRAN DOF - AXIAL	=	YES
19 IAX	- HUB ANGL DOF - ROLL	=	YES
20 IAY	- HUB ANGL DOF - PITCH	=	YES
21 IAZ	- HUB ANGL DOF - YAW	=	NO
22 NI	- NO. OTHER IMPLCT DOF	=	0
23 MASSL	- FUSELAGE MASS (LB)	=	7.29140E+03
24 IMXF	- ROLL MOI SLUG-FT(SQ)	=	3.00000E+03
25 IMYF	- PITCH MOI ABOUT CG	=	8.00000E+03

LIST COMPLETE
COMMAND

Figure 4. Example LIST 1.

LIST
DATA SET
VERT
DATA MEMBER
CFM2
VERT /CFM2 ON FILE U2

***** VERT /CFM2 *****

1.5 X 1.5 ALUMINUM TUBE, 1/8 WALL, 240 LONG

***** INPUT FOR STRUCTURAL COMPONENT CFM2. MODAL FUSELAGE *****

1 RBM	- RIGID BODY MODES	=	YES	
2 IXCG	- LONGITUDINAL	=	NO	
3 IYCG	- LATERAL	=	YES	
4 IZCG	- VERTICAL	=	YES	
5 IROLL	- ROLL	=	NO	
6 IPTCH	- PITCH	=	YES	
7 IYAW	- YAW	=	YES	
MORE.				
8 CG	- CG STATION (IN)	=	1.20000E+02	
9 NMODE	- NO. OF ELASTIC MODES	=	6	
10 NS	- NO. FUSELAGE STAS	=	5	
11 X	- (REAL) INPUT STATION VALUES			
	0.00000E+00	6.00000E+01	1.20000E+02	1.80000E+02
	2.40000E+02			
12 VC1	- MODE1 VERTICAL COMP	=	YES	
13 Z1	- (REAL) MODE1 VERTICAL DISP			
	2.00000E+00	-1.98400E-01	-1.21560E+00	-1.98400E-01
	2.00000E+00			
14 ZP1	- (REAL) MODE1 VERTICAL SLOPE			
	-3.87270E-02	0.00000E+00	0.00000E+00	0.00000E+00
	3.87270E-02			
15 LC1	- MODE1 LATERAL COMP	=	NO	
16 TC1	- MODE1 TORSION COMP	=	NO	
17 VC2	- MODE2 VERTICAL COMP	=	YES	
18 Z2	- (REAL) MODE2 VERTICAL DISP			
	2.00000E+00	-1.16940E+00	0.00000E+00	1.16940E+00
	-2.00000E+00			
19 ZP2	- (REAL) MODE2 VERTICAL SLOPE			
	-6.54940E-02	0.00000E+00	0.00000E+00	0.00000E+00
	-6.54940E-02			

MORE.

Figure 5. Example LIST 2.

20	LC2	- MODE2 LATERAL COMP =	NO
21	TC2	- MODE2 TORSION COMP =	NO
22	VC3	- MODE3 VERTICAL COMP =	YES
23	Z3	- (REAL) MODE3 VERTICAL DISP 2.00000E+00 -1.24220E+00 1.42240E+00 -1.24220E+00 2.00000E+00	
24	ZP3	- (REAL) MODE3 VERTICAL SLOPE -9.16270E-02 0.00000E+00 0.00000E+00 0.00000E+00 9.16270E-02	
25	LC3	- MODE3 LATERAL COMP =	NO
26	TC3	- MODE3 TORSION COMP =	NO
27	VC4	- MODE4 VERTICAL COMP =	NO
28	LC4	- MODE4 LATERAL COMP =	YES
29	Y4	- (REAL) MODE4 LATERAL DISP 2.00000E+00 -1.98400E-01 -1.21560E+00 -1.98400E-01 2.00000E+00	
30	YP4	- (REAL) MODE4 LATERAL SLOPE -3.87270E-02 0.00000E+00 0.00000E+00 0.00000E+00 3.87270E-02	
31	TC4	- MODE4 TORSION COMP =	NO
32	VC5	- MODE5 VERTICAL COMP =	NO
33	LC5	- MODE5 LATERAL COMP =	YES
MORE..			
34	Y5	- (REAL) MODE5 LATERAL DISP 2.00000E+00 -1.16940E+00 0.00000E+00 1.16940E+00 -2.00000E+00	
35	YP5	- (REAL) MODE5 LATERAL SLOPE -6.54940E-02 0.00000E+00 0.00000E+00 0.00000E+00 -6.54940E-02	
36	TC5	- MODE5 TORSION COMP =	NO
37	VC6	- MODE6 VERTICAL COMP =	NO
38	LC6	- MODE6 LATERAL COMP =	YES
39	Y6	- (REAL) MODE6 LATERAL DISP 2.00000E+00 -1.24220E+00 1.42240E+00 -1.24220E+00 2.00000E+00	
40	YP6	- (REAL) MODE6 LATERAL SLOPE -9.16270E-02 0.00000E+00 0.00000E+00 0.00000E+00 9.16270E-02	
41	TC6	- MODE6 TORSION COMP =	NO
42	NR	- NO. OF ROTORS =	0
43	NI	- NO. OTHER IMPLCT DOF=	0
44	MASSL	- FUSELAGE MASS (LB) =	1.58430E+01
45	IMYF	- PITCH MOI ABOUT CG =	1.64010E+01
46	IMZF	- YAW MOI ABOUT CG =	1.64010E+01
47	MMS	- (REAL) MODAL MASS (SLUGS)	

MORE..

Figure 5. Example LIST 2 (continued)

4.92030E-01 4.92030E-01 4.92030E-01 4.92030E-01
4.92030E-01 4.92030E-01
48 MD - (REAL) MODAL DAMPING (PCT)
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00
49 FREQ - (REAL) MODAL FREQUENCY (HZ)
7.09000E+00 1.95500E+01 3.83300E+01 7.09000E+00
1.95500E+01 3.83300E+01

LIST COMPLETE
COMMAND

Figure 5. Example LIST 2 (continued)

user must supply a component structure or rotor number to distinguish them from the degrees of freedom formed by other uses of the same component in the model. Structure and rotor numbers must be unique in a given model, except in the cases of rotor control systems and damaged rotors. The component input (ds/C---) and the force input (ds/F---) for a given model must exist on the data base before a solution can be performed. Global variables, if any, follow the component/force ds/dm list. Two models are shown in Figures 6 and 7. The component rotor or structure number is found in the column labeled (NO.). Note that in the second example, VERT/CFM2 is used 4 times and in the first example, B2Z1T2/CRE3 and 3000/CCEØ have been assigned to rotor 1 and 8300-4/CFM2 has been assigned to structure 1.

LIST
DATA SET
AH1G-35A
DATA MEMBER
MODEL
AH1G-35A/MODEL ON FILE U1

***** MODEL AH1G-35A *****

AH1G TRIM

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CRE3	1	B2Z1T2	FRA3	FCT1.65
				REQUIRED DS/DM=	AFD161 /AIRFOIL
2	CCE0	1	3000	NONE	
3	CLC1		COUPLE	NONE	
4	CFM2	1	8300-4	FFC2	AH1G16.5

MORE..

***** GLOBAL VARIABLES *****

1 VSOUND	- SOUND VELOCITY	= 1.13800E+03
2 RHO	- AIR DENSITY RATIO	= 8.79000E-01

LIST COMPLETE
COMMAND

Figure 6. Example Model 1.

LIST
DATA SET
PACOSS1
DATA MEMBER
MODEL
PACOSS1 /MODEL ON FILE U2

***** MODEL PACOSS1 *****

PACOSS STRUCTURE SEGMENT 1

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CSF1		HORIZ	NONE	
2	CFM2	1	VERT	NONE	
3	CFM2	2	VERT	NONE	
4	CFM2	3	VERT	NONE	
5	CFM2	4	VERT	NONE	
6	CLC2		VERT1	NONE	
7	CLC2		VERT2	NONE	
8	CLC2		VERT3	NONE	
9	CLC2		VERT4	NONE	MORE..
10	CSF1		MASS	NONE	

GLOBAL VARIABLES

NO INPUT REQUIRED

LIST COMPLETE
COMMAND

Figure 7. Example Model 2.

2.2 COMPONENT DATA SETS

Input data for a component is formed using the NEW command or its variations (new data sets may be input during model formulation and the addition phase of model editing) or by editing an existing component data set. In the examples which follow, the NEW command has been used to form sample data sets. The user should refer directly to paragraph 3.1 of the DYSCO 4.1 User's Manual while reviewing the sample dialogues.

2.2.1 CFM2 - Fuselage Modal.

2.2.1.1 CFM2 User Notes - The user must supply modes from a separate analysis and the modes are assumed to be orthogonal, but it is not necessary to specify enough stations to totally define a mode shape. Mode shapes need only be defined such that if modal interpolation is required (implicit degrees of freedom), adequate definition has been made, or the user can simply define mode shapes at stations that coincide with implicit degree of freedom locations.

Modes can be obtained from test data, from some outside analysis, or by formulating a finite element model using DYSCO (CSF1) and performing an eigenanalysis of the system. The mode shapes, frequency, and damping obtained can be used for the modal representation. There are no limitations on the mode shapes, except that they be consistent for all modes, and that, if modal slopes are required (modal coupling), consistency be maintained.

2.2.1.2 CFM2 Sample Input - Inputs for two CFM2 data sets follow. In the first example, a fuselage with two rigid body modes and one elastic mode is considered. The elastic mode is defined in the vertical direction and modal displacements and slopes are input for five stations.

In the second example, a rigid fuselage with a rotor attached is considered. Since there are no elastic degrees of freedom, no fuselage stations are required. The rotor may be rigid or elastic. Only the location and orientation of the hub degrees of freedom with respect to the fuselage are required.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CFM2
DATA SET
BEAM
SAVE FILE(R,U1,...)
U1

STRUCTURAL COMPONENT CFM2 . MODAL FUSELAGE

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
MODAL BEAM

RBM (Y OR N)
RIGID BODY MODES
ENTER 1 Y OR N VALUE
Y

MORE...

IXCG (Y OR N)
LONGITUDINAL
ENTER 1 Y OR N VALUE
N

IYCG (Y OR N)
LATERAL
ENTER 1 Y OR N VALUE
N

IZCG (Y OR N)
VERTICAL
ENTER 1 Y OR N VALUE
Y

IROLL (Y OR N)
ROLL
ENTER 1 Y OR N VALUE
N

IPTCH (Y OR N)
PITCH

MORE...

ENTER 1 Y OR N VALUE

Y

IYAW (Y OR N)

YAW

ENTER 1 Y OR N VALUE

N

CG (REAL)

CG STATION (IN)

ENTER 1 REAL VALUE

?

120

NMODE (INTEGER)

NO. OF ELASTIC MODES

ENTER 1 INTEGER VALUE(S)

1

NS (INTEGER)

NO. FUSELAGE STAS

ENTER 1 INTEGER VALUE(S)

MORE...

5

X (REAL)

INPUT STATION VALUES

ENTER 5 REAL VALUE(S)

?

0 120 240 360 480

VC1 (Y OR N)

MODE1 VERTICAL COMP

ENTER 1 Y OR N VALUE

Y

Z1 (REAL)

MODE1 VERTICAL DISP

NULL VECTOR (Y OR N)

N

ENTER 5 REAL VALUE(S)

?

1 -.2 -1.2 -.2 1

ZP1 (REAL)

MORE...

MODE1 VERTICAL SLOPE
NULL VECTOR (Y OR N)
N
ENTER 5 REAL VALUE(S)
?
-.01 -.005 0 .005 .01

LC1 (Y OR N)
MODE1 LATERAL COMP
ENTER 1 Y OR N VALUE
N

TC1 (Y OR N)
MODE1 TORSION COMP
ENTER 1 Y OR N VALUE
N

NR (INTEGER)
NO. OF ROTORS
ENTER 1 INTEGER VALUE(S)
0

NI (INTEGER)
NO. OTHER IMPLCT DOF
ENTER 1 INTEGER VALUE(S)
0

MASSL (REAL)
FUSELAGE MASS (LB)
ENTER 1 REAL VALUE
?
3000

IMYF (REAL)
PITCH MOI ABOUT CG
ENTER 1 REAL VALUE
?
3000

MMS (REAL)
MODAL MASS (SLUGS)
ENTER 1 REAL VALUE(S)
?
50

MORE...

MORE...

MD (REAL)
MODAL DAMPING (PCT)

ENTER 1 REAL VALUE(S)

?

5

FREQ (REAL)
MODAL FREQUENCY (HZ)

ENTER 1 REAL VALUE(S)

?

10

***** INPUT FOR STRUCTURAL COMPONENT CFM2. MODAL FUSELAGE

1 RBM	- RIGID BODY MODES	=	YES
2 IXCG	- LONGITUDINAL	=	NO
3 IYCG	- LATERAL	=	NO
4 IZCG	- VERTICAL	=	YES
5 IROLL	- ROLL	=	NO
6 IPTCH	- PITCH	=	YES
7 IYAW	- YAW	=	NO
MORE...			
8 CG	- CG STATION (IN)	=	1.20000E+02
9 NMODE	- NO. OF ELASTIC MODES	=	1
10 NS	- NO. FUSELAGE STAS	=	5
11 X	- (REAL) INPUT STATION VALUES		
	0.00000E+00	1.20000E+02	2.40000E+02
	4.80000E+02		3.60000E+02
12 VC1	- MODE1 VERTICAL COMP	=	YES
13 Z1	- (REAL) MODE1 VERTICAL DISP		
	1.00000E+00	-2.00000E-01	-1.20000E+00
	1.00000E+00		-2.00000E-01
14 ZP1	- (REAL) MODE1 VERTICAL SLOPE		
	-1.00000E-02	-5.00000E-03	0.00000E+00
	1.00000E-02		5.00000E-03
15 LC1	- MODE1 LATERAL COMP	=	NO
16 TC1	- MODE1 TORSION COMP	=	NO
17 NR	- NO. OF ROTORS	=	0
18 NI	- NO. OTHER IMPLCT DOF	=	0
19 MASSL	- FUSELAGE MASS (LB)	=	3.00000E+03
20 IMYF	- PITCH MOI ABOUT CG	=	3.00000E+03
21 MMS	- MODAL MASS (SLUGS)	=	5.00000E+01
22 MD	- MODAL DAMPING (PCT)	=	5.00000E+00
23 FREQ	- MODAL FREQUENCY (HZ)	=	1.00000E+01

MORE...

RE-ENTER (Y OR N)
N
DATA SET BEAM FOR CFM2 SAVED ON U1
COMPONENT, FORCE, OR N
CFM2
DATA SET
FUSLAT
SAVE FILE(R,U1,...)
U1

STRUCTURAL COMPONENT CFM2 . MODAL FUSELAGE

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
RIDID FUSELAGE WITH LATERAL DOF

RBM (Y OR N)
RIGID BODY MODES
ENTER 1 Y OR N VALUE

MORE...

Y

IXCG (Y OR N)
LONGITUDINAL
ENTER 1 Y OR N VALUE
N

IYCG (Y OR N)
LATERAL
ENTER 1 Y OR N VALUE
Y

IZCG (Y OR N)
VERTICAL
ENTER 1 Y OR N VALUE
N

IROLL (Y OR N)
ROLL
ENTER 1 Y OR N VALUE
Y

MORE...

```
IPTCH      (Y OR N)
    PITCH
ENTER 1 Y OR N VALUE
N
-----
IYAW       (Y OR N)
    YAW
ENTER 1 Y OR N VALUE
N
-----
NMODE      (INTEGER)
    NO. OF ELASTIC MODES
ENTER    1 INTEGER VALUE(S)
0
-----
NR         (INTEGER)
    NO. OF ROTORS
ENTER    1 INTEGER VALUE(S)
1
-----
NROT       (INTEGER)
    ROTOR NUMBERS
ENTER    1 INTEGER VALUE(S)          MORE...
1
-----
XROT       (REAL)
    ROTOR STATIONS
ENTER  1 REAL VALUE(S)
?
-9.9
-----
ZROT       (REAL)
    ROTOR VERTICAL HT
ENTER  1 REAL VALUE(S)
?
84.24
-----
ASF        (REAL)
    FWD SHAFT ANGLE
ENTER  1 REAL VALUE(S)
?
6
-----
ASL        (REAL)          MORE...

```

LAT SHAFT ANGLE
ENTER 1 REAL VALUE(S)

?
4

IX (Y OR N)
HUB TRAN DOF - LONG

ENTER 1 Y OR N VALUE

N

IY (Y OR N)
HUB TRAN DOF - LAT

ENTER 1 Y OR N VALUE

Y

IZ (Y OR N)
HUB TRAN DOF - AXIAL

ENTER 1 Y OR N VALUE

N

IAX (Y OR N)
HUB ANGL DOF - ROLL

ENTER 1 Y OR N VALUE

Y

MORE...

IAY (Y OR N)
HUB ANGL DOF - PITCH

ENTER 1 Y OR N VALUE

N

IAZ (Y OR N)
HUB ANGL DOF - YAW

ENTER 1 Y OR N VALUE

N

NI (INTEGER)
NO. OTHER IMPLCT DOF
ENTER 1 INTEGER VALUE(S)

0

MASSL (REAL)
FUSELAGE MASS (LB)
ENTER 1 REAL VALUE

?

VM READ

12434

IMXF (REAL)
ROLL MOI SLUG-FT(SQ)
ENTER 1 REAL VALUE

?
7700

INPUT FOR STRUCTURAL COMPONENT CFM2. MODAL FUSELAGE

1 RBM	- RIGID BODY MODES	=	YES
2 IXCG	- LONGITUDINAL	=	NO
3 IYCG	- LATERAL	=	YES
4 IZCG	- VERTICAL	=	NO
5 IROLL	- ROLL	=	YES
6 IPTCH	- PITCH	=	NO
7 IYAW	- YAW	=	NO
8 NMODE	- NO. OF ELASTIC MODES	=	0
9 NR	- NO. OF ROTORS	=	1
10 NROT	- ROTOR NUMBERS	=	.1
11 XROT	- ROTOR STATIONS	=	-9.90000E+00
12 ZROT	- ROTOR VERTICAL HT	=	8.42400E+01
13 ASF	- FWD SHAFT ANGLE	=	6.00000E+00
14 ASL	- LAT SHAFT ANGLE	=	4.00000E+00
15 IX	- HUB TRAN DOF - LONG	=	NO
16 IY	- HUB TRAN DOF - LAT	=	YES
17 IZ	- HUB TRAN DOF - AXIAL	=	NO
18 IAX	- HUB ANGL DOF - ROLL	=	YES
19 IAY	- HUB ANGL DOF - PITCH	=	NO
20 IAZ	- HUB ANGL DOF - YAW	=	NO
21 NI	- NO. OTHER IMPLCT DOF	=	0
22 MASSL	- FUSELAGE MASS (LB)	=	1.24340E+04
23 IMXF	- ROLL MOI SLUG-FT(SQ)	=	7.70000E+03

MORE...

RE-ENTER (Y OR N)

N

DATA SET FUSLAT FOR CFM2 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

VM READ

2.2.2 CRR2 - Rotor, Rigid Blades.

2.2.2.1 CRR2 User Notes - Rotor system analyses which include rotors with rigid blades should generally be limited to trim and performance estimates. Limited damage assessment and some stability analyses, such as ground resonance modeling, can also be performed.

2.2.2.2 CRR2 Sample Input - Input is shown for a CRR2 data set which could be used in a limited ground resonance analysis. Degrees of freedom have been chosen so that motion is confined to the lateral direction.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CRR2
DATA SET
ROTLAT
SAVE FILE(R,U1,...)
U1

ROTOR COMPONENT CRR2 . ROTOR RIGID BLADES

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
RIGID ROTOR WITH LATERAL DOF

IBETA (Y OR N)
BLADE FLAPPING DOF
*
* *
* * BLADE MUST HAVE AT LEAST ONE OF FLAP, LAG OR PITCH DOF *
MORE...
* *
*
ENTER 1 Y OR N VALUE
N

IZETA (Y OR N)
BLADE LAG DOF
ENTER 1 Y OR N VALUE
Y

ITHET (Y OR N)
BLADE PITCH DOF
ENTER 1 Y OR N VALUE
N

IX (Y OR N)
HUB TRAN DOF - LONG
ENTER 1 Y OR N VALUE
N

IY (Y OR N)
HUB TRAN DOF - LAT
MORE...

ENTER 1 Y OR N VALUE

Y

IZ (Y OR N)

HUB TRAN DOF - AXIAL

ENTER 1 Y OR N VALUE

N

IAX (Y OR N)

HUB ANGL DOF - ROLL

ENTER 1 Y OR N VALUE

Y

IAY (Y OR N)

HUB ANGL DOF - PITCH

ENTER 1 Y OR N VALUE

N

IAZ (Y OR N)

HUB ANGL DOF - YAW

ENTER 1 Y OR N VALUE

N

MORE...

NB (INTEGER)

NUMBER OF BLADES

ENTER 1 INTEGER VALUE(S)

4

R (REAL)

ROTOR RADIUS

ENTER 1 REAL VALUE

?

283.45

RPM (REAL)

ROTOR RPM

ENTER 1 REAL VALUE

?

309.4

IC (INTEGER)

ROTOR ROTATION

-1 IS CLOCKWISE; +1 IS CNTRCLOCKWISE

ENTER 1 INTEGER VALUE(S)

MORE...

1

PSI (REAL)
AZIMUTH OF REF BLADE
AZIMUTH OF REFERENCE BLADE AT T = 0
ENTER 1 REAL VALUE
?
0

E1 (REAL)
HINGE OFFSET
ENTER 1 REAL VALUE
?
8.25

CZETA (REAL)
LAG DAMPER VALUE
ENTER 1 REAL VALUE
?
628

KZETA (REAL) MORE...
LAG SPRING STIFFNSS
ENTER 1 REAL VALUE
?
10627.2

MHUB (REAL)
HUB MASS
ENTER 1 REAL VALUE
?
600.62

IHUBX (REAL)
HUB MOI - REF BLADE
MOMENT OF INERTIA ABOUT REFERENCE BLADE AXIS
ENTER 1 REAL VALUE
?
0

IHUBY (REAL)
HUB MOI - PERPENDCLR
MOMENT OF INERTIA ABOUT PERPENDICULAR AXIS
ENTER 1 REAL VALUE MORE...

?

0

TH0 (REAL)

ROOT PITCH ANGLE

ENTER 1 REAL VALUE

?

0

UB (Y OR N)

UNIFORM BLADE

ENTER 1 Y OR N VALUE

Y

UMB (REAL)

BLADE MASS/UNIT LNTH

ENTER 1 REAL VALUE

?

.78623

UITH (REAL)

TOTAL FEATHERING MOI

ENTER 1 REAL VALUE

MORE...

?

0

UCG (REAL)

C G OFFSET

+ VALUE IS FWD; - IS AFT

ENTER 1 REAL VALUE

?

0

UTHX (REAL)

TOTAL BUILT-IN TWIST

- VALUE = NOSE DOWN; + VALUE = UP

ENTER 1 REAL VALUE

?

0

NX (INTEGER)

NO. OF BLADE STAS.

ENTER 1 INTEGER VALUE(S)

10

MORE...

INPUT FOR ROTOR COMPONENT CRR2. ROTOR RIGID BLADES

1 IBETA	- BLADE FLAPPING DOF =	NO
2 IZETA	- BLADE LAG DOF =	YES
3 ITHET	- BLADE PITCH DOF =	NO
4 IX	- HUB TRAN DOF - LONG =	NO
5 IY	- HUB TRAN DOF - LAT =	YES
6 IZ	- HUB TRAN DOF - AXIAL=	NO
7 IAX	- HUB ANGL DOF - ROLL =	YES
8 IAY	- HUB ANGL DOF - PITCH=	NO
9 IAZ	- HUB ANGL DOF - YAW =	NO
10 NB	- NUMBER OF BLADES =	4
11 R	- ROTOR RADIUS =	2.83450E+02
12 RPM	- ROTOR RPM =	3.09400E+02
13 IC	- ROTOR ROTATION =	1
14 PSI	- AZIMUTH OF REF BLADE=	0.00000E+00
15 E1	- HINGE OFFSET =	8.25000E+00
16 CZETA	- LAG DAMPER VALUE =	6.28000E+02
17 KZETA	- LAG SPRING STIFFNSS=	1.06272E+04
18 MHUB	- HUB MASS =	6.00620E+02
19 IHUBX	- HUB MOI - REF BLADE =	0.00000E+00
20 IHUBY	- HUB MOI - PERPENDCLR=	0.00000E+00
21 TH0	- ROOT PITCH ANGLE =	0.00000E+00
22 UB	- UNIFORM BLADE =	YES
23 UMB	- BLADE MASS/UNIT LNTH=	7.86230E-01
24 UITH	- TOTAL FEATHERING MOI=	0.00000E+00
25 UCG	- C G OFFSET =	0.00000E+00
26 UTHX	- TOTAL BUILT-IN TWIST=	0.00000E+00
27 NX	- NO. OF BLADE STAS. =	10

MORE . . .

RE-ENTER (Y OR N)

N

DATA SET ROTLAT FOR CRR2 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

VM READ

2.2.3 CRE3 - Rotor, Elastic Blades.

2.2.3.1 CRE3 User Notes - The user should carefully review the Theoretical Manual and the User's Manual prior to formulating an elastic rotor simulation using CRE3.

CRE3 can be substituted into any rotor system analysis using CRR2 and can be used in conjunction with CRD3 to perform detailed rotor blade damage assessments. In addition, the user can set "switches" which will allow time history blade moments to be calculated (SII3).

2.2.3.2 CRE3 Sample Input - Input is shown for a CRE3 data set which could be used in a limited ground resonance analysis. Degrees of freedom have been chosen so that motion is confined to the lateral direction, and one rigid and one elastic in-plane blade degree of freedom have been input. Note that even though only in-plane blade degrees of freedom have been specified, in-plane and out-of-plane stiffnesses are required due to in-plane, out-of-plane coupling and, as a result, in-plane and out-of-plane moments are generated.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CRE3
DATA SET
ROTLAT
SAVE FILE(R,U1,...)
U1

ROTOR COMPONENT CRE3 . ROTOR ELASTIC BLADES

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
ELASTIC ROTOR WITH LATERAL DOF

JV (Y OR N)
INPLANE DOF
ENTER 1 Y OR N VALUE
Y

MORE...

JW (Y OR N)
OUTPLANE DOF
ENTER 1 Y OR N VALUE
N

JF (Y OR N)
TORSION DOF
ENTER 1 Y OR N VALUE
N

JS (Y OR N)
SHAFT PERTURBED DOF
ENTER 1 Y OR N VALUE
N

JX (Y OR N)
XHUB(LONG) DOF
ENTER 1 Y OR N VALUE
N

JY (Y OR N)
YHUB(LAT) DOF

MORE...

ENTER 1 Y OR N VALUE
Y

JZ (Y OR N)
ZHUB(AXIAL) DOF
ENTER 1 Y OR N VALUE
N

JAX (Y OR N)
ALFX(ROLL) DOF
ENTER 1 Y OR N VALUE
Y

JAY (Y OR N)
ALFY(PTCH) DOF
ENTER 1 Y OR N VALUE
N

JAZ (Y OR N)
ALFZ(YAW) DOF
ENTER 1 Y OR N VALUE
N

MORE...

NV (INTEGER)
NO. OF INPLANE MODES
ENTER 1 INTEGER VALUE(S)
2

NB (INTEGER)
NO. OF BLADES
ENTER 1 INTEGER VALUE(S)
2

NX (INTEGER)
NO. OF STATIONS
ENTER 1 INTEGER VALUE(S)
20

ITYP (INTEGER)
MODE INPUT 1 OR 2
1 = MODE SHAPE INPUT BY USER2 = MODE SHAPE GENERATED AUTOMATICALLY BASED ON UNIFORM NONROTATING BEAM
ENTER 1 INTEGER VALUE(S)
1

MORE...

X (REAL)
STATIONS
ENTER 20 REAL VALUE(S)
?
0 15 45 52.79 52.8 62.9 82.7 101.7 121.5 138.6
?
150.5 163.7 178.2 191.4 205.15 218.35 231.25 245.5 257.4 264

NIP (INTEGER)
INPLANE HINGE STA

ENTER 1 INTEGER VALUE(S)
1

VPP (REAL)
2ND DERIVATIVE OF IP
MODES
TYPE MATRIX
(0=NULL), (3=GENERAL)
3
INPUT BY ROWS OR COLUMNS (R OR C) MORE...
C
OPTION TO SPECIFY NULL COLUMNS (Y OR N)
Y
NULL COL 1 (Y OR N)
Y
NULL COL 2 (Y OR N)
N
PREPARE TO ENTER COL 2
ENTER 20 REAL VALUES
?
3.6485E-5 9.2447E-5 1.5321E-5 1.4412E-5 1.4412E-5 2.5838E-5 2.2203E-5
?
1.7918E-5 1.61E-5 1.3763E-5 1.2335E-5 1.0257E-5 8.6994E-6 7.0115E-6
?
4.6743E-6 2.8565E-6 1.5581E-6 5.1936E-7 0 0

VP (REAL)
1ST DERIVATIVE OF IP
MODES
TYPE MATRIX
(0=NULL), (3=GENERAL)
3
MORE...

INPUT BY ROWS OR COLUMNS (R OR C)
C
OPTION TO SPECIFY NULL COLUMNS (Y OR N)
N
PREPARE TO ENTER COL 1
ENTER 20 REAL VALUES
?
3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3
?
3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3
?
3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3 3.7878E-3
PREPARE TO ENTER COL 2
ENTER 20 REAL VALUES
?
0 9.67E-4 2.5835E-3 2.6993E-3 2.6995E-3 2.9027E-3 3.3783E-3 3.7595E-3
?
4.0963E-3 4.3516E-3 4.5069E-3 4.656E-3 4.7934E-3 4.9971E-3 4.9775E-3
?
5.0272E-3 5.0556E-3 5.0705E-3 5.0735E-3 5.375E-3

V (REAL)

MORE...

INPLANE MODE SHAPES
TYPE MATRIX
(0=NULL), (3=GENERAL)
3
INPUT BY ROWS OR COLUMNS (R OR C)
C
OPTION TO SPECIFY NULL COLUMNS (Y OR N)
N
PREPARE TO ENTER COL 1
ENTER 20 REAL VALUES
?
0 .05681 .17045 .2 .2001 .2382 .31325 .3852 .4602 .525 .57 .62 .675
?
.725 .777 .8271 .8759 .93 .975 1
PREPARE TO ENTER COL 2
ENTER 20 REAL VALUES
?
0 .007252 .06051 .08108 .08111 .1094 .17159 .2394 .3171 .3894 .4421
?
.5025 .5711 .635 .703 .7689 .834 .9061 .9665 1

C1PF (REAL)

MORE...

IP MODAL DAMPING
(LBF-SEC/IN)
NULL VECTOR (Y OR N)
Y

NI (INTEGER)
NO. OF IMPLICIT DOFS
ENTER 1 INTEGER VALUE(S)
0

KIP (REAL)
IP SPRING RATE
(IN-LBF/DEG)
ENTER 1 REAL VALUE
?
0

CIP (REAL)
IP DAMPING RATE
(IN-LBF-SEC/DEG)
ENTER 1 REAL VALUE
?
0

OM (REAL)
RPM
ENTER 1 REAL VALUE
?
324

IC (INTEGER)
ROTATION DIRECTION
1 = COUNTERCLOCKWISE -1 = CLOCKWISE
ENTER 1 INTEGER VALUE(S)
1

PSIO (REAL)
AZIMUTH OF REF BLADE
AT T=0 (DEG)
ENTER 1 REAL VALUE
?
0

MHUB (REAL)

MORE...

MORE...

HUB WEIGHT (LB)
ENTER 1 REAL VALUE

?

0

IHUBX (REAL)
HUB M.O.I. ABOUT X-

AXIS(LB-IN**2)

ENTER 1 REAL VALUE

?

0

TH0 (REAL)
ROOT PTCH ANG (DEG)

ENTER 1 REAL VALUE

?

15

NONLIN (Y OR N)
NONLIN TERMS

ENTER 1 Y OR N VALUE

N

MORE...

IU (Y OR N)
UNIFORM BLADE

ENTER 1 Y OR N VALUE

N

M (REAL)
MASS PER UNIT LENGTH
(LB/IN)

NULL VECTOR (Y OR N)

N

ENTER 20 REAL VALUE(S)

?

5.7834 5.7834 5.26 5.26 .89 .89 .82 .8446 .797 .726 .875 1.098

?

1.063 1.039 1.26 1.186 1.266 1.189 1.16 1.16

SE (REAL)
CG OFFSET FROM EA
(IN)

NULL VECTOR (Y OR N)

Y

MORE...

SEA (REAL)
AREA CENTROID OFFSET
FROM EA (+ FWD EA) (IN)
NULL VECTOR (Y OR N)
Y

KM1 (REAL)
MASS ROG ABOUT
LOCAL CHORDWISE AXIS IN BEAMWISE DIRECTION (IN)
NULL VECTOR (Y OR N)
Y

KM2 (REAL)
MASS ROG ABOUT
LOCAL BEAMWISE AXIS IN CHORDWISE DIRECTION (IN)
NULL VECTOR (Y OR N)
Y

KA (REAL)
AREA ROG OF CROSS
SECTION (IN)
NULL VECTOR (Y OR N)
Y

THP (REAL)
PRETWIST RATE DEG/IN
NULL VECTOR (Y OR N)
N
ENTER 20 REAL VALUE(S)
?
-.04 -.04 -.04 -.04 -.04 -.04 -.04 -.04 -.04 -.04
?
-.04 -.04 -.04 -.04 -.04 -.04 -.04 -.04 -.04 -.04

EIY (REAL)
CHORDWISE EI*10E-6
(LBF*IN**2)
NULL VECTOR (Y OR N)
N
ENTER 20 REAL VALUE(S)
?
5000 5000 5000 5000 4240 4240 4150 4290 3820 3600
MORE...

?
3390 3255 2910 2650 2650 2650 2655 2660 2690 2690

EIZ (REAL)
BEAMWISE EI*10E-6
(LBF*IN**2)

NULL VECTOR (Y OR N)

N

ENTER 20 REAL VALUE(S)

?

180 180 300 300 89.5 89.5 58 53 46 40

?

40 41 41 39.6 39.5 42 42.4 42.4 38 38

EA (REAL)
SECTION EA*10E-6
(LBF)

NULL VECTOR (Y OR N)

Y

JIL (Y OR N)
INTERNAL LOADS

ENTER 1 Y OR N VALUE
Y

MORE...

NXIL (INTEGER)
NO. OF STATIONS
ENTER 1 INTEGER VALUE(S)
5

INDIL (INTEGER)
STATION INDICES
ENTER 5 INTEGER VALUE(S)
1 2 3 4 5

JIPIL (Y OR N)
INPLANE MOMENTS
ENTER 1 Y OR N VALUE
Y

JOPIL (Y OR N)
OUTPLANE MOMENTS
ENTER 1 Y OR N VALUE
Y

MORE...

INPUT FOR ROTOR COMPONENT CRE3. ROTOR ELASTIC BLADES

1 JV	- INPLANE DOF	=	YES	
2 JW	- OUTPLANE DOF	=	NO	
3 JP	- TORSION DOF	=	NO	
4 JS	- SHAFT PERTURBED DOF	=	NO	
5 JX	- XHUB(LONG) DOF	=	NO	
6 JY	- YHUB(LAT) DOF	=	YES	
7 JZ	- ZHUB(AXIAL) DOF	=	NO	
8 JAX	- ALFX(ROLL) DOF	=	YES	
9 JAY	- ALFY(PITCH) DOF	=	NO	
10 JAZ	- ALFZ(YAW) DOF	=	NO	
11 NV	- NO. OF INPLANE MODES	=	2	
12 NB	- NO. OF BLADES	=	2	
13 NX	- NO. OF STATIONS	=	20	
14 ITYF	- MODE INPUT 1 OR 2	=	1	
15 X	- (REAL) STATIONS			
	0.00000E+00	1.50000E+01	4.50000E+01	5.27900E+01
	5.28000E+01	6.29000E+01	8.27000E+01	1.01700E+02
	1.21500E+02	1.38600E+02	1.50500E+02	1.63700E+02
	1.78200E+02	1.91400E+02	2.05150E+02	2.18350E+02
				MORE...
16 NIF	2.31250E+02	2.45500E+02	2.57400E+02	2.64000E+02
17 VPP	- INPLANE HINGE STA	=	1	
	- (REAL) 2ND DERIVATIVE OF IP			

GENERAL MATRIX

ROW	1	
	0.00000E+00	3.64850E-05
ROW	2	
	0.00000E+00	9.24470E-05
ROW	3	
	0.00000E+00	1.53210E-05
ROW	4	
	0.00000E+00	1.44120E-05
ROW	5	
	0.00000E+00	1.44120E-05
ROW	6	
	0.00000E+00	2.58380E-05
ROW	7	
	0.00000E+00	2.22030E-05
ROW	8	
	0.00000E+00	1.79180E-05
ROW	9	

MORE...

ROW	0.00000E+00	1.61000E-05
	10	
ROW	0.00000E+00	1.37630E-05
	11	
ROW	0.00000E+00	1.23350E-05
	12	
ROW	0.00000E+00	1.02570E-05
	13	
ROW	0.00000E+00	8.69940E-06
	14	
ROW	0.00000E+00	7.01150E-06
	15	
ROW	0.00000E+00	4.67430E-06
	16	
ROW	0.00000E+00	2.85650E-06
	17	
ROW	0.00000E+00	1.55810E-06
	18	
ROW	0.00000E+00	5.19360E-07
	19	NULL ROW
ROW	20	NULL ROW

18 VP - (REAL) 1ST DERIVATIVE OF IP

MORE...

GENERAL MATRIX

ROW	1	
	3.78780E-03	0.00000E+00
ROW	2	
	3.78780E-03	9.67000E-04
ROW	3	
	3.78780E-03	2.58350E-03
ROW	4	
	3.78780E-03	2.69930E-03
ROW	5	
	3.78780E-03	2.69950E-03
ROW	6	
	3.78780E-03	2.90270E-03
ROW	7	
	3.78780E-03	3.37830E-03
ROW	8	
	3.78780E-03	3.75950E-03
ROW	9	
	3.78780E-03	4.09630E-03
ROW	10	
	3.78780E-03	4.35160E-03

MORE...

ROW	11	
	3.78780E-03	4.50690E-03
ROW	12	
	3.78780E-03	4.65600E-03
ROW	13	
	3.78780E-03	4.79340E-03
ROW	14	
	3.78780E-03	4.99710E-03
ROW	15	
	3.78780E-03	4.97750E-03
ROW	16	
	3.78780E-03	5.02720E-03
ROW	17	
	3.78780E-03	5.05560E-03
ROW	18	
	3.78780E-03	5.07050E-03
ROW	19	
	3.78780E-03	5.07350E-03
ROW	20	
	3.78780E-03	5.37500E-03
19 V	- (REAL) INPLANE MODE SHAPES	
	GENERAL MATRIX	

MORE...

ROW	1	NULL ROW
ROW	2	
	5.68100E-02	7.25200E-03
ROW	3	
	1.70450E-01	6.05100E-02
ROW	4	
	2.00000E-01	8.10800E-02
ROW	5	
	2.00100E-01	8.11100E-02
ROW	6	
	2.38200E-01	1.09400E-01
ROW	7	
	3.13250E-01	1.71590E-01
ROW	8	
	3.85200E-01	2.39400E-01
ROW	9	
	4.60200E-01	3.17100E-01
ROW	10	
	5.25000E-01	3.89400E-01
ROW	11	
	5.70000E-01	4.42100E-01

MORE...

ROW	12			
	6.20000E-01	5.02500E-01		
ROW	13			
	6.75000E-01	5.71100E-01		
ROW	14			
	7.25000E-01	6.35000E-01		
ROW	15			
	7.77000E-01	7.03000E-01		
ROW	16			
	8.27100E-01	7.68900E-01		
ROW	17			
	8.75900E-01	8.34000E-01		
ROW	18			
	9.30000E-01	9.06100E-01		
ROW	19			
	9.75000E-01	9.66500E-01		
ROW	20			
	1.00000E+00	1.00000E+00		
20	CIPF	- IP MODAL DAMPING	=	0.00000E+00
21	NI	- NO. OF IMPLICIT DOFS	=	0
22	KIP	- IP SPRING RATE	=	0.00000E+00
23	CIP	- IP DAMPING RATE	=	0.00000E+00
				MORE...
24	OM	- RPM	=	3.24000E+02
25	IC	- ROTATION DIRECTION	=	1
26	PSIO	- AZIMUTH OF REF BLADE	=	0.00000E+00
27	MHUB	- HUB WEIGHT (LB)	=	0.00000E+00
28	IHUBX	- HUB M.O.I. ABOUT X-	=	0.00000E+00
29	TH0	- ROOT PTCH ANG (DEG)	=	1.50000E+01
30	NONLIN	- NONLIN TERMS	=	NO
31	IU	- UNIFORM BLADE	=	NO
32	M	- (REAL) MASS PER UNIT LENGTH		
		5.78340E+00	5.78340E+00	5.26000E+00
		8.90000E-01	8.90000E-01	8.20000E-01
		7.97000E-01	7.26000E-01	8.75000E-01
		1.06300E+00	1.03900E+00	1.26000E+00
		1.26600E+00	1.18900E+00	1.16000E+00
33	SE	- (REAL) CG OFFSET FROM EA		
		0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00
34	SEA	- (REAL) AREA CENTROID OFFSET		
		0.00000E+00	0.00000E+00	0.00000E+00

MORE...

	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
35 KM1	- (REAL) MASS ROG ABOUT			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
36 KM2	- (REAL) MASS ROG ABOUT			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
37 KA	- (REAL) AREA ROG OF CROSS			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
38 THP	- (REAL) PRETWIST RATE DEG/IN			MORE...
	-4.00000E-02	-4.00000E-02	-4.00000E-02	-4.00000E-02
	-4.00000E-02	-4.00000E-02	-4.00000E-02	-4.00000E-02
	-4.00000E-02	-4.00000E-02	-4.00000E-02	-4.00000E-02
	-4.00000E-02	-4.00000E-02	-4.00000E-02	-4.00000E-02
	-4.00000E-02	-4.00000E-02	-4.00000E-02	-4.00000E-02
39 EIY	- (REAL) CHORDWISE EI*10E-6			
	5.00000E+03	5.00000E+03	5.00000E+03	5.00000E+03
	4.24000E+03	4.24000E+03	4.15000E+03	4.29000E+03
	3.82000E+03	3.60000E+03	3.39000E+03	3.25500E+03
	2.91000E+03	2.65000E+03	2.65000E+03	2.65000E+03
	2.65500E+03	2.66000E+03	2.69000E+03	2.69000E+03
40 EIZ	- (REAL) BEAMWISE EI*10E-6			
	1.80000E+02	1.80000E+02	3.00000E+02	3.00000E+02
	8.95000E+01	8.95000E+01	5.80000E+01	5.30000E+01
	4.60000E+01	4.00000E+01	4.00000E+01	4.10000E+01
	4.10000E+01	3.96000E+01	3.95000E+01	4.20000E+01
	4.24000E+01	4.24000E+01	3.80000E+01	3.80000E+01
41 EA	- (REAL) SECTION EA*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
42 JIL	- INTERNAL LOADS	=	YES	
43 NXIL	- NO. OF STATIONS	=	5	
44 INDIL	- STATION INDICES			
	1	2	3	4
45 JIPIL	- INPLANE MOMENTS	=	YES	
46 JOPIL	- OUTPLANE MOMENTS	=	YES	

RE-ENTER (Y OR N)

N

DATA SET ROTLAT FOR CRE3 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

VM READ

2.2.4 CCE1 - Control System, Elastic Rods.

2.2.4.1 CCE1 User Notes - During model formulation, CCE1 must follow the rotor with which it is to be coupled. Control rod degrees of freedom are defined with respect to the rotating coordinate system of the rotor, and swashplate degrees of freedom are defined with respect to the fixed coordinate system of the rotor hub. The number of control rods is equal to the number of blades and all control rods have identical characteristics. However, CSF1 can be used to add or subtract stiffness or damping from a rod or rods resulting in nonidentical control rods. Also note that a control rod is equivalent to a pitch bearing spring or damper.

2.2.4.2 CCE1 Sample Input -

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CCE1
DATA SET
CONROD
SAVE FILE(R,U1,...)
U1

CONTROL SYSTEM COMPONENT CCE1 . CONTROL RODS SWASHPLATE

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
ROTOR CONTROL SYSTEM

MSP (REAL)
SWASH PLATE MASS
(LB)

ENTER 1 REAL VALUE

?

MORE...

20

ISP (REAL)
MOI ABOUT DIAMETER
(LB-IN SQ)

ENTER 1 REAL VALUE

?

2000

CSCOL (REAL)
COLLECTIVE DAMPING
(LB-SEC/IN)

ENTER 1 REAL VALUE

?

100

CSCYC (REAL)
CYCLIC DAMPING
(LB-SEC-IN/DEG)

ENTER 1 REAL VALUE

?

10

MORE...

KSCOL (REAL)
COLLECTIVE STIFFNESS
(LB/IN)
ENTER 1 REAL VALUE

?
1000

KSCYC (REAL)
CYCLIC STIFFNESS
(LB-IN/DEG)
ENTER 1 REAL VALUE

?
100

LROD (REAL)
AXIS-CONTRL ROD DIST
(IN)
ENTER 1 REAL VALUE

?
10

CROD (REAL)
CONTROL ROD DAMPING
(LB-SEC/IN)
ENTER 1 REAL VALUE

?
100

KROD (REAL)
CONTRL ROD STIFFNESS
(LB/IN)
ENTER 1 REAL VALUE

?
1000

MORE...

INPUT FOR CONTROL SYSTEM COMPONENT CCE1. CONTROL RODS SWASHPLATE

1 MSP	- SWASH PLATE MASS	= 2.00000E+01
2 ISP	- MOI ABOUT DIAMETER	= 2.00000E+03
3 CSCOL	- COLLECTIVE DAMPING	= 1.00000E+02
4 CSCYC	- CYCLIC DAMPING	= 1.00000E+01
5 KSCOL	- COLLECTIVE STIFFNESS	= 1.00000E+03
6 KSCYC	- CYCLIC STIFFNESS	= 1.00000E+02

MORE...

7 LROD - AXIS-CTRL ROD DIST= 1.00000E+01
8 CROD - CONTROL ROD DAMPING = 1.00000E+02
9 KROD - CTRL ROD STIFFNESS= 1.00000E+03

RE-ENTER (Y OR N)

N

DATA SET CONROD FOR CCE1 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

VM READ

2.2.5 CCEØ - Control System, Elastic Rods.

2.2.5.1 CCEØ User Notes - CCEØ is a simplified version of CCE1. The only input is control rod stiffness. During model formulation, CCEØ must follow the rotor system with which it is coupled.

2.2.5.1 CCEØ Sample Input -

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CCE0
DATA SET
CONROD
SAVE FILE(R,U1,...)
U1

CONTROL SYSTEM COMPONENT CCE0 . CONTROL RODS

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
ROTOR CONTROL SYSTEM

KROD (REAL)
CONTROL ROD STIFFNESS
(LB/IN)
ENTER 1 REAL VALUE

?

MORE...

1000

INPUT FOR CONTROL SYSTEM COMPONENT CCE0. CONTROL RODS

1 KROD -- CONTROL ROD STIFFNESS= 1.00000E+03

RE-ENTER (Y OR N)

N
DATA SET CONROD FOR CCE0 SAVED ON U1
COMPONENT, FORCE, OR N

N
COMMAND

VM READ

2.2.6 CSF1 - Structure, Finite Element.

2.2.6.1 CSF1 User Notes - CSF1 can be used to input constant coefficients for any set of equations of motion of the form

$$\ddot{MX} + CX + KX = F$$

If a CSF1 data set is used alone in a model or if a model contains only CSF1 data sets and if the degrees of freedom are expressed in consistent units, those units can be purely arbitrary. However, when combined with other types of data sets, CSF1 data sets must be defined so that consistency is maintained. Typical mass, damping, stiffness, force, and moment units have been noted with the input prompts shown for CSF1 in the User's Manual, but any set of consistent units can be used.

2.2.6.2 CSF1 Sample Input - Input for the spring-mass-damper system with constant applied force, shown in Figure 8, follows.

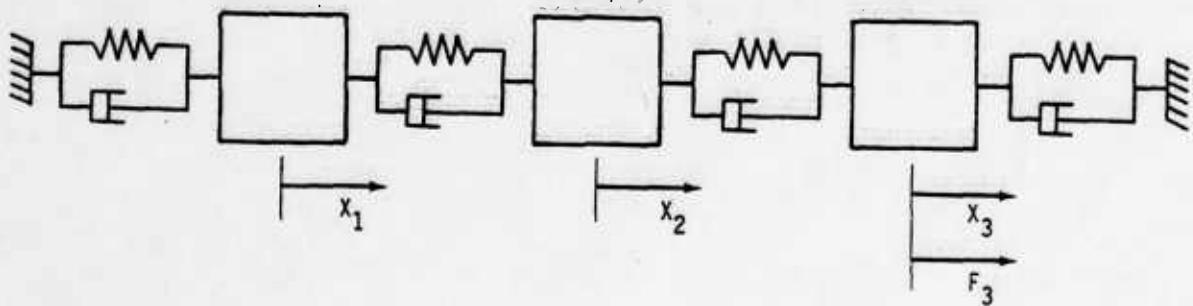


Figure 8. Spring-Mass-Damper System.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CSF1
DATA SET
SMD
SAVE FILE(R,U1,...)
U1

COMPONENT CSF1. FINITE ELEMENT

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
SPRING-MASS-DAMPER SYSTEM

NCDF (INTEGER)
NUMBER OF DOF
ENTER 1 INTEGER VALUE(S)
3

MORE...
CDFLI (DOF)
DOF NAMES
ENTER 3 DOF VALUES (A4,I4) ONE PER LINE
X 1
X 2
X 3

CM (REAL)
MASS MATRIX
TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)
1
INPUT 3 DIAGONAL REAL VALUES

?
1 2 3

CC (REAL)
DAMPING MATRIX
TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)
2
PREPARE TO ENTER ROW 1

MORE...

```

ENTER 1 REAL VALUES
?
3
PREPARE TO ENTER ROW 2
ENTER 2 REAL VALUES
?
-2 5
PREPARE TO ENTER ROW 3
ENTER 3 REAL VALUES
?
0 -3 7
-----
CK (REAL)
STIFFNESS MATRIX
TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)
2
PREPARE TO ENTER ROW 1
ENTER 1 REAL VALUES
?
30
PREPARE TO ENTER ROW 2
ENTER 2 REAL VALUES
?
-20 50
PREPARE TO ENTER ROW 3
ENTER 3 REAL VALUES
?
0 -30 70
-----
CF (REAL)
FORCE VECTOR
NULL VECTOR (Y OR N)
N
ENTER 3 REAL VALUE(S)
?
0 0 1
*****
INPUT FOR COMPONENT CSF1. FINITE ELEMENT

1 NCDF - NUMBER OF DOF      =      3
2 CDFLI - (DOF) DOF NAMES
          X 1000 X 2000 X 3000
3 CM   - (REAL) MASS MATRIX
MORE...

```

DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)

1.00000E+00 2.00000E+00 3.00000E+00

4 CC - (REAL) DAMPING MATRIX

SYMMETRIC MATRIX (LOWER TRIANGLE PRINTED)

ROW 1

3.00000E+00

ROW 2

-2.00000E+00 5.00000E+00

ROW 3

0.00000E+00 -3.00000E+00 7.00000E+00

5 CK - (REAL) STIFFNESS MATRIX

SYMMETRIC MATRIX (LOWER TRIANGLE PRINTED)

ROW 1

3.00000E+01

ROW 2

-2.00000E+01 5.00000E+01

ROW 3

0.00000E+00 -3.00000E+01 7.00000E+01

6 CF - (REAL) FORCE VECTOR

0.00000E+00 0.00000E+00 1.00000E+00

MORE...

RE-ENTER (Y OR N)

N

DATA SET SMD FOR CSF1 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

VM READ

2.2.7 CES1 - Elastic Stop (Nonlinear Spring).

2.2.7.1 CES1 User Notes - CES1 is generally used in two types of applications: as an elastic stop which allows a degree of freedom to move freely through a specified distance before encountering the resistance of a spring or damper or both, and in an extension of that application, as a component of a nonlinear spring or damper which has specific spring or damping rates for different ranges of displacement.

2.2.7.2 CES1 Sample Input - Two CES1 data sets can be used to model a nonlinear spring for which the Force/Displacement function is shown in figure 9. Up to a displacement of 1 inch (as in the case of CSF1, units may be arbitrary), the spring rate is zero; from 1 to 2 inches, the spring rate is 100 lb/in.; and beyond 2 inches the spring rate is 200 lb/in. Inputs for the data sets follow. Note that the spring rates are additive.

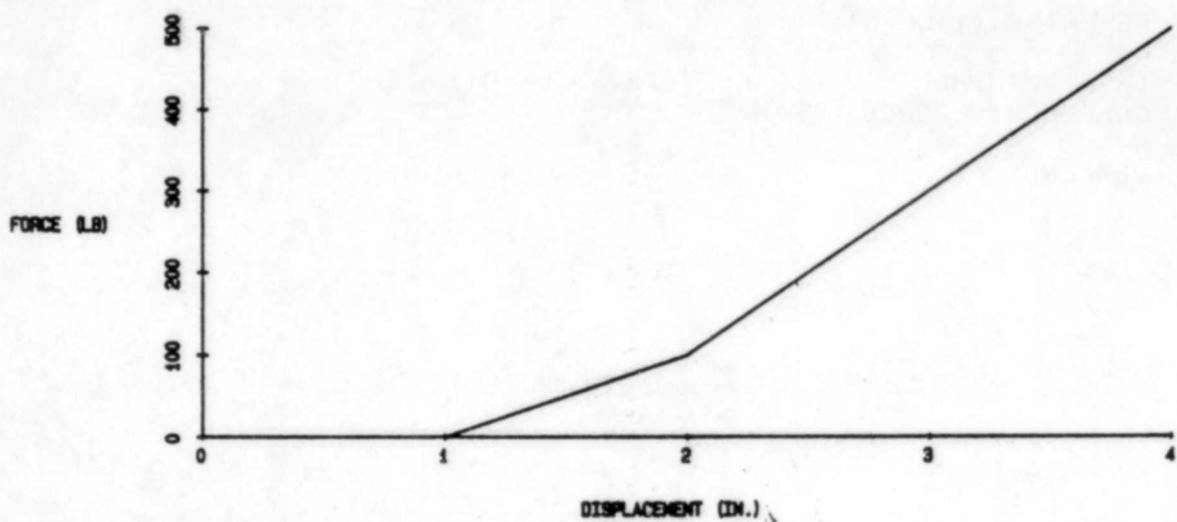


Figure 9. Nonlinear Spring Force/Displacement Function.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CES1
DATA SET
NL1
SAVE FILE(R,U1,...)
U1

COMPONENT CES1. ELASTIC STOP

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
NONLINEAR SPRING

MCDF (INTEGER)
+ OF DOF-EXCEPT BASE
ENTER 1 INTEGER VALUE(S)
1

MORE...

CDFLI (DOF)
DOF NAMES
ENTER 1 DOF VALUE (A4,I4)
X 1

BASE (Y OR N)
EXISTNCE OF BASE DOF
ENTER 1 Y OR N VALUE /
N

C1 (REAL)
UPPER DAMPING COEFF
ENTER 1 REAL VALUE
?
0

C2 (REAL)
LOWER DAMPING COEFF
ENTER 1 REAL VALUE
?
0

MORE...

K1 (REAL)
 UPPER SPRING COEFF
ENTER 1 REAL VALUE
?
100

K2 (REAL)
 LOWER SPRING COEFF
ENTER 1 REAL VALUE
?
100

DELT1 (REAL)
 UPPER GAP SIZE
ENTER 1 REAL VALUE
?
1

DELT2 (REAL)
 LOWER GAP SIZE
ENTER 1 REAL VALUE
?

MORE...

1

INPUT FOR COMPONENT CES1. ELASTIC STOP

1 MCDF	- # OF DOF-EXCEPT BASE=	1
2 CDFLI	- DOF NAMES =	X 1000
3 BASE	- EXISTNCE OF BASE DOF=	NO
4 C1	- UPPER DAMPING COEFF =	0.00000E+00
5 C2	- LOWER DAMPING COEFF =	0.00000E+00
6 K1	- UPPER SPRING COEFF =	1.00000E+02
7 K2	- LOWER SPRING COEFF =	1.00000E+02
8 DELT1	- UPPER GAP SIZE =	1.00000E+00
9 DELT2	- LOWER GAP SIZE =	1.00000E+00

RE-ENTER (Y OR N)

N

DATA SET NL1 FOR CES1 SAVED ON U1

COMPONENT, FORCE, OR N

CES1

DATA SET

NL2

MORE...

SAVE FILE(R,U1,...)
U1

COMPONENT CES1. ELASTIC STOP

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
NONLINEAR SPRING

MCDF (INTEGER)
+ OF DOF-EXCEPT BASE
ENTER 1 INTEGER VALUE(S)
1

CDFLI (DOF)
DOF NAMES
ENTER 1 DOF VALUE (A4,I4)
X 1

BASE (Y OR N)
EXISTNCE OF BASE DOF

ENTER 1 Y OR N VALUE
N

MORE...

C1 (REAL)
UPPER DAMPING COEFF
ENTER 1 REAL VALUE

?
0

C2 (REAL)
LOWER DAMPING COEFF
ENTER 1 REAL VALUE

?
0

K1 (REAL)
UPPER SPRING COEFF
ENTER 1 REAL VALUE

?
100

K2 (REAL)

MORE...

LOWER SPRING COEFF
ENTER 1 REAL VALUE

?
100

DELT1 (REAL)
UPPER GAP SIZE

ENTER 1 REAL VALUE

?
2

DELT2 (REAL)
LOWER GAP SIZE

ENTER 1 REAL VALUE

?
2

INPUT FOR COMPONENT CES1. ELASTIC STOP

1 MCDF	- # OF DOF-EXCEPT BASE=	1
2 CDFLI	- DOF NAMES =	X 1000
3 BASE	- EXISTNCE OF BASE DOF=	NO
MORE...		
4 C1	- UPPER DAMPING COEFF =	0.00000E+00
5 C2	- LOWER DAMPING COEFF =	0.00000E+00
6 K1	- UPPER SPRING COEFF =	1.00000E+02
7 K2	- LOWER SPRING COEFF =	1.00000E+02
8 DELT1	- UPPER GAP SIZE =	2.00000E+00
9 DELT2	- LOWER GAP SIZE =	2.00000E+00

RE-ENTER (Y OR N)

N

DATA SET NL2 FOR CES1 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

VM READ

2.2.8 CLC1 - Linear Constraints.

2.2.8.1 CLC1 User Notes - CLC1 allows the user to replace an existing degree of freedom of a component with a function of other, arbitrary degrees of freedom. The function must have constant coefficients. This equation, with others, can be formulated in matrix form:

$$\{X_I\} = [T]\{X\}$$

where X_I are the implicit degrees of freedom being replaced by functions of arbitrary degrees of freedom, X . X cannot include degrees of freedom from X_I ; a degree of freedom cannot be a function of itself.

2.2.8.2 CLC1 Sample Input - In this example, CLC1 is used to impose an elastic coupling constraint on two identical fuselage representations (refer to paragraph 2.2.1.2, first example). The two fuselages are to be elastically coupled at abutting ends. The constraint is defined by equating the sums of the modal displacements and slopes (angular displacements) of the two fuselages at the point of attachment:

Displacement

$$ZCG1000 - (360)PTCH1000 + (1.0)QFUS1100 = \\ ZCG2000 + (120)PTCH2000 + (1.0)QFUS2100$$

Slope

$$PTCH1000 - .01 QFUS1100 = \\ PTCH2000 - .01 QFUS2100$$

Substituting the second equation into the first yields

$$ZCG1000 = ZCG2000 + (480)PTCH2000 - (2.6)QFUS2100 + (2.6)QFUS1100$$

$$PTCH1000 = PTCH2000 - (.01)QFUS2100 + (.01)QFUS1100$$

which is input into a CLC1 data set as shown. The two degrees of freedom, ZCG1000 and PTCH1000, will be replaced by the two implicit relations.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CLC1
DATA SET
CREAM
SAVE FILE(R,U1,...)
U1

COMPONENT CLC1. LINEAR CONSTRAINTS

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
ELASTIC COUPLING

NCDF (INTEGER)
NUMBER OF DOF
ENTER 1 INTEGER VALUE(S)

4

MORE...

CDFLI (DOF)
DOF NAMES
ENTER 4 DOF VALUES (A4,I4) ONE PER LINE
ZCG 2000
PTCH2000
QFUS2100
QFUS1100

NCIDF (INTEGER)
OF CONSTRAINT EQNS
ENTER 1 INTEGER VALUE(S)

2

CIDFLI (DOF)
IMPLICIT DOF NAMES
ENTER 2 DOF VALUES (A4,I4) ONE PER LINE
ZCG 1000
PTCH1000

COEF (REAL)
COEFFICIENT MATRIX
TYPE MATRIX

MORE...

(0=NULL), (3=GENERAL)
 3
 INPUT BY ROWS OR COLUMNS (R OR C)
 R
 OPTION TO SPECIFY NULL ROWS (Y OR N)
 N
 PREPARE TO ENTER ROW 1
 ENTER 4 REAL VALUES
 ?
 1 480 -2.6 2.6
 PREPARE TO ENTER ROW 2
 ENTER 4 REAL VALUES
 ?
 0 1 -.01 .01

 INPUT FOR COMPONENT CLC1. LINEAR CONSTRAINTS

1 NCDF	- NUMBER OF DOF	=	4	
2 CDFLI	- (DOF) DOF NAMES			
	ZCG 2000 PTCH2000 QFUS2100 QFUS1100			
3 NCIDF	- # OF CONSTRAINT EQNS=	2		
4 CIDFLI	- IMPLICIT DOF NAMES =	ZCG 1000	PTCH1000	
			MORE...	
5 COEF	- (REAL) COEFFICIENT MATRIX			
	GENERAL MATRIX			
ROW 1	1.00000E+00	4.80000E+02	-2.60000E+00	2.60000E+00
ROW 2	0.00000E+00	1.00000E+00	-1.00000E-02	1.00000E-02

 RE-ENTER (Y OR N)
 N
 DATA SET CREAM FOR CLC1 SAVED ON U1
 COMPONENT, FORCE, OR N
 N
 COMMAND VM READ

2.2.9 CFM3 - Fuselage, Modal (3-d).

2.2.9.1 CFM3 User Notes - Mode shapes need only be defined at node points where coupling with other components is to take place. Up to three translational and three rotational implicit degrees of freedom can be specified (NODDF) in local coordinate systems defined separately at each of those points. The user defines the X and Y vectors of the local coordinate systems in terms of the fuselage coordinate system (X and Y vector direction cosines).

2.2.9.2 CFM3 Sample Input - Input is shown for a CFM3 data set with four rigid body modes and eight elastic modes. The rigid body modes are defined at the CG and the elastic modes are defined at four node points. Mode shape input is only shown for one component of modal displacement for the first elastic mode. Four implicit degrees of freedom consistent with the fuselage degrees of freedom are specified at each of the node points. The local X, Y vectors coincide with the fuselage coordinate system vectors.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CFM3
DATA SET
PS1
SAVE FILE(R,U1,...)
U1

STRUCTURAL COMPONENT CFM3 . 3-D MODAL FUSELAGE

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
PACOSS SEGMENT 1

RBM (Y OR N)
RIGID BODY MODES
ENTER 1 Y OR N VALUE
Y

MORE...

IXCG (Y OR N)
LONGITUDINAL
ENTER 1 Y OR N VALUE
N

IYCG (Y OR N)
LATERAL
ENTER 1 Y OR N VALUE
Y

IZCG (Y OR N)
VERTICAL
ENTER 1 Y OR N VALUE
Y

IROLL (Y OR N)
ROLL
ENTER 1 Y OR N VALUE
N

IPITCH (Y OR N)
PITCH

MORE...

ENTER 1 Y OR N VALUE
Y

IYAW (Y OR N)
YAW

ENTER 1 Y OR N VALUE
Y

CG (REAL)
XYZ CG LOCATION (IN)
NULL VECTOR (Y OR N)
Y

NS (INTEGER)
NO. OF NODAL POINTS
ENTER 1 INTEGER VALUE(S)
4

XYZNS (REAL)
XYZ FOR EACH NODE
XYZ REF. TO FUSELAGE SYS.
TYPE MATRIX MORE...
(0=NULL), (3=GENERAL)
3

INPUT BY ROWS OR COLUMNS (R OR C)
C

OPTION TO SPECIFY NULL COLUMNS (Y OR N)
N

PREPARE TO ENTER COL 1

ENTER 3 REAL VALUES
?
-120 -20 -20

PREPARE TO ENTER COL 2

ENTER 3 REAL VALUES
?
-120 -20 20

PREPARE TO ENTER COL 3

ENTER 3 REAL VALUES
?
-120 20 20

PREPARE TO ENTER COL 4

ENTER 3 REAL VALUES
?
-120 20 -20

MORE...

```
-----  
NMODE      (INTEGER)  
NO. OF ELASTIC MODES  
ENTER 1 INTEGER VALUE(S)  
8  
-----  
MXCG      (Y OR N)  
MODE X-COMPONENT  
ENTER 1 Y OR N VALUE  
N  
-----  
MYCG      (Y OR N)  
MODE Y-COMPONENT  
ENTER 1 Y OR N VALUE  
Y  
-----  
MZCG      (Y OR N)  
MODE Z-COMPONENT  
ENTER 1 Y OR N VALUE  
Y  
-----  
MROLL     (Y OR N)                                MORE...  
MODE ALFX-COMPONENT  
ENTER 1 Y OR N VALUE  
N  
-----  
MPTCH     (Y OR N)  
MODE ALFY-COMPONENT  
ENTER 1 Y OR N VALUE  
Y  
-----  
MYAW      (Y OR N)  
MODE ALFZ-COMPONENT  
ENTER 1 Y OR N VALUE  
Y  
-----  
YY        (REAL)  
MODES Y-COMPONENT  
TYPE MATRIX  
(0=NULL), (3=GENERAL)  
3  
INPUT BY ROWS OR COLUMNS (R OR C)  
R  
OPTION TO SPECIFY NULL ROWS (Y OR N)                MORE...  
-----
```

Y
NULL ROW 1 (Y OR N)
N
PREPARE TO ENTER ROW 1
ENTER 4 REAL VALUES
?
-27.5611 -10.8154 -10.8265 -27.5335
NULL ROW 2 (Y OR N)
Y
NULL ROW 3 (Y OR N)
Y
NULL ROW 4 (Y OR N)
Y
NULL ROW 5 (Y OR N)
Y
NULL ROW 6 (Y OR N)
Y
NULL ROW 7 (Y OR N)
Y
NULL ROW 8 (Y OR N)
Y

MORE...

ZZ (REAL)
MODES Z-COMPONENT
TYPE MATRIX
(0=NULL), (3=GENERAL)
0

YY (REAL)
MODES ALFY-COMPONENT
TYPE MATRIX
(0=NULL), (3=GENERAL)
0

ZZP (REAL)
MODES ALFZ-COMPONENT
TYPE MATRIX
(0=NULL), (3=GENERAL)
0

NODOF (Y OR N)
DOF Y OR N FOR NODES
PREPARE TO ENTER ROW 1
ENTER 4 Y OR N VALUES (35A2)

MORE...

N N N N
PREPARE TO ENTER ROW 2
ENTER 4 Y OR N VALUES (35A2)
Y Y Y Y
PREPARE TO ENTER ROW 3
ENTER 4 Y OR N VALUES (35A2)
Y Y Y Y
PREPARE TO ENTER ROW 4
ENTER 4 Y OR N VALUES (35A2)
N N N N
PREPARE TO ENTER ROW 5
ENTER 4 Y OR N VALUES (35A2)
Y Y Y Y
PREPARE TO ENTER ROW 6
ENTER 4 Y OR N VALUES (35A2)
Y Y Y Y

XYZD (REAL)
LOCAL X,Y VECTORS
IN TERMS OF FUSELAGE SYS.
TYPE MATRIX
(0=NULL), (3=GENERAL)

MORE...

3
INPUT BY ROWS OR COLUMNS (R OR C)
R
OPTION TO SPECIFY NULL ROWS (Y OR N)
Y
NULL ROW 1 (Y OR N)
N
PREPARE TO ENTER ROW 1
ENTER 4 REAL VALUES
?
1 1 1 1
NULL ROW 2 (Y OR N)
Y
NULL ROW 3 (Y OR N)
Y
NULL ROW 4 (Y OR N)
Y
NULL ROW 5 (Y OR N)
N
PREPARE TO ENTER ROW 5
ENTER 4 REAL VALUES
?

MORE...

1 1 1 1
NULL ROW 6 (Y OR N)

Y

MASSL (REAL)
FUSELAGE MASS (LB)

ENTER 1 REAL VALUE

?

153.437

IMYY (REAL)
PTCH MOI SLUG-FT(SQ)

ENTER 1 REAL VALUE

?

163.25

IMZZ (REAL)
YAW MOI SLUG-FT(SQ)

ENTER 1 REAL VALUE

?

163.25

IMYZ (REAL)
YZ PRODUCT OF INERT.

ENTER 1 REAL VALUE

?

0

MORE...

MMS (REAL)
MODAL MASS (SLUGS)

NULL VECTOR (Y OR N)

N

ENTER 8 REAL VALUE(S)

?

80.248 81.122 84.373 85.367

?

.21539 .26977 .26613 .21273

MD (REAL)
MODAL DAMPING (PCT)

NULL VECTOR (Y OR N)

Y

FREQ (REAL)

MORE...

MODAL FREQUENCY (HZ)
NULL VECTOR (Y OR N)

N

ENTER 8 REAL VALUE(S)

?

18.901 18.907 18.909 18.910

?

37.513 37.517 37.518 37.527

INPUT FOR STRUCTURAL COMPONENT CFM3. 3-D MODAL FUSELAGE

1 RBM	- RIGID BODY MODES	=	YES
2 IXCG	- LONGITUDINAL	=	NO
3 IYCG	- LATERAL	=	/ YES
4 IZCG	- VERTICAL	=	YES
5 IROLL	- ROLL	=	NO
6 IPTCH	- PITCH	=	YES
7 IYAW	- YAW	=	YES
8 CG	- (REAL) XYZ CG LOCATION (IN)		
	0.00000E+00 0.00000E+00 0.00000E+00		
9 NS	- NO. OF NODAL POINTS =		4
10 XYZNS	- (REAL) XYZ FOR EACH NODE		

MORE...

GENERAL MATRIX

ROW 1

-1.20000E+02 -1.20000E+02 -1.20000E+02 -1.20000E+02

ROW 2

-2.00000E+01 -2.00000E+01 2.00000E+01 2.00000E+01

ROW 3

-2.00000E+01 2.00000E+01 2.00000E+01 -2.00000E+01

11 NMODE	- NO. OF ELASTIC MODES=	8
12 MXCG	- MODE X-COMPONENT	= NO
13 MYCG	- MODE Y-COMPONENT	= YES
14 MZCG	- MODE Z-COMPONENT	= YES
15 MROLL	- MODE ALFX-COMPONENT	= NO
16 MPTCH	- MODE ALFY-COMPONENT	= YES
17 MYAW	- MODE ALFZ-COMPONENT	= YES
18 YY	- (REAL) MODES Y-COMPONENT	

GENERAL MATRIX

ROW 1

-2.75611E+01 -1.08154E+01 -1.08265E+01 -2.75335E+01

ROW 2 NULL ROW

ROW 3 NULL ROW

MORE...

ROW	4	NULL ROW
ROW	5	NULL ROW
ROW	6	NULL ROW
ROW	7	NULL ROW
ROW	8	NULL ROW
19 ZZ	- (REAL) MODES Z-COMPONENT	
	NULL MATRIX	
20 YYF	- (REAL) MODES ALFY-COMPONENT	
	NULL MATRIX	
21 ZZP	- (REAL) MODES ALFZ-COMPONENT	
	NULL MATRIX	
22 NODOF	- DOF Y OR N FOR NODES	
ROW	1	NO NO NO NO
ROW	2	YES YES YES YES
ROW	3	YES YES YES YES
ROW	4	YES YES YES YES
ROW	5	NO NO NO NO
ROW	6	YES YES YES YES
23 XYZD	- (REAL) LOCAL X,Y VECTORS	
	GENERAL MATRIX	
ROW	1	1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
ROW	2	NULL ROW
ROW	3	NULL ROW
ROW	4	NULL ROW
ROW	5	1.00000E+00 1.00000E+00 1.00000E+00 1.00000E+00
ROW	6	NULL ROW
24 MASSL	- FUSELAGE MASS (LB) = 1.53437E+02	
25 IMYY	- PTCH MOI SLUG-FT(SQ)= 1.63250E+02	
26 IMZZ	- YAW MOI SLUG-FT(SQ) = 1.63250E+02	
27 IMYZ	- YZ PRODUCT OF INERT.= 0.00000E+00	
28 MMS	- (REAL) MODAL MASS (SLUGS)	
	8.02480E+01 8.11220E+01 8.43730E+01 8.53670E+01	
	MORE...	

29 MD 2.15390E-01 2.69770E-01 2.66130E-01 2.12730E-01
- (REAL) MODAL DAMPING (PCT)
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
30 FREQ - (REAL) MODAL FREQUENCY (HZ)
1.89010E+01 1.89070E+01 1.89090E+01 1.89100E+01
3.75130E+01 3.75170E+01 3.75180E+01 3.75270E+01

RE-ENTER (Y OR N)

N

DATA SET PS1 FOR CFM3 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

VM READ

2.2.10 CRD3 - Rotor, Damaged (Nonidentical) Blades.

2.2.10.1 CRD3 User Notes - Careful attention must be paid to the blade property input. The user is asked to input two types of blade properties, incremental and nonincremental. An incremental value is the change in a nominal value input for CRE3, and a nonincremental value replaces a value input for CRE3. Illustrations of these two types of input occur in the following example and are discussed.

Note that as with CRE3, "switches" can be set which allow time history blade moments to be calculated (SII3).

2.2.10.2 CRD3 Sample Input - Input is shown for a CRD3 data set which removes 1 lb from the blade tips of the rotor modeled in Section 6 of the User's Manual (B2ZIT2/CRE3). The user must select the same type and number of blade degrees of freedom as selected for the CRE3 data set.

The change in mass per unit length and the associated CG offset from the elastic axis and mass radius of gyration about the beamwise axis have been input for the affected blade stations. The inputs for SE and KM2 for the affected stations are nonincremental values. Thus, to retain the values input for the CRE3 data set, changing only mass, the values for SE and KM2 from the CRE3 data set have been input for the affected stations. To retain the same blade pretwist rates, the values from the CRE3 data set must also be input, but for all stations, in order to retain the same blade geometry. Nonincremental parameters previously set to zero have been reset to zero. Incremental parameters for which there are no changes have also been set to zero.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CRD3
DATA SET
B2Z1T2
SAVE FILE(R,U1,...)
U1

DAMAGED ROTOR COMPONENT CRD3 . ROTOR DAMAGED BLADES

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
1 LB REMOVED FROM BLADE TIPS

JW (Y OR N)
INPLANE DOF
ENTER 1 Y OR N VALUE
Y

JW (Y OR N)
OUTPLANE DOF
ENTER 1 Y OR N VALUE
Y

MORE...

JP (Y OR N)
TORSION DOF
ENTER 1 Y OR N VALUE
Y

NV (INTEGER)
NO. OF INPLANE MODES
ENTER 1 INTEGER VALUE(S)
1

NW (INTEGER)
NO. OF OUTPLNE MODES
ENTER 1 INTEGER VALUE(S)
2

NP (INTEGER)
NO. OF TORSION MODES

MORE...

ENTER 1 INTEGER VALUE(S)
2

NDB (INTEGER)
NO. OF DAMAGED
BLADES
ENTER 1 INTEGER VALUE(S)
2

IDB (INTEGER)
BLADE NOS. OF
DAMAGED BLADES
ENTER 2 INTEGER VALUE(S)
1 2

NX (INTEGER)
NO. OF BLADE STAS
ENTER 1 INTEGER VALUE(S)
20

JXD (Y OR N) MORE...
NEW STATIONS
ENTER 1 Y OR N VALUE
N

ITYP (INTEGER)
MODE INPUT 0,1, OR 2
0 = USE OLD MODE SHAPES, 1 = INPUT NEW MODE SHAPES, 2 = GENERATE
NEW MODE SHAPES
ENTER 1 INTEGER VALUE(S)
0

CIPP (REAL)
IP MODAL DAMPING
INCREMENT (LBF-SEC/IN)
ENTER 1 REAL VALUE(S)
?
0

COPP (REAL)
OF MODAL DAMPING
INCREMENT (LBF-SEC/IN)
NULL VECTOR (Y OR N) MORE...

Y

CTORR (REAL)
 TORSION MODAL
 DAMPING INCREMENT (IN-LBF-SEC/DEG)
NULL VECTOR (Y OR N)
Y

KIP (REAL)
 IP SPRING RATE
 INCREMENT (IN-LBF/DEG)
ENTER 1 REAL VALUE
?
0

CIP (REAL)
 IP DAMPING RATE
 INCREMENT (IN-LBF-SEC/DEG)
ENTER 1 REAL VALUE
?
0

KOP (REAL) MORE...
 OP SPRING RATE
 INCREMENT (IN-LBF/DEG)
ENTER 1 REAL VALUE
?
0

COP (REAL)
 OP DAMPING RATE
 INCREMENT (IN-LBF-SEC/DEG)
ENTER 1 REAL VALUE
?
0

KTOR (REAL)
 TORSION SPRING RATE
 INCREMENT (IN-LBF/DEG)
ENTER 1 REAL VALUE
?
0

CTOR (REAL)
MORE...

TORSION DAMPING RATE
INCREMENT (IN-LBF-SEC/DEG)
ENTER 1 REAL VALUE
?
0

IU (Y OR N)
UNIFORM BLADE
ENTER 1 Y OR N VALUE
N

M (REAL)
MASS PER UNIT LENGTH
INCREMENT (LB/IN)
NULL VECTOR (Y OR N)
N
ENTER 20 REAL VALUE(S)
?
0 -.16 -.16

SE (REAL)
CG OFFSET FROM EA
(IN)
NULL VECTOR (Y OR N)
N
ENTER 20 REAL VALUE(S)
?
0 -1.97 -1.97

SEA (REAL)
AREA CENTROID OFFSET
FROM EA (+ FWD EA) (IN)
NULL VECTOR (Y OR N)
Y

KM1 (REAL)
MASS ROG ABOUT
LOCAL CHORDWISE AXIS IN BEAMWISE DIRECTION (IN)
NULL VECTOR (Y OR N)
Y

KM2 (REAL)
MASS ROG ABOUT
LOCAL BEAMWISE AXIS IN CHORDWISE DIRECTION (IN)

MORE...

MORE...

NULL VECTOR (Y OR N)

N

ENTER 20 REAL VALUE(S)

?

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 7.11 7.11

KA (REAL)

AREA ROG OF CROSS

SECTION (IN)

NULL VECTOR (Y OR N)

Y

THP (REAL)

PRETWIST RATE DEG/IN

NULL VECTOR (Y OR N)

N

ENTER 20 REAL VALUE(S)

?

-.0378753 -.0378753 -.0378753 -.0378753 -.0378753 -.0378753 -.0378753

?

-.0378753 -.0378753 -.0378753 -.0378753 -.0378753 -.0378753 -.0378753

?

MORE...

-.0378753 -.0378753 -.0378753 -.0378753 -.0378753 -.0378753

EIY (REAL)

CHORDWISE EI*10E-6

INCREMENT (LBF*IN**2)

NULL VECTOR (Y OR N)

Y

EIZ (REAL)

BEAMWISE EI*10E-6

INCREMENT (LBF*IN**2)

NULL VECTOR (Y OR N)

Y

EA (REAL)

SECTION EA*10E-6

INCREMENT (LBF)

NULL VECTOR (Y OR N)

Y

GJ (REAL)

SECTION GJ*10E-6

MORE...

INCREMENT (LBF*IN**2)
NULL VECTOR (Y OR N)

Y

EB1 (REAL)

CROSS SEC INTEGRAL

INCREMENT (IN**6) (SEE MANUAL)

NULL VECTOR (Y OR N)

Y

EB2 (REAL)

CROSS SEC INTEGRAL

INCREMENT (IN**5) (SEE MANUAL)

NULL VECTOR (Y OR N)

Y

EC1 (REAL)

CROSS SEC INTEGRAL

INCREMENT (IN**6) (SEE MANUAL)

NULL VECTOR (Y OR N)

Y

MORE...

EC1STA (REAL)

CROSS SEC INTEGRAL

INCREMENT (IN**5) (SEE MANUAL)

NULL VECTOR (Y OR N)

Y

JIL (Y OR N)

INTERNAL LOADS

ENTER 1 Y OR N VALUE

N

INPUT FOR DAMAGED ROTOR COMPONENT CRD3. ROTOR DAMAGED BLADES

1 JV	- INPLANE DOF	=	YES
2 JW	- OUTPLANE DOF	=	YES
3 JP	- TORSION DOF	=	YES
4 NV	- NO. OF INPLANE MODES	=	1
5 NW	- NO. OF OUTPLNE MODES	=	2
6 NP	- NO. OF TORSION MODES	=	2
7 NDB	- NO. OF DAMAGED	=	2
8 IDB	- BLADE NOS. OF	=	1
9 NX	- NO. OF BLADE STAS	=	20

MORE...

10 JXD	- NEW STATIONS	=	NO
11 ITYP	- MODE INPUT 0,1, OR 2=		0
12 CIPP	- IF MODAL DAMPING	=	0.00000E+00
13 COPP	- OP MODAL DAMPING	=	0.00000E+00 0.00000E+00
14 CTORR	- TORSION MODAL	=	0.00000E+00 0.00000E+00
15 KIP	- IF SPRING RATE	=	0.00000E+00
16 CIP	- IF DAMPING RATE	=	0.00000E+00
17 KOP	- OP SPRING RATE	=	0.00000E+00
18 COP	- OP DAMPING RATE	=	0.00000E+00
19 KTOR	- TORSION SPRING RATE =		0.00000E+00
20 CTOR	- TORSION DAMPING RATE=		0.00000E+00
21 IU	- UNIFORM BLADE	=	NO
22 M	- (REAL) MASS PER UNIT LENGTH		
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 -1.60000E-01		-1.60000E-01
23 SE	- (REAL) CG OFFSET FROM EA		
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	MORE...		
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 -1.97000E+00		-1.97000E+00
24 SEA	- (REAL) AREA CENTROID OFFSET		
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
25 KM1	- (REAL) MASS ROG ABOUT		
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
26 KM2	- (REAL) MASS ROG ABOUT		
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	0.00000E+00 0.00000E+00 7.11000E+00		7.11000E+00
27 KA	- (REAL) AREA ROG OF CROSS		
	0.00000E+00 0.00000E+00 0.00000E+00		0.00000E+00
	MORE...		

	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
28 THP	- (REAL) PRETWIST RATE DEG/IN			
	-3.78753E-02	-3.78753E-02	-3.78753E-02	-3.78753E-02
	-3.78753E-02	-3.78753E-02	-3.78753E-02	-3.78753E-02
	-3.78753E-02	-3.78753E-02	-3.78753E-02	-3.78753E-02
	-3.78753E-02	-3.78753E-02	-3.78753E-02	-3.78753E-02
	-3.78753E-02	-3.78753E-02	-3.78753E-02	-3.78753E-02
29 EIY	- (REAL) CHORDWISE EI*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
30 EIZ	- (REAL) BEAMWISE EI*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
31 EA	- (REAL) SECTION EA*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
32 GJ	- (REAL) SECTION GJ*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
33 EB1	- (REAL) CROSS SEC INTEGRAL			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
34 EB2	- (REAL) CROSS SEC INTEGRAL			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MORE...

35 EC1 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
- (REAL) CROSS SEC INTEGRAL
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
36 EC1STA - (REAL) CROSS SEC INTEGRAL
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
37 JIL - INTERNAL LOADS = NO

RE-ENTER (Y OR N)

N

DATA SET B2Z1T2 FOR CRD3 SAVED ON U1

COMPONENT, FORCE, OR N

N

MORE...

COMMAND

VM READ

2.2.11 CLC2 - Linear Constraints.

2.2.11.1 CLC2 User Notes - CLC2 solves for the implicit degrees of freedom selected by the user for a set of constraint equations. However, improper selection of implicit degrees of freedom will result in partitioning the input coefficients into a singular matrix during the definition phase of a RUN, preventing solution of the constraint equations. The RUN will be terminated and the user will be asked to edit the CLC2 data set and specify new implicit degrees of freedom. Also, in some cases, implicit degree of freedom selections, though not improper, will result in an ill-conditioned matrix and erroneous implicit coefficients. When a new CLC2 data set (or a new model) is implemented, the user should carefully examine the model details, including the implicit coefficient table, and the constant coupled system matrices to determine if the model has been formulated correctly.

2.2.11.2 CLC2 Sample Input - Input is shown for a CLC2 data set which imposes the same constraint derived for the CLC1 example. The displacement and slope relations have been input directly and the implicit degrees of freedom selected as shown.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CLC2
DATA SET
CBEAM
SAVE FILE(R,U1,...)
U1

COMPONENT CLC2. LINEAR CONSTRAINTS

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
ELASTIC COUPLING

NCDF (INTEGER)
NUMBER OF DOF
ENTER 1 INTEGER VALUE(S)

6

MORE...
CDFLI (DOF)
DOF NAMES
ENTER 6 DOF VALUES (A4,I4) ONE PER LINE
ZCG 1000
ZCG 2000
PTCH1000
PTCH2000
QFUS1100
QFUS2100

NCIDF (INTEGER)
NO OF CONSTRAINT EQS
ENTER 1 INTEGER VALUE(S)

2

COEF (REAL)
COEFFICIENT MATRIX
TYPE MATRIX
(0=NULL), (3=GENERAL)
3
INPUT BY ROWS OR COLUMNS (R OR C)
R

MORE...

OPTION TO SPECIFY NULL ROWS (Y OR N)

N

PREPARE TO ENTER ROW 1

ENTER 6 REAL VALUES

?

1 -1 -360 -120 1 -1

PREPARE TO ENTER ROW 2

ENTER 6 REAL VALUES

?

0 0 1 -1 -.01 .01

NIDOF (INTEGER)

NO OF IMPLICIT DOF

ENTER 1 INTEGER VALUE(S)

2

INDEX (INTEGER)

IMPLICIT DOF INDICES

ENTER 2 INTEGER VALUE(S)

1 3

INPUT FOR COMPONENT CLC2. LINEAR CONSTRAINTS

MORE...

1 NCDF - NUMBER OF DOF = 6

2 CDFLI - (DOF) DOF NAMES

ZCG 1000 ZCG 2000 PTCH1000 PTCH2000 QFUS1100
QFUS2100

3 NCIDF - NO OF CONSTRAINT EQS= 2

4 COEF - (REAL) COEFFICIENT MATRIX
GENERAL MATRIX

ROW 1

1.00000E+00 -1.00000E+00 -3.60000E+02 -1.20000E+02
1.00000E+00 -1.00000E+00

ROW 2

0.00000E+00 0.00000E+00 1.00000E+00 -1.00000E+00
-1.00000E-02 1.00000E-02

5 NIDOF - NO OF IMPLICIT DOF = 2

6 INDEX - IMPLICIT DOF INDICES= 1 3

RE-ENTER (Y OR N)

N

DATA SET CBEAM FOR CLC2 SAVED ON U1

MORE...

COMPONENT, FORCE, OR N

N

COMMAND

2.2.12 CLC0 - Linear Constraints.

2.2.12.1 CLC0 User Notes - The user selects the system or component degrees of freedom to be eliminated from a model and one degree of freedom which is not. The eliminated (implicit) degrees of freedom are automatically set equal to zero times the retained (explicit) degree of freedom.

2.2.12.2 CLC0 Sample Input - Input is shown for a CLC0 data set which, when combined with the previously discussed CLC2 and CFM2 data sets, results in a single elastic fuselage free to pivot about a single fixed point.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CLC0
DATA SET
GROUND
SAVE FILE(R,U1,...)
U1

COMPONENT CLC0. ELIMINATE DOF

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
ELIMINATE RIGID BODY DOF

NCIDF (INTEGER)
OF ELIMINATED DOF
ENTER 1 INTEGER VALUE(S)
1

MORE...

CIDFLI (DOF)
ELIMINATED DOF NAMES
ENTER 1 DOF VALUE (A4,I4)
ZCG 2000

CDFLI (DOF)
1 EXPLICIT DOF NAME
ENTER 1 DOF VALUE (A4,I4)
PTCH2000

INPUT FOR COMPONENT CLC0. ELIMINATE DOF

1 NCIDF - # OF ELIMINATED DOF = 1
2 CIDFLI - ELIMINATED DOF NAMES= ZCG 2000
3 CDFLI - 1 EXPLICIT DOF NAME = PTCH2000

RE-ENTER (Y OR N)
N
DATA SET GROUND FOR CLC0 SAVED ON U1
COMPONENT, FORCE, OR N
N

MORE...

COMMAND

VM READ

2.2.13 CGF2 - General Force.

2.2.13.1 CGF2 User Notes - CGF2 is used to apply periodic forces to component and system degrees of freedom during a time integration type solution. The component mass, damping, and stiffness matrices are automatically set to zero, and a time-varying force vector can be defined with a combination of polynomial, Fourier series, and Tabular functions. The functions can only be applied to degrees of freedom included as component degrees of freedom of the data set. Rigid body and elastic (modal) degrees of freedom are allowed. The force amplitude (units: 1b, in.-lb, etc.) is determined by the degree of freedom to which it is applied.

Start and end times are input for each force application. The application is repeated with the end time becoming the start time for each successive application, resulting in a periodic function. The periodicity can be eliminated (as when only a single application is desired) by specifying zero force over the remaining time period of interest.

2.2.13.2 CGF2 Sample Input - Input is shown for a CGF2 data set in which two polynomial functions and two tabular functions are applied to four degrees of freedom. The same polynomial function is applied to two of the degrees of freedom, and the same tabular function is applied to the other two. The two functions are shown in Figure 10.

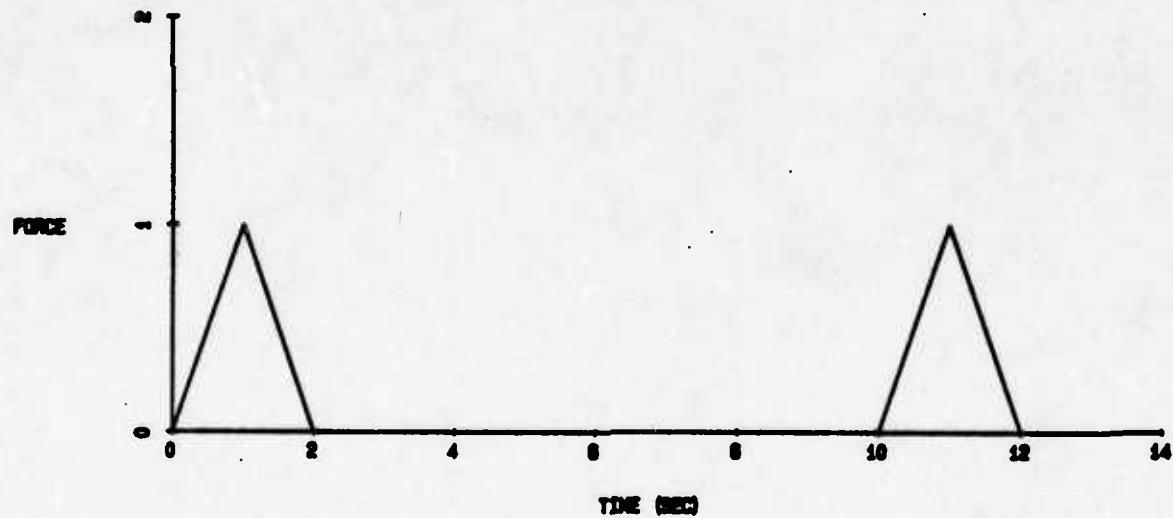
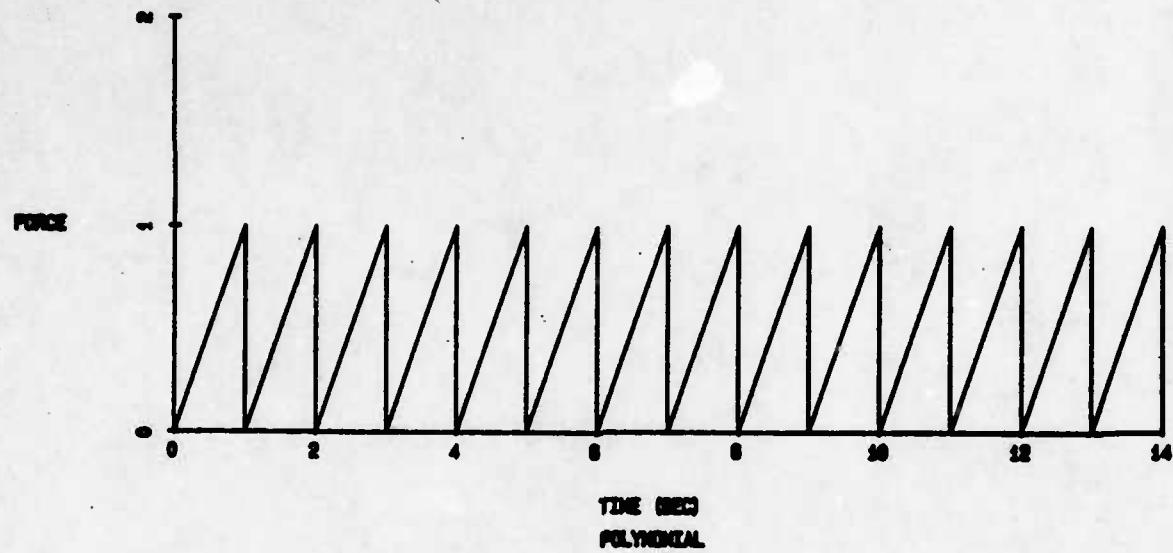


Figure 10. Example Forcing Functions.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CGF2
DATA SET
FORCE
SAVE FILE(R,U1,...)
U1

COMPONENT CGF2. GENERAL FORCE

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
APPLIED FORCE

NODEF (INTEGER)
NUMBER OF DOF
ENTER 1 INTEGER VALUE(S)

4

NAMEDOF (DOF)
DOF NAMES
ENTER 4 DOF VALUES (A4,I4) ONE PER LINE
X 1
X 2
Y 1
Y 2

MORE...

IA (Y OR N)
TYPE A FORCE
(POLYNOMIAL)
ENTER 1 Y OR N VALUE
Y

IB (Y OR N)
TYPE B FORCE
(FOURIER SERIES)
ENTER 1 Y OR N VALUE
N

IC (Y OR N)
TYPE C FORCE

MORE...

(TABULAR)
ENTER 1 Y OR N VALUE
Y

NA (INTEGER)
NO. OF TYPE A
APPLICATIONS
ENTER 1 INTEGER VALUE(S)
2

NAMENA (DOF)
DOF NAME FOR EACH
TYPE A APPLICATION
ENTER 2 DOF VALUES (A4,I4) ONE PER LINE

X 1
X 2

COEFNA (REAL)
COEFFS FOR EACH
TYPE A POLYNOMIAL UP TO 4TH POWER
TYPE MATRIX
(0=NULL), (3=GENERAL)

3
INPUT BY ROWS OR COLUMNS (R OR C)
C
OPTION TO SPECIFY NULL COLUMNS (Y OR N)
N

PREPARE TO ENTER COL 1
ENTER 5 REAL VALUES
?

0 1 0 0 0

PREPARE TO ENTER COL 2
ENTER 5 REAL VALUES
?

0 1 0 0 0

T1NA (REAL)
START TIME FOR EACH
TYPE A APPLICATION
NULL VECTOR (Y OR N)
Y

T2NA (REAL)
END TIME FOR EACH

MORE...

MORE...

TYPE A APPLICATION
NULL VECTOR (Y OR N)

N

ENTER 2 REAL VALUE(S)

?

1 1

NC (INTEGER)

NO. OF TYPE C
APPLICATIONS

ENTER 1 INTEGER VALUE(S)

2

NAMENC (DOF)

DOF NAME FOR EACH
TYPE C APPLICATION

ENTER 2 DOF VALUES (A4,I4) ONE PER LINE

Y 1

Y 2

NSNC1 (INTEGER)

NO. OF TIME POINTS

MORE...

1ST TYPE C APPLICATION

ENTER 1 INTEGER VALUE(S)

4

COEFNC1 (REAL)

TIMES AND FORCES

FOR 1ST TYPE C APPLICATION

TYPE MATRIX

(0=NULL), (3=GENERAL)

3

INPUT BY ROWS OR COLUMNS (R OR C)

R

OPTION TO SPECIFY NULL ROWS (Y OR N)

Y

NULL ROW 1 (Y OR N)

N

PREPARE TO ENTER ROW 1

ENTER 2 REAL VALUES

?

0 0

NULL ROW 2 (Y OR N)

N

MORE...

PREPARE TO ENTER ROW 2

ENTER 2 REAL VALUES

?

1 1

NULL ROW 3 (Y OR N)

N

PREPARE TO ENTER ROW 3

ENTER 2 REAL VALUES

?

2 0

NULL ROW 4 (Y OR N)

N

PREPARE TO ENTER ROW 4

ENTER 2 REAL VALUES

?

10 0

NSNC2 (INTEGER)

NO. OF TIME POINTS

2ND TYPE C APPLICATION

ENTER 1 INTEGER VALUE(S)

4

MORE...

COEFNC2 (REAL)

TIMES AND FORCES

FOR 2ND TYPE C APPLICATION

TYPE MATRIX

(0=NULL), (3=GENERAL)

3

INPUT BY ROWS OR COLUMNS (R OR C)

R

OPTION TO SPECIFY NULL ROWS (Y OR N)

N

PREPARE TO ENTER ROW 1

ENTER 2 REAL VALUES

?

0 0

PREPARE TO ENTER ROW 2

ENTER 2 REAL VALUES

?

1 1

PREPARE TO ENTER ROW 3

ENTER 2 REAL VALUES

?

MORE...

2 0

PREPARE TO ENTER ROW 4

ENTER 2 REAL VALUES

?

10 0

INPUT FOR COMPONENT CGF2. GENERAL FORCE

1	NODF	- NUMBER OF DOF	=	4
2	NAMEDOF	- (DOF) DOF NAMES		
	X	1000 X 2000 Y	1000 Y	2000
3	IA	- TYPE A FORCE	=	YES
4	IB	- TYPE B FORCE	=	NO
5	IC	- TYPE C FORCE	=	YES
6	NA	- NO. OF TYPE A	=	2
7	NAMENA	- DOF NAME FOR EACH	=	X 1000 X 2000
8	COEFNA	- (REAL) COEFFS FOR EACH		
		GENERAL MATRIX		

ROW 1 NULL ROW

ROW 2

1.00000E+00 1.00000E+00

MORE...

ROW 3 NULL ROW

ROW 4 NULL ROW

ROW 5 NULL ROW

9	T1NA	- START TIME FOR EACH	=	0.00000E+00	0.00000E+00
10	T2NA	- END TIME FOR EACH	=	1.00000E+00	1.00000E+00
11	NC	- NO. OF TYPE C	=	2	
12	NAMENC	- DOF NAME FOR EACH	=	Y 1000	Y 2000
13	NSNC1	- NO. OF TIME POINTS	=	4	
14	COEFNC1	- (REAL) TIMES AND FORCES			
		GENERAL MATRIX			

ROW 1 NULL ROW

ROW 2

1.00000E+00 1.00000E+00

ROW 3

2.00000E+00 0.00000E+00

ROW 4

1.00000E+01 0.00000E+00

15	NSNC2	- NO. OF TIME POINTS	=	4
16	COEFNC2	- (REAL) TIMES AND FORCES		
		GENERAL MATRIX		

MORE...

ROW 1 NULL ROW
ROW 2 1.00000E+00 1.00000E+00
ROW 3 2.00000E+00 0.00000E+00
ROW 4 1.00000E+01, 0.00000E+00

RE-ENTER (Y OR N)

N

DATA SET FORCE FOR CGF2 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

2.2.14 CLG2 - Landing Gear.

2.2.14.1 CLG2 User Notes - The rigid body, strut, and tire degrees of freedom are included automatically; however, degrees of freedom which are not required can be eliminated. When eliminating degrees of freedom, if a given implicit degree of freedom, a tire degree of freedom for instance, is expressed in terms of some number of explicit degrees of freedom (strut, rigid body) and all but one or all of those explicit degrees of freedom are eliminated using CLC, the implicit degree of freedom will become a function of the next set of explicit degrees of freedom shown in the implicit coefficients table (RUN - details). To avoid this problem: (1) if all but one explicit degree of freedom are eliminated, in the model ds/CLC- must precede the data sets (ds/CLG2) in which the explicit degrees of freedom occur; and (2) if all explicit degrees of freedom are eliminated, the ds/CLC- which eliminates the explicit degrees of freedom must be followed by a ds/CLC- which eliminates the implicit degree of freedom and both must precede the data sets in which the explicit degrees of freedom occur.

2.2.14.2 CLG2 Sample Input - Input is shown for a data set which represents the starboard main landing gear of the ACAP helicopter. The gear strut is canted at an angle of 16 degrees in a plane perpendicular to the longitudinal axis of the fuselage; therefore, the strut Z-translation vector has components in the fuselage Y and Z directions, and the strut X-translation vector is parallel to the fuselage X-axis.

The rigid body degrees of freedom have been named as fuselage implicit degrees of freedom (CFM3) to take advantage of the automatic coupling feature. Note that the local coordinate system defined for the implicit degrees of freedom in the CFM3 data set must be consistent with the strut direction cosines.

Finally, the scrubbing coefficients are the coefficients of friction between the ground and the tire for the specified directions. If the brakes-on condition is elected, the brake friction must be accounted for in the longitudinal coefficient.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CLG2
DATA SET
ACAPSTAR
SAVE FILE(R,U1,...)
U1

STRUCTURAL COMPONENT CLG2 . LANDING GEAR

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
STARBOARD MAIN GEAR

NAMEZS (DOF)
STRUT Z-TRANSLATION
DOF
ENTER 1 DOF VALUE (A4,I4)
TRAZ1030

MORE...

NAMEXS (DOF)
STRUT X-TRANSLATION
DOF
ENTER 1 DOF VALUE (A4,I4)
TRAX1030

NAMEYS (DOF)
STRUT Y-TRANSLATION
DOF
ENTER 1 DOF VALUE (A4,I4)
TRAY1030

NAMEAX (DOF)
STRUT X-ROTATION
DOF
ENTER 1 DOF VALUE (A4,I4)
ROTX1030

NAMEAY (DOF)
STRUT Y-ROTATION
DOF

MORE...

ENTER 1 DOF VALUE (A4,I4)
ROTY1030

NAMEDL (DOF)
STRUT ELONGATION
DOF

ENTER 1 DOF VALUE (A4,I4)
LSTR1030

M1 (REAL)
TIRE MASS

ENTER 1 REAL VALUE
?

.25

M2 (REAL)
STRUT MASS

ENTER 1 REAL VALUE
?

.1

L0 (REAL)

UNDEFORMED LENGTH
OF STRUT

MORE...

ENTER 1 REAL VALUE

?

64.89

ZCOS (REAL)
STRUT Z-TRAN DIR COS
WRT FUSELAGE COORDS

NULL VECTOR (Y OR N)

N

ENTER 3 REAL VALUE(S)

?

0 .2743 . 616

XCOS (REAL)
STRUT X-TRAN DIR COS
WRT FUSELAGE COORDS

NULL VECTOR (Y OR N)

N

ENTER 3 REAL VALUE(S)

?

MORE...

1 0 0

NKL (INTEGER)
NO. OF DEF POINTS
STRUT ELONGATION SPRING
ENTER 1 INTEGER VALUE(S)
2

COEFKLSL (REAL)
STRUT DISPLACEMENT
ENTER 2 REAL VALUE(S)
?

-10 10

COEFKLSR (REAL)
STRUT SPRING RATE
NULL VECTOR (Y OR N)
N
ENTER 2 REAL VALUE(S)
?

720 720

NCL (INTEGER)
NO. OF DEF POINTS
STRUT ELONGATION DAMPER
ENTER 1 INTEGER VALUE(S)
2

COEFCLV (REAL)
STRUT VELOCITY
ENTER 2 REAL VALUE(S)
?

-100 100

COEFCLDR (REAL)
STRUT DAMPING RATE
NULL VECTOR (Y OR N)
Y

NKX (INTEGER)
NO. OF DEF POINTS
TIRE LONGITUDINAL SPRING
ENTER 1 INTEGER VALUE(S)
2

MORE...

MORE...

COEFKXLD (REAL)
TIRE LONG DISPLACEMT
ENTER 2 REAL VALUE(S)
?
-10 10

COEFKXSR (REAL)
TIRE SPRING RATE
NULL VECTOR (Y OR N)
N
ENTER 2 REAL VALUE(S)
?
1503 1503

NCX (INTEGER)
NO. OF DEF POINTS
TIRE LONGITUDINAL DAMPER
ENTER 1 INTEGER VALUE(S)
2

COEFCXV (REAL)
TIRE LONG VELOCITY
ENTER 2 REAL VALUE(S)
?
-100 100

COEFCXDR (REAL)
TIRE DAMPING RATE
NULL VECTOR (Y OR N)
N
ENTER 2 REAL VALUE(S)
?
15 15

NKY (INTEGER)
NO. OF DEF POINTS
TIRE LATERAL SPRING
ENTER 1 INTEGER VALUE(S)
2

COEFKYLD (REAL)
TIRE LAT DISPLACEMT

MORE...

MORE...

ENTER 2 REAL VALUE(S)

?

-10 10

COEFKYSR (REAL)

TIRE SPRING RATE

NULL VECTOR (Y OR N)

N

ENTER 2 REAL VALUE(S)

?

1391 1391

NCY (INTEGER)

NO. OF DEF POINTS

TIRE LATERAL DAMPER

ENTER 1 INTEGER VALUE(S)

2

COEFCYV (REAL)

TIRE LAT VELOCITY

ENTER 2 REAL VALUE(S)

?

-100 100

MORE...

COEFCYDR (REAL)

TIRE DAMPING RATE

NULL VECTOR (Y OR N)

N

ENTER 2 REAL VALUE(S)

?

15 15

NKZ (INTEGER)

NO. OF DEF POINTS

TIRE VERTICAL SPRING

ENTER 1 INTEGER VALUE(S)

2

COEFKZVD (REAL)

TIRE VERT DISPLACEMT

ENTER 2 REAL VALUE(S)

?

-10 10

MORE...

COEFKZSR (REAL)
TIRE SPRING RATE
NULL VECTOR (Y OR N)
N
ENTER 2 REAL VALUE(S)
?
2923 2923

NCZ (INTEGER)
NO. OF DEF POINTS
TIRE VERTICAL DAMPER
ENTER 1 INTEGER VALUE(S)
2

COEFCZV (REAL)
TIRE VERT VELOCITY
ENTER 2 REAL VALUE(S)
?
-100 100

COEFCZDR (REAL)
TIRE DAMPING RATE
NULL VECTOR (Y OR N)
N
ENTER 2 REAL VALUE(S)
?
15 15

FRIC (Y OR N)
GROUND FRICTION
ENTER 1 Y OR N VALUE
Y

BRAKE (Y OR N)
BRAKES ON
ENTER 1 Y OR N VALUE
N

SCOX (REAL)
LONG SCRUBBING COEFF
ENTER 1 REAL VALUE
?

MORE...

MORE...

32.472

SCOY (REAL)
LAT SCRUBBING COEFF
ENTER 1 REAL VALUE
?
48.709

INPUT FOR STRUCTURAL COMPONENT CLG2. LANDING GEAR

1 NAMEZS	- STRUT Z-TRANSLATION =	TRAZ1030
2 NAMEXS	- STRUT X-TRANSLATION =	TRAX1030
3 NAMEYS	- STRUT Y-TRANSLATION =	TRAY1030
4 NAMEAX	- STRUT X-ROTATION =	ROTX1030
5 NAMEAY	- STRUT Y-ROTATION =	ROTY1030
6 NAMEDL	- STRUT ELONGATION =	LSTR1030
7 M1	- TIRE MASS =	2.50000E-01
8 M2	- STRUT MASS =	1.00000E-01
9 L0	- UNDEFORMED LENGTH =	6.48900E+01
10 ZCOS	- (REAL) STRUT Z-TRAN DIR COS	
	0.00000E+00 2.74300E-01 9.61600E-01	
11 XCOS	- (REAL) STRUT X-TRAN DIR COS	
	1.00000E+00 0.00000E+00 0.00000E+00	MORE...
12 NKL	- NO. OF DEF POINTS =	2
13 COEFKLSL	- STRUT DISPLACEMENT =	-1.00000E+01 1.00000E+01
14 COEFKLSR	- STRUT SPRING RATE =	7.20000E+02 7.20000E+02
15 NCL	- NO. OF DEF POINTS =	2
16 COEFCLV	- STRUT VELOCITY =	-1.00000E+02 1.00000E+02
17 COEFLDR	- STRUT DAMPING RATE =	0.00000E+00 0.00000E+00
18 NKX	- NO. OF DEF POINTS =	2
19 COEFKXLD	- TIRE LONG DISPLACEMT=	-1.00000E+01 1.00000E+01
20 COEFKXSR	- TIRE SPRING RATE =	1.50300E+03 1.50300E+03
21 NCX	- NO. OF DEF POINTS =	2
22 COEFCXV	- TIRE LONG VELOCITY =	-1.00000E+02 1.00000E+02
23 COEFCXDR	- TIRE DAMPING RATE =	1.50000E+01 1.50000E+01
24 NKY	- NO. OF DEF POINTS =	2
25 COEFKYLD	- TIRE LAT DISPLACEMT =	-1.00000E+01 1.00000E+01
26 COEFKYSR	- TIRE SPRING RATE =	1.39100E+03 1.39100E+03
27 NCY	- NO. OF DEF POINTS =	2
28 COEFCYV	- TIRE LAT VELOCITY =	-1.00000E+02 1.00000E+02
29 COEFCYDR	- TIRE DAMPING RATE =	1.50000E+01 1.50000E+01
30 NKZ	- NO. OF DEF POINTS =	2
31 COEFKZVD	- TIRE VERT DISPLACEMT=	-1.00000E+01 1.00000E+01
32 COEFKZSR	- TIRE SPRING RATE =	2.92300E+03 2.92300E+03

MORE...

33 NCZ	- NO. OF DEF POINTS	=	2	
34 COEFCZV	- TIRE VERT VELOCITY	=	-1.00000E+02	1.00000E+02
35 COEFCZDR	- TIRE DAMPING RATE	=	1.50000E+01	1.50000E+01
36 FRIC	- GROUND FRICTION	=	YES	
37 BRAKE	- BRAKES ON	=	NO	
38 SCOX	- LONG SCRUBBING COEFF=	3.24720E-01		
39 SCOY	- LAT SCRUBBING COEFF =	4.87090E-01		

RE-ENTER (Y OR N)

N

DATA SET ACAPSTAR FOR CLG2 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

2.2.15 CLS2 - Modal Lifting Surface.

2.2.15.1 CLS2 User Notes - Elastic modes must be defined along the principal axis, but modal interpolation is performed to allow implicit coupling with degrees of freedom defined at node points in the plane of the structure, but not on the principal axis or coincident with the mode shape stations. Modes must be obtained from a separate analysis (see paragraph 2.2.1.1, CFM2 User Notes).

For ease of input, wing inertias may be defined with respect to the CG or the attachment point. Likewise, aileron inertias may be defined with respect to the aileron CG or the hinge.

The user has the option of choosing a left- or right-handed coordinate system for the structure. If the symmetry option is elected, an opposite-handed coordinate system will be automatically defined for the additional structure so that degree of freedom definitions will be consistent, i.e., positive Z direction defined in the same direction for both halves of the structure, positive X outboard, positive Y aft.

2.2.15.2 CLS2 Sample Input - Input is shown for a data set for which a left side (PORT) orientation has been selected for the initial coordinate definition (right-handed coordinate system). Motion of the wing has been restricted to out-of-plane degrees of freedom, and a control surface has been defined aft of the spanwise axis. Two implicit degrees of freedom, which could represent stores or additional structure, have been defined at the wing tip. The orientation of the local X, Y vectors coincides with that of the wing coordinate system vectors. The symmetry option has been used to create a corresponding "right side" structure.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CLS2
DATA SET
WNGAIL
SAVE FILE(R,U1,...)
U1

STRUCTURAL COMPONENT CLS2 . MODAL LIFTING SURFACE

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
WING - AILERON COMBINATION

WING (ALPHA)
PORT OR STARBOARD
ENTER PORT OR STAR
PORT ASSUMED IF OTHER THAN PORT OR STAR IS ENTERED
ENTER 4 CHARACTERS (68/LINE)

MORE...

PORT

RBM (Y OR N)
RIGID BODY MODES
ENTER 1 Y OR N VALUE
Y

ISTA (Y OR N)
STATIONWISE (X)
ENTER 1 Y OR N VALUE
N

ICHORD (Y OR N)
CHORDWISE (Y)
ENTER 1 Y OR N VALUE
N

IOP (Y OR N)
OUT OF PLANE (Z)
ENTER 1 Y OR N VALUE
Y

IPITCH (Y OR N)
PITCHING (X--X)
ENTER 1 Y OR N VALUE
N

IFLAP (Y OR N)
FLAPPING (Y--Y)
ENTER 1 Y OR N VALUE
Y

ISWEET (Y OR N)
SWEEPING (Z--Z)
ENTER 1 Y OR N VALUE
N

ATTXY (REAL)
WING ATTACH NODE XY
X Y COORDINATES OF ROOT OF WING ELASTIC AXIS (IN)
RIGID BODY DOF DEFINED HERE
NULL VECTOR (Y OR N)
Y

MORE...

AILERON (Y OR N)
CONTROL SURF OPTION
ENTER 1 Y OR N VALUE
Y

AILCG (REAL)
AILERON CG XY (IN)
NULL VECTOR (Y OR N)
N

ENTER 2 REAL VALUE(S)

?
15 -7

AILCI (Y OR N)
REFERENCE AXES AT CG
YES = INERTIAS ABOUT AILERON CG
NO = INERTIAS ABOUT AILERON HINGE
ENTER 1 Y OR N VALUE
Y

AILINERT (REAL)
AILERON INERTIAS

1. MASS (LB)
2. IXX (LB-IN**2) MOI ABOUT HINGE/AXIS THROUGH CG
3. IYY MOI ABOUT AXIS THROUGH CG
4. IZZ MOI ABOUT OUT-OF-PLANE AXIS AT HINGE/CG
5. IYZ

NULL VECTOR (Y OR N)

N

ENTER 5 REAL VALUE(S)

?

2 4 6 8 10

HINGE (REAL)

REACTION POINTS

ROW1-- INBOARD X Y

ROW2-- OUTBOARD X Y

TYPE MATRIX

(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)

3

INPUT BY ROWS OR COLUMNS (R OR C)

R

OPTION TO SPECIFY NULL ROWS (Y OR N)

N

MORE...

PREPARE TO ENTER ROW 1

ENTER 2 REAL VALUES

?

12 -5

PREPARE TO ENTER ROW 2

ENTER 2 REAL VALUES

?

17 -7

WINGCG (REAL)

WING CG XY (IN)

NULL VECTOR (Y OR N)

N

ENTER 2 REAL VALUE(S)

?

10 1

WINGCI (Y OR N)

REFERENCE AXES AT CG

YES = INERTIAS ABOUT WING CG

NO = INERTIAS ABOUT ATTACH NODE

ENTER 1 Y OR N VALUE

MORE...

Y

WINGINER (REAL)

WING INERTIAS

1. MASS (LB) 2. IXX 3. IYY 4. IZZ 5. IXY 6. IYZ
(LB-IN**2)

NULL VECTOR (Y OR N)

N

ENTER 6 REAL VALUE(S)

?

3.5 7 9 11 13

NMODE (INTEGER)

NO. OF ELASTIC MODES

ENTER 1 INTEGER VALUE(S)

2

NSTA (INTEGER)

NO. MODAL STATIONS

ENTER 1 INTEGER VALUE(S)

5

MSTAT (REAL)

MODE SHAPE STATIONS

NULL VECTOR (Y OR N)

N

ENTER 5 REAL VALUE(S)

?

0 5 10 15 20

IPCOMP (Y OR N)

IP COMPONENTS

ENTER 1 Y OR N VALUE

N

OPCOMP (Y OR N)

OP COMPONENTS

ENTER 1 Y OR N VALUE

Y

TORCOMP (Y OR N)

TORSION COMPONENTS

ENTER 1 Y OR N VALUE

N

MORE...

MORE...

OPMODE (REAL)
 MODES OF COMPONENT
TYPE MATRIX
(0=NULL), (3=GENERAL)
3
INPUT BY ROWS OR COLUMNS (R OR C)
R
OPTION TO SPECIFY NULL ROWS (Y OR N)
N
PREPARE TO ENTER ROW 1
ENTER 5 REAL VALUES
?
0 -.5 -1 -.5 0
PREPARE TO ENTER ROW 2
ENTER 5 REAL VALUES
?
0 1 0 -1 0

OPSLOP (REAL)
 OP SLOPES
TYPE MATRIX
(0=NULL), (3=GENERAL)
3
INPUT BY ROWS OR COLUMNS (R OR C)
R
OPTION TO SPECIFY NULL ROWS (Y OR N)
N
PREPARE TO ENTER ROW 1
ENTER 5 REAL VALUES
?
-.05 -.025 0 .025 .05
PREPARE TO ENTER ROW 2
ENTER 5 REAL VALUES
?
.1 0 -.1 0 .1

MODINERT (REAL)
 MODAL PROPERTIES
 COLUMN 1. MODAL MASS --2. DAMPING --3. FREQUENCY
 NMODE ROWS
TYPE MATRIX
(0=NULL), (3=GENERAL)
3

MORE...

MORE...

INPUT BY ROWS OR COLUMNS (R OR C)
R
OPTION TO SPECIFY NULL ROWS (Y OR N)
N
PREPARE TO ENTER ROW 1
ENTER 3 REAL VALUES
?
.05 .08 111
PREPARE TO ENTER ROW 2
ENTER 3 REAL VALUES
?
.02 .03 555

NAUX (INTEGER)
NO. OF AUX NODES
OPTIONAL AUXILIARY NODES AT WHICH IMPLICIT DOFS ARE DEFINED
THEY NEED NOT BEAR ANY RELATION TO MODE STATIONS
ENTER 1 INTEGER VALUE(S)

1

XYAUX (REAL)
XY FOR EACH AUX NODE

MORE...

TYPE MATRIX
(0=NULL), (3=GENERAL)
3
INPUT BY ROWS OR COLUMNS (R OR C)
R
OPTION TO SPECIFY NULL ROWS (Y OR N)
N
PREPARE TO ENTER ROW 1
ENTER 2 REAL VALUES
?
20 0

NODOF (Y OR N)
DOF Y OR N FOR NODES
COLUMNS---Y OR N FOR XAUX YAUX ZAUX PAUX FAUX SAUX
6 COLUMNS, NAUX ROWS
PREFARE TO ENTER ROW 1
ENTER 6 Y OR N VALUES (35A2)

N N Y N Y N

LOCVEC (REAL)
LOCAL XY VECTORS

MORE...

DIRECTION COSINES FOR LOCAL XY VECTORS
WRT WING COORDINATE SYSTEM
6 COLUMNS, NAXX ROWS

TYPE MATRIX

(0=NULL), (3=GENERAL)

3

INPUT BY ROWS OR COLUMNS (R OR C)

R

OPTION TO SPECIFY NULL ROWS (Y OR N)

N

PREPARE TO ENTER ROW 1

ENTER 6 REAL VALUES

?

1 0 0 0 1 0

YZSYMM (Y OR N)

SYMMETRY OPTION

OPTION TO CREATE IDENTICAL WING CHIRALLY REFLECTED
THROUGH YZ SYMMETRY PLANE

ENTER 1 Y OR N VALUE

Y

***** HOLDING *****

INPUT FOR STRUCTURAL COMPONENT CLS2. MODAL LIFTING SURFACE

1 WING	- PORT OR STARBOARD	=PORT	
2 RBM	- RIGID BODY MODES	=	YES
3 ISTA	- STATIONWISE (X)	=	NO
4 ICHORD	- CHORDWISE (Y)	=	NO
5 IOP	- OUT OF PLANE (Z)	=	YES
6 IPITCH	- PITCHING (X--X)	=	NO
7 IFLAP	- FLAPPING (Y--Y)	=	YES
8 ISWEEP	- SWEEPING (Z--Z)	=	NO
9 ATTXY	- WING ATTACH NODE XY	= 0.00000E+00 . 0.00000E+00	
10 AILERON	- CONTROL SURF OPTION	=	YES
11 AILCG	- AILERON CG XY (IN)	= 1.50000E+01 -7.00000E+00	
12 AILCI	- REFERENCE AXES AT CG=		YES
13 AILINERT	- (REAL) AILERON INERTIAS		
	2.00000E+00 4.00000E+00 6.00000E+00 8.00000E+00		
	1.00000E+01		
14 HINGE	- (REAL) REACTION POINTS		
	GENERAL MATRIX		

ROW 1

1.20000E+01 -5.00000E+00

MORE...

ROW 2
 1.70000E+01 -7.00000E+00
 15 WINGCG - WING CG XY (IN) . = 1.00000E+01 1.00000E+00
 16 WINGCI - REFERENCE AXES AT CG= YES
 17 WINGINER - (REAL) WING INERTIAS
 3.00000E+00 5.00000E+00 7.00000E+00 9.00000E+00
 1.10000E+01 1.30000E+01
 18 NMODE - NO. OF ELASTIC MODES= 2
 19 NSTA - NO. MODAL STATIONS = 5
 20 MSTAT - (REAL) MODE SHAPE STATIONS
 0.00000E+00 5.00000E+00 1.00000E+01 1.50000E+01
 2.00000E+01
 21 IPCOMP - IP COMPONENTS = NO
 22 OPCOMP - OP COMPONENTS = YES
 23 TORCOMP - TORSION COMPONENTS = NO
 24 OPMODE - (REAL) MODES OP COMPONENT
 GENERAL MATRIX

ROW 1
 0.00000E+00 -5.00000E-01 -1.00000E+00 -5.00000E-01
 0.00000E+00
 ROW 2
 MORE...
 0.00000E+00 1.00000E+00 0.00000E+00 -1.00000E+00
 0.00000E+00
 25 OPSLOP - (REAL) OP SLOPES

GENERAL MATRIX

ROW 1
 -5.00000E-02 -2.50000E-02 0.00000E+00 2.50000E-02
 5.00000E-02
 ROW 2
 1.00000E-01 0.00000E+00 -1.00000E-01 0.00000E+00
 1.00000E-01
 26 MODINERT - (REAL) MODAL PROPERTIES

GENERAL MATRIX

ROW 1
 5.00000E-02 8.00000E-02 1.11000E+02
 ROW 2
 2.00000E-02 3.00000E-02 5.55000E+02
 27 NAUX - NO. OF AUX NODES = 1
 28 XYAUX - (REAL) XY FOR EACH AUX NODE
 GENERAL MATRIX

MORE...

ROW 1 2.00000E+01 0.00000E+00
29 NODOF - DOF Y OR N FOR NODES
ROW 1 NO NO YES NO YES NU
30 LOCVEC - (REAL) LOCAL XY VECTORS
GENERAL MATRIX

ROW 1 1.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
1.00000E+00 0.00000E+00
31 YZSYMM - SYMMETRY OPTION = YES

RE-ENTER (Y OR N)
N
DATA SET WNGAIL FOR CLS2 SAVED ON U1
COMPONENT, FORCE, OR N
N
COMMAND

2.2.16 CGL0 - Global Transformation.

2.2.16.1 CGL0 User Notes - The user is asked to specify the model sequence numbers of the data sets for which transformation of the global acceleration vector to the component coordinate system is required. The sequence numbers of data sets which specify null component mass matrices need not be included. Sequence numbers are found in the column labeled INDEX in the listing of a model data set.

2.2.16.2 CGL0 Sample Input - In this example, the component X and Y coordinate axes are coincident with the global coordinate axes.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CGLO
DATA SET
TGC
SAVE FILE(R,U1,...)
U1

COMPONENT CGLO. GLOBAL REFERENCE

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
TRANSFORM GLOBAL ACCELERATIONS TO COMPONENT COORDS

NCGL (INTEGER)
NO. OF COMPONENTS
FOR WHICH GLOBAL TRANSFORM WILL BE PERFORMED
ENTER 1 INTEGER VALUE(S)

2

MORE...

IGSEQ (INTEGER)
SEQUENCE NUMBERS
OF COMPONENTS SELECTED
ENTER 2 INTEGER VALUE(S)

1 4

XYDG (REAL)
COMPONENT X,Y VECTOR
IN TERMS OF GLOBAL SYSTEM

TYPE MATRIX
(0=NULL),(3=GENERAL)

3

INPUT BY ROWS OR COLUMNS (R OR C)

C

OPTION TO SPECIFY NULL COLUMNS (Y OR N)

N

PREPARE TO ENTER COL 1

ENTER 6 REAL VALUES

?

1 0 0 0 1 0

PREPARE TO ENTER COL 2

MORE...

ENTER 6 REAL VALUES

?

1 0 0 0 1 0

CDFLI (DOF)

DOF NAME

ENTER 1 DOF VALUE (A4,I4)

X

INPUT FOR COMPONENT CGL0. GLOBAL REFERENCE

1 NCGL - NO. OF COMPONENTS = 2
2 IGSEQ - SEQUENCE NUMBERS = 1
3 XYDG - (REAL) COMPONENT X,Y VECTOR
GENERAL MATRIX

ROW 1
1.00000E+00 1.00000E+00
ROW 2 NULL ROW
ROW 3 NULL ROW
ROW 4 NULL ROW
ROW 5

MORE...

1.00000E+00 1.00000E+00
ROW 6 NULL ROW
4 CDFLI - DOF NAME = X 0

RE-ENTER (Y OR N)

N

DATA SET TGC FOR CGL0 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

2.2.17 CSF3 - Nonlinear Spring, Damper System:

2.2.17.1 CSF3 User Notes - See paragraph 2.2.6.1, CSF1 User Notes.

2.2.17.2 CSF3 Sample Input - The following single degree of freedom nonlinear equation is input:

$$\ddot{x} + 3\dot{xx} + x^3 = 0$$

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
CSF3
DATA SET
NONLIN
SAVE FILE(R,U1,...)
U1

COMPONENT CSF3. NONLINEAR FINITE ELEMENT

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
NONLINEAR EQUATION

NCDF (INTEGER)
NO. OF DOF
ENTER 1 INTEGER VALUE(S)
1

MORE...

CDFLI (DOF)
DOF NAMES
ENTER 1 DOF VALUE (A4,I4)
X

CM (REAL)
M
TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)
1
INPUT 1 DIAGONAL REAL VALUES

?
1

CC (REAL)
C
TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)
0

CK (REAL)
K

MORE...

TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)

0

CC2 (REAL)

C2

TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)

0

CC3 (REAL)

C3

TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)

0

CK2 (REAL)

K2

TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)

0

CK3 (REAL)

K3

TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)

1

INPUT 1 DIAGONAL REAL VALUES

?

1

CA (REAL)

A

TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)

0

CB (REAL)

B

TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)

0

CD (REAL)

MORE...

MORE...

```

D
TYPE MATRIX
(0=NULL), (1=DIAGONAL), (2=SYMMETRIC), (3=GENERAL)
1
INPUT      1 DIAGONAL REAL VALUES
?
3
-----
CF          (REAL)
F
ENTER 1 REAL VALUE(S)
?
0
-----
IGR          (Y OR N)
GLOBAL REFERENCE
ENTER 1 Y OR N VALUE
N
*****
INPUT FOR COMPONENT CSF3. NONLINEAR FINITE ELEMENT

1 NCDF      - NO. OF DOF      =      1           MORE...
2 COFLI     - DOF NAMES      =      X      0
3 CM         - (REAL) M
DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)

1.00000E+00
4 CC         - (REAL) C
NULL MATRIX

5 CK         - (REAL) K
NULL MATRIX

6 CC2        - (REAL) C2
NULL MATRIX

7 CC3        - (REAL) C3
NULL MATRIX

8 CK2        - (REAL) K2
NULL MATRIX

9 CK3        - (REAL) K3
DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)
MORE...

```

1.00000E+00
10 CA - (REAL) A
NULL MATRIX
11 CB - (REAL) B
NULL MATRIX
12 CD - (REAL) D
DIAGUNAL MATRIX (DIAGUNAL VALUES PRINTED)

3.00000E+00
13 CF - F = 0.00000E+00
14 IGR - GLOBAL REFERENCE = NU

RE-ENTER (Y OR N)

N

DATA SET NONLIN FOR CSF3 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

2.3 FORCE DATA SETS

Input data for a force is formed using the NEW command or its variations (new data sets may be input during model formulation and the addition phase of model editing) or by editing an existing force data set. In the examples which follow, the NEW command has been used to form sample data sets. The user should refer directly to paragraph 3.2 of the DYSCO 4.1 User's Manual while reviewing the sample dialogues.

2.3.1 FSS1 - Sinusoidal Shaker.

2.3.1.1 FSS1 User Notes - FSS1 is limited to continuous application to CSF1 degrees of freedom, and the same forcing function can be applied to any degree of freedom using CGF2. The force amplitude (units: 1b, in.-lb, etc.) is determined by the degree of freedom to which it is applied.

2.3.1.2 FSS1 Sample Input -

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
FSS1
DATA SET
SHAKER
SAVE FILE(R,U1,...)
U1

FORCE FSS1 . SINUSOIDAL SHAKER

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
SHAKER

DOF (DOF)
DOF FORCED BY SHAKER
ENTER 1 DOF VALUE (A4,I4)
X 1

FREQ (REAL)
FREQUENCY (HZ)
ENTER 1 REAL VALUE
?

10

COSC (REAL)
COSINE COMPONENT
ENTER 1 REAL VALUE
?

1

SINC (REAL)
SINE COMPONENT
ENTER 1 REAL VALUE
?

2

INPUT FOR FORCE FSS1. SINUSOIDAL SHAKER

1 DOF - DOF FORCED BY SHAKER= X 1000
2 FREQ - FREQUENCY (HZ) = 1.00000E+01

MORE...

3 COSC - COSINE COMPONENT = 1.00000E+00
4 SINC - SINE COMPONENT = 2.00000E+00

RE-ENTER (Y OR N)

N

DATA SET SHAKER FOR FSS1 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

2.3.2 FRA0 - Rotor Aerodynamics, Linear (2-d).

2.3.2.1 FRA0 User Notes - FRA0 may be used with any of the rotor component modules. The lift, drag, and pitching moment distributions are identical for each blade, but factors can be multiplied times C_L , C_D , or C_M at points along the blades to simulate blade cutouts, tip loss effects, or other losses. The factors are applied identically to each blade in the system. Note: When an aerodynamics data set is used in conjunction with a trim solution (STR3), the wind velocity in the data set must be set to zero.

2.3.2.2 FRA0 Sample Input - Input for an FRA0 data set follows. The user must specify at least two aerodynamic factor stations (nondimensional), and the list of stations must start with zero and end with one. If no factors are desired, a factor of one is specified at stations zero and one. Between factor stations the factors are linearly interpolated.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
FRA0
DATA SET
B AERO
SAVE FILE(R,U1,...)
U1

FORCE FRA0 . ROTOR AERO LINEAR

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
2-D LINEAR BLADE AERO

VAIR (REAL)
WIND VELOCITY
VX,VY,VZ (FT/SEC) IN HUB SYSTEM
NULL VECTOR (Y OR N)
Y

MORE...

ALAMDA (REAL)
AVG INDUCED VELOCITY
POS UP HUB REF
ENTER 1 REAL VALUE
?
-.012

ILINEA (Y OR N)
INDUCED VLCTY VARIES
ENTER 1 Y OR N VALUE
N

XAC (REAL)
A/C OFFSET FROM F.A.
+FWD (PERCENT OF CHORD)
ENTER 1 REAL VALUE
?
0

A0 (REAL)
LIFT CURVE SLOPE

MORE...

(1/DEG)
ENTER 1 REAL VALUE
?
.1

ALOL (REAL)
ALPHA FOR ZERO LIFT
(DEG)
ENTER 1 REAL VALUE
?
0

CD0 (REAL)
DRAG COEFFICIENT
ENTER 1 REAL VALUE
?
.0085

CM0 (REAL)
MOMENT COEFFICIENT
ENTER 1 REAL VALUE
?
0

ASTALL (REAL)
POS STALL ANGLE
(DEG)
ENTER 1 REAL VALUE
?
25

NXA (INTEGER)
OF AERO STATIONS
ENTER 1 INTEGER VALUE(S)
12

XSTA (REAL)
NON-DIMENSL STATIONS
NULL VECTOR (Y OR N)
N
ENTER 12 REAL VALUE(S)
?
.177 .225 .4 .6 .7 .75 .8 .85 .9 .935 .97 1

MORE...

MORE...

CHORD (REAL)
CHORD FOR STATIONS

NULL VECTOR (Y OR N)

N

ENTER 12 REAL VALUE(S)

?

27 27 27 27 27 27 27 27 27 27 27 27

NY (INTEGER)

OF FACTOR STATIONS

ENTER 1 INTEGER VALUE(S)

2

XF (REAL)

NON-DIMENSL STATIONS

ENTER 2 REAL VALUE(S)

?

0 1

FL (REAL)

FACTORS FOR CL

NULL VECTOR (Y OR N)

N

ENTER 2 REAL VALUE(S)

?

1 1

FD (REAL)

FACTORS FOR CD

NULL VECTOR (Y OR N)

N

ENTER 2 REAL VALUE(S)

?

1 1

FM (REAL)

FACTORS FOR CM

NULL VECTOR (Y OR N)

N

ENTER 2 REAL VALUE(S)

?

1 1

INPUT FOR FORCE FRAQ. ROTOR AERO LINEAR

MORE...

MORE...

1 VAIR	- (REAL) WIND VELOCITY		
	0.00000E+00	0.00000E+00	0.00000E+00
2 ALAMDA	- AVG INDUCED VELOCITY= -1.20000E-02		
3 ILINEA	- INDUCED VLCTY VARIES= NO		
4 XAC	- A/C OFFSET FROM F.A.= 0.00000E+00		
5 A0	- LIFT CURVE SLOPE = 1.00000E-01		
6 ALOL	- ALPHA FOR ZERO LIFT = 0.00000E+00		
7 CDO	- DRAG COEFFICIENT = 8.50000E-03		
8 CM0	- MOMENT COEFFICIENT = 0.00000E+00		
9 ASTALL	- POS STALL ANGLE = 2.50000E+01		
10 NXA	- # OF AERO STATIONS = 12		
11 XSTA	- (REAL) NON-DIMENSL STATIONS		
	1.77000E-01	2.25000E-01	4.00000E-01
	7.00000E-01	7.50000E-01	8.00000E-01
	9.00000E-01	9.35000E-01	9.70000E-01
12 CHORD	- (REAL) CHORD FOR STATIONS		
	2.70000E+01	2.70000E+01	2.70000E+01
	2.70000E+01	2.70000E+01	2.70000E+01
	2.70000E+01	2.70000E+01	2.70000E+01
13 NY	- # OF FACTOR STATIONS= 2		
14 XF	- NON-DIMENSL STATIONS= 0.00000E+00		
	MORE...		
15 FL	- FACTORS FOR CL = 1.00000E+00		
16 FD	- FACTORS FOR CD = 1.00000E+00		
17 FM	- FACTORS FOR CM = 1.00000E+00		

RE-ENTER (Y OR N)

N

DATA SET B AERO FOR FRA0 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

2.3.3 FRA2 - Rotor Aerodynamics, Tabular (2-d).

2.3.3.1 FRA2 User Notes - FRA2 may be used with any of the rotor component modules. The airfoil tables required by an FRA2 data set are automatically listed in the model ds. The lift, drag, and pitching moment distributions are identical for each blade, but factors can be multiplied times C_L , C_D , or C_M at points along the blades to simulate blade cutouts, tip loss effects, or other losses. The factors are applied identically to each blade in the system. Note: When an aerodynamics data set is used in conjunction with a trim solution (STR3), the wind velocity in the data set must be set to zero.

2.3.2.2 FRA2 Sample Input - Input for an FRA2 data set follows. The user must specify at least two aerodynamic factor stations (nondimensional), and the list of stations must start with zero and end with one. If no factors are desired, a factor of one is specified at stations zero and one. Between factor stations the factors are linearly interpolated. In this example, the coefficients have been set to zero between the blade root and station .177 and allowed to vary linearly from zero to their original values between stations .177 and .225, remaining at the original values as far as station .97. From station .97 to the blade tip, the coefficients are linearly reduced to zero.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
FRA2
DATA SET
B AERO
SAVE FILE(R,U1,...)
U1

FORCE FRA2 . ROTOR AERO TABULAR

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
2-D TABULAR BLADE AERO

VAIR (REAL)
WIND VELOCITY
VX, VY, VZ, W.R.T. HUB SYS (FT/SEC)
NULL VECTOR (Y OR N)
N

MORE...

ENTER 3 REAL VALUE(S)

?
159.48 0 -6.099

ALAMDA (REAL)
NONDIM INDUCED VEL
+UPWARD (AVERAGE)
ENTER 1 REAL VALUE

?
-.01041

INDUC (INTEGER)
INDUCED VEL TYPE
ENTER 1 INTEGER VALUE(S)

1

NXA (INTEGER)
NO. AERO STAS
ENTER 1 INTEGER VALUE(S)
12

SAERO (REAL)

MORE...

NONDIM AERO STAS
ENTER 12 REAL VALUE(S)
?
.177 .225 .4 .6 .7 .75 .8 .85 .9 .935 .97 1

NUMAF (INTEGER)
NO. AIRFOIL TABLES
ENTER 1 INTEGER VALUE(S)
1

AFTAB1 (AIRFOIL DS)
NAME AF TABLE 1
ENTER AIRFOIL DATASET NAME
AFD161

NUMAF1 (INTEGER)
NO. STAS AF 1
ENTER 1 INTEGER VALUE(S)
12

STA-AF1 (INTEGER)
STAS AF 1
MORE...
NULL VECTOR (Y OR N)
N
ENTER 12 INTEGER VALUE(S)
1 2 3 4 5 6 7 8 9 10 11 12

XAC (REAL)
A/C OFFSET FROM F.A.
+FWD (PERCENT OF CHORD)
ENTER 1 REAL VALUE
?
0

CHORD (REAL)
CHORD (IN)
NULL VECTOR (Y OR N)
N
ENTER 12 REAL VALUE(S)
?
27 27 27 27 27 27 27 27 27 27 27 27

NX (INTEGER)
NO. AERO FACTOR STAS
MORE...

ENTER 1 INTEGER VALUE(S)
5

XF (REAL)
NONDIM FACTOR STAS
ENTER 5 REAL VALUE(S)

?
0 .177 .225 .97 1

FL (REAL)
FACTORS FOR CL
NULL VECTOR (Y OR N)
N
ENTER 5 REAL VALUE(S)

?
0 0 1 1 0

FD (REAL)
FACTORS FOR CD
NULL VECTOR (Y OR N)
N
ENTER 5 REAL VALUE(S)

?
0 0 1 1 0

FM (REAL)
FACTORS FOR CM
NULL VECTOR (Y OR N)
N
ENTER 5 REAL VALUE(S)

?
0 0 1 1 0

INPUT FOR FORCE FRA2. ROTOR AERO TABULAR

1 VAIR	- (REAL) WIND VELOCITY			
	1.59480E+02	0.00000E+00	-6.09900E+00	
2 ALAMDA	- NONDIM INDUCED VEL	=	-1.04100E-02	
3 INDUC	- INDUCED VEL TYPE	=	1	
4 NXA	- NO. AERO STAS	=	12	
5 SAERO	- (REAL) NONDIM AERO STAS			
	1.77000E-01	2.25000E-01	4.00000E-01	6.00000E-01
	7.00000E-01	7.50000E-01	8.00000E-01	8.50000E-01
	9.00000E-01	9.35000E-01	9.70000E-01	1.00000E+00

MORE...

6 NUMAF	- NO. AIRFOIL TABLES	=				
7 AFTAB1	- NAME AF TABLE 1	=	AFD161	/AIRFOIL		
8 NUMAF1	- NO. STAS AF 1	=		12		
9 STA-AF1	- STAS AF 1					
	1	2	3	4	5	
	6	7	8	9	10	
	11	12				
10 XAC	- A/C OFFSET FROM F.A.=	0.00000E+00				
11 CHORD	- (REAL) CHORD (IN)					
	2.70000E+01	2.70000E+01	2.70000E+01	2.70000E+01		
	2.70000E+01	2.70000E+01	2.70000E+01	2.70000E+01		
	2.70000E+01	2.70000E+01	2.70000E+01	2.70000E+01		
12 NX	- NO. AERO FACTOR STAS=		5			
13 XF	- (REAL) NONDIM FACTOR STAS					
	0.00000E+00	1.77000E-01	2.25000E-01	9.70000E-01		
	1.00000E+00					
14 FL	- (REAL) FACTORS FOR CL					
	0.00000E+00	0.00000E+00	1.00000E+00	1.00000E+00		
	0.00000E+00					
15 FD	- (REAL) FACTORS FOR CD					
	0.00000E+00	0.00000E+00	1.00000E+00	1.00000E+00		
	0.00000E+00					
16 FM	- (REAL) FACTORS FOR CM					
	0.00000E+00	0.00000E+00	1.00000E+00	1.00000E+00		
	0.00000E+00					

MORE...

RE-ENTER (Y OR N)

N

DATA SET B AERO FOR FRA2 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

2.3.4 FRA3 - Rotor Aerodynamics, General.

2.3.4.1 FRA3 User Notes - FRA3 may be used with any of the rotor component modules, but is primarily suited for use with CRE3 and CRD3. The steady state lift, drag, and pitching moment coefficients can be calculated automatically or be obtained from airfoil tables. The same airfoil table can be used with FRA3 and FRA2 data sets, and the tables required by a force data set are automatically listed in the model ds. The lift, drag, and pitching moment distributions are identical for each blade, but factors can be multiplied times C_L , C_D , or C_M at points along the blades to simulate blade cutouts, tip loss effects, or other losses. The factors are applied identically to each blade in the system. Note: When an aerodynamics data set is used in conjunction with a trim solution (STR3), the wind velocity in the data set must be set to zero.

2.3.4.2 FRA3 Sample Input - Input is shown for the FRA3 data set used in the helicopter simulation presented in Section 6 of the User's Manual (FCT1.65/FRA3). The user must specify at least two aerodynamic factor stations (nondimensional), and the list of stations must start with zero and end with one. If no factors are desired, a factor of one is specified at stations zero and one. Between factor stations the factors are linearly interpolated.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
FRA3
DATA SET
FCT1.65
SAVE FILE(R,U1,...)
U1

FORCE FRA3 . ROTOR AERO GENERAL

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
GENERAL AERO, INDUCED VEL 1.65

IEQS (Y OR N)
AERODYNAMICS BY EQS
ENTER 1 Y OR N VALUE
N

INFTAB (Y OR N)
INDUCED VEL BY TABLE
ENTER 1 Y OR N VALUE
N

MORE...

IUNSTD (Y OR N)
UNSTEADY AERO
ENTER 1 Y OR N VALUE
N

VAIRH (REAL)
WIND VELOCITY
VX, VY, VZ, W.R.T. HUB SYS (FT/SEC)
NULL VECTOR (Y OR N)
Y

ASTALL (REAL)
STALL ANGLE (DEG)
ENTER 1 REAL VALUE
?
20

MORE...

RFCT (REAL)
INDUCED VEL FACTOR
ENTER 1 REAL VALUE

?

1.65

TIPLOC (REAL)
TIP LOSS COEFFICIENT
ENTER 1 REAL VALUE

?

.95

XH (REAL)
HUB EXTENT (IN)
ENTER 1 REAL VALUE

?

3.96

ALT (REAL)
VEHICLE HEIGHT (FT)
ENTER 1 REAL VALUE

?

200

MORE...

K27 (REAL)
TIP VORTEX COEFF
ENTER 1 REAL VALUE

?

0

CDO (REAL)
BLADE DRAG COEFFAT
ALFA=0, M=.3
ENTER 1 REAL VALUE

?

.0068

Q1C (REAL)
Q1C COEFFICIENT
MEFF=M*(COS Q1C*GAMA)**Q2C
ENTER 1 REAL VALUE

?

1

MORE...

Q2C (REAL)
Q2C COEFFICIENT
MEFF=M*(COS Q1C*GAMA)**Q2C

ENTER 1 REAL VALUE

?

.5

ALAMDA (REAL)
NONDIM INDUCED VEL
POSITIVE UPWARD

ENTER 1 REAL VALUE

?

-.012

NXA (INTEGER)
NO. OF STATIONS
ENTER 1 INTEGER VALUE(S)

12

XAERO (REAL)
NONDIM AERO STATIONS
ENTER 12 REAL VALUE(S)

MORE...

?

.177 .225 .4 .6 .7 .75 .8 .85 .9 .935 .97 1

NUMAF (INTEGER)
NO. AIRFOIL TABLES
ENTER 1 INTEGER VALUE(S)

1

AFTAB1 (AIRFOIL DS)
NAME AF TABLE 1
ENTER AIRFOIL DATASET NAME
AFD161

NUMAF1 (INTEGER)
NO. OF STATIONS AF 1
ENTER 1 INTEGER VALUE(S)

12

STA-AF1 (INTEGER)
STATIONS FOR AF 1
NULL VECTOR (Y OR N)
N

MORE...

ENTER 12 INTEGER VALUE(S)
1 2 3 4 5 6 7 8 9 10 11 12

XACC (REAL)
A/C OFFSET FROM E.C.
+FWD (PERCENT OF CHORD)

NULL VECTOR (Y OR N)
Y

CHORDC (REAL)
CHORD (IN)
NULL VECTOR (Y OR N)

N
ENTER 12 REAL VALUE(S)

?
28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5 28.5

NX (INTEGER)
NO. AERO FACTOR STAS
ENTER 1 INTEGER VALUE(S)

2

----- MORE...

XF (REAL)
NONDIM FACTOR STAS
ENTER 2 REAL VALUE(S)

?
0 1

FL (REAL)
FACTORS FOR CL
NULL VECTOR (Y OR N)

N
ENTER 2 REAL VALUE(S)

?
1 1

FD (REAL)
FACTORS FOR CD
NULL VECTOR (Y OR N)

N
ENTER 2 REAL VALUE(S)

?
1 1

----- MORE...

FM (REAL)
 FACTORS FOR CM
 NULL VECTOR (Y OR N)
 N
 ENTER 2 REAL VALUE(S)

?

1 1

 INPUT FOR FORCE FRA3. ROTOR AERO GENERAL

1 IEQS	- AERODYNAMICS BY EQS =	NO
2 INFTAB	- INDUCED VEL BY TABLE=	NO
3 IUNSTD	- UNSTEADY AERO =	NO
4 VAIRH	- (REAL) WIND VELOCITY	
	0.00000E+00 0.00000E+00 0.00000E+00	
5 ASTALL	- STALL ANGLE (DEG) =	2.00000E+01
6 RFCT	- INDUCED VEL FACTOR =	1.65000E+00
7 TIPLOC	- TIP LOSS COEFFICIENT=	9.50000E-01
8 XH	- HUB EXTENT (IN) =	3.96000E+00
9 ALT	- VEHICLE HEIGHT (FT) =	2.00000E+02
10 K27	- TIP VORTEX COEFF =	0.00000E+00
11 CDO	- BLADE DRAG COEFFAT =	6.80000E-03

MORE...

12 Q1C	- Q1C COEFFICIENT =	1.00000E+00
13 Q2C	- Q2C COEFFICIENT =	5.00000E-01
14 ALAMDA	- NONDIM INDUCED VEL =	-1.20000E-02
15 NXA	- NO. OF STATIONS =	12
16 XAERO	- (REAL) NONDIM AERO STATIONS	
	1.77000E-01 2.25000E-01 4.00000E-01 6.00000E-01	
	7.00000E-01 7.50000E-01 8.00000E-01 8.50000E-01	
	9.00000E-01 9.35000E-01 9.70000E-01 1.00000E+00	
17 NUMAF	- NO. AIRFOIL TABLES =	1
18 AFTAB1	- NAME AF TABLE 1 = AFD161 /AIRFOIL	
19 NUMAF1	- NO. OF STATIONS AF 1=	12
20 STA-AF1	- STATIONS FOR AF 1	

1	2	3	4	5
6	7	8	9	10
11	12			

21 XACC	- (REAL) A/C OFFSET FROM E.C.	
	0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00	
	0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00	
	0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00	

22 CHORDC	- (REAL) CHORD (IN)	
	2.85000E+01 2.85000E+01 2.85000E+01 2.85000E+01	
	2.85000E+01 2.85000E+01 2.85000E+01 2.85000E+01	

MORE...

	2.85000E+01	2.85000E+01	2.85000E+01	2.85000E+01
23 NX	- NO. AERO FACTOR STAS=	2		
24 XF	- NONDIM FACTOR STAS =	0.00000E+00	1.00000E+00	
25 FL	- FACTORS FOR CL =	1.00000E+00	1.00000E+00	
26 FD	- FACTORS FOR CD =	1.00000E+00	1.00000E+00	
27 FM	- FACTORS FOR CM =	1.00000E+00	1.00000E+00	

RE-ENTER (Y OR N)

N

DATA SET FCT1.65 FOR FRA3 SAVED ON U1

COMPONENT, FORCE, OR N

N

COMMAND

2.3.5 FFAØ - Fuselage Aerodynamics, Flat Plate Drag.

2.3.5.1 FFAØ User Notes - FFAØ may be used with either CFM2 or CFM3. Wind direction is limited to the vertical plane through the fuselage longitudinal axis. Note: When an aerodynamics data set is used in conjunction with a trim solution (STR3), the wind velocity in the data set must be set to zero.

2.3.5.2 FFAØ Sample Input -

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
FFAO
DATA SET
PLATE
SAVE FILE(R,U1,...)
U1

FORCE FFAO . FUSELAGE AERO PLATE DRAG

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
FUSELAGE FLAT PLATE DRAG

VAIR (REAL)
WIND SPEED
(FT/SEC)
ENTER 1 REAL VALUE
?

MORE...

20

CD (REAL)
TOTAL DRAG COEFF
ENTER 1 REAL VALUE
?

16.5

YANGL (REAL)
WND AXS-REF DOF ANGL
ENTER 1 REAL VALUE
?

30

INPUT FOR FORCE FFAO. FUSELAGE AERO PLATE DRAG

1 VAIR - WIND SPEED = 2.00000E+01
2 CD - TOTAL DRAG COEFF = 1.65000E+01
3 YANGL - WND AXS-REF DOF ANGLE= 3.00000E+01

RE-ENTER (Y OR N)

MORE...

N
DATA SET PLATE FOR FFAO SAVED ON U1
COMPONENT, FORCE, OR N
N

2.3.6 FFC2 - Fuselage Aerodynamics, Linear (2-d).

2.3.6.1 FFC2 User Notes - FFC2 may be used with either CFM2 or CFM3. The aerodynamic forces and moments are resolved at the fuselage CG, but do not include any modal forces (forces are applied to rigid body degrees of freedom only). Note: When an aerodynamic data set is used in conjunction with a trim solution (STR3), the wind velocity in the data set must be set to zero.

2.3.6.2 FFC2 Sample Input - Input is shown for the FFC2 data set used in the helicopter simulation presented in Section 6 of the User's Manual (AH1G16.5/ FFC2). Aerodynamic coefficients have been input for the fuselage, wing, horizontal stabilizer, and vertical stabilizer. Tail rotor thrust has not been included.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
FFC2
DATA SET
AH1G16.5
SAVE FILE(R,U1,...)
U1

FORCE FFC2 . FUSELAGE AERO LINEAR

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
AH1G, 16.5 SQ FT FLAT PLATE DRAG

VAIR (REAL)
WIND VELOCITY
VX,VY,VZ (FT/SEC) W.R.T. BODY SYSTEM
NULL VECTOR (Y OR N)
Y

MORE...

IFUSE (Y OR N)
FUSELAGE AERO FORCES
ENTER 1 Y OR N VALUE
Y

RFUSE (REAL)
FUSELAGE A/C LOC
RX,RY,RZ IN TERMS OF X,Y,Z COORDINATE SYSTEM(IN)
NULL VECTOR (Y OR N)
N
ENTER 3 REAL VALUE(S)
?
-.68 0 14.925

AFUSE (REAL)
FUSELAGE AREA
(SQR FT)
ENTER 1 REAL VALUE
?
1

MORE...

AL0FUS (REAL)
FUSLAG LIFT COEFF C0
ENTER 1 REAL VALUE
?
0

AL1FUS (REAL)
FUSLAG LIFT COEFF C1
(1/DEG)
ENTER 1 REAL VALUE
?
.32

AL2FUS (REAL)
FUSLAG LIFT COEFF C2
(1/DEG/DEG)
ENTER 1 REAL VALUE
?
.0025

CD0FUS (REAL)
FUSLAG DRAG COEFF C0
ENTER 1 REAL VALUE
?
16.5

MORE...

CD1FUS (REAL)
FUSLAG DRAG COEFF C1
(1/DEG)
ENTER 1 REAL VALUE
?
.032

CD2FUS (REAL)
FUSLAG DRAG COEFF C2
(1/DEG/DEG)
ENTER 1 REAL VALUE
?
.01

CM0FUS (REAL)
FUSELAG MOM COEFF C0
ENTER 1 REAL VALUE
?

MORE...

-324

CM1FUS (REAL)
FUSELAG MOM COEFF C1
(1/DEG)
ENTER 1 REAL VALUE
?

48

CM2FUS (REAL)
FUSELAG MOM COEFF C2
(1/DEG/DEG)
ENTER 1 REAL VALUE
?

-12

FUINCI (REAL)
FUSELAG INCIDENCE
(DEG)
ENTER 1 REAL VALUE
?

0

MORE...

FUD0 (REAL)
FUSLAG DOWNWASH ANGL
(DEG)
ENTER 1 REAL VALUE
?

0

FURATI (REAL)
FUSLAG VELOCITY RATIO
(LOCAL STREAM VEL/FREE STREAM VEL)**2
ENTER 1 REAL VALUE
?

1

IWING (Y OR N)
CONSIDER WING
ENTER 1 Y OR N VALUE
Y

RWING (REAL)
WING A/C LOC

MORE...

RX,RY,RZ IN TERMS OF X,Y,Z COORDINATE SYSTEM(IN)
NULL VECTOR (Y OR N)

N.

ENTER 3 REAL VALUE(S)

?

-10.95 0 12.005

AWING (REAL)

WING AREA (SQR FT)

ENTER 1 REAL VALUE

?

28.15

AL0WIN (REAL)

WING LIFT COEFF C0

ENTER 1 REAL VALUE

?

.58

AL1WIN (REAL)

WING LIFT COEFF C1

(1/DEG)

ENTER 1 REAL VALUE

?

.06

AL2WIN (REAL)

WING LIFT COEFF C2

(1/DEG/DEG)

ENTER 1 REAL VALUE

?

-.007

CD0WIN (REAL)

WING DRAG COEFF C0

ENTER 1 REAL VALUE

?

.064

CD1WIN (REAL)

WING DRAG COEFF C1

(1/DEG)

ENTER 1 REAL VALUE

?

MORE...

CD2WIN (REAL)

WING DRAG COEFF C2

(1/DEG)

ENTER 1 REAL VALUE

?

MORE...

0

CD2WIN (REAL)
WING DRAG COEFF C2
(1/DEG/DEG)

ENTER 1 REAL VALUE

?

0

CM0WIN (REAL)
WING MOM COEFF C0

ENTER 1 REAL VALUE

?

-1

CM1WIN (REAL)
WING MOM COEFF C1
(1/DEG)

ENTER 1 REAL VALUE

?

0

CM2WIN (REAL)
WING MOM COEFF C2
(1/DEG/DEG)

ENTER 1 REAL VALUE

?

0

MORE...

WINCI (REAL)
WING INCIDENCE (DEG)

ENTER 1 REAL VALUE

?

4.8

WINGDO (REAL)
WING DOWNWASH ANGLE
(DEG)

ENTER 1 REAL VALUE

?

0

WRATI (REAL)
WING VELOCITY RATIO

MORE...

(LOCAL STREAM VEL/FREE STREAM VEL)**2
ENTER 1 REAL VALUE

?

1

IHT (Y OR N)
CONSIDER HORIZ TAIL

ENTER 1 Y OR N VALUE
Y

RHT (REAL)
HTAIL A/C LOC
RX,RY,RZ IN TERMS OF X,Y,Z COORDINATE SYSTEM(IN)

NULL VECTOR (Y OR N)

N

ENTER 3 REAL VALUE(S)

?

196.82 0 -40.8

AHT (REAL)
HORIZONTAL TAIL AREA
(SQR FT)

MORE...

ENTER 1 REAL VALUE

?

15.2

AL0HT (REAL)
HTAIL LIFT COEFF C0
ENTER 1 REAL VALUE

?

.25

AL1HT (REAL)
HTAIL LIFT COEFF C1
(1/DEG)

ENTER 1 REAL VALUE

?

.00755

AL2HT (REAL)
HTAIL LIFT COEFF C2
(1/DEG/DEG)

ENTER 1 REAL VALUE

?

MORE...

.00152

CD0HT (REAL)

HTAIL DRAG COEFF C0

ENTER 1 REAL VALUE

?

.025

CD1HT (REAL)

HTAIL DRAG COEFF C1

(1/DEG)

ENTER 1 REAL VALUE

?

0

CD2HT (REAL)

HTAIL DRAG COEFF C2

(1/DEG/DEG)

ENTER 1 REAL VALUE

?

0

MORE...

CM0HT (REAL)

HTAIL MOM COEFF C0

ENTER 1 REAL VALUE

?

0

CM1HT (REAL)

HTAIL MOM COEFF C1

(1/DEG)

ENTER 1 REAL VALUE

?

0

CM2HT (REAL)

HTAIL MOM COEFF C2

(1/DEG/DEG)

ENTER 1 REAL VALUE

?

0

HTINCI (REAL)

HTAIL INCIDENCE

MORE...

(DEG)
ENTER 1 REAL VALUE

?
6.87

HTDO (REAL)
HTAIL DOWNWASH ANGLE
(DEG)

ENTER 1 REAL VALUE
?
0

HTRATI (REAL)
HTAIL VELOCITY RATIO
(LOCAL STREAM VEL/FREE STREAM VEL)**2
ENTER 1 REAL VALUE

?
1

IVT (Y OR N)
CONSIDER VERT TAIL
ENTER 1 Y OR N VALUE

Y

MORE...

RVT (REAL)
VTAIL A/C LOC
RX,RY,RZ IN TERMS OF X,Y,Z COORDINATE SYSTEM(IN)
NULL VECTOR (Y OR N)
N
ENTER 3 REAL VALUE(S)
?
300.32 0 .7

AVT (REAL)
VERTICAL TAIL AREA
(SQR FT)
ENTER 1 REAL VALUE

?
18.87

AL0VT (REAL)
VTAIL LIFT COEFF C0
ENTER 1 REAL VALUE
?

MORE...

.22

AL1VT (REAL)
VTAIL LIFT COEFF C1
(1/DEG)

ENTER 1 REAL VALUE

?

0

AL2VT (REAL)
VTAIL LIFT COEFF C2
(1/DEG/DEG)

ENTER 1 REAL VALUE

?

0

CD0VT (REAL)
VTAIL DRAG COEFF C0
ENTER 1 REAL VALUE

?

.05

MORE...

CD1VT (REAL)
VTAIL DRAG COEFF C1
(1/DEG)

ENTER 1 REAL VALUE

?

0

CD2VT (REAL)
VTAIL DRAG COEFF C2
(1/DEG/DEG)

ENTER 1 REAL VALUE

?

0

CM0VT (REAL)
VTAIL MOM COEFF C0
ENTER 1 REAL VALUE

?

0

CM1VT (REAL)
VTAIL MOM COEFF C1

MORE...

(1/DEG)
ENTER 1 REAL VALUE

?

0

CM2VT (REAL)
VTAIL MOM COEFF C2

(1/DEG/DEG)

ENTER 1 REAL VALUE

?

0

VTINCI (REAL)
VTAIL INCIDENCE
(DEG)

ENTER 1 REAL VALUE

?

4.5

VTDO (REAL)
VTAIL DOWNWASH ANGLE
(DEG)

ENTER 1 REAL VALUE

?

0

VTRATI (REAL)
VTAIL VELOCITY RATIO
(LOCAL STREAM VEL/FREE STREAM VEL)**2

ENTER 1 REAL VALUE

?

1

ITAIL (Y OR N)
CONSIDER TAIL ROTOR

ENTER 1 Y OR N VALUE

N

IPROP (Y OR N)
CONSIDER PROPELLER

ENTER 1 Y OR N VALUE

N

INPUT FOR FORCE FFC2. FUSELAGE AERO LINEAR

MORE...

1 VAIR - (REAL) WIND VELOCITY
 0.00000E+00 0.00000E+00 0.00000E+00
 2 IFUSE - FUSELAGE AERO FORCES= YES
 3 RFUSE - (REAL) FUSELAGE A/C LOC
 -6.80000E-01 0.00000E+00 1.49250E+01
 4 AFUSE - FUSELAGE AREA = 1.00000E+00
 5 AL0FUS - FUSLAG LIFT COEFF C0= 0.00000E+00
 6 AL1FUS - FUSLAG LIFT COEFF C1= 3.20000E-01
 7 AL2FUS - FUSLAG LIFT COEFF C2= 2.50000E-03
 8 CD0FUS - FUSLAG DRAG COEFF C0= 1.65000E+01
 9 CD1FUS - FUSLAG DRAG COEFF C1= 3.20000E-02
 10 CD2FUS - FUSLAG DRAG COEFF C2= 1.00000E-02
 11 CM0FUS - FUSELAGE MOM COEFF C0= -3.24000E+02
 12 CM1FUS - FUSELAGE MOM COEFF C1= 4.80000E+01
 13 CM2FUS - FUSELAGE MOM COEFF C2= -1.20000E-01
 14 FUINCI - FUSELAGE INCIDENCE = 0.00000E+00
 15 FUDO - FUSLAG DOWNWASH ANGL= 0.00000E+00
 16 FURATI - FUSLAG VELOCITY RATIO= 1.00000E+00
 17 IWING - CONSIDER WING = YES
 18 RWING - (REAL) WING A/C LOC
 -1.09500E+01 0.00000E+00 1.20050E+01

MORE...

19 AWING - WING AREA (SQR FT) = 2.81500E+01
 20 AL0WIN - WING LIFT COEFF C0 = 5.80000E-01
 21 AL1WIN - WING LIFT COEFF C1 = 6.00000E-02
 22 AL2WIN - WING LIFT COEFF C2 = -7.00000E-03
 23 CD0WIN - WING DRAG COEFF C0 = 6.40000E-02
 24 CD1WIN - WING DRAG COEFF C1 = 0.00000E+00
 25 CD2WIN - WING DRAG COEFF C2 = 0.00000E+00
 26 CM0WIN - WING MOM COEFF C0 = -1.00000E+00
 27 CM1WIN - WING MOM COEFF C1 = 0.00000E+00
 28 CM2WIN - WING MOM COEFF C2 = 0.00000E+00
 29 WINCI - WING INCIDENCE (DEG)= 4.80000E+00
 30 WINGDO - WING DOWNWASH ANGLE = 0.00000E+00
 31 WRATI - WING VELOCITY RATIO = 1.00000E+00
 32 IHT - CONSIDER HORIZ TAIL = YES
 33 RHT - (REAL) HTAIL A/C LOC
 1.96820E+02 0.00000E+00 -4.08000E+01
 - HORIZONTAL TAIL AREA= 1.52000E+01
 - HTAIL LIFT COEFF C0 = -2.50000E-01
 - HTAIL LIFT COEFF C1 = 7.55000E-03
 - HTAIL LIFT COEFF C2 = 1.52000E-03
 - HTAIL DRAG COEFF C0 = -2.50000E-02
 - HTAIL DRAG COEFF C1 = 0.00000E+00

MORE...

40 CD2HT - HTAIL DRAG COEFF C2 = 0.00000E+00
 41 CM0HT - HTAIL MOM COEFF C0 = 0.00000E+00
 42 CM1HT - HTAIL MOM COEFF C1 = 0.00000E+00
 43 CM2HT - HTAIL MOM COEFF C2 = 0.00000E+00
 44 HTINCI - HTAIL INCIDENCE = 6.87000E+00
 45 HTDO - HTAIL DOWNWASH ANGLE= 0.00000E+00
 46 HTRATI - HTAIL VELOCITY RATIO= 1.00000E+00
 47 IVT - CONSIDER VERT TAIL = YES
 48 RVT - (REAL) VTAIL A/C LOC
 3.00320E+02 0.00000E+00 7.00000E-01
 49 AVT - VERTICAL TAIL AREA = 1.88700E+01
 50 AL0VT - VTAIL LIFT COEFF C0 = 2.20000E-01
 51 AL1VT - VTAIL LIFT COEFF C1 = 0.00000E+00
 52 AL2VT - VTAIL LIFT COEFF C2 = 0.00000E+00
 53 CD0VT - VTAIL DRAG COEFF C0 = 5.00000E-02
 54 CD1VT - VTAIL DRAG COEFF C1 = 0.00000E+00
 55 CD2VT - VTAIL DRAG COEFF C2 = 0.00000E+00
 56 CM0VT - VTAIL MOM COEFF C0 = 0.00000E+00
 57 CM1VT - VTAIL MOM COEFF C1 = 0.00000E+00
 58 CM2VT - VTAIL MOM COEFF C2 = 0.00000E+00
 59 VTINCI - VTAIL INCIDENCE = 4.50000E+00
 60 VTDO - VTAIL DOWNWASH ANGLE= 0.00000E+00

MORE...

61 VTRATI - VTAIL VELOCITY RATIO= 1.00000E+00
 62 ITAIL - CONSIDER TAIL ROTOR = NO
 63 IPROP - CONSIDER PROPELLER = NO

RE-ENTER (Y OR N)

N

DATA SET AH1G16.5 FOR FFC2 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

VM READ

2.3.7 FLA2 - Lifting Surface Aerodynamics.

2.3.7.1 FLA2 User Notes - FLA2 is used exclusively with CLS2. The aerodynamic forces and moments are resolved at the wing attachment point, but do not include modal forces (forces are applied to rigid body degrees of freedom only). However, the computed section angles of attack include the modal displacements. Application of this algorithm is limited to representing conditions that do not include flow separation and shock waves and do not violate the limits of linearity used in small perturbation analysis.

2.3.7.2 FLA2 Sample Input - Input is shown for a swept and tapered vertical stabilizer. A rudder has been defined and extends from the root to 80% of the span.

NEW
NEW MODEL (Y OR N)
N
COMPONENT, FORCE, OR N
FLA2
DATA SET
FIN
SAVE FILE(R,U1,...)
U1

FORCE FLA2 . LIFTING SURFACE AERO

BEGIN INPUT
DESCRIPTION (UP TO 71 CHARACTERS)
VERTICAL STABILIZER

NWNG (INTEGER)
NO. OF SEMI-SPANS
ENTER 1 INTEGER VALUE(S)
1

B2 (REAL)
LENGTH OF SEMI-SPAN
(IN)
ENTER 1 REAL VALUE
?
150

MORE...

S (REAL)
PLANFORM AREA
(IN**2)
ENTER 1 REAL VALUE
?
8000

TR (REAL)
TAPER RATIO
(TIP CHORD/ROOT CHORD)
ENTER 1 REAL VALUE
?

.2

QMACH (REAL)

MORE...

FREESTREAM MACH NO.
ENTER 1 REAL VALUE

?
.3

QLAM (REAL)
LEADING EDGE SWEEP
(DEGREES)

ENTER 1 REAL VALUE

?
30

ICS (Y OR N)
CONTROL SURFACE

ENTER 1 Y OR N VALUE

Y

YCS0 (REAL)
SPANWISE LOCATION
CONTROL SURFACE OUTBD EDGE (PERCENT SEMI-SPAN)

ENTER 1 REAL VALUE

?
80

MORE...

CLAB (REAL)
LIFT CURVE SLOPE
(PER RAD)

NULL VECTOR (Y OR N)

N

ENTER 8 REAL VALUE(S)

?
.1 .1 .1 .1 .1 .1 .1 .1

A08 (REAL)
0 LIFT ANGLE
(DEG)

NULL VECTOR (Y OR N)

Y

CMA8 (REAL)
MOMENT CURVE SLOPE
(PER RAD)

NULL VECTOR (Y OR N)

N

MORE...

ENTER 8 REAL VALUE(S)

? .001 .001 .001 .001 .001 .001 .001 .001

CM08 (REAL)

0 LIFT MOMENT COEFF

NULL VECTOR (Y OR N)

Y

CLD (REAL)

C S LIFT CURVE

SLOPE (PER RAD)

ENTER 1 REAL VALUE

?

.1

CMD (REAL)

C S MOMENT CURVE

SLOPE (PER RAD)

ENTER 1 REAL VALUE

?

.001

MORE...

PA (REAL)

AMBIENT PRESSURE

(PSI)

ENTER 1 REAL VALUE

?

14.7

INPUT FOR FORCE FLA2. LIFTING SURFACE AERO

1 NWNG	- NO. OF SEMI-SPANS	=	1	
2 B2	- LENGTH OF SEMI-SPAN	=	1.50000E+02	
3 S	- PLANFORM AREA	=	8.00000E+03	
4 TR	- TAPER RATIO	=	2.00000E-01	
5 QMACH	- FREESTREAM MACH NO.	=	3.00000E-01	
6 QLAM	- LEADING EDGE SWEEP	=	3.00000E+01	
7 ICS	- CONTROL SURFACE	=	YES	
8 YCS0	- SPANWISE LOCATION	=	8.00000E+01	
9 CLAB	- (REAL) LIFT CURVE SLOPE			
	1.00000E-01	1.00000E-01	1.00000E-01	1.00000E-01
	1.00000E-01	1.00000E-01	1.00000E-01	1.00000E-01
10 A08	- (REAL) 0 LIFT ANGLE			

MORE...

	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
11 CMA8	- (REAL) MOMENT CURVE SLOPE			
	1.00000E-03	1.00000E-03	1.00000E-03	1.00000E-03
	1.00000E-03	1.00000E-03	1.00000E-03	1.00000E-03
12 CM08	- (REAL) 0 LIFT MOMENT COEFF			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
13 CLD	- C S LIFT CURVE	=	1.00000E-01	
14 CMD	- C S MOMENT CURVE	=	1.00000E-03	
15 PA	- AMBIENT PRESSURE	=	1.47000E+01	

RE-ENTER (Y OR N)

N

DATA SET FIN FOR FLA2 SAVED ON U1
COMPONENT, FORCE, OR N

N

COMMAND

2.4 SOLUTIONS

Solution data is input during a RUN sequence. In the examples which follow, the RUN command has been used to demonstrate solution features. The user should refer directly to paragraph 3.3 of the DYSCO 4.1 User's Manual while reviewing the sample dialogues.

2.4.1 SEA3 - Eigenanalysis. A solution for the spring-mass-damper system shown in Figure 11 is performed. Note that damping is ignored. The model details and the constant coupled system matrices are also printed out.

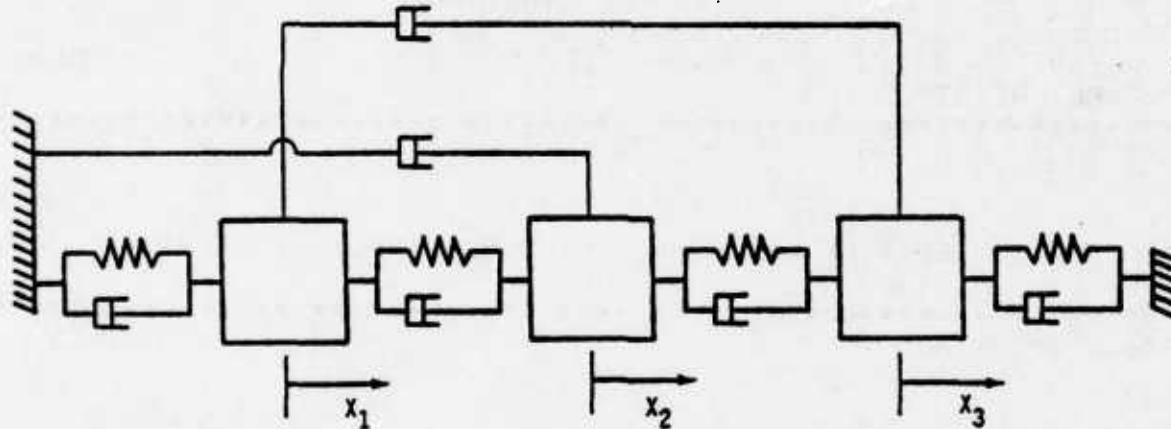


Figure 11. Spring-Mass-Damper System.

RUN

MODEL NAME (DATA SET)

AD

LIST MODEL SUMMARY (Y OR N)

Y

***** MODEL AD *****

SMD SYSTEM WITH ADDITIONAL DAMPERS

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CSF1		SMD	NONE	
2	CSF1		C5	NONE	
3	CSF1		C6	NONE	

GLOBAL VARIABLES

MORE...

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

DETAILS (Y OR N)

Y

COMPONENT DOF/SYSTEM DOF

1, 6 2, 7 3, 8 4, 9 5, 10

1 CSF1 X 0 Y 0 Z 0
 (1) (2) (3)

2 CSF1 X 0 Z 0
 (1) (3)

MORE...

3 CSF1 Y 0
(2)

SYSTEM DOF

1 X 0
2 Y 0
3 Z 0

PRINT MATRICES (Y OR N)

Y

MASS (Y OR N)

Y

GENERAL MATRIX

ROW	1		
	1.00000E+00	0.00000E+00	0.00000E+00
ROW	2		
	0.00000E+00	2.00000E+00	0.00000E+00
ROW	3		
	0.00000E+00	0.00000E+00	3.00000E+00

MORE...

DAMPING (Y OR N)

Y

GENERAL MATRIX

ROW	1		
	8.00000E+00	-2.00000E+00	-5.00000E+00
ROW	2		
	-2.00000E+00	1.10000E+01	-3.00000E+00
ROW	3		
	-5.00000E+00	-3.00000E+00	1.20000E+01

STIFFNESS (Y OR N)

Y

GENERAL MATRIX

ROW	1		
	3.00000E+01	-2.00000E+01	0.00000E+00
ROW	2		
	-2.00000E+01	5.00000E+01	-3.00000E+01
ROW	3		
	0.00000E+00	-3.00000E+01	7.00000E+01

FORCE (Y OR N)

Y

MORE...

0.00000E+00 0.00000E+00 0.00000E+00

SOLUTION OR N
SEA3
SAVE CASE FOR LATER EXECUTION (Y OR N)
N

SOLUTION SEA3. EIGEN ANALYSIS

BEGIN INPUT

NMODES (INTEGER)
NO. OF MODES
ENTER 1 INTEGER VALUE(S)

3

ITMAX (INTEGER)
MAX NO. OF ITERATNS
ENTER 1 INTEGER VALUE(S)

1000

TOL (REAL)
RATIO TOLERANCE
EIGENVALUE
ENTER 1 REAL VALUE
?

.0001

TOLM (REAL)
RATIO TOLERANCE
EIGENVECTOR
ENTER 1 REAL VALUE
?

.0001

MORE...

SOLUTION INPUT FOR SEA3.EIGEN ANALYSIS

1 NMODES	- NO. OF MODES	=	3
2 ITMAX	- MAX NO. OF ITERATNS	=	1000
3 TOL	- RATIO TOLERANCE	=	1.00000E-04
4 TOLM	- RATIO TOLERANCE	=	1.00000E-04

MORE...

RE-ENTER (Y OR N)

N

***** SOLUTION SEA3 FOR MODEL AD
MODEL - SMD SYSTEM WITH ADDITIONAL DAMPERS
SOLUTION - EIGEN ANALYSIS

MODE	1	2	3
FREQ HZ	4.2294E-01	8.1391E-01	1.0690E+00
RAD/S	2.6574E+00	5.1139E+00	6.7169E+00
GEN MASS	3.8935E+00	2.4674E+00	2.5019E+00
NO ITERS	25	43	13

SYS DOF

X	0	0.8719	1.0000	1.0000
Y	0	1.0000	0.1925	-0.7555
Z	0	0.6146	-0.6814	0.3466

MORE...

COMMAND

2.4.2 SEA4 - Eigenanalysis. A solution for the spring-mass-damper system shown in Figure 11 is performed. Note that damping is ignored.

RUN
MODEL NAME (DATA SET)
AD
LIST MODEL SUMMARY (Y OR N)
Y

***** MODEL AD *****

SMD SYSTEM WITH ADDITIONAL DAMPERS

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CSF1		SMD	NONE	
2	CSF1		C5	NONE	
3	CSF1		C6	NONE	

GLOBAL VARIABLES

MORE...

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

DETAILS (Y OR N)

N

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

SEA4

SAVE CASE FOR LATER EXECUTION (Y OR N)

N

SOLUTION SEA4. EIGEN ANALYSIS

BEGIN INPUT

MORE...

NMODES (INTEGER)
NUMBER OF MODES
ENTER 1 INTEGER VALUE(S)

3

SOLUTION INPUT FOR SEA4.EIGEN ANALYSIS

1 NMODES - NUMBER OF MODES = 3

RE-ENTER (Y OR N)

N

SOLUTION SEA4 FOR MODEL AD
MODEL - SMD SYSTEM WITH ADDITIONAL DAMPERS
SOLUTION - EIGEN ANALYSIS

MODE 1 2 3 MORE...
FREQ HZ 4.2295E-01 8.1395E-01 1.0690E+00
RAD/S 2.6575E+00 5.1142E+00 6.7169E+00

GEN MASS 3.8934E+00 2.4671E+00 2.5037E+00

SYS DOF

X	0	0.8719	1.0000	1.0000
Y	0	1.0000	0.1923	-0.7558
Z	0	0.6146	-0.6815	0.3470

THE PERFORMANCE INDEX IS 0.004278

*** THE EIGEN-ANALYSIS HAS BEEN PERFORMED WELL (SATISFACTORILY, POORLY)
IF P IS LESS THAN 1 (BETWEEN 1 AND 100, GREATER THAN 100).

COMMAND

2.4.3 SEA5 - Eigenanalysis. Two solutions are performed for the spring-mass-damper system shown in Figure 11. Damping has been ignored in the first example and included in the second example. The eigenvectors for different combinations of system and component degrees of freedom have been selected for output in the two examples. Note that the degrees of freedom for which output has been selected must be unique. A component degree of freedom included in more than one data set may only be selected once. Once selected, it is eliminated from the list of remaining degrees of freedom as shown in the second example.

RUN
MODEL NAME (DATA SET)
AD
LIST MODEL SUMMARY (Y OR N)
Y

***** MODEL AD *****

SMD SYSTEM WITH ADDITIONAL DAMPERS

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CSF1		SMD		NONE
2	CSF1		C5		NONE
3	CSF1		C6		NONE

GLOBAL VARIABLES

NO INPUT REQUIRED

MORE...

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)
N

DETAILS (Y OR N)

N

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

SEA5

SAVE CASE FOR LATER EXECUTION (Y OR N)

N

SOLUTION SEA5. GENERAL EIGEN ANALYSIS

BEGIN INPUT

MORE...

```
-----  
NMODES (INTEGER)  
NUMBER OF MODES  
ENTER 1 INTEGER VALUE(S)  
6  
-----  
IDAMP (Y OR N)  
CONSIDER DAMPING  
MATRIX - YES OR NO?  
ENTER 1 Y OR N VALUE  
N  
-----  
DOFPRINT (MODEL DOFS CHOSEN )  
DOFS TO BE PRINTED  
SYSTEM DOFS  
1 X 0 2 Y 0 3 Z 0  
ALL SYSTEM DOFS (Y OR N)  
N  
SELECT DOFS BY INDEXES  
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0  
1 3 0  
MORE...  
ANY COMPONENT DOFS (Y OR N)  
Y  
SET OF COMPONENTS  
1 SMD /CSF1  
2 C5 /CSF1  
3 C6 /CSF1  
SELECT COMPONENTS BY INDICES  
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0  
3 0  
DOFS FOR COMPONENT C6 /CSF1  
1 Y 0  
SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)  
Y  
SELECT DOFS BY INDEXES  
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0  
1 0  
*****  
SOLUTION INPUT FOR SEAS.GENERAL EIGEN ANALYSIS  
1 NMODES - NUMBER OF MODES = 6  
MORE...
```

2 IDAMP - CONSIDER DAMPING = NO
 3 DOFPRINT - (MODEL DOFS SELECTED) DOFS TO BE PRINTED
 SYSTEM DOFS SELECTED
 X 0 Z 0
 COMPONENT C6 /CSF1 DOFS
 Y 0

RE-ENTER (Y OR N)
N

***** SOLUTION SEA5 FOR MODEL AD *****
 MODEL - SMD SYSTEM WITH ADDITIONAL DAMPERS
 SOLUTION - GENERAL EIGEN ANALYSIS

OUTPUT MODES

MODE	1	FREQUENCY (HZ)	DAMPING	MORE...
		1.0690E+00	2.3756E-06	

COMPLEX EIGENVECTOR (NORMALIZED TO LARGEST COMPONENT)			
DOF -	VELOCITY	REAL	IMAGINARY
X	0	1.0000	0.0000
Z	0	0.3470	0.0000
Y	0	-0.7558	0.0000
DOF - DISPLACEMENT			
X	0	0.0000	-0.1489
Z	0	0.0000	-0.0517
Y	0	0.0000	0.1125

MODE	2	FREQUENCY (HZ)	DAMPING
		-1.0690E+00	2.3748E-06

COMPLEX EIGENVECTOR (NORMALIZED TO LARGEST COMPONENT)			
DOF -	VELOCITY	REAL	IMAGINARY
X	0	1.0000	0.0000

MORE...

Z	0	0.3470	0.0000
Y	0	-0.7558	0.0000
DOF - DISPLACEMENT			
X	0	0.0000	0.1489
Z	0	0.0000	0.0517
Y	0	0.0000	-0.1125

MODE 3 FREQUENCY (HZ) DAMPING
 4.2295E-01 -8.3898E-07

COMPLEX EIGENVECTOR (NORMALIZED TO LARGEST COMPONENT)			
DOF - VELOCITY		REAL	IMAGINARY
X	0	0.8719	0.0000
Z	0	0.6146	0.0000
Y	0	1.0000	0.0000
DOF - DISPLACEMENT			
X	0	0.0000	-0.3281
Z	0	0.0000	-0.2313
Y	0	0.0000	-0.3763

MORE...

MODE 4 FREQUENCY (HZ) DAMPING
 -4.2295E-01 -8.5378E-07

COMPLEX EIGENVECTOR (NORMALIZED TO LARGEST COMPONENT)			
DOF - VELOCITY		REAL	IMAGINARY
X	0	0.8719	0.0000
Z	0	0.6146	0.0000
Y	0	1.0000	0.0000
DOF - DISPLACEMENT			
X	0	0.0000	0.3281
Z	0	0.0000	0.2313
Y	0	0.0000	0.3763

MODE 5 FREQUENCY (HZ) DAMPING
 8.1395E-01 3.8611E-06

MORE...

COMPLEX EIGENVECTOR
(NORMALIZED TO LARGEST COMPONENT)

DOF - VELOCITY	REAL	IMAGINARY
X 0	1.0000	0.0000
Z 0	-0.6815	0.0000
Y 0	0.1923	0.0000

DOF - DISPLACEMENT	REAL	IMAGINARY
X 0	0.0000	-0.1955
Z 0	0.0000	0.1333
Y 0	0.0000	-0.0376

MODE 6	FREQUENCY (HZ)	DAMPING
	-8.1394E-01	3.8636E-06

COMPLEX EIGENVECTOR
(NORMALIZED TO LARGEST COMPONENT)

DOF - VELOCITY	REAL	IMAGINARY
X 0	1.0000	0.0000
Z 0	-0.6815	0.0000
Y 0	0.1923	0.0000

DOF - DISPLACEMENT	REAL	IMAGINARY
X 0	0.0000	0.1955
Z 0	0.0000	-0.1333
Y 0	0.0000	0.0376

MORE...

MODE	FREQUENCY (HZ)	DAMPING
1	1.0690E+00	2.3756E-06
2	-1.0690E+00	2.3748E-06
3	4.2295E-01	-8.3898E-07
4	-4.2295E-01	-8.5378E-07
5	8.1395E-01	3.8611E-06
6	-8.1394E-01	3.8636E-06

COMMAND

RERUN
RERUNNING MODEL AD

DETAILS (Y OR N)
N
PRINT MATRICES (Y OR N)
N

SOLUTION OR N
SEAS
SAVE CASE FOR LATER EXECUTION (Y OR N)
N

SOLUTION SEAS. GENERAL EIGEN ANALYSIS

BEGIN INPUT

NMODES (INTEGER)
NUMBER OF MODES
ENTER 1 INTEGER VALUE(S)
6

MORE...

IDAMP (Y OR N)
CONSIDER DAMPING
MATRIX - YES OR NO?
ENTER 1 Y OR N VALUE
Y

DOFPRINT (MODEL DOFS CHOSEN)
DOFS TO BE PRINTED
SYSTEM DOFS
1 X 0 2 Y 0 3 Z 0

ALL SYSTEM DOFS (Y OR N)
N
SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
0
ANY COMPONENT DOFS (Y OR N)
Y

SET OF COMPONENTS
1 SMD /CSF1

MORE...

2 C5 /CSF1
3 C6 /CSF1
SELECT COMPONENTS BY INDICES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
1 2 3 0
DOFS FOR COMPONENT SMD /CSF1
1 X 0 2 Y 0 3 Z 0

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)

Y

SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
2 0
DOFS FOR COMPONENT C5 /CSF1
1 X 0 2 Z 0

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)

Y

SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
1 2 0

MORE...
COMPONENT C6 CSF1 HAS NO UNIQUE DOFS BEYOND THOSE PREVIOUSLY SELECTED

SOLUTION INPUT FOR SEA5.GENERAL EIGEN ANALYSIS

1 NMODES - NUMBER OF MODES = 6
2 IDAMP - CONSIDER DAMPING = YES
3 DOFPRINT - (MODEL DOFS SELECTED) DOFS TO BE PRINTED
COMPONENT SMD /CSF1 DOFS
Y 0
COMPONENT C5 /CSF1 DOFS
X 0 Z 0

RE-ENTER (Y OR N)
N

***** SOLUTION SEA5 FOR MODEL AD *****
MODEL - SMD SYSTEM WITH ADDITIONAL DAMPERS
SOLUTION - GENERAL EIGEN ANALYSIS

MORE...

OUTPUT MODES

MODE 1	FREQUENCY (HZ)	DAMPING
	8.8058E-01	-2.9045E+00

COMPLEX EIGENVECTOR		
(NORMALIZED TO LARGEST COMPONENT)		
DOF - VELOCITY	REAL	IMAGINARY
Y 0	1.0000	0.0000
X 0	-0.5863	0.0669
Z 0	-0.4555	0.4547
DOF - DISPLACEMENT		
Y 0	-0.0744	-0.1417
X 0	0.0531	0.0781
Z 0	0.0983	0.0307

MODE 2	FREQUENCY (HZ)	DAMPING
	-8.8058E-01	-2.9045E+00

MORE...

COMPLEX EIGENVECTOR		
(NORMALIZED TO LARGEST COMPONENT)		
DOF - VELOCITY	REAL	IMAGINARY
Y 0	1.0000	0.0000
X 0	-0.5863	-0.0669
Z 0	-0.4555	-0.4547
DOF - DISPLACEMENT		
Y 0	-0.0744	0.1417
X 0	0.0531	-0.0781
Z 0	0.0983	-0.0307

MODE 3	FREQUENCY (HZ)	DAMPING
	4.0332E-01	-1.2299E+00

COMPLEX EIGENVECTOR		
(NORMALIZED TO LARGEST COMPONENT)		
DOF - VELOCITY	REAL	IMAGINARY
Y 0	1.0000	0.0000
X 0	0.7461	0.0407

MORE...

Z	0	0.5938	0.2432
DOF - DISPLACEMENT			
Y	0	-0.1550	-0.3194
X	0	-0.1026	-0.2446
Z	0	-0.0144	-0.2273

MODE	4	FREQUENCY (HZ)	DAMPING
		-4.0332E-01	-1.2299E+00

COMPLEX EIGENVECTOR
(NORMALIZED TO LARGEST COMPONENT)

DOF - VELOCITY	REAL	IMAGINARY	
Y	0	1.0000	0.0000
X	0	0.7461	-0.0407
Z	0	0.5938	-0.2432
DOF - DISPLACEMENT			
Y	0	-0.1550	0.3194
X	0	-0.1026	0.2446
Z	0	-0.0144	0.2273

MORE...

MODE	5	FREQUENCY (HZ)	DAMPING
		3.7635E-01	-4.6155E+00

COMPLEX EIGENVECTOR
(NORMALIZED TO LARGEST COMPONENT)

DOF - VELOCITY	REAL	IMAGINARY	
Y	0	0.0835	0.1213
X	0	1.0000	0.0000
Z	0	-0.3715	0.0095
DOF - DISPLACEMENT			
Y	0	-0.0037	-0.0282
X	0	-0.1716	-0.0879
Z	0	0.0646	0.0310

MODE	6	FREQUENCY (HZ)	DAMPING
		-3.7635E-01	-4.6155E+00

COMPLEX EIGENVECTOR

MORE...

(NORMALIZED TO LARGEST COMPONENT)

DOF - VELOCITY	REAL	IMAGINARY
Y 0	0.0835	-0.1213
X 0	1.0000	0.0000
Z 0	-0.3715	-0.0095

DOF - DISPLACEMENT		
Y 0	-0.0037	0.0282
X 0	-0.1716	0.0879
Z 0	0.0646	-0.0310

MODE	FREQUENCY (HZ)	DAMPING
1	8.8058E-01	-2.9045E+00
2	-8.8058E-01	-2.9045E+00
3	4.0332E-01	-1.2299E+00
4	-4.0332E-01	-1.2299E+00
5	3.7635E-01	-4.6155E+00
6	-3.7635E-01	-4.6155E+00

COMMAND

2.4.4 SSF3 - Stability Floquet. A solution is performed for the spring-mass-damper system shown in Figure 11. Since the system is linear and nonperiodic (constant coefficients), an initial integration increment approximately an order of magnitude smaller than the period of the highest undamped frequency of the system has been selected. An error check should always be used unless the characteristics of the system are well known. In general, constant values can be selected for the error allowed and the increment for computing the Floquet transition matrix. Smaller values may be required for systems with more degrees of freedom, repeated roots (this algorithm can accommodate up to four repeated roots), higher frequencies, and wider frequency ranges.

RUN
MODEL NAME (DATA SET)
AD
LIST MODEL SUMMARY (Y OR N)
Y

***** MODEL AD *****

SMD SYSTEM WITH ADDITIONAL DAMPERS

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CSF1		SMD	NONE	
2	CSF1		C5	NONE	
3	CSF1		C6	NONE	

GLOBAL VARIABLES

MORE...

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

DETAILS (Y OR N)

N

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

SSF3

SAVE CASE FOR LATER EXECUTION (Y OR N)

N

SOLUTION SSF3. STABILITY FLOQUET

BEGIN INPUT

MORE...

H (REAL)
INITIAL INCREMENT
(SEC)

ENTER 1 REAL VALUE

?

.1

TPER (REAL)
INTEGRATION PERIOD

ENTER 1 REAL VALUE

?

.2

HTD (REAL)
SEPARATE INCREMENT
TIME DEP COEFS

ENTER 1 REAL VALUE

?

0

HF (REAL)

SEPARATE INCREMENT
FORCE COMPUTATION

ENTER 1 REAL VALUE

?

0

MORE...

E (REAL)
ERROR CHECK VALUE
IF 0 THEN CONSTANT INCREMENT USED

ENTER 1 REAL VALUE

?

.0001

NALLOW (INTEGER)
NO. OF ITERATIONS
ALLOWED

ENTER 1 INTEGER VALUE(S)

10

CEA (Y OR N)
CONSTANT ERROR
ALLOWED, ENTER YES. IF NOT ENTER NO

MORE...

ENTER 1 Y OR N VALUE

Y

CEALLO (REAL)

CONSTANT ERROR
ALLOWED

ENTER 1 REAL VALUE

?

.0001

CI (Y OR N)

CONSTANT INCREMENT

FOR COMPUTING TRANSITION MATRIX, ENTER YES ELSE ENTER NO
ENTER 1 Y OR N VALUE

Y

CICRE (REAL)

CONSTANT INCREMENT
TO BE USED

ENTER 1 REAL VALUE

?

.5

MORE...

ICON (INTEGER)

ROTOR CONTROLS

INPUT TYPE 0 = NULL, 1 = GENERAL, 2 = CONTINUE
ENTER 1 INTEGER VALUE(S)

0

IPRINT (Y OR N)

PRINT EIGENVECTORS
YES OR NO

ENTER 1 Y OR N VALUE

Y

SOLUTION INPUT FOR SSF3.STABILITY FLOQUET

1 H	- INITIAL INCREMENT	=	1.00000E-01
2 TPER	- INTEGRATION PERIOD	=	2.00000E-01
3 HTD	- SEPARATE INCREMENT	=	0.00000E+00
4 HF	- SEPARATE INCREMENT	=	0.00000E+00
5 E	- ERROR CHECK VALUE	=	1.00000E-04
6 NALLOW	- NO. OF ITERATIONS	=	10
7 CEA	- CONSTANT ERROR	=	YES

MORE...

8 CEALLO = CONSTANT ERROR = 1.00000E-04
 9 CI = CONSTANT INCREMENT = YES
 10 CICRE = CONSTANT INCREMENT = 5.00000E-01
 11 ICON = ROTOR CONTROLS = 0
 12 IPRINT = PRINT EIGENVECTORS = YES

RE-ENTER (Y OR N)

N

***** SOLUTION SSF3 FOR MODEL AD *****
 MODEL - SMD SYSTEM WITH ADDITIONAL DAMPERS
 SOLUTION - STABILITY FLOQUET

	FREQUENCY	DAMPING
	5.53287	-2.90481

SYSTEM DOF EIGENVECTOR

X	ODOT	-0.5863	0.0669
Y	ODOT	1.0000	0.0000
Z	ODOT	-0.4555	0.4547
X	0	0.0531	0.0781
Y	0	-0.0744	-0.1417
Z	0	0.0983	0.0307

MORE...

	FREQUENCY	DAMPING
	-5.53286	-2.90480

SYSTEM DOF EIGENVECTOR

X	ODOT	-0.5863	-0.0669
Y	ODOT	1.0000	0.0000
Z	ODOT	-0.4555	-0.4547
X	0	0.0531	-0.0781
Y	0	-0.0744	0.1417
Z	0	0.0983	-0.0307

MORE...

FREQUENCY DAMPING
2.53419 -1.22994

SYSTEM DOF EIGENVECTOR

X	ODOT	0.7461	0.0407
Y	ODOT	1.0000	0.0000
Z	ODOT	0.5938	0.2432
X	0	-0.1026	-0.2446
Y	0	-0.1550	-0.3194
Z	0	-0.0144	-0.2273

FREQUENCY DAMPING
-2.53419 -1.22994

SYSTEM DOF EIGENVECTOR

X	ODOT	0.7461	-0.0407
Y	ODOT	1.0000	0.0000
Z	ODOT	0.5938	-0.2432
X	0	-0.1026	0.2446
Y	0	-0.1550	0.3194
Z	0	-0.0144	0.2273

MORE...

FREQUENCY DAMPING
2.36465 -4.61560

SYSTEM DOF EIGENVECTOR

X	ODOT	1.0000	0.0000
Y	ODOT	0.0835	0.1214
Z	ODOT	-0.3716	0.0095
X	0	-0.1716	-0.0879
Y	0	-0.0037	-0.0282
Z	0	0.0646	0.0310

FREQUENCY DAMPING
-2.36465 -4.61560

SYSTEM DOF EIGENVECTOR

X	ODOT	1.0000	0.0000
---	------	--------	--------

MORE...

Y	DDOT	0.0835	-0.1214
Z	DDOT	-0.3716	-0.0095
X	0	-0.1716	0.0879
Y	0	-0.0037	0.0282
Z	0	0.0646	-0.0310

	FREQUENCY	DAMPING
	5.53287	-2.90481
	-5.53286	-2.90480
	2.53419	-1.22994
	-2.53419	-1.22994
	2.36465	-4.61560
	-2.36465	-4.61560

COMMAND

2.4.5 STH3 - Time History. A solution is performed for the helicopter simulation presented in Section 6 of the User's Manual (AH1G-35A/MODEL). A time history of the trimmed system is obtained. The aerodynamics data sets have been edited to include the wind velocity vector for the trim condition, which has been derived from the given fuselage velocity and the calculated fuselage pitch angle from the last iteration of the trim solution. Also, a CSF1 component has been added to account for the forces due to gravity at the hub (blade weight) and the fuselage CG. The gravity vectors are determined by the fuselage pitch angle.

The integration increment has been set equal to a fraction of the rotation period of the rotor determined by using the error check in a preliminary run. An error check should always be used unless the characteristics of the system are well known. The initial conditions for the elastic degrees of freedom and for the rotor control settings of the trimmed system have been input, and the initial conditions for the system (fuselage) rigid body degrees of freedom have been set to zero. Rotor force output has also been elected.

The rotor data set (B2Z1T2/CRE3) has been edited to allow the time history blade moments to be calculated. Storage of the time history system state vectors for every fifth time increment has been elected (see paragraph 2.4.7).

Note that the final solution increment converges because of the difference between the specified end time and the computed increment.

LIST
DATA SET
FCT1.65
DATA MEMBER

FRA3

FCT1.65 /FRA3 FOUND ON FOLLOWING MULTIPLES FILES

R FCT1.65 /FRA3

ENTER CORRECT FILE

R

FCT1.65 /FRA3 ON FILE R

***** FCT1.65 /FRA3 *****

GENERAL AERO, INDUCED VEL 1.65

REQUIRES DS/DM AFD161 /AIRFOIL

NO SEQUENTIAL FILES REQUIRED

INPUT FOR FORCE FRA3. ROTOR AERO GENERAL

MORE...

1 IEQS	- AERODYNAMICS BY EQS =	NO
2 INFTAB	- INDUCED VEL BY TABLE=	NO
3 IUNSTD	- UNSTEADY AERO =	NO
4 VAIRH	- (REAL) WIND VELOCITY	
	1.13987E+02 0.00000E+00	-1.73500E+00
5 ASTALL	- STALL ANGLE (DEG) =	2.00000E+01
6 RFCT	- INDUCED VEL FACTOR =	1.65000E+00
7 TIPLOC	- TIP LOSS COEFFICIENT=	9.50000E-01
8 XH	- HUB EXTENT (IN) =	3.96000E+00
9 ALT	- VEHICLE HEIGHT (FT) =	2.00000E+02
10 K27	- TIP VORTEX COEFF =	0.00000E+00
11 CD0	- BLADE DRAG COEFFAT =	6.80000E-03
12 Q1C	- Q1C COEFFICIENT =	1.00000E+00
13 Q2C	- Q2C COEFFICIENT =	5.00000E-01
14 ALAMDA	- NONDIM INDUCED VEL =	-1.20000E-02
15 NXA	- NO. OF STATIONS =	12
16 XAERO	- (REAL) NONDIM AERO STATIONS	
	1.77000E-01 2.25000E-01 4.00000E-01	6.00000E-01
	7.00000E-01 7.50000E-01 8.00000E-01	8.50000E-01
	9.00000E-01 9.35000E-01 9.70000E-01	1.00000E+00
17 NUMAF	- NO. AIRFOIL TABLES =	1
18 AFTAB1	- NAME AF TABLE 1 = AFD161 /AIRFOIL	

MORE...

19 NUMAF1	- NO. OF STATIONS AF 1=	12			
20 STA-AF1	- STATIONS FOR AF 1				
	1	2	3	4	5
	6	7	8	9	10
	11	12			
21 XACC	- (REAL) A/C OFFSET FROM E.C.				
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	
22 CHORDC	- (REAL) CHORD (IN)				
	2.85000E+01	2.85000E+01	2.85000E+01	2.85000E+01	
	2.85000E+01	2.85000E+01	2.85000E+01	2.85000E+01	
	2.85000E+01	2.85000E+01	2.85000E+01	2.85000E+01	
23 NX	- NO. AERO FACTOR STAS=	2			
24 XF	- NONDIM FACTOR STAS =	0.00000E+00	1.00000E+00		
25 FL	- FACTORS FOR CL	=	1.00000E+00	1.00000E+00	
26 FD	- FACTORS FOR CD	=	1.00000E+00	1.00000E+00	
27 FM	- FACTORS FOR CM	=	1.00000E+00	1.00000E+00	

LIST COMPLETE
COMMAND

LIST
DATA SET
B2Z1T2
DATA MEMBER
CRE3
B2Z1T2 /CRE3 ON FILE U1

***** B2Z1T2 /CRE3 *****

ELASTIC ROTOR WITH 2 OP, 1 IP, 2 TOR MODES

***** INPUT FOR ROTOR COMPONENT CRE3. ROTOR ELASTIC BLADES *****

1 JV	- INPLANE DOF	=	YES
2 JW	- OUTPLANE DOF	=	YES
3 JP	- TORSION DOF	=	YES
4 JS	- SHAFT PERTURBED DOF	=	NO
5 JX	- XHUB(LONG) DOF	=	YES
6 JY	- YHUB(LAT) DOF	=	NO
7 JZ	- ZHUB(AXIAL) DOF	=	YES

MORE...

66 EC1STA	- (REAL) CROSS SEC INTEGRAL				
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	

67 JIL	- INTERNAL LOADS	=	YES		
68 NXIL	- NO. OF STATIONS	=	10		
69 INDIL	- STATION INDICES				

1	2	3	4	5
6	7	8	9	10

70 JIPIL	- INPLANE MOMENTS	=	YES		
71 JOPIL	- OUTPLANE MOMENTS	=	YES		
72 JTORIL	- TWIST MOMENTS	=	YES		

LIST COMPLETE

MORE...

COMMAND

LIST
DATA SET
GRAV
DATA MEMBER
CSF1
GRAV /CSF1 ON FILE U1

***** GRAV /CSF1 *****

GRAVITY VECTORS

***** INPUT FOR COMPONENT CSF1. FINITE ELEMENT *****

1 NCDF - NUMBER OF DOF = 4
2 CDFLI - (DOF) DOF NAMES XCG 1000 ZCG 1000 XHUB1000 ZHUB1000
3 CM - (REAL) MASS MATRIX
NULL MATRIX
4 CC - (REAL) DAMPING MATRIX
NULL MATRIX MORE...
5 CK - (REAL) STIFFNESS MATRIX
NULL MATRIX
6 CF - (REAL) FORCE VECTOR
-1.10980E+02 -7.29056E+03 -1.53500E+01 -1.00838E+03

LIST COMPLETE
COMMAND

RUN

MODEL NAME (DATA SET)

AH1G-35A

LIST MODEL SUMMARY (Y OR N)

Y

***** MODEL AH1G-35A *****

AH1G TRIM

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CRE3	1	B2Z1T2	FRA3	FCT1.65
				REQUIRED DS/DM=	AFD161 /AIRFOIL
2	CCE0	1	3000	NONE	
3	CLC1		COUPLE	NONE	
4	CFM2	1	8300-4	FFC2	AH1G16.5
5	CSF1		GRAV	NONE	

MORE...

GLOBAL VARIABLES

1 VSOUND	- SOUND VELOCITY	= 1.13800E+03
2 RHO	- AIR DENSITY RATIO	= 8.79000E-01

FCT1.65 /FRA3 FOUND ON FOLLOWING MULTIPLES FILES

R U1

ENTER CORRECT FILE

R

AH1G16.5/FFC2 FOUND ON FOLLOWING MULTIPLES FILES

R U1

ENTER CORRECT FILE

R

TEMPORARY RUN EDIT OF GLOBAL VARIABLES FOR MODEL (Y OR N)

N

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

MURE...

DETAILS (Y OR N)

Y

COMPONENT DOF/SYSTEM DOF

1. 6 2. 7 3. 8 4. 9 5. 10

1	CRE3	IP 1110 IP 1210 XHUB1000 (-1) (-4) (-7)	OP 1110 OP 1210 ZHUB1000 (-2) (-5) (-9)	OP 1120 OP 1220 ALFX1000 (-3) (-6) (-11)	TOR 1110 TOR 1210 ALFY1000 (1) (3) (-12)	TOR 1120 TOR 1220 (2) (4)
2	CCE0	RODR1100 (-13)	RODR1200 (-17)			
3	CLC1	TEET 0 (5)	OPOP1120 (6)	OPOP1220 (7)	IPIP1110 (8)	IPIP1210 (9)
					MORE...	
4	CFM2	XCG 1000 (10)	ZCG 1000 (11)	ROLL1000 (12)	PTCH1000 (13)	
5	CSF1	XCG 1000 (10)	ZCG 1000 (11)	XHUB1000 (-7)	ZHUB1000 (-9)	

SYSTEM DOF

- 1 TOR 1110
- 2 TOR 1120
- 3 TOR 1210
- 4 TOR 1220
- 5 TEET 0
- 6 OPOP1120
- 7 OPOP1220
- 8 IPIP1110
- 9 IPIP1210
- 10 XCG 1000
- 11 ZCG 1000
- 12 ROLL1000

MORE...

- 13 PTCH1000

IMPLICIT COEFFICIENTS

I	COEF	DOF	I	CUEF	DOF
1	2.640E+02	*IPIP1110	11	1.000E+00	*ROLL1000
2	2.640E+02	*TEET 0	12	1.000E+00	*PTCH1000
3	2.640E+02	*OPOP1120	13	-9.250E+00	TOR 1110
4	2.640E+02	*IPIP1210	14	-4.940E-01	TOR 1120
5	-2.640E+02	*TEET 0	15	1.410E+01	TEET 0
6	2.640E+02	*OPOP1220	16	1.245E+00	*OPOP1120
7	1.000E+00	XCG 1000	17	-9.250E+00	TOR 1210
8	9.649E+01	*PTCH1000	18	-4.940E-01	TOR 1220
9	1.000E+00	ZCG 1000	19	-1.410E+01	TEET 0
10	6.800E-01	*PTCH1000	20	1.245E+00	*OPOP1220

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

STH3

SAVE CASE FOR LATER EXECUTION (Y OR N)

N

MORE...

SOLUTION STH3. TIME HISTORY

BEGIN INPUT

TSTA (REAL)
START TIME
(SEC)

ENTER 1 REAL VALUE

?

0

H (REAL)
INITIAL INCREMENT
(SEC)

ENTER 1 REAL VALUE

?

.0037037

HTD (REAL)
SEPARATE INCREMENT
TIME DEP COEFS
ENTER 1 REAL VALUE

MORE...

?
0

HF (REAL)
SEPARATE INCREMENT
FORCE COMPUTATION
ENTER 1 REAL VALUE
?
0

TEND (REAL)
END TIME
(SEC)
ENTER 1 REAL VALUE
?
.185185

E (REAL)
ERROR CHECK VALUE
IF 0 THEN CONSTANT INCREMENT USED
ENTER 1 REAL VALUE
?
MORE...
0

ICOPT (INTEGER)
INITIAL CONDITION
INPUT TYPE
0=NONE, 1=SINGLE DISPLACEMENT, 2=GENERAL, 3=CONTINUE
ENTER 1 INTEGER VALUE(S).
2

YV (REAL)
INITIAL VELOCITY
EACH SYSTEM DOF
NULL VECTOR (Y OR N)
N
ENTER 13 REAL VALUE(S)
?
-1.774053 -.015659 1.686185 -.007411 .281252 -.229984 .291828
?
.033634 -.089879 0 0 0 0

YD (REAL)
INITIAL DISPLACEMENT
MORE...

EACH SYSTEM DOF
NULL VECTOR (Y OR N)
N
ENTER 13 REAL VALUE(S)
?
.009831 .005187 -.069426 -.003506 .018313 .028074 .023984
?
-.00445 -.003366 0 0 0 0

ICON (INTEGER)
ROTOR CONTROLS
INPUT TYPE 0 = NULL, 1 = GENERAL, 2 = CONTINUE
ENTER 1 INTEGER VALUE(S)

↑

MROT (INTEGER)
NUMBER OF ROTORS
ENTER 1 INTEGER VALUE(S)

1

IR1 (INTEGER)
ROTOR NUMBER
ENTER 1 INTEGER VALUE(S)

MORE...

1

A01 (REAL)
COLLECTIVE ANGLE
(RAD)
ENTER 1 REAL VALUE

?

-.01565

A1C1 (REAL)
COSINE ANGLE (RAD)
ENTER 1 REAL VALUE

?

.00793

A1S1 (REAL)
SINE ANGLE (RAD)
ENTER 1 REAL VALUE

?

-.06254

MORE...

NH1 (INTEGER)
HIGHER HARMONIC
COLLECTIVE HARMONIC, 0=NONE

ENTER 1 INTEGER VALUE(S)

0

ITOUT (INTEGER)
ROTOR FORCE OUTPUT

NO. OF ROTORS

ENTER 1 INTEGER VALUE(S)

1

ITROT (INTEGER)
ROTOR NUMBERS

ENTER 1 INTEGER VALUE(S)

1

CRT (Y OR N)
OUTPUT THIS TERMINAL

(Y OR N)

ENTER 1 Y OR N VALUE

Y

MORE...

ILOF (Y OR N)
SAVE STATE VECTORS
FOR INTERFACE, INTERNAL LOADS CALCULATIONS

ENTER 1 Y OR N VALUE

Y

JIIL (INTEGER)
INPUT I, EVERY ITH
STATE VECTOR TO BE WRITTEN TO LOADS FILE

ENTER 1 INTEGER VALUE(S)

5

SOLUTION INPUT FOR STH3.TIME HISTORY

1 TSTA	- START TIME	=	0.00000E+00
2 H	- INITIAL INCREMENT	=	3.70370E-03
3 HTD	- SEPARATE INCREMENT	=	0.00000E+00
4 HF	- SEPARATE INCREMENT	=	0.00000E+00
5 TEND	- END TIME	=	1.85185E-01
6 E	- ERROR CHECK VALUE	=	0.00000E+00
7 ICOPT	- INITIAL CONDITION	=	2

MORE...

8 YV - (REAL) INITIAL VELOCITY
 -1.77405E+00 -1.56590E-02 1.68618E+00 -7.41100E-03
 2.81252E-01 -2.29984E-01 2.91828E-01 3.36340E-02
 -8.98790E-02 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00
 9 YD - (REAL) INITIAL DISPLACEMENT
 9.83100E-03 5.18700E-03 -6.94260E-02 -3.50600E-03
 1.83130E-02 2.80740E-02 2.39840E-02 -4.45000E-03
 -3.36600E-03 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00
 10 ICON - ROTOR CONTROLS = 1
 11 MROT - NUMBER OF ROTORS = 1
 12 IR1 - ROTOR NUMBER = 1
 13 A01 - COLLECTIVE ANGLE = -1.56500E-02
 14 A1C1 - COSINE ANGLE (RAD) = 7.93000E-03
 15 A1S1 - SINE ANGLE (RAD) = -6.25400E-02
 16 NH1 - HIGHER HARMONIC = 0
 17 ITOUT - ROTOR FORCE OUTPUT = 1
 18 ITROT - ROTOR NUMBERS = 1
 19 CRT - OUTPUT THIS TERMINAL= YES
 20 ILOP - SAVE STATE VECTORS = YES
 21 JIIL - INPUT I, EVERY ITH = 5

MORE...

RE-ENTER (Y OR N)

N

SOLUTION STH3 FOR MODEL AH1G-35A*****
MODEL - AH1G TRIM
SOLUTION - TIME HISTORY

TIME HISTORY DISPLACEMENTS

TIME	TOR 1110	TOR 1120	TOR 1210	TOR 1220
	TEET 0	OPOP1120	OPOP1220	1P1P1110
	IPIP1210	XCG 1000	ZCG 1000	ROLL1000
	PTCH1000			
	TORQ1	XFOR1	YFOR1	ZFOR1
0.0000E+00	9.8310E-03 1.8313E-02 -3.3660E-03 0.0000E+00	5.1870E-03 2.8074E-02 0.0000E+00	-6.9426E-02 2.3984E-02 0.0000E+00	-3.5060E-03 -4.4500E-03 0.0000E+00

MORE...

	-1.0157E+05	-3.0206E+02	-3.8798E+02	1.0465E+04
3.7037E-03	2.1781E-03	6.2219E-03	-6.3030E-02	-3.1631E-03
	1.9252E-02	2.7389E-02	2.5137E-02	-4.3766E-03
	-3.7334E-03	2.1965E-04	2.5948E-03	2.3055E-07
	8.8936E-07			
	-1.0133E+05	-2.4708E+02	-4.0820E+02	1.0406E+04
7.4074E-03	-6.9082E-03	8.1780E-03	-5.6254E-02	-2.3459E-03
	1.9979E-02	2.7024E-02	2.6424E-02	-4.4009E-03
	-4.1610E-03	8.7306E-04	1.0388E-02	1.6817E-06
	3.3582E-06			
	-1.0014E+05	-1.9057E+02	-4.1143E+02	1.0291E+04
1.1111E-02	-1.6073E-02	8.7027E-03	-4.8933E-02	-1.5848E-03
	2.0483E-02	2.6947E-02	2.7834E-02	-4.5127E-03
	-4.6336E-03	1.9365E-03	2.3413E-02	5.7165E-06
	6.6925E-06			
	-9.7450E+04	-1.3538E+02	-3.9584E+02	1.0076E+04
1.4815E-02	-2.4364E-02	6.2679E-03	-4.0983E-02	-1.2796E-03
	2.0770E-02	2.7084E-02	2.9363E-02	-4.6970E-03
	-5.1341E-03	3.3725E-03	4.1767E-02	1.4155E-05
	9.7924E-06			
	-9.3206E+04	-8.5652E+01	-3.6012E+02	9.7333E+03
1.8518E-02	-3.1878E-02	1.4043E-03	-3.2557E-02	-1.3770E-03
			MORE...	
	2.0864E-02	2.7318E-02	3.1023E-02	-4.9354E-03
	-5.6452E-03	5.1401E-03	6.5637E-02	2.9431E-05
	1.1481E-05			
	-8.7615E+04	-4.6988E+01	-3.0600E+02	9.2804E+03
2.2222E-02	-3.9521E-02	-3.7050E-03	-2.4076E-02	-1.3602E-03
	2.0793E-02	2.7515E-02	3.2822E-02	-5.2053E-03
	-6.1505E-03	7.2059E-03	9.5279E-02	5.4694E-05
	1.0847E-05			
	-8.2316E+04	-2.1571E+01	-2.4389E+02	8.7949E+03
2.5926E-02	-4.8070E-02	-6.9787E-03	-1.6083E-02	-6.0461E-04
	2.0552E-02	2.7574E-02	3.4726E-02	-5.4812E-03
	-6.6365E-03	9.5475E-03	1.3096E-01	9.3810E-05
	7.5209E-06			
	-7.8191E+04	-1.0959E+01	-1.8201E+02	8.3571E+03
2.9630E-02	-5.7353E-02	-7.9977E-03	-8.9876E-03	1.0987E-03
	2.0092E-02	2.7459E-02	3.6645E-02	-5.7356E-03
	-7.0926E-03	1.2152E-02	1.7288E-01	1.5118E-04
	1.8555E-06			
	-7.5870E+04	-1.2927E+01	-1.2748E+02	8.0133E+03

TIME HISTORY DISPLACEMENTS

MORE...

TIME	TOR 1110	TOR 1120	TOR 1210	TOR 1220
	TEET 0	OPOP1120	OPOP1220	IPIP1110
	IPIP1210	XCG 1000	ZCG 1000	ROLL1000
	PTCH1000			
	TORQ1	XFOR1	YFOR1	ZFOR1
3.3333E-02	-6.6242E-02 1.9325E-02 -7.5115E-03 -5.0119E-06 -7.4989E+04	-8.0972E-03 2.7203E-02 1.5012E-02 -2.5083E+01	-2.8728E-03 3.8440E-02 2.2119E-01 -8.3006E+01	3.2315E-03 -5.9411E-03 2.3132E-04 7.7616E+03
3.7037E-02	-7.3444E-02 1.8164E-02 -7.8870E-03 -1.1270E-05 -7.4925E+04	-8.9815E-03 2.6873E-02 1.8111E-02 -4.4449E+01	2.4820E-03 3.9964E-02 2.7597E-01 -5.0055E+01	4.7371E-03 -6.0730E-03 3.3830E-04 7.5837E+03
4.0741E-02	-7.8440E-02 1.6554E-02 -8.2131E-03 -1.4763E-05 -7.4941E+04	-1.1038E-02 2.6523E-02 2.1416E-02 -1.2852E-02	7.3520E-03 4.1101E-02 3.3730E-01 -3.0430E+01	4.6583E-03 -6.1129E-03 4.7509E-04 7.4831E+03
4.4444E-02	-8.1780E-02 1.4492E-02 -8.4820E-03 -1.3508E-05	2.6184E-02 2.4857E-02	1.1766E-02 4.1789E-02 4.0525E-01	2.8011E-03 -6.0504E-03 6.4302E-04
4.8148E-02	-7.4541E+04 -8.4488E-02 1.2017E-02 -8.6835E-03 -6.2793E-06	-9.1765E+01 -1.2376E-02 2.5879E-02 2.8319E-02 -1.1361E+02	-2.5679E+01 1.5409E-02 4.2005E-02 4.7989E-01 -3.5250E+01	7.4986E+03 -9.1054E-05 -5.8847E-03 8.4113E-04 7.6753E+03
5.1852E-02	-7.3474E+04 -8.7148E-02 9.1965E-03 -8.8053E-03 6.9184E-06	-8.6939E-03 2.5643E-02 3.1644E-02 -1.3063E+02	1.7849E-02 4.1756E-02 5.6118E-01 -5.4936E+01	-2.8410E-03 -5.6240E-03 1.0658E-03 8.0128E+03
5.5555E-02	-7.2123E+04 -8.9440E-02 6.1197E-03 -8.8338E-03 2.4632E-05	-2.8888E-03 2.5524E-02 3.4654E-02 -1.4049E+02	1.8934E-02 4.1072E-02 6.4897E-01 -7.7364E+01	-4.6692E-03 -5.2856E-03 1.3109E-03 8.4444E+03
5.9259E-02	-7.1437E+04 -9.0503E-02 2.9073E-03 -8.7564E-03 4.4164E-05	2.7001E-03 2.5554E-02 3.7187E-02 -1.4049E+02	1.9033E-02 4.0025E-02 7.4303E-01 -7.7364E+01	-5.6856E-03 -4.8950E-03 1.5686E-03 8.4444E+03

MORE...

6.2963E-02	-7.1450E+04 -8.9758E-02 -2.8377E-04 -8.5641E-03 6.2248E-05 -7.2250E+04	-1.4662E+02 6.1486E-03 2.5714E-02 3.9139E-02 -1.5260E+02	-9.6486E+01 1.8860E-02 3.8740E-02 8.4309E-01 -1.1015E+02	8.8681E+03 -6.6008E-03 -4.4842E-03 1.8312E-03 9.1969E+03
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TIME HISTORY DISPLACEMENTS

TIME	TOR 1110 TEET 0 IPIP1210 PTCH1000 TORQ1	TOR 1120 OPOP1120 XCG 1000 XFOR1	TOR 1210 OPOP1220 ZCG 1000 YFOR1	TOR 1220 IPIP1110 ROLL1000 ZFOR1
6.6666E-02	-8.7467E-02 -3.2763E-03 -8.2553E-03 7.5988E-05 -7.3605E+04	7.1232E-03 2.5931E-02 4.0490E-02 -1.6259E+02	1.8989E-02 3.7378E-02 9.4895E-01 -1.2088E+02	-7.8690E-03 -4.0882E-03 2.0928E-03 9.4023E+03
7.0370E-02	-8.4563E-02 -5.9116E-03 -7.8387E-03	6.7110E-03 2.6116E-02 4.1314E-02	1.9410E-02 3.6099E-02 1.0605E+00	-9.0019E-03 -3.7406E-03 2.3498E-03
				MORE...
7.4074E-02	8.3739E-05 -7.5756E+04 -8.1954E-02 -8.0904E-03 -7.3340E-03 8.5581E-05 -7.9033E+04	-1.7821E+02 6.2463E-03 2.6205E-02 4.1769E-02 -2.0006E+02	-1.3284E+02 1.9526E-02 3.5016E-02 1.1776E+00 -1.5099E+02	9.5194E+03 -8.7091E-03 -3.4700E-03 2.6012E-03 9.6111E+03
7.7777E-02	-7.9843E-02 -9.7925E-03 -6.7723E-03 8.3234E-05 -8.3888E+04	6.0750E-03 2.6194E-02 4.2072E-02 -2.2621E+02	1.8604E-02 3.4176E-02 1.3003E+00 -1.7886E+02	-5.8553E-03 -3.2967E-03 2.8475E-03 9.7207E+03
8.1481E-02	-7.7616E-02 -1.1067E-02 -6.1929E-03 7.9474E-05 -8.9967E+04	5.2850E-03 2.6133E-02 4.2463E-02 -2.5292E+02	1.6337E-02 3.3569E-02 1.4284E+00 -2.2010E+02	-4.9583E-04 -3.2320E-03 3.0898E-03 9.8506E+03
8.5184E-02	-7.4399E-02 -1.2002E-02 -5.6397E-03 7.7299E-05 -9.6973E+04	2.7155E-03 2.6095E-02 4.3160E-02 -2.7231E+02	1.3024E-02 3.3153E-02 1.5619E+00 -2.7301E+02	5.8936E-03 -3.2786E-03 3.3294E-03 9.9791E+03
				MORE...

8.8888E-02	-6.9775E-02	-1.7697E-03	9.2329E-03	1.1242E-02
	-1.2704E-02	2.6163E-02	3.2877E-02	-3.4321E-03
	-5.1562E-03	4.4327E-02	1.7006E+00	3.5672E-03
	7.9140E-05			
	-1.0341E+05	-2.7650E+02	-3.3226E+02	1.0069E+04
9.2592E-02	-6.4056E-02	-6.8363E-03	5.2065E-03	1.4157E-02
	-1.3279E-02	2.6416E-02	3.2675E-02	-3.6822E-03
	-4.7818E-03	4.6047E-02	1.8447E+00	3.8036E-03
	8.6329E-05			
	-1.0808E+05	-2.5963E+02	-3.8685E+02	1.0104E+04
9.6295E-02	-5.7927E-02	-1.0455E-02	5.2895E-04	1.4680E-02
	-1.3837E-02	2.6944E-02	3.2463E-02	-4.0141E-03
	-4.5461E-03	4.8317E-02	1.9942E+00	4.0389E-03
	9.8962E-05			
	-1.1004E+05	-2.2178E+02	-4.2576E+02	1.0087E+04

TIME HISTORY DISPLACEMENTS

TIME	TOR 1110	TOR 1120	TOR 1210	TOR 1220
	TEET 0	OPOF1120	OPOP1220	IPIP1110
	IPIP1210	XCG 1000	ZCG 1000	ROLL1000
	PTCH1000			
				MORE...
	TORQ1	XFOR1	YFOR1	ZFOR1
9.9999E-02	-5.1834E-02	-1.1237E-02	-5.6046E-03	1.3891E-02
	-1.4477E-02	2.7837E-02	3.2138E-02	-4.4101E-03
	-4.4657E-03	5.1067E-02	2.1491E+00	4.2733E-03
	1.1615E-04			
	-1.0903E+05	-1.6792E+02	-4.3974E+02	1.0010E+04
1.0370E-01	-4.5620E-02	-9.2830E-03	-1.3699E-02	1.2694E-02
	-1.5257E-02	2.9156E-02	3.1613E-02	-4.8518E-03
	-4.5406E-03	5.4190E-02	2.3096E+00	4.5068E-03
	1.3658E-04			
	-1.0511E+05	-1.0696E+02	-4.2305E+02	9.8505E+03
1.0741E-01	-3.8730E-02	-5.9143E-03	-2.3433E-02	1.0882E-02
	-1.6168E-02	3.0890E-02	3.0847E-02	-5.3225E-03
	-4.7531E-03	5.7576E-02	2.4756E+00	4.7399E-03
	1.5919E-04			
	-9.9090E+04	-4.8752E+01	-3.7527E+02	9.5641E+03
1.1111E-01	-3.0773E-02	-2.6098E-03	-3.3739E-02	7.2863E-03
	-1.7120E-02	3.2944E-02	2.9860E-02	-5.8095E-03
	-5.0686E-03	6.1148E-02	2.6471E+00	4.9729E-03
	1.8384E-04			
	-9.1316E+04	-3.7058E+00	-2.9770E+02	9.1044E+03
1.1481E-01	-2.1966E-02	-3.6893E-05	-4.3508E-02	1.0582E-03
				MORE...

	-1.7962E-02	3.5141E-02	2.8718E-02	-6.3041E-03
	-5.4389E-03	6.4888E-02	2.8244E+00	5.2061E-03
	2.1179E-04			
	-8.3218E+04	2.2059E+01	-2.0204E+02	8.4845E+03
1.1852E-01	-1.3110E-02	2.0918E-03	-5.2298E-02	-7.1223E-03
	-1.8516E-02	3.7275E-02	2.7495E-02	-6.8007E-03
	-5.8083E-03	6.8840E-02	3.0074E+00	5.4387E-03
	2.4573E-04			
	-7.6538E+04	2.7053E+01	-1.0422E+02	7.7797E+03
1.2222E-01	-5.1352E-03	4.3391E-03	-6.0463E-02	-1.5004E-02
	-1.8624E-02	3.9140E-02	2.6249E-02	-7.2942E-03
	-6.1206E-03	7.3091E-02	3.1964E+00	5.6692E-03
	2.8916E-04			
	-7.3751E+04	1.6568E+01	-2.1931E+01	7.1220E+03
1.2592E-01	1.4090E-03	6.7113E-03	-6.8584E-02	-2.0031E-02
	-1.8159E-02	4.0563E-02	2.5023E-02	-7.7762E-03
	-6.3270E-03	7.7738E-02	3.3915E+00	5.8954E-03
	3.4534E-04			
	-7.4223E+04	-5.4078E+00	3.5238E+01	6.6431E+03
1.2963E-01	6.5470E-03	8.3872E-03	-7.6709E-02	-2.0942E-02
	-1.7034E-02	4.1407E-02	2.3868E-02	-8.2324E-03
	-6.3907E-03	8.2829E-02	3.5927E+00	6.1156E-03
	4.1619E-04			MORE...
	-7.6263E+04	-3.4994E+01	6.4102E+01	6.4217E+03

TIME HISTORY DISPLACEMENTS

TIME	TOR 1110	TOR 1120	TOR 1210	TOR 1220
	TEET 0	OPOPOP1120	OPOPOP1220	IPIPIP1110
	IPIPIP1210	XCG 1000	ZCG 1000	ROLL1000
	PTCH1000			
	TORQ1	XFOR1	YFOR1	ZFOR1
1.3333E-01	1.0666E-02	8.2126E-03	-8.4061E-02	-1.8447E-02
	-1.5205E-02	4.1575E-02	2.2851E-02	-8.6409E-03
	-6.2902E-03	8.8320E-02	3.7999E+00	6.3284E-03
	5.0149E-04			
	-7.7671E+04	-6.8180E+01	6.7217E+01	6.4542E+03
1.3703E-01	1.4124E-02	5.5384E-03	-8.9477E-02	-1.4503E-02
	-1.2687E-02	4.1033E-02	2.2037E-02	-8.9718E-03
	-6.0210E-03	9.4058E-02	4.0131E+00	6.5326E-03
	5.9860E-04			
	-7.7217E+04	-9.9238E+01	5.0766E+01	6.6790E+03
1.4074E-01	1.7003E-02	7.5636E-04	-9.2267E-02	-1.0743E-02
	-9.5796E-03	3.9833E-02	2.1449E-02	-9.1892E-03
	MORE...			

	-5.5957E-03	9.9787E-02	4.2320E+00	6.7259E-03
	7.0275E-04			
1.4444E-01	-7.5148E+04	-1.2288E+02	2.3102E+01	7.0221E+03
	1.9142E-02	-4.8295E-03	-9.2783E-02	-7.3442E-03
	-6.0732E-03	3.8124E-02	2.1049E-02	-9.2557E-03
	-5.0437E-03	1.0520E-01	4.4565E+00	6.9046E-03
	8.0754E-04			
1.4815E-01	-7.2457E+04	-1.3630E+02	-7.0551E+00	7.4308E+03
	2.0393E-02	-9.6660E-03	-9.2172E-02	-3.3367E-03
	-2.4199E-03	3.6125E-02	2.0746E-02	-9.1385E-03
	-4.4071E-03	1.1002E-01	4.6866E+00	7.0639E-03
	9.0592E-04			
1.5185E-01	-7.0891E+04	-1.4089E+02	-3.2306E+01	7.8740E+03
	2.0847E-02	-1.2672E-02	-9.1537E-02	2.0166E-03
	1.1190E-03	3.4073E-02	2.0441E-02	-8.8168E-03
	-3.7358E-03	1.1403E-01	4.9222E+00	7.1996E-03
	9.9141E-04			
1.5555E-01	-7.1063E+04	-1.4308E+02	-4.8854E+01	8.3147E+03
	2.0864E-02	-1.3563E-02	-9.1169E-02	8.0203E-03
	4.3298E-03	3.2167E-02	2.0069E-02	-8.2874E-03
	-3.0804E-03	1.1717E-01	5.1630E+00	7.3097E-03
	1.0595E-03			
	MORE...			
1.5926E-01	-7.3125E+04	-1.5024E+02	-5.7705E+01	8.6933E+03
	2.0888E-02	-1.2675E-02	-9.0467E-02	1.2571E-02
	7.0794E-03	3.0540E-02	1.9617E-02	-7.5690E-03
	-2.4870E-03	1.1953E-01	5.4089E+00	7.3951E-03
	1.1088E-03			
1.6296E-01	-7.6830E+04	-1.6777E+02	-6.4209E+01	8.9454E+03
	2.1183E-02	-1.0500E-02	-8.8599E-02	1.3518E-02
	9.3170E-03	2.9255E-02	1.9111E-02	-6.7024E-03
	-1.9935E-03	1.2134E-01	5.6597E+00	7.4593E-03
	1.1410E-03			
	-8.1517E+04	-1.9765E+02	-7.7016E+01	9.0415E+03

TIME HISTORY DISPLACEMENTS

TIME	TOR 1110	TOR 1120	TOR 1210	TOR 1220
	TEET 0	OPUP1120	OPUP1220	IPIP1110
	IPIP1210	XCG 1000	ZCG 1000	ROLL1000
	PTCH1000			
	TORQ1	XFOR1	YFOR1	ZFOR1
1.6666E-01	2.1659E-02	-7.3998E-03	-9.5595E-02	1.0345E-02
	1.1099E-02	2.6335E-02	1.8588E-02	-5.7469E-03
	-1.6202E-03	1.2290E-01	5.9153E+00	7.5071E-03
				MORE...

	1.1610E-03			
1.7037E-01	-8.7043E+04	-2.3611E+02	-1.0356E+02	9.0176E+03
	2.1846E-02	-3.0545E-03	-8.1416E-02	4.6456E-03
	1.2375E-02	2.7721E-02	1.8100E-02	-4.7748E-03
	-1.4092E-03	1.2457E-01	6.1754E+00	7.5435E-03
	1.1746E-03			
	-9.3760E+04	-2.7514E+02	-1.4656E+02	8.9547E+03
1.7407E-01	2.1177E-02	2.2252E-03	-7.7770E-02	-1.0180E-03
	1.3382E-02	2.7375E-02	1.7720E-02	-3.8636E-03
	-1.3447E-03	1.2664E-01	6.4402E+00	7.5724E-03
	1.1881E-03			
	-1.0150E+05	-3.0723E+02	-2.0670E+02	8.9344E+03
1.7777E-01	1.9182E-02	8.1072E-03	-7.4922E-02	-4.7914E-03
	1.4236E-02	2.7179E-02	1.7562E-02	-3.0887E-03
	-1.4339E-03	1.2933E-01	6.7096E+00	7.5965E-03
	1.2061E-03			
	-1.0968E+05	-3.2435E+02	-2.7923E+02	8.9941E+03
1.8148E-01	1.5725E-02	1.3537E-02	-7.2422E-02	-6.5508E-03
	1.5109E-02	2.7002E-02	1.7768E-02	-2.5154E-03
	-1.6679E-03	1.3273E-01	6.9836E+00	7.6170E-03
	1.2308E-03			
	-1.1676E+05	-3.1991E+02	-3.5447E+02	9.0909E+03
			MORE...	
1.8518E-01	1.0977E-02	1.7107E-02	-6.9191E-02	-7.4928E-03
	1.6148E-02	2.6723E-02	1.8466E-02	-2.1913E-03
	-2.0313E-03	1.3680E-01	7.2621E+00	7.6345E-03
	1.2623E-03			
	-1.2100E+05	-2.9097E+02	-4.1721E+02	9.1430E+03
1.8519E-01	1.0972E-02	1.7109E-02	-6.9187E-02	-7.4937E-03
	1.6149E-02	2.6723E-02	1.8467E-02	-2.1911E-03
	-2.0317E-03	1.3680E-01	7.2623E+00	7.6345E-03
	1.2624E-03			
	-1.2110E+05	-2.9114E+02	-4.1782E+02	9.1465E+03

*** TIME HISTORY SOLUTION COMPLETE ***

STATE VECTOR AT T= 1.85185E-01

DOF	VELOCITY	DISPLACEMENT
-----	----------	--------------

TOR 1110	-1.43374E+00	1.09716E-02
TOR 1120	5.98976E-01	1.71088E-02

MORE...

TOR 1210	1.06336E+00	-6.91870E-02
TOR 1220	-2.58674E-01	-7.49373E-03
TEET 0	3.12230E-01	1.61493E-02
OPOP1120	-9.76570E-02	2.67225E-02
OPOP1220	2.63362E-01	1.84668E-02
IPIP1110	5.09470E-02	-2.19110E-03
IPIP1210	-1.14001E-01	-2.03168E-03
XCG 1000	1.18108E+00	1.36803E-01
ZCG 1000	7.58040E+01	7.26233E+00
ROLL1000	4.32850E-03	7.63450E-03
PTCH1000	9.24421E-03	1.26238E-03

COMMAND

2.4.6 STH4 - Time History. Inputs for two solutions are presented. In the first example, a solution is performed for a ground resonance model similar to the model formulated in Section 5 of the User's Manual. The initial integration increment has been set equal to a fraction of the rotation period of the rotor, and the error check has been invoked. A displacement of 0.1 radian for the blade 1 lag degree of freedom has been input for the initial condition.

The displacement and velocity for a combination of system and component degrees of freedom are output, and the time history system state vectors for every other time increment are saved.

The component displacements and velocities can be verified against the system displacements and velocities using the implicit coefficients table in the model details. In the details, the positive integers in parentheses under the degree of freedom names indicate system degrees of freedom, the negative integers index the implicit coefficients, and zero indicates that a degree of freedom has been eliminated. In this example Y2000 is replaced by

$$(1.0 \times \text{YCG1000}) + (75.76 \times \text{ROLL1000})$$

Substituting the output displacements/velocities for YCG1000 and ROLL1000 yields the output displacement/velocity for Y2000. Outputs for Z1000, Y1000, and Z2000 correlate in a similar manner.

In the second example, a solution is performed for the spring-mass-damper system shown in Figure 11. A displacement of 1 inch for degree of freedom X has been input for the initial condition. Note that outputs for the print and plot options are selected independently. Also, the time history system state vectors for every fifth time increment are saved (see paragraph 2.4.7).

Note that the final solution increment converges because of the difference between the specified end time and the computed increment.

RUN
MODEL NAME (DATA SET)
LAT
LIST MODEL SUMMARY (Y OR N)
Y

***** MODEL LAT *****

LATERAL GROUND RESONANCE MODEL

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CRR2	1	ROTLAT	NONE	
2	CFM2	1	FUSLAT	NONE	
3	CSF1		LMAIN	NONE	
4	CSF1		RMAIN	NONE	
5	CSF1		TAIL	NONE	
6	CLC1		CGEAR	NONE	

***** MORE... *****

GLOBAL VARIABLES

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)
N

DETAILS (Y OR N)
Y

COMPONENT DOF / SYSTEM DOF

1, 6 2, 7 3, 8 4, 9 5, 10

1 CRR2	ZETA1100	ZETA1200	ZETA1300	ZETA1400	YHUB1000
	ALFX1000				

MORE...

		(-1)	(-3)	(-2)	(-4)	(-6)	(-5)	(-3)	(-4)	(-1)
2	CFM2	YCG 1000		ROLL1000						
		(-5)		(-6)						
3	CSF1	X 2000		Y 2000		Z 2000				
		(-0)		(-4)		(-6)				
4	CSF1	X 1000		Y 1000		Z 1000				
		(-0)		(-7)		(-9)				
5	CSF1	X 3000		Y 3000		Z 3000				
		(-0)		(-10)		(-0)				
6	CLC1	YCG 1000		ROLL1000						
		(-5)		(-6)						

SYSTEM DOF

1 ZETA1100
 2 ZETA1200
 3 ZETA1300
 4 ZETA1400
 5 YCG 1000
 6 ROLL1000

MORE...

IMPLICIT COEFFICIENTS

I	COEF	DOF	I	COEF	DOF
1	9.976E-01	YCG 1000	7	1.000E+00	YCG 1000
2	-8.403E+01	*ROLL1000	8	7.576E+01	*ROLL1000
3	9.945E-01	*ROLL1000	9	6.600E+01	*ROLL1000
4	1.000E+00	YCG 1000	10	1.000E+00	YCG 1000
5	7.576E+01	*ROLL1000	11	7.576E+01	*ROLL1000
6	-6.600E+01	*ROLL1000			

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

STH4

MORE...

SAVE CASE FOR LATER EXECUTION (Y OR N)
N

SOLUTION STH4. TIME HISTORY

BEGIN INPUT

TSTA (REAL)
START TIME
(SEC)

ENTER 1 REAL VALUE

?

0

H (REAL)
INITIAL INCREMENT
(SEC)

ENTER 1 REAL VALUE

?

.0096962

HTD (REAL)
SEPARATE INCREMENT
TIME DEP COEFS

ENTER 1 REAL VALUE

?

0

HF (REAL)
SEPARATE INCREMENT
FORCE COMPUTATION

ENTER 1 REAL VALUE

?

0

TEND (REAL)
END TIME
(SEC)

ENTER 1 REAL VALUE

?

.193924

E (REAL)

MORE...

MORE...

ERROR CHECK VALUE
IF 0 THEN CONSTANT INCREMENT USED
ENTER 1 REAL VALUE

?

.0001

IDFLI (SYSTEM DOFS CHOSEN)

TEST DOF

NAME (A4,I4)

SYSTEM DOFS

1 ZETA1100

2 ZETA1200

3 ZETA1300

4 ZETA1400

5 YCG 1000

6 ROLL1000

SELECT ONE SYSTEM DOF BY INDEX

1

ICOPT (INTEGER)

INITIAL CONDITION

INPUT TYPE

0=NONE, 1=SINGLE DISPLACEMENT, 2=GENERAL, 3=CONTINUE

ENTER 1 INTEGER VALUE(S)

1

MORE...

VI (REAL)

INITIAL DISPLACEMENT

SINGLE SYSTEM DOF (IN OR RAD)

ENTER 1 REAL VALUE

?

.1

IIDFLI (SYSTEM DOFS CHOSEN)

DOF NAME

INITIAL CONDITION

SYSTEM DOFS

1 ZETA1100

2 ZETA1200

3 ZETA1300

4 ZETA1400

5 YCG 1000

6 ROLL1000

SELECT ONE SYSTEM DOF BY INDEX

1

CRT (Y OR N)

OUTPUT THIS TERMINAL

(Y OR N)

ENTER 1 Y OR N VALUE

MORE...

Y

PROP (INTEGER)
PRINT
1=DISPLACEMENT 2=VELOCITY 3=BOTH
ENTER 1 INTEGER VALUE(S)
3

DOFPRINT (MODEL DOFS CHOSEN)
DOFS TO BE PRINTED
SYSTEM DOFS
1 ZETA1100 2 ZETA1200 3 ZETA1300 4 ZETA1400
5 YCG 1000 6 ROLL1000

ALL SYSTEM DOFS (Y OR N)
N
SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
1 5 6 0
ANY COMPONENT DOFS (Y OR N)
Y

SET OF COMPONENTS MORE...
1 ROTLAT /CRR2
2 FUSLAT /CFM2
3 LMAIN /CSF1
4 RMAIN /CSF1
5 TAIL /CSF1
6 CGEAR /CLC1
SELECT COMPONENTS BY INDICES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
3 4 0
DOFS FOR COMPONENT LMAIN /CSF1
1 X 2000 2 Y 2000 3 Z 2000

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)
Y
SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
2 3 0
DOFS FOR COMPONENT RMAIN /CSF1
1 X 1000 2 Y 1000 3 Z 1000

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)
MORE...

```

Y
SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER      0
2 3 0
-----
PLOP    (INTEGER)
PLOT
 0=NONE 1=DISPLACEMENT 2=VELOCITY 3=BOTH
ENTER 1 INTEGER VALUE(S)
0
-----
FLOP    (Y OR N)
CONDITION CODES
TO BE OUTPUT (Y OR N)
ENTER 1 Y OR N VALUE
N
-----
ILOP    (Y OR N)
SAVE STATE VECTORS
FOR INTERFACE, INTERNAL LOADS CALCULATIONS
ENTER 1 Y OR N VALUE
Y
MORE...
-----
JIIL    (INTEGER)
INPUT I, EVERY ITH
STATE VECTOR TO BE WRITTEN TO LOADS FILE
ENTER 1 INTEGER VALUE(S)
2
*****
SOLUTION INPUT FOR STH4.TIME HISTORY

 1 TSTA   - START TIME      = 0.00000E+00
 2 H      - INITIAL INCREMENT = 9.69620E-03
 3 HTD   - SEPARATE INCREMENT = 0.00000E+00
 4 HF    - SEPARATE INCREMENT = 0.00000E+00
 5 TEND  - END TIME        = 1.93924E-01
 6 E     - ERROR CHECK VALUE = 1.00000E-04
 7 IDFLI - (SYSTEM DOF SELECTED)
           TEST DOF          = ZETA1100
 8 ICOPT  - INITIAL CONDITION = 1
 9 VI    - INITIAL DISPLACEMENT= 1.00000E-01
10 IIDFLI - (SYSTEM DOF SELECTED)
           DOF NAME          = ZETA1100
11 CRT   - OUTPUT THIS TERMINAL= YES
MORE...

```

12 PROP - PRINT = 3
 13 DOFPRINT - (MODEL DOFS SELECTED) DOFS TO BE PRINTED
 SYSTEM DOFS SELECTED
 ZETA1100 YCG 1000 ROLL1000
 COMPONENT LMAIN /CSF1 DOFS
 Y 2000 Z 2000
 COMPONENT RMAIN /CSF1 DOFS
 Y 1000 Z 1000
 14 PLOP - PLOT = 0
 15 FLOP - CONDITION CODES = NO
 16 ILOP - SAVE STATE VECTORS = YES
 17 JIIL - INPUT I, EVERY ITH = 2

RE-ENTER (Y OR N)

N

***** SOLUTION STH4 FOR MODEL LAT *****
 MODEL - LATERAL GROUND RESONANCE MODEL
 SOLUTION - TIME HISTORY

MORE...

TIME HISTORY DISPLACEMENTS AND VELOCITIES

TIME	ZETA1100	YCG 1000	ROLL1000	Y 2000
0.0000E+00	Z 2000	Y 1000	Z 1000	
0.0000E+00	1.0000E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
9.6962E-03	9.9431E-02	1.0035E-02	-2.1703E-04	-6.4080E-03
9.6962E-03	1.4324E-02	-6.4080E-03	-1.4324E-02	
9.6962E-03	-1.1591E-01	2.0464E+00	-4.3810E-02	-1.2727E+00
9.6962E-03	2.8915E+00	-1.2727E+00	-2.8915E+00	
1.9392E-02	9.7790E-02	3.8781E-02	-8.1975E-04	-2.3323E-02
1.9392E-02	5.4103E-02	-2.3323E-02	-5.4103E-02	
1.9392E-02	-2.2019E-01	3.8152E+00	-7.8469E-02	-2.1296E+00
1.9392E-02	5.1790E+00	-2.1296E+00	-5.1790E+00	
2.9089E-02	9.5212E-02	8.2355E-02	-1.6911E-03	-4.5763E-02
2.9089E-02	1.1161E-01	-4.5763E-02	-1.1161E-01	
2.9089E-02	-3.0910E-01	5.0723E+00	-9.8517E-02	-2.3914E+00
2.9089E-02	6.5021E+00	-2.3914E+00	-6.5021E+00	
3.8785E-02	9.1841E-02	1.3500E-01	-2.6734E-03	-6.7540E-02

MORE...

3.8785E-02	1.7645E-01	-6.7540E-02	-1.7645E-01	-1.9926E+00
	-3.8427E-01	5.6703E+00	-1.0115E-01	
	6.6758E+00	-1.9926E+00	-6.6758E+00	
4.8481E-02	8.7786E-02	1.9005E-01	-3.5966E-03	-8.2435E-02
	2.3738E-01	-8.2435E-02	-2.3738E-01	
4.8481E-02	-4.5136E-01	5.5708E+00	-8.6615E-02	-9.9121E-01
	5.7166E+00	-9.9121E-01	-5.7166E+00	
5.8177E-02	8.3093E-02	2.4099E-01	-4.3075E-03	-8.5342E-02
	2.8429E-01	-8.5342E-02	-2.8429E-01	
5.8177E-02	-5.1672E-01	4.8449E+00	-5.8083E-02	4.4452E-01
	3.8335E+00	4.4452E-01	-3.8335E+00	
6.7873E-02	7.7759E-02	2.8250E-01	-4.6950E-03	-7.3198E-02
	3.0987E-01	-7.3198E-02	-3.0987E-01	
6.7873E-02	-5.8388E-01	3.6566E+00	-2.0969E-02	2.0680E+00
	1.3840E+00	2.0680E+00	-1.3840E+00	
7.7569E-02	7.1767E-02	3.1113E-01	-4.7078E-03	-4.5535E-02
	3.1072E-01	-4.5535E-02	-3.1072E-01	
7.7569E-02	-6.5177E-01	2.2296E+00	1.8081E-02	3.5995E+00
	-1.1934E+00	3.5995E+00	1.1934E+00	
8.7265E-02	6.5133E-02	3.2575E-01	-4.3598E-03	-4.5525E-03
	2.8775E-01	-4.5525E-03	-2.8775E-01	
8.7265E-02	-7.1523E-01	8.0495E-01	5.2412E-02	4.7757E+00
				MORE...
9.6962E-02	-3.4592E+00	4.7757E+00	3.4592E+00	
	5.7932E-02	3.2745E-01	-3.7248E-03	4.5261E-02
	2.4584E-01	4.5261E-02	-2.4584E-01	
9.6962E-02	-7.6777E-01	-4.0198E-01	7.6517E-02	5.3949E+00
	-5.0501E+00	5.3949E+00	5.0501E+00	
1.0666E-01	5.0295E-02	3.1916E-01	-2.9205E-03	9.7902E-02
	1.9275E-01	9.7902E-02	-1.9275E-01	
1.0666E-01	-8.0471E-01	-1.2380E+00	8.6963E-02	5.3504E+00
	-5.7396E+00	5.3504E+00	5.7396E+00	
1.1635E-01	4.2380E-02	3.0487E-01	-2.0857E-03	1.4686E-01
	1.3765E-01	1.4686E-01	-1.3765E-01	
1.1635E-01	-8.2538E-01	-1.6357E+00	8.2905E-02	4.6453E+00
	-5.4717E+00	4.6453E+00	5.4717E+00	
1.2605E-01	3.4331E-02	2.8879E-01	-1.3543E-03	1.8618E-01
	8.9384E-02	1.8618E-01	-8.9384E-02	
1.2605E-01	-8.3309E-01	-1.6205E+00	6.6116E-02	3.3884E+00
	-4.3636E+00	3.3884E+00	4.3636E+00	
1.3575E-01	2.6250E-02	2.7444E-01	-8.3215E-04	2.1140E-01
	5.4922E-02	2.1140E-01	-5.4922E-02	
1.3575E-01	-8.3304E-01	-1.3000E+00	4.0547E-02	1.7718E+00
	-2.6761E+00	1.7718E+00	2.6761E+00	
1.4544E-01	1.8187E-02	2.6403E-01	-5.7926E-04	2.2015E-01
				MORE...

1.4544E-01	3.8231E-02	2.2015E-01	-3.8231E-02	
	-8.2954E-01	-8.3870E-01	1.1518E-02	3.3943E-02
	-7.6022E-01	3.3943E-02	7.6022E-01	
1.5514E-01	1.0170E-02	2.5803E-01	-6.0159E-04	2.1245E-01
	3.9705E-02	2.1245E-01	-3.9705E-02	
1.5514E-01	-8.2376E-01	-4.2264E-01	-1.5312E-02	-1.5827E+00
	1.0106E+00	-1.5827E+00	-1.0106E+00	
1.6483E-01	2.2269E-03	2.5513E-01	-8.5286E-04	1.9052E-01
	5.6289E-02	1.9052E-01	-5.6289E-02	
1.6483E-01	-8.1347E-01	-2.2164E-01	-3.4998E-02	-2.8731E+00
	2.3099E+00	-2.8731E+00	-2.3099E+00	
1.7453E-01	-5.5775E-03	2.5264E-01	-1.2460E-03	1.5824E-01
	8.2237E-02	1.5824E-01	-8.2237E-02	
1.7453E-01	-7.9456E-01	-3.5526E-01	-4.4187E-02	-3.7029E+00
	2.9164E+00	-3.7029E+00	-2.9164E+00	
1.8423E-01	-1.3142E-02	2.4700E-01	-1.6716E-03	1.2037E-01
	1.1032E-01	1.2037E-01	-1.1032E-01	
1.8423E-01	-7.6369E-01	-8.6925E-01	-4.1677E-02	-4.0267E+00
	2.7507E+00	-4.0267E+00	-2.7507E+00	
1.9392E-01	-2.0347E-02	2.3466E-01	-2.0196E-03	8.1657E-02
	1.3329E-01	8.1657E-02	-1.3329E-01	
1.9392E-01	-7.2041E-01	-1.7263E+00	-2.8555E-02	-3.8896E+00
	1.8846E+00	-3.8896E+00	-1.8846E+00	
1.9392E-01	-2.0347E-02	2.3466E-01	-2.0196E-03	8.1655E-02
	1.3329E-01	8.1655E-02	-1.3329E-01	
1.9392E-01	-7.2041E-01	-1.7263E+00	-2.8554E-02	-3.8896E+00
	1.8845E+00	-3.8896E+00	-1.8845E+00	
1.9392E-01	-2.0348E-02	2.3466E-01	-2.0196E-03	8.1652E-02
	1.3330E-01	8.1652E-02	-1.3330E-01	
1.9392E-01	-7.2040E-01	-1.7264E+00	-2.8552E-02	-3.8895E+00
	1.8845E+00	-3.8895E+00	-1.8845E+00	
			MORE...	

*** TIME HISTORY SOLUTION COMPLETE ***

SYSTEM STATE VECTOR AT T = 1.93924E-01

DOF	VELOCITY	DISPLACEMENT
-----	----------	--------------

ZETA1100	-7.20403E-01	-2.03477E-02
ZETA1200	-6.16191E-02	-6.29539E-03
ZETA1300	-4.28237E-03	1.12289E-02

MORE...

ZETA1400	6.16192E-02	6.29539E-03
YCG 1000	-1.72642E+00	2.34659E-01
ROLL1000	-2.85524E-02	-2.01963E-03

COMMAND

RUN

MODEL NAME (DATA SET)

AD

LIST MODEL SUMMARY (Y OR N)

Y

***** MODEL AD *****

SMD SYSTEM WITH ADDITIONAL DAMPERS

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CSF1		SMD	NONE	
2	CSF1		C5	NONE	
3	CSF1		C6	NONE	

***** GLOBAL VARIABLES, *****

MORE...

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

DETAILS (Y OR N)

N

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

STH4

SAVE CASE FOR LATER EXECUTION (Y OR N)

N

SOLUTION STH4. TIME HISTORY

BEGIN INPUT

MORE...

TSTA (REAL)

START TIME

(SEC)

ENTER 1 REAL VALUE

?

0

H (REAL)

INITIAL INCREMENT

(SEC)

ENTER 1 REAL VALUE

?

.1

HTD (REAL)

SEPARATE INCREMENT

TIME DEF COEFS

ENTER 1 REAL VALUE

?

0

HF (REAL)

SEPARATE INCREMENT

FORCE COMPUTATION

ENTER 1 REAL VALUE

?

0

TEND (REAL)

END TIME

(SEC)

ENTER 1 REAL VALUE

?

5

E (REAL)

ERROR CHECK VALUE

IF 0 THEN CONSTANT INCREMENT USED

ENTER 1 REAL VALUE

?

0

ICOPT (INTEGER)

MORE...

MORE...

INITIAL CONDITION
INPUT TYPE
0=NONE, 1=SINGLE DISPLACEMENT, 2=GENERAL, 3=CONTINUE
ENTER 1 INTEGER VALUE(S)

1

V1 (REAL)
INITIAL DISPLACEMENT
SINGLE SYSTEM DOF (IN OR RAD)
ENTER 1 REAL VALUE

?

1

IIDFLI (SYSTEM DOFS CHOSEN)
DOF NAME
INITIAL CONDITION
SYSTEM DOFS
1 X 0 2 Y 0 3 Z 0

SELECT ONE SYSTEM DOF BY INDEX

1

MORE...

CRT (Y OR N)
OUTPUT THIS TERMINAL
(Y OR N)
ENTER 1 Y OR N VALUE

Y

PROP (INTEGER)
PRINT
1=DISPLACEMENT 2=VELOCITY 3=BOTH
ENTER 1 INTEGER VALUE(S)

1

DOOPRINT (MODEL DOFS CHOSEN)
DOFS TO BE PRINTED
SYSTEM DOFS
1 X 0 2 Y 0 3 Z 0

ALL SYSTEM DOFS (Y OR N)

Y

ANY COMPONENT DOFS (Y OR N)

N

MORE...

```
PLOP (INTEGER)
PLOT
0=NONE 1=DISPLACEMENT 2=VELOCITY 3=BOTH
ENTER 1 INTEGER VALUE(S)
3
-----
JPLT (INTEGER)
INPUT N, EVERY NTH
SOLUTION TO BE WRITTEN TO PLOT FILE
ENTER 1 INTEGER VALUE(S)
1
-----
DOFPLOT (MODEL DOFS CHOSEN )
DOFS TO BE PLOTTED
SYSTEM DOFS
1 X 0 2 Y 0 3 Z 0
ALL SYSTEM DOFS (Y OR N)
N
SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
1 0 MORE...
ANY COMPONENT DOFS (Y OR N)
Y
SET OF COMPONENTS
1 SMD /CSF1
2 C5 /CSF1
3 C6 /CSF1
SELECT COMPONENTS BY INDICES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
1 0
DOFS FOR COMPONENT SMD /CSF1
1 Y 0 2 Z 0
SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)
Y
SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
1 2 0
-----
FLOP (Y OR N)
CONDITION CODES
TO BE OUTPUT (Y OR N)
MORE...
```

ENTER 1 Y OR N VALUE

N

ILOP (Y OR N)

SAVE STATE VECTORS

FOR INTERFACE, INTERNAL LOADS CALCULATIONS
ENTER 1 Y OR N VALUE

Y

JIIL (INTEGER)

INPUT I, EVERY ITH

STATE VECTOR TO BE WRITTEN TO LOADS FILE

ENTER 1 INTEGER VALUE(S)

5

SOLUTION INPUT FOR STH4.TIME HISTORY

1 TSTA - START TIME = 0.00000E+00
2 H - INITIAL INCREMENT = 1.00000E-01
3 HTD - SEPARATE INCREMENT = 0.00000E+00
4 HF - SEPARATE INCREMENT = 0.00000E+00
5 TEND - END TIME = 5.00000E+00

MORE...

6 E - ERROR CHECK VALUE = 0.00000E+00

7 ICOPT - INITIAL CONDITION = 1

8 VI - INITIAL DISPLACEMENT = 1.00000E+00

9 IIDFLI - (SYSTEM DOF SELECTED)
DOF NAME = X 0

10 CRT - OUTPUT THIS TERMINAL = YES

11 PROPF - PRINT = 1

12 DOFFPRINT - (MODEL DOFs SELECTED) DOFs TO BE PRINTED
SYSTEM DOFs SELECTED

X 0 Y 0 Z 0

13 PLOP - PLOT = 3

14 JPLT - INPUT N, EVERY NTH = 1

15 DOFFPLOT - (MODEL DOFs SELECTED) DOFs TO BE PLOTTED
SYSTEM DOFs SELECTED

X 0

COMPONENT SMD /CSF1 DOFs

Y 0 Z 0

16 FLOP - CONDITION CODES = NO

17 ILOP - SAVE STATE VECTORS = YES

18 JIIL - INPUT I, EVERY ITH = 5

MORE...

RE-ENTER (Y OR N)

N

***** SOLUTION STH4 FOR MODEL AD
MODEL - SMD SYSTEM WITH ADDITIONAL DAMPERS
SOLUTION - TIME HISTORY

TIME HISTORY DISPLACEMENTS

TIME	X	0	Y	0	Z	0
0.0000E+00	1.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00		
1.0000E-01	8.8771E-01	3.6323E-02	-4.1319E-03			
2.0000E-01	6.6589E-01	1.0074E-01	-2.2327E-02			
3.0000E-01	4.4497E-01	1.4660E-01	-4.8640E-02			
4.0000E-01	2.7054E-01	1.5577E-01	-7.0419E-02			
5.0000E-01	1.5164E-01	1.3157E-01	-7.9917E-02			
6.0000E-01	7.9425E-02	8.8015E-02	-7.6306E-02			
7.0000E-01	3.9343E-02	4.0635E-02	-6.3534E-02			
8.0000E-01	1.7983E-02	9.2600E-04	-4.7171E-02			
9.0000E-01	5.8930E-03	-2.5543E-02	-3.1936E-02			
						MORE...
1.0000E+00	-2.1813E-03	-3.8420E-02	-2.0513E-02			
1.1000E+00	-8.3429E-03	-4.0611E-02	-1.3512E-02			
1.2000E+00	-1.2922E-02	-3.6211E-02	-1.0092E-02			
1.3000E+00	-1.5630E-02	-2.8969E-02	-8.7916E-03			
1.4000E+00	-1.6261E-02	-2.1497E-02	-8.2107E-03			
1.5000E+00	-1.4973E-02	-1.5146E-02	-7.3983E-03			
1.6000E+00	-1.2254E-02	-1.0270E-02	-5.9540E-03			
1.7000E+00	-8.7606E-03	-6.6478E-03	-3.9254E-03			
1.8000E+00	-5.1332E-03	-3.8662E-03	-1.6170E-03			
1.9000E+00	-1.8654E-03	-1.5691E-03	5.9993E-04			
2.0000E+00	7.4863E-04	4.3588E-04	2.4217E-03			
2.1000E+00	2.6031E-03	2.1813E-03	3.6765E-03			
2.2000E+00	3.7324E-03	3.6022E-03	4.3282E-03			
2.3000E+00	4.2514E-03	4.6092E-03	4.4446E-03			
2.4000E+00	4.3044E-03	5.1451E-03	4.1510E-03			
2.5000E+00	4.0306E-03	5.2111E-03	3.5887E-03			
2.6000E+00	3.5466E-03	4.8670E-03	2.8860E-03			
2.7000E+00	2.9429E-03	4.2139E-03	2.1432E-03			
2.8000E+00	2.2870E-03	3.3705E-03	1.4306E-03			
2.9000E+00	1.6291E-03	2.4514E-03	7.9133E-04			
3.0000E+00	1.0072E-03	1.5524E-03	2.4909E-04			
3.1000E+00	4.5054E-04	7.4276E-04	-1.8600E-04			
						MORE...

3.2000E+00	-2.0030E-05	6.5348E-05	-5.1245E-04
3.3000E+00	-3.9138E-04	-4.6037E-04	-7.3447E-04
3.4000E+00	-6.5830E-04	-8.3264E-04	-8.6046E-04
3.5000E+00	-8.2334E-04	-1.0619E-03	-9.0211E-04
3.6000E+00	-8.9558E-04	-1.1660E-03	-8.7372E-04
3.7000E+00	-8.8907E-04	-1.1668E-03	-7.9125E-04
3.8000E+00	-8.2093E-04	-1.0875E-03	-6.7131E-04
3.9000E+00	-7.0931E-04	-9.5106E-04	-5.2995E-04
4.0000E+00	-5.7174E-04	-7.7896E-04	-3.8162E-04
4.1000E+00	-4.2383E-04	-5.9042E-04	-2.3837E-04
4.2000E+00	-2.7847E-04	-4.0173E-04	-1.0937E-04
4.2999E+00	-1.4545E-04	-2.2583E-04	-7.5023E-07
4.3999E+00	-3.1451E-05	-7.2144E-05	8.4167E-05
4.4999E+00	5.9728E-05	5.3366E-05	1.4455E-04
4.5999E+00	1.2674E-04	1.4796E-04	1.8152E-04

TIME HISTORY DISPLACEMENTS

TIME	X 0	Y 0	Z 0
4.6999E+00	1.7023E-04	2.1164E-04	1.9764E-04
4.7999E+00	1.9235E-04	2.4663E-04	1.9638E-04
4.8999E+00	1.9622E-04	2.5668E-04	1.8166E-04
4.9999E+00	1.8556E-04	2.4652E-04	1.5747E-04
5.0000E+00	1.8555E-04	2.4651E-04	1.5746E-04

MORE...

*** TIME HISTORY SOLUTION COMPLETE ***

SYSTEM STATE VECTOR AT T = 5.00000E+00

DOF	VELOCITY	DISPLACEMENT
-----	----------	--------------

X 0	-1.66317E-04	1.85554E-04
Y 0	-1.85780E-04	2.46513E-04
Z 0	-2.76475E-04	1.57456E-04

COMMAND

2.4.7 SII3 - Component Interface and Internal Loads. Inputs for two solutions are presented. In the first example, internal loads are computed from the time history solution of the spring-mass-damper system presented in paragraph 2.4.6. Internal loads are computed for the degrees of freedom of SMD/CSF1. Note that interface loads and internal loads may only be calculated for one component at a time.

The force and strain energy at time zero reflect the initial displacement of X with respect to Y. Subsequently, forces are generated between X and Y and Y and Z. Because there is no internal connection between X and Z, no forces, etc., are generated.

In the second example, interface and internal loads are computed for B2Z1T2/CRE3 from the time history solution presented in paragraph 2.4.5. The interface loads acting at the hub and the blade moments acting at stations 1 - 10 are output. The types of moments to be computed and the blade station selections are included in the CRE3 data set. Therefore, only the data set and at least one internal degree of freedom need be selected at solution time. Internal loads are output first, followed by the interface loads.

RUN
MODEL NAME (DATA SET)
AD
LIST MODEL SUMMARY (Y OR N)
Y

***** MODEL AD *****

SMD SYSTEM WITH ADDITIONAL DAMPERS

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CSF1		SMD	NONE	
2	CSF1		C5	NONE	
3	CSF1		C6	NONE	

GLOBAL VARIABLES

MORE...

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

DETAILS (Y OR N)

N

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

SII3

SAVE CASE FOR LATER EXECUTION (Y OR N)

N

SOLUTION SII3. TIME HISTORY LOADS

BEGIN INPUT

MORE...

IFL (Y OR N)
INTERFACE LOADS
OPTION
ENTER 1 Y OR N VALUE
N

INL (Y OR N)
INTERNAL LOADS
OPTION
ENTER 1 Y OR N VALUE
Y

INLDF (COMPONENT DOFS)
INTERNAL DOF
SELECT ONLY ONE COMPONENT

SET OF COMPONENTS
1 SMD /CSF1
2 C5 /CSF1
3 C6 /CSF1

SELECT COMPONENTS BY INDICES

ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER
1 0

MORE...

0

DOFS FOR COMPONENT SMD /CSF1
1 X 0 2 Y 0 3 Z 0

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)

Y

SELECT DOFS BY INDEXES

ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER
1 2 3 0

0

SOLUTION INPUT FOR SII3.TIME HISTORY LOADS

1 IFL - INTERFACE LOADS = NO
2 INL - INTERNAL LOADS = YES
3 INLDF - (COMPONENT DOFS SELECTED) INTERNAL DOF
COMPONENT SMD /CSF1 DOFS
X 0 Y 0 Z 0

RE-ENTER (Y OR N)
N

MORE...

***** SOLUTION SII3 FOR MODEL AD
MODEL - SMD SYSTEM WITH ADDITIONAL DAMPERS
SOLUTION - TIME HISTORY LOADS

WARNING:

SOLUTION NOT VALID IF TEMP EDIT WAS USED WITH TIME
HISTORY RUN OR WITH THIS SOLUTION

SOLUTION NOT VALID IF SEPARATE TIME INCREMENTS
(HTD, HF) HAVE BEEN USED IN TIME HISTORY RUN

TIME HISTORY INTERNAL LOADS FOR SMD

/CSF1

***** TIME 0.0000E+00 *****

INTERNAL DOF

MORE...

X 0 Y 0

FORCES

INTERNAL DOF

Y	0	-2.0000E+01
Z	0	0.0000E+00 0.0000E+00

STRAIN ENERGY

INTERNAL DOF

Y	0	1.0000E+01
Z	0	0.0000E+00 0.0000E+00

ENERGY DISSIPATION RATE

INTERNAL DOF

Y	0	0.0000E+00
Z	0	0.0000E+00 0.0000E+00

MORE...

***** TIME 5.0000E-01 *****

INTERNAL DOF

X 0 Y 0

FORCES

INTERNAL DOF

Y	0	7.9382E-01
Z	0	0.0000E+00 -5.3799E+00

STRAIN ENERGY

INTERNAL DOF

Y	0	4.0269E-03
Z	0	0.0000E+00 6.7092E-01

ENERGY DISSIPATION RATE

MORE...

INTERNAL DOF

Y	0	3.5710E-01
Z	0	0.0000E+00 1.5515E-01

***** TIME 1.0000E+00 *****

INTERNAL DOF

X 0 Y 0

FORCES

INTERNAL DOF

Y	0	-7.3580E-01
Z	0	0.0000E+00 1.0338E+00

STRAIN ENERGY

INTERNAL DOF

MORE...

Y	0	1.3132E-02
Z	0	0.0000E+00

		4.8095E-03
--	--	------------

ENERGY DISSIPATION RATE

INTERNAL DOF

Y	0	3.0424E-05
Z	0	0.0000E+00

		4.1097E-02
--	--	------------

***** TIME 1.5000E+00 *****

INTERNAL DOF

X	0	Y	0
---	---	---	---

FORCES

INTERNAL DOF

Y	0	6.9026E-02
Z	0	0.0000E+00

		9.3380E-02
--	--	------------

MORE...

STRAIN ENERGY

INTERNAL DOF

Y	0	2.9993E-07
Z	0	0.0000E+00

		9.0043E-04
--	--	------------

ENERGY DISSIPATION RATE

INTERNAL DOF

Y	0	1.3137E-03
Z	0	0.0000E+00

		3.2227E-03
--	--	------------

***** TIME 3.0000E+00 *****

INTERNAL DOF

X 0 Y 0

FORCES

INTERNAL DOF

Y	0	5.4783E-03
Z	0	0.0000E+00 -2.7859E-02

STRAIN ENERGY

INTERNAL DOF

Y	0	2.9716E-06
Z	0	0.0000E+00 2.5478E-05

MORE...

ENERGY DISSIPATION RATE

INTERNAL DOF

Y	0	7.3551E-06
Z	0	0.0000E+00 2.1052E-05

***** TIME 3.5000E+00 *****

INTERNAL DOF

X 0 Y 0

FORCES

INTERNAL DOF

Y	0	-5.7071E-03
Z	0	0.0000E+00 9.5841E-03

MORE...

STRAIN ENERGY

INTERNAL DOF

Y	0	5.6904E-07
Z	0	0.0000E+00 3.8293E-07

ENERGY DISSIPATION RATE

INTERNAL DOF

Y	0	2.1914E-07
Z	0	0.0000E+00 3.8253E-06

***** TIME . 4.0000E+00 *****

INTERNAL DOF

X	0	Y 0
---	---	------------

FORCES

MORE...

INTERNAL DOF

Y	0	-3.3804E-03
Z	0	0.0000E+00 1.0848E-02

STRAIN ENERGY

INTERNAL DOF

Y	0	4.2942E-07
Z	0	0.0000E+00 2.3682E-06

ENERGY DISSIPATION RATE

INTERNAL DOF

Y	0	1.4597E-07
Z	0	0.0000E+00 1.9143E-07

***** TIME . 4.4999E+00 *****

INTERNAL DOF

MORE...

X 0 Y 0

FORCES

INTERNAL DOF

Y	0	4.9619E-04
Z	0	0.0000E+00 8.7573E-04

STRAIN ENERGY

INTERNAL DOF

Y	0	4.0473E-10
Z	0	0.0000E+00 1.2471E-07

ENERGY DISSIPATION RATE

INTERNAL DOF

Y	0	9.7164E-08
Z	0	0.0000E+00 5.7640E-07

MORE...

***** TIME 4.9999E+00 *****

INTERNAL DOF

X 0 Y 0

FORCES

INTERNAL DOF

Y	0	1.1809E-03
Z	0	0.0000E+00 -2.9458E-03

STRAIN ENERGY

INTERNAL DOF

Y	0	3.7161E-08
Z	0	0.0000E+00 1.1895E-07

MORE...

ENERGY DISSIPATION RATE

INTERNAL DOF

Y 0 3.6709E-10
Z 0 0.0000E+00 1.2539E-08

COMMAND

RUN

MODEL NAME (DATA SET)

AH1G-35A

LIST MODEL SUMMARY (Y OR N)

Y

***** MODEL AH1G-35A *****

AH1G TRIM

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CRE3	1	B2Z1T2	FRA3	FCT1.65
				REQUIRED DS/DM=	AFD161 /AIRFOIL
2	CCE0	1	3000	NONE	
3	CLC1		COUPLE	NONE	
4	CFM2	1	8300-4	FFC2	AH1G16.5
5	CSF1		GRAV	NONE	

MORE...

GLOBAL VARIABLES

1 VSOUND - SOUND VELOCITY = 1.13800E+03
2 RHO - AIR DENSITY RATIO = 8.79000E-01

FCT1.65 /FRA3 FOUND ON FOLLOWING MULTIPLES FILES

R U1

ENTER CORRECT FILE

R

AH1G16.5/FFC2 FOUND ON FOLLOWING MULTIPLES FILES

R U1

ENTER CORRECT FILE

R

TEMPORARY RUN EDIT OF GLOBAL VARIABLES FOR MODEL (Y OR N)

N

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

MORE...

DETAILS (Y OR N)

N
PRINT MATRICES (Y OR N)
N

SOLUTION OR N

SII3
SAVE CASE FOR LATER EXECUTION (Y OR N)
N

SOLUTION SII3. TIME HISTORY LOADS

BEGIN INPUT

IFL (Y OR N)
INTERFACE LOADS
OPTION

ENTER 1 Y OR N VALUE
Y

IFLDF (COMPONENT DOFS)
INTERFACE DOF
MORE...
SELECT ONLY ONE COMPONENT

SET OF COMPONENTS

1 B2Z1T2 /CRE3
2 3000 /CCE0
3 COUPLE /CLC1
4 8300-4 /CFM2

SELECT COMPONENTS BY INDICES

ENTER UNIQUE INTEGER VALUES - 10 TERMINATE ENTER 0
1 0

DOFS FOR COMPONENT B2Z1T2 /CRE3

1 IP 1110	2 OP 1110	3 OP 1120	4 TOR 1110
5 TOR 1120	6 IP 1210	7 OP 1210	8 OP 1220
9 TOR 1210	10 TOR 1220	11 XHUB1000	12 ZHUB1000
13 ALFX1000	14 ALFY1000		

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)

Y

SELECT DOFS BY INDEXES

ENTER UNIQUE INTEGER VALUES - 10 TERMINATE ENTER 0
11 12 13 14 0

MORE...

IFLPL (Y OR N)
PLOT INTERFACE LOADS
ENTER 1 Y OR N VALUE
N

INL (Y OR N)
INTERNAL LOADS
OPTION
ENTER 1 Y OR N VALUE
Y

INLDF (COMPONENT DOFS)
INTERNAL DOF
SELECT ONLY ONE COMPONENT

SET OF COMPONENTS
1 B2Z1T2 /CRE3
2 3000 /CCE0
3 COUPLE /CLC1
4 8300-4 /CFM2

SELECT COMPONENTS BY INDICES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0

MORE...

1 0
DOFS FOR COMPONENT B2Z1T2 /CRE3
1 IP 1110 2 OP 1110 3 OP 1120 4 TOR 1110
5 TOR 1120 6 IP 1210 7 OP 1210 8 OP 1220
9 TOR 1210 10 TOR 1220 11 XHUB1000 12 ZHUB1000
13 ALFX1000 14 ALFY1000

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)

Y

SELECT DOFS BY INDEXES

ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0

1 0

SOLUTION INPUT FOR SII3.TIME HISTORY LOADS

1 IFL - INTERFACE LOADS = YES
2 IFLDF - (COMPONENT DOFS SELECTED) INTERFACE DOF
COMPONENT B2Z1T2 /CRE3 DOFS
XHUB1000 ZHUB1000 ALFX1000 ALFY1000
3 IFLPL - PLOT INTERFACE LOADS= NO
4 INL - INTERNAL LOADS = YES
5 INLDF - (COMPONENT DOFS SELECTED) INTERNAL DOF

MORE...

COMPONENT B2Z1T2 /CRE3 DOFS
IP 1110

RE-ENTER (Y OR N)

N

***** SOLUTION SI13 FOR MODEL AH1G-35A*****

MODEL - AH1G TRIM

SOLUTION - TIME HISTORY LOADS

WARNING:

SOLUTION NOT VALID IF TEMP EDIT WAS USED WITH TIME HISTORY RUN OR WITH THIS SOLUTION

SOLUTION NOT VALID IF SEPARATE TIME INCREMENTS (HTD,HF) HAVE BEEN USED IN TIME HISTORY RUN

MORE...

TIME HISTORY INTERNAL LOADS FOR B2Z1T2 /CRE3

BLADE MOMENTS

TIME	BLADE	STATION	INPLANE	OUTPLANE
0.0000E+00	1	1	-1.4533E+06	6.5627E+03
0.0000E+00	1	2	-1.9328E+06	-1.5804E+03
0.0000E+00	1	3	-5.4969E+05	2.6049E+03
0.0000E+00	1	4	-4.7553E+05	1.6883E+03
0.0000E+00	1	5	-4.0325E+05	5.0363E+02
0.0000E+00	1	6	-1.4598E+06	4.4656E+03
0.0000E+00	1	7	-1.5002E+06	3.1075E+03
0.0000E+00	1	8	-1.0489E+06	1.5734E+03
0.0000E+00	1	9	-7.0042E+05	7.6781E+02
0.0000E+00	1	10	-4.8652E+05	3.4124E+02
0.0000E+00	2	1	-1.2460E+06	2.7916E+03
0.0000E+00	2	2	-1.6334E+06	-4.1992E+03
0.0000E+00	2	3	-4.6965E+05	4.6745E+02
0.0000E+00	2	4	-4.0557E+05	-4.3271E+01
0.0000E+00	2	5	-3.4392E+05	-1.2960E+01
0.0000E+00	2	6	-1.2558E+06	1.9268E+03

MORE...

0.0000E+00	2	7	-1.2914E+06	1.3258E+03
0.0000E+00	2	8	-9.0093E+05	5.3453E+02
0.0000E+00	2	9	-6.0005E+05	1.3912E+02
0.0000E+00	2	10	-4.1582E+05	-3.3137E+01

BLADE MOMENTS

TIME	BLADE	STATION	INPLANE	OUTPLANE
1.8518E-02	1	1	-1.4270E+06	3.2358E+03
1.8518E-02	1	2	-1.8934E+06	-6.9690E+03
1.8518E-02	1	3	-5.3863E+05	4.5387E+02
1.8518E-02	1	4	-4.6570E+05	-2.1498E+02
1.8518E-02	1	5	-3.9491E+05	-6.4191E+01
1.8518E-02	1	6	-1.4312E+06	2.7012E+03
1.8518E-02	1	7	-1.4703E+06	1.9436E+03
1.8518E-02	1	8	-1.0270E+06	8.3573E+02
1.8518E-02	1	9	-6.8507E+05	2.7293E+02
1.8518E-02	1	10	-4.7537E+05	1.4843E+01
1.8518E-02	2	1	-1.6211E+06	3.5670E+03
1.8518E-02	2	2	-2.1511E+06	-8.1521E+03
1.8518E-02	2	3	-6.1186E+05	4.2513E+02
				MORE...
1.8518E-02	2	4	-5.2901E+05	-3.2852E+02
1.8518E-02	2	5	-4.4860E+05	-9.8076E+01
1.8518E-02	2	6	-1.6258E+06	2.9973E+03
1.8518E-02	2	7	-1.6701E+06	2.1575E+03
1.8518E-02	2	8	-1.1666E+06	9.1388E+02
1.8518E-02	2	9	-7.7814E+05	2.8379E+02
1.8518E-02	2	10	-5.3992E+05	-1.7839E+00

BLADE MOMENTS

TIME	BLADE	STATION	INPLANE	OUTPLANE
3.7037E-02	1	1	-1.4172E+06	-9.9395E+02
3.7037E-02	1	2	-1.8792E+06	-1.4941E+04
3.7037E-02	1	3	-5.3353E+05	-2.3910E+03
3.7037E-02	1	4	-4.6103E+05	-2.7848E+03
3.7037E-02	1	5	-3.9095E+05	-8.3086E+02
3.7037E-02	1	6	-1.4172E+06	6.1035E+02
3.7037E-02	1	7	-1.4549E+06	5.9379E+02
3.7037E-02	1	8	-1.0152E+06	-5.0546E+01
3.7037E-02	1	9	-6.7628E+05	-3.4463E+02
3.7037E-02	1	10	-4.6863E+05	-4.0590E+02
				MORE...

3.7037E-02	2	1	-2.0902E+06	6.1965E+03
3.7037E-02	2	2	-2.7986E+06	-9.5799E+03
3.7037E-02	2	3	-7.9025E+05	1.5276E+03
3.7037E-02	2	4	-6.8395E+05	3.7603E+02
3.7037E-02	2	5	-5.7999E+05	1.1211E+02
3.7037E-02	2	6	-2.0902E+06	5.1056E+03
3.7037E-02	2	7	-2.1457E+06	3.6838E+03
3.7037E-02	2	8	-1.5007E+06	1.7194E+03
3.7037E-02	2	9	-1.0024E+06	7.0396E+02
3.7037E-02	2	10	-6.9642E+05	2.0521E+02

BLADE MOMENTS

TIME	BLADE	STATION	INPLANE	OUTPLANE
5.5555E-02	1	1	-1.3415E+06	-8.9463E+02
5.5555E-02	1	2	-1.7690E+06	-1.3103E+04
5.5555E-02	1	3	-5.0476E+05	-2.1457E+03
5.5555E-02	1	4	-4.3594E+05	-2.4872E+03
5.5555E-02	1	5	-3.6968E+05	-7.4208E+02
5.5555E-02	1	6	-1.3445E+06	4.5860E+02
5.5555E-02	1	7	-1.3809E+06	4.5486E+02
				MORE...
5.5555E-02	1	8	-9.6311E+05	-9.0244E+01
5.5555E-02	1	9	-6.4122E+05	-3.3536E+02
5.5555E-02	1	10	-4.4414E+05	-3.7886E+02
5.5555E-02	2	1	-2.1547E+06	6.4266E+03
5.5555E-02	2	2	-2.9039E+06	-1.1279E+04
5.5555E-02	2	3	-8.1532E+05	1.4373E+03
5.5555E-02	2	4	-7.0610E+05	1.9456E+02
5.5555E-02	2	5	-5.9877E+05	5.7951E+01
5.5555E-02	2	6	-2.1494E+06	5.4589E+03
5.5555E-02	2	7	-2.2053E+06	3.9605E+03
5.5555E-02	2	8	-1.5434E+06	1.8329E+03
5.5555E-02	2	9	-1.0317E+06	7.3423E+02
5.5555E-02	2	10	-7.1723E+05	1.9846E+02

BLADE MOMENTS

TIME	BLADE	STATION	INPLANE	OUTPLANE
7.4074E-02	1	1	-1.3606E+06	2.7901E+03
7.4074E-02	1	2	-1.7787E+06	-4.4579E+03
7.4074E-02	1	3	-5.1257E+05	4.2531E+02
7.4074E-02	1	4	-4.4252E+05	-9.3984E+01
				MORE...

7.4074E-02	1	5	-3.7526E+05	-2.8086E+01
7.4074E-02	1	6	-1.3722E+06	1.9352E+03
7.4074E-02	1	7	-1.4113E+06	1.3318E+03
7.4074E-02	1	8	-9.8426E+05	5.2906E+02
7.4074E-02	1	9	-6.5536E+05	1.2892E+02
7.4074E-02	1	10	-4.5404E+05	-4.3544E+01
7.4074E-02	2	1	-1.8343E+06	5.8468E+03
7.4074E-02	2	2	-2.4694E+06	-8.7482E+03
7.4074E-02	2	3	-6.9412E+05	1.4533E+03
7.4074E-02	2	4	-6.0108E+05	3.7657E+02
7.4074E-02	2	5	-5.0971E+05	1.1226E+02
7.4074E-02	2	6	-1.8312E+06	4.7567E+03
7.4074E-02	2	7	-1.8792E+06	3.4242E+03
7.4074E-02	2	8	-1.3151E+06	1.5953E+03
7.4074E-02	2	9	-8.7901E+05	6.5038E+02
7.4074E-02	2	10	-6.1102E+05	1.8699E+02

BLADE MOMENTS

TIME	BLADE	STATION	INPLANE	OUTPLANE
9.2592E-02	1	1	-1.3716E+06	3.3825E+03 MORE...
9.2592E-02	1	2	-1.7990E+06	-4.1812E+03
9.2592E-02	1	3	-5.1713E+05	6.9388E+02
9.2592E-02	1	4	-4.4661E+05	1.0666E+02
9.2592E-02	1	5	-3.7873E+05	3.1759E+01
9.2592E-02	1	6	-1.3826E+06	2.2709E+03
9.2592E-02	1	7	-1.4218E+06	1.5547E+03
9.2592E-02	1	8	-9.9201E+05	6.4506E+02
9.2592E-02	1	9	-6.6079E+05	1.8863E+02
9.2592E-02	1	10	-4.5795E+05	-1.4443E+01
9.2592E-02	2	1	-1.6874E+06	8.0214E+03
9.2592E-02	2	2	-2.2370E+06	-4.8396E+02
9.2592E-02	2	3	-6.3803E+05	3.3816E+03
9.2592E-02	2	4	-5.5180E+05	2.3123E+03
9.2592E-02	2	5	-4.6793E+05	6.8980E+02
9.2592E-02	2	6	-1.6971E+06	5.3447E+03
9.2592E-02	2	7	-1.7444E+06	3.7045E+03
9.2592E-02	2	8	-1.2194E+06	1.9112E+03
9.2592E-02	2	9	-8.1401E+05	9.6506E+02
9.2592E-02	2	10	-5.6531E+05	4.5452E+02

BLADE MOMENTS

MORE...

TIME	BLADE	STATION	INPLANE	OUTPLANE
1.1111E-01	1	1	-1.7192E+06	4.2108E+03
1.1111E-01	1	2	-2.2798E+06	-7.7221E+03
1.1111E-01	1	3	-6.4897E+05	7.3295E+02
1.1111E-01	1	4	-5.6103E+05	-8.9738E+01
1.1111E-01	1	5	-4.7580E+05	-2.6842E+01
1.1111E-01	1	6	-1.7252E+06	3.3482E+03
1.1111E-01	1	7	-1.7725E+06	2.3877E+03
1.1111E-01	1	8	-1.2381E+06	1.0363E+03
1.1111E-01	1	9	-8.2583E+05	3.4926E+02
1.1111E-01	1	10	-5.7301E+05	3.2001E+01
1.1111E-01	2	1	-1.5564E+06	3.9832E+03
1.1111E-01	2	2	-2.0607E+06	-6.3327E+03
1.1111E-01	2	3	-5.8746E+05	8.5368E+02
1.1111E-01	2	4	-5.0784E+05	1.0933E+02
1.1111E-01	2	5	-4.3065E+05	3.2563E+01
1.1111E-01	2	6	-1.5628E+06	3.1330E+03
1.1111E-01	2	7	-1.6057E+06	2.2332E+03
1.1111E-01	2	8	-1.1215E+06	9.9979E+02
1.1111E-01	2	9	-7.4801E+05	3.6900E+02
1.1111E-01	2	10	-5.1901E+05	7.0242E+01

MORE...

BLADE MOMENTS

TIME	BLADE	STATION	INPLANE	OUTPLANE
1.2963E-01	1	1	-2.1657E+06	6.6359E+03
1.2963E-01	1	2	-2.9027E+06	-9.7369E+03
1.2963E-01	1	3	-8.1895E+05	1.7417E+03
1.2963E-01	1	4	-7.0888E+05	5.2627E+02
1.2963E-01	1	5	-6.0113E+05	1.5693E+02
1.2963E-01	1	6	-2.1648E+06	5.4795E+03
1.2963E-01	1	7	-2.2221E+06	3.9585E+03
1.2963E-01	1	8	-1.5543E+06	1.8717E+03
1.2963E-01	1	9	-1.0384E+06	7.8960E+02
1.2963E-01	1	10	-7.2159E+05	2.5192E+02
1.2963E-01	2	1	-1.2675E+06	-2.7294E+03
1.2963E-01	2	2	-1.6887E+06	-1.7820E+04
1.2963E-01	2	3	-4.7673E+05	-3.4700E+03
1.2963E-01	2	4	-4.1200E+05	-3.7380E+03
1.2963E-01	2	5	-3.4937E+05	-1.1152E+03
1.2963E-01	2	6	-1.2628E+06	-2.2308E+02
1.2963E-01	2	7	-1.2954E+06	6.4484E+01

MORE...

1.2963E-01	2	8	-9.0385E+05	-6.8098E+02
1.2963E-01	2	9	-6.0195E+05	-5.8351E+02
1.2963E-01	2	10	-4.1698E+05	-5.4901E+02

BLADE MOMENTS

TIME	BLADE	STATION	INPLANE	OUTPLANE
1.4815E-01	1	1	-1.9133E+06	3.4728E+03
1.4815E-01	1	2	-2.5993E+06	-1.5605E+04
1.4815E-01	1	3	-7.2397E+05	-3.1864E+02
1.4815E-01	1	4	-6.2737E+05	-1.3273E+03
1.4815E-01	1	5	-5.3201E+05	-3.9607E+02
1.4815E-01	1	6	-1.8998E+06	4.0001E+03
1.4815E-01	1	7	-1.9471E+06	3.0269E+03
1.4815E-01	1	8	-1.3634E+06	1.2688E+03
1.4815E-01	1	9	-9.1182E+05	3.7419E+02
1.4815E-01	1	10	-6.3416E+05	-2.9129E+01
1.4815E-01	2	1	-1.0912E+06	-1.0242E+03
1.4815E-01	2	2	-1.4392E+06	-1.1274E+04
1.4815E-01	2	3	-4.1049E+05	-1.9466E+03
1.4815E-01	2	4	-3.5451E+05	-2.2072E+03
				MORE...
1.4815E-01	2	5	-3.0063E+05	-6.5853E+02
1.4815E-01	2	6	-1.0933E+06	2.4000E+02
1.4815E-01	2	7	-1.1228E+06	2.8713E+02
1.4815E-01	2	8	-7.8301E+05	-1.2914E+02
1.4815E-01	2	9	-5.2126E+05	-3.1265E+02
1.4815E-01	2	10	-3.6102E+05	-3.3593E+02

BLADE MOMENTS

TIME	BLADE	STATION	INPLANE	OUTPLANE
1.6666E-01	1	1	-1.4810E+06	5.1521E+03
1.6666E-01	1	2	-1.9918E+06	-6.1326E+03
1.6666E-01	1	3	-5.6050E+05	1.4734E+03
1.6666E-01	1	4	-4.8534E+05	5.8030E+02
1.6666E-01	1	5	-4.1157E+05	1.7306E+02
1.6666E-01	1	6	-1.4795E+06	4.0348E+03
1.6666E-01	1	7	-1.5186E+06	2.8859E+03
1.6666E-01	1	8	-1.0628E+06	1.3710E+03
1.6666E-01	1	9	-7.1032E+05	5.8543E+02
1.6666E-01	1	10	-4.9377E+05	1.9350E+02
1.6666E-01	2	1	-9.5824E+05	3.2829E+03
				MORE...

1.6666E-01	2	2	-1.2445E+06	3.0306E+02
1.6666E-01	2	3	-3.6110E+05	1.2425E+03
1.6666E-01	2	4	-3.1162E+05	8.2588E+02
1.6666E-01	2	5	-2.6426E+05	2.4635E+02
1.6666E-01	2	6	-9.7022E+05	1.8267E+03
1.6666E-01	2	7	-9.9869E+05	1.1961E+03
1.6666E-01	2	8	-6.9631E+05	5.6708E+02
1.6666E-01	2	9	-4.6352E+05	2.4502E+02
1.6666E-01	2	10	-3.2108E+05	8.5228E+01

BLADE MOMENTS

TIME	BLADE	STATION	INPLANE	OUTPLANE
1.8518E-01	1	1	-1.3567E+06	9.7176E+03
1.8518E-01	1	2	-1.7748E+06	7.2875E+03
1.8518E-01	1	3	-5.1303E+05	4.9855E+03
1.8518E-01	1	4	-4.4325E+05	3.9690E+03
1.8518E-01	1	5	-3.7588E+05	1.1841E+03
1.8518E-01	1	6	-1.3750E+06	5.5814E+03
1.8518E-01	1	7	-1.4159E+06	3.7331E+03
1.8518E-01	1	8	-9.8898E+05	2.0695E+03
				MORE...
1.8518E-01	1	9	-6.5968E+05	1.1758E+03
1.8518E-01	1	10	-4.5782E+05	6.5470E+02
1.8518E-01	2	1	-9.5416E+05	3.1108E+03
1.8518E-01	2	2	-1.2452E+06	-8.1206E+02
1.8518E-01	2	3	-3.5977E+05	1.0213E+03
1.8518E-01	2	4	-3.1060E+05	5.8789E+02
1.8518E-01	2	5	-2.6339E+05	1.7535E+02
1.8518E-01	2	6	-9.6452E+05	1.8072E+03
1.8518E-01	2	7	-9.9252E+05	1.1954E+03
1.8518E-01	2	8	-6.9230E+05	5.3981E+02
1.8518E-01	2	9	-4.6102E+05	2.0711E+02
1.8518E-01	2	10	-3.1943E+05	4.8926E+01

TIME HISTORY INTERFACE LOADS FOR B2Z1T2 /CRE3

TIME	XHUB1000	ZHUB1000	ALFX1000	ALFY1000
0.0000E+00	-3.8484E+02	-5.0256E+03	-3.3217E+02	-4.2121E+04
1.8518E-02	-2.0448E+02	-6.6279E+03	1.4967E+05	-1.9945E+05
3.7037E-02	-9.8537E+01	-6.7554E+03	5.5958E+05	-2.1192E+05
5.5555E-02	9.0509E+02	-5.3629E+03	7.6950E+05	1.7080E+05
				MORE...

7.4074E-02	4.9317E+02	-5.1494E+03	3.0659E+05	3.9995E+05
9.2592E-02	-4.7244E+02	-6.0990E+03	2.8526E+03	2.0407E+05
1.1111E-01	6.6871E+01	-7.2786E+03	-1.0685E+04	-4.4256E+02
1.2963E-01	-3.1652E+02	-6.6784E+03	4.1400E+05	-1.8967E+05
1.4815E-01	1.3732E+03	-4.8052E+03	6.4456E+05	1.5825E+05
1.6666E-01	1.1996E+02	-4.8682E+03	1.6361E+05	2.2717E+05
1.8518E-01	-4.8618E+02	-6.0860E+03	7.0480E+03	2.8157E+04

COMMAND

2.4.8 SFD1 - Frequency Domain, Mobility. A solution is performed for the ground resonance model discussed in paragraph 2.4.6. Response degrees of freedom have been selected from system and component degrees of freedom. Forced degrees of freedom can only be selected from system degrees of freedom. Peaks in the magnitudes of the complex mobilities indicate resonance frequencies.

RUN
MODEL NAME (DATA SET)

LAT

LIST MODEL SUMMARY (Y OR N)

Y

***** MODEL LAT *****

LATERAL GROUND RESONANCE MODEL

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CRR2	1	ROTLAT	NONE	
2	CFM2	1	FUSLAT	NONE	
3	CSF1		LMAIN	NONE	
4	CSF1		RMAIN	NONE	
5	CSF1		TAIL	NONE	
6	CLC1		CGEAR	NONE	

MORE...

GLOBAL VARIABLES

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

DETAILS (Y OR N)

N

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

SFD1

SAVE CASE FOR LATER EXECUTION (Y OR N)

N

MORE...

SOLUTION SFD1. FREQUENCY DOMAIN MOBIL.

BEGIN INPUT

FO (REAL)
STARTING FREQ
ENTER 1 REAL VALUE
?
10

FE (REAL)
ENDING FREQ
ENTER 1 REAL VALUE
?
20

FD (REAL)
INCREMENTAL FREQ
ENTER 1 REAL VALUE
?
2

IOU (INTEGER)
OUTPUT UNITS TYPE
1 = DISPLACEMENT/UNIT FORCE
2 = ACCELERATION/UNIT FORCE (G/LB)
ENTER 1 INTEGER VALUE(S)
1

IPL (Y OR N)
WRITE PLOT FILES
(Y OR N)
ENTER 1 Y OR N VALUE
N

RDOF (MODEL DOFS CHOSEN)
RESPONSE DOF
SYSTEM DOFS
1 ZETA1100 2 ZETA1200 3 ZETA1300 4 ZETA1400
5 YCG 1000 6 ROLL1000

ALL SYSTEM DOFS (Y OR N)
N
SELECT DOFS BY INDEXES

MORE...

MORE...

ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
5 6 0

ANY COMPONENT DOFS (Y OR N)
Y

SET OF COMPONENTS

1 ROTLAT /CRR2
2 FUSLAT /CFM2
3 LMAIN /CSF1
4 RMAIN /CSF1
5 TAIL /CSF1
6 CGEAR /CLC1

SELECT COMPONENTS BY INDICES

ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
3 4 0

DOFS FOR COMPONENT LMAIN /CSF1

1 X 2000 2 Y 2000 3 Z 2000

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)

Y

SELECT DOFS BY INDEXES

ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0

MORE...

2 3 0

DOFS FOR COMPONENT RMAIN /CSF1

1 X 1000 2 Y 1000 3 Z 1000

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)

Y

SELECT DOFS BY INDEXES

ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0

2 3 0

SDOF (SYSTEM DOFS CHOSEN)

FORCED DOF

SYSTEM DOFS

1 ZETA1100 2 ZETA1200 3 ZETA1300 4 ZETA1400
5 YCG 1000 6 ROLL1000

ALL SYSTEM DOFS (Y OR N)

N

SELECT DOFS BY INDEXES

ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0

5 6 0

MORE...

SOLUTION INPUT FOR SFD1.FREQUENCY DOMAIN MOBIL.

1 F0 - STARTING FREQ = 1.00000E+01
2 FE - ENDING FREQ = 2.00000E+01
3 FD - INCREMENTAL FREQ = 2.00000E+00
4 IOU - OUTPUT UNITS TYPE = 1
5 IPL - WRITE PLOT FILES = NO
6 RDOF - (MODEL DOFS SELECTED) RESPONSE DOF
SYSTEM DOFS SELECTED
YCG 1000 ROLL1000
COMPONENT LMAIN /CSF1 DOFS
Y 2000 Z 2000
COMPONENT RMAIN /CSF1 DOFS
Y 1000 Z 1000
7 SDOF - (SYSTEM DOFS SELECTED) FORCED DOF
YCG 1000 ROLL1000

RE-ENTER (Y OR N)

N

***** SOLUTION SFD1 FOR MODEL LAT *****

MORE...

MODEL - LATERAL GROUND RESONANCE MODEL
SOLUTION - FREQUENCY DOMAIN MOBIL.

FREQUENCY DOMAIN, DISPLACEMENT/UNIT FORCE

FREQ HZ 1.0000E+01

FORCED DOF

YCG 1000 ROLL1000

REAL

RESPONSE DOF

YCG 1000	-7.7074E-06	-2.4609E-08
ROLL1000	-2.4609E-08	-1.8976E-09
Y 2000	-9.5718E-06	-1.6837E-07

MORE...

Z	2000	1.6242E-06	1.2524E-07
Y	1000	-9.5718E-06	-1.6837E-07
Z	1000	-1.6242E-06	-1.2524E-07

IMAG

RESPONSE DOF

YCG	1000	-2.2208E-08	-1.7125E-09
ROLL	1000	-1.7125E-09	-1.3205E-10
Y	2000	-1.5194E-07	-1.1716E-08
Z	2000	1.1302E-07	8.7152E-09
Y	1000	-1.5194E-07	-1.1716E-08
Z	1000	-1.1302E-07	-8.7152E-09

FREQ HZ 1.2000E+01

FORCED DOF

YCG 1000 ROLL1000

MORE...

REAL

RESPONSE DOF

YCG	1000	-5.2293E-06	-1.4897E-08
ROLL	1000	-1.4897E-08	-1.2769E-09
Y	2000	-6.3579E-06	-1.1163E-07
Z	2000	9.8323E-07	8.4274E-08
Y	1000	-6.3579E-06	-1.1163E-07
Z	1000	-9.8323E-07	-8.4274E-08

IMAG

RESPONSE DOF

YCG	1000	-9.7497E-09	-8.3567E-10
ROLL	1000	-8.3567E-10	-7.1627E-11
Y	2000	-7.3060E-08	-6.2621E-09
Z	2000	5.5154E-08	4.7274E-09
Y	1000	-7.3060E-08	-6.2621E-09
Z	1000	-5.5154E-08	-4.7274E-09

MORE...

FREQ HZ 1.4000E+01

FORCED DOF

YCG 1000 ROLL1000

REAL

RESPONSE DOF

YCG 1000	-3.7911E-06	-1.0042E-08
ROLL1000	-1.0042E-08	-9.2121E-10
Y 2000	-4.5519E-06	-7.9832E-08
Z 2000	6.6275E-07	6.0800E-08
Y 1000	-4.5519E-06	-7.9832E-08
Z 1000	-6.6275E-07	-6.0800E-08

IMAG

RESPONSE DOF

MORE...

YCG 1000	-5.1633E-09	-4.7368E-10
ROLL1000	-4.7368E-10	-4.3455E-11
Y 2000	-4.1049E-08	-3.7658E-09
Z 2000	3.1263E-08	2.8680E-09
Y 1000	-4.1049E-08	-3.7658E-09
Z 1000	-3.1263E-08	-2.8680E-09

FREQ HZ 1.6000E+01

FORCED DOF

YCG 1000 ROLL1000

REAL

RESPONSE DOF

YCG 1000	-2.8784E-06	-7.2584E-09
ROLL1000	-7.2584E-09	-6.9724E-10
Y 2000	-3.4283E-06	-6.0081E-08
Z 2000	4.7905E-07	4.6018E-08

MORE...

Y	1000	-3.4283E-06	-6.0081E-08
Z	1000	-4.7905E-07	-4.6018E-08

IMAG

RESPONSE DOF

YCG	1000	-3.0814E-09	-2.9600E-10
ROLL	1000	-2.9600E-10	-2.8434E-11
Y	2000	-2.5506E-08	-2.4501E-09
Z	2000	1.9536E-08	1.8766E-09
Y	1000	-2.5506E-08	-2.4501E-09
Z	1000	-1.9536E-08	-1.8766E-09

FREQ HZ 1.8000E+01

FORCED DOF

YCG 1000 ROLL1000

REAL

MORE...

RESPONSE DOF

YCG	1000	-2.2615E-06	-5.5087E-09
ROLL	1000	-5.5087E-09	-5.4665E-10
Y	2000	-2.6789E-06	-4.6923E-08
Z	2000	3.6358E-07	3.6079E-08
Y	1000	-2.6789E-06	-4.6923E-08
Z	1000	-3.6358E-07	-3.6079E-08

IMAG

RESPONSE DOF

YCG	1000	-1.9960E-09	-1.9807E-10
ROLL	1000	-1.9807E-10	-1.9656E-11
Y	2000	-1.7002E-08	-1.6872E-09
Z	2000	1.3073E-08	1.2973E-09
Y	1000	-1.7002E-08	-1.6872E-09
Z	1000	-1.3073E-08	-1.2973E-09

MORE...

FREQ HZ 2.0000E+01

FORCED DOF

YCG 1000 ROLL1000

REAL

RESPONSE DOF

YCG 1000	-1.8246E-06	-4.3335E-09
ROLL1000	-4.3335E-09	-4.4037E-10
Y 2000	-2.1529E-06	-3.7696E-08
Z 2000	2.8601E-07	2.9065E-08
Y 1000	-2.1529E-06	-3.7696E-08
Z 1000	-2.8601E-07	-2.9065E-08

IMAG

RESPONSE DOF

YCG 1000	-1.3721E-09	-1.3943E-10
ROLL1000	-1.3943E-10	-1.4169E-11
Y 2000	-1.1936E-08	-1.2129E-09
Z 2000	9.2027E-09	9.3517E-10
Y 1000	-1.1936E-08	-1.2129E-09
Z 1000	-9.2027E-09	-9.3517E-10

MORE...

*** FREQUENCY DOMAIN SOLUTION COMPLETE***

COMMAND

2.5 PLOT FILES

A plot file is a permanent, sequential file currently used to store time history solutions (displacement, velocity), time history interface loads, or frequency domain mobilities. The data is stored in a standardized format and can be post-processed for plotting or other purposes by external user-supplied routines. If the user attempts to save data without having assigned a plot file, a warning message will be printed, but normal execution will continue. Data from different RUNs can be added to a file during a DYSCO session, but a previously assigned file will be overwritten.

Currently, there are two plot file classifications - time history and frequency domain. Time history data includes output from STH3, STH4, STR3, and SII3, and frequency domain data is output from SFD1.

2.5.1 Time History Plot Files. Time history plot files can be one of three types:

- a. Time history displacements
- b. Time history velocities or interface loads
- c. Time history displacements and velocities.

The data associated with each of the file types and the FORTRAN format statements used to write the data are shown below.

2.5.1.1 Time History Plot File Format -

Displacements (Type 1)

no. of dof/dof name 1/dof name 2/ ... /dof name n
[FORMAT (1X,I4,5(2X,A4,I4)/*',(4X,5(2X,A4,I4)))]

file type
[FORMAT(1X,I4)]

no. of time increments/start time/end time/max displacement/min
displacement
[FORMAT(1X,I4,1P4E13.4)]

time₁/displacement₁[dof₁]

time₁/displacement₁[dof_n]
time₂/displacement₂[dof₁]

time₂/displacement₂[dof_n]

time_n/displacement_n[dof_{1,2,...,n}]
[FORMAT(1X,1P2E13.4)]

Velocities or Interface Loads (Type 2) -

component data set/data member [interface loads only]
[FORMAT(1X,2A4,1X,A4)]

no. of dof/dof name 1/dof name 2/ ... /dof name n
[FORMAT(1X,I4,5(2X,A4,I4)/*',(4X,5(2X,A4,I4)))]

file type
[FORMAT(1X,I4)]

no. of time increments/start time/end time/max velocity/min velocity
/ max load / min load
[FORMAT(1X,I4,1P4E13.4)]

time₁/velocity(load)₁[dof₁]

time₁/velocity(load)₁[dof_n]

time₂/velocity(load)₂[dof₁]

time₂/velocity(load)₂[dof_n]

time_n/velocity(load)_n[dof_{1,2,...,n}]

Displacements and Velocities (Type 3) -

no. of dof/dof name 1/dof name 2/ ... /dof name n
[FORMAT(1X,I4,5(2X,A4,I4)/*',(4X,5(2X,A4,I4)))]

file type

[FORMAT(1X,I4)]

no. of time increments/start time/end time/max displacement/min
displacement

max velocity/min velocity

[FORMAT(1X,I4,1P4E13.4/5X,1P2E13.4)]

```
time1/displacement1[dof1]  
.  
.  
.  
time1/displacement1[dofn]  
time1/velocity1[dof1]  
.  
.  
.  
time1/velocity1[dofn]  
time2/displacement2[dof1]  
.  
.  
.  
time2/displacement2[dofn]  
time2/velocity2[dof1]  
.  
.  
.  
time2/velocity2[dofn]  
.  
.  
.  
timen/displacementn[dof1,2,...,n]  
timen/velocityn[dof1,2,...,n]  
[Format(1X,1P2E13.4)]
```

2.5.1.2 Sample Time History Plot Files - The time history solution for the ground resonance model, shown in paragraph 2.4.6, is repeated below. The solution has actually been run three times to generate examples of the three types of time history plot files. These follow the solution. The displacements and velocities have been output in the solution shown and can be compared with the data in the plot files. Note, only data for every other time increment has been written to the plot files and the loads file.

In addition, the time history interface loads have been computed from the saved time history solution state vectors and have been written to a plot file. The loads solution and plot file are also shown.

RUN
MODEL NAME (DATA SET)
LAT
LIST MODEL SUMMARY (Y OR N)
Y

***** MODEL LAT *****

LATERAL GROUND RESONANCE MODEL

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CRR2	1	ROTLAT	NONE	
2	CFM2	1	FUSLAT	NONE	
3	CSF1		LMAIN	NONE	
4	CSF1		RMAIN	NONE	
5	CSF1		TAIL	NONE	
6	CLC1		CGEAR	NONE	

MORE...

GLOBAL VARIABLES

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)
N

DETAILS (Y OR N)
Y

***** COMPONENT DOF/SYSTEM DOF *****

1, 6 2, 7 3, 8 4, 9 5, 10

1 CRR2 ZETA1100 ZETA1200 ZETA1300 ZETA1400 YHUB1000
ALFX1000

MORE...

		(-1)	(-3)	(-2)	(-4)	(-5)	(-6)	(-7)	(-8)
2	CFM2	YCG 1000		ROLL1000					
		(-5)		(-6)					
3	CSF1	X 2000		Y 2000		Z 2000			
		(-8)		(-4)		(-6)			
4	CSF1	X 1000		Y 1000		Z 1000			
		(-8)		(-7)		(-9)			
5	CSF1	X 3000		Y 3000		Z 3000			
		(-8)		(-10)		(-8)			
6	CLC1	YCG 1000		ROLL1000					
		(-5)		(-6)					

SYSTEM DOF

1	ZETA1100	MORE...
2	ZETA1200	
3	ZETA1300	
4	ZETA1400	
5	YCG 1000	
6	ROLL1000	

IMPLICIT COEFFICIENTS

I	COEF	DOF	I	COEF	DOF
1	9.976E-01	YCG 1000	7	1.000E+00	YCG 1000
2	-8.403E+01	*ROLL1000	8	7.576E+01	*ROLL1000
3	9.945E-01	*ROLL1000	9	6.600E+01	*ROLL1000
4	1.000E+00	YCG 1000	10	1.000E+00	YCG 1000
5	7.576E+01	*ROLL1000	11	7.576E+01	*ROLL1000
6	-6.600E+01	*ROLL1000			

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

STH4

MORE...

SAVE CASE FOR LATER EXECUTION (Y OR N)
N

SOLUTION STH4. TIME HISTORY

BEGIN INPUT

TSTA (REAL)
START TIME
(SEC)

ENTER 1 REAL VALUE

?

0

H (REAL)
INITIAL INCREMENT
(SEC)

ENTER 1 REAL VALUE

?

.0096962

HTD (REAL)
SEPARATE INCREMENT
TIME DEP COEFS

ENTER 1 REAL VALUE

?

0

HF (REAL)
SEPARATE INCREMENT
FORCE COMPUTATION

ENTER 1 REAL VALUE

?

0

TEND (REAL)
END TIME
(SEC)

ENTER 1 REAL VALUE

?

.096962

E (REAL)

MORE...

MORE...

ERROR CHECK VALUE
IF 0 THEN CONSTANT INCREMENT USED
ENTER 1 REAL VALUE

?

.0001

IDFL1 (SYSTEM DOFS CHOSEN)

TEST DOF

NAME (A4,I4)

SYSTEM DOFS

1 ZETA1100	2 ZETA1200	3 ZETA1300	4 ZETA1400
5 YCG 1000	6 ROLL1000		

SELECT ONE SYSTEM DOF BY INDEX

1

ICOPT (INTEGER)

INITIAL CONDITION

INPUT TYPE

0=NONE, 1=SINGLE DISPLACEMENT, 2=GENERAL, 3=CONTINUE

ENTER 1 INTEGER VALUE(S)

1

MORE...

VI (REAL)

INITIAL DISPLACEMENT

SINGLE SYSTEM DOF (IN OR RAD)

ENTER 1 REAL VALUE

?

.1

I1DFL1 (SYSTEM DOFS CHOSEN)

DOF NAME

INITIAL CONDITION

SYSTEM DOFS

1 ZETA1100	2 ZETA1200	3 ZETA1300	4 ZETA1400
5 YCG 1000	6 ROLL1000		

SELECT ONE SYSTEM DOF BY INDEX

1

CRT (Y OR N)

OUTPUT THIS TERMINAL

(Y OR N)

ENTER 1 Y OR N VALUE

MORE...

```

Y
-----
PROP      (INTEGER)
PRINT
 1=DISPLACEMENT 2=VELOCITY 3=BOTH
ENTER    1 INTEGER VALUE(S)
3
-----
DOFFPRINT (MODEL DOFS CHOSEN )
  DOFS TO BE PRINTED
SYSTEM DOFS
 1 ZETA1100      2 ZETA1200      3 ZETA1300      4 ZETA1400
 5 YCG 1000      6 ROLL1000

ALL SYSTEM DOFS (Y OR N)
N
SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER      0
1 5 6 0
ANY COMPONENT DOFS (Y OR N)
Y
MORE...
SET OF COMPONENTS
 1 ROTLAT /CRR2
 2 FUSLAT /CFM2
 3 LMAIN  /CSF1
 4 RMAIN  /CSF1
 5 TAIL   /CSF1
 6 CGEAR  /CLC1
SELECT COMPONENTS BY INDICES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER      0
3 0
DOFS FOR COMPONENT LMAIN /CSF1
 1 X  2000  2 Y  2000  3 Z  2000

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)
Y
SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER      0
2 3 0
-----
PLOP      (INTEGER)
PLOT
 0=NONE 1=DISPLACEMENT 2=VELOCITY 3=BOTH
MORE...

```

ENTER 1 INTEGER VALUE(S)
3

JPLT (INTEGER)
INPUT N, EVERY NTH
SOLUTION TO BE WRITTEN TO PLOT FILE
ENTER 1 INTEGER VALUE(S)
2

DOFPLOT (MODEL DOFS CHOSEN)
DOFS TO BE PLOTTED
SYSTEM DOFS
1 ZETA1100 2 ZETA1200 3 ZETA1300 4 ZETA1400
5 YCG 1000 6 ROLL1000
ALL SYSTEM DOFS (Y OR N)
N
SELECT DOFS BY INDEXES . . .
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
1 5 6 0
ANY COMPONENT DOFS (Y OR N)
Y MORE...
SET OF COMPONENTS
1 ROTLAT /CRR2
2 FUSLAT /CFM2
3 LMAIN /CSF1
4 RMAIN /CSF1
5 TAIL /CSF1
6 CGEAR /CLC1
SELECT COMPONENTS BY INDICES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
3 0
DOFS FOR COMPONENT LMAIN /CSF1
1 X 2000 2 Y 2000 3 Z 2000
SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)
Y
SELECT DOFS BY INDEXES
ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
2 3 0

FLDP (Y OR N)
CONDITION CODES MORE...

TO BE OUTPUT (Y OR N)
ENTER 1 Y OR N VALUE
N

ILOP (Y OR N)
SAVE STATE VECTORS
FOR INTERFACE, INTERNAL LOADS CALCULATIONS
ENTER 1 Y OR N VALUE
Y

JIIL (INTEGER)
INPUT I, EVERY ITH
STATE VECTOR TO BE WRITTEN TO LOADS FILE
ENTER 1 INTEGER VALUE(S)
2

SOLUTION INPUT FOR STH4.TIME HISTORY

1 TSTA - START TIME = 0.00000E+00
2 H - INITIAL INCREMENT = 9.69620E-03
3 HTD - SEPARATE INCREMENT = 0.00000E+00
4 HF - SEPARATE INCREMENT = 0.00000E+00

5 TEND - END TIME = 9.69620E-02
6 E - ERROR CHECK VALUE = 1.00000E-04
7 IDFLI - (SYSTEM DOF SELECTED)
TEST DOF = ZETA1100
8 ICOPT - INITIAL CONDITION = 1
9 VI - INITIAL DISPLACEMENT= 1.00000E-01
10 IIDFLI - (SYSTEM DOF SELECTED)
DOF NAME = ZETA1100
11 CRT - OUTPUT THIS TERMINAL= YES
12 PROP - PRINT = 3
13 DOFPRINT - (MODEL DOFS SELECTED) DOFS TO BE PRINTED
SYSTEM DOFS SELECTED
ZETA1100 YCG 1000 ROLL1000
COMPONENT LMAIN /CSF1 DOFS
Y 2000 Z 2000
14 PLOP - PLOT = 3
15 JPLT - INPUT N, EVERY NTH = 2
16 DOFPLOT - (MODEL DOFS SELECTED) DOFS TO BE PLOTTED
SYSTEM DOFS SELECTED
ZETA1100 YCG 1000 ROLL1000
COMPONENT LMAIN /CSF1 DOFS
Y 2000 Z 2000

MORE...

MORE...

17 FLUP = CONDITION CODES = NO
 18 ILOP = SAVE STATE VECTORS = YES
 19 JIIL = INPUT I, EVERY ITL = 2

RE-ENTER (Y OR N)

N

***** SOLUTION STH4 FOR MODEL LAT *****
 MODEL - LATERAL GROUND RESONANCE MODEL
 SOLUTION - TIME HISTORY

TIME HISTORY DISPLACEMENTS AND VELOCITIES

TIME	ZETAL1000	YCG 1000	ROLL1000	Y 2000
0.0000E+00	Z 2000			
0.0000E+00	1.0000E-01	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00			
0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
0.0000E+00	0.0000E+00			
9.6962E-03	9.9431E-02	1.0035E-02	-2.1703E-04	-6.4080E-03
9.6962E-03	1.4324E-02			
9.6962E-03	-1.1591E-01	2.0464E+00	-4.3810E-02	-1.2727E+00
9.6962E-03	2.8915E+00			
1.9392E-02	9.7790E-02	3.8781E-02	-8.1975E-04	-2.3323E-02
1.9392E-02	5.4103E-02			
1.9392E-02	-2.2019E-01	3.8152E+00	-7.8469E-02	-2.1296E+00
1.9392E-02	5.1790E+00			
2.9089E-02	9.5212E-02	8.2355E-02	-1.6911E-03	-4.5763E-02
2.9089E-02	1.1161E-01			
2.9089E-02	-3.0910E-01	5.0723E+00	-9.8517E-02	-2.3914E+00
2.9089E-02	6.5021E+00			
3.8785E-02	9.1841E-02	1.3500E-01	-2.6734E-03	-6.7540E-02
3.8785E-02	1.7645E-01			
3.8785E-02	-3.8427E-01	5.6703E+00	-1.0115E-01	-1.9926E+00
3.8785E-02	6.6758E+00			
4.8481E-02	8.7786E-02	1.9005E-01	-3.5966E-03	-8.2435E-02
4.8481E-02	2.3738E-01			
4.8481E-02	-4.5136E-01	5.5708E+00	-8.6615E-02	-9.9121E-01
4.8481E-02	5.7166E+00			
5.8177E-02	8.3093E-02	2.4099E-01	-4.3075E-03	-8.5342E-02
5.8177E-02	2.8429E-01			
			MORE...	

5.8177E-02	-5.1672E-01 3.8335E+00	4.8449E+00	-5.8083E-02	4.4452E-01
6.7873E-02	7.7759E-02 3.0987E-01	2.8250E-01	-4.6950E-03	-7.3198E-02
6.7873E-02	-5.8388E-01 1.3840E+00	3.6566E+00	-2.0969E-02	2.0680E+00
7.7569E-02	7.1767E-02 3.1072E-01	3.1113E-01	-4.7078E-03	-4.5535E-02
7.7569E-02	-6.5177E-01 -1.1934E+00	2.2296E+00	1.8081E-02	3.5995E+00
8.7265E-02	4.5133E-02 2.8775E-01	3.2575E-01	-4.3598E-03	-4.5525E-03
8.7265E-02	-7.1523E-01 -3.4592E+00	8.0495E-01	5.2412E-02	4.7757E+00
9.6962E-02	5.7932E-02 2.4584E-01	3.2745E-01	-3.7248E-03	4.5261E-02
9.6962E-02	-7.6777E-01 -5.0501E+00	-4.0198E-01	7.6517E-02	5.3949E+00
9.6962E-02	5.7932E-02 2.4583E-01	3.2745E-01	-3.7248E-03	4.5262E-02
9.6962E-02	-7.6777E-01 -5.0501E+00	-4.0200E-01	7.6517E-02	5.3949E+00
			MORE . . .	
9.6962E-02	5.7932E-02 2.4583E-01	3.2745E-01	-3.7248E-03	4.5263E-02
9.6962E-02	-7.6777E-01 -5.0501E+00	-4.0202E-01	7.6517E-02	5.3949E+00

*** TIME HISTORY SOLUTION TERMINATED AT 0.09696 SECONDS ***

SYSTEM STATE VECTOR AT T = 9.69619E-02

DOF	VELOCITY	DISPLACEMENT
-----	----------	--------------

ZETA1100	-7.67767E-01	5.79319E-02
ZETA1200	-4.81731E-02	-2.67860E-04
ZETA1300	1.00143E-01	5.75292E-03
ZETA1400	4.81731E-02	2.67864E-04
YCG 1000	-4.02019E-01	3.27450E-01
ROLL1000	7.65170E-02	-3.72476E-03

COMMAND

LATO PLT1 A

5 ZETA1100 YCG 1000 , ROLL1000 Y 2000 Z 2000

1
7 0.0000E+00 9.6962E-02 3.2745E-01 -8.5342E-02
0.0000E+00 1.0000E-01
0.0000E+00 0.0000E+00
0.0000E+00 0.0000E+00
0.0000E+00 0.0000E+00
0.0000E+00 0.0000E+00
1.9392E-02 9.7790E-02
1.9392E-02 3.8781E-02
1.9392E-02 -8.1975E-04
1.9392E-02 -2.3323E-02
1.9392E-02 5.4103E-02
3.8785E-02 9.1841E-02
3.8785E-02 1.3500E-01
3.8785E-02 -2.6734E-03
3.8785E-02 -6.7540E-02
3.8785E-02 1.7645E-01
5.8177E-02 8.3093E-02

MORE...

5.8177E-02 2.4099E-01
5.8177E-02 -4.3075E-03
5.8177E-02 -8.5342E-02
5.8177E-02 2.8429E-01
7.7569E-02 7.1767E-02
7.7569E-02 3.1113E-01
7.7569E-02 -4.7078E-03
7.7569E-02 -4.5535E-02
7.7569E-02 3.1072E-01
9.6962E-02 5.7932E-02
9.6962E-02 3.2745E-01
9.6962E-02 -3.7248E-03
9.6962E-02 4.5261E-02
9.6962E-02 2.4584E-01
9.6962E-02 5.7932E-02
9.6962E-02 3.2745E-01
9.6962E-02 -3.7248E-03
9.6962E-02 4.5263E-02
9.6962E-02 2.4583E-01

LATV PLT1 A

5 ZETA1100 YCG 1000 ROLL1000 Y 2000 Z 2000

2

7	0.0000E+00	9.6962E-02	6.6758E+00	-5.0501E+00
0.0000E+00	0.0000E+00			
1.9392E-02	-2.2019E-01			
1.9392E-02	3.8152E+00			
1.9392E-02	-7.8469E-02			
1.9392E-02	-2.1296E+00			
1.9392E-02	5.1790E+00			
3.8785E-02	-3.8427E-01			
3.8785E-02	5.6703E+00			
3.8785E-02	-1.0115E-01			
3.8785E-02	-1.9926E+00			
3.8785E-02	6.6758E+00			
5.8177E-02	-5.1672E-01			

MORE . . .

5.8177E-02	4.8449E+00
5.8177E-02	-5.8083E-02
5.8177E-02	4.4452E-01
5.8177E-02	3.8335E+00
7.7569E-02	-6.5177E-01
7.7569E-02	2.2296E+00
7.7569E-02	1.8081E-02
7.7569E-02	3.5995E+00
7.7569E-02	-1.1934E+00
9.6962E-02	-7.6777E-01
9.6962E-02	-4.0198E-01
9.6962E-02	7.6517E-02
9.6962E-02	5.3949E+00
9.6962E-02	-5.0501E+00
9.6962E-02	-7.6777E-01
9.6962E-02	-4.0202E-01
9.6962E-02	7.6517E-02
9.6962E-02	5.3949E+00
9.6962E-02	-5.0501E+00

LATDV PLT1 A

5 ZETA1100 YCG 1000 ROLL1000 Y 2000 Z 2000

3

7 0.0000E+00 9.6962E-02 3.2745E-01 -8.5342E-02
6.6758E+00 -5.0501E+00
0.0000E+00 1.0000E-01
0.0000E+00 0.0000E+00
1.9392E-02 9.7790E-02
1.9392E-02 3.8781E-02
1.9392E-02 -8.1975E-04
1.9392E-02 -2.3323E-02
1.9392E-02 5.4103E-02

MORE...

1.9392E-02 -2.2019E-01
1.9392E-02 3.8152E+00
1.9392E-02 -7.8469E-02
1.9392E-02 -2.1296E+00
1.9392E-02 5.1790E+00
3.8785E-02 9.1841E-02
3.8785E-02 1.3500E-01
3.8785E-02 -2.6734E-03
3.8785E-02 -6.7540E-02
3.8785E-02 1.7645E-01
3.8785E-02 -3.8427E-01
3.8785E-02 5.6703E+00
3.8785E-02 -1.0115E-01
3.8785E-02 -1.9926E+00
3.8785E-02 6.6758E+00
5.8177E-02 8.3093E-02
5.8177E-02 2.4099E-01
5.8177E-02 -4.3075E-03
5.8177E-02 -8.5342E-02
5.8177E-02 2.8429E-01
5.8177E-02 -5.1672E-01
5.8177E-02 4.8449E+00

MORE...

5.8177E-02	-5.8083E-02
5.8177E-02	4.4452E-01
5.8177E-02	3.8335E+00
7.7569E-02	7.1767E-02
7.7569E-02	3.1113E-01
7.7569E-02	-4.7078E-03
7.7569E-02	-4.5535E-02
7.7569E-02	3.1072E-01
7.7569E-02	-6.5177E-01
7.7569E-02	2.2296E+00
7.7569E-02	1.8081E-02
7.7569E-02	3.5995E+00
7.7569E-02	-1.1934E+00
9.6962E-02	5.7932E-02
9.6962E-02	3.2745E-01
9.6962E-02	-3.7248E-03
9.6962E-02	4.5261E-02
9.6962E-02	2.4584E-01
9.6962E-02	-7.6777E-01
9.6962E-02	-4.0198E-01
9.6962E-02	7.6517E-02
9.6962E-02	5.3949E+00

MORE...

9.6962E-02	-5.0501E+00
9.6962E-02	5.7932E-02
9.6962E-02	3.2745E-01
9.6962E-02	-3.7248E-03
9.6962E-02	4.5263E-02
9.6962E-02	2.4583E-01
9.6962E-02	-7.6777E-01
9.6962E-02	-4.0202E-01
9.6962E-02	7.6517E-02
9.6962E-02	5.3949E+00
9.6962E-02	-5.0501E+00

RERUN
RERUNNING MODEL LAT

DETAILS (Y OR N)

N

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

SII3

SAVE CASE FOR LATER EXECUTION (Y OR N)

N

SOLUTION SII3. TIME HISTORY LOADS

BEGIN INPUT

IFL (Y OR N)
INTERFACE LOADS

OPTION

ENTER 1 Y OR N VALUE

MORE...

Y

IFLDF (COMPONENT DOFS)
INTERFACE DOF
SELECT ONLY ONE COMPONENT

SET OF COMPONENTS

- 1 RUTLAT /CRR2
- 2 FUSLAT /CFM2
- 3 LMAIN /CSF1
- 4 RMAIN /CSF1
- 5 TAIL /CSF1
- 6 CGEAR /CLC1

SELECT COMPONENTS BY INDICES

ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
3 0

DOFS FOR COMPONENT LMAIN /CSF1

1 X 2000 2 Y 2000 3 Z 2000

SELECT DOF INDEXES (Y OR N) OR QUIT COMPONENTS (Q)

Y

SELECT DOFs BY INDEXES

MORE...

ENTER UNIQUE INTEGER VALUES - TO TERMINATE ENTER 0
2 3 0

IFLPL (Y OR N)
PLOT INTERFACE LOADS
ENTER 1 Y OR N VALUE
Y

INL (Y OR N)
INTERNAL LOADS
OPTION
ENTER 1 Y OR N VALUE
N

SOLUTION INPUT FOR SII3.TIME HISTORY LOADS

1 IFL - INTERFACE LOADS = YES
2 IFLDF - (COMPONENT DOFS SELECTED) INTERFACE DOF
COMPONENT LMAIN /CSF1 DOFS
Y 2000 Z 2000
3 IFLPL - PLOT INTERFACE LOADS= YES
4 INL - INTERNAL LOADS = NO

MORE...

RE-ENTER (Y OR N)
N

SOLUTION SII3 FOR MODEL LAT *****
MODEL - LATERAL GROUND RESONANCE MODEL
SOLUTION - TIME HISTORY LOADS

WARNING:

SOLUTION NOT VALID IF TEMP EDIT WAS USED WITH TIME
HISTORY RUN OR WITH THIS SOLUTION

SOLUTION NOT VALID IF SEPARATE TIME INCREMENTS
(HTD,HF) HAVE BEEN USED IN TIME HISTORY RUN

TIME HISTORY INTERFACE LOADS FOR LMAIN /CSF1

MORE...

TIME	Y	Z
0.0000E+00	2000	2000
1.9392E-02	0.0000E+00	0.0000E+00
3.8785E-02	-6.9149E+01	3.8757E+02
5.8177E-02	-2.0025E+02	5.8298E+02
7.7569E-02	-2.5302E+02	4.7777E+02
9.6962E-02	-1.3500E+02	1.6329E+02
9.6962E-02	1.3419E+02	-1.4455E+02
9.6962E-02	1.3420E+02	-1.4455E+02

COMMAND

LATL PLT1 A

LMAIN CSF1
2 Y 2000 Z 2000
2
7 0.0000E+00 9.6962E-02 5.8298E+02 -2.5302E+02
0.0000E+00 0.0000E+00
0.0000E+00 0.0000E+00
1.9392E-02 -6.9149E+01
1.9392E-02 3.8757E+02
3.8785E-02 -2.0025E+02
3.8785E-02 5.8298E+02
5.8177E-02 -2.5302E+02
5.8177E-02 4.7777E+02
7.7569E-02 -1.3500E+02
7.7569E-02 1.6329E+02
9.6962E-02 1.3419E+02
9.6962E-02 -1.4455E+02
9.6962E-02 1.3420E+02
9.6962E-02 -1.4455E+02

2.5.2 Frequency Domain Plot Files. Frequency domain plot files can be one of two types:

- a. Real mobilities
- b. Complex mobilities.

The data associated with each of the file types and the FORTRAN format statements used to write the data are shown below.

2.5.2.1 Frequency Domain Plot File Format

Real Mobilities (Type 1)

```
no. of forced dof/dof name 1/dof name 2/ ... /dof name n  
no. of response dof/dof name 1/dof name 2/ ... /dof name n  
[FORMAT(1X,I4,5(2X,A4,I4)/* ,(4X,5(2X,A4,I4)))]
```

```
file type  
[FORMAT(1X,I4)]
```

```
no. of frequency increments/start freq/end freq/max real mobil/min  
real mobil  
[FORMAT(1X,I4,1P4E13.4)]
```

```
freq1/real mobil1[forced dof1, response dof1]
```

```
.
```

```
.
```

```
freq1/real mobil1[forced dof1, response dofn]
```

```
freq1/real mobil1[forced dof2, response dof1]
```

```
.
```

```
.
```

freq₁/real mobil₁[forced dof₂, response dof_n]
.

.

.

freq₁/real mobil₁[forced dof_n, response dof_{1,2,...,n}]
.

.

.

freq_n/real mobil_n[forced dof_{1,2,...,n}, response dof_{1,2,...,n}]

Complex Mobilities (Type 2) -

no. of response dof/dof name 1/dof name 2/ ... /dof name n

no. of forced dof/dof name 1/dof name 2/ ... /dof name n

[FORMAT(1X,I4,5(2X,A4,I4)'''',(4X,5(2X,A4,I4)))]

file type

[FORMAT(1X,I4)]

no. of frequency increments/start freq/end freq/max real mobil/min
real mobil

max imag mobil/min imag mobil

[FORMAT(1X,I4,1P4E13.4/5X,1P2E13.4)]

freq₁/real mobil₁[forced dof₁, response dof₁]
.

.

.

freq₁/real mobil₁[forced dof₁, response dof_n]

freq₁/real mobil₁[forced dof₂, response dof₁]
.

.

.

$\text{freq}_1/\text{real } \text{mobil}_1[\text{forced dof}_2, \text{response dof}_n]$

$\text{freq}_1/\text{real } \text{mobil}_1[\text{forced dof}_n, \text{response dof}_{1,2,\dots,n}]$

$\text{freq}_1/\text{imag } \text{mobil}_1[\text{forced dof}_1, \text{response dof}_n]$

$\text{freq}_1/\text{imag } \text{mobil}_1[\text{forced dof}_2, \text{response dof}_n]$

$\text{freq}_1/\text{imag } \text{mobil}_1[\text{forced dof}_n, \text{response dof}_{1,2,\dots,n}]$

$\text{freq}_n/\text{real } \text{mobil}_n[\text{forced dof}_{1,2,\dots,n}, \text{response dof}_{1,2,\dots,n}]$

2.5.2.2 Sample Frequency Domain Plot Files - The mobilities for the frequency domain solution shown in paragraph 2.4.8 have been written to the plot file shown below.

EXS PLT1 A

2 YCG 1000 ROLL1000
6 YCG 1000 ROLL1000 Y 2000 Z 2000 Y 1000
Z 1000
2
6 1.0000E+01 2.0000E+01 1.6242E-06 -9.5718E-06
1.1302E-07 -1.5194E-07
1.0000E+01 -7.7074E-06
1.0000E+01 -2.4609E-08
1.0000E+01 -9.5718E-06
1.0000E+01 1.6242E-06
1.0000E+01 -9.5718E-06
1.0000E+01 -1.6242E-06
1.0000E+01 -2.4609E-08
1.0000E+01 -1.8976E-09
1.0000E+01 -1.6837E-07
1.0000E+01 1.2524E-07
1.0000E+01 -1.6837E-07
1.0000E+01 -1.2524E-07
1.0000E+01 -2.2208E-08
1.0000E+01 -1.7125E-09

1.0000E+01 -1.5194E-07
1.0000E+01 1.1302E-07
1.0000E+01 -1.5194E-07
1.0000E+01 -1.1302E-07
1.0000E+01 -1.7125E-09
1.0000E+01 -1.3205E-10
1.0000E+01 -1.1716E-08
1.0000E+01 8.7152E-09
1.0000E+01 -1.1716E-08
1.0000E+01 -8.7152E-09
1.2000E+01 -5.2293E-06
1.2000E+01 -1.4897E-08
1.2000E+01 -6.3579E-06
1.2000E+01 9.8323E-07
1.2000E+01 -6.3579E-06
1.2000E+01 -9.8323E-07
1.2000E+01 -1.4897E-08
1.2000E+01 -1.2769E-09
1.2000E+01 -1.1163E-07
1.2000E+01 8.4274E-08
1.2000E+01 -1.1163E-07
1.2000E+01 -8.4274E-08

MORE...

MORE...

1.2000E+01	-9.7497E-09
1.2000E+01	-8.3567E-10
1.2000E+01	-7.3060E-08
1.2000E+01	5.5154E-08
1.2000E+01	-7.3060E-08
1.2000E+01	-5.5154E-08
1.2000E+01	-8.3567E-10
1.2000E+01	-7.1627E-11
1.2000E+01	-6.2621E-09
1.2000E+01	4.7274E-09
1.2000E+01	-6.2621E-09
1.2000E+01	-4.7274E-09
1.4000E+01	-3.7911E-06
1.4000E+01	-1.0042E-08
1.4000E+01	-4.5519E-06
1.4000E+01	6.6275E-07
1.4000E+01	-4.5519E-06
1.4000E+01	-6.6275E-07
1.4000E+01	-1.0042E-08
1.4000E+01	-9.2121E-10
1.4000E+01	-7.9832E-08
1.4000E+01	6.0800E-08

MORE...

1.4000E+01	-7.9832E-08
1.4000E+01	-6.0800E-08
1.4000E+01	-5.1633E-09
1.4000E+01	-4.7368E-10
1.4000E+01	-4.1049E-08
1.4000E+01	3.1263E-08
1.4000E+01	-4.1049E-08
1.4000E+01	-3.1263E-08
1.4000E+01	-4.7368E-10
1.4000E+01	-4.3455E-11
1.4000E+01	-3.7658E-09
1.4000E+01	2.8680E-09
1.4000E+01	-3.7658E-09
1.4000E+01	-2.8680E-09
1.6000E+01	-2.8784E-06
1.6000E+01	-7.2584E-09
1.6000E+01	-3.4283E-06
1.6000E+01	4.7905E-07
1.6000E+01	-3.4283E-06
1.6000E+01	-4.7905E-07
1.6000E+01	-7.2584E-09
1.6000E+01	-6.9724E-10

MORE...

1.6000E+01	-6.0081E-08
1.6000E+01	4.6018E-08
1.6000E+01	-6.0081E-08
1.6000E+01	-4.6018E-08
1.6000E+01	-3.0814E-09
1.6000E+01	-2.9600E-10
1.6000E+01	-2.5506E-08
1.6000E+01	1.9536E-08
1.6000E+01	-2.5506E-08
1.6000E+01	-1.9536E-08
1.6000E+01	-2.9600E-10
1.6000E+01	-2.8434E-11
1.6000E+01	-2.4501E-09
1.6000E+01	1.8766E-09
1.6000E+01	-2.4501E-09
1.6000E+01	-1.8766E-09
1.8000E+01	-2.2615E-06
1.8000E+01	-5.5087E-09
1.8000E+01	-2.6789E-06
1.8000E+01	3.6358E-07
1.8000E+01	-2.6789E-06
1.8000E+01	-3.6358E-07

MORE...

1.8000E+01	-5.5087E-09
1.8000E+01	-5.4665E-10
1.8000E+01	-4.6923E-08
1.8000E+01	3.6079E-08
1.8000E+01	-4.6923E-08
1.8000E+01	-3.6079E-08
1.8000E+01	-1.9960E-09
1.8000E+01	-1.9807E-10
1.8000E+01	-1.7002E-08
1.8000E+01	1.3073E-08
1.8000E+01	-1.7002E-08
1.8000E+01	-1.3073E-08
1.8000E+01	-1.9807E-10
1.8000E+01	-1.9656E-11
1.8000E+01	-1.6872E-09
1.8000E+01	1.2973E-09
1.8000E+01	-1.6872E-09
1.8000E+01	-1.2973E-09
2.0000E+01	-1.8246E-06
2.0000E+01	-4.3335E-09
2.0000E+01	-2.1529E-06
2.0000E+01	2.8601E-07

MORE...

2.0000E+01	-2.1529E-06
2.0000E+01	-2.8601E-07
2.0000E+01	-4.3335E-09
2.0000E+01	-4.4037E-10
2.0000E+01	-3.7696E-08
2.0000E+01	2.9065E-08
2.0000E+01	-3.7696E-08
2.0000E+01	-2.9065E-08
2.0000E+01	-1.3721E-09
2.0000E+01	-1.3943E-10
2.0000E+01	-1.1936E-08
2.0000E+01	9.2027E-09
2.0000E+01	-1.1936E-08
2.0000E+01	-9.2027E-09
2.0000E+01	-1.3943E-10
2.0000E+01	-1.4169E-11
2.0000E+01	-1.2129E-09
2.0000E+01	9.3517E-10
2.0000E+01	-1.2129E-09
2.0000E+01	-9.3517E-10

2.6 MODELING EXAMPLES

2.6.1 PACOSS Tower. The PACOSS (Passive and Active Control of Space Structures) tower is a truss structure built for the Air Force Flight Dynamics Laboratory for the purpose of testing vibration suppression systems being developed for use with large space structures. The structure (Figure 12) is composed of aluminum and plexiglass tubing and is bolted to the floor in an upright position.

The tower is divided into three segments which are identical in geometry, but the middle segment is rotated 90° with respect to the other segments and its vertical members have thicker walls. Modeling strategy was to simulate a tower segment (Figure 13) using a finite element representation of the horizontal and diagonal members and a modal representation of the vertical members, then reduce the complex system to a simple representation with all of the properties of the complex system. This was accomplished by coupling the finite element and modal components and performing an eigenanalysis of the coupled system. A simple 3-D modal representation of the segment was then formulated from the eigensolution. This process was repeated for the middle segment, and the modal representations for all three segments were coupled together. Appropriate boundary conditions were then applied and an eigenanalysis of the complete coupled system was performed.

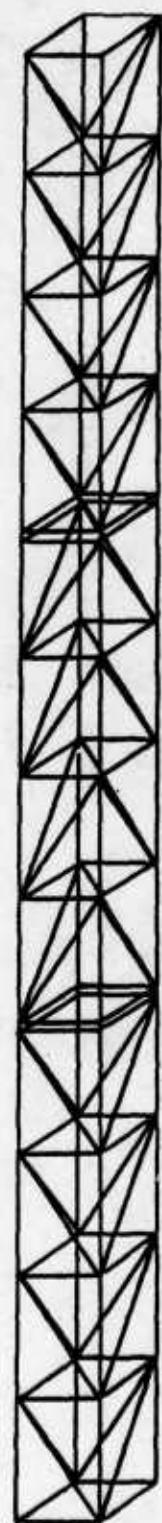


Figure 12. PACOSS Tower.

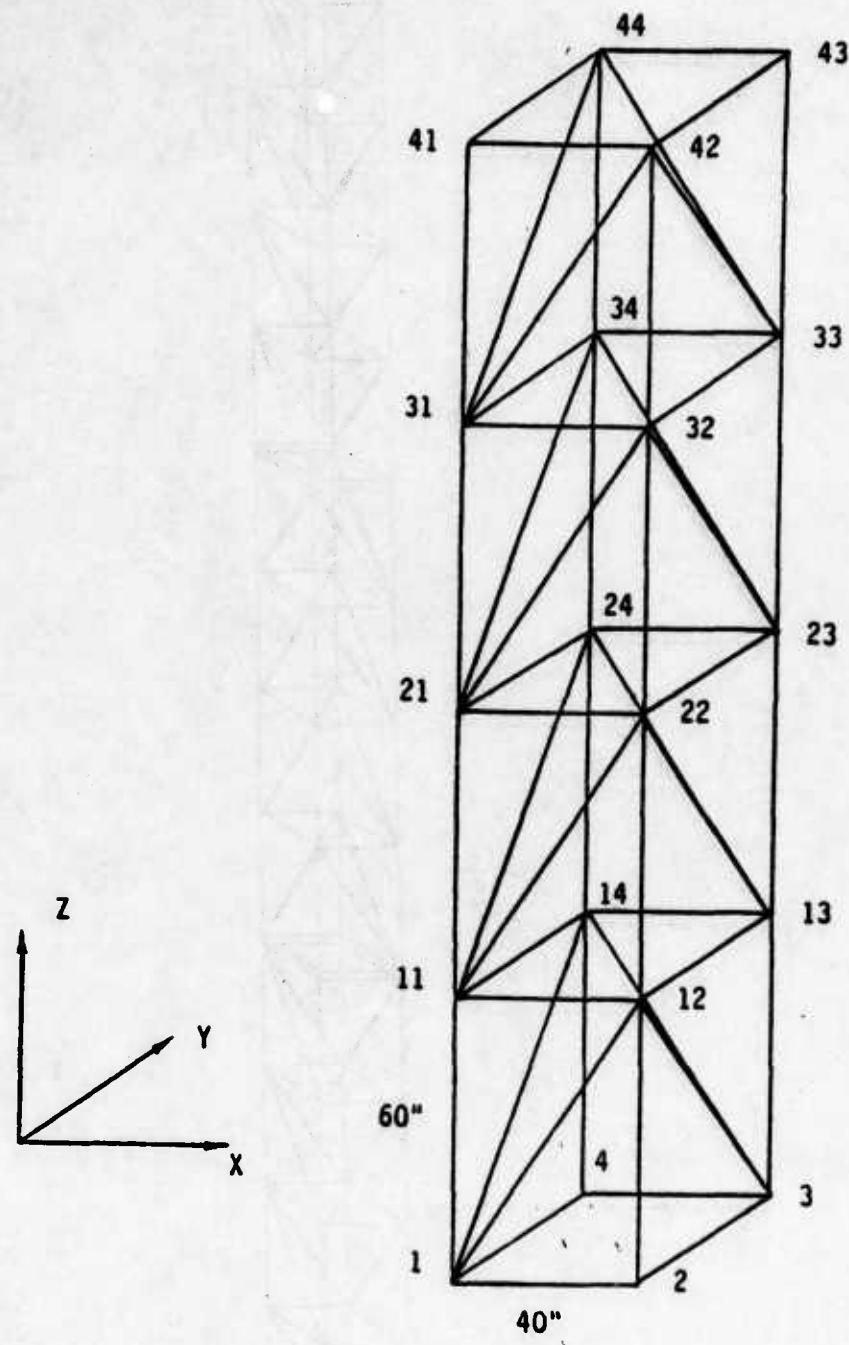


Figure 13. PACOSS Segment 1.

LIST
DATA SET
HORIZ1
DATA MEMBER
CSF1
HORIZ1 /CSF1 ON FILE U1

***** HORIZ1 /CSF1 *****

1.5 DIA PLEXIGLASS TUBE, 1/8 WALL, 40 LONG

***** INPUT FOR COMPONENT CSF1. FINITE ELEMENT *****

1 NCDF - NUMBER OF DOF = 24
2 CDFLI - (DOF) DOF NAMES
XX 11 XX 12 XX 21 XX 22 XX 31
XX 32 YY 12 YY 13 YY 22 YY 23
YY 32 YY 33 XX 13 XX 14 XX 23
XX 24 XX 33 XX 34 YY 11 YY 14
YY 21 YY 24 YY 31 YY 34

MORE...

3 CM - (REAL) MASS MATRIX
NULL MATRIX

4 CC - (REAL) DAMPING MATRIX
NULL MATRIX

5 CK - (REAL) STIFFNESS MATRIX
SYMMETRIC MATRIX (LOWER TRIANGLE PRINTED)

ROW	1			
	7.26700E+03			
ROW	2			
	-7.26700E+03	7.26700E+03		
ROW	3			
	0.00000E+00	0.00000E+00	7.26700E+03	
ROW	4			
	0.00000E+00	0.00000E+00	-7.26700E+03	7.26700E+03
ROW	5			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ROW	6			
	7.26700E+03			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MORE...

ROW	-7.26700E+03	7.26700E+03		
	7			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	7.26700E+03	
ROW	8			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-7.26700E+03	7.26700E+03
ROW	9			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	7.26700E+03			
ROW	10			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-7.26700E+03	7.26700E+03		
ROW	11			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	7.26700E+03	
ROW	12			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
			MORE...	
ROW	13			
	0.00000E+00	0.00000E+00	-7.26700E+03	7.26700E+03
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	7.26700E+03			
ROW	14			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-7.26700E+03	7.26700E+03		
ROW	15			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	7.26700E+03	
ROW	16			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-7.26700E+03	7.26700E+03
ROW	17			

MORE...

ROW 24
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 -7.26700E+03 7.26700E+03

6 CF - (REAL) FORCE VECTOR
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

LIST COMPLETE
COMMAND

LIST
DATA SET
HORIZZ
DATA MEMBER
CSF1
HORIZZ /CSF1 ON FILE U1

* ***** HORIZZ /CSF1 *****

1.5 X 1.5 ALUMINUM TUBE, 1/8 WALL, 40 LONG

***** INPUT FOR COMPONENT CSF1. FINITE ELEMENT *****

1 NCDF - NUMBER OF DOF = 16
2 CDFLI - (DOF) DOF NAMES
XX 1 XX 2 XX 41 XX 42 YY 2
YY 3 YY 42 YY 43 XX 3 XX 4
XX 43 XX 44 YY 1 YY 4 YY 41
YY 44

3 CM - (REAL) MASS MATRIX

MORE...

NULL MATRIX

4 CC - (REAL) DAMPING MATRIX
NULL MATRIX

5 CK - (REAL) STIFFNESS MATRIX
SYMMETRIC MATRIX (LOWER TRIANGLE PRINTED)

ROW	1			
	1.77031E+05			
ROW	2			
	-1.77031E+05	1.77031E+05		
ROW	3			
	0.00000E+00	0.00000E+00	1.77031E+05	
ROW	4			
	0.00000E+00	0.00000E+00	-1.77031E+05	1.77031E+05
ROW	5			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ROW	6			
	1.77031E+05			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-1.77031E+05	1.77031E+05		

MORE...

ROW	7			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	1.77031E+05	
ROW	8			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-1.77031E+05	1.77031E+05
ROW	9			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.77031E+05			
ROW	10			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-1.77031E+05	1.77031E+05		
ROW	11			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	1.77031E+05	
ROW	12			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-1.77031E+05	1.77031E+05
				MORE...
ROW	13			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.77031E+05			
ROW	14			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-1.77031E+05	1.77031E+05		
ROW	15			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	1.77031E+05	
ROW	16			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-1.77031E+05	1.77031E+05
6 CF	- (REAL) FORCE VECTOR			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
				MORE...

0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

LIST COMPLETE
COMMAND

LIST
DATA SET
DIAG
DATA MEMBER
CSF1
DIAG /CSF1 ON FILE U1

***** DIAG /CSF1 *****

1.5 DIA PLEXIGLASS TUBE, 1/8 WALL, 72 LONG

***** INPUT FOR COMPONENT CSF1. FINITE ELEMENT *****

1 NCDF - NUMBER OF DOF = 32
2 CDFLI - (DOF) DOF NAMES
XZ 1 XZ 12 XZ 11 XZ 22 XZ 21
XZ 32 XZ 31 XZ 42 YZ 3 YZ 12
YZ 13 YZ 22 YZ 23 YZ 32 YZ 33
YZ 42 XZ 3 XZ 14 XZ 13 XZ 24
XZ 23 XZ 34 XZ 33 XZ 44 YZ 1
MORE...

YZ 14 YZ 11 YZ 24 YZ 21 YZ 34
YZ 31 YZ 44

3 CM - (REAL) MASS MATRIX
NULL MATRIX

4 CC - (REAL) DAMPING MATRIX
NULL MATRIX

5 CK - (REAL) STIFFNESS MATRIX
SYMMETRIC MATRIX (LOWER TRIANGLE PRINTED)

ROW 1
4.03100E+03
ROW 2
-4.03100E+03 4.03100E+03
ROW 3
0.00000E+00 0.00000E+00 4.03100E+03
ROW 4
0.00000E+00 0.00000E+00 -4.03100E+03 4.03100E+03
ROW 5
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
4.03100E+03

MORE...

ROW	6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-4.03100E+03	4.03100E+03		
ROW	7			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	4.03100E+03	
ROW	8			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-4.03100E+03	4.03100E+03
ROW	9			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	4.03100E+03			
ROW	10			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-4.03100E+03	4.03100E+03		
ROW	11			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	4.03100E+03	
ROW	12			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	4.03100E+03	
			MORE...	
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-4.03100E+03	4.03100E+03
ROW	13			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	4.03100E+03			
ROW	14			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-4.03100E+03	4.03100E+03		
ROW	15			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	4.03100E+03	
ROW	16			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MORE...

ROW	17	0.00000E+00	0.00000E+00	-4.03100E+03	4.03100E+03
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		4.03100E+03			
ROW	18	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		-4.03100E+03	4.03100E+03		
ROW	19	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	4.03100E+03	
ROW	20	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	MORE...	
ROW	21	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	-4.03100E+03	4.03100E+03
ROW	22	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		4.03100E+03			
ROW	23	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		-4.03100E+03	4.03100E+03		
					MORE...


```

0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

```

BOM 30

四

MORE...

0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 4.03100E+03

ROW

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	-4.03100E+03	4.03100E+03

6 CF

- (REAL) FORCE VECTOR

[View Details](#) | [Edit](#) | [Delete](#)

MORE . . .

LIST COMPLETE COMMAND

LIST
DATA SET
DIAG1
DATA MEMBER
CLC1
DIAG1 /CLC1 ON FILE U1

***** DIAG1 /CLC1 *****

COUPLE DIAGONAL AND HORIZONTAL MEMBERS - XZ

***** INPUT FOR COMPONENT CLC1. LINEAR CONSTRAINTS *****

1 NCDF - NUMBER OF DOF = 16

2 CDFLI - (DOF) DOF NAMES

XX	1	XX	12	XX	11	XX	22	XX	21
XX	32	XX	31	XX	42	XX	3	XX	14
XX	13	XX	24	XX	23	XX	34	XX	33
XX	44								

3 NCIDF - # OF CONSTRAINT EQNS= 16

MORE...

4 CIDFLI - (DOF) IMPLICIT DOF NAMES

XZ	1	XZ	12	XZ	11	XZ	22	XZ	21
XZ	32	XZ	31	XZ	42	XZ	3	XZ	14
XZ	13	XZ	24	XZ	23	XZ	34	XZ	33
XZ	44								

5 COEF - (REAL) COEFFICIENT MATRIX

DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)

5.54700E-01	5.54700E-01	5.54700E-01	5.54700E-01	5.54700E-01
5.54700E-01	5.54700E-01	5.54700E-01	-5.54700E-01	-5.54700E-01
-5.54700E-01	-5.54700E-01	-5.54700E-01	-5.54700E-01	-5.54700E-01
-5.54700E-01				

LIST COMPLETE
COMMAND

LIST
DATA SET
DIAG2
DATA MEMBER
CLC1
DIAG2 /CLC1 ON FILE U1

***** DIAG2 /CLC1 *****

COUPLE DIAGONAL AND HORIZONTAL MEMBERS - YZ

***** INPUT FOR COMPONENT CLC1. LINEAR CONSTRAINTS *****

1 NCDF - NUMBER OF DOF = 16
2 CDFLI - (DOF) DOF NAMES

YY	3	YY	12	YY	13	YY	22	YY	23
YY	32	YY	33	YY	42	YY	1	YY	14
YY	11	YY	24	YY	21	YY	34	YY	31
YY	44								

3 NCIDF - # OF CONSTRAINT EQNS= 16

MORE...

4 CIDFLI - (DOF) IMPLICIT DOF NAMES

YZ	3	YZ	12	YZ	13	YZ	22	YZ	23
YZ	32	YZ	33	YZ	42	YZ	1	YZ	14
YZ	11	YZ	24	YZ	21	YZ	34	YZ	31
YZ	44								

5 COEF - (REAL) COEFFICIENT MATRIX

DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)

-5.54700E-01	-5.54700E-01	-5.54700E-01	-5.54700E-01	-5.54700E-01
-5.54700E-01	-5.54700E-01	-5.54700E-01	5.54700E-01	5.54700E-01
5.54700E-01	5.54700E-01	5.54700E-01	5.54700E-01	5.54700E-01
5.54700E-01				

LIST COMPLETE
COMMAND

RUN
MODEL NAME (DATA SET)
HORIZ
LIST MODEL SUMMARY (Y OR N)
Y

***** MODEL HORIZ *****

COUPLED DIAGONAL AND HORIZONTAL MEMBERS

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CSF1		HORIZ1	NONE	
2	CSF1		HORIZ2	NONE	
3	CSF1		DIAG	NONE	
4	CLC1		DIAG1	NONE	
5	CLC1		DIAG2	NONE	

MORE...

GLOBAL VARIABLES

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

DETAILS (Y OR N)

Y

COMPONENT DOF/SYSTEM DOF

1, 6	2, 7	3, 8	4, 9	5, 10
------	------	------	------	-------

1	CSF1	XX	11	XX	12	XX	21	XX	22	XX	31
		XX	32	YY	12	YY	13	YY	22	YY	23
		YY	32	YY	33	XX	13	XX	14	XX	23

MORE...

		XX	24	XX	33	XX	34	YY	11	YY	14
		YY	21	YY	24	YY	31	YY	34		
		(	1)	(	2)	(	3)	(	4)	(	5)
		(	6)	(	7)	(	8)	(	9)	(	10)
		(	11)	(	12)	(	13)	(	14)	(	15)
		(	16)	(	17)	(	18)	(	19)	(	20)
		(	21)	(	22)	(	23)	(	24)		
2	CSF1	XX	1	XX	2	XX	41	XX	42	YY	2
		YY	3	YY	42	YY	43	XX	3	XX	4
		XX	43	XX	44	YY	1	YY	4	YY	41
		YY	44			(	25)	(	26)	(	27)
						(	27)	(	28)	(	29)
						(	30)	(	31)	(	32)
						(	32)	(	33)	(	34)
						(	35)	(	36)	(	37)
						(	37)	(	38)	(	39)
						(	38)				
3	CSF1	XZ	1	XZ	12	XZ	11	XZ	22	XZ	21
		XZ	32	XZ	31	XZ	42	YZ	3	YZ	12
		YZ	13	YZ	22	YZ	23	YZ	32	YZ	33
		YZ	42	XZ	3	XZ	14	XZ	13	XZ	24
		XZ	23	XZ	34	XZ	33	XZ	44	YZ	1
										MORE...	
		YZ	14	YZ	11	YZ	24	YZ	21	YZ	34
		YZ	31	YZ	44						
		(	-1)	(	-2)	(	-3)	(	-4)	(	-5)
		(	-6)	(	-7)	(	-8)	(	-9)	(	-10)
		(	-11)	(	-12)	(	-13)	(	-14)	(	-15)
		(	-16)	(	-17)	(	-18)	(	-19)	(	-20)
		(	-21)	(	-22)	(	-23)	(	-24)	(	-25)
		(	-26)	(	-27)	(	-28)	(	-29)	(	-30)
		(	-31)	(	-32)						
4	CLC1	XX	1	XX	12	XX	11	XX	22	XX	21
		XX	32	XX	31	XX	42	XX	3	XX	14
		XX	13	XX	24	XX	23	XX	34	XX	33
		XX	44								
		(	25)	(	2)	(	1)	(	4)	(	3)
		(	6)	(	5)	(	28)	(	33)	(	14)
		(	13)	(	16)	(	15)	(	18)	(	17)
		(	36)								
5	CLC1	YY	3	YY	12	YY	13	YY	22	YY	23
		YY	32	YY	33	YY	42	YY	1	YY	14
		YY	11	YY	24	YY	21	YY	34	YY	31
										MORE...	

YY	44				
(30)	(7)	(8)	(9)	(10)	
(11)	(12)	(31)	(37)	(20)	
(19)	(22)	(21)	(24)	(23)	
(40)					

SYSTEM DOF

1	XX	11
2	XX	12
3	XX	21
4	XX	22
5	XX	31
6	XX	32
7	YY	12
8	YY	13
9	YY	22
10	YY	23
11	YY	32
12	YY	33
13	XX	13
14	XX	14
15	XX	23
16	XX	24
17	XX	33
18	XX	34
19	YY	11
20	YY	14
21	YY	21
22	YY	24
23	YY	31
24	YY	34
25	XX	1
26	XX	2
27	XX	41
28	XX	42
29	YY	2
30	YY	3
31	YY	42
32	YY	43
33	XX	3
34	XX	4
35	XX	43

MORE...

MORE...

36	XX	44
37	YY	1
38	YY	4
39	YY	41
40	YY	44

IMPLICIT COEFFICIENTS

I	COEF	DOF	I	COEF	DOF
1	5.547E-01	*XX	1	-5.547E-01	*XX
2	5.547E-01	*XX	12	-5.547E-01	*XX
3	5.547E-01	*XX	11	-5.547E-01	*XX
4	5.547E-01	*XX	22	-5.547E-01	*XX
5	5.547E-01	*XX	21	-5.547E-01	*XX
6	5.547E-01	*XX	32	-5.547E-01	*XX
7	5.547E-01	*XX	31	-5.547E-01	*XX
8	5.547E-01	*XX	42	-5.547E-01	*XX
9	-5.547E-01	*YY	3	5.547E-01	*YY
10	-5.547E-01	*YY	12	5.547E-01	*YY
11	-5.547E-01	*YY	13	5.547E-01	*YY
					MORE...
12	-5.547E-01	*YY	22	5.547E-01	*YY
13	-5.547E-01	*YY	23	5.547E-01	*YY
14	-5.547E-01	*YY	32	5.547E-01	*YY
15	-5.547E-01	*YY	33	5.547E-01	*YY
16	-5.547E-01	*YY	42	5.547E-01	*YY

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

N

COMMAND

LIST
DATA SET
HORIZ
DATA MEMBER
CSF1
HORIZ /CSF1 ON FILE U1

***** HORIZ /CSF1 *****

COUPLED DIAGONAL AND HORIZONTAL MEMBERS

***** INPUT FOR COMPONENT CSF1. FINITE ELEMENT *****

1 NCDF - NUMBER OF DOF = 40
2 CDFLI - (DOF) DOF NAMES

XX	11	XX	12	XX	21	XX	22	XX	31
XX	32	YY	12	YY	13	YY	22	YY	23
YY	32	YY	33	XX	13	XX	14	XX	23
XX	24	XX	33	XX	34	YY	11	YY	14
YY	21	YY	24	YY	31	YY	34	XX	1

MORE...

XX	2	XX	41	XX	42	YY	2	YY	3
YY	42	YY	43	XX	3	XX	4	XX	43
XX	44	YY	1	YY	4	YY	41	YY	44

3 CM - (REAL) MASS MATRIX
NULL MATRIX

4 CC - (REAL) DAMPING MATRIX
NULL MATRIX

5 CK - (REAL) STIFFNESS MATRIX
SYMMETRIC MATRIX (LOWER TRIANGLE PRINTED)

ROW	1			
	8.50730E+03			
ROW	2			
	-7.26700E+03	8.50730E+03		
ROW	3			
	0.00000E+00	0.00000E+00	8.50730E+03	
ROW	4			
	-1.24031E+03	0.00000E+00	-7.26700E+03	8.50730E+03
ROW	5			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MORE...

ROW	8.50730E+03			
	6			
	0.00000E+00	0.00000E+00	-1.24031E+03	0.00000E+00
	-7.26700E+03	8.50730E+03		
ROW	7			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	8.50730E+03	
ROW	8			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-7.26700E+03	8.50730E+03
ROW	9			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	-1.24031E+03
	8.50730E+03			
ROW	10			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-7.26700E+03	8.50730E+03		
ROW	11			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	-1.24031E+03	8.50730E+03	
	MORE...			
ROW	12			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-7.26700E+03	8.50730E+03
ROW	13			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	8.50730E+03			
ROW	14			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-7.26700E+03	8.50730E+03		
ROW	15			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	8.50730E+03	
ROW	16			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MORE...

	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ROW	-1.24031E+03	0.00000E+00	-7.26700E+03	8.50730E+03
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ROW	17	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	8.50730E+03			
ROW	18	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-1.24031E+03	0.00000E+00
	-7.26700E+03	8.50730E+03		
ROW	19	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	8.50730E+03	
ROW	20	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-7.26700E+03	8.50730E+03
ROW	21	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	8.50730E+03			
ROW	22	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-1.24031E+03	0.00000E+00
	-7.26700E+03	8.50730E+03		
ROW	23	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MORE...

MORE...

	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	8.50730E+03	
ROW 24				
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-1.24031E+03	0.00000E+00	-7.26700E+03	8.50730E+03
ROW 25				
	0.00000E+00	-1.24031E+03	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.78271E+05			
ROW 26				
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
				MORE...
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-1.77031E+05	1.77031E+05		
ROW 27				
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	1.77031E+05	
ROW 28				
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-1.24031E+03	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-1.77031E+05	1.78271E+05
ROW 29				
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
				MORE...

MORE . . .

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
-1.77031E+05	1.77031E+05		

ROW 39

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	1.77031E+05

ROW 40

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MORE...

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	-1.24031E+03	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	-1.77031E+05	1.78271E+05

6 CF

- (REAL) FORCE VECTOR

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MORE...

LIST COMPLETE
COMMAND

LIST
DATA SET
VERT
DATA MEMBER
CFM2
VERT /CFM2 ON FILE U1

***** VERT /CFM2 *****

1.5 X 1.5 ALUMINUM TUBE, 1/8 WALL, 240 LONG

***** INPUT FOR STRUCTURAL COMPONENT CFM2. MODAL FUSELAGE *****

1 RBM	- RIGID BODY MODES	=	YES	
2 IXCG	- LONGITUDINAL	=	NO	
3 IYCG	- LATERAL	=	YES	
4 IZCG	- VERTICAL	=	YES	
5 IROLL	- ROLL	=	NO	
6 IPTCH	- PITCH	=	YES	
7 IYAW	- YAW	=	YES	
MORE...				
8 CG	- CG STATION (IN)	=	1.20000E+02	
9 NMODE	- NO. OF ELASTIC MODES	=	6	
10 NS	- NO. FUSELAGE STAS	=	5	
11 X	- (REAL) INPUT STATION VALUES			
	0.00000E+00	6.00000E+01	1.20000E+02	1.80000E+02
	2.40000E+02			
12 VC1	- MODE1 VERTICAL COMP	=	YES	
13 Z1	- (REAL) MODE1 VERTICAL DISP			
	2.00000E+00	-1.98400E-01	-1.21560E+00	-1.98400E-01
	2.00000E+00			
14 ZP1	- (REAL) MODE1 VERTICAL SLOPE			
	-3.87270E-02	0.00000E+00	0.00000E+00	0.00000E+00
	3.87270E-02			
15 LC1	- MODE1 LATERAL COMP	=	NO	
16 TC1	- MODE1 TORSION COMP	=	NO	
17 VC2	- MODE2 VERTICAL COMP	=	YES	
18 Z2	- (REAL) MODE2 VERTICAL DISP			
	2.00000E+00	-1.16940E+00	0.00000E+00	1.16940E+00
	-2.00000E+00			
19 ZP2	- (REAL) MODE2 VERTICAL SLOPE			
	-6.54940E-02	0.00000E+00	0.00000E+00	0.00000E+00
	-6.54940E-02			

MORE...

20 LC2	- MODE2 LATERAL COMP =	NO
21 TC2	- MODE2 TORSION COMP =	NO
22 VC3	- MODE3 VERTICAL COMP =	YES
23 Z3	- (REAL) MODE3 VERTICAL DISP 2.00000E+00 -1.24220E+00 1.42240E+00 -1.24220E+00 2.00000E+00	
24 ZP3	- (REAL) MODE3 VERTICAL SLOPE -9.16270E-02 0.00000E+00 0.00000E+00 0.00000E+00 9.16270E-02	
25 LC3	- MODE3 LATERAL COMP =	NO
26 TC3	- MODE3 TORSION COMP =	NO
27 VC4	- MODE4 VERTICAL COMP =	NO
28 LC4	- MODE4 LATERAL COMP =	YES
29 Y4	- (REAL) MODE4 LATERAL DISP 2.00000E+00 -1.98400E-01 -1.21560E+00 -1.98400E-01 2.00000E+00	
30 YP4	- (REAL) MODE4 LATERAL SLOPE -3.87270E-02 0.00000E+00 0.00000E+00 0.00000E+00 3.87270E-02	
31 TC4	- MODE4 TORSION COMP =	NO
32 VC5	- MODE5 VERTICAL COMP =	NO
33 LC5	- MODE5 LATERAL COMP =	YES
34 Y5	- (REAL) MODE5 LATERAL DISP 2.00000E+00 -1.16940E+00 0.00000E+00 1.16940E+00 -2.00000E+00	
35 YP5	- (REAL) MODE5 LATERAL SLOPE -6.54940E-02 0.00000E+00 0.00000E+00 0.00000E+00 -6.54940E-02	
36 TC5	- MODE5 TORSION COMP =	NO
37 VC6	- MODE6 VERTICAL COMP =	NO
38 LC6	- MODE6 LATERAL COMP =	YES
39 Y6	- (REAL) MODE6 LATERAL DISP 2.00000E+00 -1.24220E+00 1.42240E+00 -1.24220E+00 2.00000E+00	
40 YP6	- (REAL) MODE6 LATERAL SLOPE -9.16270E-02 0.00000E+00 0.00000E+00 0.00000E+00 9.16270E-02	
41 TC6	- MODE6 TORSION COMP =	NO
42 NR	- NO. OF ROTORS =	0
43 NI	- NO. OTHER IMPLCT DOF =	0
44 MASSL	- FUSELAGE MASS (LB) = 1.58430E+01	
45 IMYF	- PITCH MOI ABOUT CG = 1.64010E+01	
46 IMZF	- YAW MOI ABOUT CG = 1.64010E+01	
47 MMS	- (REAL) MODAL MASS (SLUGS)	

MORE...

MORE...

48 MD 4.92030E-01 4.92030E-01 4.92030E-01 4.92030E-01
4.92030E-01 4.92030E-01 - (REAL) MODAL DAMPING (PCT)
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00
49 FREQ - (REAL) MODAL FREQUENCY (HZ)
7.09000E+00 1.95500E+01 3.83300E+01 7.09000E+00
1.95500E+01 3.83300E+01

LIST COMPLETE
COMMAND

LIST
 DATA SET
 VERT
 DATA MEMBER
 CFM2
 VERT /CFM2 ON FILE U1

***** VERT /CFM2 *****

1.5 X 1.5 ALUMINUM TUBE, 3/16 WALL, 240 LONG

***** INPUT FOR STRUCTURAL COMPONENT CFM2. MODAL FUSELAGE *****

1 RBM	- RIGID BODY MODES	=	YES	
2 IXCG	- LONGITUDINAL	=	NO	
3 IYCG	- LATERAL	=	YES	
4 IZCG	- VERTICAL	=	YES	
5 IROLL	- ROLL	=	NO	
6 IPTCH	- PITCH	=	YES	
7 IYAW	- YAW	=	YES	
			MORE...	
8 CG	- CG STATION (IN)	=	1.20000E+02	
9 NMODE	- NO. OF ELASTIC MODES	=	6	
10 NS	- NO. FUSELAGE STAS	=	5	
11 X	- (REAL) INPUT STATION VALUES			
	0.00000E+00	6.00000E+01	1.20000E+02	1.80000E+02
	2.40000E+02			
12 VC1	- MODE1 VERTICAL COMP	=	YES	
13 Z1	- (REAL) MODE1 VERTICAL DISP			
	2.00000E+00	-1.98400E-01	-1.21560E+00	-1.98400E-01
	2.00000E+00			
14 ZP1	- (REAL) MODE1 VERTICAL SLOPE			
	-3.87270E-02	0.00000E+00	0.00000E+00	0.00000E+00
	3.87270E-02			
15 LC1	- MODE1 LATERAL COMP	=	NO	
16 TC1	- MODE1 TORSION COMP	=	NO	
17 VC2	- MODE2 VERTICAL COMP	=	YES	
18 Z2	- (REAL) MODE2 VERTICAL DISP			
	2.00000E+00	-1.16940E+00	0.00000E+00	1.16940E+00
	-2.00000E+00			
19 ZP2	- (REAL) MODE2 VERTICAL SLOPE			
	-6.54940E-02	0.00000E+00	0.00000E+00	0.00000E+00
	-6.54940E-02			

MORE...

20	LC2	- MODE2 LATERAL COMP =	NO
21	TC2	- MODE2 TORSION COMP =	NO
22	VC3	- MODE3 VERTICAL COMP =	YES
23	Z3	- (REAL) MODE3 VERTICAL DISP 2.00000E+00 -1.24220E+00 1.42240E+00 -1.24220E+00 2.00000E+00	
24	ZP3	- (REAL) MODE3 VERTICAL SLOPE -9.16270E-02 0.00000E+00 0.00000E+00 0.00000E+00 9.16270E-02	
25	LC3	- MODE3 LATERAL COMP =	NO
26	TC3	- MODE3 TORSION COMP =	NO
27	VC4	- MODE4 VERTICAL COMP =	NO
28	LC4	- MODE4 LATERAL COMP =	YES
29	Y4	- (REAL) MODE4 LATERAL DISP 2.00000E+00 -1.98400E-01 -1.21560E+00 -1.98400E-01 2.00000E+00	
30	YP4	- (REAL) MODE4 LATERAL SLOPE -3.87270E-02 0.00000E+00 0.00000E+00 0.00000E+00 3.87270E-02	
31	TC4	- MODE4 TORSION COMP =	NO
32	VC5	- MODE5 VERTICAL COMP =	NO
33	LC5	- MODE5 LATERAL COMP =	YES
			MORE...
34	Y5	- (REAL) MODE5 LATERAL DISP 2.00000E+00 -1.16940E+00 0.00000E+00 1.16940E+00 -2.00000E+00	
35	YP5	- (REAL) MODE5 LATERAL SLOPE -6.54940E-02 0.00000E+00 0.00000E+00 0.00000E+00 -6.54940E-02	
36	TC5	- MODE5 TORSION COMP =	NO
37	VC6	- MODE6 VERTICAL COMP =	NO
38	LC6	- MODE6 LATERAL COMP =	YES
39	Y6	- (REAL) MODE6 LATERAL DISP 2.00000E+00 -1.24220E+00 1.42240E+00 -1.24220E+00 2.00000E+00	
40	YP6	- (REAL) MODE6 LATERAL SLOPE -9.16270E-02 0.00000E+00 0.00000E+00 0.00000E+00 9.16270E-02	
41	TC6	- MODE6 TORSION COMP =	NO
42	NR	- NO. OF ROTORS =	0
43	NI	- NO. OTHER IMPLCT DOF=	0
44	MASSL	- FUSELAGE MASS (LB) =	2.26850E+01
45	IMYF	- PITCH MOI ABOUT CG =	2.34840E+01
46	IMZF	- YAW MOI ABOUT CG =	2.34840E+01
47	MMS	- (REAL) MODAL MASS (SLUGS)	

MORE...

7.04510E-01 7.04510E-01 7.04510E-01 7.04510E-01
7.04510E-01 7.04510E-01
48 MD - (REAL) MODAL DAMPING (PCT)
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00
49 FREQ - (REAL) MODAL FREQUENCY (HZ)
6.81000E+00 1.87800E+01 3.68100E+01 6.81000E+00
1.87800E+01 3.68100E+01

LIST COMPLETE
COMMAND

LIST
DATA SET
VERT1
DATA MEMBER
CLC2
VERT1 /CLC2 ON FILE U1

***** VERT1 /CLC2 *****

COUPLE VERTICAL AND HORIZONTAL MEMBERS

***** INPUT FOR COMPONENT CLC2. LINEAR CONSTRAINTS *****

1 NCDF - NUMBER OF DOF = 20
2 CDFLI - (DOF) DOF NAMES
XX 1 XX 11 XX 21 XX 31 XX 41
YY 1 YY 11 YY 21 YY 31 YY 41
YCG 1000 ZCG 1000 PTCH1000 YAW 1000 QFUS1100
QFUS1200 QFUS1300 QFUS1400 QFUS1500 QFUS1600

3 NCIDF - NO OF CONSTRAINT EQS= 10

MORE...

4 COEF - (REAL) COEFFICIENT MATRIX
GENERAL MATRIX

ROW 1
-1.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 1.00000E+00
-1.20000E+02 0.00000E+00 2.00000E+00 -2.00000E+00
2.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

ROW 2
0.00000E+00 -1.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 1.00000E+00
-6.00000E+01 0.00000E+00 -1.98400E-01 1.16940E+00
-1.24220E+00 0.00000E+00 0.00000E+00 0.00000E+00

ROW 3
0.00000E+00 0.00000E+00 -1.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 1.00000E+00
0.00000E+00 0.00000E+00 -1.21560E+00 0.00000E+00
1.42240E+00 0.00000E+00 0.00000E+00 0.00000E+00

ROW 4
MORE...

	0.00000E+00	0.00000E+00	0.00000E+00	-1.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E+00
	6.00000E+01	0.00000E+00	-1.98400E-01	-1.16940E+00
ROW 5	-1.24220E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E+00
	1.20000E+02	0.00000E+00	2.00000E+00	2.00000E+00
ROW 6	2.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	-1.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	1.00000E+00	0.00000E+00
	0.00000E+00	1.20000E+02	0.00000E+00	0.00000E+00
ROW 7	0.00000E+00	2.00000E+00	-2.00000E+00	2.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	-1.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	1.00000E+00	0.00000E+00
	0.00000E+00	6.00000E+01	0.00000E+00	0.00000E+00
ROW 8	0.00000E+00	-1.98400E-01	1.16940E+00	-1.24220E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	-1.00000E+00
	0.00000E+00	0.00000E+00	1.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
ROW 9	0.00000E+00	-1.21560E+00	0.00000E+00	1.42240E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	-1.00000E+00	0.00000E+00	1.00000E+00	0.00000E+00
	0.00000E+00	-6.00000E+01	0.00000E+00	0.00000E+00
ROW 10	0.00000E+00	-1.98400E-01	-1.16940E+00	-1.24220E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	-1.00000E+00	1.00000E+00	0.00000E+00
	0.00000E+00	-1.20000E+02	0.00000E+00	0.00000E+00
	0.00000E+00	2.00000E+00	2.00000E+00	2.00000E+00
5 NIDOF	- NO OF IMPLICIT DOF =	10		
6 INDEX	- IMPLICIT DOF INDICES	11	12	13
			14	15
				MORE...

16

17

18

19

20

LIST COMPLETE
COMMAND

LIST
DATA SET
VERT2
DATA MEMBER
CLC2
VERT2 /CLC2 ON FILE U1

***** VERT2 /CLC2 *****

COUPLE VERTICAL AND HORIZONTAL MEMBERS

***** INPUT FOR COMPONENT CLC2. LINEAR CONSTRAINTS *****

1 NCDF	- NUMBER OF DOF	=	20
2 CDFLI	- (DOF) DOF NAMES		
	XX 2 XX 12 XX 22 XX 32 XX 42		
	YY 2 YY 12 YY 22 YY 32 YY 42		
	YCG 2000 ZCG 2000 PTCH2000 YAW 2000 QFUS2100		
	QFUS2200 QFUS2300 QFUS2400 QFUS2500 QFUS2600		
3 NCIDF	- NO OF CONSTRAINT EQS=		10

LIST
DATA SET
VERT3
DATA MEMBER
CLC2
VERT3 /CLC2 ON FILE U1

***** VERT3 /CLC2 *****

COUPLE VERTICAL AND HORIZONTAL MEMBERS

***** INPUT FOR COMPONENT CLC2. LINEAR CONSTRAINTS *****

1 NCDF	- NUMBER OF DOF	=	20
2 CDFLI	- (DOF) DOF NAMES		
	XX 3 XX 13 XX 23 XX 33 XX 43		
	YY 3 YY 13 YY 23 YY 33 YY 43		
	YCG 3000 ZCG 3000 PTCH3000 YAW 3000 QFUS3100		
	QFUS3200 QFUS3300 QFUS3400 QFUS3500 QFUS3600		
3 NCIDF	- NO OF CONSTRAINT EQS=		10

LIST
DATA SET
VERT4
DATA MEMBER
CLC2
VERT4 /CLC2 ON FILE U1

***** VERT4 /CLC2 *****

COUPLE VERTICAL AND HORIZONTAL MEMBERS

***** INPUT FOR COMPONENT CLC2. LINEAR CONSTRAINTS *****

1 NCDF	- NUMBER OF DOF	=	20
2 CDFLI	- (DOF) DOF NAMES		
	XX 4 XX 14 XX 24 XX 34 XX 44		
	YY 4 YY 14 YY 24 YY 34 YY 44		
	YCG 4000 ZCG 4000 PTCH4000 YAW 4000 QFUS4100		
	QFUS4200 QFUS4300 QFUS4400 QFUS4500 QFUS4600		
3 NCIDF	- NO OF CONSTRAINT EQS=		10

LIST
DATA SET
MASS
DATA MEMBER
CSF1
MASS /CSF1 ON FILE U1

***** MASS /CSF1 *****

LUMPED MASSES

***** INPUT FOR COMPONENT CSF1. FINITE ELEMENT *****

1 NCDF - NUMBER OF DOF = 40
2 CDFLI - (DOF) DOF NAMES

XX	1	XX	11	XX	21	XX	31	XX	41
YY	1	YY	11	YY	21	YY	31	YY	41
XX	2	XX	12	XX	22	XX	32	XX	42
YY	2	YY	12	YY	22	YY	32	YY	42
XX	3	XX	13	XX	23	XX	33	XX	43
									MORE...
YY	3	YY	13	YY	23	YY	33	YY	43
XX	4	XX	14	XX	24	XX	34	XX	44
YY	4	YY	14	YY	24	YY	34	YY	44

3 CM - (REAL) MASS MATRIX
DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)

1.00470E-02	7.15730E-03	7.15730E-03	7.15730E-03	7.93120E-03
1.00470E-02	7.15730E-03	7.15730E-03	7.15730E-03	7.93120E-03
7.93120E-03	7.15730E-03	7.15730E-03	7.15730E-03	1.00470E-02
7.93120E-03	7.15730E-03	7.15730E-03	7.15730E-03	1.00470E-02
1.00470E-02	7.15730E-03	7.15730E-03	7.15730E-03	7.93120E-03
1.00470E-02	7.15730E-03	7.15730E-03	7.15730E-03	7.93120E-03
7.93120E-03	7.15730E-03	7.15730E-03	7.15730E-03	1.00470E-02
7.93120E-03	7.15730E-03	7.15730E-03	7.15730E-03	1.00470E-02

4 CC - (REAL) DAMPING MATRIX
NULL MATRIX

5 CK - (REAL) STIFFNESS MATRIX
NULL MATRIX

6 CF - (REAL) FORCE VECTOR
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
MORE...

**LIST COMPLETE
COMMAND**

RUN

MODEL NAME (DATA SET)

S1

LIST MODEL SUMMARY (Y OR N)

Y

***** MODEL S1 *****

PACOSS STRUCTURE SEGMENT 1

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CSF1		HORIZ	NONE	
2	CFM2	1	VERT	NONE	
3	CFM2	2	VERT	NONE	
4	CFM2	3	VERT	NONE	
5	CFM2	4	VERT	NONE	
6	CLC2		VERT1	NONE	
7	CLC2		VERT2	NONE	
8	CLC2		VERT3	NONE	
9	CLC2		VERT4	NONE	
10	CSF1		MASS	NONE	MORE...

GLOBAL VARIABLES

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

DETAILS (Y OR N)

Y

COMPONENT DOF/SYSTEM DOF

1, 6	2, 7	3, 8	4, 9	5, 10
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MORE...

1	CSF1	XX 11	XX 12	XX 21	XX 22	XX 31
		XX 32	YY 12	YY 13	YY 22	YY 23
		YY 32	YY 33	XX 13	XX 14	XX 23
		XX 24	XX 33	XX 34	YY 11	YY 14
		YY 21	YY 24	YY 31	YY 34	XX 1
		XX 2	XX 41	XX 42	YY 2	YY 3
		YY 42	YY 43	XX 3	XX 4	XX 43
		XX 44	YY 1	YY 4	YY 41	YY 44
		(1)	(2)	(3)	(4)	(5)
		(6)	(7)	(8)	(9)	(10)
		(11)	(12)	(13)	(14)	(15)
		(16)	(17)	(18)	(19)	(20)
		(21)	(22)	(23)	(24)	(25)
		(26)	(27)	(28)	(29)	(30)
		(31)	(32)	(33)	(34)	(35)
		(36)	(37)	(38)	(39)	(40)
2	CFM2	YCG 1000	ZCG 1000	PTCH1000	YAW 1000	QFUS1100
		QFUS1200	QFUS1300	QFUS1400	QFUS1500	QFUS1600
		(-1)	(-6)	(-11)	(-16)	(-21)
		(-26)	(-31)	(-36)	(-41)	(-46)
3	CFM2	YCG 2000	ZCG 2000	PTCH2000	YAW 2000	QFUS2100
		QFUS2200	QFUS2300	QFUS2400	QFUS2500	QFUS2600
		(-51)	(-56)	(-61)	(-66)	(-71)
		(-76)	(-81)	(-86)	(-91)	(-96)
4	CFM2	YCG 3000	ZCG 3000	PTCH3000	YAW 3000	QFUS3100
		QFUS3200	QFUS3300	QFUS3400	QFUS3500	QFUS3600
		(-101)	(-106)	(-111)	(-116)	(-121)
		(-126)	(-131)	(-136)	(-141)	(-146)
5	CFM2	YCG 4000	ZCG 4000	PTCH4000	YAW 4000	QFUS4100
		QFUS4200	QFUS4300	QFUS4400	QFUS4500	QFUS4600
		(-151)	(-156)	(-161)	(-166)	(-171)
		(-176)	(-181)	(-186)	(-191)	(-196)
6	CLC2	XX 1	XX 11	XX 21	XX 31	XX 41
		YY 1	YY 11	YY 21	YY 31	YY 41
		(25)	(1)	(3)	(5)	(27)
		(37)	(19)	(21)	(23)	(39)

MORE...

7	CLC2	XX	2	XX	12	XX	22	XX	32	XX	42
		YY	2	YY	12	YY	22	YY	32	YY	42
		(26)		(2)		(4)		(6)		(28)	
		(29)		(7)		(9)		(11)		(31)	
8	CLC2	XX	3	XX	13	XX	23	XX	33	XX	43
		YY	3	YY	13	YY	23	YY	33	YY	43
		(33)		(13)		(15)		(17)		(35)	
		(30)		(8)		(10)		(12)		(32)	
9	CLC2	XX	4	XX	14	XX	24	XX	34	XX	44
		YY	4	YY	14	YY	24	YY	34	YY	44
		(34)		(14)		(16)		(18)		(36)	
		(38)		(20)		(22)		(24)		(40)	
10	CSF1	XX	1	XX	11	XX	21	XX	31	XX	41
		YY	1	YY	11	YY	21	YY	31	YY	41
		XX	2	XX	12	XX	22	XX	32	XX	42
		YY	2	YY	12	YY	22	YY	32	YY	42
		XX	3	XX	13	XX	23	XX	33	XX	43
		YY	3	YY	13	YY	23	YY	33	YY	43
		XX	4	XX	14	XX	24	XX	34	XX	44
		YY	4	YY	14	YY	24	YY	34	YY	44
		(25)		(1)		(3)		(5)		(27)	
		(37)		(19)		(21)		(23)		(39)	
		(26)		(2)		(4)		(6)		(28)	
		(29)		(7)		(9)		(11)		(31)	
		(33)		(13)		(15)		(17)		(35)	
		(30)		(8)		(10)		(12)		(32)	
		(34)		(14)		(16)		(18)		(36)	
		(38)		(20)		(22)		(24)		(40)	

SYSTEM DOF

1	XX	11
2	XX	12
3	XX	21
4	XX	22
5	XX	31
6	XX	32
7	YY	12
8	YY	13
9	YY	22

MORE...

10	YY	23
11	YY	32
12	YY	33
13	XX	13
14	XX	14
15	XX	23
16	XX	24
17	XX	33
18	XX	34
19	YY	11
20	YY	14
21	YY	21
22	YY	24
23	YY	31
24	YY	34
25	XX	1
26	XX	2
27	XX	41
28	XX	42
29	YY	2
30	YY	3
31	YY	42

MORE...

32	YY	43
33	XX	3
34	XX	4
35	XX	43
36	XX	44
37	YY	1
38	YY	4
39	YY	41
40	YY	44

IMPLICIT COEFFICIENTS

I	COEF	DOF	I	COEF	DOF
1	9.787E-02	YY	1	101	9.787E-02
2	2.881E-01	YY	11	102	2.881E-01
3	2.280E-01	YY	21	103	2.280E-01
4	2.881E-01	YY	31	104	2.881E-01
5	9.787E-02	*YY	41	105	9.787E-02
6	9.787E-02	XX	1	106	9.787E-02
7	2.881E-01	XX	11	107	2.881E-01

MORE...

8	2.280E-01	XX	21	108	2.280E-01	XX	23
9	2.881E-01	XX	31	109	2.881E-01	XX	33
10	9.787E-02	*XX	41	110	9.787E-02	*XX	43
11	-2.246E-03	XX	1	111	-2.246E-03	XX	3
12	-3.841E-03	XX	11	112	-3.841E-03	XX	13
13	1.863E-09	XX	21	113	1.863E-09	XX	23
14	3.841E-03	XX	31	114	3.841E-03	XX	33
15	2.246E-03	*XX	41	115	2.246E-03	*XX	43
16	2.246E-03	YY	1	116	2.246E-03	YY	3
17	3.841E-03	YY	11	117	3.841E-03	YY	13
18	1.863E-09	YY	21	118	1.863E-09	YY	23
19	-3.841E-03	YY	31	119	-3.841E-03	YY	33
20	-2.246E-03	*YY	41	120	-2.246E-03	*YY	43
21	1.455E-01	XX	1	121	1.455E-01	XX	3
22	3.154E-02	XX	11	122	3.154E-02	XX	13
23	-3.541E-01	XX	21	123	-3.541E-01	XX	23
24	3.154E-02	XX	31	124	3.154E-02	XX	33
25	1.455E-01	*XX	41	125	1.455E-01	*XX	43
26	-1.152E-01	XX	1	126	-1.152E-01	XX	3
27	2.305E-01	XX	11	127	2.305E-01	XX	13
28	-5.960E-08	XX	21	128	-5.960E-08	XX	23
29	-2.305E-01	XX	31	129	-2.305E-01	XX	33
MORE...							
30	1.152E-01	*XX	41	130	1.152E-01	*XX	43
31	5.555E-02	XX	1	131	5.555E-02	XX	3
32	-1.756E-01	XX	11	132	-1.756E-01	XX	13
33	2.401E-01	XX	21	133	2.401E-01	XX	23
34	-1.756E-01	XX	31	134	-1.756E-01	XX	33
35	5.555E-02	*XX	41	135	5.555E-02	*XX	43
36	1.455E-01	YY	1	136	1.455E-01	YY	3
37	3.154E-02	YY	11	137	3.154E-02	YY	13
38	-3.541E-01	YY	21	138	-3.541E-01	YY	23
39	3.154E-02	YY	31	139	3.154E-02	YY	33
40	1.455E-01	*YY	41	140	1.455E-01	*YY	43
41	-1.152E-01	YY	1	141	-1.152E-01	YY	3
42	2.305E-01	YY	11	142	2.305E-01	YY	13
43	5.960E-08	YY	21	143	5.960E-08	YY	23
44	-2.305E-01	YY	31	144	-2.305E-01	YY	33
45	1.152E-01	*YY	41	145	1.152E-01	*YY	43
46	5.555E-02	YY	1	146	5.555E-02	YY	3
47	-1.756E-01	YY	11	147	-1.756E-01	YY	13
48	2.401E-01	YY	21	148	2.401E-01	YY	23
49	-1.756E-01	YY	31	149	-1.756E-01	YY	33
50	5.555E-02	*YY	41	150	5.555E-02	*YY	43
51	9.787E-02	YY	2	151	9.787E-02	YY	4

MORE...

52	2.881E-01	YY	12	152	2.881E-01	YY	14
53	2.280E-01	YY	22	153	2.280E-01	YY	24
54	2.881E-01	YY	32	154	2.881E-01	YY	34
55	9.787E-02	*YY	42	155	9.787E-02	*YY	44
56	9.787E-02	XX	2	156	9.787E-02	XX	4
57	2.881E-01	XX	12	157	2.881E-01	XX	14
58	2.280E-01	XX	22	158	2.280E-01	XX	24
59	2.881E-01	XX	32	159	2.881E-01	XX	34
60	9.787E-02	*XX	42	160	9.787E-02	*XX	44
61	-2.246E-03	XX	2	161	-2.246E-03	XX	4
62	-3.841E-03	XX	12	162	-3.841E-03	XX	14
63	1.863E-09	XX	22	163	1.863E-09	XX	24
64	3.841E-03	XX	32	164	3.841E-03	XX	34
65	2.246E-03	*XX	42	165	2.246E-03	*XX	44
66	2.246E-03	YY	2	166	2.246E-03	YY	4
67	3.841E-03	YY	12	167	3.841E-03	YY	14
68	1.863E-09	YY	22	168	1.863E-09	YY	24
69	-3.841E-03	YY	32	169	-3.841E-03	YY	34
70	-2.246E-03	*YY	42	170	-2.246E-03	*YY	44
71	1.455E-01	XX	2	171	1.455E-01	XX	4
72	3.154E-02	XX	12	172	3.154E-02	XX	14
73	-3.541E-01	XX	22	173	-3.541E-01	XX	24

MORE...

74	3.154E-02	XX	32	174	3.154E-02	XX	34
75	1.455E-01	*XX	42	175	1.455E-01	*XX	44
76	-1.152E-01	XX	2	176	-1.152E-01	XX	4
77	2.305E-01	XX	12	177	2.305E-01	XX	14
78	-5.960E-08	XX	22	178	-5.960E-08	XX	24
79	-2.305E-01	XX	32	179	-2.305E-01	XX	34
80	1.152E-01	*XX	42	180	1.152E-01	*XX	44
81	5.555E-02	XX	2	181	5.555E-02	XX	4
82	-1.756E-01	XX	12	182	-1.756E-01	XX	14
83	2.401E-01	XX	22	183	2.401E-01	XX	24
84	-1.756E-01	XX	32	184	-1.756E-01	XX	34
85	5.555E-02	*XX	42	185	5.555E-02	*XX	44
86	1.455E-01	YY	2	186	1.455E-01	YY	4
87	3.154E-02	YY	12	187	3.154E-02	YY	14
88	-3.541E-01	YY	22	188	-3.541E-01	YY	24
89	3.154E-02	YY	32	189	3.154E-02	YY	34
90	1.455E-01	*YY	42	190	1.455E-01	*YY	44
91	-1.152E-01	YY	2	191	-1.152E-01	YY	4
92	2.305E-01	YY	12	192	2.305E-01	YY	14
93	5.960E-08	YY	22	193	5.960E-08	YY	24
94	-2.305E-01	YY	32	194	-2.305E-01	YY	34
95	1.152E-01	*YY	42	195	1.152E-01	*YY	44

MORE...

96	5.555E-02	YY	2	196	5.555E-02	YY	4
97	-1.756E-01	YY	12	197	-1.756E-01	YY	14
98	2.401E-01	YY	22	198	2.401E-01	YY	24
99	-1.756E-01	YY	32	199	-1.756E-01	YY	34
100	5.555E-02	*YY	42	200	5.555E-02	*YY	44

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

SEA4

SAVE CASE FOR LATER EXECUTION (Y OR N)

N

SOLUTION SEA4. EIGEN ANALYSIS

BEGIN INPUT

NMODES (INTEGER)

NUMBER OF MODES

ENTER 1 INTEGER VALUE(S)

8

MORE...

SOLUTION INPUT FOR SEA4.EIGEN ANALYSIS

1 NMODES - NUMBER OF MODES = 8

RE-ENTER (Y OR N)

N

***** SOLUTION SEA4 FOR MODEL S1 *****

MODEL - PACOSS STRUCTURE SEGMENT 1

SOLUTION - EIGEN ANALYSIS

WARNING: NEGATIVE EIGENVALUE (SET TO 0)

MODE	1	2	3	4	5
------	---	---	---	---	---

MORE...

FREQ	HZ	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.8886E+01
RAD/S		0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.1867E+02

GEN MASS	2.2800E-01	3.5845E-01	2.8496E-01	1.9553E-01	1.7829E-01
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SYS DOF

XX	11	0.0409	0.1759	0.5396	0.9975	-0.0799
XX	12	0.0410	0.1759	0.5396	0.9974	-0.0897
XX	21	0.0404	0.1759	0.5401	0.9981	0.0062
XX	22	0.0405	0.1759	0.5400	0.9980	-0.0066
XX	31	0.0400	0.1761	0.5409	0.9990	0.0894
XX	32	0.0401	0.1761	0.5407	0.9989	0.0796
YY	12	-0.4199	-0.7386	0.9979	-0.2848	0.6981
YY	13	-0.4199	-0.7386	0.9979	-0.2848	0.6225
YY	22	-0.4202	-0.7390	0.9981	-0.2850	0.0512
YY	23	-0.4203	-0.7391	0.9982	-0.2850	-0.0482
YY	32	-0.4209	-0.7397	0.9988	-0.2852	-0.6202
YY	33	-0.4210	-0.7399	0.9989	-0.2852	-0.6961
XX	13	0.4888	0.9993	0.6911	-0.3698	0.2272
XX	14	0.4888	0.9993	0.6910	-0.3698	0.2548
XX	23	0.4888	0.9992	0.6915	-0.3699	-0.0181
					MORE...	
XX	24	0.4888	0.9992	0.6914	-0.3699	0.0182
XX	33	0.4891	0.9993	0.6922	-0.3701	-0.2549
XX	34	0.4891	0.9993	0.6921	-0.3701	-0.2272
YY	11	0.9997	-0.8067	0.0595	0.0207	0.6057
YY	14	0.9997	-0.8067	0.0595	0.0207	0.6796
YY	21	0.9997	-0.8071	0.0599	0.0206	-0.0486
YY	24	0.9997	-0.8071	0.0599	0.0206	0.0483
YY	31	0.9994	-0.8072	0.0600	0.0206	-0.6796
YY	34	0.9994	-0.8072	0.0600	0.0206	-0.6058
XX	1	0.0412	0.1760	0.5394	0.9972	-0.1283
XX	2	0.0412	0.1760	0.5394	0.9972	-0.1284
XX	41	0.0399	0.1763	0.5416	1.0000	0.1283
XX	42	0.0399	0.1764	0.5416	1.0000	0.1282
YY	2	-0.4198	-0.7386	0.9981	-0.2848	1.0000
YY	3	-0.4198	-0.7386	0.9981	-0.2848	0.9990
YY	42	-0.4219	-0.7406	1.0000	-0.2855	-0.9984
YY	43	-0.4219	-0.7406	1.0000	-0.2855	-0.9994
XX	3	0.4890	0.9996	0.6911	-0.3699	0.3649
XX	4	0.4890	0.9996	0.6911	-0.3699	0.3652
XX	43	0.4898	1.0000	0.6930	-0.3705	-0.3656
XX	44	0.4898	1.0000	0.6930	-0.3705	-0.3652
YY	1	1.0000	-0.8067	0.0591	0.0208	0.9734
					MORE...	

YY	4	1.0000	-0.8067	0.0591	0.0208	0.9744
YY	41	0.9997	-0.8077	0.0601	0.0206	-0.9744
YY	44	0.9997	-0.8077	0.0601	0.0206	-0.9734

MODE	6	7	8
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FREQ HZ	1.8893E+01	1.8896E+01	1.8897E+01
RAD/S	1.1871E+02	1.1873E+02	1.1874E+02

GEN MASS	1.5624E-01	9.6617E-02	8.9382E-02
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SYS DOF

XX	11	-0.1390	0.0818	0.6224
XX	12	-0.1559	0.0917	0.6981
XX	21	0.0108	-0.0063	-0.0487
XX	22	-0.0114	0.0067	0.0507
XX	31	0.1555	-0.0914	-0.6965
XX	32	0.1385	-0.0814	-0.6207
YY	12	0.5794	-0.2422	0.1486
YY	13	0.5165	-0.2159	0.1325
YY	22	0.0418	-0.0171	0.0110
YY	23	-0.0407	0.0174	-0.0102
YY	32	-0.5158	0.2160	-0.1318
YY	33	-0.5788	0.2423	-0.1480
XX	13	0.1968	0.6219	-0.0359
XX	14	0.2207	0.6976	-0.0402
XX	23	-0.0156	-0.0492	0.0028
XX	24	0.0159	0.0501	-0.0029
XX	33	-0.2207	-0.6968	0.0400
XX	34	-0.1967	-0.6211	0.0357
YY	11	-0.6218	-0.0007	-0.0406
YY	14	-0.6975	-0.0007	-0.0455
YY	21	0.0494	0.0002	0.0029
YY	24	-0.0499	0.0000	-0.0035
YY	31	0.6973	0.0011	0.0449
YY	34	0.6215	0.0009	0.0400
XX	1	-0.2231	0.1312	0.9990
XX	2	-0.2233	0.1314	1.0000
XX	41	0.2232	-0.1312	-0.9993
XX	42	0.2229	-0.1311	-0.9983
YY	2	0.8303	-0.3473	0.2128
YY	3	0.8295	-0.3470	0.2126

MORE...

MORE...

YY	42	-0.8294	0.3469	-0.2121
YY	43	-0.8302	0.3472	-0.2124
XX	3	0.3160	0.9990	-0.0577
XX	4	0.3163	1.0000	-0.0577
XX	43	-0.3165	-0.9994	0.0573
XX	44	-0.3162	-0.9985	0.0572
YY	1	-0.9987	-0.0012	-0.0650
YY	4	-0.9997	-0.0012	-0.0651
YY	41	1.0000	0.0015	0.0646
YY	44	0.9990	0.0015	0.0645

THE PERFORMANCE INDEX IS 0.007622

*** THE EIGEN-ANALYSIS HAS BEEN PERFORMED WELL (SATISFACTORILY, POORLY)
IF P IS LESS THAN 1 (BETWEEN 1 AND 100, GREATER THAN 100).

COMMAND

LIST

DATA SET

S1

DATA MEMBER

CFM3

S1 /CFM3 ON FILE U3

***** S1 /CFM3 *****

SEGMENT 1

***** INPUT FOR STRUCTURAL COMPONENT CFM3. 3-D MODAL FUSELAGE *****

1 RBM	- RIGID BODY MODES	=	YES
2 IXCG	- LONGITUDINAL	=	NO
3 IYCG	- LATERAL	=	YES
4 IZCG	- VERTICAL	=	YES
5 IROLL	- ROLL	=	'NO'
6 IPTCH	- PITCH	=	YES
7 IYAW	- YAW	=	YES

MORE...

8 CG	- (REAL) XYZ CG LOCATION (IN)		
	0.00000E+00	0.00000E+00	0.00000E+00
9 NS	- NO. OF NODAL POINTS =		4
10 XYZNS	- (REAL) XYZ FOR EACH NODE		

GENERAL MATRIX

ROW 1	-1.20000E+02	-1.20000E+02	-1.20000E+02	-1.20000E+02
ROW 2	-2.00000E+01	-2.00000E+01	2.00000E+01	2.00000E+01
ROW 3	-2.00000E+01	2.00000E+01	2.00000E+01	-2.00000E+01
11 NMODE	- NO. OF ELASTIC MODES=		4	
12 MXCG	- MODE X-COMPONENT	=	NO	
13 MYCG	- MODE Y-COMPONENT	=	YES	
14 MZCG	- MODE Z-COMPONENT	=	YES	
15 MROLL	- MODE ALFX-COMPONENT	=	NO	
16 MPTCH	- MODE ALFY-COMPONENT	=	NO	
17 MYAW	- MODE ALFZ-COMPONENT	=	NO	
18 YY	- (REAL) MODES Y-COMPONENT			

GENERAL MATRIX

MORE...

ROW	1					
	-9.99700E-01	-3.92300E-01	-3.92700E-01	-9.98700E-01		
ROW	2					
	-3.86500E-01	2.04600E-01	2.04800E-01	-3.86100E-01		
ROW	3					
	2.22200E-01	-9.98100E-01	-9.99100E-01	2.22000E-01		
ROW	4					
	3.31100E-01	-7.72200E-01	-7.73000E-01	3.30800E-01		
19 ZZ	- (REAL) MODES Z-COMPONENT					
	GENERAL MATRIX					
ROW	1					
	2.02000E-02	2.02000E-02	2.97200E-01	2.96900E-01		
ROW	2					
	-4.46900E-01	-4.46400E-01	-9.99300E-01	-9.98300E-01		
ROW	3					
	7.45900E-01	7.45200E-01	-6.24800E-01	-6.24200E-01		
ROW	4					
	-9.99800E-01	-9.98800E-01	1.60800E-01	1.60700E-01		
20 NODOF	- DOF Y OR N FOR NODES					
ROW	1	NO	NO	NO	NO	
	2	YES	YES	YES	YES	MORE...
ROW	3	YES	YES	YES	YES	
ROW	4	NO	NO	NO	NO	
ROW	5	NO	NO	NO	NO	
ROW	6	NO	NO	NO	NO	
21 XYZD	- (REAL) LOCAL X,Y VECTORS					
	GENERAL MATRIX					
ROW	1					
	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00		
ROW	2	NULL ROW				
ROW	3	NULL ROW				
ROW	4	NULL ROW				
ROW	5					
	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00		
ROW	6	NULL ROW				
22 MASSL	- FUSELAGE MASS (LB) = 1.69280E+02					
	MORE...					

23 IMYY - PITCH MOI SLUG-FT(SQ)= 1.79650E+02
24 IMZZ - YAW MOI SLUG-FT(SQ) = 1.79650E+02
25 IMYZ - YZ PRODUCT OF INERT.= 0.00000E+00
26 MMS - (REAL) MODAL MASS (SLUGS)
1.05580E-01 1.18160E-01 1.69490E-01 1.47230E-01
27 MD - (REAL) MODAL DAMPING (PCT)
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
28 FREQ - (REAL) MODAL FREQUENCY (HZ)
1.88940E+01 1.88960E+01 1.88990E+01 1.89080E+01

LIST COMPLETE
COMMAND

LIST
DATA SET
S2
DATA MEMBER
CFM3
S2 /CFM3. ON FILE U3

***** S2 /CFM3 *****

SEGMENT 2

***** INPUT FOR STRUCTURAL COMPONENT CFM3. 3-D MODAL FUSELAGE *****

1 RBM	- RIGID BODY MODES	=	YES
2 IXCG	- LONGITUDINAL	=	NO
3 IYCG	- LATERAL	=	YES
4 IZCG	- VERTICAL	=	YES
5 IROLL	- ROLL	=	NO
6 IPTCH	- PITCH	=	YES
7 IYAW	- YAW	=	YES

MORE...

8 CG	- (REAL) XYZ CG LOCATION (IN)	0.00000E+00	0.00000E+00	0.00000E+00
9 NS	- NO. OF NODAL POINTS =	8		
10 XYZNS	- (REAL) XYZ FOR EACH NODE			

GENERAL MATRIX

ROW 1	1.20000E+02	1.20000E+02	1.20000E+02	1.20000E+02
	-1.20000E+02	-1.20000E+02	-1.20000E+02	-1.20000E+02
ROW 2	-2.00000E+01	-2.00000E+01	2.00000E+01	2.00000E+01
	-2.00000E+01	-2.00000E+01	2.00000E+01	2.00000E+01
ROW 3	-2.00000E+01	2.00000E+01	2.00000E+01	-2.00000E+01
	-2.00000E+01	2.00000E+01	2.00000E+01	-2.00000E+01
11 NMODE	- NO. OF ELASTIC MODES=		4	
12 MXCG	- MODE X-COMPONENT	=	NO	
13 MYCG	- MODE Y-COMPONENT	=	YES	
14 MZCG	- MODE Z-COMPONENT	=	YES	
15 MROLL	- MODE ALFX-COMPONENT	=	NO	
16 MPTCH	- MODE ALFY-COMPONENT	=	NO	
17 MYAW	- MODE ALFZ-COMPONENT	=	NO	

MORE...

18 YY - (REAL) MODES Y-COMPONENT
GENERAL MATRIX

ROW	1				
	9.99000E-01	3.93100E-01	3.92700E-01	1.00000E+00	
	-9.99700E-01	-3.92300E-01	-3.92700E-01	-9.98700E-01	
ROW	2				
	3.86800E-01	-2.05000E-01	-2.04800E-01	3.87200E-01	
	-3.86500E-01	2.04600E-01	2.04800E-01	-3.86100E-01	
ROW	3				
	-2.21900E-01	1.00000E+00	9.99000E-01	-2.22200E-01	
	2.22200E-01	-9.98100E-01	-9.99100E-01	2.22000E-01	
ROW	4				
	-3.31100E-01	7.72900E-01	7.72100E-01	-3.31500E-01	
	3.31100E-01	-7.72200E-01	-7.73000E-01	3.30800E-01	

19 ZZ - (REAL) MODES Z-COMPONENT
GENERAL MATRIX

ROW	1				
	-2.02000E-02	-2.03000E-02	-2.97100E-01	-2.97400E-01	
	2.02000E-02	2.02000E-02	2.97200E-01	2.96900E-01	
ROW	2				
	4.46700E-01	4.47200E-01	9.99000E-01	1.00000E+00	
	-4.46900E-01	-4.46400E-01	-9.99300E-01	-9.98300E-01	
ROW	3				
	-7.45300E-01	-7.46000E-01	6.23500E-01	6.24100E-01	
	7.45900E-01	7.45200E-01	-6.24800E-01	-6.24200E-01	
ROW	4				
	9.99000E-01	1.00000E+00	-1.60100E-01	-1.60300E-01	
	-9.99800E-01	-9.98800E-01	1.60800E-01	1.60700E-01	

MORE...

20 NODOF - DOF Y OR N FOR NODES

ROW	1	NO							
ROW	2	YES							
ROW	3	YES							
ROW	4	NO							
ROW	5	NO							
ROW	6	NO							

21 XYZD - (REAL) LOCAL X,Y VECTORS

MORE...

GENERAL MATRIX

ROW	1				
	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	
	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	
ROW	2	NULL ROW			
ROW	3	NULL ROW			
ROW	4	NULL ROW			
ROW	5				
	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	
	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00	
ROW	6	NULL ROW			
22 MASSL	- FUSELAGE MASS (LB)	= 1.69280E+02			
23 IMYY	- PTCH MOI SLUG-FT(SQ)	= 1.79650E+02			
24 IMZZ	- YAW MOI SLUG-FT(SQ)	= 1.79650E+02			
25 IMYZ	- YZ PRODUCT OF INERT.	= 0.00000E+00			
26 MMS	- (REAL) MODAL MASS (SLUGS)				
	1.05580E-01	1.18160E-01	1.69490E-01	1.47230E-01	
27 MD	- (REAL) MODAL DAMPING (PCT)				
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	
28 FREQ	- (REAL) MODAL FREQUENCY (HZ)				
	1.88940E+01	1.88960E+01	1.88990E+01	1.89080E+01	

MORE...

LIST COMPLETE
COMMAND

LIST
DATA SET
S3
DATA MEMBER
CFM3
S3 /CFM3 ON FILE U3

***** S3 /CFM3 *****

SEGMENT 3

***** INPUT FOR STRUCTURAL COMPONENT CFM3. 3-D MODAL FUSELAGE *****

1 RBM	- RIGID BODY MODES	=	YES
2 IXCG	- LONGITUDINAL	=	NO
3 IYCG	- LATERAL	=	YES
4 IZCG	- VERTICAL	=	YES
5 IROLL	- ROLL	=	NO
6 IPTCH	- PITCH	=	YES
7 IYAW	- YAW	=	YES
8 CG	- (REAL) XYZ CG LOCATION (IN)		
	0.00000E+00 0.00000E+00 0.00000E+00		
9 NS	- NO. OF NODAL POINTS =		4
10 XYZNS	- (REAL) XYZ FOR EACH NODE		

MORE...

GENERAL MATRIX

ROW 1	1.20000E+02 1.20000E+02 1.20000E+02 1.20000E+02
ROW 2	-2.00000E+01 -2.00000E+01 2.00000E+01 2.00000E+01
ROW 3	-2.00000E+01 2.00000E+01 2.00000E+01 -2.00000E+01
11 NMODE	- NO. OF ELASTIC MODES= 4
12 MXCG	- MODE X-COMPONENT = NO
13 MYCG	- MODE Y-COMPONENT = YES
14 MZCG	- MODE Z-COMPONENT = YES
15 MROLL	- MODE ALFX-COMPONENT = NO
16 MPTCH	- MODE ALFY-COMPONENT = NO
17 MYAW	- MODE ALFZ-COMPONENT = NO
18 YY	- (REAL) MODES Y-COMPONENT

GENERAL MATRIX

MORE...

ROW	1	7.12000E-02	-1.00000E+00	-9.99000E-01	7.12000E-02
ROW	2	-9.98900E-01	-5.69000E-02	-5.68000E-02	-9.99900E-01
ROW	3	-3.79000E-02	-4.48200E-01	-4.47800E-01	-3.79000E-02
ROW	4	6.84000E-02	-1.16100E-01	-1.16000E-01	6.85000E-02
19 ZZ	- (REAL) MODES Z-COMPONENT GENERAL MATRIX				
ROW	1	-3.91500E-01	-3.91900E-01	9.08000E-02	9.09000E-02
ROW	2	-2.02000E-02	-2.02000E-02	7.30000E-02	7.31000E-02
ROW	3	9.99000E-01	1.00000E+00	-5.90500E-01	-5.91000E-01
ROW	4	5.40500E-01	5.41000E-01	9.99000E-01	1.00000E+00
20 NODOF	- DOF Y OR N FOR NODES				
ROW	1	NO	NO	NO	NO
					MORE...
ROW	2	YES	YES	YES	YES
ROW	3	YES	YES	YES	YES
ROW	4	NO	NO	NO	NO
ROW	5	NO	NO	NO	NO
ROW	6	NO	NO	NO	NO
21 XYZD	- (REAL) LOCAL X,Y VECTORS GENERAL MATRIX				
ROW	1	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00
ROW	2	NULL ROW			
ROW	3	NULL ROW			
ROW	4	NULL ROW			
ROW	5	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00
ROW	6	NULL ROW			
22 MASSL	- FUSELAGE MASS (LB) = 1.76120E+02				
					MORE...

23 IMYY - PITCH MOI SLUG-FT(SQ)= 1.86730E+02
24 IMZZ - YAW MOI SLUG-FT(SQ) = 1.86730E+02
25 IMYZ - YZ PRODUCT OF INERT.= 0.00000E+00
26 MMS - (REAL) MODAL MASS (SLUGS)
1.18960E-01 1.02890E-01 1.58210E-01 1.33630E-01
27 MD - (REAL) MODAL DAMPING (PCT)
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
28 FREQ - (REAL) MODAL FREQUENCY (HZ)
1.73660E+01 1.73720E+01 1.73810E+01 1.73850E+01

LIST COMPLETE
COMMAND

LIST
DATA SET
GROUND
DATA MEMBER
CLC0
GROUND /CLC0 ON FILE U3

***** GROUND /CLC0 *****

ELIMINATE END DOF

INPUT FOR COMPONENT CLC0. ELIMINATE DOF

1 NCIDF - # OF ELIMINATED DOF = 2
2 CIDFLI - ELIMINATED DOF NAMES= YC 1000 ZC 1000
3 CDFLI - 1 EXPLICIT DOF NAME = PH 1000

LIST COMPLETE
COMMAND

MORE...

LIST
DATA SET
CJ1
DATA MEMBER
CLC2
CJ1 /CLC2 ON FILE U3

***** CJ1 /CLC2 *****

COUPLE JOINT 1 DOF

***** INPUT FOR COMPONENT CLC2. LINEAR CONSTRAINTS *****

1 NCDF - NUMBER OF DOF = 16
2 CDFLI - (DOF) DOF NAMES
YC 1000 YW 1000 YC 2000 YW 2000 ZC 1000
PH 1000 ZC 2000 PH 2000 QF 1100 QF 1200
QF 1300 QF 1400 QF 2100 QF 2200 QF 2300
QF 2400

3 NCIDF - NO OF CONSTRAINT EQS= 8

MORE...

4 COEF - (REAL) COEFFICIENT MATRIX
GENERAL MATRIX

ROW 1
1.00000E+00 -1.20000E+02 -1.00000E+00 -1.20000E+02
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-9.99700E-01 -3.86500E-01 2.22200E-01 3.31100E-01
-9.99000E-01 -3.86800E-01 2.21900E-01 3.31100E-01

ROW 2
1.00000E+00 -1.20000E+02 -1.00000E+00 -1.20000E+02
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-3.92300E-01 2.04600E-01 -9.98100E-01 -7.72200E-01
-3.93100E-01 2.05000E-01 -1.00000E+00 -7.72900E-01

ROW 3
1.00000E+00 -1.20000E+02 -1.00000E+00 -1.20000E+02
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-3.92700E-01 2.04800E-01 -9.99100E-01 -7.73000E-01
-3.92700E-01 2.04800E-01 -9.99000E-01 -7.72100E-01

ROW 4
1.00000E+00 -1.20000E+02 -1.00000E+00 -1.20000E+02
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-9.98700E-01 -3.86100E-01 2.22000E-01 3.30800E-01

MORE...

ROW	-1.00000E+00	-3.87200E-01	2.22200E-01	3.31500E-01
	5			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.00000E+00	1.20000E+02	-1.00000E+00	1.20000E+02
	2.02000E-02	-4.46900E-01	7.45900E-01	-9.99800E-01
	2.02000E-02	-4.46700E-01	7.45300E-01	-9.99000E-01
ROW	6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.00000E+00	1.20000E+02	-1.00000E+00	1.20000E+02
	2.02000E-02	-4.46400E-01	7.45200E-01	-9.98800E-01
	2.03000E-02	-4.47200E-01	7.46000E-01	-1.00000E+00
ROW	7			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.00000E+00	1.20000E+02	-1.00000E+00	1.20000E+02
	2.97200E-01	-9.99300E-01	-6.24800E-01	1.60800E-01
	2.97100E-01	-9.99000E-01	-6.23500E-01	1.60100E-01
ROW	8			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.00000E+00	1.20000E+02	-1.00000E+00	1.20000E+02
	2.96900E-01	-9.98300E-01	-6.24200E-01	1.60700E-01
	2.97400E-01	-1.00000E+00	-6.24100E-01	1.60300E-01

5 NIDOF - NO OF IMPLICIT DOF = 8

MORE...

6 INDEX - IMPLICIT DOF INDICES

9	10	11	12	13
14	15	16		

LIST COMPLETE
COMMAND

LIST
DATA SET
CJ2
DATA MEMBER
CLC2
CJ2 /CLC2 ON FILE U3

***** CJ2 /CLC2 *****

COUPLE JOINT 2 DOF

***** INPUT FOR COMPONENT CLC2. LINEAR CONSTRAINTS *****

1 NCDF - NUMBER OF DOF = 16
2 CDFLI - (DOF) DOF NAMES
YC 2000 YW 2000 YC 3000 YW 3000 ZC 2000
PH 2000 ZC 3000 PH 3000 QF 2100 QF 2200
QF 2300 QF 2400 QF 3100 QF 3200 QF 3300
QF 3400
3 NCIDF - NO OF CONSTRAINT EQS= 8 MORE...
4 COEF - (REAL) COEFFICIENT MATRIX
GENERAL MATRIX

ROW 1
1.00000E+00 -1.20000E+02 -1.00000E+00 -1.20000E+02
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-9.99700E-01 -3.86500E-01 2.22200E-01 3.31100E-01
-7.12000E-02 9.98900E-01 3.79000E-02 -6.84000E-02

ROW 2
1.00000E+00 -1.20000E+02 -1.00000E+00 -1.20000E+02
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-3.92300E-01 2.04600E-01 -9.98100E-01 -7.72200E-01
1.00000E+00 5.69000E-02 4.48200E-01 1.16100E-01

ROW 3
1.00000E+00 -1.20000E+02 -1.00000E+00 -1.20000E+02
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-3.92700E-01 2.04800E-01 -9.99100E-01 -7.73000E-01
9.99000E-01 5.68000E-02 4.47800E-01 1.16000E-01

ROW 4
1.00000E+00 -1.20000E+02 -1.00000E+00 -1.20000E+02
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
-9.98700E-01 -3.86100E-01 2.22000E-01 3.30800E-01

MORE...

ROW	-7.12000E-02	9.99900E-01	3.79000E-02	-6.85000E-02
	5			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.00000E+00	1.20000E+02	-1.00000E+00	1.20000E+02
	2.02000E-02	-4.46900E-01	7.45900E-01	-9.99800E-01
	3.91500E-01	2.02000E-02	-9.99000E-01	-5.40500E-01
ROW	6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.00000E+00	1.20000E+02	-1.00000E+00	1.20000E+02
	2.02000E-02	-4.46400E-01	7.45200E-01	-9.98800E-01
	3.91900E-01	2.02000E-02	-1.00000E+00	-5.41000E-01
ROW	7			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.00000E+00	1.20000E+02	-1.00000E+00	1.20000E+02
	2.97200E-01	-9.99300E-01	-6.24800E-01	1.60800E-01
	-9.08000E-02	-7.30000E-02	5.90500E-01	-9.99000E-01
ROW	8			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	1.00000E+00	1.20000E+02	-1.00000E+00	1.20000E+02
	2.96900E-01	-9.98300E-01	-6.24200E-01	1.60700E-01
	-9.09000E-02	-7.31000E-02	5.91000E-01	-1.00000E+00

5 NIDOF - NO OF IMPLICIT DOF = 8

MORE ...

6 INDEX - IMPLICIT DOF INDICES

9	10	11	12	13
14	15	16		

LIST COMPLETE
COMMAND

LIST
DATA SET
SUSP
DATA MEMBER
CSF1
SUSP /CSF1 FOUND ON FOLLOWING MULTIPLES FILES
U2 U3
ENTER CORRECT FILE
U3
SUSP /CSF1 ON FILE U3

***** SUSP /CSF1 *****

SOFT SUSPENSION

INPUT FOR COMPONENT CSF1. FINITE ELEMENT

1 NCDF - NUMBER OF DOF = 12
2 CDFLI - (DOF) DOF NAMES
YC 1000 ZC 1000 PH 1000 YW 1000 YC 2000
ZC 2000 PH 2000 YW 2000 YC 3000 ZC 3000
PH 3000 YW 3000
MORE...
3 CM - (REAL) MASS MATRIX
NULL MATRIX
4 CC - (REAL) DAMPING MATRIX
NULL MATRIX
5 CK - (REAL) STIFFNESS MATRIX
DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)
5.00000E+00 5.00000E+00 5.00000E+00 5.00000E+00 5.00000E+00
5.00000E+00 5.00000E+00 5.00000E+00 5.00000E+00 5.00000E+00
5.00000E+00 5.00000E+00
6 CF - (REAL) FORCE VECTOR
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

LIST COMPLETE
COMMAND

MORE...

LIST
DATA SET
PLATE
DATA MEMBER
CSF1
PLATE /CSF1 ON FILE U3

***** PLATE /CSF1 *****

PLATE MASS

INPUT FOR COMPONENT CSF1. FINITE ELEMENT

1 NCDF - NUMBER OF DOF = 2
2 CDFLI - DOF NAMES = YC 3000 ZC 3000
3 CM - (REAL) MASS MATRIX
DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)

1.00000E-01 1.00000E-01
4 CC - (REAL) DAMPING MATRIX

MORE...

NULL MATRIX

5 CK - (REAL) STIFFNESS MATRIX
NULL MATRIX

6 CF - FORCE VECTOR = 0.00000E+00 0.00000E+00

LIST COMPLETE
COMMAND

RUN

MODEL NAME (DATA SET)

PACOSSG

LIST MODEL SUMMARY (Y OR N)

Y

***** MODEL PACOSSG *****

PACOSS TOWER (CANTILEVERED)

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CFM3	1	S1	NONE	
2	CFM3	2	S2	NONE	
3	CFM3	3	S3	NONE	
4	CLC0		GROUND	NONE	
5	CLC2		CJ1	NONE	
6	CLC2		CJ2	NONE	
7	CSF1		SUSP	NONE	
8	CSF1		PLATE	NONE	

MORE...

Y

***** COMPONENT DOF / SYSTEM DOF *****

	1, 6	2, 7	3, 8	4, 9	5, 10
--	------	------	------	------	-------

1	CFM3	YC 1000 QF 1200 (0) (-1)	ZC 1000 QF 1300 (0) (-1)	PH 1000 QF 1400 (1) (-1)	YW 1000 (2) (-2)	QF 1100 (-1)
2	CFM3	YC 2000 QF 2200 (3) (-1)	ZC 2000 QF 2300 (4) (-1)	PH 2000 QF 2400 (5) (-1)	YW 2000 (6) (-6)	QF 2100 (-1)
3	CFM3	YC 3000 QF 3200 (7) (-9)	ZC 3000 QF 3300 (8) (-17)	PH 3000 QF 3400 (9) (-25)	YW 3000 (10) (-10)	QF 3100 (-1)

MORE...

4	CLC0	PH	1000	YW	1000	YC	2000	YW	2000	ZC	1000
		PH	1000	ZC	2000	PH	2000	PH	2000	ZC	1000
		(	1)	(	2)	(	3)	(	6)	(	0)
		(	1)	(	4)	(	5)				
5	CLC2	YC	1000	YW	1000	YC	2000	YW	2000	ZC	1000
		PH	1000	ZC	2000	PH	2000	PH	2000	ZC	1000
		(	0)	(	2)	(	3)	(	6)	(	0)
		(	1)	(	4)	(	5)				
6	CLC2	YC	2000	YW	2000	YC	3000	YW	3000	ZC	2000
		PH	2000	ZC	3000	PH	3000	PH	3000	ZC	2000
		(	3)	(	6)	(	7)	(	10)	(	4)
		(	5)	(	8)	(	9)				
7	CSF1	YC	1000	ZC	1000	PH	1000	YW	1000	YC	2000
		ZC	2000	PH	2000	YW	2000	YC	3000	ZC	3000
		PH	3000	YW	3000	(	0)	(	1)	(	2)
		(	4)	(	5)	(	6)	(	7)	(	8)
		(	9)	(	10)						
										MORE...	
8	CSF1	YC	3000	ZC	3000						
		(	7)	(	8)						

SYSTEM DOF

1	PH	1000
2	YW	1000
3	YC	2000
4	ZC	2000
5	PH	2000
6	YW	2000
7	YC	3000
8	ZC	3000
9	PH	3000
10	YW	3000

IMPLICIT COEFFICIENTS

I	COEF	DOF	I	COEF	DOF
					MORE...

1	-3.996E-01	YC	2000	17	-1.519E-01	YC	2000
2	4.796E+01	YW	2000	18	1.823E+01	YW	2000
3	3.996E-01	YC	3000	19	1.519E-01	YC	3000
4	4.796E+01	YW	3000	20	1.823E+01	YW	3000
5	-1.342E-01	ZC	2000	21	1.479E-01	ZC	2000
6	-1.611E+01	PH	2000	22	1.774E+01	PH	2000
7	1.342E-01	ZC	3000	23	-1.479E-01	ZC	3000
8	-1.611E+01	*PH	3000	24	1.774E+01	*PH	3000
9	-5.164E-01	YC	2000	25	3.052E-04	YC	2000
10	6.193E+01	YW	2000	26	-3.516E-02	YW	2000
11	5.164E-01	YC	3000	27	-3.052E-04	YC	3000
12	6.193E+01	YW	3000	28	-3.516E-02	YW	3000
13	3.603E-02	ZC	2000	29	5.981E-01	ZC	2000
14	4.328E+00	PH	2000	30	7.177E+01	PH	2000
15	-3.603E-02	ZC	3000	31	-5.981E-01	ZC	3000
16	4.328E+00	*PH	3000	32	7.177E+01	*PH	3000

PRINT MATRICES (Y OR N)

VM READ

N

SOLUTION OR N

SEA4

SAVE CASE FOR LATER EXECUTION (Y OR N)

N

SOLUTION SEA4. EIGEN ANALYSIS

BEGIN INPUT

NMODES (INTEGER)

NUMBER OF MODES

ENTER 1 INTEGER VALUE(S)

10

SOLUTION INPUT FOR SEA4.EIGEN ANALYSIS

1 NMODES - NUMBER OF MODES = 10

MORE...

RE-ENTER (Y OR N)

N

***** SOLUTION SEA4 FOR MODEL PACOSSG *****
MODEL - PACOSS TOWER (CANTILEVERED)
SOLUTION - EIGEN ANALYSIS

MODE	1	2	3	4	5
FREQ HZ	7.6648E-03	7.6648E-03	7.7085E-03	9.2003E-03	4.3441E-01
RAD/S	4.8159E-02	4.8159E-02	4.8434E-02	5.7807E-02	2.7295E+00
GEN MASS	2.1558E+03	2.1558E+03	4.5320E+03	4.5320E+03	9.4230E-01

SYS DOF

PH 1000	1.0000	0.0000	0.0000	0.0000	0.0000
YW 1000	0.0000	1.0000	0.0000	0.0000	0.0000
YC 2000	0.0000	0.0000	0.0012	0.0031	0.1753
ZC 2000	0.0000	0.0000	-0.0009	-0.0011	-0.4948
PH 2000	0.0000	0.0000	-0.1756	-1.0000	0.0064
YW 2000	0.0000	0.0000	-1.0000	0.1756	0.0023
YC 3000	0.0000	0.0000	-0.0015	-0.0003	-0.3540
ZC 3000	0.0000	0.0000	0.0000	-0.0003	1.0000
PH 3000	0.0000	0.0000	0.1756	1.0000	0.0062
YW 3000	0.0000	0.0000	1.0000	-0.1755	0.0022

MODE	6	7	8	9	10
FREQ HZ	4.3482E-01	5.1521E-01	5.1531E-01	4.6080E+00	9.4498E+00
RAD/S	2.7321E+00	3.2372E+00	3.2378E+00	2.8953E+01	5.9375E+01
GEN MASS	9.3693E-01	6.9514E-01	6.9242E-01	3.8846E+00	4.9496E+00

SYS DOF

PH 1000	0.0000	0.0000	0.0000	0.0000	0.0000
YW 1000	0.0000	0.0000	0.0000	0.0000	0.0000
YC 2000	-0.4922	-0.4104	1.0000	-0.3448	1.0000
ZC 2000	-0.1742	1.0000	0.4103	1.0000	0.3443
PH 2000	0.0022	-0.0022	-0.0009	0.0241	0.0084
YW 2000	-0.0064	-0.0009	0.0022	0.0083	-0.0243
YC 3000	1.0000	-0.2035	0.4924	0.2710	-0.7877
ZC 3000	0.3541	0.4963	0.2021	-0.7859	-0.2712
PH 3000	0.0022	-0.0021	-0.0009	0.0231	0.0081
YW 3000	-0.0061	-0.0009	0.0021	0.0080	-0.0234

2.6.2 ACAP Ground Resonance Simulation - Blade Damage. The purpose of this analysis was to evaluate the effect of blade damage on the stability of the ACAP (Advanced Composite Airframe Program) helicopter. Inertia and stiffness properties for a 4-bladed rotor were chosen so that the blade lead-lag frequency exceeds the rotation frequency of the rotor, resulting in an unstable system above a critical rotor RPM. Coupled to the rotor is a representation of the Sikorsky S-75 fuselage and landing gear as shown in Figures 14 and 15. The fuselage is modeled with rigid body degrees of freedom only. The landing gear is a tricycle type with the two main gears connected through a piston, spring, and damper which act to couple the roll and lateral degrees of freedom of the gear (teetering hydraulic system).

Ballistic damage to the rotor blades was simulated by inertia and stiffness reductions in the original rotor component data set and by introducing a rotor damage component data set in the original model (Figure 16).

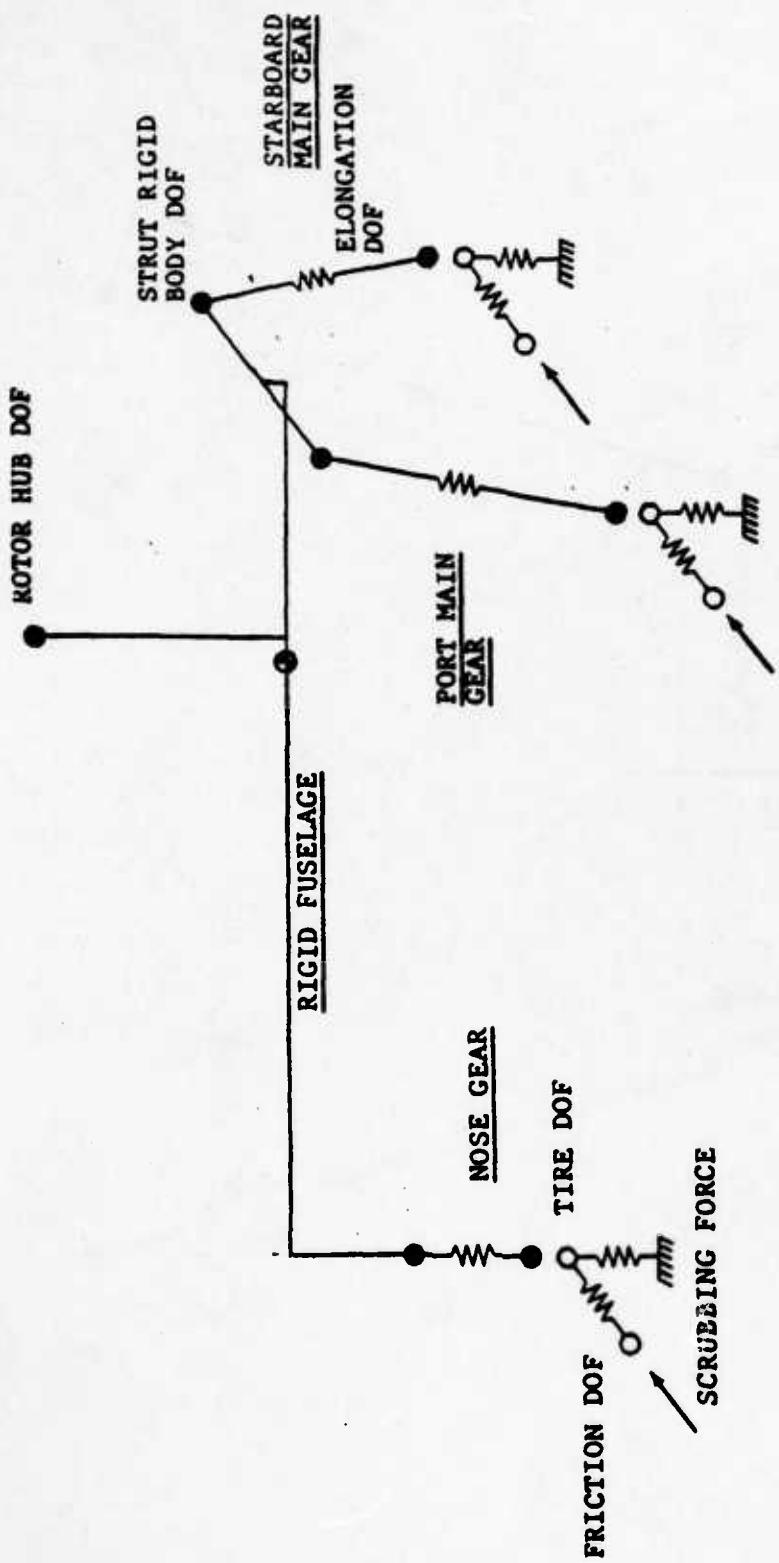


Figure 14. ACAP Fuselage and Landing Gear.

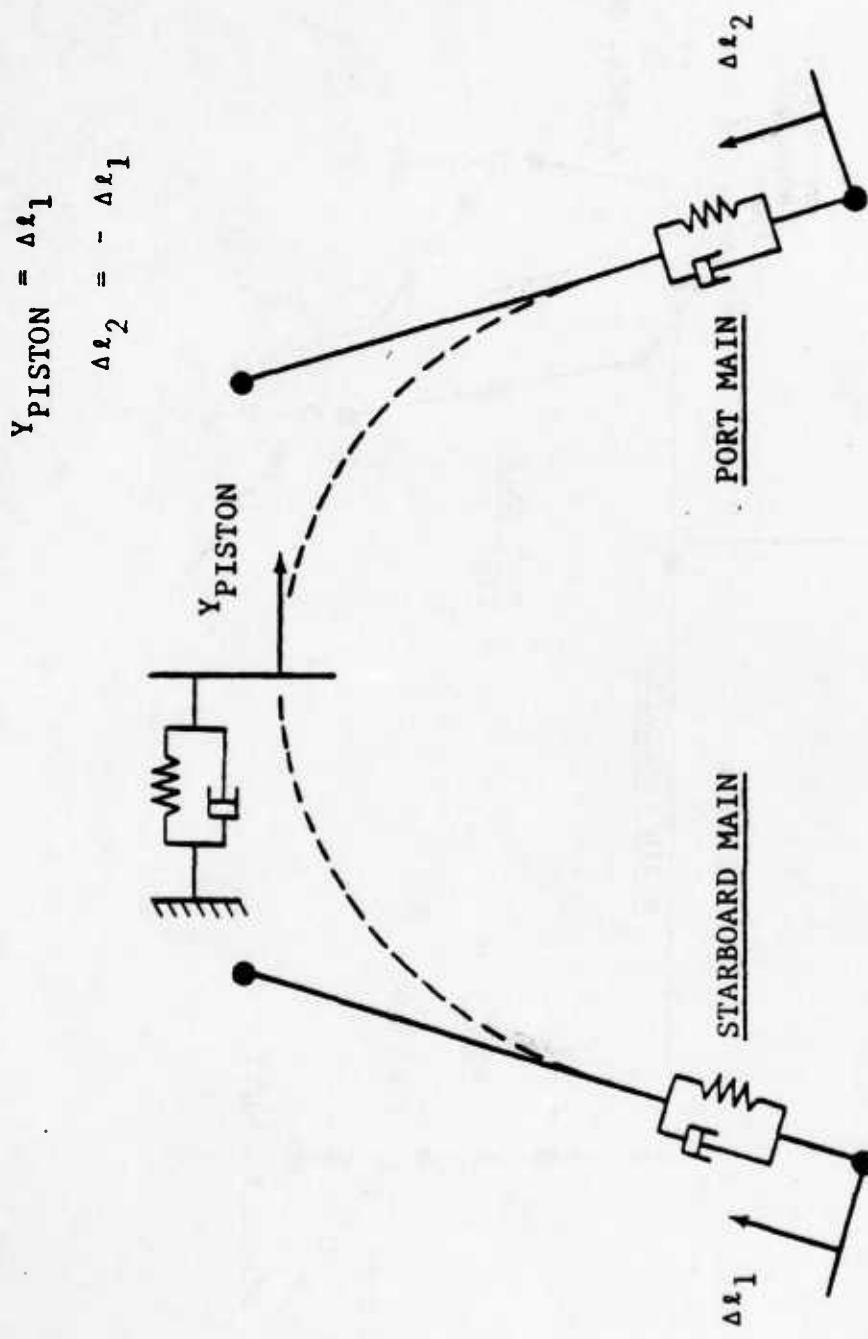


Figure 15. Coupled Main Landing Gear - Teetering Hydraulic System.

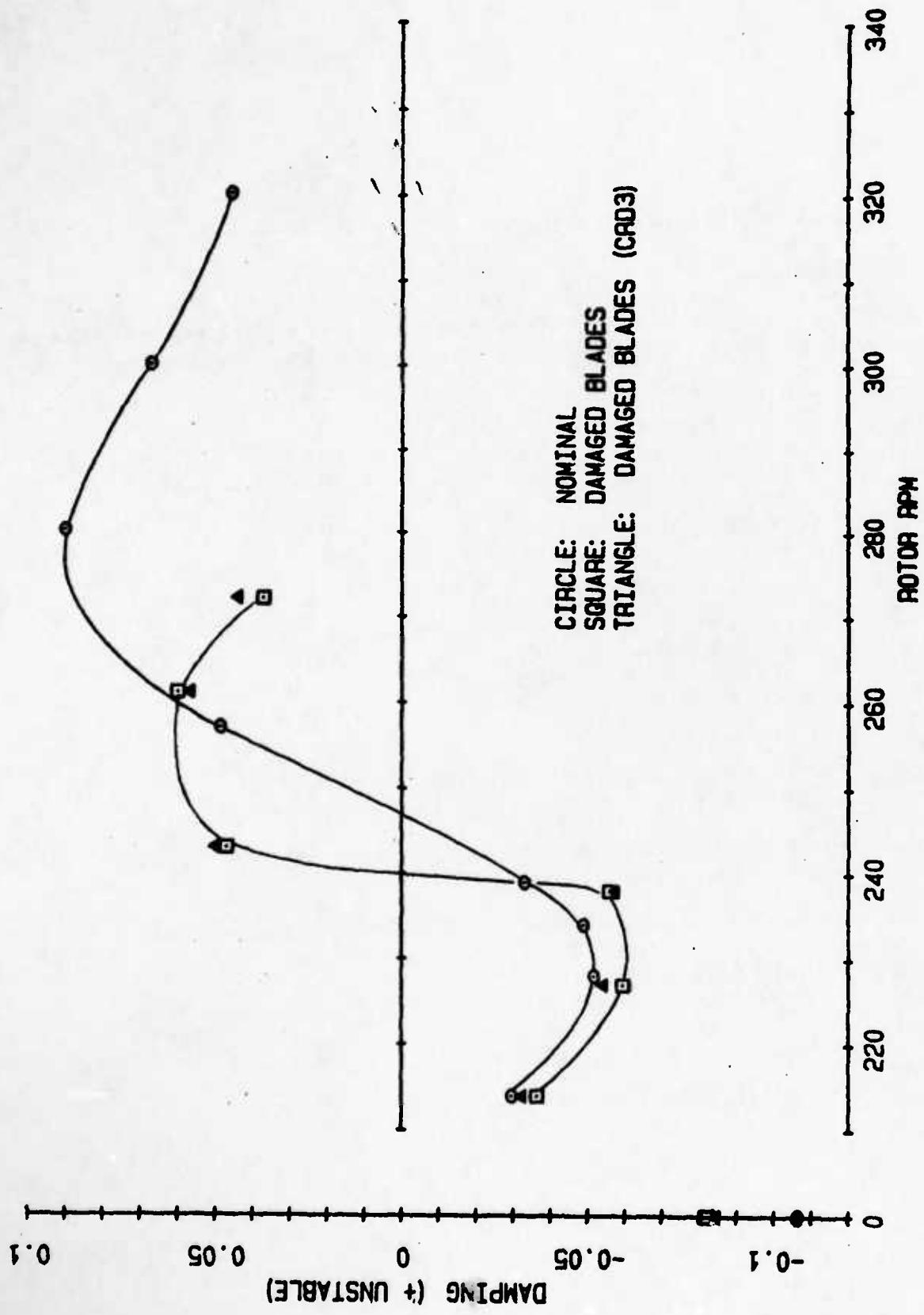


Figure 16. ACAP Ground Resonance Stability.

LIST
DATA SET
ACAPFUS
DATA MEMBER
CFM3
ACAPFUS /CFM3 ON FILE U1

***** ACAPFUS /CFM3 *****

RIGID ACAP FUSELAGE

***** INPUT FOR STRUCTURAL COMPONENT CFM3. 3-D MODAL FUSELAGE *****

1 RBM	- RIGID BODY MODES	=	YES
2 IXCG	- LONGITUDINAL	=	NO
3 IYCG	- LATERAL	=	YES
4 IZCG	- VERTICAL	=	NO
5 IROLL	- ROLL	=	YES
6 IPTCH	- PITCH	=	NO
7 IYAW	- YAW	=	NO
8 CG	- (REAL) XYZ CG LOCATION (IN)		
	1.93000E+02 0.00000E+00 9.68000E+01		
9 NS	- NO. OF NODAL POINTS =		7
10 XYZNS	- (REAL) XYZ FOR EACH NODE		

MORE...

GENERAL MATRIX

ROW 1	2.00000E+02	5.40000E+01	2.61000E+02	2.61000E+02
	2.61000E+02	2.61000E+02	2.61000E+02	
ROW 2	0.00000E+00	0.00000E+00	-3.02500E+01	-1.10000E+01
	3.02500E+01	1.10000E+01	0.00000E+00	
ROW 3	1.57000E+02	6.30000E+01	9.95000E+01	6.30000E+01
	9.95000E+01	6.30000E+01	9.95000E+01	
11 NMODE	- NO. OF ELASTIC MODES=			0
12 NODOF	- DOF Y OR N FOR NODES			
ROW 1	NO NO NO NO NO NO NO			
ROW 2	YES YES YES YES YES YES YES			
ROW 3				

MORE...

ROW	4	NO	NO	YES	YES	YES	YES	NO
ROW	5	YES	YES	YES	NO	YES	NO	NO
ROW	6	NO	NO	NO	NO	NO	NO	NO
ROW	7	NO	NO	NO	NO	NO	NO	NO

13 XYZD - (REAL) LOCAL X,Y VECTORS
GENERAL MATRIX

ROW	1	1.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00
		1.00000E+00	1.00000E+00	1.00000E+00	
ROW	2	NULL ROW			
ROW	3	NULL ROW			
ROW	4	NULL ROW			
ROW	5	1.00000E+00	1.00000E+00	9.61600E-01	5.45900E-01
		9.61600E-01	5.45900E-01	1.00000E+00	
ROW	6	0.00000E+00	0.00000E+00	-2.74300E-01	-8.37900E-01
		2.74300E-01	8.37900E-01	0.00000E+00	

MORE...

14 MASSL - FUSELAGE MASS (LB) = 8.47000E+03
15 IMXX - ROLL MOI SLUG-FT(SQ)= 2.47608E+03

LIST
DATA SET
ACAPSTAR
DATA MEMBER
CLG2
ACAPSTAR/CLG2 ON FILE U1

***** ACAPSTAR/CLG2 *****

STARBOARD MAIN GEAR STRUT

***** INPUT FOR STRUCTURAL COMPONENT CLG2. LANDING GEAR *****

1 NAMEZS	- STRUT Z-TRANSLATION =	TRAZ1030
2 NAMEXS	- STRUT X-TRANSLATION =	TRAX1030
3 NAMEYS	- STRUT Y-TRANSLATION =	TRAY1030
4 NAMEAX	- STRUT X-ROTATION =	ROTX1030
5 NAMEAY	- STRUT Y-ROTATION =	ROTY1030
6 NAMEDL	- STRUT ELONGATION =	LSTR1030
7 M1	- TIRE MASS =	2.50000E-01
		MORE...
8 M2	- STRUT MASS =	1.00000E-01
9 L0	- UNDEFORMED LENGTH =	6.48900E+01
10 ZCOS	- (REAL) STRUT Z-TRAN DIR COS	
	0.00000E+00 2.74300E-01 9.61600E-01	
11 XCOS	- (REAL) STRUT X-TRAN DIR COS	
	1.00000E+00 0.00000E+00 0.00000E+00	
12 NKL	- NO. OF DEF POINTS =	2
13 COEFKLSL	- STRUT DISPLACEMENT =	-1.00000E+01 1.00000E+01
14 COEFKLSR	- STRUT SPRING RATE =	7.20000E+02 7.20000E+02
15 NCL	- NO. OF DEF POINTS =	2
16 COEFCLV	- STRUT VELOCITY =	-1.00000E+02 1.00000E+02
17 COEFCLDR	- STRUT DAMPING RATE =	0.00000E+00 0.00000E+00
18 NKX	- NO. OF DEF POINTS =	2
19 COEFKXLD	- TIRE LONG DISPLACEMT =	-1.00000E+01 1.00000E+01
20 COEFKXSR	- TIRE SPRING RATE =	1.50300E+03 1.50300E+03
21 NCX	- NO. OF DEF POINTS =	2
22 COEFCXV	- TIRE LONG VELOCITY =	-1.00000E+02 1.00000E+02
23 COEFCXDR	- TIRE DAMPING RATE =	1.50000E+01 1.50000E+01
24 NKY	- NO. OF DEF POINTS =	2
25 COEFKYLD	- TIRE LAT DISPLACEMT =	-1.00000E+01 1.00000E+01
26 COEFKYSR	- TIRE SPRING RATE =	1.39100E+03 1.39100E+03
27 NCY	- NO. OF DEF POINTS =	2

MORE...

28	COEFCYV	- TIRE LAT VELOCITY	=	-1.00000E+02	1.00000E+02
29	COEFCYDR	- TIRE DAMPING RATE	=	1.50000E+01	1.50000E+01
30	NKZ	- NO. OF DEF POINTS	=	2	
31	COEFKZVD	- TIRE VERT DISPLACEMT	=	-1.00000E+01	1.00000E+01
32	COEFKZSR	- TIRE SPRING RATE	=	2.92300E+03	2.92300E+03
33	NCZ	- NO. OF DEF POINTS	=	2	
34	COEFCZV	- TIRE VERT VELOCITY	=	-1.00000E+02	1.00000E+02
35	COEFCZDR	- TIRE DAMPING RATE	=	1.50000E+01	1.50000E+01
36	FRIC	- GROUND FRICTION	=	YES	
37	BRAKE	- BRAKES ON	=	NO	
38	SCOX	- LONG SCRUBBING COEFF	=	3.24720E+01	
39	SCOY	- LAT SCRUBBING COEFF	=	4.87090E+01	

LIST COMPLETE
COMMAND

LIST
DATA SET
ACAPPORT
DATA MEMBER
CLG2
ACAPPORT/CLG2 ON FILE U1

***** ACAPPORT/CLG2 *****

PORT MAIN GEAR STRUT

***** INPUT FOR STRUCTURAL COMPONENT CLG2. LANDING GEAR *****

1 NAMEZS	- STRUT Z-TRANSLATION =	TRAZ1050
2 NAMEXS	- STRUT X-TRANSLATION =	TRAX1050
3 NAMEYS	- STRUT Y-TRANSLATION =	TRAY1050
4 NAMEAX	- STRUT X-ROTATION =	ROTX1050
5 NAMEAY	- STRUT Y-ROTATION =	ROTY1050
6 NAMEDL	- STRUT ELONGATION =	LPRT1050
7 M1	- TIRE MASS =	2.50000E-01
		MORE...
8 M2	- STRUT MASS =	1.00000E-01
9 L0	- UNDEFORMED LENGTH =	6.48900E+01
10 ZCOS	- (REAL) STRUT Z-TRAN DIR COS 0.00000E+00 -2.74300E-01 9.61600E-01	
11 XCOS	- (REAL) STRUT X-TRAN DIR COS 1.00000E+00 0.00000E+00 0.00000E+00	
12 NKL	- NO. OF DEF POINTS =	2
13 COEFKLSL	- STRUT DISPLACEMENT =	-1.00000E+01 1.00000E+01
14 COEFKLSR	- STRUT SPRING RATE =	7.20000E+02 7.20000E+02
15 NCL	- NO. OF DEF POINTS =	2
16 COEFCLV	- STRUT VELOCITY =	-1.00000E+02 1.00000E+02
17 COEFCLDR	- STRUT DAMPING RATE =	0.00000E+00 0.00000E+00
18 NKX	- NO. OF DEF POINTS =	2
19 COEFKXLD	- TIRE LONG DISPLACEMT =	-1.00000E+01 1.00000E+01
20 COEFKXSR	- TIRE SPRING RATE =	1.50300E+03 1.50300E+03
21 NCX	- NO. OF DEF POINTS =	2
22 COEFCXV	- TIRE LONG VELOCITY =	-1.00000E+02 1.00000E+02
23 COEFCXDR	- TIRE DAMPING RATE =	1.50000E+01 1.50000E+01
24 NKY	- NO. OF DEF POINTS =	2
25 COEFKYLD	- TIRE LAT DISPLACEMT =	-1.00000E+01 1.00000E+01
26 COEFKYSR	- TIRE SPRING RATE =	1.39100E+03 1.39100E+03
27 NCY	- NO. OF DEF POINTS =	2

MORE...

28	COEFCYV	- TIRE LAT VELOCITY	=	-1.00000E+02	1.00000E+02
29	COEFCYDR	- TIRE DAMPING RATE	=	1.50000E+01	1.50000E+01
30	NKZ	- NO. OF DEF POINTS	=	2	
31	COEFKZVD	- TIRE VERT DISPLACEMT	=	-1.00000E+01	1.00000E+01
32	COEFKZSR	- TIRE SPRING RATE	=	2.92300E+03	2.92300E+03
33	NCZ	- NO. OF DEF POINTS	=	2	
34	COEFCZV	- TIRE VERT VELOCITY	=	-1.00000E+02	1.00000E+02
35	COEFCZDR	- TIRE DAMPING RATE	=	1.50000E+01	1.50000E+01
36	FRIC	- GROUND FRICTION	=	YES	
37	BRAKE	- BRAKES ON	=	NO	
38	SCOX	- LONG SCRUBBING COEFF	=	3.24720E+01	
39	SCOY	- LAT SCRUBBING COEFF	=	4.87090E+01	

LIST COMPLETE
COMMAND

LIST
 DATA SET
 ACAPAAUX
 DATA MEMBER
 CLG2
 ACAPAAUX /CLG2 ON FILE U1

***** ACAPAAUX /CLG2 *****

AUXILIARY (NOSE GEAR) STRUT

***** INPUT FOR STRUCTURAL COMPONENT CLG2. LANDING GEAR *****

1 NAMEZS	- STRUT Z-TRANSLATION	=	TRAZ1020
2 NAMEXS	- STRUT X-TRANSLATION	=	TRAX1020
3 NAMEYS	- STRUT Y-TRANSLATION	=	TRAY1020
4 NAMEAX	- STRUT X-ROTATION	=	ROTX1020
5 NAMEAY	- STRUT Y-ROTATION	=	ROTY1020
6 NAMEDL	- STRUT ELONGATION	=	LAUX1020
7 M1	- TIRE MASS	=	2.50000E-01
			MORE...
8 M2	- STRUT MASS	=	1.00000E-01
9 L0	- UNDEFORMED LENGTH	=	2.59000E+01
10 ZCOS	- (REAL) STRUT Z-TRAN DIR COS	=	 0.00000E+00 0.00000E+00 1.00000E+00
11 XCOS	- (REAL) STRUT X-TRAN DIR COS	=	 1.00000E+00 0.00000E+00 0.00000E+00
12 NKL	- NO. OF DEF POINTS	=	2
13 COEFKLSL	- STRUT DISPLACEMENT	=	-1.00000E+01 1.00000E+01
14 COEFKLSR	- STRUT SPRING RATE	=	7.05820E+02 7.05820E+02
15 NCL	- NO. OF DEF POINTS	=	2
16 COEFCLV	- STRUT VELOCITY	=	-1.00000E+02 1.00000E+02
17 COEFCLDR	- STRUT DAMPING RATE	=	1.00000E+01 1.00000E+01
18 NKX	- NO. OF DEF POINTS	=	2
19 COEFKXLD	- TIRE LONG DISPLACEMT	=	-1.00000E+01 1.00000E+01
20 COEFKXSR	- TIRE SPRING RATE	=	1.50300E+03 1.50300E+03
21 NCX	- NO. OF DEF POINTS	=	2
22 COEFCXV	- TIRE LONG VELOCITY	=	-1.00000E+02 1.00000E+02
23 COEFCXDR	- TIRE DAMPING RATE	=	1.50000E+01 1.50000E+01
24 NKY	- NO. OF DEF POINTS	=	2
25 COEFKYLD	- TIRE LAT DISPLACEMT	=	-1.00000E+01 1.00000E+01
26 COEFKYSR	- TIRE SPRING RATE	=	1.39100E+03 1.39100E+03
27 NCY	- NO. OF DEF POINTS	=	2

MORE...

28 COEFCYV	- TIRE LAT VELOCITY	=	-1.00000E+02	1.00000E+02
29 COEFCYDR	- TIRE DAMPING RATE	=	1.50000E+01	1.50000E+01
30 NKZ	- NO. OF DEF POINTS	=	2	
31 COEFKZVD	- TIRE VERT DISPLACEMT	=	-1.00000E+01	1.00000E+01
32 COEFKZSR	- TIRE SPRING RATE	=	2.92300E+03	2.92300E+03
33 NCZ	- NO. OF DEF POINTS	=	2	
34 COEFCZV	- TIRE VERT VELOCITY	=	-1.00000E+02	1.00000E+02
35 COEFCZDR	- TIRE DAMPING RATE	=	1.50000E+01	1.50000E+01
36 FRIC	- GROUND FRICTION	=	YES	
37 BRAKE	- BRAKES ON	=	NO	
38 SCOX	- LONG SCRUBBING COEFF	=	3.18320E+01	
39 SCOY	- LAT SCRUBBING COEFF	=	4.77480E+01	

LIST COMPLETE
COMMAND

LIST
 DATA SET
 GRR
 DATA MEMBER
 CRE3
 GRR /CRE3 ON FILE U1

***** GRR /CRE3 *****

STIFF INPLANE ROTOR FOR GROUND RESONANCE

***** INPUT FOR ROTOR COMPONENT CRE3. ROTOR ELASTIC BLADES *****

1 JV	- INPLANE DOF	=	YES	
2 JW	- OUTPLANE DOF	=	NO	
3 JP	- TORSION DOF	=	NO	
4 JS	- SHAFT PERTURBED DOF	=	NO	
5 JX	- XHUB(LONG) DOF	=	NO	
6 JY	- YHUB(LAT) DOF	=	YES	
7 JZ	- ZHUB(AXIAL) DOF	=	NO	
				MORE...
8 JAX	- ALFX(ROLL) DOF	=	YES	
9 JAY	- ALFY(PTCH) DOF	=	NO	
10 JAZ	- ALFZ(YAW) DOF	=	NO	
11 NV	- NO. OF INPLANE MODES	=	1	
12 NB	- NO. OF BLADES	=	4	
13 NX	- NO. OF STATIONS	=	13	
14 ITYP	- MODE INPUT 1 OR 2	=	2	
15 X	- (REAL) STATIONS			
	0.00000E+00	2.00000E+01	4.00000E+01	6.00000E+01
	8.00000E+01	1.00000E+02	1.20000E+02	1.40000E+02
	1.60000E+02	1.80000E+02	2.00000E+02	2.20000E+02
	2.40000E+02			
16 NIP	- INPLANE HINGE STA	=	1	
17 CIFF	- IP MODAL DAMPING	=	2.50000E-01	
18 IBIP	- IP BC 1 OR 2	=	2	
19 NI	- NO. OF IMPLICIT DOFS	=	0	
20 KIP	- IP SPRING RATE	=	5.58000E+08	
21 CIP	- IP DAMPING RATE	=	0.00000E+00	
22 OM	- RPM	=	3.00000E+02	
23 IC	- ROTATION DIRECTION	=	1	
24 PSIO	- AZIMUTH OF REF BLADE	=	0.00000E+00	
25 MHUB	- HUB WEIGHT (LB)	=	0.00000E+00	

MORE...

26 IHUBX	- HUB M.O.I. ABOUT X- =	0.00000E+00
27 TH0	- ROOT PTCH ANG (DEG) =	0.00000E+00
28 NONLIN	- NONLIN TERMS =	NO
29 IU	- UNIFORM BLADE =	YES
30 M0	- UNIFORM MASS DENSITY=	7.50000E-01
31 SEO	- UNIFORM CG OFFSET =	0.00000E+00
32 SEA0	- UNIFORM AC OFFSET =	0.00000E+00
33 KM10	- UNIFORM MASS ROG =	0.00000E+00
34 KM20	- UNIFORM MASS ROG =	6.00000E+00
35 KAO	- UNIFORM AREA ROG =	6.00000E+00
36 THPO	- UNIFRM PRETWIST RATE=	0.00000E+00
37 EIY0	- UNIFORM CHORDWISE EI=	5.55800E+02
38 EA0	- UNIFORM SEC EA*10E-6=	2.00000E+01
39 EIZ0	- UNIFORM BEAMWISE EI=	1.65000E+02
40 JIL	- INTERNAL LOADS =	NO

LIST COMPLETE
COMMAND

LIST
DATA SET
CROT
DATA MEMBER
CLC1
CROT /CLC1 ON FILE U1

***** CROT /CLC1 *****

COUPLE ROTOR HUB, FUSELAGE DOF

INPUT FOR COMPONENT CLC1. LINEAR CONSTRAINTS

1 NCDF - NUMBER OF DOF = 2
2 CDFLI - DOF NAMES = TRAY1010 RDTX1010
3 NCIDF - # OF CONSTRAINT EQNS= 2
4 CIDFLI - IMPLICIT DOF NAMES = YHUB1000 ALFX1000
5 COEF - (REAL) COEFFICIENT MATRIX
DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)

MORE...

1.00000E+00 1.00000E+00

LIST COMPLETE
COMMAND

LIST
DATA SET
PISTON
DATA MEMBER
CSF1
PISTON /CSF1 ON FILE U1

***** PISTON /CSF1 *****

CENTERING PISTON FOR MAIN GEAR CROSS-TIE

***** INPUT FOR COMPONENT CSF1. FINITE ELEMENT *****

1 NCDF - NUMBER OF DOF = 1
2 CDFLI - DOF NAMES = YP . 1000
3 CM - (REAL) MASS MATRIX
DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)

1.00000E-01
4 CC - (REAL) DAMPING MATRIX

DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)

MORE...

2.00000E+01
5 CK - (REAL) STIFFNESS MATRIX
DIAGONAL MATRIX (DIAGONAL VALUES PRINTED)

2.00000E+03
6 CF - FORCE VECTOR = 0.00000E+00

LIST COMPLETE
COMMAND

LIST
DATA SET
CROSSTIE
DATA MEMBER
CLC1
CROSSTIE/CLC1 ON FILE U1

***** CROSSTIE/CLC1 *****

CONSTRAINTS FOR MAIN GEAR HYDRAULIC CROSSTIE

***** INPUT FOR COMPONENT CLC1. LINEAR CONSTRAINTS *****

1 NCDF - NUMBER OF DOF = 1
2 CDFLI - DOF NAMES = LSTR1030
3 NCIDE - # OF CONSTRAINT EQNS= 2
4 CIDFLI - IMPLICIT DOF NAMES = LPRT1050 YP 1000
5 COEF - (REAL) COEFFICIENT MATRIX
GENERAL MATRIX

MORE...

ROW 1
-1.00000E+00
ROW 2
1.00000E+00

LIST COMPLETE
COMMAND

LIST
DATA SET
LOCKG
DATA MEMBER
CLC1
LOCKG /CLC1 ON FILE U1

***** LOCKG /CLC1 *****

LANDING GEAR CONSTRAINTS

***** INPUT FOR COMPONENT CLC1. LINEAR CONSTRAINTS *****

1 NCDF - NUMBER OF DOF = 1
2 CDFLI - DOF NAMES = RL 1000
3 NCIDF - # OF CONSTRAINT EQNS= 8
4 CIDFLI - (DOF) IMPLICIT DOF NAMES
TRAZ1020 LAUX1020 TRAX1020 TRAX1030 TRAX1050
ROTY1020 ROTY1030 ROTY1050
5 COEF - (REAL) COEFFICIENT MATRIX

MORE...

NULL MATRIX

LIST COMPLETE
COMMAND

LIST
DATA SET
LOCKT
DATA MEMBER
CLC1
LOCKT /CLC1 ON FILE U1

***** LOCKT /CLC1 *****

TIRE CONSTRAINTS

INPUT FOR COMPONENT CLC1. LINEAR CONSTRAINTS

1 NCDF - NUMBER OF DOF = 1
2 CDFLI - DOF NAMES = RL 1000
3 NCIDF - # OF CONSTRAINT EQNS= 4
4 CIDFLI - (DOF) IMPLICIT DOF NAMES
TIRE2010 TIRE3010 TIRE4010 TIRE4030
5 COEF - (REAL) COEFFICIENT MATRIX
NULL MATRIX

MORE...

LIST COMPLETE
COMMAND

LIST
DATA SET
LOCKF
DATA MEMBER.
CLC1
LOCKF /CLC1 ON FILE U1

***** LOCKF /CLC1 *****

ELIMINATE FRICTION DOF

***** INPUT FOR COMPONENT CLC1. LINEAR CONSTRAINTS *****

1 NCDF - NUMBER OF DOF = 1
2 CDFLI - DOF NAMES = RL 1000
3 NCIDF - # OF CONSTRAINT EQNS= 3
4 CIDFLI - (DOF) IMPLICIT DOF NAMES
 FRCY2000 FRCY3000 FRCY4000
5 COEF - (REAL) COEFFICIENT MATRIX
NULL MATRIX

MORE...

LIST COMPLETE
COMMAND

LIST
DATA SET
TIRE
DATA MEMBER
CSF1
TIRE /CSF1 ON FILE U1

***** TIRE /CSF1 *****

TIRE DOF

***** INPUT FOR COMPONENT CSF1. FINITE ELEMENT *****

1 NCDF - NUMBER OF DOF = 9
2 CDFLI - (DOF) DOF NAMES
TIRE2010 TIRE2020 TIRE2030 TIRE3010 TIRE3020
TIRE3030 TIRE4010 TIRE4020 TIRE4030
3 CM - (REAL) MASS MATRIX
NULL MATRIX

4 CC - (REAL) DAMPING MATRIX MORE...
NULL MATRIX

5 CK - (REAL) STIFFNESS MATRIX
NULL MATRIX

6 CF - (REAL) FORCE VECTOR
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00

***** LIST COMPLETE
COMMAND

LIST
DATA SET
AFM
DATA MEMBER
CSF1
AFM /CSF1 ON FILE U1

***** AFM /CSF1 *****

AUXILIARY FUSELAGE ATTACH POINTS

INPUT FOR COMPONENT CSF1. FINITE ELEMENT

1 NCDF - NUMBER OF DOF = 5
2 CDFLI - (DOF) DOF NAMES TRAY1040 TRAZ1040 TRAY1060 TRAZ1060 TRAY1070
3 CM - (REAL) MASS MATRIX
NULL MATRIX
4 CC - (REAL) DAMPING MATRIX
NULL MATRIX MORE...
5 CK - (REAL) STIFFNESS MATRIX
NULL MATRIX
6 CF - (REAL) FORCE VECTOR
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00

LIST COMPLETE
COMMAND

RUN

MODEL NAME (DATA SET)

ACAPF

LIST MODEL SUMMARY (Y OR N)

Y

***** MODEL ACAPF *****

ACAP WITH FRICTION DOF ELIMINATED

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CLC1		LOCKG	NONE	
2	CLC1		LOCKT	NONE	
3	CFM3	1	ACAPFUS	NONE	
4	CLG2	2	ACAPSTAR	NONE	
5	CLG2	3	ACAPPORT	NONE	
6	CLG2	4	ACAPAUX	NONE	
7	CSF1		TIRE	NONE	
8	CSF1		AFM	NONE	
9	CSF1		PISTON	NONE	
10	CLC1		CROSSTIE	NONE	MORE...
11	CRE3	1	GRR	NONE	
12	CLC1		CROT	NONE	
13	CLC1		LOCKF	NONE	

GLOBAL VARIABLES

NO INPUT REQUIRED

TEMPORARY RUN EDIT OF ANY COMPONENT/FORCE INPUT (Y OR N)

N

DETAILS (Y OR N)

Y

MORE...

COMPONENT DOF / SYSTEM DOF

1, 6 2, 7 3, 8 4, 9 5, 10

1	CLC1	RL 1000 (1)			
2	CLC1	RL 1000 (1)			
3	CFM3	YC 1000 (2)	RL 1000 (1)		
4	CLG2	TRAX1030 LSTR1030 (0) (3)	TRAY1030 FRCY2000 (-1) (0)	TRAZ1030 (-3)	ROTX1030 (-5) (0)
5	CLG2	TRAX1050 LPRT1050 (0) (-11)	TRAY1050 FRCY3000 (-6) (0)	TRAZ1050 (-8)	ROTX1050 (-10) (0) MORE...
6	CLG2	TRAX1020 LAUX1020 (0) (0)	TRAY1020 FRCY4000 (-12) (0)	TRAZ1020 (0)	ROTX1020 (-14) (0)
7	CSF1	TIRE2010 TIRE3030 (0) (-33)	TIRE2020 TIRE4010 (-15) (0)	TIRE2030 TIRE4020 (-21) (-39)	TIRE3010 TIRE4030 (0) (0) (-27)
8	CSF1	TRAY1040 (-42)	TRAZ1040 (-44)	TRAY1060 (-46)	TRAZ1060 (-48) (-50)
9	CSF1	YP 1000 (-52)			
10	CLC1	LSTR1030 (3)			

MORE...

11	CRE3	IP 1110 ALFX1000 (-4) (-55)	IP 1210 (-5)	IP 1310 (-6)	IP 1410 (-7)	YHUB1000 (-53)
12	CLC1	TRAY1010 (-56)	ROTX1010 (-58)			
13	CLC1	RL 1000 (1)				

SYSTEM DOF

1 RL 1000
 2 YC 1000
 3 LSTR1030
 4 IP 1110
 5 IP 1210
 6 IP 1310
 7 IP 1410

MORE...

IMPLICIT COEFFICIENTS

I	COEF	DOF	I	COEF	DOF
1	9.616E-01	YC 1000	30	-8.182E+00	RL 1000
2	5.701E+00	*RL 1000	31	6.240E+01	RL 1000
3	2.743E-01	YC 1000	32	2.743E-01	*LSTR1030
4	-2.983E+01	*RL 1000	33	2.638E-01	YC 1000
5	1.000E+00	*RL 1000	34	1.564E+00	RL 1000
6	9.616E-01	YC 1000	35	-2.638E-01	YC 1000
7	5.701E+00	*RL 1000	36	2.868E+01	RL 1000
8	-2.743E-01	YC 1000	37	1.780E+01	RL 1000
9	2.983E+01	*RL 1000	38	-9.616E-01	*LSTR1030
10	1.000E+00	*RL 1000	39	1.000E+00	YC 1000
11	-1.000E+00	*LSTR1030	40	3.380E+01	RL 1000
12	1.000E+00	YC 1000	41	2.590E+01	*RL 1000
13	3.380E+01	*RL 1000	42	5.459E-01	YC 1000
14	1.000E+00	*RL 1000	43	2.767E+01	*RL 1000
15	2.743E-01	LSTR1030	44	8.379E-01	YC 1000
16	9.247E-01	YC 1000	45	2.232E+01	*RL 1000
17	5.483E+00	RL 1000	46	5.459E-01	YC 1000

MORE...

18	7.524E-02	YC	1000	47	2.767E+01	*RL	1000
19	-8.182E+00	RL	1000	48	-8.379E-01	YC	1000
20	6.240E+01	*RL	1000	49	-2.232E+01	*RL	1000
21	9.616E-01	LSTR1030		50	1.000E+00	YC	1000
22	-2.638E-01	YC	1000	51	-2.700E+00	*RL	1000
23	-1.564E+00	RL	1000	52	1.000E+00	*LSTR1030	
24	2.638E-01	YC	1000	53	1.000E+00	YC	1000
25	-2.868E+01	RL	1000	54	-6.020E+01	*RL	1000
26	-1.780E+01	*RL	1000	55	1.000E+00	*RL	1000
27	9.247E-01	YC	1000	56	1.000E+00	YC	1000
28	5.483E+00	RL	1000	57	-6.020E+01	*RL	1000
29	7.524E-02	YC	1000	58	1.000E+00	*RL	1000

PRINT MATRICES (Y OR N)

N

SOLUTION OR N

***** SOLUTION SSF3 FOR MODEL ACAPP *****
MODEL - ACAP WITH FRICTION DOF ELIMINATED
SOLUTION - STABILITY FLOQUET

***** THIS MODEL WAS EDITED AT RUN TIME (300 RPM) *****

FREQUENCY	DAMPING
-115.67746	-42.04611
-115.67746	-42.04611
13.83969	-0.83117
-13.83972	-0.83124
2.36125	0.06715
	MORE...
-2.36125	0.06715
35.81461	-1.06139
-35.81470	-1.06146
35.26747	-0.96586
-35.26744	-0.96582
35.28421	-1.06926
-35.28419	-1.06928
35.28036	-1.06570
-35.28035	-1.06572

COMMAND

LIST
 DATA SET
 GRRD
 DATA MEMBER
 CRE3
 GRRD /CRE3 ON FILE U1

***** GRRD /CRE3 *****

DAMAGED GROUND RESONANCE ROTOR

***** INPUT FOR ROTOR COMPONENT CRE3. ROTOR ELASTIC BLADES *****

1 JV	- INPLANE DOF	=	YES	
2 JW	- OUTPLANE DOF	=	NO	
3 JP	- TORSION DOF	=	NO	
4 JS	- SHAFT PERTURBED DOF	=	NO	
5 JX	- XHUB(LONG) DOF	=	NO	
6 JY	- YHUB(LAT) DOF	=	YES	
7 JZ	- ZHUB(AXIAL) DOF	=	NO	
			MORE...	
8 JAX	- ALFX(ROLL) DOF	=	YES	
9 JAY	- ALFY(PITCH) DOF	=	NO	
10 JAZ	- ALFZ(YAW) DOF	=	NO	
11 NV	- NO. OF INPLANE MODES	=	1	
12 NB	- NO. OF BLADES	=	4	
13 NX	- NO. OF STATIONS	=	13	
14 ITYP	- MODE INPUT 1 OR 2	=	2	
15 X	- (REAL) STATIONS			
	0.00000E+00	2.00000E+01	4.00000E+01	6.00000E+01
	8.00000E+01	1.00000E+02	1.20000E+02	1.40000E+02
	1.60000E+02	1.80000E+02	2.00000E+02	2.20000E+02
	2.40000E+02			
16 NIP	- INPLANE HINGE STA	=	1	
17 CIIPP	- IP MODAL DAMPING	=	2.50000E-01	
18 IBIP	- IP BC 1 OR 2	=	2	
19 NI	- NO. OF IMPLICIT DOFS	=	0	
20 KIP	- IP SPRING RATE	=	5.58000E+08	
21 CIP	- IP DAMPING RATE	=	0.00000E+00	
22 OM	- RPM	=	3.00000E+02	
23 IC	- ROTATION DIRECTION	=	1	
24 PSIO	- AZIMUTH OF REF BLADE	=	0.00000E+00	
25 MHUB	- HUB WEIGHT (LB)	=	0.00000E+00	

MORE...

26	IHUBX	- HUB M.O.I. ABOUT X-	=	0.00000E+00	
27	TH0	- ROOT PTCH ANG (DEG)	=	0.00000E+00	
28	NONLIN	- NONLIN TERMS	=	NO	
29	IU	- UNIFORM BLADE	=	NO	
30	M	- (REAL) MASS PER UNIT LENGTH			
		7.50000E-01	7.50000E-01	6.75000E-01	7.50000E-01
		7.50000E-01	7.50000E-01	7.50000E-01	7.50000E-01
		7.50000E-01	7.50000E-01	7.50000E-01	7.50000E-01
		7.50000E-01			
31	SE	- (REAL) CG OFFSET FROM EA			
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00			
32	SEA	- (REAL) AREA CENTROID OFFSET			
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00			
33	KM1	- (REAL) MASS ROG ABOUT			
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
					MORE...
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00			
34	KM2	- (REAL) MASS ROG ABOUT			
		6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
		6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
		6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
		6.00000E+00			
35	KA	- (REAL) AREA ROG OF CROSS			
		6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
		6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
		6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
		6.00000E+00			
36	THP	- (REAL) PRETWIST RATE DEG/IN			
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
		0.00000E+00			
37	EIY	- (REAL) CHORDWISE EI*10E-6			
		5.55800E+02	5.55800E+02	5.00000E+02	5.55800E+02
		5.55800E+02	5.55800E+02	5.55800E+02	5.55800E+02
		5.55800E+02	5.55800E+02	5.55800E+02	5.55800E+02
		5.55800E+02			
					MORE...

38 EIZ - (REAL) BEAMWISE EI*10E-6
1.65000E+02 1.65000E+02 1.65000E+02 1.65000E+02
1.65000E+02 1.65000E+02 1.65000E+02 1.65000E+02
1.65000E+02 1.65000E+02 1.65000E+02 1.65000E+02
1.65000E+02
39 EA - (REAL) SECTION EA*10E-6
2.00000E+01 2.00000E+01 2.00000E+01 2.00000E+01
2.00000E+01 2.00000E+01 2.00000E+01 2.00000E+01
2.00000E+01 2.00000E+01 2.00000E+01 2.00000E+01
2.00000E+01
40 JIL - INTERNAL LOADS = NO

LIST COMPLETE
COMMAND

LIST
 DATA SET
 GRRD
 DATA MEMBER
 CRD3
 GRRD /CRD3 ON FILE U1

***** GRRD /CRD3 *****

GROUND RESONANCE ROTOR DAMAGE

***** INPUT FOR DAMAGED ROTOR COMPONENT CRD3. ROTOR DAMAGED BLADES *****

1 JV	- INPLANE DOF	=	YES	
2 JW	- OUTPLANE DOF	=	NO	
3 JP	- TORSION DOF	=	NO	
4 NV	- NO. OF INPLANE MODES	=	1	
5 NDB	- NO. OF DAMAGED	=	4	
6 IDB	- BLADE NOS. OF			
	1	2	3	4
7 NX	- NO. OF BLADE STAS	=	13	MORE...
8 JXD	- NEW STATIONS	=	NO	
9 ITYP	- MODE INPUT 0,1, OR 2	=	2	
10 CIPP	- IP MODAL DAMPING	=	0.00000E+00	
11 IBIP	- IP BC 1 OR 2	=	2	
12 KIP	- IP SPRING RATE	=	0.00000E+00	
13 CIP	- IP DAMPING RATE	=	0.00000E+00	
14 IU	- UNIFORM BLADE	=	NO	
15 M	- (REAL) MASS PER UNIT LENGTH			
	0.00000E+00	0.00000E+00	-7.50000E-02	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
16 SE	- (REAL) CG OFFSET FROM EA			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
17 SEA	- (REAL) AREA CENTROID OFFSET			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MORE...

	0.00000E+00			
18 KM1	- (REAL) MASS RIG ABOUT			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
19. KM2	- (REAL) MASS RIG ABOUT			
	6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
	6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
	6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
	6.00000E+00			
20 KA	- (REAL) AREA RIG OF CROSS			
	6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
	6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
	6.00000E+00	6.00000E+00	6.00000E+00	6.00000E+00
	6.00000E+00			
21 THP	- (REAL) PRETWIST RATE DEG/IN			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
22 EIY	- (REAL) CHORDWISE EI*10E-6			
	0.00000E+00	0.00000E+00	-5.58000E+01	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
23 EIZ	- (REAL) BEAMWISE EI*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
24 EA	- (REAL) SECTION EA*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
25 JIL	- INTERNAL LOADS = NO			

LIST COMPLETE
COMMAND

***** SOLUTION SSF3 FOR MODEL ACAPD *****
MODEL - DAMAGED ACAP GROUND RESONANCE MODEL
SOLUTION - STABILITY FLOQUET

***** THIS MODEL WAS EDITED AT RUN TIME (238 RPM) *****

FREQUENCY	DAMPING
34.39589	-1.25660
-34.39659	-1.25718
13.66451	-1.01190
-13.66450	-1.01188
2.40310	-0.05590
	HURE...
-2.40311	-0.05591
115.55717	-41.09233
-115.55722	-41.09227
33.37157	-1.07549
-33.37157	-1.07546
34.01982	-1.06511
-34.01981	-1.06510
34.02486	-1.06820
-34.02489	-1.06817

***** COMMAND

***** SOLUTION SSF3 FOR MODEL ACAPDD *****
MODEL - DAMAGED ACAP GROUND RESONANCE MODEL (CRD3)
SOLUTION - STABILITY FLOQUET

***** THIS MODEL WAS EDITED AT RUN TIME (238 RPM) *****

FREQUENCY	DAMPING
34.40465	-1.25222
-34.40436	-1.25200
13.62780	-1.02289
-13.62781	-1.02294
2.41658	-0.05745
	MORE...
-2.41658	-0.05746
115.60188	-41.11543
-115.60191	-41.11549
33.37268	-1.07387
-33.37274	-1.07392
34.02176	-1.06673
-34.02173	-1.06673
34.02176	-1.06763
-34.02167	-1.06751

***** COMMAND

2.6.3 Time History Pitch Link Loads - Blade Damage. The helicopter model in Section 6 of the User's Manual (AH1G-35A/MODEL) was used to demonstrate a time history of the pitch link (control rod) loads for the reference blade in an undamaged and damaged condition. The initial conditions and control settings were obtained from the baseline trim solution. Data sets FCT1.65/FRA3 and AH1G16.5/FFC2 were edited to include the trimmed vehicle velocity (wind vector), and FCT1.65/FRA3 was further edited to include the trimmed induced velocity. The acceleration due to gravity was applied using the global reference system with the trimmed fuselage pitch accounted for.

The damage modeled was a 50 percent loss in in-plane and out-of-plane bending stiffness and a 30 percent loss in torsional stiffness over a 1 foot section of the reference blade starting 27 inches outboard of the pitch horn (Figures 17, 18, and 19). For the damaged blade, new blade stations were added for precise definition of the blade properties. The reduced stiffness results in increased curvature in the damaged blade modes. Time histories of the interface loads acting on the individual control rod coupled to the reference blade were generated for the nominal and damaged blade models (Figure 20).

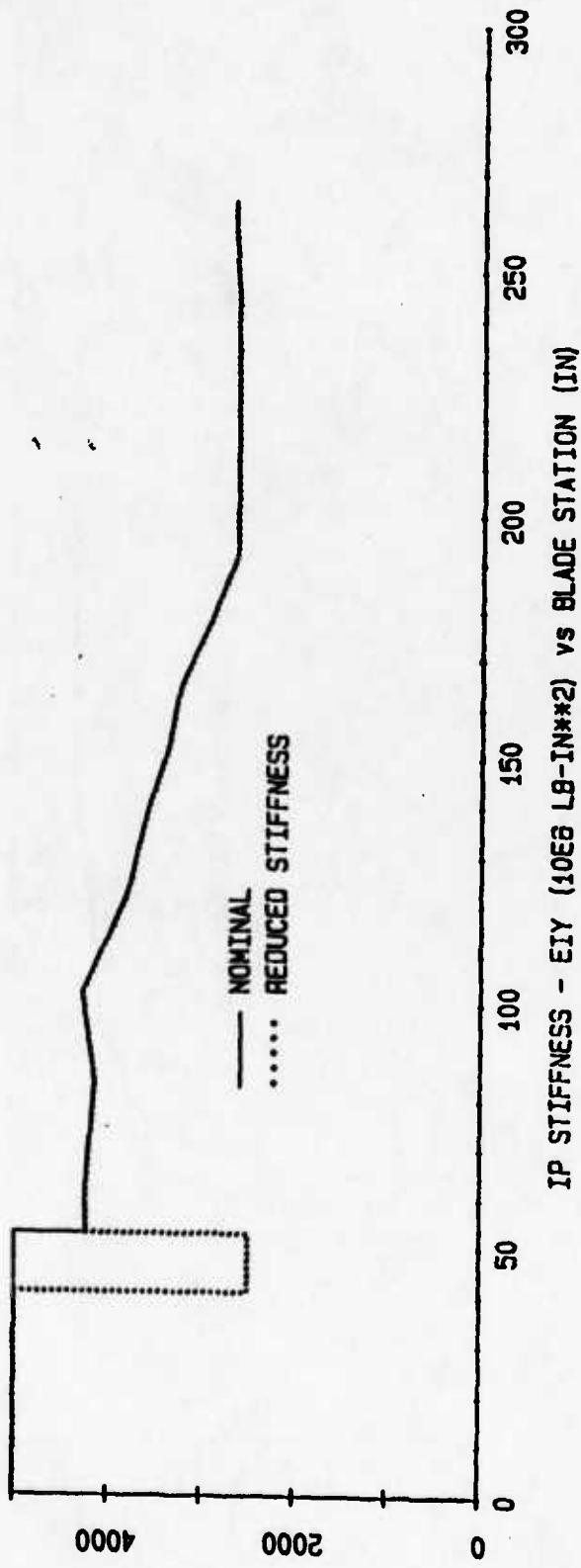


Figure 17. In-Plane Blade Stiffnesses.

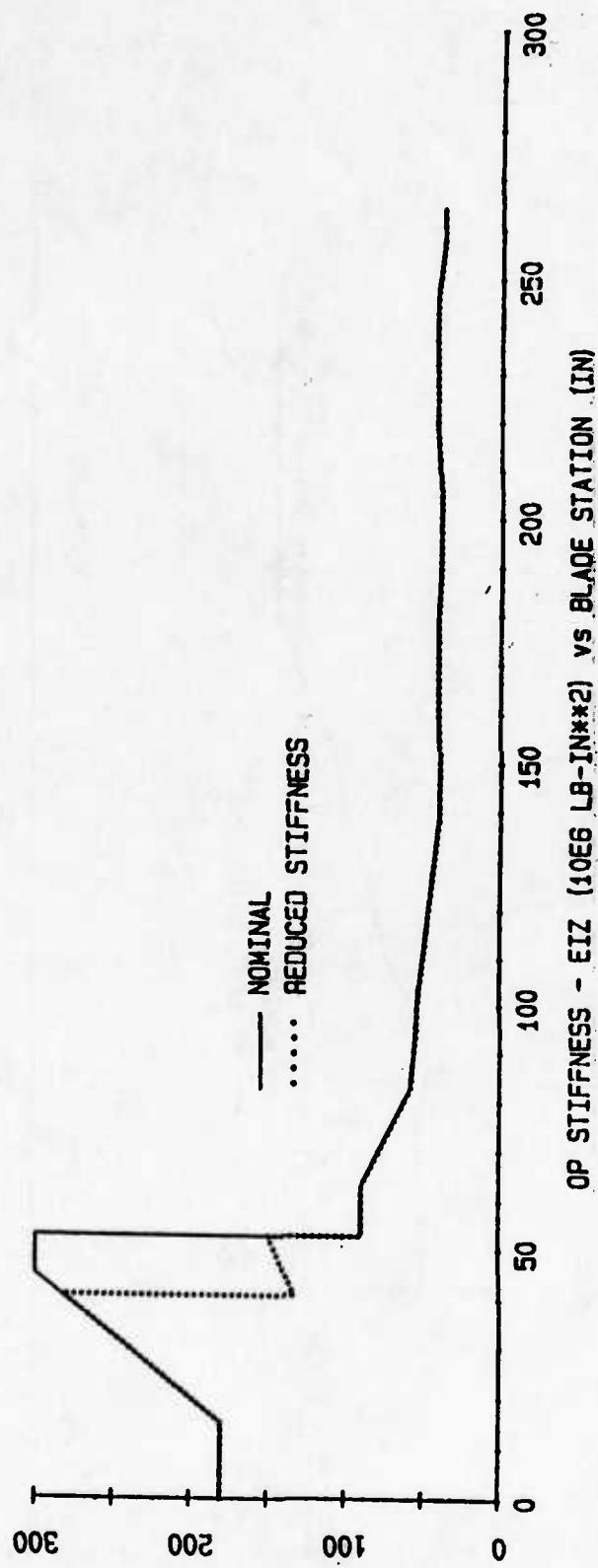


Figure 18. Out-of-Plane Blade Stiffnesses.

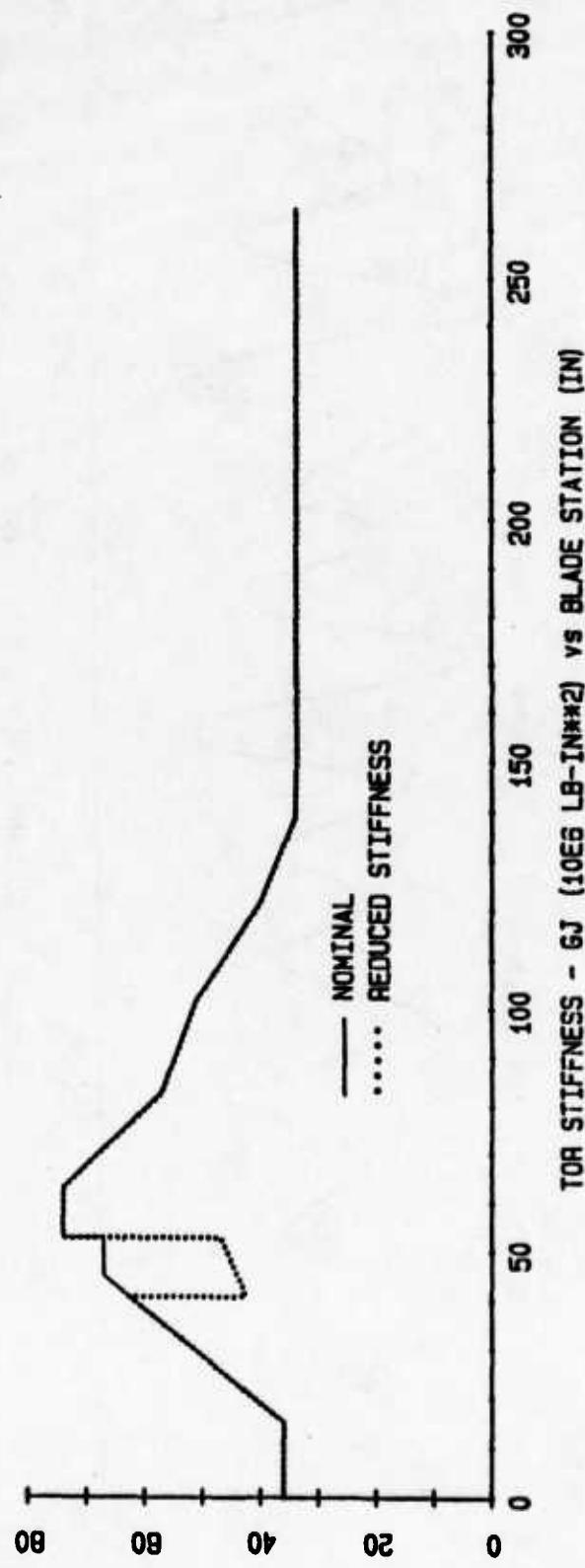


Figure 19. Torsion Blade Stiffnesses.

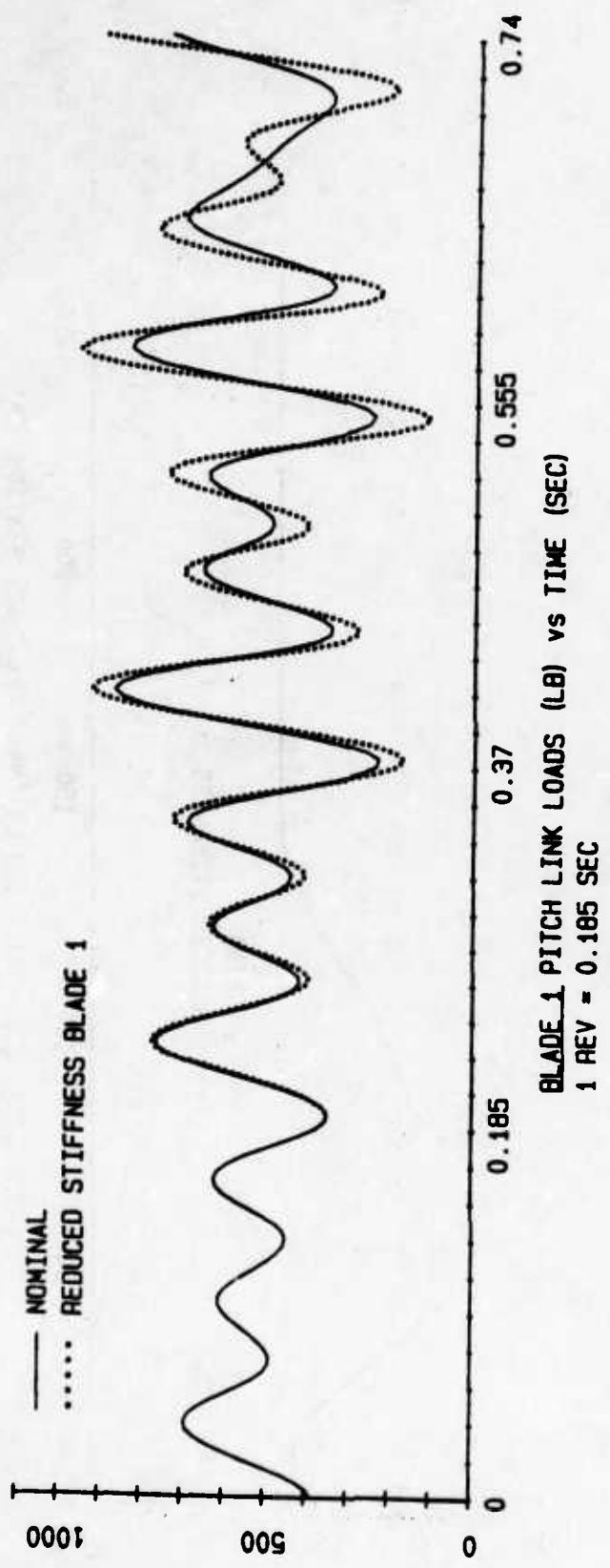


Figure 20. Time History Pitch Link Loads.

LIST
DATA SET
TGC
DATA MEMBER
CGLO
TGC /CGLO ON FILE U1

***** TGC /CGLO *****

TRANSFORM GLOBAL ACCELERATIONS TO COMPONENT COORDS

INPUT FOR COMPONENT CGLO. GLOBAL REFERENCE

1 NCGL - NO. OF COMPONENTS = 2
2 IGSEQ - SEQUENCE NUMBERS = 1
3 XYDG - (REAL) COMPONENT X,Y VECTOR
GENERAL MATRIX

ROW 1
1.00000E+00 1.00000E+00

MORE...

ROW 2 NULL ROW

ROW 3 NULL ROW

ROW 4 NULL ROW

ROW 5

1.00000E+00 1.00000E+00

ROW 6 NULL ROW

4 CDFLI - DOF NAME = X 0

LIST COMPLETE.
COMMAND

LIST
DATA SET
DEL
DATA MEMBER
CLC0
DEL /CLC0 ON FILE U1

***** DEL /CLC0 *****

DELETE ARTIFICIAL CGLO DOF

INPUT FOR COMPONENT CLC0. ELIMINATE DOF

1 NCIDE - # OF ELIMINATED DOF = 1
2 CIDFLI - ELIMINATED DOF NAMES= X 0
3 CDFLI - 1 EXPLICIT DOF NAME = XCG 1000

LIST COMPLETE
COMMAND

MORE...

RUN
MODEL NAME (DATA SET)

AH1GR

LIST MODEL SUMMARY (Y OR N)

Y

***** MODEL AH1GR *****

AH1 WITH GRAVITY FORCE APPLIED THROUGH GLOBAL REF SYS

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CRE3	1	B2Z1T2	FRA3	FCT1.65
				REQUIRED DS/DM=	AFD161 /AIRFOIL
2	CCE0	1	3000	NONE	
3	CLC1		COUPLE	NONE	
4	CFM2	1	8300-4	FFC2	AH1G16.5
5	CGL0		TGC	NONE	
6	CLC0		DEL	NONE	

MORE...

GLOBAL VARIABLES

1 VSOUND - SOUND VELOCITY = 1.13800E+03
2 RHO - AIR DENSITY RATIO = 8.79000E-01

RUNNING

SOLUTION INPUT FOR STH3.TIME HISTORY

```

1 TSTA      - START TIME      = 0.00000E+00
2 H          - INITIAL INCREMENT = 3.70370E-03
3 HTD       - SEPARATE INCREMENT = 0.00000E+00
4 HF         - SEPARATE INCREMENT = 0.00000E+00
5 TEND      - END TIME        = 7.40740E-01
6 E          - ERROR CHECK VALUE = 0.00000E+00
7 ICOPT     - INITIAL CONDITION = 2
8 YV         - (REAL) INITIAL VELOCITY
              -1.77456E+00 -1.55660E-02 1.68748E+00 -7.87600E-03
              2.81340E-01 -2.29978E-01 2.91548E-01 3.36010E-02
              -8.98260E-02 0.00000E+00 0.00000E+00 0.00000E+00
              0.00000E+00
9 YD         - (REAL) INITIAL DISPLACEMENT
              9.88300E-03 5.19700E-03 -6.94290E-02 -3.51700E-03
              1.83410E-02 2.80760E-02 2.39880E-02 -4.44800E-03
              -3.36500E-03 0.00000E+00 0.00000E+00 0.00000E+00
              0.00000E+00
10 ICON      - ROTOR CONTROLS = 1
                           MORE...
11 MROT      - NUMBER OF ROTORS = 1
12 IR1       - ROTOR NUMBER = 1
13 A01       - COLLECTIVE ANGLE = -1.56300E-02
14 A1C1      - COSINE ANGLE (RAD) = 7.91000E-03
15 A1S1      - SINE ANGLE (RAD) = -6.25800E-02
16 NH1       - HIGHER HARMONIC = 0
17 ITOUT     - ROTOR FORCE OUTPUT = 0
18 CRT       - OUTPUT THIS TERMINAL= YES
19 ITEET     - TEETERING ROTOR = YES
20 LINK      - (REAL) HORIZONTAL TAIL LINK
              1.00000E-01 -1.24000E-01 3.52000E+00
21 ILOP      - SAVE STATE VECTORS = YES
22 JIIL      - INPUT I. EVERY ITH = 1
23 GS         - VERT ACCELERATION = 1.00000E+00
24 ICF        - CONSIDER CENTRIFUGAL= NO
25 XYDI      - (REAL) GLOBAL X.Y VECTOR
              9.99880E-01 0.00000E+00 1.52100E-02 0.00000E+00
              1.00000E+00 0.00000E+00
*****
```

RE-ENTER (Y OR N)

SOLUTION INPUT FOR SII3, TIME HISTORY LOADS

1 IFL - INTERFACE LOADS = YES
2 IFLDF - (COMPONENT DOFS SELECTED) INTERFACE DOF
COMPONENT 3000 /CCE0 DOFS
RODR1100 RODR1200
3 IFLPL - PLOT INTERFACE LOADS= YES
4 INL - INTERNAL LOADS = NO

RE-ENTER (Y OR N)

DATA SET
BTLOSS
DATA MEMBER
CRD3
BTLOSS /CRD3 ON FILE U1

***** BTLOSS /CRD3 *****

50 PCT LOSS (EIY,EIZ) 30 PCT LOSS (GJ) BS 40.79 - 52.79

INPUT FOR DAMAGED ROTOR COMPONENT CRD3. ROTOR DAMAGED BLADES

1 JV	- INPLANE DOF	=	YES	
2 JW	- OUTPLANE DOF	=	YES	
3 JP	- TORSION DOF	=	YES	
4 NV	- NO. OF INPLANE MODES=		1	
5 NW	- NO. OF OUTPLNE MODES=		2	
6 NP	- NO. OF TORSION MODES=		2	
7 NDB	- NO. OF DAMAGED	=	1	
			MORE...	
8 IDB	- BLADE NOS. OF	=	1	
9 NX	- NO. OF BLADE STAS	=	21	
10 JXD	- NEW STATIONS	=	YES	
11 X	- (REAL) STATIONS			
	0.00000E+00	1.50000E+01	4.07800E+01	4.07900E+01
	5.27900E+01	5.28000E+01	6.29000E+01	8.27000E+01
	1.01700E+02	1.21500E+02	1.38600E+02	1.50500E+02
	1.63700E+02	1.78200E+02	1.91400E+02	2.05150E+02
	2.18350E+02	2.31250E+02	2.45500E+02	2.57400E+02
	2.64000E+02			
12 ITYP	- MODE INPUT 0,1, OR 2=		1	
13 VPPD	- (REAL) 2ND DERIVATIVE OF IP			

GENERAL MATRIX

ROW	1
	3.64850E-05
ROW	2
	9.24470E-05
ROW	3
	1.53210E-05
ROW	4
	2.29820E-05

MORE...

ROW	5	2.16190E-05
ROW	6	1.44120E-05
ROW	7	2.58380E-05
ROW	8	2.22030E-05
ROW	9	1.79180E-05
ROW	10	1.61000E-05
ROW	11	1.37630E-05
ROW	12	1.23350E-05
ROW	13	1.02570E-05
ROW	14	8.69940E-06
ROW	15	7.01150E-06
ROW	16	4.67430E-06
ROW	17	2.85650E-06
ROW	18	1.55810E-06
ROW	19	5.19360E-07
ROW	20	NULL ROW
ROW	21	NULL ROW
14 VPD	- (REAL) 1ST DERIVATIVE OF IP GENERAL MATRIX	
ROW	1	NULL ROW
ROW	2	9.67000E-04
ROW	3	2.58350E-03
ROW	4	2.58350E-03
ROW	5	2.79090E-03

MORE...

MORE...

ROW	6	
	2.79110E-03	
ROW	7	
	2.99430E-03	
ROW	8	
	3.46990E-03	
ROW	9	
	3.85110E-03	
ROW	10	
	4.18790E-03	
ROW	11	
	4.44320E-03	
ROW	12	
	4.59850E-03	
ROW	13	
	4.74760E-03	
ROW	14	
	4.88500E-03	
ROW	15	
	5.08810E-03	
ROW	16	
	5.06910E-03	
ROW	17	
	5.11880E-03	
ROW	18	
	5.14720E-03	
ROW	19	
	5.16210E-03	
ROW	20	
	5.16510E-03	
ROW	21	
	5.46660E-03	
15 VD	- (REAL) INPLANE MODE SHAPES	
	GENERAL MATRIX	
ROW	1	NULL ROW
ROW	2	
	7.25200E-03	
ROW	3	
	6.05100E-02	
ROW	4	
	6.05100E-02	
ROW	5	
	8.10800E-02	

MORE...

MORE...

		8.11100E-02
ROW	7	1.09400E-01
ROW	8	1.71590E-01
ROW	9	2.39400E-01
ROW	10	3.17100E-01
ROW	11	3.89400E-01
ROW	12	4.42100E-01
ROW	13	5.02500E-01
ROW	14	5.71100E-01
ROW	15	6.35000E-01
ROW	16	7.03000E-01
		MORE...
ROW	17	7.68900E-01
ROW	18	8.34000E-01
ROW	19	9.06100E-01
ROW	20	9.66500E-01
ROW	21	1.00000E+00
16 WPPD	- (REAL) 2ND DERIVATIVE OF OP GENERAL MATRIX	
ROW	1	0.00000E+00 3.91000E-05
ROW	2	0.00000E+00 5.00700E-05
ROW	3	0.00000E+00 1.46800E-05
ROW	4	0.00000E+00 2.20200E-05
ROW	5	
		MORE...

ROW	6	0.00000E+00	1.89800E-05
ROW	7	0.00000E+00	1.26500E-05
ROW	8	0.00000E+00	4.67600E-05
ROW	9	0.00000E+00	4.91800E-05
ROW	10	0.00000E+00	3.31100E-05
ROW	11	0.00000E+00	2.47100E-05
ROW	12	0.00000E+00	1.81400E-05
ROW	13	0.00000E+00	1.36900E-05
ROW	14	0.00000E+00	9.83600E-06
ROW	15	0.00000E+00	6.92000E-06
ROW	16	0.00000E+00	5.19000E-06
			MORE...
ROW	17	0.00000E+00	3.60800E-06
ROW	18	0.00000E+00	2.22400E-06
ROW	19	0.00000E+00	1.28500E-06
ROW	20	0.00000E+00	4.94300E-07
ROW	21	NULL ROW	
17 WPD		- (REAL) 1ST DERIVATIVE OF OP GENERAL MATRIX	
ROW	1	3.78780E-03	0.00000E+00
ROW	2	3.78780E-03	6.68800E-04
ROW	3	3.78780E-03	1.64000E-03
ROW	4	3.78780E-03	1.64000E-03
ROW	5		
			MORE...

ROW	6	3.78780E-03	1.83400E-03
ROW	7	3.78780E-03	1.83400E-03
ROW	8	3.78780E-03	2.13400E-03
ROW	9	3.78780E-03	3.08400E-03
ROW	10	3.78780E-03	3.86600E-03
ROW	11	3.78780E-03	4.43900E-03
ROW	12	3.78780E-03	4.80500E-03
ROW	13	3.78780E-03	4.99500E-03
ROW	14	3.78780E-03	5.15000E-03
ROW	15	3.78780E-03	5.27100E-03
ROW	16	3.78780E-03	5.35100E-03

MORE...

ROW	17	3.78780E-03	5.41200E-03
ROW	18	3.78780E-03	5.45000E-03
ROW	19	3.78780E-03	5.47300E-03
ROW	20	3.78780E-03	5.48600E-03
ROW	21	3.78780E-03	5.48900E-03

18 WD - (REAL) OUTPLANE MODE SHAPES
GENERAL MATRIX

ROW	1	NULL ROW	
ROW	2	5.68100E-02	5.01600E-03
ROW	3	1.70450E-01	3.96500E-02
ROW	4	1.70450E-01	3.96500E-02
ROW	5		

MORE...

ROW	6	
ROW	7	2.00100E-01 5.28500E-02
ROW	8	2.38200E-01 7.20000E-02
ROW	9	3.13250E-01 1.21900E-01
ROW	10	3.85200E-01 1.86300E-01
ROW	11	4.60200E-01 2.66800E-01
ROW	12	5.25000E-01 3.44300E-01
ROW	13	5.70000E-01 4.01600E-01
ROW	14	6.20000E-01 4.67300E-01
ROW	15	6.75000E-01 5.41600E-01
ROW	16	7.25000E-01 6.10600E-01
		MORE...
ROW	17	7.77000E-01 6.83400E-01
ROW	18	8.27100E-01 7.54000E-01
ROW	19	8.75900E-01 8.23200E-01
ROW	20	9.30000E-01 9.00000E-01
ROW	21	9.75000E-01 9.64000E-01
19 PHFPD	- (REAL) 2ND DERIVATIVE OF TO NULL MATRIX	
20 PHFD	- (REAL) 1ST DERIVATIVE OF TO GENERAL MATRIX	
ROW	1	0.00000E+00 3.74000E-03
ROW	2	0.00000E+00 3.74000E-03
ROW	3	
		MORE...

ROW	4	0.00000E+00	3.74000E-03
ROW	5	0.00000E+00	4.86000E-03
ROW	6	0.00000E+00	4.86000E-03
ROW	7	0.00000E+00	3.74000E-03
ROW	8	0.00000E+00	3.74000E-03
ROW	9	0.00000E+00	3.74000E-03
ROW	10	0.00000E+00	3.74000E-03
ROW	11	0.00000E+00	3.74000E-03
ROW	12	0.00000E+00	3.74000E-03
ROW	13	0.00000E+00	3.74000E-03
ROW	14	0.00000E+00	3.74000E-03
ROW	15	0.00000E+00	3.74000E-03
ROW	16	0.00000E+00	3.74000E-03
ROW	17	0.00000E+00	3.74000E-03
ROW	18	0.00000E+00	3.74000E-03
ROW	19	0.00000E+00	3.74000E-03
ROW	20	0.00000E+00	3.74000E-03
ROW	21	0.00000E+00	3.74000E-03

MORE...

21 PHD - (REAL) TORSION MODE SHAPES
GENERAL MATRIX

ROW	1	1.00000E+00	0.00000E+00
ROW	2	1.00000E+00	5.60000E-02

MORE...

ROW	3		
	1.00000E+00	1.68200E-01	
ROW	4		
	1.00000E+00	1.68200E-01	
ROW	5		
	1.00000E+00	2.10700E-01	
ROW	6		
	1.00000E+00	2.10800E-01	
ROW	7		
	1.00000E+00	2.48500E-01	
ROW	8		
	1.00000E+00	3.22500E-01	
ROW	9		
	1.00000E+00	3.93400E-01	
ROW	10		
	1.00000E+00	4.67400E-01	
ROW	11		
	1.00000E+00	5.31400E-01	
ROW	12		
	1.00000E+00	5.75700E-01	
ROW	13		
	1.00000E+00	6.25100E-01	
ROW	14		
	1.00000E+00	6.79300E-01	
ROW	15		
	1.00000E+00	7.28700E-01	
ROW	16		
	1.00000E+00	7.80000E-01	
ROW	17		
	1.00000E+00	8.29300E-01	
ROW	18		
	1.00000E+00	8.77600E-01	
ROW	19		
	1.00000E+00	9.30900E-01	
ROW	20		
	1.00000E+00	9.75300E-01	
ROW	21		
	1.00000E+00	1.00000E+00	
22	CIFF	- IP MODAL DAMPING	= 0.00000E+00
23	COPP	- OP MODAL DAMPING	= 0.00000E+00 0.00000E+00
24	CTORR	- TORSION MODAL	= 0.00000E+00 0.00000E+00
25	KIP	- IP SPRING RATE	= 0.00000E+00
26	CIP	- IP DAMPING RATE	= 0.00000E+00
27	KOF	- OP SPRING RATE	= 0.00000E+00

MORE...

MORE...

28 COP	- OP DAMPING RATE	=	0.00000E+00	
29 KTOR	- TORSION SPRING RATE	=	0.00000E+00	
30 CTOR	- TORSION DAMPING RATE	=	0.00000E+00	
31 IU	- UNIFORM BLADE	=	NU	
32 M	- (REAL) MASS PER UNIT LENGTH			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
33 SE	- (REAL) CG OFFSET FROM EA			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
34 SEA	- (REAL) AREA CENTROID OFFSET			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
				MORE...
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
35 KM1	- (REAL) MASS ROG ABOUT			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
36 KM2	- (REAL) MASS ROG ABOUT			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
37 KA	- (REAL) AREA ROG OF CROSS			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
				MORE...

	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
38 THF	- (REAL) PRETWIST RATE DEG/IN			
	-3.78753E-02	-3.78753E-02	-3.78753E-02	-3.78753E-02
	-3.78753E-02	-3.78753E-02	-3.78753E-02	-3.78753E-02
	-3.78753E-02	-3.78753E-02	-3.78753E-02	-3.78753E-02
	-3.78753E-02	-3.78753E-02	-3.78753E-02	-3.78753E-02
	-3.78753E-02	-3.78753E-02	-3.78753E-02	-3.78753E-02
	-3.78753E-02			
39 EIY	- (REAL) CHORDWISE EI*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	-2.50000E+03
	-2.50000E+03	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
40 EIZ	- (REAL) BEAMWISE EI*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	-1.50000E+02
	-1.50000E+02	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
				MORE...
	0.00000E+00			
41 EA	- (REAL) SECTION EA*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
42 GJ	- (REAL) SECTION GJ*10E-6			
	0.00000E+00	0.00000E+00	0.00000E+00	-2.01000E+01
	-2.01000E+01	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			
43 EB1	- (REAL) CROSS SEC INTEGRAL			
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00			

44 EB2 - (REAL) CROSS SEC INTEGRAL
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00
45 EC1 - (REAL) CROSS SEC INTEGRAL
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00
46 EC1STA - (REAL) CROSS SEC INTEGRAL
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00
47 JIL - INTERNAL LOADS = NO
***** MORE... *****

LIST COMPLETE
COMMAND

LIST
DATA SET
DTGC
DATA MEMBER
CGL0
DTGC /CGL0 ON FILE U1

***** DTGC /CGL0 *****

TRANSFORM GLOBAL ACCELERATIONS TO COMPONENT COORDS

INPUT FOR COMPONENT CGL0. GLOBAL REFERENCE

1 NCGL - NO. OF COMPONENTS = 3
2 IGSEQ - SEQUENCE NUMBERS
 1 2 5
3 XYDG - (REAL) COMPONENT X.Y VECTOR
GENERAL MATRIX

ROW 1
1.00000E+00 1.00000E+00 1.00000E+00
ROW 2 NULL ROW
ROW 3 NULL ROW
ROW 4 NULL ROW
ROW 5
1.00000E+00 1.00000E+00 1.00000E+00
ROW 6 NULL ROW

MORE...

4 CDFLI - DOF NAME = X 0

LIST COMPLETE
COMMAND

MODEL NAME (DATA SET)
DAH1GR

LIST MODEL SUMMARY (Y OR N)
Y

***** MODEL DAH1GR *****

AH1GR WITH BLADE DAMAGE

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CRE3	1	B2Z1T2	FRA3	FCT1.65
2	CRD3	1	BTLOSS	FRA3	FCT1.65 REQUIRED DS/DM= AFD161 /AIRFOIL
3	CCE0	1	3000	NONE	
4	CLC1		COUPLE	NONE	
5	CFM2	1	8300-4	FFC2	AH1G16.5
6	CGL0		DTGC	NONE	
7	CLC0		DEL	NONE	

MORE...

GLOBAL VARIABLES

1 VSOUND - SOUND VELOCITY = 1.13900E+03
2 RHO - AIR DENSITY RATIO = 8.79000E-01

MULTIPLE REFERENCE TO AFD161 /AIRFOIL
THE SAME UNIT HAS BEEN ASSIGNED

RUNNING

SOLUTION INPUT FOR STH3.TIME HISTORY

1 TSTA	- START TIME	=	1.85185E-01
2 H	- INITIAL INCREMENT	=	3.70370E-03
3 HTD	- SEPARATE INCREMENT	=	0.00000E+00
4 HF	- SEPARATE INCREMENT	=	0.00000E+00
5 TEND	- END TIME	=	7.40740E-01
6 E	- ERROR CHECK VALUE	=	0.00000E+00
7 ICOPT	- INITIAL CONDITION	=	3
8 ICON	- ROTOR CONTROLS	=	2
9 ITOUT	- ROTOR FORCE OUTPUT	=	0
10 CRT	- OUTPUT THIS TERMINAL	=	YES
11 ITEET	- TEETERING ROTOR	=	YES
12 LINK	- (REAL) HORIZONTAL TAIL LINK		
	1.00000E-01 -1.24000E-01	3.52000E+00	
13 ILOP	- SAVE STATE VECTORS	=	YES
14 JIIL	- INPUT I. EVERY ITH	=	1
15 GS	- VERT ACCELERATION	=	1.00000E+00
16 ICF	- CONSIDER CENTRIFUGAL	=	NO
17 XYDI	- (REAL) GLOBAL X.Y VECTOR		

MORE...

9.99880E-01	0.00000E+00	1.52100E-02	0.00000E+00
1.00000E+00	0.00000E+00		

RE-ENTER (Y OR N)

SOLUTION INPUT FOR SII3.TIME HISTORY LOADS

1 IFL - INTERFACE LOADS = YES
2 IFLDF - (COMPONENT DOFS SELECTED) INTERFACE DOF
COMPONENT 3000 /CCEO DOFS
RODR1100 RODR1200
3 IFLPL - PLOT INTERFACE LOADS= YES
4 INL - INTERNAL LOADS = NO

RE-ENTER (Y OR N)

2.6.4 Trim - Global Reference System. The trim solution of the model in Section 6 of the User's Manual (AH2G-35A/MODEL) was repeated to validate the global reference system. The baseline model was then modified in order to trim for a 10 degree, steady left banked turn at 60 knots with force balancing for the XCG, YCG, ZCG, ALFX, ALFY (no ALFZ) degrees of freedom. To minimize the size of the model and reduce solution time, the torsion and out-of-plane elastic degrees of freedom of the blades were deleted; the effect of the elastic modes on trim is small by comparison to the rigid body modes.

Using the information above and the simple relationships for a steady coordinated turn, the turn rate, Ω , and the turn radius, R , were calculated:

$$R = V^2 / (g \tan \phi)$$

$$\Omega = V/R$$

where V is forward velocity, g is acceleration due to gravity, and ϕ is bank angle. The initial velocities, displacements, and control settings were obtained from the baseline trim solution, and the trim (control) parameters were chosen to be A0, A1S, A1C, APTCH, and AYAW with AROLL (bank angle) held constant.

EXECUTION BEGINS...

USER FILE U1 TO BE INITIALIZED (Y OR N)

COMMAND

MODEL NAME (DATA SET)

LIST MODEL SUMMARY (Y OR N)

***** MODEL AH1T *****

AH1 TRIM. GRAVITY FORCE APPLIED THROUGH GLOBAL REF SYS

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CRE3	1	B2Z1T2	FRA3	FCT1.65
				REQUIRED DS/DM=	AFD161 /AIRFOIL
2	CCE0	1	3000	NONE	
3	CLC1		COUPLE	NONE	
4	CFM2	1	8300-4	FFC2	AK1G16.5
5	CGL0		TGC	NONE	
6	CLC0		DEL	NONE	

MORE...

GLOBAL VARIABLES

1 VSOUND	- SOUND VELOCITY	= 1.13800E+03
2 RHO	- AIR DENSITY RATIO	= 8.79000E-01

SOLUTION INPUT FOR STR3. TRIM SOLUTION

1 IFUS	- PERIODIC MOTION	=	NO
2 ITEET	- TEETERING ROTOR	=	YES
3 TRCOVA7	- VALUE A	=	1.00000E-01
4 TRCOVA8	- VALUE B	=	-1.24000E-01
5 TRCOVA9	- VALUE C	=	3.52000E+00
6 H	- INITIAL INCREMENT	=	3.70370E-03
7 TPER	- INTEGRATION PERIOD	=	1.85185E-01
8 HTD	- SEPARATE INCREMENT	=	0.00000E+00
9 HF	- SEPARATE INCREMENT	=	0.00000E+00
10 E	- ERROR CHECK VALUE	=	0.00000E+00
11 ITRIM	- CASE NUMBER	=	1
12 NALLOW	- NO. OF ITERATIONS	=	8
13 CEA	- CONSTANT ERROR	=	YES
14 CEALLO	- CONSTANT ERROR	=	1.00000E-05
15 EALLOWT1	- (REAL) TRIM ERRORS ALLOWED		
	1.00000E-05 1.00000E-05 1.00000E-05 1.00000E-05		
16 CI	- CONSTANT INCREMENT	=	YES
17 CICRE	- CONSTANT INCREMENT	=	5.00000E-03
18 DELTAT1	- (REAL) CONTROL VAR INCRMNTS		
	5.00000E-03 5.00000E-03 5.00000E-03 5.00000E-03		
19 IWIND	- WIND VELOCITY Y OR N=		NO
20 VTRANG	- (REAL) FUSELAGE TRANS VEL		
	-1.36800E+03 0.00000E+00 0.00000E+00		
21 IROTN	- FUSELAGE ANGULAR VEL=		NO
22 CT	- ROTOR THRUST	=	8.00000E+03
23 IGUESS	- INITIAL GUESSES	=	NO
24 APTCH	- GUESS FUSELAGE ANGLE=	-1.50000E-02	
25 ISTEAD	- STEADY TIME HISTORY =		NO
26 CRT	- OUTPUT THIS TERMINAL=		YES
27 GS	- VERT ACCELERATION	=	1.00000E+00

RE-ENTER (Y OR N)

***** SOLUTION STR3 FOR MODEL AH1T *****
MODEL - AH1 TRIM, GRAVITY FORCE APPLIED THROUGH GLOBAL REF SYS
SOLUTION - TRIM SOLUTION

NO. OF ITERATION = 1

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT
TOR 1110	0.207232	0.032726
TOR 1120	-0.633156	0.041145
TOR 1210	-1.941833	-0.135442
TOR 1220	4.441874	-0.019792
TEET 0	0.562461	0.041244
OPOP1120	-0.890812	0.034387
OPOP1220	-0.200462	0.025052
IPIP1110	0.048308	-0.002321
IPIP1210	-0.074492	-0.005202

A0 = -0.04959 A1C = 0.01164 A1S = -0.05127

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9995E-01	0.0000E+00	9.9998E-03
0.0000E+00	1.0000E+00	0.0000E+00
-9.9998E-03	0.0000E+00	9.9995E-01

MORE...

FUSELAGE PITCH ANGLE = -0.0171235

AERODYNAMIC FORCES ARE:

TORQ -144170.75	XFOR 282.76	YFOR 198.97	ZFOR 11905.85	HP -741.15
MOMX 52449.19	MOMY 231336.12			

INDUCED VEL = -0.01200

VEL W.R.T. ROTOR SYSTEM ARE:

-1367.9316 0.0000 13.6798

VEL W.R.T. FUSE SYSTEM ARE:

-1367.9316 0.0000 13.6798

UNBALANCE FORCES ARE:

FX	FZ	MX	MY
428.01	3835.17	52409.59	272898.69

FUSLAGE LIFT.DRAG.MOM.FX.FY.FZ:

-2.48 223.91 -4774.82 223.87 0.00 -4.72

WING LIFT.DRAG.MOM.FX.FY.FZ:

270.91 24.47 -382.35 27.18 0.00 270.65

HTAIL LIFT.DRAG.MOM.FX.FY.FZ:

-35.23 5.16 0.00 4.81 0.00 -35.28

VTAIL LIFT.DRAG.MOM.FX.FY.FZ:

56.39 12.82 0.00 12.82 56.39 0.00

NO. OF ITERATION = 2

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT	MORE...
TOR 1110	-2.381526	0.026240	
TOR 1120	-1.348439	0.012936	
TOR 1210	2.455760	-0.075191	
TOR 1220	0.895980	-0.009412	
TEET 0	0.482120	0.047529	
OPOP1120	-0.227840	0.025087	
OPOP1220	0.417426	0.016615	
IPIP1110	-0.038940	-0.003402	
IPIP1210	-0.121398	-0.002156	

A0 = -0.01061 A1C = -0.02924 A1S = -0.09173

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9993E-01	0.0000E+00	1.2123E-02
0.0000E+00	1.0000E+00	0.0000E+00
-1.2123E-02	0.0000E+00	9.9993E-01

FUSELAGE PITCH ANGLE = -0.0085347

AERODYNAMIC FORCES ARE:

TORQ -55446.84	XFOR -46.31	YFOR -184.86	ZFOR 4823.69	HP -285.04
MOMX 172769.06	MOMY 59710.14			

INDUCED VEL = -0.02015

VEL W.R.T. ROTOR SYSTEM ARE:

-1367.8994	0.0000	16.5845
------------	--------	---------

MORE...

VEL W.R.T. FUSE SYSTEM ARE:

-1367.8994	0.0000	16.5845
------------	--------	---------

UNBALANCE FORCES ARE:

FX 81.82	FZ -3244.31	MX 172729.87	MY 63686.53
-------------	----------------	-----------------	----------------

FUSLAGE LIFT.DRAG.MOM.FX.FY.FZ:

-3.00	223.88	-4854.40	223.82	0.00	-5.72
-------	--------	----------	--------	------	-------

WING LIFT.DRAG.MOM.FX.FY.FZ:

270.83	24.47	-382.35	27.75	0.00	270.52
--------	-------	---------	-------	------	--------

HTAIL LIFT.DRAG.MOM.FX.FY.FZ:

-31.34	5.16	0.00	4.78	0.00	-31.40
--------	------	------	------	------	--------

VTAIL LIFT.DRAG.MOM.FX.FY.FZ:

56.39	12.82	0.00	12.82	56.39	0.00
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MORE...

NO. OF ITERATION = 3

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT
TOR 1110	-1.863174	0.008771
TOR 1120	-0.046465	0.005057
TOR 1210	1.754134	-0.069708
TOR 1220	-0.046881	-0.003408
TEET 0	0.277514	0.018023
OPOP1120	-0.213060	0.028282
OPOP1220	0.245676	0.024696
IPIP1110	0.026687	-0.004516
IPIP1210	-0.064251	-0.003437

MORE...

A0 = -0.01590 A1C = 0.00840 A1S = -0.06279

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9999E-01	0.0000E+00	3.5347E-03
0.0000E+00	1.0000E+00	0.0000E+00
-3.5347E-03	0.0000E+00	9.9999E-01

FUSELAGE PITCH ANGLE = -0.0145171

AERODYNAMIC FORCES ARE:

TORQ -90180.19	XFOR -343.04	YFOR -201.32	ZFOR 8081.32	HF -463.60
MOMX 27809.63	MOMY 29331.90			

MORE...

INDUCED VEL = -0.02018

VEL W.R.T. ROTOR SYSTEM ARE:

-1367.9915 0.0000 4.8355

VEL W.R.T. FUSE SYSTEM ARE:

-1367.9915 0.0000 4.8355

UNBALANCE FORCES ARE:

FX	FZ	MX	MY
-145.38	28.40	27770.10	5824.95

FUSLAGE LIFT, DRAG, MOM, FX, FY, FZ:

-0.88 224.03 -4532.84 224.02 0.00 -1.67

WING LIFT, DRAG, MOM, FX, FY, FZ:

270.66 24.47 -382.35 25.43 0.00 270.57

HTAIL LIFT, DRAG, MOM, FX, FY, FZ:

-19.87 5.16 0.00 5.09 0.00 -19.89

MORE...

VTAIL LIFT, DRAG, MOM, FX, FY, FZ:

56.39 12.82 0.00 12.82 56.39 0.00

NO. OF ITERATION = 4

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT
TOR 1110	-1.769011	0.010815
TOR 1120	-0.027402	0.005140
TOR 1210	1.682513	-0.069516
TOR 1220	0.007120	-0.003544
TEET 0	0.282620	0.019433

MORE...

OP0P1120	-0.228842	0.028056
OP0P1220	0.290379	0.023940
IPIP1110	0.033168	-0.004439
IPIP1210	-0.089830	-0.003348

A0 = -0.01518 A1C = 0.00824 A1S = -0.06282

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9995E-01	0.0000E+00	9.5169E-03
0.0000E+00	1.0000E+00	0.0000E+00
-9.5169E-03	0.0000E+00	9.9995E-01

FUSELAGE PITCH ANGLE = -0.0152220

AERODYNAMIC FORCES ARE:

MORE...

TORQ	XFOR	YFOR	ZFOR	HP
-84417.75	-141.93	-172.74	7978.04	-433.97
MOMX	MOMY			
-1818.16	2251.94			

INDUCED VEL = -0.02037

VEL W.R.T. ROTOR SYSTEM ARE:

-1367.9380	0.0000	13.0192
------------	--------	---------

VEL W.R.T. FUSE SYSTEM ARE:

-1367.9380	0.0000	13.0192
------------	--------	---------

UNBALANCE FORCES ARE:

FX	FZ	MX	MY
7.31	-86.09	-1857.65	-1024.69

FUSLAGE LIFT, DRAG, MOM, FX, FY, FZ:

-2.36	223.91	-4756.73	223.88	0.00	-4.49
-------	--------	----------	--------	------	-------

MORE...

WING LIFT,DRAG,MOM,FX,FY,FZ:					
270.92	24.47	-382.35	27.05	0.00	270.67
HTAIL LIFT,DRAG,MOM,FX,FY,FZ:					
-28.64	5.16	0.00	4.89	0.00	-28.69
VTAIL LIFT,DRAG,MOM,FX,FY,FZ:					
56.39	12.82	0.00	12.82	56.39	0.00

NO. OF ITERATION = 5

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT	
TOR 1110	-1.774584	0.009832	
TOR 1120	-0.015357	0.005196	MORE...
TOR 1210	1.687107	-0.069426	
TOR 1220	-0.008171	-0.003511	
TEET 0	0.281262	0.018330	
OPOP1120	-0.229909	0.028075	
OPOP1220	0.291709	0.023984	
IPIP1110	0.033565	-0.004449	
IPIP1210	-0.089911	-0.003365	

A0 = -0.01565 A1C = 0.00791 A1S = -0.06256

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9995E-01	0.0000E+00	1.0222E-02
0.0000E+00	1.0000E+00	0.0000E+00

MORE...

-1.0222E-02 0.0000E+00 9.9995E-01

FUSELAGE PITCH ANGLE = -0.0152182

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HP
-85514.50	-143.70	-177.26	8131.79	-439.61

MOMX	MOMY
1667.41	3575.41

INDUCED VEL = -0.02010

VEL W.R.T. ROTOR SYSTEM ARE:

-1367.9285	0.0000	13.9834
------------	--------	---------

VEL W.R.T. FUSE SYSTEM ARE:

-1367.9285	0.0000	13.9834
------------	--------	---------

UNBALANCE FORCES ARE:

MORE...

FX	FZ	MX	MY
-0.16	67.12	1627.93	181.75

FUSLAGE LIFT,DRAG,MOM,FX,FY,FZ:

-2.53	223.90	-4783.14	223.87	0.00	-4.82
-------	--------	----------	--------	------	-------

WING LIFT,DRAG,MOM,FX,FY,FZ:

270.91	24.47	-382.35	27.24	0.00	270.64
--------	-------	---------	-------	------	--------

HTAIL LIFT,DRAG,MOM,FX,FY,FZ:

-28.86	5.16	0.00	4.87	0.00	-28.91
--------	------	------	------	------	--------

VTAIL LIFT,DRAG,MOM,FX,FY,FZ:

56.39	12.82	0.00	12.82	56.39	0.00
-------	-------	------	-------	-------	------

NO. OF ITERATION = 6

INITIAL CONDITIONS ARE:

MORE...

	VELOCITY	DISPLACEMENT
TOR 1110	-1.778028	0.011047
TOR 1120	-0.010194	0.005204
TOR 1210	1.693367	-0.069413
TOR 1220	-0.010762	-0.003588
TEET 0	0.280345	0.018444
OFOP1120	-0.230222	0.028071
OFOP1220	0.290117	0.023964
IPIP1110	0.033917	-0.004440
IPIP1210	-0.089645	-0.003349

$A_0 = -0.01498 \quad A_{1C} = 0.00829 \quad A_{1S} = -0.06279$

MORE...

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9995E-01	0.0000E+00	1.0218E-02
0.0000E+00	1.0000E+00	0.0000E+00
-1.0218E-02	0.0000E+00	9.9995E-01

FUSELAGE PITCH ANGLE = -0.0151873

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HF
-84918.12	-143.47	-172.72	7967.91	-436.55
MOMX	MOMY			
-2092.36	3345.21			

INDUCED VEL = -0.02050

VEL W.R.T. ROTOR SYSTEM ARE:

MORE...

-1367.9285 0.0000 13.9782

VEL W.R.T. FUSE SYSTEM ARE:

-1367.9285 0.0000 13.9782

UNBALANCE FORCES ARE:

FX	FZ	MX	MY
0.10	-96.81	-2131.84	-128.66

FUSLAGE LIFT.DRAG.MOM.FX.FY.FZ:

-2.53	223.90	-4783.00	223.87	0.00	-4.82
-------	--------	----------	--------	------	-------

WING LIFT.DRAG.MOM.FX.FY.FZ:

270.91	24.47	-382.35	27.24	0.00	270.64
--------	-------	---------	-------	------	--------

HTAIL LIFT.DRAG.MOM.FX.FY.FZ:

-28.91	5.16	0.00	4.87	0.00	-28.96
--------	------	------	------	------	--------

VTAIL LIFT.DRAG.MOM.FX.FY.FZ:

56.39	12.82	0.00	12.82	56.39	0.00
-------	-------	------	-------	-------	------

MORE...

NO. OF ITERATION = 7

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT
TOR 1110	-1.773714	0.009740
TOR 1120	-0.015978	0.005187
TOR 1210	1.685614	-0.069425
TOR 1220	-0.007143	-0.003500
TEET 0	0.281244	0.018302
OPOP1120	-0.229979	0.028075
OPOP1220	0.291953	0.023986

MORE...

IPIP1110 0.033622 -0.004450

IPIP1210 -0.089886 -0.003367

A0 = -0.01570 A1C = 0.00791 A1S = -0.06251

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9995E-01 0.0000E+00 1.0187E-02

0.0000E+00 1.0000E+00 0.0000E+00

-1.0187E-02 0.0000E+00 9.9995E-01

FUSELAGE PITCH ANGLE = -0.0152236

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HP
-85765.50	-143.96	-177.95	8167.77	-440.90

MORE...

MOMX	MOMY
2300.23	3515.37

INDUCED VEL = -0.02007

VEL W.R.T. ROTOR SYSTEM ARE:

-1367.9290	0.0000	13.9361
------------	--------	---------

VEL W.R.T. FUSE SYSTEM ARE:

-1367.9290	0.0000	13.9361
------------	--------	---------

UNBALANCE FORCES ARE:

FX	FZ	MX	MY
-0.14	103.12	2260.77	124.10

FUSLAGE LIFT.DRAG.MOM.FX.FY.FZ:

-2.53	223.90	-4781.84	223.87	0.00	-4.81
-------	--------	----------	--------	------	-------

WING LIFT.DRAG.MOM.FX.FY.FZ:

270.91	24.47	-382.35	27.23	0.00	270.64
--------	-------	---------	-------	------	--------

MORE...

HTAIL LIFT,DRAG,MOM,FX,FY,FZ:

-28.85 5.16 0.00 4.87 0.00 -28.91

VTAIL LIFT,DRAG,MOM,FX,FY,FZ:

56.39 12.82 0.00 12.82 56.39 0.00

TRIM SECTION TERMINATED AT NITERA = 8

COMMAND

EXECUTION BEGINS...

USER FILE U1 TO BE INITIALIZED (Y OR N)

COMMAND

MODEL NAME (DATA SET)

LIST MODEL SUMMARY (Y OR N)

***** MODEL AH1T *****

AH1 TRIM, GRAVITY FORCE APPLIED THROUGH GLOBAL REF SYS

INDEX	COMP	NO.	DATA SET	FORCE	DATA SET
1	CRE3	1	B1Z1T1	FRA3	FCT1.65
				REQUIRED DS/DM= AFD161	/AIRFOIL
2	CCE0	1	3000	NONE	
3	CLC1		COUPLE	NONE	
4	CFM2	1	8300-4	FFC2	AH1G16.5
5	CGL0		TGC	NONE	
6	CLC0		DEL	NONE	

MORE...

GLOBAL VARIABLES

1 VSOUND	- SOUND VELOCITY	= 1.13800E+03
2 RHO	- AIR DENSITY RATIO	= 8.79000E-01

SOLUTION INPUT FOR STR3.TRIM SOLUTION

1 IFUS	- PERIODIC MOTION	=	NO	
2 ITEET	- TEETERING ROTOR	=	YES	
3 TRCOVA7	- VALUE A	=	1.00000E-01	
4 TRCOVA8	- VALUE B	=	-1.24000E-01	
5 TRCOVA9	- VALUE C	=	3.52000E+00	
6 H	- INITIAL INCREMENT	=	3.70370E-03	
7 TPER	- INTEGRATION PERIOD	=	1.85185E-01	
8 HTD	- SEPARATE INCREMENT	=	0.00000E+00	
9 HF	- SEPARATE INCREMENT	=	0.00000E+00	
10 E	- ERROR CHECK VALUE	=	0.00000E+00	
11 ITRIM	- CASE NUMBER	=	2	
12 NALLOW	- NO. OF ITERATIONS	=	10	
13 CEA	- CONSTANT ERROR	=	YES	
14 CEALLO	- CONSTANT ERROR	=	1.00000E-05	
15 EALLOWT2	- (REAL) TRIM ERRORS ALLOWED			
	1.00000E-05	1.00000E-05	1.00000E-05	1.00000E-05
	1.00000E-05			
16 CI	- CONSTANT INCREMENT	=	YES	
17 CICRE	- CONSTANT INCREMENT	=	5.00000E-03	
18 DELTAT2	- (REAL) CONTROL VAR INCRMNTS			
	5.00000E-03	5.00000E-03	5.00000E-03	5.00000E-03
	5.00000E-03			
19 IWIND	- WIND VELOCITY Y OR N=		NO	
20 VTRANG	- (REAL) FUSELAGE TRANS VEL			
	-1.21420E+03	0.00000E+00	0.00000E+00	
21 IROTIN	- FUSELAGE ANGULAR VEL=		YES	
22 VRDTG	- (REAL) FUSELAGE ANGULAR VEL			
	0.00000E+00	0.00000E+00	5.61100E-02	
23 CT	- ROTOR THRUST	=	8.20000E+03	
24 IGUESS	- INITIAL GUESSES	=	YES	
25 TESTV	- (REAL) INITIAL VELOCITY			
	-1.77458E+00	1.68711E+00	2.81262E-01	3.35650E-02
	-8.99110E-02	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00		
26 TESTD	- (REAL) INITIAL DISPLACEMENT			
	9.83200E-03	-6.94260E-02	1.83300E-02	-4.44900E-03
	-3.36500E-03	0.00000E+00	0.00000E+00	0.00000E+00
	0.00000E+00	0.00000E+00		
27 A0	- COLLECTIVE COMPONENT=	-1.56300E-02		
28 A1C	- COSINE COMPONENT	=	7.91000E-03	
29 A1S	- SINE COMPONENT	=	-6.25800E-02	
30 ICONST	- CONST EULER ANGLE	=ROLL		
31 EULANGLE	- (REAL) GUESS 3 EULER ANGLES			
	1.74530E-01	0.00000E+00	0.00000E+00	
32 ISTEAD	- STEADY TIME HISTORY	=	NO	
33 CRT	- OUTPUT THIS TERMINAL	=	YES	
34 GS	- VERT ACCELERATION	=	1.00000E+00	
35 ICF	- CONSIDER CENTRIFUGAL	=	YES	
36 RT	- RADIUS OF TURN	=	1.80380E+03	

***** SOLUTION STR3 FOR MODEL AH1T *****
MODEL - AH1 TRIM, GRAVITY FORCE APPLIED THROUGH GLOBAL REF SYS
SOLUTION - TRIM SOLUTION

NO. OF ITERATION = 1

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT
TOR 1110	-1.803469	-0.059514
TOR 1210	1.590745	0.019210
TEET 0	-2.120655	0.010593
IPIP1110	0.009785	-0.000660
IPIP1210	-0.075410	-0.000711

MORE...

A0 = 0.00307 A1C = -0.05399 A1S = 0.04679

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9999E-01	0.0000E+00	-5.0000E-03
8.6822E-04	9.8481E-01	1.7364E-01
4.9240E-03	-1.7365E-01	9.8480E-01

ROLL ANG= 0.17453 PITCH ANG= 0.00325 YAW ANG= -0.05025

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HP
-91815.81	-169.79	-171.17	7626.04	-472.01
MOMX	MOMY			
-104833.12	-36873.89			

INDUCED VEL = -0.02000

MORE...

VEL W.R.T. ROTOR SYSTEM ARE:

-1213.2446 -1.0271 -5.9721

VEL W.R.T. FUSE SYSTEM ARE:

-1214.1848 -1.0542 -5.9787

UNBALANCE FORCES ARE:

FX	FY	FZ	MX	MY
40.20	1139.64	-861.44	-88352.75	-43556.26

FUSLAGE LIFT, DRAG, MOM, FX, FY, FZ:

0.97 176.66 -3322.03 176.65 0.00 1.84

WING LIFT, DRAG, MOM, FX, FY, FZ:

212.09 19.28 -301.21 18.23 0.00 212.18

HTAIL LIFT, DRAG, MOM, FX, FY, FZ:

-18.78 4.07 0.00 4.16 0.00 -18.76

VTAIL LIFT, DRAG, MOM, FX, FY, FZ:

44.42	10.10	0.00	10.06	44.43	0.00	MORE...
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NO. OF ITERATION = 2

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT
TOR 1110	-1.662546	-0.029787
TOR 1210	1.658504	-0.010709
TEET 0	-1.466288	0.016710
IPIP1110	0.009578	-0.000632
IPIP1210	-0.003601	-0.000863

A0 = 0.00252 A1C = -0.03445 A1S = 0.01540

MORE...

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9870E-01 -5.0225E-02 -8.2541E-03

5.0895E-02 9.8349E-01 1.7364E-01

-6.0311E-04 -1.7383E-01 9.8477E-01

ROLL ANG= 0.17453 PITCH ANG= 0.00277 YAW ANG= -0.03871

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HP
-99547.62	-152.37	483.21	10057.75	-511.75

MOMX	MOMY
-26657.82	4710.71

INDUCED VEL = -0.02145

VEL W.R.T. ROTOR SYSTEM ARE:

-1211.6855 -61.7520 0.7389

MORE...

VEL W.R.T. FUSE SYSTEM ARE:
 -1212.6257 -61.7966 0.7323

UNBALANCE FORCES ARE:

FX	FY	FZ	MX	MY
-55.46	1790.86	1562.07	-73293.19	1871.55

FUSLAGE LIFT, DRAG, MOM, FX, FY, FZ:

-0.12 176.08 -3475.58 176.08 0.00 -0.22

WING LIFT, DRAG, MOM, FX, FY, FZ:

212.39 19.23 -300.43 19.36 0.00 212.38

HTAIL LIFT, DRAG, MOM, FX, FY, FZ:

-25.14 4.06 0.00 4.04 0.00 -25.14

VTAIL LIFT, DRAG, MOM, FX, FY, FZ:

44.31 10.07 0.00 7.80 44.76 0.00

MORE...

NO. OF ITERATION = 3

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT
TOR 1110	-1.680462	-0.029032
TOR 1210	1.683062	-0.010498
TEET 0	-1.539558	0.017639
IPIP1110	0.008878	-0.000666
IPIP1210	-0.005228	-0.000898

A0 = 0.00316 A1C = -0.03548 A1S = 0.01815

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

MORE...

9.9922E-01 -3.8704E-02 -7.7720E-03

3.9465E-02 9.8402E-01 1.7364E-01

9.2724E-04 -1.7381E-01 9.8478E-01

ROLL ANG= 0.17453 PITCH ANG= 0.00218 YAW ANG= -0.03933

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HP
-99828.69	-156.89	250.39	9736.17	-513.20

MOMX	MOMY
-2048.88	4963.18

INDUCED VEL = -0.02307

VEL W.R.T. ROTOR SYSTEM ARE:

-1212.3132 -47.8768 -1.1192

MORE...

VEL W.R.T. FUSE SYSTEM ARE:
-1213.2534 -47.9189 -1.1259

UNBALANCE FORCES ARE:

FX	FY	FZ	MX	MY
-31.79	1559.32	1240.77	-26221.05	1733.85

FUSLAGE LIFT,DRAG,MOM,FX,FY,FZ:

0.18	176.30	-3434.18	176.30	0.00	0.35
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WING LIFT,DRAG,MOM,FX,FY,FZ:

212.42	19.25	-300.74	19.05	0.00	212.44
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HTAIL LIFT,DRAG,MOM,FX,FY,FZ:

-25.50	4.06	0.00	4.08	0.00	-25.50
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VTAIL LIFT,DRAG,MOM,FX,FY,FZ:

44.35	10.08	0.00	8.32	44.71	0.00
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MORE...

NO. OF ITERATION = 4

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT
TOR 1110	-1.688733	-0.026937
TOR 1210	1.692024	-0.009648
TEET 0	-1.517574	0.017289
IPIP1110	0.008898	-0.000687
IPIP1210	-0.005120	-0.000906

A0 = 0.00484 A1C = -0.03433 A1S = 0.01694

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9920E-01 -3.9318E-02 -7.1808E-03

MORE...

3.9967E-02 2.8400E-01 1.7364E-01

2.3873E-04 -1.7379E-01 9.8478E-01

ROLL ANG= 0.17453 PITCH ANG= 0.00134 YAW ANG= -0.03826

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HP
-100593.06	-154.12	266.83	9823.24	-517.13
MOMX	MOMY			
7284.31	2594.55			

INDUCED VEL = -0.02307

VEL W.R.T. ROTOR SYSTEM ARE:

-1212.2896	-48.4897	-0.2832
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VEL W.R.T. FUSE SYSTEM ARE:

-1213.2297	-48.5285	-0.2899
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MORE...

UNBALANCE FORCES ARE:

FX	FY	FZ	MX	MY
-35.55	1575.80	1327.50	-18483.09	-364.35

FUSLAGE LIFT, DRAG, MOM, FX, FY, FZ:

0.05	176.27	-3454.28	176.27	0.00	0.09
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WING LIFT, DRAG, MOM, FX, FY, FZ:

212.50	19.25	-300.73	19.20	0.00	212.50
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HTAIL LIFT, DRAG, MOM, FX, FY, FZ:

-25.67	4.06	0.00	4.07	0.00	-25.66
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VTAIL LIFT, DRAG, MOM, FX, FY, FZ:

44.35	10.08	0.00	8.30	44.72	0.00
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NO. OF ITERATION = 5

MORE...

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT
TOR 1110	-1.700868	-0.024573
TOR 1210	1.705497	-0.008566
TEET 0	-1.494236	0.016920
IPIP1110	0.008949	-0.000710
IPIP1210	-0.005246	-0.000918
A0 =	0.00679	A1C = -0.03313 A1S = 0.01558

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9925E-01 -3.8247E-02 -6.3352E-03

3.8766E-02 9.8405E-01 1.7364E-01

MORE...

-4.0719E-04 -1.7376E-01 9.8479E-01

ROLL ANG= 0.17453 PITCH ANG= 0.00045 YAW ANG= -0.03712

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HP
-102653.50	-154.51	265.35	10010.18	-527.72
MOMX	MOMY			
7197.80	2547.19			

INDUCED VEL = -0.02307

VEL W.R.T. ROTOR SYSTEM ARE:

-1212.3467 -47.0357 0.5010

VEL W.R.T. FUSE SYSTEM ARE:

-1213.2869 -47.0700 0.4944

UNBALANCE FORCES ARE:

MORE...

FX	FY	FZ	MX	MY
-39.85	1574.44	1514.14	-18427.57	-375.29

FUSLAGE LIFT, DRAG, MOM, FX, FY, FZ:

-0.08	176.28	-3473.61	176.28	0.00	-0.15
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WING LIFT, DRAG, MOM, FX, FY, FZ:

212.60	19.25	-300.76	19.33	0.00	212.59
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HTAIL LIFT, DRAG, MOM, FX, FY, FZ:

-25.82	4.06	0.00	4.05	0.00	-25.82
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VTAIL LIFT, DRAG, MOM, FX, FY, FZ:

44.35	10.08	0.00	8.35	44.71	0.00
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NO. OF ITERATION = 6

INITIAL CONDITIONS ARE:

MORE...

	VELOCITY	DISPLACEMENT
TOR 1110	-1.713992	-0.022191
TOR 1210	1.720093	-0.007395
TEET 0	-1.471865	0.016535
IPIP1110	0.009007	-0.000733
IPIP1210	-0.005409	-0.000930

A0 = 0.00880 A1C = -0.03194 A1S = 0.01426

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9930E-01	-3.7109E-02	-5.4547E-03
3.7492E-02	9.8409E-01	1.7364E-01
-1.0757E-03	-1.7372E-01	9.8479E-01

MORE...

ROLL ANG= 0.17453 PITCH ANG= -0.00040 YAW ANG= -0.03604

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HP
-105112.06	-155.40	264.08	10228.60	-540.36
MOMX	MOMY			
7087.64	2490.15			

INDUCED VEL = -0.02307

VEL W.R.T. ROTOR SYSTEM ARE:

-1212.4053	-45.4934	1.3128
------------	----------	--------

VEL W.R.T. FUSE SYSTEM ARE:

-1213.3455	-45.5230	1.3061
------------	----------	--------

UNBALANCE FORCES ARE:

FX	FY	FZ	MX	MY	MORE...
-44.75	1573.29	1732.28	-18415.43	-425.67	

FUSLAGE LIFT,DRAG,MOM,FX,FY,FZ:

-0.21	176.28	-3493.60	176.28	0.00	-0.40
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WING LIFT,DRAG,MOM,FX,FY,FZ:

212.70	19.25	-300.79	19.48	0.00	212.68
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HTAIL LIFT,DRAG,MOM,FX,FY,FZ:

-25.97	4.06	0.00	4.03	0.00	-25.97
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VTAIL LIFT,DRAG,MOM,FX,FY,FZ:

44.36	10.08	0.00	8.41	44.70	0.00
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NO. OF ITERATION = 7

INITIAL CONDITIONS ARE:

VELOCITY	DISPLACEMENT	MORE...
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TOR 1110	-1.728398	-0.019728
TOR 1210	1.735839	-0.006139
TEET 0	-1.449360	0.016135
IPIP1110	0.009038	-0.000759
IPIP1210	-0.005608	-0.000943

A0 = 0.01091 A1C = -0.03071 A1S = 0.01291

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9934E-01	-3.6032E-02	-4.5968E-03
3.6282E-02	9.8414E-01	1.7364E-01
-1.7328E-03	-1.7370E-01	9.8480E-01

ROLL ANG= 0.17453 PITCH ANG= -0.00125 YAW ANG= -0.03498
MORE...

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HP
-107710.81	-156.23	263.01	10454.70	-553.72
MOMX	MOMY			
6975.04	2425.90			

INDUCED VEL = -0.02306

VEL W.R.T. ROTOR SYSTEM ARE:

-1212.4583	-44.0292	2.1106
------------	----------	--------

VEL W.R.T. FUSE SYSTEM ARE:

-1213.3984	-44.0541	2.1039
------------	----------	--------

UNBALANCE FORCES ARE:

FX	FY	FZ	MX	MY
-49.57	1572.34	1958.09	-18425.97	-471.02

MORE...

FUSLAGE LIFT, DRAG, MOM, FX, FY, FZ:

-0.34 176.29 -3513.24 176.29 0.00 -0.65

WING LIFT, DRAG, MOM, FX, FY, FZ:

212.78 19.25 -300.81 19.62 0.00 212.75

HTAIL LIFT, DRAG, MOM, FX, FY, FZ:

-26.12 4.06 0.00 4.02 0.00 -26.12

VTAIL LIFT, DRAG, MOM, FX, FY, FZ:

44.36 10.08 0.00 8.47 44.70 0.00

NO. OF ITERATION = 8

INITIAL CONDITIONS ARE:

	VELOCITY	DISPLACEMENT
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TOR 1110	-1.743319	-0.017174
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MORE...

TOR 1210	1.752255	-0.004782
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TEET 0	-1.427094	0.015719
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IPIP1110	0.009057	-0.000786
----------	----------	-----------

IPIP1210	-0.005848	-0.000957
----------	-----------	-----------

A0 = 0.01313 A1C = -0.02947 A1S = 0.01154

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9938E-01 -3.4974E-02 -3.7483E-03

3.5093E-02 9.8418E-01 1.7364E-01

-2.3839E-03 -1.7367E-01 9.8480E-01

ROLL ANG= 0.17453 PITCH ANG= -0.00209 YAW ANG= -0.03394

AERODYNAMIC FORCES ARE:

MORE...

TORQ	XFOR	YFOR	ZFOR	HP
-110512.25	-157.07	261.90	10691.96	-568.12

MOMX 6863.21	MOMY 2358.40
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INDUCED VEL = -0.02306

VEL W.R.T. ROTOR SYSTEM ARE:

-1212.5083	-42.5899	2.9012
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VEL W.R.T. FUSE SYSTEM ARE:

-1213.4485	-42.6102	2.8946
------------	----------	--------

UNBALANCE FORCES ARE:

FX	FY	FZ	MX	MY
-54.39	1571.34	2195.07	-18431.02	-513.91

FUSLAGE LIFT,DRAG,MOM,FX,FY,FZ:

-0.47	176.29	-3532.71	176.29	0.00	-0.89
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MORE...

WING LIFT,DRAG,MOM,FX,FY,FZ:

212.86	19.25	-300.84	19.76	0.00	212.82
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HTAIL LIFT,DRAG,MOM,FX,FY,FZ:

-26.26	4.06	0.00	4.00	0.00	-26.27
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VTAIL LIFT,DRAG,MOM,FX,FY,FZ:

44.37	10.08	0.00	8.52	44.69	0.00
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NO. OF ITERATION = 9

INITIAL CONDITIONS ARE:

VELOCITY	DISPLACEMENT
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TOR 1110	-1.757343	-0.014681
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TOR 1210	1.767384	-0.003423
----------	----------	-----------

MORE...

TEET 0	-1.406184	0.015290
IPIP1110	0.009075	-0.000812
IPIP1210	-0.006142	-0.000970
A0 = 0.01532	A1C = -0.02825	A1S = 0.01025

INERTIAL TO GLOBAL TRANSFORMATION MATRIX

9.9942E-01	-3.3933E-02	-2.9052E-03
3.3921E-02	9.8422E-01	7364E-01
-3.0328E-03	-1.7364E-01	9.8480E-01

ROLL ANG= 0.17453 PITCH ANG= -0.00290 YAW ANG= -0.03299

AERODYNAMIC FORCES ARE:

TORQ	XFOR	YFOR	ZFOR	HP	MORE...
-113567.31	-158.05	260.86	10941.59	-583.83	
MOMX 6738.11	MOMY 2293.01				

INDUCED VEL = -0.02306

VEL W.R.T. ROTOR SYSTEM ARE:

-1212.5554	-41.1716	3.6891
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VEL W.R.T. FUSE SYSTEM ARE:

-1213.4956	-41.1873	3.6825
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UNBALANCE FORCES ARE:

FX	FY	FZ	MX	MY
-59.34	1570.41	2444.42	-18456.79	-560.50

FUSLAGE LIFT, DRAG, MOM, FX, FY, FZ:

-0.59	176.29	-3552.09	176.29	0.00	-1.13
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WING LIFT, DRAG, MOM, FX, FY, FZ:

MORE...

212.94	19.26	-300.86	19.90	/ 0.00	212.88
HTAIL LIFT,DRAG,MOM,FX,FY,FZ:			/	/	
-26.40	4.06	0.00	3.98	0.00	-26.41
VTAIL LIFT,DRAG,MOM,FX,FY,FZ:					
44.37	10.08	0.00	8.57	44.69	0.00
TRIM SECTION TERMINATED AT NITERA = 10					

COMMAND					