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COLLOCATION FLUTTER ANALYSIS

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VOLUME I.

GENERAL PROGRAM DESCRIPTION

APRIL 1969



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MISSILE SYSTEMS DIVISION

HUGHES

HUGHES AIRCRAFT COMPANY

COFA

COLLOCATION FLUTTER ANALYSIS STUDY

VOLUME I

THE COFA PROGRAM

Prepared by the Dynamics and Environment
Section Personnel, Hughes Aircraft Company
Under Contract Number 0019-68-C-0247

APRIL 1969

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ABSTRACT

This study covers the development of a set of computer programs to perform flutter analysis by the collocation method. While this method has been known for some time, only recently have advances in computer technology made the method technically and economically feasible. The ingredients of a collocation flutter analysis are (1) a flexibility matrix, (2) aerodynamic influence coefficient matrix, and (3) an eigenvalue solution. This study is presented in four volumes. Volume I contains a general program discussion. Volume II contains the program FLUENC which calculates the flexibility matrix. Volume III contains a set of three programs to calculate aerodynamic influence coefficients for subsonic, transonic, and supersonic flight regimes. Volume IV contains the program COFA which sets up and solves the flutter eigenvalue matrix.

FOREWORD

This report covers the research conducted by the Missile Systems Division of Hughes Aircraft Company, Canoga Park, California, under Contract Number 00019-68-C-0247.

This work was performed to develop a comprehensive set of computer programs that perform flutter analysis using the collocation method. A set of three computer programs to calculate unsteady aerodynamic influence coefficients for subsonic, transonic, and supersonic lifting surfaces with interaction between the wing and a downstream control surface lying in the wake of the wing are presented. A program to calculate structural influence coefficients is presented, and a program to set up and solve the flutter eigen matrix is presented.

The Program Manager for Hughes Aircraft Company was R. J. Oedy. Dr. V. Weingarten assisted in the development of the structural analysis program, and Dr. W. P. Rodden assisted in the development of the aerodynamic programs and flutter analysis programs.

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PART I - INTRODUCTION

Collocation is a term used to describe a mathematical procedure for (among other things) solving integral equations. The word literally means to co-locate, i.e., an approximate solution is co-located to satisfy the equation at a specified discrete number of locations in the space (the collocation points). When the integral equation for vibration analysis is solved by the collocation method it is generally referred to as the lumped-parameter method since the properties of the continuum are assumed to be concentrated ("lumped") at the collocation points. The collocation method leads to a formulation of the flutter problem similar to that of the vibration problem where, in addition to the structural influence coefficients (SIC's) and mass matrix, aerodynamic influence coefficients (AIC's) are required.

The vibration problem can be large if many degrees of freedom are necessary to model the vibrating system, and the calculation of the modes and frequencies requires solving a large eigenvalue problem. However, since both the SIC's and mass matrix are real symmetric matrices, special techniques can be utilized to find the modes and frequencies rapidly (and, hence, economically). The corresponding formulation of the flutter problem does not possess any special properties that permit convenient determination of the modes, frequencies, and flutter velocities. For this reason a series or modal solution has traditionally been employed to reduce the size of the flutter problem and the corresponding computing time.

Present day computer capacities and speeds, and advances in eigenvalue methods however, no longer limit flutter analysis to modal methods and the advantages of a direct solution can be realized. One advantage is that questions of convergence of the modal solution are avoided. Another advantage is that the flexibility, mass and aerodynamic data are kept separate so that a change in any one set can be made independently of the other two. Finally, the flutter analysis can be done without performing a vibration analysis. This is a particular advantage when variations in mass or stiffness distribution must be investigated. Examples include control surface mass balance optimization studies or weight reduction due to burning fuel.

PART II - GENERAL DISCUSSION OF FLUTTER

A. The Mechanism of Flutter

Flutter is a self-excited vibration of a flexible body in a fluid stream. The flutter speed is defined as the minimum speed at which the aeroelastic system will sustain a neutrally stable oscillation. At lower speeds the motion will be damped, and at higher speeds, or at least in a range of higher speeds, the motion will be divergent. Usually only a small increase beyond the flutter speed is required to produce a rapid divergence of such violence that a complete structural failure results in only a few cycles of motion.

At the flutter speed, a critical phasing between the motion and the loading permits extraction of an amount of energy from the air stream equal to that dissipated by internal damping during each cycle and thereby sustains a neutrally stable periodic motion. The simplest type of flutter occurs when a simple motion induces an aerodynamic force having a component in the direction of the motion and in phase with the velocity. This is described as a case of negative aerodynamic damping or single degree of freedom flutter. The term classical flutter is used to denote the more complicated instability that typically arises from a critical coupling of two or more modes of motion, each of which is usually stable by itself. It is the classical flutter mechanism with which we are primarily concerned because its generality includes the single degree of freedom instability as a special case.

B. The Ingredients for Flutter Analysis

Since flutter is a dynamic aerolastic instability the forces involved are structural, aerodynamic, and inertial. In the present lumped-parameter or collocation formulation these appear as matrices of structural influence coefficients (SIC's), aerodynamic influence coefficients (AIC's), and masses. The combination of the various matrices to formulate the flutter stability problem leads to a non-Hermitian eigenvalue problem. Since this is the most general type of eigenvalue problem, methods for its solution are quite limited. The method that has been employed is the power method, or as it is sometimes called, the matrix iteration method.

PART III - DISCUSSION OF COFA PROGRAM

A. The Flutter Analysis

1. The Technical Approach -

The collocation method of flutter analysis had been known for many years but it was not demonstrated to be computationally feasible until 1956 in Reference 1. The method was extended to include an arbitrary number of rigid body degrees of freedom in Reference 2. A complete discussion of the general flutter analysis is given in the Flutter Analysis Report. It is sufficient for the introductory purposes of this report to consider the formulation of the flutter problem for a restrained vehicle.

The basic equation is the relationship between the deflections $\{h\}$ to the forces $\{F\}$ through the structural influence coefficients (SIC's) $[a]$.

$$\{h\} = [a] \{F\} \quad (3.1)$$

The force matrix must include both the inertial and aerodynamic forces.

$$\{F\} = -[M] \ddot{\{h\}} + \{F_a\} \quad (3.2)$$

where $[M]$ is the mass matrix corresponding to the chosen set of control points. We define a complex matrix of oscillatory aerodynamic influence coefficients (AIC's), $[C_h]$, by the equation

$$\{F_a\} = \rho \omega^2 b_r^2 s [C_h] \{h\} \quad (3.3)$$

where ρ is the density, ω is the frequency, b_r is the reference semi-chord, and s is the reference semi-span. Combining Eqs. (3.2) and (3.3) for harmonic motion, we find the total force to be

$$\{F\} = \omega^2 \left([M] + \rho b_r^2 s [C_h] \right) \{h\} \quad (3.4)$$

If we substitute Eq. (3.4) into Eq. (3.1) and divide the static SIC's by $(1 + ig)$ where g is the artificial structural damping necessary to sustain the assumed harmonic motion, we obtain the matrix equation for flutter

$$\{h\} = \frac{\omega^2}{1 + ig} [a] \left([M] + \rho b_r^2 s [C_h] \right) \{h\} \quad (3.5)$$

Eq.(3.5) can be solved for the complex mode shape, $\{h\}$, and the complex eigenvalue, $(1 + ig)/\omega^2$, by complex matrix iteration (the power method). From the eigenvalue

$$\lambda = \lambda_R + i \lambda_I \quad (3.6a)$$

$$= (1 + ig)/\omega^2 \quad (3.6b)$$

we obtain the flutter frequency

$$\omega = 1/\sqrt{\lambda_R} \quad (3.7)$$

the required artificial damping

$$g = \lambda_I / \lambda_R \quad (3.8)$$

and, since the AIC's required the assumption of a reference reduced frequency, $k_r = \omega b_r / U$, for its calculation, we find the velocity

$$U = \omega b_r / k_r \quad (3.9)$$

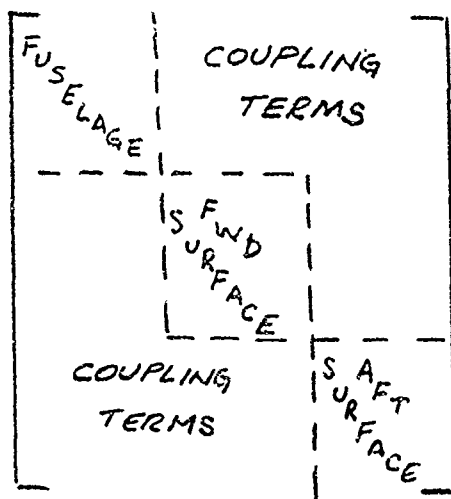
From a series of solutions for different reduced frequencies, a required damping velocity curve can be constructed for a specific altitude. The flutter velocity corresponds to the lowest velocity at which the required damping is equal to the actual structural damping of the system.

2. Program Capabilities

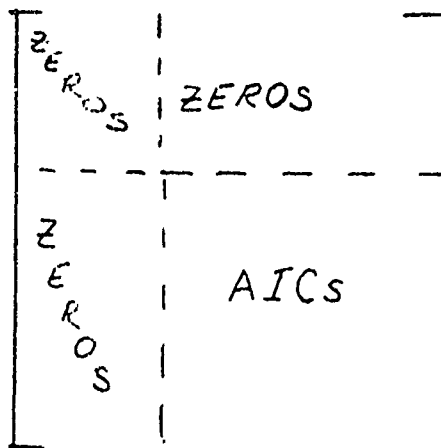
The COFA program has the limitations of analyzing a system with a maximum of 49 collocation stations. In the use of these 49 stations, there is a great deal of flexibility. Entire vehicles may be analyzed as single entities or as conglomerates of components with single or tandem aerodynamic surfaces. Both may be analyzed. When the components are used to synthesize a structure, the attachment between the components must be statically determinant. The components may be either flexible or rigid. The coupling of flexible components is demonstrated in the example problem of this volume. The coupling of flexible to rigid components is demonstrated in the example problems of Volume IV. The systems analyzed may be cantilevered or free in space. Up to six rigid body modes may be used in the analysis of systems free in space. In addition, there is the capability of using a free-free boundary condition built into the program for freeing cantilevered or fixed systems.

There are two classes of tandem surface problems; they are aerodynamically non-interfering surfaces and aerodynamically interfering surfaces. For non-interfering surfaces the structural system may be analyzed as a single entity or a conglomerate of components. The most usual way is to use the component synthesis technique. When the component technique is used, the AIC, SIC, and mass matrices are partitioned with a partition corresponding to each structural component. This results in dealing with smaller order matrices, and the analysis is straightforward as presented in Volume IV. The only precaution is that the mass, flexibility, and aerodynamic matrix partitions be entered serially into the computer program in an identical manner, so that the information is properly located in the overall dynamical matrix, i.e. fuselage first; forward surface second; and aft surface third; etc. For interfering surfaces, the analysis must be conducted as a single structural entity; for interfering surfaces the following procedure must be followed:

- a. When calculating the structural influence coefficients the fuselage characteristics must be entered first, followed by the forward surface then the aft surface. This results in a flexibility matrix of the following form



- b. The COFA aerodynamic programs do not calculate aerodynamic forces for the fuselage; thus, in order to enter the aerodynamics properly into the program, the aerodynamic matrix must be banded by zeros as follows



If fuselage aerodynamics are obtained from a different source, they may be properly entered into the analysis in the upper left partition. The off diagonal partitions are for wing-fuselage interference effects. The details of using the COFA Program may be found in Volume IV.

B. The Calculation of Structural Influence Coefficients

1. The Technical Approach -

There are many methods by which structural influence coefficients may be calculated. The SIC's calculated for this program use the direct stiffness method. The direct stiffness method was chosen as it is readily adapted to highly redundant structures and is especially suited to the use of high speed digital computers. The structure is regarded as an assemblage of beams and plates. The stiffness matrix for the entire structure is computed by the simple summation of the stiffness matrices of the elements of the structure. Finally, the matrix of SIC's is obtained by the inversion of the stiffness matrix.

For a given idealized structure, the analysis of stresses and deflections due to a given system of loads is a purely mathematical problem. Two conditions must be satisfied in the analysis: 1) the forces developed in the members must be in equilibrium and, 2) the deformation of the members must be compatible - i.e., consistent with each other and the boundary conditions. In addition, the forces and deflections in each member must be related in accordance with the stress-strain relationship assumed for the material. These conditions are satisfied by the direct stiffness method in the following way. The displacements of the joints of the structure are considered as unknown quantities. Thus, an infinite number of systems of mutually compatible deformations in the members are possible; the correct pattern of displacements is the one for which the equations of equilibrium are satisfied. The concept of static determinateness or indeterminateness is irrelevant when the analysis is considered from this viewpoint. This approach is the basis for many relaxation type analysis (such as moment distribution) and is used extensively in the analysis of complex aircraft structures.

2. Program Capabilities -

The program FLUENC calculates structural influence coefficients for systems with up to 50 mass points. The mass points may be connected by any combination of beams or plates. Each member may have its own material property. The program also calculates the natural frequencies and mode shapes of the structure. The program can calculate the modes and frequencies for structures fixed or free in space. Caution should be exercised not to use the flexibility matrix of structures free in space as the flexibility matrix of such a structure cannot be directly calculated. The flexibility matrix of a free structure can be obtained by 1) arbitrarily fixing the structure, 2) calculating the flexibility matrix for the fixed structure, 3) enter the flexibility matrix of the fixed structure into the COFA program and use the free-free boundary condition to obtain the flexibility matrix of the free-free structure. The details of using the program FLUENC may be found in Volume II.

C. The Unsteady Aerodynamic Lifting Surface Theories

1. The Subsonic Kernel Function Procedure

a) The Technical Approach -

The linearized equation for the perturbation potential ϕ for a body immersed in a compressible, inviscid, perfect gas, when we assume the flow to be isentropic and irrotational, is

$$(1 - M^2) \frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} + \frac{\partial^2 \phi}{\partial z^2} = \frac{1}{a_0^2} \frac{\partial^2 \phi}{\partial t^2} + \frac{2M}{a_0} \frac{\partial \phi}{\partial x \partial t} \quad (3.10)$$

in which M is the Mach number, a_0 is the ambient speed of sound, and x, y, z are the Cartesian coordinates of the flow field. The linearized perturbation pressure coefficient is related to the potential through

$$C_p = - \frac{2}{U^2} \left(\frac{U \partial \phi}{\partial x} + \frac{\partial \phi}{\partial t} \right) \quad (3.11)$$

where V is the free-stream velocity. The problem in lifting surface theory is to find the difference in the pressure coefficients between the upper and lower surfaces, i.e., the lifting pressure coefficient. The evaluation of Eq.(3.11) requires the solution of Eq. (3.10). The differential equation (3.10) must be solved subject to certain boundary conditions. There can be no flow through the surface, i.e., at the surface the normal velocity of the fluid must equal the normal velocity of the surface (the downwash velocity). Additional conditions at subsonic speeds require that the pressure must remain finite at the trailing edge (the Kutta condition) and the potential must vanish at an infinite distance from the surface. The additional conditions at supersonic speeds are that no disturbance can propagate upstream of the leading edge, and that the disturbances must propagate from the surface as outgoing waves. At transonic speeds a combination of the subsonic and supersonic boundary conditions are required.

The foregoing general review of lifting surface theory leads us to consider specific Mach number regimes. The first numerical method for solving the subsonic pressure distribution for planar lifting surfaces undergoing simple harmonic motion was developed by Watkins, Woolston, and Cunningham (Reference 3). The approach taken was to recast the differential equation for the velocity potential into an integral equation relating the surface downwash to the lifting pressure coefficient (the acceleration potential). The solution was carried out by assuming a series form for the pressure coefficient based on known exact solutions, e.g., the two-dimensional solution for chordwise pressure, and the elliptical spanwise loading on an elliptical wing. From this series of pressure modes the problem reduced to solving for the amplitude of each pressure mode. A collocation method was used in which the downwash was matched at a discrete number of points. The numerical difficulties are numerous since the integral equation is singular and the many integrals of the pressure modes require extreme accuracy. Since the publication of Reference 3, many investigators have refined the procedures, notably Hsu (Reference 4), Vivian and Andrew (Reference 5), and Rowe (Reference 6). The present study is an extension of References 7 and 8 to obtain AIC's, thereby eliminating the limitations introduced by the requirements for polynomial surface fitting in References 7 and 8. The details of the AIC's and the numerical problems of the subsonic lifting surface theory are discussed in the Unsteady Aerodynamics Report, Part III and Part IV, Section A, respectively.

b) Program Capabilities -

The Subsonic AIC program calculates AIC's for systems with up to 40 collocation stations. The systems analyzed may be a single surface or tandem surfaces. Up to 20 collocation stations per surface may be used. When analyzing single surfaces, a dummy trailing surface must be input and isolated from the leading surface. The following single surface planforms may be analyzed: rectangle, trapezoidal, delta, cropped delta and cropped trapezoid. The trailing edge of the surface must be straight and normal to the direction aerodynamic flow. When analyzing tandem surfaces, the forward surface may be anyone of the single surfaces previously defined; the aft surface must be a rectangular surface with the spanwise dimension equal to the spanwise dimension of the wing.

The program automatically sets the number of chordwise and spanwise pressure series terms equal to the number of chordwise and spanwise collocation station. This maximizes the number of pressure series terms used and increases computation accuracy. For best accuracy a minimum of three chordwise collocation stations should be used. The number of kernel function chordwise integration stations is a variable in the program, and is a function of the number of chordwise collocation stations. (The number of integration stations equals factor times the number of chordwise collocation stations.) The factor, NIØNCX, which is input data, should be such that the minimum number of integration stations is 15. The maximum number of integration stations per surface is 40.

When analyzing single surfaces, the dummy surface is required to have two chordwise collocation stations. The number of spanwise collocation stations on the dummy surface is established internally in the program and is set equal to the number of spanwise collocation stations used in the analysis of the single surface. The details of using the Subsonic AIC program may be found in Volume III.

2. The Transonic Box Method

a) The Technical Approach -

The basic development of the transonic box method was made by Rodemich and Andrew (Reference 9). References 7 and 8 include extensions of Reference 9 to interfering wing-tail configurations. The basic formulation of the transonic potential equation, pressure coefficient, and boundary conditions has been included in the introductory discussion of the technical approach to the subsonic problem above in Section A, and the details of the AIC's and the numerical problems of the transonic box method are discussed in the Unsteady Aerodynamics Report, Part III, and Part V, Section A, respectively. For the purposes of this introductory summary it is sufficient to outline the basic procedure.

The transonic box method is designed to calculate the unsteady potentials from which the pressure distributions may be obtained for arbitrary modes of surface motion. The method used was suggested by the successes of the supersonic box methods (References 10 and 11). The potential is generated by a doublet distribution rather than by a source distribution because the latter method would involve diaphragm regions of infinite extent, whereas the doublet distribution is confined to the wing and its wake. As with the subsonic problem, the differential equation is rewritten as an integral equation. The integral equation is approximated numerically by a matrix equation so that the basic step in the box method is the solution of the system of simultaneous equations which determine a set of values of potential on the surface from a corresponding array of upwash values. The solution procedure obtains the velocity potential over the surface one spanwise row of boxes at a time until the trailing edge row is completed. The numerical complexity is not increased, however, by a large number of box rows over the configuration because the influence coming from more than 15 rows away has been found to be negligible. The results are valid for high reduced frequency k , such that $k \gg |M - 1|$ where M is the Mach number.

b) Program Capabilities -

The Transonic AIC program calculates AIC's for systems with up to 40 collocation stations. The systems analyzed may be a single surface or tandem surfaces. Up to 20 collocation stations per surface may be used. The following single surface planforms may be analyzed: rectangular, trapezoidal, delta, cropped delta, and cropped trapezoid. It is not necessary to enter a second surface into the program when analyzing a single surface. The trailing edge of the surface must be straight and normal to the aerodynamic flow direction. When analyzing tandem surfaces, the forward surface may be any one of the single surfaces previously defined; the aft surface must be a rectangular surface with the spanwise dimension equal to the spanwise dimension of the wing.

The maximum allowable number of Mach boxes is 45. The layout of the boxes on the surface is determined in the program, and is a function of the number of chordwise boxes. The Mach boxes are square, and can be located on the surface by placing the center of one box at the intersection of the root chord and the trailing edge of the forward surface. The length of the side of a Mach box is approximately equal to the root chord length divided by the number of chordwise boxes chosen. It is not necessary to layout the Mach boxes, as this is done by the program, but this knowledge is helpful in choosing the optimum number of chordwise Mach boxes. In general, the accuracy increases as the number of Mach boxes increase. Therefore, the maximum number of Mach boxes should be used. The details of the Transonic AIC program may be found in Volume III.

3. The Supersonic Box Method

a) The Technical Approach -

The basic work on the supersonic box method was done by Pines, Dugundji, and Neuringer (Reference 10) and by Zartarian and Hsu (Reference 11). Further refinements were made by Moore and Andrew (Reference 12). References 7 and 8 also include extensions of Reference 12 to interfering wing-tail configurations. The fundamentals of the potential equation have been presented above in the introductory discussion of the technical approach to the subsonic problem in Section A, and the details of the AIC's and the numerical problems of the supersonic box method are discussed in the Unsteady Aerodynamics Report, Part III and Part VI, Section A, respectively. We merely outline the basic procedure in this introductory summary.

Pines, et al, (Reference 10) published the first source superposition method to approximate successfully the aerodynamic forces on an oscillating thin planar surface in supersonic flow. They employed Evvard's diaphragm concept (Reference 13) to handle subsonic leading edges and overlaid the surface and diaphragm with a grid of square boxes. For purposes of calculating pressures, they assumed that the source strength over the area of each box is a constant value which satisfies the condition of tangential flow at the center of the box. The Mach-box procedure is basically the same as the method of Pines et al, differing only in that the surface and diaphragm is overlaid with a grid of rectangular boxes, the diagonals of which are parallel to Mach lines. As in the Subsonic and Transonic cases the potential equation is written as an integral equation, this time relating the downwash to the source strengths, and approximated by a matrix equation. The numerical difficulties are primary ones of computer logic since the zones of influence of a given Mach box is limited to the region within the aft Mach lines. The matrix formulation leads to a partitioned form since there are two boundary conditions to be matched. The first boundary condition is the downwash on the surface, and the second is that there be no pressure difference off of the surface in the diaphragm regions. The zero pressure conditions leads to a relationship between the diaphragm potentials and the surface potentials, and the surface downwash condition then leads to the surface potentials. The surface pressures then follow from the surface potentials.

b) Program Capabilities -

The Supersonic AIC program calculates AIC's for systems with up to 40 collocation stations. The systems analyzed may be a single surface or tandem surfaces. Up to 20 collocation stations per surface may be used. The following single surface planforms may be analyzed: rectangular, trapezoidal, delta, cropped delta, and cropped trapezoid. It is not necessary to enter a second surface into the program when analyzing a single surface. The trailing edge of the surface must be straight and normal to the direction of flow. When analyzing tandem surfaces, the forward surface may be any one of the single surfaces previously defined; the aft surface must be a rectangular surface with the spanwise dimension equal to the spanwise dimension of the wing.

The maximum allowable number of Mach boxes is 45. The layout of the boxes on the surface is determined in the program, and is a function of the number of chordwise boxes and the Mach number. The Mach boxes are rectangular with a length in the chordwise direction equal to approximately the root chord divided by the number of chordwise Mach boxes, and a length in the spanwise direction equal to the length in the chordwise direction divided by the square root of the Mach number squared minus one. The Mach boxes can be located on the surface by placing the center of one box at the intersection of the root chord and the trailing edge of the wing. It is not necessary to layout the Mach boxes, as this is done by the program, but this knowledge is useful in choosing the correct number of chordwise Mach boxes. In general, the accuracy increases as the number of Mach boxes increase. Therefore, the maximum number of Mach boxes should be used. The details of the Supersonic AIC program may be found in Volume III.

PART IV - SAMPLE PROBLEM

As an example problem, a typical missile with tandem aerodynamic surfaces is used. The tandem surfaces are in close proximity such that aerodynamic interference between surfaces occurs. Thus, the structure must be modeled as one entity. The analysis will be performed for the missile free in space with two rigid body modes (pitching and plunging); thus, the free boundary condition of the COFA program will be employed.

The entire missile is flexible. For a missile free in space, two basic modes of flutter can exist. They are symmetrical and anti-symmetrical flutter; these modes of flutter are demonstrated in Figure 4.1. An analysis for symmetrical flutter is presented. Due to symmetry, only one half of the structure needs to be included in the analysis. A sketch of the missile to be analyzed is shown in Figure 4.2.

The first step in the analysis is to develop a structural idealization (mathematical model) that is consistent with the program FLUENC. The mathematical model established for this example is shown in Figure 4.3. The structure was arbitrarily fixed in translation at mass points 5 and 7, as a flexibility matrix for a structure free in space can not be directly calculated. These points will be released later using the free-free boundary condition of the COFA program. The next step is to run the program FLUENC to generate the flexibility matrix. The computer program FLUENC normally yields a reduced flexibility matrix: i.e. the rows and columns pertaining to the fixed points are eliminated. This is satisfactory when the constrained points are included in a rigid component or a fixed reference point; however, when the constrained points are part of a flexible structure or component this is not satisfactory. A full flexibility matrix is required in order that the entire inertia of the structure may be included. As a consequence, the option to punch the expanded flexibility matrix for the structure was necessary. This option inserts rows and columns of zeros in the flexibility matrix corresponding to the constrained mass points. Next a set of flight parameters were chosen and the aerodynamics program was run. For this example the subsonic AIC program was used, the flight parameters used are

Mach number = .5

Reduced Frequency = 1.0, 1.5, 2.0

Altitude = sea level

The computer output for the subsonic AIC program is shown on pages 38 through 42 . As the AIC programs only establish AIC's for the aerodynamic surfaces, the output from the computer program must be banded by the proper number of zeros, corresponding to the number of mass points on the fuselage. The flexibility matrix, the modified AIC matrix, the proper rigid body modal matrices corresponding to symmetrical flutter, and a rigid body mass matrix corresponding to the arbitrarily fixed points in the FLUENC analysis, are entered into the COFA program. The output from the COFA program is shown on pages 61 through 65 . The pertinent flutter information is shown on page 65 .

The data shown is for the specific flight parameters entered. For the output data to be valid, the flutter velocity must equal the assumed input velocity. When this occurs, the damping value yielded is the damping required at that velocity and is a point on the flutter boundary. Thus, determining a point on the stability boundary is an iterative procedure based upon varying the reduced frequency for a given set of flight parameters until the flutter velocity is approximately equal to the input velocity. In general, this occurs at a different reduced frequency for each flutter mode; thus, for one set of flight parameters, there are as many iterative analyses required as there are modes requested in the analysis. The above analysis determines one point on the flutter boundary. To determine the entire flutter boundary, the above multiple iterative procedure must be repeated for several sets of flight parameters. A typical "V-g" curve is shown in Figure 4.4 for a given altitude. Using a set of these curves, for several altitudes, a flutter boundary of the type specified in MIL-A-8870 or MIL-M-8856 may be constructed.

When solving an antisymmetrical flutter problem the technique is identical to that of the symmetrical problem with the exception of the fuselage structural data input for calculating the flexibility matrix. For the antisymmetrical case, the fuselage torsional stiffness and polar moments of inertia rather than the bending stiffnesses and translational masses are required. In addition, the fuselage mass points must be restrained in translation, allowing only rotation of the fuselage. The mass and stiffness data for the aerodynamic surfaces is identical to that for the symmetrical analysis.

As noted above, the analyses are an iterative procedure. Thus, whether an analysis is valid or not is an arbitrary decision, as the output velocity will never exactly be the input velocity. Normally when the output velocity is within five percent of the input velocity, the results are considered valid. For the example problem, an input velocity of 320 kts (Mach .5) was used. The output velocity for the second mode, using a $1/k_r = .660$, was 308 kts (page 65). This normally would be considered a valid point on the flutter boundary for the second mode. Scanning the results on page 65 it can be seen that the valid data point for the first mode requires a $1/k_r$ value between 1.00 and .666; also for the third mode a value between .666 and .500. For modes 4, 5 and 6, the $1/k_r$ value must be greater than 2.0. It is noted that the function of flutter velocity versus $1/k_r$ is not generally linear; thus, interpolation will not necessarily yield the correct $1/k_r$ to use in subsequent iterations.

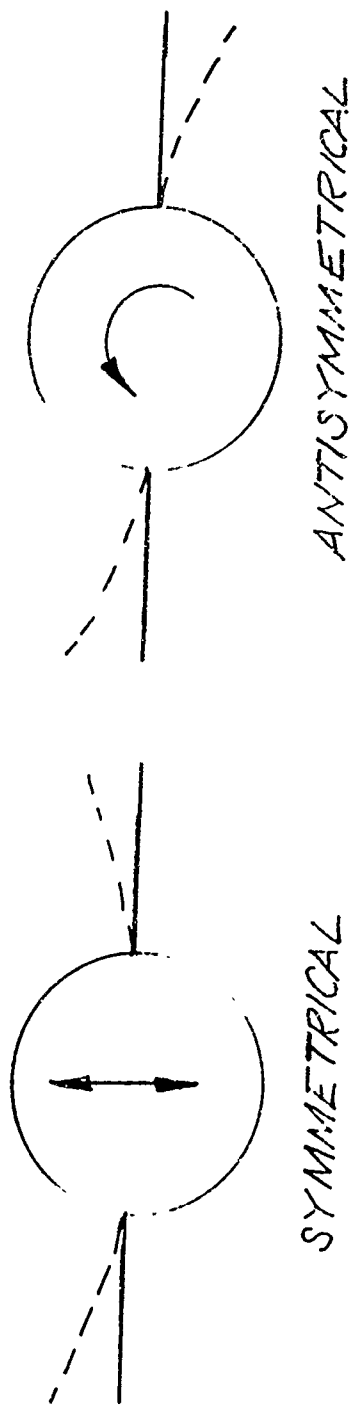


FIGURE 4.1
TYPICAL MODES OF FLUTTER

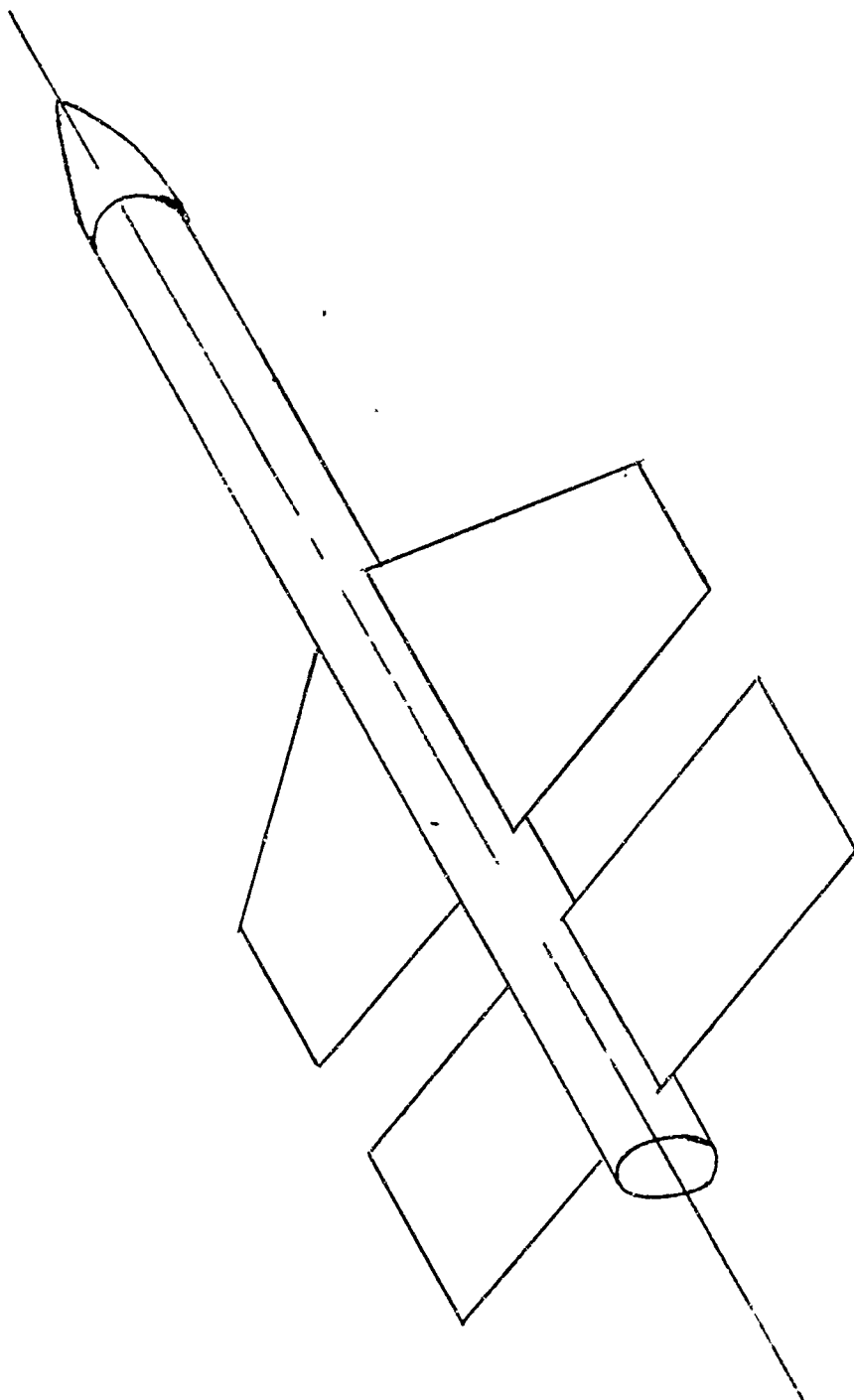


FIGURE A.2
SAMPLE PROBLEM-TYPICAL MISSILE
FIXED WING-MOVABLE CONTROL SURFACE

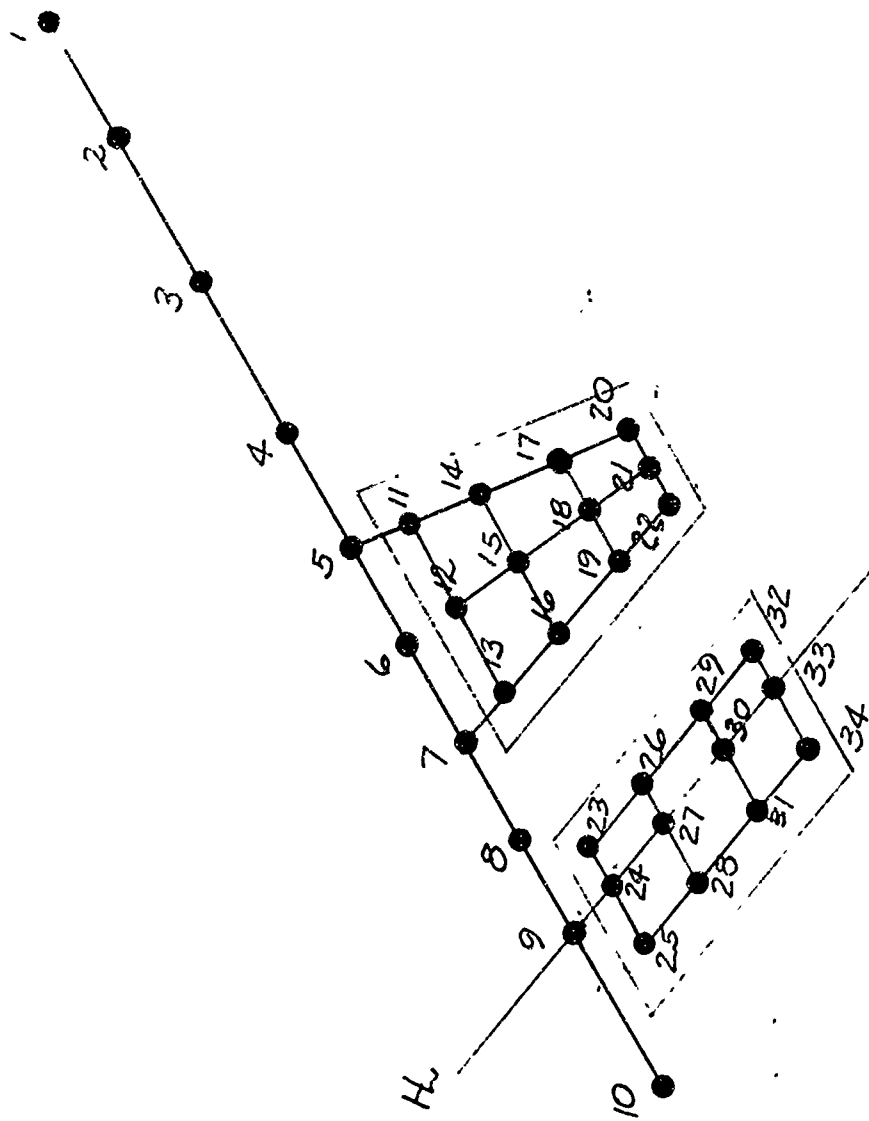


FIGURE 4.3
MATHEMATICAL MODEL

TYPICAL MISSILE WITH AERODYNAMICALLY COUPLED JANDEN SURFACES

NJTS = 34 NR = 10 NRE = 46 NPE = 0 NMODE = 5 NKEY = 1 NLUHP = 34

MATERIAL PROPERTIES
 NO. YOUNG'S MODULUS POISSON RATIO MODULUS OF RIGIDITY DENSITY
 1 0.1000E 08 0.30000 0.36462E 07 0.
 2 0.4000E 08 0.30000 0.15385E 08 0.

JOINT COORDINATES

JOINT NO.	X COORD.	Y COORD.
1	0.	0.
2	15.00000	0.
3	25.00000	0.
4	35.00000	0.
5	45.00000	0.
6	55.00000	0.
7	65.00000	0.
8	75.00000	0.
9	85.00000	0.
10	100.00000	0.
11	46.05000	5.00000
12	55.62500	5.00000
13	65.20000	5.00000
14	48.13000	15.00000
15	56.87500	15.00000
16	65.62500	15.00000
17	50.20500	25.00000
18	58.12500	25.00000
19	66.04000	25.00000
20	52.29000	35.00000
21	59.37500	35.00000
22	66.45500	35.00000
23	81.66000	5.00000
24	85.00000	5.00000
25	91.66000	5.00000
26	81.66000	15.00000
27	85.00000	15.00000
28	91.66000	15.00000
29	81.66000	25.00000
30	85.00000	25.00000
31	91.66000	25.00000
32	81.66000	35.00000
33	85.00000	35.00000
34	91.66000	35.00000

JOINT RESTRAINT CODE

JOINT NO.	Z DISPLACEMENT	ROTATION ABOUT X	ROTATION ABOUT Y
1	0	1	0
2	0	1	0
3	0	1	0
4	0	1	0

5	1	0
6	0	0
7	1	0
8	0	0
9	0	0
10	0	0

COORDINATE NUMBERS FOR EACH Z DISPLACEMENT AT EACH UNRESTRAINED JOINT

JOINT NO.	COORD. NO.
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24
25	25
26	26
27	27
28	28
29	29
30	30
31	31
32	32
33	33
34	34

L U M P E D. W E I G H T S.

JOINT NO.	WEIGHT
1	25.0000
2	25.0000
3	50.0000
4	50.0000
5	50.0000
6	50.0000
7	75.0000
8	75.0000
9	75.0000
10	25.0000
11	0.3330
12	0.3330
13	0.3330

14	0.2880
15	0.2880
16	0.2880
17	0.2550
18	0.2550
19	0.2550
20	0.2220
21	0.2220
22	0.2220
23	0.0840
24	0.1250
25	0.0410
26	0.0840
27	0.1250
28	0.0410
29	0.0840
30	0.1250
31	0.0410
32	0.0840
33	0.1250
34	0.0410

BEAM ELEMENT PROPERTIES *****

ELEMENT NO.	A	I	J	MAT	JOINT 1	JOINT 2
1	1.5000	35.0000	70.0000	1	1	2
2	1.5000	35.0000	70.0000	1	2	3
3	1.5000	35.0000	70.0000	1	3	4
4	3.0000	70.0000	140.0000	1	4	5
5	3.0000	70.0000	140.0000	1	5	6
6	3.0000	70.0000	140.0000	1	6	7
7	3.0000	70.0000	140.0000	1	7	8
8	3.0000	70.0000	140.0000	1	8	9
9	1.5000	35.0000	70.0000	1	9	10
10	0.5000	0.2660	0.0266	2	5	11
11	1.5000	0.2660	0.0266	2	11	14
12	0.5000	0.2660	0.0266	2	14	17
13	0.5000	0.2660	0.0266	2	17	20
14	0.5000	0.2660	0.0266	2	12	15
15	0.5000	0.2660	0.0266	2	15	18
16	0.5000	0.2660	0.0266	2	18	21
17	0.5000	0.2660	0.0266	2	7	13
18	0.5000	0.2660	0.0266	2	13	16
19	0.5000	0.2660	0.0266	2	16	19
20	0.5000	0.2660	0.0266	2	19	22
21	0.5000	0.2660	0.0266	2	11	12
22	0.5000	0.2660	0.0266	2	12	13
23	0.5000	0.2660	0.0266	2	14	15
24	0.5000	0.2660	0.0266	2	15	16
25	0.5000	0.2660	0.0266	2	17	18
26	0.5000	0.2660	0.0266	2	18	19
27	0.5000	0.2660	0.0266	2	20	21
28	0.5000	0.2660	0.0266	2	21	22
29	0.3000	0.8000	1.6000	1	9	24
30	0.5000	0.2660	0.0266	1	23	24
31	0.5000	0.2660	0.0266	1	24	25
32	0.5000	0.2660	0.0266	1	26	27
33	0.5000	0.2660	0.0266	1	27	28
34	0.5000	0.2660	0.0266	1	29	30
35	0.5000	0.2660	0.0266	1	30	31

REDUCED UPPER TRIANGULAR SIFFNESS MATRIX

ROW 1	0.19748E 06	-0.57485E 06	0.48680E 06	-0.14534E 06	-0.12183E 05	-0.84034E 03	0.16937E 03	-0.11633E 02	-0.18876E 03
	-0.34593E 01	-0.13117E 01	0.12948E 02	0.69176E 01	0.21095E 00	-0.32085E 01	-0.38742E 01	-0.52817E 01	0.53735E 00
	0.25681E 02	0.94667E 02	0.45592E 00	-0.34060E 00	-0.11492E 00	0.48476E 03	-0.71414E 03	0.22938E 03	0.46933E 06
	-0.51935E 05	0.47242E 05	0.64961E 00	-0.52872E 07	8.46376E 07				
ROW 2	0.22485E 07	-0.27681E 07	0.14534E 07	0.12183E 06	0.84034E 04	-0.16937E 04	0.11633E 03	0.18876E 04	0.34993E 02
	8.13173E 02	-0.12948E 03	-0.69176E 00	-0.21095E 01	0.32085E 02	0.38742E 00	0.52817E 00	-0.53735E 01	-0.25681E 01
	-0.94667E 01	-0.45592E 01	0.34060E 01	0.11492E 01	-0.48476E 02	0.71414E 02	-0.22938E 02	-0.46933E 05	0.51935E 04
	-0.47242E 04	-0.64961E 07	0.52872E 06	-0.46376E 06					
ROW 3	0.51042E 07	-0.44405E 07	-0.54825E 06	-0.37815E 05	0.76216E 04	-0.52358E 03	-0.48942E 04	-0.15747E 03	-0.59279E 02
	0.58258E 03	0.31129E 01	0.94929E 01	-0.14534E 03	-0.17434E 01	-0.23498E 01	0.24181E 02	0.11556E 00	0.42688E 00
	0.20498E 02	-0.15327E 02	-0.51714E 01	0.21014E 01	-0.32136E 01	0.10322E 01	0.21128E 04	-0.23371E 03	0.21259E 03
	-0.29232E 06	-0.23793E 05	0.20869E 05						
ROW 4	0.68485E 07	-0.26864E 07	0.18538E 06	-0.37346E 05	0.25651E 04	0.23901E 05	0.77159E 03	0.29947E 03	-0.28546E 04
	-0.15253E 02	-0.46515E 02	0.78749E 03	0.85426E 01	0.11478E 02	-0.11849E 03	-0.56825E 00	-0.28874E 01	-0.18044E 01
	0.75102E 02	0.25348E 02	-0.10689E 00	0.15747E 00	-0.598578E 03	-0.10349E 03	9.11452E 02	-0.10417E 02	-0.14324E 05
	-0.11658E 04	-0.18226E 04							
ROW 5	0.99667E 07	0.30050E 07	-0.68565E 06	0.41808E 05	-0.28438E 05	-0.19883E 04	0.78533E 04	0.34884E 04	-0.36277E 01
	-0.68377E 03	-0.84443E 03	-0.65325E 01	0.17242E 03	0.14145E 03	0.27824E 01	-0.28514E 02	-0.16289E 04	0.12188E 04
	0.41095E 03	-0.17335E 01	0.25537E 01	-0.82025E 00	-0.16783E 02	0.18572E 01	-0.18893E 01	-0.23229E 04	0.18977E 03
	-0.16584E 03								
ROW 6	0.34325E 07	-0.42514E 07	0.58049E 06	-0.21369E 04	0.86598E 03	-0.66039E 04	0.23283E 03	0.20664E 02	0.66119E 03
	0.57983E 02	-0.39577E 01	-0.16643E 03	-0.96878E 01	0.62335E 00	0.27743E 02	-0.22738E 05	0.16994E 02	0.57345E 04
	-0.24189E 02	0.35635E 02	-0.11446E 02	-0.23419E 01	0.25915E 00	-0.23573E 00	-0.32415E 03	-0.26383E 02	-0.23141E 02
ROW 7	0.34325E 07	-0.42514E 07	0.58049E 06	-0.21369E 04	0.86598E 03	-0.66039E 04	0.23283E 03	0.20664E 02	0.66119E 03
	0.57983E 02	-0.39577E 01	-0.16643E 03	-0.96878E 01	0.62335E 00	0.27743E 02	-0.22738E 05	0.16994E 02	0.57345E 04
	-0.24189E 02	0.35635E 02	-0.11446E 02	-0.23419E 01	0.25915E 00	-0.23573E 00	-0.32415E 03	-0.26383E 02	-0.23141E 02
ROW 8	0.24162E 06	-0.29582E 07	0.12264E 02	-0.91422E 02	0.32232E 01	0.28697E 00	0.91532E 01	-0.80270E 00	-0.54489E 01
	-0.23839E 01	0.13410E 00	0.86294E 02	0.38406E 00	0.27209E 04	-0.20344E 04	-0.68944E 03	0.28955E 01	-0.42657E 01
	0.13781E 01	0.28034E 07	-0.31022E 01	0.24218E 01	0.38802E 04	-0.31582E 03	0.27761E 03		

ROW 9	0.71902E-06	-0.40051E-05	0.19036E-05	-0.20196E-06	0.84026E-03	-0.37711E-03	0.64936E-05	0.17693E-03	0.81226E-02
	-0.10878E-05	0.49346E-02	-0.30186E-02	0.11583E-01	-0.86618E-00	-0.29223E-00	0.12327E-02	-0.18168E-02	0.50328E-03
	-0.11934E-05	-0.13206E-04	0.12013E-04	0.16519E-07	-0.13445E-06	0.11793E-06			
ROW 10	0.96516E-05	-0.38363E-05	0.13363E-04	-0.41191E-05	0.14875E-04	0.17097E-03	-0.25129E-05	-0.37443E-02	-0.22449E-02
	-0.42037E-04	0.17561E-02	-0.48021E-00	0.35206E-00	0.12115E-00	-0.51104E-03	0.75285E-03	-0.24182E-03	-0.39477E-06
	0.54750E-05	-0.49803E-05	-0.68407E-08	0.55739E-07	-0.48898E-07				
ROW 11	0.76064E-06	-0.65086E-02	-0.33379E-03	-0.21396E-06	-0.53577E-02	0.69927E-03	0.68801E-05	0.18830E-02	-0.12305E-03
	-0.11483E-05	0.35797E-01	-0.26766E-01	-0.90312E-00	0.38095E-02	-0.56121E-02	0.18026E-02	0.36883E-05	-0.48614E-04
	0.37125E-04	0.51050E-07	-0.41550E-06	0.36445E-06					
ROW 12	0.18436E-06	-0.51049E-05	0.24255E-05	-0.10107E-06	0.22992E-04	-0.34927E-03	0.26797E-05	-0.43714E-03	0.75618E-02
	-0.12621E-00	0.94370E-01	0.31841E-01	-0.13431E-03	0.19787E-03	-0.63555E-04	-0.13084E-06	0.14390E-05	-0.13989E-05
	-0.17999E-08	0.14649E-07	-0.12849E-07						
ROW 13	0.20294E-06	-0.50733E-05	0.16050E-04	-0.91422E-05	0.20494E-04	0.25464E-02	0.25271E-05	-0.20385E-03	-0.11201E-01
	-0.83754E-02	0.28260E-02	-0.11920E-04	0.17561E-04	-0.56406E-05	-0.11541E-07	0.12771E-06	-0.11617E-06	-0.15974E-09
	0.13002E-08	-0.11404E-08							
ROW 14	0.19388E-06	-0.77602E-02	0.15963E-04	-0.10709E-06	-0.65459E-02	0.10508E-02	0.28277E-05	-0.35841E-00	0.26799E-00
	-0.90421E-01	-0.38141E-03	0.56189E-03	-0.18048E-03	-0.36228E-06	0.40863E-05	-0.37178E-05	-0.51112E-08	0.41601E-07
	-0.36489E-07								
ROW 15	0.13639E-06	-0.69129E-05	0.32645E-05	-0.39569E-05	0.34129E-04	-0.46723E-03	0.31431E-01	-0.23501E-01	-0.79295E-02
	0.33448E-04	-0.49275E-04	0.15827E-04	0.32384E-07	-0.35835E-06	0.32597E-06	0.44823E-09	-0.36482E-08	0.31999E-08
ROW 16	0.23706E-06	-0.68975E-05	0.27417E-04	-0.43167E-05	0.29664E-04	0.21453E-02	-0.16041E-02	-0.54124E-03	0.22831E-05
	-0.33634E-05	0.10803E-05	0.22104E-08	-0.24460E-07	0.22249E-07	0.30594E-10	-0.24981E-09	0.21842E-09	
ROW 17	0.14224E-06	-0.10793E-03	0.25542E-04	-0.41321E-05	0.80214E-01	-0.67455E-01	-0.22768E-01	0.96005E-04	-0.14143E-03
	0.45428E-04	0.92950E-07	-0.10286E-05	0.93561E-06	0.12865E-08	-0.10471E-07	0.91847E-08		
ROW 18	0.64224E-05	-0.93278E-05	0.45294E-05	-0.52510E-02	0.32262E-02	0.13247E-02	-0.55880E-05	0.82322E-02	-0.26442E-05
	-0.54101E-08	0.59867E-07	-0.54457E-07	-0.74883E-10	0.60948E-09	-0.53460E-09			
ROW 19	0.20261E-06	-0.92801E-05	-0.33798E-03	0.25265E-03	-0.85246E-04	-0.35958E-06	0.52973E-06	-0.17015E-06	-0.44814E-02
	0.38524E-08	-0.35043E-08	-0.48187E-11	0.39220E-10	-0.34401E-10				
ROW 20	0.64573E-05	-0.15038E-01	0.11244E-01	0.37940E-02	-0.16004E-04	0.23577E-04	-0.75728E-05	-0.15494E-07	0.17146E-06
	-0.15596E-06	-0.21446E-09	0.17455E-08	-0.16311E-08					
ROW 21	0.11438E-06	-0.13578E-06	0.26905E-05	-0.11891E-05	0.20158E-04	-0.16060E-03	0.04535E-04	0.48877E-02	-0.17898E-01
	-0.10753E-04	-0.84226E-01	0.33240E-00						
ROW 22	0.53063E-06	-0.47288E-05	0.77597E-03	-0.67125E-05	0.32870E-02	0.52467E-03	0.19777E-05	0.26735E-03	-0.90760E-02

-0.32924E-04 -0.45462E-02

ROW 23
0.25273E-05 -0.19461E-03 0.70749E-03 -0.10327E-05 -0.21770E-01 0.25256E-02 0.64203E-04 0.32666E-00 -0.39783E-01
-0.10203E-04

ROW 24
0.18156E-06 -0.11101E-06 0.36243E-05 -0.24544E-05 0.22169E-04 -0.17970E-03 0.64498E-04 -0.34655E-02 -0.40350E-01

ROW 25
0.21299E-06 -0.55283E-05 0.21575E-04 -0.30378E-05 0.73641E-03 -0.23777E-02 0.72766E-04 -0.12175E-02

ROW 26
0.44907E-05 -0.17970E-03 0.76672E-03 -0.23014E-05 -0.40320E-01 -0.17629E-02 0.64195E-04

ROW 27
0.110154E-06 -0.11218E-06 0.36234E-05 -0.11916E-05 0.25090E-04 -0.17789E-03

ROW 28
0.19455E-06 -0.55572E-05 0.25088E-04 -0.13211E-05 0.91545E-03

ROW 29
0.44903E-05 -0.17789E-03 0.91555E-03 -0.10318E-05

ROW 30
0.78076E-05 -0.10987E-06 0.36056E-05

ROW 31
0.16892E-06 -0.54759E-05

ROW 32
0.22960E-05

REDUCED UPPER TRIANGULAR FLEXIBILITY MATRIX

ROW 1
0.83073E-04 0.43438E-04 0.21776E-04 0.72572E-05 -0.16051E-05 0.21394E-05 0.42789E-05 0.74880E-05 -0.41524E-06
-0.29351E-06 0.20012E-07 -0.11108E-05 -0.59161E-06 -0.41861E-07 -0.16806E-05 -0.92676E-06 -0.17898E-06 -0.21875E-05
-0.12731E-05 -0.35927E-06 0.35644E-05 0.42790E-05 0.57038E-05 0.35651E-05 0.42797E-05 0.57046E-05 -0.35661E-05
0.42807E-05 0.57056E-05 0.35672E-05 0.42818E-05 0.57066E-05

ROW 2
0.25228E-04 0.13565E-04 0.47888E-05 -0.10781E-05 0.14263E-05 0.28524E-05 -0.49920E-05 -0.27683E-06 -0.19567E-06
0.13341E-07 -0.73998E-06 -0.39441E-06 -0.27908E-07 -0.11204E-05 -0.61784E-06 -0.11927E-06 -0.14983E-05 -0.84874E-06
-0.23951E-06 0.23763E-05 0.28526E-05 0.38026E-05 0.23767E-05 0.28531E-05 0.38031E-05 0.23774E-05 0.28538E-05
0.38037E-05 0.23781E-05 0.28545E-05 0.38044E-05

ROW 3
0.80921E-05 0.30932E-05 -0.71340E-06 0.95887E-06 0.19817E-05 0.33280E-05 -0.18455E-06 -0.13845E-06 0.88942E-08
-0.49332E-06 -0.26294E-06 -0.18605E-07 -0.74695E-06 -0.41190E-06 -0.79511E-07 -0.97223E-06 -0.56583E-06 -0.15968E-06
0.15842E-05 0.19018E-05 -0.25358E-05 0.15842E-05 0.19021E-05 0.25354E-05 0.15849E-05 0.19025E-05 0.25358E-05
0.15854E-05 -0.19030E-05 0.25363E-05

ROW 4
0.14275E-05 -0.15670E-06 0.47534E-06 0.95888E-06 0.16649E-05 -0.92227E-07 -0.65224E-07 0.44471E-08 -0.24666E-06
-0.13147E-06 -0.93026E-08 -0.37348E-06 -0.29595E-06 -0.39756E-07 -0.48612E-06 -0.28292E-06 -0.79039E-07 0.79209E-06
0.95889E-06 0.12675E-05 0.79225E-06 0.92105E-06 0.12677E-05 0.79247E-06 0.95128E-06 0.12679E-05 0.79272E-06
0.95151E-06 0.12682E-05

ROW 5	0.23788E-06	-0.35673E-06	-0.71346E-06	-0.12486E-05	0.34716E-07	0.25249E-07	-0.54194E-08	0.92012E-07	0.44197E-07
	-0.70910E-08	0.13740E-06	0.67302E-07	-0.21219E-08	0.17671E-06	0.91768E-07	0.67599E-08	-0.59433E-06	-0.71348E-06
	-0.95106E-06	-0.59445E-06	-0.71360E-06	-0.94119E-06	-0.59461E-06	-0.71376E-06	-0.95135E-06	-0.59479E-06	-0.71394E-06
	-0.95152E-06								
ROW 6	0.14277E-05	0.30935E-05	0.55921E-05	-0.46504E-07	-0.35771E-07	0.17230E-07	-0.12130E-06	-0.45315E-07	0.37667E-07
	-0.17610E-08	-0.63237E-07	0.48233E-07	-0.22971E-06	-0.93802E-07	0.52890E-07	0.25311E-05	0.30935E-05	0.42029E-05
	0.25376E-05	0.30940E-05	0.42035E-05	0.25384E-05	0.30940E-05	0.42042E-05	0.25392E-05	0.30955E-05	0.42849E-05
ROW 7	0.76155E-05	0.14756E-04	-0.93169E-07	-0.71542E-07	0.34461E-07	-0.24271E-06	-0.90639E-07	0.75333E-07	-0.35221E-06
	-0.12651E-06	0.96487E-07	-0.44143E-06	-0.16776E-06	0.10560E-06	0.60257E-05	0.76156E-05	0.10786E-04	0.60270E-05
	0.76169E-05	0.10787E-04	0.60287E-05	0.76187E-05	0.10789E-04	0.60307E-05	0.76206E-05	0.10791E-04	
ROW 8	0.33679E-04	-0.16305E-06	-0.12520E-06	0.60306E-07	-0.42484E-06	-0.15869E-06	0.13183E-06	-0.61636E-06	-0.22140E-06
	-0.16885E-06	-0.77259E-06	-0.29350E-06	0.19488E-06	0.11258E-04	0.14755E-04	0.21731E-04	0.11260E-04	0.14758E-04
	0.21734E-04	0.11264E-04	0.14762E-04	0.21737E-04	0.11267E-04	0.14766E-04	0.21741E-04		
ROW 9	0.38916E-05	0.21342E-05	0.26835E-06	0.14387E-04	0.92794E-05	0.21478E-05	0.23509E-04	0.14392E-04	0.52837E-05
	0.31876E-04	0.28484E-04	0.90874E-05	-0.77611E-07	-0.93170E-07	-0.12420E-06	-0.77624E-07	-0.93186E-07	-0.12421E-06
	-0.77648E-07	-0.93209E-07	-0.12423E-06	-0.77672E-07	-0.93231E-07	-0.12426E-06			
ROW 10	0.13711E-04	0.19517E-05	0.79186E-05	0.94396E-05	0.73152E-05	0.18977E-04	0.10295E-04	0.10251E-04	0.13114E-04
	0.12362E-04	0.12362E-04	-0.59596E-07	-0.71543E-07	-0.92368E-07	-0.59607E-07	-0.71555E-07	-0.92380E-07	-0.59624E-07
	-0.71572E-07	-0.95396E-07	-0.59642E-07	-0.71590E-07	-0.95413E-07				
ROW 11	0.16776E-05	0.21696E-05	0.79270E-05	0.13698E-04	0.53575E-05	0.11941E-04	0.22528E-04	0.92553E-05	0.19989E-04
	0.30727E-04	0.28706E-07	0.34461E-07	0.45936E-07	0.28712E-07	0.34467E-07	0.45943E-07	0.28720E-07	0.34475E-07
	0.45951E-07	0.28729E-07	0.34484E-07	0.45959E-07					
ROW 12	0.92695E-04	0.56012E-04	0.17312E-04	0.17368E-03	0.10746E-03	0.41823E-04	0.24744E-03	0.15962E-03	0.71792E-04
	-0.20223E-06	-0.24277E-06	-0.32361E-06	-0.20227E-06	-0.24281E-06	-0.32366E-06	-0.20233E-06	-0.24287E-06	-0.32371E-06
	-0.20239E-06	-0.24293E-06	-0.32377E-06						
ROW 13	0.62750E-04	0.53786E-04	0.11335E-03	0.11295E-03	0.10933E-03	0.16895E-03	0.16600E-03	0.16365E-03	-0.75496E-07
	-0.98631E-07	-0.12081E-06	-0.75511E-07	-0.98646E-07	-0.12083E-06	-0.75531E-07	-0.98667E-07	-0.12085E-06	-0.75554E-07
	-0.98689E-07	-0.12087E-06							
ROW 14	0.86655E-04	0.42017E-04	0.10416E-03	0.16699E-03	0.72556E-04	0.15582E-03	0.23919E-03	0.62754E-07	0.75335E-07
	0.10042E-06	0.62767E-07	0.75348E-07	0.10043E-06	0.62785E-07	0.75366E-07	0.10045E-06	0.62804E-07	0.75385E-07
	0.10047E-06								
ROW 15	0.17984E-03	0.23767E-03	0.97406E-04	0.57876E-03	0.37131E-03	0.16460E-03	-0.29339E-06	-0.35221E-06	-0.46950E-06
	-0.29345E-06	-0.35227E-06	-0.46956E-06	-0.29353E-06	-0.35235E-06	-0.46964E-06	-0.29362E-06	-0.35244E-06	-0.46973E-06
ROW 16	0.23884E-03	0.23021E-03	0.13735E-03	0.36895E-03	0.36384E-03	0.18239E-06	-0.12622E-06	-0.16864E-06	-0.10541E-06
	-0.12654E-06	-0.16667E-06	-0.130544E-06	-0.12656E-06	-0.16669E-06	-0.130547E-06	-0.12660E-06	-0.16672E-06	
ROW 17	0.36669E-03	0.16579E-03	0.36408E-03	0.56437E-03	0.60637E-03	0.96488E-07	0.12822E-06	0.80392E-07	0.96585E-07

ROW 18	0.12864E-06	0.80415E-07	0.96570E-07	0.12866E-06	0.80440E-07	0.96554E-07	0.12868E-06	-0.44151E-06	-0.58851E-06
ROW 19	0.09567E-03	0.61266E-03	0.27337E-03	-0.36771E-06	-0.34143E-06	-0.58843E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 20	0.09567E-06	-0.44161E-06	-0.58841E-06	-0.36780E-06	-0.34172E-06	-0.58871E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 21	0.09567E-03	0.61266E-03	0.27337E-03	-0.36771E-06	-0.34143E-06	-0.58843E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 22	0.09567E-06	-0.44161E-06	-0.58841E-06	-0.36780E-06	-0.34172E-06	-0.58871E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 23	0.09567E-03	0.61266E-03	0.27337E-03	-0.36771E-06	-0.34143E-06	-0.58843E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 24	0.09567E-06	-0.44161E-06	-0.58841E-06	-0.36780E-06	-0.34172E-06	-0.58871E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 25	0.09567E-03	0.61266E-03	0.27337E-03	-0.36771E-06	-0.34143E-06	-0.58843E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 26	0.09567E-06	-0.44161E-06	-0.58841E-06	-0.36780E-06	-0.34172E-06	-0.58871E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 27	0.09567E-03	0.61266E-03	0.27337E-03	-0.36771E-06	-0.34143E-06	-0.58843E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 28	0.09567E-06	-0.44161E-06	-0.58841E-06	-0.36780E-06	-0.34172E-06	-0.58871E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 29	0.09567E-03	0.61266E-03	0.27337E-03	-0.36771E-06	-0.34143E-06	-0.58843E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 30	0.09567E-06	-0.44161E-06	-0.58841E-06	-0.36780E-06	-0.34172E-06	-0.58871E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 31	0.09567E-03	0.61266E-03	0.27337E-03	-0.36771E-06	-0.34143E-06	-0.58843E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06
ROW 32	0.09567E-06	-0.44161E-06	-0.58841E-06	-0.36780E-06	-0.34172E-06	-0.58871E-06	-0.36779E-06	-0.44151E-06	-0.58851E-06

UPPER TRIANGLE OF EXPANDED FLEXIBILITY MATRIX WITH ATTACH POINTS INCLUDED

ROW 1	0.83073E-04	0.43438E-04	0.21776E-04	0.72572E-05	0.	-0.16051E-05	0.	0.59161E-06	0.21394E-05
	0.42789E-05	0.74980E-05	-0.41524E-06	-0.29351E-06	0.20012E-07	-0.11100E-05	-0.59161E-06	-0.41861E-07	-0.41861E-07
	-0.16806E-05	-0.92512E-06	-0.17890E-06	-0.21875E-05	-0.12731E-05	-0.35927E-06	0.35644E-05	0.42790E-05	0.42790E-05
	0.57038E-05	0.35651E-05	0.42797E-05	0.57046E-05	0.35661E-05	0.42867E-05	0.57056E-05	0.57056E-05	0.57056E-05
	0.42818E-05	0.57066E-05							
ROW 2	0.25228E-04	0.13565E-04	0.47588E-05	0.	-0.10701E-05	0.	0.14266E-05	0.28526E-05	0.28526E-05
	0.49920E-05	-0.27683E-06	-0.19567E-06	0.13341E-07	-0.73988E-06	-0.39441E-06	-0.27908E-07	-0.11204E-05	-0.11204E-05
	-0.61784E-06	-0.11927E-06	-0.14583E-05	-0.84874E-06	-0.23951E-06	0.23763E-05	0.28526E-05	0.38023E-05	0.38023E-05
	0.23767E-05	0.28531E-05	0.38031E-05	0.23774E-05	0.28538E-05	0.38037E-05	0.23781E-05	0.28545E-05	0.28545E-05
	0.38044E-05								
ROW 3	0.80911E-05	0.30932E-05	0.	-0.71340E-06	0.	0.95087E-06	0.12017E-05	0.33280E-05	0.33280E-05
	-0.18455E-06	-0.13045E-06	0.88942E-08	-0.49332E-06	-0.26294E-06	-0.18605E-07	-0.74695E-06	-0.41190E-06	-0.41190E-06
	-0.79511E-07	-0.27223E-06	-0.56583E-06	-0.15968E-06	0.15842E-05	0.12018E-05	0.25350E-05	0.15845E-05	0.15845E-05
	0.19021E-05	0.25354E-05	0.15849E-05	0.19025E-05	0.25358E-05	0.15854E-05	0.19030E-05	0.25363E-05	0.25363E-05
ROW 4	0.14275E-05	0.	-0.35670E-06	0.	0.47544E-06	0.95088E-06	0.16340E-05	-0.22278E-07	-0.22278E-07
	-0.65224E-07	0.44474E-08	-0.24666E-06	-0.13147E-06	-0.93026E-08	-0.37348E-06	-0.20595E-06	-0.39750E-07	-0.39750E-07
	-0.48618E-06	-0.28292E-06	-0.79839E-07	0.79289E-06	0.95089E-06	0.12675E-05	0.79225E-06	0.25105E-06	0.25105E-06
	0.12677E-05	0.79247E-06	0.95128E-06	0.12679E-05	0.79272E-06	0.95151E-06	0.12682E-05		
ROW 5	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.
ROW 6	0.23788E-06	0.	-0.35673E-06	-0.71346E-06	-0.12480E-05	0.34716E-07	0.25349E-07	-0.54419E-08	-0.54419E-08
	0.92012E-07	0.44197E-07	-0.70910E-08	0.13740E-06	0.67302E-07	-0.21215E-08	0.17671E-06	0.93700E-07	0.93700E-07
	0.67599E-08	-0.59433E-06	-0.71348E-06	-0.95106E-06	-0.59415E-06	-0.71360E-06	-0.95119E-06	-0.59461E-06	-0.59461E-06
	-0.71376E-06	-0.95135E-06	-0.59479E-06	-0.71394E-06	-0.95152E-06				
ROW 7	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.
ROW 8	0.14277E-05	0.30935E-05	0.56921E-05	-0.48584E-07	-0.35771E-07	0.17230E-07	-0.12130E-06	-0.45315E-07	-0.45315E-07
	0.37667E-07	-0.17610E-06	-0.63257E-07	0.48243E-07	-0.22071E-06	-0.63802E-07	0.52800E-07	0.25371E-05	0.25371E-05
	0.30935E-05	0.30935E-05	0.25376E-05	0.30940E-05	0.42035E-05	0.25384E-05	0.30948E-05	0.42042E-05	0.42042E-05
	0.25392E-05	0.10952E-05	0.42049E-05						

ROW 9	0.76155E-05	0.14756E-04	-0.93169E-07	-0.71542E-07	0.34461E-07	-0.24277E-06	-0.90630E-07	0.75333E-07
	-0.35221E-06	-0.12651E-06	0.96487E-07	-0.44143E-06	-0.16776E-06	0.10560E-06	9.60257E-05	0.76156E-05
	0.10780E-04	0.60270E-05	0.76169E-05	0.10787E-04	0.60287E-05	0.76187E-05	0.10789E-04	0.60307E-05
	0.76206E-05	-0.10791E-04						
ROW 10	0.33679E-04	-0.16305E-06	-0.12520E-06	0.60306E-07	-0.42484E-06	-0.15860E-06	0.13183E-06	-0.61636E-06
	-0.22149E-06	0.16885E-06	-0.77250E-06	-0.29359E-06	0.10480E-06	0.11258E-04	0.14756E-04	0.21731E-04
	0.52837E-04	0.11268E-04	0.21734E-04	0.11264E-04	0.14762E-04	0.21737E-04	0.11267E-04	0.14766E-04
	0.21741E-04							
ROW 11	0.38915E-05	0.21342E-05	0.26835E-06	0.14387E-04	0.82794E-05	0.21478E-05	0.23509E-04	0.14397E-04
	-0.93186E-07	-0.12421E-06	-0.77648E-07	0.90874E-05	-0.77611E-07	-0.93170E-07	-0.12420E-06	-0.77626E-07
				-0.93208E-07	-0.12423E-06	-0.77672E-07	-0.93231E-07	-0.12426E-06
ROW 12	0.13711E-04	0.19517E-05	0.79186E-05	0.94396E-05	0.73152E-05	0.10977E-04	0.10205E-04	0.10231E-04
	0.13114E-04	0.12684E-04	0.12362E-04	-0.59598E-07	-0.71543E-07	-0.95366E-07	-0.59687E-07	-0.71555E-07
	-0.95388E-07	-0.59624E-07	-0.71572E-07	-0.95396E-07	-0.59642E-07	-0.71598E-07	-0.95413E-07	
ROW 13	0.36770E-05	0.21696E-05	0.79270E-05	0.13698E-04	0.53575E-05	0.13941E-04	0.22528E-04	0.92553E-05
	0.19989E-04	0.30727E-04	0.28706E-07	0.34461E-07	0.45936E-07	0.28712E-07	0.34467E-07	0.45943E-07
	0.28720E-07	0.34475E-07	0.45951E-07	0.28729E-07	0.34484E-07	0.45959E-07		
ROW 14	0.92699E-04	0.56012E-04	0.17312E-04	0.17368E-03	0.10746E-03	0.41823E-04	0.24744E-03	0.15962E-03
	0.71799E-04	-0.20223E-06	-0.24277E-06	-0.32361E-06	-0.20227E-06	-0.24281E-06	-0.32366E-06	-0.20233E-06
	-0.24287E-06	-0.32371E-06	-0.20239E-06	-0.24293E-06	-0.32377E-06			
ROW 15	0.62759E-04	0.53786E-04	0.11335E-03	0.11295E-03	0.10933E-03	0.16895E-03	0.16600E-03	0.16345E-03
	-0.75496E-07	-0.90631E-07	-0.12881E-06	-0.75511E-07	-0.90646E-07	-0.12883E-06	-0.75531E-07	-0.90667E-07
	-0.12085E-06	-0.75554E-07	-0.90669E-07	-0.12087E-06				
ROW 16	0.68659E-04	0.42017E-04	0.10416E-03	0.16698E-03	0.72556E-04	0.15582E-03	0.23919E-03	0.62754E-07
	0.75335E-07	0.10842E-06	0.62767E-07	0.725348E-07	0.10943E-06	0.62785E-07	0.75366E-07	0.10945E-06
	0.62804E-07	0.75385E-07	0.10847E-06					
ROW 17	0.37984E-03	0.23767E-03	0.97486E-04	0.57876E-03	0.37131E-03	0.16488E-03	-0.29339E-06	-0.35221E-06
	-0.46950E-06	-0.29345E-06	-0.35227E-06	-0.46956E-06	-0.29353E-06	-0.35235E-06	-0.46964E-06	-0.29362E-06
	-0.35244E-06	-0.46973E-06						
ROW 18	0.23884E-03	0.23093E-03	0.37355E-03	0.36895E-03	0.36388E-03	-0.18539E-06	-0.12652E-06	-0.18864E-06
	-0.10541E-06	-0.12654E-06	-0.16067E-06	-0.18544E-06	-0.12656E-06	-0.18869E-06	-0.12657E-06	-0.18868E-06

-0.16072E-06

ROW 19

0.36689E-03 0.16575E-03 0.36308E-03 0.56147E-03 0.60375E-07 0.96488E-07 0.12842E-06 0.09392E-07
0.96585E-07 0.12844E-06 0.00415E-07 0.96529E-07 0.12866E-06 0.00448E-07 0.96554E-07 0.12888E-06

ROW 20

0.95567E-03 0.61266E-03 0.27337E-03 -0.36771E-06 -0.44843E-06 -0.58841E-06 -0.36779E-06 -0.44158E-06
-0.58851E-06 -0.36789E-06 -0.44181E-06 -0.58861E-06 -0.36888E-06 -0.44172E-06 -0.58871E-06

ROW 21

0.68844E-03 0.59880E-04 -0.13981E-06 -0.16777E-06 -0.22383E-06 -0.13828E-06 -0.16779E-06 -0.22384E-06
-0.13981E-06 -0.16783E-06 -0.22390E-06 -0.13985E-06 -0.16787E-06 -0.22394E-06

ROW 22

0.93067E-03 0.87966E-07 0.16568E-06 0.14077E-06 0.87983E-07 0.10562E-06 0.14079E-06 0.88018E-07
0.10565E-06 0.14081E-06 0.88039E-07 0.14086E-06 0.87983E-07 0.10565E-06 0.14088E-06

ROW 23

0.23741E-04 0.11235E-04 -0.46098E-05 0.36324E-04 0.26340E-04 0.79275E-05 0.49936E-04 0.43143E-04
0.26465E-04 0.85575E-04 0.53546E-04 0.33562E-04 0.26340E-04 0.79275E-05 0.49936E-04 0.43143E-04

ROW 24

0.12025E-04 0.15995E-04 0.26868E-04 0.28457E-04 0.31628E-04 0.42594E-04 0.44894E-04 0.43143E-04
0.28141E-04 0.29731E-04 0.64998E-04 0.33562E-04 0.28457E-04 0.42594E-04 0.44894E-04 0.43143E-04

ROW 25

0.92993E-04 0.10219E-05 -0.10219E-05 0.99165E-04 0.49334E-05 0.37983E-04 0.10219E-05 0.4282E-04
0.44783E-04 0.10566E-03 0.30428E-04 0.99165E-04 0.49334E-05 0.37983E-04 0.10219E-05 0.4282E-04

ROW 26

0.34483E-03 0.74467E-03 -0.74467E-03 0.74467E-03 0.62871E-03 0.47086E-03 0.14587E-04 0.62499E-03
0.97524E-04 0.74467E-03 0.74467E-03 0.74467E-03 0.62871E-03 0.47086E-03 0.14587E-04 0.62499E-03

ROW 27

0.21432E-01 0.22524E-01 0.47281E-01 0.43812E-01 0.43812E-01 0.43812E-01 0.43812E-01 0.43812E-01
0.21432E-01 0.22524E-01 0.47281E-01 0.43812E-01 0.43812E-01 0.43812E-01 0.43812E-01 0.43812E-01

ROW 28

0.73908E-03 0.73922E-04 0.44780E-03 0.12918E-02 0.18643E-03 0.11837E-03 0.17791E-02 0.43812E-01

ROW 29

0.13298E-02 0.95537E-03 0.21259E-03 0.29181E-02 0.14869E-02 0.14760E-03 0.14760E-03 0.43812E-01

ROW 30

0.94727E-01 0.7814E-03 0.15146E-02 0.15146E-02 0.15146E-02 0.15146E-02 0.15146E-02 0.43812E-01

ROW 31

0.25847E-03 50 E-03 0.14587E-02 0.36274E-03 0.36274E-03 0.36274E-03 0.36274E-03 0.43812E-01

ROW 32

0.32860E-02	0.25098E-02	0.96514E-03
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ROW 33

0.25097E-02 0.24900E-02

NOV 34

0.55671E-02

REDUCED UPPER TRIANGULAR WEIGHT MATRIX

1 NOV

0.2500E.02.

[illegible]

ROW 2

0-2500E-02

DATE	DESCRIPTION	AMOUNT	BALANCE
1900	TO BALANCE	100.00	100.00
1901	BY BALANCE	100.00	200.00
1902	TO BALANCE	100.00	300.00
1903	BY BALANCE	100.00	400.00
1904	TO BALANCE	100.00	500.00
1905	BY BALANCE	100.00	600.00
1906	TO BALANCE	100.00	700.00
1907	BY BALANCE	100.00	800.00
1908	TO BALANCE	100.00	900.00
1909	BY BALANCE	100.00	1000.00
1910	TO BALANCE	100.00	1100.00
1911	BY BALANCE	100.00	1200.00
1912	TO BALANCE	100.00	1300.00
1913	BY BALANCE	100.00	1400.00
1914	TO BALANCE	100.00	1500.00
1915	BY BALANCE	100.00	1600.00
1916	TO BALANCE	100.00	1700.00
1917	BY BALANCE	100.00	1800.00
1918	TO BALANCE	100.00	1900.00
1919	BY BALANCE	100.00	2000.00
1920	TO BALANCE	100.00	2100.00
1921	BY BALANCE	100.00	2200.00
1922	TO BALANCE	100.00	2300.00
1923	BY BALANCE	100.00	2400.00
1924	TO BALANCE	100.00	2500.00
1925	BY BALANCE	100.00	2600.00
1926	TO BALANCE	100.00	2700.00
1927	BY BALANCE	100.00	2800.00
1928	TO BALANCE	100.00	2900.00
1929	BY BALANCE	100.00	3000.00
1930	TO BALANCE	100.00	3100.00
1931	BY BALANCE	100.00	3200.00
1932	TO BALANCE	100.00	3300.00
1933	BY BALANCE	100.00	3400.00
1934	TO BALANCE	100.00	3500.00
1935	BY BALANCE	100.00	3600.00
1936	TO BALANCE	100.00	3700.00
1937	BY BALANCE	100.00	3800.00
1938	TO BALANCE	100.00	3900.00
1939	BY BALANCE	100.00	4000.00
1940	TO BALANCE	100.00	4100.00
1941	BY BALANCE	100.00	4200.00
1942	TO BALANCE	100.00	4300.00
1943	BY BALANCE	100.00	4400.00
1944	TO BALANCE	100.00	4500.00
1945	BY BALANCE	100.00	4600.00
1946	TO BALANCE	100.00	4700.00
1947	BY BALANCE	100.00	4800.00
1948	TO BALANCE	100.00	4900.00
1949	BY BALANCE	100.00	5000.00
1950	TO BALANCE	100.00	5100.00
1951	BY BALANCE	100.00	5200.00
1952	TO BALANCE	100.00	5300.00
1953	BY BALANCE	100.00	5400.00
1954	TO BALANCE	100.00	5500.00
1955	BY BALANCE	100.00	5600.00
1956	TO BALANCE	100.00	5700.00
1957	BY BALANCE	100.00	5800.00
1958	TO BALANCE	100.00	5900.00
1959	BY BALANCE	100.00	6000.00
1960	TO BALANCE	100.00	6100.00
1961	BY BALANCE	100.00	6200.00
1962	TO BALANCE	100.00	6300.00
1963	BY BALANCE	100.00	6400.00
1964	TO BALANCE	100.00	6500.00
1965	BY BALANCE	100.00	6600.00
1966	TO BALANCE	100.00	6700.00
1967	BY BALANCE	100.00	6800.00
1968	TO BALANCE	100.00	6900.00
1969	BY BALANCE	100.00	7000.00
1970	TO BALANCE	100.00	7100.00
1971	BY BALANCE	100.00	7200.00
1972	TO BALANCE	100.00	7300.00
1973	BY BALANCE	100.00	7400.00
1974	TO BALANCE	100.00	7500.00
1975	BY BALANCE	100.00	7600.00
1976	TO BALANCE	100.00	7700.00
1977	BY BALANCE	100.00	7800.00
1978	TO BALANCE	100.00	7900.00
1979	BY BALANCE		

MON 2

0.5000E 62

[illegible]

NOV 4

0.5808E.02

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523</
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MON 5

0.50000002

[illegible]

6 NOV 68

0.7500E 02

[illegible]

QOM. 7

0.7500E 02

[illegible]

ROW 8

1.25890E 02

0.25890E-02

[illegible]

Abstract

Journal of Management Inquiry 20(4) 403-417

Abstract

REGISTRATION NO.

1000

HERE ARE THE EIGENVALUES AND EIGENVECTORS

EIGENVECTOR NUMBER 1
CORRESPONDING TO 1.2431656E-05
1.000000E-00 5.4942504E-01 2.8956006E-01 1.0198256E-01 2.5893890E-02 4.7414512E-02
1.0449420E-01 1.9933320E-01 6.3802740E-03 4.5111410E-03 3.5171355E-04 1.8137977E-02
-9.9251658E-03 1.0594392E-03 -2.8621349E-02 -1.6271173E-02 -3.9874489E-03 -3.8304938E-02
-2.3806465E-02 -7.7221027E-03 8.571401E-02 1.0582029E-01 1.4553438E-01 9.8412937E-02
1.1952757E-01 1.6289247E-01 1.1684120E-01 1.3910497E-01 1.8331725E-01 1.3777984E-01
1.6027544E-01 2.0511256E-01

EIGENVECTOR NUMBER 2
CORRESPONDING TO 2.8039211E-05
-1.5489999E-01 -6.4672757E-02 -1.8471959E-02 3.2698523E-03 -1.7664241E-02 9.5851244E-02
2.4696881E-01 5.2824663E-01 -1.6082869E-03 -1.2949356E-03 1.0799532E-03 -4.5213562E-03
-1.0817058E-03 2.7339503E-03 -6.8087791E-03 -1.3560454E-03 4.0358022E-03 -8.7062718E-03
-1.8682248E-03 5.0825453E-03 2.0374894E-01 2.6093389E-01 3.6981248E-01 3.4374429E-01
4.0913597E-01 5.5092826E-01 5.4776460E-01 6.2167224E-01 7.6713595E-01 7.8061574E-01
8.5399114E-01 1.0000000E-00

EIGENVECTOR NUMBER 3
CORRESPONDING TO 4.3328807E-05
2.1796538E-03 6.5790983E-04 -5.6583332E-05 -2.8282817E-04 4.7622906E-04 -2.4253131E-03
-6.3457042E-03 -1.4308372E-02 5.1749603E-05 3.9357314E-05 -2.8699178E-05 1.4919521E-04
4.0666132E-04 -7.7678451E-05 2.3026971E-04 5.4660994E-05 -1.1922586E-04 2.9989769E-04
7.3803010E-05 -1.5379343E-04 1.5759983E-02 1.5922290E-02 6.1527410E-03 2.5559960E-01
2.5235382E-01 2.7953943E-01 6.0323156E-01 6.0790122E-01 6.1417854E-01 1.0000000E-00
9.9366139E-01 9.8001037E-01

EIGENVECTOR NUMBER 4
CORRESPONDING TO 6.2475530E-05
9.7551997E-04 1.6820259E-04 -1.7880596E-04 -2.3098497E-04 8.9622011E-05 2.2531093E-05
1.0634025E-04 1.0328284E-04 3.6028232E-02 2.4747586E-02 3.4522297E-02 2.7336800E-01
2.8251094E-01 2.6233973E-01 6.1939248E-01 6.0975550E-01 5.9592726E-01 1.0000000E-00
9.8168848E-01 9.6441954E-01 7.0102572E-05 1.0493107E-04 1.7551359E-04 3.8747457E-05
8.1975391E-05 1.6664724E-04 -1.7349771E-06 4.8573347E-05 1.4940868E-04 -4.6776962E-05
1.0983098E-05 1.2598644E-04

EIGENVECTOR NUMBER 5
CORRESPONDING TO 1.2676136E-06
1.3755801E-04 -2.31255412E-05 -7.7436280E-05 -6.2546180E-05 5.7484782E-05 -2.2257886E-04
-3.9337577E-04 -6.6603086E-04 9.2045341E-06 5.0705673E-06 -6.5691127E-06 3.0424150E-05
-8.4378481E-08 -3.4136023E-05 5.9343342E-05 -5.8720263E-06 -7.0847655E-05 8.3280078E-05
-1.2677529E-05 -1.0871998E-04 -9.7864893E-03 -4.7456958E-04 2.3681893E-02 -1.8488673E-01
-1.0025687E-03 3.6595235E-01 -3.4812518E-01 1.5045557E-04 6.9436927E-01 -4.9240754E-01
5.3561661E-03 1.0000000E-00

HERE ARE THE NATURAL FREQUENCIES

THE NATURAL FREQUENCY NUMBER	1	IS	56.116	CPS
THE NATURAL FREQUENCY NUMBER	2	IS	84.276	CPS
THE NATURAL FREQUENCY NUMBER	3	IS	104.763	CPS
THE NATURAL FREQUENCY NUMBER	4	IS	125.798	CPS
THE NATURAL FREQUENCY NUMBER	5	IS	179.190	CPS

HUGHES AIRCRAFT CO. SUBSONIC AIC PROGRAM

FLIGHT CONDITIONS AND GEOMETRY

MACH NUMBER = 0.50000 SPEED OF SOUND = 13480.000 L/T $\rho_0 = 0.100000000E 01$

	WING	TAIL
L.E. STATION (L)	0.	40.000
ROOT CHORD (L)	30.000	15.000
L.E. SPAN (L)	0.	35.000
T.E. SPAN (L)	35.000	35.000
TIP CHORD (L)	20.000	15.000
TOTAL AREA (L*L)	1750.000	1050.000
SPAN COLL. STA.	4	4
CHORD COLL. STA.	3	3
CHORD INTG. STA.	18	18
SPAN PRES MODES	4	4
CHORD PRES MODES	3	3

HUGHES AIRCRAFT CO. SUBSONIC AIC PROGRAM (CONT-D)

OSCILLATORY FREQUENCY (CPS) 7.15136E 01

REFERENCE CHORD 1.50000E 01

REDUCED FREQUENCY (REF. CHORD) 1.00000E 00

REDUCED VELOCITY (REF. CHORD) 1.00000E 00

FREE STREAM MACH NUMBER 5.00000E-01

FREE STREAM VELOCITY 6.74000E 03

DENSITY 1.00

DYNAMIC PRESSURE (1/2*RH0*VEL**2) 2.27138E 07

AERODYNAMIC INFLUENCE COEFFICIENTS

	RL	IM	RL	IM	RL	IM	RL	IM
ROW = 1								
2.6152E 00	-7.3687E-01	-4.8823E 00	-3.2104E-01	3.0947E 00	3.1773E-02	-6.8182E 00	1.6042E 00	1.1440E 01
-5.4858E 00	-5.7732E-02	4.2262E 00	-9.7701E-01	-6.7706E 00	3.5455E-01	3.0436E 00	-2.3376E-01	-1.0421E 00
1.6664E 00	1.0982E-03	-7.1213E-01	-8.6658E-04	-2.9527E-01	9.0611E-02	6.0997E-01	-1.5677E-01	3.2860E-01
-3.8379E-02	3.2667E-02	7.4865E-02	-6.2473E-02	-4.3454E-02	2.3371E-02	-1.4552E-01	7.7996E-02	2.9810E-01
-1.6693E-01	3.3885E-02	-1.1589E-02	9.1471E-03	2.4095E-02	-1.7101E-02	-1.4160E-02	5.3565E-03	
ROW = 2								
-1.0936E 00	-2.7342E-03	3.9008E 00	3.0083E 00	-1.8168E 00	-3.4271E 00	2.6669E 00	6.2186E-02	-5.7566E 00
2.1025E 00	3.6053E 00	-1.9480E 00	-6.8787E-02	4.5326E 00	2.3169E 00	-1.9988E 00	-2.4544E 00	4.4641E-01
-9.9782E-01	5.2948E-01	3.4812E-01	4.8335E-01	-7.7620E-02	2.5152E-01	1.7725E-01	-4.9636E-01	-1.5122E-01
-1.1350E-02	5.9325E-02	2.6955E-02	-1.1627E-01	-2.7331E-02	5.4249E-02	-3.5491E-02	1.6357E-01	8.4514E-02
-8.1975E-02	1.4924E-01	-1.6009E-03	1.5618E-02	4.5075E-03	-3.0837E-02	-6.0436E-03	1.4706E-02	
ROW = 3								
-1.8910E 00	6.5292E-01	5.6824E 00	1.0458E 00	-3.5902E 00	-1.8191E 00	4.9241E 00	-1.4114E-00	-1.0195E-01
4.9991E 00	1.9440E 00	-3.2432E 00	8.5815E-01	6.8259E 00	3.0930E-01	-3.4546E 00	-1.1282E 00	7.9806E-01
-1.5538E 00	-1.8940E-01	7.2164E-01	2.8566E-01	1.9261E-01	1.1684E-01	-3.8180E-01	-2.4860E-01	1.6209E-01
2.9277E-02	2.1422E-02	-5.3739E-02	-4.4178E-02	2.0385E-02	2.7375E-02	1.0430E-01	6.4680E-02	-2.0304E-01
8.4510E-02	9.3000E-02	9.5018E-03	5.0122E-03	-1.8626E-02	-1.0761E-02	7.9715E-03	7.7922E-03	
ROW = 4								
-1.3045E 00	-3.7374E-01	-2.3091E 00	-2.2811E-01	1.3927E 00	1.2970E-02	-3.3846E 00	7.7892E-01	5.7614E 00
-2.8097E 00	-6.2032E-02	2.9544E 00	-6.8535E-01	-4.6499E 00	1.7269E-01	2.0175E 00	-1.3141E-01	-7.2923E-01
1.1677E 00	7.5524E-03	-4.9881E-01	-5.9817E-03	-1.5964E-01	1.0047E-01	3.3272E-01	-1.8739E-01	-1.9152E-01
-3.0091E-02	2.9858E-02	6.1949E-02	-5.7347E-02	-3.7872E-02	2.1099E-02	-9.3715E-02	7.5502E-02	1.9618E-01
-1.1675E-01	4.5701E-02	-8.5713E-03	8.1606E-03	1.8202E-02	-1.15459E-02	-1.1130E-02	5.2387E-03	
ROW = 5								
-5.5837E-01	-6.5447E-03	2.1158E 00	1.5454E 00	-1.8195E 00	1.2668E 00	1.4596E-02	-2.7109E 00	-1.6918E 00
9.7790E-01	1.6849E 00	-1.4241E 00	-5.6690E-02	3.3526E 00	1.6952E 00	-1.5009E 00	-1.8093E 00	3.8567E-01
-6.0263E-01	-3.5473E-01	2.3630E-01	3.1900E-01	-7.0944E-02	1.9668E-01	1.5838E-01	-3.8648E-01	-1.2735E-01

-1.5893E-02 4.8666E-02 3.5788E-02 -9.5365E-02 -2.9622E-02 4.2827E-02 -4.2658E-02 1.3192E-01 9.6479E-02 -2.5902E-01
-8.0377E-02 1.1651E-01 -3.3315E-03 1.2934E-02 7.723E-03 -2.5441E-02 -7.0422E-03 1.1642E-02

ROW = 6

-9.5431E-01 3.2669E-01 2.9214E 00 5.3542E-01 -1.8581E 00 -9.5127E-01 2.4058E 00 -6.9928E-01 -4.9689E 00 -3.1162E-01
2.4447E 00 9.0898E-01 -2.3041E 00 5.9203E-01 4.883E 00 2.8517E-01 -2.469E 00 -8.6490E-01 5.5620E-01 -9.7584E-02
-1.0688E 00 -1.3674E-01 4.9173E-01 1.9544E-01 1.0471E-01 8.8257E-02 -2.0473E-01 -1.8413E-01 8.0392E-02 1.1803E-01
2.0992E-02 1.9068E-02 -3.9699E-02 -3.9699E-02 2.4110E-02 6.5099E-02 5.4146E-02 -1.2666E-01 -1.1266E-01
4.9747E-02 7.2010E-02 6.5060E-03 4.7509E-03 -1.2782E-02 -9.9924E-03 5.2025E-03 6.6257E-03

ROW = 7

-1.6650E-01 3.3717E-02 5.6935E-01 -1.1020E-01 -5.0337E-01 -1.5215E-02 7.6947E-01 -2.0488E-01 -1.1942E 00 3.7417E-02
5.1267E-01 -2.7077E-02 6.0174E-01 -1.5330E-01 -7.0599E-01 9.6767E-02 1.7594E-01 -1.5353E-02 1.9435E-01 -3.8973E-02
-2.9148E-01 -1.8810E-03 1.1203E-01 -4.2103E-01 -6.052E-03 9.5370E-02 1.9640E-02 -1.8959E-01 -3.3271E-02 9.1976E-02
-1.2887E-02 2.2894E-02 2.9860E-02 4.4628E-02 -2.1361E-02 1.7765E-02 -2.3074E-02 6.3610E-02 5.4701E-02 -1.2492E-01
-4.4193E-02 5.4227E-02 -3.3024E-03 6.2540E-03 7.6334E-03 -1.2225E-02 -5.5480E-03 4.9704E-03

ROW = 8

4.0641E-02 -1.3001E-02 8.1880E-02 -7.1241E-02 -1.2468E-01 -1.9869E-02 -3.8985E-01 -2.3115E-02 8.8648E-01 5.3001E-01
3.5881E-01 -5.4214E-01 -4.0888E-01 -2.9429E-02 1.0651E 00 5.0673E-01 -5.2510E-01 -5.7549E-01 -1.1475E-01 -6.2871E-03
2.6668E-01 -1.2500E-01 -1.2429E-01 -1.3093E-01 -5.6207E-02 1.1543E-01 1.2140E-01 -2.2478E-01 -8.8124E-02 9.6491E-02
-1.7227E-02 3.1088E-02 3.7361E-02 -6.0762E-02 -2.6417E-02 2.5516E-02 4.4061E-02 8.1882E-02 9.5210E-02 -1.5962E-01
-6.7531E-02 6.7371E-02 -4.8670E-03 8.6556E-03 1.0547E-02 -1.6851E-02 -7.4004E-03 7.0273E-03

ROW = 9

9.7246E-02 -4.2524E-02 -1.9521E-01 -1.1123E-02 1.1153E-01 8.6807E-03 -6.1485E-01 1.7086E-01 1.3039E 00 1.2241E-01
-6.4145E-01 -2.8234E-01 -5.4211E-01 1.1642E-01 1.2314E 00 1.6256E-01 -6.1564E-01 -3.0508E-01 -1.6388E-01 3.4369E-02
3.4791E-01 3.2246E-02 -1.7397E-01 -6.7354E-02 5.3541E-03 4.8186E-02 -6.153E-03 -9.5861E-02 -8.9283E-03 4.8061E-02
7.4930E-03 1.3870E-02 -1.4947E-02 -2.8227E-02 4.4000E-03 1.6268E-02 1.3698E-02 3.5697E-02 -2.5912E-02 -7.1971E-02
4.6547E-03 3.9418E-02 1.9856E-03 3.9771E-03 -3.8437E-03 -8.0336E-03 1.0167E-03 4.5225E-03

ROW = 10

-2.6524E 00 7.0128E-01 5.5980E 00 2.0655E-01 -3.8124E 00 -2.4568E-01 9.8196E 00 -2.3479E 00 -1.6476E 01 4.6466E-01
7.8615E 00 1.1595E-01 -5.9086E 00 1.3315E 00 9.9441E 00 -4.7121E-01 -4.6751E 00 1.6912E-01 1.8141E 00 -3.3437E-01
-2.8663E 00 -2.9261E-02 1.1966E 00 1.2483E-02 1.5584E-01 6.522E-02 -3.1032E-01 1.4407E-01 1.3843E-01 1.1243E-01
1.3094E-02 6.3152E-03 -1.9950E-02 -1.3083E-02 6.2079E-03 6.9325E-03 8.3521E-02 2.801E-02 -1.6420E-01 -6.4170E-02
7.3783E-02 5.2369E-02 1.0073E-02 1.5810E-03 -2.0545E-02 -4.1642E-03 9.8864E-03 4.8998E-03

ROW = 11

1.0163E 00 -4.2876E-02 -3.1727E 00 -2.5649E 00 1.3594E 00 2.7617E 00 -3.9969E 00 -6.8642E-02 8.7215E 00 5.1184E 00
-3.3293E 00 -5.2429E 00 2.5491E 00 9.1385E-02 -5.4657E 00 -3.0109E 00 2.2073E 00 2.9856E 00 -8.1743E-01 -5.7937E-02
1.6870E 00 9.0856E-01 -6.9317E-01 -8.5406E-01 -5.2348E-02 -5.3590E-03 1.0449E-01 1.5449E-02 -5.0154E-02 -2.1679E-02
-1.3256E-02 2.4839E-03 2.6875E-02 -4.5455E-03 -1.4262E-02 -8.9073E-04 -3.4517E-02 2.0806E-03 6.8566E-02 -1.1697E-03
-3.4055E-02 -7.0825E-03 -3.6079E-03 1.1550E-03 7.1911E-03 -1.8144E-03 -3.7035E-03 -3.9284E-05

ROW = 12

1.8546E 00 -6.7302E-01 -5.3695E 00 -8.3089E-01 3.4056E 00 1.5153E 00 -7.1817E 00 2.0810E 00 1.4954E 01 9.5458E-01
-7.3994E 00 -2.7891E-01 -4.4804E 00 -1.1369E 00 -9.1433E 00 -5.3659E-01 4.5062E 00 1.5021E 00 -1.4133E 00 2.6118E-01
2.7683E 00 3.1602E-01 -1.3000E 00 -4.9778E-01 -1.1662E-01 -5.9988E-03 2.3601E-01 2.1945E-02 -1.1622E-01 -4.1793E-02
-1.0821E-02 5.1266E-03 1.8313E-02 -9.841E-03 -9.0170E-03 4.0158E-03 -6.0761E-02 6.7970E-03 1.2179E-01 -8.3683E-03
-6.1632E-02 -1.1117E-02 -6.5526E-03 2.0841E-03 1.3663E-02 -3.3806E-03 -7.3180E-03 -2.5449E-04

ROW = 13

1.7857E-01 4.4691E-01 -1.0520E 00 1.8833E 00 2.3132E 00 -1.3544E 00 -1.0367E 00 -1.4173E 00 3.3656E 00 -5.7398E-01
-3.9522E 00 5.2294E-01 4.4141E-01 -1.9336E-01 -2.6532E 00 1.9851E 00 2.5945E 00 -1.1180E 00 -3.0552E-01 1.4919E-01
9.060E-01 -5.4716E-01 -0.0200E-01 2.4275E-01 -7.0346E-01 -2.4985E-01 3.5632E 00 4.2461E-01 -2.6370E 00 1.3066E 00
-3.7426E-01 6.6749E-01 -3.2247E 00 -1.1693E 00 2.2287E 00 1.7097E 00 -2.7489E-01 -1.7743E-01 2.2633E 00 2.8597E-01
-1.8245E 00 -5.5009E-01 -1.2510E-02 8.9459E-02 -2.6651E-01 -1.5631E-01 2.6776E-01 2.4050E-01

ROW = 14

-1.5774E-01 3.9393E-01 5.627E 00 -1.8001E-01 -2.4000E-01 -3.8944E-01 1.1982E-01 -1.6001E 00 -6.1914E-01 1.6420E 00

-1.1131E-01 -4.6001E-03 -1.1358E-02 4.4783E-01 1.7055E-01 -1.2623E-01 1.6513E-01 -2.0709E-01 -3.4354E-02 -2.9495E-02
1.2098E-01 -1.0143E-02 -1.1569E-01 -4.8450E-03 -1.7572E-00 -2.1752E-00 3.1172E-00 4.3031E-00 -9.8920E-01 -2.3906E-00
1.4549E-00 2.7322E-00 -2.4610E-00 -5.3569E-00 5.3880E-01 2.8180E-00 1.2195E-00 1.6138E-00 2.1495E-00 3.1841E-00
-6.5610E-01 -1.7501E-00 1.8942E-01 3.7423E-01 -3.1521E-01 -7.3303E-01 6.2806E-02 3.8289E-01

ROW =15

2.7330E-01 1.0459E-02 3.5430E-01 -8.2326E-01 -7.3511E-01 2.5575E-01 -2.4883E-01 1.0812E-00 2.3778E-01 -2.0249E-01
7.4877E-01 -2.6350E-01 -8.2678E-02 3.034E-02 7.6035E-01 -4.4822E-01 -8.1087E-01 1.1625E-01 7.0002E-02 -6.2878E-02
-2.4713E-01 2.2729E-01 -1.2034E-01 1.2034E-01 4.0709E-00 -1.9688E-00 5.6896E-00 4.2544E-00 1.3865E-00 -2.0883E-00
4.9120E-00 2.4273E-00 -6.5087E-00 -5.2361E-00 1.3404E-00 2.4114E-00 -3.1180E-00 -1.4743E-00 4.3025E-00 3.1897E-00
-1.0201E-00 -1.5307E-00 6.7209E-01 3.4352E-01 -8.8593E-01 -7.3752E-01 1.7753E-01 3.3802E-01

ROW =16

9.7333E-02 2.2462E-01 -3.4806E-01 9.8636E-01 1.0235E-00 -8.1356E-01 -5.3085E-01 -7.8687E-01 1.6966E-00 -7.8859E-02
-1.9509E-00 1.2056E-01 -6.3154E-01 -2.4563E-01 -1.8733E-00 1.5485E-00 1.6112E-00 -9.4112E-01 -2.2785E-01 1.1002E-01
7.1469E-01 -3.7432E-01 -5.7453E-01 1.5288E-01 -5.1547E-01 -1.2522E-02 2.1073E-00 1.4884E-03 -1.5074E-00 -5.8790E-01
-3.3845E-01 3.4188E-01 -8.1802E-01 -5.9718E-01 9.6673E-01 8.7055E-01 -3.7102E-01 -1.0411E-01 1.9143E-00 1.6667E-01
-1.4341E-00 -6.7715E-01 -7.0855E-02 6.4402E-02 -1.4852E-01 -1.1216E-01 1.8261E-01 1.6589E-01

ROW =17

-7.1194E-02 4.5570E-01 7.1933E-01 -4.5889E-02 -1.6659E-01 -2.8609E-01 6.9566E-02 -8.2534E-01 -3.3685E-01 8.9457E-01
-2.3274E-02 -2.7791E-01 4.5835E-02 2.0888E-01 -8.0743E-03 7.3301E-02 1.8542E-01 -2.1861E-01 -2.8477E-02 -1.1571E-02
9.5949E-02 -8.2646E-02 -8.7813E-04 -1.0011E-00 -1.0673E-00 -1.3325E-00 -9.6720E-01 -1.1717E-00 1.7183E-00 2.3172E-00
6.2004E-01 1.3098E-00 -1.0313E-00 -2.5632E-01 1.0675E-01 1.3325E-00 -9.6720E-01 -1.1717E-00 1.7183E-00 2.3172E-00
-5.5246E-01 -1.2906E-00 1.1902E-01 2.5699E-01 -1.9619E-01 -5.0289E-01 3.3244E-02 2.6027E-01

ROW =18

1.4426E-01 1.2606E-02 2.0605E-01 -3.6240E-01 -3.7128E-01 7.9246E-02 -1.0312E-01 5.5325E-01 6.6641E-02 -1.0847E-01
-4.1748E-01 -1.2534E-01 -6.5067E-02 -2.0404E-03 4.6582E-01 -2.3948E-01 -4.8971E-01 6.3434E-02 5.8709E-02 -5.2135E-02
-1.9668E-01 1.6863E-01 -1.7141E-01 -8.5746E-02 -1.1414E-00 -9.9160E-01 2.9954E-00 2.1469E-00 7.6393E-01 -1.0703E-00
2.3791E-00 1.1575E-00 -3.1041E-00 -2.5002E-00 6.0937E-01 1.1281E-00 -2.2351E-00 -1.0781E-00 3.1327E-00 2.3284E-00
-7.7085E-01 -1.1459E-00 4.6326E-01 2.3567E-01 -6.0539E-01 -5.0624E-01 1.1781E-01 2.2957E-01

ROW =19

5.0983E-03 -1.1922E-02 4.5605E-01 3.4332E-02 -3.9528E-01 -2.6150E-01 8.2738E-02 8.5741E-02 -2.6159E-01 2.8846E-01
4.1814E-01 -2.3693E-01 1.4297E-01 -1.8990E-01 -2.4336E-01 7.0509E-01 2.9467E-01 -5.3635E-01 4.2728E-02 -5.2663E-02
-1.1337E-01 1.7884E-01 -1.2743E-01 -1.0820E-01 -3.2841E-01 2.1866E-01 3.0891E-01 -4.0568E-01 -2.3626E-01 1.9017E-01
-1.6544E-01 -3.7669E-02 6.5306E-01 6.4867E-02 4.5678E-01 -2.1007E-01 -4.2502E-01 5.1873E-02 1.0546E-00 -9.6670E-02
-6.2824E-01 -1.3786E-01 -5.5997E-02 -5.1731E-03 1.7932E-01 8.9204E-03 -1.1705E-01 -4.6493E-02

ROW =20

2.8456E-02 -3.1318E-02 9.7848E-02 1.1288E-01 -6.5034E-02 -1.7461E-01 4.6570E-03 1.2507E-01 3.3422E-02 -6.2725E-02
4.5943E-02 -2.7200E-02 6.0363E-02 -6.0682E-02 -7.8910E-02 2.4620E-01 9.6039E-02 -2.0155E-01 9.4359E-03 -1.1781E-02
-2.8394E-02 4.6447E-02 2.9913E-02 -3.0584E-02 -1.4921E-01 1.5566E-01 3.0987E-01 -2.9251E-01 -1.8850E-01 1.0461E-01
-3.0778E-01 -3.5723E-01 5.4870E-01 7.0764E-01 -1.8022E-01 -3.9691E-01 -4.3225E-01 -3.1177E-01 7.9379E-01 6.2739E-01
-3.0940E-01 -3.8536E-01 -8.1635E-02 -8.4609E-02 1.4631E-01 1.6814E-01 -5.0382E-02 -9.5888E-02

ROW =21

-1.4971E-01 -3.3313E-01 2.1942E-00 -1.1568E-00 -2.8342E-00 1.0809E-01 1.4891E-00 2.0342E-00 -4.6395E-00 8.7324E-01
5.5259E-00 -8.8569E-01 -1.4620E-00 4.2583E-01 5.0192E-00 -2.2506E-00 -4.3531E-00 7.5710E-01 5.2841E-01 -3.1825E-01
-1.6434E-00 1.3536E-00 -1.0566E-00 4.5688E-01 5.7964E-01 -1.4101E-00 -1.0177E-00 1.5736E-00 1.4150E-00
3.3445E-01 -8.2883E-01 3.6440E-00 1.4351E-00 -3.4690E-00 -2.5147E-00 -3.3233E-01 5.8629E-01 -1.7975E-00 -1.0261E-00
1.8196E-00 1.5032E-00 6.0601E-02 -1.1313E-01 5.9792E-01 1.9173E-01 -5.7775E-01 -3.9489E-01

ROW =22

-1.4971E-01 -3.3313E-01 2.1942E-00 -1.1568E-00 -2.8342E-00 1.0809E-01 1.4891E-00 2.0342E-00 -4.6395E-00 8.7324E-01
5.5259E-00 -8.8569E-01 -1.4620E-00 4.2583E-01 5.0192E-00 -2.2506E-00 -4.3531E-00 7.5710E-01 5.2841E-01 -3.1825E-01
-1.6434E-00 1.3536E-00 -1.0566E-00 4.5688E-01 5.7964E-01 -1.4101E-00 -1.0177E-00 1.5736E-00 1.4150E-00
3.3445E-01 -8.2883E-01 3.6440E-00 1.4351E-00 -3.4690E-00 -2.5147E-00 -3.3233E-01 5.8629E-01 -1.7975E-00 -1.0261E-00
1.8196E-00 1.5032E-00 6.0601E-02 -1.1313E-01 5.9792E-01 1.9173E-01 -5.7775E-01 -3.9489E-01

ROW =23

2.2106E-01	-8.0338E-01	-8.5549E-01	5.2321E-01	1.4384E-01	-1.8912E-01	-6.9677E-02	2.0586E 00	7.1144E-01	-2.0528E 00
2.0426E-01	5.0656E-01	-8.9858E-02	-4.3042E-01	3.7710E-01	2.9247E-01	-5.1211E-01	-1.1207E-01	6.5240E-02	-2.2074E-03
-2.0952E-01	1.0733E-01	1.9236E-01	-6.1027E-02	1.0829E 00	2.1325E 00	-1.8180E 00	-4.1789E 00	3.6955E-01	2.1871E 00
-2.2537E 00	-3.9295E 00	3.8527E 00	7.7132E 00	-9.2740E-01	-4.0917E 00	1.2467E 00	2.2909E 00	-2.1150E 00	-4.4919E 00
4.7698E-01	2.3679E 00	-3.7839E-01	-6.4956E-01	6.4562E-01	1.2751E 00	-1.5660E-01	-6.7041E-01		

ROW =24

-2.0565E-01	-8.0686E-02	-8.5198E-01	6.7913E-01	1.0143E 00	6.1760E-02	3.5461E-01	-2.0140E 00	-6.3374E-01	9.6280E-01
-8.9375E-01	1.5547E-01	2.9029E-01	-9.0094E-02	-1.4694E 00	5.8700E-01	1.3430E 00	-6.3421E-02	-1.3450E-01	1.0617E-01
4.3884E-01	-3.7315E-01	-3.8662E-01	1.9724E-01	3.9618E 00	1.7857E 00	-5.3278E 00	-3.8842E 00	1.1870E 00	1.8085E 00
-7.1850E -00	-3.5404E 00	9.5566E 00	7.6371E 00	-1.9965E 00	-3.5318E 00	4.2137E 00	1.9569E 00	-5.6791E 00	-4.2444E 00
1.2621E 00	1.9863E 00	-1.2013E 00	-6.1491E-01	1.5998E 00	1.3195E 00	-3.3212E-01	-6.1197E-01		

SAMPLE PROBLEM TYPICAL MISSILE
FLUTTER ANALYSIS BY A COLLOCATION METHOD USING AEROYNAMIC INFLUENCE COEFFICIENTS

NSUR = 1 NAERO = 1 NRIGID = 2 NFUS = 0 NDENS = 1 MODES OUT = 6 NDELM = 1 NPUNCH = 0

8 (REF) = 0.13330000E 01 K = 0.10000000E 01

SURFACE H S EXTERNAL STORES SIZE

1 0.13300000E 01 0.33330000E 01 0

1 COLUMN 1 RIGID COMPONENT MASS MATRIX

2 COLUMN 2 COLUMN

1 0.10000000E-09 0.10000000E-09

2 0. 0.10000000E-09

COLUMN 5	COLUMN 6
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
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87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

44

	COLUMN 13	COLUMN 14	COLUMN 15	COLUMN 16	COLUMN 17	COLUMN 18
20	0.	0.	0.	0.	0.	0.
21	0.	0.	0.	0.	0.	0.
22	0.	0.	0.	0.	0.	0.
23	0.	0.	0.	0.	0.	0.
24	0.	0.	0.	0.	0.	0.
25	0.	0.	0.	0.	0.	0.
26	0.	0.	0.	0.	0.	0.
27	0.	0.	0.	0.	0.	0.
28	0.	0.	0.	0.	0.	0.
29	0.	0.	0.	0.	0.	0.
30	0.	0.	0.	0.	0.	0.
31	0.	0.	0.	0.	0.	0.
32	0.	0.	0.	0.	0.	0.
33	0.	0.	0.	0.	0.	0.
34	0.	0.	0.	0.	0.	0.

	COLUMN 19	COLUMN 20	COLUMN 21	COLUMN 22	COLUMN 23	COLUMN 24
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.
13	0.33300000E 00	0.	0.	0.	0.	0.
14	0.	0.28800000E 00	0.	0.	0.	0.
15	0.	0.	0.28800000E 00	0.	0.	0.
16	0.	0.	0.	0.28800000E 00	0.	0.
17	0.	0.	0.	0.	0.25500000E 00	0.
18	0.	0.	0.	0.	0.	0.25500000E 00
19	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.
21	0.	0.	0.	0.	0.	0.
22	0.	0.	0.	0.	0.	0.
23	0.	0.	0.	0.	0.	0.
24	0.	0.	0.	0.	0.	0.
25	0.	0.	0.	0.	0.	0.
26	0.	0.	0.	0.	0.	0.
27	0.	0.	0.	0.	0.	0.
28	0.	0.	0.	0.	0.	0.
29	0.	0.	0.	0.	0.	0.
30	0.	0.	0.	0.	0.	0.
31	0.	0.	0.	0.	0.	0.
32	0.	0.	0.	0.	0.	0.
33	0.	0.	0.	0.	0.	0.
34	0.	0.	0.	0.	0.	0.

	COLUMN 25	COLUMN 26	COLUMN 27	COLUMN 28	COLUMN 29	COLUMN 30
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.
19	0.25500000E 00	0.22200000E 00	0.22200000E 00	0.22200000E 00	0.04900000E-01	0.12500000E 00
20	0.	0.	0.	0.	0.	0.
21	0.	0.	0.	0.	0.	0.
22	0.	0.	0.	0.	0.	0.
23	0.	0.	0.	0.	0.	0.
24	0.	0.	0.	0.	0.	0.
25	0.	0.	0.	0.	0.	0.
26	0.	0.	0.	0.	0.	0.
27	0.	0.	0.	0.	0.	0.
28	0.	0.	0.	0.	0.	0.
29	0.	0.	0.	0.	0.	0.
30	0.	0.	0.	0.	0.	0.
31	0.	0.	0.	0.	0.	0.
32	0.	0.	0.	0.	0.	0.
33	0.	0.	0.	0.	0.	0.
34	0.	0.	0.	0.	0.	0.

	COLUMN 25	COLUMN 26	COLUMN 27	COLUMN 28	COLUMN 29	COLUMN 30
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.
21	0.	0.	0.	0.	0.	0.
22	0.	0.	0.	0.	0.	0.
23	0.	0.	0.	0.	0.	0.
24	0.	0.	0.	0.	0.	0.
25	0.41000000E-01	0.41000000E-01	0.12500000E 00	0.41000000E-01	0.41000000E-01	0.
26	0.	0.	0.	0.	0.	0.
27	0.	0.	0.	0.	0.	0.
28	0.	0.	0.	0.	0.	0.
29	0.	0.	0.	0.	0.	0.

RIGID BODY MODAL MATRIX
SURFACE 1, 34 CONTROL POINTS

	COLUMN 1	COLUMN 2
1	0.1000000E 01	0.
2	0.1000000E 01	0.1500000E 02
3	0.1000000E 01	0.2500000E 02
4	0.1000000E 01	0.3500000E 02
5	0.1000000E 01	0.4500000E 02
6	0.1000000E 01	0.5500000E 02
7	0.1000000E 01	0.6500000E 02
8	0.1000000E 01	0.7500000E 02
9	0.1000000E 01	0.8500000E 02
10	0.1000000E 01	0.1000000E 03
11	0.1000000E 01	0.4605000E 02
12	0.1000000E 01	0.5562500E 02
13	0.1000000E 01	0.6528000E 02
14	0.1000000E 01	0.4813000E 02
15	0.1000000E 01	0.5687500E 02
16	0.1000000E 01	0.6562500E 02
17	0.1000000E 01	0.5020500E 02
18	0.1000000E 01	0.5812500E 02
19	0.1000000E 01	0.6004000E 02
20	0.1000000E 01	0.5229000E 02
21	0.1000000E 01	0.5937500E 02
22	0.1000000E 01	0.6645500E 02
23	0.1000000E 01	0.8166000E 02
24	0.1000000E 01	0.8500000E 02
25	0.1000000E 01	0.9166000E 02
26	0.1000000E 01	0.8166000E 02
27	0.1000000E 01	0.8500000E 02
28	0.1000000E 01	0.9166000E 02
29	0.1000000E 01	0.8166000E 02
30	0.1000000E 01	0.8500000E 02
31	0.1000000E 01	0.9166000E 02
32	0.1000000E 01	0.8166000E 02
33	0.1000000E 01	0.8500000E 02
34	0.1000000E 01	0.9166000E 02

FLEXIBILITY MATRIX

SURFACE 1, 34 CONTROL POINTS

	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6
1	0.83072800E-04	0.43437700E-04	0.21776100E-04	0.72371800E-05	0.	-0.16051300E-05
2	0.43437700E-04	0.25228400E-04	0.13565100E-04	0.47587800E-05	0.	-0.10700900E-05
3	0.21776100E-04	0.13565100E-04	0.80910495E-05	0.14231700E-05	0.	-0.71339600E-06
4	0.47587800E-05	0.30931700E-05	0.30931700E-05	0.14275400E-05	0.	-0.35669900E-06
5	0.	0.	0.	0.	0.	0.
6	-0.16051300E-05	-0.10700900E-05	-0.71339600E-06	-0.35669900E-06	0.	0.23788200E-06
7	0.	0.	0.	0.	0.	0.
8	0.21394400E-05	0.14263000E-05	0.95087200E-06	0.47543800E-06	0.	-0.35673300E-06
9	0.42786800E-05	0.28526000E-05	0.19017400E-05	0.95087500E-06	0.	-0.71346400E-06
10	0.74880300E-05	0.49920400E-05	0.33280400E-05	0.16640300E-05	0.	-0.12485000E-05
11	-0.41524300E-06	-0.27683000E-06	-0.18455400E-06	-0.92277500E-07	0.	0.34715600E-07
12	-0.29354500E-06	-0.19567100E-06	-0.13044800E-06	-0.65224300E-07	0.	0.25248900E-07
13	0.28011800E-07	0.13341300E-07	0.88942200E-08	0.44471300E-08	0.	-0.54193700E-08
14	-0.11099600E-05	-0.73997800E-06	-0.49332100E-06	-0.24666100E-06	0.	0.92011700E-07
15	-0.59161100E-06	-0.39440900E-06	-0.26294000E-06	-0.13147100E-06	0.	0.44196600E-07
16	-0.41861100E-07	-0.27907600E-07	-0.18605100E-07	-0.93026000E-08	0.	-0.70910100E-08
17	-0.16806200E-05	-0.11204200E-05	-0.74695000E-06	-0.37347700E-06	0.	0.13739600E-06
18	-0.92676000E-06	-0.61784300E-06	-0.41189700E-06	-0.20594900E-06	0.	0.67301800E-07
19	-0.17889700E-06	-0.11926500E-06	-0.79510700E-07	-0.39755500E-07	0.	-0.21219000E-08
20	-0.21875000E-05	-0.14583400E-05	-0.97223200E-06	-0.48611800E-06	0.	0.17670900E-06
21	-0.12731000E-05	-0.84873900E-06	-0.56582900E-06	-0.28291600E-06	0.	0.91699700E-07
22	-0.35627000E-06	-0.23762600E-06	-0.15967700E-06	-0.79387000E-07	0.	0.67598700E-08
23	0.35627000E-05	0.23762600E-05	0.15941800E-05	0.79209400E-06	0.	-0.59432700E-06
24	0.42789500E-05	0.28526500E-05	0.19017700E-05	0.95089100E-06	0.	-0.71347600E-06
25	0.35650900E-05	0.23767400E-05	0.15945000E-05	0.95105200E-06	0.	-0.95105700E-06
26	0.42796700E-05	0.28531300E-05	0.19020900E-05	0.95225300E-06	0.	-0.59444500E-06
27	0.35668000E-05	0.23774000E-05	0.15949400E-05	0.95127500E-06	0.	-0.71359500E-06
28	0.42806800E-05	0.28538000E-05	0.19025400E-05	0.95137600E-06	0.	-0.95119100E-06
29	0.35671800E-05	0.23781300E-05	0.15854300E-05	0.95151500E-06	0.	-0.59460900E-06
30	0.42817600E-05	0.28545200E-05	0.19030200E-05	0.95151500E-06	0.	-0.71376200E-06
31	0.35671800E-05	0.23781300E-05	0.15854300E-05	0.95151500E-06	0.	-0.95135800E-06
32	0.42817600E-05	0.28545200E-05	0.19030200E-05	0.95151500E-06	0.	-0.59479100E-06
33	0.35671800E-05	0.23781300E-05	0.15854300E-05	0.95151500E-06	0.	-0.71394000E-06
34	0.42817600E-05	0.28545200E-05	0.19030200E-05	0.95151500E-06	0.	-0.95152400E-06
	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	COLUMN 12
1	0.21394400E-05	0.14263000E-05	0.95087200E-06	0.47543800E-06	-0.41524300E-06	-0.29350500E-06
2	0.42786800E-05	0.28526000E-05	0.19017400E-05	0.95087500E-06	-0.27683000E-06	-0.19567100E-06
3	0.74880300E-05	0.49920400E-05	0.33280400E-05	0.16640300E-05	-0.18455400E-06	-0.13044800E-06
4	0.47587800E-06	0.30931700E-06	0.30931700E-06	0.14275400E-06	-0.92277500E-07	-0.65224300E-07
5	0.	0.	0.	0.	0.	0.
6	-0.35673300E-06	-0.71346400E-06	-0.46564400E-07	-0.34715600E-07	0.	0.25248900E-07
7	0.	0.	0.	0.	0.	0.
8	0.14276800E-05	0.30934500E-05	0.55921000E-05	0.14755600E-04	-0.46564400E-07	-0.35771000E-07
9	0.30934500E-05	0.76154600E-05	0.14755600E-04	0.14755600E-04	-0.93168700E-07	-0.71542000E-07
10	0.	0.55921000E-05	0.14755600E-04	0.33280400E-05	-0.16304500E-06	-0.12519800E-06
11	0.	-0.46584400E-07	-0.93168700E-07	-0.16304500E-06	0.38916200E-05	0.21341600E-05
12	0.	-0.35771000E-07	-0.71542000E-07	-0.12519800E-06	0.21341600E-05	0.13710700E-04
13	0.	0.17230300E-07	0.34606000E-07	0.60306100E-07	0.26835300E-06	0.19516700E-05
14	0.	-0.12138400E-06	-0.24276800E-06	-0.42484400E-06	0.14386600E-04	0.79185600E-05
15	0.	-0.45315100E-07	-0.90630000E-07	-0.15808200E-06	0.82793900E-05	0.94396100E-05
16	0.	0.17666700E-07	0.75333400E-07	0.13183300E-06	0.21477700E-05	0.73152300E-05
17	0.	-0.17610400E-06	-0.35220700E-06	-0.61636200E-06	0.23509100E-04	0.10977300E-04
18	0.	-0.63256800E-07	-0.12651300E-06	-0.22139800E-06	0.14397500E-04	0.10204800E-04

19	0.	0.48243400E-07	0.96486700E-07	0.16885200E-06	0.52636900E-05	0.10250600E-04
20	0.	-0.22071300E-06	-0.44142600E-06	-0.77249500E-06	0.31875900E-04	0.13114000E-04
21	0.	-0.83881600E-07	-0.16776300E-06	-0.29358500E-06	0.20484000E-04	0.12684300E-04
22	0.	0.52799800E-07	0.10560600E-06	0.18479900E-06	0.90873700E-05	0.12362200E-04
23	0.	0.25371300E-05	0.60257100E-05	0.11257900E-04	-0.77611000E-07	-0.59595600E-07
24	0.	0.30935000E-05	0.76155900E-05	0.14755900E-04	-0.933170200E-07	-0.71543200E-07
25	0.	0.42029000E-05	0.10785800E-04	0.21735900E-04	-0.12419500E-06	-0.95366400E-07
26	0.	0.25376500E-05	0.60269800E-05	0.11260300E-04	-0.77626400E-07	-0.59607500E-07
27	0.	0.30940200E-05	0.76168800E-05	0.14758400E-04	-0.93318500E-07	-0.71555100E-07
28	0.	0.42034900E-05	0.10787300E-04	0.21737300E-04	-0.12421300E-06	-0.95379800E-07
29	0.	0.25383700E-05	0.60287400E-05	0.11263700E-04	-0.77647800E-07	-0.59623900E-07
30	0.	0.30947500E-05	0.76186700E-05	0.14761800E-04	-0.933207500E-07	-0.71571800E-07
31	0.	0.42041900E-05	0.10789000E-04	0.21737100E-04	-0.12423400E-06	-0.95395900E-07
32	0.	0.25391600E-05	0.60336900E-05	0.11267500E-04	-0.77671600E-07	-0.59642100E-07
33	0.	0.30955300E-05	0.76205800E-05	0.14765700E-04	-0.933230800E-07	-0.71589700E-07
34	0.	0.42049400E-05	0.10790800E-04	0.21746700E-04	-0.12425600E-06	-0.95413200E-07

COLUMN 13

COLUMN 14

COLUMN 15

COLUMN 16

COLUMN 17

COLUMN 18

1	0.20011800E-07	-0.11099600E-05	-0.59161100E-06	-0.41861100E-07	-0.16806200E-05	-0.92676000E-06
2	0.13311300E-07	-0.73997800E-06	-0.39440900E-06	-0.77249500E-06	0.31875900E-04	0.13114000E-04
3	0.88942200E-08	-0.49332100E-06	-0.26294000E-06	-0.27976000E-07	-0.11204200E-05	-0.61784300E-06
4	0.44471300E-08	-0.24666100E-06	-0.13147100E-06	-0.18655100E-07	-0.74695000E-06	-0.41189700E-06
5	0.	0.	0.	-0.93026000E-08	-0.37347700E-06	-0.20594900E-06
6	-0.54193700E-08	0.92011700E-07	0.44196600E-07	0.	0.	0.
7	0.	0.	0.	-0.70910100E-08	0.13739600E-06	0.67301800E-07
8	0.17230300E-07	-0.12138400E-06	-0.45315100E-07	0.37666700E-07	-0.17610400E-06	-0.63256800E-07
9	0.34460600E-07	-0.24276800E-06	-0.90630800E-07	0.75333400E-07	-0.35220700E-06	-0.12651300E-06
10	0.60306100E-07	-0.42484400E-06	-0.15860200E-06	0.13183300E-06	-0.61636200E-06	-0.22139800E-06
11	0.26835300E-06	0.14386600E-04	0.82793900E-05	0.21477700E-05	0.23509100E-04	0.14397500E-04
12	0.19516700E-05	0.79185600E-05	0.94396100E-05	0.73352300E-05	0.10977300E-04	0.10204800E-04
13	0.36776200E-05	0.21696100E-05	0.79269900E-05	0.1367800E-04	0.53574800E-05	0.13940800E-04
14	0.2166100E-05	0.22694700E-04	0.56012200E-04	0.17311800E-04	0.17367900E-05	0.10745900E-05
15	0.79269900E-05	0.56012200E-04	0.62750200E-04	0.57376400E-04	0.11335200E-03	0.11294700E-03
16	0.13697800E-04	0.17311800E-04	0.53786600E-04	0.88655400E-04	0.42016700E-04	0.10416400E-03
17	0.53574800E-05	0.17367900E-03	0.11335200E-03	0.42016700E-04	0.37984000E-03	0.23767400E-03
18	0.13940800E-04	0.10745900E-03	0.11294700E-03	0.10416400E-03	0.23767400E-03	0.23883800E-03
19	0.22528200E-04	0.41822800E-04	0.19932900E-03	0.16698900E-03	0.97485600E-04	0.23092600E-03
20	0.92557700E-05	0.274743700E-03	0.16894400E-03	0.72596100E-04	0.57875800E-03	0.37354900E-03
21	0.19988800E-04	0.15961600E-03	0.16600400E-03	0.15562100E-03	0.37113100E-03	0.36895500E-03
22	0.30777100E-04	0.71792400E-04	0.1636500E-03	0.23918500E-03	-0.1646000E-03	0.36384500E-03
23	0.28706300E-07	-0.20223000E-06	-0.75496200E-07	0.62753900E-07	-0.29339400E-06	-0.10538800E-06
24	0.34461200E-07	-0.24277200E-06	-0.90631500E-07	0.75334600E-07	-0.35221300E-06	-0.12651500E-06
25	0.45936500E-07	-0.32361300E-06	-0.12081100E-06	0.10042000E-06	-0.46949700E-06	-0.16864400E-06
26	0.2812100E-07	-0.20227000E-06	-0.75510900E-07	0.62766800E-07	-0.29345200E-06	-0.10540800E-06
27	0.34461100E-07	-0.24281200E-06	-0.90646300E-07	0.75337600E-07	-0.35227100E-06	-0.12653600E-06
28	0.45943100E-07	-0.32362800E-06	-0.12082800E-06	0.10043500E-06	-0.46956200E-06	-0.16866700E-06
29	0.28720100E-07	-0.20232500E-06	-0.75531400E-07	0.62784600E-07	-0.29353200E-06	-0.10543600E-06
30	0.34475200E-07	-0.24286900E-06	-0.90667100E-07	0.75365700E-07	-0.35235300E-06	-0.12656500E-06
31	0.45950900E-07	-0.32371300E-06	-0.12084800E-06	0.10045200E-06	-0.46964100E-06	-0.16869500E-06
32	0.2872900E-07	-0.20230700E-06	-0.75554100E-07	0.62804300E-07	-0.29362100E-06	-0.10546800E-06
33	0.34484000E-07	-0.24292900E-06	-0.90689400E-07	0.75385000E-07	-0.35244000E-06	-0.12659500E-06
34	0.45959400E-07	-0.32377100E-06	-0.12086900E-06	0.10047100E-06	-0.46972500E-06	-0.16872500E-06

COLUMN 19

COLUMN 20

COLUMN 21

COLUMN 22

COLUMN 23

COLUMN 24

6	-0.21219000E-08	0.17670900E-06	0.91699700E-07	0.67598700E-08	-0.59437700E-06	-0.71347600E-06
7	0.	0.	0.	0.	0.	0.
8	-0.48243400E-07	-0.22071300E-06	-0.83881600E-07	0.52799800E-07	0.25371300E-05	0.30935000E-05
9	0.96486700E-07	-0.44142600E-06	-0.16776300E-06	0.10560000E-06	0.60257100E-05	0.76155900E-05
10	0.16885200E-06	0.77249500E-06	-0.29358500E-06	0.18479900E-06	0.11257900E-04	0.14755900E-04
11	0.52836900E-05	0.31875900E-04	0.20484000E-04	0.90873700E-05	-0.77611000E-07	-0.93170200E-07
12	0.10250600E-04	0.13114000E-04	0.12684300E-04	0.12362200E-04	-0.59595600E-07	-0.71543200E-07
13	0.22828200E-04	0.92552700E-05	0.19988800E-04	0.30727100E-04	0.28706300E-07	0.34461200E-07
14	0.41827200E-04	0.24743700E-03	0.15961600E-03	0.71792400E-04	-0.20223000E-06	-0.24277200E-06
15	0.910932900E-03	0.16894900E-03	0.16004000E-03	0.23695000E-03	-0.75496200E-07	-0.90631500E-07
16	0.16698900E-03	0.72556100E-04	0.15582700E-03	0.23918500E-03	0.62763900E-07	0.75334600E-07
17	0.97481600E-04	0.57875800E-03	0.37131300E-03	0.16460000E-03	-0.293339400E-06	-0.35221300E-06
18	0.23071600E-03	0.37354900E-03	0.36895500E-03	0.36384500E-03	-0.10538000E-06	-0.12651500E-06
19	0.3661900E-03	0.16575200E-03	0.36308500E-03	0.56146700E-03	0.80375000E-07	0.96488400E-07
20	0.1655200E-03	0.95566800E-03	0.61266300E-03	0.27337400E-03	-0.36771500E-06	-0.44143300E-06
21	0.36109500E-03	0.61266300E-03	0.60940200E-03	0.59980400E-03	-0.13974900E-06	-0.16776600E-06
22	0.5614700E-03	0.27337400E-03	0.59980400E-03	0.93066800E-03	0.87966200E-07	0.10560100E-06
23	0.8077500E-07	-0.36771500E-06	-0.13974900E-06	0.87966200E-07	0.23743800E-04	0.11234700E-04
24	0.96488400E-07	-0.44143300E-06	-0.16776600E-06	0.10560100E-06	-0.11234700E-04	0.12824700E-04
25	0.12861800E-06	-0.58842700E-06	-0.22363000E-06	0.14076600E-06	-0.46898500E-05	0.15994700E-04
26	0.80391800E-07	-0.36778700E-06	-0.13977600E-06	0.87984800E-07	0.36326300E-04	0.26867500E-04
27	0.96505300E-07	-0.44150600E-06	-0.16779300E-06	0.10562800E-06	0.26560300E-04	0.28457500E-04
28	0.12863700E-06	-0.58850900E-06	-0.22366100E-06	0.14078700E-06	0.75275200E-05	0.31628500E-04
29	0.80414800E-07	-0.36788700E-06	-0.13981300E-06	0.88010400E-07	0.49935700E-04	0.42503600E-04
30	0.96529700E-07	-0.44160800E-06	-0.16783100E-06	0.10564600E-06	0.40146900E-04	0.44093600E-04
31	0.12866800E-06	-0.58860700E-06	-0.22369700E-06	0.14081200E-06	0.20464700E-04	0.47264000E-04
32	0.80440400E-07	-0.36799900E-06	-0.13985500E-06	0.88038700E-07	0.63574900E-04	0.58141000E-04
33	0.96553700E-07	-0.44171700E-06	-0.16787100E-06	0.10567300E-06	0.53546000E-04	0.59730700E-04
34	0.12868400E-06	-0.58871200E-06	-0.22373600E-06	0.14083900E-06	0.33562400E-04	0.62900500E-04
	COLUMN 25	COLUMN 26	COLUMN 27	COLUMN 28	COLUMN 29	COLUMN 30

1	0.57038000E-05	0.35650900E-05	0.27967000E-05	0.57046200E-05	0.35660800E-05	0.42806812E-05
2	0.38025500E-05	0.23767400E-05	0.28531300E-05	0.38031000E-05	0.23774000E-05	0.28538000E-05
3	0.25350500E-05	0.15845000E-05	0.19020900E-05	0.25355100E-05	0.15849400E-05	0.19025400E-05
4	0.12675300E-05	0.79225300E-06	0.995105200E-06	0.12677100E-05	0.79247300E-06	0.995127500E-06
5	0.	0.	0.	0.	0.	0.
6	-0.95105700E-06	-0.59444500E-06	-0.71359500E-06	-0.95119100E-06	-0.59460900E-06	-0.71376200E-06
7	0.	0.	0.	0.	0.	0.
8	0.42029000E-05	0.25376500E-05	0.30940200E-05	0.42034900E-05	0.25383700E-05	0.30947500E-05
9	0.10785800E-04	0.60269800E-05	0.76168800E-05	0.10787300E-04	0.60287400E-05	0.76186700E-05
10	0.21730900E-04	0.11260300E-04	0.147558400E-04	0.21733700E-04	0.11263700E-04	0.14761800E-04
11	-0.12419500E-06	-0.77626400E-07	-0.93185800E-07	-0.12421300E-06	-0.77647800E-07	-0.93207500E-07
12	-0.95366400E-07	-0.59607500E-07	-0.71555100E-07	-0.95379800E-07	-0.59623900E-07	-0.71571800E-07
13	0.45936500E-07	0.28712100E-07	0.34467100E-07	0.45943100E-07	0.28720100E-07	0.34475200E-07
14	-0.32361300E-06	-0.20227000E-06	-0.24281200E-06	-0.32365800E-06	-0.20232500E-06	-0.24286900E-06
15	-0.12041100E-06	-0.75514900E-07	-0.90646300E-07	-0.12042800E-06	-0.75531400E-07	-0.90667100E-07
16	0.10042800E-06	0.62766800E-07	0.75347600E-07	0.10043500E-06	0.62784000E-07	0.75365700E-07
17	0.46949700E-06	-0.29345200E-06	-0.35227100E-06	0.46956200E-06	-0.29353200E-06	-0.35235300E-06
18	-0.16864400E-06	-0.10540800E-06	-0.12653600E-06	-0.16866700E-06	-0.10543600E-06	-0.12656500E-06
19	0.17861900E-06	0.30391800E-07	0.96505300E-07	0.17867000E-06	0.30404700E-07	0.96528700E-07
20	0.58842700E-06	-0.36778700E-06	-0.44150600E-06	0.58850900E-06	-0.36788700E-06	-0.44160800E-06
21	-0.22363000E-06	-0.13977600E-06	-0.16779300E-06	-0.22366100E-06	-0.13981300E-06	-0.16783100E-06
22	0.40746000E-06	0.37984800E-07	0.10562800E-06	0.40752700E-06	0.379935700E-07	0.10564600E-06
23	0.14689800E-05	0.36326300E-04	0.26560300E-04	0.14693600E-05	0.36326300E-04	0.26560300E-04
24	0.15994700E-04	0.26867500E-04	0.28457500E-04	0.15997900E-04	0.26867500E-04	0.28457500E-04
25	0.42992900E-04	-0.10918800E-05	0.30420400E-04	0.42999200E-04	-0.10918800E-05	0.30420400E-04
26	-0.10918800E-05	0.30420400E-04	0.42999200E-04	-0.10918800E-05	0.30420400E-04	0.42999200E-04
27	0.30420400E-04	0.21467000E-03	0.21662060E-03	0.30420400E-04	0.21467000E-03	0.21662060E-03
28	0.95104700E-04	-0.21967100E-04	0.22524400E-03	0.73907900E-03	0.54321800E-04	0.46787600E-03

29	0.65334300E-05	0.62871400E-03	0.42681300E-03	0.54321800E-04	0.13289500E-02	0.95531800E-03
30	0.37983400E-04	0.42585900E-03	0.43011800E-03	0.46787600E-03	0.95531800E-03	0.96796600E-03
31	0.1005900E-03	0.19526600E-04	0.43344500E-03	0.12910900E-02	0.21259100E-03	0.97833700E-03
32	0.14282200E-04	0.8898800E-03	0.64006500E-03	0.18943300E-03	0.20101200E-02	0.15159900E-02
33	0.44782800E-04	0.62499200E-03	0.64099100E-03	0.71836900E-03	0.1488900E-02	0.15146300E-02
34	0.10565500E-03	0.97523500E-04	0.64319400E-03	0.1772800E-02	0.44760100E-03	0.15115000E-02
1	0.57055900E-05	0.15671800E-05	0.42817600E-05	0.57066300E-05	COLUMN 34	
2	0.38037400E-05	0.23781300E-05	0.28545200E-05	0.38044400E-05	COLUMN 34	
3	0.25358400E-05	0.15854300E-05	0.17030200E-05	0.25363000E-05	COLUMN 34	
4	0.12679300E-05	0.79271800E-06	0.95151500E-06	0.12681600E-05	COLUMN 34	
5	0.	0.	0.	0.	COLUMN 34	
6	-0.95135200E-06	-0.59479100E-06	-0.7139400E-06	-0.95152400E-06	COLUMN 34	
7	0.	0.	0.	0.	COLUMN 34	
8	0.42041900E-05	0.25391600E-05	0.30955300E-05	0.42049400E-05	COLUMN 34	
9	0.1078900E-04	0.60306900E-04	0.76205800E-05	0.10790800E-04	COLUMN 34	
10	0.21737100E-04	0.11267500E-04	0.14765500E-04	0.21740700E-04	COLUMN 34	
11	-0.12423400E-06	-0.77671600E-07	-0.93230800E-07	-0.12425600E-06	COLUMN 34	
12	-0.95395900E-07	-0.59642100E-07	-0.71589700E-07	-0.95413200E-07	COLUMN 34	
13	0.45950900E-07	0.2672900E-07	0.3448400E-07	0.45959400E-07	COLUMN 34	
14	-0.32371300E-06	-0.20238700E-06	-0.24292900E-06	-0.32377100E-06	COLUMN 34	
15	-0.12084800E-06	-0.75554100E-07	-0.90689400E-07	-0.12086900E-06	COLUMN 34	
16	0.10045200E-06	0.67804300E-07	0.7538500E-07	0.10047100E-06	COLUMN 34	
17	-0.46964100E-06	-0.29362100E-06	-0.3524400E-06	-0.46972500E-06	COLUMN 34	
18	-0.16869500E-06	-0.10546800E-06	-0.12659500E-06	-0.16872500E-06	COLUMN 34	
19	0.1286600E-06	0.80440400E-07	0.96553700E-07	0.12868400E-06	COLUMN 34	
20	-0.58869700E-06	-0.36799900E-06	-0.44171700E-06	-0.58871200E-06	COLUMN 34	
21	-0.22369700E-06	-0.13985500E-06	-0.16787100E-06	-0.22373600E-06	COLUMN 34	
22	0.14081200E-06	0.88038700E-07	0.10567400E-06	0.14083900E-06	COLUMN 34	
23	0.20464700E-04	0.63574900E-04	0.5354600E-04	0.2046700E-04	COLUMN 34	
24	0.4726400E-04	0.58141000E-04	0.59730700E-04	0.4726500E-04	COLUMN 34	
25	0.1005900E-03	0.14282200E-04	0.44782800E-04	0.1005900E-03	COLUMN 34	
26	0.19526600E-04	0.8898800E-03	0.62499200E-03	0.19526600E-04	COLUMN 34	
27	0.43344500E-03	0.64006500E-03	0.64099100E-03	0.43344500E-03	COLUMN 34	
28	0.12910900E-02	0.18843300E-03	0.71836900E-03	0.12910900E-02	COLUMN 34	
29	0.21259100E-03	0.20101200E-02	0.1488900E-02	0.21259100E-03	COLUMN 34	
30	0.97833700E-03	0.15159900E-02	0.15146300E-02	0.97833700E-03	COLUMN 34	
31	0.25053800E-02	0.52507100E-03	0.36269700E-02	0.25053800E-02	COLUMN 34	
32	0.52507100E-03	0.32860300E-02	0.25097800E-02	0.52507100E-03	COLUMN 34	
33	0.15591300E-02	0.25097800E-02	0.25096800E-02	0.15591300E-02	COLUMN 34	
34	0.36269700E-02	0.96514300E-03	0.24979500E-02	0.36269700E-02	COLUMN 34	

WEIGHTING MATRIX
SURFACE 1. NO WEIGHTING MATRIX

AERODYNAMIC MATRIX
 SURFACE 1, 34 CONTROL POINTS
 1./K R = 0.10000000E 01

COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5	COLUMN 6	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	COLUMN 12
1	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
23	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
24	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
26	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
27	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
28	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
31	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
32	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
33	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
34	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	COLUMN 13	COLUMN 14	COLUMN 15	COLUMN 16	COLUMN 17	COLUMN 18
20	0.	0.	0.	0.	0.	0.
21	0.	0.	0.	0.	0.	0.
22	0.	0.	0.	0.	0.	0.
23	0.	0.	0.	0.	0.	0.
24	0.	0.	0.	0.	0.	0.
25	0.	0.	0.	0.	0.	0.
26	0.	0.	0.	0.	0.	0.
27	0.	0.	0.	0.	0.	0.
28	0.	0.	0.	0.	0.	0.
29	0.	0.	0.	0.	0.	0.
30	0.	0.	0.	0.	0.	0.
31	0.	0.	0.	0.	0.	0.
32	0.	0.	0.	0.	0.	0.
33	0.	0.	0.	0.	0.	0.
34	0.	0.	0.	0.	0.	0.

	COLUMN 19	COLUMN 20	COLUMN 21	COLUMN 22	COLUMN 23	COLUMN 24
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.
13	0.	0.	0.	0.	0.	0.
14	0.	0.	0.	0.	0.	0.
15	0.	0.	0.	0.	0.	0.
16	0.	0.	0.	0.	0.	0.
17	0.	0.	0.	0.	0.	0.
18	0.	0.	0.	0.	0.	0.
19	0.	0.	0.	0.	0.	0.
20	0.	0.	0.	0.	0.	0.
21	0.	0.	0.	0.	0.	0.
22	0.	0.	0.	0.	0.	0.
23	0.	0.	0.	0.	0.	0.
24	0.	0.	0.	0.	0.	0.
25	0.	0.	0.	0.	0.	0.
26	0.	0.	0.	0.	0.	0.
27	0.	0.	0.	0.	0.	0.
28	0.	0.	0.	0.	0.	0.
29	0.	0.	0.	0.	0.	0.
30	0.	0.	0.	0.	0.	0.
31	0.	0.	0.	0.	0.	0.
32	0.	0.	0.	0.	0.	0.
33	0.	0.	0.	0.	0.	0.
34	0.	0.	0.	0.	0.	0.

	COLUMN 19	COLUMN 20	COLUMN 21	COLUMN 22	COLUMN 23	COLUMN 24
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.

30 -0.65034400E-01 -0.17461100E 00 -0.46570000E-02 0.12507400E 00 -0.33422300E-01 -0.42724500E-01
31 -0.72861300E-01 -0.42785700E-01 0.5541600E-01 -0.18042100E 00 -0.13434800E 00 0.12313400E 00
32 -0.28342200E-01 0.10809100E 00 0.1469100E 01 0.20342100E 01 0.20342100E 01 0.97324400E 00
33 -0.14363900E 00 -0.18911600E 00 -0.69677300E-01 0.20585800E-01 0.71144200E 00 -0.28528100E-01
34 0.10143300E 01 0.61759600E-01 0.35460700E 00 -0.2014000E 01 -0.63373800E 00 0.96287700E 00
COLUMN 31 COLUMN 32 COLUMN 33 COLUMN 34 COLUMN 35 COLUMN 36

1 0. 0. 0. 0. 0. 0.
2 0. 0. 0. 0. 0. 0.
3 0. 0. 0. 0. 0. 0.
4 0. 0. 0. 0. 0. 0.
5 0. 0. 0. 0. 0. 0.
6 0. 0. 0. 0. 0. 0.
7 0. 0. 0. 0. 0. 0.
8 0. 0. 0. 0. 0. 0.
9 0. 0. 0. 0. 0. 0.
10 0. 0. 0. 0. 0. 0.
11 -0.54858500E 01 -0.57732100E-01 0.42262200E 01 -0.97700800E 00 -0.67706400E 01 0.35455500E 00
12 0.21825400E 01 0.36052700E 01 -0.1946000E 01 -0.68765900E-01 -0.45326300E 01 0.23168900E 01
13 0.49991300E-01 0.19439500E 01 -0.32431700E 01 0.85014900E 00 -0.68259200E 01 0.30929600E 00
14 -0.28096500E 01 -0.62031900E-01 0.29544100E 01 -0.68534700E 00 -0.46498800E 01 0.17268900E 00
15 0.97790100E 00 0.16849400E 01 -0.14240900E 01 -0.56689900E-01 0.3352500E 01 0.16952100E 01
16 0.24446900E-01 0.90897800E 00 -0.23041300E 01 -0.59282600E 00 -0.48827800E 01 0.28517500E 00
17 0.51267400E 00 -0.27077300E-01 0.60174100E 00 -0.15329600E 00 -0.74859400E 00 -0.66767200E-01
18 -0.35680700E 00 -0.54213500E 00 -0.40807900E 00 -0.29428700E-01 0.10651300E 01 0.50673300E 00
19 0.61145400E 00 -0.28234900E 00 -0.54210800E 00 0.11641900E 00 0.12134200E 01 0.16255500E 00
20 -0.70614900E 01 0.11594900E 00 -0.59886400E 01 0.13315300E-01 0.99640599E-01 -0.47121300E 00
21 -0.33293300E 01 -0.52429000E 01 0.25491100E 01 0.91385200E-01 -0.54656600E 01 -0.30109200E 01
22 -0.73994400E 01 -0.27891200E 01 0.4484300E 01 0.11368900E-01 -0.91432300E 01 -0.53658600E 00
23 -0.39527300E 01 0.52293900E 00 0.84141100E 00 -0.19335800E 00 -0.26531700E 01 0.19051100E 01
24 -0.11136900E 00 -0.46001100E 00 0.11358100E-01 0.4478300E 00 -0.17054800E 00 -0.12623300E 00
25 -0.74677400E 00 -0.2635000E 00 -0.8267800E-01 0.30533600E-01 -0.76063300E 00 -0.44822300E 00
26 -0.19508900E-01 0.12855900E 00 -0.63154400E 00 -0.24963500E 00 -0.18732600E 01 0.15485100E 01
27 -0.23274900E-01 -0.27791400E 00 0.45035500E-01 0.20887700E-02 -0.80742900E-02 0.73301300E-01
28 0.41744100E 00 -0.12834500E 00 -0.65067300E-01 -0.20483700E-02 -0.46562300E 00 -0.23947900E 00
29 0.41813900E 00 -0.23693400E 00 0.14297500E 00 -0.18990300E 00 -0.24335700E 00 0.70569400E 00
30 0.45943300E-01 -0.27200300E-01 0.60363500E-01 -0.60682200E-01 -0.78909600E-01 0.24619600E 00
31 -0.5499200E-02 -0.2585800E-02 0.1083000E-01 -0.2264600E-01 -0.50573600E-01 0.2304900E-01
32 0.52258600E 01 -0.88569200E 00 -0.14620300E 01 0.4253300E 00 0.50191600E 01 -0.22505900E 01
33 0.20426100E 00 0.50656100E 00 -0.69857900E-01 -0.43042400E 00 0.3770900E 00 0.29247100E 00
34 -0.89374900E 00 0.15846800E 00 0.29029200E 00 -0.90093600E-01 -0.14694400E 01 0.58700200E 00
COLUMN 37 COLUMN 38 COLUMN 39 COLUMN 40 COLUMN 41 COLUMN 42

1 0. 0. 0. 0. 0. 0.
2 0. 0. 0. 0. 0. 0.
3 0. 0. 0. 0. 0. 0.
4 0. 0. 0. 0. 0. 0.
5 0. 0. 0. 0. 0. 0.
6 0. 0. 0. 0. 0. 0.
7 0. 0. 0. 0. 0. 0.
8 0. 0. 0. 0. 0. 0.
9 0. 0. 0. 0. 0. 0.
10 0. 0. 0. 0. 0. 0.
11 -0.36435700E 01 -0.23375900E 00 0.10428600E 01 -0.19187100E 00 0.16663700E 01 0.10981900E-02
12 -0.19084300E 01 -0.24544100E 01 0.44643100E 00 0.37177300E-01 -0.89782100E 00 -0.5294600E 00
13 -0.36646300E 01 -0.1782100E 01 0.7980600E 00 -0.14596100E 00 -0.15537600E 01 -0.18939700E 00
14 0.20775100E 01 -0.13141200E 00 -0.72923300E 00 0.13194600E 00 0.11677200E 01 0.75523600E-02
15 -0.15609200E 01 -0.10092560E 01 0.30566900E 00 0.2522000E-01 -0.60262600E 00 -0.35473400E 00

[illegible]

26	0.96672500E 00	0.87054800E 00	-0.37102500E 00	-0.10411000E 00	0.19143300E 01	0.16667200E 00
27	0.18675300E 00	0.13324900E 01	-0.36720200E 00	-0.11717200E 01	0.17183500E 01	0.23171500E 01
28	0.60937300E 00	0.11281300E 01	-0.22331000E 01	-0.10782700E 01	0.31377000E 01	0.23284300E 01
29	-0.45677600E 00	-0.21007300E 00	-0.42502500E 00	-0.51873200E 01	0.10546100E 01	-0.96670300E 01
30	-0.18022100E 00	-0.39691400E 00	-0.43235400E 00	-0.31176600E 00	0.79378000E 00	0.62738500E 00
31	-0.22805800E 00	-0.35602700E 00	-0.58358100E 00	-0.32248000E 00	0.90742500E 00	0.68666200E 00
32	-0.34689900E 00	-0.25146700E 01	-0.33233100E 00	-0.58628600E 00	-0.17975200E 01	-0.10260700E 01
33	-0.92739600E 01	-0.40917100E 01	0.12466700E 01	0.22908800E 01	-0.21149900E 01	-0.44918700E 01
34	-0.19964600E 01	-0.3518400E 01	0.42137200E 01	0.19569400E 01	-0.56790900E 01	-0.42443900E 01

1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.
11	-0.16693500E 00	0.33865100E 01	-0.11509100E 01	-0.91471000E 02	0.24095700E 01	-0.17100600E 01
12	-0.81974900E 01	0.14924400E 00	-0.16090000E 02	0.15618400E 01	0.45074500E 02	-0.38836700E 01
13	0.94517600E 01	0.93000000E 01	0.95017500E 02	0.50122000E 02	-0.18626000E 01	-0.18768900E 01
14	-0.11674900E 00	0.45701100E 01	-0.85713200E 02	0.61606100E 02	0.18201800E 01	-0.15458800E 01
15	-0.88377300E 01	0.11559000E 00	-0.33314700E 02	0.12934300E 01	0.77233400E 02	-0.25448800E 01
16	0.49747500E 01	0.72910200E 01	0.65060100E 02	0.47508300E 02	-0.12781900E 01	-0.99237800E 02
17	-0.44193300E 01	0.542826700E 01	-0.33024300E 02	0.62539600E 02	0.76333500E 02	-0.12225000E 01
18	-0.67531300E 01	0.67370600E 01	-0.48678400E 02	0.865561800E 02	0.10546700E 01	-0.16859900E 01
19	0.46547500E 02	0.39417600E 01	0.19856000E 02	0.39771500E 02	-0.38436700E 02	-0.88336400E 02
20	0.73783200E 01	0.52369000E 01	0.10072500E 02	0.15809800E 02	-0.20544600E 01	-0.41642000E 02
21	-0.34054600E 01	-0.78024800E 02	-0.36079200E 02	0.11550300E 02	0.71911000E 02	-0.19143980E 02
22	-0.81631900E 01	-0.11117300E 01	-0.65526100E 02	0.20848000E 02	0.3663100E 01	-0.33806000E 02
23	-0.18205400E 00	-0.95009200E 00	-0.72599700E 01	0.89459200E 01	-0.26651200E 00	-0.15631400E 00
24	-0.05609800E 00	-0.17500800E 01	0.10842400E 00	0.37423200E 00	-0.31521200E 00	-0.73302700E 00
25	-0.10206800E 01	0.15386500E 01	0.67208700E 00	0.34352400E 00	-0.58592600E 00	-0.73751800E 00
26	-0.14341100E 01	-0.67115200E 00	-0.70695300E 01	0.64402300E 01	-0.14852400E 00	-0.11216100E 00
27	-0.55245200E 00	-0.12986000E 01	0.11901800E 00	0.25699200E 00	-0.19619000E 00	-0.58249000E 00
28	-0.7764980E 00	-0.11958700E 01	0.46326300E 00	0.23567200E 00	-0.60538900E 00	-0.50623700E 00
29	-0.62624300E 00	-0.13786200E 00	-0.59966800E 01	-0.51730700E 02	0.17932900E 00	0.89204990E 02
30	-0.38939600E 00	-0.38536400E 00	-0.81635100E 01	-0.84689500E 01	0.14638700E 00	0.16813600E 00
31	-0.27446500E 00	-0.3786200E 00	-0.14970400E 00	-0.62813200E 01	0.21903500E 00	0.17645200E 00
32	0.18195900E 01	0.15031500E 01	0.60688800E 01	-0.11312600E 00	0.59791900E 00	0.19173100E 00
33	0.47698400E 00	0.23679100E 01	-0.37839800E 00	-0.64956100E 00	0.64561900E 00	0.12751000E 01
34	0.12621300E 01	0.19865100E 01	-0.12012600E 01	-0.64149300E 00	0.159960300E 01	0.13195000E 01

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2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.
11	-0.16693500E 00	0.33865100E 01	-0.11509100E 01	-0.91471000E 02	0.24095700E 01	-0.17100600E 01
12	-0.81974900E 01	0.14924400E 00	-0.16090000E 02	0.15618400E 01	0.45074500E 02	-0.38836700E 01
13	0.94517600E 01	0.93000000E 01	0.95017500E 02	0.50122000E 02	-0.18626000E 01	-0.18768900E 01
14	-0.11674900E 00	0.45701100E 01	-0.85713200E 02	0.61606100E 02	0.18201800E 01	-0.15458800E 01
15	-0.88377300E 01	0.11559000E 00	-0.33314700E 02	0.12934300E 01	0.77233400E 02	-0.25448800E 01
16	0.49747500E 01	0.72910200E 01	0.65060100E 02	0.47508300E 02	-0.12781900E 01	-0.99237800E 02
17	-0.44193300E 01	0.542826700E 01	-0.33024300E 02	0.62539600E 02	0.76333500E 02	-0.12225000E 01
18	-0.67531300E 01	0.67370600E 01	-0.48678400E 02	0.865561800E 02	0.10546700E 01	-0.16859900E 01
19	0.46547500E 02	0.39417600E 01	0.19856000E 02	0.39771500E 02	-0.38436700E 02	-0.88336400E 02
20	0.73783200E 01	0.52369000E 01	0.10072500E 02	0.15809800E 02	-0.20544600E 01	-0.41642000E 02
21	-0.34054600E 01	-0.78024800E 02	-0.36079200E 02	0.11550300E 02	0.71911000E 02	-0.19143980E 02
22	-0.81631900E 01	-0.11117300E 01	-0.65526100E 02	0.20848000E 02	0.3663100E 01	-0.33806000E 02
23	-0.18205400E 00	-0.95009200E 00	-0.72599700E 01	0.89459200E 01	-0.26651200E 00	-0.15631400E 00
24	-0.05609800E 00	-0.17500800E 01	0.10842400E 00	0.37423200E 00	-0.31521200E 00	-0.73302700E 00
25	-0.10206800E 01	0.15386500E 01	0.67208700E 00	0.34352400E 00	-0.58592600E 00	-0.73751800E 00
26	-0.14341100E 01	-0.67115200E 00	-0.70695300E 01	0.64402300E 01	-0.14852400E 00	-0.11216100E 00
27	-0.55245200E 00	-0.12986000E 01	0.11901800E 00	0.25699200E 00	-0.19619000E 00	-0.58249000E 00
28	-0.7764980E 00	-0.11958700E 01	0.46326300E 00	0.23567200E 00	-0.60538900E 00	-0.50623700E 00
29	-0.62624300E 00	-0.13786200E 00	-0.59966800E 01	-0.51730700E 02	0.17932900E 00	0.89204990E 02
30	-0.38939600E 00	-0.38536400E 00	-0.81635100E 01	-0.84689500E 01	0.14638700E 00	0.16813600E 00
31	-0.27446500E 00	-0.3786200E 00	-0.14970400E 00	-0.62813200E 01	0.21903500E 00	0.17645200E 00
32	0.18195900E 01	0.15031500E 01	0.60688800E 01	-0.11312600E 00	0.59791900E 00	0.19173100E 00
33	0.47698400E 00	0.23679100E 01	-0.37839800E 00	-0.64956100E 00	0.64561900E 00	0.12751000E 01
34	0.12621300E 01	0.19865100E 01	-0.12012600E 01	-0.64149300E 00	0.159960300E 01	0.13195000E 01

1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
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6	0.	0.	0.	0.	0.	0.
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8	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.
11	-0.16693500E 00	0.33865100E 01	-0.11509100E 01	-0.91471000E 02	0.24095700E 01	-0.17100600E 01
12	-0.81974900E 01	0.14924400E 00	-0.16090000E 02	0.15618400E 01	0.45074500E 02	-0.38836700E 01
13	0.94517600E 01	0.93000000E 01	0.95017500E 02	0.50122000E 02	-0.18626000E 01	-0.18768900E 01
14	-0.11674900E 00	0.45701100E 01	-0.85713200E 02	0.61606100E 02	0.18201800E 01	-0.15458800E 01
15	-0.88377300E 01	0.11559000E 00	-0.33314700E 02	0.12934300E 01	0.77233400E 02	-0.25448800E 01
16	0.49747500E 01	0.72910200E 01	0.65060100E 02	0.47508300E 02	-0.12781900E 01	-0.99237800E 02
17	-0.44193300E 01	0.542826700E 01	-0.33024300E 02	0.62539600E 02	0.76333500E 02	-0.12225000E 01
18	-0.67531300E 01	0.67370600E 01	-0.48678400E 02	0.865561800E 02	0.10546700E 01	-0.16859900E 01
19	0.46547500E 02	0.39417600E 01	0.19856000E 02	0.39771500E 02	-0.38436700E 02	-0.88336400E 02
20	0.73783200E 01	0.52369000E 01	0.10072500E 02	0.15809800E 02	-0.20544600E 01	-0.41642000E 02
21	-0.34054600E 01	-0.78024800E 02	-0.36079200E 02	0.11550300E 02	0.71911000E 02	-0.19143980E 02
22	-0.81631900E 01	-0.11117300E 01	-0.65526100E 02	0.20848000E 02	0.3663100E 01	-0.33806000E 02
23	-0.18205400E 00	-0.95009200E 00	-0.72599700E 01	0.89459200E 01	-0.26651200E 00	-0.15631400E 00
24	-0.05609800E 00	-0.17500800E 01	0.10842400E 00	0.37423200E 00	-0.31521200E 00	-0.73302700E 00
25	-0.10206800E 01	0.15386500E 01	0.67208700E 00	0.34352400E 00	-0.58592600E 00	-0.73751800E 00
26	-0.14341100E 01	-0.67115200E 00	-0.70695300E 01	0.64402300E 01	-0.14852400E 00	-0.11216100E 00
27	-0.55245200E 00	-0.12986000E 01	0.11901800E 00	0.25699200E 00	-0.19619000E 00	-0.58249000E 00
28	-0.7764980E 00	-0.11958700E 01	0.46326300E 00	0.23567200E 00	-0.60538900E 00	-0.50623700E 00
29	-0.62624300E 00	-0.13786200E 00	-0.59966800E 01	-0.51730700E 02	0.17932900E 00	0.89204990E 02
30	-0.38939600E 00	-0.38536400E 00	-0.81635100E 01	-0.84689500E 01	0.14638700E 00	0.16813600E 00
31	-0.27446500E 00	-0.3786200E 00	-0.14970400E 00	-0.62813200E 01	0.21903500E 00	0.17645200E 00
32	0.18195900E 01	0.15031500E 01	0.60688800E 01	-0.11312600E 00	0.59791900E 00	0.19173100E 00
33	0.47698400E 00	0.23679100E 01	-0.37839800E 00	-0.64956100E 00	0.64561900E 00	0.12751000E 01
34	0.12621300E 01	0.19865100E 01	-0.12012600E 01	-0.64149300E 00	0.159960300E 01	0.13195000E 01

1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.
11	-0.16693500E 00	0.33865100E 01	-0.11509100E 01	-0.91471000E 02	0.24095700E	

15	-0.70421700E-02	0.11642260E-01
16	0.52023200E-02	0.66257100E-02
17	-0.55480500E-02	0.49704300E-02
18	-0.74003900E-02	0.70272900E-02
19	0.10167200E-02	0.45224600E-02
20	0.98864200E-02	0.48998000E-02
21	-0.37034900E-02	-0.39283700E-04
22	-0.73180200E-02	-0.25449000E-03
23	0.28775900E-00	0.24049500E-00
24	0.62006400E-01	0.38289300E-00
25	0.1752800E-00	0.33801500E-00
26	0.18261400E-00	0.16588600E-00
27	0.33244385E-01	0.26026600E-00
28	0.11760700E-00	0.22957000E-00
29	-0.11765100E-00	-0.46492500E-01
30	-0.50382100E-01	-0.95607900E-01
31	-0.57943289E-01	-0.91119900E-01
32	-0.57775100E-00	-0.39468700E-00
33	-0.15660488E-00	-0.67648600E-00
34	-0.33212000E-00	-0.61196700E-00

OUTPUT DATA

FLUTTER ANALYSIS BY A COLLOCATION METHOD, USING AERODYNAMIC INFLUENCE COEFFICIENTS.

DENSITY = 0.23780000E-02 REDUCED VELOCITY = 0.10000000E 01

2 RIGID BODY DEGREES OF FREEDOM

MODE	EIGENVALUE	ITERATIONS	S.P.	D.P.	AITKENS S.P.	D.P.
1	0.17131410E-02	-0.72322634E-03	25	0	4	0
2	0.15157342E-02	0.25350746E-05	14	0	3	0
3	0.73601308E-03	-0.14775008E-03	39	0	3	0
4	0.56287548E-03	-0.28860156E-03	17	0	3	0
5	0.32688921E-03	-0.83572808E-04	30	0	4	0
6	0.38201017E-03	0.47060941E-06	10	0	1	0

EIGENVECTORS

COLUMN	1	COLUMN	2	COLUMN	3	COLUMN	4	COLUMN	5	COLUMN	6
1	0.37643184E-02	0.80785241E-02	-0.13083326E 00	-0.17352749E 00	-0.21184392E-02	0.26283327E-02					
2	0.1965667E-02	0.29771531E-02	-0.43331379E-01	-0.57166711E-01	-0.19433986E-03	0.40957239E-03					
3	0.79181301E-03	0.17373480E-03	0.43627465E-02	0.63471594E-02	0.67433470E-03	-0.72229894E-03					
4	0.3168380E-03	-0.16344189E-02	0.34632312E-01	0.46853828E-01	0.92823931E-03	-0.13255245E-02					
5	-0.13218182E-02	-0.23693806E-02	0.46845185E-01	0.53555786E-01	0.64995364E-03	-0.14494931E-02					
6	-0.21969870E-02	-0.21788966E-02	0.44511541E-01	0.51157253E-01	0.50124968E-04	-0.13986483E-02					
7	-0.28948243E-02	-0.10320762E-02	0.27739456E-01	6.3975766E-01	-0.73461328E-03	-0.93641223E-03					
8	-0.34236945E-02	0.95860283E-03	-0.11176997E-02	0.23554941E-02	-0.16167295E-02	-0.38783438E-03					
9	-0.39333056E-02	0.35423904E-02	-0.38202477E-01	-0.45685127E-01	-0.26603667E-02	0.28076097E-03					
10	-0.51691147E-02	0.79435493E-02	-0.10312494E 00	-0.12928879E 00	-0.50164371E-02	0.13653605E-02					
11	-0.14536092E-02	-0.33906591E-02	0.50773181E-01	0.53842680E-01	-0.92093510E-03	0.24627580E-02					
12	-0.22198041E-02	-0.26426604E-02	0.40414338E-01	0.53456639E-01	-0.14363292E-02	0.19181678E-02					
13	-0.28237340E-02	-0.18346718E-02	0.29868909E-01	0.41471687E-01	-0.42863891E-02	9.36461925E-02					
14	-0.20512834E-02	-0.93737831E-02	0.26615594E-01	0.73729641E-01	-0.11394135E-01	0.2736265E-01					
15	-0.19565898E-02	-0.86473640E-02	0.40781275E-01	0.65925887E-01	-0.2862874E-01	0.32560594E-01					
16	-0.1877831E-02	-0.70791439E-02	0.46234537E-01	0.56523828E-01	-0.28316621E-01	0.33799398E-01					
17	-0.31302892E-02	-0.1725323E-01	0.10164463E 00	0.87809737E-01	-0.27038114E-01	0.63766813E-01					
18	-0.15281868E-02	-0.15943354E-01	0.86066488E-01	0.8222788E-01	-0.45992822E-01	0.71892097E-01					
19	0.51591930E-03	-0.1490530E-01	0.75915013E-01	0.86677688E-01	-0.64144784E-01	0.77745844E-01					
20	-0.44211907E-02	-0.27537946E-01	0.13177539E 00	0.96696629E-01	-0.45134925E-01	0.10283377E 00					
21	-0.96908137E-03	-0.23961320E-01	0.11418507E 00	0.10101119E 00	-0.74989087E-01	0.11453976E 00					
22	0.24480211E-02	-0.22564264E-01	0.96701087E-01	0.14527770E 00	-0.10477070E 00	0.12631485E 00					
23	0.16786183E-01	-0.26610741E-02	-0.39862011E-02	-0.27472321E-01	0.18891179E-01	-0.45805818E-03					
24	0.16421816E-01	0.71617029E-02	-0.18660726E-01	-0.43179221E-01	0.18780944E-01	-0.81184858E-03					
25	0.69122601E-02	-0.16207665E-01	-0.56213495E-01	-0.73586688E-01	0.10535459E-01	0.11186633E-02					
26	0.27405729E 00	-0.18580306E-01	0.26669872E 00	-0.26273874E-01	0.27194718E 00	0.10405294E-01					

27	0.23279708E+00	0.47209725E-01	0.18687398E+00	-0.20641377E-01	0.24293449E+00	-0.19276797E-01
28	0.16740659E+00	-0.16146866E+00	0.43751792E-01	-0.76791868E-02	0.61242910E+00	-0.80841389E-01
29	0.62018514E+00	-0.17059901E-01	0.41705639E+00	-0.35774926E-01	0.61740246E+00	-0.92739224E-02
30	0.54078013E+00	-0.10627347E+00	0.47756580E+00	-0.47756580E-02	0.56165864E+00	-0.51682833E-01
31	0.38014052E+00	-0.35120461E+00	0.19321891E+00	0.57869071E-01	0.44755909E+00	-0.17294512E+00
32	0.10000000E+00	-0.10000000E+00	0.10000000E+00	0.	0.10000000E+00	0.
33	0.12542395E+00	0.12542395E+00	0.79802895E+00	0.38871136E-01	0.90711855E+00	-0.91033076E-01
34	0.87357339E+00	0.17243078E+00	0.77065954E+00	0.11646092E+00	0.72057259E+00	-0.27305778E+00
	COLUMN 7	COLUMN 8	COLUMN 9	COLUMN 10	COLUMN 11	COLUMN 12
1	-0.92342652E-03	0.93245277E-03	0.18032191E-02	-0.58706462E-03	-0.243060737E+00	-0.11772136E+00
2	0.33636750E-04	0.26611177E-03	-0.36212173E-03	-0.1164644E-03	0.50843932E-01	0.24869456E-01
3	8.43284813E-03	-0.96721004E-04	-0.11493591E-02	0.14723195E-03	0.15177272E+00	0.74341653E-01
4	0.48705526E-03	-0.31195582E-03	-0.10844131E-02	0.59303335E-03	0.13384684E+00	0.65015894E-01
5	0.24329271E-03	-0.35432235E-03	-0.46206123E-03	0.2724438E-03	0.39691480E-01	0.19834431E-01
6	-0.16877689E-03	-0.23505363E-03	0.17327298E-03	0.66365693E-04	-0.68631770E-01	0.2851957E-01
7	0.67591149E-03	0.49900503E-04	0.45244077E-03	0.96901766E-04	-0.11747978E+00	-0.55895152E-01
8	0.12874809E-02	0.46278486E-03	0.90909150E-04	0.97463875E-04	-0.95320107E-01	-0.45085755E-01
9	-0.37413947E-02	0.91924016E-03	-0.10718000E-02	0.53680204E-03	0.53055633E-02	0.39553040E-02
10	0.1911872E-02	0.15383473E-03	0.46033034E-02	0.12741614E-02	0.2471270E+00	0.13230705E+00
11	0.11417481E-03	-0.71750451E-03	-0.50854279E-02	0.67172732E-02	0.34318146E-01	0.15159346E-01
12	-0.29334973E-03	-0.40470186E-03	0.20948821E-02	0.19537077E-02	-0.43860216E-01	0.25747105E-01
13	-0.43834097E-03	0.29019538E-03	0.80556757E-02	-0.33118468E-01	-0.13161374E+00	-0.98285066E-02
14	0.3732443E-03	0.30230092E-02	0.42979485E-01	0.47544612E-01	0.47492837E-01	0.98285066E-02
15	0.52160287E-03	-0.29923050E-02	0.45941164E-01	-0.26875470E-01	0.24943135E-01	-0.46967291E-01
16	0.13933444E-02	-0.26565667E-02	0.63717150E-01	-0.98244689E-01	-0.31003361E-02	-0.99802360E-01
17	-0.81454236E-03	0.62128255E-02	0.10017700E+00	0.10563966E+00	0.72358344E-01	0.791718336E-02
18	0.17727052E-02	0.62434917E-02	0.12723265E+00	-0.58798058E-01	0.11993947E+00	0.67367494E-01
19	0.4528200E-02	-0.63440101E-02	-0.15393344E+00	-0.22902783E+00	0.21417969E+00	-0.11868873E+00
20	-0.1386913E-02	-0.95965634E-02	0.16521012E+00	0.16316879E+00	0.10139674E+00	0.62531662E-02
21	0.32155592E-02	-0.98975118E-02	0.21267500E+00	-0.95305514E-01	0.23375105E+00	0.84449488E-01
22	0.74578062E-02	-0.10196999E-01	0.26031677E+00	-0.95359351E-02	0.36806946E+00	-0.17611597E+00
23	0.19734281E-01	0.26175160E-03	0.2244114E-01	-0.13609367E-02	-0.14713482E-01	-0.23839340E-01
24	0.19738147E-01	-0.11183304E-02	0.19771786E-01	-0.25049537E-02	0.27566760E-01	-0.17715723E-02
25	0.12680110E-01	-0.87209297E-03	0.61055722E-02	-0.60185481E-03	0.10695511E+00	0.42035179E-01
26	0.26672868E+00	0.17823547E-01	0.28883789E+00	0.21920004E-01	0.28962227E+00	-0.56214876E-02
27	0.24944493E+00	-0.31519418E-01	0.23519369E+00	-0.45374707E-01	0.245325237E+00	-0.53379141E-01
28	0.2329437E+00	-0.13250488E+00	0.14477336E+00	-0.18331308E+00	0.17523168E+00	-0.15331572E+00
29	0.61954309E+00	-0.15702000E-01	0.63305524E+00	-0.19603336E-01	0.64782121E+00	0.93937626E-03
30	0.57697975E+00	0.02224185E-01	0.53780910E+00	-0.11633089E+00	0.53220937E+00	0.12311935E+00
31	0.51189152E+00	-0.87741983E-00	0.34497592E+00	-0.38671168E+00	0.29807779E+00	-0.36946983E+00
32	0.10000000E+00	0.	0.10000000E+00	0.	0.10000000E+00	0.
33	0.93097215E+00	-0.14268887E+00	0.86207719E+00	-0.28056483E+00	0.82096164E+00	-0.19983037E+00
34	0.81866782E+00	-0.42731934E+00	0.58511031E+00	-0.60026634E+00	0.46106953E+00	-0.59772949E+00

CHECK EIGENVALUES AND EIGENVECTORS

COLUMN 1		COLUMN 2		COLUMN 3		COLUMN 4		COLUMN 5		COLUMN 6	
0.1713141E-02	-0.72322613E-03	0.15157343E-02	0.25352235E-05	0.73081400E-03	-0.14774981E-03	0.10283366E-04	0.47084308E-06	0.26283908E-02	0.40958770E-03	0.73421510E-01	0.5915777E-01
0.56287563E-03	-0.28860138E-03	0.32688941E-03	-0.83572584E-04	0.30281033E-03	0.47084308E-06	0.10283366E-04	0.47084308E-06	0.26283908E-02	0.40958770E-03	0.73421510E-01	0.5915777E-01
1	0.37643246E-02	0.80705214E-02	-0.13083320E-00	-0.17352760E-00	-0.21181130E-02	-0.17352760E-00	-0.21181130E-02	-0.17352760E-00	-0.21181130E-02	-0.17352760E-00	-0.21181130E-02
2	0.19556688E-02	0.29771524E-02	-0.43331164E-01	-0.57166746E-01	-0.19431128E-03	-0.57166746E-01	-0.19431128E-03	-0.57166746E-01	-0.19431128E-03	-0.57166746E-01	-0.19431128E-03
3	0.79181268E-03	0.17373510E-03	0.43627420E-02	0.63471592E-02	0.67432328E-03	0.63471592E-02	0.67432328E-03	0.63471592E-02	0.67432328E-03	0.63471592E-02	0.67432328E-03
4	0.1368567E-03	-0.16344179E-02	0.34632277E-01	0.46853012E-01	0.92815921E-03	0.46853012E-01	0.92815921E-03	0.46853012E-01	0.92815921E-03	0.46853012E-01	0.92815921E-03
5	0.13218208E-02	-0.23693795E-02	0.46845133E-01	0.63555668E-01	0.64085568E-03	0.63555668E-01	0.64085568E-03	0.63555668E-01	0.64085568E-03	0.63555668E-01	0.64085568E-03
6	0.21969895E-02	-0.21786888E-02	0.44511490E-01	0.61157233E-01	0.50830750E-04	0.44511490E-01	0.61157233E-01	0.44511490E-01	0.61157233E-01	0.44511490E-01	0.61157233E-01
7	0.28948261E-02	-0.10320759E-02	0.27739474E-01	0.39757658E-01	-0.73467962E-03	0.27739474E-01	0.39757658E-01	0.27739474E-01	0.39757658E-01	0.27739474E-01	0.39757658E-01
8	0.34236948E-02	0.45860236E-03	-0.11769996E-02	0.23554921E-02	-0.16167234E-02	-0.11769996E-02	0.23554921E-02	-0.11769996E-02	0.23554921E-02	-0.11769996E-02	0.23554921E-02
9	0.39333042E-02	0.35423889E-02	-0.38202462E-01	-0.45605153E-01	-0.26663028E-02	-0.38202462E-01	-0.45605153E-01	-0.38202462E-01	-0.45605153E-01	-0.38202462E-01	-0.45605153E-01
10	0.51691101E-02	0.79943599E-02	-0.10371249E-00	-0.12928887E-00	-0.50162424E-02	-0.10371249E-00	-0.12928887E-00	-0.10371249E-00	-0.12928887E-00	-0.10371249E-00	-0.12928887E-00
11	0.14536116E-02	0.33906576E-02	0.50773126E-01	0.65384245E-01	-0.92103785E-03	0.50773126E-01	0.65384245E-01	0.50773126E-01	0.65384245E-01	0.50773126E-01	0.65384245E-01
12	0.22198661E-02	-0.26426594E-02	0.40414094E-01	0.53456627E-01	-0.14364189E-02	0.40414094E-01	0.53456627E-01	0.40414094E-01	0.53456627E-01	0.40414094E-01	0.53456627E-01
13	0.28237358E-02	-0.18346710E-02	0.29860959E-01	0.41471681E-01	-0.42864583E-02	0.29860959E-01	0.41471681E-01	0.29860959E-01	0.41471681E-01	0.29860959E-01	0.41471681E-01
14	0.20512051E-02	-0.93737788E-02	0.72615339E-01	0.73729641E-01	-0.11394273E-01	0.72615339E-01	0.73729641E-01	0.72615339E-01	0.73729641E-01	0.72615339E-01	0.73729641E-01
15	0.19560598E-02	-0.86473603E-02	0.60781128E-01	0.65925885E-01	-0.20862995E-01	0.60781128E-01	0.65925885E-01	0.60781128E-01	0.65925885E-01	0.60781128E-01	0.65925885E-01
16	0.18772853E-02	-0.70791391E-02	0.46234502E-01	0.56523032E-01	-0.20316727E-01	0.46234502E-01	0.56523032E-01	0.46234502E-01	0.56523032E-01	0.46234502E-01	0.56523032E-01
17	0.31302900E-02	-0.1725315E-01	0.10164457E-00	0.84709743E-01	-0.27030310E-01	0.10164457E-00	0.84709743E-01	0.10164457E-00	0.84709743E-01	0.10164457E-00	0.84709743E-01
18	0.1521886E-02	-0.15943345E-01	0.86066433E-01	0.82227008E-01	-0.45993001E-01	0.86066433E-01	0.82227008E-01	0.86066433E-01	0.82227008E-01	0.86066433E-01	0.82227008E-01
19	0.51591613E-03	-0.14905820E-02	0.75911497E-01	0.86677627E-01	-0.64144961E-01	0.75911497E-01	0.86677627E-01	0.75911497E-01	0.86677627E-01	0.75911497E-01	0.86677627E-01
20	0.44211905E-02	-0.25379440E-01	0.13177332E-00	0.96696648E-01	-0.45135170E-01	0.13177332E-00	0.96696648E-01	0.13177332E-00	0.96696648E-01	0.13177332E-00	0.96696648E-01
21	0.9698354E-03	-0.23961305E-01	0.11418581E-00	0.10101121E-00	-0.74969231E-01	0.11418581E-00	0.10101121E-00	0.11418581E-00	0.10101121E-00	0.11418581E-00	0.10101121E-00
22	0.24460176E-01	-0.72564246E-01	0.96701038E-01	0.10927774E-00	-0.10477092E-00	0.96701038E-01	0.10927774E-00	0.96701038E-01	0.10927774E-00	0.96701038E-01	0.10927774E-00
23	0.1678013E-01	-0.26610732E-02	-0.39861909E-02	-0.27472326E-01	0.18891216E-01	-0.39861909E-02	-0.27472326E-01	-0.39861909E-02	-0.27472326E-01	-0.39861909E-02	-0.27472326E-01
24	0.16421817E-01	0.71617020E-02	-0.18660112E-01	-0.43179245E-01	0.18709104E-01	-0.18660112E-01	-0.43179245E-01	-0.18660112E-01	-0.43179245E-01	-0.18660112E-01	-0.43179245E-01
25	0.69122624E-02	-0.16207665E-01	-0.56213467E-01	-0.73580721E-01	0.10535564E-01	-0.56213467E-01	-0.73580721E-01	-0.56213467E-01	-0.73580721E-01	-0.56213467E-01	-0.73580721E-01
26	0.27406729E-00	-0.18580301E-01	-0.26669874E-00	-0.26273084E-01	0.27194723E-00	-0.18580301E-01	-0.26669874E-00	-0.18580301E-01	-0.26669874E-00	-0.18580301E-01	-0.26669874E-00
27	0.23279787E-00	0.47209719E-01	0.18687098E-00	-0.20641397E-01	0.24293450E-00	0.47209719E-01	0.18687098E-00	0.47209719E-01	0.18687098E-00	0.47209719E-01	0.18687098E-00
28	0.16746651E-00	-0.16146087E-00	0.43751754E-01	-0.76792123E-02	0.28242986E-00	-0.16146087E-00	0.43751754E-01	-0.16146087E-00	0.43751754E-01	-0.16146087E-00	0.43751754E-01
29	0.6208515E-00	-0.17005892E-01	0.61905642E-00	-0.15777492E-01	0.51740253E-00	-0.17005892E-01	0.61905642E-00	-0.17005892E-01	0.61905642E-00	-0.17005892E-01	0.61905642E-00
30	0.54078807E-00	0.10627349E-00	0.47756577E-00	0.87178588E-02	-0.56165861E-00	0.10627349E-00	0.47756577E-00	0.10627349E-00	0.47756577E-00	0.10627349E-00	0.47756577E-00
31	0.38014037E-00	0.35120611E-00	0.19321877E-00	0.5769036E-01	0.44759879E-00	0.35120611E-00	0.19321877E-00	0.35120611E-00	0.19321877E-00	0.35120611E-00	0.19321877E-00
32	0.10000000E-01	-0.16024661E-09	0.10000000E-01	0.14353787E-10	0.10000000E-01	-0.16024661E-09	0.10000000E-01	-0.16024661E-09	0.10000000E-01	-0.16024661E-09	0.10000000E-01
33	0.87357331E-00	0.17244074E-00	0.79020289E-00	0.30871112E-01	0.90711847E-00	0.17244074E-00	0.79020289E-00	0.17244074E-00	0.79020289E-00	0.17244074E-00	0.79020289E-00
34	0.62077890E-00	0.51668162E-00	0.37065931E-00	0.31646099E-00	0.72057235E-00	0.51668162E-00	0.37065931E-00	0.51668162E-00	0.37065931E-00	0.51668162E-00	0.37065931E-00
1	-0.92504975E-03	0.93262222E-03	0.18041662E-02	-0.58767274E-03	-0.24390627E-00	0.93262222E-03	0.18041662E-02	0.93262222E-03	0.18041662E-02	0.93262222E-03	0.18041662E-02
2	0.31782584E-04	0.26616188E-03	-0.36181460E-03	-0.11642730E-03	0.58044307E-01	0.26616188E-03	-0.36181460E-03	0.26616188E-03	-0.36181460E-03	0.26616188E-03	-0.36181460E-03
3	0.43283244E-03	-0.96723764E-04	-0.11493906E-03	0.44723365E-03	0.15177264E-00	-0.96723764E-04	-0.11493906E-03	-0.96723764E-04	-0.11493906E-03	-0.96723764E-04	-0.11493906E-03
4	0.40695703E-03	-0.31201121E-03	-0.1084631E-02	0.29295966E-03	0.13384647E-00	-0.31201121E-03	-0.1084631E-02	-0.31201121E-03	-0.1084631E-02	-0.31201121E-03	-0.1084631E-02
5	0.24318340E-03	-0.3542113E-03	-0.46234126E-03	0.27227053E-03	0.39891023E-01	-0.3542113E-03	-0.46234126E-03	-0.3542113E-03	-0.46234126E-03	-0.3542113E-03	-0.46234126E-03
6	0.16587866E-03	-0.23513230E-03	0.17347059E-03	0.66193522E-04	-0.66032182E-01	-0.23513230E-03	0.17347059E-03	-0.23513230E-03	0.17347059E-03	-0.23513230E-03	0.17347059E-03
7	-0.67999191E-03	0.49847129E-04	0.45225609E-03	-0.98979372E-04	-0.11749825E-00	0.49847129E-04	0.45225609E-03	0.49847129E-04	0.45225609E-03	0.49847129E-04	0.45225609E-03
8	-0.12574041E-02	0.46278147E-03	0.9090633E-04	0.97631717E-04	-0.95320099E-01	0.46278147E-03	0.9090633E-04	0.46278147E-03	0.9090633E-04	0.46278147E-03	0.9090633E-04
9	-0.19643033E-02	0.91927980E-03	-0.10716333E-02	0.53684198E-03	0.5385645E-02	0.91927980E-03	-0.10716333E-02	0.91927980E-03	-0.10716333E-02	0.91927980E-03	-0.10716333E-02
10	-0.37408987E-02	0.15384384E-02	-0.42672402E-02	0.32742026E-02	0.27471348E-00	0.15384384E-02	-0.42672402E-02	0.15384384E-02	-0.42672402E-02	0.15384384E-02	-0.42672402E-02
11	0.11486693E-03	-0.71762861E-03	0.50539232E-02	0.67170595E-02	0.34317455E-01	-0.71762861E-03	0.50539232E-02	-0.71762861E-03	0.50539232E-02	-0.71762861E-03	0.50539232E-02
12	-0.29949489E-03	-0.40477574E-03	0.20945614E-02	-0.19574110E-02	-0.43080626E-01	-0.29949489E-03	-0.40477574E-03	-0.29949489E-03	-0.40477574E-03	-0.29949489E-03	-0.40477574E-03
13	-0.43841636E-03	-0.29026713E-03	0.80554839E-02	-0.13118583E-03	-0.10513201E-00	-0.43841636E-03	-0.29026713E-03	-0.43841636E-03	-0.29026713E-03	-0.43841636E-03	-0.29026713E-03
14	-0.37548815E-03	-0.30231203E-02	0.42979086E-01	0.47544463E-03	0.47492240E-01	-0.37548815E-03	-0.30231203E-02	-0.37548815E-03	-0.30231203E-02	-0.37548815E-03	-0.30231203E-02
15	0.52147434E-03	-0.20929553E-03	0.55440819E-01	-0.26875625E-01	0.2494260E-01	0.52147434E-03	-0.20929553E-03	0.52147434E-03	-0.20929553E-03	0.52147434E-03	-0.20929553E-03
16	0.13792341E-02	-0.26566883E-02	0.63716828E-01	-0.98244885E-01	-0.31704383E-02	-0.26566883E-02	0.63716828E-01	-0.26566883E-02	-0.98244885E-01	-0.31704383E-02	-0.98244885E-01
17	-0.61478865E-03	-0.62121715E-02	-0.10017049E-00	0.10563966E-00	0.72357753E-01	-0.61478865E-03	-0.62121715E-02	-0.61478865E-03	-0.62121715E-02	-0.61478865E-03	-0.62121715E-02

18	0.17225058E-02	-0.62436510E-02	0.12723211E 00	-0.58796207E-01	0.1193883E 00	-0.67376000E-01
19	0.45226913E-02	-0.63416453E-02	0.15393302E-00	-0.22202824E 00	0.21417902E 00	-0.11886922E 00
20	-0.10389786E-02	-0.95998119E-02	0.10520948E 00	0.16316877E 00	0.10139602E 00	0.62531884E-02
21	0.32153178E-02	-0.98977481E-02	0.21267430E 00	0.95305719E-01	0.23375024E 00	-0.84449741E-01
22	0.74576566E-02	-0.10197321E-01	0.26031623E 00	-0.35359403E 00	0.36606868E 00	-0.17611666E 00
23	0.19174331E-01	0.78182762E-03	0.22431251E-01	-0.14608828E-02	-0.14713282E-01	-0.23840352E-01
24	0.19748233E-01	-0.11182890E-02	0.19771925E-01	-0.25049075E-02	0.27567043E-01	-0.17716990E-02
25	0.12680259E-01	-0.87201233E-03	0.61059595E-02	-0.60174196E-03	0.10695563E 00	-0.42034919E-01
26	0.26672877E 00	0.17823589E-01	0.28883806E 00	0.21926976E-01	0.28696246E 00	-0.5621593E-02
27	0.24994495E 00	-0.41519362E-01	0.43519382E 00	-0.45374561E-01	0.24532552E 00	-0.33379213E-01
28	0.23429433E 00	-0.13254073E 00	0.14473862E 00	-0.18331261E 00	0.17523204E 00	-0.15301578E 00
29	0.61254319E 00	0.15702065E-01	0.63305537E 00	0.19803308E-01	0.64782142E 00	0.93919049E-03
30	0.57997976E 00	-0.82248144E-01	0.53760814E 00	-0.11630879E 00	0.53280940E 00	-0.12311946E 00
31	0.51189137E 00	-0.27741979E 00	0.34497288E 00	-0.38671102E 00	0.29900775E 00	-0.36946987E 00
32	0.10000000E 01	0.35264014E-08	0.10000000E 01	0.68221209E-09	0.10000000E 01	0.18497447E-11
33	0.93997211E 00	-0.14268900E 00	0.86207720E 00	-0.20056466E 00	0.82086171E 00	-0.19983097E 00
34	0.81866740E 00	-0.42791915E 00	0.58511584E 00	-0.60026543E 00	0.46106928E 00	-0.59772946E 00

1/k_r = 1.00

MODE	OMEGA (CPS)	DAMPING	VELOCITY (KNOTS)
1	0.7554/063E 02	-0.42216393E 00	0.37464703E 03
2	0.80316100E 02	0.16725060E-02	0.39829726E 03
3	0.11503940E 03	-0.19998281E 00	0.57049433E 03
4	0.13179774E 03	-0.51272719E 00	0.65368096E 03
5	0.17294732E 03	-0.25566096E 00	0.85766673E 03
6	0.17969207E 03	0.15541400E-02	0.69111472E 03

1/k_r = .666

MODE	OMEGA (CPS)	DAMPING	VELOCITY (KNOTS)
1	0.80206381E 02	0.17403223E-02	0.26491021E 03
2	0.93454539E 02	-0.26253529E 00	0.38865920E 03
3	0.11795854E 03	-0.10386371E 00	0.38959047E 03
4	0.14495671E 03	-0.31769228E 00	0.47875933E 03
5	0.1788941E 03	-0.16137299E-03	0.59386994E 03
6	0.20985074E 03	-0.42646878E 00	0.69044749E 03

1/k_r = .500

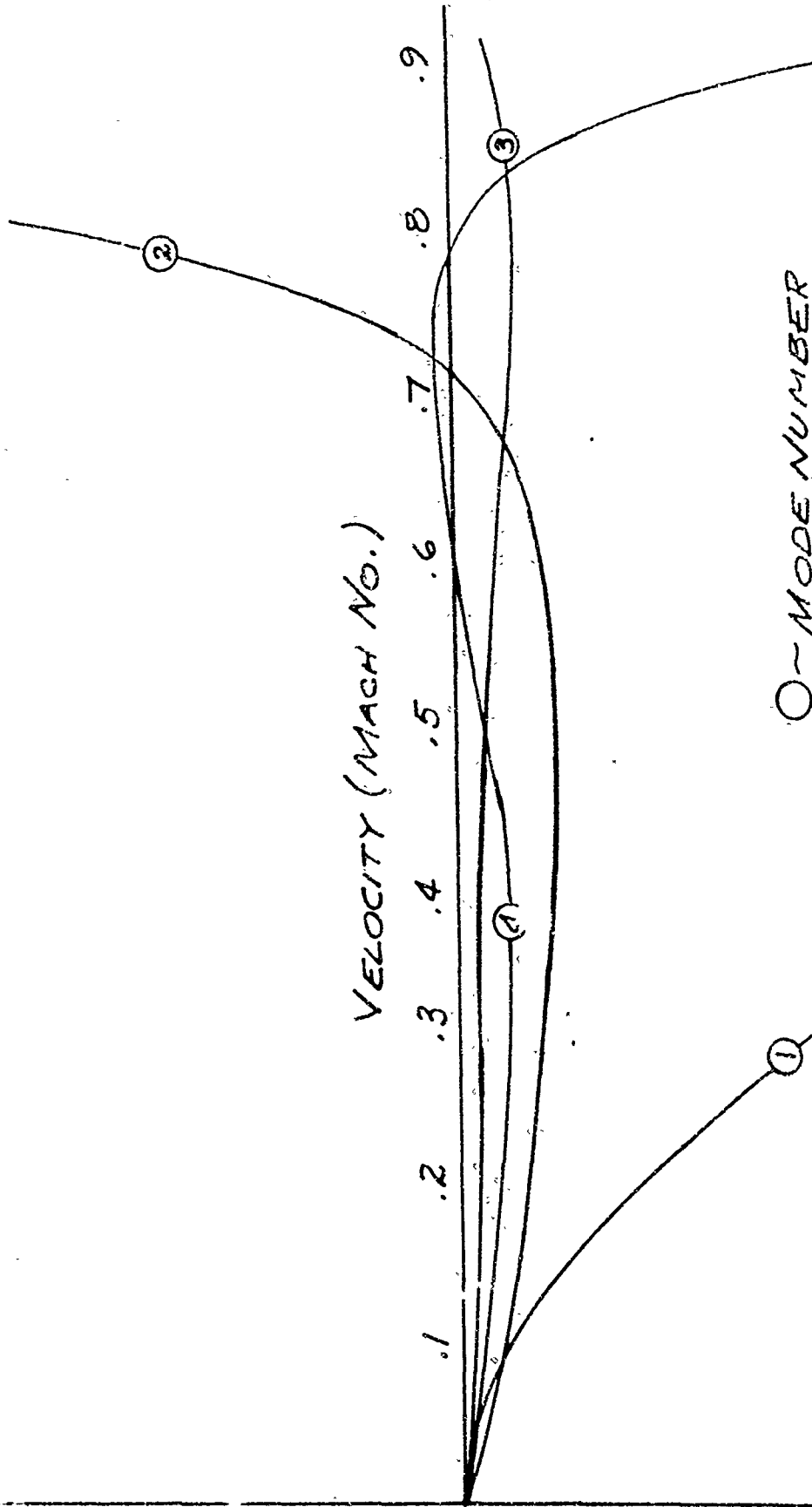
MODE	OMEGA (CPS)	DAMPING	VELOCITY (KNOTS)
1	0.80334597E 02	-0.71199755E-02	0.19919449E 03
2	0.93867853E 02	-0.24628489E 00	0.23280061E 03
3	0.11683951E 03	-0.33436035E-01	0.28971064E 03
4	0.15819281E 03	-0.31823869E 00	0.37241216E 03
5	0.17953335E 03	0.1729238E-02	0.44516301E 03
6	0.23483285E 03	-0.14656309E-01	0.58220227E 03

ARTIFICIAL STRUCTURAL DAMPING (%)

7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7

VELOCITY (MACH NO.)

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



○ ~ MODE NUMBER

FIGURE 4.4

TYPICAL "V-9" DIAGRAM

PART V - REFERENCES

1. W. P. Rodden, "A Matrix Approach to Flutter Calculations," Rept. NA-56-1070, 1 May 1956, North American Aviation, Inc.; published later as "A Matrix Approach to Flutter Analysis," Fairchild Fund Paper No. FF-23, May 1959, Institute of the Aeronautical Sciences.
2. W. P. Rodden, "On Vibration and Flutter Analysis With Free-Free Boundary Conditions," Journal of the Aeronautical Sciences, Vol. 28, 1961, pp 65-66.
3. C. E. Watkins, D. S. Woolston, and H. J. Cunningham, "A Systematic Kernel Function Procedure for Determining Aerodynamic Forces on Oscillating or Steady Finite Wings at Subsonic Speeds," Tech Rept. R-48, 1959, NASA.
4. P. T. Hsu, "Calculation of Pressure Distributions for Oscillating Wings of Arbitrary Planform in Subsonic Flow by the Kernel Function Method, Part I," Tech. Rept. 64-1, 1957, MIT, Aeroelastic and Structures Research Laboratory.
5. H. T. Vivian and L. V. Andrew, "Unsteady Aerodynamics for Advanced Configurations, Part I - Application of the Subsonic Kernel Function to Nonplanar Lifting Surfaces," Rept. FDL-TDR-64-152, Part I, 1965, Air Force Flight Dynamics Laboratory.
6. W. S. Rowe, "Collocation Method for Calculating the Aerodynamic Pressure Distributions on a Lifting Oscillating in Subsonic Compressible Flow," Proceedings of the AIAA Symposium on Structural Dynamics and Aeroelasticity, Boston, 1965, pp. 31-45.
7. M. T. Moore and A. C. Park, "Unsteady Aerodynamics for Missile Wings and Control Surfaces," Rept. SID 65-1254, March 1966, North American Aviation, Inc.
8. L. V. Andrew, "Unsteady Aerodynamics for Missile Wings and Control Surfaces," Rept. NA 67-574, 15 September 1967, North American Aviation, Inc.
9. E. R. Rodemich and L. V. Andrew, "Unsteady Aerodynamics for Advanced Configurations, Part II - A Transonic Box Method for Planar Lifting Surfaces," Rept. FDL-TDR 64-152, Part II, May 1965, Air Force Flight Dynamics Laboratory.

10. S. Pines, K. Dugundji, and J. Neuringer, "Aerodynamic Flutter Derivatives for a Flexible Wing with Supersonic and Subsonic Edge," Journal of the Aeronautical Sciences, Volume 22, No. 10, October 1955.
11. G. Zartarian and P. T. Hsu, "Theoretical Studies on the Prediction of Unsteady Supersonic Airloads on Elastic Wings, Parts I and II, Tech. Rept. 56-97, 1955, Wright Air Development Center.
12. M. T. Moore and L. V. Andrew, "Unsteady Aerodynamics for Advanced Configurations, Part IV - Application of the Supersonic Mach Box Method to Intersecting Planar Lifting Surfaces," Rept. FDL-TDR 64-152, Part IV, May 1975, Air Force Flight Dynamics Laboratory.
13. J. C. Evvard, "Use of Source Superposition Distributions for Evaluating Theoretical Aerodynamics of Thin Finite Wings at Supersonic Speeds," Rept. 951, 1950, NACA.

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13. ABSTRACT THIS STUDY COVERS THE DEVELOPMENT OF A SET OF COMPUTER PROGRAM TO PERFORM FLUTTER ANALYSIS BY THE COLLOCATION METHOD. WHILE THIS METHOD HAS BEEN KNOWN FOR SOME TIME, ONLY RECENTLY HAVE ADVANCES IN COMPUTER TECHNOLOGY MADE THE METHOD TECHNICALLY AND FINANCIALLY FEASIBLE. THE INGREDIENTS OF A COLLOCATION FLUTTER ANALYSIS ARE 1) A FLEXIBILITY MATRIX, 2) AERODYNAMIC INFLUENCE COEFFICIENT MATRIX, AND 3) AN EIGENVALUE SOLUTION. THIS STUDY IS PRESENTED IN FOUR VOLUMES. VOLUME I CONTAINS A GENERAL PROGRAM DISCUSSION. VOLUME II CONTAINS THE PROGRAM FLUENC WHICH CALCULATES THE FLEXIBILITY MATRIX. VOLUME III CONTAINS A SET OF THREE PROGRAMS TO CALCULATE AERODYNAMIC INFLUENCE COEFFICIENTS FOR SUBSONIC, TRANSONIC, AND SUPERSONIC FLIGHT REGIMES. VOLUME IV CONTAINS THE PROGRAM COFA WHICH SETS UP AND SOLVES THE FLUTTER EIGENVALUE MATRIX.			

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