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GENERAL PURPOSE COMPUTER PROGRAM  
FOR INTERACTING SUPERSONIC  
CONFIGURATIONS

USER'S MANUAL

BY

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Prepared under Contract No. NAS1-13986

BY

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FOR



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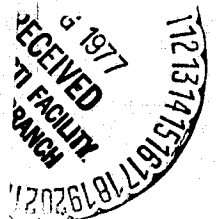
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## SUMMARY

This manual describes the input data required to execute program ISCON - an abbreviation for "Interacting Supersonic Configuration". The work accomplished by Bell Aerospace Textron under contract 1-13986 with the National Aeronautics and Space Administration, Langley Research Center, Hampton, Virginia. Sample cases are included which show both input and output.

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## INTRODUCTION

This manual describes the input data required to execute the computer program ISCON (Interacting Supersonic Configuration). A theoretical manual and a Programmer's Manual is also available (see References 1 and 2).

The purpose of the computer program is to generate a numerical procedure for the determination of unsteady aerodynamic forces on arbitrarily interacting wings and tails in supersonic flow. A velocity potential gradient method is used. Constant Mach number is assumed throughout the flow field. Lifting surfaces are represented by trapezoidal elements which can be generated automatically by the program. The wake field is represented by rectangular strip elements.

A short review of the formulation is presented as well as input overview and input format. Instruction on how to use ISCON, a sample problem, and the restart feature are discussed. Program size limitations, computer program flow, and error messages are also included in this manual.

The appendix includes a description of the SS31 Program used to compute the coefficients of a surface spline.

# SECTION 1

## FORMULATION

The equations used for the computer program are presented here. A complete description of these equations will be found in Reference 1.

### 1. Generated Downwash Influence Coefficients, Matrix W

(Subprogram LOOPW)

The influence coefficients of the velocity components are given by

$$W_{ij,2n} = \iint F_{2n,ij} d\xi d\eta \quad (1)$$

where  $i$  = receiving element

$j$  = influencing element

and  $n$  denotes the  $n$ th term in the series.

For  $n=0$  and  $1$ , the integrals are evaluated in closed form, while for  $n > 2$  numerical integrations of Gaussian type are used.

### 2. Input Downwash

(Subprograms ROMODE, MAIN)

Input downwash is defined as

$$\frac{d\eta}{dt} = \left[ ik\eta + \frac{d\eta}{dx} \right] e^{\frac{ik' Mx}{\beta}} \quad (2)$$

for a given mode  $\eta$ , where  $\eta$  is defined at the center of every element. The modes ( $\eta$ ) may be either input in the structural grid system or generated by polynomial expressions. In the former case,  $\frac{d\eta}{dx}$  is determined using spline equation. When a polynomial is input,  $\frac{d\eta}{dx}$  is computed directly in the program.

### 3. Potential Gradient

(Subprogram ITRATE,MAIN)

The potential gradient may now be defined in terms of the input downwash and the generated downwash influence coefficients

$$\frac{\partial \phi}{\partial X} = [W^{-1}] \left[ \frac{dn}{dt} - [W_{TE}] \phi_{TE} \right] \quad (3)$$

where

$[W_{TE}]$  = downwash coefficients for Wake elements

$\phi_{TE}$  = velocity potentials of the trailing edge elements

The equation is solved by relaxation technique (see References 2 and 4). When wake effects are considered, equation is solved by iteration.

### 4. Pressure

Subprograms PHIL,MAIN)

The velocity potential  $\phi$  is determined by integrating the potential gradient  $\frac{\partial \phi}{\partial X}$  for each span. The pressures in each element may now be determined from the equation:

$$\Delta P = \left[ -\frac{ik\phi}{\beta} + \frac{\partial \phi}{\partial X} \right] e^{-\frac{ik^1 M^2 X}{\beta}} \quad (4)$$

### 5. The Generalized Aerodynamic Coefficients (Subprogram MAIN)

The generalized aerodynamic coefficients are then given by

$$Q_{ij} = q \ell^3 \gamma_{ij} \quad (5)$$

where  $q = 1/2 \rho V^2$  the dynamic pressure

$\ell$  = is a reference length

and  $\gamma_{ij}$  is the nondimensional aerodynamic coefficients

(This is output by the program)

$\gamma_{ij}$  in the program is calculated as follows:

$$\tilde{Q}_{ij} = 4 \pi \sum_{\ell=1 \dots NE} \eta_i^\ell \Delta P_j^\ell A^\ell \quad (6)$$

where

$\eta_i$  is the  $i$ th deformation mode

$\Delta P_j$  is the  $j$ th pressure mode

and  $A^\ell$  is the area of the  $\ell$ th element

## 6. Lift (Subprogram MAIN)

The lift/unit span and total lift are generated, and output by the program

$$\begin{aligned} \text{Lift/Unit} &= \sum_j \Delta P_j^\ell A^\ell / \Delta S \\ \text{Span} & \\ j &= \text{over} \\ &\quad \text{chord elements only} \end{aligned} \quad (7)$$

$$\begin{aligned} \text{Total Lift} &= \sum_\ell \Delta P_j^\ell A^\ell \\ \ell &= \text{over} \\ &\quad \text{all elements} \end{aligned} \quad (8)$$

## 7. Moment (Subprogram MAIN)

The moment/Unit span =

$$\begin{aligned} &\sum_\ell (X_p - X_\ell) \Delta P_j^\ell A^\ell / \Delta S \\ \ell &= \text{over chord elements only} \end{aligned} \quad (9)$$

where

$X_p$  = position of the pitch axis

$X_\ell$  = X coordinate of the center of the  $\ell^{\text{th}}$  element

Total Moment =

$$\begin{aligned} &\sum_\ell (X_p - X_\ell) \Delta P_j^\ell A^\ell \\ \ell &= \text{over all elements} \end{aligned} \quad (10)$$



## SECTION 2

### INPUT OVERVIEW

The input package for this program expects to find required data arranged in a specific order. Each card type is identified by a label field carrying an applicable name in columns 1-6. These label fields are used by the program as an identifier for checking, that correct data has been input. The input package supplied with this program will accept the following label card fields.

1. TITLE
2. RUN
3. WING
4. CORNER
5. PERCNT
6. LINE
7. GRID
8. SPAN
9. CHORD
10. FREQ
11. MODE
12. MDWING
13. MDPOLY
14. RIGM
15. END

Section 1 (TITLE) must be the first card.

Sections 5, 6, 7, 8, 9, 12, 13 and 14 are optional.

Section 14 (END) must be the last card.

Failure to observe these rules will terminate execution.

One general format describes most input cards. This format can be set up as shown in Figure 2.1. This general format is (A6, 9I2, 4E12.0), the actual input for each section, however, changes since all fields are not needed as follows:

|     | LABEL  | FORMAT               | PAGE |
|-----|--------|----------------------|------|
| 1.  | TITLE  | A6, 56A1             | 3.9  |
| 2.  | RUN    | A6, 3I2, 12X, 4E12.0 | 3.10 |
| 3.  | WING   | A6, 9I2, 2E12.0      | 3.12 |
| 4.  | CORNER | A6, I2, 16X, 3E12.0  | 3.16 |
| 5.  | PERCNT | A6, I2, 16X, 4E12.0  | 3.17 |
| 6.  | LINE   | A6, 2I2, 14X, 2E12.0 | 3.18 |
| 7.  | GRID   | A6, 2I2              | 3.20 |
| 8.  | SPAN   | A6, 2I2, 14X, 1E12.0 | 3.21 |
| 9.  | CHROD  | A6, I2, 16X, 2E12.0  | 3.22 |
| 10. | FREQ   | A6, I2, 16X, 4E12.0  | 3.23 |
| 11. | MODE   | A6, 4I2              | 3.25 |
| 12. | MDWING | A6, 4I2              | 3.26 |
| 13. | MDPOLY | A6, 3I2, 6X, 6E9.0   | 3.28 |
| 14. | RIGM   | A6, I2               | 3.29 |
| 15. | END    | A6                   | 3.30 |

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|        | 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 |  |  |  |  |  |
|--------|-------------------------|---|---|---|---|----|---|---|---|----|----|----|----|----|----|-------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|--|--|--|
| LABEL  | ← INTEGER DATA →        |   |   |   |   |    |   |   |   |    |    |    |    |    |    | ← FLOATING POINT DATA → |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| TITLE  | ← 56 CHARACTER TITLE →  |   |   |   |   |    |   |   |   |    |    |    |    |    |    |                         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| RUN    | I1 I2 I3                |   |   |   |   | F1 |   |   |   |    |    |    |    |    |    |                         |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F3 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| WING   | I1 I2 I3 I4 I5 I6 I7 I8 |   |   |   |   |    |   |   |   |    |    |    |    |    |    |                         |    |    | F1 |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| CORNER | I1                      |   |   |   |   | F1 |   |   |   |    |    |    |    |    |    |                         |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F3 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| PERCNT | I1                      |   |   |   |   | F1 |   |   |   |    |    |    |    |    |    |                         |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F3 |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F4 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| LINE   | I1 I2                   |   |   |   |   | F1 |   |   |   |    |    |    |    |    |    |                         |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| GRID   | I1 I2                   |   |   |   |   |    |   |   |   |    |    |    |    |    |    |                         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| SPAN   | I1 I2                   |   |   |   |   | F1 |   |   |   |    |    |    |    |    |    |                         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| CHORD  | I1                      |   |   |   |   | F1 |   |   |   |    |    |    |    |    |    |                         |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| FREQ   | I1                      |   |   |   |   | F1 |   |   |   |    |    |    |    |    |    |                         |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F3 |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F4 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |
| MODE   | I1 I2 I3 I4             |   |   |   |   |    |   |   |   |    |    |    |    |    |    |                         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |

FIGURE 2.1 - BASIC INPUT FORMATS

Figure 2.1 - (CONTINUED) - Basic Input Formats

| 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 |  |  |  |  |  |  |    |
|-------|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|--|--|--|--|----|
| MDWIN |   |   |   |   |   | I1 | I2 | I3 | I4 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |    |
| MDPOL |   |   |   |   |   | I1 | I2 | I3 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F1 |    |    |    |    |    |    |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    | F3 |    |    |    |    |    |    |    |    |    |    | F4 |    |    |    |    |    |    |    |    |    |    | F5 |    |    |    |    |  |  |  |  |  |  | F6 |
| RIGM  |   |   |   |   |   | I1 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |    |
| END   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |    |

### SECTION 3

#### INPUT FORMAT

For each problem to be run, there are 7 types of data described:

|                           | Pages |
|---------------------------|-------|
| A TITLE data              | 3.9   |
| B RUN data                | 3.10  |
| C Geometric Data          | 3.11  |
| D Grid Specification Data | 3.19  |
| E Frequency Data          | 3.23  |
| F MODE data               | 3.24  |
| G END data                | 3.30  |

Figure 3.1 includes all types of input and gives an overview of the input deck physical arrangement.

Figure 3.2 represents an annotated input form for the ISCON Program.

The pages following these figures describe each label section in detail.

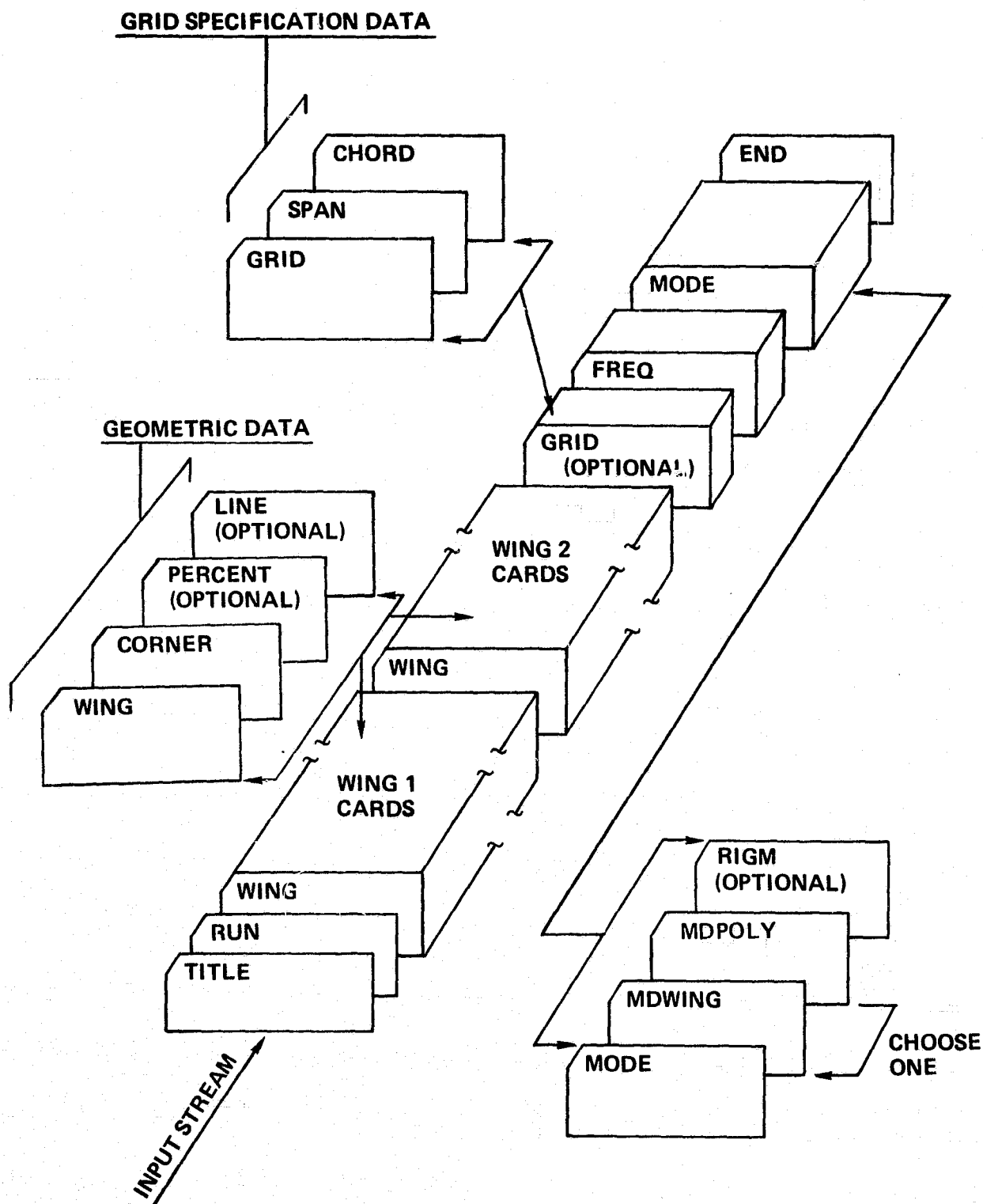


Fig. 3.1. Input Overview Physical Arrangement of Data Deck. The Label Identifiers are Shown in Their Relative Locations

## COMPUTER INPUT FORM

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FIGURE 3.2 - ANNOTATED INPUT FORM

| 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 |  |
|--|---|---|---|---|---|-------------------------|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| TITLE  |   |   |   |   |   | 56 CHARACTER TITLE      |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| RUN  |   |   |   |   |   | I1 I2 I3                |   |   | F1 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F3 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| I1 = RUN TYPE I2 = PLOT INDICATOR I3 = WAKE ELEMENT EFFECT CONTROL |   |   |   |   |   |                         |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| F1 = MACH NUMBER F2 = REFERENCE LENGTH F3 = PITCHING MOMENT AXIS   |   |   |   |   |   |                         |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| WING   |   |   |   |   |   | I1 I2 I3 I4 I5 I6 I7 I8 |   |   |    |    |    |    |    | F1 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| I1 = WING NUMBER I2 = NO. OF CORNER POINTS I3 = SYMMETRY CODE      |   |   |   |   |   |                         |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| I4 = PRINT CODE I5 = NO. OF SECTIONS ON WING (MAXIMUM OF 3)        |   |   |   |   |   |                         |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| I6, I7, I8, = NO. OF SPANS IN EACH SECTION                         |   |   |   |   |   |                         |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| F1 = ELEMENT ASPECT RATIO  |   |   |   |   |   |                         |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |
| F2 = WING ASPECT RATIO   |   |   |   |   |   |                         |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |

| 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 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|--|---|---|---|---|----|----|---|---|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| CORNER   |   |   |   |   | I1 |    |   |   |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    | F1 |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F3 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| I1 = CORNER POINT NUMBER                                     |   |   |   |   |    |    |   |   |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| F1 = X-COORDINATE  |   |   |   |   |    |    |   |   |    |    |    |    |    |    |    |    |    |    |    | F2 = Y-COORDINATE |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F3 = Z-COORDINATE |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PERCENT  |   |   |   |   | I1 |    |   |   |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    | F1 |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F3 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | F4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| I1 = CHORD LINE NUMBER F1 = PERCENTAGE FOR INBOARD-SECTION 1 |   |   |   |   |    |    |   |   |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| F2 = PERCENTAGE FOR OUTBOARD SECTION 1 - INBOARD SECTION 2   |   |   |   |   |    |    |   |   |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| F3 = PERCENTAGE FOR OUTBOARD SECTION 2 - INBOARD SECTION 3   |   |   |   |   |    |    |   |   |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| F4 = PERCENTAGE FOR OUTBOARD SECTION 3                       |   |   |   |   |    |    |   |   |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| LINE   |   |   |   |   | I1 | I2 |   |   |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    | F1 |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    | F2 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| I1 = SECTION NUMBER THAT CONTROL LINE IS IN                  |   |   |   |   |    |    |   |   |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| I2 = CONTROL LINE NUMBER (1 OR 2)                            |   |   |   |   |    |    |   |   |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |



☐ 029  
☐ 026  
EXT.

COMPUTER INPUT FORM

☐ RUN  
☐ HOLD

CUSTOMER

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ORIGINAL PAGE IS  
OF POOR QUALITY

IDENT NO.

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

F1 = X-COORDINATE AT BEGINNING OF CONTROL LINE

F2 = X-COORDINATE AT END OF CONTROL LINE

GRID I1/I2

I1 = WING NUMBER      I2 = SECTION NUMBER

FIGURE 3.2 - (CONTINUED) - ANNOTATED INPUT FORM

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

# COMPUTER INPUT FORM

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FIGURE 3.2 - (CONTINUED) - ANNOTATED INPUT FORM

| 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 |
|-------|---|---|---|---|---|----|---|---|----|----|----|----|----|----|------------------------------------|----|----|----|----|----|----|----|----|----|------------------|----|----|----|----|----|----|----|----|----|------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| SPAN  |   |   |   |   | I1                                      | I2 |   |   |    |    |    |    |    |    |                                    |    | F1 |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       |   |   |   |   | I1 = SPAN NUMBER                        |    |   |   |    |    |    |    |    |    | I2 = NUMBER OF CHORDS IN THIS SPAN |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       |   |   |   |   | F1 = SPAN WIDTH                         |    |   |   |    |    |    |    |    |    |                                    |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| CHORD |   |   |   |   | I1                                      |    |   |   |    |    |    |    |    |    |                                    | F1 |    |    |    |    |    |    |    |    |                  | F2 |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       |   |   |   |   | I1 = CHORD CARD NUMBER                  |    |   |   |    |    |    |    |    |    |                                    |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       |   |   |   |   | F1 = X-COORDINATE AT BEGINNING OF SPAN  |    |   |   |    |    |    |    |    |    |                                    |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       |   |   |   |   | F2 = X-COORDINATE AT END OF SPAN        |    |   |   |    |    |    |    |    |    |                                    |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| FREQ  |   |   |   |   | I1                                      |    |   |   |    |    |    |    |    |    |                                    | F1 |    |    |    |    |    |    |    |    |                  | F2 |    |    |    |    |    |    |    |    |                  | F3 |    |    |    |    |    |    |    |    |    | F4 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       |   |   |   |   | I1 = NUMBER OF FREQUENCIES (12 MAXIMUM) |    |   |   |    |    |    |    |    |    |                                    |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|       |   |   |   |   | F1 = FREQUENCY 1                        |    |   |   |    |    |    |    |    |    | F2 = FREQUENCY 2                   |    |    |    |    |    |    |    |    |    | F3 = FREQUENCY 3 |    |    |    |    |    |    |    |    |    | F4 = FREQUENCY 4 |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

# COMPUTER INPUT FORM

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FIGURE 3.2-(CONTINUED)-ANNOTATED INPUT FORM

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

MODE I1I2I3I4

I1 = TOTAL NUMBER OF MODES I2 = NUMBER OF STRUCTURAL DYNAMIC MODES

I3 = NUMBER OF RIGID BODY MODES I4 = MODE DEFINITION OPTION

MDWING I1I2I3I4

I1 = WING NUMBER I2, I3, I4 = SECTION NUMBERS CORRESPONDING TO  
SPLINE DATA WHICH FOLLOWS

MDPOLY I1I2I3

|    |    |    |    |    |    |
|----|----|----|----|----|----|
| F1 | F2 | F3 | F4 | F5 | F6 |
|----|----|----|----|----|----|

I1 = EQUATION NUMBER I2 = WING NUMBER I3 = MODE NUMBER

F1 = COEFFICIENT OF CONSTANT F2 = COEFFICIENT OF X

F3 = COEFFICIENT OF Y F4 = COEFFICIENT OF XY

F5 = COEFFICIENT OF  $X^2$  F6 = COEFFICIENT OF  $Y^2$

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

## COMPUTER INPUT FORM

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|  |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|--|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 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 |
| <p>RIGM</p> <p>II</p> <p>II = MODE NUMBER</p> <p>END</p> |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

FIGURE 3.2 - (CONTINUED) - ANNOTATED INPUT FORM

A. TITLE Data - First Card

(A5, 1X, 56A1)

|   |   |   |   |   |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| T | I | T | L | E |

TITLE for Run

7 - 62

(56 BCD Characters)



Problem description may be defined by this card. It must be the first card in a case. It is used to identify both plot output and computer program results. This card is mandatory.

B. RUN DATA - Card 2

(A3, 3X, 3I2, 12X, 3E12.0)

This card is mandatory.

1 2 3

|   |   |   |
|---|---|---|
| R | U | N |
|---|---|---|

7 8

|  |  |
|--|--|
|  |  |
|--|--|

a. Run TYPE

01 execute run

02 check run

03 RESTART run

9 10

|  |  |
|--|--|
|  |  |
|--|--|

b. PLOT indicator

00 NO plot

01 plot is desired

11 12

|  |  |
|--|--|
|  |  |
|--|--|

c. Wake element effect

00 NO wake element effect

01 Wake element effect is computed  
when present

25 - 36

|  |  |
|--|--|
|  |  |
|--|--|

d. Mach number (E12.0) (M)

37 - 48

|  |  |
|--|--|
|  |  |
|--|--|

e. Reference length (E12.0) (l)

49 - 60

|  |  |
|--|--|
|  |  |
|--|--|

f. Pitching axis (E12.0) ( $X_p$ )

C.           Geometric Data

This information is described on four card types: WING, CORNER, PERCNT, and LINE, and must be in this order. As a group, they define the geometric data for a given wing. A separate group must appear for each wing. The first card in the group is the WING data card. This card defines how the wing is to be subdivided into sections and spans. The CORNER cards follow and define the coordinates of the wing. An automatic mesh is generated and chord line percentages may be defined with the use of optional PERCNT card. To define the control surfaces optional hinge lines are defined by LINE cards (see Fig. 5-2.

1. WING

(A4, 2X, 9I2, 2E12.0)

This is the first card of each wing data group    1   2   3   4

W   I   N   G

7   8

Wing number

9   10

Number of corner points

11   12

Symmetry Code

01 Symmetric Mode

-1 Antisymmetric Mode

00 No symmetry (e.g., Fin)

13   14

Print Code

00, 01, 02, or 03

See remarks for definition

15   16

Grid Generation Code

-1, 00, or a positive integer  $\leq 70$

See remarks for definition

17   18

Number of sections on wing

19   20   21   22   23   24

Number of spans per section

25   26

Element aspect ratio (see remarks) (AR)<sub>e</sub>

Wing aspect Ratio (see remarks)



## REMARKS

### 1. PRINT CODE

- a. Print option 00 corresponds to minimum standard output. This consists of the generalized aerodynamic coefficients and the total lift and pitching moment.
- b. Print option 01 requests a tabular print of lift and pitching moment per unit span for the wing.
- c. Print option 02 requests a tabular print of the velocity potentials and element pressures at the center of each element of the wing.
- d. Print option 03 requests both tables in b and c above.

### 2. GRID GENERATION CODE

- a. Grid option 00 indicates that the automatic grid generator will determine a mesh over this wing based on the number of spans in each section and the element aspect ratio input for this wing. Control lines, if present, are defined for each section with the use of the optional LINE card. No PERCNT cards are input for this wing.
- b. Grid option entered as a positive integer, equal to the number of chord lines for the wing, indicates that automatic grid generator will determine a mesh based on the number of spans in each section and the definition of the chord lines for this wing as input on the PERCNT cards. Control lines are determined from the definition of the chord lines on the PERCNT card. No LINE cards are input for this wing.

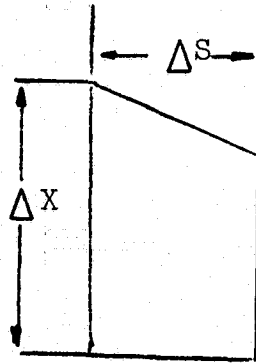
c. Grid option entered as -1, indicates that the automatic grid generator will determine a mesh based upon the grid option specified for the previous wing. A grid option of -1 may not be entered for wing number 1. In addition, if the grid option for the previous wing indicates a mesh defined by PERCNT cards, the chord line definition for the previous wing will be used for the current wing and no PERCNT cards need be input for this wing.

### 3. ELEMENT ASPECT RATIO

This input is required only when the grid generation code is input as 00. The element aspect ratio for a specific wing is found as follows.

In order to generate an appropriate number of elements in the stream direction, for various Mach ranges, any desired value of the element aspect ratio can be specified. This is defined as the ratio of the element chord to the element span; i.e.,

$$(AR)_{el} = \frac{\Delta X}{\Delta S} > 0$$



The suggested values are

$$AR_{el} \geq 1.0 \text{ for } M > \sqrt{2}$$

$$AR_{el} < 1.0 \text{ for } M < \sqrt{2}$$

Default value = 1.1

### 4. WING ASPECT RATIO

The aspect ratio of the wing is merely an optional user identification. It is used on both the printed and plotted output.

## 2. CORNER

(A6, I2, 16X, 3E12.0)

These cards define the coordinates of the corner points of the wing in the structural reference system.

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| C | O | R | N | E | R |

7 8

|  |  |
|--|--|
|  |  |
|--|--|

Corner point number

25 - 36

|  |  |
|--|--|
|  |  |
|--|--|

X Coordinate

37 - 48

|  |  |
|--|--|
|  |  |
|--|--|

Y Coordinate

49 - 60

|  |  |
|--|--|
|  |  |
|--|--|

Z Coordinate

These cards must be input for each corner point on the wing.

A maximum of 8 corner points may be defined.

STEP 4 PERCNT

(A4,2X,I2,16X,4E12.0)

These cards define the chord line percentages for the current wing and are required if the grid generation code on the WING card is a positive integer.

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| P | E | R | C | N | T |

Chord line number

|   |   |
|---|---|
| 7 | 8 |
|---|---|

Percentage inboard section 1

|    |   |    |
|----|---|----|
| 25 | - | 36 |
|----|---|----|

Percentage at outboard section 1  
inboard section 2

|    |    |
|----|----|
| 37 | 48 |
|----|----|

Percentage outboard section 2  
inboard section 3

|    |    |
|----|----|
| 49 | 60 |
|----|----|

Percentage outboard section 3

|    |    |
|----|----|
| 61 | 72 |
|----|----|

#### Remarks

1. Each PERCNT card defines a chord line percentage at both the beginning and end of each section of the wing. The chord line is defined as a percentage with values between 0.0 and 100.0.
2. The first chord line is usually given the value 0.0. The last chord line is usually given the value 100.0.
3. The number of percent chord cards must be exactly equal to the number entered on the grid generation code of the WING card for the current wing.

3. LINE

(A4, 2X, 2I2, 14X, 2E12.0)

These cards are optional and define control surfaces in a section. A maximum of two control surfaces are allowed per section.

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| L | I | N | E |

Section number that control  
line is in

|                      |                      |
|----------------------|----------------------|
| 7                    | 8                    |
| <input type="text"/> | <input type="text"/> |

Control line number (1 or 2)

|                      |                      |
|----------------------|----------------------|
| 9                    | 10                   |
| <input type="text"/> | <input type="text"/> |

X Coordinate of beginning  
of control line

|                      |   |                      |
|----------------------|---|----------------------|
| 25                   | - | 36                   |
| <input type="text"/> |   | <input type="text"/> |

X Coordinate of end of  
control line

|                      |   |                      |
|----------------------|---|----------------------|
| 37                   | - | 48                   |
| <input type="text"/> |   | <input type="text"/> |

Note: If two control lines in a section are required,  
then the first LINE card must define the leading  
control line.

D. Grid Specification Data (Optional)

The User has the option to define the specific element configuration of any or all sections. The information needed to specify the elements of a particular section is defined on the GRID, SPAN, and CHORD data cards. These cards, if present, follow the last geometric data group in the input deck. The group must be repeated for every section for which the User wishes to exactly define the grid. The data group for the lowest wing number and the lowest section number of that wing must appear first. The rest follows in ascending order.

1. GRID

(A4, 2X, 2I2)

This card is the first card of a grid specification data group.

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| G | R | I | D |

Wing number

|   |   |
|---|---|
| 7 | 8 |
|   |   |

Section number

|   |    |
|---|----|
| 9 | 10 |
|   |    |



## 2. SPAN\*

(A4, 2X, 2I2, 14X, E12.0)

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| S | P | A | N |

Span number

|                      |                      |
|----------------------|----------------------|
| 7                    | 8                    |
| <input type="text"/> | <input type="text"/> |

Number of chords in this  
span station

|                      |                      |
|----------------------|----------------------|
| 9                    | 10                   |
| <input type="text"/> | <input type="text"/> |

Span width

|                      |   |                      |
|----------------------|---|----------------------|
| 25                   | - | 36                   |
| <input type="text"/> |   | <input type="text"/> |

This card defines the span number, the number of chord lines in the span, and the span width.

This card is followed by the exact number of CHORD cards specified on this card. A SPAN card must be present for every span in the section (as defined on the appropriate WING card). The SPAN cards must appear in order of ascending span number.

\*This card must appear if GRID specified.

### 3. CHORD\*

(A4, I2, 16X, 2E12.0)

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| C | H | O | R | D |

**\*\*Chord card number**

| 9 | 10 |
|---|----|
|   |    |

First X coordinate

(The coordinate at the beginning  
of the span)

| 25 | - | 36 |
|----|---|----|
|    |   |    |

Second X coordinate

(The coordinate at the end of  
the span)

| 37 | - | 48 |
|----|---|----|
|    |   |    |

A CHORD card is needed for every chord line in the span.

This must correspond to the number of chord lines input

on the SPAN card. The card defines the X coordinates of

a single chord line. The CHORD cards must appear in order.

The first card in a given span must define the leading

edge of the span. Each successive CHORD card defines the

next chord line in the span, with the final CHORD line

defining the trailing edge line.

**\*Must appear if GRID specified.**

**\*\*The CHORD card number is merely a user convenience.**

If is only important that successive CHORD cards define

successive chord lines, and that the total number of

CHORD cards be defined on the preceding SPAN card. This

makes adding or deleting a chord line simple.

E. Frequency Data

(A4, 2X, I2, 16X, 4E12.0)

This data is mandatory. The numerical values of the reduced frequencies (k) are supplied here.

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| F | R | E | Q |

7 8

|  |  |
|--|--|
|  |  |
|--|--|

Number of frequencies

(must be  $\leq 12$ )

25 - 36

|  |  |
|--|--|
|  |  |
|--|--|

Frequency 1

37 - 48

|  |  |
|--|--|
|  |  |
|--|--|

Frequency 2

49 - 60

|  |  |
|--|--|
|  |  |
|--|--|

Frequency 3

61 - 72

|  |  |
|--|--|
|  |  |
|--|--|

Frequency 4

If more than 4 frequencies are required, they appear on succeeding cards with the format (24X, 4E12.0). A maximum of 12 frequencies may be input.

F. Modal Data

This data is defined by MODE, MDWING, MDPOLY, and RIGM data.

MODE is mandatory. MDWING, MDPOLY, and RIGM data is optional.

MODE identifies the types of modal data to follow.

MDWING data is input when spline coefficients are available as defined by References 3 and 5.

MDPOLY cards are used to define the modes by polynomial expressions.

RIGM cards are required to represent the rigid body modes for wings and control surfaces.

# MODE

(A4, 2X, 4I2)

This card identifies the beginning of the mode input data.

Exactly one MODE card is required for each run.

|   |   |   |   |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| M | O | D | E |

NM = Total number of modes

|   |   |
|---|---|
| 7 | 8 |
|   |   |

NS = Number of structural modes

|   |    |
|---|----|
| 9 | 10 |
|   |    |

NR = Number of rigid body modes

|    |    |
|----|----|
| 11 | 12 |
|    |    |

M = Mode definition option

|    |    |
|----|----|
| 13 | 14 |
|    |    |

M = 00 Structural modes are defined  
using spline coefficient (MDWING  
data)

M = A positive integer identifies  
that the structural modes are  
defined by polynomials on the  
MDPOLY cards. There will be  
exactly M "MDPOLY" cards  
following the mode card.

MDWING, MDPOLY and RIGM data cards may now follow.

1. MDWING

(A6, 4I2)

This card defines the wing number and section number for the modes and spline coefficients cards which follow.

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| M | D | W | I | N | G |

Wing number

|   |   |
|---|---|
| 7 | 8 |
|   |   |

List section numbers

which correspond to

the spline data which

follows

|   |    |
|---|----|
| 9 | 10 |
|   |    |

|    |    |
|----|----|
| 11 | 12 |
|    |    |

|    |    |
|----|----|
| 13 | 14 |
|    |    |

MDWING data must be defined for all sections.

Two types of data follow every MDWING card:

1. The coordinates of the structural grid, and
2. Mode/spline data.

The format of all this data corresponds to the punched output of program SS31, reference 3 and Appendix.

(1) Coordinates

N = no. grid points in structural grid

9 10 11

|  |  |  |
|--|--|--|
|  |  |  |
|--|--|--|

- 1) X Coordinate: header card for X (80A1)  
coordinates - used only as identifier.  
X Coordinates for each grid point N (5E15.7)  
values must be input.
- 2) Y Coordinates: header card for Y (80A1)  
coordinates - used only as identifier.  
Y Coordinates for each grid point N (5E15.7)  
values must be input.

(2) Mode/Spline Data

The modes in the structural grid and the spline coefficients are now input.

- a. Mode number identifier "MODE NUMBER 1" (80A1)
- b. Mode data identifier "(Z(I),I=1,N)" (80A1)
- c. Mode values list N values for Z (5E15.7)
- d. A spline coefficient header (80A1)  
"(A(I), I=1,N)"
- e. A spline coefficient values, list (5E15.7)  
N values for A
- f. B spline coefficient header (80A1)  
"(B(I), I=1,3)"
- g. B spline coefficient values, list 3 values (3E15.5)  
Repeat for a,b,c,d,e,f,g, for all modes.  
Z, A, and B are defined by program SS31.  
See reference 3 and reference 5.

## 2. MDPOLY

(A6, 3I2, 6X, 6E9.0)

Defines MODE equation

$$\eta = C_0 + C_x X + C_y Y + C_{xy} XY + C_{xx} X^2 + C_{yy} Y^2$$

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| M | D | P | O | L | Y |

Equation number

|                      |                      |
|----------------------|----------------------|
| 7                    | 8                    |
| <input type="text"/> | <input type="text"/> |

WING number

|                      |                      |
|----------------------|----------------------|
| 9                    | 10                   |
| <input type="text"/> | <input type="text"/> |

Mode number

|                      |                      |
|----------------------|----------------------|
| 11                   | 12                   |
| <input type="text"/> | <input type="text"/> |

$C_0$  = coefficient of constant

|                      |   |                      |
|----------------------|---|----------------------|
| 19                   | - | 27                   |
| <input type="text"/> |   | <input type="text"/> |

$C_x$  = coefficient of X

|                      |   |                      |
|----------------------|---|----------------------|
| 28                   | - | 36                   |
| <input type="text"/> |   | <input type="text"/> |

$C_y$  = coefficient of Y

|                      |   |                      |
|----------------------|---|----------------------|
| 37                   | - | 45                   |
| <input type="text"/> |   | <input type="text"/> |

$C_{xy}$  = coefficient of XY

|                      |   |                      |
|----------------------|---|----------------------|
| 46                   | - | 54                   |
| <input type="text"/> |   | <input type="text"/> |

$C_{xx}$  = coefficient of  $X^2$

|                      |   |                      |
|----------------------|---|----------------------|
| 55                   | - | 63                   |
| <input type="text"/> |   | <input type="text"/> |

$C_{yy}$  = coefficient of  $Y^2$

|                      |   |                      |
|----------------------|---|----------------------|
| 64                   | - | 72                   |
| <input type="text"/> |   | <input type="text"/> |

Each mode equation is identified by equation number, wing number and mode number.

Repeat MDPOLY for each equation. Where M = total no. of equations defined on MODE card.



### 3. RIGM

(A4, 2X, I2)

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| R | I | G | M |

Mode number = L.

| 7 | 8 |
|---|---|
|   |   |

Cards which define element number,  
modal values and the derivatives follow. (6X, I4, 14X, 2E12.0)

Element Number

| 7 | 8 | 9 | 10 |
|---|---|---|----|
|   |   |   |    |

Modal Value

| 25 | - | 36 |
|----|---|----|
|    |   |    |

Derivative with respect to X

| 37 | - | 48 |
|----|---|----|
|    |   |    |

This card must be repeated for all non-zero values. This section allows the User to input rigid mode data. These values must be based on the aerodynamic grid in the structural reference system. Since the grid is generated by the program, a "CHECK" run must be made first in order to define this data. RIGM section data must be repeated for all applicable modes in ascending order.

G. END

(A3)

|   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| E | N | D |

This card is mandatory. It must appear as the last card of a problem. The program will then recycle to the next case.

## SECTION 4

### HOW TO USE ISCON

Using ISCON requires 4 steps - • idealize the planform,

- prepare the input cards, • make plot and check runs and
- make execution runs.

#### Step 1. Idealization

Create a scale drawing of the planform (as shown in Figure 4.1):

- Define a reference system (x, y, z) such that the x axis is parallel to the center line (Figure 4.1).
- Idealize wings, sections, and spans as shown in Figure 4.2.
- Two sides of the sections must be parallel to x axis. Parallel sides are defined by the corner points as shown in Figure 4.2.
- Divide each section into subdivisions called spans. Each span is parallel to the x axis. Only the number of spans in each section are required for input.
- Define all control lines by their x coordinates of the end points.

## Step 2. INPUT Cards

The input cards for the ISCON program must now be defined. Details of these cards have been discussed in Section 3.

- a. TITLE cards
- b. Prepare the RUN card.
- c. Prepare WING and CORNER cards for the first wing. This information is supplied by Step 1 above.
- d. If chord lines are input as percentages, prepare PERCNT cards.
- e. If chord lines are not input as percentages, define LINE cards for control lines determined in Step 1. A LINE card is required for each control line. Repeat c. for each wing.
- f. After all wings have been defined, it may be desirable to input GRID cards for all sections for which an automatic grid is not desired. These cards define user specified elements.
- g. Prepare frequency data - FREQ card.
- h. Prepare MODE data.
- i. Supply END card.

## Step 3. Check and Plot Runs

Run the program using check and plot options on the RUN card. This will check input cards for sufficiency, generate the grid and plot the structure. Determine RIGM input if desired.

## Step 4. Execute Run

Examine the generated mesh. Change the RUN card to execute option if the input and mesh are satisfactory. Make the final computer run.

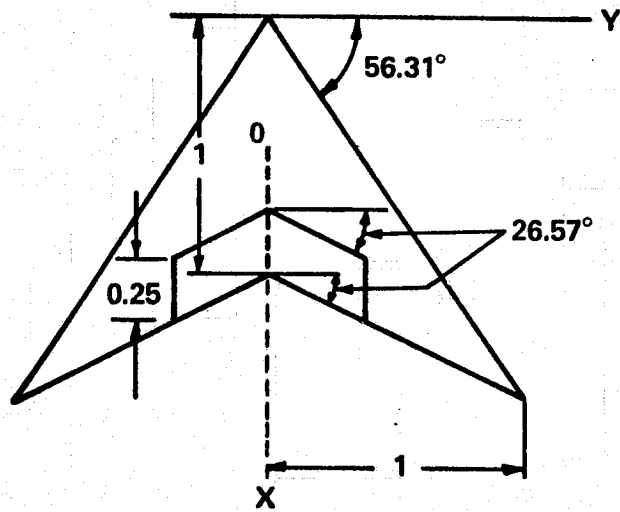


Figure 4.1. Arrowhead Wing  $AR = 4$

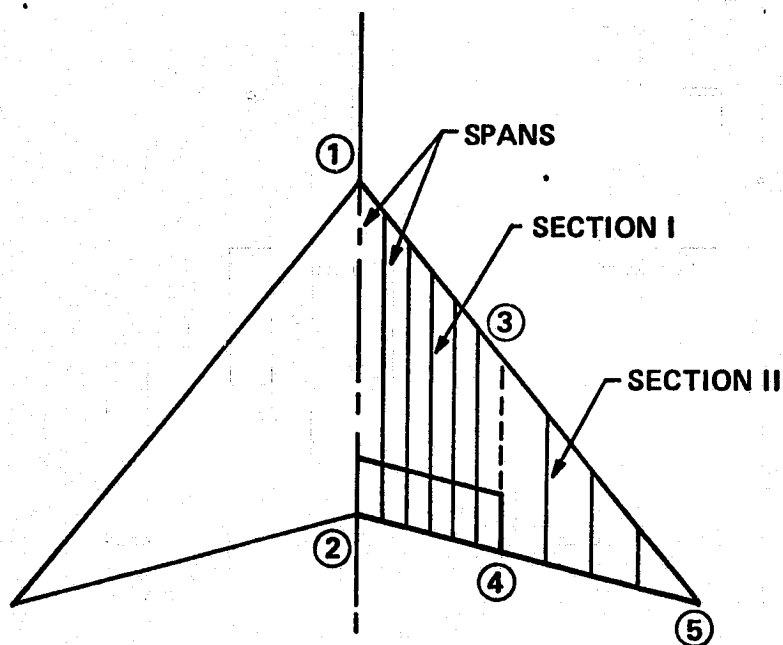


Figure 4.2. Idealization of Symmetric Arrowhead Wing

## SECTION 5

### SAMPLE PROBLEM/DATA/RESULTS

The purpose of this section is to demonstrate graphically how the user describes a plan form, the actual data required, and the results generated by the computer. Figure 5.1 shows a symmetric tapered swept back wing with one control line.

Figure 5.2 shows the idealization of the wing for input to the computer program. The wing is symmetric and, therefore, only the symmetric half need be input. Since the wing contained a control line, it was divided into 2 sections - I and II. A total of 6 corner points was therefore required to define the wing. The grid points on Figure 5.2 are indicated by numbers. The sections are shown by dotted lines.

INPUT cards necessary for the program are shown in Figure 5.3. This echo print of the data deck is output by the program.

The printout from a run is dependent on the print options defined by the USER on the WING cards. The test case described here requested all possible options. Output is shown on pages 5.6 through 5.48.

- ITEM A. Description of input data excluding modal input.
- ITEM B. Generated mesh. The coordinates of each element in each span are listed for every wing and section.
- ITEM C. Table of Influencing Sections. The table indicates the influence of the elements of each wing section on every other wing section.

ITEM D. Modal data. Two forms of printing modal data are presented for illustration purposes.

1. Modal data described by polynomial
2. Modal data described by spline coefficients is included in Figure 5.5.

ITEM E. Modal data generated for aerodynamic grid lists number and derivatives for each element.

ITEM F. The tables printed here are dependent on the print option defined on the WING cards.

1. Lift and pitching moments/unit span for all wings requested
2. Velocity potentials and element pressures for all wings requested

Output for frequency = .5 is shown.

ITEM G. Generalized aerodynamic coefficients are listed for each displacement mode on each pressure mode.

ITEM H. Total lift and pitching moments on every wing for every mode.

Repeat ITEMS F, G, and H for each frequency.

ITEM I. Job completed message:

END of execution

END of job

ITEM J. TIME print of cpu seconds used for each major task in the program is presented in a table.



Abnormal termination of this program may be caused by an error condition checked on by the program. A discussion of error messages is presented in Section 9. Poor input data will normally be the problem. When such an error is detected, the program cycles to the next case which begins with a TITLE card.

The output of a second computer run is Figure 5.5 for the same planform. This figure shows an example of spline modal input instead of polynomial modal input. No rigid body mode input is defined in this case.

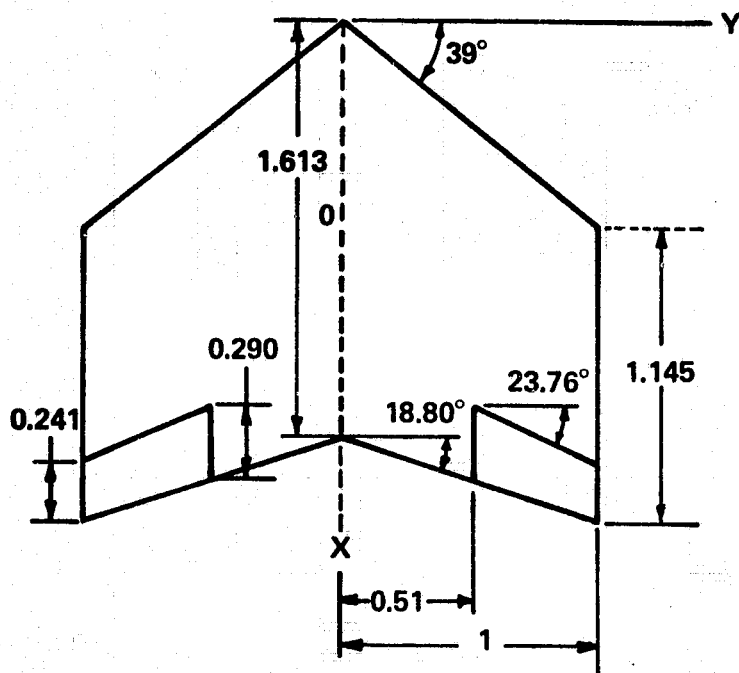


Figure 5.1. Tapered Swept-Back Wing  $AR = 1.45$

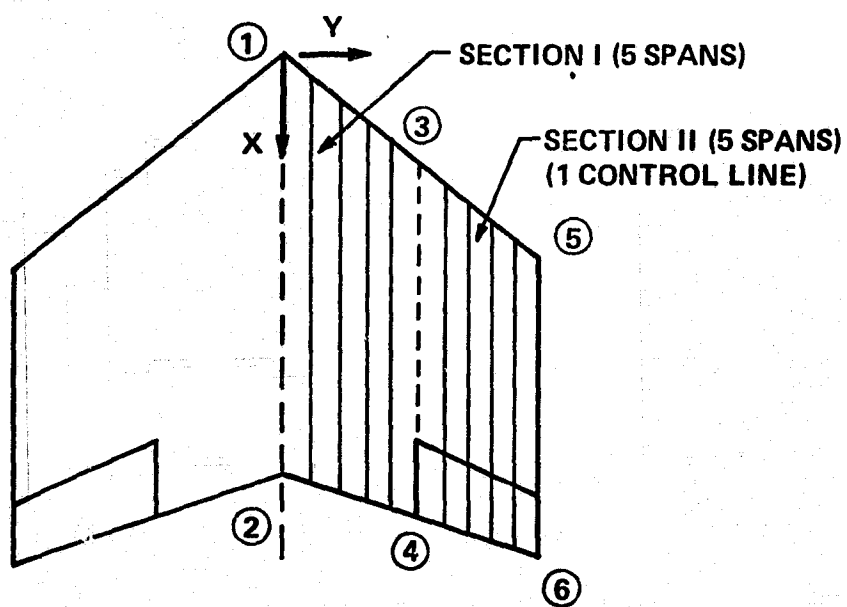


Fig. 5.2. Idealization of Tapered Swept Back Wing

\* \* \* \* ISCCN ANALYSIS INPUT DATA DECK \* \* \* \*

1 2 3 4 5 6 7 8  
1234567890123456789012345678901234567890123456789012345678901234567890

TITLE TAPERED SWEPT-BACK WING CASE 1  
RUN 1 0 0 1.20 1.0 0.8065  
WING 1 6 1 3 0 2 5 5 1.1 1.45  
CORNER 1 0.0 0.0  
2 1.613 0.0  
3 0.412990 0.51  
4 1.78662 0.51  
5 0.809784 1.0  
6 1.95478 1.0  
LINE 2 1 1.49662 1.71378  
FREQ 2 0.0 0.5 1.0  
MODE 5 4 1 4  
MDPOLY 1 1 1 1.0  
MDPOLY 2 1 2 -0.8065 1.0  
MDPOLY 3 1 3 0.6504 -1.613 1.0  
MDPOLY 4 1 4 1.0  
RIGM 5  
61 0.066250 .9152412  
62 0.196617 .9152412  
70 0.066305 .9152412  
71 0.192100 .9152412  
79 0.066258 .9152412  
80 0.187584 .9152412  
88 0.066232 .9152412  
89 0.183160 .9152412  
96 0.066287 .9152412  
97 0.178644 .9152412  
END

1234567890123456789012345678901234567890123456789012345678901234567890  
1 2 3 4 5 6 7 8

-5.6-

ORIGINAL PAGE IS  
OF POOR QUALITY

TAPERED SWEEPED-BACK WING CASE 1

MACH NUMBER 1.20000

REFERENCE LENGTH 1.00000

PITCHING MOMENT AXIS 0.80650

RUN TYPE CODE 1  
(COMPLETE RUN ATTEMPT)

PLOT REQUEST CODE 0  
(NO PLOTS ARE REQUESTED)

WAKE EFFECT CODE 0  
(WAKE EFFECT IS NOT CONSIDERED)

ORIGINAL PAGE IS  
OF POOR QUALITY

# DATA FOR WING 1

NUMBER OF CORNER POINTS 6  
 SYMMETRY CODE 1  
 (SYMMETRIC)  
 OUTPUT PRINT CODE 3  
 GRID GENERATION CODE 0  
 (GRID BASED ON ELEMENT ASPECT RATIO)  
 NUMBER OF SECTIONS 2  
 NUMBER OF SPANS IN  
 SECTION 1 5  
 SECTION 2 5  
 ELEMENT ASPECT RATIO 1.1000  
 ASPECT RATIO OF WING 1.4500

## COORDINATES OF THE CORNER POINTS OF WING 1

|   | X           | Y           | Z   |
|---|-------------|-------------|-----|
| 1 | 0.0         | 0.0         | 0.0 |
| 2 | 0.161300+01 | 0.0         | 0.0 |
| 3 | 0.412990+00 | 0.510000+00 | 0.0 |
| 4 | 0.178660+01 | 0.510000+00 | 0.0 |
| 5 | 0.809780+00 | 0.100000+01 | 0.0 |
| 6 | 0.195480+01 | 0.100000+01 | 0.0 |

## CONTROL LINES FOR WING 1

| SECTION | LINE | X1          | X2          |
|---------|------|-------------|-------------|
| 2       | 1    | 0.149660+01 | 0.171380+01 |

NUMBER OF FREQUENCIES 2  
 LIST OF FREQUENCIES 0.0 0.5000

TAPERED SWEPT-BACK WING CASE 1  
AERODYNAMIC GRID FOR MACH NUMBER 1.2000

STRUCTURAL REFERENCE SYSTEM OR  
ROTATED STRUCTURAL REFERENCE SYSTEM

WING 1 SECTION 1  
Z = 0.0

| SPAN | ELEMENT | X1          | X2          | X3          | X4          | Y1          | Y2          | XC          | YC          |
|------|---------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1    | 1       | 0.0         | 0.825980-01 | 0.229230+00 | 0.146640+00 | 0.0         | 0.102000+00 | 0.158610+00 | 0.510000-01 |
| 1    | 2       | 0.146640+00 | 0.229230+00 | 0.375870+00 | 0.293270+00 | 0.0         | 0.102000+00 | 0.305240+00 | 0.510000-01 |
| 1    | 3       | 0.293270+00 | 0.375870+00 | 0.522510+00 | 0.439910+00 | 0.0         | 0.102000+00 | 0.451880+00 | 0.510000-01 |
| 1    | 4       | 0.439910+00 | 0.522510+00 | 0.669140+00 | 0.586550+00 | 0.0         | 0.102000+00 | 0.598520+00 | 0.510000-01 |
| 1    | 5       | 0.586550+00 | 0.669140+00 | 0.815780+00 | 0.723180+00 | 0.0         | 0.102000+00 | 0.745150+00 | 0.510000-01 |
| 1    | 6       | 0.723180+00 | 0.815780+00 | 0.962420+00 | 0.879820+00 | 0.0         | 0.102000+00 | 0.891790+00 | 0.510000-01 |
| 1    | 7       | 0.879820+00 | 0.962420+00 | 0.110910+01 | 0.102650+01 | 0.0         | 0.102000+00 | 0.105840+01 | 0.510000-01 |
| 1    | 8       | 0.102650+01 | 0.110910+01 | 0.125570+01 | 0.117310+01 | 0.0         | 0.102000+00 | 0.118510+01 | 0.510000-01 |
| 1    | 9       | 0.117310+01 | 0.125570+01 | 0.140230+01 | 0.131970+01 | 0.0         | 0.102000+00 | 0.132170+01 | 0.510000-01 |
| 1    | 10      | 0.131970+01 | 0.140230+01 | 0.154900+01 | 0.146640+01 | 0.0         | 0.102000+00 | 0.147830+01 | 0.510000-01 |
| 1    | 11      | 0.146640+01 | 0.154900+01 | 0.164770+01 | 0.161300+01 | 0.0         | 0.102000+00 | 0.150580+01 | 0.510000-01 |
| 2    | 12      | 0.165200+00 | 0.165200+00 | 0.311830+00 | 0.229230+00 | 0.102000+00 | 0.204000+00 | 0.241210+00 | 0.153000+00 |
| 2    | 13      | 0.229230+00 | 0.311830+00 | 0.458470+00 | 0.375870+00 | 0.102000+00 | 0.204000+00 | 0.387840+00 | 0.153000+00 |
| 2    | 14      | 0.375870+00 | 0.458470+00 | 0.605110+00 | 0.522510+00 | 0.102000+00 | 0.204000+00 | 0.534480+00 | 0.153000+00 |
| 2    | 15      | 0.522510+00 | 0.605110+00 | 0.751740+00 | 0.669140+00 | 0.102000+00 | 0.204000+00 | 0.681120+00 | 0.153000+00 |
| 2    | 16      | 0.669140+00 | 0.751740+00 | 0.898380+00 | 0.815780+00 | 0.102000+00 | 0.204000+00 | 0.827750+00 | 0.153000+00 |
| 2    | 17      | 0.815780+00 | 0.898380+00 | 0.104530+01 | 0.962420+00 | 0.102000+00 | 0.204000+00 | 0.974390+00 | 0.153000+00 |
| 2    | 18      | 0.962420+00 | 0.104530+01 | 0.119170+01 | 0.110910+01 | 0.102000+00 | 0.204000+00 | 0.112100+01 | 0.153000+00 |
| 2    | 19      | 0.110910+01 | 0.119170+01 | 0.133830+01 | 0.125570+01 | 0.102000+00 | 0.204000+00 | 0.126770+01 | 0.153000+00 |
| 2    | 20      | 0.125570+01 | 0.133830+01 | 0.148490+01 | 0.140230+01 | 0.102000+00 | 0.204000+00 | 0.141430+01 | 0.153000+00 |
| 2    | 21      | 0.140230+01 | 0.148490+01 | 0.163160+01 | 0.154900+01 | 0.102000+00 | 0.204000+00 | 0.150090+01 | 0.153000+00 |
| 2    | 22      | 0.154900+01 | 0.163160+01 | 0.168240+01 | 0.164770+01 | 0.102000+00 | 0.204000+00 | 0.165010+01 | 0.153000+00 |
| 3    | 23      | 0.165200+00 | 0.247790+00 | 0.394430+00 | 0.311830+00 | 0.204000+00 | 0.306000+00 | 0.325800+00 | 0.255000+00 |
| 3    | 24      | 0.311830+00 | 0.394430+00 | 0.541070+00 | 0.458470+00 | 0.204000+00 | 0.306000+00 | 0.470440+00 | 0.255000+00 |
| 3    | 25      | 0.458470+00 | 0.541070+00 | 0.687700+00 | 0.605110+00 | 0.204000+00 | 0.306000+00 | 0.617080+00 | 0.255000+00 |
| 3    | 26      | 0.605110+00 | 0.687700+00 | 0.834340+00 | 0.751740+00 | 0.204000+00 | 0.306000+00 | 0.763710+00 | 0.255000+00 |
| 3    | 27      | 0.751740+00 | 0.834340+00 | 0.980980+00 | 0.898380+00 | 0.204000+00 | 0.306000+00 | 0.910350+00 | 0.255000+00 |
| 3    | 28      | 0.898380+00 | 0.980980+00 | 0.112760+01 | 0.104530+01 | 0.204000+00 | 0.306000+00 | 0.105700+01 | 0.255000+00 |
| 3    | 29      | 0.104530+01 | 0.112760+01 | 0.127420+01 | 0.119170+01 | 0.204000+00 | 0.306000+00 | 0.120360+01 | 0.255000+00 |
| 3    | 30      | 0.119170+01 | 0.127420+01 | 0.142090+01 | 0.133830+01 | 0.204000+00 | 0.306000+00 | 0.135030+01 | 0.255000+00 |
| 3    | 31      | 0.133830+01 | 0.142090+01 | 0.156750+01 | 0.148490+01 | 0.204000+00 | 0.306000+00 | 0.149690+01 | 0.255000+00 |
| 3    | 32      | 0.148490+01 | 0.156750+01 | 0.171420+01 | 0.163160+01 | 0.204000+00 | 0.306000+00 | 0.164350+01 | 0.255000+00 |
| 3    | 33      | 0.163160+01 | 0.171420+01 | 0.171720+01 | 0.168240+01 | 0.204000+00 | 0.306000+00 | 0.169440+01 | 0.255000+00 |
| 4    | 34      | 0.247790+00 | 0.330390+00 | 0.477030+00 | 0.394430+00 | 0.306000+00 | 0.408000+00 | 0.406400+00 | 0.357000+00 |
| 4    | 35      | 0.394430+00 | 0.477030+00 | 0.623660+00 | 0.541070+00 | 0.306000+00 | 0.408000+00 | 0.553040+00 | 0.357000+00 |
| 4    | 36      | 0.541070+00 | 0.623660+00 | 0.770300+00 | 0.687700+00 | 0.306000+00 | 0.408000+00 | 0.694670+00 | 0.357000+00 |
| 4    | 37      | 0.687700+00 | 0.770300+00 | 0.916940+00 | 0.834340+00 | 0.306000+00 | 0.408000+00 | 0.846310+00 | 0.357000+00 |
| 4    | 38      | 0.834340+00 | 0.916940+00 | 0.106360+01 | 0.980980+00 | 0.306000+00 | 0.408000+00 | 0.992950+00 | 0.357000+00 |
| 4    | 39      | 0.980980+00 | 0.106360+01 | 0.121020+01 | 0.112760+01 | 0.306000+00 | 0.408000+00 | 0.113960+01 | 0.357000+00 |
| 4    | 40      | 0.112760+01 | 0.121020+01 | 0.135680+01 | 0.127420+01 | 0.306000+00 | 0.408000+00 | 0.128620+01 | 0.357000+00 |
| 4    | 41      | 0.127420+01 | 0.135680+01 | 0.150350+01 | 0.142090+01 | 0.306000+00 | 0.408000+00 | 0.143290+01 | 0.357000+00 |
| 4    | 42      | 0.142090+01 | 0.150350+01 | 0.165100+01 | 0.156750+01 | 0.306000+00 | 0.408000+00 | 0.157950+01 | 0.357000+00 |
| 4    | 43      | 0.156750+01 | 0.165100+01 | 0.179190+01 | 0.171720+01 | 0.306000+00 | 0.408000+00 | 0.170940+01 | 0.357000+00 |
| 5    | 44      | 0.330390+00 | 0.412990+00 | 0.559610+00 | 0.477030+00 | 0.408000+00 | 0.510000+00 | 0.439000+00 | 0.459000+00 |
| 5    | 45      | 0.477030+00 | 0.559610+00 | 0.706260+00 | 0.623660+00 | 0.408000+00 | 0.510000+00 | 0.635640+00 | 0.459000+00 |
| 5    | 46      | 0.623660+00 | 0.706260+00 | 0.852900+00 | 0.770300+00 | 0.408000+00 | 0.510000+00 | 0.742270+00 | 0.459000+00 |
| 5    | 47      | 0.770300+00 | 0.852900+00 | 0.999540+00 | 0.916940+00 | 0.408000+00 | 0.510000+00 | 0.928910+00 | 0.459000+00 |
| 5    | 48      | 0.916940+00 | 0.999540+00 | 0.114620+01 | 0.106360+01 | 0.408000+00 | 0.510000+00 | 0.107550+01 | 0.459000+00 |

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|   |    |             |             |             |             |             |             |             |             |
|---|----|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 5 | 49 | C.106360+01 | C.114820+01 | 0.129280+01 | 0.121020+01 | 0.408000+00 | 0.510000+00 | 0.122220+01 | 0.459000+00 |
| 5 | 50 | 0.121020+01 | 0.129280+01 | 0.143940+01 | 0.135680+01 | 0.408000+00 | 0.510000+00 | 0.136880+01 | 0.459000+00 |
| 5 | 51 | 0.135680+01 | 0.143940+01 | 0.158610+01 | 0.150350+01 | 0.408000+00 | 0.510000+00 | 0.151550+01 | 0.459000+00 |
| 5 | 52 | 0.150350+01 | 0.158610+01 | 0.173270+01 | 0.165010+01 | 0.408000+00 | 0.510000+00 | 0.166210+01 | 0.459000+00 |
| 5 | 53 | 0.165010+01 | 0.173270+01 | 0.178660+01 | 0.175190+01 | 0.408000+00 | 0.510000+00 | 0.175370+01 | 0.459000+00 |

# WING 1 SECTION 2

Z = 0.0

| SPAN | ELEMENT | X1          | X2          | X3          | X4          | Y1          | Y2          | XC          | YC          |
|------|---------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1    | 54      | 0.412590+00 | 0.492350+00 | 0.647150+00 | 0.507790+00 | 0.510000+00 | 0.608000+00 | 0.576510+00 | 0.559000+00 |
| 1    | 55      | 0.507790+00 | 0.647150+00 | 0.801950+00 | 0.722600+00 | 0.510000+00 | 0.608000+00 | 0.731320+00 | 0.559000+00 |
| 1    | 56      | 0.722600+00 | 0.801950+00 | 0.956760+00 | 0.877400+00 | 0.510000+00 | 0.608000+00 | 0.886120+00 | 0.559000+00 |
| 1    | 57      | 0.877400+00 | 0.956760+00 | 0.111150+01 | 0.103220+01 | 0.510000+00 | 0.608000+00 | 0.104090+01 | 0.559000+00 |
| 1    | 58      | 0.103220+01 | 0.111160+01 | 0.126040+01 | 0.118700+01 | 0.510000+00 | 0.608000+00 | 0.119570+01 | 0.559000+00 |
| 1    | 59      | 0.118700+01 | 0.126040+01 | 0.142120+01 | 0.134180+01 | 0.510000+00 | 0.608000+00 | 0.135050+01 | 0.559000+00 |
| 1    | 60      | 0.134180+01 | 0.142120+01 | 0.154010+01 | 0.149660+01 | 0.510000+00 | 0.608000+00 | 0.149100+01 | 0.559000+00 |
| 1    | 61      | 0.149660+01 | 0.154010+01 | 0.168510+01 | 0.164160+01 | 0.510000+00 | 0.608000+00 | 0.163430+01 | 0.559000+00 |
| 1    | 62      | 0.164160+01 | 0.168510+01 | 0.182030+01 | 0.173600+01 | 0.510000+00 | 0.608000+00 | 0.177540+01 | 0.559000+00 |
| 2    | 63      | 0.492350+00 | 0.571710+00 | 0.726510+00 | 0.647150+00 | 0.608000+00 | 0.706000+00 | 0.655870+00 | 0.657000+00 |
| 2    | 64      | 0.647150+00 | 0.726510+00 | 0.881320+00 | 0.801960+00 | 0.608000+00 | 0.706000+00 | 0.810680+00 | 0.657000+00 |
| 2    | 65      | 0.801960+00 | 0.881320+00 | 0.103610+01 | 0.956760+00 | 0.608000+00 | 0.706000+00 | 0.965480+00 | 0.657000+00 |
| 2    | 66      | 0.956760+00 | 0.103610+01 | 0.119090+01 | 0.111160+01 | 0.608000+00 | 0.706000+00 | 0.112030+01 | 0.657000+00 |
| 2    | 67      | 0.111160+01 | 0.119090+01 | 0.134570+01 | 0.126040+01 | 0.608000+00 | 0.706000+00 | 0.127510+01 | 0.657000+00 |
| 2    | 68      | 0.126040+01 | 0.134570+01 | 0.150050+01 | 0.142120+01 | 0.608000+00 | 0.706000+00 | 0.142990+01 | 0.657000+00 |
| 2    | 69      | 0.142120+01 | 0.150050+01 | 0.158350+01 | 0.154010+01 | 0.608000+00 | 0.706000+00 | 0.154160+01 | 0.657000+00 |
| 2    | 70      | 0.154010+01 | 0.158350+01 | 0.172850+01 | 0.168510+01 | 0.608000+00 | 0.706000+00 | 0.167780+01 | 0.657000+00 |
| 2    | 71      | 0.168510+01 | 0.172850+01 | 0.185390+01 | 0.182030+01 | 0.608000+00 | 0.706000+00 | 0.181100+01 | 0.657000+00 |
| 2    | 72      | 0.571710+00 | 0.651070+00 | 0.805870+00 | 0.726510+00 | 0.706000+00 | 0.804000+00 | 0.735230+00 | 0.755000+00 |
| 3    | 73      | 0.726510+00 | 0.805870+00 | 0.960670+00 | 0.881320+00 | 0.706000+00 | 0.804000+00 | 0.890030+00 | 0.755000+00 |
| 3    | 74      | 0.805870+00 | 0.960670+00 | 0.115500+01 | 0.103610+01 | 0.706000+00 | 0.804000+00 | 0.104480+01 | 0.755000+00 |
| 3    | 75      | 0.103610+01 | 0.115500+01 | 0.127030+01 | 0.119090+01 | 0.706000+00 | 0.804000+00 | 0.119960+01 | 0.755000+00 |
| 3    | 76      | 0.119090+01 | 0.127030+01 | 0.142510+01 | 0.134570+01 | 0.706000+00 | 0.804000+00 | 0.135440+01 | 0.755000+00 |
| 3    | 77      | 0.134570+01 | 0.142510+01 | 0.157990+01 | 0.150050+01 | 0.706000+00 | 0.804000+00 | 0.150930+01 | 0.755000+00 |
| 3    | 78      | 0.150050+01 | 0.157990+01 | 0.162690+01 | 0.158350+01 | 0.706000+00 | 0.804000+00 | 0.159220+01 | 0.755000+00 |
| 3    | 79      | 0.158350+01 | 0.162690+01 | 0.177150+01 | 0.172850+01 | 0.706000+00 | 0.804000+00 | 0.172120+01 | 0.755000+00 |
| 3    | 80      | 0.172850+01 | 0.177150+01 | 0.188750+01 | 0.185390+01 | 0.706000+00 | 0.804000+00 | 0.184660+01 | 0.755000+00 |
| 4    | 81      | 0.651070+00 | 0.730430+00 | 0.885230+00 | 0.805870+00 | 0.804000+00 | 0.902000+00 | 0.814590+00 | 0.853000+00 |
| 4    | 82      | 0.805870+00 | 0.885230+00 | 0.104000+01 | 0.960670+00 | 0.804000+00 | 0.902000+00 | 0.969390+00 | 0.853000+00 |
| 4    | 83      | 0.960670+00 | 0.104000+01 | 0.119480+01 | 0.111550+01 | 0.804000+00 | 0.902000+00 | 0.112420+01 | 0.853000+00 |
| 4    | 84      | 0.111550+01 | 0.119480+01 | 0.134960+01 | 0.127030+01 | 0.804000+00 | 0.902000+00 | 0.127900+01 | 0.853000+00 |
| 4    | 85      | 0.127030+01 | 0.134960+01 | 0.150440+01 | 0.142510+01 | 0.804000+00 | 0.902000+00 | 0.143380+01 | 0.853000+00 |
| 4    | 86      | 0.142510+01 | 0.150440+01 | 0.165930+01 | 0.157990+01 | 0.804000+00 | 0.902000+00 | 0.158800+01 | 0.853000+00 |
| 4    | 87      | 0.165930+01 | 0.167030+01 | 0.177030+01 | 0.162690+01 | 0.804000+00 | 0.902000+00 | 0.164280+01 | 0.853000+00 |
| 4    | 88      | 0.167030+01 | 0.177030+01 | 0.181530+01 | 0.177150+01 | 0.804000+00 | 0.902000+00 | 0.176460+01 | 0.853000+00 |
| 4    | 89      | 0.177150+01 | 0.181530+01 | 0.192110+01 | 0.188750+01 | 0.804000+00 | 0.902000+00 | 0.188220+01 | 0.853000+00 |
| 5    | 90      | 0.730430+00 | 0.809730+00 | 0.964590+00 | 0.885230+00 | 0.902000+00 | 0.100000+01 | 0.893950+00 | 0.951000+00 |
| 5    | 91      | 0.809730+00 | 0.964590+00 | 0.111940+01 | 0.104000+01 | 0.902000+00 | 0.100000+01 | 0.104880+01 | 0.951000+00 |
| 5    | 92      | 0.104000+01 | 0.111940+01 | 0.127420+01 | 0.119480+01 | 0.902000+00 | 0.100000+01 | 0.127360+01 | 0.951000+00 |
| 5    | 93      | 0.119480+01 | 0.127420+01 | 0.142900+01 | 0.134960+01 | 0.902000+00 | 0.100000+01 | 0.135840+01 | 0.951000+00 |
| 5    | 94      | 0.134960+01 | 0.142900+01 | 0.158380+01 | 0.150440+01 | 0.902000+00 | 0.100000+01 | 0.151320+01 | 0.951000+00 |
| 5    | 95      | 0.150440+01 | 0.158380+01 | 0.171360+01 | 0.167030+01 | 0.902000+00 | 0.100000+01 | 0.166250+01 | 0.951000+00 |
| 5    | 96      | 0.167030+01 | 0.171360+01 | 0.185880+01 | 0.181530+01 | 0.902000+00 | 0.100000+01 | 0.180810+01 | 0.951000+00 |
| 5    | 97      | 0.181530+01 | 0.185880+01 | 0.195480+01 | 0.192110+01 | 0.902000+00 | 0.100000+01 | 0.191780+01 | 0.951000+00 |

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR



TABLE OF INFLUENCING SECTIONS FOR MACH NUMBER 1.2000

KEY 0 ALL ELEMENTS OF INFLUENCING SECTION HAVE ZERO INFLUENCE ON ALL ELEMENTS OF RECEIVING SECTION

1 NON-ZERO INFLUENCE IS ASSUMED

| RECEIVING<br>SECTIONS | INFLUENCING SECTIONS |                  |
|-----------------------|----------------------|------------------|
|                       | WING 1<br>SECT 1     | WING 1<br>SECT 2 |
| WING 1<br>SECT 1      | 1                    | 1                |
| WING 1<br>SECT 2      | 1                    | 1                |

NO WAKE EFFECTS HAVE BEEN DETERMINED

|                                       |   |
|---------------------------------------|---|
| TOTAL NUMBER MODES                    | 5 |
| MODES DEFINED BY SPLINE OR POLYNOMIAL | 4 |
| NUMBER OF RIGID MODES                 | 1 |
| NUMBER OF POLYNOMIAL EQUATIONS        | 4 |

ORIGINAL PAGE IS  
OF POOR QUALITY

# INPUT MODAL DATA

MODAL DATA INPUT IS GENERATED BY POLYNOMIAL DEFINED BY USER

| EQUATION | WING | MODE | 4 MODE FUNCTION EQUATIONS<br>COEFFICIENTS |             |     |     |            |            |
|----------|------|------|---|-------------|-----|-----|------------|------------|
|          |      |      | CONSTANT                                  | X           | Y   | XY  | X SQUARE   | Y SQUARE   |
| 1        | 1    | 1    | 0.1000D+01                                | 0.0         | 0.0 | 0.0 | 0.0        | 0.0        |
| 2        | 1    | 2    | -0.8065D+00                               | 0.1000D+01  | 0.0 | 0.0 | 0.0        | 0.0        |
| 3        | 1    | 3    | 0.6504D+00                                | -0.1613D+01 | 0.0 | 0.0 | 0.1000D+01 | 0.0        |
| 4        | 1    | 4    | 0.0                                       | 0.0         | 0.0 | 0.0 | 0.0        | 0.1000D+01 |

STRUCTURAL REFERENCE SYSTEM OR  
ROTATED STRUCTURAL REFERENCE SYSTEM

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

| ELEMENT | MODE 1      |           | MODE 2       |             | MODE 3      |              |
|---------|-------------|-----------|--------------|-------------|-------------|--------------|
|         | ETA         | D(ETA)/DX | ETA          | D(ETA)/DX   | ETA         | D(ETA)/DX    |
| 1       | 0.100000+01 | 0.0       | -0.647892+00 | 0.100000+01 | 0.419722+00 | -0.129578+01 |
| 2       | 0.100000+01 | 0.0       | -0.501256+00 | 0.100000+01 | 0.251215+00 | -0.100251+01 |
| 3       | 0.100000+01 | 0.0       | -0.354619+00 | 0.100000+01 | 0.125713+00 | -0.709238+00 |
| 4       | 0.100000+01 | 0.0       | -0.207983+00 | 0.100000+01 | 0.432146+01 | -0.415966+00 |
| 5       | 0.100000+01 | 0.0       | -0.613465+01 | 0.100000+01 | 0.372114+02 | -0.122693+00 |
| 6       | 0.100000+01 | 0.0       | 0.852899+01  | 0.100000+01 | 0.723212+02 | 0.170580+00  |
| 7       | 0.100000+01 | 0.0       | 0.231926+00  | 0.100000+01 | 0.537475+01 | 0.463853+00  |
| 8       | 0.100000+01 | 0.0       | 0.378563+00  | 0.100000+01 | 0.143267+00 | 0.757125+00  |
| 9       | 0.100000+01 | 0.0       | 0.525199+00  | 0.100000+01 | 0.275792+00 | 0.105040+01  |
| 10      | 0.100000+01 | 0.0       | 0.571835+00  | 0.100000+01 | 0.451321+00 | 0.134367+01  |
| 11      | 0.100000+01 | 0.0       | 0.799322+00  | 0.100000+01 | 0.638874+00 | 0.159864+01  |
| 12      | 0.100000+01 | 0.0       | -0.565294+00 | 0.100000+01 | 0.319515+00 | -0.113059+01 |
| 13      | 0.100000+01 | 0.0       | -0.418658+00 | 0.100000+01 | 0.175232+00 | -0.837315+00 |
| 14      | 0.100000+01 | 0.0       | -0.272021+00 | 0.100000+01 | 0.739533+01 | -0.544042+00 |
| 15      | 0.100000+01 | 0.0       | -0.125385+00 | 0.100000+01 | 0.156791+01 | -0.250770+00 |
| 16      | 0.100000+01 | 0.0       | 0.212515+01  | 0.100000+01 | 0.409378+03 | 0.425031+01  |
| 17      | 0.100000+01 | 0.0       | 0.157888+00  | 0.100000+01 | 0.281441+01 | 0.335776+00  |
| 18      | 0.100000+01 | 0.0       | 0.314524+00  | 0.100000+01 | 0.988833+01 | 0.629049+00  |
| 19      | 0.100000+01 | 0.0       | 0.461161+00  | 0.100000+01 | 0.212627+00 | 0.922321+00  |
| 20      | 0.100000+01 | 0.0       | 0.607797+00  | 0.100000+01 | 0.369375+00 | 0.121559+01  |
| 21      | 0.100000+01 | 0.0       | 0.754433+00  | 0.100000+01 | 0.569127+00 | 0.150887+01  |
| 22      | 0.100000+01 | 0.0       | 0.843621+00  | 0.100000+01 | 0.711654+00 | 0.168724+01  |
| 23      | 0.100000+01 | 0.0       | -0.482696+00 | 0.100000+01 | 0.232953+00 | -0.965352+00 |
| 24      | 0.100000+01 | 0.0       | -0.336060+00 | 0.100000+01 | 0.112894+00 | -0.672119+00 |
| 25      | 0.100000+01 | 0.0       | -0.189423+00 | 0.100000+01 | 0.358389+01 | -0.378846+00 |
| 26      | 0.100000+01 | 0.0       | -0.427863+01 | 0.100000+01 | 0.173846+02 | -0.855736+01 |
| 27      | 0.100000+01 | 0.0       | 0.103850+00  | 0.100000+01 | 0.107425+01 | 0.207659+00  |
| 28      | 0.100000+01 | 0.0       | 0.250486+00  | 0.100000+01 | 0.627009+01 | 0.500972+00  |
| 29      | 0.100000+01 | 0.0       | 0.397122+00  | 0.100000+01 | 0.157664+00 | 0.794245+00  |
| 30      | 0.100000+01 | 0.0       | 0.543759+00  | 0.100000+01 | 0.295631+00 | 0.108752+01  |
| 31      | 0.100000+01 | 0.0       | 0.690395+00  | 0.100000+01 | 0.476603+00 | 0.138079+01  |
| 32      | 0.100000+01 | 0.0       | 0.837031+00  | 0.100000+01 | 0.700579+00 | 0.167406+01  |
| 33      | 0.100000+01 | 0.0       | 0.987920+00  | 0.100000+01 | 0.788359+00 | 0.177584+01  |
| 34      | 0.100000+01 | 0.0       | -0.400988+00 | 0.100000+01 | 0.160036+00 | -0.800196+00 |
| 35      | 0.100000+01 | 0.0       | -0.253462+00 | 0.100000+01 | 0.642005+01 | -0.506923+00 |
| 36      | 0.100000+01 | 0.0       | -0.106825+00 | 0.100000+01 | 0.113694+01 | -0.213650+00 |
| 37      | 0.100000+01 | 0.0       | 0.398112+01  | 0.100000+01 | 0.154268+02 | 0.796224+01  |
| 38      | 0.100000+01 | 0.0       | 0.186443+00  | 0.100000+01 | 0.347204+01 | 0.372895+00  |
| 39      | 0.100000+01 | 0.0       | 0.333084+00  | 0.100000+01 | 0.110903+00 | 0.665168+00  |
| 40      | 0.100000+01 | 0.0       | 0.475720+00  | 0.100000+01 | 0.230089+00 | 0.959441+00  |
| 41      | 0.100000+01 | 0.0       | 0.620357+00  | 0.100000+01 | 0.392280+00 | 0.125271+01  |
| 42      | 0.100000+01 | 0.0       | 0.772993+00  | 0.100000+01 | 0.597476+00 | 0.154599+01  |
| 43      | 0.100000+01 | 0.0       | 0.922891+00  | 0.100000+01 | 0.815170+00 | 0.180578+01  |
| 44      | 0.100000+01 | 0.0       | -0.317500+00 | 0.100000+01 | 0.100764+00 | -0.635000+00 |
| 45      | 0.100000+01 | 0.0       | -0.170364+00 | 0.100000+01 | 0.291521+01 | -0.341727+00 |
| 46      | 0.100000+01 | 0.0       | -0.242272+01 | 0.100000+01 | 0.544706+03 | -0.484544+01 |
| 47      | 0.100000+01 | 0.0       | 0.122409+00  | 0.100000+01 | 0.145418+01 | 0.244818+00  |

|    |               |     |               |               |               |               |
|----|---------------|-----|---------------|---------------|---------------|---------------|
| 48 | 0.1000000D+01 | 0.0 | 0.2690460+00  | 0.1000000D+01 | 0.7234320-01  | 0.5380910+00  |
| 49 | 0.1000000D+01 | 0.0 | 0.156820+00   | 0.1000000D+01 | 0.1727490+00  | 0.8313640+00  |
| 50 | 0.1000000D+01 | 0.0 | 0.5023180+00  | 0.1000000D+01 | 0.3161600+00  | 0.1124640+01  |
| 51 | 0.1000000D+01 | 0.0 | 0.7089550+00  | 0.1000000D+01 | 0.5025740+00  | 0.1417510+01  |
| 52 | 0.1000000D+01 | 0.0 | 0.8555910+00  | 0.1000000D+01 | 0.7319540+00  | 0.1711180+01  |
| 53 | 0.1000000D+01 | 0.0 | 0.9471900+00  | 0.1000000D+01 | 0.8971270+00  | 0.1894380+01  |
| 54 | 0.1000000D+01 | 0.0 | -0.2299870+00 | 0.1000000D+01 | 0.5285180-01  | -0.4599740+00 |
| 55 | 0.1000000D+01 | 0.0 | -0.7518290-01 | 0.1000000D+01 | 0.5610220-02  | -0.1523660+00 |
| 56 | 0.1000000D+01 | 0.0 | 0.7962140-01  | 0.1000000D+01 | 0.6297320-02  | 0.1592430+00  |
| 57 | 0.1000000D+01 | 0.0 | 0.2344260+00  | 0.1000000D+01 | 0.5491320-01  | 0.4688510+00  |
| 58 | 0.1000000D+01 | 0.0 | 0.3892300+00  | 0.1000000D+01 | 0.1514580+00  | 0.7784600+00  |
| 59 | 0.1000000D+01 | 0.0 | 0.5440340+00  | 0.1000000D+01 | 0.2959310+00  | 0.1088070+01  |
| 60 | 0.1000000D+01 | 0.0 | 0.6844680+00  | 0.1000000D+01 | 0.4684540+00  | 0.1368940+01  |
| 61 | 0.1000000D+01 | 0.0 | 0.8278360+00  | 0.1000000D+01 | 0.6852700+00  | 0.1655670+01  |
| 62 | 0.1000000D+01 | 0.0 | 0.9689160+00  | 0.1000000D+01 | 0.9387560+00  | 0.1937830+01  |
| 63 | 0.1000000D+01 | 0.0 | -0.1506280+00 | 0.1000000D+01 | 0.2264670-01  | -0.3012570+00 |
| 64 | 0.1000000D+01 | 0.0 | 0.4175910-02  | 0.1000000D+01 | -0.2481170-04 | 0.8351830-02  |
| 65 | 0.1000000D+01 | 0.0 | 0.1589800+00  | 0.1000000D+01 | 0.2523250-01  | 0.3179600+00  |
| 66 | 0.1000000D+01 | 0.0 | 0.3137840+00  | 0.1000000D+01 | 0.9841850-01  | 0.6275690+00  |
| 67 | 0.1000000D+01 | 0.0 | 0.4685890+00  | 0.1000000D+01 | 0.2195330+00  | 0.9371780+00  |
| 68 | 0.1000000D+01 | 0.0 | 0.6233930+00  | 0.1000000D+01 | 0.3885770+00  | 0.1246790+01  |
| 69 | 0.1000000D+01 | 0.0 | 0.7350850+00  | 0.1000000D+01 | 0.5403080+00  | 0.1470170+01  |
| 70 | 0.1000000D+01 | 0.0 | 0.8712680+00  | 0.1000000D+01 | 0.7590660+00  | 0.1742540+01  |
| 71 | 0.1000000D+01 | 0.0 | 0.1004510+01  | 0.1000000D+01 | 0.1008990+01  | 0.2009020+01  |
| 72 | 0.1000000D+01 | 0.0 | -0.7126960-01 | 0.1000000D+01 | 0.5037100-02  | -0.1425390+00 |
| 73 | 0.1000000D+01 | 0.0 | 0.8353470-01  | 0.1000000D+01 | 0.6935800-02  | 0.1670690+00  |
| 74 | 0.1000000D+01 | 0.0 | 0.2383390+00  | 0.1000000D+01 | 0.5676320-01  | 0.4766780+00  |
| 75 | 0.1000000D+01 | 0.0 | 0.3931430+00  | 0.1000000D+01 | 0.1545190+00  | 0.7862870+00  |
| 76 | 0.1000000D+01 | 0.0 | 0.5479480+00  | 0.1000000D+01 | 0.3002040+00  | 0.1095900+01  |
| 77 | 0.1000000D+01 | 0.0 | 0.7027520+00  | 0.1000000D+01 | 0.4938180+00  | 0.1405500+01  |
| 78 | 0.1000000D+01 | 0.0 | 0.7857030+00  | 0.1000000D+01 | 0.6172860+00  | 0.1571410+01  |
| 79 | 0.1000000D+01 | 0.0 | 0.9147000+00  | 0.1000000D+01 | 0.8366340+00  | 0.1829400+01  |
| 80 | 0.1000000D+01 | 0.0 | 0.1040100+01  | 0.1000000D+01 | 0.1081770+01  | 0.2080200+01  |
| 81 | 0.1000000D+01 | 0.0 | 0.8089230-02  | 0.1000000D+01 | 0.2318560-04  | 0.1617850-01  |
| 82 | 0.1000000D+01 | 0.0 | 0.1528940+00  | 0.1000000D+01 | 0.2649200-01  | 0.3257870+00  |
| 83 | 0.1000000D+01 | 0.0 | 0.3176980+00  | 0.1000000D+01 | 0.1008900+00  | 0.6353960+00  |
| 84 | 0.1000000D+01 | 0.0 | 0.4725020+00  | 0.1000000D+01 | 0.2232160+00  | 0.9450040+00  |
| 85 | 0.1000000D+01 | 0.0 | 0.6273060+00  | 0.1000000D+01 | 0.3934710+00  | 0.1254610+01  |
| 86 | 0.1000000D+01 | 0.0 | 0.7821110+00  | 0.1000000D+01 | 0.6116550+00  | 0.1564220+01  |
| 87 | 0.1000000D+01 | 0.0 | 0.8363200+00  | 0.1000000D+01 | 0.6993890+00  | 0.1672640+01  |
| 88 | 0.1000000D+01 | 0.0 | 0.9581320+00  | 0.1000000D+01 | 0.9179750+00  | 0.1916260+01  |
| 89 | 0.1000000D+01 | 0.0 | 0.1075690+01  | 0.1000000D+01 | 0.1157070+01  | 0.2151330+01  |
| 90 | 0.1000000D+01 | 0.0 | 0.8744800-01  | 0.1000000D+01 | 0.7604910-02  | 0.1748960+00  |
| 91 | 0.1000000D+01 | 0.0 | 0.2422520+00  | 0.1000000D+01 | 0.5864390-01  | 0.4845050+00  |
| 92 | 0.1000000D+01 | 0.0 | 0.3970570+00  | 0.1000000D+01 | 0.1576120+00  | 0.7941130+00  |
| 93 | 0.1000000D+01 | 0.0 | 0.5518610+00  | 0.1000000D+01 | 0.3045080+00  | 0.1103720+01  |
| 94 | 0.1000000D+01 | 0.0 | 0.7066650+00  | 0.1000000D+01 | 0.4993330+00  | 0.1413330+01  |
| 95 | 0.1000000D+01 | 0.0 | 0.8559760+00  | 0.1000000D+01 | 0.7326530+00  | 0.1711950+01  |
| 96 | 0.1000000D+01 | 0.0 | 0.1001560+01  | 0.1000000D+01 | 0.1003090+01  | 0.2003130+01  |
| 97 | 0.1000000D+01 | 0.0 | 0.1111280+01  | 0.1000000D+01 | 0.1234910+01  | 0.2222570+01  |

4

| ELEMENT | ETA          | D(ETA) /DX |
|---------|--------------|------------|
| 1       | 0.2601000-02 | 0.0        |
| 2       | 0.2601000-02 | 0.0        |
| 3       | 0.2601000-02 | 0.0        |
| 4       | 0.2601000-02 | 0.0        |
| 5       | 0.2601000-02 | 0.0        |
| 6       | 0.2601000-02 | 0.0        |
| 7       | 0.2601000-02 | 0.0        |
| 8       | 0.2601000-02 | 0.0        |
| 9       | 0.2601000-02 | 0.0        |
| 10      | 0.2601000-02 | 0.0        |
| 11      | 0.2601000-02 | 0.0        |
| 12      | 0.2340900-01 | 0.0        |
| 13      | 0.2340900-01 | 0.0        |
| 14      | 0.2340900-01 | 0.0        |
| 15      | 0.2340900-01 | 0.0        |
| 16      | 0.2340900-01 | 0.0        |
| 17      | 0.2340900-01 | 0.0        |
| 18      | 0.2340900-01 | 0.0        |
| 19      | 0.2340900-01 | 0.0        |
| 20      | 0.2340900-01 | 0.0        |
| 21      | 0.2340900-01 | 0.0        |
| 22      | 0.2340900-01 | 0.0        |
| 23      | 0.6502500-01 | 0.0        |
| 24      | 0.6502500-01 | 0.0        |
| 25      | 0.6502500-01 | 0.0        |
| 26      | 0.6502500-01 | 0.0        |
| 27      | 0.6502500-01 | 0.0        |
| 28      | 0.6502500-01 | 0.0        |
| 29      | 0.6502500-01 | 0.0        |
| 30      | 0.6502500-01 | 0.0        |
| 31      | 0.6502500-01 | 0.0        |
| 32      | 0.6502500-01 | 0.0        |
| 33      | 0.6502500-01 | 0.0        |
| 34      | 0.1274490+00 | 0.0        |
| 35      | 0.1274490+00 | 0.0        |
| 36      | 0.1274490+00 | 0.0        |
| 37      | 0.1274490+00 | 0.0        |
| 38      | 0.1274490+00 | 0.0        |
| 39      | 0.1274490+00 | 0.0        |
| 40      | 0.1274490+00 | 0.0        |
| 41      | 0.1274490+00 | 0.0        |
| 42      | 0.1274490+00 | 0.0        |
| 43      | 0.1274490+00 | 0.0        |
| 44      | 0.2106810+00 | 0.0        |
| 45      | 0.2106810+00 | 0.0        |
| 46      | 0.2106810+00 | 0.0        |
| 47      | 0.2106810+00 | 0.0        |
| 48      | 0.2106810+00 | 0.0        |
| 49      | 0.2106810+00 | 0.0        |
| 50      | 0.2106810+00 | 0.0        |
| 51      | 0.2106810+00 | 0.0        |
| 52      | 0.2106810+00 | 0.0        |
| 53      | 0.2106810+00 | 0.0        |
| 54      | 0.3124810+00 | 0.0        |
| 55      | 0.3124810+00 | 0.0        |
| 56      | 0.3124810+00 | 0.0        |
| 57      | 0.3124810+00 | 0.0        |

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OF POC

|    |              |     |
|----|--------------|-----|
| 58 | 0.212481D+00 | 0.0 |
| 59 | 0.212481D+00 | 0.0 |
| 60 | 0.212481D+00 | 0.0 |
| 61 | 0.212481D+00 | 0.0 |
| 62 | 0.212481D+00 | 0.0 |
| 63 | 0.431649D+00 | 0.0 |
| 64 | 0.431649D+00 | 0.0 |
| 65 | 0.431649D+00 | 0.0 |
| 66 | 0.431649D+00 | 0.0 |
| 67 | 0.431649D+00 | 0.0 |
| 68 | 0.431649D+00 | 0.0 |
| 69 | 0.431649D+00 | 0.0 |
| 70 | 0.431649D+00 | 0.0 |
| 71 | 0.431649D+00 | 0.0 |
| 72 | 0.570025D+00 | 0.0 |
| 73 | 0.570025D+00 | 0.0 |
| 74 | 0.570025D+00 | 0.0 |
| 75 | 0.570025D+00 | 0.0 |
| 76 | 0.570025D+00 | 0.0 |
| 77 | 0.570025D+00 | 0.0 |
| 78 | 0.570025D+00 | 0.0 |
| 79 | 0.570025D+00 | 0.0 |
| 80 | 0.570025D+00 | 0.0 |
| 81 | 0.727609D+00 | 0.0 |
| 82 | 0.727609D+00 | 0.0 |
| 83 | 0.727609D+00 | 0.0 |
| 84 | 0.727609D+00 | 0.0 |
| 85 | 0.727609D+00 | 0.0 |
| 86 | 0.727609D+00 | 0.0 |
| 87 | 0.727609D+00 | 0.0 |
| 88 | 0.727609D+00 | 0.0 |
| 89 | 0.727609D+00 | 0.0 |
| 90 | 0.904401D+00 | 0.0 |
| 91 | 0.904401D+00 | 0.0 |
| 92 | 0.904401D+00 | 0.0 |
| 93 | 0.904401D+00 | 0.0 |
| 94 | 0.904401D+00 | 0.0 |
| 95 | 0.904401D+00 | 0.0 |
| 96 | 0.904401D+00 | 0.0 |
| 97 | 0.904401D+00 | 0.0 |

## RIGID BODY MODE INPUT

## AERODYNAMIC GRID

STRUCTURAL REFERENCE SYSTEM OR  
ROTATED STRUCTURAL REFERENCE SYSTEM

ONLY ELEMENTS WITH A NON-ZERO MODAL VALUE MUST BE INPUT

| ELEMENT | ETA          | D(ETA)/DX    |
|---------|--------------|--------------|
| 61      | 0.66250JD-01 | 0.915241D+00 |
| 62      | 0.196617D+00 | 0.915241D+00 |
| 70      | 0.663050D-01 | 0.915241D+00 |
| 71      | 0.19210CD+00 | 0.915241D+00 |
| 79      | 0.662680D-01 | 0.915241D+00 |
| 80      | 0.187584D+00 | 0.915241D+00 |
| 88      | 0.66232JD-01 | 0.915241D+00 |
| 99      | 0.18316CD+00 | 0.915241D+00 |
| 96      | 0.66267JD-01 | 0.915241D+00 |
| 97      | 0.178644D+00 | 0.915241D+00 |

IHO208I IBCOM - PROGRAM INTERRUPT (P) - UNDERFLOW CLD PSW IS FF85000D92082EAA . REGISTER CONTAINED FD40000000000000

TRACEBACK ROUTINE CALLED FROM ISN REG. 14 REG. 15 REG. 0 REG. 1

DECOM 0057 620833E2 00082A28 00000035 0008306C

DIAG 0314 4207BFFA 00082FA0 0000003C 00054430

MAIN 000111F0 01053BD8 FD000008 000C17F8

ENTRY POINT= 01053BD8

STANDARD FIXUP TAKEN , EXECUTION CONTINUING

IHO208I IBCOM - PROGRAM INTERRUPT (P) - UNDERFLOW CLD PSW IS FF85000D92082EAA . REGISTER CONTAINED FD40000000000000

TRACEBACK ROUTINE CALLED FROM ISN REG. 14 REG. 15 REG. 0 REG. 1

DECOM 0057 620833E2 00082A28 00000035 0008306C

DIAG 0314 4207BFFA 00082FA0 0000003C 00054430

MAIN 000111F0 01053BD8 FD000008 000C17F8

ENTRY POINT= 01053BD8

STANDARD FIXUP TAKEN , EXECUTION CONTINUING

IHO208I IBCOM - PROGRAM INTERRUPT (P) - UNDERFLOW CLD PSW IS FF85000D92082EAA . REGISTER CONTAINED 7D40000000000000

TRACEBACK ROUTINE CALLED FROM ISN REG. 14 REG. 15 REG. 0 REG. 1

DECOM 0057 620833E2 00082A28 00000035 0008306C

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-5.18-



FREQUENCY = 0.5000

MODE NUMBER 1  
FREQUENCY = 0.5000

LIFT AND PITCHING MOMENT PER UNIT SPAN FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | SPAN WIDTH   | --- LIFT PER UNIT SPAN --- |              | PITCHING MOMENT PER UNIT SPAN ABOUT X=0.806500D+00 |              |
|---------|------|--------------|----------------------------|--------------|--|--------------|
| 1       | 1    | 0.1C2000D+00 | -.158020D+00               | -.197630D+01 | -.364075D+00                                       | -.214512D+00 |
| 1       | 2    | 0.1C2000D+00 | -.215473D+00               | -.181513D+01 | -.410928D+00                                       | -.205538D+00 |
| 1       | 3    | 0.1C2000D+00 | -.284475D+00               | -.165007D+01 | -.394035D+00                                       | -.204024D+00 |
| 1       | 4    | 0.1C2000D+00 | -.253725D+00               | -.149628D+01 | -.466724D+00                                       | -.160531D+00 |
| 1       | 5    | 0.192000D+00 | -.997077D-01               | -.117226D+01 | -.778693D+00                                       | -.143366D+00 |
| 2       | 1    | 0.58C000D-01 | -.248400D+00               | -.805759D+00 | -.445784D+00                                       | -.540789D+00 |
| 2       | 2    | 0.58C000D-01 | 0.671037D-03               | -.847447D+00 | -.755532D+00                                       | -.233589D+00 |
| 2       | 3    | 0.58C000D-01 | 0.160364D+00               | -.534401D+00 | -.921918D+00                                       | -.404817D+00 |
| 2       | 4    | 0.58C000D-01 | 0.889255D-01               | -.244519D+00 | -.684977D+00                                       | -.511327D+00 |
| 2       | 5    | 0.58C000D-01 | 0.188576D+00               | 0.329589D+00 | -.780537D+00                                       | -.720598D+00 |

MODE NUMBER 1  
FREQUENCY = 0.5000

VELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | ELEMENT | --- VELOCITY POTENTIAL --- |              | ----- PRESSURE ----- |              | ----- XC ----- |
|---------|------|---------|----------------------------|--------------|----------------------|--------------|----------------|
| 1       | 1    | 1       | -.417524D-02               | -.267049D-01 | -.381345D+00         | -.253288D+01 | 0.158608D+00   |
| 1       | 1    | 2       | -.113125D-01               | -.506340D-01 | -.319370D+00         | -.166223D+01 | 0.305244D+00   |
| 1       | 1    | 3       | -.200299D-01               | -.683480D-01 | -.420963D+00         | -.156227D+01 | 0.451881D+00   |
| 1       | 1    | 4       | -.306805D-01               | -.837339D-01 | -.439318D+00         | -.138881D+01 | 0.598517D+00   |
| 1       | 1    | 5       | -.424292D-01               | -.963698D-01 | -.433553D+00         | -.123334D+01 | 0.745154D+00   |
| 1       | 1    | 6       | -.429775D-01               | -.967518D-01 | 0.162447D+01         | 0.548962D+00 | 0.891790D+00   |
| 1       | 1    | 7       | -.535974D-01               | -.104629D+00 | -.229259D+01         | -.234704D+01 | 0.103843D+01   |
| 1       | 1    | 8       | -.746798D-01               | -.118074D+00 | 0.143389D+00         | -.857568D+00 | 0.118506D+01   |
| 1       | 1    | 9       | -.868062D-01               | -.122522D+00 | -.708113D+00         | -.884152D+00 | 0.133170D+01   |
| 1       | 1    | 10      | -.984555D-01               | -.125844D+00 | 0.274858D+00         | -.860395D+00 | 0.147834D+01   |
| 1       | 1    | 11      | -.937740D-01               | -.127807D+00 | 0.224063D+01         | -.834010D+00 | 0.160582D+01   |
| 1       | 2    | 12      | -.865078D-02               | -.380375D-01 | -.749220D+00         | -.331963D+01 | 0.241206D+00   |
| 1       | 2    | 13      | -.193774D-01               | -.643343D-01 | -.365400D+00         | -.137237D+01 | 0.387842D+00   |
| 1       | 2    | 14      | -.303484D-01               | -.794629D-01 | -.614594D+00         | -.151924D+01 | 0.534479D+00   |
| 1       | 2    | 15      | -.432859D-01               | -.927883D-01 | -.505633D+00         | -.122834D+01 | 0.681115D+00   |
| 1       | 2    | 16      | -.485926D-01               | -.947907D-01 | 0.835377D+00         | 0.254674D+00 | 0.827752D+00   |
| 1       | 2    | 17      | -.588386D-01               | -.101038D+00 | -.144504D+01         | -.190761D+01 | 0.974388D+00   |
| 1       | 2    | 18      | -.730653D-01               | -.110969D+00 | 0.390933D+00         | -.694216D+00 | 0.112102D+01   |
| 1       | 2    | 19      | -.880985D-01               | -.115577D+00 | -.155380D+01         | -.102919D+01 | 0.126766D+01   |
| 1       | 2    | 20      | -.101864D+00               | -.118768D+00 | 0.679460D+00         | -.799950D+00 | 0.141430D+01   |
| 1       | 2    | 21      | -.994413D-01               | -.119111D+00 | 0.124060D+01         | -.546021D+00 | 0.150093D+01   |
| 1       | 2    | 22      | -.960399D-01               | -.118198D+00 | 0.121194D+01         | -.424270D+00 | 0.165012D+01   |
| 1       | 3    | 23      | -.138581D-01               | -.474118D-01 | -.115845D+01         | -.397178D+01 | 0.323804D+00   |

MODE NUMBER 2  
FREQUENCY = C.5000

LIFT AND PITCHING MOMENT PER UNIT SPAN FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | SPAN WIDTH   | --- LIFT PER UNIT SPAN --- |              | PITCHING MOMENT PER UNIT SPAN ABOUT X=0.806500D+00 |              |
|---------|------|--------------|----------------------------|--------------|--|--------------|
| 1       | 1    | 0.102000D+00 | -.436764D+01               | -.802108C+00 | 0.630740D-01                                       | 0.195175D+01 |
| 1       | 2    | 0.102000D+00 | -.403124D+01               | -.798290C+00 | 0.120102D+00                                       | 0.212049D+01 |
| 1       | 3    | 0.102000D+00 | -.368445D+01               | -.758519C+00 | 0.140072D+00                                       | 0.216130D+01 |
| 1       | 4    | 0.102000D+00 | -.336657D+01               | -.888356C+00 | 0.238974D+00                                       | 0.234866D+01 |
| 1       | 5    | 0.102000D+00 | -.273441D+01               | -.129184C+01 | 0.337658D+00                                       | 0.297848D+01 |
| 2       | 1    | 0.980000D-01 | -.193535D+01               | -.107454C+01 | -.580169D+00                                       | 0.249409D+01 |
| 2       | 2    | 0.980000D-01 | -.202513D+01               | -.142003C+01 | 0.498622D-01                                       | 0.292056D+01 |
| 2       | 3    | 0.980000D-01 | -.141457D+01               | -.167093C+01 | -.268735D+00                                       | 0.320525D+01 |
| 2       | 4    | 0.980000D-01 | -.736996D+00               | -.136842C+01 | -.646043D+00                                       | 0.258917D+01 |
| 2       | 5    | 0.980000D-01 | 0.382215D+00               | -.129879C+01 | -.103067D+01                                       | 0.246105D+01 |

MODE NUMBER 2  
FREQUENCY = C.5000

VELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | ELEMENT | --- VELOCITY PCTENTIAL --- |              | ----- PRESSURE ----- |              | ---- XC ---- |
|---------|------|---------|----------------------------|--------------|----------------------|--------------|--------------|
| 1       | 1    | 1       | -.504133D-01               | 0.275248C-01 | -.479194D+01         | 0.239956D+01 | 0.158608D+00 |
| 1       | 1    | 2       | -.935249D-01               | 0.542375C-01 | -.314800D+01         | 0.120195D+01 | 0.305244D+00 |
| 1       | 1    | 3       | -.124313D+00               | 0.751148C-01 | -.294221D+01         | 0.954100D+00 | 0.451881D+00 |
| 1       | 1    | 4       | -.150829D+00               | 0.945488C-01 | -.267793D+01         | 0.592563D+00 | 0.598517D+00 |
| 1       | 1    | 5       | -.173330D+00               | 0.111088C+00 | -.248097D+01         | 0.193341D+00 | 0.745154D+00 |
| 1       | 1    | 6       | -.178679D+00               | 0.973994C-01 | 0.536953D-01         | -.484921D+01 | 0.891790D+00 |
| 1       | 1    | 7       | -.197245D+00               | 0.103896D+00 | -.415115D+01         | 0.376736D+01 | 0.103843D+01 |
| 1       | 1    | 8       | -.225513D+00               | 0.131209C+00 | -.238744D+01         | -.181974D+01 | 0.118506D+01 |
| 1       | 1    | 9       | -.242860D+00               | 0.135832C+00 | -.220000D+01         | -.339427D+00 | 0.133170D+01 |
| 1       | 1    | 10      | -.260809D+00               | 0.138200C+00 | -.267615D+01         | -.240050D+01 | 0.147834D+01 |
| 1       | 1    | 11      | -.280216D+00               | 0.111624C+00 | -.284837D+01         | -.622597D+01 | 0.160582D+01 |
| 1       | 2    | 12      | -.703015D-01               | 0.424584D-01 | -.614652D+01         | 0.348754D+01 | 0.241206D+00 |
| 1       | 2    | 13      | -.116386D+00               | 0.759263C-01 | -.258700D+01         | 0.924801D+00 | 0.387842D+00 |
| 1       | 2    | 14      | -.141483D+00               | 0.978190D-01 | -.278849D+01         | 0.120982D+01 | 0.534479D+00 |
| 1       | 2    | 15      | -.163627D+00               | 0.119031C+00 | -.239266D+01         | 0.487491D+00 | 0.681115D+00 |
| 1       | 2    | 16      | -.168954D+00               | 0.116830C+00 | -.142328D+00         | -.304386D+01 | 0.827752D+00 |
| 1       | 2    | 17      | -.183121D+00               | 0.123095C+00 | -.358625D+01         | 0.204172D+01 | 0.974388D+00 |
| 1       | 2    | 18      | -.205891D+00               | 0.136311C+00 | -.211364D+01         | -.228305D+01 | 0.112102D+01 |
| 1       | 2    | 19      | -.221049D+00               | 0.147198C+00 | -.211197D+01         | 0.146376D+01 | 0.126766D+01 |
| 1       | 2    | 20      | -.237105D+00               | 0.153987C+00 | -.271314D+01         | -.315649D+01 | 0.141430D+01 |
| 1       | 2    | 21      | -.254623D+00               | 0.128350C+00 | -.210649D+01         | -.434497D+01 | 0.156093D+01 |
| 1       | 2    | 22      | -.262392D+00               | 0.108981C+00 | -.157354D+01         | -.437166D+01 | 0.165012D+01 |
| 1       | 3    | 23      | -.860975D-01               | 0.565019C-01 | -.723172D+01         | 0.449347D+01 | 0.323834D+00 |
| 1       | 3    | 24      | -.134622D+00               | 0.956533C-01 | -.218403D+01         | 0.618161D+00 | 0.470440D+00 |
| 1       | 3    | 25      | -.155293D+00               | 0.117808C+00 | -.266509D+01         | 0.137114D+01 | 0.617077D+00 |
| 1       | 3    | 26      | -.157810D+00               | 0.120411C+00 | 0.562024D+00         | -.302223D+01 | 0.763713D+00 |
| 1       | 3    | 27      | -.174267D+00               | 0.137884C+00 | -.471493D+01         | 0.413751D+01 | 0.910350D+00 |
| 1       | 3    | 28      | -.195884D+00               | 0.152296C+00 | -.113918D+01         | -.413954D+01 | 0.105599D+01 |
| 1       | 3    | 29      | -.206177D+00               | 0.150869C+00 | -.230490D+01         | 0.141611D+01 | 0.120362D+01 |
| 1       | 3    | 30      | -.219913D+00               | 0.165211D+00 | -.215445D+01         | -.164482D+01 | 0.135026D+01 |
| 1       | 3    | 31      | -.232172D+00               | 0.142253C+00 | -.201501D+01         | -.513038D+01 | 0.149087D+01 |
| 1       | 3    | 32      | -.240812D+00               | 0.116484C+00 | -.975705D+00         | -.229322D+01 | 0.164553D+01 |
| 1       | 3    | 33      | -.243200D+00               | 0.107197C+00 | -.165094D+01         | -.532435D+01 | 0.169442D+01 |
| 1       | 4    | 34      | -.990931D-01               | 0.706252C-01 | -.811190D+01         | 0.547715D+01 | 0.406402D+00 |

MODE NUMBER 3  
FREQUENCY = C.5000

LIFT AND PITCHING MOMENT PER UNIT SPAN FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | SPAN WIDTH   | --- LIFT PER UNIT SPAN --- |              | PITCHING MOMENT PER UNIT SPAN ABOUT X=0.806500D+00 |               |
|---------|------|--------------|----------------------------|--------------|--|---------------|
| 1       | 1    | 0.102000D+00 | -0.449751D+01              | 0.109994E+01 | 0.484568D+01                                       | -0.150941D+01 |
| 1       | 2    | 0.102000D+00 | -0.495641D+01              | 0.104157D+01 | 0.513978D+01                                       | -0.160443D+01 |
| 1       | 3    | 0.102000D+00 | -0.536347D+01              | 0.943563E+00 | 0.545174D+01                                       | -0.158674D+01 |
| 1       | 4    | 0.102000D+00 | -0.562706D+01              | 0.854599E+00 | 0.562002D+01                                       | -0.152899D+01 |
| 1       | 5    | 0.102000D+00 | -0.592295D+01              | 0.868242E+00 | 0.555232D+01                                       | -0.164377D+01 |
| 2       | 1    | 0.580000D-01 | -0.636409D+01              | 0.651515D+00 | 0.643937D+01                                       | -0.122722D+01 |
| 2       | 2    | 0.580000D-01 | -0.572114D+01              | 0.575635E+00 | 0.563584D+01                                       | -0.113590D+01 |
| 2       | 3    | 0.580000D-01 | -0.539656D+01              | 0.637677E+00 | 0.538685D+01                                       | -0.121013D+01 |
| 2       | 4    | 0.580000D-01 | -0.475139D+01              | 0.319299E+00 | 0.483341D+01                                       | -0.630473D+00 |
| 2       | 5    | 0.580000D-01 | -0.362418D+01              | 0.645336E+00 | 0.350168D+01                                       | -0.991590D+00 |

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MODE NUMBER 3  
FREQUENCY = C.5000

VELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | ELEMENT | --- VELOCITY POTENTIAL --- |               | ----- PRESSURE ----- |               | ---- XC ---- |
|---------|------|---------|----------------------------|---------------|----------------------|---------------|--------------|
| 1       | 1    | 1       | 0.746028D-01               | -0.253764E-01 | 0.635626D+01         | -0.215345D+01 | 0.158608D+00 |
| 1       | 1    | 2       | 0.121221D+00               | -0.508341E-01 | 0.215495D+01         | -0.804887D+00 | 0.305244D+00 |
| 1       | 1    | 3       | 0.132401D+00               | -0.634248E-01 | 0.518087D+00         | -0.546574D+00 | 0.451881D+00 |
| 1       | 1    | 4       | 0.122933D+00               | -0.816048E-01 | -0.117543D+01        | -0.369941D-01 | 0.598517D+00 |
| 1       | 1    | 5       | 0.941181D-01               | -0.875498E-01 | -0.267355D+01        | 0.443255D+00  | 0.745154D+00 |
| 1       | 1    | 6       | 0.374539D-01               | -0.631426E-01 | -0.590653D+01        | 0.468955D+01  | 0.891790D+00 |
| 1       | 1    | 7       | -0.207802D-01              | -0.494900E-01 | -0.363318D+01        | -0.233966D+01 | 0.103843D+01 |
| 1       | 1    | 8       | -0.319017D-01              | -0.462396E-01 | -0.603827D+01        | 0.234705D+01  | 0.118506D+01 |
| 1       | 1    | 9       | -0.160758D+00              | -0.179306E-01 | -0.710754D+01        | 0.101598D+01  | 0.133170D+01 |
| 1       | 1    | 10      | -0.245827D+00              | 0.180069E-01  | -0.738883D+01        | 0.259110D+01  | 0.147634D+01 |
| 1       | 1    | 11      | -0.315843D+00              | 0.631022E-01  | -0.690321D+01        | 0.274316D+01  | 0.160582D+01 |
| 1       | 2    | 12      | 0.968488D-01               | -0.393373E-01 | 0.763758D+01         | -0.316895D+01 | 0.241206D+00 |
| 1       | 2    | 13      | 0.140957D+00               | -0.708806E-01 | 0.711888D+00         | -0.458058D+00 | 0.387842D+00 |
| 1       | 2    | 14      | 0.138169D+00               | -0.864097E-01 | -0.199934D+00        | -0.751624D+00 | 0.534479D+00 |
| 1       | 2    | 15      | 0.117528D+00               | -0.101699E+00 | -0.210164D+01        | 0.159882D+00  | 0.681115D+00 |
| 1       | 2    | 16      | 0.573083D-01               | -0.896896E-01 | -0.516973D+01        | 0.317971D+01  | 0.827752D+00 |
| 1       | 2    | 17      | 0.110212D-01               | -0.787180E-01 | -0.356758D+01        | -0.873969D+00 | 0.974383D+00 |
| 1       | 2    | 18      | -0.499495D-01              | -0.665596E-01 | -0.580731D+01        | 0.279985D+01  | 0.112102D+01 |
| 1       | 2    | 19      | -0.127001D+00              | -0.453958E-01 | -0.679828D+01        | -0.249954D+00 | 0.126766D+01 |
| 1       | 2    | 20      | -0.210912D+00              | -0.140901E-01 | -0.703878D+01        | 0.349418D+01  | 0.141430D+01 |
| 1       | 2    | 21      | -0.294785D+00              | 0.396498E-01  | -0.751425D+01        | 0.254470D+01  | 0.150093D+01 |
| 1       | 2    | 22      | -0.346458D+00              | 0.659439E-01  | -0.774686D+01        | 0.837426D+00  | 0.165012D+01 |
| 1       | 3    | 23      | 0.109710D+00               | -0.520749E-01 | 0.827256D+01         | -0.406051D+01 | 0.323804D+00 |
| 1       | 3    | 24      | 0.149233D+00               | -0.875864E-01 | -0.469925D+00        | -0.401023D-01 | 0.470440D+00 |
| 1       | 3    | 25      | 0.134358D+00               | -0.103354D+00 | -0.908885D+00        | -0.858960D+00 | 0.617077D+00 |
| 1       | 3    | 26      | 0.906696D-01               | -0.990775E-01 | -0.513483D+01        | 0.317389D+01  | 0.763713D+00 |
| 1       | 3    | 27      | 0.426755D-01               | -0.100392E+00 | -0.206024D+01        | -0.268408D+01 | 0.910350D+00 |
| 1       | 3    | 28      | -0.136507D-01              | -0.926857E-01 | -0.608506D+01        | 0.434643D+01  | 0.105699D+01 |
| 1       | 3    | 29      | -0.901461D-01              | -0.645031E-01 | -0.619980D+01        | -0.170741D+00 | 0.120362D+01 |
| 1       | 3    | 30      | -0.172427D+00              | -0.420344E-01 | -0.710964D+01        | 0.240273D+01  | 0.135026D+01 |
| 1       | 3    | 31      | -0.256580D+00              | 0.749311E-02  | -0.703666D+01        | 0.337513D+01  | 0.149689D+01 |
| 1       | 3    | 32      | -0.346168D+00              | 0.541936E-01  | -0.878238D+01        | 0.900057D+00  | 0.164353D+01 |
| 1       | 3    | 33      | -0.374108D+00              | 0.658263E-01  | -0.577706D+01        | 0.276771D+00  | 0.169420D+01 |
| 1       | 4    | 34      | 0.115797D+00               | -0.645101E-01 | 0.841451D+01         | -0.488350D+01 | 0.406402D+00 |

MODE NUMBER 4  
FREQUENCY = 0.5000

LIFT AND PITCHING MOMENT PER UNIT SPAN FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | SPAN WIDTH   | --- LIFT PER UNIT SPAN --- |               | PITCHING MOMENT PER UNIT SPAN ABOUT X=0.806500D+00 |               |
|---------|------|--------------|----------------------------|---------------|--|---------------|
| 1       | 1    | 0.102000D+00 | -0.189593D+00              | -0.347774D+00 | 0.761116D-01                                       | 0.173310D+00  |
| 1       | 2    | 0.102000D+00 | -0.184557D+00              | -0.347404D+00 | 0.802726D-01                                       | 0.158873D+00  |
| 1       | 3    | 0.102000D+00 | -0.180703D+00              | -0.354541E+00 | 0.907210D-01                                       | 0.134530D+00  |
| 1       | 4    | 0.102000D+00 | -0.147453D+00              | -0.364408D+00 | 0.623607D-01                                       | 0.103470D+00  |
| 1       | 5    | 0.102000D+00 | -0.625025D-01              | -0.344830E+00 | -0.622754D-01                                      | 0.556438D-01  |
| 2       | 1    | 0.980000D-01 | -0.109097D+00              | -0.314231E+00 | 0.432222D-01                                       | -0.542773D-01 |
| 2       | 2    | 0.980000D-01 | 0.119368D-01               | -0.350989E+00 | -0.127824D+00                                      | -0.317678D-01 |
| 2       | 3    | 0.980000D-01 | 0.559615D-01               | -0.273319E+00 | -0.193506D+00                                      | -0.142744D+00 |
| 2       | 4    | 0.980000D-01 | 0.458231D-01               | -0.199083D+00 | -0.177160D+00                                      | -0.193957D+00 |
| 2       | 5    | 0.980000D-01 | -0.102758D-01              | 0.963175E-01  | -0.178278D+00                                      | -0.394797D+00 |

MODE NUMBER 4  
FREQUENCY = 0.5000

VELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | ELEMENT | --- VELOCITY POTENTIAL --- |               | ----- PRESSURE ----- |               | ----- XC ----- |
|---------|------|---------|----------------------------|---------------|----------------------|---------------|----------------|
| 1       | 1    | 1       | 0.169677D-04               | 0.479215E-04  | 0.684318D-03         | -0.698538D-02 | 0.158608D+00   |
| 1       | 1    | 2       | -0.910485D-05              | -0.209471D-03 | -0.532393D-02        | -0.367758D-01 | 0.302244D+00   |
| 1       | 1    | 3       | -0.194662D-03              | -0.903735E-03 | -0.212763D-01        | -0.826848D-01 | 0.451881D+00   |
| 1       | 1    | 4       | -0.718073D-03              | -0.218130E-02 | -0.512325D-01        | -0.140497D+00 | 0.598517D+00   |
| 1       | 1    | 5       | -0.180363D-02              | -0.411902E-02 | -0.975537D-01        | -0.205122D+00 | 0.745134D+00   |
| 1       | 1    | 6       | -0.213227D-02              | -0.482218E-02 | 0.107774D+00         | 0.518324D-01  | 0.891790D+00   |
| 1       | 1    | 7       | -0.470777D-02              | -0.792115D-02 | -0.494621D+00        | -0.601064D+00 | 0.103843D+01   |
| 1       | 1    | 8       | -0.100448D-01              | -0.130100E-01 | -0.278065D+00        | -0.371221D+00 | 0.118506D+01   |
| 1       | 1    | 9       | -0.158072D-01              | -0.169529E-01 | -0.523274D+00        | -0.456195D+00 | 0.133170D+01   |
| 1       | 1    | 10      | -0.229568D-01              | -0.207044E-01 | -0.462746D+00        | -0.431834D+00 | 0.147834D+01   |
| 1       | 1    | 11      | -0.234863D-01              | -0.217743E-01 | 0.636612D+00         | -0.108911D+00 | 0.160582D+01   |
| 1       | 2    | 12      | -0.498364D-04              | -0.357118D-03 | -0.563556D-02        | -0.483619D-01 | 0.241206D+00   |
| 1       | 2    | 13      | -0.198917D-03              | -0.105378E-02 | -0.119670D-01        | -0.721761D-01 | 0.367842D+00   |
| 1       | 2    | 14      | -0.581040D-03              | -0.217958E-02 | -0.352084D-01        | -0.124486D+00 | 0.534479D+00   |
| 1       | 2    | 15      | -0.142211D-02              | -0.392334E-02 | -0.728123D-01        | -0.185012D+00 | 0.681115D+00   |
| 1       | 2    | 16      | -0.197067D-02              | -0.483537E-02 | 0.414912D-01         | 0.303240D-02  | 0.827752D+00   |
| 1       | 2    | 17      | -0.395856D-02              | -0.754598E-02 | -0.323633D+00        | -0.490259D+00 | 0.974388D+00   |
| 1       | 2    | 18      | -0.764761D-02              | -0.118598E-01 | -0.179195D+00        | -0.326051D+00 | 0.112102D+01   |
| 1       | 2    | 19      | -0.131078D-01              | -0.160236D-01 | -0.587065D+00        | -0.500633D+00 | 0.126760D+01   |
| 1       | 2    | 20      | -0.199341D-01              | -0.201253D-01 | -0.350805D+00        | -0.418406D+00 | 0.141430D+01   |
| 1       | 2    | 21      | -0.222185D-01              | -0.216155D-01 | 0.233856D+00         | -0.124904D+00 | 0.150093D+01   |
| 1       | 2    | 22      | -0.221252D-01              | -0.216543E-01 | 0.634395D-01         | -0.160493D+00 | 0.165012D+01   |
| 1       | 3    | 23      | -0.278162D-03              | -0.146096E-02 | -0.249172D-01        | -0.147836D+00 | 0.323804D+00   |
| 1       | 3    | 24      | -0.716293D-03              | -0.300645E-02 | -0.210046D-01        | -0.123071D+00 | 0.470440D+00   |
| 1       | 3    | 25      | -0.143911D-02              | -0.474757E-02 | -0.565426D-01        | -0.187031D+00 | 0.617077D+00   |
| 1       | 3    | 26      | -0.182914D-02              | -0.533540D-02 | 0.630788D-01         | 0.611048D-01  | 0.763713D+00   |
| 1       | 3    | 27      | -0.398527D-02              | -0.853798D-02 | -0.372514D+00        | -0.628301D+00 | 0.910350D+00   |
| 1       | 3    | 28      | -0.707219D-02              | -0.128718E-01 | -0.403107D-02        | -0.197630D+00 | 0.105659D+01   |
| 1       | 3    | 29      | -0.109922D-01              | -0.165257E-01 | -0.495104D+00        | -0.521549D+00 | 0.120362D+01   |
| 1       | 3    | 30      | -0.176151D-01              | -0.210426E-01 | -0.398862D+00        | -0.435091D+00 | 0.135026D+01   |
| 1       | 3    | 31      | -0.194797D-01              | -0.222500E-01 | 0.367775D+00         | -0.354218D-01 | 0.149689D+01   |
| 1       | 3    | 32      | -0.211649D-01              | -0.221817D-01 | -0.382728D+00        | -0.178109D+00 | 0.164353D+01   |
| 1       | 3    | 33      | -0.214873D-01              | -0.222490D-01 | 0.503432D+00         | -0.135432D+00 | 0.169442D+01   |
| 1       | 4    | 34      | -0.765956D-03              | -0.347024E-02 | -0.646290D-01        | -0.320401D+00 | 0.406402D+00   |

-5.02-

MODE NUMBER 5  
FREQUENCY = 0.5000

LIFT AND PITCHING MOMENT PER UNIT SPAN FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | SPAN WIDTH   | --- LIFT PER UNIT SPAN --- |               | PITCHING MOMENT PER UNIT SPAN ABOUT X=0.806500D+00 |               |
|---------|------|--------------|----------------------------|---------------|--|---------------|
| 1       | 1    | 0.102000D+00 | -0.183203D-16              | -0.402036E-16 | -0.993001D-18                                      | 0.615994D-18  |
| 1       | 2    | 0.102000D+00 | -0.288454D-15              | -0.371908E-16 | 0.151103D-16                                       | -0.395329D-17 |
| 1       | 3    | 0.102000D+00 | -0.310952D-01              | 0.273614E-02  | 0.416238D-01                                       | -0.366257D-02 |
| 1       | 4    | 0.102000D+00 | -0.118148D+00              | 0.187192E-01  | 0.160818D+00                                       | -0.254798D-01 |
| 1       | 5    | 0.102000D+00 | -0.358664D+00              | 0.340812E-01  | 0.486713D+00                                       | -0.463900D-01 |
| 2       | 1    | 0.980000D-01 | -0.784441D+00              | -0.157665E-01 | 0.103103D+01                                       | 0.293105D-01  |
| 2       | 2    | 0.980000D-01 | -0.103598D+01              | -0.108224E-01 | 0.141758D+01                                       | 0.251765D-01  |
| 2       | 3    | 0.980000D-01 | -0.120659D+01              | 0.193020E-01  | 0.172580D+01                                       | -0.183525D-01 |
| 2       | 4    | 0.980000D-01 | -0.128526D+01              | 0.580683E-01  | 0.191539D+01                                       | -0.803017D-01 |
| 2       | 5    | 0.980000D-01 | -0.853968D+00              | 0.320665E-01  | 0.127354D+01                                       | -0.366057D-01 |

MODE NUMBER 5  
FREQUENCY = 0.5000

VELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | ELEMENT | --- VELOCITY POTENTIAL --- |               | ----- PRESSURE ----- |               | ----- XC ----- |
|---------|------|---------|----------------------------|---------------|----------------------|---------------|----------------|
| 1       | 1    | 1       | -0.579208D-33              | -0.123274D-33 | -0.313516D-31        | -0.141789D-31 | 0.158638D+00   |
| 1       | 1    | 2       | -0.516861D-33              | -0.270370D-33 | 0.442259D-31         | -0.209079D-31 | 0.305244D+00   |
| 1       | 1    | 3       | -0.228191D-33              | -0.393081E-33 | 0.100465D-31         | -0.350913D-32 | 0.451881D+00   |
| 1       | 1    | 4       | -0.103125D-34              | -0.727157E-33 | 0.321850D-31         | -0.559476D-31 | 0.598517D+00   |
| 1       | 1    | 5       | -0.672281D-34              | -0.957982E-33 | -0.283623D-31        | 0.183801D-31  | 0.745154D+00   |
| 1       | 1    | 6       | -0.320450D-33              | -0.130417D-32 | -0.473999D-32        | -0.810087D-31 | 0.891790D+00   |
| 1       | 1    | 7       | -0.493892D-18              | -0.221947E-17 | -0.857732D-16        | -0.379517D-15 | 0.103545D+01   |
| 1       | 1    | 8       | -0.173282D-17              | -0.419029E-17 | -0.696909D-16        | 0.275897D-16  | 0.118506D+01   |
| 1       | 1    | 9       | -0.265117D-17              | -0.401385E-17 | -0.380837D-16        | -0.262041D-16 | 0.133173D+01   |
| 1       | 1    | 10      | -0.390122D-17              | -0.419670E-17 | -0.124930D-15        | -0.427825D-16 | 0.147834D+01   |
| 1       | 1    | 11      | -0.363625D-17              | -0.321946E-17 | 0.231297D-15         | 0.175370D-15  | 0.160582D+01   |
| 1       | 2    | 12      | -0.261412D-33              | 0.172330E-33  | -0.127194D-31        | 0.883122D-32  | 0.241206D+00   |
| 1       | 2    | 13      | -0.177783D-33              | 0.145100E-33  | 0.239745D-31         | -0.177198D-31 | 0.387842D+00   |
| 1       | 2    | 14      | 0.742557D-34               | -0.204087E-34 | 0.186443D-31         | -0.110430D-31 | 0.534479D+00   |
| 1       | 2    | 15      | 0.221758D-33               | -0.282598E-33 | 0.768321D-32         | -0.315303D-31 | 0.768111D+00   |
| 1       | 2    | 16      | 0.216003D-33               | -0.686492E-33 | -0.269529D-32        | -0.344274D-31 | 0.627752D+00   |
| 1       | 2    | 17      | -0.184798D-18              | -0.104944E-17 | -0.325576D-16        | -0.282149D-15 | 0.974388D+00   |
| 1       | 2    | 18      | -0.990293D-18              | -0.330165E-17 | -0.631657D-16        | -0.677456D-17 | 0.112102D+01   |
| 1       | 2    | 19      | -0.225663D-17              | -0.409592E-17 | -0.112710D-15        | -0.145865D-15 | 0.126766D+01   |
| 1       | 2    | 20      | -0.355042D-17              | -0.448222E-17 | -0.485082D-16        | 0.389458D-16  | 0.141400D+01   |
| 1       | 2    | 21      | -0.333263D-17              | -0.337151E-17 | 0.138613D-15         | 0.100370D-15  | 0.150093D+01   |
| 1       | 2    | 22      | -0.351749D-17              | -0.259677E-17 | -0.153628D-15        | 0.819006D-16  | 0.165012D+01   |
| 1       | 3    | 23      | -0.170214D-33              | 0.157024E-33  | -0.770373D-32        | 0.768154D-32  | 0.323804D+00   |
| 1       | 3    | 24      | -0.993575D-34              | 0.118300E-33  | 0.171048D-31         | -0.170985D-31 | 0.470440D+00   |
| 1       | 3    | 25      | 0.496145D-34               | -0.189542E-35 | 0.820662D-32         | -0.342840D-32 | 0.617077D+00   |
| 1       | 3    | 26      | 0.156935D-33               | -0.323931E-33 | 0.103246D-31         | -0.504728D-31 | 0.763713D+00   |
| 1       | 3    | 27      | -0.104807D-19              | -0.190129E-17 | -0.287113D-17        | -0.325344D-15 | 0.910300D+00   |
| 1       | 3    | 28      | -0.529425D-18              | -0.309018E-17 | -0.367632D-16        | 0.118811D-15  | 0.105699D+01   |
| 1       | 3    | 29      | -0.150054D-17              | -0.357870E-17 | -0.100724D-15        | -0.211585D-15 | 0.120362D+01   |
| 1       | 3    | 30      | -0.328659D-17              | -0.498532E-17 | -0.144967D-15        | -0.574570D-16 | 0.135026D+01   |
| 1       | 3    | 31      | -0.319302D-17              | -0.369512E-17 | 0.222673D-15         | 0.222676D-15  | 0.149689D+01   |
| 1       | 3    | 32      | -0.374153D-17              | -0.236222E-17 | -0.292159D-15        | -0.173597D-16 | 0.164353D+01   |
| 1       | 3    | 33      | -0.233679D-02              | 0.202898E-03  | -0.115375D+01        | 0.101521D+00  | 0.169442D+01   |
| 1       | 4    | 34      | -0.123223D-33              | 0.137410E-33  | -0.706896D-32        | 0.839887D-32  | 0.400402D+00   |

FREQUENCY = C.5000  
5 MODES

GENERALIZED AERODYNAMIC COEFFICIENTS  
MACH NUMBER = 1.2000

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

DISPLACEMENT  
MODE

---- PRESSURE MODE 1 ----

---- PRESSURE MODE 2 ----

---- PRESSURE MODE 3 ----

|   |              |              |              |              |              |              |
|---|--------------|--------------|--------------|--------------|--------------|--------------|
| 1 | -.169059D+00 | -.206655D+01 | -.483265D+01 | -.226519D+01 | -.104470D+02 | 0.153539D+01 |
| 2 | 0.753300D+00 | 0.439045D+00 | 0.200106D+00 | -.334165D+01 | -.695469D+01 | 0.174086D+01 |
| 3 | 0.516048D+00 | -.108319D+00 | -.620244D+00 | -.207060D+01 | -.416424D+01 | 0.711933D+00 |
| 4 | 0.331005D-01 | -.278090D+00 | -.760754D+00 | -.890933D+00 | -.329483D+01 | 0.397387D+00 |
| 5 | 0.295873D-01 | 0.133742D-01 | 0.117456D-01 | -.107436D+00 | -.196219D+00 | 0.102779D-01 |

DISPLACEMENT  
MODE

---- PRESSURE MODE 4 ----

---- PRESSURE MODE 5 ----

|   |              |              |              |              |
|---|--------------|--------------|--------------|--------------|
| 1 | -.157129D+00 | -.562923D+00 | -.111619D+01 | 0.273716D-01 |
| 2 | 0.489190D-01 | 0.216095D-01 | -.105058D+01 | 0.207223D-01 |
| 3 | 0.552193D-01 | 0.172176D-01 | -.993555D+00 | 0.143681D-01 |
| 4 | -.460522D-02 | -.121636D+00 | -.624065D+00 | 0.161672D-01 |
| 5 | 0.393831D-02 | 0.525505D-02 | -.936282D-01 | -.436443D-02 |

FREQUENCY = C.5000

TOTAL LIFT AND PITCHING MOMENTS  
MACH NUMBER = 1.2000

MODE

WING

----- LIFT -----

PITCHING MOMENT ABOUT X = 0.806500D+00

|   |   |              |              |              |              |
|---|---|--------------|--------------|--------------|--------------|
| 1 | 1 | -.845295D-01 | -.103327D+01 | -.597972D+00 | -.330943D+00 |
| 2 | 1 | -.241632D+01 | -.113260D+01 | -.150836D+00 | 0.251886D+01 |
| 3 | 1 | -.522350D+01 | 0.767695D+00 | 0.524229D+01 | -.131222D+01 |
| 4 | 1 | -.735643D-01 | -.281462D+00 | -.368741D-01 | -.162888D-01 |
| 5 | 1 | -.558097D+00 | 0.136858D-01 | 0.791902D+00 | -.156200D-01 |

\*\*\*\*\* END OF EXECUTION RUN \*\*\*\*\*  
\*\*\*\*\* PROGRAM WILL NOW CYCLE TO NEXT CASE \*\*\*\*\*

H

| SECTION                          | CPU SECONDS USED | TOTAL CPU |
|----------------------------------|------------------|-----------|
| READ INPUT AND GEVERATE GRID     | 1.150            | 2.633     |
| FIND INFLUENCE COEFFICIENT MATR. | 54.550           | 57.183    |
| READ AND PROCESS MODE INPUT      | 1.283            | 58.466    |
|                                  |                  |           |
| READ AND DECOMPOSE COEFF. MATRIX | 5.934            | 64.400    |
| SOLVE FOR POTENTIAL GRADIENT     | 0.100            | 64.500    |
| SOLVE FOR POTENTIAL GRADIENT     | 8.283            | 72.783    |
| SOLVE FOR POTENTIAL GRADIENT     | 7.550            | 80.233    |
| SOLVE FOR POTENTIAL GRADIENT     | 1.000            | 81.333    |
| SOLVE FOR POTENTIAL GRADIENT     | 5.633            | 86.966    |
| SOLVE FOR DOWNWASH FOR ONE FREQ. | 0.967            | 87.933    |
|                                  |                  |           |
| READ AND DECOMPOSE COEFF. MATRIX | 5.150            | 93.083    |
| SOLVE FOR POTENTIAL GRADIENT     | 6.733            | 99.816    |
| SOLVE FOR POTENTIAL GRADIENT     | 7.984            | 107.800   |
| SOLVE FOR POTENTIAL GRADIENT     | 6.766            | 114.566   |
| SOLVE FOR POTENTIAL GRADIENT     | 6.584            | 121.150   |
| SOLVE FOR POTENTIAL GRADIENT     | 5.583            | 126.733   |
| SOLVE FOR DOWNWASH FOR ONE FREQ. | 1.100            | 127.833   |

ORIGINAL PAGE IS  
OF POOR QUALITY



1 2 3 4 5 6 7 8  
1234567890123456789012345678901234567890123456789012345678901234567890

TITLE TAPERED SWEEP-BACK WING CASE 2  
RUN 1 0 0 1.20 1.0 0.8065  
WING 1 6 1 3 0 2 5 5 1.1 1.45  
COPNER 1 0.0 0.0  
2 1.613 0.0  
3 0.412990 0.51  
4 1.78662 0.51  
5 0.809784 1.0  
6 1.95478 1.0  
LINE 2 1 1.49662 1.71378  
FREQ 2 0.0 0.5 1.0  
MODE 2 2 0 0  
MDWING 1 1 2  
N =105

(X(I),I=1,105)

|               |               |               |               |               |
|---------------|---------------|---------------|---------------|---------------|
| 1.0333735E-01 | 2.2741419E-01 | 3.5149097E-01 | 4.7556758E-01 | 5.9964454E-01 |
| 7.2372139E-01 | 8.4779835E-01 | 9.7187519E-01 | 1.0959501E 00 | 1.2200289E 00 |
| 1.3441048E 00 | 1.4681826E 00 | 1.5802908E 00 | 1.8593526E-01 | 3.1001198E-01 |
| 4.3408877E-01 | 5.5816555E-01 | 6.8224257E-01 | 8.0631936E-01 | 9.3039638E-01 |
| 1.0544729E 00 | 1.1785498E 00 | 1.3026266E 00 | 1.4267025E 00 | 1.5769129E 00 |
| 2.6853317E-01 | 3.9260966E-01 | 5.1668698E-01 | 6.4076346E-01 | 7.6484054E-01 |
| 8.8891727E-01 | 1.0129938E 00 | 1.1370707E 00 | 1.2611465E 00 | 1.3852234E 00 |
| 1.5093102E 00 | 1.6355734E 00 | 3.5113114E-01 | 4.7520787E-01 | 5.9928465E-01 |
| 7.2336149E-01 | 8.4743857E-01 | 9.7151536E-01 | 1.0955915E 00 | 1.2196674E 00 |
| 1.3437443E 00 | 1.4678221E 00 | 1.6321955E 00 | 4.3372887E-01 | 5.5780566E-01 |
| 6.8188268E-01 | 8.0595946E-01 | 9.3003649E-01 | 1.0541115E 00 | 1.1781893E 00 |
| 1.3022652E 00 | 1.4263439E 00 | 1.5504208E 00 | 1.6908569E 00 | 5.1287037E-01 |
| 6.3327348E-01 | 7.5367665E-01 | 8.7407988E-01 | 9.9448299E-01 | 1.1148844E 00 |
| 1.2352886E 00 | 1.3556919E 00 | 1.4671135E 00 | 1.5908346E 00 | 1.7333832E 00 |
| 5.9222919E-01 | 7.1263236E-01 | 8.3303559E-01 | 9.5243876E-01 | 1.0738401E 00 |
| 1.1942434E 00 | 1.3146477E 00 | 1.4683065E 00 | 1.6994152E 00 | 6.7158788E-01 |
| 7.9199106E-01 | 9.1239417E-01 | 1.0327969E 00 | 1.1531992E 00 | 1.2736025E 00 |
| 1.3940067E 00 | 1.5297022E 00 | 1.7379475E 00 | 7.5094676E-01 | 8.7134987E-01 |
| 9.9175298E-01 | 1.1121559E 00 | 1.2325583E 00 | 1.3529615E 00 | 1.4733658E 00 |
| 1.5910988E 00 | 1.7764807E 00 | 8.3030510E-01 | 9.5070827E-01 | 1.0711107E 00 |
| 1.1915131E 00 | 1.3119164E 00 | 1.4323206E 00 | 1.5922928E 00 | 1.8150120E 00 |

(Y(I),I=1,105)

|               |               |               |               |               |
|---------------|---------------|---------------|---------------|---------------|
| 5.0999999E-02 | 5.0999999E-02 | 5.0999999E-02 | 5.0999999E-02 | 5.0999999E-02 |
| 5.0999999E-02 | 5.0999999E-02 | 5.0999999E-02 | 5.0999999E-02 | 5.0999999E-02 |
| 5.0999999E-02 | 5.0999999E-02 | 5.0999999E-02 | 1.5300000E-01 | 1.5300000E-01 |
| 1.5300000E-01 | 1.5300000E-01 | 1.5300000E-01 | 1.5300000E-01 | 1.5300000E-01 |
| 1.5300000E-01 | 1.5300000E-01 | 1.5300000E-01 | 1.5300000E-01 | 1.5300000E-01 |
| 2.5500000E-01 | 2.5500000E-01 | 2.5500000E-01 | 2.5500000E-01 | 2.5500000E-01 |
| 2.5500000E-01 | 2.5500000E-01 | 2.5500000E-01 | 2.5500000E-01 | 2.5500000E-01 |
| 2.5500000E-01 | 2.5500000E-01 | 2.5500000E-01 | 3.5699999E-01 | 3.5699999E-01 |
| 3.5699999E-01 | 3.5699999E-01 | 3.5699999E-01 | 3.5699999E-01 | 3.5699999E-01 |

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|               |               |               |               |               |
|---------------|---------------|---------------|---------------|---------------|
| 3.5699999E-01 | 3.5899999E-01 | 3.5699999E-01 | 4.5899999E-01 | 4.5899999E-01 |
| 4.5899999E-01 | 4.5899999E-01 | 4.5899999E-01 | 4.5899999E-01 | 4.5899999E-01 |
| 4.5899999E-01 | 4.5899999E-01 | 4.5899999E-01 | 4.5899999E-01 | 5.5899990E-01 |
| 5.5899990E-01 | 5.5899990E-01 | 5.5899990E-01 | 5.5899990E-01 | 5.5899990E-01 |
| 5.5899990E-01 | 5.5899990E-01 | 5.5899990E-01 | 5.5899990E-01 | 5.5899990E-01 |
| 6.5699977E-01 | 6.5699977E-01 | 6.5699977E-01 | 6.5699977E-01 | 6.5699977E-01 |
| 6.5699977E-01 | 6.5699977E-01 | 6.5699977E-01 | 6.5699977E-01 | 7.5499988E-01 |
| 7.5499988E-01 | 7.5499988E-01 | 7.5499988E-01 | 7.5499988E-01 | 7.5499988E-01 |
| 7.5499988E-01 | 7.5499988E-01 | 7.5499988E-01 | 8.5299987E-01 | 8.5299987E-01 |
| 8.5299987E-01 | 8.5299987E-01 | 8.5299987E-01 | 8.5299987E-01 | 8.5299987E-01 |
| 8.5299987E-01 | 8.5299987E-01 | 9.5099986E-01 | 9.5099986E-01 | 9.5099986E-01 |
| 9.5099986E-01 | 9.5099986E-01 | 9.5099986E-01 | 9.5099986E-01 | 9.5099986E-01 |

[illegible]

|                |                |                |                |                |
|----------------|----------------|----------------|----------------|----------------|
| 2.8915038E-06  | -2.3053719E-06 | 5.3206008E-07  | -1.2413858E-07 | -1.9339222E-08 |
| -2.7794545E-08 | -2.1500756E-08 | -1.8771370E-08 | -1.6650283E-08 | -1.5544313E-08 |
| -1.1634999E-08 | -3.0423177E-08 | 3.3272929E-08  | -2.4111271E-06 | 1.6713821E-06  |
| -1.3339269E-07 | 1.0504033E-07  | 3.8668468E-08  | 3.4960976E-08  | 2.6834655E-08  |
| 2.1994492E-08  | 1.8950779E-08  | 1.5245625E-08  | 1.1008474E-08  | -8.3186329E-09 |
| 3.0594560E-07  | -7.9448512E-08 | 2.9585507E-09  | -1.7406613E-08 | -6.9119643E-09 |
| -6.7002865E-09 | -5.1691131E-09 | -4.0669335E-09 | -4.3617341E-09 | 4.2660808E-10  |
| -2.0176312E-08 | 3.0250739E-08  | -9.3624635E-08 | 1.0205730E-07  | -1.6091159E-08 |
| 5.0847930E-09  | 7.6955908E-10  | 1.2269714E-09  | 5.9997496E-10  | 9.7370556E-10  |
| 9.5078190E-10  | -7.0359607E-10 | -1.2640164E-08 | -3.1569616E-08 | 4.4836771E-08  |
| -7.8566949E-09 | 6.9352746E-10  | -3.2183545E-10 | -2.0704288E-10 | 1.1415059E-10  |

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-7.9662210E-10 2.0257784E-09 -1.0607764E-C8 6.6693353E-09 -3.1389813E-08  
3.8491123E-08 -6.7225479E-09 1.0101495E-09 -1.6380525E-10 3.4358472E-10  
-1.5106270E-10 -7.6604989E-10 5.4859690E-09 -2.4275881E-08 4.0649880E-08  
-2.5256668E-08 2.9834382E-08 -5.3351670E-09 7.8922668E-10 -4.1510040E-10  
-3.4227732E-10 1.3911428E-11 3.9779277E-11 -2.668694E-08 -2.1597593E-08  
2.4167196E-08 -3.9619756E-09 8.6047081E-10 1.9360877E-09 1.3919823E-09  
1.5644357E-09 1.6849819E-09 1.5180749E-08 -1.8215463E-08 1.9911180E-08  
-5.4780926E-09 -5.5251341E-09 -7.1318560E-09 -1.1048321E-08 6.5464367E-10  
-3.4855766E-08 -7.8658672E-08 -2.1591713E-08 1.0950945E-08 3.9923584E-09  
5.5551510E-09 4.0037165E-09 1.1028636E-08 -2.3897652E-08 1.5400582E-07

(B(I),I=1, 3)

1.CC0C000E 00 -2.7026488E-07 -1.2340786E-C7

MODE NUMBER 2

(Z(I),I=1,105)

-7.0316255E-01 -5.7908577E-01 -4.5500866E-01 -3.3093238E-01 -2.0685536E-01  
-8.2778513E-02 4.1298449E-02 1.6537517E-01 2.8945106E-01 4.1352886E-01  
5.3760475E-01 6.6168255E-01 7.7379078E-01 -6.2056458E-01 -4.9648798E-01  
-3.7241119E-01 -2.4833435E-01 -1.2425739E-01 -1.8060209E-04 1.2389648E-01  
2.4757297E-01 3.7204975E-01 4.9612665E-01 6.2020350E-01 7.7041286E-01  
-5.3796667E-01 -4.1389018E-01 -2.8981286E-01 -1.6573638E-01 -4.1659359E-02  
8.2417369E-02 2.0549385E-01 3.3057070E-01 4.5464748E-01 5.7872438E-01  
7.0280117E-01 8.2907438E-01 -4.5536876E-01 -3.3129197E-01 -2.0721519E-01  
-8.3138466E-02 4.0938620E-02 1.6501540E-01 2.8909159E-01 4.1316837E-01  
5.3724527E-01 6.6132307E-01 8.2569647E-01 -3.7277108E-01 -2.4865424E-01  
-1.2461716E-01 -5.4043508E-01 1.2353659E-01 2.4761248E-01 3.7165027E-01  
4.9576616E-01 6.1984396E-01 7.4392074E-01 8.8435698E-01 -2.9362959E-01  
-1.7322636E-01 -5.2323249E-01 6.7579925E-02 1.8798298E-01 3.0838537E-01  
4.2878866E-01 5.4919195E-01 6.6061449E-01 7.8433466E-01 9.2688417E-01  
-2.1427565E-01 -9.3867481E-02 2.6535627E-02 1.4693874E-01 2.6734108E-01  
3.8774437E-01 5.0314766E-01 6.6180748E-01 8.9291614E-01 -1.3491207E-01  
-1.4508899E-02 1.0589415E-01 2.2629684E-01 3.4670019E-01 4.6710348E-01  
5.8750677E-01 7.2320318E-01 9.3144846E-01 -5.5553198E-02 6.4849913E-02  
1.8525308E-01 3.0565596E-01 4.2605919E-01 5.4646248E-01 6.6686577E-01  
7.8459877E-01 9.6998056E-01 2.3805138E-02 1.4420825E-01 2.6461077E-01  
3.8591406E-01 5.0541729E-01 6.2582058E-01 7.8579277E-01 1.0085115E 00

(A(I),I=1,105)

-4.0181085E-06 2.4023670E-05 -2.9230388E-05 1.2020354E-05 -5.1911386E-10  
4.3147374E-07 -1.5786844E-07 -1.6523438E-05 3.0746698E-05 2.3382563E-06  
-3.6448128E-06 -1.3314620E-05 3.9392489E-06 -6.9375028E-06 1.6478980E-06  
3.1380032E-06 -2.9535022E-06 -1.3003355E-06 -1.1485308E-06 7.1197519E-06  
-1.1379205E-05 -1.5297264E-05 -2.2211592E-05 3.5112666E-05 -1.3513793E-05  
5.7881853E-06 4.7227285E-08 1.2452192E-06 -1.1323700E-06 3.7685468E-06  
2.0007174E-06 8.2062807E-06 1.9440995E-06 2.3904096E-05 -1.1563755E-05  
-7.5087128E-06 3.6095398E-06 -2.8686773E-06 -2.8476443E-06 4.5525849E-06  
-2.6992748E-06 -4.7679105E-06 -3.7609607E-06 -2.8045499E-05 -9.0364171E-07  
-5.6035135E-06 2.4138673E-05 2.1700340E-05 2.0462321E-06 -3.2575108E-06  
-1.7309976E-06 4.7007852E-06 -1.4602501E-06 3.3220727E-05 5.9391041E-06

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\*\*\*\*\* ISCON ANALYSIS INPUT DATA CHECK \*\*\*\*\*

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3.0818381E-05 -3.6428319E-05 -1.6517370E-05 -2.4250156E-05 1.1801018E-07  
3.8765156E-06 -3.4175046E-05 6.8982536E-06 -3.1197793E-05 5.4807342E-06  
-3.1127682E-05 -1.4117004E-05 4.6067711E-05 -2.1544023E-05 2.1430678E-05  
-6.1551020E-08 9.2259103E-07 1.0478743E-06 -4.3878077E-07 2.0875174E-05  
1.1241219E-05 -1.3510046E-05 6.3401403E-06 -8.7762764E-06 -1.3630870E-06  
-1.4533061E-06 3.0033725E-06 -2.2156222E-05 1.2550267E-05 1.7815066E-05  
-3.2167431E-05 2.7878967E-05 1.6447913E-05 1.1400234E-06 -2.3134135E-06  
1.6963328E-05 -2.0997875E-05 -1.0790986E-05 2.5193571E-05 -1.0421609E-05  
-2.1076237E-05 -1.0567824E-05 2.1147625E-06 -2.5188920E-06 -7.5667840E-06  
1.7360348E-05 5.9973985E-07 -1.2224436E-05 1.5840225E-05 -2.5579611E-06

(B(I), I=1, 3)

-8.0645328E-01 9.9999475E-01 -1.1907750E-06

END

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TAPERED SWEEP-BACK WING

CASE 2

MACH NUMBER 1.20000

REFERENCE LENGTH 1.00000

PITCHING MOMENT AXIS 0.80650

RUN TYPE CODE 1  
(COMPLETE RUN ATTEMPT)

PLOT REQUEST CODE 0  
(NO PLOTS ARE REQUESTED)

WAKE EFFECT CODE 0  
(WAKE EFFECT IS NOT CONSIDERED)

DATA FOR WING 1

NUMBER OF CORNER POINTS 6  
 SYMMETRY CODE 1  
 (SYMMETRIC)  
 OUTPUT PRINT CODE 3  
 GRID GENERATION CODE 0  
 (GRID BASED ON ELEMENT ASPECT RATIO)  
 NUMBER OF SECTIONS 2  
 NUMBER OF SPANS IN  
 SECTION 1 5  
 SECTION 2 5  
 ELEMENT ASPECT RATIO 1.1000  
 ASPECT RATIO OF WING 1.4500

COORDINATES OF THE CORNER POINTS OF WING 1

|   | X           | Y           | Z   |
|---|-------------|-------------|-----|
| 1 | 0.0         | 0.0         | 0.0 |
| 2 | 0.16130D+01 | 0.0         | 0.0 |
| 3 | 0.41299D+00 | 0.51000D+00 | 0.0 |
| 4 | 0.17866D+01 | 0.51000D+00 | 0.0 |
| 5 | 0.80978D+00 | 0.10000D+01 | 0.0 |
| 6 | 0.19548D+01 | 0.10000D+01 | 0.0 |

CONTROL LINES FOR WING 1

| SECTION | LINE | X1          | X2          |
|---------|------|-------------|-------------|
| 2       | 1    | 0.14966D+01 | 0.17138D+01 |

NUMBER OF FREQUENCIES 2  
 LIST OF FREQUENCIES 0.0 0.5000

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AERODYNAMIC GRID FOR MACH NUMBER 1.2000

STRUCTURAL REFERENCE SYSTEM OR  
ROTATED STRUCTURAL REFERENCE SYSTEM

## WING 1 SECTION 1

Z = 0.0

| SPAN | ELEMENT | X1          | X2          | X3          | X4          | Y1          | Y2          | XC          | YC          |
|------|---------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1    | 1       | 0.0         | 0.825980-01 | 0.229230+00 | 0.146640+00 | 0.0         | 0.102000+00 | 0.158610+00 | 0.510000-01 |
| 1    | 2       | 0.146640+00 | 0.229230+00 | 0.375870+00 | 0.293270+00 | 0.0         | 0.102000+00 | 0.305240+00 | 0.510000-01 |
| 1    | 3       | 0.293270+00 | 0.375870+00 | 0.522510+00 | 0.439910+00 | 0.0         | 0.102000+00 | 0.451880+00 | 0.510000-01 |
| 1    | 4       | 0.439910+00 | 0.522510+00 | 0.669140+00 | 0.586550+00 | 0.0         | 0.102000+00 | 0.598520+00 | 0.510000-01 |
| 1    | 5       | 0.586550+00 | 0.669140+00 | 0.815780+00 | 0.733180+00 | 0.0         | 0.102000+00 | 0.745150+00 | 0.510000-01 |
| 1    | 6       | 0.733180+00 | 0.815780+00 | 0.962420+00 | 0.879820+00 | 0.0         | 0.102000+00 | 0.891790+00 | 0.510000-01 |
| 1    | 7       | 0.879820+00 | 0.962420+00 | 0.110910+01 | 0.102650+01 | 0.0         | 0.102000+00 | 0.103840+01 | 0.510000-01 |
| 1    | 8       | 0.102650+01 | 0.110910+01 | 0.125570+01 | 0.117310+01 | 0.0         | 0.102000+00 | 0.118510+01 | 0.510000-01 |
| 1    | 9       | 0.117310+01 | 0.125570+01 | 0.140230+01 | 0.131970+01 | 0.0         | 0.102000+00 | 0.133170+01 | 0.510000-01 |
| 1    | 10      | 0.131970+01 | 0.140230+01 | 0.154900+01 | 0.146640+01 | 0.0         | 0.102000+00 | 0.147830+01 | 0.510000-01 |
| 1    | 11      | 0.146640+01 | 0.154900+01 | 0.164770+01 | 0.161300+01 | 0.0         | 0.102000+00 | 0.160580+01 | 0.510000-01 |
| 2    | 12      | 0.825980-01 | 0.165200+00 | 0.311830+00 | 0.229230+00 | 0.102000+00 | 0.204000+00 | 0.241210+00 | 0.153000+00 |
| 2    | 13      | 0.229230+00 | 0.311830+00 | 0.458470+00 | 0.375870+00 | 0.102000+00 | 0.204000+00 | 0.387840+00 | 0.153000+00 |
| 2    | 14      | 0.375870+00 | 0.458470+00 | 0.605110+00 | 0.522510+00 | 0.102000+00 | 0.204000+00 | 0.534480+00 | 0.153000+00 |
| 2    | 15      | 0.522510+00 | 0.605110+00 | 0.751740+00 | 0.669140+00 | 0.102000+00 | 0.204000+00 | 0.691120+00 | 0.153000+00 |
| 2    | 16      | 0.669140+00 | 0.751740+00 | 0.893380+00 | 0.815780+00 | 0.102000+00 | 0.204000+00 | 0.827750+00 | 0.153000+00 |
| 2    | 17      | 0.815780+00 | 0.893380+00 | 0.104500+01 | 0.962420+00 | 0.102000+00 | 0.204000+00 | 0.974390+00 | 0.153000+00 |
| 2    | 18      | 0.962420+00 | 0.104500+01 | 0.119170+01 | 0.110910+01 | 0.102000+00 | 0.204000+00 | 0.112100+01 | 0.153000+00 |
| 2    | 19      | 0.110910+01 | 0.119170+01 | 0.133830+01 | 0.125570+01 | 0.102000+00 | 0.204000+00 | 0.126770+01 | 0.153000+00 |
| 2    | 20      | 0.125570+01 | 0.133830+01 | 0.148490+01 | 0.140230+01 | 0.102000+00 | 0.204000+00 | 0.141430+01 | 0.153000+00 |
| 2    | 21      | 0.140230+01 | 0.148490+01 | 0.163160+01 | 0.154900+01 | 0.102000+00 | 0.204000+00 | 0.156090+01 | 0.153000+00 |
| 2    | 22      | 0.154900+01 | 0.163160+01 | 0.168240+01 | 0.164770+01 | 0.102000+00 | 0.204000+00 | 0.165010+01 | 0.153000+00 |
| 3    | 23      | 0.165200+00 | 0.247790+00 | 0.394430+00 | 0.311830+00 | 0.204000+00 | 0.306000+00 | 0.323800+00 | 0.255000+00 |
| 3    | 24      | 0.311830+00 | 0.394430+00 | 0.541070+00 | 0.458470+00 | 0.204000+00 | 0.306000+00 | 0.470440+00 | 0.255000+00 |
| 3    | 25      | 0.458470+00 | 0.541070+00 | 0.687730+00 | 0.605110+00 | 0.204000+00 | 0.306000+00 | 0.617080+00 | 0.255000+00 |
| 3    | 26      | 0.605110+00 | 0.687730+00 | 0.834340+00 | 0.751740+00 | 0.204000+00 | 0.306000+00 | 0.763710+00 | 0.255000+00 |
| 3    | 27      | 0.751740+00 | 0.834340+00 | 0.980980+00 | 0.893380+00 | 0.204000+00 | 0.306000+00 | 0.910350+00 | 0.255000+00 |
| 3    | 28      | 0.893380+00 | 0.980980+00 | 0.112760+01 | 0.104500+01 | 0.204000+00 | 0.306000+00 | 0.105700+01 | 0.255000+00 |
| 3    | 29      | 0.104500+01 | 0.112760+01 | 0.127420+01 | 0.119170+01 | 0.204000+00 | 0.306000+00 | 0.120360+01 | 0.255000+00 |
| 3    | 30      | 0.119170+01 | 0.127420+01 | 0.142090+01 | 0.133830+01 | 0.204000+00 | 0.306000+00 | 0.135030+01 | 0.255000+00 |
| 3    | 31      | 0.133830+01 | 0.142090+01 | 0.155750+01 | 0.148490+01 | 0.204000+00 | 0.306000+00 | 0.149690+01 | 0.255000+00 |
| 3    | 32      | 0.148490+01 | 0.155750+01 | 0.171420+01 | 0.163160+01 | 0.204000+00 | 0.306000+00 | 0.164350+01 | 0.255000+00 |
| 3    | 33      | 0.163160+01 | 0.171420+01 | 0.171720+01 | 0.168240+01 | 0.204000+00 | 0.306000+00 | 0.169440+01 | 0.255000+00 |
| 4    | 34      | 0.247790+00 | 0.330390+00 | 0.477030+00 | 0.394430+00 | 0.306000+00 | 0.408000+00 | 0.406400+00 | 0.357000+00 |
| 4    | 35      | 0.394430+00 | 0.477030+00 | 0.623660+00 | 0.541070+00 | 0.306000+00 | 0.408000+00 | 0.553040+00 | 0.357000+00 |
| 4    | 36      | 0.541070+00 | 0.623660+00 | 0.770300+00 | 0.687700+00 | 0.306000+00 | 0.408000+00 | 0.699670+00 | 0.357000+00 |
| 4    | 37      | 0.687700+00 | 0.770300+00 | 0.916940+00 | 0.834340+00 | 0.306000+00 | 0.408000+00 | 0.846310+00 | 0.357000+00 |
| 4    | 38      | 0.834340+00 | 0.916940+00 | 0.106360+01 | 0.980980+00 | 0.306000+00 | 0.408000+00 | 0.992950+00 | 0.357000+00 |
| 4    | 39      | 0.980980+00 | 0.106360+01 | 0.121020+01 | 0.112760+01 | 0.306000+00 | 0.408000+00 | 0.113960+01 | 0.357000+00 |
| 4    | 40      | 0.112760+01 | 0.121020+01 | 0.135680+01 | 0.127420+01 | 0.306000+00 | 0.408000+00 | 0.128620+01 | 0.357000+00 |
| 4    | 41      | 0.127420+01 | 0.135680+01 | 0.150350+01 | 0.142090+01 | 0.306000+00 | 0.408000+00 | 0.143290+01 | 0.357000+00 |
| 4    | 42      | 0.142090+01 | 0.150350+01 | 0.165010+01 | 0.156750+01 | 0.306000+00 | 0.408000+00 | 0.157950+01 | 0.357000+00 |
| 4    | 43      | 0.156750+01 | 0.165010+01 | 0.171720+01 | 0.171720+01 | 0.306000+00 | 0.408000+00 | 0.170540+01 | 0.357000+00 |
| 5    | 44      | 0.330390+00 | 0.412990+00 | 0.559630+00 | 0.477030+00 | 0.408000+00 | 0.510000+00 | 0.489000+00 | 0.459000+00 |
| 5    | 45      | 0.477030+00 | 0.559630+00 | 0.706250+00 | 0.623660+00 | 0.408000+00 | 0.510000+00 | 0.635640+00 | 0.459000+00 |
| 5    | 46      | 0.623660+00 | 0.706250+00 | 0.852900+00 | 0.770300+00 | 0.408000+00 | 0.510000+00 | 0.782270+00 | 0.459000+00 |
| 5    | 47      | 0.770300+00 | 0.852900+00 | 0.999540+00 | 0.916940+00 | 0.408000+00 | 0.510000+00 | 0.928910+00 | 0.459000+00 |
| 5    | 48      | 0.916940+00 | 0.999540+00 | 0.114620+01 | 0.106360+01 | 0.408000+00 | 0.510000+00 | 0.107550+01 | 0.459000+00 |

|   |    |             |             |             |             |             |             |             |             |
|---|----|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 5 | 49 | C.10636D+01 | 0.11462D+01 | 0.12928D+01 | 0.12102E+01 | C.40800D+00 | 0.51000D+00 | 0.12222D+01 | 0.45900D+00 |
| 5 | 50 | C.12102D+01 | 0.12928D+01 | 0.14394D+01 | 0.13568E+01 | C.40800E+00 | 0.51000D+00 | 0.13688D+01 | 0.45900D+00 |
| 5 | 51 | C.13568D+01 | 0.14394D+01 | 0.15861D+01 | 0.15035E+01 | C.40800D+00 | 0.51000D+00 | 0.15155D+01 | 0.45900D+00 |
| 5 | 52 | C.15035D+01 | 0.15861D+01 | 0.17327D+01 | 0.15501E+01 | C.40800D+00 | 0.51000D+00 | 0.16621D+01 | 0.45900D+00 |
| 5 | 53 | C.16501D+01 | 0.17327D+01 | 0.17866D+01 | 0.17519E+01 | C.40800D+00 | 0.51000D+00 | 0.17537D+01 | 0.45900D+00 |

# WING 1 SECTION 2

Z = 0.0

| SPAN | ELEMENT | X1          | X2          | X3          | X4          | Y1          | Y2          | XC          | YC          |
|------|---------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1    | 54      | C.41299D+00 | 0.49235D+00 | 0.64715D+00 | 0.56779E+00 | C.51000D+00 | 0.60800D+00 | 0.57651D+00 | 0.55900D+00 |
| 1    | 55      | C.56779D+00 | 0.64715D+00 | 0.80195D+00 | 0.72260E+00 | C.51000D+00 | 0.60800D+00 | 0.73132D+00 | 0.55900D+00 |
| 1    | 56      | C.72260D+00 | 0.80195D+00 | 0.95676D+00 | 0.87740E+00 | C.51000D+00 | 0.60800D+00 | 0.88612D+00 | 0.55900D+00 |
| 1    | 57      | C.87740D+00 | 0.95676D+00 | 0.11115D+01 | 0.10322E+01 | C.51000D+00 | 0.60800D+00 | 0.10409D+01 | 0.55900D+00 |
| 1    | 58      | C.10322D+01 | 0.11115D+01 | 0.12564D+01 | 0.11870E+01 | C.51000D+00 | 0.60800D+00 | 0.11957D+01 | 0.55900D+00 |
| 1    | 59      | C.11870D+01 | 0.12564D+01 | 0.14212D+01 | 0.13418E+01 | C.51000D+00 | 0.60800D+00 | 0.13505D+01 | 0.55900D+00 |
| 1    | 60      | C.13418D+01 | 0.14212D+01 | 0.15401D+01 | 0.14966E+01 | C.51000D+00 | 0.60800D+00 | 0.14910D+01 | 0.55900D+00 |
| 1    | 61      | C.14966D+01 | 0.15401D+01 | 0.16851D+01 | 0.16416E+01 | C.51000D+00 | 0.60800D+00 | 0.16343D+01 | 0.55900D+00 |
| 1    | 62      | C.16416D+01 | 0.16851D+01 | 0.18203D+01 | 0.17866E+01 | C.51000D+00 | 0.60800D+00 | 0.17754D+01 | 0.55900D+00 |
| 2    | 63      | C.49235D+00 | 0.57171D+00 | 0.72651D+00 | 0.64715E+00 | C.60800D+00 | 0.70500D+00 | 0.65587D+00 | 0.65700D+00 |
| 2    | 64      | C.64715D+00 | 0.72651D+00 | 0.88132D+00 | 0.80196E+00 | C.60800D+00 | 0.70500D+00 | 0.81068D+00 | 0.65700D+00 |
| 2    | 65      | C.80196D+00 | 0.88132D+00 | 0.10361D+01 | 0.95676E+00 | C.60800D+00 | 0.70500D+00 | 0.96548D+00 | 0.65700D+00 |
| 2    | 66      | C.95676D+00 | 0.10361D+01 | 0.11909D+01 | 0.11116E+01 | C.60800D+00 | 0.70500D+00 | 0.11203D+01 | 0.65700D+00 |
| 2    | 67      | C.11116D+01 | 0.11909D+01 | 0.13457D+01 | 0.12664E+01 | C.60800D+00 | 0.70500D+00 | 0.12751D+01 | 0.65700D+00 |
| 2    | 68      | C.12664D+01 | 0.13457D+01 | 0.15005D+01 | 0.14212E+01 | C.60800D+00 | 0.70500D+00 | 0.14259D+01 | 0.65700D+00 |
| 2    | 69      | C.14212D+01 | 0.15005D+01 | 0.15835D+01 | 0.15401E+01 | C.60800D+00 | 0.70500D+00 | 0.15416D+01 | 0.65700D+00 |
| 2    | 70      | C.15401D+01 | 0.15835D+01 | 0.17285D+01 | 0.16851E+01 | C.60800D+00 | 0.70500D+00 | 0.16778D+01 | 0.65700D+00 |
| 2    | 71      | C.16851D+01 | 0.17285D+01 | 0.18539D+01 | 0.18203E+01 | C.60800D+00 | 0.70500D+00 | 0.18110D+01 | 0.65700D+00 |
| 3    | 72      | C.57171D+00 | 0.65107D+00 | 0.80587D+00 | 0.72651E+00 | C.70600D+00 | 0.80400D+00 | 0.73523D+00 | 0.75500D+00 |
| 3    | 73      | C.72651D+00 | 0.80587D+00 | 0.96067D+00 | 0.88132E+00 | C.70600D+00 | 0.80400D+00 | 0.89003D+00 | 0.75500D+00 |
| 3    | 74      | C.88132D+00 | 0.96067D+00 | 0.11155D+01 | 0.10361E+01 | C.70600D+00 | 0.80400D+00 | 0.10448D+01 | 0.75500D+00 |
| 3    | 75      | C.10361D+01 | 0.11155D+01 | 0.12703D+01 | 0.11909E+01 | C.70600D+00 | 0.80400D+00 | 0.11996D+01 | 0.75500D+00 |
| 3    | 76      | C.11909D+01 | 0.12703D+01 | 0.14251D+01 | 0.13457E+01 | C.70600D+00 | 0.80400D+00 | 0.13544D+01 | 0.75500D+00 |
| 3    | 77      | C.13457D+01 | 0.14251D+01 | 0.15799D+01 | 0.15005E+01 | C.70600D+00 | 0.80400D+00 | 0.15053D+01 | 0.75500D+00 |
| 3    | 78      | C.15005D+01 | 0.15799D+01 | 0.16269D+01 | 0.15835E+01 | C.70600D+00 | 0.80400D+00 | 0.15922D+01 | 0.75500D+00 |
| 3    | 79      | C.15835D+01 | 0.16269D+01 | 0.17719D+01 | 0.17285E+01 | C.70600D+00 | 0.80400D+00 | 0.17212D+01 | 0.75500D+00 |
| 3    | 80      | C.17285D+01 | 0.17719D+01 | 0.18875D+01 | 0.18539E+01 | C.70600D+00 | 0.80400D+00 | 0.18465D+01 | 0.75500D+00 |
| 4    | 81      | C.65107D+00 | 0.73043D+00 | 0.88523D+00 | 0.80587E+00 | C.80400D+00 | 0.90200D+00 | 0.81459D+00 | 0.85300D+00 |
| 4    | 82      | C.80587D+00 | 0.88523D+00 | 0.10400D+01 | 0.96067E+00 | C.80400D+00 | 0.90200D+00 | 0.96939D+00 | 0.85300D+00 |
| 4    | 83      | C.96067D+00 | 0.10400D+01 | 0.11948D+01 | 0.11155E+01 | C.80400D+00 | 0.90200D+00 | 0.11242D+01 | 0.85300D+00 |
| 4    | 84      | C.11155D+01 | 0.11948D+01 | 0.13495D+01 | 0.12703E+01 | C.80400D+00 | 0.90200D+00 | 0.12750D+01 | 0.85300D+00 |
| 4    | 85      | C.12703D+01 | 0.13495D+01 | 0.15044D+01 | 0.14251E+01 | C.80400D+00 | 0.90200D+00 | 0.14338D+01 | 0.85300D+00 |
| 4    | 86      | C.14251D+01 | 0.15044D+01 | 0.16593D+01 | 0.15799E+01 | C.80400D+00 | 0.90200D+00 | 0.15860D+01 | 0.85300D+00 |
| 4    | 87      | C.15799D+01 | 0.16593D+01 | 0.16703D+01 | 0.16269E+01 | C.80400D+00 | 0.90200D+00 | 0.16428D+01 | 0.85300D+00 |
| 4    | 88      | C.16269D+01 | 0.16703D+01 | 0.18153D+01 | 0.17719E+01 | C.80400D+00 | 0.90200D+00 | 0.17643D+01 | 0.85300D+00 |
| 4    | 89      | C.17719D+01 | 0.18153D+01 | 0.19211D+01 | 0.18875E+01 | C.80400D+00 | 0.90200D+00 | 0.18822D+01 | 0.85300D+00 |
| 5    | 90      | C.73043D+00 | 0.80978D+00 | 0.96459D+00 | 0.88523E+00 | C.90200D+00 | 0.10000D+01 | 0.89395D+00 | 0.95100D+00 |
| 5    | 91      | C.88523D+00 | 0.96459D+00 | 0.11194D+01 | 0.10400E+01 | C.90200D+00 | 0.10000D+01 | 0.10488D+01 | 0.95100D+00 |
| 5    | 92      | C.10400D+01 | 0.11194D+01 | 0.12742D+01 | 0.11948E+01 | C.90200D+00 | 0.10000D+01 | 0.12036D+01 | 0.95100D+00 |
| 5    | 93      | C.11948D+01 | 0.12742D+01 | 0.14290D+01 | 0.13496E+01 | C.90200D+00 | 0.10000D+01 | 0.13584D+01 | 0.95100D+00 |
| 5    | 94      | C.13496D+01 | 0.14290D+01 | 0.15838D+01 | 0.15044E+01 | C.90200D+00 | 0.10000D+01 | 0.15132D+01 | 0.95100D+00 |
| 5    | 95      | C.15044D+01 | 0.15838D+01 | 0.17138D+01 | 0.16703E+01 | C.90200D+00 | 0.10000D+01 | 0.16625D+01 | 0.95100D+00 |
| 5    | 96      | C.16703D+01 | 0.17138D+01 | 0.18588D+01 | 0.18153E+01 | C.90200D+00 | 0.10000D+01 | 0.18081D+01 | 0.95100D+00 |
| 5    | 97      | C.18153D+01 | 0.18588D+01 | 0.19548D+01 | 0.19211E+01 | C.90200D+00 | 0.10000D+01 | 0.19178D+01 | 0.95100D+00 |

ORIGINAL PAGE IS  
OF POOR QUALITY



TABLE OF INFLUENCING SECTIONS FOR MACH NUMBER 1.2000

KEY 0 ALL ELEMENTS OF INFLUENCING SECTION HAVE ZERO INFLUENCE ON ALL ELEMENTS OF RECEIVING SECTION

1 NON-ZERO INFLUENCE IS ASSUMED

| RECEIVING<br>SECTIONS | INFLUENCING SECTIONS |                  |
|-----------------------|----------------------|------------------|
|                       | WING 1<br>SECT 1     | WING 1<br>SECT 2 |
| WING 1<br>SECT 1      | 1                    | 1                |
| WING 1<br>SECT 2      | 1                    | 1                |

NO WAKE EFFECTS HAVE BEEN DETERMINED

|                                       |   |
|---------------------------------------|---|
| TOTAL NUMBER MODES                    | 2 |
| MODES DEFINED BY SPLINE OR POLYNOMIAL | 2 |
| NUMBER OF RIGID MODES                 | 0 |
| NUMBER OF POLYNOMIAL EQUATIONS        | 0 |

ORIGINAL PAGE IS  
OF POOR QUALITY

# INPUT MODAL DATA

WING 1 SECTION 1

WING 1 SECTION 2

2 MODES

ECHO CHECK

STRUCTURAL REFERENCE SYSTEM OR

ROTATED STRUCTURAL REFERENCE SYSTEM

N =105

(X(I), I=1, 105)

|               |               |               |               |               |
|---------------|---------------|---------------|---------------|---------------|
| 1.0333735D-01 | 2.2741419D-01 | 3.5149097D-01 | 4.7556758D-01 | 5.9964454D-01 |
| 7.2372139D-01 | 8.4779835D-01 | 9.7187519D-01 | 1.0959501D+00 | 1.2200289D+00 |
| 1.3441048D+00 | 1.4681826D+00 | 1.5802908D+00 | 1.8593526D-01 | 3.1001198E-01 |
| 4.3408877D-01 | 5.5816555D-01 | 6.8224257D-01 | 8.0631936D-01 | 9.3039638E-01 |
| 1.0544729D+00 | 1.1785498D+00 | 1.3026266D+00 | 1.4267025D+00 | 1.5769129D+00 |
| 2.6853317D-01 | 3.9260966D-01 | 5.1663698D-01 | 6.4076346D-01 | 7.6484054E-01 |
| 8.8891727D-01 | 1.0129938D+00 | 1.1370707D+00 | 1.2611405D+00 | 1.3852234D+00 |
| 1.5093702D+00 | 1.6395734D+00 | 3.5113114D-01 | 4.7520787D-01 | 5.9928465E-01 |
| 7.2336149D-01 | 8.4743957D-01 | 9.7151536D-01 | 1.0955915D+00 | 1.2196674D+00 |
| 1.3437443D+00 | 1.4678221D+00 | 1.6321955D+00 | 4.3372887D-01 | 5.5780566E-01 |
| 6.8188268D-01 | 8.0595946D-01 | 9.3003649D-01 | 1.0541115D+00 | 1.1781893D+00 |
| 1.5022652D+00 | 1.4203439D+00 | 1.5504208D+00 | 1.6908569D+00 | 5.1287037D-01 |
| 6.3327348D-01 | 7.5367665D-01 | 8.7407988D-01 | 9.9448299D-01 | 1.1148844D+00 |
| 1.2352886D+00 | 1.3556919D+00 | 1.4671135D+00 | 1.5908346D+00 | 1.7233822E+00 |
| 5.9222919D-01 | 7.1263236D-01 | 8.3303559D-01 | 9.5343876D-01 | 1.0738401D+00 |
| 1.1942434D+00 | 1.3146477D+00 | 1.4683065D+00 | 1.6994152D+00 | 6.7158788E-01 |
| 7.9199106D-01 | 9.1239417D-01 | 1.0327969D+00 | 1.1531992D+00 | 1.2736025D+00 |
| 1.3940067D+00 | 1.5247022D+00 | 1.7379475D+00 | 7.5094676D-01 | 8.7134987E-01 |
| 9.9175298D-01 | 1.1121559D+00 | 1.2325583D+00 | 1.3529615D+00 | 1.4753658E+00 |
| 1.5910588D+00 | 1.7764307D+00 | 8.3739510D-01 | 9.5070827D-01 | 1.0711107D+00 |
| 1.1915131D+00 | 1.3115164D+00 | 1.4320206D+00 | 1.5922928D+00 | 1.8150120E+00 |

(Y(I), I=1, 105)

|               |               |               |               |               |
|---------------|---------------|---------------|---------------|---------------|
| 5.0999999D-02 | 5.0999999D-02 | 5.0999999D-02 | 5.0999999D-02 | 5.0999999D-02 |
| 5.0999999D-02 | 5.0999999D-02 | 5.0999999D-02 | 5.0999999D-02 | 5.0999999D-02 |
| 5.0999999D-02 | 5.0999999D-02 | 5.0999999D-02 | 1.5300000D-01 | 1.5300000D-01 |
| 1.5300000D-01 | 1.5300000D-01 | 1.5300000D-01 | 1.5300000D-01 | 1.5300000D-01 |
| 1.5300000D-01 | 1.5300000D-01 | 1.5300000D-01 | 1.5300000D-01 | 1.5300000D-01 |
| 2.5500000D-01 | 2.5500000D-01 | 2.5500000D-01 | 2.5500000D-01 | 2.5500000D-01 |
| 2.5500000D-01 | 2.5500000D-01 | 2.5500000D-01 | 2.5500000D-01 | 2.5500000D-01 |
| 2.5500000D-01 | 2.5500000D-01 | 3.5699999D-01 | 3.5699999D-01 | 3.5699999D-01 |
| 3.5699999D-01 | 3.5699999D-01 | 3.5699999D-01 | 3.5699999D-01 | 3.5699999D-01 |
| 3.5699999D-01 | 3.5699999D-01 | 3.5699999D-01 | 4.5899999D-01 | 4.5899999D-01 |
| 4.5899999D-01 | 4.5899999D-01 | 4.5899999D-01 | 4.5899999D-01 | 4.5899999D-01 |
| 4.5899999D-01 | 4.5899999D-01 | 4.5899999D-01 | 4.5899999D-01 | 5.5899999D-01 |
| 5.5899999D-01 | 5.5899999D-01 | 5.5899999D-01 | 5.5899999D-01 | 5.5899999D-01 |
| 5.5899999D-01 | 5.5899999D-01 | 5.5899999D-01 | 5.5899999D-01 | 5.5899999D-01 |
| 6.5699977D-01 | 6.5699977D-01 | 6.5699977D-01 | 6.5699977D-01 | 6.5699977D-01 |
| 6.5699977D-01 | 6.5699977D-01 | 6.5699977D-01 | 6.5699977D-01 | 7.5499988D-01 |
| 7.5499988D-01 | 7.5499988D-01 | 7.5499988D-01 | 7.5499988D-01 | 7.5499988D-01 |
| 7.5499988D-01 | 7.5499988D-01 | 7.5499988D-01 | 8.5299987D-01 | 8.5299987D-01 |
| 8.5299987D-01 | 8.5299987D-01 | 8.5299987D-01 | 8.5299987D-01 | 8.5299987D-01 |
| 8.5299987D-01 | 8.5299987D-01 | 9.5099986D-01 | 9.5099986D-01 | 9.5099986D-01 |
| 9.5099986D-01 | 9.5099986D-01 | 9.5099986D-01 | 9.5099986D-01 | 9.5099986D-01 |

MODE NUMBER 1

(Z(I), I=1, 105)



3.87744370-01 5.08147660-01 6.61807480-01 8.92916140-01 -1.34912070-01  
 -1.45088990-02 1.05854150-01 2.26256840-01 3.45700190-01 +.57102480-01  
 5.87506770-01 7.23203180-01 9.31448460-01 -5.55531930-02 6.48499130-02  
 1.85253080-01 3.05655960-01 4.26059190-01 5.45462480-01 6.66865770-01  
 7.84598770-01 9.69980660-01 2.38051380-02 1.44208250-01 2.64610770-01  
 3.85014060-01 5.05417290-01 6.25820580-01 7.85792770-01 1.00851150+00

(A(I), I=1, 105)

-4.01810850-06 2.40236700-05 -2.92303880-05 1.20203540-05 -5.19113860-10  
 -4.31473040-07 -1.57868440-07 -1.65234380-05 3.07456980-05 2.33825630-06  
 -3.64481280-06 -1.33146200-05 3.93924890-06 -6.93750280-06 1.64789800-06  
 3.13800320-06 -2.95350220-06 -1.30033550-06 -1.14853080-06 7.11975190-06  
 -1.13792050-05 -1.52572640-05 -2.22115920-05 3.51126660-05 -1.35137930-05  
 5.79819530-06 4.72272850-08 1.24521920-06 -1.13237000-06 3.76854680-06  
 2.00071740-06 8.20628070-06 1.94409950-06 2.39040960-05 -1.15637550-05  
 -7.50871280-06 3.60953980-06 -2.86867730-06 -2.84764430-06 4.55258490-06  
 -2.69927480-06 -4.76791050-06 -3.76096070-06 -2.80454990-05 -9.03641710-07  
 -5.60391350-06 2.41386730-05 2.17003400-05 2.04623210-06 -3.25751080-06  
 -1.73099760-06 4.70078520-06 -1.46625010-06 3.32207270-05 5.93910410-06  
 3.08193810-05 -3.64283190-05 -1.65173700-05 -2.42501560-05 1.18010180-07  
 3.87651560-06 -3.41756460-06 6.89825360-06 -3.11977930-05 5.48072420-06  
 -3.11276820-05 -1.41170040-05 4.60677110-05 -2.15440230-05 2.14306780-05  
 -6.15510200-08 9.22591030-07 1.04787430-06 -4.38780770-07 2.08751740-05  
 1.12412190-05 -1.35100460-05 6.34014030-06 -8.77627640-06 -1.36308700-06  
 -1.45330610-06 3.00337250-06 -2.21562220-05 1.25502670-05 1.78150660-05  
 -3.21674210-05 2.78789670-05 1.64479130-05 1.14002340-06 -2.31341350-06  
 1.69632280-05 -2.09978750-05 -1.07909860-05 2.51935710-05 -1.04216090-05  
 -2.10762370-05 -1.05678240-05 2.11476250-06 -2.51889200-06 -7.56678400-06  
 1.73603480-05 5.99739850-07 -1.22244360-05 1.58402250-05 -2.55796110-06

(B(I), I=1, 3)

-8.06493280-01 9.99994750-01 -1.19077500-06

ERATED MODAL DATA

WING 1 SECTION 1  
WING 1 SECTION 2

AERODYNAMIC GRID

STRUCTURAL REFERENCE SYSTEM OR  
ROTATED STRUCTURAL REFERENCE SYSTEM

| ELEMENT | MODE 1        |           | MODE 2        |              |
|---------|---------------|-----------|---------------|--------------|
|         | ETA           | D(ETA)/DX | ETA           | D(ETA)/DX    |
| 1       | 0.100000D+01  | 0.0       | -0.647892D+00 | 0.100001D+01 |
| 2       | 0.100000D+01  | 0.0       | -0.501256D+00 | 0.999990D+00 |
| 3       | 0.100000D+01  | 0.0       | -0.354619D+00 | 0.100001D+01 |
| 4       | 0.100000D+01  | 0.0       | -0.207983D+00 | 0.999999D+00 |
| 5       | 0.100000D+01  | 0.0       | -0.613465D-01 | 0.999999D+00 |
| 6       | -0.100000D+01 | 0.0       | 0.852398D-01  | 0.100000D+01 |
| 7       | 0.100000D+01  | 0.0       | 0.231927D+00  | 0.100001D+01 |
| 8       | 0.100000D+01  | 0.0       | 0.378563D+00  | 0.999993D+00 |
| 9       | 0.100000D+01  | 0.0       | 0.525199D+00  | 0.999999D+00 |
| 10      | 0.100000D+01  | 0.0       | 0.571835D+00  | 0.100000D+01 |
| 11      | 0.100000D+01  | 0.0       | 0.799322D+00  | 0.100000D+01 |
| 12      | 0.100000D+01  | 0.0       | -0.555294D+00 | 0.100000D+01 |
| 13      | 0.100000D+01  | 0.0       | -0.418658D+00 | 0.100000D+01 |
| 14      | 0.100000D+01  | 0.0       | -0.272021D+00 | 0.999999D+00 |
| 15      | 0.100000D+01  | 0.0       | -0.125385D+00 | 0.100000D+01 |
| 16      | 0.100000D+01  | 0.0       | 0.212516D-01  | 0.100000D+01 |
| 17      | 0.100000D+01  | 0.0       | 0.157888D+00  | 0.999999D+00 |
| 18      | 0.100000D+01  | 0.0       | 0.314524D+00  | 0.999999D+00 |
| 19      | 0.100000D+01  | 0.0       | 0.451161D+00  | 0.100000D+01 |
| 20      | 0.100000D+01  | 0.0       | 0.607798D+00  | 0.100001D+01 |
| 21      | 0.100000D+01  | 0.0       | 0.754434D+00  | 0.999996D+00 |
| 22      | 0.100000D+01  | 0.0       | 0.843621D+00  | 0.100000D+01 |
| 23      | 0.100000D+01  | 0.0       | -0.482696D+00 | 0.999999D+00 |
| 24      | 0.100000D+01  | 0.0       | -0.336059D+00 | 0.100000D+01 |
| 25      | 0.100000D+01  | 0.0       | -0.189423D+00 | 0.999999D+00 |
| 26      | 0.100000D+01  | 0.0       | -0.427867D-01 | 0.100000D+01 |
| 27      | 0.100000D+01  | 0.0       | 0.103850D+00  | 0.100000D+01 |
| 28      | 0.100000D+01  | 0.0       | 0.250486D+00  | 0.999999D+00 |
| 29      | 0.100000D+01  | 0.0       | 0.397123D+00  | 0.100001D+01 |
| 30      | 0.100000D+01  | 0.0       | 0.543760D+00  | 0.100000D+01 |
| 31      | 0.100000D+01  | 0.0       | 0.690395D+00  | 0.999998D+00 |
| 32      | 0.100000D+01  | 0.0       | 0.837032D+00  | 0.100000D+01 |
| 33      | 0.100000D+01  | 0.0       | 0.887921D+00  | 0.100000D+01 |
| 34      | 0.100000D+01  | 0.0       | -0.400098D+00 | 0.100000D+01 |
| 35      | 0.100000D+01  | 0.0       | -0.253461D+00 | 0.100000D+01 |
| 36      | 0.100000D+01  | 0.0       | -0.106825D+00 | 0.999999D+00 |
| 37      | 0.100000D+01  | 0.0       | 0.398111D-01  | 0.100000D+01 |
| 38      | 0.100000D+01  | 0.0       | 0.186448D+00  | 0.100000D+01 |
| 39      | 0.100000D+01  | 0.0       | 0.333084D+00  | 0.100001D+01 |
| 40      | 0.100000D+01  | 0.0       | 0.479721D+00  | 0.100000D+01 |
| 41      | 0.100000D+01  | 0.0       | 0.626358D+00  | 0.100000D+01 |
| 42      | 0.100000D+01  | 0.0       | 0.772994D+00  | 0.100000D+01 |
| 43      | 0.100000D+01  | 0.0       | 0.902892D+00  | 0.999999D+00 |
| 44      | 0.100000D+01  | 0.0       | -0.317500D+00 | 0.100000D+01 |
| 45      | 0.100000D+01  | 0.0       | -0.170863D+00 | 0.100000D+01 |
| 46      | 0.100000D+01  | 0.0       | -0.242271D-01 | 0.100000D+01 |

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OF POOR QUALITY

|    |              |     |               |              |
|----|--------------|-----|---------------|--------------|
| 47 | 0.1000000+01 | 0.0 | 0.1224090+00  | 0.1000000+01 |
| 48 | 0.1000000+01 | 0.0 | 0.2690470+00  | 0.1000000+01 |
| 49 | 0.1000000+01 | 0.0 | 0.4156830+00  | 0.1000000+01 |
| 50 | 0.1000000+01 | 0.0 | 0.5623190+00  | 0.9999910+00 |
| 51 | 0.1000000+01 | 0.0 | 0.7089550+00  | 0.9999960+00 |
| 52 | 0.1000000+01 | 0.0 | 0.8555910+00  | 0.1000000+01 |
| 53 | 0.1000000+01 | 0.0 | 0.9471910+00  | 0.1000010+01 |
| 54 | 0.1000000+01 | 0.0 | -0.2299870+00 | 0.1000000+01 |
| 55 | 0.1000000+01 | 0.0 | -0.7518280-01 | 0.9999990+00 |
| 56 | 0.1000000+01 | 0.0 | 0.7962140-01  | 0.9999970+00 |
| 57 | 0.1000000+01 | 0.0 | 0.2344260+00  | 0.1000010+01 |
| 58 | 0.1000000+01 | 0.0 | 0.3892300+00  | 0.9999890+00 |
| 59 | 0.1000000+01 | 0.0 | 0.5440340+00  | 0.1000000+01 |
| 60 | 0.1000000+01 | 0.0 | 0.6844690+00  | 0.9999920+00 |
| 61 | 0.1000000+01 | 0.0 | 0.8278360+00  | 0.1000010+01 |
| 62 | 0.1000000+01 | 0.0 | 0.9689170+00  | 0.1000000+01 |
| 63 | 0.1000000+01 | 0.0 | -0.1506280+00 | 0.1000000+01 |
| 64 | 0.1000000+01 | 0.0 | 0.4175960-02  | 0.9999990+00 |
| 65 | 0.1000000+01 | 0.0 | 0.1589800+00  | 0.1000000+01 |
| 66 | 0.1000000+01 | 0.0 | 0.3137860+00  | 0.1000000+01 |
| 67 | 0.1000000+01 | 0.0 | 0.4685890+00  | 0.9999920+00 |
| 68 | 0.1000000+01 | 0.0 | 0.6233940+00  | 0.1000010+01 |
| 69 | 0.1000000+01 | 0.0 | 0.7350860+00  | 0.9999970+00 |
| 70 | 0.1000000+01 | 0.0 | 0.8712690+00  | 0.1000000+01 |
| 71 | 0.1000000+01 | 0.0 | 0.1004510+01  | 0.1000000+01 |
| 72 | 0.1000000+01 | 0.0 | -0.7126950-01 | 0.1000000+01 |
| 73 | 0.1000000+01 | 0.0 | 0.8353470-01  | 0.1000000+01 |
| 74 | 0.1000000+01 | 0.0 | 0.2383390+00  | 0.1000010+01 |
| 75 | 0.1000000+01 | 0.0 | 0.3931440+00  | 0.1000000+01 |
| 76 | 0.1000000+01 | 0.0 | 0.5479480+00  | 0.9999910+00 |
| 77 | 0.1000000+01 | 0.0 | 0.7027530+00  | 0.1000010+01 |
| 78 | 0.1000000+01 | 0.0 | 0.7857030+00  | 0.9999970+00 |
| 79 | 0.1000000+01 | 0.0 | 0.9147010+00  | 0.1000000+01 |
| 80 | 0.1000000+01 | 0.0 | 0.1040100+01  | 0.1000000+01 |
| 81 | 0.1000000+01 | 0.0 | 0.8089270-02  | 0.1000000+01 |
| 82 | 0.1000000+01 | 0.0 | 0.1528940+00  | 0.1000000+01 |
| 83 | 0.1000000+01 | 0.0 | 0.3176980+00  | 0.1000010+01 |
| 84 | 0.1000000+01 | 0.0 | 0.4725030+00  | 0.1000000+01 |
| 85 | 0.1000000+01 | 0.0 | 0.6273070+00  | 0.9999930+00 |
| 86 | 0.1000000+01 | 0.0 | 0.7821110+00  | 0.9999990+00 |
| 87 | 0.1000000+01 | 0.0 | 0.8363200+00  | 0.1000000+01 |
| 88 | 0.1000000+01 | 0.0 | 0.9581320+00  | 0.9999990+00 |
| 89 | 0.1000000+01 | 0.0 | 0.1075690+01  | 0.1000000+01 |
| 90 | 0.1000000+01 | 0.0 | 0.8744800-01  | 0.9999990+00 |
| 91 | 0.1000000+01 | 0.0 | 0.2422520+00  | 0.1000000+01 |
| 92 | 0.1000000+01 | 0.0 | 0.3970580+00  | 0.1000000+01 |
| 93 | 0.1000000+01 | 0.0 | 0.5518620+00  | 0.9999920+00 |
| 94 | 0.1000000+01 | 0.0 | 0.7066550+00  | 0.1000000+01 |
| 95 | 0.1000000+01 | 0.0 | 0.8559760+00  | 0.9999970+00 |
| 96 | 0.1000000+01 | 0.0 | 0.1001560+01  | 0.1000000+01 |
| 97 | 0.1000000+01 | 0.0 | 0.1111280+01  | 0.1000000+01 |

FREQUENCY = 0.0

MODE NUMBER 1  
FREQUENCY = 0.0LIFT AND PITCHING MOMENT PER UNIT SPAN FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | SPAN WIDTH   | --- LIFT PER UNIT SPAN --- |     | PITCHING MOMENT PER UNIT SPAN ABOUT X=0.806500D+00 |     |
|---------|------|--------------|----------------------------|-----|--|-----|
| 1       | 1    | 0.102000D+00 | 0.0                        | 0.0 | 0.0  | 0.0 |
| 1       | 2    | 0.102000D+00 | 0.0                        | 0.0 | 0.0  | 0.0 |
| 1       | 3    | 0.102000D+00 | 0.0                        | 0.0 | 0.0  | 0.0 |
| 1       | 4    | 0.102000D+00 | 0.0                        | 0.0 | 0.0  | 0.0 |
| 1       | 5    | 0.102000D+00 | 0.0                        | 0.0 | 0.0  | 0.0 |
| 2       | 1    | 0.980000D-01 | 0.0                        | 0.0 | 0.0  | 0.0 |
| 2       | 2    | 0.980000D-01 | 0.0                        | 0.0 | 0.0  | 0.0 |
| 2       | 3    | 0.980000D-01 | 0.0                        | 0.0 | 0.0  | 0.0 |
| 2       | 4    | 0.980000D-01 | 0.0                        | 0.0 | 0.0  | 0.0 |
| 2       | 5    | 0.980000D-01 | 0.0                        | 0.0 | 0.0  | 0.0 |

ORIGINAL PAGE IS  
OF POOR QUALITYMODE NUMBER 1  
FREQUENCY = 0.0VELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | ELEMENT | --- VELOCITY POTENTIAL --- |     | ----- PRESSURE ----- |     | --- XC ---   |
|---------|------|---------|----------------------------|-----|----------------------|-----|--------------|
| 1       | 1    | 1       | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.158608D+00 |
| 1       | 1    | 2       | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.305244D+00 |
| 1       | 1    | 3       | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.451881D+00 |
| 1       | 1    | 4       | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.598517D+00 |
| 1       | 1    | 5       | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.745154D+00 |
| 1       | 1    | 6       | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.891790D+00 |
| 1       | 1    | 7       | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.103843D+01 |
| 1       | 1    | 8       | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.118506D+01 |
| 1       | 1    | 9       | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.133170D+01 |
| 1       | 1    | 10      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.147834D+01 |
| 1       | 1    | 11      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.160582D+01 |
| 1       | 2    | 12      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.241206D+00 |
| 1       | 2    | 13      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.387842D+00 |
| 1       | 2    | 14      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.534479D+00 |
| 1       | 2    | 15      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.681115D+00 |
| 1       | 2    | 16      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.827752D+00 |
| 1       | 2    | 17      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.974388D+00 |
| 1       | 2    | 18      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.112102D+01 |
| 1       | 2    | 19      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.126766D+01 |
| 1       | 2    | 20      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.141430D+01 |
| 1       | 2    | 21      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.156093D+01 |
| 1       | 2    | 22      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.165012D+01 |
| 1       | 3    | 23      | 0.0                        | 0.0 | 0.0                  | 0.0 | 0.323804D+00 |



MODE NUMBER 2  
FREQUENCY = C.O

LIFT AND PITCHING MOMENT PER UNIT SPAN FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | SPAN WIDTH   | --- LIFT PER UNIT SPAN --- |     | PITCHING MOMENT PER UNIT SPAN ABOUT X=0.80650D+00 |     |
|---------|------|--------------|----------------------------|-----|---|-----|
| 1       | 1    | 0.102000D+00 | -0.535605D+01              | 0.0 | -0.138046D+00                                     | 0.0 |
| 1       | 2    | 0.102000D+00 | -0.537697D+01              | 0.0 | 0.152125D+00                                      | 0.0 |
| 1       | 3    | 0.102000D+00 | -0.542061D+01              | 0.0 | 0.554802D+00                                      | 0.0 |
| 1       | 4    | 0.102000D+00 | -0.519640D+01              | 0.0 | 0.723474D+00                                      | 0.0 |
| 1       | 5    | 0.102000D+00 | -0.458823D+01              | 0.0 | 0.458199D+00                                      | 0.0 |
| 2       | 1    | 0.980000D-01 | -0.495388D+01              | 0.0 | 0.156942D+01                                      | 0.0 |
| 2       | 2    | 0.980000D-01 | -0.398718D+01              | 0.0 | 0.707289D+00                                      | 0.0 |
| 2       | 3    | 0.980000D-01 | -0.338486D+01              | 0.0 | 0.527627D+00                                      | 0.0 |
| 2       | 4    | 0.980000D-01 | -0.293641D+01              | 0.0 | 0.853227D+00                                      | 0.0 |
| 2       | 5    | 0.980000D-01 | -0.180079D+01              | 0.0 | 0.303796D+00                                      | 0.0 |

MODE NUMBER 2  
FREQUENCY = C.O

VELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | ELEMENT | --- VELOCITY PCTENTIAL --- |     | ----- PRESSURE ----- |     | ----- XC ----- |
|---------|------|---------|----------------------------|-----|----------------------|-----|----------------|
| 1       | 1    | 1       | 0.544469D-01               | 0.0 | -0.519704D+01        | 0.0 | 0.158608D+00   |
| 1       | 1    | 2       | 0.105823D+00               | 0.0 | -0.360851D+01        | 0.0 | 0.302440D+00   |
| 1       | 1    | 3       | 0.149381D+00               | 0.0 | -0.369140D+01        | 0.0 | 0.451881D+00   |
| 1       | 1    | 4       | 0.190982D+00               | 0.0 | -0.364088D+01        | 0.0 | 0.598517D+00   |
| 1       | 1    | 5       | 0.233951D+00               | 0.0 | -0.365272D+01        | 0.0 | 0.745154D+00   |
| 1       | 1    | 6       | -0.132248D-01              | 0.0 | 0.186618D+01         | 0.0 | 0.891790D+00   |
| 1       | 1    | 7       | 0.635638D+00               | 0.0 | -0.858330D+01        | 0.0 | 0.103843D+01   |
| 1       | 1    | 8       | 0.309396D+00               | 0.0 | -0.296154D+01        | 0.0 | 0.118506D+01   |
| 1       | 1    | 9       | 0.515493D+00               | 0.0 | -0.492160D+01        | 0.0 | 0.133170D+01   |
| 1       | 1    | 10      | 0.397867D+00               | 0.0 | -0.315667D+01        | 0.0 | 0.147834D+01   |
| 1       | 1    | 11      | -0.453540D-01              | 0.0 | 0.122068D+01         | 0.0 | 0.160582D+01   |
| 1       | 2    | 12      | 0.787648D-01               | 0.0 | -0.693884D+01        | 0.0 | 0.241206D+00   |
| 1       | 2    | 13      | 0.137875D+00               | 0.0 | -0.319237D+01        | 0.0 | 0.387842D+00   |
| 1       | 2    | 14      | 0.188124D+00               | 0.0 | -0.393491D+01        | 0.0 | 0.534479D+00   |
| 1       | 2    | 15      | 0.224988D+00               | 0.0 | -0.362461D+01        | 0.0 | 0.681115D+00   |
| 1       | 2    | 16      | 0.107407D+00               | 0.0 | 0.289549D+00         | 0.0 | 0.827752D+00   |
| 1       | 2    | 17      | 0.465371D+00               | 0.0 | -0.659150D+01        | 0.0 | 0.974388D+00   |
| 1       | 2    | 18      | 0.259592D+00               | 0.0 | -0.216658D+01        | 0.0 | 0.112102D+01   |
| 1       | 2    | 19      | 0.624702D+00               | 0.0 | -0.666401D+01        | 0.0 | 0.126760D+01   |
| 1       | 2    | 20      | 0.313983D+00               | 0.0 | -0.222510D+01        | 0.0 | 0.141430D+01   |
| 1       | 2    | 21      | 0.221855D+00               | 0.0 | -0.103448D+01        | 0.0 | 0.150050D+01   |
| 1       | 2    | 22      | 0.237034D+00               | 0.0 | -0.110982D+01        | 0.0 | 0.165012D+01   |
| 1       | 3    | 23      | 0.100229D+00               | 0.0 | -0.849445D+01        | 0.0 | 0.323804D+00   |
| 1       | 3    | 24      | 0.166044D+00               | 0.0 | -0.288582D+01        | 0.0 | 0.470440D+00   |
| 1       | 3    | 25      | 0.223339D+00               | 0.0 | -0.420196D+01        | 0.0 | 0.617077D+00   |
| 1       | 3    | 26      | 0.122287D+00               | 0.0 | 0.942771D+00         | 0.0 | 0.763713D+00   |
| 1       | 3    | 27      | 0.514949D+00               | 0.0 | -0.894093D+01        | 0.0 | 0.910350D+00   |
| 1       | 3    | 28      | 0.143884D+00               | 0.0 | 0.112454D+00         | 0.0 | 0.105699D+01   |
| 1       | 3    | 29      | 0.554346D+00               | 0.0 | -0.630355D+01        | 0.0 | 0.120362D+01   |
| 1       | 3    | 30      | 0.432398D+00               | 0.0 | -0.372598D+01        | 0.0 | 0.135026D+01   |
| 1       | 3    | 31      | 0.143489D+00               | 0.0 | 0.719860D-01         | 0.0 | 0.149689D+01   |
| 1       | 3    | 32      | 0.510150D+00               | 0.0 | -0.363318D+01        | 0.0 | 0.164333D+01   |
| 1       | 3    | 33      | 0.112048D+00               | 0.0 | 0.518807D+00         | 0.0 | 0.169442D+01   |
| 1       | 4    | 34      | 0.120542D+00               | 0.0 | -0.995448D+01        | 0.0 | 0.406402D+00   |

FREQUENCY = 0.0  
2 MODES

GENERALIZED AERODYNAMIC COEFFICIENTS  
MACH NUMBER = 1.2000

DISPLACEMENT  
MODE

---- PRESSURE MODE 1 ----

---- PRESSURE MODE 2 ----

|   |     |     |               |     |
|---|-----|-----|---------------|-----|
| 1 | 0.0 | 0.0 | -0.863578D+C1 | 0.0 |
| 2 | 0.0 | 0.0 | -0.751907D+00 | 0.0 |

FREQUENCY = 0.0

TOTAL LIFT AND PITCHING MOMENTS  
MACH NUMBER = 1.2000

MODE

WING

----- LIFT -----

PITCHING MOMENT ABOUT X = 0.806500D+00

|   |   |               |     |              |     |
|---|---|---------------|-----|--------------|-----|
| 1 | 1 | 0.0           | 0.0 | 0.0          | 0.0 |
| 2 | 1 | -0.431789D+01 | 0.0 | 0.566770D+00 | 0.0 |

# TAPERED SWEEP-BACK WING CASE 2

FREQUENCY = 0.5000

REPRODUCIBILITY OF THE  
ORIGINAL PAGE IS POOR

MODE NUMBER 1  
FREQUENCY = 0.5000

LIFT AND PITCHING MOMENT PER UNIT SPAN FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | SPAN WIDTH   | --- LIFT PER UNIT SPAN --- |              | PITCHING MOMENT PER UNIT SPAN ABOUT X=0.806500D+00 |              |
|---------|------|--------------|----------------------------|--------------|--|--------------|
| 1       | 1    | 0.102000D+00 | -.158020D+00               | -.197630D+01 | -.364075D+00                                       | -.214512D+00 |
| 1       | 2    | 0.102000D+00 | -.215473D+00               | -.181513D+01 | -.410928D+00                                       | -.205538D+00 |
| 1       | 3    | 0.102000D+00 | -.284475D+00               | -.165007D+01 | -.394035D+00                                       | -.204024D+00 |
| 1       | 4    | 0.102000D+00 | -.253725D+00               | -.149628D+01 | -.466724D+00                                       | -.160531D+00 |
| 1       | 5    | 0.102000D+00 | -.997077D-01               | -.117226D+01 | -.778653D+00                                       | -.143366D+00 |
| 2       | 1    | 0.580000D-01 | -.248400D+00               | -.805759D+00 | -.445784D+00                                       | -.540789D+00 |
| 2       | 2    | 0.580000D-01 | 0.671037D-03               | -.847447D+00 | -.755532D+00                                       | -.233589D+00 |
| 2       | 3    | 0.580000D-01 | 0.160364D+00               | -.534401D+00 | -.921918D+00                                       | -.404817D+00 |
| 2       | 4    | 0.580000D-01 | 0.889255D-01               | -.244519D+00 | -.684977D+00                                       | -.511327D+00 |
| 2       | 5    | 0.580000D-01 | 0.188576D+00               | 0.329589D+00 | -.780537D+00                                       | -.720598D+00 |

MODE NUMBER 1  
FREQUENCY = 0.5000

VELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | ELEMENT | --- VELOCITY PCTENTIAL --- |              | ----- PRESSURE ----- |              | ---- XC ---- |
|---------|------|---------|----------------------------|--------------|----------------------|--------------|--------------|
| 1       | 1    | 1       | -.417524D-02               | -.267049D-01 | -.381345D+00         | -.253288D+01 | 0.158608D+00 |
| 1       | 1    | 2       | -.113125D-01               | -.506340D-01 | -.319370D+00         | -.166223D+01 | 0.305244D+00 |
| 1       | 1    | 3       | -.200299D-01               | -.683480D-01 | -.420563D+00         | -.150227D+01 | 0.451881D+00 |
| 1       | 1    | 4       | -.306805D-01               | -.837339D-01 | -.439318D+00         | -.138981D+01 | 0.598517D+00 |
| 1       | 1    | 5       | -.424292D-01               | -.963698D-01 | -.433553D+00         | -.123334D+01 | 0.745154D+00 |
| 1       | 1    | 6       | -.429776D-01               | -.967518D-01 | 0.162447D+01         | 0.548962D+00 | 0.891790D+00 |
| 1       | 1    | 7       | -.535974D-01               | -.104629D+00 | -.229259D+01         | -.234764D+01 | 0.103843D+01 |
| 1       | 1    | 8       | -.746798D-01               | -.118074D+00 | 0.143389D+00         | -.857568D+00 | 0.118506D+01 |
| 1       | 1    | 9       | -.863062D-01               | -.122522D+00 | -.708113D+00         | -.884152D+00 | 0.133170D+01 |
| 1       | 1    | 10      | -.984555D-01               | -.125684D+00 | 0.274898D+00         | -.860395D+00 | 0.147834D+01 |
| 1       | 1    | 11      | -.937740D-01               | -.127307D+00 | 0.224063D+01         | -.834610D+00 | 0.160582D+01 |
| 1       | 2    | 12      | -.865078D-02               | -.380375D-01 | -.749220D+00         | -.331963D+01 | 0.241206D+00 |
| 1       | 2    | 13      | -.193774D-01               | -.643343D-01 | -.365400D+00         | -.137237D+01 | 0.387842D+00 |
| 1       | 2    | 14      | -.303484D-01               | -.794629D-01 | -.614594D+00         | -.151924D+01 | 0.534479D+00 |
| 1       | 2    | 15      | -.432859D-01               | -.927883D-01 | -.505633D+00         | -.122834D+01 | 0.681115D+00 |
| 1       | 2    | 16      | -.485926D-01               | -.947907D-01 | 0.835377D+00         | 0.254674D+00 | 0.827752D+00 |
| 1       | 2    | 17      | -.588386D-01               | -.101038D+00 | -.144504D+01         | -.190761D+01 | 0.974388D+00 |
| 1       | 2    | 18      | -.730650D-01               | -.110969D+00 | 0.390933D+00         | -.694216D+00 | 0.112102D+01 |
| 1       | 2    | 19      | -.880985D-01               | -.115577D+00 | -.155380D+01         | -.102919D+01 | 0.126766D+01 |
| 1       | 2    | 20      | -.101364D+00               | -.118768D+00 | 0.679460D+00         | -.799950D+00 | 0.141430D+01 |
| 1       | 2    | 21      | -.994413D-01               | -.119111D+00 | 0.124006D+01         | -.546021D+00 | 0.156093D+01 |
| 1       | 2    | 22      | -.960399D-01               | -.118198D+00 | 0.121194D+01         | -.424270D+00 | 0.165012D+01 |
| 1       | 3    | 23      | -.138581D-01               | -.474118D-01 | -.115845D+01         | -.397178D+01 | 0.323804D+00 |

MODE NUMBER 2  
FREQUENCY = C.5000

LIFT AND PITCHING MOMENT PER UNIT SPAN FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | SPAN WIDTH   | --- LIFT PER UNIT SPAN --- |              | PITCHING MOMENT PER UNIT SPAN ABOUT X=0.806500D+00 |              |
|---------|------|--------------|----------------------------|--------------|--|--------------|
| 1       | 1    | 0.102000D+00 | -.436764D+01               | -.802106E+00 | 0.630697D-01                                       | 0.195176D+01 |
| 1       | 2    | 0.102000D+00 | -.403124D+01               | -.798289E+00 | 0.120102D+00                                       | 0.212049D+01 |
| 1       | 3    | 0.102000D+00 | -.368445D+01               | -.758519E+00 | 0.140069D+00                                       | 0.216130D+01 |
| 1       | 4    | 0.102000D+00 | -.336656D+01               | -.888358E+00 | 0.238971D+C0                                       | 0.234866D+01 |
| 1       | 5    | 0.102000D+00 | -.273442D+01               | -.129185E+01 | 0.337663D+00                                       | 0.297849D+01 |
| 2       | 1    | 0.980000D-01 | -.193535D+01               | -.107453E+01 | -.580166D+00                                       | 0.249409D+01 |
| 2       | 2    | 0.980000D-01 | -.202513D+01               | -.142003E+01 | 0.498684D-01                                       | 0.292056D+01 |
| 2       | 3    | 0.980000D-01 | -.141457D+01               | -.167093E+01 | -.268730D+00                                       | 0.320526D+01 |
| 2       | 4    | 0.980000D-01 | -.737002D+00               | -.136843E+01 | -.646033D+00                                       | 0.258918D+01 |
| 2       | 5    | 0.980000D-01 | 0.382210D+00               | -.129879E+01 | -.103066D+01                                       | 0.246105D+01 |

MODE NUMBER 2  
FREQUENCY = C.5000

VELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING 1  
MACH NUMBER = 1.2000

| SECTION | SPAN | ELEMENT | --- VELOCITY PCTENTIAL --- |              | ----- PRESSURE ----- |              | ----- XC ----- |
|---------|------|---------|----------------------------|--------------|----------------------|--------------|----------------|
| 1       | 1    | 1       | -.504139D-01               | 0.275249D-01 | -.479197D+01         | 0.239957D+01 | 0.158608D+00   |
| 1       | 1    | 2       | -.935253D-01               | 0.542377D-01 | -.314792D+01         | 0.120195D+01 | 0.305244D+00   |
| 1       | 1    | 3       | -.124313D+00               | 0.751150E-01 | -.294229D+01         | 0.994117D+00 | 0.451881D+00   |
| 1       | 1    | 4       | -.150829D+00               | 0.945492E-01 | -.267788D+01         | 0.592560D+C0 | 0.598517D+00   |
| 1       | 1    | 5       | -.173330D+00               | 0.111088E+00 | -.248096D+01         | 0.193348D+00 | 0.745154D+00   |
| 1       | 1    | 6       | -.178679D+00               | 0.973999E-01 | 0.537036D-01         | -.484922D+01 | 0.891790D+00   |
| 1       | 1    | 7       | -.197246D+00               | 0.103896E+00 | -.415123D+01         | 0.376737D+01 | 0.103843D+01   |
| 1       | 1    | 8       | -.225513D+00               | 0.131210E+00 | -.238735D+01         | -.181975D+01 | 0.118506D+01   |
| 1       | 1    | 9       | -.242860D+00               | 0.135833E+00 | -.220007D+01         | -.339398D+00 | 0.133170D+01   |
| 1       | 1    | 10      | -.260809D+00               | 0.138201E+00 | -.267613D+01         | -.240093D+01 | 0.147834D+01   |
| 1       | 1    | 11      | -.289216D+00               | 0.111624E+00 | -.284834D+01         | -.622599D+01 | 0.160582D+01   |
| 1       | 1    | 12      | -.703019D-01               | 0.424585E-01 | -.614654D+01         | 0.348755D+01 | 0.241206D+00   |
| 1       | 2    | 13      | -.116386D+00               | 0.759265E-01 | -.258696D+01         | 0.924794D+00 | 0.387842D+00   |
| 1       | 2    | 14      | -.141484D+00               | 0.978192E-01 | -.278853D+01         | 0.120983D+01 | 0.534479D+00   |
| 1       | 2    | 15      | -.163627D+00               | 0.119031E+00 | -.239264D+01         | 0.487488D+00 | 0.681115D+00   |
| 1       | 2    | 16      | -.158954D+00               | 0.116830E+00 | -.142323D+00         | -.304366D+01 | 0.827752D+00   |
| 1       | 2    | 17      | -.181321D+00               | 0.123095E+00 | -.335824D+01         | 0.204172D+01 | 0.974389D+00   |
| 1       | 2    | 18      | -.205391D+00               | 0.136311E+00 | -.211367D+01         | -.228305D+01 | 0.112102D+01   |
| 1       | 2    | 19      | -.221050D+00               | 0.147199E+00 | -.211197D+01         | 0.146377D+01 | 0.126766D+01   |
| 1       | 2    | 20      | -.237165D+00               | 0.153987E+00 | -.271315D+01         | -.315650D+01 | 0.141430D+01   |
| 1       | 2    | 21      | -.254623D+00               | 0.128351E+00 | -.210645D+01         | -.434497D+01 | 0.156093D+01   |
| 1       | 2    | 22      | -.262392D+00               | 0.108782E+00 | -.157358D+01         | -.437168D+01 | 0.165612D+01   |
| 1       | 3    | 23      | -.860977D-01               | 0.505020E-01 | -.723173D+01         | 0.449348D+01 | 0.323804D+00   |
| 1       | 3    | 24      | -.134522D+00               | 0.955534E-01 | -.218400D+01         | 0.618151D+00 | 0.475440D+00   |
| 1       | 3    | 25      | -.155295D+00               | 0.117608E+00 | -.266512D+01         | 0.137116D+01 | 0.617077D+00   |
| 1       | 3    | 26      | -.157310D+00               | 0.120411E+00 | 0.562047D+00         | -.302224D+01 | 0.763713D+00   |
| 1       | 3    | 27      | -.174267D+00               | 0.137385E+00 | -.471493D+01         | 0.413752D+01 | 0.913550D+00   |
| 1       | 3    | 28      | -.195883D+00               | 0.152296E+00 | -.113918D+01         | -.413954D+01 | 0.105699D+01   |
| 1       | 3    | 29      | -.206177D+00               | 0.150869E+00 | -.230499D+01         | 0.141613D+01 | 0.129362D+01   |
| 1       | 3    | 30      | -.219913D+00               | 0.165211D+00 | -.215434D+01         | -.164486D+01 | 0.130202D+01   |
| 1       | 3    | 31      | -.232172D+00               | 0.142253E+00 | -.201504D+01         | -.513035D+01 | 0.149689D+01   |
| 1       | 3    | 32      | -.240812D+00               | 0.116484E+00 | -.975694D+00         | -.229323D+01 | 0.164353D+01   |
| 1       | 3    | 33      | -.243200D+00               | 0.107197E+00 | -.165095D+01         | -.532438D+01 | 0.169442D+01   |
| 1       | 4    | 34      | -.990933D-01               | 0.706254E-01 | -.811191D+01         | 0.547716D+01 | 0.406402D+00   |

FREQUENCY = 0.5000  
2 MODES

GENERALIZED AERODYNAMIC COEFFICIENTS  
MACH NUMBER = 1.2000

DISPLACEMENT  
MODE

---- PRESSURE MODE 1 ----

---- PRESSURE MODE 2 ----

1  
2

-.169059D+00 -.206655D+01  
0.793300D+00 0.439045D+00

-.483264D+01 -.226519D+01  
0.200102D+00 -.334165D+01

FREQUENCY = 0.5000

TOTAL LIFT AND PITCHING MOMENTS  
MACH NUMBER = 1.2000

MODE

WING

----- LIFT -----

PITCHING MOMENT ABOUT X = 0.806500D+00

1  
2

1  
1

-.845295D-01 -.103327D+01  
-.241632D+01 -.113260D+01

-.597972D+00 -.330942D+00  
-.150833D+00 0.251887D+01

| SECTION                          | CPU SECONDS USED | TOTAL CPU |
|----------------------------------|------------------|-----------|
| READ INPUT AND GENERATE GRID     | 2.150            | 129.983   |
| FIND INFLUENCE COEFFICIENT MATR. | 59.800           | 189.783   |
| READ AND PROCESS MODE INPUT      | 4.417            | 194.200   |
|                                  |                  |           |
| READ AND DECOMPOSE COEFF. MATRIX | 6.516            | 200.716   |
| SOLVE FOR POTENTIAL GRADIENT     | 0.150            | 200.866   |
| SOLVE FOR POTENTIAL GRADIENT     | 8.334            | 209.200   |
| SOLVE FOR DOWNWASH FOR ONE FREQ. | 0.883            | 210.083   |
|                                  |                  |           |
| READ AND DECOMPOSE COEFF. MATRIX | 5.667            | 215.750   |
| SOLVE FOR POTENTIAL GRADIENT     | 7.333            | 223.083   |
| SOLVE FOR POTENTIAL GRADIENT     | 7.783            | 230.866   |
| SOLVE FOR DOWNWASH FOR ONE FREQ. | 0.967            | 231.833   |

## SECTION 6

### RESTART

This program has the capability of restart. The User may alter MODE data and generate new results without computing the influence coefficients and wake effects performed on the initial run. The data from the original run must have been stored on files 8 and 15. File 15 is necessary only if wake effects were considered. When RESTART is desired, the program will not recycle to the next case.

The User defines a restart as Code 03 on his RUN card. See Section 8 - "Computer Program Flow" for a pictorial view of the file generation. The input deck for the new restart run will remain the same as the original deck except for the new RUN card and the altered MODE data.

## SECTION 7

### SIZE LIMITATIONS

At delivery date, this program contains the following limitations (these limitations may change):

- |    |                              |     |
|----|------------------------------|-----|
| 1. | Number of wings              | 4   |
| 2. | Number of sections/wing      | 3   |
| 3. | Number of modes              | 10  |
| 4. | Number of spans              | 100 |
| 5. | Number of corner points/wing | 8   |
| 6. | Number of frequencies        | 12  |
| 7. | Number elements/span         | 70  |
| 8. | Number of elements:          |     |

The maximum number of elements is based on the amount of dummy storage made available  $NDUM =$  the number of storage set when the program is compiled. At delivery,  $NDUM$  is set so that the program is capable of handling 300 elements. Since the number of elements is defined by the mesh generator, the mesh is generated by the program first. Then the amount of required storage is determined. If enough storages are not available in the program, the run is terminated, and the program cycles to the next case.



## SECTION 8

### COMPUTER PROGRAM FLOW

Figure 8.1 illustrates the computer program flow of the ISCON program. The program is divided into two phases - Mesh Generation Phase and Solution Phase.

#### Mesh Generation Phase

This phase reads and processes all input, generates the mesh, prints the grid and determines dynamic storage area constants. The downwash coefficients are computed by LOOPW for all frequencies and wake effects if desired.

#### Solution Phase

In the Solution Phase, each frequency is selected for solution. The downwash is generated for each mode by using DIAG and ITRATE. Wake effects are iterated if present. The output is displayed and the program now cycles to the next case.

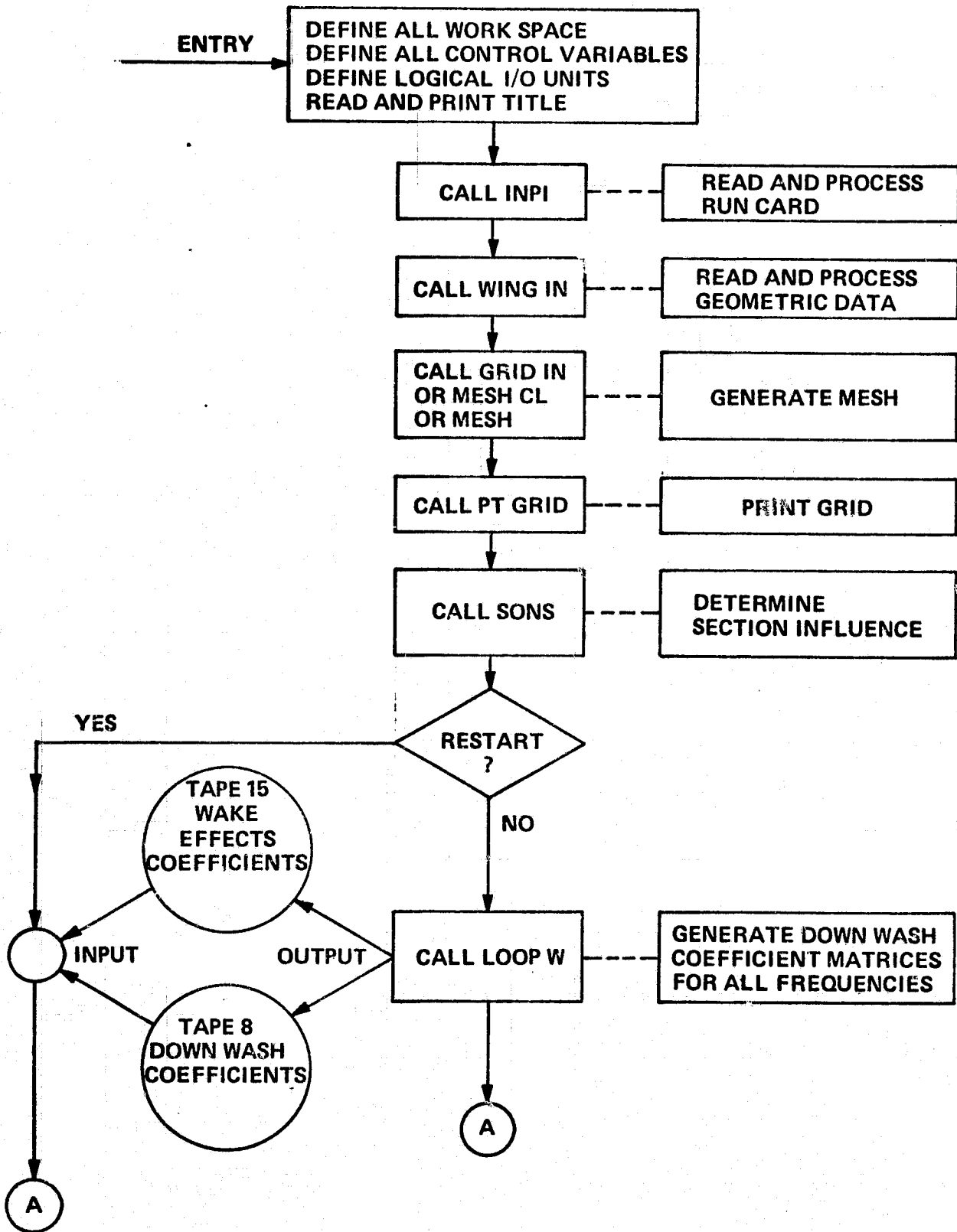


Figure 8.1. Computer Program Flow

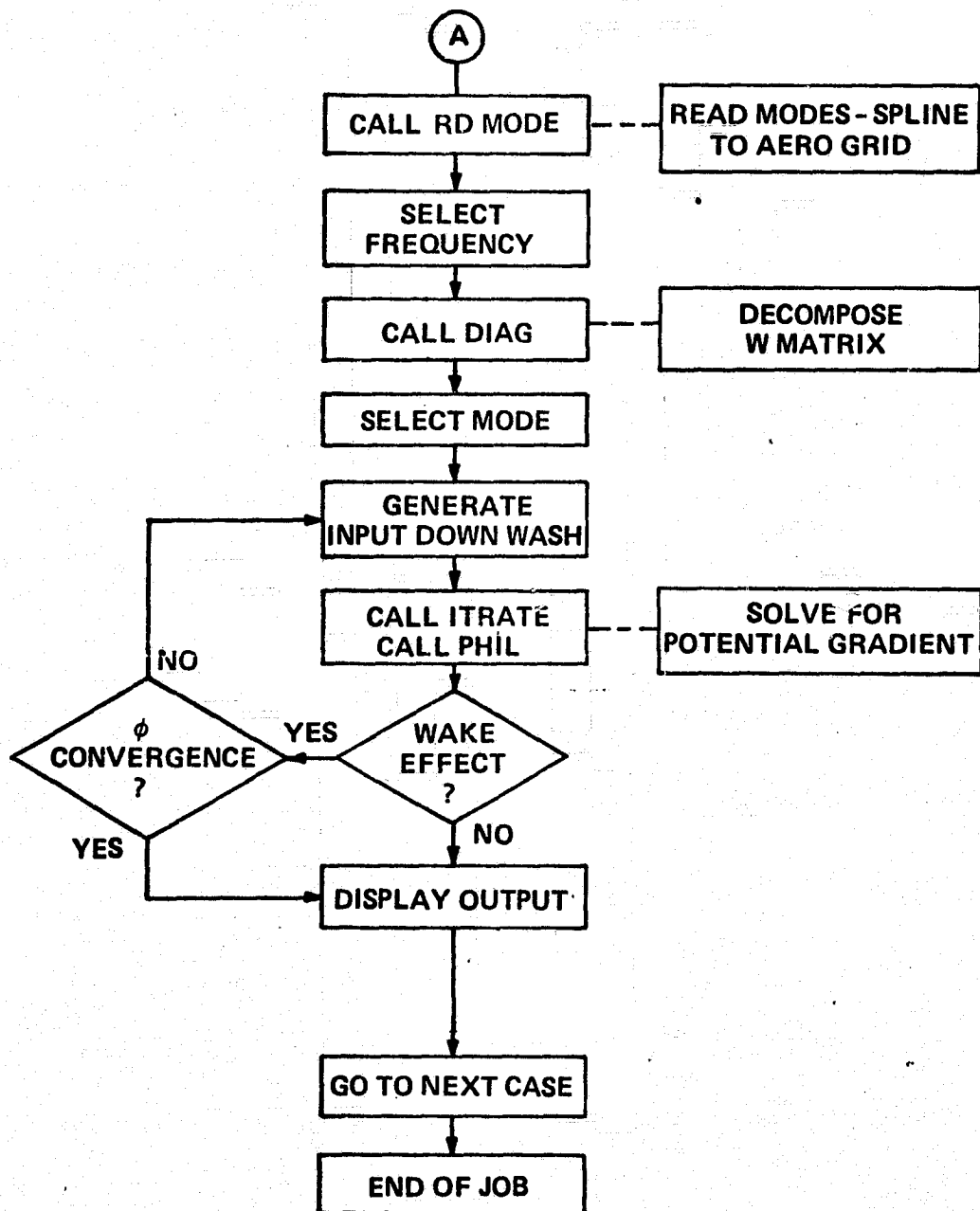


Figure 8.1. Computer Program Flow (cont.)

## SECTION 9

### ERROR MESSAGES

Several input data checks are made as the data cards are read by the program. When errors are detected, the error is printed and wherever possible, the program continues to read and check data. Execution does not take place and the program cycles to the next case. The error messages are extensive and self-explanatory.

Another type of error message is printed when convergence problems occur. These result when any of three conditions occur:

1. The computation of velocity influence coefficients is represented by a finite series as an approximation to an infinite series. The number of terms taken in the finite series approximation is determined from the relative position of the receiving and influencing elements. If this finite series does not converge for at least one pair of elements, a table is printed out. The table gives the convergence information for every computation that did not converge. Execution continues.
2. The program calculates the potential gradient using an iteration technique (see Reference 4). Convergence may not be achieved by the program in solving this downwash coefficient equation. The last two iterations are then printed and execution continues, using the last iteration as the final approximation.
3. Wake effects are computed by the program based on the

convergence of potentials. Execution continues if convergence fails after 4 iterations.

The decision to continue execution was made because most of the program computations have been completed and also because even though convergence fails, it has been observed that the final answers are often acceptable. The User must make his own decision.

## REFERENCES

1. Appa, K. - "Unsteady Supersonic Aerodynamics of Interacting Wings By The Method of Potential Gradient"  
NASA-CR- , October 1976
2. Crill, W. and Dale, B. - "General Purpose Computer Program for Interacting Supersonic Configurations - Programmer's Manual"  
NASA-CR-(13986 ) Vol II, October 1976
3. Desmarais, R. - "Use of a Modal Deflection Function In An Unsteady Aerodynamic Force Program"
4. Bratkovich, A. and Marshal, F. J. - "Iteration Techniques for the Solution of Large Linear Systems in Computational Aerodynamics"  
Journal of Aircraft, Vol 12, No. 2, February, 1975
5. Harder, R. and Desmarais, R. - "Interpolation using Surface Splines"  
Journal of Aircraft, Vol 9, No. 2, February 1972

## SECTION II

### APPENDIX

This section describes the input data required to execute computer program SS31 - a program to compute the coefficients of a surface spline. This program was developed by Robert N. Desmarais, National Aeronautics and Space Administration, Langley Research Center, Hampton, Virginia. A sample case is included to show both input and output.

## INTRODUCTION

This section describes the input data required to execute computer program SS31. The purpose of this computer program is to generate the coefficients of a surface spline. The coefficients of the surface spline depends upon the solution of a system of linear equations, and the formulation of that system of equations is presented here. A description of the input and output format as well as a sample problem are also presented.



## FORMULATION

The spline algorithm used in the computer program SS31 is summarized here, based on the manuscripts received from Robert Desmarais and the authors of this computer program.

Let the vibration mode be defined by N triplets of numbers

$$X_k, Y_k, Z_k, k = 1, N$$

where  $Z_k$  is the modal value at location  $X_k, Y_k$ .

The desired spline is

$$Z(X,Y)=b_1+b_2X+b_3Y+\sum_{k=1}^N a_k R_k^2 \log_n (R_k^2 + \epsilon^2)$$

where

$$R_k^2 = (X-X_k)^2 + (Y-Y_k)^2$$

and

$\epsilon$  is a small quantity (i.e., 1.0E-70). It is necessary to compute the N+3 surface spline coefficients;  $b_1, b_2, b_3$  and  $a_j, j=1, N$ . This can be accomplished by solving N+3 simultaneous equations. These equations are:

$$\sum_{j=1}^N S_{jk} a_j + b_1 + X_k b_2 + Y_k b_3 = Z_k, k=1, N$$

and

$$\sum_{j=1}^N a_j = \sum_{j=1}^N X_j a_j = \sum_{j=1}^N Y_j a_j = 0$$

where

$$S_{jk} = s_j \quad \text{If } j = k$$

$$S_{jk} = R_{jk}^2 \log_n (R_{jk}^2 + \epsilon^2) \text{ otherwise}$$

$$R_{jk}^2 \text{ is defined as } R_{jk}^2 = (X_k - X_j)^2 + (Y_k - Y_j)^2.$$

Note that  $X_k, Y_k$ , and  $Z_k, k=1, N$ ; are the input quantities. The quantity  $S_j (j=1, N)$  are constants, like smoothing coefficients

and are usually set to zero. The purpose of this program \$\$31 is simply to compute the surface spline coefficients  $a_j$ ,  $j=1, k$  and  $b_1$ ,  $b_2$ , and  $b_3$ .

Program \$\$31 is not concerned with the actual use of these surface spline coefficients. They are used, for example in certain aerodynamic computer programs, (i.e., program ISCON). Their use is discussed here only for completeness.

If the aerodynamic program reads the following:

$$X_k, Y_k, a_k, b_1, b_2, b_3, k=1, N$$

instead of

$$X_k, Y_k, \text{ and } Z_k, k=1, N$$

the program will compute

$$Z(X,Y)=b_1+b_2X+b_3Y+\sum_{k=1}^N a_k R_k^2 \log_n(R_k^2 + \epsilon^2)$$

and

$$\frac{\partial Z}{\partial X} = b_2 + 2 \sum_{k=1}^N a_k (X-X_k) \left[ \frac{R_k^2}{(R_k^2 + \epsilon^2)} + \log_n(R_k^2 + \epsilon^2) \right]$$

where

$$R_k^2 = (X-X_k)^2 + (Y-Y_k)^2$$

and

$\epsilon$  is again a small number (1.0E-70).

## INPUT DESCRIPTION

Program SS31 has a very simple input format. The only information needed by SS31 is the definition of the mode. Specifically this consists of four groups of data.

- 1) The number of points at which the modal value is given.
- 2) The location, as a pair of rectangular coordinates, for every point at which the modal value is defined.
- 3) The smoothing constant for each point.
- 4) The actual modal value at each point.

The program requires that the input data be arranged in a specific order. The program is capable of determining the spline coefficients for more than one set of modal values over the same lattice of points. To employ this capability, the data group 4, (the last data group input) is simply repeated for each unique set of modal values. A detailed description of each input data group follows.

### 1) Input Data Group 1

This group consists of a single card and must be the first card present in the input deck to program SS31. The number of points that define the lattice at which the modal values are given is punched as an integer, right adjusted in column 4. That integer is the only information present in this data group.

### 2) Input Data Group 2

The location of every point in the lattice for which modal values are given is input in this data group. It should be noted that while the location of each point is defined by a pair of rectangular coordinates,  $(X(I), Y(I))$ , the geometry of the actual lattice itself is arbitrary, and is not restricted to a rectangular

grid. If Data Group 1 specifies that the lattice is defined over N points, then N values of X are read followed by N values of Y.

The format under which the array of X coordinates is to be read must be input on the first card of this data group. The format must have the same form as a FORTRAN IV FORMAT statement, except that the word FORMAT and the statement number are omitted. The entire format, including opening and closing parentheses, must be written on this card.

The second card contains the beginning of the X coordinates. This card, and as many additional cards as is necessary to complete the reading of N values, will be read to define the X coordinates. The X array is actually read by a FORTRAN IV statement of the form:

```
READ(I5,FMTX) (X(I), I=1, N)
```

where I5 is the unit number of the input data (i.e. card reader) and FMTX is the array containing the format code read on the first card of the input data group.

The Y coordinates are input in the same manner. Immediately after the last card containing X values, the card specifying the format of the Y coordinates is read. Following this card is the beginning of the Y coordinates. Exactly enough cards are read under the specified format to define the N values of the Y coordinates. The Y array is read with a FORTRAN IV statement of the form:

```
READ(I5, FMTY)(Y(I), I=1, N)
```

where FMTY is the array containing the format code specified on the card immediately preceding the Y values.

When the last card containing Y values has been read, the location (SCI), Y(I), is defined for all N points at which the modal values are to be input. This completes input datagroup 2.

### 3) Input Data Group 3

A spring constant like smoothing coefficient  $S(I)$ , is input for every point,  $(X(I), Y(I), I=1, N)$ . \*(Note that in Mr. Desmarais' formulation, he states that these coefficients are usually defined to be 0.0). The form of the input is identical to the form described for the input for either the X and Y coordinates. The first card of this data group specified the format by which the smoothing coefficients will be read. The smoothing coefficients themselves follow starting on the next card. Exactly enough cards are read under the specified format to define the N smoothing coefficients. The array of smoothing coefficients is read with a FORTRAN IV statement of the form

```
READ(I5,FMTS)(S(I), I=1, N),
```

where FMTS is the array containing the format code specified on the card immediately preceeding the smoothing constants. The smoothing constant information is the only input in Data Group 3.

### 4) Input Data Group 4

This data group defines the modal value for a single vibration mode at each of the N locations,  $(X(I), Y(I), I=1, N)$ , input in Data Group 2.

The first card of this data group contains a user supplied title. The title is used only to identify the output associated with this mode and the contents of the title is completely at the discretion of the user. The only restriction is that the title should not begin with the word END starting in Column 1.

The title may appear anywhere on this card and may use the complete 80 columns of the card. This card is expected by program SS31 and may not be omitted. If not title information is desired a blank card should be input.

The actual modal information follows this title card. The form of the modal input is exactly the same as the form described for the input for either the X and Y coordinates. The card immediately following the title card contains the format by which the modal data is to be read. The very next card contains the beginning of the modal data. Enough cards are read under the specified format to define the modal value,  $Z(I)$ , at every location  $(X(I), Y(I))$ , of the N points defined in Data Group 2. The array of modal values is read with a FORTRAN IV statement of the form

```
READ(I5, FMTX)(Z(I), I=1, N)
```

where FMTZ is the array containing the specified format code.

The title card, format code, and modal information comprise Data Group 4. This data group may be repeated if surface spline coefficients are desired for more than one mode defined at N point in Data Group 2.

#### The END card

To identify the completion of the input data, a single card with only the word END starting in column 1, should end the input deck. This card is expected by the program and prevents an END-OF-FILE message for the input file.

A complete overview of the input is shown in Figure 11.1.

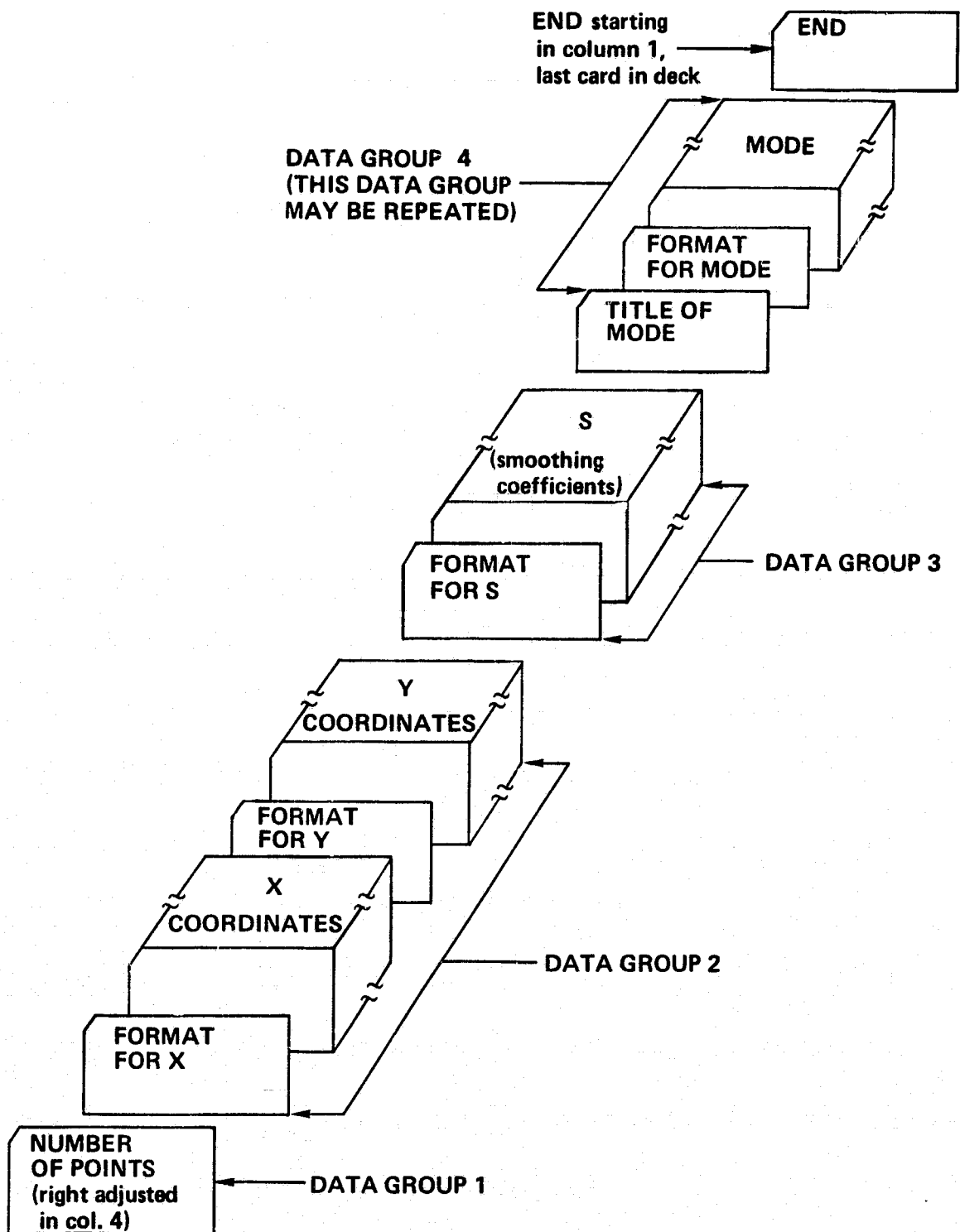


Figure 11.1 Data Deck Arrangement for Spline Program

## OUTPUT DESCRIPTION

Program SS31 prints out the input data and the generated surface spline coefficients. The number of points which defines the input lattice appears as the first line of output. The arrays of X coordinates, Y coordinates, and smoothing constants are output successively. Each array is preceded by a header line giving the name of the array and the number of points that were defined in the array. The form of the heading is the same as the form the array would have in a FORTRAN write statement with an "implied DO". For example, the heading for the X array for which five (5) points have been defined is:

(X(I), I=1, 5).

The output for each mode follows the list of smoothing coefficients. The first line of output is the title input with each mode. The list of modal values is the first array output. It is noted in the heading as the Z array. It is followed by the listing of the surface spline coefficients calculated by this program. First are the N coefficients of the A array, and the 3 coefficients of the B array. This completes the output for a single mode. The entire group of output, from the title to the B array, is repeated for every group.

Punched card output from program SS31 is almost identical to the printed output. The difference is that the smoothing coefficients are not punched, and no blank cards are punched between arrays.

### Sample Test Case

A sample test case for program SS31 is presented here. A listing of the card input is shown in Figure 11.2. The printed



printed output is given in Figure 11.3. A listing of the punched output is given in Figure 11.4.

ORIGINAL PAGE IS  
OF POOR QUALITY

```
5  
(5F3.0)  
0. 2. 1. 0. 2.  
(5F3.0)  
0. 0. 1. 2. 2.  
(5F3.0)  
0. 0. 0. 0. 0.  
TEST MODE =1  
(5F3.0)  
0. 0. 1. 0. 0.  
TEST MODE =2  
(5F3.0)  
0. 0. 1. 0. 2.  
END
```

Program SS31 (Input Deck)

Figure 11.2

N = 5

|                |               |               |     |               |
|----------------|---------------|---------------|-----|---------------|
| (X(I), I=1, 5) |               |               |     |               |
| 0.0            | 2.0000000E+00 | 1.0000000E+00 | 0.0 | 2.0000000E+00 |

|                |     |               |               |               |
|----------------|-----|---------------|---------------|---------------|
| (Y(I), I=1, 5) |     |               |               |               |
| 0.0            | 0.0 | 1.0000000E+00 | 2.0000000E+00 | 2.0000000E+00 |

|                     |     |     |     |     |
|---------------------|-----|-----|-----|-----|
| (SMOOTH(I), I=1, 5) |     |     |     |     |
| 0.0                 | 0.0 | 0.0 | 0.0 | 0.0 |

TEST MODE =1

|                |     |               |     |     |
|----------------|-----|---------------|-----|-----|
| (Z(I), I=1, 5) |     |               |     |     |
| 0.0            | 0.0 | 1.0000000E+00 | 0.0 | 0.0 |

|                |                |               |                |                |
|----------------|----------------|---------------|----------------|----------------|
| (A(I), I=1, 5) |                |               |                |                |
| -6.0112353E-02 | -6.0112193E-02 | 2.4044871E-01 | -6.0112208E-02 | -6.0112178E-02 |

|                |               |               |  |
|----------------|---------------|---------------|--|
| (B(I), I=1, 3) |               |               |  |
| 1.3333311E+00  | 6.5872280E-07 | 7.3154234E-07 |  |

TEST MODE =2

|                |     |               |     |               |
|----------------|-----|---------------|-----|---------------|
| (Z(I), I=1, 5) |     |               |     |               |
| 0.0            | 0.0 | 1.0000000E+00 | 0.0 | 2.0000000E+00 |

|                |                |               |                |               |
|----------------|----------------|---------------|----------------|---------------|
| (A(I), I=1, 5) |                |               |                |               |
| 6.0112275E-02  | -1.2022448E-01 | 1.2022430E-01 | -1.2022448E-01 | 6.0112286E-02 |

|                |               |               |  |
|----------------|---------------|---------------|--|
| (B(I), I=1, 3) |               |               |  |
| 1.6666603E-01  | 4.9999976E-01 | 5.0000036E-01 |  |

Program SS31 - Printed Output

Figure 11.3

```

N = 5
(X(I), I=1, 5)
0.0 2.0000000E+00 1.0000000E+00 0.0 2.0000000E+00
(Y(I), I=1, 5)
0.0 0.0 1.0000000E+00 2.0000000E+00 2.0000000E+00
TEST MODE =1
(Z(I), I=1, 5)
0.0 0.0 1.0000000E+00 0.0 0.0
(A(I), I=1, 5)
-6.0112353E-02 -6.0112193E-02 2.4044871E-01 -6.0112208E-02 -6.0112178E-02
(B(I), I=1, 3)
1.3333311E+00 6.5872280E-07 7.3154234E-07
TEST MODE =2
(Z(I), I=1, 5)
0.0 0.0 1.0000000E+00 0.0 2.0000000E+00
(A(I), I=1, 5)
6.0112275E-02 -1.2022448E-01 1.2022430E-01 -1.2022448E-01 6.0112286E-02
(B(I), I=1, 3)
1.6666603E-01 4.9999976E-01 5.0000036E-01

```

ORIGINAL PAGE IS  
OF POOR QUALITY

Program SS31 - Punched Output

Figure 11.4