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Produced by the NASA Center for Aerospace Information (CASI)

NASA CR-145127

(NASA-CR-145127) GENERAL PURPOSE COMPUTER PROGRAM FOR INTERACTING SUPERSONIC CONFIGURATIONS: PROGRAMMER'S MANUAL (Bell Aerospace Textron, Buffalo, N. Y.) 218 p HC A10/MF A01 CSCL 01A G3/02 N79-18901 Unclas 14551

GENERAL PURPOSE COMPUTER PROGRAM FOR INTERACTING SUPERSONIC CONFIGURATIONS

PROGRAMMER'S MA

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FOR

NASA

National Aeronautics and
Space Administration

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1979

Summary

This manual contains details for the program ISCON, an abbreviation for "Inter acting Supersonic Configuration". The programmer will find an accompanying User's Manual necessary to execute test cases.

The work was accomplished by Bell Aerospace Textron under contract NAS1-13986 with the National Aeronautics and Space Administration, Langley Research Center, Hampton, Virginia.

The program was written in Fortran IV for the CDC 6400/6600 series computers at NASA, LRC.

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[redacted]

INTRODUCTION

This manual describes the computer program in support of the problem to generate a numerical procedure for the determination of unsteady aerodynamic forces on arbitrary interacting wings and tails in supersonic flow. See Reference 1.

The information presented here is geared to the programmer. It is sufficient to fully describe the program logic and the required peripheral storage. Figure 1 gives an overview of the entire program, and is the basis for the control program. A separate section is devoted to the definition of external files. Program limitations and convergence criteria are discussed. Individual subroutine write-ups are presented along with the complete Fortran source listing.

All User oriented information is contained in the ISCON User's Manual. For a presentation of input format and test case results this manual should be consulted.

Section 1

Computer Program Flow

Figure 1 illustrates the computer program flow of the ISCON program. The program is divided into two phases - mesh generation phase and solution.

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 computes 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.

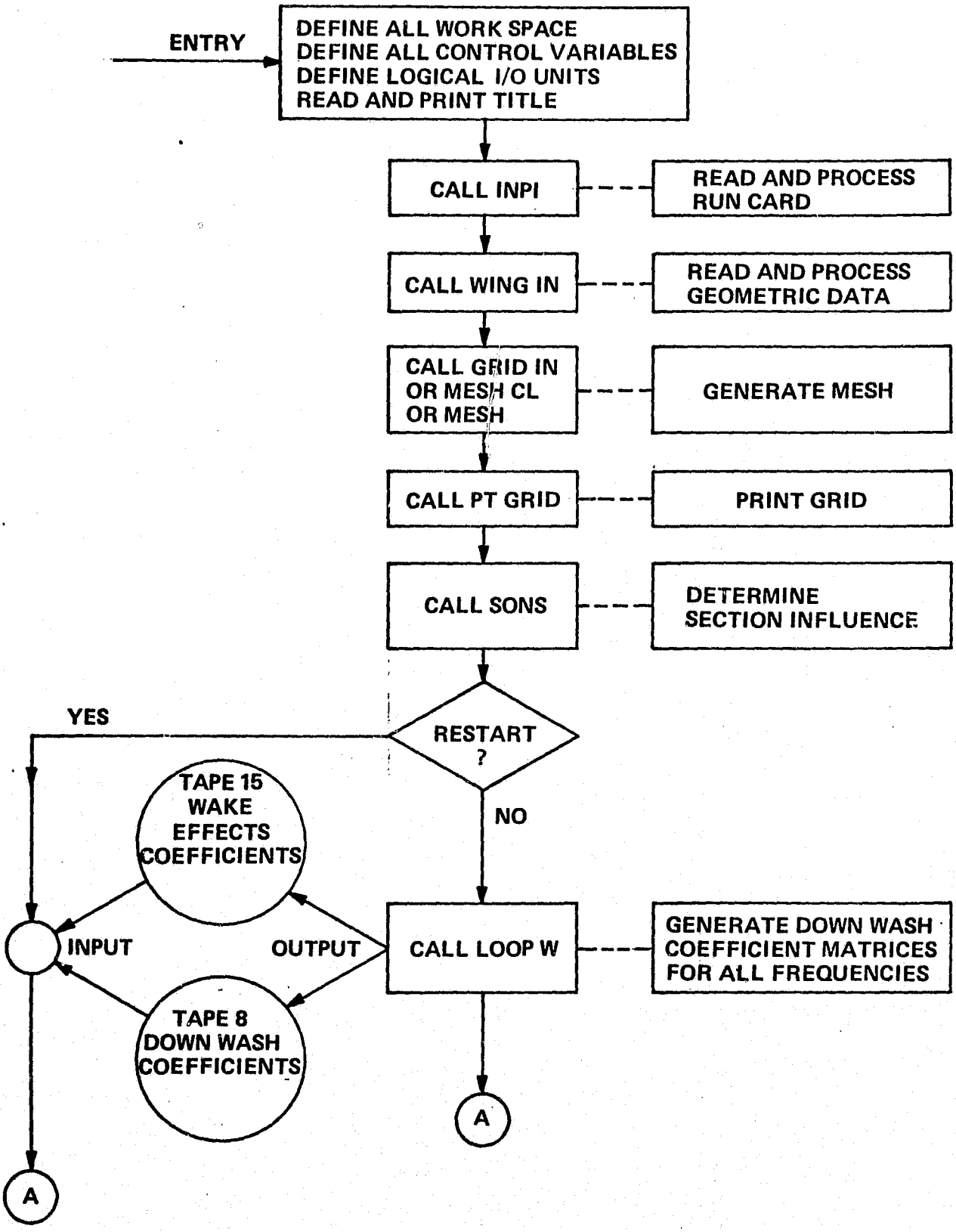

Figure 1. Computer Program Flow

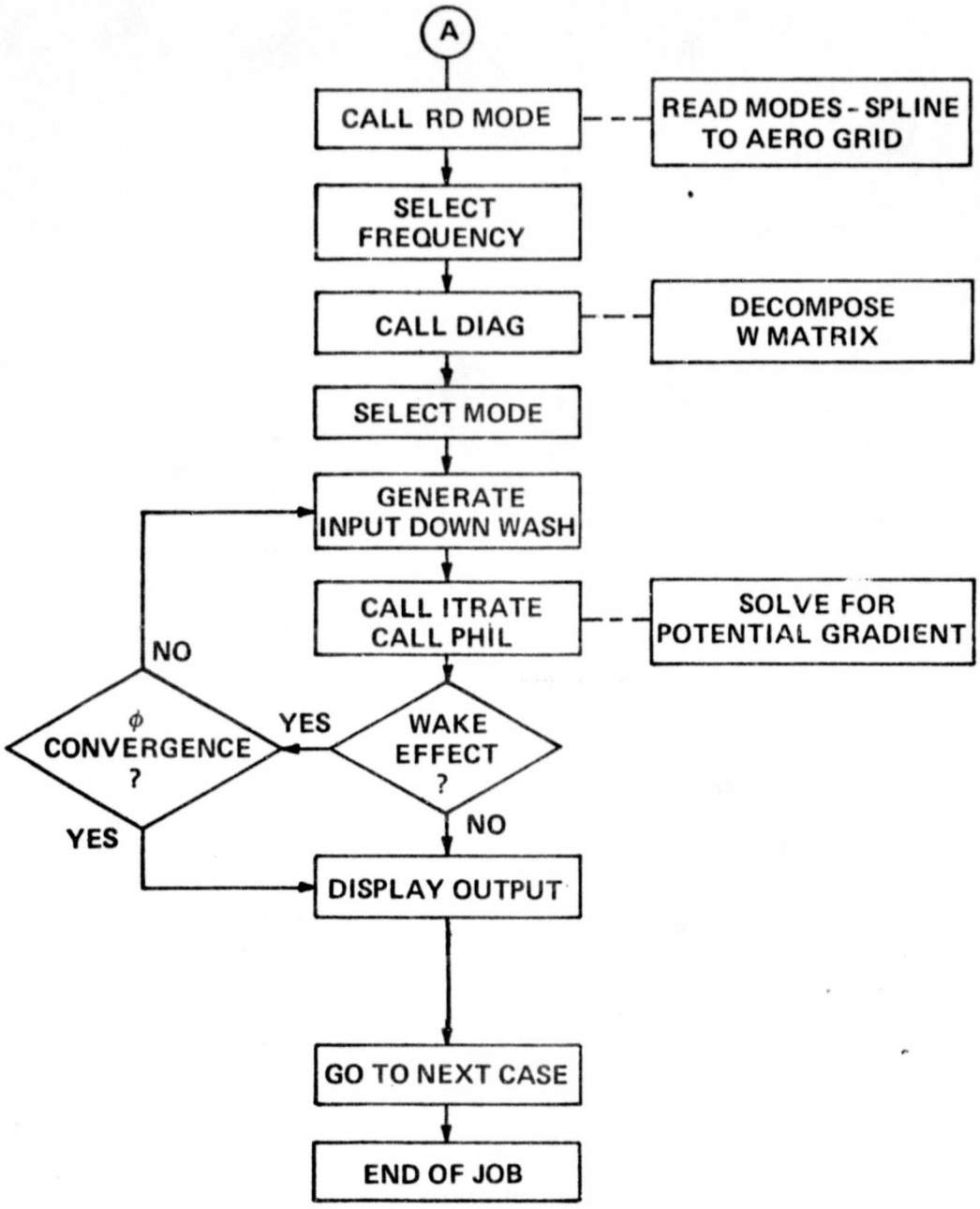

Figure 1. Computer Program Flow (contd)

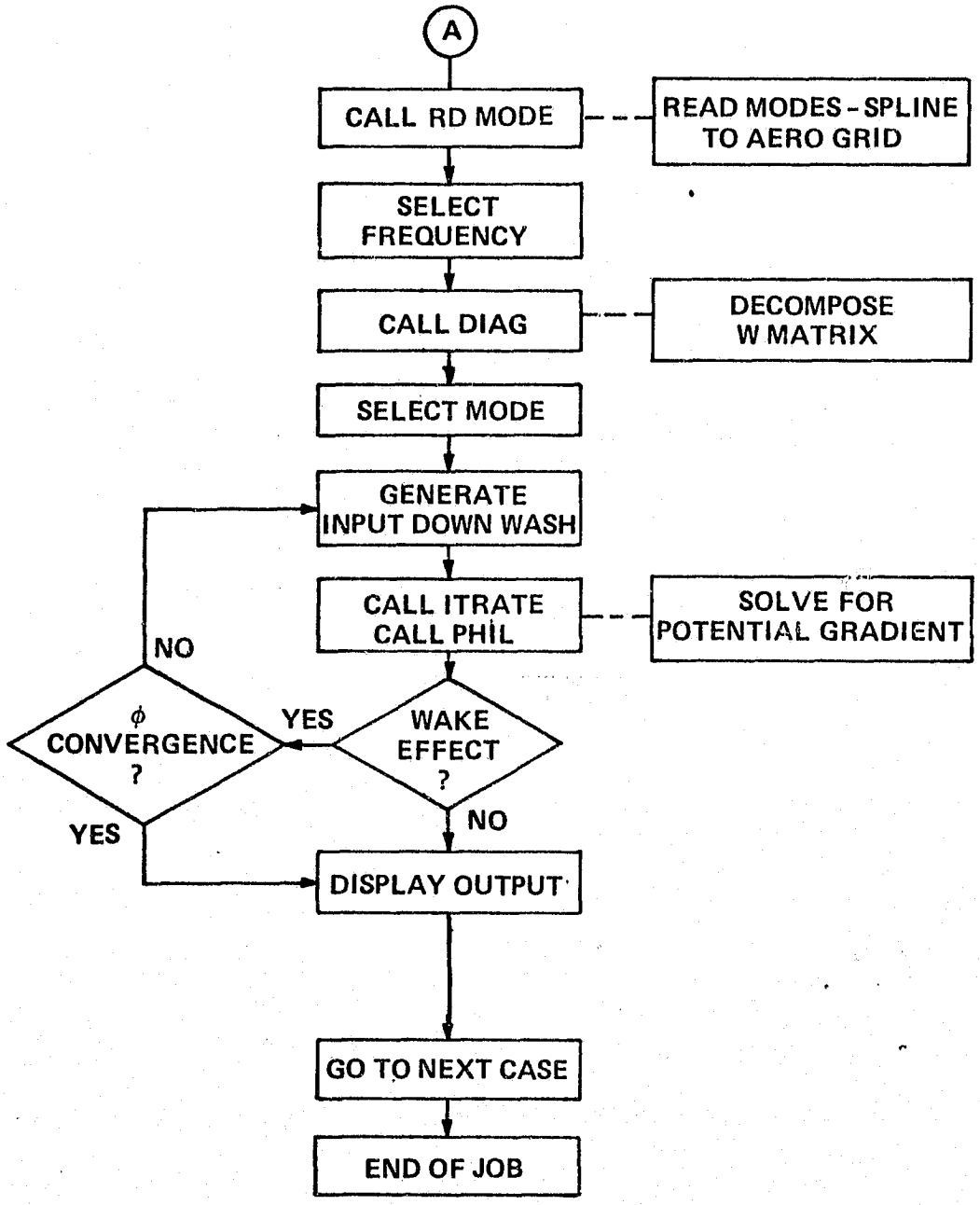

Figure 1. Computer Program Flow (contd)

Section 2

External File Structure

This program uses eleven (11) files during the course of operation. The delivery version of the ISCON program defines the unit designations with a block data statement which assigns values to COMMON TAPE. These may be altered if desired.

UNIT NAME	UNIT ID	TYPE	USAGE
I9	8	(S,P)	Store downwash coefficients for all frequencies
I10	10	S	Card images for 1 case, diagonal blocks of coefficients
I11	11	S	Off diagonal blocks of coefficients
I12	12	(S,W)	Wake coefficients for 1 frequency
I13	13	S	Store ETA and dETA/dx
I14	14	S	Store ETA and dETA/dx
J9	9	S	Time Print BCD tape
I15	15	(S,P,W)	Wake Element effects for 1 frequency
I5	5	P	Standard Card input
I6	6	P	Standard Line Printer
(not defined in Fortran)		P	Standard Plot Tape

Where S = Scratch, W = Wake, P = Permanent

If the restart feature is desired, then units designated as (P) must be permanent files. Units I12 and I15 are only required when WAKE effect is desired. When Plot is requested, the standard plot tape is needed.

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Section 3

PROBLEM 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.

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Section 4

CONVERGENCE CRITERIA

Convergence criteria are set up in the program using block data statements. These constants may be changed by altering their value in the block data subprogram.

1. Criteria of Convergence for both wake and potential gradient iteration is used by the subroutine IRELE. This uses a norm type of convergence based on EPS = .01. EPS is set up in common block CEPS.

2. The maximum number of iterations used for potential gradient iterations in subprogram ITRATE is assigned the variable name ITMAX. This variable is set at 10 in the program delivery version. It is included in the common block ITERAT.

3. The parameter PERC is required by LOOPW. It is used to improve computational economy in computing the velocity influence matrix. PERC represents the ratio of W_{ij}/W_{ii}, that is, the ratio of far field influencing coefficient to the receiving element self coefficient. This variable is set equal to .005 and is contained in common block PEREPS.

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Section 5

Subroutine Write-Ups

The main computer program COMMON blocks are defined in this section. These blocks are referenced by the subroutine write-ups which are presented alphabetically for each subprogram.

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COMMON BLOCKS

NAME	VARIABLES	DEFINITIONS	SUBROUTINE REFERENCE
BASIC	MACH BEETA	Mach Number SQRT ($MACH^2$-1)	FGEN, MECH, MESHCL, WINTGR
CEPS	EPS	Convergence criteria for ITRATE, IRELE	IRELE, ITRATE
EEW	XUP,YUP	X and Y coordinates of the upper end of the influencing line	WINTGRR, WVINT
	XLW,YLW	X and Y coordinates of the lower end of the influencing line	
	EREØNE	Logical variable set to .TRUE. if a line (in the right hand sense) has influence on a given receiving point	
	EMIRRO	Logical variable set equal to .TRUE. if the mirror image of the line has influence on a given receiving point	
	RR	Average hyperbolic radius of the endpoints of an influencing line with respect to given receiving point	
	RL	Average hyperbolic radius of the mirror image of the end-points of an influencing line with respect to a given receiving point	
	RTR	The product of the hyperbolic radii at the endpoints of an influencing line with respect to a given receiving point	
	RTL	The product of the hyperbolic radii at the endpoints of the mirror image of an influencing line with respect to a given receiving point	

NAME	VARIABLES	DEFINITIONS	SUBROUTINE REFERENCE
FQ1	NFREQ	Number of frequencies that are input for the current run	MAIN,FGEN, FREQW,LOOPW, WAKET,WINTGR
	CF	An array, a list of 30 frequency coefficients for each frequency	
	FREQ	A list of the frequencies input	
	FREQP	A list of modified frequencies FREQP(I)=FREQ(I)*MACH/BEETA	
	FRTEØT	The largest modified frequency	
	NTMXX	The maximum number of non-zero frequency coefficients	
ITERAT	ITMAX	Maximum number iteratives	ITRATE
ITG	IGUESS	Guess vector indicator	ITRATE
K1112	KST11 KST12	Maximum element numbers for non-zero coefficients	ITRATE,DIAG, WAKET,WRITEO, WTEPHT
MCOM	CFTABLE	Table of equations coefficients for mode polynomial	RDMODE
MODEF	EM	Storage for modal values for a single point	MFUN, RDMODE
	DM	Storage for values of the derivative of the modes for a single point	
	X	X coordinate of the point	
	Y	Y coordinate of the point	
	J1	Wing number that the point is on	
	J2	Section of WING J1 that the point is on	
NEXTCS	IFLUSH	Set equal to if an error is found that is serious enough to cause termination of run	MAIN,INPI, WINTGR

NAME	VARIABLES	DEFINITIONS	SUBROUTINE REFERENCE
PARAM	NWING	Total number elements in structure	FREQW
RRLL	TVW	Transformation matrix to change the velocity influence coefficients from the receiving point to the influencing point	LØØPW, RTØI, WINTGR
	YRO, YLO	Y coordinate of the receiving element in the system of the influencing element, YLO is in the system of the mirror image of the influencing element	
	ZR	Z coordinate of the receiving element in the system of the influencing element	
	ZRZR	ZR*ZR	
	ZL	Z coordinate of the receiving element in the system of the mirror image of the influencing element	
	ZLZL	ZL*ZL	
TAPE	I9,I10, I11,I12, I13,I14, J9,I15	File numbers set up by block data subprogram	MAIN,DIAG, ITRATE, LØØPW, TIMØUT, WRITEØ
TIMER	ITIME	Time point array	MAIN
VELCOM	NMAX	Maximum dimension of D	MAIN,DIAG, ITRATE
	PRINT	Print control	
	NWBLOCK	Number blocks for ITRATE	
	NWROW	Number rows in block	
WAKEUP	WTES	Array of wake effects for elements	MAIN,DIAG, LOOPW,WAKET, WINTGR
	TREDGE	Trailing edge indicator	
	WAKE1	Wake indicator	
	WAKE	Wake indicator	
	WAKENZ	Wake indicator for non-zero term	

NAME	VARIABLES	DEFINITIONS	SUBROUTINE REFERENCE
WV1	NTERM	Number of terms taken in the finite series approximation of the velocity influence expression	WINTGR, WVINT
	V(30)	Array of sidewash contributions for up to thirty terms	
	W(30)	Array of upwash contributions for up to thirty terms	
WW1	XO,YO,ZD	The X, Y and Z coordinates of a receiving point	LØØPW, WVINT, WINTGR
	ZDZD	ZD*ZD	
	SYMK	Symmetry code of the wing that the influencing element is in	
	NINSID	A counter to tell how many elements in the current span, from the bottom up, that have been found to have influence on the current receiving point, so far	
XYSCAL	XX	X coordinate of a point	ZFDZ
	YY	Y coordinate of a point	
	XO	Offset value in X direction currently taken to be 0.0.	
	YO	Offset value in Y direction, currently taken to be 0.0.	
	BREF	Scalar transformation value, currently set to 1.0	
	ZZZ	Value of first mode input	
	ITEST	Set equal to 1 if mode is a constant for the entire grid	
ZFDZIO	I5 I6	Input unit numbers Output unit numbers	MAIN,READAB, READXY

NAME	VARIABLES	DEFINITIONS	SUBROUTINE REFERENCE
ZFUNNY	N	Number points on structural grid for spline	ROMODE, READAB, ZFDZ
	IERF	Error indicator number	
	B1,B2,B3	Spline constants	
	NFUNMX	Maximum N value	

Subroutine Write-Ups

Name	Function	Page
MAIN	Main calling program	5.10
BLOCK	Define COMMON constants	5.12
CABSO	Compute absolute value of a complex number	5.14
DECOM	Decompose matrix for solution	5.15
DIAG	Determine matrix blocks	5.17
ECHO	Provide input deck echo print	5.19
EFPLOT	Calls LRC CALPLT plot routine to end plot tape	5.21
EONE	Generate element influence	5.22
FGEN	Generate frequency coefficients	5.23
FREQW	Determines coefficients for 1 freq.	5.25
GETTIM	Transforms CPU time to integer	5.26
GRIDIN	Reads grid input data	5.28
INP1	Reads and analyzes RUN card	5.30
IRELE	Test for convergence	5.34
ITRATE	Iteration equation solver	5.35
LOOPW	Evaluate W, Wake coefficients	5.36
MESH	Grid for section without control lines	5.40
MESHCL	Grid for section with control lines	5.42
MFUN	Generate modes by polynomial	5.44
MXERR	Prints error messages	5.45
OUTP1	Prints velocity potentials, pressures	5.46
OUTP2	Prints total lift and total pressures	5.47
OUTP3	Prints aerodynamic coefficients	5.48
PHIL	Generate velocity potential	5.49
PLOT	Calls LRC CALPLT and NFRAME plot routines	5.51

Subroutine Write-Ups (contd)

Name	Function	Page
PLOTGD	Plots aerodynamic grid	5.52
PTGRID	Prints aerodynamic grid	5.54
RDETA	Read ETA from files 14, 15	5.56
RDMODE	Read and generate mode data	5.57
READAB	Read spline coefficients	5.60
READXY	Read Structural Grid	5.62
RSTART	Reads and checks restart files	5.64
RTOI	Generates transformation matrices	5.66
SOLVE	Backsubstitution for solution	5.58
SONS	Finds influence of sections	5.70
SONSPT	Prints influence of sections	5.72
SYMBOL	Calls LRC plot routine NOTATE	5.73
TIMOUT	Time print on file J9	5.74
TMAX	Computes the maximum elements in a real array	5.76
TRANS	Transformation of coordinates	5.77
WAKET	Write wake effects on file T12	5.78
WINGCK	Check course points for compatibility	5.80
WINGIN	Read wing input data	5.82
WINTGR	Computes W coefficients for 2 elements	5.87
WRETA	Write ETA in file I13 and I14	5.89
WRITEO	Write W coefficients on file I11	5.90
WRITZ	Write W coefficients in file I10	5.91
WRITZW	Write Wake effects on file I12	5.92
WTEPNT	Generate wake effects	5.93

Subroutine Write-Ups (contd)

Name	Function	Page
WVINT	Evaluates equations for influence coefficients	5.95
ZFDZ	Evaluate model functions and derivatives	5.96

1. Subroutine Name: MAIN

2. Purpose:

The main organization of the ISCON program is defined here. See Section 1 for a description of this subprogram and program flow.

3. Subroutine Required:

DIAG	SONS	RDETA	MESHCL
ECHO	LOOPW	WRETA	PLOTGD
FGEN	MXERR	EFPLOT	PTGRID
INP1	OUTP1	GETTIM	RDMUDE
MESH	OUTP2	GRIDIN	RSTART
PHIL	OUTP3	ITRATE	SONSPT
TIMOUT	WINGIN	WTEPHT	

See Section 6 for the function of each one of these subroutines.

4. Files Used:

I5, I6, I9, I10, I11, I12, I13, I14, J9, I15

These files are defined in Section 2.

5. Common Blocks Used:

BASIC	Contains	Mach number variables
FQ1	Contains	frequency variables
MXSTOR	Contains	maximum parameters
NEXTCU	Contains	error control
TIMEP	Contains	time variable
Param	Contains	no. elements
TAPE	Contains	tape definitions
WAKEUP	Contains	WAKE parameters
VELCOM	Contains	iteration parameters

WAKE	Contains	wake controls
ZFDZIO	Contains	ECHO tape def.
ZFUNNY	Contains	mode function parameters

6. Calling Sequence: None

1. Subroutine Name: BLOCK DATA

2. Purpose:

Set up constants. Common blocks used in tape definitions, convergence criteria, print controls, iteration maximums, and storage limits.

3. Common Blocks:

ITERAT	Maximum no. iterations
MXSTOR	Maximum storage limits
TAPE	File definitions
VELCOM	Maximum block size, print control

4. Definitions:

1. ITERAT — ITMAX=10=maximum no. iterations for solution

2. MXSTOR
   - NWINGS = no. wings = 4
   - NSECTN = no. sections = 3
   - NMODES = no. nodes = 10
   - NSPANS = no. spans = 100
   - NCORNR = no. corner pts. = 8
   - NFRQUN = no. frequencies = 12
   - NEPSPN = no. elements/span = 70
   - NMXFDZ = no. mode storage = 300

3. TAPE
   - I9 = 8
   - I10 = 10
   - I11 = 11
   - I12 = 12
   - I13 = 13

I14 = 14

J9 = 9

I15 = 15

See Section 2 for file descriptions.

4. VELCOM NMAX = maximum solution block size = 10

PRINT = print control = 2

5. <u>Calling Sequence</u>: None

1. Function Name: CABSO

2. Purpose:

   Compute absolute value of complex number.

3. Input Arguments:

   A = complex number

4. Output Argument:

   CABSO = value of function

5. Subroutine User: IRELE

6. Subroutine Used: SQRT

7. Calling Sequence:

   CABSO = CABSO(A)

1. Subroutine Name: DECOM

2. Purpose:

Factorization of the matrix A into a product of a lower triangular matrix L and an upper triangular matrix U. L has a unit diagonal which is not stored.

3. Equations and Procedure:

Matrix triangularization by Gaussian elimination. See Algorithm 423, "Collected Algorithms from CACM", by Cleve Moler.

4. Input Arguments:

N	Order of the Matrix A
NDIM	First dimension of A declared in calling program. If A is singly subscripted in calling program, set NDIM=N.
A	On input the matrix to be factored.

5. Output Arguments:

A	On output A(I,J) I.LE.J contains the upper triangle U, A(I,J) I.GT.J contains (I-L), where I is the identity matrix and L is the lower triangle.
IP	IP(K) K.LT.N contains the row interchange information. IP(N) contains (-1)**(number of interchanges) or 0.

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence:

Call DECOM(N,NDIM,A,IP)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 347 words

13. Subroutines Used: None

14. Subroutine User: MAIN

15. Remarks:

(1) If IP(N)=0 then matrix A is singular.

(2) Use DECOM in conjunction with subroutine "solve" to obtain the solution of the linear system A*X = B.

(3) Determinant(A) = IP(N)*A(1,1)*A(2,2),*....*A(N,N).

(4) The row interchange information stored in IP is not easy to interpret. However, it is used properly by "solve".

1. Subroutine Name: DIAG

2. Purpose:

Process coefficient matrix for 1 frequency.

The incore blocks are determined based on the W coefficient matrices stored on file I9. After decomposing, the diagonal blocks are stored on file I10. The off-diagonal terms are stored in compressed form on file I11. If wake effects have been computed, the wake coefficients are stored in compressed form on file I12. WAKENZ is set .FALSE. if no wake effects or else.TRUE. on return.

3. Input Arguments

IF	frequency number
LRE	logical record length on tape I9
NNCH	row number of trailing edge elements
MC	maximum dimension of incore matrix
NET	number of elements in total system
FRQ	frequency value
NSPT	No. trailing edges

4. Output Arguments

WROW	W coefficients work storage from file I9
D	decomposed block (incore) stored on file I10
AROW	off diagonal block stored on file I11
IZ	non zero element numbers array
IP	decomposing information array
CWROW	wake coefficients work storage from file I15
CAROW	wake effects for 1 frequency stored on file 12

5. Subroutines Used:

WRITEO

WAKET

DECOM

FREQW

6. Subroutine User:

Main program

7. Calling Sequence:

CALL DIAG (WROW, IF, LRECL, NNCH, MC, D, NET, AROW, IZ, IP, NSPT, FRQ, CAROW, CWROW)

8. Files Used:

I9 = (input) file containing W coefficients, for all frequencies

I10 = diagonal block, decomposed for 1 frequency (output)

I11 = off diagonal terms (output)

I15 = (input) wake coefficients

I13 = wake effects for 1 frequency in compressed form

1. Subroutine Name: ECHØ

2. Purpose:

To read the input for a given case, and print out an echo check of the input data.

3. Equations and Procedures:

The input deck is read from unit I5, and placed on unit I11 and printed with format control on unit I6. If an end of file is encountered, the subroutine sets the variable KØNTRL equal to 1.

4. Input Arguments: None

5. Output Arguments:

KØNTRL	Integer variable set equal to 1 if an end of file is encountered on reading the input stream.

6. Common Blocks:

/TAPE/

I11	Unit number of file to have card images of input stream.

/ZFDZIØ/

J5	Unit number of input stream - card reader
J6	Unit number for printed output

7. Error Returns: None

8. Calling Sequence:

Call ECHO(KØNTRL)

9. Input Tapes: None

10. Output Tapes:

    Ill Contains card images of input deck.

11. Scratch Tapes: None

12. Storage Required: 225 words

13. Subroutine Required: None

14. Subroutine User: MAIN

15. Remarks:

    The test for the end of file differs from IBM to CDC. Make sure that the correct coding is present for the correct installation.

1. Subroutine Name: EFPLOT

2. Purpose:

To end the plot tape on the CDC version.

3. Equations and Procedure:

CDC plot routine is called to end the tape, CALL CALPLT (0.0, 0.0,999). This routine replaces the IBM version of the CALCOMP routine EFPLOT.

4. Input Arguments:

A Dummy argument, not used, but present to keep the call to the routine identical to the IBM-CALCOMP version of EFPLOT. (In that version this argument represents four characters to be printed out on the plot just before ending the plot tape.)

5. Output Arguments: None

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence: Call EFPLOT(A)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: relatively very small

13. Subroutine Required: CALPLT

14. Subroutine User: MAIN

15. Remarks:

This subroutine is not used in the IBM version. It is replaced by the standard CALCOMP routine of the same name.

1. Subroutine Name: EONE

2. Purpose:

This routine determines if an element and its mirror image are in the Mach cone.

3. Equations and Procedure:

This routine examines the end points of a line. If either one end point or the other is in the Mach cone, the line is in the mach cone and EREONE is set equal to .TRUE. The mirror image of the line is found and the same test is made. If the mirror image of the line is inside the MACH cone then EMIRRO is set equal to .TRUE. This routine is used to test only one line per call.

4. Input Arguments: None

5. Output Arguments: None

6. Common Blocks Used:

/EEW/

/RRLL/

/WW1/

7. Error Returns: None

8. Calling Sequence: CALL EONE

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 275 words

13. Subroutines Required: None

14. Subroutine User: WINTGR

15. Remarks: None

1. Subroutine Name: FGEN

2. Purpose:

To calculate KAPPA and the frequency coefficients for each frequency.

3. Equations and Procedure:

For each frequency, K, the modified frequency KAPPA is defined by:

$$\text{KAPPA} = \frac{K*M}{\sqrt{M*M-1}}$$

where M is the MACH NUMBER.

(The list of frequencies is stored in FREQ, and the modified frequencies are stored in FREQP).

The frequency coefficients are calculated from:

$C_1 = 1.0$

$C_J = -C_N * \left(\frac{\text{KAPPA}**2}{(2*N)(2*N-1)}\right)$

for $J > 1$, where $N=J-1$.

Currently a maximum of 30 terms are taken (J=30) for each frequency. A check on the exponent is made to avoid an exponent underflow. A scalar, XUNDER, is defined to be -77.5 on the IBM machine and -292.0 on the CDC machine. This is close to the largest negative exponent allowed each machine.

4. Input Arguments: None

5. Output Arguments: None

6. Common Blocks Used:

/BASIC/ and /FQ1/

7. Error Returns: None

8. Calling Sequence: Call FGEN

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 263 words

13. Subroutine User: MAIN

14. Subroutine Required: None

15. Remarks: None

1. Subroutine Name: FREQW

2. Purpose:

Read one record W coefficient for all frequencies from file I8. The coefficients for the input frequency are then determined and stored in AROW.

3. Input Arguments:

I8 = file number containing coefficients

NF = frequency number

LRECL= length of file recond on file I8

4. Output Arguments:

WROW = work storage for coefficients all frequencies

AROW = output coefficients record - one frequency

5. Files Used:

I8 = input file containing W coefficient

6. Subroutine User: DIAG

7. Calling Sequence:

Call FREQW (I8,AROW,WROW,NF,LRECL)

1. Subroutine Name: GETTIM

2. Purpose:

This is a FØRTRAN routine to be used on the CDC machine only. It replaces an identically named system routine on the IBM 360-65 at Bell Aerospace. This routine calculates the elapsed CPU time in milliseconds and stores it as an integer.

3. Equations and Procedure:

This routine depends on the CDC routine ØECØND, which returns the elapsed CPU time in seconds as a floating point number. Subroutine GETTIM multiplies this number by 1000 and stores it in second location of an integer array, eight words in length. This will mimic the IBM system routine GETTIM.

4. Input Arguments:

ITIME Integer array of length 8.

5. Output Argument:

ITIME Integer array of length 8, time is put in second location.

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence:

CALL GETTIM (ITIME)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: Small

13. Subroutines Required:

    ØECØND, a CDC routine that gives elapsed CPU seconds.

14. Subroutine User: MAIN

15. Remarks: None

1. Subroutine Name: GRIDIN

2. Purpose:

To read in specific grid information for one section and generate mesh for that section.

3. Procedure:

a) GRID card is read and checked.

b) SPAN card is read and checked.

c) CHORD cards are read for every span.

Cards are checked to make sure elements are not crossed.

d) The next SPAN card is read, along with its CHORD cards for every span.

e) Next input card is read.

4. Input Arguments:

I5	Input unit (usually card reader 5)
I6	Output unit (printer 6)
ERROR	Logical that comes in false, may be set true
BEETA	Sort (Mach*Mach-1) used to transform CORNX and CL
NWING	No. wings in structure
NSECT	Array no. sections in each wing
LAB, ID, FD	information on last card read

(Both input and output)

5. Output Arguments:

CORNX,CORNY,CORNZ	X,Y, and Z coordinates of corner points 1, 2, 3, 4, in global system
NSP	Desired number of spans for section (Input by user)
XYZ	4 X and 2 Y local coord. for each element of section

Z	Z coordinate for all elements in section (from trans)
TRS	2 by 2 trans matrix to go from local to global
NNCH	Element number (W.R.T. total structure of last element in span. (Used for labeling plot)
SW	Span width
XLE	Average X coordinate of leading edge per span
NE	Number of elements in section
ICL	ICL(I,J) Code for section I of wing J ICL(I,J) = -1 specified grid information is input here ICL is updated if another 'GRID' section is encountered after read present 'GRID' section
NETSV	Counter of total number of elements in structure

6. Common Blocks Used: None

7. Error Returns:

Input cards are checked. If an error is found, ERROR is set equal to .TRUE. and an error message is written.

8. Calling Sequence:

```
SUBROUTINE GRIDIN(CORNX,CORNY,CORNZ,XYZ,Z,TRS,NNCH,SW,XLE,
1 NSP, NE, NETSV, REFLEM, MFREQ, FREQ,
1 NWING, NSECT, ICL, ERROR,  BEETA, LBA, ID, FD, I5, I6)
```

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 1244

13. Subroutine User: MAIN

14. Subroutine Required: TRANS

15. Remarks: None

1. Subroutine Name: INPJ

2. Purpose:

To read and check the RUN data card.

3. Equations and Procedure:

The RUN data card is read with a format of (A4,2X,9I2,4E12.0).

a) A check is made to be sure that it is a RUN card.

b) The first integer field contains the run type code and is stored in scalar ITRUN.

c) The second integer field contains the plot request code. If there is a '1' in this field (column 10), a plot of the structure is to be generated, and the logical variable PLOTR is set equal to .TRUE..

d) The first floating point field contains the mach number and is stored in the real variable MACH. A check is made to see that it is greater than 1.0.

e) The third integer field contains the code to consider wake effects and is stored in the variable IWTE.

f) The first floating point field contains the mach number and is stored in the real variable MACH. A check is made to see that it is greater than 1.0.

g) The second floating point field contains the Reference length and is stored in REFLEN. A check is made to be sure that it was not input as 0.0.

h) The third floating point field contains the pitching axis, and is stored in the variable XPIN.

i) The fourth floating point field contains the element aspect ratio. This is stored in the variable EARO.

4. Input Arguments:

I5	Logical unit number containing the input deck - usually the card reader.
I6	Logical unit number for output unit - usually the system printer.
TITLE	Array containing title as character information.
LAB	Input and output of character information in first 4 columns of current input card.
FD	Floating point array 4 words long to store floating point fields of current input card.
ID	Integer array 9 words long to store the integer fields of the current input card.

5. Output Arguments:

ITRUN	Run type requested. ITRUN=1, the run is a complete execution attempt. ITRUN≠1, the run is a "check run".
MACH	Mach number (a floating point number).
REFLEN	Reference length.
XP	Pitching moment axis after being normalized by BEETA and REFLEN.
XPIN	Pitching moment axis as input.
PLØTR	Logical variable set to .TRUE. if plotting is requested. Otherwise it is .FALØE.

BEETA	BEETA=SØRT(MACH*MACH-1.0).
ERRØR	SET TØ .TRUE if error condition is encountered.
EARØ	Element aspect ratio
IWTE	Code set to 0 if wake effect is not considered greater than 0 if wake effects are considered.

6. Common Blocks Used:

/NEXTCS/

IFLUSH	Set equal to 1 if run card is not found. This will cause the main routine to terminate the current case.

7. ERRØR RETURNS

See discription of IFLUSH above.

Logical ERRØR is set equal to .TRUE. if any of several errors exist in reading the input. The error condition generates an appropriate error message. All error message format statements are numbered between 2000 and 2026. The following is a list of error messages in this routine. (All messages are preceeded by the statement ERRØR IN READING INPUT).

a) RUN CARD IS MISSING ØR ØUT ØF ØRDER. RUN CARD MUST IMMEDIATELY FØLLØW THE TITLE CARD AND BE THE SECØND CARD IN THE INPUT DECK. JØB IS TERMINATED.

b) MACH NUMBER MUST BE GREATER THAN 1.0.
MACH NUMBER WAS READ AS _____.
MACH NUMBER WILL BE SET EQUAL TØ 2.0 IN AN ATTEMPT TØ CHECK THE REST ØF THE DATA.

c) REFERENCE LENGTH WAØ READ AØ 0.0. THIØ IØ NØT ALLØWED. REFERENCE LENGTH WILL BE SØT EQUAL TØ 1.0 IN AN ATTEMPT TØ CHECK THE REØT ØF THE DATA.
REFERENCE LENGTH MUØT BE INPUT AØ A NØN-ZERØ FLØATING PØINT NUMBER IN CØLUMNØ 37 THRØUGH 48 ØF THE RUN DATA CARD.

d) ØFF-DIAGØNAL PERCENTAGE, IF ENTERED, MUØT BE GREATER THAN ØR EQUAL TØ 0.0 AND LEØØ THAN 1.0.
ØFF DIAGØNAL WAØ INPUT AØ _____.

8. Calling Sequence:

CALL INP1(I5,I6,TITLE,ITRUN,MACH,REFLEN,XP,XPIN,PLØTR,IWTE, EARØ,BEETA,LAB,ID,FD,ERRØR).

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 688

13. Subroutine User: MAIN

14. Subroutine Required: None

15. Remarks: None

1. Subroutine Name: IRELE

2. Purpose:

Check relative error between A and B.

If Relative error is less than Eps, IRELE is set = 0 otherwise IRELE is set =1. If KRELE = 1, do not test for convergence.

3. Input Arguments:

A = argument #1

B = argument #2

KRELE = code to signify former convergence

4. Calling Sequence:

Function IRELE (A,B,KRELE)

5. Output Arguments:

IRELE = 1 means A, B has not converged.

IRELE = 0 means A, B has converged

6. Subroutine User: ITRATE,WAKET

1. Subroutine Name: ITRATE

2. Purpose:

Downwash equation solver using block iteration with successive over relaxation. See Reference 3.

3. Input Arguments:

I9 = file containing coefficients off diagonal

NWR = input downwash - real

NWI = input downwash - imaginary

MC = block dimension

4. Output Arguments:

GW = output solution vector

5. Work Storage:

D = diagonal block storage

6. Common Block:

CEPS	defines convergence
ITERATE	control variables for ITRATE
ITG	defines ELEMENT DATA on file
TAPE	file unit numbers
VELCOM	define block information

7. Calling Sequence:

```
CALL ITRATE (I9, NWR, NWI, GW, GT, MC, D, IP, DNWR, DNWI,
             RWR, RWI, NET, A, IZ, GWESS, WW)
```

8. Subroutines:

SOLVE

9. Used By:

MAIN program

1. Subroutine Name: LOOPW

2. Purpose:

To organize the calculation of the velocity influence matrix.

3. Equations and Procedure:

Procedure is outlined in the accompanying flow chart.

4. Input Arguments:

Input arguments are defined in the comment statements at the beginning of the routine.

5. Output Arguments:

Output arguments are also listed in comment cards in subroutine.

6. Common Blocks Used:

/FQ1/

/RRLL/

/TAPE/

/WAKEUP/

/WW1/

7. Error Returns: None

8. Calling Sequence:

Call LOOPW(NET,NWING,XYZ,NSP,SYM,TRS,NNCH,NE,NSECT,ZSECT, ISONS,I6,TAPE8,XCEN,AREA,WROW,LRECL,WTEROW,LRWTE,PERC, ERROR,IWTE,REFLEN)

9. Input Tapes: None

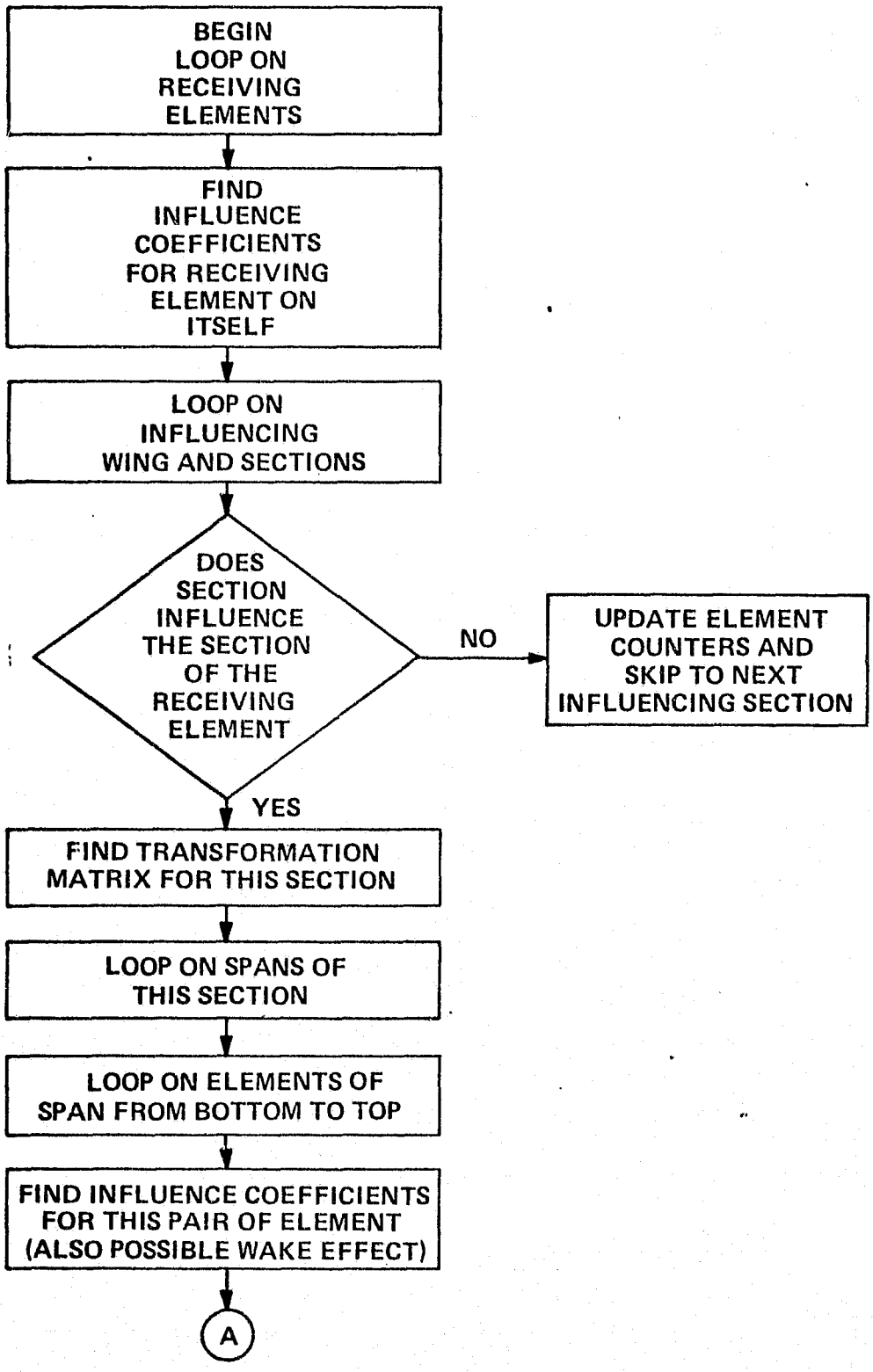
10. Output Tapes:

Two tapes are generated in the subroutine. The first is on logical unit TAPE8. The first record on this tape contains

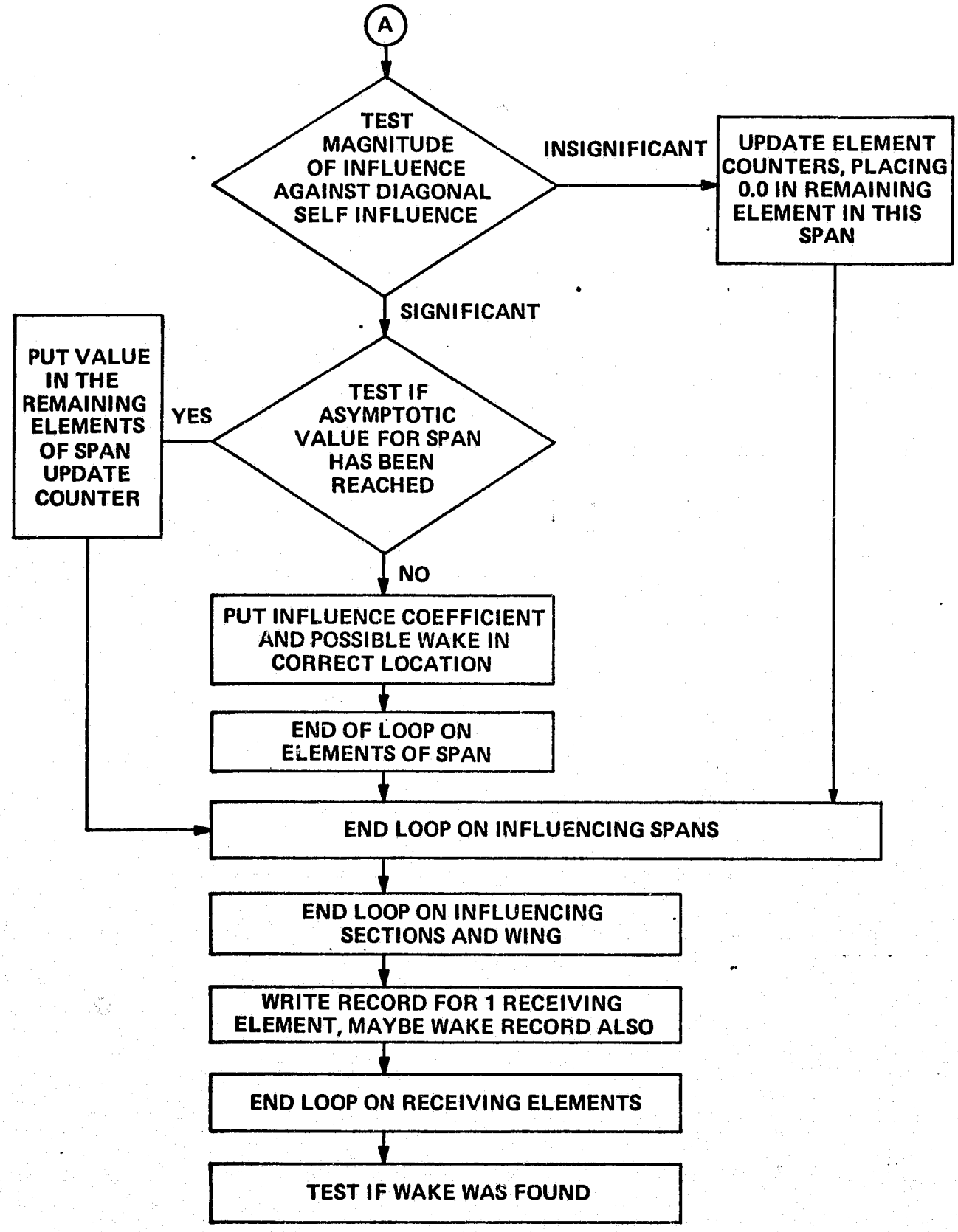
the "restart record". This record contains the mach number, number of elements, reference length, wake element code, number of frequencies, and a list of the frequencies. Following is a record for every element on the tape. These records contain the element number and the array of influence coefficients for every frequency at every influencing element (all other elements).

If wake effect is requested, a second tape is written. This tape is defined on logical unit I15. It also begins with a restart record as defined above. It has a record only for those elements that have some nonzero wake coefficients. The record begins with the receiving element number and has a list of wake effects (complex numbers) for every frequency for every trailing edge number.

11. Scratch Tapes: None
12. Storage Required: 1110 words
13. Subroutines Required: RTOI and WINTRGR
14. Subroutine User: MAIN
15. Remarks: Domain of Effective Far Field Elements - Contribution to the velocity component at a receiving point, from far field elements (i.e. when is large) is small. Computational economy can be agained by truncating the domain of influence, when the order of the magnitude of the influence coefficient W_{ij} is less than say (E) of W_{ii}. The parameter E is fixed in the program at .005 and called PERC. The programmer can update this quality by changing the variable PERC in the BLOCK DATA routine.



Flow Chart of Subroutine LOOPW



Flow Chart of Subroutine LOOPQ (Cont.)

1. Subroutine Name: MESH

2. Purpose:

To generate a mesh (grid) for a section without control lines.

3. Procedure:

Corner points of are input. These corner points are transformed to the aerodynamic reference system in subroutine TRANS. The number of spans (strip of the wing running parallel to the X axis) is input. This determines the span width. The height to width ratio of the elements is given by CRATIO.

4. Input Arguments:

CORNX,CORNY,CORNZ	X,Y, and Z coord. of corner pts. 1,2,3,4 in global system.
NSP	Desired number of spans for section (input by user).

5. Output Arguments:

XYZ	4 X and 2 Y local coord. for each element of section.
Z	Z coordinate for all elements in section (from trans).
TRS	2 by 2 trans matrix to go from local to global.
NNCH	Element number (W.R.T. total structure) of last element in span. (Used for labeling plot).
SW	Span Width.

XLE	Average X coordinate of leading edge per span.
NE	Number of elements in section.
NETSV	Counter of total number of elements in structure.

6. Common Blocks Used:

   /BASIC/

7. Error Returns: None

8. Calling Sequence:

   SUBROUTINE MESH(CORNX,CORNY,CORNZ,XYZ,Z,TRS,NNCH,SW,XLE,NSP, NE,NETSV).

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 459 words

13. Subroutine User: MAIN

14. Subroutine Required: TRANS

15. Remarks: None

1. Subroutine Name: MESHCL

2. Purpose:

To generate a mesh (grid) for a section with 1 or 2 control lines.

3. Procedure:

The procedure is similar to subroutine MESH except that element size is determined by control lines.

4. Input Arguments:

CORNX,CORNY,CORNZ	X,Y and Z coord. of corner pts. 1,2,3,4 in global system.
NSP	Desired number of spans for section (input by user).
ICL	Number of control lines in section.
CL(1),CL(2)	x coord. of first control line.
CL(3),CL(4)	x coord. of second control line.

5. Output Arguments:

XYZ	4 X and 2 Y local coord. for each element of section.
Z	Z coordinate for all elements in section (from trans).
TRS	2 by 2 trans matrix to go from local to global.
NNCH	Element number (W.R.T. total structure) of last element in span. (Used for labeling plot).
SW	Span width.

XLE	Average X coordinate of leading edge per span.
NE	Number of elements in section.
NETSV	Counter of total number of elements in structure.

6. Common Blocks Used:

   /BAØIC/

7. Error Returns: None

8. Calling Sequence:

   Subroutine MESHCL(CORNX,CORNY,CORNZ,XYZ,Z,TRS,NNCH,SW,XLE, NSP,NE,NETSV,ICL,CL).

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 829 words.

13. Subroutine User: MAIN

14. Subroutine Required: TRANØ

15. Remarks: None

1. Subroutine Name: MFUN

2. Purpose and Equations:

a. Generate modes by using a quadratic polynomial

b. The coefficients are supplied by a table - CTABLE

c. The wing number and mode number are stored in IFTABL

d. The derivative is formed and stored in DM

e. $EM = C_o + C_xX + C_yY + C_{xy}XY + C_{xx}X^2 + C_{yy}Y^2$

$DM = C_x + C_{xy}Y + 2C_{xx}X^2$

3. Input Arguments:

JMODE = number modes

4. Common Blocks:

a. Common/MFUN/CTABLE,IFTABLE,NTABL,NFQF

This common block contains input:

1) CTABL =coefficient tables

2) IFTABL =table containing wing number and mode number

3) NEQF =number equations

b. Common/MODEF/EM,DM,X,Y,J1,J2

1) EM =mode output

2) DM =derivative = output

3) X =value of x (input)

4) Y =value of y (input)

5) J1 =wing number (input)

6) J2 =mode number (input)

5. Calling Sequence:

Call MFUN (JMODE)

6. Subroutine User: RDMODE

1. Subroutine Name: MXERR

2. Purpose:

Whenever a program limit has been exceeded, this subroutine will write an error message to inform the user.

3. Input Arguments:

IERR	=	identifies error
MXNO	=	program limit
NOIN	=	value in error
I6	=	output tape for printing

4. Calling Sequence:

Call MXERR(IERR,MXNO,NOIN, I6)

5. Output:

An error message is printed for the following parameters if their limit is exceeded:

Number wings

Number sections

Number modes

Number spaces

Number corner points

Number frequencies

Number elements/span

1. Subroutine Name: OUTP1

2. Purpose:

To output the LIFT AND PRESSURE MOMENT PER UNIT SPAN FOR WING - and the VELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING - tables.

3. Equations and Procedures:

Information is printed out in tabular form.

4. Input Arguments:

Defined by comment statements at the beginning of subroutine.

5. Output Arguments: None

6. Common Blocks: None

7. Error Returns: None

8. Calling Sequence:

Call OUTP1 (MACH,FREQ,JMODE,JWING,NS,NSP,SW,DLSPAN,PMSPAN, XP,INDXI,PRES,IPW,I6,LINE,LMAX,NNCH,NE,TITLE,NSPT)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 650 words

13. Subroutine User: MAIN

14. Subroutine Required: None

15. Remarks: None

1. Subroutine Name: OUTP2

2. Purpose:

Print the Total Lift and Pitching Moment tables.

3. Equations and Procedures:

Information is printed out in tabular form.

4. Input Arguments:

I6	Logical unit number of output device (printer)
NWING	number of wings in structure
TL(I,J)	Total lift on wing I due to mode J
TM(I,J)	Total moment on wing I due to mode J
JMODE	Total number of modes for run
FREQ	Frequency
MACH	Mach number
LINE	Current line count
LMAX	Maximum number of lines per page

5. Output Arguments: None

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence:

Call OUTP2 (I6,NWING,XP,TL,JMODE,FREQ,MACH,LINE,LMAX)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 260 words

13. Subroutine User: MAIN

14. Subroutine Required: None

15. Remarks: None

1. Subroutine Name: OUTP3

2. Purpose:

Write the table of GENERALIZED AERODYNAMIC COEFFICIENT MATRIX IN AGARD DEFINITION.

3. Procedure:

Information is printed out in tabular form.

4. Input Arguments:

I6	Logical unit number of printer
MACH	Mach number
FREQ	Frequency
Q	Aerodynamic coefficient matrix
LINE	Current line
LMAX	Total number of lines allowed on page
TITLE	Print title information, 4 characters per word, 56 characters in total

5. Output Arguments: None

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence:

Call OUTP3 (I6,MACH,GREQ,JMODE,Q,LINE,LMAX,TITLE)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 430 words

13. Subroutine User: MAIN

14. Subroutine Required: None

15. Remarks: None

1. Subroutine Name: PHIL

2. Purpose: Integration of velocity potentials.

3. Equations and Procedure:

The velocity potentials are integrated separately for each span. The equation and method is given in detail in Reference #1. This routine also determines the convergence of the velocity potentials when wake effect is considered.

4. Input Arguments:

XLE	X coordinate of the center of the leading edge line for the span.
XCEN	X coordinates of the center of the elements of the span.
DPDX	Functional values to be integrated (COMPLEX).
NEPS	The number of elements per span.
A	Complex constant used as exponent. A = (0.0, K'*M).
CXP	Complex expotentials taken at the center of the element. CXP(I) = CEXP (0.0,XCENLI)*K'*M).

5. Output Arguments:

PHI	Velocity potential for the span.
PHIW	This array is used as both input and output to test for wake convergence. On input it is the velocity potential of the last iteration. On output it is identical to PHI.

6. Common Blocks Used: /WAKE/

7. Error Returns: None

8. Calling Sequence:

Call PHIL(XLE,XCEN,DPDX,NEPS,PHI,A,CXP,PHIW)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 914 words

13. Subroutines Required: None

14. Subroutine User: MAIN

15. Remarks: None

1. Subroutine Name: PLOT

2. Purpose:

This routine positions the pen of the plotter and skips plot frames on the CDC version of the plotter.

3. Equations and Procedure

The Langley plotting routines, CALPLT and NFRAME, are called in place of the standard CALCOMP routine PLOT.

4. Input Arguments

X, Y, IPEN These are the arguments of the standard CALCOMP routine PLOT.

5. Output Arguments: None

6. Common Bocks Used: None

7. Error Returns: None

8. Calling Sequence:

Call PLOT(X,Y, IPEN)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: Relatively small

13. Subroutines Required: CALPLT, NFRAME

14. Subroutine User: PLOTGD

15. Remarks:

This routine is not used in the IBM version of the program. Instead, the standard CALCOMP routine PLOTS, with entry point PLOT is used.

1. Subroutine Name: PLOTGD

2. Purpose:

Generate a plot of each section of a wing.

3. Equations and Procedure:

Standard CALCOMP plotting techniques are used.

4. Input Arguments:

NE	Number of elements in each section of the wing
XYZ	X and Y coordinates of each element (aerodynamic Reference System)
NNCH	Array containing last element number of each span
NSP	Number of spans in each section of the wing
NSECT	Number of sections in the wing
TITLE	56 characters of title information. 14 words, 4 characters in each word
JWING	wing number
ZSECT	Z coordinate of all elements in the section
AR	Aspect Ratio
MACH	Mach Number

5. Output Arguments: None

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence:

Call PLOTGD(NE,XYZ,NNCH,NSP,NSECT, TITLE,JWING,ZSECT,AR,MACH)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 740 words

13. Subroutine Required:

This routine requires the following CALCOMP routines:

NUMBER, SYMBOL, LINE, PLOT

14. Subroutine User: MAIN

15. Remarks: None

1. Subroutine Name: PTGRID

2. Purpose:

To print out the aerodynamic grid and calculate the X coordinate of the center of each element.

3. Equations and Procedure:

The coordinates of each point are found in the structural reference (or rotated structural reference) system. These are then printed out in tabular form along with the X and Y coordinates of the center of the element. The X coordinate of the center of the element is stored (in the aerodynamic system) in the array XCEN.

4. Input Arguments:

I6	Logical unit number of output device.
TITLE	Array containing title information (56 characters, 14 words, 4 characters each).
MACH	Mach number
NWING	Number of wings
NØECT	Number of sections in each wing.
NØP	Number of spans in section I of wing J-NØP(I,J).
NNCH	Array containing the element number of the last element of each span.
XYZ	X and Y coordinates of the structure in the aerodynamic system.
ZØECT	Z coordinates of each section.
REFLEN	Input reference length.
BEETA	BEETA=SQRT(MACH**2-1.0).

5. Output Arguments:

XCEN X coordinates of the center of each element

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence:

Subroutine PTGRID (I.6,TITLE,MACH,NWING,NSECT,NSP,NNCH,XYZ, ZSECT,REFLEN,BEETA).

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 406 words

13. Subroutine User: MAIN

14. Subroutine Required: None

15. Remarks: None

1. Subroutine Name: RDETA

2. Purpose:

Read DETADX, ETA arrays from Tape I13

3. Input Arguments:

I13 = Tape number

NET = number of elements

4. Output Arguments:

DETADX = array on tape I13

ETA = array on tape I13

5. Scratch Tapes: I13

6. Subroutine User:

Main program

7. Calling Sequence:

Call RDETA (I13,DETADX,ETA,NET)

1. Subroutine Name: RDMØDE

2. Purpose:

Read and define modal input.

3. Equations and Procedure:

Mode type of input is determined. (MDWING or MDPØLY)
If MDPØLY is present, the coefficient of the polynomials are read, and the modal values and their derivatives at each element is found using MFUN. If MDWING data is present, the spline routine obtained from Robert Desmarais, is used. Cards from program ØØ31 are read by subroutines
READAB and READXY. Note that this routine is really ZFUN with minor changes. The next data card is read. If it is another MDWING card, the above procedure is repeated. If it is a RIGM card, the rigid mode data is read. This is done until an END card is reached.

4. Input Arguments:

NWING	Number of wings in structure
NØECT	Number of sections in each wing.
NE	Number of elements in each section of each wing.
XCEN	X coordinate of the center of each element in the aerodynamic grid in the aerodynamic reference system.
XYZ	X and Y coordinates of the structure in the aerodynamic system.
BEETA	ØQRT(MACH*MACH-1.0)
REFLEN	Reference length

NET	Total number of elements.
LAB	Label on last card read.
ID	Integer field of last card read.
I5	Unit number of device containing the input deck.
I6	Unit number of device for printout.

5. Output Arguments:

ETA	The modes, for all modes and all elements.
DETADX	The derivative of the mode at every point.
ERRØR	Logical variable set equal to .TRUE. if an error is encountered.

6. Common Blocks Used:

/MCØM/

/MØDEF/

/XYØCAL/

7. Error Returns:

The program returns the logical variable ERRØR equal to .TRUE. if an error condition is present in reading the input.

8. Calling Sequence:

Call RDMØDE(JMØDE,NWING,NØECT,NE,XCEN,XYZ,BEETA,REFLEN,NET, LAB,ID,ERRØR,ETA,DETADX,I5,I6).

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 1896 words

13. Subroutines Required:

ZFDZ, READAB, MFUN and READXY.

14. Subroutine User: MAIN

15. Remarks: None

1. Subroutine Name: READAB

2. Purpose:

To read in the spline coefficients used for finding mode information.

3. Equations and Procedure:

This reads in the surface spline coefficients and the modal values as punched from program ØØ31. This program was received from and written by Robert Desmarais. The modes are read and used only to see if the mode is constant for all points in the grid. For this reason the modes and the spline coefficients may have the same storage unless the user of the routine wishes to use both the modal values at the structural grid and the spline coefficients.

4. Input Arguments:

Z	Storage to read in modal values.
A	Storage to read in surface spline coefficients.

5. Output Arguments:

Z	Modal values for the structural grid.
A	Surface spline coefficients.

6. Common Blocks Used:

/ZFUNNY/ and /ZFDZIØ/

7. Error Returns: None

8. Calling Sequence:

CALL READXY(Z, A)

(Note that if the modes at the structural grid are not of interest, Z may share the same storage as A).

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 230 words

13. Subroutines Required: None

14. Subroutine User: RDMØDE

15. Remarks:

This subroutine corresponds to entry point READZAB of the function subprogram ZFUN written by Robert Desmarais of Langley Research Center. READAB is to be used in conjunction with subroutines READXY and ZFDZ.

1. Subroutine Name: READXY

2. Purpose:

To read in the structural grid used for spline data.

3. Equations and Procedure:

This reads in the structural grid for the spline routine. This is a modified version of subroutine ZFUN. It reads in the number of points in the structural grid and the X and Y coordinates of the structural grid, exactly as it was punched from Program ØØ31. (ØØ31 was written by Robert Desmarais of Langley Research Center).

4. Input Arguments: None

5. Output Arguments:

X	X coordinates of the structural surface.
Y	Y coordinates of the structural surface.

6. Common Blocks Used: /ZFUNNY/ and /ZFDZIØ/

7. Error Returns

IERF is set equal to 680 if the number of points to be read exceeds the maximum allowed by the program. IERF is in common /ZFUNNY/

8. Calling Sequence

CALL READ(X,Y)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 210 words

13. Subroutines Required: None

14. Subroutine User: RDMODE

15. Remarks:

This subroutine corresponds to entry point READZXY of the function subprogram ZFUN, written by Robert Desmarais. READXY is to be used in conjunction with subroutines READAB and ZFDZ.

1. Subroutine Name: RØTART

2. Purpose:

Read and check restart tape.

3. Equations and Procedure:

The first record of the "restart" tape is read and compared against the current run. If the tape is compatible with the current run, execution proceeds. If not, a table is printed out giving the information on the restart tape and for the current run. If wake elements are requested, this same test is made on the wake effect tape, I15.

4. Input Arguments:

MACH	Mach number
NET	Total number of elements
NFREQ	Number of frequencies
FREQ	List of frequencies
REFLEN	Reference length
IWTE	Wake effect code
I8	Logical unit number of restart tape containing velocity influence coefficients.
I15	Logical unit number of restart tape containing wake effects.
I6	Logical unit number of output device.
FREQR	Space used to read frequencies from restart tape.
XYZ	X and Y coordinates of elements.

5. Output Arguments

AREA	Area of each element.

6. Common Blocks Used

/NEXTCØ/ (see Error Returns)

7. Error Returns

IFLUØH in CØMMØN/NEXTCØ/ is set equal to 1 if either one of the restart tapes are not compatible with the present run. This forces termination of the program. The program will not cycle to the next case to avoid writing over the restart tape.

8. Calling Sequence:

Call RØTART(MACH,NET,NFREQ,FREQ,REFLEN,IWTE,I8,I15,I6,FREQR, XYZ,AREA).

9. Input Tapes:

Logical unit I8 and I15, the restart tapes. I15 is optional and needed only when wake is required in the current run.

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 450 words

13. Subroutines Required: None

14. Subroutine User: MAIN

15. Remarks: None

1. Subroutine Name: RTOI

2. Purpose:

This routine transforms a pair of coordinates from the reference system of the receiving element to the reference system of the influencing system.

3. Equations and Procedures:

The point is first transformed from the receiving system to the reference system. This new set of coordinates is then put in the influencing system. The transformation matrix to relate the velocity influence from the influencing system to the receiving system is also defined.

4. Input Arguments:

TR Transformation matrix to go from receiving system to the reference system.

TI Transformation matrix to go from the influencing system to the reference system.

YCR Y coordinate in the receiving system.

XCR Z coordinate in the receiving system.

5. Output Arguments:

ZRO Z coordinate of the receiving point in the influencing system.

ZLO Z coordinate of the mirror image of the receiving point in the influencing system.

6. Common Blocks Used:

/RRLL/

7. Error Returns: None

8. Calling Sequence:

Call RTOI (TR,TI,YCR,ZCR,ZRO,ZLO)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 200 words

13. Subroutines Required: None

14. Subroutine User: LOOPW

15. Remarks: None

1. Subroutine Name: SOLVE

2. Purpose:

Solution of the linear system of equations C*X = B.

3. Equations and Procedure:

Back substitution based on the factored form of the coefficient matrix. See Algorithm 423, "Collected Algorithms from CACM", by Cleve Moler.

4. Input Arguments:

N	Order of the Matrix A
NDIM	First dimension of a declared in calling program. If A is singly subscripted in calling program, SFT NDIM-N.
A	Contains the triangular factors of the matrix C (as determined by subroutine "DECOM").
B	On input, the RHS vector
IP	Vector of dimension N containing Row interchange information (as determined by subroutine "DECOM").

5. Output Arguments:

B	The solution vector

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence:

Call SOLVE(N,NDIM,A,B,IP)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 249 words

13. Subroutines Required: None

14. Subroutine User:

MAIN

15. Remarks:

Subroutine SOLVE must be used in conjunction with subroutine DECOM.

1. Subroutine Name: SONS

2. Purpose:

Determines if the elements of one section influence the elements of any other section.

3. Equations and Procedure:

Each section is treated as having two receiving points and two influencing points. The receiving points are then taken to be the corner at the trailing edge of the section. The influencing points are the corner points of the section at the leading edge. Each section is examined to see if any other sections "influencing points" have any influence on its receiving points. The Boolean matrix ISONS(K1,K2) is determined such that ISONS(K1,K2)=1 if section K2 has influence of section K1, ISONS(K1,K2) = 0 if section K2 has no influence on section K1.

4. Input Arguments:

NWING Number of wings

NSECT Number os sections in each wing

CORNX, CORNY, CORNZ Array of X,Y, and Z coorindates for the wing corner points

5. Output Arguments:

ISONS See Equations and Procedures section above.

7. Common Blocks Used: None

8. Calling Sequence:

Call SONS(NWING,NSECT,CORNX,CORNY,CORNZ,ISONS)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 430 words

13. Subroutine User: MAIN

14. Subroutine Required: None

15. Remarks: None

1. Subroutine Name: SØNSPT

2. Purpose:

Print out a table to show if any section is influenced by any other section.

3. Procedure:

ISØNS (see Subroutine SØNS write-up) is printed in tabular form.

4. Input Arguments:

ISØNS	See write up, (Equations and Procedure Section) for Subroutine SØNS.
NWING	Number of wings.
NSECT	Number of sections in each wing.
MACH	Mach number (REAL)
I6	Logical unit number of prints.

5. Output Arguments: None

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence:

Call SØNSPT(ISØNS,NWING,NSECT,MACH,I6)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 325 words

13. Subroutine User: MAIN

14. Subroutine Required: None

15. Remarks: None

1. Subroutine Name: SYMBOL

2. Purpose:

   To plot character information in the CDC version of the program.

3. Equations and Procedure

   This routine calls the Langley plotting routine NOTATE.

4. Input Arguments:

   The input arguments are identical to either the standard CALCOMP routine SYMBOL or the Langley plot routine NOTATE.

5. Output Arguments: None

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence:

   Call SYMBOL (X,Y,SIZE,CHAR,ANG,NCHAR)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: None

13. Subroutine Required: NOTATE

14. Subroutine User: PLOTGD

15. Remarks:

    This routine is only used in the CDC version of the program. In the IBM version, this routine is replaced by the standard CALCOMP routine SYMBOL.

1. Subroutine Name: TIMOUT

2. Purpose:

To print in tabular form the elapsed time from the last call to this routine.

3. Equations and Procedure:

Procedure is fairly obvious. Note that eight scalars are used to receive title information. Scalars were used instead of an array to permit the same routine to be used on both the CDC and IBM machines. Scalars were needed because of the different word length of the two machines.

4. Input Arguments:

MSEC	Integer value of current elapsed time in milliseconds.
A, B, C, D, E, F, G, and H	Eight scalars used to input 4 characters of title information each.

5. Output Arguments: None

6. Common Blocks Used:

/TAPE/

7. Error Returns: None

8. Calling Sequence:

Call TIMOUT(MSEC,A,B,C,D,E,F,G,H)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 124 words

13. Subroutine Required: None

14. Subroutine User: MAIN

15. Remarks:

This routine prints the time on logical unit J9, the seventh scalar (integer) in COMMON/TAPE/. It is suggested that this output device be separate from the output device of the rest of the run.

1. Subroutine Name: TMAX

2. Purpose:

   1. Generate maximum value in array.

   2. Test each element in the array and determine whether it is zero relative to the maximum.

   3. Let element = 0.0 if it is relatively = 0.0.

3. Input Requirements:

   NET = number elements in array

   A = array of real numbers

4. Output Arguments:

   A = array which has been set equal to zero in those locations which the original element = relatively small.

   GBAR = maximum value

5. Subroutine User: ITRATE

6. Calling Sequence:

   Call TMAX (NET,A,GBAR)

7. Subroutine Used: CABSO

1. Subroutine Name: TRANS

2. Purpose:

To find the transformation matrix to transform coordinates from one rectangular system to another. This routine is used to find the transformation matrix from the reference system of the section to the main reference system.

3. Equations and Procedure:

The equations are found in Reference 1.

4. Input Arguments:

X,Y,Z X,Y,Z coordinates of the corner points of the structure

5. Output Arguments

XP,YP X and Y coordinates of the corner points of the section in the local reference system of the section

ZC The local Z coordinate of all points in the section

6. Common Blocks Used: None

7. Error Returns: None

8. Calling Sequence:

Call TRANS (X,Y,Z,T,XP,YP,ZC)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 266 words

13. Subroutines Required: None

14. Subroutine User:

MESH, MESHCL and GRIDIN

15. Remarks: None

1. Subroutine Name: WAKET

2. Purpose:

Write Wake element effects on tape I12 for 1 frequency

3. Input Arguments:

FRQ = frequency

I12 = output tape number

IF = frequency number

LRECLW = length of record on tape I8

K1 = number frequencies

4. Output Arguments:

IZ = non zero elements in record

AROW = elements selected for given frequency stored on tape I12

WROW = record from tape I8 containing wake effects coefficients

NNCH = row numbers of trailing edge elements

5. Calling Sequence:

Call WAKET (I12,AROW,WROW,IF,LRECLW,NSPT,I8,IZ,K1,NNCH,FRQ)

6. Files:

I12 Output tape containing effects for 1 frequency

I8 input tape contains effects for all frequencies

7. Subroutines Used: WRITZW

8. Subroutine User: DIAG

9. Calling Sequence:

Call DIAG (WROW,IF,LRECL,NNCH,MC,D,NET,AROW,IZ,IP,NSPT, FRQ,CWROW,CAROW)

10. Common Blocks:

COMMON/TAPE/	Defines tape storage
COMMON/VELCOM/	NW block and NWROW
COMMON/WAKE/	Defines wake effect controls
COMMON/WAKEUP	Defines wake effects variabiles

11. Files:

I9 =Input file containing W coefficients

I15=Input file containing Wake effects

I10=Output file containing D block compound

I11=Output file containing block off diagonals

I12=Output file containing WAKE effects

12. Subroutines Used:

1. FREQW
2. WAKET
3. WRITED
4. DECOM

1. Subroutine Name: WINGCK

2. Purpose:

Check on the validity of the corner points of a wing.

3. Equation and Procedure

The corner points of a given wing are checked in pairs. The leading corner point must have an X coordinate that is less than or equal to the trailing corner point. The Y and Z coordinates of the leading corner point must be the same as the Y and Z coordinates of the trailing corner point, respectively

4. Input Arguments

CORNX, CORNY, CORNZ	Input X, Y, and Z coordinates of the wing
NWING	Wing number, used in error message printout
ICN	Number of corner points
I6	Logical unit number of output device

5. Output Arguments

ERROR	Error code, set equal to .TRUE. if an error condition exists.

6. Common Blocks Used: None

7. Error Returns:

See Equations and Procedure and definition of ERROR above.

8. Calling Argument:

```
Call WINGCK(CORNX,CORNY,CORNZ,NWING,ICN,ERROR,I6)
```

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 175 words

13. Subroutines Required: None

14. Subroutine User: WINGIN

15. Remarks: None

1. Subroutine Name: WINGIN

2. Purpose:

To read and check the geometric input. All geometric input label cards with the exception of the SPAN and CHORD sections are read here.

3. Equations and Procedure:

Each label card is read with the same format: READ (I5,1000) LAB,ID,FD; 1000 FORMAT (A4,2X,9I2,4E12.0), where ID and FD are dimensional 9 and 4 respectively. The program then branches to the section that processes that label section.

4. Input Arguments:

I5	Logical unit number containing the input deck - usually the card reader
I6	Logical unit number of the output unit. Usually the system printer
BEETA	SQRT (MACH*MACH-1)
REFLEN	Reference length

5. Output Arguments:

NWING	Number of wings in structure
NSECT	Array containing the number of sections for each wing
AR	Aspect ratio of each wing - array
NSP	NSP(I,J) is the number of spans for section I of wing J
CORNX) CORNY) CORNZ)	The X, Y, and Z coordinates of the corner points of each wing XORNX(I,J) is the X coordinate of corner point I of wing J.

SYM	Array, SYM(J) is the symmetry code of wing J
ICL	Code for section I of wing J ICL(I,J) = 1, specific grid information is input. ICL(I,J) = 0, MESH generated, no control lines. ICL(I,J) = 1, or 2, MESH generated with 1 or 2 control lines.
CL	X coordinate of control lines for each section. CL(K,I,J) for section I of wing J. K = 1, and 2 for first and second coordinates of first control line of the section. K = 3, 4 for first and second coordinates of second control line in section.
IWP	Print control for each wing
ERROR	Set equal to .TRUE. if an error is found.
NFREQ	Number of frequencies
FREQ	List of frequencies
LAB	Label of last card read
ID	Integer field of last card read
FD	Floating point field of last card read

6. Common Blocks Used: None

7. ERROR Returns:

Logical ERROR is set equal to .TRUE. if any of several errors exist in reading the input. The error condition generates an appropriate error message. All error message format statements are numbered between 2000 and 2022. (All messages are preceeded by the statement ERROR IN READING INPUT.)

Messages a through f have to do with errors on the WING data card, and are preceeded by the message:

WING DATA CARD IS INCORRECT.

a) DATA FOR WING - WAS READ WHEN DATA FOR WING - WAS EXPECTED BY THE PROGRAM.

(WING data cards must appear in consecutive order in the deck. Each WING data card is the first card of a WING data group.)

b) WING NUMBER MUST BE GREATER THAN ZERO AND LESS THAN OR EQUAL TO 4. IT WAS READ AS ___. IT WILL BE TREATED AS WING 1 FOR CHECK PURPOSE ONLY.

c) NO MORE THAN FOUR WING DATA CARDS MAY BE INPUT.

d) THE NUMBER OF SECTIONS INPUT FOR WING __ IS .

THIS IS GREATER THAN THE MAXIMUM PER WING OF 3.

e) NUMBER OF CORNER POINTS, __ IS NOT CONSISTANT WITH THE NUMBER OF SECTION __ FOR WING __.

(A wing with 1 section may have only 3 or 4 corner points. A wing with 2 sections, 5 or 6 corner points. A wing with 3 sections, 7 or 8 corner points.)

f) SYMMETRY CODE FOR WING __, IS INPUT AS _____.

SYMMETRY CODE MAY ONLY EQUAL -1, 0, OR 1.

g) "CORNER" DATA CARD IS MISSING FOR WING _____.

(The CORNER cards defining a wing must immediately follow the WING card for that wing.)

Messages h through l have to do with eerors on the LINE data card.

They are preceeded by the following message

ERROR ON CONTROL "LINE" DATA CARD FOR WING ____.

h) MORE THAN TWO CONTROL LINES ARE SPECIFIED FOR SECTION ____.

i) CONTROL LINES ARE NOT INPUT IN ORDER FOR SECTION ____.

j) CONTROL LINE IS SPECTIFIED FOR SECTION ___ OF WING ___. THIS WING HAS _____ SECTIONS (CONTROL LINE IGNORED).

k) CONTROL LINE ___ FOR SECTION ____ IS NOT DEFINED TO BE INSIDE OF THE SECTION.

l) CONTROL LINE 2 OF SECTION ____ IS ABOVE THE FIRST CONTROL LINE.(In a section with 2 control lines, the leading control line must always be defined first and designated as control line number 1).

m) MODE DATA IS MISSING OR OUT OF ORDER.

n) FREQUENCY DATA IS MISSING OR OUT OF ORDER.

o) A LABEL CARD IS EXPECTED BUT NOT PRESENT. CARD WILL BE PRINTED ON THE FOLLOWING LINE AND THE NEXT CARD WILL BE READ.

p) ERROR ON GRID LABEL CARD GRID DATA PRESENT FOR WING ___.

SECTION ____

THIS SECTION HAS NOT BEED DEFINED FOR THE STRUCTURE.

8. <u>Calling Sequence</u>:

Call WINGIN(I5,I6,NWING,NSECT,AR,NSP,CORNX,CORNY,CONRZ, SYM,ICL,CL,ERROR,BEETA,IPW,NFREQ,FREQ,REFLEN,LAB,ID,FD)

9. <u>Input Tapes</u>: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 2022

13. Subroutine User: MAIN

14. Subroutine Required: WINGCK

15. Remarks: None

1. Subroutine Name: WINTGR

2. Purpose:

To organize the computation of velocity influence coefficients of a pair of elements.

3. Equations and Procedure:

The influence of a single line and its mirror image is determined with respect to a given receiving point. This influence is combined with the influence of the preceeding (lower) line in the span, (if any). Subroutine EØNE is used to determine if there is any influence at all, and subroutine WVINT calculates the frequency independent terms. Wake effects are also calculated.

4. Input Arguments:

X,Y	X and Y coordinates of points of the influencing element.

5. Output Arguments:

WRØW	Array of influence coefficients for all frequencies.

6. Common Blocks Used:

/EEW/

/EXCEED/

/FQ1/

/FKTEST/

/RRLL/

/WAKE/

/WAKEUP/

/WV1/

/WW1/

7. Error Returns: None

8. Calling Sequence:

   Call WINTGR(X,Y,WRØW)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 1630 words

13. Subroutine Required: WVINT

14. Subroutines User: LØØPW

15. Remarks: None

C-2

1. Subroutine Name: WRETA

2. Purpose of Procedures:

WDETA, WETA arrays are stored on tape I13 - each mode is a row.

3. Input Arguments:

NET = no. of elements

JMODE= no. modes

WDETA= WDETA array

WETA = WETA array

I13 = tape no.

4. Calling Sequence:

Call WRETA(NET,JMODE,WDETA,WETA,I13)

5. Scratch Tapes: I13

6. Subroutine User: MAIN program

1. Subroutine Name: WRITEO

2. Purpose and Procedures:

Test for nonzero elements in a row and store the nonzero elements and the corresponding row numbers on tape. The record is not written if NNZ = 0.

3. Input Arguments:

K = row numbers

AROW = array of numbers to be tested

NET = total number elements

4. Output Arguments:

IZ = array containing row numbers of nonzero element.

ANEW=array of nonzero elements

5. Calling Sequence:

Call WRITEO (K,AROW,IZ,ANEW,NET)

6. Scratch Tapes:

I11 = tape on which records are written

7. Subroutines Required:

WRITZ

8. Subroutine User: DIAG

9. Common Blocks:

/TAPE/I9,I10,I11

1. Subroutine Name: WRITZ

2. Purpose:

Write nonzero elements of coefficient matrix

3. Equations and Procedures:

WRITE (I12), K,NNZ,IZ,ANEW

4. Input Arguments:

I11 = tape number

K = row number

NNZ = number nonzero element numbers

IZ = array of element number

ANEW = nonzero elements of W. This array is real

5. Calling Sequence:

Call WRITZ(I11,K,NNZ,IZ,ANEW)

6. Scratch Tape:

I11 = output tape containing ANEW records

7. Subroutine User: WRITEO

8. Remarks:

This subroutine is different from WRITZW because ANEW is real.

1. Subroutine Name: WRITZW

2. Purpose:

Write records for wake element coefficient matrix

3. Equations and Procedures:

Write (I12) K,NNZ,IZ,ANEW

4. Input Arguments:

I12 = tape number

K = row number

NNZ = number of nonzero element numbers

IZ = array of element number

ANEW = nonzero elements of WTE. This array is complex.

5. Calling Sequence:

Call WRITZW (I12,K,NNZ,IZ,ANEW)

6. Scratch Tapes:

I12 = output tape containing ANEW records.

7. Subroutine User: WAKET

8. Remarks:

This subroutine is different from WRITZ because ANEW is complex.

1. Subroutine Name: WTEPHT

2. Purpose:

Generate wake effect in computation of dn/dt.

3. Equations and Procedures:

$dn/dt = dn/dt - W_{TE}\emptyset$

a) IZ and W_{TE} are read from tape I12

b) If the record is appropriate for the desired element, the nonzero terms are determined from the IZ array.

c) W_{TE} is post multiplied by $\emptyset$ elements and subtracted from DEDT.

d) The result from step c) is stored back on DEDT.

Steps a), b), c), and d) are repeated for each element.

4. Input Arguments:

DEDT = dh/dt array

NET = number of elements

PHIW = $\emptyset$ array of length NET

I12 = tape containing W_{TE} arrays

W_{TE} = W_{TE} work array - only nonzero terms

5. Output Arguments:

DEDT = revised dn/dt

6. Error Return: None

7. Calling Sequence:

Call WTEPHT(DEDT,NET,PHIW,IZ,I12,WTE)

8. Scratch Tapes:

I12 = tape containing NET records.

Each record is of form:

KEL,NNZ,IZ,WTE.

9. Common Statements: None

10. Subroutine User: MAIN

11. Subroutines Required: None

1. Subroutine Name: WVINT

2. Purpose:

   To evaluate the velocity influence of a line on a point.

3. Equations and Procedure:

   The equations for this section are given in Reference 1. A Gaussian quadrature is used to evaluate the higher order terms of the H expressions.

4. Input Arguments: None

5. Output Arguments: None

6. Common Blocks Used:

   /EEW/

   /WVI/

   /WWI/

7. Error Returns: None

8. Calling Sequence:

   Call WVINT

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 1384 words

13. Subroutine Required: None

14. Subroutine User: WINTGR

15. Remarks: None

1. Subroutine Name: ZFDZ

2. Purpose:

   To evaluate modal functions and its derivatives.

3. Equations and Procedure:

   This subroutine is a modified version of ZFUN, the routine written by Robert Desmarais of Langley Research Center. It calculates the modal values and the derivative for 1 aerodynamic grid point and one mode, given the coordinates of the structural grid system and the surface spline coefficients.

4. Input Arguments:

X, Y	Structural grid coordinates
A	Surface spline coefficients

5. Output Arguments

ZFUN	Modal value at aerodynamic grid point
DZDX	Derivative of the function (modal value) at the aerodynamic grid point.

6. Common Blocks Used:

   /XYØCAL/ and /ZFUNNY/

7. Error Returns: None

8. Calling Sequence:

   CALL ZFDZ(ZFUN, DFDZ, X, Y, A)

9. Input Tapes: None

10. Output Tapes: None

11. Scratch Tapes: None

12. Storage Required: 151 words

13. Subroutines Required: None

14. Subroutine User: RDMØDE

15. Remarks:

This subroutine corresponds to the main entry of the function subprogram ZFUN, written by Robert Desmarais. It also includes the evaluation of the derivative done at entry point DZDX of ZFUN. Subroutine ZFDZ is to be used in conjunction with subroutines READXY and READAB. These two subroutines read the spline input data that is punched by program ØØ31. (Program ØØ31 was also written and received from Robert Desmarais).

Section 6

Source Program Listings

The source program listings for each subroutine are included in this section. The routines are indexed by deck number. A list of deck names and numbers can be found on the next page.

The program consists of 51 subprograms each with a unique sequence number. Columns 73, 74, 75 contain the "Deck" number and columns 76 through 80 contain the card sequence number for that subprogram. The first card is always ----0010 - with successive increments of 10.

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Subroutine Deck Numbers

Name	Deck No.	Name	Deck No.
MAIN	1	PLOTGD	26
BLOCK	2	PTGRID	27
CABSO	3	RDETA	28
DECOM	4	RDMODE	29
DIAG	5	READAB	30
ECHO	6	READXY	31
EFPLOT	7	RSTART	32
EONE	8	RTOI	33
FGEN	9	SOLVE	34
FREQW	10	SONS	35
GETTIM	11	SONSPT	36
GRIDIN	12	SYMBOL	37
INP1	13	TIMOUT	38
IRELE	14	TMAX	39
ITRATE	15	TRANS	40
LOOPW	16	WAKET	41
MESH	17	WINGCK	42
MESCL	18	WINGIN	43
MFUN	19	WINTGR	44
MXERR	20	WRETA	45
OUTP1	21	WRITEO	46
OUTP2	22	WRITZ	47
OUTP3	23	WRITZW	48
PHIL	24	WTEPHT	49
PLOT	25	WVINT	50
		ZFDZ	51

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DISPLAY...FILE DECK 01

```
C       MAIN
C    CONSTANT POTENTIAL GRADIENT METHOD
C      CHANGE STORAGES TO  300,70,100  FROM 200, 40,  50
       COMPLEX  CAROW(100)
       COMPLEX  CE, PRES(300)
       COMPLEX CFREQ
       COMPLEX  CWROW ( 1200)
       COMPLEX CXKM
       COMPLEX  CXP(300)
       COMPLEX  DCWORK(901)
       COMPLEX DEDT,DPDX
       COMPLEX  DLS,PMS,DLOAD
       COMPLEX  DLSPAN(100),PMPSPN(100)
       COMPLEX   ESWRKC(1)
       COMPLEX  GT(300)
       COMPLEX Q(10,10)
       COMPLEX  PHI(70)
       COMPLEX  PHIW(300)
       COMPLEX  SWORKC( 1671 )
       COMPLEX TL(4,10), TM(4,10)
       COMPLEX  WTE( 100)
       COMPLEX  WTEROW(1200)
       COMPLEX  WTES
       COMPLEX  WW( 300)
       REAL IBUFF
       REAL MACH
       INTEGER PRINT
       INTEGER TAPE8
       LOGICAL ERROR
       LOGICAL PLOTR
       LOGICAL PLOTR1
       LOGICAL TEXCD
       LOGICAL TREDGE
       LOGICAL WAKE,WAKE1,WAKENZ
       DIMENSION            AR(4), ISONS(12,12)
       DIMENSION AREA(300)
       DIMENSION AROW (300)
       DIMENSION CWORK(4529)
       DIMENSION DWORK(3901 )
       DIMENSION  D(60,60), IP(60),  DNWR(60), DNWI(60), RWR(60), RWI(60)
       DIMENSION DR(300),DI(300),  DPDX(300), DEDT(300)
       DIMENSION ECWORK(1)
       DIMENSION EDCWRK (1)
       DIMENSION EMISC (1)
       DIMENSION ESWRKR( 1)
       DIMENSION   ETA(300),  DETADX(300)
       DIMENSION EWORKM (1)
       DIMENSION  FREQR(12)
       DIMENSION IBUFF(2000)
       DIMENSION ICL(3,4), CL(4,3,4)
       DIMENSION ID(9), FD(4)
       DIMENSION IPW(4)
       DIMENSION IZ(300)
       DIMENSION ITIME(8)
       DIMENSION  NE(3,4)
       DIMENSION  NSECT(4), CORNX(8,4), CORNY(8,4), CORNZ(8,4), NSP(3,4)
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LINE  57          DIMENSION NSPWS(4)                                          00100570
LINE  58          DIMENSION SW(100), XLE(100),NNCH(100)                       00100580
LINE  59          DIMENSION SWORK( 8444   )                                   00100590
LINE  60          DIMENSION SWORKR(1201   )                                   00100600
LINE  61          DIMENSION SYM(4)                                            00100610
LINE  62          DIMENSION  TITLE( 24)                                       00100620
LINE  63          DIMENSION TRS(4,3,4), ZSECT(3,4)                            00100630
LINE  64          DIMENSION WETA(300,10), WDETA(300,1                         00100640
LINE  65          DIMENSION WORKM(10601 )                                     00100650
LINE  66          DIMENSION WROW(3600).                                       00100660
LINE  67          DIMENSION XCEN(300)                                         00100670
LINE  68          DIMENSION XYZ (1800).                                       00100680
LINE  69          DIMENSION   XYZFDZ(300,3)                                   00100690
LINE  70          COMMON/BASIC/MACH,BETA,KAPPA,IPRNT(5).                      00100700
LINE  71          COMMON / FQ1 / NFREQ, CF(12,30), FREQ(12), FREQP(12), FRTEST,NTMXX00100710
LINE  72          COMMON /ITG/   IGWESS                                       00100720
LINE  73          COMMON/MXSTOR/ NWINGS,NSECTN,NMODES,NSPANS,NCORNR,NFRQUN,NEPSPN 00100730
LINE  74         1 ,NMXFDZ                                                    00100740
LINE  75  C             MAXIMUM NWINGS     =4                                 00100750
LINE  76  C             MAXIMUM NSECTIONS =3                                  00100760
LINE  77  C             MAXIMUM NMODES     =10                                00100770
LINE  78  C             MAXIMUM NSPANS     =50                                00100780
LINE  79  C             MAXIMUM NCORNER PTS = 8                               C0100790
LINE  80  C             MAXIMUM NFREQUENCIES = 12                             00100800
LINE  81  C             MAXIMUM NELEMENTS / SPAN  =40                         00100810
LINE  82          COMMON / NEXTGS /  IFLUSH                                   00100820
LINE  83          COMMON/PARAM/ NET                                           00100830
LINE  84          COMMON  / PEREPS /  PERC                                    00100840
LINE  85          COMMON  /TAPE/ I9,I10,I11,I12,I13,I14,J9,I15                00100850
LINE  86          COMMON/TIMEP/  ITIME                                        00100860
LINE  87          COMMON /VELCOM/  NMAX,PRINT,NWBLCK,NWROW(20)                00100870
LINE  88          COMMON /WAKE/ ITWM, ITW, ICNVGW, EPSW, JCNVGW,LRWTE ,INTE   00100880
LINE  89          COMMON/WAKEUP/ WTES(12), TREDGE,WAKEL,WAKE, WAKENZ          00100890
LINE  90          COMMON / ZFDZIO /  J5, J6                                   00100900
LINE  91          COMMON /ZFUNNY/ N,IERF, B1,B2, B3,NFUNMX                    00100910
LINE  92          EQUIVALENCE  (AROW(1),CAROW(1))                             00100920
LINE  93          EQUIVALENCE ( MSEC, ITIME(2) )                              00100930
LINE  94          EQUIVALENCE (CWORK (  1)  ,    NE(1) )                      00100940
LINE  95          EQUIVALENCE (CWORK ( 13)  ,   NSP(1) )                      00100950
LINE  96          EQUIVALENCE (CWORK ( 25)  ,   SYM(1) )                      00100960
LINE  97          EQUIVALENCE (CWORK ( 29)  ,  AREA(1) )                      00100970
LINE  98          EQUIVALENCE( CWORK( 329 ) ,  XCEN  (1) )                    00100980
LINE  99          EQUIVALENCE( CWORK( 629 ) ,  XLE   (1) )                    00100990
LINE 100          EQUIVALENCE( CWORK( 729 ) ,  SW    (1) )                    00101000
LINE 101          EQUIVALENCE( CWORK( 829 ) ,  NNCH  (1) )                    00101010
LINE 102          EQUIVALENCE( CWORK( 929 ) ,  WROW  (1) )                    00101020
LINE 103          EQUIVALENCE( CWORK(4529 ) ,  ECWORK(1) )                    00101030
LINE 104          EQUIVALENCE(DCWORK(   1 ) ,  DLSPAN(1) )                    00101040
LINE 105          EQUIVALENCE(DCWORK( 101 ) ,  PMPSPN(1) )                    00101050
LINE 106          EQUIVALENCE(DCWORK( 201 ) ,  PRES  (1) )                    00101060
LINE 107          EQUIVALENCE(DCWORK( 501 ) ,  WTE   (1) )                    00101070
LINE 108          EQUIVALENCE(DCWORK( 601 ) ,  ETA   (1) )                    00101080
LINE 109          EQUIVALENCE(DCWORK( 751 ) ,  DETADX(1) )                    00101090
LINE 110          EQUIVALENCE(DCWORK( 901 ) ,  EDCWRK(1) )                    00101100
LINE 111          EQUIVALENCE (DWORK(1),  DCWORK(1))                          00101110
LINE 112          EQUIVALENCE ( DWORK(1), ESWRKC(1))                          00101120
LINE 113          EQUIVALENCE(DWORK(1),D(1))                                  00101130
LINE 114          EQUIVALENCE(DWORK(3661), DNWR(1) )                          00101140
LINE 115          EQUIVALENCE(DWORK(3721), DNWI(1) )                          00101150
LINE 116          EQUIVALENCE(DWORK(3781), RWR(1)  )                          00101160
LINE 117          EQUIVALENCE(DWORK(3841), RWI(1)  )                          00101170
LINE 118          EQUIVALENCE  ( SWORK(1), SWORKR (1))                        00101180
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LINE 119          EQUIVALENCE  ( SWORK(1), WORKM  (1))                          00101190
LINE 120          EQUIVALENCE( SWORK( 1201 ), SWORKC(1) )                      00101200
LINE 121          EQUIVALENCE (SWORKC  (1)  , Q(1)        )                    00101210
LINE 122          EQUIVALENCE (SWORKC(101), P[illegible](1)  ).                00101220
LINE 123          EQUIVALENCE (SWORKC( 171 ),    PHIW    ( 1). )               00101230
LINE 124          EQUIVALENCE (SWORKC( 471 ),    DE[illegible]   ( 1) )        00101240
LINE 125          EQUIVALENCE (SWORKC( 771 ),    D[illegible]    ( 1) )        00101250
LINE 126          EQUIVALENCE (SWORKC(1071 ),    CXP     ( 1) )                00101260
LINE 127          EQUIVALENCE (SWORKC(1371 ),    WW      ( 1) )                00101270
LINE 128          EQUIVALENCE ( SWORKC(1671), ESWRKC(1))                       00101280
LINE 129          EQUIVALENCE ( SWORKR(1    ), DR(1 ) )                        00101290
LINE 130          EQUIVALENCE (SWORKR( 301 ),    DI      ( 1) )                00101300
LINE 131          EQUIVALENCE (SWORKR( 601 ),    IZ      ( 1). ).              00101310
LINE 132          EQUIVALENCE (SWORKR( 901 ),    AROW    ( 1). ).              00101320
LINE 133          EQUIVALENCE (SWORKR(1201 ),    ESWRKR  ( 1) )                00101330
LINE 134          EQUIVALENCE (TAPE8,T9)                                       00101340
LINE 135          EQUIVALENCE (WORKM(1    ),AR      (1 ) )                     00101350
LINE 136          EQUIVALENCE (WORKM(5    ),CL      (1 ) )                     00101360
LINE 137          EQUIVALENCE (WORKM(53   ),FD      (1 ) )                     00101370
LINE 138          EQUIVALENCE (WORKM(57   ),ID      (1 ) )                     00101380
LINE 139          EQUIVALENCE (WORKM(66   ),ICL     (1 ) )                     00101390
LINE 140          EQUIVALENCE (WORKM(78   ),TRS     (1 ) )                     00101400
LINE 141          EQUIVALENCE (WORKM(126 ),CORNX    (1 ) )                     00101410
LINE 142          EQUIVALENCE (WORKM(158 ),CORNY    (1 ) )                     00101420
LINE 143          EQUIVALENCE (WORKM(190 ),CORNZ    (1 ) )                     00101430
LINE 144          EQUIVALENCE (WORKM(222 ),ISONS    (1 ) )                     00101440
LINE 145          EQUIVALENCE (WORKM(366 ),ZSECT    (1 ) )                     00101450
LINE 146          EQUIVALENCE (WORKM(378 ),EMISC    (1 ) )                     00101460
LINE 147          EQUIVALENCE (WORKM( 401), XYZ(1))                            00101470
LINE 148          EQUIVALENCE (WORKM (2201 ),    WTEROW (1)   )                00101480
LINE 149          EQUIVALENCE (WORKM  (4601 ),    WETA    (1). )               00101490
LINE 150          EQUIVALENCE (WORKM  (7601 ),    WDETA   (1)   )              00101500
LINE 151          EQUIVALENCE (WORKM  (10601),    EWORKM (1)   )               00101510
LINE 152          EQUIVALENCE  (WROW(1),  XYZFDZ(1))                           00101520
LINE 153          EQUIVALENCE (IBUFF(1), WETA (1))                             00101530
LINE 154          DATA  I3/6/                                                  00101540
LINE 155          DATA  I5, I6 / 11, 6 /                                       00101550
LINE 156          DATA  LMODE  / 4HMODE /                                      00101560
LINE 157          DATA   ITITLE / 4HTITL /                                     00101570
LINE 158          DATA  LMAX  /  62  /                                         00101580
LINE 159          DATA TWOPI  /  6.283185308   /                               00101590
LINE 160          DATA XP  / 0.0 /                                             00101600
LINE 161  C                                                                    00101610
LINE 162          J5 = I5                                                      00101620
LINE 163          J6 = I6                                                      00101630
LINE 164          PLOTR1= .FALSE.                                              00101640
LINE 165        4 CONTINUE                                                     00101650
LINE 166          IERR =0                                                      00101660
LINE 167          CALL ECHO (KONTRL)                                           00101670
LINE 168          IF(KONTRL .EQ. 1) GO TO 10                                   00101680
LINE 169          PLOTR =  .FALSE.                                             00101690
LINE 170          IFLUSH = 0                                                   00101700
LINE 171          NETSV =0                                                     00101710
LINE 172          CALL GETTIM ( ITIME )                                        00101720
LINE 173  C            SECTION TO READ AND WRITE INPUT DATA                    00101730
LINE 174  C       ---------------------------------------------------------------00101740
LINE 175  C                                                                    00101750
LINE 176          ERROR = .FALSE.                                              00101760
LINE 177          RKEX = 0.0                                                   00101770
LINE 178          NTMAX = 1                                                    00101780
LINE 179          NCVEL = 0                                                    00101790
LINE 180          TEXCO = .FALSE.                                              00101800
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LINE 181  C      READ( 5, 1006 ) TITLE                                          00101810
LINE 182   6     CONTINUE                                                       00101820
LINE 183         READ ( I5,1006, END =10)  LABEL, TITLE                         00101830
LINE 184  CDC    READ( I5,1006) LABEL, TITLE                                    00101840
LINE 185  CDC    IF( EOF(I5) ) 10,8                                             00101850
LINE 186  CDC  8 CONTINUE                                                       00101860
LINE 187         IF (  LABEL .NE. ITITLE )        GO TO   6                     00101870
LINE 188         WRITE( I6, 2006 ) TITLE                                        00101880
LINE 189  C           NWING  NO. WINGS (BETWEEN 1AND 4)                         00101890
LINE 190  C                                                                     00101900
LINE 191         CALL INP1( I5, I6, TITLE, ITRUN, MACH, REFLEN, XP, XPIN, PLOTR,  00101910
LINE 192        1     LWTE,EARO, BEETA, LAB, ID, FD, ERROR )                    00101920
LINE 193         IF ( IFLUSH .NE. 0 ) GO TO 500                                 00101930
LINE 194  C                                                                     00101940
LINE 195         CALL WINGIN( I5, I6, NWING, NSECT, AR,NSP, CORNX, CORNY, CORNZ,  00101950
LINE 196        1         SYM, ICL, CL, ERROR, BEETA, IPW, NFREQ, FREQ,         00101960
LINE 197        2                 REFLEN, LAB, ID, FD )                         00101970
LINE 198  C                                                                     00101980
LINE 199  C      MAIN 158                                                       00101990
LINE 200         IF(NWINGS .LT.NWING )  GO TO 610                               00102000
LINE 201  C      ------------------------------------------------------------------00102010
LINE 202  C           GENERATE AERO GRID                                        00102020
LINE 203  C                                                                     00102030
LINE 204  C           NET      TOTAL NUMBER OF ELEMENTS IN THE STRUCTURE        00102040
LINE 205  C           NEW      TOTAL NUMBER OF ELEMENTS IN THE WING             00102050
LINE 206  C           NSPT     TOTAL NUMBER OF SPANS IN A WING                  00102060
LINE 207         NSPT = 1                                                       00102070
LINE 208         NET =  0                                                       00102080
LINE 209  C                                                                     00102090
LINE 210         IF(PLOTR)   PLOTR1=.TRUE.                                      00102100
LINE 211  CDC    REPLACES                                                       00102110
LINE 212  CDC    IF(PLOTR1) CALL PSEUDO                                         00102120
LINE 213         IF( PLOTR ) CALL PLOTS( IBUFF, 8000 )                          00102130
LINE 214  C           LOOP ON WINGS  J                                          00102140
LINE 215  C      NWBLOK =0                                                      00102150
LINE 216         DO 20 J=1,NWING                                                00102160
LINE 217  C                                                                     00102170
LINE 218         NSPW = 0                                                       00102180
LINE 219         NEW = 0                                                        00102190
LINE 220         NS = NSECT(J)                                                  00102200
LINE 221         IF(NSECTN .LT. NS   )  GO TO 620                               00102210
LINE 222  C                                                                     00102220
LINE 223  C           LOOP ON SECTIONS OF EACH WING  I                          00102230
LINE 224         DO 19 I=1,NS                                                   00102240
LINE 225  C                                                                     00102250
LINE 226  C           JCN      INDEX TO FOUR CORNER POINTS THAT DEFINE THE SECTION 00102260
LINE 227         JCN = 2*I - 1                                                  00102270
LINE 228         NINDEX = 6*(NET&NEW). & 1                                      00102280
LINE 229  C                                                                     00102290
LINE 230  C           BRANCH TO CORRECT MESH GENERATING ROUTINE                 00102300
LINE 231         IF( ICL(I,J) ) 15, 16, 17                                      00102310
LINE 232   15    CALL GRIDIN( CORNX(JCN,J), CORNY(JCN,J),CORNZ(JCN,J), XYZ(NINDEX), 00102320
LINE 233        1     ZSECT(I,J), TRS(1,I,J), NACH(NSPT), SW(NSPT), XLE(NSPT),  00102330
LINE 234        2     NSP(I,J), NE(I,J), NETSV, REFLEN, NFREQ, FREQ,            00102340
LINE 235        3              NWING, NSECT, ICL, ERROR, BEETA, LAB, ID, FD, I5, I6 )00102350
LINE 236         GO TO 18                                                       00102360
LINE 237   16    CALL MESH  ( CORNX(JCN,J), CORNY(JCN,J),CORNZ(JCN,J), XYZ(NINDEX), 00102370
LINE 238        1     ZSECT(I,J), TRS(1,I,J), NACH(NSPT), SW(NSPT), XLE(NSPT),  00102380
LINE 239        2     NSP(I,J), NE(I,J), NETSV, EARO )                          00102390
LINE 240         GO TO 18                                                       00102400
LINE 241   17    CALL MESHCL( CORNX(JCN,J), CORNY(JCN,J),CORNZ(JCN,J), XYZ(NINDEX), 00102410
LINE 242        1     ZSECT(I,J), TRS(1,I,J), NACH(NSPT), SW(NSPT), XLE(NSPT),  00102420
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LINE 243        2      NSP(I,J), NE(I,J), NETSV, ICL(I,J), CL(1,I,J), EARU )
LINE 244   18   CONTINUE
LINE 245   C
LINE 246        NSPW = NSPW & NSP(I,J)
LINE 247        NSPT = NSPT & NSP(I,J)
LINE 248        NEW = NEW & NE(I,J)
LINE 249   C          END LOOP ON SECTIONS OF WING
LINE 250   19   CONTINUE
LINE 251   C
LINE 252        NINDEX = 6*NET & 1
LINE 253   C          JCN      NUMBER OF CORNER POINTS THAT DEFINE THE WING
LINE 254        JCN = 2*(NSECT(J)-1) & 4
LINE 255        IF(NCORNR .LT. JCN )  GO TO 650
LINE 256        IM = NSPT-NSPW
LINE 257        IF( PLOTR ) CALL PLOTGD( NE(1,J), XYZ(NINDEX), NNCH(IM), NSP(1,J),
LINE 258       1              NSECT(J), TITLE, J, ZSECT(1,J), AR, MACH )
LINE 259        NSPWG(J) = NSPW
LINE 260        NET = NET & NEW
LINE 261   C          END LOOP ON WINGS
LINE 262   20   CONTINUE
LINE 263        IF(NFRQUN .LT. NFREQ)  GO TO 660
LINE 264   C    IF( PLOTR ) CALL ENDPLT
LINE 265   C
LINE 266        NSPT = NSPT - 1
LINE 267        IF(NSPANS .LT. NSPT )  GO TO 640
LINE 268   C    WRITE( 6, 1014 ) ( NNCH(I), I=1,NSPT )
LINE 269   C    WRITE( 6, 1015 ) ( SW(I), I=1,NSPT )
LINE 270   C    WRITE( 6, 1015 ) ( XLE(I), I=1,NSPT ).
LINE 271   C1014 FORMAT (///  (10I8).)
LINE 272   C1015 FORMAT( // ( / 5E12.4 ) )
LINE 273   C    GENERATE NWROW AND  NWBLOK
LINE 274        NMAXD = NMAX
LINE 275        NWBLOK=0
LINE 276        ISUM=NNCH(1)
LINE 277        DO 1020       IB=2,NSPT
LINE 278        ISUM1= ISUM
LINE 279        IDIFF = NNCH (IB)- NNCH(IB-1)
LINE 280        ISUM =  ISUM & IDIFF
LINE 281        IF(ISUM .LE. NMAXD)     GO TO 1020
LINE 282        NWBLOK = NWBLOK &1
LINE 283        NWROW (NWBLOK) = ISUM1
LINE 284        ISUM =  IDIFF
LINE 285   1020 CONTINUE
LINE 286        NWBLOK =  NWBLOK &1
LINE 287        NWROW(NWBLOK) =  ISUM
LINE 288        CALL PTGRID(I6,TITLE,MACH,NWING, NSECT, NSP, NNCH, XYZ, ZSECT,
LINE 289       1              REFLEN, BEETA, XCEN )
LINE 290   C
LINE 291   C          CALL SONS TO DETERMINE ISONS(K1,K2)=1 IF SECTION K2 HAS
LINE 292   C          INFLUENCE ON SECTION K1, OTERWISE ISONS(K1,K2)=0
LINE 293        CALL SONS( NWING, NSECT, CORNX, CORNY, CORNZ, ISONS )
LINE 294   C
LINE 295        CALL        SONSPT( ISONS, NWING, NSECT, MACH, I6 )
LINE 296   25   CONTINUE
LINE 297   C    ------------------------------------------------------------------
LINE 298   C
LINE 299   C
LINE 300   C    ------------------------------------------------------------------
LINE 301   C
LINE 302   C
LINE 303        CALL GETTIM ( ITIME )
LINE 304   C
```

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      WRITE(J9, 4001 )
 4001 FORMAT(1H1,5X,7HSECTION,30X,16HCPU SECONDS USED,5X,9HTOTAL CPU,//)
C
      CALL TIMOUT(MSEC,4HREAD,4H INP,4HUT A,4HND G,4HENER,4HATE ,4HGRID,
     1  4H    )
C     ------------------------------------------------------------------
      CALL FGEN
      LRECL = NET*NFREQ
C
C
C
C           IF THERE IS ONLY ONE FREQUENCY, AND IT = 0.0, SET IWTE= 0
      LRWTE = 1
      IF( NFREQ .EQ. 1  .AND.  FREQ(1) .EQ. 0.0 ) IWTE = 0
      IF( IWTE .NE. 0 ) LRWTE = NSPT*NFREQ
      ITWM = IWTE
      IF(IWTE.EQ. 1) ITWM = 1
      IF( ERROR ) GO TO 60
      IF( ITRUN .NE. 1 ) GO TO 60
C     WRITE( 6,3002) IWTE, ITWM
C
      CALL      LOOPW ( NET,        NWING, XYZ, NSP, SYM, TRS, NNCH, NE,
     1   NSECT, ZSECT, ISONS, I6, TAPE8, XCEN, AREA, WROW, LRECL,
     2 WTEROW,LRWTE,PERC,ERROR, IWTE, REFLEN)
C
      CALL GETTIM ( ITIME )
      CALL TIMOUT(MSEC,4HFIND,4H INF,4HLUEN,4HCE C,4HOEFF,4HICIE,4HNT M,
     1  4HATR.)
C
C     IF( TEXCD ) WRITE( I6, 1021 ) NTMAX, NCVEL, RKEX,  FRTEST
C     WRITE( I6, 1022 ) NTMAX, RKEX
      GO TO 110
C
   60 CONTINUE
      IF( ITRUN .NE. 3 ) GO TO 110
C           CALL SUBROUTINE TO READ RESTART TAPE
      CALL RSTART( MACH, NET, NFREQ, FREQ, REFLEN, IWTE,TAPE8,I15,I6,
     1      FREQR, XYZ, AREA )
C
  110 CONTINUE
C     ------------------------------------------------------------------
C
C           READ MODE INPUT
C                MODE CARD HAS BEEN READ
C        CALL ROUTINE TO READ MODES IN UNNORMALIZED STRUCTURAL REF. SYST.
C
C
      WRITE(I6,2006)  TITLE
      IF( LAB .NE. LMODE ) GO TO 132
C
      CALL RDMODE( JMODE, NWING, NSECT, NE, XCEN, XYZ, BEETA, REFLEN,
     1  NET, LAB, ID, ERROR,WETA,WDETA,I5,I6,XYZFDZ(1,1),XYZFDZ(1,2),
     2  XYZFDZ(1,3), NMXFDZ,IERR)
C
      IF(IERR .NE.0)    GO TO 680
      IF(NMODES .LT. JMODE)  GO TO 630
      IF( JMODE .EQ. 0 ) GO TO 500
      IF( IFLUSH .EQ. 1 ) GO TO 500
C
      CALL GETTIM ( ITIME )
      CALL TIMOUT(MSEC,4HREAD,4H AND,4H PRO,4HCESS,4H MOD,4HE IN,4HPUT ,
     1  4H    )
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LINE 367  C                                                                    00103670
LINE 368  C                                                                    00103680
LINE 369        IF( LTRUN .EQ. 3 ) GO TO 132                                   00103690
LINE 370        IF( LTRUN .EQ. 1 ) GO TO 132                                   00103700
LINE 371        WRITE( I6, 3031 )                                              00103710
LINE 372        IF( PLOTR ) WRITE( I6,3032 )                                   00103720
LINE 373        GO TO  4                                                       00103730
LINE 374   132  CONTINUE                                                       00103740
LINE 375        IF( .NOT. ERROR )  GO TO 135                                   00103750
LINE 376        WRITE( I6, 3033 )                                              00103760
LINE 377        GO TO  4                                                       00103770
LINE 378   135  CONTINUE                                                       00103780
LINE 379        CALL WRETA (NET,JMODE,WDETA, WETA, I13)                        00103790
LINE 380        CALL WRETA (NET,JMODE,WDETA, WETA, I14)                        00103800
LINE 381  C                                                                    00103810
LINE 382  C                                                                    00103820
LINE 383  C                                                                    00103830
LINE 384  C                                                                    00103840
LINE 385  C     ---------------------------------------------------------------00103850
LINE 386  C                                                                    00103860
LINE 387  C            LOOP ON FREQUENCIES                                     00103870
LINE 388  C                                                                    00103880
LINE 389        DO 300 IF=1,NFREQ                                              00103890
LINE 390  C                                                                    00103900
LINE 391  C           SET LINE .EQ. LMAX & 1 TO FORCE NEW PAGE WITH FREQ. HEADING 00103910
LINE 392        LINE = LMAX & 1                                                00103920
LINE 393  C                                                                    00103930
LINE 394  C                                                                    00103940
LINE 395        FRQ = FREQ(IF)                                                 00103950
LINE 396        CFREQ = CMPLX(0.0,-FRQ/BEETA)                                  00103960
LINE 397        XKM = FREQP(IF)*MACH                                           00103970
LINE 398        CXKM = CMPLX( 0.0, XKM )                                       00103980
LINE 399        MC =NMAX                                                       00103990
LINE 400        CALL DIAG( WROW, IF, LRECL,NNCH,MC,D,NET,AROW,IZ,IP,NSPT ,FRQ, 00104000
LINE 401       1 CAROW, CWROW )                                                00104010
LINE 402        CALL GETTIM( ITIME )                                           00104020
LINE 403        WRITE(J9,3025)                                                 00104030
LINE 404        CALL TIMOUT(MSEC,4HREAD,4H AND,4H DEC,4HOMPO,4HSE C,4HOEFF,4H. MA,00104040
LINE 405       1  4HTRIX )                                                     00104050
LINE 406  C                                                                    00104060
LINE 407  C           FIND POSITIVE EXPONENTIAL                                00104070
LINE 408        DO 168 I=1,NET                                                 00104080
LINE 409        FBZ = XCEN(I)*XKM                                              00104090
LINE 410        CXP(I) = CMPLX( COS(FBZ), SIN(FBZ) )                           00104100
LINE 411   168  CONTINUE                                                       00104110
LINE 412  C                                                                    00104120
LINE 413  C           ZERO OUT GENERALIZED COEFFICIENTS  (Q)                   00104130
LINE 414        DO 165 I=1,JMODE                                               00104140
LINE 415        DO 165 J=1,JMODE                                               00104150
LINE 416   165  Q(I,J) = (0.0, 0.0)                                            00104160
LINE 417        REWIND  I13                                                    00104170
LINE 418  C                                                                    00104180
LINE 419  C           LOOP ON PRESSURE MODES                                   00104190
LINE 420  C                                                                    00104200
LINE 421        DO 280 JM = 1,JMODE                                            00104210
LINE 422  C                                                                    00104220
LINE 423  C          SET LINE=LMAX TO FORCE NEW PAGE FOR JM .GT. 1             00104230
LINE 424        IF( JM .GT. 1  .AND. LINE .NE. (LMAX&1) )  LINE=LMAX           00104240
LINE 425        ITW=0                                                          00104250
LINE 426        IF(FRQ .EQ. 0.0)  JCNVGW = NET                                 00104260
LINE 427        CALL RDETA ( I13,DETADX,ETA,NET)                               00104270
LINE 428        DO 187    I=1,NET                                              00104280
```

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```
LINE 429  C           CALCULATE  DEDT FOR ONE FREQUENCY AND ONE MODE
LINE 430        DEDT(I)=CMPLX (DETADX(I), FRQ* ETA(I)) * CXP(I)
LINE 431  C     DEDT(I) = CMPLX( DETADX(I,JM), FRQ*ETA(I,JM) )*CXP(I)
LINE 432        PHIW( I ) =0.0
LINE 433    167 CONTINUE
LINE 434    169 CONTINUE
LINE 435        ICNVGW=0
LINE 436        JCNVGW = 0
LINE 437  C     WRITE( I6, 2010 ) NDEDT
LINE 438  C     WRITE( I6, 3008 )  IF, FREQ(IF), IM
LINE 439  C
LINE 440  C
LINE 441        DO 170 I = 1, NET
LINE 442  C     WRITE( I6, 2009 ) DEDT(I)
LINE 443        DR(I)     = DEDT(I)
LINE 444        DI   (I) = AIMAG( DEDT(I))
LINE 445    170 CONTINUE
LINE 446  C     WRITE( I6, 2010 ) NDPDX
LINE 447  C     WRITE( I6, 2009 )   DPDX(I)
LINE 448        DO 172            I= 1,NET
LINE 449        CABSI = SQRT( DR(I) **2  &  DI(I) ** 2)
LINE 450        IF (CABSI.NE. 0.0)   GO TO 178
LINE 451    172 CONTINUE
LINE 452        DO 174        I=1,NET
LINE 453    174 DPDX(I) =0.0
LINE 454        GO TO        181
LINE 455    178 CONTINUE
LINE 456        WRITE(I6, 3027)
LINE 457   3027 FORMAT(1H1,18X,  38HSOLUTION FOR DOWNWASH USING ITERATION )
LINE 458        IF( WAKENZ )     IGWESS=0
LINE 459        IF( .NOT. WAKENZ)  IGWESS=0
LINE 460        IF( LWTE .EQ.0)    IGWESS=0
LINE 461        IF (LTW  .EQ. 0)  IGWESS=0
LINE 462        CALL ITRATE( L11,DR,DI, DPDX, GT   ,MC,D, IP,DNWR,DNWI,RWR,RWI,
LINE 463       1 NET,AROW,IZ ,DPDX,WW)
LINE 464    181 CONTINUE
LINE 465        CALL GETTIM(LTIME)
LINE 466        CALL TIMOUT(MSEC,4HSOLV,4HE FO,4HR PC,4HTENT,4HIAL ,4HGRAD,4HIENT,
LINE 467       1  4H     )
LINE 468        DO  180 I=1,NET
LINE 469        DPDX(I) = DPDX(I)/CXP(I)
LINE 470    180 CONTINUE
LINE 471  C
LINE 472  C           LOOP ON WINGS AND SPANS
LINE 473  C
LINE 474  C           NSPI IS SPAN COUNTER
LINE 475        NSPI = 0
LINE 476        INDXR = 1
LINE 477        DO 240 J=1,NWING
LINE 478  C
LINE 479        TL(J,JM) = ( 0.0, 0.0 )
LINE 480        TM(J,JM) = ( 0.0, 0.0 )
LINE 481        INDXL = INDXR
LINE 482        NSPW = NSPWG(J)
LINE 483  C     WRITE( I6, 3007 )
LINE 484  C
LINE 485  C           LOOP ON SPANS IN WING
LINE 486        DO 220 ISP=1,NSPW
LINE 487  C
LINE 488        NSPI = NSPI  & 1
LINE 489        NEPS = NNCH(NSPI) - INDXR & 1
LINE 490        IF(NEPSPN .LT. NEPS )  GO TO 670
```

```
LINE 491          CALL PHIL( XLE(NSPI),XCEN(INDXR),DPDX(INDXR),NEPS,PHI,CXKM,
LINE 492         1   CXP(INDXR), PHIW(INDXR))
LINE 493          IF(FR).EQ.0.0)  GO TO 182
LINE 494           IF(LWTE.EQ.0)  GO TO 182
LINE 495          IF(.NOT. WAKE  )  GO TO 182
LINE 496          IF(.NOT. WAKENZ)  GO TO 182
LINE 497    182   CONTINUE
LINE 498  C       WRITE( I6, 3002 ) J, ISP
LINE 499          DLS = (0.0, 0.0)
LINE 500          PMS = (0.0, 0.0)
LINE 501  C
LINE 502  C            LOOP ON NUMBER OF ELEMENTS IN SPAN ISP
LINE 503          DO 210 IE=1,NEPS
LINE 504          PRES(INDXR) =  (DPDX(INDXR) & CFREQ*PHI(IE) )*TWOPI
LINE 505          DLOAD = PRES(INDXR)*AREA(INDXR)
LINE 506  C       WRITE( I6, 3003 ) INDXR, PHI(IE), PRES(INDXR), DLOAD
LINE 507          DLS = DLS & DLOAD
LINE 508          PMS = PMS & ( XP - XCEN(INDXR). )*DLOAD
LINE 509          INDXR = INDXR & 1
LINE 510  C               END LOOP ON ELEMENT IE OF SPAN ISP
LINE 511    210   CONTINUE
LINE 512  C
LINE 513          DLSPAN(NSPI) = DLS/SW(NSPI).
LINE 514          PMPSPN(NSPI) = PMS/SW(NSPI)
LINE 515  C       WRITE( I6, 3004 ) DLSPAN(NSPI), PMPSPN(NSPI)
LINE 516          TL(J,JM) = TL(J,JM) & DLS
LINE 517          TM(J,JM) = TM(J,JM) & PMS
LINE 518  C
LINE 519  C               END LOOP ON SPAN ISP OF WING J
LINE 520    220   CONTINUE
LINE 521  C       WRITE( I6, 3005 ) TL(J,JM), TM(J,JM)
LINE 522  C
LINE 523          IF( IPW(J) .EQ. 0 ) GO TO 240
LINE 524          IF (LWTE.EQ. 0)  GO TO   230
LINE 525          IF( .NOT. WAKE)  GO TO   230
LINE 526          IF( .NOT. WAKENZ) GO TO  230
LINE 527          WRITE (I6, 3040)  ITW
LINE 528    230   CONTINUE
LINE 529          CALL JUTP1( MACH, FRQ,JM,J,NSECT(J), NSP(1,J), SW,          DLSPAN,
LINE 530         1      PMPSPN, XPIN,INDXI, PRES, IPW, I3, LINE, LMAX, NNCH, NE(1,J),
LINE 531         1      TITLE , PHIW, NSPT )
LINE 532  C
LINE 533  C               END LOOP ON WINGS J
LINE 534    240   CONTINUE
LINE 535           IF(LWTE.EQ.0) GO TO 245
LINE 536          IF((ITWM .EQ. ITW) .OR. (JCNVGW. EQ.NET)). GO TO 245
LINE 537          IF(.NOT. WAKE  ). GO TO 245
LINE 538          IF(.NOT. WAKENZ)  GO TO 245
LINE 539          REWIND I12
LINE 540          ITW =  ITW&1
LINE 541          CALL WTEPHT( DEDT, NET, PHIW,I2, I12, WTE)
LINE 542          GO TO 169
LINE 543  C
LINE 544    245   CONTINUE
LINE 545  C
LINE 546  C            LOOP ON DISPLACEMENT MODE TO CALCULATE Q
LINE 547  C
LINE 548          REWIND I14
LINE 549          DO  270  IM=1,JMODE
LINE 550  C            READ ETA FROM I14
LINE 551          CALL RDETA ( I14,DETADX,ETA,NET)
LINE 552  C            LOOP OVER ALL ELEMENTS BY WINGS
```

```
LINE 553          INDXR  = 0                                                    00105530
LINE 554          DO   260 J=1,NWING                                            00105540
LINE 555          SYMCON = 2.0                                                  00105550
LINE 556   C              SYMMETRY CODE   SYMCON  DEFINED HERE                  00105560
LINE 557          IF( SYM(J) .EQ. 0.0 )  SYMCON = 1.0                           00105570
LINE 558          NS = NSECT(J)                                                 00105580
LINE 559          NEW = 0                                                       00105590
LINE 560          DO   265 I=1,NS                                               00105600
LINE 561    265   NEW = NEW + NE(I,J)                                           00105610
LINE 562          DO   250 IE = 1,NEW                                           00105620
LINE 563          INDXR  = INDXR + 1                                            00105630
LINE 564          DLOAD  = PRES(INDXR)*AREA(INDXR) SYMCON                       00105640
LINE 565          Q(IM,JM) = Q(IM,JM)  + ETA(INDXR)*DLOAD                       00105650
LINE 566    250   CONTINUE                                                      00105660
LINE 567    260   CONTINUE                                                      00105670
LINE 568    270   CONTINUE                                                      00105680
LINE 569   C                                                                    00105690
LINE 570   C                END LOOP ON MODE JM                                00105700
LINE 571    280   CONTINUE                                                      00105710
LINE 572   C                                                                    00105720
LINE 573   C      WRITE( I6, 2010 )  NOIJ                                       00105730
LINE 574   C      DO 320 I=1,JMODE                                              00105740
LINE 575   C320   WRITE( I6, 3006 ) I, ( Q(I,J), J=1,JMODE )                    00105750
LINE 576   C                END LOOP ON FREQUENCY IF                           00105760
LINE 577          LINE = LMAX                                                   00105770
LINE 578          CALL OUTP3( I3, MACH, FRQ, JMODE, Q, LINE, LMAX, TITLE )      00105780
LINE 579          CALL OUTP2( I3, NWING,XPIN,TL, TM, JMODE, FRQ, MACH, LINE, LMAX ) 00105790
LINE 580          CALL GETTIM ( ITIME )                                         00105800
LINE 581          CALL TIMOUT(MSEC,4HSOLV,4HE FO,4HR DO,4HNNWA,4HSH F,4HOR O,4HNE F, 00105810
LINE 582         1  4HREQ.)                                                     00105820
LINE 583    300   CONTINUE                                                      00105830
LINE 584    500   CONTINUE                                                      00105840
LINE 585          WRITE( I6, 3026 )                                             00105850
LINE 586          IF(IRUN .EQ. 3) GO TO 10                                      00105860
LINE 587          WRITE ( I6, 3030).                                            00105870
LINE 588   C                                                                    00105880
LINE 589   C                                                                    00105890
LINE 590   C                                                                    00105900
LINE 591          GO TO 4                                                       00105910
LINE 592    610   IERR = 610                                                    00105920
LINE 593          CALL MXERR (IERR, NWINGS ,NWING   , I6 )                      00105930
LINE 594          GO TO 500                                                     00105940
LINE 595    620   IERR = 620                                                    00105950
LINE 596          CALL MXERR (IERR, NSECTN , NS     , I6 )                      00105960
LINE 597          GO TO 500                                                     00105970
LINE 598    630   IERR = 630                                                    00105980
LINE 599          CALL MXERR (IERR, NMODES ,JMODE   , I6 ).                     00105990
LINE 600          GO TO 500                                                     00106000
LINE 601    640   IERR = 640                                                    00106010
LINE 602          CALL MXERR (IERR, NSPANS ,NSPT    , I6 )                      00106020
LINE 603          GO TO 500                                                     00106030
LINE 604    650   IERR = 650                                                    00106040
LINE 605          CALL MXERR (IERR, NCORNR , JCN    , I6 )                      00106050
LINE 606          GO TO 500                                                     00106060
LINE 607    660   IERR = 660                                                    00106070
LINE 608          CALL MXERR (IERR, NFRQUN ,NFREQ   , I6 )                      00106080
LINE 609          GO TO 500                                                     00106090
LINE 610    670   IERR = 670                                                    00106100
LINE 611          CALL MXERR (IERR, NEPSPN ,NEPS    , I6 )                      00106110
LINE 612          GO TO 500                                                     00106120
LINE 613    680   IERR=680                                                      00106130
LINE 614          CALL MXERR(IERR, NFXMDZ,N, I6)                                00106140
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LINE 615          GO TO 500
LINE 616   CDC    REPLACES
LINE 617   C   10 CONTINUE
LINE 618     10   IF( PLOTR1) CALL PLOTS( IBUFF, 8000 )
LINE 619          IF(PLOTR1)  CALL EFPLOT(4HEND )
LINE 620          WRITE(I6,3028)
LINE 621    3028 FORMAT(1H0//// 5X, 10(1H*),5X,1[illegible]D OF JOB   , 5X,10(1H*))
LINE 622          STOP
LINE 623   C
LINE 624    1006 FORMAT(A4,2X, 14A4, 10A1)
LINE 625    2006 FORMAT  (1H1, /20X,14A4, 10A1//)
LINE 626    3025 FORMAT(1H0)
LINE 627    3026 FORMAT(1H1)
LINE 628    3030 FORMAT(////  5X, 10(1H*), 5X, 20HEND OF EXECUTION RUN,5X,10(1H*)
LINE 629        1  //  5X, 10(1H*),5X,  35HPROGRAM WILL NOW CYCLE TO NEXT CASE,5X,
LINE 630        2  10(1H*))
LINE 631    3040 FORMAT(1H1,  8X,   33HWAKE EFFECTS VELOCITY POTENTIALS   / 8X
LINE 632        1 17HITERATION NUMBER   , I12 )
LINE 633   C3004 FORMAT( / 9H LIFT/DS=, 1P2E12.4, 5X,11H MOMENT/DS=,1P2E12.4 / )
LINE 634   C3002 FORMAT( 2I5 )
LINE 635   C3003 FORMAT( 11X, I3, 3( 6X, 1P2E12.4 )  )
LINE 636   C3005 FORMAT( /// 5X, 4HTL = , 1P2E12.5, 5X, 4HTM =, 1P2E12.5 / )
LINE 637   C3007 FORMAT(// 10H WING SPAN/11X,3HELE,13X,3HPHI,27X,4HPRES,26X,4HLOAD)
LINE 638    3031 FORMAT( ////  5X, 10(1H*), 5X,16HEND OF CHECK RUN, 5X, 10(1H*) //
LINE 639        1  5X, 10(1H*), 5X, 70HTO EXECUTE A COMPLETE RUN PUT A '1' IN COLUM
LINE 640        2N 8 OF THE 'RUN' DATA CARD, 5X,  10(1H*)  )
LINE 641    3032 FORMAT( / 5X, 10(1H*), 5X, 78HIF ANOTHER PLOT IS NOT DESIRED, PUT
LINE 642        1 A '0' IN COLUMN 10 OF THE 'RUN' DATA CARD, 5X, 10(1H*)  )
LINE 643    3033 FORMAT(/// 1X, 120(1H*) // 5X, 10(1H*),5X, 40HRUN TERMINATED DUE T
LINE 644        1O ERRORS GIVEN ABOVE,  5X, 55(1H*) // 1X, 120(1H*) )
LINE 645   C1000 FORMAT( A4, 2X, 9I2, 4E12.0 )
LINE 646   C1001 FORMAT( 24X, 4E12.0 )
LINE 647   C1003 FORMAT( 1X, 'COL=', I3, 5X,  1P5E16.5 / ( 13X, 1P5E16.5  )  )
LINE 648   C1008 FORMAT( 3E10.0 )
LINE 649   C1009 FORMAT( I5 /(5E10.0) )
LINE 650   C1011 FORMAT( 15X, A4 )
LINE 651   C1021 FORMAT( /// 1X, 120(1H*) / 5X, 9HMORE THAN, I3, 37H TERMS ARE NEED
LINE 652   C     1ED FOR CONVERGENCE FOR,  I5, 19H PAIRS OF ELEMENTS. // 5X,
LINE 653   C     2 27H THE MAXIMUM RADIUS*KAPPA =, E15.4, 14H, WITH KAPPA =,E15.6//)
LINE 654   C1022 FORMAT( // 5X, 55H THE GREATEST NUMBER OF TERMS NEEDED FOR CONVERG
LINE 655   C     1ENCE IS, I3 //5X,26HTHE MAXIMUM RADIUS*KAPPA =, E15.4 // )
LINE 656   C2007 FORMAT( 20X,  11HMACH NUMBER, F22.4 //)
LINE 657   C2008 FORMAT(                                  // 20X, 21HNUMBER OF FREQUENCI
LINE 658   C     1ES, I12  / 20X, 19HLIST OF FREQUENCIES, 5F14.4 / (39X, 5F14.4) )
LINE 659   C2009 FORMAT( 2E18.6 )
LINE 660   C2010 FORMAT( /// 5X,  2A4 )
LINE 661   C3001 FORMAT(/// 18H RECEIVING ELEMENT, I5, 5X, 6HNUMBER, I4, 5X,
LINE 662   C     1 10HOF SECTION, I2, 5X, 7HOF WING,I2 // (1X, 10E13.4 )  )
LINE 663   C3006 FORMAT( 1X, 4HROW=, I3,      4(6X, 1P2E12.4)/(8X,4(6X,1P2E12.4)) )
LINE 664   C3008 FORMAT( // 1X, 8HFREQ. NO, I3, 8X, 6HFREQ =,F8.4, 5X, 4HMODE,I3//)
LINE 665   C3034 FORMAT( /// 21X, 19HMODAL DATA FOR WING, I2,  8H SECTION, I2 )
LINE 666          END
```

DISPLAY...FILE DECK 02

```
LINE   1          BLOCK DATA
LINE   2          INTEGER PRINT
LINE   3          COMMON/CEPS/  EPS
LINE   4          COMMON / ITERAT / ITMAX
LINE   5          COMMON /MAXE/ NMXE
LINE   6          COMMON/MXSTOR/ NWINGS,NSECTN,NMODES,NSPANS,NCORNR,NFRQUN,NEPSPN
LINE   7         1 , NMXFDZ
LINE   8          COMMON  / PEREPS /  PERC
LINE   9          COMMON  /TAPE/ I9,I10,I11,I12,I13,I14,J9,I15
LINE  10          COMMON /VELCOM /  NMAX,PRINT, NWBLOK, NWROW(20)
LINE  11   C      NWINGS= 4
LINE  12   C      NSECTN= 3
LINE  13   C      NMODES= 10
LINE  14   C      NSPANS=  100
LINE  15   C      NCORNR= 8
LINE  16   C      NFRQUN= 12
LINE  17   C      NEPSPN= 70
LINE  18          DATA   EPS /.01/
LINE  19          DATA ITMAX /10/
LINE  20          DATA I9,I10,I11 /8,10,11/
LINE  21          DATA   I12/12/
LINE  22          DATA   I13/13/
LINE  23          DATA   I14/14/
LINE  24          DATA   I15/15/
LINE  25          DATA  J9/9/
LINE  26          DATA NMAX/60/
LINE  27          DATA            NWINGS,NSECTN,NMODES,NSPANS,NCORNR,NFRQUN,NEPSPN
LINE  28         1 , NMXFDZ
LINE  29         2   / 4,3, 10, 100, 8, 12, 70, 300 /
LINE  30          DATA   PERC  /  0.005  /
LINE  31          DATA PRINT /2/
LINE  32          END
```

DISPLAY...FILE DECK 03

```
LINE   1        FUNCTION CABSO( A)                                    00300010
LINE   2        COMPLEX  A                                            00300020
LINE   3        AR = A                                                00300030
LINE   4        AI = AIMAG(A)                                         00300040
LINE   5        CABSO =  AR**2 & AI**2                                00300050
LINE   6        CABSO =  SQRT (CABSO)                                 00300060
LINE   7        RETURN                                                00300070
LINE   8        END                                                   00300080
```

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DISPLAY...FILE DECK 04

```
LINE   1          SUBROUTINE DECOM  (N,NDIM,A,IP)                                00400010
LINE   2   C                                                                     00400020
LINE   3   C      SUBROUTINE DECOM                                               00400030
LINE   4   C                                                                     00400040
LINE   5   C      PURPOSE                                                        00400050
LINE   6   C         FACTORIZATION OF THE MATRIX A INTO A PRODUCT OF A LOWER     00400060
LINE   7   C         TRIANGULAR MATRIX L AND AN UPPER TRIANGULAR MATRIX U.  L HAS 00400070
LINE   8   C         A UNIT DIAGONAL WHICH IS NOT STORED.                        00400080
LINE   9   C                                                                     00400090
LINE  10   C      USAGE                                                          00400100
LINE  11   C         CALL DECOM(N,NDIM,A,IP)                                     00400110
LINE  12   C                                                                     00400120
LINE  13   C      DESCRIPTION OF PARAMETERS                                      00400130
LINE  14   C         N   - ORDER OF THE MATRIX A                                 00400140
LINE  15   C         NDIM- FIRST DIMENSION OF A DECLARED IN CALLING PROGRAM. IF A IS00400150
LINE  16   C               SINGLY SUBSCRIPTED IN CALLING PROGRAM, SET NDIM=N.    00400160
LINE  17   C         A   - ON INPUT THE MATRIX TO BE FACTORED.                   00400170
LINE  18   C               ON OUTPUT A(I,J) I.LE.J CONTAINS THE UPPER TRIANGLE U, 00400180
LINE  19   C                         A(I,J) I.GT.J CONTAINS (I-L), WHERE I IS THE 00400190
LINE  20   C                         IDENTITY MATRIX AND L IS THE LOWER TRIANGLE. 00400200
LINE  21   C         IP  - IP(K) K.LT.N CONTAINS THE ROW INTERCHANGE INFORMATION. 00400210
LINE  22   C               IP(N) CONTAINS (-1)**(NUMBER OF INTERCHANGES) OR 0.   00400220
LINE  23   C                                                                     00400230
LINE  24   C      REMARKS                                                        00400240
LINE  25   C         (1) IF IP(N)=0 THEN MATRIX A IS SINGULAR.                   00400250
LINE  26   C         (2) USE DECOM IN CONJUNCTION WITH SUBROUTINE 'SOLVE' TO OBTAIN 00400260
LINE  27   C             THE SOLUTION OF THE LINEAR SYSTEM A*X = B.              00400270
LINE  28   C         (3) DETERMINANT(A) = IP(N)*A(1,1)*A(2,2),*....*A(N,N).      00400280
LINE  29   C         (4) THE ROW INTERCHANGE INFORMATION STORED IN IP IS NOT EASY TO00400290
LINE  30   C             INTERPRET. HOWEVER, IT IS USED PROPERLY BY 'SOLVE'.     00400300
LINE  31   C                                                                     00400310
LINE  32   C      SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED.                 00400320
LINE  33   C         NONE                                                        00400330
LINE  34   C                                                                     00400340
LINE  35   C      METHOD                                                         00400350
LINE  36   C         MATRIX TRIANGULARIZATION BY GAUSSIAN ELIMINATION.  SEE      00400360
LINE  37   C         ALGORITHM 423, 'COLLECTED ALGORITHMS FROM CACM', BY CLEVE MOLER00400370
LINE  38   C                                                                     00400380
LINE  39          DIMENSION A(NDIM,1),IP(1)                                      00400390
LINE  40          IP(N) = 1                                                      00400400
LINE  41          DO 6 K = 1,N                                                   00400410
LINE  42          IF (K .EQ. N) GO TO 5                                          00400420
LINE  43          KP1 = K&1                                                      00400430
LINE  44          M = K                                                          00400440
LINE  45          DO 1 I = KP1,N                                                 00400450
LINE  46          IF (ABS(A(I,K)) .GT. ABS(A(M,K))) M=I                          00400460
LINE  47        1 CONTINUE                                                       00400470
LINE  48          IP(K) = M                                                      00400480
LINE  49          IF (M .NE. K) IP(N) = -IP(N)                                   00400490
LINE  50          T = A(M,K)                                                     00400500
LINE  51          A(M,K) = A(K,K)                                                00400510
LINE  52          A(K,K) = T                                                     00400520
LINE  53          IF (T .EQ. 0.) GO TO 5                                         00400530
LINE  54          DO 2 I = KP1,N                                                 00400540
LINE  55        2    A(I,K) = -A(I,K)/T                                          00400550
LINE  56          DO 4 J = KP1,N                                                 00400560
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LINE  57          T = A(M,J)                                          00400570
LINE  58          A(M,J) = A(K,J)                                     00400580
LINE  59          A(K,J) = T                                          00400590
LINE  60          IF (T .EQ. 0.) GO TO 4                              00400600
LINE  61          DO 3 I = KP1,N                                      00400610
LINE  62  C       IF ( A(I,J) .EQ. 0.0) GO TO  21                     00400620
LINE  63  C       C = (A(I,J) & A(I,K) *T)  / A(I,J)                  00400630
LINE  64  C       C = ABS(C)                                          00400640
LINE  65  C       IF( C.LE. .0001)     A(I,J)=0.0                     00400650
LINE  66  C       IF( C.LE. .0001)     GO TO 3                        00400660
LINE  67  C 21    CONTINUE                                            00400670
LINE  68            A(I,J) = A(I,J) & A(I,K)*T                        00400680
LINE  69    3     CONTINUE                                            00400690
LINE  70      4   CONTINUE                                            00400700
LINE  71      5   IF (A(K,K) .EQ. 0.) IP(N) = 0                       00400710
LINE  72      6   CONTINUE                                            00400720
LINE  73          RETURN                                              00400730
LINE  74          END                                                 00400740
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DISPLAY...FILE DECK 05

```
LINE   1        SUBROUTINE DIAG(WROW,IF,LRECL,NNCH,MC, D, NET,AROW,IZ, IP ,
LINE   2       1 NSPT,FRQ,CAROW,CWROW)
LINE   3        COMPLEX  CAROW(1), CWROW(1)
LINE   4        COMPLEX WTES
LINE   5        INTEGER PRINT
LINE   6        LOGICAL TREDGE
LINE   7        LOGICAL  WAKE,WAKE1,WAKENZ
LINE   8        DIMENSION  AROW(NET), IZ(NET)
LINE   9        DIMENSION  D(MC,MC), IP(MC)
LINE  10        DIMENSION  NNCH(1)
LINE  11        DIMENSION WROW(LRECL)
LINE  12        COMMON /K1112/ KST11,KST12
LINE  13        COMMON  /TAPE/ I9,I10,I11,I12,I13,I14,J9,I15
LINE  14        COMMON /VELCOM/  NMAX,PRINT,NWBLOK,NWROW(20)
LINE  15        COMMON /WAKE/ ITWM, ITW, ICNVGW, EPSW, JCNVGW,LRWTE,IWTE
LINE  16        COMMON/WAKEUP/ WTES(12), TREDGE,WAKE1,WAKE, WAKENZ, KWAKE
LINE  17        REWIND  I11
LINE  18        REWIND I9
LINE  19        REWIND I10
LINE  20        I8 = I9
LINE  21        IF (IWTE .EQ.0)   REWIND I12
LINE  22        IF(WAKE)          REWIND I15
LINE  23        READ(I9)
LINE  24        IF(WAKE) READ(I15)
LINE  25        IBT =0
LINE  26        K1=0
LINE  27        K=0
LINE  28        WAKENZ=.FALSE.
LINE  29        DO 40          IB=1,NWBLOK
LINE  30        NROW =  NWROW(IB)
LINE  31        DO 20          I = 1,NROW
LINE  32        K=K&1
LINE  33        CALL FREQW(I9,AROW,WROW,       IF,LRECL)
LINE  34        DO 15          J=1,NROW
LINE  35        M= J&IBT
LINE  36        D(I,J)  = AROW(M)
LINE  37        AROW(M) = 0.0
LINE  38     15 CONTINUE
LINE  39        IF(NWBLOK .NE.1)
LINE  40       1CALL WRITEO(K, AROW, IZ, WROW,NET)
LINE  41        IF (IWTE .EQ.0)   GO TO 20
LINE  42        IF( .NOT. WAKE ) GO TO 20
LINE  43        IF( K .GT. KWAKE ) GO TO 20
LINE  44        IF(K1 .GT.K) GO TO 20
LINE  45        IF(FRQ.EQ.0.0)   GO TO 20
LINE  46        CALL WAKET( I12,CAROW,CWROW,IF,LRWTE,NSPT,
LINE  47       1 I15,IZ,K1,NNCH,FRQ,K)
LINE  48     20 CONTINUE
LINE  49        IBT =  IBT & NROW
LINE  50  C     CALL MATPRT( D, NROW, NROW, 'D MATRIX' )
LINE  51        CALL DECOM( NROW,NMAX,D,IP)
LINE  52        WRITE   (I10) D, IP
LINE  53     40 CONTINUE
LINE  54        END FILE I10
LINE  55        END FILE I11
LINE  56        REWIND  I10
```

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```
LINE  57        REWIND  I11                                          00500570
LINE  58        IF(IWTE .NE. 0)   END FILE I12                       00500580
LINE  59        IF(IWTE .NE. 0)   REWIND I12                         00500590
LINE  60        RETURN                                               00500600
LINE  61        END                                                  00500610
```

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DISPLAY...FILE DECK 06

```
LINE   1          SUBROUTINE ECHO( KONTRL).                                    00600010
LINE   2          DIMENSION CARD(20)                                           00600020
LINE   3          COMMON /TAPE/ I9,I10,I11,I12,I13,I14,J9,I15                  00600030
LINE   4          COMMON / ZFDZIO / J5,J6                                      00600040
LINE   5          DATA CEND/4HEND /                                            00600050
LINE   6          KONTRL = 0                                                   00600060
LINE   7          REWIND I11                                                   00600070
LINE   8          LINES = 0                                                    00600080
LINE   9          WRITE(J6,500)                                                00600090
LINE  10       10 READ(J5,2000 , END = 100) CARD                               00600100
LINE  11  CDC10 READ (  J5,2000) CARD                                          00600110
LINE  12  CDC     IF ( EOF(J5)) 100,11                                         00600120
LINE  13       11 CONTINUE                                                     00600130
LINE  14          LINES = LINES & 1                                            00600140
LINE  15          IF( LINES .LT. 47 ) GO TO 50                                 00600150
LINE  16          WRITE(J6,700)                                                00600160
LINE  17          WRITE(J6,500)                                                00600170
LINE  18          LINES = 0                                                    00600180
LINE  19       50 WRITE(I11, 2000) CARD                                        00600190
LINE  20          WRITE(J6,600) CARD                                           00600200
LINE  21          IF( CARD(1) .EQ. CEND)  GO TO 90                             00600210
LINE  22          GO TO 10                                                     00600220
LINE  23  C           END OF ONE CASE                                          00600230
LINE  24       90 WRITE(J6,700)                                                00600240
LINE  25          END FILE I11                                                 00600250
LINE  26          REWIND I11                                                   00600260
LINE  27          RETURN                                                       00600270
LINE  28  C           END OF JOB                                               00600280
LINE  29      100 KONTRL = 1                                                   00600290
LINE  30          RETURN                                                       00600300
LINE  31      500 FORMAT(1H1,41X, 46H* * * * ISCON ANALYSIS INPUT DATA DECK * * * *,00600310
LINE  32         1 //,1H0,24X,1H ,9X,1H1,9X,1H2,9X,1H3,9X,1H4,9X,1H5,9X,1H6,9X,1H7, 00600320
LINE  33         2 9X,1H8 /25X,81H 123456789012345678901234567890123456789012345678900600330
LINE  34          30123456789012345678901234567890 //)                         00600340
LINE  35      600 FORMAT(1H ,25X,20A4).                                        00600350
LINE  36      700 FORMAT(//25X,81H 123456789012345678901234567890123456789012345678900600360
LINE  37          10123456789012345678901234567890 /25X,1H ,9X,1H1,9X,1H2,9X,1H3,9X,100600370
LINE  38          2H4,9X,1H5,9X,1H6,9X,1H7,9X,1H8)                             00600380
LINE  39     2000 FORMAT(20A4).                                                00600390
LINE  40          END                                                          00600400
```

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DISPLAY...FILE DECK 07

```
LINE   1        SUBROUTINE EFPLOT (A)                          00700010
LINE   2        CALL CALPLT(0.0,0.0,999)                       00700020
LINE   3        RETURN                                         00700030
LINE   4        END                                            00700040
```

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```
      SUBROUTINE EONE                                                   00800010
C                                                                       00800020
      LOGICAL EREONE, EMIRRO                                            00800030
      COMMON / EEW / XUP, YUP, XLW, YLW, EREONE, EMIRRO, RR, RL, RTR,RTL 00800040
      COMMON / RRLL / TVW(4), YRO, YLO, ZR, ZRZR, ZL, ZLZL              00800050
      COMMON / WW1 / XO,YO,ZD,ZDZD, SYMK                                00800060
C                                                                       00800070
C          TEST IF ELEMENT AND MIRROR IMAGE OF ELEMENT ARE IN MACH CONE 00800080
C          EREONE     TRUE IF ELEMENT IS IN MACH CONE                  00800090
C          EMIRRO     TRUE IF SYMMETRY CODE .NE. 0 AND MIRROR IMAGE IS 00800100
C                     IN MACH CONE.  IF EREONE=FALSE THEN EMIRRO=FALSE. 00800110
C          XO,YO      COORDINATES OF RECEIVING PT.(CENTER OF REC. ELE.) 00800120
C          XLW,YLW    1ST PT. ON LINE          OF INFLUENCING ELE.      00800130
C          XUP,YUP    2ND PT. ON LINE          OF INFLUENCING ELE.      00800140
C          SYMK       SYMMETRY CODE ( 0.0 FOR NO SYMMETRY )            00800150
C         RR      AVERAGE R OF RIGHT-HAND ELEMENT                       00800160
C         RL      AVERAGE R OF LEFT-HAND ELEMENT                        00800170
C                                                                       00800180
C          NOTE THIS ROUTINE IS ALSO USED TO TEST TRAILING EDGE LINE OF 00800190
C          ELEMENT WHEN X1,Y1 AND X2,Y2 ARE ON TRAILING EDGE AND SYM=0.0 00800200
C                                                                       00800210
      EREONE = .FALSE.                                                  00800220
      EMIRRO = .FALSE.                                                  00800230
      RR = 0.0                                                          00800240
      RL = 0.0                                                          00800250
      ZETA1 = XO - XLW                                                  00800260
      ZETA2 = XO - XUP                                                  00800270
      IF( ZETA1 .LE. 0.0  .AND.  ZETA2 .LE. 0.0 ) RETURN                00800280
      ETA1 = YRO - YLW                                                  00800290
      ETA2 = YRO - YUP                                                  00800300
      T1 = SQRT( ETA1*ETA1 & ZRZR )                                     00800310
      T2 = SQRT( ETA2*ETA2 & ZRZR )                                     00800320
   10 CONTINUE                                                          00800330
      R1 = ZETA1 - T1                                                   00800340
      R2 = ZETA2 - T2                                                   00800350
      IF( R1 .LE. 0.0 .AND.  R2 .LE. 0 ) RETURN                         00800360
      R1 = R1*(ZETA1 & T1)                                              00800370
      R2 = R2*(ZETA2 & T2)                                              00800380
      IF( EREONE ) GO TO 90                                             00800390
      EREONE = .TRUE.                                                   00800400
      RTR = R1*R2                                                       00800410
      IF( R1 .LT. 0.0 ) R1 = 0.0                                        00800420
      IF( R2 .LT. 0.0 ) R2 = 0.0                                        00800430
      R1 = SQRT( R1 )                                                   00800440
      R2 = SQRT( R2 )                                                   00800450
      RR = 0.5*( R1 & R2 )                                              00800460
      IF( SYMK.EQ. 0.0 ) RETURN                                         00800470
      ETA1 = YLO - YLW                                                  00800480
      ETA2 = YLO - YUP                                                  00800490
      T1 = SQRT( ETA1*ETA1 & ZLZL )                                     00800500
      T2 = SQRT( ETA2*ETA2 & ZLZL )                                     00800510
      GO TO 10                                                          00800520
   90 CONTINUE                                                          00800530
      EMIRRO = .TRUE.                                                   00800540
      RTL = R1*R2                                                       00800550
      IF( R1 .LT. 0.0 ) R1 = 0.0                                        00800560
```

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```
LINE  57        IF( R2 .LT. 0.0 ) R2 = 0.0                          00800570
LINE  58        R1 = SQRT( R1 )                                     00800580
LINE  59        R2 = SQRT( R2 )                                     00800590
LINE  60        RL = 0.5*( R1 & R2 )                                00800600
LINE  61        RETURN                                              00800610
LINE  62        END                                                 00800620
```

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DISPLAY...FILE DECK 09

```
      SUBROUTINE FGEN
      REAL MACH
      COMMON/BASIC/MACH,BEETA
      COMMON / FQ1 / NFREQ, CF(12,30), FREQ(12), FREQP(12), FRTEST,NTMXX
C           NTMX      THE MAXIMUM NUMBER OF TERMS USED IN WINTGR, WVINT
C           XUNDER    MACHINE DEPENDENT NUMBER,LARGEST NEGATIVE EXPONENT
      NTMX = 30
CDC   XUNDER = -292.0
      XUNDER = -77.5
C     WRITE( 6, 1001 )  NFREQ, ( FREQ (I), I=1,NFREQ )
      FRTEST =-1.0E&65
      DO 5 I=1,NFREQ
      FREQP(I) = FREQ(I)*MACH/BEETA
    5 FRTEST = AMAX1( FREQP(I), FRTEST )
C     WRITE( 6, 1001 )  NFREQ, ( FREQP(I), I=1,NFREQ ), FRTEST
C
      NTMXX = 1
      DO 40 I = 1,NFREQ
      CF(I,1)  = 1.0
      XKK = FREQP(I)*FREQP(I)
      IF( XKK .GT. 0.0 ) GO TO 15
      DO 10 J = 2,NTMX
   10 CF(I,J) = 0.0
      GO TO 40
   15 CONTINUE
      DO 30 J=2, NTMX
      N = J - 1
      N2 = N&N
      FACTOR = XKK/FLOAT(N2*(N2-1))
      A10 = ABS( CF(I,N) )
      A10 = ALOG10( A10 )  &  ALOG10( FACTOR )
      IF( A10 .GE. XUNDER ) GO TO 25
      DO 20  J1 = J,NTMX
   20 CF(I,J1) = 0.0
      NTMXX = MAX0( NTMXX, N  )
      GO TO 40
   25 CONTINUE
      CF(I,J) = -CF(I,N)*FACTOR
   30 CONTINUE
      NTMXX = NTMX
C
   40 CONTINUE
C
C     DO 50 I = 1,NFREQ
C     WRITE( 6, 1001 )  I, ( CF(I,J), J=1, NTMX  )
C1001 FORMAT( // I8, 5X, 5E18.5 / ( 13X, 5E18.5 ) )
C50   CONTINUE
      RETURN
      END
```

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DISPLAY...FILE DECK 10

```
LINE   1        SUBROUTINE FREQW(IB,AROW,WROW       ,NF,LRECL)          01000010
LINE   2        DIMENSION  WROW(LRECL), AROW( NWING)                    01000020
LINE   3        COMMON /FQ1/ NFREQ                                      01000030
LINE   4        COMMON/PARAM/ NWING                                     01000040
LINE   5        EQUIVALENCE (NET,NWING )                                01000050
LINE   6        READ(IB)  K1, WROW                                      01000060
LINE   7        K=NF                                                    01000070
LINE   8        DO 100   J=1,NWING                                      01000080
LINE   9        AROW(J) = WROW(K)                                       01000090
LINE  10        K =  K & NFREQ                                          01000100
LINE  11    100  CONTINUE                                               01000110
LINE  12        RETURN                                                  01000120
LINE  13        END                                                     01000130
```

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DISPLAY...FILE DECK 11

```
LINE   1        SUBROUTINE GETTIM ( ITIME )                          01100010
LINE   2        DIMENSION ITIME(8)                                   01100020
LINE   3        CALL SECOND(A)                                       01100030
LINE   4        ITIME(2)  =  A * 1000.0                              01100040
LINE   5        RETURN                                               01100050
LINE   6        END                                                  01100060
```

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```
      SUBROUTINE GRIDIN( CORNX,CORNY,CORNZ,XYZ,Z,TRS,NNCH,SW,XLE,
     1     NSP, NE, NETSV, REFLEN, NFREQ, FREQ,
     1     NWING, NSECT, ICL, ERROR, BEETA, LAB, ID, FD, I5, I6 )
C
C     PURPOSE  GENERATE MESH FOR 1 SECTION WHEN OPTIONAL DATA FOR A
C              PARTICULAR SECTION IS PRESENT, 'GRID' DATA
C
C      INPUT
C
C          I5      INPUT UNIT ( USUALLY CARD READER 5 )
C          I6      OUTPUT UNIT ( PRINTER 6 )
C          ERROR   LOGICAL THAT COMES IN FALSE,MAY BE SET TRUE
C          BEETA   SQRT(MACH*MACH-1) USED TO TRANSFORM CORNX AND CL
C          NWING   NO. WINGS IN STRUCTURE
C          NSECT   ARRAY  NO. SECTIONS IN EACH WING
C          LAB, ID, FD  INFORMATION ON LAST CARD READ
C          (BOTH INPUT AND OUTPUT)
C
C      OUTPUT
C          CORNX,CORNY, CORNZ   X,Y, AND Z COORD. OF CORNER PTS 1,2,3,4
C                               IN GLOBAL SYSTEM
C          NSP     DESIRED NUMBER OF SPANS FOR SECTION (INPUT BY USER)
C          XYZ     4 X AND 2 Y LOCAL COORD. FOR EACH ELEMENT OF SECTION
C          Z       Z COORDINATE FOR ALL ELEMENTS IN SECTION (FROM TRANS)
C          TRS     2 BY 2 TRANS MATRIX TO GO FROM LOCAL TO GLOBAL
C          NNCH    ELEMENT NUMBER (W.R.T. TOTAL STRUCTURE) OF LAST
C                  ELEMENT IN SPAN. (USED FOR LABELING PLOT)
C          SW      SPAN WIDTH
C          XLE     AVERAGE X COORDINATE OF LEADING EDGE PER SPAN
C          NE      NUMBER OF ELEMENTS IN SECTION.
C          ICL     ICL(I,J) CODE FOR SECTION I OF WING J
C                  ICL(I,J) = -1 SPECIFIC GRID INFORMATION IS INPUT
C                HERE ICL IS UPDATED IF ANOTHER 'GRID' SECTION IS ENCOUNT
C                ERED AFTER READ PRESENT 'GRID' SECTION
C          NETSV   COUNTER OF TOTAL NUMBER OF ELEMENTS IN STRUCTURE
C
      LOGICAL ERROR
      LOGICAL FREQR
      DIMENSION CORNX(1), CORNY(1), CORNZ(1), TRS(1), X(4), Y(4)
      DIMENSION FREQ(10)
      DIMENSION ID(9), FD(4)
      DIMENSION XLE(1), SW(1)
      DIMENSION XYZ(1), NNCH(40), ICL(3,4), NSECT(1)
      DATA  LB, LE, LC / 4H    ,  4HEND , 4HCHOR  /
      DATA  LG, LS, LM, LF       /   4HGRID, 4HSPAN, 4HMODE, 4HFREQ  /
C
C          TRANSFORM CORNER POINTS TO LOCAL SYSTEM, WORK IN LOCAL SYSTEM
      CALL TRANS( CORNX, CORNY, CORNZ, TRS, X, Y, Z )
C
C
C          'GRID' CARD MUST HAVE BEEN LAST CARD READ. (EITHER IN WINGIN
C          OR IN A PREVIOUSE CALL TO THIS ROUTINE - SEE 80 CONTINUE)
C
      FREQR = .FALSE.
      JW = ID(1)
      IS = ID(2)
```

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```
LINE  57          Y1 = Y(1) * REFLEN                                          01200570
LINE  58   C            INITIALIZE ELEMENT AND SPAN COUNTERS (NE AND ISP)     01200580
LINE  59          NE = 0                                                      01200590
LINE  60          ISP = 0                                                     01200600
LINE  61   C                                                                  01200610
LINE  62          WRITE( I6, 3000 ) JW, IS                                    01200620
LINE  63   C                                                                  01200630
LINE  64    10    CONTINUE                                                    01200640
LINE  65          READ( I5, 1000 ) LAB, ID, FD                                01200650
LINE  66   C                                                                  01200660
LINE  67          IF( LAB .EQ. LS ) GO TO 20                                  01200670
LINE  68          IF( LAB .EQ. LG ) GO TO 80                                  01200680
LINE  69          IF( LAB .EQ. LF ) GO TO 50                                  01200690
LINE  70          IF( LAB .EQ. LM ) GO TO 65                                  01200700
LINE  71          IF( LAB .EQ. LE ) GO TO 60                                  01200710
LINE  72          IF( LAB .EQ. LB ) GO TO 70                                  01200720
LINE  73   C                                                                  01200730
LINE  74   C            INVALID LABEL CARD READ                               01200740
LINE  75          WRITE( I6, 2000 )                                           01200750
LINE  76          WRITE( I6, 2018 )                                           01200760
LINE  77          WRITE( I6, 2017 ) LAB, ID , FD                              01200770
LINE  78          ERROR = .TRUE.                                              01200780
LINE  79          GO TO 10                                                    01200790
LINE  80   C                                                                  01200800
LINE  81    20    CONTINUE                                                    01200810
LINE  82   C            'SPAN' CARD HAS BEEN READ. UPDATE SPAN COUNTER AND CHECK CARD01200820
LINE  83   C                                                                  01200830
LINE  84          ISP = ISP & 1                                               01200840
LINE  85          NC = ID(2)                                                  01200850
LINE  86          YSPAN = FD(1)                                               01200860
LINE  87          IF( ID(1) .EQ. ISP ) GO TO 21                               01200870
LINE  88   C            SPAN CARDS ARE OUT OF ORDER                           01200880
LINE  89          WRITE( I6, 2000 )                                           01200890
LINE  90          WRITE( I6, 2026 ) ID(1), ISP                                01200900
LINE  91          ERROR = .TRUE.                                              01200910
LINE  92    21    CONTINUE                                                    01200920
LINE  93          IF( YSPAN .GT. 0.0 ) GO TO 22                               01200930
LINE  94   C            SPAN WIDTH LESS THAN OR EQUAL TO ZERO                 01200940
LINE  95          WRITE( I6, 2000 )                                           01200950
LINE  96          WRITE( I6, 2027 ) ISP, YSPAN                                01200960
LINE  97          ERROR = .TRUE.                                              01200970
LINE  98    22    CONTINUE                                                    01200980
LINE  99          IF( NC .GT. 0 ) GO TO 23                                    01200990
LINE 100   C            NUMBER OF CHORD LINES MUST BE GREATER THAN OR EQUAL TO ZERO 01201000
LINE 101          WRITE( I6, 2000 )                                           01201010
LINE 102          WRITE( I6, 2028) ISP                                        01201020
LINE 103          ERROR = .TRUE.                                              01201030
LINE 104    23    CONTINUE                                                    01201040
LINE 105   C                                                                  01201050
LINE 106          WRITE( I6, 3001 ) ISP, NC, YSPAN                            01201060
LINE 107   C                                                                  01201070
LINE 108          Y2 = Y1 & YSPAN                                             01201080
LINE 109   C            READ 1ST 'CHORD' CARD,  MUST BE LABELED 'CHORD'       01201090
LINE 110          READ( I5, 1000 ) LAB, ID, FD                                01201100
LINE 111          IF( LAB .EQ. LC ) GO TO 24                                  01201110
LINE 112   C            CHORD CARD NOT FOUND                                  01201120
LINE 113          WRITE( I6, 2000 )                                           01201130
LINE 114          WRITE( I6, 2029 ) ISP                                       01201140
LINE 115          ERROR = .TRUE.                                              01201150
LINE 116    24    CONTINUE                                                    01201160
LINE 117          IC = 1                                                      01201170
LINE 118          X1 = FD(1)                                                  01201180
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LINE 119          X2 = FD(2)                                                    01201190
LINE 120   C                                                                    01201200
LINE 121          WRITE( I6, 3002 ) IC, X1, X2                                  01201210
LINE 122          X2 = X2/BEETA                                                 01201220
LINE 123          X1 = X1/BEETA                                                 01201230
LINE 124          SW(ISP) = YSPAN/REFLEN                                        01201240
LINE 125          XLE(ISP) = 0.5*(X1&X2)/REFLEN                                 01201250
LINE 126   C                                                                    01201260
LINE 127   C           LOOP ON NUMBER OF CHORD CARDS  2,NC                      01201270
LINE 128          DO 30 IC = 2, NC                                              01201280
LINE 129   C                                                                    01201290
LINE 130          READ( I5, 1000 )  LAB, ID, X4, X3                             01201300
LINE 131   C                                                                    01201310
LINE 132          WRITE( I6, 3002 ) IC, X4, X3                                  01201320
LINE 133          X3 = X3/BEETA                                                 01201330
LINE 134          X4 = X4/BEETA                                                 01201340
LINE 135   C                                                                    01201350
LINE 136          XMIN = AMIN1( (X4-X1),  (X3-X2) )                             01201360
LINE 137          IF( XMIN .GT. 0.0 ) GO TO 25                                  01201370
LINE 138          XMAX = AMAX1( (X4-X1), (X3-X2) )                              01201380
LINE 139          IF( XMIN .EQ. 0.0  .AND.  XMAX .GT. 0.0 ) GO TO 25            01201390
LINE 140          WRITE( I6, 2000 )                                             01201400
LINE 141          WRITE( I6, 2031 ) IC, ISP                                     01201410
LINE 142          ERROR = .TRUE.                                                01201420
LINE 143    25    CONTINUE                                                      01201430
LINE 144   C                                                                    01201440
LINE 145          NJ = 6*NE                                                     01201450
LINE 146          NE = NE&1                                                     01201460
LINE 147          XYZ(NJ&1) = X1/REFLEN                                         01201470
LINE 148          XYZ(NJ&2) = X2/REFLEN                                         01201480
LINE 149          XYZ(NJ&3) = X3/REFLEN                                         01201490
LINE 150          XYZ(NJ&4) = X4/REFLEN                                         01201500
LINE 151          XYZ(NJ&5) = Y1/REFLEN                                         01201510
LINE 152          XYZ(NJ&6) = Y2/REFLEN                                         01201520
LINE 153          X1 = X4                                                       01201530
LINE 154          X2 = X3                                                       01201540
LINE 155    30    CONTINUE                                                      01201550
LINE 156   C                                                                    01201560
LINE 157          Y1 = Y2                                                       01201570
LINE 158          NNCH(ISP) = NE & NETSV                                        01201580
LINE 159   C                                                                    01201590
LINE 160          GO TO 10                                                      01201600
LINE 161   C                                                                    01201610
LINE 162    50    CONTINUE                                                      01201620
LINE 163   C           FREQUENCY CARD READ                                      01201630
LINE 164          FREQR = .TRUE.                                                01201640
LINE 165          DO 55  I =1, 4                                                01201650
LINE 166     55   FREQ(I) = FD(I)                                               01201660
LINE 167          NFREQ = ID(1)                                                 01201670
LINE 168          IF( NFREQ .GT. 4 ) READ( I5, 1001 ) ( FREQ(I), I=5, NFREQ )   01201680
LINE 169          WRITE( I6, 3006 )        NFREQ, ( FREQ(I), I=1,NFREQ)         01201690
LINE 170          GO TO 10                                                      01201700
LINE 171   C                                                                    01201710
LINE 172    60    CONTINUE                                                      01201720
LINE 173   C           END CARD READ                                            01201730
LINE 174   C           BOTH MODE AND FREQUENCY DATA MISSING                     01201740
LINE 175          WRITE( I6, 2000 )                                             01201750
LINE 176          WRITE( I6, 2014 )                                             01201760
LINE 177          WRITE( I6, 2015 )                                             01201770
LINE 178          ERROR = .TRUE.                                                01201780
LINE 179          GO TO 90                                                      01201790
LINE 180   C                                                                    01201800
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LINE 181     65  CONTINUE                                                    01201810
LINE 182         IF( FREQR ) GO TO 90                                        01201820
LINE 183         WRITE( I6, 2000 )                                           01201830
LINE 184         WRITE( I6, 2015 )                                           01201840
LINE 185         ERROR = .TRUE.                                              01201850
LINE 186         GO TO 90                                                    01201860
LINE 187  C                                                                  01201870
LINE 188     70  CONTINUE                                                    01201880
LINE 189  C           LABEL CARD EXPECTED BUT NOT RECEIVED                   01201890
LINE 190         WRITE( I6, 2000 )                                           01201900
LINE 191         WRITE( I6,2016 )                                            01201910
LINE 192         WRITE( I6, 2017 ) LAB, ID , FD                              01201920
LINE 193         ERROR = .TRUE.                                              01201930
LINE 194         GO TO 10                                                    01201940
LINE 195  C                                                                  01201950
LINE 196     80  CONTINUE                                                    01201960
LINE 197  C           GRID CARD READ                                         01201970
LINE 198  C                                                                  01201980
LINE 199         I = ID(2)                                                   01201990
LINE 200         J = ID(1)                                                   01202000
LINE 201         IF( I .GT. NSECT(J) ) GO TO 81                              01202010
LINE 202         IF( I .GT. NWING ) GO TO 81                                 01202020
LINE 203         IF( J .LT. JW ) GO TO 82                                    01202030
LINE 204         IF( J .EQ. JW  .AND.  I .LE. IS ) GO TO 82                  01202040
LINE 205         ICL(I,J) = -1                                               01202050
LINE 206         GO TO 90                                                    01202060
LINE 207     81  CONTINUE                                                    01202070
LINE 208  C           GRID DATA SPECIFIED FOR SECTION THAT DOES NOT EXIST    01202080
LINE 209         WRITE( I6, 2000 )                                           01202090
LINE 210         WRITE( I6, 2020 )                                           01202100
LINE 211         WRITE( I6, 2021 ) J, I                                      01202110
LINE 212         ERROR = .TRUE.                                              01202120
LINE 213         GO TO 90                                                    01202130
LINE 214     82  CONTINUE                                                    01202140
LINE 215  C           GRID DATA FOR NEXT GRID SECTION IS OUT OF ORDER        01202150
LINE 216         WRITE( I6, 2000 )                                           01202160
LINE 217         WRITE( I6, 2022 ) J, I                                      01202170
LINE 218         ERROR = .TRUE.                                              01202180
LINE 219  C                                                                  01202190
LINE 220     90  CONTINUE                                                    01202200
LINE 221  C                                                                  01202210
LINE 222  C           SECTION TO RETURN                                      01202220
LINE 223         NETSV = NETSV & NE                                          01202230
LINE 224         IF( ISP .EQ. NSP ) RETURN                                   01202240
LINE 225  C           NUMBER OF SPAN CARDS READ DOES NOT AGREE WITH NO. SPANS (NSP)01202250
LINE 226         WRITE( I6, 2030 ) IS, JW, NSP, ISP                          01202260
LINE 227         RETURN                                                      01202270
LINE 228  C                                                                  01202280
LINE 229   1000  FORMAT( A4, 2X, 9I2, 4E12.0 )                               01202290
LINE 230   1001  FORMAT( 24X, 4E12.0 )                                       01202300
LINE 231  C                                                                  01202310
LINE 232   2000  FORMAT(/// 1X, 129(1H*) //24H ERROR IN READING INPUT.    )  01202320
LINE 233   2014  FORMAT(37H MODE DATA IS MISSING OR OUT OF ORDER )           01202330
LINE 234   2015  FORMAT(42H FREQUENCY DATA IS MISSING OR OUT OF ORDER )      01202340
LINE 235   2016  FORMAT( 42H A LABEL CARD IS EXPECTED BUT NOT PRESENT. )     01202350
LINE 236   2017  FORMAT(                                          67H CARD WILL B01202360
LINE 237        1E PRINTED ON FOLLOWING LINE AND NEXT CARD WILL BE READ. / 1X,01202370
LINE 238        2 A4, 2X, 9I2,4E12.0 )                                       01202380
LINE 239   2018  FORMAT( 32H AN INVALID LABEL CARD WAS READ. )               01202390
LINE 240   2020  FORMAT( 27H ERROR ON GRID LABEL CARD. )                     01202400
LINE 241   2021  FORMAT( 27H GRID DATA PRESENT FOR WING, I2, 8H SECTION, I2 /01202410
LINE 242        1 53H THIS SECTION HAS NOT BEEN DEFINED FOR THE STRUCTURE.  )01202420
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LINE 243   2022 FORMAT( 19H GRID DATA FOR WING, I2,  8H SECTION, I2, 17H IS OUT OF01202430
LINE 244       1 ORDER. )                                                        01202440
LINE 245   2026 FORMAT( 43H SPAN CARDS ARE OUT OF ORDER. CARD FOR SPAN, I2,       01202450
LINE 246       1 28H WAS READ WHEN CARD FOR SPAN, I2, 13H WAS EXPECTED  )         01202460
LINE 247   2027 FORMAT( 25H THE WIDTH OF SPAN NUMBER, I2,  7H EQUALS, E14.6 /     01202470
LINE 248       1  42H THE SPAN WIDTH MUST BE GREATER THAN ZERO. )                 01202480
LINE 249   2028 FORMAT( 34H THE NUMBER OF CHORD LINES IN SPAN, I2, 7H EQUALS, I3 /01202490
LINE 250       1 48H THE NUMBER OF CHORDS MUST BE GREATER THAN ZERO. )            01202500
LINE 251   2029 FORMAT( 20H CHORD CARD FOR SPAN, I3,10H NOT FOUND )               01202510
LINE 252   2030 FORMAT(  8H SECTION, I2, 8H OF WING, I2, 20H WAS DEFINED TO HAVE, 01202520
LINE 253       1  I3, 7H SPANS., I4, 33H 'SPAN' CARDS WERE ACTUALLY READ.   )     01202530
LINE 254   2031 FORMAT(18H CHORD LINE NUMBER, I3,  8H OF SPAN, I3,                01202540
LINE 255       1 62H IS IDENTICAL TO, CROSSES, OR IS ABOVE THE PREVIOUS CHORD LINE01202550
LINE 256       2   )                                                             01202560
LINE 257  C                                                                      01202570
LINE 258   3000 FORMAT(1H1/24X, 19HGRID INPUT FOR WING, I2, 8H SECTION, I2 )      01202580
LINE 259   3001 FORMAT(/ 24X, 4HSPAN, I3, 4H HAS, I3,27H CHORD LINES AND A WIDTH O01202590
LINE 260       1F,  E13.6  / 24X,     5HCHORD,  9X, 2HX1, 14X, 2HX2 )            01202600
LINE 261   3002 FORMAT( 24X, I5, 5X, 2E16.6 )                                    01202610
LINE 262   3006 FORMAT(                          // // 20X, 21HNUMBER OF FREQUENCI01202620
LINE 263       1ES, I12  / 20X, 19HLIST OF FREQUENCIES, 5F14.4 / (39X, 5F14.4) )  01202630
LINE 264        END                                                              01202640

ND READ

C OF JOB.

   39.4 SEC. USED    .011 HRS. CHARGED   49.974 HRS. REMAINING
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DISPLAY...FILE DECK 13

```
LINE   1          SUBROUTINE INP1( I5, I6, TITLE, ITRUN, MACH, REFLEN, XP, XPIN,     01300010
LINE   2         1   PLOTR, IWTE,EARO, BEETA, LAB, ID, FD, ERROR )                   01300020
LINE   3          REAL MACH                                                          01300030
LINE   4          LOGICAL ERROR, PLOTR                                               01300040
LINE   5          DIMENSION TITLE(14), FD(4), ID(9)                                  01300050
LINE   6          COMMON / NEXTCS /  IFLUSH                                          01300060
LINE   7          DATA  LRUN  /  4HRUN  /                                            01300070
LINE   8  C            EARO   ELEMENT ASPECT RATIO                                   01300080
LINE   9  C                                                                          01300090
LINE  10  C            READ RUN CARD                                                 01300100
LINE  11  C                                                                          01300110
LINE  12          READ( I5, 1000 ) LAB, ID, FD                                       01300120
LINE  13  C                                                                          01300130
LINE  14          IF( LAB .EQ. LRUN ) GO TO 2                                        01300140
LINE  15          WRITE( I6, 2000 )                                                  01300150
LINE  16          WRITE( I6, 2023 )                                                  01300160
LINE  17          IFLUSH = 1                                                         01300170
LINE  18     2    CONTINUE                                                           01300180
LINE  19          ITRUN = ID(1)                                                      01300190
LINE  20          PLOTR = .FALSE.                                                    01300200
LINE  21          IF( ID(2) .EQ. 1 ) PLOTR = .TRUE.                                  01300210
LINE  22          IWTE = 0                                                           01300220
LINE  23          IF( ID(3) .EQ. 1 ) IWTE = 1                                        01300230
LINE  24          MACH = FD(1)                                                       01300240
LINE  25          BEETA=SQRT(MACH*MACH-1.0)                                          01300250
LINE  26          REFLEN = FD(2)                                                     01300260
LINE  27          XPIN = FD(3)                                                       01300270
LINE  28          EARO = FD(4)                                                       01300280
LINE  29          IF( EARO .EQ. 0.0)EARO = 1.1                                       01300290
LINE  30          IF( MACH .GT. 1.0 ) GO TO 5                                        01300300
LINE  31          WRITE( I6, 2000 )                                                  01300310
LINE  32          WRITE( I6,2024 ) MACH                                              01300320
LINE  33          MACH = 2.0                                                         01300330
LINE  34          ERROR = .TRUE.                                                     01300340
LINE  35     5    CONTINUE                                                           01300350
LINE  36          IF( REFLEN .NE. 0.0 ) GO TO 6                                      01300360
LINE  37          WRITE( I6, 2000 )                                                  01300370
LINE  38          WRITE( I6, 2025 )                                                  01300380
LINE  39          ERROR = .TRUE.                                                     01300390
LINE  40          REFLEN = 1.                                                        01300400
LINE  41     6    CONTINUE                                                           01300410
LINE  42          IF ( EARO  .GT. 0.0 ) GO TO 7                                      01300420
LINE  43          WRITE( I6, 2000 )                                                  01300430
LINE  44          WRITE( 6, 2027 ) EARO                                              01300440
LINE  45          ERROR = .TRUE.                                                     01300450
LINE  46          EARO = 1.0                                                         01300460
LINE  47     7    CONTINUE                                                           01300470
LINE  48          XP = XPIN/(BEETA*REFLEN)                                           01300480
LINE  49          WRITE( I6, 3007 ) MACH, REFLEN, XPIN                               01300490
LINE  50          WRITE( I6, 3019 ) EARO                                             01300500
LINE  51          WRITE( I6, 3008 ) ITRUN                                            01300510
LINE  52          IF( ITRUN .EQ. 3 ) GO TO 88                                        01300520
LINE  53          IF( ITRUN .NE. 1 ) GO TO 8                                         01300530
LINE  54          WRITE( I6, 3009 )                                                  01300540
LINE  55          GO TO 9                                                            01300550
LINE  56    88    CONTINUE                                                           01300560
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LINE  57          WRITE( I6, 3018 )                                          01300570
LINE  58          GO TO 9                                                    01300580
LINE  59    8     CONTINUE                                                   01300590
LINE  60          WRITE(I6, 3010 )                                           01300600
LINE  61    9     CONTINUE                                                   01300610
LINE  62          WRITE( I6, 3011 ) ID(2)                                    01300620
LINE  63          IF( PLOTR ) GO TO 11                                       01300630
LINE  64          WRITE( I6,3012)                                            01300640
LINE  65          GO TO 12                                                   01300650
LINE  66     11   CONTINUE                                                   01300660
LINE  67          WRITE( I6, 3013 )                                          01300670
LINE  68     12   CONTINUE                                                   01300680
LINE  69          WRITE( I6, 3015 ) IWTE                                     01300690
LINE  70          IF( IWTE .NE. 1 ) WRITE( I6, 3016 )                        01300700
LINE  71          IF( IWTE .EQ. 1 ) WRITE( I6, 3017 )                        01300710
LINE  72          RETURN                                                     01300720
LINE  73    1000  FORMAT( A4, 2X, 9I2, 4E12.0 )                              01300730
LINE  74    2000  FORMAT(/// 1X, 129(1H*) //24H ERROR IN READING INPUT.   )  01300740
LINE  75    2023  FORMAT( 38H RUN CARD IS MISSING OR OUT OF ORDER / 89H RUN CARD MUS01300750
LINE  76         1T IMMEDIATELY FOLLOW THE TITLE CARD AND BE THE SECOND CARD IN THE 01300760
LINE  77         2INPUT DECK / 18H JOB IS TERMINATED  )                      01300770
LINE  78    2024  FORMAT( 37H MACH NUMBER MUST BE GREATER THAN 1.0  / 24H MACH NUMBE01300780
LINE  79         1R WAS READ AS, E13.6 / 80H MACH NUMBER WILL BE SET EQUAL TO 2.0 IN01300790
LINE  80         2 AN ATTEMP TO CHECK THE REST OF THE DATA // )              01300800
LINE  81    2025  FORMAT(  56H REFERENCE LENGTH WAS READ AS 0.0.  THIS IS NOT ALLOWE01300810
LINE  82         1D. /  87H REFERENCE LENGTH WILL BE SET EQUAL TO 1.0 IN AN ATTEMPT 01300820
LINE  83         2TO CHECK THE REST OF THE DATA./116H REFERENCE LENGTH MUST BE INPUT01300830
LINE  84         3 AS A NON-ZERO FLOATING POINT NUMBER IN COLUMNS 39 THROUGH 48 OF T01300840
LINE  85         4HE 'RUN' DATA CARD. // )                                   01300850
LINE  86    2026  FORMAT(     92H OFF-DIAGONAL PERCENTAGE, IF ENTERED, MUST BE GREATE01300860
LINE  87         1R THAN OR EQUAL TO 0.0 AND LESS THAN 1.0 / 37H OFF-DIAGONAL PERCEN01300870
LINE  88         2TAGE WAS INPUT AS, E16.6 // )                              01300880
LINE  89    2027  FORMAT(     61H ELEMENT ASPECT RATIO, IF ENTERED, MUST BE A POSITIV01300890
LINE  90         1E NUMBER. /33H ELEMENT ASPECT RATIO WAS READ AS, E13.6 /   01300900
LINE  91         2 97H ELEMENT ASPECT RATIO WILL BE SET EQUAL TO 1.0 IN AN ATTEMPT 01300910
LINE  92         3O CHECK THE REST OF THE INPUT DATA. / )                    01300920
LINE  93    3007  FORMAT( 20X, 11HMACH NUMBER, F22.5 // 20X,16HREFERENCE LENGTH,  01300930
LINE  94         1 F17.5  //  20X, 20HPITCHING MOMENT AXIS, F13.5  )         01300940
LINE  95    3008  FORMAT( / 20X, 13HRUN TYPE CODE,  I20 )                    01300950
LINE  96    3009  FORMAT( 20X, 22H(COMPLETE RUN ATTEMPT))                    01300960
LINE  97    3010  FORMAT( 20X, 11H(CHECK RUN)  )                             01300970
LINE  98    3011  FORMAT( / 20X,17HPLOT REQUEST CODE, I16 )                  01300980
LINE  99    3012  FORMAT( 20X, 24H(NO PLOTS ARE REQUESTED)  )                01300990
LINE 100    3013  FORMAT( 20X, 21H(PLOTS ARE REQUESTED)  )                   01301000
LINE 101    3014  FORMAT( /20X,23HOFF-DIAGONAL PERCENTAGE, F10.5 )           01301010
LINE 102    3015  FORMAT( / 20X, 16HWAKE EFFECT CODE, I17 )                  01301020
LINE 103    3016  FORMAT( 20X,   31H(WAKE EFFECT IS NOT CONSIDERED)  )       01301030
LINE 104    3017  FORMAT( 20X,   27H(WAKE EFFECT IS CONSIDERED) )            01301040
LINE 105    3018  FORMAT( 20X, 13H(RESTART RUN)   )                          01301050
LINE 106    3019  FORMAT( / 20X, 20HELEMENT ASPECT RATIO, F13.5 )            01301060
LINE 107          END                                                        01301070
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```
LINE   1        FUNCTION IRELE   ( GT,GW,NET)                                    01400010
LINE   2        COMPLEX  GBAR, RI, RIS                                           01400020
LINE   3        COMMON / CEPS /   EPS                                            01400030
LINE   4        COMPLEX   GT(1), GW(1)                                           01400040
LINE   5        IRELE =1                                                         01400050
LINE   6        ANET = NET                                                       01400060
LINE   7        RABSO = 0.0                                                      01400070
LINE   8        DO 600          IEL=1,NET                                        01400080
LINE   9        GTABS=  CABSO(GT(IEL) )                                          01400090
LINE  10        GABSW=  CABSO ( GW(IEL))                                         01400100
LINE  11        IF (GABSW .EQ. 0.0  .AND. GTABS .EQ. 0.0)   ANET = ANET -1.0     01400110
LINE  12        IF (GABSW .EQ. 0.0  .AND. GTABS .EQ. 0.0)   GO TO 600            01400120
LINE  13        RI =  GT(IEL) -GW(IEL)                                           01400130
LINE  14        RIS=  RI * RI                                                    01400140
LINE  15        IF( GTABS.NE. 0.0)   RIS =  RIS / GT(IEL)                        01400150
LINE  16   600  RABSO   =  CABSO( RIS)&RABSO                                     01400160
LINE  17        ERROR   =   RABSO /  ANET                                        01400170
LINE  18        ERROR   =   SQRT( ERROR)                                         01400180
LINE  19        IF (ERROR.GT.EPS   )        RETURN                               01400190
LINE  20        IRELE = 0                                                        01400200
LINE  21        RETURN                                                           01400210
LINE  22        END                                                              01400220
```

DISPLAY...FILE DECK 15

```
      SUBROUTINE ITRATE (I9, NWR,N[illegible]MC,D,IP,DNWR,DNWI, RWR,RWI,
     1 NET, A, IZ ,GWESS,WW)
      COMPLEX GW, GT,WW
      COMPLEX GWESS
      REAL NWR, NWI
      INTEGER PRINT
      DIMENSION A(NET), IZ(NET)
      DIMENSION D(MC,MC) , IP(MC),DNWR(MC),DNWI(MC), RWR(MC), RWI(MC)
      DIMENSION  GWESS(200)
      DIMENSION      NWR(200),NWI(200),GW(200),GT(200)
      DIMENSION WW(200)
      COMMON  /CEPS/ EPS
      COMMON /ITERAT/ ITMAX
      COMMON /ITG/  IGWESS
      COMMON /K1112/ KST11,KST12
      COMMON /TAPE/  IN, I10
      COMMON / VELCOM / NMAX, PRINT, NWBLOK, NWROW( 20)
      REWIND I10
      NWING = NET
      IF (NWBLOK .EQ. 1)   GO TO 700
      IMAX=50
      IF (ITMAX.NE.0) IMAX=ITMAX
C
C
C     SET CONVERGENCE CRITERIA - EPS
C
C
      ALF1=0.9
      ALF2=1.1
   10 ALF=ALF1
      REWIND I9
      DO 90 N=1,NWING
      GT(N)=0.
   90 CONTINUE
  100 IT=1
      ITEST=0
      IF(IGWESS.NE.0) GO TO 166
  700 CONTINUE
      IW=1
      IW1= 1
      DO 160      NN=1,NWBLOK
      NROW=NWROW(NN)
      NCOL=NROW
      READ(I10) D, IP
      DO 155 I=1,NROW
      RWR(I) = NWR(IW1)
      RWI(I) = NWI(IW1)
      IW1= IW1&1
  155 CONTINUE
      CALL  SOLVE(NROW,NMAX,D,RWR     ,IP)
      CALL  SOLVE(NROW,NMAX,D,RWI     ,IP)
      CALL   TMAX( NET, RWR, RMAXR)
      CALL   TMAX( NET, RWI, RMAXI)
  148 DO 150 J=1,NCOL
      GW(IW)=CMPLX(RWR(J),RWI(J))
      IW=IW&1
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LINE  57     150 CONTINUE                                                    01500570
LINE  58     160 CONTINUE                                                    01500580
LINE  59    166  CONTINUE                                                    01500590
LINE  60         IF(NWBLOK.EQ.1) GO TO 530                                  01500600
LINE  61    172  CONTINUE                                                    01500610
LINE  62         REWIND I10                                                 01500620
LINE  63     190 IF (IABS(PRINT).LT.3) GO TO 200                            01500630
LINE  64  C      WRITE (6,630) IT                                           01500640
LINE  65  C                        WRITE (6,650) NWING,(GW(N),N=1,NWING)    01500650
LINE  66     200 CONTINUE                                                    01500660
LINE  67         IF (ITEST.EQ.0.AND.IT.NE.1) GO TO 530                      01500670
LINE  68         IF (IT.EQ.IMAX) GO TO 540                                  01500680
LINE  69     330 JJ=0                                                        01500690
LINE  70         IT=IT&1                                                    01500700
LINE  71         II=1                                                       01500710
LINE  72         ITEST=0                                                    01500720
LINE  73         REWIND  I9                                                 01500730
LINE  74         REWIND  I10                                                01500740
LINE  75         JJ=0                                                       01500750
LINE  76         II=1                                                       01500760
LINE  77         L=0                                                        01500770
LINE  78         L1=0                                                       01500780
LINE  79         DO 510 I=1,NWBLOK                                          01500790
LINE  80         NROW=NWROW(I)                                              01500800
LINE  81         READ (I10) D,IP                                            01500810
LINE  82  C      IF ( IABS(PRINT) .LT. 3)   GO TO  340                      01500820
LINE  83  C      WRITE (6,564)   I,NROW                                     01500830
LINE  84  C      WRITE (6,566) NROW,D                                       01500840
LINE  85  C566   FORMAT(1H0,  7HITRATE ,   7HNROW = , I3, / (1X,10F10.5))   01500850
LINE  86  C      WRITE (6,562) NROW,IP                                      01500860
LINE  87  C340   CONTINUE                                                   01500870
LINE  88  C562   FORMAT(1H0,  7HITRATE ,   7HNROW = , I3, / (1X,10F10.5))   01500880
LINE  89  C564   FORMAT(1H0,  7HITRATE ,  10HBLOCK NO. , I13, I13,  5H ROWS )  01500890
LINE  90         DO 471 J=1,NROW                                            01500900
LINE  91         L= L&1                                                     01500910
LINE  92         DNWR(J)=0.0                                                01500920
LINE  93         DNWI(J)=0.0                                                01500930
LINE  94  C      IF (NWING.LE.NMAX) GO TO 470                               01500940
LINE  95         IF(L.GT. KST11) NNZ =0                                     01500950
LINE  96 -       IF(L.GT. KST11) GO TO 470                                  01500960
LINE  97         IF(L1.LT. L )                                              01500970
LINE  98        1READ(I9)  L1, NNZ, (IZ(M),M=1,NNZ), (A(M),M=1,NNZ)         01500980
LINE  99         IF(L1.GT.L)  NNZ=0                                         01500990
LINE 100         IF(NNZ  .EQ. 0)  GO TO 470                                 01501000
LINE 101         DO 460          M=1,NNZ                                    01501010
LINE 102          K= IZ(M )                                                 01501020
LINE 103         DNWR(J)= DNWR(J)  & A(M) * REAL  (GW(K)).                  01501030
LINE 104    460  DNWI(J)= DNWI(J)  & A(M) * AIMAG( GW(K))                   01501040
LINE 105    470  RWR(J)= NWR(J&JJ) -DNWR(J)                                 01501050
LINE 106         RWI(J)= NWI(J&JJ) -DNWI(J)                                 01501060
LINE 107         IF (IABS(PRINT).LT. 3)   GO TO 471                         01501070
LINE 108  C      WRITE(6, 3000)   J, J1,DNW(J), NW(J),RW(J)                 01501080
LINE 109  C3000  FORMAT(4X, 27H J,J1,DNW(J),NW(J),RW(J) =     /(6X, 2I4,6E12.4) )  01501090
LINE 110     471 CONTINUE                                                    01501100
LINE 111         CALL SOLVE ( NROW,NMAX,D,RWR, IP )                         01501110
LINE 112         CALL  SOLVE (NROW,NMAX,D,RWI, IP )                         01501120
LINE 113         DO 500 M=1,NROW                                            01501130
LINE 114         GT(II)=GW(II)                                              01501140
LINE 115         SAVE=NW(II)                                                01501150
LINE 116         GW(II) =  CMPLX( RWR(M), RWI(M))                           01501160
LINE 117         NW(II)=GW(II)-GT(II).                                      01501170
LINE 118         IF(IT .EQ.2)      GO TO 490                                01501180
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```
      SAVE=NW(II)*SAVE
      ALF=ALF1
      IF (SAVE.GE.0.) ALF=ALF2
  490 CONTINUE
      GW(II)=ALF*GW(II)&(1.-ALF)*GT(II)
C     ITEST = IRELE(GT(II), GW(II),  ITEST)
      II=II&1
  500 CONTINUE
      JJ=JJ&NWROW(I)
  510 CONTINUE
      ITEST =  IRELE(GT, GW,NET)
      GO TO 190
  530 WRITE (6,580) IT,EPS
       RETURN
  540 WRITE (6,590) IMAX,EPS
C     IF (IMETH.EQ.0) GO TO 550
C     IMETH=0
C     GO TO 60
  550 CONTINUE
      WRITE (6,600)
                        WRITE (6,650) NWING,(GT(N),N=1,NWING)
 560  WRITE (6,610)
                        WRITE (6,650) NWING,(GW(N),N=1,NWING)
      RETURN
C
C
  570 FORMAT (2X,10HRW(N),N=1,,I3/(1X,10F10.5))
  580 FORMAT (1H0,30HTHE ITERATION CONVERGED AFTER ,I3,2X,35HITERATIONS
     1WITH A TEST CRITERION OF,F10.7)
  590 FORMAT (1H0,37HTHE ITERATION DID NOT CONVERGE AFTER ,I3,2X,35HITER
     1ATIONS WITH A TEST CRITERION OF,F10.7)
  600 FORMAT (1H0,41HTHE SOLUTION AT THE PREVIOUS ITERATION IS)
  610 FORMAT (1H0,40HTHE SOLUTION AT THE PRESENT ITERATION IS)
  630 FORMAT (17H0ITERATION NUMBER,I4)
 650  FORMAT( 2X,10HGW(N),N=1,,I3/(4X, 6E18.6))
C
      END
```

DISPLAY...FILE DECK 16

```
LINE   1          SUBROUTINE LOOPW( NET,        NWING, XYZ, NSP, SYM, TRS, NNCH, NE,01600010
LINE   2         1   NSECT, ZSECT, ISONS, I6, TAPE8, XCEN, AREA, WROW, LRECL,       01600020
LINE   3         2 WTEROW,LRWTE,PERC,ERROR, IWTE, REFLEN)                           01600030
LINE   4   C          NET     TOTAL NUMBER OF ELEMENTS                              01600040
LINE   5   C          NTERM     NUMBER OF TERMS IN INFLUENCE FUNCTION               01600050
LINE   6   C          NWING     NUMBER OF WINGS IN STRUCTURE                        01600060
LINE   7   C          XYZ     COORDINATE ARRAY OF ALL ELEMENTS                      01600070
LINE   8   C          NSP     NSP(I,J), NO. SPANS IN SECTION I OF WING J            01600080
LINE   9   C          SYM(J)  SYMMETY CODE FOR WING J                               01600090
LINE  10   C          TRS     TRS(I,J,1)  TRANSFORMATICN MATRIX OF SECT. I OF WING J01600100
LINE  11   C          NNCH    ELEMENT NUMBER AT END OF SPAN                         01600110
LINE  12   C          NE(I,J) NUMBER OF ELEMENTS IN SECTION I OF WING J             01600120
LINE  13   C          NSECT(5) NUMBER OF SECTIONS IN WING J                         01600130
LINE  14   C          ZSECT(I,J) Z COORDINATE OF ALL ELEMENTS OF SECTION I, WING J 01600140
LINE  15   C          ISONS  BOOLEAN MATRIX TO TELL IF ONE SECTION HAS INFLUENCE   01600150
LINE  16   C          ISONS(K1,K2) = 1 IF SETION K2 HAS INFLU. ON REC. SECTION K1  01600160
LINE  17   C          I6      LOGICAL UNIT NUMBER FOR OUTPUT (PRINTER)              01600170
LINE  18   C          TAPE8   LOGICAL UNIT NUMBER OF TAPE TO CONTAIN FREQUENCY-INDE-01600180
LINE  19   C                  PENDENT TERMS                                         01600190
LINE  20   C          XCEN    X CENTER OF EACH ELEMENT (OUTPUT)                     01600200
LINE  21   C          XO        X COORDINATE OF RECEIVING PT. (CENTER OF ELEMENT ) 01600210
LINE  22   C          YRO       Y COORDINATE OF RECEIVING PT. (IN RIGHT SIDE )    01600220
LINE  23   C          YLO       Y COORDINATE OF RECEIVING PT. (IN LEFT SIDE ))    01600230
LINE  24   C          AREA    AREA FOR EACH ELEMENT (OUTPUT)                        01600240
LINE  25   C          WROW    STORAGE FOR FREQUENCY TERMS FOR ONE RECEIVING ELEMENT 01600250
LINE  26   C         LRECL  LENGTH OF WROW EQUAL TO NTERM*NET                       01600260
LINE  27   C          ERROR   LOGICAL SET TO TRUE IF ERROR IS DETECTED              01600270
LINE  28          COMPLEX  WTEROW(LRWTE)                                            01600280
LINE  29          COMPLEX WTES                                                      01600290
LINE  30          REAL MACH                                                         01600300
LINE  31          INTEGER TAPE8                                                     01600310
LINE  32          LOGICAL BKWSP                                                     01600320
LINE  33          LOGICAL ERROR                                                     01600330
LINE  34          LOGICAL TREDGE                                                    01600340
LINE  35          LOGICAL WAKE,WAKE1,WAKENZ                                         01600350
LINE  36          LOGICAL WAKE2                                                     01600360
LINE  37          DIMENSION  ISONS(12,1),                    TRS(4,3,1), NSP(3,1)   01600370
LINE  38          DIMENSION  NNCH(1), SYM(1)                                        01600380
LINE  39          DIMENSION  NSECT(1), NE(3,1), ZSECT(3,1), XCEN(1), XYZ(1), AREA(1)01600390
LINE  40          DIMENSION WFSV(20)                                                01600400
LINE  41          DIMENSION WROW(LRECL)                                             01600410
LINE  42          COMMON/BASIC/MACH                                                 01600420
LINE  43          COMMON / FQ1 / NFREQ, CF(12,30), FREQ(12), FREQP(12), FRTEST      01600430
LINE  44          COMMON / RRLL / TVW(4), YRO, YLO, ZR, ZRZR, ZL, ZLZL, IRC, IIN    01600440
LINE  45          COMMON  /TAPE/ I9,I10,I11,I12,I13,I14,J9,I15                      01600450
LINE  46          COMMON/WAKEUP/ WTES(12), TREDGE,WAKE1,WAKE, WAKENZ, KWAKE         01600460
LINE  47          COMMON / WW1 / XO,YO,ZD,ZDZD, SYMK, NINSID                        01600470
LINE  48   C      ------------------------------------------------------------------01600480
LINE  49   C            THE FREQUENCY-INDEPENDENT TERMS FOR ALL INFLUENCING ELEMENTS01600490
LINE  50   C            OF A GIVEN RECEIVING ELEMENT ARE STORED IN WROW               01600500
LINE  51   C            COMPUTE 1 ROW FOR EVERY ELEMENT  (CALLED RECEIVING ELEMENT) 01600510
LINE  52   C            NTERMS IS THE NO. TERMS USED TO COMPUTE AN ELEMENT OF W       01600520
LINE  53   C            INDXR  INDEX INTO XYZ FOR RECEIVING ELEMENT                   01600530
LINE  54   C            INDXI  INDEX INTO XYZ FOR INFLUENCING ELEMENT                 01600540
LINE  55   C            IRC RECEIVING ELEMENT COUNTER                                 01600550
LINE  56   C            IIN INFLUENCING ELEMENT COUNTER                               01600560
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LINE  57  C          K1 IS COUNTER FOR RECEIVING SECTION, K2 FOR INFLUENCING SECT.01600570
LINE  58        IF(IWTE.NE.0)  REWIND I15                                        01600580
LINE  59        REWIND TAPE8                                                     01600590
LINE  60  C                                                                      01600600
LINE  61        WRITE                                                            01600610
LINE  62       1  (TAPE8)  MACH,NET,REFLEN,IWTE, NFREQ, (FREQ(I),I=1,NFREQ)      01600620
LINE  63        IF(IWTE.NE.0)                                                    01600630
LINE  64       1WRITE(I15) MACH,NET,REFLEN,IWTE, NFREQ, (FREQ(I), I=1,NFREQ)     01600640
LINE  65  C                                                                      01600650
LINE  66        WAKE = .FALSE.                                                   01600660
LINE  67        INDXR = 1                                                        01600670
LINE  68        IRC = 0                                                          01600680
LINE  69        K1 = 0                                                           01600690
LINE  70        KW = 0                                                           01600700
LINE  71        KWAKE = 0                                                        01600710
LINE  72  C     ----------------------------------------------------------------01600720
LINE  73  C     ICOL = 1                                                         01600730
LINE  74  C     ----------------------------------------------------------------01600740
LINE  75  C          LOOP ON RECEIVING ELEMENTS BY WING J AND SECTION I OF WING J 01600750
LINE  76  C                                                                      01600760
LINE  77  C                                                                      01600770
LINE  78        DO 100  J=1,NWING                                                01600780
LINE  79        NSR = NSECT(J)                                                   01600790
LINE  80        SYMK = SYM(J)                                                    01600800
LINE  81        DO 95 I=1,NSR                                                    01600810
LINE  82  C                                                                      01600820
LINE  83        K1 = K1 & 1                                                      01600830
LINE  84        NER = NE(I,J)                                                    01600840
LINE  85  C          ZSECT(I,J) Z COORDINATE OF SECTION I,WING J                 01600850
LINE  86        ZCR = ZSECT(I,J)                                                 01600860
LINE  87  C          LOOP ON THE NUMBER OF ELEMENTS IN SECT. I OF WING J (RECIEV.)01600870
LINE  88  C                                                                      01600880
LINE  89        DO 90  IER=1,NER                                                 01600890
LINE  90  C                                                                      01600900
LINE  91        WAKE2 = .FALSE.                                                  01600910
LINE  92        IRC = IRC.& 1                                                    01600920
LINE  93  C          FIND CENTER PT.(XO,YCR,ZCR) IN RECEIVING SECTION SYSTEM     01600930
LINE  94        XO = XCEN(IRC)                                                   01600940
LINE  95        YCR = .50*(XYZ(INDXR&4)&XYZ(INDXR&5))                            01600950
LINE  96        DSX = 0.5*(XYZ(INDXR&5)-XYZ(INDXR&4))                            01600960
LINE  97        AREA(IRC)=DSX*(XYZ(INDXR&3)-XYZ(INDXR) &XYZ(INDXR&2)-XYZ(INDXR&1))01600970
LINE  98  C              ZCR IS CONSTANT FOR ALL ELEMENTS IN SECTION I OF WING J 01600980
LINE  99        INDXR = INDXR & 6                                                01600990
LINE 100  C                                                                      01601000
LINE 101        IF( IWTE .EQ. 0 ) GO TO 50                                       01601010
LINE 102        DO 45 IEI=1,LRWTE                                                01601020
LINE 103     45 WTERDW(IEI) = (0.0, 0.0)                                         01601030
LINE 104     50 CONTINUE                                                         01601040
LINE 105  C                                                                      01601050
LINE 106  C                                                                      01601060
LINE 107  C          FIND DIAGONAL ELEMENT                                       01601070
LINE 108        CALL RTOI ( TRS(1,I,J), TRS(1,I,J), YCR, ZCR, ZRO, ZLO )         01601080
LINE 109        ZR = ZRO - ZCR                                                   01601090
LINE 110        ZL = ZLO & ZCR                                                   01601100
LINE 111        ZRZR = ZR*ZR                                                     01601110
LINE 112        ZLZL = ZL*ZL                                                     01601120
LINE 113        TREDGE = .FALSE.                                                 01601130
LINE 114        NINSID = 0                                                       01601140
LINE 115        IIN = IRC                                                        01601150
LINE 116        INDXI = 6*IRC - 5                                                01601160
LINE 117        ICOL = NFREQ*(IRC-1) & 1                                         01601170
LINE 118  C                                                                      01601180
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LINE 119          CALL WINTGR( XYZ(INDXI), XYZ(INDXI&4), WROW(ICOL) )
LINE 120   C
LINE 121          WII = WROW(ICOL)
LINE 122   C
LINE 123   C
LINE 124   C
LINE 125   C           SET UP CONSTANTS FOR INFLUENCING ELEMENTS
LINE 126   C
LINE 127          INDXI = 1
LINE 128          IIN = 1
LINE 129          NSPI = 0
LINE 130          K2 = 0
LINE 131   C      ------------------------------------------------------------------
LINE 132          ICOL = 1
LINE 133   C      ------------------------------------------------------------------
LINE 134   C
LINE 135   C           LOOP ON INFLU. ELEMENT BY WING JJ, SECTIUN II  (DO 85, DU 80)
LINE 136   C
LINE 137          DO 85 JJ = 1,NWING
LINE 138          SYMK = SYM(JJ)
LINE 139          NSI = NSECT(JJ)
LINE 140          DO 80 II=1,NSI
LINE 141   C
LINE 142   C           NEI  NO. ELEMENTS IN SECTION II OF WING JJ
LINE 143          NEI = NE(II,JJ)
LINE 144          NSPS = NSP(II,JJ)
LINE 145          K2 = K2 & 1
LINE 146   C          CHECK IF SECTION K2 HAS ZERO INFLUENCE ON SECTION K1
LINE 147          IF( ISONS(K1,K2) .NE. 0 ) GO TO 60
LINE 148   C
LINE 149   C          SECT. K2  HAS ZERO INFLUENCE ON SECT. K1
LINE 150   C
LINE 151          NTNEI = NEI*NFREQ
LINE 152          DO 55  IEI=1,NTNEI
LINE 153          WROW(ICOL) = 0.0
LINE 154          ICOL = ICOL & 1
LINE 155     55   CONTINUE
LINE 156          INDXI = INDXI & 6*NEI
LINE 157          IIN = IIN & NEI
LINE 158          NSPI = NSPI & NSPS
LINE 159   C           LOOP TO NEXT INFLUENCING SECTION II
LINE 160          GO TO 80
LINE 161   C
LINE 162     60   CONTINUE
LINE 163   C           SECTION IS ASSUMED TO HAVE SOME ELEMENTS WITH NON-ZERO INFLU-
LINE 164   C           ENCE. EACH ELEMENT MUST BE CONSIDERED.
LINE 165   C
LINE 166   C           TRANSFORM CENTER PT. FROM RECEIVING SECTION SYSTEM TO INFLU-
LINE 167   C           ENCING SECTION SYSTEM. X IS SAME IN BOTH SYSTEMS.
LINE 168   C
LINE 169          CALL RTOI ( TRS(1,I,J), TRS(1,II,JJ), YCR, ZCR, ZRO, ZLO )
LINE 170   C
LINE 171   C           ZD        DIFFERENCE BETWEEN Z'S  OF INFLU. AND RECEIV. ELEM.
LINE 172   C           ZDZD IS THE SQUARE OF THE DIFFERENCE OF THE REC AND INFL Z'S
LINE 173          ZR = ZRO - ZSECT(II,JJ)
LINE 174          ZL = ZLO & ZSECT(II,JJ)
LINE 175          ZRZR = ZR*ZR
LINE 176          ZLZL = ZL*ZL
LINE 177   C
LINE 178   C           LOOP ON SPANS OF INFLUENCING SECTION II OF WING JJ  DO 75 ISP
LINE 179   C
LINE 180          DO 75 ISP=1,NSPS
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LINE 181  C                                                                    01601810
LINE 182        NSPI = NSPI & 1                                                01601820
LINE 183        NEPSM1 = NNCH(NSPI) - IIN                                      01601830
LINE 184        NEPS = NEPSM1 & 1                                              01601840
LINE 185  C                                                                    01601850
LINE 186  C            BUMP INDXI AND ICOL TO LAST ELEMENT IN SPAN             01601860
LINE 187        IIN = IIN & NEPS                                               01601870
LINE 188        INDXI = INDXI & 6*NEPSM1                                       01601880
LINE 189        ICOL = ICOL & NFREQ*NEPSM1                                     01601890
LINE 190        BKWSP = .FALSE.                                                01601900
LINE 191        NINSID = 0                                                     01601910
LINE 192        TREDGE = .TRUE.                                                01601920
LINE 193  C                                                                    01601930
LINE 194  C          LOOP ON INFLU. ELEM. OF SPAN ISP FROM BOTTOM UP   DO 70 IEI  01601940
LINE 195  C                                                                    01601950
LINE 196        DO 70 IEI = 1,NEPS                                             01601960
LINE 197  C                                                                    01601970
LINE 198        IIN = IIN - 1                                                  01601980
LINE 199        IF( BKWSP) GO TO 65                                            01601990
LINE 200        WAKE1 = .FALSE.                                                01602000
LINE 201  C                                                                    01602010
LINE 202        CALL WINTGR( XYZ(INDXI), XYZ(INDXI&4), WROW(ICOL) )            01602020
LINE 203  C                                                                    01602030
LINE 204        TREDGE = .FALSE.                                               01602040
LINE 205  C                                                                    01602050
LINE 206        IF( NINSID .EQ. 0 ) GO TO 69                                   01602060
LINE 207  C                                                                    01602070
LINE 208        IF( .NOT. WAKE1 ) GO TO 58                                     01602080
LINE 209        WAKE = .TRUE.                                                  01602090
LINE 210        WAKE2 = .TRUE.                                                 01602100
LINE 211        INDWK = NFREQ*(NSPI-1)                                         01602110
LINE 212        DO 56 IW=1,NFREQ                                               01602120
LINE 213        INDWK = INDWK & 1                                              01602130
LINE 214        WTERDW(INDWK) = WTES(IW)                                       01602140
LINE 215     56 CONTINUE                                                       01602150
LINE 216     58 CONTINUE                                                       01602160
LINE 217  C                                                                    01602170
LINE 218        IF( NINSID .EQ. 1 ) GO TO 69                                   01602180
LINE 219        RD = ABS( WROW(ICOL) / WII )                                   01602190
LINE 220        IF( RD .GT. PERC ) GO TO 62                                    01602200
LINE 221        BKWSP = .TRUE.                                                 01602210
LINE 222        IJ = ICOL - 1                                                  01602220
LINE 223        DO 68 IF=1,NFREQ                                               01602230
LINE 224        IJ = IJ & 1                                                    01602240
LINE 225        WROW(IJ) = 0.0                                                 01602250
LINE 226     68 WFSV(IF) = 0.0                                                 01602260
LINE 227     62 CONTINUE                                                       01602270
LINE 228        IF( NINSID .LE. 2 ) GO TO 69                                   01602280
LINE 229        IJ = ICOL & NFREQ - 1                                          01602290
LINE 230        IF( NINSID .GT. 3 ) GO TO 63                                   01602300
LINE 231  C                                                                    01602310
LINE 232     61 CONTINUE                                                       01602320
LINE 233        TESTW = WROW(IJ)                                               01602330
LINE 234        GO TO 69                                                       01602340
LINE 235  C                                                                    01602350
LINE 236     63 CONTINUE                                                       01602360
LINE 237        TEST = TESTW - WROW(IJ)                                        01602370
LINE 238        IF( WROW(IJ) .NE. 0.0 ) TEST = TEST/WROW(IJ)                   01602380
LINE 239        IF( ABS(TEST) .GT. .02 )  GO TO 61                             01602390
LINE 240        BKWSP = .TRUE.                                                 01602400
LINE 241        IJ = ICOL -1                                                   01602410
LINE 242        DO  64  IF=1,NFREQ                                             01602420
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LINE 243          IJ = IJ & 1                                                  01602430
LINE 244     64   WFSV(IF) = WROW(IJ)                                          01602440
LINE 245          GO TO 69                                                     01602450
LINE 246   C                                                                   01602460
LINE 247    65    CONTINUE                                                     01602470
LINE 248          IJ = ICOL - 1                                                01602480
LINE 249          DO 67 IF=1,NFREQ                                             01602490
LINE 250          IJ = IJ & 1                                                  01602500
LINE 251     67   WROW(IJ) = WFSV(IF)                                          01602510
LINE 252   C                                                                   01602520
LINE 253     69   CONTINUE                                                     01602530
LINE 254          ICOL = ICOL - NFREQ                                          01602540
LINE 255          INDXI = INDXI - 6                                            01602550
LINE 256   C                                                                   01602560
LINE 257   C           END LOOP ON ELEMENTS IN THE INFLUENCING SPAN            01602570
LINE 258     70   CONTINUE                                                     01602580
LINE 259   C                                                                   01602590
LINE 260          IIN = IIN & NEPS                                             01602600
LINE 261          INDXI = INDXI & 6*NEPS & 6                                   01602610
LINE 262          ICOL = ICOL & NFREQ*NEPS & NFREQ                             01602620
LINE 263   C                                                                   01602630
LINE 264   C           END LOOP ON INFLUENCING SPANS OF SECTION II OF WING JJ  01602640
LINE 265     75   CONTINUE                                                     01602650
LINE 266   C                                                                   01602660
LINE 267   C           END LOOP ON INFLUENCING SECTION II OF WING JJ           01602670
LINE 268     80   CONTINUE                                                     01602680
LINE 269   C                                                                   01602690
LINE 270   C           END LOOP ON INFLUENCING WING JJ                         01602700
LINE 271     85   CONTINUE                                                     01602710
LINE 272   C                                                                   01602720
LINE 273   C           WROW 1 ROW HAS BEEN COMPUTED FOR A GIVEN RECEIVING ELEMENT. 01602730
LINE 274   C           WRITE WROW ON FILE AND LOOP TO NEXT RECEIVING ELEMENT   01602740
LINE 275   C      ---------------------------------------------------------------01602750
LINE 276          WRITE(TAPE8) IRC,WROW                                        01602760
LINE 277   C      ZERO FOR WAKE ELEMENTS                                       01602770
LINE 278   C      WAKE = FALSE  -  NO WAKE ELEMENTS FOR ANY ELEMENT            01602780
LINE 279   C      WAKE1= TRWE  -  ELEMENT IS WAKED                             01602790
LINE 280          IF (IWTE .EQ.0) GO TO 90                                     01602800
LINE 281          IF( .NOT. WAKE2 ) GO TO 90                                   01602810
LINE 282          WRITE( I15 ) IRC,WTEROW                                      01602820
LINE 283          KWAKE = IRC                                                  01602830
LINE 284          KW = KW & 1                                                  01602840
LINE 285   C      IF(IWTE.NE.0)WRITE(6,3001)IRC,IER,I,J, WTEROW                01602850
LINE 286   C      ---------------------------------------------------------------01602860
LINE 287   C      WRITE( I6, 3001 ) IRC, IER, I, J,(WROW(IJ), IJ=IJ1,ICOL )    01602870
LINE 288   C      ICOL = ICOL & 1                                              01602880
LINE 289   C                                                                   01602890
LINE 290   C      WRITE( I6,3001 ) IRC, IER, I, J,  WRCW                       01602900
LINE 291   C                                                                   01602910
LINE 292   C           END LOOP ON RECEIVING ELEMENT IN SECTION I OF WING J    01602920
LINE 293     90   CONTINUE                                                     01602930
LINE 294   C                                                                   01602940
LINE 295   C           END LOOP ON RECEIVING SECTION I OF WING J               01602950
LINE 296     95   CONTINUE                                                     01602960
LINE 297   C                                                                   01602970
LINE 298   C           END LOOP ON RECEIVING WING J                            01602980
LINE 299    100   CONTINUE                                                     01602990
LINE 300   C                                                                   01603000
LINE 301   C      ---------------------------------------------------------------01603010
LINE 302    110   CONTINUE                                                     01603020
LINE 303   C                                                                   01603030
LINE 304   C                                                                   01603040
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LINE 305          IF(WAKE)     END FILE I15                                          01603050
LINE 306          I6 =6                                                              01603060
LINE 307          IF(.NOT. WAKE) WRITE(I6,1000)                                      01603070
LINE 308          IF(WAKE )      WRITE (I6,1010)  KW                                 01603080
LINE 309     1000 FORMAT(1H0///16X,37HNO WAKE EFFECTS HAVE BEEN DETERMINED  )        01603090
LINE 310     1010 FORMAT(1H0///16X,38HWAKE EFFECTS HAVE BEEN DETERMINED FOR  ,I4,    01603100
LINE 311        1 9H ELEMENTS )                                                     01603110
LINE 312          END FILE TAPE8                                                     01603120
LINE 313          RETURN                                                             01603130
LINE 314  C3001 FORMAT(/// 18H RECEIVING ELEMENT, I5, 5X, 6HNUMBER, I4, 5X,          01603140
LINE 315  C     1 10HOF SECTION, I2, 5X, 7HOF WING,I2 // (1X, 10E13.4 )  )           01603150
LINE 316          END                                                                01603160
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DISPLAY...FILE DECK 17

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LINE   1        SUBROUTINE MESH(CORNX,CORNY,CORNZ, XYZ, Z, TRS, NNCH, SW, XLE,
LINE   2       1                NSP, NE, NETSV, EARO )
LINE   3  C
LINE   4  C     PURPOSE   GENERATE MESH FOR 1 SECTION WWITHOUT CONTROL LINES
LINE   5  C
LINE   6  C      INPUT
LINE   7  C
LINE   8  C          CORNX,CORNY, CORNZ   X,Y, AND Z COORD. OF CORNER PTS 1,2,3,4
LINE   9  C                               IN GLOBAL SYSTEM
LINE  10  C          NSP     DESIRED NUMBER OF SPANS FOR SECTION (INPUT BY USER)
LINE  11  C          EARO    ELEMENT ASPECT RATIO
LINE  12  C
LINE  13  C      OUTPUT
LINE  14  C
LINE  15  C          XYZ     4 X AND 2 Y LOCAL COORD. FOR EACH ELEMENT OF SECTION
LINE  16  C          Z       Z COORDINATE FOR ALL ELEMENTS IN SECTION (FROM TRANS)
LINE  17  C          TRS     2 BY 2 TRANS MATRIX TO GO FROM LOCAL TO GLOBAL
LINE  18  C          NNCH    ELEMENT NUMBER (W.R.T. TOTAL STRUCTURE) OF LAST
LINE  19  C                  ELEMENT IN SPAN. (USED FOR LABELING PLOT)
LINE  20  C          SW      SPAN WIDTH
LINE  21  C          XLE     AVERAGE X COORDINATE OF LEADING EDGE PER SPAN
LINE  22  C          NE      NUMBER OF ELEMENTS IN SECTION.
LINE  23  C          NETSV   COUNTER OF TOTAL NUMBER OF ELEMENTS IN STRUCTURE
LINE  24  C
LINE  25        DIMENSION CORNX(1), CORNY(1), CORNZ(1), TRS(1), X(4), Y(4)
LINE  26        DIMENSION XLE(1), SW(1)
LINE  27        DIMENSION                    XYZ(1),NNCH(20)
LINE  28        COMMON/BASIC/MACH,BEETA
LINE  29        EQUIVALENCE (X(1), X1), (X(2),X2), (X(3),X3), (X(4),X4)
LINE  30        EQUIVALENCE (Y(1), Y1), (Y(2),Y2), (Y(3),Y3), (Y(4),Y4)
LINE  31        DATA DTEST  /.98  /
LINE  32  C
LINE  33  C          NOTE THAT ELEMENT IS NUMBERED CLOCKWISE WHILE SECT IS COUNTER
LINE  34  C
LINE  35  C          DX34   DISTANCE BETWEEN POINTS THREE AND FOUR
LINE  36  C          DX12  DISTANCE BETWEEN POINTS 1 AND 2
LINE  37  C          DS      Y INCREMENT BETWEEN SPANS, (SPAN LENGTH)
LINE  38  C          NC1,NC2 NUMBER OF CORD DIVISIONS IN AREA 1 AND 2
LINE  39  C          DC1   CHORD LENGTH
LINE  40  C          DS      Y INCREMENT BETWEEN SPANS, (SPAN LENGTH)
LINE  41  C          DXLE     X INCREMENT A LONG LEADING EDGE
LINE  42  C          DXTE     X INCREMENT ALONG TRAILING EDGE
LINE  43  C
LINE  44  C          TRANSFORM CORNER POINTS TO LOCAL SYSTEM, WORK IN LOCAL SYSTEM
LINE  45  C
LINE  46        CALL TRANS( CORNX, CORNY, CORNZ, TRS, X, Y, Z )
LINE  47  C
LINE  48  C          FIND CRATIO  (CHORD TO SPAN RATIO)
LINE  49  C
LINE  50        DC = Y3 - Y1
LINE  51        DS = (X3 - X1)*BEETA
LINE  52        CRATIO = ( EARO*SQRT( DS*DS & DC*DC) ) / (DC*BEETA)
LINE  53  C
LINE  54  C     ASSUME CONSTANT SLOPE FOR ALL LINES
LINE  55  C
LINE  56        DX34 = X4 - X3
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LINE  57          DX12 = X2 - X1                                          01700570
LINE  58          DS = (Y3-Y1)/NSP                                        01700580
LINE  59          DC = CRATIO*DS                                          01700590
LINE  60          DXLE = (X3-X1)/NSP                                      01700600
LINE  61          DXTE = (X4-X2)/NSP                                      01700610
LINE  62   C                                                              01700620
LINE  63   C           COMPUTE  NC1, DC1  FOR AREA 1                      01700630
LINE  64   C                                                              01700640
LINE  65          NC1=1                                                   01700650
LINE  66          DC1 = AMAX1(DX12, DX34 )                                01700660
LINE  67          IF( DC1 .LT. DC ) GO TO 11                              01700670
LINE  68          NC1 = DC1/DC                                            01700680
LINE  69          DC1 = DC1/NC1                                           01700690
LINE  70     11   CONTINUE                                                01700700
LINE  71   C                                                              01700710
LINE  72   C                                                              01700720
LINE  73   C      ----------------------------------------------------------01700730
LINE  74   C                                                              01700740
LINE  75          NE=0                                                    01700750
LINE  76   C                                                              01700760
LINE  77   C           LOOP ON SPANS                                      01700770
LINE  78          DO  100  I=1,NSP                                        01700780
LINE  79   C                                                              01700790
LINE  80   C           FIND THE Y COORD. FOR THIS SPAN  (AY AND BY )      01700800
LINE  81          BY = Y1 & I*DS                                          01700810
LINE  82          AY = BY - DS                                            01700820
LINE  83   C           FIND AX,BX, X COORD ON LEADING EDGE ON BOTH SIDES OF SPAN  01700830
LINE  84          BX = X1 & I*DXLE                                        01700840
LINE  85          AX = BX - DXLE                                          01700850
LINE  86          SW(I) = DS                                              01700860
LINE  87          XLE(I) = 0.5*(AX&BX)                                    01700870
LINE  88   C           FIND CX,DX THE X COOR ON TRAILING EDGE             01700880
LINE  89          CX = X2 & I*DXTE                                        01700890
LINE  90          DX = CX - DXTE                                          01700900
LINE  91   C                                                              01700910
LINE  92          DXM = DTEST*DC1                                         01700920
LINE  93          CXM = CX - DXM                                          01700930
LINE  94          DXM = DX - DXM                                          01700940
LINE  95   C                                                              01700950
LINE  96   C           LOOP ON NC1 FOR AREA 1                             01700960
LINE  97          DO 20  J1 = 1,NC1                                       01700970
LINE  98   C                                                              01700980
LINE  99          NJ = 6*NE                                               01700990
LINE 100          NE=NE&1                                                 01701000
LINE 101          XYZ(NJ&5)=AY                                            01701010
LINE 102          XYZ(NJ&6)=BY                                            01701020
LINE 103          XD = J1*DC1                                             01701030
LINE 104          XC = BX & XD                                            01701040
LINE 105          XD = AX & XD                                            01701050
LINE 106          XA = XD - DC1                                           01701060
LINE 107          XB = XC - DC1                                           01701070
LINE 108          XYZ(NJ&1)=XA                                            01701080
LINE 109          XYZ(NJ&2)=XB                                            01701090
LINE 110          XYZ(NJ&3)=XC                                            01701100
LINE 111          XYZ(NJ&4)=XD                                            01701110
LINE 112   C           CHECK TO SEE IF WE HAVE REACHED TRAILING EDGE (CX AND DX )  01701120
LINE 113          IF( XC .GT. CX  .OR.  XD .GT. DX ) GO TO 19             01701130
LINE 114          GO TO 20                                                01701140
LINE 115     19   CONTINUE                                                01701150
LINE 116          XYZ(NJ&3)=CX                                            01701160
LINE 117          XYZ(NJ&4)=DX                                            01701170
LINE 118          GO TO 60                                                01701180
```

```
LINE 119     20  CONTINUE                                                    01701190
LINE 120  C                                                                 01701200
LINE 121     60  CONTINUE                                                    01701210
LINE 122         NNCH(I) = NE & NETSV                                       01701220
LINE 123  C                                                                 01701230
LINE 124    100  CONTINUE                                                   01701240
LINE 125  C                                                                 01701250
LINE 126  C            UPDATE COUNTER OF TOTAL ELEMENTS FOR STRUCTURE       01701260
LINE 127         NETSV = NETSV & NE                                         01701270
LINE 128         RETURN                                                     01701280
LINE 129         END                                                        01701290
```

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DISPLAY...FILE DECK 18

```
      SUBROUTINE MESHCL(CORNX,CORNY,CORNZ,XYZ,Z,TRS,NNCH,SW,XLE,
     1                  . NSP, NE, NETSV, ICL, CL, EARO )
C
C     PURPOSE   GENERATE MESH FOR 1 SECTION WITH CONTROL LINES
C
C      INPUT
C
C          CORNX,CORNY, CORNZ   X,Y, AND Z COORD. OF CORNER PTS 1,2,3,4
C                               IN GLOBAL SYSTEM
C          NSP     DESIRED NUMBER OF SPANS FOR SECTION (INPUT BY USER)
C          ICL     NUMBER OF CONTROL LINES IN SECTION ( 1OR2 )
C          CL(1),CL(2)  X COORD. OF FIRST CONTROL LINE
C          CL(3),CL(4)   X COORD. OF SECOND CONTROL LINE
C          EARO    ELEMENT ASPECT RATIO
C
C      OUTPUT
C
C          XYZ     4 X AND 2 Y LOCAL COORD. FOR EACH ELEMENT OF SECTION
C          Z       Z COORDINATE FOR ALL ELEMENTS IN SECTION (FROM TRANS)
C          TRS     2 BY 2 TRANS MATRIX TO GO FROM LOCAL TO GLOBAL
C          NNCH    ELEMENT NUMBER (W.R.T. TOTAL STRUCTURE) OF LAST
C                  ELEMENT IN SPAN. (USED FOR LABELING PLOT)
C          SW      SPAN WIDTH
C          XLE     AVERAGE X COORDINATE OF LEADING EDGE PER SPAN
C          NE      NUMBER OF ELEMENTS IN SECTION.
C          NETSV   COUNTER OF TOTAL NUMBER OF ELEMENTS IN STRUCTURE
C
      DIMENSION CL(1)
      DIMENSION CORNX(1), CORNY(1), CORNZ(1), TRS(1), X(4), Y(4)
      DIMENSION XLE(1), SW(1)
      DIMENSION                XYZ(1),NNCH(20)
      COMMON/BASIC/MACH,BEETA
      EQUIVALENCE (X(1), X1), (X(2),X2), (X(3),X3), (X(4),X4)
      EQUIVALENCE (Y(1), Y1), (Y(2),Y2), (Y(3),Y3), (Y(4),Y4)
      DATA DTEST  /.98  /
C
C          SECTION IS DIVIDED INTO 3 AREAS
C          AREA 1  BETWEEN LEADING EDGE AND 1ST CONTROL LINE
C          AREA 2  BETWEEN FIRST AND 2ND CONTROL LINES
C          AREA 3  BETWEEN CONTROL LINE AND TRAILING EDGE
C          AREA 2 DOES NOT EXIST IF THERE IS ONLY ONE CONTROL LINE
C          NOTE THAT ELEMENT IS NUMBERED CLOCKWISE WHILE SECT IS COUNTER
C
C          DXLE     X INCREMENT A LONG LEADING EDGE
C          DXTE     X INCREMENT ALONG TRAILING EDGE
C          DXC1     X INCREMENT ALONG FIRST CONTROL LINE (LEADING C.LINE)
C          DXC2     X INCREMENT ALONG SECOND CONTROL LINE IF IT EXISTS
C          DC1,2,3 CHORD LENGTH IN AREAS 1, 2, AND 3
C          NC1,2,3 NUMBER OF CORD DIVISIONS IN AREA 1, 2, AND 3
C          DX34   DISTANCE BETWEEN POINTS THREE AND FOUR
C          DX22   DISTANCE BETWEEN 1 AND 2  MINUS DX34
C
C
C          TRANSFORM CORNER POINTS TO LOCAL SYSTEM, WORK IN LOCAL SYSTEM
C
      CALL TRANS( CORNX, CORNY, CORNZ, TRS, X, Y, Z )
```

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```
C
C          FIND CRATIO  (CHORD TO SPAN RATIO)
C
      DC = Y3 - Y1
      DS = (X3 - X1)*BEETA
      CRATIO = ( EARO*SQRT( DS*DS & DC*DC) ) / (DC*BEETA)
C
C     ASSUME CONSTANT SLOPE FOR ALL LINES
C
      DX34 = X4 - X3
      DX22 = X2 - X1 - DX34
      DS = (Y3-Y1)/NSP
      DC = CRATIO*DS
      DXLE = (X3-X1)/NSP
      DXTE = (X4-X2)/NSP
C
C          FIND INFORMATION FOR AREA BETWEEN LEADING EDGE AND 1ST C.LINE
C
      CL1 = CL(1)
      CL2 = CL(2)
      DXC1 = (CL2-CL1)/NSP
      NC1 = 1
      DC1= AMAX1( CL1-X1,CL2-X3 )
      IF( DC1 .LT. DC ) GO TO 11
      NC1 = DC1/DC
      DC1 = DC1/NC1
   11 CONTINUE
C
C          FIND INFO FOR AREA BETWEEN CONTROL LINES
C
      NC2 = 0
      IF( ICL .EQ. 1 ) GO TO 14
C
      CL3 = CL(3)
      CL4 = CL(4)
      DXC2 = (CL4-CL3)/NSP
C         FIND DC3 FOR AREA BETWEEN SECOND CONTROL LINE AND TRAILINGEDGE
      DC3= AMAX1( X2-CL3, X4-CL4 )
      NC2 = 1
      DC2= AMAX1( CL3-CL1, CL4-CL2 )
      IF( DC2 .LT. DC ) GO TO 16
      NC2 = DC2/DC
      DC2 = DC2/NC2
      GO TO 16
C
C
   14 CONTINUE
C         FIND DC3 FOR AREA BETWEEN FIRST CONTROL LINE AND TRAILING EDGE
      DC3= AMAX1( X2-CL1, X4-CL2 )
C
   16 CONTINUE
C
      NC3 = 1
      IF( DC3 .LT. DC ) GO TO 18
      NC3 = DC3/DC
      DC3 = DC3/NC3
   18 CONTINUE
C
C     ------------------------------------------------------------------
C
C          LOOP ON SPANS
      NE = 0
```

```
LINE 119  C                                                                    01801190
LINE 120        DO  100  I=1,NSP                                               01801200
LINE 121  C                                                                    01801210
LINE 122  C           FIND THE Y COORD. FOR THIS SPAN  (AY AND BY )            01801220
LINE 123        BY = Y1 & I*DS                                                 01801230
LINE 124        AY = BY - DS                                                   01801240
LINE 125  C           FIND AX,BX, X COORD ON LEADING EDGE ON BOTH SIDES OF SPAN 01801250
LINE 126        BX = X1 & I*DXLE                                               01801260
LINE 127        AX = BX - DXLE                                                 01801270
LINE 128        SW(I) = DS                                                     01801280
LINE 129        XLE(I) = 0.5*(AX&BX)                                           01801290
LINE 130  C           FIND CX,DX THE  X COOR ON TRAILING EDGE                  01801300
LINE 131        CX = X2 & I*DXTE                                               01801310
LINE 132        DX = CX - DXTE                                                 01801320
LINE 133  C           FIND  ACL1, BCL1 X COORD ON FIRST CONTROL LINE           01801330
LINE 134        BCL1 = CL1 & I*DXC1                                            01801340
LINE 135        ACL1 = BCL1 - DXC1                                             01801350
LINE 136  C                                                                    01801360
LINE 137        TD1 = DTEST*DC1                                                01801370
LINE 138        TC1 = BCL1 - TD1                                               01801380
LINE 139        TD1 = ACL1 - TD1                                               01801390
LINE 140  C                                                                    01801400
LINE 141        DXM = DTEST*DC3                                                01801410
LINE 142        CXM = CX - DXM                                                 01801420
LINE 143        DXM = DX - DXM                                                 01801430
LINE 144  C                                                                    01801440
LINE 145  C           LOOP ON NC1 FOR AREA 1                                   01801450
LINE 146        DO 20  J1 = 1,NC1                                              01801460
LINE 147  C                                                                    01801470
LINE 148        NJ = 6*NE                                                      01801480
LINE 149        NE=NE&1                                                        01801490
LINE 150        XYZ(NJ&5)=AY                                                   01801500
LINE 151        XYZ(NJ&6)=BY                                                   01801510
LINE 152        XD = J1*DC1                                                    01801520
LINE 153        XC = BX & XD                                                   01801530
LINE 154        XD = AX & XD                                                   01801540
LINE 155        XA = XD - DC1                                                  01801550
LINE 156        XB = XC - DC1                                                  01801560
LINE 157        XYZ(NJ&1)=XA                                                   01801570
LINE 158        XYZ(NJ&2)=XB                                                   01801580
LINE 159        XYZ(NJ&3)=XC                                                   01801590
LINE 160        XYZ(NJ&4)=XD                                                   01801600
LINE 161  C           CHECK TO SEE IF WE HAVE REACHED THE FIRST CONTROL LINE   01801610
LINE 162        IF( XC .GT. BCL1  .OR.  XD  .GT. ACL1 ) GO TO 19               01801620
LINE 163        GO TO 20                                                       01801630
LINE 164   19   CONTINUE                                                       01801640
LINE 165        XYZ(NJ&3) = BCL1                                               01801650
LINE 166        XYZ(NJ&4) = ACL1                                               01801660
LINE 167        GO TO 25                                                       01801670
LINE 168  C                                                                    01801680
LINE 169   20   CONTINUE                                                       01801690
LINE 170  C                                                                    01801700
LINE 171   25   CONTINUE                                                       01801710
LINE 172  C                                                                    01801720
LINE 173        IF( ICL .EQ. 1 ) GO TO 40                                      01801730
LINE 174  C                                                                    01801740
LINE 175  C           SECTION FOR AREA 2                                       01801750
LINE 176  C                                                                    01801760
LINE 177  C           FIND  ACL2, BCL2  X COORD ON SECOND CONTROL LINE         01801770
LINE 178        BCL2 = CL3 & I*DXC2                                            01801780
LINE 179        ACL2 = BCL2 - DXC2                                             01801790
LINE 180  C                                                                    01801800
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LINE 181          TD2 = DTEST*DC2                                          01801810
LINE 182          TC2 = BCL2 - TD2                                         01801820
LINE 183          TD2 = ACL2 - TD2                                         01801830
LINE 184   C                                                               01801840
LINE 185   C            LOOP ON NC2 FOR AREA 2                             01801850
LINE 186          DO 30 J1 = 1,NC2                                         01801860
LINE 187   C                                                               01801870
LINE 188          NJ = 6*NE                                                01801880
LINE 189          NE=NE&1                                                  01801890
LINE 190          XYZ(NJ&5)=AY                                             01801900
LINE 191          XYZ(NJ&6)=BY                                             01801910
LINE 192          XD = J1*DC2                                              01801920
LINE 193          XC = BCL1 & XD                                           01801930
LINE 194          XD = ACL1 & XD                                           01801940
LINE 195          XA = XD - DC2                                            01801950
LINE 196          XB = XC - DC2                                            01801960
LINE 197          XYZ(NJ&1)=XA                                             01801970
LINE 198          XYZ(NJ&2)=XB                                             01801980
LINE 199          XYZ(NJ&3)=XC                                             01801990
LINE 200          XYZ(NJ&4)=XD                                             01802000
LINE 201   C            CHECK TO SEE IF WE HAVE REACHED SECOND CONTROL LINE 01802010
LINE 202          IF( XC .GT. BCL2  .OR.  XD  .GT. ACL2 ) GO TO 29         01802020
LINE 203          GO TO 30                                                 01802030
LINE 204     29   CONTINUE                                                 01802040
LINE 205          XYZ(NJ&3) = BCL2                                         01802050
LINE 206          XYZ(NJ&4) = ACL2                                         01802060
LINE 207          GO TO 45                                                 01802070
LINE 208     30   CONTINUE                                                 01802080
LINE 209          GO TO 45                                                 01802090
LINE 210   C                                                               01802100
LINE 211     40   CONTINUE                                                 01802110
LINE 212   C            THIS SECTION IS REACHED IFF THERE WAS ONLY 1 CONTROL LINE 01802120
LINE 213   C            ACL1,BCL1 ARE PUT INTO ACL2,BCL2 AND AREA 3 IS ALWAYS TREATED01802130
LINE 214   C            AS THE PART BETWEEN 2ON CONTROL  LINE AND LEADING EDGE 01802140
LINE 215          ACL2 = ACL1                                              01802150
LINE 216          BCL2 = BCL1                                              01802160
LINE 217     45   CONTINUE                                                 01802170
LINE 218   C                                                               01802180
LINE 219   C            LOOP ON NC3 FOR AREA 3                             01802190
LINE 220   C                                                               01802200
LINE 221          DO 50 J1=1,NC3                                           01802210
LINE 222   C                                                               01802220
LINE 223          NJ = 6*NE                                                01802230
LINE 224          NE=NE&1                                                  01802240
LINE 225          XYZ(NJ&5)=AY                                             01802250
LINE 226          XYZ(NJ&6)=BY                                             01802260
LINE 227          XYZ(NJ&7)=BY                                             01802270
LINE 228          XYZ(NJ&8)=AY                                             01802280
LINE 229          XD = J1*DC3                                              01802290
LINE 230          XC = BCL2 & XD                                           01802300
LINE 231          XD = ACL2 & XD                                           01802310
LINE 232          XA = XD - DC3                                            01802320
LINE 233          XB = XC - DC3                                            01802330
LINE 234          XYZ(NJ&1)=XA                                             01802340
LINE 235          XYZ(NJ&2)=XB                                             01802350
LINE 236          XYZ(NJ&3)=XC                                             01802360
LINE 237          XYZ(NJ&4)=XD                                             01802370
LINE 238   C            CHECK TO SEE IF WE REACHED TRAILING EDGE (CX,DX)   01802380
LINE 239          IF( XC .GT. CX  .OR.  XD .GT. DX ) GO TO 49              01802390
LINE 240          GO TO 50                                                 01802400
LINE 241     49   CONTINUE                                                 01802410
LINE 242          XYZ(NJ&3)=CX                                             01802420
```

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```
LINE 243          XYZ(NJ&4)=DX                                          01802430
LINE 244          GO TO 60                                              01802440
LINE 245       50 CONTINUE                                              01802450
LINE 246    C                                                           01802460
LINE 247       60 CONTINUE                                              01802470
LINE 248          NNCH(I) = NE & NETSV                                  01802480
LINE 249    C                                                           01802490
LINE 250      100 CONTINUE                                              01802500
LINE 251    C                                                           01802510
LINE 252    C           UPDATE COUNTER OF TOTAL ELEMENTS FOR STRUCTURE 01802520
LINE 253          NETSV = NETSV & NE                                    01802530
LINE 254          RETURN                                                01802540
LINE 255          END                                                   01802550
```

DISPLAY...FILE DECK 19

```
LINE   1        SUBROUTINE  MFUN ( JMODE)                                          01900010
LINE   2        COMMON  / MODEF /  EM(10), DM(10), X, Y, J1, J2                    01900020
LINE   3        DIMENSION   CTABLE(6,20), IFTABL(2,20)                             01900030
LINE   4        COMMON /MCOM/  CTABLE, IFTABL, NTABL,NEQF                          01900040
LINE   5        DO  200   IH = 1, JMODE                                            01900050
LINE   6        EM(IH) = 0.0                                                       01900060
LINE   7        DM(IH) =0.0                                                        01900070
LINE   8        DO  100        I=1,NEQF                                            01900080
LINE   9        IFW =  IFTABL (1, I)                                               01900090
LINE  10        IFM =  IFTABL (2,I)                                                01900100
LINE  11        IF( (IFW.EQ. J1) .AND. ( IFM.EQ.IH) )   GO TO 90                   01900110
LINE  12        GO TO 100                                                          01900120
LINE  13   90   CO =  CTABLE ( 1 ,I )                                              01900130
LINE  14        CX =  CTABLE ( 2 ,I )                                              01900140
LINE  15        CY =  CTABLE ( 3 ,I )                                              01900150
LINE  16        CXY=  CTABLE ( 4 ,I )                                              01900160
LINE  17        CX2=  CTABLE ( 5 ,I )                                              01900170
LINE  18        CY2=  CTABLE ( 6 ,I )                                              01900180
LINE  19        EM(IH) =  CO & CX *X  &CY * Y & CXY* X * Y & CX2 *X**2 &CY2*Y**2   01900190
LINE  20        DM(IH) =  CX & CXY * Y  & 2.0 * CX2* X                             01900200
LINE  21        GO TO  200                                                         01900210
LINE  22   100  CONTINUE                                                           01900220
LINE  23   200  CONTINUE                                                           01900230
LINE  24        RETURN                                                             01900240
LINE  25        END                                                                01900250
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DISPLAY...FILE DECK 20

```
LINE   1        SUBROUTINE MXERR(IERR,MXNO,NOIN,I6)                                  02000010
LINE   2        WRITE (I6,700)                                                       02000020
LINE   3        IF(IERR .EQ. 610 ) WRITE(I6,710) MXNO, NOIN                          02000030
LINE   4        IF(IERR .EQ. 620 ) WRITE(I6,720) MXNO, NOIN                          02000040
LINE   5        IF(IERR .EQ. 630 ) WRITE(I6,730) MXNO, NOIN                          02000050
LINE   6        IF(IERR .EQ. 640 ) WRITE(I6,740) MXNO, NOIN                          02000060
LINE   7        IF(IERR .EQ. 650 ) WRITE(I6,750) MXNO, NOIN                          02000070
LINE   8        IF(IERR .EQ. 660 ) WRITE(I6,760) MXNO, NOIN                          02000080
LINE   9        IF(IERR .EQ. 670 ) WRITE(I6,770) MXNO, NOIN                          02000090
LINE  10        IF( IERR.EQ. 680)  WRITE(I6, 780) MXNO,NOIN                          02000100
LINE  11   700  FORMAT(1H0 ///8X,   42HERROR IN INPUT    MAXIMUM ALLOWED EXCEEDED)02000110
LINE  12   710  FORMAT(1H0 /  8X,   20HMAXIMUM NO. WINGS = 1I3,6X,          4H NO.02000120
LINE  13       1 ,9H INPUT = 1I3 )                                                   02000130
LINE  14   720  FORMAT(1H0 /  8X,30HMAXIMUM NO. SECTIONS / WING = 1I1, 6X,   4H NO.02000140
LINE  15       1 ,9H INPUT = 1I3 )                                                   02000150
LINE  16   730  FORMAT(1H0 /  8X,20HMAXIMUM NO. MODES =    1I3,6X,           4H NO.02000160
LINE  17       1 ,9H INPUT = 1I3 )                                                   02000170
LINE  18   740  FORMAT(1H0 /  8X,20HMAXIMUM NO. SPANS =    1I3,6X,           4H NO.02000180
LINE  19       1 ,9H INPUT = 1I3 )                                                   02000190
LINE  20   750  FORMAT(1H0 /  8X,28HMAXIMUM NO. CORNER POINTS = 1I1,6X,      4H NO.02000200
LINE  21       1 ,9H INPUT =  1I3  )                                                 02000210
LINE  22   760  FORMAT(1H0 /  8X,26HMAXIMUM NO. FREQUENCIES =  1I2,6X,       4H NO.02000220
LINE  23       1 ,9H INPUT = 1I3 )                                                   02000230
LINE  24   770  FORMAT(1H0 /  8X,30HMAXIMUM NO. ELEMENTS / SPAN = 1I2,6X,    4H NO.02000240
LINE  25       1 ,9H INPUT =  1I2  )                                                 02000250
LINE  26   780  FORMAT( 1H0, 8X,  36HMAXIMUM NO. POINTS ON SPLINE DATA = 1I3,6X,  02000260
LINE  27       1 4H NO., 9H INPUT = 1I3)                                             02000270
LINE  28        RETURN                                                               02000280
LINE  29        END                                                                  02000290

/END READ
```

END OF JOB.

39.6 SEC. USED .012 HRS. CHARGED 49.962 HRS. REMAINING

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DISPLAY...FILE DECK 21

```
LINE   1        SUBROUTINE OUTP1( MACH, FREQ, JMODE, JWING, NS, NSP, SW, DLSPAN,   02100010
LINE   2       1                  PMSPAN, XP,  INDXI, PRES, IPW, I6, LINE, LMAX,   02100020
LINE   3       1                  NNCH, NE, TITLE, PHIW, NSPT )                    02100030
LINE   4  C                                                                         02100040
LINE   5  C          MACH       MACH NUMBER                                         02100050
LINE   6  C          FREQ       FREQUENCY                                           02100060
LINE   7  C          JMODE      MODE NUMBER                                         02100070
LINE   8  C          JWING      WING NUMBER                                         02100080
LINE   9  C          NS         NUMBER OF SECTIONS IN JWING                         02100090
LINE  10  C          NSP        NUMBER OF SPANS IN EACH SECTION OF JWING (ARRAY)    02100100
LINE  11  C          DLSPAN     LIFT/UNIT SPAN FOR EACH SPAN OF JWING (ARRAY)       02100110
LINE  12  C          PMSPAN     PITCHING MOMENT/UNIT SPAN FOR EACH SPAN (ARRAY)     02100120
LINE  13  C          XP                                                              02100130
LINE  14  C          INDXI      ELEMENT NUMBER OF FIRS ELEMENT OF JWING             02100140
LINE  15  C          PRES       ELEMENT PRESSURES FOR JWING (ARRAY)                 02100150
LINE  16  C          IPW        PRINT  CONTROL FOR JWING                            02100160
LINE  17  C          IPW=1      LIFT AND PRESSURE MOMENTS/UNIT SPAN TO BE PRINTED   02100170
LINE  18  C          IPW=2      ELEMENT PRESSURES TO BE PRINTED                     02100180
LINE  19  C          IPW=3      BOTH OF THE ABOVE TO BE PRINTED                     02100190
LINE  20  C          IPW=0      NONE OF THE ABOVE TO BE PRINTED                     02100200
LINE  21  C          I6         LOGICAL UNIT NUMBER FOR OUTPUT DIVISE               02100210
LINE  22  C          SW         SPAN WIDTH (ARRAY)                                  02100220
LINE  23  C          LINE       CURRENT LINE ON OUTPUT PAGE                         02100230
LINE  24  C          LMAX       MAXIMUM LINE ON A PRINTED PAGE                      02100240
LINE  25  C          NNCH       ARRAY CONTAINING ELEMENT NUMBER OF THE LAST ELEMENT02100250
LINE  26  C                     OF EVERY SPAN IN THE COMPLETE STRUCTURE             02100260
LINE  27  C          NE         ARRAY CONTAINING THE NUMBER OF ELEMENTS IN EACH     02100270
LINE  28  C                     SECTION OF JWING.                                   02100280
LINE  29  C                                                                         02100290
LINE  30        REAL MACH.                                                          02100300
LINE  31        COMPLEX          DLSPAN(1), PMSPAN(1), PRES(1)                      02100310
LINE  32        COMPLEX  PHIW(1)                                                    02100320
LINE  33        DIMENSION NNCH(1), NE(1)                                            02100330
LINE  34        DIMENSION NSP(1), SW(1)                                             02100340
LINE  35        DIMENSION  TITLE(14)                                                02100350
LINE  36  C                                                                         02100360
LINE  37        DO 15  KSPCT = 1,NSPT                                               02100370
LINE  38        IF( NNCH(KSPCT) .GE. INDXI ) GO TO 17                               02100380
LINE  39   15   CONTINUE                                                            02100390
LINE  40   17   CONTINUE                                                            02100400
LINE  41  C                                                                         02100410
LINE  42        IF( LINE .NE. LMAX&1 ) GO TO 25                                     02100420
LINE  43        WRITE( I6, 2015 ) TITLE, FREQ                                       02100430
LINE  44        LINE = 6                                                            02100440
LINE  45  C                                                                         02100450
LINE  46   25   CONTINUE                                                            02100460
LINE  47  C                                                                         02100470
LINE  48        IF( IPW .EQ. 2 ) GO TO 123                                          02100480
LINE  49  C                                                                         02100490
LINE  50  C          WRITE LIFT AND PRESSURE MOMENT TABLE                           02100500
LINE  51  C     ------------------------------------------------------------------02100510
LINE  52  C                                                                         02100520
LINE  53        IF(  LMAX - LINE .GT. 14 ) GO TO 30                                 02100530
LINE  54        WRITE( I6, 2020 )                                                   02100540
LINE  55        LINE = 7                                                            02100550
LINE  56        GO TO 35                                                            02100560
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LINE  57   30   CONTINUE                                                    02100570
LINE  58        WRITE( 16, 2021 )                                           02100580
LINE  59        LINE = LINE & 12                                            02100590
LINE  60   35   CONTINUE                                                    02100600
LINE  61        WRITE( 16, 2001 ) JWING                                     02100610
LINE  62  C                                                                 02100620
LINE  63        K = 1                                                       02100630
LINE  64        ISPCT = KSPCT                                               02100640
LINE  65        WRITE( 16, 2002 )JMODE, FREQ, MACH                          02100650
LINE  66        WRITE( 16, 2003 ) XP                                        02100660
LINE  67  C          LOOP ON SECTIONS                                       02100670
LINE  68        DO 120  ISECT=1,NS                                          02100680
LINE  69        NSPAN = NSP(ISECT)                                          02100690
LINE  70  C          LOOP ON SPANS OF SECTION                               02100700
LINE  71        DO 115  ISPAN=1,NSPAN                                       02100710
LINE  72        WRITE(16,2004) ISECT,ISPAN,SW(ISPCT),DLSPAN(ISPCT),PMSPAN(ISPCT)  02100720
LINE  73        ISPCT = ISPCT & 1                                           02100730
LINE  74        K = K & 1                                                   02100740
LINE  75   115  CONTINUE                                                    02100750
LINE  76        LINE = LINE & NSPAN                                         02100760
LINE  77   120  CONTINUE                                                    02100770
LINE  78  C                                                                 02100780
LINE  79        LINE = MOD(LINE,LMAX)                                       02100790
LINE  80  C                                                                 02100800
LINE  81   123  CONTINUE                                                    02100810
LINE  82        IF( IPW .EQ. 1 ) RETURN                                     02100820
LINE  83  C                                                                 02100830
LINE  84  C          WRITE ELEMENT PRESSURE TABLE                           02100840
LINE  85  C     ------------------------------------------------------------02100850
LINE  86  C                                                                 02100860
LINE  87  C          CALCULATE THE NUMBER OF ELEMENTS IN JWING  'NEWJ'      02100870
LINE  88        NEWJ = 0                                                    02100880
LINE  89        DO 125 I=1,NS                                               02100890
LINE  90   125  NEWJ = NEWJ & NE(I)                                         02100900
LINE  91        INDXR = INDXI & NEWJ - 1                                    02100910
LINE  92  C                                                                 02100920
LINE  93        IF( LMAX - LINE  .GT.  14 ) GO TO 130                       02100930
LINE  94        WRITE( 16, 2020 )                                           02100940
LINE  95        LINE = 7                                                    02100950
LINE  96        GO TO 135                                                   02100960
LINE  97   130  CONTINUE                                                    02100970
LINE  98        WRITE( 16, 2021 )                                           02100980
LINE  99        LINE = LINE & 12                                            02100990
LINE 100   135  CONTINUE                                                    02101000
LINE 101        WRITE( 16, 2005 ) JWING                                     02101010
LINE 102  C                                                                 02101020
LINE 103        WRITE( 16, 2002 )JMODE, FREQ, MACH                          02101030
LINE 104        WRITE( 16, 2009 )                                           02101040
LINE 105        INDXR = INDXI                                               02101050
LINE 106        ISPCT = KSPCT                                               02101060
LINE 107  C          LOOP ON SECTIONS                                       02101070
LINE 108        DO 220  ISECT=1,NS                                          02101080
LINE 109        NSPAN = NSP(ISECT)                                          02101090
LINE 110  C          LOOP ON SPANS OF SECTION                               02101100
LINE 111        DO 215  ISPAN=1,NSPAN                                       02101110
LINE 112        NEPS = NNCH(ISPCT)- INDXR & 1                               02101120
LINE 113        DO 210 IEL = 1,NEPS                                         02101130
LINE 114        WRITE( 16, 2010 ) ISECT, ISPAN, INDXR, PHIW(INDXR), PRES(INDXR)  02101140
LINE 115        INDXR = INDXR & 1                                           02101150
LINE 116   210  CONTINUE                                                    02101160
LINE 117        ISPCT = ISPCT & 1                                           02101170
LINE 118   215  CONTINUE                                                    02101180
```

```
LINE 119   220  CONTINUE                                                          02101190
LINE 120  C                                                                       02101200
LINE 121        LINE = LINE & NEWJ                                                02101210
LINE 122        LINE = NEWJ/3 & LINE                                              02101220
LINE 123        IF( MOD(NEWJ,3) .GT. 0 ) LINE=LINE&1                              02101230
LINE 124        LINE = MOD( LINE, LMAX )                                          02101240
LINE 125  C                                                                       02101250
LINE 126        RETURN                                                            02101260
LINE 127   2001 FORMAT(       46X, 47HLIFT AND PITCHING MOMENT PER UNIT SPAN FOR W102101270
LINE 128       1NG, I2  )                                                         02101280
LINE 129   2002 FORMAT( 1H&,5X, 11HMODE NUMBER, I3 / 6X, 11HFREQUENCY =, F7.4,    02101290
LINE 130       1  22X, 13HMACH NUMBER =, F7.4 / )                                 02101300
LINE 131   2003 FORMAT( 5X, 31H SECTION   SPAN      SPAN WIDTH,                   02101310
LINE 132       1    8X,      27H--- LIFT PER UNIT SPAN ----,                      02101320
LINE 133       2 7X, 38HPITCHING MOMENT PER UNIT SPAN ABOUT X=,  E12.6 / )        02101330
LINE 134   2004 FORMAT((6X, 2I7, 5X, E12.6, 2( 7X, E12.6, 3X, E12.6, 4X )  ) )    02101340
LINE 135   2005 FORMAT( 46X,50HVELOCITY POTENTIALS AND ELEMENT PRESSURES FOR WING,02101350
LINE 136       1    I2 )                                                          02101360
LINE 137   2007 FORMAT(      3(6X,7HELEMENT,3X,8(1H-),10H PRESSURE ,9(1H-)    ) / ) 02101370
LINE 138   2008 FORMAT(          3( 6X, I7, 3X, E12.6 , 3X, E12.6      )    )    02101380
LINE 139   2009 FORMAT(6X, 27HSECTION   SPAN      ELEMENT,  11X,                  02101390
LINE 140       1 27H--- VELOCITY POTENTIAL ----, 11X, 8(1H-), 10H PRESSURE ,      02101400
LINE 141       2    9(1H-) / )                                                    02101410
LINE 142   2010 FORMAT( 6X, 2I7, I13,  2( 11X, E12.6 , 3X, E12.6 )  )             02101420
LINE 143   2015 FORMAT( 1H1, 45X, 14A4 // 46X,11HFREQUENCY =, F7.4//1X, 65(2H &) )02101430
LINE 144   2020 FORMAT( 1H1 )                                                     02101440
LINE 145   2021 FORMAT(  / / / / / /  )                                           02101450
LINE 146        END                                                               02101460
```

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```
LINE   1          SUBROUTINE OUTP2( I6,NWING,XP,TL,TM,JMODE,FREQ,MACH,LINE,LMAX )
LINE   2          COMPLEX TL(4,10), TM(4,10)
LINE   3          REAL MACH
LINE   4   C            TL          TOTAL LIFT PER WING
LINE   5   C            TM          TOTAL MOMENT PER WING
LINE   6   C
LINE   7   C
LINE   8   C            WRITE TABLE OF TOTAL LIFT AND PITCHING MOMENTS
LINE   9   C
LINE  10          IF(  LMAX - LINE .GT. 14 ) GO TO 30
LINE  11          WRITE( I6, 2020 )
LINE  12          LINE = 7
LINE  13          GO TO 35
LINE  14     30   CONTINUE
LINE  15          WRITE( I6, 2021 )
LINE  16          LINE = LINE & 12
LINE  17     35   CONTINUE
LINE  18          WRITE( I6, 2008 )
LINE  19          WRITE( I6, 2002 )      FREQ, MACH
LINE  20          WRITE( I6, 2011 )  XP
LINE  21   C
LINE  22          DO 50 I=1,JMODE
LINE  23          WRITE( I6,2009) (I,  J, TL(J,I), TM(J,I), J=1,NWING)
LINE  24     50   CONTINUE
LINE  25   C
LINE  26          LINE = LINE & NWING*JMODE
LINE  27          LINE = MOD( LINE, LMAX )
LINE  28   C
LINE  29          RETURN
LINE  30    2002 FORMAT( 6X, 11HFREQUENCY =, F7.4,
LINE  31        1  22X, 13HMACH NUMBER =, F7.4 / )
LINE  32    2008 FORMAT(     46X,31HTOTAL LIFT AND PITCHING MOMENTS   )
LINE  33    2009 FORMAT((15X,I4,6X, I4, 5X, 2( 3X, E12.6), 8X, 2( 3X, E12.6 )    ) )
LINE  34    2011 FORMAT(      15X, 4HMODE, 6X,
LINE  35        1  4HWING, 8X, 10(1H-),6H LIFT , 11(1H-), 8X, 25HPICHING MOMENT AB
LINE  36        1UT X = ,E12.6  / )
LINE  37    2020 FORMAT( 1H1 )
LINE  38    2021 FORMAT(  / / / / / /  )
LINE  39          END
```

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```
LINE   1          SUBROUTINE OUTP3( I6, MACH, FREQ, JMODE, Q, LINE, LMAX, TITLE )   02300010
LINE   2          COMPLEX Q(10,10)                                                  02300020
LINE   3          COMPLEX ROW(3)                                                    02300030
LINE   4          REAL MACH                                                         02300040
LINE   5          DIMENSION NST(3)                                                  02300050
LINE   6          DIMENSION  TITLE(14)                                              02300060
LINE   7  C                                                                         02300070
LINE   8  C            WRITE TABLE PRINT OF GENERALIZED AERODYNAMIC COEFFIC. MATRIX 02300080
LINE   9  C                                                                         02300090
LINE  10          IF( LINE .NE. LMAX&1 ) GO TO 25                                   02300100
LINE  11          WRITE( I6, 2015 ) TITLE, FREQ                                     02300110
LINE  12          LINE = 6                                                          02300120
LINE  13          GO TO 30                                                          02300130
LINE  14  C                                                                         02300140
LINE  15   25     CONTINUE                                                          02300150
LINE  16          IF( LMAX - LINE .GE. 13&JMODE ) GO TO 30                          02300160
LINE  17          WRITE( I6, 2020 )                                                 02300170
LINE  18          LINE = 8                                                          02300180
LINE  19          GO TO 35                                                          02300190
LINE  20   30     CONTINUE                                                          02300200
LINE  21          LINE = LINE & 13                                                  02300210
LINE  22          WRITE( I6, 2021 )                                                 02300220
LINE  23   35     CONTINUE                                                          02300230
LINE  24          WRITE( I6, 2010 ) FREQ, JMODE, MACH                               02300240
LINE  25  C                                                                         02300250
LINE  26          NCL = 3                                                           02300260
LINE  27          DO 100  J=1,JMODE,3                                               02300270
LINE  28          KK = JMODE - J & 1                                                02300280
LINE  29          IF( KK .LT. 3 ) NCL = KK                                          02300290
LINE  30          DO  50  K=1,NCL                                                   02300300
LINE  31          KO = K & J - 1                                                    02300310
LINE  32   50     NST(K) = KO                                                       02300320
LINE  33          IF( J .EQ. 1 ) GO TO 65                                           02300330
LINE  34          IF( LMAX - LINE .GE. 5&JMODE ) GO TO 60                           02300340
LINE  35          WRITE( I6, 2020 )                                                 02300350
LINE  36          LINE = 6                                                          02300360
LINE  37          GO TO 65                                                          02300370
LINE  38    60    CONTINUE                                                          02300380
LINE  39          WRITE( I6, 2022 )                                                 02300390
LINE  40          LINE = LINE & 5                                                   02300400
LINE  41    65    CONTINUE                                                          02300410
LINE  42          WRITE( I6, 2011 )   NST(1)                                        02300420
LINE  43          IF( NCL .GE. 2  ) WRITE( I6, 2023 ) NST(2)                        02300430
LINE  44          IF( NCL .EQ. 3  ) WRITE( I6, 2024 ) NST(3)                        02300440
LINE  45          WRITE( I6, 2022 )                                                 02300450
LINE  46          DO 90  I=1,JMODE                                                  02300460
LINE  47          DO 80  K=1,NCL                                                    02300470
LINE  48          KO = K & J - 1                                                    02300480
LINE  49    80    ROW(K) = Q(I,KO)                                                  02300490
LINE  50    90    WRITE( I6, 2012 )    I, ( ROW(K), K=1,NCL )                       02300500
LINE  51          LINE = LINE & JMODE                                               02300510
LINE  52          LINE = MOD( LINE,LMAX )                                           02300520
LINE  53   100    CONTINUE                                                          02300530
LINE  54          RETURN                                                            02300540
LINE  55   2010   FORMAT( 10X, 11HFREQUENCY =, F7.4,  18X,                          02300550
LINE  56        1 56HGENERALIZED AERODYNAMIC COEFFICIENTS IN AGARD DEFINITION  /    02300560
```

```
LINE  57        2 10X,I3,6H MODES, 27X, 13HMACH NUMBER =, F7.4  )                  02300570
LINE  58    2011 FORMAT( / 10X, 12HDISPLACEMENT /  13X, 4HMODE, 8X,                02300580
LINE  59         1    18H---- PRESSURE MODE, I3, 5H ---- )                         02300590
LINE  60    2012 FORMAT( 19X, I3, 3( 8X, E12.6, 2X, E12.6 )  )                     02300600
LINE  61    2015 FORMAT( 1H1, 45X, 14A4 // 46X,11HFREQUENCY =, F7.4//1X, 65(2H &) )02300610
LINE  62    2020 FORMAT( 1H1 )                                                     02300620
LINE  63    2021 FORMAT(  / / / / / /  )                                           02300630
LINE  64    2022 FORMAT(    )                                                      02300640
LINE  65    2023 FORMAT( 1H&, 63X, 18H---- PPESSURE MODE, I3, 5H ---- )            02300650
LINE  66    2024 FORMAT( 1H&, 97X, 18H---- PRESSURE MODE, I3, 5H ---- )            02300660
LINE  67         END                                                               02300670
```

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```
LINE   1        SUBROUTINE PHIL (XLE, XCEN,DPDX,NEPS, PHI, A,CXP, PHIW )
LINE   2        COMPLEX  B1,  B0,  AA, XI, XIP1, EX
LINE   3        COMPLEX C1, CX, XDIFS
LINE   4        COMPLEX EAXI, EAXIP1, AXI, AXIP1, SUM
LINE   5        COMPLEX PHI(1), DPDX(1), A, CXP(1)
LINE   6        COMPLEX   PHIW(1)
LINE   7        LOGICAL  WAKE1, WAKE, WAKENZ, TREDGE
LINE   8        DIMENSION XCEN(1)
LINE   9        COMMON/WAKE/  ITWM, ITW,ICNVGW,EPSW,JCNVGW
LINE  10        COMMON /WAKEUP/ WTES(12),TREDGE, WAKE1,WAKE, WAKENZ
LINE  11        DATA C1          / (1.0, 0.0) /
LINE  12  C
LINE  13        IF( NEPS .EQ. 1 ) GO TO 40
LINE  14  C
LINE  15        XIP1 = CMPLX( XCEN(2), 0.0 )
LINE  16        CX = CMPLX( (XCEN(1)-XCEN(2)), 0.0 )
LINE  17        B1 = ( DPDX(1) - DPDX(2) ) /CX
LINE  18        B0 = DPDX(2) - B1*XIP1
LINE  19        IF( CABS(A)  .LT. 1.0E-20 ) GO TO 20
LINE  20  C
LINE  21  C
LINE  22        XI = CMPLX( XLE, 0.0 )
LINE  23        XIP1 = CMPLX( XCEN(1), 0.0 )
LINE  24        AA = A * A
LINE  25        AXI = A*XI
LINE  26        AXIP1 = A*XIP1
LINE  27        EAXI = CEXP( AXI )
LINE  28        EAXIP1 = CXP(1)
LINE  29        EX = C1 / EAXIP1
LINE  30  C
LINE  31        SUM      =          (B1/AA)*( (AXIP1-C1)*EAXIP1 - (AXI-C1)*EAXI )
LINE  32       1                   & (B0/A)*( EAXIP1  - EAXI )
LINE  33  C
LINE  34        PHI(1) = SUM*EX
LINE  35  C
LINE  36  C
LINE  37        XI = XIP1
LINE  38        DO 10  IP1=2,NEPS
LINE  39        I = IP1 - 1
LINE  40        XIP1 = CMPLX( XCEN(IP1), 0.0 )
LINE  41        CX = CMPLX( (XCEN(I)-XCEN(IP1)), 0.0 )
LINE  42        B1 = ( DPDX(I) - DPDX(IP1) ) / CX
LINE  43        B0 = DPDX(IP1) - B1*XIP1
LINE  44  C
LINE  45        XI = XIP1
LINE  46        AXI = AXIP1
LINE  47        EAXI = EAXIP1
LINE  48        AXIP1 = A*XIP1
LINE  49        EAXIP1 = CXP(IP1)
LINE  50        EX = C1 / EAXIP1
LINE  51  C
LINE  52        SUM      = SUM    &(B1/AA)*( (AXIP1-C1)*EAXIP1 - (AXI-C1)*EAXI )
LINE  53       1                   & (B0/A)*( EAXIP1  - EAXI )
LINE  54  C
LINE  55        PHI(IP1) = SUM*EX
LINE  56  C
```

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```
   10 CONTINUE
C
      GO TO 52
   20 CONTINUE
      CX = CMPLX( (XLE-XCEN(1)), 0.0 )
      XDIFS = CMPLX( 0.5*(XLE*XLE-XCEN(1)*XCEN(1)), 0.0 )
      SUM = B0*CX & B1*XDIFS
      PHI(1) = SUM
      DO 30  IP1=2,NEPS
      I = IP1 - 1
      CX = CMPLX( (XCEN(I)-XCEN(IP1)), 0.0 )
      B1 = ( DPDX(I) - DPDX(IP1) ) / CX
      B0 = DPDX(IP1) - B1*XIP1
      XDIFS = CMPLX( 0.5*(XCEN(I)*XCEN(I)-XCEN(IP1)*XCEN(IP1)), 0.0 )
      SUM = SUM & B0*CX & B1*XDIFS
      PHI(IP1) = SUM
   30 CONTINUE
      GO TO 52
C
   40 CONTINUE
C
C           SECTION FOR ONLY ONE ELEMENT PER SPAN
C
       CX = CMPLX( XCEN(1)-XLE, 0.0 )
      IF( CABS(A) .LT. 1.0E-20 ) GO TO 50
      PHI(1) = (DPDX(1)/A)*( C1 - CEXP( -A*CX ) )
      GO TO 52
   50 PHI(1) =  DPDX(1)*CX
   52 ICNVGW  = 0
C     INITIALIZE  ICNVGW ==0
C     ICNVGW =1 MEANS AT LEAST ONE PHI HAS NOT CONVERGED FOR SPAN
C     ICNVGW=0 MEANS CONVERGENCE HAS OCCURED FOR WAKE ELEMENTS
C     ITW =     WAKE CONVG.  ITERATION COUNTER  INITIALLY SET =0
C     ITWM = MAX. NO. ITERATIONS IF WAKE EFFECT IS DESIRED
C     ITWM = 0 IF WAKE ELEMENT EFFECT IS NOT DESIRED
      IF(ITW .EQ.0)      GO TO 58
      IF( .NOT. WAKE)    GO TO 58
      ICNVGW = IRELE( PHI, PHIW,NEPS)
      IF(ICNVGW .EQ.0 )  JCNVGW = JCNVGW & NEPS
   58 CONTINUE
      DO 60   IP1=1,NEPS
C     IF(ITW .EQ.0)      GO TO 60
C     IF( .NOT. WAKE)    GO TO 60
C     ICNVGW =IRELE(PHI(IP1), PHIW(IP1), ICNVGW )
C     IF( ICNVGW .EQ. 0 ) JCNVGW = JCNVGW & 1
   60 PHIW(IP1) = PHI(IP1)
   62 RETURN
      END
```

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```
LINE   1        SUBROUTINE PLOT(X,Y,IPEN)                          02500010
LINE   2        IF( IPEN .EQ. -23) GO TO 100                       02500020
LINE   3        IF( IPEN .EQ. 23) IPEN = -3                        02500030
LINE   4        CALL CALPLT( X,Y, IPEN)                            02500040
LINE   5        RETURN                                             02500050
LINE   6    100 SX = X & 2.0                                       02500060
LINE   7        CALL NFRAME(SX,Y)                                  02500070
LINE   8        RETURN                                             02500080
LINE   9        END                                                02500090
```

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```
LINE   1          SUBROUTINE PLOTGD ( NE, XYZ, NNCH, NSP, NSECT, TITLE, JWING,      02600010
LINE   2         1                        ZSECT, AR, MACH )                         02600020
LINE   3          REAL MACH                                                          02600030
LINE   4          DIMENSION  NE(1), ZSECT(1), NSP(1)                                 02600040
LINE   5          DIMENSION PH(7), PV(7)                                             02600050
LINE   6          DIMENSION XYZ(1), NNCH(1), TITLE(1)                                02600060
LINE   7          DATA  FGDX, FGDY  /  15.0, 10.0  /                                 02600070
LINE   8          DATA HT, HTW, HHT  /  .07, .06202, .035  /                         02600080
LINE   9          DATA  NETSV  / 1 /                                                 02600090
LINE  10   C                                                                         02600100
LINE  11   C                                                                         02600110
LINE  12          IF( JWING .EQ. 1 ) NETSV = 1                                       02600120
LINE  13          NEPWT = 0                                                          02600130
LINE  14          KINDEX = 1                                                         02600140
LINE  15          KFIRST = 1                                                         02600150
LINE  16          KLAST = 0                                                          02600160
LINE  17   C                                                                         02600170
LINE  18          DO 100  IS=1,NSECT                                                 02600180
LINE  19   C                                                                         02600190
LINE  20          NEPS = NE(IS)                                                      02600200
LINE  21          K = KINDEX                                                         02600210
LINE  22          XMAX = XYZ(K)                                                      02600220
LINE  23          XMIN = XMAX                                                        02600230
LINE  24          YMAX = XYZ(K&4)                                                    02600240
LINE  25          YMIN = YMAX                                                        02600250
LINE  26          DO 10  I=1,NEPS                                                    02600260
LINE  27          DO 3  J = 1,4                                                      02600270
LINE  28          XMIN = AMIN1( XMIN, XYZ(K) )                                       02600280
LINE  29          XMAX = AMAX1( XMAX, XYZ(K) )                                       02600290
LINE  30     3    K = K & 1.                                                         02600300
LINE  31          DO 6  J=1,2                                                        02600310
LINE  32          YMIN = AMIN1( YMIN, XYZ(K) )                                       02600320
LINE  33          YMAX = AMAX1( YMAX, XYZ(K) )                                       02600330
LINE  34     6    K = K & 1                                                          02600340
LINE  35    10    CONTINUE                                                           02600350
LINE  36   C          FGDX =  MAXIMUN X PLOT SIZE                                   02600360
LINE  37   C          FGDY  = MAXIMUM Y  PLOT SIZE                                  02600370
LINE  38          SFH = (XMAX-XMIN)/FGDX                                             02600380
LINE  39          SFV = (YMAX-YMIN)/FGDY                                             02600390
LINE  40   C          SF   IS A SCALE FACTOR SUCH THAT 1 INCH = SF                   02600400
LINE  41          SF = AMAX1( SFH,SFV )                                              02600410
LINE  42   C          TMXX  AND  TMYY  ARE THE ACTUAL DIMENSION OF THE PLOT          02600420
LINE  43          TMXX = (XMAX-XMIN)/SF                                              02600430
LINE  44          TMYY = (YMAX-YMIN)/SF                                              02600440
LINE  45          PH(6) = XMIN                                                       02600450
LINE  46          PH(7) = SF                                                         02600460
LINE  47          PV(6) = YMIN                                                       02600470
LINE  48          PV(7) = SF                                                         02600480
LINE  49   C      WRITE(6,1002 )  XMAX, XMIN, YMAX, YMIN,                            02600490
LINE  50   C     1          SFH, SFV, TMXX, TMYY, SF                                02600500
LINE  51   C                                                                         02600510
LINE  52   C          DRAW LINE TO MARK ORIGINAL ORIGIN, LIFT PEN, AND REORIGIN      02600520
LINE  53   C                                                                         02600530
LINE  54          CALL PLOT( 0.25, 0.0, 2 )                                          02600540
LINE  55          CALL PLOT( 0.75, 0.0, 3 )                                          02600550
LINE  56          CALL PLOT( 2.0, 0.25, 23 )                                         02600560
```

```
C
C          SECTION TO PUT TITLE AND HEADING ON PLOT
C
      Y = 0.25
      DO 12  I=1,14
      CALL SYMBOL ( -1.5, Y, .21, TITLE(I), 90.0, 4 )
   12 Y = Y & 0.728
C
      CALL SYMBOL ( -1.15, .25, .21, 14HASPECT RATIO =, 90.0, 14 )
      CALL NUMBER ( -1.15, 2.98, .21, AR, 90.0,  3 )
      CALL SYMBOL ( -1.15, 4.7, .21,  13HMACH NUMBER =, 90.0, 13 )
      CALL NUMBER ( -1.15, 7.10, .21, MACH, 90.0, 3 )
      CALL SYMBOL ( -0.80, .25,  .21, 14HSECTION NUMBER, 90.0, 14 )
      FPN =FLOAT(IS)
      CALL NUMBER ( -0.80,  2.98, .21, FPN, 90.0, -1 )
      CALL SYMBOL ( -0.80, 3.52, .21,  7HOF WING,  90.0, 7 )
      FPN = FLOAT(JWING)
      CALL NUMBER ( -0.80, 4.97, .21, FPN, 90.0, -1 )
      CALL SYMBOL ( -0.80, 6.33, .21, 3HZ =, 90.0, 3 )
      FPN = ZSECT(IS)
      CALL NUMBER ( -0.80, 7.06, .21, FPN, 90.0, 3 )
C
C          SECTION TO PLOT ELEMENTS
C
      K = KINDEX
      DO 20  I=1,NEPS
      DO 19  J=1,4
      PH(J) = XYZ(K)
      IF( J .GT. 2 ) GO TO 19
      PV(J) = XYZ(K&4)
   19 K = K & 1
      PV(3) = XYZ(K&1)
      PV(4) = XYZ(K)
      K = K & 2
      PH(5) = PH(1)
      PV(5) = PV(1)
C     WRITE(6,1003 )  I, ( PH(IJ),IJ=1,5), (PV(IJ),IJ=1,5)
      CALL LINE( PH, PV, 5, 1, 0, 0, 0.0)
   20 CONTINUE
C
C          SECTION TO LABLE ELEMENTS ON THE TRAILING EDGE
C
      KLAST = NSP(IS) & KLAST
      DO 30 I=KFIRST,KLAST
C           NETSV IS THE NUMBER OF ELEMENTS IN THE PREVIOUS WINGS PLUS 1
      J = 6*(NNCH(I)-NETSV) & 1
      SFH = 0.25*( XYZ(J) & XYZ(J&1) &XYZ(J&2) & XYZ(J&3) )
      SFV = 0.50*( XYZ(J&4) & XYZ(J&5))
      SFH = (SFH-XMIN)/SF & HHT
      SFV = (SFV-YMIN)/SF - HTW
C         (SFH,SFV) ARE COORDINATES OF CENTER OF ELEMENT
C         TO CENTER CHARACTER, MOVE OFF CENTER BY (HTW,HHT)
      GP =  FLOAT(  NNCH(I)  )
      CALL NUMBER( SFH, SFV, HT, GP, 90.0, -1 )
   30 CONTINUE
      KFIRST = KFIRST & NSP(IS)
C
C           SECTION TO REORIGIN FOR NEXT PLOT AND BUMP BLOCK ADDRESS BY 1
C
      SX = TMXX & 3.0
      SX = AMAX1( SX, 17. )
      CALL PLOT( SX, -.25,-23 )
```

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```
LINE 119  C                                                                    02601190
LINE 120  C           UPDATE COUNTER OF ELEMENTS IN WING                       02601200
LINE 121        NEPWT = NEPWT & NEPS                                           02601210
LINE 122        KINDEX = KINDEX & 6*NEPS                                       02601220
LINE 123  C                                                                    02601230
LINE 124  C          END LOOP ON SECTIONS                                      02601240
LINE 125   100  CONTINUE                                                       02601250
LINE 126  C           UPDATE ELEMENT COUNTER                                   02601260
LINE 127  C           NETSV IS THE NUMBER OF ELEMENTS IN THE PREVIOUS WINGS PLUS 1 02601270
LINE 128        NETSV = NETSV & NEPWT                                          02601280
LINE 129  C                                                                    02601290
LINE 130        RETURN                                                         02601300
LINE 131  C1002 FORMAT( //  ' XMAX,XMIN', 2E14.4, 5X, 'YMAX,YMIN', 2E14.4 //   02601310
LINE 132  C     2                                  ' SFH ,SFV ', 2E14.4 //     02601320
LINE 133  C     3              ' TMXX,TMYY', 2E14.4, 5X, 'SF       ', 1E14.4 //  02601330
LINE 134  C     4/  ' PH FOLLOWED BY PV FOR EVERY ELEMENT '  /  )               02601340
LINE 135  C1003 FORMAT( //  I5, 2(/ 5X, 5E14.4 )  )                             02601350
LINE 136        END                                                            02601360
```

DISPLAY...FILE DECK 27

```
LINE   1        SUBROUTINE PTGRID( I6, TITLE, MACH, NWING, NSECT, NSP, NNCH, XYZ,  02700010
LINE   2       1                   ZSECT, REFLEN, BEETA, XCEN )                    02700020
LINE   3        REAL MACH                                                          02700030
LINE   4        DIMENSION NNCH(1), NSP(3,1)                                        02700040
LINE   5        DIMENSION TITLE(14), NSECT(1), XYZ(1), ZSECT(3,4)                  02700050
LINE   6        DIMENSION XCEN(1)                                                  02700060
LINE   7        DIMENSION XY(8)                                                    02700070
LINE   8        BL = BEETA*REFLEN                                                  02700080
LINE   9        WRITE( I6,3000 ) TITLE, MACH                                       02700090
LINE  10        WRITE( I6, 3003 )                                                  02700100
LINE  11        KSPAN = 0                                                          02700110
LINE  12        K = 0                                                              02700120
LINE  13        N1 = 1                                                             02700130
LINE  14        DO 100 J=1,NWING                                                   02700140
LINE  15        NS = NSECT(J)                                                      02700150
LINE  16        DO 95  I=1,NS                                                      02700160
LINE  17        WRITE( I6,3001) J, I, ZSECT(I,J)                                   02700170
LINE  18        NSPAN = NSP(I,J)                                                   02700180
LINE  19        DO 90 ISPAN =1,NSPAN                                               02700190
LINE  20        KSPAN = KSPAN & 1                                                  02700200
LINE  21        NEPS = NNCH(KSPAN) - K                                             02700210
LINE  22        DO 85 IE = 1,NEPS                                                  02700220
LINE  23        K = K & 1                                                          02700230
LINE  24        XY(7) = 0                                                          02700240
LINE  25        IN = N1                                                            02700250
LINE  26        DO  80  JJ = 1, 4                                                  02700260
LINE  27        XY(JJ) = XYZ(IN)*BL                                                02700270
LINE  28        XY(7)  = XY(7) & XY(JJ)                                            02700280
LINE  29        IN = IN & 1                                                        02700290
LINE  30     80 CONTINUE                                                           02700300
LINE  31        XY(7) = XY(7)/4.0                                                  02700310
LINE  32        XY(5) = XYZ(IN)*REFLEN                                             02700320
LINE  33        XY(6) = XYZ(IN&1)*REFLEN                                           02700330
LINE  34        XY(8) = 0.5*( XY(5) & XY(6) )                                      02700340
LINE  35        WRITE( I6, 3002 ) ISPAN, K, XY                                     02700350
LINE  36        XCEN(K) = XY(7)/BL                                                 02700360
LINE  37        N1 = N1 & 6                                                        02700370
LINE  38     85 CONTINUE                                                           02700380
LINE  39     90 CONTINUE                                                           02700390
LINE  40     95 CONTINUE                                                           02700400
LINE  41    100 CONTINUE                                                           02700410
LINE  42        RETURN                                                             02700420
LINE  43   3000 FORMAT(1H1/35X,14A4//35X, 32HAERODYNAMIC GRID FOR MACH NUMBER,     02700430
LINE  44       1  F8.4 / )                                                         02700440
LINE  45   3001 FORMAT( /  6H  WING, I2, 8H SECTION, I2 /  5H  Z =,2X,E11.5/       02700450
LINE  46       1       14H SPAN  ELEMENT, 4X, 2HX1, 12X, 2HX2, 12X, 2HX3, 12X,2HX4,02700460
LINE  47       2 12X, 2HY1, 12X, 2HY2, 13X, 2HXC, 12X, 2HYC / )                    02700470
LINE  48   3002 FORMAT( I5, I9, 1X, 6( 3X, E11.5), 4X, E11.5, 3X, E11.5 )          02700480
LINE  49   3003 FORMAT(  /                          35X,  30HSTRUCTURAL REFERENCE SYS02700490
LINE  50       1TEM OR  /  35X, 35HROTATED STRUCTURAL REFERENCE SYSTEM  /  )       02700500
LINE  51        END                                                                02700510
```

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```
LINE   1        SUBROUTINE  RDETA (  I13, DETADX, ETA, NET)          02800010
LINE   2        DIMENSION  DETADX(NET) , ETA(NET)                    02800020
LINE   3        READ (I13)                                           02800030
LINE   4       1     JM1,NET1, DETADX, ETA                           02800040
LINE   5        RETURN                                               02800050
LINE   6        END                                                  02800060
```

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DISPLAY...FILE DECK 29

```
LINE   1        SUBROUTINE RDMODE( JMODE, NWING, NSECT, NE, XCEN, XYZ, BEETA,      02900010
LINE   2       1  REFLEN,NET,LAB, ID,ERROR,ETA,DETADX,I5,I6, XF,YF,  A, NMX,IERR) 02900020
LINE   3        LOGICAL ERROR                                                      02900030
LINE   4  C            ETA AND DETADX DIMENSIONED   ( NUMBER OF ELEMENTS, NO. MODE)02900040
LINE   5        DIMENSION  CFTABL(6,20), IFTABL(2,20)                              02900050
LINE   6        DIMENSION  ETA(NET,1), DETADX(NET,1)                               02900060
LINE   7        DIMENSION ID(1)                                                    02900070
LINE   8        DIMENSION MODE(20)                                                 02900080
LINE   9        DIMENSION  MODEF4(6)                                               02900090
LINE  10        DIMENSION  NCHECK(4,3)                                             02900100
LINE  11        DIMENSION  NSECT(1), NE(3,1), XCEN(1), XYZ(1)                      02900110
LINE  12        DIMENSION  NUMBR(3), MODEF1(7), MODEF2(13), MODEF3(7)              02900120
LINE  13        DIMENSION  XF(1),YF(1),  A(1)                                      02900130
LINE  14        COMMON /MCOM/ CFTABL, IFTABL, NTABL, NEQF                          02900140
LINE  15        COMMON  / MODEF /  EM(10), DM(10), X, Y, J1, J2                    02900150
LINE  16        COMMON /XYSCAL / XX, YY, XO, YC, BREF, ZZZ, ITEST                  02900160
LINE  17        COMMON /ZFUNNY/ N,IERF, B1,B2, B3,NFUNMX                           02900170
LINE  18        DATA  LBLANK  / 4H     /                                           02900180
LINE  19        DATA  LEND / 3HEND   /                                             02900190
LINE  20        DATA LMW  / 4HMOWI  /                                              02900200
LINE  21        DATA  LRIG          /  4HRIGM /                                    02900210
LINE  22        DATA MODONE  / 2H ) /                                              02900220
LINE  23        DATA MODEF1 /  3H(//, 1H1, 4H(24X, 4H,4HM, 4HODE,, 4HI2,3, 3HX)) /02900230
LINE  24        DATA MODEF2 /  4H(10H, 4H   E, 4HLEME, 3HNT,, 1H1, 4H(10X, 4H,3HE,02900240
LINE  25       1      4HTA,9, 4HX,11, 4HHD(E, 4HTA)/, 4HDX  , 3H)/) /             02900250
LINE  26        DATA MODEF3 / 4H((I1, 2H0,, 1H1, 4H(3X,, 4H2E15, 4H.6)), 1H)  /   02900260
LINE  27        DATA MODEF4  / 4H(/ 2, 4HOX,I, 1H1, 4H,6H , 4HMODE, 2HS)  /       02900270
LINE  28        DATA  NCHECK  / 12*0   /                                           02900280
LINE  29        DATA NUMBR   /  1H1, 1H2, 1H3  /                                   02900290
LINE  30  C                                                                        02900300
LINE  31        XO    = 0.0                                                        02900310
LINE  32        YO    = 0.0                                                        02900320
LINE  33        BREF = 1.0                                                         02900330
LINE  34        JMODE = 0                                                          02900340
LINE  35        WRITE(I6,1999)  ID(1),ID(2),ID(3),ID(4)                            02900350
LINE  36        IF( ID(1) .EQ. 0 ) RETURN                                          02900360
LINE  37   1999 FORMAT    (// 21X,  18HTOTAL NUMBER MODES,21X,1I2/21X, 6HMODES ,   02900370
LINE  38       132HDEFINED BY SPLINE OR POLYNOMIAL  , 1X, 1I2/21X,  9HNUMBER OF ,  02900380
LINE  39       2        13H RIGID MODES ,17X, 1I2 / 21X,21HNUMBER OF POLYNOMIAL  ,  02900390
LINE  40       310HEQUATIONS  ,  8X, 1I2  ///)                                     02900400
LINE  41        JRIGID = ID(1)                                                     02900410
LINE  42        JTYPE = ID(4)                                                      02900420
LINE  43  C     RDMODE                                                             02900430
LINE  44        IF( LAB .EQ. LRIG  ) GO TO 215                                     02900440
LINE  45        JMODE = ID(2)                                                      02900450
LINE  46        BR = BEETA*REFLEN                                                  02900460
LINE  47        HALFR = 0.5*REFLEN                                                 02900470
LINE  48        IF( JMODE .GE. 10 ) MODEF4(3) = NUMBR(2)                           02900480
LINE  49        IF( JMODE .EQ. 1 )  MODEF4(6) = MODONE                             02900490
LINE  50  C                                                                        02900500
LINE  51        IF( JTYPE .EQ. 0 )  GO TO 10                                       02900510
LINE  52        WRITE( I6, 2001 )                                                  02900520
LINE  53        WRITE(6,2009)                                                      02900530
LINE  54        NEQF = JTYPE                                                       02900540
LINE  55        WRITE( I6, 400)  NEQF                                              02900550
LINE  56        DO  500          I=1,NEQF                                          02900560
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LINE  57          READ (I5, 405)     IEQ, IFTABL(1, IEQ) , IFTABL(2, IEQ),
LINE  58         1   (CFTABL( J, IEQ),  J=1, 6)
LINE  59          WRITE(I6, 410)     IEQ, (IFTABL( J, IEQ), J=1,2) ,(CFTABL(J,IEQ),
LINE  60         1    J =1,6 )
LINE  61     500 CONTINUE
LINE  62  C            LOOP OVER ELEMENTS BY WING SECTION
LINE  63          J = 5
LINE  64          I = 1
LINE  65          DO 600 J1=1,NWING
LINE  66          NS = NSECT(J1)
LINE  67          DO 395 J2=1,NS
LINE  68          IN1 = NE(J2,J1)
LINE  69          DO 390 K=1,IN1
LINE  70          X = XCEN(I)*BR
LINE  71          Y =      ( XYZ(J) & XYZ(J&1) ) * HALFR
LINE  72          CALL  MFUN ( JMODE)
LINE  73          DO 380 IH=1,JMODE
LINE  74          ETA(I,IH) = EM(IH)
LINE  75          DETADX(I,IH) = DM(IH)
LINE  76    380   CONTINUE
LINE  77          I = I & 1
LINE  78          J = J&6
LINE  79     390  CONTINUE
LINE  80     395  CONTINUE
LINE  81    600   CONTINUE
LINE  82          IN1 = 1
LINE  83          IN2 = NET
LINE  84          GO TO 132
LINE  85     10   CONTINUE
LINE  86  C            READ MDWING CARD
LINE  87  C
LINE  88          READ( I5, 1000) LAB, NW, NI1, NI2, NI3
LINE  89  C
LINE  90          IF( LAB .EQ. LEND ) GO TO 330
LINE  91          IF( LAB .NE. LMW )  GO TO  300
LINE  92  C
LINE  93  C            CHECK TO SEE IF SECTION IS DEFINED
LINE  94          IF( NW .GT. NWING ) GO TO 310
LINE  95  C
LINE  96  C            HOW MANY SECTIONS ARE DEFINED
LINE  97  C
LINE  98          NSI = 3
LINE  99          IF( NI3 .EQ. 0 ) NSI = 2
LINE 100          IF( NI2 .EQ. 0 ) NSI = 1
LINE 101          IF( NI1 .EQ. 0 ) GO TO 310
LINE 102  C           IF 2 SECTIONS ARE INPUT, THEY MUST BE CONTINJOUS
LINE 103  C
LINE 104          IF( NSI .EQ. 2  .AND. IABS(NI2-NI1) .NE. 1 ) GO TO 320
LINE 105  C
LINE 106  C            FIND FIRST AND LAST SECTION FOR THIS MODE GROUP
LINE 107  C
LINE 108          NSF = NI1
LINE 109          NSL = NI1
LINE 110          WRITE( I6, 2001 )
LINE 111          WRITE( I6, 2002 ) NW, NI1
LINE 112          IF( NSI .EQ. 1 ) GO TO 20
LINE 113          NSF = MINO( NSF,NI2 )
LINE 114          NSL = MAXO( NSL,NI2 )
LINE 115          WRITE( I6, 2002 ) NW, NI2
LINE 116          IF( NSI .EQ. 2 ) GO TO 20
LINE 117          NSF = MINO( NSF, NI3 )
LINE 118          NSL = MAXO( NSL, NI3 )
```

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LINE 119          WRITE( I6, 2002 ) NW, NI3                                    02901190
LINE 120    20    CONTINUE                                                     02901200
LINE 121   C                                                                   02901210
LINE 122   C            MORE CHECK TO SEE IF SECTION IS DEFINED                02901220
LINE 123          IF( NSL .GT. NSECT(NW) )GO TO 310                            02901230
LINE 124   C                                                                   02901240
LINE 125   C            FIND FIRST AND LAST ELEMENT NUMBERS, IN1, IN2          02901250
LINE 126   C                                                                   02901260
LINE 127          IN1 = 1                                                      02901270
LINE 128          IF( NW .EQ. 1 ) GO TO 30                                     02901280
LINE 129   C            FIND NUMBER OF ELEMENTS IN LOWER NUMBER WINGS          02901290
LINE 130          NWM1 = NW - 1                                                02901300
LINE 131          DO 25  J=1,NWM1                                              02901310
LINE 132          NS = NSECT(J)                                                02901320
LINE 133          DO 25  I=1,NS                                                02901330
LINE 134    25    IN1 = IN1 & NE(I,J)                                          02901340
LINE 135   C                                                                   02901350
LINE 136    30    CONTINUE                                                     02901360
LINE 137          IF( NSF .EQ. 1 ) GO TO 40                                    02901370
LINE 138   C            FIND NUMBER OF ELEMENTS IN LOWER NUMBER SECTIONS OF WING NW  02901380
LINE 139          NS = NSF - 1                                                 02901390
LINE 140          DO 35  I=1,NS                                                02901400
LINE 141    35    IN1 = IN1 & NE(I,NW)                                         02901410
LINE 142   C                                                                   02901420
LINE 143    40    CONTINUE                                                     02901430
LINE 144   C            NOW THAT WE HAVE IN1, FIND LAST ELEMENT IN2            02901440
LINE 145   C                                                                   02901450
LINE 146          IN2 = IN1 & NE(NSF,NW) - 1                                   02901460
LINE 147          NCHECK(NSF,NW) = 1                                           02901470
LINE 148          IF( NSI .EQ. 1 ) GO TO 45                                    02901480
LINE 149   C                                                                   02901490
LINE 150          IN2 = IN2 & NE(NSF&1,NW)                                     02901500
LINE 151          NCHECK(NSF&1,NW) = 1                                         02901510
LINE 152          IF( NSI .EQ. 2 ) GO TO 45                                    02901520
LINE 153          IN2 = IN2 & NE(NSL,NW)                                       02901530
LINE 154          NCHECK(NSL,NW) = 1                                           02901540
LINE 155    45    CONTINUE                                                     02901550
LINE 156   C                                                                   02901560
LINE 157   C            IN1 AND IN2 HAVE BEEN FOUND                            02901570
LINE 158   C                                                                   02901580
LINE 159          WRITE( I6, MODEF4 ) JMODE                                    02901590
LINE 160          WRITE( I6, 2003 )                                            02901600
LINE 161          WRITE( I6, 2008 )                                            02901610
LINE 162   C                                                                   02901620
LINE 163   C            SECTION TO READ MODE DATA                              02901630
LINE 164   C      ------------------------------------------------------------02901640
LINE 165   C                                                                   02901650
LINE 166   C            READ MODE INPUT                                        02901660
LINE 167   C                MODE CARD HAS BEEN READ                            02901670
LINE 168   C                                                                   02901680
LINE 169          NFUNMX = NMX                                                 02901690
LINE 170          CALL READXY( XF,YF)                                          02901700
LINE 171          IERR = IERF                                                  02901710
LINE 172          IF( IERR .NE.0)  RETURN                                      02901720
LINE 173   C                                                                   02901730
LINE 174          DO 130 J=1,JMODE                                             02901740
LINE 175          READ( I5, 1006 ) MODE                                        02901750
LINE 176          WRITE( I6,1016 ) MODE                                        02901760
LINE 177          CALL READAB(A, A)                                            02901770
LINE 178          IF( ITEST .EQ. 0 ) GO TO 110                                 02901780
LINE 179          DO 105 I = IN1, IN2                                          02901790
LINE 180          ETA(I,J) = ZZZ                                               02901800
```

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LINE 181          DETADX(I,J) = 0.0                                          02901810
LINE 182    105   CONTINUE                                                   02901820
LINE 183          GO TO 130                                                  02901830
LINE 184    110   CONTINUE                                                   02901840
LINE 185  C             BUMP INDXR TO FIRST ELEMENT IN SECTION               02901850
LINE 186          INDXR = 6*(IN1-1) & 1                                      02901860
LINE 187          DO 120 I = IN1, IN2                                        02901870
LINE 188  C             NOTE XO, YO ARE COOR. OF CENTER OF ELEM IN UNNORMALIZED 02901880
LINE 189  C             STRUCTURAL REFERENCE SYSTEM                          02901890
LINE 190          XX = BR*XCEN(I)                                            02901900
LINE 191          YY = HALFR*(XYZ(INDXR&4) & XYZ(INDXR&5))                   02901910
LINE 192          INDXR = INDXR & 6                                          02901920
LINE 193  C                                                                  02901930
LINE 194          CALL ZFDZ( ETA(I,J), DETADX(I,J), XF,YF,A)                 02901940
LINE 195  C                                                                  02901950
LINE 196    120   CONTINUE                                                   02901960
LINE 197  C                                                                  02901970
LINE 198    130   CONTINUE                                                   02901980
LINE 199  C                                                                  02901990
LINE 200    132   CONTINUE                                                   02902000
LINE 201  C                                                                  02902010
LINE 202          IPR = 1                                                    02902020
LINE 203          WRITE( I6, 2004 ) IPR                                      02902030
LINE 204          IF(JTYPE .NE.0)   GO TO    135                             02902040
LINE 205          WRITE( I6, 2002 ) NW, NI1                                  02902050
LINE 206          IF( NSI .GE. 2 ) WRITE( I6, 2002 )   NW, NI2               02902060
LINE 207          IF( NSI .EQ. 3 ) WRITE( I6, 2002 )   NW, NI3               02902070
LINE 208    135   CONTINUE                                                   02902080
LINE 209          WRITE( I6, 2005 )                                          02902090
LINE 210          WRITE( I6, 2008 )                                          02902100
LINE 211          J1 = 1                                                     02902110
LINE 212          IHS = JMODE/3                                              02902120
LINE 213          IF( 3*IHS .NE. JMODE ) IHS = IHS & 1                       02902130
LINE 214  C                                                                  02902140
LINE 215          DO 138 IH = 1,IHS                                          02902150
LINE 216          J2 = J1 & 2                                                02902160
LINE 217          IF( J2 .GT. JMODE ) J2 = JMODE                             02902170
LINE 218          INUMB = J2 - J1 & 1                                        02902180
LINE 219          MODEF1(2) = NUMBR(INUMB)                                   02902190
LINE 220          MODEF2(5) = NUMBR(INUMB)                                   02902200
LINE 221          MODEF3(3) = NUMBR(INUMB)                                   02902210
LINE 222          IF( IH .GE. 2 ) WRITE( I6, 2010 )                          02902220
LINE 223          WRITE( I6, MODEF1 ) ( I, I=J1,J2)                          02902230
LINE 224          WRITE( I6, MODEF2 )                                        02902240
LINE 225          WRITE( I6, MODEF3 ) (I,(ETA(I,J),DETADX(I,J),J=J1,J2), I=IN1,IN2) 02902250
LINE 226          J1 = J1 & 3                                                02902260
LINE 227    138   CONTINUE                                                   02902270
LINE 228  C                                                                  02902280
LINE 229          IN1 = IN2 & 1                                              02902290
LINE 230  C                                                                  02902300
LINE 231    140   CONTINUE                                                   02902310
LINE 232          IF(JTYPE .NE.0)   GO  TO 200                               02902320
LINE 233  C                                                                  02902330
LINE 234  C             CHECK TO SEE IF ALL SECTIONS HAVE BEEN READ AND ACCOUNTED FOR 02902340
LINE 235  C                                                                  02902350
LINE 236          DO 150 J=1,NWING                                           02902360
LINE 237          NS = NSECT(J)                                              02902370
LINE 238          DO 150 I=1,NS                                              02902380
LINE 239          IF( NCHECK(I,J) .EQ. 0 ) GO TO 10                          02902390
LINE 240     150  CONTINUE                                                   02902400
LINE 241  C                                                                  02902410
LINE 242  C       ------------------------------------------------------------02902420
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```
C
C           READ NEXT CARD, CHECK FOR RIGID MODE INPUT
  200 READ( I5, 1000 ) LAB, JRIGID
  210 CONTINUE
      IF( LAB .EQ. LEND )RETURN
      IF( LAB .NE. LRIG ) GO TO 340
  215 CONTINUE
C           SECTION FOR RIGID MODES
C           CHECK THAT RIGID MODE NUMBER IS IN ORDER.
      JMODE = JMODE & 1
      IF( JRIGID .NE. JMODE  )    GO TO 350
C           ZERO OUT ALL ETA AND DETADX FOR THAT MODE
      DO 220 I=1,NET
      ETA(I,JMODE) = 0.0
      DETADX(I,JMODE) = 0.0
  220 CONTINUE
      WRITE( I6, 2006 )
      WRITE( I6, 2005 )
      WRITE( I6, 2008 )
      WRITE( I6, 2007 )
      MODEF1(2) = NUMBR(1)
      WRITE( I6, MODEF1 ) JMODE
      MODEF2(5) = NUMBR(1)
      MODEF3(3) = NUMBR(1)
      WRITE( I6, MODEF2 )
  230 CONTINUE
      READ( I5, 1001 ) LAB, IEL, ETA(IEL,JMODE), DETADX(IEL,JMODE)
      IF( LAB .NE. LBLANK )  GO TO 240
      WRITE( I6, MODEF3 ) IEL, ETA(IEL,JMODE), DETADX(IEL,JMODE)
      GO TO 230
  240 CONTINUE
      JRIGID = IEL / 100
      GO TO 210
C
C
C           ERROR SECTION
C
  300 CONTINUE
C           MDWI INPUT CARD NOT FOUND
      WRITE( I6, 3000 )
      WRITE( I6, 3001 )
      ERROR = .TRUE.
      RETURN
  310 CONTINUE
C           SECTION IS NOT DEFINED
      WRITE( I6, 3000 )
      WRITE( I6, 3002 )
      WRITE( I6, 2002 ) NW, NI1
      IF( NSI .GE. 2 ) WRITE( I6, 2002 )  NW, NI2
      IF( NSI .EQ. 3 ) WRITE( I6, 2002 )  NW, NI3
      ERROR = .TRUE.
      RETURN
  320 CONTINUE
C           SECTIONS ARE NOT ADJACENT
      WRITE( I6, 3000 )
      WRITE( I6, 3003 ) NI1, NI2
      ERROR = .TRUE.
      RETURN
  330 CONTINUE
C           MODES NOT PRESENT FOR ALL SECTIONS
      WRITE( I6, 3000 )
      WRITE( I6, 3004 )
```

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LINE 305   3004 FORMAT(50H MODAL DATA NOT PRESENT FOR THE FOLLOWING SECTIONS   )   02903050
LINE 306        DO 332 J=1,NWING                                                   02903060
LINE 307        NS = NSECT(J)                                                      02903070
LINE 308        DO 332 I=1,NS                                                      02903080
LINE 309        IF( NCHECK(I,J) .EQ. 0 ) WRITE( I6, 2002 ) J, I                    02903090
LINE 310    332 CONTINUE                                                           02903100
LINE 311        ERROR = .TRUE.                                                     02903110
LINE 312        RETURN                                                             02903120
LINE 313  C                                                                        02903130
LINE 314    340 CONTINUE                                                           02903140
LINE 315        WRITE( I6, 3000 )                                                  02903150
LINE 316        WRITE( I6, 3005 ) LAB                                              02903160
LINE 317        ERROR = .TRUE.                                                     02903170
LINE 318        RETURN                                                             02903180
LINE 319  C                                                                        02903190
LINE 320    350 CONTINUE                                                           02903200
LINE 321        WRITE( I6, 3000 )                                                  02903210
LINE 322        WRITE( I6, 3006 ) JMODE, JRIGID                                    02903220
LINE 323        ERROR = .TRUE.                                                     02903230
LINE 324        RETURN                                                             02903240
LINE 325    400 FORMAT ( 1H0// 50X,   1I4,  25H MODE FUNCTION EQUATIONS   /        02903250
LINE 326       1 4X, 8HEQUATION ,2X,4X, 4HWING, 2X,4X, 4HMODE,4X,20X,              02903260
LINE 327       2   12HCOEFFICIENTS /36X,8HCONSTANT ,  2X, 8X, 1HX, 5X, 8X,1HY, 5X,02903270
LINE 328       4  6X, 2HXY,6X ,                                                    02903280
LINE 329       3 3X,8HX SQUARE   , 3X, 3X,8HY SQUARE    )                          02903290
LINE 330    405 FORMAT( 6X, 3I2, 12X, 8E6.6 )                                      02903300
LINE 331    410 FORMAT (1H0,8X,1I2,4X,4X,1I2, 4X,4X,I2,2X,(6E14.4))                02903310
LINE 332   1000 FORMAT( A4, 2X, 4I2 )                                              02903320
LINE 333   1001 FORMAT( A4, 2X, I4, 14X, 2E12.0 )                                  02903330
LINE 334   1006 FORMAT ( 20A4 )                                                    02903340
LINE 335   1016 FORMAT( 1X, 20A4 )                                                 02903350
LINE 336   2001 FORMAT( 1H1// 24X,16HINPUT MODAL DATA // )                         02903360
LINE 337   2002 FORMAT(  20X,  4HWING, I2, 10H   SECTION, I2 )                     02903370
LINE 338   2003 FORMAT( // 20X,10HECHO CHECK  )                                    02903380
LINE 339   2004 FORMAT(  I1, 19X, 20HGENERATED MODAL DATA // )                     02903390
LINE 340   2005 FORMAT( //20X,16HAERODYNAMIC GRID/)                                02903400
LINE 341   2006 FORMAT(1H1,///  20X, 21HRIGID BODY MODE INPUT )                    02903410
LINE 342   2007 FORMAT( // 20X, 55HONLY ELEMENTS WITH A NON-ZERO MODAL VALUE MUST 02903420
LINE 343       1BE INPUT )                                                         02903430
LINE 344   2008 FORMAT(                          20X,  30HSTRUCTURAL REFERENCE SYS02903440
LINE 345       1TEM OR   /  20X, 35HROTATED STRUCTURAL REFERENCE SYSTEM  /  )      02903450
LINE 346   2009 FORMAT (// 20X, 44HMODAL DATA INPUT IS GENERATED BY POLYNOMIAL  , 02903460
LINE 347       115HDEFINED BY USER )                                               02903470
LINE 348   2010 FORMAT( 1H1 )                                                      02903480
LINE 349  C                                                                        02903490
LINE 350   3000 FORMAT( /// 1X, 120(1H*) // 29H ERROR IN READING MODE INPUT. / )   02903500
LINE 351   3001 FORMAT(  46H 'MDWING' DATA CARD IS EXPECTED BUT NOT FOUND. /       02903510
LINE 352       1 51H THIS CARD MUST PRECEDE EACH MODE DATA INPUT GROUP.  /         02903520
LINE 353       2105H THIS CARD MUST FOLLOW THE 'MODE' DATA CARD OR THE LAST DATA C02903530
LINE 354       3ARD OF THE PRECEDING MODE DATA INPUT GROUP. / )                    02903540
LINE 355   3002 FORMAT(76H 'MDWING' DATA CARD SPECIFIES INPUT FOR A SECTION THAT H02903550
LINE 356       1AS NOT BEEN DEFINED. /   19H SECTIONS SPECIFIED   )                02903560
LINE 357   3003 FORMAT( 64H 'MDWING' DATA CARD SPECIFIES TWO SECTIONS THAT ARE NUT02903570
LINE 358       1ADJACENT.  /  8H SECTION, I3,12H AND SECTION, I3 )                 02903580
LINE 359   3005 FORMAT( /  90H A LABEL DATA CARD FOLLOWING FLEXABLE MODE DATA INPU02903590
LINE 360       1T IS EITHER OUT OF ORDER OR INCORRECT. / 68H THE FIRST FOUR CHARAC02903600
LINE 361       2TERS OF THE CARD FOLLOW WITHIN PARENTHESES.  (,  A4, 1H)  )        02903610
LINE 362   3006 FORMAT( /  35H RIGID MODE NUMBER IS NOT IN ORDER. / 24H MODE NUMBE02903620
LINE 363       1R EXPECTED IS,  I4  / 21H MODE NUMBER INPUT IS, I4 )               02903630
LINE 364  C                                                                        02903640
LINE 365        END                                                                02903650
```

DISPLAY...FILE DECK 30

```
LINE   1          SUBROUTINE READAB(Z, A)                                03000010
LINE   2              INTEGER HEADER(20)                                 03000020
LINE   3          DIMENSION  Z(1),A(1)                                   03000030
LINE   4          COMMON / ZFDZIO /  I5, I6                              03000040
LINE   5          COMMON  /ZFUNNY/  N,IERF,B1,B2, B3,NFUNMX              03000050
LINE   6          COMMON /XYSCAL / XX, YY, XO, YC, BREF, ZZZ, ITEST      03000060
LINE   7  C                                                              03000070
LINE   8  C                                                              03000080
LINE   9  C  INITIALIZATION ENTRY POINT (COEFFICIENTS).                  03000090
LINE  10          READ( I5, 11 ) HEADER                                  03000100
LINE  11          WRITE( I6, 11 ) HEADER                                 03000110
LINE  12          READ( I5, 13 )  ( Z(I), I=1,N )                        03000120
LINE  13          WRITE( I6, 12 ) (Z(I), I=1,N)                          03000130
LINE  14          ITEST = 0                                              03000140
LINE  15          ZZZ = Z(1)                                             03000150
LINE  16          DO 5 I=2, N                                            03000160
LINE  17          IF ( Z(I) .NE. ZZZ ) GO TO 7                           03000170
LINE  18     5    CONTINUE                                               03000180
LINE  19          ITEST = 1                                              03000190
LINE  20     7    CONTINUE                                               03000200
LINE  21          READ( I5, 11 ) HEADER                                  03000210
LINE  22          WRITE( I6, 11 ) HEADER                                 03000220
LINE  23          READ( I5, 13 )  ( A(I), I=1,N )                        03000230
LINE  24          WRITE( I6, 12 ) (A(I), I=1,N)                          03000240
LINE  25          READ( I5, 11 ) HEADER                                  03000250
LINE  26          WRITE( I6, 11 ) HEADER                                 03000260
LINE  27          READ( I5, 13 )  B1, B2, B3                             03000270
LINE  28          WRITE( I6, 12 ) B1,B2,B3                               03000280
LINE  29           RETURN                                                03000290
LINE  30    11       FORMAT(20A4)                                        03000300
LINE  31    12       FORMAT( 1P5E15.7)                                   03000310
LINE  32   13    FORMAT(  5E15.7  )                                      03000320
LINE  33           END                                                   03000330
```

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DISPLAY...FILE DECK 31

```
LINE   1          SUBROUTINE READXY(X,Y)                                03100010
LINE   2              INTEGER HEADER(20)                                03100020
LINE   3          DIMENSION  X(1), Y(1)                                 03100030
LINE   4          COMMON / ZFDZIO /  I5, I6                             03100040
LINE   5          COMMON /ZFUNNY/ N,IERF,B1,B2,B3,NFUNMX                03100050
LINE   6   C                                                            03100060
LINE   7   C   INITIALIZATION ENTRY POINT (ABSCISSAS).                  03100070
LINE   8   C   USAGE    CALL READ NXY                                   03100080
LINE   9          READ( I5, 10 ) N                                      03100090
LINE  10          WRITE( I6, 10 ) N                                     03100100
LINE  11          READ( I5, 11 ) HEADER                                 03100110
LINE  12          WRITE( I6, 11 ) HEADER                                03100120
LINE  13          IERF =0                                               03100130
LINE  14          IF (N.GT. NFUNMX)    IERF=680                         03100140
LINE  15          IF (N.GT. NFUNMX)    RETURN                           03100150
LINE  16          READ( I5, 13 )  ( X(I), I=1,N )                       03100160
LINE  17          WRITE( I6, 12 ) (X(I), I=1,N)                         03100170
LINE  18          READ( I5, 11 ) HEADER                                 03100180
LINE  19          WRITE( I6, 11 ) HEADER                                03100190
LINE  20          READ( I5, 13 )  ( Y(I), I=1,N )                       03100200
LINE  21          WRITE( I6, 12 ) (Y(I), I=1,N)                         03100210
LINE  22           RETURN                                               03100220
LINE  23       10 FORMAT( 5X, 3HN = ,I3)                                03100230
LINE  24      11      FORMAT(20A4)                                      03100240
LINE  25      12      FORMAT( 1P5E15.7)                                 03100250
LINE  26     13   FORMAT(  5E15.7  )                                    03100260
LINE  27          END                                                   03100270
```

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DISPLAY...FILE DECK 32

```
LINE   1          SUBROUTINE RSTART ( MACH, NET, NFREQ, FREQ, REFLEN, IWTE, I8, I15,03200010
LINE   2         1          I6, FREQR, XYZ, AREA )                                   03200020
LINE   3          LOGICAL ERROR                                                      03200030
LINE   4          REAL MACH, MACHR                                                   03200040
LINE   5          DIMENSION FREQ(1), FREQR(1),       AREA(1), XYZ(1)                 03200050
LINE   6          COMMON / NEXTCS /  IFLUSH                                          03200060
LINE   7          ERROR = .FALSE.                                                    03200070
LINE   8          IS = I8                                                            03200080
LINE   9    10    CONTINUE                                                           03200090
LINE  10          REWIND IS                                                          03200100
LINE  11          READ(IS) MACHR, NETR, RRFL, IWTER, NFREQR, (FREQR(I),I=1,NFREQR)   03200110
LINE  12          IF( MACHR  .NE. MACH  ) GO TO 90                                   03200120
LINE  13          IF( NETR   .NE. NET   ) GO TO 90                                   03200130
LINE  14          IF( NFREQR .NE. NFREQ ) GO TO 90                                   03200140
LINE  15          IF( REFLEN .NE. RRFL  ) GO TO 90                                   03200150
LINE  16          IF( IWTE .NE. 0  .AND.  IWTER .EQ. 0 )      GO TO 90               03200160
LINE  17          DO 15  I=1,NFREQ                                                   03200170
LINE  18          IF( FREQR(I) .NE. FREQ(I) ) GO TO 90                               03200180
LINE  19    15    CONTINUE                                                           03200190
LINE  20          IF( IWTE .EQ. 0 ) GO TO 30                                         03200200
LINE  21          IF( IS .EQ. I15 ) GO TO 30                                         03200210
LINE  22          IS = I15                                                           03200220
LINE  23          GO TO 10                                                           03200230
LINE  24    30    CONTINUE                                                           03200240
LINE  25          IF( ERROR ) GO TO 99                                               03200250
LINE  26    C           RESTART TAPE(S) HAVE BEEN READ AND FOUND TO BE CORRECT       03200260
LINE  27    C           FIND AREA                                                    03200270
LINE  28          INDXR = 1                                                          03200280
LINE  29          DO  50  IRC = 1, NET                                               03200290
LINE  30          DSX = 0.5*(XYZ(INDXR&5)-XYZ(INDXR&4))                              03200300
LINE  31          AREA(IRC)=DSX*(XYZ(INDXR&3)-XYZ(INDXR) &XYZ(INDXR&2)-XYZ(INDXR&1))03200310
LINE  32          INDXR = INDXR & 6                                                  03200320
LINE  33    50    CONTINUE                                                           03200330
LINE  34          RETURN                                                             03200340
LINE  35    90    CONTINUE                                                           03200350
LINE  36    C           ERROR IN RESTART TAPE                                        03200360
LINE  37          ERROR = .TRUE.                                                     03200370
LINE  38          WRITE( I6, 2000 ) IS                                               03200380
LINE  39          WRITE( I6, 2001 )                                                  03200390
LINE  40          WRITE( I6, 2002 ) MACH, MACHR, NET, NETR, REFLEN, RRFL, IWTE,      03200400
LINE  41         1      IWTER, NFREQ, NFREQR, ( I, FREQ(I), FREQR(I),I=1,NFREQ)     03200410
LINE  42          IF( IWTE .EQ. 0 ) GO TO 99                                         03200420
LINE  43          IF( IS .EQ. I15 ) GO TO 99                                         03200430
LINE  44          IS = I15                                                           03200440
LINE  45          GO TO 10                                                           03200450
LINE  46    99    CONTINUE                                                           03200460
LINE  47          IFLUSH = 1                                                         03200470
LINE  48          RETURN                                                             03200480
LINE  49    2000  FORMAT(1H1/ 60(2H *) //38H ERROR IN READING RESTART TAPE ON UNIT   03200490
LINE  50         1  I4 )                                                             03200500
LINE  51    2001  FORMAT( /48H RESTART TAPE DID NOT CORRESPOND TO CURRENT RUN.       03200510
LINE  52         1 67H FOLLOWING IS A COMPARISON OF THE CURRENT RUN AND THE RESTART 03200520
LINE  53         2TAPE. /// 41X, 11HCURRENT RUN, 9X, 12HRESTART TAPE   )             03200530
LINE  54    2002  FORMAT( / 11X, 24HMACH NUMBER                  ,   E17.5, E21.5   03200540
LINE  55         1  / 11X,        24HTOTAL NUMBER OF ELEMENTS,    I17,    I21        03200550
LINE  56         2  / 11X,        24HREFERENCE LENGTH         ,   E17.5, E21.5       03200560
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LINE  57      3  / 11X,       24HWAKE EFFECT CODE          ,   I17,    I21          03200570
LINE  58      4  / 11X,       24HNUMBER OF FREQUENCIES     ,   I17,    I21          03200580
LINE  59      5  /   (   11X, 10HFREQUENCY(, I2, 1H), 11X,    E17.5,  E21.5 )    )  03200590
LINE  60       END                                                                  03200600
```

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CISPLAY...FILE          DECK 33

LINE   1          SUBROUTINE RTOI( TR, TI, YCR, ZCR, ZRO, ZLO )                    03300010
LINE   2   C                                                                       03300020
LINE   3   C          RTOI TRANSFROMS YCR AND ZCR FROM THE RECEIVING SYSTEM TO THE 03300030
LINE   4   C          INFTUENCING SYSTEM. YCR, ZCR ARE FIRT PUT IN REFERENC SYSTEM 03300040
LINE   5   C          BY PREMULTIPLING BY TR. THIS IS Y,Z WHICH IS PUT IN INFLUENC- 03300050
LINE   6   C          ING SYSTEM YC,ZC BY PREMULT. BY THE TRANSPOSE OF TI          03300060
LINE   7   C                                                                       03300070
LINE   8          DIMENSION TR(1), TI(1)                                           03300080
LINE   9          COMMON / RRLL / TVW(4), YRO, YLO, ZR, ZRZR, ZL, ZLZL             03300090
LINE  10          Y = TR(1)*YCR & TR(3)*ZCR                                        03300100
LINE  11          Z = TR(2)*YCR & TR(4)*ZCR                                        03300110
LINE  12          YRO = TI(1)*Y & TI(2)*Z                                          03300120
LINE  13          ZRO = TI(3)*Y & TI(4)*Z                                          03300130
LINE  14          YLO = -TI(1)*Y & TI(2)*Z                                         03300140
LINE  15          ZLO = TI(3)*Y - TI(4)*Z                                          03300150
LINE  16          TVW(1) = TR(3)*TI(1) & TR(4)*TI(2)                               03300160
LINE  17          TVW(2) = TR(3)*TI(3) & TR(4)*TI(4)                               03300170
LINE  18          TVW(3) = -TR(3)*TI(1) & TR(4)*TI(2)                              03300180
LINE  19          TVW(4) =  TR(3)*TI(3) - TR(4)*TI(4)                              03300190
LINE  20          RETURN                                                           03300200
LINE  21          END                                                              03300210

END READ

END OF JOB.

   33.2 SEC. USED     .010 HRS. CHARGED   49.952 HRS. REMAINING
```

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DISPLAY...FILE DECK 34

```
      SUBROUTINE SOLVE (N,NDIM,A,B,IP)                                  03400010
C                                                                       03400020
C     SUBROUTINE SOLVE                                                  03400030
C                                                                       03400040
C     PURPOSE                                                           03400050
C        SOLUTION OF THE LINEAR SYSTEM OF EQUATIONS C*X = B.            03400060
C                                                                       03400070
C     USAGE                                                             03400080
C        CALL SOLVE(N,NDIM,A,B,IP)                                      03400090
C                                                                       03400100
C     DESCRIPTION OF PARAMETERS                                         03400110
C        N    - ORDER OF THE MATRIX A                                   03400120
C        NDIM- FIRST DIMENSION OF A DECLARED IN CALLING PROGRAM. IF A IS03400130
C                SINGLY SUBSCRIPTED IN CALLING PROGRAM, SET NDIM=N.     03400140
C        A    -CONTAINS THE TRIANGULAR FACTORS OF THE MATRIX C (AS      03400150
C                DETERMINED BY SUBROUTINE 'DECOM').                     03400160
C        B    -ON INPUT, THE RHS VECTOR, ON OUTPUT, THE SOLUTION VECTOR. 03400170
C        IP   -VECTOR OF DIMENSION N CONTAINING ROW INTERCHANGE         03400180
C                INFORMATION (AS DETERMINED BY SUBROUTINE 'DECOM').     03400190
C                                                                       03400200
C     REMARKS                                                           03400210
C        'SOLVE' MUST BE USED IN CONJUNCTION WITH SUBROUTINE 'DECOM'.   03400220
C                                                                       03400230
C     SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED.                    03400240
C        NONE                                                           03400250
C                                                                       03400260
C     METHOD                                                            03400270
C        BACK SUBSTITUTION BASED ON THE FACTORED FORM OF THE COEFFICIENT03400280
C        MATRIX.  SEE ALGORITHM 423, 'COLLECTED ALGORITHMS FROM CACM',  03400290
C        BY CLEVE MOLER.                                                03400300
C                                                                       03400310
      DIMENSION A(NDIM,1),B(1),IP(1)                                    03400320
      IF (N .EQ. 1) GO TO 9                                             03400330
      NM1 = N-1                                                         03400340
      DO 7 K = 1,NM1                                                    03400350
        KP1 = K&1                                                       03400360
        M = IP(K)                                                       03400370
      T = B(M)                                                          03400380
      B(M) = B(K)                                                       03400390
      B(K) = T                                                          03400400
      DO 7 I = KP1,N                                                    03400410
    7 B(I) = B(I) & A(I,K)*T                                            03400420
      DO 8 KB = 1,NM1                                                   03400430
      KM1 = N - KB                                                      03400440
      K = KM1 & 1                                                       03400450
      B(K) = B(K)/A(K,K)                                                03400460
      T = -B(K)                                                         03400470
      DO 8 I = 1,KM1                                                    03400480
    8 B(I) = B(I) & A(I,K)*T                                            03400490
    9 B(1) = B(1)/A(1,1)                                                03400500
      RETURN                                                            03400510
      END                                                               03400520
```

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DISPLAY...FILE DECK 35

```
LINE   1        SUBROUTINE SONS( NWING, NSECT, CORNX, CORNY, CORNZ, ISONS )        03500010
LINE   2  C                                                                        03500020
LINE   3  C         SUBROUTINE SONS DETERMINES BOOLEAN MATRIX ISONS                03500030
LINE   4  C         ISONS(K1,K2) = 1  IF SECTION K2 HAS INFLUENCE ON REC. SECT. K103500040
LINE   5  C                      = 0  IF K2 DOES NOT INFLUENCE K1                  03500050
LINE   6  C         K1 IS RECEVING SECTION NUMBER,  K2 IS INFLUENCING SECTION NUM.03500060
LINE   7  C                                                                        03500070
LINE   8        DIMENSION NSECT(1), CORNX(8,4),CORNY(8,4),CORNZ(8,4), ISONS(12,12)03500080
LINE   9  C         LOOP ON RECEIVING SECTIONS ( DO 30 AND DO 25 )                 03500090
LINE  10        K1 = 0                                                             03500100
LINE  11  C                                                                        03500110
LINE  12        DO 30 J=1,NWING                                                    03500120
LINE  13        NS1 = NSECT(J)                                                     03500130
LINE  14        DO 25 I=1,NS1                                                      03500140
LINE  15  C                                                                        03500150
LINE  16        K1 = K1 & 1                                                        03500160
LINE  17        JCN1 = 2*I - 2                                                     03500170
LINE  18  C         LOOP ON SECTIONS WHICH MAY HAVE INFLUENCE ( DO 20 AND DO 15 ) 03500180
LINE  19        K2 = 0                                                             03500190
LINE  20  C                                                                        03500200
LINE  21        DO 20  JJ=1,NWING                                                  03500210
LINE  22        NS2 = NSECT(JJ)                                                    03500220
LINE  23        DO 15  II=1,NS2                                                    03500230
LINE  24  C                                                                        03500240
LINE  25        K2 = K2 & 1                                                        03500250
LINE  26        ISONS(K1,K2) = 1                                                   03500260
LINE  27  C        A SECTION ALWAYS INFLUENCES ITSELF AND ADJACENT SECTIONS        03500270
LINE  28        IF( J .EQ. JJ  .AND.  IABS(I-II) .LE. 1 ) GO TO 15                 03500280
LINE  29        JCN2 = 2*II - 1                                                    03500290
LINE  30  C         LOOP ON BOTTOM CORNER POINTS OF RECEIVING SECTION (PTS 2, 4 ) 03500300
LINE  31  C         IF LOOP (DO 10) IS COMPLETED, SECTION DOES NOT INFLUENCE       03500310
LINE  32  C                                                                        03500320
LINE  33        DO 10  I2 = 2,4,2                                                  03500330
LINE  34  C                                                                        03500340
LINE  35        IND1 = JCN1 & I2                                                   03500350
LINE  36        XC = CORNX(IND1,J)                                                 03500360
LINE  37        YC = CORNY(IND1,J)                                                 03500370
LINE  38        ZC = CORNZ(IND1,J)                                                 03500380
LINE  39  C         LOOK AT TOP CORNER PTS. OF INFLUENCING SECTION (PTS 1 AND 3)  03500390
LINE  40        IND1 = JCN2 & 2                                                    03500400
LINE  41        X1 = CORNX(JCN2,JJ)                                                03500410
LINE  42        X3 = CORNX(IND1,JJ)                                                03500420
LINE  43        IF( XC .LT. X1  .AND. XC .LT. X3 ) GO TO 10                        03500430
LINE  44        Y1 = CORNY(JCN2,JJ)                                                03500440
LINE  45        Y3 = CORNY(IND1,JJ)                                                03500450
LINE  46        Z1 = CORNZ(JCN2,JJ)                                                03500460
LINE  47        Z3 = CORNZ(IND1,JJ)                                                03500470
LINE  48        YCY1 = YC - Y1                                                     03500480
LINE  49        Y3YC = Y3 - YC                                                     03500490
LINE  50        IF( Y1 .EQ. Y3 ) GO TO 8                                           03500500
LINE  51        IF( YCY1*Y3YC .LE. 0.0 ) GO TO 8                                   03500510
LINE  52  C         YC IS BETWEEN Y1 AND Y3, CHECK INTERSECTION                    03500520
LINE  53        A = YCY1/(Y1-Y3)                                                   03500530
LINE  54        X = X1 - A*(X3-X1)                                                 03500540
LINE  55        Z = Z1 - A*(Z3-Z1)                                                 03500550
LINE  56        R = XC - X & Z - ZC                                                03500560
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LINE  57  C          IF R GT 0, SECTION HAS INFLUENCE SO BRANCH OUT OF DO 10 LOOP  03500570
LINE  58        IF( R .GT. 0.0 ) GO TO 15                                          03500580
LINE  59        GO TO 10                                                           03500590
LINE  60    8   CONTINUE                                                           03500600
LINE  61  C          YC IS OUTSIDE OF Y1,Y3  CHECK BOTH POINTS                     03500610
LINE  62  C                                                                        03500620
LINE  63        ZHI = XC - X1                                                      03500630
LINE  64        ETA = YC - Y1                                                      03500640
LINE  65        ZO  = ZC - Z1                                                      03500650
LINE  66        T = SQRT( ETA*ETA  &  ZO*ZO )                                      03500660
LINE  67        R = ZHI - T                                                        03500670
LINE  68  C          IF R GT 0, SECTION HAS INFLUENCE SO BRANCH OUT OF DO 10 LOOP  03500680
LINE  69        IF( R .GT. 0.0 ) GO TO 15                                          03500690
LINE  70  C                                                                        03500700
LINE  71        ZHI = XC - X3                                                      03500710
LINE  72        ETA = YC - Y3                                                      03500720
LINE  73        ZO  = ZC - Z3                                                      03500730
LINE  74        T = SQRT( ETA*ETA  &  ZO*ZO )                                      03500740
LINE  75        R = ZHI - T                                                        03500750
LINE  76  C          IF R GT 0, SECTION HAS INFLUENCE SO BRANCH OUT OF DO 10 LOOP  03500760
LINE  77        IF( R .GT. 0.0 ) GO TO 15                                          03500770
LINE  78  C                                                                        03500780
LINE  79   10   CONTINUE                                                           03500790
LINE  80  C          WE DID NOT BRANCH OUT OF DO 10 LOOP                           03500800
LINE  81  C          SECTION K2 DOES NOT INFLUENCE SECTION K1                      03500810
LINE  82        ISONS(K1,K2) = 0                                                   03500820
LINE  83  C                                                                        03500830
LINE  84  C           END LOOP ON INFLUENCING SECTION (15) AND WING (20)           03500840
LINE  85    15  CONTINUE                                                           03500850
LINE  86    20  CONTINUE                                                           03500860
LINE  87  C                                                                        03500870
LINE  88  C           END LOOP ON RECEIVING SECTION (25) AND WING (30)             03500880
LINE  89    25  CONTINUE                                                           03500890
LINE  90    30  CONTINUE                                                           03500900
LINE  91  C                                                                        03500910
LINE  92        RETURN                                                             03500920
LINE  93        END                                                                03500930
```

DISPLAY...FILE DECK 36

```
LINE   1          SUBROUTINE SONSPT( ISONS, NWING, NSECT, MACH, I6 )                03600010
LINE   2   C            SONSPT PRINTS SECTION INFLUENCE TABLE                       03600020
LINE   3          REAL MACH                                                         03600030
LINE   4          DIMENSION IFT1( 9), IFT2( 9), IF(15)                              03600040
LINE   5          DIMENSION ISONS(12,12), NSECT(1), IW(15), IS(15)                  03600050
LINE   6   C                                                                        03600060
LINE   7          DATA IFT1 /  4H(11H, 4H REC, 4HEIVI, 4HNG ,, 1H , 4H(6H ,         03600070
LINE   8         1  4H WIN, 4HG,I2, 2H)) /                                          03600080
LINE   9          DATA IF / 1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9,2H10,2H11,2H12,2H13,03600090
LINE  10         1 2H14, 2H15 /                                                     03600100
LINE  11          DATA IFT2 /  4H(11H, 4H SEC, 4HTION, 4HS  ,, 1H , 4H(6H ,         03600110
LINE  12         1  4H SEC, 4HT,I2, 2H)) /                                          03600120
LINE  13   C                                                                        03600130
LINE  14          WRITE( I6, 1001 )  MACH                                           03600140
LINE  15          WRITE( I6, 1002 )                                                 03600150
LINE  16          K = 0                                                             03600160
LINE  17          DO 10 J=1,NWING                                                   03600170
LINE  18          NS= NSECT(J)                                                      03600180
LINE  19          DO  5 I=1,NS                                                      03600190
LINE  20          K = K & 1                                                         03600200
LINE  21          IW(K) = J                                                         03600210
LINE  22          IS(K) = I                                                         03600220
LINE  23    5     CONTINUE                                                          03600230
LINE  24    10    CONTINUE                                                          03600240
LINE  25          IFT1(5) = IF(K)                                                   03600250
LINE  26          IFT2(5) = IF(K)                                                   03600260
LINE  27          WRITE( I6, IFT1 )(IW(I),I=1,K)                                    03600270
LINE  28          WRITE( I6, IFT2 ) (IS(I), I=1,K)                                  03600280
LINE  29          DO 20  I=1,K                                                      03600290
LINE  30          WRITE( I6, 1003 ) IW(I), IS(I), ( ISONS(I,J), J=1,K )             03600300
LINE  31    20    CONTINUE                                                          03600310
LINE  32    1001 FORMAT( 1H1 / 40X,45HTABLE OF INFLUENCING SECTIONS FOR MACH NUMBER03600320
LINE  33         1       ,F8.4  )                                                  03600330
LINE  34    1002 FORMAT( //2X,50HKEY  0  ALL ELEMENTS OF INFLUENCING SECTION HAVE Z03600340
LINE  35         1,  50HERO INFLUENCE ON ALL ELEMENTS OF RECEIVING SECTION //       03600350
LINE  36         2 7X,  32H1  NON-ZERO INFLUENCE IS ASSUMED ///                     03600360
LINE  37         3 13X, 20HINFLUENCING SECTIONS   )                                 03600370
LINE  38    1003 FORMAT( / 5H WING, I2  /  5H SECT, I2, 4X, 15I8  )                03600380
LINE  39          RETURN                                                            03600390
LINE  40          END                                                               03600400
```

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```
LINE  1     SUBROUTINE SYMBOL(X,Y,SIZE,CHAR,ANG,NCHAR)          03700010
LINE  2     DIMENSION CHAR(3)                                   03700020
LINE  3     CALL NOTATE(X,Y,SIZE,CHAR,ANG,NCHAR)                03700030
LINE  4     RETURN                                              03700040
LINE  5     END                                                 03700050
```

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DISPLAY...FILE DECK 38

```
LINE   1        SUBROUTINE TIMOUT(MSEC,A,B,C,D,E,F,G,H)                 03800010
LINE   2        COMMON  /TAPE/ I9,I10,I11,I12,I13,I14,J9                03800020
LINE   3        DATA TI / 0.0 /                                         03800030
LINE   4        T = MSEC                                                03800040
LINE   5        T = T/1000.                                             03800050
LINE   6        TI = T - TI                                             03800060
LINE   7        WRITE(J9,3001)A,B,C,D,E,F,G,H,TI,T                      03800070
LINE   8        TI = T                                                  03800080
LINE   9        RETURN                                                  03800090
LINE  10   3001 FORMAT( 6X, 8A4,  5X, F8.3, 13X, F8.3 )                 03800100
LINE  11        END                                                     03800110
```

CISPLAY...FILE DECK 39

```
LINE   1        SUBROUTINE TMAX(NET, A, GBAR)                          03900010
LINE   2        DIMENSION   A(1)                                       03900020
LINE   3        DATA  EPS  / .0000001/                                 03900030
LINE   4        GBAR  =0.0                                             03900040
LINE   5        DO 480      IEL=1,NET                                  03900050
LINE   6        G =  ABS(A(IEL))                                       03900060
LINE   7        IF(G.GT. GBAR  )    GBAR = G                           03900070
LINE   8   480  CONTINUE                                               03900080
LINE   9        IF(GBAR .EQ.0.0)  GO TO 600                            03900090
LINE  10        DO 580              IEL = 1,NET                        03900100
LINE  11        G = EPS * GBAR                                         03900110
LINE  12        G = ABS( G)                                            03900120
LINE  13        AIEL = ABS (A(IEL) )                                   03900130
LINE  14        IF (G .GT. AIEL)      A(IEL) =0.0                      03900140
LINE  15   580  CONTINUE                                               03900150
LINE  16   600  RETURN                                                 03900160
LINE  17        END                                                    03900170
```

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DISPLAY...FILE DECK 40

```
LINE   1          SUBROUTINE TRANS( X, Y, Z, T, XP, YP,  ZC )                    04000010
LINE   2          DIMENSION X(1), Y(1), Z(1), T(4), XP(1), YP(1)                 04000020
LINE   3          T1X = X(4) - X(1)                                              04000030
LINE   4          T1Y = Y(4) - Y(1)                                              04000040
LINE   5          T1Z = Z(4) - Z(1)                                              04000050
LINE   6          T2X = X(3) - X(2)                                              04000060
LINE   7          T2Y = Y(3) - Y(2)                                              04000070
LINE   8          T2Z = Z(3) - Z(2)                                              04000080
LINE   9          XN = T1Y*T2Z - T1Z*T2Y                                         04000090
LINE  10          YN = T1Z*T2X - T1X*T2Z                                         04000100
LINE  11          ZN = T1X*T2Y - T1Y*T2X                                         04000110
LINE  12          XYZN = XN*XN & YN*YN & ZN*ZN                                   04000120
LINE  13          XYZN = SQRT(XYZN)                                              04000130
LINE  14          XN = XN/XYZN                                                   04000140
LINE  15          YN = YN/XYZN                                                   04000150
LINE  16          ZN = ZN/XYZN                                                   04000160
LINE  17  C                                                                      04000170
LINE  18          T(1) = ZN                                                      04000180
LINE  19          T(2) = -YN                                                     04000190
LINE  20          T(3) = YN                                                      04000200
LINE  21          T(4) = ZN                                                      04000210
LINE  22  C                                                                      04000220
LINE  23          IT = 0                                                         04000230
LINE  24          ZC = YN*Y(1) & ZN*Z(1)                                         04000240
LINE  25          ZX = ZC                                                        04000250
LINE  26          IF( ABS(ZC) .LT. 1.E-10 ) ZX = 1.0                             04000260
LINE  27          DO 10  I=1,4                                                   04000270
LINE  28          XP(I) = X(I)                                                   04000280
LINE  29          YP(I) = ZN*Y(I) - YN*Z(I)                                      04000290
LINE  30  C           FOLLOWING CALCULATION FOR DEBUG                            04000300
LINE  31  C       Z1     = YN*Y(I) & ZN*Z(I)                                     04000310
LINE  32  C       IF( ABS(ZC-Z1)/ZX .GT. 0.001 ) IT = 1                          04000320
LINE  33   10     CONTINUE                                                       04000330
LINE  34  C       WRITE( 6,1001 ) ( X(I),XP(I), Y(I),YP(I), Z(I),Z1    ,I=1,4)   04000340
LINE  35  C       WRITE( 6,1002 ) T                                              04000350
LINE  36  C       IF( IT .EQ. 1 ) GO TO 20                                       04000360
LINE  37          RETURN                                                         04000370
LINE  38  C20     CONTINUE                                                       04000380
LINE  39  C       WRITE( 6, 1003 )                                               04000390
LINE  40  C1003 FORMAT(/1X,120(1H*)//79H ERROR IN TRANS - ALL Z'S ARE NOT IDENTICA04000400
LINE  41  C     1L FOR A SECTION. PROCEED WITH CAUTION  // 1X, 120(1H*) /// )    04000410
LINE  42  C       RETURN                                                         04000420
LINE  43  C1001 FORMAT( //  3(2E14.4,2X) )                                       04000430
LINE  44  C1002 FORMAT( // (2E14.4 ))                                            04000440
LINE  45          END                                                            04000450
```

DISPLAY...FILE DECK 41

```
LINE   1        SUBROUTINE WAKET(I12,AROW,WROW, IF ,LRECLW,NSPT, IB , IZ,K1,NNCH  04100010
LINE   2       1,FRQ,K)                                                           04100020
LINE   3        COMPLEX WTES                                                      04100030
LINE   4        COMPLEX  AROW(NSPT), WROW(LRECLW)                                 04100040
LINE   5        COMPLEX   AROWJ                                                   04100050
LINE   6        LOGICAL TREDGE,WAKE1,WAKE,WAKENZ                                  04100060
LINE   7        DIMENSION  IZ(NSPT)                                               04100070
LINE   8        DIMENSION  NNCH(NSPT)                                             04100080
LINE   9        COMMON /FQ1/ NFREQ                                                04100090
LINE  10        COMMON /K1112/ KST11,KST12                                        04100100
LINE  11        COMMON/WAKEUP/ WTES(12), TREDGE,WAKE1,WAKE, WAKENZ, KWAKE         04100110
LINE  12        IF(K1.EQ.K)  GO TO 60                                             04100120
LINE  13        READ(IB)     K1,WROW                                              04100130
LINE  14        IF(K1.NE.K)  RETURN                                               04100140
LINE  15   60   CONTINUE                                                          04100150
LINE  16        NNZ = 0                                                           04100160
LINE  17        L = IF                                                            04100170
LINE  18        DO 100       J = 1,NSPT                                           04100180
LINE  19        AROWJ =  WROW(L)                                                  04100190
LINE  20        AR  =         AROWJ                                               04100200
LINE  21        AI  = AIMAG (AROWJ)                                               04100210
LINE  22        AC  = SQRT( AR **2 & AI **2)                                      04100220
LINE  23        IF  (  AC  .EQ.  0.0)  GO TO 100                                  04100230
LINE  24        NNZ = NNZ & 1                                                     04100240
LINE  25        IZ(NNZ) = NNCH(J)                                                 04100250
LINE  26        AROW(NNZ) = AROWJ                                                 04100260
LINE  27   100  L=L&NFREQ                                                         04100270
LINE  28        IF (NNZ .NE.0)  WAKENZ =.TRUE.                                    04100280
LINE  29        IF(NNZ.EQ.0) RETURN                                               04100290
LINE  30        CALL WRITZW( I12, K1,NNZ, IZ,AROW)                                04100300
LINE  31        KST12 =K1                                                         04100310
LINE  32        RETURN                                                            04100320
LINE  33        END                                                               04100330
```

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```
LINE   1        SUBROUTINE WINGCK(CORNX,CORNY,CORNZ, NWING, ICN, ERROR, I6 )      04200010
LINE   2        LOGICAL ERROR                                                     04200020
LINE   3        DIMENSION CORNX(1), CORNY(1), CORNZ(1)                            04200030
LINE   4  C           CHECK ON VALIDITY OF CORNER POINTS OF WING                  04200040
LINE   5        ICNM1 = ICN-1                                                     04200050
LINE   6        DO 10 I=1,ICNM1,2                                                 04200060
LINE   7        J = I & 1                                                         04200070
LINE   8        IF(CORNX(J) .LT. CORNX(I) ) GO TO 5                               04200080
LINE   9        IF(CORNY(J) .NE. CORNY(I) ) GO TO 5                               04200090
LINE  10        IF(CORNZ(J) .NE. CORNZ(I) ) GO TO 5                               04200100
LINE  11        GO TO 10                                                          04200110
LINE  12      5 WRITE( I6, 1001 ) I, J, NWING                                     04200120
LINE  13        ERROR = .TRUE.                                                    04200130
LINE  14     10 CONTINUE                                                          04200140
LINE  15        RETURN                                                            04200150
LINE  16   1001 FORMAT( // 120(1H*) /32H ERROR IN DEFINING CORNER POINTS, I2,     04200160
LINE  17       1  3HAND, I2,8H OF WING, I2 / )                                    04200170
LINE  18        END                                                               04200180
```


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```
LINE   1          SUBROUTINE WINGIN(I5, I6, NWING, NSECT, AR, NSP, CORNX, CORNY,     04300010
LINE   2         1              CORNZ, SYM, ICL, CL, ERROR, BEETA, IPW, NFREQ, FREQ, 04300020
LINE   3         2               REFLEN, LAB, ID, FD )                              04300030
LINE   4   C                                                                        04300040
LINE   5   C            THIS ROUTINE READS AND WRITES INPUT FOR WING DATA           04300050
LINE   6   C                                                                        04300060
LINE   7   C       INPUT                                                            04300070
LINE   8   C                                                                        04300080
LINE   9   C           I5      INPUT UNIT ( USUALLY CARD READER 5 )                 04300090
LINE  10   C           I6      OUTPUT UNIT ( PRINTER 6 )                            04300100
LINE  11   C           BEETA   SQRT(MACH*MACH-1) USED TO TRANSFORM CORNX AND CL     04300110
LINE  12   C           ERROR   LOGICAL THAT COMES IN FALSE,MAY BE SET TRUE          04300120
LINE  13   C                                                                        04300130
LINE  14   C       OUTPUT                                                           04300140
LINE  15   C                                                                        04300150
LINE  16   C           NWING   NUMBER OF WING READ FOR STRUCTURE                    04300160
LINE  17   C           NSECT   ARRAY- NO. SECTIONS IN EACH WING                     04300170
LINE  18   C           AR      ARRAY- ASPECT RATIO OF EACH WING                     04300180
LINE  19   C           NSP     NSP(I,J) NO. SPANS FOR SECTION I OF WING J           04300190
LINE  20   C           CORNX,CORNY,CORNZ  X,Y,AND Z COORD. OF CORNER PTS. OF WING   04300200
LINE  21   C           SYM     SYM(J)   SYMMETRY CODE FOR WING J (A REAL MATRIX)    04300210
LINE  22   C                   SYM=  FOR SYMMETRY, -1 FOR ANTI-SYM, 0 FOR NO SYM.   04300220
LINE  23   C           ICL     ICL(I,J) CODE FOR SECTION I OF WING J                04300230
LINE  24   C                   ICL(I,J) = -1 SPECIFIC GRID INFORMATION IS INPUT     04300240
LINE  25   C                   ICL(I,J) =  0 AUTOMATIC MESH - NO CONTROL LINES      04300250
LINE  26   C                   ICL(I,J) = 1, OR 2   AUTO MESH WITH 1 OR 2 CONTROL L. 04300260
LINE  27   C           CL      X COORD OF CONTROL LINES FOR EACH SECTION            04300270
LINE  28   C                   CL IS READ IN REF. SYSTEM, THEN DIVIDED BY BEETA     04300280
LINE  29   C           LAB, ID, FD  INFORMATION ON LAST CARD READ                   04300290
LINE  30   C                                                                        04300300
LINE  31          LOGICAL ERROR, CLINPT                                             04300310
LINE  32          LOGICAL FREQR                                                     04300320
LINE  33          DIMENSION CORNX(8,4), CORNY(8,4), CORNZ(8,4), CL(4,3,4)           04300330
LINE  34          DIMENSION FREQ(1), IPW(1)                                         04300340
LINE  35          DIMENSION NSECT(1), AR(1), NSP(3,4), ICL(3,4), ID(9), FD(4)       04300350
LINE  36          DIMENSION  SK1(4), SK2(4), SK3(4), SKODE(4)                       04300360
LINE  37          DIMENSION SYM(4)                                                  04300370
LINE  38   C                                                                        04300380
LINE  39          DATA L1, L2, L3, L4, LB / 4HGRID, 4HWING, 4HCORN, 4HLINE, 4H    / 04300390
LINE  40          DATA L5, L6, LEND / 4HFREQ, 4HMODE, 4HEND /                       04300400
LINE  41          DATA SK1 / 4H(SYM, 4HMETR, 4HIC) , 4H      /                      04300410
LINE  42          DATA SK2 / 4H(ANT, 4HI-SY, 4HMMET, 4HRIC)  /                      04300420
LINE  43          DATA SK3 / 4H(NOT, 4H SYM, 4HMETR, 4HIC)   /                      04300430
LINE  44   C                                                                        04300440
LINE  45          FREQR = .FALSE.                                                   04300450
LINE  46          NWING = 0                                                         04300460
LINE  47          BEERFL = BEETA*REFLEN                                             04300470
LINE  48   C                                                                        04300480
LINE  49   C      ------------------------------------------------------------------04300490
LINE  50   C                                                                        04300500
LINE  51    10    READ( I5,1000 ) LAB,  ID, FD                                      04300510
LINE  52   C                                                                        04300520
LINE  53          IF( LAB .EQ. L2 ) GO TO 20                                        04300530
LINE  54          IF( LAB .EQ. L4 ) GO TO 40                                        04300540
LINE  55          IF( LAB .EQ. L1) GO TO 80                                         04300550
LINE  56          IF( LAB .EQ. L6 ) GO TO 65                                        04300560
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LINE  57          IF( LAB .EQ. L5 ) GO TO 50                                  04300570
LINE  58          IF( LAB .EQ. LEND ) GO TO 60                                04300580
LINE  59          IF( LAB .EQ. LB ) GO TO 70                                  04300590
LINE  60    C                                                                 04300600
LINE  61    C           INVALID LABEL CARD READ                               04300610
LINE  62          WRITE( I6, 2000 )                                           04300620
LINE  63          WRITE( I6, 2018 )                                           04300630
LINE  64          WRITE( I6, 2017 ) LAB, ID , FD                              04300640
LINE  65          ERROR = .TRUE.                                              04300650
LINE  66          GO TO 10                                                    04300660
LINE  67    C                                                                 04300670
LINE  68    C     ------------------------------------------------------------04300680
LINE  69    C                                                                 04300690
LINE  70     20   CONTINUE                                                    04300700
LINE  71    C           'WING' CARD HAS BEEN READ.                            04300710
LINE  72    C                                                                 04300720
LINE  73          CLINPT = .FALSE.                                            04300730
LINE  74          NWING = NWING & 1                                           04300740
LINE  75    C                                                                 04300750
LINE  76          JW = ID(1)                                                  04300760
LINE  77          NC = ID(2)                                                  04300770
LINE  78          ISYM = ID(3)                                                04300780
LINE  79          IPW(JW) = ID(4)                                             04300790
LINE  80          NS = ID(5)                                                  04300800
LINE  81    C                                                                 04300810
LINE  82          IF( NWING .LE. 4 ) GO TO 21                                 04300820
LINE  83    C           MORE THAN 4 WING DATA CARDS READ                      04300830
LINE  84          WRITE( I6, 2000 )                                           04300840
LINE  85          WRITE( I6, 2001 )                                           04300850
LINE  86          WRITE( I6, 2004 )                                           04300860
LINE  87          ERROR = .TRUE.                                              04300870
LINE  88     21   CONTINUE                                                    04300880
LINE  89          IF( NWING .EQ. ID(1) ) GO TO 22                             04300890
LINE  90    C           WING DATA CARD OUT OF SEQUENCE                        04300900
LINE  91          WRITE( I6, 2000 )                                           04300910
LINE  92          WRITE( I6, 2001 )                                           04300920
LINE  93          WRITE( I6, 2002 ) ID(1), NWING                              04300930
LINE  94          ERROR = .TRUE.                                              04300940
LINE  95     22   CONTINUE                                                    04300950
LINE  96          IF( ID(1) .GT. 0 .AND. ID(1) .LE. 4 ) GO TO 23              04300960
LINE  97    C           WING NUMBER NOT BETWEEN 1 AND 4                       04300970
LINE  98          WRITE( I6, 2000 )                                           04300980
LINE  99          WRITE( I6, 2001 )                                           04300990
LINE 100          WRITE( I6, 2003 ) ID(1)                                     04301000
LINE 101          ERROR = .TRUE.                                              04301010
LINE 102          JW = 1                                                      04301020
LINE 103     23   CONTINUE                                                    04301030
LINE 104          IF( NS .LE. 3 ) GO TO 24                                    04301040
LINE 105    C           MORE THAN 3 SECTIONS INPUT FOR GIVEN WING             04301050
LINE 106          WRITE( I6, 2000 )                                           04301060
LINE 107          WRITE( I6, 2001 )                                           04301070
LINE 108          WRITE( I6,2005 ) JW, NS                                     04301080
LINE 109          ERROR = .TRUE.                                              04301090
LINE 110          NS = 3                                                      04301100
LINE 111     24   CONTINUE                                                    04301110
LINE 112          NST = (NC&1)/2 - 1                                          04301120
LINE 113          IF(NS .EQ. NST ) GO TO 25                                   04301130
LINE 114    C           NO. CORNER PTS NOT CONSISTANT WITH NO. SECTIONS OF WING 04301140
LINE 115          WRITE( I6, 2000 )                                           04301150
LINE 116          WRITE( I6, 2001 )                                           04301160
LINE 117          WRITE( I6, 2006 ) NC, NS, JW                                04301170
LINE 118          ERROR = .TRUE.                                              04301180
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LINE 119          IF( NST .LE. 3 ) NS = NST                                    04301190
LINE 120     25   CONTINUE                                                     04301200
LINE 121   C                                                                   04301210
LINE 122          NSECT(JW) = NS                                               04301220
LINE 123          SYM(JW) = FLOAT(ISYM)                                        04301230
LINE 124          DO 26 I=1,NS                                                 04301240
LINE 125          ICL(I,JW)=0                                                  04301250
LINE 126     26   NSP(I,JW) = ID(I&5)                                          04301260
LINE 127          AR(JW) = FD(1)                                               04301270
LINE 128   C                                                                   04301280
LINE 129   C            CHECK ON SYMMETRY CODE                                 04301290
LINE 130          IF( IABS(ISYM) .LE. 1 ) GO TO 27                             04301300
LINE 131          WRITE( I6, 2000 )                                            04301310
LINE 132          WRITE( I6, 2001 )                                            04301320
LINE 133          WRITE( I6, 2022 ) JW, ISYM                                   04301330
LINE 134          ERROR = .TRUE.                                               04301340
LINE 135     27   CONTINUE                                                     04301350
LINE 136   C                                                                   04301360
LINE 137          IF( ISYM ) 28, 30, 32                                        04301370
LINE 138     28   CONTINUE                                                     04301380
LINE 139          DO 29 I = 1,4                                                04301390
LINE 140     29   SKODE(I) = SK2(I)                                            04301400
LINE 141          GO TO 34                                                     04301410
LINE 142     30   CONTINUE                                                     04301420
LINE 143          DO 31 I = 1,4                                                04301430
LINE 144     31   SKODE(I) = SK3(I)                                            04301440
LINE 145          GO TO 34                                                     04301450
LINE 146     32   CONTINUE                                                     04301460
LINE 147          DO 33 I = 1,4                                                04301470
LINE 148     33   SKODE(I) = SK1(I)                                            04301480
LINE 149   C                                                                   04301490
LINE 150     34   CONTINUE                                                     04301500
LINE 151   C                                                                   04301510
LINE 152          WRITE( I6, 3000 ) JW, NC, ISYM, SKODE, IPW(JW), NSECT(JW)    04301520
LINE 153          WRITE( I6, 3001 ) ( I, NSP(I,JW),I=1,NS )                    04301530
LINE 154          WRITE( I6, 3005 ) AR(JW)                                     04301540
LINE 155   C                                                                   04301550
LINE 156   C                                                                   04301560
LINE 157   C            READ CORNER POINTS                                     04301570
LINE 158   C                                                                   04301580
LINE 159          DO 36 I=1,NC                                                 04301590
LINE 160          READ( I5, 1000 ) LAB, ID, FD                                 04301600
LINE 161          IF( I .GT. 1 ) GO TO 35                                      04301610
LINE 162          IF( LAB .EQ. L3 ) GO TO 35                                   04301620
LINE 163   C            CORNER DATA CARD MISSING                               04301630
LINE 164          WRITE( I6, 2000 )                                            04301640
LINE 165          WRITE( I6, 2007 ) JW                                         04301650
LINE 166          ERROR = .TRUE.                                               04301660
LINE 167     35   CONTINUE                                                     04301670
LINE 168          CORNX(I,JW) = FD(1)                                          04301680
LINE 169          CORNY(I,JW) = FD(2)                                          04301690
LINE 170          CORNZ(I,JW) = FD(3)                                          04301700
LINE 171     36   CONTINUE                                                     04301710
LINE 172   C                                                                   04301720
LINE 173          WRITE(I6,3004) JW, (I,CORNX(I,JW),CORNY(I,JW),CORNZ(I,JW),I=1,NC) 04301730
LINE 174   C                                                                   04301740
LINE 175          IF(  2*(NC/2) .EQ. NC ) GO TO 37                             04301750
LINE 176          CORNX(NC&1,JW) = CORNX(NC,JW)                                04301760
LINE 177          CORNY(NC&1,JW) = CORNY(NC,JW)                                04301770
LINE 178          CORNZ(NC&1,JW) = CORNZ(NC,JW)                                04301780
LINE 179          NC = NC&1                                                    04301790
LINE 180     37   CONTINUE                                                     04301800
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LINE 181  C                                                                    04301810
LINE 182  C          CALL ROUTINE TO CHECK FOR PHYSICAL ERROR ON CORNER POINT  04301820
LINE 183        CALL WINGCK(CORNX(1,JW),CORNY(1,JW),CORNZ(1,JW),JW,NC,ERROR,I6) 04301830
LINE 184  C                                                                    04301840
LINE 185        DO 38 I=1,NC                                                   04301850
LINE 186        CORNX(I,JW) = CORNX(I,JW)/BEERFL                               04301860
LINE 187        CORNY(I,JW) = CORNY(I,JW)/REFLEN                               04301870
LINE 188        CORNZ(I,JW) = CORNZ(I,JW)/REFLEN                               04301880
LINE 189   38   CONTINUE                                                       04301890
LINE 190        GO TO 10                                                       04301900
LINE 191  C                                                                    04301910
LINE 192   40   CONTINUE                                                       04301920
LINE 193  C                                                                    04301930
LINE 194  C          SECTION TO PROCESS CONTROL LINE  INFORMATION              04301940
LINE 195  C                                                                    04301950
LINE 196        IS = ID(1)                                                     04301960
LINE 197        K = ICL(IS,JW) & 1                                             04301970
LINE 198        ICL(IS,JW) = K                                                 04301980
LINE 199        IF( IS .LE. NSECT(JW) ) GO TO 41                               04301990
LINE 200  C          CONTROL LINE SPECIFIED FOR SECTION THAT DOES NOT EXIST    04302000
LINE 201        WRITE( I6, 2000 )                                              04302010
LINE 202        WRITE( I6, 2008 ) JW                                           04302020
LINE 203        WRITE( I6,2011 ) IS, JW, NSECT(JW)                             04302030
LINE 204        ERROR = .TRUE.                                                 04302040
LINE 205        GO TO 10                                                       04302050
LINE 206   41   CONTINUE                                                       04302060
LINE 207        IF( K .LE. 2 ) GO TO 42                                        04302070
LINE 208  C          MORE THAN TWO CONTROL LINES READ FOR SAME SECTION         04302080
LINE 209        WRITE( I6, 2000 )                                              04302090
LINE 210        WRITE( I6, 2008 ) JW                                           04302100
LINE 211        WRITE( I6, 2009) IS                                            04302110
LINE 212        ERROR = .TRUE.                                                 04302120
LINE 213   42   CONTINUE                                                       04302130
LINE 214        IF( K .EQ. ID(2) ) GO TO 43                                    04302140
LINE 215  C          CONTROL LINE DATA OUT OF SEQUENCE                         04302150
LINE 216        WRITE( I6, 2000 )                                              04302160
LINE 217        WRITE( I6, 2008 ) JW                                           04302170
LINE 218        WRITE( I6, 2010 ) IS                                           04302180
LINE 219        ERROR = .TRUE.                                                 04302190
LINE 220   43   CONTINUE                                                       04302200
LINE 221  C                                                                    04302210
LINE 222        IF( .NOT. CLINPT ) WRITE( I6, 3002) JW                         04302220
LINE 223  C                                                                    04302230
LINE 224        CLINPT = .TRUE.                                                04302240
LINE 225        WRITE( I6, 3003 ) IS, K, FD(1), FD(2)                          04302250
LINE 226  C                                                                    04302260
LINE 227        X1 = FD(1)/BEERFL                                              04302270
LINE 228        X2 = FD(2)/BEERFL                                              04302280
LINE 229        ICN = 2*IS - 1                                                 04302290
LINE 230        IF( X1 .LT. CORNX(ICN,JW) )   GO TO 44                         04302300
LINE 231        IF( X1 .GT. CORNX(ICN&1,JW) ) GO TO 44                         04302310
LINE 232        IF( X2 .LT. CORNX(ICN&2,JW) ) GO TO 44                         04302320
LINE 233        IF( X2 .GT. CORNX(ICN&3,JW) ) GO TO 44                         04302330
LINE 234        GO TO 45                                                       04302340
LINE 235   44   CONTINUE                                                       04302350
LINE 236  C          CONTROL LINE DEFINED OUTSIDE OF SECTION                   04302360
LINE 237        WRITE( I6, 2000 )                                              04302370
LINE 238        WRITE( I6, 2008 ) JW                                           04302380
LINE 239        WRITE( I6, 2012 ) K, IS                                        04302390
LINE 240        ERROR = .TRUE.                                                 04302400
LINE 241   45   CONTINUE                                                       04302410
LINE 242        IF( K .EQ. 1 ) GO TO 46                                        04302420
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LINE 243          IF( X1 .GE. CL(1,IS,JW)  .AND.  X2 .GE. CL(2,IS,JW) ) GO TO 46     04302430
LINE 244   C            SECOND CONTROL LINE DEFINED ABOVE FIRST                        04302440
LINE 245          WRITE( I6, 2000 )                                                    04302450
LINE 246          WRITE( I6, 2008 ) JW                                                 04302460
LINE 247          WRITE( I6, 2013 ) IS                                                 04302470
LINE 248          ERROR = .TRUE.                                                       04302480
LINE 249       46 CONTINUE                                                             04302490
LINE 250          JCN = 2*K - 1                                                        04302500
LINE 251          CL(JCN,IS,JW) = X1                                                   04302510
LINE 252          CL(JCN&1,IS,JW) = X2                                                 04302520
LINE 253          GO TO 10                                                             04302530
LINE 254   C                                                                           04302540
LINE 255       50 CONTINUE                                                             04302550
LINE 256   C            FREQUENCY CARD READ                                            04302560
LINE 257          DO 55  I =1, 4                                                       04302570
LINE 258       55 FREQ(I) = FD(I)                                                      04302580
LINE 259          NFREQ = ID(1)                                                        04302590
LINE 260          IF( NFREQ .GT. 4 ) READ( I5, 1001 ) ( FREQ(I), I=5, NFREQ )          04302600
LINE 261          WRITE( I6, 3006 )        NFREQ, ( FREQ(I), I=1,NFREQ)                04302610
LINE 262          FREQR = .TRUE.                                                       04302620
LINE 263          GO TO 10                                                             04302630
LINE 264   C                                                                           04302640
LINE 265       60 CONTINUE                                                             04302650
LINE 266   C            END CARD READ                                                  04302660
LINE 267   C            MODE DATA IS MISSING                                           04302670
LINE 268          WRITE( I6, 2000 )                                                    04302680
LINE 269          IF( .NOT. FREQR ) WRITE( I6, 2015 )                                  04302690
LINE 270          WRITE( I6, 2014 )                                                    04302700
LINE 271          ERROR = .TRUE.                                                       04302710
LINE 272          RETURN                                                               04302720
LINE 273   C                                                                           04302730
LINE 274       65 CONTINUE                                                             04302740
LINE 275          IF( FREQR ) RETURN                                                   04302750
LINE 276          WRITE( I6, 2000 )                                                    04302760
LINE 277          WRITE( I6, 2015 )                                                    04302770
LINE 278          ERROR = .TRUE.                                                       04302780
LINE 279          RETURN                                                               04302790
LINE 280   C                                                                           04302800
LINE 281       70 CONTINUE                                                             04302810
LINE 282   C            LABEL CARD EXPECTED BUT NOT RECEIVED                           04302820
LINE 283          WRITE( I6, 2000 )                                                    04302830
LINE 284          WRITE( I6,2016 )                                                     04302840
LINE 285          WRITE( I6, 2017 ) LAB, ID , FD                                       04302850
LINE 286          ERROR = .TRUE.                                                       04302860
LINE 287          GO TO 10                                                             04302870
LINE 288   C                                                                           04302880
LINE 289       80 CONTINUE                                                             04302890
LINE 290   C            GRID CARD READ                                                 04302900
LINE 291          I = ID(2)                                                            04302910
LINE 292          J = ID(1)                                                            04302920
LINE 293          IF( I .GT. NSECT(J) ) GO TO 81                                       04302930
LINE 294          IF( J .GT. NWING ) GO TO 81                                          04302940
LINE 295          ICL(I,J) = -1                                                        04302950
LINE 296          RETURN                                                               04302960
LINE 297       81 CONTINUE                                                             04302970
LINE 298   C            GRID DATA SPECIFIED FOR SECTION THAT DOES NOT EXIST            04302980
LINE 299          WRITE( I6, 2000 )                                                    04302990
LINE 300          WRITE( I6, 2020 )                                                    04303000
LINE 301          WRITE( I6, 2021 ) J, I                                               04303010
LINE 302          ERROR = .TRUE.                                                       04303020
LINE 303          RETURN                                                               04303030
LINE 304   C                                                                           04303040
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LINE 305   1000 FORMAT( A4, 2X, 9I2, 4E12.0 )                                  04303050
LINE 306   1001 FORMAT( 24X, 4E12.0 )                                          04303060
LINE 307  C                                                                    04303070
LINE 308   2000 FORMAT(/// 1X, 129(1H*)    *** ERROR IN READING INPUT.    )    04303080
LINE 309   2001 FORMAT(29H WING DATA CAR  IS INCORRECT. )                      04303090
LINE 310   2002 FORMAT( 14H DATA FOR WING, I2,28H WAS READ WHEN DATA FOR WING, I3,04303100
LINE 311       1 28H WAS EXPECTED BY THE PROGRAM // )                          04303110
LINE 312   2003 FORMAT( 82H WING NUMBER MUST BE GREATER THAN ZERO AND LESS THAN OR04303120
LINE 313       1 EQUAL TO 4. IT WAS READ AS, I2 /56H IT WILL BE TREATED AS WING 1 04303130
LINE 314       2FOR FOR CHECK PURPOSE ONLY / )                                 04303140
LINE 315   2004 FORMAT( 47H NO MORE THAN FOUR WING DATA CARDS MAY BE INPUT )   04303150
LINE 316   2005 FORMAT( 34H NUMBER OF SECTIONS INPUT FOR WING, I2,3H IS, I2 /  04303160
LINE 317       1 47H THIS IS GREATER THAN THE MAXIMUM PER WING OF 3 )          04303170
LINE 318   2006 FORMAT( 24H NUMBER OF CORNER POINTS, I2, 19H IS NOT CONSISTANT ,04303180
LINE 319       1 27HWITH THE NUMBER OF SECTIONS, I2,  9H FOR WING, I2  )       04303190
LINE 320   2007 FORMAT(36H 'CORNER' DATA CARD MISSING FOR WING, I2 )           04303200
LINE 321   2008 FORMAT(43H ERROR ON CONTROL 'LINE' DATA CARD FOR WING, I2 )    04303210
LINE 322   2009 FORMAT(54H MORE THAN TWO CONTROL LINES ARE SPECIFIED FOR SECTION,04303220
LINE 323       I  I2 )                                                         04303230
LINE 324   2010 FORMAT(49H CONTROL LINES ARE NOT INPUT IN ORDER FOR SECTION, I2 )04303240
LINE 325   2011 FORMAT(38H CONTROL LINE IS SPECIFIED FOR SECTION, I2, 8H OF WING,04303250
LINE 326       1 I2 /  14H THIS WING HAS, I2,  31H SECTIONS. CONTROL LINE IGNORED)04303260
LINE 327   2012 FORMAT(13H CONTROL LINE, I2, 12H FOR SECTION, I2,44H IS NOT DEFINE04303270
LINE 328       1D TO BE INSIDE OF THE SECTION. )                               04303280
LINE 329   2013 FORMAT( 26H CONTROL LINE 2 OF SECTION, I2, 33H IS ABOVE THE FIRST 04303290
LINE 330       1CONTROL LINE.  )                                               04303300
LINE 331   2014 FORMAT(37H MODE DATA IS MISSING OR OUT OF ORDER )              04303310
LINE 332   2015 FORMAT(42H FREQUENCY DATA IS MISSING OR OUT OF ORDER )         04303320
LINE 333   2016 FORMAT( 42H A LABEL CARD IS EXPECTED BUT NOT PRESENT. )        04303330
LINE 334   2017 FORMAT(                                        67H CARD WILL B04303340
LINE 335       1E PRINTED ON FOLLOWING LINE AND NEXT CARD WILL BE READ. / 1X,  04303350
LINE 336       2 A4, 2X, 9I2,4E12.0 )                                          04303360
LINE 337   2018 FORMAT( 32H AN INVALID LABEL CARD WAS READ. )                  04303370
LINE 338   2020 FORMAT( 27H ERROR ON GRID LABEL CARD. )                        04303380
LINE 339   2021 FORMAT( 27H GRID DATA PRESENT FOR WING, I2, 8H SECTION, I2 /   04303390
LINE 340       1 53H THIS SECTION HAS NOT BEEN DEFINED FOR THE STRUCTURE.  )   04303400
LINE 341   2022 FORMAT( 23H SYMMETRY CODE FOR WING, I2, 12H IS INPUT AS, I4 /  04303410
LINE 342       1 41H SYMMETRY CODE MAY ONLY EQUAL -1, 0, OR 1 / )              04303420
LINE 343  C                                                                    04303430
LINE 344   3000 FORMAT(////20X,          13HDATA FOR WING, I2 // 24X,          04303440
LINE 345       1 23HNUMBER OF CORNER POINTS, I6  //  24X,                      04303450
LINE 346       2 13HSYMMETRY CODE, I16 / 24X, 4A4 // 24X,                      04303460
LINE 347       3 17HOUTPUT PRINT CODE, I12  // 24X,                            04303470
LINE 348       4 18HNUMBER OF SECTIONS, I11 //                                 04303480
LINE 349       5  24X, 18HNUMBER OF SPANS IN  )                                04303490
LINE 350   3001 FORMAT(  33X,  7HSECTION, I2, I11)                             04303500
LINE 351   3002 FORMAT( /24X,22HCONTROL LINES FOR WING, I2 / 24X, 12HSECTION LINE,04303510
LINE 352       1  10X, 2HX1, 14X, 2HX2 )                                       04303520
LINE 353   3003 FORMAT( 26X, 2I5,5X, 2E16.5 )                                  04303530
LINE 354   3004 FORMAT( / 24X, 40HCOORDINATES OF THE CORNER POINTS OF WING, I2 04303540
LINE 355       1  /  30X, 1HX, 15X, 1HY, 15X, 1HZ  / ( 20X, I5, 3E16.5 )  )    04303550
LINE 356   3005 FORMAT( / 24X, 12HASPECT RATIO, F17.4 )                        04303560
LINE 357   3006 FORMAT(                          // // 20X, 21HNUMBER OF FREQUENCI04303570
LINE 358       1ES, I12  / 20X, 19HLIST OF FREQUENCIES, 5F14.4 / (39X, 5F14.4) )04303580
LINE 359  C                                                                    04303590
LINE 360        END                                                            04303600
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DISPLAY...FILE DECK 44

```
      SUBROUTINE WINTGR( X, Y, [illegible]
      COMPLEX WTES
      INTEGER GOBACK
      LOGICAL EREONE, EMIRRO, TRAILR, [illegible]
      LOGICAL ERROR
      LOGICAL MIRROR
      LOGICAL TEXCD
      LOGICAL TRAINF
      LOGICAL TREDGE, WAKE1
      DIMENSION CXR(12), CXI(12)
      DIMENSION RKTERM(30)
      DIMENSION SKA(30)
      DIMENSION WLEAD(20)
      DIMENSION WSAVE(20)
      DIMENSION X(1), Y(1), WROW(1)
      COMMON/BASIC/MACH,BEETA,KAPPA,IPRNT(5)
      COMMON / EEW / XUP, YUP, XLW, YLW, EREONE, EMIRRO, RR, RL, RTR,RTL
      COMMON / FQ1 / NFREQ, CF(12,30), FREQ(12), FREQP(12), FRTEST,NTMXX
      COMMON / RRLL / TVW(4), YRO, YLO, ZR, ZRZR, ZL, ZLZL, IRC, IIN
      COMMON /WAKE/ ITWM, ITW, ICNVGW, EPSW, JCNVGW,LRWTE ,IWTE
      COMMON / WAKEUP / WTES(12), TREDGE, WAKE1
      COMMON / WV1 / NTERM, V(30), W(30)
      COMMON / WW1 / XO,YO,ZD,ZDZD, SYMK, NINSID
      COMMON  / ZFDZIO / I5, I6
      DATA KCONV  / 0 /
      DATA RKTERM  / 0.221, 0.645, 1.192, 1.807, 2.461, 3.14, 3.835,
     1   4.541, 5.255, 5.974, 6.697, 7.42, 8.15, 8.88, 9.61, 10.34,
     2   11.08, 11.81, 12.55, 13.28, 14.02, 14.76, 15.49, 16.23, 16.97,
     3   17.71, 18.44, 19.18, 19.92, 20.6   /
C           X        X COOR. OF POINTS OF INFLUENCING ELEMENT
C           Y        Y COOR. OF POINTS OF INFLUENCING ELEMENT
C           XO         X COORDINATE OF RECEIVING PT. (CENTER OF ELEMENT )
C           YRO        Y COORDINATE OF RECEIVING PT. (IN RIGHT SIDE )
C           YLO        Y COORDINATE OF RECEIVING PT. (IN LEFT SIDE ))
C           ZD         DIFFERENCE BETWEEN Z'S  OF INFLU. AND RECEIV. ELEM.
C           ZDZD IS THE SQUARE OF THE DIFFERENCE OF THE REC AND INFL Z'S
C           TVW      TRANSFORMATION TO COMBINE UPWASH AND SIDEWASH
C           NTERM    NO. TERMS IN APPROXIMATION OF VELOCITY INTEGRALS
C           SYM        SYMMETRY CODE ( 0.0 FOR NO SYMMETRY )
C           ERROR    LOGICAL SET EQUAL TO TRUE IF AN ERROR IS DETECTED
C           WROW     AN ARRAY OF THE FREQUENCY INDEPENDENT TERMS OF THE
C                    VELOCITY INTEGALS FOR A FIVEN REC. ELEM AND INFL ELEM
C                    ENCING ELEMENT HAS NO INFLUENCE.(NOT MIRROR ELEMENT)
C           IFIRST   .TRUE. IF ELEMENT IS THE FIRST ELEMENT OF INFLU. SPAN
C           WAKE1    LOGICAL SET TO .TRUE. IF WAKE ELEMENT HAS INFLUENCE
C           TREDGE   LOGICAL INPUT AS TRUE IF INFL. ELEM. IS THE TRAIALING
C                    EDGE ELEMENT OF ITS SPAN
C           WTES(J) COMPLEX ARRAY OF INFLUENCE OF WAKE EFFECT FOR
C                    FREQUENCY J
C
C
C           INITIALIZE WROW TO ZERO
C
      DO  10  I=1,NFREQ
   10 WROW(I) = 0.0
C
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LINE  57  C          TEST LEADING EDGE LINE                                  04400570
LINE  58        YLW = Y(1)                                                   04400580
LINE  59        YUP = Y(2)                                                   04400590
LINE  60        XLW = X(1)                                                   04400600
LINE  61        XUP = X(2)                                                   04400610
LINE  62  C                                                                  04400620
LINE  63        CALL EONE                                                    04400630
LINE  64  C                                                                  04400640
LINE  65  C          IF ELEMENT IS NOT IN MACH CONE, RETURN WITH ZERO IN WROW.  04400650
LINE  66  C          PROCEES ANYWAY IF IT IS A SELF ELEMENT  (DIAGONAL TERM)  04400660
LINE  67        IF( EREONE  .OR.  IIN .EQ. IRC ) GO TO 20                    04400670
LINE  68  C                                                                  04400680
LINE  69        RETURN                                                       04400690
LINE  70  C                                                                  04400700
LINE  71    20  CONTINUE                                                     04400710
LINE  72        IF( IRC .EQ. 1  .AND.  IIN .EQ. 1 ) KCONV = 0                04400720
LINE  73  C                                                                  04400730
LINE  74        ASSIGN 310 TO IWAKE1                                         04400740
LINE  75        ASSIGN 160 TO IWAKE2                                         04400750
LINE  76  C                                                                  04400760
LINE  77        NTERM = 1                                                    04400770
LINE  78        RRU = RR                                                     04400780
LINE  79        RLU = RL                                                     04400790
LINE  80        MIRROR = EMIRRO                                              04400800
LINE  81        TRAINF = .FALSE.                                             04400810
LINE  82        WAKE1 = .FALSE.                                              04400820
LINE  83        IF( .NOT. TREDGE ) GO TO 25                                  04400830
LINE  84  C          TEST TRAILING EDGE LINE                                 04400840
LINE  85  C                                                                  04400850
LINE  86        YLW = Y(2)                                                   04400860
LINE  87        YUP = Y(1)                                                   04400870
LINE  88        XLW = X(3)                                                   04400880
LINE  89        XUP = X(4)                                                   04400890
LINE  90  C                                                                  04400900
LINE  91        CALL EONE                                                    04400910
LINE  92  C                                                                  04400920
LINE  93        YLW = Y(1)                                                   04400930
LINE  94        YUP = Y(2)                                                   04400940
LINE  95        XLW = X(1)                                                   04400950
LINE  96        XUP = X(2)                                                   04400960
LINE  97  C                                                                  04400970
LINE  98        IF( .NOT. EREONE ) GO TO 40                                  04400980
LINE  99        TRAINF = .TRUE.                                              04400990
LINE 100        IF( LWTE .NE. 0  .AND.  RTR   .GT. 0.0 )  WAKE1 = .TRUE.     04401000
LINE 101        GO TO 40                                                     04401010
LINE 102  C                                                                  04401020
LINE 103    25  CONTINUE                                                     04401030
LINE 104        IF( NINSID .EQ. 0  ) GO TO 40                                04401040
LINE 105        DO 30 I=1,NFREQ                                              04401050
LINE 106    30  WROW(I) = -WLEAD(I)                                          04401060
LINE 107  C                                                                  04401070
LINE 108    40  CONTINUE                                                     04401080
LINE 109        DO 45 I=1,NFREQ                                              04401090
LINE 110    45  WLEAD(I) = 0.0                                               04401100
LINE 111  C                                                                  04401110
LINE 112  C                                                                  04401120
LINE 113        NINSID = NINSID & 1                                          04401130
LINE 114  C                                                                  04401140
LINE 115        YO = YRO                                                     04401150
LINE 116        ZO = ZR                                                      04401160
LINE 117        ZOZO = ZRZR                                                  04401170
LINE 118        TV = TVW(1)                                                  04401180
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LINE 119          TW = TVW(2)                                                  04401190
LINE 120   C                                                                   04401200
LINE 121          IF( FRTEST .EQ. 0.0 ) GO TO 145                              04401210
LINE 122   C                                                                   04401220
LINE 123   C            SECTION FOR NEAR FIELD  [illegible]  EDGE              04401230
LINE 124   C            DECIDE HOW MANY TERMS ARE [illegible] SED ON PK        04401240
LINE 125          RK = RRU*FRTEST                                              04401250
LINE 126          ASSIGN 145 TO GOBACK                                         04401260
LINE 127          GO TO 600                                                    04401270
LINE 128    145   CONTINUE                                                     04401280
LINE 129   C                                                                   04401290
LINE 130          CALL WVINT                                                   04401300
LINE 131   C                                                                   04401310
LINE 132          ASSIGN 150 TO GOBACK                                         04401320
LINE 133          GO TO 800                                                    04401330
LINE 134    150   CONTINUE                                                     04401340
LINE 135          DO 155 I=1,NFREQ                                             04401350
LINE 136          WLEAD(I) = WLEAD(I) & SKA(I)                                 04401360
LINE 137          WROW(I) = WROW(I) & SKA(I)                                   04401370
LINE 138    155   CONTINUE                                                     04401380
LINE 139   C                                                                   04401390
LINE 140          GO TO IWAKE2, ( 160, 320 )                                   04401400
LINE 141    160   CONTINUE                                                     04401410
LINE 142   C                                                                   04401420
LINE 143   C            CHECK IF LEFT HAND ELEMENT (MIRROR IMAGE) EXISTS       04401430
LINE 144   C                                                                   04401440
LINE 145          IF( .NOT. MIRROR ) GO TO 300                                 04401450
LINE 146   C            SECTION FOR LEFT HAND SIDE OF LEADING EDGE             04401460
LINE 147          IF( FRTEST .EQ. 0.0 ) GO TO 185                              04401470
LINE 148   C                                                                   04401480
LINE 149   C            SECTION FOR NEAR FIELD, LEFT HAND SIDE LEADING EDGE    04401490
LINE 150   C            DECIDE HOW MANY TERMS ARE NEEDED BASED ON RK           04401500
LINE 151          RK = RLU*FRTEST                                              04401510
LINE 152          ASSIGN 185 TO GOBACK                                         04401520
LINE 153          GO TO 600                                                    04401530
LINE 154    185   CONTINUE                                                     04401540
LINE 155   C                                                                   04401550
LINE 156          YO = YLU                                                     04401560
LINE 157          ZO = ZL                                                      04401570
LINE 158          ZOZO = ZLZL                                                  04401580
LINE 159          TV = TVW(3)                                                  04401590
LINE 160          TW = TVW(4)                                                  04401600
LINE 161   C                                                                   04401610
LINE 162          CALL WVINT                                                   04401620
LINE 163   C                                                                   04401630
LINE 164          ASSIGN 190 TO GOBACK                                         04401640
LINE 165          GO TO 800                                                    04401650
LINE 166    190   CONTINUE                                                     04401660
LINE 167          DO 195 I=1,NFREQ                                             04401670
LINE 168          WLEAD(I) = WLEAD(I) - SYMK*SKA(I)                            04401680
LINE 169          WROW(I) = WROW(I) - SYMK*SKA(I)                              04401690
LINE 170    195   CONTINUE                                                     04401700
LINE 171   C                                                                   04401710
LINE 172    300   CONTINUE                                                     04401720
LINE 173   C                                                                   04401730
LINE 174          IF( .NOT. TRAINF ) RETURN                                    04401740
LINE 175          GO TO IWAKE1, ( 310,320 )                                    04401750
LINE 176   C      ------------------------------------------------------------04401760
LINE 177   C                                                                   04401770
LINE 178    310   CONTINUE                                                     04401780
LINE 179   C                                                                   04401790
LINE 180   C            FIND INFLUENCE OF TRAILING EDGE OF TRAILING EDGE ELEMENT 04401800
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LINE 181  C          (THE RIGHT HAND ELEMENT ONLY AT THIS TIME)                 04401810
LINE 182  C                                                                     04401820
LINE 183        ASSIGN 320 TO IWAKE1                                            04401830
LINE 184        ASSIGN 320 TO IWAKE2                                            04401840
LINE 185  C                                                                     04401850
LINE 186        YLW = Y(2)                                                      04401860
LINE 187        YUP = Y(1)                                                      04401870
LINE 138        XLW = X(3)                                                      04401880
LINE 189        XUP = X(4)                                                      04401890
LINE 190        YO = YRO                                                        04401900
LINE 191        ZD = ZR                                                         04401910
LINE 192        ZDZD = ZRZR                                                     04401920
LINE 193        TV = TVW(1)                                                     04401930
LINE 194        TW = TVW(2)                                                     04401940
LINE 195        SYM =-1.0                                                       04401950
LINE 196        MIRROR = EMIRRO                                                 04401960
LINE 197  C                                                                     04401970
LINE 198        DO 315 J=1,NFREQ                                                04401980
LINE 199        WTES(J) = (0.0, 0.0)                                            04401990
LINE 200        WSAVE(J) = WLEAD(J)                                             04402000
LINE 201   315  WLEAD(J) = 0.0                                                  04402010
LINE 202  C                                                                     04402020
LINE 203        IF( FRTEST .EQ. 0.0 ) GO TO 145                                 04402030
LINE 204        RK = RR*FRTEST                                                  04402040
LINE 205        ASSIGN 145 TO GOBACK                                            04402050
LINE 206        GO TO 600                                                       04402060
LINE 207  C                                                                     04402070
LINE 208   320  CONTINUE                                                        04402080
LINE 209  C                                                                     04402090
LINE 210        IF( .NOT. WAKE1 ) GO TO 370                                     04402100
LINE 211  C                                                                     04402110
LINE 212  C          SECTION TO COMPUTE WAKE EFFECT                             04402120
LINE 213  C          THIS SECTION HANDLES BOTH RIGHT AND LEFT HAND ELEMENTS     04402130
LINE 214  C                                                                     04402140
LINE 215        Z1  = XO - XLW                                                  04402150
LINE 216        Z2  = XO -XUP                                                   04402160
LINE 217        E1  = YO - YLW                                                  04402170
LINE 218        E2  = YO - YUP                                                  04402180
LINE 219        Z3P = SQRT( E2*E2 & ZDZD )                                      04402190
LINE 220        Z4P = SQRT( E1*E1 & ZDZD )                                      04402200
LINE 221        ZTE = 0.5*(Z1&Z2)                                               04402210
LINE 222        ZLW = 0.5*(Z3P&Z4P)                                             04402220
LINE 223  C          DIVIDE ZDIS=ZU-ZL INTO A NUMBER OF DIVISIONS               04402230
LINE 224        ZDIS  = ZTE - ZLW                                               04402240
LINE 225        DS  = E2 - E1                                                   04402250
LINE 226        NW = ZDIS/DS                                                    04402260
LINE 227        IF( NW .EQ. 0 ) NW = 1                                          04402270
LINE 228        IF( FRTEST .EQ. 0.0 ) NW = 1                                    04402280
LINE 229        DELTAZ = ZDIS/NW                                                04402290
LINE 230        ZSMZTE = -0.5*DELTAZ                                            04402300
LINE 231  C                                                                     04402310
LINE 232  C          FIND WAKE EFFECT OF TRAILING EDGE LINE                     04402320
LINE 233  C          (NOTE WLEAD WAS COMPUTED IN OPPOSITE DIRECTION)            04402330
LINE 234  C                                                                     04402340
LINE 235        DO 325 I=1,NFREQ                                                04402350
LINE 236        FBZ = -( FREQ(I)/BFETA )*ZSMZTE                                 04402360
LINE 237        CXR(I) = COS( FBZ )                                             04402370
LINE 238        CXI(I) = SIN( FBZ )                                             04402380
LINE 239        WTES(I) = WTES(I) - CMPLX( WLEAD(I)*CXR(I), WLEAD(I)*CXI(I) )   04402390
LINE 240   325  CONTINUE                                                        04402400
LINE 241  C          IF NW=1 WE ARE DONE                                        04402410
LINE 242        IF( NW .EQ. 1 ) GO TO 370                                       04402420
```

```
LINE 243  C                                                                    04402430
LINE 244  C          SECTION TO FIND WAKE EFFECT OF THE REST OF THE WAKE ELEMENTS 04402440
LINE 245  C                                                                    04402450
LINE 246  C          XLW = AVERAGE X                                           04402460
LINE 247        XLW = 0.5*(XLW&XUP)                                            04402470
LINE 248  C          NOTE CHANGE IN DIRECTI                                    04402480
LINE 249        YLW = Y(1)                                                     04402490
LINE 250        YUP = Y(2)                                                     04402500
LINE 251        ELS = (YO-YLW)**2 & ZDZD                                       04402510
LINE 252        EUS = (YO-YUP)**2 & ZDZD                                       04402520
LINE 253  C                                                                    04402530
LINE 254        DO 360 LINE = 2, NW                                            04402540
LINE 255  C                                                                    04402550
LINE 256        DO 227 I=1,NFREQ                                               04402560
LINE 257   227  WLEAD(I) = 0.0                                                 04402570
LINE 258  C                                                                    04402580
LINE 259        XLW = XLW & DELTAZ                                             04402590
LINE 260        XUP = XLW                                                      04402600
LINE 261        ZETA = XO - XLW                                                04402610
LINE 262        ZSMZTE = ZSMZTE - DELTAZ                                       04402620
LINE 263  C                                                                    04402630
LINE 264        IF( FRTEST .EQ. 0.0 ) GO TO 330                                04402640
LINE 265        RR = 0.5*( SQRT( ZETA**2 - ELS )  &  SQRT( ZETA**2 - EUS ) )   04402650
LINE 266        RK = RR*FRTEST                                                 04402660
LINE 267        ASSIGN 330 TO GOBACK                                           04402670
LINE 268        GO TO 600                                                      04402680
LINE 269   330  CONTINUE                                                       04402690
LINE 270  C                                                                    04402700
LINE 271        CALL WVINT                                                     04402710
LINE 272  C                                                                    04402720
LINE 273        ASSIGN 340 TO GOBACK                                           04402730
LINE 274        GO TO 800                                                      04402740
LINE 275   340  CONTINUE                                                       04402750
LINE 276        DO 345 I=1,NFREQ                                               04402760
LINE 277   345  WLEAD(I) = WLEAD(I) - SYM*SKA(I)                               04402770
LINE 278  C                                                                    04402780
LINE 279        DO 350 J=1,NFREQ                                               04402790
LINE 280        FBZ = -( FREQ(J)/BEETA )*ZSMZTE                                04402800
LINE 281        CXIPR = COS( FBZ )                                             04402810
LINE 282        CXIPI = SIN( FBZ )                                             04402820
LINE 283        WTES(J) = WTES(J)                                              04402830
LINE 284       1  & CMPLX( WLEAD(J)*(CXR(J)-CXIPR), WLEAD(J)*(CXI(J)-CXIPI) )  04402840
LINE 285        CXR(J) = CXIPR                                                 04402850
LINE 286        CXI(J) = CXIPI                                                 04402860
LINE 287   350  CONTINUE                                                       04402870
LINE 288  C                                                                    04402880
LINE 289  C          END LOOP ON LINE                                          04402890
LINE 290   360  CONTINUE                                                       04402900
LINE 291  C                                                                    04402910
LINE 292   370  CONTINUE                                                       04402920
LINE 293  C                                                                    04402930
LINE 294  C          CHECK IF MIRROR IMAGE OF TRAILING EDGE LINE HAS INFLUENCE AND04402940
LINE 295  C          HAS NOT YET BEEN CONSIDERED.                              04402950
LINE 296  C                                                                    04402960
LINE 297        IF( .NOT. EMIRRO ) GO TO 380                                   04402970
LINE 298        IF( RTL .LE. 0.0 ) GO TO 380                                   04402980
LINE 299  C          FIND INFLUENCE OF THE MIRROR IMAGE OF THE TRAILING EDGE.  04402990
LINE 300  C                                                                    04403000
LINE 301  C          SET EMIRRO TO .FALSE. SO THAT WE DO NOT BRANCH HERE AGAIN 04403010
LINE 302        EMIRRO = .FALSE.                                               04403020
LINE 303  C                                                                    04403030
LINE 304        DO 375 I=1,NFREQ                                               04403040
```

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LINE 305   375  WLEAD(I) = 0.0                                          04403050
LINE 306  C                                                             04403060
LINE 307        XLW = X(3)                                              04403070
LINE 308        XUP = X(4)                                              04403080
LINE 309        YLW = Y(2)                                              04403090
LINE 310        YUP = Y(1)                                              04403100
LINE 311        YO = YLO                                                04403110
LINE 312        ZD = ZL                                                 04403120
LINE 313        ZDZD = ZLZL                                             04403130
LINE 314        TV = TVW(3)                                             04403140
LINE 315        TW = TVW(4)                                             04403150
LINE 316        SYM = SYMK                                              04403160
LINE 317        IF( FRTEST .EQ. 0.0 ) GO TO 185                         04403170
LINE 318        RK = RL*FRTEST                                          04403180
LINE 319        ASSIGN 185 TO GOBACK                                    04403190
LINE 320        GO TO 600                                               04403200
LINE 321  C                                                             04403210
LINE 322   380  CONTINUE                                                04403220
LINE 323  C                                                             04403230
LINE 324  C           WE ARE FINISHED CALCULATING WAKE EFFECT           04403240
LINE 325  C           AND/OR INFLUENCE OF TRAILING EDGE OF A TRAILING EDGE ELEMENT 04403250
LINE 326  C           PUT WLEAD BACK TO WSAVE AND RETRUN                04403260
LINE 327  C                                                             04403270
LINE 328        DO 390 I=1,NFREQ                                        04403280
LINE 329   390  WLEAD(I) = WSAVE(I)                                     04403290
LINE 330  C                                                             04403300
LINE 331        RETURN                                                  04403310
LINE 332  C                                                             04403320
LINE 333  C     ------------------------------------------------------------04403330
LINE 334  C                                                             04403340
LINE 335   600  CONTINUE                                                04403350
LINE 336  C           SECTION TO FIND NUMBER OF TERMS TAKEN IN SERIES   04403360
LINE 337        IF( RK .GT. 20.5 ) GO TO 615                            04403370
LINE 338        DO 610 NTERM=6,NTMXX                                    04403380
LINE 339        IF( RK .LE. RKTERM(NTERM) ) GO TO 620                   04403390
LINE 340   610  CONTINUE                                                04403400
LINE 341   615  CONTINUE                                                04403410
LINE 342        TEXCD = .TRUE.                                          04403420
LINE 343        NCVEL = NCVEL & 1                                       04403430
LINE 344        NTERM = NTMXX                                           04403440
LINE 345   620  CONTINUE                                                04403450
LINE 346        NTERM = MIN0( NTERM, NTMXX )                            04403460
LINE 347        IF( RK .GT. RKEX ) RKEX = RK                            04403470
LINE 348        IF( NTERM .GT. NTMAX ) NTMAX = NTERM                    04403480
LINE 349        GO TO GOBACK, ( 145, 185, 330 )                         04403490
LINE 350  C     ------------------------------------------------------------04403500
LINE 351  C                                                             04403510
LINE 352  C                                                             04403520
LINE 353   800  CONTINUE                                                04403530
LINE 354  C                                                             04403540
LINE 355        DO 810 I=1,NFREQ                                        04403550
LINE 356   810  SKA(I) = 0.0                                            04403560
LINE 357  C                                                             04403570
LINE 358        NTM1 = MAX0( NTERM-1, 1 )                               04403580
LINE 359        DO 820 J=1,NTM1                                         04403590
LINE 360        SAVE = TV*V(J) & TW*W(J)                                04403600
LINE 361        DO 820 I=1,NFREQ                                        04403610
LINE 362        SKA(I) = SKA(I) & SAVE*CF(I,J)                          04403620
LINE 363   820  CONTINUE                                                04403630
LINE 364  C                                                             04403640
LINE 365        IF( NTERM .EQ. 1 ) GO TO GOBACK, ( 150, 190, 340 )      04403650
LINE 366  C                                                             04403660
```

```
LINE 367          SAVE = TV*V(NTERM) & TW*W(NTERM)                                04403670
LINE 368          DO 830 I=1,NFREQ                                                04403680
LINE 369          SKL = SKA(I)                                                    04403690
LINE 370          SKA(I) = SKA(I) & SAVE*CF(I,NTERM)                              04403700
LINE 371          IF( KCONV .GT. 1000 ) GO TO 830                                 04403710
LINE 372          DIK = ABS( SKA(I) - SKL )                                       04403720
LINE 373          RERO = 1.0                                                      04403730
LINE 374          IF( SKA(I) .NE. 0.0 ) RERO = DIK/ABS(SKA(I))                    04403740
LINE 375          IF( RERO .LT. 0.05  ) GO TO 830                                 04403750
LINE 376          IF( SKA(I) .EQ. 0.0 .AND.  DIK .LT. [illegible] ) GO TO 830     04403760
LINE 377  C           WE HAVE NOT CONVERGED                                       04403770
LINE 378          IF( KCONV .EQ. 0 ) WRITE( I6, 4009 )                            04403780
LINE 379          KCONV = KCONV & 1                                               04403790
LINE 380          WRITE( I6, 4010 ) KCONV,IRC,IIN,NTERM,FREQ(I),SKA(I),SKL,RERO   04403800
LINE 381          IF( KCONV .LE. 1000 ) GO TO 830                                 04403810
LINE 382          WRITE( I6, 4011 )                                               04403820
LINE 383          IFLUSH = 1                                                      04403830
LINE 384   830    CONTINUE                                                        04403840
LINE 385  C                                                                       04403850
LINE 386          GO TO GOBACK, ( 150, 190, 340 )                                 04403860
LINE 387  C                                                                       04403870
LINE 388   4009 FORMAT( 1H1, 120(1H*) // 10X, 85HTHE VELOCITY INFLUENCE COMPUTATIO04403880
LINE 389       1N DID NOT CONVERGE FOR AT LEAST ONE PAIR OF ELEMENTS // 15X,      04403890
LINE 390       2  3HREC, 5X, 4HINFL, 4X, 5HTERMS, 5X, 9HFREQUENCY, 8X, 5HFINAL,   04403900
LINE 391       3  12X, 8HPREVIOUS, 9X, 8HRELATIVE / 15X, 4HELEM, 4X, 4HELEM, 31X, 04403910
LINE 392       4  5HVALUE, 12X, 5HVALUE, 12X, 5HERROR / ).                        04403920
LINE 393   4010 FORMAT( I11, 2I3, I9, 4E17.6  )                                   04403930
LINE 394   4011 FORMAT( /// 1X, 120(1H*)  /    75H WARNING -  AT LEAST 1000 VELOCI04403940
LINE 395       1TY INFLUENCE COMPUTATIONS DID NOT CONVERGE.  /                    04403950
LINE 396       2 54H CONVERGENCE TESTING HAS BEEN TERMINATED FOR THIS RUN. // )   04403960
LINE 397          END                                                             04403970

/ENC READ
```

END OF JOB.

43.1 SEC. USED .012 HRS. CHARGED 49.906 HRS. REMAINING

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DISPLAY...FILE DECK 45

```
LINE   1        SUBROUTINE   WRETA( NET, JMODE,W[illegible], WETA,     113)          04500010
LINE   2        DIMENSION   WETA(NET,10),            WDETA(NET,10)                   04500020
LINE   3        REWIND  113                                                          04500030
LINE   4        DO 30       JM=1, JMODE                                              04500040
LINE   5        WRITE (113) JM, NET, (WDETA(I,JM), I=1,NET), (WETA(I,JM),I=1,NET)    04500050
LINE   6     30 CONTINUE                                                             04500060
LINE   7        END FILE  113                                                        04500070
LINE   8        REWIND 113                                                           04500080
LINE   9        RETURN                                                               04500090
LINE  10        END                                                                  04500100
```

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DISPLAY...FILE DECK 46

```
LINE   1          SUBROUTINE WRITEO (K,AROW, IZ, ANEW, NET)                04600010
LINE   2          DIMENSION  AROW(NET), IZ(NET), ANEW(NET)                 04600020
LINE   3          COMMON /K1112/ KST11,KST12                               04600030
LINE   4          COMMON  /TAPE/ I9,I10,I11                                04600040
LINE   5           NNZ=0                                                   04600050
LINE   6          DO 100   I=1,NET                                         04600060
LINE   7           IF ( AROW( I) .EQ. 0.0)   GO TO 100                     04600070
LINE   8           NNZ = NNZ&1                                             04600080
LINE   9           M = NNZ                                                 04600090
LINE  10           IZ(M) = I                                               04600100
LINE  11           ANEW(M) = AROW(I)                                       04600110
LINE  12    100    CONTINUE                                                04600120
LINE  13          IF(NNZ.EQ. 0)   RETURN                                   04600130
LINE  14          CALL WRITZ( I11,K,NNZ,IZ, ANEW)                          04600140
LINE  15          KST11 =K                                                 04600150
LINE  16           RETURN                                                  04600160
LINE  17           END                                                     04600170
```

DISPLAY...FILE DECK 47

```
LINE   1        SUBROUTINE WRITZ( I11,K,NNZ, IZ, ANEW)                  04700010
LINE   2        DIMENSION  IZ(NNZ), ANEW(NNZ)                           04700020
LINE   3        WRITE (I11)  K,NNZ, IZ, ANEW                            04700030
LINE   4        RETURN                                                  04700040
LINE   5        END                                                     04700050
```

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DISPLAY...FILE DECK 48

```
LINE   1        SUBROUTINE WRITZW  (I12,K,NNZ,IZ,ANEW)                04800010
LINE   2        DIMENSION  IZ(NNZ)                                    04800020
LINE   3        COMPLEX    ANEW(NNZ)                                  04800030
LINE   4        WRITE(I12) K,NNZ, IZ,ANEW                             04800040
LINE   5    200 CONTINUE                                              04800050
LINE   6        RETURN                                                04800060
LINE   7        END                                                   04800070
```

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DISPLAY...FILE DECK 49

```
LINE   1        SUBROUTINE WTEPHT  (  DEDT,NET, PHIW, IZ,  I12,WTE)          04900010
LINE   2        COMPLEX  DEDT(1), PHIW(1), WTE(1)                            04900020
LINE   3        DIMENSION IZ(1)                                              04900030
LINE   4        COMMON /K1112/ KST11,KST12                                   04900040
LINE   5        KEL =  0                                                     04900050
LINE   6        DO 300       IEL=1,NET                                       04900060
LINE   7        IF(IEL .GT. KST12)  GO TO 300                                04900070
LINE   8        IF(KEL.LT. IEL)                                              04900080
LINE   9       1READ (I12)  KEL, NNZ, (IZ(I), I=1,NNZ), (WTE(I),I=1,NNZ)     04900090
LINE  10   204  IF(KEL.NE.IEL)  GO TO 300                                    04900100
LINE  11        DO 200     M=1,NNZ                                           04900110
LINE  12        K= IZ(M)                                                     04900120
LINE  13        I = IEL                                                      04900130
LINE  14        DEDT(I) =  DEDT(I) - WTE(M) *  PHIW(K)                       04900140
LINE  15   200  CONTINUE                                                     04900150
LINE  16   300  CONTINUE                                                     04900160
LINE  17        REWIND  I12                                                  04900170
LINE  18        RETURN                                                       04900180
LINE  19        END                                                          04900190
```

DISPLAY...FILE DECK 50

```
      SUBROUTINE WVINT
C
C          XO,YO   COORDINATES OF RECEIVING PT.(CENTER OF REC. ELE. )
C          XUP, YUP COORDINATES OF UPPER END OF LINE
C          XLW, YLW COORDINATES OF LOWER END OF LINE
C          ZDZD IS THE SQUARE OF THE DIFFERENCE OF THE REC AND INFL Z'S
C          ZD         DIFFERENCE BETWEEN Z'S  OF INFLU. AND RECEIV. ELEM.
C         V, W      SIDE WASH AND UPNASH INTEGRALS
C         NTERM     NUMBER OF TERMS IN APPROXIMATION OF V AND W
C
      REAL L1
      DIMENSION  GETA(5), GCOF(5), XX(3), AG(3)
      DIMENSION H(31)
      COMMON / EEW / XUP, YUP, XLW, YLW
      COMMON / WV1 / NTERM, V(30), W(30)
      COMMON / WW1 / XO,YO,ZD,ZDZD
      DATA NGT / 5 /
      DATA  PIO2  / 1.570796 /
      DATA    XX(1), AG(1),   XX(2), AG(2),   XX(3), AG(3)   /
     *.90617984593866399279762687 82,   .23692688505618908751426404 07,
     *.53846931010568309103631442 07,   .47862867049936646804129151 48,
     *.0000000000000000000000000000,   .56888888888888888888888888888   /
C
C          SET UP CONSTANTS
      ZUP = XO - XUP
      ZLW = XO - XLW
      EUP = YO - YUP
      ELW = YO - YLW
      ZZUP = ZUP*ZUP
      ZZLW = ZLW*ZLW
      EEUP = EUP*EUP
      EELW = ELW*ELW
      SLOPE = (XUP-XLW)/(YUP-YLW)
      ALPHA = ZLW - SLOPE*ELW
      AA = ALPHA*ALPHA
      TTUP = EEUP & ZDZD
      TTLW = EELW & ZDZD
      RRUP = ZZUP - TTUP
      RRLW = ZZLW - TTLW
      IF( RRUP .LT. 0.0  .OR.  ZUP .LE. 0.0 )  RRUP = 0.0
      IF( RRLW .LT. 0.0  .OR.  ZLW .LE. 0.0 )  RRLW = 0.0
      RUP = SQRT( RRUP )
      RLW = SQRT( RRLW )
      SS = SLOPE*SLOPE
      TESTC = SS - 1.0
      AMZ = AA & SS*ZDZD
      ACZ = AMZ - ZDZD
      SIGNU = SIGN( PIO2, EUP )
      SIGNL = SIGN( PIO2, ELW )
      SZZ = SLOPE*ZDZD
C                 FO
      SQRC = ABS( TESTC )
      IF( SQRC .LT. 0.001  ) GO TO 20
      SQRC = SQRT( SQRC )
      SQACZ = SQRT( ACZ )
      IF( TESTC .GT. 0.0 ) GO TO 22
```

```
C                 C .LT. 0      ( TESTC = C ) COMPUTE S2
      FU =-SIGNU
      IF( RUP .GT. 0.0 ) FU = [illegible]( (SLOPE*ZUP-EUP)/SQACZ )
      FL =-SIGNL
      IF( RLW .GT. 0.0 ) FL = [illegible] ( (SLOPE*ZLW-ELW)/SQACZ )
      FO = -( FU - FL )/SQRC
      GO TO 30
   20 CONTINUE
C                 C = 0
      FO = (RUP - RLW) / ( SLOPE-[illegible]HA )
      GO TO 30
   22 CONTINUE
      FU = SQRC*RUP & SLOPE*ZUP - EUP
      FL = SQRC*RLW & SLOPE*ZLW - ELW
      IF( RLW .EQ. 0. ) GO TO 26
      IF( RUP .EQ. 0. ) GO TO 24
C                 C .GT. 0   NEITHER RUP NOR RLW IS ZERO
      FO = ( ALOG(FU/FL) / SQRC )
      GO TO 30
C                 C .GT. 0   RUP .EQ. 0
   24 CONTINUE
      FO = ( ALOG( ABS(SQACZ/FL) ) )/SQRC
      GO TO 30
   26 CONTINUE
      FO = ( ALOG( ABS(FU/SQACZ) ) )/SQRC
C                 FO HAS BEEN COMPUTED
   30 CONTINUE
C                FIND AL1  ( AL1 IS CALLED L1 IN THE NOTES )
      ALU = 0.0
      ALL = ZUP - RUP
      IF( RUP .GT. 0.0  .AND.  ALL .GT. .1E-5 )
     1              ALU = 0.5*ALOG( (ZUP&RUP)/ALL )
      ALL = 0.0
      AL1 = ZLW - RLW
      IF( RLW .GT. 0.0  .AND.  AL1 .GT. .1E-5 )
     1              ALL = 0.5 *ALOG( (ZLW&RLW)/AL1 )
      AL1 = ALU - ALL
C                 FIND S1
      S1 = 0.0
      IF( ZD .EQ. 0 ) GO TO 40
      FL = ALPHA*ELW - SZZ
      SL = SQRT( TTLW*ACZ )
      FU = ALPHA*EUP - SZZ
      IF( RUP .EQ. 0 ) GO TO 32
      SU = SQRT( TTUP*ACZ )
      IF( RLW .EQ. 0 ) GO TO 34
C                 S1  FOR RUP .GT. 0,  RL .GT. 0  AND ZD .NE. 0
      S1 = ARSIN(FU/SU) - ARSIN(FL/SL)
      GO TO 40
   32 CONTINUE
      S1 = SIGN( PIO2, FU )  -  ARSIN(FL/SL)
      GO TO 40
   34 CONTINUE
      S1 = ARSIN(FU/SU) - SIGN( PIO2,FL )
   40 CONTINUE
C
C           F1  AND  F2
C
      F1 = (ALPHA*ZD*S1/AMZ) & SZZ*AL1/AMZ
      F2 = SLOPE*F1 - AL1
C
      W(1) =  RUP*EUP/TTUP - RLW*ELW/TTLW - TESTC*FO & SS*F1 - SLOPE*F2
```

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```
LINE 119          IF( NTERM .LE. 1 ) GO TO 71                                    05001190
LINE 120   C                                                                     05001200
LINE 121          W(2) =                                                         05001210
LINE 122         1        -0.5*( (ZUP&ALPHA)*EUP*ALU - (ZLW&ALPHA)*ELW*ALL      05001220
LINE 123         2      -  RUP*EUP & RLW*ELW ) - 0.5*(AA-3.0*TESTC*ZDZD)*F0     05001230
LINE 124         3      - (1.5*SZZ-2.0*AA)*F1 & 3.5*SZZ*F2                      05001240
LINE 125   C                                                                     05001250
LINE 126          IF( NTERM .LE. 2 ) GO TO 71                                    05001260
LINE 127   C                                                                     05001270
LINE 128          NHT = NTERM - 2                                                05001280
LINE 129          IWT = NTERM - 1                                                05001290
LINE 130   C                                                                     05001300
LINE 131   C           FIND 5 PT. GAUSS-LEFENDRE POINTS AND COEFFICIENTS (GETA,GCOF)05001310
LINE 132          F1 = 0.5*(EUP - ELW)                                           05001320
LINE 133          F2 = 0.5*(ELW & EUP)                                           05001330
LINE 134          DO  43  IG=1,3                                                 05001340
LINE 135          N = 6 - IG                                                     05001350
LINE 136          F0        =  F1*XX(IG)                                         05001360
LINE 137          GETA(N)   =  F0 & F2                                           05001370
LINE 138          GETA(IG) = -F0 & F2                                            05001380
LINE 139          GCOF(IG) =  F1*AG(IG)                                          05001390
LINE 140     43   GCOF(N)   =  GCOF(IG)                                          05001400
LINE 141   C                                                                     05001410
LINE 142   C                                                                     05001420
LINE 143          DO 45  N=3,NTERM                                               05001430
LINE 144          V(N) = 0.0                                                     05001440
LINE 145     45   W(N) = 0.0                                                     05001450
LINE 146   C                                                                     05001460
LINE 147   C                                                                     05001470
LINE 148   C           LOOP ON TERMS OF QUADRATURE                               05001480
LINE 149          DO 70 IG=1,NGT                                                 05001490
LINE 150   C                                                                     05001500
LINE 151          ETA = GETA(IG)                                                 05001510
LINE 152          ZETA = SLOPE*ETA & ALPHA                                       05001520
LINE 153          IF( ZETA .LE. 0.0 )  GO TO 70                                  05001530
LINE 154          TTHH = ETA*ETA & ZDZD                                          05001540
LINE 155          RR = ZETA*ZETA - TTHH                                          05001550
LINE 156          IF( RR .LE. 0.0 ) GO TO   70                                   05001560
LINE 157          COF = GCOF(IG)                                                 05001570
LINE 158          RH = SQRT( RR )                                                05001580
LINE 159          FL = ZETA - RH                                                 05001590
LINE 160          ALH = 0.0                                                      05001600
LINE 161          IF( (FL/ZETA) .GT. 1.E-6) ALH = 0.5*ALOG( (ZETA&RH)/FL )       05001610
LINE 162   C            LOOP TO FIND NHT (=NTERM) H TERMS                        05001620
LINE 163          H(1) = ZETA*ALH - RH                                           05001630
LINE 164          DO 50 N=1,NHT                                                  05001640
LINE 165          NH = N&1                                                       05001650
LINE 166          N2 = 2*N                                                       05001660
LINE 167          RH = RH*RR                                                     05001670
LINE 168          H(NH) = RH/(N2*(N2&1))   -   (N2-1)*TTHH*H(N)/N2               05001680
LINE 169     50   CONTINUE                                                       05001690
LINE 170   C                                                                     05001700
LINE 171   C        FIND CONTRIBUTION OF UPWASH FOR A GIVEN PT. (FOR A GIVEN IG) 05001710
LINE 172          DO 60 N=2,IWT                                                  05001720
LINE 173          NW = N&1                                                       05001730
LINE 174          W(NW) = W(NW) - COF*(2*N-1)*( H(N) - (2*(N-1)-1)*ZDZD*H(N-1) ) 05001740
LINE 175     60   CONTINUE                                                       05001750
LINE 176   C                                                                     05001760
LINE 177     70   CONTINUE                                                       05001770
LINE 178   C                                                                     05001780
LINE 179   C                                                                     05001790
LINE 180     71   CONTINUE                                                       05001800
```

ORIGINAL PAGE IS
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```
C
      V(1) = 0.0
      V(2) = 0.0
C
C
C           IF  ZD = 0, THERE IS NO SIDEWASH
      IF( ZD .EQ. 0.0 ) RETURN
C
C         SECTION FOR SIDEWASH
C
      V(1) =       - ZD*( RUP/TTUP - RLW/TTLW )
      IF( NTERM .LE. 1 ) GO TO 90
      HU = ZUP*ALU - RUP
      HL = ZLW*ALL - RLW
      V(2) =       - ZD*( HU - HL )
      IF( NTERM .LE. 2 ) GO TO 90
      RSU = RUP
      RSL = RLW
C
      DO 80 N=2,IWT
      NV = N&1
      NH = N-1
      N2 = 2*NH
C           NOTE THAT H IS COMPUTED FOR NH = N-1
      IF( RUP .EQ. 0.0 ) GO TO 74
      RSU = RSU*RRUP
      HU  = RSU/(N2*(N2&1)) - (N2-1)*TTUP*HU/N2
   74 CONTINUE
      IF( RLW .EQ. 0.0 ) GO TO 76
      RSL = RSL*RRLW
      HL  = RSL/(N2*(N2&1)) - (N2-1)*TTLW*HL/N2
   76 CONTINUE
      V(NV) =       - ZD*(2*N-1)*( HU - HL )
   80 CONTINUE
C
   90 CONTINUE
      RETURN
      END
```

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OF POOR QUALITY

DISPLAY...FILE DECK 51

```
LINE   1          SUBROUTINE  ZFDZ( ZFUN, DZDX, X,Y,A)                                  05100010
LINE   2  C            SUBROUTINE TO EVALUATE FUNCTION (ZFUN), AND DERIVATIVE (DZDX)05100020
LINE   3          DIMENSION   X(1),Y(1), A(1)                                          05100030
LINE   4          COMMON  /ZFUNNY/  N,IERF, B1, B2,B3,NFUNMX                           05100040
LINE   5          COMMON /XYSCAL / XX, YY, XO, YO, BREF, ZZZ, ITEST                    05100050
LINE   6              DATA EPS/1.E-78/                                                 05100060
LINE   7           XP = XO&BREF*XX                                                     05100070
LINE   8           YP = YO&BREF*YY                                                     05100080
LINE   9           ZFUN = B1&B2*XP&B3*YP                                               05100090
LINE  10          DZDX = B2                                                            05100100
LINE  11           DO 1 I=1,N                                                          05100110
LINE  12          XPMXI = XP - X(I)                                                    05100120
LINE  13          R2 = XPMXI*XPMXI & (YP-Y(I))**2                                      05100130
LINE  14          R2PEPS = R2 & EPS                                                    05100140
LINE  15          XXLOG = ALOG( R2PEPS )                                               05100150
LINE  16          ZFUN = ZFUN & A(I)*R2*XXLOG                                          05100160
LINE  17          DZDX = DZDX & 2.0*A(I)*XPMXI*( XXLOG & R2/R2PEPS )                   05100170
LINE  18      1    CONTINUE                                                            05100180
LINE  19           RETURN                                                              05100190
LINE  20          END                                                                  05100200
```

/END READ

END OF JOB.

53.6 SEC. USED .015 HRS. CHARGED 49.937 HRS. REMAINING