NASA Contractor Report 3228

The Incorporation of Plotting Capability Into the "Unified Subsonic Supersonic Aerodynamic Analysis Program," Version B

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The Incorporation of Plotting Capability Into the "Unified Subsonic Supersonic Aerodynamic Analysis Program," Version B

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Section 1

INTRODUCTION

The B01 version of the Unified Subsonic Supersonic Aerodynamic Analysis (USSAERO) program is the result of numerous modifications and additions made to the B00 version. These modifications and additions affect the program input, its computational options, the code readability, and the overlay structure.

The most extensive modifications were made in November 1976, by Analytical Methods, Inc. These changes included a new procedure to calculate the strength of the source and vortex singularities in the non-planar boundary condition option for the wing. Also included in the November 1976 modifications were the added options to calculate the velocities and pressure coefficients at arbitrary field points, and to input normal velocities at body panel control points (inlet and exhaust nozzle modeling).

This report describes the revised input; the plotting overlay programs, which were also modified, and their associated subroutines; the auxiliary files used by the program; the revised output data; and the program overlay structure.

The locations of the different labeled common blocks used throughout the program, are listed in Appendix A. These might be helpful as a reference for a programmer.

The user will notice that some of the figures in this report are not referenced in the text. They are purposely introduced in the report to help a user not familiar with the terminology.

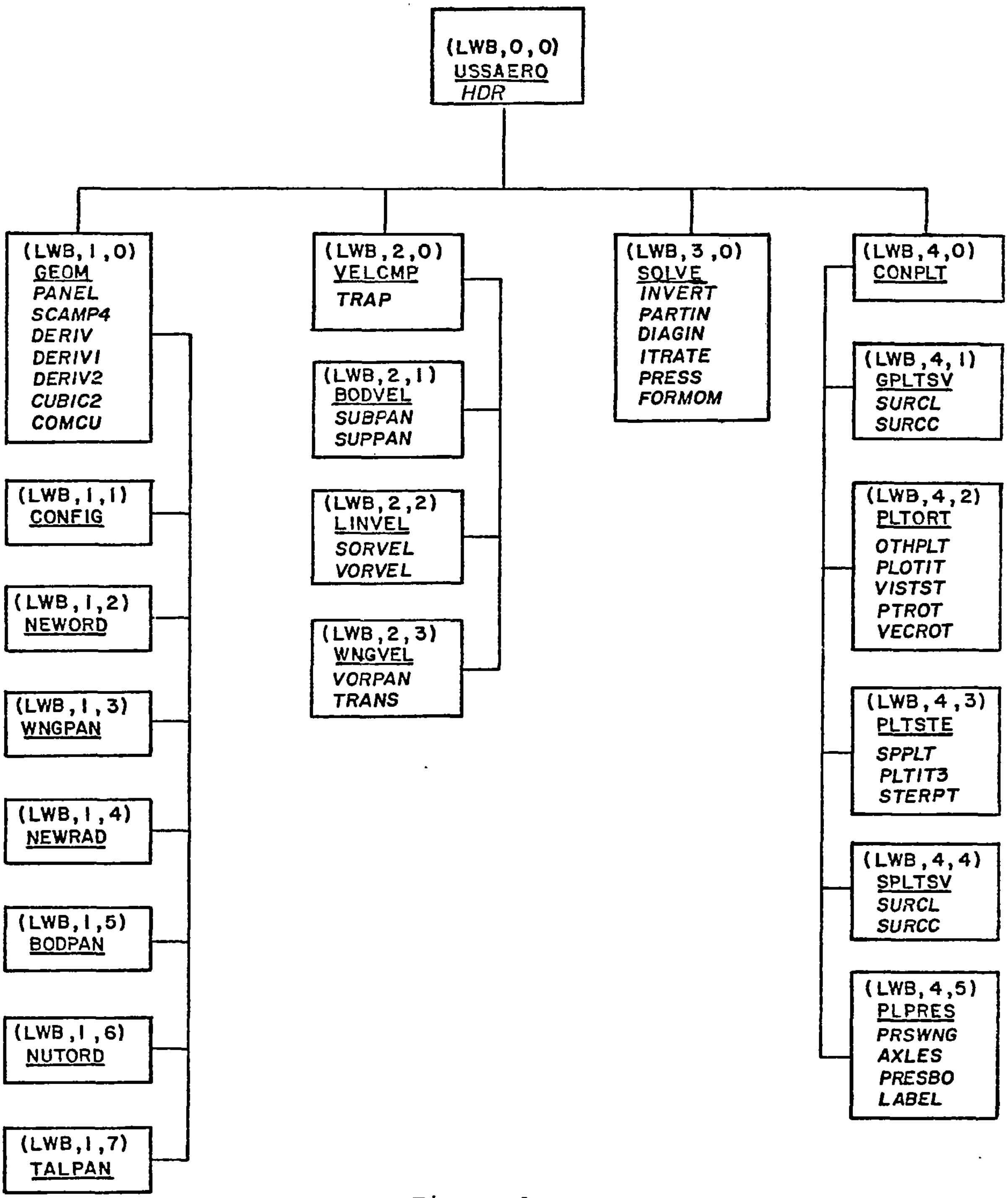


Figure 1

USSAERO PROGRAM OVERLAY STRUCTURE

Section 2
PROGRAM DESCRIPTION

The USSAERO computer program was converted to CDC FORTRAN EXTENDED VERSION 4, to be run under the NOS 1.3 operating system on CDC's CYBER-173 or CYBER-175. The program occupies 130,000 octal words to load and operates in the overlay mode. The purpose of the description which follows is to give the user a better view of the different functional areas of the program. To facilitate this reading, the user should refer to Figures 1 through 5.

2.1 Overlay (LWB, 0, 0)

This overlay consists of program USSAERO and subroutine HDR. Program USSAERO controls the sequence of computations to determine the aerodynamic characteristics of a wing body-tail configuration. It calls subroutine HDR to print out the program acronym in large block letters followed by the installation name, the program name, operating system version number and compiler name, date of run, and time of run. It then reads the entire input data from disk file TAPE 5 and prints it out. One should notice that TAPE 5 which contains the input data is not equivalenced to file INPUT, therefore it can afterwards be re-wound and read by the different routines throughout the program. The initial printout of the input data is generated to help the user check out his own input for correctness.

The following three primary overlay programs, GEOM, VELCMP, and SOLVE are then called to perform the remaining computations. The last primary overlay program CONPLT can be optionally called to plot the initial configuration geometry, the singularity paneling geometry and, finally, the pressure distributions.

2.2 Overlay (LWB, 1, 0)

This overlay consists of program GEOM and subroutines PANEL, DERIV, SCAMP4, DERIV1, DERIV2, COMCU, and CUBIC2. Although these subroutines are loaded with this overlay, they are called by some of its secondary level overlays or by each other. The case identification and initial configuration parameters are read from the input file. The secondary overlay program CONFIG is then called to complete the input of the configuration description. The auxiliary case identification is then read, followed by the boundary condition and print option. Finally, the revised configuration parameters used for specifying the panel subdivisions are read. Depending on the values of the revised configuration parameters, the program calls the secondary overlay programs NEWORD, WNGPAN, NEWRAD, BODPAN, NUTORD, or TALPAN, which interpolate the input geometry and calculate the corner points, control points and inclination angles of the panels on the wing, body, or tail.

2.3 Overlay (LWB, 1, 1)

This overlay consists of program CONFIG. As it was mentioned above, CONFIG completes the input of the initial configuration description. The configuration reference area is read from the input file if $J0 \neq 0$, otherwise the reference area is set equal to unity. The reference area is then written on TAPE 9. If $J1 \neq 0$, the wing geometry data is read from the input file in the order specified in reference 1. The program computes the upper and lower surface coordinates of the wing airfoils, and writes the entire wing geometry array as one record on TAPE 9.

If $J2 \neq 0$, the body geometry data is also read from the input file in the order specified in reference 1 for each body segment. For arbitrary cross-sections, the y and z ordinates of the body segment are read in, but for circular cross-sections, the body cross-sectional area is read in and the corresponding radius calculated by the program. The entire body geometry array is then written as one record on TAPE 9.

If $J3 \neq 0$, the pod geometry is read in, but no further use is made of this data.

If $J4 \neq 0$, the fin geometry data is read in. The program computes the coordinates of the fin airfoils and writes the fin geometry array as one record on TAPE 9. Similarly, if $J5 \neq 0$, the

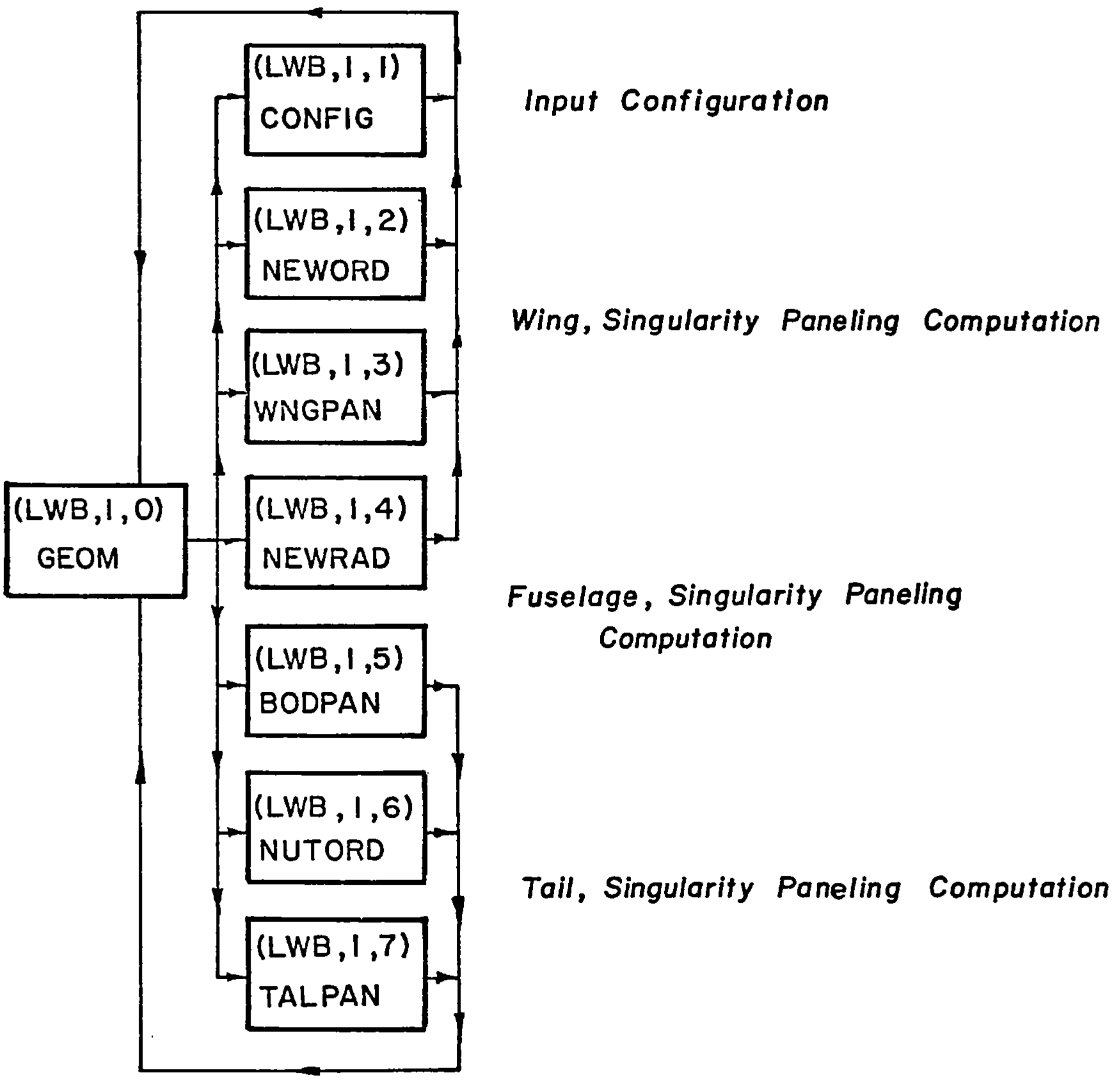


Figure 2

CONFIGURATION INPUT AND SINGULARITY PANELING OVERLAYS the tail or canard geometry data is read in, the tail airfoil coordinates calculated, and the tail geometry array written on TAPE 9.

If one or more of the above components is missing, the program writes a dummy record on TAPE 9 and continues.

2.4 Overlay (LWB, 1, 2)

This overlay consists solely of program NEWORD. Program NEWORD revises the chordwise panel edge spacing on the wing and computes new airfoil ordinates by interpolation.

The program first checks the input data to determine if the wing has a round leading edge. If so, an array of wing leading edge radii is read in. The program then checks if the percent chord locations of the panel edges are to be redefined. If so, an array of revised chordwise locations are read in, otherwise the edges are used as originally defined.

The wing panel geometry is established by considering regions defined by sequential pairs of the originally defined airfoil sections. The leading and trailing edge slopes and dihedral angle of the region are calculated, and the origins and chord lengths of any intermediate panel edges obtained by linear interpolation in the spanwise direction.

The individual panel geometry is then calculated. For the planar boundary condition option, the corner points and control points are calculated in the plane of the wing, while the wing camber and thickness slopes at the panel edges are obtained by a linear interpolation of the slopes determined in the program NEWORD. For the non-planar boundary condition, the corner points and control points are calculated on the upper and lower surfaces of the wing, and the panel inclination angles determined by subroutine PANEL. In addition, both options calculate the panel area, chord, span, and leading edge x coordinate.

The same procedure is followed for each of the regions between the remaining airfoil sections. Prior to each step, the leading and trailing edge slopes and dihedral angles of the region are compared with those calculated for the previous region. If all these quantities are the same, the calculation proceeds normally. Otherwise, a new wing segment is defined, and the leading and trailing edge slopes, sine and cosine of the dihedral angle, and a wing indicator parameter for the segment are stored in a special array before continuing the calculations. The program also computes the number of rows and columns of panels in each wing segment, the total number of panels, and the total number of segments on the wing.

For each wing section, the original camber and thickness distributions are rewritten as one dimensional arrays. NEWORD calls DERIV to fit a chain of cubic curves having continuous first derivatives between each pair of points on these two curves, and the four coefficients of the cubic curve calculated within each interval. For wing sections having round leading edges with infinite leading edge slope, the slope at the second percent chord location is calculated by fitting the curve $z = \sqrt{2px} + ax + bx^2$ through the first three points. The program then calculates the coefficients of the cubic curves through the remaining points in the usual way, starting with the slope determined from the first derivative of the above formula.

The revised camber and thickness ordinates and slopes are then calculated at the new chordwise locations by the formulas

$$z = c_1 + c_2 x + c_3 x^2 + c_4 x^3$$

$$dz/dx = c_2 + 2c_3 x + 3c_4 x^2$$

where the coefficients correspond to the interval of the curve under consideration. For wings having round leading edges, the formula given in the previous paragraph is used in the first interval.

Each time DERIV is called, it calls subroutine SCAMP4 which in turn calls subroutines DERIV1, DERIV2, COMCU, and CUBIC2.

2.5 Overlay (LWB, 1, 3)

This overlay consists only of program WNGPAN.

Program WNGPAN revises the spanwise panel edge spacing for the wing and computes the panel geometry.

The program first checks if the spanwise panel spacing is to be revised. If so, an array of revised panel edge locations is read in; otherwise, the panel edges are used as originally defined.

2.6 Overlay (LWB, 1, 4)

This overlay consists of program NEWRAD which revises the circumferential panel edge spacing for the fuselage.

For each body segment, there are three options for redefining the meridian lines. Considering the first segment, if KRADX(1) = 0, the meridian lines are not changed. If KRADX(1) is positive, the meridian lines are relocated at KRADX(1) equally spaced values of the meridian angle ϕ. If KRADX(1) is negative, an array of arbitrary meridian angles is read in.

If the body has a circular cross section, the y and z coordinates are calculated at each axial station as follows:

$$y = r \cos\phi$$

$$z = z_C + r \sin\phi$$

where the body radius r and camber z_C have been previously calculated in program CONFIG.

If the body has an arbitrary cross section, the y and z coordinates are obtained by linear interpolation at the new values of the original y and z coordinates read in program CONFIG.

The x, y, and z coordinates are written on TAPE 10, and the procedure repeated for the remaining body segments.

2.7 Overlay (LWB, 1, 5)

This overlay consists of program BODPAN, which revises the axial panel edge spacing for the fuselage and computes the body panel geometry.

For each body segment, the x, y, and z coordinates of the cross sections are read from TAPE 10. If the value of KFORX of the segment is positive, an array of new axial stations for the segment is read in; otherwise the original axial stations are retained.

The body panel geometry is established by a linear interpolation along body meridian lines of the y and z coordinates at the new axial stations. The interpolation is started with the first ring of panels at the nose and continued until the last ring of panels on the last segment is reached. The corner point coordinates, the control point coordinates, the inclination angle, and area are calculated for each panel in sequence.

The panel control point coordinates, the panel dihedral angle Θ, the panel inclination angle δ, the corner point coordinates and the panel areas are stored in the COMMON block POINT, and the entire sequence of arrays written as a single record on TAPE 10 following the wing and tail panel geometry arrays. The remaining body geometry parameters are stored in COMMON blocks PARAM and BTHET. Finally, if the print option is negative, the corner point coordinates, control point coordinates, inclination angles, and areas are written on the output file.

2.8 Overlay (LWB, 1, 6)

This overlay consists of program NUTORD which revises the chordwise panel spacing of fins, and/or canards, and computes the new airfoil ordinates.

The program first tests to determine if the component under consideration is a fin (vertical tail) or a canard (horizontal tail). The program then initializes the appropriate constants, and reads in an array of leading edge radii if the component has a round leading edge.

Each horizontal or vertical tail component is then treated as an additional wing segment, and the procedure follows the steps described under program NEWORD.

2.9 Overlay (LWB, 1, 7)

This overlay consists of program TALPAN which revises the spanwise panel edge spacing for the fins and/or canards, and computes the panel geometry.

The program first tests to determine if the component under consideration is a fin (vertical tail), or a canard (horizontal tail). The program initializes the appropriate constants, then rewinds TAPE 7, reads the wing geometry arrays from that file, and stores them in COMMON block POINT. Each horizontal or vertical tail component is then treated as an additional wing segment, following the steps described under subroutine WNGPAN.

At the completion of the calculation, the combined wing and tail geometry arrays are stored in COMMON block POINT, and the entire sequence of arrays is written as a single record back on TAPE 7. The augmented CHORD and SLOPE arrays are also written on TAPE 7 at this point. The remaining wing and tail geometry parameters are stored in COMMON blocks PARAM and SEG. Finally, if the print option is positive, the fin, canard or tail panel corner point coordinates, control point coordinates, inclination angles, areas, and chords are written on the output file.

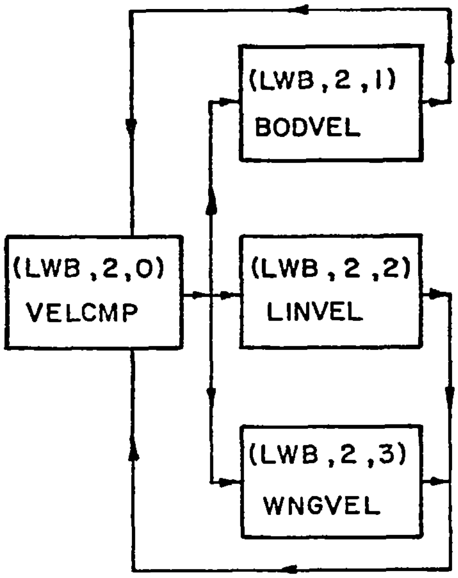
2.10 Overlay (LWB, 2, 0)

This overlay consists of program VELCMP and subroutine TRAP. VELCMP computes the u, v, and w components of the velocity at panel control points and forms the aerodynamic influence coefficient matrices.

VELCMP reads from TAPE 5, the Mach number, angle of attack, (NORVEL) a flag indicating if normal velocities at body control points are to be input, a local Mach number flag (not used), and the number of field points where the calculation of velocities is desired.

If the Mach number is negative, or the same as the previous case, a return is executed. Otherwise, the program proceeds to compute the velocity components.

For wing alone, or wing-body configurations, a preliminary calculation is made to determine if the wing control points require relocation, and to compute the number and size of the wing diagonal blocks for later use in the matrix calculations. For wing-body



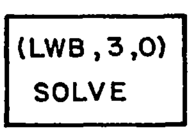
Calculation of velocity components induced at specified body panel control points

Calculation of velocity components induced at specified control points by source and vortex distributions on panels located on the plane of the wing and tail surfaces

Calculation of velocity components at panel control points, induced by source and vortex distributions on wing and tail surfaces

Figure 3

Overlays for the computation of the u, v, and w velocity components and of the influence coefficient matrices.



Solves for strengths of body sources and wing vortices that satisfy the boundary condition of tangential flow at panel control points, and determine the corresponding pressure distributions, forces and moments on the configuration

Figure 4

SOLUTION OVERLAY

configurations, the body geometry is first placed in temporary storage on TAPE 10. The program then proceeds to recalculate the chordwise locations of the wing control points for wings having supersonic edges, provided the planar boundary condition option has been selected. (An edge is defined to be supersonic if the component of the Mach number normal to the edge is greater than one.) Considering one wing segment at a time, the program tests to determine if either the leading or trailing edge is supersonic. If all edges are subsonic, the control points retain their original locations at the panel centroids. If the leading edge is subsonic and the trailing edge is supersonic, the control points in a given column of panels are adjusted uniformly between the centroid of the leading edge panel and the trailing edge of the last panel in the column. If both edges are supersonic, the control points are relocated at the panel leading edges, and the trailing edge of the last panel in the column. A wing supersonic trailing edge indicator array is also computed at this point in the program. The revised control points are stored in COMMON block POINT, and the entire wing geometry array written on TAPE 7. The body geometry temporarily stored on TAPE 10 is then rewritten on TAPE 7 following the wing geometry arrays.

If NORVEL is greater than zero (see input description), VELCMP reads an array of normal velocities at body control points. The array of normal velocities is stored in labeled common (NORVEL).

If FLDPTS is greater than zero (see input description), VELCMP reads arrays of x, y, and z coordinates of control points at specified field locations. It then proceeds to calculate the u, v, and w velocity components at those control points, which are influenced by source distributions on the body panels or by vortex distributions on the wing panels.

2.11 <u>Overlay (LWB, 2, 1)</u>

This overlay consists of program BODVEL, and subroutines SUBPAN and SUPPAN. BODVEL computes the u, v, and w velocity components induced at specified control points, by body panels.

The x, y, and z coordinates of the control point, and the corresponding panel inclination angles Θ and δ are read from COMMON block POINT.

Starting with the first body segment, the body panel corner point coordinates and inclination angles are also read from COMMON block POINT for each row and column of panels. Considering a single body panel, the corner point and control point coordinates are transformed to a new coordinate system with origin at the first corner of the panel and inclined at an angle Θ with respect to the horizontal. The velocity components induced by this inclined constant source panel at the given control point are computed in routine SUBPAN or SUPPAN depending if Mach is less than one or if it is greater or equal to one, respectively. Either of the two subroutines is called twice to obtain the influence of panels located on both right and left sides of the body. These velocity components are combined and transformed back to the reference coordinate system to obtain the final u, v, and w components of the velocity, and the velocity normal to the panel at the control point. This process is repeated for each panel on the body, following which the u, v, and w component arrays are written on TAPE 8, and the array of normal velocities on TAPE 9.

If the control point is in the same ring of panels on the body as the influencing panel and the body has more than 60 panels, the normal velocity at the control point is written on TAPE 10, and its value set to zero in the array written on TAPE 9. This procedure sets up the diagonal blocks of the aerodynamic matrix for later use in the iterative solution procedure. If the print option is selected, the axial and normal arrays are written on the output tape. The process is repeated for each control point.

2.12 Overlay (LWB, 2, 2)

This overlay consists of program LINVEL and subroutines SORVEL and VORVEL. Program LINVEL computes the u, v, and w velocity components induced at specified control points by source and vortex distributions lying on the mean plane of the wing and tail surfaces.

The x, y, and z coordinates of the control point, and the corresponding panel inclination angles Θ and δ are read from COMMON block POINT.

Starting with the first wing segment, the panel leading and trailing edge slopes are calculated and stored. The program then computes the velocity components induced by the panel corner points along the inboard edge of the first column of panels. These calculations are performed by subroutines VORVEL and SORVEL, which return the three components of velocity induced by constant and linear varying vortex and source distributions. These subroutines are called twice to obtain the contributions of both left and right wing panels. In addition, a second call to subroutine VORVEL is required at panel trailing edge corner points if the panel spacing is not uniform.

To compute the velocity components induced by the panel corner points along the outboard edge of this and the remaining columns of panels, the procedure is repeated. However, for the remaining columns of panels, advantage is taken of the fact that the velocity components along the inboard edges of a given column of panels are the same as those computed at the outboard edges of the previous column of panels. Therefore, the inboard velocity components are not recomputed, but stored in temporary arrays prior to the calculation of the outboard velocity component arrays.

Once the velocity components induced by the panel corner points along the outboard edge of a given column of panels are computed, the inboard and outboard influences of each panel in the column are combined to obtain the resultant panel velocity components. First, the velocity components induced by the right and left wing panels are calculated, using appropriate combination rules for the source and vortex panels, and applying special rules for leading and trailing edge panels. Finally, the contributions of the left and right wing panels are combined, the velocity components transformed back to the reference coordinate system, and the velocity normal to the panel at the control point computed.

The procedure is repeated for each column of panels in each wing segment, until all wing panels are accounted for. At this point the u, v, and w components of velocity induced by the source panels are written as a single record on TAPE 8, followed by the r, v, and w components of velocity induced by the vortex panels. If the thickness option is not requested, only the vortex panel arrays are written on this tape. The normal velocities are then written as a single record on TAPE 9. If the control point is in the same column of panels on the wing as the influencing panel, and the wing has more than 60 panels, the normal velocity at the control point is written on TAPE 10 and its value set to zero in the array written on TAPE 9. This procedure sets up the diagonal blocks of the aerodynamic matrix for later use in the iterative solution procedure. Finally, if the print option is selected, the axial and normal velocity component arrays induced by the vortex panels and source panels are written on the output tape.

The process is repeated for each control point.

Note: The word wing includes any tail, fin, or canard in the above description.

2.13 Overlay (LWB, 2, 3)

This overlay consists of program WNGVEL and subroutines VORPAN and TRANS. Program WNGVEL computes the r, v, and w velocity components induced at specified control points by source and vortex distributions located on the wing and/or tail surfaces.

The program first applies the Gothert rule compressibility transformation to the tangent of the panel inclination angles, and computes trigonometric functions of the revised angles.

The three coordinates of the first control point, and the corresponding panel inclination angles Θ and δ are read from COMMON block POINT. If the control point is on the body, the inclination angle Θ is obtained from COMMON block BTHET.

The program then computes the influence of each panel at the control point. The panels on the upper surface of each chordwise column are considered first, followed by those on the lower surface. This process is repeated for each column of panels on a wing segment, starting with the inboard panel, and continued until all wing and tail segments have been included.

The coordinates of the four corner points of the influencing panel are obtained from COMMON block POINT in the reference coordinate system. They are indexed according to the panel row and column numbers. They are first used to calculate the leading and trailing edge slopes and the chord lengths of the inboard and outboard edges of the panel in a panel coordinate system lying in the plane of the panel and originating at the inboard leading edge corner. The control point is also transformed to the panel coordinate system, and the velocity components induced at the control point by each of the four corners computed by subroutine VORPAN. This subroutine is called twice for each corner point to obtain the contributions of both left and right wing panels.

The contribution of a wake consisting of two concentrated edge vortices with a constant strength vortex sheet between them is calculated following the last panel in each column. The wake vortices are all oriented in a streamwise direction, and are assumed to lie in a plane parallel to the reference axis and containing the trailing edge of the last panel in the column. The velocity components at the control point induced by the upstream corners of the wake are obtained by four additional calls to VORPAN.

The velocity components induced by the four corners of the panel and the wake are now combined to obtain the resultant velocities at the control point. The velocity components induced by the right and left wing panels are combined and the results transformed back to the reference coordinate system by subroutine TRANS. This subroutine calculates the u, v, and w velocity components and the normal velocity at the control point. A similar procedure is applied to calculate the transformed velocity components induced by the three components of the wake. The wake velocity components are then multiplied by the appropriate strength factors and added to obtain the final values of the velocity components at the control point.

Special rules are applied to obtain the velocity components of the leading and trailing edge panels in each column. These rules are designed to provide a continuous vortex distribution around the nose of the airfoil, and to enforce the Kutta condition at the trailing edge.

The procedure is repeated for each column of panels of each wing segment. When all panel influences have been computed, the u, v, and w components of velocity are written as a single record on TAPE 8, and the normal velocities written in one array on TAPE 9. If the control point is in the same column of panels on the wing as the influencing panel, and the wing has more than 60 panels, the normal velocity at the control point is written on TAPE 10, and its value set equal to zero in the array written on TAPE 9. This procedure sets up the diagonal blocks of the aerodynamic matrix for later use in the iterative solution procedure. Finally, if the print option is selected, the axial and normal velocity component arrays are written on the output file.

This process is repeated for each control point.

2.14 Overlay (LWB, 3, 0)

This overlay consists of program SOLVE, and subroutine INVERT, PARTIN, DIAGIN, ITRATE, PRESS, and FORMOM. Program SOLVE first calculates the array of normal velocities required to satisfy the boundary conditions at the wing and body panel control points. The panel inclination angles Θ and δ are obtained from the geometry arrays on TAPE 7, and the angle of attack α from common block PARAM.

If the planar boundary condition and wing thickness options have been selected, the program next computes the normal velocities induced on the body and non-coplanar wing or tail segments by wing source distribution. These normal velocities are subtracted from those previously calculated to obtain the resultant normal velocities at the control points.

The coefficients of the equations to be solved have previously been stored in row order on TAPE 9. Three different procedures are followed to solve the equations depending on the order of the matrix of coefficients. If the configuration to be analyzed consists of an isolated wing or body, and the order of the matrix does not exceed 60, the equations are solved in subroutine PARTIN by direct inversion of the matrix. If the configuration consists of a wing-body combination, and the order of the wing and body partition does not exceed 60, subroutine PARTIN inverts the diagonal partitions of the matrix and writes the inverse matrices on TAPE 10. An iterative procedure described in subroutine ITRATE is then applied to solve the equations. For any configuration for which the order of the wing or body partition exceeds 60, the diagonal blocks of the matrix are read from TAPE 7, inverted, and written on TAPE 10 by subroutine DIAGIN. Subroutine ITRATE is then called to solve the resulting equations by an iterative procedure.

Once the strengths of the source and vortex distribution have been determined, the program calculates the three components of velocity and pressure coefficient at each panel control point, starting with the body panels. The velocity components corresponding to unit strength source and vortex distribution are obtained from TAPE 8. The first three records on this file contain the velocity components at body control points induced by the body source panels, the wing source panels (if present), and the wing vortex panels. The program multiplies these by the corresponding source and vortex strength, and sums the products to obtain the resultant velocity component arrays at each body control point. The magnitude of the normal velocity at the body control points is also calculated at this point. If the absolute value of the print option is greater than one, the three components of velocity and the normals are written on the output file. The program then calls subroutine PRESS to obtain the pressure coefficients at the body

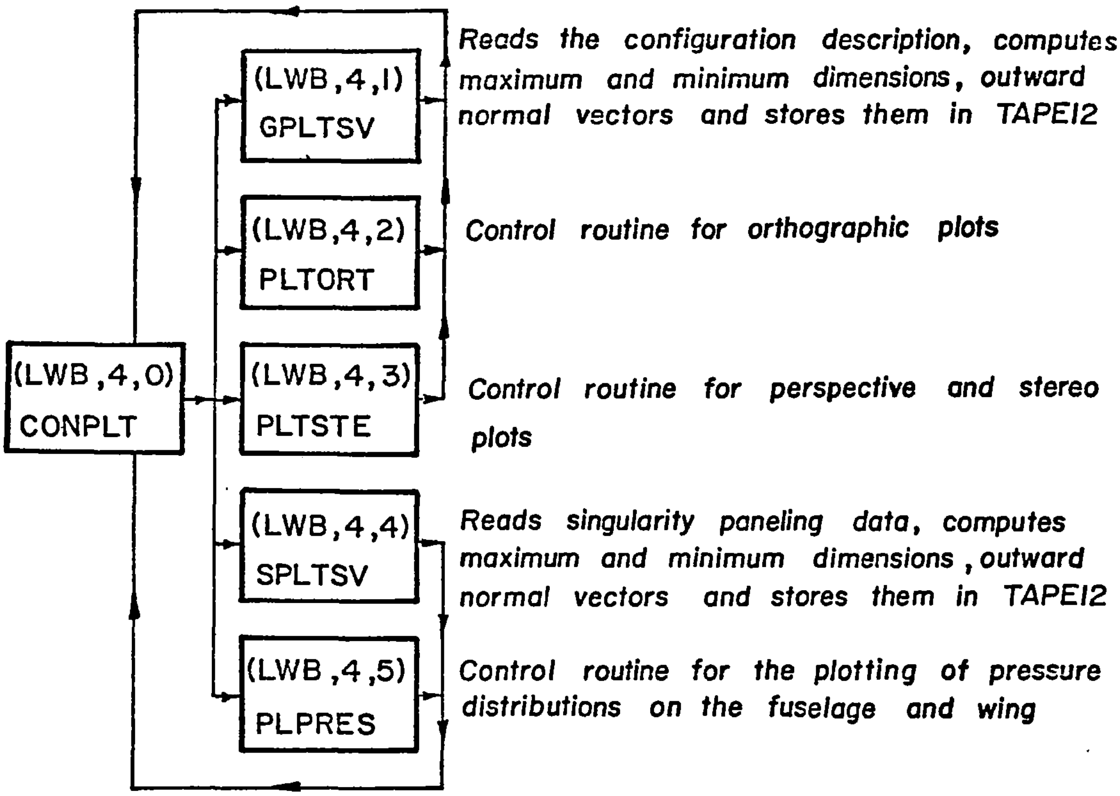


Figure 5

PLOTTING OUTPUT OVERLAYS

panels, and subroutine FORMOM to integrate the pressures and calculate the force and moment acting on the body.

The velocity components at the wing and tail panel control points are computed next. The remaining three records containing the velocity components at wing and tail control points induced by the body source panels, the wing source panels (if present) and the wing vortex panels are read from TAPE 8. The program multiplies these by the corresponding source and vortex strengths and sums the products to obtain the resultant velocity component arrays at the wing and tail panel control points. If the absolute value of the print option is greater than one, the velocity component arrays are written on the output file. The program then calls subroutine PRESS to obtain the pressure coefficients, and subroutine FORMOM to calculate the force and moment acting on the wing.

If the planar boundary condition option has been selected, two passes through this section are required to obtain the velocity components, pressure and forces on both upper and lower surfaces.

The program writes the values of the stagnation pressure coefficient, the critical pressure coefficient, the vacuum pressure coefficient, and the elapsed time on the output file prior to returning.

2.15 Overlay (LWB, 4, 0)

This overlay consists solely of program CONPLT. Program CONPLT selects the proper plot control program. It calls overlays (LWB, 4, 1) and (LWB, 4, 2) or (LWB, 4, 3) to generate the input geometry plots, and it calls overlays (LWB, 4, 4) and (LWB, 4, 2) or (LWB, 4, 3) to plot the singularity paneling geometry. It finally calls overlay (LWB, 4, 5) to generate the pressure distribution plots of the configuration.

2.16 Overlay (LWB, 4, 1)

This overlay consists of program GPLTSV and subroutines SURCL and SURCC. Program GPLTSV reads the input geometry from TAPE 3, computes lines and normal unit vectors by either calling SURCL or

SURCC, and stores them in arrays, and writes them as alternate records to TAPE 12. Subroutine SURCL computes outward normal vectors with four adjoining input points taken in a clockwise direction. Subroutine SURCC computes outward normal vectors with the four adjoining input points taken in a counter-clockwise direction.

2.17 Overlay (LWB, 4, 2)

This overlay consists of program PLTORT and subroutines OTHPLT, PLOTIT, VISTST, PTROT, and VECROT, which it calls to generate orthographic and/or three-view plots. Subroutine OTHPLT is the control routine for the orthogonal projections. It calls subroutine PLOTIT. Subroutine PLOTIT reads lines of points and components of outward normal vectors defining a surface from TAPE 12, manipulates them in a specific manner, and plots them. This subroutine calls subroutines PTROT, VECROT, and VISTST to rotate and check visibility. Subroutine VECROT transforms outward normal vectors for desired paper plane. Subroutine VISTST tests a line of points for visibility.

2.18 Overlay (LWB, 4, 3)

This overlay consists of program PLTSTE and subroutines SPPLT, STERPT, and PLTIT3. Subroutine SPPLT is the control routine for the perspective and/or stereo plots. It calls subroutines STERPT and PLTIT3 to generate the plots. Subroutine STERPT generates a perspective view of input data for a given three-dimensional array. Two passes through this routine will generate a pair of stereo frames.

Subroutine PLTIT3 reads lines of points, and outward normal vectors defining a surface from a disk file and plots perspective views or stereo frames.

2.19 Overlay (LWB, 4, 4)

This overlay consists of program SPLTSV and subroutines SURCL and SURCC. Program SPLTSV reads singularity paneling geometry from

TAPE 3, computes the lines of points, and the outward normal vectors, stores them in arrays and writes them to TAPE 12, which will, later on, be read by overlay (LWB, 4, 2) and/or overlay (LWB, 4, 3). Subroutines SURCL and SURCC have been previously described in this section.

2.20 Overlay (LWB, 4, 5)

This overlay consists of program PLPRES and subroutines PRSWNG, AXLES, PRESBO, and LABEL. Program PLPRES reads TAPE 12, which contains the pressure distribution information for the fuselage and/or for the wing, computes maximum and minimum values, scale factors and calls subroutines AXLES, PRESBO, PRESWNG, and LABEL.

Subroutine AXLES (computes) plots axes and scales with their proper annotation. Subroutine PRESBO plots the fuselage pressure coefficients versus meridian angles for each ring of panels around it.

Subroutine PRESWNG plots the wing pressure coefficients for the upper or lower surface versus the chordwise percent distances. Subroutine LABEL plots legends to the graphs of the fuselage pressure distribution or the wing pressure distribution. A more detailed description of the plotting overlay programs and their associated routines follows in Section 3.

Section 3

DESCRIPTION OF THE PLOT OVERLAY PROGRAMS

3.1 Program CONPLT (Overlay (LWB, 4, 0))

PURPOSE: This program selects the proper plot control program.

INPUT: (1) Orthographic Projections

Variable	Value	Description
HORZ		"X", "Y", or "Z" for horizontal axis.
VERT		"X", "Y", or "Z" for vertical axis.
TEST1		Word "OUT" for deletion of hidden lines; otherwise, leave blank.
PHI		Roll angle, degrees.
THETA		Pitch angle, degrees.
PSI		Yaw angle, degrees.
PLOTSZ		PLOTSZ determines the size of plot (scale factor is calculated using PLOTSZ and the maximum dimension of the configuration).
TYPE		Word "ORT"
KODE	0	Continue reading plot cards.
	1	After processing this plot card, end reading plot cards.

INPUT: (2) Three-View Orthographic Plot

Variable	Value	Description
PHI		Y-origin on paper of plan view, in.
THETA		Y-origin on paper of side view, in.
PSI		Y-origin on paper of front view, in.
PLOTSZ		PLOTSZ determines size of plot (scale factor is calculated using PLOTSZ and the maximum dimension of the configuration).

Variable	Value	Description
TYPE		Word "VU3"
KODE	0 1	Continue reading plot cards. After processing this plot card, end reading plot cards.

INPUT: (3) Perspective Views

Variable	Value	Description
PHI		X-coordinate of view point in data coordinate system.
THETA		Y-coordinate of view point in data Coordinate system.
PSI		Z-coordinate of view point in data coordinate system.
XF		X-coordinate of focal point in data coordinate system.
YF		Y-coordinate of focal point in data coordinate system.
ZF		Z-coordinate of focal point in data coordinate system.
DIST		Distance from eye to viewing - plane, in.
FMAG		Viewing - plane magnification factor; it controls size of projected image.
PLOTSZ		Diameter of viewing - plane. DIST and PLOTSZ determine a cone which is the field of vision.
TYPE		Word "PER"
KODE	0 1	Continue reading plot cards. After processing this plot card, end reading plot cards.

INPUT: (4) Stereo Frames

PLOT		Plot control flag
KONPLT		Integer used to select geometry plots or pressure distribution plots.

The plot card for the stereo frames is identical to that for the perspective views, except that the word "STE" is used in place of the word "PER".

USAGE: CALL OVERLAY (LWB,4,0)

COMMON BLOCKS: BLANK2, CONPLT, FILES, LWB, GRAPH, PTYPE

3.2 Program GPLTSV (Overlay (LWB, 4, 1))

PURPOSE: This program reads the configuration description from TAPE 3, computes maximum and minimum dimensions, and then proceeds to compute the outward normal unit vectors, and writes the lines of points and vectors on TAPE 12.

INPUT:

J0	Reference area parameter
J1	Wing definition parameter
J2	Fuselage definition parameter
J3	Pod definition parameter
J4	Fin definition parameter
J5	Canard or tail definition parameter
J6	Fuselage camber parameter
NWAF	Number of wing airfoil sections
NWAFOR	Number of ordinates used to define each wing airfoil section.
WAFORG	Origin cordinates used to define each wing airfoil section (x, y, z, chord).
WAFORD	Array of half-thickness ordinates in percent chord.
XAF	Array of percent chords for wing airfoil ordinates.
TZORD	Array of mean camber line ordinates.

NFUS Number of fuselage segments.

NRADX Array containing integers which are the number of points used to define half-sections of the fuselage segments.

NFORX Array containing integers which are the number of axial stations of the fuselage segments.

XFUS Array containing the x-coordinates of the axial stations of a fuselage segment.

ZFUS Array of fuselage camber ordinates

SFUS Array of y and z ordinates used to define half-sections of an arbitrary fuselage segment.

FUSARD Array of fuselage cross sectional areas.

NP Number of pods.

XPOD Array of x-coordinates of pod axial stations.

NPODOR Number of axial stations on pod.

PODORD Array of pod radii.

NF Number of fins.

NFINOR Number of ordinates used to define fin airfoil sections.

FINORG Origin coordinates and chord of fin airfoil sections (x, y, z, chord).

XFIN Array of percent chords for fin airfoil.

FINORD Array of fin airfoil half-thickness ordinates in percent chord.

NCAN Number of canards or tails.

NCANOR Number of ordinates used to define canard airfoil (x, y, z, chord).

CANORG Origin ordinates and chord length of canard airfoil (x, y, z, chord).

XCAN Array of percent chords for canard airfoil sections.

CANARD Array of canard airfoil half-thickness ordinates in percent chord.

OUTPUT:

ALRT Array of point chordinates defining lines.

VECRT Array of numbers representing outward normal unit vectors.

USAGE: CALL OVERLAY(LWB,4,1)

COMMON BLOCKS: BLANK, BLANK2, FILES, ONE, SCRAT, PI

ROUTINES CALLED : SURCC, SURCL

NOTE: This program is called only once for each configuration. Arrays ALRT, VECRT are stored on TAPE 12.

3.2.1 Subroutine SURCL

PURPOSE: This routine computes the outward normal unit vectors with four adjoining points taken in clockwise direction.

INPUT:

NPT Number of points.

FLINE Array of line points

OUTPUT:

FVEC Array containing outward normal unit vector components.

COMMON BLOCKS: None

USAGE: CALL SURCL (NPT, FLINE, FVEC)

ERROR RETURNS: None

3.2.2 Subroutine SURCC

PURPOSE: This routine computes the outward normal unit vectors with four adjoining points taken in a counterclockwise direction.

INPUT:

NPT	Number of points.
FLINE	Array of line points.

OUTPUT:

FVEC	Array containing outward normal unit vector components.

COMMON BLOCKS: None

USAGE: CALL SURCC (NPT, FLINE, FVEC)

ERROR RETURNS: None

3.3 Program PLTORT (Overlay (LWB, 4, 2))

PURPOSE: This routine is the control routine for the orthographic projection options. It notates the plot title, sets the origin for the plot, and after that it calls OTHPLT.

INPUT:

PHI	Y-origin on paper of plan view, inches, (stacked three-view plots only).
THETA	Y-origin on paper of side view, inches, (stacked three-view plots only).
PSI	Y-origin on paper of front view, inches, (stacked three-view plots only).
BIGD	Maximum value of XMAX, YMAX, ZMAX dimensions.

TYPE BCD variable indicating type of plot.

PLOTSZ Variable which determines the size of the plot. Scale factor is calculated using PLOTSZ and maximum dimension of configuration.

PLOT Plot control integer.

OUTPUT:

YORG Y-origin computed for placing view of plot.

USAGE: CALL OVERLAY(LWB,4,2)

COMMON BLOCKS: BLANK, BLANK2, NEWCOM, FILES, HEAD, GRAPH, PTYPE

SUB-ROUTINES CALLED : CALPLT, NFRAME, NOTATE, OTHPLT

3.3.1 Subroutine OTHPLT

PURPOSE: This routine adjusts minimum values of X, Y, and Z for the grid lines, sets up the axes, checks paper plane (centers plot within paper size if size of plot is greater than 28 inches), and establishes the offsets for the placement of the plot; then it calls subroutine PLOTIT for the plotting of the different components of the aircraft.

INPUT:

XMAX Maximum value of X (input Coord. Sys.).

XMIN Minimum value of X (Input Coord. Sys.).

YMAX Maximum value of Y (Input Coord. Sys.).

YMIN Minimum value of Y (Input Coord. Sys.).

ZMAX Maximum value of Z (Input Coord. Sys.).

ZMIN Minimum value of Z (Input Coord. Sys.).

HORZ	"X", "Y", or "Z" for horizontal axis.
VERT	"X", "Y", or "Z" for vertical axis.
PHI	Same as defined in PLTCON.
THETA	Same as defined in PLTCON.
PSI	Same as defined in PLTCON.
OUTPUT:	
NWAF	Number of airfoil sections used to describe the wing.
NW	Number of ordinates used to describe each wing airfoil section.
ITEST	Control integer for checking paper plane.
ITEST1	Test control integer for hidden lines.
ITEST2	Control integer which equals 0 if PSI=THETA=PHI=0, otherwise it equals 1.
IHORZ	Control integer which determines whether X, Y, or Z is the horizontal variable.
IVERT	Control integer which determines whether X, Y, or Z is the vertical variable.
HMIN	Minimum value of the horizontal variable (X, Y, or Z).
VMIN	Minimum value of the vertical variable (X, Y, or Z).
SCALE	Scale factor.
A	Rotation matrix array.
C	Coefficients of vector transformation equation.
NANG1	Number of points used to define a half-section of a fuselage segment.
NUM2	Number of fin airfoil sections.
NFOR	Number of points used to define a fin airfoil section.
NCOR	Number of points used to define a canard airfoil section.

USAGE: CALL OTHPLT

COMMON BLOCKS: NEWCOM, GRAPH, BLANK, BLANK2, PTYPE, ONE, PI

SUB-ROUTINES CALLED : PLOTIT

3.3.2 Subroutine PLOTIT

PURPOSE: This routine generates instructions which drive the equipment to produce plots. It reads lines of points and outward normal unit vectors from itermediate storage (TAPE 12) and manipulates them as necessary.

INPUT:

NL Number of lines.

NPT Number of points.

ITEST Control integer for checking paper plane.

ITEST1 Control integer for testing of hidden lines.

ITEST2 Control integer which equals 0 when PSI=THETA=PHI=0, otherwise equals 1.

IHORZ Control integer which determines whether X, Y, or Z is the horizontal variable.

IVERT Control integer which determines whether X, Y, or Z is the vertical variable.

HMIN Minimum value of the horizontal variable.

VMIN Minimum value of the vertical variable.

SCALE Scale factor.

A Rotation matrix array.

C Array containing coefficients of transformation equation.

OUTPUT: Orthographic plots.

USAGE: CALL PLOTIT

COMMON
BLOCKS: FILES

SUB-
ROUTINES
CALLED : PTROT, VERCROT, VISTST

3.3.3 Subroutine PTROT

PURPOSE: This routine rotates and projects a set of 3-D points.

INPUT:

NPT Number of points.

A Rotation matrix array.

ALINE Array containing rotated line.

OUTPUT:

RLINE Array containing rotated line.

USAGE: CALL PTROT

COMMON
BLOCKS: None

SUB-
ROUTINES
CALLED : None

3.3.4 Subroutine VECROT

PURPOSE: This routine does the vector transformation.

INPUT:

NVEC Number of vectors.

C Array containing transformation coefficients.

FVEC Input vectors.

OUTPUT:

RVEC   Transformed vectors.

USAGE: CALL VECROT

COMMON
BLOCKS: None

SUB-
ROUTINES
CALLED   : None

3.3.5 Subroutine VISTST

PURPOSE: This routine tests a line of points for visibility.

INPUT:

KODE   Control integer which tells us whether we have the first line, last line or any other.

NPT   Number of points.

RLINE   Array containing line of points to be tested for visibility.

RVEC   Array of transformed vectors.

OUTPUT:

PLINE   Array containing visible points.

ICOUNT   Counter containing number of visible points.

NNUM   Array containing counter ICOUNT for each set of points which are visible.

USAGE: CALL VISTST

COMMON
BLOCKS: None

SUB-
ROUTINES
CALLED   : None

3.4 Program PLTSTE (Overlay (LWB, 4, 3))

PURPOSE: This routine is the control routine for the perspective and stereo plots.

INPUT:

ISP Control integer specifying the type to be stereo or perspective:

ISP=1 perspective

ISP=2 stereo

USAGE: CALL OVERLAY (LWB, 4, 3)

COMMON BLOCKS: GRAPH, BLANK, BLANK2, FILES, HEAD, PTYPE

SUB-ROUTINES CALLED : SPPLT

3.4.1 Subroutine SPPLT

PURPOSE: This routine calls subroutine STERPT to generate the perspective views or stereo views of an aircraft.

INPUT:

PLOT Plot control integer:

0 - No plot output.

1 - Plot output of singularity paneling on the Calcomp plotter.

2 - Plot output of singularity paneling on the Varian or Versatec plotter.

A negative value of PLOT will generate the input configuration plots.

PHI X - of view point (location of viewer) in data coordinate system.

THETA	Y - of view point in data coordinate system.
PSI	Z - of view point in data coordinate system.
XF	X - of focal point (determines direction and focus) in data coordinate system.
YF	Y - of focal point in data coordinate system.
ZF	Z - of focal point in data coordinate system.
DIST	Distance from eye to viewing plane, inches.
FMAG	Viewing plane magnification factor FMAG controls the size of the projected image.
PLOTSZ	Diameter of viewing plane, (inches). DIST and PLOTSZ together, determine a cone which is the field of vision.
ISP	Control integer indicating whether more than one set of arrays will be plotted in the same frame set from the same view point.
J1	Wing definition parameter.
J2	Fuselage definition parameter.
J3	Pod definition parameter.
J4	Fin definition parameter.
J5	Canard definition parameter.
NWAF	Number of wing airfoil sections.
NWAFOR	Number of ordinates used to describe a wing airfoil section.
NFUS	Number of fuselage segments.
NRADX	Number of points used to represent a half-section of a fuselage segment.
NFORX	Number of sections in a fuselage segment.
NP	Number of pods,
NPODOR	Number of stations at which pod radii are to be specified.

NF Number of fins.

NFINOR Number of ordinates used to define each fin airfoil section.

NCAN Number of canards.

NCANOR Number of ordinates used to define each canard airfoil section.

K1 through K5: Same as J1 through J5. Used for singularity paneling plots.

KWAF Same as NWAF, but used for singularity paneling only.

KWAFOR Same as NWAFOR. Singularity paneling.

KRADX Same as NRADX. Singularity paneling.

KFORX Same as NFORX. Singularity paneling.

KF Number of airfoil sections used to define inboard and outboard edges of singularity panels of a fin.

KFINOR Same as NFINOR. Singularity paneling.

KAN Number of airfoil sections used to define inboard and outboard edges of singularity panels of a canard.

KANOR Number of ordinates specifying leading and trailing edges of singularity panels of a canard.

COMMON BLOCKS: NEWCOM, BLANK, BLANK2, FILES, GRAPH, ONE

SUB-ROUTINES CALLED : PLTIT3

3.4.2 Subroutine PLTIT3

PURPOSE: This routine reads from TAPE 12 lines of points which define a surface, and plots perspective or stereo views.

INPUT:

ALINE Array containing lines of points.

NL Number of lines.

NPT Number of points.

PHI X - of viewing point in data coordinate system.

THETA Y - of viewing point in data coordinate system.

PSI Z - of viewing point in data coordinate system.

XF X of focal point in data coordinate system.

YF Y of focal point in data coordinate system.

ZF Z of focal point in data coordinate system.

PLOTSZ Diameter of viewing plane, inches.

DIST Distance from eye to viewing plane.

FMAG Magnification factor of viewing plane.

NCI Integer value indicating that more than one set of arrays will be plotted in the same frame set from the same viewing point.

OUTPUT: Perspective or stereo frames.

COMMON BLOCKS: FILES

SUB-ROUTINES CALLED : STERPT

3.4.3 Subroutine STERPT

PURPOSE: This routine plots the stereo frames, or the perspective view. Stereo plots are generated in two passes.

INPUT:

X, Y, AND Z:	Arrays of X, Y, and Z values to be transformed and plotted.
N	Number of points to be plotted.
K	Interleave factor of a mixed array (normally 1).
NC	Integer value indicating whether more than one set of arrays will be plotted in the same frame set from the same view point:
	0 - First set of arrays.
	1 to N successive sets of arrays.
	-1 - Plot the left frame for an array.
	-2 - Plot the right frame for an array.
IP	3 - Pen up when moving to first point in the array.
PAG	Diameter in floating point inches of the viewing plane. Determined by DIST and PLOTSZ.
PLA	Distance from eye to viewing plane specified in floating point inches.
XPR	Viewing plane magnification factor.
OUTPUT:	Perspective or stereo plots.
COMMON BLOCKS:	PI
SUB-ROUTINE CALLED :	None

3.5 Program SPLTSV

PURPOSE: This program reads the singularity paneling data from TAPE 3, computes maximum and minimum dimensions. It then proceeds to compute outward normal unit vectors, generates lines, and stores lines of points and vectors on TAPE 12.

INPUT:

K0	Reference area parameter.
K1	Wing definition parameter.
K2	Fuselage definition parameter.
K3	Pod definition parameter.
K4	Fin definition.
K5	Canard definition parameter.
K6	Fuselage camber parameter.
KWF	Number of wing airfoil sections.
KWAFOR	Number of ordinates used to define each wing airfoil section.
NFUS	Number of fuselage segments.
KRADX	Number of fuselage axial stations in one segment.
NF	Number of fins.
KWF	Number of airfoil sections.
NCANR	Number of ordinates used to define a canard airfoil section.
XC	Array containing X-coordinates of panel corner points.
YC	Array containing Y-coordinates of panel corner points.
ZC	Array containing Z-coordinates of panel corner points.

OUTPUT:

ALRT	Array containing lines of points.
VECRT	Array containing outward normal unit vectors.

COMMON
BLOCKS: NEWCOM, FILES, BLANK, BLANK2

SUB-
ROUTINES
CALLED : SURCL, SURCC

3.6 Program PLPRES (Overlay (LWB, 4, 5))

PURPOSE: This is the control routine for the plotting of the pressure distributions on the fuselage and on the wing.

INPUT:

NP Number of panels of component.

COMPT Component identification integer:

1 - Fuselage.

2 - Wing and/or tail.

NPASS Pass number:

1 - Fuselage pressure distribution and wing pressure distributions for upper and lower surfaces if non-planar boundary condition option is selected. Wing pressure distribution for the upper surface if planar boundary condition option is selected.

2 - Wing pressure distribution for the lower surface if the planar boundary condition option is selected.

X Fuselage panel control points X-coordinate.

Y Fuselage panel control points Y-coordinate.

Z Fuselage panel control points Z-coordinate.

CP Array of pressure coefficients.

XQ Array of wing panel X-coordinates.

NFUS Number of fuselage segments.

PLOT	Plot control integer:
	0 - No plot output.
	1 - Plot output on Calcomp plotter.
	2 - Plot output on Varian plotter.
NRADX(I)	Number of points used to represent a half-section in fuselage segment (I = 1,NFUS).
NFORX(I)	Number of sections (stations) in fuselage segment (I = 1,NFUS).
NSEG	Number of wing segments.
NROW	Array containing numbers of rows of panels in each wing segment.
NCOL	Array containing numbers of columns of panels in each wing segment.

OUTPUT:

PHI	Array containing meridian angles (in degrees) fuselage panel control points.
XX	Array of fuselage panel control point X-coordinates.
YY	Array of wing panel control point Y-coordinates.
CP	Array of pressure coefficients.
NR	Number of fuselage panels at a specified station.
XQ	Array of wing panel X-coordinates.
NPW	Number is wing panels at a specified column.
USAGE:	CALL OVERLAY (LWB, 4, 3)
COMMON BLOCKS:	SCALE, PARAM, GRAPH, PRESS, SEG, FILES, NEWCOM, PI, CLINE
SUB-ROUTINES CALLED :	PRESBO, AXLES, PRSWNG, LABEL

3.6.1 Subroutine PRESBO

PURPOSE: This routine plots the pressure distribution at specified sections (stations) of the fuselage. The curves are plotted in groups of ten or less. Each curve represents the pressure distribution at a station.

INPUT:

X	Fuselage pagel control point X-coordinate.
KF	Number of points to be plotted per curve.
PHI	Array containing the meridian angles (in degrees) of panel control points.
CP	Array containing pressure coefficients.
CPMIN	Minimum value in CP-array.
CSCALE	Scale factor.
KK	Control integer which specifies symbol to be used in the plotting of each curve. Values of KK from 1 to 10.

OUTPUT: Fuselage pressure distribution plots.

USAGE: CALL PRESBO(X,KF,PHI,CP)

COMMON BLOCKS: SCALE

3.6.2 Subroutine AXLES

PURPOSE: This routine computes the axes for the pressure distribution plots.

INPUT:

COMPT	Component identification integer.
CSCALE	Scale factor for CP-arrays.

CPMIN Origin of CP scale.

PLOT Plot control integer.

OUTPUT: Axes with or without grid.

USAGE: CALL AXLES(COMPT)

3.6.3 Subroutine PRSWNG

PURPOSE: This subroutine plots the wing pressure distribution for each column of panels each time it is called.

INPUT:

NR Number of panels.

CSCALE Scale factor of CP's in column.

CPMIN Origin of CP-axes.

XQ Non-dimensional panel X-coordinate.

CP Array of pressure coefficients.

OUTPUT: Pressure distributions plots for each column on wing.

USAGE: CALL PRESWNG(NR,L,XQ,CP)

COMMON BLOCKS: SCALE, GRAPH

3.6.4 Subroutine LABEL

PURPOSE: This subroutine plots the legends to the graphs of the fuselage pressure distribution or of the wing pressure distribution.

INPUT:

PLOT Plot control integer.

COMPT Component identification integer.

LL Total number of curves plotted.

XX	Array of X or Y-coordinates of the different sections for which pressure distribution was plotted.
KL	Total number of curves to be plotted.
L	Integer counter of number of curves per frame, $L \leq 10$.
OUTPUT:	Plots of the legends to the graphs of the pressure distribution frames.
USAGE:	CALL LABEL(LL,XX,KL,L,COMPT)
COMMON BLOCKS:	SCALE, GRAPH, FILES, PARAM

Section 4
AUXILIARY FILES

USSAERO designates TAPE 6 as its output file and which contains its printed tables.

Disk file TAPE 5 contains the input data to the program. The contents of TAPE 5 are initially read in, each record in 8A10 format printed out under the same format, and then, the file is re-wound before being used throughout the program. The initial printout of the contents of TAPE 5 gives the user the opportunity to check his input data.

In addition to TAPE 5 and TAPE 6, USSAERO specifies nine auxiliary files which are utilized as temporary storage and data transfer. These files are designated: TAPE 3, TAPE 7, TAPE 8, TAPE 9, TAPE 10, TAPE 11, TAPE 12, TAPE 13, and TAPE 14.

TAPE 3 is used as temporary storage of the input geometry data which is followed by the singularity paneling geometry data. The input geometry data is written to TAPE 3 by program CONFIG (Overlay (LWB, 1, 1)). The singularity paneling geometry data is written to TAPE 3 by programs WNGPAN (Overlay (LWB, 1, 3)). BODPAN (Overlay (LWB, 1, 5)), and TALPAN (Overlay (LWB, 1, 7)).

TAPE 7 is primarily used for the storage of the panel geometry data. The first logical record is written to this file by program WNGPAN, and it contains wing panel geometry data. If the configuration has additionally, fins and/or canards, the first logical record will be re-written to TAPE 7 by program TALPAN, and its contents will be wing, fin, and/or canard panel geometry data. The second logical record is written to TAPE 7 by program BODPAN, and its contents are the body (fuselage) panel geometry data. Additional records are written to TAPE 7 by program VELCMP (Overlay (LWB, 2, 0)), if the aerodynamic matrix partitions matrices are further subdivided into blocks. The diagonal block matrices are stored in individual logical records on this file after the panel geometry data. A maximum of 50 additional records containing the elements of the diagonal block matrices may be written to this file.

TAPE 8 is used to store the velocity component arrays u, v, and w. Each record in this file contains one row of the velocity components from a given matirx partition. In the first partition, NBODY logical records are written to TAPE 8 by program BODVEL (Overlay (LWB, 2, 1)). In the second partition, another NBODY logical records are written to TAPE 8 by program LINVEL (Overlay (LWB, 2, 2)) or program WNGVEL (Overlay (LWB, 2, 3)). However, if the planar boundary condition with thickness option is selected, program LINVEL writes an additional NBODY records to this file. In the third partition, NWING records are written to TAPE 8 by program BODVEL. In the fourth partition, another NWING records are written to this file, by either program LINVEL (Overlay (LWB, 2, 2)) or by program WNGVEL (Overlay (LWB, 2, 3)). If the planar boundary condition with thickness option is selected, program LINVEL writes an additional NWING records to TAPE 8.

TAPE 9 is first used in program CONFIG to store the input configuration geometry data. Five logical records are written to TAPE 9, and they contain: reference area, wing geometry data, body (fuselage) geometry data. Dummy records are written to TAPE 9 for missing components. TAPE 9 is re-initiated in program VELCMP, and used to store normal velocity arrays. Each logical record contains one row of normal velocities from a given matrix partition. In the first partition, NBODY records are written to this file by program WNGVEL. In the third partition, NWING records are written to TAPE 9 by program BODVEL, and in the fourth partition, an additional NWING records are written to this file by program LINVEL or by program WNGVEL. Thus, a total of two (NBODY + NWING) records are written to TAPE 9.

TAPE 10 is first used in program NEWRAD as temporary storage for the body panel corner point coordinates. It is reinitialized by program VELCMP, and then used to store the elements of the diagonal block matrices, if the matrix partitions are further subdivided into blocks. Each record contains one row of normal velocities from a given diagonal block matrix in a given matrix partition. The records are written at the same time the normal velocity arrays for the remainder of the row are written on TAPE 9. Thus, a total of two (NBODY + NWING) records are also written on TAPE 10. These records are subsequently read by program VELCMP, transferred to TAPE 7, and the file re-initialized a second time. TAPE 10 is finally used to store the elements of the inverse diagonal block matrices, or the inverse diagonal partition matrices, if the matrix is not subdivided into blocks. In the former case, the elements of each inverse diagonal block matrix are written as a single record on TAPE 10 by subroutine DIAGIN, or in the latter case, the elements of each inverse diagonal partition matrix are written on this file by subroutine PARTIN.

TAPE 11 is first used by program GEOM as temporary storage for the input geometry control integers and for the revised configuration paneling description control integers. The first record is read by program CONPLT (Overlay (LWB, 4, 0)) and program GPLTSV (Overlay (LWB, 4, 1)). The second is read in by program SPLTSV (Overlay (LWB, 4, 4)).

TAPE 12 is first used by program GPLTSV which writes arrays of lines alternately with arrays of outward normal vectors to it, for the plotting of the input geometry. The file is then re-initialized by program SPTSV which writes arrays of lines alternately with arrays of outward normal vectors to it, for the plotting of the singularity paneling. The file is re-initialized for the last time in subroutine FORMOM which writes fuselage and wing (upper surface only) pressure distribution. The number of records written to this file is a function of the input geometry and of the singularity paneling.

TAPE 13 is first used by program GEOM which writes the plot control cards to it. The file is re-initialized by subroutine

FORMOM which writes the wing (lower surface only) pressure distribution to it.

TAPE 14 is first used as a temporary storage for the normal velocity arrays in subroutine ITRATE, if NBODY and NWING are not equal to zero. The NBODY records in TAPE 9 which correspond to the second partition and the NWING records in the same file corresponding to the fourth partition, are copied to TAPE 14. This file is re-initialized in plot overlay programs PLTORT and/or PLTSTE where it is used as temporary storage for alpha-numeric information to be notated on the geometry plots.

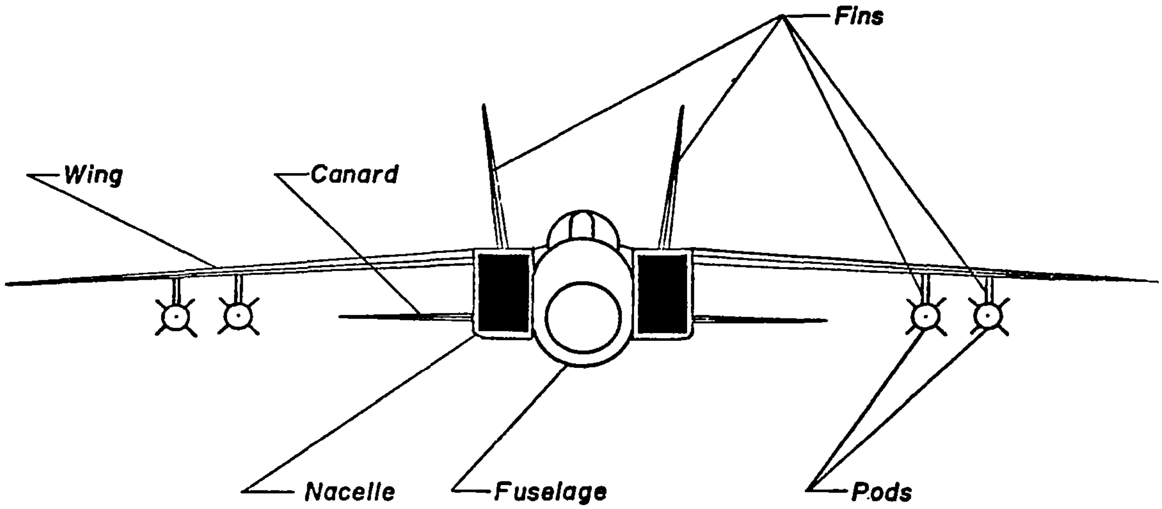


Figure 6

AIRCRAFT COMPONENTS

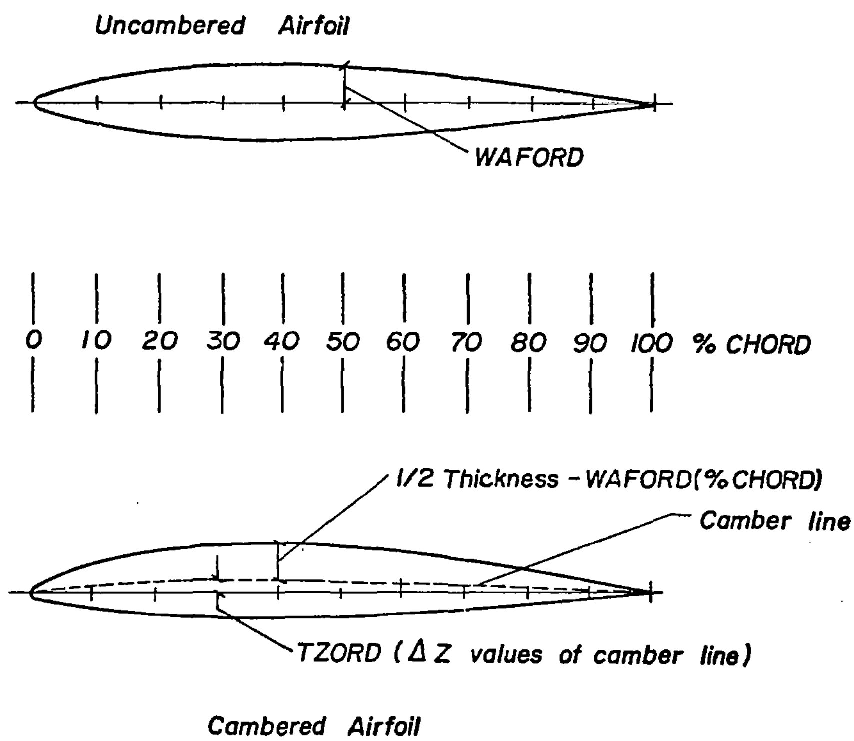


Figure 7

CAMBERED AND UNCAMBERED AIRFOILS

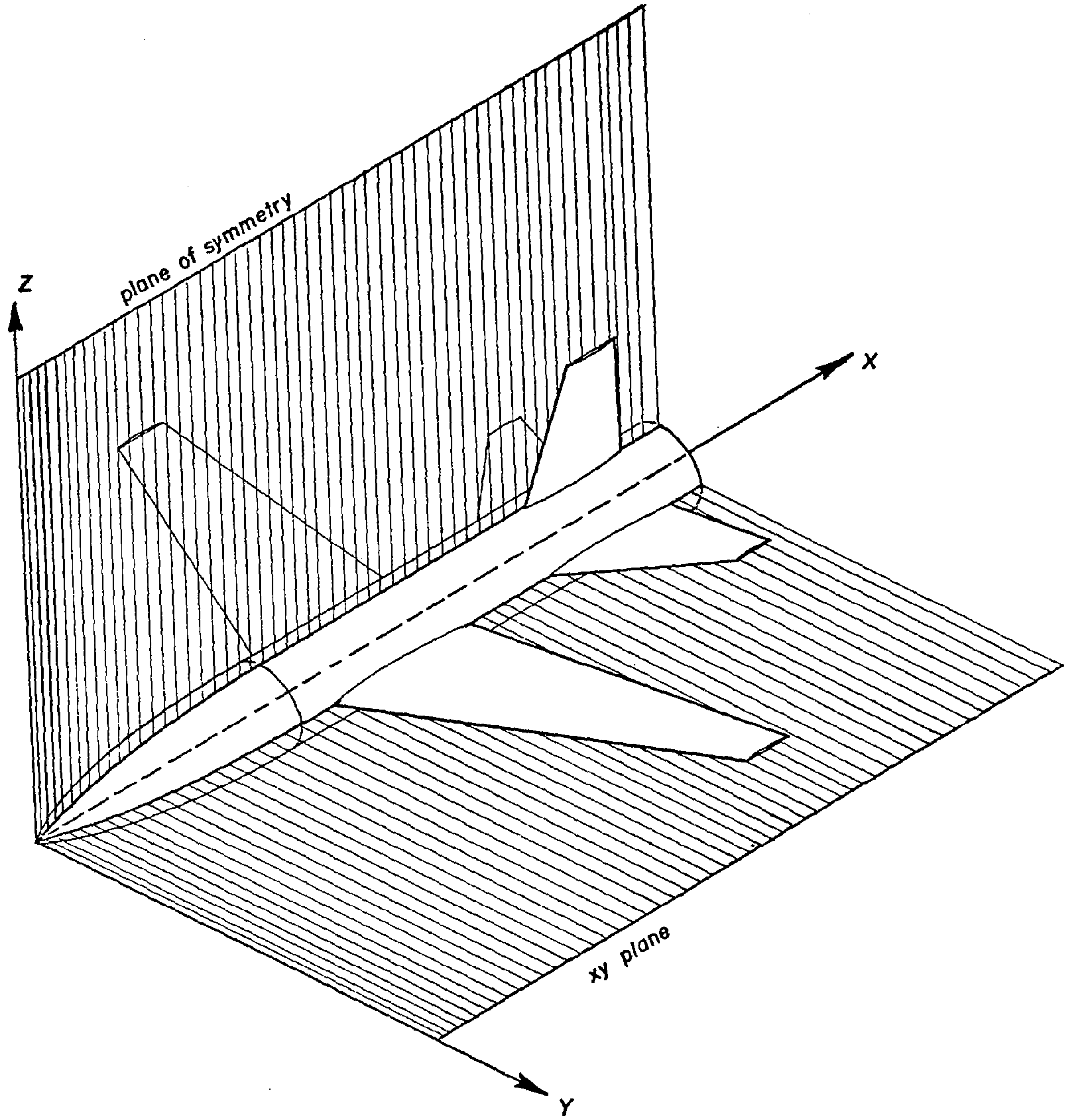


Figure 8

UNCAMBERED FUSELAGE AIRCRAFT CONFIGURATION

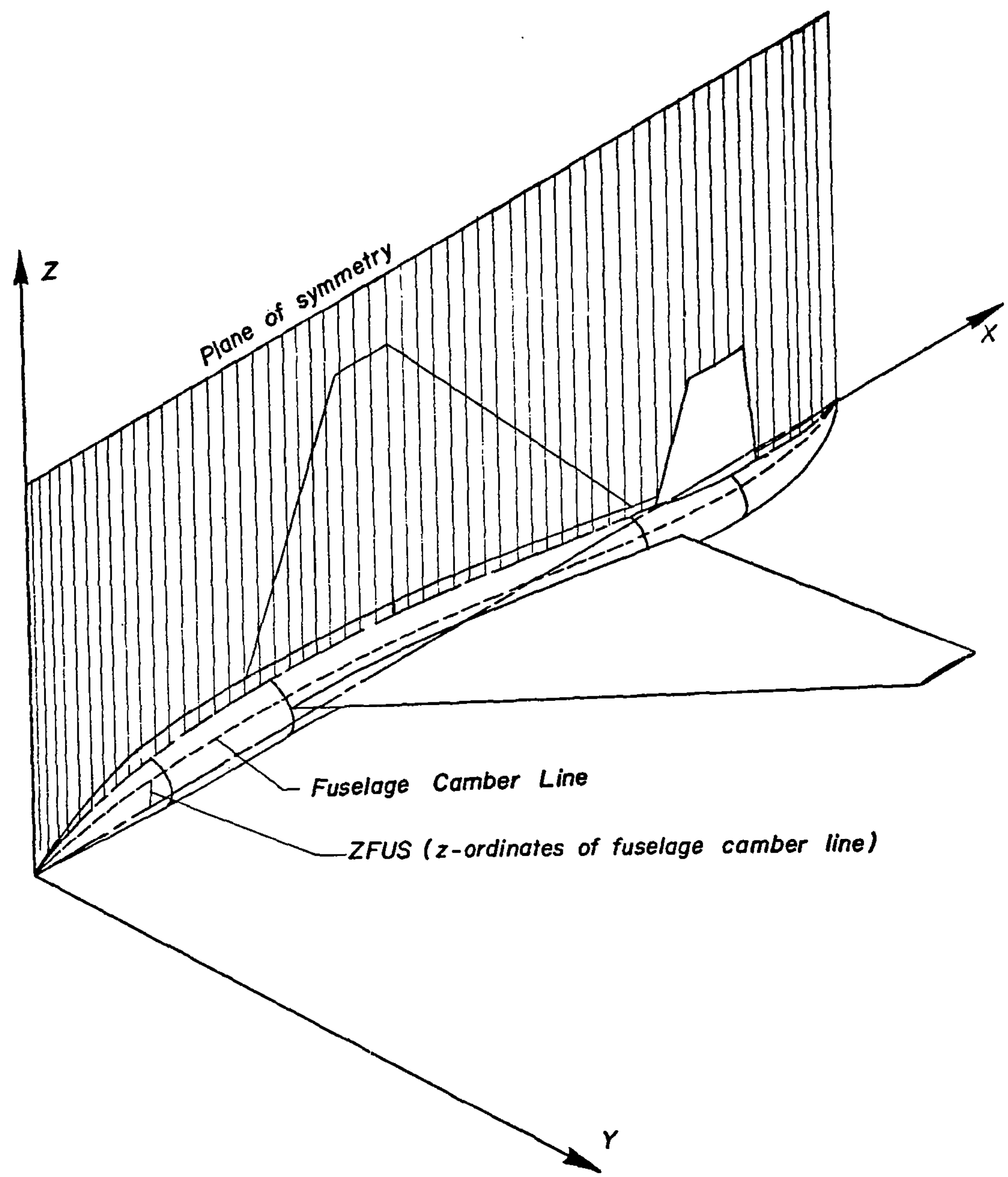


Figure 9

CAMBERED FUSELAGE AIRCRAFT CONFIGURATION

Section 5
INPUT DESCRIPTION

The input to the USSAERO program consists of two parts, namely, the numerical description of the initial configuration geometry followed by the plot information cards; and the auxiliary input data which specifies the singularity paneling scheme, program options, Mach number, angle of attack, normal velocities, and field points, again, followed by plot information cards. The project input is illustrated in Appendix B.

Input Geometry

Columns	Variable	Value	Description
1-80	TITLE1		This card contains any desired identifying information.

Control Integers

Columns	Variable	Value	Description
1-3	J0	0	No reference area.
		1	Reference area to be read.
4-6	J1	0	No wing data.
		1	Cambered wing data to be read.
		-1	Uncambered wing data to be read.
7-9	J2	0	No fuselage data.
		1	Data for arbitrarily shaped fuselage to be read.
		-1	Data for circular fuselage to be read. (With J6=0, fuselage will be cambered. With J6=-1, fuselage will be symmetrical with respect to the xy-plane. With J6=1, entire configuration will be symmetrical with respect to the xy-plane.)
10-12	J3	0	No POD (Nacelle) data.
		1	POD (Nacelle) data to be read.

Columns	Variable	Value	Description
13-15	J4	0	No fin (vertical tail) data.
		1	Fin data to be read.
16-18	J5	0	No canard (horizontal tail data).
		1	Canard data to be read.
19-21	J6	0	A cambered circular or arbitrary fuselage if J2 is non-zero.
		1	Complete configuration is symmetrical with respect to the xy-plane, which implies an uncambered circular fuselage, if there is one.
		-1	Uncambered circular fuselage with J2 non-zero.
22-24	NWAF	2-20	Number of airfoil sections used to describe the wing.
25-27	NWAFOR	3-30	Number of ordinates used to define each wing airfoil section. If the value of NWAFOR is input with a negative sign, the program will expect to read lower surface ordinates also.
28-30	NFUS	1-4	Number of fuselage segments.
31-33	NRADX(1)	3-20	Number of points used to represent half-section of first fuselage segment. If fuselage is circular, the program computes the indicated number of Y- and Z-coordinates.
34-36	NFORX(1)	2-30	Number of stations for first fuselage segment.
37-39	NRADX(2)	3-20	Same as NRADX(1), but for the second fuselage segment.
40-42	NFORX(2)	2-30	Same as NFORX(1), but for the second fuselage segment.
43-45	NRADX(3)	3-20	Same as NRADX(1), but for the third fuselage segment.
46-48	NFORX(3)	2-30	Same as NFORX(1), but for the third fuselage segment.

Columns	Variable	Values	Description
49-51	NRADX(4)	3-20	Same as NRADX(1), but for the fourth fuselage segment.
52-54	NFORX(4)	2-30	Same as NFORX(1), but for the fourth fuselage segment.
55-57	NP	0-9	Number of PODS (Nacelles).
58-60	NPODOR	4-30	Number of stations at which pod radii are to be specified.
61-63	NF	0-6	Number of fins (vertical tails) to be described.
64-66	NFINOR	3-10	Number of ordinates used to describe each fin airfoil section.
67-69	NCAN	0-6	Number of canards (horizontal tails) to be described.
70-72	NCANOR	3-10	Number of ordinates used to define each canard airfoil section. If the value of CANOR is negative, the program will expect to read lower surface ordinates also; otherwise, the airfoil is assumed to be symmetrical.
73-75	PLOT		Plot flag.
		-1	Plots of input geometry + singularity paneling geometry + pressure distributions. In this case, plot cards should be placed before TITLE2 card and before the MACH NO., ALPHA cards.
		0	No plots will be generated.
		+1	Plots of singularity paneling geometry and pressure distributions will be generated. Plot cards should be placed before the MACH NO., ALPHA cards.

Reference Area

Columns	Variable	Value	Description
1-7	REFA		Reference Area Card.

Wing

Columns	Variable	Value	Description
1-7	XAF		Cards, each containing up to 10 values of percent chord, at which ordinates of airfoils are to be specified. Total of NWAFOR values. Each card may be identified in columns 73-80 by XAFJ, where J denotes the last location specified on that card.
	WAFORG		NWAF cards, each containing values of:
1-7			X-coordinate of wing airfoil leading edge,
8-14			Y-coordinate of wing airfoil leading edge,
15-21			Z-coordinate of wing airfoil leading edge,
22-28			wing airfoil streamwise chord length. Each card may be identified in columns 73-80 by WAFORGJ, where J denotes the airfoil number, starting from the most inboard airfoil.
	TZORD		NWAF cards, each containing up to 10 values of DELTAZ (mean camber line). A total of NWAFOR values will be read per airfoil. Each card may be identified in columns 73-80 by TZORJ, where J denotes the last location on that card. These values will be input only if J1<0.
1-7 8-14 etc.			
	WAFORD		
1-7 8-14 etc.			Cards, each containing up to 10 values of wing half-thickness, (each specified as percent of the chord) specified for each wing airfoil. If NWAFOR<0, the same number of values will be read for the wing lower surface.

Body (Fuselage)

Columns	Variable	Value	Description
1-7 8-14 etc.	XFUS		Cards, each containing up to 10 values of X-coordinates of body axial stations specified for each body segment. Total number of values per segment is specified by NFORX. Each card may be identified in columns 73-80 by XFUSJ, where J denotes the last location on that card.
1-7 8-14 etc.	ZFUS		Cards, each containing up to 10 values of Z-ordinates of fuselage camber line, specified at each fuselage segment. Total number of values per segment is specified by NFORX. Each card may be identified in columns 73-80 by ZFUSJ, where J denotes the last location on that card.
1-7 8-14 etc.	SFUS		Cards, each containing up to 10 values of Y-ordinates of half-cross-section points. A total of NRADX values are input. The cards containing NRADX values of Y-coordinates are followed by cards containing the Z-coordinates of the same points. These sets of cards are repeated for each fuselage segment. They will only be read, if J1 = 1. (Fuselage of arbitrary shape).
1-7 8-14 etc.	FUSARD		Cards, each containing up to 10 values of fuselage cross-sectional areas. Total of NFORX values will be read per fuselage segment. Each card may be identified in columns 73-80 by FUSARDJ, where J denotes last station specified on that card. Fuselage has circular cross-sections.

Fin

Columns	Variable	Value	Description
	FINORG		
1-7			X-ordinate on inboard airfoil leading edge,
8-14			Y-ordinate on inboard airfoil leading edge,
15-21			Z-ordinate on inboard airfoil leading edge,
22-28			Chord length of inboard airfoil,
29-35			X-ordinate on outboard airfoil leading edge,
36-42			Y-ordinate of outboard airfoil leading edge,
43-49			Z-ordinate of outboard airfoil leading edge,
50-56			Chord length of outboard airfoil. This card may be identified in columns 73-80 by FINORGJ, where J denotes the fin number.
1-7 8-14 etc.	XFIN		Cards, each containing up to 10 values of fin airfoil percent chord. Each card can be identified in columns 73-80 by XFINJ, where J denotes the fin number.
1-7	FINORD		Cards, each containing up to 10 values of fin airfoil half-thickness, expressed in percent chord. Since the fin airfoil must be summetrical, only the ordinates on the positive Y-side of the fin chord plane are required. each card may be identified in columns 73-80 by FINORDJ, where J denotes the fin number.

NOTE: FINORG, XFIN and FINORD are input for each fin.

Canard

Columns	Variable	Value	Description
	CANORG		
1-7			X-ordinate of inboard airfoil leading edge,
8-14			Y-ordinate of inboard airfoil leading edge.

Columns	Variable	Value	Description
15-21			Z-ordinate of inboard airfoil leading edge,
22-28			Chord length of inboard airfoil.
29-35			X-ordinate of outboard airfoil leading edge,
36-42			Y-ordinate of outboard airfoil leading edge,
43-49			Z-ordinate of outboard airfoil leading edge,
50-56			Chord length of outboard airfoil. This card may be identified in columns 73-80 by CANORGJ, where J denotes canard number.
1-7 8-14 etc.	XCAN		Cards, each containing up to 10 values of canard airfoil percent chord. Each card may be identified in columns 73-80 by XCANJ, where J denotes canard number. Total number of values is NCANOR/airfoil.
1-7 8-14 etc.	CANORD		Cards, each containing up to 10 values of canard airfoil half-thickness, expressed in percent chord. If canard airfoil is not symmetrical, the lower ordinates are presented on a second CANORD set of cards. The program expects both upper and lower ordinates to be punched as positive values in percent chord.

NOTE: CANORG, XCAN, and CANORD are input for each canard.

Plot Cards

For

(1) Orthographic Projections

Columns	Variable	Value	Description
1	HORZ		"X", "Y", or "Z" for horizontal axis.
3	VERT		"X", "Y", or "Z" for vertical axis.
5-7	TEST1		Word "OUT" for deletion of hidden lines; otherwise, leave blank.

Columns	Variable	Value	Description
8-12	PHI		Roll angle, degrees.
13-17	THETA		Pitch angle, degrees.
18-22	PSI		Yaw angle, degrees.
48-52	PLOTSZ		PLOTSZ determines the size of plot (scale factor is calculated using PLOTSZ and the maximum dimension of configuration).
53-55	TYPE		Word "ORT"
72	KODE	0	Continue reading plot cards.
		1	After processing this plot card, end reading plot cards.

(2) Three-View Orthographic Plot

Columns	Variable	Value	Description
8-12	PHI		Y-origin on paper of plan view, in.
13-17	THETA		Y-origin on paper of side view, in.
18-22	PSI		Y-origin on paper of front view, in.
48-52	PLOTSZ		PLOTSZ determines size of plot (A scale factor is calculated using PLOTSZ and the maximum dimension of the configuration).
53-55	TYPE		Word "VU3".
72	KODE	0	Continue reading plot cards.
		1	After processing this plot card, end reading plot cards.

(3) Perspective Views

Columns	Variable	Value	Description
8-12	PHI		X-coordinate of view point in data coordinate system.
13-17	THETA		Y-coordinate of view point in data coordinate system.

Columns	Variable	Value	Description
18-22	PSI		Z-coordinate of view point in data coordinate system.
23-27	XF		X-coordinate of focal point in data coordinate system.
28-32	YF		Y-coordinate of focal point in data coordinate system.
33-37	ZF		Z-coordinate of focal point in data coordinate system.
38-42	DIST		Distance from eye to viewing - plane, in.
43-47	FMAG		Viewing - plane magnification factor; it controls size of projected image.
48-52	PLOTSZ		Diameter of viewing - plane. DIST and PLOTSZ determine a cone which is the field of vision.
53-55	TYPE		Word "PER"
72	KODE	0 1	Continue reading plot cards. After processing this plot card, end reading plot cards.

(4) Stereo Frames

Input is identical to that for perspective views except that word "STE" is used in columns 53-55.

The USSAERO Program is restricted to a total of 600 singularity panels on the wing-fin-canard combination. There is an additional restriction that the total number of singularity panels in the spanwise direction on the wing-fin-canard combination cannot exceed 20. The remaining input cards contain detailed description of the singularity paneling of each component of the configuration. Each card contains up to ten (10) values, each value punched in a 7-column field with a decimal point, and may be identified in columns 73-80. The cards are arranged in the following order:

1) Title Card, 2) Options Card, 3) Control Integer, 4) Reference Lengths, 5) Wing Data Cards, 6) Body Data Cards, 7) Fin Data Cards, 8) Canard Data Cards, 9) Singularity Paneling Plot Information Cards and, finally, 10) Mach Number, Angle of Attack Cards.

Singularity Paneling Geometry

Columns	Variable	Value	Description
1-50	TITLE2		This card contains identifying information.

Options

Columns	Variable	Value	Description
1-3	LINBC	0	Non-planar boundary condition.
		1	Planar boundary condition.
4-6	THICK	0	Do not calculate wing thickness matrix.
		1	Calculate wing thickness matrix if LINBC = 1.
7-8	PRINT		Print option flag.
		0	Print the pressures, the forces and the moments.
		1	Print option 0 and print the spanwise loads on the wing, fin and canard.
		2	Print option 1 and print the velocity components, source and vortex strengths.
		3	Print option 2 and print the steps in the iterative solution.
		4	Print option 3 and print the axial and normal velocity matrices.
			If PRINT 0, the panel geometry will be included in the printout.
9-12	LCPA	blank	Not used.
13-15	LCPB	blank	Not used.
16-18	ITMETH		Iterative solution method selection flag.
		0, 2	Blocked GAUSS-SEIDEL iterative solution procedure.

Columns	Variable	Value	Description
16-18	ITMETH	1	Blocked JACOBI iterative solution procedure.
		3	Blocked controlled successive over-relaxation iterative solution procedure.
		4	Blocked successive over-relaxation iterative solution procedure.
19-21	ITMAX	0	Maximum number of iterations set at 50.
		integer	Maximum number of iterations specified.
22-24	CCTEST	0.	Convergence criterion set at .001
		real	Convergence criterion specified.
29-35	DCTEST	0.	Divergence criterion set at 1000.
		real	Divergence criterion specified.
36-42	ALF1		Relaxation factor < 1
43-49	ALF2		Relaxation factor > 1

Control Integers

Columns	Variable	Value	Description
1-3	K0		Reference length flag.
		0	No reference length to be read.
		1	Reference length to be read.
4-6	K1		Wing definition flag.
		0	No wing data to be read.
		1	Wing data follows. Wing has sharp leading edge.
		3	Wing data follows. Wing has round leading edge.
7-9	K2		Body (fuselage) definition flag.
		0	No fuselage data to be read.
		1	Fuselage data to be read.
10-12	K3		POD definition flag (Not used).
13-15	K4		Fin definition flag.
		0	No fin data to be read.
		1	Fin data follows. Fin has sharp leading edge.

Columns	Variable	Value	Description
13-15	K4	3	Fin data to be read. Fin has round leading edge.
16-18	K5		Canard (horizontal tail) definition flag.
		0	No canard data to be read.
		1	Canard data to follow. Canard has sharp leading edge.
		3	Canard data follows. Canard has round leading edge.
19-21	K6		Not used.
22-24	KWAF	0	Number of wing sections used to define the inboard and outboard panel edges. If KWAF = 0, the panel edges are defined by NWAF in geometry input.
24-27	KWAFOR	0 3-30	Number of ordinates used to define the leading and trailing edges of the wing panels. If KWAFOR = 0, the panel edges are defined by NWAFOR in the input geometry.
28-30	KFUS		Number of fuselage segments. The program sets KFUS = NFUS.
31-33	KRADX(1)	0 3-20	Number of meridian lines used to define panel edges of first body segment. There are 3 options for defining the panel edges. If KRADX(1) = 0, the meridian lines are defined by NRADX(1) in geometry input. If KRADX(1) is positive, the meridian lines calculated at equally spaced PHIK's. If KRADX(1) is negative, the meridian lines are calculated at specified values of PHIK.
34-36	KFORX(1)	0, 2-30	Number of axial stations used to define leading and trailing edges of panels on first body segment. If KFORX(1)=0, the panel edges are defined by NFORX(1) in the geometry input.
37-39	KRADX(2)	0, 3-20	Same as KRADX(1), but for second body segment.

Columns	Variable	Value	Description
40-42	KFORX(2)	0, 2-30	Same as KFORX(1), but for second body segment
43-45	KRADX(3)	0, 3-20	Same as KFORX(1), but for third body segment.
46-48	KFORX(3)	0, 2-30	Same as KFORX(1), but for third body segment.

Configuration Paneling Description Control Integers

Columns	Variable	Value	Description
1-3	KF(1)	0, 2-20	Number of fin sections used to define the inboard and outboard panel edges on the first fin. If KF(1) = 0, the root and tip chords define the panel edges.
4-6	KFINOR(1)	0, 3-30	Number of ordinates used to define the leading and trailing edges of the fin panels on the first fin. If KFINOR(1) = 0, the panel edges are defined by NFINOR.
7-9	KF(2)	0, 2-20	Same as for KF(1), but for second fin.
10-12	KFINOR(2)	0, 3-30	Same as for KFINOR(1), but for second fin.
13-15	KF(3)	0, 2-20	Same as for KF(1), but for third fin.
16-18	KFINOR(3)	0, 3-30	Same as for KFINOR(1), but for third fin.
19-21	KF(4)	0, 2-20	Same as for KF(1), but for fourth fin.

Columns	Variable	Value	Description
22-24	KFINOR(4)	0, 3-30	Same as for KFINOR(1), but for fourth fin.
25-27	KF(5)	0, 2-20	Same as for KF(1), but for fifth fin.
28-30	KFINOR(5)	0, 3-30	Same as for KFINOR(1), but for fifth fin.
31-33	KF(6)	0, 2-20	Same as for KF(1), but for sixth fin.
34-36	KFINOR(6)	0, 3-30	Same as for KFINOR(1), but for sixth fin.
37-39	KCAN(1)	0, 2-20	Number of canard sections used to define edges on the first canard. If KCAN(1) = 0, the root tip chords define the panel edges. If KCAN(1) negative, no vortex sheets carry through the body and concentrated vortices are shed from the inboard edge of the canard or tail surface.
40-42	KCANOR(1)	0, 3-30	Number of ordinates used to define the leading and trailing edges of the first canard. If KCANOR(1) = 0, the panel edges are defined by NCANOR.
43-45	KCAN(2)	0, 2-20	Same as for KCAN(1), but for second canard.
46-48	KCANOR(2)	0, 3-30	Same as for KCANOR(1), but for second canard.
49-51	KCAN(3)	0, 2-20	Same as for KCAN(1) but for third canard.
52-54	KCANOR(3)	0, 3-30	Same as for KCANOR(1), but for third canard.
55-57	KCAN(4)	0, 2-20	Same as for KCAN(1), but for fourth canard.
58-60	KCANOR(4)	0, 3-30	Same as for KCANOR(1), but for fourth canard.

Columns	Variable	Value	Description
61-63	KCAN(5)	0, 2-20	Same as for KCAN(1), but for fifth canard.
64-66	KCANOR(5)	0, 3-30	Same as for KCANOR(1), but for fifth canard.
67-69	KCAN(6)	0, 2-20	Same as for KCAN(1), but for sixth canard.
70-72	KCAN(6)	0, 3-30	Same as for KCANOR(1), but for sixth canard.

REFERENCE LENGTHS: This card can be identified with REFL in columns 73-80, and contains the following:

Columns	Variable	Value	Description
1-7	REFAR		Wing reference area. If REFAR = 0, the value of the reference area is defined as the value of REFA in the geometry input.
8-14	REFB		Wing semi-span. If REFB = 0, a value of 1.0 is used for the reference semi-span.
15-21	REFC		Wing reference chord. If REFC = 0, a value of 1.0 is used for the reference chord.
22-28	REFD		Body reference diameter. If FERD = 0, a value of 1.0 is used for the reference diameter.
29-35	REFL		Body reference length. If REFL = 0, a value of 1.0 is used for the reference length.
36-42	REFX		X-coordinate of moment center.
43-49	REFZ		Z-coordinate of moment center.

Wing

Columns	Variable	Value	Description
1-7 8-14 etc.	RHO		Cards containing NWAF values. RADII of wing leading edge, expressed in percent of the chord. Required, only if K1 = 3. It may be identified in columns 73-80 by RHOJ, where J denotes the number of the last radius given on that card. This card contains NWAF values RHO.
1-7 8-14 etc	XAFK		Cards containing WAFOR values of wing panel leading edge locations, expressed in percent chord. This card may be identified in columns 73-80 as XAFKJ, where J denotes the last location given on that card. Omit if KWAFOR=0.
1-7	YK		Card containing KWAF values of Y-coordinate of Wing panel inboard and outboard edges. This card may be identified in columns 73-80 by YKJ, where J denotes last Y-coordinate on that card.

Body (Fuselage)

Columns	Variable	Value	Description
1-7 8-14 etc.	PHIK		Cards containing KRADX(1) values of the body meridian angles expressed in degrees, and may be identified in columns 73-80 by PHIKJ, where J denotes the body segment number. Convention used is that PHIK = 0. at the bottom of the body and PHIK = 180 at the top of the body. Omit, unless KRADX(1) is negative. Repeat same cards for each fuselage segment.
1-7 8-14 etc.	XJ		Array containing KFORX(1) values of X-coordinates of body axial stations. This card may be identified in columns 73-80 by XFUSKJ, where J denotes the body segment number. Omit if KFORX = 0. Repeat this card for each fuselage segment.

Fin

Columns	Variable	Value	Description
1-7 8-14 etc.	RHO		Array containing NF fin leading edge RADII. This array is required only if K4 = 3. This card is identified in columns 73-80 by RHOFIN.
1-7 8-14 etc.	XAFK		Array containing KFINOR(1) values of fin panel leading edge locations. This card is required only if K4 = 1. It may be identified in columns 73-80 by KFINKJ, where J denotes the fin number. Repeat this card for each fin.
1-7 8-14 etc.	YK		This array contains KF(1) values of the Z-coordinates of the fin panel inboard edges. This card is identified in columns 73-80 as ZFINKJ, where J denotes the fin number. These values start with the most inboard values.

Canard

Columns	Variable	Value	Description
1-7 8-14 etc.	RHO		Cards containing NCAN values of canard leading edge RADII, one value for each canard. This card can be identified in columns 73-80 as RHOCAN. This array is input only if K5 = 3.
1-7 8-14 etc.	XCAN		Card containing KCANOR(1) values of canard panel leading edge X-coordinates expressed in percent chord. The cards may be identified in columns 73-80 by XCANKJ, where J denotes the canard number. Repeat this card for each canard.
1-7	YK		Card containing KCAN(1) values of Y-coordinates of panel inboard edges. This card may be identified in columns 73-80 by YCANKJ, where J denotes canard number. Repeat this card for each canard.

Plot Cards

For

(1) Orthographic Projections

Columns	Variable	Value	Description
1	HORZ		"X", "Y", or "Z" for horizontal axis.
3	VERT		"X", "Y", or "Z" for vertical axis.
5-7	TEST1		Word "OUT" for deletion of hidden lines; otherwise, leave blank.
8-12	PHI		Roll angle, degrees.
13-17	THETA		Pitch angle, degrees.
18-22	PSI		Yaw angle, degrees.
48-52	PLOTSZ		PLOTSZ determines the size of plot (scale factor is calculated using PLOTSZ and the maximum dimension of configuration).
53-55	TYPE		Word "ORT"
72	KODE	0	Continue reading plot cards.
		1	After processing this plot card, end reading plot cards.

(2) Three-View Orthographic Plot

Columns	Variable	Value	Description
8-12	PHI		Y-origin on paper of plan view, in.
13-17	THETA		Y-origin on paper of side view, in.
18-22	PSI		Y-origin on paper of front view, in.
48-52	PLOTSZ		PLOTSZ determines size of plot. (A scale factor is calculated using PLOTSZ and the maximum dimension of the configuration.)
53-55	TYPE		Word "VU3"

Columns	Variable	Value	Description
72	KODE	0 1	Continue reading plot cards After processing this plot card, end reading plot cards.

(3) Perspective Views

Columns	Variable	Value	Description
8-12	PHI		X-coordinate of view point in data coordinate system.
13-17	THETA		Y-coordinate of view point in data coordinate system.
18-22	PSI		Z-coordinate of view point in data coordinate system.
23-27	XF		X-coordinate of focal point in data coordinate system.
28-32	YF		Y-coordinate of focal point in data coordinate system.
33-37	ZF		Z-coordinate of focal point in data coordinate system.
38-42	DIST		Distance from eye to viewing - plane, in.
43-47	FMAG		Viewing - plane magnification factor; It controls size of projected image.
48-52	PLOTSZ		Diameter of viewing-plane. DIST and PLOTSZ determine a cone which is the field of vision.
53-55	TYPE		Word "PER"
72	KODE	0 1	Continue reading plot cards. After processing this plot card, end reading plot cards.

(4) Stereo Frames

Input is identical to that for perspective views except that word "STE" is used in columns 53-55.

Mach Number, Angle of Attack

Columns	Variable	Value	Description
1-7	MACH	real	The free stream subsonic or supersonic Mach for which a solution is desired.
		-1.	This value indicates the last case for the current configuration was just run. After completion, the program will read geometry cards for the next configuration or terminate if no configuration remains.
8-14	ALPHA		The angle of attack in degrees for which a solution is desired.
15-21	NORVEL	0.	Apply the usual boundary condition of zero normal velocity on the body panels.
		1.	Modify the usual boundary condition by the addition of the normal velocities specified on the normal velocity input cards.
22-28	LMACH	blank	Local Mach number flag. Not used.
29-35	FLDPTS	0	No field point calculations
		≤ 600	Velocities and pressures will be calculated at the field points specified on the field point coordinates input cards. FLDPTS specifies the number of field points. This card may be identified in columns 73-80 by MALPHA.
50-56	COPLAN*		Coplanar wing segment flag
		1.0	Program identifies coplanar wing segments and sets equivalent elements of KOPLAN array to one.
		0.0	Program does not identify coplanar wing segments.

*NOTE: This flag is input, only when the planar boundary condition option is chosen. This flag permits the program to detect coplanar wing segments and take that condition into account when computing the transversal velocities.

Field Point

Columns	Variable	Value	Description
1-7 8-14 etc.	XPT		Cards, containing X, Y, and Z-coordinates of flow-field points at which velocities and pressure coefficients are to be computed. Omit if FLDPTS = 0.

Section 6
OUTPUT DATA

The USSAERO program output consists of two parts:

1) A complete listing of the input data cards,
2) Program execution output.

The quantity and type of execution output depends upon the PRINT option selected, the number of panels used, and/or the number of components of the configuration.

The program execution output options are described below:

PRINT = 0 The program prints the case description, Mach number and angle of attack, followed by a table listing the panel number, control point coordinates (both dimensional and non-dimensional), pressure coefficient, normal force, axial force, and pitching moment. Separate tables are printed for the body and wing panels, noting that any tail, fin or canard panels are included with the wing output. If the planar boundary condition option has been selected, the results for the wing upper surface are given in one table, followed by a separate table giving the results for the wing lower surface. Additional tables giving the total coefficients on the body, the wing and the complete configuration follow the pressure coefficient tables. These include the reference area, reference span and reference chord, the normal force, axial force, pitching moment, lift and drag coefficients, and the center of pressure of the component.

PRINT = 1 In addition to the output described for PRINT = 0, the program prints out additional tables giving the normal force, axial force, pitching moment lift and drag coefficients, and the center of pressure of each column of panels on the wing and tail surfaces. In addition, the indices of the first and last panel in the column are listed, together with the span, chord and origin of the column.

PRINT = 2 In addition to the output described for PRINT = 1, the program prints out tables listing the panel number, the source or vortex strength of that panel, and the axial velocity u, lateral velocity v, and vertical velocity w at the panel control point. The normal velocity is also calculated for body panels. Separate tables are printed for the body and wing panels, noting again that any tail, fin, or canard panels are included with the wing output. If the planar boundary condition option has been selected, separate tables are given for the wing upper and lower surfaces.

PRINT = 3 In addition to the output described for PRINT = 2, the program prints out the iteration number, and the source and vortex strength arrays obtained at each step of the iterative solution procedure.

PRINT = 4 In addition to the output described for PRINT = 3, the program prints out tables of the axial and normal velocity components which make up the elements of the aerodynamic matrices. The program prints out the matrix row number, and gives the number of elements in that row. A maximum of four matrix partitions will be printed if this option is selected, each of which is identified by a number and its influence description prior to printing the velocity component tables.

If a negative value of PRINT is selected, the program prints all the information described above for the positive values, together with the complete panel geometry description of the configuration following the list of input cards. This consists of tables giving the wing panel corner points, control points, inclination angles, areas, and chords. If the configuration has a horizontal tail, fin or canard, additional tables are printed giving the same information as listed above for the wing. Finally, if the configuration includes a body, the body panel corner points, control points, areas, and inclination angles are listed.

The program output is illustrated in Appendix B.

Section 7

REFERENCES

1. Craidon, Charlotte B.: Description of a Digital Computer Program for Airplane Configuration Plots. NASA TM X-2074. 1970.

2. Woodward, F. A.: An Improved Method for the Aerodynamic Analysis of Wing-Body-Tail Configurations in Subsonic and Supersonic Flow. NASA CR-2228, Parts I and II, 1973; Vol. I - Theory and Application. Vol. II Computer Program Description.

3. Woodward, F. A.: USSAERO Computer Program Development, Versions B and C. NASA CR-3227, 1980.

Appendix A

LABELED COMMON BLOCKS

IN

USSAERO

LIST OF SYMBOLS

COMMON BLOCKS	ROUTINES
BODCOM	USSAERO, BODVEL, SUBPAN, SUPPAN
BTHET	USSAERO, BODVEL, WNGVEL, BODPAN
BLANK	USSAERO, GEOM, CONFIG, NEWORD, WNGPAN, NEWRAD, BODPAN, NUTORD, TALPAN, GPLTSV, PLTORT, OTHPLT, PLTSTE, SPPLT, SPLTSV
BLANK2	USSAERO, GEOM, CONFIG, CONPLT, GPLTSV, PLTORT, OTHPLT, PLTSTE, SPPLT, SPLTSV
COEF	USSAERO, DERIV, COMCU, NEWORD, NUTORD
COMPS	USSAERO, LINVEL, SORVEL, VORVEL
COMPV	USSAERO, WNGVEL, VORPAN
CONPLT	USSAERO, CONPLT
CLINE	USSAERO, BODPAN, PLPRES
EPS	USSAERO, PANEL, WNGPAN, TALPAN, VELCMP, SUBPAN, SUPPAN, LINVEL, SORVEL, VORVEL, WNGVEL, VORPAN, ITRATE, FORMON
FORM	USSAERO, SOLVE, FORMOM
FILES	USSAERO, GEOM, CONFIG, NEWORD, WNGPAN, NEWRAD, BODPAN, NUTORD, TALPAN, VELCMP, BODVEL, SUPPAN, LINVEL, WNGVEL, SOLVE, INVERT, PARTIN, DIAGIN, ITRATE, FORMOM, CONPLT, GPLTSV, PLTORT, PLOTIT, PLTSTE, SPPLT, PLTIT3, SPLTSV, PSPRES, LABEL
GRAPH	USSAERO, GEOM, CONFIG, WNGPAN, BODPAN, TALPAN, FORMOM, CONPLT, PLTORT, OTHPLT, PLTSTE, SPPLT, PLPRES, PRSWNG, LABEL
HEAD	USSAERO, GEOM, FORMOM, PLTORT, PLTSTE
ITERAT	USSAERO, GEOM, ITRATE
ITB	USSAERO
ITB1	USSAERO
KP	VELCMP, SOLVE

COMMON BLOCKS	ROUTINES
KUTTA	USSAERO, WNGPAN, TALPAN, VELCMP, BODVEL
LINCOM	USSAERO, WNGPAN, TALPAN, VELCMP, SOLVE
LWB	USSAERO, GEOM, VELCMP, SOLVE, CONPLT
MATCOM	USSAERO, VELCMP, SOLVE
NEWCOM	USSAERO, GEOM, NEWORD, WNGPAN, NEWRAD, BODPAN, NUTORD, TALPAN, VELCMP, BODVEL, FORMOM, PLTORT, OTHPLT, SPPLT, SPLTSV, PLPRES
NORVEL	USSAERO, VELCMP, SOLVE
ONE	USSAERO, CONFIG, GPLTSV, OTHPLT, SPPLT
PI	USSAERO, CONFIG, WNGPAN, NEWRAD, BODPAN, TALPAN, SUBPAN, SUPPAN, LINVEL, SORVEL, VORVEL, WNGVEL, VORPAN, SOLVE, GPLTSV, OTHPLT, STERPT, PLPRES
PTYPE	USSAERO, CONPLT, PLTORT, OTHPLT, PLTSTE, GEOM
POINT	USSAERO, PANEL WNGPAN, NEWRAD, BODPAN, TALPAN, DIAGIN, ITRATE, FORMOM
PARAM	USSAERO, GOEM, WNGPAN, BODPAN, TALPAN, VELCMP, BODVEL, LINVEL, VORVEL, WNGVEL, VORPAN, SOLVE, PARTIN, DIAGIN, ITRATE, PRESS, FORMOM, PLPRES. LABEL
PRESS	USSAERO, GEOM, SOLVE, FORMOM, PLPRES
SEG	USSAERO, GOEM, WNBPAN, TALPAN, VELCMP, BODVEL LINVEL, WNGVEL, SOLVE, PARTIN, DIAGIN, ITRATE, FORMOM, PLPRES
SCRAT	USSAERO, GEOM, PANEL, CONFIG, NEWORD, WNGPAN, NEWRAD, BODPAN, NUTORD, TALPAN, VELCMP, BODVEL, LINVEL WNGVEL, SOLVE, PARTIN, ITRATE, FORMOM, GPLTSV
SCALE	USSAERO, PLPRES, PRESWNG, PRESBO, LABEL
SUPER	USSAERO, VELCMP, SOLVE
TRAN	USSAERO, WNGVEL, TRANS
SUPSUB	USSAERO, GEOM, WINGPAN, TALPAN, VELCMP

COMMON BLOCKS	ROUTINES
VELCOM	USSAERO, GEOM, WNGPAN, BODPAN, TALPAN, VELCMP, BODVEL, LINVEL, WNGVEL, SOLVE, PARTIN, DIAGIN, ITRATE, FORMOM

Appendix B

SAMPLE INPUT AND OUTPUT DATA

```
         NACA RM L51F07 TRANSONIC WING-BODY DEFINITION
  0 -1 -1              1  2 26  1   7 20                                       -2
0.        .50       .75       1.25      2.50      5.0       7.5       10.       15.       20.        XAF1
25.       30.       35.       40.       45.       50.       55.       60.       65.       70.        XAF2
75.       80.       85.       90.       95.       100.                                             XAF3
14.325    1.6       0.        7.1                                                                  WAFORG
25.375    12.       0.        4.5                                                                  WAFORG
0.        .464      .563      .718      .981      1.313     1.591     1.824     2.194     2.474      WAFORD
2.687     2.842     2.945     2.996     2.992     2.925     2.793     2.602     2.364     2.087      WAFORD
1.775     1.437     1.083     .727      .370      .013                                             WAFORD
0.        .464      .563      .718      .981      1.313     1.591     1.824     2.194     2.474      WAFORD
2.687     2.842     2.945     2.996     2.992     2.925     2.793     2.602     2.364     2.087      WAFORD
1.775     1.437     1.083     .727      .370      .013                                             WAFORD
0.        2.        4.        6.        8.        10.       12.       14.       16.       18.        XFUS1
20.       22.       24.       26.       28.       30.       32.       34.       36.       38.        XFUS2
0.        .7329     1.9607    3.385     4.799     6.0524    7.0686    7.7931    8.3264    8.6361     FUSARD
8.7616    8.6049    8.1433    7.4506    6.4063    4.9323    3.2174    2.0106    2.0106    2.0106     FUSARD
          6.  2.    4.                                              10.VU3                       0 GPLOT
X Z OUT 30. 30.     30.                                             10.ORT                       0 GPLOT
X Y OUT 30. 30.     30.                                             10.ORT                       1 GPLOT
         NACA TRANSONIC WING-BODY PANELING
  0  1 -3                3
  1  3  1                    6 15  1   0 18
144.      12.       6.125                         20.                                              REFA
.229      .229                                                                                     RHO
0.        2.5       5.        10.       15.       20.       30.       40.       50.       60.        XAFK1
70.       80.       90.       95.       100.                                                       XAFK2
1.60      3.60      6.00      8.40      10.80     12.0                                             YK
0.        2.        5.        8.        11.       13.       14.325    15.73-    17.16     18.59      KFORX1
20.02     21.425    23.00     25.0      28.0      33.0      36.0      38.0                           KFORX2
X Y           0.    0.        0.                                    10.ORT                       0 SPPLT
X Z           0.    0.        0.                                    10.ORT                       1 SPPLT
.6        4.
-1.
```

```
*******************************************************************************************************

UUU      UUU   SSSSSSSSSSSS   SSSSSSSSSSSS   AAAAAAAAAAAA   EEEEEEEEEEEE   RRRRRRRRRRRR   OOOOOOOOOOOO
UUU      UUU   SSSSSSSSSSSS   SSSSSSSSSSSS   AAAAAAAAAAAA   EEEEEEEEEEEE   RRRRRRRRRRRR   OOOOOOOOOOOO
UUU      UUU   SSS      SSS   SSS      SSS   AAA      AAA   EEE            RRR      RRR   OOO      OOO
UUU      UUU   SSS            SSS            AAA      AAA   EEE            RRR      RRR   OOO      OOO
UUU      UUU   SSS            SSS            AAA      AAA   EEE            RRRRRRRRRRRR   OOO      OOO
UUU      UUU   SSSSSSSSSSSS   SSSSSSSSSSSS   AAAAAAAAAAAA   EEEEEEE        RRRRRRRRRRRR   OOO      OOO
UUU      UUU   SSSSSSSSSSSS   SSSSSSSSSSSS   AAAAAAAAAAAA   EEEEEEE        RRRRRR         OOO      OOO
UUU      UUU            SSS            SSS   AAA      AAA   EEE            RRR RRR        OOO      OOO
UUU      UUU            SSS            SSS   AAA      AAA   EEE            RRR  RRR       OOO      OOO
UUU      UUU   SSS      SSS   SSS      SSS   AAA      AAA   EEE            RRR   RRR      OOO      OOO
UUUUUUUUUUUU   SSSSSSSSSSSS   SSSSSSSSSSSS   AAA      AAA   EEEEEEEEEEEE   RRR    RRR     OOOOOOOOOOOO
UUUUUUUUUUUU   SSSSSSSSSSSS   SSSSSSSSSSSS   AAA      AAA   EEEEEEEEEEEE   RRR     RRR    OOOOOOOOOOOO
*******************************************************************************************************

                      NASA-LANGLEY RESEARCH CENTER   ,   CDC CYBER SERIES

                       UNIFIED SUBSONIC-SUPERSONIC AERODYNAMICS PROGRAM

                   VERSION   801  -  NOS-FTN
                   DATE OF RUN     79/08/31.
                   TIME OF RUN     09.47.20.
*******************************************************************************************************
```

UNIFIED SUBSONIC-SUPERSONIC AERODYNAMICS PROGRAM   VERSION 801

LIST OF INPUT CARDS

```
00000000011111111112222222222333333333344444444445555555555666666666677777777778
12345678901234567890123456789012345678901234567890123456789012345678901234567890

      NACA RM L51F07 TRANSONIC WING-BODY DEFINITION
  0 -1 -1         1  2 26  1  7 20                                      -2
0.      .50     .75     1.25    2.50    5.0     7.5     10.     15.     20.      XAF1
25.     30.     35.     40.     45.     50.     55.     60.     65.     70.      XAF2
75.     80.     85.     90.     95.     100.                                     XAF3
14.325  1.6     0.      7.1                                                      WAFORG
25.375  12.     0.      4.5                                                      WAFORG
0.      .464    .563    .718    .981    1.313   1.591   1.824   2.194   2.474    WAFORD
2.687   2.842   2.945   2.996   2.992   2.925   2.793   2.602   2.364   2.087    WAFORD
1.775   1.437   1.083   .727    .370    .013                                     WAFORD
0.      .464    .563    .718    .981    1.313   1.591   1.824   2.194   2.474    WAFORD
2.687   2.842   2.945   2.996   2.992   2.925   2.793   2.602   2.364   2.087    WAFORD
1.775   1.437   1.083   .727    .370    .013                                     WAFORD
0.      2.      4.      6.      8.      10.     12.     14.     16.     18.      XFUS1
20.     22.     24.     26.     28.     30.     32.     34.     36.     38.      XFUS2
0.      .7329   1.9607  3.385   4.799   6.0524  7.0686  7.7931  8.3264  8.6361   FUSARD
8.7616  8.6049  8.1433  7.4506  6.4063  4.9323  3.2174  2.0106  2.0106  2.0106   FUSARD
         6.  2.   4.                                    10.VU3              0 GPLOT
X Z OUT 30. 30.   30.                                   10.ORT              0 GPLOT
X Y OUT 30. 30.   30.                                   10.ORT              1 GPLOT
      NACA TRANSONIC WING-BODY PANELING
  0  1 -3         3
  1  3  1            6 15  1  0 18
144.    12.     6.125                   20.                                     REFA
.229    .229                                                                    RHO
0.      2.5     5.      10.     15.     20.     30.     40.     50.     60.     XAFK1
70.     80.     90.     95.     100.                                            XAFK2
1.60    3.60    6.00    8.40    10.80   12.0                                    YK
0.      2.      5.      8.      11.     13.     14.325  15.73   17.16   18.59   KFORX1
20.02   21.425  23.00   25.0    28.0    33.0    36.0    38.0                    KFORX2
X Y        0.    0.    0.                               10.ORT              0 SPPLT
X Z        0.    0.    0.                               10.ORT              1 SPPLT
.6      4.
-1.


00000000011111111112222222222333333333344444444445555555555666666666677777777778
```

WING PANEL CORNER POINT COORDINATES
1 AND 3 INDICATE WING PANEL LEADING-EDGE POINTS, 2 AND 4 INDICATE TRAILING-EDGE POINTS

PANEL	X_1	Y_1	Z_1	X_2	Y_2	Z_2	X_3	Y_3	Z_3	X_4	Y_4	Z_4
1	14.32500	1.60000	0.00000	14.50250	1.60000	.06965	16.45000	3.60000	0.00000	16.61500	3.60000	.06475
2	14.50250	1.60000	.06965	14.68000	1.60000	.09322	16.61500	3.60000	.06475	16.78000	3.60000	.08666
3	14.68000	1.60000	.09322	15.03500	1.60000	.12950	16.78000	3.60000	.08666	17.11000	3.60000	.12038
4	15.03500	1.60000	.12950	15.39000	1.60000	.15577	17.11000	3.60000	.12038	17.44000	3.60000	.14480
5	15.39000	1.60000	.15577	15.74500	1.60000	.17565	17.44000	3.60000	.14480	17.77000	3.60000	.16328
6	15.74500	1.60000	.17565	16.45500	1.60000	.20178	17.77000	3.60000	.16328	18.43000	3.60000	.18757
7	16.45500	1.60000	.20178	17.16500	1.60000	.21272	18.43000	3.60000	.18757	19.09000	3.60000	.19774
8	17.16500	1.60000	.21272	17.87500	1.60000	.20768	19.09000	3.60000	.19774	19.75000	3.60000	.19305
9	17.87500	1.60000	.20768	18.58500	1.60000	.18474	19.75000	3.60000	.19305	20.41000	3.60000	.17173
10	18.58500	1.60000	.18474	19.29500	1.60000	.14818	20.41000	3.60000	.17173	21.07000	3.60000	.13774
11	19.29500	1.60000	.14818	20.00500	1.60000	.10203	21.07000	3.60000	.13774	21.73000	3.60000	.09484
12	20.00500	1.60000	.10203	20.71500	1.60000	.05162	21.73000	3.60000	.09484	22.39000	3.60000	.04798
13	20.71500	1.60000	.05162	21.07000	1.60000	.02627	22.39000	3.60000	.04798	22.72000	3.60000	.02442
14	21.07000	1.60000	.02627	21.42500	1.60000	.00092	22.72000	3.60000	.02442	23.05000	3.60000	.00086
15	14.32500	1.60000	0.00000	14.50250	1.60000	-.06965	16.45000	3.60000	0.00000	16.61500	3.60000	-.06475
16	14.50250	1.60000	-.06965	14.68000	1.60000	-.09322	16.61500	3.60000	-.06475	16.78000	3.60000	-.08666
17	14.68000	1.60000	-.09322	15.03500	1.60000	-.12950	16.78000	3.60000	-.08666	17.11000	3.60000	-.12038
18	15.03500	1.60000	-.12950	15.39000	1.60000	-.15577	17.11000	3.60000	-.12038	17.44000	3.60000	-.14480
19	15.39000	1.60000	-.15577	15.74500	1.60000	-.17565	17.44000	3.60000	-.14480	17.77000	3.60000	-.16328
20	15.74500	1.60000	-.17565	16.45500	1.60000	-.20178	17.77000	3.60000	-.16328	18.43000	3.60000	-.18757
21	16.45500	1.60000	-.20178	17.16500	1.60000	-.21272	18.43000	3.60000	-.18757	19.09000	3.60000	-.19774
22	17.16500	1.60000	-.21272	17.87500	1.60000	-.20768	19.09000	3.60000	-.19774	19.75000	3.60000	-.19305
23	17.87500	1.60000	-.20768	18.58500	1.60000	-.18474	19.75000	3.60000	-.19305	20.41000	3.60000	-.17173
24	18.58500	1.60000	-.18474	19.29500	1.60000	-.14818	20.41000	3.60000	-.17173	21.07000	3.60000	-.13774
25	19.29500	1.60000	-.14818	20.00500	1.60000	-.10203	21.07000	3.60000	-.13774	21.73000	3.60000	-.09484
26	20.00500	1.60000	-.10203	20.71500	1.60000	-.05162	21.73000	3.60000	-.09484	22.39000	3.60000	-.04798
27	20.71500	1.60000	-.05162	21.07000	1.60000	-.02627	22.39000	3.60000	-.04798	22.72000	3.60000	-.02442
28	21.07000	1.60000	-.02627	21.42500	1.60000	-.00092	22.72000	3.60000	-.02442	23.05000	3.60000	-.00086
29	16.45000	3.60000	0.00000	16.61500	3.60000	.06475	19.00000	6.00000	0.00000	19.15000	6.00000	.05886
30	16.61500	3.60000	.06475	16.78000	3.60000	.08666	19.15000	6.00000	.05886	19.30000	6.00000	.07878
31	16.78000	3.60000	.08666	17.11000	3.60000	.12038	19.30000	6.00000	.07878	19.60000	6.00000	.10944
32	17.11000	3.60000	.12038	17.44000	3.60000	.14480	19.60000	6.00000	.10944	19.90000	6.00000	.13164
33	17.44000	3.60000	.14480	17.77000	3.60000	.16328	19.90000	6.00000	.13164	20.20000	6.00000	.14844
34	17.77000	3.60000	.16328	18.43000	3.60000	.18757	20.20000	6.00000	.14844	20.60000	6.00000	.17052
35	18.43000	3.60000	.18757	19.09000	3.60000	.19774	20.80000	6.00000	.17052	21.40000	6.00000	.17976
36	19.09000	3.60000	.19774	19.75000	3.60000	.19305	21.40000	6.00000	.17976	22.00000	6.00000	.17550
37	19.75000	3.60000	.19305	20.41000	3.60000	.17173	22.00000	6.00000	.17550	22.60000	6.00000	.15612
38	20.41000	3.60000	.17173	21.07000	3.60000	.13774	22.60000	6.00000	.15612	23.20000	6.00000	.12522
39	21.07000	3.60000	.13774	21.73000	3.60000	.09484	23.20000	6.00000	.12522	23.80000	6.00000	.08622
40	21.73000	3.60000	.09484	22.39000	3.60000	.04798	23.80000	6.00000	.08622	24.40000	6.00000	.04362
41	22.39000	3.60000	.04798	22.72000	3.60000	.02442	24.40000	6.00000	.04362	24.70000	6.00000	.02220
42	22.72000	3.60000	.02442	23.05000	3.60000	.00086	24.70000	6.00000	.02220	25.00000	6.00000	.00078

43	16.45000	3.60000	0.00000	16.61500	3.60000	-.06475	19.00000	6.00000	0.00000	19.15000	6.00000	-.05886
44	16.61500	3.60000	-.06475	16.78000	3.60000	-.08666	19.15000	6.00000	-.05886	19.30000	6.00000	-.07878
45	16.78000	3.60000	-.08666	17.11000	3.60000	-.12038	19.30000	6.00000	-.07878	19.60000	6.00000	-.10944
46	17.11000	3.60000	-.12038	17.44000	3.60000	-.14480	19.60000	6.00000	-.10944	19.90000	6.00000	-.13164
47	17.44000	3.60000	-.14480	17.77000	3.60000	-.16328	19.90000	6.00000	-.13164	20.20000	6.00000	-.14844
48	17.77000	3.60000	-.16328	18.43000	3.60000	-.18757	20.20000	6.00000	-.14644	20.80000	6.00000	-.17052
49	18.43000	3.60000	-.18757	19.09000	3.60000	-.19774	20.80000	6.00000	-.17052	21.40000	6.00000	-.17976
50	19.09000	3.60000	-.19774	19.75000	3.60000	-.19305	21.40000	6.00000	-.17976	22.00000	6.00000	-.17550
51	19.75000	3.60000	-.19305	20.41000	3.60000	-.17173	22.00000	6.00000	-.17550	22.60000	6.00000	-.15612
52	20.41000	3.60000	-.17173	21.07000	3.60000	-.13774	22.60000	6.00000	-.15612	23.20000	6.00000	-.12522
53	21.07000	3.60000	-.13774	21.73000	3.60000	-.09484	23.20000	6.00000	-.12522	23.80000	6.00000	-.08622
54	21.73000	3.60000	-.09484	22.39000	3.60000	-.04798	23.80000	6.00000	-.08622	24.40000	6.00000	-.04362
55	22.39000	3.60000	-.04798	22.72000	3.60000	-.02442	24.40000	6.00000	-.04362	24.70000	6.00000	-.02220
56	22.72000	3.60000	-.02442	23.05000	3.60000	-.00086	24.70000	6.00000	-.02220	25.00000	6.00000	-.00078
57	19.00000	6.00000	0.00000	19.15000	6.00000	.05886	21.55000	8.40000	0.00000	21.68500	8.40000	.05297
58	19.15000	6.00000	.05886	19.30000	6.00000	.07678	21.68500	8.40000	.05297	21.82000	8.40000	.07090
59	19.30000	6.00000	.07878	19.60000	6.00000	.10944	21.82000	8.40000	.07090	22.09000	8.40000	.09850
60	19.60000	6.00000	.10944	19.90000	6.00000	.13164	22.09000	8.40000	.09650	22.36000	8.40000	.11648
61	19.90000	6.00000	.13164	20.20000	6.00000	.14844	22.36000	8.40000	.11848	22.63000	8.40000	.13360
62	20.20000	6.00000	.14844	20.80000	6.00000	.17052	22.63000	8.40000	.13360	23.17000	8.40000	.15347
63	20.80000	6.00000	.17052	21.40000	6.00000	.17976	23.17000	8.40000	.15347	23.71000	8.40000	.16178
64	21.40000	6.00000	.17976	22.00000	6.00000	.17550	23.71000	8.40000	.16178	24.25000	8.40000	.15795
65	22.00000	6.00000	.17550	22.60000	6.00000	.15612	24.25000	8.40000	.15795	24.79000	8.40000	.14051
66	22.60000	6.00000	.15612	23.20000	6.00000	.12522	24.79000	8.40000	.14051	25.33000	8.40000	.11270
67	23.20000	6.00000	.12522	23.80000	6.00000	.08622	25.33000	8.40000	.11270	25.87000	8.40000	.07760
68	23.80000	6.00000	.08622	24.40000	6.00000	.04362	25.87000	8.40000	.07760	26.41000	8.40000	.03926
69	24.40000	6.00000	.04362	24.70000	6.00000	.02220	26.41000	8.40000	.03926	26.68000	8.40000	.01998
70	24.70000	6.00000	.02220	25.00000	6.00000	.00078	26.68000	8.40000	.01998	26.95000	8.40000	.00070
71	19.00000	6.00000	0.00000	19.15000	6.00000	-.05886	21.55000	8.40000	0.00000	21.68500	8.40000	-.05297
72	19.15000	6.00000	-.05886	19.30000	6.00000	-.07878	21.68500	8.40000	-.05297	21.82000	8.40000	-.07090
73	19.30000	6.00000	-.07878	19.60000	6.00000	-.10944	21.82000	8.40000	-.07090	22.09000	8.40000	-.09850
74	19.60000	6.00000	-.10944	19.90000	6.00000	-.13164	22.09000	8.40000	-.09850	22.36000	8.40000	-.11648
75	19.90000	6.00000	-.13164	20.20000	6.00000	-.14844	22.36000	8.40000	-.11848	22.63000	8.40000	-.13360
76	20.20000	6.00000	-.14844	20.80000	6.00000	-.17052	22.63000	8.40000	-.13360	23.17000	8.40000	-.15347
77	20.80000	6.00000	-.17052	21.40000	6.00000	-.17976	23.17000	8.40000	-.15347	23.71000	8.40000	-.16178
78	21.40000	6.00000	-.17976	22.00000	6.00000	-.17550	23.71000	8.40000	-.16178	24.25000	8.40000	-.15795
79	22.00000	6.00000	-.17550	22.60000	6.00000	-.15612	24.25000	8.40000	-.15795	24.79000	8.40000	-.14051
80	22.60000	6.00000	-.15612	23.20000	6.00000	-.12522	24.79000	8.40000	-.14051	25.33000	8.40000	-.11270
81	23.20000	6.00000	-.12522	23.80000	6.00000	-.08622	25.33000	8.40000	-.11270	25.87000	8.40000	-.07760
82	23.80000	6.00000	-.08622	24.40000	6.00000	-.04362	25.87000	8.40000	-.07760	26.41000	8.40000	-.03926
83	24.40000	6.00000	-.04362	24.70000	6.00000	-.02220	26.41000	8.40000	-.03926	26.68000	8.40000	-.01998
84	24.70000	6.00000	-.02220	25.00000	6.00000	-.00078	26.68000	8.40000	-.01998	26.95000	8.40000	-.00070
85	21.55000	8.40000	0.00000	21.68500	8.40000	.05297	24.10000	10.80000	0.00000	24.22000	10.80000	.04709
86	21.68500	8.40000	.05297	21.82000	8.40000	.07090	24.22000	10.80000	.04709	24.34000	10.80000	.06302
87	21.82000	8.40000	.07090	22.09000	8.40000	.09850	24.34000	10.80000	.06302	24.56000	10.80000	.08755
88	22.09000	8.40000	.09850	22.36000	8.40000	.11848	24.58000	10.80000	.08755	24.82000	10.80000	.10531
89	22.36000	8.40000	.11848	22.63000	8.40000	.13360	24.82000	10.80000	.10531	25.06000	10.80000	.11675
90	22.63000	8.40000	.13360	23.17000	8.40000	.15347	25.06000	10.80000	.11875	25.54000	10.80000	.13642
91	23.17000	8.40000	.15347	23.71000	8.40000	.16178	25.54000	10.80000	.13642	26.02000	10.80000	.14381

92	23.71000	8.40000	.16178	24.25000	8.40000	.15795	26.02000	10.80000	.14381	26.50000	10.80000	.14040
93	24.25000	8.40000	.15795	24.79000	8.40000	.14051	26.50000	10.80000	.14040	26.98000	10.80000	.12490
94	24.79000	8.40000	.14051	25.33000	8.40000	.11270	26.98000	10.80000	.12490	27.46000	10.80000	.10018
95	25.33000	8.40000	.11270	25.87000	8.40000	.07760	27.46000	10.80000	.10018	27.94000	10.80000	.06898
96	25.87000	8.40000	.07760	26.41000	8.40000	.03926	27.94000	10.80000	.06898	28.42000	10.80000	.03490
97	26.41000	8.40000	.03926	26.68000	8.40000	.01998	28.42000	10.80000	.03490	28.66000	10.80000	.01776
98	26.68000	8.40000	.01998	26.95000	8.40000	.00070	28.66000	10.80000	.01776	28.90000	10.80000	.00062
99	21.55000	8.40000	0.00000	21.68500	8.40000	-.05297	24.10000	10.80000	0.00000	24.22000	10.80000	-.04709
100	21.68500	8.40000	-.05297	21.82000	8.40000	-.07090	24.22000	10.80000	-.04709	24.34000	10.80000	-.06302
101	21.82000	8.40000	-.07090	22.09000	8.40000	-.09850	24.34000	10.80000	-.06302	24.58000	10.80000	-.08755
102	22.09000	8.40000	-.09850	22.36000	8.40000	-.11848	24.58000	10.80000	-.08755	24.82000	10.80000	-.10531
103	22.36000	8.40000	-.11848	22.63000	8.40000	-.13360	24.82000	10.80000	-.10531	25.06000	10.80000	-.11875
104	22.63000	8.40000	-.13360	23.17000	8.40000	-.15347	25.06000	10.80000	-.11875	25.54000	10.80000	-.13642
105	23.17000	8.40000	-.15347	23.71000	8.40000	-.16178	25.54000	10.80000	-.13642	26.02000	10.80000	-.14381
106	23.71000	8.40000	-.16178	24.25000	8.40000	-.15795	26.02000	10.80000	-.14381	26.50000	10.80000	-.14040
107	24.25000	8.40000	-.15795	24.79000	8.40000	-.14051	26.50000	10.80000	-.14040	26.98000	10.80000	-.12490
108	24.79000	8.40000	-.14051	25.33000	8.40000	-.11270	26.98000	10.80000	-.12490	27.46000	10.80000	-.10018
109	25.33000	8.40000	-.11270	25.87000	8.40000	-.07760	27.46000	10.80000	-.10018	27.94000	10.80000	-.06898
110	25.87000	8.40000	-.07760	26.41000	8.40000	-.03926	27.94000	10.80000	-.06898	28.42000	10.80000	-.03490
111	26.41000	8.40000	-.03926	26.68000	8.40000	-.01998	28.42000	10.80000	-.03490	28.66000	10.80000	-.01776
112	26.68000	8.40000	-.01998	26.95000	8.40000	-.00070	28.66000	10.80000	-.01776	28.90000	10.80000	-.00062
113	24.10000	10.80000	0.00000	24.22000	10.80000	.04709	25.37500	12.00000	0.00000	25.48750	12.00000	.04415
114	24.22000	10.80000	.04709	24.34000	10.80000	.06302	25.48750	12.00000	.04415	25.60000	12.00000	.05909
115	24.34000	10.80000	.06302	24.58000	10.80000	.08755	25.60000	12.00000	.05909	25.82500	12.00000	.08208
116	24.58000	10.80000	.08755	24.82000	10.80000	.10531	25.82500	12.00000	.08208	26.05000	12.00000	.09873
117	24.82000	10.80000	.10531	25.06000	10.80000	.11875	26.05000	12.00000	.09873	26.27500	12.00000	.11133
118	25.06000	10.80000	.11875	25.54000	10.80000	.13642	26.27500	12.00000	.11133	26.72500	12.00000	.12789
119	25.54000	10.80000	.13642	26.02000	10.80000	.14381	26.72500	12.00000	.12789	27.17500	12.00000	.13482
120	26.02000	10.80000	.14381	26.50000	10.80000	.14040	27.17500	12.00000	.13482	27.62500	12.00000	.13163
121	26.50000	10.80000	.14040	26.98000	10.80000	.12490	27.62500	12.00000	.13163	28.07500	12.00000	.11709
122	26.98000	10.80000	.12490	27.46000	10.80000	.10018	28.07500	12.00000	.11709	28.52500	12.00000	.09392
123	27.46000	10.80000	.10018	27.94000	10.80000	.06898	28.52500	12.00000	.09392	28.97500	12.00000	.06467
124	27.94000	10.80000	.06898	28.42000	10.80000	.03490	28.97500	12.00000	.06467	29.42500	12.00000	.03271
125	28.42000	10.80000	.03490	28.66000	10.80000	.01776	29.42500	12.00000	.03271	29.65000	12.00000	.01665
126	28.66000	10.80000	.01776	28.90000	10.80000	.00062	29.65000	12.00000	.01665	29.87500	12.00000	.00058
127	24.10000	10.80000	0.00000	24.22000	10.80000	-.04709	25.37500	12.00000	0.00000	25.48750	12.00000	-.04415
128	24.22000	10.80000	-.04709	24.34000	10.80000	-.06302	25.48750	12.00000	-.04415	25.60000	12.00000	-.05909
129	24.34000	10.80000	-.06302	24.58000	10.80000	-.08755	25.60000	12.00000	-.05909	25.82500	12.00000	-.08208
130	24.58000	10.80000	-.08755	24.82000	10.80000	-.10531	25.82500	12.00000	-.08208	26.05000	12.00000	-.09873
131	24.82000	10.80000	-.10531	25.06000	10.80000	-.11875	26.05000	12.00000	-.09873	26.27500	12.00000	-.11133
132	25.06000	10.80000	-.11875	25.54000	10.80000	-.13642	26.27500	12.00000	-.11133	26.72500	12.00000	-.12789
133	25.54000	10.80000	-.13642	26.02000	10.80000	-.14381	26.72500	12.00000	-.12789	27.17500	12.00000	-.13482
134	26.02000	10.80000	-.14381	26.50000	10.80000	-.14040	27.17500	12.00000	-.13482	27.62500	12.00000	-.13163
135	26.50000	10.80000	-.14040	26.98000	10.80000	-.12490	27.62500	12.00000	-.13163	28.07500	12.00000	-.11709
136	26.98000	10.80000	-.12490	27.46000	10.80000	-.10018	28.07500	12.00000	-.11709	28.52500	12.00000	-.09392
137	27.46000	10.80000	-.10018	27.94000	10.80000	-.06898	28.52500	12.00000	-.09392	28.97500	12.00000	-.06467
138	27.94000	10.80000	-.06898	28.42000	10.80000	-.03490	28.97500	12.00000	-.06467	29.42500	12.00000	-.03271
139	28.42000	10.80000	-.03490	28.66000	10.80000	-.01776	29.42500	12.00000	-.03271	29.65000	12.00000	-.01665
140	28.66000	10.80000	-.01776	28.90000	10.80000	-.00062	29.65000	12.00000	-.01665	29.87500	12.00000	-.00058

WING PANEL CENTROID POINTS AND INCLINATION ANGLES

POINT	X CP	Y CP	Z CP	THETA RAD	DELTA RAD	THETA DEG	DELTA DEG
1	15.46024	2.58783	.03361	-.39501	.34749	-22.63248	19.90948
2	15.63156	2.58783	.07860	-.14177	.13072	-8.12254	7.48960
3	15.88855	2.58783	.10749	-.11014	.10123	-6.31084	5.80025
4	16.23120	2.58783	.13768	-.08116	.07362	-4.64992	4.21829
5	16.57386	2.58783	.15995	-.06280	.05583	-3.59631	3.19891
6	17.08783	2.58783	.18215	-.04342	.03675	-2.48765	2.10555
7	17.77314	2.58783	.20004	-.02231	.01539	-1.27820	.88207
8	18.45844	2.58783	.20288	-.00066	-.00710	-.03760	-.40679
9	19.14375	2.58783	.18938	.02296	-.03228	1.31578	-1.84952
10	19.82905	2.58783	.16067	.04047	-.05141	2.31857	-2.94572
11	20.51436	2.56783	.12075	.05242	-.06482	3.00356	-3.71390
12	21.19966	2.58783	.07415	.05758	-.07076	3.29916	-4.05448
13	21.71364	2.58783	.03759	.05792	-.07116	3.31829	-4.07716
14	22.05629	2.58783	.01312	.05792	-.07116	3.31829	-4.07716
15	15.46024	2.58783	-.03361	.39501	-.34749	22.63248	-19.90948
16	15.63156	2.58783	-.07860	.14177	-.13072	8.12254	-7.48960
17	15.68855	2.58783	-.10749	.11014	-.10123	6.31084	-5.80025
18	16.23120	2.58783	-.13768	.08116	-.07362	4.64992	-4.21829
19	16.57386	2.58783	-.15995	.06280	-.05583	3.59831	-3.19891
20	17.08783	2.58783	-.18215	.04342	-.03675	2.48765	-2.10555
21	17.77314	2.58783	-.20004	.02231	-.01539	1.27820	-.88207
22	18.45844	2.58783	-.20288	.00066	.00710	.03760	.40679
23	19.14375	2.58783	-.18938	-.02296	.03228	-1.31578	1.84952
24	19.82905	2.58783	-.16067	-.04047	.05141	-2.31857	2.94572
25	20.51436	2.58783	-.12075	-.05242	.06482	-3.00356	3.71390
26	21.19966	2.58783	-.07415	-.05758	.07076	-3.29916	4.05448
27	21.71364	2.58783	-.03759	-.05792	.07116	-3.31829	4.07716
28	22.05629	2.58783	-.01312	-.05792	.07116	-3.31829	4.07716
29	17.78357	4.78095	.03092	-.39501	.34749	-22.63248	19.90948
30	17.94119	4.78095	.07232	-.14177	.13072	-8.12254	7.48960
31	18.17762	4.78095	.09889	-.11014	.10123	-6.31084	5.80025
32	18.49286	4.78095	.12666	-.08116	.07362	-4.64992	4.21829
33	18.80810	4.78095	.14715	-.06280	.05583	-3.59831	3.19891
34	19.28095	4.78095	.16758	-.04342	.03675	-2.48765	2.10555
35	19.91143	4.78095	.18404	-.02231	.01539	-1.27820	.88207
36	20.54190	4.78095	.18665	-.00066	-.00710	-.03760	-.40679
37	21.17238	4.78095	.17423	.02296	-.03228	1.31578	-1.84952
38	21.80286	4.78095	.14782	.04047	-.05141	2.31857	-2.94572
39	22.43333	4.78095	.11109	.05242	-.06482	3.00356	-3.71390
40	23.06381	4.78095	.06822	.05758	-.07076	3.29916	-4.05448
41	23.53667	4.78095	.03458	.05792	-.07116	3.31829	-4.07716
42	23.85190	4.78095	.01207	.05792	-.07116	3.31829	-4.07716
43	17.78357	4.78095	-.03092	.39501	-.34749	22.63248	-19.90948

44	17.94119	4.78095	-.07232	.14177	-.13072	8.12254	-7.48960
45	18.17762	4.78095	-.09889	.11014	-.10123	6.31084	-5.80025
46	18.49286	4.78095	-.12666	.08116	-.07362	4.64992	-4.21829
47	18.80810	4.78095	-.14715	.06280	-.05583	3.59831	-3.19891
48	19.28095	4.78095	-.16758	.04342	-.03675	2.48765	-2.10555
49	19.91143	4.78095	-.18404	.02231	-.01539	1.27820	-.88207
50	20.54190	4.78095	-.18665	.00066	.00710	.03760	.40679
51	21.17238	4.78095	-.17423	-.02296	.03228	-1.31578	1.84952
52	21.80286	4.78095	-.14782	-.04047	.05141	-2.31857	2.94572
53	22.43333	4.78095	-.11109	-.05242	.06482	-3.00356	3.71390
54	23.06381	4.78095	-.06822	-.05758	.07076	-3.29916	4.05448
55	23.53667	4.78095	-.03458	-.05792	.07116	-3.31829	4.07716
56	23.85190	4.78095	-.01207	-.05792	.07116	-3.31829	4.07716
57	20.32395	7.17895	.02798	-.39501	.34749	-22.63248	19.90948
58	20.46658	7.17895	.06544	-.14177	.13072	-8.12254	7.48960
59	20.68053	7.17895	.08949	-.11014	.10123	-6.31084	5.80025
60	20.96579	7.17895	.11462	-.08116	.07362	-4.64992	4.21629
61	21.25105	7.17895	.13316	-.06280	.05583	-3.59831	3.19891
62	21.67895	7.17895	.15165	-.04342	.03675	-2.48765	2.10555
63	22.24947	7.17895	.16654	-.02231	.01539	-1.27820	.88207
64	22.82000	7.17895	.16890	-.00066	-.00710	-.03760	-.40679
65	23.39053	7.17895	.15766	.02296	-.03228	1.31578	-1.84952
66	23.96105	7.17895	.13376	.04047	-.05141	2.31857	-2.94572
67	24.53158	7.17895	.10053	.05242	-.06482	3.00356	-3.71390
68	25.10211	7.17895	.06173	.05758	-.07076	3.29916	-4.05448
69	25.53000	7.17895	.03129	.05792	-.07116	3.31829	-4.07716
70	25.81526	7.17895	.01093	.05792	-.07116	3.31829	-4.07716
71	20.32395	7.17895	-.02798	.39501	-.34749	22.63248	-19.90948
72	20.46658	7.17895	-.06544	.14177	-.13072	8.12254	-7.48960
73	20.68053	7.17895	-.06949	.11014	-.10123	6.31084	-5.80025
74	20.96579	7.17895	-.11462	.08116	-.07362	4.64992	-4.21829
75	21.25105	7.17895	-.13316	.06280	-.05583	3.59831	-3.19891
76	21.67895	7.17895	-.15165	.04342	-.03675	2.48765	-2.10555
77	22.24947	7.17895	-.16654	.02231	-.01539	1.27820	-.88207
78	22.82000	7.17895	-.16890	.00066	.00710	.03760	.40679
79	23.39053	7.17895	-.15766	-.02296	.03228	-1.31578	1.84952
80	23.96105	7.17895	-.13376	-.04047	.05141	-2.31857	2.94572
81	24.53158	7.17895	-.10053	-.05242	.06482	-3.00356	3.71390
82	25.10211	7.17895	-.06173	-.05758	.07076	-3.29916	4.05448
83	25.53000	7.17895	-.03129	-.05792	.07116	-3.31829	4.07716
84	25.81526	7.17895	-.01093	-.05792	.07116	-3.31829	4.07716
85	22.86382	9.57647	.02504	-.39501	.34749	-22.63248	19.90948
86	22.99147	9.57647	.05856	-.14177	.13072	-8.12254	7.48960
87	23.18294	9.57647	.08009	-.11014	.10123	-6.31084	5.80025
88	23.43824	9.57647	.10258	-.08116	.07362	-4.64992	4.21829
89	23.69353	9.57647	.11917	-.06280	.05583	-3.59831	3.19891
90	24.07647	9.57647	.13571	-.04342	.03675	-2.48765	2.10555
91	24.58706	9.57647	.14904	-.02231	.01539	-1.27820	.88207
92	25.09765	9.57647	.15116	-.00066	-.00710	-.03760	-.40679

93	25.60824	9.57647	.14110	.02296	-.03228	1.31578	-1.84952
94	26.11882	9.57647	.11971	.04047	-.05141	2.31857	-2.94572
95	26.62941	9.57647	.08997	.05242	-.06482	3.00356	-3.71390
96	27.14000	9.57647	.05525	.05758	-.07076	3.29916	-4.05448
97	27.52294	9.57647	.02801	.05792	-.07116	3.31829	-4.07716
98	27.77824	9.57647	.00978	.05792	-.07116	3.31829	-4.07716
99	22.86382	9.57647	-.02504	.39501	-.34749	22.63248	-19.90948
100	22.99147	9.57647	-.05656	.14177	-.13072	8.12254	-7.48960
101	23.18294	9.57647	-.08009	.11014	-.10123	6.31084	-5.80025
102	23.43824	9.57647	-.10258	.08116	-.07362	4.64992	-4.21829
103	23.69353	9.57647	-.11917	.06280	-.05583	3.59831	-3.19891
104	24.07647	9.57647	-.13571	.04342	-.03675	2.48765	-2.10555
105	24.58706	9.57647	-.14904	.02231	-.01539	1.27820	-.88207
106	25.09765	9.57647	-.15116	.00066	.00710	.03760	.40679
107	25.60824	9.57647	-.14110	-.02296	.03228	-1.31578	1.84952
108	26.11882	9.57647	-.11971	-.04047	.05141	-2.31857	2.94572
109	26.62941	9.57647	-.08997	-.05242	.06482	-3.00356	3.71390
110	27.14000	9.57647	-.05525	-.05758	.07076	-3.29916	4.05448
111	27.52294	9.57647	-.02801	-.05792	.07116	-3.31829	4.07716
112	27.77824	9.57647	-.00978	-.05792	.07116	-3.31829	4.07716
113	24.78879	11.39355	.02282	-.39501	.34749	-22.63248	19.90948
114	24.90508	11.39355	.05335	-.14177	.13072	-8.12254	7.48960
115	25.07952	11.39355	.07296	-.11014	.10123	-6.31084	5.80025
116	25.31210	11.39355	.09345	-.08116	.07362	-4.64992	4.21829
117	25.54468	11.39355	.10857	-.06280	.05583	-3.59831	3.19891
118	25.89355	11.39355	.12364	-.04342	.03675	-2.48765	2.10555
119	26.35871	11.39355	.13578	-.02231	.01539	-1.27820	.88207
120	26.82387	11.39355	.13771	-.00066	-.00710	-.03760	-.40679
121	27.28903	11.39355	.12855	.02296	-.03228	1.31578	-1.84952
122	27.75419	11.39355	.10906	.04047	-.05141	2.31857	-2.94572
123	28.21935	11.39355	.08196	.05242	-.06482	3.00356	-3.71390
124	28.68452	11.39355	.05033	.05758	-.07076	3.29916	-4.05448
125	29.03339	11.39355	.02551	.05792	-.07116	3.31829	-4.07716
126	29.26597	11.39355	.00891	.05792	-.07116	3.31829	-4.07716
127	24.78879	11.39355	-.02282	.39501	-.34749	22.63248	-19.90948
128	24.90508	11.39355	-.05335	.14177	-.13072	8.12254	-7.48960
129	25.07952	11.39355	-.07296	.11014	-.10123	6.31084	-5.80025
130	25.31210	11.39355	-.09345	.08116	-.07362	4.64992	-4.21829
131	25.54468	11.39355	-.10857	.06280	-.05583	3.59831	-3.19891
132	25.89355	11.39355	-.12364	.04342	-.03675	2.48765	-2.10555
133	26.35871	11.39355	-.13578	.02231	-.01539	1.27820	-.88207
134	26.82387	11.39355	-.13771	.00066	.00710	.03760	.40679
135	27.28903	11.39355	-.12855	-.02296	.03228	-1.31578	1.84952
136	27.75419	11.39355	-.10906	-.04047	.05141	-2.31857	2.94572
137	28.21935	11.39355	-.08196	-.05242	.06482	-3.00356	3.71390
138	28.68452	11.39355	-.05033	-.05758	.07076	-3.29916	4.05448
139	29.03339	11.39355	-.02551	-.05792	.07116	-3.31829	4.07716
140	29.26597	11.39355	-.00891	-.05792	.07116	-3.31829	4.07716

WING PANEL AREAS AND CHORDS

PANEL	AREA	CHORD
1	.39466	.17133
2	.34895	.17133
3	.69272	.34265
4	.68913	.34265
5	.68742	.34265
6	1.37222	.68530
7	1.37050	.68530
8	1.37003	.68530
9	1.37108	.68530
10	1.37294	.68530
11	1.37477	.68530
12	1.37572	.68530
13	.68789	.34265
14	.68789	.34265
15	.39466	.17133
16	.34895	.17133
17	.69272	.34265
18	.68913	.34265
19	.68742	.34265
20	1.37222	.68530
21	1.37050	.68530
22	1.37003	.68530
23	1.37108	.68530
24	1.37294	.68530
25	1.37477	.68530
26	1.37572	.68530
27	.68789	.34265
28	.68789	.34265
29	.43557	.15762
30	.38512	.15762
31	.76452	.31524
32	.76056	.31524
33	.75868	.31524
34	1.51445	.63048
35	1.51256	.63048
36	1.51204	.63048
37	1.51319	.63048
38	1.51524	.63048
39	1.51727	.63048
40	1.51831	.63048
41	.75919	.31524
42	.75919	.31524
43	.43557	.15762
44	.38512	.15762
45	.76452	.31524
46	.76056	.31524
47	.75868	.31524
48	1.51445	.63048
49	1.51256	.63048
50	1.51204	.63048
51	1.51319	.63048
52	1.51524	.63048
53	1.51727	.63048
54	1.51831	.63048
55	.75919	.31524
56	.75919	.31524
57	.39409	.14263
58	.34844	.14263
59	.69171	.28526
60	.68812	.28526
61	.68642	.28526
62	1.37022	.57053
63	1.36850	.57053
64	1.36803	.57053
65	1.36907	.57053
66	1.37093	.57053
67	1.37276	.57053
68	1.37371	.57053
69	.68689	.28526
70	.68689	.28526
71	.39409	.14263
72	.34844	.14263
73	.69171	.28526
74	.68812	.28526
75	.68642	.28526
76	1.37022	.57053
77	1.36850	.57053
78	1.36803	.57053
79	1.36907	.57053
80	1.37093	.57053
81	1.37276	.57053
82	1.37371	.57053
83	.68689	.28526
84	.68689	.28526
85	.35260	.12765
86	.31176	.12765
87	.61890	.25529
88	.61569	.25529
89	.61417	.25529
90	1.22598	.51059
91	1.22445	.51059
92	1.22403	.51059
93	1.22496	.51059
94	1.22662	.51059
95	1.22826	.51059
96	1.22911	.51059
97	.61458	.25529
98	.61458	.25529
99	.35260	.12765
100	.31176	.12765
101	.61890	.25529
102	.61569	.25529
103	.61417	.25529
104	1.22598	.51059
105	1.22445	.51059
106	1.22403	.51059
107	1.22496	.51059
108	1.22662	.51059
109	1.22826	.51059
110	1.22911	.51059
111	.61458	.25529
112	.61458	.25529
113	.16075	.11629
114	.14213	.11629
115	.28215	.23258
116	.28068	.23258
117	.27999	.23258
118	.55890	.46516
119	.55821	.46516
120	.55801	.46516
121	.55844	.46516
122	.55920	.46516
123	.55994	.46516
124	.56033	.46516
125	.28018	.23258
126	.28018	.23258
127	.16075	.11629
128	.14213	.11629
129	.28215	.23258
130	.28068	.23258
131	.27999	.23258
132	.55690	.46516
133	.55821	.46516
134	.55801	.46516
135	.55844	.46516
136	.55920	.46516
137	.55994	.46516
138	.56033	.46516
139	.28018	.23258
140	.28018	.23258

BODY PANEL CORNER POINT COORDINATES
1 AND 3 INDICATE BODY PANEL LEADING-EDGE POINTS, 2 AND 4 INDICATE TRAILING-EDGE POINTS

PANEL	X_1	Y_1	Z_1	X_2	Y_2	Z_2	X_3	Y_3	Z_3	X_4	Y_4	Z_4
1	0.00000	0.00000	0.00000	2.00000	.00000	-.48300	0.00000	0.00000	0.00000	2.00000	.24150	-.41829
2	0.00000	0.00000	0.00000	2.00000	.24150	-.41829	0.00000	0.00000	0.00000	2.00000	.41829	-.24150
3	0.00000	0.00000	0.00000	2.00000	.41829	-.24150	0.00000	0.00000	0.00000	2.00000	.48300	.00000
4	0.00000	0.00000	0.00000	2.00000	.48300	.00000	0.00000	0.00000	0.00000	2.00000	.41829	.24150
5	0.00000	0.00000	0.00000	2.00000	.41829	.24150	0.00000	0.00000	0.00000	2.00000	.24150	.41829
6	0.00000	0.00000	0.00000	2.00000	.24150	.41829	0.00000	0.00000	0.00000	2.00000	-.00000	.48300
7	2.00000	.00000	-.48300	5.00000	.00000	-.91401	2.00000	.24150	-.41829	5.00000	.45701	-.79156
8	2.00000	.24150	-.41829	5.00000	.45701	-.79156	2.00000	.41829	-.24150	5.00000	.79156	-.45701
9	2.00000	.41829	-.24150	5.00000	.79156	-.45701	2.00000	.48300	.00000	5.00000	.91401	.00000
10	2.00000	.48300	.00000	5.00000	.91401	.00000	2.00000	.41829	.24150	5.00000	.79156	.45701
11	2.00000	.41829	.24150	5.00000	.79156	.45701	2.00000	.24150	.41829	5.00000	.45701	.79156
12	2.00000	.24150	.41829	5.00000	.45701	.79156	2.00000	-.00000	.48300	5.00000	-.00000	.91401
13	5.00000	.00000	-.91401	8.00000	.00000	-1.23595	5.00000	.45701	-.79156	8.00000	.61797	-1.07036
14	5.00000	.45701	-.79156	8.00000	.61797	-1.07036	5.00000	.79156	-.45701	8.00000	1.07036	-.61797
15	5.00000	.79156	-.45701	8.00000	1.07036	-.61797	5.00000	.91401	.00000	8.00000	1.23595	.00000
16	5.00000	.91401	.00000	8.00000	1.23595	.00000	5.00000	.79156	.45701	8.00000	1.07036	.61797
17	5.00000	.79156	.45701	8.00000	1.07036	.61797	5.00000	.45701	.79156	8.00000	.61797	1.07036
18	5.00000	.45701	.79156	8.00000	.61797	1.07036	5.00000	-.00000	.91401	8.00000	-.00000	1.23595
19	8.00000	.00000	-1.23595	11.00000	.00000	-1.44400	8.00000	.61797	-1.07036	11.00000	.72200	-1.25054
20	8.00000	.61797	-1.07036	11.00000	.72200	-1.25054	8.00000	1.07036	-.61797	11.00000	1.25054	-.72200
21	8.00000	1.07036	-.61797	11.00000	1.25054	-.72200	8.00000	1.23595	.00000	11.00000	1.44400	.00000
22	8.00000	1.23595	.00000	11.00000	1.44400	.00000	8.00000	1.07036	.61797	11.00000	1.25054	.72200
23	8.00000	1.07036	.61797	11.00000	1.25054	.72200	8.00000	.61797	1.07036	11.00000	.72200	1.25054
24	8.00000	.61797	1.07036	11.00000	.72200	1.25054	8.00000	-.00000	1.23595	11.00000	-.00000	1.44400
25	11.00000	.00000	-1.44400	13.00000	.00000	-1.53750	11.00000	.72200	-1.25054	13.00000	.76875	-1.33151
26	11.00000	.72200	-1.25054	13.00000	.76875	-1.33151	11.00000	1.25054	-.72200	13.00000	1.33151	-.76875
27	11.00000	1.25054	-.72200	13.00000	1.33151	-.76875	11.00000	1.44400	.00000	13.00000	1.53750	.00000
28	11.00000	1.44400	.00000	13.00000	1.53750	.00000	11.00000	1.25054	.72200	13.00000	1.33151	.76875
29	11.00000	1.25054	.72200	13.00000	1.33151	.76875	11.00000	.72200	1.25054	13.00000	.76875	1.33151
30	11.00000	.72200	1.25054	13.00000	.76875	1.33151	11.00000	-.00000	1.44400	13.00000	-.00000	1.53750
31	13.00000	.00000	-1.53750	14.32500	.00000	-1.58361	13.00000	.76875	-1.33151	14.32500	.79181	-1.37145
32	13.00000	.76875	-1.33151	14.32500	.79181	-1.37145	13.00000	1.33151	-.76875	14.32500	1.37145	-.79181
33	13.00000	1.33151	-.76875	14.32500	1.37145	-.79181	13.00000	1.53750	.00000	14.32500	1.58361	.00000
34	13.00000	1.53750	.00000	14.32500	1.58361	.00000	13.00000	1.33151	.76875	14.32500	1.37145	.79181
35	13.00000	1.33151	.76875	14.32500	1.37145	.79181	13.00000	.76875	1.33151	14.32500	.79181	1.37145
36	13.00000	.76875	1.33151	14.32500	.79181	1.37145	13.00000	-.00000	1.53750	14.32500	-.00000	1.58361
37	14.32500	.00000	-1.58361	15.73000	.00000	-1.62084	14.32500	.79181	-1.37145	15.73000	.81042	-1.40369
38	14.32500	.79181	-1.37145	15.73000	.81042	-1.40369	14.32500	1.37145	-.79181	15.73000	1.40369	-.81042
39	14.32500	1.37145	-.79181	15.73000	1.40369	-.81042	14.32500	1.58361	.00000	15.73000	1.62084	.00000
40	14.32500	1.58361	.00000	15.73000	1.62084	.00000	14.32500	1.37145	.79181	15.73000	1.40369	.81042
41	14.32500	1.37145	.79181	15.73000	1.40369	.81042	14.32500	.79181	1.37145	15.73000	.81042	1.40369
42	14.32500	.79181	1.37145	15.73000	.81042	1.40369	14.32500	-.00000	1.58361	15.73000	-.00000	1.62084

43	15.73000	.00000	-1.62084	17.16000	.00000	-1.64540	15.73000	.81042	-1.40369	17.16000	.82270	-1.42496
44	15.73000	.81042	-1.40369	17.16000	.82270	-1.42496	15.73000	1.40369	-.81042	17.16000	1.42496	-.82270
45	15.73000	1.40369	-.81042	17.16000	1.42496	-.82270	15.73000	1.62084	.00000	17.16000	1.64540	.00000
46	15.73000	1.62084	.00000	17.16000	1.64540	.00000	15.73000	1.40369	.81042	17.16000	1.42496	.82270
47	15.73000	1.40369	.81042	17.16000	1.42496	.82270	15.73000	.81042	1.40369	17.16000	.82270	1.42496
48	15.73000	.81042	1.40369	17.16000	.82270	1.42496	15.73000	-.00000	1.62084	17.16000	-.00000	1.64540
49	17.16000	.00000	-1.64540	18.59000	.00000	-1.66154	17.16000	.82270	-1.42496	18.59000	.83077	-1.43893
50	17.16000	.82270	-1.42496	18.59000	.83077	-1.43893	17.16000	1.42496	-.82270	18.59000	1.43893	-.83077
51	17.16000	1.42496	-.82270	18.59000	1.43893	-.83077	17.16000	1.64540	.00000	18.59000	1.66154	.00000
52	17.16000	1.64540	.00000	18.59000	1.66154	.00000	17.16000	1.42496	.82270	18.59000	1.43893	.83077
53	17.16000	1.42496	.82270	18.59000	1.43893	.83077	17.16000	.82270	1.42496	18.59000	.83077	1.43893
54	17.16000	.82270	1.42496	18.59000	.83077	1.43893	17.16000	-.00000	1.64540	18.59000	-.00000	1.66154
55	18.59000	.00000	-1.66154	20.02000	.00000	-1.66985	18.59000	.83077	-1.43893	20.02000	.83493	-1.44613
56	18.59000	.83077	-1.43893	20.02000	.83493	-1.44613	18.59000	1.43893	-.83077	20.02000	1.44613	-.83493
57	18.59000	1.43893	-.83077	20.02000	1.44613	-.83493	18.59000	1.66154	.00000	20.02000	1.66985	.00000
58	18.59000	1.66154	.00000	20.02000	1.66985	.00000	18.59000	1.43893	.83077	20.02000	1.44613	.83493
59	18.59000	1.43893	.83077	20.02000	1.44613	.83493	18.59000	.83077	1.43893	20.02000	.83493	1.44613
60	18.59000	.83077	1.43893	20.02000	.83493	1.44613	18.59000	-.00000	1.66154	20.02000	-.00000	1.66985
61	20.02000	.00000	-1.66985	21.42500	.00000	-1.65931	20.02000	.83493	-1.44613	21.42500	.82966	-1.43701
62	20.02000	.83493	-1.44613	21.42500	.82966	-1.43701	20.02000	1.44613	-.83493	21.42500	1.43701	-.82966
63	20.02000	1.44613	-.83493	21.42500	1.43701	-.82966	20.02000	1.66985	.00000	21.42500	1.65931	.00000
64	20.02000	1.66985	.00000	21.42500	1.65931	.00000	20.02000	1.44613	.83493	21.42500	1.43701	.82966
65	20.02000	1.44613	.83493	21.42500	1.43701	.82966	20.02000	.83493	1.44613	21.42500	.82966	1.43701
66	20.02000	.83493	1.44613	21.42500	.82966	1.43701	20.02000	-.00000	1.66985	21.42500	-.00000	1.65931
67	21.42500	.00000	-1.65931	23.00000	.00000	-1.63250	21.42500	.82966	-1.43701	23.00000	.81625	-1.41379
68	21.42500	.82966	-1.43701	23.00000	.81625	-1.41379	21.42500	1.43701	-.82966	23.00000	1.41379	-.81625
69	21.42500	1.43701	-.82966	23.00000	1.41379	-.81625	21.42500	1.65931	.00000	23.00000	1.63250	.00000
70	21.42500	1.65931	.00000	23.00000	1.63250	.00000	21.42500	1.43701	.82966	23.00000	1.41379	.81625
71	21.42500	1.43701	.82966	23.00000	1.41379	.81625	21.42500	.82966	1.43701	23.00000	.81625	1.41379
72	21.42500	.82966	1.43701	23.00000	.81625	1.41379	21.42500	-.00000	1.65931	23.00000	-.00000	1.63250
73	23.00000	.00000	-1.63250	25.00000	.00000	-1.57500	23.00000	.81625	-1.41379	25.00000	.78750	-1.36399
74	23.00000	.81625	-1.41379	25.00000	.78750	-1.36399	23.00000	1.41379	-.81625	25.00000	1.36399	-.78750
75	23.00000	1.41379	-.81625	25.00000	1.36399	-.78750	23.00000	1.63250	.00000	25.00000	1.57500	.00000
76	23.00000	1.63250	.00000	25.00000	1.57500	.00000	23.00000	1.41379	.81625	25.00000	1.36399	.78750
77	23.00000	1.41379	.81625	25.00000	1.36399	.78750	23.00000	.81625	1.41379	25.00000	.78750	1.36399
78	23.00000	.81625	1.41379	25.00000	.78750	1.36399	23.00000	-.00000	1.63250	25.00000	-.00000	1.57500
79	25.00000	.00000	-1.57500	28.00000	.00000	-1.42800	25.00000	.78750	-1.36399	28.00000	.71400	-1.23669
80	25.00000	.78750	-1.36399	28.00000	.71400	-1.23669	25.00000	1.36399	-.78750	28.00000	1.23669	-.71400
81	25.00000	1.36399	-.78750	28.00000	1.23669	-.71400	25.00000	1.57500	.00000	28.00000	1.42800	.00000
82	25.00000	1.57500	.00000	28.00000	1.42800	.00000	25.00000	1.36399	.78750	28.00000	1.23669	.71400
83	25.00000	1.36399	.78750	28.00000	1.23669	.71400	25.00000	.78750	1.36399	28.00000	.71400	1.23669
84	25.00000	.78750	1.36399	28.00000	.71400	1.23669	25.00000	-.00000	1.57500	28.00000	-.00000	1.42800
85	28.00000	.00000	-1.42800	33.00000	.00000	-.90599	28.00000	.71400	-1.23669	33.00000	.45300	-.78461
86	28.00000	.71400	-1.23669	33.00000	.45300	-.78461	28.00000	1.23669	-.71400	33.00000	.78461	-.45300
87	28.00000	1.23669	-.71400	33.00000	.78461	-.45300	28.00000	1.42800	.00000	33.00000	.90599	.00000
88	28.00000	1.42800	.00000	33.00000	.90599	.00000	28.00000	1.23669	.71400	33.00000	.78461	.45300
89	28.00000	1.23669	.71400	33.00000	.78461	.45300	28.00000	.71400	1.23669	33.00000	.45300	.78461
90	28.00000	.71400	1.23669	33.00000	.45300	.78461	28.00000	-.00000	1.42800	33.00000	-.00000	.90599
91	33.00000	.00000	-.80500	36.00000	.00000	-.80000	33.00000	.45300	-.78461	36.00000	.40000	-.69282

92	33.00000	.45300	-.78461	36.00000	.40000	-.69282	33.00000	.78461	-.45300	36.00000	.69282	-.40000
93	33.00000	.78461	-.45300	36.00000	.69282	-.40000	33.00000	.90599	.00000	36.00000	.80000	.00000
94	33.00000	.90599	.00000	36.00000	.80000	.00000	33.00000	.78461	.45300	36.00000	.69282	.40000
95	33.00000	.78461	.45300	36.00000	.69282	.40000	33.00000	.45300	.78461	36.00000	.40000	.69282
96	33.00000	.45300	.78461	36.00000	.40000	.69282	33.00000	-.00000	.90599	36.00000	-.00000	.80000
97	36.00000	.00000	-.80000	38.00000	.00000	-.80000	36.00000	.40000	-.69282	38.00000	.40000	-.69282
98	36.00000	.40000	-.69282	38.00000	.40000	-.69282	36.00000	.69282	-.40000	38.00000	.69282	-.40000
99	36.00000	.69282	-.40000	38.00000	.69282	-.40000	36.00000	.80000	.00000	38.00000	.80000	.00000
100	36.00000	.80000	.00000	38.00000	.80000	.00000	36.00000	.69282	.40000	38.00000	.69282	.40000
101	36.00000	.69282	.40000	38.00000	.69282	.40000	36.00000	.40000	.69282	38.00000	.40000	.69282
102	36.00000	.40000	.69282	38.00000	.40000	.69282	36.00000	-.00000	.80000	38.00000	-.00000	.80000

BODY PANEL CENTROID POINT COORDINATES

POINT	X CP	Y CP	Z CP
1	1.33333	.08050	-.30043
2	1.33333	.21993	-.21993
3	1.33333	.30043	-.08050
4	1.33333	.30043	.08050
5	1.33333	.21993	.21993
6	1.33333	.08050	.30043
7	3.65426	.18017	-.67239
8	3.65426	.49223	-.49223
9	3.65426	.67239	-.18017
10	3.65426	.67239	.18017
11	3.65426	.49223	.49223
12	3.65426	.18017	.67239
13	6.57487	.27075	-1.01047
14	6.57487	.73971	-.73971
15	6.57487	1.01047	-.27075
16	6.57487	1.01047	.27075
17	6.57487	.73971	.73971
18	6.57487	.27075	1.01047
19	9.53882	.33567	-1.25272
20	9.53882	.91706	-.91706
21	9.53882	1.25272	-.33567
22	9.53882	1.25272	.33567
23	9.53882	.91706	.91706
24	9.53882	.33567	1.25272
25	12.01045	.37281	-1.39134
26	12.01045	1.01854	-1.01854
27	12.01045	1.39134	-.37281
28	12.01045	1.39134	.37281
29	12.01045	1.01854	1.01854
30	12.01045	.37281	1.39134
31	13.66576	.39017	-1.45612
32	13.66576	1.06596	-1.06596
33	13.66576	1.45612	-.39017
34	13.66576	1.45612	.39017
35	13.66576	1.06596	1.06596
36	13.66576	.39017	1.45612
37	15.03022	.40057	-1.49497
38	15.03022	1.09439	-1.09439
39	15.03022	1.49497	-.40057
40	15.03022	1.49497	.40057
41	15.03022	1.09439	1.09439
42	15.03022	.40057	1.49497
43	16.44679	.40829	-1.52375
44	16.44679	1.11546	-1.11546
45	16.44679	1.52375	-.40829
46	16.44679	1.52375	.40829
47	16.44679	1.11546	1.11546
48	16.44679	.40829	1.52375
49	17.87616	.41337	-1.54272
50	17.87616	1.12935	-1.12935
51	17.87616	1.54272	-.41337
52	17.87616	1.54272	.41337
53	17.87616	1.12935	1.12935
54	17.87616	.41337	1.54272
55	19.30559	.41642	-1.55412
56	19.30559	1.13769	-1.13769
57	19.30559	1.55412	-.41642
58	19.30559	1.55412	.41642
59	19.30559	1.13769	1.13769
60	19.30559	.41642	1.55412
61	20.72176	.41615	-1.55308
62	20.72176	1.13693	-1.13693
63	20.72176	1.55308	-.41615
64	20.72176	1.55308	.41615
65	20.72176	1.13693	1.13693
66	20.72176	.41615	1.55308
67	22.21036	.41149	-1.53568
68	22.21036	1.12420	-1.12420
69	22.21036	1.53568	-.41149
70	22.21036	1.53568	.41149
71	22.21036	1.12420	1.12420
72	22.21036	.41149	1.53568
73	23.99402	.40098	-1.49648
74	23.99402	1.09550	-1.09550
75	23.99402	1.49648	-.40098
76	23.99402	1.49648	.40098
77	23.99402	1.09550	1.09550
78	23.99402	.40098	1.49648
79	26.47552	.37567	-1.40204
80	26.47552	1.02636	-1.02636
81	26.47552	1.40204	-.37567
82	26.47552	1.40204	.37567
83	26.47552	1.02636	1.02636
84	26.47552	.37567	1.40204
85	30.31362	.29661	-1.10698
86	30.31362	.81036	-.81036
87	30.31362	1.10698	-.29661
88	30.31362	1.10698	.29661
89	30.31362	.81036	.81036
90	30.31362	.29661	1.10698
91	34.46893	.21352	-.79688
92	34.46893	.58336	-.58336
93	34.46893	.79688	-.21352
94	34.46893	.79688	.21352
95	34.46893	.58336	.58336
96	34.46893	.21352	.79688
97	37.00000	.20000	-.74641
98	37.00000	.54641	-.54641
99	37.00000	.74641	-.20000
100	37.00000	.74641	.20000
101	37.00000	.54641	.54641
102	37.00000	.20000	.74641

BODY PANEL AREAS AND INCLINATION ANGLES

PANEL	AREA	DELTA RAD	THETA RAD	DELTA DEG	THETA DEG
1	.25673	.22917	-2.87979	13.13065	-165.00000
2	.25673	.22917	-2.35619	13.13065	-135.00000
3	.25673	.22917	-1.83260	13.13065	-105.00000
4	.25673	.22917	-1.30900	13.13065	-75.00000
5	.25673	.22917	-.78540	13.13065	-45.00000
6	.25673	.22917	-.26180	13.13065	-15.00000
7	1.09512	.13789	-2.87979	7.90076	-165.00000
8	1.09512	.13789	-2.35619	7.90076	-135.00000
9	1.09512	.13789	-1.83260	7.90076	-105.00000
10	1.09512	.13789	-1.30900	7.90076	-75.00000
11	1.09512	.13789	-.78540	7.90076	-45.00000
12	1.09512	.13789	-.26180	7.90076	-15.00000
13	1.67830	.10329	-2.87979	5.91790	-165.00000
14	1.67830	.10329	-2.35619	5.91790	-135.00000
15	1.67830	.10329	-1.83260	5.91790	-105.00000
16	1.67830	.10329	-1.30900	5.91790	-75.00000
17	1.67830	.10329	-.78540	5.91790	-45.00000
18	1.67830	.10329	-.26180	5.91790	-15.00000
19	2.08553	.06689	-2.87979	3.83237	-165.00000
20	2.08553	.06689	-2.35619	3.83237	-135.00000
21	2.08553	.06689	-1.83260	3.83237	-105.00000
22	2.08553	.06689	-1.30900	3.83237	-75.00000
23	2.08553	.06689	-.78540	3.83237	-45.00000
24	2.08553	.06689	-.26180	3.83237	-15.00000
25	1.54491	.04513	-2.87979	2.58556	-165.00000
26	1.54491	.04513	-2.35619	2.58556	-135.00000
27	1.54491	.04513	-1.83260	2.58556	-105.00000
28	1.54491	.04513	-1.30900	2.58556	-75.00000
29	1.54491	.04513	-.78540	2.58556	-45.00000
30	1.54491	.04513	-.26180	2.58556	-15.00000
31	1.07094	.03360	-2.87979	1.92526	-165.00000
32	1.07094	.03360	-2.35619	1.92526	-135.00000
33	1.07094	.03360	-1.83260	1.92526	-105.00000
34	1.07094	.03360	-1.30900	1.92526	-75.00000
35	1.07094	.03360	-.78540	1.92526	-45.00000
36	1.07094	.03360	-.26180	1.92526	-15.00000
37	1.16565	.02559	-2.87979	1.46625	-165.00000
38	1.16565	.02559	-2.35619	1.46625	-135.00000
39	1.16565	.02559	-1.83260	1.46625	-105.00000
40	1.16565	.02559	-1.30900	1.46625	-75.00000
41	1.16565	.02559	-.78540	1.46625	-45.00000
42	1.16565	.02559	-.26180	1.46625	-15.00000
43	1.20904	.01658	-2.87979	.95023	-165.00000
44	1.20904	.01658	-2.35619	.95023	-135.00000
45	1.20904	.01658	-1.83260	.95023	-105.00000
46	1.20904	.01658	-1.30900	.95023	-75.00000
47	1.20904	.01658	-.78540	.95023	-45.00000
48	1.20904	.01658	-.26180	.95023	-15.00000
49	1.22401	.01090	-2.87979	.62467	-165.00000
50	1.22401	.01090	-2.35619	.62467	-135.00000
51	1.22401	.01090	-1.83260	.62467	-105.00000
52	1.22401	.01090	-1.30900	.62467	-75.00000
53	1.22401	.01090	-.78540	.62467	-45.00000
54	1.22401	.01090	-.26180	.62467	-15.00000
55	1.23300	.00561	-2.87979	.32171	-165.00000
56	1.23300	.00561	-2.35619	.32171	-135.00000
57	1.23300	.00561	-1.83260	.32171	-105.00000
58	1.23300	.00561	-1.30900	.32171	-75.00000
59	1.23300	.00561	-.78540	.32171	-45.00000
60	1.23300	.00561	-.26180	.32171	-15.00000
61	1.21065	-.00724	-2.87979	-.41510	-165.00000
62	1.21065	-.00724	-2.35619	-.41510	-135.00000
63	1.21065	-.00724	-1.83260	-.41510	-105.00000
64	1.21065	-.00724	-1.30900	-.41510	-75.00000
65	1.21065	-.00724	-.78540	-.41510	-45.00000
66	1.21065	-.00724	-.26180	-.41510	-15.00000
67	1.34206	-.01644	-2.87979	-.94212	-165.00000
68	1.34206	-.01644	-2.35619	-.94212	-135.00000
69	1.34206	-.01644	-1.83260	-.94212	-105.00000
70	1.34206	-.01644	-1.30900	-.94212	-75.00000
71	1.34206	-.01644	-.78540	-.94212	-45.00000
72	1.34206	-.01644	-.26180	-.94212	-15.00000
73	1.66096	-.02776	-2.87979	-1.59072	-165.00000
74	1.66096	-.02776	-2.35619	-1.59072	-135.00000
75	1.66096	-.02776	-1.83260	-1.59072	-105.00000
76	1.66096	-.02776	-1.30900	-1.59072	-75.00000
77	1.66096	-.02776	-.78540	-1.59072	-45.00000
78	1.66096	-.02776	-.26180	-1.59072	-15.00000
79	2.33431	-.04729	-2.87979	-2.70976	-165.00000
80	2.33431	-.04729	-2.35619	-2.70976	-135.00000
81	2.33431	-.04729	-1.83260	-2.70976	-105.00000
82	2.33431	-.04729	-1.30900	-2.70976	-75.00000
83	2.33431	-.04729	-.78540	-2.70976	-45.00000
84	2.33431	-.04729	-.26180	-2.70976	-15.00000
85	3.03573	-.10050	-2.87979	-5.75847	-165.00000
86	3.03573	-.10050	-2.35619	-5.75847	-135.00000
87	3.03573	-.10050	-1.83260	-5.75847	-105.00000
88	3.03573	-.10050	-1.30900	-5.75847	-75.00000
89	3.03573	-.10050	-.78540	-5.75847	-45.00000
90	3.03573	-.10050	-.26180	-5.75847	-15.00000
91	1.32540	-.03412	-2.87979	-1.95468	-165.00000
92	1.32540	-.03412	-2.35619	-1.95468	-135.00000

93	1.32540	-.03412	-1.83260	-1.95468	-105.00000
94	1.32540	-.03412	-1.30900	-1.95468	-75.00000
95	1.32540	-.03412	-.78540	-1.95468	-45.00000
96	1.32540	-.03412	-.26180	-1.95468	-15.00000
97	.82822	0.00000	-2.87979	0.00000	-165.00000
98	.82822	0.00000	-2.35619	0.00000	-135.00000
99	.82822	0.00000	-1.83260	0.00000	-105.00000
100	.82822	0.00000	-1.30900	0.00000	-75.00000
101	.82822	0.00000	-.78540	0.00000	-45.00000
102	.82822	0.00000	-.26180	0.00000	-15.00000

```
PARTITION =  1  TIME =  11.93800
NWING=   140  NBODY=   102  NCPT=   140  NSEG=     1
NBROW(N),N=1,   2
    48    54
NWROW(N),N=1,   5
    28    28    28    28    28
NROW(N),N=1,   1
    14
NCOL(N),N=1,   1
     5
INFLUENCE OF BODY ON BODY
```

```
PARTITION =  2  TIME =  44.42200
INFLUENCE OF WING ON BODY
```

```
PARTITION =  3  TIME =  505.35600
INFLUENCE OF BODY ON WING
```

```
PARTITION =  4  TIME = 550.42500
INFLUENCE OF WING ON WING
NWING=  140  NBODY=  102  NCPT=   140  NSEG=     1
NBBLOK=     2  NWBLOK=     5

VELCMP, TIME =1181.72200
```

```
BEGIN A NEW CASE

CONTROLLED SUCCESSIVE OVERRELAXATION METHOD     ALF1= .90     ALF2= 1.10


ITRATE, TIME =1189.06400

ITERATION NUMBER   1
 GB(N),N=1,102
     .38550    .34553    .27631    .19639    .12717    .08720    .29422    .25420    .18487    .10483
     .03550   -.00452    .25973    .21996    .15108    .07154    .00266   -.03711    .21931    .17971
     .11112    .03192   -.03667   -.07627    .19427    .15498    .08695    .00839   -.05965   -.09893
     .18040    .14157    .07431   -.00335   -.07061   -.10944    .16971    .13160    .06559   -.01063
    -.07663   -.11474    .15640    .11931    .05507   -.01911   -.08336   -.12045    .15508    .11787
     .05343   -.02099   -.08543   -.12264    .15204    .11381    .04759   -.02887   -.09509   -.13332
     .13754    .09862    .03121   -.04664   -.11405   -.15298    .12947    .09017    .02210   -.05649
    -.12456   -.16365    .11854    .07903    .01060   -.06842   -.13685   -.17636    .09859    .05894
    -.00972   -.08901   -.15767   -.19731    .03998   -.00002   -.06931   -.14931   -.21860   -.25860
     .11655    .07798    .00772   -.07341   -.14367   -.18423    .14793    .10905    .04170   -.03607
    -.10342   -.14230
 GW(N),N=1,140
     .41082    .11447    .11185    .08226    .06330    .04273    .01854   -.00832   -.03988   -.06082
    -.07313   -.07518   -.07181   -.06854    .20704    .09509    .05732    .03652    .02586    .01848
     .00974    .00498    .00202    .00072   -.00063   -.00076   -.00047   -.00026    .41029    .11404
     .11138    .08168    .06256    .04197    .01818   -.00822   -.03944   -.06011   -.07232   -.07444
    -.07122   -.06806    .23029    .10686    .06519    .04273    .03146    .02372    .01401    .00825
     .00460    .00229    .00100    .00039    .00016    .00011    .41005    .11390    .11125    .08155
     .06241    .04181    .01809   -.00821   -.03937   -.05996   -.07213   -.07424   -.07104   -.06791
     .23994    .11173    .06843    .04527    .03373    .02585    .01589    .00981    .00585    .00327
     .00174    .00089    .00044    .00028    .40986    .11379    .11115    .08147    .06234    .04172
     .01802   -.00822   -.03935   -.05989   -.07200   -.07409   -.07090   -.06778    .25216    .11787
     .07250    .04842    .03651    .02843    .01822    .01182    .00750    .00457    .00272    .00156
     .00082    .00051    .41228    .11510    .11248    .08292    .06401    .04327    .01673   -.00841
    -.04012   -.06114   -.07345   -.07543   -.07198   -.06865    .19226    .08763    .05235    .03263
     .02243    .01545    .00756    .00342    .00084   -.00073   -.00139   -.00130   -.00076   -.00044

ITRATE, TIME =1189.34800

ITERATION NUMBER   2
 GB(N),N=1,102
     .38665    .34638    .27663    .19614    .12649    .08627    .29572    .25529    .18526    .10446
     .03455   -.00611    .26196    .22159    .15163    .07093    .00109   -.03972    .22291    .18241
     .11204    .03076   -.04033   -.08131    .19903    .15923    .08895    .00621   -.06770   -.11042
     .18074    .14596    .08265   -.00626   -.06895   -.13485    .16201    .13693    .20607   -.03222
    -.11195   -.15719    .15346    .14484    .32023   -.17667   -.12832   -.16765    .17223    .16821
     .32972   -.26553   -.14213   -.16740    .19276    .18096    .25789   -.28497   -.14550   -.15779
     .19137    .17087   -.19343   -.20218   -.16574   -.16886    .18332    .16006    .20256   -.29311
```

-.18535	-.18561	.16808	.14959	.21378	-.28964	-.20524	-.20983	.14904	.13483
.15414	-.29483	-.23310	-.24180	.10425	.07057	.02222	-.26245	-.30458	-.32129
.19795	.16434	.06477	-.13079	-.22991	-.26324	.22553	.19155	.09265	-.08722
-.18584	-.21969								

GW(N),N=1,140

.40611	.11214	.10922	.07940	.06012	.03937	.01543	-.01151	-.04264	-.06318
-.07517	-.07705	-.07371	-.07054	.37140	.17556	.10945	.07498	.05779	.04615
.03134	.02111	.01363	.00825	.00364	.00205	.00111	.00070	.41630	.11555
.11319	.08327	.06401	.04319	.01899	-.00814	-.04048	-.06171	-.07405	-.07600
-.07264	-.06942	.42166	.19972	.12455	.08546	.06626	.05327	.03699	.02673
.01933	.01357	.00926	.00597	.00336	.00212	.42066	.11687	.11445	.08422
.06475	.04370	.01929	-.00799	-.04027	-.06138	-.07357	-.07541	-.07199	-.06876
.46108	.21888	.13685	.09442	.07369	.05974	.04224	.03109	.02291	.01640
.01138	.00743	.00420	.00265	.42094	.11695	.11449	.08422	.06473	.04367
.01928	-.00791	-.03991	-.06077	-.07278	-.07458	-.07122	-.06803	.49102	.23312
.14572	.10049	.07833	.06337	.04436	.03200	.02290	.01579	.01047	.00650
.00349	.00216	.42107	.11716	.11490	.08513	.06630	.04595	.02188	-.00588
-.03821	-.05989	-.07279	-.07516	-.07191	-.06667	.49222	.23105	.14210	.09363
.06823	.05058	.03013	.01932	.01237	.00568	.00244	.00047	-.00024	-.00020

ITRATE, TIME =1190.76100

ITERATION NUMBER 3

GB(N),N=1,102

.38786	.34727	.27697	.19579	.12547	.08487	.29732	.25647	.18571	.10398
.03318	-.00766	.26439	.22338	.15230	.07018	-.00100	-.04205	.22711	.18550
.11322	.02944	-.04324	-.08527	.20681	.16506	.09115	.00369	-.07295	-.11730
.19361	.15678	.08724	-.01120	-.09789	-.14456	.17469	.15647	.26457	-.10240
-.12735	-.16792	.16929	.17818	.50676	-.37666	-.15762	-.18051	.19598	.21578
.59961	-.54251	-.18726	-.18564	.22104	.23996	.52995	-.55556	-.20485	-.18551
.22528	.23903	.45398	-.55599	-.23503	-.20488	.22356	.23641	.46816	-.55322
-.26219	-.22813	.21556	.23367	.48416	-.55738	-.28942	-.25864	.20598	.22831
.45299	-.55227	-.32657	-.29933	.18280	.19570	.18742	-.40528	-.41233	-.39990
.29695	.27281	.13705	-.20323	-.33830	-.36217	.32257	.29530	.15714	-.15187
-.28952	-.31664								

GW(N),N=1,140

.40591	.11202	.10908	.07923	.05990	.03909	.01513	-.01124	-.04244	-.06300
-.07498	-.07684	-.07348	-.07029	.43119	.20749	.13206	.09428	.07600	.06401
.04830	.03600	.02648	.01895	.01335	.00951	.00594	.00385	.41563	.11537
.11298	.08308	.06383	.04302	.01886	-.00819	-.04044	-.06159	-.07389	-.07582
-.07246	-.06924	.48189	.23027	.14511	.10167	.08116	.06748	.05070	.03990
.03153	.02429	.01818	.01280	.00772	.00499	.41955	.11655	.11412	.08394
.06450	.04349	.01913	-.00803	-.04023	-.06128	-.07345	-.07529	-.07188	-.06865
.51585	.24646	.15528	.10899	.08683	.07221	.05429	.04273	.03371	.02584
.01917	.01334	.00794	.00510	.41982	.11662	.11416	.08394	.06449	.04347
.01914	-.00791	-.03990	-.06073	-.07274	-.07455	-.07119	-.06801	.53690	.25615
.16108	.11256	.08918	.07363	.05426	.04150	.03148	.02298	.01612	.01057
.00594	.00374	.42021	.11695	.11466	.08492	.06609	.04571	.02161	-.00557
[illegible]	-.05972	-.07269	-.07511	-.07188	[illegible]	[illegible]	[illegible]	.14888	.09866

```
    .07238    .05415    .03302    .02178    .01441    .00879    .00443    .00149    .00014    .00000

ITRATE, TIME =1192.15200

ITERATION NUMBER   4
 GB(N),N=1,102
    .38844    .34770    .27712    .19562    .12504    .08429    .29811    .25704    .18591    .10376
    .03261   -.00848    .26561    .22427    .15262    .06984   -.00188   -.04331    .22927    .18709
    .11379    .02886   -.04487   -.08748    .21078    .16803    .09225    .00258   -.07601   -.12138
    .19987    .16200    .08961   -.01360   -.10333   -.15114    .18646    .16571    .28921   -.12590
   -.13703   -.17701    .18370    .19531    .59467   -.46393   -.17544   -.19160    .20659    .23868
    .74225   -.68471   -.21064   -.19693    .23488    .27104    .68843   -.71410   -.23602   -.19951
    .24256    .27700    .61866   -.72117   -.27300   -.22211    .24435    .28029    .64360   -.72825
   -.30610   -.24888    .24033    .28269    .66453   -.73721   -.33850   -.28343    .23613    .28337
    .62194   -.72478   -.38166   -.32951    .22624    .25872    .27912   -.49932   -.47700   -.44328
    .35333    .33794    .18292   -.24922   -.40338   -.41847    .37788    .35748    .19781   -.19266
   -.35167   -.37188
 GW(N),N=1,140
    .40586    .11201    .10908    .07923    .05991    .03911    .01515   -.01121   -.04241   -.06297
   -.07496   -.07682   -.07345   -.07026    .46191    .22355    .14321    .10352    .08451    .07226
    .05620    .04332    .03331    .02505    .01854    .01370    .00877    .00571    .41556    .11535
    .11296    .08306    .06381    .04301    .01885   -.00819   -.04043   -.06158   -.07387   -.07581
   -.07244   -.06923    .51260    .24554    .15516    .10953    .08779    .07349    .05606    .04488
    .03616    .02843    .02171    .01556    .00952    .00618    .41944    .11652    .11408    .08391
    .06448    .04347    .01912   -.00802   -.04022   -.06126   -.07343   -.07528   -.07187   -.06865
    .54251    .25951    .16373    .11523    .09206    .07681    .05818    .04620    .03684    .02858
    .02147    .01512    .00910    .00587    .41970    .11659    .11412    .08391    .06446    .04345
    .01912   -.00791   -.03989   -.06072   -.07274   -.07455   -.07120   -.06801    .55697    .26580
    .16719    .11688    .09261    .07646    .05631    .04304    .03267    .02387    .01678    .01102
    .00622    .00391    .42013    .11693    .11464    .08490    .06607    .04568    .02158   -.00559
   -.03799   -.05974   -.07270   -.07512   -.07189   -.06866    .52955    .24906    .15355    .10174
    .07465    .05584    .03403    .02242    .01483    .00889    .00446    .00149    .00013   -.00000

ITRATE, TIME =1193.55300

ITERATION NUMBER   5
 GB(N),N=1,102
    .38871    .34789    .27719    .19555    .12484    .08402    .29848    .25731    .18601    .10366
    .03234   -.00884    .26619    .22469    .15278    .06969   -.00230   -.04388    .23030    .18784
    .11407    .02858   -.04562   -.08850    .21270    .16947    .09279    .00205   -.07744   -.12328
    .20295    .16459    .09078   -.01477   -.10589   -.15419    .19033    .17033    .30193   -.13874
   -.14160   -.18114    .18850    .20381    .63780   -.50705   -.18385   -.19671    .21156    .24964
    .81002   -.75248   -.22155   -.20185    .24117    .28560    .76407   -.78970   -.25059   -.20581
    .25030    .29463    .69723   -.79969   -.29066   -.22989    .25360    .30052    .72722   -.81148
   -.32635   -.25819    .25129    .30515    .75033   -.82267   -.36098   -.29446    .24944    .30853
    .70451   -.80671   -.40682   -.34286    .24562    .28859    .32372   -.54375   -.50666   -.46265
    .37872    .36780    .20434   -.27070   -.43322   -.44383    .40279    .38598    .21677   -.21167
   -.38014   -.39675
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GW(N),N=1,140

.40586	.11201	.10908	.07923	.05991	.03911	.01515	-.01121	-.04241	-.06297
-.07496	-.07682	-.07345	-.07025	.47595	.23092	.14834	.10779	.08846	.07607
.05979	.04653	.03618	.02750	.02060	.01532	.00984	.00640	.41556	.11535
.11296	.08307	.06381	.04301	.01885	-.00819	-.04043	-.06158	-.07387	-.07580
-.07244	-.06923	.52577	.25210	.15948	.11283	.09065	.07609	.05836	.04696
.03799	.02999	.02296	.01649	.01011	.00656	.41945	.11652	.11408	.08391
.06448	.04347	.01912	-.00802	-.04022	-.06126	-.07343	-.07528	-.07167	-.06864
.55320	.26475	.16712	.11773	.09417	.07866	.05972	.04752	.03793	.02945
.02212	.01557	.00936	.00603	.41971	.11659	.11412	.08392	.06446	.04345
.01913	-.00791	-.03989	-.06072	-.07274	-.07455	-.07119	-.06801	.56518	.26979
.16974	.11873	.09414	.07778	.05738	.04393	.03338	.02442	.01717	.01128
.00637	.00400	.42013	.11693	.11464	.08490	.06607	.04568	.02158	-.00560
-.03799	-.05974	-.07270	-.07512	-.07189	-.06866	.53577	.25202	.15541	.10301
.07561	.05660	.03454	.02279	.01510	.00909	.00458	.00153	.00015	.00000

ITRATE, TIME =1194.95400

ITERATION NUMBER 6

GB(N),N=1,102

.38883	.34798	.27722	.19552	.12476	.08390	.29864	.25743	.18605	.10362
.03222	-.00900	.26644	.22488	.15285	.06962	-.00249	-.04413	.23075	.18817
.11419	.02846	-.04595	-.08895	.21354	.17010	.09303	.00181	-.07807	-.12413
.20431	.16573	.09130	-.01529	-.10703	-.15555	.19221	.17238	.30762	-.14441
-.14365	-.18300	.19080	.20759	.65734	-.52660	-.18765	-.19899	.21366	.25443
.84046	-.78292	-.22635	-.20395	.24385	.29193	.79721	-.82285	-.25692	-.20849
.25359	.30219	.73097	-.83345	-.29822	-.23319	.25752	.30910	.76280	-.84691
-.33494	-.26212	.25590	.31462	.78679	-.85899	-.37047	-.29909	.25501	.31913
.73938	-.84152	-.41743	-.34845	.25376	.30111	.34254	-.56261	-.51918	-.47078
.38940	.38041	.21341	-.27980	-.44581	-.45450	.41327	.39801	.22479	-.21972
-.39217	-.40722								

GW(N),N=1,140

.40566	.11201	.10908	.07923	.05991	.03911	.01515	-.01121	-.04241	-.06297
-.07496	-.07682	-.07345	-.07025	.48206	.23412	.15057	.10963	.09015	.07770
.06130	.04787	.03737	.02850	.02142	.01595	.01024	.00666	.41556	.11535
.11296	.08307	.06381	.04301	.01685	-.00819	-.04043	-.06158	-.07387	-.07580
-.07244	-.06923	.53134	.25486	.16129	.11421	.09184	.07715	.05929	.04779
.03873	.03061	.02346	.01686	.01033	.00671	.41945	.11652	.11408	.08391
.06448	.04347	.01912	-.00802	-.04022	-.06126	-.07343	-.07528	-.07187	-.06864
.55774	.26697	.16856	.11880	.09506	.07944	.06038	.04809	.03843	.02986
.02245	.01581	.00951	.00613	.41971	.11659	.11412	.08392	.06446	.04345
.01913	-.00791	-.03989	-.06072	-.07274	-.07455	-.07119	-.06801	.56870	.27149
.17083	.11952	.09478	.07833	.05782	.04429	.03368	.02465	.01734	.01140
.00643	.00405	.42013	.11693	.11464	.08490	.06607	.04568	.02158	-.00560
-.03799	-.05974	-.07270	-.07512	-.07189	-.06866	.53846	.25331	.15621	.10355
.07602	.05691	.03474	.02294	.01521	.00916	.00462	.00156	.00015	.00001

ITRATE, TIME =1196.37100

ITERATION NUMBER

GB(N),N=1,102

.38888	.34802	.27724	.19550	.12472	.08385	.29870	.25748	.18607	.10360
.03218	-.00907	.26654	.22495	.15287	.06959	-.00256	-.04423	.23094	.18831
.11424	.02841	-.04609	-.08914	.21389	.17037	.09313	.00171	-.07834	-.12448
.20488	.16621	.09152	-.01551	-.10752	-.15612	.19300	.17325	.31007	-.14686
-.14453	-.18379	.19176	.20921	.66568	-.53494	-.18927	-.19994	.21454	.25645
.85331	-.79577	-.22836	-.20483	.24497	.29458	.81113	-.83677	-.25957	-.20961
.25497	.30534	.74506	-.84754	-.30138	-.23457	.25915	.31268	.77762	-.86167
-.33852	-.26377	.25783	.31857	.80198	-.87412	-.37442	-.30102	.25734	.32355
.75393	-.85601	-.42185	-.35078	.25716	.30633	.35039	-.57046	-.52440	-.47417
.39386	.38566	.21719	-.28359	-.45106	-.45895	.41764	.40303	.22814	-.22307
-.39718	-.41159								

GW(N),N=1,140

.40586	.11201	.10908	.07923	.05991	.03911	.01515	-.01121	-.04241	-.06297
-.07496	-.07682	-.07345	-.07025	.48461	.23546	.15150	.11041	.09086	.07838
.06193	.04842	.03785	.02891	.02175	.01620	.01041	.00677	.41556	.11535
.11296	.08307	.06381	.04301	.01885	-.00819	-.04043	-.06158	-.07387	-.07580
-.07244	-.06923	.53367	.25602	.16205	.11479	.09233	.07760	.05968	.04815
.03904	.03087	.02368	.01702	.01043	.00677	.41944	.11652	.11408	.08391
.06448	.04347	.01912	-.00802	-.04022	-.06126	-.07343	-.07528	-.07187	-.06864
.55965	.26791	.16916	.11924	.09544	.07977	.06066	.04834	.03864	.03004
.02259	.01591	.00957	.00617	.41971	.11659	.11412	.08392	.06446	.04345
.01913	-.00791	-.03989	-.06072	-.07274	-.07455	-.07119	-.06801	.57017	.27221
.17129	.11985	.09505	.07856	.05800	.04444	.03380	.02474	.01741	.01145
.00646	-.00406	.42013	.11693	.11464	.08490	.06607	.04568	.02158	-.00560
-.03799	-.05974	-.07270	-.07512	-.07189	-.06866	.53958	.25384	.15654	.10378
.07619	.05704	.03483	.02300	.01525	.00918	.00464	.00157	.00016	.00001

ITRATE, TIME =1197.77600

ITERATION NUMBER 8

GB(N),N=1,102

.38890	.34803	.27724	.19550	.12470	.08383	.29873	.25750	.18608	.10359
.03215	-.00909	.26659	.22498	.15289	.06958	-.00260	-.04428	.23102	.18837
.11426	.02839	-.04615	-.08922	.21404	.17048	.09317	.00167	-.07845	-.12463
.20512	.16642	.09161	-.01560	-.10772	-.15636	.19332	.17362	.31108	-.14788
-.14489	-.18412	.19216	.20988	.66915	-.53841	-.18994	-.20034	.21491	.25729
.85865	-.80111	-.22920	-.20520	.24544	.29568	.81690	-.84254	-.26067	-.21008
.25555	.30666	.75090	-.85339	-.30269	-.23514	.25984	.31417	.78376	-.86778
-.34001	-.26445	.25863	.32022	.80827	-.88039	-.37607	-.30183	.25832	.32539
.75995	-.86202	-.42369	-.35176	.25858	.30851	.35364	-.57372	-.52657	-.47559
.39572	.38785	.21876	-.28516	-.45325	-.46061	.41947	.40512	.22952	-.22446
-.39926	-.41341								

GW(N),N=1,140

.40586	.11201	.10908	.07923	.05991	.03911	.01515	-.01121	-.04241	-.06297
-.07496	-.07682	-.07345	-.07025	.48568	.23602	.15189	.11073	.09115	.07866
.06219	.04865	.03806	.02908	.02189	.01631	.01048	.00682	.41556	.11535
.11296	.08307	.06381	.04301	.01885	-.00819	-.04043	-.06158	-.07387	-.07580
-.07244	-.06923	.53464	.25650	.16237	.11503	.09254	.07779	.05985	.04830

103

.03918	.03099	.02377	.01709	.01047	.00680	.41944	.11652	.11408	.08391
.06448	.04347	.01912	-.00802	-.04022	-.06126	-.07343	-.07528	-.07187	-.06864
.56045	.26830	.16941	.11943	.09559	.07991	.06077	.04844	.03873	.03011
.02265	.01595	.00960	.00619	.41971	.11559	.11412	.08392	.06446	.04345
.01913	-.00791	-.03989	-.06072	-.07274	-.07455	-.07119	-.06801	.57078	.27250
.17148	.11999	.09517	.07866	.05808	.04450	.03385	.02478	.01744	.01147
.00647	.00407	.42013	.11693	.11464	.08490	.06607	.04568	.02158	-.00560
-.03799	-.05974	-.07270	-.07512	-.07189	-.06866	.54005	.25406	.15668	.10387
.07627	.05710	.03487	.02303	.01527	.00920	.00464	.00157	.00016	.00001

ITRATE, TIME =1199.16700

ITERATION NUMBER 9

GB(N),N=1,102

.38891	.34804	.27724	.19550	.12470	.08382	.29874	.25751	.18608	.10359
.03215	-.00911	.26661	.22500	.15289	.06958	-.00261	-.04430	.23105	.18839
.11427	.02838	-.04617	-.08926	.21410	.17052	.09319	.00165	-.07850	-.12469
.20522	.16650	.09165	-.01564	-.10780	-.15646	.19346	.17377	.31151	-.14830
-.14504	-.18425	.19232	.21016	.67060	-.53986	-.19022	-.20051	.21506	.25764
.86088	-.80334	-.22956	-.20535	.24563	.29614	.81932	-.84496	-.26113	-.21027
.25579	.30721	.75336	-.85584	-.30324	-.23539	.26012	.31480	.78635	-.87036
-.34064	-.26474	.25897	.32091	.81092	-.88303	-.37676	-.30217	.25872	.32617
.76249	-.86455	-.42446	-.35217	.25917	.30942	.35501	-.57509	-.52748	-.47618
.39649	.38877	.21942	-.28582	-.45417	-.46158	.42023	.40599	.23011	-.22505
-.40014	-.41418								

GW(N),N=1,140

.40586	.11201	.10908	.07923	.05991	.03911	.01515	-.01121	-.04241	-.06297
-.07496	-.07682	-.07345	-.07025	.48613	.23626	.15205	.11086	.09128	.07878
.06230	.04875	.03814	.02915	.02195	.01636	.01051	.00684	.41556	.11535
.11296	.08307	.06381	.04301	.01885	-.00819	-.04043	-.06158	-.07387	-.07580
-.07244	-.06923	.53505	.25670	.16250	.11513	.09263	.07787	.05992	.04836
.03923	.03103	.02380	.01712	.01049	.00681	.41944	.11652	.11408	.08391
.06448	.04347	.01912	-.00802	-.04022	-.06126	-.07343	-.07528	-.07187	-.06864
.56078	.26846	.16952	.11951	.09566	.07997	.06082	.04848	.03876	.03014
.02267	.01597	.00961	.00619	.41971	.11659	.11412	.08392	.06446	.04345
.01913	-.00791	-.03989	-.06072	-.07274	-.07455	-.07119	-.06801	.57104	.27263
.17156	.12005	.09521	.07870	.05811	.04453	.03387	.02480	.01745	.01148
.00648	.00408	.42013	.11693	.11464	.08490	.06607	.04568	.02158	-.00560
-.03799	-.05974	-.07270	-.07512	-.07189	-.06866	.54025	.25415	.15674	.10391
.07630	.05712	.03488	.02304	.01528	.00920	.00465	.00157	.00016	.00001

ITRATE, TIME =1200.57400

ITERATION NUMBER 10

GB(N),N=1,102

.38891	.34804	.27724	.19549	.12470	.08382	.29875	.25751	.18608	.10359
.03214	-.00911	.26661	.22500	.15289	.06957	-.00262	-.04430	.23106	.18840
.11427	.02838	-.04618	-.08927	.21413	.17054	.09320	.00164	-.07852	-.12472
.20526	.16654	.09167	-.01566	-.10784	-.15650	.19352	.17383	.31169	-.14848

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   -.14511   -.18431    .19239    .21028    .67120   -.54046   -.19034   -.20058    .21513    .25779
    .86181   -.80427   -.22970   -.20542    .24571    .29634    .82034   -.84597   -.26133   -.21036
    .25589    .30744    .75439   -.85687   -.30348   -.23549    .26024    .31506    .78743   -.87144
   -.34090   -.26486    .25911    .32120    .81203   -.88413   -.37705   -.30231    .25889    .32649
    .76355   -.86561   -.42479   -.35234    .25942    .30980    .35558   -.57566   -.52786   -.47643
    .39682    .38915    .21969   -.28610   -.45455   -.46191    .42055    .40636    .23035   -.22529
   -.40050   -.41450
 GW(N),N=1,140
    .40586    .11201    .10908    .07923    .05991    .03911    .01515   -.01121   -.04241   -.06297
   -.07496   -.07682   -.07345   -.07025    .48631    .23635    .15212    .11092    .09133    .07883
    .06235    .04879    .03818    .02919    .02198    .01638    .01053    .00684    .41556    .11535
    .11296    .08307    .06381    .04301    .01885   -.00819   -.04043   -.06158   -.07387   -.07580
   -.07244   -.06923    .53522    .25679    .16256    .11518    .09267    .07790    .05995    .04838
    .03926    .03105    .02382    .01713    .01050    .00682    .41944    .11652    .11408    .08391
    .06448    .04347    .01912   -.00802   -.04022   -.06126   -.07343   -.07528   -.07187   -.06864
    .56092    .26853    .16956    .11954    .09569    .07999    .06084    .04850    .03878    .03015
    .02268    .01598    .00961    .00620    .41971    .11659    .11412    .08392    .06446    .04345
    .01913   -.00791   -.03989   -.06072   -.07274   -.07455   -.07119   -.06801    .57115    .27268
    .17159    .12007    .09523    .07872    .05813    .04454    .03388    .02481    .01746    .01148
    .00648    .00408    .42013    .11693    .11464    .08490    .06607    .04568    .02158   -.00560
   -.03799   -.05974   -.07270   -.07512   -.07189   -.06866    .54033    .25419    .15677    .10393
    .07631    .05713    .03469    .02304    .01528    .00920    .00465    .00158    .00016    .00001

ITRATE, TIME =1201.97900

ITERATION NUMBER  11
 GB(N),N=1,102
    .38891    .34804    .27724    .19549    .12469    .08382    .29875    .25751    .18608    .10359
    .03214   -.00911    .26662    .22501    .15289    .06957   -.00262   -.04431    .23107    .18841
    .11427    .02837   -.04619   -.08927    .21414    .17055    .09320    .00164   -.07852   -.12473
    .20528    .16655    .09167   -.01566   -.10785   -.15652    .19354    .17386    .31176   -.14856
   -.14513   -.18434    .19242    .21033    .67146   -.54072   -.19039   -.20061    .21515    .25785
    .86221   -.80467   -.22977   -.20544    .24575    .29642    .82076   -.84640   -.26141   -.21039
    .25593    .30754    .75482   -.85730   -.30357   -.23553    .26029    .31517    .78788   -.87189
   -.34101   -.26491    .25917    .32132    .81250   -.88460   -.37717   -.30237    .25897    .32662
    .76400   -.86606   -.42492   -.35241    .25953    .30996    .35582   -.57590   -.52802   -.47653
    .39696    .38931    .21981   -.28622   -.45471   -.46205    .42068    .40651    .23046   -.22540
   -.40066   -.41463
 GW(N),N=1,140
    .40586    .11201    .10908    .07923    .05991    .03911    .01515   -.01121   -.04241   -.06297
   -.07496   -.07682   -.07345   -.07025    .48639    .23640    .15215    .11094    .09135    .07885
    .06237    .04881    .03820    .02920    .02199    .01639    .01053    .00685    .41556    .11535
    .11296    .08307    .06381    .04301    .01885   -.00819   -.04043   -.06158   -.07387   -.07580
   -.07244   -.06923    .53529    .25682    .16258    .11519    .09268    .07792    .05996    .04839
    .03926    .03106    .02383    .01713    .01050    .00682    .41944    .11652    .11408    .08391
    .06448    .04347    .01912   -.00802   -.04022   -.06126   -.07343   -.07528   -.07187   -.06864
    .56098    .26856    .16958    .11956    .09570    .08000    .06085    .04850    .03879    .03016
    .02268    .01598    .00961    .00620    .41971    .11659    .11412    .08392    .06446    .04345
    .01913   -.00791   -.03989   -.06072   -.07274   -.07455   -.07119   -.06801    .57119    .27270
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    .17161    .12008    .09524    .07872    .05813    .04455    .03389    .02481    .01746    .01148
    .00648    .00408    .42013    .11693    .11464    .08490    .06607    .04568    .02158   -.00560
   -.03799   -.05974   -.07270   -.07512   -.07189   -.06866    .54036    .25421    .15678    .10394
    .07631    .05714    .03489    .02304    .01528    .00921    .00465    .00158    .00016    .00001

THE ITERATION CONVERGED AFTER  11  ITERATIONS WITH A TEST CRITERION OF  .0010000

THE SOLUTICN AT THE PREVIOUS ITERATION IS
 GB(N),N=1,102
    .38891    .34804    .27724    .19549    .12470    .08362    .29875    .25751    .18608    .10359
    .03214   -.00911    .26661    .22500    .15289    .06957   -.00262   -.04430    .23106    .18840
    .11427    .02838   -.04618   -.08927    .21413    .17054    .09320    .00164   -.07852   -.12472
    .20526    .16654    .09167   -.01566   -.10784   -.15650    .19352    .17383    .31169   -.14848
   -.14511   -.18431    .19239    .21028    .67120   -.54046   -.19034   -.20058    .21513    .25779
    .86181   -.80427   -.22970   -.20542    .24571    .29634    .82034   -.84597   -.26133   -.21036
    .25589    .30744    .75439   -.85687   -.30348   -.23549    .26024    .31506    .78743   -.87144
   -.34090   -.26486    .25911    .32120    .81203   -.88413   -.37705   -.30231    .25889    .32649
    .76355   -.86561   -.42479   -.35234    .25942    .30980    .35558   -.57566   -.52786   -.47643
    .39682    .38915    .21969   -.28610   -.45455   -.46191    .42055    .40636    .23035   -.22529
   -.40050   -.41450
 GV(N),N=1,140
    .40586    .11201    .10908    .07923    .05991    .03911    .01515   -.01121   -.04241   -.06297
   -.07496   -.07682   -.07345   -.07025    .48631    .23635    .15212    .11092    .09133    .07883
    .06235    .04879    .03818    .02919    .02198    .01638    .01053    .00684    .41556    .11535
    .11296    .08307    .06381    .04301    .01885   -.00819   -.04043   -.06158   -.07387   -.07580
   -.07244   -.06923    .53522    .25679    .16256    .11518    .09267    .07790    .05995    .04838
    .03926    .03105    .02382    .01713    .01050    .00682    .41944    .11652    .11408    .08391
    .06448    .04347    .01912   -.00802   -.04022   -.06126   -.07343   -.07528   -.07187   -.06864
    .56092    .26853    .16956    .11954    .09569    .07999    .06084    .04850    .03878    .03015
    .02268    .01598    .00961    .00620    .41971    .11659    .11412    .08392    .06446    .04345
    .01913   -.00791   -.03989   -.06072   -.07274   -.07455   -.07119   -.06801    .57115    .27268
    .17159    .12007    .09523    .07872    .05813    .04454    .03388    .02481    .01746    .01148
    .00648    .00408    .42013    .11693    .11464    .08490    .06607    .04568    .02158   -.00560
   -.03799   -.05974   -.07270   -.07512   -.07189   -.06866    .54033    .25419    .15677    .10393
    .07631    .05713    .03489    .02304    .01528    .00920    .00465    .00158    .00016    .00001

THE SOLUTION AT THE PRESENT ITERATION IS
 GB(N),N=1,102
    .38891    .34804    .27724    .19549    .12469    .08382    .29875    .25751    .18608    .10359
    .03214   -.00911    .26662    .22501    .15289    .06957   -.00262   -.04431    .23107    .18841
    .11427    .02837   -.04619   -.08927    .21414    .17055    .09320    .00164   -.07852   -.12473
    .20528    .16655    .09167   -.01566   -.10785   -.15652    .19354    .17386    .31176   -.14856
   -.14513   -.18434    .19242    .21033    .67146   -.54072   -.19039   -.20061    .21515    .25785
    .86221   -.80467   -.22977   -.20544    .24575    .29642    .82076   -.84640   -.26141   -.21039
    .25593    .30754    .75482   -.85730   -.30357   -.23553    .26029    .31517    .78788   -.87189
   -.34101   -.26491    .25917    .32132    .81250   -.88460   -.37717   -.30237    .25897    .32662
    .76400   -.86606   -.42492   -.35241    .25953    .30996    .35582   -.57590   -.52802   -.47653
    .39696    .38931    .21981   -.28622   -.45471   -.46205    .42068    .40651    .23046   -.22540
   -.40066   -.41463
```

GW(N),N=1,140

.40586	.11201	.10908	.07923	.05991	.03911	.01515	-.01121	-.04241	-.06297
-.07496	-.07682	-.07345	-.07025	.48639	.23640	.15215	.11094	.09135	.07885
.06237	.04881	.03820	.02920	.02199	.01639	.01053	.00685	.41556	.11535
.11296	.08307	.06381	.04301	.01885	-.00819	-.04043	-.06158	-.07387	-.07580
-.07244	-.06923	.53529	.25682	.16258	.11519	.09268	.07792	.05996	.04639
.03926	.03106	.02383	.01713	.01050	.00682	.41944	.11652	.11408	.08391
.06448	.04347	.01912	-.00802	-.04022	-.06126	-.07343	-.07528	-.07187	-.06864
.56098	.26856	.16958	.11956	.09570	.06000	.06085	.04850	.03879	.03016
.02268	.01598	.00961	.00620	.41971	.11659	.11412	.08392	.06446	.04345
.01913	-.00791	-.03989	-.06072	-.07274	-.07455	-.07119	-.06801	.57119	.27270
.17161	.12008	.09524	.07872	.05813	.04455	.03389	.02481	.01746	.01148
.00648	.00408	.42013	.11693	.11464	.08490	.06607	.04568	.02158	-.00560
-.03799	-.05974	-.07270	-.07512	-.07189	-.06866	.54036	.25421	.15678	.10394
.07631	.05714	.03489	.02304	.01528	.00921	.00465	.00158	.00016	.00001

VELOCITIES ON BODY, MACH= .600 ALPHA= 4.000

PANEL NO.	SOURCE STRENGTH	AXIAL VELOCITY	LATERAL VELOCITY	VERTICAL VELOCITY	NORMAL VELOCITY	PRESSURE COEFFICIENT
1	.38891	-.12544	.08865	-.25662	.29224	.20012
2	.34804	-.11691	.21724	-.14303	.27465	.17456
3	.27724	-.10215	.23775	.01051	.24420	.13692
4	.19549	-.08510	.16961	.11966	.20904	.10372
5	.12469	-.07034	.08096	.15517	.17858	.08373
6	.08382	-.06182	.02050	.15073	.16100	.07585
7	.29875	-.05137	.06986	-.18698	.20386	.08677
8	.25751	-.04602	.16512	-.09138	.18598	.06723
9	.18608	-.03674	.16467	.02962	.15501	.03996
10	.10359	-.02602	.09435	.09904	.11924	.01874
11	.03214	-.01674	.02449	.09825	.08827	.00917
12	-.00911	-.01138	-.00046	.07205	.07038	.00734
13	.26662	-.02134	.06230	-.15782	.16987	.03546
14	.22501	-.01715	.14409	-.06938	.15191	.01805
15	.15289	-.00988	.13502	.03857	.12081	-.00549
16	.06957	-.00147	.06360	.09183	.08489	-.02230
17	-.00262	.00581	.00126	.07607	.05379	-.02796
18	-.04431	.01002	-.00912	.04081	.03583	-.02747
19	.23107	-.00457	.05429	-.12407	.13390	.00608
20	.18841	-.00131	.12142	-.04271	.11589	-.00799
21	.11427	.00441	.10201	.05162	.08469	-.02901
22	.02837	.01109	.02803	.08669	.04866	-.04248
23	-.04619	.01694	-.02648	.05284	.01746	-.04476
24	-.08927	.02033	-.01964	.00610	-.00055	-.04208
25	.21414	-.00388	.05029	-.10273	.11231	.00899
26	.17055	-.00078	.10983	-.02358	.09428	-.00777
27	.09320	.00555	.06325	.06592	.06304	-.03148
28	.00164	.01406	.00422	.09098	.02697	-.04902
29	-.07852	.02196	-.04760	.04295	-.00427	-.05413
30	-.12473	.02653	-.02813	-.01434	-.02231	-.05238
31	.20528	-.01693	.04601	-.09155	.10085	.03588
32	.16655	-.02070	.10152	-.01467	.08281	.03248
33	.09167	-.01898	.07529	.08413	.05156	.01304
34	-.01566	.00818	-.01407	.11339	.01547	-.04507
35	-.10785	.02926	-.06685	.04591	-.01578	-.07174
36	-.15652	.03646	-.03554	-.02425	-.03382	-.07207
37	.19354	-.02689	.03328	-.08656	.09288	.05669
38	.17386	-.04094	.06459	-.03979	.07483	.08037
39	.31176	-.06351	.05640	.04841	.04356	.11150
40	-.14856	.07034	-.03450	.16468	.00749	-.19311
41	-.14513	.06026	-.07370	.04225	-.02378	-.13529
42	-.18434	.05551	-.03757	-.03178	-.04183	-.11069
43	.19242	-.01864	.01809	-.08171	.08391	.04139
44	.21033	-.02439	.02512	-.06745	.06585	.05255

45	.67146	-.01691	.06751	.11953	.03455	-.00208
46	-.54072	.09835	-.05145	.19266	-.00146	-.26591
47	-.19039	.08612	-.04349	-.00083	-.03277	-.17809
48	-.20061	.07311	-.02785	-.04390	-.05082	-.14582
49	.21515	-.00194	.01320	-.07745	.07825	.00850
50	.25785	.00245	.01698	-.06818	.06019	-.00032
51	.86221	.01904	.07828	.17982	.02866	-.10097
52	-.80467	.10223	-.05759	.19178	-.00711	-.27421
53	-.22977	.08667	-.01562	-.03741	-.03844	-.17406
54	-.20544	.07564	-.01567	-.05344	-.05650	-.15020
55	.24575	.01219	.01652	-.07119	.07297	-.01983
56	.29642	.02026	.03178	-.04604	.05491	-.03740
57	.82076	.03640	.07970	.20554	.02358	-.14917
58	-.84640	.08555	-.05324	.15273	-.01238	-.22094
59	-.26141	.07592	-.00428	-.05693	-.04371	-.15046
60	-.21039	.06974	-.00784	-.06145	-.06177	-.13752
61	.25593	.01548	.01808	-.05730	.06014	-.02667
62	.30754	.01928	.03850	-.02081	.04208	-.03773
63	.75482	.02817	.07326	.23267	.01075	-.14698
64	-.85730	.04726	-.06584	.14702	-.02521	-.14116
65	-.30357	.05413	-.01074	-.06977	-.05653	-.10516
66	-.23553	.05480	-.00735	-.07567	-.07460	-.10652
67	.26029	.01302	.01617	-.04821	.05096	-.02196
68	.31517	.01223	.03229	-.01396	.03290	-.02380
69	.78788	.01366	.06774	.24762	.00157	-.12642
70	-.87189	.00833	-.09144	.20791	-.03437	-.09643
71	-.34101	.02860	-.02887	-.06473	-.06570	-.05361
72	-.26491	.03507	-.01196	-.08412	-.08376	-.06628
73	.25917	.01774	.01266	-.03716	.03965	-.03198
74	.32132	.01892	.02491	-.00489	.02159	-.03794
75	.81250	.02684	.06875	.29706	-.00973	-.18550
76	-.88460	.00225	-.12062	.27344	-.04566	-.13040
77	-.37717	.01522	-.05392	-.05558	-.07698	-.02877
78	-.30237	.02015	-.02082	-.09343	-.09504	-.03661
79	.25897	.02866	.01083	-.01656	.02013	-.05579
80	.32662	.03057	.02489	.02399	.00209	-.06607
81	.76400	.03954	.07415	.39694	-.02921	-.29093
82	-.86606	-.00918	-.16583	.36867	-.06512	-.19317
83	-.42492	.00082	-.08921	-.04734	-.09641	-.00522
84	-.35241	.00369	-.03335	-.10987	-.11445	-.00522
85	.25953	.02271	.01827	.04168	-.03307	-.05344
86	.30996	.02292	.05348	.12930	-.05104	-.08325
87	.35582	.01788	.04432	.49148	-.08217	-.33731
88	-.57590	-.04591	-.23553	.43861	-.11801	-.21525
89	-.52802	-.05070	-.19274	-.01202	-.14914	.06332
90	-.47653	-.05029	-.06903	-.15014	-.16711	.09221
91	.39696	-.01110	.06282	-.01805	.03329	.02031
92	.38931	-.01307	.15912	.13692	.01524	-.03714
93	.21981	-.02010	.10018	.43308	-.01600	-.21406

94	-.28622	-.03459	-.16401	.41542	-.05205	-.18640
95	-.45471	-.04158	-.20553	.08967	-.08330	.01846
96	-.46205	-.04352	-.07976	-.08207	-.10134	.08391
97	.42068	.00225	.07010	-.05095	.06736	-.00489
98	.40651	-.00259	.17801	.10830	.04930	-.05310
99	.23046	-.01128	.12454	.39511	.01804	-.20064
100	-.22540	-.02149	-.12444	.39472	-.01804	-.18092
101	-.40066	-.03016	-.17770	.10798	-.04930	.00097
102	-.41463	-.03499	-.06996	-.05099	-.06736	.06863

NACA RM L51F07 TRANSONIC WING-BODY DEFINITION
NACA TRANSONIC WING-BODY PANELING

INTEGRATION OF THE PRESSURE DISTRIBUTION

ON THE BODY

MACH= .6000 ALPHA= 4.0000

POINT	X	Y	Z	X/L	Y/D	Z/D	CP	CN	CA	CM	POINT
1	1.33333	.08050	-.30043	1.33333	.08050	-.30043	.20012	.04833	.01167	.89863	1
2	1.33333	.21993	-.21993	1.33333	.21993	-.21993	.17456	.03086	.01018	.57384	2
3	1.33333	.30043	-.08050	1.33333	.30043	-.08050	.13692	.00886	.00799	.16475	3
4	1.33333	.30043	.08050	1.33333	.30043	.08050	.10372	-.00671	.00605	-.12480	4
5	1.33333	.21993	.21993	1.33333	.21993	.21993	.08373	-.01480	.00488	-.27525	5
6	1.33333	.08050	.30043	1.33333	.08050	.30043	.07585	-.01832	.00442	-.34061	6
7	3.65426	.18017	-.67239	3.65426	.18017	-.67239	.08677	.09091	.01306	1.47725	7
8	3.65426	.49223	-.49223	3.65426	.49223	-.49223	.06723	.05156	.01012	.83785	8
9	3.65426	.67239	-.18017	3.65426	.67239	-.18017	.03996	.01122	.00602	.18230	9
10	3.65426	.67239	.18017	3.65426	.67239	.18017	.01674	-.00526	.00282	-.08551	10
11	3.65426	.49223	.49223	3.65426	.49223	.49223	.00917	-.00703	.00138	-.11427	11
12	3.65426	.18017	.67239	3.65426	.18017	.67239	.00734	-.00769	.00110	-.12497	12
13	6.57487	.27075	-1.01047	6.57487	.27075	-1.01047	.03546	.05718	.00614	.76145	13
14	6.57487	.73971	-.73971	6.57487	.73971	-.73971	.01805	.02131	.00312	.28372	14
15	6.57487	1.01047	-.27075	6.57487	1.01047	-.27075	-.00549	-.00237	-.00095	-.03156	15
16	6.57487	1.01047	.27075	6.57487	1.01047	.27075	-.02230	.00964	-.00386	.12833	16
17	6.57487	.73971	.73971	6.57487	.73971	.73971	-.02796	.03300	-.00484	.43949	17
18	6.57487	.27075	1.01047	6.57487	.27075	1.01047	-.02747	.04429	-.00475	.58977	18
19	9.53882	.33567	-1.25272	9.53882	.33567	-1.25272	.00808	.01623	.00113	.16840	19
20	9.53882	.91706	-.91706	9.53882	.91706	-.91706	-.00799	-.01176	-.00111	-.12202	20
21	9.53882	1.25272	-.33567	9.53882	1.25272	-.33567	-.02901	-.01562	-.00404	-.16208	21
22	9.53882	1.25272	.33567	9.53882	1.25272	.33567	-.04248	.02288	-.00592	.23737	22
23	9.53882	.91706	.91706	9.53882	.91706	.91706	-.04476	.06586	-.00624	.68322	23
24	9.53882	.33567	1.25272	9.53882	.33567	1.25272	-.04208	.08457	-.00587	.87740	24
25	12.01045	.37281	-1.39134	12.01045	.37281	-1.39134	.00899	.01340	.00063	.10617	25
26	12.01045	1.01854	-1.01854	12.01045	1.01854	-1.01854	-.00777	-.00847	-.00054	-.06716	26
27	12.01045	1.39134	-.37281	12.01045	1.39134	-.37281	-.03148	-.01257	-.00219	-.09964	27
28	12.01045	1.39134	.37281	12.01045	1.39134	.37281	-.04902	.01958	-.00342	.15518	28
29	12.01045	1.01854	1.01854	12.01045	1.01854	1.01854	-.05413	.05908	-.00377	.46815	29
30	12.01045	.37281	1.39134	12.01045	.37281	1.39134	-.05238	.07808	-.00365	.61877	30
31	13.66576	.39017	-1.45612	13.66576	.39017	-1.45612	.03588	.03709	.00129	.23306	31
32	13.66576	1.06596	-1.06596	13.66576	1.06596	-1.06596	.03248	.02458	.00117	.15448	32
33	13.66576	1.45612	-.39017	13.66576	1.45612	-.39017	.01304	.00361	.00047	.02270	33
34	13.66576	1.45612	.39017	13.66576	1.45612	.39017	-.04507	.01249	-.00162	.07845	34

35	13.66576	1.06596	1.06596	13.66576	1.06596	1.06596	-.07174	.05430	-.00258	.34117	35
36	13.66576	.39017	1.45612	13.66576	.39017	1.45612	-.07207	.07451	-.00259	.46817	36
37	15.03022	.40057	-1.49497	15.03022	.40057	-1.49497	.05669	.06380	.00169	.31456	37
38	15.03022	1.09439	-1.09439	15.03022	1.09439	-1.09439	.08037	.06622	.00240	.32649	38
39	15.03022	1.49497	-.40057	15.03022	1.49497	-.40057	.11150	.03363	.00333	.16579	39
40	15.03022	1.49497	.40057	15.03022	1.49497	.40057	-.19311	.05824	-.00576	.28714	40
41	15.03022	1.09439	1.09439	15.03022	1.09439	1.09439	-.13529	.11148	-.00404	.54961	41
42	15.03022	.40057	1.49497	15.03022	.40057	1.49497	-.11069	.12459	-.00330	.61424	42
43	16.44679	.40829	-1.52375	16.44679	.40829	-1.52375	.04139	.04833	.00083	.17046	43
44	16.44679	1.11546	-1.11546	16.44679	1.11546	-1.11546	.05255	.04492	.00105	.15843	44
45	16.44679	1.52375	-.40829	16.44679	1.52375	-.40829	-.00208	-.00065	-.00004	-.00229	45
46	16.44679	1.52375	.40829	16.44679	1.52375	.40829	-.26591	.08320	-.00533	.29344	46
47	16.44679	1.11546	1.11546	16.44679	1.11546	1.11546	-.17809	.15223	-.00357	.53694	47
48	16.44679	.40829	1.52375	16.44679	.40829	1.52375	-.14562	.17028	-.00292	.60057	48
49	17.87616	.41337	-1.54272	17.87616	.41337	-1.54272	.00650	.01005	.00011	.02117	49
50	17.87616	1.12935	-1.12935	17.87616	1.12935	-1.12935	-.00032	-.00028	-.00000	-.00059	50
51	17.87616	1.54272	-.41337	17.87616	1.54272	-.41337	-.10097	-.03199	-.00135	-.06738	51
52	17.87616	1.54272	.41337	17.87616	1.54272	.41337	-.27421	.08686	-.00366	.18297	52
53	17.87616	1.12935	1.12935	17.87616	1.12935	1.12935	-.17406	.15064	-.00232	.31731	53
54	17.87616	.41337	1.54272	17.87616	.41337	1.54272	-.15020	.17757	-.00200	.37405	54
55	19.30559	.41642	-1.55412	19.30559	.41642	-1.55412	-.01983	-.02362	-.00014	-.01619	55
56	19.30559	1.13769	-1.13769	19.30559	1.13769	-1.13769	-.03740	-.03261	-.00026	-.02235	56
57	19.30559	1.55412	-.41642	19.30559	1.55412	-.41642	-.14917	-.04760	-.00103	-.03263	57
58	19.30559	1.55412	.41642	19.30559	1.55412	.41642	-.22094	.07051	-.00153	.04832	58
59	19.30559	1.13769	1.13769	19.30559	1.13769	1.13769	-.15046	.13118	-.00104	.08991	59
60	19.30559	.41642	1.55412	19.30559	.41642	1.55412	-.13752	.16378	-.00095	.11225	60
61	20.72176	.41615	-1.55308	20.72176	.41615	-1.55308	-.02667	-.03119	.00023	.02215	61
62	20.72176	1.13693	-1.13693	20.72176	1.13693	-1.13693	-.03773	-.03230	.00033	.02293	62
63	20.72176	1.55308	-.41615	20.72176	1.55308	-.41615	-.14698	-.04605	.00129	.03270	63
64	20.72176	1.55308	.41615	20.72176	1.55308	.41615	-.14116	.04423	.00124	-.03141	64
65	20.72176	1.13693	1.13693	20.72176	1.13693	1.13693	-.10516	.09002	.00092	-.06392	65
66	20.72176	.41615	1.55308	20.72176	.41615	1.55308	-.10652	.12456	.00093	-.08845	66
67	22.21036	.41149	-1.53568	22.21036	.41149	-1.53568	-.02196	-.02647	.00048	.06218	67
68	22.21036	1.12420	-1.12420	22.21036	1.12420	-1.12420	-.02380	-.02258	.00053	.04932	68
69	22.21036	1.53568	-.41149	22.21036	1.53568	-.41149	-.12642	-.04391	.00279	.09590	69
70	22.21036	1.53568	.41149	22.21036	1.53568	.41149	-.09643	.03349	.00213	-.07315	70
71	22.21036	1.12420	1.12420	22.21036	1.12420	1.12420	-.05361	.05086	.00118	-.11110	71
72	22.21036	.41149	1.53568	22.21036	.41149	1.53568	-.06626	.08590	.00146	-.18763	72
73	23.99402	.40098	-1.49648	23.99402	.40098	-1.49648	-.03198	-.05129	.00147	.20264	73
74	23.99402	1.09550	-1.09550	23.99402	1.09550	-1.09550	-.03794	-.04455	.00175	.17600	74
75	23.99402	1.49648	-.40098	23.99402	1.49648	-.40098	-.18550	-.07971	.00855	.31494	75
76	23.99402	1.49648	.40098	23.99402	1.49648	.40098	-.13040	.05604	.00601	-.22140	76
77	23.99402	1.09550	1.09550	23.99402	1.09550	1.09550	-.02877	.03378	.00133	-.13347	77
78	23.99402	.40098	1.49648	23.99402	.40098	1.49648	-.03661	.05871	.00169	-.23198	78
79	26.47552	.37567	-1.40204	26.47552	.37567	-1.40204	-.05579	-.12566	.00616	.80507	79
80	26.47552	1.02636	-1.02636	26.47552	1.02636	-1.02636	-.06607	-.10893	.00729	.69790	80
81	26.47552	1.40204	-.37567	26.47552	1.40204	-.37567	-.29093	-.17557	.03211	1.12487	81
82	26.47552	1.40204	.37567	26.47552	1.40204	.37567	-.19317	.11658	.02132	-.74689	82
83	26.47552	1.02636	1.02636	26.47552	1.02636	[illegible]	[illegible]	.00861	.00058	-.05517	83

84	26.47552	.37567	1.40204	26.47552	.37567	1.40204	-.00522	.01176	.00058	-.07536	84
85	30.31362	.29661	-1.10698	30.31362	.29661	-1.10698	-.05344	-.15592	.01628	1.59004	85
86	30.31362	.81036	-.81036	30.31362	.81036	-.81036	-.08325	-.17780	.02536	1.81322	86
87	30.31362	1.10698	-.29661	30.31362	1.10698	-.29661	-.33731	-.26369	.10274	2.68909	87
88	30.31362	1.10698	.29661	30.31362	1.10698	.29661	-.21525	.16827	.06556	-1.71606	88
89	30.31362	.81036	.81036	30.31362	.81036	.81036	.06332	-.13524	-.01929	1.37923	89
90	30.31362	.29661	1.10698	30.31362	.29661	1.10698	.09221	-.26901	-.02809	2.74339	90
91	34.46893	.21352	-.79688	34.46893	.21352	-.79688	.02031	.02598	-.00092	-.37523	91
92	34.46893	.58336	-.58336	34.46893	.58336	-.58336	-.03714	-.03479	.00168	.50242	92
93	34.46893	.79688	-.21352	34.46893	.79688	-.21352	-.21406	-.07339	.00968	1.05978	93
94	34.46893	.79688	.21352	34.46893	.79688	.21352	-.18640	.06391	.00843	-.92286	94
95	34.46893	.58336	.58336	34.46893	.58336	.58336	.01846	-.01729	-.00083	.24970	95
96	34.46893	.21352	.79688	34.46893	.21352	.79688	.08391	-.10736	-.00379	1.55040	96
97	37.00000	.20000	-.74641	37.00000	.20000	-.74641	-.00489	-.00391	0.00000	.06644	97
98	37.00000	.54641	-.54641	37.00000	.54641	-.54641	-.05310	-.03110	0.00000	.52867	98
99	37.00000	.74641	-.20000	37.00000	.74641	-.20000	-.20064	-.04301	0.00000	.73115	99
100	37.00000	.74641	.20000	37.00000	.74641	.20000	-.18092	.03878	0.00000	-.65929	100
101	37.00000	.54641	.54641	37.00000	.54641	.54641	.00097	-.00057	0.00000	.00963	101
102	37.00000	.20000	.74641	37.00000	.20000	.74641	.06863	-.05491	0.00000	.93340	102

TOTAL COEFFICIENTS

ON THE BODY

REFA= 144.0000 REFD= 1.0000 REFL= 1.0000

REFX= 20.0000 REFZ= 0.0000

MACH=	.60000
ALPHA=	4.00000
CN=	.01843
CA=	.00396
CM=	.06391
CL=	.01811
CD=	.00523
XCP=	-.20262

VELOCITIES ON WING, MACH= .600   ALPHA= 4.000

PANEL NO.	VORTEX STRENGTH	AXIAL VELOCITY	LATERAL VELOCITY	VERTICAL VELOCITY	NORMAL VELOCITY	PRESSURE COEFFICIENT
1	.40586	.23130	-.22364	.50569	.27917	-.82204
2	.11201	.26565	-.25713	.13470	.06156	-.66020
3	.10908	.19087	-.17482	.07103	.03184	-.44380
4	.07923	.16832	-.14711	.02848	.00404	-.37704
5	.05991	.15726	-.13140	.00318	-.01384	-.34492
6	.03911	.14639	-.11474	-.02267	-.03299	-.31467
7	.01515	.13829	-.10258	-.04997	-.05437	-.29301
8	-.01121	.13109	-.09104	-.07771	-.07683	-.27511
9	-.04241	.11836	-.07780	-.10758	-.10189	-.24706
10	-.06297	.09946	-.06211	-.12876	-.12087	-.20684
11	-.07496	.07481	-.04762	-.14195	-.13412	-.15524
12	-.07682	.04421	-.03227	-.14557	-.13999	-.09132
13	-.07345	.01414	-.01591	-.14290	-.14038	-.02906
14	-.07025	-.01821	.00561	-.13935	-.14038	.03610
15	.48639	-.43810	.48618	-.08659	-.40024	.46891
16	.23640	-.19165	.22669	-.14443	-.19850	.30138
17	.15215	-.12675	.16168	-.14087	-.16979	.21451
18	.11094	-.08008	.11775	-.12807	-.14272	.14276
19	.09135	-.05324	.09471	-.11669	-.12518	.09793
20	.07885	-.02867	.07633	-.10209	-.10629	.05463
21	.06237	.00033	.05596	-.08387	-.08509	.00088
22	.04881	.02331	.03917	-.06248	-.06267	-.04360
23	.03620	.03490	.02826	-.03705	-.03750	-.06744
24	.02920	.03605	.02395	-.01749	-.01834	-.07119
25	.02199	.02720	.02325	-.00436	-.00489	-.05470
26	.01639	.01073	.02724	.00027	.00108	-.02226
27	.01053	-.00736	.03514	-.00108	.00147	.01355
28	.00685	-.02681	.04720	-.00317	.00147	.05120
29	.41556	.27437	-.26486	.53978	.27917	-.96228
30	.11535	.29761	-.28969	.14362	.06156	-.75012
31	.11296	.21277	-.20050	.07611	.03183	-.50191
32	.08307	.18413	-.17044	.03155	.00404	-.41889
33	.06381	.16865	-.15439	.00526	-.01384	-.37605
34	.04301	.15224	-.13791	-.02145	-.03299	-.33292
35	.01685	.14059	-.12728	-.04939	-.05437	-.30335
36	-.00819	.12950	-.11841	-.07768	-.07684	-.27716
37	-.04043	.11209	-.10469	-.10800	-.10190	-.23845
38	-.06158	.08758	-.08530	-.12909	-.12087	-.18516
39	-.07387	.05899	-.06298	-.14173	-.13413	-.12405
40	-.07580	.02755	-.03877	-.14477	-.14000	-.05769
41	-.07244	-.00078	-.01701	-.14191	-.14039	.00093
42	-.06923	-.03120	.00671	-.13836	-.14039	.06172
43	.53529	-.45906	.51465	-.06650	-.40024	.46325
44	.25682	-.19578	.23633	-.14251	-.19850	.30396

45	.16258	-.12219	.15938	-.14159	-.16979	.20690
46	.11519	-.07096	.10633	-.12968	-.14272	.12795
47	.09268	-.04233	.07696	-.11841	-.12518	.07981
48	.07792	-.01792	.05192	-.10355	-.10630	.03657
49	.05996	.00615	.02696	-.08461	-.08509	-.00837
50	.04839	.02068	.01102	-.06252	-.06267	-.03687
51	.03926	.02480	.00467	-.03684	-.03750	-.04615
52	.03106	.01946	.00694	-.01766	-.01834	-.03698
53	.02383	.00820	.01445	-.00514	-.00489	-.01593
54	.01713	-.00672	.02509	-.00085	.00107	.01287
55	.01050	-.02219	.03652	-.00223	.00147	.04292
56	.00662	-.03976	.04998	-.00426	.00147	.07634
57	.41944	.29066	-.29098	.55706	.27917	-1.02544
58	.11652	.30853	-.31093	.14807	.06156	-.76694
59	.11408	.21884	-.21719	.07858	.03163	-.52225
60	.08391	.18714	-.18477	.03294	.00404	-.43042
61	.06448	.16948	-.16715	.00611	-.01384	-.38179
62	.04347	.15049	-.14876	-.02105	-.03299	-.33211
63	.01912	.13615	-.13582	-.04927	-.05437	-.29594
64	-.00802	.12307	-.12464	-.07763	-.07684	-.26485
65	-.04022	.10433	-.10867	-.10784	-.10190	-.22281
66	-.06126	.07913	-.08726	-.12874	-.12087	-.16777
67	-.07343	.05041	-.06329	-.14119	-.13413	-.10633
68	-.07528	.01927	-.03786	-.14413	-.14000	-.04076
69	-.07187	-.00858	-.01550	-.14127	-.14039	.01658
70	-.06864	-.03826	.00625	-.13777	-.14039	.07555
71	.56098	-.47737	.52549	-.05479	-.40024	.47180
72	.26856	-.20685	.23919	-.14063	-.19850	.32143
73	.16958	-.12977	.15799	-.14097	-.16979	.22116
74	.11956	-.07698	.10264	-.12953	-.14272	.14015
75	.09570	-.04780	.07214	-.11841	-.12518	.09111
76	.08000	-.02330	.04650	-.10359	-.10630	.04771
77	.06085	.00048	.02176	-.08464	-.08509	.00321
78	.04850	.01472	.00677	-.06256	-.06267	-.02476
79	.03879	.01878	.00165	-.03697	-.03751	-.03393
80	.03016	.01358	.00518	-.01789	-.01834	-.02507
81	.02268	.00249	.01383	-.00548	-.00490	-.00442
82	.01598	-.01245	.02549	-.00128	.00107	.02427
83	.00961	-.02811	.03766	-.00272	.00147	.05452
84	.00620	-.04602	.05170	-.00481	.00147	.08837
85	.41971	.29502	-.30068	.56281	.27917	-1.04497
86	.11659	.30989	-.31754	.14919	.06156	-.79396
87	.11412	.21802	-.22144	.07896	.03183	-.52221
88	.08392	.18470	-.18725	.03296	.00404	-.42596
89	.06446	.16582	-.16820	.00597	-.01384	-.37415
90	.04345	.14524	-.14792	-.02128	-.03299	-.32054
91	.01913	.12892	-.13263	-.04945	-.05437	-.27964
92	-.00791	.11398	-.11939	-.07757	-.07684	-.24427
93	-.03989	.09361	-.10185	-.10736	-.10190	-.19879

94	-.06072	.06726	-.07963	-.12782	-.12087	-.14173
95	-.07274	.03814	-.05570	-.14000	-.13413	-.08013
96	-.07455	.00761	-.03118	-.14292	-.14000	-.01668
97	-.07119	-.01894	-.01007	-.14021	-.14039	.03736
98	-.06801	-.04660	.01202	-.13696	-.14039	.09176
99	.57119	-.48625	.53009	-.04939	-.40024	.47627
100	.27270	-.21270	.24084	-.13961	-.19850	.33049
101	.17161	-.13363	.15787	-.14059	-.16979	.22821
102	.12008	-.07948	.10157	-.12943	-.14272	.14510
103	.09524	-.04930	.07057	-.11842	-.12518	.09424
104	.07872	-.02357	.04458	-.10366	-.10630	.04842
105	.05813	.00158	.01982	-.08470	-.08509	.00109
106	.04455	.01669	.00521	-.06255	-.06267	-.02872
107	.03389	.02086	.00068	-.03688	-.03751	-.03814
108	.02481	.01489	.00472	-.01781	-.01834	-.02771
109	.01746	.00232	.01360	-.00548	-.00490	-.00408
110	.01148	-.01460	.02527	-.00142	.00107	.02855
111	.00648	-.03195	.03743	-.00298	.00146	.06207
112	.00408	-.05166	.05203	-.00523	.00146	.09927
113	.42013	.27734	-.27244	.54410	.27917	-.97614
114	.11693	.29639	-.29256	.14383	.06156	-.74881
115	.11464	.20676	-.19621	.07502	.03183	-.48689
116	.08490	.17131	-.15676	.02949	.00404	-.36645
117	.06607	.14687	-.13246	.00266	-.01385	-.32268
118	.04568	.11720	-.11104	-.02391	-.03299	-.25124
119	.02158	.09337	-.10280	-.05066	-.05438	-.19746
120	-.00560	.07598	-.10023	-.07731	-.07684	-.16023
121	-.03799	.05592	-.09354	-.10593	-.10190	-.11860
122	-.05974	.03190	-.08072	-.12604	-.12087	-.06904
123	-.07270	.00739	-.06353	-.13841	-.13413	-.01366
124	-.07512	-.01586	-.04237	-.14190	-.14000	.02933
125	-.07189	-.03510	-.02163	-.13973	-.14039	.06871
126	-.06866	-.05606	.00038	-.13696	-.14039	.11013
127	.54036	-.45802	.51068	-.06856	-.40024	.46647
128	.25421	-.18676	.22697	-.14504	-.19650	.29281
129	.15678	-.10741	.14883	-.14427	-.16979	.16285
130	.10394	-.04971	.09689	-.13202	-.14272	.08902
131	.07631	-.01787	.07081	-.12017	-.12518	.03274
132	.05714	.00476	.05118	-.10442	-.10630	-.00846
133	.03489	.02216	.03131	-.08476	-.08509	-.04090
134	.02304	.02883	.01834	-.06246	-.06267	-.05361
135	.01528	.02571	.01153	-.03697	-.03751	-.04809
136	.00921	.01469	.00937	-.01801	-.01834	-.02736
137	.00465	-.00041	.00948	-.00544	-.00490	.00145
138	.00158	-.01803	.01186	-.00089	.00106	.03575
139	.00016	-.03529	.01815	-.00210	.00146	.06956
140	.00001	-.05599	.03086	-.00432	.00146	.10926

NACA RM L51F07 TRANSONIC WING-BODY DEFINITION
NACA TRANSONIC WING-BODY PANELING

INTEGRATION OF THE PRESSURE DISTRIBUTION

ON THE WING

MACH= .6000 ALPHA= 4.0000

POINT	X	Y	Z	X/C	2Y/B	Z/C	CP	CN	CA	CM	POINT
1	15.46024	2.58783	.03361	.01250	.21565	.00490	-.82204	.28155	-.11048	1.27446	1
2	15.63156	2.58783	.07860	.03750	.21565	.01147	-.66020	.22612	-.03003	.98542	2
3	15.88855	2.58783	.10749	.07500	.21565	.01569	-.44380	.30400	-.03107	1.24656	3
4	16.23120	2.58783	.13768	.12500	.21565	.02009	-.37704	.25827	-.01911	.97075	4
5	16.57386	2.58783	.15995	.17500	.21565	.02334	-.34492	.23627	-.01323	.80739	5
6	17.08783	2.58783	.18215	.25000	.21565	.02658	-.31467	.43109	-.01586	1.25253	6
7	17.77314	2.58783	.20004	.35000	.21565	.02919	-.29301	.40142	-.00618	.89267	7
8	18.45844	2.58783	.20288	.45000	.21565	.02961	-.27511	.37691	.00268	.58156	8
9	19.14375	2.58783	.18938	.55000	.21565	.02764	-.24706	.33848	.01093	.29189	9
10	19.82905	2.58783	.16067	.65000	.21565	.02345	-.20684	.28337	.01459	.05079	10
11	20.51436	2.58783	.12075	.75000	.21565	.01762	-.15524	.21268	.01382	-.10772	11
12	21.19966	2.58783	.07415	.85000	.21565	.01082	-.09132	.12511	.00888	-.14943	12
13	21.71364	2.58783	.03759	.92500	.21565	.00546	-.02906	.01991	.00142	-.03406	13
14	22.05629	2.58783	.01312	.97500	.21565	.00191	.03610	-.02473	-.00177	.05083	14
15	15.46024	2.58783	-.03361	.01250	.21565	-.00490	.46891	.16060	.06302	.72697	15
16	15.63156	2.58783	-.07860	.03750	.21565	-.01147	.30138	.10322	.01371	.44985	16
17	15.88855	2.58783	-.10749	.07500	.21565	-.01569	.21451	.14694	.01502	.60251	17
18	16.23120	2.58783	-.13768	.12500	.21565	-.02009	.14276	.09779	.00724	.36756	18
19	16.57386	2.58783	-.15995	.17500	.21565	-.02334	.09793	.06708	.00376	.22922	19
20	17.08783	2.58783	-.18215	.25000	.21565	-.02658	.05463	.07484	.00275	.21745	20
21	17.77314	2.58783	-.20004	.35000	.21565	-.02919	.00088	.00121	.00002	.00268	21
22	18.45844	2.58783	-.20288	.45000	.21565	-.02961	-.04360	-.05973	.00042	-.09217	22
23	19.14375	2.58783	-.18938	.55000	.21565	-.02764	-.06744	-.09239	.00298	-.07967	23
24	19.82905	2.58783	-.16067	.65000	.21565	-.02345	-.07119	-.09754	.00502	-.01748	24
25	20.51436	2.58783	-.12075	.75000	.21565	-.01762	-.05470	-.07493	.00487	.03795	25
26	21.19966	2.58783	-.07415	.85000	.21565	-.01082	-.02226	-.03050	.00217	.03643	26
27	21.71364	2.58783	-.03759	.92500	.21565	-.00548	.01355	.00928	-.00066	-.01588	27
28	22.05629	2.58783	-.01312	.97500	.21565	-.00191	.05120	.03507	-.00250	-.07209	28
29	17.78357	4.78095	.03092	.01250	.39841	.00490	-.96228	.36374	-.14273	.80180	29
30	17.94119	4.78095	.07232	.03750	.39841	.01147	-.75012	.28354	-.03765	.58104	30
31	18.17762	4.78095	.09889	.07500	.39841	.01569	-.50191	.37945	-.03678	.68766	31
32	18.49286	4.78095	.12666	.12500	.39841	.02009	-.41889	.31668	-.02343	.47432	32
33	18.80810	4.78095	.14715	.17500	.39841	.02334	-.37605	.28429	-.01592	.33650	33
34	19.28095	4.78095	.14758	.25000	.39841	.02658	-.33292	.50338	-.01852	.35885	34

35	19.91143	4.78095	.18404	.35000	.39841	.02919	-.30335	.45866	-.00706	.03932	35
36	20.54190	4.78095	.18665	.45000	.39841	.02961	-.27716	.41906	.00298	-.22653	36
37	21.17238	4.78095	.17423	.55000	.39841	.02764	-.23845	.36053	.01165	-.42065	37
38	21.80286	4.78095	.14782	.65000	.39841	.02345	-.18516	.27996	.01442	-.50260	38
39	22.43333	4.78095	.11109	.75000	.39841	.01762	-.12405	.18757	.01219	-.45507	39
40	23.06381	4.78095	.06822	.85000	.39841	.01082	-.05769	.08722	.00619	-.26681	40
41	23.53667	4.78095	.03458	.92500	.39841	.00548	.00093	-.00070	-.00005	.00249	41
42	23.85190	4.78095	.01207	.97500	.39841	.00191	.06172	-.04666	-.00333	.17970	42
43	17.78357	4.78095	-.03092	.01250	.39841	-.00490	.46325	.17511	.06871	.38599	43
44	17.94119	4.78095	-.07232	.03750	.39841	-.01147	.30396	.11490	.01526	.23545	44
45	18.17762	4.78095	-.09889	.07500	.39841	-.01569	.20690	.15642	.01599	.28347	45
46	18.49286	4.78095	-.12666	.12500	.39841	-.02009	.12795	.09673	.00716	.14488	46
47	18.80810	4.78095	-.14715	.17500	.39841	-.02334	.07981	.06033	.00338	.07142	47
48	19.28095	4.78095	-.16758	.25000	.39841	-.02658	.03657	.05530	.00203	.03942	48
49	19.91143	4.78095	-.18404	.35000	.39841	-.02919	-.00837	-.01266	-.00019	-.00109	49
50	20.54190	4.78095	-.18665	.45000	.39841	-.02961	-.03687	-.05574	.00040	.03013	50
51	21.17238	4.78095	-.17423	.55000	.39841	-.02764	-.04615	-.06978	.00225	.08141	51
52	21.80286	4.78095	-.14782	.65000	.39841	-.02345	-.03698	-.05591	.00288	.10038	52
53	22.43333	4.78095	-.11109	.75000	.39841	-.01762	-.01593	-.02409	.00157	.05644	53
54	23.06381	4.78095	-.06822	.85000	.39841	-.01082	.01287	.01946	-.00138	-.05954	54
55	23.53667	4.78095	-.03458	.92500	.39841	-.00548	.04292	.03245	-.00232	-.11467	55
56	23.85190	4.78095	-.01207	.97500	.39841	-.00191	.07634	.05771	-.00412	-.22225	56
57	20.32395	7.17895	.02798	.01250	.59825	.00490	-1.02544	.35070	-.13761	-.11746	57
58	20.46658	7.17895	.06544	.03750	.59825	.01147	-.78694	.26913	-.03574	-.12791	58
59	20.68053	7.17895	.08949	.07500	.59825	.01569	-.52225	.35722	-.03651	-.24636	59
60	20.96579	7.17895	.11462	.12500	.59825	.02009	-.43042	.29440	-.02179	-.28683	60
61	21.25105	7.17895	.13316	.17500	.59825	.02334	-.38179	.26115	-.01462	-.32865	61
62	21.67895	7.17895	.15165	.25000	.59825	.02658	-.33211	.45432	-.01672	-.76532	62
63	22.24947	7.17895	.16654	.35000	.59825	.02919	-.29594	.40484	-.00623	-.91172	63
64	22.82000	7.17895	.16890	.45000	.59825	.02961	-.26485	.36231	.00257	-1.02128	64
65	23.39053	7.17895	.15766	.55000	.59825	.02764	-.22281	.30480	.00985	-1.03188	65
66	23.96105	7.17895	.13376	.65000	.59825	.02345	-.16777	.22951	.01182	-.90752	66
67	24.53158	7.17895	.10053	.75000	.59825	.01762	-.10633	.14545	.00945	-.65818	67
68	25.10211	7.17895	.06173	.85000	.59825	.01082	-.04076	.05577	.00396	-.28428	68
69	25.53000	7.17895	.03129	.92500	.59825	.00549	.01658	-.01134	-.00081	.06269	69
70	25.81526	7.17895	.01093	.97500	.59825	.00192	.07555	-.05168	-.00369	.30046	70
71	20.32395	7.17895	-.02798	.01250	.59825	-.00490	.47180	.16136	.06332	-.05404	71
72	20.46658	7.17895	-.06544	.03750	.59825	-.01147	.32143	.10993	.01460	-.05225	72
73	20.68053	7.17895	-.08949	.07500	.59825	-.01569	.22116	.15128	.01546	-.10433	73
74	20.96579	7.17895	-.11462	.12500	.59825	-.02009	.14015	.09586	.00709	-.09339	74
75	21.25105	7.17895	-.13316	.17500	.59825	-.02334	.09111	.06232	.00349	-.07843	75
76	21.67895	7.17895	-.15165	.25000	.59825	-.02658	.04771	.06526	.00240	-.10993	76
77	22.24947	7.17895	-.16654	.35000	.59825	-.02919	.00321	.00439	.00007	-.00988	77
78	22.82000	7.17895	-.16890	.45000	.59825	-.02961	-.02476	-.03388	.00024	.09549	78
79	23.39053	7.17895	-.15766	.55000	.59825	-.02764	-.03393	-.04642	.00150	.15716	79
80	23.96105	7.17895	-.13376	.65000	.59825	-.02345	-.02507	-.03429	.00177	.13560	80
81	24.53158	7.17895	-.10053	.75000	.59825	-.01762	-.00442	-.00605	.00039	.02737	81
82	25.10211	7.17895	-.06173	.85000	.59825	-.01082	.02427	.03320	-.00236	-.16926	82
83	25.53000	7.17895	-.03129	.92500	.59825	-.00549	.05452	.03729	-.00266	-.20613	83

84	25.81526	7.17895	-.01093	.97500	.59825	-.00192	.08837	.06045	-.00432	-.35146	84
85	22.86382	9.57647	.02504	.01250	.79804	.00491	-1.04497	.31976	-.12547	-.91888	85
86	22.99147	9.57647	.05856	.03750	.79804	.01147	-.79396	.24295	-.03226	-.72867	86
87	23.18294	9.57647	.08009	.07500	.79804	.01569	-.52221	.31960	-.03266	-1.01987	87
88	23.43824	9.57647	.10258	.12500	.79804	.02009	-.42596	.26069	-.01929	-.89828	88
89	23.69353	9.57647	.11917	.17500	.79804	.02334	-.37415	.22898	-.01282	-.84728	89
90	24.07647	9.57647	.13571	.25000	.79804	.02658	-.32054	.39234	-.01444	-1.60132	90
91	24.58706	9.57647	.14904	.35000	.79804	.02919	-.27964	.34228	-.00527	-1.57083	91
92	25.09765	9.57647	.15116	.45000	.79804	.02961	-.24427	.29899	.00212	-1.52380	92
93	25.60824	9.57647	.14110	.55000	.79804	.02764	-.19879	.24331	.00786	-1.36345	93
94	26.11882	9.57647	.11971	.65000	.79804	.02345	-.14173	.17347	.00893	-1.06038	94
95	26.62941	9.57647	.08997	.75000	.79804	.01762	-.06013	.09808	.00638	-.64963	95
96	27.14000	9.57647	.05525	.85000	.79804	.01082	-.01668	.02041	.00145	-.14567	96
97	27.52294	9.57647	.02801	.92500	.79804	.00549	.03736	-.02286	-.00163	.17194	97
98	27.77824	9.57647	.00978	.97500	.79804	.00191	.09176	-.05615	-.00401	.43674	98
99	22.86382	9.57647	-.02504	.01250	.79804	-.00491	.47627	.14574	.05719	-.41880	99
100	22.99147	9.57647	-.05856	.03750	.79804	-.01147	.33049	.10113	.01343	-.30332	100
101	23.18294	9.57647	-.08009	.07500	.79804	-.01569	.22821	.13967	.01427	-.44569	101
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103	23.69353	9.57647	-.11917	.17500	.79804	-.02334	.09424	.05767	.00323	-.21340	103
104	24.07647	9.57647	-.13571	.25000	.79804	-.02658	.04842	.05926	.00218	-.24187	104
105	24.58706	9.57647	-.14904	.35000	.79804	-.02919	.00109	.00133	.00002	-.00612	105
106	25.09765	9.57647	-.15116	.45000	.79804	-.02961	-.02872	-.03516	.00025	.17918	106
107	25.60824	9.57647	-.14110	.55000	.79804	-.02764	-.03814	-.04668	.00151	.26159	107
108	26.11882	9.57647	-.11971	.65000	.79804	-.02345	-.02771	-.03392	.00175	.20735	108
109	26.62941	9.57647	-.08997	.75000	.79804	-.01762	-.00408	-.00499	.00032	.03306	109
110	27.14000	9.57647	-.05525	.85000	.79804	-.01082	.02855	.03494	-.00248	-.24935	110
111	27.52294	9.57647	-.02801	.92500	.79804	-.00549	.06207	.03799	-.00271	-.28569	111
112	27.77824	9.57647	-.00978	.97500	.79804	-.00191	.09927	.06075	-.00434	-.47249	112
113	24.78879	11.39355	.02282	.01250	.94946	.00490	-.97614	.13617	-.05343	-.65332	113
114	24.90508	11.39355	.05335	.03750	.94946	.01147	-.74881	.10446	-.01387	-.51312	114
115	25.07952	11.39355	.07296	.07500	.94946	.01569	-.48689	.13584	-.01388	-.69102	115
116	25.31210	11.39355	.09345	.12500	.94946	.02009	-.38645	.10782	-.00798	-.57349	116
117	25.54468	11.39355	.10857	.17500	.94946	.02334	-.32268	.09003	-.00504	-.49972	117
118	25.89355	11.39355	.12364	.25000	.94946	.02658	-.25124	.14019	-.00516	-.82687	118
119	26.35871	11.39355	.13578	.35000	.94946	.02919	-.19746	.11018	-.00170	-.70084	119
120	26.82387	11.39355	.13771	.45000	.94946	.02961	-.16023	.08941	.00063	-.61003	120
121	27.28903	11.39355	.12855	.55000	.94946	.02764	-.11860	.06618	.00214	-.46209	121
122	27.75419	11.39355	.10906	.65000	.94946	.02345	-.06904	.03853	.00198	-.29853	122
123	28.21935	11.39355	.08196	.75000	.94946	.01762	-.01866	.01041	.00068	-.08552	123
124	28.68452	11.39355	.05033	.85000	.94946	.01082	.02933	-.01636	-.00116	.14206	124
125	29.03339	11.39355	.02551	.92500	.94946	.00548	.06871	-.01917	-.00137	.17314	125
126	29.26597	11.39355	.00891	.97500	.94946	.00191	.11013	-.03073	-.00219	.28469	126
127	24.78879	11.39355	-.02282	.01250	.94946	-.00490	.46647	.06507	.02553	-.31220	127
128	24.90508	11.39355	-.05335	.03750	.94946	-.01147	.29281	.04065	.00542	-.26065	128
129	25.07952	11.39355	-.07296	.07500	.94946	-.01569	.18285	.05101	.00521	-.25951	129
130	25.31210	11.39355	-.09345	.12500	.94946	-.02009	.08902	.02484	.00184	-.13210	130
131	25.54468	11.39355	-.10857	.17500	.94946	-.02334	.03274	.00913	.00051	-.05070	131
132	25.89355	11.39355	-.12364	.25000	.94946	-.02658	-.00846	-.00472	-.00017	.02784	132

133	26.35871	11.39355	-.13578	.35000	.94946	-.02919	-.04090	-.02282	-.00035	.14516	133
134	26.82387	11.39355	-.13771	.45000	.94946	-.02961	-.05361	-.02992	.00021	.20411	134
135	27.28903	11.39355	-.12855	.55000	.94946	-.02764	-.04809	-.02683	.00087	.19548	135
136	27.75419	11.39355	-.10906	.65000	.94946	-.02345	-.02736	-.01527	.00079	.11831	136
137	28.21935	11.39355	-.08196	.75000	.94946	-.01762	.00145	.00081	-.00005	-.00666	137
138	28.68452	11.39355	-.05033	.85000	.94946	-.01082	.03575	.01995	-.00142	-.17319	138
139	29.03339	11.39355	-.02551	.92500	.94946	-.00548	.06956	.01941	-.00139	-.17528	139
140	29.26597	11.39355	-.00891	.97500	.94946	-.00191	.10926	.03048	-.00218	-.28244	140

TOTAL COEFFICIENTS

ON THE WING

REFA= 144.0000 REFB= 12.0000 REFC= 6.1250

REFX= 20.0000 REFZ= 0.0000

MACH= .60000
ALPHA= 4.00000
CN= .23499
CA= -.00717
CM= -.03226
CL= .23491
CD= .00923
XCP= 3.40257

TOTAL COEFFICIENTS

ON THE COMPLETE CONFIGURATION

REFA= 144.0000 REFB= 12.0000 REFC= 6.1250

REFX= 20.0000 REFZ= 0.0000

MACH= .60000
ALPHA= 4.00000
CN= .25341
CA= -.00322
CM= .03165
CL= .25302
CD= .01447
XCP= 3.14040

SECTION COEFFICIENTS

ON THE WING

DELY= 2.0000 REFL= 6.1250 XLE= 15.3746

MACH=	.60000
ALPHA=	4.00000
CN=	.27808
CA=	-.00420
CM=	.12516
CL=	.27770
CD=	.01521
XCP=	2.81523

DELY= 2.4000 REFL= 6.1250 XLE= 17.7048

MACH=	.60000
ALPHA=	4.00000
CN=	.29257
CA=	-.00849
CM=	.02831
CL=	.29245
CD=	.01194
XCP=	3.16855

DELY= 2.4000 REFL= 6.1250 XLE= 20.2526

MACH=	.60000
ALPHA=	4.00000
CN=	.29850
CA=	-.00987
CM=	-.08511
CL=	.29846
CD=	.01098
XCP=	3.55042

SECTION COEFFICIENTS

ON THE WING

DELY= 2.4000 REFL= 6.1250 XLE= 22.8000

MACH=	.60000
ALPHA=	4.00000
CN=	.28304
CA=	-.01060
CM=	-.18627
CL=	.28309
CD=	.00917
XCP=	3.92343

DELY= 1.2000 REFL= 6.1250 XLE= 24.7306

MACH=	.60000
ALPHA=	4.00000
CN=	.20153
CA=	-.01174
CM=	-.18241
CL=	.20186
CD=	.00235
XCP=	4.17041

CPSTAG = 1.09327 CPCRIT = -1.29434 CPVAC = -3.96825

SOLVE, TIME =1217.65400

BEGIN A NEW CONFIGURATION

THE PLOT CONTROL CARD IMAGE IS,

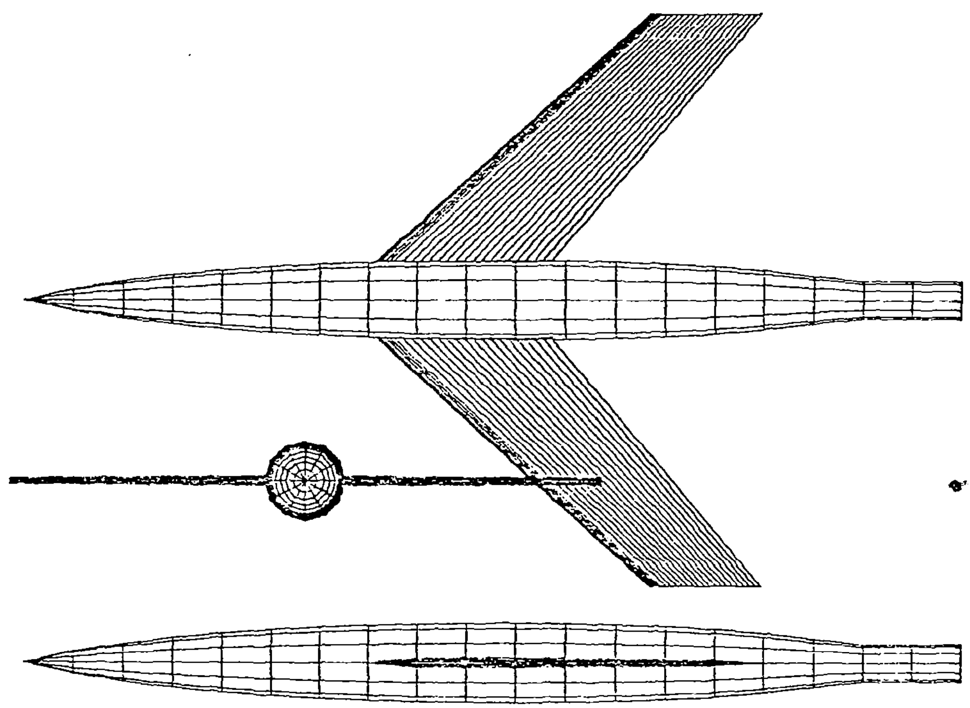
PLOT.VARIAN(XO=1.,YO=1.)

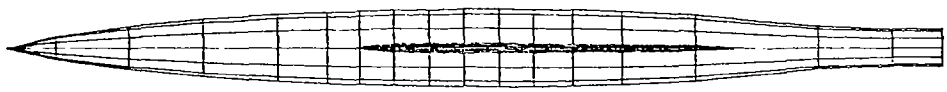
FRAME	XO	YO	XM	YM	CAL. POS
1	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
2	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
3	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
4	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
5	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
6	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
7	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
8	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
9	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
10	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
11	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
12	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.
13	1.000000E+00	1.000000E+00	1.000000E+00	1.000000E+00	0.

Appendix C

PLOTTING OUTPUT

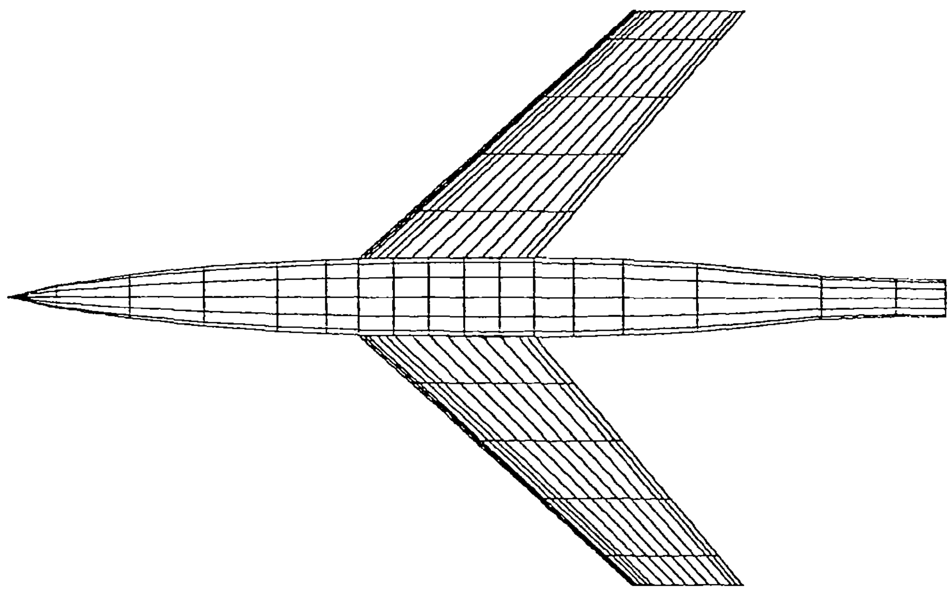
NACA RM L51F07 TRANSONIC WING-BODY DEFINITION





NACA TRANSONIC WING-BODY PANELING

X Z 0. 0. 0. 0. 0. 0. 0. 0. 10.00T



NACA TRANSONIC WING-BODY PANELING

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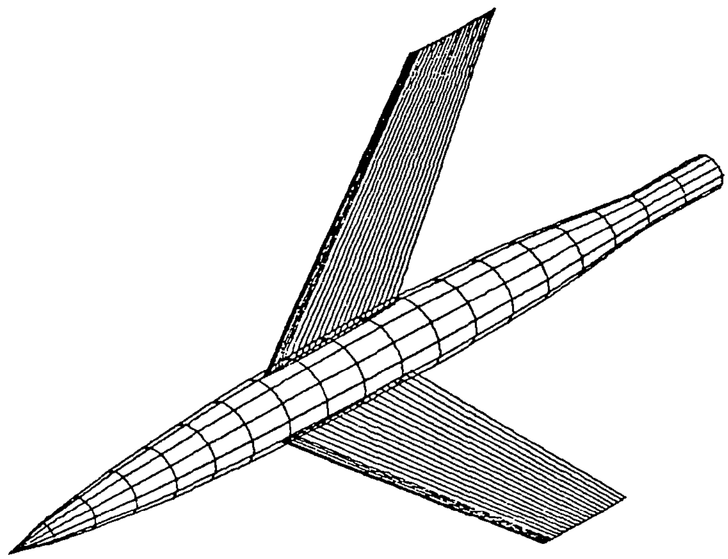
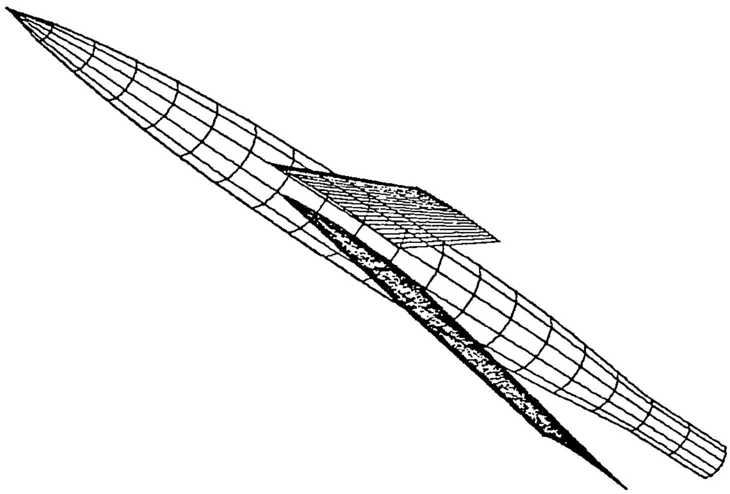


NACA RM L51F07 TRANSONIC WING-BODY DEFINITION

X Y OUT 30. 30. 30. 0. 0. 0. 0. 0. 10.0RT 1



NACA RM L51F07 TRANSONIC WING-BODY DEFINITION

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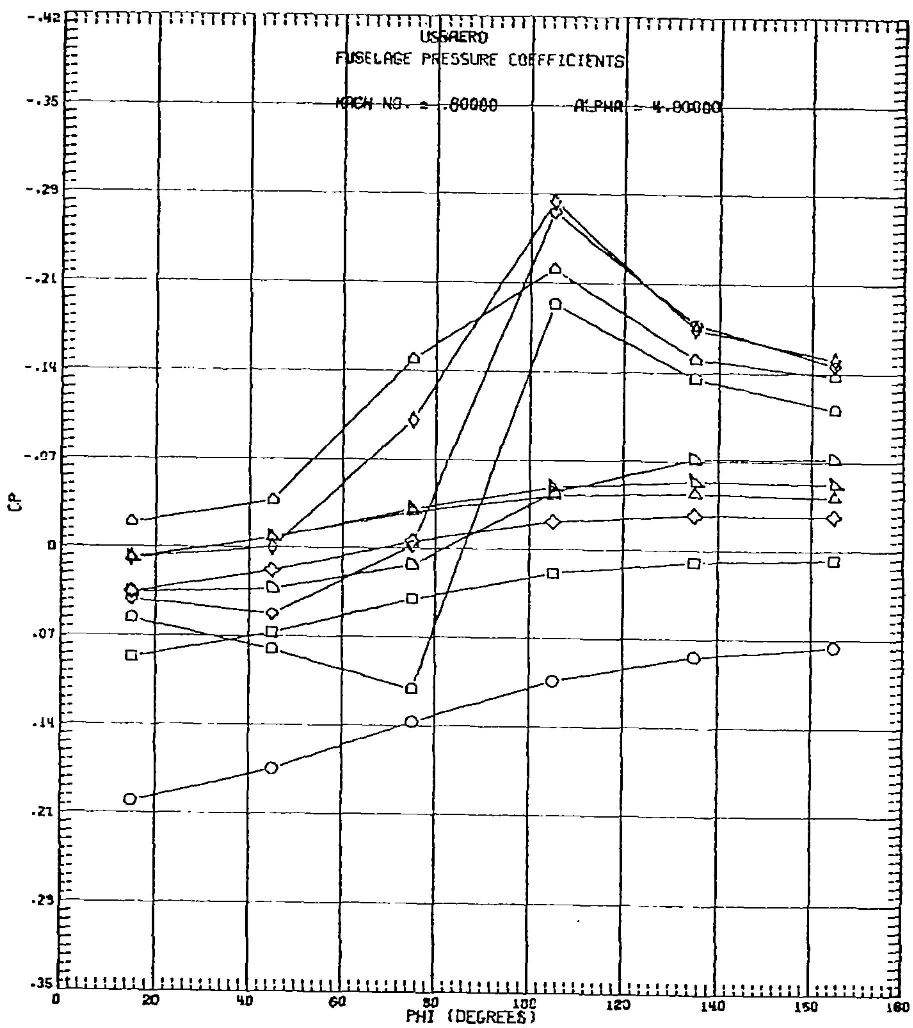


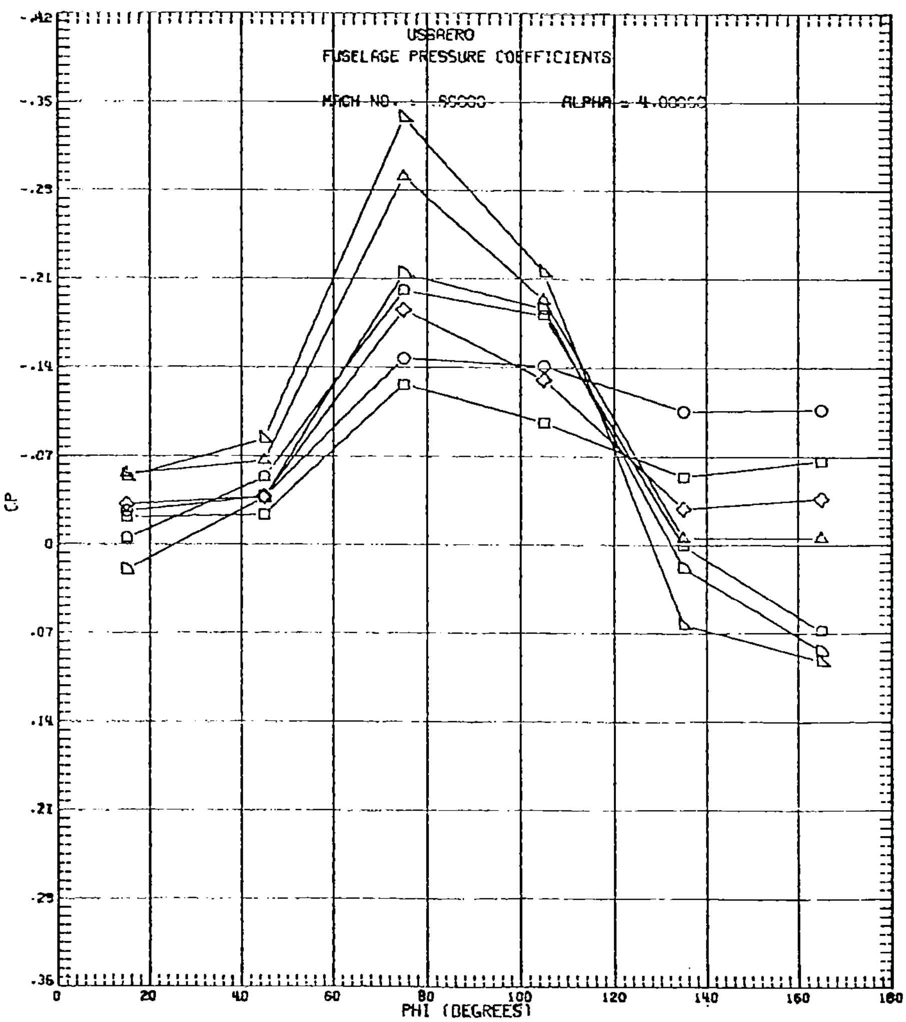
USSAERO
FUSELAGE PRESSURE COEFFICIENTS
MACH NO. = .80000
ALPHA = 4.00000
CP
PHI (DEGREES)

LEGEND

FUSELAGE PRESSURE PLOTS

MACH NO. = .60000 ALPHA = 4.00000

○ X = 1.33333
□ X = 3.65426
◇ X = 6.57497
△ X = 9.53992
◺ X = 12.01046
◁ X = 13.56576
⌂ X = 15.03022
⚲ X = 16.44573
◊ X = 17.87616
△ X = 19.30559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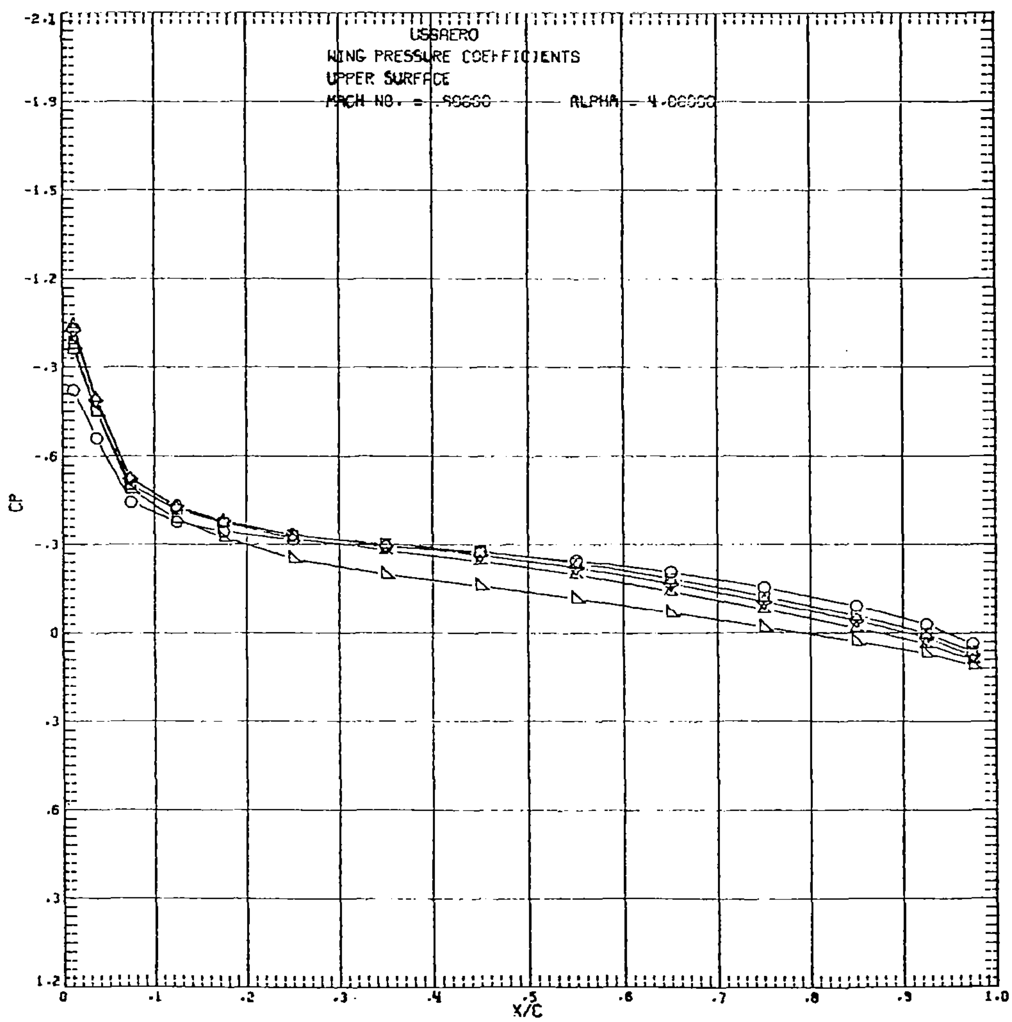
FUSELAGE PRESSURE COEFFICIENTS
MACH NO. = .85000
ALPHA = 4.00000
CP
PHI (DEGREES)

LEGEND
FUSELAGE PRESSURE PLOTS

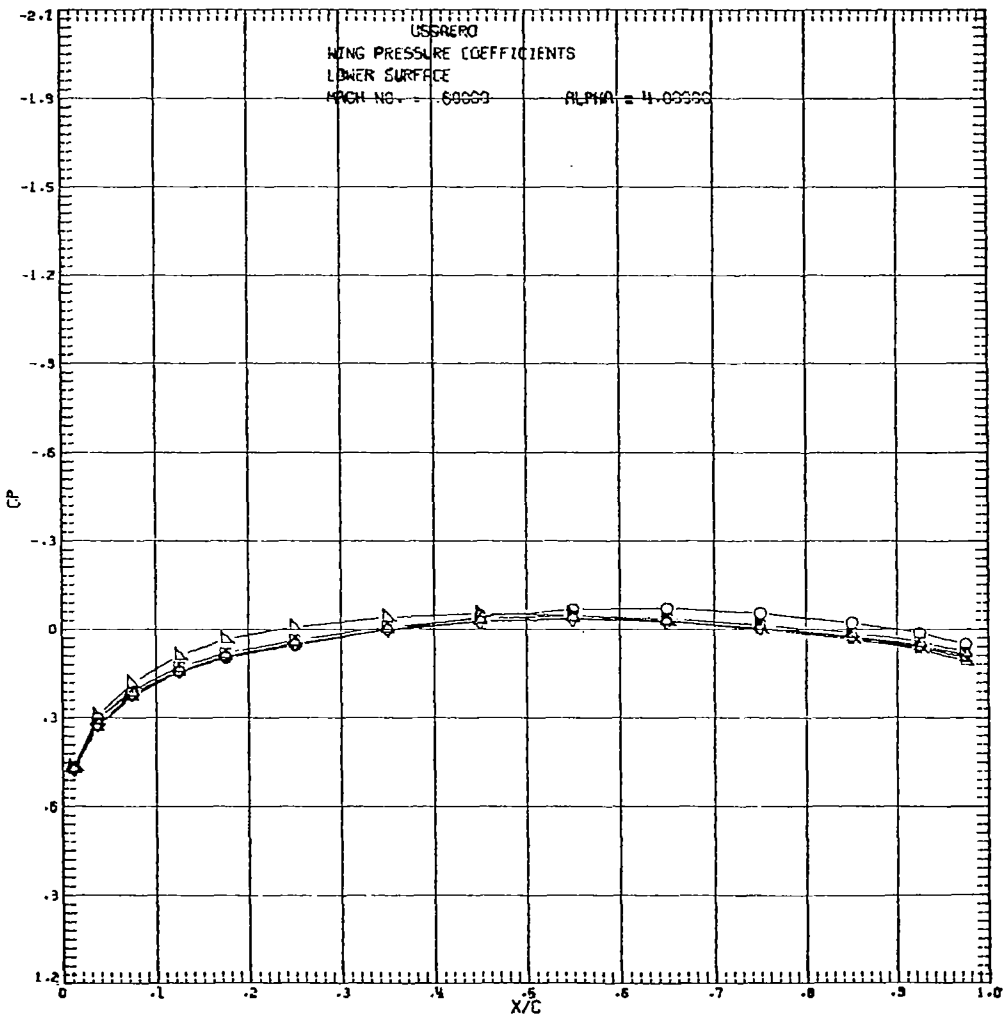
MACH NO. = .60000 ALPHA = 4.00000

○ X = 20.72176
□ X = 22.21036
◇ X = 23.33402
△ X = 26.47552
◺ X = 30.31382
◿ X = 34.46933
⌂ X = 37.00000


USSAERO
WING PRESSURE COEFFICIENTS
UPPER SURFACE
MACH NO. = .50000 ALPHA = 4.00000
CP
X/C

LEGEND
WING PRESSURE PLOTS
UPPER SURFACE
MACH NO. = .60000 ALPHA = 4.00000

○ Y = 2.58783
□ Y = 4.78095
◇ Y = 7.17895
△ Y = 9.57647
⊿ Y = 11.33355


USSAERO
WING PRESSURE COEFFICIENTS
LOWER SURFACE
MACH NO. = .60000
ALPHA = 4.00000
CP
X/C

LEGEND
WING PRESSURE PLOTS
LOWER SURFACE
MACH NO. = .60000 ALPHA = 4.00000

○ Y = 2.59783
□ Y = 4.78085
◇ Y = 7.17995
△ Y = 9.57647
◺ Y = 11.33355

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Langley Technical Monitor: Charles H. Fox, Jr.
Topical Report

16. Abstract

The B01 version of the Unified Subsonic Supersonic Aerodynamic Analysis (USSAERO) program is the result of numerous modifications and additions made to the B00 version. These modifications and additions affect the program input, its computational options, the code readability, and the overlay structure.

This report describes the revised input; the plotting overlay programs, which were also modified, and their associated subroutines; the auxiliary files used by the program, the revised output data; and the program overlay structure. This information is presented from the viewpoint of a programmer.

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