NASA Contractor Report 3980

USSAERO Version D Computer Program Development Using ANSI Standard FORTRAN 77 and DI-3000 Graphics

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CONTRACT NAS1-17999
MAY 1986

NASA

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Prepared for
Langley Research Center
under Contract NAS1-17999

National Aeronautics
and Space Administration

**Scientific and Technical
Information Branch**

1986

SUMMARY

The D00 version of the Unified Subsonic and Supersonic Aerodynamics Analysis (USSAERO) program is the result of numerous modifications and enhancements to the B01 version.

Both versions calculate the pressure distribution and aerodynamic characteristics of aeronautical configurations in subsonic and supersonic potential flow.

The changes which resulted in the D00 version include conversion to ANSI standard FORTRAN 77 and the DI-3000 graphics package; removal of the CDC overlay structure; adding an input data analyzer routine; increasing the number of fuselage, fin and canard segments; enhancing the computer code to include the analysis of multiple pods, pylons and finned external stores; and modifying the wing analysis code to allow for coplanar wings.

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Section 1
INTRODUCTION

This FORTRAN 77 version (D00) of the Unified Subsonic and Supersonic Aerodynamic Analysis Computer Program (USSAERO) is the result of numerous enhancements to the B01 version.

These modifications include:

1) conversion to ANSI standard FORTRAN 77 and the DI-3000 graphics package
2) an input data error analysis routine
3) expanding the allowable number of fuselage, fin and canard segments
4) the analysis of multiple pods
5) enhancing the wing analysis to include coplanar wings
6) enabling the user to treat each aircraft component segment as a unique item
7) enhancing user control over the plotting capabilities
8) removal of the overlay structure

This report describes the D00 version program component limitations; presents the revised data input specifications and ordering; and gives a detailed description of every possible input card.

Appendix A describes the input and output files for version D00. Program features which are dependent upon the NASA Langley Research Center computer complex are presented in Appendix B. An example of the new input error analysis feature is shown in Appendix C and a comparison run between versions B01 and D00 is given in Appendix D.

Section 2

PROGRAM LIMITS

I. Aircraft components

A. wing: maximum of one (1)

B. fuselage: maximum of six (6)

C. pod: maximum of six (6)

D. fin: maximum of ten (10)

E. canard: maximum of ten (10)

II. Body components (fuselages plus pods)

A. axial stations: maximium of thirty (30)

B. panels: maximum of six hundred (600)

III. Lifting surface components (wing plus fins plus canards)

A. airfoil sections: maximum of twenty (20)

B. panels: maximum of six hundred (600)

NOTE: if the non-planar boundary condition option is selected (LINBC = 0), then the total number of lifting surface panels will equal twice the number of lifting surface panels for the planar boundary condition option.

Section 3

INPUT SPECIFICATIONS AND ORDERING

This section is designed to aid the user in determining which input cards are required for a particular configuration and the order in which they must appear.

Every input deck to USSAERO is divided into two sections: the initial configuration geometry and the auxiliary input. The first section is the master description of the configuration's geometry and the second is the controller for the aerodynamic analysis.

The following charts present all possible input cards, their inclusion criteria, and their repetition factor.

INPUT CARD REQUIREMENTS AND ORDER
INITIAL CONFIGURATION GEOMETRY

CARD/CARD CATEGORY	INCLUSION CRITERIA	REPETITION FACTOR
TITLE	Mandatory	
MAIN CONTROL	Mandatory	
WING CONTROL	JWNG = 1 OR -1	
FUSELAGE CONTROL	NFUS > 0	
POD CONTROL	NPOD > 0	
FIN CONTROL	NF > 0	
CANARD CONTROL	NCAN > 0	
REFERENCE AREA	JRF = 1	
WING DEFINITION CARDS	JWNG = 1 OR -1	
AIRFOIL ORDINATES' CHORD LOCATIONS	Mandatory	
AIRFOILS' ORIGIN/CHORD LENGTH	Mandatory	NWAF times
MEAN CAMBER LINES	JWNG = 1	NWAF times
ORDINATES (upper)	Mandatory	
ORDINATES (lower)	NWAFOR < 0	NWAF times

INPUT CARD REQUIREMENTS AND ORDER (cont.)
INITIAL CONFIGURATION GEOMETRY

CARD/CARD CATEGORY	INCLUSION CRITERIA	REPETITION FACTOR
FUSELAGE SEGMENT DEFINITION CARDS	NFUS > 0	
X-ORDINATES	Mandatory	
CAMBER LINE ORDINATES	J2TEST = 2	NFUS times
Y-ORDINATES	J2TEST = 3	
Z-ORDINATES	J2TEST = 3	NFORX times
CROSS-SECTIONAL AREAS	J2TEST = 1 or 2	
POD SEGMENT DEFINITION CARDS	NPOD > 0	
ORIGIN	Mandatory	
X-ORDINATES	Mandatory	NPOD times
Y-ORDINATES	J3TEST = -1 or 1	
Z-ORDINATES	J3TEST = -1 or 1	NPORX times
CROSS-SECTIONAL AREAS	J3TEST = 0	
FIN SEGMENT DEFINITION CARDS	NF > 0	
AIRFOILS' ORIGIN/CHORD LENGTH	Mandatory	
AIRFOIL ORDINATES' CHORD LOCATIONS	Mandatory	NF times
ORDINATES	Mandatory	

INPUT CARD REQUIREMENTS AND ORDER (cont.)
INITIAL CONFIGURATION GEOMETRY

CARD/CARD CATEGORY	INCLUSION CRITERIA	REPETITION FACTOR
CANARD SEGMENT DEFINITION CARDS	NCAN > 0	
AIRFOILS' ORIGIN/CHORD LENGTH	Mandatory	NCAN times
AIRFOIL ORDINATES' CHORD LOCATIONS	Mandatory	
ORDINATES (upper)	Mandatory	
ORDINATES (lower)	NCANOR < 0	
PLOT CARDS	PLOT = 1	until KODE = 1

INPUT CARD REQUIREMENTS AND ORDER (cont.)
AUXILIARY INPUT

CARD/CARD CATEGORY	INCLUSION CRITERIA	REPETITION FACTOR
TITLE	Mandatory	
NOTE: if only HALT is on the card (columns 1 → 5) then omit all of the following cards		
BOUNDARY CONDITION/CONTROL POINT	Mandatory	
CONTROL	Mandatory	
WING CONTROL	JWNG = 1 OR -1, K1 < 0	
FUSELAGE CONTROL	NFUS > 0, K2 < 0	
POD CONTROL	NPOD > 0, K3 < 0	
FIN LEADING-EDGE CONTROL	NF > 0, K4 < 0	
FIN CONTROL	NF > 0, K4 < 0	
CANARD LEADING-EDGE CONTROL	NCAN > 0, K5 < 0	
CANARD CONTROL	NCAN > 0, K5 < 0	
REFERENCE DIMENSIONS	KO = 1	
WING REDEFINITION CARDS	JWNG = 1 OR -1, K1 < 0 OR K1 = 3	
RADII	K1 = ± 3	
AIRFOIL ORDINATES' CHORD LOCATIONS	K1 < 0, KWAFOR > 0	
Y-ORDINATES	K1 < 0, KWAF > 0	

INPUT CARD REQUIREMENTS AND ORDER (cont.)
AUXILIARY INPUT

CARD/CARD CATEGORY	INCLUSION CRITERIA	REPETITION FACTOR
FUSELAGE REDEFINITION CARDS	NFUS > 0, K2 < 0	
MERIDIAN ANGLES	KRADX < 0	NFUS times
X-ORDINATES	KFORX > 0	
POD REDEFINITION CARDS	NPOD > 0, K3 < 0	
MERIDIAN ANGLES	KPRADX < 0	NPOD times
X-ORDINATES	KPORX > 0	
FIN REDEFINITION CARDS	NF > 0, K4 < 0	
RADII	K4TEST = 3	
AIRFOIL ORDINATES' CHORD LOCATIONS	KFINOR > 0	NF times
Z-ORDINATES	KF > 0	
CANARD REDEFINITION CARDS	NCAN > 0, K5 < 0	
RADII	K5TEST = 3	
AIRFOIL ORDINATES' CHORD LOCATIONS	KANOR > 0	NCAN times
Y-ORDINATES	KAN > 0	
PLOT CARDS	IPLOT = 1	until KODE = 1

INPUT CARD REQUIREMENTS AND ORDER (cont.)
AUXILIARY INPUT

CARD/CARD CATEGORY	INCLUSION CRITERIA	REPETITION FACTOR
AERODYNAMIC INPUT NOTE: if MACH = -1.0 then omit all of the following cards	Mandatory	
PRESSURE PLOT CONTROL	MPLOT = -1	
FUSELAGE PRESSURE CONTROL	KPLOTB = -1	
POD PRESSURE CONTROL	KPLOTP = -1	
FIN PRESSURE CONTROL	KPLOTF = -1	
CANARD PRESSURE CONTROL	KPLOTC = -1	
NORMAL VELOCITY INPUT	NORVEL = 1.0	
FIELD POINT	FLDPTS > 0.0	FLDPTS times
TERMINATION	Mandatory	

Section 4

INPUT CARDS

This section presents all possible input cards in the order which they must appear (if used). Each chart lists the input variable/variables name, allowable value(s), card columns where variable must go, and a description of the variable. Note that the card identifier label which goes in columns 73 through 80 is optional.

INITIAL CONFIGURATION GEOMETRY INPUT
TITLE CARD

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 70	TITLE1	Alphanumeric	Identifying Information
73 → 80	———	TITLEA	Card identifier

INITIAL CONFIGURATION GEOMETRY INPUT
MAIN CONTROL CARD

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	JRF	0	No reference area data
		1	Reference area to be read
4 → 6	JWNG	-1	Uncambered wing data to be read
		0	No wing data
		1	Cambered wing data to be read
7 → 9	NFUS	0	No fuselage data
		1 → 6	Number of fuselage segments to be described
10 → 12	NPOD	0	No pod data
		1 → 6	Number of pod segments to be described
13 → 15	NF	0	No fin data
		1 → 10	Number of fin segments to be described
16 → 18	NCAN	0	No canard data
		1 → 10	Number of canard segments to be described
19 → 21	PLOT	0	No plot cards for initial geometry
		1	Plot cards to be read for initial geometry
73 → 80	----	GCNTRL	Card identifier

INITIAL CONFIGURATION GEOMETRY INPUT
WING CONTROL CARD
(omit if JWNG=0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	NWAF	2 → 20	Number of wing airfoil sections
4 → 6	NWAFOR	±3 → ±30	Number of ordinates used to define each wing airfoil section. If NWAFOR is negative then upper and lower ordinates must be input.
73 → 80	-------	WCNTRL	Card identifier

INITIAL CONFIGURATION GEOMETRY INPUT
FUSELAGE CONTROL CARD
(omit if NFUS=0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	J2TEST (1)	1 2 3	Circular shape for first fuselage Circular cambered shape for first fuselage Arbitrary shape for first fuselage
4 → 6	NRADX (1)	3 → 20	Number of meridian lines used to define panel edges of first fuselage
7 → 9	NFORX (1)	2 → 30	Number of axial stations for first fuselage
10 → 12	J2TEST (2)	0, 1, 2, 3	Second fuselage
13 → 15	NRADX (2)	0, 3 → 20	Second fuselage
16 → 18	NFORX (2)	0, 2 → 30	Second fuselage
19 → 21	J2TEST (3)	0, 1, 2, 3	Third fuselage
22 → 24	NRADX (3)	0, 3 → 20	Third fuselage
25 → 27	NFORX (3)	0, 2 → 30	Third fuselage
28 → 30	J2TEST (4)	0, 1, 2, 3	Fourth fuselage
31 → 33	NRADX (4)	0, 3 → 20	Fourth fuselage
34 → 36	NFORX (4)	0, 2 → 30	Fourth fuselage

INITIAL CONFIGURATION GEOMETRY INPUT
FUSELAGE CONTROL CARD (cont.)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
37 → 39	J2TEST(5)	0, 1, 2, 3	Fifth fuselage
40 → 42	NRADX(5)	0, 3 → 20	Fifth fuselage
43 → 45	NFORX(5)	0, 2 → 30	Fifth fuselage
46 → 48	J2TEST(6)	0, 1, 2, 3	Sixth fuselage
49 → 51	NRADX(6)	0, 3 → 20	Sixth fuselage
52 → 54	NFORX(6)	0, 2 → 30	Sixth fuselage
73 → 80	----	FCNTRL	Card identifier

INITIAL CONFIGURATION GEOMETRY INPUT
POD CONTROL CARD
(omit if NPOD = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	J3TEST (1)	-1	Completely arbitrary shape for first pod
		0	Circular shape for first pod
		1	Axis-symmetric arbitrary shape for first pod
4 → 6	NPRADX (1)		Number of meridian lines used to define panel edges of first pod
		3 → 10	If J3TEST = 0 or -1
		3 → 20	If J3TEST = 1
7 → 9	NPORX (1)	2 → 30	Number of axial stations for first pod
10 → 12	J3TEST (2)	-1, 0, 1	Second pod
13 → 15	NPRADX (2)	0, 3 → 10, 3 → 20	Second pod
16 → 18	NPORX (2)	0, 2 → 30	Second pod
19 → 21	J3TEST (3)	-1, 0, 1	Third pod
22 → 24	NPRADX (3)	0, 3 → 10, 3 → 20	Third pod
25 → 27	NPORX (3)	0, 2 → 30	Third pod
28 → 30	J3TEST (4)	-1, 0, 1	Fourth pod
31 → 33	NPRADX (4)	0, 3 → 10, 3 → 20	Fourth pod

INITIAL CONFIGURATION GEOMETRY INPUT
POD CONTROL CARD (cont.)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
34 → 36	NPORX (4)	0, 2 → 30	Fourth pod
37 → 39	J3TEST (5)	-1, 0, 1	Fifth pod
40 → 42	NPRADX (5)	0, 3 → 10, 3 → 20	Fifth pod
43 → 45	NPORX (5)	0, 2 → 30	Fifth pod
46 → 48	J3TEST (6)	-1, 0, 1	Sixth pod
49 → 51	NPRADX (6)	0, 3 → 10, 3 → 20	Sixth pod
52 → 54	NPORX (6)	0, 2 → 30	Sixth pod
73 → 80	----	PCNTRL	Card identifier

INITIAL CONFIGURATION GEOMETRY INPUT
FIN CONTROL CARD
(omit if NF = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	NFINOR (1)	3 → 30	Number of ordinates used to define each airfoil section for first fin
4 → 6	NFINOR (2)	0, 3 → 30	Second fin
7 → 9	NFINOR (3)	0, 3 → 30	Third fin
10 → 12	NFINOR (4)	0, 3 → 30	Fourth fin
13 → 15	NFINOR (5)	0, 3 → 30	Fifth fin
16 → 18	NFINOR (6)	0, 3 → 30	Sixth fin
19 → 21	NFINOR (7)	0, 3 → 30	Seventh fin
22 → 24	NFINOR (8)	0, 3 → 30	Eighth fin
25 → 27	NFINOR (9)	0, 3 → 30	Ninth fin
28 → 30	NFINOR (10)	0, 3 → 30	Tenth fin
73 → 80	-------	FINCRL	Card identifier

INITIAL CONFIGURATION GEOMETRY INPUT
CANARD CONTROL CARD
(omit if NCAN = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	NCANOR (1)	±3 → ±30	Number of ordinates used to define each airfoil section for first canard. If NCANOR is negative then upper and lower ordinates must be input.
4 → 6	NCANOR (2)	0, ±3 → ±30	Second canard
7 → 9	NCANOR (3)	0, ±3 → ±30	Third canard
10 → 12	NCANOR (4)	0, ±3 → ±30	Fourth canard
13 → 15	NCANOR (5)	0, ±3 → ±30	Fifth canard
16 → 18	NCANOR (6)	0, ±3 → ±30	Sixth canard
19 → 21	NCANOR (7)	0, ±3 → ±30	Seventh canard
22 → 24	NCANOR (8)	0, ±3 → ±30	Eighth canard
25 → 27	NCANOR (9)	0, ±3 → ±30	Ninth canard
28 → 30	NCANOR (10)	0, ±3 → ±30	Tenth canard
73 → 80	----	CANCRL	Card identifier

INITIAL CONFIGURATION GEOMETRY INPUT
REFERENCE AREA CARD
(omit if JRF = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7	REFA	real	Wing reference area
73 → 80	----	REFA	Card identifier

INITIAL CONFIGURATION GEOMETRY INPUT
WING DEFINITION CARDS
AIRFOIL ORDINATES' CHORD LOCATIONS
(omit if JWNG = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	XAF	0.0 → 100.0	NWAFOR values describing the locations in percent chord at which the ordinates of all wing airfoils are to be specified. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is wing leading-edge to trailing edge.
73 → 80	----	XAFj	Card identifier, j is the card repetition number

INITIAL CONFIGURATION GEOMETRY INPUT
WING DEFINITION CARDS (cont.)
AIRFOILS' ORIGIN/CHORD LENGTH
(omit if JWNG = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7	WAFORGX	real	X-ordinate of airfoil leading-edge
8 → 14	WAFORGY	real	Y-ordinate of airfoil leading-edge
15 → 21	WAFORGZ	real	Z-ordinate of airfoil leading-edge
22 → 28	WAFORGC	real	Airfoil streamwise chord length
73 → 80	----	WAFORGj	Card identifier, j is the airfoil number

NOTE: Repeat this AIRFOILS' ORIGIN/CHORD LENGTH process NWAF times, order of input is inboard airfoil to outboard airfoil

INITIAL CONFIGURATION GEOMETRY INPUT
WING DEFINITION CARDS (cont.)
MEAN CAMBER LINES
(omit if JWNG = 0 or if JWNG = -1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	TZORD	real	NWAFOR values of delta Z referenced to the Z-ordinate of the airfoil leading edge, each value corresponding to a specified percent chord location on the the airfoil. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is wing leading-edge to trailing-edge.
73 → 80	----	TZORDjk	Card identifier, j is the airfoil number, k is the card repetition number

NOTE: Repeat this MEAN CAMBER LINES process NWAF times; order of input is inboard airfoil to outboard airfoil.

INITIAL CONFIGURATION GEOMETRY INPUT
WING DEFINITION CARDS (cont.)
ORDINATES
(omit if JWNG = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	WAFORD	0.0 → 100.0	NWAFOR values of airfoil half-thickness expressed as percent chord, each value corresponding to a specified percent chord location on the airfoil. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is wing leading edge to trailing-edge.
73 → 80	----	WAFORDjk	Card identifier, j is the airfoil number, k is the card repetition number

NOTE: If NWAFOR < 0, repeat this ORDINATES process for the lower wing

NOTE: Repeat this ORDINATES process NWAF times, order of input is inboard airfoil to outboard airfoil

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST FUSELAGE SEGMENT DEFINITION CARDS
X-ORDINATES
(omit if NFUS = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	XFUS	real	NFORX values of the X-ordinates of the fuselage stations. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is minimum X-ordinate to maximum.
73 → 80	-----	XFUSjk	Card identifier, j is the fuselage segment number, k is the card repetition number

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST FUSELAGE SEGMENT DEFINITION CARDS (cont.)
CAMBER LINE ORDINATES
(omit if NFUS = 0 or if J2TEST = 1 or 3)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	ZFUS	real	NFORX values of delta Z, each value corresponding to a X-ordinate fuselage station. Each card contains up to 10 values, each value input in a 7-column field width as a real number.
73 → 80	----	ZFUSjk	Card identifier, j is the fuselage segment number, k is the card repetition number

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST FUSELAGE SEGMENT DEFINITION CARDS (cont.)
Y and Z-ORDINATES
(omit if NFUS = 0 or if J2TEST = 1 or 2)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	SFUS (card 1)	real	NRADX values of the Y-ordinates of the first X-ordinate fuselage station. Each card contains up to 10 values, each value input in a 7-column field width as a real number. Order of input is bottom of fuselage to top.
73 → 80	----	YFjkl	Card identifier, j is the fuselage segment number, k is the fuselage station number, l is the card repetition number.
1 → 7 8 → 14 etc.	SFUS (card 2)	real	NRADX values of the Z-ordinates of the first X-ordinate fuselage station
73 → 80	----	ZFjkl	Card identifier, j is the fuselage segment number, k is the fuselage station number, l is the card repetition number.

NOTE: Repeat this Y and Z-ORDINATES pairing process NFORX times

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST FUSELAGE SEGMENT DEFINITION CARDS (cont.)
CROSS-SECTIONAL AREAS
(omit if NFUS = 0 or if J2TEST = 3)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	FUSARD	real	NFORX values of cross-sectional area, each value corresponding to a X-ordinate fuselage station. Each card contains up to 10 values, each value input in a 7-column field width as a real number.
73 → 80	----	FUSARjk	Card identifier, j is the fuselage segment number, k is the card repetition number

NOTE: Repeat this FUSELAGE SEGMENT DEFINITION CARDS process NFUS times

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST POD SEGMENT DEFINITION CARDS
ORIGIN
(omit if NPOD = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7	PODORGX	real	X-ordinate of origin
8 → 14	PODORGY	real	Y-ordinate of origin
15 → 21	PODORGZ	real	Z-ordinate of origin
73 → 80	----	PODORGj	Card identifier, j is the pod segment number

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST POD SEGMENT DEFINITION CARDS (cont.)
X-ORDINATES
(omit if NPOD = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	XPOD	real	NPORX values of the X-ordinates of the pod stations referenced to the pod origin. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is minimum X-ordinate to maximum, where the first value is 0.0 and the last is the pod length.
73 → 80	----	XPODjk	Card identifier, j is the pod segment, k is the card repetition number

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST POD SEGMENT DEFINITION CARDS (cont.)
Y and Z-ORDINATES
(omit if NPOD = 0 or if J3TEST = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	SPOD (card 1)	real	NPRADX values of the Y-ordinates (referenced to the pod origin) X-ordinate pod station. Each card contains up to 10 values, each value input in a 7-column field width as a real number. Order of input is bottom of pod to top.
73 → 80	----	YPjkl	Card identifier, j is the pod segment number, k is the pod station number, l is the card repetition number
1 → 7 8 → 14	SPOD (card 2)	real	NPRADX values of the Z-ordinates (referenced to the pod origin) of the first X-ordinate station.
73 → 80	----	ZPjkl	Card identifier, j is the pod segment number, k is the pod station number, l is the card repetition number

NOTE: Repeat this Y and Z-ORDINATES pairing process NPORX times

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST POD SEGMENT DEFINITION CARDS (cont.)
CROSS-SECTIONAL AREAS
(omit if NPOD = 0 or if J3TEST = 1 or -1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	PODARD	real	NPORX values of cross-sectional area, each value corresponding to a X-ordinate pod station. Each card contains up to 10 values, each value input in a 7-column field width as a real number.
73 → 80	----	PODARjk	Card identifier, j is the pod segment number, k is the card repetition number

NOTE: Repeat this POD SEGMENT DEFINITION CARDS process NPOD times.

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST FIN SEGMENT DEFINITION CARDS
AIRFOILS' ORIGIN/CHORD LENGTH
(omit if NF = 0)

COLUMN	VARIABLE	VALUE	DESCRIPTION
1 → 7	FINIX	real	X-ordinate of inboard airfoil leading-edge
8 → 14	FINIY	real	Y-ordinate of inboard airfoil leading-edge
15 → 21	FINIZ	real	Z-ordinate of inboard airfoil leading-edge
22 → 28	FINIC	real	Chord length of inboard airfoil
29 → 35	FINOX	real	X-ordinate of outboard airfoil leading-edge
36 → 42	FINOY	real	Y-ordinate of outboard airfoil leading-edge
43 → 49	FINOZ	real	Z-ordinate of outboard airfoil leading-edge
50 → 56	FINOC	real	Chord length of outboard airfoil
73 → 80	----	FINORGj	Card identifier, j is the fin segment number

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST FIN SEGMENT DEFINITION CARDS (cont.)
AIRFOIL ORDINATES' CHORD LOCATIONS
(omit if NF = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	XFIN	0.0 → 100.0	NFINOR values describing the locations in percent chord at which the fin airfoil ordinates are to be specified. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is fin leading-edge to trailing-edge.
73 → 80	----	XFINjk	Card identifier, j is the fin segment number, k is the card repetition number

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST FIN SEGMENT DEFINITION CARDS (cont.)
ORDINATES
(omit if NF = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	FINORD	0.0 → 100.0	NFINOR values of airfoil half-thickness expressed as percent chord, each value corresponding to a specific percent chord location on the airfoil. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is fin leading-edge to trailing-edge.
73 → 80	----	FINORDjk	Card identifier, j is the fin segment number, k is the card repetition number

NOTE: Repeat this FIN SEGMENT DEFINITION CARDS process NF times

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST CANARD SEGMENT DEFINITION CARDS
AIRFOILS' ORIGIN/CHORD LENGTH
(omit if NCAN = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7	CANIX	real	X-ordinate of inboard airfoil leading-edge
8 → 14	CANIY	real	Y-ordinate of inboard airfoil leading-edge
15 → 21	CANIZ	real	Z-ordinate of inboard airfoil leading-edge
22 → 28	CANIC	real	Chord length of inboard airfoil
29 → 35	CANOX	real	X-ordinate of outboard airfoil leading-edge
36 → 42	CANOY	real	Y-ordinate of outboard airfoil leading-edge
43 → 49	CANOZ	real	Z-ordinate of outboard airfoil leading-edge
50 → 56	CANOC	real	Chord length of outboard airfoil
73 → 80	----	CANORGj	Card identifier, j is the canard segment number

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST CANARD SEGMENT DEFINITION CARDS (cont.)
AIRFOIL ORDINATES' CHORD LOCATIONS
(omit if NCAN = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	XCAN	0.0 → 100.0	NCANOR values describing the locations in percent chord at which the canard airfoil ordinates are to be specified. Each card contains up to 10 values, each input in a 7-column field width as a real number. The order of input is canard leading-edge to trailing-edge.
73 → 80	----	XCANjk	Card identifier, j is the canard segment number, k is the card repetition number

INITIAL CONFIGURATION GEOMETRY INPUT
FIRST CANARD SEGMENT DEFINITION CARDS (cont.)
ORDINATES
(omit if NCAN = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	CANORD	0.0 → 100.0	NCANOR values of airfoil half-thickness expressed as percent chord, each value corresponding to a specific percent chord location on the airfoil. Each card up to 10 values, each value input in a 7-column field width as a real number. The order of input is canard leading-edge to trailing-edge.
73 → 80	----	CANORDjk	Card identifier, j is the canard segment number, k is the card repetition number

NOTE: If NCANOR < 0, repeat this ORDINATES process for the lower part of the canard

NOTE: Repeat this CANARD SEGMENT DEFINITION CARDS process NCAN times

INITIAL CONFIGURATION GEOMETRY INPUT
PLOT CARD
(omit if IPLOT = 0)
ORTHOGRAPHIC TYPE

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1	HORZ	X,Y, or Z	Horizontal axis identification
3	VERT	X,Y, or Z	Vertical axis identification
5 → 7	TEST1	OUT or leave blank	If word OUT appears, then hidden lines will be deleted. If this option is not wanted, leave columns 5 thru 7 blank
8 → 12	PH1	real	Roll angle, degrees
13 → 17	THETA	real	Pitch angle, degrees
18 → 22	PSI	real	Yaw angle, degrees
48 → 52	PLOTSZ	real	Desired size of plot, inches
53 → 55	TYPE	ORT	Identifies this as an orthographic plot
72	KODE	0	More plot cards follow
		1	Last plot card
73 → 80	----	GOPLTj	Card identifier, j is the card repetition number

INITIAL CONFIGURATION GEOMETRY INPUT
PLOT CARD (cont.)
THREE-VIEW ORTHOGRAPHIC TYPE

COLUMNS	VARIABLE	VALUE	DESCRIPTION
8 → 12	PHI	real	Y-origin on paper of plan view, inches
13 → 17	THETA	real	Y-origin on paper of side view, inches
18 → 22	PSI	real	Y-origin on paper of front view, inches
48 → 52	PLOTSZ	real	Desired size of the plot, inches
53 → 55	TYPE	VU3	Identifies this as a three-way orthographic plot
72	KODE	0	More plot cards follow
		1	Last plot card
73 → 80	----	G3PLTj	Card identifier, j is the card repetition number

INITIAL CONFIGURATION GEOMETRY INPUT
PLOT CARD (cont.)
PERSPECTIVE/STEREO TYPE

COLUMNS	VARIABLE	VALUE	DESCRIPTION
8 → 12	PHI	real	X-coordinate of view point in data coordinate system
13 → 17	THETA	real	Y-coordinate of view point in data coordinate system
18 → 22	PSI	real	Z-coordinate of view point in data coordinate system
23 → 27	XF	real	X-coordinate of focal point in data coordinate system
28 → 32	YF	real	Y-coordinate of focal point in data coordinate system
33 → 37	ZF	real	Z-coordinate of focal point in data coordinate system
38 → 42	DIST	real	Distance from eye to viewing-plane, inches
43 → 47	FMAG	real	Viewing-plane magnification factor
48 → 52	PLOTSZ	real	Diameter of viewing-plane, inches
53 → 55	TYPE	PER	Identifies this as a perspective plot
		STE	Identifies this as a stereo plot
72	KODE	0	More plot cards follow
		1	Last plot card
73 → 80	----	GPSPLTj	Card identifier, j is the card repetition number

AUXILIARY INPUT
TITLE CARD

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 70	TITLE2	Alphanumeric	Identifying information: If the only information is the word HALT in columns 1 thru 5, then program execution will terminate.
73 → 80	----	TITLEB	Card identifier

AUXILIARY INPUT
BOUNDARY CONDITION / CONTROL POINT DEFINITION CARD

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	LINBC	0	Non-planar boundary condition option, control points on surface of wing, fins, and canards
		1	Planar boundary condition, control points in plane of wing, fins and canards
4 → 6	THICK	0	Wing thickness matrix not calculated if LINBC = 1
		1	Calculate wing thickness matrix if LINBC = 1
7 → 9	PRINT	0	Print out the pressures, forces, moments and panel geometry
		1	Print out option 0 and the spanwise loads on the wing, fins and canards
		2	Print out option 1, the velocity components and source and vortex strengths
		3	Print out option 2 and the steps in the iterative solution
		4	Print out option 3 and the axial and normal velocity matrices

NOTE: Print options 3 and 4 will generate a large quantity of output

AUXILIARY INPUT

BOUNDARY CONDITION / CONTROL POINT DEFINITION CARD (cont.)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
10 → 12	ITMETH	0	Blocked JACOBI iterative solution procedure
		1	Blocked GAUSS-SIEDEL iterative solution procedure
		2	Blocked controlled successive over-relaxation iterative solution procedure
		3	Blocked successive over-relaxation iterative solution procedure
13 → 15	ITMAX	0	Maximum number of iterations set at 50
		integer	Specified maximum number of iterations
16 → 22	CCTEST	0.0	Convergence criterion set at 0.001
		real	Specified convergence criterion
23 → 29	DCTEST	0.0	Divergence criterion set at 1000.0
		real	Specified divergence criterion

AUXILIARY INPUT
BOUNDARY CONDITION / CONTROL POINT DEFINITION CARD (cont.)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
30 → 36	ALF1	>0.0 and < 1.0	Relaxation factor, set only if ITMETH = 3
73 → 80	----	BCCP	Card identifier

AUXILIARY INPUT
CONTROL CARD

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	K0	0	No reference dimensions
		1	Reference dimensions to be read
4 → 6	K1	-3	Wing data to be read, wing has round leading-edge (radii input is required)
		-1	Wing data to be read, wing has sharp leading-edge
		0	Omit wing
		1	Default wing values to initial configuration input, wing has sharp leading-edge
		3	Default wing values to initial configuration input, wing has round leading-edge (radii input is required)

AUXILIARY INPUT
CONTROL CARD (cont.)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
7 → 9	K2	-1	Fuselage data to be read
		0	Omit all fuselages
		1	Default all fuselage values to initial configuration input
10 → 12	K3	-1	Pod data to be read
		0	Omit all pods
		1	Default all pod values to initial configuration input
13 → 15	K4	-1	Fin data to be read
		0	Omit all fins
		1	Default all fin values to initial configuration input

AUXILIARY INPUT
CONTROL CARD (cont.)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
16 → 18	K5	-1	Canard data to be read
		0	Omit all canards
		1	Default all canard values to initial configuration input
19 → 21	IPLOT	0	No plot cards for auxiliary input
		1	Plot cards to be read for auxiliary input
73 → 80	----	ACNTRL	Card identifier

AUXILIARY INPUT
WING CONTROL CARD
(omit if JWNG = 0 or if K1 > or = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	KWAF	0, 2 → 20	Number of wing airfoil sections If 0, then will default to NWAF
4 → 6	KWAFOR	0, 3 → 30	Number of ordinates used to define each wing airfoil section . If 0, then will default to NWAFOR.
73 → 80	----	AWCTRL	Card identifier

AUXILIARY INPUT
FUSELAGE CONTROL CARD
(omit if NFUS = 0, or if K2 > or = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	KRADX (1)	0, ± 3 → ± 20	Number of meridian lines used to define panel edges of first fuselage. If 0, then will default to NRADX. If negative, then user must input KRADX meridian angles
4 → 6	KFORX (1)	0, 2 → 30	Number of axial stations for first fuselage. If 0, then will default to NFORX
7 → 9	KRADX (2)	0, ± 3 → ± 20	Second fuselage
10 → 12	KFORX (2)	0, 2 → 30	Second fuselage
13 → 15	KRADX (3)	0, ± 3 → ± 20	Third fuselage
16 → 18	KFORX (3)	0, 2 → 30	Third fuselage
19 → 21	KRADX (4)	0, ± 3 → ± 20	Fourth fuselage
22 → 24	KFORX (4)	0, 2 → 30	Fourth fuselage
25 → 27	KRADX (5)	0, ± 3 → ± 20	Fifth fuselage
28 → 30	KFORX (5)	0, 2 → 30	Fifth fuselage
31 → 33	KRADX (6)	0, ± 3 → ± 20	Sixth fuselage
34 → 36	KFORX (6)	0, 2 → 30	Sixth fuselage
73 → 80	----	AFCTRL	Card identifier

AUXILIARY INPUT
POD CONTROL CARD
(omit if NPOD = 0, or if K3 > or = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	KPRADX (1)		Number of meridian lines used to define panel edges of first pod
			If J3TEST = 1
			If J3TEST = 0 or -1
		0, ± 3 → ± 10	Note: if 0, then will default to NPRADX;
		0, ± 3 → ± 20	if negative, then user must input KPRADX meridian angles
4 → 6	KPORX (1)	0, 2 → 30	Number of axial stations for first pod
7 → 9	KPRADX (2)	0, ± 3 → ± 20	Second pod
10 → 12	KPORX (2)	0, 2 → 30	Second pod
13 → 15	KPRADX (3)	0, ± 3 → ± 20	Third pod
16 → 18	KPORX (3)	0, 2 → 30	Third pod
19 → 21	KPRADX (4)	0, ± 3 → ± 20	Fourth pod
22 → 24	KPORX (4)	0, 2 → 30	Fourth pod
25 → 27	KPRADX (5)	0, ± 3 → ± 20	Fifth pod
28 → 30	KPORX (5)	0, 2 → 30	Fifth pod
31 → 33	KPRADX (6)	0, ± 3 → ± 20	Sixth pod
34 → 36	KPORX (6)	0, 2 → 30	Sixth pod
73 → 80	----	APCTRL	Card identifier

AUXILIARY INPUT
FIN LEADING-EDGE CONTROL CARD
(omit if NF = 0, or if K4 > or = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	K4TEST (1)	1 3	First fin has sharp leading-edge First fin has round leading-edge radii input is required
4 → 6	K4TEST (2)	0,1,3	Second fin
7 → 9	K4TEST (3)	0,1,3	Third fin
10 → 12	K4TEST (4)	0,1,3	Fourth fin
13 → 15	K4TEST (5)	0,1,3	Fifth fin
16 → 18	K4TEST (6)	0,1,3	Sixth fin
19 → 21	K4TEST (7)	0,1,3	Seventh fin
22 → 24	K4TEST (8)	0,1,3	Eighth fin
25 → 27	K4TEST (9)	0,1,3	Ninth fin
28 → 30	K4TEST (10)	0,1,3	Tenth fin
73 → 80	----	AFINLE	Card identifier

AUXILIARY INPUT
FIN CONTROL CARD
(omit if NF = 0, or if K4 > or = 0)

COLUMNS	VARIBLE	VALUE	DESCRIPTION
1 → 3	KF (1)	0,2 → 20	Number of airfoil sections for the first fin. If 0, then the inboard and outboard airfoils define the fin.
4 → 6	KFINOR (1)	0,3 → 30	Number of ordinates used to define each airfoil section for first fin. If 0, then will default to NFINOR.
7 → 9	KF (2)	0,2 → 20	Second fin
10 → 12	KFINOR (2)	0,3 → 30	Second fin
13 → 15	KF (3)	0,2 → 20	Third fin
16 → 18	KFINOR (3)	0,3 → 30	Third fin
19 → 21	KF (4)	0,2 → 20	Fourth fin
22 → 24	KFINOR (4)	0,3 → 30	Fourth fin
25 → 27	KF (5)	0,2 → 20	Fifth fin
28 → 30	KFINOR (5)	0,3 → 30	Fifth fin
31 → 33	KF (6)	0,2 → 20	Sixth fin
34 → 36	KFINOR (6)	0,3 → 30	Sixth fin
37 → 39	KF (7)	0,2 → 20	Seventh fin
40 → 42	KFINOR (7)	0,3 → 30	Seventh fin
43 → 45	KF (8)	0,2 → 20	Eighth fin

AUXILIARY INPUT
FIN CONTROL CARD (cont.)
(omit if NF=0, or if K4 > or = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
46 → 48	KFINOR (8)	0,3 → 30	Eighth fin
49 → 51	KF (9)	0,2 → 20	Ninth fin
52 → 54	KFINOR (9)	0,3 → 30	Ninth fin
55 → 57	KF (10)	0,2 → 20	Tenth fin
58 → 60	KFINOR (10)	0,3 → 30	Tenth fin
73 → 80	----	AFINCRL	Card identifier

AUXILIARY INPUT
CANARD LEADING - EDGE CONTROL CARD
(omit if NCAN = 0, k5 > or = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	K5TEST (1)	1 3	First canard has sharp leading-edge First canard has round leading-edge and radii input is required
4 → 6	K5TEST (2)	0,1,3	Second canard
7 → 9	K5TEST (3)	0,1,3	Third canard
10 → 12	K5TEST (4)	0,1,3	Fourth canard
13 → 15	K5TEST (5)	0,1,3	Fifth canard
16 → 18	K5TEST (6)	0,1,3	Sixth canard
19 → 21	K5TEST (7)	0,1,3	Seventh canard
22 → 24	K5TEST (8)	0,1,3	Eighth canard
25 → 27	K5TEST (9)	0,1,3	Ninth canard
28 → 30	K5TEST (10)	0,1,3	Tenth canard
73 → 80	----	ACANLE	Card identifier

AUXILIARY INPUT
CANARD CONTROL CARD
(omit if NCAN = 0, or if K5 > or = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	KAN (1)	0,±2 → ±20	Number of airfoil sections for the first canard. If 0, then the inboard and outboard airfoils define the canard. IF negative, then no vortex sheets carry through the body and concentrated vortices are shed from the inboard edge of the canard.
4 → 6	KANOR (1)	0,3 → 30	Number of ordinates used to define each airfoil section for first canard. IF 0, then will default to NCANOR
7 → 9	KAN (2)	0,±2 → ±20	Second canard
10 → 12	KANOR (2)	0,3 → 30	Second canard
13 → 15	KAN (3)	0,±2 → ±20	Third canard
16 → 18	KANOR (3)	0,3 → 30	Third canard
19 → 21	KAN (4)	0,±2 → ±20	Fourth canard
22 → 24	KANOR (4)	0,3 → 30	Fourth canard
25 → 27	KAN (5)	0,±2 → ±20	Fifth canard
28 → 30	KANOR (5)	0,3 → 30	Fifth canard
31 → 33	KAN (6)	0,2± → ±20	Sixth canard
34 → 36	KANOR (6)	0,3 → 30	Sixth canard

AUXILIARY INPUT
CANARD CONTROL CARD (cont.)
(omit if NCAN = 0, or if K5 > or = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
37 → 39	KAN (7)	0,2 → 20	Seventh canard
40 → 42	KANOR (7)	0,3 → 30	Seventh canard
43 → 45	KAN (8)	0,2 → 20	Eighth canard
46 → 48	KANOR (8)	0,3 → 30	Eighth canard
49 → 51	KAN (9)	0,2 → 20	Ninth canard
52 → 54	KANOR (9)	0,3 → 30	Ninth canard
55 → 57	KAN (10)	0,2 → 20	Tenth canard
58 → 60	KANOR (10)	0,3 → 30	Tenth canard
73 → 80	----	ACANCRL	Card identifier

AUXILIARY INPUT
REFERENCE DIMENSIONS CARD
(omit if KO = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7	REFAR	0.0, real	Wing reference area. If 0.0, then will default to REFA
8 → 14	REFB	0.0, real	Wing semispan. If 0.0, then will default to 1.0
15 → 21	REFC	0.0, real	Wing reference chord. If 0.0, then will default to 1.0
22 → 28	REFD	0.0, real	Fuselage reference diameter. If 0.0, then will default to 1.0
29 → 35	REFL	0.0, real	Fuselage reference length. If 0.0, then will default to 1.0
36 → 42	REFX	real	X-coordinate of moment center
43 → 49	REFZ	real	Z-coordinate of moment center
73 → 80	----	AREF	Card identifier

AUXILIARY INPUT
WING REDEFINITION CARDS
RADII
(omit if JWNG = 0, or if K1 = 0, ±1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	RHO	0.0 → 100.0	NWAF values of leading-edge radius expressed in percent chord. Each card contains up to 10 values, each value input in a 7-column field width as a real number. Order of input is inboard airfoil to outboard airfoil.
73 → 80	----	AWRADj	Card identifier, j is the card repetition number

AUXILIARY INPUT
WING REDEFINITION CARDS (cont.)
AIRFOIL ORDINATES' CHORD LOCATIONS
(omit if JWNG = 0, K1 > or = 0, KWAFOR = 0)

COLUMNS	VARIABLE	VALUE	DEFINITION
1 → 7 8 → 14 etc.	XAFK	0.0 → 100.0	KWAFOR values describing the new locations in percent chord at which the ordinates of all wing airfoils are to be specified. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is wing leading-edge to trailing-edge.
73 → 80	----	AXAFj	Card identifier, j is the card repetition number

AUXILIARY INPUT
WING REDEFINITION CARDS (cont.)
Y-ORDINATES
(omit if JWNG = 0, K1 > or = 0, KWAF = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	YK	real	KWAF values of the new Y-ordinate of each airfoil's leading-edge. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is inboard airfoil to outboard airfoil.
73 → 80	----	AWYKj	Card identifier, j is the card repetition number

AUXILIARY INPUT
FUSELAGE REDEFINITION CARDS
MERIDIAN ANGLES
(omit if NFUS = 0, K2 > or = 0, KRADX > or = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	PHIK	real	KRADX values of the new fuselage meridian angles expressed in degrees. Each card contains up to 10 values, each value input in a 7-column field width as a real number. Order of input is bottom of fuselage to top with PHIK = 0.0 at the bottom and 180.0 at the top.
73 → 80	----	AFMAjk	Card identifier, j is fuselage segment number, k is the card repetition number

NOTE: Repeat this MERIDIAN ANGLES process NFUS times.

AUXILIARY INPUT
FUSELAGE REDEFINITION CARDS (cont.)
X-ORDINATES
(omit if NFUS = 0, K2 > or = 0, KFORX = 0)

COLUMN	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	XJ	real	KFORX values of the new X-ordinates of the fuselage stations. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is minimum X-ordinate to maximum.
73 → 80	-----	AXFUSjk	Card identifier, j is the fuselage segment number, k is the card repetition number

NOTE: Repeat this X-ORDINATES process NFUS times.

AUXILIARY INPUT
POD REDEFINITION CARDS
MERIDIAN ANGLES
(omit if NPOD = 0, K3 > or = 0, KPRADX > or = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	GAMK	real	KPRADX values of the new pod meridian angles expressed in degrees. Each card contains up to 10 values, each value input in a 7-column field width as a real number. If J3TEST = 0 or 1, the order of input is bottom of pod to top with GAMK=0.0 at the bottom and 180.0 at the top. If J3TEST=-1, the order of input is bottom of pod to top and then back to bottom (i.e. full 360.0 degrees traversed in a counter clockwise direction)
73 → 80	----	APMAjk	Card identifier, j is the pod segment number, K is the card repetition number

NOTE: Repeat this MERIDIAN ANGLES process NPOD times.

AUXILIARY INPUT
POD REDEFINITION CARDS (cont.)
X-ORDINATES
(omit if NPOD = 0, K3 > or = 0, KPORX = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	XJP	real	KPORX values of the new X-ordinates of the pod stations (referenced to the pod origin). Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is minimum x-ordinate to maximum.
73 → 80	----	AXPODjk	Card identifier, j is the pod segment number, k is the card repetition number

NOTE: Repeat this X-ORDINATES process NPOD times.

AUXILIARY INPUT
FIN REDEFINITION CARDS
RADII
(omit if NF = 0, K4 > or = 0, K4TEST = 1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7	RHO	0.0 → 100.0	Leading-edge radius expressed in percent chord
73 → 80	----	AFRADj	Card identifier, j is the fin segment number

AUXILIARY INPUT
FIN REDEFINITION CARDS (cont.)
AIRFOIL ORDINATES' CHORD LOCATIONS
(omit if NF=0, K4 > or = 0, KFINOR = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	XAFK	0.0 → 100.0	KFINOR values describing the new locations in percent chord at which the ordinates of the fin airfoils are to be specified. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is fin leading-edge to trailing-edge.
73 → 80	----	AXFINjk	Card identifier, j is the fin segment number, k is the card repetition number

AUXILIARY INPUT
FIN REDEFINITION CARDS (cont.)
Z-ORDINATES
(omit if NF = 0, K4 > or = 0, KF = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	YK	real	KF values of the new Z-ordinate of each airfoil's leading-edge. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is inboard airfoil to outboard airfoil.
73 → 80	----	AFZKjk	Card identifier, j is the fin segment number, k is the card repetition number

NOTE: Repeat this FIN REDEFINTION CARDS process NF times.

AUXILIARY INPUT
CANARD REDEFINITION CARDS
RADII
(omit if NCAN = 0, K5 > or = 0, K5TEST = 1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7	RHO	0.0 → 100.0	Leading-edge radius expressed in percent chord
73 → 80	----	ACRADj	Card identifier, j is the canard segment number

AUXILIARY INPUT
CANARD REDEFINITION CARDS (cont.)
AIRFOIL ORDINATES' CHORD LOCATIONS
(omit if NCAN = 0, K5 > or = 0, KANOR = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	XAFK	0.0 → 100.0	KANOR values describing the new locations in percent chord at which the ordinates of the canard airfoils are to be specified. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is canard leading-edge to trailing-edge.
73 → 80	----	AXCANjk	Card identifier, j is the canard segment number, k is the card repetition number

AUXILIARY INPUT
CANARD REDEFINITION CARDS (cont.)
Y-ORDINATES
(omit if NCAN = 0, K5 > or = 0, KAN = 0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	YK	real	KAN values of the new Y-ordinate of each airfoil's leading-edge. Each card contains up to 10 values, each value input in a 7-column field width as a real number. The order of input is inboard airfoil to outboard airfoil.
73 → 80	----	ACYKjk	Card identifier, j is the canard segment number, k is the card repetition number

NOTE: Repeat this CANARD REDEFINITION CARDS process NCAN times.

AUXILIARY INPUT
PLOT CARD
(omit if IPLOT = 0)
ORTHOGRAPHIC TYPE

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1	HORZ	X,Y, or Z	Horizontal axis identification
3	VERT	X,Y, or Z	Vertical axis identification
5 → 7	TEST1	OUT or leave blank	If word OUT appears, then hidden lines will be deleted. If this option is not wanted leave columns 5 thru 7 blank
8 → 12	PH1	real	Roll angle, degrees
13 → 17	THETA	real	Pitch angle, degrees
18 → 22	PSI	real	Yaw angle, degrees
48 → 52	PLOTSZ	real	Desired size of plot, inches
53 → 55	TYPE	ORT	Identifies this as an orthographic plot
72	KODE	0	More plot cards follow
		1	Last plot card
73 → 80	----	AOPLTj	Card identifier, j is the card repetition number

AUXILIARY INPUT
PLOT CARD (cont.)
THREE-VIEW ORTHOGRAPHIC TYPE

COLUMNS	VARIABLE	VALUE	DESCRIPTION
8 → 12	PHI	real	Y-origin on paper of plan view, inches
13 → 17	THETA	real	Y-origin on paper of side view, inches
18 → 22	PSI	real	Y-origin on paper of front view, inches
48 → 52	PLOTSZ	real	Desired size of the plot, inches
53 → 55	TYPE	VU3	Identifies this as a three-way orthographic plot
72	KODE	0	More plot cards follow
		1	Last plot card
73 → 80	----	A3PLTj	Card identifier, j is the card repetition number

AUXILIARY INPUT
PLOT CARD (cont.)
PERSPECTIVE/STEREO TYPE

COLUMNS	VARIABLE	VALUE	DESCRIPTION
8 → 12	PHI	real	X-coordinate of view point in data coordinate system
13 → 17	THETA	real	Y-coordinate of view point in data coordinate system
18 → 22	PSI	real	Z-coordinate of view point in data coordinate system
23 → 27	XF	real	X-coordinate of focal point in data coordinate system
28 → 32	YF	real	Y-coordinate of focal point in data coordinate system
33 → 37	ZF	real	Z-coordinate of focal point in data coordinate system
38 → 42	DIST	real	Distance from eye to viewing-plane, inches
43 → 47	FMAG	real	Viewing-plane magnification factor
48 → 52	PLOTSZ	real	Diameter of viewing-plane, inches
53 → 55	TYPE	PER	Identifies this as a perspective plot
		STE	Identifies this as a stereo plot
72	KODE	0	More plot cards follow
		1	Last plot card
73 → 80	----	APSPLTj	Card identifier, j is the card repetition number

AUXILIARY INPUT
AERODYNAMIC INPUT CARD

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7	MACH	real	The free stream subsonic or supersonic Mach number (including 0.0) at which aerodynamic output is desired
		-1.0	Indicates the termination of the aerodynamic calculation for the given configuration
8 → 14	ALPHA	real	The angle of attack in degrees
15 → 21	NORVEL	0.0	The boundary condition of where zero normal velocity is applied at body panel control points
		1.0	Modified boundary condition applied at body panel control points (input for non-zero normal velocities is required)
22 → 28	FLDPTS	real	The number of field points at which velocity and pressure calculations is desired (input is required for each field point location)
		0.0	No field point calculations
29 → 31	KOP	1	Given configuration has a coplanar wing
		0	Not a coplanar wing

AUXILIARY INPUT
AERODYNAMIC INPUT CARD (cont.)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
32 → 34	MPLOT	-1	User selects which configuration segments are to have presure coefficient plots (control input is required)
		0	No plots
		1	Plot pressure coefficients for all configuration segments
73 → 80	----	AEROIN	Card identifier

AUXILIARY INPUT
PRESSURE PLOT CONTROL CARD
(omit if MPLOT = 0 or 1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	KPLOTW	1	Plot wing pressure coefficients
		0	No plots for wing
4 → 6	KPLOTB	-1	User selects which fuselage segments are to have pressure plots (input for segment control is required)
		0	No plots for fuselage segments
		1	Plot pressure coefficients for all fuselage segments
7 → 9	KPLOTP	-1	User selects which pod segments are to have pressure plots (input for segment control is required)
		0	No plots for pod segments
		1	Plot pressure coefficients for all pod segments
10 → 12	KPLOTF	-1	User selects which fin segments are to have pressure plots (input for segment control is required)
		0	No plots for fin segments
		1	Plot pressure coefficients for all fin segments

AUXILIARY INPUT
PRESSURE PLOT CONTROL CARD (cont.)
(omit if MPLOT = 0 or 1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
13 → 15	KPLOTC	-1	User selects which canard segments are to have pressure plots (input for segment control is required)
		0	No plots for canard segments
		1	Plot pressure coefficients for all canard segments
73 → 80	----	PRPLOT	Card identifier

AUXILIARY INPUT
FUSELAGE PRESSURE CONTROL CARD
(omit if KPLOTB = 0 or 1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	IBPLOT (1)	0	Omit pressure coefficients plot for first fuselage segment
		1	Plot pressure coefficients for first fuselage segment
4 → 6	IBPLOT (2)	0,1	Second fuselage
7 → 9	IBPLOT (3)	0,1	Third fuselage
10 → 12	IBPLOT (4)	0,1	Fourth fuselage
13 → 15	IBPLOT (5)	0,1	Fifth fuselage
16 → 18	IBPLOT (6)	0,1	Sixth fuselage
73 → 80	----	BPRPLT	Card identifier

AUXILIARY INPUT
POD PRESSURE CONTROL CARD
(omit if KPLOTP = 0 or 1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	IPPLOT (1)	0	Omit pressure coefficients plot for first pod segment
		1	Plot pressure coefficients for first pod segment
4 → 6	IPPLOT (2)	0,1	Second pod
7 → 9	IPPLOT (3)	0,1	Third pod
10 → 12	IPPLOT (4)	0,1	Fourth pod
13 → 15	IPPLOT (5)	0,1	Fifth pod
16 → 18	IPPLOT (6)	0,1	Sixth pod
73 → 80	----	PPRPLT	Card identifier

AUXILIARY INPUT
FIN PRESSURE CONTROL CARD
(omit if KPLOTF = 0 or 1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	IFPLOT (1)	0	Omit pressure coefficients plot for first fin segment
		1	Plot pressure coefficients for first fin segment
4 → 6	IFPLOT (2)	0,1	Second fin
7 → 9	IFPLOT (3)	0,1	Third fin
10 → 12	IFPLOT (4)	0,1	Fourth fin
13 → 15	IFPLOT (5)	0,1	Fifth fin
16 → 18	IFPLOT (6)	0,1	Sixth fin
19 → 21	IFPLOT (7)	0,1	Seventh fin
22 → 24	IFPLOT (8)	0,1	Eighth fin
25 → 27	IFPLOT (9)	0,1	Ninth fin
28 → 30	IFPLOT (10)	0,1	Tenth fin
73 → 80	----	FPRPLT	Card identifier

AUXILIARY INPUT
CANARD PRESSURE CONTROL CARD
(omit if KPLOTC = 0 or 1)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 3	ICPLOT (1)	0	Omit pressure coefficients plot for first canard segment
		1	Plot pressure coefficients for first segment
4 → 6	ICPLOT (2)	0,1	Second canard
7 → 9	ICPLOT (3)	0,1	Third canard
10 → 12	ICPLOT (4)	0,1	Fourth canard
13 → 15	ICPLOT (5)	0,1	Fifth canard
16 → 18	ICPLOT (6)	0,1	Sixth canard
19 → 21	ICPLOT (7)	0,1	Seventh canard
22 → 24	ICPLOT (8)	0,1	Eighth canard
25 → 27	ICPLOT (9)	0,1	Ninth canard
28 → 30	ICPLOT (10)	0,1	Tenth canard
73 → 80	----	CPRPLT	Card identifier

AUXILIARY INPUT
NORMAL VELOCITY INPUT CARD
(omit if NORVEL = 0.0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7 8 → 14 etc.	QB	real	Normal velocities specified at the control point of each body panel. One value of normal velocity is input for each body panel, in order of the body panel numbers assigned by the program. Each card contains up to 10 values, each value input in a 7-column field width as a real number.
73 → 80	----	NORVELj	Card identifier, j is the card repetition number

AUXILIARY INPUT
FIELD POINT CARD
(omit if FLDPTS = 0.0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7	XPT	real	X-coordinate of the field point
8 → 14	YPT	real	Y-coordinate of the field point
15 → 21	ZPT	real	Z-coordinate of the field point
73 → 80	----	FLDPTj	Card identifier, j is the card repetition number

NOTE: Repeat this FIELD POINT process FLDPTS times.

AUXILIARY INPUT
TERMINATION CARD
(omit if MACH = -1.0)

COLUMNS	VARIABLE	VALUE	DESCRIPTION
1 → 7	MACH	-1.0	Terminates the run
73 → 80	----	STOP	Card identifier

Section 5

REFERENCES

1. Winter, Octavio A.: The Incorporation of Plotting Capability Into the "Unified Subsonic Supersonic Aerodynamic Analysis Program", Version B. NASA CR-3228, 1980.

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

3. 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.

Appendix A

INPUT/OUTPUT FILES

The data input to USSAERO version D00 must reside on a file named DATIN. Numerical output is written to a file named DATOUT. If the plotting options are activated, the plot output resides on the DI-3000 output file named DIMETA. When run on the CDC CYBER 170/180 series computers at NASA Langley Research Center, the program plus the DI-3000 graphics library requires a minimum core length of 275K octal.

Appendix B

EXTERNAL ROUTINES

Due to its plotting capabilities, version D00 of USSAERO requires the use of an external graphics library. The plot routine call statements which reside in USSAERO refer to the DI-3000 graphics package. These plot routine calls may have to be replaced by the users' equivalent graphics package commands.

USSAERO also makes calls to system dependent time, date and termination routines. These calls may also have to be replaced by the users' equivalent system routines.

This appendix describes these external system/graphics routines and identifies where they are used in USSAERO. Appropriate comments have been placed in the USSAERO program code to further assist the user in locating the calls to these external routines.

USSAERO REFERENCES TO EXTERNAL ROUTINES

DI-3000 ROUTINE	called by	USSAERO ROUTINE
JBASE		AXLES
JBEGIN		USAERO
JCLOSE		PLOTIT PLTORT PLTSTE PRESBO PRSWNG STERPT
JDEVON		USAERO
JDFONT		USAERO
JDINIT		USAERO
JDRAW		AXLES PLOTIT PRESBO PRSWNG STERPT
JDSIZE		USAERO
JEND		GEOM
JFRAME		LABEL PLTSTE
JLSTYL		PRSWNG
JMOVE		AXLES LABEL PLOTIT PLTORT PLTSTE PRESBO PRSWNG STERPT
JOPEN		PLOTIT PLTORT PLTSTE PRESBO PRSWNG STERPT
JSIZE		AXLES LABEL
JVPORT		USAERO
JWINDO		AXLES PLTORT PLTSTE STERPT USAERO
J3STRG		AXLES LABEL PLTORT PLTSTE

SYSTEM ROUTINES

DATE: returns the current date as the value of the function in the form YY/MM/DD where MM is the number of the month, DD is the day within the month, and YY is the year. The value returned is type character with a length of 10.

EXIT: terminates program execution and returns control to the operating system.

TIME: returns the current reading of the system clock as the value of the function in the form HH.MM.SS where HH is hours from 0 to 23, MM is minutes, and SS is seconds. The value returned is type character with a length of 10.

SYSTEM ROUTINE	called by	USSAERO ROUTINE
DATE		USAERO
EXIT		GEOM INVERT SUPPAN
		WNGVEL
TIME		HDR

APPENDIX C

INPUT ERROR ANALYSIS EXAMPLE

This appendix presents an example using the new input error analysis routine. The routine was developed as a user aid in identifying input card errors. Each control card variable is checked against permissable values and an error is written out when the check fails.

The following pages present the input and output of the error example.

ERROR EXAMPLE INPUT

ORIGINAL PAGE IS
OF POOR QUALITY

```
      NACA RM A51G31 SWEPT WING   VERSION D00                                  TITLEA
  0 -1  0  0  0  0  0                                                         GCNTRL
  2 51                                                                        UCNTRL
0.      2.5     5.      10.     15.     20.     30.     40.     50.     60.    XAF1
70.     80.     90.     95.     100.                                          XAF2
0.      0.      0.      1.0                                                   UAFORG1
1.25    1.125   0.      .5                                                    UAFORG2
0.      1.268   1.741   2.383   2.841   3.186   3.634   3.811   3.693   3.252 UAFORD11
2.583   1.760   .887    .451    .014                                          UAFORD12
0.      1.268   1.741   2.383   2.841   3.186   3.634   3.811   3.693   3.252 UAFORD21
2.583   1.760   .887    .451    .014                                          UAFORD22
    SINGULARITY PANELING NACA RM A51G31   VERSION D00                       TITLEB
  0  0 -2                                                                     DCCP
  1 -3  0  0  0  0  0                                                       ACNTRL
  4  0                                                                      AUCTRL
1.69    1.125                                                               AREF
.485    .485                                                                AURAD1
0.      .45     .7875   1.125                                               AUYK1
-1.                                                                         STOP
```

ERROR EXAMPLE OUTPUT

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

  UUU     UUU   $$$$$$$$$$$$   $$$$$$$$$$$$   AAAAAAAAAAAA   EEEEEEEEEEEE   RRRRRRRRRRRR   0000000000000
  UUU     UUU   $$$$$$$$$$$$   $$$$$$$$$$$$   AAAAAAAAAAAA   EEEEEEEEEEEE   RRRRRRRRRRRR   0000000000000
  UUU     UUU   $$$      $$$   $$$      $$$   AAA      AAA   EEE            RRR      RRR   000        000
  UUU     UUU   $$$            $$$            AAA      AAA   EEE            RRR      RRR   000        000
  UUU     UUU   $$$            $$$            AAA      AAA   EEE            RRRRRRRRRRRR   000        000
  UUU     UUU   $$$$$$$$$$$$   $$$$$$$$$$$$   AAAAAAAAAAAA   EEEEEEE        RRRRRRRRRRRR   000        000
  UUU     UUU   $$$$$$$$$$$$   $$$$$$$$$$$$   AAAAAAAAAAAA   EEEEEEE        RRRRRR         000        000
  UUU     UUU            $$$            $$$   AAA      AAA   EEE            RRR RRR        000        000
  UUU     UUU            $$$            $$$   AAA      AAA   EEE            RRR  RRR       000        000
  UUU     UUU   $$$      $$$   $$$      $$$   AAA      AAA   EEE            RRR   RRR      000        000
  UUUUUUUUUUU   $$$$$$$$$$$$   $$$$$$$$$$$$   AAA      AAA   EEEEEEEEEEEE   RRR    RRR     0000000000000
   UUUUUUUUU    $$$$$$$$$$$$   $$$$$$$$$$$$   AAA      AAA   EEEEEEEEEEEE   RRR     RRR    0000000000000

**********************************************************************************************************************************

                        NASA-LANGLEY RESEARCH CENTER ,NOS-CDC 6000 SERIES

                        UNIFIED SUBSONIC-SUPERSONIC AERODYNAMICS PROGRAM

                                          V E R S I O N  D 0 0
                                F O R T R A N  7 7
                                C Y B E R - 3 0 0 0   G R A P H I C S
                               DATE OF RUN     85/06/27.
                               TIME OF RUN     13.04.08.
**********************************************************************************************************************************
```

UNIFIED SUBSONIC-SUPERSONIC AERODYNAMICS PROGRAM VERSION D00

LIST OF INPUT CARDS

```
 CARD      0000000001111111111222222222233333333334444444444555555555566666666667777777778      CARD
NUMBER     1234567890123456789012345678901234567890123456789012345678901234567890123456789      NUMBER

    1          NACA RM A61G31 SWEPT WING   VERSION D00                                          TITLEA     1
    2        0 -1  0  0  0  0  0                                                                GCNTRL     2
    3        2 51                                                                               UCNTRL     3
    4      0.     2.5    5.     10.    15.    20.    30.    40.    50.    60.                  XAF1       4
    5      70.    80.    90.    95.    100.                                                     XAF2       5
    6      0.     0.     0.     1.0                                                             UNFORG1    6
    7      1.25   1.125  0.     .5                                                              UNFORG2    7
    8      0.     1.268  1.741  2.383  2.841  3.186  3.634  3.811  3.693  3.252               UNFORD11   8
    9      2.583  1.760  .887   .461   .814                                                    UNFORD12   9
   10      0.     1.268  1.741  2.383  2.841  3.186  3.634  3.811  3.693  3.252               UNFORD21  10
   11      2.583  1.760  .887   .451   .814                                                    UNFORD22  11
   12         SINGULARITY PANELING NACA RM A51G31   VERSION D00                               TITLEB    12
   13        0  0 -2                                                                           BCCP      13
   14        1 -3  0  0  0  0  0                                                              ACNTRL    14
   15        4  0                                                                             AUCTRL    15
   16      1.69   1.125                                                                       AREF      16
   17      .485   .485                                                                        AURAD1    17
   18      0.     .45    .7875  1.125                                                         AUYK1     18
   19      -1.                                                                               STOP      19
```

```
***** ERRORS IN INPUT DATA *****

CARD     ITEM     NAME       VALUE      LIMITS

  3        2      NUMFOR       51       -3 THRU -30 OR 3 THRU 30

***** INPUT PROCESSING HALTED AT THIS POINT *****
```

APPENDIX D

COMPARISON RUN BETWEEN VERSIONS B01 AND D00

This appendix shows the input card differences between versions B01 and D00. The configuration used is the transonic wing-body model which appears in reference 1. Differences between the two inputs are highlighted by asterisks.

```
          NACA RM LS1F07 TRANSONIC WING-BODY DEFINITION
*** 0 -1 -1            1  2 26  1  7 20                                    -2
  0.0    0.5    0.75   1.25   2.5    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    0.0    7.1                                                WAFORG
  25.375 12.    0.0    4.5                                                WAFORG
  0.0    0.464  0.563  0.718  0.981  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  0.727  0.37   0.013                                 WAFORD
  0.0    0.464  0.563  0.718  0.981  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  0.727  0.37   0.013                                 WAFORD
  0.0    2.0    4.0    6.0    8.0    10.0   12.0   14.0   16.0   18.0     XFUS1
  20.0   22.0   24.0   26.0   28.0   30.0   32.0   34.0   36.0   38.0     XFUS1
  0.0    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
  144.0  12.0   6.125                 20.0                                 REFA
  0.229  0.229                                                             RHO
  0.0    2.5    5.0    10.0   15.0   20.0   30.0   40.0   50.0   60.0     XAFK1
  70.0   80.0   90.0   95.0   100.0                                        XAFK1
  1.6    3.6    6.0    8.4    10.8   12.0                                 YK
  0.0    2.0    5.0    8.0    11.0   13.0   14.325 15.73  17.16  18.59    KFORX1
  20.02  21.425 23.0   25.0   28.0   33.0   36.0   38.0                   KFORX2
  X Y      0.   0.   0.                                 10.ORT           0 SPLOT1
  X Z      0.   0.   0.                                 10.ORT           1 SPLOT2
  .6     4.
  -1.0
```

VERSION D00 INPUT

```
                NACA RM L51F07 TRANSONIC WING-BODY DEFINITION                   TITLEA
***    0 -1  1             1                                                    GCNTRL
***    2 26                                                                     WCNTRL
***    1  7 20                                                                  FCNTRL
       0.0     0.5     0.75    1.25    2.5     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     0.0     7.1                                                     WAFORG1
       25.375  12.     0.0     4.5                                                     WAFORG2
       0.0     0.464   0.563   0.718   0.981   1.313   1.591   1.824   2.194   2.474   WAFORD11
       2.687   2.842   2.945   2.996   2.992   2.925   2.793   2.602   2.364   2.087   WAFORD12
       1.775   1.437   1.083   0.727   0.37    0.013                                   WAFORD13
       0.0     0.464   0.563   0.718   0.981   1.313   1.591   1.824   2.194   2.474   WAFORD21
       2.687   2.842   2.945   2.996   2.992   2.925   2.793   2.602   2.364   2.087   WAFORD22
       1.775   1.437   1.083   0.727   0.37    0.013                                   WAFORD23
       0.0     2.0     4.0     6.0     8.0     10.0    12.0    14.0    16.0    18.0    XFUS11
       20.0    22.0    24.0    26.0    28.0    30.0    32.0    34.0    36.0    38.0    XFUS12
       0.0     0.7329  1.9607  3.385   4.799   6.0524  7.0686  7.7931  8.3264  8.6361  FUSARD11
       8.7616  8.6049  8.1433  7.4506  6.4063  4.9323  3.2174  2.0106  2.0106  2.0106  FUSARD12
                6.      2.      4.                                      10.UU3          0G3PLT1
       X Z OUT  30.     30.     30.                                     10.ORT          0G0PLT1
       X Y OUT  30.     30.     30.                                     10.ORT          1G0PLT2
                NACA TRANSONIC WING-BODY PANELING                               TITLEB
***    0  1  3  3                                                                BCCP
***    1 -3 -1             1                                                    ACNTRL
***    6 15                                                                     AWCTRL
***    0 18                                                                     AFCTRL
       144.0   12.0    6.125                   20.0                            AREF
       0.229   0.229                                                           AWRAD1
       0.0     2.5     5.0     10.0    15.0    20.0    30.0    40.0    50.0    60.0    XAFK1
       70.0    80.0    90.0    95.0    100.0                                   XAFK2
       1.6     3.6     6.0     8.4     10.8    12.0                            AWYK1
       0.0     2.0     5.0     8.0     11.0    13.0    14.325  15.73   17.16   18.59   AXFUS11
       20.02   21.425  23.0    25.0    28.0    33.0    36.0    38.0                    AXFUS12
       X Y       0.      0.      0.                                    10.ORT          0A0PLT1
       X Z       0.      0.      0.                                    10.ORT          1A0PLT2
       .6      4.                                                                      AEROIN
       -1.0                                                                            STOP
```

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA CR-3980		

4. Title and Subtitle	5. Report Date
USSAERO Version D Computer Program Development Using ANSI Standard FORTRAN 77 and DI-3000 Graphics	May 1986
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Michael R. Wiese	
	10. Work Unit No.
9. Performing Organization Name and Address	11. Contract or Grant No.
Computer Sciences Corporation Hampton, Virginia 23666	NAS1-17999
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	Contractor Report
National Aeronautics and Space Administration Washington, DC 20546	14. Sponsoring Agency Code 505-61-71-03

15. Supplementary Notes

Langley Technical Monitor: Charles H. Fox, Jr.

16. Abstract

The D version of the Unified Subsonic Supersonic Aerodynamic Analysis (USSAERO) program is the result of numerous modifications and enhancements to the B01 version.

These changes include conversion to ANSI standard FORTRAN 77; use of the DI-3000 graphics package; removal of the overlay structure; a revised input format; the addition of an input data analysis routine; and increasing the number of aeronautical components allowed.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Potential flow Pressure distribution theory Aerodynamic characteristics Subsonic aerodynamics Supersonic aerodynamics Panel methods Lifting surface Computer program	Unclassified - Unlimited Subject Category 02

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	104	A06

For sale by the National Technical Information Service, Springfield, Virginia 22161

NASA-Langley, 1986