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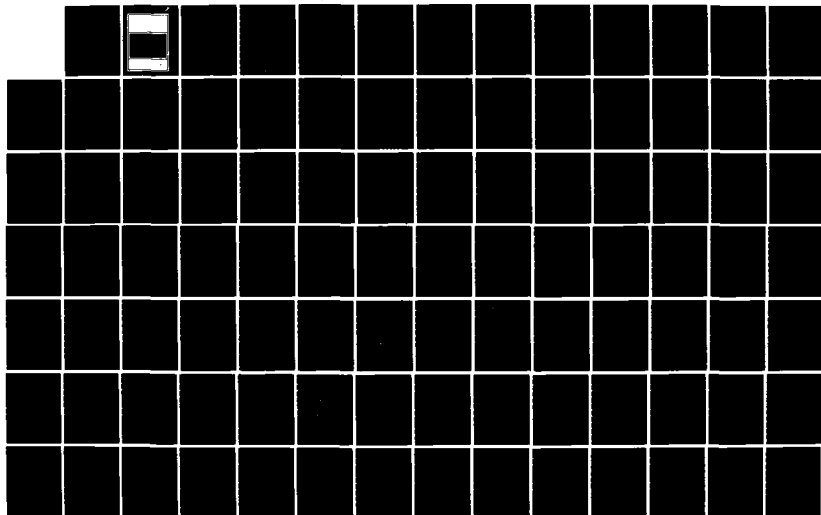
EXPERIMENTAL DATA BASE FOR COMPUTERS PROGRAM ASSESSMENT 1/2
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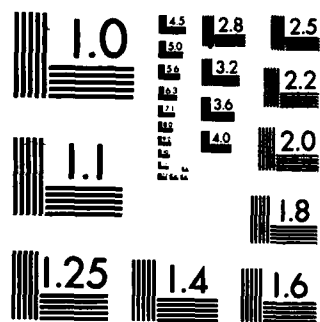
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ADVISORY GROUP FOR AEROSPACE RESEARCH & DEVELOPMENT

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AGARD ADVISORY REPORT No.138

**Fluid Dynamics Panel
Working Group 04
on**

**Experimental Data Base for Computers
Program Assessment**

Addendum

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NOV 6 1984

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ADDENDUM TO
AGARD Advisory Report No.138
EXPERIMENTAL DATA BASE FOR COMPUTERS
PROGRAM ASSESSMENT
REPORT OF THE FLUID DYNAMICS PANEL
WORKING GROUP 04

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PREFACE

The data collected in this Addendum complement those included in the AGARD Advisory Report No. AR-138 issued in May 1979. In that report certain recommendations were made with regard to further, more rigorous test cases. At the time the AGARD Fluid Dynamics Panel instructed the TES (Technique d'Essais en Soufflerie) committee to pay heed to those recommendations and take action, when a suitable experimental data base became available. A number of 3-D test cases that closely match these recommendations have since then appeared and the TES committee has felt obliged to follow up on its own recommendations and make these data available to the AGARD community.

Regarding further 2-D test cases, no test has yet appeared that matches the recommendations for the "ideal" test case given in AR-138. However, considerable effort is still being expended in many NATO countries towards the perfection of the 2-D test methodology (e.g. US., Canada and the Garteur group in Europe). The TES-committee will stay à jour with these developments and, if and when warranted, follow up with appropriate action.

Concerning body-alone configurations, it was recommended in AR-138 that the data given for the ONERA calibration body C5 (case C4 in AR-138) should be complemented with boundary layer survey data. This would result in virtually the ideal test case for bodies of revolution at zero angle of attack. However no such data have so far been produced.

L.H.OHMAN
Chairman
Fluid Dynamics Panel
Committee on Windtunnel & Testing
Techniques

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INTRODUCTION

by

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National Research Council
Ottawa, Ontario K1A 0R6

The presented data originate from three different sources, the Lockheed-Georgia Co., USA., the Aircraft Research Association (ARA), Bedford, England and the Aeronautical Research Institute of Sweden (FFA).

The two Lockheed-Georgia supplied data sets are for a high and a low aspect ratio wing in wing-alone configuration. The investigation, from which these data are extracted, was specifically designed to provide data for computer program assessment, so that wing geometries are quite simple, although based on supercritical airfoil technology. The data were obtained in the Lockheed-Georgia 0.508m x 0.712m Compressible Flow Windtunnel, using reflection plane (half-model) technique, with special attention paid to the thinning of the reflection plane boundary layer. Furthermore, extensive wall boundary pressure data were obtained and are included in the data sets, allowing for the evaluation of wall interference effects.

The ARA data are for a high aspect ratio swept wing and a low aspect ratio swept wing wing-body combination tested in the ARA 9ft x 8ft transonic windtunnel. The wing geometries are rather complicated, requiring a large number of airfoil sections (modern, but not supercritical) for proper definition. The data are corrected for wall interference.

The FFA-supplied data were obtained in free flight with a low aspect ratio swept wing aircraft of simple wing geometry. The flight test was specifically designed for obtaining interference-free aerodynamic data of high quality at realistic Reynolds numbers. The accuracy and repeatability of these data are comparable with those of the above windtunnel test data.

The data are presented in the same format as in the main body of AR-138, with the data sets designated B-6 to B-10. The 3-D cases in AR-138 were given the designation B-1 to B-5. A brief summary of the geometric characteristics and test conditions for the five cases are provided below. The reader/user should be aware of the fact that the data included here represent a selection only of data from rather comprehensive investigations, the extent of which is given under respective headings.

Suitable contacts and addresses are included in the data sets, should further information be required.

Data Set	Config.	Leading Edge Sweep	Aspect Ratio	Taper Ratio	No. & Type of Airfoil Sections	Mach No. Range	Angle of Attack Range	RN Range Based on M.A.C.	Comments
B-6	Semi-span wing	27°	8	0.4	2 supercritical t/c = 0.12	0.62-0.84	-2° to +5°	6 x 10 ⁶	Wall boundary pressure data incl.
B-7	Semi-span wing	35°	3.8	0.4	2 supercritical t/c = 0.06			10 x 10 ⁶	Wall boundary pressure data incl.
B-8	Wing/body full model	40° inboard 34.4° outboard	9	0.25	10 advanced t/c = 0.14 - 0.105 - 0.11	0.50-0.93	-4° to +3°	3.5 x 10 ⁶	Corrected for wall int.
B-9	Wing/body full model	40°	4	0.25	10 advanced t/c = 0.105 - 0.07	0.5-0.82	0° to +8°	2.8-3.7 x 10 ⁶	Corrected for wall int.
B-10	Aircraft	38.9°	4.519	0.335	1 'classic' t/c = 0.10	0.4-0.89	0° to +10°	10 - 30 x 10 ⁶	Free flight

6. TRANSONIC WING AND FAR FIELD TEST DATA ON A HIGH ASPECT RATIO TRANSPORT WING FOR THREE DIMENSIONAL COMPUTATIONAL METHOD EVALUATION.

BY

K.P. BURDGES AND B.L. HINSON
LOCKHEED-GEORGIA COMPANY
86 SOUTH COBB DRIVE
MARIETTA, GEORGIA 30063

6.1 INTRODUCTION

The data presented in this contribution were obtained in the Lockheed-Georgia Compressible Flow Wind Tunnel as part of a research program sponsored by the United States Air Force Office of Scientific Research. The intent of the experiment was to provide force and pressure data on a state-of-the-art supercritical moderate aspect ratio transport wing for evaluation of three-dimensional flow computation methods. The wing, though simply defined, is representative of high performance supercritical technology. The pressure distributions on this wing exhibit recompression of the local supersonic flow over the front part of the wing, terminating the supersonic region with a moderate strength, swept shock wave. The strength of the shock wave increases with free stream Mach number until a small region of trailing edge separation occurs in the 70% semispan pressure data for $M = .84$. The latter condition is an interesting test case for viscous modeling techniques.

In the past, there has been some lack of understanding as to the far field boundary conditions in wind tunnel experiments, e.g. porous walls. The accuracy of current computational methods has caused concern over the influence of small differences between far field boundary conditions of wind tunnel experiments and the free air boundary condition applied at the edge of the mathematical computational zone. In an effort to improve the rigor of the code evaluation, a far field boundary condition was measured in the experiment to be included as a boundary condition when evaluating computational methods.

Experimental longitudinal static pressure distributions near the wind tunnel walls were measured at 4 spanwise positions, above and below the model. These measurements are included in the data set. Other measurements, such as the effect of wall porosity and empty tunnel pressure distributions were obtained, but are not appropriate in this data set. All data presented are not corrected for any wind tunnel wall interference.

A simple body was included in the original test program to provide wing/body interference effects as well. These data are not included in this data set, but are available on magnetic tape through the United States Air Force Office of Scientific Research, Bolling Air Force Base, D.C.

6.2 DATA SET

1. General Description

- | | | |
|-----|--|--|
| 1.1 | Model Designation or Name | LOCKHEED - AFOSR Wing A |
| 1.2 | Model Type (e.g., Full Span Wing-Body, Semi-Span Wing) | Semi Span Wing. (Wing-body data in Reference Report) |
| 1.3 | Design Requirement/Conditions | This model was designed to provide state-of-the-art transonic performance characteristics, but with a simple geometry suitable for ease of input into theoretical math models. |
| 1.4 | Additional Remarks | Extensive far field boundary condition measurements were made to provide a rigorous test case for theoretical models and eliminate uncertainties about wind tunnel wall effects. |

2. Model Geometry

- | | | |
|-------|---------------------|---|
| 2.1 | Wing Data | |
| 2.1.1 | Wing Planform | Simple, swept back, tapered - See Figure 6.1. |
| 2.1.2 | Aspect Ratio | 8.0 |
| 2.1.3 | Quarter Chord Sweep | 25.0° |

2.1.4	Trailing Edge Sweep	14.6°
2.1.5	Taper Ratio	0.4
2.1.6	Twist	4.8°
2.1.7	Mean Aerodynamic Chord	12.26 cm (4.825 in)
2.1.8	Span or Semispan	45.7 cm (18.0 in) Semispan
2.1.9	Number of Airfoil Sections Used to Define Wing	Two, t/c = .12 Supercritical
2.1.10	Spanwise Location of Reference Section and Section Coordinates (Note if Ordinates are Design or Actual Measured Values)	y/b = 0, 1.0 Design Coordinates in Table I
2.1.11	Lofting Procedure Between Reference Sections	Straight Line
2.1.12	Form of Wing-Body Fillet, Strakes	None
2.1.13	Form of Wing Tip	Airfoil thickness form rotated about camber line
2.2	Body Data (Detail Description of Body Geometry)	See Figure 6.2.
2.3	Wing-Body Combination	
2.3.1	Relative Body Diameter (Average Body Diameter at Wing Location Divided by Wing Span)	.097
2.3.2	Relative Vertical Location of Wing (Height Above or Below Axis Divided by Average Body Radius at Wing Location)	Three Positions: high, medium, low - Wing. See Reference Report.
2.3.3	Wing Setting Angle	2.76°
2.3.4	Dihedral	0.0°
2.4	Cross Sectional Area Development	See Figure 6.3.
2.5	Fabrication Tolerances/Waviness	+ .05 mm
3.	<u>Wind Tunnel</u>	
3.1	Designation	Lockheed-Georgia Compressible Flow Wind Tunnel
3.2	Type of Tunnel	
3.2.1	Continuous or Blowdown Indicate Minimum Run Time if Applicable	Blow down 12 sec (Max. = 120 sec)
3.2.2	Stagnation Pressure	19 - 172 dynes/cm ² (20-175 psia)
3.2.3	Stagnation Temperature	266 - 311 K (480 - 560° R)
3.3	Test Section	
3.3.1	Shape of Test Section	Rectangular
3.3.2	Size of Test Section (Width, Height, Length)	50.8 cm (20.0 in) x 71.2 cm (28.0 in) x 183 cm (72.0 in)

3.3.3	Type of Test Section Walls Closed, Open, Slotted, Perforated	Solid at model centerline (floor of tunnel). Perforated with 60° inclined holes.
	Open Area Ratio (Give Range if Variable)	0 ~ 10%
	Slot/Hole Geometry (e.g., 30-Degree Slanted Holes)	60° slanted holes in two sliding plates.
	Treatment of Side Wall Boundary Layer	
	Full Span Model	No treatment
	Half-model testing	Floor boundary layer removed (model centerline) 53.6 cm (21.0 in) ahead of balance centerline.
3.4	Flow Field (Empty Test Section)	
3.4.1	Reference Static Pressure	Wall static upstream of porous section
3.4.2	Flow Angularity	0
3.4.3	Mach Number Distri- bution	Shown in Ref. Rept.
3.4.4	Pressure Gradient	Shown in Ref. Rept.
3.4.5	Turbulence/Noise Level	Not measured
3.5	Freestream Mach Number (or Velocity)	
3.5.1	Range	0.2 to 1.1
3.5.2	Pressure Used to Determine Mach Number (e.g., Settling Chamber Total Pressure and Plenum Chamber Pressure)	Settling chamber total pressure and wall static pressure.
3.5.3	Accuracy of Mach Number Determination (ΔM)	.002
3.5.4	Maximum Mach Number Variation During a Run	.005
3.6	Reynolds Number Range	
3.6.1	Unit Reynolds Number Range (Give Range at Representative Mach Numbers; 1/m)	15 to 150 million per meter
3.6.2	Means of Varying Reynolds Number (e.g., by Pressurization)	Pressurization
3.7	Temperature Range and Dewpoint, Can Temperature be Controlled?	Temp not controlled Dewpoint = 222 K (400°R)
3.8	Model Attitudes	
3.8.1	Angle-of-Attack	Constant during run
3.8.2	Accuracy in Determining Angles	0.05 Deg.
3.9	Organization Operating the Tunnel and Location of Tunnel	Lockheed-Georgia Co.
3.10	Who is to be Contacted for Additional Infor- mation	K. P. Burdges Dept. 72-74, Zone 403 Lockheed-Georgia Co. Marietta, Ga. 30063 USA

3.11 Literature Concerning
this Facility

G. A. Pounds and Stanewsky, E.,
"The Compressible Flow Facility,
Part 1: Design" Lockheed GA. Co.
ER 9219-1, Oct. 1967.

3.12 Additional Remarks

4. Tests

- 4.1 Type of Tests Transonic force and pressure
- 4.2 Wing Span or Semispan to
Tunnel Width .67
- 4.3 Test Conditions
- 4.3.1 Angle-of-Attack -2.0 to 5.0 Degrees
- 4.3.2 Mach Number 0.62 to 0.84
- 4.3.3 Dynamic Pressure 14.4 dynes/cm² (14.6 psia)
- 4.3.4 Reynolds Number 6 Million based on MAC
- 4.3.5 Stagnation Temperature 289 K (520°R)
- 4.4 Transition
- 4.4.1 Free or Fixed Fixed
- 4.4.2 Position of Free
Transition
- 4.4.3 Position of Fixed
Transition, Width of
Strips, Size and Type
of Roughness Elements 1.2 mm (.05 in) wide strip of
glass beads 0.058 mm (0.0023 in)
dia located .05 MAC from LE
- 4.4.4 Were Checks Made to
Determine if Transition
Occurred at Trip
Locations? No
- 4.5 Bending or Torsion Under Load
- 4.5.1 Describe Any Aero-
elastic Measurements
Made During Tests None
- 4.5.2 Describe Results of Any
Bench Calibrations None
- 4.6 Were Different Sized Models
Used in Wind-Tunnel Investi-
gation? If so, Indicate Sizes No
- 4.7 Areas and Length Used to Form
Coefficients Wing Area - 528 cm² (81.8 in²)
Mean Aerodynamic Chord - 12.26 cm
(4.825 in)
Wing Semispan - 45.7 cm (18.0 in)
- 4.8 References on Tests Hinson, B. L. and Burdges, K. P.,
"Acquisition and Application of
Transonic Wing and Far-Field Test
Data for Three-Dimensional Com-
putational Method Evaluation,"
AFOSR-TR-80-0421, March 1980.
- 4.9 Additional Remarks Ratio of model solid blockage area
to test section cross-sectional
area:
Wing - .018
Wing with body - .027

5. Instrumentation

5.1 Surface Pressure Measurements

5.1.1	Pressure Orifices in Wing. Location and Number on Upper and Lower Surfaces	110 upper surface, 50 lower surface, measured positions in Table II.
5.1.2	Pressure Orifices on Fuselage. Location and Number	None
5.1.3	Pressure Orifices on Components, Give Component and Orifice Location	None
5.1.4	Geometry of Orifices	Normal to surface, .5 mm (.020 in) dia.
5.1.5	Type of Pressure Transducer and Scanning Devices Used. Indicate Range and Accuracy	Statham 12.5 psid transducers Scanivalve Model J2 +0.5% Full Scale
5.2	Force Measurements	
5.2.1	Type and Location of Balance	5 component floor balance (semi-span)
5.2.2	Forces and Moments that Can be Measured. Maximum Loads and Accuracy	Normal Force: 3.34 kN; $\pm 0.25\%$ Axial Force: 334 N; $\pm 0.25\%$ Pitching Moment: 203 m-N; $\pm 0.25\%$ Rolling Moment: 678 m-N; $\pm 0.25\%$ Yawing Moment: 68 m-N; $\pm 0.25\%$
5.2.3	Forces and Moments on Components	None
	Type and Location of Balance	
	Maximum Loads and Accuracy	
6.	<u>Data</u>	
6.1	Accuracy	
6.1.1	Pressure Coefficients	± 0.002
6.1.2	Aerodynamic Coefficients	$\pm .002$ on C_p , $\pm .001$ on C_L , $\pm .0003$ on C_D , $\pm .0007$ on C_M
6.1.3	Boundary Layer and Wake Quantities	
6.1.4	Repeatability	Note duplicate symbols on force data. Figure 6.5 - 6.7
6.1.5	Additional Remarks	
6.2	Wall Interference Corrections	Not applied, but static pressure measured at 4 spanwise locations near the tunnel walls above and below the model to provide far-field boundary conditions for code correlations. (See Figures 6.4, 6.12 and Table III, V - VIII.)
6.3	Data Presentation	
6.3.1	Aerodynamic Coefficients	See Figure 6.5 - 6.7
6.3.2	Surface Pressure Coefficients	See Figure 6.8 - 6.11, Table V, VI, VII, and VIII
6.3.3	Flow Conditions	See Table IV
	- Aerodynamic coefficient data	$M = .62, .72, .76, .78, .80, .82, .84$ $\alpha = -2$ to 3°

- Pressure data

Wing PressuresM = .62, .80, .82, .84 at $\alpha = 3^\circ$ Wind-Tunnel Wall PressuresM = .62, .80, .82, .84 at $\alpha = 3^\circ$

6.3.4	Boundary Layer and/or Wake Data	None
6.3.5	Flow Conditions for Boundary Layer and/or Wake Data	None
6.3.6	Wall Interference Corrections Included?	No
6.3.7	Aeroelastic Corrections Included?	No
6.3.8	Other Corrections?	No

7. References

1. Hinson, B. L., and Burdges, K. P., "Acquisition and Application of Transonic Wing and Far-Field Test Data for Three-Dimensional Computational Method Evaluation," AFOSR-TR-80-0421, March 1980.
2. Pounds, G. A., and Stanewsky, E., "The Compressible Flow Facility, Part 1: Design," Lockheed-Georgia Company ER 9219-1, October 1967.

8. List of Symbols

AR	wing aspect ratio, b^2/S
b	wing span
C	streamwise local chord of wing
C_D	drag coefficient
C_L	lift coefficient
C_M	pitching-moment coefficient about quarter chord of MAC
C_p	pressure coefficient
M	freestream Mach number
MAC	mean aerodynamic chord of wing
R_N	Reynolds number based on freestream conditions and MAC
S	wing planform area
x	streamwise coordinate measured from wing leading edge
y	spanwise coordinate measured from plane of symmetry
#	Coordinate Normal to Airfoil Chord or Tunnel Center Plane
α	angle of wing reference plane relative to tunnel axis
θ	wing section local incidence angle relative to WRP
λ	wing taper ratio, C_t/C_r
Λ'	wing sweep angle
η	span station, $y/(b/2)$, ETA
τ	wind tunnel wall porosity

Subscripts:

L lower surface
LE leading edge
M measured
r,R wing root
t wing tip
TE trailing edge
U upper surface

Abbreviations:

CFWT Lockheed Compressible Flow Wind Tunnel
WRP wing reference plane

TABLE II - PRESSURE ORIFICE MEASURED LOCATIONS

UPPER SURFACE					
ETA X/C	.15	.3	.5	.7	.95
	.0193	.0180	.0185	.0175	.0196
	.0480	.0467	.0459	.0514	.0480
	.0975	.0968	.0975	.0958	.0929
	.1471	.1474	.1479	.1463	.1440
	.1967	.1971	.1956	.1964	.1930
	.2478	.2465	.2458	.2442	.2434
	.2982	.2963	.2962	.2956	.2959
	.3471	.3463	.3461	.3465	.3438
	.3981	.3971	.3752	.3955	.3940
	.4465	.4465	.4466	.4438	.4426
	.4970	.4777	.4965	.4952	.4948
	.5475	.5468	.5459	.5451	.5419
	.5972	.5965	.5972	.5940	.5945
	.6467	.6463	.6468	.6442	.6442
	.6969	.6965	.6956	.6946	.6930
	.7471	.7475	.7455	.7444	.7437
	.7981	.7963	.7965	.7944	.7941
	.8478	.8464	.8458	.8450	.8417
	.8984	.8967	.8960	.8951	.8930
	.9490	.9467	.9458	.9449	.9416
	1.0000	1.0000	1.0000	1.0000	1.0000

LOWER SURFACE					
	.0471	.0470	.0453	.0440	.0472
	.0976	.0989	.0948	.0965	.0946
	.1976	.1975	.1954	.1949	.1954
	.2974	.2962	.2952	.2931	.2954
	.3970	.3968	.3952	.3938	.3967
	.4973	.4964	.4952	.4942	.4952
	.5972	.5948	.5955	.5951	.5968
	.6976	.6921	.6954	.6964	.6973
	.7967	.7964	.7953	.7961	.7912
	.8983	.8985	.8979	.9014	.9017
	.9472	.9497	.9522	.9476	.9201
	1.0000	1.0000	1.0000	1.0000	1.0000

TABLE I - WING A DESIGN ORDINATES

X/C	ROOT SECTION		TIP SECTION	
	Z_U/C	Z_L/C	Z_U/C	Z_L/C
.00000	.00000	.00000	.00000	.00000
.00241	.00952	.00800	.00788	.00899
.00961	.01758	.01578	.01697	.01588
.02153	.02431	.02205	.02557	.02141
.03806	.03018	.02822	.03305	.02589
.05904	.03496	.03432	.03984	.02964
.08427	.03857	.04055	.04610	.03320
.11349	.04136	.04684	.05172	.03659
.14645	.04364	.05309	.05658	.03990
.18280	.04554	.05889	.06067	.04296
.22221	.04704	.06391	.06401	.04562
.26430	.04807	.06772	.06665	.04775
.30866	.04864	.07031	.06859	.04922
.35486	.04874	.07126	.06983	.04992
.40245	.04835	.07094	.07036	.04964
.45099	.04736	.06882	.07021	.04802
.50000	.04574	.06540	.06943	.04460
.54901	.04345	.06008	.06799	.03923
.59755	.04062	.05349	.06591	.03238
.64514	.03726	.04548	.06311	.02478
.69134	.03353	.03695	.05956	.01710
.73570	.02958	.02858	.05504	.00997
.77779	.02554	.02034	.04948	.00381
.81720	.02153	.01323	.04295	.00099
.85355	.01767	.00734	.03585	.00423
.88651	.01410	.00283	.02874	.00596
.91573	.01087	.00016	.02206	.00617
.94096	.00806	.00168	.01618	.00522
.96194	.00574	.00195	.01134	.00357
.97847	.00382	.00142	.00745	.00155
.99039	.00237	.00048	.00481	.00003
.99759	.00124	.00043	.00285	.00146
1.00000	.00080	.00080	.00207	.00207

TABLE III - LOCATIONS OF FAR FIELD PRESSURE ORIFICE

Z/C _R Y/C _R	1.231 0.0	-1.231 0.0	1.423 .923	1.423 1.990	1.423 3.029	-1.423 .856	-1.423 1.990	-1.423 3.019
X/C _R	X/C _R	X/C _R	X/C _R	X/C _R	X/C _R	X/C _R	X/C _R	X/C _R
-2.850	-2.850	-2.839	-2.839	-2.839	-2.839	-2.839	-2.839	-2.839
-2.712	-2.712	-2.378	-2.378	-2.378	-2.378	-2.378	-2.378	-2.378
-2.191	-2.191	-1.917	-1.917	-1.917	-1.917	-1.917	-1.917	-1.917
-1.148	-1.148	-1.455	-1.455	-1.455	-1.455	-1.455	-1.455	-1.455
-0.451	-0.451	-1.301	-1.301	-1.301	-1.301	-1.301	-1.301	-1.301
-0.106	-0.106	-1.148	-1.148	-1.148	-1.148	-1.148	-1.148	-1.148
+0.240	+0.240	-0.994	-0.994	-0.994	-0.994	-0.994	-0.994	-0.994
0.586	0.586	-0.840	-0.840	-0.840	-0.840	-0.840	-0.840	-0.840
0.934	0.934	-0.686	-0.686	-0.686	-0.686	-0.686	-0.686	-0.686
1.281	1.281	-0.532	-0.532	-0.532	-0.532	-0.532	-0.532	-0.532
1.627	1.627	-0.378	-0.378	-0.378	-0.378	-0.378	-0.378	-0.378
2.324	2.324	-0.225	-0.225	-0.225	-0.225	-0.225	-0.225	-0.225
3.017	3.017	-0.071	-0.071	-0.071	-0.071	-0.071	-0.071	-0.071
3.712	3.712	+0.083	+0.083	+0.083	+0.083	+0.083	+0.083	+0.083
		0.237	0.237	0.237	0.237	0.237	0.237	0.237
		0.390	0.390	0.390	0.390	0.390	0.390	0.390
		0.544	0.544	0.544	0.544	0.544	0.544	0.544
		0.698	0.698	0.698	0.698	0.698	0.698	0.698
		0.852	0.852	0.852	0.852	0.852	0.852	0.852
		1.006	1.006	1.006	1.006	1.006	1.006	1.006
		1.159	1.159	1.159	1.159	1.159	1.159	1.159
		1.313	1.313	1.313	1.313	1.313	1.313	1.313
		1.467	1.467	1.467	1.467	1.467	1.467	1.467
		1.621	1.621	1.621	1.621	1.621	1.621	1.621
		1.775	1.775	1.775	1.775	1.775	1.775	1.775
		1.928	1.928	1.928	1.928	1.928	1.928	1.928
		2.082	2.082	2.082	2.082	2.082	2.082	2.082
		2.236	2.236	2.236	2.236	2.236	2.236	2.236
		2.697	2.697	2.697	2.697	2.697	2.697	2.697
		3.159	3.159	3.159	3.159	3.159	3.159	3.159
		3.620	3.620	3.620	3.620	3.620	3.620	3.620

TABLE IV - SUMMARY OF TEST CONDITIONS

M	.62	.72	.76	.78	.80	.82	.84
-2	○ □ ◇ △	○	○	○	○ □ ◇ △	○ □ ◇ △	
-1	○ □ ◇ △	○	○	○	○ □ ◇ △	○ □ ◇ △	
0	○ □ ◇ △	○	○	○	○ □ ◇ △	○ □ ◇ △	
1	○ □ ◇ △	○	○	○	○ □ ◇ △	○ □ ◇ △	
2	○ □ ◇ △	○ □ ◇ △	○ □ ◇ △	○ □ ◇ △	○ □ ◇ △	○ □ ◇ △	○ □ ◇ △
3	○ □ ◇ △	○	○	○	○ □ ◇ △	○ □ ◇ △	
4	○ □ ◇ △	○			○		
5	○ □ ◇ △						
C _L = .45	○ □ ◇ △			○	○	○ □ ◇ △	

○ CLEAN WING, $\tau = 4\%$ □ CLEAN WING, $\tau = 3\%$ ◇ CLEAN WING, $\tau = 5\%$ △ CLEAN WING, $\tau = 6\%$ ○ HIGH WING, $\tau = 4\%$ ○ MID WING, $\tau = 4\%$ ○ LOW WING, $\tau = 4\%$

TABLE V - TABLE OF MEASURED PRESSURE COEFFICIENTS, $M = .62$

RUN 18

MACH .6217

ALPHA 2.976

REN 6.03

 C_L .41279 C_D .02318 C_M -.04172

WING PRESSURE DATA

STA	.15	.30	.5	.7	.95
C_l	.41279	.44446	.48228	.48056	.33109
C_m	-.02660	-.03295	-.04228	-.05403	-.05708
X/C	C_p	X/C	C_p	X/C	C_p
UPPER SURFACE					
.0193	-1.4986	.0180	-1.5763	.0185	-1.4618
.0480	-1.4270	.0467	-1.3004	.0459	-1.5415
.0975	-.8560	.0968	-.9695	.0975	-.9724
.1471	-.6823	.1474	-.7301	.1479	-.7645
.1967	-.5833	.1971	-.6351	.1956	-.6683
.2478	-.5358	.2465	-.5723	.2458	-.6004
.2982	-.4955	.2963	-.5274	.2962	-.5466
.3471	-.4713	.3463	-.4928	.3461	-.5085
.3981	-.4457	.3971	-.4608	.3752	-.4886
.4465	-.4473	.4465	-.4390	.4466	-.4517
.4970	-.3825	.4777	-.3885	.4965	-.4178
.5475	-.3486	.5468	-.3569	.5459	-.3859
.5972	-.3109	.5965	-.3308	.5972	-.3513
.6467	-.2792	.6463	-.2949	.6468	-.3275
.6769	-.2427	.6965	-.2535	.6956	-.2891
.7471	-.1883	.7475	-.2043	.7455	-.2415
.7981	-.1392	.7963	-.1485	.7965	-.1848
.8478	-.0844	.8464	-.0901	.8458	-.1077
.8984	-.0279	.8967	-.0301	.8960	-.0482
.9490	.0435	.9467	.0398	.9458	.0368
1.0000	.0037	1.0000	.0217	1.0000	.0664
LOWER SURFACE					
.0471	.3391	.0470	.3407	.0453	.3161
.0976	.1692	.0989	.1560	.0948	.1480
.1976	-.0752	.1975	-.0640	.1954	-.0436
.2974	-.2273	.2962	-.1954	.2952	-.2051
.3970	-.2574	.3968	-.2351	.3952	-.2391
.4973	-.2490	.4964	-.2330	.4952	-.2168
.5972	-.1495	.5948	-.1522	.5955	-.1050
.6976	.0197	.6921	.0319	.6954	.0762
.7967	.1692	.7964	.1918	.7953	.2057
.8983	.2720	.8985	.2888	.8979	.2896
.9472	.2834	.9497	.2978	.9522	.2854
1.0000	.0037	1.0000	.0217	1.0000	.0664

FAR FIELD MEASUREMENT

Z/C _R	1.231	-1.231	1.423	1.423	1.423	-1.423	-1.423	-1.423
Y/C _R	0.0	0.0	.923	1.990	3.029	.856	1.990	3.019
X/C _R	C_p	C_p	X/C _R	C_p	C_p	C_p	C_p	C_p
-2.850		.0564	-2.839	-.0097	.0018	.0195	.0187	.0174
-2.712	-.0186	.0314	-2.378	.0055	.0126	.0114	.0031	.0137
-2.191	.0072	.0248	-1.917	.0008	.0093	.0144	.0097	.0085
-1.148	.0166	-.0032	-1.455	.0068	.0061	.0182	.0123	.0095
-0.451	.0324	-.0033	-1.301	.0081	.0087	.0127	.0135	.0021
-0.106	.0368	-.0286	-1.148	-.0021	.0127	.0148	.0132	.0120
+0.240	.0342	-.0488	-0.994	.0015	.0101	.0118	.0183	.0093
0.586	.0171	-.0816	-0.840	.0029	.0072	.0074	.0177	.0085
0.934	.0243	-.0755	-0.686	.0037	.0064	.0096	.0209	.0117
1.281	.0165	-.0071	-0.532	-.0034	.0037	.0092	.0242	.0134
1.627	.0314	-.0647	-0.378	-.0038	-.0039	.0043	.0217	.0126
2.324	.0136	-.0492	-0.225	-.0062	-.0034	.0027	.0343	.0164
3.017	-.0137	-.0507	-0.071	-.0251	-.0046	.0039	.0251	.0169
3.712	-.0788	-.0607	+0.083	-.0255	-.0094	.0026	.0360	.0192
			0.237	-.0304	-.0188	-.0002	.0336	.0184
			0.390	-.0376	.0046	-.0027	.0349	.0409
			0.544	-.0490	-.0097	-.0052	.0394	.0373
			0.698	-.0542	-.0123	-.0060	.0401	.0422
			0.852	-.0569	-.0183	-.0074	.0359	.0447
			1.006	-.0591	-.0259	-.0098	.0313	.0443
			1.159	-.0607	-.0291	-.0116	.0411	.0426
			1.313	-.0606	-.0333	-.0178	.0315	.0398
			1.467	-.0550	-.0359	-.0169	.0227	.0379
			1.621	-.0515	-.0351	-.0133	.0229	.0319
			1.775	-.0470	-.0339	-.0119	.0346	.0329
			1.928	-.0130	-.0365	-.0149	.0293	.0259
			2.082	-.0224	-.0357	-.0107	.0276	.0208
			2.236	-.0356	-.0373	-.0092	.0193	.0218
			2.697	-.0356	-.0316	-.0098	.0067	.0099
			3.159	-.0354	-.0253	.0038	-.0124	.0017
			3.620	-.0348	-.0253	.0009	-.0250	.0010

TABLE VI - TABLE OF MEASURED PRESSURE COEFFICIENTS, M = .80

RUN 92

MACH .8009

ALPHA 2.941

REN 6.11

 C_L .53581 C_D .03556 C_M -.05270

WING PRESSURE DATA

STA	.15	.30	.5	.7	.95
C_l	.48576	.53396	.56957	.57607	.38178
C_m	-.03632	-.02907	-.03954	-.05203	-.05021
X/C	C_p	X/C	C_p	X/C	C_p
UPPER SURFACE					
.0193	-.8298	.0180	-.8460	.0185	-.7557
.0480	-1.1767	.0467	-1.1726	.0459	-1.1674
.0975	-1.2542	.0968	-1.2952	.0975	-1.2295
.1471	-1.1771	.1474	-1.2291	.1479	-1.2209
.1967	-.6797	.1971	-1.1964	.1956	-1.2045
.2478	-.6945	.2465	-1.1745	.2458	-1.1878
.2982	-.6713	.2963	-1.1321	.2962	-1.1759
.3471	-.6783	.3463	-.7377	.3461	-1.1505
.3981	-.6641	.3971	-.5372	.3752	-.6727
.4465	-.6775	.4465	-.4568	.4466	-.6116
.4970	-.6809	.4777	-.4040	.4965	-.4817
.5475	-.4052	.5468	-.3544	.5459	-.3496
.5972	-.3557	.5965	-.3208	.5972	-.2855
.6467	-.3165	.6463	-.2850	.6468	-.2615
.6769	-.2676	.6965	-.2344	.6956	-.2264
.7471	-.2049	.7475	-.1801	.7455	-.1805
.7981	-.1354	.7963	-.1187	.7965	-.1351
.8478	-.0693	.8464	-.0548	.8458	-.0560
.8984	-.0052	.8967	.0098	.8960	.0017
.9490	.0761	.9467	.0836	.9458	.0869
1.0000	.1425	1.0000	.1524	1.0000	.1507
LOWER SURFACE					
.0471	.2799	.0470	.3040	.0453	.2665
.0976	.1710	.0989	.1262	.0948	.1124
.1976	-.0918	.1975	-.1102	.1954	-.0971
.2974	-.2919	.2962	-.2827	.2952	-.2861
.3970	-.3408	.3968	-.3319	.3952	-.3336
.4973	-.3442	.4964	-.3109	.4952	-.2855
.5972	-.1889	.5948	-.1764	.5955	-.1220
.6976	.0293	.6921	.0507	.6954	.0928
.7967	.1954	.7964	.2185	.7953	.2332
.8983	.3147	.8985	.3198	.8979	.3215
.9472	.3225	.9497	.3327	.9522	.3221
1.0000	.1425	1.0000	.1524	1.0000	.1507

FAR FIELD MEASUREMENT

Z/C _R	1.231	-1.231	1.423	1.423	1.423	-1.423	-1.423	-1.423
Y/C _R	0.0	0.0	.923	1.990	3.029	.856	1.990	3.019
X/C _R	C_p	C_p	X/C _R	C_p	C_p	C_p	C_p	C_p
-2.850		.0355	-2.839	-.0043	.0006	.0159	.0199	.0135
-2.712	.0015	.0245	-2.378	.0085	.0120	.0092	.0062	.0127
-2.191	.0143	.0268	-1.917	.0020	.0122	.0125	.0108	.0100
-1.148	.0177	.0046	-1.455	.0080	.0095	.0159	.0150	.0096
-0.451	.0479	.0172	-1.301	.0131	.0159	.0162	.0198	.0058
-0.106	.0513	-.0052	-1.148	.0014	.0151	.0144	.0184	.0148
+0.240	.0508	-.0668	-0.994	.0086	.0165	.0134	.0249	.0139
0.586	.0272	-.1278	-0.840	.0127	.0133	.0109	.0280	.0111
0.934	.0260	-.1146	-0.686	.0135	.0159	.0134	.0324	.0177
1.281	.0288	-.0159	-0.532	.0120	.0136	.0125	.0385	.0205
1.627	.0502	-.0666	-0.378	.0090	.0095	.0127	.0342	.0250
2.324	.0352	-.0434	-0.225	.0084	.0031	.0108	.0487	.0238
3.017	.0135	-.0403	-0.071	-.0111	.0063	.0101	.0427	.0293
3.712	-.0504	-.0404	+0.083	-.0147	.0005	.0100	.0541	.0305
			0.237	-.0246	-.0072	.0069	.0545	.0327
			0.390	-.0426	.0045	.0058	.0529	.0514
			0.544	-.0649	-.0118	-.0014	.0508	.0464
			0.698	-.0781	-.0229	-.0027	.0527	.0488
			0.852	-.0898	-.0376	-.0081	.0485	.0506
			1.006	-.0903	-.0476	-.0143	.0452	.0529
			1.159	-.0949	-.0586	-.0161	.0507	.0503
			1.313	-.0862	-.0627	-.0275	.0450	.0481
			1.467	-.0773	-.0620	-.0248	.0361	.0471
			1.621	-.0664	-.0558	-.0202	.0384	.0435
			1.775	-.0573	-.0495	-.0179	.0508	.0453
			1.928	-.0217	-.0429	-.0151	.0473	.0447
			2.082	-.0298	-.0377	-.0104	.0420	.0421
			2.236	-.0340	-.0384	-.0044	.0398	.0392
			2.697	-.0308	-.0254	.0055	.0290	.0354
			3.159	-.0241	-.0119	.0309	.0133	.0315
			3.620	-.0252	-.0106	.0286	-.0069	.0149

TABLE VII - TABLE OF MEASURED PRESSURE COEFFICIENTS, $M = .82$

RUN 35

MACH .8184

ALPHA 2.940

REN 5.98

 C_L .52955 C_D .03950 C_M -.05628

WING PRESSURE DATA

STA	.15	.30	.5	.7	.95
C_1	.48678	.55374	.60707	.59367	.39149
C_m	-.04090	-.03642	-.05240	-.06046	-.05195
X/C	C_p	X/C	C_p	X/C	C_p
UPPER SURFACE					
.0193	-.7682	.0180	-.7991	.0185	-.6953
.0480	-1.1177	.0467	-1.1225	.0459	-1.0893
.0975	-1.1942	.0968	-1.2114	.0975	-1.1573
.1471	-1.1390	.1474	-1.1789	.1479	-1.1544
.1967	-.6929	.1971	-1.1459	.1956	-1.1471
.2478	-.6603	.2465	-1.1315	.2458	-1.1327
.2982	-.6655	.2963	-1.1002	.2962	-1.1213
.3471	-.6857	.3463	-.9344	.3461	-1.1055
.3981	-.6861	.3971	-.7444	.3752	-1.1110
.4465	-.7244	.4465	-.6879	.4466	-1.0589
.4970	-.7084	.4777	-.7102	.4965	-.5772
.5475	-.7022	.5468	-.3716	.5459	-.4977
.5972	-.3903	.5965	-.3070	.5972	-.3890
.6467	-.3009	.6463	-.2657	.6468	-.2927
.6769	-.2509	.6965	-.2184	.6956	-.2100
.7471	-.1996	.7475	-.1653	.7455	-.1481
.7981	-.1296	.7963	-.1058	.7965	-.1010
.8478	-.0617	.8464	-.0408	.8458	-.0346
.8984	.0009	.8967	.0242	.8960	.0199
.9490	.0784	.9467	.0931	.9458	.0955
1.0000	.1640	1.0000	.1540	1.0000	.1334
LOWER SURFACE					
.0471	.2828	.0470	.3008	.0453	.2458
.0976	.1746	.0989	.1240	.0948	.1047
.1976	-.0940	.1975	-.1161	.1954	-.1046
.2974	-.3097	.2962	-.2960	.2952	-.3002
.3970	-.3675	.3968	-.3572	.3952	-.3530
.4973	-.3710	.4964	-.3260	.4952	-.2959
.5972	-.1984	.5948	-.1761	.5955	-.1229
.6976	.0275	.6921	.0543	.6954	.0934
.7967	.1957	.7964	.2228	.7953	.2353
.8983	.3150	.8985	.3260	.8979	.3241
.9472	.3264	.9497	.3398	.9522	.3245
1.0000	.1640	1.0000	.1540	1.0000	.1334

TABLE VIII - TABLE OF MEASURED PRESSURE COEFFICIENTS, $M = .84$

RUN 98

MACH .8387

ALPHA 2.931

REN 6.05

 C_L .51149 C_D .04512 C_M -.05052

WING PRESSURE DATA

STA	.15	.30	.5	.7	.95
C_l	.4827	.55731	.59315	.53559	.35603
C_m	-.04874	-.04545	-.06374	-.06222	-.04954
X/C	C_p	X/C	C_p	X/C	C_p
UPPER SURFACE					
.0193	-.6971	.0180	-.7034	.0185	-.6195
.0480	-1.0352	.0467	-1.0200	.0459	-.9869
.0975	-1.1179	.0968	-1.1410	.0975	-1.0741
.1471	-1.0679	.1474	-1.0941	.1479	-1.0818
.1967	-.6504	.1971	-1.0744	.1956	-1.0739
.2478	-.6320	.2465	-1.0674	.2458	-1.0659
.2982	-.6410	.2963	-1.0445	.2962	-1.0618
.3471	-.6509	.3463	-1.0138	.3461	-1.0521
.3981	-.6630	.3971	-.7581	.3752	-1.0611
.4465	-.7148	.4465	-.7467	.4466	-1.0403
.4970	-.6972	.4777	-.7473	.4965	-.6161
.5475	-.7127	.5468	-.7660	.5459	-.5201
.5972	-.7121	.5965	-.4410	.5972	-.4774
.6467	-.5229	.6463	-.2730	.6468	-.4188
.6769	-.2576	.6965	-.1985	.6956	-.3362
.7471	-.1735	.7475	-.1393	.7455	-.2351
.7981	-.1093	.7963	-.0814	.7965	-.1337
.8478	-.0467	.8464	-.0214	.8458	-.0525
.8984	.0136	.8967	.0378	.8960	.0154
.9490	.0888	.9467	.1031	.9458	.0487
1.0000	.1327	1.0000	.1409	1.0000	.1150
LOWER SURFACE					
.0471	.2890	.0470	.2981	.0453	.2525
.0976	.1812	.0989	.1233	.0948	.0991
.1976	-.0859	.1975	-.1191	.1954	-.1158
.2974	-.3009	.2962	-.3135	.2952	-.3226
.3970	-.3669	.3968	-.3845	.3952	-.3889
.4973	-.3965	.4964	-.3422	.4952	-.3196
.5972	-.1979	.5948	-.1807	.5955	-.1311
.6976	.0307	.6921	.0543	.6954	.0818
.7967	.2003	.7964	.2229	.7953	.2260
.8983	.3220	.8985	.3262	.8979	.3146
.9472	.3306	.9497	.3404	.9522	.3129
1.0000	.1327	1.0000	.1409	1.0000	.1150

FAR FIELD MEASUREMENT

Z/C _R	1.231	-1.231	1.423	1.423	1.423	-1.423	-1.423	-1.423
Y/C _R	0.0	0.0	.923	1.990	3.029	.856	1.990	3.019
X/C _R	C_p	C_p	X/C _R	C_p	C_p	C_p	C_p	C_p
-2.850		.0332	-2.839	.0007	.0058	.0196	.0240	.0181
-2.712	.0120	.0313	-2.378	.0130	.0168	.0133	.0108	.0172
-2.191	.0215	.0314	-1.917	.0069	.0168	.0168	.0185	.0134
-1.148	.0237	.0125	-1.455	.0147	.0160	.0212	.0211	.0160
-0.451	.0545	.0278	-1.301	.0187	.0201	.0180	.0243	.0092
-0.106	.0627	.0103	-1.148	.0081	.0221	.0193	.0241	.0211
*0.240	.0600	-.0454	-0.994	.0146	.0213	.0173	.0296	.0177
0.586	.0315	-.1392	-0.840	.0210	.0216	.0179	.0353	.0179
0.934	.0287	-.1321	-0.686	.0210	.0243	.0219	.0384	.0244
1.281	.0359	-.0141	-0.532	.0222	.0229	.0201	.0467	.0272
1.627	.0573	-.0661	-0.378	.0202	.0199	.0191	.0427	.0320
2.324	.0437	-.0376	-0.225	.0202	.0155	.0199	.0573	.0329
3.017	.0237	-.0335	-0.071	.0032	.0177	.0191	.0528	.0377
3.712	-.0397	-.0305	+0.083	.0004	.0133	.0199	.0637	.0397
			0.237	-.0112	.0049	.0166	.0618	.0409
			0.390	-.0289	.0133	.0139	.0611	.0565
			0.544	-.0561	-.0009	.0067	.0573	.0509
			0.698	-.0781	-.0130	.0042	.0563	.0517
			0.852	-.0955	-.0295	-.0010	.0533	.0536
			1.006	-.1016	-.0477	-.0068	.0466	.0507
			1.159	-.1036	-.0599	-.0112	.0556	.0494
			1.313	-.0946	-.0659	-.0251	.0475	.0460
			1.467	-.0801	-.0623	-.0232	.0416	.0476
			1.621	-.0676	-.0551	-.0162	.0435	.0449
			1.775	-.0576	-.0480	-.0162	.0558	.0468
			1.928	-.0195	-.0407	-.0115	.0531	.0462
			2.082	-.0258	-.0332	-.0072	.0498	.0468
			2.236	-.0302	-.0346	-.0020	.0472	.0429
			2.697	-.0253	-.0206	.0125	.0378	.0411
			3.159	-.0182	-.0046	.0407	.0223	.0398
			3.620	-.0171	-.0039	.0378	.0036	.0234

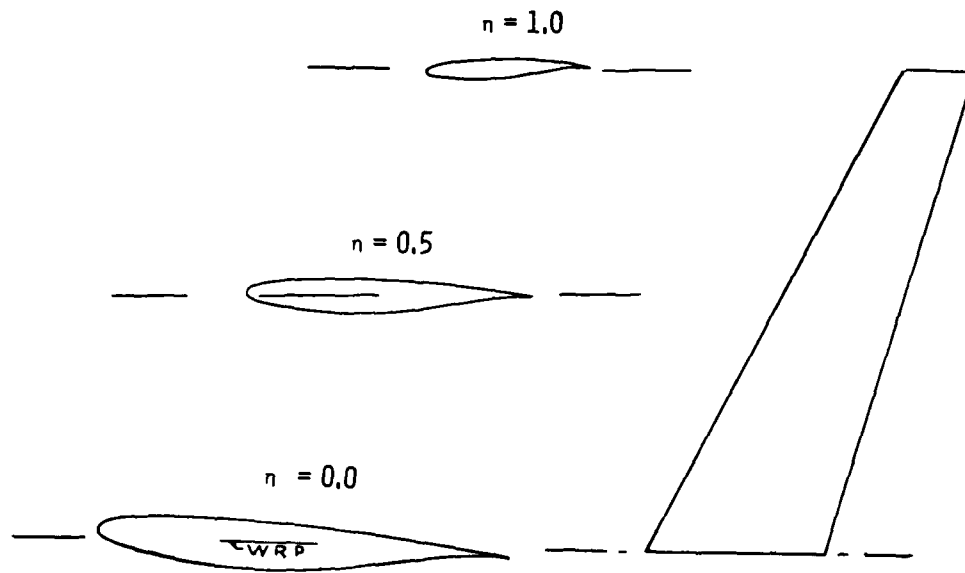


Figure 6.1 - Wing A Geometry

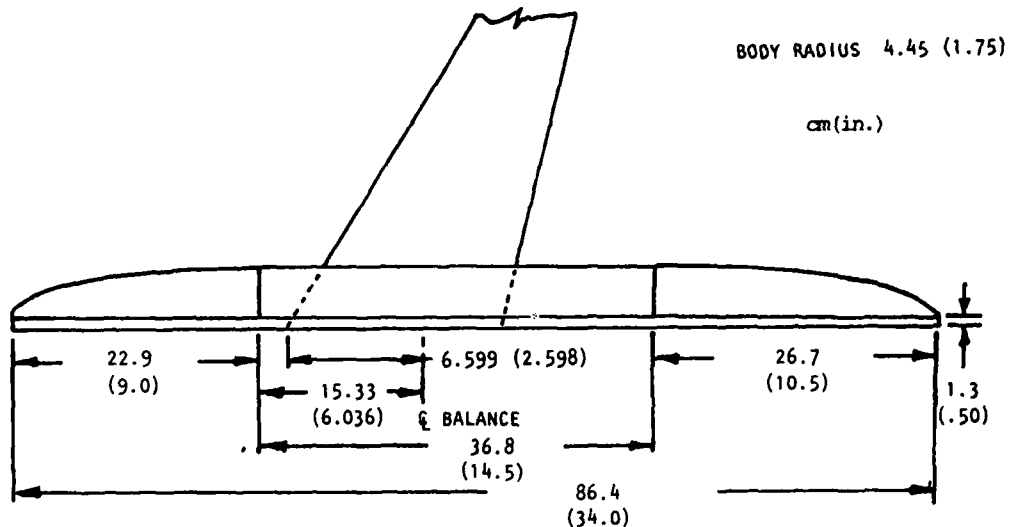


Figure 6.2 - Wing Body Geometry

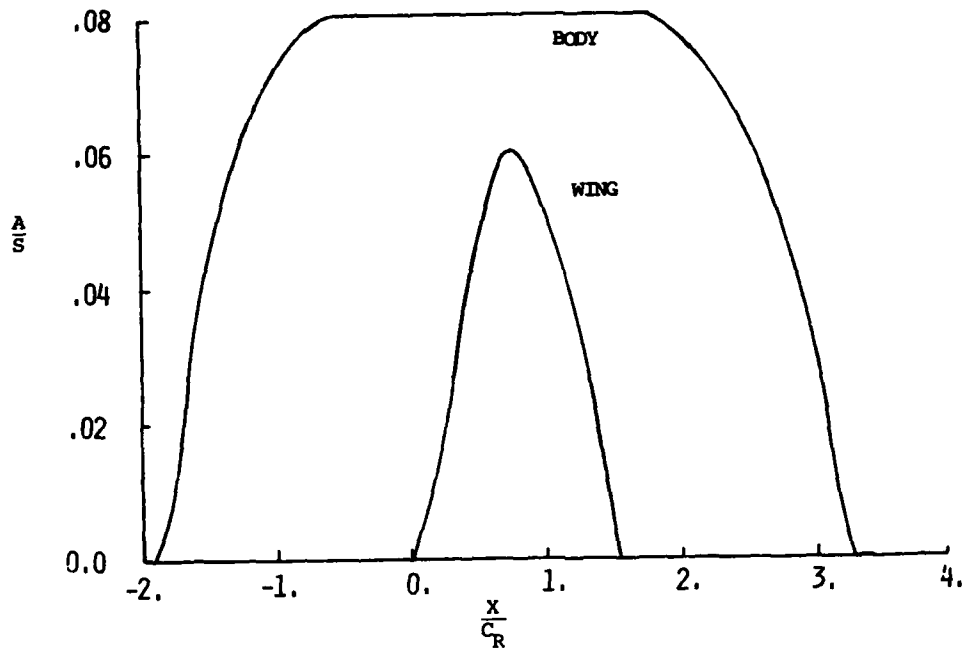


Figure 6.3 - Model Area Distribution

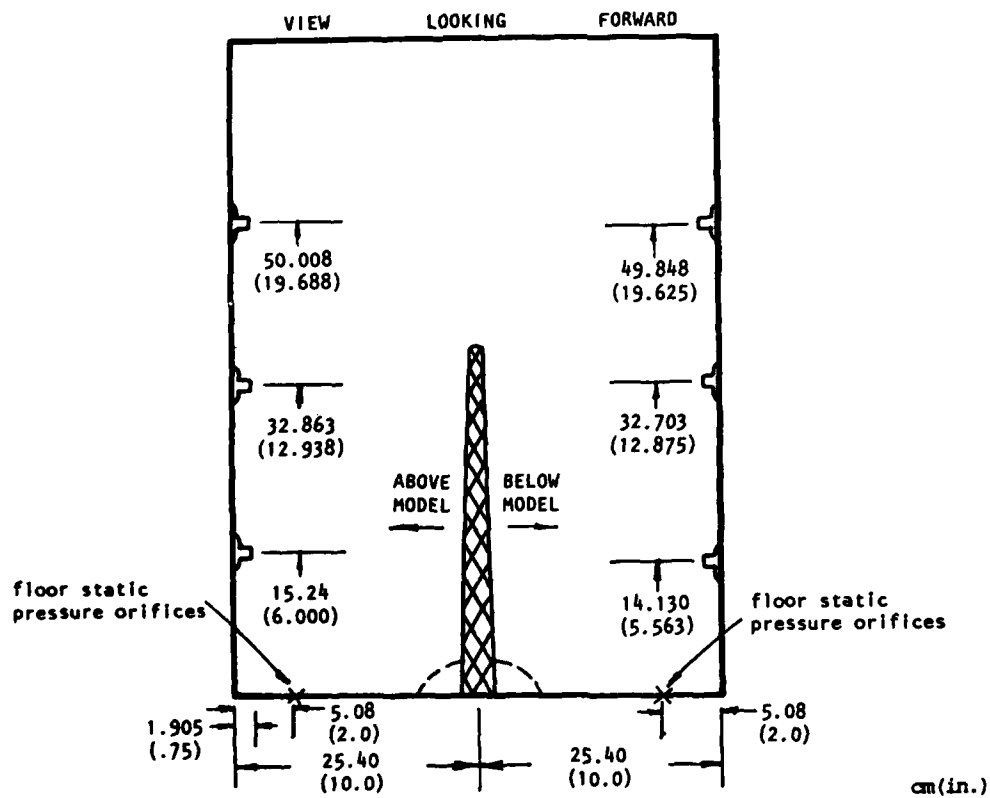


Figure 6.4 - Far Field Pressure Rail Location

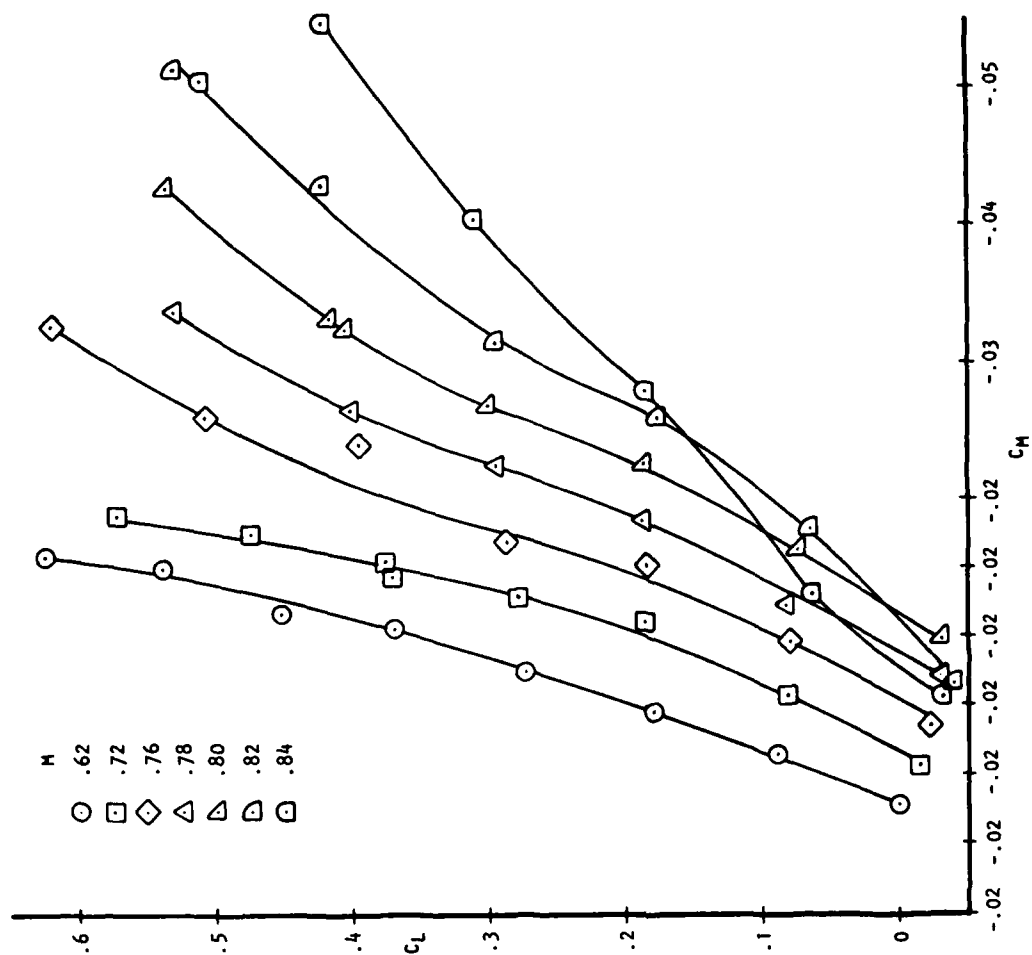


Figure 6.5 - Summary of Lift

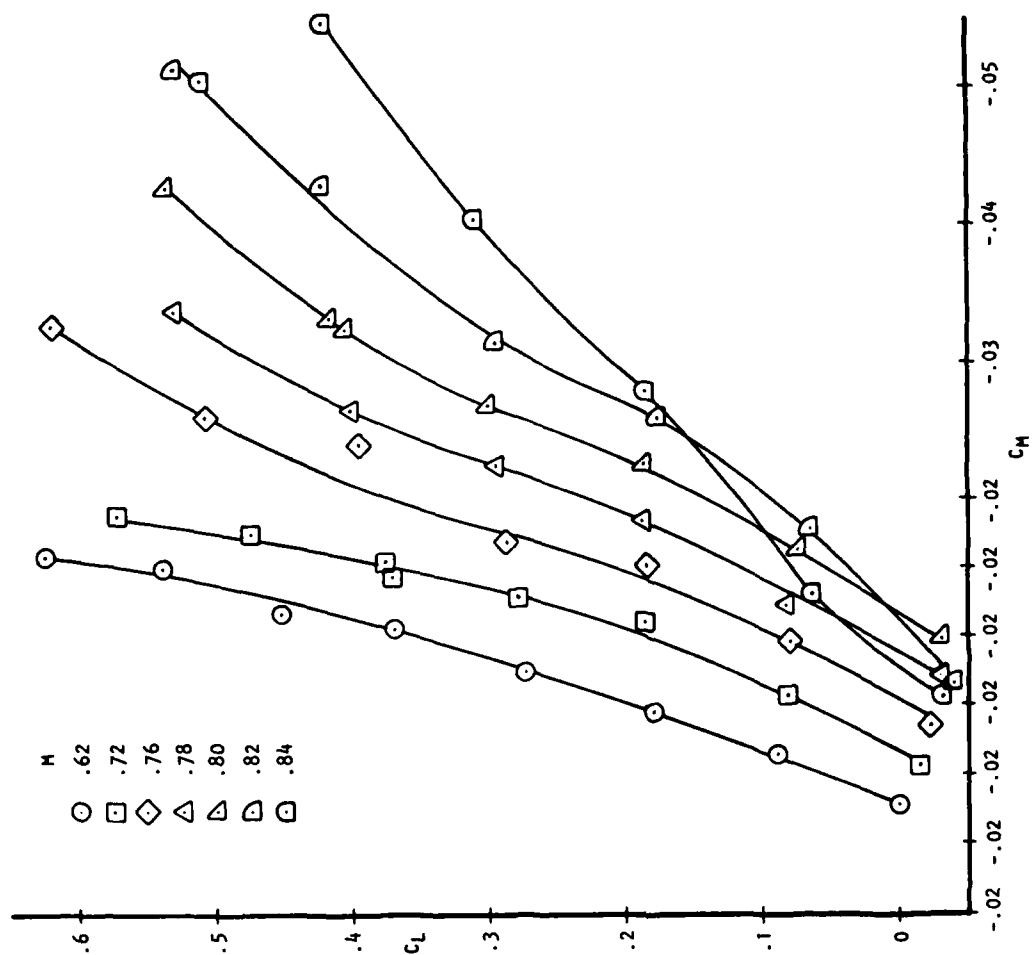


Figure 6.6 - Summary of Pitching Moment

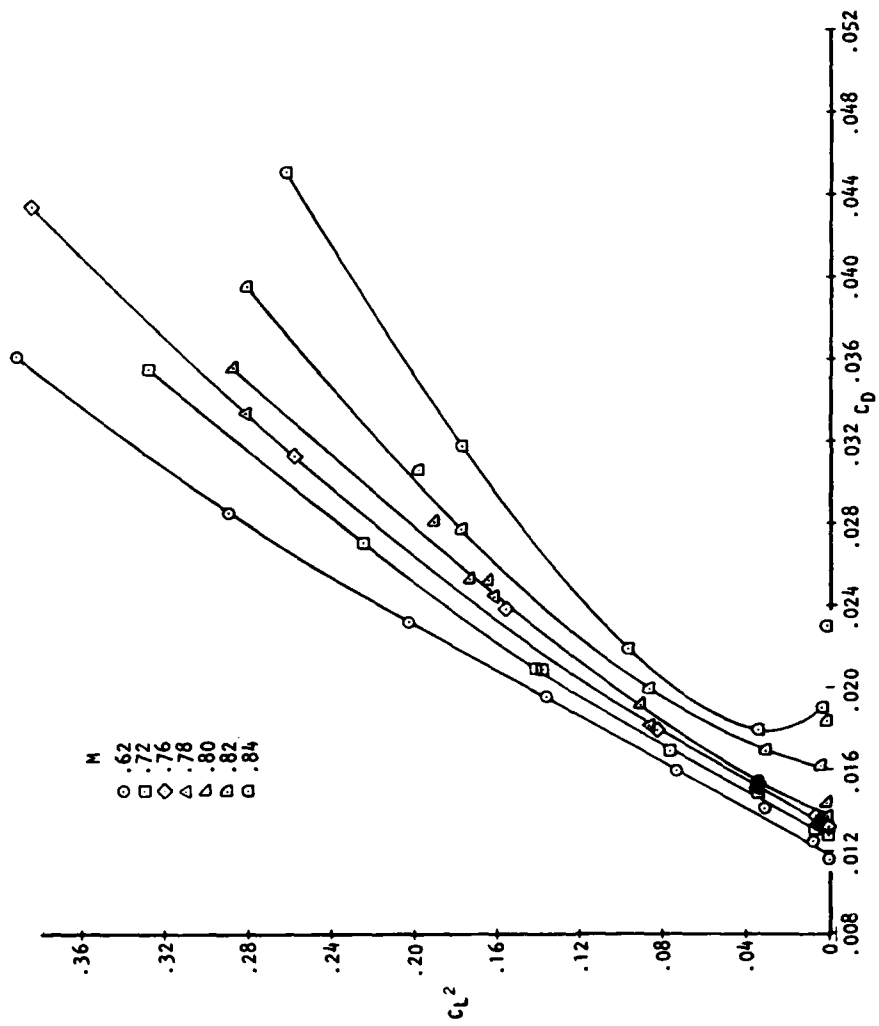
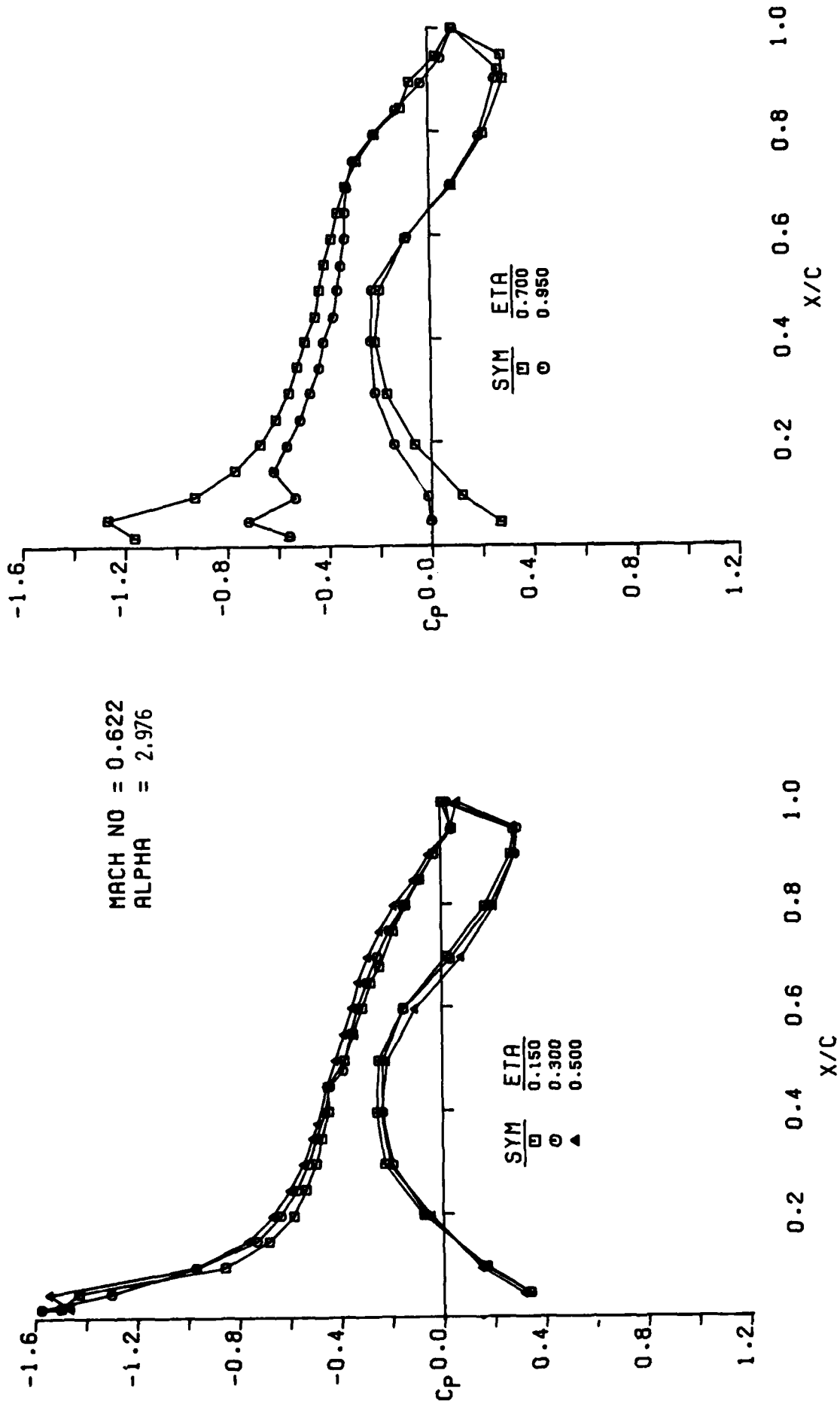


Figure 6.7 - Summary of Drag Data

Figure 6.8 - Wing Pressure Data, $M = .62$

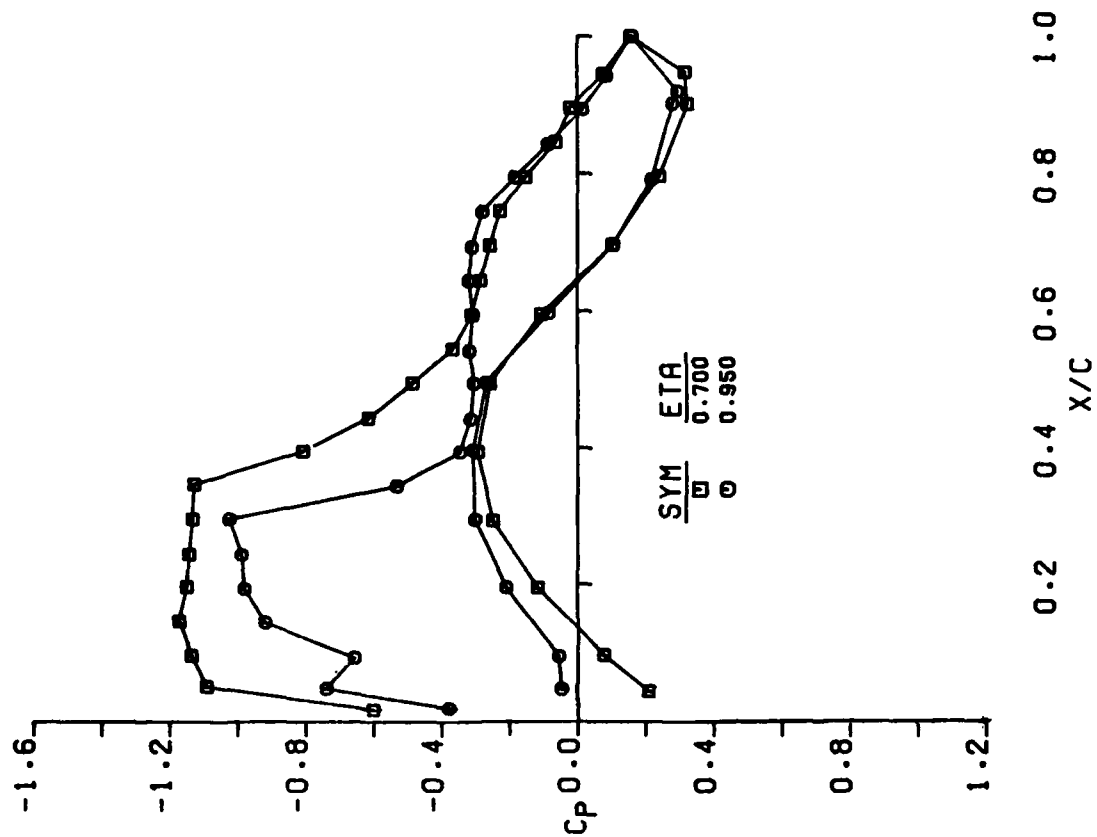
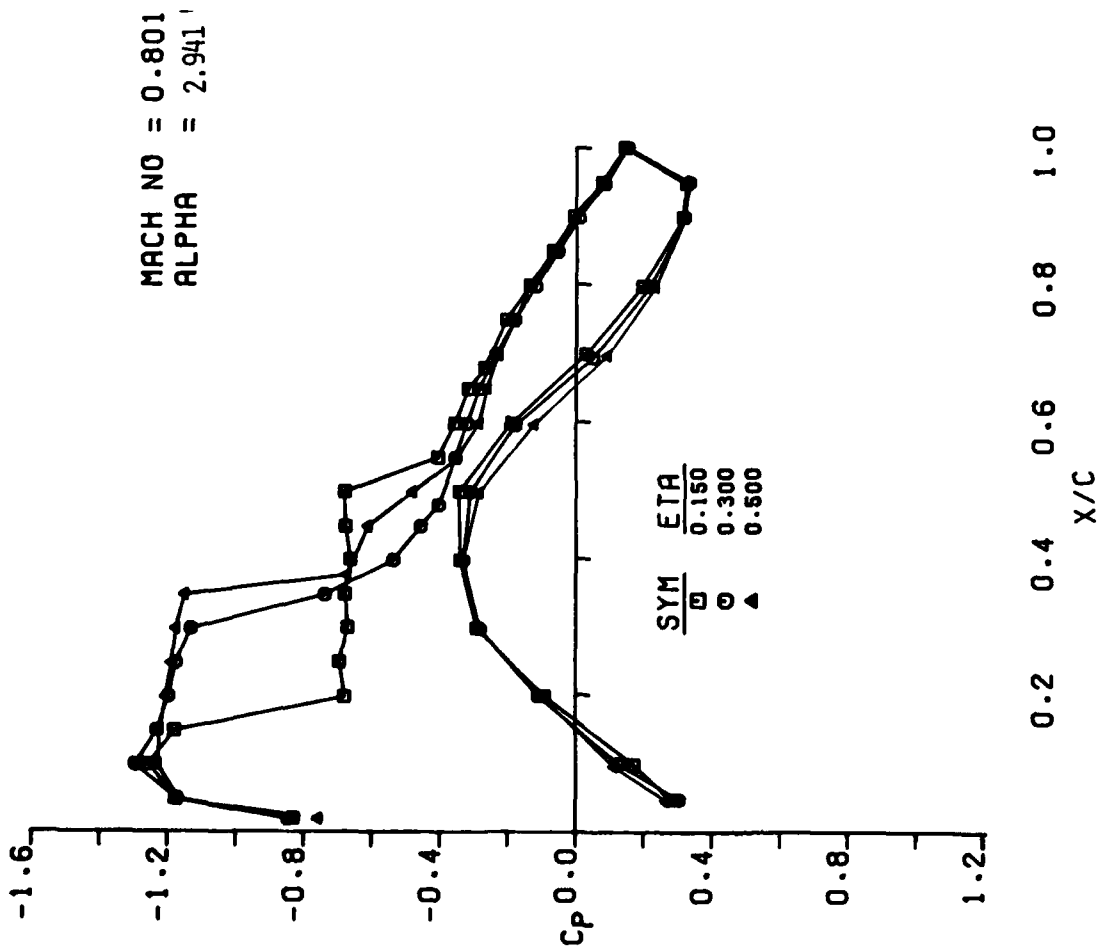


Figure 6.9 - Wing Pressure Data, $M = .80$

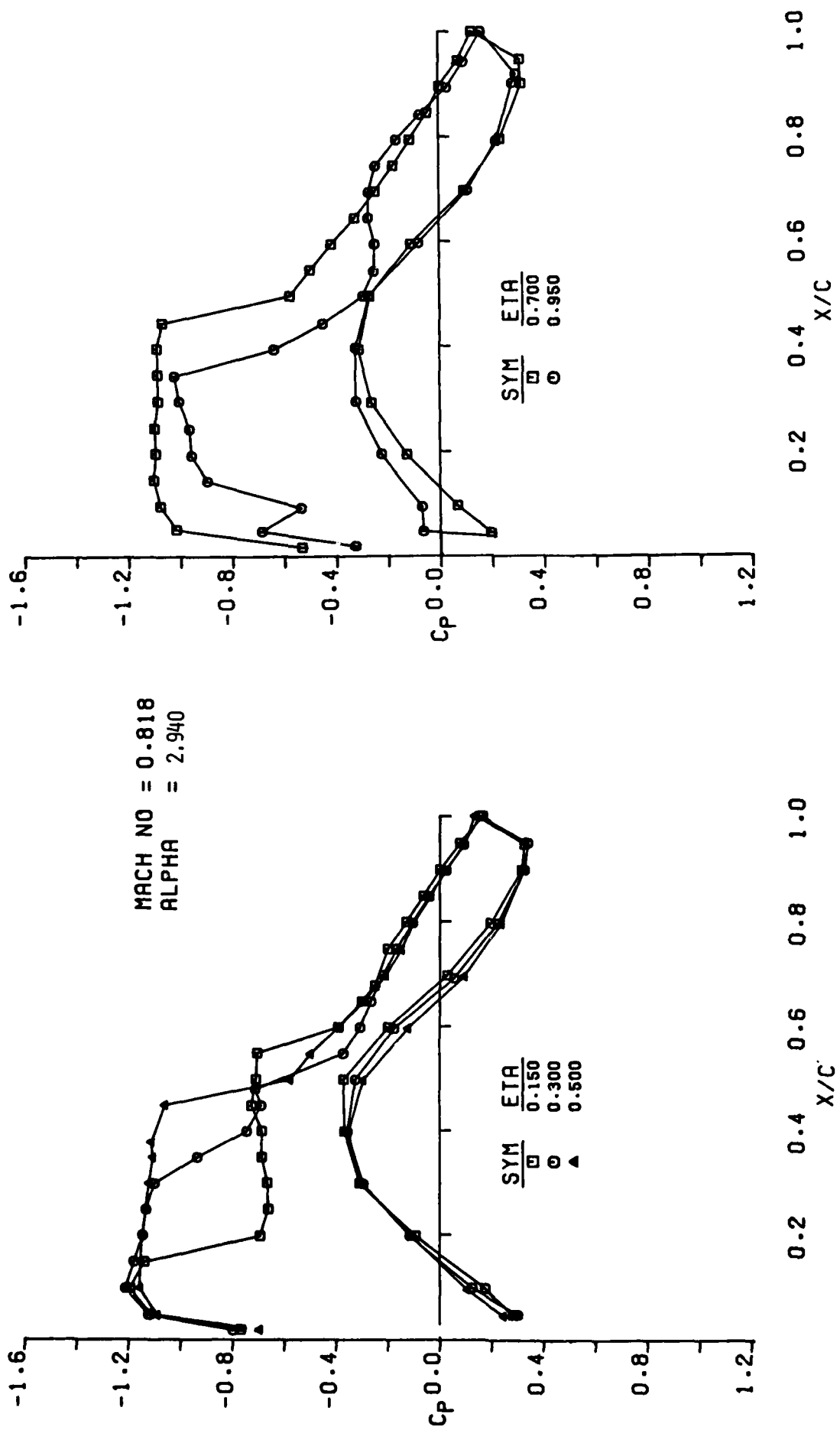


Figure 6.10 - Wing Pressure Data, $M = .82$

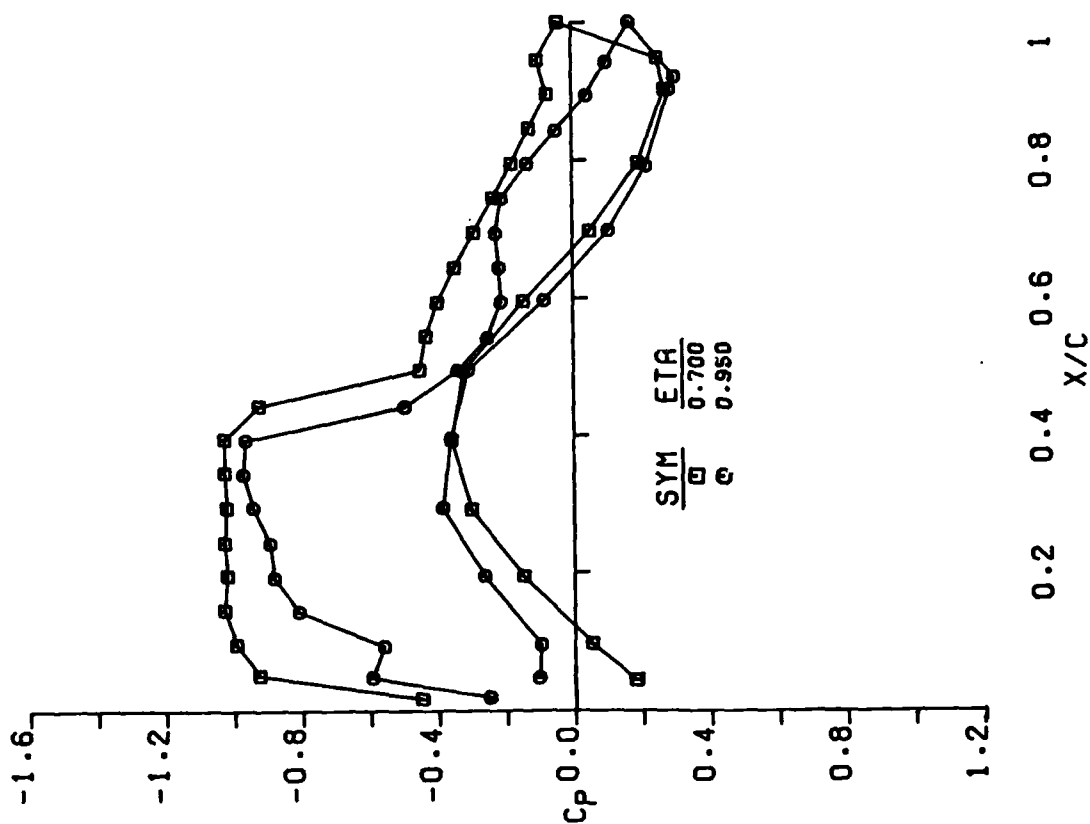
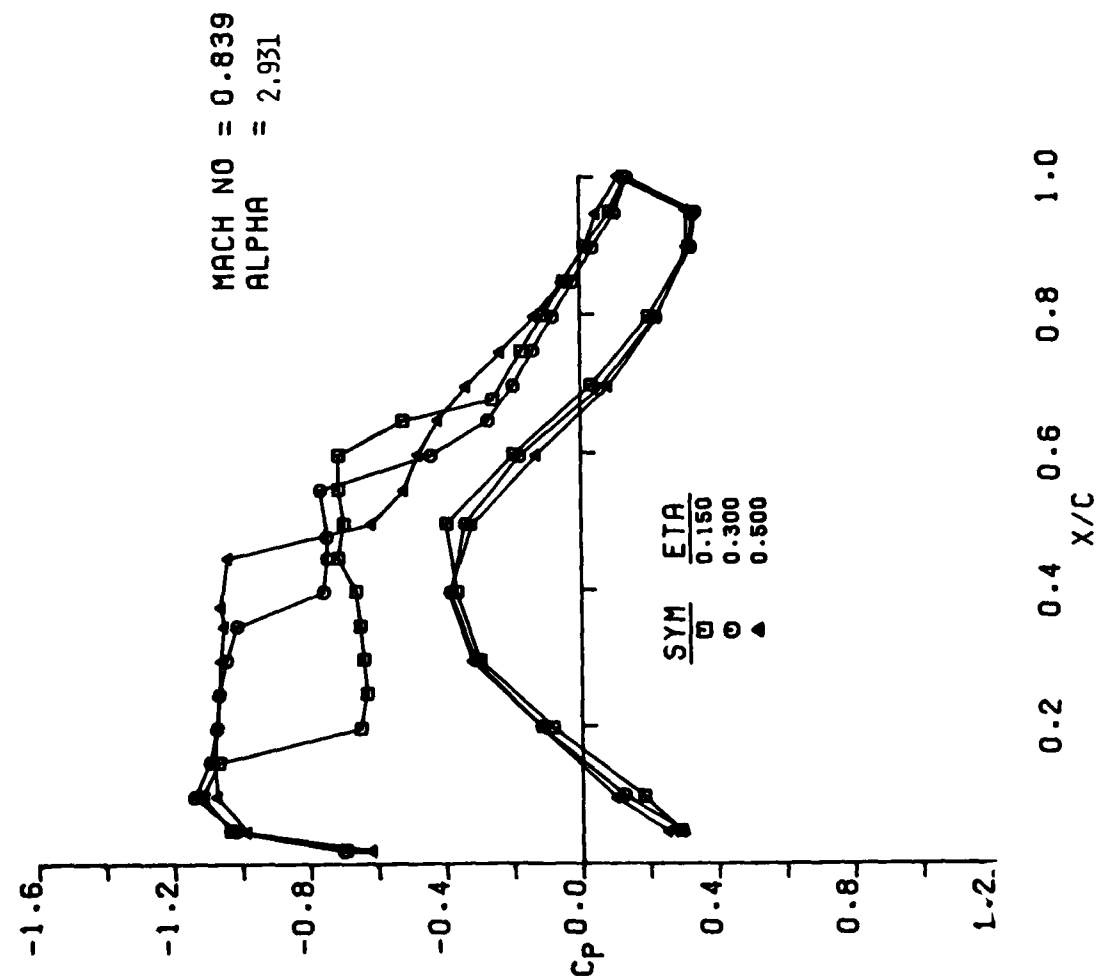
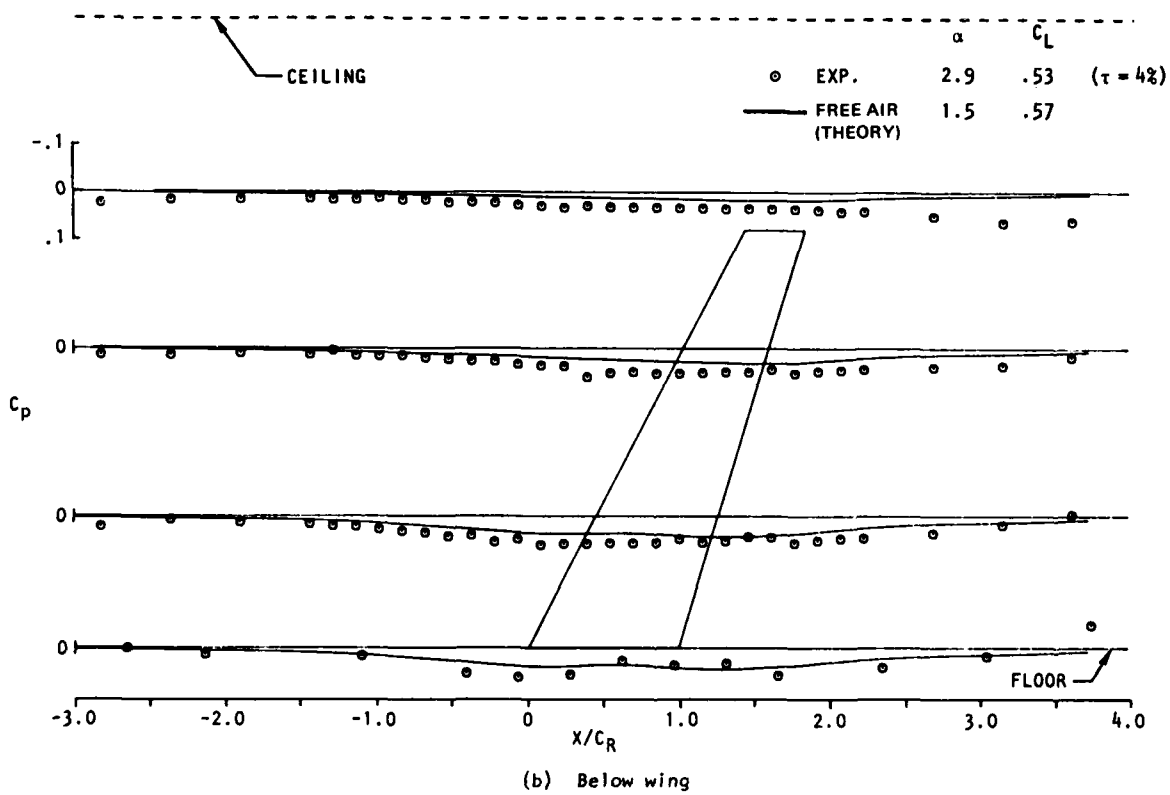
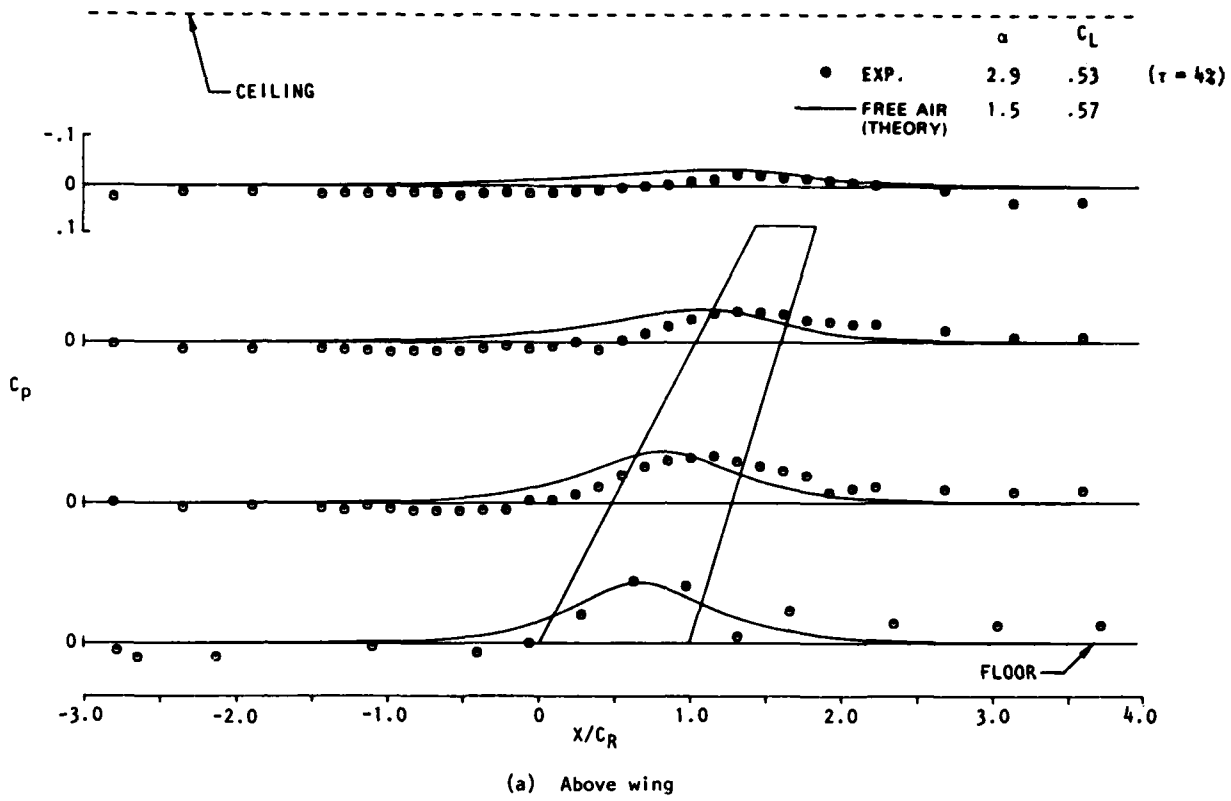


Figure 6.11 - Wing Pressure Data, M = .84

Figure 6.12 - Far Field Pressure Data, $M = .82$

7. TRANSONIC WING AND FAR FIELD TEST DATA ON A MODERATE ASPECT RATIO WING FOR THREE DIMENSIONAL COMPUTATIONAL METHOD EVALUATION

BY

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7.1 INTRODUCTION

The data presented in this contribution were obtained in the Lockheed-Georgia Compressible Flow Wind Tunnel as part of a research program sponsored by the United States Air Force Office of Scientific Research. The intent of the experiment was to provide force and pressure data on a state-of-the-art supercritical moderate aspect ratio fighter wing for evaluation of three-dimensional flow computation methods. The wing, though simply defined, is representative of high performance supercritical technology. The supersonic flow region exhibits a swept shock wave that partially recompresses the supersonic flow and an unswept aft terminal shock that produces the classic lamda pattern. This wing with its more highly swept leading edge and complex shock pattern will provide a challenging test case for three-dimensional transonic flow programs.

In the past, there has been some lack of understanding as to the far field boundary conditions in wind tunnel experiments, e.g. porous walls. The accuracy of current computational methods has caused concern over the influence of small differences between far field boundary conditions of wind tunnel experiments and the free air boundary condition applied at the edge of the mathematical computational zone. In an effort to improve the rigor of the code evaluation, a far field boundary condition was measured in the experiment to be included as a boundary condition when evaluating computational methods.

Experimental longitudinal static pressure distributions near the wind tunnel walls were measured at 4 spanwise positions, above and below the model. These measurements are included in the data set. Other measurements, such as the effect of wall porosity and empty tunnel pressure distributions were obtained, but are not appropriate in this data set. All data presented are not corrected for any wind tunnel wall interference.

A simple body was included in the original test program to provide wing/body interference effects as well. These data are not included in this data set, but are available on magnetic tape through the United States Air Force Office of Scientific Research, Bolling Air Force Base, D.C.

7.2 DATA SET

1. General Description

- | | | |
|-----|-------------------------------|--|
| 1.1 | Model Designation or Name | LOCKHEED - AFOSR Wing B |
| 1.2 | Model Type | Semi Span Wing. (Wing body data in Reference Report) |
| 1.3 | Design Requirement/Conditions | This model was designed to provide state-of-the-art transonic performance characteristics, but with a simple geometry suitable for ease of input into theoretical math models. |
| 1.4 | Additional Remarks | Extensive far field boundary condition measurements were made to provide a rigorous test case for theoretical models and eliminate uncertainties about wall effects. |

2. Model Geometry

- | | | |
|-------|---------------------|---|
| 2.1 | Wing Data | |
| 2.1.1 | Wing Planform: | Simple, swept back, tapered - See Figure 7.1. |
| 2.1.2 | Aspect Ratio | 3.8 |
| 2.1.3 | Quarter Chord Sweep | 30.0° |

2.1.4	Trailing Edge Sweep	13.4°
2.1.5	Taper Ratio	0.4
2.1.6	Twist	6.5°
2.1.7	Mean Aerodynamic Chord	17.71 cm (6.974 in)
2.1.8	Span or Semispan	31.8 cm (12.5 in) Semispan
2.1.9	Number of Airfoil Sections Used to Define Wing	Two, t/c = .06 Supercritical
2.1.10	Spanwise Location of Reference Section and Section Coordinates (Note if Ordinates are Design or Actual Measured Values)	y/b = 0, 1.0 Design Coordinates in Table I
2.1.11	Lofting Procedure Between Reference Sections	Straight Line
2.1.12	Form of Wing-Body Fillet, Strakes	None
2.1.13	Form of Wing Tip	Airfoil thickness form rotated about camber line
2.2	Body Data (Detail Description of Body Geometry)	See Figure 7.2.
2.3	Wing-Body Combination	
2.3.1	Relative Body Diameter (Average Body Diameter at Wing Location Divided by Wing Span)	.140
2.3.2	Relative Vertical Location of Wing (Height Above or Below Axis Divided by Average Body Radius at Wing Location)	Three Positions: high, medium, low - Wing. See Reference Report.
2.3.3	Wing Setting Angle	2.5°
2.3.4	Dihedral	0
2.4	Cross Sectional Area Development	See Figure 7.3
2.5	Fabrication Tolerances/Waviness	± .05 mm
3.	<u>Wind Tunnel</u>	
3.1	Designation	Lockheed-Georgia Compressible Flow Wind Tunnel
3.2	Type of Tunnel	
3.2.1	Continuous or Blowdown Indicate Minimum Run Time if Applicable	Blow down 12 sec. (Max. = 120 sec.)
3.2.2	Stagnation Pressure	19 - 172 dynes/cm ² (20-175 PSIA)
3.2.3	Stagnation Temperature	266 - 311 K (480 - 560° R)
3.3	Test Section	
3.3.1	Shape of Test Section	Rectangular
3.3.2	Size of Test Section (Width, Height, Length)	50.8 cm (20.0 in) x 71.2 cm (28.0 in) x 183 cm (72.0 in)

3.3.3	Type of Test Section Walls Closed, Open, Slotted, Perforated	Solid at model centerline (floor of tunnel). Perforated with 60° inclined holes
	Open Area Ratio (Give Range if Variable)	0 - 10%
	Slot/Hole Geometry (e.g., 30-Degree Slanted Holes)	60° slanted holes in two sliding plates
	Treatment of Side Wall Boundary Layer	
	Full-Span Model	No treatment
	Half-Model Testing	Floor boundary layer removed (model centerline) 53.6 cm (21.0 in) ahead of balance centerline.
3.4	Flow Field (Empty Test Section)	
3.4.1	Reference Static Pressure	Wall static upstream of porous section
3.4.2	Flow Angularity	0
3.4.3	Mach Number Distribution	Shown in Ref. Rept.
3.4.4	Pressure Gradient	Shown in Ref. Rept.
3.4.5	Turbulence/Noise Level	Not measured
3.5	Freestream Mach Number (or Velocity)	
3.5.1	Range	0.2 to 1.1
3.5.2	Pressure Used to Determine Mach Number (e.g., Settling Chamber Total Pressure and Plenum Chamber Pressure)	Settling chamber total pressure and wall static pressure
3.5.3	Accuracy of Mach Number Determination (ΔM)	.002
3.5.4	Maximum Mach Number Variation During a Run	.005
3.6	Reynolds Number Range	
3.6.1	Unit Reynolds Number Range (Give Range at Representative Mach Numbers; 1/m)	15 to 150 million per meter
3.6.2	Means of Varying Reynolds Number (e.g., by Pressurization)	Pressurization
3.7	Temperature Range and Dewpoint, Can Temperature be Controlled?	Temp not controlled Dewpoint = 222 K (400°R)
3.8	Model Attitudes	
3.8.1	Angle-of-Attack	Constant during run
3.8.2	Accuracy in Determining Angles	0.05 Deg.
3.9	Organization Operating the Tunnel and Location of Tunnel	Lockheed-Georgia Co.
3.10	Who is to be Contacted for Additional Information	K. P. Burdges Dept. 72-74, Zone 403 Lockheed-Georgia Co. Marietta, Ga. 30063 USA

3.11	Literature Concerning this Facility	G.A. Pounds and Stanewsky, E., "The Compressible Flow Facility, Part 1: Design" Lockheed GA. Co. ER 9219-1, Oct. 1967.
3.12	Additional Remarks	
4.	<u>Tests</u>	
4.1	Type of Tests	Transonic force and pressure
4.2	Wing Span or Semispan to Tunnel Width	.46
4.3	Test Conditions	
4.3.1	Angle-of-Attack	-2.0 to 5.0 Degrees
4.3.2	Mach Number	0.70 to 0.94
4.3.3	Dynamic Pressure	14.4 dynes/cm ² (14.6 psia)
4.3.4	Reynolds Number	10 Million based on MAC
4.3.5	Stagnation Temperature	289 K (520°R)
4.4	Transition	
4.4.1	Free or Fixed	Fixed
4.4.2	Position of Free Transition	
4.4.3	Position of Fixed Transition, Width of Strips, Size and Type of Roughness Elements	1.2 mm (.05 in) wide strip of glass beads 0.058 mm (0.0023 in) dia located .05 MAC from LE
4.4.4	Were Checks Made to Determine if Transition Occurred at Trip Locations?	No
4.5	Bending or Torsion Under Load	
4.5.1	Describe Any Aeroelastic Measurements Made During Tests	None
4.5.2	Describe Results of Any Bench Calibrations	None
4.6	Were Different Sized Models Used in Wind-Tunnel Investigation? If so, Indicate Sizes	No
4.7	Areas and Length Used to Form Coefficients	Wing Area - 530.0 cm ² (82.1 in. ²) Mean Aerodynamic Chord 17.71 cm (6.974 in) Wing Semispan - 31.8 cm (12.5 in)
4.8	References on Tests	Hinson, B. L. and Burdges, K.P., "Acquisition and Application of Transonic Wing and Far-Field Test Data for Three-Dimensional Computational Method Evaluation," AFOSR-TR-80-0421, March 1980.
4.9	Additional Remarks	Ratio of model solid blockage area to test section cross-sectional area: Wing - 0.009 Wing with body - 0.019

5. Instrumentation

5.1 Surface Pressure Measurements

- | | |
|--|---|
| 5.1.1 Pressure Orifices in Wing. Location and Number on Upper and Lower Surfaces | 110 upper surface, 50 lower surface measured positions in Table II |
| 5.1.2 Pressure Orifices on Fuselage. Location and Number | None |
| 5.1.3 Pressure Orifices on Components, Give Component and Orifice Location | None |
| 5.1.4 Geometry of Orifices | Normal to surface, .5 mm (.020 in) dia. |
| 5.1.5 Type of Pressure Transducer and Scanning Devices Used. Indicate Range and Accuracy | Statham 12.5 psid transducers
Scanivalve Model J2

0.5% Full Scale |

5.2 Force Measurements

- | | |
|---|---|
| 5.2.1 Type and Location of Balance | 5 component floor balance (semispan) |
| 5.2.2 Forces and Moments that can be Measured. Maximum Loads and Accuracy | Normal Force: 3.34 kN; $\pm 0.25\%$
Axial Force: 334 N; $\pm 0.25\%$
Pitching Moment: 203 m-N; $\pm 0.25\%$
Rolling Moment: 678 m-N; $\pm 0.25\%$
Yawing Moment: 68 m-N; $\pm 0.25\%$ |
| 5.2.3 Forces and Moments on Components | None |
| Type and Location of Balance | |
| Maximum Loads and Accuracy | |

6. Data

6.1 Accuracy

- | | |
|--|--|
| 6.1.1 Pressure Coefficients | $\pm .002$ |
| 6.1.2 Aerodynamic Coefficients | $\pm .002$ on C_D , $\pm .001$ on C_L ,
$\pm .0003$ on C_D , $\pm .0007$ on C_M |
| 6.1.3 Boundary Layer and Wake Quantities | |
| 6.1.4 Repeatability | Note duplicate symbols on force data. Figure 7.5 - 7.7. |
| 6.1.5 Additional Remarks | |

6.2 Wall Interference Corrections

Not applied, but static pressure measured at 4 spanwise locations near the tunnel walls above and below the model to provide far-field boundary conditions for code correlations. (See Figures 7.4, 7.13 and Table III, V - IX)

6.3 Data Presentation

- | | |
|-------------------------------------|-------------------------------------|
| 6.3.1 Aerodynamic Coefficients | See Figure 7.5 - 7.7. |
| 6.3.2 Surface Pressure Coefficients | See Figure 7.8 - 7.12, Table V - IX |

6.3.3	Flow Conditions	See Table IV
	- Aerodynamic coefficient data	$M = .7, .75, .8, .84, .86, .88, .90, .92, .94$ $\alpha = -2$ to 5°
	- Pressure data	<u>Wing Pressures</u> $M = .70, .80, .85, .88, .90; \alpha = 4^\circ$ <u>Wind-Tunnel Wall Pressures</u> $M = .70, .80, .85, .88, .90; \alpha = 4^\circ$
6.3.4	Boundary Layer and/or Wake Data	None
6.3.5	Flow Conditions for Boundary Layer and/or Wake Data	None
6.3.6	Wall Interference Corrections Included?	No
6.3.7	Aeroelastic Corrections Included?	No
6.3.8	Other Corrections?	No

7. References

1. Hinson, B. L., and Burdges, K. P., "Acquisition and Application of Transonic Wing and Far-Field Test Data for Three-Dimensional Computational Method Evaluation," AFOSR-TR-80-0421, March 1980.
2. Pounds, G. A., and Stanewsky, E., "The Compressible Flow Facility, Part 1: Design," Lockheed-Georgia Company ER 9219-1, October 1967.

8. List of Symbols

AR	wing aspect ratio, b^2/S
b	wing span
C	streamwise local chord of wing
C_D	drag coefficient
C_L	lift coefficient
C_M	pitching-moment coefficient about quarter chord of MAC
C_p	pressure coefficient
M	freestream Mach number
MAC	mean aerodynamic chord of wing
R_N	Reynolds number based on freestream conditions and MAC
S	wing planform area
x	streamwise coordinate measured from wing leading edge
y	spanwise coordinate measured from plane of symmetry
z	coordinate normal to airfoil chord or tunnel center plane
α	angle of wing reference plane relative to tunnel axis
θ	wing section local incidence angle relative to WRP
λ	wing taper ratio, C_t/C_r
Λ'	wing sweep angle
η	span station, $y/(b/2)$, ETA

τ wind tunnel wall porosity

Subscripts:

L lower surface

LE leading edge

M measured

r,R wing root

t wing tip

TE trailing edge

U upper surface

Abbreviations:

CFWT Lockheed Compressible Flow Wind Tunnel

WRP wing reference plane

TABLE I - WING B DESIGN ORDINATES

X/C	ROOT SECTION		TIP SECTION	
	Z_U/C	Z_L/C	Z_U/C	Z_L/C
.00000	.00000	.00000	.00000	.00000
.00241	.00617	-.00528	.00507	-.00606
.00961	.01181	-.00895	.00972	-.01066
.02153	.01649	-.01198	.01401	-.01408
.03806	.01991	-.01511	.01770	-.01691
.05904	.02268	-.01839	.02110	-.01951
.08427	.02517	-.02111	.02421	-.02161
.11349	.02737	-.02333	.02700	-.02325
.14645	.02925	-.02503	.02949	-.02439
.18280	.03075	-.02618	.03168	-.02492
.22221	.03191	-.02691	.03360	-.02498
.26430	.03277	-.02705	.03522	-.02446
.30866	.03330	-.02682	.03654	-.02344
.35486	.03346	-.02582	.03762	-.02180
.40245	.03325	-.02458	.03847	-.01967
.45099	.03258	-.02287	.03905	-.01689
.50000	.03155	-.02070	.03933	-.01361
.54901	.03013	-.01768	.03922	-.00950
.59755	.02842	-.01376	.03882	-.00326
.64514	.02639	-.00985	.03799	.00042
.69134	.02417	-.00615	.03669	.00474
.73570	.02178	-.00316	.03491	.00814
.77779	.01925	-.00109	.03258	.01020
.81720	.01660	.00003	.02962	.01087
.85355	.01388	.00043	.02608	.01026
.88651	.01116	.00043	.02211	.00867
.91573	.00865	.00032	.01793	.00651
.94096	.00644	.00012	.01379	.00417
.96194	.00459	-.00021	.00991	.00196
.97847	.00308	-.00055	.00674	.00006
.99039	.00196	-.00082	.00445	-.00138
.99759	.00130	-.00102	.00305	-.00227
1.00000	.00109	-.00109	.00259	-.00257

TABLE II - PRESSURE ORIFICE MEASURED LOCATIONS

ETA (X/C)	UPPER SURFACE			
	.216	.4	.6	.8
.0217	.0197	.0208	.0189	.0187
.0497	.0497	.0503	.0495	.0483
.1005	.0992	.1003	.0993	.0989
.1496	.1495	.1507	.1492	.1483
.1993	.1993	.2001	.1995	.1995
.2500	.2496	.2509	.2487	.2490
.3001	.2995	.3002	.2999	.2982
.3504	.3495	.3504	.3496	.3495
.4006	.3997	.4009	.3991	.3994
.4503	.4493	.4502	.4497	.4493
.5000	.4976	.5001	.4997	.4995
.5499	.5488	.5501	.5492	.5485
.5997	.5993	.6001	.5997	.5985
.6500	.6495	.6503	.6493	.6486
.7001	.6994	.7004	.6992	.6995
.7498	.7492	.7494	.7494	.7489
.8015	.7993	.8005	.7988	.7987
.8512	.8493	.8507	.8497	.8490
.9005	.8993	.9010	.9007	.8950
.9515	.9492	.9513	.9513	1.0000
1.0000	1.0000	1.0000	1.0000	1.0000

LOWER SURFACE			
.0521	.0500	.0520	.0500
.1012	.1013	.1012	.1012
.1992	.2008	.2005	.2005
.3010	.2999	.2999	.2999
.4003	.3999	.3999	.3974
.4997	.4999	.5003	.4986
.5992	.5990	.5990	.5968
.6992	.6997	.6995	.6985
.7980	.8005	.7994	.7968
.8916	.9016	.8933	.8961
.9548	.9518	.9480	.9452
1.0000	1.0000	1.0000	1.0000

TABLE III - LOCATIONS OF FAR FIELD PRESSURE ORIFICE

Z/C _R	.851	-.851	.984	.984	.984	-.984	-.984	-.984
Y/C _R	0.0	0.0	.638	1.376	2.094	.592	1.370	2.088
X/C _R	X/C _R	X/C _R	X/C _R	X/C _R	X/C _R	X/C _R	X/C _R	X/C _R
-1.848	-1.848	-1.841	-1.841	-1.841	-1.841	-1.841	-1.841	-1.841
-1.753	-1.753	-1.522	-1.522	-1.522	-1.522	-1.522	-1.522	-1.522
-1.392	-1.392	-1.203	-1.203	-1.203	-1.203	-1.203	-1.203	-1.203
-.671	-.671	-.883	-.883	-.883	-.883	-.883	-.883	-.883
-.189	-.189	-.777	-.777	-.777	-.777	-.777	-.777	-.777
.050	.050	-.670	-.670	-.670	-.670	-.670	-.670	-.670
.289	.289	-.564	-.564	-.564	-.564	-.564	-.564	-.564
.529	.529	-.457	-.457	-.457	-.457	-.457	-.457	-.457
.769	.769	-.351	-.351	-.351	-.351	-.351	-.351	-.351
1.009	1.009	-.245	-.245	-.245	-.245	-.245	-.245	-.245
1.249	1.249	-.138	-.138	-.138	-.138	-.138	-.138	-.138
1.731	1.731	-.032	-.032	-.032	-.032	-.032	-.032	-.032
2.211	2.211	.075	.075	.075	.075	.075	.075	.075
2.690	2.690	.181	.181	.181	.181	.181	.181	.181
		.287	.287	.287	.287	.287	.287	.287
		.393	.393	.393	.393	.393	.393	.393
		.500	.500	.500	.500	.500	.500	.500
		.607	.607	.607	.607	.607	.607	.607
		.713	.713	.713	.713	.713	.713	.713
		.819	.819	.819	.819	.819	.819	.819
		.925	.925	.925	.925	.925	.925	.925
		1.032	1.032	1.032	1.032	1.032	1.032	1.032
		1.139	1.139	1.139	1.139	1.139	1.139	1.139
		1.245	1.245	1.245	1.245	1.245	1.245	1.245
		1.351	1.351	1.351	1.351	1.351	1.351	1.351
		1.457	1.457	1.457	1.457	1.457	1.457	1.457
		1.564	1.564	1.564	1.564	1.564	1.564	1.564
		1.670	1.670	1.670	1.670	1.670	1.670	1.670
		1.989	1.989	1.989	1.989	1.989	1.989	1.989
		2.309	2.309	2.309	2.309	2.309	2.309	2.309
		2.628	2.628	2.628	2.628	2.628	2.628	2.628

TABLE IV - SUMMARY OF TEST CONDITIONS

α M	.70	.75	.80	.82	.84	.85	.86	.88	.90	.91	.92	.94
-2	□ Δ					□ Δ			□ Δ		□ Δ	
-1	□ Δ					□ Δ			□ Δ		□ Δ	
0	□ Δ	○	○	○	○	□ Δ	○	○	□ Δ	○	□ Δ	○
1	□ Δ	○	○	○	○	□ Δ	○	○	□ Δ	○	□ Δ	○
2	□ Δ	○	○	○	○	□ Δ	○	○	□ Δ	○	□ Δ	○
3	□ Δ	○	○	○	○	□ Δ	○	○	□ Δ	○	□ Δ	○
4	□ Δ	○	○	○	○	□ Δ	○	○	□ Δ	○	□ Δ	○
5	□ Δ	○	○	○	○	□ Δ	○	○	□ Δ	○	□ Δ	○
C _L = .0	○	○	○	○	○	○	○	○	○		○	○
C _L = .5	□ Δ	○	○	○	○	○	○	○	□ Δ			

○ CLEAN WING, $\tau = 4\%$ □ CLEAN WING, $\tau = 3\%$ ◇ CLEAN WING, $\tau = 5\%$ △ CLEAN WING, $\tau = 6\%$ ○ HIGH WING, $\tau = 4\%$ ⊕ MID WING, $\tau = 4\%$ △ LOW WING, $\tau = 4\%$

TABLE V - TABLE OF MEASURED PRESSURE COEFFICIENTS, M = .70

RUN 5

MACH .7007

ALPHA 3.955

RIN 10.41

 C_L 42866 C_D .02656 C_M -.05436

WING PRESSURE DATA

STA	.216	.400	.600	.800	.950
C_l	.42243	.44659	.45476	.41795	.29805
C_m	-.04838	-.05369	-.06079	-.07235	-.06813
X/C	C_p	X/C	C_p	X/C	C_p
UPPER SURFACE					
.0197	-.15330	.0208	-.17256	.0189	-.15859
.0497	-.7852	.0503	-.8921	.0495	-.9127
.0992	-.5808	.1003	-.6013	.0993	-.5941
.1495	-.4872	.1507	-.5113	.1492	-.5073
.1993	-.4342	.2001	-.4513	.1995	-.4504
.2496	-.3960	.2509	-.4115	.2487	-.4068
.2995	-.3755	.3002	-.3799	.2999	-.3728
.3495	-.3190	.3504	-.3532	.3496	-.3471
.3997	-.2990	.4009	-.3154	.3991	-.3355
.4493	-.2921	.4502	-.3107	.4497	-.2984
.4976	-.2866	.5001	-.2882	.4997	-.2927
.5488	-.2764	.5501	-.2733	.5492	-.2806
.5993	-.2564	.6001	-.2615	.5997	-.2742
.6495	-.2340	.6503	-.2460	.6493	-.2691
.6994	-.2091	.7004	-.2270	.6992	-.2535
.7492	-.1945	.8005	-.1880	.7494	-.2384
.7993	-.1702	.8500	-.1437	.7988	-.2082
.8493	-.1306	.8997	-.0997	.8497	-.1732
.8993	-.0779	.9510	-.0343	.9007	-.1184
.9492	-.0249	1.0000	.0152	.9513	-.0415
1.0000	.0638			1.0000	.0286
LOWER SURFACE					
.0503	.2587	.0500	.2442	.0520	.2086
.1013	.1323	.1000	.1224	.1012	.1048
.2008	.0435	.2004	.0428	.2005	.0443
.3012	.0126	.2999	.0129	.2999	-.0012
.4011	.0037	.3999	-.0015	.3999	.0048
.6012	.0686	.4999	-.0020	.5003	-.0034
.8010	.1956	.5997	.0833	.5990	.0865
.8998	.1474	.6997	.1656	.6995	.1716
1.0000	.0638	.8005	.2051	.7994	.2135
		.9016	.1672	.8933	.1883
		.9518	.1302	.9480	.1498
		1.0000	.0152	1.0000	.0286
				1.0000	.0429
				1.0000	-.0052

TAIL PLATE MEASUREMENT

Z/C _R	.851	-.851	.984	.984	.984	-.984	-.984	-.984
Y/C _R	0.0	0.0	.638	1.376	2.094	.592	1.370	2.088
X/C _p	C_p	C_p	X/C _p	C_p	C_p	C_p	C_p	C_p
-1.44	.0047	.0292	-1.041	-.0095	.0026	.0197	.0224	.0147
-1.25	.0047	.0196	-1.522	-.0051	.0154	.0053	.0023	.0128
-1.04	.0062	.0245	-1.293	-.0001	.0089	.0070	.0107	.0064
-1.67	.0147	-.0059	-1.883	.0049	.0036	.0108	.0126	.0068
-1.19	.0365	-.0064	-1.777	.0062	.0066	.0093	.0150	-.0017
-1.06	.0456	-.0357	-1.640	-.0088	.0134	.0077	.0122	.0107
-1.04	.0527	-.0599	-1.564	.0016	.0085	.0068	.0213	.0070
-1.04	.0400	-.0921	-1.457	.0004	.0098	.0056	.0194	.0042
-1.04	.0470	-.0854	-1.381	.0015	.0068	.0064	.0240	.0106
-1.04	.0318	-.0797	-1.346	-.0056	.0077	.0081	.0261	.0135
-1.04	.0463	-.0701	-1.338	-.0043	-.0027	.0075	.0257	.0140
-1.04	.0229	-.0520	-1.332	-.0074	-.0037	.0052	.0391	.0128
-1.04	-.0024	-.0548	-1.275	-.0257	-.0064	.0065	.0341	.0136
-1.04	-.0673	-.0712	-1.251	-.0312	-.0068	.0028	.0427	.0169
			-1.211	-.0329	-.0116	.0075	.0478	.0204
			-1.197	-.0421	.0022	.0068	.0503	.0348
			-1.187	-.0552	-.0125	-.0009	.0527	.0286
			-1.167	-.0612	-.0169	.0044	.0551	.0308
			-1.157	-.0651	-.0214	-.0035	.0545	.0355
			-1.149	-.0661	-.0241	-.0047	.0460	.0375
			-1.136	-.0695	-.0310	-.0058	.0550	.0347
			-1.132	-.0671	-.0319	-.0084	.0449	.0336
			-1.130	-.0604	-.0327	-.0071	.0342	.0328
			-1.125	-.0546	-.0323	-.0012	.0338	.0256
			-1.121	-.0495	-.0272	-.0035	.0468	.0307
			-1.117	-.0159	-.0297	-.0060	.0377	.0253
			-1.113	-.0291	-.0269	-.0008	.0308	.0238
			-1.109	-.0383	-.0307	.0031	.0246	.0216
			-1.109	-.0370	-.0257	.0010	.0125	.0123
			-1.109	-.0334	-.0187	.0100	-.0040	.0070
			-1.109	-.0353	-.0239	.0121	-.0223	-.0093

TABLE VI - TABLE OF MEASURED PRESSURE COEFFICIENTS, $M = .80$

RUN 42 MACH .8011 ALPHA 3.939 RIN 10.39 C_L .44997 C_D .02980 C_M -.05832

WING PRESSURE DATA										
STA	.216		.400		.600		.800		.950	
C_l	.45030		.48821		.49288		.44478		.32369	
C_m	-.05112		-.05185		-.05948		-.07276		-.06984	
	X/C	C_p	X/C	C_p	X/C	C_p	X/C	C_p	X/C	C_p
UPPER SURFACE										
.0197	-1.1361	.0208	-1.2730	.0189	-1.1784	.0187	-1.0760	.0217	-.9655	
.0497	-1.3051	.0503	-1.3665	.0495	-1.3372	.0483	-1.2482	.0497	-.8567	
.0992	-.5798	.1003	-1.2070	.0993	-1.2132	.0989	-.7947	.1005	-.4596	
.1495	-.5097	.1507	-.4705	.1492	-.4749	.1483	-.3632	.1496	-.3648	
.1993	-.4567	.2001	-.4226	.1995	-.3761	.1995	-.3650	.1993	-.3098	
.2496	-.4207	.2509	-.4011	.2487	-.3694	.2490	-.3718	.2500	-.2688	
.2995	-.3952	.3002	-.3816	.2999	-.3546	.2982	-.3355	.3001	-.2487	
.3495	-.3408	.3504	-.3584	.3496	-.3488	.3495	-.3262	.3504	-.2374	
.3997	-.3284	.4009	-.3098	.3991	-.3334	.3994	-.2999	.4006	-.2312	
.4493	-.3047	.4502	-.3210	.4497	-.3031	.4493	-.3020	.4503	-.2079	
.4976	-.3093	.5001	-.3035	.4997	-.2990	.4995	-.2735	.5000	-.2091	
.5488	-.2954	.5501	-.2884	.5492	-.2907	.5485	-.2836	.5499	-.2084	
.5993	-.2709	.6001	-.2760	.5997	-.2865	.5985	-.2807	.5997	-.2186	
.6495	-.2537	.6503	-.2570	.6493	-.2801	.6486	-.2879	.6500	-.2262	
.6994	-.2260	.7004	-.2351	.6992	-.2677	.6995	-.2857	.7001	-.2463	
.7492	-.2100	.8005	-.1883	.7494	-.2491	.7489	-.2876	.7498	-.2771	
.7993	-.1737	.8500	-.1439	.7988	-.2144	.7987	-.2705	.8015	-.2669	
.8493	-.1333	.8997	-.0877	.8497	-.1699	.8990	-.1573	.8512	-.2507	
.8993	-.0693	.9510	-.0192	.9007	-.1054	.9509	-.0678	.9005	-.2042	
.9492	-.0098	1.0000	.0014	.9513	-.0255	1.0000	.0638	.9515	-.1123	
1.0000	.0858			1.0000	.0538			1.0000	.0065	
LOWER SURFACE										
.0503	.2466	.0500	.2220	.0520	.1875	.0500	.1183	.0521	-.0406	
.1013	.1234	.1000	.1019	.1012	.0834	.0973	.0582	.1012	-.0925	
.2008	.0340	.2004	.0279	.2005	.0312	.1981	-.0378	.1992	-.1183	
.3012	.0013	.2999	.0022	.2999	-.0145	.2981	-.0531	.3010	-.0866	
.4011	-.0085	.3999	-.0125	.3999	.0039	.3974	-.0385	.4003	-.0599	
.6012	.0731	.4999	-.0080	.5003	-.0093	.4986	-.0285	.4997	-.0360	
.8010	.2158	.5997	.0917	.5990	.0964	.5968	.0848	.5992	.0721	
.8998	.1687	.6997	.1785	.6995	.1888	.6985	.1880	.6992	.1587	
1.0000	.0858	.8005	.2269	.7994	.2355	.7968	.2497	.7980	.2000	
		.9016	.1896	.8933	.2118	.8961	.2271	.8916	.1811	
		.9518	.1524	.9480	.1732	.9452	.1629	.9548	.0874	
		1.0000	.0014	1.0000	.0538	1.0000	.0638	1.0000	.0065	

FAR FIELD MEASUREMENT

Z/C _R	.851	-.851	.984	.984	.984	-.984	-.984	-.984	-.984
Z/C _R	0.0	0.0	.638	1.376	2.094	.592	1.370	2.088	
X/C _R	C_p	C_p	X/C _R	C_p	C_p	C_p	C_p	C_p	C_p
-1.848		.0613	-1.841	-.0025	-.0006	.0159	.0202	.0128	.0177
-1.753	.0189	.0319	-1.522	-.0081	.0140	.0053	.0044	.0138	.0124
-1.392	.0135	.0288	-1.203	-.0001	.0116	.0075	.0125	.0098	.0137
-.671	.0129	-.0009	-.883	.0055	.0104	.0115	.0115	.0103	.0085
-.189	.0403	.0042	-.777	.0104	.0095	.0148	.0173	-.0020	.0121
.050	.0519	-.0223	-.670	-.0028	.0095	.0091	.0161	.0105	.0113
.289	.0588	-.0646	-.564	.0057	.0077	.0101	.0233	.0051	.0099
.529	.0450	-.1098	-.457	.0049	.0163	.0069	.0212	.0036	.0124
.769	.0574	-.0996	-.351	.0064	.0082	.0090	.0265	.0103	.0121
1.009	.0492	-.0840	-.245	.0053	.0110	.0111	.0348	.0130	.0141
1.249	.0684	-.0707	-.138	.0020	.0029	.0089	.0308	.0158	.0129
1.731	.0439	-.0431	-.032	-.0026	-.0022	.0134	.0420	.0182	.0156
2.211	.0226	-.0350	.075	-.0184	.0045	.0106	.0428	.0240	.0180
2.690	-.0406	-.0323	.181	-.0229	.0016	.0059	.0521	.0249	.0174
			.287	-.0312	-.0080	.0082	.0534	.0279	.0223
			.391	-.0419	.0043	.0022	.0587	.0418	.0166
			.500	-.0558	-.0108	-.0012	.0640	.0355	.0194
			.607	-.0630	-.0163	-.0000	.0678	.0389	.0198
			.713	-.0690	-.0234	-.0003	.0693	.0433	.0193
			.819	-.0743	-.0274	-.0043	.0590	.0451	.0200
			.925	-.0778	-.0329	-.0030	.0663	.0442	.0229
			1.032	-.0747	-.0329	-.0066	.0556	.0451	.0229
			1.139	-.0661	-.0332	-.0049	.0471	.0434	.0245
			1.245	-.0582	-.0310	-.0006	.0451	.0383	.0227
			1.351	-.0511	-.0260	.0002	.0586	.0427	.0267
			1.457	-.0174	-.0260	.0029	.0520	.0382	.0306
			1.564	-.0244	-.0210	.0191	.0494	.0386	.0318
			1.670	-.0275	-.0252	.0055	.0473	.0358	.0259
			1.989	-.0240	-.0163	.0166	.0348	.0304	.0443
			2.309	-.0177	-.0006	.0370	.0198	.0339	.0543
			2.628	-.0203	-.0062	.0323	-.0001	.0157	.0534

TABLE VII - TABLE OF MEASURED PRESSURE COEFFICIENTS, $M = .85$

RUN 16

MACH .8491

ALPHA 3.955

PIT 10.16

 C_L .47339 C_D .03272 C_M -.06274

WING PRESSURE DATA									
STA	.216	.400	.600	.800	.950				
C_L	.46131	.50760	.51620	.47617	.32740				
C_m	-.05560	-.05429	-.05836	-.06986	-.07100				
X/C	C_p	X/C	C_p	X/C	C_p	X/C	C_p	X/C	C_p
UPPER SURFACE									
.0197	-.9726	.0208	-1.0859	.0189	-.9935	.0187	-.9086	.0217	-.8409
.0497	-1.1344	.0503	-1.1977	.0495	-1.1559	.0483	-1.0776	.0497	-.9476
.0992	-.6005	.1003	-1.0739	.0993	-1.0623	.0989	-.9691	.1005	-.7983
.1495	-.5796	.1507	-1.0041	.1492	-1.0187	.1483	-.9513	.1496	-.3128
.1993	-.4986	.2001	-.5172	.1995	-.9598	.1995	-.8394	.1993	-.1624
.2496	-.4726	.2509	-.4731	.2487	-.4209	.2490	-.2818	.2500	-.2018
.2995	-.4560	.3002	-.4314	.2999	-.2986	.2982	-.2144	.3001	-.2160
.3495	-.4171	.3504	-.3400	.3496	-.2732	.3495	-.2588	.3504	-.2261
.3997	-.3353	.4009	-.3108	.3991	-.2788	.3994	-.2517	.4006	-.2147
.4493	-.3126	.4502	-.3112	.4497	-.2457	.4493	-.2370	.4503	-.1960
.4976	-.3102	.5001	-.2954	.4997	-.2624	.4995	-.2460	.5000	-.2011
.5488	-.3048	.5501	-.2821	.5492	-.2673	.5485	-.2678	.5499	-.2007
.5993	-.2849	.6001	-.2719	.5997	-.2713	.5985	-.2732	.5997	-.2138
.6495	-.2627	.6503	-.2572	.6493	-.2762	.6486	-.2851	.6500	-.2249
.6994	-.2296	.7004	-.2353	.6992	-.2628	.6995	-.2887	.7001	-.2488
.7492	-.2098	.8005	-.1871	.7494	-.2496	.7489	-.2934	.7498	-.2823
.7993	-.1746	.8500	-.1415	.7988	-.2142	.7987	-.2741	.8015	-.2740
.8493	-.1295	.8997	-.0799	.8497	-.1676	.8990	-.1502	.8512	-.2599
.8993	-.0606	.9510	-.0055	.9007	-.0962	.9509	-.0585	.9005	-.2107
.9492	.0031	1.0000	.0322	.9513	-.0126	1.0000	.0738	.9515	-.1126
1.0000	.1029			1.0000	.0644			1.0000	.0199
LOWER SURFACE									
.0503	.2353	.0500	.2127	.0520	.1682	.0500	.0995	.0521	-.0556
.1013	.1260	.1000	.0957	.1012	.0733	.0973	.0525	.1012	-.1112
.2008	.0361	.2004	.0228	.2005	.0214	.1981	-.0485	.1992	-.1366
.3012	.0032	.2999	-.0045	.2999	-.0203	.2981	-.0605	.3010	-.0905
.4011	-.0105	.3999	-.0145	.3999	-.0048	.3974	-.0457	.4003	-.0578
.6012	.0743	.4999	-.0064	.5003	-.0095	.4986	-.0295	.4997	-.0335
.8010	.2295	.5997	.0969	.5990	.1015	.5968	.0932	.5992	.0838
.8998	.1840	.6997	.1924	.6995	.1999	.6985	.1997	.6992	.1702
1.0000	.1029	.8005	.2409	.7994	.2496	.7968	.2635	.7980	.2116
		.9016	.2059	.8933	.2292	.8961	.2442	.8916	.1963
		.9518	.1702	.9480	.1903	.9452	.1816	.9548	.0972
		1.0000	.0322	1.0000	.0644	1.0000	.0738	1.0000	.0199

EXTRINSEIC MEASUREMENT

Z/C _R	.851	-.851	.984	.984	.984	-.984	-.984	-.984
Y/C _R	0.0	0.0	.638	1.376	2.094	.592	1.370	2.088
-.1.943		.0497	-1.841	.0055	.0113	.0203	.0274	.0205
-.1.753	.0182	.0340	-1.522	.0127	.0177	.0182	.0090	.0181
-.1.397	.0233	.0314	-1.203	.0087	.0164	.0177	.0177	.0138
-.1.671	.0208	.0083	-.883	.0114	.0163	.0187	.0185	.0152
-.1.399	.0534	.0202	-.777	.0144	.0212	.0166	.0208	.0080
-.1.351	.0628	-.0069	-.670	.0028	.0217	.0191	.0215	.0195
-.1.359	.0666	-.0597	-.564	.0102	.0196	.0184	.0271	.0163
-.1.369	.0508	-.1186	-.457	.0146	.0168	.0142	.0305	.0116
-.1.369	.0639	-.1125	-.351	.0162	.0160	.0191	.0352	.0165
-.1.359	.0583	-.0829	-.245	.0142	.0128	.0209	.0429	.0189
-.1.359	.0762	-.0653	-.138	.0119	.0149	.0221	.0397	.0228
-.1.351	.0541	-.0351	-.031	.0112	.0054	.0193	.0556	.0250
-.1.351	.0303	-.0294	-.075	-.0092	.0097	.0199	.0505	.0308
-.1.351	-.0294	-.0263	-.181	-.0109	.0077	.0202	.0648	.0347
			-.0214	.0052	.0121	.0656	.0352	.0282
			-.0354	.0101	.0137	.0707	.0501	.0273
			-.0572	-.0043	.0073	.0716	.0462	.0278
			-.0696	-.0130	.0052	.0750	.0469	.0262
			-.0766	-.0222	.0066	.0764	.0512	.0290
			-.0768	-.0292	.0052	.0722	.0517	.0282
			-.0827	-.0344	.0008	.0784	.0521	.0283
			-.0762	-.0365	-.0080	.0698	.0512	.0299
			-.0687	-.0355	.0020	.0578	.0504	.0292
			-.0603	-.0305	.0031	.0540	.0470	.0321
			-.0524	-.0233	.0050	.0649	.0521	.0352
			-.0177	-.0229	.0088	.0591	.0466	.0372
			-.0233	-.0189	.0107	.0569	.0463	.0394
			-.0263	-.0212	.0162	.0539	.0436	.0376
			-.0196	-.0082	.0267	.0440	.0426	.0539
			-.0135	.0041	.0527	.0281	.0418	.0716
			-.0128	.0053	.0531	.0101	.0293	.0722

TABLE VIII - TABLE OF MEASURED PRESSURE COEFFICIENTS, $M = .88$

RUN 65

MACH .8786

ALPHA 3.959

PIN 9.99

 C_L .49613 C_D .03667 C_M -.07633

WING PRESSURE DATA

WING PRESSURE DATA

STA	.216	.400	.600	.800	.950				
C_l	.47559	.52698	.53953	.48322	.35009				
C_m	-.06627	-.06212	-.06123	-.06813	-.06889				
X/C	C_p	X/C	C_p	X/C	C_p				
UPPER SURFACE									
.0197	-.8583	.0208	-.9824	.0189	-.8839	.0187	-.8020	.0217	-.7416
.0497	-1.0381	.0503	-1.0809	.0495	-1.0392	.0483	-.9636	.0497	-.8452
.0992	-.4543	.1003	-.9747	.0993	-.9676	.0989	-.8772	.1005	-.7404
.1495	-.5314	.1507	-.9370	.1492	-.9300	.1483	-.8523	.1496	-.7659
.1993	-.4961	.2001	-.5773	.1995	-.8897	.1995	-.8288	.1993	-.7908
.2496	-.4715	.2509	-.4951	.2487	-.8762	.2490	-.8225	.2500	-.3741
.2995	-.4583	.3002	-.4822	.2999	-.5800	.2982	-.7949	.3001	-.0969
.3495	-.4350	.3504	-.4836	.3496	-.4611	.3495	-.3059	.3504	-.1026
.3997	-.4400	.4009	-.4361	.3991	-.3572	.3994	-.1578	.4006	-.1348
.4493	-.4252	.4502	-.4519	.4497	-.4378	.4493	-.1432	.4503	-.1108
.4976	-.4411	.5001	-.4523	.4997	-.2356	.4995	-.1131	.5000	-.1447
.5488	-.4521	.5501	-.4725	.5492	-.1905	.5485	-.1507	.5499	-.1662
.5993	-.4370	.6001	-.2214	.5997	-.2030	.5985	-.1968	.5997	-.1932
.6495	-.2495	.6503	-.2139	.6493	-.2284	.6486	-.2365	.6500	-.2110
.6994	-.2097	.7004	-.2180	.6992	-.2412	.6995	-.2723	.7001	-.2457
.7492	-.1975	.8005	-.1741	.7494	-.2291	.7489	-.2888	.7498	-.2862
.7993	-.1647	.8500	-.1275	.7988	-.2066	.7987	-.2784	.8015	-.2809
.8493	-.1193	.8997	-.0679	.8497	-.1582	.8990	-.1458	.8512	-.2751
.8993	-.0553	.9510	.0106	.9007	-.0848	.9509	-.0494	.9005	-.2250
.9492	.0142	1.0000	.0555	.9513	.0022	1.0000	.0927	.9515	-.1150
1.0000	.1173			1.0000	.0913			1.0000	.0235
LOWER SURFACE									
.0503	.2409	.0500	.2134	.0520	.1486	.500	.0770	.0521	-.0862
.1013	.1245	.1000	.0861	.1012	.0614	.0973	.0301	.1012	-.1562
.2008	.0324	.2004	.0153	.2005	.0118	.1981	-.0633	.1992	-.1756
.3012	-.0008	.2999	-.0108	.2999	-.0289	.2981	-.0765	.3010	-.1065
.4011	-.0172	.3999	-.0231	.3999	-.0093	.3974	-.0578	.4003	-.0551
.6012	.0779	.4999	-.0109	.5003	-.0120	.4986	-.0348	.4997	-.0236
.8010	.2376	.5997	.0985	.5990	.1030	.5968	.0955	.5992	.0916
.8998	.1939	.6997	.1990	.6995	.2056	.6985	.2061	.6992	.1788
1.0000	.1173	.8005	.2496	.7994	.2581	.7968	.2722	.7980	.2207
		.9016	.2162	.8933	.2390	.8961	.2550	.8916	.2022
		.9518	.1784	.9480	.2012	.9452	.1937	.9548	.1038
		1.0000	.0555	1.0000	.0913	1.0000	.0927	1.0000	.0235

FAR FIELD MEASUREMENT

Z/C _R	.851	-.851	.984	.984	.984	-.984	-.984	-.984	-.984
Z/C _R	0.0	0.0	.638	1.376	2.094	.592	1.370	2.088	
X/C _R	C_p	C_p	X/C _R	C_p	C_p	C_p	C_p	C_p	C_p
-1.848		.0364	-1.841	.0067	.0103	.0151	.0278	.0252	.0285
-1.753	.0212	.0283	-1.522	.0163	.0203	.0125	.0121	.0208	.0207
-1.392	.0230	.0351	-1.203	.0090	.0203	.0095	.0225	.0158	.0228
-.671	.0210	.0096	-.883	.0134	.0224	.0074	.0193	.0171	.0151
-.139	.0556	.0256	-.777	.0160	.0129	.0156	.0218	.0078	.0219
.050	.0707	.0014	-.670	.0036	.0289	.0078	.0208	.0202	.0188
.289	.0746	-.0542	-.564	.0153	.0146	.0183	.0310	.0160	.0182
.529	.0596	-.1343	-.457	.0183	.0151	.0187	.0320	.0157	.0227
.769	.0726	-.1345	-.351	.0189	.0169	.0143	.0373	.0217	.0196
1.009	.0637	-.0873	-.245	.0186	.0181	.0258	.0447	.0265	.0263
1.249	.0807	-.0676	-.138	.0174	.0119	.0158	.0415	.0295	.0231
1.731	.0568	-.0320	-.032	.0181	.0067	.0311	.0580	.0289	.0268
2.211	.0334	-.0273	.075	-.0008	.0219	.0077	.0544	.0332	.0266
2.690	-.0233	-.0223	.181	.0005	.0123	.0198	.0710	.0371	.0306
			.287	-.0139	-.0031	.0096	.0673	.0378	.0320
			.393	-.0258	.0167	.0138	.0772	.0563	.0321
			.500	-.0533	-.0018	.0161	.0767	.0479	.0293
			.607	-.0728	-.0106	.0040	.0796	.0514	.0301
			.713	-.0859	-.0270	.0036	.0818	.0509	.0312
			.819	-.0921	-.0338	-.0061	.0740	.0555	.0306
			.925	-.0953	-.0455	-.0003	.0811	.0509	.0293
			1.032	-.0856	-.0440	-.0161	.0719	.0540	.0292
			1.139	-.0725	-.0407	-.0002	.0637	.0534	.0324
			1.245	-.0605	-.0383	-.0041	.0613	.0462	.0336
			1.351	-.0498	-.0257	-.0057	.0742	.0555	.0340
			1.457	-.0147	-.0264	-.0017	.0677	.0480	.0359
			1.564	-.0231	-.0187	.0083	.0616	.0486	.0372
			1.670	-.0267	-.0250	.0112	.0572	.0428	.0365
			1.989	-.0201	-.0095	.0121	.0455	.0441	.0549
			2.309	-.0143	.0058	.0569	.0299	.0463	.0779
			2.628	-.0095	.0100	.0523	.0156	.0362	.0781

TABLE IX - TABLE OF MEASURED PRESSURE COEFFICIENTS, $M = .90$

RUN 29

MACH .9001

ALPHA 3.896

PIN 10.40

 C_L .50003 C_D .03772 C_M -.08433

WING PRESSURE DATA

STA	.216	.400	.600	.800	.950
C_l	.48138	.52195	.54609	.51830	.35401
C_m	-.07263	-.06872	-.06981	-.07794	-.06974
x/c	C_p	x/c	C_p	x/c	C_p
UPPER SURFACE					
.0197	-.7967	.0208	-.9006	.0189	-.8095
.0497	-.9552	.0503	-1.0056	.0495	-.9520
.0992	-.5105	.1003	-.9047	.0993	-.8894
.1495	-.5229	.1507	-.8621	.1492	-.8537
.1993	-.4868	.2001	-.5583	.1995	-.8189
.2496	-.4564	.2509	-.4870	.2487	-.8238
.2995	-.4477	.3002	-.4720	.2999	-.6597
.3495	-.4212	.3504	-.4714	.3496	-.4612
.3997	-.4280	.4009	-.4349	.3991	-.4534
.4493	-.4189	.4502	-.4528	.4497	-.4428
.4976	-.4346	.5001	-.4528	.4997	-.4479
.5488	-.4404	.5501	-.4518	.5492	-.4518
.5993	-.4598	.6001	-.4927	.5997	-.4723
.6495	-.4463	.6503	-.5150	.6493	-.1876
.6994	-.4032	.7004	-.2004	.6992	-.1535
.7492	-.2026	.8005	-.1193	.7494	-.1758
.7993	-.1449	.8500	-.0975	.7988	-.1722
.8493	-.1032	.8997	-.0490	.8497	-.1401
.8993	-.0360	.9510	.0290	.9007	-.0742
.9492	.0281	1.0000	.0425	.9513	.0202
1.0000	.1248			1.0000	.1033
LOWER SURFACE					
.0503	.2411	.0500	.1837	.0520	.1271
.1013	.1175	.1000	.0719	.1012	.0403
.2008	.0245	.2004	.0011	.2005	-.0061
.3012	-.0115	.2999	-.0252	.2999	-.0441
.4011	-.0307	.3999	-.0333	.3999	-.0253
.5012	.0717	.4999	-.0223	.5003	-.0218
.6010	.2385	.5997	.0968	.5990	.1014
.6998	.1977	.6997	.1998	.6995	.2073
1.0000	.1248	.8005	.2538	.7994	.2624
		.9016	.2203	.8933	.2438
		.9518	.1861	.9480	.2079
		1.0000	.0425	1.0000	.1033
				1.0000	.0976
				1.0000	.0257

FAR FIELD MEASUREMENT

Z/C_R	.851	-.851	.984	.984	.984	-.984	-.984	-.984
Y/C_R	0.0	0.0	.638	1.376	2.094	.592	1.370	2.088
x/L_R	C_p	C_p	x/L_R	C_p	C_p	C_p	C_p	C_p
-1.848		.0471	-1.841	.0087	.0114	.0293	.0322	
-1.753	.0209	.0284	-1.522	.0168	.0216	.0219	.0222	
-1.392	.0194	.0322	-1.203	.0082	.0195	.0236	.0183	.0217
-.671	.0197	.0107	-.883	.0145	.0223	.0231	.0191	.0193
-.189	.0569	.0322	-.777	.0181	.0227	.0195	.0227	.0198
.050	.0745	.0120	-.670	.0062	.0233	.0209	.0223	.0209
.289	.0765	-.0413	-.564	.0138	.0280	.0294	.0271	.0200
.529	.0588	-.1306	-.457	.0197	.0239	.0197	.0321	.0219
.769	.0729	-.1590	-.351	.0222	.0245	.0229	.0374	.0221
1.009	.0684	-.0957	-.245	.0211	.0303	.0264	.0441	.0249
1.249	.0854	-.0661	-.138	.0230	.0232	.0243	.0451	.0254
1.731	.0604	-.0364	-.032	.0242	.0207	.0240	.0614	.0272
2.211	.0360	-.0269	.075	.0049	.0240	.0268	.0563	.0308
2.690	-.0266	-.0197	.181	.0045	.0219	.0248	.0703	.0318
			.287	-.0043	.0098	.0192	.0726	.0342
			.393	-.0224	.0254	.0188	.0742	.0307
			.500	-.0476	.0043	.0126	.0764	.0313
			.607	-.0702	-.0078	.0115	.0784	.0310
			.713	-.0900	-.0211	.0054	.0802	.0302
			.819	-.1007	-.0375	.0026	.0752	.0309
			.925	-.1077	-.0492	.0009	.0816	.0314
			1.032	-.0947	-.0497	-.0049	.0739	.0309
			1.139	-.0785	-.0474	-.0041	.0654	.0294
			1.245	-.0642	-.0406	.0021	.0642	.0324
			1.351	-.0527	-.0304	.0018	.0765	.0331
			1.457	-.0139	-.0266	.0022	.0695	.0334
			1.564	-.0204	-.0210	.0155	.0664	.0378
			1.670	-.0249	-.0235	.0111	.0610	.0353
			1.989	-.0186	-.0103	.0226	.0502	.0535
			2.309	-.0121	.0066	.0571	.0336	.0767
			2.628	-.0116	.0080	.0617	.0161	.0862

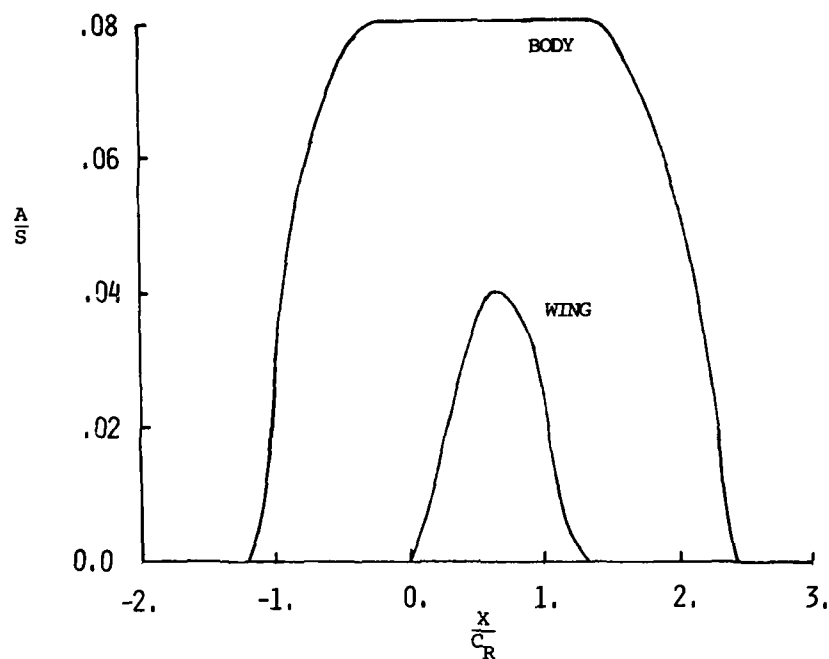


Figure 7.3 - Model Area Distribution

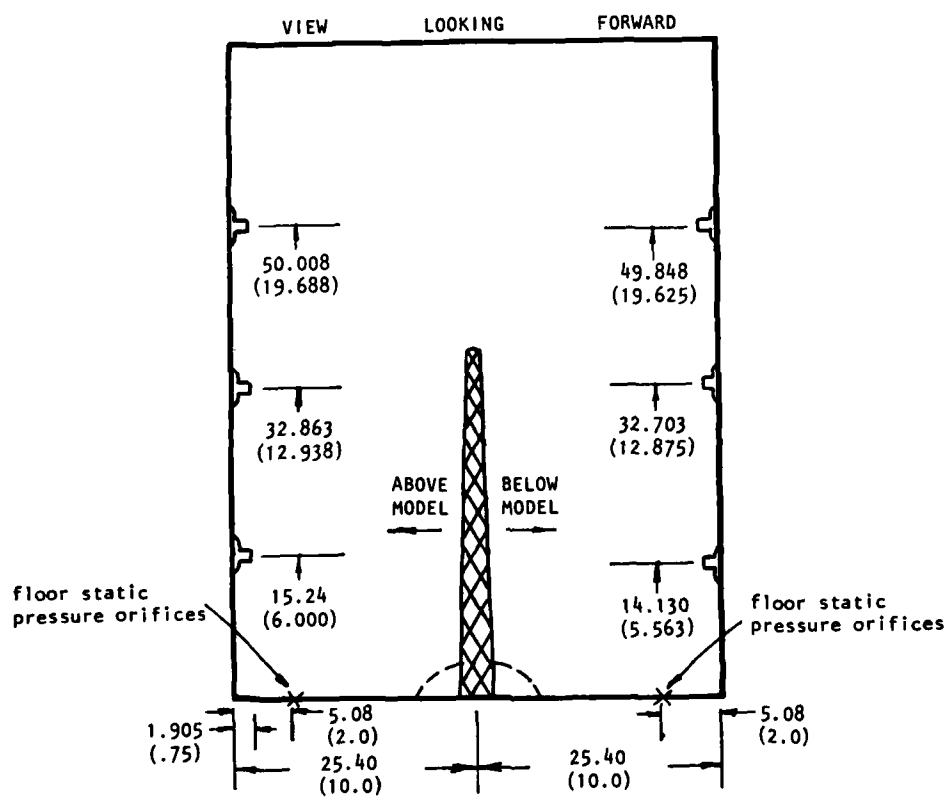


Figure 7.4 - Far Field Pressure Rail Location - cm (in.)

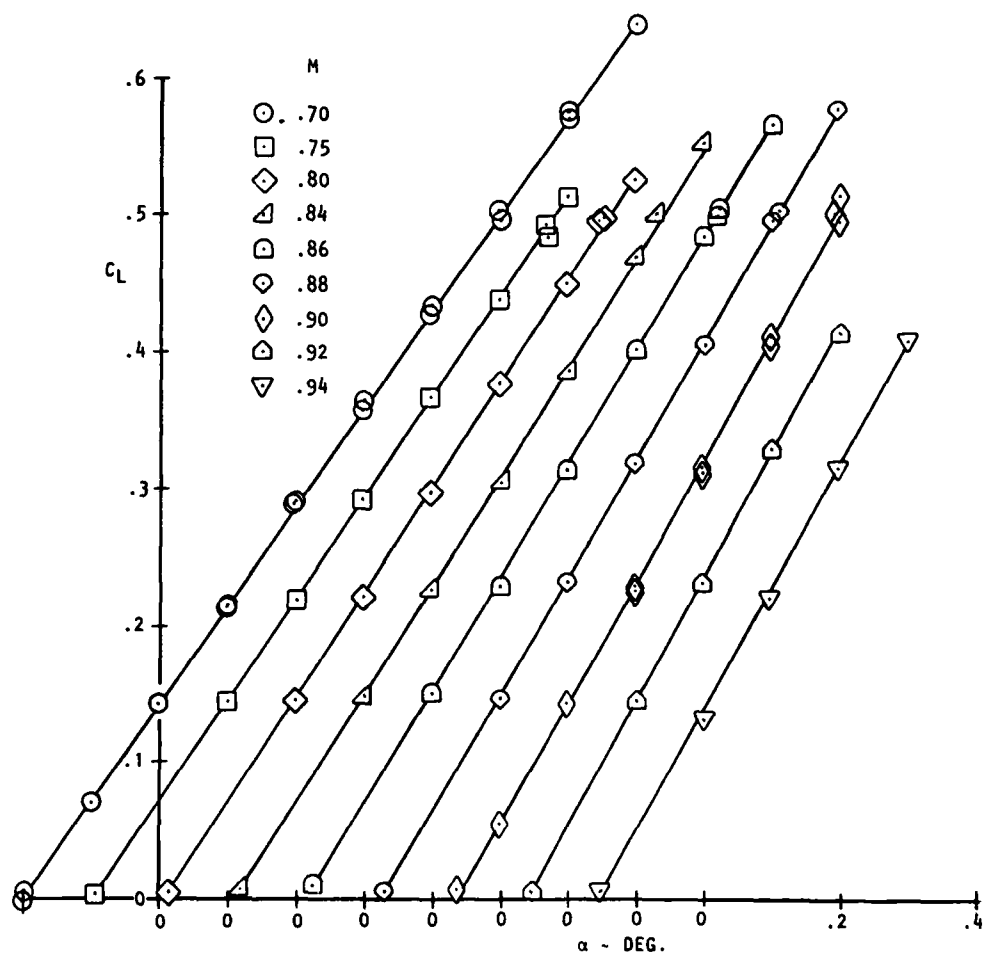


Figure 7.5 - Summary of Lift

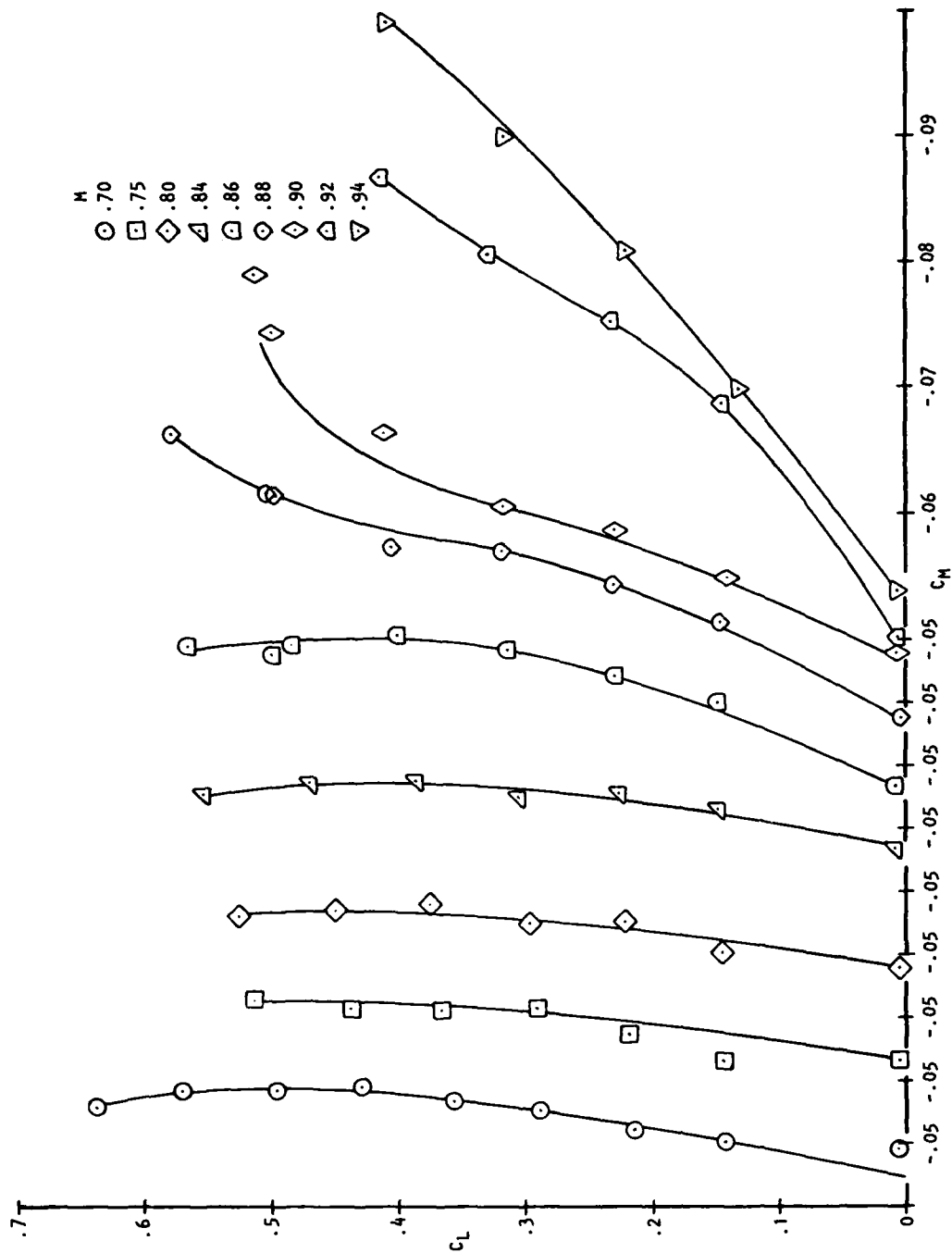


Figure 7.6 - Summary of Pitching Moment

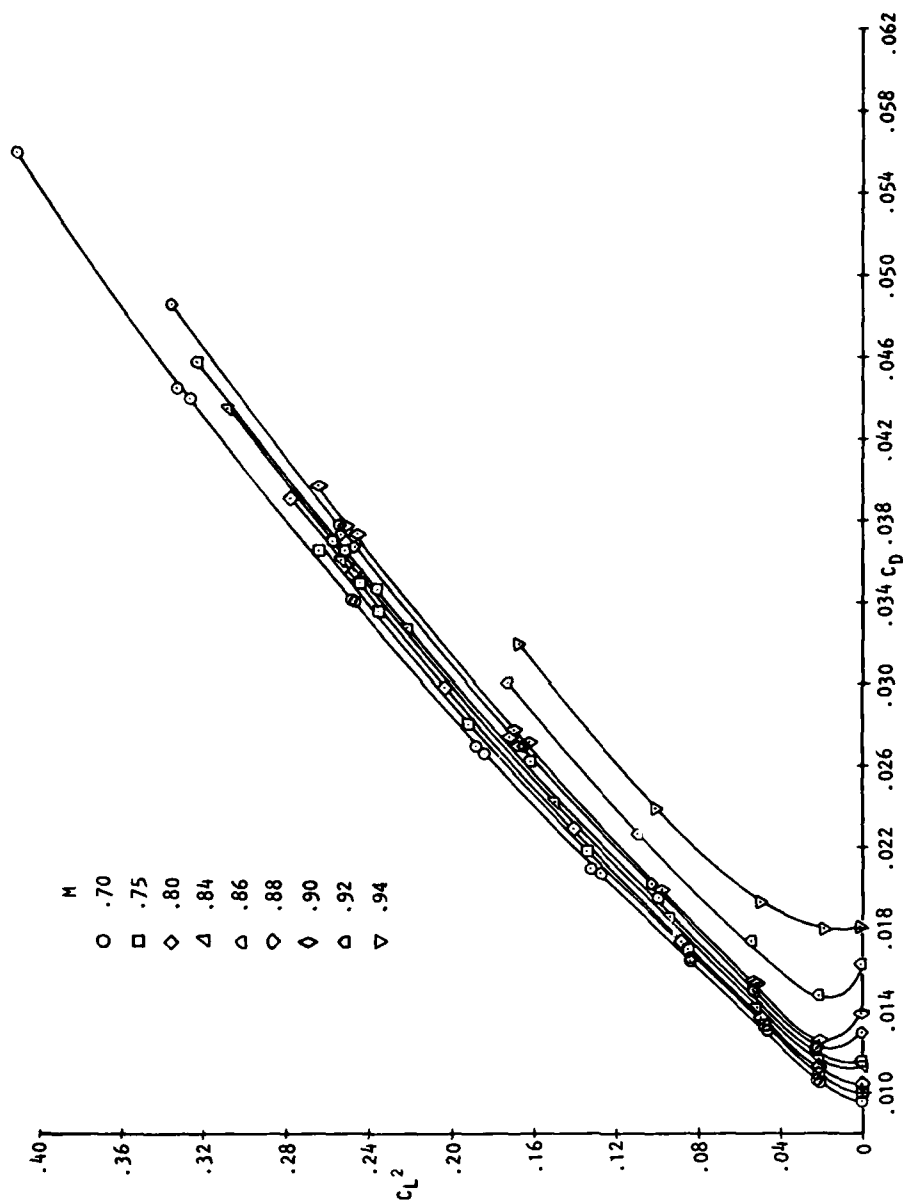
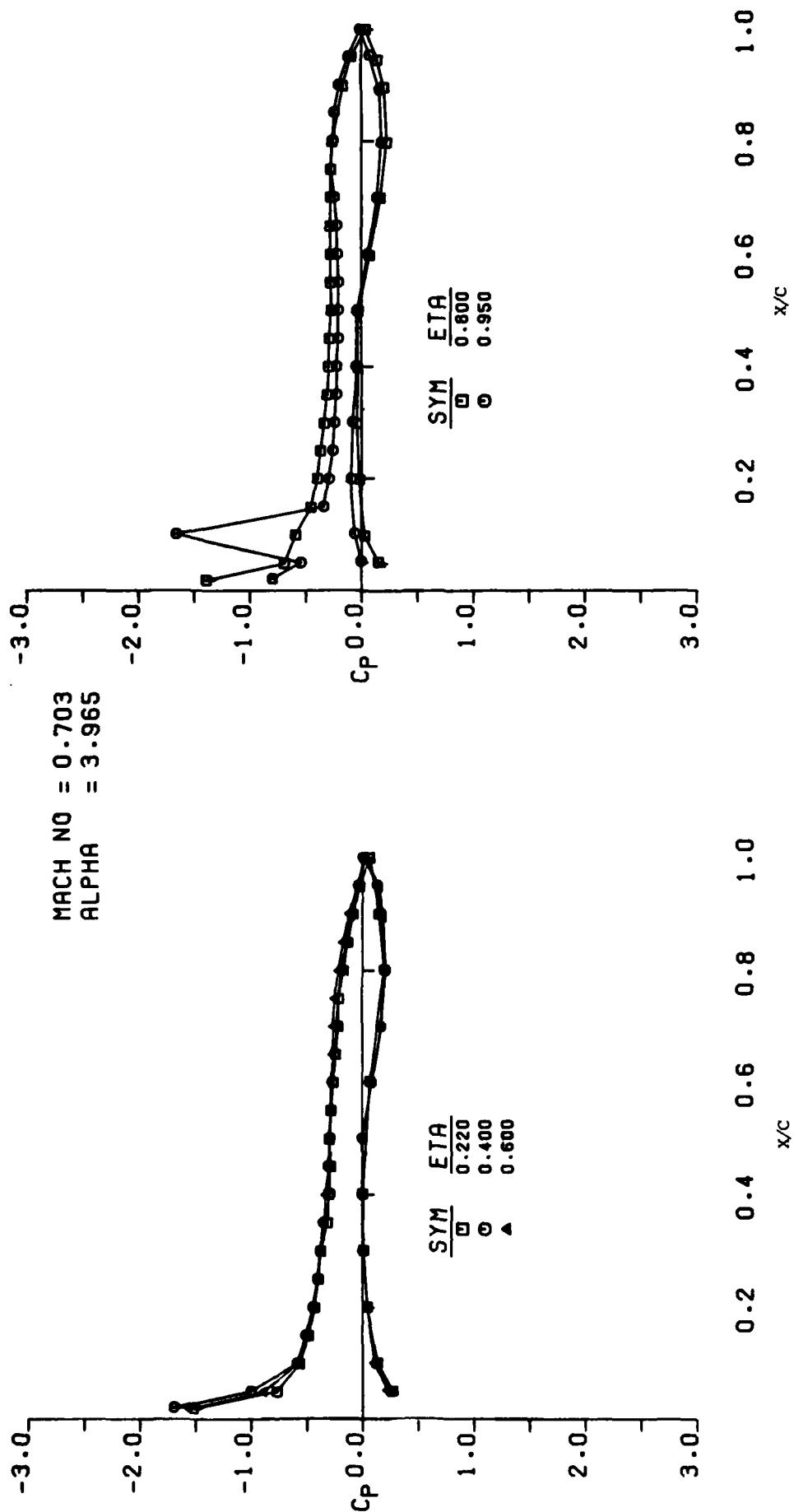


Figure 7.7 - Summary of Drag Data

Figure 7.8 - Wing Pressure Data for $M = .70$

MACH NO = 0.801
ALPHA = 3.939

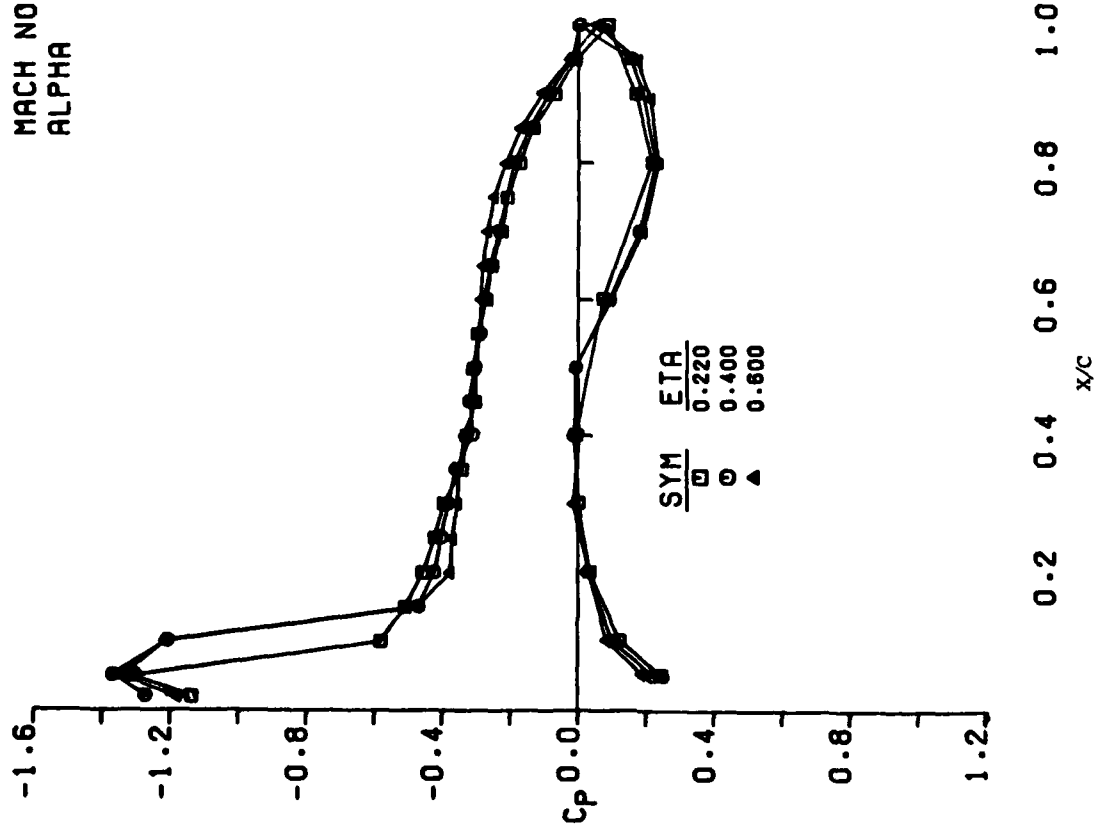


Figure 7.9 - Wing Pressure Data for M = .80

MACH NO = 0.849
ALPHA = 3.955

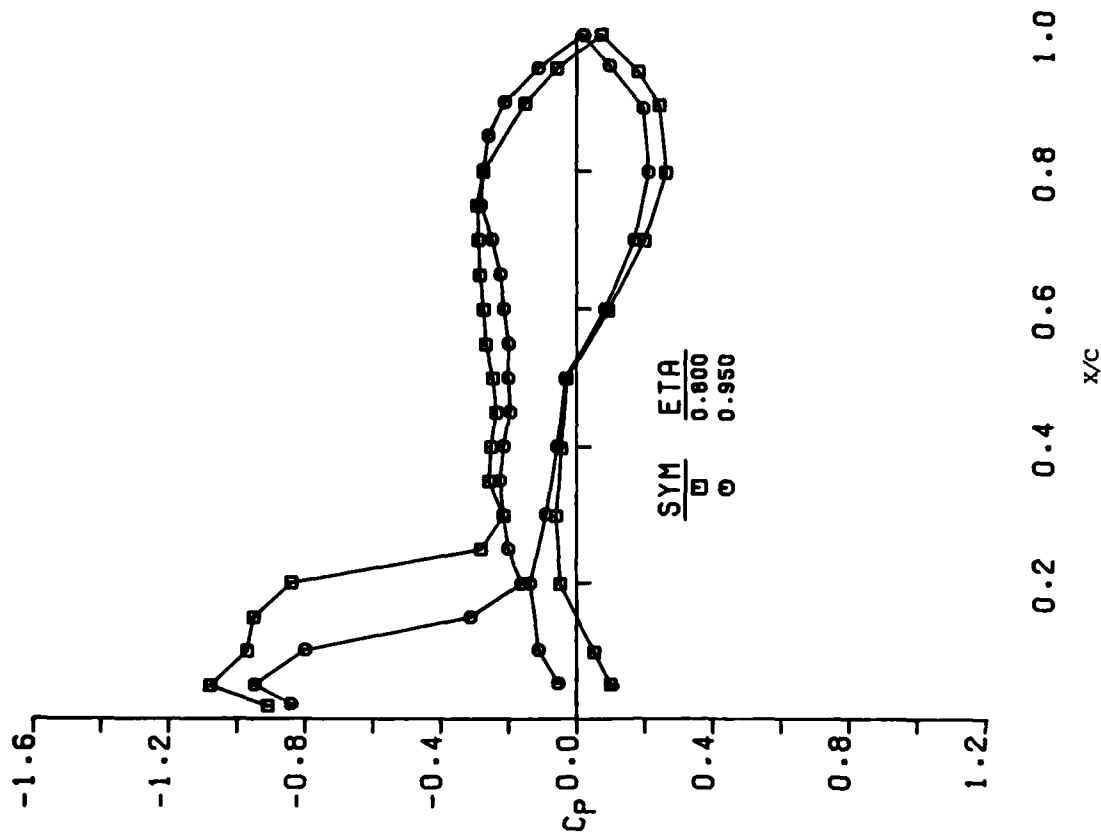
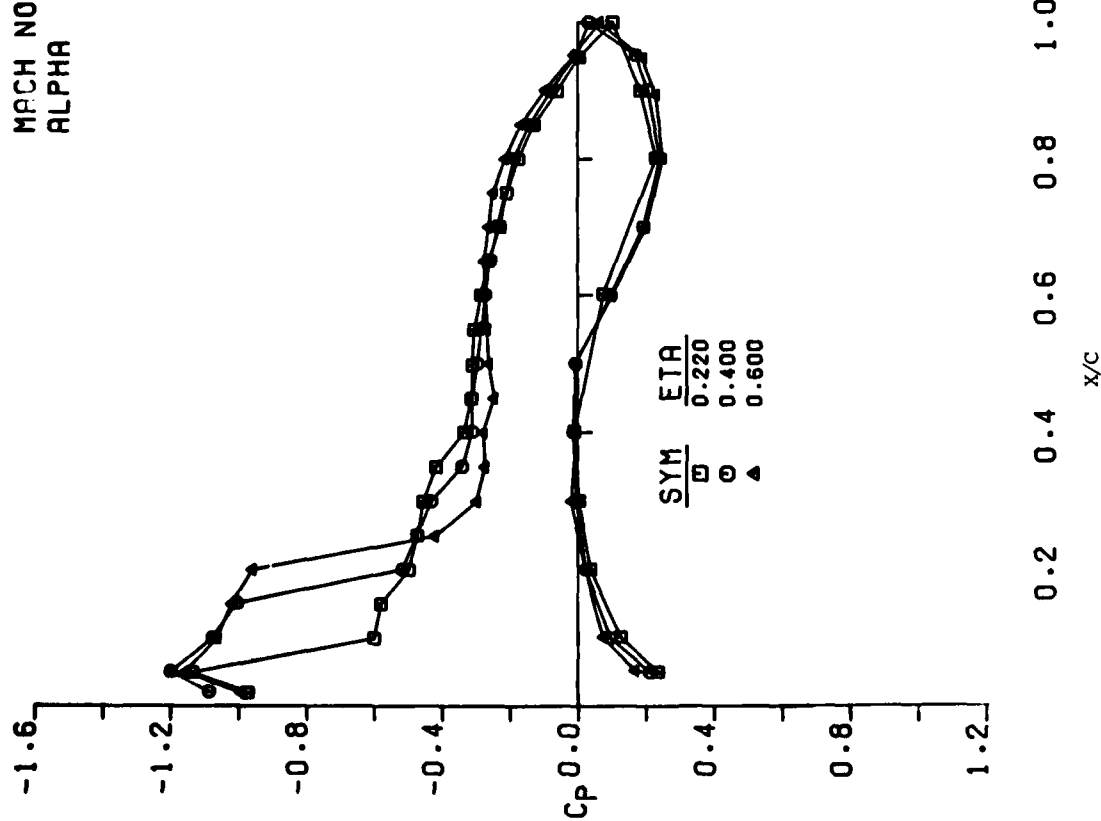
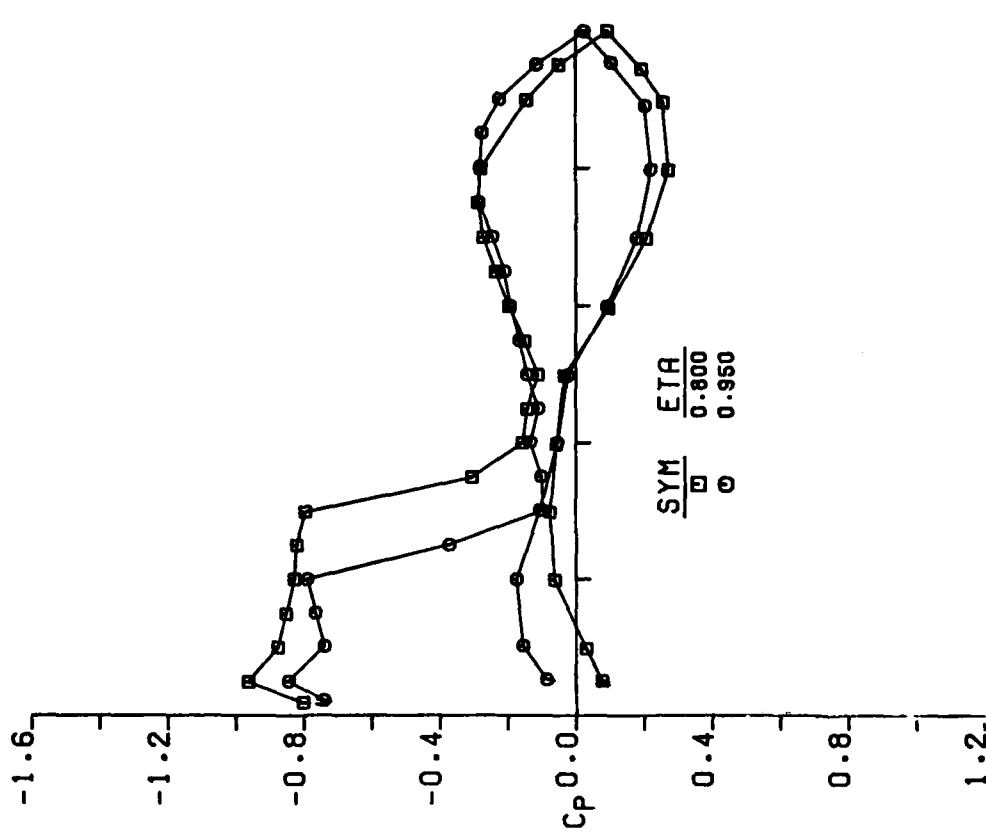
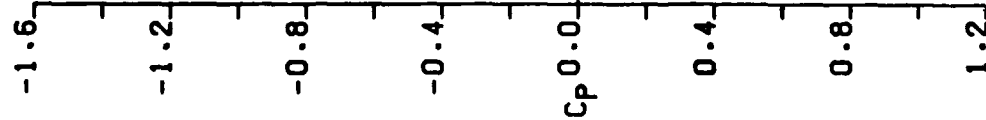


Figure 7.10 - Wing Pressure Data for $M = .85$

MACH NO = 0.879
ALPHA = 3.959



0.2 0.4 0.6 0.8 1.0
x/c

0.2 0.4 0.6 0.8 1.0
x/c

Figure 7.11 - Wing Pressure Data for M = .88

MACH NO = 0.900
ALPHA = 3.896

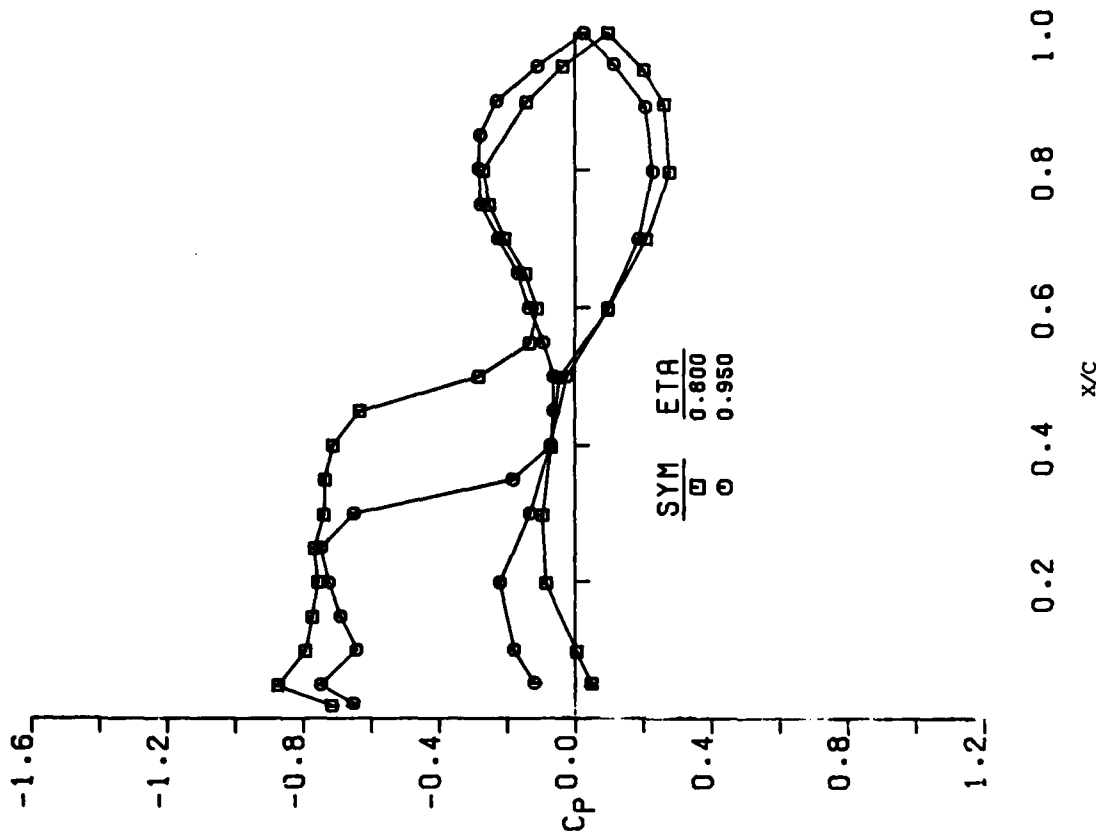
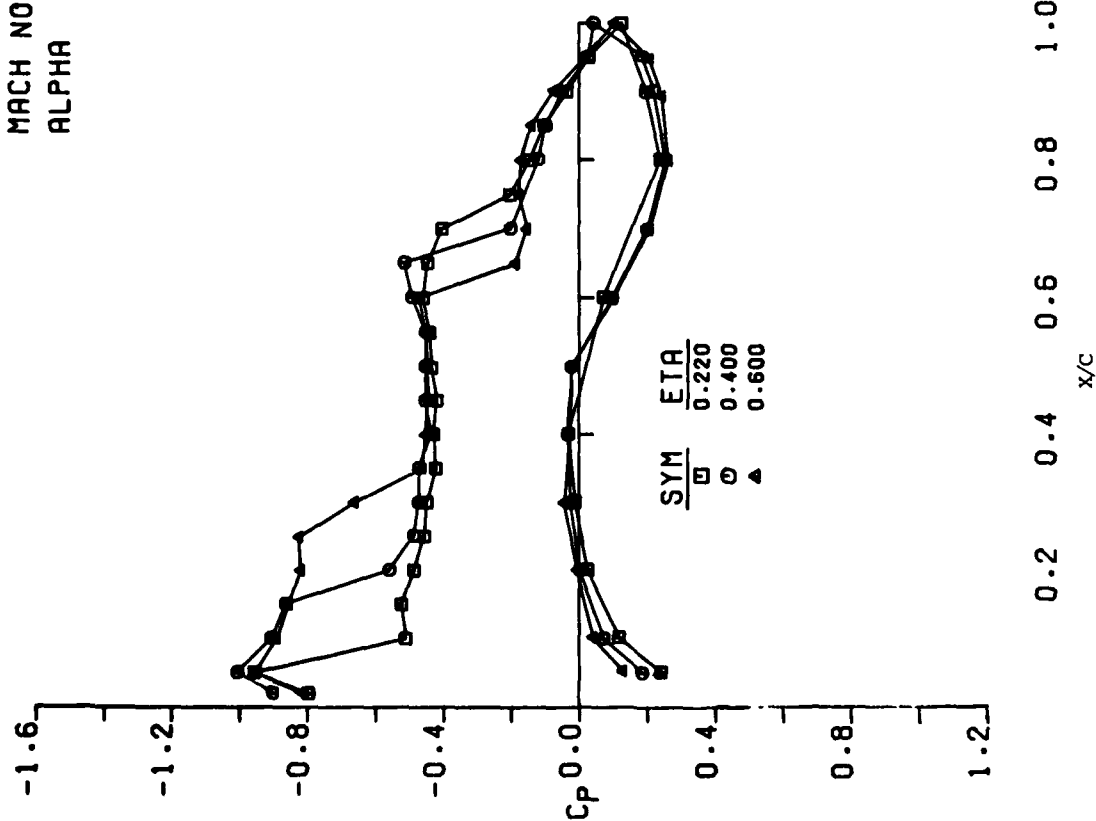
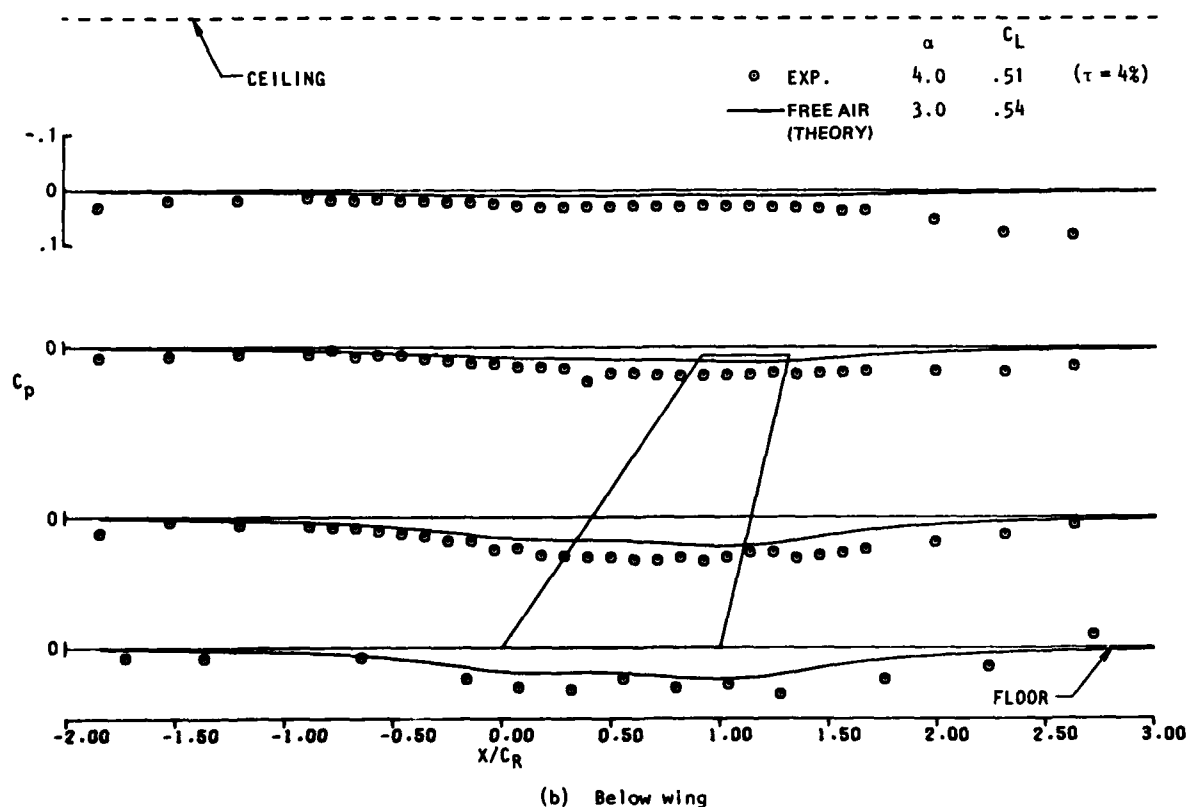
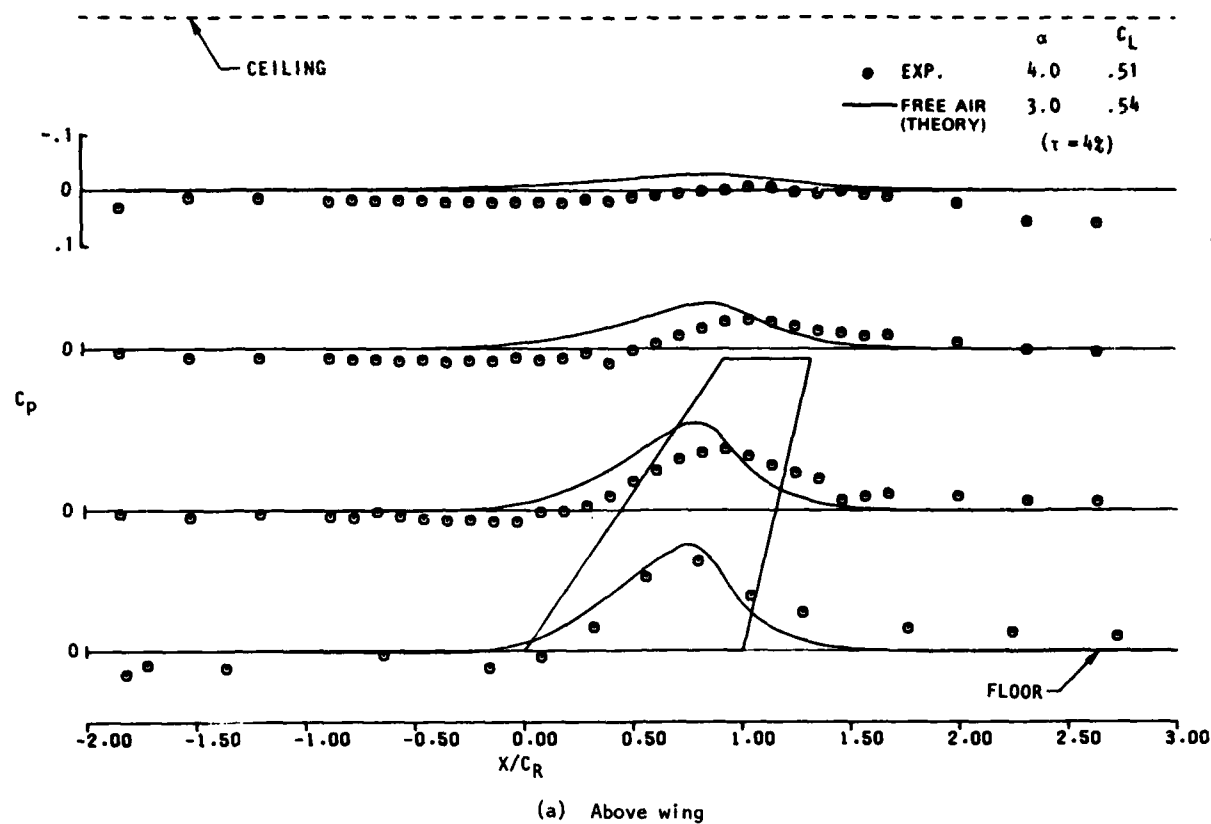
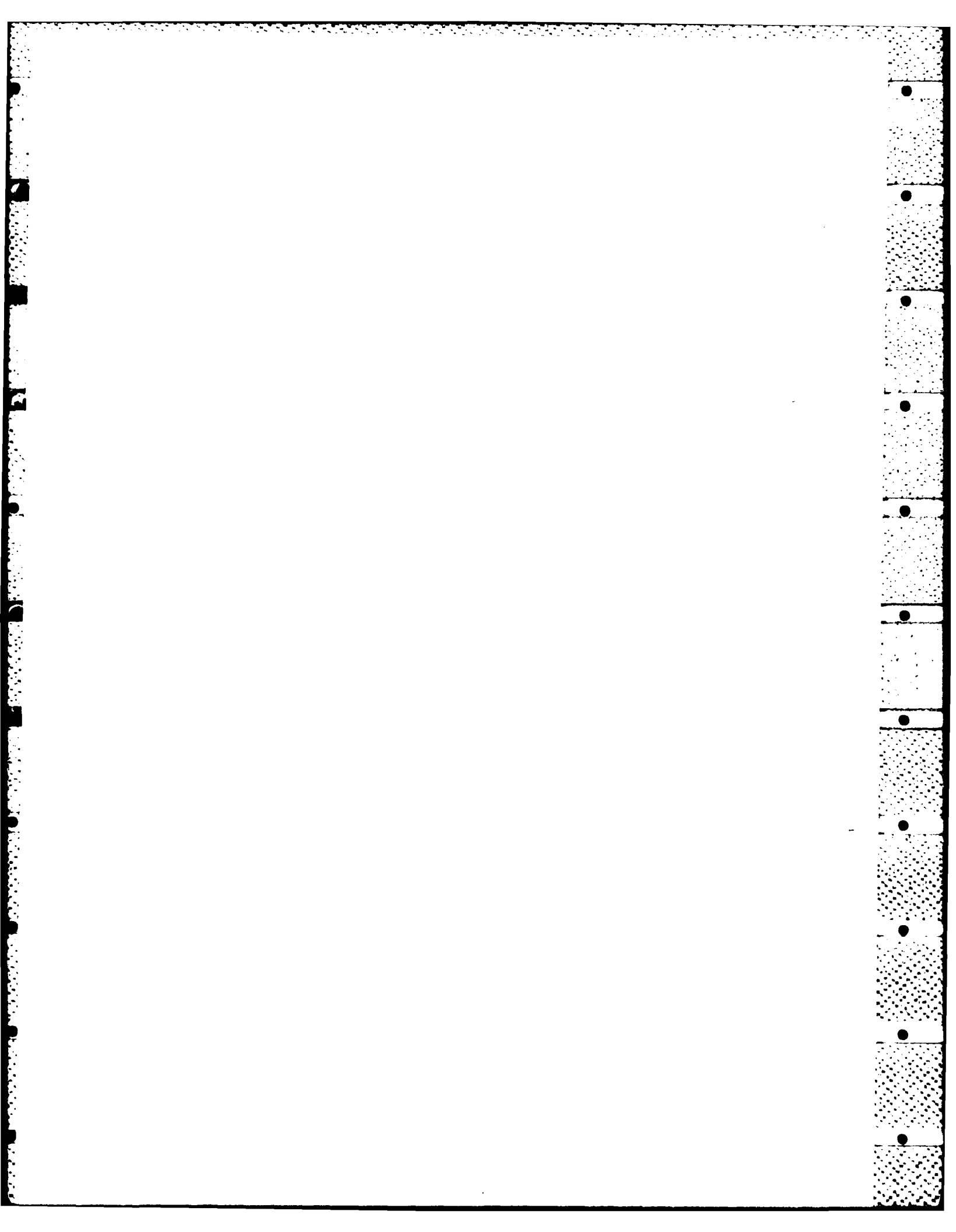


Figure 7.12 - Wing Pressure Data for $M = .90$

Figure 7.13 - Far Field Pressure Measurements for $M = .90$



8. PRESSURE DISTRIBUTIONS MEASURED ON RESEARCH WING M100 MOUNTED ON AN AXISYMMETRIC BODY

by

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8.1 INTRODUCTION

This contribution contains selected data from measurements of surface pressure distributions on a research wing in the ARA 9ft x 8ft transonic wind tunnel. Tabulated data are given for an incidence range at constant Mach number and a Mach number range at approximately constant lift coefficient. Overall force measurements for the same test conditions as the presented pressures are also given.

8.2 DATA SET

1 General Description

1.1 Model Designation or Name	M100
1.2 Model Type (eg Full Span Wing-Body, Semi-Span Wing)	Full span wing-body
1.3 Design Requirements/Conditions	Transport wing research model
1.4 Additional Remarks	M100 was a civil transport research wing design mounted on a simple axisymmetric fuselage. The design was not orientated to any specific project but geometric constraints were applied commensurate with a practical aircraft design. The model was given a nominal scale of 1:23.

2 Model Geometry

2.1 Wing Data

2.1.1 Wing Planform	Straight wing with leading and trailing edge kinks, see Figure 8.1
2.1.2 Aspect Ratio	9.02
2.1.3 Leading-Edge Sweep	40° inboard, 34.4° outboard
2.1.4 Trailing-Edge Sweep	6.6° inboard, 26.3° outboard
2.1.5 Taper Ratio	0.2243 (tip chord/root chord at fuselage side)
2.1.6 Twist	4° root, -1° tip. (Included in ordinates of Table 1).
2.1.7 Aerodynamic Mean Chord	0.245 m
Standard Mean Chord	0.202 m
2.1.8 Span or Semispan	1.811 m span
2.1.9 Number of Airfoil Sections used to Define Wing	17 sections were used to design the wing but 82 sections were specified for model manufacture. 28 points on each surface defined the section at each spanwise station.
2.1.10 Spanwise Location of Reference Section and Section Coordinates (Note if Ordinates are Design or Actual Measured Values)	Design ordinates for 17 sections plus a model centre line section are listed in Table 8.1.
2.1.11 Lofting Procedure between Reference Sections	Piecewise cubics were used to interpolate between the design chordwise ordinates.
2.1.12 Form of Wing-Body Fillet, Strakes	No leading edge fillet. Small flat sided fillet in the junction between the fuselage and wing upper surface. This fillet extended a relatively short distance downstream of the wing trailing edge. There were no fillets on the wing lower surface.
2.1.13 Form of Wing Tip	Straight

2.2	Body Data (Detail Description of Body Geometry)	Axisymmetric fuselage with tangent ogive nose and rear body. See Figure 8.1.
2.3	Wing-Body Combination	
2.3.1	Relative Body Diameter (Average Body Diameter at Wing Location Divided by Wing Span)	0.11
2.3.2	Relative Vertical Location of Wing (Height above or below Body Axis Divided by Average Body Radius at Wing Location)	-0.44 (see Figure 8.1)
2.3.3	Wing Setting Angle	0°
2.3.4	Dihedral	5°
2.4	Cross Sectional Area Development	See Figure 8.2 and Table 8.2
2.5	Fabrication Tolerances/Waviness	±0.05 mm
2.6	Additional Remarks	Nil
3	Wind Tunnel	
3.1	Designation	ARA 9ft x 8ft TWT
3.2	Type of Tunnel	
3.2.1	Continuous or Blowdown. Indicate Minimum Run Time if Applicable	Continuous
3.2.2	Stagnation Pressure	0.8 to 1.2 bar
3.2.3	Stagnation Temperature	Up to 323 K
3.3	Test Section	
3.3.1	Shape of Test Section	Rectangular
3.3.2	Size of Test Section (Width, Height, Length)	2.74 m x 2.44 m x 3.66 m
3.3.3	Type of Test Section, Closed, Open, Slotted, Perforated	Perforated
	Open Area Ratio (Give Range if Variable)	22%
	Slot/Hole Geometry (eg 30-Degree Slanted Holes)	Normal holes vented into large plenum chamber
	Treatment of Sidewall Boundary Layer	
	Full span models) Half model testing)	Tunnel has capability for full and half span model testing
3.4	Flow Field (Empty Test Section)	
3.4.1	Reference Static Pressure	Plenum chamber
3.4.2	Flow Angularity	Up to +0.15° in vicinity of model. (This is mainly due to the working section flow being horizontal and the roof set at +0.3° to allow for the boundary layer growth in the working section).
3.4.3	Mach Number Distribution	$\Delta M = \pm 0.002$ (See Reference 1).
3.4.4	Pressure Gradient	Insignificant over the length of the current model (see Reference 1)
3.4.5	Turbulence/Noise Level	-
3.4.6	Sidewall Boundary Layer	-
3.5	Freestream Mach number (or Velocity)	
3.5.1	Range	0.3 to 1.4
3.5.2	Pressures used to Determine Mach Number (eg Settling Chamber Total Pressure and Plenum Chamber Pressure)	Settling chamber total pressure (with a small correction applied), and plenum chamber static pressure

3.5.3	Accuracy of Mach Number Determination (ΔM)	$\Delta M = \pm 0.001$						
3.5.4	Maximum Mach Number Variation in x, y, z - Direction (Empty Tunnel; Specify at what Mach Number)	Streamwise variation of $\Delta M = \pm 0.002$ over Mach number range.						
	Maximum Variation of Flow Direction -							
	Maximum Mach Number Variation During a Traverse	$\Delta M = \pm 0.001$						
3.6	Reynolds Number Range							
3.6.1	Unit Reynolds Number Range (Give Range at Representative Mach Numbers: 1/m)	<table><tr><td>M = 0.40</td><td>R/m = $8.5 \times 10^6 \pm 20\%$</td></tr><tr><td>0.80</td><td>$13.0 \times 10^6 \pm 20\%$</td></tr><tr><td>1.40</td><td>$14.8 \times 10^6 \pm 20\%$</td></tr></table>	M = 0.40	R/m = $8.5 \times 10^6 \pm 20\%$	0.80	$13.0 \times 10^6 \pm 20\%$	1.40	$14.8 \times 10^6 \pm 20\%$
M = 0.40	R/m = $8.5 \times 10^6 \pm 20\%$							
0.80	$13.0 \times 10^6 \pm 20\%$							
1.40	$14.8 \times 10^6 \pm 20\%$							
3.6.2	Means of Varying Reynolds Number (eg by Pressurisation)	Pressurisation ($= \pm 0.2$ bar)						
3.7	Temperature Range of Dewpoint. Can Temperature be Controlled?	Most runs made at 300 to 320 K stagnation temperature. Temperature and dewpoint both controlled. Dewpoint temperature 250°K for supersonic running.						
3.8	Model Attitudes							
3.8.1	Angle of Attack, Yaw, Roll	Incidence -10° to 22° with straight sting, Roll $\pm 180^\circ$						
3.8.2	Accuracy in Determining Angles	Incidence $\pm 0.01^\circ$ Roll $\pm 0.1^\circ$						
3.9	Organisation Operating the Tunnel and Location of Tunnel	Aircraft Research Association Limited Manton Lane, Bedford, England						
3.10	Who is to be Contacted for Additional Information	Chief Aerodynamicist, ARA						
3.11	Literature Concerning this Facility	Reference 1 Reference 2						
3.12	Additional Remarks	Nil						
4	<u>Tests</u>							
4.1	Type of Tests	Surface pressures, overall force and moment measurements, surface oil flow visualisation and RMS wing root bending moments						
4.2	Wing Span or Semispan to Tunnel Width	$\frac{\text{Wing span}}{\text{Tunnel width}} = 0.66$						
4.3	Test Conditions							
4.3.1	Angle of Attack	-4° to $+3^\circ$						
4.3.2	Mach Number	0.50 to 0.93						
4.3.3	Dynamic Pressure	Approx 14,000 to 35,000 N/m ²						
4.3.4	Reynolds Number	$R_E \approx 3.2 \times 10^6$						
4.3.5	Stagnation Temperature	300 K						
4.4	Transition							
4.4.1	Free or Fixed	Fixed						
4.4.2	Position of Free Transition	N/A						
4.4.3	Position of Fixed Transition, Width of Strips, Size and Type of Roughness	See Figure 8.3 Width: 1.27 mm normal to leading edge. Ballotini set in a thin film of Araldite Diameters 0.102 to 0.127 mm and 0.089 to 0.102 mm						
4.4.4	Were Checks made to Determine if Transition Occurred at Trip Locations	Yes (acenaphthene sublimation)						

4.5 Wing Bending or Torsion Under Load

4.5.1 Describe any Aeroelastic Measurements Made During Tests

RMS wing root bending moment

4.5.2 Describe Results of Any Bench Calibrations

Measurements on a similar model have indicated maximum aeroelastic wing tip deflection and twist of about +25 mm and 0.25° nose down respectively, (relative to the wing root).

4.6 Were Different Sized Models Used in Wind-Tunnel Investigations. If so, Indicate Sizes

No

4.7 Areas and Lengths Used to Form Coefficients

Area : $S = 0.367 \text{ m}^2$
Chord : $\bar{c} = 0.245 \text{ m}$

4.8 References on Tests

None

4.9 Related Reports

None

5 Instrumentation

5.1 Surface Pressure Measurements

5.1.1 Pressure Orifices in Wing. Locations and Number on Upper and Lower Surfaces

The locations of the wing pressure orifices are listed in Table 8.3.

5.1.2 Pressure Orifices on Fuselage. Location and Number

N/A

5.1.3 Pressure Orifices on Components. Give Component and Orifice Location

None

5.1.4 Geometry of Orifices

Round holes 0.6 mm diameter, 0.4 mm near trailing edge

5.1.5 Type of Pressure Transducer and Scanning Devices Used. Indicate Range and Accuracy).

Druck differential pressure transducers, modular 'S' type Scanivalves. Range $\pm 0.8 \text{ bar}$. (Wind tunnel plenum pressure was applied to the reference side of the differential transducers diaphragm)

5.2 Force Measurements

5.2.1 Type and Location of Balance

ARA 24" 6 component internal strain-gauge balance

5.2.2 Forces and Moments that can be Measured, Maximum Loads and Calibration Accuracy for Balance of 5.2.1

	Maximum load	Average absolute error
Normal force	$\pm 7100 \text{ N}$	$\pm 8.0 \text{ N}$
Axial force	$\pm 670 \text{ N}$	$\pm 0.5 \text{ N}$
Side force	$\pm 1500 \text{ N}$	$\pm 6.0 \text{ N}$
Pitching moment	$\pm 750 \text{ Nm}$	$\pm 0.4 \text{ Nm}$
Rolling moment	$\pm 240 \text{ Nm}$	$\pm 0.5 \text{ Nm}$
Yawing moment	$\pm 200 \text{ Nm}$	$\pm 0.7 \text{ Nm}$

5.2.3 Forces and Moments on Components

None

Type and Location of Balance

N/A

Maximum Loads and Accuracy

N/A

5.3 Boundary Layer and Flow-Field Measurements

5.3.1 Boundary-Layer Probe Type, Position and Drive Mechanism

No

5.3.2 Probe Dimension Relative to Boundary-Layer Thickness

N/A

5.3.3 Laser-Doppler Velocimeter. Give Description of Apparatus and Accuracy

No

5.3.4 Method and/or Instrument Used to Determine Boundary-Layer Transition

Acenaphthene sublimation tests

5.3.5 Describe any Downstream Rakes or Probes Used. Reason for Use

None

5.4 Surface Flow Visualisation

5.4.1 Indicate Method Used to Determine

- Streamline pattern Oil flows
- Boundary-layer transition Acenaphthene sublimation

5.4.2 Accuracy of Method N/A

5.5 Skin Friction Measurements None

5.5.1 Type of Instrument N/A

5.5.2 Geometry and Accuracy of Instrument N/A

5.5.3 Locations Where Probe Used N/A

5.6 Simulation of Exhaust Jet No

5.6.1 Describe Ducting of Air N/A

5.7 Additional Remarks Nil

6 Data

6.1 Accuracy

6.1.1 Pressure Coefficients $C_p \pm 0.002$

6.1.2 Aerodynamic Coefficients $C_L \pm 0.002$, $C_D \pm 0.0002$ (absolute accuracy)
 $C_L \pm 0.001$, $C_D \pm 0.00015$ (during a given test series if drag is a prime objective)

6.1.3 Boundary Layer and Wake Quantities N/A

6.1.4 Repeatability $C_L \pm 0.001$ at condition below the lift break
 $C_D \pm 0.00005$ at conditions below the steep drag rise and with predominantly attached flow

6.1.5 Additional Remarks Nil

6.2 Wall Interference Corrections

6.2.1 Solid and Wake Blockage. Give Procedures and Equations Solid, but not wake, blockage corrections have been applied. See 6.2.2 below. Internal ARA Memo

6.2.2 Give Blockage Factors as Functions of Mach Number Mach number corrections are
 $M < 0.86 \quad \Delta M = 0$
 $M = 0.88 \quad \Delta M = -0.0004$

6.2.3 Upwash, Streamline Curvature and Lift Interference. Give Procedure and Equations Working section flow angle and streamline curvature effects on C_m were determined by testing the model both erect and inverted. See Table 8.5.

6.2.4 Give Lift Interference Parameters as Function of Mach Number. Wall constraint is allowed for by correcting incidence.
 $\Delta \alpha^\circ = -0.2636 C_L$

6.2.5 Reference on Wall-Interference Corrections Internal ARA Memo

6.2.6 Additional Remarks Blockage buoyancy correction given in Table 8.6.

6.3 Data Presentation

6.3.1 Aerodynamic Coefficients C_L , C_D and C_m values are given in Table 8.4.

6.3.2 Surface Pressure Coefficients Table 8.7 and Figure 8.4

6.3.3 Flow Conditions for

- Aerodynamic coefficient data See Table 8.4
- Pressure data

6.3.4 Boundary Layer and/or Wake Data None

6.3.5 Flow Conditions for Boundary Layer and/or Wake Data N/A

6.3.6 Wall Interference Corrections included?

Wall interference corrections have been applied to the data presented and the corrections themselves are detailed in 6.2.

6.3.7 Aeroelastic Corrections Included? No

6.3.8 Other Corrections

The overall drag measurements have been corrected for the force acting on the fuselage base, ie

$$\Delta C_D = C_p \text{ (Base)} \frac{(\text{Base Area})}{\text{Ref Area}} \cos \alpha$$

6.3.9 Additional Remarks

6.4 Were Tests Carried out in Different Facilities on the Current Model? If so, What Facilities. Are Data Included in Present Data Base.

No

7 References

- 1) Haines A B The centre-line Mach-number distributions and auxiliary suction requirements for the ARA 9 ft x 8 ft transonic wind tunnel.
Jones J C M ARC R&M 3140, 1960
- 2) Hills R Design and operational problems of the electrically driven transonic wind tunnel.
Journal of the Royal Aero Society, Vol 62, page 12, 1958

8 List of Symbols

c	Local chord
$\bar{c}$	Standard mean chord
$\bar{c}_a$	Aerodynamic mean chord
C_p	Pressure coefficient
C_D	Drag coefficient D/qS
C_L	Lift coefficient L/qS
C_m	Pitching moment coefficient $m/qS\bar{c}$
D	Drag
L	Lift
m	Pitching moment
M	Mach number
q	Dynamic pressure
R_c	Reynolds number
S	Wing area
x	Chordwise distance from local leading edge in streamwise direction
y	Spanwise distance from origin of wing axis system (see Figure 8.1) <u>in dihedral plane</u>
z	Wing ordinate normal to dihedral plane
α	Angle of attack
η	Ratio of spanwise distance from origin of wing axis system to net semispan, ETA

Y=-55.4409 CHORD=442.5731		Y=0.0000 CHORD=371.0809		Y=43.4783 CHORD=335.8190	
UPPER SURFACE		UPPER SURFACE		UPPER SURFACE	
X/C	Z/C	X/C	Z/C	X/C	Z/C
0.000000	0.007658	0.000000	0.002523	0.000000	0.001098
0.002408	0.002539	0.002408	0.014713	0.002408	0.012232
0.005607	0.034074	0.005607	0.005607	0.005607	0.005607
0.021530	0.047021	0.021530	0.007930	0.021530	0.003701
0.030060	0.055523	0.030060	0.047366	0.030060	0.037044
0.045000	0.060057	0.045000	0.053341	0.045000	0.045000
0.064566	0.075545	0.064566	0.063945	0.064566	0.055000
0.113455	0.080771	0.113455	0.067223	0.113455	0.064223
0.146447	0.085559	0.146447	0.070521	0.146447	0.068114
0.162003	0.083226	0.162003	0.071138	0.162003	0.068493
0.222215	0.080640	0.222215	0.063468	0.222215	0.063557
0.264302	0.074523	0.264302	0.053332	0.264302	0.051198
0.306658	0.067054	0.306658	0.043303	0.306658	0.036637
0.354658	0.057651	0.354658	0.033043	0.354658	0.025105
0.402455	0.046043	0.402455	0.024559	0.402455	0.014472
0.450391	0.032140	0.450391	0.016881	0.450391	0.007027
0.500000	0.016881	0.500000	0.009009	0.500000	0.002062
0.549009	0.005533	0.549009	0.001088	0.549009	0.001248
0.597545	0.000435	0.597545	0.000225	0.597545	0.000420
0.645142	-0.000549	0.645142	-0.000514	0.645142	-0.000351
0.691342	-0.001239	0.691342	-0.000998	0.691342	-0.000524
0.735636	-0.001730	0.735636	-0.001452	0.735636	-0.000761
0.777765	-0.002030	0.777765	-0.001652	0.777765	-0.000847
0.815735	-0.002168	0.815735	-0.001644	0.815735	-0.000854
0.851940	-0.002168	0.851940	-0.001530	0.851940	-0.000844
0.881940	-0.002048	0.881940	-0.001294	0.881940	-0.000762
0.900393	-0.001707	0.900393	-0.000931	0.900393	-0.000567
1.000000	-0.070609	1.000000	-0.064891	1.000000	-0.060767
LOWER SURFACE		LOWER SURFACE		LOWER SURFACE	
X/C	Z/C	X/C	Z/C	X/C	Z/C
0.000000	-0.007658	0.000000	-0.002523	0.000000	-0.001098
0.002408	-0.002539	0.002408	-0.007320	0.002408	-0.009317
0.005607	-0.014000	0.005607	-0.012410	0.005607	-0.010491
0.021530	-0.022450	0.021530	-0.032463	0.021530	-0.026370
0.030060	-0.030060	0.030060	-0.032463	0.030060	-0.033563
0.045000	-0.033719	0.045000	-0.033731	0.045000	-0.033566
0.064566	-0.041474	0.064566	-0.044665	0.064566	-0.045521
0.113455	-0.047141	0.113455	-0.050430	0.113455	-0.051442
0.146447	-0.052278	0.146447	-0.053593	0.146447	-0.054417
0.162003	-0.055332	0.162003	-0.055332	0.162003	-0.056039
0.222215	-0.057814	0.222215	-0.056557	0.222215	-0.056455
0.264302	-0.071532	0.264302	-0.065661	0.264302	-0.070197
0.306658	-0.074362	0.306658	-0.073036	0.306658	-0.073033
0.354658	-0.074362	0.354658	-0.072527	0.354658	-0.074555
0.402455	-0.072527	0.402455	-0.070794	0.402455	-0.073933
0.450391	-0.072527	0.450391	-0.068528	0.450391	-0.072891
0.500000	-0.074362	0.500000	-0.075431	0.500000	-0.075433
0.549009	-0.074362	0.549009	-0.073223	0.549009	-0.072008
0.597545	-0.073036	0.597545	-0.071426	0.597545	-0.069334
0.645142	-0.071089	0.645142	-0.069094	0.645142	-0.067104
0.691342	-0.068526	0.691342	-0.066800	0.691342	-0.064856
0.735636	-0.065873	0.735636	-0.064393	0.735636	-0.062477
0.777765	-0.062730	0.777765	-0.061726	0.777765	-0.059369
0.815735	-0.059001	0.815735	-0.058226	0.815735	-0.056465
0.851940	-0.054770	0.851940	-0.053533	0.851940	-0.053117
0.881940	-0.049144	0.881940	-0.048058	0.881940	-0.049100
0.900393	-0.042737	0.900393	-0.042737	0.900393	-0.043068
1.000000	-0.072373	1.000000	-0.066937	1.000000	-0.063068
UPPER SURFACE		UPPER SURFACE		UPPER SURFACE	
X/C	Z/C	X/C	Z/C	X/C	Z/C
0.000000	0.010313	0.000000	0.000000	0.000000	0.000000
0.002408	0.020452	0.002408	0.000000	0.002408	0.007867
0.005607	0.029741	0.005607	0.005607	0.005607	0.016009
0.021530	0.037769	0.021530	0.026517	0.021530	0.025591
0.030060	0.044808	0.030060	0.033060	0.030060	0.031057
0.045000	0.049343	0.045000	0.040041	0.045000	0.037137
0.064566	0.054084	0.064566	0.044964	0.064566	0.042191
0.113455	0.058643	0.113455	0.048735	0.113455	0.046063
0.146447	0.058643	0.146447	0.051335	0.146447	0.046964
0.162003	0.058643	0.162003	0.052859	0.162003	0.050807
0.222215	0.058643	0.222215	0.052859	0.222215	0.051864
0.264302	0.058643	0.264302	0.050723	0.264302	0.050805
0.306658	0.043333	0.306658	0.047517	0.306658	0.049237
0.354658	0.043333	0.354658	0.043193	0.354658	0.046842
0.402455	0.030607	0.402455	0.030789	0.402455	0.043163
0.450391	0.030607	0.450391	0.020007	0.450391	0.033276
0.500000	0.030607	0.500000	0.005533	0.500000	0.029141
0.549009	0.030607	0.549009	0.001683	0.549009	0.023791
0.597545	0.030607	0.597545	0.001233	0.597545	0.018358
0.645142	0.030607	0.645142	0.000566	0.645142	0.012239
0.691342	0.030607	0.691342	0.000000	0.691342	0.007338
0.735636	0.030607	0.735636	0.000000	0.735636	0.002346
0.777765	0.030607	0.777765	0.000000	0.777765	0.000825
0.815735	0.030607	0.815735	0.000000	0.815735	0.000000
0.851940	0.030607	0.851940	0.000000	0.851940	0.000000
0.881940	0.030607	0.881940	0.000000	0.881940	0.000000
0.900393	0.030607	0.900393	0.000000	0.900393	0.000000
1.000000	0.054705	1.000000	0.045279	1.000000	0.033438
LOWER SURFACE		LOWER SURFACE		LOWER SURFACE	
X/C	Z/C	X/C	Z/C	X/C	Z/C
0.000000	-0.000000	0.000000	-0.000000	0.000000	-0.000000
0.002408	-0.005772	0.002408	-0.005772	0.002408	-0.007225
0.005607	-0.018481	0.005607	-0.018481	0.005607	-0.013841
0.021530	-0.028032	0.021530	-0.028032	0.021530	-0.020062
0.030060	-0.032810	0.030060	-0.032810	0.030060	-0.026074
0.045000	-0.035566	0.045000	-0.035566	0.045000	-0.031550
0.064566	-0.041911	0.064566	-0.041911	0.064566	-0.037657
0.113455	-0.051118	0.113455	-0.051118	0.113455	-0.043121
0.146447	-0.051118	0.146447	-0.051118	0.146447	-0.048227
0.162003	-0.051118	0.162003	-0.051118	0.162003	-0.053037
0.222215	-0.051118	0.222215	-0.051118	0.222215	-0.057412
0.264302	-0.051118	0.264302	-0.051118	0.264302	-0.061011
0.306658	-0.051118	0.306658	-0.051118	0.306658	-0.063658
0.354658	-0.051118	0.354658	-0.051118	0.354658	-0.065300
0.402455	-0.051118	0.402455	-0.051118	0.402455	-0.065933
0.450391	-0.051118	0.450391	-0.051118	0.450391	-0.065444
0.500000	-0.051118	0.500000	-0.051118	0.500000	-0.064133
0.549009	-0.051118	0.549009	-0.051118	0.549009	-0.061828
0.597545	-0.051118	0.597545	-0.051118	0.597545	-0.058500
0.645142	-0.051118	0.645142	-0.051118	0.645142	-0.054133
0.691342	-0.051118	0.691342	-0.051118	0.691342	-0.049133
0.735636	-0.051118	0.735636	-0.051118	0.735636	-0.043643
0.777765	-0.051118	0.777765	-0.051118	0.777765	-0.036970
0.815735	-0.051118	0.815735	-0.051118	0.815735	-0.029436
0.851940	-0.051118	0.851940	-0.051118	0.851940	-0.020341
0.881940	-0.051118	0.881940	-0.051118	0.881940	-0.009341
0.900393	-0.051118	0.900393	-0.051118	0.900393	-0.003658
1.000000	-0.057240	1.000000	-0.048058	1.000000	-0.036658

TABLE 8.1 M100 WING GEOMETRY

Y=217.3912

CHORD=213.6509

Y=251.7311

CHORD=186.5733

Y=304.3478

CHORD=179.0176

UPPER SURFACE

Z/C

X/C

0.000000

0.000000

0.000000

0.002408

0.007274

0.002408

0.009507

0.014935

0.009507

0.015330

0.023551

0.015330

0.030606

0.045938

0.030606

0.053039

0.081215

0.053039

0.084265

0.134335

0.084265

0.113435

0.216447

0.113435

0.146447

0.336903

0.146447

0.182215

0.500000

0.182215

0.222215

0.727766

0.222215

0.264302

0.950000

0.264302

0.306556

1.182215

0.306556

0.354656

1.464447

0.354656

0.405931

1.822215

0.405931

0.459009

2.222215

0.459009

0.500000

2.64302

0.500000

0.537545

3.06556

0.537545

0.575445

3.54656

0.575445

0.61343

4.05931

0.61343

0.651343

4.59009

0.651343

0.689333

5.00000

0.689333

0.727766

5.40593

0.727766

0.765554

5.82221

0.765554

0.803342

6.22221

0.803342

0.84113

6.64302

0.84113

0.87892

7.06383

0.87892

0.91671

7.48464

0.91671

0.95450

7.90545

0.95450

0.99229

8.32626

0.99229

1.000000

8.74707

1.000000

UPPER SURFACE

Z/C

X/C

0.000000

0.000000

0.000000

0.002408

0.007274

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UPPER SURFACE

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LOWER SURFACE

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LOWER SURFACE

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LOWER SURFACE

Z/C

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LOWER SURFACE

Z/C

X/C

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LOWER SURFACE

Z/C

X/C

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0.081215

TABLE 8.1 (contd) M100 WING GEOMETRY

Y=532.6085 CHORD=135.7787		Y=566.9367 CHORD=125.5085		Y=641.3045 CHORD=115.1858	
UPPER SURFACE		UPPER SURFACE		UPPER SURFACE	
X/C	Z/C	X/C	Z/C	X/C	Z/C
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.002408	0.007678	0.002408	0.007678	0.002408	0.007434
0.009607	0.015331	0.009607	0.015331	0.009607	0.015230
0.021530	0.023641	0.021530	0.023641	0.021530	0.022804
0.038060	0.030645	0.038060	0.030645	0.038060	0.029669
0.053039	0.036774	0.053039	0.036774	0.053039	0.035667
0.064265	0.042039	0.064265	0.042039	0.064265	0.041669
0.113436	0.046640	0.113436	0.046640	0.113436	0.045377
0.146447	0.050451	0.146447	0.050451	0.146447	0.049351
0.182803	0.053883	0.182803	0.053883	0.182803	0.052661
0.222215	0.056889	0.222215	0.056889	0.222215	0.056012
0.264302	0.059481	0.264302	0.059481	0.264302	0.058673
0.306656	0.061590	0.306656	0.061590	0.306656	0.060833
0.351940	0.063110	0.351940	0.063110	0.351940	0.062438
0.402455	0.064105	0.402455	0.064105	0.402455	0.063457
0.450931	0.064463	0.450931	0.064463	0.450931	0.063874
0.500000	0.064172	0.500000	0.064172	0.500000	0.063574
0.549003	0.063167	0.549003	0.063167	0.549003	0.062528
0.597544	0.061412	0.597544	0.061412	0.597544	0.061858
0.645141	0.058311	0.645141	0.058311	0.645141	0.059072
0.691341	0.055742	0.691341	0.055742	0.691341	0.056214
0.735637	0.052822	0.735637	0.052822	0.735637	0.052621
0.777784	0.047877	0.777784	0.047877	0.777784	0.049007
0.815734	0.038563	0.815734	0.038563	0.815734	0.040366
0.851939	0.026982	0.851939	0.026982	0.851939	0.031147
0.886333	0.018527	0.886333	0.018527	0.886333	0.022728
0.919333	0.013564	0.919333	0.013564	0.919333	0.016807
0.950333	0.011364	0.950333	0.011364	0.950333	0.014589
1.000000	0.000000	1.000000	0.000000	1.000000	0.000000
LOWER SURFACE		LOWER SURFACE		LOWER SURFACE	
X/C	Z/C	X/C	Z/C	X/C	Z/C
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.002408	-0.002408	0.002408	-0.002408	0.002408	-0.002574
0.009607	-0.013080	0.009607	-0.012676	0.009607	-0.012302
0.021530	-0.018170	0.021530	-0.017631	0.021530	-0.017276
0.038060	-0.022503	0.038060	-0.022042	0.038060	-0.021720
0.053039	-0.026366	0.053039	-0.026043	0.053039	-0.025306
0.064265	-0.029327	0.064265	-0.028320	0.064265	-0.028128
0.113436	-0.033341	0.113436	-0.033378	0.113436	-0.033306
0.146447	-0.036831	0.146447	-0.037241	0.146447	-0.037553
0.182803	-0.040013	0.182803	-0.040473	0.182803	-0.040823
0.222215	-0.042681	0.222215	-0.043212	0.222215	-0.043536
0.264302	-0.044658	0.264302	-0.045181	0.264302	-0.045306
0.306656	-0.045953	0.306656	-0.046368	0.306656	-0.046305
0.351940	-0.046455	0.351940	-0.046181	0.351940	-0.046276
0.402455	-0.044027	0.402455	-0.044611	0.402455	-0.044602
0.450931	-0.041043	0.450931	-0.041517	0.450931	-0.041355
0.500000	-0.036614	0.500000	-0.036862	0.500000	-0.036326
0.549003	-0.030935	0.549003	-0.030864	0.549003	-0.030456
0.597544	-0.024231	0.597544	-0.024080	0.597544	-0.023534
0.645141	-0.017435	0.645141	-0.016528	0.645141	-0.016326
0.691341	-0.010601	0.691341	-0.010064	0.691341	-0.009343
0.735637	-0.004327	0.735637	-0.003696	0.735637	-0.002933
0.777784	-0.000957	0.777784	-0.001826	0.777784	-0.000438
0.815734	0.000754	0.815734	0.001626	0.815734	0.000332
0.851939	0.009435	0.851939	0.010688	0.851939	0.011780
0.886333	0.025605	0.886333	0.026137	0.886333	0.025128
0.919333	0.051591	0.919333	0.051933	0.919333	0.050784
0.950333	0.075933	0.950333	0.075933	0.950333	0.075933
1.000000	0.000000	1.000000	0.000000	1.000000	0.000000

Y=695.6523 CHORD=104.8904		Y=760.6696 CHORD=92.5355		Y=809.9335 CHORD=83.2412	
UPPER SURFACE		UPPER SURFACE		UPPER SURFACE	
X/C	Z/C	X/C	Z/C	X/C	Z/C
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.002408	0.007405	0.002408	0.007324	0.002408	0.007742
0.009607	0.015134	0.009607	0.015729	0.009607	0.015561
0.021530	0.022536	0.021530	0.023089	0.021530	0.023387
0.038060	0.029169	0.038060	0.029235	0.038060	0.029608
0.053039	0.034900	0.053039	0.034900	0.053039	0.034900
0.064265	0.040044	0.064265	0.040407	0.064265	0.040897
0.113436	0.044580	0.113436	0.045078	0.113436	0.045727
0.146447	0.046657	0.146447	0.046448	0.146447	0.046727
0.182803	0.048330	0.182803	0.048248	0.182803	0.048131
0.222215	0.049590	0.222215	0.049573	0.222215	0.049493
0.264302	0.050728	0.264302	0.050734	0.264302	0.050793
0.306656	0.051532	0.306656	0.051813	0.306656	0.051301
0.351940	0.052332	0.351940	0.052463	0.351940	0.051414
0.402455	0.053132	0.402455	0.053132	0.402455	0.052003
0.450931	0.053932	0.450931	0.053932	0.450931	0.052603
0.500000	0.054732	0.500000	0.054732	0.500000	0.053203
0.549003	0.055532	0.549003	0.055532	0.549003	0.053803
0.597544	0.056332	0.597544	0.056332	0.597544	0.054403
0.645141	0.057132	0.645141	0.057132	0.645141	0.055003
0.691341	0.057932	0.691341	0.057932	0.691341	0.055603
0.735637	0.058732	0.735637	0.058732	0.735637	0.056203
0.777784	0.059532	0.777784	0.059532	0.777784	0.056803
0.815734	0.060332	0.815734	0.060332	0.815734	0.057403
0.851939	0.061132	0.851939	0.061132	0.851939	0.058003
0.886333	0.061932	0.886333	0.061932	0.886333	0.058603
0.919333	0.062732	0.919333	0.062732	0.919333	0.059203
0.950333	0.063532	0.950333	0.063532	0.950333	0.059803
1.000000	0.000000	1.000000	0.000000	1.000000	0.000000
LOWER SURFACE		LOWER SURFACE		LOWER SURFACE	
X/C	Z/C	X/C	Z/C	X/C	Z/C
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.002408	-0.002408	0.002408	-0.002408	0.002408	-0.002408
0.009607	-0.012467	0.009607	-0.012467	0.009607	-0.012467
0.021530	-0.017437	0.021530	-0.017437	0.021530	-0.017437
0.038060	-0.021888	0.038060	-0.021888	0.038060	-0.021888
0.053039	-0.026108	0.053039	-0.026108	0.053039	-0.026108
0.064265	-0.030179	0.064265	-0.030179	0.064265	-0.030179
0.113436	-0.034061	0.113436	-0.034061	0.113436	-0.034061
0.146447	-0.037687	0.146447	-0.037687	0.146447	-0.037687
0.182803	-0.041059	0.182803	-0.041059	0.182803	-0.041059
0.222215	-0.044183	0.222215	-0.044183	0.222215	-0.044183
0.264302	-0.047060	0.264302	-0.047060	0.264302	-0.047060
0.306656	-0.049694	0.306656	-0.049694	0.306656	-0.049694
0.351940	-0.052084	0.351940	-0.052084	0.351940	-0.052084
0.402455	-0.054230	0.402455	-0.054230	0.402455	-0.054230
0.450931	-0.056141	0.450931	-0.056141	0.450931	-0.056141
0.500000	-0.057818	0.500000	-0.057818	0.500000	-0.057818
0.549003	-0.059260	0.549003	-0.059260	0.549003	-0.059260
0.597544	-0.060474	0.597544	-0.060474	0.597544	-0.060474
0.645141	-0.061461	0.645141	-0.061461	0.645141	-0.061461
0.691341	-0.062229	0.691341	-0.062229	0.691341	-0.062229
0.735637	-0.062781	0.735637	-0.062781	0.735637	-0.062781
0.777784	-0.063129	0.777784	-0.063129	0.777784	-0.063129
0.815734	-0.063277	0.815734	-0.063277	0.815734	-0.063277
0.851939	-0.063235	0.851939	-0.063235	0.851939	-0.063235
0.886333	-0.063003	0.886333	-0.063003	0.886333	-0.063003
0.919333	-0.062581	0.919333	-0.062581	0.919333	-0.062581
0.950333	-0.061969	0.950333	-0.061969	0.950333	-0.061969
1.000000	0.000000	1.000000	0.000000	1.000000	0.000000

TABLE 8.1(contd) M100 WING GEOMETRY

Distance aft of model nose metres	Fuselage radius metres	Total cross sectional area metres ²
0	0	0
0.0508	0.0186	0.001083
0.1016	0.0351	0.003877
0.1524	0.0497	0.007755
0.2032	0.0623	0.012186
0.2540	0.0730	0.016741
0.3048	0.0818	0.021041
0.3556	0.0888	0.024801
0.4064	0.0941	0.027807
0.4572	0.0975	0.029855
0.5080	0.0992	0.030923
0.5311	0.0994	0.031064
+	+	+
0.6195	0.0994	0.031064
0.6703	0.0994	0.035102
0.7211	0.0994	0.039805
0.7719	0.0994	0.043368
0.8227	0.0994	0.045446
0.8735	0.0994	0.045378
0.9243	0.0994	0.043610
0.9751	0.0994	0.040245
1.0259	0.0994	0.036888
1.0767	0.0994	0.035693
1.1275	0.0994	0.034877
1.1783	0.0994	0.033769
1.2291	0.0993	0.031632
1.2799	0.0975	0.029941
1.3307	0.0955	0.028655
1.3815	0.0909	0.025977
1.4323	0.0859	0.023155
1.4831	0.0782	0.019227
1.5339	0.0681	0.014557
1.5847	0.0549	0.009456
1.6286	0.0445	0.006207

TABLE 8.2 CROSS SECTIONAL AREA DISTRIBUTIONS

Wing Upper Surface

25 pressure tappings were installed on the upper surface at each of the 8 spanwise pressure measuring stations. These tappings were located at:

x/c = 0.000	0.015*	0.025*	0.050	0.075	0.100	0.150
0.200	0.250	0.300	0.350	0.400	0.450	0.500
0.550	0.600	0.650	0.700	0.750	0.800	0.850
0.900	0.950	0.990	1.000			

*0.015 and 0.025 are nominal locations, the actual x/c positions of these ports varied across the span as detailed below.

Nominal x/c	ETA = 0.019	0.123	0.231	0.325	0.455	0.633	0.817	0.935
0.015	0.013	0.013	0.014	0.014	0.015	0.016	0.017	0.017
0.025	0.022	0.022	0.021	0.021	0.020	0.020	0.018	0.018

Wing Lower Surface

20 pressure tappings were installed on the lower surface at each of the 8 spanwise pressure measuring stations. These tappings were located at:

x/c = 0.010#	0.025#	0.050	0.075	0.100	0.160	0.220
0.280	0.340	0.400	0.460	0.520	0.580	0.640
0.700	0.760	0.820	0.880	0.940	0.990	

#0.010 and 0.025 are nominal locations, the actual x/c positions of these ports varied across the span as detailed below.

Nominal x/c	ETA = 0.019	0.123	0.231	0.325	0.455	0.633	0.817	0.935
0.010	0.013	0.013	0.014	0.014	0.015	0.016	0.017	0.017
0.025	0.022	0.022	0.021	0.021	0.020	0.020	0.018	0.018

Unserviceable Pressure Ports

The following pressure ports were unserviceable for these tests:

Upper Surface	ETA = 0.325	x/c = 1.000	
Lower Surface	ETA = 0.325	x/c = 0.220	
	ETA = 0.455	x/c = 0.015	0.640
	ETA = 0.633	x/c = 0.280	
	ETA = 0.935	x/c = 0.050	

Total number of upper surface ports	200
Total number of lower surface ports	160
	360
Total number of unserviceable ports	6
	354

TABLE 8.3 LOCATION OF M100 WING STATIC PRESSURE PORTS

MACH NUMBER	α°	C_L	C_D	C_m	TRANSITION* BAND
0.8001	-3.017	-0.0232	0.01647	-0.0592	1
0.8004	-1.460	0.1478	0.01692	-0.0674	1
0.8015	-0.644	0.2338	0.01819	-0.0701	1
0.8011	0.148	0.3195	0.02032	-0.0715	1
0.8018	1.066	0.4224	0.02434	-0.0724	1
0.8013	2.021	0.5461	0.03097	-0.0828	1
0.8027	2.873	0.6479	0.04070	-0.0922	1
0.8014	1.826	0.4170	0.02239	-0.0520	2
0.6000	1.733	0.4199	0.02272	-0.0555	2
0.7021	1.378	0.4073	0.02271	-0.0600	2
0.8208	0.888	0.4214	0.02475	-0.0791	1
0.8391	0.787	0.4273	0.02550	-0.0872	1
0.8596	0.539	0.4154	0.02625	-0.0955	1
0.8792	0.467	0.4054	0.02990	-0.0976	1

*See Figure 8.3

TABLE 8.4 SUMMARY OF TEST CONDITIONS

M	0.5	0.6	0.7	0.74	0.78	0.82	0.88
$\Delta\alpha^\circ$	0.1477	0.1409	0.1309	0.1239	0.1165	0.1125	0.1049
ΔC_m	-0.0014	-0.0017	-0.0017	-0.0017	-0.0017	-0.0016	-0.0012

TABLE 8.5 INCIDENCE AND C_m CORRECTIONS

M	0.5	0.6	0.7	0.8	0.85	0.90
ΔC_D	-0.00013	-0.00016	-0.00023	-0.00033	-0.00043	-0.00061

TABLE 8.6 BLOCKAGE BUOYANCY CORRECTIONS

ETA=	0.015	0.123	0.231	0.325	0.455	0.633	0.817	0.935
X/C								
0.000	-0.7583	-0.5573	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.010	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.025	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.050	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.075	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.100	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.125	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.150	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.175	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.200	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.250	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.300	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.350	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.400	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.450	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.500	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.550	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.600	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.650	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.700	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.750	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.800	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.850	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.900	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
0.950	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342
1.000	-0.7586	-0.5574	-0.4137	-0.7110	-0.7253	-0.7442	-0.7457	-0.7342

MACH=0.802 ALPHA=1.068 CL=0.422 LOWER SURFACE OF VALVE9. TRANSITION 1.

[illegible]

MACH=0.801 ALPHA=2.021 CL=0.546 UPPER SURFACE CP VALUES. TRANSITION 1.

ETA=	0.018	0.123	0.231	0.325	0.455	0.633	0.817	0.935
X/C								
0.000	-0.7543	-0.5398	-0.3662	-0.6718	-0.7075	-0.7024	-0.7241	-0.6693
0.010	-0.1938	-0.2492	-0.5805	-0.4573	-0.5732	-0.4711	-0.5733	-0.7708
0.025	-0.5443	-0.5445	-0.7209	-0.6008	-0.6437	-0.5321	-0.5872	-0.3943
0.050	-0.4666	-0.5171	-0.5776	-1.0946	-0.0255	-0.0532	-0.6508	-0.5813
0.075	-0.5989	-0.5611	-1.1268	-1.1435	-1.1411	-1.1505	-1.0556	-0.6831
0.100	-0.5989	-0.5611	-1.1268	-1.1435	-1.1411	-1.1505	-1.0556	-0.6831
0.125	-0.7397	-0.1053	-0.2023	-0.3095	-0.8811	-1.1639	-1.1077	-0.9893
0.150	-0.8202	-0.1063	-0.2503	-0.3558	-1.7427	-1.1855	-1.1021	-0.6975
0.200	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.250	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.300	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.350	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.400	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.450	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.500	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.550	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.600	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.650	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.700	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.750	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.800	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.850	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.900	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
0.950	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893
1.000	-0.8796	-1.1080	-0.2545	-1.3636	-1.7277	-1.1291	-0.9780	-0.5893

MACH=0.801 ALPHA=2.021 CL=0.546 LOWER SURFACE CP VALUES. TRANSITION 1.

[illegible]

TABLE 8.7 (contd) M100 WING PRESSURE DISTRIBUTIONS

MACH=0.803 ALPHA=2.673 CL=0.648 UPPER SURFACE CP VALUES. TRANSITION 1.									
ETA=	0.015	0.123	0.231	0.325	0.455	0.633	0.817	0.935	
X/C									
0.000	0.7454	0.5078	0.3453	0.8148	0.6558	0.6558	0.6870	0.5994	
0.010	0.1766	0.3528	0.7173	0.5394	0.7517	0.7474	0.7393	0.5997	
0.020	0.1686	0.6611	0.8543	0.7091	0.7727	0.7678	0.7408	0.5999	
0.030	0.0509	0.0000	0.5166	0.1636	0.5544	0.5544	0.5000	0.4000	
0.040	0.0736	0.0000	0.3967	0.4348	0.5204	0.5204	0.4446	0.4000	
0.050	0.0442	0.0000	0.2967	0.4076	0.4821	0.4821	0.4000	0.4000	
0.060	0.0665	0.0000	0.3426	0.4406	0.4632	0.4632	0.3717	0.4000	
0.070	0.0665	0.0000	0.3602	0.4446	0.4632	0.4632	0.3717	0.4000	
0.080	0.0665	0.0000	0.3444	0.4314	0.4514	0.4514	0.3634	0.4000	
0.090	0.0665	0.0000	0.3044	0.4111	0.4366	0.4366	0.3493	0.4000	
0.100	0.0665	0.0000	0.2660	0.3833	0.4166	0.4166	0.3353	0.4000	
0.110	0.0665	0.0000	0.2333	0.3556	0.3967	0.3967	0.3213	0.4000	
0.120	0.0665	0.0000	0.2000	0.3278	0.3778	0.3778	0.3073	0.4000	
0.130	0.0665	0.0000	0.1667	0.2999	0.3489	0.3489	0.2833	0.4000	
0.140	0.0665	0.0000	0.1333	0.2722	0.3200	0.3200	0.2589	0.4000	
0.150	0.0665	0.0000	0.1000	0.2444	0.2911	0.2911	0.2344	0.4000	
0.160	0.0665	0.0000	0.0667	0.2167	0.2622	0.2622	0.2093	0.4000	
0.170	0.0665	0.0000	0.0333	0.1889	0.2333	0.2333	0.1844	0.4000	
0.180	0.0665	0.0000	0.0000	0.1611	0.2044	0.2044	0.1593	0.4000	
0.190	0.0665	0.0000	0.0000	0.1333	0.1767	0.1767	0.1344	0.4000	
0.200	0.0665	0.0000	0.0000	0.1056	0.1489	0.1489	0.1093	0.4000	
0.210	0.0665	0.0000	0.0000	0.0778	0.1211	0.1211	0.0844	0.4000	
0.220	0.0665	0.0000	0.0000	0.0500	0.0933	0.0933	0.0593	0.4000	
0.230	0.0665	0.0000	0.0000	0.0222	0.0656	0.0656	0.0313	0.4000	
0.240	0.0665	0.0000	0.0000	0.0000	0.0378	0.0378	0.0033	0.4000	
0.250	0.0665	0.0000	0.0000	0.0000	0.0100	0.0100	0.0000	0.4000	
0.260	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.270	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.280	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.290	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.300	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.310	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.320	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.330	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.340	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.350	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.360	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.370	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.380	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.390	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.400	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.410	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.420	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.430	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.440	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.450	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.460	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.470	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.480	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.490	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.500	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.510	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.520	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.530	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.540	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.550	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.560	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.570	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.580	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.590	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.600	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.610	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.620	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.630	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.640	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.650	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.660	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.670	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.680	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.690	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.700	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.710	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.720	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.730	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.740	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.750	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.760	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.770	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.780	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.790	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.800	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.810	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.820	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.830	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.840	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.850	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.860	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.870	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.880	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.890	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.900	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.910	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.920	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.930	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.940	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.950	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.960	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.970	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.980	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
0.990	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	
1.000	0.0665	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4000	

MACH=0.803 ALPHA=2.673 CL=0.648 LOWER SURFACE CP VALUES. TRANSITION 1.									
ETA=	0.015	0.123	0.231	0.325	0.455	0.633	0.817	0.935	
X/C									
0.000	0.7454	0.5078	0.3453	0.8148	0.6558	0.6558	0.6870	0.5994	
0.010	0.4346	0.3459	0.3067	0.4855	0.4310	0.4310	0.4259	0.4347	
0.020	0.2373	0.2855	0.3074	0.4178	0.4213	0.3893	0.4296	0.4053	
0.030	0.1766	0.3201	0.1807	0.2556	0.2497	0.2185	0.2639	0.2639	
0.040	0.1362	0.0913	0.1009	0.1970	0.1947	0.1720	0.1981	0.1418	
0.050	0.1109	0.0306	0.0784	0.1500	0.1370	0.1200	0.1295	0.0915	
0.060	0.0908	0.0550	0.0580	0.0980	0.0436	0.0000	0.0000	0.1565	
0.070	0.0300	0.0860	0.0566	0.0000	0.0214	0.0000	0.0211	0.0542	
0.080	0.0744	0.1176	0.0468	0.0042	0.0555	0.0000	0.0336	0.1631	
0.090	0.0509	0.1241	0.0444	0.0198	0.0000	0.0000	0.1396	0.1787	
0.100	0.0333	0.1089	0.0434	0.0148	0.0000	0.0000	0.1148	0.1923	
0.110	0.0167	0.1069	0.0425	0.0100	0.0000	0.0000	0.0903	0.2039	
0.120	0.0000	0.0							

TABLE 8.7 (contd) M100 WING PRESSURE DISTRIBUTIONS

MACH=0.501 ALPHA=1.828 CL=0.417 UPPER SURFACE CP VALUES. TRANSITION P.

ETA-	0.019	0.123	0.231	0.395	0.455	0.633	0.817	0.935
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[illegible]

MACH=0.501 ALPHA=1.888 CL=0.417 LOWER SURFACE CP VALUES. TRANSITION E.

ETA=	0.019	0.123	0.231	0.325	0.455	0.633	0.817	0.935
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[illegible]

MACH=0.600 ALPHA=1.733 CL=0.420 UPPER SURFACE CP VALUES. TRANSITION P.

ETA=	0.019	0.123	0.231	0.325	0.455	0.633	0.817	0.935
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X	0.0000	0.0010	0.0020	0.0030	0.0040	0.0050	0.0060	0.0070	0.0080	0.0090	0.0100	0.0110	0.0120	0.0130	0.0140	0.0150	0.0160	0.0170	0.0180	0.0190	0.0200	0.0210	0.0220	0.0230	0.0240	0.0250	0.0260	0.0270	0.0280	0.0290	0.0300	0.0310	0.0320	0.0330	0.0340	0.0350	0.0360	0.0370	0.0380	0.0390	0.0400	0.0410	0.0420	0.0430	0.0440	0.0450	0.0460	0.0470	0.0480	0.0490	0.0500	0.0510	0.0520	0.0530	0.0540	0.0550	0.0560	0.0570	0.0580	0.0590	0.0600	0.0610	0.0620	0.0630	0.0640	0.0650	0.0660	0.0670	0.0680	0.0690	0.0700	0.0710	0.0720	0.0730	0.0740	0.0750	0.0760	0.0770	0.0780	0.0790	0.0800	0.0810	0.0820	0.0830	0.0840	0.0850	0.0860	0.0870	0.0880	0.0890	0.0900	0.0910	0.0920	0.0930	0.0940	0.0950	0.0960	0.0970	0.0980	0.0990	1.0000																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
YC	0.6772	0.4339	0.2107	0.0146	0.7669	0.7136	0.7354	0.7004	0.6023	0.5009	0.4300	0.3822	0.3539	0.3256	0.2969	0.2650	0.2319	0.1970	0.1600	0.1222	0.0840	0.0450	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MACH=0.600 ALPHA=1.733 CL=0.420 LOWER SURFACE CP VALUES. TRANSITION 2

ETA= 0.019 0.123 0.231 0.325 0.455 0.633 0.817 0.935

0.000	0.8772	0.4661	0.2054	0.5629	0.6588	0.5518	0.6736	0.6463
0.010	0.1086	0.2843	0.5893	0.3508		0.2791	0.2637	0.2637
0.025	0.1663	0.2051	0.2805	0.3747	0.3601	0.2837	0.3108	0.2666
0.050	0.0686	0.0767	0.1490	0.2129	0.2093	0.1312	0.1518	
0.075	0.0511	-0.0283	0.0624	0.1417	0.1376	0.0977	0.0326	0.0301
0.100	0.0219	-0.0529	0.0429	0.0903	0.0565	0.0501	0.0266	0.0405
0.150	0.0391	-0.0327	0.0217	0.0303	0.0264	-0.0055	0.0384	-0.0325
0.200	0.0674	-0.0106	0.0794	0.0136	-0.0303	-0.0634	0.0821	-0.1415
0.250	-0.1125	-0.1345	0.126	-0.0971	-0.0593		0.0624	-0.1931
0.300	-0.1139	-0.1404	0.1374	-0.1310	-0.1193	-0.1239	0.1636	-0.1911
0.400	-0.1080	-0.1369	0.1474	-0.1366	-0.1406	-0.1371	0.1749	-0.2046
0.460	-0.1014	-0.1136	0.1136	-0.1551	-0.1181	-0.1097	0.1416	-0.1621
0.520	-0.0694	-0.0517	0.0895	-0.0592	-0.0779	-0.0662	0.0737	-0.1248
0.600	-0.0303	-0.0319	0.0686	-0.0592	-0.0331	-0.0035	0.0180	-0.0529
0.640	-0.0263	-0.0345	0.0686	-0.0592	0.0192	0.0031	0.0566	-0.0795
0.700	0.1168	0.0260	0.0111	0.0234	0.1036	0.2410	0.1444	0.0795
0.760	0.0626	0.0723	0.0586	0.0772	0.1560	0.2021	0.1666	0.1320
0.820	0.0365	0.1216	0.1169	0.1204	0.2119	0.2377	0.1914	0.1736
0.880	0.1370	0.1804	0.1881	0.1807	0.2471	0.2663	0.2161	0.1950
0.940	0.1527	0.2451	0.2451	0.2211	0.2307	0.2391	0.2111	0.1728
0.990	0.1127	0.1918	0.1740	0.1943	0.2307	0.2391	0.1301	0.0506
1.000	0.1351	0.1914	0.1043		0.1700	0.1881	0.1088	

TABLE 8.7 (contd) M100 WING PRESSURE DISTRIBUTIONS

MACH=0.702 ALPHA=1.378 CL=0.407 UPPER SURFACE CP VALUES. TRANSITION 2.								
ETA=	0.019	0.123	0.231	0.325	0.455	0.633	0.817	0.935
X/C								
0.000	0.7118	0.5169	0.3473	0.6524	0.7141	0.7035	0.7139	0.6960
0.010	0.1602	0.3411	0.6635	0.6189	0.6366	0.4762	0.4976	0.7416
0.025	0.0900	0.0880	0.0653	0.1730	0.0366	0.5594	0.4788	0.6331
0.050	0.0501	0.0080	0.0518	0.0266	0.0122	0.5421	0.7915	0.7107
0.075	0.0265	0.0036	0.0547	0.0375	0.0065	0.9105	0.7250	0.5370
0.100	0.0176	0.0000	0.0607	0.0409	0.0025	0.6476	0.5591	0.5154
0.150	0.0036	0.0000	0.0738	0.0199	0.0125	0.5648	0.5317	0.4664
0.200	0.0000	0.0000	0.0663	0.0547	0.0575	0.5533	0.5023	0.4378
0.250	0.0000	0.0000	0.0709	0.0737	0.0700	0.5155	0.4785	0.4236
0.300	0.0000	0.0000	0.0633	0.0734	0.0532	0.4594	0.4551	0.4049
0.350	0.0000	0.0000	0.0507	0.0730	0.0478	0.4320	0.4514	0.3555
0.400	0.0000	0.0000	0.4421	0.4351	0.4678	0.4840	0.4130	0.3678
0.450	0.0000	0.0000	0.3606	0.4045	0.4540	0.4737	0.4220	0.3008
0.500	0.0000	0.0000	0.3434	0.3659	0.4469	0.4679	0.4083	0.3733
0.550	0.0000	0.0000	0.3084	0.3659	0.4469	0.4469	0.3933	0.3638
0.600	0.0000	0.0000	0.2803	0.3360	0.4301	0.4301	0.3410	0.2770
0.650	0.0000	0.0000	0.2533	0.3162	0.3901	0.3901	0.2966	0.2325
0.700	0.0000	0.0000	0.1734	0.2729	0.3363	0.3363	0.2487	0.1708
0.750	0.0000	0.0000	0.1445	0.2051	0.2241	0.2241	0.1657	0.0906
0.800	0.0000	0.0000	0.1020	0.1212	0.1316	0.1316	0.1013	0.0257
0.850	0.0000	0.0000	0.0734	0.0736	0.0736	0.0736	0.0444	0.0539
0.900	0.0000	0.0000	0.0550	0.0196	0.0196	0.0230	0.0230	0.0734
0.950	0.0000	0.0000	0.0470	0.0669	0.0282	0.0320	0.0584	0.0923
1.000	0.0470	0.1003	0.1112	0.0669	0.0282	0.0320	0.0584	0.0923

MACH=0.702 ALPHA=1.378 CL=0.407 LOWER SURFACE CP VALUES. TRANSITION 2.								
ETA=	0.019	0.123	0.231	0.325	0.455	0.633	0.817	0.935
X/C								
0.000	0.7118	0.5169	0.3473	0.6524	0.7141	0.7035	0.7139	0.6960
0.010	0.1602	0.3411	0.6635	0.6189	0.6366	0.4762	0.4976	0.7416
0.025	0.0900	0.0880	0.0653	0.1730	0.0366	0.5594	0.4788	0.6331
0.050	0.0501	0.0080	0.0518	0.0266	0.0122	0.5421	0.7915	0.7107
0.075	0.0265	0.0036	0.0547	0.0375	0.0065	0.9105	0.7250	0.5370
0.100	0.0176	0.0000	0.0607	0.0409	0.0025	0.6476	0.5591	0.5154
0.150	0.0036	0.0000	0.0738	0.0199	0.0125	0.5648	0.5317	0.4664
0.200	0.0000	0.0000	0.0663	0.0547	0.0575	0.5533	0.5023	0.4378
0.250	0.0000	0.0000	0.0709	0.0737	0.0700	0.5155	0.4785	0.4236
0.300	0.0000	0.0000	0.0633	0.0734	0.0532	0.4594	0.4551	0.4049
0.350	0.0000	0.0000	0.0507	0.0730	0.0478	0.4320	0.4514	0.3555
0.400	0.0000	0.0000	0.4421	0.4351	0.4678	0.4840	0.4130	0.3678
0.450	0.0000	0.0000	0.3606	0.4045	0.4540	0.4737	0.4220	0.3008
0.500	0.0000	0.0000	0.3434	0.3659	0.4469	0.4679	0.4083	0.3733
0.550	0.0000	0.0000	0.3084	0.3659	0.4469	0.4469	0.3933	0.3638
0.600	0.0000	0.0000	0.2803	0.3360	0.4301	0.4301	0.3410	0.2770
0.650	0.0000	0.0000	0.2533	0.3162	0.3901	0.3901	0.2966	0.2325
0.700	0.0000	0.0000	0.1734	0.2729	0.3363	0.3363	0.2487	0.1708
0.750	0.0000	0.0000	0.1445	0.2051	0.2241	0.2241	0.1657	0.0906
0.800	0.0000	0.0000	0.1020	0.1212	0.1316	0.1316	0.1013	0.0257
0.850	0.0000	0.0000	0.0734	0.0736	0.0736	0.0736	0.0444	0.0539
0.900	0.0000	0.0000	0.0550	0.0196	0.0196	0.0230	0.0230	0.0734
0.950	0.0000	0.0000	0.0470	0.0669	0.0282	0.0320	0.0584	0.0923
1.000	0.0470	0.1003	0.1112	0.0669	0.0282	0.0320	0.0584	0.0923

MACH=0.821 ALPHA=0.888 CL=0.421 UPPER SURFACE CP VALUES. TRANSITION 1.								
ETA=	0.019	0.123	0.231	0.325	0.455	0.633	0.817	0.935
X/C								
0.000	0.7690	0.5735	0.4330	0.7150	0.7405	0.7540	0.7472	0.7457
0.010	0.3168	0.0973	0.3260	0.2446	0.3051	0.2251	0.2671	0.4542
0.025	0.0876	0.0408	0.4867	0.3652	0.3857	0.2914	0.2491	0.0977
0.050	0.3140	0.2658	0.7960	0.6547	0.7789	0.8345	0.6081	0.6894
0.075	0.4877	0.7739	0.9894	0.8347	0.9789	0.8825	0.8181	0.6910
0.100	0.6365	0.9239	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.150	0.6365	0.9239	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.200	0.7277	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.250	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.300	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.350	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.400	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.450	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.500	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.550	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.600	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.650	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.700	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.750	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.800	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.850	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.900	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
0.950	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910
1.000	0.7636	0.9955	0.9894	0.9015	0.9789	0.8825	0.8181	0.6910

MACH=0.821 ALPHA=0.888 CL=0.421 LOWER SURFACE CP VALUES. TRANSITION 1.								
ETA=	0.019	0.123	0.231	0.325	0.455	0.633	0.817	0.935
X/C								
0.000	0.7690	0.5735	0.4330	0.7150	0.7405	0.7540	0.7472	0.7457
0.010	0.2755	0.1455	0.1970	0.2707	0.1662	0.1662	0.1754	0.1468
0.025	0.1234	0.0834	0.1139	0.1390	0.1771	0.1271	0.1590	0.1203
0.050	0.0899	0.0687	0.0990	0.1436	0.1771	0.1271	0.1590	0.1203
0.075	0.0158	0.1138	0.0766	0.0467	0.0168	0.0347	0.0175	0.0874
0.100	0.0000	0.1936	0.0557	0.0084	0.0204	0.0632	0.0731	0.1335
0.150	0.0000	0.0763	0.1357	0.1050	0.0084	0.1077	0.1425	0.1900
0.200	0.0000	0.1264	0.1957	0.1557	0.0084	0.1601	0.1784	0.2558
0.250	0.0000	0.1694	0.2446	0.2046	0.0084	0.2046	0.2579	0.3034
0.300	0.0000	0.2046	0.2894	0.2446	0.0084	0.2446	0.2977	0.3414
0.350	0.0000	0.2394	0.3246	0.2894	0.0084	0.2894	0.3414	0.3731
0.400	0.0000	0.2746	0.3594	0.3246	0.0084	0.3246	0.3731	0.4049
0.450	0.0000	0.3094	0.3946	0.3594	0.0084	0.3594	0.4049	0.4378
0.500	0.0000	0.3446	0.4294	0.3946	0.0084	0.3946	0.4378	0.4707
0.550	0.0000	0.3794	0.4646	0.4294	0.0084	0.4294	0.4707	0.5036
0.600	0.0000	0.4146	0.4994	0.4646	0.0084	0.4646	0.5036	0.5365
0.650	0.0000	0.4494	0.5346	0.4994	0.0084	0.4994	0.5365	0.5694
0.700	0.0000	0.4846	0.5694	0.5346	0.0084	0.5346	0.5694	0.6023
0.750	0.0000	0.5194	0.6046	0.5694	0.0084	0.5694	0.6023	0.6352
0.800	0.0000	0.5546	0.6394	0.6046	0.0084	0.6046	0.6352	0.6681
0.850	0.0000	0.5894	0.6746	0.6394	0.0084	0.6394	0.6681	0.7010
0.900	0.0000	0.6246	0.7094	0.6746	0.0084	0.6746	0.7010	0.7339
0.950	0.0000	0.6594	0.7446	0.7094	0.0084	0.7094	0.7339	0.7668
1.000	0.0000	0.6946	0.7794	0.7446	0.0084	0.7446	0.7668	0.7997

TABLE 8.7 (contd) M100 WING PRESSURE DISTRIBUTIONS

ETA=	0.019	0.123	0.231	0.325	0.455	0.633	0.817	0.935
X/C								
0.000	0.7739	0.5769	0.4371	0.7179	0.7369	0.7523	0.7463	0.7425
0.010	0.9467	-	0.2728	0.1871	0.2304	-	0.2224	0.4018
0.020	0.9659	-	0.3470	0.3141	0.3087	-	0.2273	0.0679
0.030	0.9790	-	0.3025	0.3141	0.3087	-	0.2273	0.0679
0.040	0.9859	-	0.2669	0.2804	0.3169	-	0.2273	0.0679
0.050	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.100	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.150	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.200	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.250	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.300	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.350	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.400	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.450	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.500	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.550	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.600	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.650	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.700	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.750	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.800	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.850	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.900	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
0.950	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679
1.000	0.9865	-	0.2369	0.2404	0.3169	-	0.2273	0.0679

MACH=0.640 ALPHA=0.787 CL=0.427 LOWER SURFACE OF VALLES. TRANSITION 1.

[illegible]

MACH=0.850 ALPHA=0.539 CL=0.415 UPPER SURFACE CP VALUES. TRANSITION 1.

[illegible]

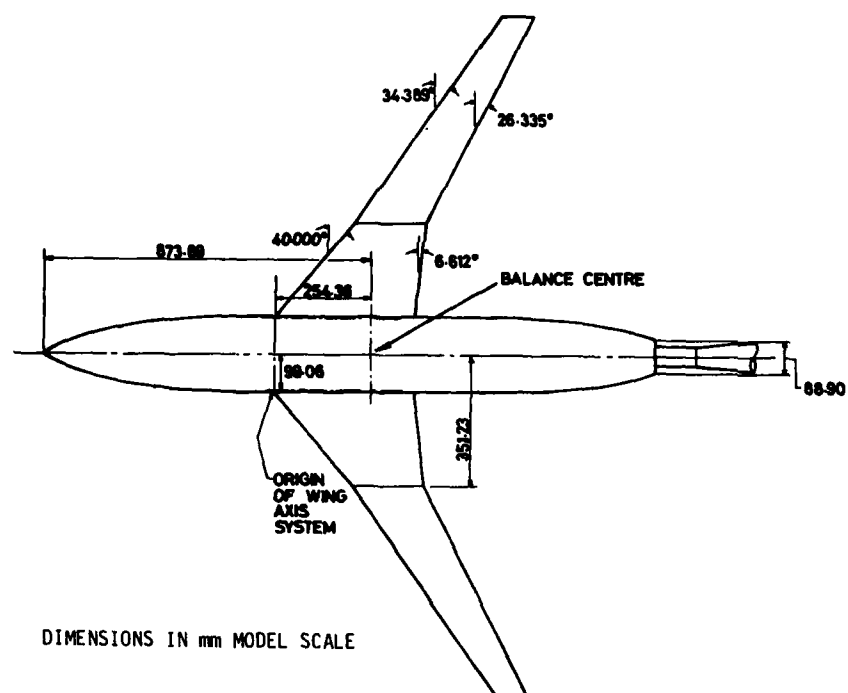
MACH=0.660 ALPHA=0.539 CL=0.415 LOWER SURFACE CP VALUES. TRANSITION 1

[illegible]

TABLE 8.7 (contd) M100 WING PRESSURE DISTRIBUTIONS

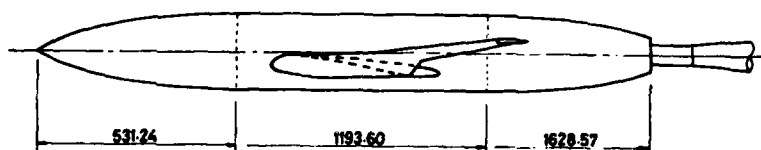
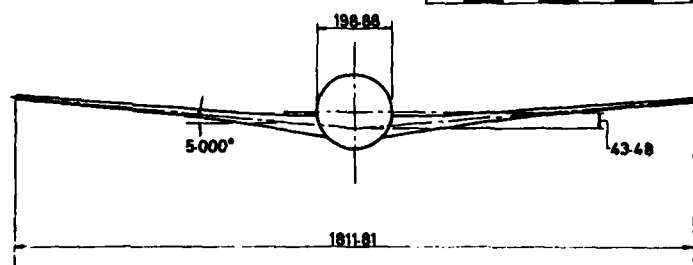
MACH=0.573 ALPHA=0.467 CL=0.405 UPPER SURFACE CP VALUES. TRANSITION 1.									
ETA=	0.019	0.123	0.231	0.325	0.455	0.633	0.817	0.935	
X/C									
0.000	0.7874	0.5595	0.4808	0.7281	0.7288	0.7829	0.7450	0.7665	
0.005	0.4840	0.1634	0.1511	0.4347	0.1508	0.0360	0.0817	0.2280	
0.010	0.1300	0.0000	0.0000	0.1547	0.0000	0.0000	0.0478	0.0560	
0.015	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.020	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.025	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.030	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.035	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.040	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.045	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.055	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.060	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.065	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.070	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.075	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.080	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.085	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.090	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.095	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.105	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.110	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.115	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.120	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.125	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.130	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.135	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.140	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.145	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.150	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.155	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.160	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.165	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.170	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.175	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.180	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.185	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.190	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.195	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.205	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.210	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.215	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.220	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.225	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.230	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.235	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.240	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.245	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.255	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.260	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.265	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.270	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.275	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.280	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.285	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.290	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.295	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.305	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.310	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.315	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.325	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.330	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.335	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.340	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.345	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.350	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.355	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.360	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.365	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.370	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.375	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.380	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.385	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.390	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.395	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.405	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.410	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.415	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.420	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.425	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.430	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.435	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.440	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.445	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.450	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.455	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.460	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.465	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.470	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.475	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.480	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.485	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.490	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.495	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.500	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.505	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.510	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.515	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.520	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.525	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.530	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.535	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.540	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.545	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.550	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.555	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.560	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.565	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.570	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.									

TABLE 8.7 (contd) M100 WING PRESSURE DISTRIBUTIONS



DIMENSIONS IN mm MODEL SCALE

0 0.2 0.4 0.6 0.8 m 1.0



SCALE 1:23

FIGURE 8.1 DETAILS OF WING-BODY MODEL M100

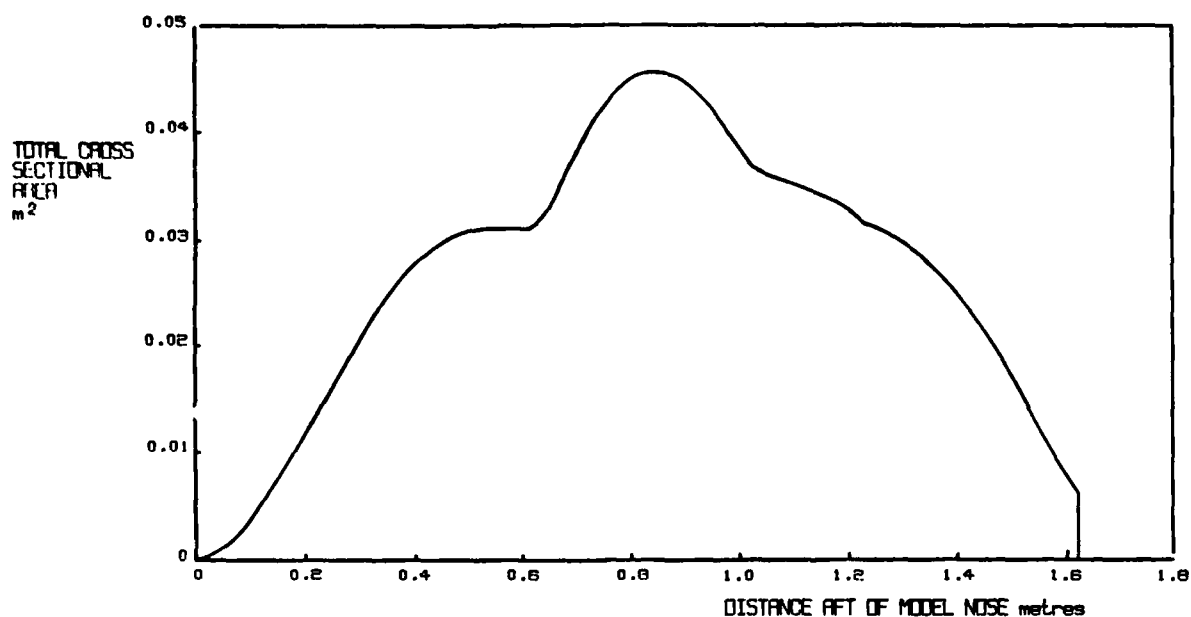


FIGURE 8.2 CROSS-SECTIONAL DEVELOPMENT

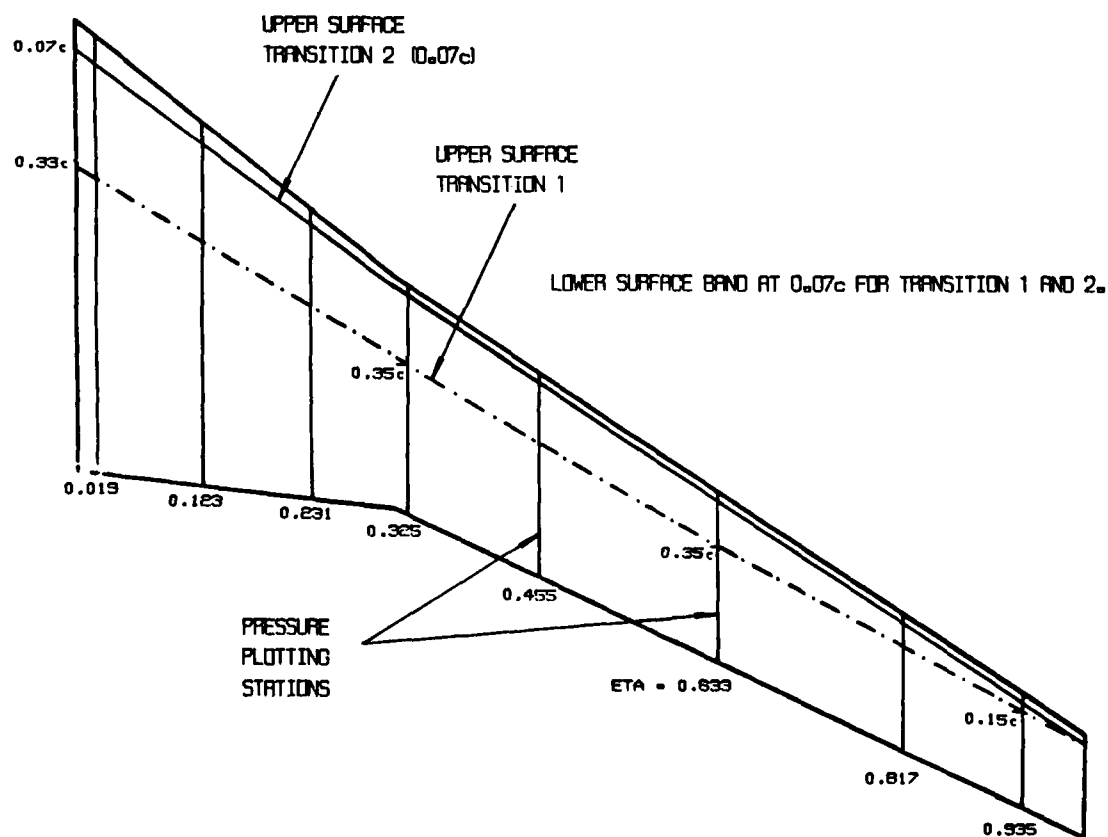


FIGURE 8.3 TRANSITION POSITION

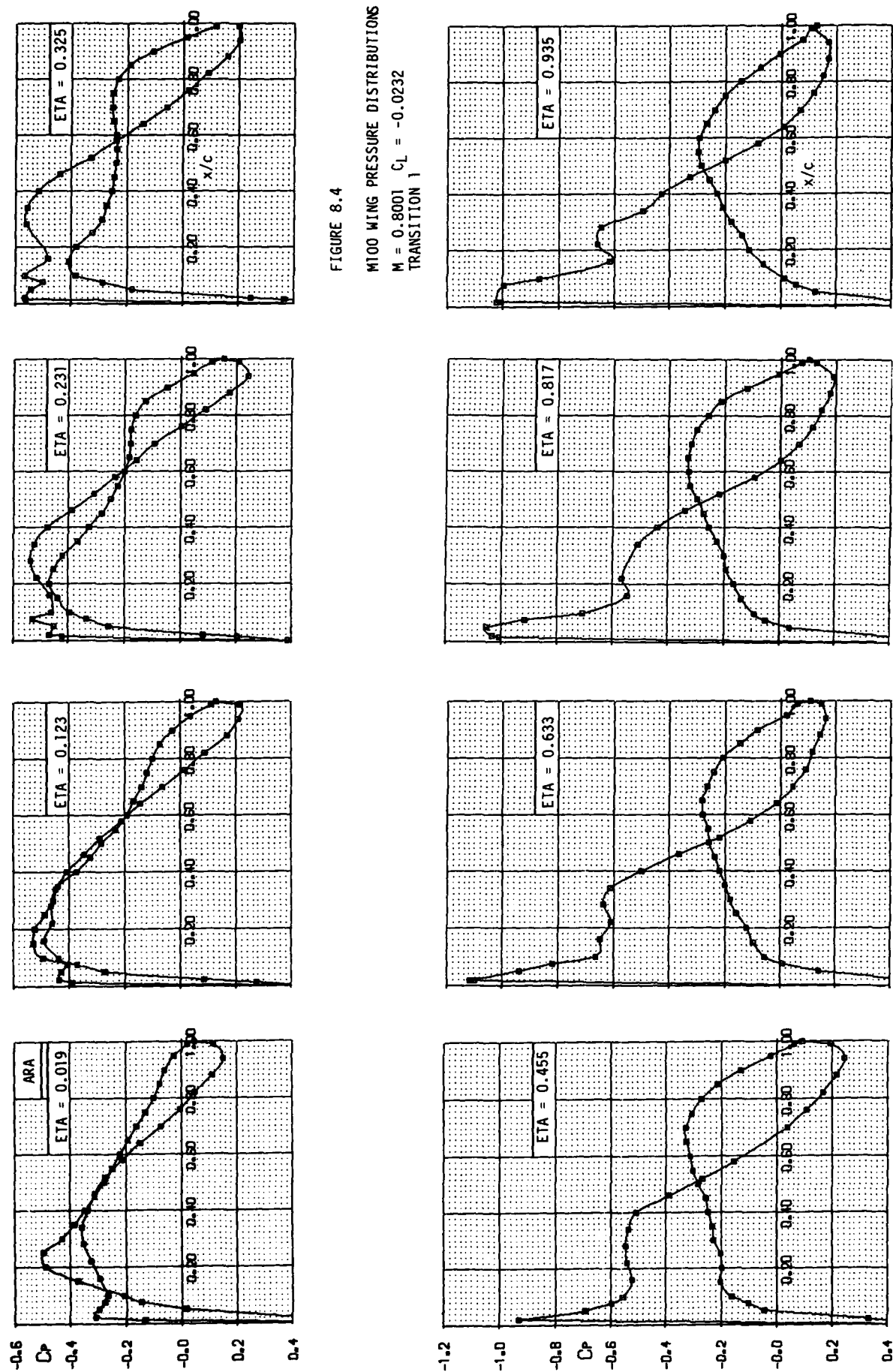


FIGURE 8.4

M100 WING PRESSURE DISTRIBUTIONS

 $M = 0.8001$ $C_L = -0.0232$
TRANSITION 1

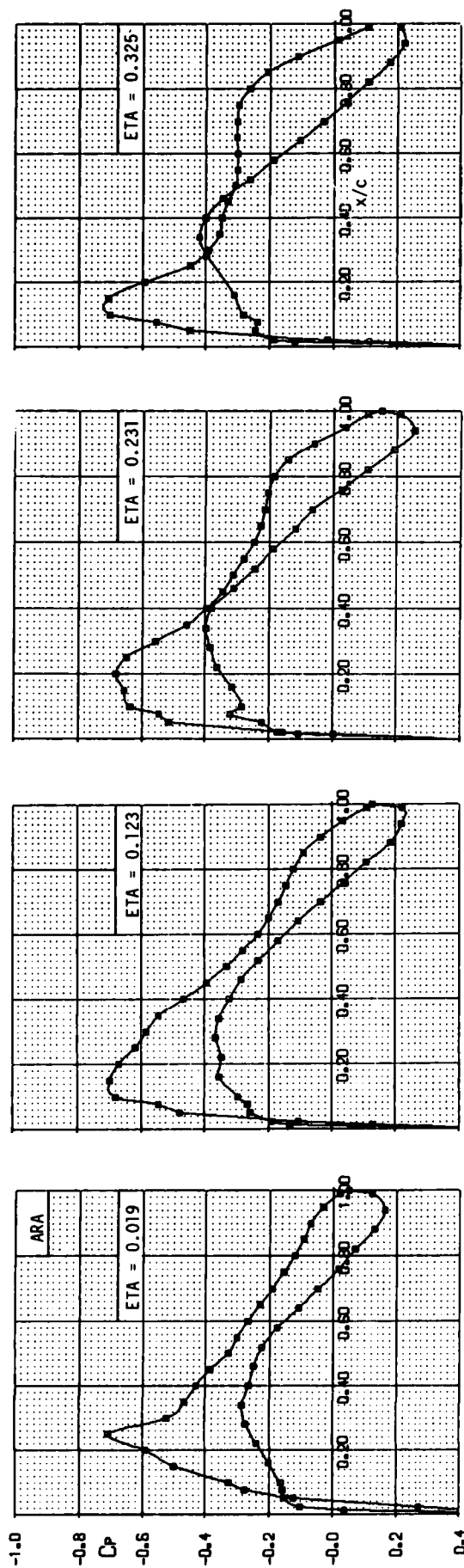
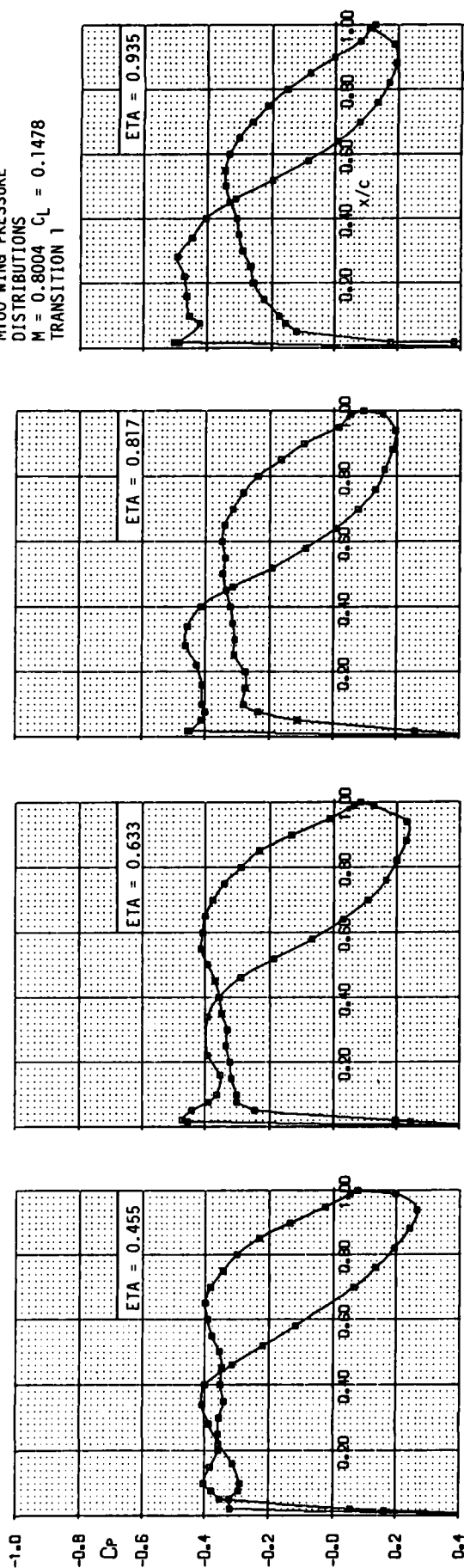


FIGURE 8.4 (contd)

M100 WING PRESSURE
DISTRIBUTIONS
 $M = 0.8004$ $C_L = 0.1478$
TRANSITION 1



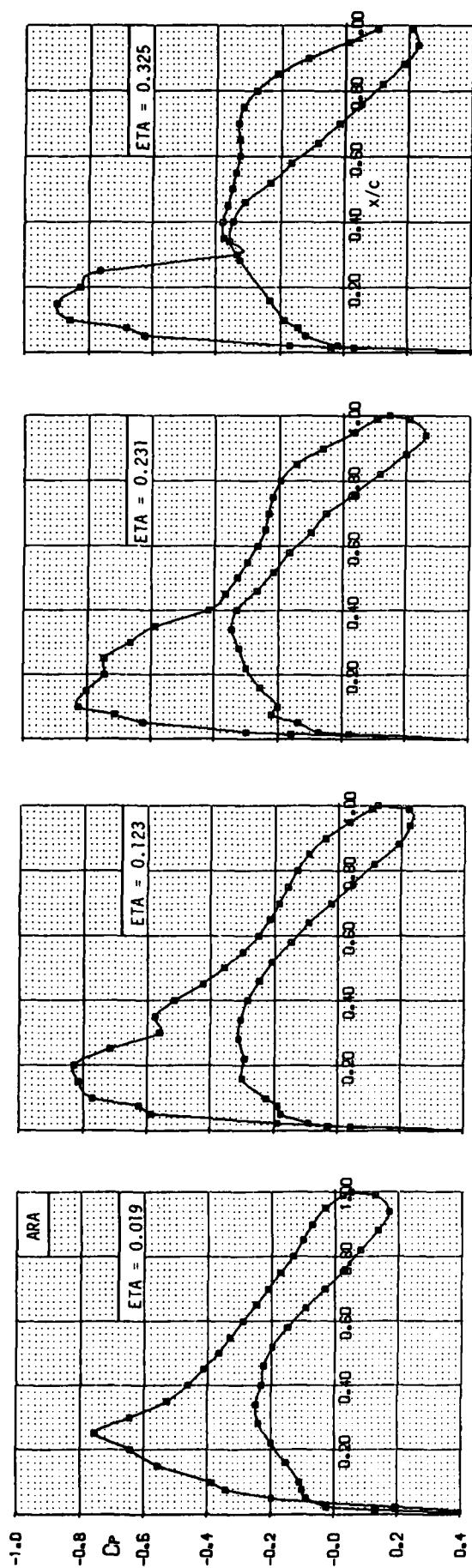
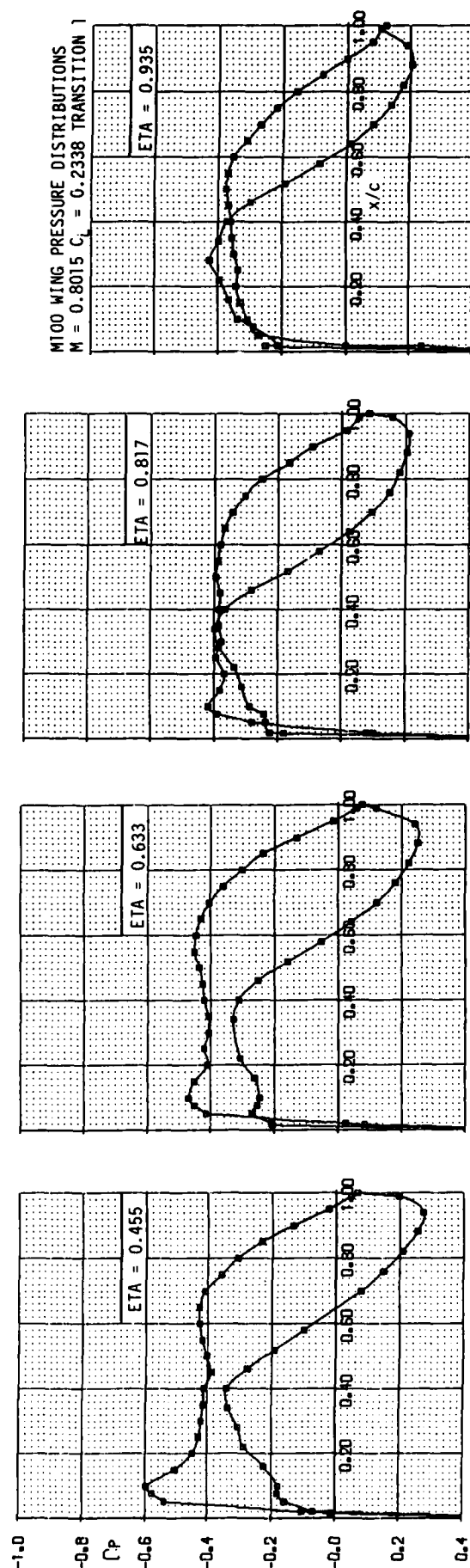


FIGURE 8.4 (concd)



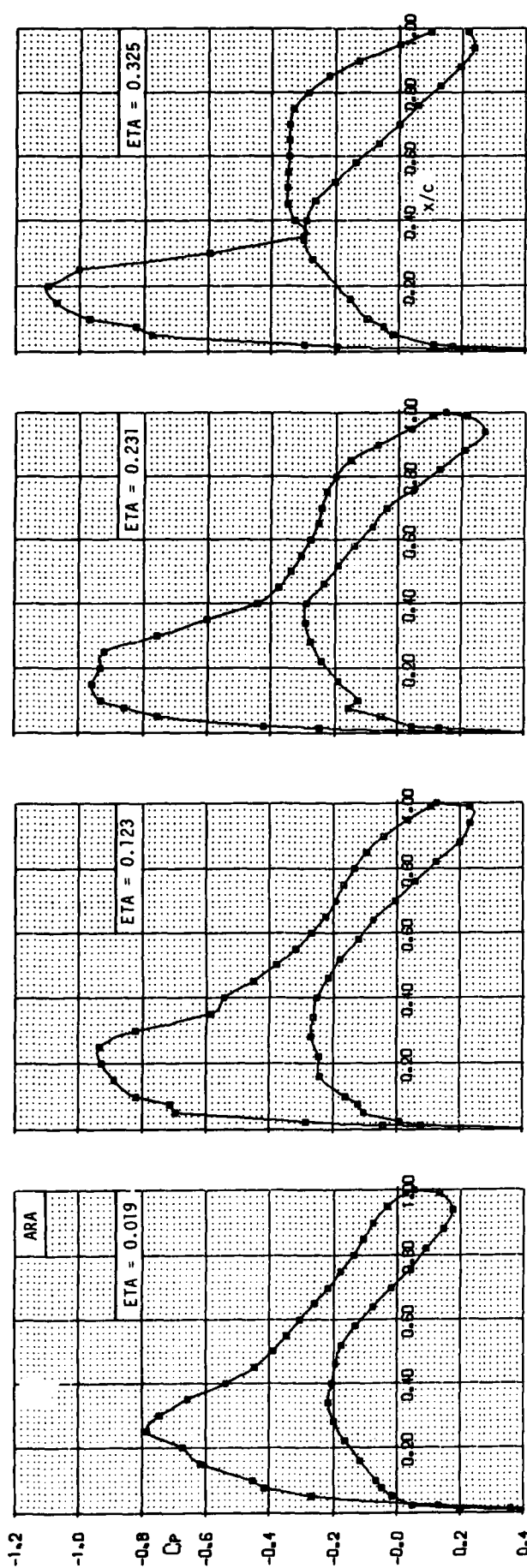
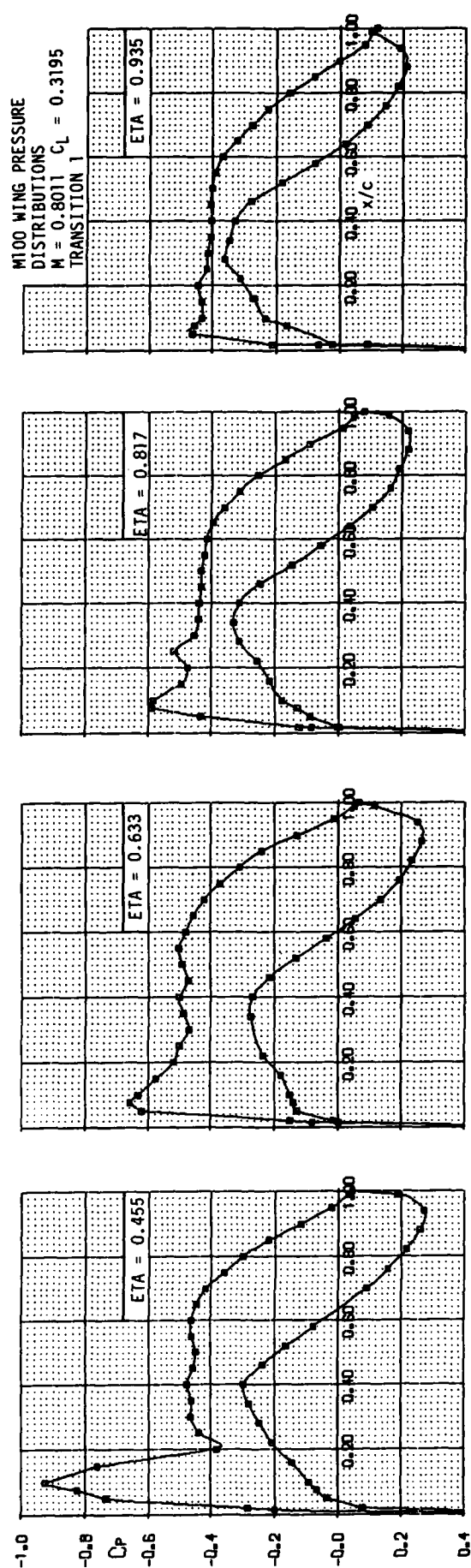


FIGURE 8.4 (contd)



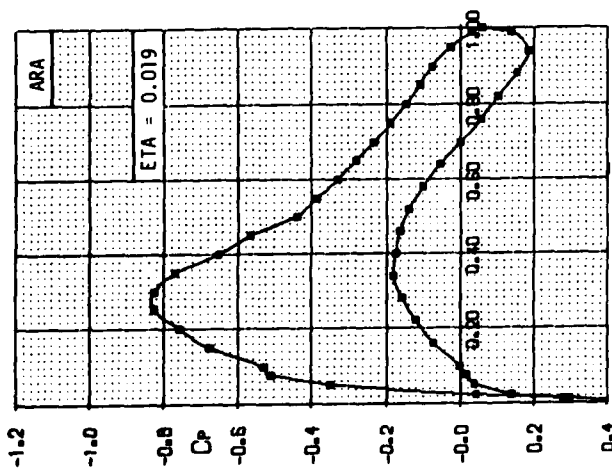
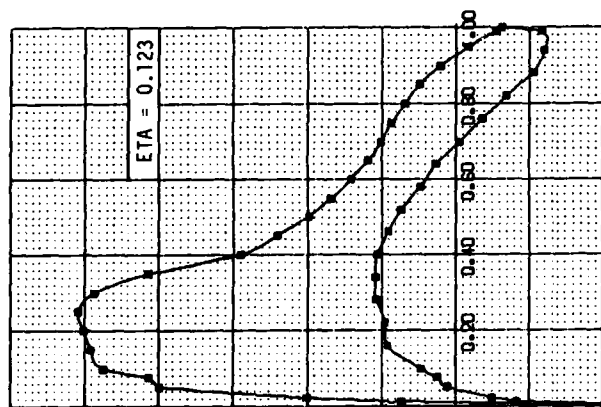
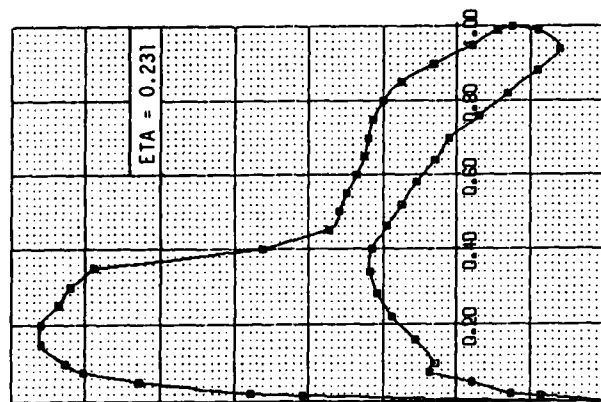
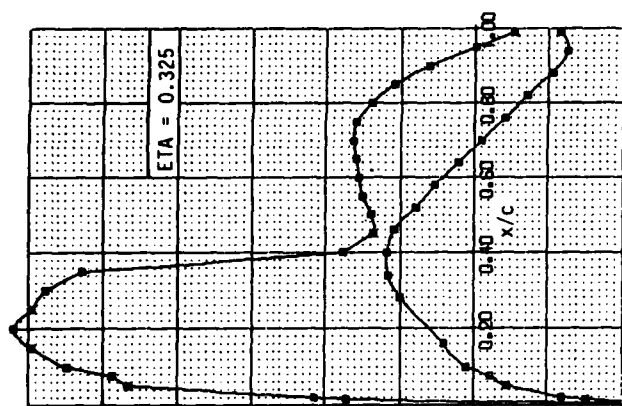
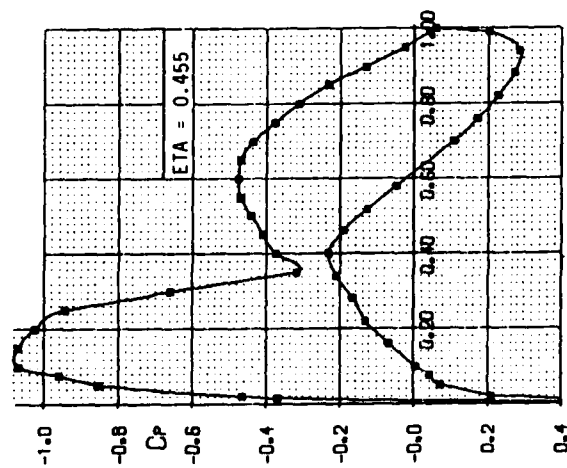
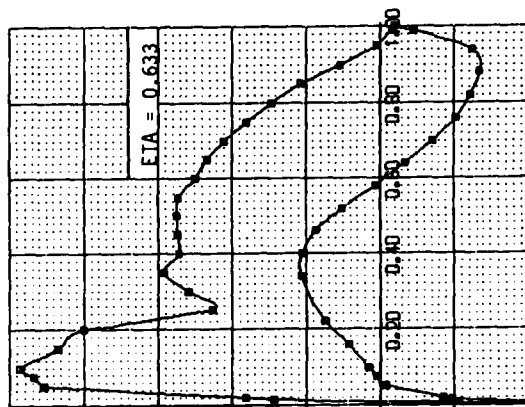
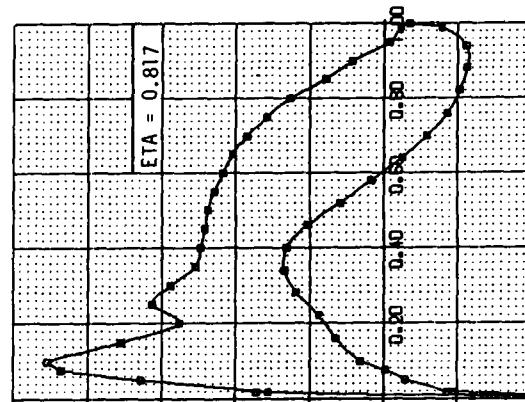
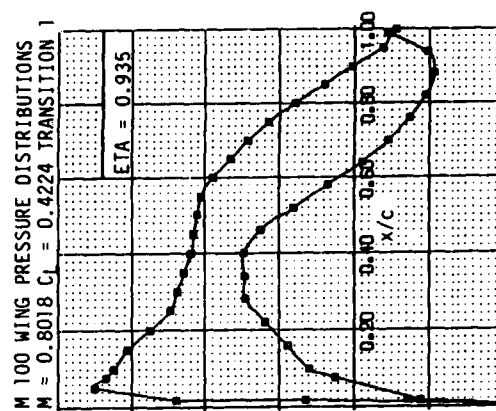
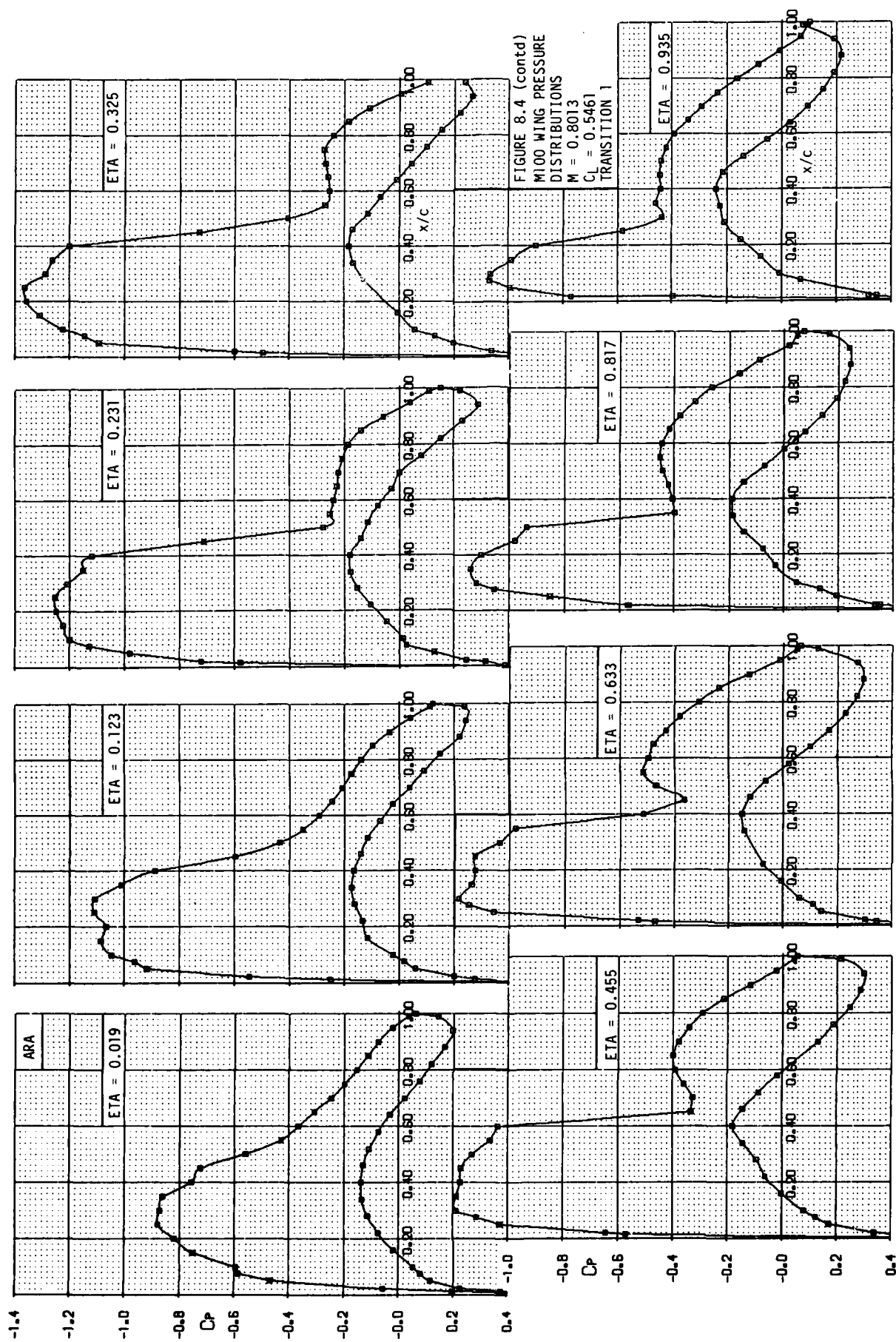
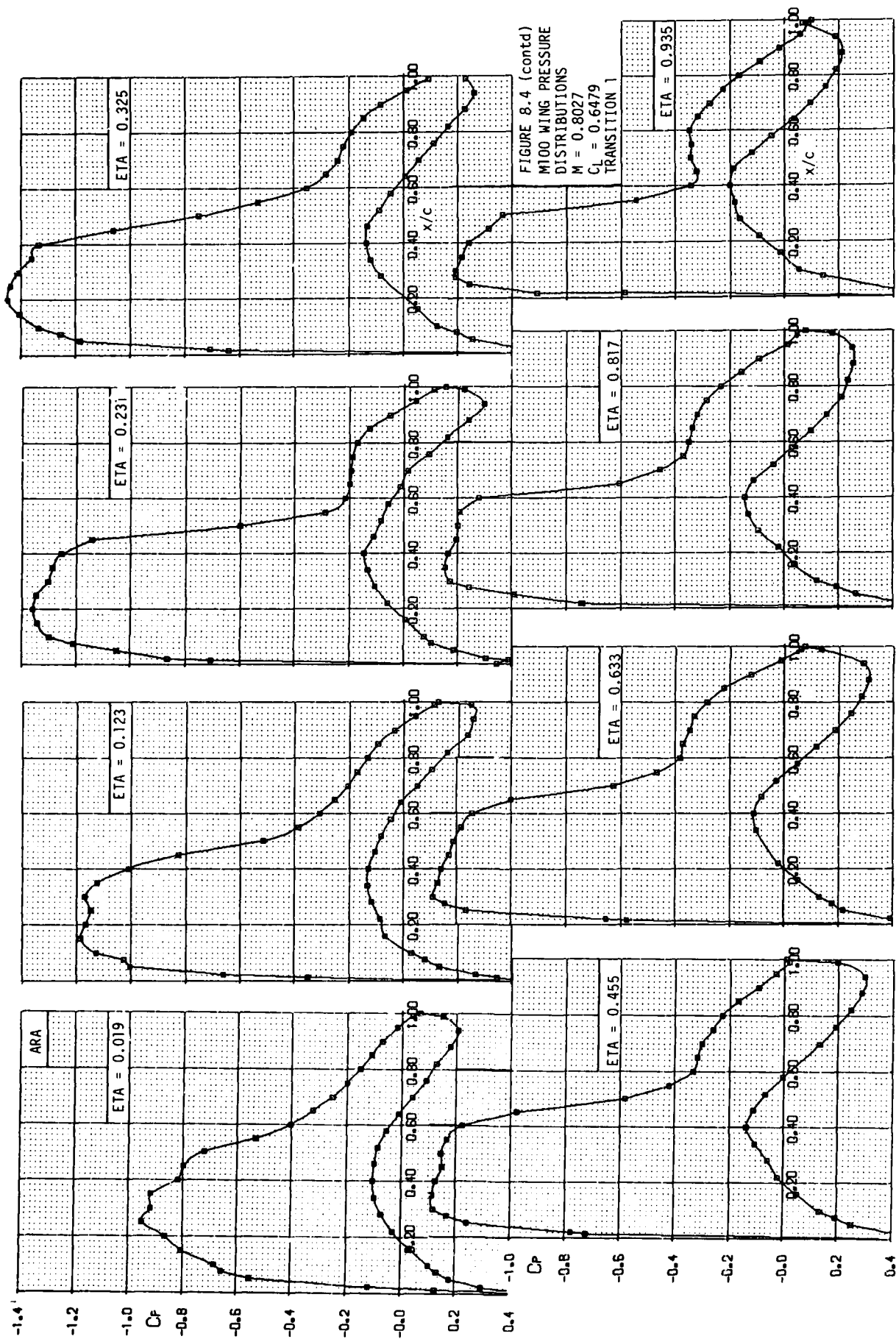


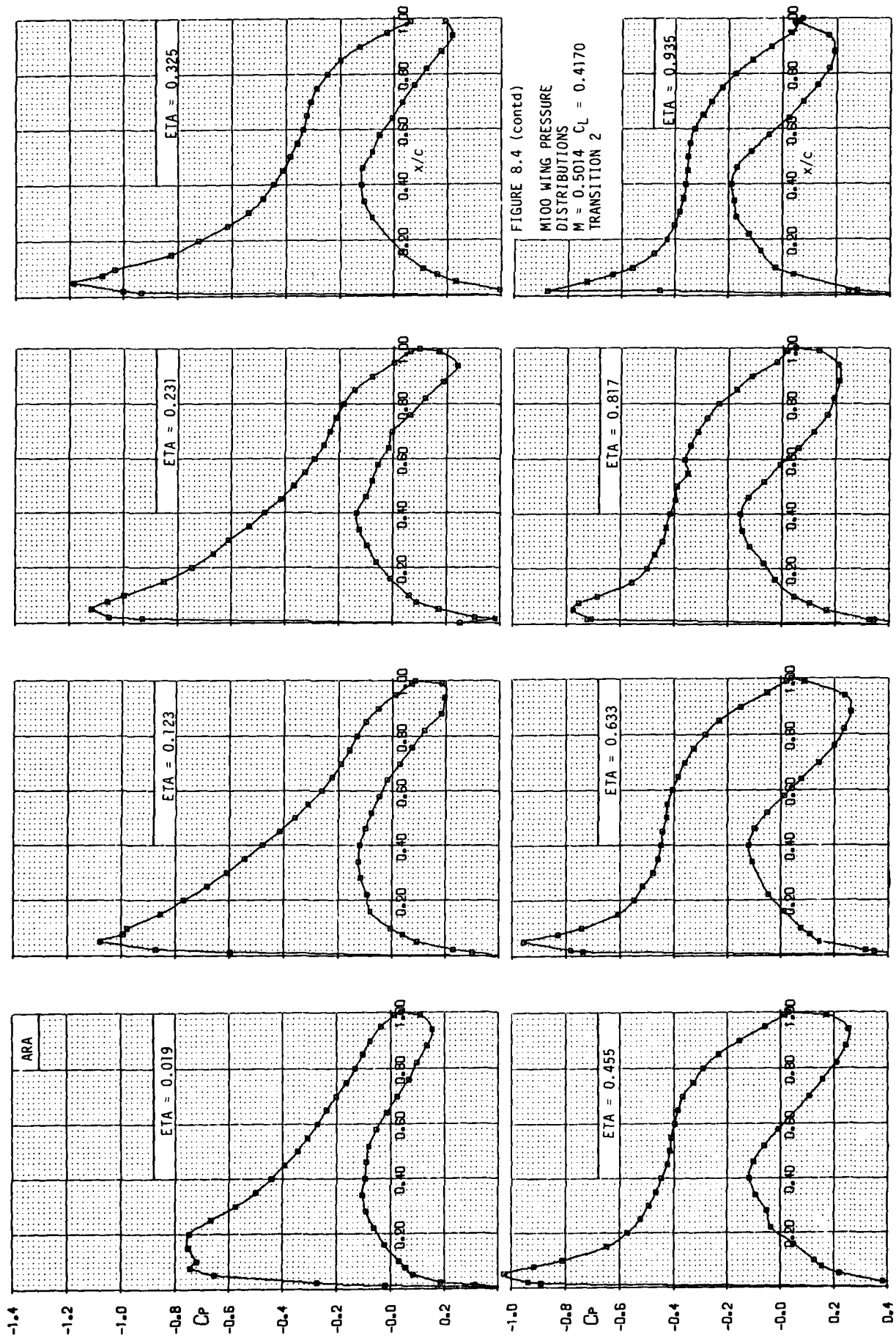
FIGURE 8.4 (contd)

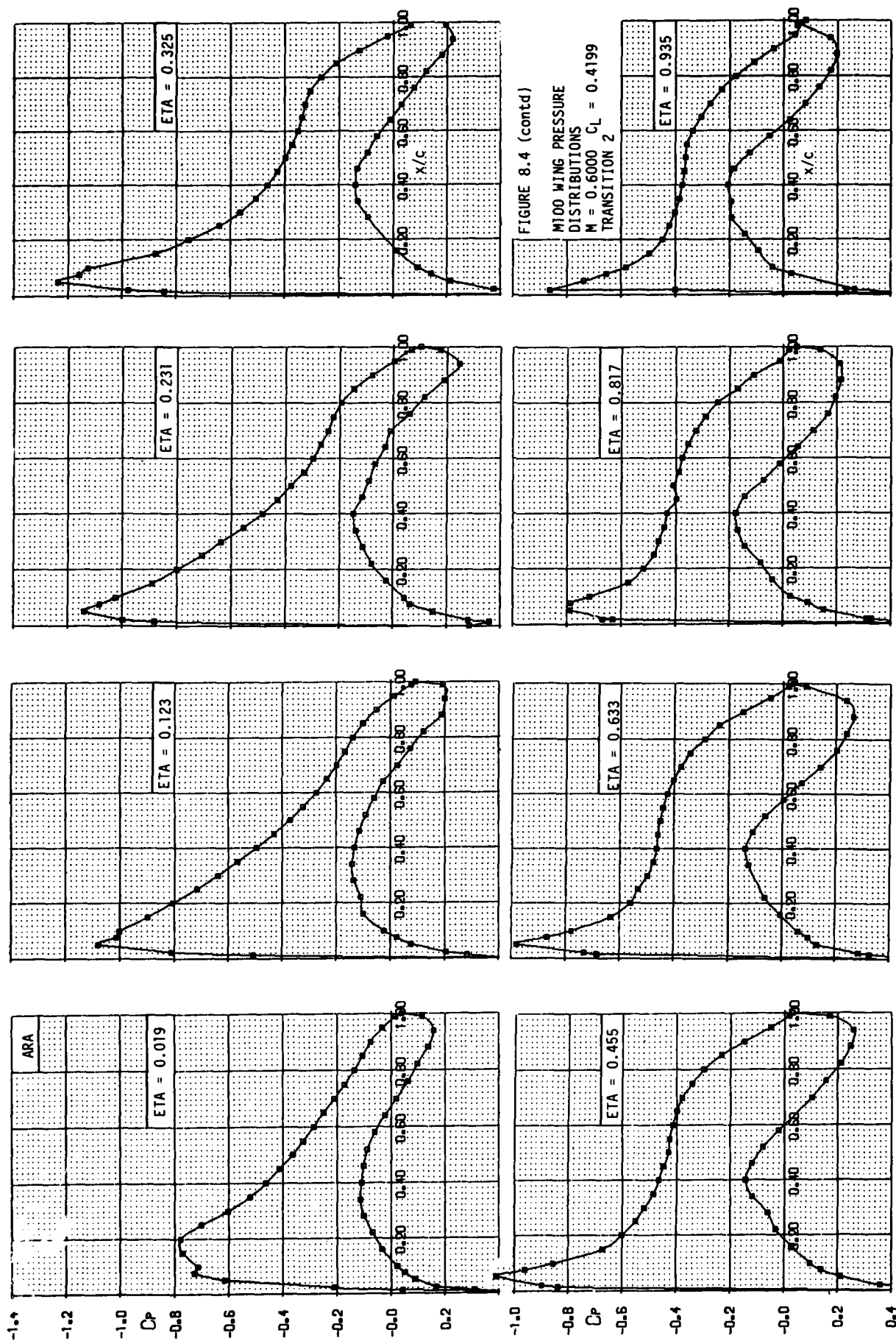


M 100 WING PRESSURE DISTRIBUTIONS
 $M = 0.8018$ $C_L = 0.4224$ TRANSITION 1









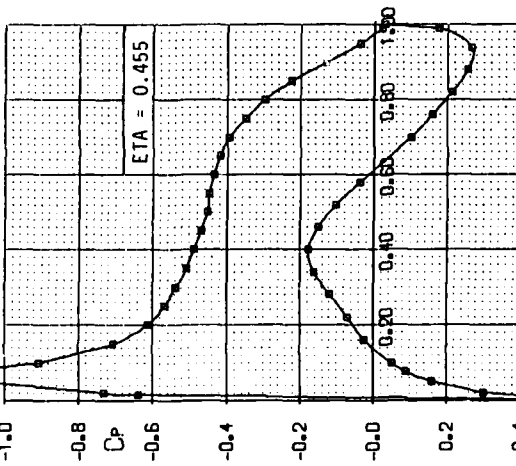
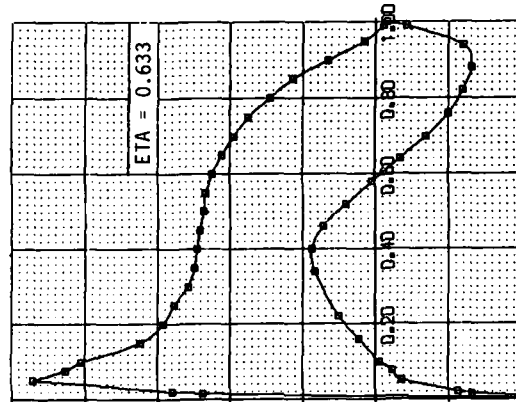
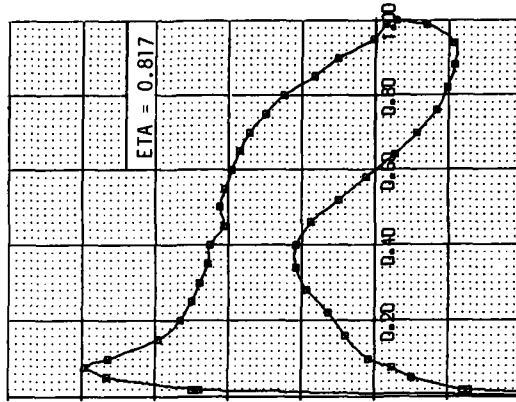
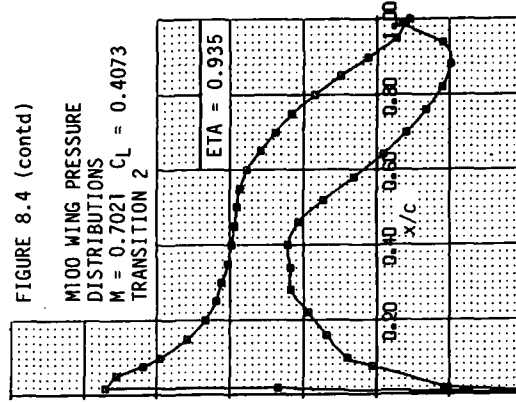
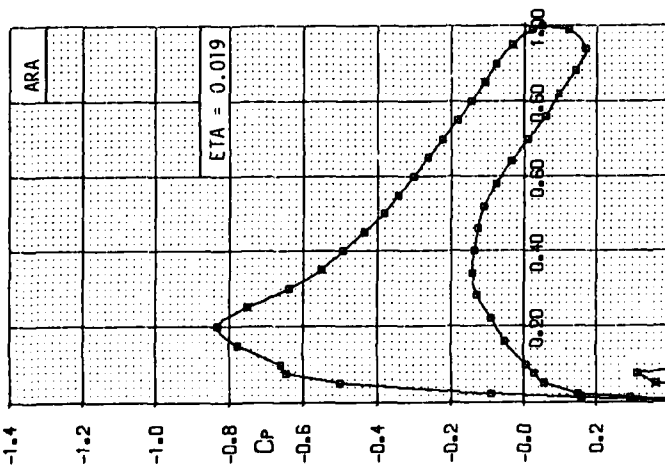
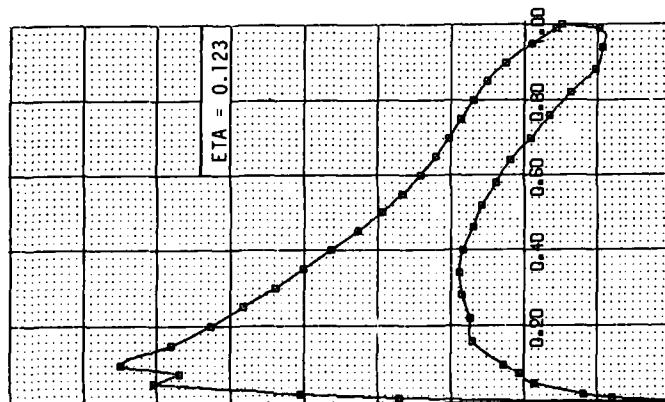
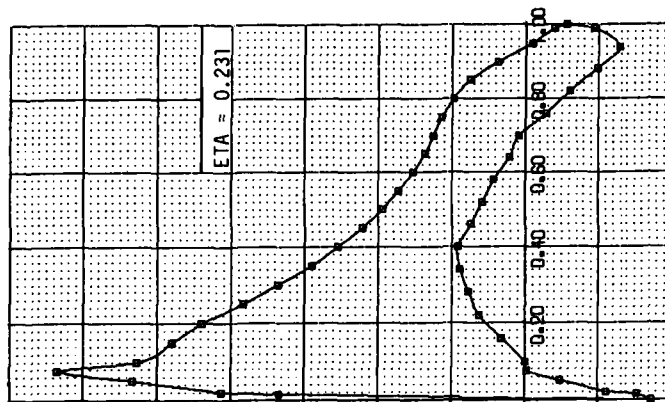
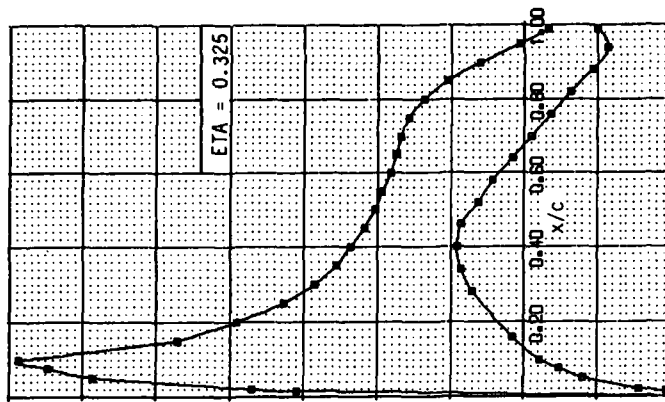


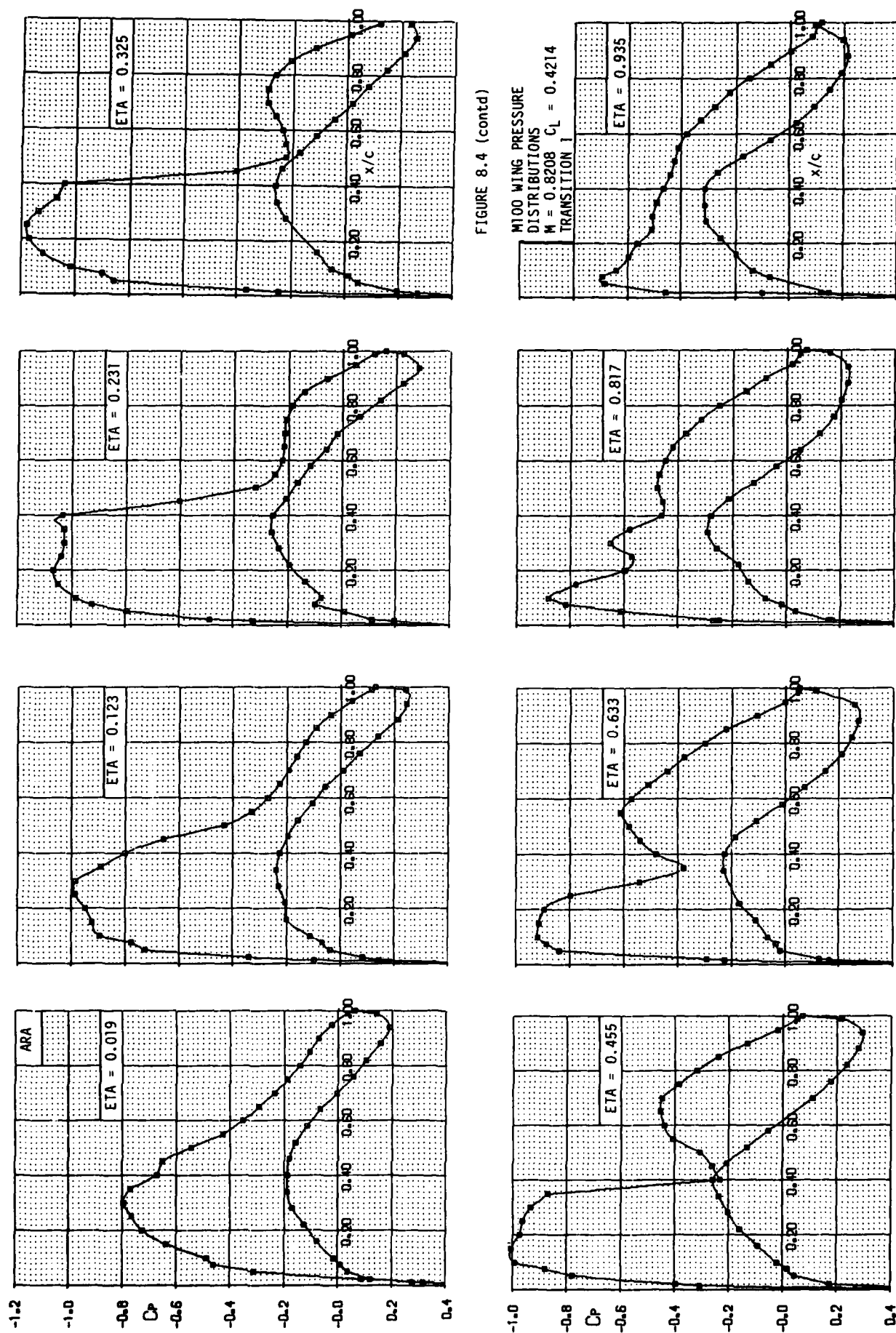
FIGURE 8.4 (contd)

M100 WING PRESSURE

DISTRIBUTIONS

 $M = 0.7021$ $C_L = 0.4073$

TRANSITION 2



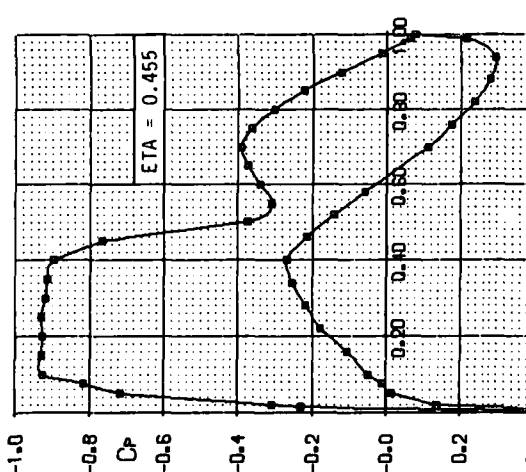
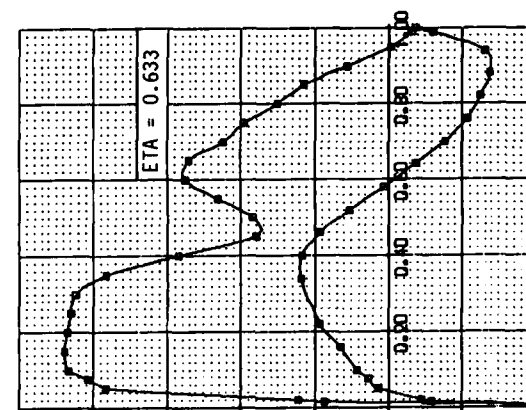
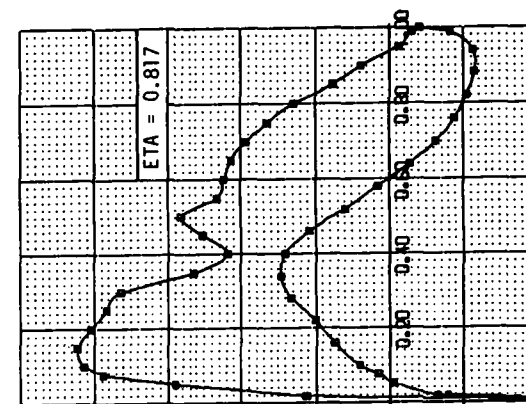
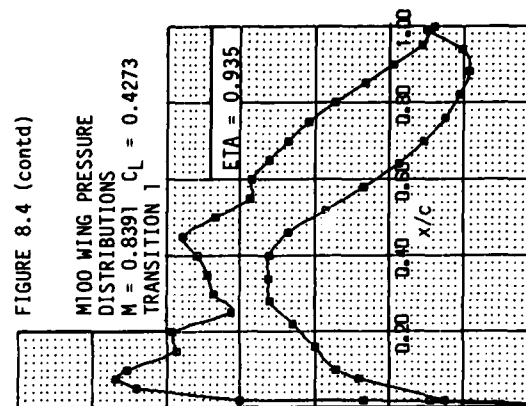
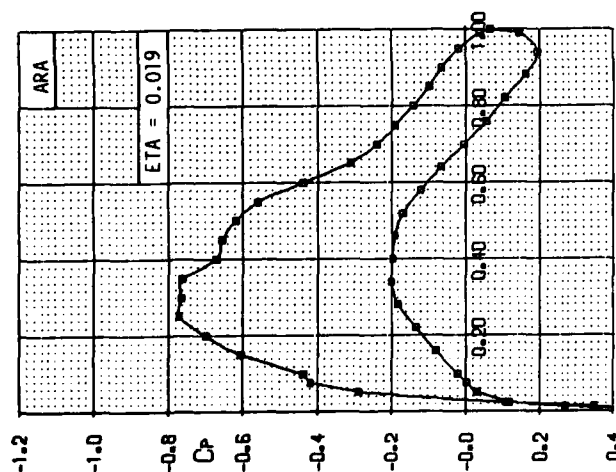
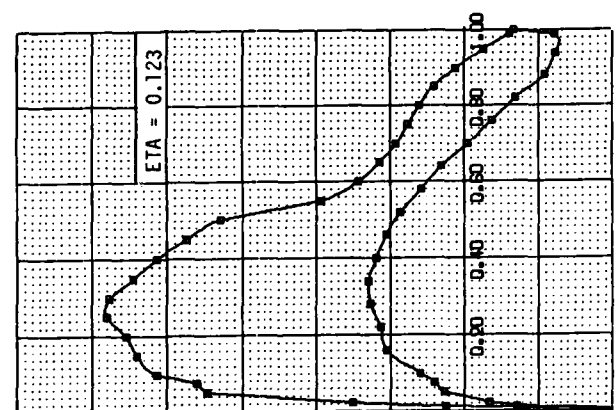
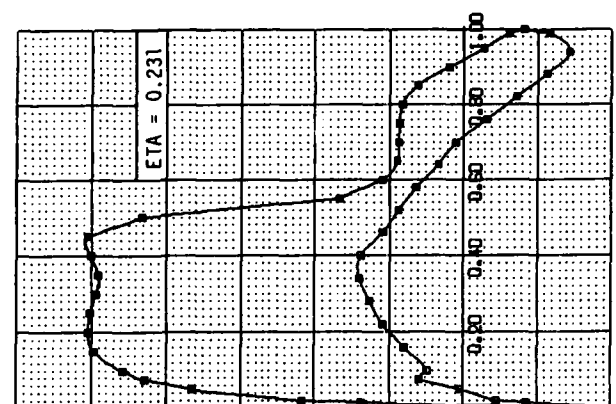
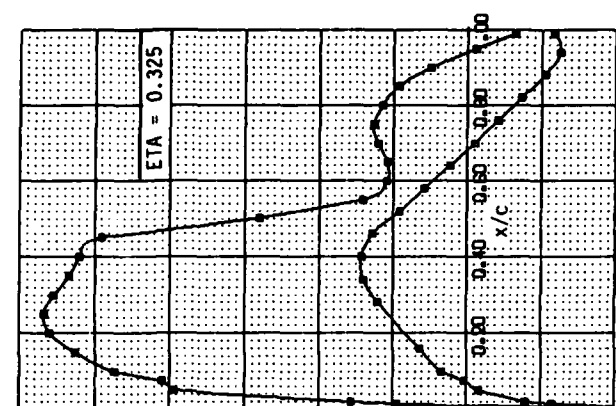
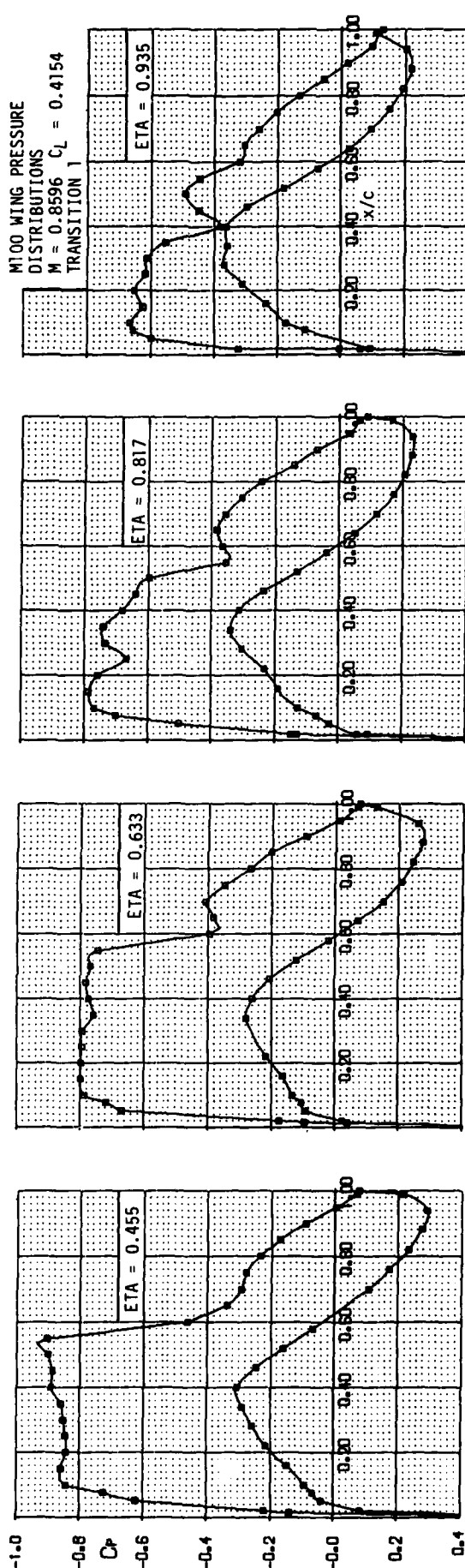
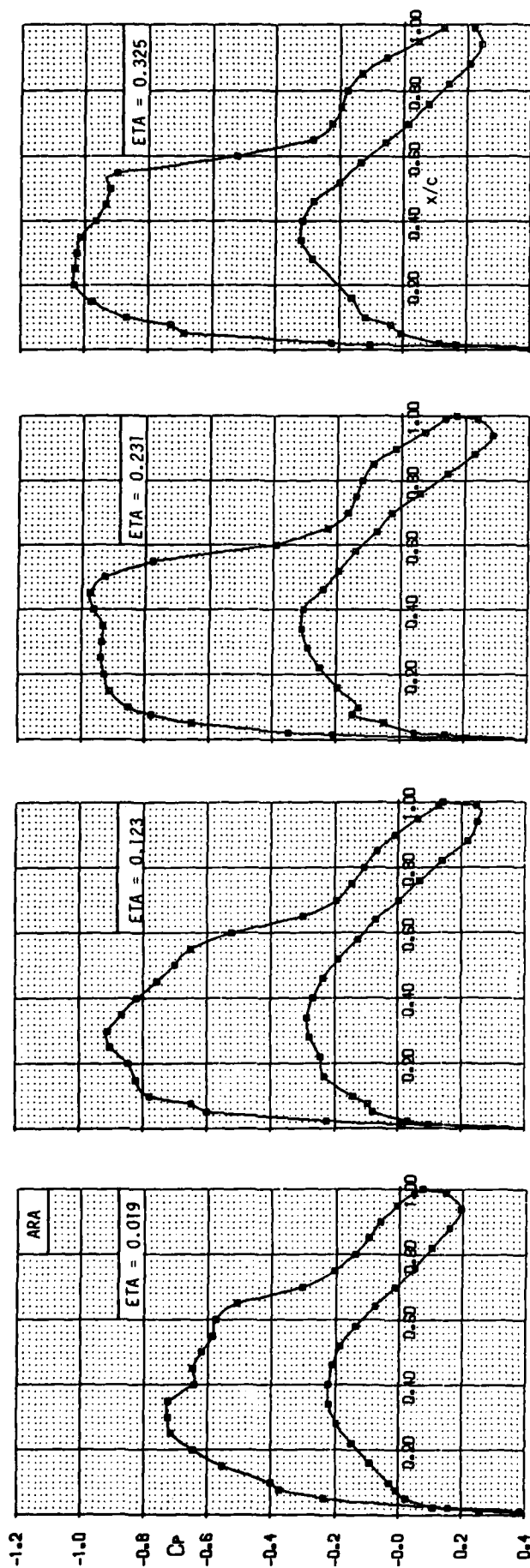


FIGURE 8.4 (contd)

M100 WING PRESSURE
DISTRIBUTIONS
 $M = 0.8391$ $C_L = 0.4273$
TRANSITION 1

FIGURE 8.4 (contd)

M100 WING PRESSURE
DISTRIBUTIONS
 $M = 0.8596$ $C_L = 0.4154$
TRANSITION 1



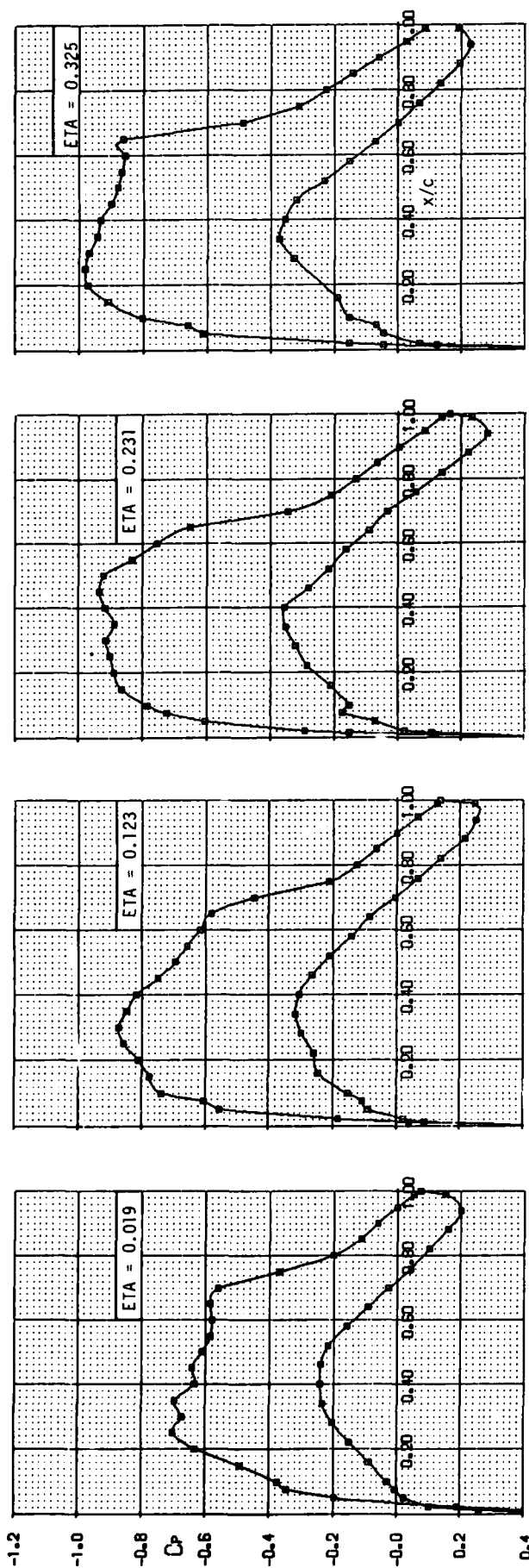
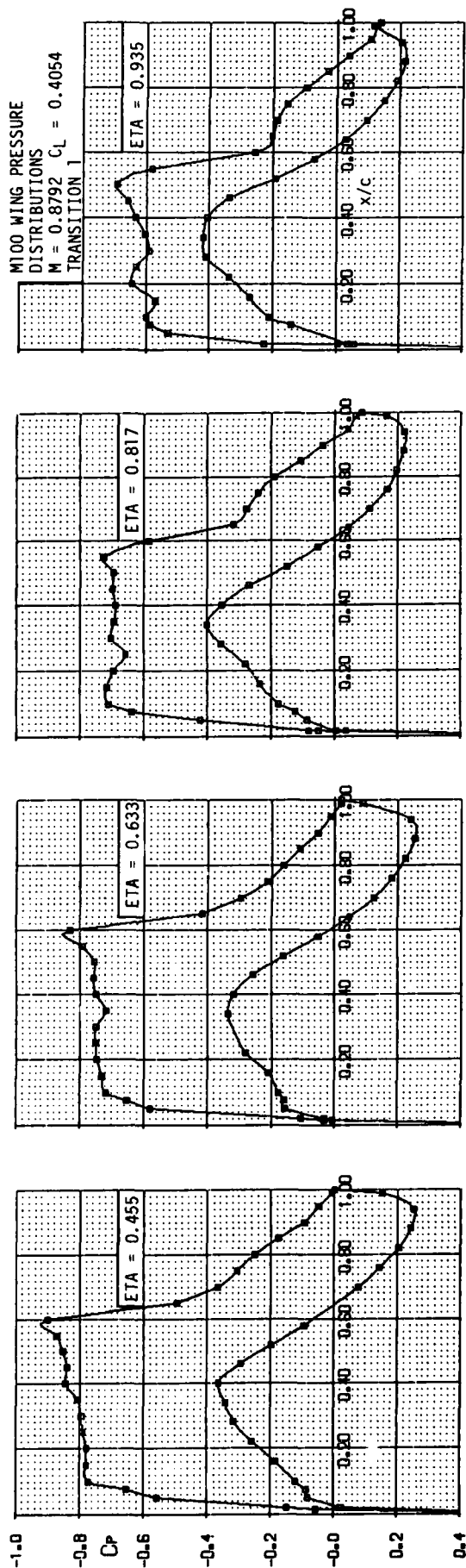


FIGURE 8.4 (contd)



9. PRESSURE DISTRIBUTIONS MEASURED ON RESEARCH WING M86 MOUNTED ON AN AXISYMMETRIC BODY

by

M P Carr
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Manton Lane, Bedford MK41 7PF, UK

9.1 INTRODUCTION

This contribution contains selected data from measurements of surface pressure distributions on a research wing in the ARA 9ft x 8ft transonic wind tunnel. Tabulated data are given for seven conditions covering three Mach numbers. Overall force measurements for the same test conditions as the presented pressures are also given.

9.2 DATA SET

1 General Description

1.1 Model Designation or Name	M86
1.2 Model Type (eg Full Span Wing-Body, Semi-Span Wing)	Full span wing-body
1.3 Design Requirements/Conditions	Combat wing research model
1.4 Additional Remarks	M86 was a combat wing research model with a square fuselage and a high mounted wing.

2 Model Geometry

2.1 Wing Data

2.1.1 Wing Planform	Straight wing with curved tip, see Figure 9.1
2.1.2 Aspect Ratio	4.0
2.1.3 Leading-Edge Sweep	40°
2.1.4 Trailing-Edge Sweep	13.5°
2.1.5 Taper Ratio	0.25 (tip chord/body centre line chord)
2.1.6 Twist	Included in ordinates of Table 9.1
2.1.7 Standard Mean Chord	0.279 m
2.1.8 Span or Semispan	1.118 m span
2.1.9 Number of Airfoil Sections used to Define wing	12 sections are used to define wing but 47 sections were specified for model manufacture
2.1.10 Spanwise Location of Reference Section and Section Coordinates (Note if Ordinates are Design or Actual Measured Values)	Design ordinates for 12 sections are listed in Table 9.1
2.1.11 Lofting Procedure between Reference Sections	Piecewise cubics
2.1.12 Form of Wing-Body Fillet, Strakes	None
2.1.13 Form of Wing Tip	Curved

2.2 Body Data (Detail Description of Body Geometry)	Square with rounded corners. Nose defined by cubic, tail defined by quadratic. See Figure 9.1
---	---

2.3 Wing-Body Combination

2.3.1 Relative Body Diameter (Average Body Diameter at Wing Location Divided by Wing Span)	0.22
2.3.2 Relative Vertical Location of Wing (Height above or Below Body Axes Divided by Average Body Radius at Wing Location)	0.62
2.3.3 Wing Setting Angle	2°
2.3.4 Dihedral	Included in ordinates of Table 9.1

2.4	Cross Sectional Area Development	See Figure 9.2 and Table 9.2
2.5	Fabrication Tolerances/Waviness	± 0.05 mm
2.6	Additional Remarks	Nil
3	<u>Wind Tunnel</u>	
3.1	Designation	ARA 9ft x 8ft TWT
3.2	Type of Tunnel	
3.2.1	Continuous or Blowdown. Indicate Minimum Run Time if Applicable	Continuous
3.2.2	Stagnation Pressure	0.8 to 1.2 bar
3.2.3	Stagnation Temperature	Up to 50° C
3.3	Test Section	
3.3.1	Shape of Test Section	Rectangular
3.3.2	Size of Test Section (Width, Height, Length)	2.74 m x 2.44 m x 3.66 m
3.3.3	Type of Test Section, Closed, Open, Slotted, Perforated. Open Area Ratio (Give Range if Variable)	Perforated 22%
	Slot/Hole Geometry (eg 30-degree Slanted Holes)	Normal holes vented into large plenum chamber
	Treatment of Sidewall Boundary Layer	
	Full span models) Half model testing)	Tunnel has capability for full and half span model testing
3.4	Flow Field (Empty Test Section)	
3.4.1	Reference Static Pressure	Plenum Chamber
3.4.2	Flow Angularity	Up to $+0.15^\circ$ in vicinity of model. (This is mainly due to the working section flow being horizontal and the roof set at $+0.3^\circ$ to allow for the boundary layer growth in the working section.
3.4.3	Mach Number Distribution	$\Delta M = \pm 0.002$ (see Reference 1)
3.4.4	Pressure Gradient	Insignificant over the length of the current model (see Reference 1)
3.4.5	Turbulence/Noise Level	-
3.4.6	Sidewall Boundary Layer	-
3.5	Freestream Mach number (or Velocity)	
3.5.1	Range	0 to 1.4
3.5.2	Pressures used to Determine Mach Number (eg Settling Chamber Total Pressure and Plenum Chamber Pressure)	Settling chamber total pressure (with a small correction applied), and plenum chamber static pressure.
3.5.3	Accuracy of Mach Number Determination (ΔM)	$\Delta M = \pm 0.001$
3.5.4	Maximum Mach Number Variation in x,y,z - Direction (Empty Tunnel Specify at what Mach Number)	Streamwise variation of $\Delta M = \pm 0.002$ over Mach number range.
	Maximum Variation of Flow Direction	-
	Maximum Mach Number Variation During a Traverse	$\Delta M = \pm 0.001$

3.6 Reynolds Number Range

3.6.1 Unit Reynolds Number Range. (Give Range at Representative Mach Numbers: 1/m)	M = 0.40 0.80 1.40	R/M $8.5 \times 10^6 \pm 20\%$ $13.0 \times 10^6 \pm 20\%$ $14.8 \times 10^6 \pm 20\%$
--	--------------------------	--

3.6.2 Means of Varying Reynolds Number (eg by Pressurisation)	Pressurisation (= ± 0.2 bar)
--	----------------------------------

3.7 Temperature Range of Dewpoint Can Temperature be Controlled?	Most runs made at 300 to 320 K stagnation temperature. Temperature and dewpoint both controlled. Dewpoint temperature 250°K for supersonic running.
---	---

3.8 Model Attitudes

3.8.1 Angle of Attack, Yaw, Roll	Incidence -10° to 22° Roll $\pm 180^\circ$
----------------------------------	--

3.8.2 Accuracy in Determining Angles	Incidence $\pm 0.01^\circ$ Roll $\pm 0.1^\circ$
--------------------------------------	---

3.9 Organisation Operating the Tunnel and Location of Tunnel	Aircraft Research Association Limited Manton Lane, Bedford, England
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3.10 Who is to be Contacted for Additional Information?	Chief Aerodynamicist, ARA.
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3.11 Literature Concerning this Facility	Reference 1 Reference 2
--	----------------------------

3.12 Additional Remarks	Nil
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4 Tests

4.1 Type of Tests	Surface pressures overall force and moment measurements, surface oil flow visualisation
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4.2 Wing Span or Semispan to Tunnel Width	$\frac{\text{Wing Span}}{\text{Tunnel Width}} = 0.40$
---	---

4.3 Test Conditions

4.3.1 Angle of Attack	$\alpha = 0$ to 8°
4.3.2 Mach Number	M = 0.85 to 0.90
4.3.3 Dynamic Pressure	Approx 14,000 to 30,000 N/m ²
4.3.4 Reynolds Number	$Re \approx 2.8 \times 10^6$ to 3.7×10^6
4.3.5 Stagnation Temperature	300 K

4.4 Transition

4.4.1 Free or Fixed	Fixed
4.4.2 Position of Free Transition	N/A
4.4.3 Position of Fixed Transition, Width of Strips, Size and Type of Roughness	See Figure 9.3 Ballotini 2.54 mm wide, 0.127 to 0.152 mm diameter. Wing upper surface 0.05c (root) to 0.35c (0.745) and to 0.30c (0.895)
4.4.4 Were Checks made to Determine if Transition Occurred at Trip Locations?	Yes (acenaphthene sublimation)

4.5 Wing Bending or Torsion Under Load

4.5.1 Describe any Aero-Elastic Measurements Made During Tests	None
4.5.2 Describe Results of Any Bench Calibrations	None

4.6 Were Different Sized Models Used in Wind-Tunnel Investigations? If so, Indicate Size	No
--	----

4.7 Areas and Lengths Used to Form Coefficients	Area: $S = 0.312 \text{ m}^2$ Chord: $c = 0.279 \text{ m}$
--	---

4.8 References on Tests	None
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4.9 Related Reports	None
---------------------	------

5 Instrumentation

5.1 Surface Pressure Measurements

- | | |
|--|--|
| 5.1.1 Pressure Orifices in Wing. Locations and Number on Upper and Lower Surfaces | The locations of the wing pressure orifices are listed in Table 9.3 |
| 5.1.2 Pressure Orifices on Fuselage Location and Number | N/A |
| 5.1.3 Pressure Orifices on Components, Give Component and Orifice Location | None |
| 5.1.4 Geometry of Orifices | Round holes 0.6 mm diameter |
| 5.1.5 Type of Pressure Transducer and Scanning Devices Used. Indicate Range and Accuracy | PM 131TC Transducers
S-type Scanivalves
Range ± 0.8 bar, accuracy ± 1 mbar |

5.2 Force Measurements

- | | | |
|--|--------------------------------------|------------------------|
| 5.2.1 Type and Location of Balance | ARA 3" internal strain gauge balance | |
| 5.2.2 Forces and Moments that can be Measured, Maximum Loads and Calibration Accuracy for Balance of 5.2.1 | Maximum Load | Average Absolute Error |
| | Normal force | $\pm 17,800$ N |
| | Axial force | $\pm 2,200$ N |
| | Side force | $\pm 4,000$ N |
| | Pitching moment | $\pm 2,170$ Nm |
| | Rolling moment | ± 680 Nm |
| | Yawing moment | ± 680 Nm |

- 5.2.3 Forces and Moments on Components None

Type and Location of Balance N/A

Maximum Loads and Accuracy N/A

5.3 Boundary Layer and Flow-Field Measurements

- | | |
|---|--------------------------------|
| 5.3.1 Boundary Layer Probe Type, Position and Drive Mechanism | No |
| 5.3.2 Probe Dimension Relative to Boundary-Layer Thickness | N/A |
| 5.3.3 Laser-Doppler Velocimeter. Give Description of Apparatus and Accuracy | No |
| 5.3.4 Method and/or Instrument Used to Determine Boundary-Layer Transition | Acenaphthene Sublimation Tests |
| 5.3.5 Describe any Downstream Rakes or Probes used. Reason for Use | None |

5.4 Surface Flow Visualisation

- | | |
|---|--------------------------|
| 5.4.1 Indicate Method Used to Determine | |
| - streamline pattern | Oil flows |
| - boundary-layer transition | Acenaphthene Sublimation |

- 5.4.2 Accuracy of Method N/A

5.5 Skin Friction Measurements

- | | |
|---|-----|
| 5.5.1 Type of Instrument | N/A |
| 5.5.2 Geometry and Accuracy of Instrument | N/A |
| 5.5.3 Locations Where Probe Used | N/A |

- 5.6 Simulation of Exhaust Jet No
- 5.6.1 Describe Ducting of Air N/A
- 5.7 Additional Remarks Nil

6 Data

6.1 Accuracy

- 6.1.1 Pressure Coefficients $C_p = \pm 0.002$
- 6.1.2 Aerodynamic Coefficients $C_L \pm 0.002, C_D \pm 0.0002$ (at low C_L)
- 6.1.3 Boundary Layer and Wake Quantities N/A
- 6.1.4 Repeatability Not specifically checked in this test but generally consistent with 6.1.1, 6.1.2
- 6.1.5 Additional Remarks Nil

6.2 Wall Interference Corrections

- 6.2.1 Solid and Wake Blockage. Give Procedures and Equations Solid, but not wake, blockage corrections have been applied. See 6.2.2 below. Internal ARA Memo
- 6.2.2 Give Blockage Factors as Functions of Mach Number
- | | |
|------------|----------------------|
| $M = 0.85$ | $\Delta M = 0$ |
| $M = 0.87$ | $\Delta M = -0.0003$ |
| $M = 0.90$ | $\Delta M = -0.0010$ |
- 6.2.3 Upwash, Streamline Curvature and Lift Interference. Give Procedure and Equation Working section flow angle and streamline curvature effects on C_m were determined by testing the model both erect and inverted. See Table 9.5
- 6.2.4 Give Lift Interference Parameters as Function of Mach Number Wall constraint is allowed for by correcting incidence $\Delta \alpha^\circ = -0.21 C_L$
- 6.2.5 Reference on Wall-Interference Correction Internal ARA Memo
- 6.2.6 Additional Remarks Blockage buoyancy correction given in Table 9.6

6.3 Data Presentation

- 6.3.1 Aerodynamic Coefficient C_L, C_m, C_D values are given in Table 9.4
- 6.3.2 Surface Pressure Coefficients Table 9.7 and Figure 9.4
- 6.3.3 Flow Conditions for
- aerodynamic coefficient data See Table 9.4
 - pressure data See Table 9.4
- 6.3.4 Boundary Layer and/or Wake Data None
- 6.3.5 Flow Conditions for Boundary Layer and/or Wake Data N/A
- 6.3.6 Wall Interference Corrections Included? Wall interference corrections have been applied to the data presented and the corrections themselves are detailed in 6.2
- 6.3.7 Aeroelastic Corrections Included? No
- 6.3.8 Other Corrections The overall drag measurements have been corrected for the force acting on the fuselage base, ie $\Delta C_D = C_p (\text{Base}) \times \frac{(\text{Base area})}{\text{Ref area}} \cos \alpha$
- 6.3.9 Additional Remarks Nil
- 6.4 Were Tests Carried out in Different Facilities on the Current Model? If so, What Facilities? Are Data Included in Present Data Base? No

7 References

- 1) Haines A B The centre-line Mach-number distributions and auxiliary suction requirements
 Jones J C M for the ARA 9ft x 8ft transonic wind tunnel.
 ARC R&M 3140, 1960
- 2) Hills R Design and operational problems of the electrically driven transonic wind
 tunnel.
 Journal of the Royal Aero Society, Vol 62, page 12, 1958

8 List of Symbols

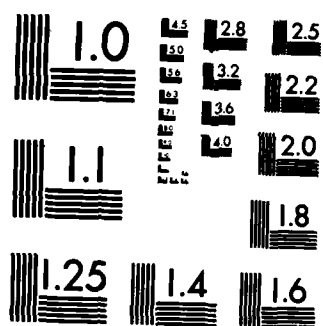
c	Local chord
$\bar{c}$	Standard mean chord
$\bar{c}$	Aerodynamic mean chord
C_p	Pressure coefficient
C_D	Drag coefficient D/qS
C_L	Lift coefficient L/qS
C_m	Pitching moment coefficient $m/qS\bar{c}$
D	Drag
L	Lift
m	Pitching moment
M	Mach number
q	Dynamic pressure
R_c	Reynolds number
S	Wing area
x	Chordwise distance from local leading edge in streamwise direction
y	Spanwise distance from origin of wing axis system (see Figure 9.1)
z	Wing ordinate normal to xy-plane
α	Angle of attack
η	Ratio of spanwise distance from origin of wing axis system to semispan, ETA GROSS

EXPERIMENTAL DATA BASE FOR COMPUTERS PROGRAM ASSESSMENT 2/2
ADDENDUM REPORT O. (U) ADVISORY GROUP FOR AEROSPACE
RESEARCH AND DEVELOPMENT NEUILLY. JUL 84

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[illegible]

TABLE 9.1 M86 WING GEOMETRY

Y-238.2111	CHORD-304.1572	UPPER SURFACE	ZC	0.00000 0.002708 0.004410 0.005127 0.005844 0.006561 0.007278 0.007995 0.008712 0.009429 0.010146 0.010863 0.011580 0.012297 0.013014 0.013731 0.014448 0.015165 0.015882 0.016599 0.017316 0.018033 0.018750 0.019467 0.020184 0.020901 0.021618 0.022335 0.023052 0.023769 0.024486 0.025203 0.025920 0.026637 0.027354 0.028071 0.028788 0.029505 0.030222 0.030939 0.031656 0.032373 0.033090 0.033807 0.034524 0.035241 0.035958 0.036675 0.037392 0.038109 0.038826 0.039543 0.040260 0.040977 0.041694 0.042411 0.043128 0.043845 0.044562 0.045279 0.045996 0.046713 0.047430 0.048147 0.048864 0.049581 0.050298 0.051015 0.051732 0.052449 0.053166 0.053883 0.054600 0.055317 0.056034 0.056751 0.057468 0.058185 0.058902 0.059619 0.060336 0.061053 0.061770 0.062487 0.063204 0.063921 0.064638 0.065355 0.066072 0.066789 0.067506 0.068223 0.068940 0.069657 0.070374 0.071091 0.071808 0.072525 0.073242 0.073959 0.074676 0.075393 0.076110 0.076827 0.077544 0.078261 0.078978 0.079695 0.080412 0.081129 0.081846 0.082563 0.083280 0.083997 0.084714 0.085431 0.086148 0.086865 0.087582 0.088299 0.089016 0.089733 0.090450 0.091167 0.091884 0.092601 0.093318 0.094035 0.094752 0.095469 0.096186 0.096903 0.097620 0.098337 0.099054 0.099771 0.100488 0.101205 0.101922 0.102639 0.103356 0.104073 0.104790 0.105507 0.106224 0.106941 0.107658 0.108375 0.109092 0.109809 0.110526 0.111243 0.111960 0.112677 0.113394 0.114111 0.114828 0.115545 0.116262 0.116979 0.117696 0.118413 0.119130 0.119847 0.120564 0.121281 0.122000 0.122717 0.123434 0.124151 0.124868 0.125585 0.126302 0.127019 0.127736 0.128453 0.129170 0.129887 0.130604 0.131321 0.132038 0.132755 0.133472 0.134189 0.134906 0.135623 0.136340 0.137057 0.137774 0.138491 0.139208 0.139925 0.140642 0.141359 0.142076 0.142793 0.143510 0.144227 0.144944 0.145661 0.146378 0.147095 0.147812 0.148529 0.149246 0.149963 0.150680 0.151397 0.152114 0.152831 0.153548 0.154265 0.154982 0.155699 0.156416 0.157133 0.157850 0.158567 0.159284 0.160001 0.160718 0.161435 0.162152 0.162869 0.163586 0.164303 0.165020 0.165737 0.166454 0.167171 0.167888 0.168605 0.169322 0.170039 0.170756 0.171473 0.172190 0.172907 0.173624 0.174341 0.175058 0.175775 0.176492 0.177209 0.177926 0.178643 0.179360 0.180077 0.180794 0.181511 0.182228 0.182945 0.183662 0.184379 0.185096 0.185813 0.186530 0.187247 0.187964 0.188681 0.189398 0.190115 0.190832 0.191549 0.192266 0.192983 0.193700 0.194417 0.195134 0.195851 0.196568 0.197285 0.198002 0.198719 0.199436 0.200153 0.200870 0.201587 0.202304 0.203021 0.203738 0.204455 0.205172 0.205889 0.206606 0.207323 0.208040 0.208757 0.209474 0.210191 0.210908 0.211625 0.212342 0.213059 0.213776 0.214493 0.215210 0.215927 0.216644 0.217361 0.218078 0.218795 0.219512 0.220229 0.220946 0.221663 0.222380 0.223097 0.223814 0.224531 0.225248 0.225965 0.226682 0.227399 0.228116 0.228833 0.229550 0.230267 0.230984 0.231701 0.232418 0.233135 0.233852 0.234569 0.235286 0.236003 0.236720 0.237437 0.238154 0.238871 0.239588 0.240305 0.241022 0.241739 0.242456 0.243173 0.243890 0.244607 0.245324 0.246041 0.246758 0.247475 0.248192 0.248909 0.249626 0.250343 0.251060 0.251777 0.252494 0.253211 0.253928 0.254645 0.255362 0.256079 0.256796 0.257513 0.258230 0.258947 0.259664 0.260381 0.261098 0.261815 0.262532 0.263249 0.263966 0.264683 0.265400 0.266117 0.266834 0.267551 0.268268 0.268985 0.269702 0.270419 0.271136 0.271853 0.272570 0.273287 0.274004 0.274721 0.275438 0.276155 0.276872 0.277589 0.278306 0.279023 0.279740 0.280457 0.281174 0.281891 0.282608 0.283325 0.284042 0.284759 0.285476 0.286193 0.286910 0.287627 0.288344 0.289061 0.289778 0.290495 0.291212 0.291929 0.292646 0.293363 0.294080 0.294797 0.295514 0.296231 0.296948 0.297665 0.298382 0.299099 0.299816 0.300533 0.301250 0.301967 0.302684 0.303401 0.304118 0.304835 0.305552 0.306269 0.306986 0.307703 0.308420 0.309137 0.309854 0.310571 0.311288 0.312005 0.312722 0.313439 0.314156 0.314873 0.315590 0.316307 0.317024 0.317741 0.318458 0.319175 0.319892 0.320609 0.321326 0.322043 0.322760 0.323477 0.324194 0.324911 0.325628 0.326345 0.327062 0.327779 0.328496 0.329213 0.329930 0.330647 0.331364 0.332081 0.332798 0.333515 0.334232 0.334949 0.335666 0.336383 0.337100 0.337817 0.338534 0.339251 0.339968 0.340685 0.341402 0.342119 0.342836 0.343553 0.344270 0.344987 0.345704 0.346421 0.347138 0.347855 0.348572 0.349289 0.350006 0.350723 0.351440 0.352157 0.352874 0.353591 0.354308 0.355025 0.355742 0.356459 0.357176 0.357893 0.358610 0.359327 0.360044 0.360761 0.361478 0.362195 0.362912 0.363629 0.364346 0.365063 0.365780 0.366497 0.367214 0.367931 0.368648 0.369365 0.370082 0.370799 0.371516 0.372233 0.372950 0.373667 0.374384 0.375101 0.375818 0.376535 0.377252 0.377969 0.378686 0.379403 0.380120 0.380837 0.381554 0.382271 0.382988 0.383705 0.384422 0.385139 0.385856 0.386573 0.387290 0.388007 0.388724 0.389441 0.390158 0.390875 0.391592 0.392309 0.393026 0.393743 0.394460 0.395177 0.395894 0.396611 0.397328 0.398045 0.398762 0.399479 0.400196 0.400913 0.401630 0.402347 0.403064 0.403781 0.404498 0.405215 0.405932 0.406649 0.407366 0.408083 0.408800 0.409517 0.410234 0.410951 0.411668 0.412385 0.413102 0.413819 0.414536 0.415253 0.415970 0.416687 0.417404 0.418121 0.418838 0.419555 0.420272 0.420989 0.421706 0.422423 0.423140 0.423857 0.424574 0.425291 0.426008 0.426725 0.427442 0.428159 0.428876 0.429593 0.430310 0.431027 0.431744 0.432461 0.433178 0.433895 0.434612 0.435329 0.436046 0.436763 0.437480 0.438197 0.438914 0.439631 0.440348 0.441065 0.441782 0.442499 0.443216 0.443933 0.444650 0.445367 0.446084 0.446801 0.447518 0.448235 0.448952 0.449669 0.450386 0.451103 0.451820 0.452537 0.453254 0.453971 0.454688 0.455405 0.456122 0.456839 0.457556 0.458273 0.458990 0.459707 0.460424 0.461141 0.461858 0.462575 0.463292 0.464009 0.464726 0.465443 0.466160 0.466877 0.467594 0.468311 0.469028 0.469745 0.470462 0.471179 0.471896 0.472613 0.473330 0.474047 0.474764 0.475481 0.476198 0.476915 0.477632 0.478349 0.479066 0.479783 0.480500 0.481217 0.481934 0.482651 0.483368 0.484085 0.484802 0.485519 0.486236 0.486953 0.487670 0.488387 0.489104 0.489821 0.490538 0.491255 0.491972 0.492689 0.493406 0.494123 0.494840 0.495557 0.496274 0.496991 0.497708 0.498425 0.499142 0.499859 0.500576 0.501293 0.502010 0.502727 0.503444 0.504161 0.504878 0.505595 0.506312 0.507029 0.507746 0.508463 0.509180 0.509897 0.510614 0.511331 0.512048 0.512765 0.513482 0.514199 0.514916 0.515633 0.516350 0.517067 0.517784 0.518501 0.519218 0.519935 0.520652 0.521369 0.522086 0.522803 0.523520 0.524237 0.524954 0.525671 0.526388 0.527105 0.527822 0.528539 0.529256 0.529973 0.530690 0.531407 0.532124 0.532841 0.533558 0.534275 0.534992 0.535709 0.536426 0.537143 0.537860 0.538577 0.539294 0.540011 0.540728 0.541445 0.542162 0.542879 0.543596 0.544313 0.545030 0.545747 0.546464 0.547181 0.547898 0.548615 0.549332 0.550049 0.550766 0.551483 0.552200 0.552917 0.553634 0.554351 0.555068 0.555785 0.556502 0.557219 0.557936 0.558653 0.559370 0.560087 0.560804 0.561521 0.562238 0.562955 0.563672 0.564389 0.565106 0.565823 0.566540 0.567257 0.567974 0.568691 0.569408 0.570125 0.570842 0.571559 0.572276 0.572993 0.573710 0.574427 0.575144 0.575861 0.576578 0.577295 0.578012 0.578729 0.579446 0.580163 0.580880 0.581597 0.582314 0.583031 0.583748 0.584465 0.585182 0.585899 0.586616 0.587333 0.588050 0.588767 0.589484 0.590201 0.590918 0.591635 0.592352 0.593069 0.593786 0.594503 0.595220 0.595937 0.596654 0.597371 0.598088 0.598805 0.599522 0.600239 0.600956 0.601673 0.602390 0.603107 0.603824 0.604541 0.605258 0.605975 0.606692 0.607409 0.608126 0.608843 0.609560 0.610277 0.610994 0.611711 0.612428 0.613145 0.613862 0.614579 0.615296 0.616013 0.616730 0.617447 0.618164 0.618881 0.619598 0.620315 0.621032 0.621749 0.622466 0.623183 0.623900 0.624617 0.625334 0.626051 0.626768 0.627485 0.628202 0.628919 0.629636 0.630353 0.631070 0.631787 0.632504 0.633221 0.633938 0.634655 0.635372 0.636089 0.636806 0.637523 0.638240 0.638957 0.639674 0.640391 0.641108 0.641825 0.642542 0.643259 0.643976 0.644693 0.645410 0.646127 0.646844 0.647561 0.648278 0.648995 0.649712 0.650429 0.651146 0.651863 0.652580 0.653297 0.654014 0.654731 0.655448 0.656165 0.656882 0.657599 0.658316 0.659033 0.659750 0.660467 0.661184 0.661901 0.662618 0.663335 0.664052 0.664769 0.665486 0.666203 0.666920 0.667637 0.668354 0.669071 0.669788 0.670505 0.671222 0.671939 0.672656 0.673373 0.674090 0.674807 0.675524 0.676241 0.676958 0.677675 0.678392 0.679109 0.679826 0.680543 0.681260 0.681977 0.682694 0.683411 0.684128 0.684845 0.685562 0.686279 0.686996 0.687713 0.688430 0.689147 0.689864 0.690581 0.691298 0.692015 0.692732 0.693449 0.694166 0.694883 0.695600 0.696317 0.697034 0.697751 0.698468 0.699185 0.699902 0.700619 0.701336 0.702053 0.702770 0.703487 0.704204 0.704921 0.705638 0.706355 0.707072 0.707789 0.708506 0.709223 0.709940 0.710657 0.711374 0.712091 0.712808 0.713525 0.714242 0.714959 0.715676 0.716393 0.717110 0.717827 0.718544 0.719261 0.720000 0.720717 0.721434 0.722151 0.722868 0.723585 0.724302 0.725019 0.725736 0.726453 0.727170 0.727887 0.728604 0.729321 0.730038 0.730755 0.731472 0.732189 0.732906 0.733623 0.734340 0.735057 0.735774 0.736491 0.737208 0.737925 0.738642 0.739359 0.740076 0.740793 0.741510 0.742227 0.742944 0.743661 0.744378 0.745095 0.745812 0.746529 0.747246 0.747963 0.748680 0.749397 0.750114 0.750831 0.751548 0.752265 0.752982 0.753699 0.754416 0.755133 0.755850 0.756567 0.757284 0.758001 0.758718 0.759435 0.760152 0.760869 0.761586 0.762303 0.763020 0.763737 0.764454 0.765171 0.765888 0.766605 0.767322 0.768039 0.768756 0.769473 0.770190 0.770907 0.771624 0.772341 0.773058 0.773775 0.774492 0.775209 0.775926 0.776643 0.777360 0.778077 0.778794 0.779511 0.780228 0.780945 0.781662 0.782379 0.783096 0.783813 0.784530 0.785247 0.785964 0.786681 0.787398 0.788115 0.788832 0.789549 0.790266 0.790983 0.791700 0.792417 0.793134 0.793851 0.794568 0.795285 0.796002 0.796719 0.797436 0.798153 0.798870 0.799587 0.800304 0.801021 0.801738 0.802455 0.803172 0.803889 0.804606 0.805323 0.806040 0.806757 0.807474 0.808191 0.808908 0.809625 0.810342 0.811059 0.811776 0.812493 0.813210 0.813927 0.814644 0.815361 0.816078 0.816795 0.817512 0.818229 0.818946 0.819663 0.820380 0.821097 0.821814 0.822531 0.823248 0.823965 0.824682 0.825399 0.826116 0.826833 0.827550 0.828267 0.828984 0.829701 0.830418 0.831135 0.831852 0.832569 0.833286 0.834003 0.834720 0.835437 0.836154 0.836871 0.837588 0.838305 0.839022 0.839739 0.840456 0.841173 0.841890 0.842607 0.843324 0.844041 0.844758 0.845475 0.846192 0.846909 0.847626 0.848343 0.849060 0.849777 0.850494 0.851211 0.851928 0.852645 0.853362 0.854079 0.854796 0.855513 0.856230 0.856947 0.857664 0.858381 0.859098 0.859815 0.860532 0.861249 0.861966 0.862683 0.863400 0.864117 0.864834 0.865551 0.866268 0.866985 0.867702 0.868419 0.869136 0.869853 0.870570 0.871287 0.872004 0.872721 0.873438 0.874155 0.874872 0.875589 0.876306 0.877023 0.877740 0.878457 0.879174 0.879891 0.880608 0.881325 0.882042 0.
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Xm	Rm	Am ²
0	0	0
0.0508	0.0249	0.00195
0.1016	0.0462	0.00671
0.1524	0.0642	0.01593
0.2032	0.0791	0.02448
0.2540	0.0913	0.03276
0.3048	0.1009	0.04019
0.3556	0.1084	0.04644
0.4064	0.1139	0.05138
0.4572	0.1179	0.05502
0.508	0.1204	0.05748
0.5588	0.1219	0.05894
0.6096	0.1227	0.05965
0.6604	0.1229	0.05988
0.6985	0.1229	0.05990
0.9159	0.1229	0.05990
↓	0.1229	↓
0.9906	0.1229	0.06426
1.016	0.1229	0.06601
1.0668	0.1229	0.06950
1.1176	0.1229	0.07172
1.1684	0.1229	0.07224
1.2192	0.1229	0.07152
1.27	0.1229	0.06700
1.3209	0.1229	0.06197
↓	0.1229	↓
1.4986	0.1229	0.05990
1.5494	0.1223	0.05931
1.6002	0.1205	0.05754
1.651	0.1175	0.05466
1.7018	0.1133	0.05075
1.7526	0.1078	0.04594
1.8034	0.1011	0.04037
1.8542	0.0933	0.03425
1.9050	0.0842	0.02781
1.9558	0.0739	0.02130
2.0020	0.0635	0.01558

x = Distance from nose

A = Cross sectional area including wing

R = Body half width

TABLE 9.2 M86 CROSS SECTIONAL AREA DEVELOPMENT

Wing Upper Surface

24 pressure tappings were installed on the upper surface at each of the 7 spanwise pressure measuring stations. These tappings were located at:

x/c =	0.010	0.025	0.040	0.060	0.080	0.100	0.120
	0.150	0.200	0.250	0.300	0.350	0.400	0.450
	0.500	0.550	0.600	0.650	0.700	0.750	0.825
	0.900	0.940	0.980				

Wing Lower Surface

The pressure tappings on the lower surface at each of the 7 spanwise measuring stations varied in number, they were located at:

Station No	3-7	3-7	4,6,7	3-7	1-7	1-7	6,7
x/c	0	0.025	0.05	0.075	0.100	0.150	0.200
Station No	1-7	2,6,7	2,4-7	1-7	2,4-6	2,4-6	1-4,7
x/c	0.250	0.300	0.350	0.400	0.450	0.500	0.550
Station No	2,5,6	1-4,6-7	5,6	1-4,6-7	6	1-7	1-7
x/c	0.600	0.700	0.780	0.860	0.940	0.980	1.000
Station No	1	2	3	4	5	6	7
Station ETA	0.24	0.40	0.52	0.64	0.74	0.83	0.89
No of tappings	9	14	12	16	14	20	16

Unserviceable Pressure Ports

The following pressure ports were unserviceable for these tests:

Upper Surface ETA = 0.74 x/c = 0.65
 ETA = 0.83 x/c = 0.20

Lower Surface ETA = 0.83 x/c = 0

Total number of upper surface ports	168
Total number of lower surface ports	101
	<u>269</u>
Total number of unserviceable ports	10
	<u>259</u>

TABLE 9.3 LOCATION OF M86 WING STATIC PRESSURE PORTS

Mach Number	α°	C_L	C_D	C_m	Transition * Band
0.850	4.203	0.364	0.03677	0.0603	AFT
0.851	5.263	0.460	0.04605	0.0847	
0.870	4.719	0.426	0.04273	0.0681	
0.869	5.007	0.454	0.04562	0.0734	
0.870	5.271	0.480	0.04852	0.0778	
0.900	4.181	0.404	0.04182	0.0401	
0.900	5.266	0.516	0.05547	0.0510	

* see Figure 9.4

TABLE 9.4 SUMMARY OF TEST CONDITIONS

M	0.50	0.70	0.80	0.90	0.95
$\Delta\alpha^\circ$	0.169	0.145	0.132	0.095	0.056
ΔC_m	0	0	0	0	0

TABLE 9.5 INCIDENCE AND C_m CORRECTIONS

M	0.50	0.60	0.70	0.80	0.85	0.90	0.95	1.0
ΔC_D	0	-0.0001	-0.0002	-0.0002	-0.0003	-0.0005	-0.0010	-0.0010

TABLE 9.6 BLOCKAGE BUOYANCY CORRECTIONS

[illegible]

MACH=0.670 ALPHA=4.72 CL=0.428 UPPER SURFACE CP VALUES.

[illegible]

MACH=0.870 ALPHA=4.72 CL=0.488 LOWER SURFACE CP VALUES.

ETA	0.240	0.400	0.520	0.640	0.740	0.830	0.890
0.000							
0.005							
0.010							
0.015							
0.020							
0.025							
0.030							
0.035							
0.040							
0.045							
0.050							
0.055							
0.060							
0.065							
0.070							
0.075							
0.080							
0.085							
0.090							
0.095							
0.100							
0.105							
0.110							
0.115							
0.120							
0.125							
0.130							
0.135							
0.140							
0.145							
0.150							
0.155							
0.160							
0.165							
0.170							
0.175							
0.180							
0.185							
0.190							
0.195							
0.200							
0.205							
0.210							
0.215							
0.220							
0.225							
0.230							
0.235							
0.240							
0.245							
0.250							
0.255							
0.260							
0.265							
0.270							
0.275							
0.280							
0.285							
0.290							
0.295							
0.300							
0.305							
0.310							
0.315							
0.320							
0.325							
0.330							
0.335							
0.340							
0.345							
0.350							
0.355							
0.360							
0.365							
0.370							
0.375							
0.380							
0.385							
0.390							
0.395							
0.400							

MACH=0.888 ALPHA=5.01 CL=0.454 UPPER SURFACE OF VALVES.

[illegible]

MACH=0.888 ALPHA= 5.01 CL=0.454 LOWER SURFACE CP VALUES.

[illegible]

TABLE 9.7 (contd) M86 WING PRESSURE DISTRIBUTIONS

MACH=0.900 ALPHA=4.18 CL=0.404 UPPER SURFACE CP VALUES.

ETA
Grades = 0.240 0.400 0.520 0.640 0.740 0.830 0.890

[illegible]

MACH=0.800 ALPHA=4.18 CL=0.404 LOWER SURFACE CP VALUES.

ETA
GROSS = 0.240 0.400 0.520 0.640 0.740 0.830 0.890

[illegible]

MACH=0.900 ALPHA=5.27 CL=0.516 UPPER SURFACE CP VALUES.

ETA
GROSS= 0.240 0.400 0.520 0.640 0.740 0.830 0.890

[illegible]

MACH=0.900 ALPHA=5.27 CL=0.516 LOWER SURFACE CP VALUES.

ETA
GROSS- 0.240 0.400 0.520 0.640 0.740 0.830 0.890

[illegible]

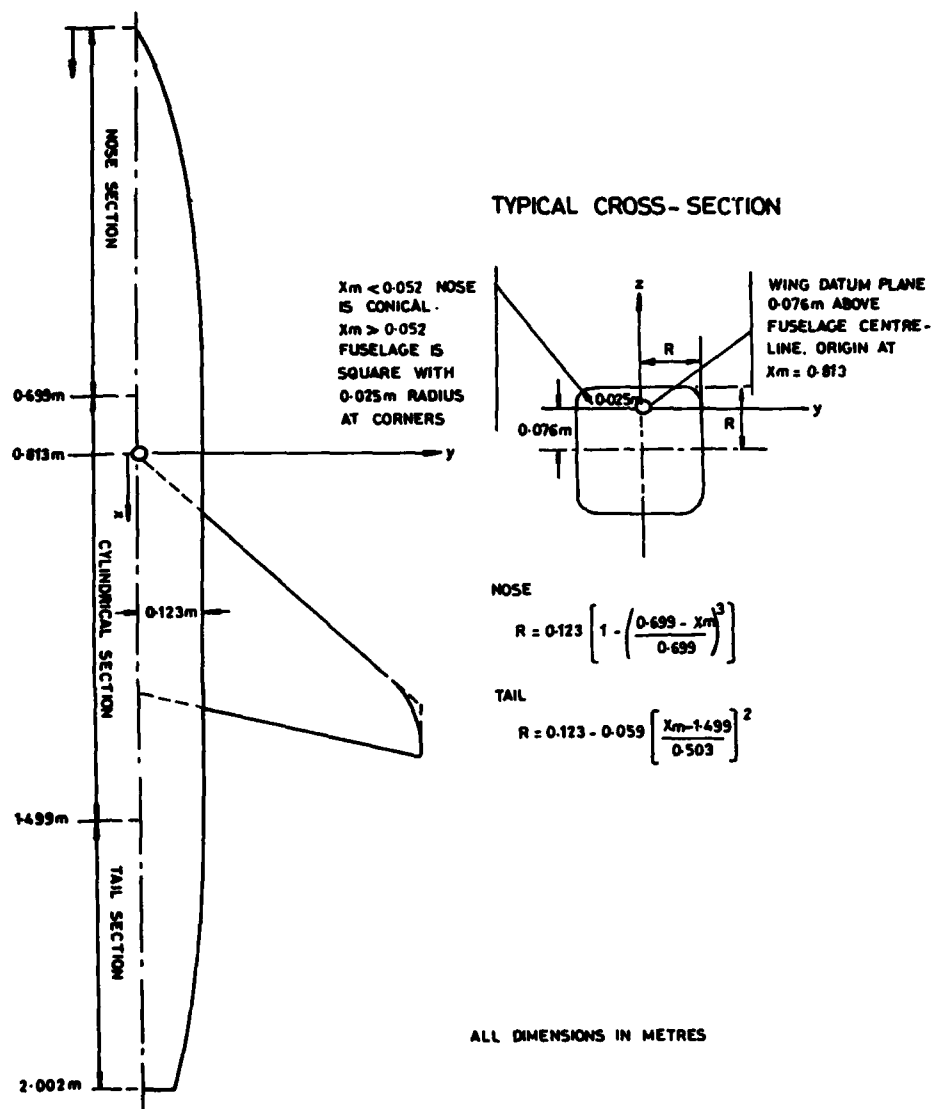


FIGURE 9.1 LAYOUT OF MODEL M86

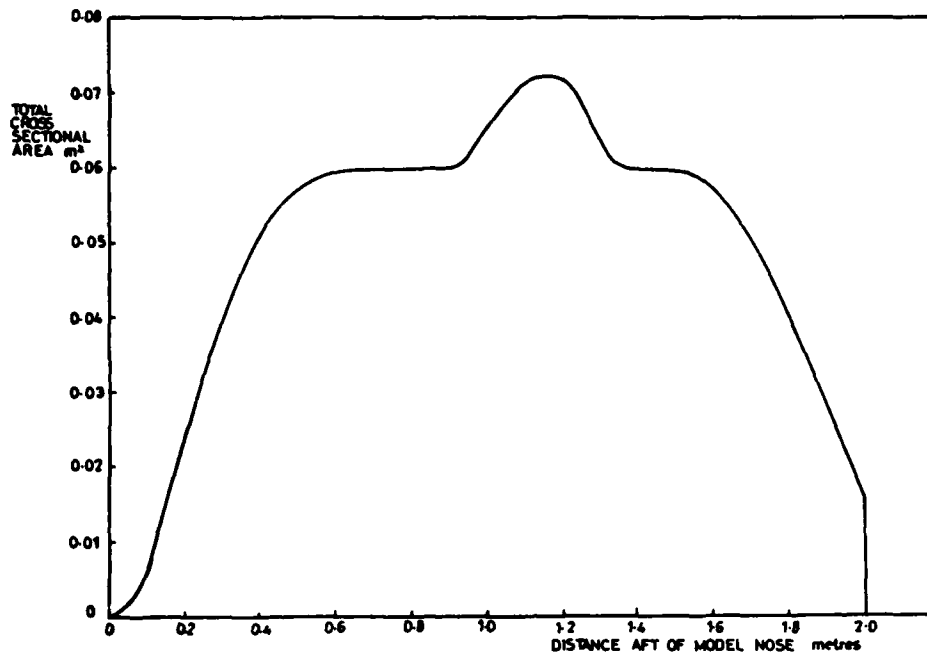


FIGURE 9.2 CROSS-SECTIONAL DEVELOPMENT

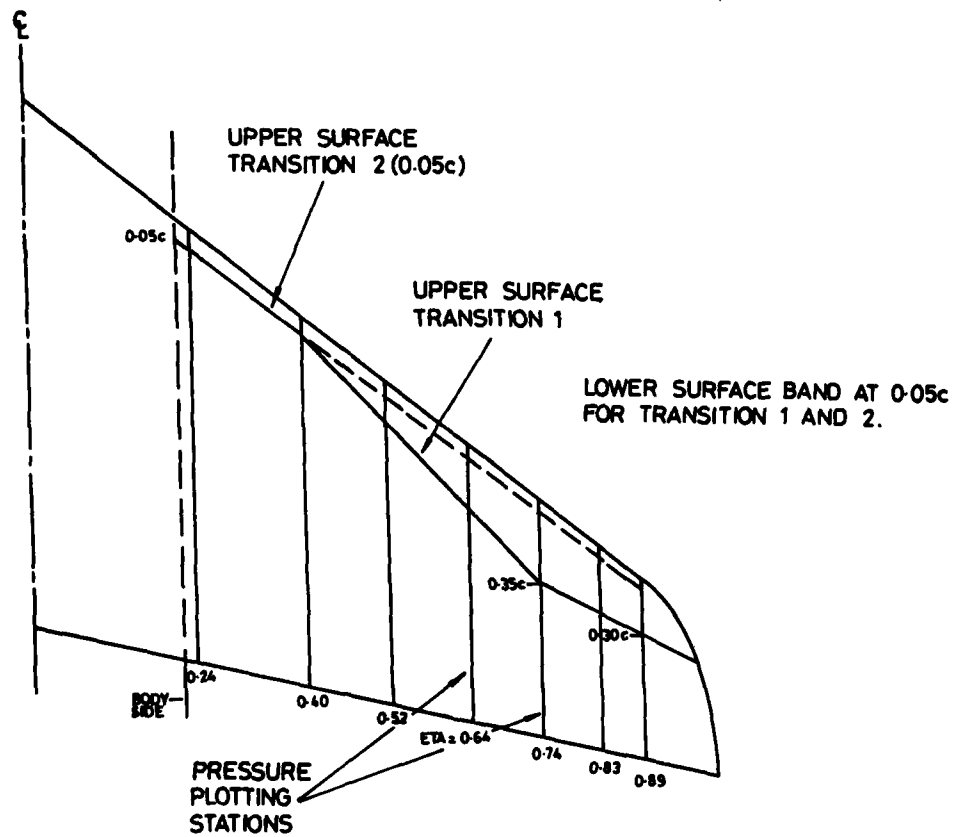


FIGURE 9.3 TRANSITION POSITION

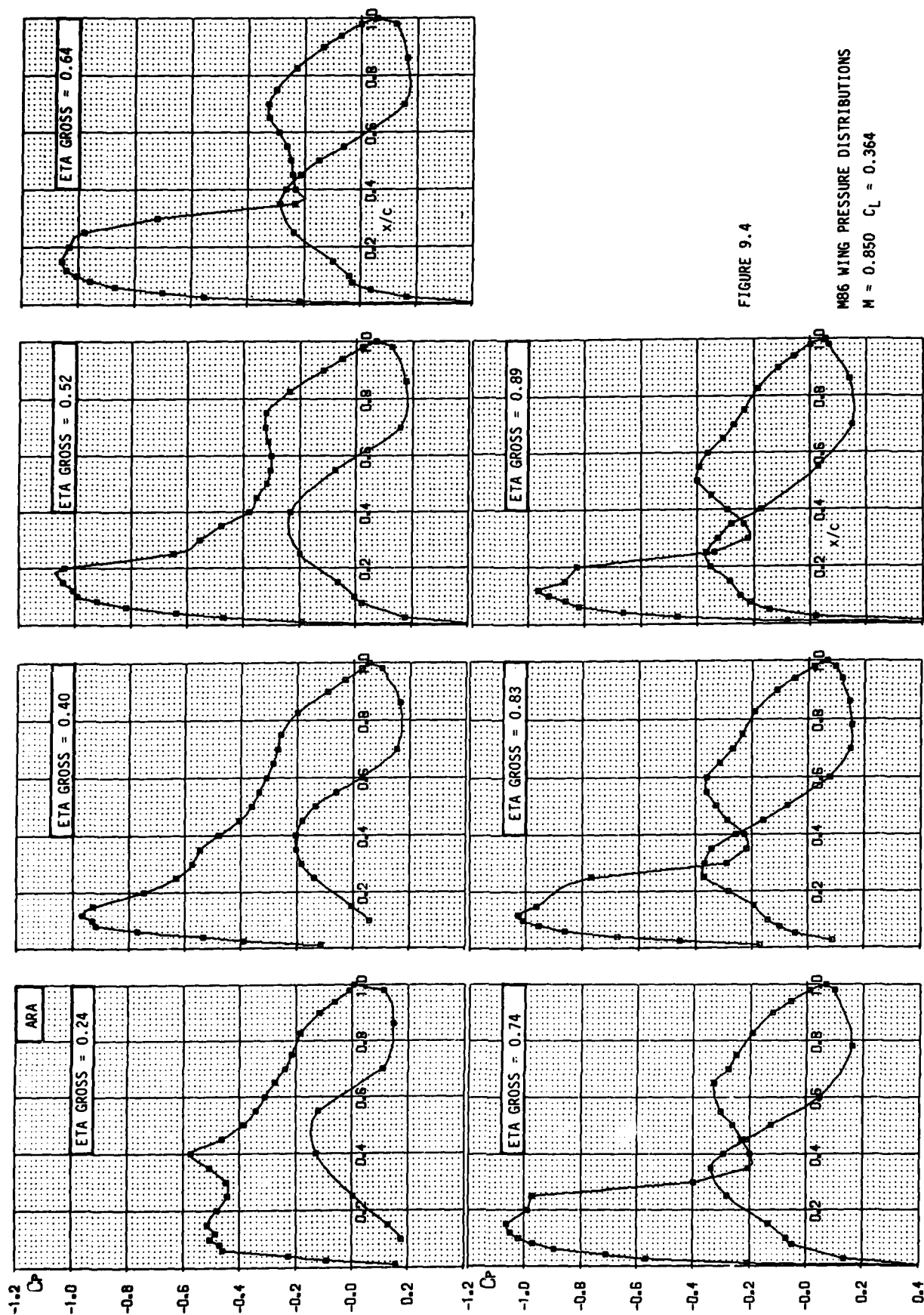


FIGURE 9.4

M86 WING PRESSURE DISTRIBUTIONS
 $M = 0.850$ $C_L = 0.364$

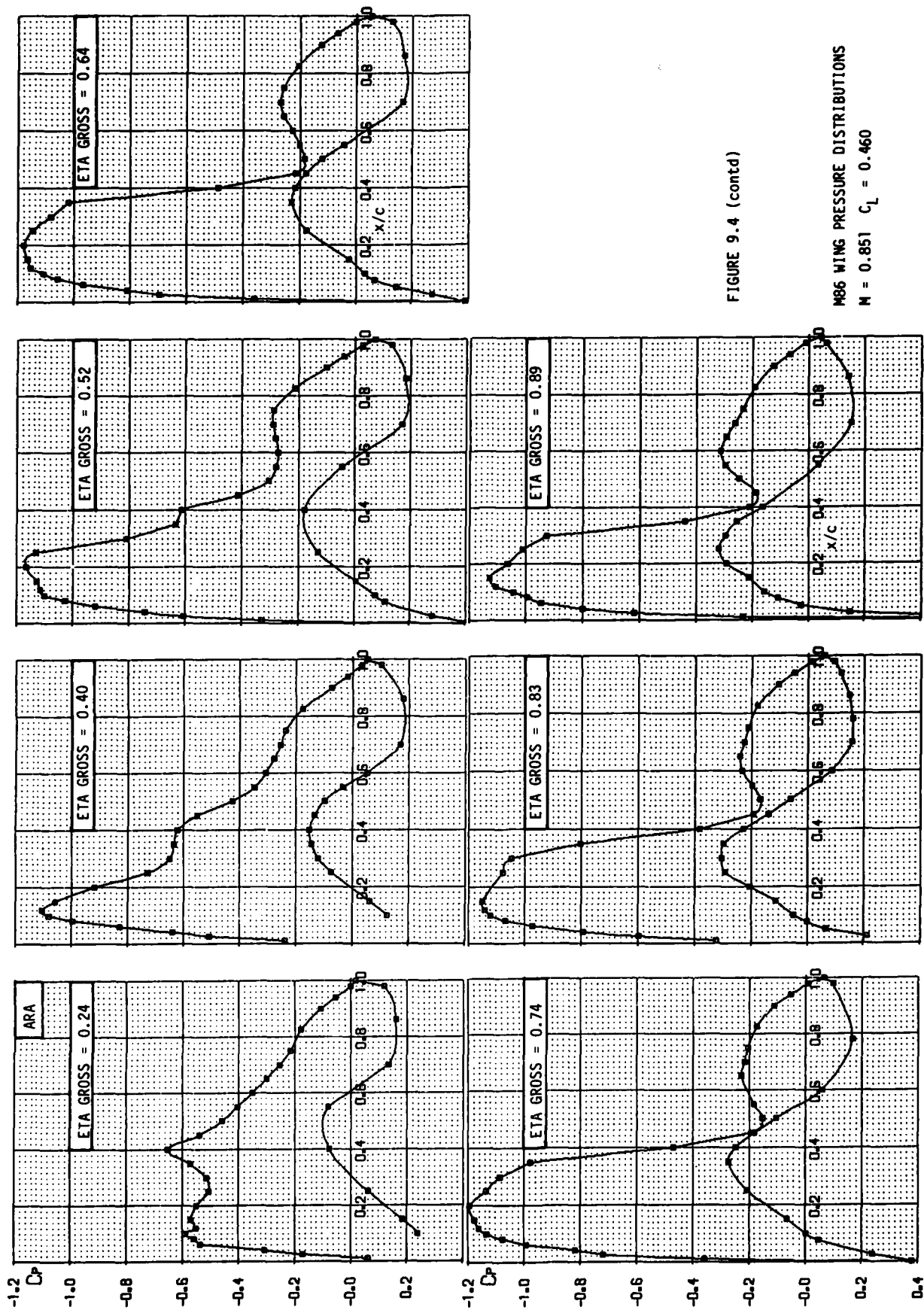


FIGURE 9.4 (contd)

M86 WING PRESSURE DISTRIBUTIONS
 $M = 0.851$ $C_L = 0.460$

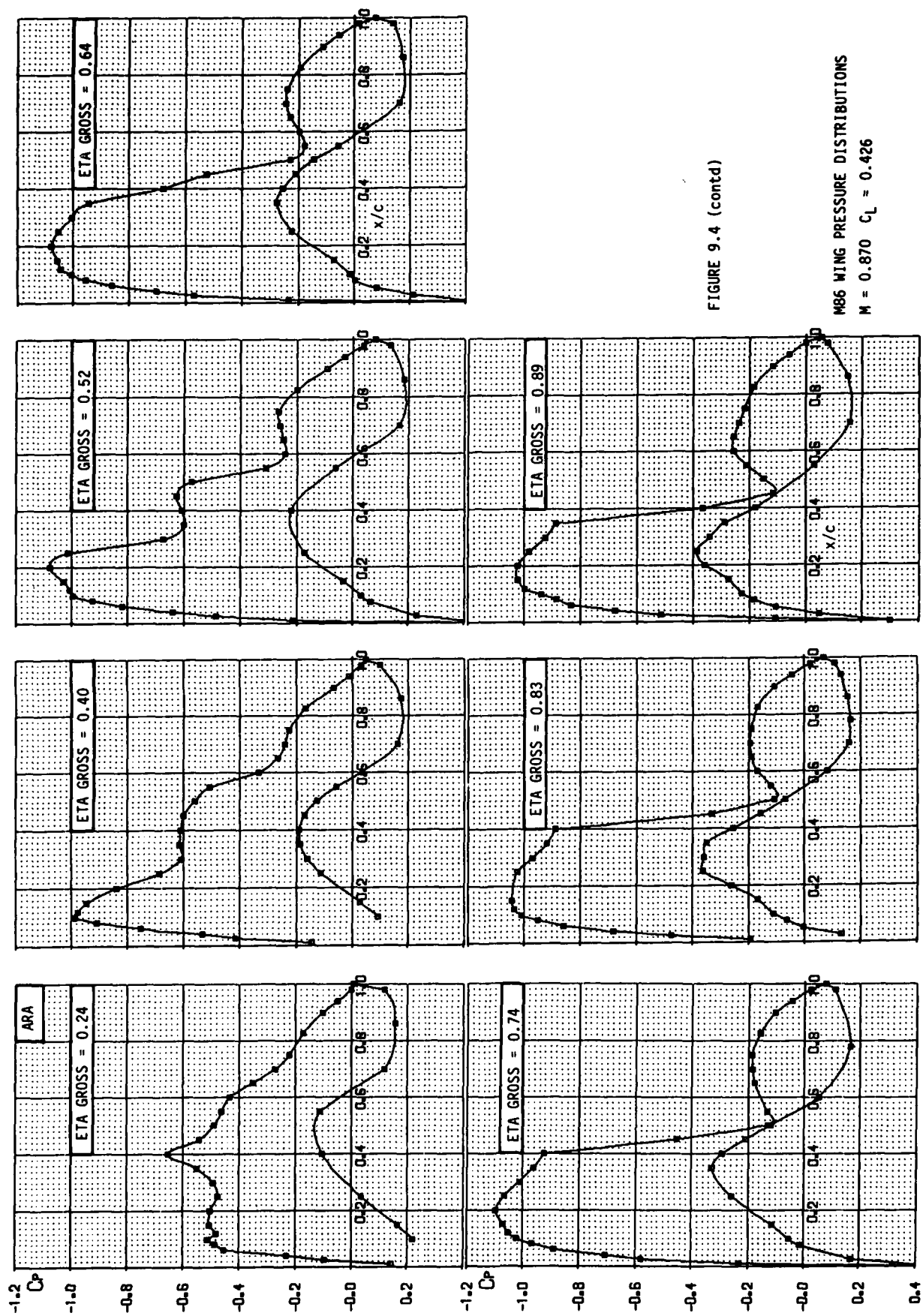


FIGURE 9.4 (contd)

M86 WING PRESSURE DISTRIBUTIONS
 $M = 0.870$ $C_L = 0.426$

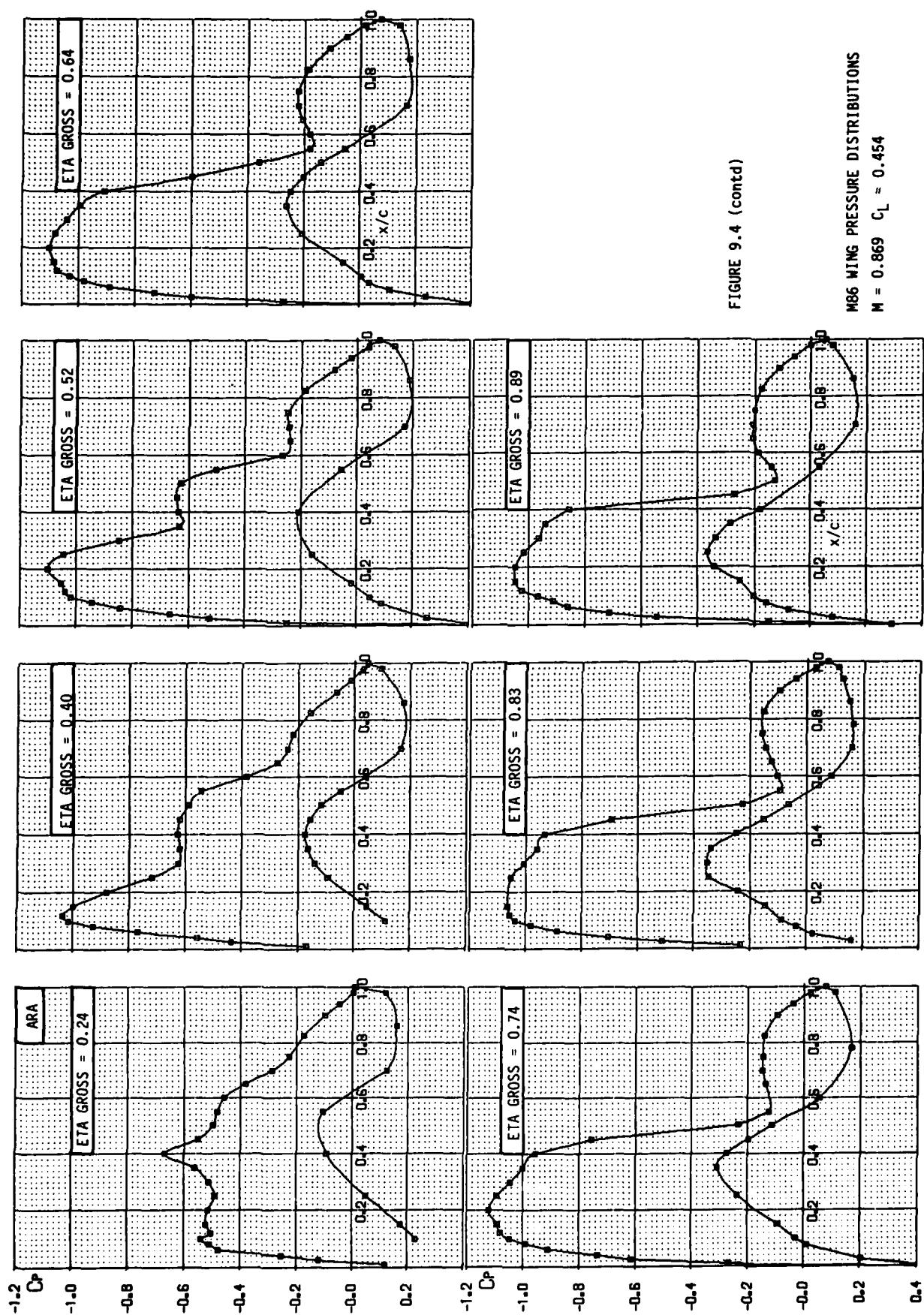


FIGURE 9.4 (contd)

MB6 WING PRESSURE DISTRIBUTIONS
 $M = 0.869$ $C_L = 0.454$

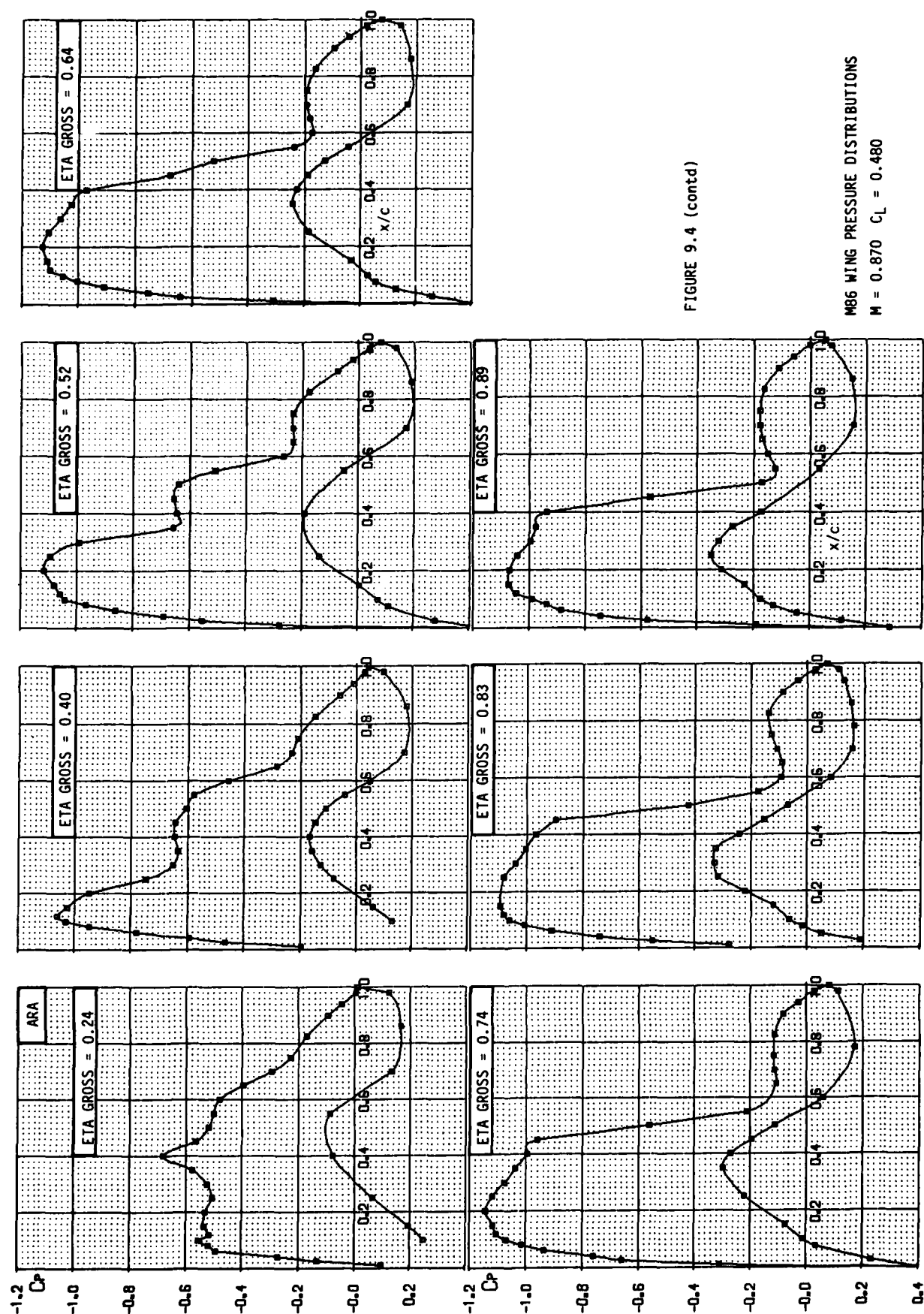


FIGURE 9.4 (contd)

MB6 WING PRESSURE DISTRIBUTIONS
 $M = 0.870$ $C_L = 0.480$

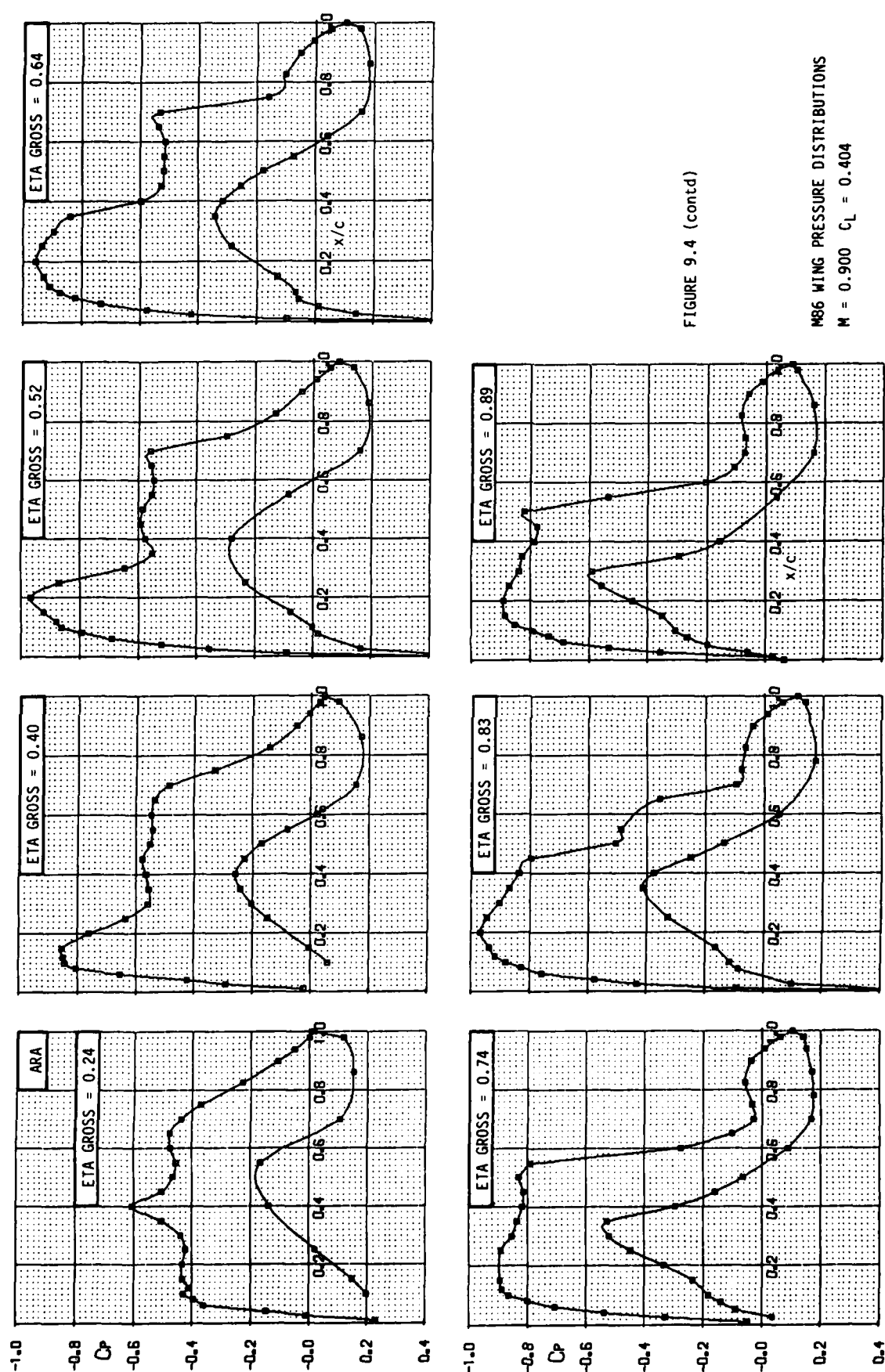
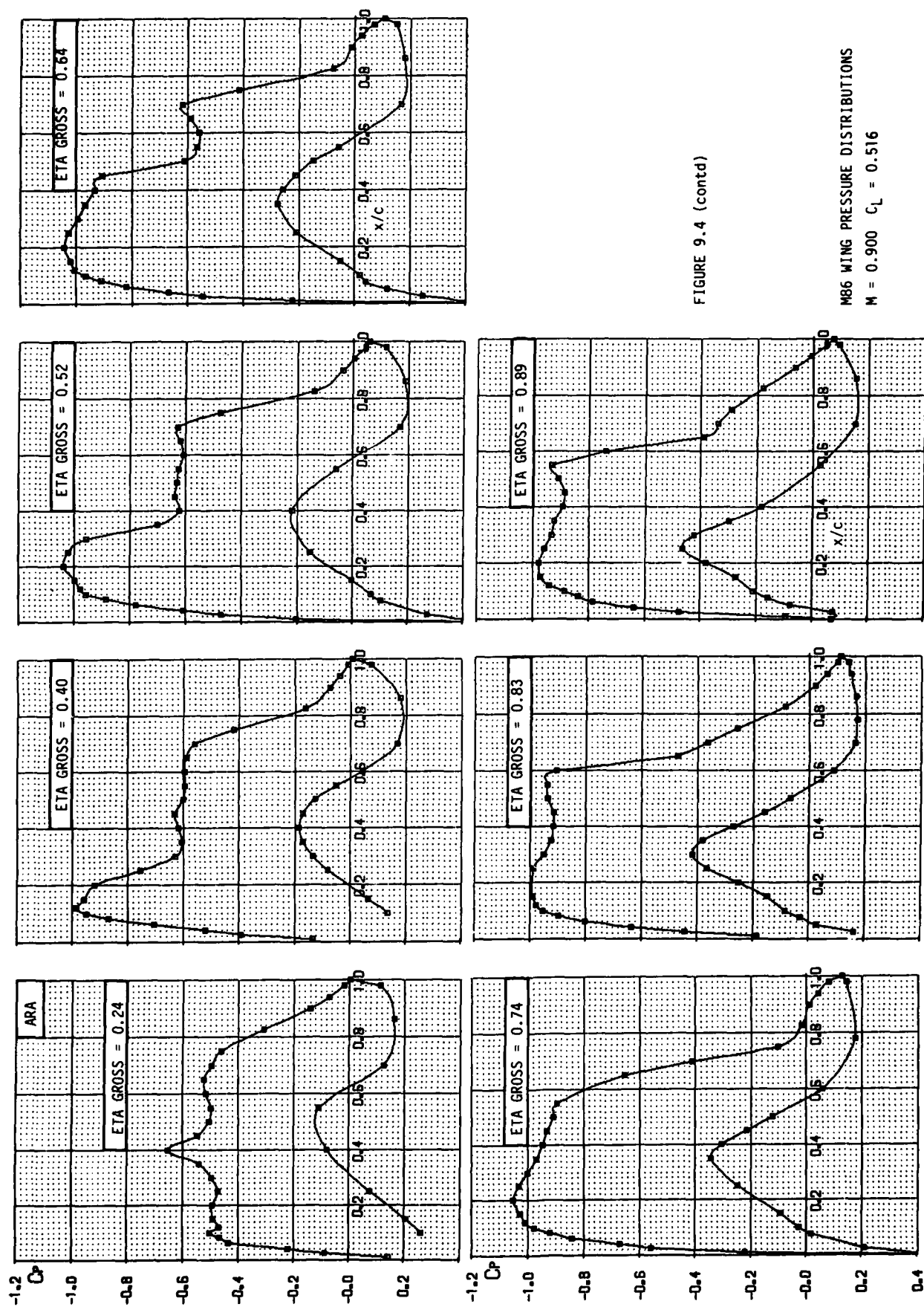


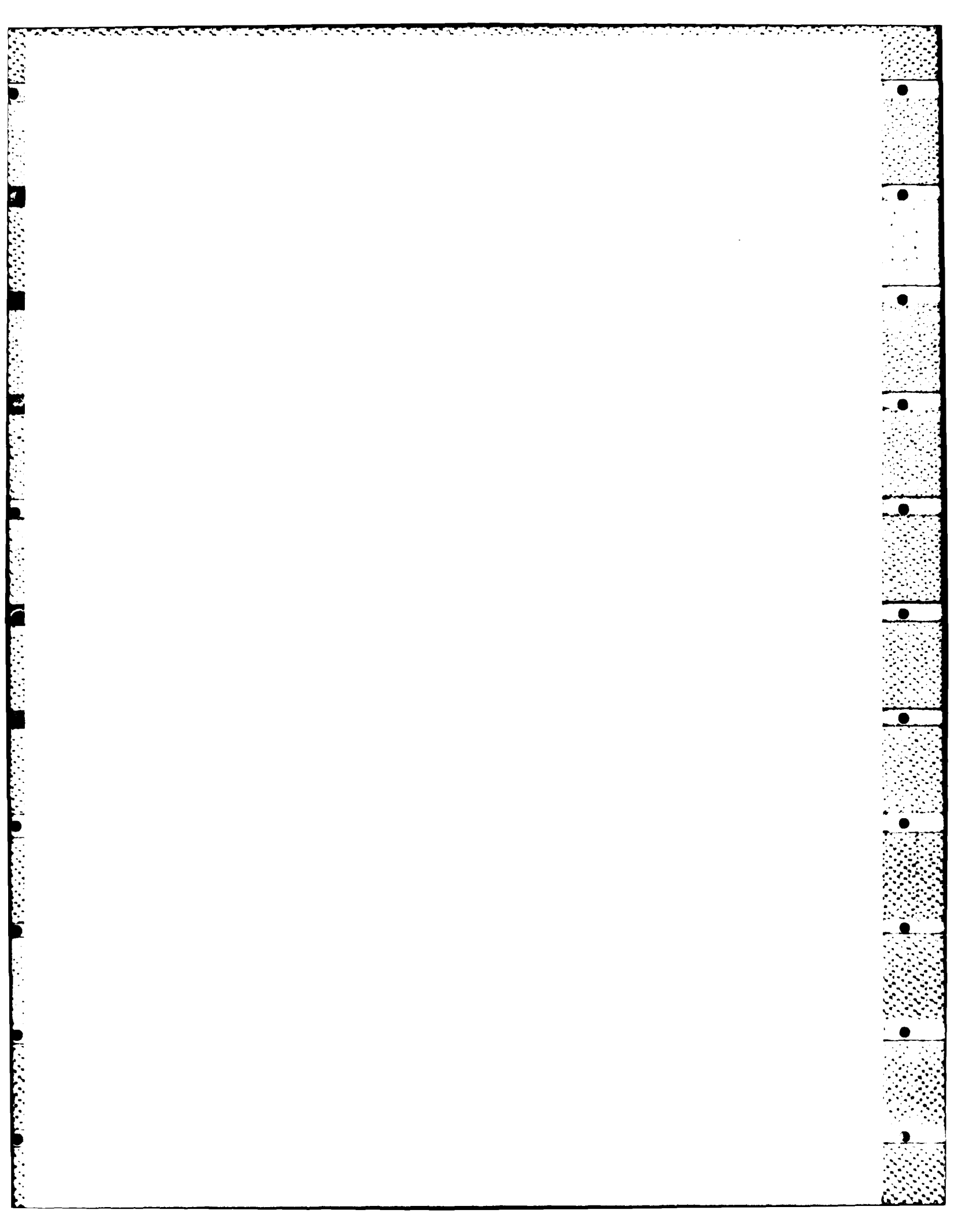
FIGURE 9.4 (contd)

MB6 WING PRESSURE DISTRIBUTIONS
 $M = 0.900$ $C_L = 0.404$

FIGURE 9.4 (contd)

M86 WING PRESSURE DISTRIBUTIONS
 $M = 0.900$ $C_L = 0.516$





10. PRESSURE DISTRIBUTION ON A SWEEP WING AIRCRAFT IN FLIGHT

by
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10.1 INTRODUCTION

The data presented here is part of a comprehensive data base developed for the flow on a swept wing aircraft under flight conditions. Only four cases among more than thirty in existence are presented, and the data concerns pressure distributions, some skin friction information and very limited boundary layer results.

The full data base contains several other types of data (including turbulence measurements), measurements taken under instationary conditions as well as particular investigations concerning drag reduction, junction flow, transition etc.

The data structure obtained during a flight test differs from tunnel results in several respects;

- ample and redundant data with elaborate checking of data validity and repeatability are required,
- forced α -M-H combinations,
- real life conditions, i.e. no wind tunnel walls, atmospheric turbulence (intensity and scale) varies with each flight and each altitude.

For the present tests the following should also be observed;

- natural transition (although some experiments were performed with transition trips and artificial roughness - not reported here),
- all data obtained are for trimmed conditions; i.e. the stabilizer/elevator has slightly different setting for each flight condition (off-trim conditions have been performed but are not reported here).

10.2 DATA SET

1. General description

- | | |
|---|--|
| 1.1 Model designation or name | Aircraft: SAAB A32A Lansen. Serial # 32209. |
| 1.2 Model type (e.g. full span wing-body, semi-span wing) | Swept wing attack aircraft: Low winged. |
| 1.3 Design requirements/conditions | Design: M = 0.9. |
| 1.4 Additional remarks | Investigation generally has clean configuration; i.e.:
- No external fuel tanks, ordnance or pods.
- Zero flap.
- Trimmed flight. |

2. Model geometry

- | | |
|------------------------------|--|
| 2.1 Wing data | See Fig. 1 and Table II.1 |
| 2.1.1 Wing planform | Swept wing with straight leading and trailing edges. |
| 2.1.2 Aspect ratio | 4.519. |
| 2.1.3 Leading-edge sweep | 38.9 deg. |
| 2.1.4 Trailing-edge sweep | 18.9 deg. |
| 2.1.5 Taper ratio | 0.330. |
| 2.1.6 Twist | None, unloaded. |
| 2.1.7 Mean aerodynamic chord | 3.140 m. |
| 2.1.8 Span or semispan | 13.00 m span. |

- | | | |
|--------|---|---|
| 2.1.9 | Number of airfoil sections used to define wing | 1 covering main wing (out to 92.9% semispan)
8 covering wing tip. (See Table II.2)
NACA 64A010 normal to 25% chord line defines main wing airfoil. (See Table II.1) |
| 2.1.10 | Spanwise location of reference section and section coordinates (Note if ordinates are design or actual measured values) | Data according to specifications on main wing, and results from templates used in the nose region at 8 spanwise locations. (See Figure 2.) See Tables III.1 and III.2 |
| 2.1.11 | Lofting procedure between reference sections | Unknown |
| 2.1.12 | Form of wing-body fillet, strakes | Fillet data: See Figure 3 |
| 2.1.13 | Form of wing tip | Wing tip data: See Table II.2 for measured coordinates. |
| 2.2 | Body data (detail description of body geometry) | See Figure 4 |
| 2.3.1 | Relative body diameter (Average body diameter at wing location divided by wing span) | ~ 0.15 |
| 2.3.2 | Relative vertical location of wing (height above or below body axis divided by average body radius at wing location) | ~ -0.7 low-wing. See Figure 1 |
| 2.3.3 | Wing setting angle | 0 deg. |
| 2.3.4 | Dihedral | 0 deg. |
| 2.4 | Cross sectional area development | See Figure 4 |
| 2.5 | Fabrication tolerances/waviness | Not known. |
| 2.6 | Additional remarks | Additional information on tail surfaces given in Figure 1. |
3. Wind tunnel
- | | | |
|-------|---|--|
| 3.1 | Designation | Flight experiment. Only appropriate numbers indicated. |
| 3.2 | Type of tunnel | - |
| 3.2.1 | - | |
| 3.2.2 | Stagnation pressure | Approx. 22 to 120 kN/m ² depending on Mach number and altitude. |
| 3.2.3 | Stagnation temperature | varies - depends on altitude (1 to 12 km) and Mach number (stall to 0.95).
T ₀ = 225-310 °K. |
| 3.3 | Test section | - |
| 3.4 | Flow field | Atmosphere; defined through meteorological information each flight. Flight outside of clouds only. Turbulence level may vary with day, time of day and altitude. |
| 3.5 | Freestream Mach number | |
| 3.5.1 | Range | Approx. 0.25 to 0.95. See Figure 5 for flight envelope. |
| 3.5.2 | Pressures used to determine Mach number (e.g., settling chamber total pressure and plenum chamber pressure) | Stagnation and static pressures:
From ordinary pitot tube of aircraft |
| 3.5.3 | Accuracy of Mach number determination (ΔM) | $\Delta M = \pm 0.002$ |

- 3.5.4 Maximum Mach number variation ± 0.001 during data collection time; 20 secs.
- 3.6 Reynolds number range
- 3.6.1 Unit Reynolds number range 3 to 15 millions/meter. See Figure 5. Flight envelope.
- 3.6.2 Means of varying Reynolds number (e.g. by pressurization) Reynolds number, angle of attack and Mach number: Varied through;
- altitude variation
- weight variation
- flight at load factors different from 1
- 3.7 Temperature range and dewpoint. Can temperature be controlled? Standard ambient temperatures at H= 7 and 10 km and $^{\circ}\text{K}$.
Temperature cannot be controlled.
Dewpoint may be estimated from atmospheric data; flights are performed in clear air.
- 3.8 Model attitudes
- 3.8.1 Angle of attack, yaw, roll 0.9 to 10 deg.
0 deg. Deliberate yaw is flown occasionally. Yaw is measured.
0 deg. for stationary flight. 360 deg. rolls performed each flight.
- 3.8.2 Accuracy in determining angles $\alpha = \pm 0.1$ deg. at cruise
 $\alpha = \pm 0.2$ deg. at stall
- 3.9 Organization operating the aircraft Swedish Air Force FMV-PROV, Malmslätt, Sweden
- 3.10 Who is to be Contacted for Additional information A. Bertelrud, FFA, The Aeronautical Research Institute of Sweden, S-161 11 Bromma, Sweden
- 3.11 -
- 3.12 Additional remarks Comprehensive data-base including data files and access programs (FORTRAN) is being established. This data-base contains many more conditions as well as results from other probe types.
4. Tests
- 4.1 Type of tests Surface pressure, Boundary layers, Skin friction.
- 4.2 Wing Span or Semispan to Tunnel Width Zero. Free flight
- 4.3 Test Conditions
- 4.3.1 Angle of attack 0 to 10 deg. During maneuvers negative angles ($\alpha = -1$ to $+3$).
- 4.3.2 Mach number 0.25 to 0.95. Even lower obtained at stall. 0.95 obtained during dive at altitude -- 0.92 at stationary, level flight.
- 4.3.3 Dynamic pressure Approx. 2.5 to 29 kN/m². See Figure 5.
- 4.3.4 Reynolds number 14 to 32 millions, based on MAC.
- 4.3.5 Stagnation temperature Varies. ICAO standard values may be used. See Table I.
- 4.4 Transition
- 4.4.1 Free or fixed Free transition for the present cases. (For some flights transition was triggered along the attachment line with a wire. In other cases along the leading edge using a tape.)
- 4.4.2 Position of free transition -
- 4.4.3 Position of fixed transition, width of strips, size and type of roughness -
- 4.4.4 Were checks made to determine if transition occurred at trip locations? -

4.5 Bending or torsion under load

- 4.5.1 Describe any aero-elastic measurements made during tests Strain gages were used at several spanwise positions to determine static and dynamic deflections during flight.
- 4.5.2 Describe result of any bench calibrations

- 4.6 Were different sized models used in wind tunnel investigations? If so, indicate sizes. Models of the aircraft has been tested in wind tunnels; both full and half models as well as wing-alone cases.

- 4.7 Areas and lengths used to form coefficients Area used is wing reference area 37.4 m²
Length used is Mean Aerodyn. Chord 3.140 m

- 4.8 References on tests See References 1 to 4.

- 4.9 Related reports See Reference 5.

5. Instrumentation

5.1 Surface pressure measurements

- 5.1.1 Pressure orifices in wing. Location and number on upper and lower surfaces Pressure orifices in wing: (See Tables III.1 to III.4.) Nose region 130 taps, wing tip 59 taps, aileron 16 taps. Movable probes 250 positions (approx.)
- 5.1.2 Pressure orifices on fuselage. Location and number. Pressure orifices on fuselage, (See Table III.5.): Forward part 30 taps. Movable probes 30 positions (approx.).
- 5.1.3 Pressure orifices on components. Give component and orifice location Orifices on stabilizer (See Tables III.6 and III.7.): Nose region 47 taps. Tip 51 taps.
- 5.1.4 Geometry of orifices Round holes, 0.5 mm diameter.

5.3 Boundary layer and flow-field measurements

- 5.3.1 Boundary layer rakes 1. Total and static pressures,
2. Pressures and split-films, 3. Hot wires.
Positions: An array of 5x4 on main wing as well as some positions in the leading edge region.
- 5.3.2 Probe dimension relative to boundary layer thickness 0.025 - 0.10 for data presented.
- 5.3.3 Laser-doppler velocimeter. Give description of apparatus and accuracy No.
- 5.3.4 Method and/or instrument used to determine boundary layer transition Modified Preston tubes, Heated films (McCroskey type).
- 5.3.5 Describe any downstream rakes or probes used. Reason for use. -

5.4 Surface flow visualization

- 5.4.1 Indicate method used to visualization flow Tufts; used on wing and fuselage: Movies at 24-300 fr/sec was used, and photographing was performed from cockpit in aircraft (close range--inside wing-tip).
- 5.4.2 Accuracy of method -

5.5 Skin friction measurements

- 5.5.1 Type of instrument Modified Preston tubes
Heated surface films (McCroskey type)
Stanton tube (razor blades)
- 5.5.2 Geometry and accuracy of instrument Preston tube diameter: 2 mm;
Accuracy for moderate crossflow $\pm 3\%$.
Heated films: (Magnitude & direction of skin friction): Accuracy $\pm 10\%$ in magnitude; ± 1 deg. in direction.

5.5.3 Locations where probe used

Preston tubes used at approx. 250 pos. on both sides of wing and approx. 30 pos. on fuselage. Heated films used on 17 positions on wing.

5.6 Simulation of exhaust jet

Measurements performed with engine on only.

6. Data

6.1 Accuracy

6.1.1 Pressure coefficients

Generally within 2% of max. neg. or pos. value

6.1.2 Aerodynamic coefficients

-

6.1.3 Boundary layer and wake quantities

-

6.1.4 Repeatability

-

6.1.5 Additional remarks

Data was recorded with 12 bits resolution covering expected range of values.

6.2 Wall interference corrections

6.3 Data presentation

6.3.1 Aerodynamic coefficients

-

6.3.2 Surface pressure

C_p on wing, stabilizer and fuselage (Table IV.)

Skin friction

C_f on wing (Table V.)

6.3.3 Flow conditions

rms of α , n_z etc. are included and bounds given for the data. (Table I.)

6.3.4 Boundary layer data

Partly analysed, only sample data set included, Table VI.

6.3.5 Flow conditions for boundary layer and/or wake data

-

6.3.6 Wall interference corrections included?

-

6.3.7 Aeroelastic corrections included?

Yes.

6.3.8 Other corrections?

-

6.3.9 Additional remarks

A computer-based data collection with FORTRAN-routines for data search is under development, and may be available.

7. References

- 1 Bertelrud, A.: Instrumentation for Measurement of Flow Properties on a Swept Wing in Flight. DGLR Vortrag 81-034 (1981).
- 2 Bertelrud, A.: Static-Pressure and Skin-Friction Distributions on a Swept Wing in Flight at Mach Numbers from 0.27 to 0.9. AIAA Paper 81-1216 (1981).
- 3 Bertelrud, A.: Steady and Unsteady Effects on the Aerodynamic Flow on a Swept Wing in Flight. AIAA Paper 81-2418 (1981).
- 4 Bertelrud, A. & Nordström, J.: Experimental and Computational Investigation of the Flow in the Leading Edge Region of a Swept Wing. AIAA Paper 83-1762 (1983).
- 5 Bertelrud, A.: Experimental and Computational Investigation of a Swept Wing Flow at Subsonic Speeds. Journal of Aircraft, Vol. 16, No. 11, pp. 742-748 (1979).

8. List of symbols

A_R, A_0, A_1, A_2, A_3	coefficients in the polynomial describing NACA 64A010
$a = \sqrt{\gamma P/\rho}$	speed of sound
B	wing span: B=13 m, or stabilizer span $B_S=5.4$ m
C_i	local chord
C_{i-T}	local chord, imaginary trapezoidal wing, $C_{i-T}=C_i$ for $\eta < 0.929$
C_{25}	local chord, normal to 25% chord line. (C_{25} is distance from L.E. to T.E. of line normal to 25% chord line.)
$C_p = \frac{P_{loc} - P_{ref}}{\gamma/2 \rho_{ref} M^2}$	static pressure coefficient
$C_f = \frac{\tau_w}{\gamma/2 \rho_{loc} M^2_{loc}}$	skin friction coefficient
C_L	lift coefficient
H	flight altitude
$H = \delta^*/\theta$	shape factor
L	lower
LE	leading edge
M	Mach number (reference)
MAC	Mean Average Chord = 3.14 m
n_z	acceleration, z-direction, close to centre of gravity
n_{zTIP}	acceleration, z-direction, at $\eta \sim 0.9$
P	pressure; absolute units
$Re/m = (M \cdot a)/\nu$	unit Reynolds number
$Re_{MAC} = (M \cdot a \cdot MAC)/\nu$	
S	coordinate along surface
S_N	coordinate along surface, normal to leading edge
T	tip
T_O	total temperature
TE	trailing edge
U	upper
V_i	indicated air speed
x	longitudinal coordinate
x_{1-TE}	" " of trailing edge
x''	" " , stabilizer. Definition: Table III.6
x'	" " , wing tip. Definition: Table III.4
x_1, x_3	" " ($x_3=x_1-1.70$ [m]) Definition: Figure 4
x_{25}	coordinate, See Definition Table II.1
y	lateral coordinate
y'	" " , wing tip (Table III.4)
y''	" " , stabilizer (Table III.7)
y_{25}	coordinate. See Definition Table II.1
z	vertical coordinate
z''	" " , stabilizer (Table III.6)
α	angle of attack
$\gamma = 1.4$	ratio of specific heats
δ	boundary layer thickness
δ_a	aileron deflection angle
$\eta = y/(B/2)$	non-dimensional spanwise position
μ	dynamic viscosity
$\nu = \mu/\rho$	kinematic viscosity
$\xi = x/C_i$	non-dimensional chordwise position
ρ	density
ω_x	angular velocity, around x-axis
ω_y	" " " " y-axis
ω_z	" " " " z-axis

Subscripts:

e	external (local) value
loc	local value
ref	reference value
s	stabilizer
x	x-direction
y	y-direction
z	z-direction

TABLES

I	TEST CASES	IV	STATIC PRESSURE COEFFICIENT, C_p
II	GEOMETRY	IV.0	Main wing
II.1	Main wing	IV.1	Leading edge stations
II.2	Wing tip	IV.2	Instrumented segment
III	STATIC PRESSURE TAPS	IV.3	Aileron
III.1	Leading edge stations	IV.4	Wing tip
III.2	Instrumented segment	IV.5	Fuselage
III.3	Aileron	IV.6	Stabilizer, leading edge
III.4	Wing tip	IV.7	Stabilizer, tip
III.5	Fuselage	V	SKIN FRICTION COEFFICIENT, C_f
III.6	Stabilizer, leading edge	VI	BOUNDARY LAYER PRESSURES
III.7	Stabilizer, tip		

Table 1. Flight conditions and typical root-mean-squares of fluctuations for certain parameters.

CASE	A	B	C	D
M	0.89	0.885	0.80	0.40
H [km]	10	7	7	7
C_L	0.177	0.116	0.143	0.570
α [deg]	2.38	1.61	1.99	8.78
$Re/m \times 10^{-6}$	7.59	10.49	9.43	4.72
$Re_{MAC} \times 10^{-6}$	23.8	32.9	29.6	14.8
T_O [K]	258	280	274	250
RMS fluctuations:				
V_i [km/h]	0.30	0.51	0.45	0.22
H_i [m]	3.5	2.9	3.2	1.6
α [deg]	0.010	0.012	0.018	0.022
n_z	0.009	0.009	0.007	0.004
n_{zTIP}	0.010	0.011	0.008	0.005
$n_{zTIP} - n_z$	0.004	0.005	0.004	0.003
δ_a [deg]	0.019	0.011	0.009	0.020
ω_x [deg/sec]	0.130	0.091	0.088	0.123
ω_y [deg/sec]	0.029	0.015	0.020	0.025
ω_z [deg/sec]	0.017	0.018	0.013	0.022

Note: • T_O given as ICAO standard atmosphere
 • 10 Hz filters applied before digitizing

Table II.1 Main wing.

Curvefit NACA 64A010 normal to 25% chord line.

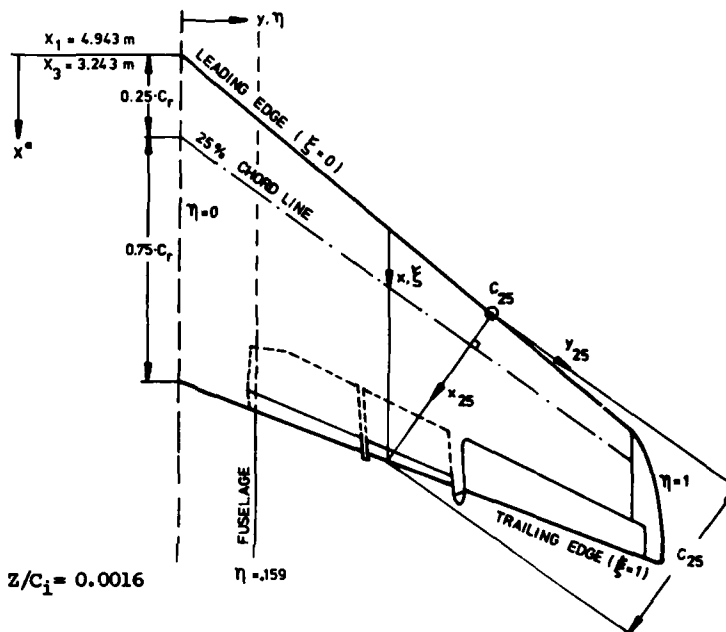
$$\frac{z_{25}}{c_{25}} = A_R \sqrt{\frac{x_{25}}{c_{25}}} + A_1 \left(\frac{x_{25}}{c_{25}}\right) + A_2 \left(\frac{x_{25}}{c_{25}}\right)^2 + A_3 \left(\frac{x_{25}}{c_{25}}\right)^3$$

where the coefficients are given by:

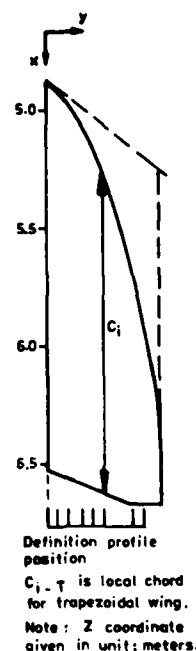
$$\begin{array}{llll} 0 < x_{25}/c_{25} < 0.1 & A_R = 0.11721775 & ; & A_1 = -0.043076644 & ; & A_2 = -0.034387405 \\ 0.1 < x_{25}/c_{25} < 0.4 & A_O = 0.0131053171 & ; & A_1 = 0.23071064 & ; & A_2 = -0.472503881 & ; & A_3 = 0.316041921 \\ 0.4 < x_{25}/c_{25} < 1 & A_O = 0.0104562228 & ; & A_1 = 0.236135343 & ; & A_2 = -0.4078524 & ; & A_3 = 0.161637864 \end{array}$$

Profile coordinates in x-direction for $\eta=0.159-0.929$, based on given polynomials

ξ	Z/C_i	ξ	Z/C_i
.001	.00317	.280	.04147
.002	.00446	.320	.04278
.004	.00627	.360	.04358
.006	.00764	.400	.04443
.008	.00879	.440	.04408
.010	.00979	.480	.04316
.020	.01362	.520	.04170
.030	.01648	.560	.03975
.040	.01881	.600	.03734
.060	.02259	.640	.03452
.080	.02562	.680	.03135
.100	.02743	.720	.02786
.120	.02975	.760	.02413
.140	.03186	.800	.02021
.160	.03377	.840	.01617
.180	.03549	.880	.01208
.200	.03703	.920	.00801
.240	.03957	.960	.00405
		1.000	.00029

Note: Physical trailing edge thickness: $Z/C_i = 0.0016$ Table II.2 Wing tip geometry. $z[m]$

η	.929	.936	.946	.952	.960	.980	.987	.991
x/C_i								
C_i	1.634	1.605	1.531	1.463	1.361	1.017	0.798	0.644
$x_{TE}[m]$	6.537	6.555	6.578	6.594	6.613	6.660	6.668	6.668
.0000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
.0050	.01142	.01123	.01125	.00980	.00966	.00445	.00536	.01688
.0075	.01389	.01365	.01362	.01194	.01169	.00572	.00656	.01948
.0125	.01773	.01741	.01727	.01528	.01482	.00792	.00847	.02278
.0250	.02455	.02411	.02365	.02129	.02030	.01240	.01193	.02651
.0500	.03372	.03316	.03206	.02952	.02763	.01928	.01671	.02779
.0750	.04040	.03981	.03815	.03564	.03303	.02456	.02024	.02685
.1000	.04579	.04522	.04307	.04067	.03750	.02873	.02309	.02559
.1500	.05428	.05383	.05096	.04870	.04484	.03478	.02752	.02997
.2000	.06073	.06043	.05711	.05489	.05068	.03879	.03085	.02401
.3000	.06918	.06903	.06541	.06296	.05860	.04344	.03522	.02710
.4000	.07226	.07202	.06858	.06580	.06153	.04550	.03703	.03031
.5000	.06992	.06954	.06647	.06360	.05952	.04506	.03632	.03097
.6000	.06215	.06189	.05919	.05666	.05304	.04110	.03314	.02888
.7000	.04946	.04979	.04742	.04568	.04298	.03300	.02801	.02542
.8000	.03326	.03448	.03248	.03177	.03045	.02191	.02231	.02247
.9000	.01628	.01776	.01635	.01654	.01657	.01219	.01866	.02114
1.000	.00215	.00201	.00175	.00209	.00223	.01276	.02125	.02048
C_{i-TE}	1.637	1.616	1.587	1.570	1.546	1.488	1.467	1.456



Station 5				Station 6				Station 7			
S_N mm	S mm	x/c_i	z/c_i	S_N mm	S mm	x/c_i	z/c_i	S_N mm	S mm	x/c_i	z/c_i
$\eta = .389 \quad C_i = 3.19 \text{ m}$				$\eta = .286 \quad C_i = 3.50 \text{ m}$				$\eta = .179 \quad C_i = 3.82 \text{ m}$			
TAP											
18	-388	-486	.1450								
17	-336	-420	.1245								
16	-283	-354	.1040								
15	-231	-288	.0835								
14	-178	-221	.0630								
1	-125.5	-155	.0428	-136.5	-167	.0418	-.0186	-143	-174	.0398	-.0181
2	-80.5	-98	.0251	-87	-104	.0242	-.0144	-91.5	-109	.0233	-.0139
3	-50	-59	.0137	-54	-62	.0126	-.0107	-55.5	-64	.0123	-.0103
4	-24.5	-26.5	.0046	-27	-29	.0042	-.0065	-27.5	-30	.0045	-.0063
5	-9	-9.5	.0007	-11	-11.5	.0010	-.0032	-11.5	-12	.0010	-.0029
6	0	0	.0000	0	0	.0000	.0000	0	0	.0000	.0001
7	10.5	11	.0012	10.5	11	.0008	.0031	12	12.5	.0009	.0030
8	22.5	24	.0040	21.5	23.5	.0033	.0058	24	26	.0031	.0056
9	38	42	.0091	39	44	.0081	.0088	42.5	47	.0080	.0087
10	59	68.5	.0164	61.5	72	.0155	.0118	66	76	.0148	.0116
11	88	105.5	.0274	79.5	95	.0216	.0138	102.5	122	.0265	.0152
12	125.5	154.5	.0418	119	146	.0357	.0174	148	181	.0413	.0187
13	186	231	.0657	190	236	.0613	.0224	196.5	244	.0576	.0217

Table III.2 Static pressure taps, instrumented segment.

ORIFICE	S_N [mm]	S [mm]	x/C_i	z/C_i	η
1	-104.3	-123.2	.0580	.0208	.834
2	-72.4	-85.9	.0390	.0187	.836
3	-47.4	-54.2	.0230	.0146	.837
4	-34.2	-39.2	.0155	.0121	.838
5	-25.1	-27.9	.0100	.0099	.839
6	-19.7	-20.9	.0068	.0082	.839
7	-14.2	-15.2	.0045	.0067	.840
8	-9.	-10.6	.0030	.0055	.840
9	-5.6	-6.1	.0018	.0043	.840
10	-3.5	-3.7	.0012	.0036	.840
11	0	0.0	.0000	.0000	.840
12	3.5	3.7	.0012	.0036	.840
13	5.8	6.3	.0018	.0043	.840
14	9.7	10.5	.0030	.0055	.840
15	13.7	14.7	.0043	.0065	.840
16	19.0	20.3	.0065	.0080	.839
17	23.6	25.9	.0091	.0094	.839
18	30.2	34.0	.0130	.0112	.839
19	37.6	42.6	.0172	.0128	.838
20	53.4	62.3	.0267	.0158	.837
21	73.1	86.0	.0391	.0188	.836
22	102.8	121.4	.0575	.0206	.834
23	135.3	162.1	.0778	.0254	.832
24	169.6	204.9	.0995	.0278	.829
25	221.3	270.5	.1325	.0311	.825
26	310.3	377.5	.1860	.0361	.820
27	370.3	451.7	.2225	.0389	.816
28	448.3	548.0	.2690	.0414	.810
29	548.8	677.9	.3305	.0433	.802
30	649.3	808.6	.3910	.0445	.794
31	749.3	933.5	.4480	.0438	.787

Table III.3 Pressure taps, aileron.

ORIFICE	ξ	η	SIDE
401	.729	0.770	P
402	.865	"	P
404	1.000	"	TE
406	.932	"	S
407	.865	"	S
408	.826	"	S
409	.779	"	S
410	.726	"	S
901	.698	0.903	P
902	.904	"	P
903	.975	"	P
904	1.000	"	TE
905	.975	"	S
906	.904	"	S
907	.849	"	S
908	.698	"	S

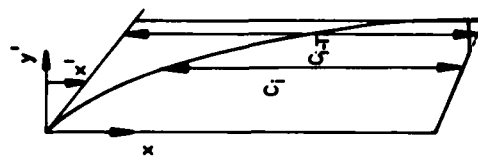
Local chords: $\eta = 0.770$ $C_i = 2.075$ m
 $\eta = 0.903$ $C_i = 1.713$ m

Note: Physical aileron starts at $\xi = 0.745$

Table III.4 Pressure taps, wing tip

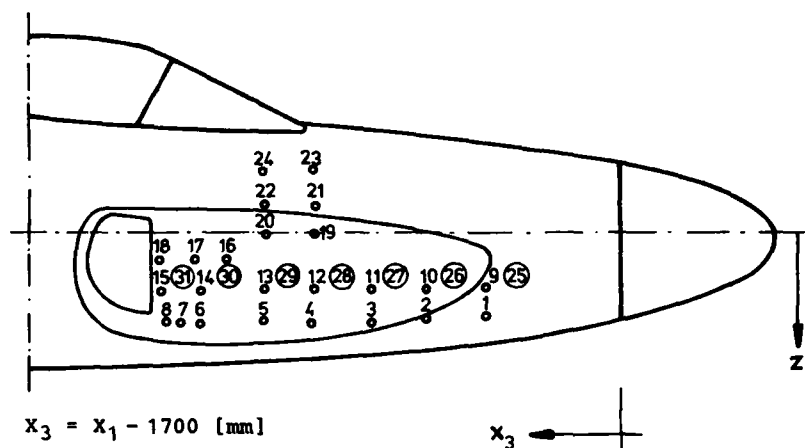
$$\xi = \frac{x-x'}{C_i} \quad C_i = -2.910 \cdot \eta + 4.340 \quad x' = 0.809 \cdot y'$$

ORIFICE	ξ	η	x [mm]	y' [mm]	C_{i-T}	x' [mm]	SIDE U/L	ORIFICE	ξ	η	x [mm]	y' [mm]	C_{i-T}	x' [mm]	SIDE U/L
1	.101	.9428	232	87.9	1.596	71	U	31	.396	.9719	822	277.5	1.512	244	L
2	.108	.9587	322	191.3	1.550	155	U	32	.395	.9644	791	228.9	1.534	185	L
3	.108	.9559	308	173.4	1.558	140	L	33	.395	.9566	759	178.2	1.556	144	L
4	.100	.9426	229	86.7	1.596	70	L	34	.490	.9425	853	86.4	1.597	70	U
5	.201	.9426	390	86.7	1.596	70	U	35	.491	.9559	905	173.1	1.558	140	U
6	.204	.9564	460	176.7	1.557	143	U	36	.491	.9716	966	275.2	1.513	223	U
7	.204	.9566	462	177.7	1.557	144	L	37	.492	.9832	1012	350.5	1.479	284	U
8	.202	.9426	392	87.0	1.596	70	L	38	.496	.9882	1036	382.2	1.464	310	U
9	.248	.9426	466	86.8	1.596	70	U	39	.500	.9893	1046	390.3	1.461	316	L
10	.298	.9425	545	86.6	1.596	70	U	40	.496	.9882	1036	383.0	1.464	310	L
11	.297	.9562	605	175.	1.557	142	U	41	.496	.9867	1030	373.8	1.469	302	L
12	.299	.9564	608	176.3	1.557	143	L	42	.494	.9837	1016	353.9	1.477	286	L
13	.298	.9425	545	86.5	1.596	70	L	43	.493	.9794	998	325.8	1.490	264	L
14	.394	.9425	699	86.4	1.596	70	U	44	.492	.9716	968	275.3	1.513	223	L
15	.394	.9565	757	177.1	1.557	143	U	45	.492	.9637	936	224.3	1.536	181	L
16	.393	.9720	819	277.7	1.511	225	U	46	.491	.9559	905	173.5	1.558	140	L
17	.393	.9770	840	310.7	1.497	251	U	47	.490	.9427	854	87.6	1.597	71	L
18	.397	.9818	865	341.6	1.483	276	U	48	.594	.9425	1018	86.4	1.597	70	U
19	.399	.9838	876	355.0	1.477	287	U	49	.594	.9558	1066	172.8	1.558	140	U
20	.399	.9846	879	359.7	1.475	291	U	50	.603	.9923	1206	409.7	1.452	331	L
21	.402	.9850	885	362.4	1.474	293	L	51	.601	.9554	1074	169.9	1.560	137	L
22	.398	.9846	878	359.6	1.475	291	L	52	.596	.9426	1022	86.9	1.597	70	L
23	.397	.9838	874	354.8	1.477	287	L	53	.692	.9425	1175	86.4	1.597	70	U
24	.397	.9830	870	319.6	1.479	283	L	54	.708	.9480	1218	122.1	1.581	39	U
25	.396	.9818	864	341.7	1.483	276	L	55	.696	.9939	1348	420.5	1.448	340	L
26	.397	.9806	860	333.9	1.486	270	L	56	.697	.9563	1228	175.8	1.557	142	L
27	.397	.9793	854	325.6	1.490	263	L	57	.699	.9427	1187	87.9	1.597	71	L
28	.396	.9782	849	318.6	1.493	258	L	58	.796	.9951	1495	428.1	1.444	346	L
29	.395	.9771	844	311.8	1.497	252	L	59	.893	.9957	1638	432.2	1.442	350	L
30	.396	.9715	833	294.4	1.504	238	L	60	.210	.9709	538	271.0	1.515	219	U
								61	.256	.9753	626	299.2	1.502	242	U



TAP	x_3 [mm]	z_1 [mm]
1	801	513
2	1170	530
3	1506	542
4	1830	541
5	2130	539
6	2504	538
7	2626	534
8	2695	522
9	800	341
10	1150	342
11	1495	340
12	1834	341
13	2137	341
14	2526	339
15	2766	338
16	2351	169
17	2542	169
18	2769	168
19	1834	15
20	2134	16
21	1835	-179
22	2135	-180
23	1834	-359
24	2134	-356
25	802	341
26	1164	341
27	1502	342
28	1834	340
29	2139	341
30	2519	342
31	2759	340

Table III.5 Pressure taps on fuselage.



Starboard side: Taps 1 - 24
 Port side: Taps (25) - (31)

Table III.6 Pressure taps. Stabilizer, leading edge.

	STATION 11 $\eta_{\text{st}} = 0.726$	STATION 12 0.529	STATION 13 0.332
ORIFICE	x''/z''	x''/z''	x''/z''
1	221.0/-41.8	285.0/-54.0	-
2	84.0/-26.0	177.0/-44.0	148.0/-45.0
3	67.5/-23.8	134.5/-39.2	43.4/-25.5
4	26.0/-15.0	65.0/-28.0	7.3/-11.2
5	5.0/-6.8	36.0/-21.6	1.0/-3.8
6	0.0/ 0.6	18.5/-15.8	0.0/ 1.5
7	1.2/ 4.2	7.5/-10.6	1.0/ 4.8
8	2.8/ 6.0	1.4/ -4.8	4.0/ 8.8
9	6.5/ 9.0	0.0/ 0.2	9.0/ 12.5
10	11.5/ 11.6	1.2/ 3.5	36.0/ 24.0
11	28.5/ 17.0	3.1/ 6.4	183.0/ 48.5
12	61.5/ 23.8	7.5/ 9.8	355.0/ 64.0
13	121.0/ 31.8	14.6/ 13.2	
14	231.0/ 42.0	23.8/ 16.6	
15		36.4/ 20.5	
16		54.8/ 24.8	
17		66.0/ 27.4	
18		78.5/ 30.0	
19		155.5/ 41.2	
20		215.0/ 47.5	
21		288.0/ 53.5	

x'' and z'' in [mm]

Stabilizer profile: NACA64A009 normal to 25% chord line.
 (See Figure 1 for dimensions and location)

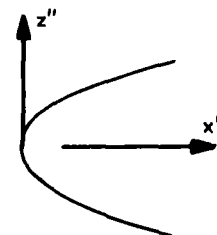
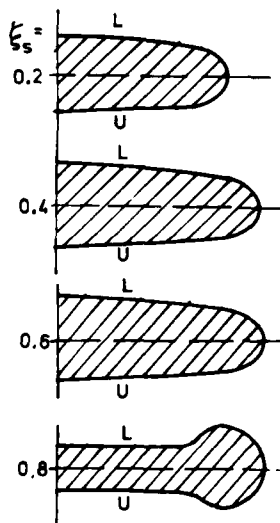
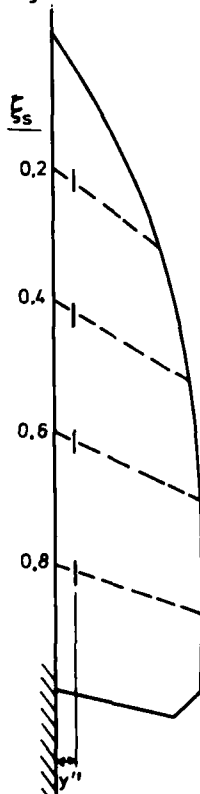


Table III.7 Pressure taps, stabilizer tip.

$$\eta_s = 0.9268 + \frac{y''}{z''/700}$$

ORIFICE	ξ_s	η_s	SIDE	y'' [mm]	z'' [mm]	ORIFICE	ξ_s	η_s	SIDE	y'' [mm]	z'' [mm]
1	0.05	.9383	T	31	-	26	0.40	.9811	L	146.5	-203
2	0.10	.9501	T	63	-	27	0.40	.9738	L	127	-266.5
3	0.15	.9629	T	97.5	-	28	0.40	.9609	L	92	-328.5
4	0.20	.9753	T	131	-	29	0.40	.9453	L	50	-369
5	0.30	.9824	T	150	-	30	0.60	.9453	U	50	-391.5
6	0.40	.9886	T	167	0	31	0.60	.9649	U	103	
7	0.50	.9922	T	176.5	-	32	0.60	.9794	U	142	
8	0.60	.9955	T	185.5	-	33	0.60	.9875	U	164	
9	0.72	.9977	T	191.5	-	34	0.60	.9924	U	177	
10	0.80	.9993	T	196	-	35	0.60	.9946	U	183	
11	0.87	1.0000	T	197.5	-	36	0.60	.9949	U	184	
12	0.20	.9453	U	50	-	37	0.60	.9949	L	184	
13	0.20	.9675	U	110	-	38	0.60	.9946	L	183	
14	0.20	.9675	L	110	-	39	0.60	.9924	L	177	
15	0.20	.9453	L	50	-	40	0.60	.9875	L	164	
16	0.40	.9453	U	50	369	41	0.60	.9794	L	142	
17	0.40	.9609	U	92	328.5	42	0.60	.9649	L	103	
18	0.40	.9738	U	127	266.5	43	0.60	.9453	L	50	
19	0.40	.9811	U	146.5	203	44	0.80	.9453	U	50	
20	0.40	.9853	U	158	141.5	45	0.80	.9731	U	125	
21	0.40	.9875	U	164	83.5	46	0.80	.9905	U	172	
22	0.40	.9883	U	166	39.5	47	0.80	.9972	U	190	
23	0.40	.9883	L	166	-39.5	48	0.80	.9972	L	190	
24	0.40	.9875	L	164	-83.5	49	0.80	.9905	L	172	
25	0.40	.9853	L	158	-141.5	50	0.80	.9731	L	125	
						51	0.80	.9453	L	50	

$$\eta_s = 0.927$$



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Table IV.1 Static pressure coefficient C_p , leading edge.
Test case A. $M=0.89$ $H=10^6$ km

SPAN STATION							
STATION	1	2	3	4	5	6	7
ORIFICE							
18		-.086			-.075		
17		-.079			-.024		
16		-.066			-.008		
15		-.020			.023		
14		.025			.043		
1	-.053	.066	.078	.061	.089	.028	.043
2	.068	.132	.113	.157	.181	.106	.135
3	.248	.246	.251	.276	.278	.231	.206
4	.384	.378	.406	.442	.472	.441	.383
5	.576	.577	.606	.607	.597	.619	.591
6	.435	.519	.581	.541	.497	.580	.646
7	-.245	.130	.198	.154	.116	.303	.442
8	-.604	-.381	-.225	-.235	-.206	.021	.196
9	-.468	-.597	-.398	-.384	-.385	-.171	.002
10	-.594	-.574	-.426	-.387	-.409	-.222	-.076
11	-.728	-.645	-.473	-.379	-.450	-.240	-.194
12	-.693	-.594	-.436	-.475	-.429	-.266	-.274
13	-.596	-.526	-.383	-.430	-.340	-.359	-.260

Table IV.1 Static pressure coefficient C_p , leading edge.
Test case B. $M=0.885$ $H=7$ km

SPAN STATION							
STATION	1	2	3	4	5	6	7
ORIFICE							
18		-.176			-.160		
17		-.171			-.105		
16		-.190			-.083		
15		-.104			-.048		
14		-.064			-.037		
1	-.107	-.027	-.007	-.023	.010	.002	
2	-.026	-.002	.010	.069	.083	.055	
3	.155	.112	.139	.177	.181	.115	
4	.274	.277	.280	.347	.390	.273	.246
5	.507	.554	.553	.560	.595	.438	
6	.479	.570	.626	.585	.575	.463	.494
7	-.081	.237	.350	.289	.265	.293	
8	-.347	-.126	-.041	-.051	-.032	.115	
9	-.294	-.299	-.245	-.212	-.208	-.037	
10	-.451	-.320	-.255	-.238	-.182	-.087	
11	-.495	-.378	-.358	-.271	-.239	-.116	
12	-.467	-.384	-.343	-.370	-.302	-.154	
13	-.484	-.426	-.278	-.250	-.257	-.248	

Table IV.1 Static pressure coefficient C_p , leading edge.
Test case C. $M=0.8$ $H=7$ km

SPAN STATION							
STATION	1	2	3	4	5	6	7
ORIFICE							
18		-.112			-.175		
17		-.094			-.085		
16		-.076			-.062		
15		-.027			-.031		
14		.016			-.014		
1	-.071	.065	-.002	.030	.039	.024	.010
2	.000	.121	.015	.122	.113	.097	.096
3	.196	.253	.143	.244	.219	.183	.162
4	.341	.403	.310	.420	.449	.376	.344
5	.559	.615	.463	.600	.595	.522	.552
6	.382	.478	.447	.520	.484	.540	.606
7	-.367	.006	.121	.096	.089	.258	.397
8	-.638	-.413	-.221	-.302	-.236	-.016	.143
9	-.478	-.562	-.352	-.440	-.389	-.204	-.051
10	-.604	-.525	-.319	-.416	-.398	-.244	-.127
11	-.610	-.523	-.390	-.422	-.424	-.272	-.215
12	-.582	-.488	-.332	-.452	-.427	-.308	-.273
13	-.495	-.411	-.293	-.392	-.382	-.378	-.238

Table IV.1 Static pressure coefficient C_p , leading edge.
Test case D. $M=0.4$ $H=7$ km

SPAN STATION							
STATION	1	2	3	4	5	6	7
ORIFICE							
18		.270			.243		
17		.321			.286		
16		.350			.323		
15		.394			.373		
14		.452			.432		
1	.398	.518	.528	.497	.490	.462	.335
2	.528	.590	.625	.591	.585	.560	.425
3	.612	.620	.744	.631	.627	.614	.485
4	.528	.394	.751	.363	.384	.462	.371
5	-.276	-.678	.216	-.512	-.608	-.250	-.113
6	-2.764	-2.829	-1.145	-2.467	-2.026	-1.522	-1.010
7	-4.365	-4.527	-2.662	-4.107	-3.288	-2.594	-1.927
8	-3.086	-4.403	-3.161	-3.949	-3.193	-2.708	-2.034
9	-1.914	-2.836	-2.729	-2.625	-2.421	-2.140	-1.445
10	-1.562	-2.121	-1.800	-1.963	-1.870	-1.606	-1.174
11	-1.256	-1.699	-1.510	-1.490	-1.501	-1.405	-1.013
12	-1.041	-1.334	-1.153	-1.277	-1.228	-1.132	-.915
13	-.819	-.977	-.915	-1.064	-.977	-.916	-.789

Table IV.2 Static pressure coefficient C_p , instrumented segment
TEST CASE

	A	B	C	D
M	0.89	0.885	0.8	0.4
H	10	7	7	7
ORIFICE				
1	.040	-.051	.017	.488
2	.125	.030	.101	.568
3	.214	.110	.188	.616
4	.286	.183	.259	.600
5	.364	.266	.342	.496
6	.436	.329	.409	.344
7	.523	.447	.510	.016
8	.593	.544	.589	-.536
9	.623	.628	.617	-1.649
10	.586	.628	.571	-2.289
11	.486	.572	.459	-3.146
12	.257	.405	.221	-4.346
13	.087	.260	.051	-4.850
14	-.130	.067	-.160	-5.082
15	-.319	-.112	-.346	-4.682
16	-.481	-.260	-.496	-4.530
17	-.533	-.334	-.550	-3.226
18	-.548	-.362	-.554	-2.737
19	-.583	-.441	-.552	-2.441
20	-.593	-.362	-.481	-1.897
21	-.541	-.377	-.493	-1.593
22	-.563	-.421	-.500	-1.337
23	-.463	-.360	-.443	-1.129
24	-.488	-.377	-.443	-.993
25	-.580	-.500	-.510	-.904
26	-.546	-.461	-.439	-.744
27	-.605	-.446	-.441	-.664
28				
29	-.528	-.498	-.417	-.536
30	-.615	-.579	-.427	-.512
31	-.481	-.421	-.263	-.344

Table IV.3 Static pressure coefficient C_p , aileron
TEST CASE

	A	B	C	D
M	0.89	.885	.80	.400
H	10	7	7	7
ORIFICE				
401	-.049	-.066	-.084	.032
402	.074	.071	.036	.097
404	.194	.191	.162	.129
406	.138	.141	.102	.089
407	.084	.081	.022	.024
408	.037	.026	-.016	-.016
409	-.002	-.023	-.076	-.081
410	-.047	-.050	-.090	-.089
901	-.072	-.079	-.102	.008
902	.119	.126	.090	.097
903	.169	.174	.144	.121
904	.201	.199	.178	.145
905	.186	.184	.154	.113
906	.117	.120	.082	.032
907	.062	.066	.026	-.016
908	-.060	-.055	-.102	-.137

Table IV.4 Static pressure coefficient C_p , wing tip.
TEST CASE

A					A				
B					B				
C					C				
D					D				
M	0.89	.885	.80	.40	M	0.89	0.885	0.80	0.40
H	10	7	7	7	H	10	7	7	7
ORIFICE					ORIFICE				
1	-.479	-.385	-.327	-1.047	36	-.294	-.248	-.278	-.592
2	-.371	-.170	-.122	-2.266	37	-.354	-.255	-.292	-1.241
3	-.024	-.047	.016	-.300	38	-.568	-.325	-.391	-1.873
4	-.043	-.091	-.043	.160	39	-.346	-.194	-.250	-1.977
5	-.627	-.443	-.300	-.677	40	-.154	-.093	-.120	-1.369
6	-.458	-.497	-.332	-.830	41		-.126	-.133	-.796
7	-.126	-.155	-.117	.083	42		-.103	-.102	-.337
8	-.136	-.169	-.130	.121	43		-.104	-.102	-.115
9	-.521	-.446	-.311	-.632	44		-.139	-.129	-.023
10	-.517	-.443	-.303	-.575	45		-.146	-.133	-.008
11	-.272	-.437	-.352	-.638	46	-.158	-.184	-.162	-.006
12	-.166	-.201	-.151	.045	47	-.189	-.215	-.203	-.032
13	-.168	-.200	-.152	.070	48	-.172	-.156	-.240	-.326
14	-.339	-.311	-.299	-.518	49	-.203	-.182	-.246	-.370
15	-.279	-.320	-.304	-.547	50	-.280	-.166	-.249	-1.768
16	-.415	-.326	-.306	-.683	51	-.152	-.157	-.162	-.070
17	-.377	-.330	-.305	-.795	52	-.144	-.157	-.165	-.019
18	-.477	-.350	-.310	-1.130	53	-.067	-.052	-.092	-.217
19	-.525	-.346	-.339	-1.542	54	-.071	-.052	-.094	-.249
20	-.475	-.258	-.252	-1.689	55	-.280	-.152	-.235	-1.807
21	-.327	-.204	-.198	-1.366	56	-.063	-.061	-.084	-.045
22	-.223	-.151	-.146	-1.083	57	-.075	-.079	-.100	-.026
23	-.166	-.155	-.150	-.830	58	-.274	-.101	-.197	-1.500
24	-.102	-.118	-.113	-.453	59	-.286	-.064	-.162	-1.226
25	-.084	-.109	-.104	-.306					
26	-.106	-.145	-.140						
27	-.118	-.166	-.170						
28	-.094	-.140	-.134						
29	-.098	-.147	-.142						
30	-.120	-.177	-.166						
31	-.134	-.183	-.167						
32	-.176	-.216	-.190						

Table IV.5 Static pressure coefficient C_p , fuselage.
Test case

	A	B	C	D
M	.89	.885	.80	.40
H	10	7	7	7
ORIFICE				
1	-.020		-.037	.070
2	-.087		-.097	-.012
3	-.124		-.131	-.111
4	-.123		-.132	-.194
5	-.075		-.088	-.272
6	.088		.052	-.640
7	.193		.154	-.611
8	.254		.211	-.714
9	-.081		-.091	-.062
10	-.112	-.110	-.119	-.133
11	-.153	-.121	-.160	-.152
12	-.157	-.151	-.167	-.141
13	-.091	-.062	-.098	-.129
14	.147	.116	.117	-.011
15	.320	.257	.311	.175
16	.054	.039	.024	-.049
17	.230	.172	.196	.042
18	.314	.255	.312	.220
19	-.151	-.132	-.160	-.087
20	-.188	-.158	-.192	-.091
21	-.023		-.043	-.067
22	-.019		-.039	-.055
23	.043		.017	-.028
24	.011		-.013	-.039
25	-.101		-.099	-.087
26	-.105		-.114	-.142
27	-.160		-.164	-.165
28	-.186		-.189	-.188
29	-.085	-.069	-.089	-.133
30	.151		.115	-.039
31	.326		.310	.161

Table IV.6 Static pressure coefficient C_p , stabilizer,
leading edge. Station 11.

Test case				
	A	B	C	D
M	0.89	0.885	0.80	0.40
H	10	7	7	7
ORIFICE				
1	-.372	-.396	-.321	-.051
2	-.334	-.351	-.305	.051
3	-.369	-.399	-.349	.055
4	-.440	-.603	-.429	.150
5	-.099	-.123	-.123	.080
6	.487	.419	.45	.464
7	.583	.555	.563	.164
8	.528	.527	.514	-.022
9	.393	.409	.387	-.201
10	.314	.340	.307	-.271
11	.151	.174	.146	-.263
12	.033	.051	.030	-.245

Table IV.6 Static pressure coefficient C_p , stabilizer,
leading edge. Station 12.

Test case				
	A	B	C	D
M	0.89	0.885	0.80	0.40
H	10	7	7	7
ORIFICE				
1	-.224	-.258	-.218	-.093
2	-.443	-.440	-.383	
3	-.336	-.385	-.359	-.063
4	-.483	-.505	-.438	-.011
5	-.561	-.670	-.480	.030
6	-.554	-.654	-.523	.108
7	-.365	-.459	-.383	.273
8	.049	-.038	.028	.542
9	.433	.369	.416	.583
10	.552	.519	.534	.441
11	.573	.572	.552	.250
12	.490	.511	.457	.056
13	.391	.421	.361	-.049
14	.290	.328	.259	-.112
15	.219	.261	.187	-.142
16	.166	.209	.133	-.149
17	.128	.169	.093	-.157
18	.098	.134	.064	-.164
19	-.026	.011	-.057	-.183
20	-.070	-.035	-.087	
21	-.136	-.104	-.134	-.190

Table IV.6 Static pressure coefficient C_p , stabilizer, leading edge. Station 13.

Test case				
	A	B	C	D
M	0.89	0.885	0.80	0.40
H	10	7	7	7
ORIFICE				
2	-.489	-.485	-.409	
3	-.462	-.606	-.542	
4	-.448	-.486	-.520	
5	.447	.426	.402	
6	.592	.573	.550	
7	.624	.630	.587	
8	.553	.550	.491	
9	.437	.462	.405	
10	.298	.330	.264	
11	.066	.093	.028	
12	-.050	-.026	-.090	

Table IV.7 Static pressure coefficient C_p , stabilizer tip. TEST CASE

	A	B	C	D
M	0.89	.885	.80	.40
H	10	7	7	7
ORIFICE				
1	.216	.214	.280	.239
2	-.120	-.137	-.014	-.060
3	-.085	-.101	-.032	-.024
4	-.107	-.122	-.057	-.088
5	-.115	-.121	-.076	-.120
6	-.075	-.076	-.049	-.108
7	-.086	-.086	-.063	-.124
8	-.056	-.055	-.039	-.124
9	-.022	-.015	-.009	-.132
10	.006	.013	.014	-.132
11	.043	.049	.046	-.148
12	-.389	-.383	-.272	-.032
13				
14				
15				
16	-.208	-.195	-.209	-.125
17				
18	-.184	-.175	-.171	-.048
19				
20	-.196	-.180	-.152	-.055
21	-.169	-.151	-.109	-.151
22	-.117	-.102	-.060	-.321
23	-.090	-.090	-.081	-.569
24	-.056	-.059	-.067	-.588
25	-.050	-.056	-.076	-.510
26				
27	-.104	-.111	-.139	-.403
28				
29	-.166	-.168	-.188	-.369

Table V. Local skin friction coefficient C_f on main wing. TEST CASE A.
 $C_f \times 10^5$; $H = 10$ km; $M = 0.89$ SUCTION SIDE

[illegible][illegible]

Table VI. Boundary layer pressures measured with rake. $\eta = 0.82$.
The tubes have 1.6 mm diameter and the rake was aligned
in the x-direction. C_p -values are wall pressures.

TEST CASE A						TEST CASE B					
M= 0.89 H= 10 km						M= 0.885 H= 7 km					
$\xi =$.20 .30 .40 .50 .60						$\xi =$.20 .30 .40 .50 .60					
C_p TUBE						C_p TUBE					
1	.155	.042	-.066	-.172	.025	1	.244	.157	.062	-.054	.025
2	.193	.092	-.037	-.107	-.005	2	.324	.195	.095	-.053	.073
3	.430	.266	.112	-.042	.020	3	.510	.372	.202	.014	.119
4	.824	.535	.351	.179	.052	4	.921	.660	.446	.182	.192
5	1.208	.973	.701	.468	.162	5	1.165	1.040	.787	.463	.384
6	1.229	1.231	1.034	.782	.347	6	1.164	1.213	1.071	.843	.533
7	1.234	1.249	1.202	1.081	.610	7	1.160	1.220	1.182	1.138	.837
8	1.236	1.246	1.207	1.206	1.160	8	1.160	1.218	1.185	1.218	1.194
9	1.231	1.244	1.205	1.198	1.219	9	1.157	1.215	1.184	1.215	1.192
10	1.201	1.231	1.190	1.136	1.217	10	1.152	1.210	1.176	1.197	1.181

TEST CASE C.						TEST CASE D					
M= 0.8 H= 7 km						M= 0.4 H= 7 km					
$\xi =$.20 .30 .40 .50 .60						$\xi =$.20 .30 .40 .50 .60					
C_p TUBE						C_p TUBE					
1	.254	.215	.199		.210	1	-.038	.008	.061	.163	
2	.316	.254	.254		.256	2	-.031	.079	.107	.264	
3	.488	.380	.359		.328	3	.107	.142	.168	.365	
4	.877	.642	.566		.460	4	.337	.244	.275	.497	
5	1.161	1.008	.826		.617	5	.658	.457	.444	.412	
6	1.165	1.168	1.039		.807	6	.934	.583	.566	.552	
7	1.167	1.178	1.156		1.009	7	1.072	.844	.727	.668	
8	1.167	1.176	1.160		1.175	8	1.080	1.064	.994	.878	
9	1.167	1.174	1.160		1.177	9	1.064	1.064	1.048	1.057	
10	1.165	1.182	1.160		1.175	10	1.064	1.064	1.048	1.064	

TUBE	WALL DISTANCE [m]
1	.0008
2	.0013
3	.0022
4	.0037
5	.0060
6	.0085
7	.0115
8	.0170
9	.0230
10	.0350

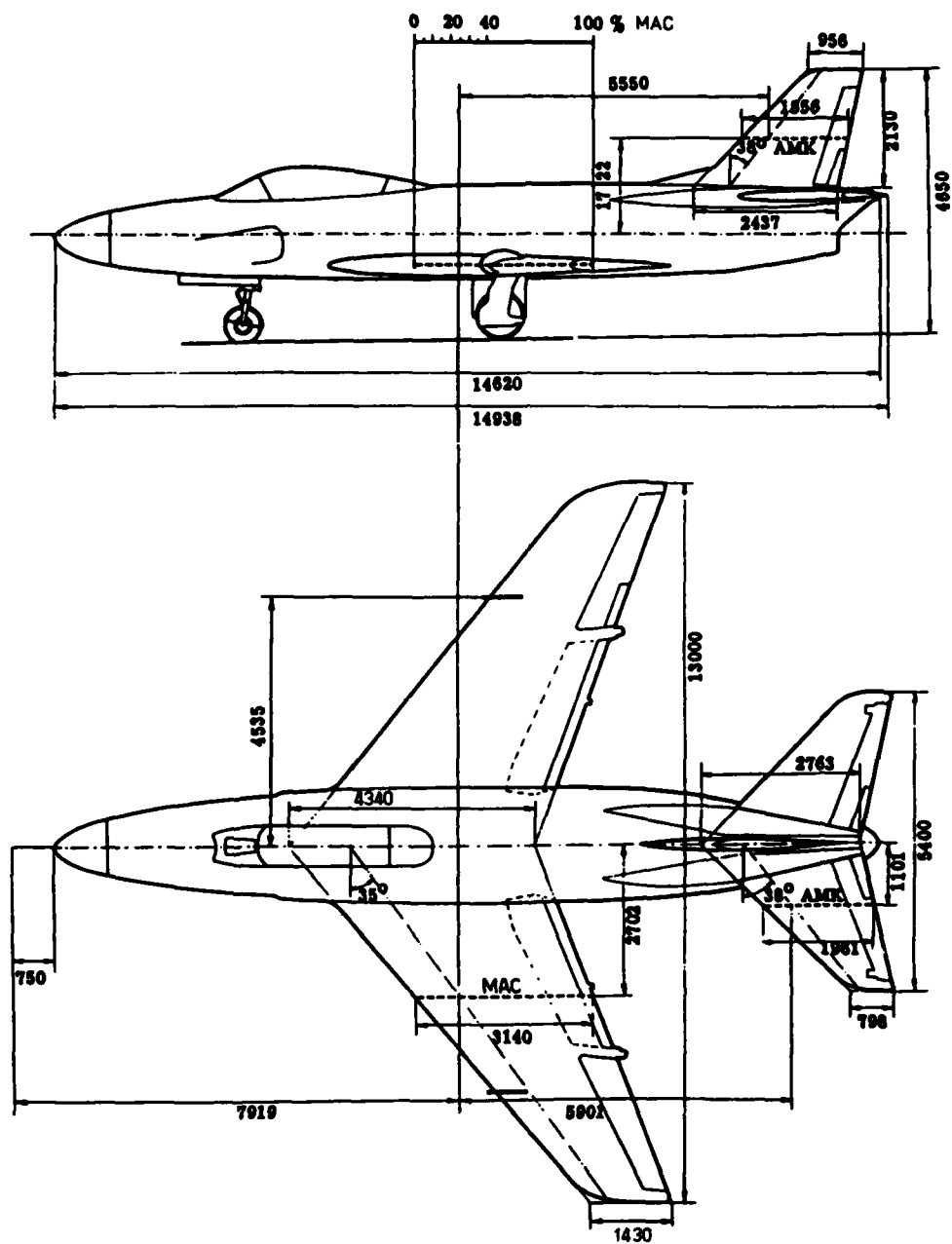


Fig. 1 Aircraft: SAAB A32A Lansen.
Main dimensions and angles.

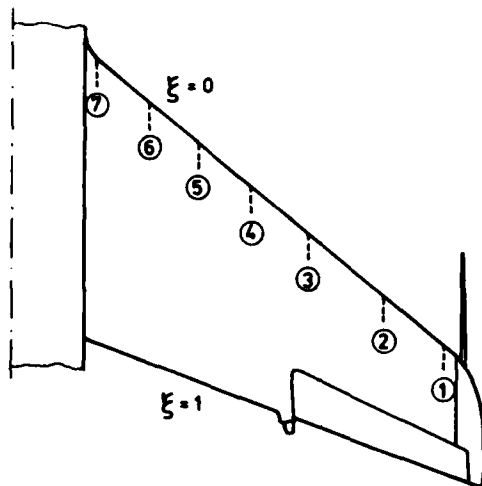


Fig. 2 Measurement stations in nose region.
(① → ⑦)

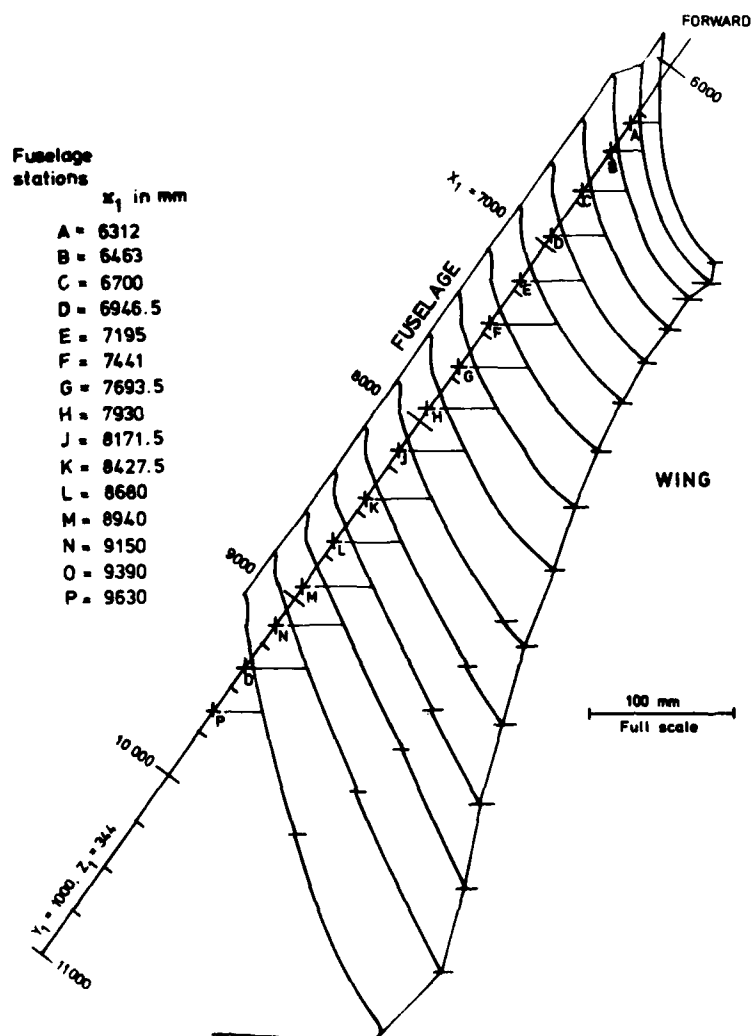


Fig. 3 Fillet data. Shape traced at stations A - P relative to line parallel with body axis. ($Y_1=1000$, $Z_1=344$)

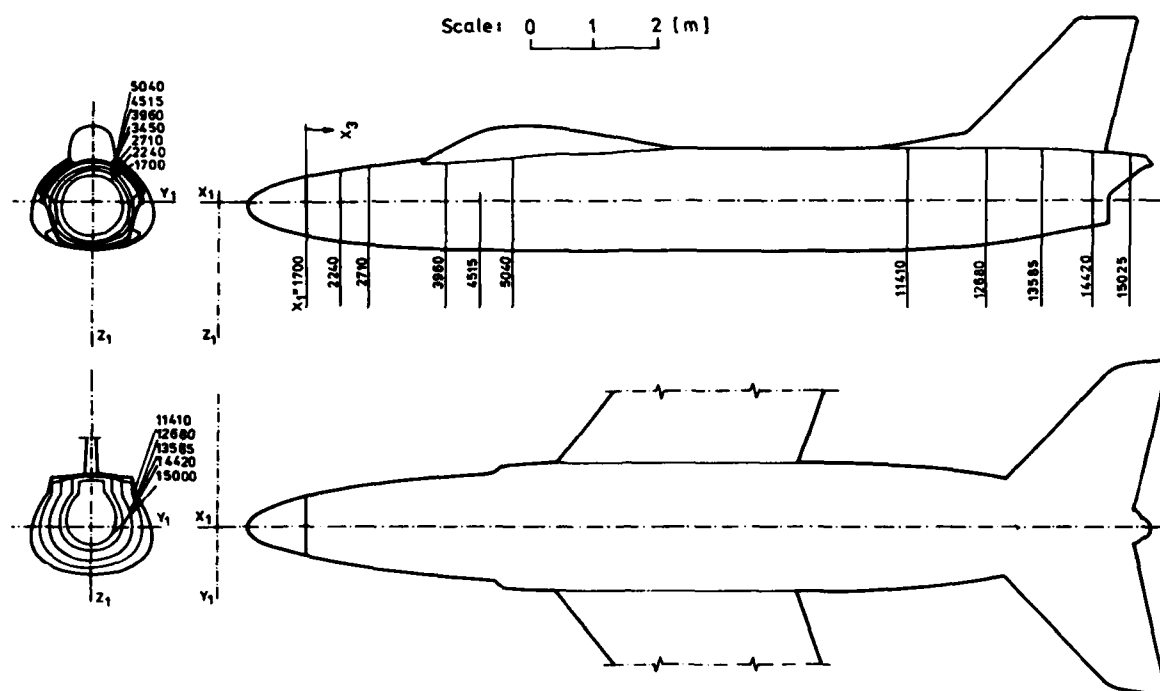


Fig. 4 Fuselage shape with cross-sectional cuts at selected stations. (X_1 values [mm] may be used for improved scale).

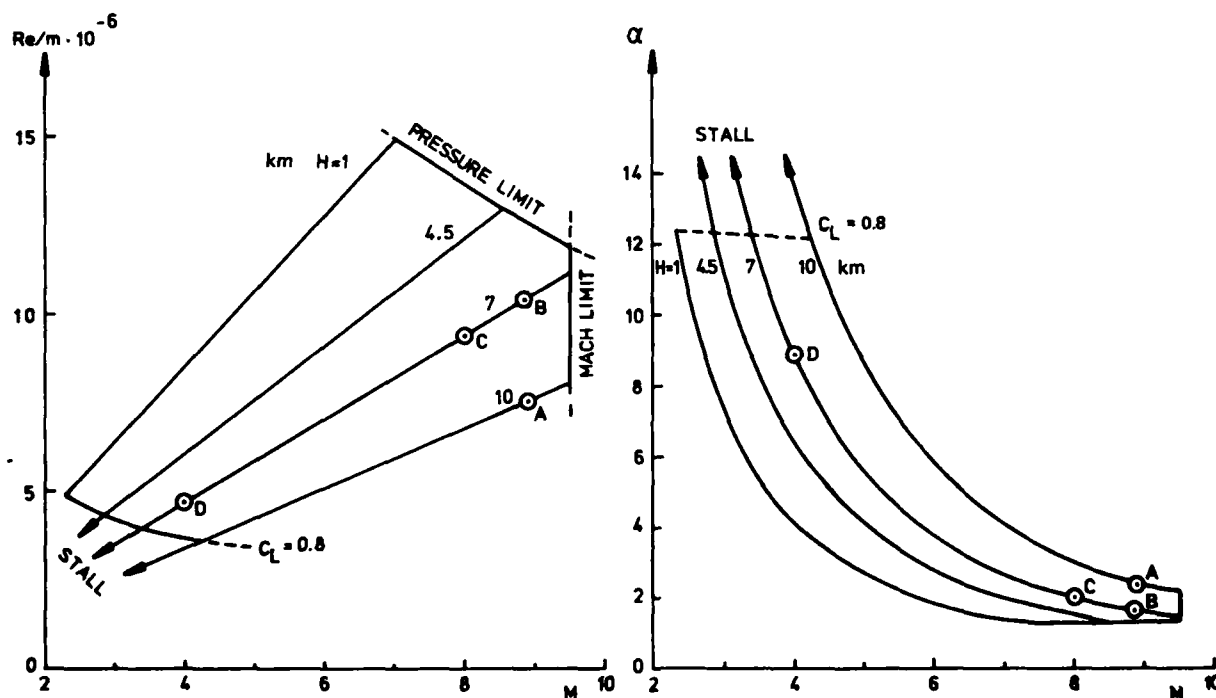


Fig. 5 Flight envelope; Re/m or α versus Mach number for various altitudes. Test cases A - D indicated.

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