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BOUNDARY LAYER TESTS OF THE SPACE SHUTTLE AFRSI MATERIAL IN THE NASA/AMES RESEARCH CENTER 2x2-FOOT TRANSONIC WIND TUNNEL (OA308)

by

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Prepared under NASA Contract Number NAS9-16283

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WIND TUNNEL TEST SPECIFICS:

Test Number:	ARC 22TWT 542-1
NASA Series Number:	0A308
Model Number:	122-Ø
Test Start Date:	July 13, 1982
Test Completion Date:	July 23, 1982

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ABSTRACT

An experimental investigation (OA308) was conducted in the NASA/Ames Research Center (ARC) 2x2-foot wind tunnel from July 13, 1982 through July 23, 1982. The purpose of this test was to obtain data for use in determining the skin friction drag due to AFRSI implementation on the Space Shuttle vehicle.

Three panels were tested; one flat metal calibration panel, one Advanced Flexible Reusable Surface Insulation (AFRSI) panel, and one Felt Reusable Surface Insulation (FRSI or Nomex Felt) panel. These three panels were tested through a Mach range of 0.6 to 0.9.

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INTRODUCTION

Advanced Flexible Reusable Surface Insulation (AFRSI) is presently under consideration as a potential replacement for the Low-Temperature Reusable Surface Insulation (LRSI) tiles on the Space Shuttle. AFRSI is a quilted blanket consisting of silica fiber felt insulation material with a quartz fabric OML cover and a glass fabric IML lining. The quilting is done with quartz thread stitched through the three layers of material. The blanket IML is bonded to the skin of the vehicle while the OML face is exposed to the high-pressure gradients, fluctuating acoustic pressures, and wind shear stresses attendant to atmospheric flight. The blankets are pliable, but individual fibrous elements are hard and brittle, and susceptible to damage, especially where they cross each other.

The objective of test OA308 was to obtain boundary layer data for use in determining the skin friction drag due to AFRSI implementation on the Space Shuttle vehicle. This objective was accomplished.

Model 122-Ø used for this test, consisted of three test specimens, boundary layer equipment, and the tunnel movable wall. The general arrangement is presented in Figure 1a. The three test specimens were tested through a Mach range of 0.6 to 0.9. It should be noted that the boundary layer equipment (static rake and boundary layer probe) was not used in the forward and aft positions simultaneously.

This report presents information on the conduct of the test, descriptions of the test panels and the test facility, instrumentation particulars, and plotted and tabulated data.

NOMENCLATURE

Symbol	Definition
$b_1 \rightarrow b_4$	Curve fit constants
C_p	Pressure coefficient
H	Boundary layer shape parameter
IN	Inches
M	Mach number
N	Boundary layer power profile parameter
P	Pressure, pounds per square inch
PSF	Pounds per square foot
q,Q	Dynamic pressure, PSF
R	Reynolds number, per foot
r	Recovery factor
T	Temperature, ^{o}R
U	Velocity in the X-direction
X	Longitudinal Station, positive aft, from origin shown in Figure 1b, inches
Y	Lateral distance, positive down, inches
Z	Normal distance, inches
δ,DELTA	Boundary layer thickness, inches
δ^*,DELSTR	Boundary layer displacement thickness, inches
θ,THETA	Boundary layer momentum thickness, inches
ρ	Density, slugs per cubic foot
e	At the edge of the boundary layer
i	Orifice number
s	Local static

NOMENCLATURE (Continued)

Symbol	Definition
T	Total, at probe tip location
Z	At probe height Z
δ	At $Z = \delta$
∞	Free Stream
1	Location of forward probe
2	Location of aft probe

Other Symbology includes

AFRSI	Advanced Flexible Reusable Surface Insulation
B.L.	Boundary Layer
CON	Condition
CONF	Configuration
DEG	Degree
DEV	Deviation
F	Fahrenheit
FRSI	Felt Reusable Surface Insulation
FT	Foot
HP	Hewlett-Packard
IML	Inner Mold Line
L.E.	Leading Edge
LOC.	Location
LRSI	Low-Temperature Reusable Surface Insulation
MID	Middle
OML	Outer Mold Line
PRES	Pressure

NOMENCLATURE (Concluded)

SLG	Slugs
sq	Square
STA.	Station
STAN	Standard
SYB	Symbol
WALL,W	Wall position, inches

REMARKS

Prior to testing, a leak check was performed on the pressure taps shown in Figure 1b. The results of this leak check were as follows: tap 4 had a very slow leak; tap 21 leaked; tap 24 had a very fast leak; and the remaining taps did not leak. Data from taps 4, 21, and 24 should be considered questionable.

Also, it should be noted that runs 105, 106, and 121 were re-run as shown in Table III. Runs 105 and 106 were re-run because during these runs there was a leak in the total head probe. Runs 121 and 122 were combined into one run. During run 121, the tunnel became too hot and had to be brought down. Run 122 was a continuation of run 121 and picked up the remaining data points that were not obtained during run 121. The data from these runs are presented in the Appendix as run 222.

CONFIGURATIONS INVESTIGATED

Model Description

Model 122-Ø was used for test OA308. It consists of three test specimens, boundary layer equipment, and the tunnel movable wall. The general arrangement is presented in Figure 1a.

Test Panels

Three panels were tested; one flat metal calibration panel, one Advanced Flexible Reusable Surface Insulation (AFRSI) panel, and one Felt Reusable Surface Insulation (FRSI or Nomex felt) panel. These test panels were mounted in a holding panel. The holding panel had an aluminum base 26.85 by 20.80 inches. The base was mounted on the frame in the movable wall to provide attachment points for the test panel and wooden filler block.

The flat metal calibration panel (measuring 14.5 by 17.5 inches) was used in place of the AFRSI and FRSI panels for the flow calibration of the test. This panel was installed flush with the tunnel wall. A photograph of the calibration panel installed in the 2x2-foot TWT is shown in Figure 2.

The AFRSI blanket specimen was bonded to a 1/8-inch aluminum backing plate (14.5 by 17.5 inches). Rectangular frames attached to the backing plate surrounded the material specimen. The frame/specimen interfaces were closed off with aluminum strips which covered the top surface of the frame, and extended inward approximately one inch over the AFRSI material.

This round-nose extension was bonded to the specimen material to prevent puffing and possible damage to the blankets. The test panel was attached to the base plate with cap screws inserted through aluminum strips and frames.

The FRSI panel was also 14.5 by 17.5 inches and was attached to the base plate with cap screws.

INSTRUMENTATION

Boundary layer probes were forward of the calibration and AFRSI test panels for a total of ten runs, as seen in Table II. During all other runs, boundary layer probes were aft of the panel.

At both stations, the probes included one total head tube mounted on a drive supplied by ARC, and a fixed static rake which gave pressures at three heights. The general arrangement is shown in Figure 1a. The dimensional (location) data are given in Table IV. The locations are illustrated in Figure 1b.

The three static pressure probes and the single total pressure probe were each connected to an individual pressure transducer. The transducers were digiquartz pressure transducers made by ParoScientific Inc., and supplied by ARC.

There was a total of 44 static pressure orifices located on the AFRSI test panel and the movable wall. Thirty-two static pressure orifices were located in the movable wall, four static pressure taps were located on the forward and aft surfaces of the test panel frame, and eight subsurface taps were located at the borderline under the AFRSI.

The flat calibration plate had 12 surface static pressure orifices at the same X-Y coordinates as those in the AFRSI test panel. All 44 static pressure orifices were connected during the calibration runs.

The static taps were connected to scanivalves. The locations of the orifices are shown in Figure 1b and listed in Table IV. Rockwell furnished the scanivalves and transducers.

TEST FACILITY DESCRIPTION

The Ames Research Center 2x2-foot wind tunnel was used for these tests. The tunnel is of the continuous-flow type with porous test section walls surrounded by a plenum chamber. Mach number is continuously variable over the range from 0.6 to 1.4 and dynamic pressure is continuously variable over the range from 200 to 1500 psf.

The tunnel can be operated so that one section of the side wall moves up to 1.4 inches into the airstream. The upstream edge of the movable wall is a sharp edged splitter plate which scoops off all or part of the tunnel sidewall boundary layer. It is possible to position the wall to achieve a boundary layer thickness from 0.25 to 1.0 inch in the panel test region.

TEST PROCEDURES

The total head (boundary layer) probe position was calibrated at ARC. Also, the pressure transducers were calibrated at ARC. In addition, standard ARC calibration procedures were employed for pretest calibration of the wall position.

The first part of the test consisted of using the calibration panel. This panel was tested at Mach numbers of 0.6, 0.8, and 0.9 as shown in Table I. The calibration panel was run with the probes in the aft and forward positions and at high and low dynamic pressures. The actual conditions used during test OA308 are shown in the run schedule (Table II).

The AFRSI panel was run next. This panel was run with the boundary layer probes in the forward position for only two runs. At this time, it was determined that the air flow upstream of the test article was unaffected by the test article. Therefore, the remaining runs were performed with the probes in the aft position at Mach numbers of 0.6 and 0.9.

The FRSI panel was the last panel to be run. This panel was run at Mach numbers of 0.6 and 0.9 with the probes only in the aft position. No runs were performed with the probes in the forward position for the FRSI panel. During the testing of the AFRSI panel, it was determined that the air flow upstream of the test article was unaffected by the test article. Since data were obtained with the probes in the forward position for the calibration panel, no additional forward probe runs were necessary.

TEST PROCEDURES (Concluded)

As part of the test procedure, grit was placed one inch aft of the leading edge of the tunnel movable wall. The purpose of this procedure was to determine the precise location at which the air flow went from laminar to turbulent. The size of the grit varied from between 0.0097 inch and 0.0116 inch.

DATA REDUCTION

Data were acquired and reduced on the facility data system. Reduced data were transferred to facility-supplied HP-9830 disk storage in the control room. This computer was used to interrogate the boundary layer probe data and make the calculations and plots needed for determining the skin friction coefficient. Rockwell supplied the HP-9830 program.

Standard tunnel equations were used to compute all tunnel conditions. Static pressure data were reduced to standard coefficient form,

$$C_{p_i} = (P_{s_i} - P_\infty) \times 144/q_\infty$$

Boundary layer probe data were reduced as follows:

(1) Mach number (M_Z) was computed at each probe height Z, using P_s chosen from the available data:

a) When $(P_s/P_t) \geq 0.5283$

$$M_Z = \sqrt{5\left[\left(\frac{P_T}{P_S}\right)_Z^{2/7} - 1\right]}$$

(2) The data were fit with a curve of the form:

$$M_Z = b_2 + b_3 Z + b_4 Z^2$$

(3) M_e was obtained using:

$$M_e = M_Z \text{ at } Z \text{ maximum}$$

(4) The velocity ratio (U_Z/U_e) was obtained using:

$$(U_Z/U_e) = \frac{M_Z}{M_e}\left(\frac{T_Z}{T_e}\right)^{1/2}$$

were:

$$(T_Z/T_e) = (1 + .2rM_e^2)/(1 + .2rM_z^2)$$

(5) The boundary layer thickness (δ) was determined by using seven data points before $(U_Z/U_e) = 1$ in the following equation:

$$Z^{3/2} = \delta^{3/2} + b_1\sqrt{1 - (U_Z/U_e)}$$

(6) Using δ as Z, M_δ was found from equation (2)

(7) If $(M_e - M_\delta) \leq \pm .001$, step (8) was referred to. Otherwise, M_e was set equal to M_δ and step (4) was referred to.

(8) N was determined using:

$$\log (Z/\delta) = (1/N) \log (U_Z/U_e)$$

(9) The density ratio (ρ_Z/ρ_e) was determined from:

$$(\rho_Z/\rho_e) = \frac{1}{(T_Z/T_e)} \quad \frac{p_Z}{p_e}$$

where

$$(P_Z/P_e) = 1.0$$

(10) The boundary layer displacement thickness (δ^*) was determined from:

$$\delta^* = \int_0^\delta \left(1 - \frac{\rho_Z \, U_Z}{\rho_e \, U_e}\right) dZ$$

(11) The boundary layer momentum thicknes (θ) was calculated from:

$$\theta = \int_0^\delta \frac{\rho_Z \, U_Z}{\rho_e \, U_e} \left(1 - \frac{U_Z}{U_e}\right) dZ$$

(12) The boundary layer shape parameter (H) was calculated from:

$$H = \delta^*/\theta$$

Typical plotted data for test 0A308 are shown in Figures 3 thru 9.

REFERENCES

1. STS82-0143, "Pretest Information for Boundary Layer Tests of the Space Shuttle AFRSI Material in the Ames Research Center 2x2-Foot Transonic Wind Tunnel (Test OA308)" (February 1982)

Table I

TEST : OA308

DATE : 8-20-82

TEST CONDITIONS

MACH NUMBER	REYNOLDS NUMBER (per unit length)	DYNAMIC PRESSURE (pounds/sq. foot)	STAGNATION TEMPERATURE (degrees Fahrenheit)
0.6	8.20×10^6	1000	86
0.6	1.26×10^6	150	78
0.8	9.02×10^6	1400	95
0.8	1.41×10^6	210	75
0.9	8.03×10^6	1400	111
0.9	7.48×10^6	1300	115
0.9	7.21×10^6	1200	104
0.9	6.84×10^6	1000	99
0.9	1.45×10^6	240	85

BALANCE UTILIZED: NA

	CAPACITY:	ACCURACY:	COEFFICIENT TOLERANCE:
NF			
SF			
AF			
PM			
RM			
YM			

COMMENTS:

Table II - Run Schedule

TEST: OA 308 DATE: 8-20-82

	CONFIGURATION	SCHD. Z				PARAMETERS/VALUES Wall	Q(PSF)								MACH NUMBERS .6	.8	.9		TEST RUN NUMBERS
	Calibration Plate	B				0	1000								105/109				
	with rear probes	B				0	150								106/110				
		B				0	210									111			
		B				0	1400									114	115		
		B				0	240										117		
		A				1.4	240										118		
		A				1.4	1400										120		
		A				1.4	150								121/122				
		A				1.4	210									123			
		A				1.4	1000								124				
	Calibration Plate	A				1.4	1000								127				
	with forward probes	A				1.4	150								129				
		B				0	150								130				
		B				0	1000								131				
		B				0	1400										133		
		B				0	240										134		
		A				1.0	1000										136		
		A				1.0	240										137		

*RESULTS OF RUNS 121 AND 122 ARE PRESENTED AS RUN 222 IN THE APPENDIX.

PROBE HEIGHT, Z, SCHEDULE (INCHES)

"A" .02 .04 .06 .08 .10 .13 .15 .17 .20 .25 .30 .35 .40 .50 .60 .70 .80 .90 1.00 1.10 1.20 1.30 1.40 1.50 1.60

"B" .02 .04 .06 .08 .10 .12 .14 .16 .20 .26 .40 .64 .96 1.40 1.55 1.70 1.85 2.0 2.1 2.2 2.3 2.4 2.5 2.6

Wall "0" means panel was flush with tunnel wall
Wall "1.0" means panel was 1.0 inch into airstream
Wall "1.4" means panel was 1.4 inches into airstream

Table II (Concluded)

TEST: OA 308 DATE: 8-20-82

	CONFIGURATION	SCHD. Z				PARAMETERS/VALUES Wall	Q(PSF)								MACH NUMBERS .6	.8	.9		TEST RUN NUMBERS
	AFRSI Panel	A				1.4	1000								140				
	with front probes	A				1.4	150								141				
	AFRSI Panel	A				1.0	1200										145		
	with rear probes	B				0	1400										146		
		A				1.4	1000								148				
		B				0	1000								150				
		B				0	150								151				
		A				1.4	150								152				
		A				1.4	240										153		
		B				0	240										154		
	Nomex Panel with	A				1.0	1300										156		
	rear probes	A				1.4	1000								157				
		B				0	1000								158				
		B				0	1400										159		
		B				0	240										160		
		A				1.4	240										161		
		A				1.4	150								162				
		B				0	150								163				

PROBE HEIGHT, Z, SCHEDULE (INCHES)

"A" .02 .04 .06 .08 .10 .13 .15 .17 .20 .25 .30 .35 .40 .50 .60 .70 .80 .90 1.00 1.10 1.20 1.30 1.40 1.50 1.60

"B" .02 .04 .06 .08 .10 .12 .14 .16 .20 .26 .40 .64 .96 1.40 1.55 1.70 1.85 2.0 2.1 2.2 2.3 2.4 2.5 2.6

Wall "0" means panel was flush with tunnel wall
Wall "1.0" means panel was 1.0 inch into airstream
Wall "1.4" means panel was 1.4 inches into airstream

Table III - Test OA308 Test Summary

Mach No.	.6								.8								.9							
Q	LOW				HIGH				LOW				HIGH				LOW				HIGH			
Wall Position*	Flush		Out		Flush		Out		Flush		Out		Flush		Out		Flush		Out		Flush		Out	
Probe Position	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd
SMOOTH PANEL	Run 110, 106	130	121**, 122**	129	109, 105	131	124	127	111	X	123	X	114	X	X	X	117	134	118	137	115	133	120	136
AFRSI PANEL	Run 151	X	152	141	150	X	148	140	X	X	X	X	X	X	X	X	154	X	153	X	146	X	145	X
FRSI (NOMEX) PANEL	Run 163	X	162	X	158	X	157	X	X	X	X	X	X	X	X	X	160	X	161	X	159	X	156	X

* Wall position "flush" means flush with tunnel wall
Wall position "out" means out into the airstream

**RESULTS OF RUNS 121 AND 122 ARE PRESENTED AS RUN 222 IN THE APPENDIX.

Table IV - Instrumentation Location OA308

PRESSURE TAP LOCATIONS, WALL ONLY

TAP NO.	X IN.	Y IN.
1	-12	-10.7
2	-9	
3	-6	
4	-3	
5	0	
6	3	
7	6	
8	9	
9	12	
11	-12	10.7
12	9	
13	6	
14	3	
15	0	
16	3	
17	6	
18	9	
19	12	

TAP NO.	X IN.	Y IN.
21	-14.475	-9
22		-6
23		-3
25		3
26		6
27		9
24	16.5★	0
31	+14.475	-9
32		-6
33		-3
34		0
35		3
36		6
37		9

X AND Y ARE MEASURED FROM A POINT ON THE CENTERLINE, 13.475 AFT OF THE L.E. OF THE TEST PANEL

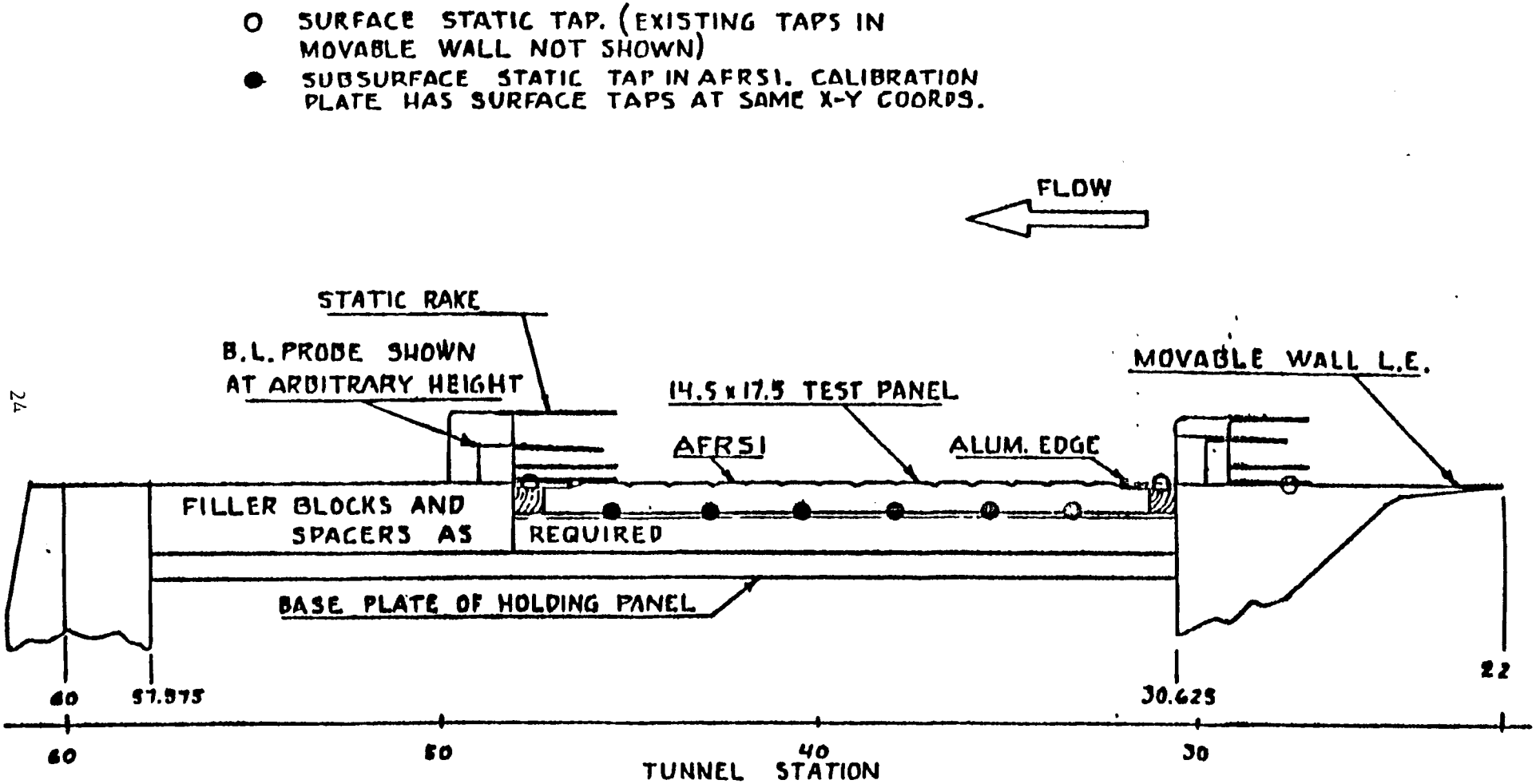
★ NEW LOCATION OF WALL TAP NO. 24

PRESSURE TAP LOCATIONS, TEST PANEL

TAP NO.	X IN.	Y IN.
301	-12.80	0
302	-10.80	0
303	-7.80	0
304	-4.90	0
305	-2.90	0
206	-.90	0
307	1.10	0
207	1.10	+3
407	1.10	-3
308	3.20	0
208	3.20	+3
408	3.20	-3

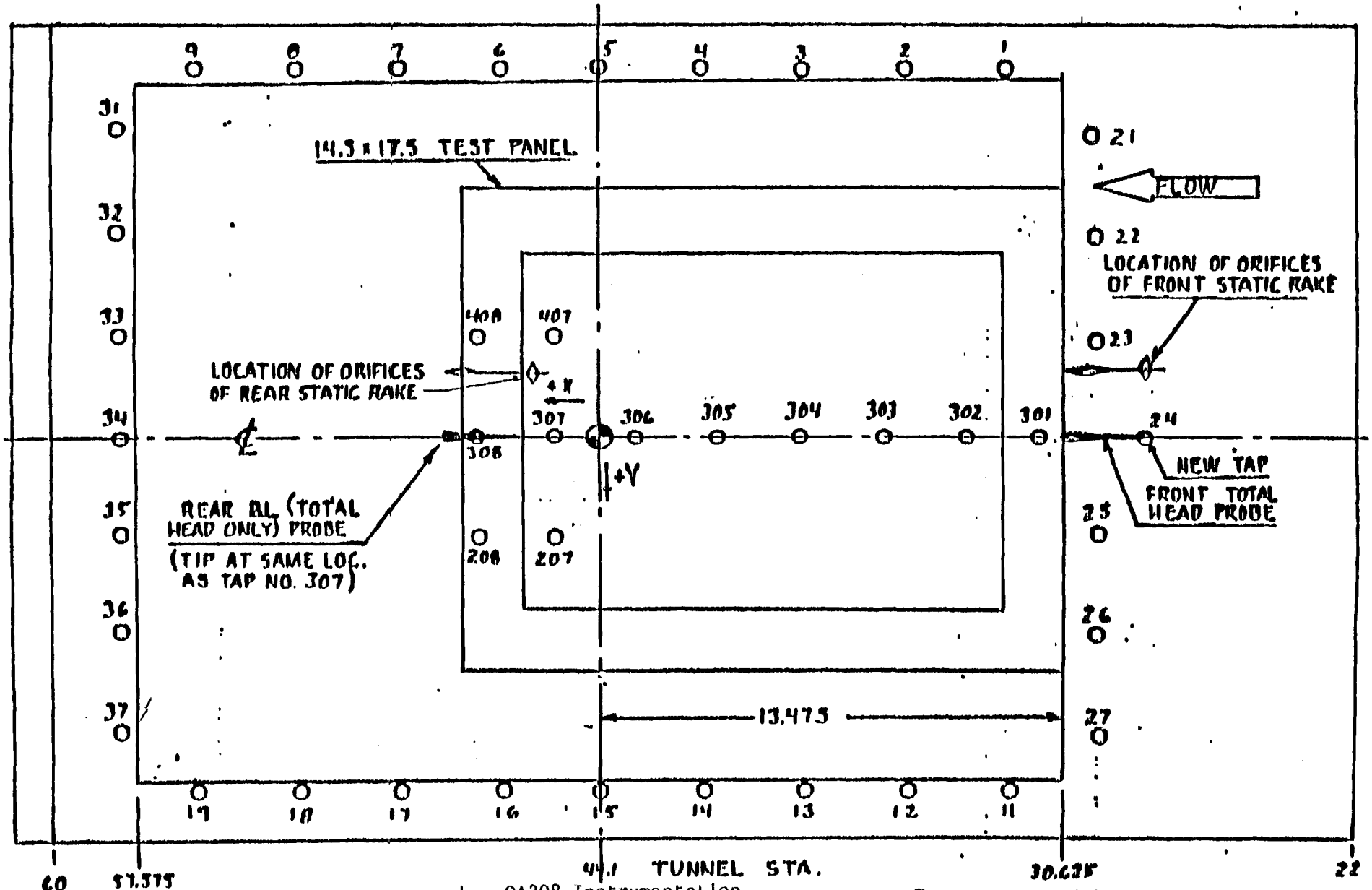
TOTAL HEAD PROBE TIP LOCATIONS
FRONT: X = -16.5, Y = 0
REAR: X = +1.10, Y = 3.0

STATIC RAKE ORIFICE LOCATIONS
BOTH RAKES: Z = 0.3 (APPROX), .4, 1.8
FRONT RAKE: X = -16.5, Y = -2.0
REAR RAKE: X = 1.10, Y = +1.0



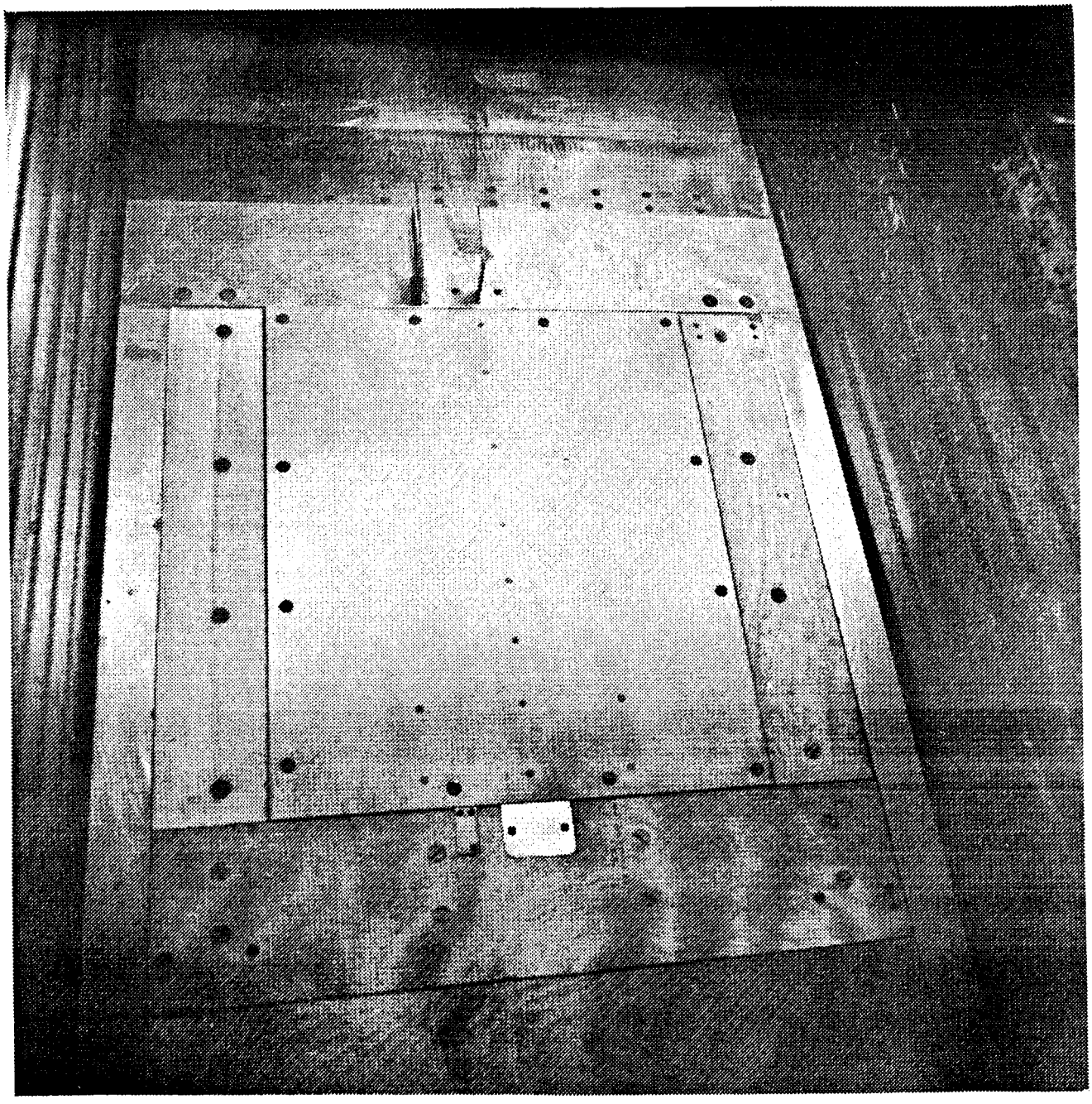
a. OA308 General Arrangement

Figure 1 - Model Sketches



b. OA308 Instrumentation

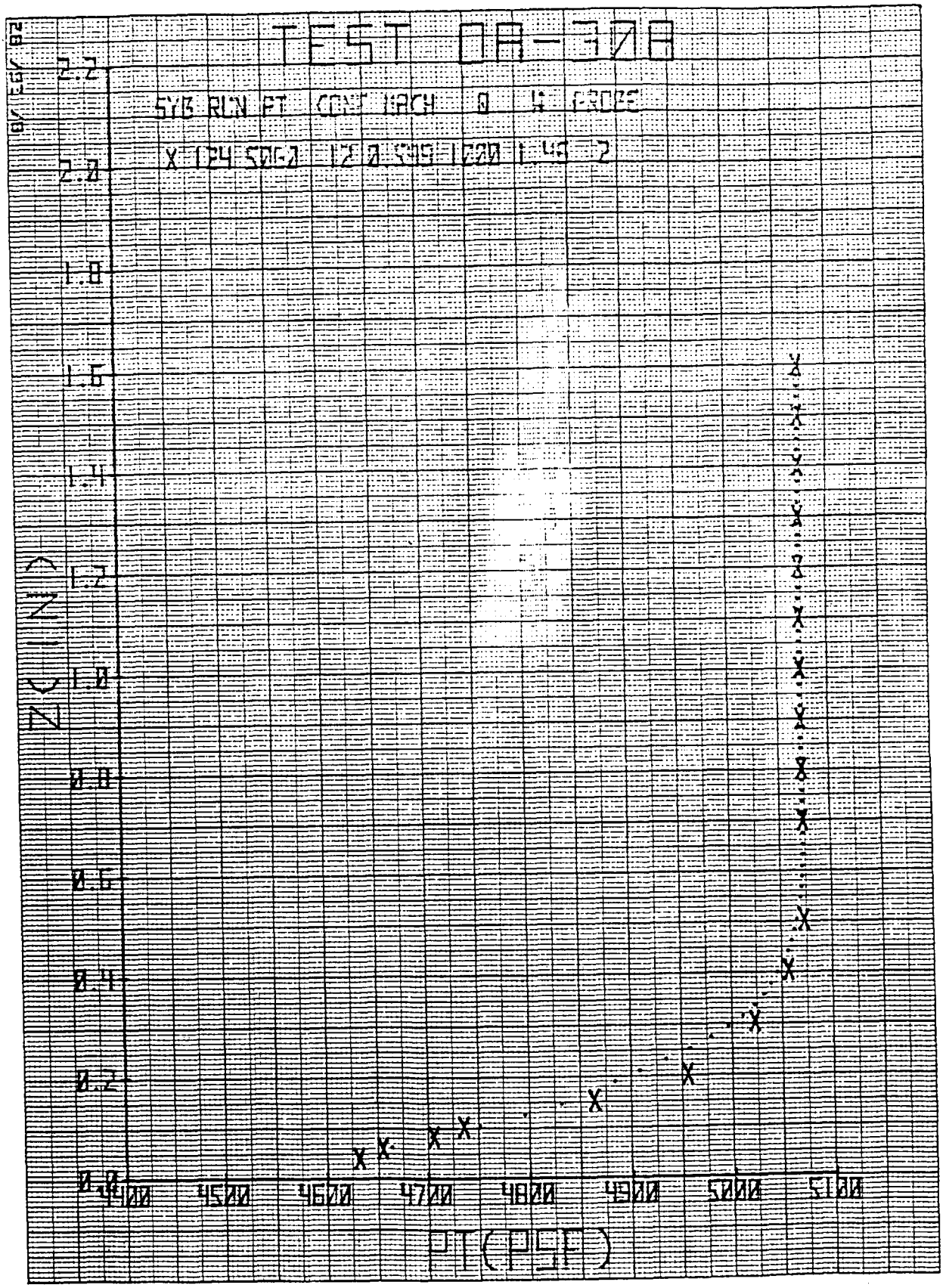
Figure 1 (Concluded)



Model Photograph - Calibration Panel

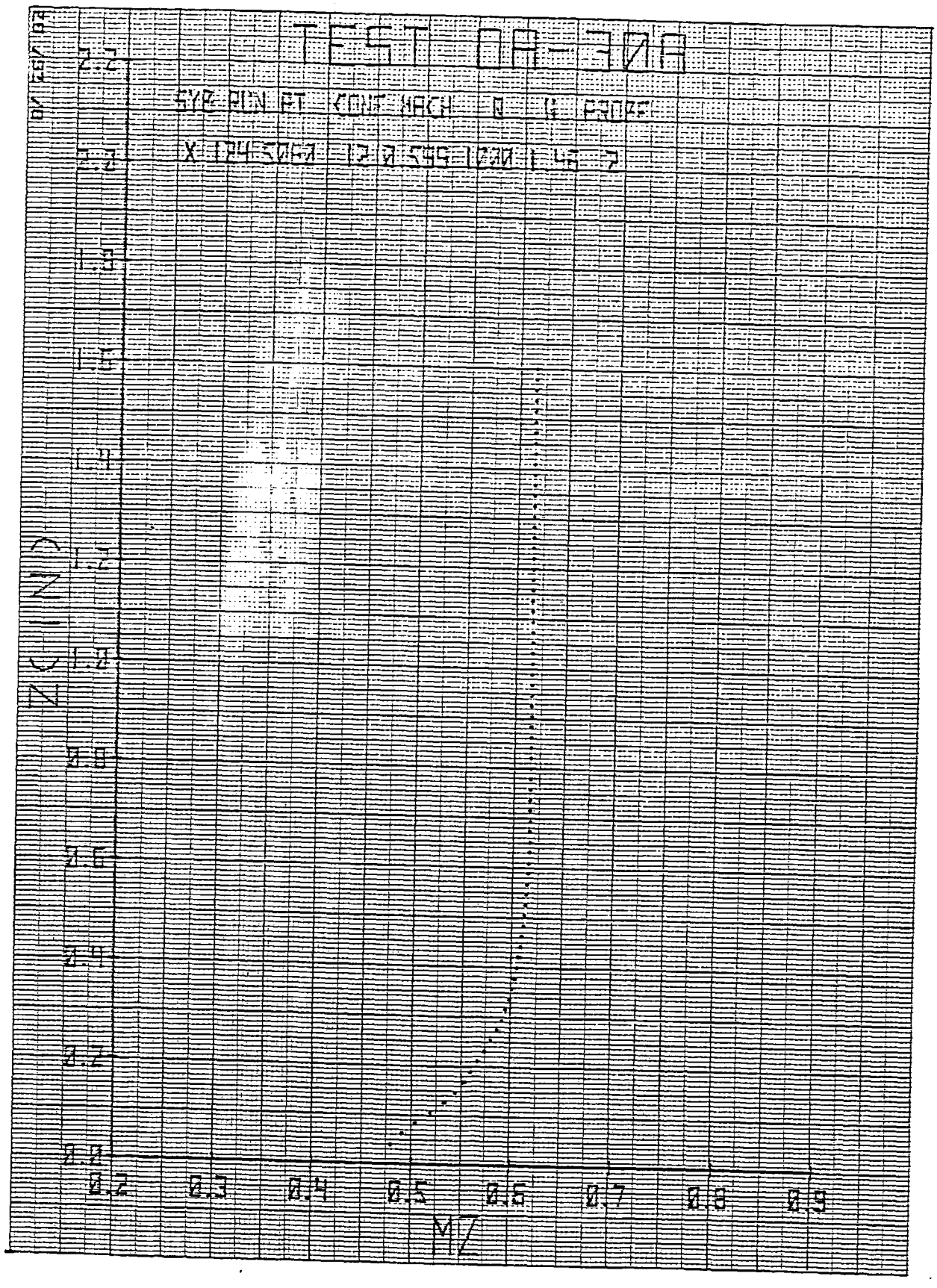
Figure 2

Data Figures



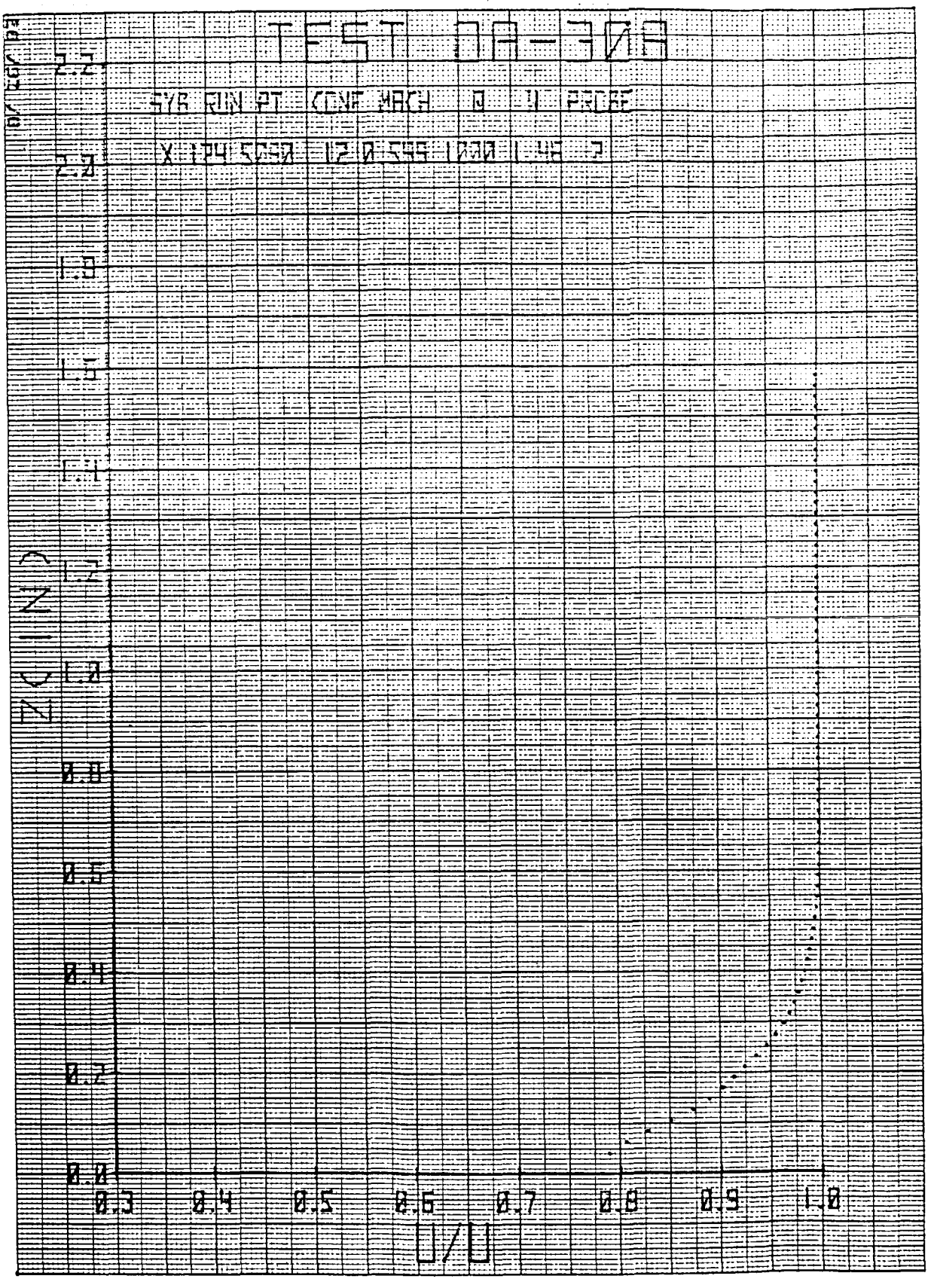
Test OA308, Typical Plotted Data - PT VS. Z

Figure 3



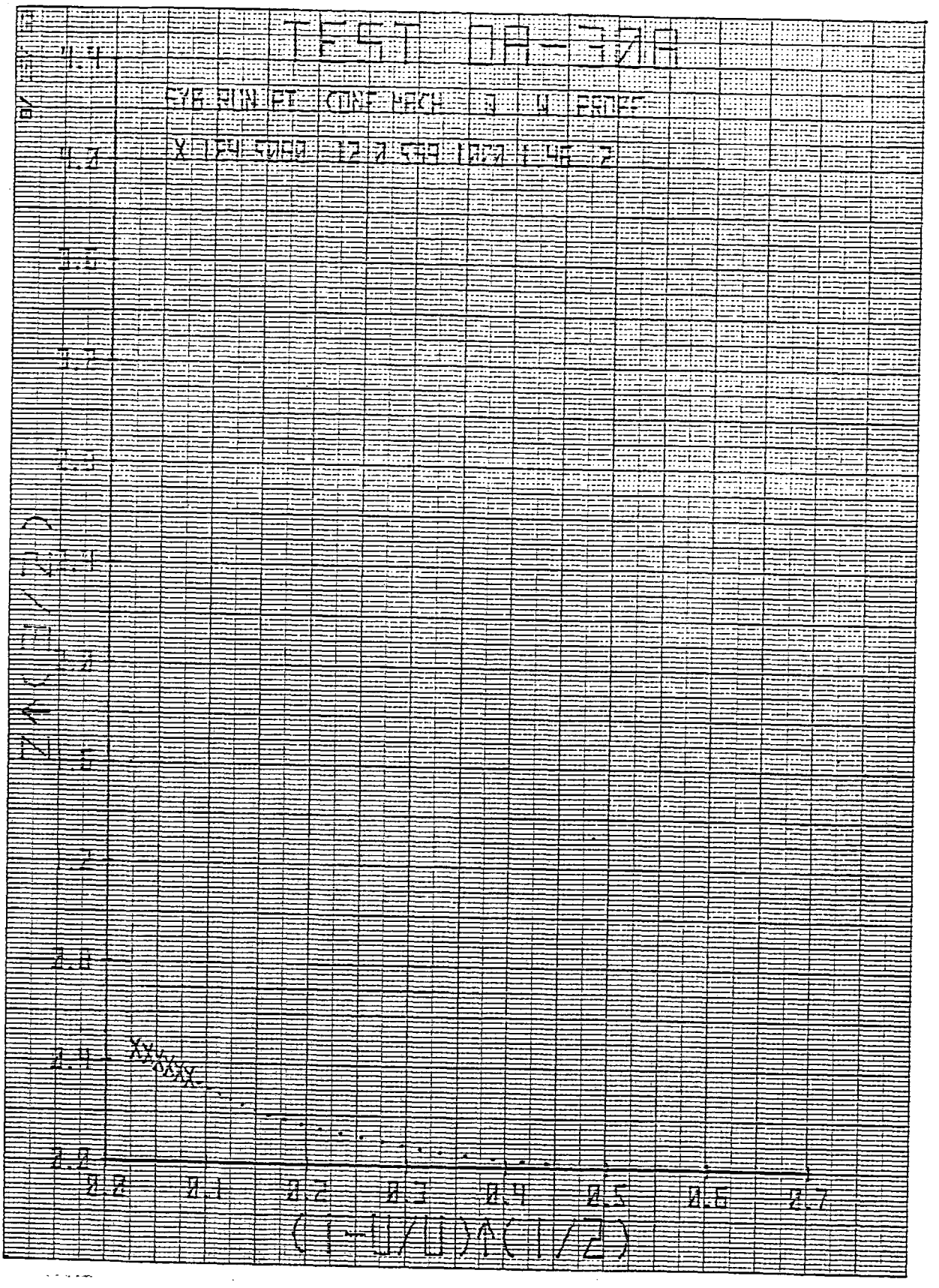
Test OA308, Typical Plotted Data - MZ VS. Z

Figure 4



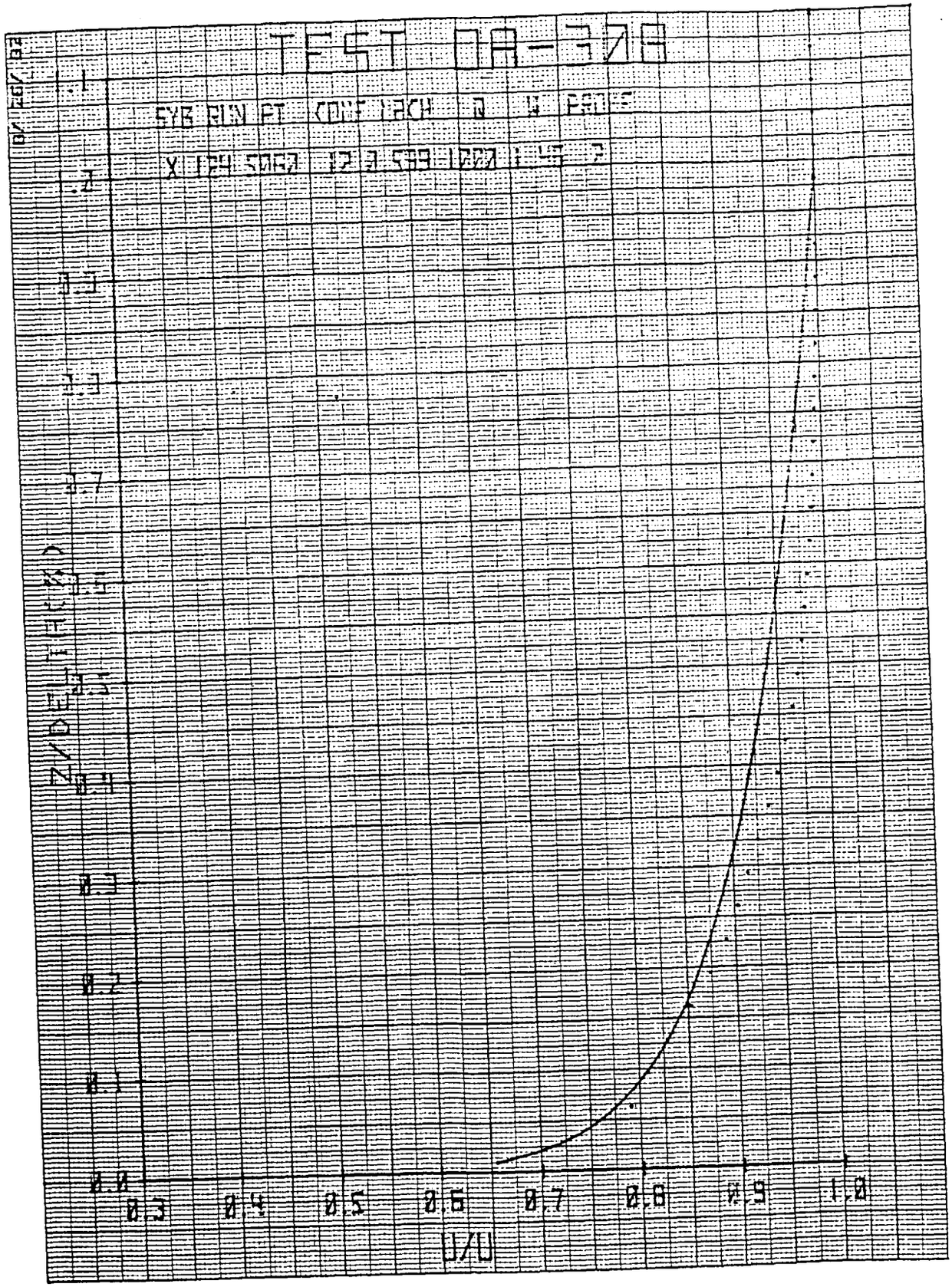
Test OA308, Typical Plotted Data - U/U VS. Z

Figure 5



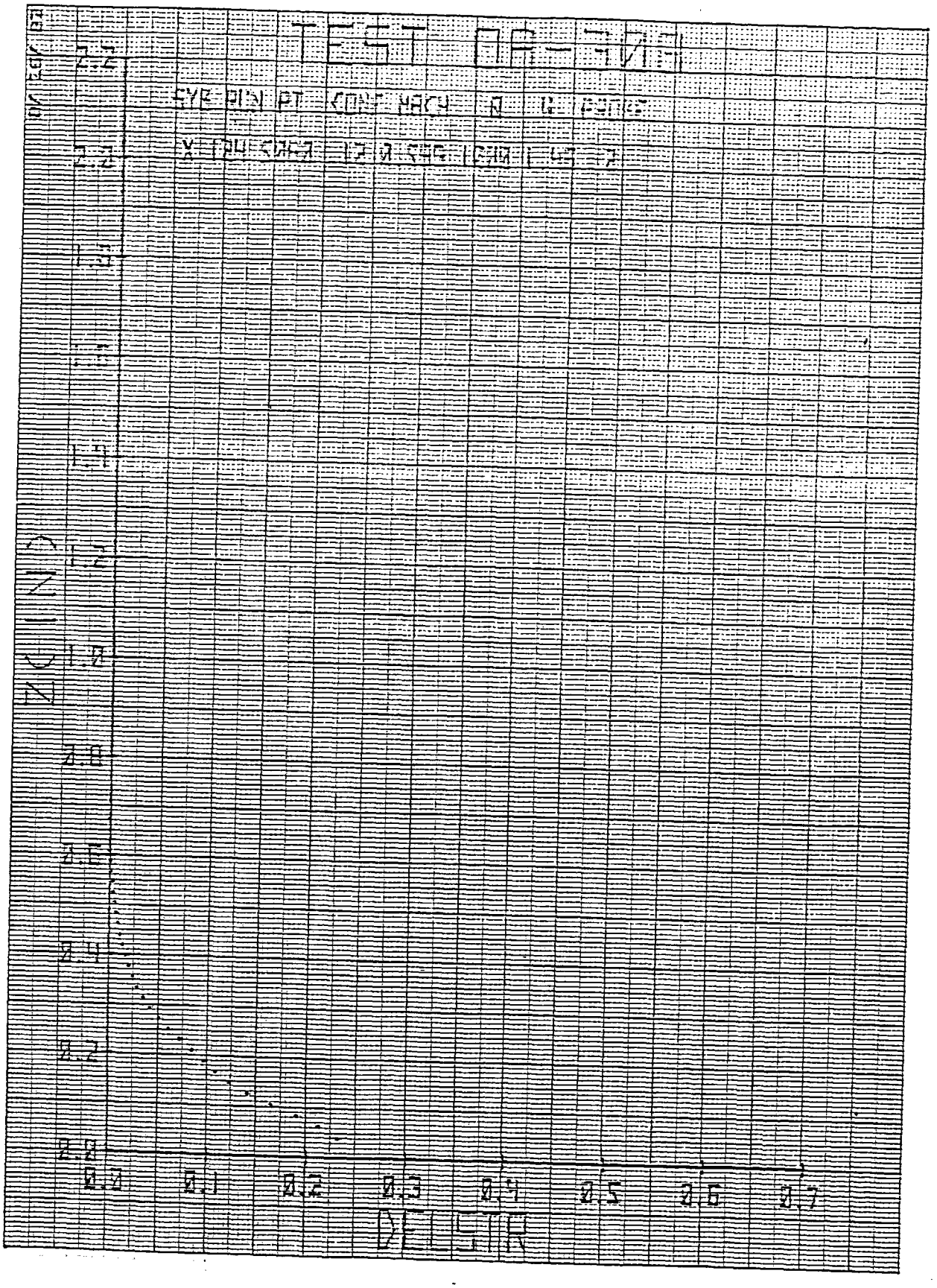
Test QA308, Typical Plotted Data - $(1-U/U)^{1/2}$ VS. $Z^{3/2}$

Figure 6



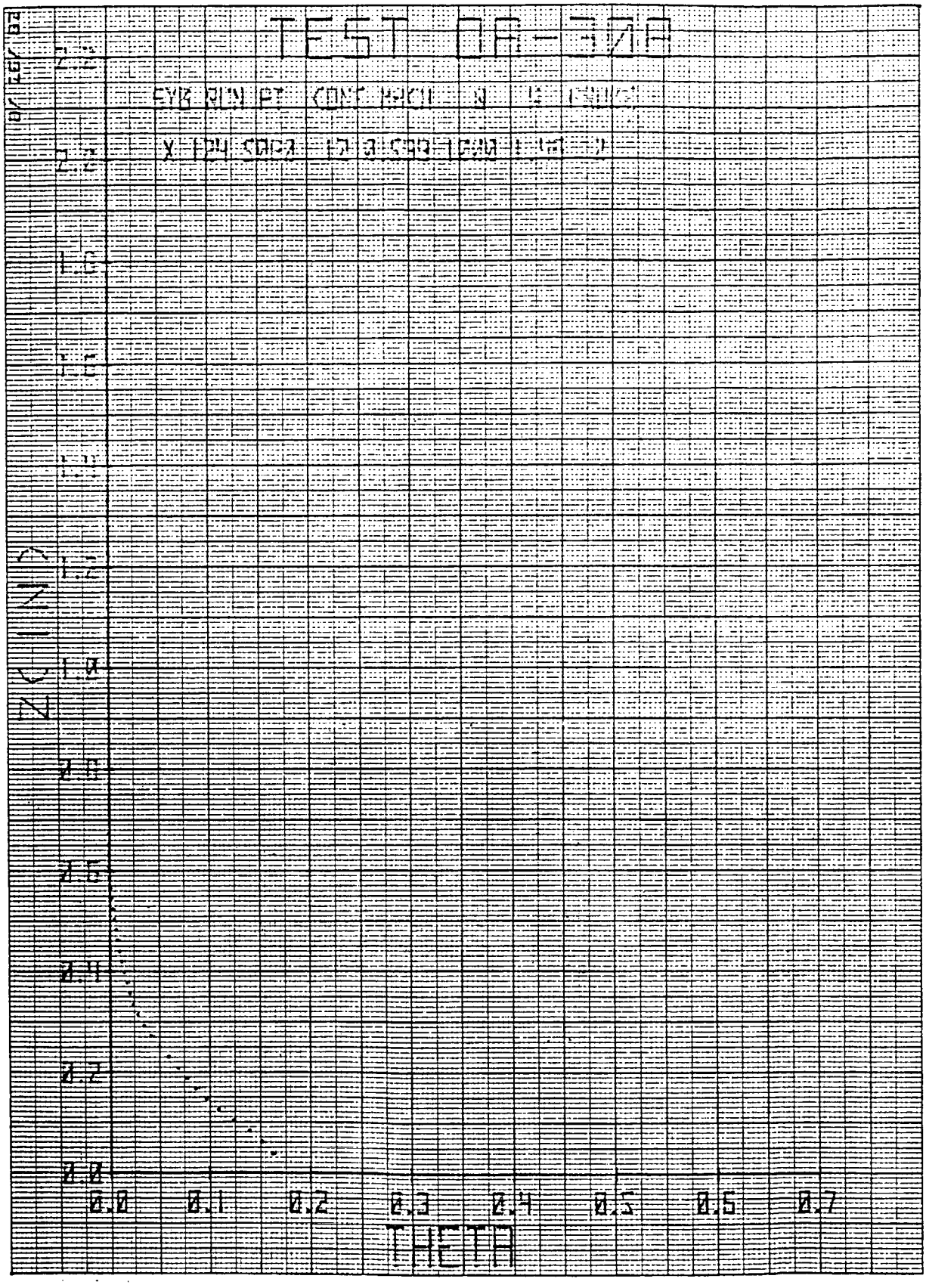
Test OA308, Typical Plotted Data - U/U VS. Z/δ

Figure 7



Test OA308, Typical Plotted Data - δ* VS. Z

Figure 8



Test OA308, Typical Plotted Data - θ VS. Z

Figure 9

Appendix

Tabulated Data

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AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	105	MACH	0.60	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	1005	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	94	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00449	SLG/FT↑3
DATA RUN MADE	7/ 13/82	REYNOLDS NUMBER/FT	8.06	

BOUNDARY LAYER THICKNESS	2.10	INSHES
DISPLACEMENT THICKNESS	0.173	INCHES
MOMENTUM THICKNESS	0.132	INCHES
SHAPE PARAMETER	1.30	
POWER PROFILE PRAMETER	9.70	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
7.0	5071	3972	3957	3947	3942	4388	0.041
8.0	5077	3983	3968	3959	3953	4417	0.041
9.0	5081	3990	3973	3963	3957	4429	0.061
10.0	5083	3985	3965	3957	3950	4469	0.082
12.0	5081	3981	3961	3955	3946	4456	0.100
13.0	5082	3979	3962	3952	3947	4497	0.120
14.0	5081	3975	3956	3949	3943	4503	0.142
15.0	5081	3980	3965	3956	3949	4525	0.162
17.0	5080	3976	3958	3950	3945	4551	0.201
18.0	5079	3978	3957	3947	3944	4592	0.260
19.0	5077	3975	3958	3948	3944	4682	0.402
20.0	5075	3980	3963	3955	3950	4747	0.640
21.0	5072	3977	3959	3949	3944	4842	0.950
22.0	5065	3993	3975	3969	3964	4859	1.409
23.0	5079	3993	3977	3967	3961	4954	2.000
24.0	5078	3982	3965	3957	3953	4954	2.102
25.0	5077	3983	3964	3958	3953	4954	2.200
26.0	5079	3982	3969	3959	3953	4954	2.200
27.0	5081	3982	3971	3961	3955	4954	2.300
28.0	5079	3982	3969	3961	3955	4954	2.400
29.0	5077	3987	3973	3964	3959	4954	2.500
AVERAGE	5078	3982	3965	3956	3951	----	----
MEAN DEV	3	4	5	5	5	----	----
STAN DEV	10	9	10	10	11	----	----
CALCULATED	5074	3975	3962	3960	3950	----	----
EDGE CON	4952	3948	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	106	MACH	0.61	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	155	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	77	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00069	SLG/FT↑3
DATA RUN MADE	7/ 13/82	REYNOLDS NUMBER/FT	1.28	

BOUNDARY LAYER THICKNESS	2.37	INSHES
DISPLACEMENT THICKNESS	0.274	INCHES
MOMENTUM THICKNESS	0.206	INCHES
SHAPE PARAMETER	1.33	
POWER PROFILE PRAMETER	8.57	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	764	594	594	594	593	647	0.041
2.0	769	598	598	597	597	656	0.062
3.0	771	600	599	599	599	658	0.080
4.0	768	597	596	596	596	659	0.101
7.0	757	591	591	590	590	660	0.160
8.0	757	595	595	595	595	666	0.200
9.0	758	596	596	596	595	674	0.262
10.0	761	600	600	600	600	685	0.400
11.0	761	596	595	595	595	689	0.641
12.0	757	595	595	594	594	704	0.961
13.0	756	594	594	594	593	711	1.401
14.0	759	596	596	596	596	725	2.001
15.0	761	596	596	596	596	734	2.103
16.0	763	597	598	597	597	734	2.203
17.0	766	599	599	598	598	734	2.302
18.0	766	598	598	598	598	734	2.400
19.0	761	594	594	594	594	734	2.500
20.0	756	590	591	590	590	734	2.602
AVERAGE	762	596	596	596	595	----	----
MEAN DEV	4	2	2	2	2	----	----
STAN DEV	5	3	3	3	3	----	----
CALCULATED	765	595	596	596	595	----	----
EDGE CON	734	595	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	109	MACH	0.60	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	1000	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	86	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00456	SLG/FT↑3
DATA RUN MADE	7/ 14/82	REYNOLDS NUMBER/FT	8.20	

BOUNDARY LAYER THICKNESS	2.14	INSHES
DISPLACEMENT THICKNESS	0.175	INCHES
MOMENTUM THICKNESS	0.135	INCHES
SHAPE PARAMETER	1.30	
POWER PROFILE PRAMETER	11.04	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	5077	3984	3969	3956	3951	4519	0.040
2.0	5078	3982	3964	3953	3947	4539	0.063
3.0	5081	3987	3968	3957	3952	4549	0.081
4.0	5081	3986	3966	3953	3950	4573	0.102
5.0	5081	3978	3960	3948	3943	4587	0.120
6.0	5079	3977	3960	3948	3942	4626	0.140
8.0	5075	3977	3960	3949	3943	4628	0.200
9.0	5072	3974	3954	3942	3937	4683	0.261
11.0	5070	3969	3948	3938	3931	4729	0.402
12.0	5079	3977	3959	3946	3941	4862	0.640
13.0	5071	3971	3959	3949	3943	4921	0.961
15.0	5079	3977	3972	3960	3955	5067	2.003
16.0	5077	3979	3971	3960	3955	5067	2.100
18.0	5080	3982	3974	3965	3958	5067	2.201
20.0	5085	3979	3973	3961	3955	5067	2.302
21.0	5080	3979	3972	3961	3955	5067	2.401
22.0	5080	3978	3972	3960	3956	5067	2.499
23.0	5081	3973	3970	3958	3953	5067	2.600
AVERAGE	5078	3978	3965	3954	3948	----	----
MEAN DEV	3	4	6	6	6	----	----
STAN DEV	5	9	10	10	11	----	----
CALCULATED	5074	3982	3961	3958	3947	----	----
EDGE CON	5065	3944	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	110	MACH	0.60	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	151	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	78	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00069	SLG/FT↑3
DATA RUN MADE	7/ 14/82	REYNOLDS NUMBER/FT	1.26	

BOUNDARY LAYER THICKNESS	2.34	INSHES
DISPLACEMENT THICKNESS	0.240	INCHES
MOMENTUM THICKNESS	0.181	INCHES
SHAPE PARAMETER	1.33	
POWER PROFILE PRAMETER	7.97	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
3.0	752	588	590	588	588	651	0.082
4.0	753	589	591	590	589	655	0.101
5.0	757	592	594	593	592	662	0.119
6.0	757	594	596	594	593	667	0.143
7.0	757	594	596	594	593	671	0.160
9.0	757	594	595	594	593	677	0.263
10.0	757	593	595	594	593	682	0.401
11.0	757	593	595	594	593	693	0.641
12.0	757	593	595	594	593	705	0.960
13.0	757	593	595	594	593	720	1.400
14.0	757	593	595	594	593	732	2.001
15.0	757	593	596	594	593	736	2.101
16.0	757	593	596	594	593	736	2.200
17.0	757	593	596	594	593	736	2.301
18.0	757	594	596	594	594	736	2.403
19.0	757	593	596	594	593	736	2.501
AVERAGE	756	593	595	593	592	----	----
MEAN DEV	1	1	1	1	1	----	----
STAN DEV	2	2	2	2	2	----	----
CALCULATED	760	595	594	594	592	----	----
EDGE CON	736	592	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	111	MACH	0.80	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	209	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	75	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00058	SLG/FT↑3
DATA RUN MADE	7/ 14/82	REYNOLDS NUMBER/FT	1.41	

BOUNDARY LAYER THICKNESS	2.17	INSHES
DISPLACEMENT THICKNESS	0.245	INCHES
MOMENTUM THICKNESS	0.169	INCHES
SHAPE PARAMETER	1.45	
POWER PROFILE PRAMETER	8.39	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	713	468	472	471	469	559	0.042
2.0	713	467	471	470	468	562	0.063
3.0	713	468	473	471	469	568	0.081
4.0	713	467	471	470	468	572	0.100
6.0	714	465	469	468	466	579	0.140
8.0	714	466	470	468	467	586	0.200
9.0	714	467	471	469	468	588	0.261
10.0	714	467	472	470	469	600	0.400
11.0	714	467	471	470	468	620	0.642
12.0	714	467	471	470	469	639	0.960
13.0	714	467	472	471	469	673	1.400
14.0	713	467	472	470	469	689	2.002
15.0	713	467	472	471	469	689	2.102
18.0	713	467	472	471	469	689	2.401
19.0	713	467	472	471	469	689	2.500
20.0	713	467	472	471	469	689	2.600
AVERAGE	713	467	471	470	468	----	----
MEAN DEV	0	0	1	1	1	----	----
STAN DEV	1	1	1	1	1	----	----
CALCULATED	712	468	471	471	468	----	----
EDGE CON	689	468	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	114	MACH	0.80	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	1408	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	95	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00371	SLG/FT↑3
DATA RUN MADE	7/ 15/82	REYNOLDS NUMBER/FT	9.02	

BOUNDARY LAYER THICKNESS	1.97	INSHES
DISPLACEMENT THICKNESS	0.170	INCHES
MOMENTUM THICKNESS	0.120	INCHES
SHAPE PARAMETER	1.41	
POWER PROFILE PRAMETER	10.37	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	4777	3127	3131	3116	3105	3883	0.041
2.0	4779	3136	3137	3120	3112	3915	0.061
3.0	4780	3142	3147	3131	3122	3953	0.081
4.0	4781	3141	3142	3127	3118	3998	0.102
5.5	4778	3145	3146	3132	3124	4035	0.121
6.5	4781	3142	3142	3126	3118	4051	0.140
7.0	4784	3137	3136	3122	3108	4070	0.161
8.0	4780	3131	3132	3117	3108	4116	0.201
9.0	4780	3135	3136	3122	3112	4158	0.261
10.0	4778	3144	3146	3131	3122	4294	0.400
11.0	4778	3140	3145	3130	3121	4394	0.642
11.5	4779	3127	3126	3114	3103	4414	0.642
12.0	4778	3130	3133	3118	3111	4562	0.960
13.0	4780	3133	3136	3124	3113	4700	1.402
14.0	4779	3132	3137	3124	3114	4751	1.701
15.0	4781	3142	3148	3133	3124	4767	2.002
16.0	4781	3139	3151	3132	3126	4770	2.101
17.0	4781	3136	3141	3129	3117	4770	2.202
18.0	4781	3139	3146	3131	3121	4770	2.301
19.0	4783	3130	3140	3125	3115	4770	2.401
20.0	4783	3125	3133	3118	3109	4770	2.501
21.0	4782	3129	3138	3123	3112	4770	2.602
AVERAGE	4780	3136	3140	3125	3115	----	----
MEAN DEV	1	5	5	5	6	----	----
STAN DEV	5	8	6	7	10	----	----
CALCULATED	4776	3127	3135	3131	3114	----	----
EDGE CON	4764	3112	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	115	MACH	0.90	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	1405	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	111	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00294	SLG/FT↑3
DATA RUN MADE	7/ 15/82	REYNOLDS NUMBER/FT	8.03	

BOUNDARY LAYER THICKNESS	2.12	INSHES
DISPLACEMENT THICKNESS	0.162	INCHES
MOMENTUM THICKNESS	0.108	INCHES
SHAPE PARAMETER	1.49	
POWER PROFILE PRAMETER	10.37	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	4191	2479	2474	2458	2447	3241	0.040
2.0	4193	2478	2473	2460	2450	3257	0.060
3.0	4185	2475	2473	2459	2447	3286	0.082
5.0	4177	2473	2467	2454	2443	3325	0.100
6.0	4191	2484	2479	2466	2455	3379	0.122
7.0	4196	2481	2477	2464	2454	3411	0.141
8.0	4197	2492	2488	2474	2465	3417	0.161
9.0	4192	2519	2517	2502	2493	3472	0.199
10.0	4195	2449	2440	2426	2416	3502	0.261
12.0	4193	2472	2467	2456	2444	3639	0.403
13.0	4194	2474	2470	2457	2445	3859	0.640
14.0	4194	2484	2478	2466	2453	4030	0.961
15.0	4195	2477	2479	2462	2453	4155	1.400
16.0	4188	2474	2469	2456	2446	4159	1.702
17.0	4186	2474	2472	2460	2448	4179	2.001
18.0	4194	2484	2486	2472	2461	4179	2.102
18.5	4190	2465	2469	2453	2443	4179	2.103
19.0	4195	2488	2489	2476	2465	4179	2.200
20.0	4195	2483	2488	2474	2464	4179	2.300
AVERAGE	4192	2479	2477	2463	2452	----	----
MEAN DEV	4	9	10	10	10	----	----
STAN DEV	6	13	16	15	15	----	----
CALCULATED	4191	2478	2472	2468	2451	----	----
EDGE CON	4179	2447	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	117	MACH	0.90	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	239	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	85	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00053	SLG/FT↑3
DATA RUN MADE	7/ 15/82	REYNOLDS NUMBER/FT	1.45	

BOUNDARY LAYER THICKNESS	2.19	INSHES
DISPLACEMENT THICKNESS	0.243	INCHES
MOMENTUM THICKNESS	0.161	INCHES
SHAPE PARAMETER	1.51	
POWER PROFILE PRAMETER	8.66	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
2.0	714	422	425	423	421	527	0.040
3.0	717	424	427	425	423	533	0.061
4.0	716	423	426	424	422	539	0.082
5.0	716	423	425	424	422	543	0.101
6.0	716	423	426	424	422	550	0.121
8.0	716	422	424	422	420	556	0.160
9.0	716	423	426	424	422	564	0.200
10.0	716	423	426	424	422	577	0.261
11.0	716	422	425	423	421	595	0.400
12.0	716	422	425	423	421	627	0.641
13.0	716	422	425	423	421	638	0.960
13.5	719	424	427	425	423	648	0.960
14.0	715	421	424	422	420	672	1.402
15.0	715	421	424	422	420	682	1.701
15.5	720	425	428	426	424	687	1.701
15.6	720	425	428	426	424	689	1.701
16.0	717	422	425	423	422	701	2.005
17.0	717	422	426	424	422	701	2.100
18.0	717	422	425	423	422	701	2.203
19.0	717	422	426	423	422	701	2.300
20.0	718	421	425	422	420	701	2.401
21.0	717	421	425	423	421	701	2.500
22.0	717	422	427	425	423	701	2.601
AVERAGE	717	422	426	424	422	----	----
MEAN DEV	1	1	1	1	1	----	----
STAN DEV	2	1	1	1	1	----	----
CALCULATED	714	422	425	424	422	----	----
EDGE CON	701	421	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	118	MACH	0.90	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	241	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	83	DEG F
WALL POSITION	1.5 INCHES	DENSITY	0.00053	SLG/FT↑3
DATA RUN MADE	7/ 15/82	REYNOLDS NUMBER/FT	1.47	

BOUNDARY LAYER THICKNESS	0.85	INSHES
DISPLACEMENT THICKNESS	0.068	INCHES
MOMENTUM THICKNESS	0.046	INCHES
SHAPE PARAMETER	1.47	
POWER PROFILE PRAMETER	9.00	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	717	423	425	422	419	557	0.040
2.0	717	423	425	422	419	561	0.065
3.0	717	423	424	422	419	572	0.082
4.0	717	423	425	422	419	581	0.100
5.0	717	423	424	422	419	608	0.154
6.0	715	422	424	421	419	617	0.199
7.0	714	422	423	420	418	645	0.300
8.5	714	422	423	421	418	674	0.402
9.0	714	422	424	422	419	683	0.500
10.0	715	422	423	421	418	692	0.601
11.0	715	422	424	422	419	697	0.699
12.0	715	422	424	421	419	697	0.802
13.0	715	423	425	422	419	697	0.900
14.0	715	422	424	421	419	697	1.002
15.0	715	422	424	421	419	697	1.103
16.0	714	422	424	421	419	697	1.200
17.0	715	422	424	421	418	697	1.300
18.0	714	421	424	421	418	697	1.402
19.0	714	422	424	421	418	697	1.500
20.0	714	422	424	421	418	697	1.602
AVERAGE	715	422	424	421	419	----	----
MEAN DEV	1	0	0	1	0	----	----
STAN DEV	1	1	1	1	0	----	----
CALCULATED	717	423	424	421	0	----	----
EDGE CON	697	418	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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RUN	120	MACH	0.90	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	1327	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	115	DEG F
WALL POSITION	1.0 INCHES	DENSITY	0.00274	SLG/FT↑3
DATA RUN MADE	7/ 15/82	REYNOLDS NUMBER/FT	7.48	

BOUNDARY LAYER THICKNESS	0.78	INSHES
DISPLACEMENT THICKNESS	0.041	INCHES
MOMENTUM THICKNESS	0.028	INCHES
SHAPE PARAMETER	1.46	
POWER PROFILE PRAMETER	11.25	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	3943	2322	2316	2301	2286	3214	0.040
2.0	3949	2327	2324	2306	2291	3259	0.060
3.0	3957	2331	2326	2310	2294	3346	0.081
4.0	3961	2337	2333	2316	2301	3421	0.100
5.0	3966	2339	2336	2318	2304	3566	0.149
6.0	3970	2347	2346	2325	2313	3724	0.201
7.0	3976	2352	2348	2329	2315	3904	0.304
8.0	3982	2355	2354	2333	2322	3926	0.400
9.0	3980	2349	2350	2329	2318	3951	0.502
10.0	3978	2348	2345	2327	2315	3953	0.601
11.0	3981	2354	2354	2335	2321	3965	0.703
12.0	3978	2351	2346	2328	2316	3965	0.803
13.0	3977	2351	2354	2333	2320	3965	0.902
14.0	3978	2348	2348	2330	2315	3965	1.000
AVERAGE	3970	2344	2341	2323	2309	----	----
MEAN DEV	10	9	10	9	10	----	----
STAN DEV	14	11	14	12	13	----	----
CALCULATED	3940	2320	2341	2323	0	----	----
EDGE CON	3964	2306	----	----	----	----	----

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ARC TEST-PHASE-TUNNEL
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RUN	222	MACH	0.60	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	150	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	83	DEG F
WALL POSITION	1.5 INCHES	DENSITY	0.00069	SLG/FT↑3
DATA RUN MADE	7/ 15/82	REYNOLDS NUMBER/FT	1.24	

BOUNDARY LAYER THICKNESS	1.13	INSHES
DISPLACEMENT THICKNESS	0.076	INCHES
MOMENTUM THICKNESS	0.057	INCHES
SHAPE PARAMETER	1.32	
POWER PROFILE PRAMETER	9.16	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
$$$$$	758	595	592	590	588	668	0.040
$$$$$	758	596	593	591	590	676	0.061
$$$$$	759	594	592	590	588	680	0.082
$$$$$	759	597	594	593	591	686	0.100
$$$$$	760	596	593	591	590	690	0.150
$$$$$	757	593	590	588	587	700	0.200
$$$$$	760	595	593	591	589	704	0.201
$$$$$	757	594	591	589	587	720	0.301
$$$$$	761	596	593	591	589	725	0.302
$$$$$	761	596	593	591	590	729	0.400
$$$$$	757	594	591	590	588	733	0.403
$$$$$	758	595	592	590	588	742	0.500
$$$$$	759	595	592	591	589	743	0.699
$$$$$	759	594	591	589	588	748	1.000
$$$$$	760	595	592	590	589	748	1.301
$$$$$	761	595	593	591	589	748	1.401
$$$$$	759	595	593	591	589	748	1.401
$$$$$	761	595	592	591	589	748	1.501
AVERAGE	759	595	592	590	589	----	----
MEAN DEV	1	1	1	1	1	----	----
STAN DEV	1	1	1	1	1	----	----
CALCULATED	761	597	592	590	0	----	----
EDGE CON	748	587	----	----	----	----	----

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RUN	123	MACH	0.80	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	209	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	84	DEG F
WALL POSITION	1.5 INCHES	DENSITY	0.00057	SLG/FT↑3
DATA RUN MADE	7/ 15/82	REYNOLDS NUMBER/FT	1.38	

BOUNDARY LAYER THICKNESS	0.84	INSHES
DISPLACEMENT THICKNESS	0.066	INCHES
MOMENTUM THICKNESS	0.047	INCHES
SHAPE PARAMETER	1.40	
POWER PROFILE PRAMETER	9.14	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	713	468	469	466	464	577	0.039
2.0	719	471	471	469	466	590	0.062
3.0	719	471	471	469	467	597	0.083
4.0	718	471	471	469	466	608	0.102
5.0	716	469	470	467	465	625	0.150
6.5	717	469	470	468	465	643	0.201
7.0	712	467	467	465	462	660	0.302
9.0	711	465	466	463	461	681	0.501
10.0	710	466	466	464	461	690	0.600
11.0	711	465	465	463	461	697	0.701
12.5	716	469	470	467	465	697	0.801
13.0	712	467	467	465	463	697	0.901
14.0	712	467	468	466	463	697	1.000
15.0	712	467	468	465	463	697	1.100
15.5	715	469	469	467	465	697	1.101
16.0	713	467	467	465	463	697	1.200
17.0	713	468	469	466	464	697	1.300
25.0	715	468	469	467	464	697	1.401
26.0	714	469	470	468	465	697	1.501
AVERAGE	714	468	469	466	464	----	----
MEAN DEV	2	1	2	2	1	----	----
STAN DEV	3	2	2	2	2	----	----
CALCULATED	712	468	469	466	0	----	----
EDGE CON	697	464	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	124	MACH	0.60	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	1000	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	113	DEG F
WALL POSITION	1.5 INCHES	DENSITY	0.00434	SLG/FT↑3
DATA RUN MADE	7/ 15/82	REYNOLDS NUMBER/FT	7.69	

BOUNDARY LAYER THICKNESS	0.64	INSHES
DISPLACEMENT THICKNESS	0.035	INCHES
MOMENTUM THICKNESS	0.027	INCHES
SHAPE PARAMETER	1.28	
POWER PROFILE PRAMETER	10.88	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	5074	3981	3943	3927	3918	4632	0.040
2.0	5075	3980	3941	3926	3916	4655	0.059
3.0	5081	3989	3950	3934	3925	4706	0.082
4.0	5075	3980	3943	3926	3916	4736	0.102
5.0	5081	3990	3957	3941	3929	4863	0.152
6.0	5080	3991	3961	3937	3927	4955	0.201
7.0	5079	3989	3953	3936	3926	5022	0.303
8.0	5080	3990	3957	3939	3931	5056	0.404
9.0	5081	3987	3954	3933	3927	5072	0.502
11.0	5082	3991	3958	3940	3934	5072	0.699
12.0	5082	3986	3950	3934	3925	5072	0.801
13.0	5082	3986	3952	3934	3927	5072	0.900
14.0	5083	3995	3964	3943	3938	5072	1.001
15.0	5081	3991	3959	3940	3932	5072	1.101
16.0	5077	3987	3949	3936	3926	5072	1.200
17.0	5079	3985	3952	3934	3926	5072	1.300
18.0	5077	3982	3948	3933	3924	5072	1.401
19.0	5081	3989	3955	3938	3929	5072	1.500
20.0	5084	3993	3958	3943	3934	5072	1.600
AVERAGE	5080	3987	3953	3935	3927	----	----
MEAN DEV	2	4	5	4	4	----	----
STAN DEV	7	7	8	8	7	----	----
CALCULATED	5074	3982	3953	3935	0	----	----
EDGE CON	5072	3927	----	----	----	----	----

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RUN	127	MACH	0.60	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	1003	PSF
PROBE POSITION	FORWARD	TOTAL TEMPERATURE	95	DEG F
WALL POSITION	1.5 INCHES	DENSITY	0.00449	SLG/FT↑3
DATA RUN MADE	7/ 16/82	REYNOLDS NUMBER/FT	8.04	

BOUNDARY LAYER THICKNESS	0.18	INSHES
DISPLACEMENT THICKNESS	0.018	INCHES
MOMENTUM THICKNESS	0.013	INCHES
SHAPE PARAMETER	1.39	
POWER PROFILE PRAMETER	5.75	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.100 LOW PSF	0.376 MID PSF	1.800 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	5083	3986	3967	3962	3948	4350	0.012
2.0	5084	3989	3970	3966	3953	4592	0.031
3.0	5081	3988	3967	3963	3953	4715	0.053
4.0	5080	3983	3959	3955	3942	4821	0.072
5.0	5080	3988	3970	3964	3951	4905	0.093
6.0	5080	3981	3961	3958	3946	4999	0.120
7.0	5081	3993	3972	3970	3956	5038	0.141
8.0	5081	3990	3972	3965	3953	5061	0.161
8.5	5077	3978	3960	3957	3943	5061	0.192
9.0	5080	3991	3970	3967	3953	5061	0.193
10.0	5080	3990	3969	3967	3953	5061	0.242
11.0	5080	3987	3973	3966	3955	5061	0.291
12.0	5084	3985	3964	3960	3946	5061	0.341
13.0	5083	3982	3962	3958	3944	5061	0.392
AVERAGE	5081	3987	3967	3963	3950	----	----
MEAN DEV	1	3	4	4	4	----	----
STAN DEV	2	4	9	8	8	----	----
CALCULATED	5077	3980	3967	3963	0	----	----
EDGE CON	5060	3966	----	----	----	----	----

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ARC TEST-PHASE-TUNNEL
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RUN	129	MACH	0.60	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	152	PSF
PROBE POSITION	FORWARD	TOTAL TEMPERATURE	69	DEG F
WALL POSITION	1.4 INCHES	DENSITY	0.00070	SLG/FT↑3
DATA RUN MADE	7/ 19/82	REYNOLDS NUMBER/FT	1.29	

BOUNDARY LAYER THICKNESS	0.22	INSHES
DISPLACEMENT THICKNESS	0.025	INCHES
MOMENTUM THICKNESS	0.018	INCHES
SHAPE PARAMETER	1.40	
POWER PROFILE PRAMETER	5.78	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.100 LOW PSF	0.376 MID PSF	1.800 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.5	758	594	595	594	591	640	0.009
1.0	761	595	596	595	593	645	0.012
1.6	762	597	598	597	595	647	0.013
2.0	762	594	596	594	592	670	0.033
3.0	761	596	597	596	594	685	0.052
3.5	762	597	598	597	595	688	0.053
4.0	764	598	599	598	596	697	0.070
5.0	763	598	599	598	595	712	0.093
6.0	762	596	597	596	593	717	0.122
7.0	761	595	597	596	593	729	0.142
8.0	760	596	597	596	594	737	0.161
9.0	759	595	596	595	593	737	0.191
10.0	759	596	596	596	593	737	0.241
11.0	759	595	596	595	592	737	0.292
12.0	752	589	590	589	587	737	0.341
13.0	753	590	592	590	588	737	0.393
14.0	755	591	593	592	589	737	0.493
15.0	755	592	594	593	590	737	0.591
16.0	756	593	594	593	590	737	0.692
AVERAGE	759	595	596	595	592	----	----
MEAN DEV	3	2	2	2	2	----	----
STAN DEV	4	3	2	3	3	----	----
CALCULATED	764	597	596	595	0	----	----
EDGE CON	737	595	----	----	----	----	----

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RUN	130	MACH	0.60	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	151	PSF
PROBE POSITION	FORWARD	TOTAL TEMPERATURE	67	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00071	SLG/FT↑3
DATA RUN MADE	7/ 19/82	REYNOLDS NUMBER/FT	1.29	

BOUNDARY LAYER THICKNESS	2.24	INSHES
DISPLACEMENT THICKNESS	0.283	INCHES
MOMENTUM THICKNESS	0.203	INCHES
SHAPE PARAMETER	1.40	
POWER PROFILE PRAMETER	7.11	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.100 LOW PSF	0.376 MID PSF	1.800 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	761	596	597	597	595	628	0.012
2.0	762	597	598	598	596	643	0.031
3.0	761	597	598	598	596	651	0.051
4.0	761	597	598	598	596	660	0.071
5.0	761	597	598	598	596	662	0.092
6.0	761	597	598	598	596	665	0.114
7.0	761	597	598	598	596	667	0.131
8.0	761	597	598	597	596	670	0.153
9.0	761	597	598	598	596	677	0.191
10.0	761	597	598	598	596	680	0.252
11.0	761	597	598	598	596	691	0.393
12.0	761	597	599	598	596	707	0.631
13.0	762	597	599	598	596	713	0.953
15.0	762	597	599	598	596	731	1.391
16.0	762	597	599	598	596	737	1.691
17.0	763	598	600	600	598	750	1.991
18.0	762	598	600	599	597	750	2.092
19.0	762	597	599	598	597	750	2.192
20.0	763	598	600	599	598	750	2.291
21.0	763	598	600	599	597	750	2.393
22.0	763	598	600	600	598	750	2.491
23.0	763	598	600	599	597	750	2.592
24.0	762	596	598	597	596	750	2.623
AVERAGE	762	597	599	598	596	----	----
MEAN DEV	1	0	1	1	1	----	----
STAN DEV	1	1	1	1	1	----	----
CALCULATED	762	597	599	598	596	----	----
EDGE CON	750	596	----	----	----	----	----

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ARC TEST-PHASE-TUNNEL
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RUN	131	MACH	0.60	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	1004	PSF
PROBE POSITION	FORWARD	TOTAL TEMPERATURE	86	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00457	SLG/FT↑3
DATA RUN MADE	7/ 19/82	REYNOLDS NUMBER/FT	8.22	

BOUNDARY LAYER THICKNESS	2.13	INSHES
DISPLACEMENT THICKNESS	0.180	INCHES
MOMENTUM THICKNESS	0.133	INCHES
SHAPE PARAMETER	1.36	
POWER PROFILE PRAMETER	8.70	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.100 LOW PSF	0.376 MID PSF	1.800 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	5085	3988	3966	3968	3953	4251	0.011
2.0	5083	3986	3966	3967	3954	4397	0.032
3.0	5082	3982	3962	3964	3950	4449	0.051
4.0	5082	3982	3959	3961	3948	4494	0.072
5.0	5082	3985	3963	3965	3951	4526	0.091
6.0	5082	3983	3960	3961	3949	4539	0.111
7.0	5082	3987	3964	3966	3952	4566	0.131
8.0	5082	3984	3964	3965	3951	4582	0.153
9.0	5082	3985	3963	3966	3952	4621	0.191
10.0	5083	3983	3964	3965	3950	4685	0.252
11.0	5084	3986	3966	3967	3953	4765	0.391
11.5	5083	3990	3969	3971	3955	4938	0.951
14.0	5083	3988	3968	3969	3955	5037	1.391
15.0	5083	3991	3971	3975	3961	5047	1.692
16.0	5083	3989	3974	3975	3960	5067	1.991
17.0	5082	3993	3972	3975	3959	5067	2.092
18.0	5082	3989	3970	3972	3958	5067	2.191
19.0	5081	3990	3974	3975	3959	5067	2.290
20.0	5080	3986	3970	3973	3957	5067	2.391
21.0	5079	3982	3967	3970	3957	5067	2.492
22.0	5080	3981	3963	3964	3950	5067	2.593
23.0	5081	3983	3970	3970	3955	5067	2.632
AVERAGE	5082	3986	3967	3968	3954	----	----
MEAN DEV	1	3	4	4	3	----	----
STAN DEV	3	8	5	7	8	----	----
CALCULATED	5082	3984	3968	3966	3954	----	----
EDGE CON	5066	3952	----	----	----	----	----

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RUN	133	MACH	0.90	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	1404	PSF
PROBE POSITION	FORWARD	TOTAL TEMPERATURE	100	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00301	SLG/FT↑3
DATA RUN MADE	7/ 19/82	REYNOLDS NUMBER/FT	8.23	

BOUNDARY LAYER THICKNESS	1.85	INSHES
DISPLACEMENT THICKNESS	0.178	INCHES
MOMENTUM THICKNESS	0.116	INCHES
SHAPE PARAMETER	1.54	
POWER PROFILE PRAMETER	8.29	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.100 LOW PSF	0.376 MID PSF	1.800 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	4197	2487	2471	2473	2454	2842	0.013
2.0	4200	2483	2464	2467	2449	3059	0.032
3.0	4202	2487	2470	2472	2454	3150	0.051
4.0	4205	2491	2474	2475	2459	3224	0.072
5.0	4207	2495	2478	2479	2464	3262	0.081
6.0	4208	2498	2483	2485	2466	3305	0.101
7.0	4210	2498	2483	2484	2467	3361	0.130
8.0	4208	2491	2474	2474	2458	3374	0.152
10.0	4201	2488	2473	2475	2457	3491	0.238
11.0	4199	2489	2477	2478	2458	3627	0.369
12.0	4196	2488	2472	2473	2457	3808	0.548
13.0	4194	2488	2477	2479	2460	3826	0.631
14.0	4194	2487	2473	2475	2456	3993	0.952
15.0	4193	2466	2455	2455	2439	4138	1.392
16.0	4191	2476	2469	2470	2451	4174	1.692
17.0	4193	2477	2473	2475	2458	4175	1.992
18.0	4192	2479	2477	2478	2458	4178	2.090
19.0	4193	2479	2476	2477	2458	4181	2.193
20.0	4194	2480	2477	2479	2458	4181	2.290
21.0	4194	2479	2475	2478	2459	4181	2.392
22.0	4194	2487	2487	2489	2470	4181	2.492
23.0	4194	2486	2484	2485	2466	4181	2.592
AVERAGE	4198	2485	2475	2476	2458	----	----
MEAN DEV	5	6	5	5	4	----	----
STAN DEV	10	10	9	9	7	----	----
CALCULATED	4198	2487	2477	2474	2458	----	----
EDGE CON	4174	2458	----	----	----	----	----

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ARC TEST-PHASE-TUNNEL
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RUN	134	MACH	0.90	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	244	PSF
PROBE POSITION	FORWARD	TOTAL TEMPERATURE	84	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00053	SLG/FT↑3
DATA RUN MADE	7/ 19/82	REYNOLDS NUMBER/FT	1.48	

BOUNDARY LAYER THICKNESS	1.63	INSHES
DISPLACEMENT THICKNESS	0.213	INCHES
MOMENTUM THICKNESS	0.132	INCHES
SHAPE PARAMETER	1.61	
POWER PROFILE PRAMETER	6.35	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.100 LOW PSF	0.376 MID PSF	1.800 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	724	426	428	427	424	477	0.012
2.0	696	410	412	412	409	487	0.031
3.0	696	416	418	417	414	505	0.053
4.0	704	420	422	421	418	519	0.072
5.0	712	425	427	426	423	533	0.092
6.0	719	428	430	429	426	543	0.112
7.0	726	431	433	432	429	554	0.129
8.0	727	431	433	432	429	558	0.153
10.0	715	423	425	424	421	561	0.192
11.0	722	428	430	429	426	579	0.252
12.0	730	429	431	431	427	603	0.391
13.0	730	428	430	429	426	632	0.633
14.0	729	428	431	430	427	675	0.951
15.0	726	427	430	429	426	704	1.392
16.0	723	426	429	429	425	706	1.693
17.0	721	426	429	429	425	706	1.992
18.0	720	425	429	428	425	706	2.092
19.0	718	424	427	426	423	706	2.191
AVERAGE	719	425	427	427	424	----	----
MEAN DEV	8	4	4	4	4	----	----
STAN DEV	11	5	5	5	5	----	----
CALCULATED	725	427	427	427	0	----	----
EDGE CON	705	423	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	136	MACH	0.90	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	1166	PSF
PROBE POSITION	FORWARD	TOTAL TEMPERATURE	99	DEG F
WALL POSITION	1.0 INCHES	DENSITY	0.00249	SLG/FT↑3
DATA RUN MADE	7/ 20/82	REYNOLDS NUMBER/FT	6.84	

BOUNDARY LAYER THICKNESS	0.21	INSHES
DISPLACEMENT THICKNESS	0.019	INCHES
MOMENTUM THICKNESS	0.012	INCHES
SHAPE PARAMETER	1.54	
POWER PROFILE PRAMETER	6.15	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.100 LOW PSF	0.376 MID PSF	1.800 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
3.0	3474	2052	2055	2055	2032	2486	0.013
4.0	3473	2057	2060	2062	2035	2764	0.032
5.0	3473	2055	2059	2059	2037	2934	0.051
6.0	3474	2062	2067	2068	2045	3112	0.071
7.0	3475	2059	2064	2066	2042	3243	0.091
10.0	3474	2057	2063	2064	2039	3387	0.161
11.0	3475	2061	2065	2066	2043	3411	0.192
12.0	3476	2058	2064	2064	2040	3421	0.242
13.0	3476	2058	2065	2066	2042	3421	0.291
14.0	3475	2060	2065	2066	2042	3421	0.342
AVERAGE	3475	2058	2063	2064	2040	----	----
MEAN DEV	1	2	3	3	3	----	----
STAN DEV	1	3	4	4	4	----	----
CALCULATED	3474	2052	2063	2064	0	----	----
EDGE CON	3415	2063	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	137	MACH	0.89	
TEST ARTICLE	SMOOTH	DYNAMIC PRESSURE	238	PSF
PROBE POSITION	FORWARD	TOTAL TEMPERATURE	83	DEG F
WALL POSITION	1.4 INCHES	DENSITY	0.00053	SLG/FT↑3
DATA RUN MADE	7/ 20/82	REYNOLDS NUMBER/FT	1.46	

BOUNDARY LAYER THICKNESS	0.25	INSHES
DISPLACEMENT THICKNESS	0.026	INCHES
MOMENTUM THICKNESS	0.017	INCHES
SHAPE PARAMETER	1.57	
POWER PROFILE PRAMETER	6.03	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.100 LOW PSF	0.376 MID PSF	1.800 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	718	428	432	431	427	514	0.012
2.0	719	429	433	432	427	554	0.032
3.0	707	414	419	418	414	574	0.051
4.0	720	423	428	427	422	609	0.072
5.0	728	428	433	432	427	648	0.090
6.0	718	422	427	426	421	676	0.121
7.0	706	414	419	418	413	679	0.142
8.0	710	417	422	421	416	689	0.161
9.0	720	423	429	428	423	701	0.192
10.0	731	430	435	435	430	702	0.243
11.0	721	423	428	427	422	703	0.292
12.0	715	420	425	424	419	703	0.341
13.0	718	421	427	426	421	703	0.392
14.0	720	423	428	427	422	703	0.493
15.0	720	423	429	428	423	703	0.593
AVERAGE	718	423	428	427	422	----	----
MEAN DEV	5	4	4	4	4	----	----
STAN DEV	7	5	5	5	5	----	----
CALCULATED	716	427	428	427	0	----	----
EDGE CON	702	427	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	140	MACH	0.60	
TEST ARTICLE	AFRSI	DYNAMIC PRESSURE	1004	PSF
PROBE POSITION	FORWARD	TOTAL TEMPERATURE	98	DEG F
WALL POSITION	1.4 INCHES	DENSITY	0.00447	SLG/FT↑3
DATA RUN MADE	7/ 20/82	REYNOLDS NUMBER/FT	7.99	

BOUNDARY LAYER THICKNESS	0.19	INSHES
DISPLACEMENT THICKNESS	0.019	INCHES
MOMENTUM THICKNESS	0.014	INCHES
SHAPE PARAMETER	1.38	
POWER PROFILE PRAMETER	5.78	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.100 LOW PSF	0.376 MID PSF	1.800 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	5082	3984	3968	3962	3952	4350	0.013
2.0	5081	3984	3969	3964	3953	4584	0.031
3.0	5081	3984	3971	3966	3954	4709	0.051
4.0	5080	3980	3965	3961	3950	4813	0.071
5.0	5079	3981	3965	3961	3948	4914	0.093
6.0	5079	3974	3959	3956	3945	5027	0.122
7.0	5078	3978	3965	3960	3949	5040	0.142
8.0	5079	3982	3971	3966	3954	5066	0.163
9.0	5081	3980	3965	3961	3950	5066	0.192
10.0	5084	3974	3959	3956	3945	5066	0.243
11.0	5087	3983	3970	3964	3954	5066	0.292
12.0	5088	3983	3971	3966	3956	5066	0.342
13.0	5087	3977	3963	3958	3946	5066	0.392
14.0	5084	3974	3961	3954	3945	5066	0.491
15.0	5081	3974	3963	3959	3948	5066	0.593
16.0	5078	3972	3961	3957	3945	5066	0.692
AVERAGE	5082	3979	3965	3961	3950	----	----
MEAN DEV	3	4	3	3	3	----	----
STAN DEV	6	4	8	9	8	----	----
CALCULATED	5082	3984	3965	3961	0	----	----
EDGE CON	5081	3964	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	141	MACH	0.60	
TEST ARTICLE	AFRSI	DYNAMIC PRESSURE	152	PSF
PROBE POSITION	FORWARD	TOTAL TEMPERATURE	80	DEG F
WALL POSITION	1.4 INCHES	DENSITY	0.00069	SLG/FT↑3
DATA RUN MADE	7/ 20/82	REYNOLDS NUMBER/FT	1.25	

BOUNDARY LAYER THICKNESS	0.20	INSHES
DISPLACEMENT THICKNESS	0.020	INCHES
MOMENTUM THICKNESS	0.014	INCHES
SHAPE PARAMETER	1.39	
POWER PROFILE PRAMETER	5.14	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.100 LOW PSF	0.376 MID PSF	1.800 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	762	596	598	597	595	642	0.012
2.0	772	605	606	606	603	676	0.031
3.0	780	611	612	611	609	703	0.051
4.0	779	610	611	611	608	713	0.072
5.0	777	609	610	609	607	721	0.091
6.0	774	606	607	607	605	739	0.122
7.0	771	603	605	604	602	742	0.142
8.0	769	602	603	602	600	742	0.162
9.0	768	601	602	601	599	742	0.192
10.0	764	598	599	598	596	742	0.242
12.0	755	591	592	591	589	742	0.343
13.0	756	592	593	593	590	742	0.392
14.0	757	592	593	592	590	742	0.492
15.0	757	592	594	593	591	742	0.592
16.0	757	593	594	593	591	742	0.691
17.0	757	596	597	596	594	742	0.792
AVERAGE	766	600	601	600	598	----	----
MEAN DEV	8	6	6	6	6	----	----
STAN DEV	9	7	7	7	7	----	----
CALCULATED	764	597	601	600	0	----	----
EDGE CON	742	601	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	145	MACH	0.90	
TEST ARTICLE	AFRSI	DYNAMIC PRESSURE	1245	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	104	DEG F
WALL POSITION	1.0 INCHES	DENSITY	0.00263	SLG/FT↑3
DATA RUN MADE	7/ 21/82	REYNOLDS NUMBER/FT	7.21	

BOUNDARY LAYER THICKNESS	1.09	INSHES
DISPLACEMENT THICKNESS	0.181	INCHES
MOMENTUM THICKNESS	0.095	INCHES
SHAPE PARAMETER	1.90	
POWER PROFILE PRAMETER	3.31	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
2.0	3713	2191	2143	2091	2034	2328	0.040
3.0	3716	2196	2148	2097	2042	2436	0.063
4.0	3719	2199	2154	2103	2053	2475	0.081
5.0	3718	2199	2151	2095	2041	2507	0.101
6.0	3720	2203	2158	2106	2056	2567	0.130
7.0	3719	2201	2155	2102	2051	2634	0.150
8.0	3719	2201	2154	2103	2049	2701	0.169
9.0	3719	2204	2159	2111	2062	2783	0.200
10.0	3720	2208	2161	2111	2059	2893	0.251
11.0	3719	2206	2163	2114	2060	3049	0.300
12.0	3718	2204	2159	2106	2052	3075	0.350
13.0	3720	2206	2161	2108	2059	3221	0.399
14.0	3719	2203	2159	2108	2053	3398	0.501
15.0	3720	2202	2159	2111	2053	3584	0.603
16.0	3718	2203	2159	2108	2052	3659	0.700
17.0	3718	2207	2163	2108	2055	3696	0.799
18.0	3719	2200	2156	2106	2053	3699	0.900
19.0	3718	2206	2164	2116	2065	3699	1.001
20.0	3719	2203	2160	2106	2051	3699	1.101
21.0	3718	2206	2163	2110	2057	3699	1.203
22.0	3716	2208	2169	2121	2069	3699	1.301
AVERAGE	3718	2203	2158	2107	2054	----	----
MEAN DEV	1	3	4	5	6	----	----
STAN DEV	5	7	6	8	10	----	----
CALCULATED	3709	2191	2158	2107	0	----	----
EDGE CON	3699	2013	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	146	MACH	0.90	
TEST ARTICLE	AFRSI	DYNAMIC PRESSURE	1405	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	114	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00293	SLG/FT↑3
DATA RUN MADE	7/ 21/82	REYNOLDS NUMBER/FT	7.98	

BOUNDARY LAYER THICKNESS	2.23	INSHES
DISPLACEMENT THICKNESS	0.330	INCHES
MOMENTUM THICKNESS	0.182	INCHES
SHAPE PARAMETER	1.81	
POWER PROFILE PRAMETER	4.17	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	4194	2481	2442	2402	2350	2557	0.020
2.0	4197	2488	2449	2405	2351	2641	0.040
3.0	4198	2481	2439	2397	2343	2706	0.061
4.0	4198	2481	2440	2398	2343	2739	0.080
5.0	4198	2488	2447	2409	2354	2787	0.101
6.0	4198	2484	2444	2404	2352	2830	0.120
8.0	4199	2492	2451	2411	2358	2882	0.142
9.0	4199	2494	2455	2413	2357	2913	0.148
10.0	4199	2494	2453	2413	2360	3004	0.179
11.0	4200	2501	2463	2422	2366	3061	0.202
12.0	4201	2502	2461	2418	2364	3099	0.219
13.0	4202	2498	2460	2420	2365	3171	0.261
14.0	4194	2479	2440	2400	2349	3326	0.400
15.0	4193	2483	2447	2404	2348	3643	0.541
17.0	4190	2484	2446	2407	2351	3898	0.960
18.0	4203	2487	2451	2411	2356	4079	1.400
19.0	4199	2477	2443	2405	2357	4133	1.702
20.0	4197	2485	2451	2409	2355	4176	2.000
21.0	4192	2477	2445	2404	2352	4176	2.099
22.0	4193	2485	2452	2415	2359	4176	2.200
23.0	4195	2485	2451	2412	2360	4176	2.300
24.0	4196	2487	2453	2413	2359	4176	2.401
25.0	4192	2489	2458	2418	2366	4176	2.500
26.0	4192	2491	2458	2418	2366	4176	2.599
AVERAGE	4197	2487	2450	2410	2356	----	----
MEAN DEV	3	5	6	6	6	----	----
STAN DEV	7	10	10	7	8	----	----
CALCULATED	4191	2478	2440	2422	2353	----	----
EDGE CON	4176	2330	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	148	MACH	0.60	
TEST ARTICLE	AFRSI	DYNAMIC PRESSURE	1016	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	91	DEG F
WALL POSITION	1.4 INCHES	DENSITY	0.00451	SLG/FT↑3
DATA RUN MADE	7/ 22/82	REYNOLDS NUMBER/FT	8.16	

BOUNDARY LAYER THICKNESS	0.88	INSHES
DISPLACEMENT THICKNESS	0.128	INCHES
MOMENTUM THICKNESS	0.080	INCHES
SHAPE PARAMETER	1.60	
POWER PROFILE PRAMETER	3.85	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	5086	3974	3908	3881	3823	4025	0.021
2.0	5083	3977	3913	3887	3830	4206	0.041
3.0	5079	3972	3908	3877	3819	4271	0.060
4.0	5077	3971	3909	3880	3832	4306	0.081
5.0	5074	3973	3909	3883	3824	4341	0.101
6.0	5070	3959	3894	3869	3810	4418	0.130
7.0	5066	3964	3901	3871	3813	4451	0.150
8.0	5062	3961	3900	3872	3818	4501	0.171
9.0	5059	3960	3897	3869	3819	4559	0.201
10.0	5065	3965	3902	3875	3819	4600	0.250
11.0	5068	3971	3910	3881	3831	4715	0.305
12.0	5064	3961	3897	3871	3815	4757	0.351
13.0	5059	3957	3894	3867	3815	4812	0.400
15.0	5070	3966	3906	3879	3827	4980	0.502
16.0	5080	3969	3906	3878	3821	5034	0.600
17.0	5074	3963	3899	3872	3821	5057	0.701
18.0	5068	3963	3898	3869	3815	5063	0.800
20.0	5063	3957	3898	3870	3817	5063	0.900
23.0	5091	3991	3929	3901	3847	5063	1.001
23.5	5072	3976	3914	3888	3833	5063	1.091
24.0	5088	3989	3930	3903	3852	5063	1.100
25.0	5083	3985	3924	3897	3843	5063	1.200
26.0	5078	3972	3911	3882	3828	5063	1.300
AVERAGE	5073	3969	3907	3879	3825	----	----
MEAN DEV	8	8	8	8	9	----	----
STAN DEV	9	10	12	13	14	----	----
CALCULATED	5091	3979	3907	3879	0	----	----
EDGE CON	5062	3845	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	150	MACH	0.60	
TEST ARTICLE	AFRSI	DYNAMIC PRESSURE	1008	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	94	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00451	SLG/FT↑3
DATA RUN MADE	7/ 21/82	REYNOLDS NUMBER/FT	8.09	

BOUNDARY LAYER THICKNESS	2.22	INSHES
DISPLACEMENT THICKNESS	0.275	INCHES
MOMENTUM THICKNESS	0.180	INCHES
SHAPE PARAMETER	1.53	
POWER PROFILE PRAMETER	4.95	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
2.0	5093	3991	3960	3942	3909	4066	0.020
3.0	5085	3976	3947	3930	3892	4173	0.040
4.0	5037	3951	3922	3904	3874	4202	0.061
5.0	5051	3965	3937	3920	3883	4234	0.080
6.0	5064	3974	3948	3932	3895	4305	0.100
7.0	5073	3972	3943	3924	3890	4323	0.120
8.0	5072	3970	3940	3922	3888	4341	0.144
9.0	5080	3973	3944	3926	3894	4378	0.161
10.0	5078	3972	3944	3926	3890	4440	0.200
11.0	5079	3969	3939	3920	3883	4488	0.261
12.0	5081	3972	3944	3924	3889	4629	0.401
13.0	5081	3972	3942	3926	3891	4752	0.640
14.0	5077	3968	3940	3921	3882	4928	0.963
15.0	5075	3967	3939	3920	3883	5003	1.400
16.0	5073	3963	3932	3917	3882	5028	1.550
18.0	5079	3967	3939	3920	3884	5056	1.850
19.0	5083	3973	3946	3926	3889	5067	1.998
20.0	5082	3969	3940	3927	3889	5067	2.099
21.0	5085	3972	3944	3927	3890	5067	2.198
22.0	5085	3973	3947	3928	3895	5067	2.299
AVERAGE	5076	3970	3942	3924	3889	----	----
MEAN DEV	8	5	5	5	5	----	----
STAN DEV	13	7	7	7	7	----	----
CALCULATED	5089	3987	3938	3928	3888	----	----
EDGE CON	5067	3874	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	151	MACH	0.61	
TEST ARTICLE	AFRSI	DYNAMIC PRESSURE	155	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	79	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00070	SLG/FT↑3
DATA RUN MADE	7/ 21/82	REYNOLDS NUMBER/FT	1.28	

BOUNDARY LAYER THICKNESS	1.94	INSHES
DISPLACEMENT THICKNESS	0.287	INCHES
MOMENTUM THICKNESS	0.196	INCHES
SHAPE PARAMETER	1.46	
POWER PROFILE PRAMETER	5.66	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	775	605	604	602	597	618	0.020
2.0	765	598	597	595	591	633	0.041
3.0	768	600	600	597	593	640	0.060
4.0	770	602	602	600	596	647	0.081
8.0	762	593	592	590	586	654	0.160
9.0	762	594	593	591	586	659	0.200
10.0	755	592	591	589	585	660	0.262
11.0	732	587	586	584	580	671	0.401
12.0	750	588	587	585	581	689	0.641
13.0	749	587	587	585	581	701	0.961
13.5	761	593	592	590	586	714	1.198
14.0	762	593	593	590	587	726	1.403
15.0	760	593	592	590	586	727	1.550
16.0	760	594	593	591	588	734	1.700
17.0	759	595	594	592	588	734	1.717
18.0	760	596	595	593	589	734	1.849
19.0	759	594	594	592	588	734	1.999
20.0	758	593	592	590	586	734	2.099
21.0	758	594	593	591	587	734	2.200
22.0	759	594	593	591	587	734	2.300
AVERAGE	760	594	594	591	587	----	----
MEAN DEV	4	3	3	3	3	----	----
STAN DEV	6	4	5	5	4	----	----
CALCULATED	773	603	593	592	587	----	----
EDGE CON	734	587	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	152	MACH	0.60	
TEST ARTICLE	AFRSI	DYNAMIC PRESSURE	152	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	76	DEG F
WALL POSITION	1.4 INCHES	DENSITY	0.00070	SLG/FT↑3
DATA RUN MADE	7/ 21/82	REYNOLDS NUMBER/FT	1.27	

BOUNDARY LAYER THICKNESS	1.15	INSHES
DISPLACEMENT THICKNESS	0.149	INCHES
MOMENTUM THICKNESS	0.100	INCHES
SHAPE PARAMETER	1.49	
POWER PROFILE PRAMETER	5.06	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	765	599	593	589	583	614	0.020
2.0	764	597	591	588	581	640	0.041
3.0	759	593	587	584	578	641	0.059
4.0	751	588	582	579	573	645	0.081
5.0	754	590	584	581	575	650	0.101
6.0	759	594	588	584	578	663	0.130
8.0	758	593	587	583	577	666	0.171
9.0	758	593	587	583	578	679	0.200
10.0	758	593	587	583	577	686	0.250
11.0	758	593	588	584	578	700	0.301
12.0	757	593	588	584	578	709	0.352
13.0	757	593	587	583	578	715	0.401
14.0	757	593	587	583	577	719	0.501
15.0	757	591	586	582	576	729	0.600
17.0	757	592	587	583	577	735	0.799
18.0	757	592	587	583	577	740	0.901
19.0	758	594	588	585	579	746	1.000
20.0	759	595	589	586	580	746	1.100
21.0	761	596	590	587	581	746	1.200
22.0	761	596	590	586	581	746	1.301
24.0	756	592	586	583	577	746	1.400
AVERAGE	758	593	588	584	578	----	----
MEAN DEV	2	2	2	2	2	----	----
STAN DEV	3	2	2	2	2	----	----
CALCULATED	765	599	588	584	0	----	----
EDGE CON	746	576	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	153	MACH	0.90	
TEST ARTICLE	AFRSI	DYNAMIC PRESSURE	245	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	79	DEG F
WALL POSITION	1.4 INCHES	DENSITY	0.00054	SLG/FT↑3
DATA RUN MADE	7/ 21/82	REYNOLDS NUMBER/FT	1.50	

BOUNDARY LAYER THICKNESS	1.05	INSHES
DISPLACEMENT THICKNESS	0.155	INCHES
MOMENTUM THICKNESS	0.089	INCHES
SHAPE PARAMETER	1.74	
POWER PROFILE PRAMETER	4.55	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	728	430	424	416	408	458	0.021
2.0	719	424	419	411	404	499	0.044
3.0	714	421	416	408	401	503	0.062
4.0	717	424	419	410	403	518	0.082
5.0	722	426	421	412	405	530	0.101
6.0	725	428	423	415	408	550	0.130
7.0	722	426	421	412	405	555	0.151
8.0	719	425	419	411	403	556	0.171
9.0	719	424	418	410	403	566	0.201
10.0	719	425	420	412	405	592	0.251
11.0	721	426	420	412	405	610	0.301
12.0	723	428	423	414	407	621	0.351
13.0	722	426	420	412	404	630	0.400
14.0	719	425	419	411	403	657	0.501
15.0	720	425	420	412	405	693	0.600
16.0	721	426	421	413	406	697	0.700
17.0	721	427	422	413	406	699	0.800
18.0	721	427	422	413	406	705	0.899
19.0	721	427	422	414	406	705	1.000
20.0	721	427	421	413	405	705	1.100
21.0	721	427	422	415	408	705	1.199
22.0	721	426	422	413	406	705	1.300
AVERAGE	721	426	421	412	405	----	----
MEAN DEV	2	1	1	1	1	----	----
STAN DEV	3	2	2	2	2	----	----
CALCULATED	730	431	421	412	0	----	----
EDGE CON	705	397	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	154	MACH	0.90	
TEST ARTICLE	AFRSI	DYNAMIC PRESSURE	240	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	82	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00053	SLG/FT↑3
DATA RUN MADE	7/ 21/82	REYNOLDS NUMBER/FT	1.47	

BOUNDARY LAYER THICKNESS	2.28	INSHES
DISPLACEMENT THICKNESS	0.307	INCHES
MOMENTUM THICKNESS	0.186	INCHES
SHAPE PARAMETER	1.65	
POWER PROFILE PRAMETER	5.41	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	716	423	421	417	411	450	0.021
2.0	716	423	421	417	411	479	0.040
3.0	716	423	421	416	411	489	0.061
4.0	716	424	422	418	412	499	0.082
5.0	716	424	422	418	413	508	0.102
6.0	717	424	422	418	412	516	0.119
7.0	717	423	422	417	412	522	0.142
8.0	717	423	421	417	411	526	0.161
9.0	717	423	421	417	412	532	0.200
10.0	717	423	421	416	411	544	0.253
11.0	717	423	421	416	411	565	0.397
13.0	717	423	422	417	412	601	0.640
14.0	716	422	421	416	411	634	0.961
15.0	715	421	420	415	410	674	1.400
16.0	714	421	419	415	410	675	1.534
17.0	714	421	420	415	410	677	1.701
19.0	714	421	420	415	410	690	1.999
20.0	714	421	420	416	410	690	2.101
21.0	715	421	420	416	410	690	2.201
24.0	715	422	422	417	412	690	2.499
AVERAGE	716	422	421	416	411	----	----
MEAN DEV	1	1	1	1	1	----	----
STAN DEV	1	1	1	1	1	----	----
CALCULATED	716	423	420	418	411	----	----
EDGE CON	690	408	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	156	MACH	0.90	
TEST ARTICLE	NOMEX	DYNAMIC PRESSURE	1257	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE .	104	DEG F
WALL POSITION	1.0 INCHES	DENSITY	0.00265	SLG/FT↑3
DATA RUN MADE	7/ 23/92	REYNOLDS NUMBER/FT	7.28	

BOUNDARY LAYER THICKNESS	0.79	INSHES
DISPLACEMENT THICKNESS	0.073	INCHES
MOMENTUM THICKNESS	0.048	INCHES
SHAPE PARAMETER	1.54	
POWER PROFILE PRAMETER	8.12	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	3741	2207	2245	2219	2205	2923	0.021
2.0	3751	2212	2248	2222	2209	2984	0.044
3.0	3755	2220	2258	2233	2218	3024	0.061
4.0	3760	2220	2255	2230	2217	3072	0.080
5.0	3784	2239	2281	2257	2237	3152	0.101
6.0	3792	2250	2288	2265	2249	3221	0.133
7.0	3808	2258	2293	2269	2254	3283	0.152
8.0	3820	2267	2306	2280	2264	3311	0.171
9.0	3831	2252	2292	2267	2250	3385	0.200
10.0	3833	2255	2295	2271	2252	3485	0.252
11.0	3827	2270	2305	2281	2267	3556	0.300
12.0	3827	2270	2310	2285	2267	3684	0.350
13.0	3828	2263	2303	2278	2259	3731	0.399
14.0	3830	2271	2311	2287	2269	3791	0.500
15.0	3830	2271	2313	2288	2268	3808	0.599
16.0	3830	2269	2311	2286	2268	3820	0.699
17.0	3831	2267	2310	2285	2268	3820	0.800
18.0	3830	2262	2302	2278	2261	3820	0.900
19.0	3830	2270	2314	2290	2270	3820	1.000
20.0	3830	2271	2314	2292	2271	3820	1.100
21.0	3831	2267	2306	2284	2267	3820	1.202
AVERAGE	3809	2254	2293	2269	2252	----	----
MEAN DEV	26	17	18	18	17	----	----
STAN DEV	32	22	23	24	22	----	----
CALCULATED	3741	2207	2293	2269	0	----	----
EDGE CON	3820	2245	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	157	MACH	0.60	
TEST ARTICLE	NOMEX	DYNAMIC PRESSURE	1007	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	107	DEG F
WALL POSITION	1.4 INCHES	DENSITY	0.00438	SLG/FT↑3
DATA RUN MADE	7/ 23/82	REYNOLDS NUMBER/FT	7.83	

BOUNDARY LAYER THICKNESS	0.73	INSHES
DISPLACEMENT THICKNESS	0.069	INCHES
MOMENTUM THICKNESS	0.051	INCHES
SHAPE PARAMETER	1.36	
POWER PROFILE PRAMETER	8.13	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	5070	3968	3961	3932	3921	4497	0.022
2.0	5064	3963	3957	3930	3920	4536	0.041
3.0	5057	3961	3951	3925	3917	4577	0.059
4.0	5051	3953	3946	3918	3910	4592	0.080
5.0	5036	3943	3937	3909	3896	4634	0.099
6.0	5030	3940	3933	3907	3897	4667	0.131
7.0	5031	3936	3929	3905	3891	4684	0.150
8.0	5040	3948	3938	3912	3903	4706	0.171
9.0	5049	3957	3949	3926	3914	4738	0.201
10.0	5058	3965	3956	3932	3921	4818	0.251
11.0	5069	3966	3957	3932	3921	4910	0.301
12.0	5079	3984	3978	3952	3940	4963	0.353
13.0	5081	3984	3975	3950	3938	4983	0.400
14.0	5083	3984	3983	3955	3942	5040	0.500
15.0	5081	3986	3984	3957	3943	5067	0.602
16.0	5085	3986	3983	3955	3941	5072	0.701
17.0	5093	3989	3991	3962	3948	5072	0.801
18.0	5084	3976	3972	3941	3931	5072	0.900
19.0	5075	3972	3966	3937	3925	5072	1.000
20.0	5066	3963	3960	3932	3919	5072	1.099
AVERAGE	5064	3966	3960	3933	3922	----	----
MEAN DEV	16	13	15	14	13	----	----
STAN DEV	19	16	18	18	17	----	----
CALCULATED	5071	3970	3960	3933	0	----	----
EDGE CON	5071	3912	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	158	MACH	0.60	
TEST ARTICLE	NOMEX	DYNAMIC PRESSURE	1006	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	101	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00443	SLG/FT↑3
DATA RUN MADE	7/ 23/82	REYNOLDS NUMBER/FT	7.93	

BOUNDARY LAYER THICKNESS	1.79	INSHES
DISPLACEMENT THICKNESS	0.187	INCHES
MOMENTUM THICKNESS	0.139	INCHES
SHAPE PARAMETER	1.35	
POWER PROFILE PRAMETER	9.21	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	5073	3973	3984	3964	3959	4421	0.020
2.0	5068	3970	3982	3961	3955	4442	0.041
3.0	5072	3970	3982	3962	3959	4472	0.060
5.0	5075	3977	3986	3967	3961	4525	0.102
6.0	5076	3978	3992	3971	3963	4535	0.122
7.0	5078	3980	3992	3972	3965	4547	0.142
8.0	5079	3979	3992	3970	3964	4573	0.160
9.0	5079	3978	3992	3970	3963	4597	0.200
10.0	5081	3980	3989	3971	3964	4614	0.263
11.0	5081	3982	3994	3974	3965	4728	0.400
12.0	5083	3984	3996	3975	3968	4827	0.639
13.0	5084	3983	3995	3975	3968	4908	0.962
14.0	5084	3983	3996	3974	3971	4979	1.404
15.0	5085	3982	3999	3975	3971	5034	1.549
16.0	5078	3982	3992	3974	3968	5049	1.698
17.0	5072	3973	3984	3964	3959	5049	1.857
18.0	5065	3969	3981	3963	3957	5049	2.102
19.0	5066	3975	3989	3971	3963	5049	2.199
20.0	5069	3976	3989	3972	3965	5049	2.298
AVERAGE	5076	3978	3990	3970	3964	----	----
MEAN DEV	5	4	4	4	3	----	----
STAN DEV	7	10	10	9	10	----	----
CALCULATED	5079	3979	3983	3979	3962	----	----
EDGE CON	5047	3962	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	159	MACH	0.90	
TEST ARTICLE	NOMEX	DYNAMIC PRESSURE	1408	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	107	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00297	SLG/FT↑3
DATA RUN MADE	7/ 23/82	REYNOLDS NUMBER/FT	8.12	

BOUNDARY LAYER THICKNESS	1.86	INSHES
DISPLACEMENT THICKNESS	0.195	INCHES
MOMENTUM THICKNESS	0.126	INCHES
SHAPE PARAMETER	1.54	
POWER PROFILE PRAMETER	8.59	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	4199	2482	2515	2489	2478	3109	0.021
2.0	4197	2483	2515	2487	2479	3136	0.039
3.0	4197	2490	2527	2499	2489	3217	0.061
4.0	4194	2488	2516	2490	2483	3231	0.083
6.0	4200	2487	2513	2489	2481	3253	0.124
7.0	4202	2491	2527	2500	2491	3321	0.139
8.0	4205	2494	2531	2504	2494	3332	0.160
9.0	4206	2494	2528	2501	2492	3406	0.200
10.0	4208	2485	2516	2490	2482	3435	0.259
11.0	4206	2481	2511	2486	2478	3558	0.398
12.0	4207	2482	2518	2492	2483	3830	0.642
13.0	4207	2481	2517	2491	2481	4003	0.959
14.0	4208	2490	2530	2501	2491	4152	1.400
15.0	4202	2486	2527	2501	2491	4168	1.549
16.0	4200	2485	2526	2498	2490	4186	1.700
17.0	4197	2487	2526	2499	2491	4186	1.855
18.0	4198	2492	2530	2504	2496	4186	1.998
19.0	4199	2488	2528	2503	2495	4186	2.101
20.0	4200	2487	2527	2502	2493	4186	2.198
21.0	4198	2485	2525	2498	2489	4186	2.277
22.0	4197	2473	2509	2485	2478	4186	2.400
23.0	4194	2474	2508	2487	2479	4186	2.499
24.0	4195	2480	2521	2496	2487	4186	2.603
AVERAGE	4201	2485	2521	2495	2487	----	----
MEAN DEV	4	4	7	6	6	----	----
STAN DEV	8	7	10	8	8	----	----
CALCULATED	4200	2483	2512	2507	2484	----	----
EDGE CON	4185	2483	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
542- 1 - 22

RUN	160	MACH	0.90	
TEST ARTICLE	NOMEX	DYNAMIC PRESSURE	243	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	86	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00053	SLG/FT↑3
DATA RUN MADE	7/ 23/82	REYNOLDS NUMBER/FT	1.47	

BOUNDARY LAYER THICKNESS	1.67	INSHES
DISPLACEMENT THICKNESS	0.216	INCHES
MOMENTUM THICKNESS	0.141	INCHES
SHAPE PARAMETER	1.53	
POWER PROFILE PRAMETER	7.92	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	724	427	433	430	429	516	0.019
2.0	725	430	436	433	432	526	0.040
3.0	725	429	436	432	431	532	0.060
4.0	724	429	436	432	431	539	0.081
5.0	721	426	432	429	428	540	0.099
7.0	717	423	430	427	426	548	0.142
8.0	714	421	428	425	424	553	0.161
10.0	713	422	429	426	425	567	0.261
11.0	713	422	429	425	425	590	0.402
12.0	714	422	428	425	424	621	0.644
14.0	720	427	434	430	430	687	1.403
15.0	721	425	432	429	428	691	1.549
16.0	721	426	433	429	429	691	1.699
17.0	722	426	433	430	429	691	1.857
18.0	721	426	434	431	430	691	2.000
19.0	721	426	433	430	429	691	2.099
20.0	721	426	433	430	429	691	2.200
AVERAGE	720	425	432	429	428	----	----
MEAN DEV	3	2	2	2	2	----	----
STAN DEV	4	3	3	3	3	----	----
CALCULATED	723	427	431	430	0	----	----
EDGE CON	691	428	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	161	MACH	0.90	
TEST ARTICLE	NOMEX	DYNAMIC PRESSURE	242	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	83	DEG F
WALL POSITION	1.4 INCHES	DENSITY	0.00053	SLG/FT↑3
DATA RUN MADE	7/ 23/82	REYNOLDS NUMBER/FT	1.48	

BOUNDARY LAYER THICKNESS	0.94	INSHES
DISPLACEMENT THICKNESS	0.082	INCHES
MOMENTUM THICKNESS	0.054	INCHES
SHAPE PARAMETER	1.52	
POWER PROFILE PRAMETER	7.33	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
2.0	715	422	430	425	423	537	0.041
3.0	715	424	432	427	425	551	0.061
4.0	717	424	432	427	426	566	0.081
5.0	719	425	432	428	426	579	0.102
7.0	718	424	433	428	426	588	0.149
8.0	717	423	431	427	425	600	0.173
9.0	716	423	432	427	425	606	0.200
10.0	716	423	431	426	425	626	0.223
12.0	716	423	431	426	424	645	0.301
13.0	716	423	431	427	425	669	0.355
14.0	716	424	432	427	425	679	0.401
15.0	717	424	432	427	425	687	0.505
16.0	717	424	432	427	425	693	0.599
17.0	717	424	432	427	426	702	0.701
19.0	717	424	433	428	426	702	0.901
20.0	717	424	432	427	426	702	0.999
21.0	717	425	433	429	427	702	1.102
22.0	718	425	433	428	427	702	1.201
23.0	718	424	432	428	426	702	1.306
AVERAGE	717	424	432	427	425	----	----
MEAN DEV	1	1	1	1	1	----	----
STAN DEV	1	1	1	1	1	----	----
CALCULATED	719	424	432	427	0	----	----
EDGE CON	702	421	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	162	MACH	0.60	
TEST ARTICLE	NOMEX	DYNAMIC PRESSURE	151	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	82	DEG F
WALL POSITION	1.4 INCHES	DENSITY	0.00069	SLG/FT↑3
DATA RUN MADE	7/ 23/82	REYNOLDS NUMBER/FT	1.25	

BOUNDARY LAYER THICKNESS	0.71	INSHES
DISPLACEMENT THICKNESS	0.080	INCHES
MOMENTUM THICKNESS	0.059	INCHES
SHAPE PARAMETER	1.36	
POWER PROFILE PRAMETER	7.54	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	761	596	596	593	592	660	0.020
2.0	759	594	595	592	591	665	0.040
3.0	759	595	596	592	592	670	0.060
4.0	759	595	596	592	592	673	0.081
5.0	759	595	595	592	591	678	0.101
6.0	759	595	596	592	592	685	0.131
7.0	759	595	595	592	591	691	0.151
9.0	760	595	596	592	592	695	0.201
10.0	760	596	596	592	592	711	0.254
10.5	760	596	596	592	592	721	0.301
13.0	758	594	594	591	590	723	0.401
14.0	759	594	595	591	591	728	0.499
15.0	758	594	594	591	590	743	0.602
16.0	758	593	594	590	590	743	0.703
17.0	758	593	594	590	590	743	0.769
18.0	757	593	593	590	589	743	0.801
19.0	758	593	593	590	589	743	0.900
20.0	761	596	597	594	593	743	0.999
21.0	760	595	596	592	592	743	1.099
22.0	760	596	596	593	592	743	1.201
AVERAGE	759	595	595	592	591	----	----
MEAN DEV	1	1	1	1	1	----	----
STAN DEV	1	1	1	1	1	----	----
CALCULATED	762	597	595	592	0	----	----
EDGE CON	743	589	----	----	----	----	----

AFRSI SKIN FRICTION DRAG TEST

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ARC TEST-PHASE-TUNNEL
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RUN	163	MACH	0.60	
TEST ARTICLE	NOMEX	DYNAMIC PRESSURE	152	PSF
PROBE POSITION	AFT	TOTAL TEMPERATURE	78	DEG F
WALL POSITION	0.0 INCHES	DENSITY	0.00069	SLG/FT↑3
DATA RUN MADE	7/ 23/82	REYNOLDS NUMBER/FT	1.26	

BOUNDARY LAYER THICKNESS	2.19	INSHES
DISPLACEMENT THICKNESS	0.252	INCHES
MOMENTUM THICKNESS	0.186	INCHES
SHAPE PARAMETER	1.36	
POWER PROFILE PRAMETER	8.35	

SEQUENCE NUMBER	TUNNEL TOTAL PRES PSF	TUNNEL STATIC PRES PSF	STATIC RAKE 0.125 LOW PSF	0.450 MID PSF	1.750 HIGH PSF	PROBE TOTAL PRES PSF	PROBE POSITION INCHES
1.0	760	594	598	596	595	649	0.022
2.0	759	594	598	595	595	651	0.039
4.0	757	592	596	594	593	653	0.079
5.0	755	591	595	592	592	660	0.101
7.0	756	592	596	593	593	663	0.141
8.0	756	592	596	594	593	664	0.160
9.0	757	592	596	594	593	667	0.199
10.0	757	593	597	595	594	675	0.262
11.0	757	593	597	595	594	685	0.401
12.0	757	593	597	595	594	696	0.639
15.0	758	593	597	595	594	724	1.550
16.0	758	593	597	595	594	728	1.700
17.0	758	593	597	595	595	732	1.857
18.0	758	593	597	594	594	735	1.998
19.0	758	593	597	595	594	735	2.099
20.0	759	594	598	595	595	735	2.199
21.0	759	594	598	595	595	735	2.301
22.0	759	594	598	596	595	735	2.398
23.0	759	594	598	596	596	735	2.501
24.0	759	594	598	596	595	735	2.598
AVERAGE	758	593	597	595	594	----	----
MEAN DEV	1	1	1	1	1	----	----
STAN DEV	1	1	1	1	1	----	----
CALCULATED	762	595	596	596	594	----	----
EDGE CON	735	593	----	----	----	----	----

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