NASA TECHNICAL MEMORANDUM

NASA TM X-73,118

NASA TM X-73,118

INVESTIGATION OF TWO BIFURCATED-DUCT INLET SYSTEMS FROM MACH 0 TO 2.0 OVER A WIDE RANGE OF ANGLES OF ATTACK

(NASA-TM-X-73118) INVESTIGATION OF TWO BIFURCATED-DUCT INLET SYSTEMS FROM MACH 0 TO 2.0 OVER A WIDE RANGE OF ANGLES OF ATTACK (NASA) 81 p HC $5.00 CSCL 01A
N76-27166
Unclas
G3/02 42379

Eldon A. Latham

Ames Research Center
Moffett Field, California 94035

May 1976

1. Report No NASA TM X-73,118	2. Government Accession No.	3. Recipient's Catalog No
4. Title and Subtitle Investigation of Two Bifurcated-Duct Inlet Systems From Mach 0 to 2.0 Over a Wide Range of Angles of Attack		5. Report Date May, 1976 6. Performing Organization Code
7. Author(s) Eldon A. Latham		8. Performing Organization Report No. A-6512
9. Performing Organization Name and Address NASA-Ames Research Center Moffett Field, Calif. 94035		10. Work Unit No. 505-04-11 11. Contract or Grant No.
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546		13. Type of Report and Period Covered Technical Memorandum 14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

A 15.354-percent-scale lightweight fighter-type inlet/forebody was tested in the Ames Unitary Plan Wind Tunnels over a Mach number range of 0 to 2.0. Model configurations consisted of side-mounted normal shock and fixed overhead ramp-type inlets. Each configuration consisted of two inlets ducted (bifurcated) to supply a single engine face. The normal shock inlet variables included a boundary layer splitter bleed system, alternate boundary-layer splitter plates, alternate upper and lower cowl lip shapes, and a blow-in-door (auxiliary inlet) in one lower lip. The only variable of the fixed overhead ramp inlet was the boundary layer bleed flow. Reynolds numbers ranged from 7.6 x 10^6 to 19.5 x 10^6/m (2.5 x 10^6 to 6.4 x 10^6/ft). Angle of attack ranged from -10° to 35° and angle of sideslip from -8° to 8°. Test measurements included engine face total pressure recovery, steady-state distortion, dynamic distortion, and surface static pressures on the forebody and inlet surfaces. This report includes only representative data of some of the important parameters. A complete listing of the tabulated data is available from NASA-Ames Research Center, Moffett Field, California.

17. Key Words (Suggested by Author(s)) Inlet High Angle of Attack Dynamic distortion Bifurcated duct		18. Distribution Statement Unlimited STAR Category 02	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 82	22. Price*

*For sale by the National Technical Information Service, Springfield, Virginia 22151

INVESTIGATION OF TWO BIFURCATED-DUCT INLET SYSTEMS FROM MACH 0 TO 2.0 OVER A WIDE RANGE OF ANGLES OF ATTACK

Eldon A. Latham

Ames Research Center

SUMMARY

A 15.354-percent-scale lightweight fighter-type inlet-forebody was tested in the Ames Unitary Plan Wind Tunnels over a Mach number range of 0 to 2.0. Model configurations consisted of side-mounted normal shock and fixed overhead ramp-type inlets. Each configuration consisted of two inlets ducted (bifurcated) to supply a single engine face. The normal shock inlet variables included a boundary layer splitter bleed system, alternate boundary-layer splitter plates, alternate upper and lower cowl lip shapes, and a blow-in door (auxiliary inlet) in one lower lip. The only variable of the fixed overhead ramp inlet was the boundary layer bleed flow. Reynolds numbers ranged from 7.6×10^6 to 19.5×10^6/m (2.5×10^6 to 6.4×10^6/ft). Angle of attack ranged from -10° to 35° and angle of sideslip from -8° to 8°. Test measurements included engine face total pressure recovery, steady-state distortion, dynamic distortion, and surface static pressures on the forebody and inlet surfaces. This report includes only representative data of some of the important parameters.

INTRODUCTION

The purpose of this investigation was to obtain inlet performance and dynamic distortion characteristics over an extensive maneuver envelope for a single engine, advanced lightweight fighter aircraft configuration with two types of side-mounted inlets. Normal shock and overhead ramp inlet configurations were tested. Several devices (bleed systems, cowl lip shapes, and a lower lip blow-in door) to minimize the normal shock inlet distortion at high angles of attack were also evaluated.

The test program, which was a cooperative effort of NASA, McDonnell Douglas Corporation, and the Navy was conducted in the Ames 11- by 11-Foot and 9- by 7-Foot Wind Tunnels (ref. 1) at Mach numbers of 0 to 2.0. Angle of attack ranged from -10° to 35° and angle of sideslip from -8° to 8°. Reynolds numbers ranged from 7.6×10^6 to 19.5×10^6/m (2.5×10^6 to 6.4×10^6/ft). Test measurements include engine face total-pressure recovery, steady-state distortion, dynamic distortion, and surface static pressures on the forebody and inlet surfaces.

NOMENCLATURE

Symbol	Definition
α, ALPHA	model angle of attack, referenced to a water line plane, degrees
β, BETA	model angle of sideslip, referenced to a buttock line plane, degrees
BID	blow-in-door angle setting relative to a W. W. plane, degrees
B.L	buttock line, centimeters
CN	correlation number
F.S.	fuselage station, centimeters
Inlet Bleed	overhead ramp inlets; refers to the bleed mass flow plug sleeve setting, inches normal shock inlet: "full open" refers to the d_1 choke or a throat bleed area of 69.55 in^2 full scale
M, MACH	tunnel freestream Mach number
P	tunnel freestream static pressure, pounds per square ft absolute
PT	tunnel freestream total pressure, pounds per square ft absolute
QO,q	tunnel freestream dynamic pressure, pounds per square foot
R/FT	Reynolds number per ft x 10^{-6}
STING MP	measured sting bending moment in the pitch plane,in-lbs
STING MY	measured sting bending moment in the yaw plane, in-lbs
TT	tunnel freestream total temperature, °F
W.L.	water line, centimeters
XMFP	schedule of main mass flow plug sleeve set positions as listed on the run schedule, inches
B_3	forward fuselage. See figures 2 and 3
C_1	fixed ramp inlet lower cowl lip. See figure 19

Symbol	Definition
C_2	normal shock inlet baseline lower cowl lip. See figure 13
C_3	normal shock inlet cowl lip, same as C_2 but with blow-in-door. See figure 14
C_4	normal shock inlet cowl lip, very blunt. See figure 16
C_5	normal shock inlet cowl lip, moderate bluntness. See figure 17
d_1	normal shock splitter bleed exit, without choke. See figure 9
D_3	fixed overhead ramp inlet duct. See figure 20
D_4	normal shock inlet duct. See figure 9
D_5	D_4 duct with increased radius upper cowl lip. See figure 9
D_{d1}	boundary layer diverter. See figures 2 and 3
E_{s1}	engine spinner. See figure 26
L_4	engine face rake. See figures 26 and 27
L_6	aft ramp rake for OHR inlet. See figure 20
L_7	lower duct rake for OHR inlet. See figure 20
L_8	upper duct rake for NS inlet. See figure 12
L_9	lower duct rake for NS inlet. See figure 12
L_{10}	inboard duct rake for inlet. See figure 12
L_{11}	fuselage rakes, both left and right-hand. See figure 8
L_{12}	fuselage rake on lower left side only. See figure 8
N_2	radome. See figures 2 and 3
q_1	inboard side plate splitter for NS inlet. Splitter leading edge is parallel and 14.50 inches (full-scale) forward and normal to the inlet plane. See figure 11
q_3	inboard side plate splitter for NS inlet. Splitter leading edge is parallel and 21.747 inches (full-scale) forward and normal to the inlet plane. See figure 11

Symbol	Definition
q_7	q_1 with increased leading edge radius. See figure 11
q_{11}	inboard side plate splitter for NS inlet. Splitter leading edge is parallel and 7.490 inches (full-scale) forward and normal to the inlet plane. Leading edge radius same as q_7. See figure 11
q_{12}	q_{11} with porous section just forward of the inlet plane. Porous area 10.18 in.^{2} (full scale). See figure 11
Q_1	duct splitter plate. See figure 25.
r_1	forward ramp for OHR inlet. See figure 21
r_2	aft ramp for OHR inlet. See figure 22

Parameters Common to All Configurations

PT2(I,J)	pressure recovery: ratio of individual compressor face total pressure to freestream total pressure for each probe in compressor face (48) WHERE: I = 1-6 (Ring No.) J = 1-8 (Leg No.)
PT2LEG(J)	average pressure recovery in LEG J WHERE J = 1-8
PT2RIN(I)	average pressure recovery in RING I WHERE I = 1-6
P2W(I)	ratio of individual compressor face wall static pressure to freestream total pressure, I = 1-8

Symbol	Definition
P2HUB(I)	ratio of individual engine hub static pressures to freestream total pressure. I = 1-4
PFX	ratio of individual forward fuselage static pressure to freestream total pressure, X=L (left), R (right), and LL (lower left)
PTFX(I)	ratio of individual forward fuselage boundary layer rake total pressure to freestream total pressure, I = 1-7
PBLDX(I)	ratio of individual boundary layer diverter static pressure to freestream total pressure, I = 1-3; U (upper surface) and L (lower surface)
PDE(I)	ratio of individual main duct mass flow plug sleeve exit static to freestream total pressure, I = 1-3
XMFP	main duct mass flow plug sleeve position, inches

Engine Face Parameters

NOTE: Data are presented for conditions noted avg, left and right. These refer to data averaged over the entire compressor face and the left and right hand sides of the compressor face.

PT2	ratio of average compressor face total to freestream total pressure
P2	ratio of average compressor face static to freestream total pressure
P2ϕPT2	ratio of average compressor face static to compressor face total pressure
WAKDRA	duct flow rate based on rake calibration (Pounds/Second)

$$\text{WAKDRA} = \frac{132.322\ (\text{M2 Rake})\ \text{A2E}}{[1 + 0.2\ (\text{M2 Rake})^2]^3} \cdot \text{C1}$$

Symbol	Definition
	M2 rake = f(P2ΦPT2)
	A2E = 5.7658 ft^2
	C1 = .7265 airflow correction constant (duct was designed and calibrated for a 16.292 percent F-15 inlet)
WAKD	duct flow rate based on plug calibration (Pounds/Second)
	WAKD = WAD · C1
	WAD = f (XMFP, PEΦPT2)
	PEΦPT2 = ratio of plug exit static to duct total pressure
PERFLΦ	percent flow in each side of duct
M_2	Mach number at engine face based on flow rate
Q2ΦPT2	ratio of dynamic to total pressure at the engine face
	Q2ΦPT2 = $0.7\ (M_2)^2\ [1 + 0.2\ (M_2)^2]^{-3.5}$
PDE	ratio of average duct plug exit static to freestream total pressure
PEΦPT2	average static to total pressure ratio at duct plug exit
ADE	theoretical duct plug exit area, $inches^2$
	ADE = $\pi[6.2964 - 0.5(XMFP)][0.7071(XMFP)-0.1464]$

Distortion Parameters

LEFT refers to left side of engine face (rake legs 1 to 4)

RIGHT refers to right side of engine face (rake legs 5 to 8)

HI refers to highest value

LOW refers to lowest value

Symbol Definition

$$D2 = \frac{PT2(i,j)_{HI} - PT2\ (i,j)_{LOW}}{PT2}$$

$$D2L = \frac{PT2\ (i,j)_{HI\ LEFT} - PT2\ (i,j)_{LOW\ LEFT}}{PT2L}$$

$$D2R = \frac{PT2\ (i,j)_{HI\ RIGHT} - PT2\ (i,j)_{LOW\ RIGHT}}{PT2R}$$

$$DF1 = \frac{PT2LEG(j)_{HI} - PT2LEG(j)_{LOW}}{PT2}$$

$$DC = \frac{[PT2LEG\ (j)_{HI} + PT2LEG\ (j)_{2ND\ HI}] - [PT2LEG\ (j)_{LOW} + PT2LEG\ (j)_{2ND\ LOW}]}{2(PT2)}$$

$$DR = \frac{PT2RIN(i)_{HI} - PT2RIN(i)_{LOW}}{PT2}$$

$$DT = DC + DR$$

$$DCL = \frac{PT2LEG(j)_{HI\ LEFT} - PT2LEG(j)_{LOW\ LEFT}}{PT2L}$$

$$DCR = \frac{PT2LEG(j)_{HI\ RIGHT} - PT2LEG(j)_{LOW\ RIGHT}}{PT2R}$$

$$DTL = DCL + DR$$

$$DTR = DCR + DR$$

P&WA Distortion Factors

NOTE: For the following distortion parameter definitions, the symbols Y and F refer to the YF401 and the F100(3) engine

KA2Y Fan distortion factor
KA2F

$$KA2 = KTH + bKRA^2$$

KTH, K_{Θ} Fan circumferential distortion factor

Symbol Definition

$$K_{\Theta} = \frac{\sum_{ring=1}^{J} \left[\left(\frac{A_N}{N^2} \right)_{max} \right]_{ring} \times \frac{1}{D_{ring}}}{(q/P_{t2})_{ref} \sum_{ring=1}^{J} \frac{1}{D_{ring}}}$$

where:

J = Number of rings (probes per leg)

D = Ring diameter

$\left(\frac{q}{P_{t2}}\right)_{ref}$ = Reference value of engine face dynamic pressure head, function of engine face Mach number

$A_N = \sqrt{a_N^2 + b_N^2}$, N-1,2,3,4

where

$$a_N = \frac{\Delta\Theta}{180} \sum_{k=1}^{K} \frac{P_{t2}/P_{to}\,(k\Delta\Theta)}{(P_{\overline{t2}}/P_{to})} \cos\,(Nk\Delta\Theta)$$

$$b_N = \frac{\Delta\Theta}{180} \sum_{k=1}^{K} \frac{P_{t2}/P_{t}\,(k\Delta\Theta)}{(P_{\overline{t2}}/P_{to}} \cos\,(Nk\Delta\Theta)$$

and

$P_{t2}/P_{to}(k\Delta\Theta)$ = Local recovery at angle, $k\Delta\Theta$

$(P_{\overline{t2}}/P_{to})$ = Face average recovery

k = Number of rake legs

$\Delta\Theta$ = angular distance between rake legs, degrees

$\left(\frac{A_N}{N^2}\right)_{max}$ = maximum value for the four Fourier coefficients calculated; normally turns out to be A_1

Symbol	Definition
KRA2, K_{ra2}	Fan Radial Distortion Factor

$$K_{ra2} = \frac{\sum_{ring=1}^{J} \left(\frac{\Delta P_{t2}}{\overline{P_{t2}}}\right)_{ring} \frac{1}{D_{ring}^{1.0}}}{(q/P_{t2})_{ref} \sum \frac{1}{D_{ring}^{1.0}}}$$

with:

$$\left(\frac{\Delta P_{t2}}{\overline{P_{t2}}}\right)_{ring} = \left| \frac{(P_{t2}/P_{to})}{\overline{P_{t2}}/P_{to}} - \frac{(P_{t2\,base}}{\overline{P_{t2}}} \right| \frac{\overline{P_{t2}}}{P_{t2\ base}}$$

where:

P_{t_2}/P_{to} = ring average recovery

$\frac{P_{t_2 base}}{\overline{P_{t2}}}$ = reference radial profile, function of $(q/P_{t2})_{ref}$

b = radial distortion weighting factor

P_{to} = freestream total pressure

KTHSPL, K_{Θ} Splitter	High Compressor Circumferential Distortion Factor
KC2, K_{C2}	High Compressor Distortion Factor

$$K_{C2} = K_{\Theta}\ \text{Splitter}\ \frac{180}{\Theta^{-}}$$

where:

$K_{\Theta splitter}$ is calculated in the same way as

K_{Θ}, but using values only for rings having diameters less than or equal to the splitter diameter, $D_{splitter}$, as defined below:

Symbol Definition

$D_{splitter} = \sqrt{a_s\,(OD^2 - ID^2) + ID^2}$

OD = Outside diameter

ID = Inside diameter

a_s = splitter streamtube area ratio, function of $(q/P_{t2})_{ref}$

θ^- = the greatest angular extent where $P_{t2}/\overline{P}_{t2} < 1.0$. If there are two regions of low $P_{t2}/\overline{P}_{t2}$ separated by 25° or less they are to be treated as one low pressure region. The lower limit of θ^- is to be 90°.

In the above definitions the folowing constants have the value of:

$J = 6$
$K = 8$
$\Delta\theta = 45°$
$OD = 5.8"$
$ID = 1.867"$

D_{ring} (1) = 2.448"
(2) = 3.320"
(3) = 4.006"
(4) = 4.590"
(5) = 5.108"
(6) = 5.580"

GE Distortion Factors

ID	Fan Distortion Factor $ID = B \cdot A_1 \cdot IDC + A_2 \cdot IDR$ B is a superposition factor A_1 is percent surge margin loss per unit IDC A_2 is percent surge margin loss per unit IDA
IDC	Fan Circumferential Distortion Factor $IDC(i) = [PT2RIN(i) - PT2MIN(i)]/PT2$ $i = 1$ to 6 PT2MIN(i) is the lowest probe value on ring i $IDCIN = [IDC(1) + IDC(2)]/2$

Symbol	Definition
	IDCØUT = [IDC(5) + IDC(6)]/2
	IDC = larger of IDCIN or IDCØUT
IDR	Fan Radial Distortion Factor
	IDR(i) = [PT2BAR - PT2RIN(i)]/PT2
	i = 1 to 6
	IDRIN = [IDR(1) + IDR(2)]/2
	IDRØUT= [IDR(5) + IDR(6)]/2
	IDR = larger of IDRIN or IDRØUT
IDCIN	IDC based on two inside rings only
IDCØUT	INC based on two outside rings only
IDRIN	IDR based on two inside rings only
IDRØUT	IDR based on two outside rings only
T(1)→T(8)	Individual Leg Turbulence Factor
	$T(J) = \frac{PT2H\ (3,J)_{RMS}}{PT2(3,J)}$, J = 1-8
$PT2H(3,J)_{RMS}$	The RMS signal from a high response total pressure probe on the third ring of the engine face rake. PT2 (3,J) is the steady state counterpart to PT2H (3,J)
TURB	Ring Average Turbulence
	$TURB = \frac{1}{8} \sum_{J=1}^{8} \frac{PT2H\ (3,J)_{RMS}}{PT2\ (3,J)}$

Overhead Ramp Inlet Parameters

PNUF(I)	ratio of individual external upper nacelle static to freestream total pressures,I = 1 -5

Symbol	Definition
PNLF(I)	ratio of individual external lower nacelle static to freestream total pressures I = 1 - 9
PNISPF(I)	ratio of individual inboard sideplate static to freestream total pressures I = 1 - 4
PNØSPF(I)	ratio of individual outboard sideplate static to freestream total pressures I = 1 - 5
PRF(I)	ratio of individual internal ramp static to freestream total pressures I = 1 - 9
PDUF(I)	ratio of individual internal upper duct static to freestream total pressures I = 1 - 14
PDLIPF(I)	ratio of individual internal lower lip static to freestream total pressures I = 1 - 6
PDLF(I)	ratio of individual internal lower duct static to freestream total pressures I = 1 - 5
PDØF(I)	ratio of individual internal outboard duct static to freestream total pressures I = 1 - 5
PDIF(I)	ratio of individual internal inboard duct static to freestream total pressures, I = 1 - 4
PTDUF(I)	ratio of individual aft ramp boundary layer rake total to freestream total pressures, I = 1 - 3
PTDLF(I)	ratio of individual lower cowl boundary layer rake total to freestream total pressure, I = 1 - 5
PDISPF	ratio of internal inboard sideplate static to freestream total pressure
PDØSPF	ratio of internal outboard sideplate static to freestream total pressure
PTBPLF	ratio of left-hand bleed plenum total to freestream total pressure
PBPLF	ratio of left-hand bleed plenum static to freestream total pressure
PTBPRF	ratio of right-hand bleed plenum total to freestream total pressure

Symbol	Definition
PBPRF	ratio of right hand bleed plenum static to freestream total pressure
PD52	ratio of average internal duct static pressure at F.S. 132.08 to freestream total pressure PD52 = 1/4[PDUF(1) + PDIF(1) + PDϕF(1) + PDLF(1)]
PD53	ratio of average internal duct static pressure at F.S. 134.62 to freestream total pressure PD53 = 1/4[PDUF(3) + PDIF(2) + PDϕF(2) + PDLF(2)]
PD57	ratio of average internal duct static pressure at F.S. 144.78 to freestream total pressure PD57 = 1/4[PDUF(5) + PDIF(3) + PDϕF(3) + PDLF(3)]
PD65	ratio of average internal duct static pressure at F.S. 165.10 to freestream total pressure PD65 = 1/4[PDUF(9) + PDIF(4) + PDϕF(4) + PDLF(4)]
PD73	ratio of average internal duct static pressure at F.S. 185.42 to freestream total pressure PD73 = 1/3[PDUF(13) + PDϕF(5) + PDLF(5)]
PTBLF(I)	ratio of individual left-hand bleed mass flow pipe total to freestream total pressures, I = 1 - 9
PBLF(I)	ratio of individual left-hand bleed mass flow plug sleeve static to freestream total pressures I = 1 - 3
PTBRF(I)	ratio of individual right-hand bleed mass flow pipe total to freestream total pressures I = 1 - 9
PBRF(I)	ratio of individual right-hand bleed mass flow plug sleeve static to freestream total pressures I = 1 - 3
XMFPBL	left bleed plug sleeve position ~ inches
XMFPBR	right bleed plug sleeve position ~ inches
PϕPTPL	ratio of left bleed plenum static to total pressure
PϕPTPR	ratio of right bleed plenum static to total pressure
PTBL	ratio of average left bleed total to freestream total pressure

Symbol	Definition
	$PTBL = \frac{1}{9} \sum_{i=1}^{9} PTBLF(i)$
PTBR	ratio of average right bleed total to freestream total pressure $PTBR = \frac{1}{9} \sum_{i=1}^{9} PTBRF(i)$
PBL	ratio of average left bleed static to freestream total pressure $PBL = \frac{1}{3} \sum_{i=1}^{3} PBLF(i)$
PBR	ratio of average right bleed static to freestream total pressure $PBR = \frac{1}{3} \sum_{i=1}^{3} PBRF(i)$
PφPTBL	ratio of average static to total pressure in the left hand bleed $P\phi PTBL = PBL/PTBL$
PφPTBR	ratio of average static to total pressure in the right hand bleed $P\phi PTBR = PBR/PTBR$
WAKBL	flow rate through left bleed duct (pounds/second) $WAKBL = WABL \cdot C1 \cdot PTBL/PT2$ $WABL = f(XMFPBL, P\phi PTBL)$ and calibration curve shown in reference 2
WAKBR	flow rate through right hand bleed duct (pounds/second) calculation same as WAKBL
ABL	theoretical left bleed exit area $(\text{inches})^2$ $ABL = \pi[2.6927 - 0.5(XMFPBL)][0.7071(XMFPBL) - .2927]$
ABR	theoretical right bleed exit area $(\text{inches})^2$ $ABR = \pi[2.6927 - 0.5(XMFPBR)][0.7071(XMFPBR) - .2927]$
ACO	inlet capture area at ALPHA = 0 (975.168 in^2)
AC	inlet capture area at ALPHA $\neq$ 0 $AC = \left[\frac{SIN(GAMMA + ALPHA)}{SIN\ (GAMMA)}\right] \cdot ACO$

Symbol	Definition
	GAMMA = 38.334 degrees
ACAPT	ACO and/or AC
MFRD	duct mass flow ratio based on ACO and AC
	$MFRD = \frac{1.5497\ (WAKD)(PT2)}{MFFO(ACO)}$
	MFFO = freestream mass flow function
MFRBL	left bleed mass flow function, based on ACO and AC. Calculation same as MFDR
MFRBR	right bleed mass flow function, based on ACO and AC
MFRI	inlet mass flow ratio, based on ACO and AC MFRI = MFRD + MFRBL + MFRBR
CDFO	freestream drag coefficient CDFO = FO/QO
	FO = f (PO,MO,WAKO) freestream drag force WAKO = [WAKD + WAKBL + WAKBR] PT2
CLFI	inlet lift coefficient
	CLFI = [F INLET·SIN(6° + ALPHA)]/QO
	calculation of F INLET can be found in reference 2
CDFI	inlet drag coefficient
	CDFI = [F INLET·COS(6° + ALPHA)]/QO
CLFR	ramp lift coefficient
	CLFR = [F RAMP·COS(6° + ALPHA)]/QO
	calculation of F RAMP can be found in reference 2
CDFR	ramp drag coefficient
	CDFR = [F RAMP·SIN(6° + ALPHA)]/QO
CLFADD	additive lift coefficient

Symbol	Definition
	CLFADD = CLFR - CLFI
CDFADD	additive drag coefficient CDFADD = CDFR + CDFI - CDFO
Normal Shock Inlet Parameters	
Nacelle Data	
PNUM(I)	ratio of individual external upper nacelle static to freestream total pressures, I = 1 - 5
PNLN(I)	ratio of individual external lower nacelle static to freestream total pressures, I = 1 - 8
PNϕ SPN(I)	ratio of individual external outboard sideplate static to freestream total pressures, I = 1 - 6
Duct Data	
PSPTN(I)	ratio of individual internal splitter static to freestream total pressures, I = 1 -3
PDUN(I)	ratio of individual internal upper duct static to freestream total pressures, I = 1 - 16
PDLN(I)	ratio of individual internal lower duct static to freestream total pressures, I = 1 - 11
PDIN(I)	ratio of individual inboard duct internal static to freestream total pressures, I = 1 - 5
PDϕN(I)	ratio of individual outboard duct internal static to freestream total pressures, I = 1 - 6
PTDIN(I)	ratio of individual inboard duct boundary layer rake total to freestream total pressures I = 1 - 5
PTDUN(I)	ratio of individual upper duct boundary layer rake total to freestream total pressures, I = 1 - 3
PTDLN(I)	ratio of individual lower duct boundary layer rake total to freestream total pressures, I = 1 - 5
PBELN(I)	ratio of individual left bleed exit static to freestream total pressures, I = 1 - 2
PBERN(I)	ratio of individual right bleed exit static to freestream total pressures, I = 1 - 2
PTBELN	ratio of left bleed exit total to freestream total pressure

Symbol	Definition
PTBERN	ratio of right bleed exit total to freestream total pressure
PBPLN	ratio of left bleed plenum static to freestream total pressure
PBPRN	ratio of right bleed plenum static to freestream total pressure
PD50	ratio of average duct static pressure at F.S. 127.00 to freestream total pressure $PD50 = \frac{1}{4}[PDUN(3) + PDIN(1) + PD\phi N(1) + PDLN(5)]$
PD51	ratio of average duct static pressure at F.S. 129.54 to freestream total pressure $PD51 = 1/4[PDUN(4) + PDIN(2) + PD\phi N(2) + PDLN(7)]$
PD53	ratio of average duct static pressure at F.S. 134.62 to freestream total pressure $PD53 = 1/4[PDUN(5) + PDIN(3) + PD\phi N(3) + PDLN(8)]$
PD57	ratio of average duct static pressure at F.S. 144.78 to freestream total pressure $PD57 = 1/4[PDUN(7) + PDIN(4) + PD\phi N(4) + PDLN(9)]$
PD65	ratio of average duct static pressure of F.S. 165.10 to freestream total pressure $PD65 = 1/4[PDUN(11) + PDIN(5) + PD\phi N(5) + PDLN(10]$
PD73	ratio of average duct static pressure of F.S. 185.42 to freestream total pressure $PD73 = 1/3[PDUN(15) + PD\phi N(6) + PDLN(11)]$

Bleed Parameters

Symbol	Definition
PSPT	ratio of average internal splitter static to freestream total pressure
PRPϕR	pressure ratio across porous plate on left-hand inlet

Symbol	Definition
	PRPφR = PBPLN/PSPT
PBEL	ratio of average left bleed exit static to free-stream total pressure
PBER	ratio of average right bleed exit static to free-stream total pressure
PφPTBL	ratio of average left bleed exit static to total pressure
	PφPTBL = PBEL/PTBELN
PφPTBR	ratio of average right bleed exit static to total pressure
	PφPTBR = PBER/PTBERN
ABE	bleed exit area (69.55 inches^2), constant
WAKBL	theoretical flow rate through left bleed exit (pounds/second)
	calculation procedure can be found in reference 2
WAKBR	theoretical flow rate through right bleed exit (pounds/second)

Mass Flow Parameters

ACO	inlet capture area at ALPHA = 0. This value is a function of the lower cowl configuration

Configuration	Cowl	ACO (IN^2)
4,5,7,9	C_2	829.44
6,8,10,11,12,15,16	C_2,C_3	844.42
13,17	C_5	889.06
14	C_4	939.46

AC	inlet capture area at ALPHA ≠ 0

$$AC = \left[\frac{SIN(GAMMA + ALPHA)}{SIN(GAMMA)}\right] \cdot ACO$$

Symbol	Definition
	GAMMA = 75 degrees for configuration 4,5,7 and 9 = 73.3 degrees for all other configurations.
MFRI	Inlet mass flow ratio, computed with ACO and/or AC $\mathrm{MFRI} = \frac{1.5497(\mathrm{WAKD})\mathrm{PT2}}{\mathrm{MFFO}(\mathrm{ACO})}$
CDFO	freestream drag coefficient calculation same as for OHR inlet
CLFI	inlet lift coefficient $\mathrm{CLFI} = [\mathrm{FIMV}\cdot\mathrm{SIN}(\mathrm{ALPHA}) + \mathrm{FIP}\cdot\mathrm{SIN}(\mathrm{ALPHA} - 15^\circ)]/\mathrm{QO}$ FIMV = inlet momentum. Calculation procedure can be found in reference 2 FIP = (PI - PO) AI inlet pressure term AI = ACO/SIN GAMMA
CDFI	inlet drag coefficient $\mathrm{CDFI} = [\mathrm{FIMV}\cdot\mathrm{COS}(\mathrm{ALPHA}) + \mathrm{FIP}\cdot\mathrm{COS}(\mathrm{ALPHA} - 15^\circ)]/\mathrm{QO}$
CLFADD	Same as CLFI
CDFADD	additive drag coefficient CDFADD = CDFI - CDFO
THETA	blow-in-door rotation angle, applies to C_3 cowl only, degrees THETA = f(pot millivolts)
ATHROAT	blow-in-door throat area ATHROAT = f(THETA) see reference 2

MODEL DESCRIPTION

Shown in figure 1 is the 15.354-percent-scale pressure model, with overhead-ramp inlets, installed in the Ames 11- by 11-Foot Wind Tunnel. The model consisted of a forebody assembly; a normal shock inlet and duct assembly, or an overhead ramp inlet and duct assembly; an engine face rake and mass flow control plug; and an ejector assembly. The general arrangement of the normal shock and overhead ramp inlet configurations is shown in figures 2 and 3. Each inlet assembly consisted of two rectangular side-mounted inlets supplying air to a simulated engine face through a bifurcated duct. Both inlet types had a capture height to width ratio of 2.0 with the duct expanding to 110 percent of the engine face area and then contracting in the last 0.7 diameter of length. Tunnel installation schematics are shown in figures 4 through 7.

Individual model parts and subassemblies, including pressure instrumentation, are shown in figures 8 through 28. It should be noted that the figures are to scale with only limited dimensions given. The forebody instrumentation used on some runs for both inlet configurations is shown in figure 8. Normal shock inlet model variables and instrumentation details are shown in figures 9 through 17. Model details included are the two upper cowl lip shapes (fig. 9); the three boundary layer splitter plates, including bleed areas (fig. 11); the three different lower cowl lip shapes (figs. 13, 16 and 17); and the blow-in door (figs. 14 and 15). Instrumentation for the overhead ramp inlet is shown in figures 18 through 24. The duct splitter just forward of the compressor face is shown in figure 25. Instrumentation at the simulated engine face and inlet mass flow controls is shown in figures 26 and 27.

An ejector used to obtain typical engine airflow rates through the inlets at Mach numbers of 0, 0.25, and 0.6 is shown in figure 28.

INSTRUMENTATION

The model was instrumented to measure both steady-state and high-frequency fluctuating pressures at the locations shown in figures 8 through 24 and 26 through 28. Bytrex and Kulite dynamic-pressure transducers were used in combination to measure a total of 60 (48 at the compressor face) high-frequency pressures in the normal shock inlet and 64 (48 at the compressor face) in the overhead ramp inlet. These transducers were flush-mounted in the duct walls, ramp surfaces and cowl lips for static pressures; they were probe-mounted in the rake legs for engine compressor face total pressures. One Bytrex transducer was mounted in a ceiling probe (fig. 29) used to monitor the freestream fluctuating total pressure. All steady-state pressures were measured with a "scanivalve" assembly mounted at the rear of the model support. When the model was mounted in the 11- by 11-Foot

Wind Tunnel the angle of attack was measured with a pendulum-type angle sensor. Model angle of attack in the 9- by 7-Foot Wind Tunnel as well as angle of sideslip in both test sections were measured with the tunnel strut drive systems.

TESTING AND PROCEDURE

The variation of engine-face total pressure recovery with inlet mass-flow ratio was established for each model configuration and test condition. All runs were made at constant Mach number and model attitude. In general, the mass flow schedule for each run consisted of two supercritical points, a match point, and two subcritical points. During supersonic operation, one of the two subcritical points usually included a "buzz" or a "buzz onset" point, or both, to define the range of stable inlet operation.

On all static, and on most transonic runs, the model ejector (fig. 28) was used to induce sufficient airflow through the inlets. A total flow of 15 lb/sec at 600 psig through the four ejector nozzles provided the proper airflow.

For each data point, tunnel and model conditions were set and the steady-state data were recorded. Thirty seconds of dynamic data were then recorded on a Vidar high-frequency system (ref. 3) and the time variant Pratt & Whitney distortion parameters for the YF401 engine were computed with the NAPTC analog computer.

Estimated uncertainties of some of the primary parameters are as follows:

$\alpha = \pm 0.1$

$\beta = \pm 0.1$

$M = \pm 0.005$

$MFRB = \pm 0.005$

$MFRI = \pm 0.02$

$PT2 = \pm 0.005$

RESULTS AND DISCUSSION

The run schedule for the present investigation is shown in table 1. A sample of the tabulated steady-state data is shown in the appendix. A complete listing of the tabulated data are not presented in this report because of the large volume required; the data are available in reference 3 or from NASA-Ames Research Center, Moffett Field, California. Selected plots of the data are presented in figures 30 through 33.

Engine-face total pressure recovery, steady-state distortion, and the time-variant Pratt & Whitney fan total distortion parameter for the YF401 engine as functions of inlet mass flow ratio and angle of attack are shown for both the normal shock and overhead ramp inlets at Mach numbers of 0.9 and 1.4. All plots are at $\beta = 0°$. Plots of the normal shock inlet performance at M = 0.9 (fig. 30) show reasonable pressure recovery at α = 0 with a rapid drop at $\alpha > 10°$. A reduction in pressure recovery is also seen at $\alpha = -10°$. At M = 1.4 (fig. 31) a slight increase in pressure recovery is seen with increasing α, and again the decrease at negative angles. The overhead ramp inlet at M = 0.9 (fig. 32) shows a drop in pressure recovery at $\alpha > 10°$, but not nearly so severe as the normal shock inlet. At negative angles of attack the loss in pressure recovery is much more pronounced at the lower mass flow ratios than with the normal shock inlet. At M = 1.4 (fig. 33) the overhead ramp inlet performance is considerably better than the normal shock inlet but shows the same slight increase in performance with increasing angle of attack. Negative angles again show a pronounced loss of performance. A large increase in mass flow ratio over that at M = 0.9 can also be seen. In general, improvements in pressure recovery are accompanied by corresponding reductions in inlet distortion for both inlet configurations.

Ames Research Center
National Aeronuatics and Space Administration
Moffett Field, California 94035
February 6, 1976

REFERENCES

1. Research Facilities Summary 1974 NASA-Ames Research Center, Moffett Field, California.
2. Spong, E. D.; Knouff, A. H.; Tibbles, T. T.: Pretest Report for VFAX Air Induction System Tests. Report No. MDC A3107, McDonnell Douglas Corporation, Saint Louis, Missouri, Sept. 1974.
3. Chamberlain, D. R.: Wind Tunnel Tests on a 15.354 Percent Scale Model 263 Bifurcated Inlet at the Ames Research Center Unitary Plan Wind Tunnels, Volumes I through XIV. Report No. MDC A3335,McDonnell Douglas Corporation, Saint Louis, Missouri, June 1975.

Table 1.

RUN SCHEDULE

RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft ($\times 10^{-6}$)	α (Deg)	β (Deg)	XMFT (In.) 1	2	3	4	5	6/7	Inlet Bleed	cn	REMARKS
1	1	In	0°	0	-	-	0	0	2.42	2.32	1.85	1.37	0.75	-	.497	14 → 19	CN 14 Vidar, Analog Data N.G.
2				0.25	150	2.50	0		2.42	2.32	1.85	1.37	0.75	-		28 → 35	CN 28 → 30 All Data N.G.
3				0.25	150	2.50	10		2.42	2.32	1.85	1.37	0.75	-		36 → 41	CN 39 Analog Data N.G.
4				0.60	870	6.43	0		2.42	2.32	1.90	1.37	0.75	-		51 → 55	
5							10		2.42	2.32	1.90	1.37	0.75	-		56 → 60	
5							-10	↓	2.42	2.32	1.90	1.37	0.75	-		61 → 65	
7							-10	8	2.42	2.32	1.90	1.37	0.75	-		66 → 70	
8							0		2.42	2.32	1.90	1.37	0.75	-		71 → 75	
9				↓	↓	↓	10	↓	2.42	2.32	1.90	1.37	0.75	-		76 → 80	
10				0.90	1200	6.71	0	0	2.42	2.22	1.90	1.37	0.75	-		81 → 86	CN 83 Analog Data N.G.
11							-10		2.42	2.22	1.90	1.37	0.75	-		96 → 100	
12							10	↓	2.42	2.22	1.90	1.37	0.75	-		101 → 105	
13							10	8	2.42	2.22	1.90	1.37	0.75	-		106 → 110	
14							0		2.42	2.22	1.90	1.37	0.75	-		111 → 115	
15							-10	↓	2.42	2.22	1.90	1.37	0.75	-		116 → 120	
16				↓	↓	↓	-10	-8	2.42	2.22	1.90	1.37	0.75	-		121 → 127	CN 122, 123 Vidar & Analog Data N.G.
17				0	-	-	0	0	2.42	2.32	1.85	1.37	0.75	1.98		142 → 149	Repeat of Run 1 CN 147, 148 Analog Data N.G.
18				0.25	150	2.50	0		2.42	2.32	1.85	1.37	0.75	-		155 → 159	Repeat of Run 2
19				0.25	150	2.50	10		2.42	2.32	1.85	1.37	0.75	2.00 1.92		160 → 166	Repeat of Run 3
20				0.60	870	6.43	0		2.42	2.27	2.11	1.37	0.75	-		167 → 171	Repeat of Run 4
21							10		2.42	2.27	2.11	2.00	1.37	0.75		172 → 178	Repeat of Run 5 CN 175 Analog Data N.G.
22							-10	↓	2.42	2.27	2.00	1.37	0.75			179 → 183	Repeat of Run 6
23	↓	↓	↓	↓	↓	↓	-10	8	2.42	2.27	1.96	1.37	0.75	-	↓	184 → 188	Repeat of Run 7

NOTES: Config. 1: $B_3N_2V_3R_{s1}D_{d1}L_4L_6Q_1e_1r_1r_2$ (Overhead Ramp Inlet)

On Runs 1 through 16 the Main Duct Mass Flow Calculation (WAKD) is not Usable due to Leaks in the Measured Duct Exit Statics.

Table 1 - Continued.

RUN SCHEDULE

RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft (x10^{-6})	α (Deg)	β (Deg)	XMFP (In.) 1	2	3	4	5	6/7	Inlet Bleed	C N	REMARKS
24	1	In	0°	0.60	870	6.43	0	8	2.42	2.27	1.96	1.37	0.75	-	.497	189 → 193	Repeat of Run 8
25				0.60	870	6.43	10	8	2.42	2.27	1.96	1.37	0.75	-		194 → 198	Repeat of Run 9
26				0.90	1200	6.71	0	0	2.42	2.22	1.37	0.75	1.96	1.86		199 → 204	Repeat of Run 10
27							-10		2.42	2.22	1.96	1.37	0.75	-		205 → 209	Repeat of Run 11
28							10	↓	2.42	2.22	1.96	1.37	0.75	1.87		210 → 216	Repeat of Run 12 CN 210 All Data N.G.
29	↓	↓	↓	↓	↓	↓	10	8	2.42	2.22	1.92	1.37	0.75	-	↓	217 → 222	Repeat of Run 13 CN 220 All Data N.G.
30-34	DATA ON THESE RUNS ARE NO GOOD DUE TO BAD SIGNAL CONDITIONER ON SCANIVALVE MODULE #3.																
35	1	In	0°	0.90	1200	6.71	10	-8	2.42	2.22	1.92	1.37	0.75	-	.497	281 → 285	Repeat of Run 30
36							-10	8	2.42	2.22	1.92	1.37	0.75	-		286 → 290	Repeat of Runs 15, 33
37							0	8	2.42	2.22	1.92	1.37	0.75	-		291 → 295	Repeat of Runs 14, 32
38							0	-8	2.42	2.22	1.92	1.37	0.75	-		296 → 300	Repeat of Run 31
39				↓		↓	-10	-8	2.42	2.22	1.92	1.37	0.75	-		306 → 310	Repeat of Runs 16, 34
40				1.20		5.71	0	0	2.42	2.22	1.87	1.37	0.75	-		325 → 330	CN 318 → 322, 327 All Data N.G. CN 330 Buzz Onset
41							-8	0	2.42	2.22	1.87	1.37	-	-		331 → 336	CN 332, 333 Vidar Data N.G. CN 336 Buzz Onset
42							-8	8	2.42	2.22	1.87	1.37	0.78	-		337 → 341	CN 341 Buzz Onset
43							0		2.42	2.22	1.87	1.37	1.15	-		342 → 346	CN 346 Buzz Onset
44							8	↓	2.42	2.22	1.87	1.37	0.67	-		347 → 354	CN 347, 348, 351 Analog Data N.G. CN 354 Buzz Onset
45							8	0	2.42	2.22	1.87	1.37	0.64	-		355 → 360	CN 355 All Data N.G. CN 360 Buzz Onset
46				↓		↓	-4	8	2.42	2.22	1.87	1.55	-	-	↓	361 → 365	CN 361 Model Attitude Set Incorrectly. CN 365 Buzz Onset
47				1.40		5.41	0	0	2.27	2.14	1.80	1.37	1.12	-	.497	366 → 370	CN 370 Buzz Onset
48							-6	0	2.27	2.14	1.80	1.75	-	-		371 → 374	CN 374 Buzz Onset
49							-6	8	2.27	2.14	1.80	1.43	-	-		375 → 380	CN 375, 378 Analog Data N.G. CN 380 Buzz Onset
50	↓	↓	↓	↓	↓	↓	0	↓	2.27	2.14	1.80	1.40	-	-	↓	381 → 384	CN 384 Buzz Onset

NOTES: Config. $B_3N_2D_3E_{S1}D_{d1}L_4L_6Q_1C_1r_1r_2$ (Overhead Ramp Inlet)

Table 1 - Continued.

RUN SCHEDULE									XMFP (In.)								
RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	R_n/Ft ($x10^{-6}$)	α (Deg)	β (Deg)	1	2	3	4	5	$\frac{6}{7}$	Inlet Bleed	CN	REMARKS
51	1	In	0°	1.40	1200	5.41	10	8	2.27	2.14	1.8C	1.37	0.88	-	.497	385 → 389	CN 389 Buzz Onset
52	↓	↓	↓	↓	↓	↓	10	0	2.27	2.14	1.80	1.37	0.76	-		390 → 394	CN 394 Buzz Onset
53	2	Out	20°	1.20	1200	5.71	8		2.42	2.22	1.87	1.37	0.62	-		405 → 416	CN 405 409 Incorrect α CN 413, 414 All Data N.G. CN 416 Buzz Onset
54							16		2.42	2.22	1.87	1.37	0.50	-		417 → 421	Run no good - Leak in S/V Calib Line
55									2.42	2.22	1.87	1.37	0.60	-		428 → 432	↓
56							↓	↓	2.42	2.22	1.87	1.37	0.60	-		435 → 439	Repeat of Runs 54 and 55
57							24		2.42	2.22	1.87	1.37	0.60	-		440 → 444	CN 444 Buzz Onset
58							16	8	2.42	2.22	1.87	1.37	0.60	-		445 → 449	
59				↓		↓	24	6	2.42	2.22	1.87	1.37	0.60	-		450 → 454	
60				1.40		5.41	20	0	2.27	2.14	1.80	1.37	0.54	-		455 → 459	CN 459 Buzz Onset
61	↓	↓		1.40		5.41	20	8	2.27	2.14	1.80	1.40	-	-		460 → 463	CN 463 Buzz Onset
62	1	In		0.90		6.71	10	0	2.35	2.22	1.90	1.37	0.75	-		470 → 477	CN 470, 472 Incorrect α Repeatability of Run 28.
63					↓	6.71	20		2.35	2.22	1.90	1.37	0.75	-		478 → 482	
64					1000	5.59	30		2.35	2.22	1.9	1.37	0.75	-		483 → 489	CN 483, 484 Incorrect Mach
65							34	↓	2.35	2.22	1.90	1.37	0.75	-		490 → 494	
66							20	8	2.35	2.22	1.90	1.37	0.75	-		495 → 499	
67				↓	↓	↓	30	8	2.35	2.22	1.90	1.37	0.75	-		500 → 504	
68				0.60	870	6.43	20	0	2.35	2.22	1.90	1.37	0.75	1.98		505 → 510	
69				0.60	870	6.43	30	0	2.35	2.22	1.98	1.37	0.75	-		511 → 515	
70							34	0	2.35	2.22	1.98	1.37	0.75	-		516 → 521	CN 516 Analog Data N.G.
71							20	8	2.35	2.22	1.98	1.37	0.75	-		522 → 526	
72				↓	↓	↓	30	8	2.35	2.22	1.98	1.37	0.75	-		527 → 531	
73	↓	↓	↓	0.25	150	2.50	20	0	2.35	2.22	1.98	1.37	0.75	2.07	↓	533 → 538	

NOTES: Config. 1: $B_3H_2D_3E_{S1}D_{a1}L_4I_6Q_1C_jr_1r_2$ (Overhead Ramp Inlet)

Config. 2: Config. 1 without ejector

Anti-Lift Cable Force = 3000 lbs on Runs 53 through 61
Anti-Lift Cable Force = 4000 lbs on Runs 62 through 73

Table 1 - Continued.

RUN SCHEDULE

RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft (x10^{-6})	α (Deg)	β (Deg)	XMFP (In.) 1	2	3	4	5	6/7	Inlet Bleed	CN	REMARKS
74	1	In	20°	0.25	150	2.50	30	0	2.35	2.22	2.07	1.37	0.75	-	.497	539 → 543	
75	↓		↓	↓	↓	↓	24		2.35	2.22	2.07	1.37	0.75	-	.497	544 → 548	
76	4		0°	0	-	-	0		2.42	2.20	2.07	1.37	0.75	-	No Bleed	563 → 568	
77	5			0	-	-			2.42	2.20	2.07	1.37	0.75	-		572 → 576	
78				1.40	1200	5.41	↓	↓	2.30	2.10	1.80	1.76	1.72	-		578 → 583	CN 578 All Data N.C. CN 582 Buzz Onset on 58[illegible] Buzz
79							10		2.30	2.16	1.80	1.37	1.14	-		584 → 588	CN 588 Buzz Onset
80							10	8	2.30	2.10	1.95	1.80	1.37	-		589 → 593	CN 593 Buzz Onset
81							0		2.30	1.95	1.80	1.54	-	-		594 → 597	CN 597 Buzz Onset
82							-6	↓	2.30	1.95	1.77	-	-	-		598 → 600	CN 600 Buzz Onset
83							-6	0	2.30	1.95	1.77	1.68	-	-		601 → 604	CN 604 Buzz Onset
84							-3	8	2.30	2.09	2.08	-	-	-		605 → 607	CN 607 Buzz Onset
85							10	0	1.95	-	-	-	-	-		608	Extension of Run 79
86				↓	↓	↓	0	0	1.95	-	-	-	-	-		609	Extension of Run 78
87				1.20	1200	5.71	0		2.42	2.21	1.89	1.67	-	-		610 → 614	CN 610 → 612 All Kulite Static Pressure Data Lost. CN 614 Buzz Onset
88							-8	↓	2.42	2.21	1.95	1.89	1.37	1.23		615 → 620	CN 620 Buzz Onset
89							-8	8	2.42	2.21	1.95	1.89	1.58	-		621 → 625	CN 625 Buzz Onset
90							0		2.42	2.21	1.95	1.89	1.55	-		626 → 631	CN 631 Buzz Onset CN 626 Analog Data N.G.
91							8	↓	2.42	2.21	1.95	1.89	1.58	-		632 → 636	CN 636 Buzz Onset
92				↓		↓	8	0	2.42	2.21	1.95	1.89	1.78	-		637 → 641	CN 641 Buzz Onset
93				0.90		6.71	0	0	2.42	2.21	1.91	1.37	0.75	-		644 → 648	
94							0	-8	2.42	2.21	1.91	1.37	0.75	-		649 → 653	
95							-10	-8	2.42	2.21	1.91	1.37	0.75	-		654 → 658	
96	↓	↓	↓	↓	↓	↓	-10	0	2.42	2.21	1.91	1.37	0.75	-	↓	659 → 665	CN 661 Lost Vidar Data CN 664 Analog Data N.G.

NOTES: Config. 1: $B_3N_2D_3E_{S1}D_{a1}L_4L_5Q_1C_1r_1r_2$ (Overhead Ramp Inlet)

Config. 4: $B_3N_2D_4E_{S1}D_{a1}L_4L_8G_1C_2d_1q_1L_{10}$ (Normal Shock Inlet)

Config. 5: $B_3N_2D_4E_{S1}D_{a1}L_4L_8Q_1C_2d_1q_1$ (Normal Shock Inlet)

Anti-Lift Cable Force = 4000 lbs on Runs 74 and 75.

MAC 1320 (REV 10 FEB 71)

Table 1 - Continued.

RUN SCHEDULE

RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft (x10⁻⁶)	α (Deg)	β (Deg)	XMFP (In.) 1	2	3	4	5	6/7	Inlet Bleed	CN	REMARKS
97	5	In	0°	0.90	1200	6.71	10	0	2.42	2.21	1.91	1.37	0.75	-	No Bleed	666 → 671	CN 670 All Data N.G.
98								0	2.42	2.21	1.91	1.37	0.75	0.30		672 → 677	Ejector Shut Off on this Run Repeatability of Run 97
99								8	2.42	2.21	1.91	1.37	0.75	-		678 → 682	
100							0		2.42	2.21	1.91	1.37	0.75	-		683 → 687	
101							10		2.42	2.21	1.91	1.37	0.75	-		688 → 692	
102							-10		2.42	2.21	1.91	1.37	0.75	-		693 → 697	
103				0.60	870	6.43	0	0	2.42	2.21	1.99	1.37	0.75	0.30		698 → 703	
104							10		2.42	2.21	1.99	1.37	0.75	-		704 → 709	CN 704 All Data N.G.
105							-10		2.42	2.21	1.99	1.37	0.75	-		710 → 714	
106							-10	8	2.42	2.21	1.99	1.37	0.75	-		715 → 719	
107							0		2.42	2.21	1.99	1.37	0.75	-		720 → 724	
108							10		2.42	2.21	1.99	1.37	0.75	-		725 → 730	CN 726 No Analog or Vidar Data
109				0.90	1200	6.71	0	0	2.42	2.21	1.91	1.37	0.75	-		731 → 735	Repeatability of Run 93
110				0.25	150	2.50	0		2.42	2.21	2.06	1.37	0.75	-		736 → 741	CN 737 No Analog or Vidar Data
111				0.25	150	2.50	10		2.42	2.21	2.09	1.37	0.75	-		742 → 746	
112				0	-	-	0		2.42	2.21	2.09	1.93	1.37	0.75		747 → 752	Analog Data N.G. on this Run
113	7			1.40	1200	5.41	0		2.30	2.10	1.95	1.80	-	-		758 → 761	CN 761 Buzz Onset
114							10		2.30	2.10	1.95	1.80	-	-		762 → 765	CN 765 Buzz Onset
115							0	8	2.30	2.10	1.95	1.80	-	-		766 → 769	Data N.G. on this Run CN 769 Buzz Onset
116				1.20		5.71	0	0	2.42	2.21	1.95	1.89	1.74	-		770 → 774	CN 774 Buzz Onset
117				0.90		6.71	0	0	2.42	2.21	1.91	1.37	1.04	-		775 → 780	CN 780 Duct Instability
118							0	8	2.42	2.21	1.91	1.37	1.06	-		781 → 785	CN 785 Duct Instability
119							10	0	2.42	2.21	1.91	1.37	1.13	-		786 → 791	CN 786 All Data N.G. CN 791 Duct Instability

NOTES Config. 5: $B_3N_2D_4E_{S1}D_{d1}L_4L_6Q_1C_2d_1q_1$ (Normal Shock Inlet)

Config. 7: $B_3N_2D_4E_{S1}D_{d1}L_4L_6Q_1C_2d_1q_3$ (Normal Shock Inlet)

Table 1 - Continued.

RUN SCHEDULE

RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft (x10^{-6})	α (Deg)	β (Deg)	XMPP (In.) 1	2	3	4	5	$\frac{6}{7}$	Inlet Bleed	CN	REMARKS
120	7	In	0°	0.90	1200	6.71	5	0	2.42	2.21	1.91	1.37	0.97	-	No Bleed	792 → 796	CN 796 Duct Instability
121	7						10		2.42	2.21	1.91	1.37	0.91	-		797 → 801	CN 801 Duct Instability
122	9						0		2.42	2.21	1.91	1.37	0.75	-		806 → 810	CN 810 Duct Instability
123							10		2.42	2.21	1.91	1.37	1.05	-		811 → 816	CN 816 Duct Instability CN 813 Analog Data N.G.
124							-10		2.42	2.21	1.91	1.37	0.75	-		817 → 821	
125							0	8	2.42	2.21	1.91	1.37	0.75	-		822 → 827	CN 827 Duct Instability
126							5	0	2.42	2.21	1.91	1.37	0.75	-		828 → 832	
127							-5		2.42	2.21	1.91	1.37	0.78	-		833 → 837	CN 837 Duct Instability
128				1.40		5.41	0		2.30	2.10	1.95	1.37	1.03	-		838 → 842	CN 842 Buzz Onset Data N.G. on this Run
129							10		2.30	2.10	1.95	1.48	-	-		843 → 846	CN 846 Buzz Onset CN 843, 844 Analog Data N.G.
130							0		1.95	1.80	-	-	-	-		847 → 848	Partial Repeat of Run 128
131								8	2.30	2.10	1.95	1.86	-	-		849 → 852	CN 852 Buzz Onset
132	8							0	2.30	2.10	1.95	1.80	-	-		863 → 866	CN 866 Buzz Onset
133							10	0	2.30	2.10	1.95	1.80	-	-		867 → 870	CN 870 Buzz Onset
134							0	8	2.30	2.10	1.95	1.89	-	-		871 → 874	CN 874 Buzz Onset
135				0.90		6.71	0	0	2.42	2.21	1.91	1.37	0.75	-		875 → 879	CN 879 Duct Instability
136							5		2.42	2.21	1.91	1.37	0.75	-		880 → 884	CN 884 Duct Instability
137							10		2.42	2.21	1.91	1.37	0.75	-		885 → 889	CN 889 Duct Instability
138							-5		2.42	2.21	1.91	1.37	0.75	-		890 → 894	CN 894 Duct Instability
139							-10		2.42	2.205	1.91	1.37	0.75	-		895 → 899	CN 899 Duct Instability
140							0	8	2.42	2.205	1.91	1.37	0.75	-		900 → 904	CN 904 Duct Instability
141	6			1.40		5.41	0	0	2.30	2.10	1.95	1.80	0.67	-		912 → 915	CN 915 Buzz Onset
142							10		2.30	2.10	1.95	1.80	0.60	1.37		916 → 922	CN 916 No Analog Data CN 921 Buzz Onset

NOTES:
Config. 6: $B_3N_2D_5E_{S1}D_{d1}L_4L_6Q_1C_2d_1q_{11}$ (Normal Shock Inlet)
Config. 7: $B_3N_2D_4E_{S1}D_{d1}L_4L_8Q_1C_2d_1q_3$ (Normal Shock Inlet)
Config. 8: $B_3N_2D_5E_{S1}D_{d1}L_4L_6Q_1C_2d_1q_7$ (Normal Shock Inlet)
Config. 9: $B_3N_2D_4E_{S1}D_{d1}L_4L_8Q_1C_2d_1q_7$ (Normal Shock Inlet)

Table 1 - Continued.

RUN SCHEDULE									XMFP (In.)								
RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft (x10⁻⁶)	α (Deg)	β (Deg)	1	2	3	4	5	6 7	Inlet Bleed	CN	REMARKS
143	6	In	0°	1.40	1200	5.41	0	0	1.37	-	-	-	-	-	No Bleed	923	Extension of Run 141
144								8	2.30	2.10	1.95	1.80	1.47	-		924 → 928	CN 928 Buzz Onset
145				0.90		6.71		0	2.42	2.20	1.91	1.37	0.75	-		929 → 933	
146							5		2.42	2.20	1.91	1.37	0.75	-		934 → 938	
147							10		2.42	2.20	1.91	1.37	0.75	-		939 → 943	
148							-10		2.42	2.20	1.91	1.37	0.75	-		944 → 948	
149							0	8	2.42	2.20	1.91	1.37	0.75	-		949 → 953	CN 953 Duct Instability
150				0	-	-		0	2.42	2.20	2.08	1.93	1.37	0.75		954 → 959	
151	10			1.40	1200	5.41			2.30	2.10	1.95	1.80	1.37	0.60	Full Open	966 → 971	
152							10		2.30	2.10	1.95	1.80	1.37	0.60		972 → 977	
153							0	8	2.30	2.10	1.95	1.80	1.52	-		978 → 982	CN 982 Buzz Onset
154				0.90		6.71	0	0	2.42	2.20	1.91	1.37	0.75	-		983 → 987	
155							5		2.42	2.20	1.91	1.37	0.75	-		988 → 992	
156							10		2.42	2.20	1.91	1.37	0.75	-		993 → 997	
157							-10		2.42	2.20	1.91	1.37	0.75	-		998 → 1002	
158							0	8	2.42	2.20	1.91	1.37	0.75	-		1003 → 1007	CN 1007 Duct Instability
159							-10	8	2.42	2.20	1.91	1.37	0.75	-		1008 → 1012	
160				1.40		5.41	-6	0	2.30	2.10	1.95	1.80	1.37	0.97		1013 → 1018	CN 1018 Buzz Onset
161				1.40		5.41	-6	8	2.30	2.10	1.95	1.80	1.71	-		1019 → 1023	
162				1.20		5.71	0	0	2.42	2.21	1.89	1.37	0.60	-		1024 → 1028	
163				1.20		5.71	-8		2.42	2.21	1.89	1.37	1.03	-		1029 → 1033	CN 1033 Buzz Onset
164				0.90		6.71	-5		2.42	2.21	1.91	1.37	0.75	-		1034 → 1038	
165				0.60	870	6.43	0		2.42	2.21	1.99	1.37	0.75	-		1039 → 1044	CN 1040 Vidar, Analog Data N.G.

NOTES: Config. 6: $B_3N_2D_5E_{S1}D_{d1}L_4L_8Q_1C_2d_1q_{11}$ (Normal Shock Inlet)
Config. 10: $B_3N_2D_5E_{S1}D_{d1}L_4L_8Q_1C_2d_1q_{12}$ (Normal Shock Inlet)

Table 1 - Continued.

RUN SCHEDULE

RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft ($\times 10^{-6}$)	α (Deg)	β (Deg)	XMFP (In.) 1	2	3	4	5	6/7	Inlet Bleed	CN	REMARKS
166	10	In	0°	0.60	870	6.43	-10	0	2.42	2.21	1.99	1.37	0.75	-	Full Open	1045 → 1049	
167				0	-	-	0		2.42	2.21	1.99	1.37	0.75	2.08		1050 → 1055	
168	↓		↓	0.25	150	2.50	0		2.42	2.21	2.08	1.37	0.75	-		1056 → 1060	
169	11		20°	0	-	-	6		2.42 0.75	2.21	2.08	1.93	1.37	0.75		1066 → 1072	CN 1066 All Data N.G.
170				0.25	150	2.50	20		2.42	2.21	2.08	1.37	0.75	-		1073 → 1077	
171				0.25	150	2.50	30		2.42	2.21	2.08	1.37	0.75	-		1078 → 1082	
172				0.90	1000	5.59	6		2.42	2.21	1.91	1.37	0.75	-		1083 → 1087	
173							10		2.42	2.21	1.91	1.37	0.75	-		1088 → 1092	
174					↓	↓	20		2.42	2.21	1.91	1.37	0.75	-		1093 → 1097	
175					800	4.4	30		2.42	2.21	1.91	1.37	0.75	-		1098 → 1103	CN 1098 taken with Ejector Off.
176	↓			↓	800	4.46	35		2.42	2.21	1.91	1.37	0.75	-		1104 → 1108	
177	10			1.40	1200	5.41	6		2.30	2.10	1.95	1.80	1.37	0.60		1125 → 1130	CN 1114 ← 1117 All Data N.G.
178							10	↓	2.30	2.10	1.95	1.60	1.37	0.60		1131 → 1136	
179				↓		↓	10	8	2.30	2.10	1.95	1.80	1.37	1.30		1137 → 1142	CN 1142 Buzz Onset
180				1.20	↓	5.71	6	0	2.42	2.21	1.89	1.37	0.6	-		1143 → 1147	
181				0.90	1000	5.59	6		2.42	2.21	1.91	1.37	0.75	-		1148 → 1152	
182							10		2.42	2.21	1.91	1.37	0.75	-		1153 → 1157	
183							20	↓	2.42	2.21	1.91	1.37	0.75	-		1158 → 1162	
184							10	8	2.42	2.21	1.91	1.37	0.75	-		1163 → 1167	
185							20	8	2.42	2.21	1.91	1.37	0.75	-		1168 → 1173	CN 1169 Analog Data N.G.
186							20	-8	2.42	2.21	1.91	1.37	0.75			1174 → 1178	
187							30	0	2.42	2.21	1.91	1.37	0.75	-		1179 → 1183	
188	↓	↓	↓	↓	↓	↓	35	0	2.42	2.21	1.91	1.37	0.75	-	↓	1184 → 1189	CN 1188 No Vidar Data

Anti-Lift Cable Force = 4000 lbs on Runs 169 through 186.

NOTES: Config. 10: $B_3N_2D_5E_{S1}D_{a1}L_4L_6Q_1C_2d_1q_{12}$ (Normal Shock Inlet)

Config. 11: $B_3N_2D_5E_{S1}D_{a1}L_4L_6Q_1C_2d_1q_{12}L_9$ (Normal Shock Inlet)

Table 1 - Continued.

RUN SCHEDULE

RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft (x10⁻⁶)	α (Deg)	β (Deg)	XMFP (In.) 1	2	3	4	5	6/7	Inlet Bleed	CN	BID (leg)	REMARKS
189	10	In	20°	0.90	1000	5.59	30	8	2.42	2.21	1.91	1.37	0.75	-	Full Open	1190 → 1194	—	
190				0.60	870	6.43	10	0	2.42	2.21	1.99	1.37	0.75	-		1195 → 1199		
191							20		2.42	2.21	1.99	1.37	0.75	-		1200 → 1204		
192							30		2.42	2.21	1.99	1.37	0.75	-		1205 → 1209		
193							10	8	2.42	2.21	1.99	1.37	0.75	-		1210 → 1214		
194							30	8	2.42	2.21	1.99	1.37	0.75	-		1215 → 1219		
195				0.25	150	2.50	10	0	2.42	2.21	2.08	1.37	0.75	-		1220 → 1224		
196				0.25	150	2.50	20		2.42	2.21	2.08	1.37	0.75	-		1225 → 1229		
197	12			0	-	-	6		2.42	2.21	2.08	1.93	1.37	0.75		1238 → 1245	Closed	CN 1238 No Vidar Data
198									2.42	2.21	2.08	1.93	1.37	0.75		1246 → 1251	6	
199									2.42	2.21	2.08	1.93	1.37	0.75		1252 → 1257	18	
200									2.42	2.21	2.08	1.93	1.37	0.75		1258 → 1263	30	
201				0.25	150	2.50	10		2.42	2.21	2.08	1.37	0.75	-		1264 → 1269	Closed	All Data N.G. Incorrect Analog S.F. on All Pts.
202									2.42	2.21	2.08	1.37	0.75	-		1270 → 1275	6	Incorrect Analog S.F. on All Pts
203									2.42	2.21	2.08	1.37	0.75	-		1276 → 1280	18	
204									2.42	2.21	2.08	1.37	0.75	-		1281 → 1285	30	
205							20		2.42	2.21	2.08	1.37	0.75	-		1286 → 1291	6	CN 1288 Analog Data N.G.
206							20		2.42	2.21	2.08	1.37	0.75	-		1292 → 1296	30	
207							30		2.42	2.21	2.08	1.37	0.75	-		1297 → 1301	6	
208							30	0	2.42	2.21	2.08	1.37	0.75	-	Full Open	1302 → 1306	30	
209				0.90	1000	5.59	6		2.42	2.21	1.91	1.37	0.75	-		1307 → 1311	Closed	
210							6		2.42	2.21	1.91	1.37	0.75	-		1312 → 1316	6	
211							10		2.42	2.21	1.91	1.37	0.75	-		1317 → 1321	Closed	

NOTES: Config 10: $B_3N_2D_5E_{31}D_{d1}I_4I_6Q_1C_2d_1q_{12}$ (Normal Shock Inlet)

Config 12: $B_3N_2D_5E_{31}D_{d1}I_4I_6Q_1C_3d_1q_{12}$ (Normal Shock Inlet)

Anti-Lift Cable Force = 4000 lbs on Runs 189 through 211.

MAC [illegible] REV 10 FEB 71

ORIGINAL PAGE IS
OF POOR QUALITY

Table 1 - Continued.

RUN SCHEDULE

RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft (x10^{-6})	α (Deg)	β (Deg)	XMFP (In.) 1	2	3	4	5	6/7	Inlet Bleed	CN	EIL (Deg)	REMARKS
212	12	In	20°	0.90	1000	5.59	10	0	2.42	2.21	1.91	1.37	0.75	-	Full Open	1322 → 1326	6	
213									2.42	2.21	1.91	1.37	0.75	-		1327 → 1331	18	
214								↓	2.42	2.21	1.91	1.37	0.75	-		1332 → 1336	30	
215								8	2.42	2.21	1.91	1.37	0.75	-		1337 → 1341	6	
216							↓	8	2.42	2.21	1.91	1.37	0.75	-		1342 → 1346	30	
217							20	0	2.42	2.21	1.91	1.37	0.75	-		1347 → 1352	6	CN 1349 No Analog Data
218							20		2.42	2.21	1.91	1.37	0.75	-		1353 → 1357	30	
219							30		2.42	2.21	1.91	1.37	0.75	-		1358 → 1362	6	
220									2.42	2.21	1.91	1.37	0.75	-		1363 → 1367	18	
221	↓			↓	↓	↓	↓		2.42	2.21	1.91	1.37	0.75	-		1368 → 1372	30	
222	13			0	-	-	6		2.42	2.21	2.08	1.93	1.37	0.75		1377 → 1382		
223				0.25	150	2.50	10		2.42	2.21	2.08	1.37	0.75	-		1384 → 1388		
224							20		2.42	2.21	2.08	1.37	0.75	-		1389 → 1393		
225				↓	↓	↓	30		2.42	2.21	2.08	1.37	0.75	-		1394 → 1398		
226				1.40	1200	5.41	6		2.30	2.10	1.95	1.80	1.37	0.60		1399 → 1404		
227				1.40		5.41	10		2.30	2.10	1.95	1.80	1.37	0.60		1405 → 1410		
228				1.20	↓	5.71	6		2.42	2.21	1.89	1.37	0.60	-		1411 → 1416		CN 1412 All Data N.G.
229				0.90	1000	5.59	6		2.42	2.21	1.91	1.37	0.75	-		1417 → 1421		
230				0.90	1000	5.59	10	↓	2.42	2.21	1.91	1.37	0.75	-		1422 → 1426		
231					1000	5.59	20	0	2.42	2.21	1.91	1.37	0.75	-		1427 → 1431		
232					1000	5.59	10	8	2.42	2.21	1.91	1.37	0.75	-		1432 → 1436		
233	↓			↓	800	4.46	30	0	2.42	2.21	1.91	1.37	0.75	-		1437 → 1441		
234	14	↓	↓	0	-	-	6	↓	2.42	2.21	2.08	1.93	1.37	0.75	↓	1447 → 1452		

NOTES: Config. 12: $B_3N_2D_5E_{S1}D_{d1}L_4L_8$ [illegible] d_1q_{12} (Normal Shock Inlet)

Config. 13: $B_3N_2D_5E_{S1}D_{d1}L_4L$ [illegible] $1q_{12}L_9$ (Normal Shock Inlet)

Config. 14: $B_3N_2D_5E_{S1}D_{d1}L_4L_8Q_1C_4d_1q_{12}L_9L_{11}L_{12}$ (Normal Shock Inlet)

Anti-Lift Cable Force = 4000 lbs on Runs 212 through 234.

Table 1 - Continued.

RUN SCHEDULE

RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft ($x10^{-6}$)	α (Deg)	β (Deg)	XMFP (In.) 1	2	3	4	5	$\frac{6}{7}$	Inlet Bleed	CN	REMARKS
235	14	In	20°	0.90	800	4.46	30	0	2.42	2.21	1.91	1.37	0.75	-	Full Open	1454 → 1458	
236					1000	5.59	6		2.42	2.25	1.91	1.37	0.75	-		1459 → 1463	
237							10	↓	2.42	2.25	1.91	1.37	0.75	-		1464 → 1468	
238							10	8	2.42	2.25	1.91	1.37	0.75	-		1469 → 1474	CN 1469 Analog Data N.G.
239				↓	↓	↓	20	0	2.42	2.25	1.91	1.37	0.75	-		1475 → 1480	CN 1478 Analog Date N.G.
240				1.20	1200	5.71	6		2.42	2.21	1.89	1.37	0.60	-		1481 → 1486	CN 1483 No Vidar/Analog Data
241				1.40		5.41	6		2.30	2.10	1.95	1.80	1.37	1.10		1487 → 1492	CN 1492 Buzz Onset
242				1.40	↓	5.41	10		2.30	2.10	1.95	1.80	1.37	0.97		1493 → 1498	CN 1498 Buzz Onset
243				0.25	150	2.50	30		2.42	2.21	2.08	1.37	0.75	-		1499 → 1504	CN 1502 Analog Data N.G.
244	↓	↓	↓	0.25	150	2.50	20		2.42	2.21	2.08	1.37	0.75	-		1505 → 1509	
245	15	Out	5°	2.00	1200	4.89	0		1.92	1.75	1.32	0.76	1.05	-		2004 → 2008	CN 2007 Buzz Onset
246				2.00	1000	4.07			1.92	1.75	1.32	1.05	0.76	2.21		2009 → 2014	CN 2013 Buzz Onset
247				1.80		4.05			2.06	1.88	1.50	0.76	1.05	2.21		2015 → 2020	CN 2018 Buzz Onset
248				1.60		4.08	↓		2.16	1.97	1.67	0.31	1.00	-		2021 → 2025	CN 2024 Buzz Onset
249							-5		2.16	1.97	1.67	1.22	0.76	-		2026 → 2030	CN 2030 Buzz Onset
250	↓						15		2.16	1.97	1.67	1.22	0.76	-		2031 → 2035	All Data N.G.
251	16						-5		2.16	1.97	1.67	1.22	0.90	-		2055 → 2059	CN 2059 Buzz Onset
252							0		2.16	1.97	1.67	1.22	0.76	-		2060 → 2064	
253							5		2.16	1.97	1.67	1.22	0.76	-		2065 → 2069	
254							10		2.16	1.97	1.67	1.22	0.76	-		2070 → 2074	
255							15	↓	2.16	1.97	1.67	1.22	0.76	-		2075 → 2082	CN 2075, 2076 All Data N.G.
256							-5	6	2.16	1.97	1.67	1.22	0.76	-		2083 → 2087	
257	↓	↓	↓	↓	↓	↓	0	↓	2.16	1.97	1.67	1.22	-	-	↓	2088 → 2091	CN 2091 Buzz Onset

NOTES: Config. 14: $B_3N_2D_5E_{81}D_{a1}L_4L_6Q_1C_4d_1q_{12}L_9L_{11}L_{12}$ (Normal Shock Inlet)

Config. 15: Config. 11 Without Ejector (Normal Shock Inlet)

Config. 16: Config. 10 Without Ejector (Normal Shock Inlet)

Anti-Lift Cable Force = 4000 lbs on Runs 235 through 244.

MAC 1320MF (10 FEB 71)

Table 1 - Continued.

RUN SCHEDULE

RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft $(x10^{-6})$	α (Deg)	β (Deg)	XMFP (In.) 1	2	3	4	5	6/7	Inlet Bleed	CN	REMARKS
258	16	Out	5°	1.60	1000	4.08	5	6	2.16	1.97	1.67	1.22	0.94	-	Full Open	2092 → 2096	CN 2096 Buzz Onset
259-261	DATA ON THESE RUNS ARE NO GOOD DUE TO LEAK IN SCANIVALVE CALIBRATION LINE																
262	16	Out	5°	1.60	1000	4.08	0	0	2.16	1.97	1.67	1.21	0.76	-	Full Open	2115 → 2121	Repeat of Run 252 CN 2118 Schlieren Picture, Data N.G.
263							15	-6	2.16	1.97	1.67	1.39	-	-		2122 → 2125	Repeat of Run 261 CN 2125 Buzz Onset
264							15	6	2.16	1.97	1.67	1.33	-	-		2126 → 2129	Repeat of Run 260 CN 2129 Buzz Onset
265							0	-6	2.16	1.97	1.67	1.21	-	-		2130 → 2133	CN 2133 Buzz Onset
266							-5	-6	2.16	1.97	1.67	-	-	-		2134 → 2136	CN 2136 Buzz Onset
267							10	6	2.16	1.97	1.67	1.21	1.12	-		2137 → 2141	Repeat of Run 259
268							5	6	2.16	1.97	1.67	1.21	0.94	-		2142 → 2146	Repeat of Run 258 CN 2146 Buzz Onset
269	↓	↓	↓	↓	↓	↓	10	0	2.16	1.97	1.67	1.21	0.76	-	↓	2147 → 2151	Repeat of Run 254
270-278	DATA ON THESE RUNS ARE NO GOOD DUE TO LEAK IN SCANIVALVE CALIBRATION LINE																
279	16	Out	5°	1.80	1000	4.05	0	0	2.10	1.88	1.50	1.05	0.76	-	Full Open	2202 → 2206	Repeatability of Run 271 CN 2206 Unstable, No Buzz
280							10	4	2.30	2.10	1.88	1.50	1.08	-		2207 → 2211	CN 2211 Buzz Onset
281							15	4	2.30	-	-	-	-	-		2212	No Data Presented Bad P_{cal}
282							-5	0	2.10	1.88	1.50	1.05	0.84	-		2219 → 2224	Repeat of Run 270 CN 2221 All Data N.G.
283							5		2.10	1.88	1.50	1.05	0.76	-		2225 → 2229	Repeat of Run 272
284							10		2.30	2.10	1.88	1.50	1.05	0.76		2230 → 2235	Repeat of Run 273
285							15	↓	2.30	2.10	1.88	1.50	1.05	0.78		2236 → 2241	Repeat of Run 274
286							-5	4	2.10	1.88	1.50	1.45	-	-		2242 → 2245	Repeat of Run 275 CN 2245 Buzz Onset
287							0	4	2.10	1.88	1.50	1.05	0.76	-		2246 → 2250	Repeat of Run 276 CN 2250 Buzz Onset
288							5	4	2.10	1.88	1.50	1.05	0.96	-		2251 → 2255	Repeat of Run 277 CN 2255 Buzz Onset
289							10	4	2.30	2.10	1.88	1.50	1.05	0.91		2256 → 2261	Repeat of Run 280 CN 2261 Buzz Onset
290	↓	↓	↓	↓	↓	↓	15	4	2.30	2.10	1.88	1.50	1.28	-	↓	2262 → 2266	Repeat of Run 281 CN 2266 Buzz Onset

NOTES: **Config. 16: Config. 10 Without Ejector (Normal Shock Inlet)**

Table 1 - Continued.

RUN SCHEDULE										XMFP (In.)							
RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft (x10⁻⁶)	α (Deg)	β (Deg)	1	2	3	4	5	6/7	Inlet Bleed	CN	REMARKS
291	16	Out	5°	2.00	1000	4.07	-5	0	2.20	1.92	1.75	1.32	0.84	-	Full Open	2267 → 2271	CN 2271 Buzz Onset
292							0		2.20	1.92	1.75	1.32	0.78	-		2272 → 2275	CN 2275 Schlieren Picture (Match Pt) CN 2276 Buzz Onset
293							5		2.20	1.92	1.75	1.32	0.52	-		2277 → 2281	CN 2280 Schlieren Picture (Match Pt) CN 2281 Schlieren Picture (B/0)
294							10		2.20	1.92	1.75	1.32	0.76	-		2282 → 2286	
295							15	↓	2.20	1.92	1.75	1.32	0.84	0.91		2287 → 2292	CN 2291 Buzz While Taking Data CN 2292 Buzz Onset
296							-5	4	2.20	1.92	1.75	-	-	-		2293 → 2295	CN 2295 Buzz Onset
297							0		2.20	1.92	1.75	1.32	0.85	0.87		2296 → 2301	CN 2300 Buzz In and Out CN 2301 Buzz Onset
298							5		2.20	1.92	1.75	1.32	0.91	0.94		2302 → 2307	CN 2306 Went into Buzz Taking Data CN 2307 Buzz Onset
299							10	↓	2.20	1.92	1.75	1.32	0.91	-		2308 → 2312	CN 2312 Buzz Onset
300				↓	↓	↓	15	4	2.20	1.92	1.75	1.38	-	-		2313 → 2317	CN 2317 Buzz Onset CN 2315 No Analog Data
301				2.00	400	1.63	0	0	2.20	1.92	1.75	1.32	0.76	-		2318 → 2322	
302				1.80		1.62			2.10	1.88	1.50	1.05	0.76	-		2323 → 2327	
303				1.60		1.63	↓		2.16	1.97	1.67	1.22	0.76	-		2328 → 2332	
304							-5		2.16	1.97	1.67	1.22	0.76	-		2333 → 2338	CN 2335 Analog Scan Error
305							10		2.16	1.97	1.67	1.22	0.76	-		2339 → 2344	CN 2342 Analog Scan Error
306	↓				↓	↓	15		2.16	1.97	1.67	1.22	0.76	-		2345 → 2350	CN 2348 No Vidar/Analog Data
307	17				1000	4.08	-5		2.16	1.97	1.67	1.22	0.76	-		2356 → 2360	CN 2360 Duct Instability Not Buzz
308							0		2.16	1.97	1.67	1.22	0.76	-		2361 → 2365	CN 2365 Duct Instability
309							5		2.16	1.97	1.67	1.22	0.76	-		2366 → 2370	
310							10		2.16	1.97	1.67	1.22	0.76	-		2371 → 2375	
311							15	↓	2.16	1.97	1.67	1.22	0.84	-		2376 → 2380	CN 2380 Buzz Onset
312							-5	6	2.16	1.97	1.67	1.54	-	-		2381 → 2384	CN 2384 Buzz Onset
313	↓	↓	↓	↓	↓	↓	0	↓	2.16	1.97	1.67	1.25	-	-	↓	2385 → 2388	CN 2388 Buzz Onset

NOTES: Config. 16: Config. 10 Without Ejector (Normal Shock Inlet)
Config. 17: Config. 13 Without Ejector (Normal Shock Inlet)

Table 1 - Continued.

RUN SCHEDULE									XMFP (In.)								
RUN	CONFIGURATION	Ejector	Adapter	M	q (psi)	Rn/Ft (x10^{-6})	α (Deg)	β (Deg)	1	2	3	4	5	6 7	Inlet Bleed	CN	REMARKS
314	17	Out	5°	1.60	1000	4.08	15	6	2.16	1.97	1.67	1.22	0.76	-	Full Open	2389 → 2393	CN 2393, 2393 Duct Instability
315				1.80		4.05	-5	0	2.10	1.88	1.50	1.05	0.91	0.76 2.42		2394 → 2400	CN 2398 Instability Onset CN 2399 Instability
316							0		2.42	2.10	1.88	1.50	1.05	0.76		2401 → 2406	
317							5		2.42	2.10	1.88	1.50	1.05	0.76		2407 → 2412	
318							10		2.42	2.10	1.88	1.50	1.05	0.76		2413 → 2418	
319							15		2.42	2.10	1.88	1.50	1.05	0.84		2419 → 2424	CN 2424 Buzz Onset
320							0	4	2.42	2.10	1.88	1.50	1.05	0.84 0.88		2425 → 2431	CN 2430 In and Out of Buzz CN 2431 Buzz Onset
321							15	4	2.42	2.10	1.88	1.50	1.34	-		2432 → 2438	CN 2436, 2437 Vidar/Analog Data N.G.
322				2.00		4.07	0	0	2.42	2.21	1.92	1.75	1.32	0.97		2439 → 2445	CN 2441 No Vidar/Analog Data
323							5	0	2.42	2.20	1.92	1.75	1.32	0.76		2446 → 2455	CN 2446 → 2449 All Data N.G.
324							10		2.42	2.20	1.92	1.75	1.32	0.76		2456 → 2461	
325	13			1.80		4.05	0		2.42	2.10	1.92	1.50	1.05	0.76	.497	2468 → 2476	CN 2472 → 2476 Duct Instability CN 2472, 2474, 2475 Analog Scan Error
326				1.80		4.05			2.42	2.10	1.92	1.50	1.84	-		2480 → 2485	CN 2484 Duct Instability CN 2485 Instability Onset
327				1.60		4.08			2.42	2.22	2.02	1.67	1.43	1.80		2486 → 2493	CN 2491 Buzz Onset CN 2488 Analog Scan Error
328									2.23	2.02	1.80	1.67	1.43	1.15	.452	2494 → 2501	CN 2501 Buzz Onset CN 2494 All Data N.G.
329									2.22	-	-	-	-	-	.542	2502 → 2503	
330					940	3.84			2.22	2.02	1.80	1.67	1.43	1.15	.542	2504 → 2509	
331							-5		2.22	2.02	1.80	1.67	1.56	-	.497	2510 → 2515	CN 2511 Analog Scan Error CN 2515 Buzz Onset
332							15		2.23	2.02	1.80	1.67	0.76	2.42		2516 → 2521	CN 2520 Buzz Onset
333							0	6	2.42	2.22	2.02	1.80	1.67	1.22		2522 → 2529	CN 2529 Buzz Onset CN 2522 → 2523 Analog Scan Error
334								-6	2.42	2.22	2.02	1.80	1.67	1.35		2530 → 2539	CN 2535 Buzz Onset
335	2			1.80		3.80		0	2.42	2.10	1.90	1.50	1.40	-		2540 → 2544	CN 2544 Buzz Onset
336	2								2.42	2.10	1.90	1.50	2.25	-	.452	2545 → 2549	CN 2548 Buzz Onset

NOTES: Config. 17: Config. 13 Without Ejector (Normal Shock Inlet)

Config. 18: $B_3N_2D_3E_{S1}D_{d1}L_4L_6Q_1C_1r_1r_2L_7L_{10}L_{11}$ (Overhead Ramp Inlet)

Config. 2: $B_3N_2D_3E_{S1}D_{d1}L_4L_6Q_1C_1r_1r_2$ (Overhead Ramp Inlet)

Table 1 - Continued.

									RUN SCHEDULE								
									XMFF (In.)								
RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft $(x10^{-6})$	α (Deg)	β (Deg)	1	2	3	4	5	$\frac{6}{7}$	Inlet Bleed	CN	REMARKS
337	2	Out	5°	1.80	940	3.80	0	0	2.42	2.20	1.90	1.50	1.66	-	.542	2550 → 2556	CN 2553 Instability Onset CN 2555 All Data N.G.
338									2.42	2.10	1.90	1.50	-	-	.497	2557 → 2560	Repeatability of Run 335 CN 2560 Instability Onset
339				1.60		3.84			2.42	2.20	1.90	1.67	1.43	1.28	.497	2561 → 2566	CN 2566 Instability Onset
340									2.42	2.20	1.90	1.67	1.43	1.20	.542	2567 → 2572	CN 2572 Instability Onset
341									2.42	2.20	1.90	1.67	1.43	-	.452	2573 → 2577	CN 2577 Instability Onset
342							-5		2.42	2.20	1.90	1.67	1.51	-	.497	2578 → 2582	CN 2582 Instability Onset
343							5		2.42	2.20	1.90	1.67	1.43	0.76		2583 → 2588	CN 2588 Slight Instability
344							10		2.42	2.20	1.90	1.67	1.43	0.76		2589 → 2594	
345							15		2.42	2.20	1.90	1.67	1.43	0.76		2595 → 2600	
346							-5	6	2.42	2.20	1.90	1.67	1.43	1.33		2601 → 2606	CN 2606 Duct Instability
347							0		2.42	2.20	1.90	1.67	1.43	-		2607 → 2611	CN 2611 Duct Instability
348							5		2.42	2.20	1.90	1.67	1.43	0.76		2612 → 2617	CN 2617 Duct Instability
349							10		2.42	2.20	1.90	1.67	1.43	0.76		2618 → 2623	CN 2623 Duct Instability
350							15		2.42	2.20	1.90	1.67	1.43	0.76		2624 → 2629	CN 2629 Duct Instability
351							2.5	0	2.42	2.20	1.90	1.67	1.43	0.94		2630 → 2635	CN 2635 Duct Instability
352							5	-6	2.42	2.20	1.90	1.67	1.43	0.76		2636 → 2641	CN 2641 Slight Instability
353							0		2.42	2.20	1.90	1.67	1.43	-		2642 → 2646	CN 2646 Duct Instability
354							15		2.42	2.20	1.90	1.67	1.43	0.76		2647 → 2652	CN 2652 Duct Instability
355				1.80		3.80	-5	0	2.42	2.10	1.90	1.60	-	-		2653 → 2656	CN 2656 Buzz Onset
356							0		2.42	2.10	1.90	1.50	-	-		2657 → 2660	CN 2660 Buzz Onset
357							5		2.42	2.10	1.90	1.50	1.17	-		2661 → 2665	CN 2665 Buzz Onset
358							10		2.42	2.10	1.90	1.50	0.76	-		2666 → 2670	CN 2670 Buzz Onset
359							15		2.42	2.10	1.90	1.50	0.76	-		2671 → 2675	

NOTES: Config. 2: $B_3W_2D_3E_{B1}D_{d1}L_4L_6Q_1C_1r_1r_2$ (Overhead Ramp Inlet)

Table 1 - Concluded.

	RUN SCHEDULE								XMEP (In.)								
RUN	CONFIGURATION	Ejector	Adapter	M	q (psf)	Rn/Ft (x10⁻⁶)	α (Deg)	β (Deg)	1	2	3	4	5	6 7	Inlet Bleed	CN	REMARKS
360	2	Out	5°	1.30	940	3.80	2.5	0	2.42	2.10	1.90	1.50	1.41	1.75	.497	2676 → 2681	CN 2680 Buzz Onset
361							-5	4	2.42	2.10	1.90	1.75	1.50	0.76		2682 → 2687	CN 2687 Duct Instability
362							0		2.42	2.10	1.90	1.76	1.70	-		2688 → 2693	CN 2693 Buzz Onset
363							5		2.42	2.10	1.90	1.75	1.50	1.21		2694 → 2702	CN 2702 Buzz Onset CN 2696, 2697 Analog Data N.G.
364							10		2.42	2.10	1.90	1.75	1.50	0.76 1.09		2703 → 2709	CN 2708 Duct Instability
365				↓		↓	15	↓	2.42	2.10	1.90	1.50	0.76	-		2710 → 2714	CN 2714 Duct Instability
366				2.00		3.83	-5	0	2.42	2.10	1.90	1.75	-	-		2715 → 2718	Duct Instability - All Data Pts.
367							0		2.42	2.10	1.90	1.75	1.63	-		2719 → 2723	CN 2719 Duct Instability CN 2723 Buzz Onset
368							5	↓	2.42	2.10	1.90	1.75	1.63	-		2724 → 2728	CN 2724-2727 Duct Instability CN 2728 Buzz Onset
369							10	0	2.42	2.10	1.90	1.50	0.76 1.75	0.94 1.32		2729 → 2737	CN 2733 All Data N.G. CN 2734 Duct Instability
370							15		2.42	2.10	1.90	1.75	1.32	0.76		2738 → 2743	CN 2743 Duct Instability
371							7.5	↓	2.42	2.10	1.90	1.75	1.32	0.76		2744 → 2748	CN 2748 Duct Instability
372							5	4	2.42	2.10	1.90	1.75	1.63	0.76		2749 → 2753	CN 2753 Buzz Onset
373				↓		↓	10	4	2.42	2.10	1.90	1.75	1.32	0.86	↓	2754 → 2759	CN 2759 Buzz Onset
374				1.80		3.80	5	0	2.42	2.10	1.90	1.50	1.03	-	.542	2760 → 2765	CN 2765 Buzz Onset CN 2761 Analog Scan Error
375	↓	↓	↓	1.60	↓	3.84	5	0	2.42	2.20	1.90	1.67	1.43	0.80	.542	2766 → 2772	CN 2771 Buzz Onset

NOTES: Config. 2: $F_3M_2D_3E_{S1}D_{d1}L_4L_6Q_1C_1r_1r_2$ (Overhead Ramp Inlet)

TABLE 2. - INDEX OF FIGURES

TABLE 2. - Concluded

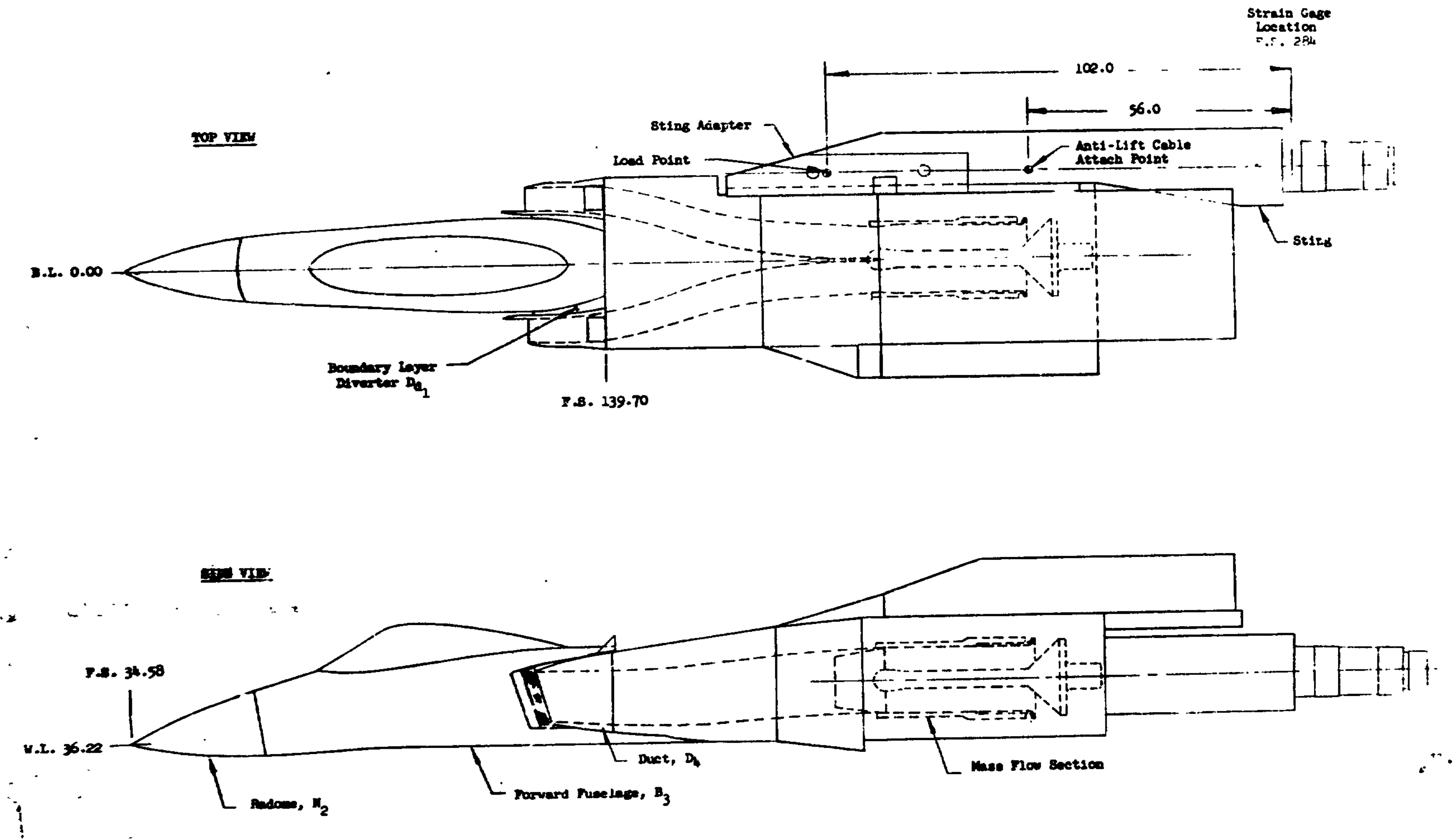
TABLE 3. - ENGINE FACE TOTAL PRESSURE NOMENCLATURE
(Refer to Figure 27)

Item No.	Steady State Pressure	High Frequency Pressure
1	PT2 (1,1)	PT2H (1,1)
2	PT2 (1,2)	PT2H (1,2)
3	PT3 (1,3)	PT2H (1,3)
4	PT2 (1,4)	PT2H (1,4)
5	PT2 (1,5)	PT2H (1,5)
6	PT2 (1,6)	PT2H (1,6)
7	PT2 (1,7)	PT2H (1,7)
8	PT2 (1,8)	PT2H (1,8)
9	PT2 (2,1)	PT2H (2,1)
10	PT2 (2,2)	PT2H (2,2)
11	PT2 (2,3)	PT2H (2,3)
12	PT2 (2,4)	PT2H (2,4)
13	PT2 (2,5)	PT2H (2,5)
14	PT2 (2,6)	PT2H (2,6)
15	PT2 (2,7)	PT2H (2,7)
16	PT2 (2,8)	PT2H (2,8)
17	PT2 (3,1)	PT2H (3,1)
18	PT2 (3,2)	PT2H (3,2)
19	PT2 (3,3)	PT2H (3,3)
20	PT2 (3,4)	PT2H (3,4)
21	PT2 (3,5)	PT2H (3,5)
22	PT2 (3,6)	PT2H (3,6)
23	PT2 (3,7)	PT2H (3,7)
24	PT2 (3,8)	PT2H (3,8)
25	PT2 (4,1)	PT2H (4,1)
26	PT2 (4,2)	PT2H (4,2)
27	PT2 (4,3)	PT2H (4,3)
28	PT2 (4,4)	PT2H (4,4)
29	PT2 (4,5)	PT2H (4,5)
30	PT2 (4,6)	PT2H (4,6)
31	PT2 (4,7)	PT2H (4,7)
32	PT2 (4,8)	PT2H (4,8)
33	PT2 (5,1)	PT2H (5,1)
34	PT2 (5,2)	PT2H (5,2)
35	PT2 (5,3)	PT2H (5,3)
36	PT2 (5,4)	PT2H (5,4)
37	PT2 (5,5)	PT2H (5,5)
38	PT2 (5,6)	PT2H (5,6)
39	PT2 (5,7)	PT2H (5,7)
40	PT2 (5,8)	PT2H (5,8)
41	PT2 (6,1)	PT2H (6,1)
42	PT2 (6,2)	PT2H (6,2)
43	PT2 (6,3)	PT2H (6,3)

TABLE 3. - Concluded.

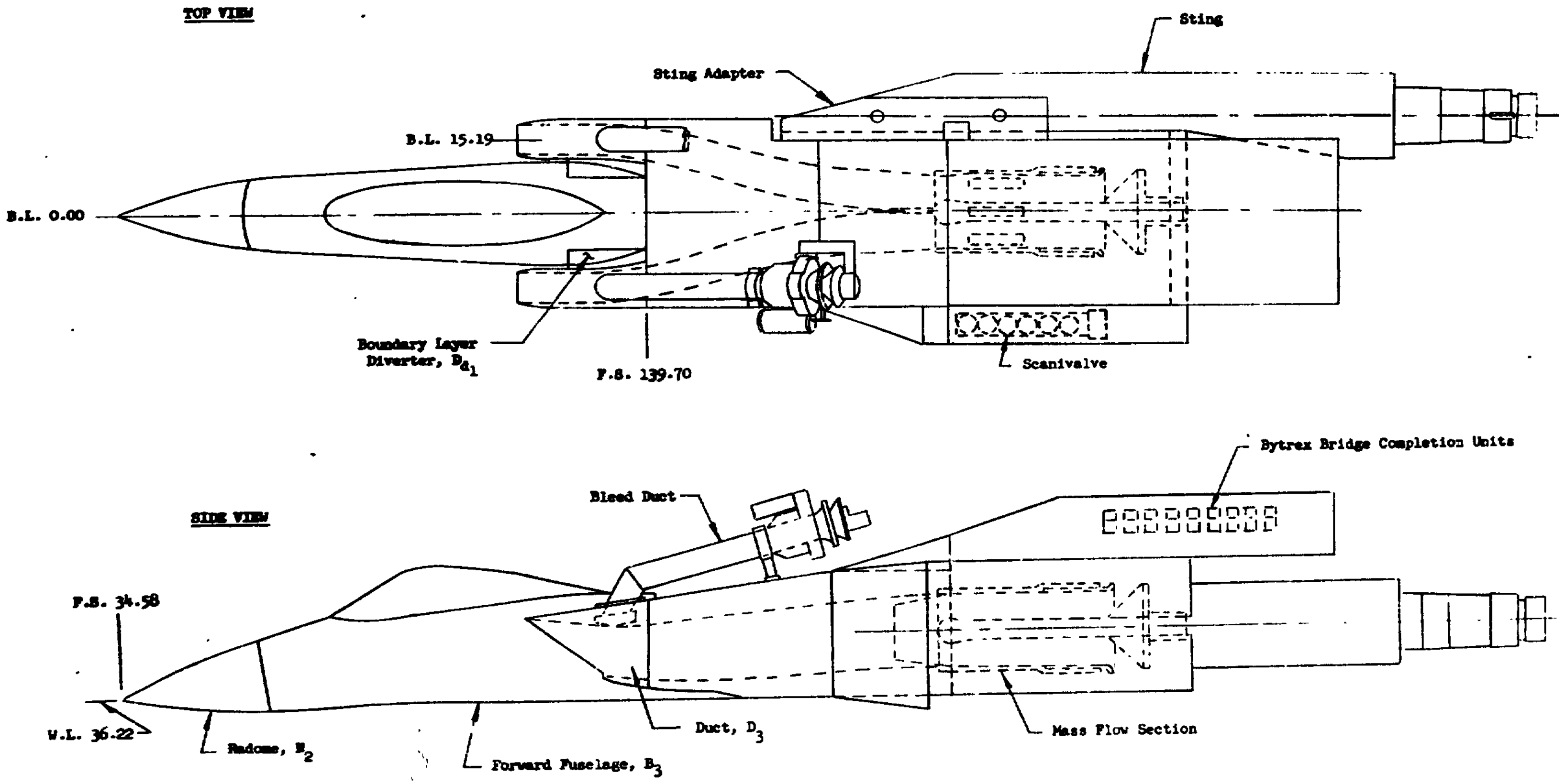
Item No.	Steady State Pressure	High Frequency Pressure
44	PT2 (6,4)	PT2H (6,4)
45	PT2 (6,5)	PT2H (6,5)
46	PT2 (6,6)	PT2H (6,6)
47	PT2 (6,7)	PT2H (6,7)
48	PT2 (6,8)	PT2H (6,8)

Figure 1 - Tunnel installation transonic test section low angle-of-attack setup.



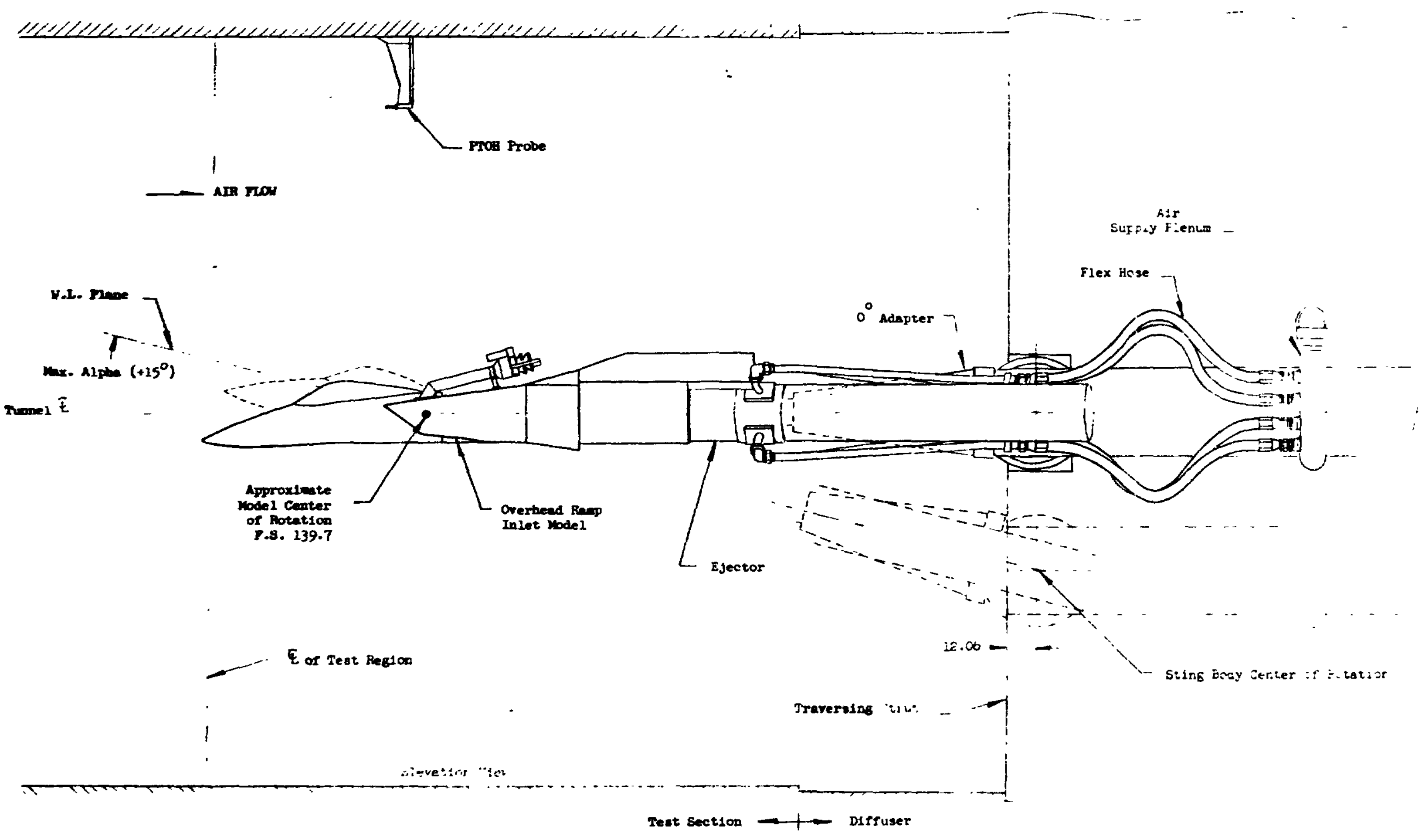
All dimensions are centimeters model scale

Figure 2 - General assembly: 15.354% bifurcated inlet, normal shock inlet configuration.



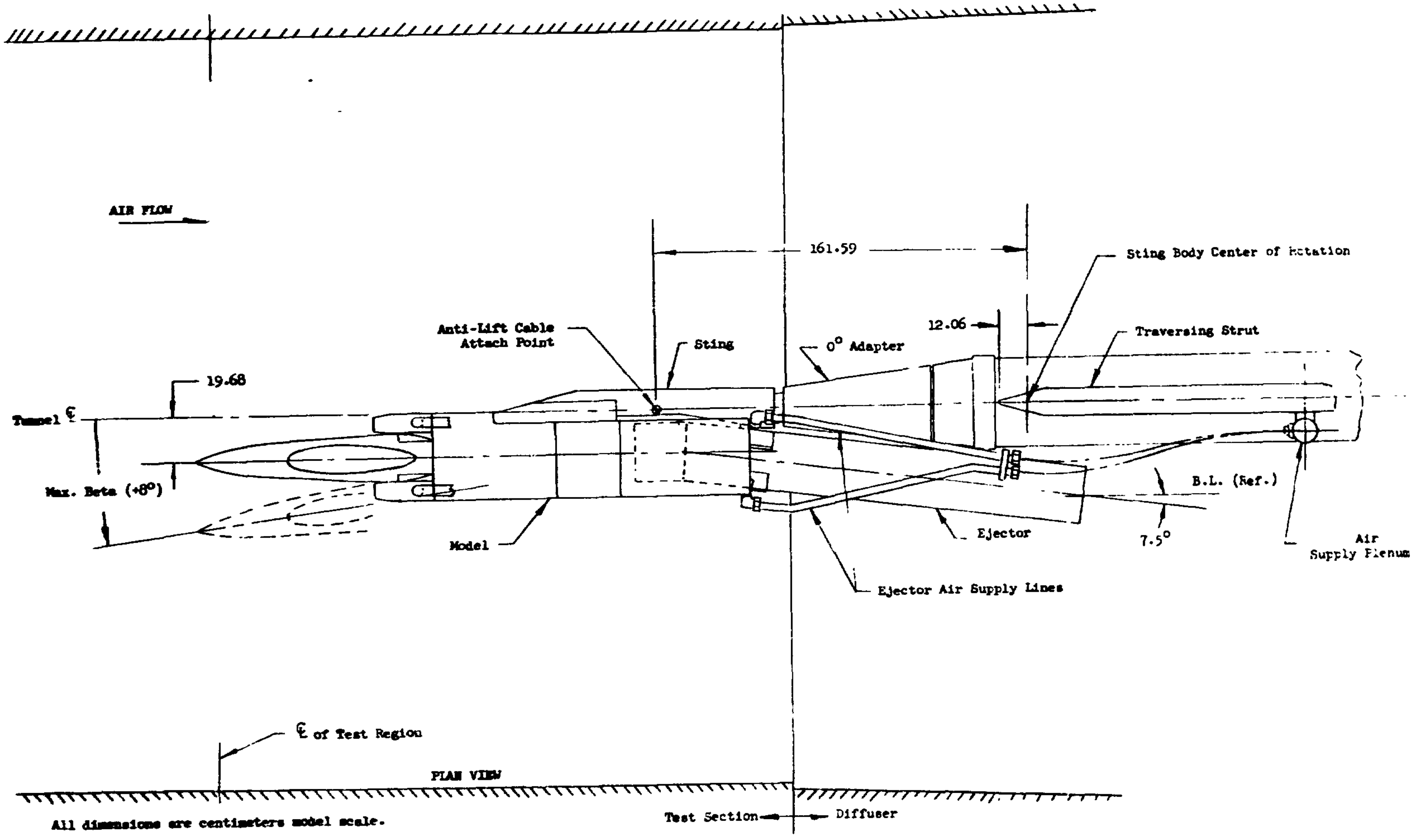
All dimensions are centimeters model scale.

Figure 3. - General assembly: 15.354% bifurcated inlet, overhead ramp configuration.



All dimensions are centimeters model scale

Figure 4 - Tunnel installation: 11-ft transonic test section low angle-of-attack setup (elevation view).



All dimensions are centimeters model scale.

Figure 5 - Tunnel installation: 11-ft transonic test section, low angle-of-attack setup (plan view).

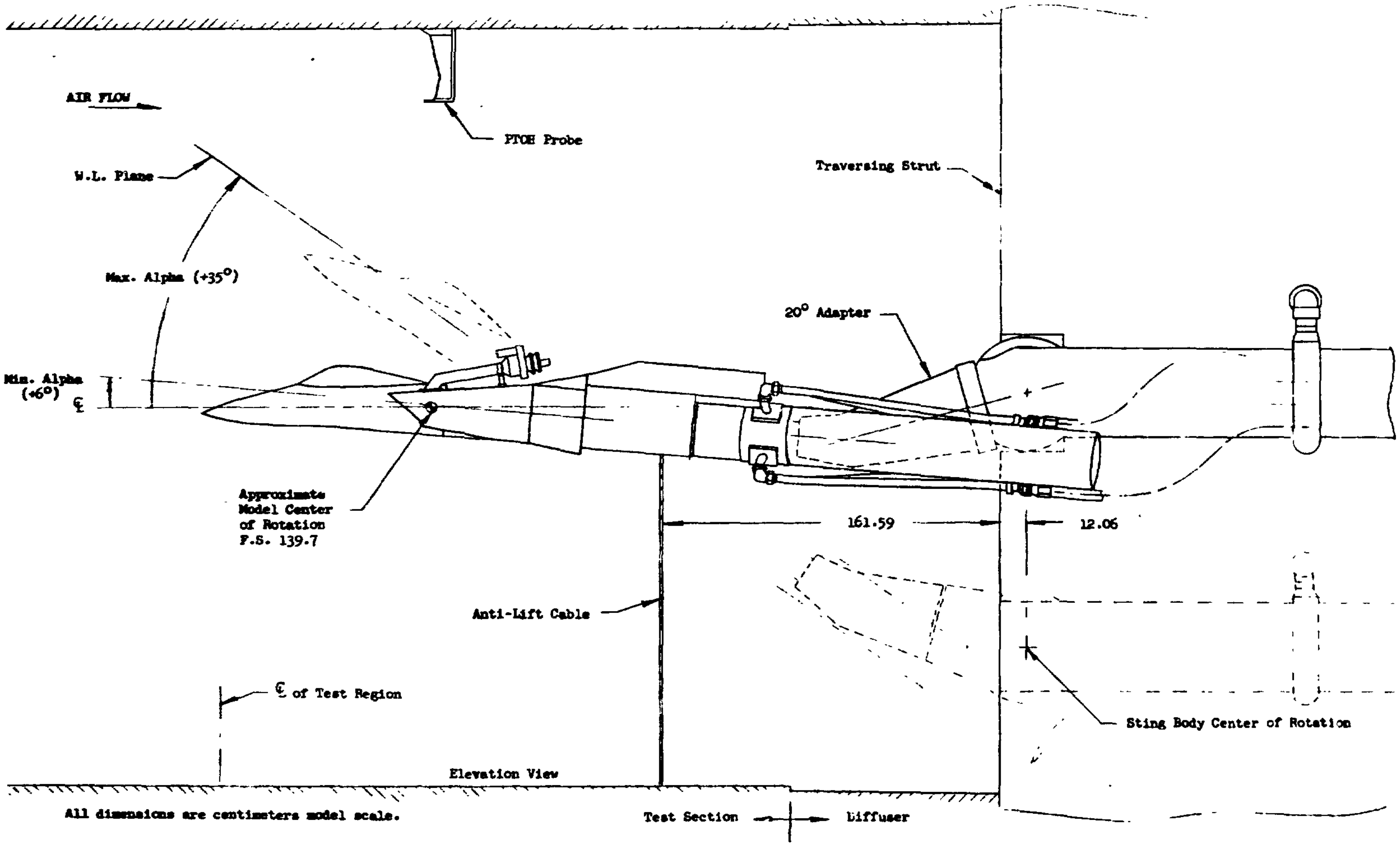
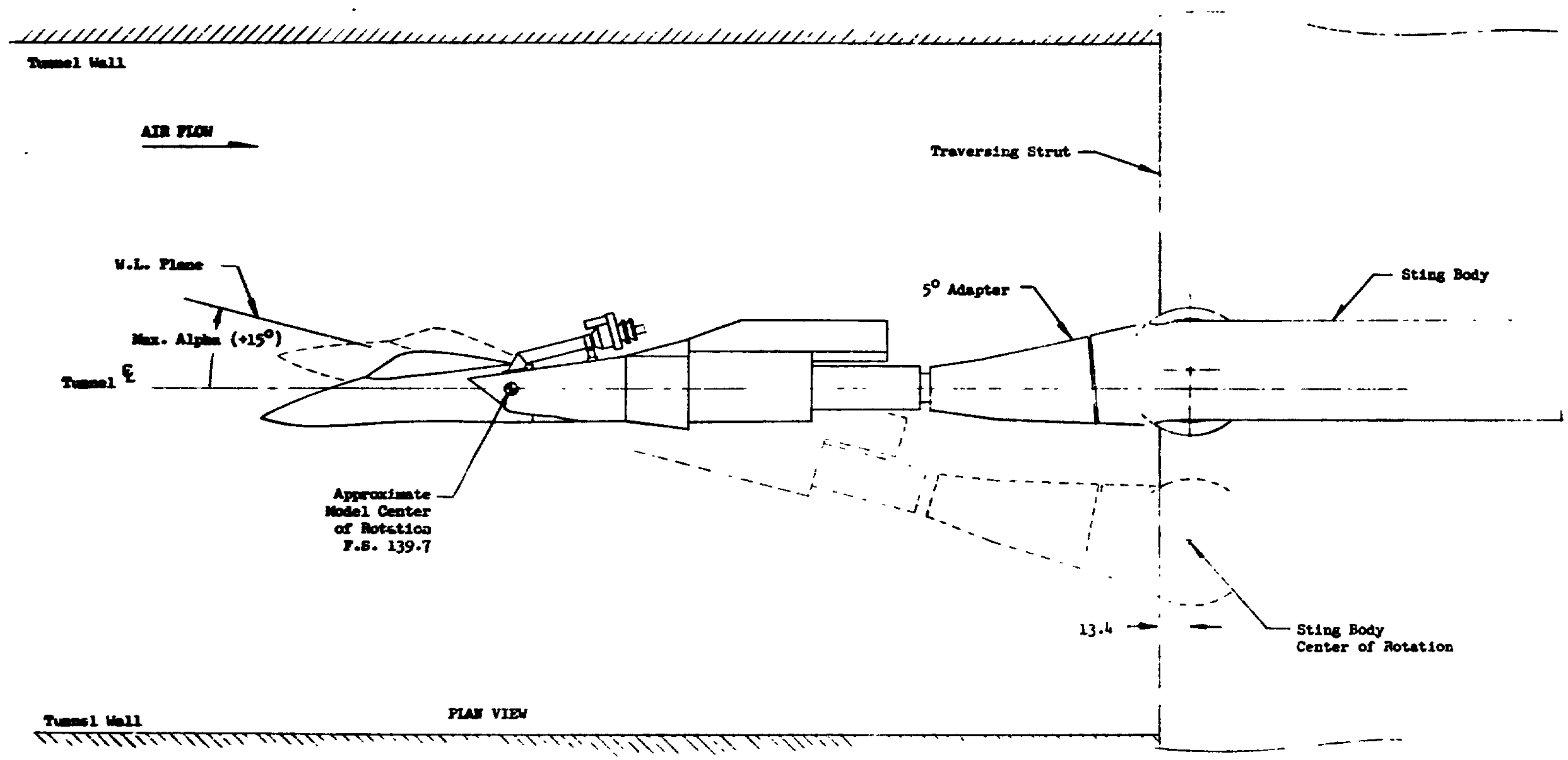
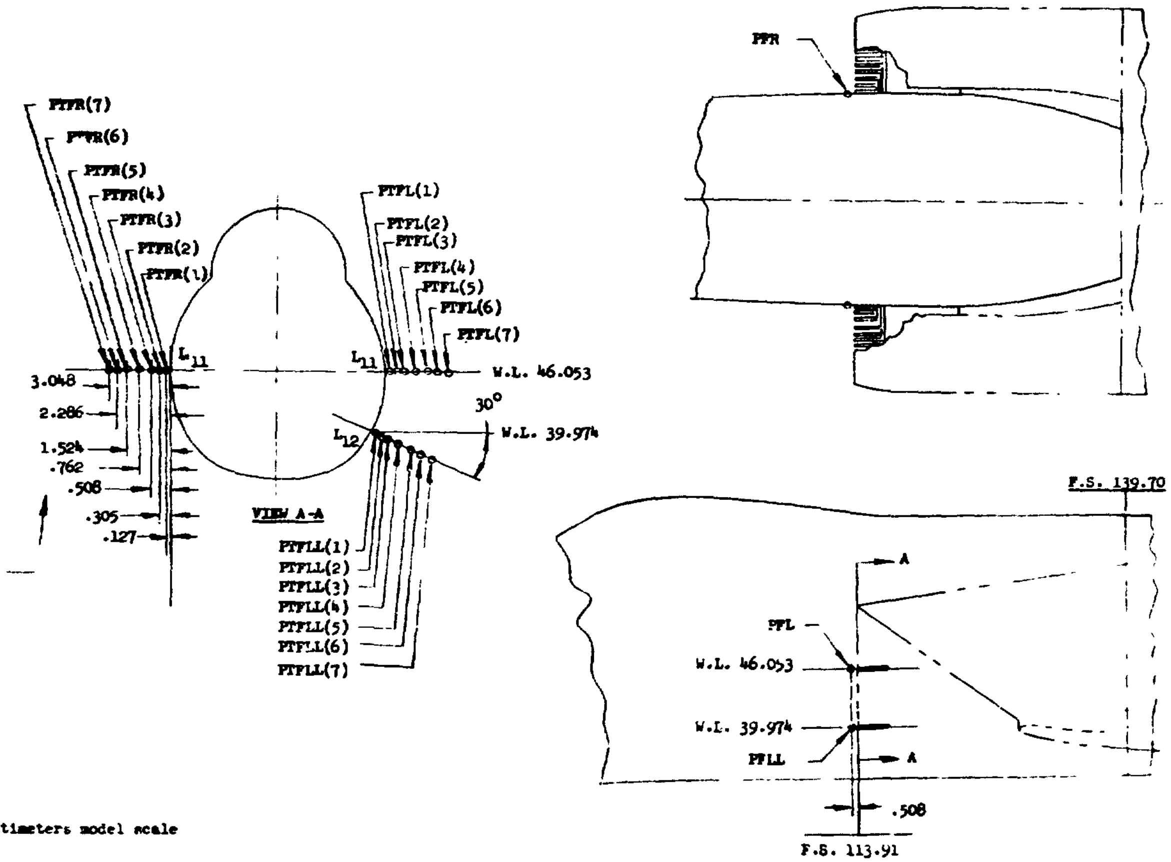


Figure 6 - Tunnel installation: 11-ft transonic test section, high angle-of-attack setup.



All dimensions are centimeters model scale

Figure 7 - Tunnel installation: 9-ft x 7-ft supersonic test section.

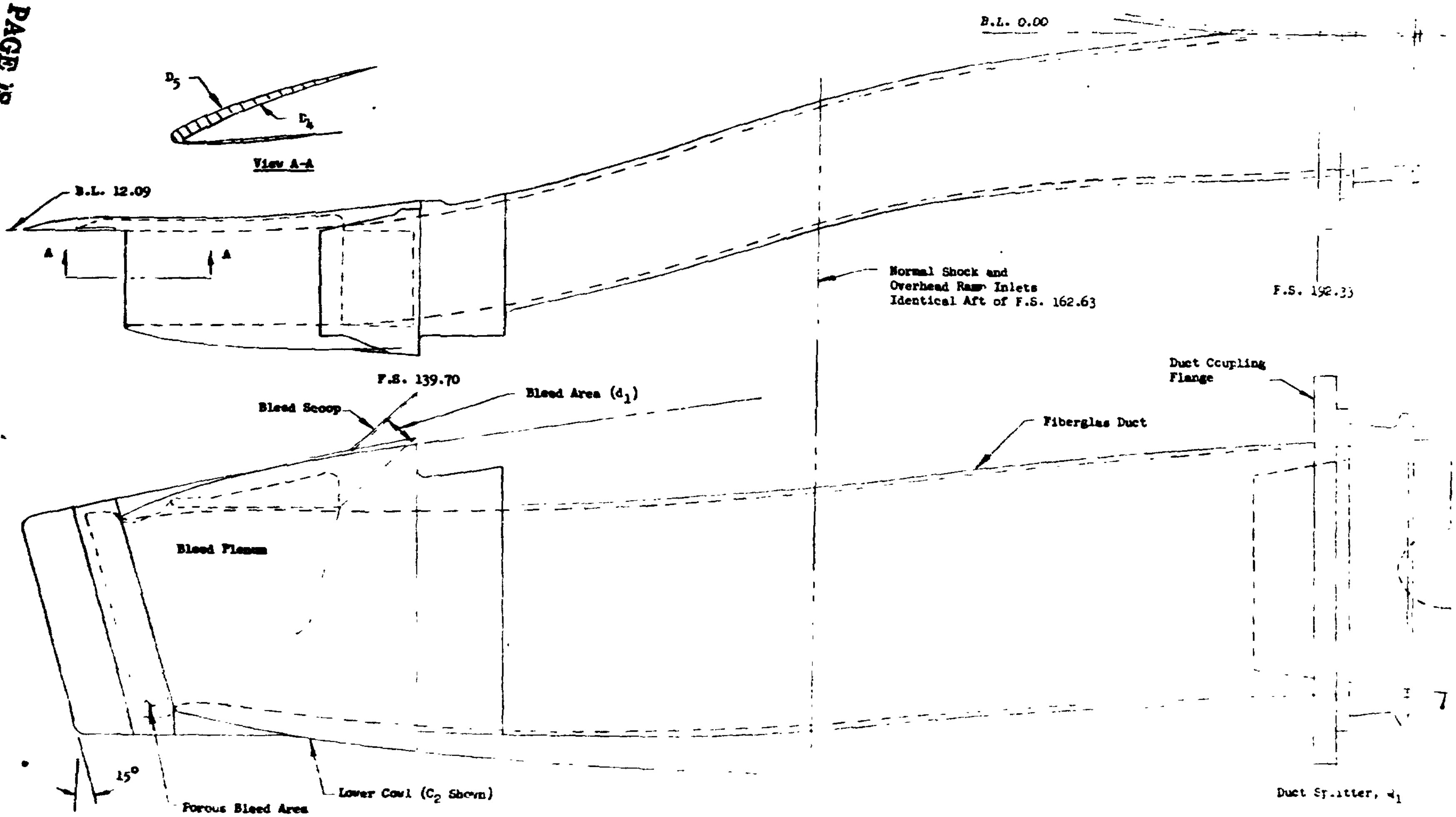


NOTE:

Tube Spacing Typical
for All Fuselage Rakes

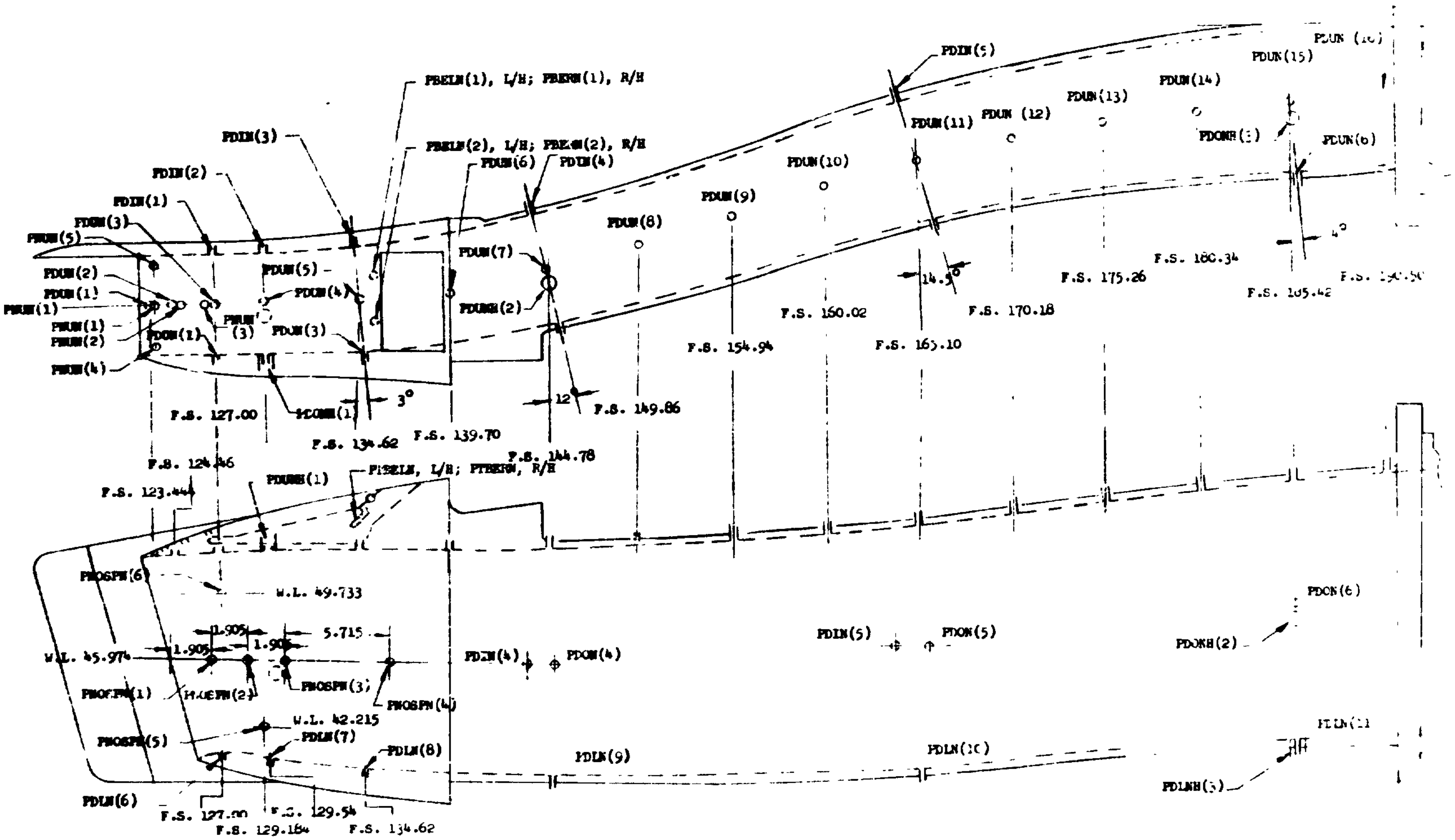
All dimensions are centimeters model scale

Figure 8 - Forward fuselage instrumentation.



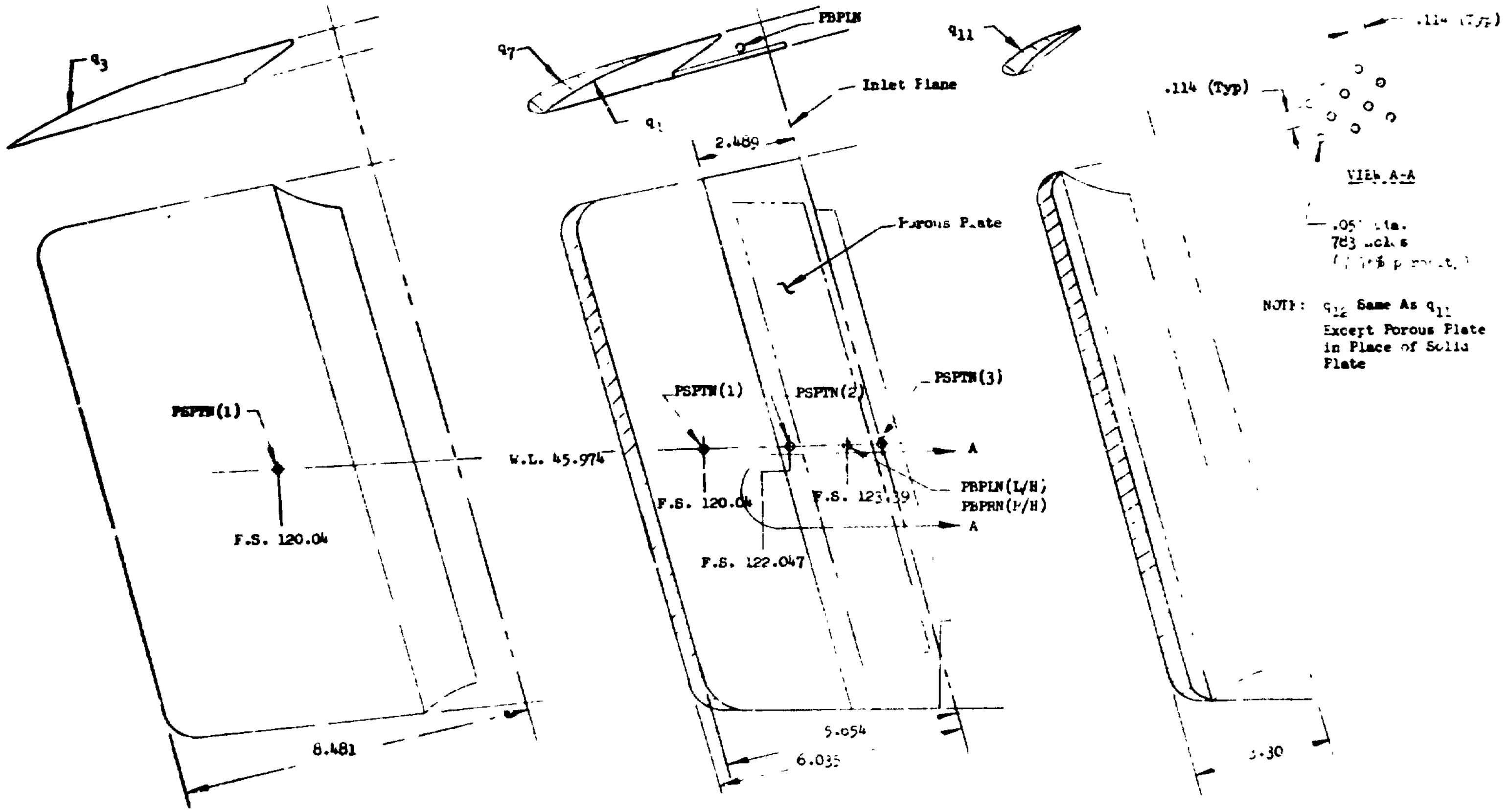
All dimensions are centimeters model scale unless noted otherwise.

Figure 9 - Normal shock inlet: D_4, D_5.



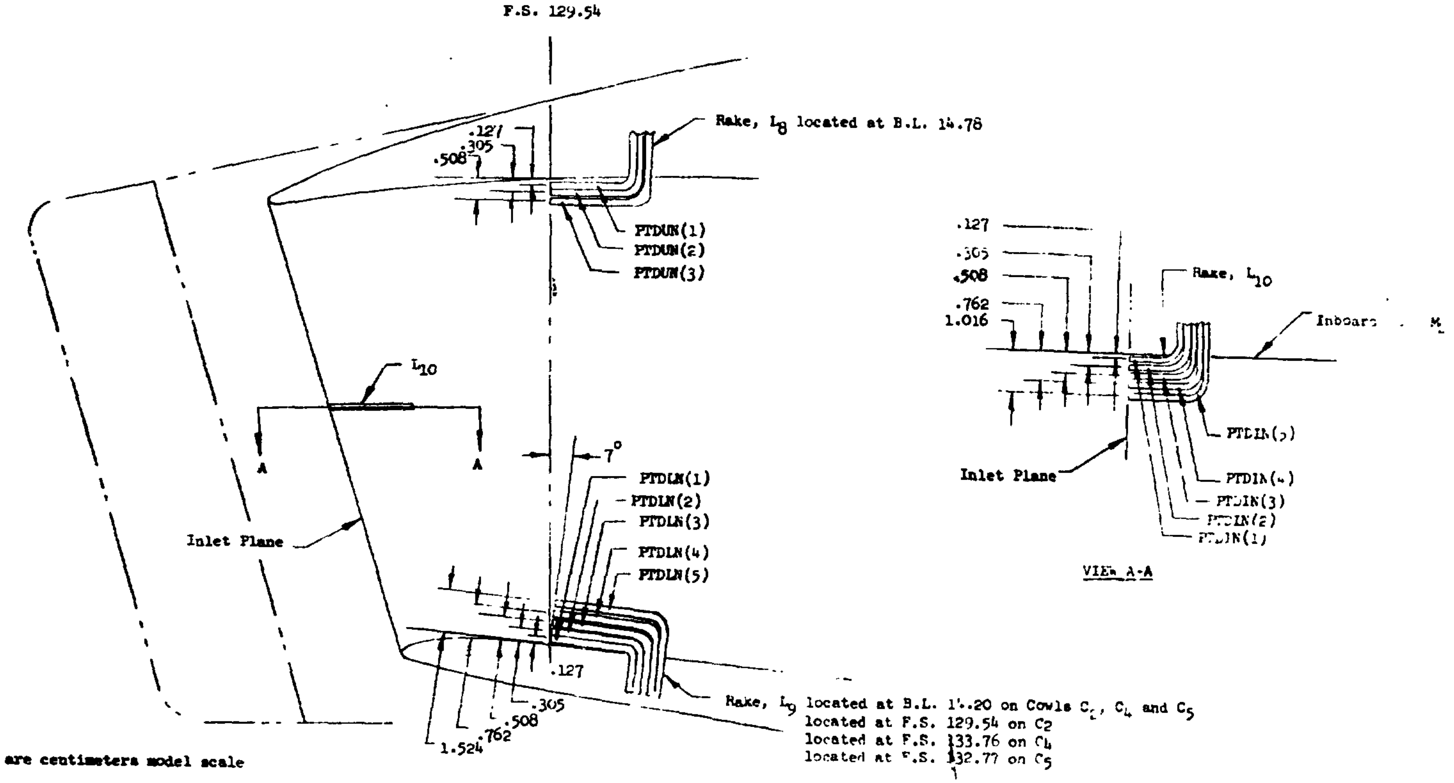
All dimensions are centimeters model scale

Figure 10 - Normal shock inlet instrumentation.



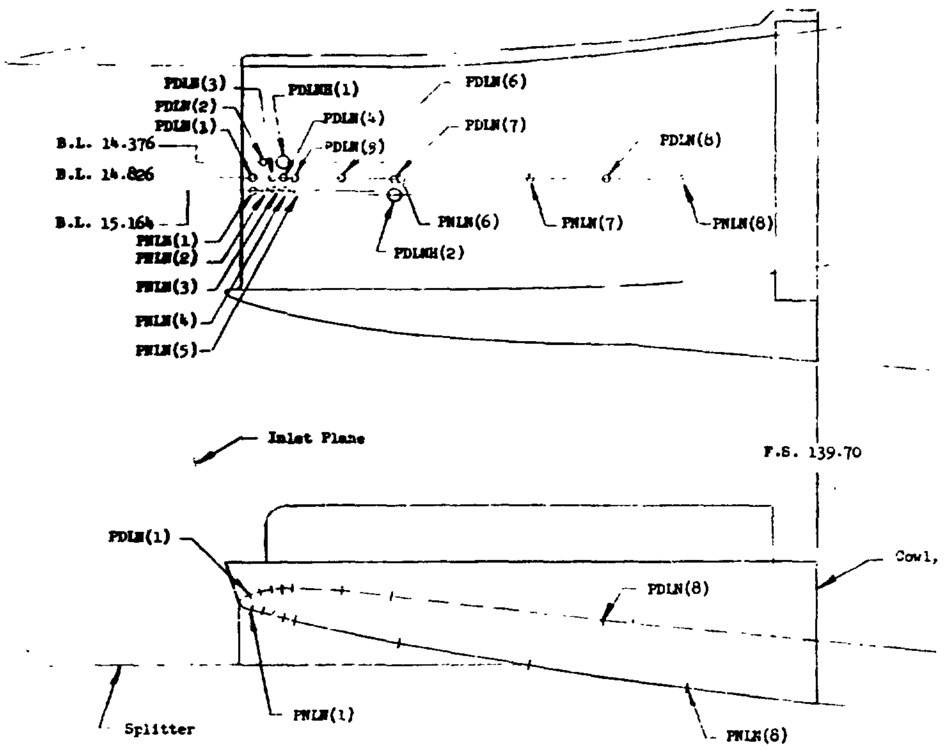
All dimensions are centimeters model scale

Figure 11 - Normal shock inlet inboard splitter leading edge configurations: q_1, q_3 q_7, q_{11}, q_{12}.



All dimensions are centimeters model scale

Figure 12 - Normal shock inlet rakes: L_8, L_9, L_{10}.



All dimensions are centimeters model scale

Orifice	B.L.	F.S.
PNLN(1)	15.164	126.083
PNLN(2)	↓	126.357
PNLN(3)	↓	126.614
PNLN(4)	↓	126.883
PNLN(5)	↓	127.160
PNLN(6)	14.826	129.62
PNLN(7)	↓	132.74
PNLN(8)	↓	136.55
[illegible]	↓	126.058
PDLN(2)	14.376	126.319
PDLN(3)	14.826	126.571
PDLN(4)	↓	126.832
PDLN(5)	↓	127.094
PDLN(6)	↓	128.27
PDLN(7)	↓	129.54
PDLN(8)	↓	134.62
PDLNH(1)	14.376	126.832
PDLNH(2)	15.182	129.54

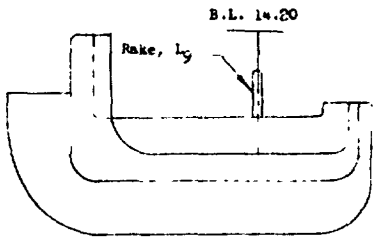
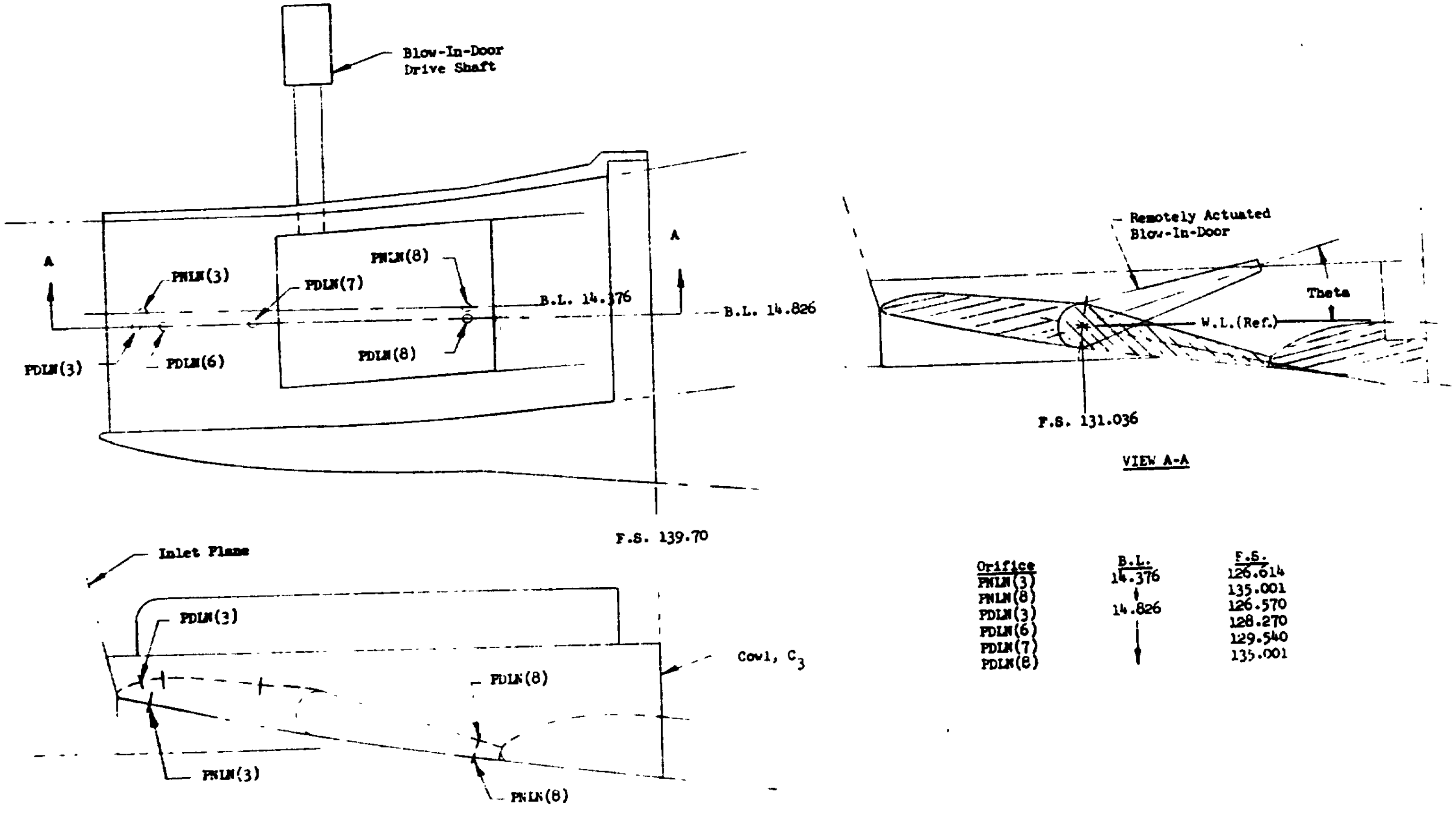


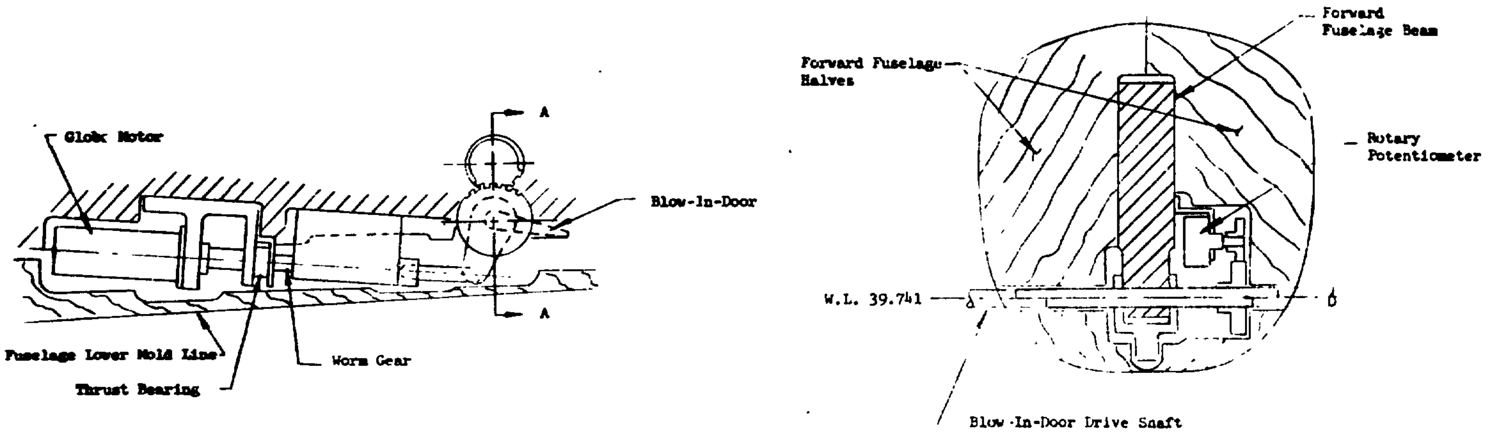
Figure 13 - Normal shock inlet, C_2 cowl.



Orifice	B.L.	F.S.
PNLN(3)	14.376	126.614
PNLN(8)	↓	135.001
PDLN(3)	14.826	126.570
PDLN(6)		128.270
PDLN(7)		129.540
PDLN(8)	↓	135.001

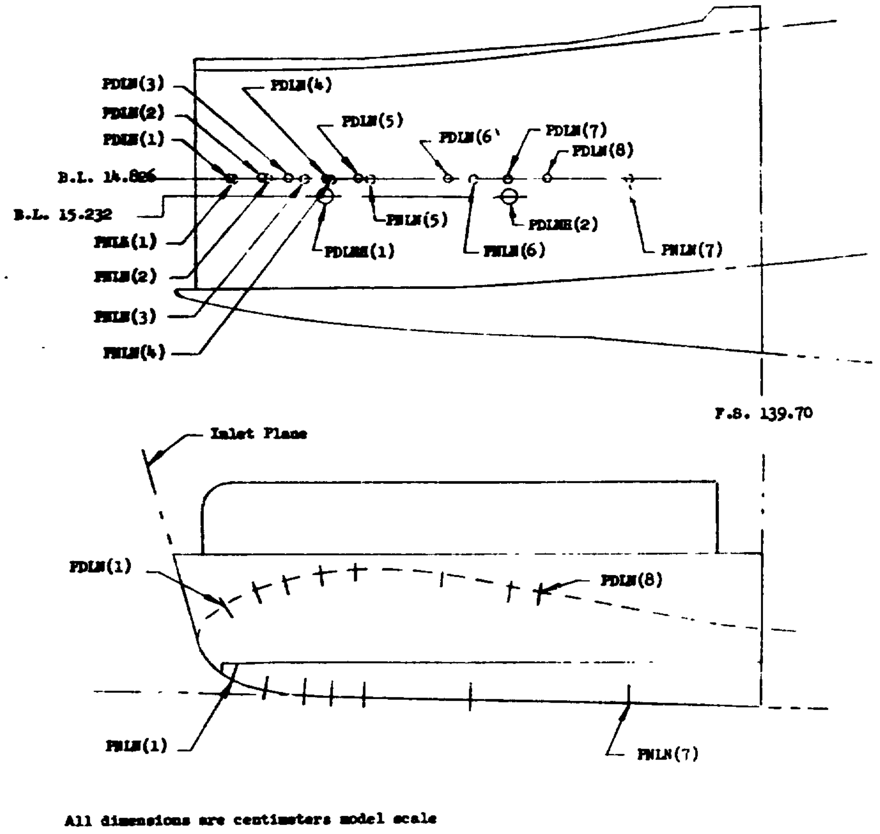
All dimensions are centimeters model scale.

Figure 14 - Normal shock inlet, C_3 cowl.



VIEW A-A
F.S. 131.035

Figure 15 - Normal shock inlet blow-in-door remote drive system, cowl C_3.



All dimensions are centimeters model scale

Orifice	B.L.	F.S.
PNLN(1)	14.826	127.025
PNLN(2)	↓	127.036
PNLN(3)		128.626
PNLN(4)		129.413
PNLN(5)		130.175
PNLN(6)		132.740
PNLN(7)		136.550
PDLN(1)		126.848
PDLN(2)		127.610
PDLN(3)		128.397
PDLN(4)		129.159
PDLN(5)		129.921
PDLN(6)		132.080
PDLN(7)		133.756
PDLN(8)		134.620
PDLNH(1)	15.232	129.159
PDLNH(2)	15.232	133.756

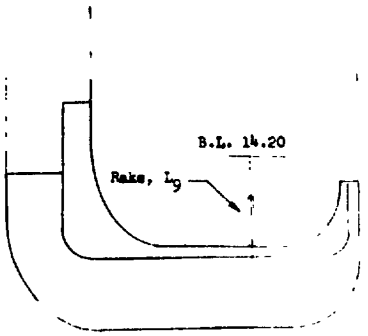
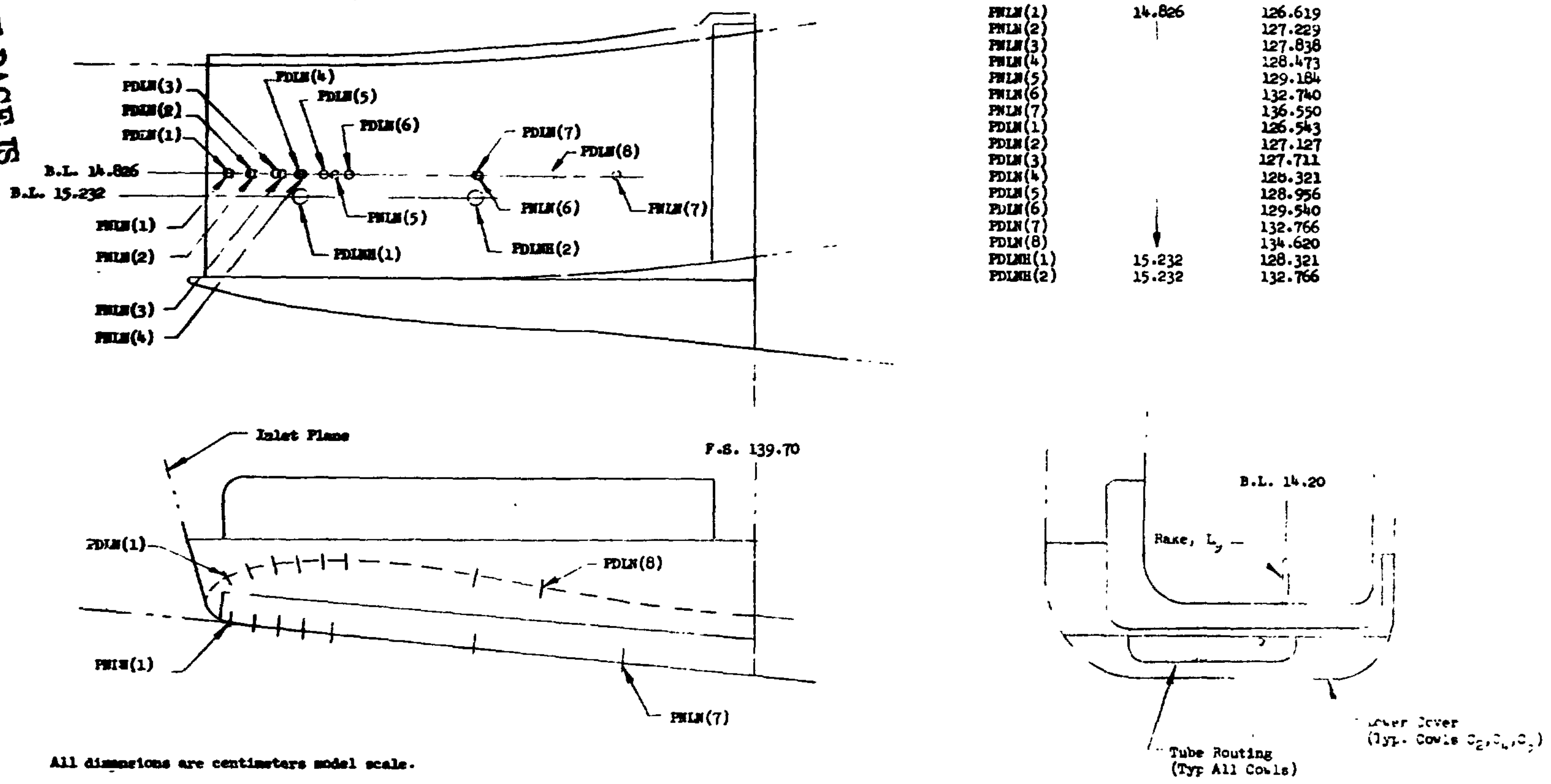


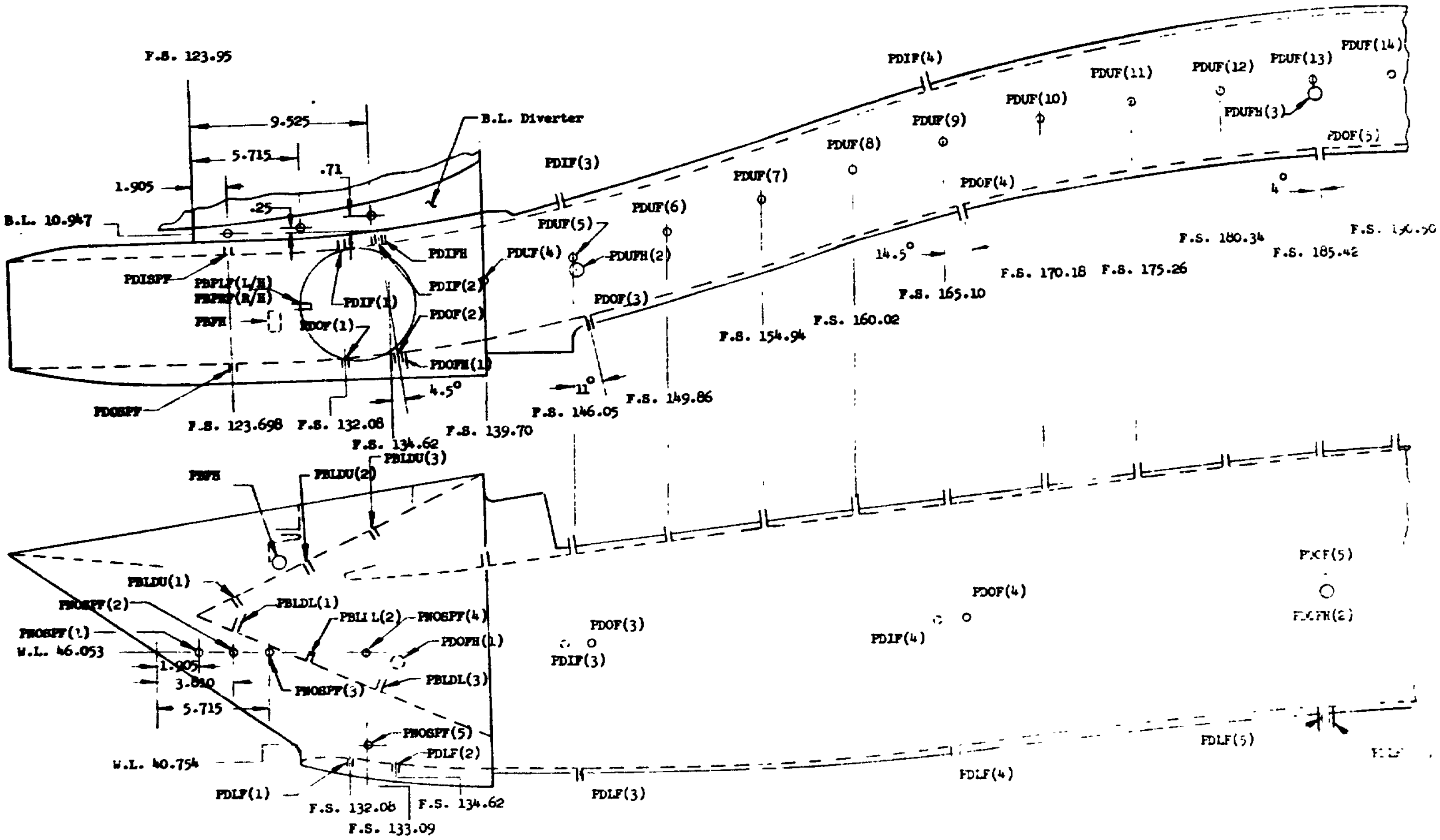
Figure 16 - Normal shock inlet, C_4 cowl.



Orifice	B.L.	F.S.
PNLN(1)	14.826	126.619
PNLN(2)		127.229
PNLN(3)		127.838
PNLN(4)		128.473
PNLN(5)		129.184
PNLN(6)		132.740
PNLN(7)		136.550
PDLN(1)		126.543
PDLN(2)		127.127
PDLN(3)		127.711
PDLN(4)		128.321
PDLN(5)		128.956
PDLN(6)		129.540
PDLN(7)		132.766
PDLN(8)		134.620
PDLNH(1)	15.232	128.321
PDLNH(2)	15.232	132.766

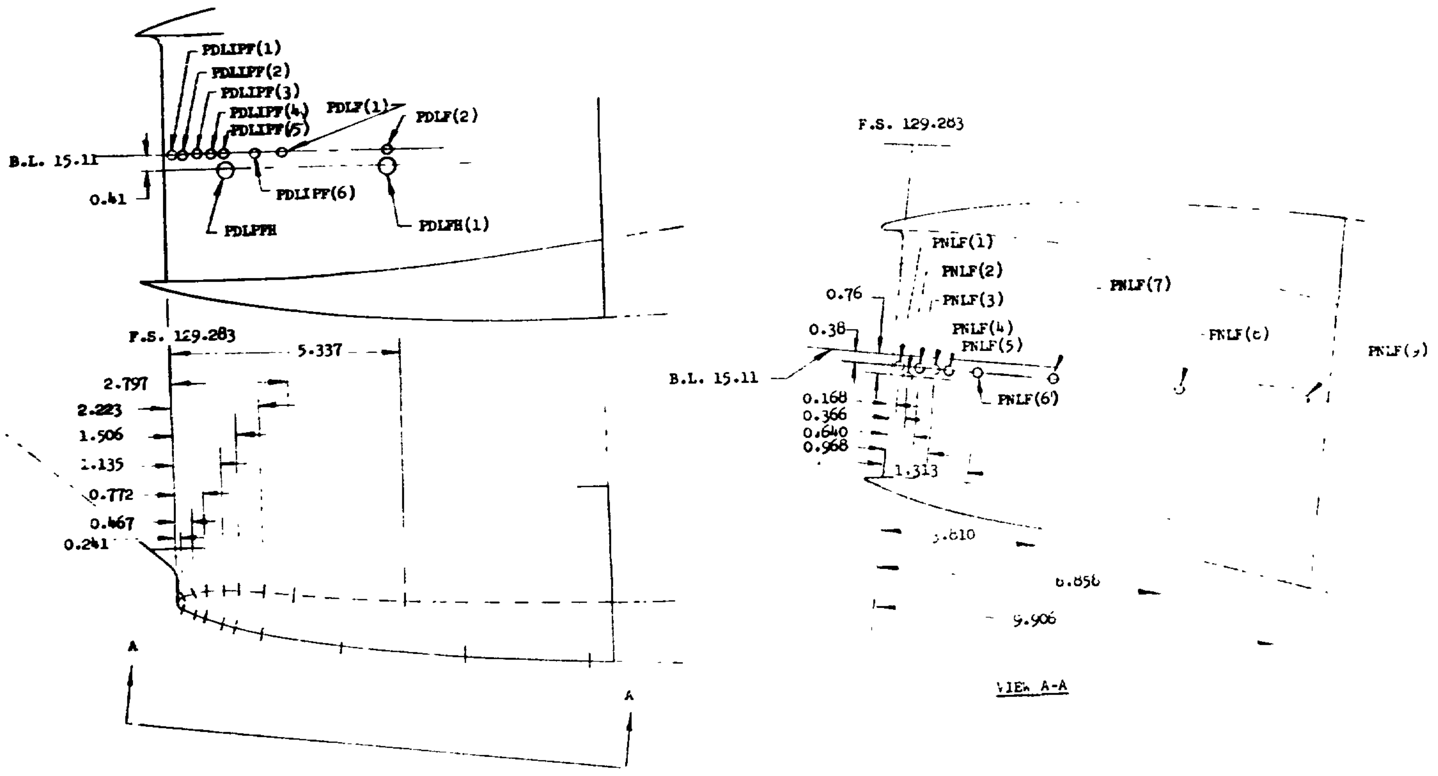
All dimensions are centimeters model scale.

Figure 17 - Normal shock inlet, C_5 cowl.



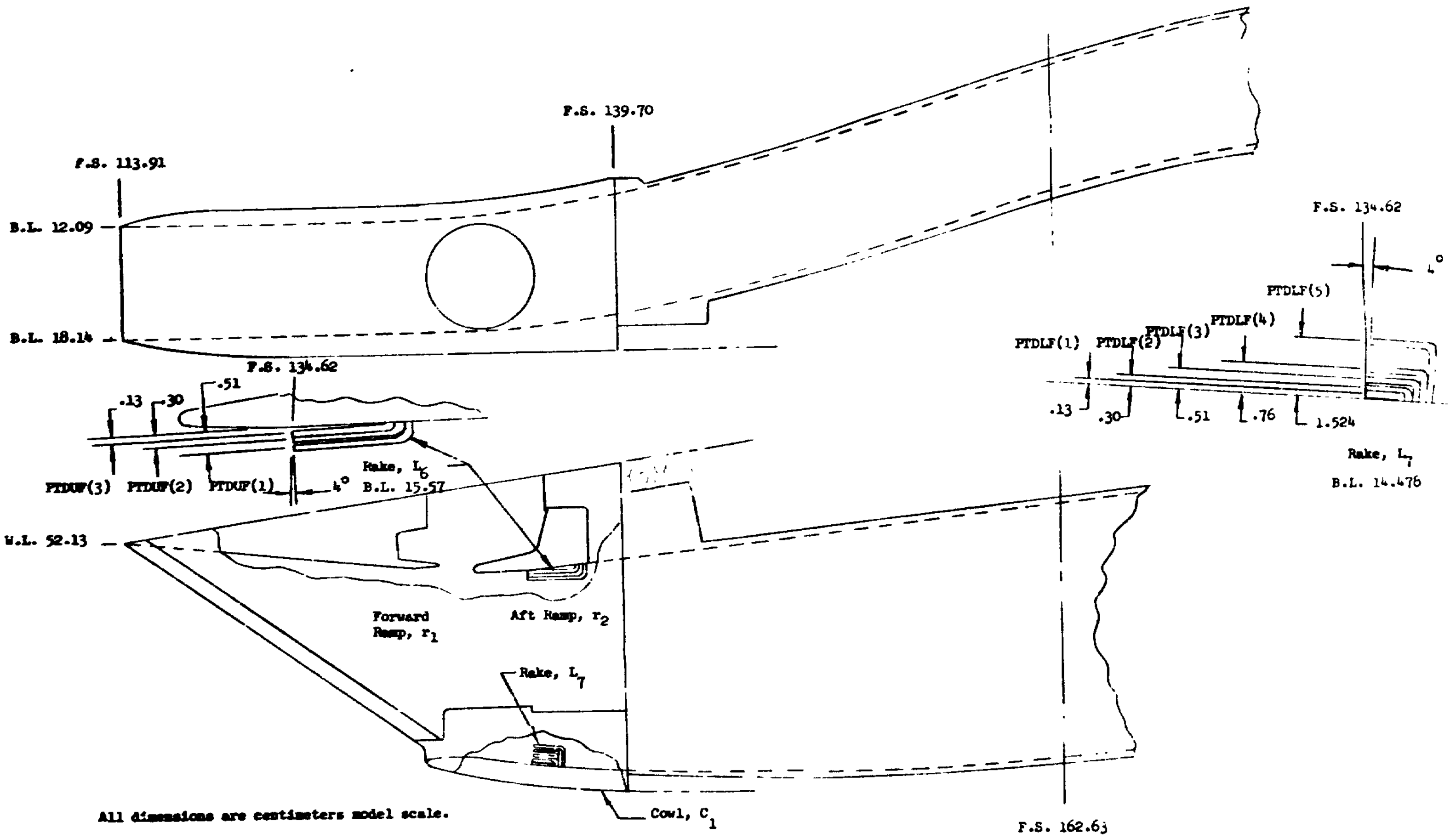
All dimensions are centimeters model scale.

Figure 18 - Overhead ramp inlet instrumentation.



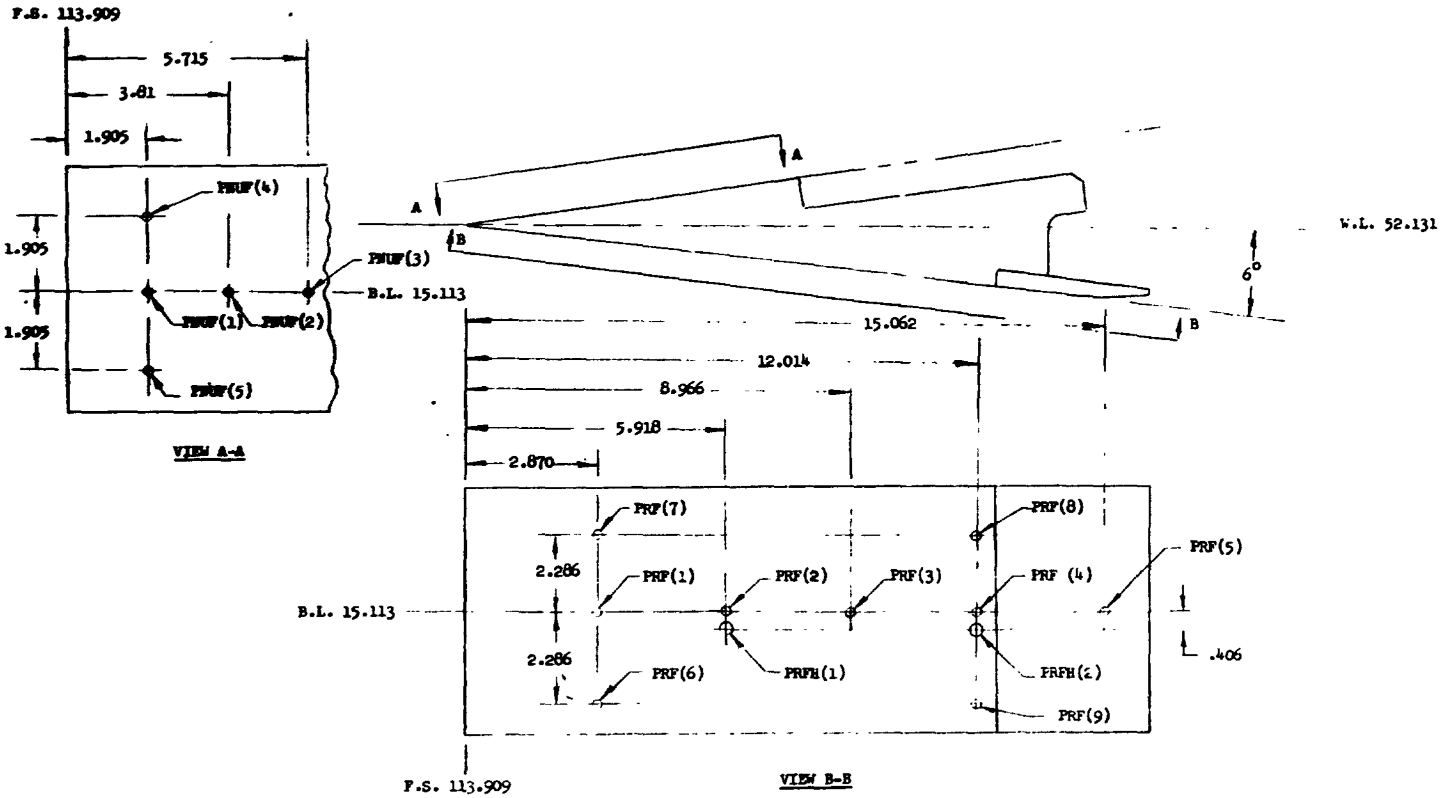
All dimensions are centimeters model scale.

Figure 19 - Overhead ramp inlet lower cowl, C_1.



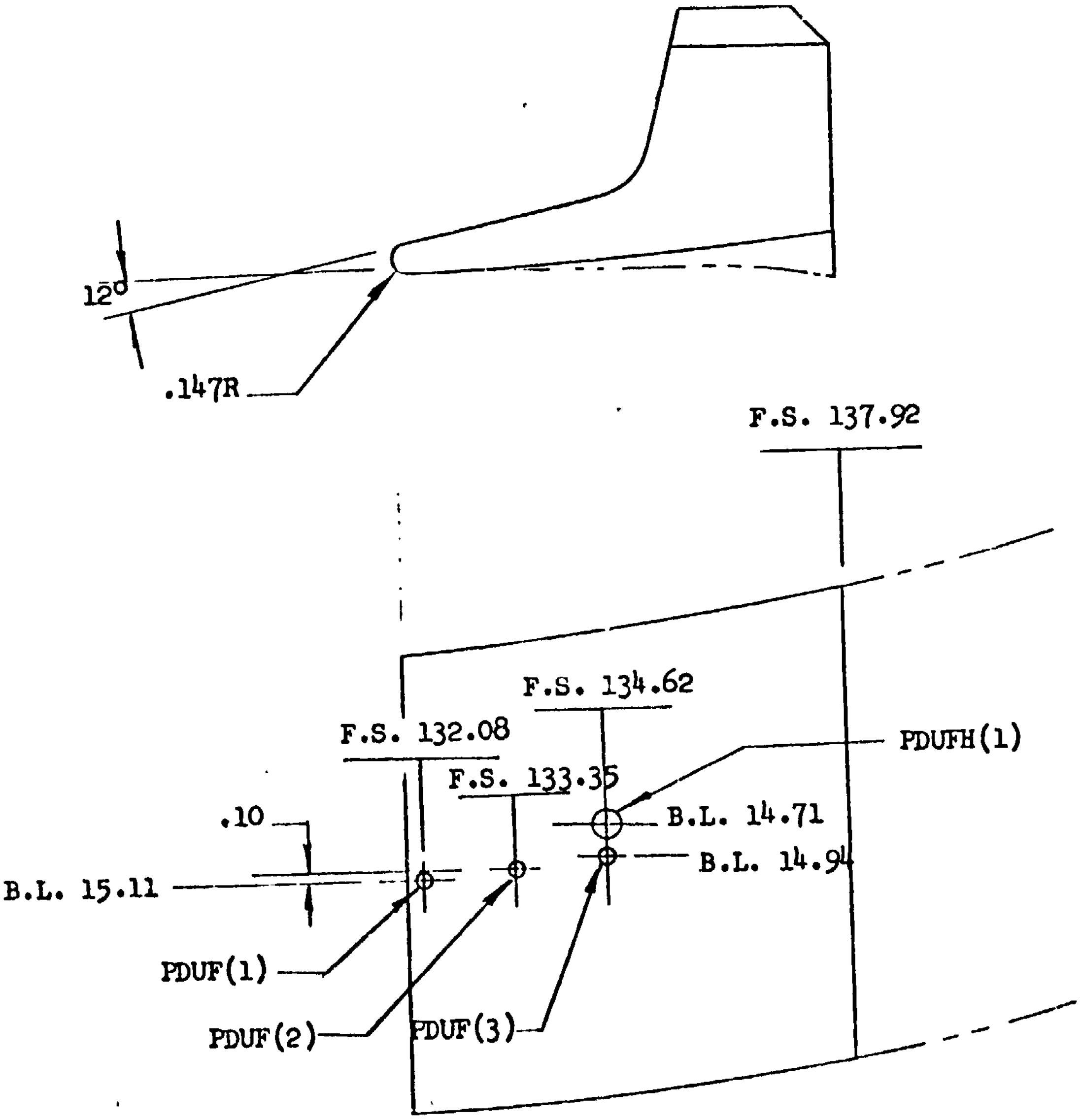
All dimensions are centimeters model scale.

Figure 20 - Overhead ramp inlet, D_3 and rakes L_6 and L_7.



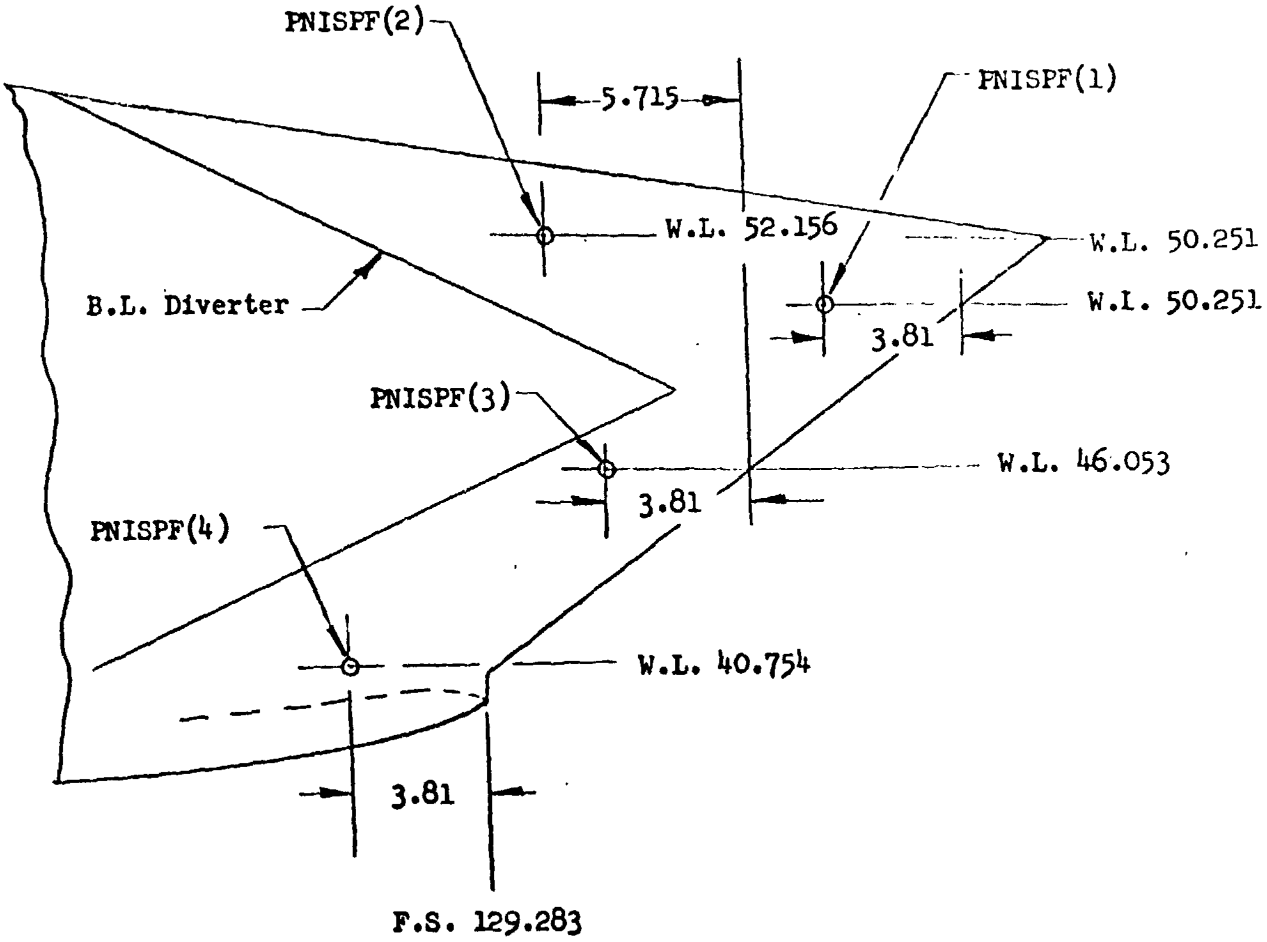
All dimensions are centimeters model scale.

Figure 21 - Overhead ramp inlet forward ramp, r_1.



All dimensions are centimeters model scale.

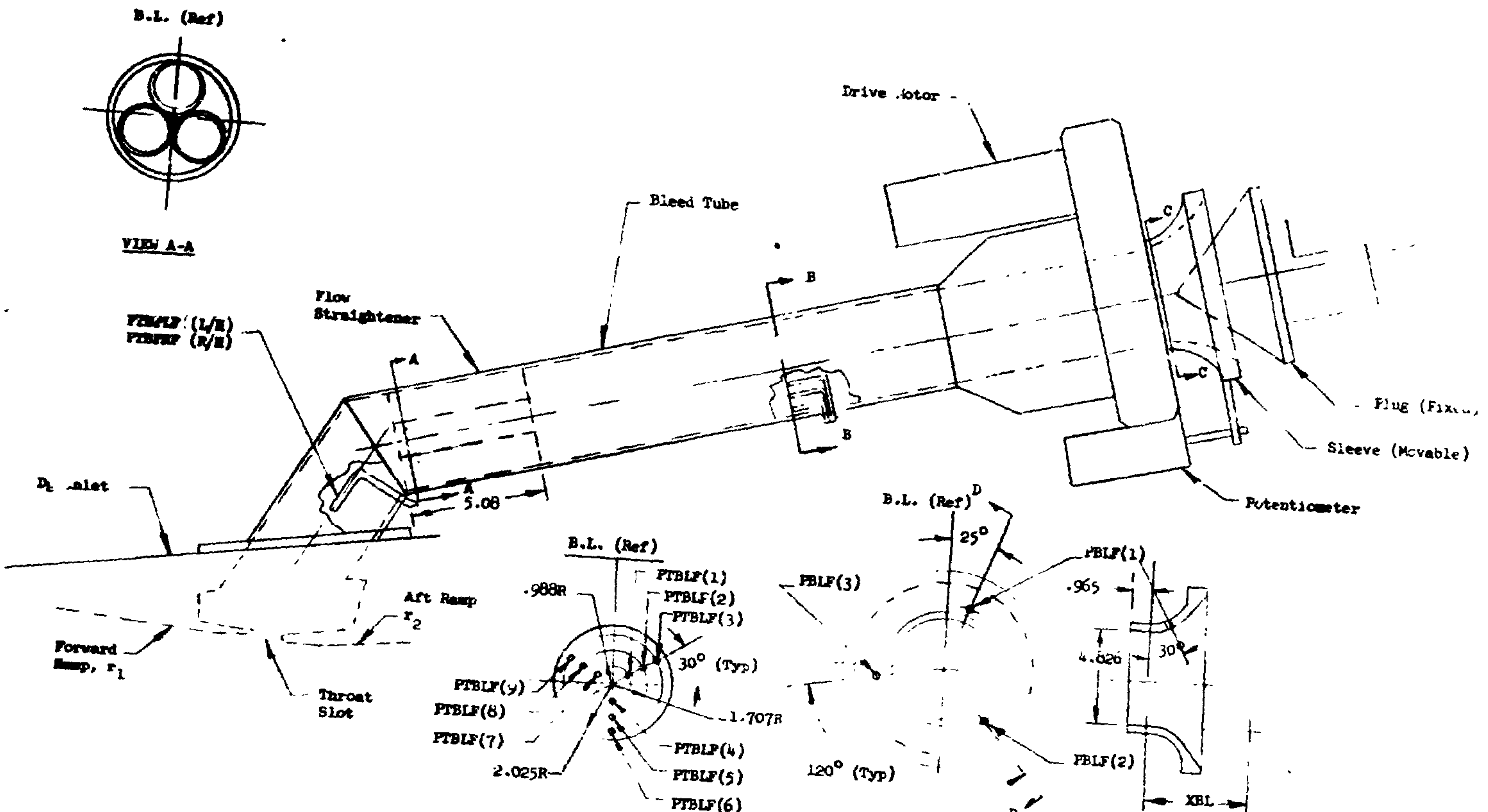
Figure 22 - Aft ramp, r_2.



VIEW LOOKING OUTBOARD

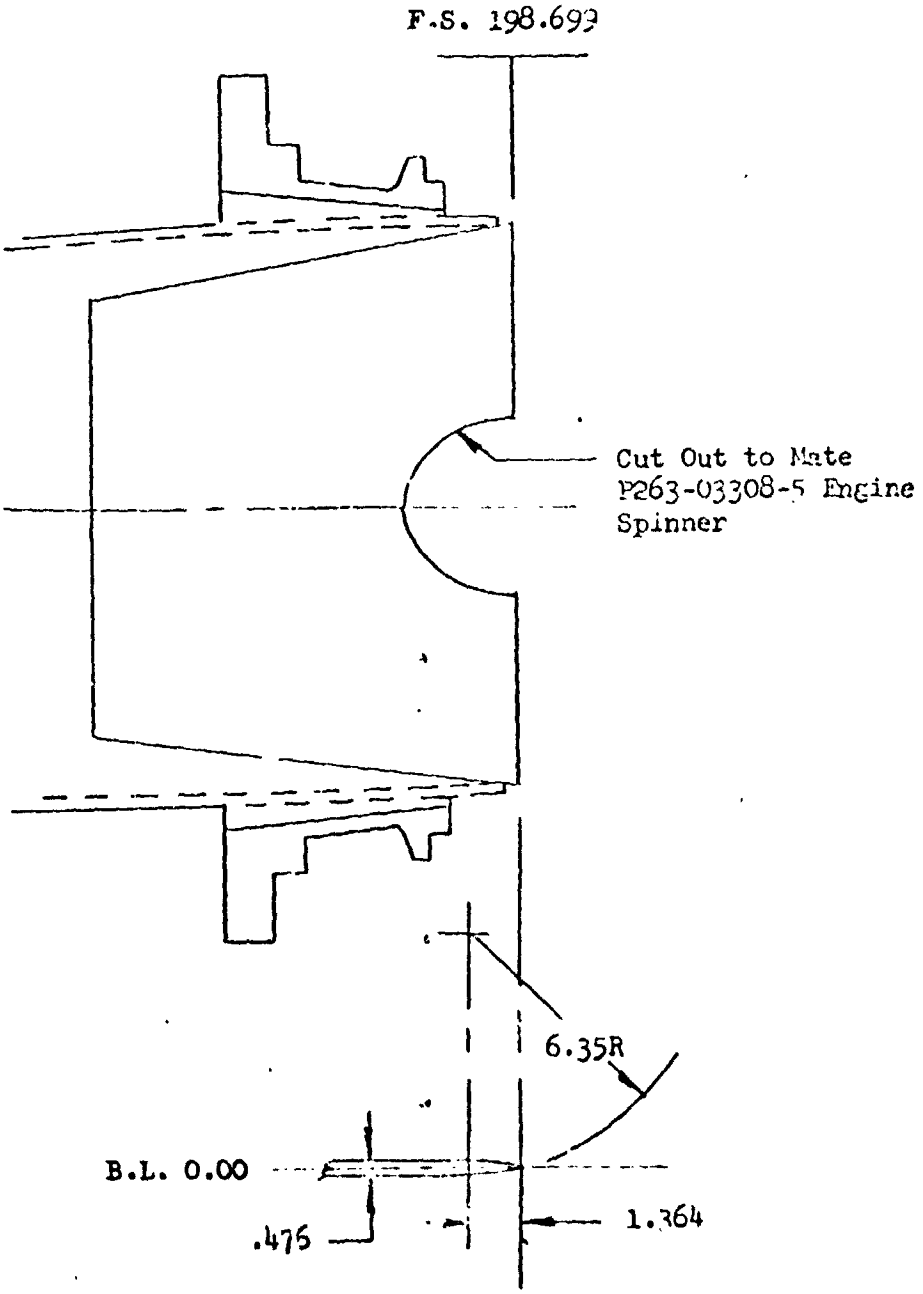
All dimensions are centimeters model scale.

Figure 23 - Overhead ramp inlet inboard side plate pressures.



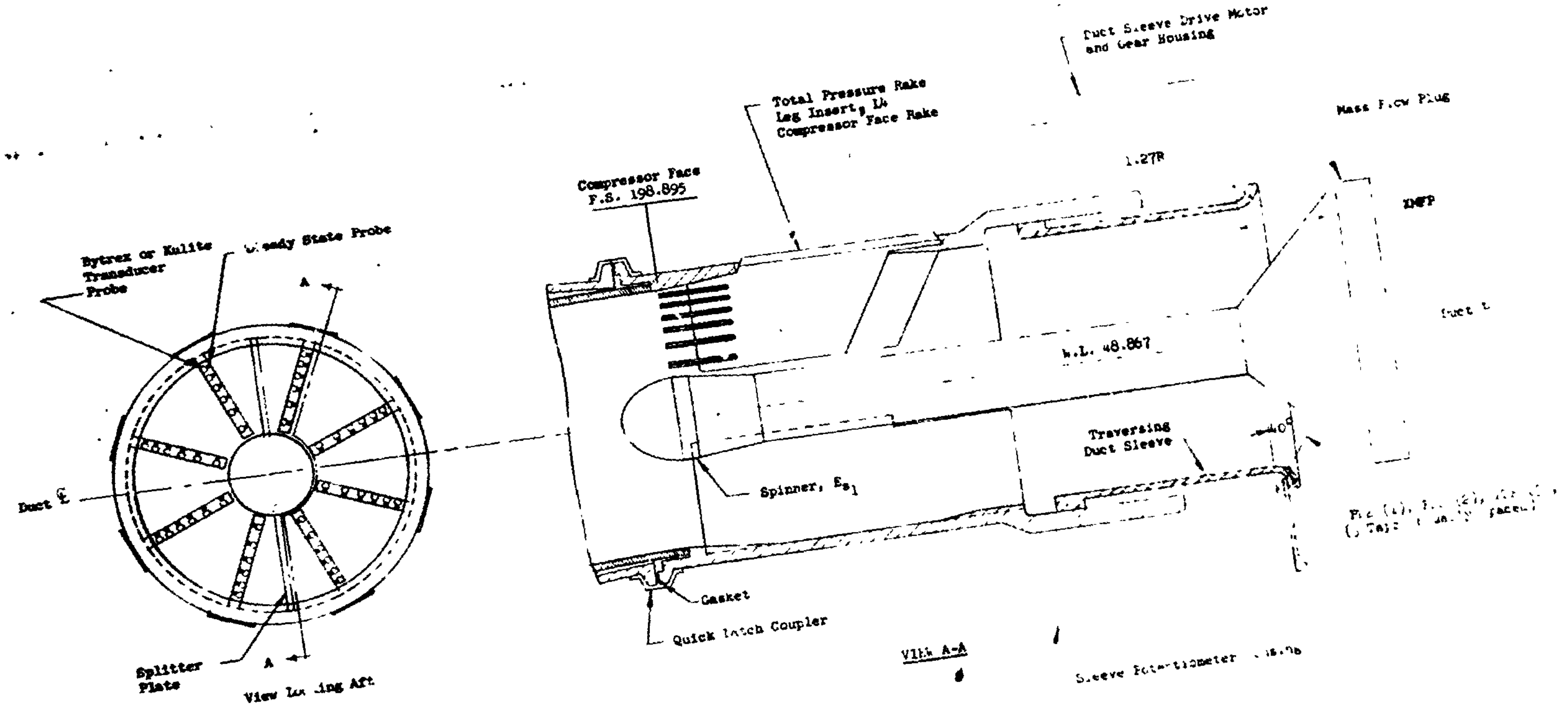
NOTE: (1) Left hand duct shown, right hand same
(2) All dimensions are centimeters model scale.

Figure 24 - Bleed duct instrumentation.



All dimensions are in centimeters model scale

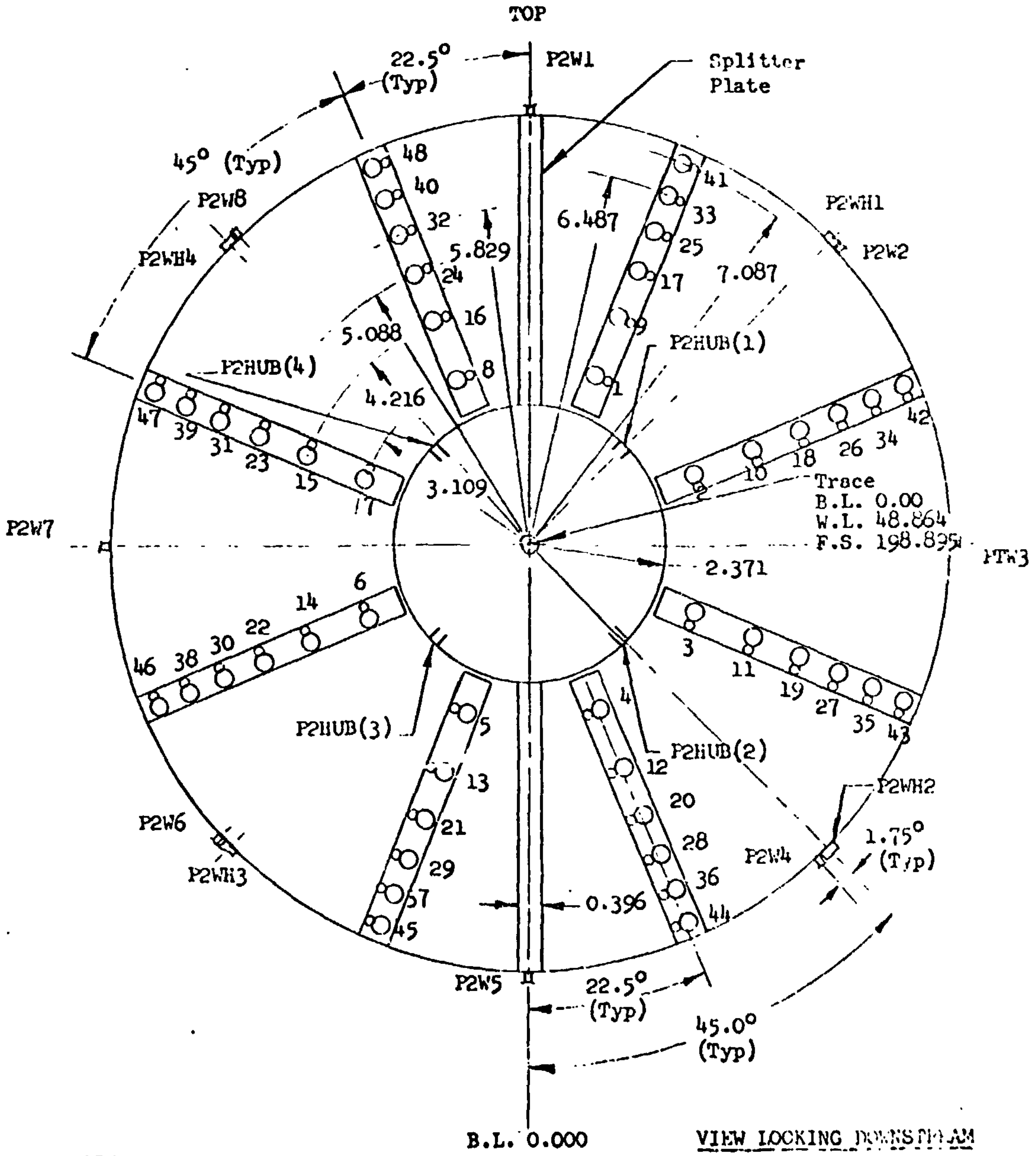
Figure 25 - Duct splitter, Q_1.



All dimensions are centimeters model scale

Figure 26 - Compressor face rake installation, L_4 E_{S1}.

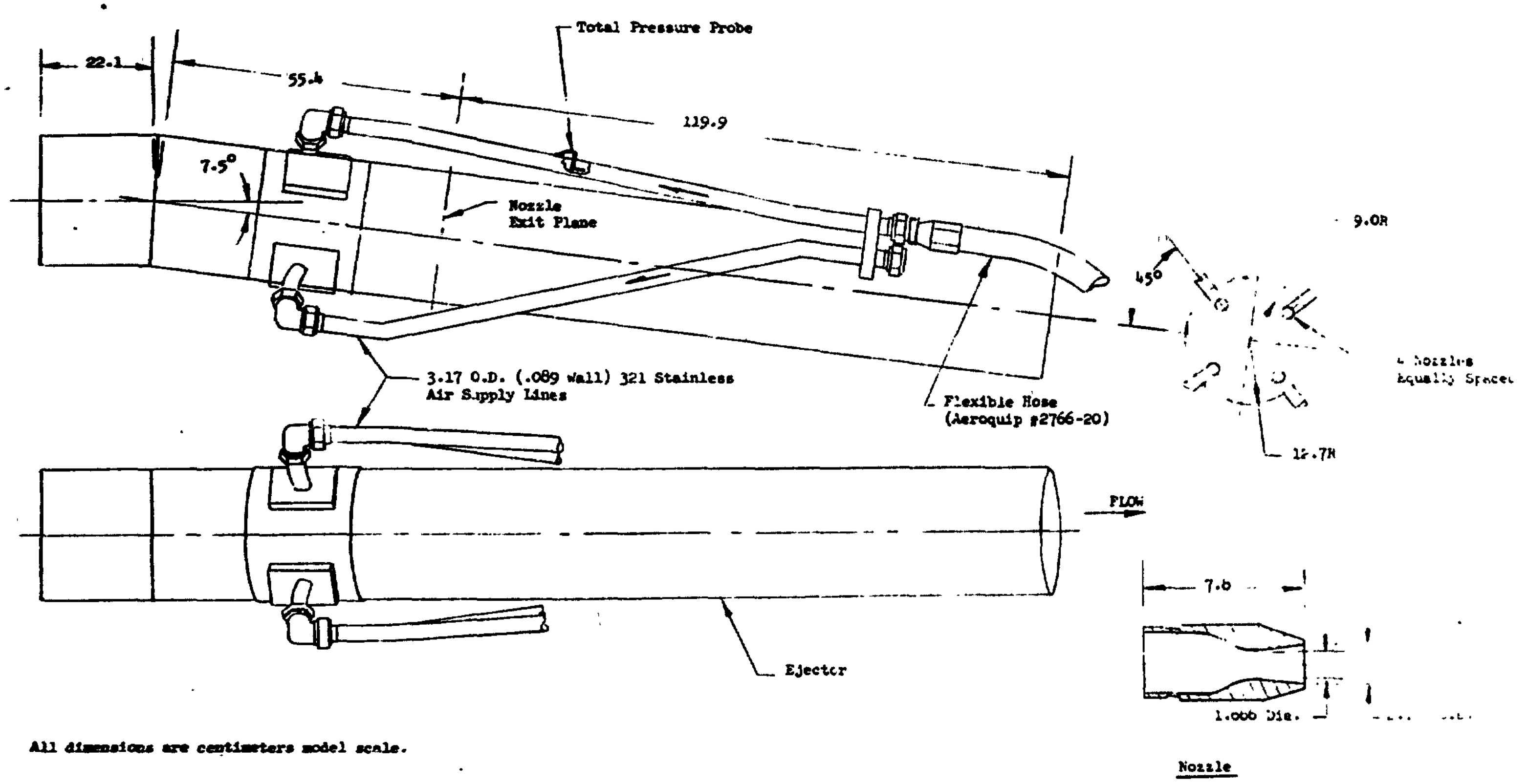
ORIGINAL PAGE IS
OF POOR QUALITY



NOTE:
(1) Pressure tube nomenclature can be found in Table 3
(2) All dimensions are centimeters model scale.

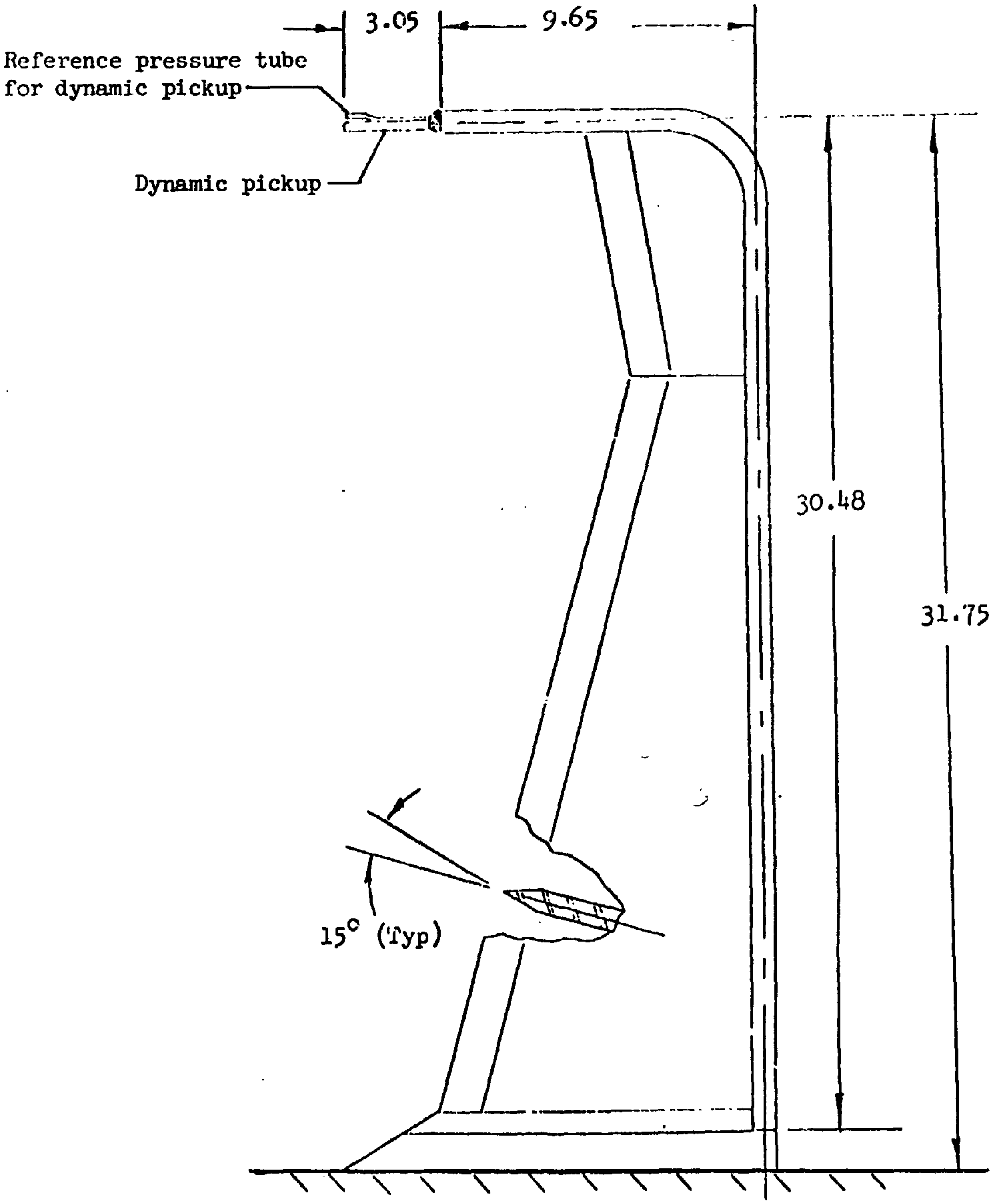
ORIGINAL PAGE IS
OF POOR QUALITY

Figure 27 - Engine face rake, L_4.



All dimensions are centimeters model scale.

Figure 28 - Ejector assembly.



All dimensions are centimeters model scale.

Figure 29 - Wall probe.

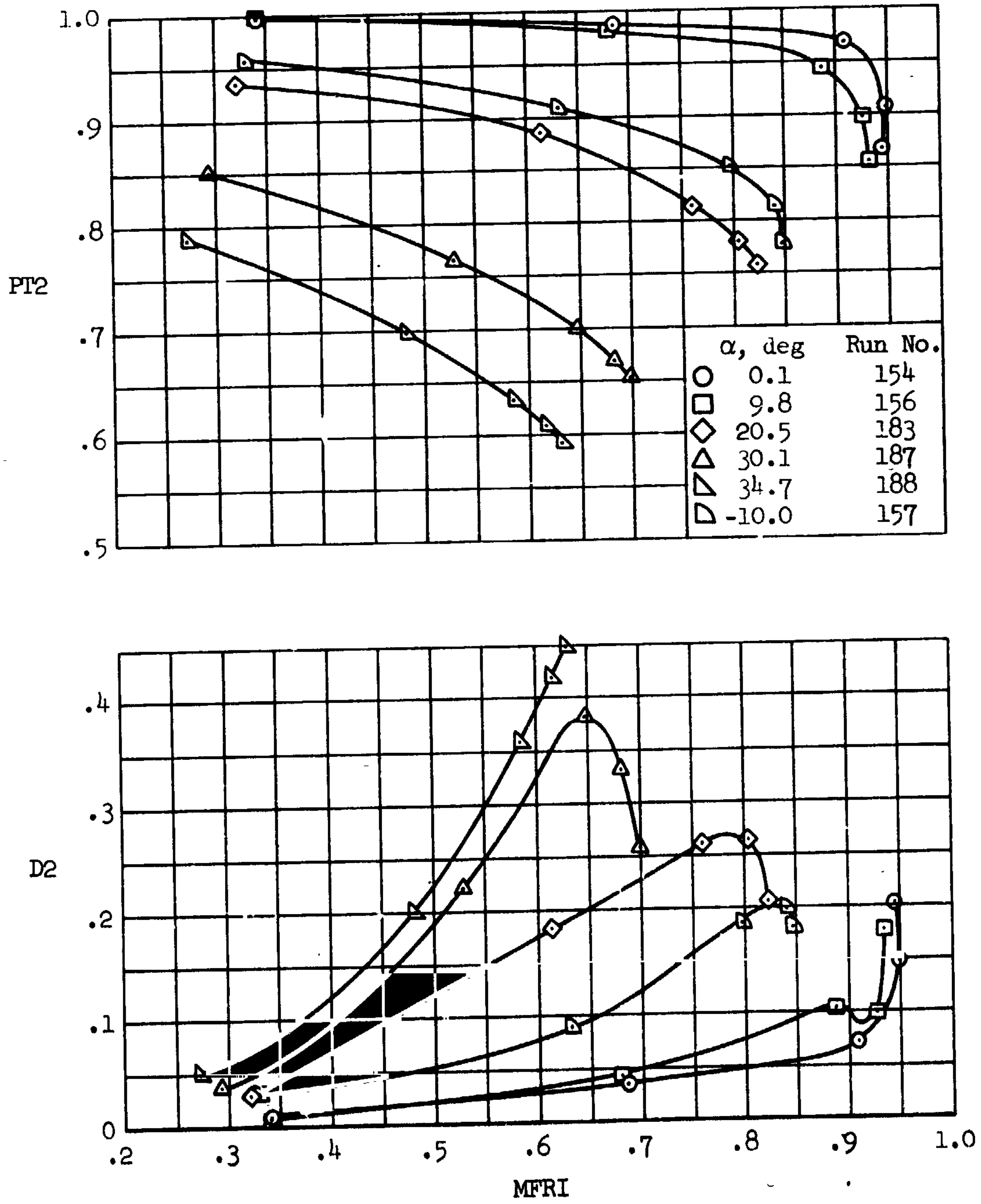


Figure 30.- Normal shock inlet performance; M = 0.9, β = 0°.

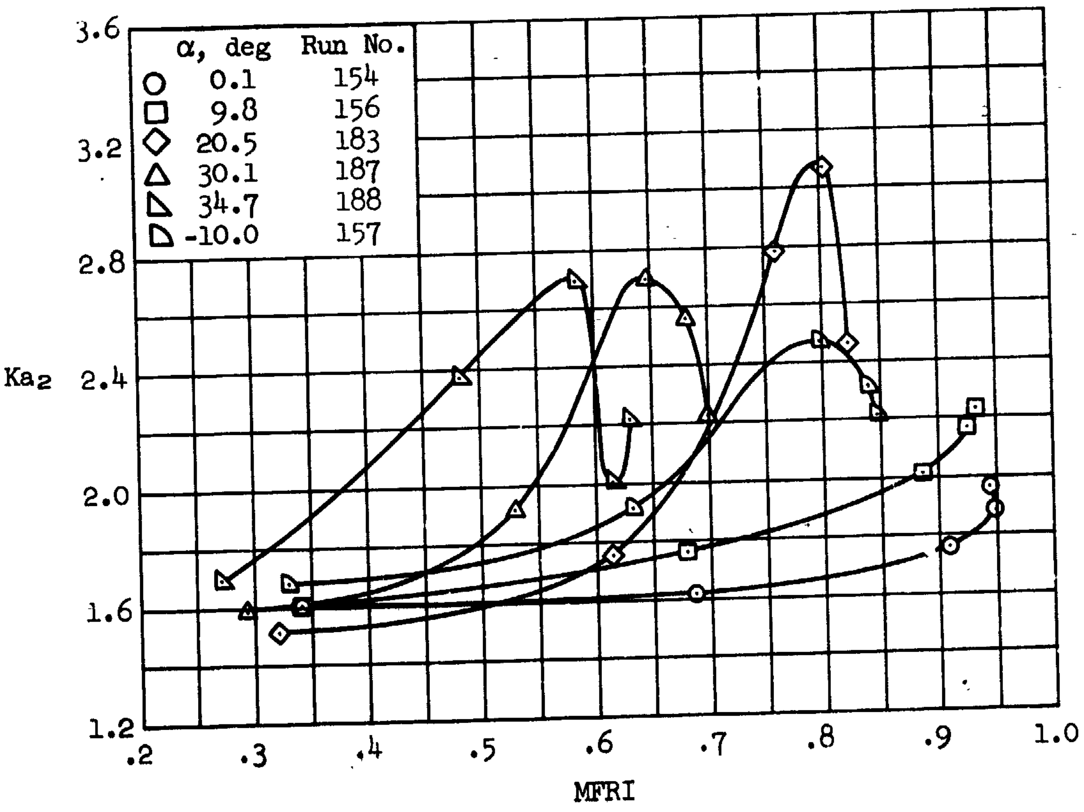


Figure 30.- Concluded.

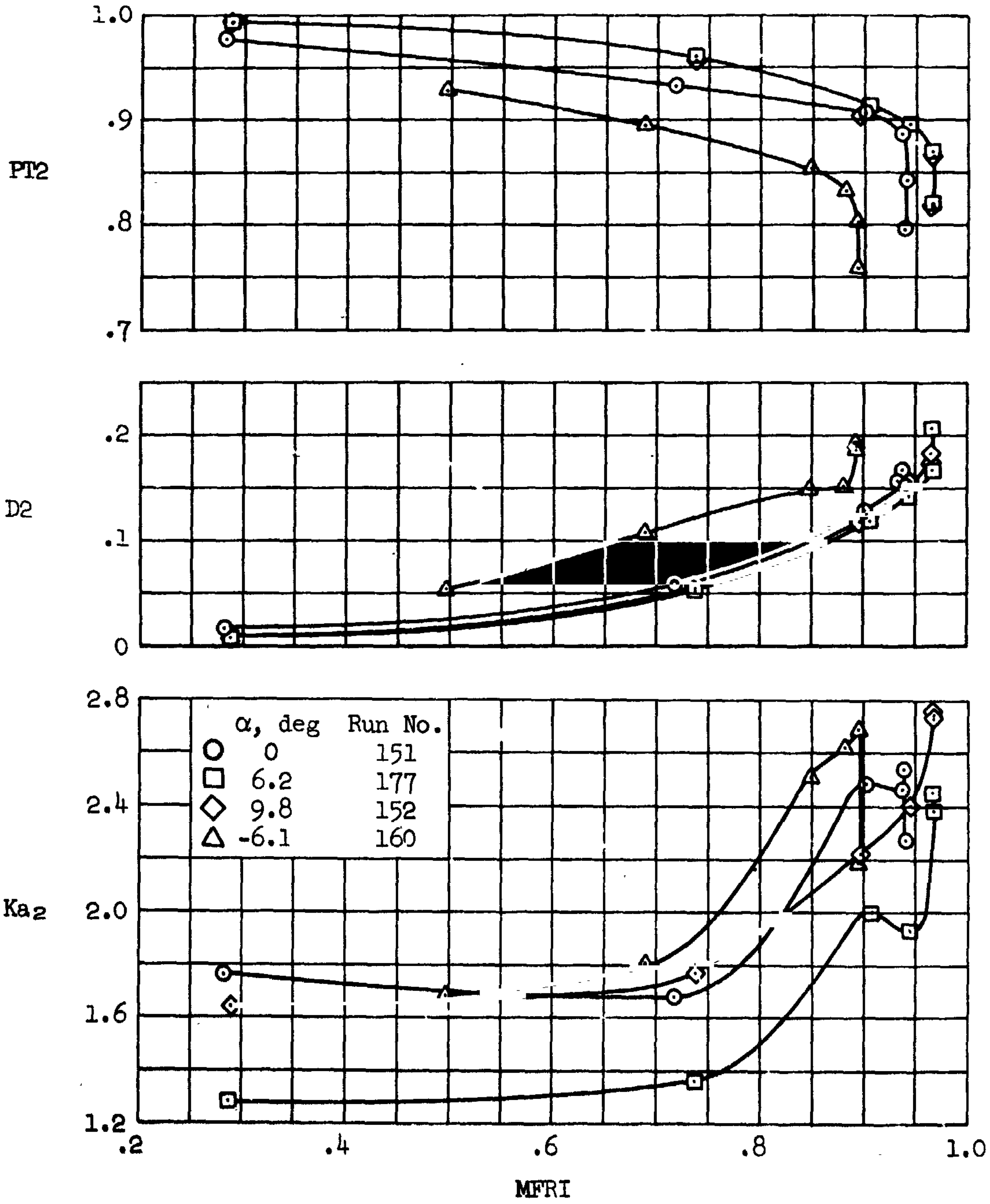


Figure 31.- Normal shock inlet performance; M = 1.4, β = 0°.

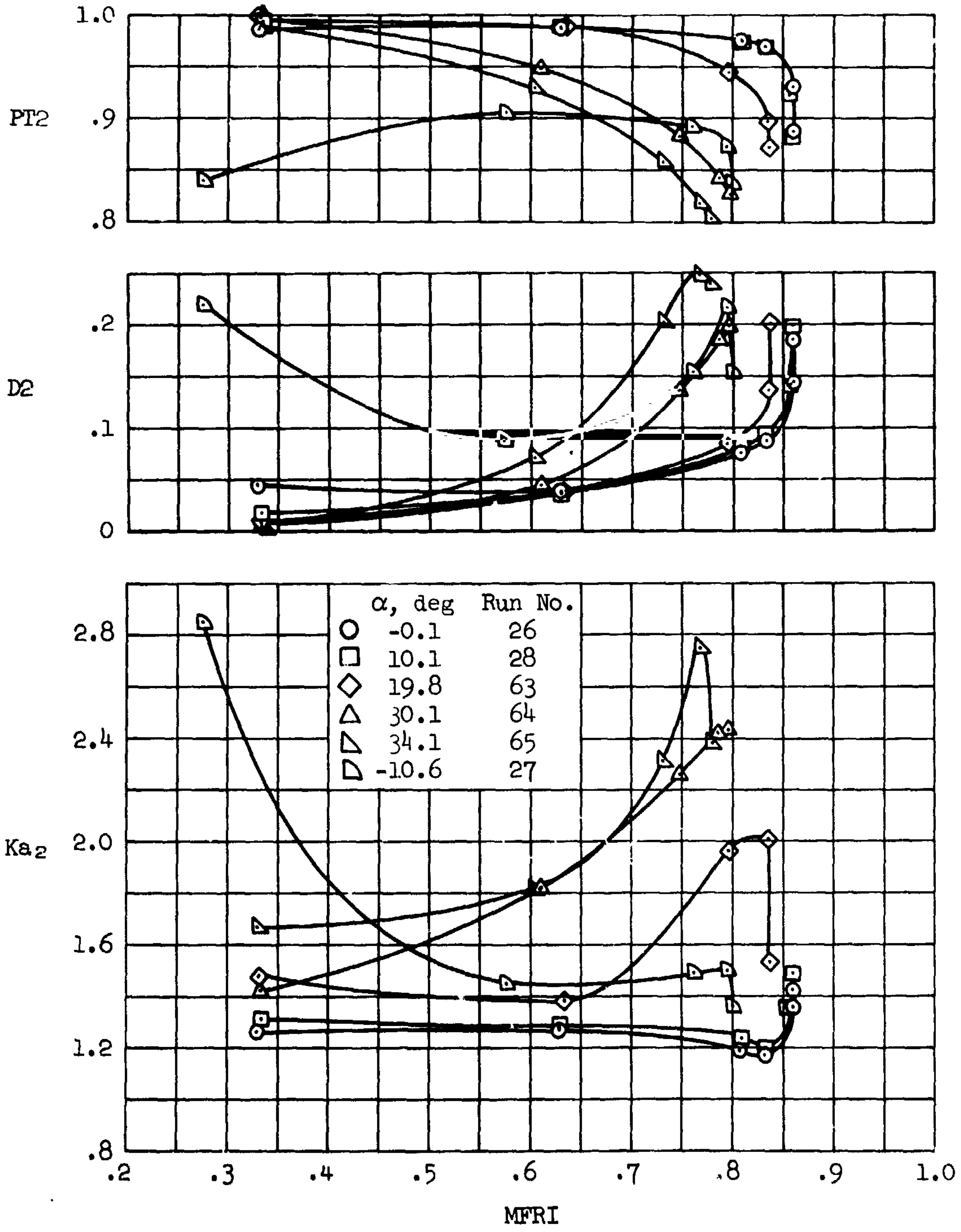


Figure 32.- Overhead ramp inlet performance; M = 0.9, β = 0°.

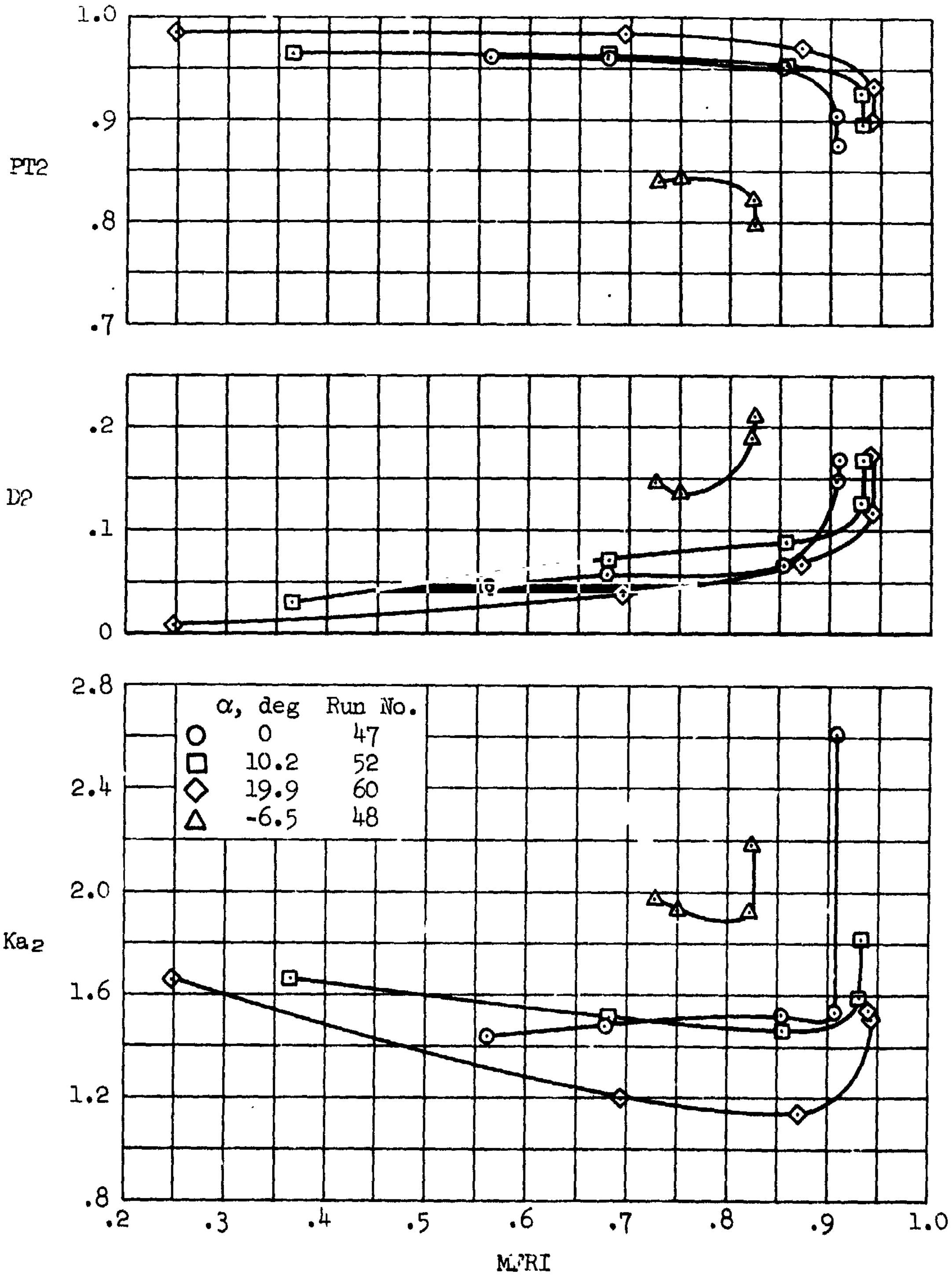


Figure 38.- Overhead ramp inlet performance; M = 1.4, β = 0°.

APPENDIX

SAMPLE OF TABULATED DATA

```
TST-053 PH-1 TN-11  26 204          ID-PRESSOUTO          26 MAR 75'02 51        PAGE 109
      RUN SEQ
       26 204

                                  15.354 PERCENT SCALE BIFURCATED DUCT INLET MODEL - MODEL 263

 TUNNEL AND MODEL CONDITIONS                                       CONFIG      1
  MACH    ALPHA    BETA    PT        P       TT     R/FT        Q  STINGMP  STINGMY
 0.895   -0.09     0.02   3578     2128     110    6.85      1192      -54      -12

 COMMON TO ALL CONFIGURATIONS
                                   ENGINE FACE DATA                                                         FUSELAGE RAKE DATA
                                        PT2(I,J)                                                                  PTFX(I)
    RING/LEG  1       2       3       4       5       6       7       8     PT2RIN(I)  X  PFX      1      2      3      4      5      6      7
        1  0.9689 0.9974 0.9941 0.9849 0.9899  1.001 0.9991 0.9838  0.9874    L 0.670
        2  0.9672  1.000  1.000 0.9930 0.9898 0.9946 0.9958 0.9725  0.9891    R 0.663
        3  0.9816 0.9959 0.9937 0.9792 0.9751 0.9874 0.9924 0.9734  0.9849   LL 0.639
        4  0.9784 0.9806 0.9995 0.9655 0.9617 0.9875 0.9838 0.9722  0.9786
        5  0.9752 0.9653 0.9913 0.9464 0.9478 0.9876 0.9752 0.9795  0.9710       DIVERTER DATA                 DUCT PLUG DATA
        6  0.9553 0.9332 0.9448 0.9334 0.9281 0.9433 0.9419 0.9618  0.9427      PBLOX(I)                          PDE(I)
  PT2LEG(J) 0.9711 0.9788 0.9873 0.9671 0.9654 0.9836 0.9814 0.9705            X    1     2     3             1     2     3   XMFP
                                                                             U 0.795 0.695 0.676        0.310 0.321 0.308 1.864
     P2X(I) 0.8240 0.7872 0.7732 0.7758 0.8094 0.7823 0.7730 0.7827           L 0.713 0.684 0.639
   P2HUB(I) 0.7579 0.7569 0.7535 0.7699

   FIXED RAMP INLET
                              1     2     3     4     5                                          1     2     3     4     5
   NACELLE DATA   PNUF(I)   0.692 0.678 0.685 0.692 0.688                  DUCT DATA   PRF(I)   0.696 0.680 0.668 0.671 0.564
                  PNLF(I)   0.765 0.659 0.564 0.559 0.480                                       0.686 0.705 0.662 0.660
                            0.382 0.550 0.543 0.547                                   PDUF(I)   0.498 0.682 0.702 0.784 0.819
                PNISPF(I)   0.703 0.681 0.692 0.615                                             0.834 0.843 0.851 0.861 0.869
                PNOSPF(I)   0.606 0.578 0.575 0.572 0.545                                       0.876 0.882 0.882 0.874
                                                                                    PDLIPF(I)   0.758 0.709 0.690 0.674 0.679
 BLEED PLUG DATA PIBLF(I)   0.593 0.695 0.692 0.639 0.689                                       0.707
                            0.690 0.691 0.688 0.688                                   PDLF(I)   0.723 0.762 0.826 0.863 0.874
                  PBLF(I)   0.617 0.616 0.615                                         PDOF(I)   0.740 0.763 0.826 0.849 0.877
                   XMFPBL   0.497                                                     PDIF(I)   0.701 0.727 0.815 0.869
                 PTBRF(I)   0.663 0.661 0.662 0.667 0.669                             PTRF(I)
                            0.659 0.661 0.660 0.659                                  PTDUF(I)   0.996 0.998 0.998
                  PBRF(I)   0.553 0.558 0.565                                        PTDLF(I)
                   XMFPBR   0.497
                                                  ABL     ABR                   PDISPF PDOSPF PTBPLF  PBPLF PTBPRF  PBPRF
                                                 0.451   0.451                   0.547  0.679  0.700  0.676  0.694  0.645
```

```
TST-053 PH-1 TN-11  26 204        ID-PRESSOUTO          26 MAR 75'02 51 CONT. PAGE 110

  TUNNEL  AND MODEL  CONDITIONS                                       CONFIG      1
   MACH    ALPHA     BETA      PT       P       TT     R/FT       Q  STINGMP  STINGMY
  0.895    -0.09     0.02    3578     2128     110     6.85    1192   -53.8    -11.9

  COMMON TO ALL CONFIGURATIONS                                                                    DUCT PLUG PARAMETERS
                               ENGINE FACE PARAMETERS                                          PDE     PEOPT2    XMFP      WAD      ADE
              PT2       P2     P2OPT2   WAKDRA    WAKD    PERFLC    M2    Q2OPT2            0.3126   0.3204    1.864    365.1    19.75
     AVG    0.9756   0.7790   0.7985    263.4    265.3             0.550  0.1722
    LEFT    0.9760   0.7787   0.7978             132.8    50.08    0.551
   RIGHT    0.9752   0.7793   0.7991             132.5    49.92    0.549                                          TURBULANCE
                                                                                                           1        2        3        4
   DISTORTION        D2      D2L      D2R      DFI      DC       DR      DT      DCL      DCR      DTL      DTR
   PARAMETERS      0.075    0.069    0.075    0.022    0.020    0.048   0.067   0.021    0.019    0.068    0.066        0.019    0.002    0.001    0.011
                                                                                                           5        6        7        8
   KA2Y    KA2F    KTHF    KRA2Y    KRA2F    KC2F   KTHSPF    ID      ICC      ICR     IDCIN   IDCOUT    IDRIN   IDROUT
   0.994   0.475   0.054   0.318    0.164    0.053   0.053   0.043   0.023    0.019    0.023    0.020   -0.013    0.019    0.008    0.002    0.002    0.017

   FOREBODY RAKE                        POPTX(I)                                                VX(I)
   PARAMTERS         X      1      2      3      4      5      6      7      1      2      3      4      5      6      7           BLHX
                     L
                     R
                     LL

  FIXED RAMP INLET                                                      MASS   FLOW  RATIOS
           DUCT STATION AVG                                  ACAPT    MFRD    MFRBL    MFRBR     MFR1       X      CXFO      CXFI      CXFR    CXFADC
   PD52     PD53     PD57     PD65     PD73           ACC    975.2   0.781    0.013    0.013    0.807       L                1.129     1.706    0.578
  0.6656   0.7387   0.8215   0.8605   0.8776           AC    973.2   0.783    0.013    0.013    0.808       D      10.94     10.91     0.177    0.139

   BLEED PLENUM AND                                                                                                                 
   PLUG PARAMETERS      POPTPL   POPTPR    PTBL    PTBR      PBL      PBR    POPTBL   POPTBR   XMFPBL   XMFPBR    WAKBL     WAKBR     WAKBT
                        0.9655   0.9291   0.6906  0.6635   0.6161   0.5585   0.8921   0.8418   0.497    0.497     4.32      4.40      8.71
                                                                                                                            ABL       ABR
   DUCT RAKE                  POPTX(I)                                    VX(I)                                             0.45      0.45
   PARAMETERS     X      1       2      3       4      5          1       2      3       4      5      BLHX
                  R
                  DU  0.7052  0.7035  0.7036                   0.9979   1.001  1.001                  0.050
                  DL

  SUMMARY
   PT2BAR   MFRID    WAKD      WAKBL     WAKBR     D2       DT      KA2Y      ID      TURB
  0.9756    0.807    265.3     4.32      4.40    0.075    0.067    0.994    0.043    0.008
```