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PRESSURES ON A FLAT PLATE: TABULATED DATA  
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EXPERIMENTAL INVESTIGATION OF EFFECTS OF JET  
DECAY RATE ON JET-INDUCED PRESSURES ON A FLAT  
PLATE: TABULATED DATA

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# EXPERIMENTAL INVESTIGATION OF EFFECTS OF JET DECAY RATE ON JET-INDUCED PRESSURES ON A FLAT PLATE: TABULATED DATA

By

John M. Kuhlman, Don S. Ousterhout, and Ronald W. Warcup

## SUMMARY

This report consists of tabulated data values for all results presented in graphical form in NASA CR-2979, and together with that report comprises the final report for grant NGL-47-003-039. Data are presented for a small scale experimental model study of a single round jet exiting perpendicular to a flat plate into a uniform subsonic crossflow. The data are grouped into four main sections. Section 1 presents the static, or no-crossflow, nozzle calibration data. Section 2 lists the individual plate surface static pressure measurements, as well as the integrated loads, for each jet nozzle configuration and velocity ratio. Section 3 lists the jet centerline location data and the appropriate power law curve fit equation, and section 4 lists the jet dynamic pressure decay data.

## INTRODUCTION

An experimental study has been undertaken to determine the effects of jet decay rate upon the pressure distribution induced by the jet on an adjacent flat plate. This simplified geometry of a single circular jet issuing at right angles to a flat rectangular plate into a uniform subsonic crossflow has been utilized as a simplified model of the interaction of the exiting engine efflux with a fuselage or wing of a jet VTOL aircraft. Such an interaction between propulsive and aerodynamic loads is particularly important during transition from hover to forward flight, and has been found to be strongly configuration dependent (refs. 1, 2, and 3).

The current data have been summarized previously in references 4 and 5, but in those reports only graphical comparisons of the data were made. The present report presents all data from references 4 and 5 in tabular form. The experimental configuration studied was the previously mentioned simplified model of a jet VTOL aircraft engine exhaust. Decay rates of the jet have been varied through use of axisymmetric centerbodies, or plugs, placed along the jet centerline in the jet nozzle and plenum. These centerbodies, having either a flat or a hemispherical tip, caused nonuniform jet exit plane dynamic pressure profiles, and increased the jet decay rate over that of a uniform jet having no plug. Details of the experimental apparatus and procedure have been given in references 4 and 5.

#### SYMBOLS

Data are presented in nondimensional coefficient form or in both SI and U.S. customary units where appropriate. Measurements and calculations have been made in U.S. customary units.

$A_{\text{eff}}$	effective jet exit area, $\text{m}^2$ ( $\text{ft}^2$ )
$D_{\text{eff}}$	effective jet diameter, $\text{m}$ ( $\text{ft}$ )
$D_n$	nominal jet diameter, $\text{m}$ ( $\text{ft}$ )
$K$	constant in equation (3-1)
$\Delta L$	jet-induced lift loss, $\text{N}$ ( $\text{lb}$ )
$m$	jet mass flow rate, $\text{kg}/\text{sec}$ ( $\text{slug}/\text{sec}$ )
$M$	jet-induced pitch moment, $\text{N}\cdot\text{m}$ ( $\text{lb}\cdot\text{ft}$ )
$n$	exponent in equation (2-1)
$p_e$	jet exit static pressure, $\text{N}/\text{m}^2$ ( $\text{lb}/\text{ft}^2$ )
$q$	dynamic pressure, $\text{N}/\text{m}^2$ ( $\text{lb}/\text{ft}^2$ )

$q_{\infty}$	crossflow dynamic pressure, $N/m^2$ ( $lb/ft^2$ )
$Q$	jet volume flow rate $m^3/sec$ ( $ft^3/sec$ , or CFM)
$r$	radial coordinate measured from jet centerline, m (ft)
$R$	$V_{eff}/V_{\infty}$ , jet-to-crossflow velocity ratio, also ideal gas constant, $J/kg-K$ ( $ft\ lb/slug\ R$ )
$s$	arc length measured along jet trajectory, m (ft)
$T$	jet thrust, N (lb)
$T_e$	jet exit temperature, K (R)
$V_{eff}$	effective jet exit velocity, m/sec (ft/sec)
$V_{\infty}$	crossflow velocity, m/sec (ft/sec)
$x$	streamwise plate coordinate, origin a center of jet orifice, m (ft)
$y$	transverse plate coordinate, origin at center of jet orifice, m (ft)
$z$	coordinate perpendicular to plate, origin at center of jet orifice on plate surface, m (ft)
$\gamma$	specific heat ratio
$\rho_{\infty}$	crossflow density, $kg/m^3$ ( $slug/ft^3$ )

#### PRESENTATION OF RESULTS

Data for static or no crossflow nozzle calibration are presented in section 1, while the tables of jet-induced plate surface static pressures and total jet-induced lift loss and pitching moment are presented in section 2. Section 3 displays all jet centerline trajectory data. Section 4 lists the jet centerline

dynamic pressure decay data. These data have been obtained for the following jet-centerbody configurations: no centerbody, flat ended centerbody flush with the nozzle exit, flat centerbody submerged  $0.375 D_n$  below the nozzle exit, flat centerbody submerged  $0.875 D_n$  below the nozzle exit, flat centerbody submerged  $1.375 D_n$  below the nozzle exit, round ended centerbody flush with the nozzle exit, round centerbody submerged  $0.5 D_n$  below the nozzle exit, and round centerbody submerged  $1.0 D_n$  below the nozzle exit. At the beginning of each section of the current report, a brief description of the data presented is given, as well as a table which lists how the data are organized in that section. No detailed discussion of these results is given in the current report, since it is intended merely as a data tabulation. Such discussion of results appears in references 4 and 5.

## SECTION I: STATIC NOZZLE CALIBRATION DATA

Nozzles used in the current work and in references 4 and 5 have been calibrated in the static, or no crossflow case only, using the following procedure, first developed by Ziegler and Wooler in reference 6:

1. Record barometric pressure, nozzle exit pressure and exit temperature, and jet flow rate.
2. Traverse 0.25 in. above nozzle exit plane across jet and record  $q$  versus  $r$ .
3. Integrate product of  $r$  times  $q$  graphically to calculate jet thrust.
4. Calculate effective jet dynamic pressure from

$$q = \frac{p_e \left( \frac{T}{\dot{m}} \right)^2}{2RT_e - \frac{\gamma - 1}{\gamma} \left( \frac{T}{\dot{m}} \right)^2} \quad (1-1)$$

where  $(p_e, T_e)$  are exit plane pressure and temperature,  $T$  is the measured jet thrust,  $\dot{m}$  is the jet mass flow rate, and  $\gamma$  equals the specific heat ratio.

5. Calculate effective jet velocity and effective jet area from

$$A_{\text{eff}} = T/2q \quad (1-2)$$

$$V_{\text{eff}} = \frac{\dot{m}RT_e}{p_e A_{\text{eff}}} \quad (1-3)$$

and 
$$D_{\text{eff}} = \sqrt{\frac{4 A_{\text{eff}}}{\pi}} \quad (1-4)$$

The calculated effective exit plane velocity,  $V_{\text{eff}}$ , has been used to calculate the nondimensional velocity ratio,  $R$ , for the crossflow data using

$$R = V_{\text{eff}} / \sqrt{2q_{\infty} / \rho_{\infty}} \quad (1-5)$$

where the subscript  $\infty$  refers to crossflow free-stream conditions. This generally leads to no more than a 5 percent difference between  $R$  values in the current work and values calculated as the square root of the ratio of the dynamic pressures. Since the estimated accuracy of the computed  $R$  values in the current work is no better than 5 percent, largely due to the measurement of the jet thrust,  $T$ , the current  $R$  values may be considered equivalent to  $R$  values calculated in the more traditional manner. One exception to this is for the flat-ended centerbody flush case, where it is estimated that inaccuracies in measurement of  $T$ , and hence in  $R$ , are at least 10 percent. This is due to the size of the pitot static probe used [0.159-cm (1/16-in.) diameter probe body], which is of the same order as the width of the annular jet exit region, 0.318 cm (1/8 in.). Thus, it is believed that  $q$  values are reduced due to a blockage effect of the probe, as well as being averaged spatially in the shear layers at the edges of the jet.

Nozzle exit plane dynamic pressure profiles are shown in figures 1 to 8, and calibration data are tabulated in table 1. The local dynamic pressure in figures 1 to 8 is actually proportional to the vertical distance between the total pressure curve and the static pressure curve. Both curves were recorded at a distance of 0.635 cm (1/4 inch) above the nozzle exit plane, by first recording the static pressure distribution, and then moving the pitot static probe upwards 0.635 cm (1/4 inch) and recording the total pressure curve.



Table 1. Tabulated Static Nozzle Calibration Data.

Nozzle Configuration	$\dot{Q}$ m <sup>3</sup> /sec (CFM)	$T_e$ K (R)	$P_e$ kPa (lb <sub>f</sub> /ft <sup>2</sup> )	$T$ N (lb <sub>f</sub> )	$\dot{m}$ kg/sec (lb <sub>m</sub> /sec)	$q$ kPa (lb <sub>f</sub> /ft <sup>2</sup> )	$V_{eff}$ m/sec (ft/sec)	$b_{eff}$ m (ft)
No plug	0.0779 (165)	292 (525)	102.1 (2132)	12.7 (2.86)	0.0936 (0.2063)	11.6 (242.9)	140.2 (460.0)	0.0264 (0.0865)
Round plug flush	0.0375 (79.5)	292 (526)	100.7 (2103)	6.14 (1.38)	0.0452 (0.0996)	11.4 (238.3)	140.1 (459.6)	0.0185 (0.0607)
Round plug 0.5 D <sub>n</sub> down	0.0632 (134)	293 (527)	102.4 (2139)	11.2 (2.51)	0.0761 (0.1678)	13.6 (284.8)	152.1 (499.0)	0.0228 (0.0749)
Round plug 1.0 D <sub>n</sub> down	0.0778 (164.8)	299 (538)	102.1 (2132)	13.3 (2.99)	0.0936 (0.2063)	12.57 (262.6)	147.5 (484.0)	0.0260 (0.0852)
Square plug flush	0.0269 (57.0)	291 (524)	101.4 (2119)	4.08 (0.918)	0.0324 (0.0714)	9.91 (206.9)	129.5 (425.0)	0.0162 (0.0531)
Square plug 0.375 D <sub>n</sub> down	0.0318 (67.4)	295 (531)	100.0 (2088)	4.89 (1.099)	0.0383 (0.0844)	9.90 (206.7)	131.4 (431.0)	0.0177 (0.0582)
Square plug 0.875 D <sub>n</sub> down	0.0589 (124.7)	293 (527)	104.2 (2177)	9.70 (2.18)	0.0709 (0.1562)	12.0 (250.9)	141.5 (464.1)	0.0228 (0.0749)
Square plug 1.375 D <sub>n</sub> down	0.0698 (147.8)	296 (533)	101.2 (2113)	11.5 (2.59)	0.0840 (0.1851)	11.6 (241.4)	141.6 (464.5)	0.0252 (0.0826)

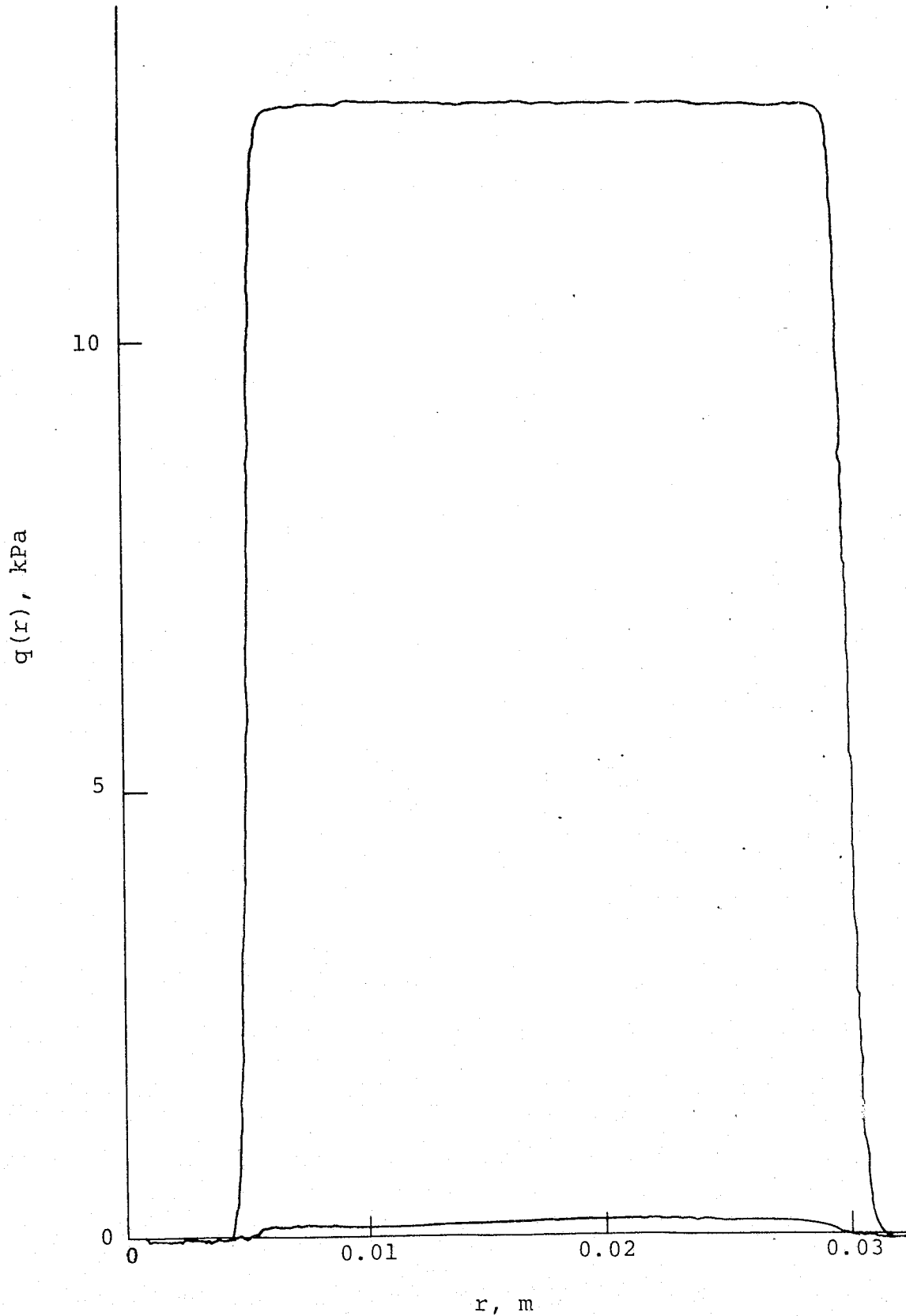


Figure 1. Static nozzle exit plane dynamic pressure profile; no plug.

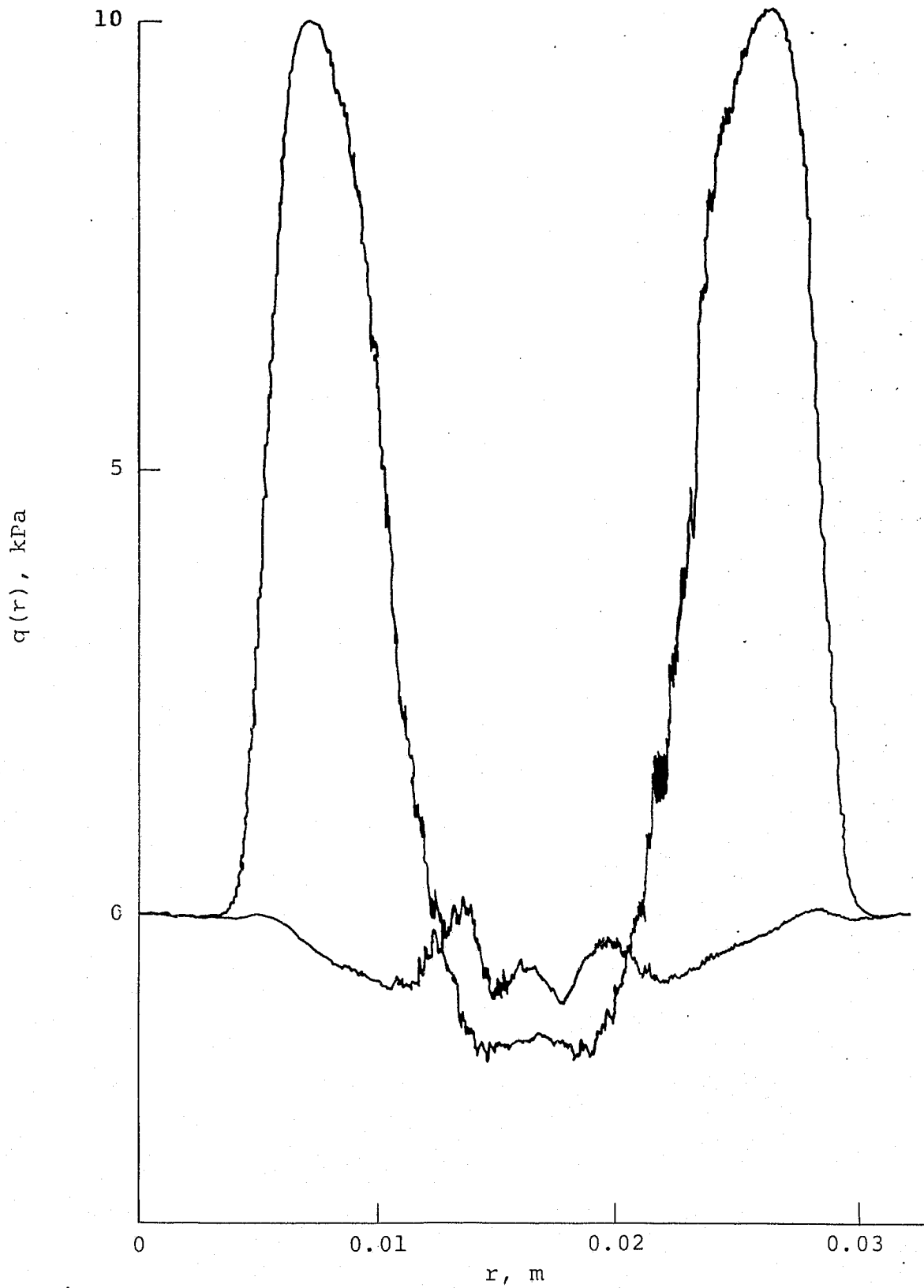


Figure 2. Static nozzle exit plane dynamic pressure profile; hemispherical tipped plug flush.

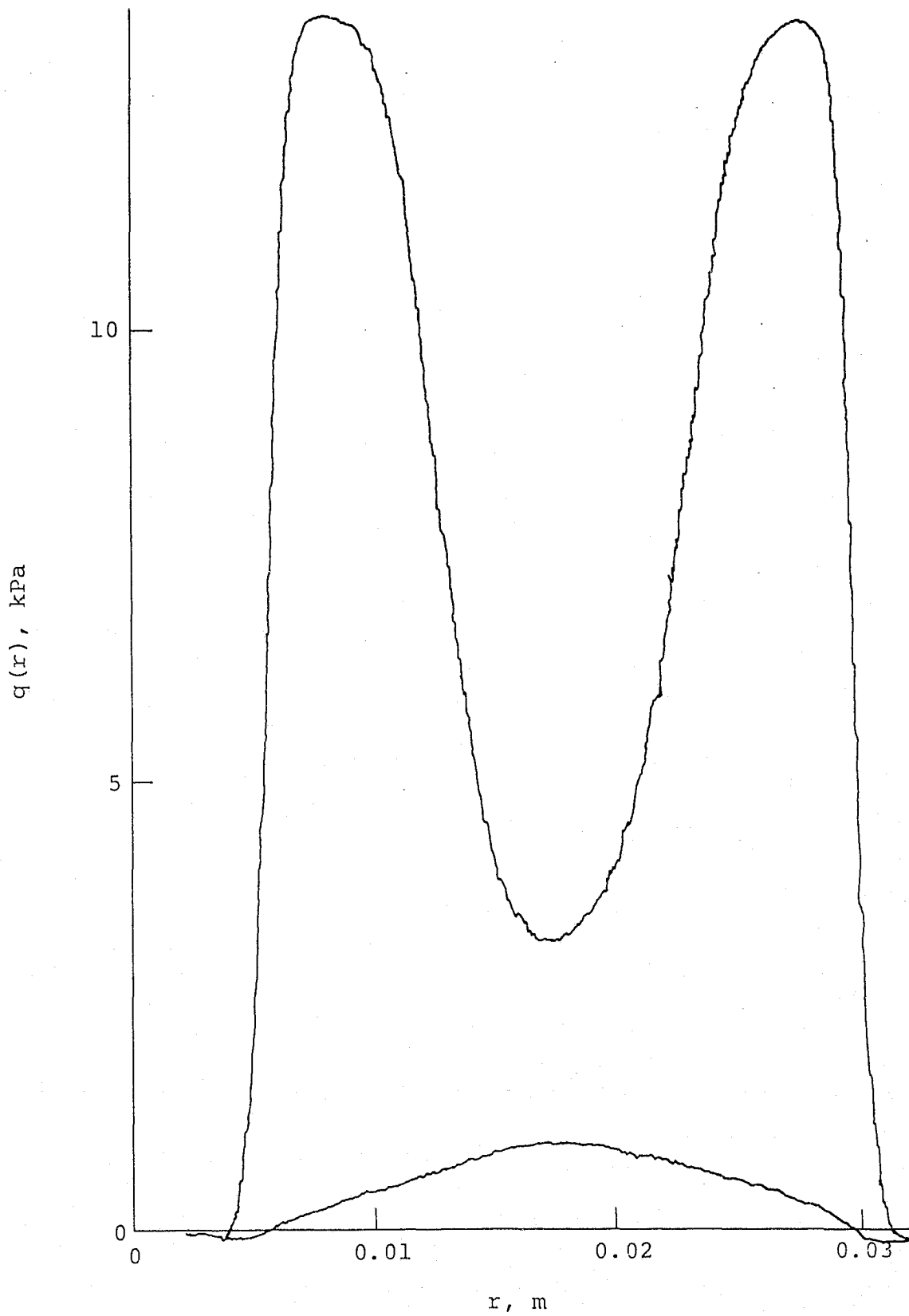


Figure 3. Static nozzle exit plane dynamic pressure profile; hemispherical tipped plug down  $0.50 D_n$ .

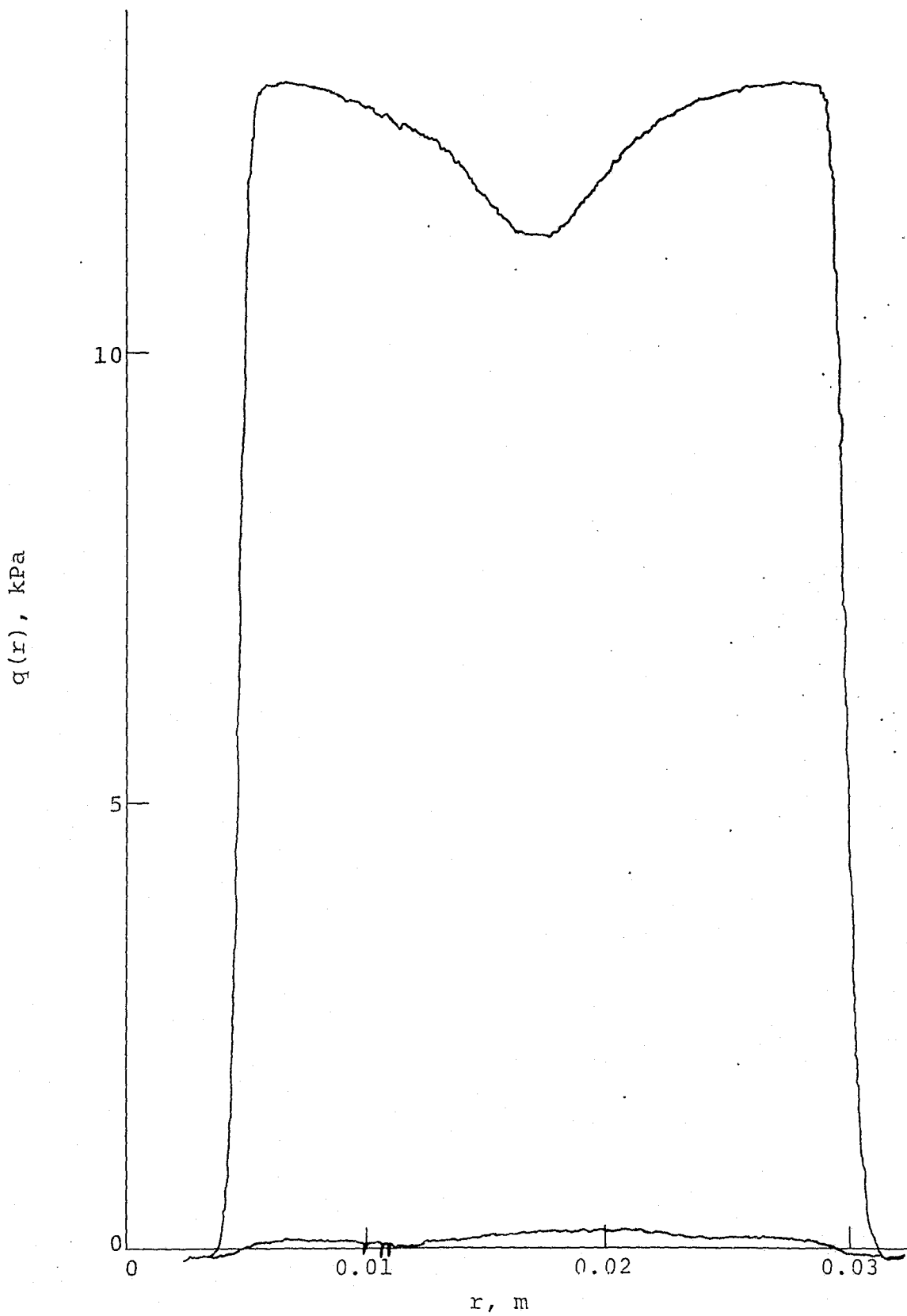


Figure 4. Static nozzle exit plane dynamic pressure profile; hemispherical tipped plug down 1.0 D.  
n

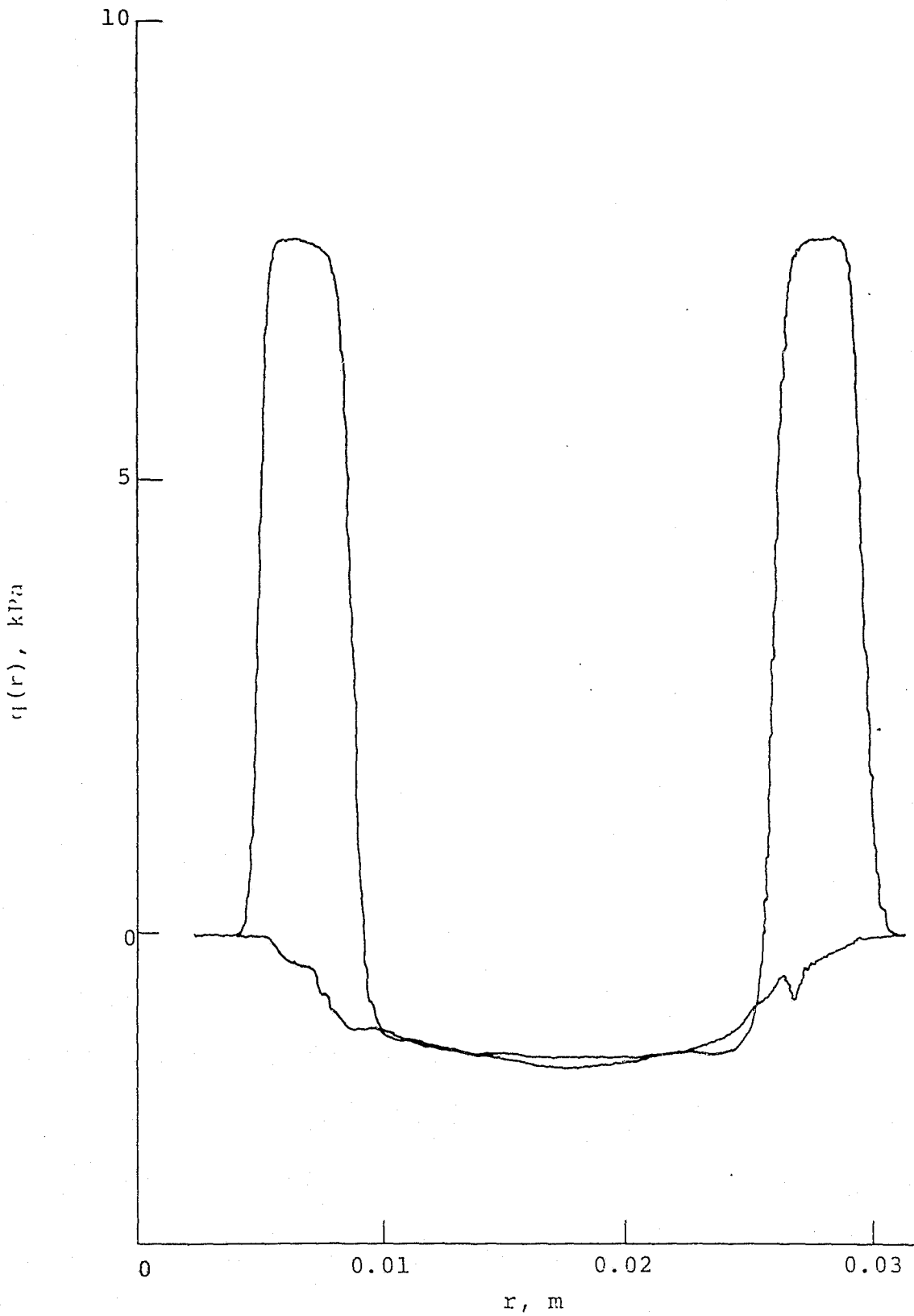


Figure 5. Static nozzle exit plane dynamic pressure profile; flat tipped plug flush.

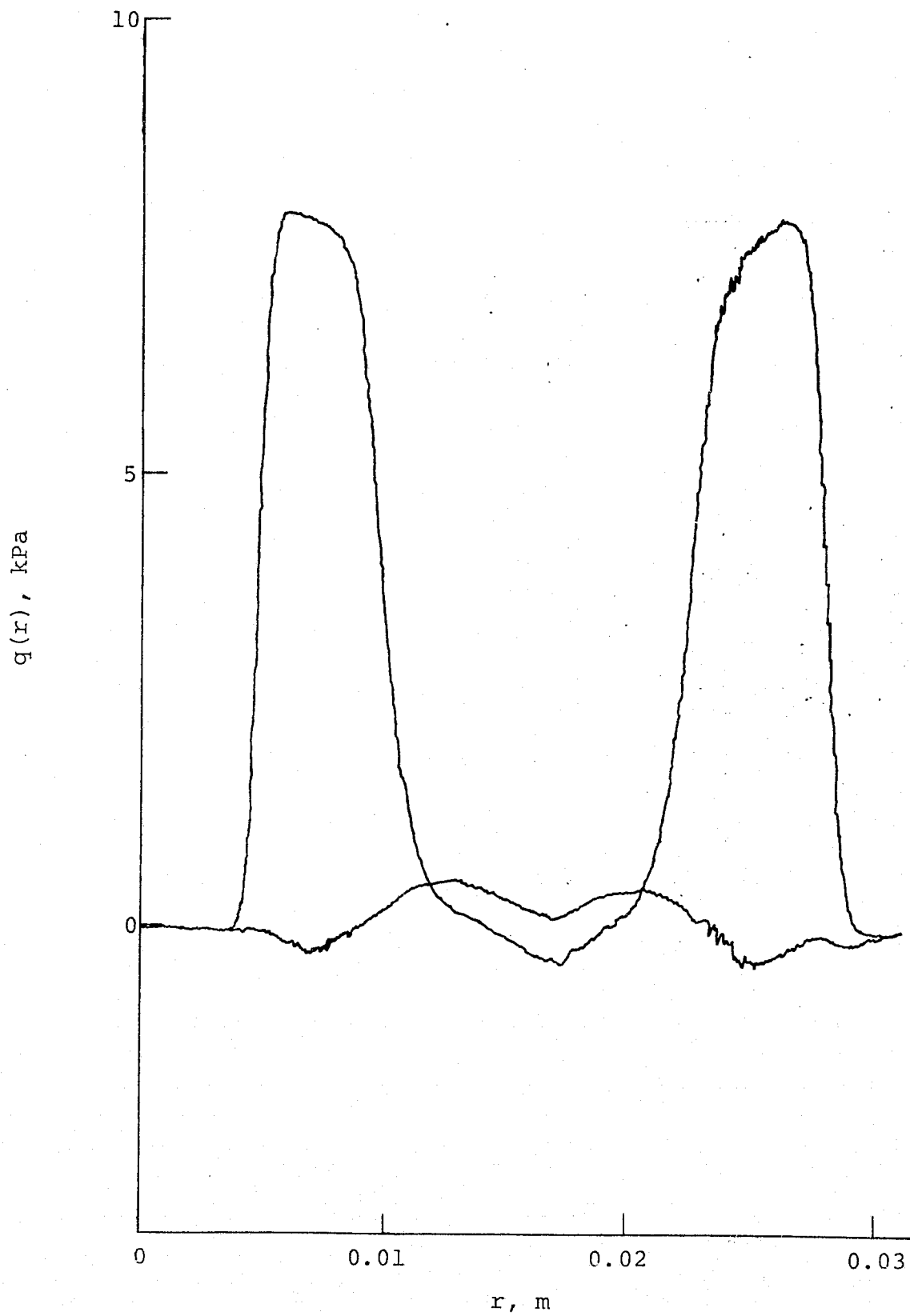


Figure 6. Static nozzle exit plane dynamic pressure profile; flat tipped plug down  $0.375 D_n$ .

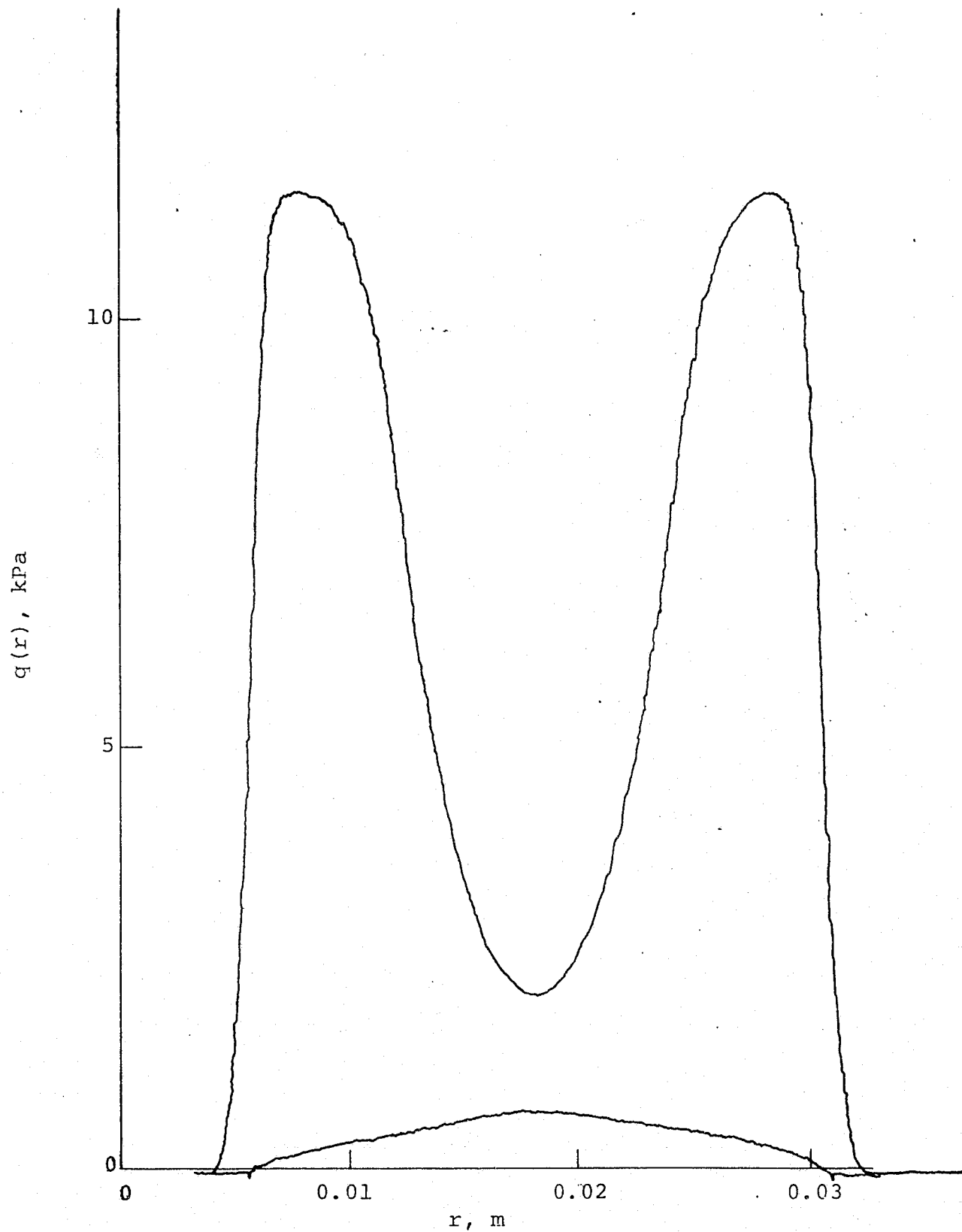


Figure 7. Static nozzle exit plane dynamic pressure profile; flat tipped plug down  $0.875 D_n$ .



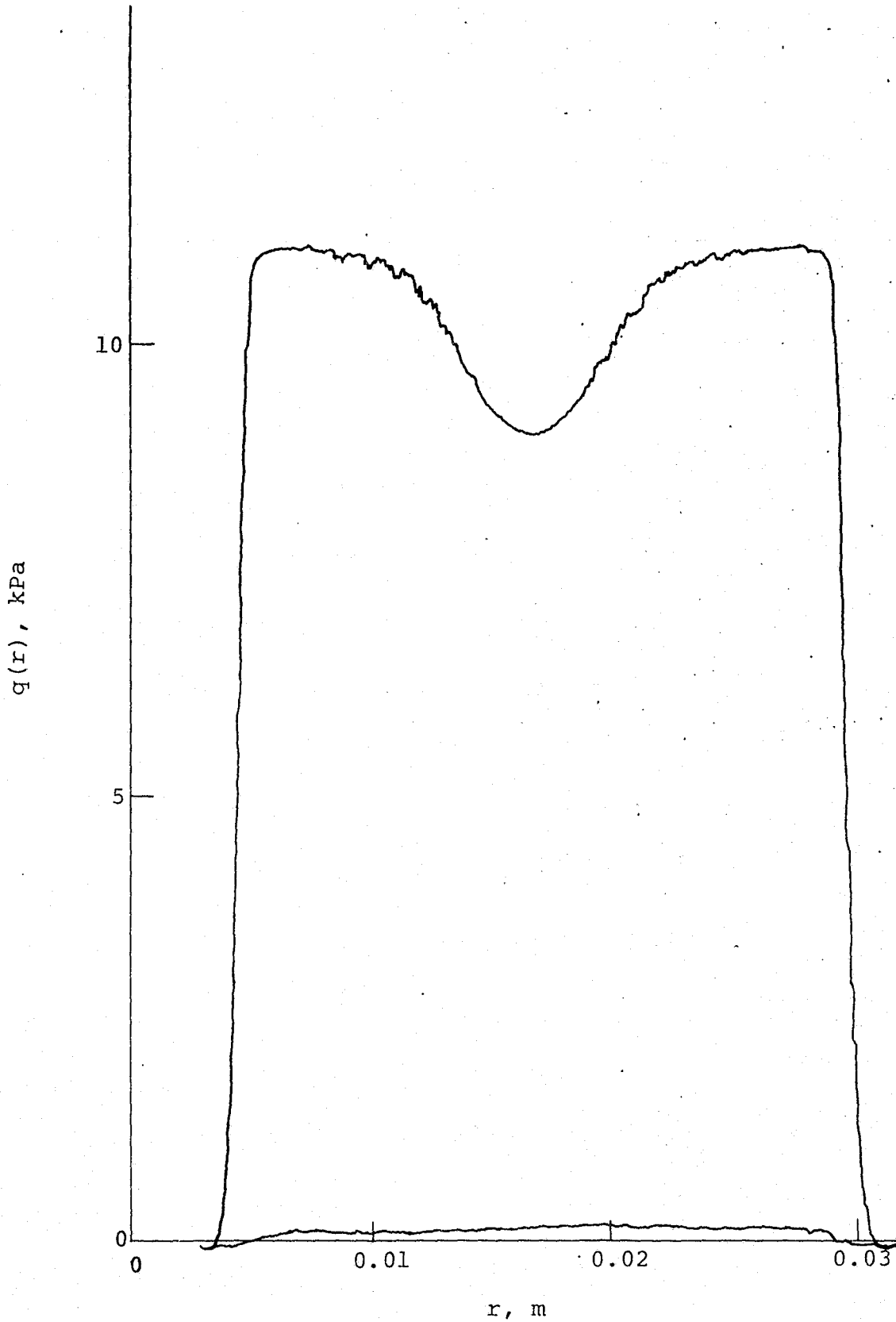


Figure 8. Static nozzle exit plane dynamic pressure profile; flat tipped plug down  $1.375 D_n$ .

## SECTION 2: PRESSURE COEFFICIENTS AND INTEGRATED LOAD DATA

In this section the experimentally measured plate surface pressures and integrated loads are presented in tabular form. All pressures have been non-dimensionalized by the crossflow dynamic pressure,  $q_\infty$ , and have been calculated as the difference between the static pressures with the jet flow on and off. The integrated lift loss and pitching moment data have been calculated by integration of the pressure data. These have been calculated assuming the pressure to be constant on each panel centered around the individual pressure ports. In figure 9 the port locations on the plate are shown, and table 2 lists the radial locations of each port.

At the top of each pressure distribution table, pertinent data defining each nozzle configuration have been listed, including the jet-to-crossflow velocity ratio,  $R$ , the plug submergence depth and centerbody diameter, in nominal jet diameters, the effective jet diameter,  $D_{eff}$ , in inches, the plug diameter, in inches, the jet volume flow rate,  $Q$ , in  $m^3/sec$  and CFM, the crossflow velocity,  $V_\infty$ , in  $m/sec$  and  $ft/sec$ , and the jet thrust,  $T$ , in  $N$  and  $lb$ . Also included are the dates each data run was made.

The data for each configuration may be found in the following tables.

Configuration	R	Table (part a. for pressures, b. for loads)
No Plug	9.11	2-1
	7.81	2-2
	6.51	2-3
	5.21	2-4
	3.91	2-5
	2.61	2-6
Round Plug Flush	9.08	2-7
	6.81	2-8
	4.54	2-9
	2.27	2-10

Configuration	R	Table (part a. for pressures, b. for loads)
Round Plug Down 0.5 $D_n$	10.35	2-11
	7.76	2-12
	5.18	2-13
	2.59	2-14
Round Plug Down 1.0 $D_n$	9.98	2-15
	7.49	2-16
	4.49	2-17
	2.5	2-18
Flat Plug Flush	8.78	2-19
	6.58	2-20
	4.42	2-21
	2.21	2-22
Flat Plug Down 0.375 $D_n$	8.72	2-23
	6.53	2-24
	4.36	2-25
	2.18	2-26
Flat Plug Down 0.875 $D_n$	9.49	2-27
	7.11	2-28
	4.74	2-29
	2.37	2-30
Flat Plug Down 1.375 $D_n$	9.48	2-31
	7.1	2-32
	4.74	2-33
	2.37	2-34

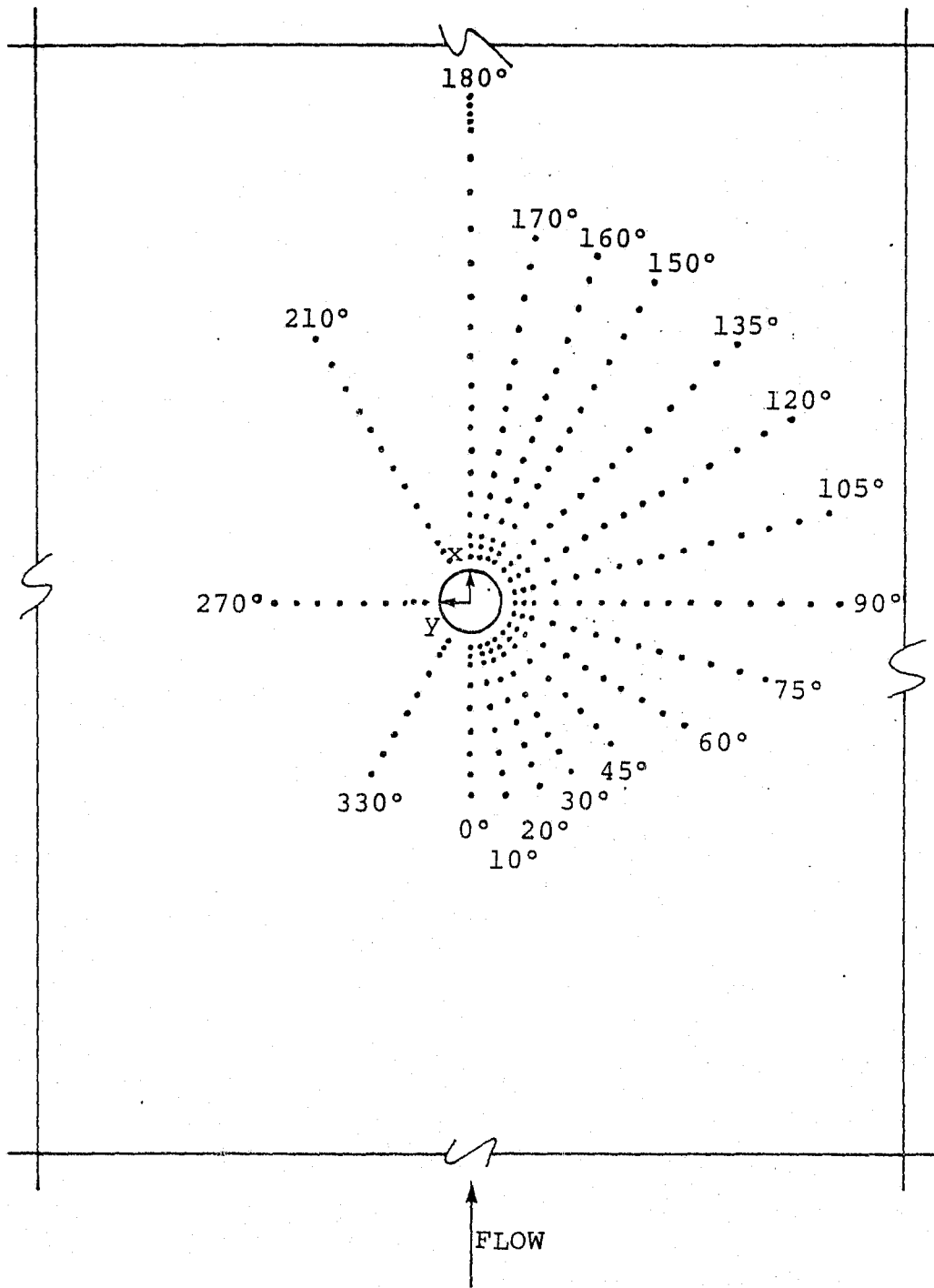


Figure 9. Plate pressure port distribution.

Table 2. Flat plate pressure port locations.

Pressure Port No.	Radial Distance	
	cm	(in.)
1	1.905	(0.750)
2	2.223	(0.875)
3	2.540	(1.000)
4	3.493	(1.375)
5	4.445	(1.750)
6	5.398	(2.125)
7	6.350	(2.500)
8	7.303	(2.875)
9	8.255	(3.250)
10	9.208	(3.625)
11	10.160	(4.000)
12	11.430	(4.500)
13	12.700	(5.000)
14	13.970	(5.500)
15	15.240	(6.000)
16	16.510	(6.500)
17	17.780	(7.000)
18	19.050	(7.500)
19	20.320	(8.000)
20	20.638	(8.125)
21	20.955	(8.250)
22	21.273	(8.375)
23	21.590	(8.500)

Table 2-1a. Pressure coefficient data for no plug configuration, R = 9.11

NO PLUG 6-2A-76  
 R = 9.11 PLUG DEPTH = .000 EFFECTIVE JET DIAMETER = 1.04 CENTROUDY DIAMETER = 0.00  
 JET FLOW RATE = 4.672 CMM ( 165.00 CFM ) FREE STREAM VELOCITY = 15.4 M/S ( 50.5 F/S )  
 JET EFFECTIVE VELOCITY = 140.2 M/S ( 460.0 F/S ) JET EFFECTIVE THRUST = 12.727 N ( 2.8610 LB )

PORT	NON-DIMENSIONALIZED PRESSURES														
	ANGLE (DEGREES)														
	0	10	20	30	45	60	75	90	105	120	135	150	160	170	180
1	0.0811	0.0762	0.0885	-0.2901	-0.7104	-1.1529	-1.4749	-1.5584	-1.4749	-1.2217	-1.0152	-0.8653	-0.7497	-0.7079	-0.6391
2	0.0000	0.0000	-0.0885	-0.2778	-0.6219	-0.9832	-1.1799	-1.2758	-1.1356	-1.0054	-0.8087	-0.6760	-0.5531	-0.5359	-0.5402
3	-0.0737	-0.0615	-0.1672	-0.2778	-0.5113	-0.8308	-1.0004	-1.0521	-0.9390	-0.8456	-0.6735	-0.5285	-0.4007	-0.4031	-0.4326
4	-0.1524	-0.1450	-0.1917	-0.2704	-0.3958	-0.5555	-0.6981	-0.7399	-0.6981	-0.5506	-0.4130	-0.3196	-0.2458	-0.2483	-0.2286
5	-0.1622	-0.1745	-0.1991	-0.2581	-0.3589	-0.4474	-0.5359	-0.5678	-0.5408	-0.4228	-0.3245	-0.2237	-0.1917	-0.1794	-0.1819
6	-0.1647	-0.1745	-0.1917	-0.2237	-0.3097	-0.4007	-0.4425	-0.4572	-0.3933	-0.3318	-0.2458	-0.1770	-0.1278	-0.1426	-0.1499
7	-0.1426	-0.1549	-0.1819	-0.2114	-0.2606	-0.3171	-0.3835	-0.3908	-0.3638	-0.2753	-0.1917	-0.1598	-0.1131	-0.1254	-0.1082
8	-0.1450	-0.1549	-0.1696	-0.1917	-0.2409	-0.2655	-0.3269	-0.3417	-0.3245	-0.2360	-0.1549	-0.1303	-0.1057	-0.1082	-0.0959
9	-0.1131	-0.1475	-0.1426	-0.1672	-0.2139	-0.2409	-0.2704	-0.2827	-0.2507	-0.2040	-0.1377	-0.1008	-0.0959	-0.0836	-0.0983
10	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2237	-0.2532	-0.2630	-0.2409	-0.1844	-0.1278	-0.0787	-0.0664	-0.0836	-0.0639
11	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1770	-0.2261	-0.2384	-0.2188	-0.1721	-0.1180	-0.0516	-0.0565	-0.0885	-0.0615
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1966	-0.2188	-0.1844	-0.1524	-0.0983	-0.0664	-0.0418	-0.0615	-0.0516
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1672	-0.1647	-0.1573	-0.1327	-0.0664	-0.0295	-0.0197	-0.0442	-0.0393
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1819	-0.1573	-0.1204	-0.0664	0.0000	-0.0098	-0.0369	-0.0442
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1524	-0.1475	-0.1057	-0.0590	0.0000	-0.0123	-0.0320	-0.0270
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0467
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0320
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0198
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0221
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0344
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0295
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0197

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Table 2-lb. Lift loss and pitching moment data for no plug configuration, R = 9.11.

PORT	NON-DIMENSIONAL AREA	M N -M	M I, R-FT	M/TD	N	L LH	L/T
1	1.5194	0.000348	0.000257	0.001035	-0.101922	-0.0222912	-0.0000008
2	2.3297	0.000486	0.000358	0.001447	-0.146834	-0.0330008	-0.011537
3	4.2977	0.000726	0.000536	0.002162	-0.238577	-0.053632	-0.018746
4	8.1179	0.000868	0.000640	0.002584	-0.364467	-0.081932	-0.028638
5	12.9800	0.000794	0.000586	0.002364	-0.493712	-0.110986	-0.038793
6	18.8840	0.000409	0.000301	0.001217	-0.622041	-0.139835	-0.048876
7	25.8298	-0.000107	-0.000079	-0.000319	-0.751503	-0.168938	-0.059049
8	33.8175	-0.000871	-0.000642	-0.002593	-0.882218	-0.198323	-0.069319
9	42.8471	-0.001812	-0.001336	-0.005394	-1.007883	-0.226572	-0.079193
10	52.9185	-0.002388	-0.000286	-0.001155	-1.101816	-0.247688	-0.086574
11	62.1073	0.000987	0.000728	0.002939	-1.177864	-0.264784	-0.092549
12	78.3142	0.004192	0.003092	0.012480	-1.279168	-0.287557	-0.100509
13	101.1776	0.007636	0.005632	0.022734	-1.390100	-0.312495	-0.109226
14	121.5520	0.011178	0.008245	0.033280	-1.464216	-0.329156	-0.115049
15	143.7786	0.014902	0.010991	0.044366	-1.535350	-0.345147	-0.120638
16	167.8575	0.015290	0.011278	0.045523	-1.537704	-0.345676	-0.120823
17	193.7886	0.015598	0.011505	0.046441	-1.539438	-0.346066	-0.120960
18	221.5719	0.015707	0.011586	0.046765	-1.540010	-0.346194	-0.121005
19	239.8771	0.015880	0.011713	0.047278	-1.540858	-0.346305	-0.121071
20	247.4017	0.015991	0.011795	0.047611	-1.541400	-0.346507	-0.121114
21	255.0421	0.016090	0.011868	0.047905	-1.541871	-0.346613	-0.121151
22	262.7983	0.016090	0.011868	0.047905	-1.541871	-0.346613	-0.121151
23	270.6702	0.016160	0.011920	0.048113	-1.542195	-0.346686	-0.121176

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Table 2-2b. Lift loss and pitching moment data for no plug configuration, R = 7.81.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N = M	LB-FT		N	LR	
1	1.5194	0.000627	0.000463	0.001867	-0.176763	-0.039736	-0.013089
2	2.3297	0.000912	0.000673	0.002715	-0.253945	-0.057087	-0.019953
3	4.2977	0.001490	0.001099	0.004436	-0.414092	-0.093088	-0.032537
4	8.1179	0.002033	0.001499	0.006052	-0.631208	-0.141896	-0.049597
5	12.9800	0.002407	0.001776	0.007167	-0.854808	-0.192161	-0.067166
6	18.8840	0.002660	0.001962	0.007918	-1.081935	-0.243219	-0.085012
7	25.8298	0.002528	0.001939	0.007825	-1.303940	-0.293126	-0.102456
8	33.8175	0.002691	0.001985	0.008012	-1.526162	-0.343001	-0.119916
9	42.8471	0.002621	0.001934	0.007805	-1.746698	-0.392658	-0.137245
10	52.9185	0.005910	0.004360	0.017597	-1.913300	-0.430110	-0.150335
11	62.1073	0.008940	0.006594	0.026618	-2.049123	-0.460643	-0.161008
12	78.3142	0.015529	0.011454	0.046234	-2.229688	-0.501234	-0.175195
13	101.1776	0.023827	0.017575	0.070940	-2.441398	-0.540826	-0.191830
14	121.5520	0.032528	0.023992	0.096843	-2.581715	-0.580370	-0.202855
15	143.7786	0.041152	0.030354	0.122520	-2.718321	-0.611078	-0.213589
16	167.8575	0.041888	0.030897	0.124712	-2.722781	-0.612081	-0.213940
17	193.7886	0.042742	0.031527	0.127254	-2.727584	-0.613161	-0.214317
18	221.5719	0.043423	0.032029	0.129281	-2.731158	-0.613964	-0.214598
19	239.8771	0.043921	0.032396	0.130762	-2.733607	-0.614515	-0.214790
20	247.4017	0.044176	0.032584	0.131524	-2.734845	-0.614793	-0.214888
21	255.0421	0.044341	0.032706	0.132014	-2.735632	-0.614970	-0.214949
22	262.7983	0.044536	0.032850	0.132595	-2.736550	-0.615176	-0.215021
23	270.6702	0.044798	0.033043	0.133376	-2.737765	-0.615458	-0.215117

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Table 2-3b. Lift loss and pitching moment data for no plug configuration, R = 6.51.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N -M	LR-FT		N	LR	
1	1.5194	0.001191	0.000878	0.003545	-0.275404	-0.061911	-0.021640
2	2.3297	0.001749	0.001290	0.005208	-0.396504	-0.089134	-0.031155
3	4.2977	0.002940	0.002168	0.008752	-0.646586	-0.145352	-0.050805
4	8.1179	0.004673	0.003447	0.013914	-0.987040	-0.221887	-0.077556
5	12.9800	0.006446	0.004755	0.019192	-1.326425	-0.298180	-0.104222
6	18.8840	0.008464	0.006243	0.025198	-1.661716	-0.373554	-0.130568
7	25.8298	0.010677	0.007875	0.031787	-1.995755	-0.448646	-0.156814
8	33.8175	0.013267	0.009786	0.039498	-2.323587	-0.522342	-0.182573
9	42.8471	0.016050	0.011838	0.047785	-2.645552	-0.594720	-0.207871
10	52.9185	0.023028	0.016986	0.068561	-2.904256	-0.652877	-0.228199
11	62.1073	0.029498	0.021758	0.087824	-3.114582	-0.700158	-0.244725
12	78.3142	0.042520	0.031363	0.126592	-3.402719	-0.764931	-0.267365
13	101.1776	0.060548	0.044660	0.180267	-3.754222	-0.843949	-0.294984
14	121.5520	0.078015	0.057544	0.232272	-3.998760	-0.898921	-0.314198
15	143.7786	0.096312	0.071040	0.286746	-4.230724	-0.951067	-0.332425
16	167.8575	0.098214	0.072443	0.292409	-4.242246	-0.953657	-0.333330
17	193.7886	0.100231	0.073930	0.298412	-4.253587	-0.956206	-0.334221
18	221.5719	0.102463	0.075577	0.305060	-4.265309	-0.958841	-0.335142
19	239.8771	0.103918	0.076650	0.309390	-4.272467	-0.960451	-0.335704
20	247.4017	0.104501	0.077080	0.311126	-4.275293	-0.961086	-0.335927
21	255.0421	0.105086	0.077511	0.312867	-4.278085	-0.961713	-0.336146
22	262.7983	0.105689	0.077956	0.314662	-4.280918	-0.962350	-0.336368
23	270.6702	0.106397	0.078418	0.316770	-4.284199	-0.963088	-0.336626

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Table 2-4a. Pressure coefficient data for no plug configuration, R = 5.21.

PORT	NON-DIMENSIONALIZED PRESSURES														
	0	10	20	30	45	60	75	90	105	120	135	150	160	170	180
1	0.2345	0.1899	0.0446	-0.1940	-0.6873	-1.4461	-2.1935	-2.6131	-2.4921	-2.0775	-1.6969	-1.5857	-1.4023	-1.2984	-1.2716
2	0.1339	0.1039	0.0179	-0.1720	-0.5883	-1.1556	-1.6839	-2.0296	-2.0361	-1.7131	-1.4169	-1.2757	-1.1288	-1.0671	-1.0647
3	0.0665	0.0454	-0.0203	-0.1745	-0.5064	-0.9129	-1.3471	-1.6433	-1.6993	-1.4680	-1.1945	-1.0290	-0.9129	-0.8878	-0.8724
4	-0.0073	-0.0219	-0.0682	-0.1688	-0.3457	-0.5794	-0.8375	-1.0347	-1.1174	-1.0030	-0.7888	-0.6476	-0.5802	-0.5567	-0.5827
5	-0.0316	-0.0454	-0.0714	-0.1300	-0.2597	-0.4269	-0.5948	-0.7336	-0.8034	-0.7466	-0.5745	-0.4609	-0.4439	-0.4423	-0.4358
6	-0.0398	-0.0414	-0.0649	-0.1096	-0.2045	-0.3287	-0.4536	-0.5478	-0.5997	-0.5713	-0.4593	-0.3400	-0.3343	-0.3700	-0.3522
7	-0.0414	-0.0406	-0.0633	-0.0893	-0.1639	-0.2516	-0.3465	-0.4374	-0.4820	-0.4723	-0.3554	-0.2637	-0.2572	-0.3116	-0.2978
8	-0.0333	-0.0414	-0.0511	-0.0755	-0.1355	-0.1972	-0.2775	-0.3489	-0.3895	-0.3814	-0.2954	-0.2013	-0.1923	-0.2508	-0.2516
9	-0.0276	-0.0390	-0.0414	-0.0649	-0.1128	-0.1729	-0.2337	-0.2840	-0.3246	-0.3157	-0.2532	-0.1607	-0.1623	-0.2126	-0.2175
10	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1363	-0.1915	-0.2337	-0.2646	-0.2678	-0.2126	-0.1307	-0.1185	-0.1458	-0.2053
11	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1128	-0.1623	-0.2021	-0.2280	-0.2280	-0.1866	-0.1079	-0.0844	-0.1550	-0.1923
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1282	-0.1623	-0.1964	-0.1907	-0.1607	-0.0771	-0.0665	-0.1169	-0.1615
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0941	-0.1298	-0.1582	-0.1591	-0.1307	-0.0617	-0.0552	-0.1063	-0.1493
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1096	-0.1290	-0.1298	-0.1039	-0.0552	-0.0316	-0.0852	-0.1242
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0998	-0.0990	-0.1120	-0.0852	-0.0406	-0.0162	-0.0682	-0.1209
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1144
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1055
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0917
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0917
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0933
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0812
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0917
23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0868

NO PLUG 6-29-76  
 R = 5.21 PLUG DEPTH = .000 EFFECTIVE JET DIAMETER = 1.04 CENTERBODY DIAMETER = 0.00  
 JET FLOW RATE = 4.672 CMM ( 165.00 CFM ) FREE STREAM VELOCITY = 26.9 M/S ( 88.4 F/S )  
 JET EFFECTIVE VELOCITY = 140.4 M/S ( 460.8 F/S ) JET EFFECTIVE THRUST = 12.747 N ( 2.8656 L.B )

Table 2-4b. Lift loss and pitching moment data for no plug configuration, R = 5.21.

PORT	NON-DIMENSIONAL AREA	M - M	M LB-FT	M/TD	N	L LH	L/T
1	1.5170	0.002466	0.001819	0.007323	-0.487979	-0.109698	-0.038281
2	2.3260	0.003708	0.002735	0.011014	-0.699101	-0.157158	-0.054843
3	4.2908	0.006516	0.004806	0.019352	-1.124911	-0.252880	-0.088247
4	8.1049	0.011109	0.008194	0.032096	-1.669765	-0.375363	-0.130989
5	12.9591	0.016463	0.012143	0.048897	-2.181609	-0.490426	-0.171142
6	18.8536	0.022526	0.016615	0.066905	-2.661061	-0.598206	-0.208754
7	25.7883	0.029208	0.021544	0.086749	-3.111756	-0.699523	-0.244110
8	33.7631	0.036188	0.026692	0.107481	-3.529236	-0.793372	-0.276860
9	42.7782	0.043595	0.032156	0.129480	-3.925043	-0.882350	-0.307910
10	52.8335	0.054230	0.040000	0.161068	-4.252594	-0.955983	-0.333606
11	62.0074	0.063316	0.046702	0.188054	-4.506755	-1.013119	-0.353544
12	78.1883	0.079646	0.058747	0.236554	-4.844899	-1.089133	-0.380071
13	101.0149	0.101444	0.074825	0.301297	-5.234450	-1.176704	-0.410630
14	121.3566	0.119543	0.088175	0.355053	-5.485691	-1.233183	-0.430339
15	143.5475	0.137028	0.101072	0.406982	-5.712190	-1.284100	-0.448108
16	167.5877	0.139935	0.103216	0.415618	-5.729803	-1.288060	-0.449489
17	193.4771	0.143044	0.105509	0.424852	-5.747291	-1.291991	-0.450861
18	221.2157	0.146147	0.107798	0.434067	-5.763578	-1.295652	-0.452139
19	239.4914	0.148327	0.109406	0.440542	-5.774308	-1.298065	-0.452981
20	247.0040	0.149253	0.110089	0.443294	-5.779797	-1.299074	-0.453333
21	254.6321	0.150084	0.110702	0.445760	-5.782761	-1.299965	-0.453644
22	262.3758	0.151051	0.111415	0.448633	-5.787308	-1.300987	-0.454000
23	270.2351	0.151994	0.112111	0.451434	-5.791677	-1.301969	-0.454343

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Table 2-5b. Lift loss and pitching moment for no plug configuration, R = 3.91.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L	L		L/I
		N	-M			LA	LA	
1	1.5170	0.006270	0.004625	0.018623	-0.890271	-0.200133	-0.069840	
2	2.3260	0.009495	0.007004	0.028202	-1.263434	-0.284020	-0.099113	
3	4.2900	0.016961	0.012510	0.050374	-1.992027	-0.447988	-0.156332	
4	8.1049	0.029776	0.021963	0.088437	-2.849968	-0.640673	-0.223573	
5	12.9591	0.044749	0.033007	0.132908	-3.574731	-0.808095	-0.281998	
6	18.8536	0.061852	0.045622	0.183706	-4.249705	-0.955334	-0.333379	
7	25.7883	0.080756	0.059566	0.239851	-4.832962	-1.086450	-0.379134	
8	33.7631	0.100551	0.074167	0.298645	-5.348525	-1.202348	-0.419579	
9	42.7782	0.121164	0.089370	0.359866	-5.803611	-1.304652	-0.455279	
10	52.8335	0.141835	0.104617	0.421260	-6.229826	-1.400465	-0.488715	
11	62.0074	0.158653	0.117023	0.471212	-6.544754	-1.471261	-0.513420	
12	70.1883	0.186086	0.137257	0.552690	-6.969232	-1.566683	-0.546719	
13	101.0149	0.219436	0.161856	0.651741	-7.430696	-1.670420	-0.582920	
14	121.3566	0.246380	0.181730	0.731760	-7.739375	-1.739812	-0.607135	
15	143.5275	0.274115	0.202187	0.814142	-8.023215	-1.803619	-0.629402	
16	167.5877	0.281139	0.207368	0.835004	-8.065764	-1.813184	-0.632740	
17	193.4771	0.288765	0.212993	0.857652	-8.108656	-1.822826	-0.636105	
18	221.2157	0.296811	0.218928	0.881552	-8.150901	-1.832322	-0.639419	
19	239.4914	0.301760	0.222578	0.896249	-8.175255	-1.837797	-0.641329	
20	247.0040	0.303857	0.224125	0.902480	-8.185420	-1.840082	-0.642127	
21	254.6321	0.305954	0.225672	0.908708	-8.195429	-1.842332	-0.642912	
22	262.3758	0.308141	0.227285	0.915202	-8.205708	-1.844643	-0.643718	
23	270.2351	0.310402	0.228952	0.921917	-8.216181	-1.846997	-0.644540	

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Table 2-6b. Lift loss and pitching moment for no plug configuration, R = 2.61.

PORT	NON-DIMENSIONAL AREA	M		M/D	L		L/T
		N	-M		N	LR	
1	1.5170	0.014306	0.010552	0.042491	-1.503636	-0.338017	-0.117957
2	2.3260	0.021532	0.015882	0.063251	-2.097196	-0.471450	-0.164520
3	4.2908	0.038196	0.028173	0.113444	-3.192088	-0.717581	-0.250412
4	8.1049	0.068515	0.050536	0.203494	-4.407234	-0.990746	-0.345737
5	12.9591	0.105423	0.077760	0.313114	-5.461272	-1.227694	-0.428424
6	18.8536	0.146173	0.107817	0.434144	-6.350453	-1.427582	-0.498178
7	25.7883	0.189011	0.139414	0.561377	-7.111133	-1.598583	-0.557851
8	33.7631	0.232307	0.171349	0.689968	-7.747932	-1.741735	-0.607807
9	42.7782	0.275716	0.203368	0.818898	-8.289531	-1.863486	-0.650294
10	52.8335	0.308471	0.227528	0.916183	-8.862529	-1.992296	-0.695244
11	62.0074	0.334044	0.246391	0.992136	-9.273589	-2.084703	-0.727491
12	78.1883	0.371748	0.274202	1.104121	-9.823488	-2.200320	-0.770629
13	101.0149	0.416462	0.307182	1.236923	-10.426102	-2.343788	-0.817903
14	121.3566	0.449467	0.331527	1.334949	-10.832953	-2.435248	-0.849819
15	143.5475	0.479029	0.353332	1.422751	-11.167734	-2.510507	-0.876082
16	167.5877	0.479029	0.353332	1.422751	-11.167734	-2.510507	-0.876082
17	193.4771	0.479029	0.353332	1.422751	-11.167734	-2.510507	-0.876082
18	221.2157	0.479029	0.353332	1.422751	-11.167734	-2.510507	-0.876082
19	239.4914	0.479029	0.353332	1.422751	-11.167734	-2.510507	-0.876082
20	247.0040	0.479029	0.353332	1.422751	-11.167734	-2.510507	-0.876082
21	254.6321	0.479029	0.353332	1.422751	-11.167734	-2.510507	-0.876082
22	262.3758	0.479029	0.353332	1.422751	-11.167734	-2.510507	-0.876082
23	270.2351	0.479029	0.353332	1.422751	-11.167734	-2.510507	-0.876082

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Table 2-7a. Pressure coefficient data for round ended plug flush configuration, R = 9.08.

PORT	NON-DIMENSIONALIZED PRESSURES														
	0	10	20	30	45	60	75	90	105	120	135	150	160	170	180
1	0.0000	-0.0372	-0.1415	-0.3178	-0.6009	-1.1050	-1.5222	-1.7432	-1.5718	-1.2664	-0.7698	-0.5314	-0.4221	-0.4122	-0.4345
2	-0.02596	-0.1068	-0.1664	-0.3054	-0.5885	-0.9312	-1.2142	-1.3558	-1.2490	-1.0181	-0.6456	-0.4196	-0.3005	-0.2682	-0.2905
3	-0.1117	-0.1266	-0.2036	-0.2980	-0.5165	-0.7400	-0.9957	-1.1199	-1.0975	-0.8716	-0.5190	-0.3203	-0.2558	-0.2011	-0.2086
4	-0.1540	-0.1664	-0.2210	-0.2582	-0.4470	-0.5413	-0.6978	-0.7524	-0.7325	-0.5662	-0.3675	-0.1986	-0.1564	-0.1192	-0.1093
5	-0.1440	-0.1540	-0.1838	-0.2260	-0.3178	-0.4196	-0.4867	-0.5513	-0.5339	-0.4395	-0.2756	-0.1465	-0.1465	-0.0944	-0.1018
6	-0.1364	-0.1664	-0.1664	-0.1962	-0.2558	-0.3402	-0.4172	-0.4470	-0.4420	-0.3650	-0.2111	-0.1291	-0.1068	-0.0720	-0.0919
7	-0.1242	-0.1316	-0.1664	-0.1689	-0.2260	-0.2806	-0.3352	-0.3650	-0.3551	-0.3228	-0.1986	-0.1117	-0.0844	-0.0695	-0.0646
8	-0.1192	-0.1117	-0.1316	-0.1515	-0.1887	-0.2433	-0.2856	-0.3154	-0.3178	-0.2533	-0.1689	-0.0869	-0.0819	-0.0546	-0.0447
9	-0.0993	-0.1068	-0.1142	-0.1291	-0.1614	-0.1937	-0.2185	-0.2533	-0.2582	-0.2409	-0.1614	-0.0795	-0.0596	-0.0447	-0.0447
10	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1738	-0.1986	-0.2185	-0.2309	-0.1912	-0.1415	-0.0770	-0.0521	-0.0472	-0.0472
11	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1515	-0.1738	-0.1962	-0.1887	-0.1763	-0.1366	-0.0571	-0.0472	-0.0372	-0.0447
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1415	-0.1788	-0.1664	-0.1564	-0.1117	-0.0521	0.0000	-0.0323	-0.0298
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1242	-0.1266	-0.1391	-0.1391	-0.1117	-0.0447	0.0000	-0.0248	-0.0298
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1242	-0.1391	-0.1242	-0.1043	-0.0372	0.0000	0.0000	-0.0222
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1117	-0.1117	-0.1018	-0.0869	-0.0397	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0248
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

R = 9.08  
 JET FLOW RATE = 2.252 CMM ( 79.53 CFM )  
 JET EFFECTIVE VELOCITY = 140.1 M/S ( 459.6 F/S )

6-30-76  
 PLUG DEPTH = .000  
 EFFECTIVE JET DIAMETER = 0.73 CENTRIFUGAL DIAMETER = 0.75  
 FREE STREAM VELOCITY = 15.4 M/S ( 50.6 F/S )  
 JET EFFECTIVE THRUST = 6.130 N ( 1.3779 LB )

Table 2-7b. Lift loss and pitching moment data for round ended plug flush configuration, R = 9.08.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N-M	L, R-FT		N	LP	
1	3.0951	0.000168	0.000124	0.001479	-0.096563	-0.021707	-0.015753
2	4.7458	0.000217	0.000160	0.001912	-0.138822	-0.031207	-0.022648
3	8.7547	0.000286	0.000211	0.002524	-0.225606	-0.050716	-0.036806
4	16.5366	0.000149	0.000110	0.001313	-0.346336	-0.077856	-0.056502
5	26.4409	-0.000037	-0.000027	-0.000324	-0.462672	-0.104009	-0.075481
6	38.4675	-0.000393	-0.000290	-0.003470	-0.580375	-0.130468	-0.094683
7	52.6165	-0.000787	-0.000581	-0.006946	-0.697511	-0.156800	-0.113793
8	68.8878	-0.001284	-0.000947	-0.011325	-0.812010	-0.182540	-0.132472
9	87.2814	-0.001705	-0.001257	-0.015041	-0.921461	-0.207144	-0.150328
10	107.7974	-0.002222	-0.00164	-0.001959	-1.003818	-0.225658	-0.163764
11	126.5153	0.001110	0.000819	0.009791	-1.069921	-0.240518	-0.174548
12	159.5296	0.003845	0.002836	0.033922	-1.154672	-0.259570	-0.188375
13	206.1033	0.007754	0.005720	0.068413	-1.256423	-0.282444	-0.204974
14	247.6069	0.011622	0.008572	0.102538	-1.325747	-0.298028	-0.216284
15	292.8836	0.015285	0.011274	0.134852	-1.388357	-0.312103	-0.226498
16	341.9333	0.015490	0.011426	0.136667	-1.389603	-0.312383	-0.226707
17	394.7561	0.015490	0.011426	0.136667	-1.389603	-0.312383	-0.226702
18	451.3520	0.015490	0.011426	0.136667	-1.389603	-0.312383	-0.226707
19	488.6404	0.015490	0.011426	0.136667	-1.389603	-0.312383	-0.226702
20	503.9685	0.015490	0.011426	0.136667	-1.389603	-0.312383	-0.226702
21	519.5323	0.015490	0.011426	0.136667	-1.389603	-0.312383	-0.226702
22	535.3320	0.015490	0.011426	0.136667	-1.389603	-0.312383	-0.226702
23	551.3675	0.015490	0.011426	0.136667	-1.389603	-0.312383	-0.226702

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Table 2-8b. Lift loss and pitching moment data for round plug flush configuration, R = 6.81.

PORT	NON-DIMENSIONAL AREA	N	M	LR-FT	M/TD	L		L/I
						H	LM	
1	3.0951	0.000623	0.000464	0.005497	-0.184373	-0.041447	-0.030079	
2	4.7458	0.000903	0.000666	0.007970	-0.262521	-0.059015	-0.042828	
3	8.7547	0.001503	0.001107	0.013261	-0.420861	-0.094610	-0.068660	
4	16.5366	0.002289	0.001688	0.020195	-0.622847	-0.140016	-0.101612	
5	26.4409	0.002995	0.002209	0.026427	-0.806064	-0.181203	-0.131502	
6	38.4675	0.003774	0.002784	0.033297	-0.980834	-0.220491	-0.160014	
7	52.6165	0.004527	0.003339	0.039939	-1.141689	-0.256652	-0.186257	
8	68.8878	0.005414	0.003993	0.047766	-1.292697	-0.290598	-0.210892	
9	87.2814	0.006368	0.004697	0.056184	-1.433867	-0.322333	-0.233923	
10	107.7974	0.008803	0.006493	0.077668	-1.544637	-0.347235	-0.251994	
11	126.5153	0.010797	0.007964	0.095262	-1.630586	-0.366556	-0.266016	
12	159.5296	0.014546	0.010729	0.120333	-1.741783	-0.391553	-0.284157	
13	206.1033	0.019646	0.014491	0.173327	-1.866803	-0.419657	-0.304553	
14	247.6069	0.023986	0.017692	0.211621	-1.946987	-0.437683	-0.317634	
15	292.8836	0.028675	0.021151	0.252994	-2.021521	-0.454438	-0.329793	
16	341.9333	0.028675	0.021151	0.252994	-2.021521	-0.454438	-0.329793	
17	394.7561	0.028675	0.021151	0.252994	-2.021521	-0.454438	-0.329793	
18	451.3520	0.028675	0.021151	0.252994	-2.021521	-0.454438	-0.329793	
19	488.6404	0.028675	0.021151	0.252994	-2.021521	-0.454438	-0.329793	
20	503.9685	0.028675	0.021151	0.252994	-2.021521	-0.454438	-0.329793	
21	519.5323	0.028675	0.021151	0.252994	-2.021521	-0.454438	-0.329793	
22	535.3320	0.028675	0.021151	0.252994	-2.021521	-0.454438	-0.329793	
23	551.3675	0.028675	0.021151	0.252994	-2.021521	-0.454438	-0.329793	

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Table 2-9a. Pressure coefficient data for round ended plug flush configuration, R = 4.54.

PORT	NON-DIMENSIONALIZED PRESSURES														
	ANGLE (DEGREES)														
	0	10	20	30	45	60	75	90	105	120	135	150	160	170	180
1	0.2045	0.1983	0.1258	0.0142	-0.2249	-0.6307	-1.1759	-1.7403	-2.1852	-2.2329	-1.4721	-0.9442	-0.8085	-0.7323	-0.7267
2	0.1580	0.1425	0.0929	0.0130	-0.1840	-0.4907	-0.8469	-1.2775	-1.6034	-1.6536	-1.1889	-0.7453	-0.5886	-0.5359	-0.5328
3	0.1190	0.1134	0.0700	0.0000	-0.1549	-0.3736	-0.6598	-0.9516	-1.2125	-1.2645	-0.9628	-0.6072	-0.4529	-0.3996	-0.3742
4	0.0657	0.0539	0.0341	0.0000	-0.0892	-0.2125	-0.3581	-0.5142	-0.6505	-0.6939	-0.5811	-0.3414	-0.2503	-0.2088	-0.1921
5	0.0390	0.0341	0.0248	0.0000	-0.0564	-0.1382	-0.2317	-0.3079	-0.4077	-0.4448	-0.3829	-0.2398	-0.1518	-0.1351	-0.1239
6	0.0316	0.0285	0.0204	0.0000	-0.0409	-0.0936	-0.1617	-0.2243	-0.2751	-0.2887	-0.2745	-0.1642	-0.0973	-0.0874	-0.0886
7	0.0297	0.0198	0.0161	0.0000	-0.0248	-0.0700	-0.1084	-0.1524	-0.2026	-0.2243	-0.2051	-0.1282	-0.0694	-0.0558	-0.0688
8	0.0265	0.0273	0.0173	0.0000	-0.0211	-0.0508	-0.0874	-0.1152	-0.1413	-0.1685	-0.1567	-0.0960	-0.0477	-0.0465	-0.0576
9	0.0223	0.0204	0.0124	0.0000	-0.0149	-0.0353	-0.0694	-0.0942	-0.1128	-0.1252	-0.1227	-0.0793	-0.0328	-0.0347	-0.0409
10	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0235	-0.0471	-0.0725	-0.0886	-0.1059	-0.1047	-0.0626	-0.0167	-0.0229	-0.0378
11	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0198	-0.0465	-0.0601	-0.0725	-0.0787	-0.0885	-0.0533	-0.0124	-0.0142	-0.0297
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0266	-0.0477	-0.0545	-0.0675	-0.0663	-0.0514	-0.0124	-0.0124	-0.0204
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0242	-0.0316	-0.0458	-0.0576	-0.0502	-0.0285	-0.0105	0.0000	-0.0167
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0279	-0.0359	-0.0409	-0.0427	-0.0266	-0.0087	0.0000	-0.0225
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0167	-0.0310	-0.0328	-0.0335	-0.0223	0.0000	0.0000	-0.0155
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0173
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0155
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0105
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0112
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0088
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0173
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0105
23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0155

R = 4.54

JET FLOW RATE = 2.252 CMM ( 79.53 CFM )

JET EFFECTIVE VELOCITY = 140.1 M/S ( 459.6 F/S )

6-30-76

PLUG DEPTH = .000

EFFECTIVE JET DIAMETER = 0.73 CENTERBODY DIAMETER = 0.75

FREE STREAM VELOCITY = 30.9 M/S ( 101.3 F/S )

JET EFFECTIVE THRUST = 6.130 N ( 1.3779 LB )

Table 2-9b. Lift loss and pitching moment data for round ended plug flush configuration, R = 4.54.

PORT	NON-DIMENSIONAL AREA	N	M	L/R-FT	M/TD	N	L	LH	L/T
1	3.0951	0.003008	0.002219	0.026542	-0.438122	-0.098490	-0.071476		
2	4.7458	0.004427	0.003265	0.039058	-0.613647	-0.137948	-0.100111		
3	8.7547	0.007475	0.005513	0.065947	-0.942826	-0.211947	-0.153814		
4	16.5366	0.011997	0.008849	0.105850	-1.297990	-0.291788	-0.211756		
5	26.4409	0.016770	0.012370	0.147956	-1.586958	-0.356748	-0.258898		
6	38.4675	0.021585	0.015921	0.190433	-1.826881	-0.410683	-0.298040		
7	52.6165	0.026661	0.019665	0.235224	-2.031948	-0.456782	-0.331494		
8	68.8878	0.031874	0.023510	0.281213	-2.206789	-0.496886	-0.360012		
9	87.2814	0.037029	0.027313	0.326697	-2.359790	-0.530481	-0.384979		
10	107.7974	0.041943	0.030937	0.370048	-2.495620	-0.561015	-0.407139		
11	126.5153	0.045681	0.033694	0.403026	-2.595366	-0.583438	-0.423411		
12	159.5296	0.052547	0.038759	0.463608	-2.729599	-0.613614	-0.445350		
13	206.1033	0.060103	0.044332	0.530266	-2.871776	-0.645575	-0.468505		
14	247.6069	0.066755	0.049238	0.588956	-2.966264	-0.666816	-0.483920		
15	292.8836	0.072682	0.053610	0.641248	-3.043673	-0.684218	-0.496549		
16	341.9333	0.073258	0.054035	0.646330	-3.047162	-0.685002	-0.497118		
17	394.7561	0.073854	0.054475	0.651592	-3.050516	-0.685756	-0.497665		
18	451.3520	0.074320	0.054818	0.655699	-3.052961	-0.686306	-0.498064		
19	488.6404	0.074666	0.055074	0.658756	-3.054666	-0.686809	-0.498342		
20	503.9685	0.074754	0.055139	0.659536	-3.055094	-0.686885	-0.498412		
21	519.5323	0.074986	0.055310	0.661582	-3.056201	-0.687034	-0.498592		
22	535.3320	0.075132	0.055417	0.662863	-3.056884	-0.687187	-0.498704		
23	551.3675	0.075351	0.055579	0.664802	-3.057902	-0.687416	-0.498870		

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Table 2-10b. Lift loss and pitching moment data for round ended plug flush configuration, R = 2.27.

PORT	NON-DIMENSIONAL AREA	N - M	TM LB-FT	M/D	L		L/T
					U	TL	
1	3.0946	0.012228	0.000019	0.107855	-0.031258	-0.209797	-0.152228
2	4.7450	0.017875	0.013184	0.157663	-1.264172	-0.204186	-0.206205
3	8.7532	0.030097	0.022199	0.265470	-1.822781	-0.409761	-0.297322
4	16.5339	0.048308	0.035632	0.426104	-2.308682	-0.518992	-0.376580
5	26.4366	0.066828	0.049292	0.589457	-2.630698	-0.571381	-0.479105
6	38.4612	0.085363	0.062963	0.752944	-2.864730	-0.643991	-0.467279
7	52.6079	0.103994	0.076706	0.917286	-3.045223	-0.684566	-0.496721
8	68.8766	0.122558	0.090399	1.081031	-3.181197	-0.715133	-0.518900
9	87.2672	0.141157	0.104118	1.245084	-3.297330	-0.741240	-0.537843
10	107.7799	0.153364	0.113122	1.352757	-3.468462	-0.779710	-0.565757
11	126.4947	0.163272	0.120429	1.440143	-3.595581	-0.808287	-0.586492
12	159.5036	0.177410	0.130858	1.564854	-3.774629	-0.848537	-0.615697
13	206.0697	0.194579	0.143522	1.716293	-3.973951	-0.893344	-0.648210
14	247.5666	0.208766	0.153985	1.841425	-4.122563	-0.926752	-0.672450
15	292.8359	0.221908	0.163679	1.957346	-4.240000	-0.953152	-0.691606
16	341.8776	0.221908	0.163679	1.957346	-4.240000	-0.953152	-0.691606
17	394.6918	0.221908	0.163679	1.957346	-4.240000	-0.953152	-0.691606
18	451.2785	0.221908	0.163679	1.957346	-4.240000	-0.953152	-0.691606
19	488.5608	0.221908	0.163679	1.957346	-4.240000	-0.953152	-0.691606
20	503.8864	0.221908	0.163679	1.957346	-4.240000	-0.953152	-0.691606
21	519.4477	0.221908	0.163679	1.957346	-4.240000	-0.953152	-0.691606
22	535.2448	0.221908	0.163679	1.957346	-4.240000	-0.953152	-0.691606
23	551.2777	0.221908	0.163679	1.957346	-4.240000	-0.953152	-0.691606

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Table 2-11b. Lift loss and pitching moment data for round ended plug down 0.5 D<sub>n</sub> configuration, R = 10.35.

PORT	NON-DIMENSIONAL AREA	N - M	M LB-FT	M/TD	N	L LB	L/T
1	2.0327	-0.000001	-0.000000	-0.000319	-0.107198	-0.224143	-0.009629
2	3.1168	-0.000163	-0.000120	-0.000640	-0.151777	-0.034794	-0.013877
3	5.7496	-0.000419	-0.000309	-0.001647	-0.255639	-0.057468	-0.022921
4	10.8603	-0.001201	-0.000886	-0.004720	-0.398948	-0.089684	-0.035770
5	17.3649	-0.002396	-0.001767	-0.009414	-0.545781	-0.122692	-0.048935
6	25.2633	-0.003855	-0.002844	-0.015149	-0.697582	-0.156817	-0.062546
7	34.5555	-0.005784	-0.004266	-0.022728	-0.856183	-0.192470	-0.076766
8	45.2416	-0.007889	-0.005819	-0.030998	-1.020040	-0.229305	-0.091457
9	57.3215	-0.010247	-0.007558	-0.040266	-1.188053	-0.267074	-0.106521
10	70.7953	-0.008779	-0.006475	-0.034497	-1.306072	-0.293605	-0.117103
11	83.0881	-0.007267	-0.005360	-0.028557	-1.406379	-0.316154	-0.126096
12	104.7700	-0.003023	-0.002230	-0.011880	-1.542819	-0.346826	-0.138330
13	135.3570	0.002720	0.002007	0.010690	-1.712951	-0.385071	-0.153584
14	162.6142	0.009569	0.007058	0.037600	-1.829837	-0.411347	-0.164064
15	192.3494	0.017066	0.012588	0.067062	-1.948781	-0.438086	-0.174728
16	224.5625	0.017066	0.012588	0.067062	-1.948781	-0.438086	-0.174728
17	259.2535	0.017066	0.012588	0.067062	-1.948781	-0.438086	-0.174728
18	296.4225	0.017066	0.012588	0.067062	-1.948781	-0.438086	-0.174728
19	320.9114	0.017066	0.012588	0.067062	-1.948781	-0.438086	-0.174728
20	330.9780	0.017066	0.012588	0.067062	-1.948781	-0.438086	-0.174728
21	341.1995	0.017066	0.012588	0.067062	-1.948781	-0.438086	-0.174728
22	351.5758	0.017066	0.012588	0.067062	-1.948781	-0.438086	-0.174728
23	362.1070	0.017066	0.012588	0.067062	-1.948781	-0.438086	-0.174728

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Table 2-12b. Lift loss and pitching moment data for round ended plug down 0.5 D<sub>n</sub> configuration, R = 7.76.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N -M	LB-FT		R	IR	
1	2.0327	0.000120	0.000000	0.000471	-0.197916	-0.044492	-0.017745
2	3.1168	0.000144	0.000106	0.000566	-0.285667	-0.064218	-0.025613
3	5.7496	0.000104	0.000076	0.000407	-0.466341	-0.104833	-0.041812
4	10.8603	-0.000267	-0.000197	-0.001050	-0.715740	-0.160898	-0.064173
5	17.3649	-0.000911	-0.000672	-0.003579	-0.961629	-0.216174	-0.086220
6	25.2633	-0.001794	-0.001323	-0.007051	-1.204923	-0.270867	-0.108034
7	34.5555	-0.002809	-0.002072	-0.011037	-1.444522	-0.324728	-0.129516
8	45.2416	-0.004051	-0.002988	-0.015919	-1.684338	-0.378639	-0.151018
9	57.3215	-0.005456	-0.004024	-0.021438	-1.919411	-0.431484	-0.172095
10	70.7953	-0.007647	-0.005952	-0.030400	-2.097513	-0.471521	-0.188064
11	83.0881	-0.010067	-0.008049	-0.040262	-2.241996	-0.504001	-0.201018
12	104.7700	0.005158	0.004542	0.024196	-2.432873	-0.546910	-0.218132
13	135.3570	0.014951	0.011028	0.058750	-2.669020	-0.599996	-0.239305
14	167.6142	0.023168	0.017088	0.091036	-2.819545	-0.633834	-0.252801
15	192.3494	0.032422	0.023914	0.127402	-2.967365	-0.667064	-0.266055
16	224.5625	0.032422	0.023914	0.127402	-2.967365	-0.667064	-0.266055
17	259.2535	0.032422	0.023914	0.127402	-2.967365	-0.667064	-0.266055
18	296.4225	0.032422	0.023914	0.127402	-2.967365	-0.667064	-0.266055
19	320.9114	0.032422	0.023914	0.127402	-2.967365	-0.667064	-0.266055
20	330.9780	0.032422	0.023914	0.127402	-2.967365	-0.667064	-0.266055
21	341.1995	0.032422	0.023914	0.127402	-2.967365	-0.667064	-0.266055
22	351.5758	0.032422	0.023914	0.127402	-2.967365	-0.667064	-0.266055
23	362.1070	0.032422	0.023914	0.127402	-2.967365	-0.667064	-0.266055

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Table 2-13a. Pressure coefficient data for round ended plug down 0.5 D<sub>n</sub> configuration, R = 5.18.

PORT	NON-DIMENSIONALIZED PRESSURES														
	0	10	20	30	45	60	75	90	105	120	135	150	160	170	180
1	0.1800	0.1468	0.0196	-0.1962	-0.6380	-1.3572	-2.0642	-2.5364	-2.5283	-2.1237	-1.2557	-0.9323	-0.7943	-0.7584	-0.7523
2	0.0934	0.0737	-0.0203	-0.1739	-0.5318	-1.0466	-1.5351	-1.9620	-2.0324	-1.7401	-1.0906	-0.7638	-0.6691	-0.5974	-0.6123
3	0.0521	0.0338	-0.0413	-0.1516	-0.4452	-0.8153	-1.2212	-1.5514	-1.6603	-1.4499	-0.9472	-0.6224	-0.5108	-0.4621	-0.4695
4	0.0000	-0.0176	-0.0514	-0.1238	-0.2815	-0.4892	-0.7192	-0.9039	-1.0155	-0.9445	-0.6597	-0.3518	-0.2672	-0.2327	-0.2206
5	-0.0169	-0.0223	-0.0514	-0.0954	-0.1921	-0.3234	-0.4804	-0.6103	-0.7043	-0.6745	-0.4831	-0.2476	-0.1705	-0.1130	-0.1231
6	-0.0189	-0.0210	-0.0386	-0.0710	-0.1455	-0.2341	-0.3423	-0.4404	-0.5074	-0.5034	-0.3816	-0.1874	-0.1055	-0.0758	-0.0710
7	-0.0169	-0.0135	-0.0304	-0.0555	-0.1042	-0.1759	-0.2591	-0.3193	-0.3802	-0.3816	-0.2970	-0.1394	-0.0677	-0.0467	-0.0419
8	-0.0169	-0.0135	-0.0271	-0.0447	-0.0852	-0.0656	-0.1962	-0.2551	-0.2097	-0.3065	-0.2469	-0.1130	-0.0528	-0.0318	-0.0243
9	0.0000	0.0000	-0.0183	-0.0318	-0.0677	-0.1035	-0.1576	-0.2043	-0.2382	-0.2483	-0.2064	-0.0961	-0.0284	-0.0183	0.0000
10	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0839	-0.1204	-0.1549	-0.1915	-0.2043	-0.1678	-0.0819	-0.0189	0.0000	0.0101
11	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0731	-0.1001	-0.1313	-0.1576	-0.1685	-0.1137	-0.0722	-0.0149	0.0000	0.0135
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0812	-0.1015	-0.1258	-0.1319	-0.0947	-0.0609	0.0000	0.0149	0.0189
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0636	-0.0839	-0.0974	-0.1035	-0.0859	-0.0480	0.0000	0.0122	0.0189
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0683	-0.0852	-0.0873	-0.0656	-0.0426	0.0000	0.0162	0.0250	
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0562	-0.0704	-0.0758	0.0000	-0.0359	0.0000	0.0162	0.0237	
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0244
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0196
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0210
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0223
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0196
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0189
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0196
23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0217

P = 5.18

JET FLOW RATE = 3.794 CMM ( 134.00 CFM )

JET EFFECTIVE VELOCITY = 152.1 M/S ( 499.0 F/S )

7-6-76

PLUG DEPTH = .500

EFFECTIVE JET DIAMETER = 0.90 CENTREBODY DIAMETER = 0.75

FREE STREAM VELOCITY = 29.4 M/S ( 96.4 F/S )

JET EFFECTIVE THRUST = 11.153 N ( 2.5072 LB )

Table 2-13b. Lift loss and pitching moment data for round ended plug down 0.5 D<sub>n</sub> configuration, R = 5.18.

PORT	NON-DIMENSIONAL AREA	N - M	M LB-FT	M/TD	N	L	L/T
1	2.0327	0.001897	0.001399	0.007452	-0.509252	-0.114480	-0.045660
2	3.1168	0.002872	0.002118	0.011285	-0.727718	-0.163591	-0.065247
3	5.7496	0.005261	0.003733	0.019887	-1.160023	-0.260773	-0.104008
4	10.8603	0.008402	0.006197	0.033015	-1.677191	-0.377033	-0.150378
5	17.3649	0.011997	0.008849	0.047143	-2.130782	-0.479000	-0.191047
6	25.2633	0.015870	0.011706	0.062360	-2.534919	-0.569850	-0.227282
7	34.5555	0.019823	0.014621	0.077893	-2.889124	-0.649475	-0.259040
8	45.2416	0.024445	0.018031	0.096056	-3.200295	-0.719426	-0.286940
9	57.3215	0.028893	0.021312	0.113537	-3.488009	-0.784104	-0.312736
10	70.7953	0.034627	0.025541	0.136065	-3.720814	-0.836439	-0.333610
11	83.0881	0.038940	0.028722	0.153012	-3.892106	-0.874945	-0.348968
12	104.7700	0.046314	0.034161	0.181991	-4.104833	-0.922766	-0.368041
13	135.3570	0.055868	0.041208	0.219532	-4.347746	-0.977373	-0.389821
14	167.6142	0.064006	0.047211	0.251510	-4.499498	-1.011487	-0.403427
15	192.3494	0.068655	0.050640	0.269780	-4.606070	-1.035445	-0.412982
16	224.5625	0.067917	0.050095	0.266878	-4.601596	-1.034439	-0.412581
17	259.2535	0.067226	0.049586	0.264166	-4.597714	-1.033566	-0.412233
18	296.4225	0.066380	0.048962	0.260838	-4.593268	-1.032567	-0.411834
19	320.9114	0.065746	0.048494	0.258348	-4.590149	-1.031866	-0.411555
20	330.9780	0.065514	0.048323	0.257435	-4.589023	-1.031612	-0.411454
21	341.1995	0.065282	0.048152	0.256525	-4.587918	-1.031364	-0.411355
22	351.5758	0.065035	0.047970	0.255555	-4.586757	-1.031103	-0.411250
23	362.1070	0.064754	0.047763	0.254452	-4.585457	-1.030811	-0.411134

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Table 2-14b. Lift loss and pitching moment data for round ended plug down 0.5 D<sub>n</sub> configuration, R = 2.59.

PORT	NON-DIMENSIONAL AREA	M		M/ZD	L		L/T
		N	LB-FT		N	LB	
1	2.0327	0.014793	0.010543	0.056166	-1.454094	-0.326880	-0.130375
2	3.1168	0.021461	0.015830	0.084331	-2.016262	-0.453256	-0.180779
3	5.7496	0.037405	0.027590	0.146984	-2.998104	-0.673974	-0.268811
4	10.8603	0.064618	0.047663	0.253917	-3.962492	-0.890768	-0.355279
5	17.3649	0.096476	0.071161	0.379103	-4.727507	-1.062744	-0.423870
6	25.2633	0.131403	0.096923	0.516347	-5.342498	-1.200994	-0.479010
7	34.5535	0.168087	0.123981	0.660496	-5.840610	-1.312969	-0.523671
8	45.2416	0.205495	0.151573	0.807491	-6.248770	-1.404724	-0.560267
9	57.3215	0.243224	0.179402	0.955746	-6.582846	-1.479824	-0.590220
10	70.7953	0.269625	0.198875	1.059487	-6.986051	-1.570464	-0.626372
11	83.0881	0.290619	0.214361	1.141985	-7.272425	-1.634841	-0.652048
12	104.7700	0.319823	0.235902	1.256743	-7.659169	-1.721781	-0.686724
13	135.3570	0.354879	0.261758	1.394492	-8.075941	-1.815472	-0.724092
14	162.6142	0.381129	0.281121	1.497642	-8.364299	-1.880294	-0.749946
15	192.3494	0.405908	0.299398	1.595011	-8.615438	-1.936751	-0.772463
16	224.5625	0.406317	0.299699	1.596618	-8.617916	-1.937308	-0.772686
17	259.2533	0.406317	0.299699	1.596618	-8.617916	-1.937308	-0.772686
18	296.4225	0.406317	0.299699	1.596618	-8.617916	-1.937308	-0.772686
19	320.9114	0.406317	0.299699	1.596618	-8.617916	-1.937308	-0.772686
20	330.9780	0.406317	0.299699	1.596618	-8.617916	-1.937308	-0.772686
21	341.1995	0.406317	0.299699	1.596618	-8.617916	-1.937308	-0.772686
22	351.5758	0.406317	0.299699	1.596618	-8.617916	-1.937308	-0.772686
23	362.1070	0.406317	0.299699	1.596618	-8.617916	-1.937308	-0.772686

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Table 2-15b. Lift loss and pitching moment data for round ended plug down 1.0 D<sub>n</sub> configuration, R = 9.98.

PORT	NON-DIMENSIONAL AREA	M			L		L/T
		N • M	LB-FT	M/TD	N	LB	
1	1.5633	0.000283	0.000200	0.000913	-0.000293	-0.020298	-0.006752
2	2.3971	0.000401	0.000296	0.001153	-0.129695	-0.029155	-0.009699
3	4.4220	0.000582	0.000429	0.001673	-0.208328	-0.046832	-0.015579
4	8.3527	0.000576	0.000425	0.001656	-0.312277	-0.070200	-0.023353
5	13.3584	0.000272	0.000201	0.000783	-0.408624	-0.091859	-0.030558
6	19.4302	-0.000311	-0.000229	-0.000894	-0.499675	-0.112327	-0.037367
7	26.5769	-0.001114	-0.000822	-0.003202	-0.586061	-0.131747	-0.043827
8	34.7956	-0.002156	-0.001590	-0.006197	-0.668720	-0.150328	-0.050009
9	44.0864	-0.003464	-0.002555	-0.009958	-0.746478	-0.167808	-0.055824
10	54.4491	-0.003208	-0.002433	-0.009480	-0.800174	-0.179879	-0.059839
11	63.9036	-0.003247	-0.002395	-0.009333	-0.839727	-0.188771	-0.062797
12	80.5793	-0.002779	-0.002050	-0.007988	-0.885532	-0.199068	-0.066222
13	104.1040	-0.002352	-0.001735	-0.006761	-0.939797	-0.211266	-0.070280
14	125.0677	-0.001451	-0.001070	-0.004170	-0.969702	-0.217989	-0.072517
15	147.9372	-0.000594	-0.000438	-0.001706	-0.996079	-0.223918	-0.074489
16	172.7126	-0.000594	-0.000438	-0.001706	-0.996079	-0.223918	-0.074489
17	199.3937	-0.000594	-0.000438	-0.001706	-0.996079	-0.223918	-0.074489
18	227.9806	-0.000594	-0.000438	-0.001706	-0.996079	-0.223918	-0.074489
19	246.8152	-0.000594	-0.000438	-0.001706	-0.996079	-0.223918	-0.074489
20	254.5575	-0.000594	-0.000438	-0.001706	-0.996079	-0.223918	-0.074489
21	262.4189	-0.000594	-0.000438	-0.001706	-0.996079	-0.223918	-0.074489
22	270.3994	-0.000594	-0.000438	-0.001706	-0.996079	-0.223918	-0.074489
23	278.4990	-0.000594	-0.000438	-0.001706	-0.996079	-0.223918	-0.074489

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Table 2-16b. Lift loss and pitching moment data for round ended plug down 1.0 D<sub>n</sub> configuration, R = 7.49.

PORT	NON-DIMENSIONAL AREA	N - M	M L/R-FT	M/TD	N	L L/R	L/T
1	1.5626	0.000748	0.000552	0.002149	-0.209141	-0.047015	-0.015633
2	2.3960	0.001102	0.000813	0.003165	-0.302511	-0.068005	-0.022612
3	4.4199	0.001821	0.001343	0.005231	-0.496085	-0.111520	-0.037081
4	8.3487	0.002602	0.001919	0.007474	-0.761047	-0.171083	-0.056886
5	13.3490	0.003275	0.002415	0.009405	-1.025970	-0.230638	-0.076688
6	19.4208	0.003859	0.002847	0.011085	-1.293727	-0.290830	-0.096702
7	26.5641	0.004446	0.003279	0.012770	-1.560325	-0.350761	-0.116629
8	34.7789	0.004994	0.003683	0.014343	-1.824125	-0.410063	-0.136347
9	44.0652	0.005558	0.004100	0.015965	-2.084244	-0.468538	-0.155790
10	54.4229	0.010340	0.007627	0.029698	-2.287961	-0.514334	-0.171017
11	63.8729	0.014628	0.010790	0.042015	-2.451773	-0.551159	-0.183262
12	80.5406	0.021746	0.017515	0.068204	-2.674484	-0.601224	-0.199909
13	104.0539	0.036270	0.026753	0.104175	-2.945940	-0.662247	-0.220199
14	125.0076	0.048501	0.035774	0.139304	-3.128736	-0.703340	-0.233863
15	147.8661	0.061372	0.045269	0.176274	-3.303099	-0.742537	-0.246896
16	172.6295	0.062870	0.046373	0.180576	-3.312173	-0.744576	-0.247574
17	199.2978	0.064655	0.047690	0.185703	-3.322213	-0.746833	-0.248324
18	227.8710	0.066322	0.048919	0.190489	-3.330961	-0.748800	-0.248978
19	246.6965	0.067454	0.049754	0.193743	-3.336536	-0.750053	-0.249395
20	254.4351	0.067951	0.050121	0.195170	-3.338945	-0.750595	-0.249575
21	262.2927	0.068431	0.050474	0.196547	-3.341232	-0.751109	-0.249746
22	270.2694	0.068916	0.050832	0.197941	-3.343515	-0.751622	-0.249917
23	278.3651	0.069460	0.051234	0.199504	-3.346034	-0.752188	-0.250105

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Table 2-17a. Pressure coefficient data for round ended plug down 1.0 D, R = 4.99.

PORT	NON-DIMENSIONALIZED PRESSURES														
	0	10	20	30	45	60	75	90	105	120	135	150	160	170	180
1	0.2531	0.2185	0.0786	-0.1466	-0.6222	-1.3580	-2.0890	-2.5187	-2.4600	-2.0570	-1.7113	-1.6247	-1.4684	-1.3742	-1.3403
2	0.1659	0.1359	0.0413	-0.1210	-0.5140	-1.0548	-1.5741	-1.9718	-1.9858	-1.7093	-1.4142	-1.2923	-1.2024	-1.1424	-1.1358
3	0.1052	0.0853	0.0000	-0.1192	-0.4290	-0.8260	-1.2503	-1.5641	-1.6474	-1.4389	-1.1950	-1.0658	-0.9659	-0.9433	-0.9386
4	0.0273	0.0140	-0.0353	-0.1086	-0.2878	-0.5100	-0.7607	-0.9479	-1.0372	-0.9692	-0.7634	-0.6608	-0.6308	-0.6348	-0.6042
5	-0.0073	-0.0120	-0.0406	-0.0913	-0.2052	-0.3464	-0.5203	-0.6528	-0.7501	-0.6928	-0.5542	-0.4550	-0.4683	-0.4416	-0.4803
6	-0.0113	-0.0133	-0.0380	-0.0739	-0.1525	-0.2545	-0.3737	-0.4863	-0.5169	-0.5362	-0.4170	-0.3304	-0.3404	-0.4023	-0.3884
7	-0.0113	-0.0147	-0.0320	-0.0600	-0.1126	-0.1952	-0.2864	-0.3584	-0.4137	-0.4130	-0.3224	-0.2491	-0.2731	-0.3324	-0.3284
8	-0.0100	-0.0087	-0.0280	-0.0440	-0.0926	-0.1479	-0.2238	-0.2871	-0.3264	-0.3271	-0.2678	-0.1872	-0.2012	-0.2611	-0.2871
9	-0.0060	-0.0113	-0.0173	-0.0346	-0.0739	-0.1166	-0.1839	-0.2345	-0.2665	-0.2725	-0.2218	-0.1366	-0.1532	-0.2078	-0.2550
10	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0973	-0.1412	-0.1918	-0.2245	-0.2278	-0.1885	-0.1092	-0.1132	-0.1459	-0.2265
11	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0833	-0.1179	-0.1579	-0.1885	-0.1905	-0.1559	-0.0873	-0.0919	-0.1512	-0.2038
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0906	-0.1219	-0.1432	-0.1446	-0.1179	-0.0673	-0.0679	-0.1119	-0.1452
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0733	-0.0946	-0.1199	-0.1109	-0.0973	-0.0553	-0.0546	-0.0986	-0.1739
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0819	-0.0906	-0.1019	-0.0846	-0.0426	-0.0360	-0.0813	-0.1625
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0653	-0.0799	-0.0846	-0.0733	-0.0366	-0.0260	0.0000	-0.1485
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1419
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1279
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1259
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1159
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1092
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1166
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1166
23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1052

ROUND END PLUG 7-6-76  
 R = 4.99 PLUG DEPTH = 1.000  
 JET FLOW RATE = 4.666 CMM ( 164.76 CFM )  
 JET EFFECTIVE VELOCITY = 148.0 M/S ( 485.5 F/S )

EFFECTIVE JET DIAMETER = 1.02 CENTREBODY DIAMETER = 0.75  
 FREE STREAM VELOCITY = 29.6 M/S ( 97.2 F/S )  
 JET EFFECTIVE THRUST = 13.379 N ( 3.0075 LBF )

Table 2-17b. Lift loss and pitching moment data for round ended plug down 1.0 D<sub>n</sub> configuration, R = 4.99.

PORT	NON-DIMENSIONAL AREA	N = M	M (LR=FT)	M/TD	N	L (R)	L/T
1	1.5626	0.003211	0.002368	0.009221	-0.579845	-0.130349	-0.043341
2	2.3960	0.004853	0.003579	0.013938	-0.829161	-0.186395	-0.061977
3	4.4199	0.008607	0.006349	0.024722	-1.326977	-0.298304	-0.099187
4	8.3487	0.014901	0.010991	0.042800	-1.948657	-0.438058	-0.145656
5	13.3490	0.022278	0.016432	0.063987	-2.517389	-0.565909	-0.188166
6	19.4208	0.030588	0.022562	0.087855	-3.036542	-0.682615	-0.226971
7	26.5641	0.039717	0.029295	0.114076	-3.508257	-0.788656	-0.262231
8	34.7789	0.049344	0.036396	0.141727	-3.937467	-0.885143	-0.294313
9	44.0652	0.059336	0.043766	0.170426	-4.330680	-0.973537	-0.323704
10	54.4229	0.071661	0.052857	0.205825	-4.669225	-1.049642	-0.349009
11	63.8729	0.081942	0.060441	0.235356	-4.926498	-1.107477	-0.368239
12	80.5406	0.099241	0.073200	0.285041	-5.252351	-1.180728	-0.392596
13	104.0539	0.122185	0.090123	0.350940	-5.632802	-1.266254	-0.421033
14	125.0076	0.141876	0.104648	0.407498	-5.884594	-1.322857	-0.439854
15	147.8661	0.158354	0.116802	0.454827	-6.093627	-1.369847	-0.455478
16	172.6295	0.162725	0.120026	0.467380	-6.120103	-1.375799	-0.457457
17	199.2978	0.167294	0.121396	0.480504	-6.145804	-1.381577	-0.459378
18	227.8710	0.172458	0.127205	0.495334	-6.172911	-1.387670	-0.461405
19	246.6965	0.175798	0.129669	0.504930	-6.189353	-1.391367	-0.462634
20	254.4351	0.177113	0.130638	0.508705	-6.195723	-1.392799	-0.463110
21	262.2927	0.178559	0.131705	0.512859	-6.202625	-1.394350	-0.463626
22	270.2694	0.180049	0.132804	0.517140	-6.209632	-1.395925	-0.464149
23	278.3651	0.181436	0.133827	0.521121	-6.216053	-1.397369	-0.464629

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Table 2-18b. Lift loss and pitching moment data for round ended plug down 1.0 D configuration, R = 2.5.

PORT	NON-DIMENSIONAL AREA	M		M/TD	N	L	L/N	L/T
		N-M	LR-FT					
1	1.5626	0.016012	0.011810	0.045990	-1.676823	-0.376950	-0.125337	
2	2.3960	0.023947	0.017663	0.068780	-2.319200	-0.521356	-0.173353	
3	4.4199	0.043071	0.031769	0.123709	-3.532991	-0.794216	-0.264079	
4	8.3487	0.078065	0.057581	0.224219	-4.847032	-1.089613	-0.362300	
5	13.3490	0.119195	0.087918	0.342352	-5.928759	-1.332785	-0.443155	
6	19.4208	0.164435	0.121287	0.472292	-6.833292	-1.536124	-0.510766	
7	26.5641	0.212924	0.157052	0.611561	-7.601549	-1.708828	-0.568191	
8	34.7789	0.261916	0.193189	0.752276	-8.230766	-1.850276	-0.615222	
9	44.0652	0.311093	0.229462	0.893525	-8.763294	-1.969988	-0.655027	
10	54.4229	0.347715	0.256475	0.998711	-9.358571	-2.103807	-0.699522	
11	63.8729	0.376789	0.277910	1.082217	-9.786923	-2.200100	-0.731540	
12	80.5406	0.418747	0.308868	1.202729	-10.367588	-2.330634	-0.774943	
13	104.0539	0.469572	0.346357	1.348711	-11.003598	-2.473609	-0.822402	
14	125.0076	0.508495	0.375066	1.460505	-11.440992	-2.571935	-0.855176	
15	147.8661	0.539765	0.398130	1.550317	-11.786632	-2.649635	-0.881012	
16	172.6295	0.540583	0.398734	1.552667	-11.791588	-2.650749	-0.881382	
17	199.2978	0.541365	0.399311	1.554916	-11.795991	-2.651739	-0.881711	
18	227.8710	0.541828	0.399653	1.556245	-11.798421	-2.652285	-0.881893	
19	246.6965	0.542230	0.399949	1.557399	-11.800399	-2.652730	-0.882041	
20	254.4351	0.542230	0.399949	1.557399	-11.800399	-2.652730	-0.882041	
21	262.2927	0.542230	0.399940	1.557399	-11.800399	-2.652730	-0.882041	
22	270.2694	0.542230	0.399949	1.557399	-11.800399	-2.652730	-0.882041	
23	278.3651	0.542230	0.399949	1.557399	-11.800399	-2.652730	-0.882041	

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Table 2-19b. Lift loss and pitching moment data for flat ended plug flush configuration, R = 8.78.

PORT	NON-DIMENSIONAL AREA	N - M	M LB-FT	P/TD	H	L	L/T
1	4.0379	0.000434	0.000320	0.006573	-0.009196	-0.020051	-0.021862
2	6.1914	0.000639	0.000471	0.009678	-0.127392	-0.028638	-0.031224
3	11.4215	0.001049	0.000774	0.015880	-0.204631	-0.046001	-0.050155
4	21.5739	0.001569	0.001157	0.023748	-0.306856	-0.068981	-0.075211
5	34.4951	0.002105	0.001553	0.031868	-0.407358	-0.091574	-0.099844
6	50.1852	0.002635	0.001944	0.039895	-0.502161	-0.112886	-0.123080
7	68.6442	0.003282	0.002421	0.049688	-0.590025	-0.132638	-0.144616
8	89.8720	0.003949	0.002912	0.059781	-0.675341	-0.151817	-0.165527
9	113.8686	0.004727	0.003487	0.071567	-0.754268	-0.169560	-0.184872
10	140.6340	0.005597	0.004866	0.099874	-0.816950	-0.183650	-0.200235
11	165.0537	0.008244	0.006081	0.124810	-0.866664	-0.194826	-0.212420
12	208.1245	0.011526	0.008502	0.174507	-0.934486	-0.210072	-0.229043
13	268.8852	0.015992	0.011796	0.242117	-1.015840	-0.228361	-0.248983
14	323.0314	0.019971	0.014730	0.302357	-1.072255	-0.241043	-0.262810
15	382.1001	0.023943	0.017660	0.362497	-1.124968	-0.252893	-0.275730
16	446.0910	0.024436	0.018024	0.369966	-1.127956	-0.253564	-0.276463
17	515.0044	0.024985	0.018429	0.378266	-1.131040	-0.254258	-0.277219
18	588.8402	0.025724	0.018974	0.389452	-1.134918	-0.255130	-0.278169
19	637.4872	0.026050	0.019215	0.394402	-1.136527	-0.255491	-0.278564
20	657.4844	0.026227	0.019345	0.397076	-1.137383	-0.255684	-0.278774
21	677.7892	0.026326	0.019418	0.398580	-1.137857	-0.255790	-0.278890
22	698.4017	0.026514	0.019557	0.401421	-1.138740	-0.255989	-0.279106
23	719.3218	0.026690	0.019686	0.404082	-1.139554	-0.256172	-0.279305

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Table 2-20b. Lift loss and pitching moment data for flat ended plug flush configuration, R = 6.58.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N - M	LB-FT		N	LB	
1	4.0379	0.000900	0.000664	0.013620	-0.154718	-0.034781	-0.037921
2	6.1914	0.001339	0.000988	0.020271	-0.220755	-0.049626	-0.054107
3	11.4215	0.002310	0.001704	0.034980	-0.352271	-0.079190	-0.086342
4	21.5739	0.003795	0.002799	0.057451	-0.515493	-0.115883	-0.126348
5	34.4951	0.005454	0.004023	0.082566	-0.663157	-0.149078	-0.162540
6	50.1852	0.007315	0.005396	0.110749	-0.796379	-0.179026	-0.195193
7	68.6442	0.009243	0.006817	0.139933	-0.917506	-0.206255	-0.224081
8	89.8720	0.011276	0.008317	0.170717	-1.025717	-0.230581	-0.251404
9	113.8686	0.013544	0.009900	0.205056	-1.126292	-0.253190	-0.276055
10	140.6340	0.016360	0.012067	0.247688	-1.214500	-0.273020	-0.297675
11	165.0537	0.018700	0.013793	0.283114	-1.278720	-0.287456	-0.313415
12	208.1245	0.023387	0.017251	0.354084	-1.372703	-0.308584	-0.336450
13	268.8852	0.029336	0.021638	0.444137	-1.477917	-0.332736	-0.362239
14	323.0314	0.034632	0.025544	0.524319	-1.549326	-0.348289	-0.379741
15	382.1001	0.039680	0.029268	0.600749	-1.613072	-0.362619	-0.395365
16	446.0910	0.040523	0.029889	0.613508	-1.618177	-0.363766	-0.396616
17	515.0044	0.041285	0.030452	0.625056	-1.622467	-0.364731	-0.397668
18	588.8402	0.042052	0.031017	0.636656	-1.626490	-0.365635	-0.398654
19	637.4872	0.042628	0.031443	0.645391	-1.629329	-0.366273	-0.399350
20	657.4844	0.042926	0.031662	0.649889	-1.630769	-0.366597	-0.399703
21	677.7892	0.043174	0.031845	0.653648	-1.631954	-0.366863	-0.399993
22	698.4017	0.043387	0.032002	0.656877	-1.632957	-0.367089	-0.400239
23	719.3218	0.043695	0.032229	0.661533	-1.634381	-0.367409	-0.400588

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Table 2-21b. Lift loss and pitching moment data for flat ended plug flush configuration, R = 4.42.

PORT	NON-DIMENSIONAL APFA	M		M/T0	L		L/T
		N - M	L, R - FT		N	L, R	
1	4.0122	0.002577	0.001901	0.038644	-0.323672	-0.072761	-0.078828
2	6.1521	0.003849	0.002839	0.057714	-0.453905	-0.102038	-0.110546
3	11.3489	0.006685	0.004931	0.100249	-0.679372	-0.157219	-0.170328
4	21.4368	0.011177	0.008244	0.167605	-0.967505	-0.217495	-0.235630
5	34.2760	0.016086	0.011865	0.241230	-1.180454	-0.265366	-0.287492
6	49.8664	0.021297	0.015708	0.319363	-1.352230	-0.303981	-0.329327
7	68.2081	0.026621	0.019636	0.399209	-1.495904	-0.336279	-0.364318
8	89.3010	0.031757	0.023424	0.476222	-1.605209	-0.360851	-0.390939
9	113.1452	0.036825	0.027162	0.552229	-1.694124	-0.380839	-0.412593
10	139.7406	0.040856	0.030135	0.612672	-1.777983	-0.399691	-0.433017
11	164.0051	0.044003	0.032457	0.659870	-1.835725	-0.412671	-0.447079
12	206.8024	0.048819	0.036009	0.732078	-1.912746	-0.429985	-0.465837
13	267.1771	0.054189	0.039970	0.812611	-1.986023	-0.446458	-0.483683
14	320.9793	0.058278	0.042986	0.873933	-2.036526	-0.457811	-0.495983
15	379.6727	0.061779	0.045568	0.926422	-2.073486	-0.466120	-0.504985
16	443.2571	0.062581	0.046160	0.938453	-2.078346	-0.467212	-0.506168
17	511.7327	0.063487	0.046828	0.952047	-2.083445	-0.468358	-0.507410
18	585.0994	0.064473	0.047555	0.966832	-2.088621	-0.469522	-0.508671
19	633.4374	0.065224	0.048109	0.978089	-2.092316	-0.470353	-0.509570
20	653.3075	0.065521	0.048328	0.982547	-2.093756	-0.470676	-0.509921
21	673.4834	0.065836	0.048561	0.987268	-2.095259	-0.471014	-0.510287
22	693.9649	0.066135	0.048781	0.991749	-2.096664	-0.471330	-0.510620
23	714.7521	0.066407	0.048982	0.995837	-2.097926	-0.471614	-0.510937

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Table 2-22b. Lift loss and pitching moment data for flat ended plug flush configuration, R = 2.21.

PORT	NON-DIMENSIONAL APFA	N - M	M LR-FT	M/TD	N	L LR	L/1
1	4.0122	0.007163	0.005283	0.107411	-0.500316	-0.112471	-0.121849
2	6.1521	0.010724	0.007910	0.160819	-0.677278	-0.152252	-0.164947
3	11.3489	0.018877	0.013924	0.283083	-0.984869	-0.221390	-0.239859
4	21.4368	0.032087	0.023668	0.481177	-1.264902	-0.284350	-0.308059
5	34.2760	0.046475	0.034280	0.696929	-1.467654	-0.329929	-0.357438
6	49.8664	0.061547	0.045397	0.922956	-1.621930	-0.364610	-0.395011
7	68.2081	0.076976	0.056778	1.154325	-1.747341	-0.392802	-0.425554
8	89.3010	0.092727	0.068396	1.390526	-1.853514	-0.416670	-0.451412
9	113.1452	0.108865	0.080298	1.632518	-1.947037	-0.437694	-0.474189
10	139.7406	0.119775	0.088346	1.796123	-2.100183	-0.472121	-0.511486
11	164.0051	0.128927	0.095096	1.933368	-2.216756	-0.498327	-0.539877
12	206.8024	0.142823	0.105346	2.141759	-2.391915	-0.537702	-0.582536
13	267.1771	0.160700	0.118532	2.409839	-2.593821	-0.583091	-0.631709
14	320.9793	0.175250	0.129265	2.628032	-2.743224	-0.616677	-0.668095
15	379.6727	0.189851	0.140034	2.846987	-2.881202	-0.647694	-0.701699
16	443.2571	0.190465	0.140487	2.856188	-2.884919	-0.648530	-0.702604
17	511.7327	0.191058	0.140924	2.865081	-2.888254	-0.649280	-0.703416
18	585.0994	0.191712	0.141406	2.874881	-2.891685	-0.650051	-0.704252
19	633.4374	0.191712	0.141406	2.874881	-2.891685	-0.650051	-0.704252
20	653.3075	0.191712	0.141406	2.874881	-2.891685	-0.650051	-0.704252
21	673.4834	0.191712	0.141406	2.874881	-2.891685	-0.650051	-0.704252
22	693.9649	0.191712	0.141406	2.874881	-2.891685	-0.650051	-0.704252
23	714.7521	0.191712	0.141406	2.874881	-2.891685	-0.650051	-0.704252

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Table 2-23a. Pressure coefficient data for flat ended plug down 0.375 D<sub>n</sub> configuration, R = 8.72.

PORT	NON-DIMENSIONALIZED PRESSURES														
	0	10	20	30	45	60	75	90	105	120	135	150	160	170	180
1	0.0000	0.0000	-0.0990	-0.2528	-0.5212	-0.9772	-1.4228	-1.6990	-1.6390	-1.4645	-1.0814	-0.7817	-0.6645	-0.6202	-0.6254
2	-0.0130	-0.0365	-0.1094	-0.2345	-0.4795	-0.8130	-1.1257	-1.3107	-1.3237	-1.1439	-0.8651	-0.6254	-0.5133	-0.4508	-0.4899
3	-0.0391	-0.0782	-0.1251	-0.2163	-0.4326	-0.7010	-0.9990	-1.0788	-1.1127	-0.9537	-0.7088	-0.4925	-0.4013	-0.3414	-0.3857
4	-0.1094	-0.1094	-0.1563	-0.1954	-0.3127	-0.4690	-0.6176	-0.7140	-0.7296	-0.6436	-0.4873	-0.3179	-0.2502	-0.2423	-0.2433
5	-0.1381	-0.1120	-0.1485	-0.1616	-0.2554	-0.3440	-0.4430	-0.5212	-0.5394	-0.4795	-0.3231	-0.2606	-0.2085	-0.2085	-0.1954
6	-0.0886	-0.1199	-0.1381	-0.1694	-0.2189	-0.2762	-0.3205	-0.3883	-0.4091	-0.3804	-0.2762	-0.1798	-0.1694	-0.1563	-0.1616
7	-0.0756	-0.0990	-0.1068	-0.1381	-0.1668	-0.2502	-0.2736	-0.3309	-0.3205	-0.2971	-0.2267	-0.1537	-0.1251	-0.1694	-0.1511
8	-0.0756	-0.0678	-0.0834	-0.1147	-0.1355	-0.2033	-0.2397	-0.2814	-0.2840	-0.2606	-0.1798	-0.1485	-0.1199	-0.1381	-0.1511
9	-0.1042	-0.0547	-0.0678	-0.0834	-0.1147	-0.1537	-0.2033	-0.2241	-0.2345	-0.2371	-0.1563	-0.1199	-0.0938	-0.1016	-0.1068
10	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1303	-0.1616	-0.1928	-0.2059	-0.2137	-0.1459	-0.0860	-0.0808	-0.0834	-0.1199
11	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1199	-0.1563	-0.1642	-0.1902	-0.1824	-0.1485	-0.0521	-0.0678	-0.0782	-0.1120
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1433	-0.1563	-0.1642	-0.1355	-0.1094	-0.0625	-0.0417	-0.0730	-0.0886
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0938	-0.1485	-0.1173	-0.1329	-0.0964	-0.0782	-0.0365	-0.0651	-0.1068
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0964	-0.1016	-0.0938	-0.0678	-0.0339	-0.0391	-0.0521	-0.0756
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0860	-0.1016	-0.0912	-0.0834	0.0000	-0.0261	0.0000	-0.0443
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0756
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0730
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0834
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0704
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0495
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0417
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0782
23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0730

SQUARE END PLUG 7-13-76  
 R = 8.72 PLUG DEPTH = .375  
 JET FLOW RATE = 1.909 CMM ( 67.40 CFM )  
 JET EFFECTIVE VELOCITY = 131.1 M/S ( 430.0 F/S )

EFFECTIVE JET DIAMETER = 0.70 CENTERBODY DIAMETER = 0.75  
 FREE STREAM VELOCITY = 15.0 M/S ( 49.3 F/S )  
 JET EFFECTIVE THROAT = 4.800 N ( 1.0971 LB )

Table 2-23b. Lift loss and pitching moment data for flat ended plug down 0.375  $D_n$  configuration, R = 8.72.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N - M	LB-FT		N	LB	
1	3.3721	0.000349	0.000257	0.004036	-0.0097515	-0.021921	-0.019987
2	5.1706	0.000503	0.000371	0.005819	-0.130365	-0.031329	-0.028557
3	9.5383	0.000808	0.000596	0.009347	-0.274227	-0.050406	-0.045946
4	18.0167	0.001208	0.000891	0.013974	-0.338073	-0.075999	-0.069275
5	29.8074	0.001627	0.001200	0.018816	-0.448326	-0.100784	-0.091867
6	41.9105	0.001993	0.001470	0.023051	-0.554710	-0.124699	-0.113666
7	57.3258	0.002450	0.001807	0.028334	-0.658525	-0.148036	-0.134938
8	75.0535	0.003106	0.002291	0.035922	-0.760371	-0.170931	-0.155808
9	95.0935	0.003781	0.002789	0.043734	-0.855504	-0.192317	-0.175301
10	117.4457	0.005791	0.004272	0.066987	-0.931553	-0.209413	-0.190884
11	137.8390	0.007559	0.005575	0.087433	-0.994013	-0.223454	-0.203683
12	173.8081	0.010862	0.008012	0.125642	-1.077530	-0.242229	-0.220797
13	224.5503	0.015982	0.011788	0.184058	-1.180133	-0.265294	-0.241821
14	269.7687	0.019875	0.014660	0.229895	-1.237632	-0.278220	-0.253603
15	319.0978	0.023248	0.017148	0.268905	-1.290642	-0.290136	-0.264465
16	372.5377	0.023840	0.017584	0.275749	-1.294226	-0.290942	-0.265200
17	430.0884	0.024502	0.018073	0.283412	-1.297953	-0.291780	-0.265963
18	491.7498	0.025371	0.018714	0.293466	-1.302516	-0.292806	-0.266898
19	532.3757	0.025887	0.019094	0.299428	-1.305053	-0.293376	-0.267418
20	549.0756	0.026038	0.019206	0.301180	-1.305787	-0.293541	-0.267569
21	566.0325	0.026170	0.019303	0.302700	-1.306414	-0.293682	-0.267697
22	583.2463	0.026424	0.019490	0.305639	-1.307609	-0.293950	-0.267942
23	600.7171	0.026668	0.019670	0.308464	-1.308710	-0.294205	-0.268174

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Table 2-24b. Lift loss and pitching moment data for flat ended plug down 0.375 D<sub>n</sub> configuration, R = 6.53.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N	LB-FT		N	LB	
1	3.3721	0.000914	0.000674	0.010577	-0.180835	-0.040652	-0.037055
2	5.1706	0.001345	0.000992	0.015559	-0.257162	-0.057810	-0.052695
3	9.5383	0.002324	0.001714	0.026882	-0.409099	-0.091966	-0.083828
4	18.0167	0.003757	0.002771	0.043457	-0.597286	-0.134270	-0.122390
5	28.8074	0.005298	0.003908	0.061277	-0.766633	-0.172339	-0.157091
6	41.9105	0.006854	0.005055	0.079277	-0.919320	-0.206663	-0.188378
7	57.3258	0.008602	0.006345	0.099499	-1.055054	-0.237176	-0.216191
8	75.0535	0.010342	0.007628	0.119625	-1.180751	-0.265433	-0.241947
9	95.0935	0.012049	0.008887	0.139365	-1.291911	-0.290422	-0.264725
10	117.4457	0.014654	0.010809	0.169503	-1.380186	-0.310266	-0.282814
11	137.8390	0.016663	0.012291	0.192742	-1.445051	-0.324847	-0.296105
12	173.8081	0.020555	0.015162	0.237760	-1.528943	-0.343706	-0.313295
13	224.5503	0.025379	0.018720	0.293554	-1.624857	-0.365268	-0.332949
14	269.7687	0.029419	0.021699	0.340282	-1.692534	-0.390482	-0.346817
15	319.0978	0.033195	0.024484	0.383959	-1.748225	-0.393001	-0.358229
16	372.5377	0.033705	0.024861	0.389859	-1.751315	-0.393696	-0.358862
17	430.0884	0.034249	0.025262	0.396154	-1.754376	-0.394384	-0.359409
18	491.7498	0.035200	0.025963	0.407151	-1.759367	-0.395506	-0.360512
19	532.3757	0.035658	0.026301	0.412450	-1.761622	-0.396013	-0.360974
20	549.0756	0.035801	0.026407	0.414110	-1.762317	-0.396169	-0.361116
21	566.0325	0.035941	0.026510	0.415725	-1.762984	-0.396319	-0.361253
22	583.2463	0.036212	0.026710	0.418860	-1.764258	-0.396605	-0.361514
23	600.7171	0.036369	0.026826	0.420676	-1.764985	-0.396769	-0.361663

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Table 2-25b. Lift loss and pitching moment data for flat ended plug down 0.375 D<sub>n</sub> configuration, R = 4.36.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N -M	IN-FT		N	LB	
1	3.3721	0.003620	0.002670	0.041869	-0.417180	-0.093782	-0.085484
2	5.1706	0.005285	0.003898	0.061130	-0.578169	-0.129972	-0.118473
3	9.5383	0.008802	0.006492	0.101812	-0.870533	-0.195696	-0.178381
4	18.0167	0.013915	0.010264	0.160957	-1.163804	-0.261623	-0.238475
5	28.8074	0.019076	0.014071	0.220653	-1.390630	-0.312614	-0.284954
6	41.9105	0.024412	0.018007	0.282375	-1.572505	-0.353499	-0.322222
7	57.3258	0.029808	0.021987	0.344789	-1.722307	-0.387175	-0.352918
8	75.0535	0.035186	0.025953	0.406995	-1.852077	-0.416347	-0.379500
9	95.0935	0.040614	0.029957	0.469772	-1.958299	-0.440226	-0.401275
10	117.4457	0.045060	0.033236	0.521198	-2.057664	-0.462563	-0.421636
11	137.8390	0.048478	0.035757	0.560737	-2.128929	-0.478583	-0.436239
12	173.8081	0.053714	0.039619	0.621300	-2.226661	-0.500553	-0.456265
13	224.5503	0.060823	0.044863	0.703532	-2.341495	-0.526368	-0.479795
14	269.7687	0.066480	0.049036	0.768969	-2.414511	-0.542782	-0.494757
15	319.0978	0.071852	0.052998	0.831102	-2.477334	-0.556905	-0.507630
16	372.5377	0.071852	0.052998	0.831102	-2.477334	-0.556905	-0.507630
17	430.0884	0.071852	0.052998	0.831102	-2.477334	-0.556905	-0.507630
18	491.7498	0.071852	0.052998	0.831102	-2.477334	-0.556905	-0.507630
19	532.3757	0.071852	0.052998	0.831102	-2.477334	-0.556905	-0.507630
20	549.0756	0.071852	0.052998	0.831102	-2.477334	-0.556905	-0.507630
21	566.0325	0.071852	0.052998	0.831102	-2.477334	-0.556905	-0.507630
22	583.2463	0.071852	0.052998	0.831102	-2.477334	-0.556905	-0.507630
23	600.7171	0.071852	0.052998	0.831102	-2.477334	-0.556905	-0.507630

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Table 2-26b. Lift loss and pitching moment data for flat ended plug down 0.375 D<sub>n</sub> configuration, R = 2.18.

PORT	NON-DIMENSIONAL AREA	N - M	M LR-FT	H/TD	N	L LR	L/T
1	3.3721	0.010042	0.007407	0.116159	-0.628257	-0.141232	-0.128736
2	5.1706	0.014816	0.010929	0.171371	-0.855370	-0.192287	-0.175274
3	9.5383	0.025451	0.018773	0.294391	-1.257657	-0.282721	-0.257706
4	18.0167	0.041937	0.030933	0.485075	-1.633675	-0.367250	-0.334756
5	28.8074	0.059668	0.044011	0.690166	-1.916393	-0.430805	-0.392688
6	41.9105	0.078087	0.057604	0.903332	-2.141463	-0.481401	-0.438607
7	57.3258	0.096850	0.071437	1.120250	-2.322458	-0.522088	-0.475894
8	75.0535	0.115978	0.085545	1.341497	-2.475973	-0.556599	-0.507351
9	95.0935	0.135005	0.099579	1.561577	-2.602070	-0.584945	-0.533190
10	117.4457	0.148145	0.109272	1.713575	-2.783314	-0.625689	-0.570329
11	137.8390	0.158932	0.117228	1.838344	-2.918832	-0.656153	-0.598097
12	173.8081	0.174389	0.128629	2.017127	-3.113920	-0.700009	-0.638073
13	224.5503	0.194328	0.143336	2.247759	-3.352901	-0.753732	-0.687042
14	269.7687	0.209076	0.154214	2.418348	-3.508411	-0.788691	-0.718908
15	319.0978	0.224533	0.165615	2.597135	-3.656848	-0.822059	-0.749324
16	372.5377	0.224861	0.165857	2.600927	-3.658834	-0.822506	-0.749731
17	430.0884	0.225169	0.166085	2.604499	-3.660571	-0.822896	-0.750087
18	491.7498	0.225169	0.166085	2.604499	-3.660571	-0.822896	-0.750087
19	532.3757	0.225169	0.166085	2.604499	-3.660571	-0.822896	-0.750087
20	549.0756	0.225169	0.166085	2.604499	-3.660571	-0.822896	-0.750087
21	566.0325	0.225169	0.166085	2.604499	-3.660571	-0.822896	-0.750087
22	583.2463	0.225169	0.166085	2.604499	-3.660571	-0.822896	-0.750087
23	600.7171	0.225169	0.166085	2.604499	-3.660571	-0.822896	-0.750087

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Table 2-27b. Lift loss and pitching moment data for flat ended plug down 0.875 D<sub>n</sub> configuration, R = 9.49.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N	LR=FT		N	LR	
1	2.0315	0.000053	0.000039	0.000236	-0.109919	-0.024710	-0.011179
2	3.1150	0.000037	0.000028	0.000167	-0.157783	-0.035470	-0.016047
3	5.7464	-0.000063	-0.000046	-0.000281	-0.255731	-0.057488	-0.026009
4	10.8543	-0.000519	-0.000383	-0.002313	-0.394896	-0.088773	-0.040163
5	17.3552	-0.001243	-0.000917	-0.005538	-0.534535	-0.120163	-0.054365
6	25.2493	-0.002187	-0.001613	-0.009747	-0.674562	-0.151641	-0.068607
7	34.5363	-0.003536	-0.002608	-0.015757	-0.813503	-0.182876	-0.082738
8	45.2165	-0.005006	-0.003692	-0.022308	-0.953666	-0.214384	-0.096993
9	57.2897	-0.006409	-0.004727	-0.028560	-1.090770	-0.245207	-0.110938
10	70.7560	-0.005392	-0.003977	-0.024026	-1.187399	-0.266927	-0.120765
11	83.0420	-0.004502	-0.003321	-0.020063	-1.266523	-0.284714	-0.128813
12	104.7119	-0.001952	-0.001440	-0.008699	-1.368718	-0.307688	-0.139207
13	135.2818	0.001056	0.000779	0.004706	-1.491333	-0.335252	-0.151677
14	162.5239	0.004670	0.003444	0.020809	-1.569918	-0.352918	-0.159670
15	192.2426	0.008550	0.006312	0.038134	-1.645295	-0.369862	-0.167336
16	224.4378	0.008558	0.006312	0.038134	-1.645295	-0.369862	-0.167336
17	259.1096	0.008558	0.006312	0.038134	-1.645295	-0.369862	-0.167336
18	296.2579	0.008558	0.006312	0.038134	-1.645295	-0.369862	-0.167336
19	320.7333	0.008558	0.006312	0.038134	-1.645295	-0.369862	-0.167336
20	330.7943	0.008558	0.006312	0.038134	-1.645295	-0.369862	-0.167336
21	341.0101	0.008558	0.006312	0.038134	-1.645295	-0.369862	-0.167336
22	351.3806	0.008558	0.006312	0.038134	-1.645295	-0.369862	-0.167336
23	361.9060	0.008558	0.006312	0.038134	-1.645295	-0.369862	-0.167336

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Table 2-28a. Pressure coefficient data for flat ended plug down 0.875 D<sub>n</sub> configuration, R = 7.11.

PORT	NON-DIMENSIONALIZED PRESSURES														
	0	10	20	30	45	60	75	90	105	120	135	150	160	170	180
1	0.0651	0.0318	-0.1056	-0.3500	-0.8215	-1.5431	-2.1404	-2.4051	-2.1332	-1.6299	-0.9646	-0.7159	-0.6291	-0.5785	-0.5742
2	0.0000	-0.0376	-0.1359	-0.3167	-0.7072	-1.2307	-1.6487	-1.8989	-1.7456	-1.3754	-0.7983	-0.5958	-0.5120	-0.4483	-0.4585
3	-0.0738	-0.0824	-0.1764	-0.3109	-0.6233	-1.0037	-1.3363	-1.5446	-1.4752	-1.1646	-0.7029	-0.4975	-0.3934	-0.3500	-0.3370
4	-0.1302	-0.1490	-0.1880	-0.2589	-0.4454	-0.6522	-0.8620	-0.9921	-0.9733	-0.7925	-0.5062	-0.3138	-0.2372	-0.1952	-0.1779
5	-0.1302	-0.1490	-0.1938	-0.2314	-0.3500	-0.4046	-0.6349	-0.7101	-0.7275	-0.6233	-0.3876	-0.2198	-0.1793	-0.1504	-0.1302
6	-0.1287	-0.1490	-0.1533	-0.2025	-0.2806	-0.3717	-0.4917	-0.5655	-0.5655	-0.5033	-0.3095	-0.1721	-0.1359	-0.1027	-0.1027
7	-0.1085	-0.1200	-0.1302	-0.1707	-0.2213	-0.2892	-0.3775	-0.4483	-0.4628	-0.4093	-0.2784	-0.1287	-0.0911	-0.0752	-0.0752
8	-0.0940	-0.1056	-0.1186	-0.1388	-0.1938	-0.2415	-0.3066	-0.3601	-0.3760	-0.3326	-0.2343	-0.1157	-0.0694	-0.0593	-0.0434
9	-0.0911	-0.0955	-0.1070	-0.1331	-0.1533	-0.2083	-0.2632	-0.3023	-0.3109	-0.2921	-0.2068	-0.1027	-0.0636	-0.0477	-0.0231
10	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1837	-0.2198	-0.2632	-0.2791	-0.2560	-0.1909	-0.0897	-0.0304	-0.0289	0.0000
11	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1591	-0.1895	-0.2140	-0.2314	-0.2198	-0.1822	-0.0767	0.0000	-0.0145	0.0000
12	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1649	-0.1808	-0.1981	-0.1880	-0.1519	-0.0665	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1287	-0.1576	-0.1837	-0.1750	-0.1273	-0.0000	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1417	-0.1475	-0.1417	-0.1215	-0.0448	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.1157	-0.1229	-0.1171	-0.1041	-0.0390	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
20	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
21	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
22	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

R = 7.11

SQUARE END PLUG 7-15-76

PLUG DEPTH = .875

EFFECTIVE JET DIAMETER = 0.90 CENTERBODY DIAMETER = 0.75

JET FLOW RATE = 3.531 CMM ( 124.70 CFM )

FREE STREAM VELOCITY = 20.2 M/S ( 66.2 F/S )

JET EFFECTIVE VELOCITY = 143.5 M/S ( 470.8 F/S )

JET EFFECTIVE THROUST = 9.832 N ( 2.2103 LB )

Table 2-28b. Lift loss and pitching moment data for flat ended plug down 0.875 D<sub>n</sub> configuration, R = 7.11.

PORT	NON-DIMENSIONAL APFA	M			L		
		N - M	LR-FT	M/TD	N	LR	L/T
1	2.0315	0.000410	0.000302	0.001826	-0.221397	-0.049770	-0.022517
2	3.1150	0.000603	0.000445	0.002686	-0.317903	-0.071465	-0.032333
3	5.7464	0.000975	0.000719	0.004345	-0.515475	-0.115079	-0.052427
4	10.8543	0.001343	0.000991	0.005985	-0.775169	-0.174258	-0.078839
5	17.3552	0.001590	0.001165	0.007041	-1.028352	-0.231174	-0.104589
6	25.2493	0.001712	0.001263	0.007628	-1.272080	-0.285963	-0.129378
7	34.5363	0.001851	0.001365	0.008248	-1.501423	-0.337520	-0.152703
8	45.2165	0.001868	0.001378	0.008326	-1.719810	-0.386613	-0.174915
9	57.2897	0.001838	0.001356	0.008190	-1.931649	-0.434235	-0.196460
10	70.7560	0.004768	0.003517	0.021247	-2.095116	-0.470982	-0.213085
11	83.0420	0.007181	0.005297	0.032001	-2.220980	-0.499276	-0.225886
12	104.7119	0.012400	0.009146	0.055255	-2.385331	-0.536222	-0.242602
13	135.2818	0.019671	0.014510	0.087659	-2.586743	-0.581500	-0.263087
14	162.5239	0.026746	0.019728	0.119186	-2.717071	-0.610797	-0.276342
15	192.2426	0.033866	0.024980	0.150913	-2.835801	-0.637488	-0.288417
16	224.4378	0.033866	0.024980	0.150913	-2.835801	-0.637488	-0.288417
17	259.1096	0.033866	0.024980	0.150913	-2.835801	-0.637488	-0.288417
18	296.2579	0.033866	0.024980	0.150913	-2.835801	-0.637488	-0.288417
19	320.7333	0.033866	0.024980	0.150913	-2.835801	-0.637488	-0.288417
20	330.7943	0.033866	0.024980	0.150913	-2.835801	-0.637488	-0.288417
21	341.0101	0.033866	0.024980	0.150913	-2.835801	-0.637488	-0.288417
22	351.3806	0.033866	0.024980	0.150913	-2.835801	-0.637488	-0.288417
23	361.9060	0.033866	0.024980	0.150913	-2.835801	-0.637488	-0.288417

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Table 2-29b. Lift loss and pitching moment data for flat ended plug down 0.875 D<sub>n</sub> configuration, R = 4.74.

PORT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N - M	LR-FT		N	LR	
1	2.0315	0.002733	0.002016	0.012170	-0.565068	-0.127027	-0.057471
2	3.1150	0.004134	0.003049	0.018420	-0.802470	-0.180384	-0.081611
3	5.7464	0.007372	0.005438	0.032852	-1.269437	-0.285369	-0.129109
4	10.8543	0.012584	0.009282	0.056077	-1.818679	-0.408839	-0.184970
5	17.3552	0.018316	0.013510	0.081619	-2.291430	-0.515114	-0.233052
6	25.2493	0.024520	0.018086	0.109267	-2.703172	-0.607673	-0.274928
7	34.5363	0.031015	0.022877	0.138208	-3.068149	-0.689720	-0.312048
8	45.2165	0.037928	0.027975	0.169011	-3.393157	-0.762782	-0.345104
9	57.2897	0.045060	0.033237	0.200797	-3.684362	-0.828245	-0.374721
10	70.7560	0.052088	0.039084	0.236125	-3.932979	-0.884134	-0.400007
11	83.0420	0.059330	0.043762	0.264384	-4.115308	-0.925121	-0.418551
12	104.7119	0.069897	0.051556	0.311471	-4.349292	-0.977721	-0.442348
13	135.2818	0.083591	0.061656	0.372493	-4.611544	-1.036675	-0.469021
14	162.5239	0.094507	0.069700	0.421139	-4.775367	-1.073503	-0.485682
15	192.2426	0.104697	0.077225	0.466548	-4.920043	-1.106026	-0.500397
16	224.4378	0.105251	0.077633	0.468013	-4.923394	-1.106779	-0.500737
17	259.1096	0.105702	0.077966	0.471025	-4.925433	-1.107350	-0.500996
18	296.2579	0.106166	0.078308	0.473091	-4.928367	-1.107897	-0.501243
19	320.7333	0.106587	0.078619	0.474970	-4.930443	-1.108364	-0.501454
20	330.7943	0.106707	0.078707	0.475505	-4.931024	-1.108494	-0.501514
21	341.0101	0.106790	0.078768	0.475873	-4.931418	-1.108583	-0.501554
22	351.3806	0.106968	0.078900	0.476668	-4.932258	-1.108772	-0.501639
23	361.9060	0.107126	0.079016	0.477371	-4.932988	-1.108936	-0.501713

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Table 2-30b. Lift loss and pitching moment data for flat ended plug down 0.875 D<sub>n</sub> configuration, R = 2.37.

PORT	NON-DIMENSIONAL AREA	N	M	M/TD	L	L/R	L/I
		→	LH-FT				
1	2.0329	0.014464	0.010668	0.064515	-1.355133	-0.304634	-0.137914
2	3.1171	0.021747	0.016041	0.097004	-1.861496	-0.418464	-0.189447
3	5.7501	0.038527	0.028418	0.171851	-2.751737	-0.618594	-0.290048
4	10.8613	0.069578	0.051320	0.310349	-3.679695	-0.827195	-0.374488
5	17.3664	0.107005	0.078927	0.477295	-4.455836	-1.001672	-0.453477
6	25.2656	0.148471	0.109512	0.662250	-5.109499	-1.148615	-0.520001
7	34.5587	0.191474	0.141231	0.854065	-5.645024	-1.269001	-0.574502
8	45.2457	0.234855	0.173229	1.047565	-6.079383	-1.366645	-0.618708
9	57.3267	0.278179	0.205185	1.240811	-6.442199	-1.448206	-0.655632
10	70.8017	0.308615	0.227635	1.376572	-6.883273	-1.547360	-0.700521
11	83.0956	0.332458	0.245221	1.482919	-7.196865	-1.617855	-0.732435
12	104.7795	0.366264	0.270156	1.633711	-7.627857	-1.714742	-0.776298
13	135.3692	0.406686	0.299971	1.814012	-8.098572	-1.820559	-0.824204
14	162.6290	0.436428	0.321909	1.946675	-8.417206	-1.892188	-0.856631
15	192.3668	0.464859	0.342880	2.073490	-8.701728	-1.956149	-0.885588
16	224.5828	0.466129	0.343817	2.079156	-8.709422	-1.957878	-0.886371
17	259.2770	0.467150	0.344570	2.083713	-8.715169	-1.959170	-0.886955
18	296.4493	0.467887	0.345113	2.086997	-8.719035	-1.960039	-0.887340
19	320.9405	0.468500	0.345566	2.089733	-8.722054	-1.960718	-0.887656
20	331.0080	0.468692	0.345707	2.090590	-8.722984	-1.960927	-0.887751
21	341.2304	0.468692	0.345707	2.090590	-8.722984	-1.960927	-0.887751
22	351.6077	0.468828	0.345808	2.091197	-8.723624	-1.961071	-0.887816
23	362.1398	0.468960	0.345905	2.091783	-8.724232	-1.961207	-0.887878

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Table 2-3lb. Lift loss and pitching moment data for flat ended plug down 1.375 D<sub>n</sub> configuration, R = 9.48.

POPT	NON-DIMENSIONAL AREA	M		M/TD	L		L/T
		N	-M		N	LP	
1	1.6694	0.000317	0.000234	0.001093	-0.091296	-0.020523	-0.007932
2	2.5597	0.000455	0.000336	0.001571	-0.132048	-0.029696	-0.011477
3	4.7219	0.000682	0.000503	0.002353	-0.215854	-0.048524	-0.018754
4	8.9191	0.000710	0.000524	0.002450	-0.327728	-0.073673	-0.028473
5	14.2611	0.000476	0.000351	0.001642	-0.439099	-0.098709	-0.038149
6	20.7477	-0.000444	-0.000333	-0.001153	-0.547310	-0.123035	-0.047451
7	28.3791	-0.000840	-0.000620	-0.002000	-0.649559	-0.146021	-0.056434
8	37.1551	-0.001782	-0.001314	-0.004149	-0.748592	-0.168284	-0.065038
9	47.0759	-0.002871	-0.002118	-0.009007	-0.844181	-0.189772	-0.073313
10	58.1413	-0.002482	-0.001830	-0.008563	-0.907879	-0.204091	-0.078877
11	68.2369	-0.002328	-0.001717	-0.008034	-0.959741	-0.215750	-0.083383
12	86.0434	-0.001856	-0.001369	-0.006403	-1.014592	-0.228080	-0.088149
13	111.1632	-0.001238	-0.000913	-0.004272	-1.074933	-0.241645	-0.093391
14	133.5485	-0.000228	-0.000168	-0.000787	-1.107829	-0.249040	-0.096249
15	157.9688	0.000933	0.000688	0.003218	-1.141300	-0.256564	-0.099157
16	184.4241	0.000933	0.000688	0.003218	-1.141300	-0.256564	-0.099157
17	212.9145	0.000933	0.000688	0.003218	-1.141300	-0.256564	-0.099157
18	243.4398	0.000933	0.000688	0.003218	-1.141300	-0.256564	-0.099157
19	263.5516	0.000933	0.000688	0.003218	-1.141300	-0.256564	-0.099157
20	271.8189	0.000933	0.000688	0.003218	-1.141300	-0.256564	-0.099157
21	280.2134	0.000933	0.000688	0.003218	-1.141300	-0.256564	-0.099157
22	288.7350	0.000933	0.000688	0.003218	-1.141300	-0.256564	-0.099157
23	297.3839	0.000933	0.000688	0.003218	-1.141300	-0.256564	-0.099157

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Table 2-32b. Lift loss and pitching moment data for flat ended plug down 1.375 D<sub>n</sub> configuration, R = 7.1.

PORT	NON-DIMENSIONAL APFA	N - M	M L/D-FT	M/TD	N	L LR	L/T
1	1.6694	0.000880	0.000649	0.003036	-0.219673	-0.049382	-0.019085
2	2.5597	0.001298	0.000957	0.004478	-0.316805	-0.071218	-0.027524
3	4.7319	0.002188	0.001614	0.007551	-0.516908	-0.116201	-0.044909
4	8.9191	0.003334	0.002459	0.011504	-0.782997	-0.176018	-0.068027
5	14.2611	0.004502	0.003321	0.015535	-1.043584	-0.234620	-0.090676
6	20.7477	0.005585	0.004119	0.019271	-1.296596	-0.291475	-0.112664
7	28.3791	0.006700	0.004942	0.023119	-1.544309	-0.347161	-0.134171
8	37.1551	0.007986	0.005891	0.027557	-1.785012	-0.401271	-0.155083
9	47.0758	0.009394	0.006929	0.032416	-2.023295	-0.454837	-0.175786
10	58.1413	0.010839	0.008050	0.037933	-2.271337	-0.497288	-0.192192
11	68.2369	0.011837	0.009367	0.043964	-2.367948	-0.531191	-0.205295
12	86.0434	0.012756	0.010325	0.049886	-2.572254	-0.570243	-0.223480
13	111.1632	0.013697	0.011280	0.056980	-2.829254	-0.636016	-0.245808
14	133.5485	0.015124	0.012797	0.064823	-2.996723	-0.673663	-0.260358
15	157.9688	0.016284	0.014639	0.071702	-3.156639	-0.709613	-0.274252
16	184.4241	0.016448	0.014753	0.072288	-3.166055	-0.711729	-0.275070
17	212.9145	0.016606	0.014872	0.072954	-3.175128	-0.713769	-0.275858
18	243.4398	0.016790	0.015011	0.073443	-3.184992	-0.715986	-0.276715
19	263.5516	0.016910	0.015097	0.073846	-3.190737	-0.717278	-0.277214
20	271.8189	0.016951	0.015127	0.073987	-3.192711	-0.717722	-0.277386
21	280.2134	0.016993	0.015158	0.074132	-3.194716	-0.718172	-0.277560
22	288.7350	0.017041	0.015194	0.074290	-3.196991	-0.718684	-0.277757
23	297.3839	0.017083	0.015224	0.074408	-3.198895	-0.719112	-0.277923

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Table 2-33b. Lift loss and pitching moment data for flat ended plug down 1.375 L<sub>n</sub> configuration, R = 4.74.

PORT	NON-DIMENSIONAL				N	L	L/L <sub>n</sub>
	AREA	N - M	L <sub>B</sub> -FT	M/TP			
1	1.6694	0.003617	0.002668	0.012482	-0.595996	-0.133980	-0.051781
2	2.5597	0.005494	0.004053	0.018950	-0.850083	-0.191099	-0.073856
3	4.7219	0.009833	0.007251	0.033930	-1.353081	-0.304173	-0.117557
4	8.9191	0.017191	0.012680	0.059321	-1.966141	-0.441989	-0.170820
5	14.2611	0.025957	0.019146	0.089569	-2.514774	-0.565321	-0.218486
6	20.7477	0.035990	0.026546	0.124189	-3.009850	-0.676614	-0.261498
7	28.3791	0.047029	0.034688	0.162280	-3.455588	-0.776816	-0.300224
8	37.1551	0.058662	0.043269	0.202422	-3.853014	-0.866158	-0.334753
9	47.0758	0.071183	0.052504	0.245626	-4.216561	-0.947883	-0.366338
10	58.1413	0.084751	0.062513	0.292447	-4.539617	-1.020506	-0.394406
11	68.2369	0.095945	0.070769	0.331072	-4.777247	-1.073925	-0.415051
12	86.0434	0.114460	0.084426	0.394962	-5.095654	-1.145503	-0.442715
13	111.1632	0.138545	0.102191	0.478070	-5.458587	-1.227090	-0.474247
14	133.5485	0.157923	0.116484	0.544937	-5.690004	-1.270113	-0.494352
15	157.9688	0.177749	0.131108	0.613348	-5.902546	-1.326892	-0.512818
16	184.4241	0.182433	0.134562	0.629510	-5.930917	-1.333270	-0.515283
17	212.9145	0.187865	0.138569	0.648254	-5.961471	-1.340139	-0.517938
18	243.4398	0.193692	0.142867	0.668361	-5.992063	-1.347016	-0.520596
19	263.5516	0.197194	0.145150	0.680445	-6.009298	-1.350890	-0.522093
20	271.8189	0.198632	0.146511	0.685408	-6.016267	-1.352457	-0.522698
21	280.2134	0.200065	0.147568	0.690353	-6.023108	-1.353995	-0.523293
22	288.7350	0.201568	0.148676	0.695318	-6.030171	-1.355583	-0.523906
23	297.3839	0.203238	0.149908	0.701301	-6.037907	-1.357322	-0.524579

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Table 2-34b. Lift loss and pitching moment data for flat ended plug down 1.375 D<sub>n</sub> configuration, R = 2.37.

PORT	NON-DIMENSIONAL AREA	N - M	M L <sub>R</sub> -FT	M/LD	N	L	LW	L/T
1	1.6694	0.015218	0.011225	0.052511	-1.476768	-0.331978	-0.128303	
2	2.5597	0.022870	0.016869	0.078915	-2.037814	-0.458101	-0.177047	
3	4.7219	0.041232	0.030413	0.142278	-3.073139	-0.690842	-0.266997	
4	8.9191	0.076115	0.056143	0.262646	-4.210994	-0.946631	-0.365855	
5	14.2611	0.118623	0.087496	0.409326	-5.181480	-1.164797	-0.450171	
6	20.7477	0.165301	0.121926	0.570393	-5.993205	-1.347272	-0.520695	
7	28.3791	0.213444	0.157437	0.736520	-6.659644	-1.497088	-0.578596	
8	37.1551	0.261102	0.192648	0.901244	-7.196327	-1.617734	-0.625223	
9	47.0758	0.308531	0.227573	1.064631	-7.639125	-1.717275	-0.663694	
10	58.1413	0.341815	0.252122	1.179480	-8.151326	-1.832418	-0.708194	
11	68.2369	0.368701	0.271954	1.272256	-8.520958	-1.915511	-0.740308	
12	86.0434	0.406367	0.299736	1.402228	-9.020791	-2.027874	-0.783734	
13	111.1632	0.450346	0.332175	1.553981	-9.553849	-2.147705	-0.830047	
14	133.5485	0.484041	0.357029	1.670252	-9.933847	-2.233129	-0.863061	
15	157.9688	0.515803	0.380456	1.779851	-10.263114	-2.307148	-0.891668	
16	184.4241	0.516887	0.381256	1.783592	-10.269681	-2.308624	-0.892239	
17	212.9145	0.517670	0.381833	1.786293	-10.274084	-2.309614	-0.892621	
18	243.4398	0.518378	0.382355	1.788736	-10.277801	-2.310449	-0.892944	
19	263.5516	0.518703	0.382595	1.789858	-10.279402	-2.310869	-0.893083	
20	271.8189	0.518927	0.382760	1.790630	-10.280486	-2.311053	-0.893177	
21	280.2134	0.519108	0.382894	1.791256	-10.281351	-2.311248	-0.893253	
22	288.7350	0.519261	0.383007	1.791783	-10.282069	-2.311409	-0.893315	
23	297.3839	0.519261	0.383007	1.791783	-10.282069	-2.311409	-0.893315	

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SECTION 3: JET CENTERLINE TRAJECTORY DATA AND RESULTANT  
POWER LAW CURVE FIT EQUATIONS

Data for each nozzle configuration are presented for the location of the jet centerline at values of R equal to 8, 6, 4 and 2.5. These data were taken using a Kiel total pressure probe. Also listed for each configuration are predicted nondimensional z coordinates calculated using a least squares curve fit power law equation, and a local slope of the curve, in degrees. These slopes were then used to orient a pitot-static probe to obtain the dynamic pressure data presented in Section 4. The power law equation was of the form

$$z/D_{\text{eff}} = K(x/D_{\text{eff}})^n \quad 3-1$$

The trajectory data may be found in the following tables (also listed below are the appropriate values of K and n):

Configuration	R	Table	K	n
No Plug	8	3-1	7.0	0.325
	6	3-2	5.37	0.333
	4	3-3	3.66	0.324
	2.5	3-4	2.55	0.328
Round Plug Flush	8	3-5	6.04	0.337
	6	3-6	4.73	0.345
	4	3-7	3.15	0.370
	2.5	3-8	2.07	0.398
Round Plug Down 0.5 D <sub>n</sub>	8	3-9	6.14	0.334
	6	3-10	4.73	0.350
	4	3-11	3.33	0.353
	2.5	3-12	2.35	0.343
Round Plug Down 1.0 D <sub>n</sub>	8	3-13	6.64	0.326
	6	3-14	5.02	0.335
	4	3-15	3.44	0.329
	2.5	3-16	2.41	0.330
Flat Plug Flush	8	3-17	6.13	0.320
	6	3-18	4.85	0.322
	4	3-19	2.97	0.373
	2.5	3-20	2.23	0.377

Configuration	R	Table	K	n
Flat Plug Down 0.375 D <sub>n</sub>	8	3-21	6.01	0.319
	6	3-22	4.59	0.332
	4	3-23	2.83	0.396
	2.5	3-24	2.15	0.384
Flat Plug Down 0.875 D <sub>n</sub>	8	3-25	6.36	0.330
	6	3-26	4.79	0.349
	4	3-27	3.38	0.348
	2.5	3-28	2.41	0.342
Flat Plug Down 1.375 D <sub>n</sub>	8	3-29	6.45	0.332
	6	3-30	4.78	0.348
	4	3-31	3.43	0.312
	2.5	3-32	2.42	0.318

Table 3-1. Jet centerline trajectory data for no plug configuration,  $R = 8$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.955826E+00	0.698789E+01	0.689708E+01	0.668780E+02
0.287714E+01	0.969885E+01	0.986266E+01	0.488502E+02
0.473901E+01	0.115550E+02	0.116447E+02	0.382205E+02
0.672117E+01	0.129715E+02	0.129894E+02	0.328979E+02
0.864357E+01	0.140095E+02	0.140934E+02	0.278893E+02
0.105659E+02	0.151696E+02	0.150436E+02	0.248019E+02
0.124884E+02	0.160489E+02	0.158824E+02	0.224292E+02

Table 3-2. Jet centerline trajectory data for no plug configuration, R = 6.

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.952518E+00	0.527681E+01	0.528013E+01	0.615825E+02
0.287261E+01	0.762143E+01	0.762911E+01	0.415226E+02
0.479394E+01	0.898912E+01	0.904952E+01	0.321841E+02
0.671540E+01	0.102591E+02	0.101258E+02	0.266888E+02
0.863745E+01	0.110651E+02	0.110121E+02	0.230280E+02
0.105597E+02	0.117489E+02	0.117751E+02	0.203935E+02
0.124820E+02	0.123595E+02	0.124503E+02	0.183944E+02

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Table 3-3. Jet centerline trajectory data for no plug configuration,  $R = 4$ .

$x/D_{\text{eff}}$	$z/D_{\text{eff}}$	PREDICTED $z/D_{\text{eff}}$	SLOPE (DEGREES)
0.943921E+00	0.356256E+01	0.359642E+01	0.509914E+02
0.286171E+01	0.517447E+01	0.515161E+01	0.302544E+02
0.478142E+01	0.620024E+01	0.608381E+01	0.224049E+02
0.670249E+01	0.681081E+01	0.678738E+01	0.181655E+02
0.862380E+01	0.734812E+01	0.736494E+01	0.154676E+02
0.105454E+02	0.778773E+01	0.786098E+01	0.135787E+02
0.124670E+02	0.825176E+01	0.829911E+01	0.121717E+02

Table 3-4. Jet centerline trajectory data for no plug configuration, R = 2.5.

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.919157E+00	0.249795E+01	0.247767E+01	0.414518E+02
0.283165E+01	0.357251E+01	0.358222E+01	0.225143E+02
0.474848E+01	0.420748E+01	0.424342E+01	0.163203E+02
0.666675E+01	0.469592E+01	0.474241E+01	0.131202E+02
0.858622E+01	0.506225E+01	0.515234E+01	0.111234E+02
0.105038E+02	0.562395E+01	0.550413E+01	0.974249E+01
0.124244E+02	0.586817E+01	0.581547E+01	0.871923E+01

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Table 3-5. Jet centerline trajectory data for round plug flush configuration,  $R = 8$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.136762E+01	0.666814E+01	0.670725E+01	0.588423E+02
0.411283E+01	0.980825E+01	0.972312E+01	0.385645E+02
0.685891E+01	0.116225E+02	0.115535E+02	0.295996E+02
0.960532E+01	0.129135E+02	0.129430E+02	0.244385E+02
0.123519E+02	0.139951E+02	0.140887E+02	0.210399E+02
0.150984E+02	0.151115E+02	0.150757E+02	0.186103E+02
0.178451E+02	0.159140E+02	0.159499E+02	0.167742E+02



Table 3-6. Jet centerline trajectory data for round plug flush configuration, R = 6.

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.136363E+01	0.527045E+01	0.526605E+01	0.531303E+02
0.410777E+01	0.771275E+01	0.770611E+01	0.329316E+02
0.685324E+01	0.910836E+01	0.919569E+01	0.248572E+02
0.959872E+01	0.105040E+02	0.103300E+02	0.203836E+02
0.123451E+02	0.112018E+02	0.112676E+02	0.174913E+02
0.150914E+02	0.118996E+02	0.120768E+02	0.154453E+02
0.178374E+02	0.120463E+02	0.127944E+02	0.139095E+02

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Table 3-7. Jet centerline trajectory data for round plug flush configuration,  $R = 4$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.135373E+01	0.148443E+01	0.352026E+01	0.438873E+02
0.409479E+01	0.536849E+01	0.530133E+01	0.255893E+02
0.683838E+01	0.648497E+01	0.640869E+01	0.191192E+02
0.958306E+01	0.726999E+01	0.726070E+01	0.156559E+02
0.123283E+02	0.788056E+01	0.796976E+01	0.134483E+02
0.150733E+02	0.857836E+01	0.858497E+01	0.118969E+02
0.178188E+02	0.910171E+01	0.913313E+01	0.107355E+02

Table 3-8. Jet centerline trajectory data for round plug flush configuration, R = 2.5.

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.132648E+01	0.220785E+01	0.231990E+01	0.348899E+02
0.405862E+01	0.374294E+01	0.362346E+01	0.195947E+02
0.679625E+01	0.471982E+01	0.445037E+01	0.146332E+02
0.953664E+01	0.541758E+01	0.509401E+01	0.120234E+02
0.122839E+02	0.541758E+01	0.563503E+01	0.103655E+02
0.150243E+02	0.611535E+01	0.610617E+01	0.920491E+01
0.177715E+02	0.611535E+01	0.652903E+01	0.83392E+01

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Table 3-9. Jet centerline trajectory data for round plug down 0.5 D<sub>n</sub> configuration, R = 8.

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.110691E+01	0.639540E+01	0.635113E+01	0.624844E+02
0.333197E+01	0.908248E+01	0.918463E+01	0.426753E+02
0.555781E+01	0.107796E+02	0.108989E+02	0.332609E+02
0.778375E+01	0.123353E+02	0.121986E+02	0.276626E+02
0.100101E+02	0.133252E+02	0.132694E+02	0.239113E+02
0.122365E+02	0.143152E+02	0.141914E+02	0.212015E+02
0.144633E+02	0.148809E+02	0.150075E+02	0.191397E+02

Table 3-10. Jet centerline trajectory data for round plug down 0.5  $D_n$  configuration,  $R = 6$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.110270E+01	0.497911E+01	0.488947E+01	0.571709E+02
0.332664E+01	0.707220E+01	0.719268E+01	0.370015E+02
0.555172E+01	0.842988E+01	0.860279E+01	0.284426E+02
0.777702E+01	0.964614E+01	0.967852E+01	0.235101E+02
0.100029E+02	0.104907E+02	0.105686E+02	0.202705E+02
0.122285E+02	0.114847E+02	0.113375E+02	0.179567E+02
0.144546E+02	0.122201E+02	0.120200E+02	0.162001E+02

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Table 3-11. Jet centerline trajectory data for round plug down  $0.5 D_n$  configuration,  $R = 4$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.109148E+01	0.347353E+01	0.343521E+01	0.400215E+02
0.331247E+01	0.502920E+01	0.500841E+01	0.204507E+02
0.553559E+01	0.604745E+01	0.609490E+01	0.212476E+02
0.775973E+01	0.681114E+01	0.686708E+01	0.173551E+02
0.998409E+01	0.751826E+01	0.750634E+01	0.140692E+02
0.122092E+02	0.802739E+01	0.805909E+01	0.131215E+02
0.144337E+02	0.870623E+01	0.854979E+01	0.118150E+02

Table 3-12. Jet centerline trajectory data for round plug down 0.5  $D_n$  configuration,  $R = 2.5$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.105937E+01	0.246372E+01	0.239592E+01	0.378189E+02
0.327504E+01	0.342534E+01	0.352939E+01	0.202966E+02
0.549413E+01	0.410413E+01	0.421510E+01	0.147509E+02
0.771389E+01	0.472636E+01	0.473571E+01	0.110977E+02
0.993601E+01	0.515061E+01	0.516554E+01	0.101161E+02
0.121588E+02	0.551829E+01	0.553612E+01	0.888125E+01
0.143792E+02	0.608395E+01	0.586416E+01	0.796737E+01

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Table 3-13. Jet centerline trajectory data for round plug down 1.0  $D_n$  configuration,  $R = 8$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.971286E+00	0.668173E+01	0.657792E+01	0.655998E+02
0.292447E+01	0.921428E+01	0.941692E+01	0.463467E+02
0.487819E+01	0.110020E+02	0.111235E+02	0.365842E+02
0.683221E+01	0.123924E+02	0.124126E+02	0.305990E+02
0.878639E+01	0.135593E+02	0.134718E+02	0.265231E+02
0.107408E+02	0.144532E+02	0.143819E+02	0.235502E+02
0.126952E+02	0.152974E+02	0.151862E+02	0.212749E+02



Table 3-14. Jet centerline trajectory for round plug down 1.0  $D_n$  configuration,  $R = 6$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.967725E+00	0.494169E+01	0.496674E+01	0.598073E+02
0.291973E+01	0.710214E+01	0.718904E+01	0.395063E+02
0.487263E+01	0.859188E+01	0.853399E+01	0.303913E+02
0.682631E+01	0.953538E+01	0.955398E+01	0.251113E+02
0.878010E+01	0.104044E+02	0.103942E+02	0.216247E+02
0.107342E+02	0.110748E+02	0.111177E+02	0.191281E+02
0.126881E+02	0.118196E+02	0.117580E+02	0.172402E+02

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Table 3-15. Jet centerline trajectory for round plug down 1.0  $D_n$  configuration,  $R = 4$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.958267E+00	0.337251E+01	0.339333E+01	0.493211E+02
0.290752E+01	0.493672E+01	0.488658E+01	0.289077E+02
0.485952E+01	0.575607E+01	0.578492E+01	0.213619E+02
0.681190E+01	0.647611E+01	0.646382E+01	0.173161E+02
0.876454E+01	0.712166E+01	0.702189E+01	0.147476E+02
0.107183E+02	0.746926E+01	0.750186E+01	0.129508E+02
0.126720E+02	0.784169E+01	0.792613E+01	0.116132E+02

Table 3-16. Jet centerline trajectory data for round plug down 1.0  $D_n$  configuration,  $R = 2.5$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.930945E+00	0.276302E+01	0.235486E+01	0.398896E+02
0.287414E+01	0.343060E+01	0.341771E+01	0.214507E+02
0.482312E+01	0.397680E+01	0.405529E+01	0.155265E+02
0.677182E+01	0.454783E+01	0.453648E+01	0.124814E+02
0.872218E+01	0.496989E+01	0.493218E+01	0.105035E+02
0.106739E+02	0.526782E+01	0.527250E+01	0.926993E+01
0.126254E+02	0.559058E+01	0.557329E+01	0.829872E+01

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Table 3-17. Jet centerline trajectory data for flat plug flush configuration,  $R = 8$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.156203E+01	0.701203E+01	0.707447E+01	0.554190E+02
0.469517E+01	0.100775E+02	0.100642E+02	0.344718E+02
0.702889E+01	0.120681E+02	0.118550E+02	0.258737E+02
0.109630E+02	0.133819E+02	0.132050E+02	0.210963E+02
0.140973E+02	0.141782E+02	0.143125E+02	0.180135E+02
0.172316E+02	0.151735E+02	0.152631E+02	0.158387E+02
0.203660E+02	0.159697E+02	0.161023E+02	0.142107E+02

Table 3-18. Jet centerline trajectory data for flat plug flush configuration, R = 6.

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.155840E+01	0.557683E+01	0.559429E+01	0.491772E+02
0.469063E+01	0.800535E+01	0.798108E+01	0.287524E+02
0.782395E+01	0.939877E+01	0.941266E+01	0.212035E+02
0.109575E+02	0.105931E+02	0.104926E+02	0.171599E+02
0.140914E+02	0.114690E+02	0.113792E+02	0.145957E+02
0.172257E+02	0.118671E+02	0.121405E+02	0.128042E+02
0.203594E+02	0.129022E+02	0.128128E+02	0.114717E+02

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Table 3-19. Jet centerline trajectory data for flat plug flush configuration,  $R = 4$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.154984E+01	0.350031E+01	0.349056E+01	0.400022E+02
0.467976E+01	0.529183E+01	0.528214E+01	0.228208E+02
0.781151E+01	0.640656E+01	0.639385E+01	0.169692E+02
0.109441E+02	0.720280E+01	0.725033E+01	0.138730E+02
0.140770E+02	0.791941E+01	0.796371E+01	0.119093E+02
0.172099E+02	0.859621E+01	0.858321E+01	0.105327E+02
0.203431E+02	0.919339E+01	0.913543E+01	0.050392E+01

Table 3-20. Jet centerline trajectory data for flat plug flush configuration, R = 2.5.

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.152116E+01	0.264419E+01	0.261165E+01	0.328954E+02
0.464575E+01	0.347831E+01	0.397730E+01	0.178762E+02
0.777297E+01	0.479395E+01	0.482837E+01	0.131714E+02
0.109012E+02	0.559016E+01	0.548452E+01	0.107326E+02
0.140320E+02	0.606789E+01	0.603180E+01	0.919801E+01
0.171639E+02	0.642618E+01	0.650743E+01	0.812887E+01
0.202940E+02	0.698353E+01	0.693136E+01	0.733218E+01

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Table 3-21. Jet centerline trajectory data for flat plug down 0.375  $D_n$  configuration,  $R = 8$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.142738E+01	0.677311E+01	0.673584E+01	0.564190E+02
0.429118E+01	0.950233E+01	0.957128E+01	0.354475E+02
0.715556E+01	0.112126E+02	0.112680E+02	0.266849E+02
0.100201E+02	0.125955E+02	0.125465E+02	0.217842E+02
0.128849E+02	0.135052E+02	0.135950E+02	0.186118E+02
0.157497E+02	0.145969E+02	0.144946E+02	0.163698E+02
0.186146E+02	0.153247E+02	0.152888E+02	0.146896E+02



Table 3-22. Jet centerline trajectory data for flat plug down 0.375 D<sub>n</sub> configuration, R = 6.

x/D <sub>eff</sub>	z/D <sub>eff</sub>	PREDICTED z/D <sub>eff</sub>	SLOPE (DEGREES)
0.142413E+01	0.513371E+01	0.516570E+01	0.502942E+02
0.428687E+01	0.749904E+01	0.744760E+01	0.299760E+02
0.715069E+01	0.888184E+01	0.882662E+01	0.222844E+02
0.100149E+02	0.986437E+01	0.987111E+01	0.181197E+02
0.128793E+02	0.107741E+02	0.107309E+02	0.154624E+02
0.157439E+02	0.113927E+02	0.114708E+02	0.135880E+02
0.186085E+02	0.120841E+02	0.121254E+02	0.122068E+02

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Table 3-23, Jet centerline trajectory data for flat plug down  $0.375 D_n$  configuration,  $R = 4$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.141609E+01	0.319911E+01	0.324046E+01	0.422342E+02
0.427598E+01	0.512776E+01	0.503055E+01	0.249659E+02
0.713824E+01	0.621944E+01	0.616156E+01	0.188601E+02
0.100010E+02	0.712918E+01	0.704123E+01	0.155692E+02
0.128648E+02	0.767502E+01	0.777906E+01	0.134578E+02
0.157281E+02	0.840281E+01	0.842297E+01	0.119660E+02
0.185920E+02	0.891227E+01	0.899945E+01	0.108443E+02

Table 3-24. Jet centerline trajectory data for flat plug down 0.375  $D_n$  configuration,  $R = 2.5$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.138892E+01	0.248012E+01	0.243487E+01	0.339800E+02
0.424473E+01	0.361716E+01	0.374119E+01	0.187195E+02
0.710268E+01	0.449048E+01	0.456001E+01	0.138654E+02
0.996217E+01	0.518186E+01	0.519346E+01	0.113337E+02
0.128220E+02	0.583685E+01	0.572262E+01	0.973679E+01
0.156839E+02	0.623712E+01	0.618352E+01	0.861931E+01
0.185462E+02	0.660101E+01	0.659516E+01	0.778522E+01

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Table 3-25. Jet centerline trajectory data for flat plug down  $0.876 D_n$  configuration,  $R = 8$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.111405E+01	0.660721E+01	0.658655E+01	0.628346E+02
0.335177E+01	0.950344E+01	0.946953E+01	0.429597E+02
0.559037E+01	0.110678E+02	0.112087E+02	0.334587E+02
0.782901E+01	0.125753E+02	0.125246E+02	0.278020E+02
0.100680E+02	0.135424E+02	0.136072E+02	0.240113E+02
0.123070E+02	0.145379E+02	0.145383E+02	0.212738E+02
0.145460E+02	0.154766E+02	0.153617E+02	0.191921E+02

Table 3-26. Jet centerline trajectory data for flat plug down 0.875  $D_n$  configuration,  $R = 6$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.111057E+01	0.500764E+01	0.496090E+01	0.573826E+02
0.334725E+01	0.728311E+01	0.730467E+01	0.373133E+02
0.558523E+01	0.856306E+01	0.873488E+01	0.286434E+02
0.782320E+01	0.984307E+01	0.982579E+01	0.236847E+02
0.100615E+02	0.108385E+02	0.107284E+02	0.204251E+02
0.123005E+02	0.114074E+02	0.115082E+02	0.180951E+02
0.145389E+02	0.123460E+02	0.122002E+02	0.163343E+02

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Table 3-27. Jet centerline trajectory data for flat plug down 0.875  $D_n$  configuration,  $R = 4$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.110098E+01	0.352307E+01	0.349649E+01	0.478611E+02
0.333519E+01	0.514434E+01	0.514211E+01	0.287163E+02
0.557178E+01	0.605453E+01	0.614759E+01	0.210058E+02
0.700066E+01	0.687938E+01	0.691381E+01	0.171258E+02
0.100462E+02	0.750513E+01	0.754743E+01	0.146522E+02
0.122839E+02	0.807400E+01	0.809456E+01	0.129161E+02
0.145213E+02	0.875664E+01	0.857991E+01	0.116195E+02

Table 3-28. Jet centerline trajectory data for flat plug down 0.875 D<sub>n</sub> configuration, R = 2.5.

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.107311E+01	0.253887E+01	0.247302E+01	0.302569E+02
0.330246E+01	0.356279E+01	0.363704E+01	0.206273E+02
0.553552E+01	0.421695E+01	0.433536E+01	0.150017E+02
0.776972E+01	0.475735E+01	0.486865E+01	0.121014E+02
0.100036E+02	0.532619E+01	0.530838E+01	0.102910E+02
0.122396E+02	0.569594E+01	0.568772E+01	0.903467E+01
0.144735E+02	0.626478E+01	0.602352E+01	0.810453E+01

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Table 3-29. Jet centerline trajectory data for flat plug down 1.375  $D_n$  configuration,  $R = 8$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.100249E+01	0.648107E+01	0.645941E+01	0.649194E+02
0.301681E+01	0.919513E+01	0.930797E+01	0.456548E+02
0.503171E+01	0.110387E+02	0.110288E+02	0.360107E+02
0.704687E+01	0.124902E+02	0.123320E+02	0.301269E+02
0.906240E+01	0.133943E+02	0.134048E+02	0.261279E+02
0.110779E+02	0.143673E+02	0.143279E+02	0.232140E+02
0.130936E+02	0.150330E+02	0.151445E+02	0.209842E+02



Table 3-30. Jet centerline trajectory data for flat plug down 1.375 D<sub>n</sub> configuration, R = 6.

x/D <sub>eff</sub>	z/D <sub>eff</sub>	PREDICTED z/D <sub>eff</sub>	SLOPE (DEGREES)
0.999371E+00	0.478954E+01	0.477988E+01	0.589822E+02
0.301263E+01	0.699155E+01	0.701538E+01	0.389978E+02
0.502700E+01	0.834860E+01	0.838245E+01	0.301060E+02
0.704163E+01	0.950082E+01	0.942464E+01	0.249571E+02
0.905676E+01	0.102690E+02	0.102866E+02	0.215509E+02
0.110720E+02	0.109859E+02	0.110309E+02	0.191076E+02
0.130871E+02	0.117284E+02	0.116912E+02	0.172565E+02

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Table 3-31. Jet centerline trajectory data for flat plug down 1.375  $D_n$  configuration,  $R = 4$ .

$x/D_{eff}$	$z/D_{eff}$	PREDICTED $z/D_{eff}$	SLOPE (DEGREES)
0.990297E+00	0.340190E+01	0.342140E+01	0.471310E+02
0.300153E+01	0.486137E+01	0.483652E+01	0.266635E+02
0.501402E+01	0.570631E+01	0.567544E+01	0.194270E+02
0.702880E+01	0.634644E+01	0.630511E+01	0.156182E+02
0.904330E+01	0.680733E+01	0.682026E+01	0.132259E+02
0.110580E+02	0.726821E+01	0.726140E+01	0.115653E+02
0.130731E+02	0.757547E+01	0.765027E+01	0.103352E+02

Table 3-32. Jet centerline trajectory data for flat plug down 1.375 D<sub>n</sub> configuration, R = 2.5.

x/D <sub>eff</sub>	z/D <sub>eff</sub>	PREDICTED z/D <sub>eff</sub>	SLOPE (DEGREES)
0.964677E+00	0.241349E+01	0.239414E+01	0.382874E+02
0.297101E+01	0.338642E+01	0.342401E+01	0.201315E+02
0.498069E+01	0.402651E+01	0.403558E+01	0.144517E+02
0.699243E+01	0.446177E+01	0.449547E+01	0.115570E+02
0.900418E+01	0.489703E+01	0.487192E+01	0.976500E+01
0.110172E+02	0.520427E+01	0.519404E+01	0.852954E+01
0.130302E+02	0.551152E+01	0.547966E+01	0.761870E+01

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#### SECTION 4: JET CENTERLINE DYNAMIC PRESSURE DECAY DATA

In this section the dynamic pressure decay data along the jet centerline are presented in tabular form. These data have been taken using a pitot static probe attached to a three dimensional traverse. The probe was oriented to be tangent to the local jet centerline using data from Section 3, and then the probe was traversed in the z-direction at various x locations to find the maximum q values. The x and z locations of the pitot static probe tip have been corrected for deflections of the probe traverse. These q data are listed in non-dimensional form versus  $s/D_{eff}$ , where s is the arc length along the jet centerline path.

These dynamic pressure data are found in the following tables:

Configuration	R	Table
No Plug	8	4-1
	6	4-2
	4	4-3
	2.5	4-4
Round Plug Flush	8	4-5
	6	4-6
	4	4-7
	2.5	4-8
Round Plug Down $0.5 D_n$	8	4-9
	6	4-10
	4	4-11
	2.5	4-12
Round Plug Down $1.0 D_n$	8	4-13
	6	4-14
	4	4-15
	2.5	4-16

Configuration	R	Table
Flat Plug Flush	8	4-17
	6	4-18
	4	4-19
	2.5	4-20
Flat Plug Down 0.375 $D_n$	8	4-21
	6	4-22
	4	4-23
	2.5	4-24
Flat Plug Down 0.875 $D_n$	8	4-25
	6	4-26
	4	4-27
	2.5	4-28
Flat Plug Down 1.375 $D_n$	8	4-29
	6	4-30
	4	4-31
	2.5	4-32

Table 4-1  
 Jet Centerline Decay Data for  
 No Plug, R = 8

---

<u>s/D<sub>eff</sub></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.000
2	0.992
3	0.997
4	0.929
5	0.636
6	0.358
7	0.217
8	0.148
9	0.107
10	0.076
11	0.058
12	0.045
13	0.035
14	0.029
15	0.024

---

Table 4-2  
Jet Centerline Decay Data for  
No Plug, R = 6

---

<u>s/D<sub>eff</sub></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.000
2	0.986
3	0.986
4	0.7305
5	0.378
6	0.212
7	0.123
8	0.0829
9	0.061
10	0.0427
11	0.033
12	0.027
14	0.022

---

Table 4-3  
 Jet Centerline Decay Data for  
 No Plug, R = 4

---

<u>s/D<sub>eff</sub></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.000
1	0.9652
2	0.9248
3	0.7752
4	0.3745
5	0.1896
6	0.1114
7	0.0705
8	0.0507
9	0.0393
10	0.0306

---



Table 4-4  
 Jet Centerline Decay Data for  
 No Plug, R = 2.5

---

$\frac{s/D_{eff}}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.000
1	0.7366
2	0.6865
3	0.4307
4	0.2194
5	0.1269
7	0.0515
10	0.0183

---

Table 4-5  
Jet Centerline Decay Data for  
Round Plug Flush, R = 8

---

$s/D_{eff}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
2	0.8297
3	0.7998
4	0.7455
5	0.4668
6	0.2696
7	0.1661
8	0.1046
9	0.0731
10	0.0521

---

Table 4-6  
 Jet Centerline Decay Data for  
 Round Plug Flush, R = 6

---

<u>s/D<sub>eff</sub></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
2	0.8366
3	0.7420
4	0.4840
5	0.2726
6	0.1514
7	0.0936
8	0.0613
9	0.040
10	0.03

---

Table 4-7  
 Jet Centerline Decay Data for  
 Round Plug Flush, R = 4

---

$\frac{s}{D_{eff}}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
1	0.7932
2	0.7321
3	0.364
4	0.2128
5	0.1293
6	0.0773
7	0.0576
8	0.039
10	0.022

---

Table 4-8  
 Jet Centerline Decay Data for  
 Round Plug Flush,  $R = 2.5$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
1	0.5044
2	0.2654
3	0.1313
4	0.0715
6	0.0291
8	0.0170
10	0.013

---

Table 4-9  
 Jet Centerline Decay Data for  
 Round Plug Down  $0.5 D_n$ ,  $R = 8$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
2	0.6944
3	0.693
4	0.5751
5	0.3941
6	0.2346
7	0.1588
8	0.1015
9	0.0754
10	0.0562

---

Table 4-10  
 Jet Centerline Decay Data for  
 Round Plug Down  $0.5 D_n$ ,  $R = 6$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
2	0.6972
3	0.6262
4	0.3705
5	0.2066
6	0.1175
7	0.0764
8	0.052
9	0.038
10	0.0266

---

Table 4-11  
 Jet Centerline Decay Data for  
 Round Plug Down  $0.5 D_n$ ,  $R = 4$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
1	0.6978
2	0.6445
3	0.4344
4	0.2205
5	0.1226
6	0.0719
7	0.0508
8	0.0367
9	0.0265
10	0.020

---



Table 4-12  
 Jet Centerline Decay Data for  
 Round Plug Down  $0.5 D_n$ ,  $R = 2.5$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
1	0.6272
2	0.5565
3	0.3465
4	0.1748
6	0.062
8	0.0352
10	0.0234

---

Table 4-13  
 Jet Centerline Decay Data for  
 Round Plug Down  $1.0 D_n$ ,  $R = 8$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0709
3	0.9902
4	0.908
5	0.5385
6	0.3295
7	0.1745
8	0.1159
9	0.0892
10	0.0638
12	0.0413
15	0.0206

---

Table 4-14  
 Jet Centerline Decay Data for  
 Round Plug Down 1.0  $D_n$ ,  $R = 6$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
2	1.0007
3	0.981
4	0.624
5	0.3611
6	0.2086
7	0.1410
8	0.0931
9	0.0706
10	0.0508

---

Table 4-15  
 Jet Centerline Decay Data for  
 Round Plug Down: 1.0  $D_n$ ,  $R = 4$

---

$\frac{s}{D_{eff}}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
1	0.9585
2	0.9539
3	0.7124
4	0.3683
5	0.2039
6	0.1287
7	0.0865
8	0.0640
9	0.0490
10	0.0410

---

Table 4-16  
Jet Centerline Decay Data for  
Round Plug Down  $1.0 D_n$ ,  $R = 2.5$

---

$\frac{s}{D_{eff}}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
1	0.7054
2	0.6557
3	0.4000
4	0.2327
5	0.1281
6	0.0886
7	0.060
8	0.047
10	0.030

---

Table 4-17  
Jet Centerline Decay Data for  
Square Plug Flush,  $R = 8$

---

$s/D_{eff}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
2	0.7166
3	0.7166
4	0.4881
5	0.3839
6	0.2067
7	0.1536
8	0.1134
9	0.077
10	0.0596

---

Table 4-18  
Jet Centerline Decay Data for  
Square Plug Flush, R = 6

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
2	0.7798
3	0.661
4	0.4714
5	0.3090
6	0.1873
7	0.1125
8	0.0757
10	0.039

---

Table 4-19  
 Jet Centerline Decay Data for  
 Square Plug Flush,  $R = 4$

---

$\frac{s}{D_{eff}}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
1	0.6851
2	0.6216
3	0.3377
4	0.1906
5	0.1179
6	0.0763
7	0.0574
8	0.042
10	0.025

---



Table 4-20  
Jet Centerline Decay Data for  
Square Plug Flush, R = 2.5

---

$\frac{s/D_{eff}}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
1	0.409
2	0.500
3	0.2024
4	0.108
6	0.039
8	0.0201
10	0.0180

---

Table 4-21  
 Jet Centerline Decay Data for  
 Square Plug Down  $0.375 D_n$ ,  $R = 8$

---

$s/D_{eff}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
2	0.7415
3	0.7688
4	0.6385
5	0.40725
6	0.2298
7	0.1406
8	0.0922
9	0.0586
10	0.0428

---

Table 4-22  
Jet Centerline Decay Data for  
Square Plug Down  $0.375 D_n$ ,  $R = 6$

---

$\frac{s}{D_{eff}}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
2	0.8288
3	0.7675
4	0.4520
5	0.2534
6	0.1344
7	0.0842
8	0.0575
9	0.042
10	0.033

---

Table 4-23  
Jet Centerline Decay Data for  
Square Plug Down  $0.375 D_n$ ,  $R = 4$

---

$\frac{s}{D_{eff}}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
1	0.7863
2	0.6744
3	0.4134
4	0.218
5	0.1265
6	0.081
8	0.038
10	0.024

---

Table 4-24  
 Jet Centerline Decay Data for  
 Square Plug Down  $0.375 D_n$ ,  $R = 2.5$

---

$s/D_{eff}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
1	0.4781
2	0.3328
3	0.1309
4	0.0782
6	0.032

---

Table 4-25  
 Jet Centerline Decay Data for  
 Square Plug Down  $0.875 D_n$ ,  $R = 8$

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
2	0.6538
3	0.6439
4	0.549
5	0.4746
6	0.3447
7	0.1692
8	0.1082
9	0.0765
10	0.0531

Table 4-26  
 Jet Centerline Decay Data for  
 Square Plug Down  $0.875 D_n$ ,  $R = 6$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
2	0.6461
3	0.644
4	0.6036
5	0.2771
6	0.1359
7	0.0875
8	0.0609
9	0.0420
10	0.0323

---

Table 4-27  
 Jet Centerline Decay Data for  
 Square Plug Down  $0.875 D_n$ ,  $R = 4$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
1	0.6405
2	0.6160
3	0.4647
4	0.2366
5	0.1248
6	0.0791
7	0.052
8	0.0383
9	0.027
10	0.018

---



Table 4-28  
 Jet Centerline Decay Data for  
 Square Plug Down  $0.875 D_n$ ,  $R = 2.5$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
1	0.6149
2	0.5542
3	0.3415
4	0.1809
6	0.0642
8	0.0312
10	0.022

---

Table 4-29  
 Jet Centerline Decay Data for  
 Square Plug Down  $1.375 D_n$ ,  $R = 8$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
2	0.8740
3	0.8564
4	0.6636
5	0.6019
6	0.3412
7	0.2147
8	0.1607
9	0.1110
10	0.083

---

Table 4-30  
 Jet Centerline Decay Data for  
 Square Plug Down  $1.375 D_n$ ,  $R = 6$

---

<u><math>s/D_{eff}</math></u>	<u><math>\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}</math></u>
0	1.0000
2	0.8266
3	0.758
4	0.557
5	0.3383
6	0.1830
7	0.125
8	0.0881
9	0.066
10	0.051

---

Table 4-31  
 Jet Centerline Decay Data for  
 Square Plug Down  $1.375 D_n$ ,  $R = 4$

---

$s/D_{eff}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
1	0.7405
2	0.7030
3	0.602
4	0.3294
5	0.1901
6	0.115
7	0.080
8	0.0573
9	0.0465
10	0.035

---

Table 4-32

Jet Centerline Decay Data for  
Square Plug Down  $1.375 D_n$ ,  $R = 2.5$

---

$\frac{s}{D_{eff}}$	$\frac{q(s) - q_{\infty}}{q(0) - q_{\infty}}$
0	1.0000
2	0.655
3	0.404
4	0.2192
5	0.1348
6	0.0888
7	0.0628
8	0.046
9	0.035
10	0.028

---

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