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NASA TN D-1612 38p

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N63-12950
code-1

TECHNICAL NOTE

D-1612

PRESSURE DISTRIBUTIONS OVER THE FORWARD PORTION OF THE PROJECT FIRE SPACE-VEHICLE CONFIGURATION AT MACH NUMBERS FROM 0.25 TO 0.60

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON February 1963

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SUMMARY

An investigation was made in the Langley 7- by 10-foot transonic tunnel to determine the pressure distributions over a 0.0628-scale model of the forward portion of the Project Fire space-vehicle configuration. Tests were made at Mach numbers of 0.248, 0.395, and 0.585. Data are presented for the model at angles of attack ranging from -8° to 8° and at roll angles of 0°, 15°, 30°, 50°, and 90°.

INTRODUCTION

Project Fire is a flight reentry program being conducted by the National Aeronautics and Space Administration for the purpose of studying total heat transfer, ultrahigh-temperature air radiance, materials response, and radio blackout effects at hyperbolic velocities. The Project Fire vehicle consists of a reentry package which is attached by an adapter to an Antares II-A2 rocket motor. These components are enclosed by a shroud and a guidance-unit shell. This assembly (designated velocity package) is mounted by means of an adapter to an Atlas D first-stage launch vehicle, which will launch the velocity package on a ballistic trajectory. Prior to reentry, the Antares motor will accelerate the reentry package to a velocity of about 37,000 feet per second. When this velocity is reached, the reentry package separates from the Antares motor and reenters the atmosphere.

The purpose of this paper is to present subsonic pressure distributions over the forward portion of the Project Fire space-vehicle configuration to aid in the structural design of this configuration. The tests were made in the Langley 7- by 10-foot transonic tunnel at Mach numbers from 0.25 to 0.60 and at angles of attack from -8° to 8°.

SYMBOLS

C_p	pressure coefficient, $\frac{p_l - p_\infty}{q_\infty}$
l	length of model, in.
M	Mach number
p_∞	free-stream static pressure, lb/sq ft
p_l	local orifice pressure, lb/sq ft
q_∞	free-stream dynamic pressure, lb/sq ft
R	Reynolds number based on a length of 1 foot
x	orifice location measured from model nose, in.
α	angle of attack, deg
ϕ	angle of roll of orifices, measured clockwise from the vertical as viewed from rear of model, deg (see fig. 1)

MODEL

Details of the 0.0628-scale model tested are given in figure 1, and a photograph is presented in figure 2. The model represents the velocity package attached by an adapter to a portion of an Atlas D first-stage launch vehicle. The model was sting supported and instrumented with forty-two 0.043-inch-diameter pressure orifices located along the surface. In order to simplify construction, a single row of orifices was used, and the model was rotated through the angle ϕ to obtain the complete pressure distributions. (See fig. 1.)

TESTS AND CORRECTIONS

The investigation was made in the Langley 7- by 10-foot transonic tunnel at Mach numbers of 0.248, 0.395, and 0.585 which correspond to dynamic pressures of 87.8, 207.9, and 403.9 pounds per square foot, respectively. The Reynolds number per foot for each test Mach number is shown in figure 3. Pressure orifices were used to measure the pressures along the model (which are presented in the form of pressure coefficient C_p) for an angle-of-attack range of -8° to 8° and for roll angles of 0°, 15°, 30°, 50°, and 90°. The tests were conducted without artificial transition strips placed on the model.

The angles of attack have not been corrected for the deflections of the sting-support system under load; however, it was estimated that the maximum correction would be about $\pm 0.1^\circ$. The accuracy of the pressure coefficients is estimated to be within the following limits:

M	C_p
0.248	± 0.0400
0.395	± 0.0150
0.585	± 0.0060

PRESENTATION OF RESULTS

The pressure coefficients are presented in tables I, II, and III for Mach numbers of 0.248, 0.395, and 0.585, respectively. Representative plots of the pressure distributions over the model are presented as follows:

	Figure
The combined effect of Reynolds number and Mach number on the pressure distribution over the model. $\alpha = 0^\circ$; $\phi = 0^\circ$	4
The effect of angle of attack on the pressure distribution over the model. $\phi = 0^\circ$; M = 0.585	5
The effect of angle of attack on the pressure distributions over the model. $\phi = 90^\circ$; M = 0.585	6
The effect of roll angle on the pressure distribution over the model. $\alpha = 0^\circ$; M = 0.585	7
The effect of roll angle on the pressure distribution over the model. $\alpha = 8^\circ$; M = 0.585	8

SUMMARY OF RESULTS

A detailed discussion of the results obtained in the low-speed investigation of the pressure distributions over the forward portion of the Project Fire space-vehicle configuration has been omitted in order to expedite publication of the data. However, some of the results obtained in the investigation are mentioned here. Increasing the Mach number to 0.395 and the Reynolds number to 2.53×10^6 resulted in essentially no change in the pressures obtained over most of the model surface; however, further increases in the Mach number and Reynolds number resulted in slight increases in the pressures. (See fig. 4.) At the low roll angles (corresponding to the upper surface of the model) the pressures obtained over most of the model length were decreased with increasing angle of attack. (See fig. 5.) However, at the higher roll angles (corresponding to the side of the model) variations in the angle of attack had no significant effect on the pressure distribution. (See fig. 6.) Increasing the roll angle from 0° to 90°

had no significant effect on the pressures obtained on the model at angles of attack of 0° and 8°. (See figs. 7 and 8.)

Langley Research Center,
National Aeronautics and Space Administration,
Langley Station, Hampton, Va., November 20, 1962.

TABLE I

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.248

(a) $\alpha = -8^{\circ}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	.9220	.9294	.9358	.9754	1.0018
.005	.7003	.6795	.6465	.5886	.3666
.010	.3436	.3238	.2940	.2137	-.0174
.020	.2545	.2277	.2041	.1516	-.0103
.040	.2955	.2781	.2600	.2137	.1035
.060	.2786	.2589	.2333	.1921	.1012
.079	.2714	.2564	.2382	.1993	.1059
.099	.2593	.2469	.2235	.1921	.0988
.139	.2135	.2108	.1871	.1564	.0585
.179	.0810	.0690	.0461	.0250	-.0458
.198	-.0130	-.0175	-.0317	-.0562	-.1311
.208	-.1600	-.1713	-.1799	-.1994	-.2662
.227	-.3553	-.4165	-.4400	-.4526	-.5198
.237	-.0974	-.0968	-.0973	-.1087	-.1406
.257	-.0613	-.0656	-.0827	-.0873	-.1097
.276	-.0564	-.0632	-.0755	-.0801	-.0837
.302	-.1600	-.1617	-.1630	-.1494	-.0956
.311	-.0637	-.0824	-.0973	-.1064	-.0814
.331	.2352	.2277	.2090	.1826	.0870
.351	.1653	.1603	.1312	.1396	.1059
.371	.1725	.1603	.1482	.1396	.1083
.391	.2207	.2133	.1968	.1826	.1462
.412	.2496	.2469	.2308	.2112	.1604
.422	.2159	.2060	.1895	.1659	.1154
.442	.1894	.1844	.1628	.1491	.0893
.461	.1894	.1867	.1579	.1420	.0774
.481	.1725	.1652	.1458	.1277	.0703
.505	.1604	.1483	.1336	.1182	.0537
.525	.1436	.1387	.1312	.1062	.0443
.564	.1291	.1123	.1020	.0871	.0230
.604	.1002	.0906	.0704	.0536	-.0126
.644	.0761	.0738	.0607	.0536	-.0197
.683	.0520	.0498	.0388	.0274	-.0387
.723	.0279	.0234	.0048	-.0037	-.0743
.763	-.0058	-.0030	-.0317	-.0371	-.1051
.802	-.0950	-.0968	-.1071	-.1207	-.1714
.822	-.1842	-.1882	-.1946	-.1947	-.2496
.851	-.3408	-.3444	-.3526	-.3547	-.3894
.861	-.2011	-.2146	-.2091	-.2138	-.2496
.881	-.1432	-.1498	-.1581	-.1541	-.1808
.921	-.0998	-.1065	-.1119	-.1135	-.1382
.960	-.1119	-.1065	-.1119	-.1159	-.1335

TABLE I.- Continued

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.248

(b) $\alpha = -4^\circ$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	.9385	.9201	.9382	1.0040	1.0018
.005	.5557	.5582	.5468	.5203	.3682
.010	.1728	.1770	.1628	.1281	-.0006
.020	.1364	.1387	.1166	.0968	.0160
.040	.2068	.2105	.1992	.1859	.1271
.060	.2043	.1985	.1919	.1738	.1318
.079	.2019	.2010	.1944	.1811	.1342
.099	.1898	.1865	.1750	.1738	.1177
.139	.1462	.1458	.1336	.1306	.0798
.179	.0105	.0140	.0072	.0054	-.0384
.198	-.0791	-.0747	-.0876	-.0908	-.1401
.208	-.2270	-.2233	-.2383	-.2304	-.2630
.227	-.4280	-.4534	-.5057	-.4974	-.5136
.237	-.1421	-.1323	-.1362	-.1221	-.1164
.257	-.0937	-.0891	-.1022	-.0884	-.0951
.276	-.0791	-.0771	-.0925	-.0812	-.0691
.302	-.1397	-.1371	-.1508	-.1269	-.0881
.311	-.1033	-.0987	-.1094	-.1005	-.0715
.331	.1801	.1818	.1676	.1618	.1223
.351	.1389	.1410	.1312	.1402	.1460
.371	.1438	.1507	.1385	.1353	.1483
.391	.1922	.1914	.1750	.1835	.1862
.412	.2164	.2154	.2066	.2051	.1886
.422	.1801	.1794	.1676	.1642	.1554
.442	.1534	.1458	.1409	.1425	.1294
.461	.1438	.1410	.1215	.1306	.1153
.481	.1292	.1338	.1142	.1137	.0988
.505	.1171	.1123	.0971	.1017	.0798
.525	.0977	.1027	.0850	.0776	.0703
.564	.0783	.0763	.0631	.0608	.0467
.604	.0468	.0475	.0291	.0391	.0207
.644	.0372	.0428	.0291	.0343	.0065
.683	.0105	.0211	.0023	.0103	-.0172
.723	-.0186	-.0147	-.0341	-.0186	-.0479
.763	-.0597	-.0507	-.0706	-.0571	-.0833
.802	-.1421	-.1298	-.1483	-.1366	-.1637
.822	-.2197	-.2185	-.2383	-.2111	-.2394
.851	-.3699	-.3672	-.3890	-.3724	-.3789
.861	-.2245	-.2258	-.2431	-.2256	-.2394
.881	-.1663	-.1563	-.1726	-.1678	-.1802
.921	-.1179	-.1179	-.1289	-.1197	-.1235
.960	-.1106	-.1011	-.1216	-.1100	-.1117

TABLE I.- Continued

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.248

(c) $\alpha = 0^{\circ}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	.9343	.9946	.9969	1.0136	1.0019
.005	.3959	.4104	.4056	.4136	.3793
.010	-.0007	.0098	.0129	.0200	-.0004
.020	.0185	.0360	.0297	.0320	.0350
.040	.1315	.1505	.1446	.1472	.1435
.060	.1387	.1505	.1470	.1568	.1411
.079	.1339	.1480	.1470	.1544	.1481
.099	.1243	.1361	.1374	.1423	.1317
.139	.0834	.0956	.0967	.1064	.0939
.179	-.0368	-.0308	-.0302	-.0184	-.0288
.198	-.1329	-.1214	-.1140	-.1096	-.1466
.208	-.2795	-.2669	-.2720	-.2585	-.2716
.227	-.4935	-.4886	-.5114	-.5008	-.5027
.237	-.1498	-.1357	-.1331	-.1288	-.1184
.257	-.1040	-.0904	-.0925	-.0904	-.0924
.276	-.0801	-.0713	-.0757	-.0712	-.0641
.302	-.1137	-.1023	-.1043	-.1000	-.0877
.311	-.0896	-.0785	-.0757	-.0760	-.0593
.331	.1267	.1409	.1374	.1448	.1458
.351	.1363	.1457	.1374	.1448	.1576
.371	.1339	.1505	.1398	.1496	.1599
.391	.1700	.1862	.1781	.1856	.1954
.412	.1916	.2052	.1949	.2024	.2118
.422	.1531	.1647	.1566	.1664	.1717
.442	.1243	.1289	.1255	.1376	.1387
.461	.1123	.1194	.1110	.1208	.1293
.481	.0906	.0979	.1039	.1016	.1104
.505	.0786	.0836	.0752	.0848	.0963
.525	.0642	.0717	.0680	.0655	.0869
.564	.0401	.0479	.0440	.0512	.0656
.604	.0113	.0241	.0106	.0224	.0373
.644	.0041	.0121	.0177	.0272	.0185
.683	-.0175	-.0141	-.0134	-.0016	-.0099
.723	-.0560	-.0522	-.0565	-.0425	-.0475
.763	-.0848	-.0809	-.0876	-.0784	-.0829
.802	-.1665	-.1548	-.1571	-.1504	-.1489
.822	-.2506	-.2407	-.2552	-.2368	-.2268
.851	-.3853	-.3813	-.3845	-.3688	-.3660
.861	-.2483	-.2359	-.2432	-.2393	-.2244
.881	-.1762	-.1643	-.1762	-.1672	-.1632
.921	-.1257	-.1166	-.1235	-.1241	-.1159
.960	-.1232	-.1095	-.1163	-.1168	-.1041

TABLE I.- Continued

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.248

(d) $\alpha = 4^{\circ}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	1.0039	.9058	.9051	.9942	.9661
.005	.2066	.2369	.2514	.2571	.3697
.010	-.1922	-.1706	-.1564	-.1139	-.0033
.020	-.0979	-.0723	-.0744	-.0436	.0276
.040	.0495	.0668	.0655	.0898	.1274
.060	.0422	.0620	.0655	.1019	.1322
.079	.0688	.0835	.0776	.1019	.1345
.099	.0543	.0739	.0632	.0825	.1060
.139	.0229	.0380	.0318	.0486	.0680
.179	-.1318	-.1059	-.1178	-.0678	-.0414
.198	-.1849	-.1634	-.1781	-.1550	-.1530
.208	-.3348	-.3145	-.3300	-.3151	-.2813
.227	-.3348	-.3168	-.3493	-.4411	-.5308
.237	-.2091	-.1874	-.2046	-.1648	-.1459
.257	-.1172	-.1011	-.1178	-.1041	-.1007
.276	-.0762	-.0651	-.0888	-.0823	-.0793
.302	-.0786	-.0627	-.0864	-.0945	-.1055
.311	-.0617	-.0507	-.0671	-.0630	-.0722
.331	.0567	.0787	.0680	.0995	.1203
.351	.1123	.1267	.1210	.1213	.1322
.371	.1244	.1410	.1307	.1262	.1416
.391	.1461	.1650	.1524	.1650	.1750
.412	.1606	.1770	.1766	.1722	.1915
.422	.1291	.1410	.1331	.1407	.1535
.442	.0977	.1123	.0994	.1068	.1203
.461	.0833	.0955	.0752	.0898	.1060
.481	.0616	.0691	.0583	.0680	.0941
.505	.0446	.0500	.0390	.0559	.0727
.525	.0229	.0451	.0270	.0486	.0561
.564	-.0013	.0211	-.0019	.0219	.0419
.604	-.0303	-.0147	-.0358	-.0097	.0133
.644	-.0448	-.0244	-.0382	-.0193	.0062
.683	-.0690	-.0507	-.0671	-.0387	-.0270
.723	-.1028	-.0843	-.0937	-.0726	-.0627
.763	-.1318	-.1083	-.1298	-.1090	-.0888
.802	-.2067	-.1850	-.1997	-.1818	-.1625
.822	-.2816	-.2545	-.2818	-.2666	-.2528
.851	-.4049	-.3792	-.4048	-.3927	-.3834
.861	-.2671	-.2450	-.2673	-.2569	-.2480
.881	-.2019	-.1730	-.2022	-.1914	-.1743
.921	-.1487	-.1226	-.1443	-.1405	-.1269
.960	-.1463	-.1203	-.1395	-.1356	-.1150

TABLE I.- Concluded

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.248

(e) $\alpha = 8^{\circ}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	.9769	.9185	.9314	.9388	.9191
.005	.0268	.0504	.0728	.1596	.3635
.010	-.3762	-.3443	-.3287	-.2480	-.0101
.020	-.2395	-.1992	-.1835	-.1323	.0136
.040	-.0050	.0076	.0003	.0270	.1034
.060	-.0050	.0076	-.0021	.0367	.1153
.079	.0121	.0385	.0245	.0367	.1129
.099	.0097	.0266	.0075	.0246	.0940
.139	-.0172	-.0043	-.0215	-.0116	.0467
.179	-.1613	-.1446	-.1666	-.1178	-.0715
.198	-.2199	-.2017	-.2174	-.1611	-.1424
.208	-.3665	-.3349	-.3697	-.3349	-.2795
.227	-.3371	-.3134	-.3673	-.5857	-.5301
.237	-.2199	-.1992	-.2174	-.1611	-.1401
.257	-.1271	-.1018	-.1206	-.1178	-.1141
.276	-.0782	-.0543	-.0868	-.0888	-.0904
.302	-.0782	-.0495	-.0820	-.0840	-.0975
.311	-.0490	-.0352	-.0626	-.0598	-.0762
.331	.0585	.0789	.0680	.0704	.0822
.351	.1074	.1218	.0946	.0922	.1058
.371	.1123	.1265	.0970	.1041	.1153
.391	.1318	.1456	.1284	.1307	.1460
.412	.1391	.1479	.1357	.1355	.1626
.422	.1098	.1194	.0946	.1041	.1177
.442	.0780	.0885	.0534	.0704	.0893
.461	.0585	.0695	.0438	.0583	.0798
.481	.0390	.0433	.0196	.0439	.0656
.505	.0145	.0266	-.0021	.0174	.0467
.525	-.0050	.0076	-.0118	-.0044	.0373
.564	-.0367	-.0209	-.0384	-.0212	.0207
.604	-.0587	-.0495	-.0650	-.0502	-.0101
.644	-.0734	-.0637	-.0820	-.0671	-.0266
.683	-.1027	-.0851	-.1062	-.0888	-.0479
.723	-.1320	-.1113	-.1351	-.1105	-.0739
.763	-.1515	-.1422	-.1738	-.1443	-.1117
.802	-.2199	-.2040	-.2367	-.2118	-.1826
.822	-.2932	-.2825	-.3045	-.2915	-.2654
.851	-.4153	-.3824	-.4109	-.4097	-.3978
.861	-.2736	-.2634	-.2875	-.2794	-.2583
.881	-.2101	-.1874	-.2150	-.2071	-.1920
.921	-.1564	-.1375	-.1691	-.1419	-.1377
.960	-.1564	-.1350	-.1617	-.1443	-.1282

TABLE II

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT $M = 0.395$

(a) $\alpha = -8^{\circ}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	.9526	.9658	.9801	1.0046	1.0230
.005	.7047	.6969	.6639	.5833	.3567
.010	.3327	.3294	.2859	.1944	-.0575
.020	.2311	.2258	.1863	.1146	-.0524
.040	.2779	.2725	.2463	.1914	.0726
.060	.2565	.2522	.2259	.1681	.0586
.079	.2534	.2563	.2299	.1783	.0716
.099	.2332	.2400	.2148	.1671	.0586
.139	.1935	.1944	.1731	.1288	.0245
.179	.0198	.0431	.0287	-.0097	-.1055
.198	-.0433	-.0401	-.0597	-.1037	-.1886
.208	-.2109	-.2086	-.2222	-.2582	-.3396
.227	-.2790	-.2523	-.1756	-.2239	-.3796
.237	-.1704	-.1589	-.1623	-.1815	-.2126
.257	-.1022	-.1000	-.1044	-.1279	-.1585
.276	-.0982	-.0939	-.1023	-.1148	-.1265
.302	-.1936	-.1904	-.1907	-.1764	-.1335
.311	-.1276	-.1325	-.1420	-.1552	-.1225
.331	.2596	.2603	.2361	.1853	.0606
.351	.1864	.1852	.1741	.1489	.0966
.371	.1884	.1852	.1720	.1428	.1016
.391	.2413	.2411	.2259	.1933	.1406
.412	.2758	.2746	.2584	.2237	.1566
.422	.2372	.2319	.2117	.1792	.1146
.442	.2047	.2014	.1852	.1489	.0846
.461	.1985	.1944	.1782	.1428	.0756
.481	.1803	.1791	.1588	.1237	.0486
.505	.1712	.1700	.1487	.1136	.0345
.525	.1549	.1568	.1355	.0984	.0196
.564	.1325	.1304	.1132	.0711	-.0015
.604	.0980	.0959	.0816	.0378	-.0374
.644	.0888	.0857	.0714	.0368	-.0385
.683	.0634	.0614	.0461	.0105	-.0645
.723	.0279	.0258	.0084	-.0259	-.1005
.763	-.0118	-.0158	-.0353	-.0643	-.1335
.802	-.1002	-.0990	-.1115	-.1472	-.2115
.822	-.1977	-.1934	-.2060	-.2330	-.2915
.851	-.3604	-.3630	-.3707	-.3967	-.4376
.861	-.2364	-.2391	-.2487	-.2734	-.3136
.881	-.1753	-.1762	-.1847	-.2117	-.2445
.921	-.1306	-.1335	-.1410	-.1633	-.1905
.960	-.1388	-.1427	-.1491	-.1663	-.1855

TABLE II.- Continued

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.395

(b) $\alpha = -4^{\circ}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	1.0013	1.0028	.9974	1.0289	1.0370
.005	.5654	.5626	.5430	.5030	.3831
.010	.1653	.1659	.1413	.0993	-.0395
.020	.1164	.1186	.0946	.0680	-.0235
.040	.1969	.2001	.1839	.1680	.1026
.060	.1837	.1901	.1697	.1538	.0957
.079	.1816	.1901	.1798	.1598	.1047
.099	.1633	.1719	.1616	.1478	.0866
.139	.1246	.1357	.1180	.1064	.0526
.179	-.0495	-.0425	-.0433	-.0319	-.0806
.198	-.1076	-.0980	-.1153	-.1278	-.1797
.208	-.2777	-.2702	-.2827	-.2853	-.3279
.227	-.3255	-.3175	-.3181	-.2853	-.3990
.237	-.2095	-.1967	-.2035	-.1832	-.2007
.257	-.1259	-.1191	-.1275	-.1238	-.1416
.276	-.1076	-.0980	-.1082	-.1036	-.1126
.302	-.1626	-.1503	-.1589	-.1419	-.1267
.311	-.1361	-.1281	-.1376	-.1308	-.1156
.331	.1846	.1941	.1727	.1568	.0967
.351	.1704	.1800	.1676	.1639	.1307
.371	.1684	.1790	.1627	.1619	.1337
.391	.2152	.2222	.2103	.2043	.1758
.412	.2417	.2485	.2357	.2306	.1958
.422	.1990	.2052	.1900	.1871	.1567
.442	.1622	.1740	.1595	.1538	.1167
.461	.1531	.1639	.1494	.1427	.1017
.481	.1337	.1437	.1281	.1185	.0766
.505	.1225	.1276	.1149	.1064	.0626
.525	.1052	.1115	.0967	.0933	.0496
.564	.0859	.0884	.0744	.0660	.0196
.604	.0451	.0592	.0389	.0347	-.0105
.644	.0381	.0471	.0317	.0236	-.0194
.683	.0126	.0229	.0084	.0024	-.0435
.723	-.0210	-.0124	-.0311	-.0349	-.0785
.763	-.0588	-.0546	-.0667	-.0712	-.1136
.802	-.1422	-.1352	-.1508	-.1551	-.1927
.822	-.2359	-.2228	-.2411	-.2428	-.2799
.851	-.3906	-.3829	-.3983	-.3983	-.4231
.861	-.2685	-.2520	-.2695	-.2751	-.3019
.881	-.1961	-.1855	-.2025	-.2055	-.2297
.921	-.1432	-.1322	-.1498	-.1510	-.1747
.960	-.1341	-.1262	-.1416	-.1439	-.1627

TABLE II.- Continued

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT $M = 0.395$

(c) $\alpha = 0^{o}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	1.0044	.9946	.9975	1.0320	1.0330
.005	.3998	.3962	.4002	.4024	.3928
.010	-.0250	-.0245	-.0290	-.0157	-.0266
.020	-.0017	-.0024	-.0047	.0045	-.0015
.040	.1152	.1147	.1168	.1233	.1199
.060	.0939	.0925	.0905	.0992	.0988
.079	.1193	.1167	.1147	.1233	.1199
.099	.1020	.1016	.1026	.1092	.1039
.139	.0654	.0673	.0651	.0709	.0668
.179	-.1063	-.1063	-.1060	-.0983	-.0988
.198	-.1642	-.1628	-.1657	-.1567	-.1650
.208	-.3319	-.3313	-.3337	-.3229	-.3235
.227	-.3542	-.3505	-.3580	-.3451	-.3557
.237	-.2282	-.2264	-.2294	-.2182	-.2182
.257	-.1337	-.1355	-.1363	-.1284	-.1320
.276	-.1052	-.1073	-.1100	-.1003	-.0998
.302	-.1174	-.1194	-.1212	-.1103	-.1119
.311	-.1093	-.1083	-.1120	-.1043	-.1068
.331	.0899	.0925	.0884	.1002	.0979
.351	.1538	.1551	.1532	.1596	.1520
.371	.1610	.1581	.1603	.1657	.1620
.391	.1966	.1984	.1957	.2019	.1982
.412	.2168	.2156	.2190	.2220	.2203
.422	.1752	.1742	.1735	.1848	.1801
.442	.1376	.1389	.1360	.1455	.1440
.461	.1244	.1207	.1219	.1294	.1219
.481	.1031	.1006	.0976	.1083	.0988
.505	.0888	.0844	.0824	.0921	.0828
.525	.0705	.0652	.0631	.0780	.0707
.564	.0441	.0431	.0379	.0488	.0396
.604	.0085	.0098	.0075	.0135	.0115
.644	-.0017	-.0044	-.0068	.0055	-.0005
.683	-.0260	-.0327	-.0301	-.0197	-.0296
.723	-.0616	-.0629	-.0654	-.0549	-.0647
.763	-.0971	-.1003	-.1029	-.0902	-.0968
.802	-.1794	-.1810	-.1819	-.1718	-.1771
.822	-.2679	-.2707	-.2739	-.2604	-.2654
.851	-.4091	-.4110	-.4157	-.4045	-.4068
.861	-.2852	-.2849	-.2882	-.2796	-.2814
.881	-.2100	-.2102	-.2163	-.2090	-.2112
.921	-.1591	-.1557	-.1636	-.1527	-.1590
.960	-.1510	-.1497	-.1545	-.1456	-.1450

TABLE II.- Continued

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.395

(d) $\alpha = 4^{\circ}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	1.0340	.9915	.9903	1.0128	1.0000
.005	.2104	.2199	.2389	.2694	.3897
.010	-.2267	-.2146	-.1905	-.1503	-.0275
.020	-.1374	-.1267	-.1084	-.0805	-.0015
.040	.0370	.0431	.0491	.0661	.1156
.060	.0208	.0309	.0359	.0448	.1166
.079	.0482	.0572	.0581	.0702	.1176
.099	.0381	.0431	.0430	.0520	.1006
.139	.0066	.0098	.0054	.0135	.0586
.179	-.1587	-.1539	-.1581	-.1392	-.1045
.198	-.2146	-.2105	-.2150	-.2039	-.1645
.208	-.3788	-.3751	-.3764	-.3647	-.3226
.227	-.3747	-.3721	-.3774	-.3667	-.3436
.237	-.2449	-.2358	-.2485	-.2393	-.2185
.257	-.1414	-.1387	-.1449	-.1402	-.1295
.276	-.0999	-.1014	-.1114	-.1058	-.1065
.302	-.0928	-.0933	-.1052	-.1089	-.1355
.311	-.0837	-.0842	-.0941	-.0896	-.0805
.331	.0583	.0662	.0602	.0773	.1076
.351	.1282	.1329	.1242	.1328	.1406
.371	.1465	.1502	.1394	.1471	.1566
.391	.1749	.1774	.1719	.1773	.1917
.412	.1861	.1895	.1830	.1884	.2056
.422	.1526	.1572	.1465	.1511	.1707
.442	.1141	.1168	.1059	.1146	.1226
.461	.0938	.0945	.0896	.0974	.1156
.481	.0674	.0703	.0643	.0773	.0946
.505	.0512	.0512	.0450	.0550	.0756
.525	.0319	.0319	.0246	.0409	.0635
.564	.0066	.0077	.0014	.0135	.0386
.604	-.0340	-.0246	-.0332	-.0199	.0085
.644	-.0441	-.0408	-.0453	-.0300	-.0054
.683	-.0695	-.0660	-.0687	-.0552	-.0294
.723	-.1009	-.0984	-.1073	-.0886	-.0615
.763	-.1374	-.1306	-.1429	-.1250	-.0955
.802	-.2165	-.2105	-.2201	-.2049	-.1775
.822	-.3017	-.2933	-.3053	-.2888	-.2726
.851	-.4274	-.4185	-.4301	-.4153	-.4076
.861	-.3038	-.2953	-.3073	-.2980	-.2826
.881	-.2328	-.2256	-.2342	-.2231	-.2085
.921	-.1740	-.1690	-.1835	-.1685	-.1595
.960	-.1709	-.1660	-.1723	-.1624	-.1496

TABLE II.- Concluded

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.395

(e) $\alpha = 8^{o}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	.9935	.9967	.9871	.9662	.9416
.005	.0128	.0280	.0501	.1308	.3581
.010	-.4185	-.3926	-.3755	-.3010	-.0508
.020	-.2701	-.2557	-.2502	-.1725	-.0196
.040	-.0277	-.0163	-.0262	-.0148	.0758
.060	-.0317	-.0163	-.0313	-.0148	.0808
.079	-.0024	.0078	-.0038	.0084	.0838
.099	-.0125	-.0022	-.0181	-.0138	.0648
.139	-.0427	-.0364	-.0527	-.0471	.0196
.179	-.1964	-.1883	-.2054	-.2029	-.1241
.198	-.2499	-.2447	-.2594	-.2575	-.1974
.208	-.4075	-.4006	-.4204	-.4133	-.3520
.227	-.3762	-.3724	-.3979	-.4011	-.3701
.237	-.2448	-.2376	-.2635	-.2697	-.2244
.257	-.1368	-.1341	-.1535	-.1635	-.1532
.276	-.0922	-.0878	-.1118	-.1240	-.1260
.302	-.0751	-.0766	-.0976	-.1058	-.1341
.311	-.0680	-.0646	-.0812	-.0886	-.0969
.331	.0582	.0642	.0512	.0398	.0628
.351	.1208	.1266	.1062	.0925	.0980
.371	.1410	.1447	.1215	.1086	.1090
.391	.1633	.1668	.1479	.1369	.1511
.412	.1723	.1738	.1489	.1450	.1592
.422	.1380	.1396	.1174	.1056	.1190
.442	.0986	.1034	.0786	.0681	.0799
.461	.0754	.0792	.0563	.0499	.0728
.481	.0482	.0521	.0257	.0266	.0547
.505	.0259	.0300	.0074	.0064	.0387
.525	.0098	.0129	-.0130	-.0098	.0216
.564	-.0196	-.0144	-.0364	-.0360	-.0005
.604	-.0549	-.0505	-.0731	-.0664	-.0307
.644	-.0671	-.0646	-.0853	-.0796	-.0437
.683	-.0903	-.0878	-.1057	-.1028	-.0658
.723	-.1236	-.1229	-.1433	-.1321	-.1010
.763	-.1580	-.1522	-.1760	-.1685	-.1301
.802	-.2277	-.2256	-.2482	-.2423	-.2095
.822	-.3054	-.3020	-.3307	-.3324	-.3059
.851	-.4216	-.4107	-.4346	-.4456	-.4364
.861	-.2984	-.2960	-.3175	-.3213	-.3139
.881	-.2246	-.2236	-.2462	-.2494	-.2386
.921	-.1721	-.1683	-.1912	-.1918	-.1843
.960	-.1721	-.1692	-.1861	-.1817	-.1752

TABLE III

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.585

(a) $\alpha = -8^{\circ}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	1.0069	1.0154	1.0317	1.0481	1.0746
.005	.7198	.7354	.7074	.6235	.4036
.010	.3100	.3499	.3216	.2192	-.0294
.020	.2171	.2382	.2128	.1309	-.0377
.040	.2782	.2935	.2803	.2161	.0986
.060	.2412	.2596	.2443	.1839	.0698
.079	.2618	.2826	.2618	.2026	.0960
.099	.2402	.2548	.2458	.1875	.0817
.139	.1986	.2152	.2051	.1522	.0564
.179	.0241	.0287	.0482	-.0014	-.1327
.198	-.0550	-.0293	-.0383	-.0881	-.1693
.208	-.2363	-.2084	-.2127	-.2568	-.3467
.227	-.3128	-.2966	-.2606	-.2412	-.3858
.237	-.1860	-.1703	-.1637	-.1804	-.2470
.257	-.1028	-.0940	-.0915	-.1208	-.1544
.276	-.0962	-.0878	-.0817	-.1047	-.1184
.302	-.1696	-.1724	-.1539	-.1540	-.1106
.311	-.1382	-.1442	-.1354	-.1457	-.1014
.331	.2480	.2742	.2499	.1849	.0600
.351	.2207	.2293	.2247	.1885	.1253
.371	.2217	.2225	.2175	.1823	.1382
.391	.2731	.2841	.2721	.2342	.1799
.412	.3091	.3176	.2942	.2643	.1989
.422	.2684	.2695	.2597	.2170	.1521
.442	.2340	.2507	.2283	.1870	.1197
.461	.2248	.2298	.2200	.1772	.1038
.481	.1992	.2120	.2045	.1549	.0827
.505	.1879	.2010	.1911	.1449	.0683
.525	.1755	.1844	.1767	.1309	.0534
.564	.1489	.1619	.1515	.1040	.0241
.604	.1124	.1269	.1168	.0697	-.0094
.644	.1020	.1186	.1117	.0656	-.0124
.683	.0744	.0908	.0844	.0359	-.0387
.723	.0415	.0527	.0452	-.0003	-.0768
.763	.0029	.0125	.0060	-.0382	-.1117
.802	-.0981	-.0779	-.0807	-.1270	-.1945
.822	-.2004	-.1786	-.1776	-.2219	-.2814
.851	-.3914	-.3730	-.3679	-.4073	-.4495
.861	-.2589	-.2445	-.2410	-.2812	-.3205
.881	-.1845	-.1713	-.1693	-.2059	-.2398
.921	-.1325	-.1222	-.1194	-.1545	-.1816
.960	-.1321	-.1311	-.1203	-.1571	-.1771

TABLE III.- Continued

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.585

(b) $\alpha = -4^{\circ}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	1.0514	1.0588	1.0631	1.0766	1.0824
.005	.6220	.5994	.5826	.5467	.4235
.010	.2117	.1834	.1675	.1245	-.0163
.020	.1436	.1289	.1121	.0820	-.0123
.040	.2251	.2167	.2099	.1893	.1238
.060	.1936	.1830	.1726	.1706	.1028
.079	.2168	.2083	.1974	.1825	.1192
.099	.1998	.1918	.1830	.1691	.1069
.139	.1555	.1533	.1467	.1256	.0752
.179	-.0301	-.0294	-.0402	-.0246	-.1043
.198	-.0898	-.0907	-.0966	-.1142	-.1595
.208	-.2765	-.2736	-.2799	-.2899	-.3381
.227	-.3455	-.3338	-.3353	-.2987	-.3698
.237	-.2110	-.2018	-.2048	-.1925	-.2312
.257	-.1228	-.1136	-.1131	-.1168	-.1350
.276	-.1059	-.0939	-.0934	-.0977	-.1023
.302	-.1533	-.1301	-.1267	-.1257	-.1007
.311	-.1398	-.1239	-.1204	-.1174	-.0941
.331	.1720	.1663	.1581	.1515	.0839
.351	.2096	.2171	.2119	.1991	.1642
.371	.2085	.2156	.2109	.2011	.1765
.391	.2575	.2603	.2565	.2442	.2113
.412	.2911	.2904	.2818	.2701	.2353
.422	.2411	.2426	.2384	.2214	.1944
.442	.2049	.2068	.2032	.1904	.1545
.461	.1926	.1944	.1886	.1769	.1376
.481	.1746	.1715	.1669	.1545	.1085
.505	.1580	.1586	.1529	.1359	.0937
.525	.1442	.1419	.1338	.1214	.0783
.564	.1189	.1170	.1110	.0893	.0512
.604	.0823	.0827	.0743	.0634	.0174
.644	.0699	.0718	.0675	.0546	.0097
.683	.0426	.0438	.0412	.0235	-.0189
.723	.0060	.0079	.0038	-.0107	-.0522
.763	-.0368	-.0316	-.0355	-.0485	-.0874
.802	-.1249	-.1198	-.1251	-.1392	-.1760
.822	-.2265	-.2190	-.2208	-.2334	-.2670
.851	-.4115	-.3976	-.4021	-.4116	-.4347
.861	-.2801	-.2678	-.2716	-.2811	-.3038
.881	-.1986	-.1888	-.1934	-.2023	-.2235
.921	-.1419	-.1292	-.1329	-.1437	-.1627
.960	-.1347	-.1198	-.1235	-.1371	-.1534

TABLE III.- Continued

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.585

(c) $\alpha = 0^\circ$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	1.0568	1.0594	1.0616	1.0813	1.0793
.005	.4915	.4319	.4365	.4404	.4376
.010	.0701	-.0124	-.0065	-.0019	-.0047
.020	.0512	.0016	.0048	.0095	.0076
.040	.1644	.1354	.1412	.1422	.1416
.060	.1379	.1119	.1153	.1184	.1174
.079	.1608	.1365	.1403	.1437	.1420
.099	.1445	.1213	.1257	.1277	.1261
.139	.1061	.0833	.0858	.0919	.0882
.179	-.0784	-.0946	-.0927	-.0890	-.0893
.198	-.1333	-.1565	-.1539	-.1533	-.1525
.208	-.3229	-.3397	-.3354	-.3316	-.3309
.227	-.3675	-.3713	-.3671	-.3622	-.3612
.237	-.2271	-.2299	-.2260	-.2212	-.2206
.257	-.1323	-.1278	-.1244	-.1237	-.1211
.276	-.1036	-.0956	-.0938	-.0931	-.0893
.302	-.1195	-.0988	-.0947	-.0947	-.0908
.311	-.1128	-.0930	-.0917	-.0895	-.0853
.331	.1086	.0901	.0883	.0945	.0922
.351	.1865	.1796	.1801	.1827	.1810
.371	.2004	.1998	.2004	.2019	.2016
.391	.2428	.2363	.2372	.2408	.2385
.412	.2634	.2560	.2569	.2589	.2601
.422	.2188	.2155	.2175	.2195	.2190
.442	.1794	.1754	.1755	.1781	.1800
.461	.1665	.1556	.1579	.1614	.1594
.481	.1466	.1318	.1319	.1355	.1318
.505	.1281	.1151	.1138	.1199	.1133
.525	.1091	.0964	.0967	.0930	.1045
.564	.0856	.0698	.0707	.0722	.0712
.604	.0481	.0339	.0350	.0386	.0358
.644	.0374	.0215	.0235	.0277	.0277
.683	.0091	-.0046	-.0035	-.0009	-.0005
.723	-.0282	-.0405	-.0388	-.0341	-.0344
.763	-.0682	-.0785	-.0776	-.0755	-.0713
.802	-.1528	-.1679	-.1648	-.1626	-.1627
.822	-.2543	-.2642	-.2623	-.2596	-.2581
.851	-.4234	-.4255	-.4226	-.4193	-.4182
.861	-.2932	-.2928	-.2935	-.2912	-.2909
.881	-.2096	-.2132	-.2100	-.2078	-.2063
.921	-.1471	-.1477	-.1467	-.1455	-.1483
.960	-.1384	-.1383	-.1336	-.1357	-.1349

TABLE III.- Continued

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.585

(d) $\alpha = 4^{\circ}$

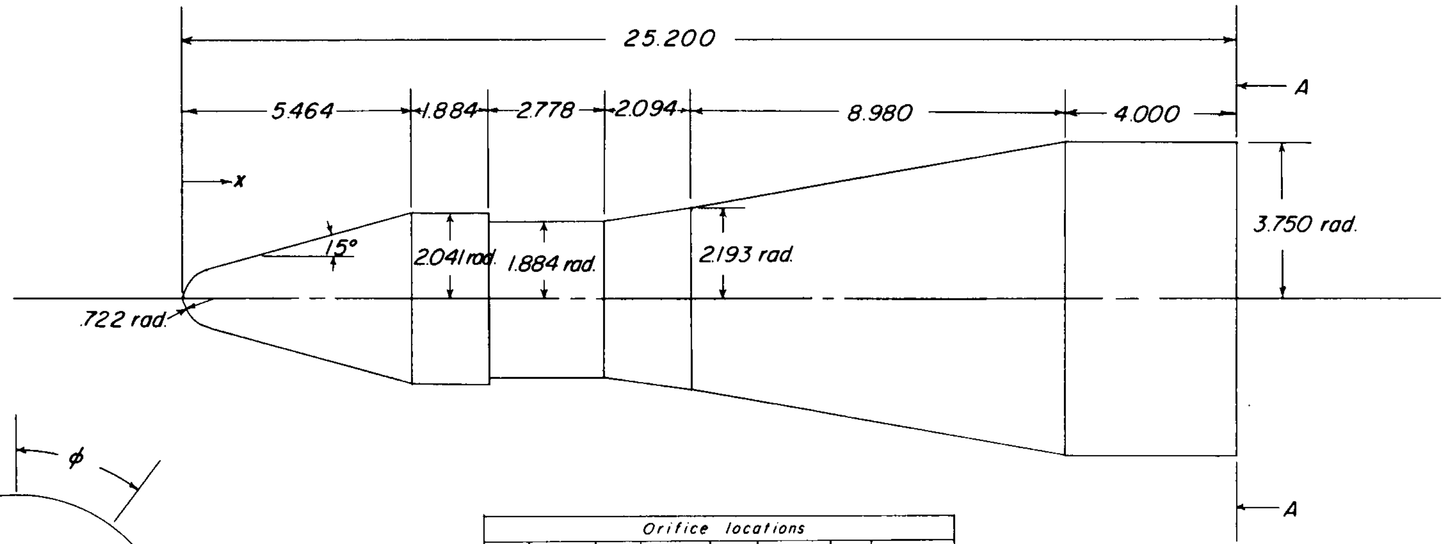
x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	1.0869	1.0568	1.0599	1.0625	1.0551
.005	.2830	.2483	.2718	.3140	.4348
.010	-.1602	-.2075	-.1863	-.1373	-.0062
.020	-.1024	-.1284	-.1162	-.0756	.0127
.040	.0705	.0595	.0676	.0832	.1381
.060	.0555	.0458	.0562	.0712	.1139
.079	.0808	.0730	.0791	.0900	.1385
.099	.0669	.0584	.0640	.0764	.1180
.139	.0313	.0215	.0256	.0375	.0816
.179	-.1483	-.1497	-.1437	-.1321	-.0945
.198	-.2045	-.2121	-.2071	-.1949	-.1567
.208	-.3888	-.3917	-.3864	-.3739	-.3375
.227	-.3965	-.3895	-.3875	-.3847	-.3657
.237	-.2515	-.2428	-.2440	-.2389	-.2255
.257	-.1416	-.1321	-.1323	-.1306	-.1249
.276	-.1018	-.0900	-.0929	-.0947	-.0956
.302	-.0879	-.0754	-.0783	-.0859	-.1013
.311	-.0843	-.0686	-.0706	-.0720	-.0781
.331	.0612	.0672	.0702	.0827	.1020
.351	.1530	.1530	.1518	.1537	.1724
.371	.1783	.1816	.1783	.1786	.1956
.391	.2150	.2118	.2110	.2150	.2330
.412	.2268	.2259	.2225	.2274	.2505
.422	.1901	.1900	.1908	.1916	.2089
.442	.1505	.1489	.1461	.1485	.1657
.461	.1272	.1265	.1263	.1298	.1493
.481	.1019	.0974	.0978	.1035	.1277
.505	.0818	.0776	.0785	.0853	.1067
.525	.0617	.0589	.0594	.0656	.0918
.564	.0333	.0292	.0297	.0365	.0677
.604	-.0053	-.0057	-.0076	.0044	.0328
.644	-.0162	-.0212	-.0175	-.0071	.0194
.683	-.0451	-.0473	-.0461	-.0371	-.0062
.723	-.0802	-.0821	-.0788	-.0724	-.0391
.763	-.1220	-.1190	-.1167	-.1077	-.0781
.802	-.2020	-.2044	-.2024	-.1938	-.1639
.822	-.3005	-.2954	-.2960	-.2903	-.2645
.851	-.4465	-.4343	-.4342	-.4335	-.4196
.861	-.3191	-.3099	-.3106	-.3080	-.2917
.881	-.2365	-.2262	-.2269	-.2255	-.2096
.921	-.1694	-.1649	-.1651	-.1617	-.1490
.960	-.1638	-.1602	-.1552	-.1508	-.1376

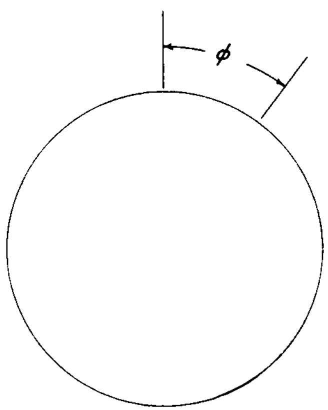
TABLE III.- Concluded

PRESSURE COEFFICIENTS OVER SURFACE OF MODEL AT M = 0.585

(e) $\alpha = 8^{\circ}$

x/l	C_p at ϕ of:				
	0°	15°	30°	50°	90°
.000	1.0610	1.0526	1.0384	1.0178	.9934
.005	.0743	.0568	.1004	.1769	.4082
.010	-.3817	-.4026	-.3590	-.2841	-.0315
.020	-.2467	-.2653	-.2578	-.1752	-.0088
.040	-.0013	-.0057	.0045	.0168	.0934
.060	-.0081	-.0108	-.0023	.0111	.0821
.079	.0194	.0173	.0261	.0359	.0996
.099	.0070	.0016	.0107	.0168	.0775
.139	-.0297	-.0347	-.0255	-.0209	.0375
.179	-.1974	-.1919	-.1871	-.1799	-.1318
.198	-.2533	-.2543	-.2470	-.2423	-.1837
.208	-.4329	-.4292	-.4205	-.4152	-.3647
.227	-.4071	-.3968	-.3926	-.4034	-.3915
.237	-.2554	-.2486	-.2470	-.2568	-.2546
.257	-.1369	-.1295	-.1308	-.1432	-.1539
.276	-.0898	-.0857	-.0869	-.1014	-.1215
.302	-.0717	-.0660	-.0684	-.0812	-.1153
.311	-.0645	-.0551	-.0550	-.0648	-.0829
.331	.0619	.0734	.0742	.0576	.0498
.351	.1399	.1436	.1397	.1196	.1176
.371	.1684	.1723	.1650	.1433	.1408
.391	.1933	.1968	.1897	.1753	.1830
.412	.2031	.2045	.1949	.1825	.1928
.422	.1700	.1717	.1624	.1490	.1485
.442	.1275	.1296	.1206	.1098	.1130
.461	.1021	.1015	.0958	.0860	.0960
.481	.0737	.0734	.0674	.0607	.0800
.505	.0510	.0485	.0457	.0401	.0641
.525	.0292	.0266	.0256	.0215	.0467
.564	-.0013	-.0040	-.0017	-.0053	.0230
.604	-.0402	-.0400	-.0390	-.0390	-.0084
.644	-.0521	-.0540	-.0513	-.0513	-.0217
.683	-.0790	-.0795	-.0771	-.0797	-.0500
.723	-.1147	-.1134	-.1097	-.1112	-.0793
.763	-.1525	-.1482	-.1453	-.1458	-.1159
.802	-.2300	-.2283	-.2279	-.2289	-.2011
.822	-.3191	-.3125	-.3125	-.3250	-.3050
.851	-.4536	-.4354	-.4261	-.4535	-.4547
.861	-.3274	-.3183	-.3105	-.3239	-.3262
.881	-.2435	-.2351	-.2315	-.2387	-.2428
.921	-.1814	-.1721	-.1705	-.1783	-.1811
.960	-.1762	-.1711	-.1649	-.1696	-.1703





Section A-A

Orifice locations							
No.	x	No.	x	No.	x	No.	x
1	0	12	5.250	23	10.376	34	18.220
2	.125	13	5.714	24	10.626	35	19.220
3	.250	14	5.964	25	11.126	36	20.220
4	.500	15	6.464	26	11.626	37	20.720
5	1.000	16	6.964	27	12.126	38	21.450
6	1.500	17	7.598	28	12.720	39	21.700
7	2.000	18	7.848	29	13.220	40	22.200
8	2.500	19	8.348	30	14.220	41	23.200
9	3.500	20	8.848	31	15.220	42	24.200
10	4.500	21	9.348	32	16.220		
11	5.000	22	9.848	33	17.220		

Figure 1.- Drawing of model. All dimensions in inches.

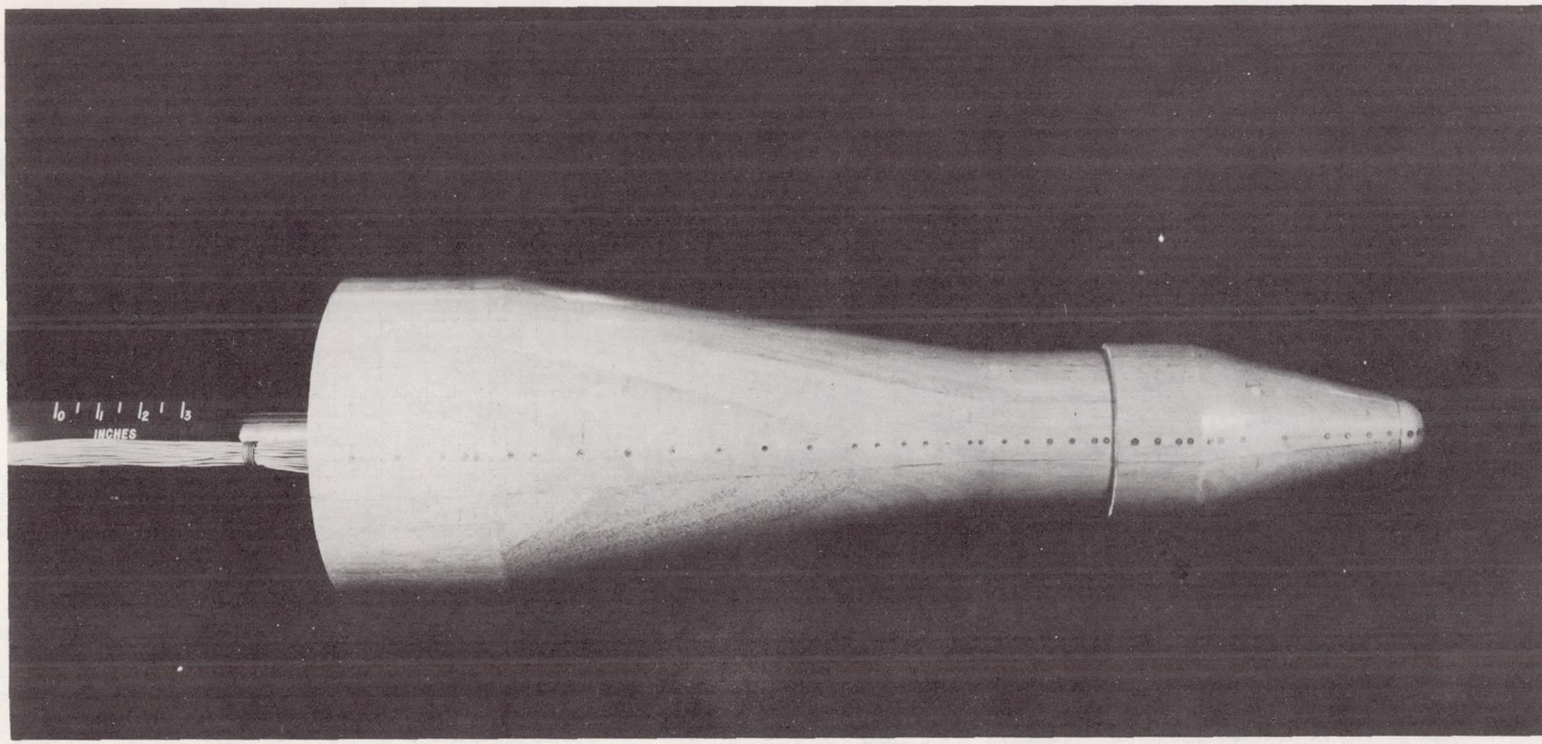


Figure 2.- Photograph of model. L-62-4498

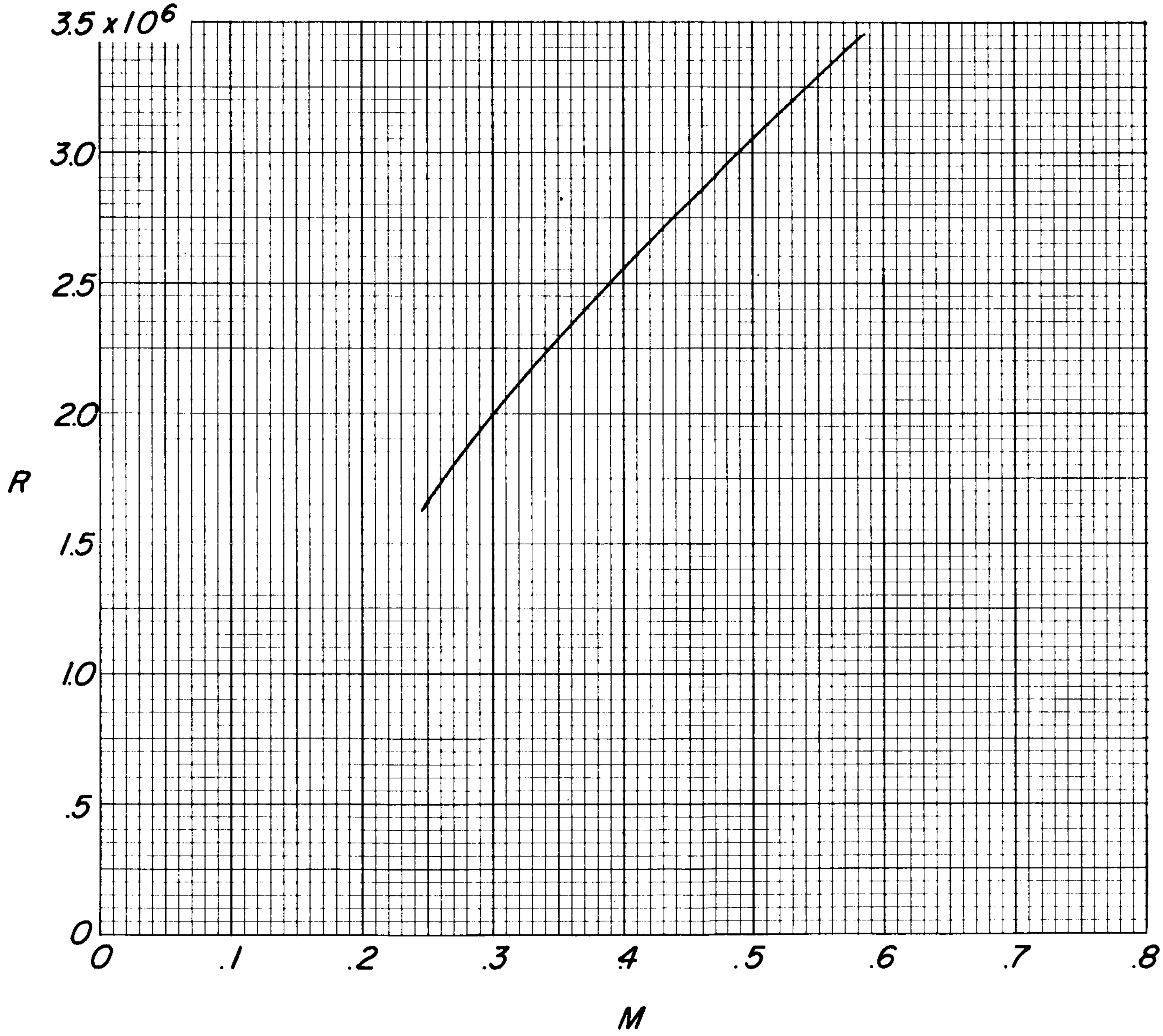


Figure 3.- Variation of Reynolds number with Mach number.

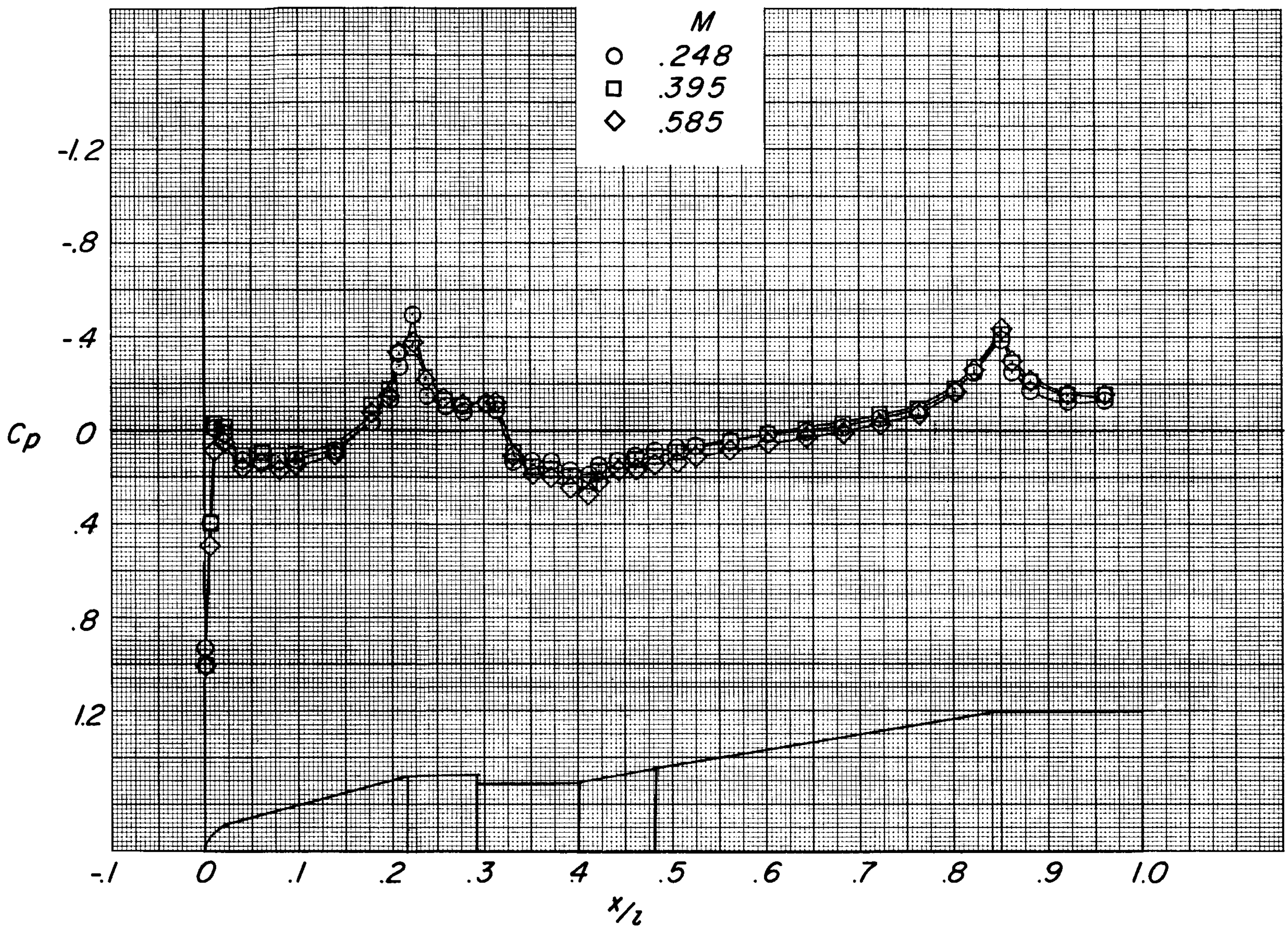


Figure 4.- Effect of Mach number and Reynolds number on pressure distribution over model. $\alpha = 0^{\circ}$; $\phi = 0^{\circ}$.

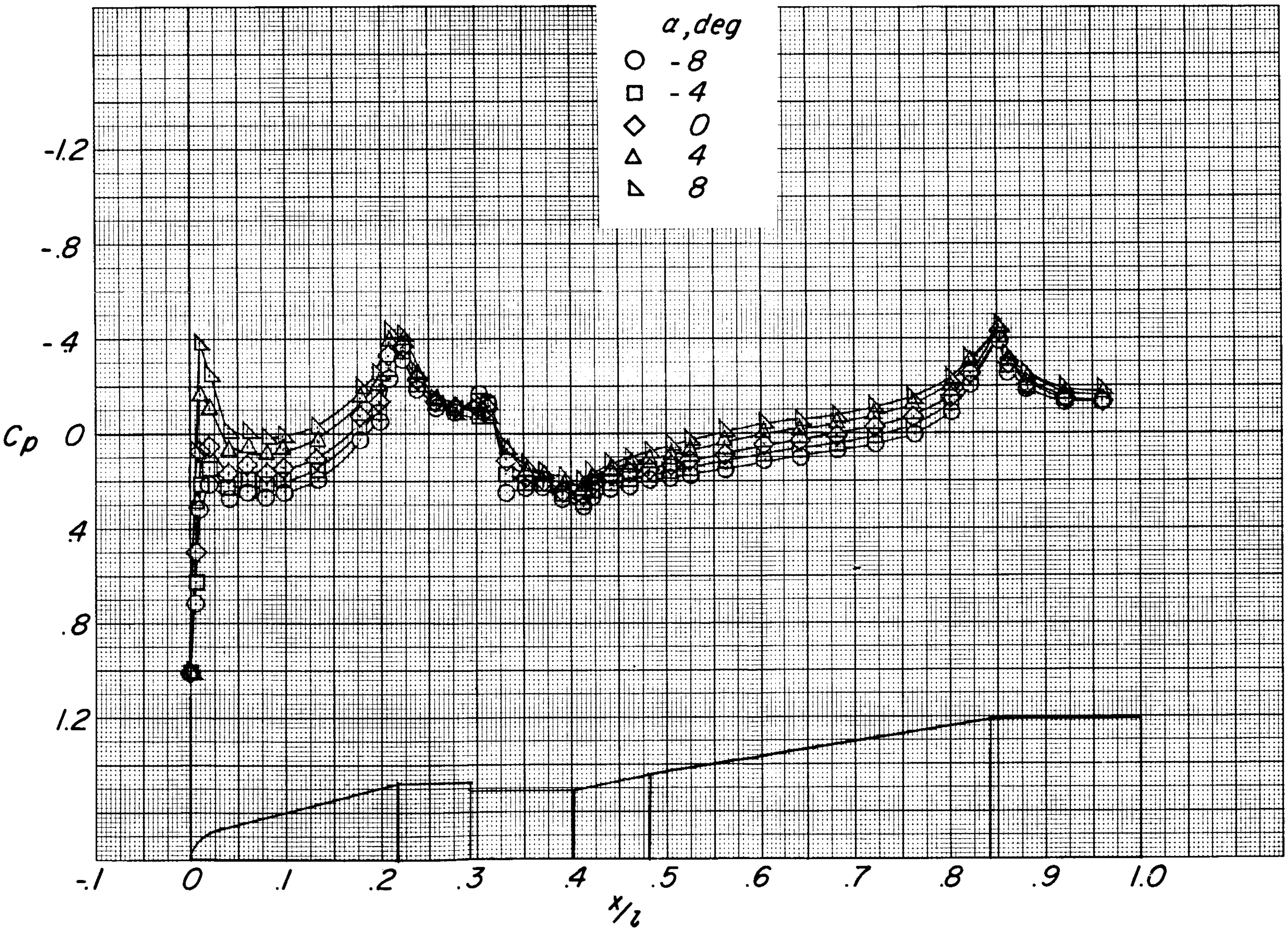


Figure 5.- Effect of angle of attack on pressure distribution over model. $\phi = 0^{\circ}$; M = 0.585.

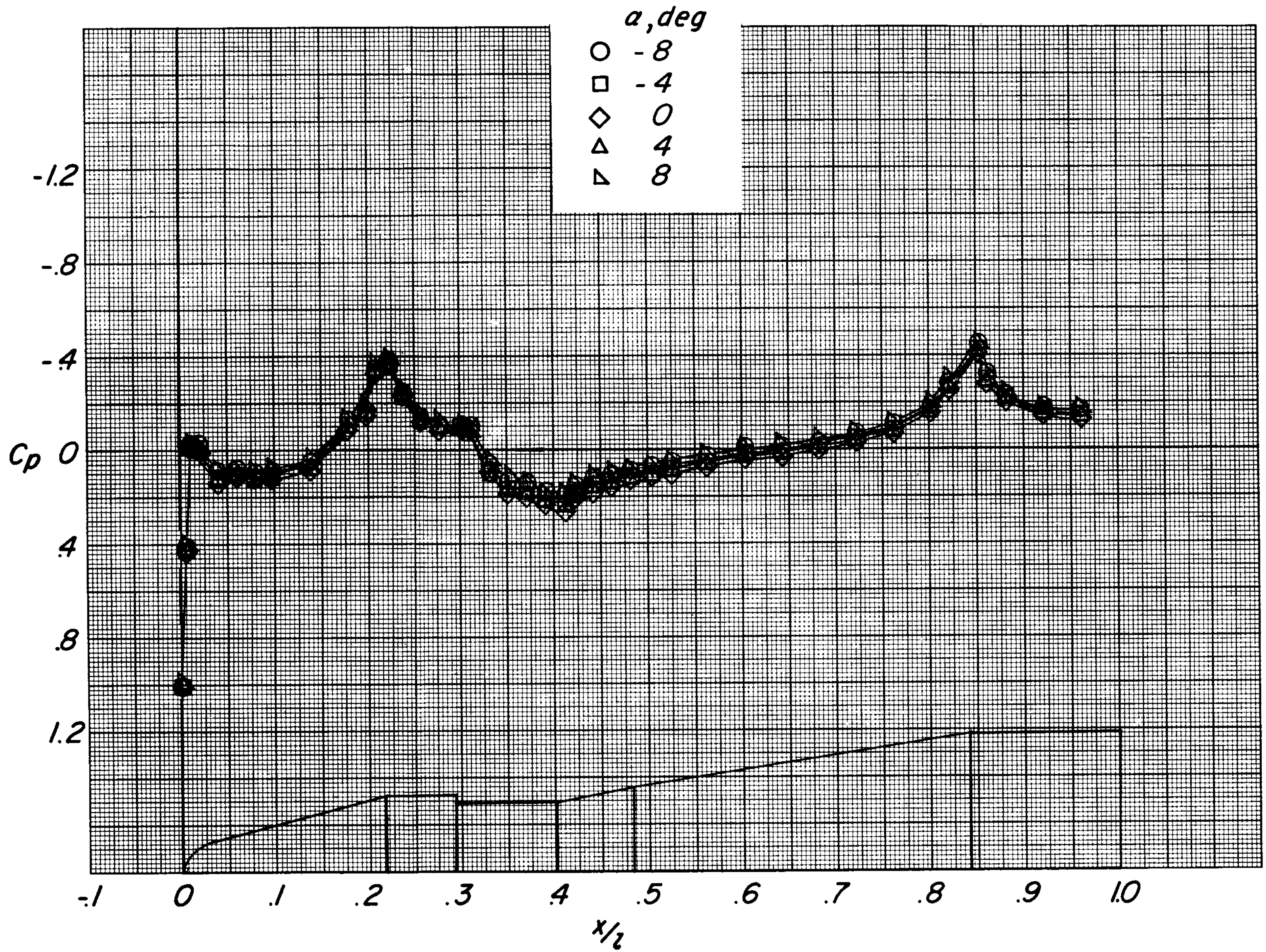


Figure 6.- Effect of angle of attack on pressure distribution over model. $\phi = 90^{\circ}$; M = 0.585.

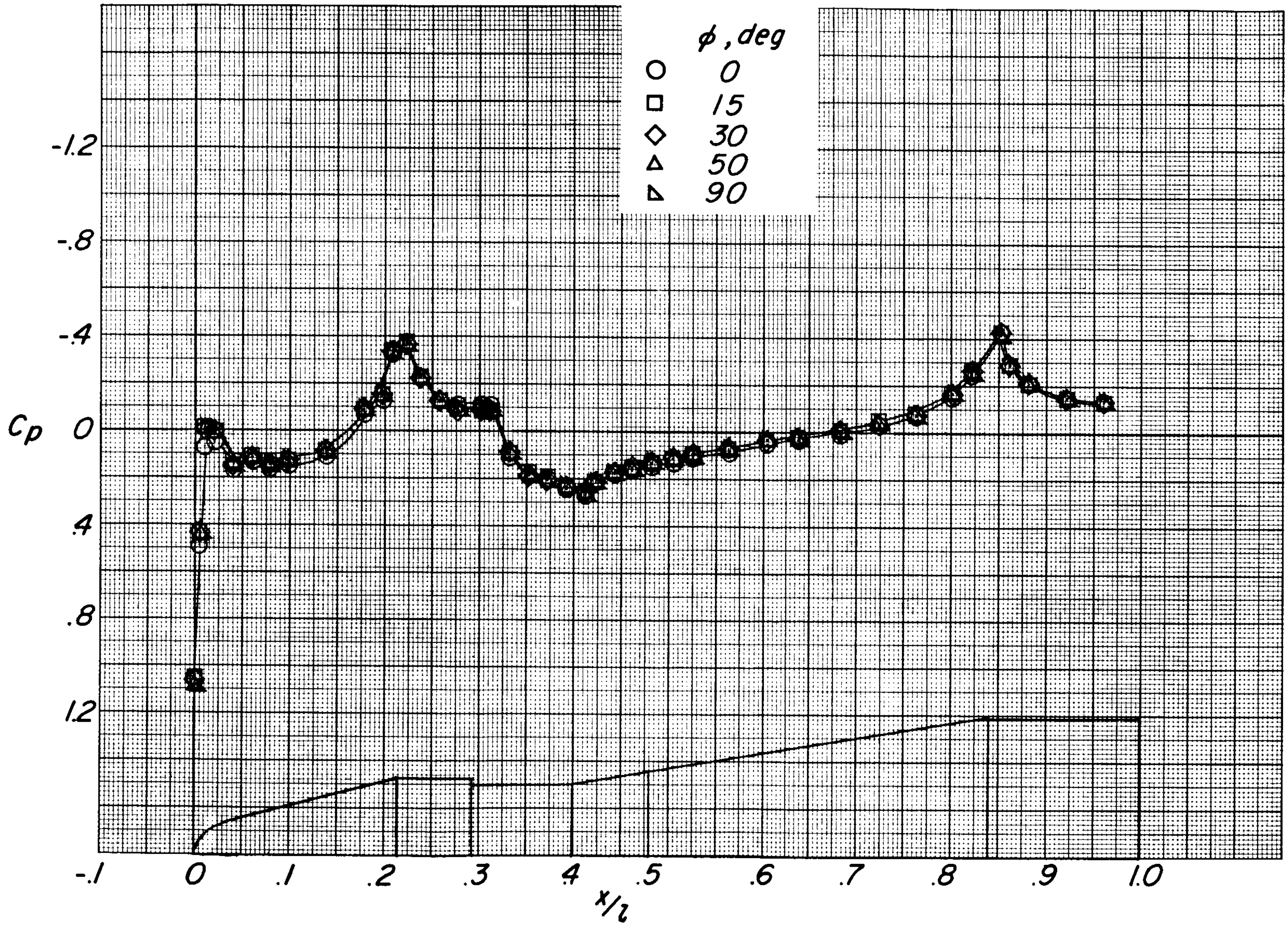


Figure 7.- Effect of roll angle on pressure distribution over model. $\alpha = 0^{\circ}$; M = 0.585.

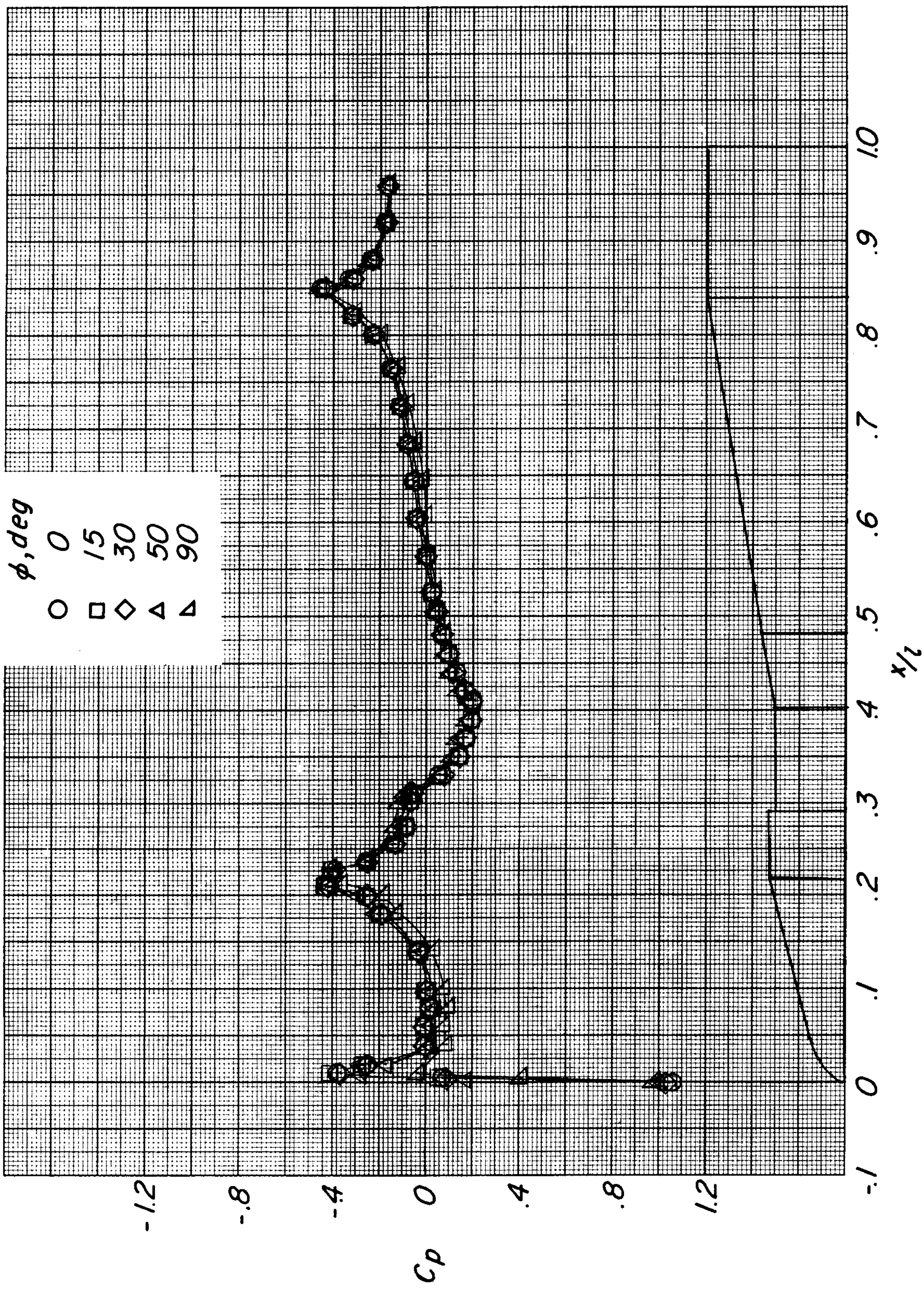


Figure 8.- Effect of roll angle on pressure distribution over model. $\alpha = 8^{\circ}$; M = 0.585.