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TABULATED PRESSURE DATA FOR A SERIES OF CONTROLS ON  
 A 60° DELTA WING AT MACH NUMBERS OF 1.61 AND 2.01

By Douglas R. Lord and K. R. Czarnecki

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## RESEARCH MEMORANDUM

TABULATED PRESSURE DATA FOR A SERIES OF CONTROLS ON  
A 60° DELTA WING AT MACH NUMBERS OF 1.61 AND 2.01

By Douglas R. Lord and K. R. Czarnecki

## SUMMARY

An investigation has been made at Mach numbers of 1.61 and 2.01 and Reynolds numbers from  $1.7 \times 10^6$  to  $7.6 \times 10^6$  to determine the pressure distributions over a 60° delta wing having 20 different control configurations. Measurements were made at angles of attack from 0° to 15° for control deflections from -30° to 30°. This report presents the complete tabulated pressure data for the range of test conditions.

## INTRODUCTION

As a part of a general program of research on controls, an investigation is underway in the Langley 4- by 4-foot supersonic pressure tunnel to determine the important parameters in the design of controls for use on a 60° delta wing at supersonic speeds. The results have been obtained from two series of tests by means of pressure distributions and direct measurements of hinge moments. The first series was conducted at a Mach number of 1.61 and consisted primarily of tip controls, some fence configurations, and a trailing-edge control with and without a spoiler mounted on the wing just ahead of the control. Much of the control hinge-moment and effectiveness results and some illustrative pressure distributions from this series have been presented in references 1 to 7. The second series of tests consisted of several trailing-edge controls and some fence configurations, all at a Mach number of 1.61 and four of the tip controls at a Mach number of 2.01.

Because of the time involved in the reduction and analysis of the data, and the immediate interest in the basic pressure data, the purpose of this report is to present tabulations of the pressures measured on the surfaces of the 20 configurations for both series of tests without any analysis. The tests were made for a wing angle-of-attack range from 0° to 15° and for a control deflection range from -30° to 30°. All

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configurations were tested at a Reynolds number of  $4.2 \times 10^6$  based on the wing mean aerodynamic chord, and one configuration was also tested at Reynolds numbers of  $1.7 \times 10^6$  and  $7.6 \times 10^6$  at a Mach number of 1.61.

## SYMBOLS

$b/2$	wing semispan
$c_R$	wing root chord
$C_p$	pressure coefficient, $\frac{p - p_l}{q}$
$M$	stream Mach number
$p$	stream static pressure
$p_l$	local surface pressure
$q$	stream dynamic pressure
$R$	Reynolds number (based on wing mean aerodynamic chord)
$x$	distance from wing apex in chordwise direction
$y$	distance from wing apex in spanwise direction
$\alpha$	wing angle of attack
$\delta$	control deflection relative to wing (positive when control trailing edge is deflected down)

## APPARATUS

## Wind Tunnel

This investigation was conducted in the Langley 4- by 4-foot supersonic pressure tunnel, which is a rectangular, closed-throat, single-return type of wind tunnel with provisions for the control of the pressure, temperature, and humidity of the enclosed air. Flexible nozzle walls were adjusted to give the desired test section Mach numbers of 1.61 and 2.01. During the tests, the dewpoint was kept below  $-20^\circ$  F so that the effects of water condensation in the supersonic nozzle were negligible.

### Model and Model Mounting

The model used in this investigation consisted of a half-delta wing having 11 interchangeable controls and various associated control adapters (or replacement sections) required to fit the controls to the basic wing component. The control configurations are presented in figure 1 grouped according to whether they were tip controls (fig. 1(a)), trailing-edge controls (fig. 1(b)), or tip controls with modifications such as fences or tabs (fig. 1(c)). The 11 basic configurations are identified as configurations A through G, I, J, J1, and J2. Modifications were made to these basic configurations to obtain the remaining 9 configurations. Configuration H was obtained by installing the control of configuration F in the hinge-line hole for configuration E. Configurations J3 and J4 were made from configuration J by adding paddle balances and a spoiler, respectively. Configuration E1 was obtained by adding a tab on a boom mounted on the inboard edge of the control of configuration E. Configurations E2, E3, and F1, F2, and F3 were made by mounting various fences on the wing at the wing-control juncture of configurations E and F, respectively. The location of the pressure orifices can be determined from tables 1 and 2 and the sketches in figure 2.

The basic wing had a  $60^\circ$  sweptback leading edge, a root chord of 18.14 inches, and a semispan of 10.48 inches. The wing had a rounded NACA 63-series section extending 30-percent root chord back from the leading edge, a constant-thickness center section with a thickness-chord ratio of 3 percent based on the root chord, and a sharp trailing edge. Near the wing tip, the nose section joined directly to the tapered trailing edge without any flat midsection. Configurations J1 and J2 had thickened trailing edges as shown in the sketches of figure 1.

The basic wing and controls were constructed of steel. (For details of construction, see ref. 1.) The paddle balances and tab were also constructed of steel. The spoiler and the fences were constructed of 1/16-inch stock brass.

The semispan wing was mounted horizontally in the tunnel from a turntable in a steel boundary-layer bypass plate which was located vertically in the test section about 10 inches from the sidewall, as shown in figures 3 and 4.

### TESTS

The model angle of attack was changed by rotating the turntable in the bypass plate on which the wing was mounted. (See fig. 3.) The angle of attack was measured by a vernier on the outside of the tunnel, inasmuch as the angular deflection of the wing under load was negligible.

Control deflection was changed by a gear mechanism mounted on the pressure box which rotated the strain-gage balance, the torque tube, and the control as a unit. The control deflections were set approximately with the aid of an electrical control-position indicator mounted on the torque tube close to the wing root and measured under load during testing with a cathetometer mounted outside the tunnel. The pressure distributions were determined from photographs of the multiple-tube manometer boards to which the pressure leads from the model orifices were connected.

Tests were made over an angle-of-attack range from  $0^\circ$  to  $15^\circ$  at increments of either  $3^\circ$  or  $6^\circ$ . The control deflection range was from  $-30^\circ$  to  $30^\circ$  at increments of  $5^\circ$  or  $10^\circ$ . Most of the tests were made at a tunnel stagnation pressure of 15 lb/sq in. absolute at  $M = 1.61$ , and 17.5 lb/sq in. absolute at  $M = 2.01$ , corresponding to a Reynolds number, based on the mean aerodynamic chord of 12.10 inches, of  $4.2 \times 10^6$ . Configuration E was also tested at  $R = 1.7 \times 10^6$  and  $7.6 \times 10^6$  at  $M = 1.61$ .

#### PRECISION OF DATA

The mean Mach numbers in the region occupied by the model are estimated from calibrations to be 1.61 and 2.01 with local variations being smaller than  $\pm 0.02$ . There is no evidence of any significant flow angularities. The estimated accuracies in setting the wing angle of attack and control deflection are  $\pm 0.05^\circ$  and  $\pm 0.1^\circ$ , respectively. The measured pressure coefficients are believed accurate to  $\pm 0.01$ . In order to facilitate the publication of the data, a complete final check has not been made and random errors may be present where damage to a model or malfunctioning of an orifice may have occurred during the tests. Such errors can usually be detected by a visual inspection of the plotted pressure distributions.

#### PRESENTATION OF DATA

The pressure measurements for the complete range of test conditions are presented in tables 3 to 28. The orifice locations are identical on the upper and lower surfaces; therefore, the location of an orifice on the upper surface corresponds to the identically numbered orifice on the lower surface. In many instances the orifice numbered 1 is on the leading edge of the wing and the pressure coefficient has been listed as if it were on the upper surface, there being no corresponding lower surface reading. The same is true for the orifices located at  $x/c_R = 0.852$  on

the trailing-edge control configurations, for these orifices are located on the rounded leading-edge part of the control and are shielded from the stream by the wing. In other cases, where orifices were known to be bad, pressures may be listed on one surface only.

Langley Aeronautical Laboratory,  
National Advisory Committee for Aeronautics,  
Langley Field, Va., November 14, 1955.

## REFERENCES

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4. Lord, Douglas R., and Czarnecki, K. R.: Recent Information on Flap and Tip Controls. NACA RM L53I17a, 1953.
5. Lord, Douglas R., and Czarnecki, K. R.: Aerodynamic Characteristics of a Full-Span Trailing-Edge Control on a  $60^\circ$  Delta Wing With and Without a Spoiler at a Mach Number of 1.61. NACA RM L53I17, 1954.
6. Lord, Douglas R., and Czarnecki, K. R.: Aerodynamic Characteristics of Several Tip Controls on a  $60^\circ$  Delta Wing at a Mach Number of 1.61. NACA RM L54E25, 1954.
7. Czarnecki, K. R., and Lord, Douglas R.: Simplified Procedures for Estimating Flap-Control Loads at Supersonic Speeds. NACA RM L55E12, 1955.

TABLE 1

## SPANWISE LOCATION OF ORIFICE STATIONS

[Chordwise extent of stations shown in fig. 2 and table 2]

Configuration	Values of $2y/b$ at station -								
	1	2	3	4	5	6	7	8	9
A	0.048	0.210	0.372	0.537	0.592	0.745	0.860	See fig. 2	-----
B	.048	.210	.372	.537	See fig. 2	.602	See fig. 2	0.734	See fig. 2
C	.048	.210	.372	.537	.601	.640	.683	.758	See fig. 2
D	.055	.242	.430	.619	.688	.776	.876	.958	-----
E, E1, E2, E3, F F1, F2, F3, G, H	.048	.210	.372	.537	.597	.733	.869	.967	-----
I	.048	.210	.372	.537	.592	.745	See fig. 2	-----	-----
J, J1, J2, J3, J4	.048	.210	.372	.537	.592	.745	See fig. 2	-----	-----















TABLE 2.- Concluded

## CHORDWISE LOCATION OF ORIFICES

[Spanwise location of orifice stations shown in fig. 2 and table 1]

(g) Configurations J, J1, J2, J3, J4

Orifice	Values of $x/c_R$ at station -								
	1	2	3	4	5	6	7	8	9
1	0.048	0.210	0.372	0.535	0.592	0.745	0.852		
2	.075	.238	.400	.562	.619	.772	.872		
3	.219	.381	.538	.700	.713	.816	.910		
4	.334	.502	.659	.860	.779	.860	.948		
5	.445	.612	.747	.852	.860	.872	.986		
6	.588	.756	.860	.872		.905			
7	.742	.860		.905		.949			
8	.860	.852		.949		.982			
9	.872	.872		.982					
10	.905	.905		1.000					
11	.949	.949							
12	.982	.982							
13		1.000							























Table 5 Continued  
 Pressure Coefficients on Delta Wing with Control  
 Configuration c M = 1.61 R = 4.2 x 10<sup>6</sup>

Orif	Upper Surface at Station									Lower Surface at Station									Orif
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = 06^\circ \quad \delta = 10^\circ$																			
1	.339	.088	.150	.002	-.388	-.347	.230	-.266	-.452					.408	.230			.452	1
2	.079	-.260	-.329	.365	-.349	-.467	-.419	-.457	-.457	.207		.240		.187	.202	.322	.523	.421	2
3	.061	.077		.130	-.352	-.163	-.336	-.453	.393	.141	.151	.154		.104	.221	.424	.375	.164	3
4	.038	.093	-.119	.184	-.284		.313	-.467		.185		.111	.164	.082		.323	.096		4
5	.083	.087	.097	.290				-.443		.109	.115	.087	.060				.126		5
6	.070	.078	.068	.303						.121	.120	.113	.020						6
7	.049	.067	.200	.301						.122	.113	-.073	-.087						7
8	.080	.207	.229							.094	-.073	-.076							8
9	.208	.201	.232							-.073	-.095	-.005							9
10	.181	.194								-.043	-.077								10
11	.204									-.079									11
$\alpha = 06^\circ \quad \delta = 20^\circ$																			
1	.338	.092	.153	.004	-.465	.348	.038	-.367	-.464					.757	.227			.700	1
2	.076	.258	-.327	.363	-.451	.265	.463	-.452	-.438	.201		.237		.468	.034	.477	.841	.535	2
3	.059	.074		.120	-.375	.371	-.389	-.474	.390	.139	.155	.151		.351	.434	.591	.659	.483	3
4	.037	.092	-.119	.193	-.339		.408	-.444		.185		.112	.323	.288		.569	.439		4
5	.081	.089	.098	.328				-.441		.105	.118	.087	.136				.383		5
6	.070	.079	.008	.356						.121	.115	.114	-.007						6
7	.047	.068	.179	.369						.120	.116	-.072	-.121						7
8	.082	.203	.233							.093	.076	.053							8
9	.208	.156	.217							-.074	.095	.060							9
10	.184	.168								-.042	-.079								10
11	.194									-.083									11
$\alpha = 12^\circ \quad \delta = 00^\circ$																			
1	.198	-.117	-.035	-.196	-.447	-.484	.322	-.334	-.464					.098	.369			.377	1
2	.304	-.432	.470	-.482	-.413	.497	-.466	-.478	-.441	.356		.409		.058	.287	.343	.387	.354	2
3	.131	-.190		.441	-.346	.449	.423	-.464	-.453	.283	.281	.297		.031	.244	.317	.333	.083	3
4	.098	-.194	-.268	.343	-.333		.436	-.471		.309		.262	.262	.031		.238	.305		4
5	.159	-.196	-.217	.370				-.432		.244	.254	.223	.018			.238	.333		5
6	.139	-.171	.168	.354						.232	.252	.252	.031			.238	.305		6
7	.123	-.144	.262	.308						.221	.243	.036	.018			.238	.305		7
8	.146	.271	.267							.225	.024	-.002				.238	.305		8
9	.264	-.258	.246							.037	.000	.026				.238	.305		9
10	.251	.267								.016	.023					.238	.305		10
11	.225									.035						.238	.305		11
$\alpha = 12^\circ \quad \delta = 10^\circ$																			
1	.196	-.119	.034	-.195	-.414	.478	.025	-.406	-.413					.557	.369			.595	1
2	.301	-.431	.471	-.481	-.421	.492	-.421	-.419	-.398	.352		.409		.290	.283	.555	.687	.461	2
3	.131	-.191		.405	-.438	.449	.418	-.427	-.346	.277	.284	.292		.246	.470	.409	.582	.375	3
4	.097	-.191	.267	.272	-.398		.428	-.418		.305		.261	.316	.204		.347	.315		4
5	.163	-.199	.217	.333				-.425		.237	.250	.219	.185			.347	.315		5
6	.144	-.172	.141	.334						.248	.250	.246	.143			.347	.315		6
7	.125	-.142	.243	.323						.217	.240	.021	.012			.347	.315		7
8	.148	.270	.282							.223	.020	.041				.347	.315		8
9	.268	-.236	.285							.034	-.005	.113				.347	.315		9
10	.252	.245								.016	.014					.347	.315		10
11	.222									.030						.347	.315		11
$\alpha = 12^\circ \quad \delta = 20^\circ$																			
1	.196	-.119	.036	-.192	-.437	.430	-.173	-.425	-.437					.832	.364			.803	1
2	.304	-.432	.473	-.461	-.444	.068	-.418	-.433	-.425	.349		.405		.596	.150	.741	1.024	.659	2
3	.129	-.192		.340	-.444	.472	-.431	-.448	-.372	.275	.282	.291		.507	.703	.524	.838	.591	3
4	.097	-.192	.181	.385	-.435		-.446	-.442		.304		.255	.504	.438		.669	.642		4
5	.159	-.197	.165	.420				-.448		.238	.251	.216	.235			.669	.642		5
6	.142	-.159	.136	.399						.245	.247	.246	.102			.669	.642		6
7	.125	-.121	.267	.281						.214	.235	.032	.034			.669	.642		7
8	.141	.244	.278							.216	.017	.166				.669	.642		8
9	.255	-.227	.283							.032	-.006	.174				.669	.642		9
10	.222	.236								.013	.019					.669	.642		10
11	.179									.028						.669	.642		11





























































Table 8 Continued  
 Pressure Coefficients on Delta Wing with Control  
 Configuration E M = 1.61 R = 4.2 x 10<sup>6</sup>

Ort	Upper Surface at Station									Lower Surface at Station									Ort
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = -03^\circ \quad \delta = 20^\circ$																			
1	.353	.323	.229	.240	-.239	.072	.017											.097	1
2	.122	.131	.137	.154	-.063	-.269	-.299					-.018	-.123			.393	.336	.373	2
3	.071	.079		.063	-.084	-.371						-.008	-.048		.240	.264	.019		3
4	.080	.056	.053	-.145	-.155	-.231	-.369					-.007	-.067		.036	.222			4
5	.066	.085		-.163	-.069	-.067						-.041	.028		.325	.071	-.003		5
6	.060	.117	-.004	-.168	-.314							.033	.666	.040	-.253	-.034			6
7	.079	.081	-.180	-.168								-.021	-.004	-.124	-.228	.017			7
8	.064	-.120	-.174									-.020	-.131	-.122					8
9	-.075	-.134	-.187									-.167	-.115	-.144					9
10	-.039	-.147										-.103	-.117						10
11	-.100											-.100							11
$\alpha = -03^\circ \quad \delta = 25^\circ$																			
1	.365	.328	.223	.234	-.335	-.037	-.089												1
2	.127	.128	.139	.157	-.335	-.330	-.349					-.020	-.122		.552	.459	.483	.238	2
3	.077	.078		.219	-.117	-.412						-.013	-.024		.398	.368	.117		3
4	.087	.052	.052	-.204	-.201	-.333	-.398					-.007	-.047		.068	.248			4
5	.068	.060	.109	-.204	-.154	-.306						-.041	.031	-.030	.309	.136	.095		5
6	.061	.106	-.019	-.197	-.362							.033	.639	.070	-.325	.041			6
7	.079	.093	-.191	-.175								-.021	-.003	-.108	-.296	.103			7
8	.060	-.123	-.199									-.027	-.109	-.121					8
9	-.065	-.136	-.202									-.169	-.099	-.139					9
10	-.031	-.156										-.092	-.101						10
11	-.081											-.074							11
$\alpha = -03^\circ \quad \delta = 30^\circ$																			
1	.359	.323	.224	.245	-.131	-.175													1
2	.132	.129	.145	.157	-.376	-.368	-.384					-.017	-.128		.715	.551	.587	.392	2
3	.070	.075		.418	-.158	-.432						-.003	-.048		.489	.489	.213		3
4	.077	.057	.056	-.279	-.238	-.382	-.415					-.001	-.066		.250	.445			4
5	.069	.061	.167	-.241	-.220	-.362						-.039	.033	-.028	-.289	.218	.197		5
6	.058	.110	-.040	-.198	-.389							.038	.613	.101	-.321	.126			6
7	.078	.111	-.211	-.168								-.017	.012	-.089	-.338	.196			7
8	.067	-.111	-.231									-.027	-.089	-.115					8
9	-.061	-.142	-.233									-.157	-.076	-.155					9
10	-.017	-.161										-.069	-.074						10
11	-.065											-.038							11
$\alpha = -06^\circ \quad \delta = -03^\circ$																			
1	.293	.349	.183	.164	.008	-.051													1
2	.195	.204	.219	.237	.298	.285	.307					-.074	-.299		-.286	-.244	-.269	-.278	2
3	.126	.150		.156	.274	-.105						-.054	-.091		-.120	-.260	-.289	-.310	3
4	.129	.110	.118	.146	.180	-.175	-.084					-.051	-.107		-.153	-.164	-.266		4
5	.120	.111	.118	.040	.151	-.051						-.084	-.084		-.122	-.249	-.120	-.259	5
6	.107	.158	.131	.042	-.057							-.062	.867		-.090	-.233	-.201		6
7	.134	.125	-.045	-.058								-.055	-.072	-.223	-.230	1.701			7
8	.114	-.056	-.049									-.062	-.203	-.218					8
9	-.048	-.050	-.050									-.199	-.204	-.211					9
10	-.012	-.049										-.142	-.208						10
11	-.064											-.190							11
$\alpha = -06^\circ \quad \delta = 00^\circ$																			
1	.306	.363	.196	.171	.102	.071													1
2	.196	.206	.224	.231	.225	.229	.245					-.066	-.284		-.280	-.263	-.282	-.325	2
3	.122	.151		.127	.182	-.124						-.045	-.083		-.110	-.251	-.268	-.338	3
4	.124	.111	.120	.108	.133	.134	-.108					-.040	-.101		-.140	-.137	-.237		4
5	.115	.115	.120	-.044	.110	-.084						-.075	-.072		-.100	-.226	-.112	-.257	5
6	.099	.164	.115	-.063	-.073							-.056	1.095		-.074	-.229	-.218		6
7	.125	.128	-.056	-.071								-.050	-.053	-.211	-.226	1.719			7
8	.114	-.066	-.069									-.054	-.191	-.204					8
9	-.046	-.061	-.073									-.192	-.190	-.203					9
10	-.007	-.056										-.131	-.195						10
11	-.072											-.173							11











































































































Table 17  
 Pressure Coefficients on Delta Wing with Control  
 Configuration G M = 1.61 R = 4.2 x 10<sup>6</sup>

Orif	Upper Surface at Station									Lower Surface at Station									Orif
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = 00^\circ \quad \delta = 00^\circ$																			
1	.385	.350	.277	.272	.210	.064	.284	-.239				.048	.013	.023	.006	.013			1
2	.055	.027	.020	.018	.052	.033	-.169					.042	.028	.013	.001	-.212			2
3	.017	.011		.015	.036	.018	-.188					.002	.000	.006	-.011	-.219			3
4	.027	-.009	-.018	-.023	.027	.018						.004	.017	-.015	-.135	-.006			4
5	.008	.002	-.003	-.130		-.157						.006	.038	.020	-.140	-.143			5
6	.005	.047	.007	.130								.025	.021	-.137	-.139	-.148			6
7	.031	.025	.149	-.131	-.117							.019	-.130	-.138					7
8	.006	.146	.155									-.136	-.127	-.135					8
9	.145	.146	.157									-.066	-.129						9
10	.079	.146										-.129							10
11	.142																		11
$\alpha = 00^\circ \quad \delta = 10^\circ$																			
1	.383	.354	.282	.275	-.217	.186	-.343					.084	.048	.237	.286	.325			1
2	.055	.033	.025	.025	-.070	-.254						.039	.015	.161	.222	-.070			2
3	.020	.016		.048	-.051	.229	-.325					.046	-.005	.197	-.058				3
4	.026	-.002	-.011	.128	-.047	.189	-.335					.000	.012	-.027	-.129	.091			4
5	.010	.001	.020	.199		.224						.022	.036	.082	-.161	-.080			5
6	.004	.052	.037	.205								.022	.019	-.080	-.161	-.081			6
7	.036	.045	.203	.199	-.195							.016	-.127	-.086					7
8	.007	.143	.200									-.149	-.092	-.088					8
9	.136	.159	.204									-.070	-.091						9
10	.072	.174										-.140							10
11	.136																		11
$\alpha = 00^\circ \quad \delta = 20^\circ$																			
1	.385	.353	.286	.273	-.325	.343	.045	-.377				.073	.038	.584	.563	.538	.217		1
2	.053	.036	.026	.400	-.310	-.350	-.383					.022	.021	.004	.375	.482	.084		2
3	.018	.015		.400	-.125	.339	-.388					.043	-.021	-.268	.455	.385	.133		3
4	.029	-.002	-.009	.292	-.126	.338						.001	.001	-.042	-.219	.261	.054		4
5	.012	.002	.169	.304								-.001	.001	-.042	-.268	.261	.054		5
6	.003	.054	.016	.338								.019	.027	.125	-.270	.022			6
7	.035	.094	.233	.340	-.272							.017	.006	-.030	-.229	.058			7
8	.007	.123	.271									.006	.143	-.032					8
9	.133	.154	.275									-.167	.057	-.061					9
10	.038	.177										-.070	.045						10
11	.098											-.145							11
$\alpha = 00^\circ \quad \delta = 30^\circ$																			
1	.384	.354	.286	.275	-.389	.394	.102	-.369				.070	.045	.918	.847	.729	.523		1
2	.055	.029	.024	.021	-.396	-.394	-.372					.034	.021	.007	.730	.788	.367		2
3	.022	.014		.314	-.240	.403	-.372					.049	-.016	-.171	.805	.634	.449		3
4	.030	-.002	.012	.477	-.255	.382	-.388					-.003	.006	-.042	-.330	.646	.651		4
5	.010	.002	.284	.406		.372						.017	.033	.224	-.276	.204			5
6	.001	.056	.088	.460								.019	.003	.057	-.331	.299			6
7	.039	.175	.223	.442	-.316							.002	-.089	.005					7
8	.016	.069	.303									.002	.027	-.034					8
9	.053	.130	.340									-.154	.027						9
10	.038	.170										-.051	.023						10
11	.013											-.019							11
$\alpha = 06^\circ \quad \delta = 00^\circ$																			
1	.327	.087	.124	.010	-.353	.085	-.393					.206	.247	.271	.257	.271	.059		1
2	.094	.290	.344	.382	-.353	.387						.142	.152	.154	.247	.201	-.006		2
3	.077	.093		.218	-.332	.364	-.398					.163	.120	.120	.193	.180	-.040		3
4	.059	.106	.132	.165	-.239	.348	-.398					.107	.121	.098	-.040	.153	-.015		4
5	.097	.103	.108	.209		.281						.128	.140	.134	-.041	.019			5
6	.085	.052	.102	.228								.110	.126	-.049	-.040				6
7	.052	.052	.227	-.236	-.270							.110	.126	-.049	-.040	-.001			7
8	.076	.216	.233									.110	-.064	-.056					8
9	.218	.214	.237									-.064	-.051	-.056					9
10	.155	.221										.001	-.051						10
11	.195											-.085							11





















Table 19 Continued  
 Pressure Coefficients on Delta Wing with Control  
 Configuration I  $M = 1.61$   $R = 4.2 \times 10^6$

Orif	Upper Surface at Station									Lower Surface at Station									Orif
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = 06^\circ \quad \delta = 00^\circ$																			
1	.377	.124	.168	.119	.210	.286	.258					.205	.225	.235	.241	.240	.380		1
2	.070	.229	.310	.351	.357	.378	.399					.135	.225	.162	.141	.160	.245		2
3	.055	.088	.092	.124	.282	.312						.139	.119	.119	.260	.134	.168	.066	3
4	.041	.085	.107	.116	.123	.362						.120	.109	.106		.059	.074		4
5	.075	.082	.105	.131	.248	.249						.119	.086	.192	.066	.050	.052		5
6	.061	.063	.073	.226	.226							.125	.258		.050				6
7	.044	.074	.091	.208								.177		.070	.051				7
8	.066	.081	.175	.219									.069	.056					8
9	.005	.169	.218										.069	.056					9
10	.181	.198	.209										.068	.076	.058				10
11	.194	.199											.067	.070					11
12	.191												.075						12
$\alpha = 06^\circ \quad \delta = 10^\circ$																			
1	.376	.122	.166	.116	.209	.285	.259					.203	.224	.233	.241	.238	.382		1
2	.074	.238	.319	.357	.363	.382	.399					.133	.224	.159	.139	.158	.245		2
3	.057	.091	.095	.127	.286	.314						.138	.118	.115	.256	.132	.170	.064	3
4	.044	.089	.110	.119	.127	.365						.118	.107	.104		.002	.073		4
5	.077	.088	.109	.143	.283	.252						.116	.084	.188	.127	.066	.025		5
6	.064	.065	.076	.310	.285							.122	.255		.127				6
7	.047	.075	.065	.290								.184		.206	.086				7
8	.069	.053	.278	.261									.189	.223					8
9	.028	.277	.325										.181	.198	.209				9
10	.282	.301	.212										.201	.201					10
11	.299	.197											.201						11
12	.184												.165						12
$\alpha = 06^\circ \quad \delta = 20^\circ$																			
1	.373	.120	.164	.115	.209	.285	.257					.201	.223	.232	.240	.236	.382		1
2	.076	.239	.320	.358	.363	.381	.399					.131	.223	.158	.136	.157	.243		2
3	.058	.093	.097	.128	.285	.313						.137	.116	.116	.260	.130	.170	.065	3
4	.045	.090	.110	.118	.127	.364						.117	.106	.102	.291	.074	.109		4
5	.078	.089	.109	.116	.288	.251						.116	.082	.391	.537	.074	.109		5
6	.065	.065	.072	.385	.300							.123	.449		.475	.099			6
7	.047	.060	.158	.337								.394		.690	.371				7
8	.072	.196	.364	.320									.652	.694					8
9	.214	.369	.340										.652	.694					9
10	.363	.345	.294										.569	.691	.562				10
11	.369	.273											.602	.564					11
12	.259												.468						12
$\alpha = 06^\circ \quad \delta = 30^\circ$																			
1	.373	.120	.165	.115	.210	.285	.326					.201	.223	.232	.239	.236	.381		1
2	.074	.238	.318	.357	.361	.380	.393					.131	.223	.159	.136	.157	.243		2
3	.057	.093	.095	.127	.284	.311						.138	.116	.116	.456	.435	.102	.023	3
4	.044	.089	.110	.118	.126	.363						.117	.106	.295		.102	.140		4
5	.077	.089	.107	.153	.286	.244						.116	.423	.521	.602	.077			5
6	.064	.065	.072	.413	.296							.372	.551		.733				6
7	.048	.061	.177	.365								.556		.653	.881	.573			7
8	.068	.223	.416	.366									.672	.881					8
9	.332	.418	.365	.366									.689	.902	.775				9
10	.396	.367	.360										.785	.788					10
11	.369	.335											.616						11
12	.298																		12
$\alpha = 09^\circ \quad \delta = 00^\circ$																			
1	.308	.051	.070	.023	.052	.157	.353					.282	.307	.314	.324	.326	.457		1
2	.162	.343	.400	.430	.439	.453	.463					.197	.307	.239	.217	.239	.324		2
3	.094	.141	.223	.348	.391	.405						.203	.188	.188	.351	.211	.256	.020	3
4	.081	.134	.147	.153	.312	.450						.180	.175	.175		.002	.004		4
5	.114	.132	.148	.148	.326	.323						.182	.151	.264	.001	.014	.014		5
6	.102	.119	.114	.280	.261							.177	.324		.014				6
7	.090	.122	.086	.262								.248		.013	.007				7
8	.110	.090	.222	.265									.007	.002					8
9	.009	.222	.261										.009	.011	.001				9
10	.235	.251	.248										.009	.011	.001				10
11	.235	.248											.010	.006					11
12	.220												.017						12











Table 20  
 Pressure Coefficients on Delta Wing with Control  
 Configuration J       $M = 1.61$        $R = 4.2 \times 10^6$

Orif	Upper Surface at Station									Lower Surface at Station									Orif
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = 00^\circ \quad \delta = 00^\circ$																			
1	.386	.368	.289	.275	.310	.358	1.711											1	
2	.053	.033	.030	.031	.017	.013	.031			.079		.044		.014	.012	.021		2	
3	.021	.016		.007	.003	.002	.016			.041	.020	.007		.010	.002	.029		3	
4	.025	.011	-.009	-.020	-.021	.070	-.165			.032		-.005	-.005	.031	.033	-.129		4	
5	.007	.011	.002	-.043	.010	.007	-.271			.001	.014	-.022		.016	.059	-.271		5	
6	.014	.000	.008	-.139						.020	.000	.033		-.145	-.196			6	
7	.016	.008		-.157		-.185				.022	.007			-.139	-.201			7	
8	.009	.084		-.148		-.166				.026				-.139	-.203			8	
9		.124		-.138										-.146				9	
10	-.084	-.142									-.150							10	
11	-.075	-.142									-.147							11	
12	-.123	-.140									-.144	-.130						12	
$\alpha = 00^\circ \quad \delta = 10^\circ$																			
1	.394	.375	.293	.279	.306	.360	1.710											1	
2	.064	.037	.038	.030	.011	.014	-.192			.076		.040		.004	.005	.387		2	
3	.026	.018		.005	-.002	-.001	-.189			.033	.019	.007		.008	.001	.291		3	
4	.028	.006	-.011	-.015	-.016	.070	-.376			.037		-.004	-.008	.038	.028	.032		4	
5	.015	.009	.002	-.025	.016	-.198	-.389			.006	.012	-.025		.014	.264	-.061		5	
6	.015	.001	.009	-.290						.021	-.002	.032			.051			6	
7	.020	.009		-.321		-.346				.018	.007		.100	.122	.036			7	
8	.002	.089		-.315		-.321				.050			.129	.129	.028			8	
9		.287		-.302									.142					9	
10	-.200	.297									.123							10	
11	-.070	.321								.095	.127							11	
12	-.185	-.139								.125	.131							12	
$\alpha = 00^\circ \quad \delta = 20^\circ$																			
1	.397	.370	.289	.276	.309	.364	1.709											1	
2	.062	.044	.039	.039	.020	.020	-.336			.069		.035		-.004	-.004	.966		2	
3	.024	.024	.039	.008	-.004	.006	-.413			.031	.016	.004		.000	-.007	.508		3	
4	.026	.008	-.007	-.007	.015	.080	-.426			.036		-.013	.272	-.041	.061	.124		4	
5	.011	.011	.007	.138	.021	-.324	-.412			-.001	.000	-.031		.208	.582	.232		5	
6	.015	.001	.017	-.394						.013	-.007	.309	.319		.385			6	
7	.023	.024		-.326		-.339				.017	.307		.319	.555	.403			7	
8	.039	.164		-.300		-.294				.252			.603	.603	.381			8	
9		.381		-.290									.528					9	
10	-.313	.400									.509							10	
11	-.148	.324								.489	.563							11	
12	-.180	.271								.483	.521							12	
$\alpha = 00^\circ \quad \delta = 30^\circ$																			
1	.388	.374	.288	.271	.307	.358	1.705											1	
2	.056	.039	.032	.026	.016	.011	-.415			.072		.029		-.007	.021	.976		2	
3	.025	.018		.007	-.001	.000	-.455			.025	.010	.001		-.003	.349	.795		3	
4	.029	.002	-.007	-.012	-.020	.100	-.461			.036		-.018	.421	.357	.620	.616		4	
5	.017	.007	.003	.211	.024	-.407	-.441			-.005	.006	.316		.441	.573	.632		5	
6	.006	.005	.010	-.344						.014	.362	.400	.423		.848			6	
7	.015	.025		-.337		-.349				.325	.419		.600	.768	.768			7	
8	.040	.190		-.347		-.357				.411			.740	.649	.649			8	
9		.388		-.340									.669					9	
10	-.374	.376									.462							10	
11	-.191	.377								.664	.598							11	
12	-.290	-.354								.641	.588							12	
$\alpha = 06^\circ \quad \delta = 00^\circ$																			
1	.338	.114	.160	.010	.120	.219	1.710											1	
2	-.074	-.234	-.307	-.351	-.361	-.382	-.361			.210		.233		.214	.227	.208		2	
3	-.054	-.076		-.130	-.276	-.296	-.380			.136	.146	.149		.154	.185	.231		3	
4	-.050	-.079	-.109	-.135	-.127	-.286	-.431			.136		.110	.113	.097	.198	-.014		4	
5	-.078	.083	-.100	-.067	.101	-.287	-.411			.109	.114	.084		.169	.160	-.100		5	
6	-.058	-.084	-.086	-.230						.104	.094	.129	-.049		-.078			6	
7	-.051	-.074		-.236		-.338				.109	.102		-.049		-.086			7	
8	-.030	.078		-.228		-.304				.068			-.051		-.087			8	
9		-.183		-.204									-.059					9	
10	-.132	-.192									-.089							10	
11	-.128	-.204									-.025	-.074						11	
12	-.166	-.198									-.082	-.054						12	









































Table 23 Continued  
 Pressure Coefficients on Delta Wing with Control  
 Configuration J3 M = 1.61 R = 4.2 x 10<sup>6</sup>

Orif	Upper Surface at Station									Lower Surface at Station									Orif
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = -09^\circ \quad \delta = 00^\circ$																			
1	.243	.215	.032	.011	.080	.027	-.226											1	
2	.256	.263	.293	.291	.296	.289	.263					-.139	-.350	-.404	-.413	-.431	-.451	-.252	2
3	.182	.187	.233	.204	.204	.216	.255					-.095	-.200	-.321	-.385	-.427	-.295	3	
4	.183	.158	.176	.395	.185	.513	-.001					-.099	-.128	-.144	-.172	-.338	-.318	-.401	4
5	.173	.161	.141	.227	.438	.317	-.043					-.114	-.139	-.159	-.173	-.253	-.386	5	
6	.162	.138	.144	.058								-.103	-.139	-.089	-.192	-.429		6	
7	.145	.145		.290		-.165						-.098	-.093		-.174	-.351		7	
8	.060	-.012		-.051	-.016							-.007			-.372	-.305		8	
9		-.005		.016											-.205			9	
10	-.026	-.031											-.211					10	
11	-.030	-.009											-.255	-.224				11	
12	.007	.029											-.232	-.215				12	
$\alpha = -12^\circ \quad \delta = 00^\circ$																			
1	.178	.104	-.075	-.161	-.081	-.148	-.243												1
2	.335	.356	.382	.368	.362	.351	.219												2
3	.258	.267	.303	.291	.293	.309	.252												3
4	.263	.237	.256	.411	.269	.476	.044												4
5	.241	.235	.217	.229	.458	.279	.092												5
6	.241	.215	.220	.251															6
7	.212	.211		-.283		-.055													7
8	.105	.009		.045	.073														8
9		.080		.114															9
10	.067	.060												-.261					10
11	.056	.110												-.292	-.277				11
12	.102	.143												-.241	-.170				12
$\alpha = -12^\circ \quad \delta = 10^\circ$																			
1	.178	.102	-.077	-.165	-.086	-.149	-.287												1
2	.335	.356	.382	.370	.363	.357	.317												2
3	.257	.268	.305	.292	.293	.312	.118												3
4	.263	.240	.257	.530	.268	.653	-.075												4
5	.244	.236	.218	.228	.593	.555	-.078												5
6	.242	.218	.220	.260															6
7	.212	.215		-.128		-.237													7
8	.101	.013		-.175	-.144														8
9		-.108		-.098															9
10	-.095	-.115													-.157				10
11	-.132	-.113													-.186	-.148			11
12	-.103	-.092													-.146	-.096			12
$\alpha = -12^\circ \quad \delta = 20^\circ$																			
1	.177	.102	-.079	-.166	-.088	-.154	-.153												1
2	.336	.350	.383	.372	.367	.356	.132												2
3	.260	.269	.308	.294	.296	.313	.050												3
4	.264	.241	.259	.583	.273	.693	-.202												4
5	.245	.237	.221	.229	.656	.312	-.231												5
6	.240	.222	.224	.097															6
7	.215	.220		-.024		-.310													7
8	.115	.093		-.328		-.293													8
9		-.256		-.274															9
10	-.220	-.259														.122			10
11	-.266	-.270														.047	.212		11
12	-.254	-.187														.149	.237		12
$\alpha = -12^\circ \quad \delta = 30^\circ$																			
1	.177	.101	-.077	-.165	-.085	-.147	-.224												1
2	.339	.360	.386	.375	.372	.360	-.055												2
3	.262	.269	.312	.298	.300	.315	.058												3
4	.265	.244	.261	.411	.278	.666	-.241												4
5	.246	.240	.227	.294	.576	.060	-.319												5
6	.241	.226	.230	-.044															6
7	.219	.230		-.002		-.329													7
8	.182	.194		-.373		-.376													8
9		-.349		-.363															9
10	-.318	-.322														.391			10
11	-.345	-.294														.419	.563		11
12	-.234	-.246														.418	.539		12

Table 23 Concluded  
 Pressure Coefficients on Delta Wing with Control  
 Configuration J3 M = 1.61 R = 4.2 x 10<sup>6</sup>

Orif	Upper Surface at Station									Lower Surface at Station									Orif
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
	$\alpha = -15^\circ$									$\delta = 00^\circ$									
1	.127	.003	-.153	-.289	-.179	-.251	-.265												1
2	.413	.415	.429	.415	.428	.416	.170			-.386	-.425	-.439	-.432	-.433	-.353	-.307			2
3	.317	.332	.374	.384	.384	.707	.221			-.164	-.407	-.420	-.420	-.437	-.343	-.378			3
4	.331	.300	.355	.421	.376	.451	.043			-.166	-.286	-.415	-.293	-.428	-.317	-.418			4
5	.306	.327	.317	.293	.468	.264	.162			-.182	-.165	-.415		-.301	-.297	-.381			5
6	.322	.323	.351	.408						-.168	-.188	-.338	-.204		-.386				6
7	.304	.308		-.320		-.032				-.151	-.144		-.426		-.398				7
8	.166	.058		.075		.121				-.052			-.416		-.338				8
9		.122		.165									-.342						9
10	.099	.097										-.251							10
11	.099	.180								-.295		-.265							11
12	.146	.169								-.251		-.153							12



Table 24  
 Pressure Coefficients on Delta Wing with Control  
 Configuration J4 M = 1.61 R = 4.2 x 10<sup>6</sup>

Ort	Upper Surface at Station									Lower Surface at Station									Ort
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = 00^\circ \quad \delta = -30^\circ$																			
1	.379	.365	.279	.258	.300	.349	.150					.078	.047	.023	.028	-.429			1
2	.050	.033	.018	.013	.000	.142	1.016					.039	.013	.016	.013	-.457			2
3	.015	.007		.065	.000	.330	.895					.044	.002	.017	.057	-.461			3
4	.023	-.007	.325	.043	.419	.630	.579					.004	.015	-.018	.041	-.147	-.450		4
5	-.002	.007	.338	.080	.182	.986	.627					.023	.005	.048	-.378	-.416			5
6	.143	.410	.154	.055								.023	.005	.048	-.378	-.416			6
7	.396	.148		.197		.671						.008	.022		-.333	-.363			7
8	.136	.127		.510		.625						.060			-.342	-.378			8
9		.149		.634											-.351				9
10	.166	.159													-.372				10
11	.248	.306										-.246	-.378						11
12	.247	.331										-.285	-.345						12
$\alpha = 00^\circ \quad \delta = -20^\circ$																			
1	.383	.361	.280	.262	.302	.352	.186					.074	.042	.023	.021	-.346			1
2	.050	.029	.018	.018	.000	.105	1.005					.041	.015	.008	.011	.011	-.451		2
3	.013	.008		.063	.001	.201	.669					.037	.000	-.002	.032	.057	-.460		3
4	.023	-.005	.310	-.168	.404	.397	.147					.002	.010	-.025	.031	-.119	-.464		4
5	-.001	.004	.342	-.011	-.049	.895	.348					.025	.002	.037	-.400	-.424			5
6	.118	.408	-.123	-.158								.006	.008	.037	-.408	-.417			6
7	.391	-.110		-.008		.321						.002			-.294	-.327			7
8	-.128	.051		.221		.294									-.283				8
9		-.109		.342											-.425				9
10	-.057	-.043													-.354				10
11	.085	.089										-.176	-.354						11
12	.108	.113										-.220	-.253						12
$\alpha = 00^\circ \quad \delta = -10^\circ$																			
1	.379	.369	.289	.265	.302	.350	.145					.071	.048	.018	.022	-.218			1
2	.052	.033	.025	.022	.002	.141	.759					.035	.010	.010	.011	-.190			2
3	.017	.011		.053	.006	.206	.427					.035	.000	-.007	.050	-.397			3
4	.025	-.001	.198	-.329	.395	.158	.048					.001	.014	-.023	.020	-.058	-.407		4
5	-.002	.012	.341	-.124	-.153	.548	.039					.018	.002	.032	-.302	-.325			5
6	.154	.400	-.314	-.287								.004	.003	.032	-.302	-.341			6
7	.388	-.300		-.133		.037						-.003			-.301	-.339			7
8	-.311	.010		.022		.003									-.303				8
9		-.271		.094											-.313				9
10	-.189	-.163													-.316				10
11	-.062	-.071										-.072	-.316						11
12	-.046	-.037										-.195	-.167						12
$\alpha = 00^\circ \quad \delta = 00^\circ$																			
1	.383	.371	.282	.268	.304	.352	.098					.087	.046	.024	.022	-.013			1
2	.054	.036	.023	.019	.005	.107	.256					.042	.012	.018	.010	.022			2
3	.018	.011		.073	.020	.199	.187					.044	.001	-.003	.026	.037	-.138		3
4	.029	-.003	.143	-.409	.384	.157	-.064					.010	.018	-.022	.022	.064	-.289		4
5	.005	.005	.338	-.205	-.209	.164	-.169					.024	.003	.033	-.142	-.196			5
6	.152	.402	-.396	-.343								.014	.007		-.141	-.201			6
7	.396	-.382		-.222		.182						.011			-.138	-.198			7
8	.392	.000		-.160		-.212									-.144				8
9		-.324		-.131											-.164				9
10	-.257	-.249													-.146				10
11	-.130	-.203										-.111	-.146						11
12	-.124	-.154										-.142	-.129						12
$\alpha = 00^\circ \quad \delta = 10^\circ$																			
1	.385	.362	.279	.264	.307	.347	.102					.068	.039	.008	.016	.340			1
2	.050	.035	.029	.018	.001	.070	-.038					.028	.011	.003	.000	.284			2
3	.014	.011		.070	.008	.211	-.048					.028	.003	-.014	-.020	.038	.032	.022	3
4	.013	-.002	.191	-.443	.370	.161	-.222					-.001	.012	-.033	.015	.251	.074		4
5	.004	.003	.346	-.220	-.218	.082	-.360					.013	-.002	.019	.098	.051			5
6	.043	.402	-.435	-.387								.022	-.002		.109	.030			6
7	.417	-.412		-.335		.328						-.002			.122	.014			7
8	-.411	-.027		-.326		.338									.123				8
9		-.350		-.307															9
10	-.301	-.326													.120				10
11	-.137	-.262										.085	.115						11
12	-.237	-.176										.115	.118						12

Table 24 Continued  
 Pressure Coefficients on Delta Wing with Control  
 Configuration J4 M = 1.61 R = 4.2 x 10<sup>6</sup>

Orif	Upper Surface at Station									Lower Surface at Station									Orif
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = 00^\circ \quad \delta = 20^\circ$																			
1	.387	.361	.283	.263	.306	.352	.232											1	
2	.057	.034	.025	.023	.002	.076	-.243			.067		.036		.002	.008	.627		2	
3	.020	.013		.061	.003	.216	-.183			.028	.011	.004		-.002	-.008	.503		3	
4	.022	.000	.188	-.447	.385	.185	-.407			.032		-.015	.252	-.042	.082	.119		4	
5	.005	.003	.345	.015	.216	-.255	-.412			-.004	.006	-.032		.138	.532	.213		5	
6	.041	.407	-.438	-.400						.011	-.010	.292	.324		.377			6	
7	.424	-.411		-.383		-.412				.019	.304		.554		.398			7	
8	-.406	.055		-.388		-.272				.225			.595		.374			8	
9		-.395		-.349									.521					9	
10	-.320	-.344									.506							10	
11	-.196	-.264								.450	.555							11	
12	-.258	-.226								.458	.511							12	
$\alpha = 00^\circ \quad \delta = 30^\circ$																			
1	.383	.365	.282	.265	.309	.351	.423											1	
2	.050	.039	.026	.025	.015	.076	-.340			.073		.032		.004	.001	.886		2	
3	.016	.013		.057	.002	.224	-.418			.035	.014	.007		.001	.359	.797		3	
4	.027	.002	.185	-.440	.385	.201	-.439			.044		-.016	.423	.374	.635	.614		4	
5	.010	.001	.346	.131	-.218	-.349	-.429			-.005	.007	.327		.436	.599	.630		5	
6	.039	.402	-.437	-.370						.012	.361	.382	.426		.825			6	
7	.423	-.414		-.373		-.352				.302	.425		.618		.755			7	
8	-.396	.109		-.382		-.319				.408			.755		.646			8	
9		-.409		-.356									.682					9	
10	-.327	-.333									.465							10	
11	-.229	-.297								.679	.617							11	
12	-.286	-.266								.649	.606							12	
$\alpha = 06^\circ \quad \delta = -30^\circ$																			
1	.320	.083	.131	-.028	.081	.208	.213											1	
2	-.097	-.280	-.341	-.388	-.385	.052	.291			.211		.253		.226	.253	-.381		2	
3	-.079	-.092		-.075	-.151	.053	.498			.152	.160	.169		.176	.202	-.339		3	
4	-.065	-.108	.003	-.050	.027	.084	.134			.151		.128	.138	.113	.222	.429		4	
5	-.099	-.105	.284	.137	.121	.101	.237			.115	.130	.106		.204	-.137	.327		5	
6	-.058	.305	.052	-.025						.129	.111	.154	-.380		-.415			6	
7	.244	.028		.096		.214				.103	.120		-.337		-.361			7	
8	.037	.126		.347		.175				.094			-.333		-.372			8	
9		.054		.453									-.338					9	
10	.084	.087									-.363							10	
11	.196	.257								-.280	-.362							11	
12	.215	.308								-.254	-.327							12	
$\alpha = 06^\circ \quad \delta = -20^\circ$																			
1	.329	.091	.130	-.016	.087	.186	.106											1	
2	-.093	-.275	-.336	-.382	-.387	-.043	.140			.207		.249		.226	.251	-.265		2	
3	-.075	-.087		-.096	-.210	-.080	.194			.151	.176	.161		.176	.197	-.166		3	
4	-.054	-.094	-.008	-.229	.086	-.048	-.031			.154		.125	.127	.112	.216	-.336		4	
5	-.092	-.098	.296	.019	-.126	-.018	-.077			.111	.125	.105		.189	-.100	.300		5	
6	-.062	.307	-.193	-.217						.128	.110	.149	-.361		-.380			6	
7	.253	-.195		-.096		.012				.107	.120		-.366		-.389			7	
8	-.215	.061		.074		-.011				.070			-.370		-.397			8	
9		-.178		.168									-.325					9	
10	-.112	-.100									-.393							10	
11	.042	.041								-.221	-.393							11	
12	.068	.070								-.216	-.213							12	
$\alpha = 06^\circ \quad \delta = -10^\circ$																			
1	.327	.096	.138	-.011	.094	.189	.003											1	
2	-.085	-.266	-.333	-.376	-.377	-.060	-.039			.207		.246		.217	.239	-.085		2	
3	-.068	-.083		-.093	-.222	-.119	-.029			.146	.158	.157		.162	.190	.025		3	
4	-.056	-.095	-.010	-.356	.137	-.139	-.220			.149		.122	.120	.097	.201	-.138		4	
5	-.089	-.091	.302	-.077	-.209	-.129	-.310			.101	.120	.092		.177	-.015	.212		5	
6	-.063	.308	-.338	-.333						.120	.101	.139	-.249		-.267			6	
7	.271	-.343		-.210		-.185				.093	.103		-.252		-.273			7	
8	-.345	.034		-.096		-.201				.056			-.252		-.277			8	
9		-.315		-.034									-.261					9	
10	-.233	-.212									-.281							10	
11	-.086	-.127								-.058	-.277							11	
12	-.068	-.083								-.183	-.252							12	

Table 24 Continued  
 Pressure Coefficients on Delta Wing with Control  
 Configuration J4 M = 1.61 R = 4.2 x 10<sup>6</sup>

Orif	Upper Surface at Station									Lower Surface at Station									Orif
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = 06^\circ \quad \delta = 00^\circ$																			
1	.329	.092	.138	-.010	.094	.191	-.047											1	
2	-.082	-.274	-.339	-.370	-.382	-.078	-.197			.219		.247		.234	.248	.235		2	
3	-.075	-.083		-.090	-.240	-.127	-.339			.159	.160	.161		.168	.194	.239		3	
4	-.056	-.094	-.013	-.428	.157	-.194	-.393			.160		.126	.129	.113	.212	.000		4	
5	-.088	-.095	.293	-.174	-.262	-.186	-.394			.112	.131	.100		.187	.183	-.038		5	
6	-.076	.310	-.419	-.366						.132	.115	.148	-.023		-.042			6	
7	.272	-.417		-.280		-.309				.106	.113		-.024		-.056			7	
8	-.406	.022		-.226		-.320				.060			-.028		-.062			8	
9		-.360		-.157									-.037					9	
10	-.263	-.301									-.061							10	
11	-.142	-.243								-.014	-.051							11	
12	-.156	-.158								-.060	-.036							12	
$\alpha = 06^\circ \quad \delta = 10^\circ$																			
1	.326	.094	.143	.007	.104	.193	-.037											1	
2	-.090	-.265	-.330	-.373	-.382	-.122	-.308			.205		.238		.222	.240	.686		2	
3	-.069	-.084		.094	-.277	-.118	-.438			.143	.152	.154		.158	.186	.457		3	
4	-.058	-.095	.063	.461	.264	-.208	-.448			.144		.123	.121	.105	.207	.082		4	
5	-.088	-.098	.299	.147	-.270	-.276	-.442			.107	.130	.095		.177	.461	.173		5	
6	-.077	.328	-.443	.412						.129	.107	.138	.268		.238			6	
7	.284	-.438		-.364		-.384				.119	.104		.277		.233			7	
8	-.409	.012		-.293		-.314				.079			.291		.213			8	
9		-.374		-.199									.292					9	
10	-.299	-.325									.257							10	
11	-.164	-.253								.218	.251							11	
12	-.240	-.210								.252	.252							12	
$\alpha = 06^\circ \quad \delta = 20^\circ$																			
1	.327	.098	.141	-.011	.102	.200	.162											1	
2	-.085	-.267	-.328	-.368	-.379	-.129	-.344			.212		.241		.217	.241	1.195		2	
3	-.068	-.084		.091	-.266	-.115	-.442			.142	.162	.151		.161	.187	.599		3	
4	-.059	-.093	.061	.451	.257	-.196	-.456			.150		.117	.526	.098	.646	.511		4	
5	-.079	-.096	.311	.282	-.266	-.362	-.422			.105	.119	.091		.526	.786	.559		5	
6	-.079	.317	-.430	.411						.121	.100	.515	.538		.738			6	
7	.280	-.420		-.375		-.335				.123	.496		.538		.670			7	
8	-.400	.127		-.326		-.315				.424			.768		.593			8	
9		-.388		-.270									.660					9	
10	-.322	-.337									.658							10	
11	-.235	-.286								.666	.714							11	
12	-.284	-.260								.619	.635							12	
$\alpha = 06^\circ \quad \delta = 30^\circ$																			
1	.334	.101	.149	-.002	.111	.212	.171											1	
2	-.082	-.256	-.324	-.366	-.371	-.125	-.425			.215		.241		.222	.348	1.265		2	
3	-.065	-.079		.078	-.269	-.098	-.456			.149	.155	.151		.165	.639	.978		3	
4	-.051	-.087	.069	.455	.267	-.154	-.466			.150		.117	.627	.592	.706	.862		4	
5	-.082	-.093	.314	.287	-.256	-.400	-.411			.107	.117	.507		.651	.618	.744		5	
6	-.075	.329	-.434	.406						.124	.526		.635		1.078			6	
7	.294	-.427		-.395		-.357				.498	.581	.590	.873		1.012			7	
8	-.411	.164		-.379		-.356				.564			1.005		.805			8	
9		-.404		-.352									.856					9	
10	-.345	-.356									.620							10	
11	-.249	-.328								.805	.737							11	
12	-.301	-.305								.750	.701							12	
$\alpha = 12^\circ \quad \delta = -30^\circ$																			
1	.192	-.123	-.036	.199	-.176	.025	.061											1	
2	-.311	-.441	-.459	-.369	-.290	.035	.072			.346		.401		.372	.397	-.346		2	
3	-.142	-.199		-.256	-.210	-.060	.177			.285	.288	.303		.323	.353	-.222		3	
4	-.125	-.194	-.270	.172	-.224	-.127	.002			.291		.268	.269	.255	.355	-.369		4	
5	-.165	-.167	-.046	.129	-.176	-.100	-.231			.243	.255	.239		.357	-.130	-.414		5	
6	-.150	.200	-.211	.155						.251	.238		-.414		-.399			6	
7	.183	-.176		-.143		-.077				.191	.232	.273	-.398		-.370			7	
8	-.158	.093		-.083		-.072				.133			-.334		-.341			8	
9		-.159		-.093									-.326					9	
10	-.078	-.095									-.424							10	
11	.154	.210								-.319	-.372							11	
12	.230	.338								-.298	-.317							12	

Table 24 Continued  
 Pressure Coefficients on Delta Wing with Control  
 Configuration J4 M = 1.61 R = 4.2 x 10<sup>6</sup>

Orif	Upper Surface at Station									Lower Surface at Station									Orif
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = 12^\circ \quad \delta = -20^\circ$																			
1	.197	-.109	-.028	-.196	-.168	-.031	-.007												1
2	-.306	-.426	-.450	-.417	-.337	-.059	-.035			.341		.398		.370	.390	-.205			2
3	-.132	-.192		-.299	-.267	-.098	-.057			.277	.290	.298		.318	.345	-.059			3
4	-.111	-.188	-.336	-.300	-.274	-.182	-.192			.290		.265	.266	.249	.353	-.189			4
5	-.159	-.194	.056	.073	-.297	-.152	-.256			.248	.252	.235		.355	-.056	-.324			5
6	-.141	.205	-.316	-.277						.254	.236	.267	-.334		-.335				6
7	.200	-.303		-.245		-.197				.185	.229		-.339		-.352				7
8	-.325	.079		-.197		-.170				.124			-.344		-.361				8
9		-.301		-.169									-.347						9
10	-.193	-.228										-.362							10
11	-.017	-.050										-.201	-.364						11
12	.016	.026										-.285	-.246						12
$\alpha = 12^\circ \quad \delta = -10^\circ$																			
1	.192	-.123	-.034	-.199	-.176	-.051	-.098												1
2	-.307	-.431	-.465	-.422	-.351	-.096	-.175			.348		.397		.367	.389	.024			2
3	-.136	-.197		-.310	-.283	-.158	-.219			.282	.283	.298		.312	.345	.113			3
4	-.117	-.192	-.329	-.399	-.304	-.231	-.374			.287		.264	.259	.247	.356	-.071			4
5	-.162	-.199	.048	.008	-.392	-.207	-.397			.233	.257	.241		.344	.068	-.147			5
6	-.149	.200	-.402	-.372						.245	.233	.266	-.168		-.175				6
7	.192	-.393		-.322		-.263				.183	.220		-.170		-.195				7
8	-.383	.068		-.266		-.227				.127			-.177		-.196				8
9		-.382		-.208									-.187						9
10	-.263	-.316										-.217							10
11	-.143	-.212										-.039	-.214						11
12	-.119	-.130										-.147	-.202						12
$\alpha = 12^\circ \quad \delta = 00^\circ$																			
1	.189	-.121	-.039	-.196	-.175	-.051	-.108												1
2	-.308	-.417	-.447	-.408	-.359	-.103	-.291			.349		.396		.371	.384	.371			2
3	-.134	-.196		-.308	-.288	-.182	-.391			.282	.220	.295		.313	.341	.317			3
4	-.114	-.191	-.323	-.455	-.310	-.252	-.405			.291		.259	.258	.246	.349	.026			4
5	-.168	-.194	.053	-.107	-.443	-.248	-.399			.241	.248	.235		.343	.266	.071			5
6	-.149	.206	-.465	-.405						.244	.228	.266	.086		.059				6
7	.197	-.454		-.364		-.299				.194	.226		.071		.050				7
8	-.409	.046		-.316		-.272				.134			.065		.050				8
9		-.407		-.233									.060						9
10	-.308	.375										.023							10
11	-.191	-.290										.064	.034						11
12	-.209	-.195										.062	.046						12
$\alpha = 12^\circ \quad \delta = 10^\circ$																			
1	.197	-.107	-.026	-.188	-.163	-.036	.039												1
2	-.299	-.422	-.451	-.412	-.352	-.085	-.350			.352		.405		.375	.389	.877			2
3	-.134	-.189		-.304	-.274	-.168	-.432			.282	.297	.302		.314	.342	.482			3
4	-.118	-.184	-.303	-.443	-.298	-.251	-.433			.288		.269	.258	.249	.350	.227			4
5	-.157	-.190	.091	-.018	-.435	-.355	-.327			.244	.249	.226		.348	.623	.395			5
6	-.144	.217	-.448	-.397						.249	.239	.274	.439		.421				6
7	.205	-.442		-.356		-.298				.209	.225		.442		.427				7
8	-.407	.052		-.326		-.291				.147			.461		.386				8
9		-.404		-.291									.442						9
10	-.304	-.367										.415							10
11	-.201	-.316										.373	.404						11
12	-.263	-.261										.396	.400						12
$\alpha = 12^\circ \quad \delta = 20^\circ$																			
1	.190	-.115	-.032	-.195	-.170	-.046	.348												1
2	-.300	-.434	-.465	-.420	-.362	-.093	-.419			.342		.398		.366	.370	1.234			2
3	-.144	-.197		-.306	-.288	-.175	-.463			.278	.280	.295		.304	.340	.737			3
4	-.125	-.193	-.310	-.453	-.307	-.249	-.448			.277		.255	.740	.234	.880	.714			4
5	-.166	-.198	.083	-.501	-.307	-.434	-.358			.236	.244	.216		.749	.838	.657			5
6	-.145	.206	-.465	-.387						.237	.222	.710	.737		.945				6
7	.209	.463		-.372		-.333				.201	.698		.904		.827				7
8	-.424	.207		-.370		-.332				.631			.897		.699				8
9		-.427		-.340									.744						9
10	-.348	-.395										.844							10
11	-.261	-.361										.792	.853						11
12	-.302	-.314										.693	.742						12



Table 24 Continued  
 Pressure Coefficients on Delta Wing with Control  
 Configuration J4 M = 1.61 R = 4.2 x 10<sup>6</sup>

Ort	Upper Surface at Station									Lower Surface at Station									Ort
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = -06^\circ \quad \delta = 10^\circ$																			
1	.296	.385	.157	.138	.173	.120	-.142			-.078	-.310		-.359	-.391	-.299			1	
2	.191	.204	.225	.245	.232	.429	.033			-.054	-.086	-.116	-.292	-.348	-.263			2	
3	.127	.139		.538	.509	.360	.096			-.056	-.112	-.135	-.151	-.304	-.308			3	
4	.121	.104	.493	-.424	.521	.210	.105			-.090	-.087	-.130	-.116	.001	-.348			4	
5	.111	.111	.575	-.268	-.188	-.035	-.194			-.071	-.090	-.071	-.025	-.259				5	
6	.155	.560	-.424	-.365						-.063	-.086		-.014	-.156				6	
7	.533	-.419		-.253		-.315				-.054			.005	-.131				7	
8	-.381	.003		-.246		.321							.003					8	
9		-.372		-.242														9	
10	-.216	-.330									.029							10	
11	-.089	-.277								-.018	.042							11	
12	-.225	-.178								.012	.037							12	
$\alpha = -06^\circ \quad \delta = 20^\circ$																			
1	.294	.385	.163	.143	.168	.113	-.121			-.083	-.320		-.372	-.381	-.252			1	
2	.191	.204	.225	.245	.235	.436	-.188			-.059	-.092	-.121	-.303	-.371	-.054			2	
3	.132	.138		.536	.512	.361	-.071			-.058	-.114	-.042	-.154	-.195	-.101			3	
4	.122	.109	.501	-.433	.525	.217	-.228			-.093	-.093	-.136	-.114	.034	-.195			4	
5	.112	.109	.580	-.139	-.188	-.191	-.331			-.073	-.098	.059	.144	-.038				5	
6	.152	.564	-.435	-.396						-.061	.121		.324	.064				6	
7	.538	-.436		-.360		-.396				.108			.354	.083				7	
8	-.378	.057		-.360		-.356							.354					8	
9		-.405		-.342									.335					9	
10	-.292	-.382									.344							10	
11	-.152	-.298								.280	.371							11	
12	-.235	-.228								.320	.354							12	
$\alpha = -06^\circ \quad \delta = 30^\circ$																			
1	.288	.393	.157	.129	.161	.114	-.108			-.085	-.318		-.366	-.028	.093			1	
2	.187	.196	.224	.235	.230	.430	-.340			-.063	-.092	-.122	-.147	.017	.387			2	
3	.129	.134		.546	.510	.363	-.238			-.059	-.115	-.042	.183	.045	.114			3	
4	.125	.107	.498	-.438	.526	.216	-.422			-.095	-.093	-.106	.068	.112	.152			4	
5	.112	.107	.577	-.102	-.197	-.316	-.418			-.079	-.032	.322	.194	.117				5	
6	.134	.557	-.431	-.415						.018	.329		.422	.174				6	
7	.537	-.431		-.373		-.361				.237			.521	.149				7	
8	-.355	.105		-.379		-.340							.514					8	
9		-.439		-.355														9	
10	-.328	-.378								.629	.487							10	
11	-.209	-.328								.599	.613							11	
12	-.297	-.290									.575							12	
$\alpha = -12^\circ \quad \delta = -30^\circ$																			
1	.164	.247	.020	-.110	-.047	-.252	.140			-.270	-.450		-.467	-.481	-.416			1	
2	.342	.342	.370	.373	.352	.573	.944			-.112	-.177	-.351	-.418	-.481	-.413			2	
3	.242	.242		.721	.716	.716	1.107			-.108	-.215	-.251	-.416	-.434	-.408			3	
4	.251	.225	.683	.267	.683	.787	.921			-.148	-.161	-.178	-.257	-.097	-.337			4	
5	.227	.291	.756	-.023	.411	.826	.805			-.120	-.163	-.123	-.439	-.403				5	
6	.388	.754	.414	.270						-.133	-.145		-.412	-.412				6	
7	.716	.373		.539		-.985				-.044			-.424	-.428				7	
8	.375	.177		.793		.865							-.411					8	
9		.372		.828														9	
10	.416	.392									-.424							10	
11	.484	.548								-.308	-.403							11	
12	.478	.578								-.319	-.355							12	
$\alpha = -12^\circ \quad \delta = -20^\circ$																			
1	.158	.250	.021	-.108	-.047	-.243	.312			-.273	-.447		-.473	-.473	-.433			1	
2	.336	.346	.373	.379	.356	.528	1.073			-.120	-.354		-.426	-.487	-.426			2	
3	.247	.242		.727	.712	.497	.808			-.115	-.216	-.259	-.429	-.453	-.428			3	
4	.246	.231	.678	-.016	.659	.605	.609			-.155	-.163	-.179	-.269	-.123	-.377			4	
5	.228	.259	.747	-.115	.066	.806	.640			-.122	-.168	-.123	-.462	-.417				5	
6	.360	.753	.042	-.012						-.136	-.161		-.407	-.432				6	
7	.707	.023		.190		.616				-.071			-.411	-.441				7	
8	.020	.103		.464		.584							-.377					8	
9		.028		.517														9	
10	.111	.082									-.437							10	
11	.275	.256								-.252	-.365							11	
12	.303	.302								-.297	-.281							12	

Table 24 Concluded  
 Pressure Coefficients on Delta Wing with Control  
 Configuration J4 M = 1.61 R = 4.2 x 10<sup>6</sup>

Ort	Upper Surface at Station									Lower Surface at Station									Ort
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	
$\alpha = -12^\circ \quad \delta = -10^\circ$																			
1	.166	.251	.021	-.108	-.047	-.247	.082												1
2	.342	.348	.374	.379	.359	.528	.838					-.270							2
3	.250	.244		.720	.712	.467	.589					-.114	-.180	-.449	-.433	-.490	-.431		3
4	.248	.233	.680	-.239	.660	.278	.147					-.114		-.218	-.270	-.420	-.462	-.429	4
5	.230	.262	.754	-.205	.082	.623	.338					-.155	-.162	-.191	-.273	-.115	-.380		5
6	.358	.755	.217	-.204								-.126	-.165	-.128		-.421	-.417		6
7	.713	-.219		.033		.235						-.142	-.155		-.417	-.430		7	
8	-.232	.041		.209		.263						-.098			-.421	-.446		8	
9		-.214		.252											-.347			9	
10	-.028	-.094												-.380				10	
11	.128	.048										-.164	-.381					11	
12	.130	.088										-.283	-.211					12	
$\alpha = -12^\circ \quad \delta = 00^\circ$																			
1	.159	.247	.010	-.116	-.059	-.257	-.090												1
2	.333	.339	.369	.368	.356	.514	.390												2
3	.243	.234		.714	.707	.457	.362					-.272		-.444	-.434	-.435	-.409		3
4	.243	.225	.671	-.364	.653	.251	.005					-.116	-.174	-.354	-.226	-.424	-.457	-.415	4
5	.225	.257	.749	-.286	-.178	.270	.069					-.125	-.159	-.187	-.291	-.107	-.359		5
6	.360	.743	-.359	-.272								-.155	-.168	-.125	-.344	-.413		6	
7	.710	-.367		-.093		-.091						-.140	-.159		-.352	-.420		7	
8	-.357	.026		-.012		-.052						-.103			-.336	-.434		8	
9		-.323		.026											-.315			9	
10	-.088	-.212												-.269				10	
11	-.037	-.136										-.216	-.258					11	
12	-.085	-.088										-.221	-.234					12	
$\alpha = -12^\circ \quad \delta = 10^\circ$																			
1	.170	.244	.013	-.114	-.045	-.254	-.147												1
2	.329	.343	.367	.374	.353	.524	.055												2
3	.240	.234		.721	.708	.454	.116					-.285		-.448	-.441	-.497	-.461		3
4	.236	.225	.679	-.411	.649	.263	-.095					-.130	-.184	-.360	-.201	-.435	-.486	-.431	4
5	.224	.270	.744	-.316	-.205	-.023	-.132					-.164	-.175	-.195	-.287	-.125	-.434		5
6	.368	.743	-.416	-.328								-.138	-.183	-.140	-.226	-.423		6	
7	.707	-.415		-.220		-.292						-.125	-.167		-.206	-.407		7	
8	-.380	.000		-.204		-.287						-.104			-.187	-.371		8	
9		-.367		-.195											-.187			9	
10	-.187	-.321												-.082				10	
11	-.062	-.273										-.073	-.065					11	
12	-.209	-.193										-.061	-.048					12	
$\alpha = -12^\circ \quad \delta = 20^\circ$																			
1	.166	.248	.010	-.119	-.052	-.256	-.135												1
2	.331	.338	.370	.379	.354	.519	.183												2
3	.243	.240		.728	.719	.466	.076					-.289		-.453	-.447	-.497	-.4294		3
4	.237	.232	.680	-.415	.660	.256	-.205					-.123	-.190	-.203	-.220	-.405	-.383	-.307	4
5	.224	.271	.751	-.284	-.215	-.210	-.286					-.158	-.171	-.190	-.318	-.102	-.343		5
6	.370	.750	-.427	-.382								-.139	-.178	-.083	-.113	-.345		6	
7	.711	-.432		-.335		-.397						-.123	-.162		-.101	-.321		7	
8	-.378	.031		-.346		-.398						-.027			-.045	-.307		8	
9		-.417		-.343											.033			9	
10	-.286	-.405												.250				10	
11	-.148	-.326										.206	.271					11	
12	-.222	-.233										.250	.298					12	
$\alpha = -12^\circ \quad \delta = 30^\circ$																			
1	.166	.253	.018	-.118	-.046	-.243	-.067												1
2	.336	.338	.368	.370	.357	.524	.316												2
3	.240	.235		.719	.719	.468	.202					-.284		-.453	-.433	-.490	-.429		3
4	.236	.227	.687	-.414	.658	.264	-.318					-.118	-.186	-.333	-.291	-.164	.046		4
5	.222	.281	.755	-.253	-.213	-.302	-.376					-.120		-.244	-.159	-.250	-.025		5
6	.374	.751	-.427	-.422								-.156	-.166	-.211	-.189	-.100	-.085		6
7	.718	-.429		-.382		-.364						-.131	-.179	.114	-.145	-.110		7	
8	-.370	.078		-.379		-.360						-.091	.207		-.079	-.141		8	
9		-.444		-.358								.191			-.010	-.208		9	
10	-.329	-.408												.573				10	
11	-.200	-.341										.554	.580					11	
12	-.278	-.289										.506	.550					12	





































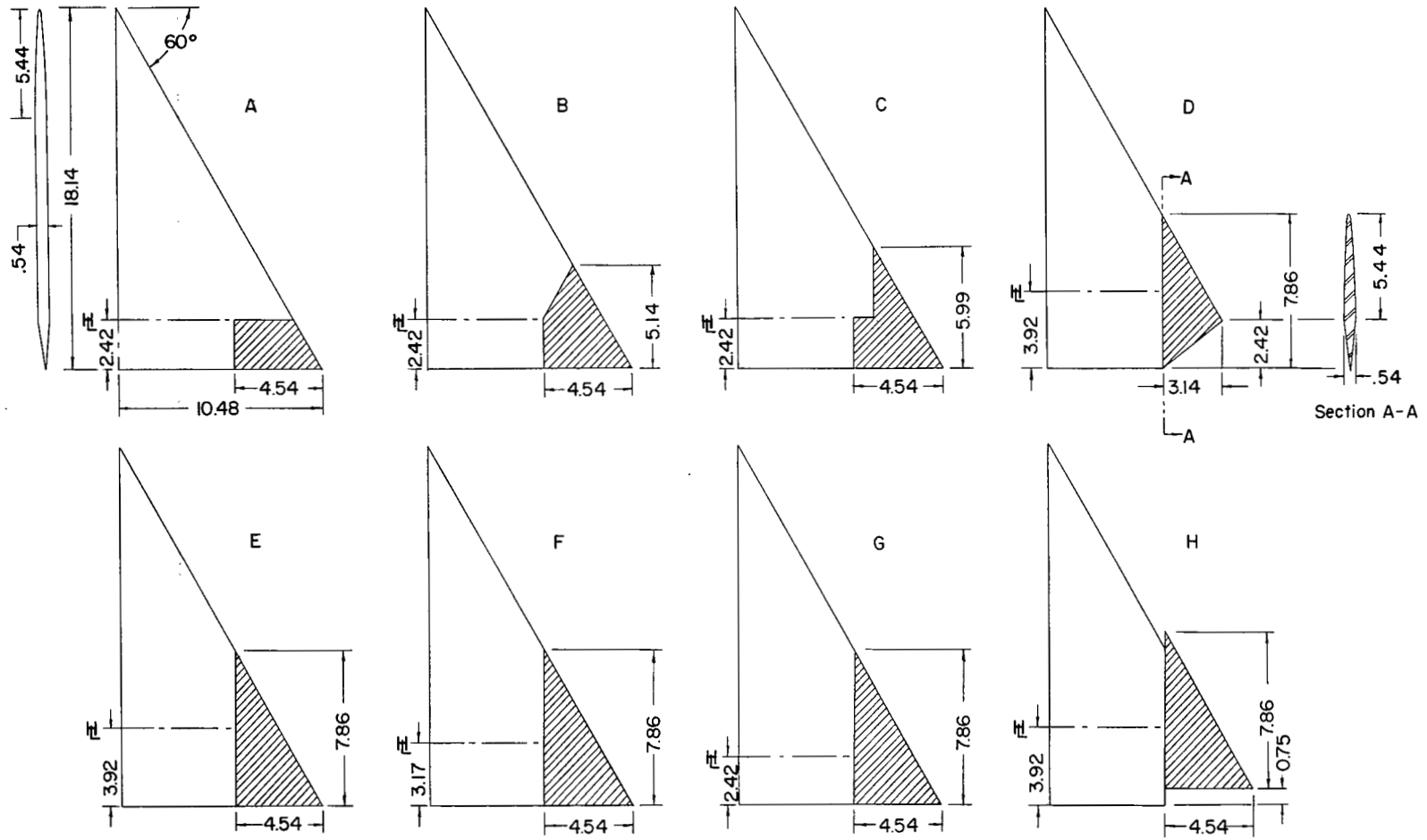






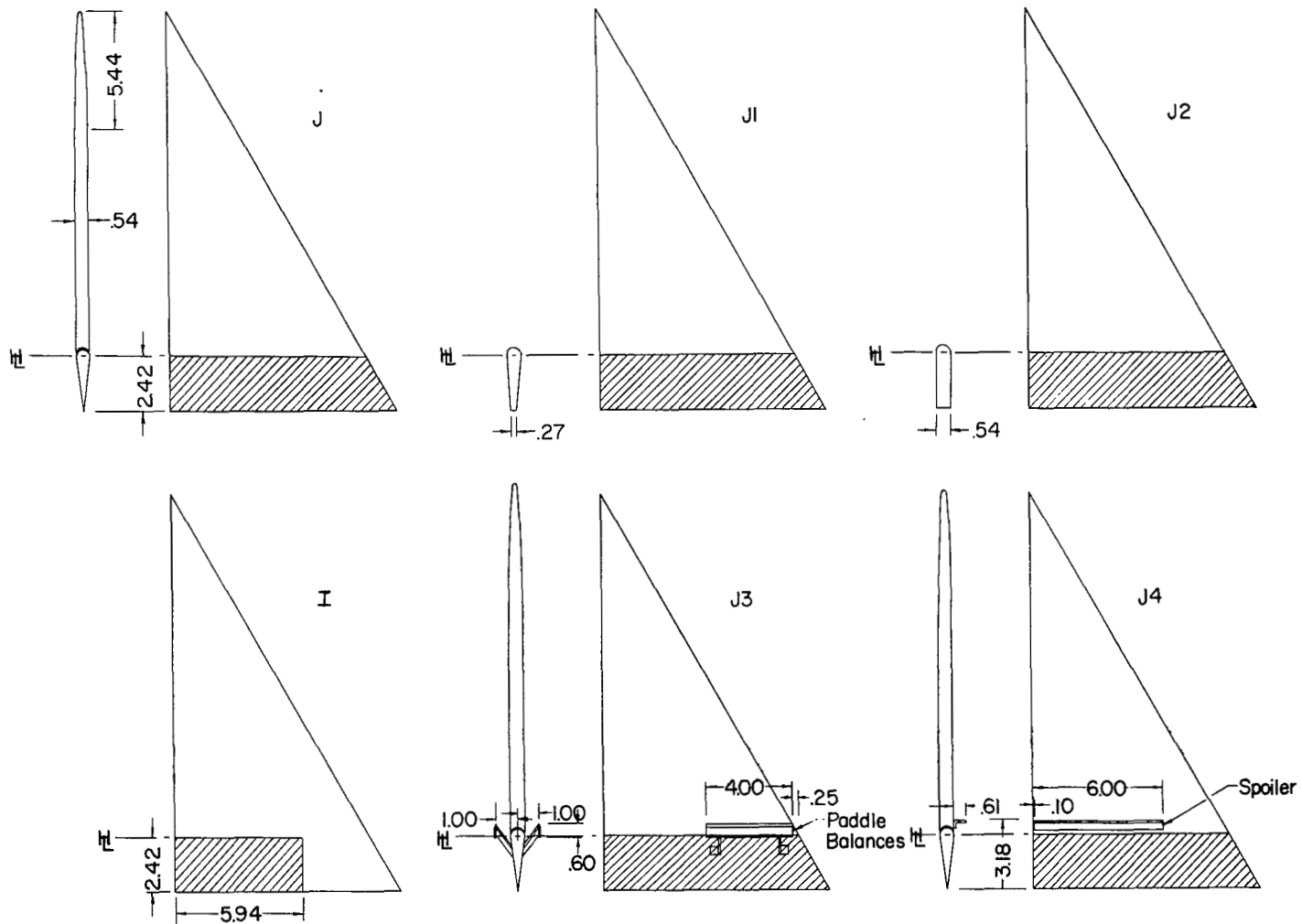






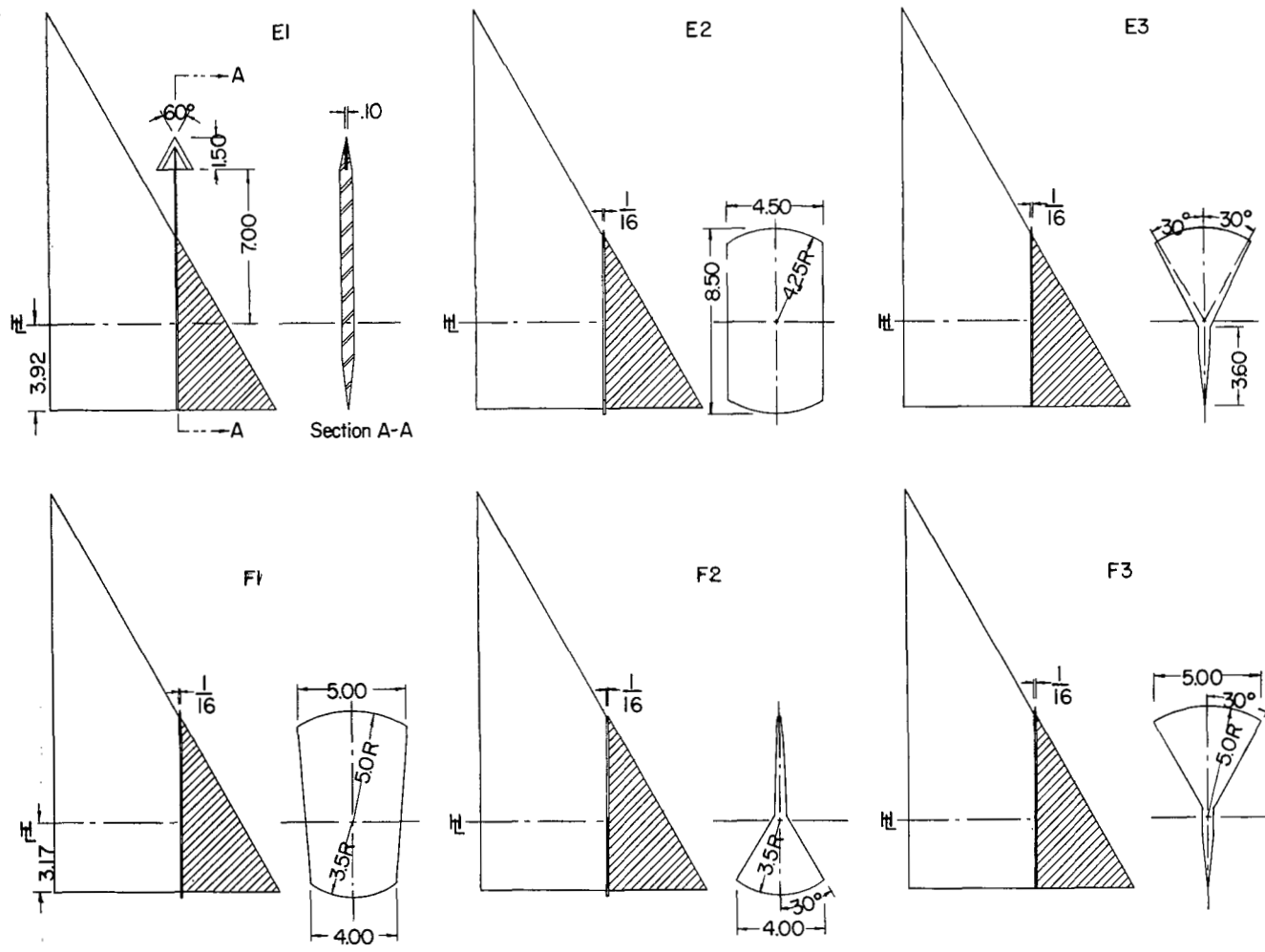
(a) Tip-control configurations.

Figure 1.- Dimensional sketches of test configurations. (All dimensions are in inches.)



(b) Trailing-edge-control configurations.

Figure 1.- Continued.



(c) Tab and fence configurations.

Figure 1.- Concluded.

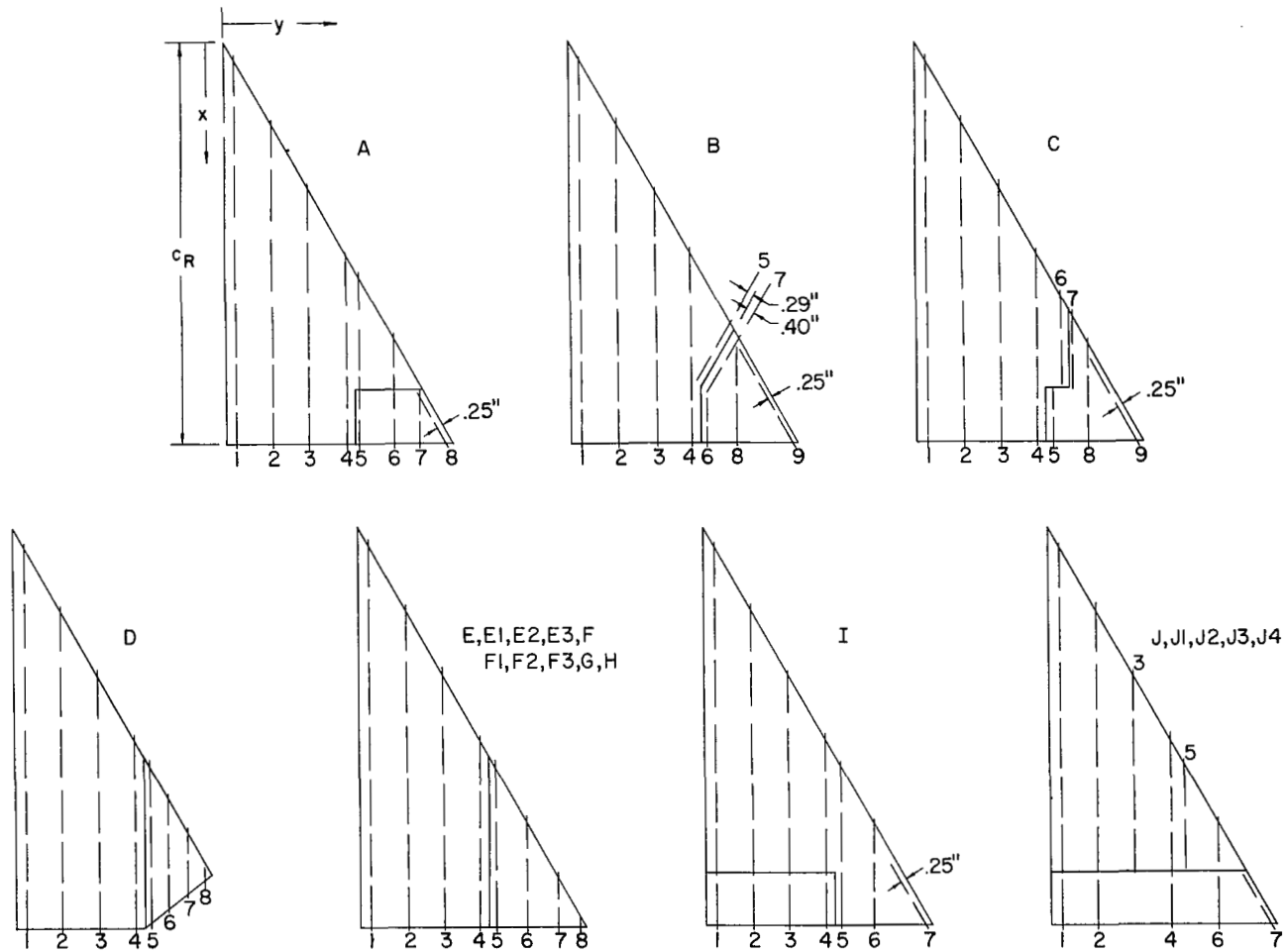
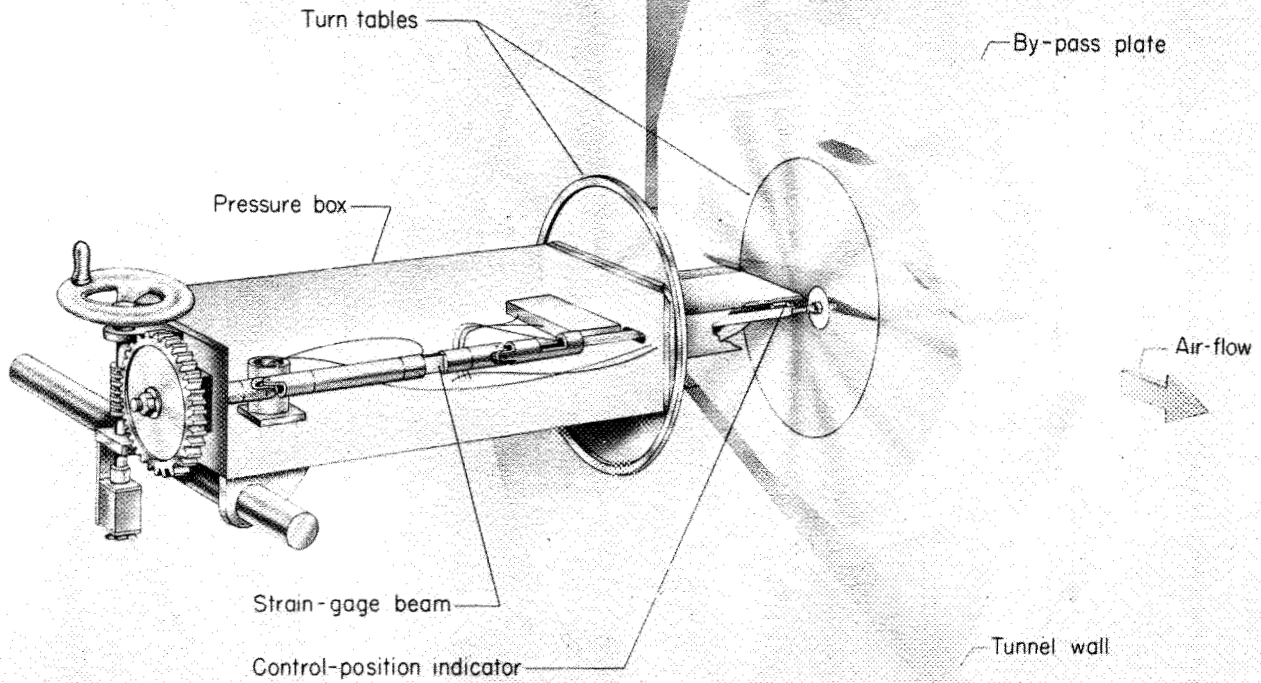


Figure 2.- Sketches showing approximate extent and location of orifice stations. Spanwise locations of stations are given in table 1 and chordwise locations of orifices in table 2.



L-77038

Figure 3.- Sketch of test setup showing one of the tip-control installations.



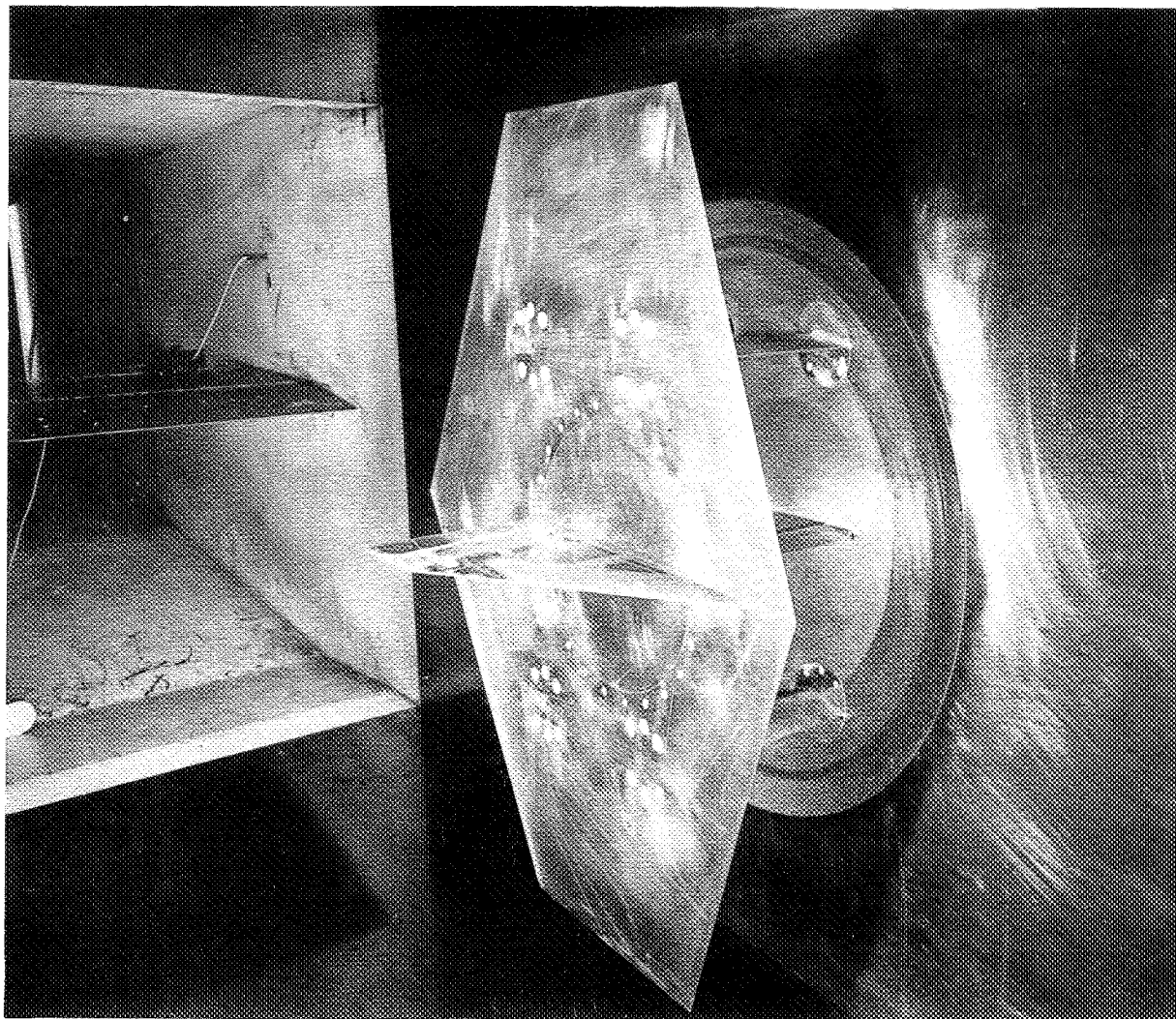


Figure 4.- Photograph of configuration J mounted on boundary-layer L-75294  
bypass plate.

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