NACA TN 3797

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

TECHNICAL NOTE 3797

SECTION CHARACTERISTICS OF THE NACA 0006 AIRFOIL WITH LEADING-EDGE AND TRAILING-EDGE FLAPS

By Bruno J. Gambucci

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SUMMARY

A wind-tunnel investigation was made to determine the section characteristics of the NACA 0006 airfoil equipped with a 0.15-chord leading-edge flap and a 0.30-chord trailing-edge flap. Lift and pitching-moment characteristics are presented for leading-edge flap deflections of 0°, 10°, 20°, 25°, 30°, 35°, 40°, and 50° with the plain trailing-edge flap deflected 0°, 35°, and 50°. Data are also presented for plain trailing-edge flap deflections of 20° and 70° with the leading-edge flap undeflected. Pressure-distribution data are presented in tabular form for the airfoil with various combinations of leading-edge and trailing-edge flap deflections. The data were obtained at a Mach number of 0.15 and a Reynolds number of 4,500,000.

INTRODUCTION

The maximum lift of the thin airfoil sections used on modern supersonic airplanes is limited at low speeds by the rearward growth of a region of separated flow that originates at the wing leading edge (ref. 1). Various means are effective for controlling the flow separation from the leading edge of thin airfoil sections - changes in leading-edge camber and nose radius, leading-edge flaps and slats, and boundary-layer control near the leading edge.

As part of a general program for providing information on high-lift devices for thin airfoils, a wind-tunnel investigation has been conducted of the NACA 0006 airfoil equipped with a 0.15-chord plain leading-edge flap and a 0.30-chord plain trailing-edge flap. The lift, pitching-moment, and pressure-distribution data from this investigation are presented herein for various leading-edge and trailing-edge flap deflections. The tests were conducted in one of the Ames 7- by 10-foot wind tunnels.

NOTATION

c airfoil chord, ft

c_l section lift coefficient, $\frac{L}{q_\infty c}$

c_m section pitching-moment coefficient referred to the quarter-chord point, $\frac{M}{q_\infty c^2}$

L lift per unit span, lb

M pitching moment per unit span referred to the quarter-chord point, lb-ft

P pressure coefficient, $\frac{p - p_\infty}{q_\infty}$

p static pressure, lb/sq ft

q_∞ free-stream dynamic pressure, $\frac{1}{2} \rho_\infty {V_\infty}^2$, lb/sq ft

V_∞ free-stream velocity, ft/sec

α angle of attack, deg

δ flap deflection, deg

ρ mass density of air, slugs/cu ft

Subscripts

f trailing-edge flap

n leading-edge flap

∞ free-stream conditions

MODEL AND TESTS

The model used for this investigation was a 4.5-foot-chord NACA 0006 airfoil which, when mounted in the 7- by 10-foot wind tunnel, spanned the 7-foot dimension (fig. 1). The model was equipped with a 0.15-chord leading-edge flap and a 0.30-chord plain trailing-edge flap.

The leading-edge flap was hinged on the lower surface, and could be deflected to any angle between 0° and 50°. The plain trailing-edge flap was also hinged on the lower surface, and could be deflected to angles of 20°, 30°, 50°, and 70° by changing a removable insert at the flap hinge line (fig. 2). With the flap deflected, the contour of the upper surface of the airfoil above the flap hinge line was an arc of a circle tangent to the airfoil surface with the center of the arc at the flap hinge. Details of the model construction are shown in figure 2.

Orifices, flush with the surface, were provided along the midspan of the model for determining the chordwise distribution of pressure.

The tests were made at a free-stream velocity of 162 feet per second (Mach number 0.15). The corresponding Reynolds number, based on the airfoil chord, was 4,500,000.

Lift and pitching moments were measured by the wind-tunnel balance system. Corrections were computed by the method of reference 2 and applied as follows:

$$\alpha = \alpha_u + 0.38\, c_{l_u} + 1.53\, c_{m_u}$$

$$c_l = 0.95\, c_{l_u}$$

$$c_m = 0.99\, c_{m_u} + 0.01\, c_{l_u}$$

where the subscript u denotes uncorrected values.

RESULTS AND DISCUSSION

A summary of the various combinations of leading-edge and trailing-edge flap deflections that were tested and an index of the figures and tables presenting the results are given in table I. The lift and pitching-moment data are presented graphically in figure 3 and the pressure-distribution data are tabulated in table II. In table II the chordwise locations of the pressure orifices in the flaps correspond to a projection of the flap orifice station onto the airfoil chord line.

It can be noted from figure 3(a) that with the leading-edge flap undeflected, small discontinuities occur in the lift curves at an angle of attack below that for maximum lift. Deflecting the plain trailing-edge flap caused these discontinuities to occur at lower angles of attack. Corresponding to each of these discontinuities in lift is a positive shift of the pitching moment. A similar behavior was observed in the tests of the plain NACA 0006 airfoil reported in reference 3. The discontinuities are attributed to leading-edge flow separation with a progressive rearward movement of the point of flow reattachment as the angle of attack is increased (ref. 1).

In order to delay the onset of leading-edge flow separation, the leading-edge flap was deflected. It can be noticed in figures 3(a) to 3(c) that when the leading-edge flap is deflected, the discontinuities in lift occur at a higher lift coefficient, and are no longer apparent at a leading-edge flap deflection of 20°. At deflections of the leading-edge flap greater than 20°, the flow separation from the leading edge was eliminated and maximum lift was limited by flow separation farther aft. The effect of leading-edge flap deflection on the maximum lift coefficient for three different deflections of the plain trailing-edge flap is presented in figure 4. It can be seen that for trailing-edge flap deflections from 0° to 50°, the optimum value of leading-edge flap deflection for maximum lift was 30°.

Ames Aeronautical Laboratory
National Advisory Committee for Aeronautics
Moffett Field, Calif., Aug. 15, 1956

REFERENCES

1. McCullough, George B., and Gault, Donald E.: Examples of Three Representative Types of Airfoil-Section Stall at Low Speed. NACA TN 2502, 1951.

2. Allen, H. Julian, and Vincenti, Walter G.: Wall Interference in a Two-Dimensional-Flow Wind Tunnel, With Consideration of the Effect of Compressibility. NACA Rep. 782, 1944.

3. McCullough, George B.: The Effect of Reynolds Number on the Stalling Characteristics and Pressure Distributions of Four Moderately Thin Airfoil Sections. NACA TN 3524, 1955.

TABLE I.- MODEL ARRANGEMENTS

Leading-edge flap deflection, δ_n, deg	Trailing-edge flap deflection, δ_f, deg	c_l vs. α c_l vs. c_m fig. no.	Pressure distribution table no.
0	0, 20, 35, 50 and 70	3(a)	II(a) to II(e)
10	0, 35, and 50	3(b)	---
20	0, 35, and 50	3(c)	II(f) to II(h)
25	0, 35, and 50	3(d)	---
30	0, 35, and 50	3(e)	II(i) to II(k)
35	0, 35, and 50	3(f)	---
40	0, 35, and 50	3(g)	---
50	0, 35, and 50	3(h)	---

TABLE II.- PRESSURE DISTRIBUTION FOR THE NACA 0006 AIRFOIL

(a) $\delta_n = 0^\circ$; $\delta_f = 0^\circ$

Angle of attack	$\alpha = 0^\circ$		$\alpha = 4.18^\circ$		$\alpha = 6.28^\circ$		$\alpha = 8.30^\circ$		$\alpha = 10.31^\circ$		$\alpha = 12.27^\circ$	
Chordwise station (percent airfoil chord)	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
0	0.97	---	-1.44	---	-4.69	---	-1.36	---	-1.20	---	-1.46	---
.1	.65	0.47	-3.10	0.55	-6.25	-1.72	-1.53	0.15	-1.35	0.18	-1.32	0.10
.5	.23	0	-2.41	.95	-3.90	.82	-1.37	.92	-1.19	.95	-1.26	.94
1.0	.07	-.10	-1.82	.77	-3.12	.98	-1.37	.99	-1.18	1.00	-1.21	1.00
2.0	-.05	-.20	-1.35	.64	-2.20	.88	-1.37	.87	-1.16	.92	-1.12	.91
5.0	-.13	-.25	-.93	.39	-1.42	.63	-1.38	.65	-1.07	.67	-1.02	.67
7.5	-.15	-.23	-.76	.29	-1.14	.52	-1.38	.54	-1.05	.55	-1.00	.54
10.0	-.14	-.21	-.64	.23	-.95	.45	-1.36	.46	-1.06	.47	-1.00	.44
12.5	-.14	---	-.52	---	-.85	---	-1.35	---	-1.07	---	-1.00	---
20	-.14	-.15	-.46	.14	-.64	.26	-1.16	.27	-1.07	.29	-1.00	.27
25	-.14	---	-.42	---	-.55	---	-.98	---	-1.05	---	-.95	---
30	-.13	-.14	-.37	.07	-.47	.20	-.81	.20	-1.00	.20	-.98	.17
35	-.12	---	-.33	---	-.42	---	-.66	---	-.95	---	-.97	---
40	-.11	-.12	-.30	.05	-.37	.16	-.56	.15	-.89	.14	-.95	.11
45	-.10	---	-.26	---	-.32	---	-.47	---	-.82	---	-.94	---
50	-.09	---	-.22	---	-.30	---	-.40	---	-.74	---	-.91	---
55	-.08	-.08	-.20	.05	-.27	.11	-.34	.10	-.66	.08	-.88	.03
60	-.07	-.07	-.17	.05	-.25	.11	-.29	.08	-.59	.07	-.84	.01
65	-.06	-.06	-.14	.05	-.21	.11	-.25	.06	-.52	.06	-.79	-.01
80	-.04	---	-.07	---	-.12	---	-.16	---	-.36	---	-.61	---
85	-.03	-.03	.04	0	-.08	.08	-.14	.03	-.32	-.04	-.57	-.14
90	-.02	0	.06	.06	-.05	.10	-.12	.02	-.29	-.07	-.54	-.17
95	-.01	.01	0	.10	0	.12	-.10	.01	-.27	-.10	-.53	-.21

TABLE II.- PRESSURE DISTRIBUTION FOR THE NACA 0006 AIRFOIL - Continued

(b) $\delta_n = 0^{\circ}$; $\delta_f = 20^{\circ}$

Angle of attack		$\alpha = -8.15^{\circ}$		$\alpha = -2.08^{\circ}$		$\alpha = 0.16^{\circ}$		$\alpha = 1.20^{\circ}$		$\alpha = 2.23^{\circ}$		$\alpha = 6.32^{\circ}$	
Chordwise station (percent airfoil chord)		Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Upper	Lower												
0	---	0.56	---	-1.43	---	-3.57	---	-4.88	---	-3.01	---	-1.86	---
.1	0.1	.98	-0.61	-3.43	0.59	-5.71	-0.28	-6.85	-0.88	-3.69	-0.71	-1.85	-0.27
.5	.5	.63	-.87	-2.70	1.00	-4.01	.97	-4.66	.86	-2.47	.83	-1.66	.88
1.0	1.0	.45	-.75	-2.15	.88	-2.96	1.00	-3.48	1.00	-2.47	1.00	-1.59	1.00
2.0	2.0	.24	-.63	-1.56	.68	-2.11	.86	-2.44	.89	-2.55	.94	-1.52	.90
5.0	5.0	.02	-.45	-1.12	.41	-1.47	.57	-1.64	.66	-2.58	.70	-1.53	.72
7.5	7.5	-.05	-.36	-.96	.33	-1.22	.47	-1.34	.53	-2.24	.59	-1.56	.62
10.0	10.0	-.10	-.30	-.87	.29	-1.06	.40	-1.16	.45	-1.80	.51	-1.58	.55
12.5	---	-.14	---	-.82	---	-.96	---	-1.06	---	-1.41	---	-1.59	---
20	20	-.21	-.14	-.74	.22	-.79	.28	-.90	.32	-.99	.38	-1.59	.39
25	---	-.25	---	-.72	---	-.76	---	-.83	---	-.89	---	-1.53	---
30	30	-.30	-.03	-.70	.22	-.73	.27	-.79	.30	-.84	.35	-1.45	.34
35	---	-.33	---	-.69	---	-.70	---	-.76	---	-.80	---	-1.35	---
40	40	-.37	.07	-.69	.26	-.69	.30	-.73	.31	-.77	.36	-1.24	.32
45	---	-.41	---	-.70	---	-.69	---	-.71	---	-.75	---	-1.13	---
50	---	-.45	---	-.71	---	-.71	---	-.70	---	-.74	---	-1.04	---
55	55	-.52	.25	-.75	.37	-.75	.39	-.69	.39	-.74	.41	-.95	.37
60	60	-.61	.33	-.81	.41	-.83	.44	-.71	.43	-.76	.45	-.86	.41
65	65	-.79	.42	-.97	.48	-.96	.50	-.79	.50	-.87	.51	-.80	.48
69.1	---	-1.28	---	-1.51	---	-1.20	---	-1.11	---	-1.12	---	-.77	---
70	---	-1.48	---	-1.75	---	-1.43	---	-1.26	---	-1.22	---	-.85	---
71	---	-1.87	---	-2.00	---	-.74	---	-1.10	---	-1.42	---	-.78	---
72	---	-1.29	---	-1.31	---	-.68	---	-.79	---	-1.00	---	-.73	---
75.80	74.74	-.78	.42	-.79	.48	-.59	.49	-.56	.47	-.65	.50	-.68	.45
80.39	---	-.47	---	-.48	---	-.48	---	-.48	---	-.51	---	-.64	---
84.98	84.33	-.30	.25	-.32	.31	-.43	.28	-.44	.27	-.44	.30	-.61	.19
89.68	89.12	-.16	.19	-.21	.23	-.37	.20	-.41	.18	-.37	.22	-.58	.07
94.15	93.91	-.05	.14	-.14	.16	-.32	.12	-.39	.09	-.29	.14	-.56	-.01

(c) $\delta_n = 0^{\circ}$; $\delta_f = 35^{\circ}$

Angle of attack		$\alpha = -10.21^{\circ}$		$\alpha = -1.91^{\circ}$		$\alpha = 0.19^{\circ}$		$\alpha = 1.24^{\circ}$		$\alpha = 2.29^{\circ}$		$\alpha = 4.32^{\circ}$	
Chordwise station (percent airfoil chord)		Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Upper	Lower												
0	---	0.20	---	-2.27	---	-5.38	---	-2.68	---	-1.94	---	-1.99	---
.1	0.1	.90	-1.43	-4.00	0.28	-6.93	-1.05	-2.45	-0.31	-2.24	-0.24	-2.47	-0.50
.5	.5	.87	-1.46	-2.95	.97	-4.33	.77	-2.45	.85	-1.92	.82	-1.57	.76
1.0	1.0	.70	-1.11	-2.25	.93	-3.48	.96	-2.45	1.00	-1.90	.94	-1.52	.97
2.0	2.0	.47	-.88	-1.70	.78	-2.46	.91	-2.49	.92	-1.90	.92	-1.53	.97
5.0	5.0	.21	-.53	-1.20	.54	-1.66	.79	-2.47	.71	-1.90	.71	-1.56	.78
7.5	7.5	.11	-.41	-1.00	.45	-1.34	.59	-2.30	.62	-1.90	.61	-1.58	.70
10.0	10.0	.04	-.33	-.86	.40	-1.15	.51	-1.95	.55	-1.90	.56	-1.60	.63
12.5	---	0	---	-.77	---	-1.04	---	-1.62	---	-1.89	---	-1.62	---
20	20	-.10	-.10	-.70	.33	-.88	.40	-1.01	.43	-1.80	.45	-1.65	.50
25	---	-.15	---	-.68	---	-.82	---	-.87	---	-1.65	---	-1.62	---
30	30	-.19	.04	-.66	.35	-.78	.40	-.80	.42	-1.48	.43	-1.55	.47
35	---	-.21	---	-.65	---	-.75	---	-.75	---	-1.28	---	-1.43	---
40	40	-.25	.16	-.63	.38	-.72	.42	-.71	.44	-1.11	.45	-1.30	.48
45	---	-.30	---	-.62	---	-.71	---	-.68	---	-.95	---	-1.22	---
50	---	-.34	---	-.60	---	-.70	---	-.66	---	-.83	---	-1.05	---
55	55	-.39	.40	-.61	.52	-.71	.55	-.65	.56	-.75	.56	-.94	.56
60	60	-.45	.47	-.63	.63	-.72	.60	-.65	.63	-.70	.64	-.85	.63
65	65	-.62	.53	-.72	.70	-.77	.69	-.65	.70	-.69	.69	-.78	.70
69.1	---	-.92	---	-.98	---	-.96	---	-.77	---	-.74	---	-.77	---
70	---	-1.15	---	-1.10	---	-1.06	---	-.82	---	-.79	---	-.79	---
71	---	-1.50	---	-1.25	---	-1.20	---	-.90	---	-.90	---	-.84	---
72	---	-.55	---	-.60	---	-.62	---	-.51	---	-.72	---	-.77	---
75.90	74.14	-.55	.55	-.57	.68	-.60	.68	-.51	.70	-.62	.70	-.70	.69
79.82	---	-.56	---	-.59	---	-.61	---	-.52	---	-.59	---	-.70	---
83.75	82.68	-.57	.34	-.60	.35	-.62	.40	-.52	.43	-.57	.43	-.67	.42
87.69	86.91	-.59	.20	-.61	.25	-.63	.25	-.52	.28	-.55	.28	-.65	.25
91.60	91.20	-.61	.04	-.62	.09	-.64	.08	-.52	.13	-.53	.13	-.65	.10

TABLE II.- PRESSURE DISTRIBUTION FOR THE NACA 0006 AIRFOIL - Continued

(d) $\delta_n = 0^\circ$; $\delta_f = 50^\circ$

Angle of attack		$\alpha = -12.20^\circ$		$\alpha = -3.90^\circ$		$\alpha = -1.82^\circ$		$\alpha = -0.77^\circ$		$\alpha = 2.32^\circ$		$\alpha = 5.31^\circ$	
Chordwise station (percent airfoil chord)		Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Upper	Lower												
0	---	0.24	---	-2.74	---	-5.87	---	-2.63	---	-2.10	---	-1.50	---
.1	0.1	.97	-0.90	-4.50	0.13	-7.40	-1.23	-2.80	-0.29	-2.55	-0.69	-1.85	-0.40
.5	.5	.80	-1.06	-3.25	.97	-5.00	.74	-2.58	.86	-1.67	.70	-1.17	.74
1.0	1.0	.63	-.81	-2.50	.97	-3.60	.98	-2.53	.98	-1.67	.94	-1.16	.94
2.0	2.0	.43	-.64	-1.90	.85	-2.63	.95	-2.46	.89	-1.68	.98	-1.15	.95
5.0	5.0	.15	-.35	-1.32	.60	-1.77	.72	-2.42	.70	-1.74	.82	-1.15	.78
7.5	7.5	.06	-.23	-1.09	.50	-1.44	.61	-2.23	.62	-1.77	.73	-1.17	.70
10.0	10.0	0	-.15	-.96	.45	-1.26	.57	-1.94	.56	-1.80	.68	-1.20	.65
12.5	---	-.06	---	-.88	---	-1.14	---	-1.62	---	-1.83	---	-1.21	---
20	20.0	-.17	.06	-.79	.40	-1.00	.49	-1.04	.47	-1.82	.57	-1.25	.53
25	---	-.23	---	-.77	---	-.94	---	-.90	---	-1.76	---	-1.25	---
30	30	-.27	.20	-.75	.45	-.90	.50	-.85	.48	-1.65	.55	-1.26	.52
35	---	-.30	---	-.75	---	-.87	---	-.80	---	-1.51	---	-1.26	---
40	40	-.35	.34	-.76	.51	-.85	.55	-.78	.54	-1.35	.58	-1.25	.56
45	---	-.40	---	-.77	---	-.85	---	-.76	---	-1.20	---	-1.24	---
50	---	-.46	---	-.78	---	-.84	---	-.75	---	-1.05	---	-1.23	---
55	55	-.53	.54	-.79	.68	-.85	.71	-.75	.68	-.93	.70	-1.20	.68
60	60	-.62	.56	-.85	.75	-.89	.78	-.76	.75	-.83	.77	-1.18	.73
65	65	-.79	.58	-.95	.79	-.97	.82	-.78	.79	-.76	.82	-1.15	.78
69.1	---	-1.24	---	-1.32	---	-1.27	---	-.94	---	-.79	---	-1.21	---
70	---	-1.57	---	-1.58	---	-1.50	---	-1.07	---	-.81	---	-1.26	---
71	---	-1.80	---	-1.65	---	-1.55	---	-1.10	---	-.77	---	-1.24	---
72	---	-.90	---	-.90	---	-.88	---	-.68	---	-.74	---	-1.20	---
75.55	73.20	-.83	.58	-.90	.78	-.86	.80	-.65	.79	-.68	.79	-1.14	.77
78.52	---	-.84	---	-.90	---	-.86	---	-.66	---	-.66	---	-1.10	---
81.50	80.08	-.85	.52	-.90	.56	-.86	.57	-.66	.57	-.66	.58	-1.09	.54
84.50	83.52	-.86	.33	-.91	.36	-.87	.38	-.67	.40	-.66	.41	-1.07	.35
87.48	86.95	-.86	.11	-.92	.13	-.87	.19	-.68	.20	-.66	.24	-1.05	.12

(e) $\delta_n = 0^\circ$; $\delta_f = 70^\circ$

Angle of attack		$\alpha = -14.14^\circ$		$\alpha = -3.82^\circ$		$\alpha = -1.71^\circ$		$\alpha = 0.34^\circ$		$\alpha = 2.35^\circ$	
Chordwise station (percent airfoil chord)		Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Upper	Lower										
0	---	0.56	---	-6.40	---	-4.42	---	-2.02	---	-2.02	---
.1	0.1	.98	-0.59	-7.98	-1.65	-3.84	-1.54	-2.02	-0.78	-1.85	-0.72
.5	.5	.79	-.78	-5.24	.68	-3.67	.60	-2.02	.71	-1.85	.71
1.0	1.0	.50	-.66	-3.92	.98	-3.67	.95	-2.02	.97	-1.85	.96
2.0	2.0	.26	-.53	-2.78	.98	-3.56	1.00	-2.02	1.00	-1.85	1.00
5.0	5.0	.05	-.27	-1.84	.79	-2.95	.84	-2.03	.87	-1.85	.87
7.5	7.5	-.04	-.15	-1.51	.68	-2.58	.76	-2.05	.79	-1.86	.79
10.0	10.0	-.10	-.06	-1.33	.62	-2.27	.70	-2.08	.73	-1.88	.74
12.5	---	-.14	---	-1.22	---	-2.01	---	-2.10	---	-1.90	---
20	20	-.24	.17	-1.07	.54	-1.53	.60	-2.13	.63	-1.94	.64
25	---	-.31	---	-1.02	---	-1.34	---	-2.11	---	-1.95	---
30	30	-.37	.38	-1.00	.58	-1.21	.62	-2.05	.65	-1.93	.65
35	---	-.40	---	-.98	---	-1.14	---	-1.95	---	-1.89	---
40	40	-.50	.56	-.98	.67	-1.09	.71	-1.82	.72	-1.83	.72
45	---	-.57	---	-.98	---	-1.06	---	-1.65	---	-1.75	---
50	---	-.64	---	-.99	---	-1.05	---	-1.47	---	-1.66	---
55	55	-.73	.59	-1.02	.79	-1.05	.83	-1.31	.84	-1.55	.81
60	60	-.84	.58	-1.06	.81	-1.06	.85	-1.17	.85	-1.44	.83
65	65	-1.02	.55	-1.16	.82	-1.12	.85	-1.08	.85	-1.33	.84
69.1	---	-1.60	---	-1.60	---	-1.33	---	-1.03	---	-1.28	---
70	---	-2.03	---	-1.87	---	-1.47	---	-1.03	---	-1.29	---
71	---	-1.92	---	-1.71	---	-1.37	---	-1.04	---	-1.33	---
72	---	-1.22	---	-1.15	---	-1.03	---	-1.01	---	-1.33	---
74.65	71.79	-1.22	.58	-1.15	.82	-1.00	.85	-.91	.88	-1.11	.88
76.60	---	-1.23	---	-1.15	---	-1.00	---	-.88	---	-1.04	---
77.52	75.78	-1.24	.73	-1.16	.77	-1.01	.79	-.87	.81	-1.04	.80
78.98	77.76	-1.25	.59	-1.16	.61	-1.01	.64	-.89	.65	-1.04	.63
80.40	79.75	-1.26	.31	-1.16	.35	-1.01	.39	-.91	.42	-1.04	.37

TABLE II.- PRESSURE DISTRIBUTION FOR THE NACA 0006 AIRFOIL - Continued

(f) $\delta_n = 20^\circ$; $\delta_f = 0^\circ$

Angle of attack		$\alpha = -0.09^\circ$		$\alpha = 6.19^\circ$		$\alpha = 8.29^\circ$		$\alpha = 10.39^\circ$		$\alpha = 12.47^\circ$		$\alpha = 14.54^\circ$	
Chordwise station (percent airfoil chord)		Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Upper	Lower												
0.05	---	-0.46	---	0.94	---	0.78	---	-1.72	---	-5.32	---	-8.97	---
.08	0.29	.72	-0.59	.56	0.66	-1.16	0.98	-3.52	0.30	-7.12	0.91	-10.45	-2.51
.35	.75	1.00	-.57	.10	.23	-1.21	.86	-2.80	1.00	-4.52	.80	-6.22	.44
.74	1.29	.95	-.57	-.05	.13	-1.18	.73	-2.30	.95	-3.50	1.00	-4.90	.92
1.57	2.39	.74	-.58	-.22	.05	-1.07	.74	-1.86	.82	-2.80	.95	-3.55	.96
4.43	5.39	.63	-.60	-.47	.12	-1.02	.42	-1.53	.62	-2.13	.82	-2.62	.87
6.42	7.84	.21	-.61	-.61	.21	-1.06	.42	-1.48	.60	-1.96	.75	-2.30	.83
8.68	10.27	.10	-.62	-.80	.28	-1.20	.47	-1.55	.61	-1.94	.73	-2.25	.80
10.97	---	-.18	---	-.95	---	-1.33	---	-1.68	---	-2.08	---	-2.34	---
13	---	-1.58	---	-3.05	---	-3.70	---	-4.20	---	-4.65	---	4.87	---
14	---	-1.08	---	-3.27	---	-2.75	---	-3.20	---	-3.35	---	-3.75	---
15	---	-.87	---	-1.70	---	-2.15	---	-2.57	---	-2.82	---	-3.10	---
16	---	-.71	---	-1.44	---	-1.84	---	-2.20	---	-2.45	---	-2.65	---
20	20	-.37	-.62	-.97	.35	-1.18	.48	-1.44	.56	-1.62	.65	-1.81	.71
25	---	-.27	---	-.73	---	-.89	---	-1.08	---	-1.24	---	-1.42	---
30	30	-.24	-.46	-.63	.22	-.75	.34	-.88	.43	-1.05	.52	-1.18	.57
35	---	-.20	---	-.54	---	-.64	---	-.77	---	-.91	---	-.98	---
40	40	-.19	-.20	-.47	.13	-.56	.25	-.67	.32	-.78	.40	-.85	.46
45	---	-.17	---	-.41	---	-.48	---	-.58	---	-.67	---	-.72	---
50	---	-.15	---	-.36	---	-.42	---	-.50	---	-.57	---	-.62	---
55	55	-.14	-.04	-.32	.10	-.37	.18	-.43	.28	-.49	.30	-.53	.35
60	60	-.13	-.02	-.29	.10	-.32	.17	-.38	.27	-.42	.29	-.44	.32
65	65	-.12	-.01	-.25	.10	-.28	.16	-.33	.26	-.35	.28	-.38	.39
80	---	-.07	---	-.15	---	-.16	---	-.17	---	-.17	---	-.19	---
85	85	-.05	0	-.10	.07	-.12	.12	-.12	.16	-.12	.18	-.14	.17
90	90	-.02	.02	-.06	.07	-.07	.11	-.07	.15	-.06	.16	-.08	.15
95	95	.04	.04	-.03	.06	-.02	.10	-.03	.12	-.01	.14	-.04	.13

(g) $\delta_n = 20^\circ$; $\delta_f = 35^\circ$

Angle of attack		$\alpha = -4.05^\circ$		$\alpha = 0.12^\circ$		$\alpha = 4.28^\circ$		$\alpha = 6.35^\circ$		$\alpha = 8.44^\circ$	
Chordwise station (percent airfoil chord)		Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Upper	Lower										
0.05	---	0.27	---	0.96	---	-1.66	---	-4.60	---	-8.38	---
.08	0.29	.92	-1.52	.25	0.87	-3.47	0.51	-6.45	-0.64	-9.92	-2.25
.35	.75	.94	-1.31	-.15	.47	-2.65	.99	-4.18	.86	-5.91	.48
.74	1.29	.80	-1.00	-.27	.38	-2.25	.96	-3.45	1.00	-4.76	.92
1.57	2.39	.53	-.60	-.42	.30	-1.82	.82	-2.62	.95	-3.50	1.00
4.43	5.39	.10	-.13	-.64	.32	-1.53	.69	-2.12	.80	-2.61	.90
6.42	7.84	-.12	.07	-.76	.38	-1.50	.67	-1.95	.76	-2.35	.86
8.68	10.29	-.33	.22	-.92	.47	-1.60	.68	-1.98	.75	-2.37	.82
10.97	---	-.56	---	-1.15	---	-1.81	---	-2.18	---	-2.51	---
13	---	-2.37	---	-3.46	---	-4.50	---	-5.02	---	-5.45	---
14	---	-1.75	---	-2.63	---	-3.45	---	-3.92	---	-4.25	---
15	---	-1.38	---	-2.05	---	-2.83	---	-3.25	---	-3.45	---
16	---	-1.14	---	-1.77	---	-2.46	---	-2.75	---	-3.00	---
20	20	-.77	.41	-1.20	.53	-1.67	.66	-1.89	.73	-2.09	.78
25	---	-.65	---	-.97	---	-1.34	---	-1.53	---	-1.65	---
30	30	-.62	.35	-.89	.45	-1.17	.60	-1.33	.63	-1.43	.70
35	---	-.60	---	-.84	---	-1.06	---	-1.19	---	-1.27	---
40	40	-.59	.37	-.79	.45	-.97	.56	-1.09	.60	-1.15	.64
45	---	-.59	---	-.76	---	-.92	---	-1.02	---	-1.07	---
50	---	-.60	---	-.75	---	-.87	---	-.96	---	-.99	---
55	55	-.62	.52	-.74	.58	-.85	.65	-.92	.68	-.93	.70
60	60	-.63	.59	-.74	.64	-.82	.70	-.88	.73	-.88	.73
65	65	-.70	.66	-.80	.70	-.83	.76	-.86	.78	-.85	.79
69.1	---	-.98	---	-1.00	---	-.96	---	-.95	---	-.90	---
70	---	-1.17	---	-1.15	---	-1.07	---	-1.03	---	-.95	---
71	---	-1.58	---	-1.25	---	-1.12	---	-1.05	---	-.98	---
72	---	-.62	---	-.65	---	-.62	---	-.64	---	-.62	---
75.90	74.14	-.62	.65	-.65	.69	-.62	.73	-.64	.73	-.62	.75
79.82	---	-.62	---	-.65	---	-.63	---	-.64	---	-.62	---
83.75	82.68	-.63	.39	-.65	.43	-.64	.49	-.64	.51	-.62	.53
87.69	86.91	-.64	.23	-.65	.27	-.64	.33	-.65	.38	-.62	.37
91.60	91.20	-.65	.07	-.65	.10	-.65	.14	-.65	.28	-.62	.20

TABLE II.- PRESSURE DISTRIBUTION FOR THE NACA 0006 AIRFOIL - Continued

(h) $\delta_n = 20^\circ$; $\delta_f = 50^\circ$

Angle of attack		$\alpha = -3.98^\circ$		$\alpha = 0.19^\circ$		$\alpha = 2.25^\circ$		$\alpha = 4.34^\circ$		$\alpha = 6.41^\circ$	
Chordwise station (percent airfoil chord)		Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Upper	Lower										
0.05	---	0.76	---	0.13	---	-1.57	---	-4.82	---	-8.68	---
.08	0.29	.94	0.09	-1.23	0.96	-3.35	0.53	-6.67	-0.75	-10.07	-2.35
.35	.75	.58	-.20	-1.25	.91	-2.66	1.00	-4.50	.83	-6.05	.41
.74	1.29	.35	-.14	-1.19	.78	-2.26	.97	-3.48	1.00	-4.75	.90
1.57	2.39	.12	-.03	-1.09	.63	-1.82	.85	-2.75	.96	-3.60	1.00
4.43	5.39	-.22	.15	-1.06	.56	-1.57	.68	-2.16	.84	-2.65	.94
6.42	7.84	-.42	.29	-1.14	.58	-1.55	.68	-2.03	.80	-2.43	.88
8.68	10.29	-.62	.40	-1.13	.62	-1.71	.72	-2.08	.78	-2.40	.85
10.97	---	-.85	---	-1.52	---	-1.89	---	-2.28	---	-2.61	---
13	---	-3.00	---	-4.20	---	-4.73	---	-5.22	---	-5.57	---
14	---	-2.15	---	-3.15	---	-3.50	---	-4.05	---	-4.35	---
15	---	-1.77	---	-2.50	---	-2.88	---	-3.27	---	-3.52	---
16	---	-1.50	---	-2.20	---	-2.50	---	-2.81	---	-3.08	---
20	20	-1.04	.51	-1.52	.66	-1.78	.72	-2.01	.75	-2.60	.81
25	---	-.89	---	-1.22	---	-1.47	---	-1.62	---	-1.75	---
30	30	-.84	.49	-1.12	.60	-1.80	.65	-1.42	.71	-1.53	.74
35	---	-.82	---	-1.06	---	-1.19	---	-1.29	---	-1.38	---
40	40	-.80	.53	-1.02	.60	-1.13	.64	-1.21	.68	-1.27	.70
45	---	-.80	---	-.98	---	-1.09	---	-1.14	---	-1.20	---
50	---	-.81	---	-.96	---	-1.07	---	-1.11	---	-1.14	---
55	55	-.82	.69	-.95	.74	-1.05	.75	-1.08	.76	-1.10	.80
60	60	-.84	.73	-.94	.80	-1.05	.81	-1.06	.81	-1.07	.85
65	65	-.97	.76	-1.02	.83	-1.10	.85	-1.09	.86	-1.05	.88
69.1	---	-1.45	---	-1.40	---	-1.42	---	-1.35	---	-1.25	---
70	---	-1.62	---	-1.53	---	-1.58	---	-1.46	---	-1.35	---
71	---	-1.73	---	-1.63	---	-1.58	---	-1.47	---	-1.30	---
72	---	-.87	---	-.87	---	-.92	---	-.90	---	-.83	---
75.55	73.20	-.87	.77	-.87	.84	-.92	.83	-.90	.85	-.83	.88
78.52	---	-.88	---	-.88	---	-.92	---	-.90	---	-.83	---
81.50	80.08	-.90	.56	-.88	.60	-.92	.62	-.90	.86	-.83	.66
84.50	83.52	-.91	.38	-.89	.43	-.92	.44	-.90	.47	-.83	.50
87.48	86.95	-.92	.15	-.90	.25	-.92	.25	-.90	.25	-.83	.29

(i) $\delta_n = 30^\circ$; $\delta_f = 0^\circ$

Angle of attack		$\alpha = -0.03^\circ$		$\alpha = 4.04^\circ$		$\alpha = 8.25^\circ$		$\alpha = 10.34^\circ$		$\alpha = 13.47^\circ$		$\alpha = 15.56^\circ$	
Chordwise station (percent airfoil chord)		Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Upper	Lower												
0.78	---	-0.63	---	-0.03	---	0.90	---	0.75	---	-1.52	---	-4.10	---
.75	1.06	.58	-0.50	.86	-1.15	.84	0.26	-.18	0.97	-3.20	0.52	-5.90	-0.50
.94	1.54	.90	-.49	.99	-1.15	.48	-.10	-.47	.65	-2.55	.99	-4.10	.87
1.25	2.09	.95	-.48	.87	-1.15	.27	-.05	-.58	.53	-2.00	.94	-3.25	1.00
1.94	3.16	.88	-.47	.67	-1.15	.03	.02	-.66	.42	-1.73	.82	-2.55	.95
4.23	6.03	.58	-.46	.24	-1.15	-.36	.21	-.86	.42	-1.57	.72	-2.10	.80
6.23	8.30	.36	-.47	0	-1.15	-.58	.36	-1.00	.50	-1.60	.72	-2.02	.77
8.27	10.63	.13	-.48	-.26	-1.15	-.88	.47	-1.22	.60	-1.78	.76	-2.20	.79
10.37	---	-.12	---	-.52	---	-1.12	---	-1.52	---	-2.22	---	-2.46	---
12	---	-1.60	---	-2.20	---	-3.10	---	-3.57	---	-4.05	---	-4.03	---
13	---	-1.36	---	-2.18	---	-3.18	---	-3.85	---	-4.66	---	-5.20	---
14	---	-1.14	---	-2.21	---	-3.15	---	-3.76	---	-4.45	---	-4.70	---
15	---	-.98	---	-1.54	---	-2.25	---	-2.67	---	-3.09	---	-3.55	---
16	---	-.85	---	-1.25	---	-1.85	---	-2.20	---	-2.65	---	-3.05	---
20	20	-.48	-.54	-.74	-1.20	-1.15	.55	-1.38	.59	-1.77	.72	-2.04	.74
25	---	-.29	---	-.52	---	-.87	---	-1.04	---	-1.32	---	-1.52	---
30	30	-.25	-.57	-.45	-1.02	-.70	.37	-.88	.42	-1.07	.56	-1.24	.60
35	---	-.23	---	-.38	---	-.60	---	-.75	---	-.89	---	-1.02	---
40	40	-.19	-.56	-.32	-.84	-.51	.25	-.65	.31	-.77	.44	-.85	.47
45	---	-.15	---	-.28	---	-.44	---	-.58	---	-.67	---	-.73	---
50	---	-.14	---	-.25	---	-.37	---	-.52	---	-.59	---	-.62	---
55	55	-.13	-.43	-.22	-.80	-.33	.19	-.43	.23	-.50	.34	-.52	.36
60	60	-.12	-.34	-.19	-.81	-.29	.19	-.37	.22	-.43	.32	-.44	.34
65	65	-.10	-.27	-.16	-.82	-.25	.20	-.31	.21	-.36	.29	-.37	.30
80	---	-.07	---	-.08	---	-.15	---	-.15	---	-.17	---	-.18	---
85	85	-.05	-.06	-.06	-.89	-.11	.12	-.11	.12	-.12	.20	-.14	.19
90	90	-.03	-.03	-.04	-.89	-.07	.10	-.07	.10	-.05	.18	-.07	.17
95	95	-.02	-.02	-.02	-.87	-.01	.11	-.02	.10	0	.16	0	.15

TABLE II.- PRESSURE DISTRIBUTION FOR THE NACA 0006 AIRFOIL - Concluded

(j) $\delta_n = 30^\circ$; $\delta_f = 35^\circ$

Angle of attack		$\alpha = 0.08^\circ$		$\alpha = 4.23^\circ$		$\alpha = 8.40^\circ$		$\alpha = 10.48^\circ$		$\alpha = 11.53^\circ$	
Chordwise station (percent airfoil chord)		Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Upper	Lower										
0.78	---	0.63	---	0.80	---	-2.23	---	-7.10	---	-1.86	---
.75	1.06	1.00	-0.70	0	0.93	-3.97	0.25	-8.70	-1.67	-3.42	0.27
.94	1.54	.93	-.68	-.35	.67	-3.05	1.00	-5.11	.57	-2.77	.91
1.25	2.09	.76	-.50	-.46	.54	-2.40	.99	-4.22	.87	-2.15	.94
1.94	3.16	.46	-.18	-.60	.47	-2.00	.98	-3.25	.95	-1.80	.84
4.23	6.03	.03	.20	-.86	.49	-1.80	.85	-2.58	.91	-1.46	.75
6.23	8.30	-.19	.35	-1.03	.57	-1.82	.84	-2.49	.87	-1.40	.74
8.27	10.63	-.54	.52	-1.27	.66	-2.05	.85	-2.65	.85	-1.44	.75
10.37	---	-.87	---	-1.66	---	-2.42	---	-3.07	---	-1.72	---
12	---	-3.15	---	-4.02	---	-4.30	---	-4.20	---	-4.20	---
13	---	-2.97	---	-4.20	---	-5.35	---	-6.10	---	-2.95	---
14	---	-3.00	---	-4.18	---	-5.28	---	-5.75	---	-2.15	---
15	---	-2.06	---	-3.00	---	-3.70	---	-4.30	---	-1.75	---
16	---	-1.76	---	-2.58	---	-3.28	---	-3.70	---	-1.65	---
20	20	-1.18	.53	-1.71	.68	-2.22	.83	-2.68	.78	-1.52	.75
25	---	-.91	---	-1.35	---	-1.70	---	-2.02	---	-1.44	---
30	30	-.80	.47	-1.17	.57	-1.45	.75	-1.62	.73	-1.37	.62
35	---	-.73	---	-1.05	---	-1.28	---	-1.38	---	-1.31	---
40	40	-.69	.45	-.98	.55	-1.14	.70	-1.22	.70	-1.25	.57
45	---	-.66	---	-.91	---	-1.05	---	-1.10	---	-1.20	---
50	---	-.65	---	-.86	---	-.97	---	-1.00	---	-1.17	---
55	55	-.64	.52	-.83	.63	-.90	.76	-.93	.70	-1.14	.60
60	60	-.65	.61	-.80	.68	-.85	.80	-.88	.74	-1.10	.65
65	65	-.72	.66	-.83	.73	-.82	.84	-.86	.80	-1.06	.71
69.1	---	-.90	---	-.98	---	-.92	---	-.84	---	-1.06	---
70	---	-1.05	---	-1.05	---	-1.00	---	-.90	---	-1.10	---
71	---	-1.11	---	-1.09	---	-.97	---	-.87	---	-1.15	---
72	---	-.54	---	-.63	---	-.60	---	-.60	---	-1.06	---
75.90	74.14	-.54	.66	-.63	.68	-.60	.82	-.60	.76	-.99	.68
79.82	---	-.55	---	-.63	---	-.61	---	-.60	---	-.98	---
83.75	82.68	-.55	.34	-.63	.46	-.61	.57	-.60	.53	-.97	.38
87.69	86.91	-.55	.23	-.63	.29	-.62	.41	-.61	.36	-.96	.19
91.60	91.20	-.56	.07	-.63	.12	-.62	.25	-.61	.17	-.95	0

(k) $\delta_n = 30^\circ$; $\delta_f = 50^\circ$

Angle of attack		$\alpha = 0.14^\circ$		$\alpha = 4.30^\circ$		$\alpha = 7.41^\circ$		$\alpha = 9.50^\circ$	
Chordwise station (percent airfoil chord)		Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Upper	Lower								
0.78	---	0.88	---	-0.26	---	-3.22	---	-7.12	---
.75	1.06	.73	0.52	-1.63	0.84	-4.93	-0.22	-8.64	-1.67
.94	1.54	.30	.24	-1.50	1.00	-3.47	.96	-5.00	.55
1.25	2.09	.15	.15	-1.40	.88	-2.82	1.00	-4.15	.90
1.94	3.16	-.07	.23	-1.24	.75	-2.30	.96	-3.15	.95
4.23	6.03	-.44	.42	-1.26	.66	-1.97	.84	-2.57	.92
6.23	8.30	-.69	.51	-1.43	.68	-2.00	.82	-2.48	.90
8.27	10.63	-1.00	.57	-1.72	.72	-2.24	.83	-2.63	.88
10.37	---	-1.32	---	-2.04	---	-2.60	---	-3.04	---
12	---	-3.50	---	-4.21	---	-4.55	---	-4.55	---
13	---	-3.65	---	-4.82	---	-5.57	---	-6.15	---
14	---	-3.67	---	-4.77	---	-5.38	---	-5.88	---
15	---	-2.50	---	-3.50	---	-3.95	---	-4.20	---
16	---	-2.15	---	-3.02	---	-3.45	---	-3.65	---
20	20	-1.52	.64	-2.05	.75	-2.32	.81	-2.68	.83
25	---	-1.22	---	-1.60	---	-1.81	---	-2.07	---
30	30	-1.09	.55	-1.38	.66	-1.55	.75	-1.71	.76
35	---	-1.02	---	-1.24	---	-1.37	---	-1.49	---
40	40	-.97	.54	-1.15	.65	-1.25	.72	-1.34	.74
45	---	-.95	---	-1.09	---	-1.16	---	-1.24	---
50	---	-.94	---	-1.04	---	-1.10	---	-1.17	---
55	55	-.94	.64	-1.02	.74	-1.05	.77	-1.10	.78
60	60	-.96	.68	-1.00	.79	-1.01	.83	-1.06	.81
65	65	-.99	.73	-1.01	.85	-.99	.91	-1.02	.85
69.1	---	-1.24	---	-1.20	---	-1.10	---	-1.10	---
70	---	-1.50	---	-1.45	---	-1.30	---	-1.25	---
71	---	-1.66	---	-1.77	---	-1.39	---	-1.26	---
72	---	-.89	---	-.90	---	-.85	---	-.85	---
75.55	73.20	-.85	.73	-.85	.84	-.80	.91	-.82	.86
78.52	---	-.85	---	-.85	---	-.80	---	-.82	---
81.50	80.08	-.85	.49	-.85	.60	-.80	.66	-.82	.65
84.50	83.52	-.86	.32	-.85	.42	-.80	.48	-.82	.48
87.48	86.95	-.86	.11	-.85	.24	-.80	.29	-.82	.28

A-19056

Figure 1.- The NACA 0006 airfoil mounted in the Ames 7- by 10-foot wind tunnel.

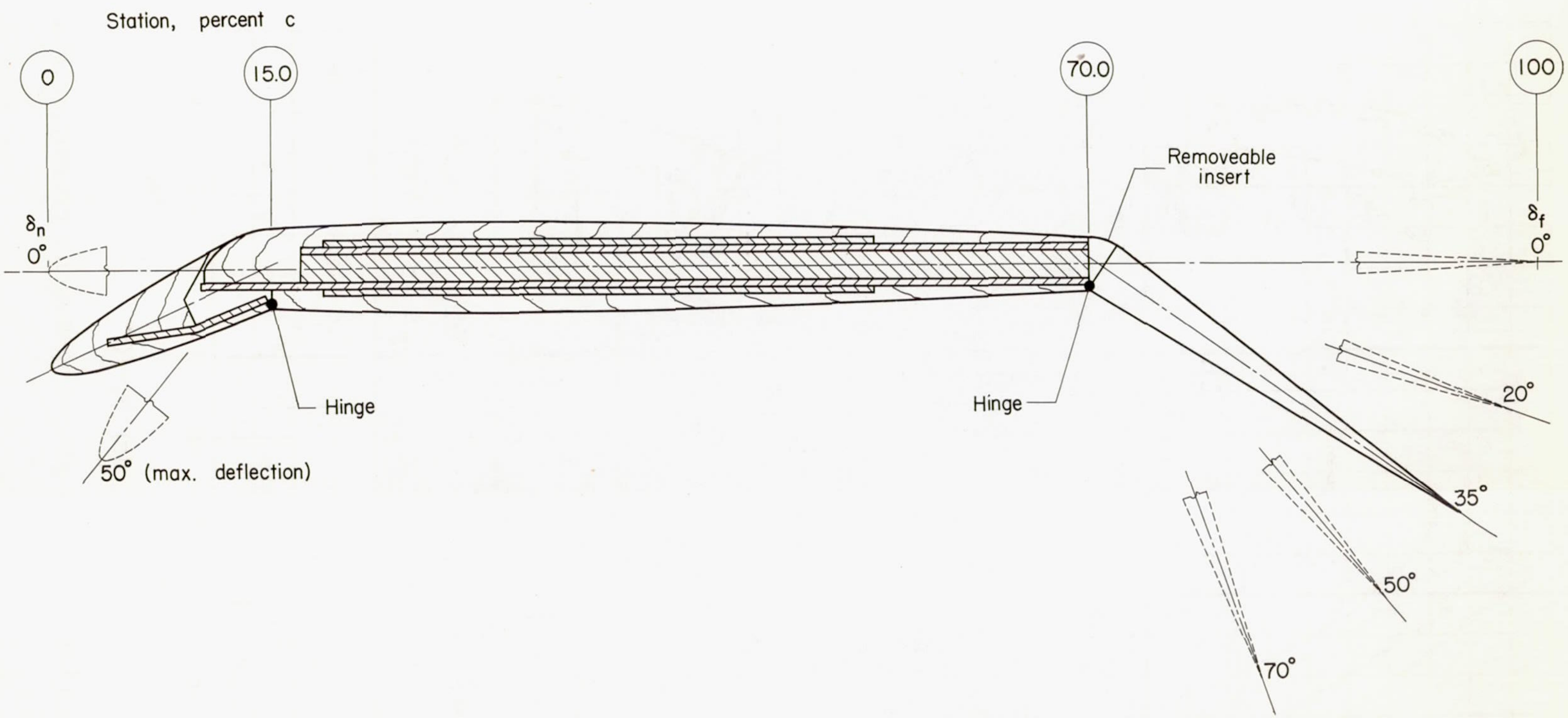


Figure 2.- Geometry of the model.

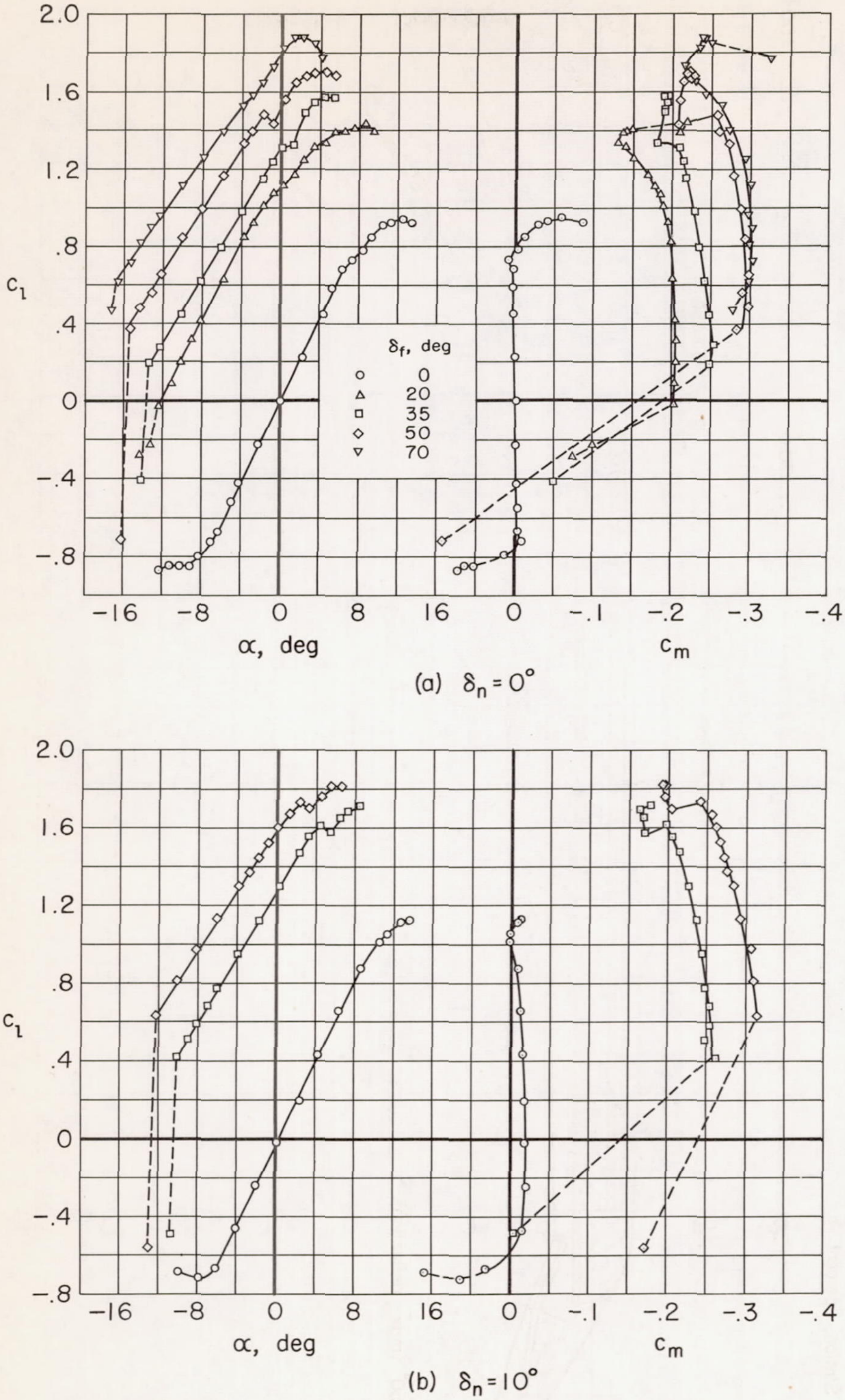
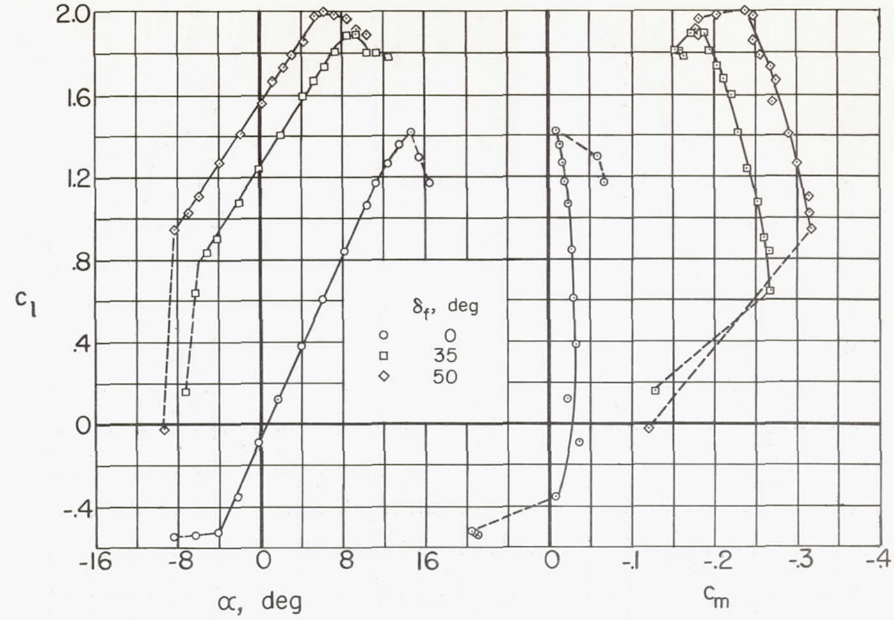
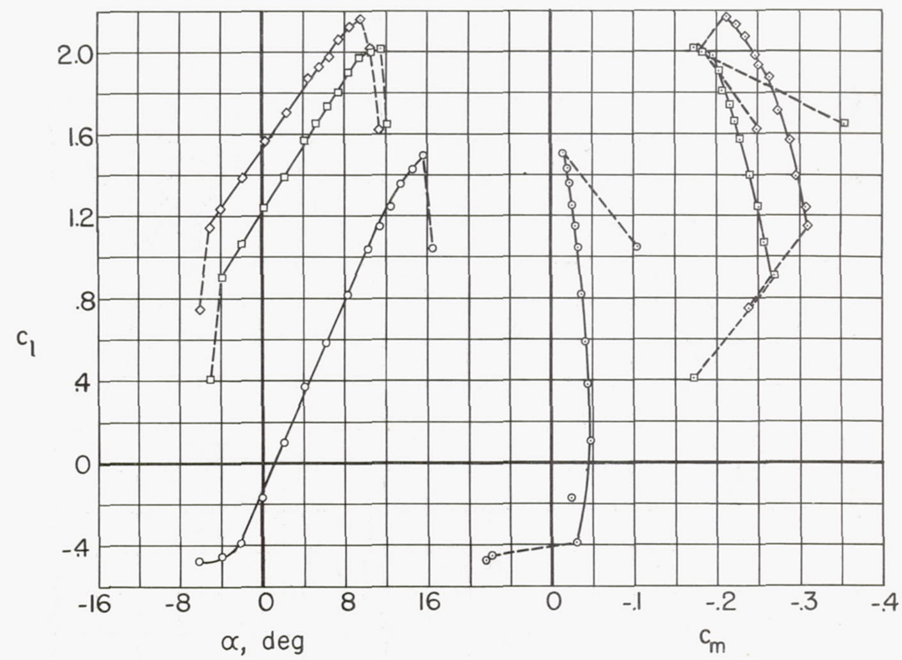


Figure 3.- Section lift and pitching-moment characteristics.

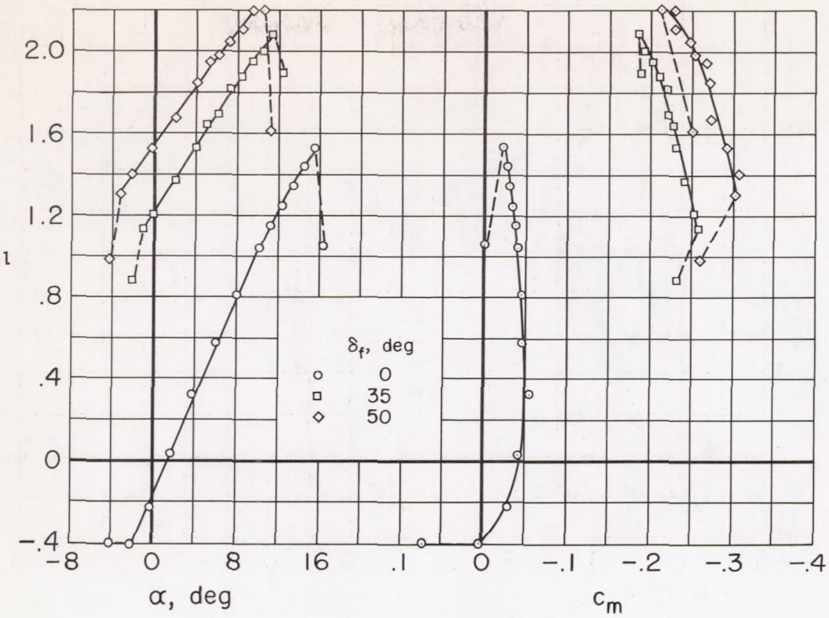


(c) δ_n=20°

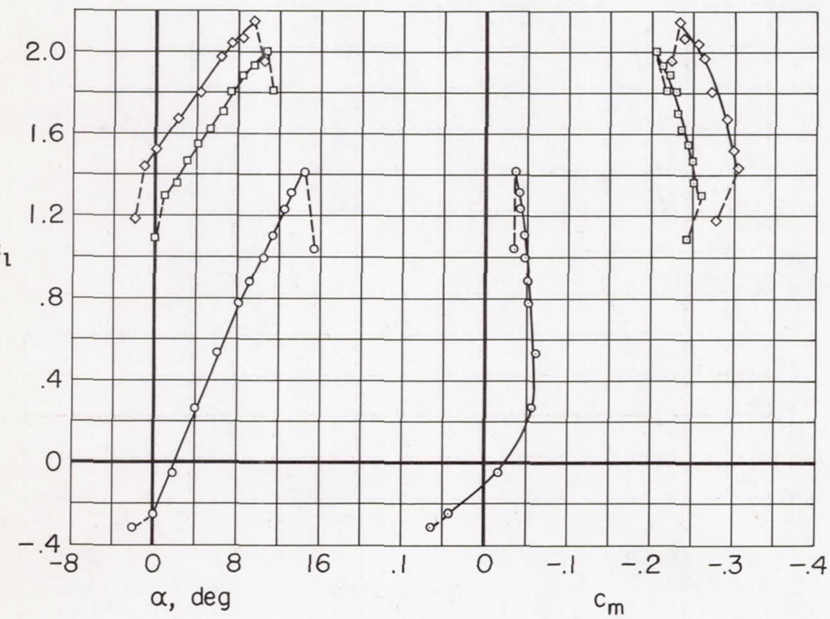


(d) δ_n=25°

Figure 3.- Continued.



(e) $\delta_n = 30^\circ$



(f) $\delta_n = 35^\circ$

Figure 3.- Continued.

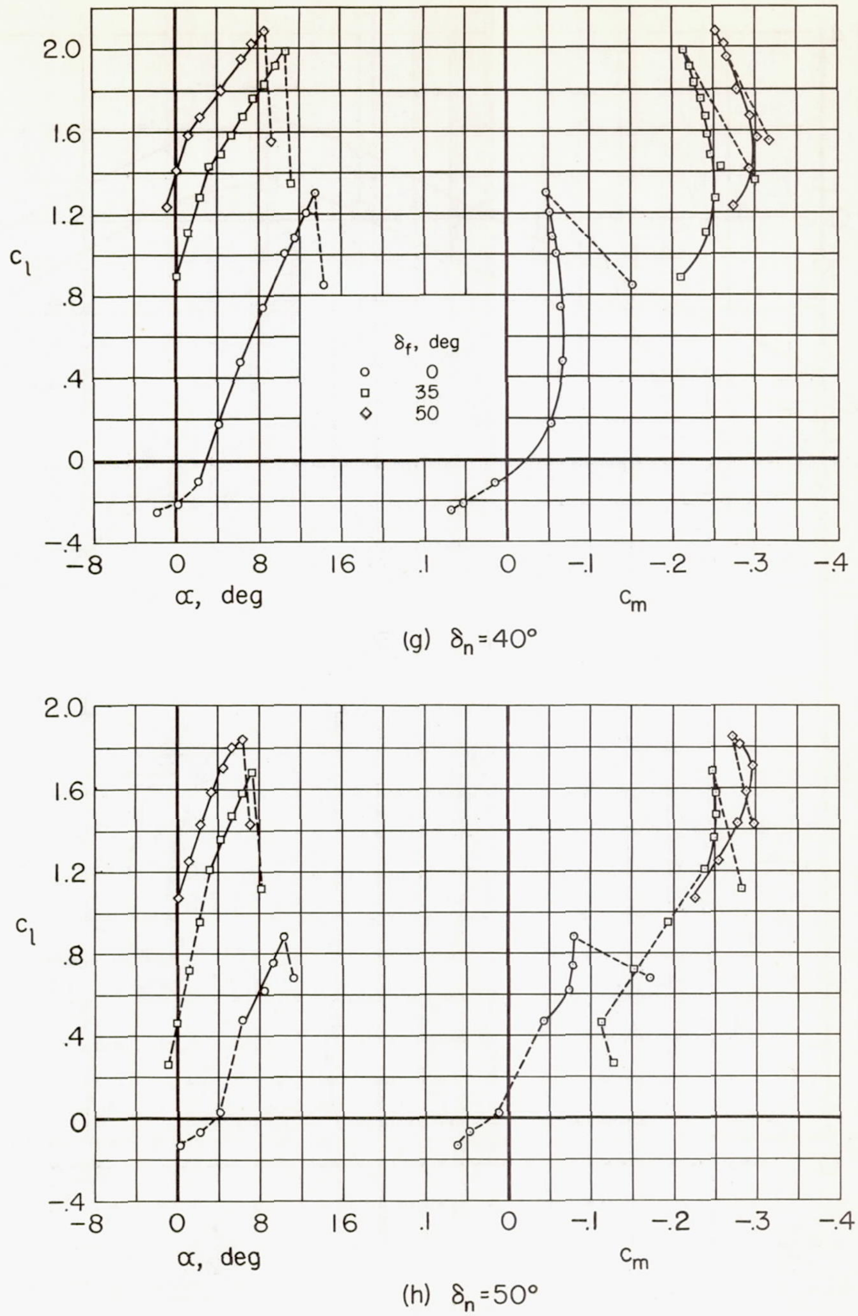


Figure 3.- Concluded.

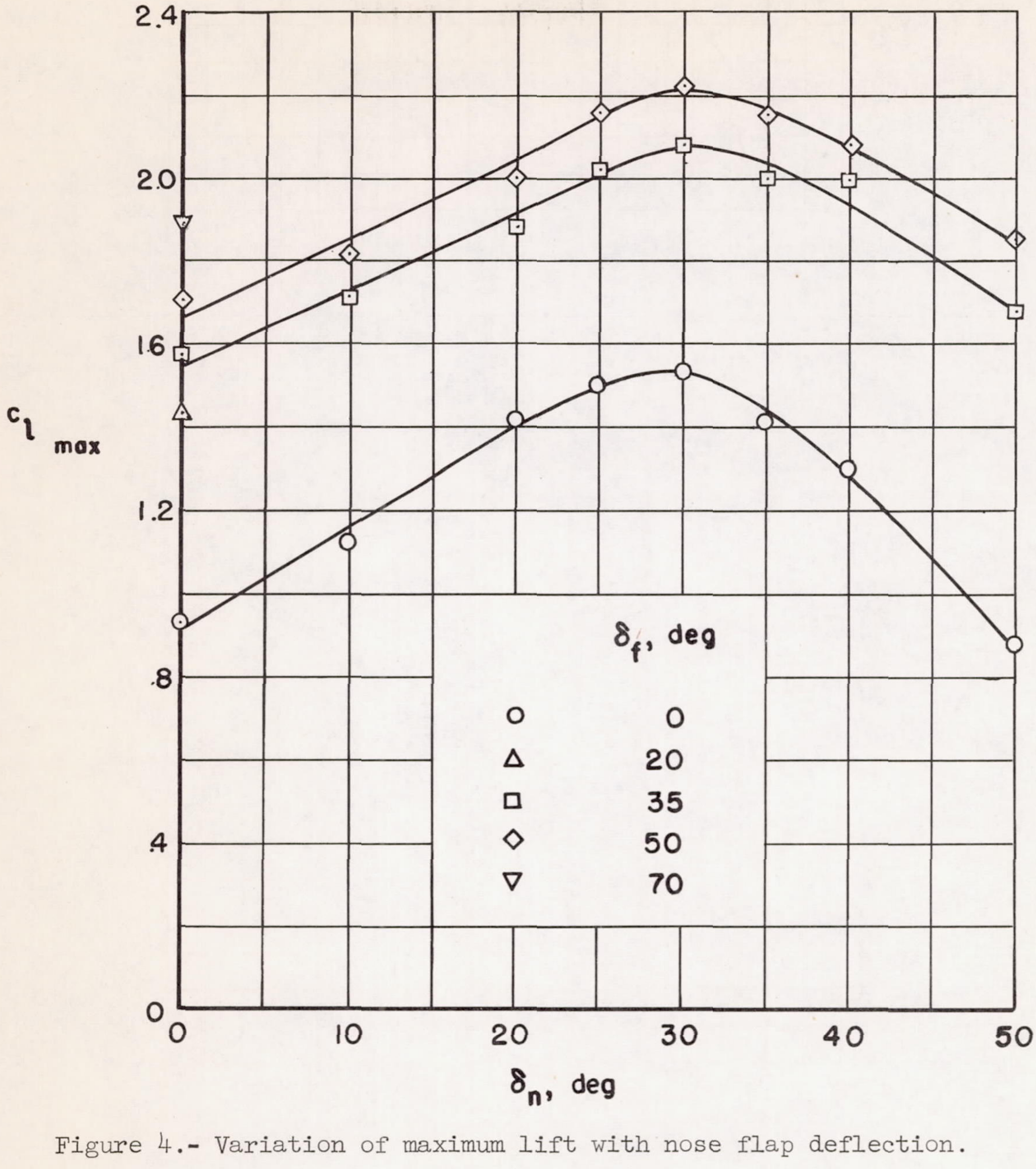


Figure 4.- Variation of maximum lift with nose flap deflection.