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RESEARCH MEMORANDUM

AERODYNAMIC CHARACTERISTICS AT A MACH NUMBER OF 4.06 OF A TYPICAL SUPERSONIC AIRPLANE MODEL USING BODY AND VERTICAL-TAIL WEDGES TO IMPROVE DIRECTIONAL STABILITY

By Robert W. Dunning

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Langley Field, Va.

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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

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AERODYNAMIC CHARACTERISTICS AT A MACH NUMBER OF 4.06 OF A TYPICAL SUPERSONIC AIRPLANE MODEL USING BODY AND VERTICAL-TAIL WEDGES TO IMPROVE DIRECTIONAL STABILITY

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SUMMARY

An investigation at a Mach number of 4.06 has been conducted on a typical supersonic airplane model with a 40° sweptback wing. The purpose of the investigation was to determine the effectiveness of using wedges on the body and on the vertical tail to increase the static directional stability. Data were obtained for angles of attack from -3° to 7° at angles of sideslip of -1° to 4°. An analysis of the data showed that the use of both wedges increased the static directional stability $\left(C_{n_{\beta}}\right)$ by as much as 0.001, with the tail wedge being considerably more effective than the body wedge.

INTRODUCTION

As the Mach number of an airplane increases in the supersonic speed range the center of pressure, both lateral and longitudinal, moves forward. The end result for a given airplane is a decrease in stability, with increasing Mach number, with the possibility that maximum potential performance cannot be obtained. This trend can be calculated theoretically and is the result of a decreasing lift-curve slope of the lifting surfaces with increasing supersonic Mach number while the lift-curve slope of the body (with its forward center of pressure) remains constant or increases. One possible solution to the problem (ref. 1) is the use of wedges to supply additional stability. These wedges could be used either on the body or on the tail, but a proper choice would have to depend on the aerodynamic and structural characteristics of these locations. The present investigation was undertaken to determine some of

the aerodynamic characteristics of such wedges on a typical supersonic airplane configuration. A model of the Bell X-2 airplane was chosen for this investigation because a great deal of experimental data were available (for example, ref. 2) which indicated the trends with Mach number. The present tests on the basic configuration without wedges and with wedges on the body, on the vertical tail, and on both the body and vertical tail were conducted at a Mach number of 4.06 and a Reynolds number of 2.7×10^6 based on the wing mean aerodynamic chord.

SYMBOLS

The results of the tests are presented in coefficient form. The data are referred to the body axis (fig. 1), with the reference center of gravity at 25 percent of the wing mean aerodynamic chord.

F_X	force along X axis
F_Y	force along Y axis
F_Z	force along Z axis
M_Y	moment about Y axis
M_Z	moment about Z axis
q	dynamic pressure
S	total wing area including area submerged in fuselage
c	wing chord
$\bar{c}$	wing mean aerodynamic chord
c_t	horizontal-tail chord
b	wing span
α	angle of attack, deg
β	angle of sideslip, deg
C_N	normal-force coefficient, $\frac{-F_Z}{qS}$

C_A axial-force coefficient (corrected so that base pressure is equal to stream static pressure), $\frac{-F_X}{qS}$

C_L lift coefficient, $C_N \cos \alpha - C_A \sin \alpha$

C_D drag coefficient, $C_A \cos \alpha + C_N \sin \alpha$

C_Y side-force coefficient, $\frac{F_Y}{qS}$

C_m pitching-moment coefficient, $\frac{M_Y}{qS\bar{c}}$

C_n yawing-moment coefficient, $\frac{M_Z}{qSb}$

δ_T wedge angle on vertical tail, deg

δ_B wedge angle on body, deg

M Mach number

R Reynolds number

$\frac{\partial C_m}{\partial C_N}$ longitudinal-stability parameter

L/D lift-drag ratio, C_L/C_D

C_{L_α} lift-curve slope per deg

N_p neutral point (longitudinal aerodynamic center at $C_m = 0$), percent $\bar{c}$

C_{Y_β} side-force-curve slope per deg

C_{n_β} yawing-moment-curve slope per deg

$$\Delta C_{Y_\beta} \qquad \left(C_{Y_{\beta_{\text{wedge open}}}} - C_{Y_{\beta_{\text{wedge off}}}}\right)_{\alpha=0}$$

$$\Delta C_{n_\beta} \qquad \left(C_{n_{\beta_{\text{wedge open}}}} - C_{n_{\beta_{\text{wedge off}}}}\right)_{\alpha=0}$$

APPARATUS

The tests were conducted in the Langley 9- by 9-inch Mach number 4 blowdown jet. Both a description and a calibration of the blowdown jet are given in reference 3. The settling-chamber pressure, which was held constant by a pressure-regulating valve, and the corresponding air temperature were continuously recorded during each run. A sting-mounted internal strain-gage balance which measured normal force, pitching moment, side force, and yawing moment, and a second sting-mounted internal strain-gage balance which measured axial forces were used to obtain the data.

MODELS

A three-view drawing of the model (which is a model of the Bell X-2 airplane) is shown in figure 2, and the geometric characteristics are presented in table I. Details of the wedges are given in figure 3 and table I. Photographs of the basic model and the model with wedges are shown in figure 4.

The airplane-model wing was swept back 40° at the quarter-chord line and had an aspect ratio of 4, a taper ratio of 0.5, and 10-percent-thick circular-arc airfoil sections normal to the quarter-chord line.

The tail wedge extended from the vertical-tail maximum-thickness line to the trailing edge and had an aspect ratio of 5.24 (obtained by considering the horizontal tail to act as a reflection plane for the tail wedge).

The body wedges extended from fuselage station 6.577 to the trailing edge of the model (fuselage station 7.567) and had an aspect ratio of 0.46. The surface of the body wedges was curved into a radius equal to the body radius at station 6.577. This radius was constant for all body-wedge angles. The wedge angles for both body and tail wedges were 0°, 5°, and 10°. The basic body and vertical tail were boattailed at their trailing edge. The average angle of boattail over the area covered by the body wedge was -10° and the average angle of boattail over the area covered by the vertical-tail wedge was -6°.

TESTS

The settling-chamber stagnation temperature during any single run varied from approximately 70° to 40° Fahrenheit, and the settling-chamber stagnation pressure was held at approximately 185 lb/sq in. absolute. These conditions correspond to an average Reynolds number of 2.7×10^6, based on wing mean aerodynamic chord. The tests were run at humidities below 5×10^{-6} pounds of water vapor per pound of dry air, which is believed to be low enough to eliminate water condensation effects. The test-section static temperature and pressure did not reach the point where liquifaction of air would take place. Data were obtained for angles of attack from -3° to 7° at angles of sideslip of -1° to 4°.

PRECISION OF DATA

The probable uncertainties in the test data due to the accuracy limitations of the balances and the recording equipment and the ability of the system to repeat data points are as follows:

C_N	±0.001
C_Y	±0.0005
C_L	±0.001
C_D	±0.0006
C_m	±0.0005
C_n	±0.00005
α	±0.1
β	±0.1

RESULTS AND DISCUSSION

The basic data for the configurations with and without wedges are presented in table II. The parts of this table are as follows:

Part	Tail-wedge angle, δ_T, deg	Body-wedge angle, δ_B, deg
a	None	None
b	None	0
c	None	5
d	0	None
e	0	10
f	5	None
g	5	0
h	5	5
i	5	10
j	10	None
k	10	0
l	10	5
m	10	10

An examination of the data revealed that the trends with wedge angle and angles of attack and sideslip could be easily seen by comparing the results obtained for the maximum and minimum values; therefore, only representative parts of the data of table II are shown in the figures. The examination of the data also showed little or no interaction between the body wedge and the tail wedge, which is to be expected in view of the Mach number and of the horizontal tail between them.

Longitudinal Characteristics

Figure 5 presents the variations of the normal-force coefficient and the pitching-moment coefficient with angle of attack for representative wedges at sideslip angles of 0° and 4°. Figure 6 presents the effect on the pitching-moment coefficient of increasing the wedge angles, and figure 7 presents the variation of the pitching-moment coefficient with normal-force coefficient. The normal-force coefficient was little affected either by the addition of body and tail wedges or by changing the sideslip angle. The pitching-moment coefficient, however, showed a positive increment when the tail wedge was added, and this increment increased with increasing wedge angle (figs. 5 and 6). This increment is mostly due to the drag of the wedge acting above the body center line, with the remainder being the result of the wedge interference pressure on the upper surface of the horizontal tail. As the angle of

attack increases to 7°, the pitching-moment increment decreases, thereby indicating that the drag increment of the tail wedge is smaller. This smaller drag increment is because of the lower "q" of the wing flow field over the tail (an effect more completely described in ref. 4). When the body wedge is added no change is noticed in the pitching moment at zero angle of attack (figs. 5 and 6), but at an angle of attack of 7° the flat underside of the wedge acts as a lifting surface and a negative pitching-moment increment is produced. Unpublished data indicate that there is no "q" effect of body flow field at these small angles. Figures 5 and 6 also show that when the model is yawed 4° at the higher angles of attack, a small loss in pitching moment results.

The longitudinal-stability parameter $\partial C_m/\partial C_N$ is presented in figure 8. At a Mach number of 4.06 there seems to be adequate longitudinal stability over the ranges of angle of attack and angle of sideslip tested and an indication that at higher angles of attack there might be increasing longitudinal stability.

Data for the lift, drag, and lift-drag ratio for the model without body wedges or tail wedges is presented in figure 9. The effect of Mach number on the airplane configuration without body or tail wedges is presented in figure 10. Only data for supersonic speeds is shown since this is the speed range of interest for the present tests. The present data extends the trends established in reference 2, with the exception of the neutral point. As pointed out in the Introduction, however, this variation of the neutral point with Mach number is to be expected because the wing and tail-surface lift coefficients decrease with increasing supersonic Mach number while the body lift coefficient increases or remains constant. If this neutral-point data is extended to higher Mach numbers (fig. 10) it appears probable that this configuration will become longitudinally neutrally stable (center of pressure at $0.25\bar{c}$) at about Mach number 5. The lift-curve slope of the configuration has decreased with Mach number such that at Mach number 4.06 the slope is only 38 percent of the value at Mach number 1.4. In order to obtain a value for the lift-drag ratio curve at a Mach number of 4.06 and $C_L = 0.1$, it was necessary to extrapolate slightly the results of figure 9. However, since the extrapolation was only about 10 percent of the scale and since the data was only slightly nonlinear the value obtained was felt to be representative of the actual experimental results.

Lateral Characteristics

The side-force and yawing-moment characteristics are presented in figures 11 and 12. With no body or tail wedges at zero angle of attack the body is just barely stable $\left(C_{n_\beta} = 0.00006\right)$. At an angle of attack

of 7° the basic model is directionally unstable $\left(C_{n_\beta} = -0.00040\right)$ because the vertical tail passes through the low "q" field (ref. 4) of the wing. The addition of a tail wedge produces a large increase in the yawing moment, although this tail-wedge increment also decreases at an angle of attack of 7° for the same reason just stated for the tail. Even with the tail wedge the configuration will probably become unstable at an angle of attack of approximately 10° $\left(C_N \approx 0.26\right)$. The body wedge is not in the wing flow field and, as can be seen from figure 12, there is little apparent effect of increasing angle of attack (increasing C_N) on its small increment. Also, as pointed out previously, there is no effect of body flow field at these small angles.

The effect of wedge angle on C_{Y_β} and C_{n_β} is shown in figure 13. The tail wedge has a linear increase in C_{n_β} with wedge deflection angle which is representative of a flat-plate section. The body wedge, however, is curved and with increasing wedge angle exhibits the non-linear characteristics of a body.

As might be expected because of its larger area, the tail wedge gives a greater increase in C_{n_β} per degree of deflection than the body wedge (fig. 13). When the contribution per unit of area to C_{Y_β} and C_{n_β} is considered, figure 14 shows that the tail wedge is still much more effective than the body wedge. This increased effectiveness can be attributed to the fact that the tail wedge has a much higher aspect ratio than the body wedge and, in addition, the tail-wedge surface is flat, whereas the body-wedge surface is curved.

The variations of C_{Y_β} and C_{n_β} with Mach number are presented in figure 15. The loss in C_{Y_β} and C_{n_β} with increasing C_L at Mach number 4, as compared with the lower Mach numbers (ref. 2), is due to two reasons. First, the loss in effectiveness $\left(\text{force-curve slope, } C_{Y_\beta}\right)$ of the upper tail is more pronounced at the higher Mach numbers and, second, it takes a larger angle of attack, with a resultant lower "q" field, to obtain a given C_L at the higher Mach numbers than at the lower Mach numbers.

CONCLUSIONS

An investigation at a Mach number of 4.06 has been conducted on a typical supersonic airplane model to determine the effectiveness of wedges on the body and on the vertical tail to increase the static directional stability. An analysis of the data indicated the following conclusions.

1. The additions of both the body and tail wedges make the configuration quite stable directionally at zero angle of attack and move the angle of attack for neutral directional stability from 1° without wedges to an extrapolated angle of 10° with wedges.

2. The high-aspect-ratio (5.24) flat-surface tail wedge produces much greater side forces and yawing moments per unit area than the low-aspect-ratio (0.46) curved-surface body wedge.

3. The vertical-tail wedges produce a positive increment in pitching-moment coefficient which becomes smaller with increasing angle of attack. The body wedges produce no pitching-moment increment at zero angle of attack, but their flat underside causes an increasingly negative increment in pitching-moment coefficient with increasing angle of attack.

Langley Aeronautical Laboratory,
National Advisory Committee for Aeronautics,
Langley Field, Va., August 20, 1957.

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2. Spearman, M. Leroy, and Robinson, Ross B.: The Aerodynamic Characteristics of a Supersonic Aircraft Configuration With a 40° Swept-back Wing Through a Mach Number Range From 0 to 2.4 As Obtained From Various Sources. NACA RM L52A21, 1952.

3. Ulmann, Edward F., and Lord, Douglas R.: An Investigation of Flow Characteristics at Mach Number 4.04 Over 6- and 9-Percent-Thick Symmetrical Circular-Arc Airfoils Having 30-Percent-Chord Trailing-Edge Flaps. NACA RM L51D30, 1951.

4. Ulmann, Edward F., and Ridyard, Herbert W.: Flow-Field Effects on Static Stability and Control at High Supersonic Mach Numbers. NACA RM L55L19a, 1956.

TABLE I.- GEOMETRIC CHARACTERISTICS OF MODEL

Wing:	
Area (including area submerged in fuselage), sq in.	10.416
Span, in.	6.456
Mean aerodynamic chord, in.	1.676
Root chord, in.	2.150
Tip chord, in.	1.075
Taper ratio	0.5
Aspect ratio	4.01
Airfoil section normal to quarter-chord line	10-percent-thick, circular arc
Sweep of leading edge, deg	42.67
Sweep of quarter-chord line, deg	40
Incidence at fuselage center line, deg	3
Dihedral, deg	3
Geometric twist, deg	0
Distance of wing leading edge below fuselage center line (at fuselage center line)	0.247
Horizontal tail:	
Area (including area submerged in fuselage), sq in.	1.763
Span, in.	2.567
Root chord, in.	0.917
Tip chord, in.	0.458
Taper ratio	0.5
Aspect ratio	3.73
Airfoil section	NACA 65-008
Sweep of leading edge, deg	42.83
Sweep of quarter-chord line, deg	40
Dihedral, deg	0
Height of tail center line above fuselage center line	0.492
Vertical tail:	
Area (exposed), sq in.	1.548
Taper ratio (ratio of tip chord to exposed root chord)	0.337
Aspect ratio (based on exposed area and span)	1.17
Sweep of leading edge, deg	40.6
Airfoil section, root	NACA 27-010
Airfoil section, tip	NACA 27-008
Fuselage:	
Length, in.	7.567
Maximum diameter (neglecting dorsal and ventral fairings), in.	0.804
Fineness ratio (neglecting dorsal and ventral fairings)	9.42
Base diameter, in.	0.450
Distance from nose to moment reference (0.25$\bar{c}$), in.	4.507
Body wedges:	
Area of wedge, sq in.	0.446
Aspect ratio	0.46
Tail wedges:	
Area of wedge, sq in.	0.687
Aspect ratio (considering horizontal tail as a reflection plane)	5.24

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES

[Body-axis data; M = 4.06; R = 2.7 × 10^6]

(a) Basic model

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0402	0.0135	0.0079	-0.0001
	0	-.0416	.0136	-.0014	.0002
	1	-.0433	.0136	-.0106	.0004
	2	-.0428	.0134	-.0202	.0006
	3	-.0435	.0133	-.0301	.0008
	4	-.0423	.0127	-.0397	.0010
-2	-1	-0.0178	0.0098	0.0080	0.0000
	0	-.0190	.0099	-.0009	.0002
	1	-.0183	.0099	-.0102	.0003
	2	-.0209	.0098	-.0195	.0005
	3	-.0210	.0098	-.0291	.0007
	4	-.0191	.0093	-.0387	.0008
-1	-1	-0.0001	0.0070	0.0076	0.0001
	0	.0019	.0069	-.0008	.0002
	1	.0023	.0065	-.0097	.0003
	2	.0036	.0063	-.0187	.0004
	3	.0024	.0065	-.0283	.0006
	4	.0031	.0062	-.0373	.0006
0	-1	0.0237	0.0039	0.0076	0.0001
	0	.0261	.0033	-.0007	.0002
	1	.0247	.0036	-.0092	.0002
	2	.0249	.0036	-.0179	.0003
	3	.0248	.0037	-.0271	.0004
	4	.0250	.0035	-.0357	.0004
1	-1	0.0455	0.0013	0.0080	0.0002
	0	.0448	.0015	-.0006	.0002
	1	.0446	.0012	-.0088	.0002
	2	.0455	.0011	-.0176	.0002
	3	.0469	.0011	-.0261	.0002
	4	.0472	.0010	-.0349	.0002
2	-1	0.0664	-0.0012	0.0081	0.0002
	0	.0667	-.0013	-.0004	.0002
	1	.0665	-.0019	-.0083	.0001
	2	.0676	-.0016	-.0167	.0001
	3	.0682	-.0014	-.0255	.0001
	4	.0671	-.0013	-.0341	.0000
3	-1	0.0893	-0.0046	0.0074	0.0003
	0	.0912	-.0046	-.0004	.0002
	1	.0892	-.0043	-.0079	.0001
	2	.0897	-.0047	-.0161	.0000
	3	.0916	-.0046	-.0248	-.0001
	4	.0900	-.0042	-.0334	-.0002
5	-1	0.1367	-0.0098	0.0076	0.0004
	0	.1382	-.0100	-.0002	.0002
	1	.1358	-.0099	-.0077	-.0001
	2	.1360	-.0097	-.0152	-.0002
	3	.1371	-.0088	-.0241	-.0005
	4	.1357	-.0078	-.0320	-.0007
7	-1	0.1885	-0.0178	0.0074	0.0006
	0	.1882	-.0176	-.0003	.0002
	1	.1884	-.0178	-.0076	-.0002
	2	.1884	-.0176	-.0154	-.0005
	3	.1875	-.0162	-.0232	-.0008
	4	.1869	-.0150	-.0311	-.0011

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7 × 10^6]

(b) Basic model with 0° body wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0430	0.0149	0.0078	-0.0001
	0	-.0417	.0146	-.0016	.0002
	1	-.0433	.0148	-.0107	.0005
	2	-.0443	.0146	-.0204	.0007
	3	-.0442	.0141	-.0308	.0010
	4	-.0434	.0135	-.0405	.0012
-2	-1	-0.0180	0.0106	0.0079	0.0000
	0	-.0203	.0108	-.0012	.0002
	1	-.0212	.0109	-.0103	.0004
	2	-.0213	.0107	-.0196	.0006
	3	-.0220	.0106	-.0296	.0008
	4	-.0227	.0101	-.0393	.0010
-1	-1	-0.0017	0.0078	0.0079	0.0000
	0	.0022	.0074	-.0009	.0002
	1	.0023	.0071	-.0097	.0003
	2	.0017	.0072	-.0191	.0005
	3	.0024	.0068	-.0284	.0006
	4	.0031	.0064	-.0373	.0007
0	-1	0.0233	0.0038	0.0078	0.0001
	0	.0245	.0042	-.0004	.0002
	1	.0257	.0038	-.0092	.0003
	2	.0255	.0039	-.0180	.0004
	3	.0258	.0036	-.0276	.0005
	4	.0251	.0036	-.0367	.0005
1	-1	0.0461	0.0013	0.0076	0.0002
	0	.0453	.0015	-.0006	.0002
	1	.0460	.0012	-.0085	.0002
	2	.0465	.0010	-.0173	.0003
	3	.0477	.0009	-.0268	.0003
	4	.0461	.0010	-.0352	.0003
2	-1	0.0659	-0.0013	0.0077	0.0002
	0	.0659	-.0012	.0000	.0002
	1	.0678	-.0015	-.0085	.0002
	2	.0674	-.0014	-.0169	.0002
	3	.0683	-.0018	-.0254	.0001
	4	.0670	-.0014	-.0343	.0001
3	-1	0.0939	-0.0050	0.0076	0.0004
	0	.0917	-.0049	-.0003	.0002
	1	.0916	-.0045	-.0083	.0001
	2	.0926	-.0047	-.0161	.0000
	3	.0917	-.0047	-.0249	.0000
	4	.0908	-.0047	-.0336	-.0001
5	-1	0.1392	-0.0113	0.0075	0.0005
	0	.1391	-.0112	-.0004	.0003
	1	.1366	-.0109	-.0077	.0000
	2	.1391	-.0110	-.0153	-.0002
	3	.1379	-.0100	-.0239	-.0004
	4	.1375	-.0093	-.0321	-.0006
6	0	0.1643	-0.0154	-0.0004	0.0003
7	-1	0.1906	-0.0203	0.0072	0.0005
	0	.1903	-.0201	.0001	.0002
	1	.1903	-.0203	-.0077	-.0001
	2	.1897	-.0197	-.0153	-.0004
	3	.1884	-.0182	-.0236	-.0007
	4	.1878	-.0169	-.0318	-.0010

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7 × 10^6]

(c) Basic model with 5° body wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0444	0.0163	0.0076	0.0000
	0	-.0429	.0157	-.0019	.0003
	1	-.0433	.0159	-.0110	.0006
	2	-.0444	.0158	-.0209	.0009
	3	-.0462	.0157	-.0315	.0013
	4	-.0443	.0147	-.0414	.0016
-2	-1	-0.0200	0.0115	0.0078	0.0000
	0	-.0202	.0115	-.0013	.0002
	1	-.0209	.0117	-.0105	.0005
	2	-.0206	.0115	-.0200	.0008
	3	-.0237	.0116	-.0298	.0011
	4	-.0225	.0108	-.0394	.0013
-1	-1	-0.0004	0.0083	0.0079	0.0001
	0	.0029	.0076	-.0008	.0002
	1	.0023	.0077	-.0098	.0004
	2	.0010	.0080	-.0193	.0007
	3	.0008	.0080	-.0285	.0008
	4	.0002	.0076	-.0379	.0010
0	-1	0.0211	0.0048	0.0081	0.0002
	0	.0258	.0046	-.0007	.0002
	0	.0250	.0044	-.0006	.0002
	1	.0257	.0042	-.0093	.0004
	1	.0246	.0042	-.0091	.0004
	2	.0245	.0045	-.0181	.0005
	2	.0246	.0043	-.0181	.0005
	3	.0230	.0047	-.0277	.0006
	3	.0246	.0044	-.0271	.0006
	4	.0238	.0043	-.0368	.0007
	4	.0246	.0043	-.0361	.0007
1	-1	0.0464	0.0012	0.0083	0.0002
	0	.0462	.0012	-.0003	.0002
	1	.0459	.0012	-.0087	.0003
	2	.0451	.0015	-.0175	.0004
	3	.0462	.0012	-.0265	.0004
	4	.0454	.0013	-.0352	.0004
2	-1	0.0687	-0.0022	0.0085	0.0002
	0	.0672	-.0021	.0001	.0002
	1	.0687	-.0019	-.0081	.0003
	2	.0686	-.0017	-.0165	.0002
	3	.0678	-.0019	-.0250	.0002
	4	.0648	-.0012	-.0343	.0002
3	-1	0.0937	-0.0059	0.0081	0.0003
	0	.0901	-.0058	.0001	.0002
	1	.0915	-.0053	-.0077	.0001
	2	.0908	-.0048	-.0158	.0001
	3	.0904	-.0047	-.0244	.0001
	4	.0891	-.0045	-.0332	.0000
4	1	0.1143	-0.0086	-0.0071	0.0001
5	-1	0.1405	-0.0132	0.0086	0.0004
	0	.1392	-.0129	.0002	.0002
	1	.1393	-.0126	-.0067	.0000
	2	.1389	-.0121	-.0147	-.0002
	3	.1377	-.0113	-.0230	-.0003
	4	.1362	-.0100	-.0316	-.0005
7	-1	0.1926	-0.0234	0.0082	0.0005
	0	.1920	-.0232	.0014	.0002
	1	.1913	-.0230	-.0064	-.0001
	2	.1913	-.0222	-.0144	-.0003
	3	.1889	-.0204	-.0225	-.0006
	4	.1874	-.0187	-.0310	-.0009

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7 × 10^6]

(d) Basic model with 0° tail wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	0	-0.0404	0.0150	-0.0009	0.0003
	1	-.0387	.0146	-.0104	.0008
	2	-.0404	.0146	-.0210	.0013
	3	-.0409	.0143	-.0308	.0018
	4	-.0408	.0139	-.0413	.0023
-2	-1	-0.0168	0.0113	0.0092	-0.0002
	0	-.0186	.0116	-.0007	.0003
	1	-.0161	.0110	-.0099	.0007
	2	-.0173	.0107	-.0206	.0013
	3	-.0183	.0107	-.0296	.0017
	4	-.0182	.0105	-.0399	.0021
-1	-1	0.0009	0.0085	0.0097	-0.0002
	0	.0038	.0080	-.0004	.0003
	1	.0026	.0081	-.0096	.0007
	2	.0023	.0079	-.0199	.0012
	3	.0011	.0080	-.0289	.0015
	4	.0021	.0079	-.0391	.0019
0	-1	0.0279	0.0049	0.0095	0.0000
	0	.0269	.0049	-.0001	.0003
	1	.0251	.0048	-.0086	.0007
	2	.0277	.0044	-.0189	.0011
	3	.0278	.0047	-.0273	.0013
	4	.0267	.0044	-.0371	.0016
1	-1	0.0499	0.0021	0.0097	0.0000
	0	.0481	.0024	.0002	.0003
	1	.0486	.0021	-.0081	.0006
	2	.0482	.0020	-.0180	.0009
	3	.0495	.0018	-.0257	.0011
	4	.0478	.0019	-.0362	.0014
2	-1	0.0732	-0.0010	0.0093	0.0001
	0	.0683	-.0001	.0005	.0003
	1	.0678	-.0004	-.0079	.0006
	2	.0679	-.0004	-.0170	.0008
	3	.0675	-.0005	-.0252	.0010
	4	.0672	-.0006	-.0352	.0012
3	-1	0.0922	-0.0033	0.0091	0.0002
	0	.0891	-.0026	.0009	.0003
	1	.0888	-.0028	-.0077	.0005
	2	.0898	-.0031	-.0164	.0006
	3	.0893	-.0029	-.0246	.0008
	4	.0874	-.0024	-.0340	.0009
5	-1	0.1395	-0.0094	0.0097	0.0003
	0	.1362	-.0086	.0015	.0003
	1	.1379	-.0090	-.0068	.0003
	2	.1383	-.0088	-.0151	.0003
	3	.1389	-.0083	-.0237	.0002
	4	.1348	-.0070	-.0322	.0003
7	-1	0.1939	-0.0182	0.0094	0.0004
	0	.1923	-.0177	.0017	.0003
	1	.1914	-.0177	-.0057	.0001
	2	.1895	-.0171	-.0145	-.0001
	3	.1879	-.0158	-.0232	-.0002
	4	.1806	-.0131	-.0316	-.0003

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7×10^6]

(e) Basic model with 0° tail wedge and 10° body wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0402	0.0189	0.0093	-0.0004
	0	-.0424	.0192	-.0012	.0003
	1	-.0424	.0188	-.0113	.0011
	2	-.0440	.0191	-.0220	.0018
	3	-.0444	.0183	-.0324	.0034
	4	-.0437	.0178	-.0432	.0040
-2	-1	-0.0197	0.0149	0.0098	-0.0003
	0	-.0198	.0147	-.0008	.0004
	1	-.0209	.0144	-.0103	.0010
	2	-.0206	.0146	-.0214	.0017
	3	-.0204	.0140	-.0311	.0032
	4	-.0201	.0135	-.0413	.0037
-1	-1	0.0018	0.0107	0.0100	-0.0003
	0	.0032	.0104	-.0004	.0003
	1	.0010	.0106	-.0097	.0010
	2	.0010	.0107	-.0204	.0016
	3	.0007	.0104	-.0302	.0030
	4	.0005	.0101	-.0403	.0034
0	-1	0.0243	0.0070	0.0094	-0.0001
	0	.0271	.0066	.0001	.0004
	1	.0247	.0069	-.0092	.0009
	2	.0249	.0067	-.0188	.0013
	3	.0257	.0067	-.0287	.0028
	4	.0259	.0064	-.0382	.0030
1	-1	0.0480	0.0031	0.0093	-0.0001
	0	.0496	.0029	.0005	.0004
	1	.0470	.0031	-.0087	.0008
	2	.0465	.0036	-.0183	.0012
	3	.0472	.0033	-.0276	.0025
	4	.0467	.0032	-.0371	.0028
2	-1	0.0734	-0.0010	0.0094	0.0000
	0	.0706	-.0005	.0010	.0003
	1	.0676	-.0001	-.0082	.0007
	2	.0674	.0002	-.0171	.0011
	3	.0667	.0003	-.0266	.0023
	4	.0673	.0003	-.0359	.0025
3	-1	0.0946	-0.0049	0.0096	0.0001
	0	.0905	-.0038	.0010	.0004
	1	.0892	-.0037	-.0078	.0006
	2	.0900	-.0036	-.0168	.0008
	3	.0882	-.0030	-.0259	.0021
	4	.0885	-.0028	-.0350	.0023
5	-1	0.1430	-0.0136	0.0091	0.0003
	0	.1427	-.0134	.0016	.0003
	1	.1400	-.0128	-.0068	.0004
	2	.1403	-.0126	-.0150	.0004
	3	.1394	-.0113	-.0240	.0015
	4	.1374	-.0100	-.0333	.0015

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7×10^6]

(f) Basic model with 5° tail wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0384	0.0173	0.0099	-0.0007
	0	-.0395	.0173	-.0005	.0002
	1	-.0416	.0175	-.0108	.0009
	2	-.0422	.0173	-.0216	.0016
	3	-.0427	.0171	-.0325	.0024
	4	-.0439	.0171	-.0437	.0031
-2	-1	-0.0153	0.0133	0.0102	-0.0006
	-1	-.0152	.0130	.0100	-.0006
	0	-.0193	.0139	-.0001	.0002
	1	-.0190	.0135	-.0104	.0008
	2	-.0206	.0136	-.0207	.0016
	3	-.0202	.0134	-.0314	.0022
	4	-.0199	.0134	-.0417	.0028
-1	-1	0.0051	0.0100	0.0103	-0.0005
	0	.0015	.0107	-.0004	.0002
	1	.0023	.0103	-.0098	.0008
	2	.0014	.0104	-.0204	.0015
	3	.0008	.0104	-.0305	.0021
	4	.0002	.0105	-.0410	.0026
0	-1	0.0251	0.0074	0.0101	-0.0004
	0	.0272	.0074	.0002	.0002
	1	.0259	.0071	-.0095	.0008
	2	.0262	.0072	-.0190	.0014
	3	.0263	.0073	-.0291	.0019
	4	.0247	.0071	-.0393	.0023
1	-1	0.0497	0.0042	0.0101	-0.0003
	0	.0493	.0045	.0005	.0002
	1	.0479	.0043	-.0087	.0007
	2	.0471	.0044	-.0181	.0012
	3	.0486	.0042	-.0280	.0017
	4	.0464	.0043	-.0382	.0021
2	-1	0.0719	0.0013	0.0098	-0.0002
	0	.0703	.0019	.0009	.0002
	1	.0689	.0017	-.0083	.0006
	2	.0669	.0020	-.0177	.0011
	3	.0673	.0020	-.0269	.0015
	4	.0674	.0022	-.0370	.0018
3	-1	0.0930	-0.0011	0.0098	-0.0001
	0	.0899	-.0005	.0012	.0002
	1	.0889	-.0007	-.0078	.0005
	2	.0880	-.0007	-.0164	.0009
	3	.0894	-.0005	-.0265	.0013
	4	.0868	-.0001	-.0358	.0016
5	-1	0.1403	-0.0072	0.0098	0.0000
	0	.1397	-.0067	.0015	.0002
	1	.1391	-.0071	-.0070	.0003
	2	.1370	-.0068	-.0150	.0005
	3	.1376	-.0062	-.0246	.0007
	4	.1362	-.0057	-.0341	.0008
7	-1	0.1911	-0.0157	0.0110	0.0001
	0	.1911	-.0154	.0018	.0001
	1	.1924	-.0156	-.0065	.0001
	2	.1902	-.0147	-.0147	.0001
	3	.1893	-.0136	-.0239	.0001
	4	.1887	-.0124	-.0326	.0001

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7 x 10^6]

(g) Basic model with 5° tail wedge and 0° body wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0405	0.0185	0.0103	-0.0007
	0	-.0408	.0184	-.0003	.0001
	0	-.0416	.0187	-.0004	.0001
	1	-.0420	.0182	-.0108	.0009
	2	-.0423	.0183	-.0217	.0017
	3	-.0426	.0180	-.0318	.0024
	4	-.0445	.0178	-.0442	.0033
-2	-1	-0.0160	0.0142	0.0109	-0.0007
	0	-.0203	.0146	.0001	.0001
	0	-.0195	.0144	.0000	.0001
	1	-.0196	.0142	-.0103	.0009
	2	-.0197	.0142	-.0207	.0016
	3	-.0209	.0143	-.0308	.0022
	4	-.0197	.0139	-.0425	.0030
-1	-1	0.0038	0.0106	0.0104	-0.0005
	0	.0031	.0107	.0000	.0002
	0	.0029	.0108	.0001	.0002
	1	.0016	.0108	-.0097	.0009
	2	.0023	.0108	-.0200	.0015
	3	.0024	.0107	-.0298	.0021
	4	.0021	.0106	-.0409	.0027
0	-1	0.0248	0.0076	0.0103	-0.0004
	0	.0282	.0073	.0005	.0002
	0	.0271	.0074	.0005	.0002
	1	.0251	.0074	-.0093	.0008
	2	.0259	.0071	-.0189	.0014
	3	.0284	.0067	-.0281	.0019
	4	.0256	.0071	-.0397	.0024
1	-1	0.0493	0.0040	0.0104	-0.0004
	-1	.0490	.0041	.0105	-.0004
	0	.0513	.0042	.0007	.0002
	0	.0508	.0043	.0009	.0002
	1	.0479	.0042	-.0087	.0007
	2	.0468	.0044	-.0182	.0013
	3	.0471	.0044	-.0272	.0017
	4	.0481	.0042	-.0380	.0021
2	-1	0.0698	0.0011	0.0100	-0.0003
	0	.0715	.0013	.0010	.0002
	0	.0704	.0015	.0012	.0002
	1	.0672	.0017	-.0081	.0006
	2	.0684	.0015	-.0174	.0011
	3	.0665	.0017	-.0264	.0015
	4	.0683	.0019	-.0371	.0019
3	-1	0.0932	-0.0019	0.0101	-0.0002
	0	.0892	-.0011	.0012	.0002
	0	.0885	-.0008	.0012	.0002
	1	.0881	-.0010	-.0075	.0006
	2	.0884	-.0010	-.0162	.0009
	3	.0880	-.0008	-.0257	.0013
	4	.0890	-.0005	-.0359	.0016
5	-1	0.1406	-0.0087	0.0098	0.0000
	0	.1386	-.0083	.0018	.0002
	0	.1397	-.0083	.0014	.0002
	1	.1373	-.0081	-.0068	.0003
	2	.1377	-.0080	-.0150	.0005
	3	.1360	-.0069	-.0243	.0008
	4	.1393	-.0065	-.0342	.0009
7	-1	0.1969	-0.0191	0.0099	0.0001
	0	.1922	-.0180	.0016	.0002
	0	.1927	-.0182	.0019	.0002
	1	.1923	-.0180	-.0062	.0002
	2	.1916	-.0172	-.0151	.0002
	3	.1894	-.0154	-.0233	.0003
	4	.1895	-.0142	-.0328	.0003

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7 × 10^6]

(h) Basic model with 5° tail wedge and 5° body wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0403	0.0198	0.0107	-0.0009
	0	-.0406	.0196	-.0006	.0000
	1	-.0413	.0197	-.0106	.0009
	1	-.0424	.0198	-.0111	.0009
	2	-.0426	.0197	-.0215	.0017
	3	-.0442	.0194	-.0325	.0026
	4	-.0433	.0188	-.0433	.0033
-2	-1	-0.0192	0.0159	0.0109	-0.0008
	0	-.0151	.0149	.0000	.0001
	1	-.0206	.0157	-.0096	.0008
	1	-.0204	.0157	-.0101	.0008
	2	-.0196	.0155	-.0204	.0016
	3	-.0209	.0154	-.0310	.0023
	4	-.0208	.0150	-.0417	.0030
-1	-1	0.0031	0.0117	0.0104	-0.0006
	0	.0038	.0116	.0002	.0001
	1	.0026	.0118	-.0091	.0008
	1	.0022	.0117	-.0095	.0008
	2	.0004	.0121	-.0199	.0015
	3	.0011	.0120	-.0304	.0022
	4	.0011	.0115	-.0402	.0027
0	-1	0.0260	0.0082	0.0102	-0.0005
	0	.0264	.0080	.0007	.0001
	1	.0243	.0080	-.0087	.0007
	1	.0255	.0080	-.0094	.0007
	2	.0254	.0082	-.0188	.0014
	3	.0272	.0080	-.0290	.0019
	4	.0251	.0081	-.0387	.0024
1	-1	0.0488	0.0047	0.0102	-0.0005
	0	.0501	.0046	.0010	.0001
	1	.0463	.0051	-.0086	.0007
	2	.0475	.0050	-.0179	.0012
	3	.0476	.0050	-.0280	.0017
	4	.0470	.0049	-.0372	.0021
2	-1	0.0728	0.0011	0.0101	-0.0004
	0	.0690	.0018	.0007	.0001
	1	.0686	.0018	-.0081	.0006
	2	.0678	.0020	-.0172	.0010
	3	.0667	.0023	-.0268	.0015
	4	.0663	.0025	-.0361	.0018
3	-1	0.0921	-0.0020	0.0104	-0.0003
	0	.0903	-.0015	.0011	.0001
	1	.0884	-.0010	-.0075	.0005
	2	.0888	-.0009	-.0164	.0008
	3	.0879	-.0006	-.0257	.0012
	4	.0877	-.0001	-.0356	.0016
5	-1	0.1415	-0.0098	0.0107	-0.0001
	0	.1401	-.0094	.0018	.0001
	1	.1401	-.0092	-.0067	.0002
	2	.1374	-.0087	-.0148	.0004
	3	.1374	-.0076	-.0242	.0007
	4	.1365	-.0068	-.0336	.0008
7	-1	0.1949	-0.0204	0.0104	0.0000
	0	.1934	-.0201	.0023	.0000
	1	.1931	-.0202	-.0062	.0001
	2	.1915	-.0193	-.0145	.0001
	3	.1903	-.0176	-.0237	.0002
	4	.1888	-.0157	-.0326	.0003

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7×10^6]

(i) Basic model with 5° tail wedge and 10° body wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0412	0.0208	0.0109	-0.0010
	0	-.0449	.0207	-.0004	.0000
	1	-.0423	.0207	-.0113	.0010
	2	-.0448	.0211	-.0224	.0019
	3	-.0439	.0207	-.0328	.0026
	3	-.0437	.0205	-.0324	.0026
	4	-.0460	.0203	-.0453	.0036
-2	-1	-0.0201	0.0165	0.0112	-0.0009
	0	-.0196	.0161	.0002	.0000
	1	-.0221	.0167	-.0107	.0009
	2	-.0215	.0167	-.0214	.0017
	3	-.0219	.0163	-.0317	.0025
	3	-.0224	.0166	-.0312	.0024
	4	-.0207	.0157	-.0432	.0032
-1	-1	0.0018	0.0123	0.0109	-0.0008
	0	.0009	.0124	.0004	.0001
	1	.0013	.0124	-.0101	.0009
	2	.0013	.0125	-.0205	.0016
	3	.0011	.0124	-.0304	.0023
	3	.0004	.0125	-.0307	.0023
	4	.0008	.0121	-.0418	.0029
0	-1	0.0240	0.0085	0.0109	-0.0007
	0	.0278	.0080	.0007	.0001
	1	.0244	.0083	-.0095	.0008
	2	.0251	.0083	-.0194	.0015
	3	.0255	.0084	-.0292	.0021
	3	.0263	.0082	-.0291	.0020
	4	.0268	.0080	-.0401	.0026
1	-1	0.0501	0.0041	0.0110	-0.0006
	0	.0497	.0044	.0010	.0001
	1	.0478	.0045	-.0089	.0007
	2	.0464	.0050	-.0186	.0013
	3	.0472	.0049	-.0281	.0018
	3	.0462	.0051	-.0283	.0019
	4	.0471	.0046	-.0390	.0024
2	-1	0.0726	0.0003	0.0104	-0.0004
	0	.0721	.0007	.0012	.0001
	1	.0687	.0012	-.0083	.0006
	2	.0682	.0014	-.0174	.0011
	3	.0674	.0017	-.0268	.0016
	3	.0664	.0018	-.0271	.0016
	4	.0673	.0018	-.0378	.0021
3	-1	0.0947	-0.0031	0.0103	-0.0003
	0	.0901	-.0023	.0014	.0001
	1	.0898	-.0023	-.0078	.0005
	2	.0881	-.0017	-.0170	.0009
	3	.0879	-.0015	-.0261	.0014
	3	.0885	-.0016	-.0262	.0014
	4	.0883	-.0012	-.0363	.0018
5	-1	0.1429	-0.0119	0.0106	-0.0002
	0	.1423	-.0110	.0017	.0001
	1	.1411	-.0113	-.0070	.0003
	2	.1405	-.0109	-.0154	.0005
	3	.1380	-.0093	-.0245	.0009
	3	.1386	-.0094	-.0246	.0008
	4	.1384	-.0084	-.0345	.0011
7	-1	0.1956	-0.0237	0.0105	-0.0001
	0	.1954	-.0236	.0022	.0000
	1	.1947	-.0234	-.0064	.0002
	2	.1945	-.0225	-.0153	.0003
	3	.1903	-.0198	-.0238	.0004
	3	.1914	-.0203	-.0244	.0004
	4	.1909	-.0187	-.0337	.0006

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7 × 10^6]

(j) Basic model with 10° tail wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0433	0.0277	0.0109	-0.0012
	0	-.0433	.0274	-.0006	-.0001
	1	-.0439	.0272	-.0114	.0011
	2	-.0460	.0272	-.0241	.0023
	3	-.0463	.0268	-.0343	.0032
	4	-.0464	.0265	-.0468	.0043
-2	-1	-0.0217	0.0236	0.0109	-0.0011
	0	-.0220	.0234	-.0001	.0000
	1	-.0229	.0232	-.0107	.0010
	2	-.0232	.0230	-.0229	.0021
	3	-.0238	.0229	-.0331	.0030
	4	-.0226	.0223	-.0451	.0040
-1	-1	0.0022	0.0191	0.0112	-0.0011
	0	-.0011	.0197	.0000	-.0001
	1	-.0004	.0194	-.0103	.0010
	2	-.0019	.0194	-.0223	.0020
	3	-.0022	.0192	-.0322	.0029
	4	-.0011	.0189	-.0437	.0038
0	-1	0.0235	0.0159	0.0111	-0.0010
	-1	.0226	.0163	.0107	-.0010
	0	.0247	.0158	.0004	-.0001
	0	.0248	.0158	.0005	.0000
	1	.0235	.0157	-.0100	.0009
	1	.0225	.0158	-.0099	.0009
	2	.0238	.0154	-.0208	.0019
	2	.0239	.0154	-.0203	.0018
	3	.0241	.0152	-.0308	.0026
	3	.0242	.0155	-.0307	.0026
	4	.0242	.0151	-.0421	.0035
	4	.0236	.0153	-.0417	.0034
1	-1	0.0467	0.0128	0.0109	-0.0009
	0	.0462	.0130	.0006	.0000
	1	.0439	.0130	-.0092	.0008
	2	.0441	.0125	-.0202	.0017
	3	.0445	.0124	-.0299	.0025
	4	.0461	.0124	-.0410	.0032
2	-1	0.0697	0.0096	0.0111	-0.0008
	0	.0678	.0102	.0008	.0000
	1	.0656	.0098	-.0087	.0008
	2	.0660	.0097	-.0192	.0016
	3	.0636	.0100	-.0290	.0023
	4	.0647	.0100	-.0394	.0029
3	-1	0.0899	0.0070	0.0109	-0.0006
	0	.0858	.0078	.0012	.0000
	1	.0862	.0074	-.0082	.0007
	2	.0860	.0071	-.0185	.0014
	3	.0855	.0073	-.0284	.0021
	4	.0852	.0076	-.0386	.0027
5	-1	0.1405	-0.0003	0.0101	-0.0004
	0	.1346	.0010	.0014	.0000
	1	.1370	.0004	-.0073	.0005
	2	.1347	.0006	-.0170	.0010
	3	.1345	.0013	-.0263	.0015
	4	.1345	.0021	-.0363	.0018
7	-1	0.1885	-0.0091	0.0105	-0.0003
	0	.1884	-.0089	.0020	.0000
	1	.1896	-.0093	-.0066	.0003
	2	.1882	-.0086	-.0161	.0006
	3	.1875	-.0074	-.0256	.0008
	4	.1862	-.0060	-.0347	.0010

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7 × 10^6]

(k) Basic model with 10° tail wedge and 0° body wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0430	0.0261	0.0115	-0.0014
	0	-.0456	.0261	-.0002	-.0001
	1	-.0439	.0259	-.0105	.0010
	1	-.0456	.0258	-.0115	.0011
	2	-.0466	.0259	-.0231	.0022
	3	-.0470	.0256	-.0348	.0033
	4	-.0473	.0252	-.0463	.0044
-2	-1	-0.0208	0.0219	0.0116	-0.0012
	0	-.0212	.0218	.0002	-.0001
	1	-.0214	.0216	-.0100	.0009
	1	-.0228	.0218	-.0108	.0010
	2	-.0239	.0218	-.0221	.0021
	3	-.0236	.0214	-.0333	.0031
	4	-.0227	.0212	-.0446	.0040
-1	-1	-0.0001	0.0184	0.0116	-0.0011
	0	-.0007	.0182	.0007	-.0001
	1	.0000	.0183	-.0094	.0009
	1	-.0013	.0181	-.0105	.0010
	2	-.0022	.0182	-.0214	.0020
	3	-.0025	.0180	-.0323	.0029
	4	-.0021	.0178	-.0433	.0038
0	-1	0.0214	0.0152	0.0117	-.0010
	0	.0242	.0146	.0007	.0000
	1	.0213	.0147	-.0089	.0009
	1	.0218	.0145	-.0101	.0009
	2	.0216	.0144	-.0206	.0019
	3	.0232	.0143	-.0309	.0027
	4	.0233	.0144	-.0417	.0035
1	-1	0.0449	0.0119	0.0117	-0.0009
	0	.0489	.0113	.0010	.0000
	1	.0444	.0111	-.0083	.0008
	1	.0449	.0112	-.0091	.0008
	2	.0445	.0115	-.0192	.0017
	3	.0440	.0114	-.0300	.0026
	4	.0445	.0114	-.0404	.0033
2	-1	0.0690	0.0085	0.0110	-0.0007
	0	.0675	.0089	.0013	.0000
	1	.0650	.0088	-.0087	.0008
	1	.0650	.0087	-.0078	.0007
	2	.0647	.0088	-.0184	.0016
	3	.0649	.0088	-.0293	.0024
	4	.0638	.0091	-.0393	.0030
3	-1	0.0892	0.0057	0.0109	-0.0006
	0	.0884	.0062	.0017	.0000
	1	.0860	.0058	-.0071	.0006
	1	.0854	.0061	-.0082	.0007
	2	.0847	.0061	-.0180	.0014
	3	.0857	.0063	-.0280	.0021
	4	.0847	.0066	-.0382	.0027
5	-1	0.1378	-0.0011	0.0109	-0.0004
	0	.1371	-.0009	.0016	.0001
	1	.1343	-.0007	-.0065	.0005
	1	.1351	-.0009	-.0074	.0005
	2	.1351	-.0008	-.0164	.0010
	3	.1351	.0000	-.0264	.0015
	4	.1331	.0011	-.0362	.0019
7	-1	0.1924	-0.0109	0.0111	-0.0003
	0	.1913	-.0109	.0020	.0000
	1	.1888	-.0105	-.0068	.0003
	2	.1888	-.0099	-.0159	.0006
	3	.1880	-.0087	-.0255	.0009
	4	.1858	-.0070	-.0352	.0012

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Continued

[Body-axis data; M = 4.06; R = 2.7 × 10^6]

(l) Basic model with 10° tail wedge and 5° body wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0422	0.0269	0.0114	-0.0014
	0	-.0460	.0274	-.0003	-.0001
	1	-.0450	.0270	-.0114	.0011
	2	-.0469	.0271	-.0228	.0022
	3	-.0475	.0269	-.0349	.0035
	4	-.0481	.0265	-.0465	.0045
-2	-1	-0.0207	0.0226	0.0113	-0.0013
	0	-.0229	.0231	.0002	-.0001
	1	-.0219	.0226	-.0107	.0010
	2	-.0243	.0228	-.0220	.0021
	3	-.0256	.0228	-.0337	.0033
	4	-.0245	.0222	-.0449	.0042
-1	-1	0.0008	0.0188	0.0117	-0.0012
	0	-.0001	.0188	.0003	-.0001
	1	-.0020	.0188	-.0102	.0010
	2	-.0023	.0189	-.0210	.0020
	3	-.0022	.0190	-.0327	.0031
	4	-.0031	.0187	-.0435	.0039
0	-1	0.0220	0.0154	0.0115	-0.0011
	0	.0250	.0151	.0007	-.0001
	0	.0236	.0151	.0011	-.0001
	1	.0215	.0151	-.0097	.0009
	1	.0223	.0149	-.0091	.0008
	2	.0230	.0149	-.0201	.0019
	2	.0236	.0149	-.0201	.0019
	3	.0235	.0149	-.0312	.0028
	3	.0232	.0149	-.0306	.0027
	4	.0224	.0151	-.0419	.0036
1	-1	0.0479	0.0112	0.0112	-0.0010
	0	.0491	.0113	.0010	-.0001
	1	.0446	.0116	-.0091	.0008
	2	.0446	.0117	-.0193	.0017
	3	.0467	.0119	-.0302	.0026
	4	.0438	.0120	-.0407	.0034
2	-1	0.0699	0.0079	0.0111	-0.0009
	0	.0691	.0084	.0012	-.0001
	1	.0652	.0087	-.0085	.0007
	2	.0653	.0087	-.0183	.0015
	3	.0630	.0090	-.0289	.0024
	4	.0650	.0092	-.0394	.0031
3	-1	0.0896	0.0049	0.0106	-0.0007
	0	.0880	.0055	.0016	-.0001
	1	.0860	.0054	-.0079	.0006
	2	.0858	.0055	-.0175	.0014
	3	.0868	.0060	-.0279	.0021
	4	.0853	.0065	-.0385	.0028
5	-1	0.1440	-0.0038	0.0107	-0.0006
	0	.1392	-.0028	.0018	-.0001
	1	.1373	-.0026	-.0071	.0003
	2	.1372	-.0024	-.0158	.0009
	3	.1373	-.0013	-.0258	.0015
	4	.1356	-.0003	-.0362	.0019
7	-1	0.1931	-0.0140	0.0111	-0.0005
	0	.1926	-.0139	.0022	-.0002
	1	.1910	-.0135	-.0063	.0001
	2	.1908	-.0128	-.0152	.0005
	3	.1903	-.0112	-.0252	.0009
	4	.1888	-.0096	-.0351	.0012

TABLE II.- STATIC LONGITUDINAL AND LATERAL AERODYNAMIC CHARACTERISTICS OF AN AIRPLANE CONFIGURATION WITH VARIOUS STABILIZING WEDGES - Concluded

[Body-axis data; M = 4.06; R = 2.7 × 10^6]

(m) Basic model with 10° tail wedge and 10° body wedge

α, deg	β, deg	C_N	C_m	C_Y	C_n
-3	-1	-0.0448	0.0287	0.0116	-0.0014
	0	-.0475	.0293	-.0005	.0000
	1	-.0472	.0292	-.0121	.0014
	2	-.0483	.0291	-.0240	.0026
	3	-.0482	.0285	-.0352	.0038
	3	-.0486	.0287	-.0351	.0037
	4	-.0480	.0277	-.0469	.0049
	4	-.0493	.0281	-.0484	.0050
-2	-1	-0.0216	0.0240	0.0118	-0.0013
	0	-.0241	.0245	-.0002	.0000
	1	-.0241	.0243	-.0117	.0013
	2	-.0257	.0245	-.0230	.0025
	3	-.0241	.0238	-.0338	.0035
	3	-.0258	.0242	-.0339	.0035
	4	-.0254	.0236	-.0452	.0046
	4	-.0246	.0234	-.0467	.0047
-1	-1	0.0005	0.0195	0.0117	-0.0012
	0	-.0014	.0199	.0001	.0001
	1	-.0010	.0197	-.0111	.0013
	2	-.0026	.0200	-.0222	.0024
	3	-.0038	.0201	-.0331	.0034
	3	-.0041	.0201	-.0332	.0034
	4	-.0046	.0198	-.0439	.0043
	4	-.0044	.0197	-.0453	.0044
0	-1	0.0222	0.0159	0.0116	-0.0011
	0	.0233	.0159	.0003	.0000
	1	.0208	.0160	-.0104	.0011
	2	.0225	.0159	-.0211	.0022
	3	.0217	.0159	-.0316	.0031
	3	.0214	.0161	-.0317	.0031
	4	.0213	.0156	-.0422	.0040
	4	.0207	.0157	-.0432	.0040
1	-1	0.0445	0.0122	0.0112	-0.0009
	0	.0480	.0117	.0007	.0000
	1	.0439	.0122	-.0097	.0010
	2	.0428	.0126	-.0205	.0021
	3	.0437	.0124	-.0303	.0029
	3	.0433	.0125	-.0307	.0029
	4	.0438	.0119	-.0409	.0036
	4	.0436	.0121	-.0419	.0037
2	-1	0.0667	0.0079	0.0113	-0.0008
	0	.0679	.0084	.0010	.0001
	1	.0647	.0088	-.0092	.0010
	2	.0650	.0089	-.0194	.0019
	3	.0631	.0091	-.0290	.0027
	3	.0636	.0091	-.0293	.0026
	4	.0625	.0092	-.0397	.0034
	4	.0645	.0092	-.0407	.0034
3	-1	0.0930	0.0040	0.0111	-0.0007
	0	.0868	.0051	.0012	.0001
	1	.0865	.0050	-.0086	.0008
	2	.0868	.0053	-.0181	.0016
	3	.0857	.0055	-.0283	.0024
	3	.0865	.0055	-.0284	.0024
	4	.0841	.0060	-.0388	.0031
	4	.0854	.0061	-.0394	.0031
5	-1	0.1406	-0.0052	0.0111	-0.0005
	0	.1396	-.0045	.0020	.0000
	1	.1375	-.0044	-.0076	.0006
	2	.1371	-.0039	-.0164	.0011
	3	.1376	-.0026	-.0263	.0017
	3	.1360	-.0026	-.0268	.0017
	4	.1343	-.0015	-.0364	.0022
	4	.1359	-.0017	-.0370	.0022
7	-1	0.1938	-0.0169	0.0110	-0.0004
	0	.1932	-.0168	.0021	.0000
	1	.1943	-.0170	-.0069	.0004
	2	.1931	-.0160	-.0160	.0008
	3	.1901	-.0137	-.0257	.0012
	3	.1901	-.0139	-.0258	.0011
	4	.1885	-.0121	-.0349	.0015
	4	.1899	-.0124	-.0357	.0015

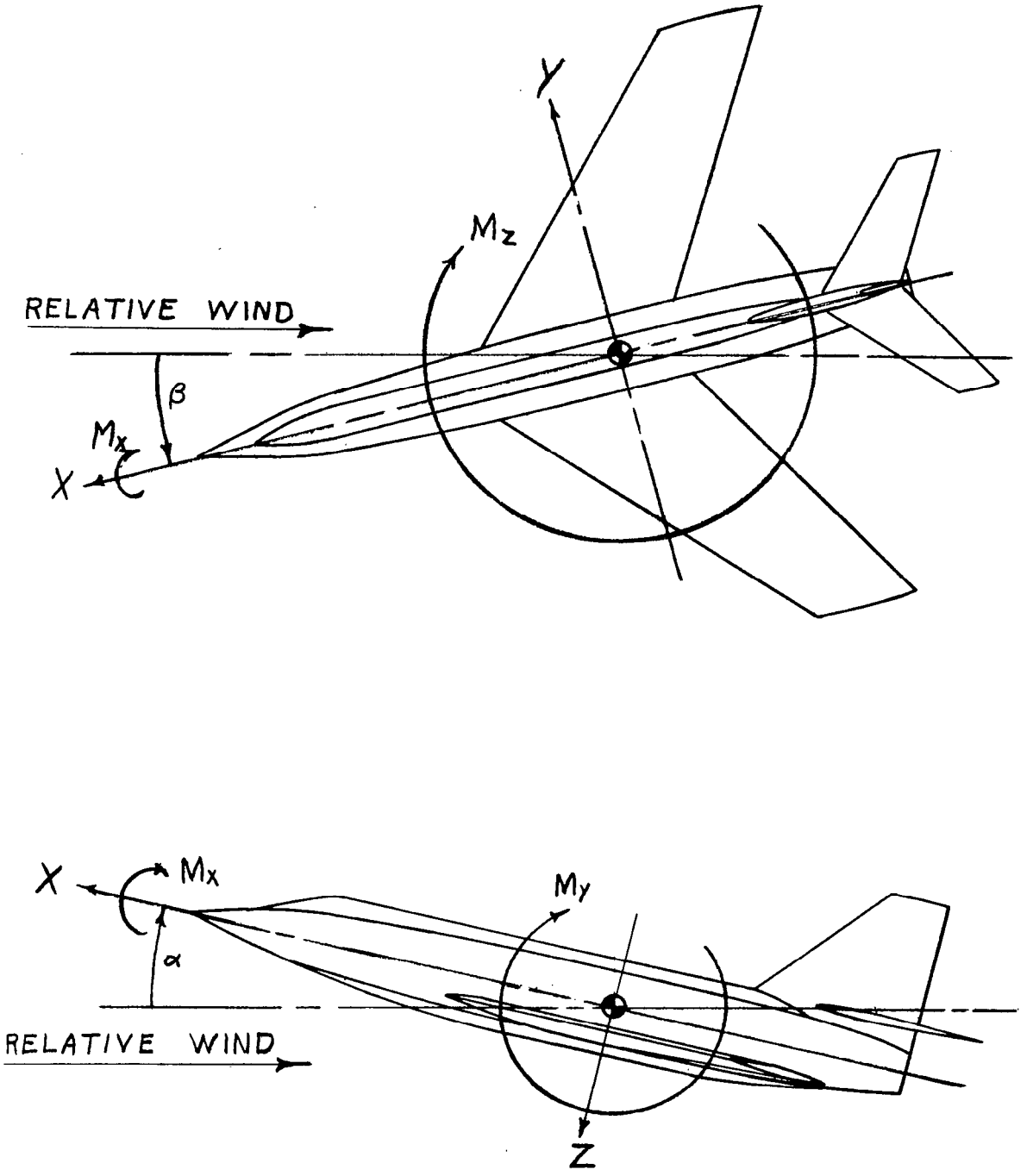


Figure 1.- Axis system.

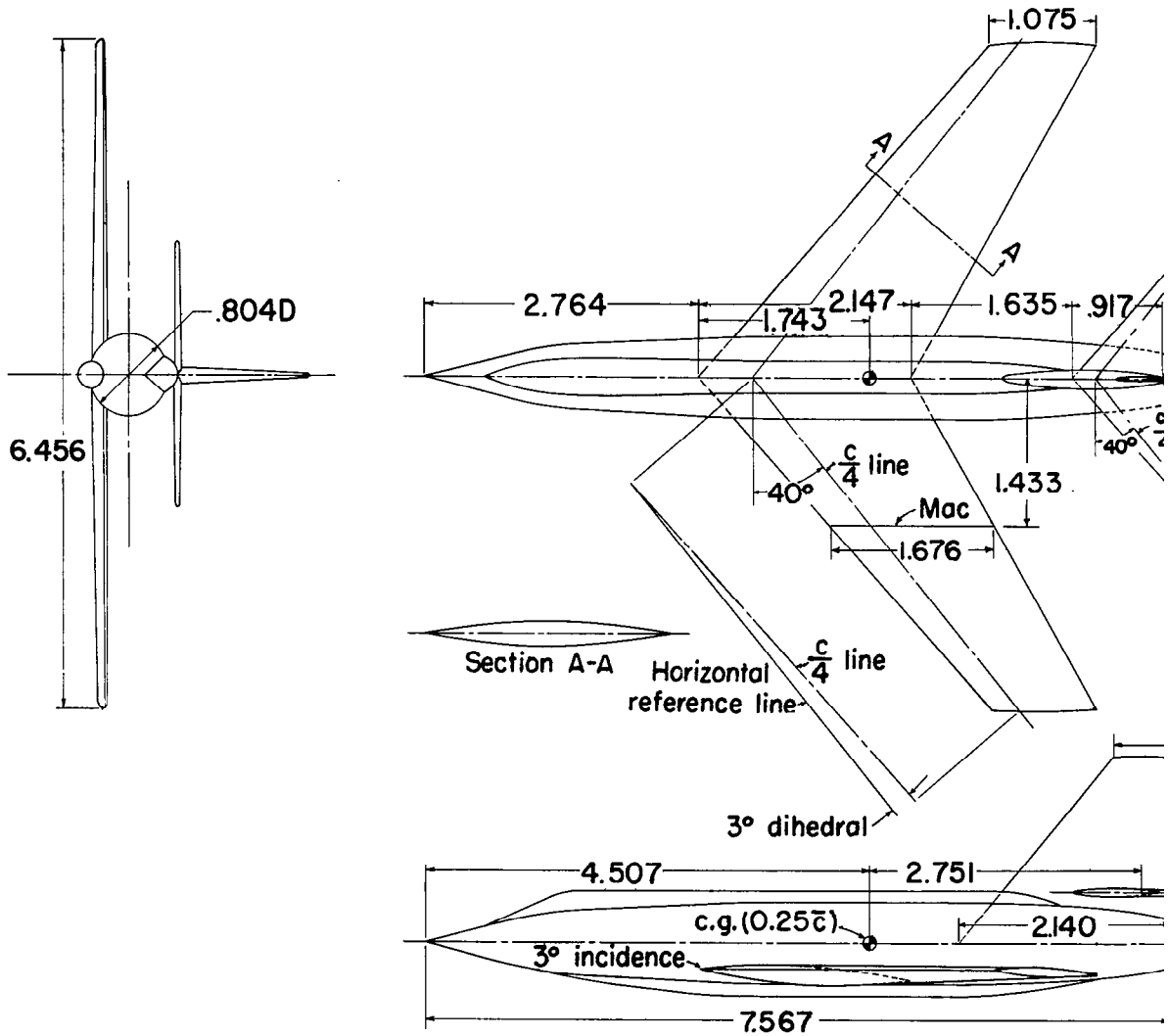


Figure 2.- Details of model of supersonic aircraft configuration. Dimensions i
otherwise noted.

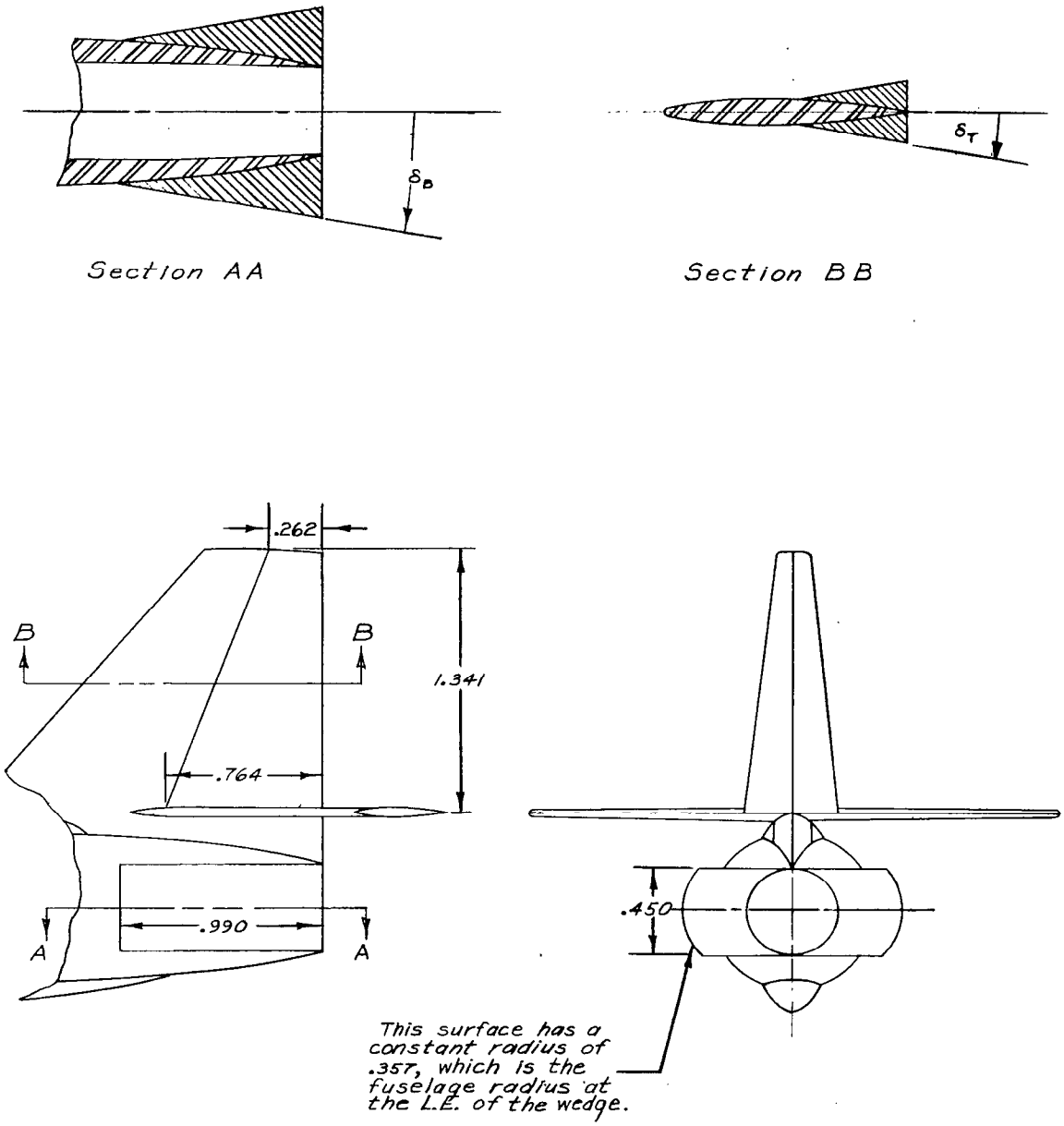
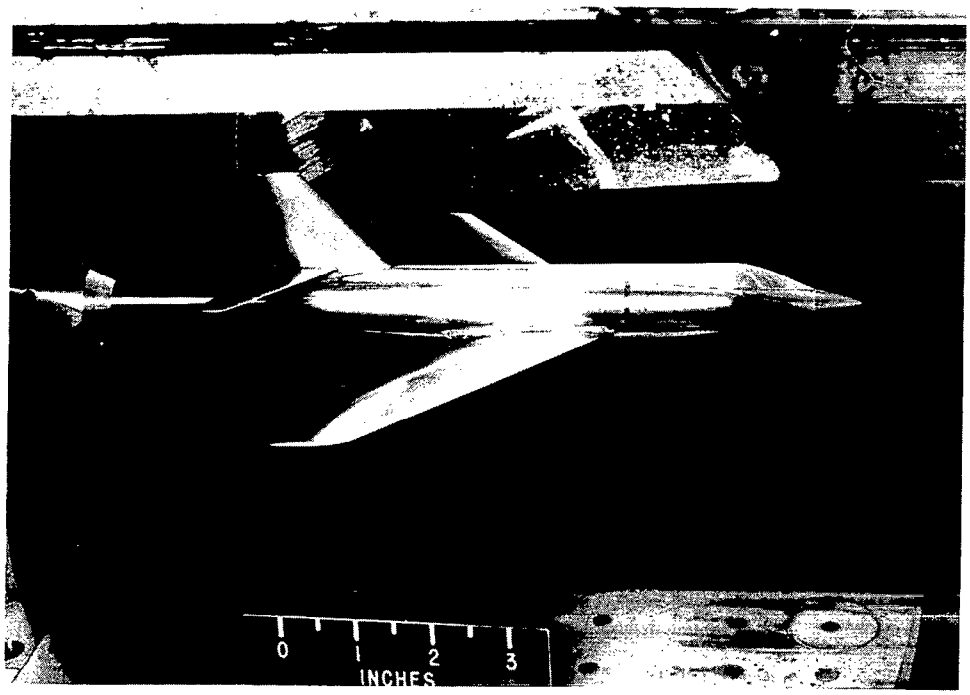
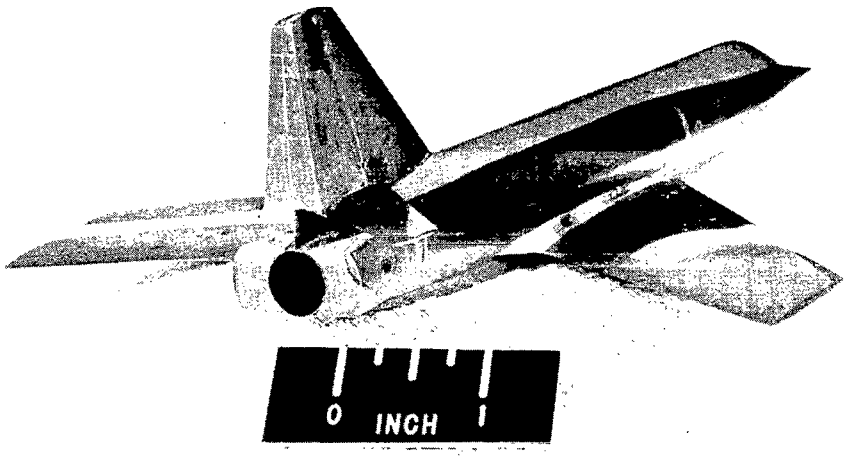


Figure 3.- Details of body and tail wedges. All dimensions in inches.



(a) Model in tunnel. L-83148



(b) Three-quarter rear view with 10° wedges. L-89178

Figure 4.- Pictures of model.

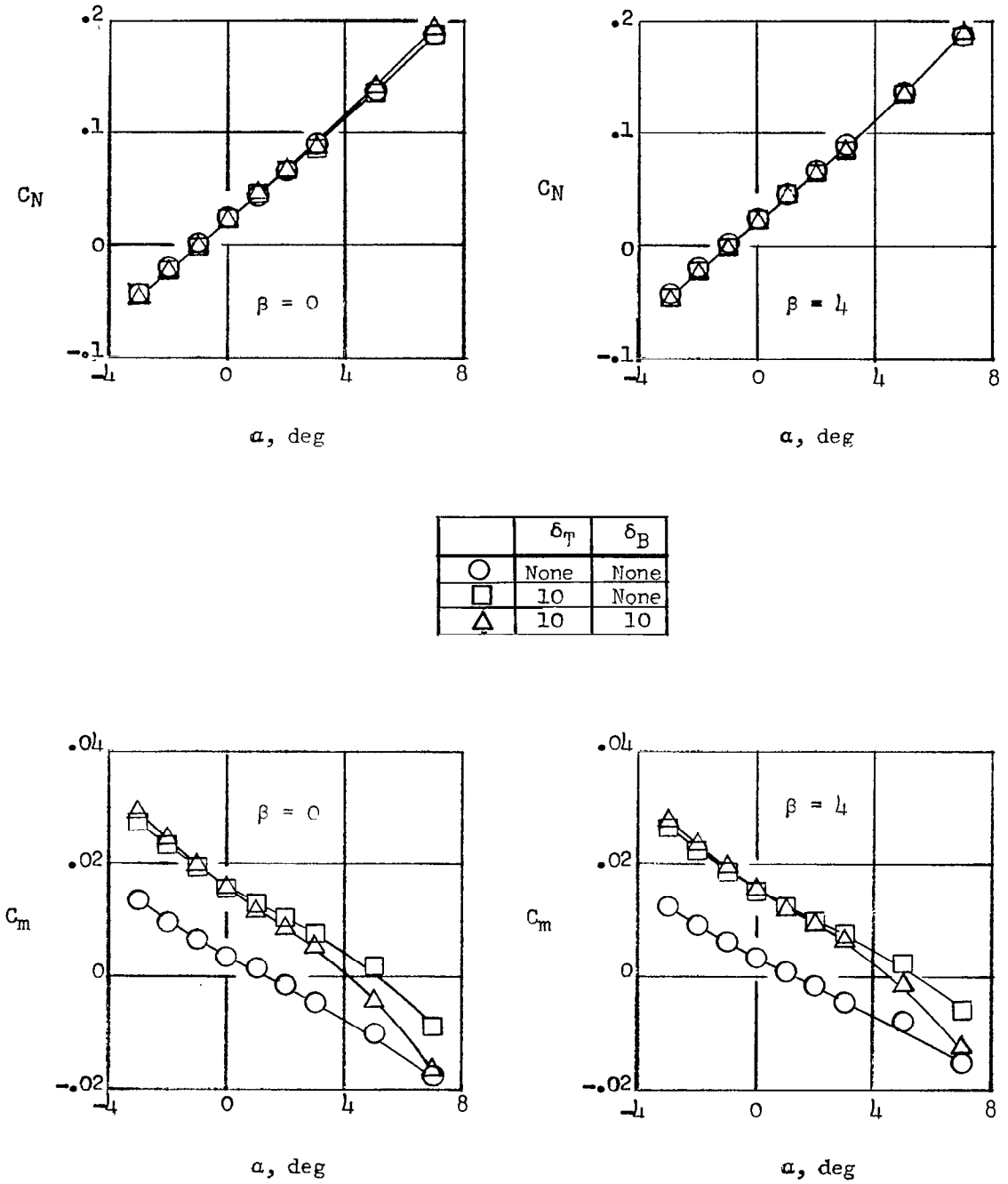


Figure 5.- Variation of normal-force coefficient and pitching-moment coefficient with angle of attack. $M = 4.06$; $R = 2.7 \times 10^6$.

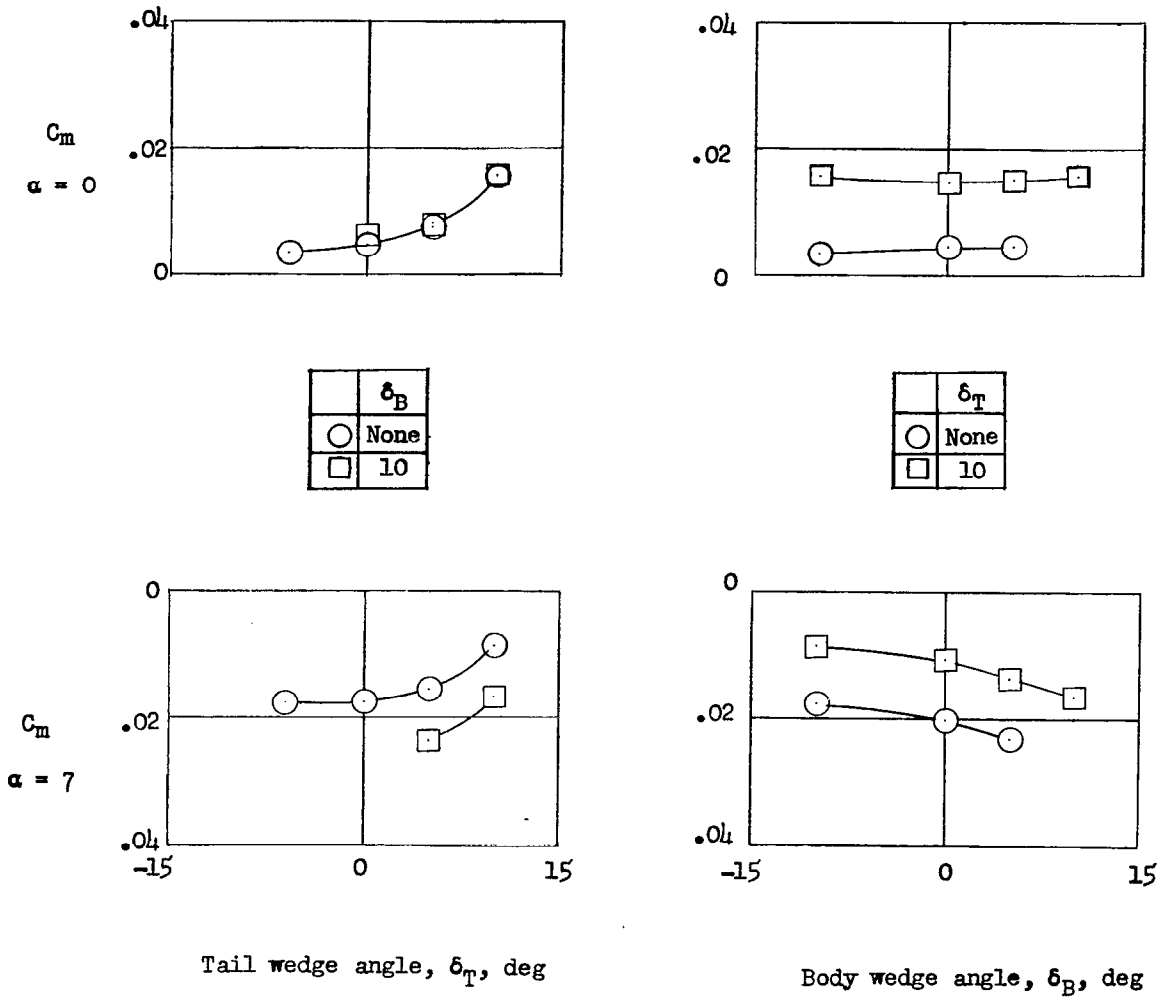


Figure 6.- Effect of wedge angle on configuration pitching-moment coefficient. $M = 4.06$; $R = 2.7 \times 10^6$; $\beta = 0$.

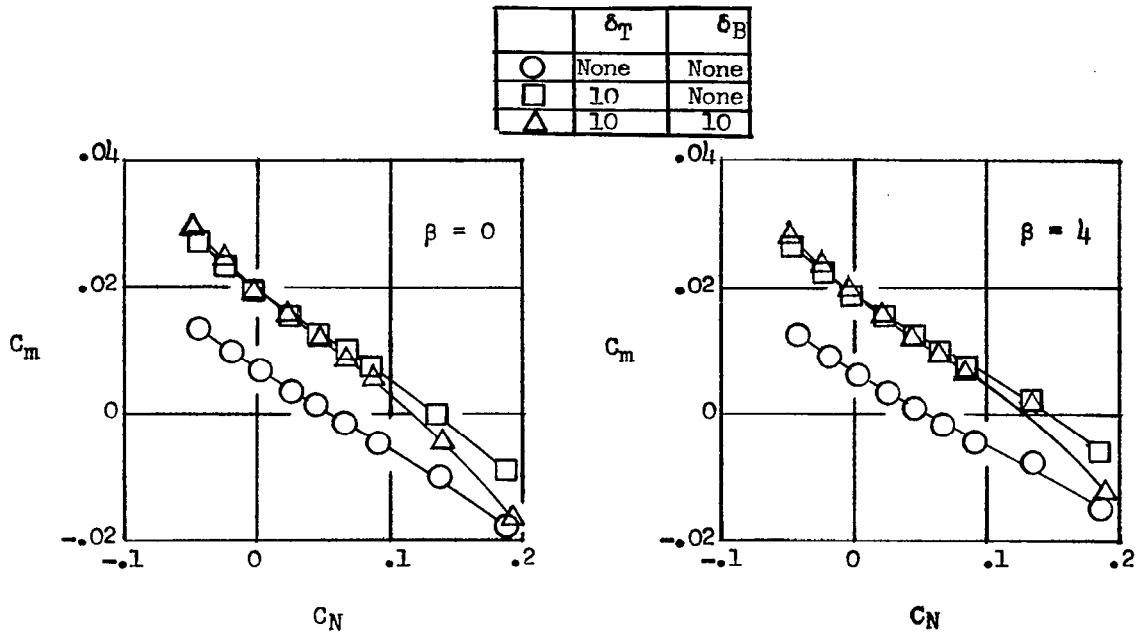


Figure 7.- Variation of pitching-moment coefficient with normal-force coefficient. $M = 4.06$; $R = 2.7 \times 10^6$.

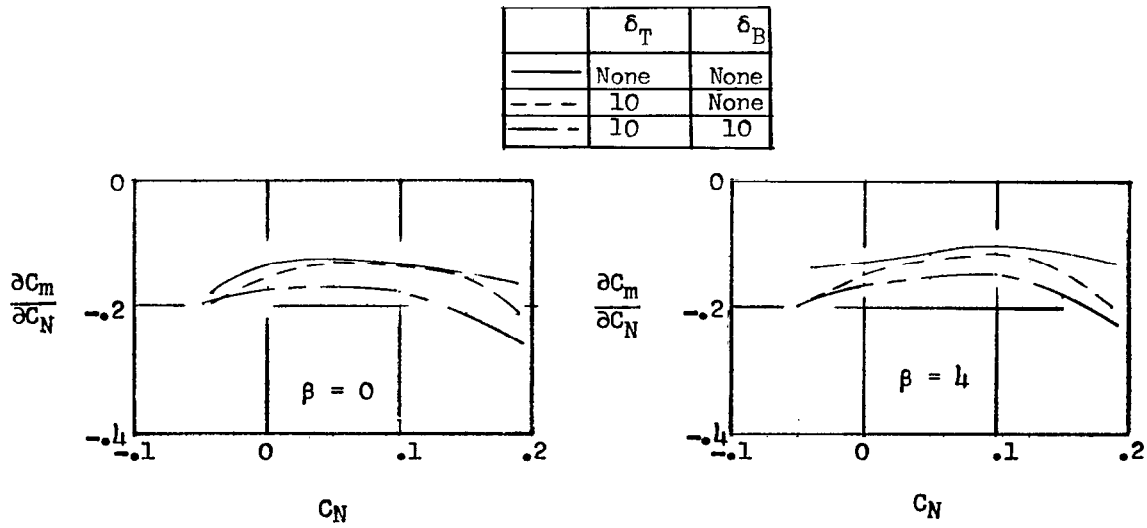


Figure 8.- Variation of longitudinal-stability parameter $\partial C_m/\partial C_N$ with normal-force coefficient. $M = 4.06$; $R = 2.7 \times 10^6$.

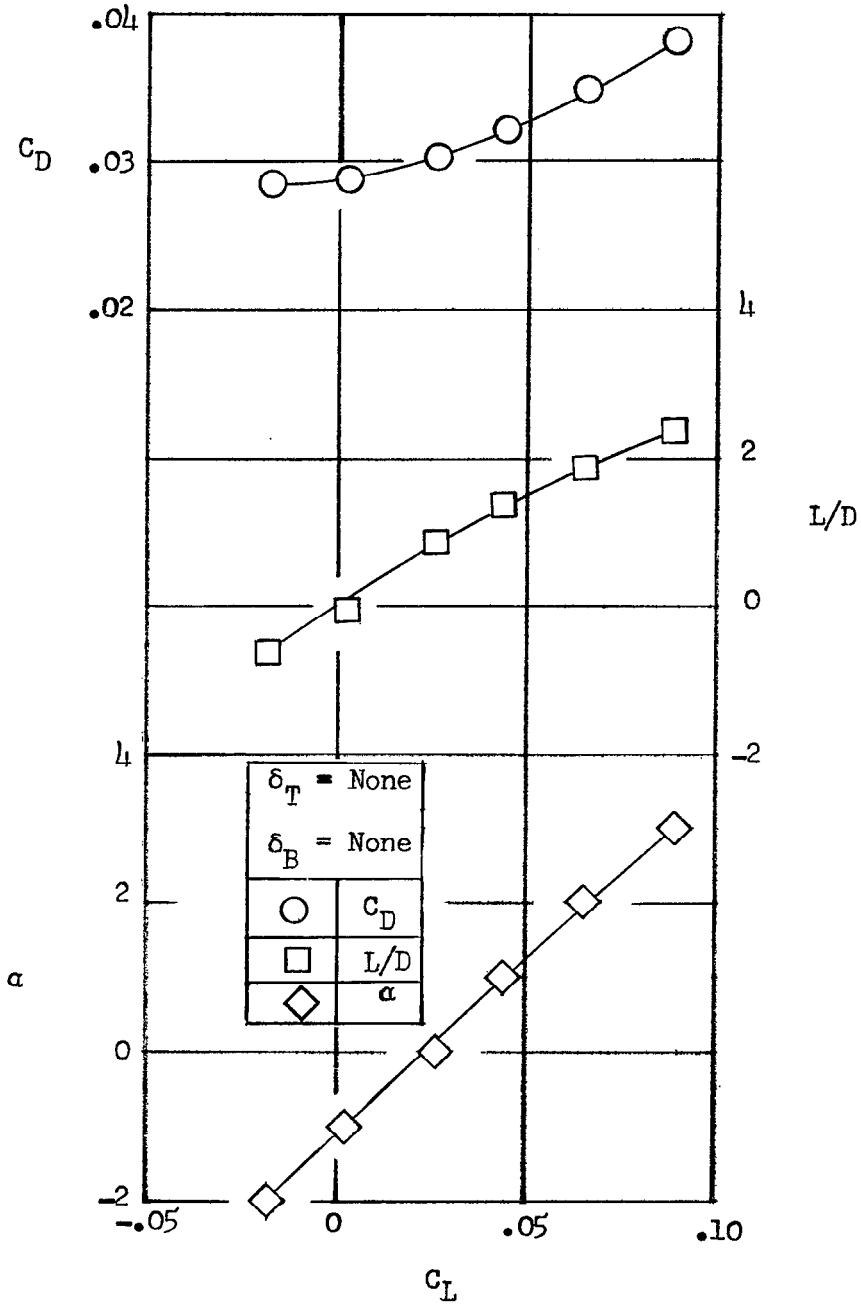


Figure 9.- Variation of drag coefficient, lift-drag ratio, and angle of attack with lift coefficient for the configuration without wedges. $M = 4.06$; $R = 2.7 \times 10^6$; $\beta = 0$.

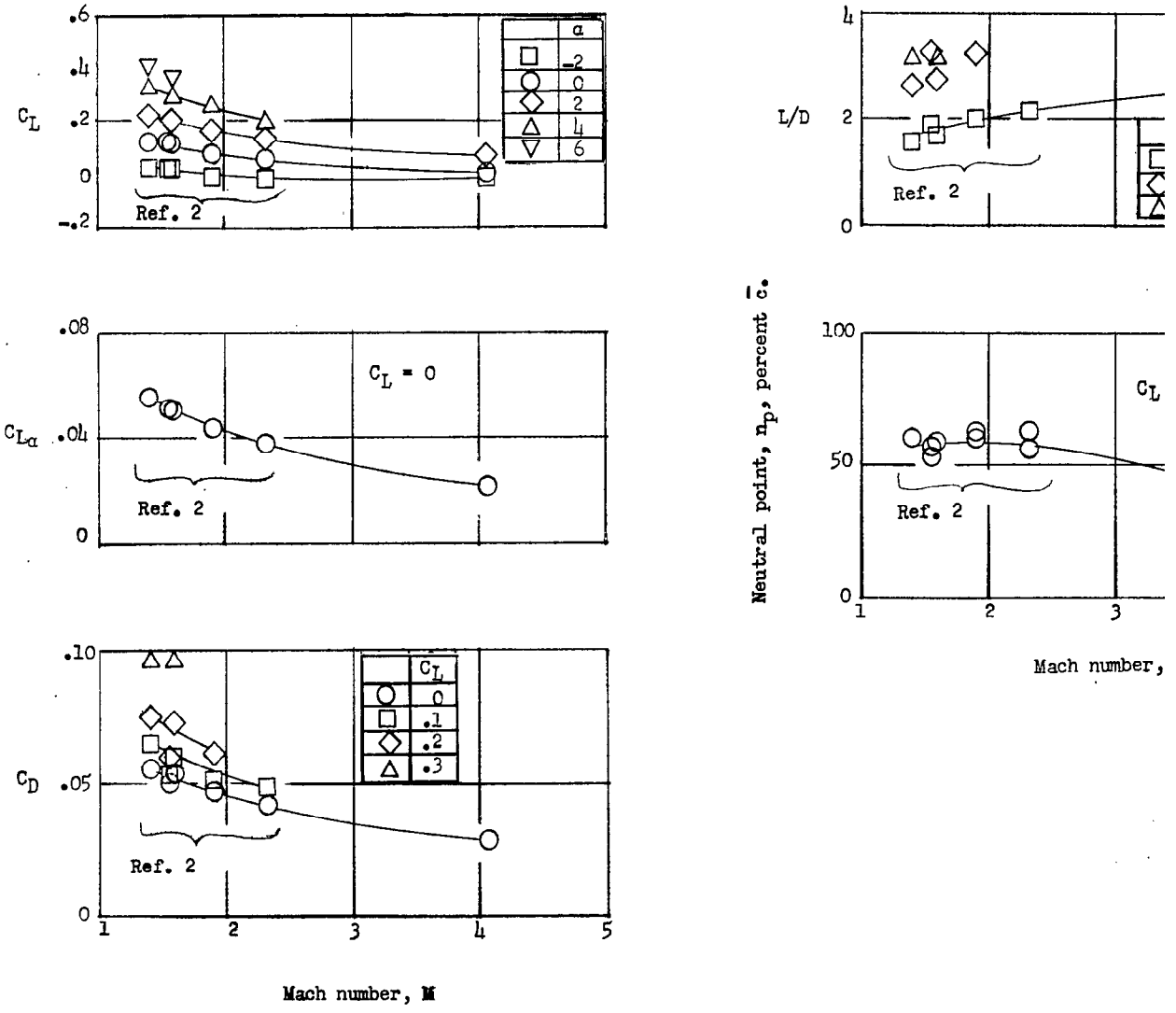


Figure 10.- Variation of longitudinal characteristics with Mach number for the without wedges. $\beta = 0$.

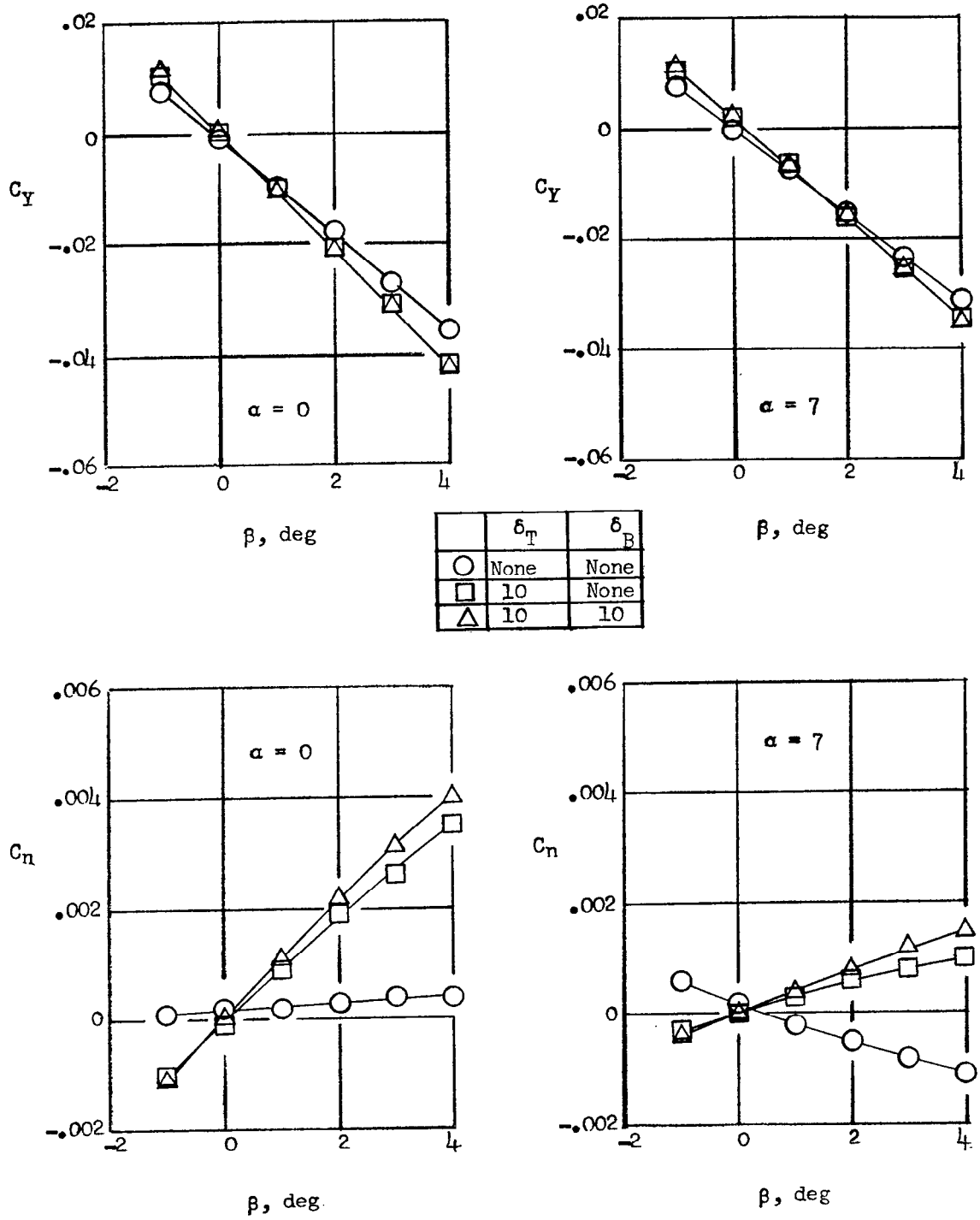
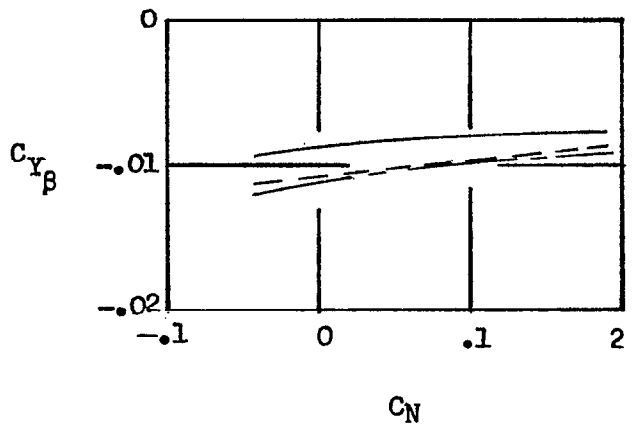


Figure 11.- Variation of side-force coefficient and yawing-moment coefficient with sideslip angle. $M = 4.06$; $R = 2.7 \times 10^6$.



	δ_T	δ_B
———	None	None
- - - -	10	None
——— -	10	10

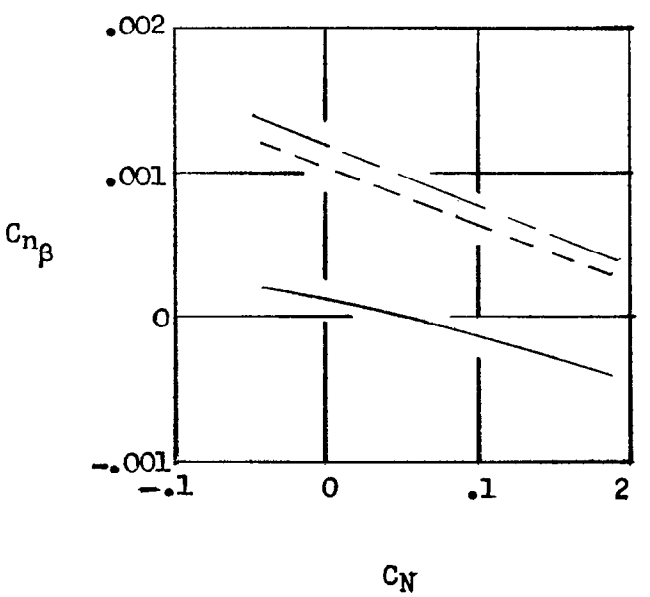
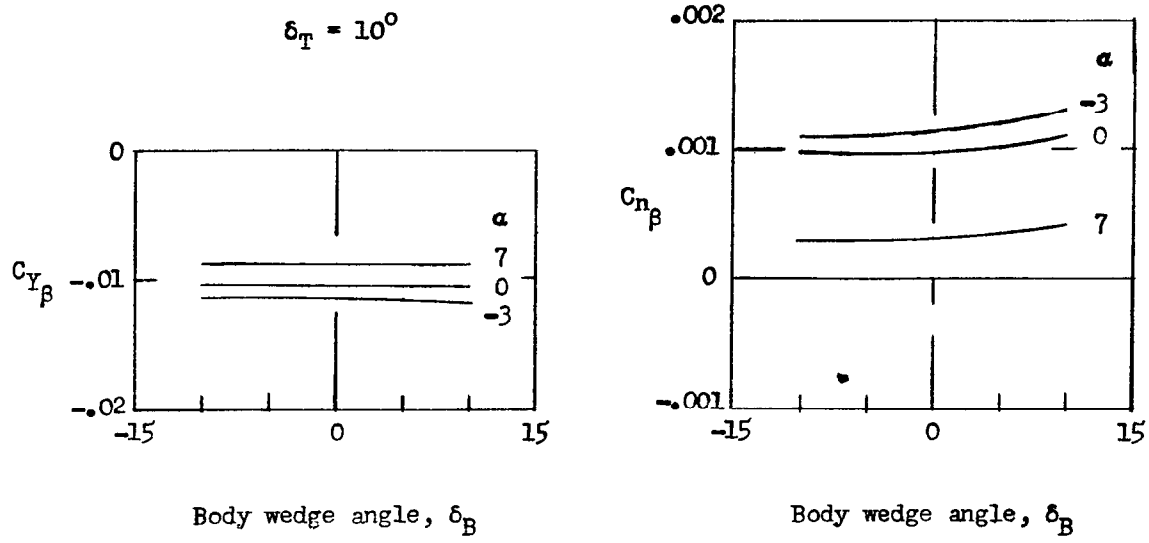
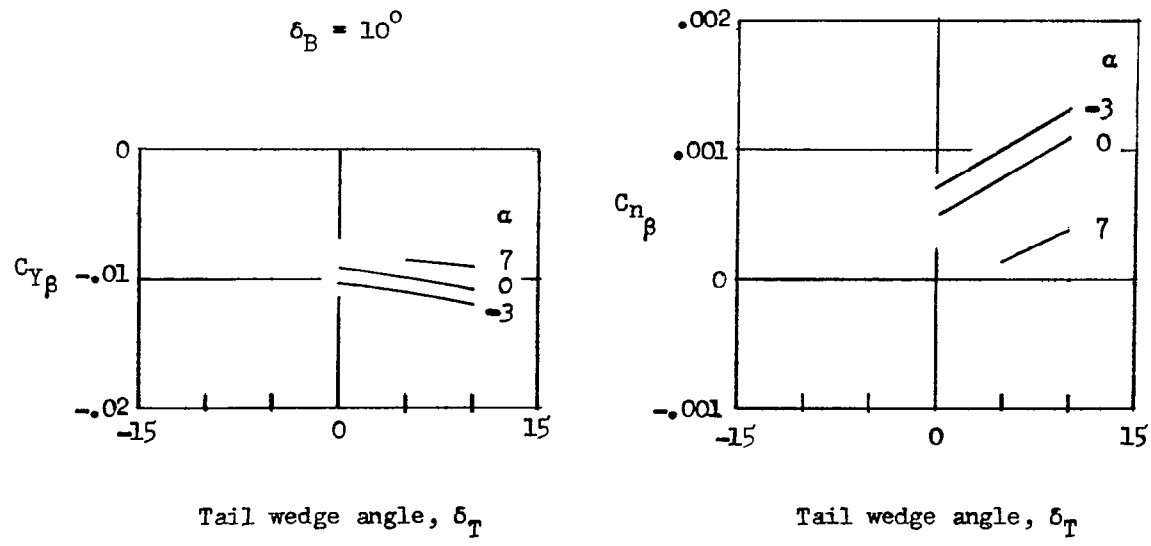


Figure 12.- Variation of stability parameters C_{Y_β} and C_{n_β} with normal-force coefficient. $M = 4.06$; $R = 2.7 \times 10^6$; $\beta = 0$.



(a) Effect of body wedge.



(b) Effect of tail wedge.

Figure 13.- Variation of stability parameters C_{Y_β} and C_{n_β} with wedge angle. $M = 4.06$; $R = 2.7 \times 10^6$; $\beta = 0$.

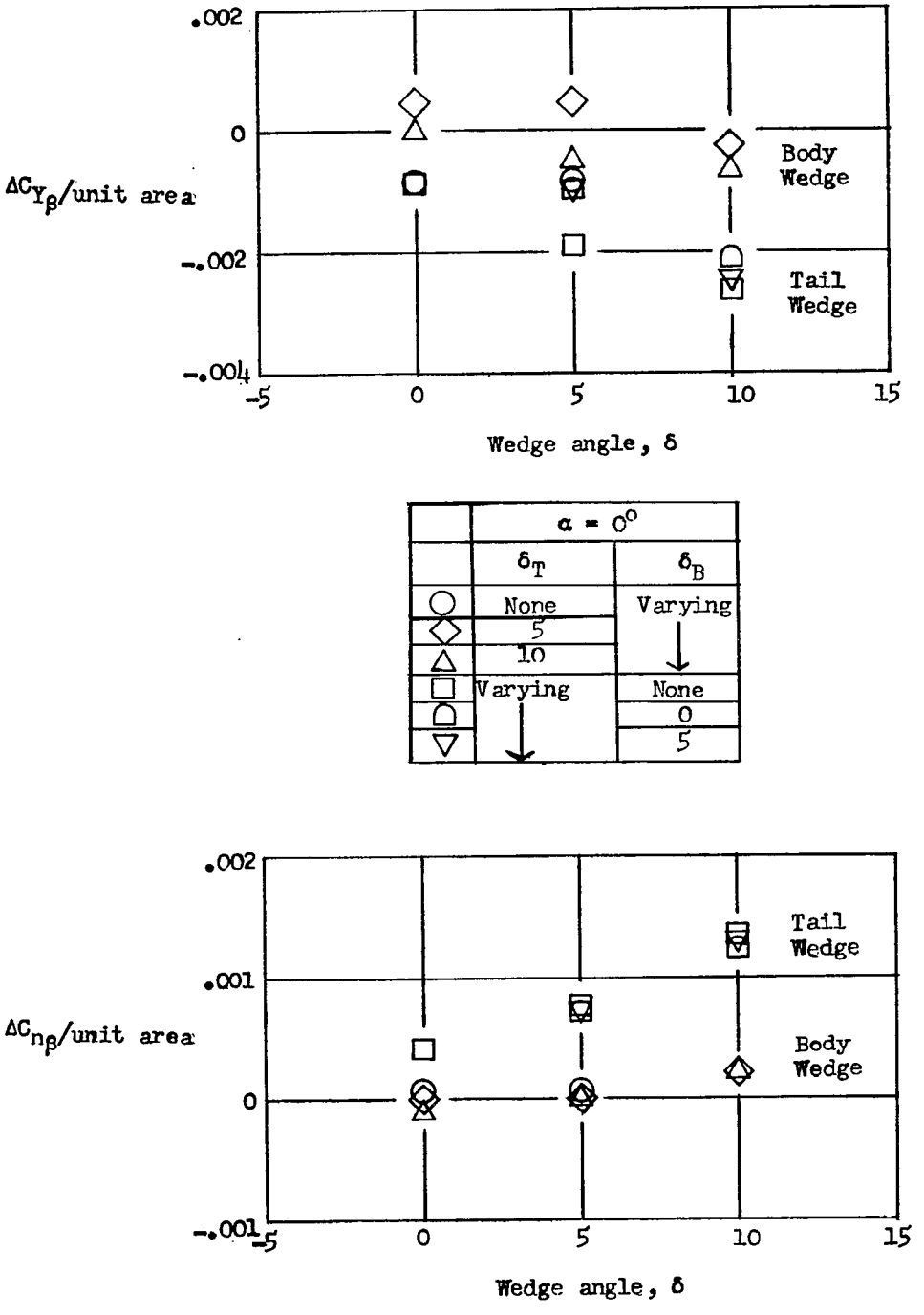


Figure 14.- Variation of incremental force and moment per unit area with wedge angle. $M = 4.06$; $R = 2.7 \times 10^6$; $\beta = 0$.