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Summary

An experimental investigation of the aerodynamic performance of leading-edge flaps on three clipped delta and three clipped double-delta wing planforms with aspect ratios of 1.75, 2.11, and 2.50 has been conducted in the Langley Unitary Plan Wind Tunnel at Mach numbers of 1.60, 1.90, and 2.16. A primary set of full-span leading-edge flaps with similar root and tip chords were investigated on each wing, and several alternate flap planforms were investigated on the aspect-ratio-1.75 wings. All leading-edge flap geometries were effective in reducing the drag at lifting conditions over the range of wing aspect ratios and Mach numbers tested. Application of a primary flap resulted in better flap performance with the double-delta planform than with the delta planform. The primary flap geometry generally yielded better performance than the alternate flap geometries tested. Trim drag due to flap-induced pitching moments was found to reduce the leading-edge flap performance more for the delta planform than for the double-delta planform. Flow-visualization techniques showed that leading-edge flap deflection reduces crossflow shock-induced separation effects. Finally, an analytic investigation showed that modified linear theory consistently predicts only the effects of leading-edge flap deflection as related to pitching moment and lift trends.

Introduction

In an effort to design high-performance aircraft that satisfy the severe aerodynamic requirements of efficient cruise and high-lift flight across the Mach number range, wings that utilize variable camber devices are under consideration. The purpose of these devices is to control the flow on the wing upper surface so that the drag is minimized at a variety of lift conditions. One such device is the variable camber wing which employs a complex system of actuators and flexible wing skins to vary the wing camber smoothly such that efficient attached-flow conditions are maintained at both low- and high-lift conditions (refs. 1 and 2). Another device is the vortex flap which is designed to generate and locate a separated leading-edge vortex and its associated suction pressures on the flap upper surface while also providing flow reattachment at the flap hinge line (ref. 3). Both the variable camber wing and the vortex flap are still in the development stage and have yet to be applied to production aircraft. A third device is the traditional leading-edge flap which, like the variable camber wing, is designed to maintain attached-flow conditions to higher levels of lift before flow separation occurs. The leading-edge flap has been utilized on production aircraft, but primarily at subsonic and transonic speeds (refs. 4 and 5).

The limited leading-edge flap studies that have been conducted at supersonic speeds (refs. 6 and 7) have indicated that performance benefits can be produced with flap deflection. Hence, additional studies are needed to quantify aerodynamic performance benefits of leading-edge flaps at supersonic speeds for a variety of generic test configurations.

The purpose of this study was to evaluate experimentally the effect of wing aspect ratio, wing planform, flap planform, and Mach number on leading-edge flap performance at supersonic speeds, and also to determine the capability of a modified linear theory analysis method to predict these effects. In addition, flow-visualization techniques were utilized to identify the flow field characteristics associated with leading-edge flap operation. Simple wing-fuselage models were chosen for the investigation. A series of full-span leading-edge flaps were tested on three clipped delta and three clipped double-delta wings with aspect ratios of 1.75, 2.11, and 2.50. The experimental tests were conducted in the Langley Unitary Plan Wind Tunnel at Mach numbers of 1.60, 1.90, and 2.16.

The experimental tests were part of a cooperative study between NASA and the General Dynamics Corporation.

Symbols

AR	aspect ratio, b^2/S
b	wing span, in.
C_A	axial-force coefficient, Axial force/qS
$C_{A,c}$	base-cavity axial-force coefficient, Base-cavity axial force/qS
C_D	drag coefficient, Drag/qS
ΔC_D	difference between minimum drag envelope and undeflected-flap drag curve at constant C_L (see fig. 10)
C_L	lift coefficient, Lift/qS
$C_{L,o}$	lift coefficient at $\alpha = 0°$
$\Delta C_{L,o}$	change in $C_{L,o}$ due to leading-edge flap deflection, $(C_{L,o})_{\delta_f \neq 0} - (C_{L,o})_{\delta_f = 0}$
C_m	pitching-moment coefficient, Pitching moment/$qS\bar{c}$
$C_{m,o}$	zero-lift pitching-moment coefficient

$\Delta C_{m,o}$	change in $C_{m,o}$ due to leading-edge flap deflection, $(C_{m,o})_{\delta_f \neq 0} - (C_{m,o})_{\delta_f = 0}$
C_N	normal-force coefficient, Normal force$/qS$
c	chord, in.
$\bar{c}$	wing mean aerodynamic chord, in.
L/D	lift-drag ratio
M	Mach number
q	dynamic pressure, psi
S	wing reference area, in^2
x	longitudinal distance from nose of fuselage, in.
y	spanwise distance from model centerline, in.
z	distance normal to reference xy-plane, in.
α	angle of attack, deg
β	$= \sqrt{M^2 - 1}$
δ_f	streamwise leading-edge flap deflection (positive when leading edge down), deg
δ_{TEF}	streamwise trailing-edge flap deflection (positive when trailing edge down), deg
η_f	leading-edge-flap performance parameter, $\int_{C_L=0}^{C_L=0.5} \Delta C_D \, dC_L$
λ	taper ratio, $c_t/c_{r,p}$
Λ	sweep angle, deg

Subscripts:

B	leading-edge break
e	exposed
LE	leading edge
max	maximum
p	projected to centerline
r	root
TE	trailing edge
t	tip

Apparatus and Tests

Test Description

The tests were performed in the Langley Unitary Plan Wind Tunnel (ref. 8) at Mach numbers of 1.60, 1.90, and 2.16. The tests were conducted at the following conditions:

Mach number	Stagnation pressure, psi	Stagnation temperature, °F	Reynolds number, per foot
1.60	7.49	125	2×10^6
1.90	8.34	125	2
2.16	9.37	125	2

The tunnel dew point was held below the minimum value at which condensation effects become significant.

Boundary-layer transition strips consisting of a 0.063-in. band of No. 60 grit were located 1.2 in. aft of the fuselage nose apex and 0.4 in. aft streamwise of the wing leading edge. The method described in reference 9 was used to select the grit size and location in order to provide for fully turbulent flow over the model at all test conditions.

The aerodynamic forces and moments were measured by means of a six-component strain-gauge balance contained within the model and attached to a supporting sting which, in turn, was connected to the permanent model-actuating system in the wind tunnel. The model angles of attack were corrected for tunnel flow misalignment and for sting and balance deflection due to aerodynamic loading on the model. Base-cavity pressures were measured by means of sting-mounted tubes that were routed from inside the cavity to pressure transducers located outside the wind tunnel. These pressures were measured throughout the test and were used to correct the force data to a condition of free-stream static pressure acting over the base area of the model. The force data were reduced about a moment reference center located at 35 percent of the mean aerodynamic chord.

Model Description

The test models consisted of simple wing-fuselage combinations as shown in figure 1. The wings were mounted on a common fuselage having a fineness ratio of 14 (fig. 2) whose cross-section dimensions are contained in reference 10. Two basic wing planforms were investigated, a clipped delta planform and a clipped double-delta planform. Wing aspect ratios of 1.75, 2.11, and 2.50 were investigated for each planform. (See table I and fig. 3.) All wings had the same reference area, tip chord length, and trailing-edge sweep. The double-delta wing geometries were defined with an outboard panel employing 23.1° of leading-edge sweep beginning at 70 percent of the wing semispan. The airfoil consisted of a 3.5-percent-thick NACA 64A-section for all the wings (NACA 64A0035).

The primary leading-edge flaps (fig. 3) were designed for efficient subsonic maneuver performance by using the method of reference 11, which employed restrictions on the flap tip chord due to structural considerations. All primary flaps had similar root and tip chords. Several alternate flap planforms were tested on the aspect-ratio-1.75 delta and double-delta wings (herein referred to as the "AR = 1.75 delta and double-delta wings"). The alternate flap (flap B) tested on the AR = 1.75 wings (fig. 4) was configured to maintain the same flap area as the primary flap (flap A) but concentrate more flap area in the outer wing panel area. In addition, a nonstreamwise break in the flap on the double-delta wing was accomplished through bisecting the leading-edge included angle of the inboard and outboard panels. The break in flap B on the delta wing was perpendicular to the leading edge. Flap C (fig. 5), which was tested on the AR = 1.75 delta wing, had the same area as the primary flap but utilized the full tip chord for the flap. On the AR = 1.75 delta wing, flap D had 55 percent more flap area than flap C, an effect accomplished by increasing the flap root chord. Flap-deflection angles of 0°, 5°, and 10° were tested. The leading-edge flap-deflection angle δ_f was measured in the streamwise direction.

Trailing-edge flap deflections of 0°, −10°, and −20° were tested in combination with deflections of the primary leading-edge flaps for the AR = 1.75 delta and double-delta wings only. The same trailing-edge flap geometry was used on both wings and is shown in figure 6.

Discussion

Experimental Results

As indicated previously, the purpose of this study was to evaluate the leading-edge flap performance at supersonic speeds on delta and double-delta wing planforms with aspect ratios of 1.75, 2.11, and 2.50. The effect of flap planform variations and trimmed flight requirements on flap performance was also studied on the aspect-ratio-1.75 delta and double-delta wings. In the discussion that follows, the term "leading-edge flap performance" refers to the effect that the deflected leading-edge flap has on the combined flap and wing aerodynamic characteristics. The results presented were obtained from the data tabulated in appendix A. The longitudinal aerodynamic characteristics of the delta and double-delta wing planforms without leading-edge flap deflection have been reported in reference 10.

The effect of leading-edge flap deflection on the longitudinal aerodynamic characteristics of the aspect-ratio-1.75 delta wing with primary flap (flap A) is shown in figure 7 for each of the test Mach numbers. The data indicate that the flap deflection of 5° becomes effective in reducing the drag at a lift coefficient between 0.2 and 0.3, which is above the lift coefficients for $(L/D)_{\max}$. Consequently, no increase results in $(L/D)_{\max}$. The flap deflection of 10° attains the efficiency of the deflection of 5° only at very high lift coefficients ($C_L > 0.4$). The effect of the leading-edge flap deflection on the lift and pitching-moment curves is to incur a negative shift in $C_{L,o}$ and $C_{m,o}$ without altering the slopes of the curves.

Similar results occur for the aspect-ratio-1.75 double-delta wing with the primary leading-edge flap (fig. 8) except that the flap deflection of 5° yields an increase in $(L/D)_{\max}$ at $M = 1.60$ and very little shift in $C_{m,o}$ occurs. The drag and pitching-moment characteristics will be analyzed in greater detail in subsequent sections for all the flap and wing configurations.

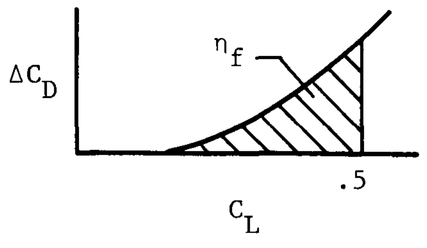
Shown in figure 9 is a summary of the increment $\Delta C_{L,o}$ for all wings with a primary leading-edge flap deflection of 5°. It should be noted that the inboard panel sweep of the double-delta wings was used in the calculation of the leading-edge sweep parameter ($\beta \cot \Lambda_{LE}$). The data show that for an increasing aspect ratio there is an increase in $\Delta C_{L,o}$. However, there is very little effect of Mach number or planform (delta versus double delta) for a given aspect ratio.

Further analysis of the drag benefits due to leading-edge flap deflection will be based primarily on the incremental drag reduction ΔC_D, which is defined in figure 10 as the difference between the minimum drag envelope and the undeflected-flap ($\delta_f = 0°$) drag curve. The minimum drag envelope is faired between the $\delta_f = 0°$, 5°, and 10° drag curves to yield the lowest drag for the configuration. Note that a positive ΔC_D represents a drag reduction due to flap deflection.

Shown in figure 11 are the incremental drag reductions ΔC_D due to leading-edge flap deflection for the six wing geometries tested with the primary flaps. Similar flap performance characteristics result for each of the configurations; specifically, the drag reductions typically begin at lift coefficients between 0.1 and 0.2 and increase nonlinearly as lift coefficient increases. At $M = 1.60$ the drag reductions increase as the aspect ratio decreases for both planforms. As

Mach number increases, the flap performance of the higher aspect-ratio wings improves relative to the AR = 1.75 wing.

In order to provide a measure of the flap performance on a given wing, a flap performance parameter was defined. As shown in the following sketch, the leading-edge-flap performance parameter η_f is defined as the integral of the drag reduction due to flap deflection over a range of C_L from 0 to 0.5:



$$\eta_f = \int_{C_L=0}^{C_L=0.5} \Delta C_D \, dC_L$$

The η_f variation with leading-edge sweep parameter ($\beta \cot \Lambda_{LE}$) for the six wing geometries is shown in figure 12. For a given wing aspect ratio, it appears that η_f approaches a minimum at the sonic leading-edge condition ($\beta \cot \Lambda_{LE} = 1$). For the double-delta wings, a minimum flap performance "bucket" occurred at the sonic leading-edge condition. This bucket occurred for the AR = 1.75 delta wing also. For the other delta wings it is difficult to determine if a similar bucket occurred because they were not tested at subsonic leading-edge conditions. Generally, the flaps seem to yield slightly better performance for the double-delta planforms than for the delta planforms.

The effect of segmenting the primary leading-edge flaps was investigated on the double-delta planforms by deflecting only the inboard flap segment. (See fig. 13.) Generally, slightly better flap performance resulted when both inboard and outboard flaps were deflected.

Drag reductions for both the primary and alternate flap planforms on AR = 1.75 wings are shown in figure 14. For the delta wing, the primary flap (flap A) and the larger alternate flap (flap D) yielded slightly larger drag reductions than flaps B and C. There was, however, a large degradation in the performance of the alternate flap (flap B) on the double-delta wing. This performance degradation may be due to flow separation in the wing crank region where the nonstreamwise change in the flap surface occurs. (See fig. 4.)

In order to assess the impact of trimmed flight requirements on the supersonic performance of leading-edge flaps, the AR = 1.75 wings with the primary flap (flap A) were trimmed using trailing-edge flaps. A 3-percent-stable static margin at $M = 1.60$ was chosen as the condition for which the configurations would be trimmed. Hence, the moment reference center was transferred from $0.35\bar{c}$ (the location for the data in appendix A) to $0.42\bar{c}$ for the delta planform and to $0.48\bar{c}$ for the double-delta planform. The leading-edge flap configurations were trimmed for both the undeflected case and for the deflected case.

The resulting drag reductions due to leading-edge flap deflection for trimmed flight conditions are shown in figure 15 and compared with the untrimmed values (trailing-edge flap undeflected). The delta planform experiences a significant reduction in leading-edge flap performance because of trim requirements, whereas the double-delta planform experiences very little drag penalty. These trim drag penalties on flap performance result when a negative zero-lift pitching-moment change due to leading-edge flap deflection (negative $\Delta C_{m,o}$) is trimmed by a drag-producing negative increment of trailing-edge flap deflection. The AR = 1.75 double-delta wing experiences only a small negative $\Delta C_{m,o}$, as shown in figure 8, resulting in only small drag penalties as previously noted. The more negative $\Delta C_{m,o}$ shown in figure 7 for the AR = 1.75 delta wing yielded the reduced flap performance benefits noted previously. These trimmed flight results accentuate the important effect of the leading-edge-flap-induced pitching moment on overall deflected-flap performance.

The trim penalties associated with leading-edge flap operation for the AR = 2.11 and 2.50 wings of a given planform will probably be larger than those for the AR = 1.75 wings because of their more negative $\Delta C_{m,o}$ due to leading-edge flap deflection as shown in figure 16. Also, since a delta planform of given aspect ratio has a more negative $\Delta C_{m,o}$ than its double-delta wing counterpart, the delta planforms should suffer greater trim drag losses. Finally, it appears that the effect of Mach number is minimal for subsonic leading-edge conditions ($\beta \cot \Lambda_{LE} < 1$), but $\Delta C_{m,o}$ tends to decrease as Mach number increases for supersonic leading-edge conditions ($\beta \cot \Lambda_{LE} > 1$) for a given wing aspect ratio.

For the primary and alternate flaps deflected 5°, the values of $\Delta C_{m,o}$ on the AR = 1.75 wings are shown in figure 17. For the delta wing, the alternate flap C has a much less negative $\Delta C_{m,o}$ than the others, an effect which would likely make it the best performing flap when trimmed conditions are considered. The alternate flap B on the double-delta wing has a positive $\Delta C_{m,o}$. This would likely make up for at least a part of its poorer untrimmed drag performance (see fig. 14) when trimmed conditions are considered, since a likely beneficial positive trailing-edge-flap-deflection increment would be needed for trim.

Flow-Visualization Results

In an effort to identify the flow field conditions corresponding to the leading-edge-flap-performance benefits previously discussed, both tuft and vapor-screen flow-visualization techniques were employed. Tuft and vapor-screen photographs were obtained for the AR = 1.75 and 2.50 delta wing configurations at Mach numbers of 1.60, 1.90, and 2.16, lift coefficients of 0.1, 0.2, 0.3, and 0.4, and leading-edge flap deflections of 0°, 5°, and 10°. These photographs are compiled in appendix B, and a representative set will be discussed subsequently. The tuft photographs were taken of the upper surface of the left wing panel. The vapor-screen photographs were taken of the flow field above the upper surface of the left wing panel with the camera behind the model and looking upstream. Shown in figures 18 to 20 are the tuft and vapor-screen photographs for the AR = 1.75 delta wing at $M = 1.90$. Flow-visualization results will be shown for flaps undeflected ($\delta_f = 0°$) and deflected ($\delta_f = 5°$) at $C_L = 0.2$, 0.3, and 0.4. It was previously shown (fig. 7) that the leading-edge flap deflection of 5° became effective in reducing the drag at a lift coefficient of about 0.2. At $C_L = 0.2$ for the undeflected case, the tufts and vapor screen indicate a crossflow shock that begins at the leading-edge/fuselage juncture. With the leading-edge flaps deflected, a crossflow shock is also observed in the vapor screen, but it has not achieved sufficient strength to impact the tufts. The tufts do, however, indicate some expansion over the flap hinge line as indicated by their inward orientation. At $C_L = 0.3$, the crossflow shock attains sufficient strength to generate a separation bubble for the undeflected-flap case, whereas for the deflected-flap case the shock has only just begun to affect the tufts and no separation bubble is evident. At $C_L = 0.4$, a separation bubble occurs for both deflected- and undeflected-flap cases, but (as indicated by close examination of the tufts and vapor screen) the extent of this separation bubble is smaller for the deflected-flap case. Hence, it appears that the deflected leading-edge flap reduces the crossflow shock-induced separation effects for a given C_L.

It has been shown that a separation bubble induces a localized low-pressure region on the wing surface. (See ref. 12.) The effect on drag of reducing the size of this low-pressure separation bubble at a given lift coefficient is better understood by considering the normal and axial components of the drag (fig. 21). Note that deflecting the flap actually increases the normal-force component of drag because the wing must operate at a greater angle of attack for a given lift coefficient. However, the large reduction in the axial-force component of drag results in an overall drag reduction due to flap deflection. A portion of this axial-force reduction is most likely due to the reduced size of the low-pressure separation bubble, the majority of which acts on the wing surface downstream of the airfoil maximum thickness ($0.4c$).

Theoretical Results

A theoretical analysis was performed using the method of reference 13 in order to determine the ability of the code to predict the supersonic aerodynamic characteristics of leading-edge flaps. The solution technique employs a modified linear theory with corrections for leading-edge thrust/vortex effects and for attached flow, nonlinear compressibility effects. This code was chosen for evaluation since it is typical of the methods currently employed to perform preliminary design analysis. In addition, this code has shown merit in predicting the aerodynamic characteristics of both cambered wings and wings with leading-edge flaps as shown in references 14 and 15.

Shown in figure 22 is a sample input geometry to the code. The fuselage is represented by a zero-thick planar surface because the thickness changes too rapidly across the fuselage width to be represented accurately in this code, whereas the wing itself is input with the appropriate airfoil thickness distribution. A previous study (ref. 10) comparing the zero-thick planar modeling with the actual fuselage modeling indicated only small differences in the linear theory estimates of the lift-dependent characteristics. The numerical input for the three delta and three double-delta wing configurations with leading-edge flaps undeflected is contained in table II. The format for this type of numerical input is defined in reference 16. Shown in table III are representative numerical inputs for a deflected leading-edge flap case for a double-delta wing and for a delta wing.

A comparison of theoretical and experimental ΔC_D values for the AR = 1.75 wings with primary leading-edge flap deflection is shown in figure 23. The code does predict benefits due to flap deflection, but the levels are not generally consistent with the experimental levels. A comparison of the η_f values for all the wings with primary leading-edge flaps is shown in figure 24. Again, neither the experimental values nor the trends are consistently predicted as the aspect ratio varies for a fixed Mach number.

Predicted values of ΔC_D for the primary and alternate leading-edge flaps on the AR = 1.75 wings are presented in figure 25. The code predicts that all the delta wing flaps have generally similar levels of performance, and it predicts a large decrease in performance for the alternate flap on the double-delta wing; these trends are similar to those observed experimentally (fig. 14) even though the absolute levels are generally not predicted.

Finally, the ability of the code to predict some of the characteristics related to trim requirements was investigated. Since the results in reference 11 indicated an inability of linear theory to predict adequately the aerodynamic characteristics of trailing-edge flaps, no attempt was made in the present investigation to predict the overall trim effects on leading-edge flap performance. However, the theoretical values of $\Delta C_{m,o}$ due to leading-edge flap deflection were determined and are shown in figure 26. Although the absolute levels of $\Delta C_{m,o}$ are not predicted, the effects of planform and aspect ratio are reasonably predicted. Similar results occur when values of $\Delta C_{L,o}$ are compared (fig. 27).

Conclusions

An investigation of the aerodynamic performance of leading-edge flaps on three clipped delta and three clipped double-delta wing planforms with aspect ratios of 1.75, 2.11, and 2.50 has been conducted in the Langley Unitary Plan Wind Tunnel at Mach numbers of 1.60, 1.90, and 2.16. A primary set of full-span leading-edge flaps with similar root and tip chords were investigated on each wing, and several alternate flap planforms were investigated on the aspect-ratio-1.75 wings. The following conclusions were reached from the investigation:

1. All leading-edge flap geometries were effective in reducing the drag at lifting conditions for the specific wing aspect ratios and Mach numbers tested.
2. The flap performance parameter of the double-delta wings approached a minimum at the sonic leading-edge condition.
3. Application of a primary flap resulted in better flap performance with the double-delta planform than with the delta planform.
4. The primary flap geometry generally yielded better performance than the alternate flap geometries tested.
5. The trim drag due to the trailing-edge flap deflections required to trim the leading-edge-flap-induced pitching moments was greater for the delta wings than for the double-delta wings.
6. Flow-visualization techniques showed that leading-edge flap deflection reduces crossflow shock-induced separation at lift coefficients above 0.2.
7. An analytic investigation showed that the modified linear theory consistently predicted only the trends of the leading-edge-flap-induced pitching moment and lift characteristics.

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Table I. Geometric Characteristics of Wing and Primary Leading-Edge Flap

Characteristic	Double delta	Delta	Double delta	Delta	Double delta	Delta
Aspect ratio	1.750	1.750	2.108	2.108	2.500	2.500
Area, S, in^2	342.653	342.653	342.653	342.653	342.653	342.653
Span, b, in.	24.488	24.488	26.878	26.878	29.268	29.268
Mean aerodynamic chord, $\bar{c}$, in.	19.355	16.910	16.934	15.271	14.933	13.902
Leading edge of $\bar{c}$:						
x, in.	14.477	17.896	16.366	18.677	17.886	19.319
y, in.	3.963	4.508	4.518	4.994	5.113	5.488
Projected root chord, $c_{r,p}$, in.	30.396	25.059	26.436	22.570	23.056	20.488
Projected root chord leading edge:						
x, in.	4.878	11.388	8.509	13.195	11.624	14.731
y, in.	0	0	0	0	0	0
Exposed root chord, $c_{r,e}$, in.	26.902	22.856	23.802	20.788	21.074	19.024
Exposed root chord leading edge:						
x, in.	7.928	13.147	10.698	14.533	13.162	15.750
y, in.	1.219	1.219	1.219	1.219	1.219	1.219
Break chord, c_B, in.	5.830		6.114		6.397	
Break chord leading edge:						
x, in.	26.324		25.407		24.554	
y, in.	8.571		9.407		10.224	
Tip chord, c_t, in.	2.927	2.927	2.927	2.927	2.927	2.927
Tip chord leading edge:						
x, in.	27.891	29.064	27.127	27.947	26.427	26.965
y, in.	12.244	12.244	13.439	13.439	14.634	14.634
Leading-edge sweep, Λ_{LE}:						
Inboard, deg	68.22	55.28	60.90	47.67	51.62	39.90
Outboard, deg	23.10		23.10		23.10	
Trailing-edge sweep, Λ_{TE}, deg	−20	−20	−20	−20	−20	−20
Taper ratio, λ	0.0963	0.1168	0.1107	0.1297	0.1270	0.1429
Airfoil (NACA)	64A0035	64A0035	64A0035	64A0035	64A0035	64A0035
Leading-edge flap root chord, in.	2.049	2.049	2.057	2.057	2.064	2.064
Leading-edge flap tip chord, in.	1.171	1.171	1.171	1.171	1.171	1.171
Leading-edge flap break chord, in.	1.463		1.463		1.463	
Leading-edge flap area, in^2	35.495	35.501	39.442	39.446	43.394	43.398

Table II. Numerical Input to Code for All Wings With Leading-Edge Flaps Undeflected

```
LEADING EDGE FLAP STUDY  AR = 1.75  DOUBLE DELTA                                 GEOM 2
  1 -1  0  0  0  0  0  6 16                                                      GEOM 3
342.65 19.355 21.251                                                             GEOM 4
0.0    .50    .75    1.25   2.50   5.0    10.0   20.0   30.0   40.0              GEOM 5A
50.0   60.0   70.0   80.0   90.0   100.0                                         GEOM 5B
0.000  0.000  0.000  37.000                                                      GEOM 6A
2.439  0.900  0.000  34.561                                                      GEOM 6B
7.317  1.219  0.000  29.683                                                      GEOM 6C
7.928  1.219  0.000  26.902                                                      GEOM 6D
26.324 8.571  0.000  5.830                                                       GEOM 6E
27.891 12.244 0.000  2.927                                                       GEOM 6F
0.     0.     0.     0.     0.     0.     0.     0.     0.     0.                GEOM 8A1
0.     0.     0.     0.     0.     0.                                            GEOM 8A2
0.     0.     0.     0.     0.     0.     0.     0.     0.     0.                GEOM 8B2
0.     0.     0.     0.     0.     0.                                            GEOM 8B2
0.     0.     0.     0.     0.     0.     0.     0.     0.     0.                GEOM 8C1
0.     0.     0.     0.     0.     0.                                            GEOM 8C2
0.0    .280   .341   .429   .591   .814   1.120  1.496  1.693  1.750             GEOM 8D1
1.641  1.409  1.094  .735   .372   .013                                          GEOM 8D2
0.0    .280   .341   .429   .591   .814   1.120  1.496  1.693  1.750             GEOM 8E1
1.641  1.409  1.094  .735   .372   .013                                          GEOM 8E2
0.0    .280   .341   .429   .591   .814   1.120  1.496  1.693  1.750             GEOM 8F1
1.641  1.409  1.094  .735   .372   .013                                          GEOM 8F2


LEADING EDGE FLAP STUDY  AR = 1.75  DELTA                                        GEOM 2
  1 -1  0  0  0  0  0  5 16                                                      GEOM 3
342.65 16.910 23.814                                                             GEOM 4
0.0    .50    .75    1.25   2.50   5.0    10.0   20.0   30.0   40.0              GEOM 5A
50.0   60.0   70.0   80.0   90.0   100.0                                         GEOM 5B
0.000  0.000  0.000  37.000                                                      GEOM 6A
2.439  0.900  0.000  34.561                                                      GEOM 6B
7.317  1.219  0.000  29.683                                                      GEOM 6C
13.146 1.219  0.000  22.856                                                      GEOM 6D
29.063 12.244 0.000  2.927                                                       GEOM 6E
0.     0.     0.     0.     0.     0.     0.     0.     0.     0.                GEOM 8A1
0.     0.     0.     0.     0.     0.                                            GEOM 8A2
0.     0.     0.     0.     0.     0.     0.     0.     0.     0.                GEOM 8B2
0.     0.     0.     0.     0.     0.                                            GEOM 8B2
0.     0.     0.     0.     0.     0.     0.     0.     0.     0.                GEOM 8C1
0.     0.     0.     0.     0.     0.                                            GEOM 8C2
0.0    .280   .341   .429   .591   .814   1.120  1.496  1.693  1.750             GEOM 8D1
1.641  1.409  1.094  .735   .372   .013                                          GEOM 8D2
0.0    .280   .341   .429   .591   .814   1.120  1.496  1.693  1.750             GEOM 8E1
1.641  1.409  1.094  .735   .372   .013                                          GEOM 8E2
```

Table II. Continued

```
LEADING EDGE FLAP STUDY  AR = 2.11  DOUBLE DELTA                                GEOM 2
  1 -1  0  0  0  0  0  6 16                                                     GEOM 3
342.65 16.934 22.293                                                            GEOM 4
0.0     .50     .75     1.25    2.50    5.0     10.0    20.0    30.0    40.0    GEOM 5A
50.0    60.0    70.0    80.0    90.0    100.0                                   GEOM 5B
0.000   0.000   0.000   37.000                                                  GEOM 6A
2.439   0.900   0.000   34.561                                                  GEOM 6B
7.317   1.219   0.000   29.683                                                  GEOM 6C
10.698  1.219   0.000   23.802                                                  GEOM 6D
25.407  9.407   0.000   6.114                                                   GEOM 6E
27.127  13.439  0.000   2.927                                                   GEOM 6F
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.      GEOM 8A1
0.      0.      0.      0.      0.      0.                                      GEOM 8A2
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.      GEOM 8B2
0.      0.      0.      0.      0.      0.                                      GEOM 8B2
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.      GEOM 8C1
0.      0.      0.      0.      0.      0.                                      GEOM 8C2
0.0     .280    .341    .429    .591    .814    1.120   1.496   1.693   1.750   GEOM 8D1
1.641   1.409   1.094   .735    .372    .013                                    GEOM 8D2
0.0     .280    .341    .429    .591    .814    1.120   1.496   1.693   1.750   GEOM 8E1
1.641   1.409   1.094   .735    .372    .013                                    GEOM 8E2
0.0     .280    .341    .429    .591    .814    1.120   1.496   1.693   1.750   GEOM 8F1
1.641   1.409   1.094   .735    .372    .013                                    GEOM 8F2
```

```
LEADING EDGE FLAP STUDY  AR = 2.11  DELTA                                       GEOM 2
  1 -1  0  0  0  0  0  5 16                                                     GEOM 3
342.65 15.271 24.021                                                            GEOM 4
0.0     .50     .75     1.25    2.50    5.0     10.0    20.0    30.0    40.0    GEOM 5A
50.0    60.0    70.0    80.0    90.0    100.0                                   GEOM 5B
0.000   0.000   0.000   37.000                                                  GEOM 6A
2.439   0.900   0.000   34.561                                                  GEOM 6B
7.317   1.219   0.000   29.683                                                  GEOM 6C
14.533  1.219   0.000   20.788                                                  GEOM 6D
27.947  13.439  0.000   2.927                                                   GEOM 6E
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.      GEOM 8A1
0.      0.      0.      0.      0.      0.                                      GEOM 8A2
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.      GEOM 8B1
0.      0.      0.      0.      0.      0.                                      GEOM 8B2
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.      GEOM 8C1
0.      0.      0.      0.      0.      0.                                      GEOM 8C2
0.0     .280    .341    .429    .591    .814    1.120   1.496   1.693   1.750   GEOM 8D1
1.641   1.409   1.094   .735    .372    .013                                    GEOM 8D2
0.0     .280    .341    .429    .591    .814    1.120   1.496   1.693   1.750   GEOM 8E1
1.641   1.409   1.094   .735    .372    .013                                    GEOM 8E2
```

Table II. Concluded

```
LEADING EDGE FLAP STUDY  AR = 2.50  DOUBLE DELTA                                                  GEOM 2
  1 -1  0  0  0  0  0  6 16                                                                       GEOM 3
342.65 14.933 23.112                                                                              GEOM 4
0.0     .50     .75     1.25    2.50    5.0     10.0    20.0    30.0    40.0                      GEOM 5A
50.0    60.0    70.0    80.0    90.0    100.0                                                     GEOM 5B
0.000   0.000   0.000   37.000                                                                    GEOM 6A
2.439   0.900   0.000   34.561                                                                    GEOM 6B
7.317   1.219   0.000   29.683                                                                    GEOM 6C
13.162  1.219   0.000   21.074                                                                    GEOM 6D
24.554  10.244  0.000   6.397                                                                     GEOM 6E
26.427  14.634  0.000   2.927                                                                     GEOM 6F
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.                        GEOM 8A1
0.      0.      0.      0.      0.      0.                                                        GEOM 8A2
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.                        GEOM 8B1
0.      0.      0.      0.      0.      0.                                                        GEOM 8B2
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.                        GEOM 8C1
0.      0.      0.      0.      0.      0.                                                        GEOM 8C2
0.0     .280    .341    .429    .591    .814    1.120   1.496   1.693   1.750                     GEOM 8D1
1.641   1.409   1.094   .735    .372    .013                                                      GEOM 8D2
0.0     .280    .341    .429    .591    .814    1.120   1.496   1.693   1.750                     GEOM 8E1
1.641   1.409   1.094   .735    .372    .013                                                      GEOM 8E2
0.0     .280    .341    .429    .591    .814    1.120   1.496   1.693   1.750                     GEOM 8F1
1.641   1.409   1.094   .735    .372    .013                                                      GEOM 8F2
```

```
LEADING EDGE FLAP STUDY  AR = 2.50  DELTA                                                         GEOM 2
  1 -1  0  0  0  0  0  5 16                                                                       GEOM 3
342.65 13.902 24.185                                                                              GEOM 4
0.0     .50     .75     1.25    2.50    5.0     10.0    20.0    30.0    40.0                      GEOM 5A
50.0    60.0    70.0    80.0    90.0    100.0                                                     GEOM 5B
0.000   0.000   0.000   37.000                                                                    GEOM 6A
2.439   0.900   0.000   34.561                                                                    GEOM 6B
7.317   1.219   0.000   29.683                                                                    GEOM 6C
15.750  1.219   0.000   19.024                                                                    GEOM 6D
26.965  14.634  0.000   2.927                                                                     GEOM 6E
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.                        GEOM 8A1
0.      0.      0.      0.      0.      0.                                                        GEOM 8A2
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.                        GEOM 8B1
0.      0.      0.      0.      0.      0.                                                        GEOM 8B2
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.                        GEOM 8C1
0.      0.      0.      0.      0.      0.                                                        GEOM 8C2
0.0     .280    .341    .429    .591    .814    1.120   1.496   1.693   1.750                     GEOM 8D1
1.641   1.409   1.094   .735    .372    .013                                                      GEOM 8D2
0.0     .280    .341    .429    .591    .814    1.120   1.496   1.693   1.750                     GEOM 8F1
1.641   1.409   1.094   .735    .372    .013                                                      GEOM 8F2
```

Table III. Numerical Input for Typical Deflected Leading-Edge Flap Case

```
LEADING EDGE FLAP STUDY  AR = 1.75  DOUBLE DELTA  FLAP = A , 5 DEG           GEOM 2
 1  1  0  0  0  0  0 11 18                                                   GEOM 3
342.65 19.355 21.251                                                         GEOM 4
  0.00     .50     .75    1.25    2.50    5.00    7.62   10.00   20.00   25.09 GEOM 5A
 30.00   40.00   50.00   60.00   70.00   80.00   90.00  100.00               GEOM 5B
0.000  0.000  0.000  37.000                                                  GEOM 6A
2.439  0.900  0.000  34.561                                                  GEOM 6B
7.317  1.219  0.000  29.683                                                  GEOM 6C
7.928  1.219  0.000  26.902                                                  GEOM 6D
7.928  1.220  0.000  26.902                                                  GEOM 6E
5.683  4.318  0.000  18.019                                                  GEOM 6F
24.818 7.969  0.000  7.555                                                   GEOM 6G
26.324 8.571  0.000  5.830                                                   GEOM 6H
26.324 8.572  0.000  5.830                                                   GEOM 6I
27.098 10.386 0.000  4.396                                                   GEOM 6J
27.891 12.244 0.000  2.927                                                   GEOM 6K
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000 GEOM 7A1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7A2
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000 GEOM 7B1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7B2
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000 GEOM 7C1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7C2
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000 GEOM 7D1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7D2
  -.179   -.167   -.162   -.150   -.120   -.062   0.000   0.000   0.000   0.000 GEOM 7E1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7E2
  -.158   -.150   -.146   -.138   -.118   -.079   -.038   0.000   0.000   0.000 GEOM 7F1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7F2
  -.132   -.129   -.127   -.124   -.116   -.099   -.082   -.066   0.000   0.000 GEOM 7G1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7G2
  -.128   -.125   -.124   -.122   -.115   -.102   -.089   -.077   -.026   0.000 GEOM 7H1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7H2
  -.128   -.125   -.124   -.122   -.115   -.102   -.089   -.077   -.026   0.000 GEOM 7I1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7I2
  -.115   -.113   -.112   -.111   -.106   -.096   -.086   -.077   -.038   -.019 GEOM 7J1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7J2
  -.102   -.101   -.100   -.099   -.096   -.090   -.083   -.077   -.051   -.038 GEOM 7K1
  -.026   -.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 7K2
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000 GEOM 8A1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 8A2
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000 GEOM 8B1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 8B2
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000 GEOM 8C1
  0.000   0.000   0.000   0.000   0.000   0.000   0.000   0.000                GEOM 8C2
  0.000    .280    .341    .429    .591    .814    .974   1.120   1.496   1.596 GEOM 8D1
  1.693   1.750   1.641   1.409   1.094    .735    .372    .013                GEOM 8D2
  0.000    .280    .341    .429    .591    .814    .974   1.120   1.496   1.596 GEOM 8E1
  1.693   1.750   1.641   1.409   1.094    .735    .372    .013                GEOM 8E2
  0.000    .280    .341    .429    .591    .814    .974   1.120   1.496   1.596 GEOM 8F1
  1.693   1.750   1.641   1.409   1.094    .735    .372    .013                GEOM 8F2
  0.000    .280    .341    .429    .591    .814    .974   1.120   1.496   1.596 GEOM 8G1
  1.693   1.750   1.641   1.409   1.094    .735    .372    .013                GEOM 8G2
  0.000    .280    .341    .429    .591    .814    .974   1.120   1.496   1.596 GEOM 8H1
  1.693   1.750   1.641   1.409   1.094    .735    .372    .013                GEOM 8H2
  0.000    .280    .341    .429    .591    .814    .974   1.120   1.496   1.596 GEOM 8I1
  1.693   1.750   1.641   1.409   1.094    .735    .372    .013                GEOM 8I2
  0.000    .280    .341    .429    .591    .814    .974   1.120   1.496   1.596 GEOM 8J1
  1.693   1.750   1.641   1.409   1.094    .735    .372    .013                GEOM 8J2
  0.000    .280    .341    .429    .591    .814    .974   1.120   1.496   1.596 GEOM 8K1
  1.693   1.750   1.641   1.409   1.094    .735    .372    .013                GEOM 8K2
```

Table III. Concluded

```
LEADING EDGE FLAP STUDY  AR = 1.75  DELTA  FLAP A , 5 DEG                          GEOM 2
 1  1  0  0  0  0  0  8 17                                                         GEOM 3
342.65 16.910 23.814                                                               GEOM 4
  0.00    .50    .75   1.25   2.50   5.00   8.96  10.00  20.00  30.00  GEOM 5A
 40.00  50.00  60.00  70.00  80.00  90.00 100.00                         GEOM 5B
0.000  0.000  0.000  37.000                                              GEOM 6A
2.439  0.900  0.000  34.561                                              GEOM 6B
7.317  1.219  0.000  29.683                                              GEOM 6C
13.148 1.220  0.000  22.854                                              GEOM 6D
16.537 3.567  0.000  18.611                                              GEOM 6E
26.065 10.167 0.000  6.681                                               GEOM 6F
28.149 11.611 0.000  4.071                                               GEOM 6G
29.063 12.244 0.000  2.927                                               GEOM 6H
  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  GEOM 7A1
  0.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 7A2
  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  GEOM 7B1
  0.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 7B2
  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  GEOM 7C1
  0.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 7C2
  -.179  -.169  -.164  -.154  -.129  -.079  0.000  0.000  0.000  0.000  GEOM 7D1
  0.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 7D2
  -.163  -.155  -.151  -.142  -.122  -.081  -.017  -.000  0.000  0.000  GEOM 7E1
  0.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 7E2
  -.117  -.114  -.112  -.110  -.102  -.088  -.064  -.058  0.000  0.000  GEOM 7F1
  0.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 7F2
  -.107  -.105  -.104  -.102  -.098  -.089  -.075  -.071  -.036  0.000  GEOM 7G1
  0.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 7G2
  -.102  -.101  -.100  -.099  -.096  -.090  -.079  -.077  -.051  -.026  GEOM 7H1
  -.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 7H2
  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  GEOM 8A1
  0.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 8A2
  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  GEOM 8B1
  0.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 8B2
  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  GEOM 8C1
  0.000  0.000  0.000  0.000  0.000  0.000  0.000                       GEOM 8C2
  0.000   .280   .341   .429   .591   .814  1.057  1.120  1.496  1.693  GEOM 8D1
  1.750  1.641  1.409  1.094   .735   .372   .013                       GEOM 8D2
  0.000   .280   .341   .429   .591   .814  1.057  1.120  1.496  1.693  GEOM 8E1
  1.750  1.641  1.409  1.094   .735   .372   .013                       GEOM 8E2
  0.000   .280   .341   .429   .591   .814  1.057  1.120  1.496  1.693  GEOM 8F1
  1.750  1.641  1.409  1.094   .735   .372   .013                       GEOM 8F2
  0.000   .280   .341   .429   .591   .814  1.057  1.120  1.496  1.693  GEOM 8G1
  1.750  1.641  1.409  1.094   .735   .372   .013                       GEOM 8G2
  0.000   .280   .341   .429   .591   .814  1.057  1.120  1.496  1.693  GEOM 8H1
  1.750  1.641  1.409  1.094   .735   .372   .013                       GEOM 8H2
```

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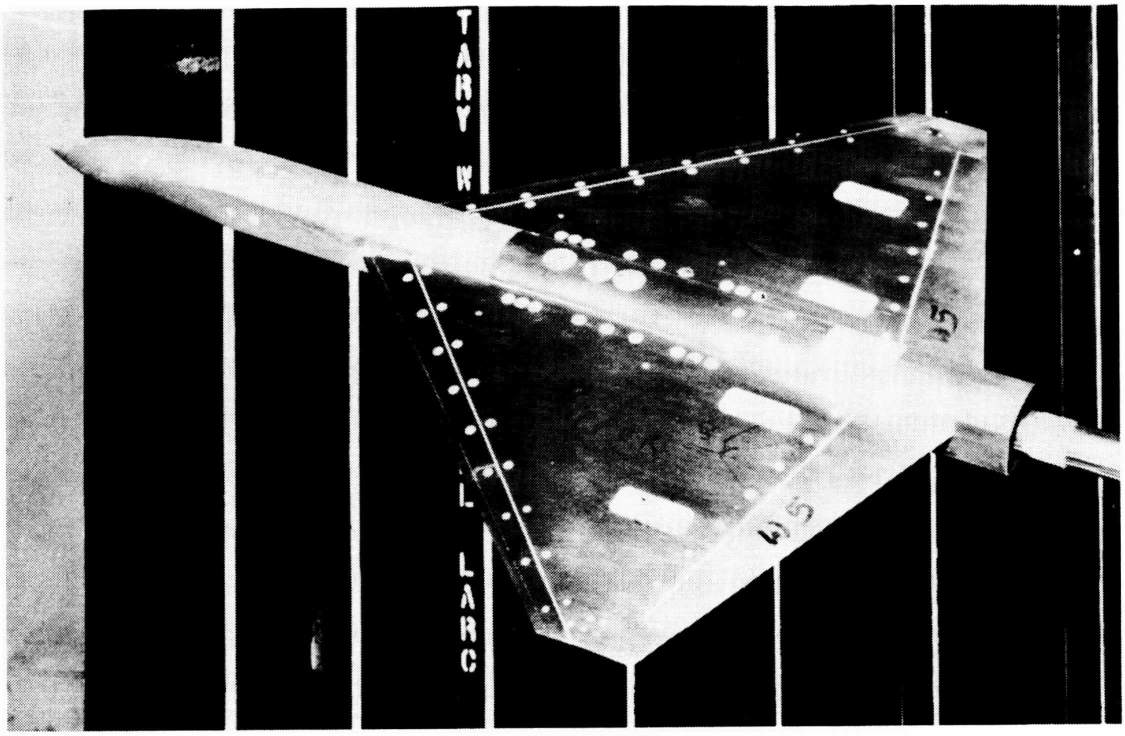
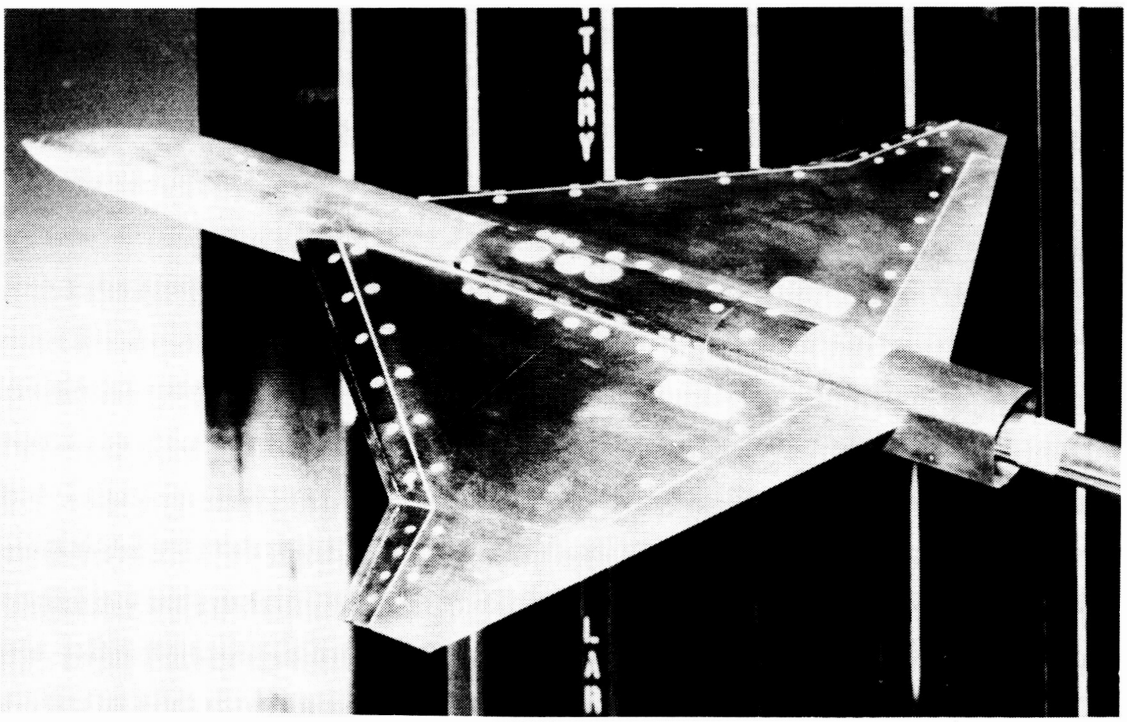


(a) Delta planform.



(b) Double-delta planform.

L-85-13,899

Figure 1. Supersonic wind-tunnel models. AR = 2.11.

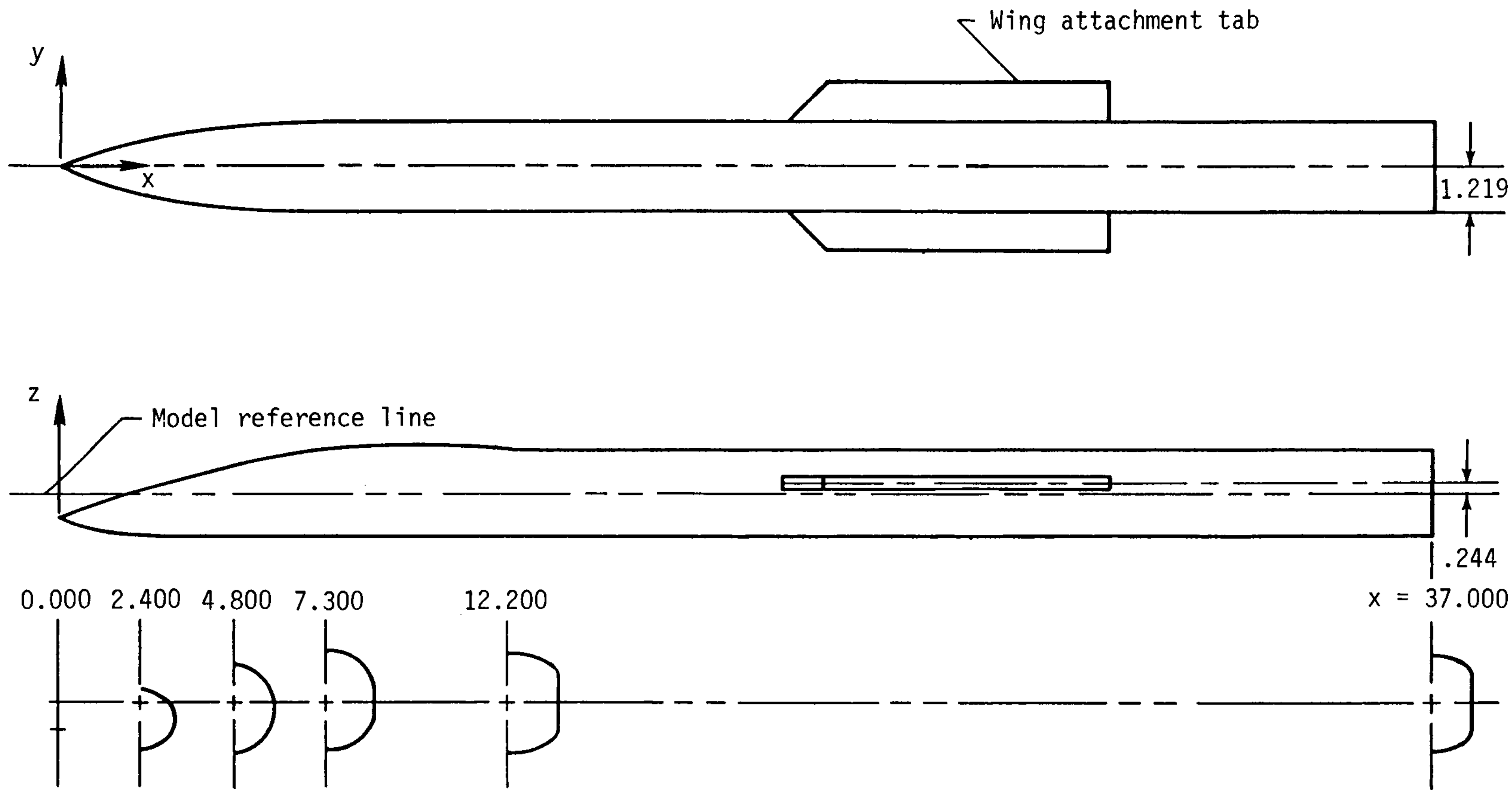


Figure 2. Sketch of fuselage geometry. Linear dimensions are given in inches.

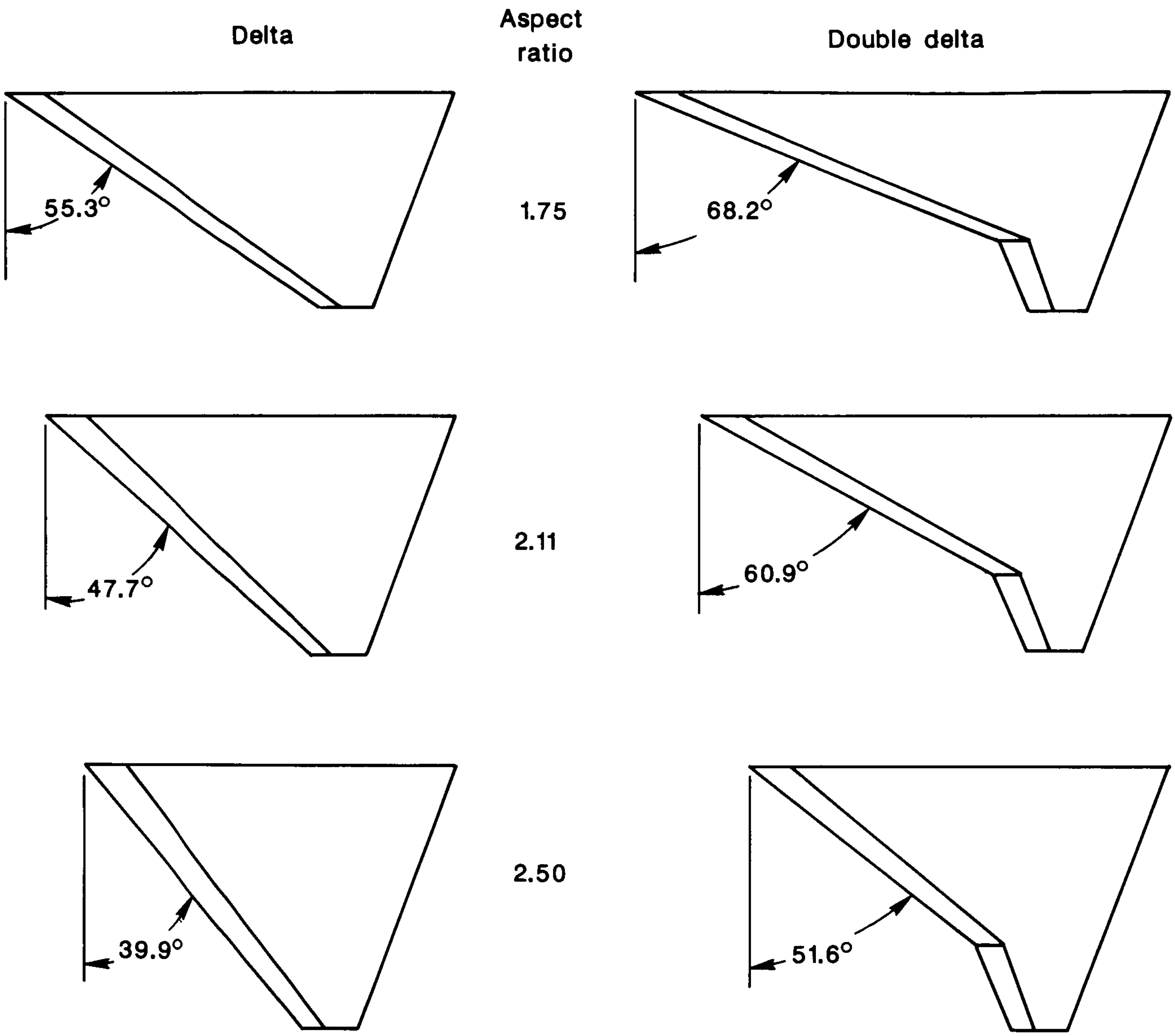
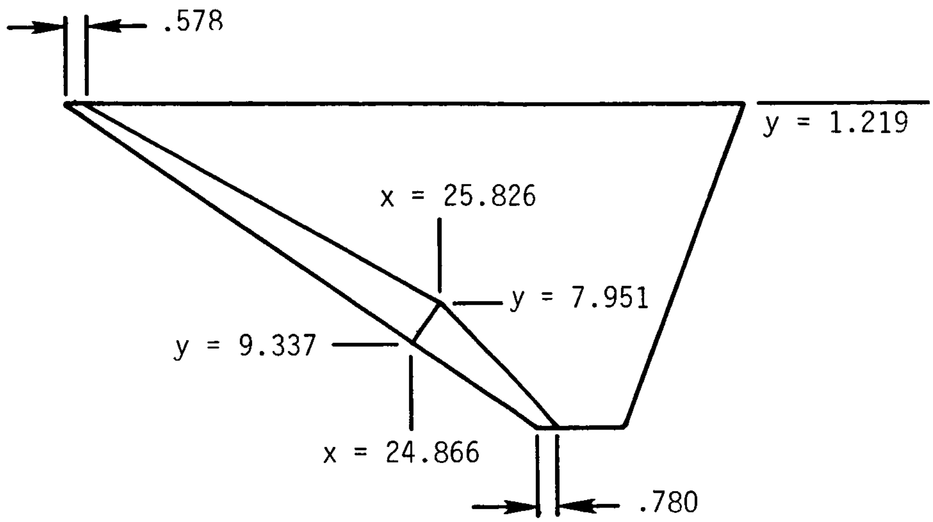
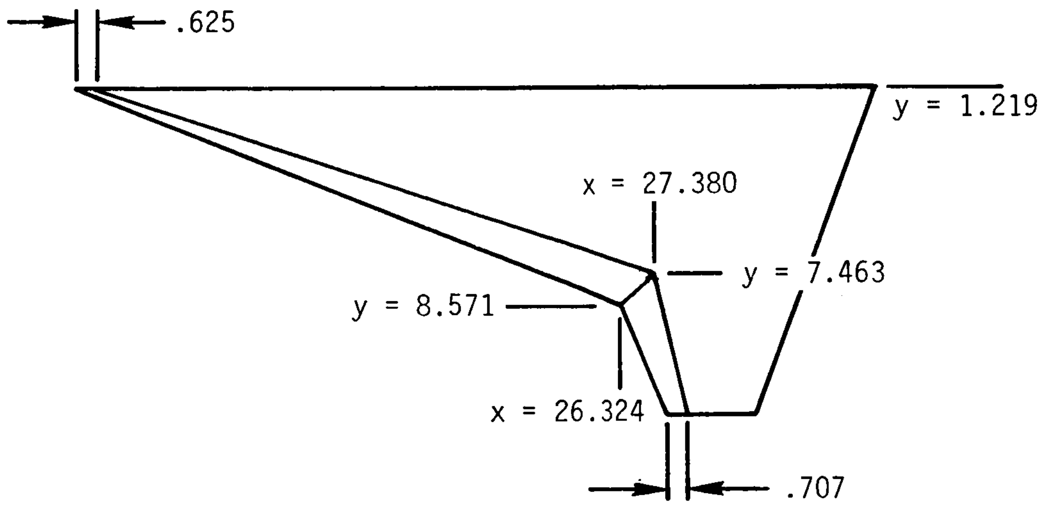


Figure 3. Geometry of exposed wing and primary leading-edge flap (flap A). See table I for dimensions.

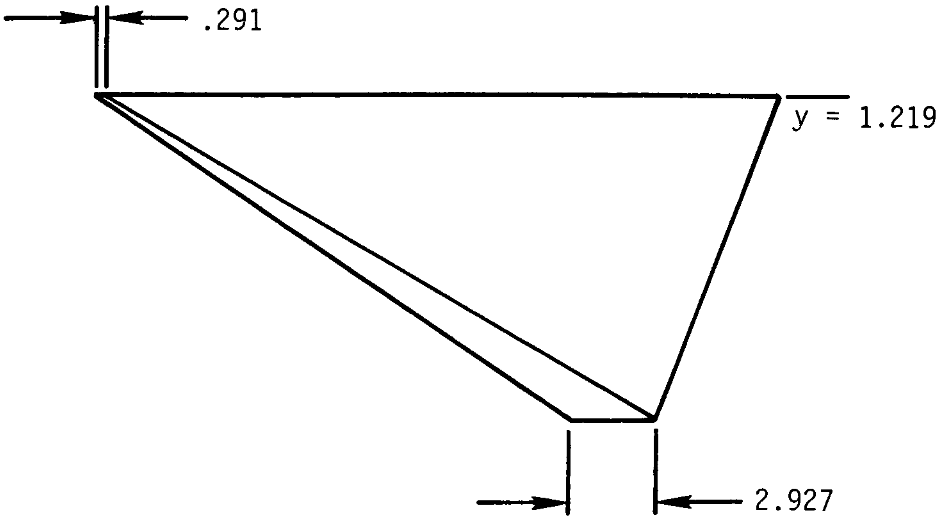


(a) Delta planform.

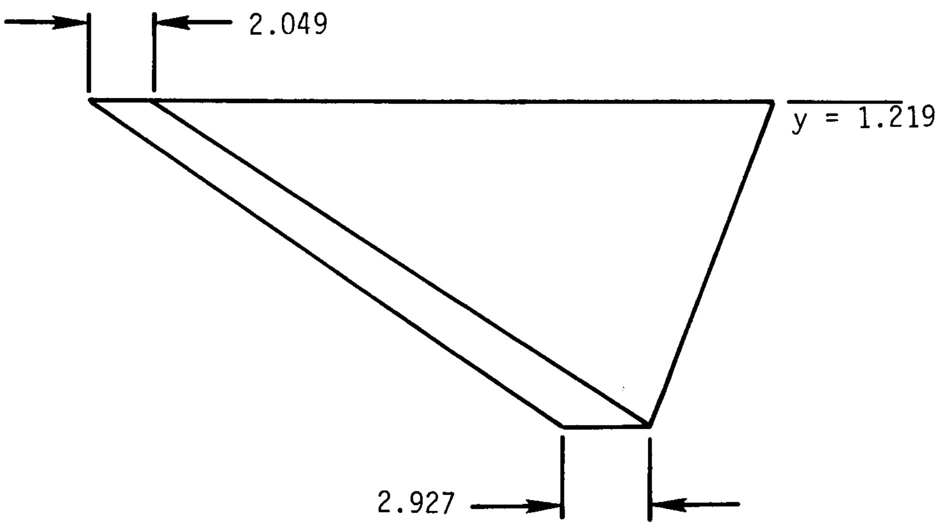


(b) Double-delta planform.

Figure 4. Geometry of alternate flap B for AR = 1.75 delta and double-delta planforms. Linear dimensions are given in inches.

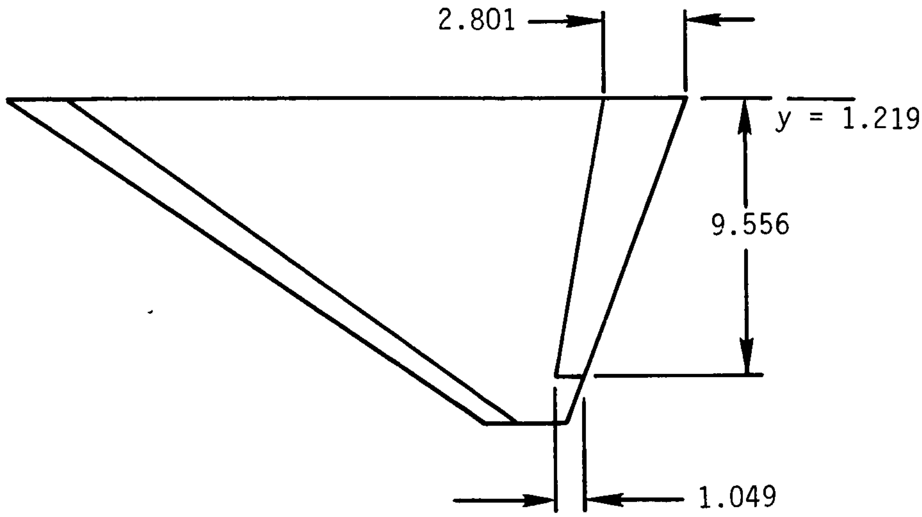


(a) Flap C.

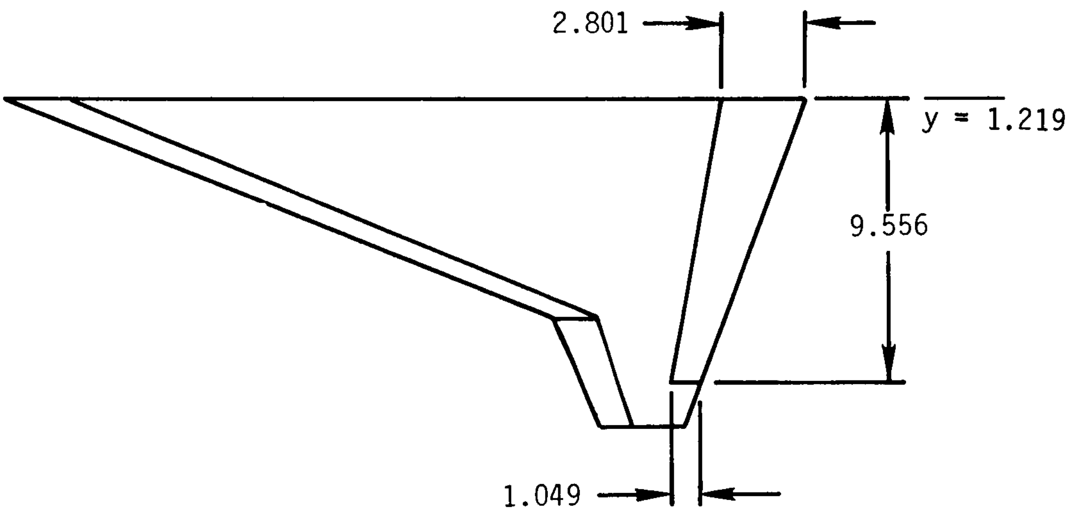


(b) Flap D.

Figure 5. Geometry of alternate flaps C and D for AR = 1.75 delta planform. Linear dimensions are given in inches.

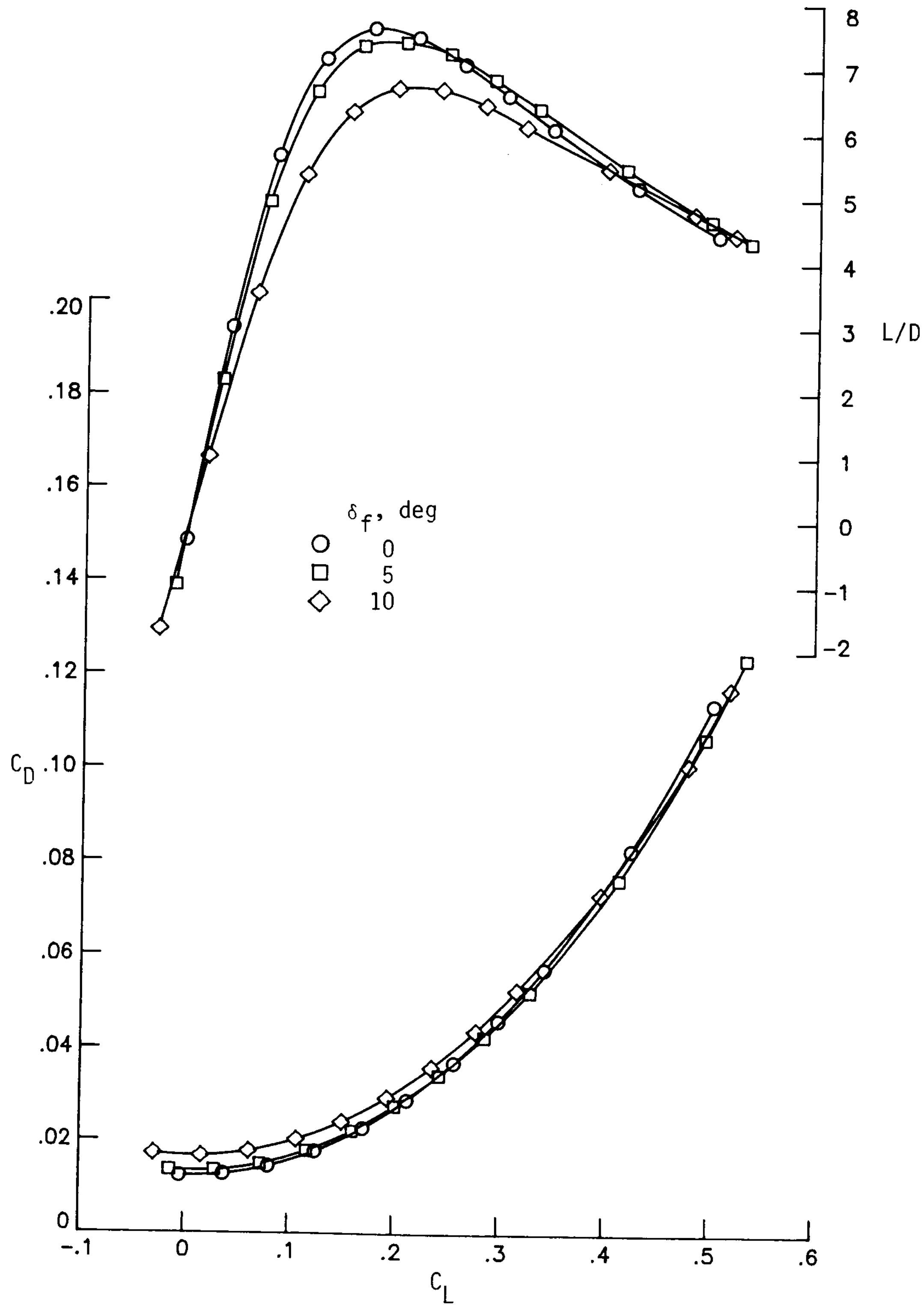


(a) Delta planform.



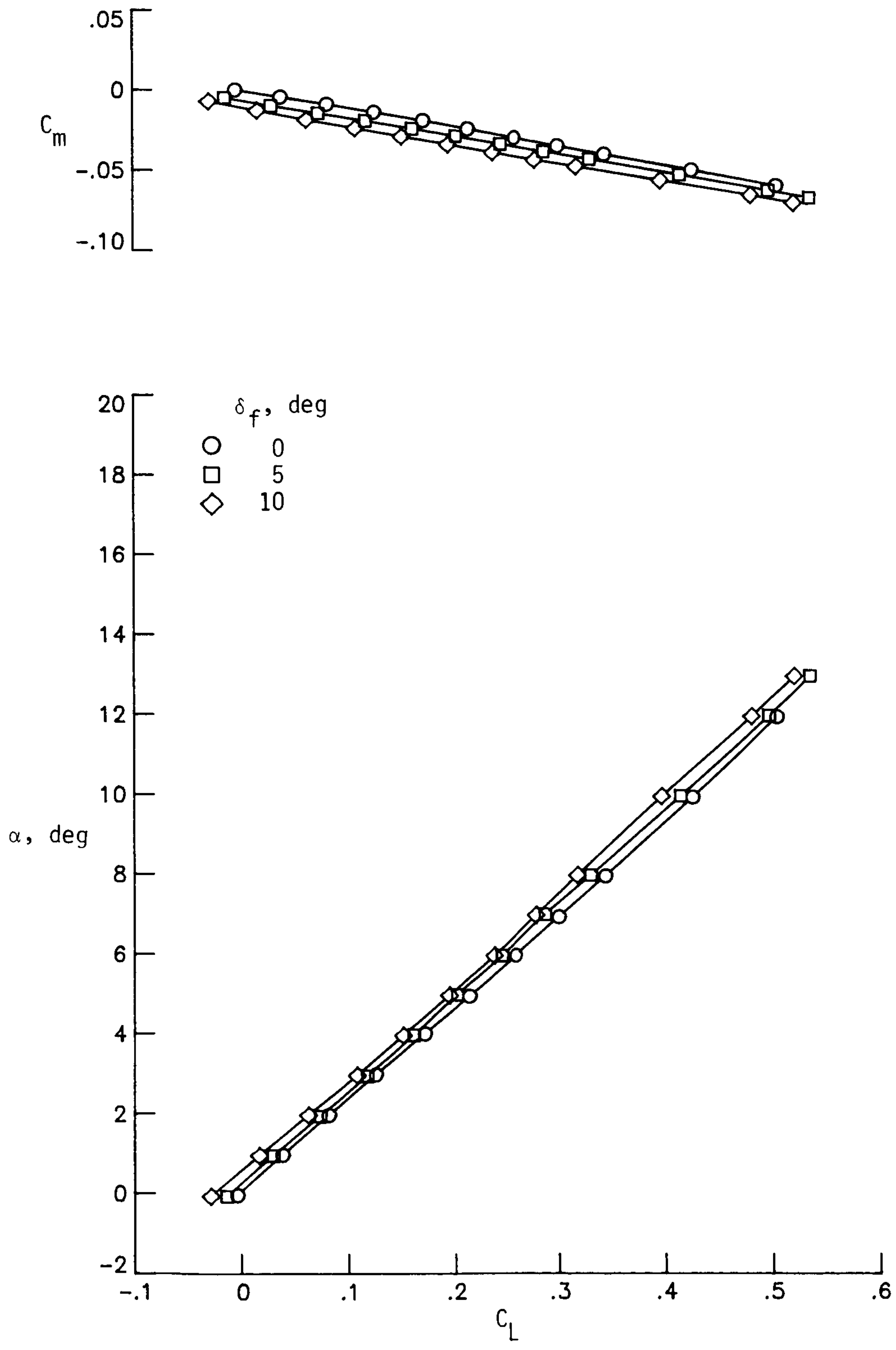
(b) Double-delta planform.

Figure 6. Geometry of trailing-edge flap for AR = 1.75 delta and double-delta planforms with primary leading-edge flap (flap A). Linear dimensions are given in inches.



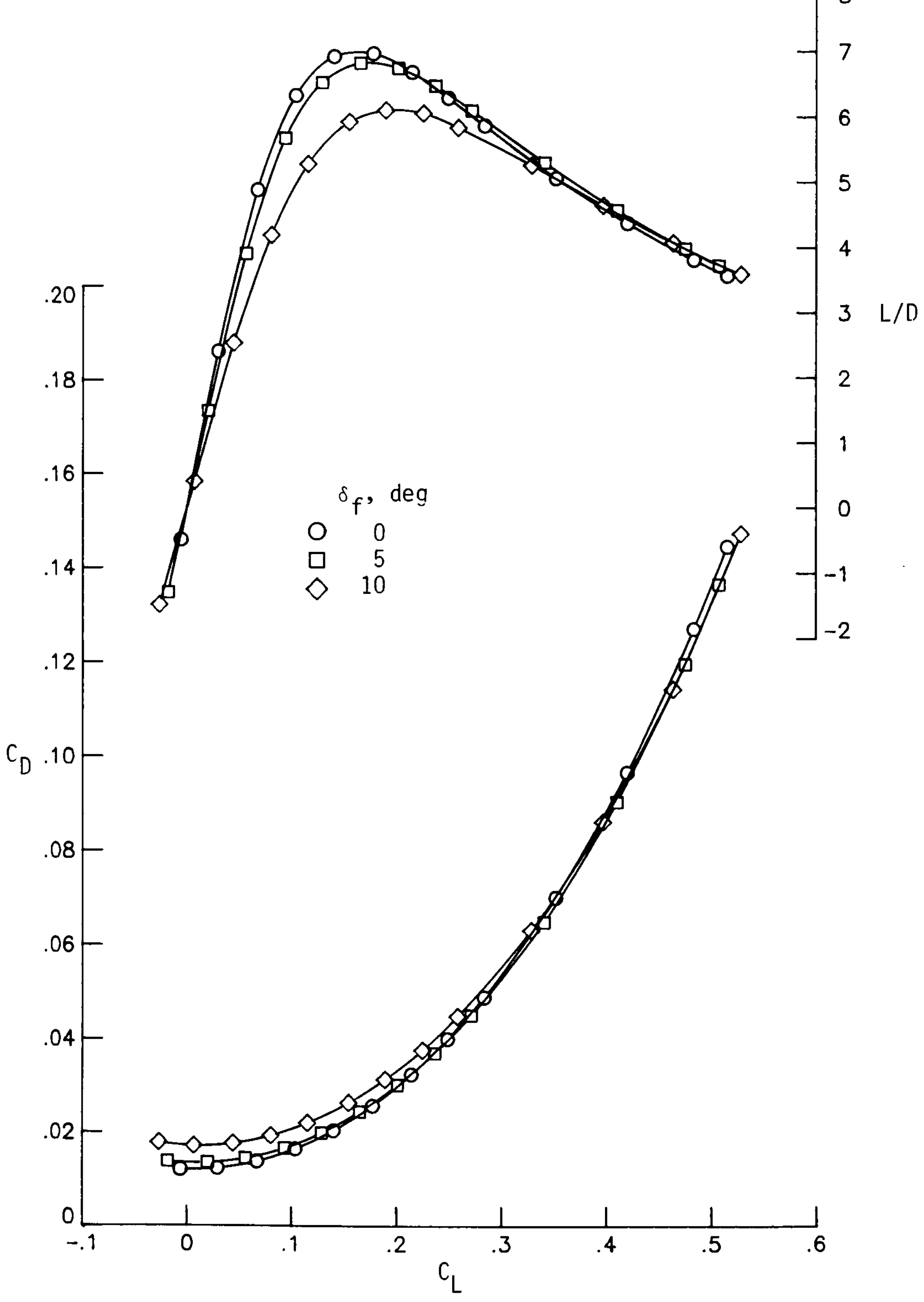
(a) $M = 1.60$.

Figure 7. Effect of primary leading-edge flap deflection on longitudinal aerodynamic characteristics of AR = 1.75 delta wing.



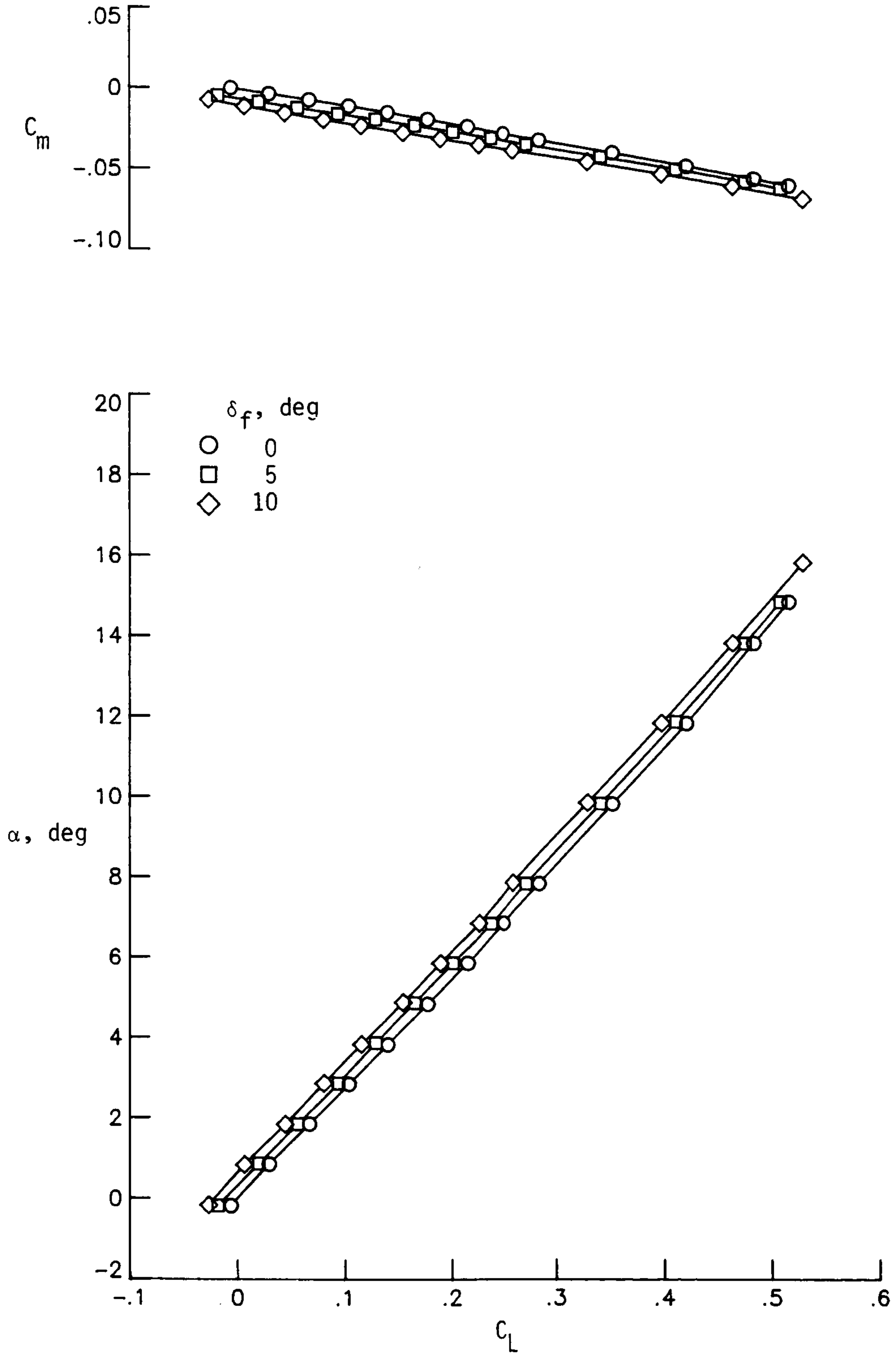
(a) Concluded.

Figure 7. Continued.



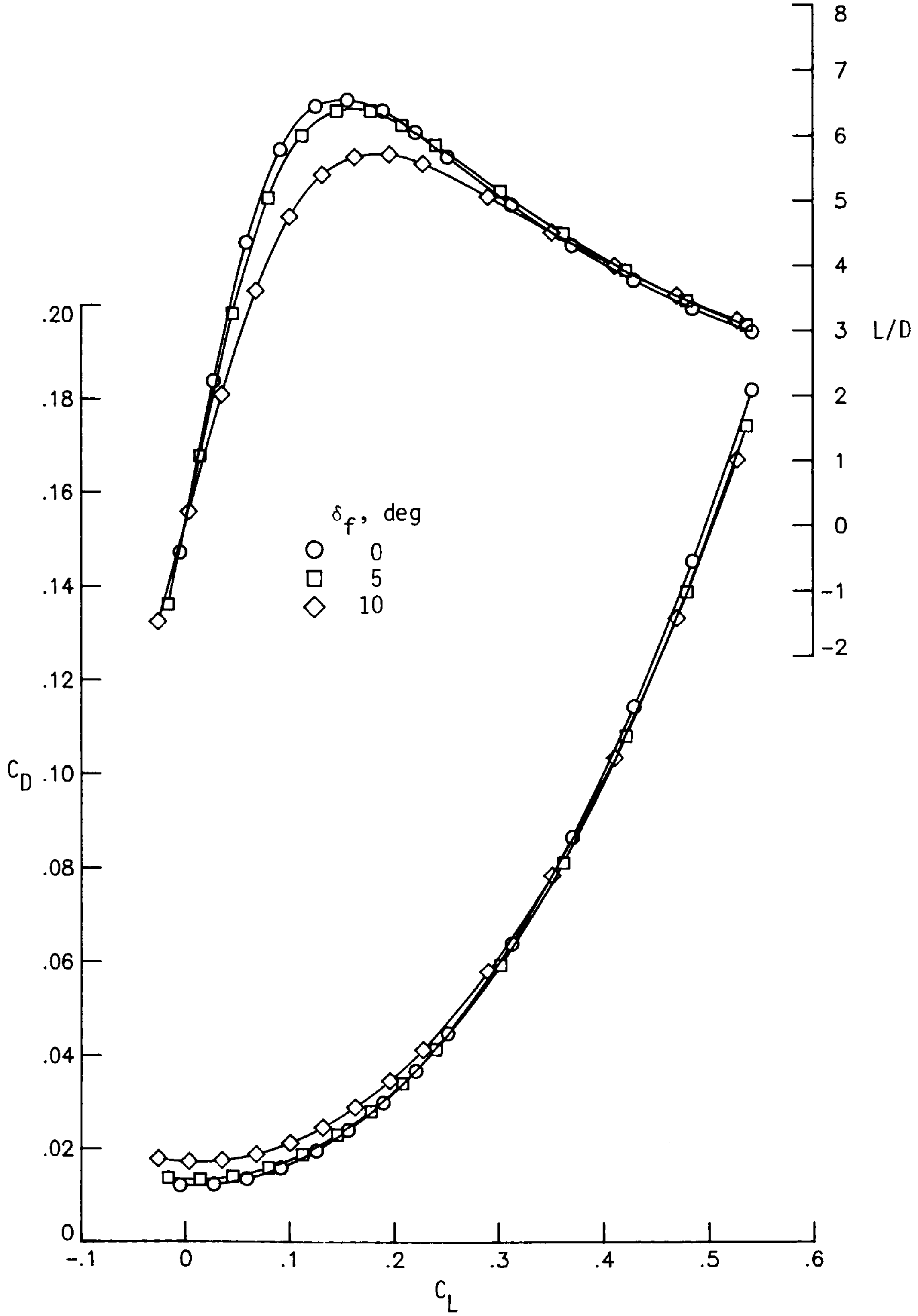
(b) $M = 1.90$.

Figure 7. Continued.



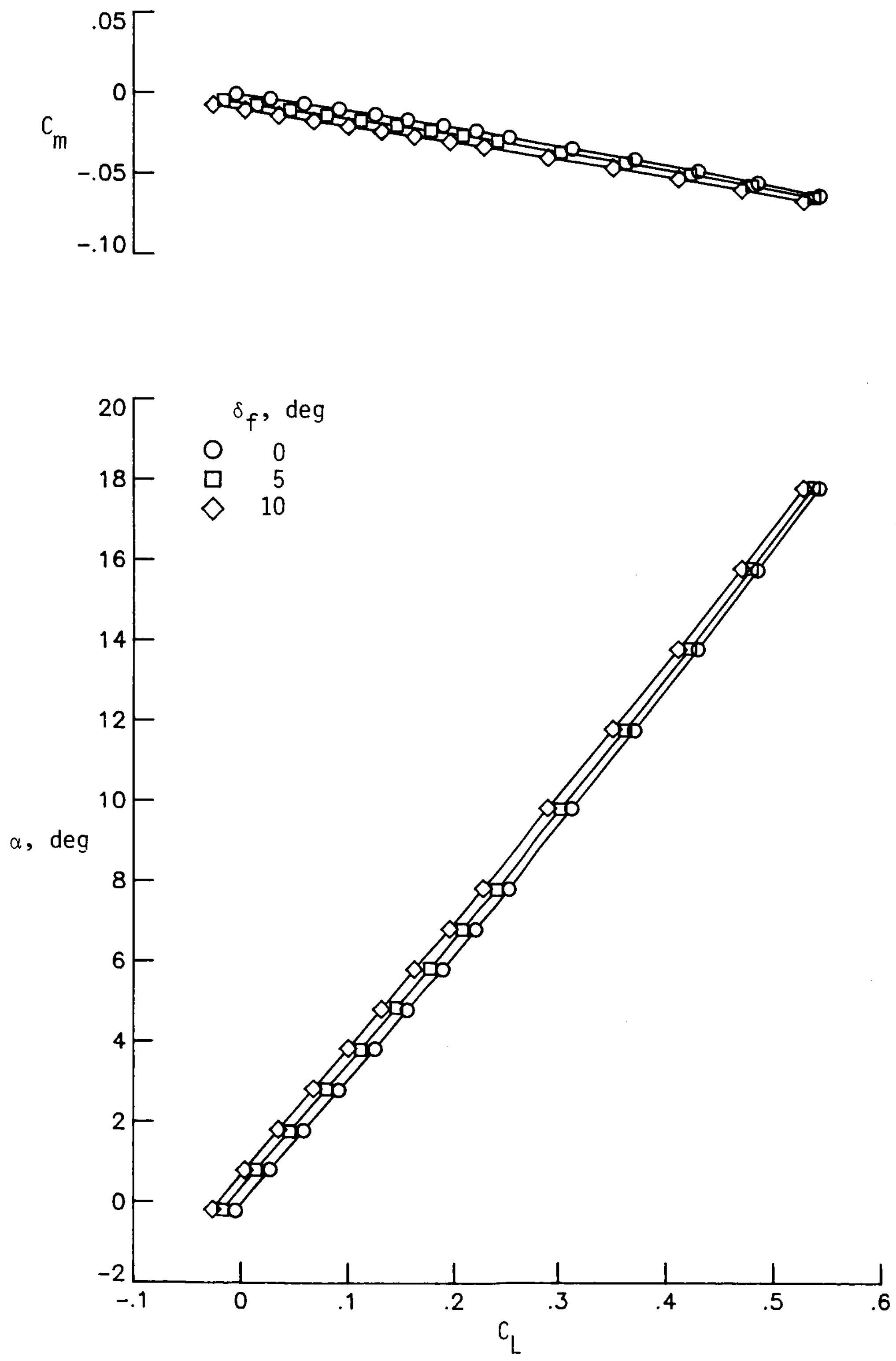
(b) Concluded.

Figure 7. Continued.



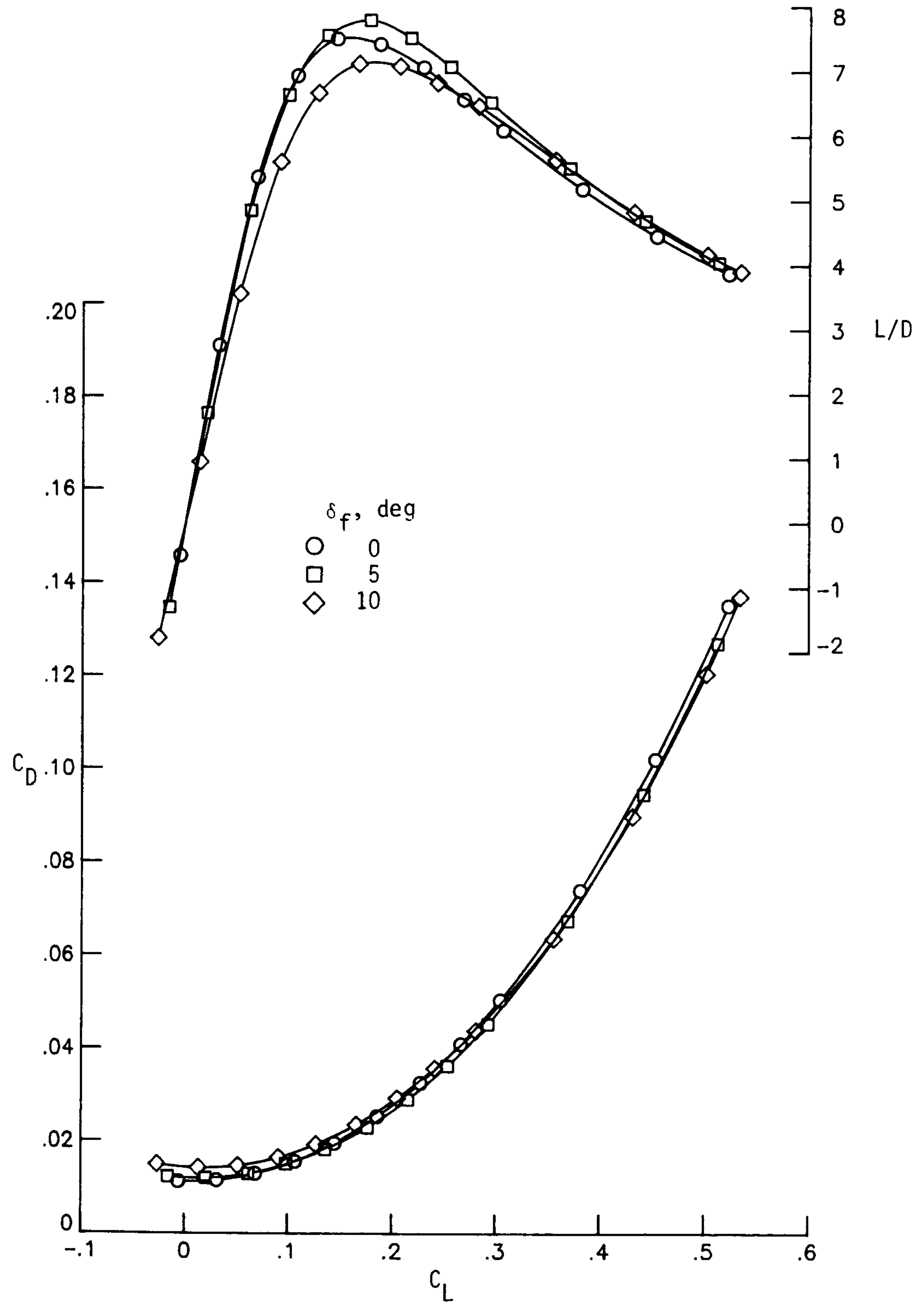
(c) $M = 2.16$.

Figure 7. Continued.



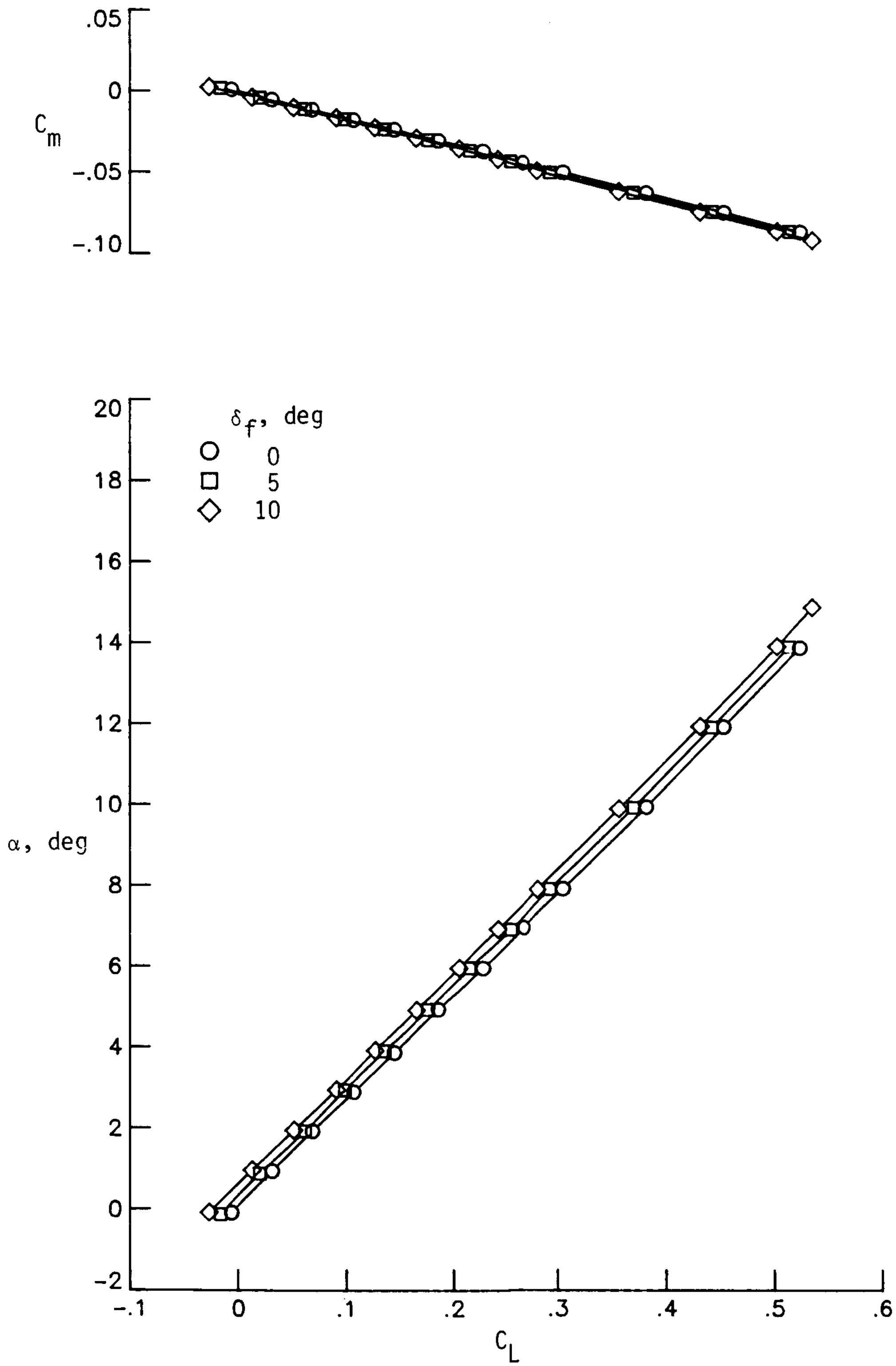
(c) Concluded.

Figure 7. Concluded.



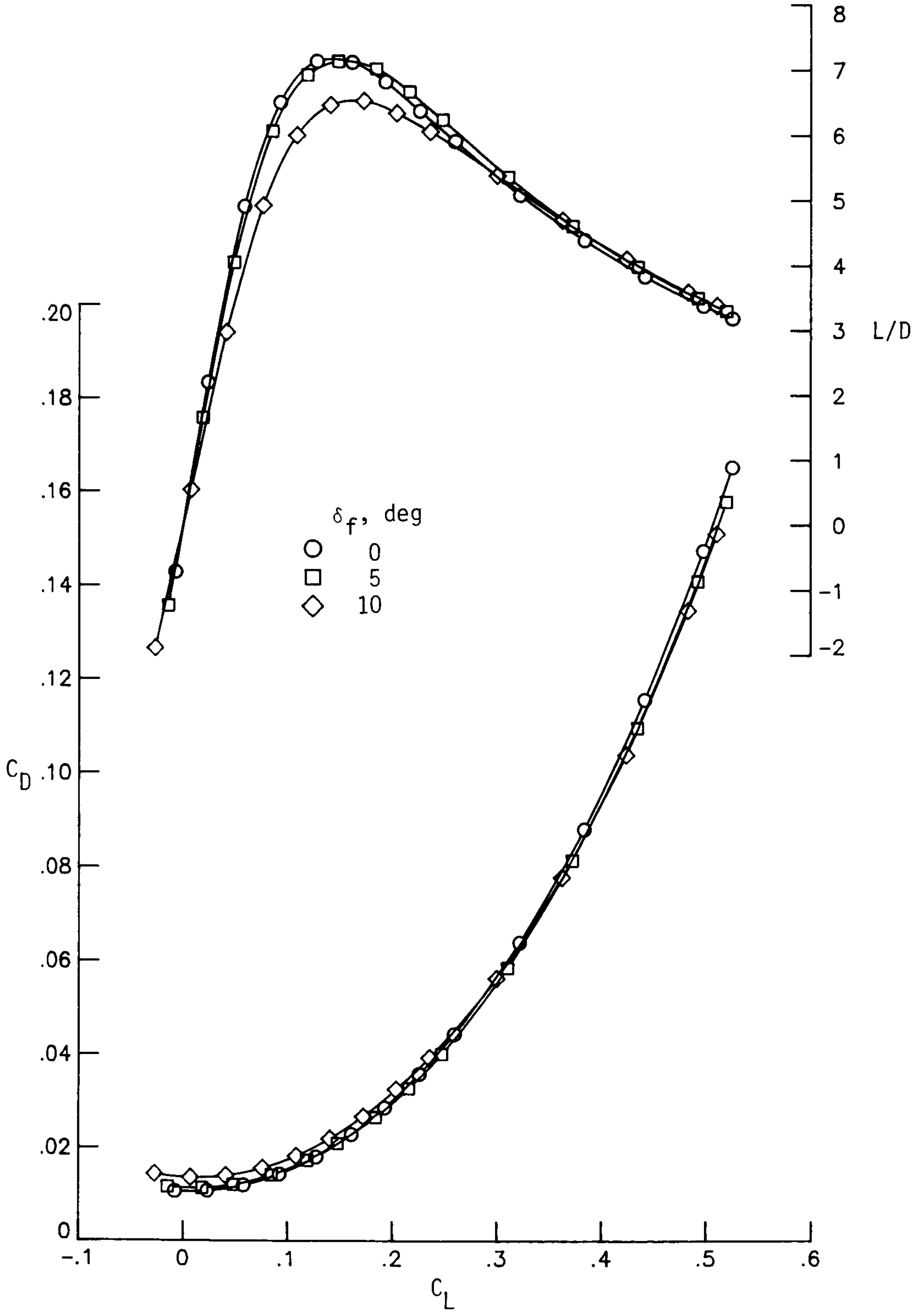
(a) $M = 1.60$.

Figure 8. Effect of primary leading-edge flap deflection on longitudinal aerodynamic characteristics of AR = 1.75 double-delta wing.



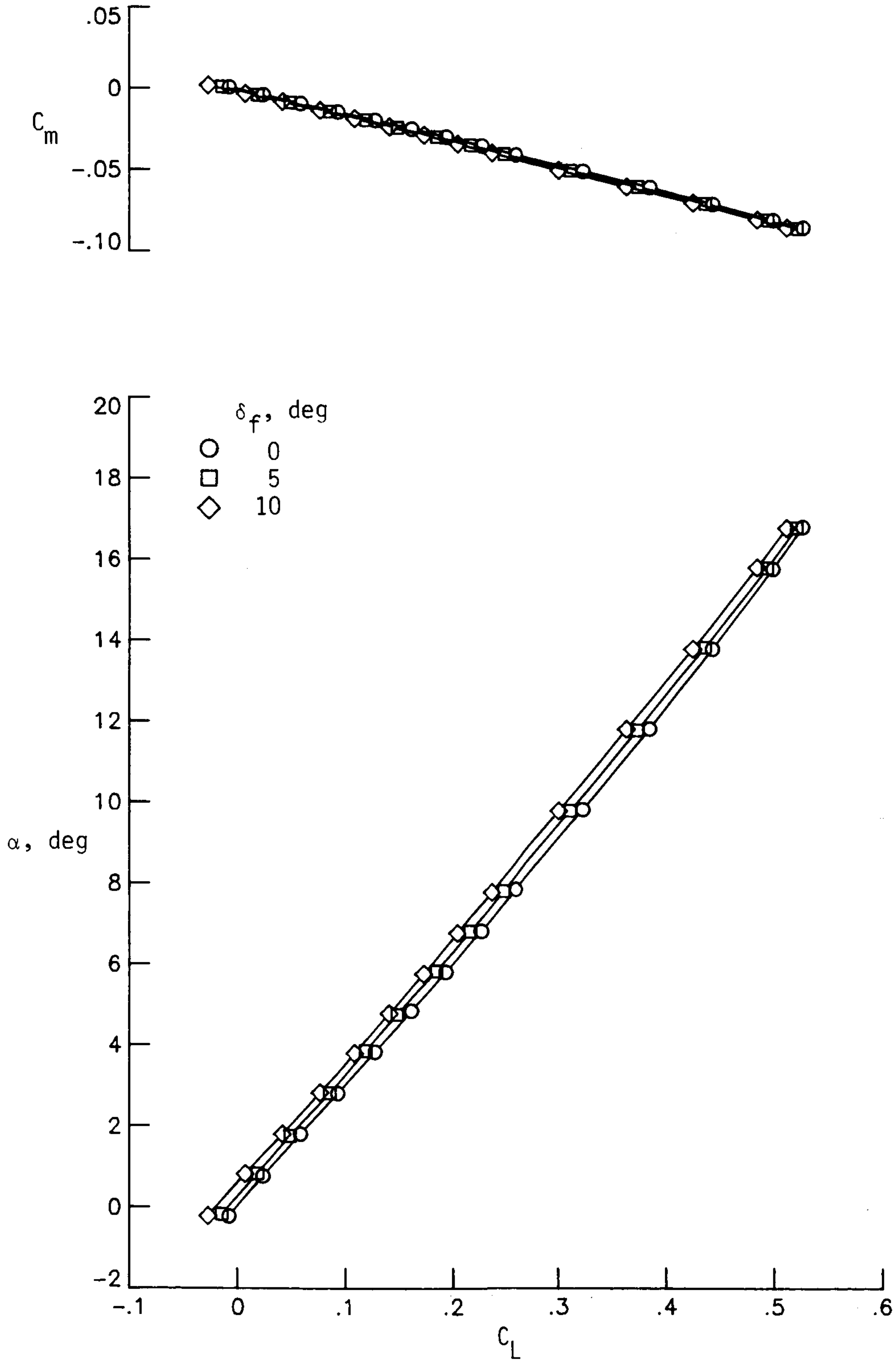
(a) Concluded.

Figure 8. Continued.



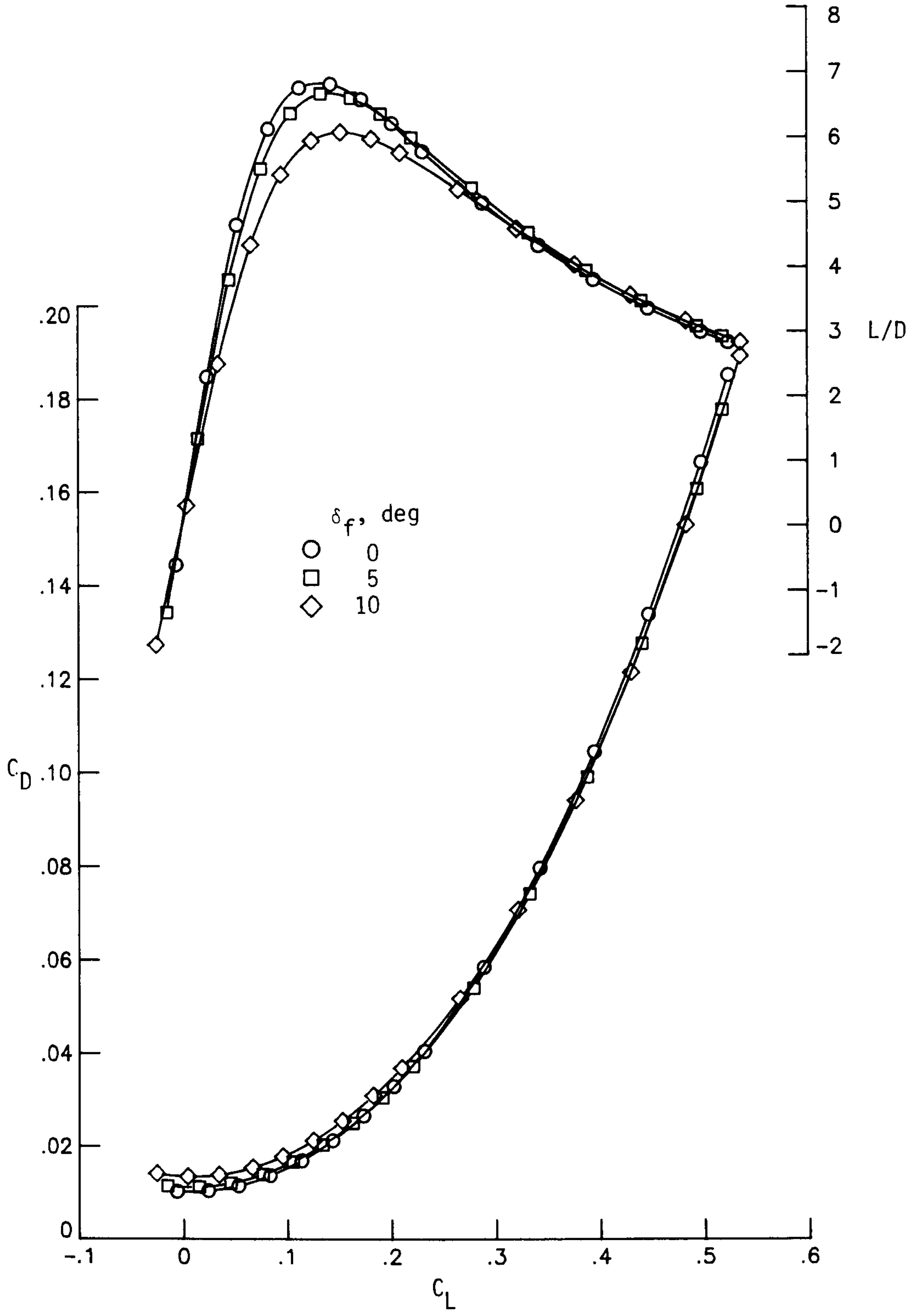
(b) $M = 1.90$.

Figure 8. Continued.



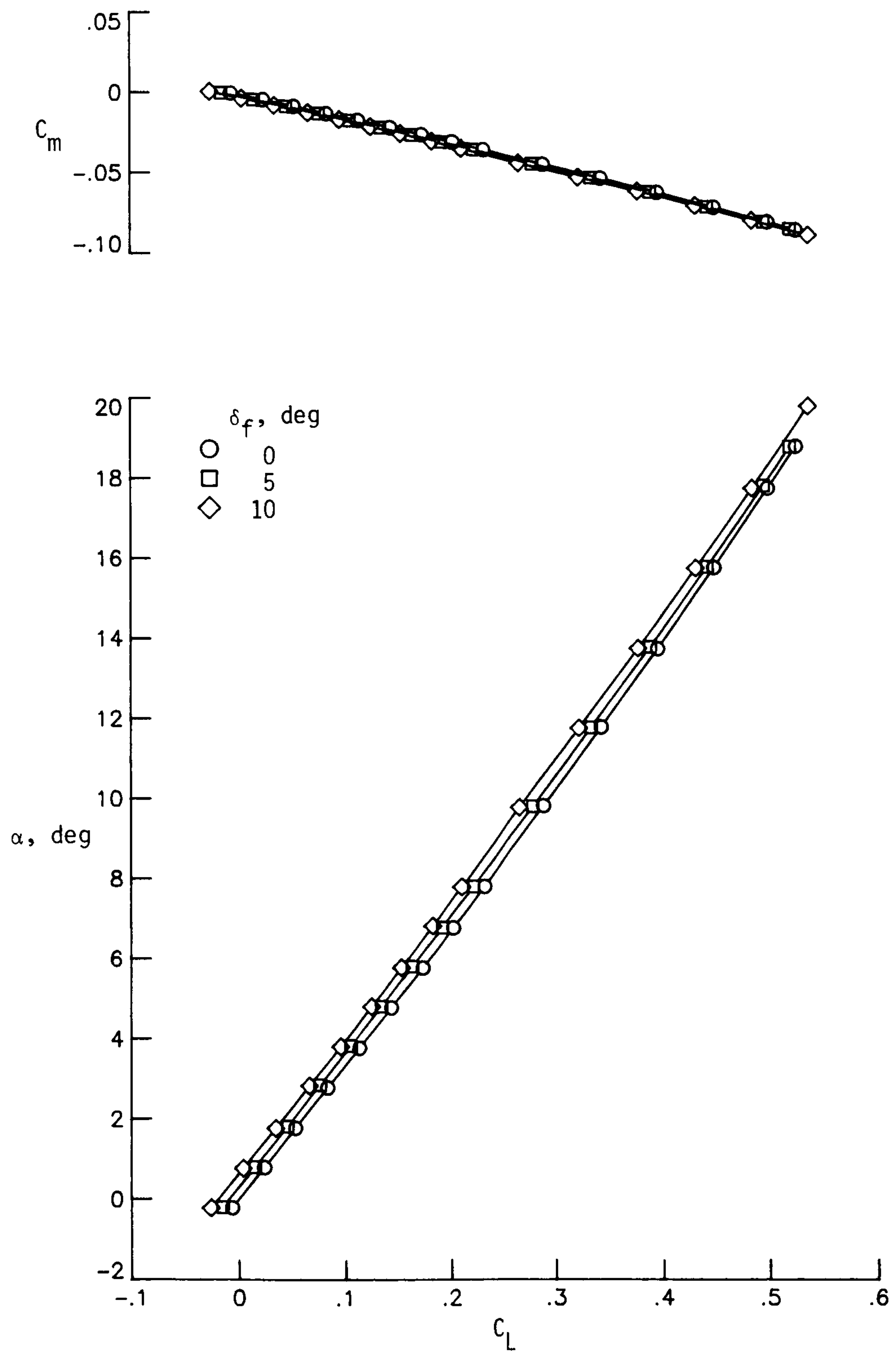
(b) Concluded.

Figure 8. Continued.



(c) $M = 2.16$.

Figure 8. Continued.



(c) Concluded.

Figure 8. Concluded.

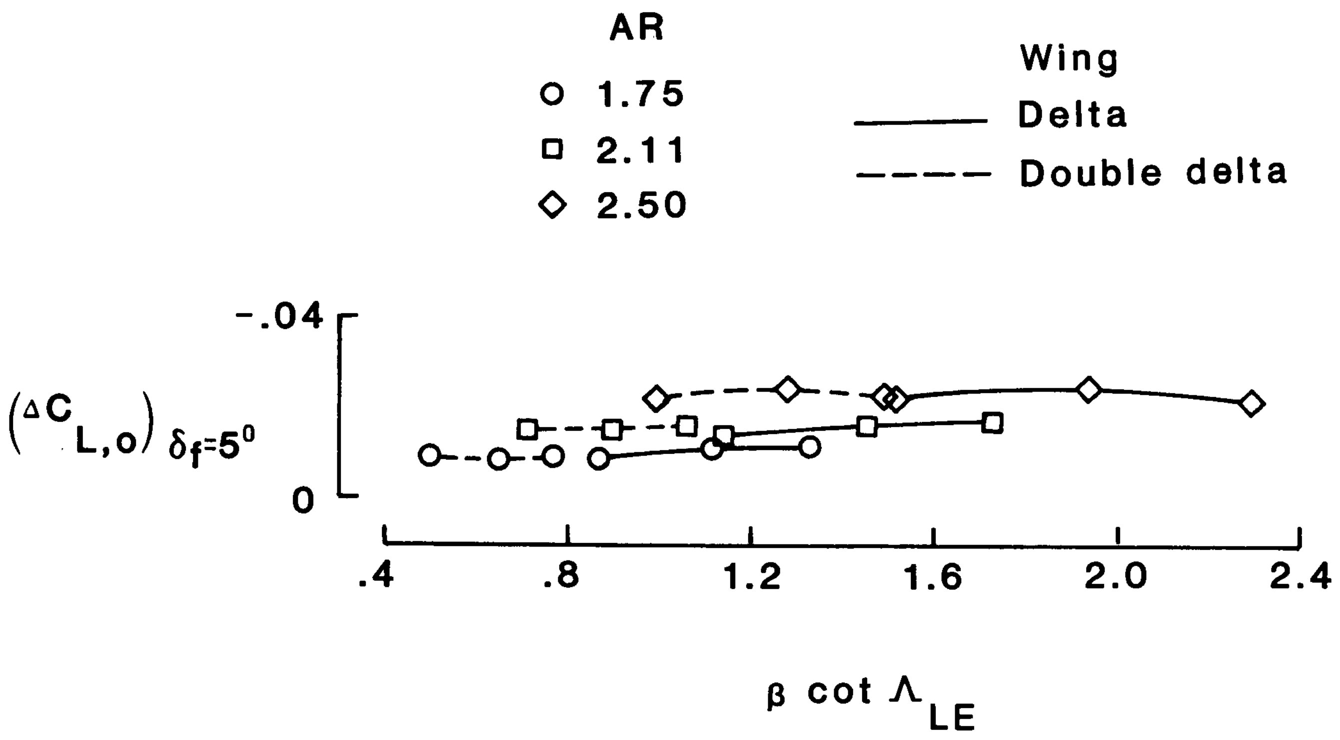


Figure 9. Lift-curve shift due to 5° deflection of primary leading-edge flap.

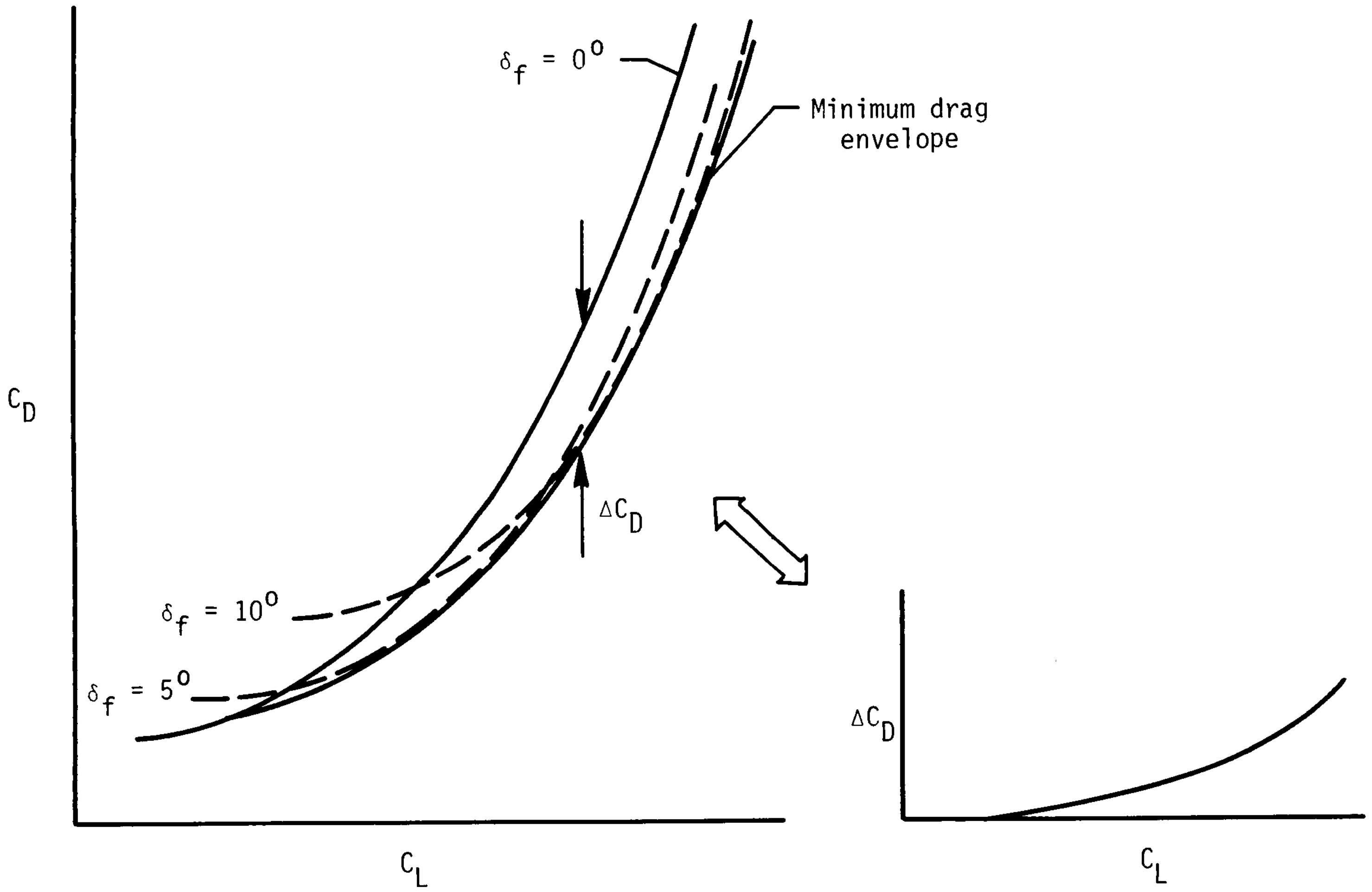


Figure 10. Incremental drag reduction ΔC_D due to leading-edge flap deflection.

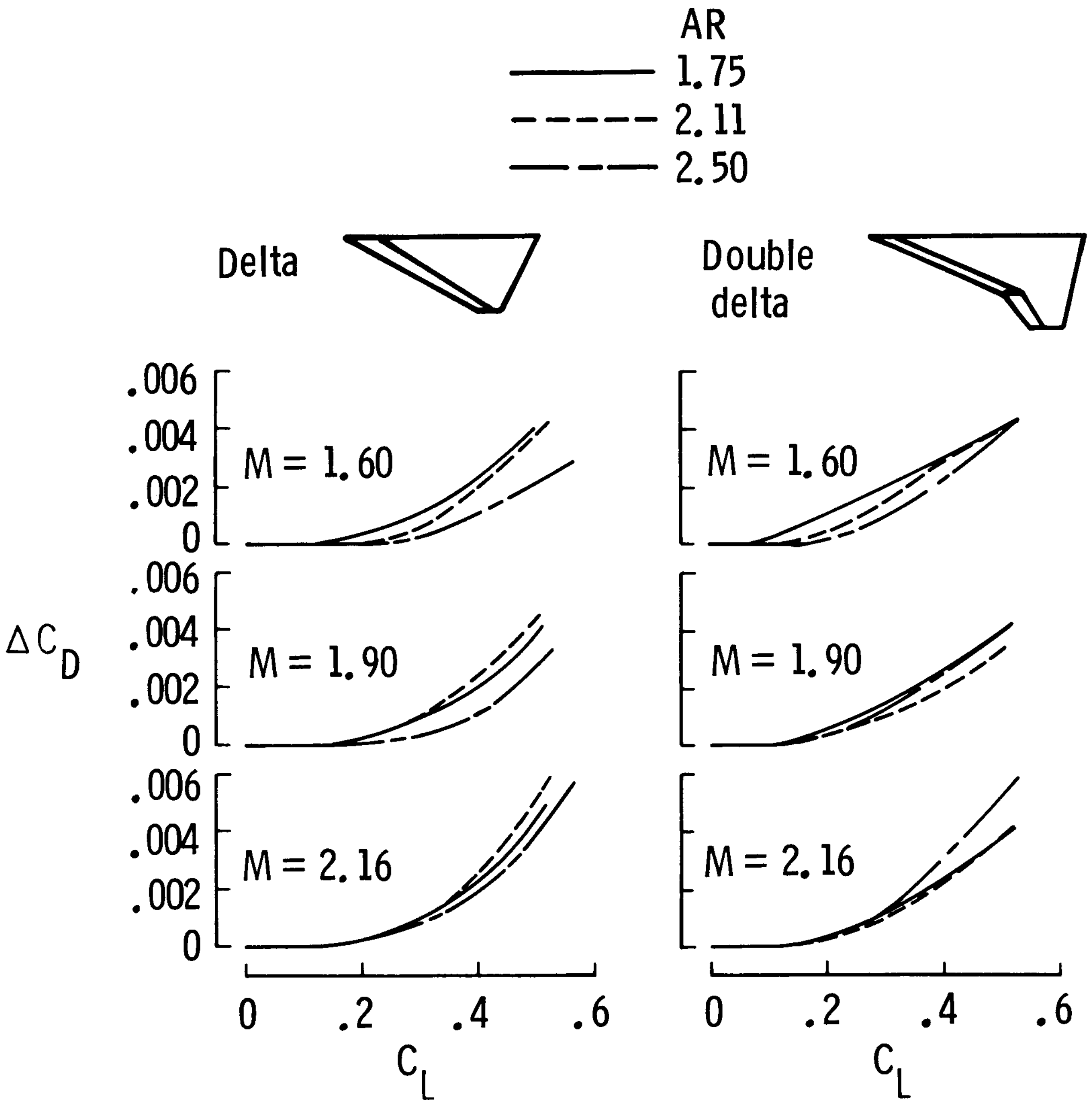


Figure 11. Drag reduction due to primary leading-edge flap deflection.

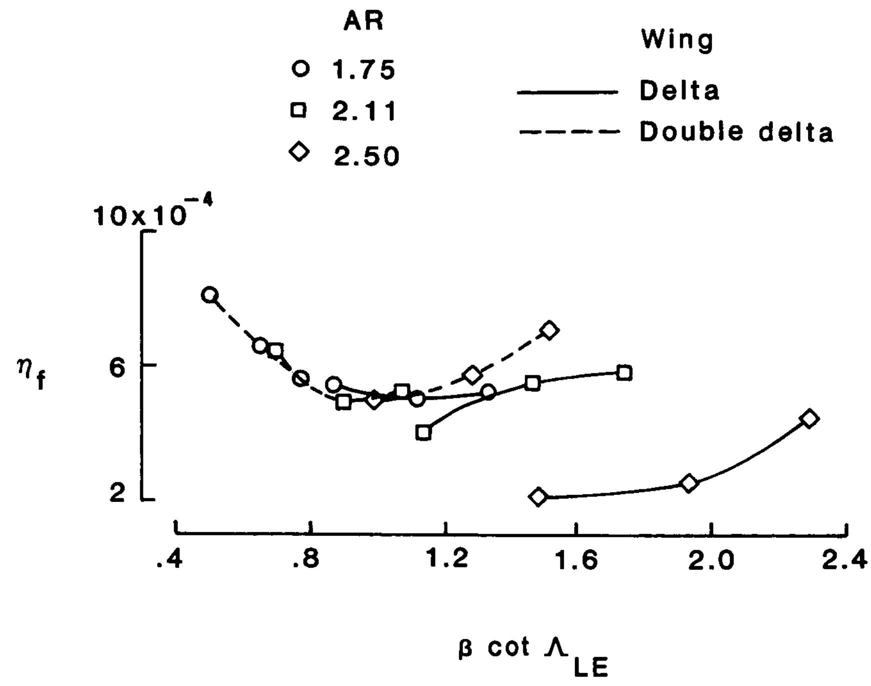


Figure 12. Comparison of flap performance parameter for primary leading-edge flaps.

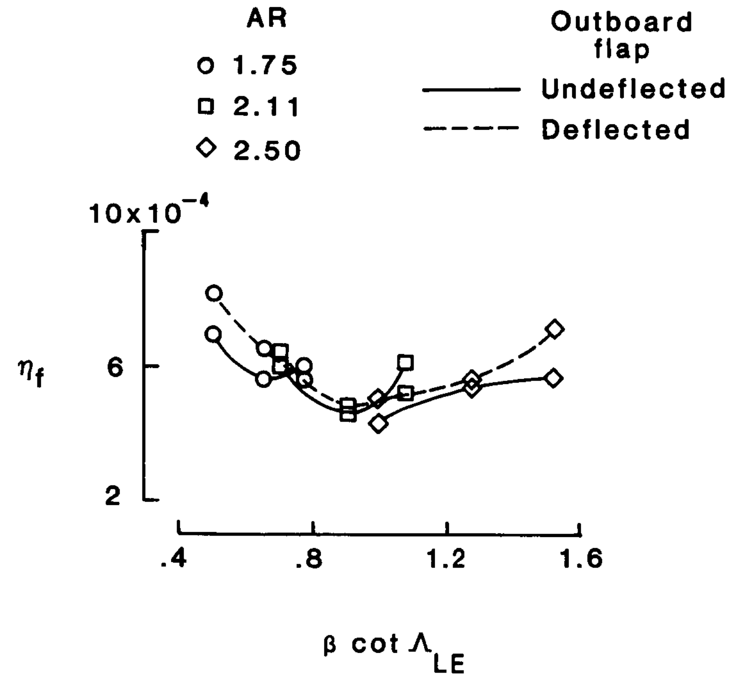


Figure 13. Effect of outboard flap segment on leading-edge-flap performance parameter for double-delta planforms.

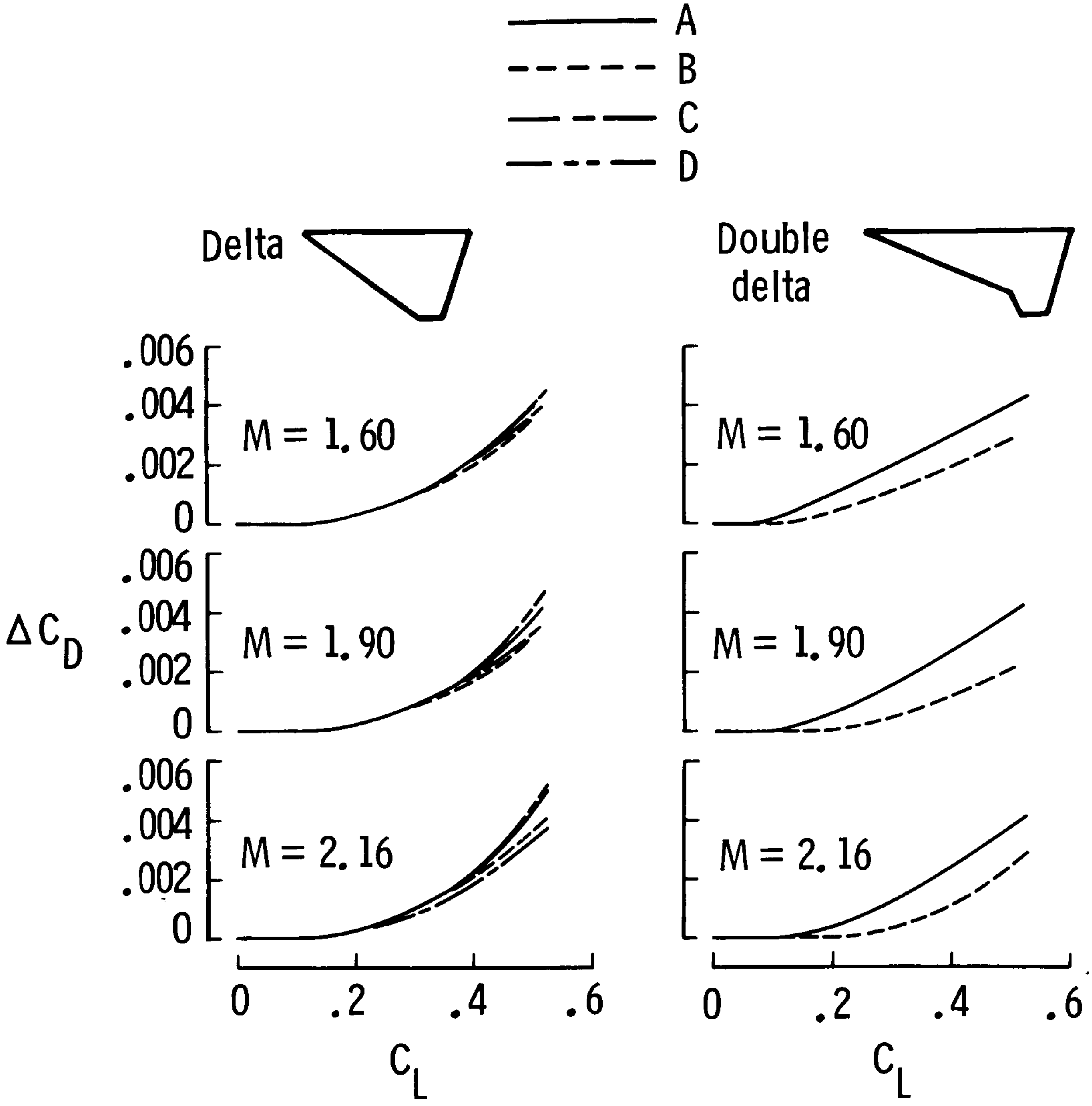


Figure 14. Comparison of primary and alternate leading-edge flap performance. AR = 1.75.

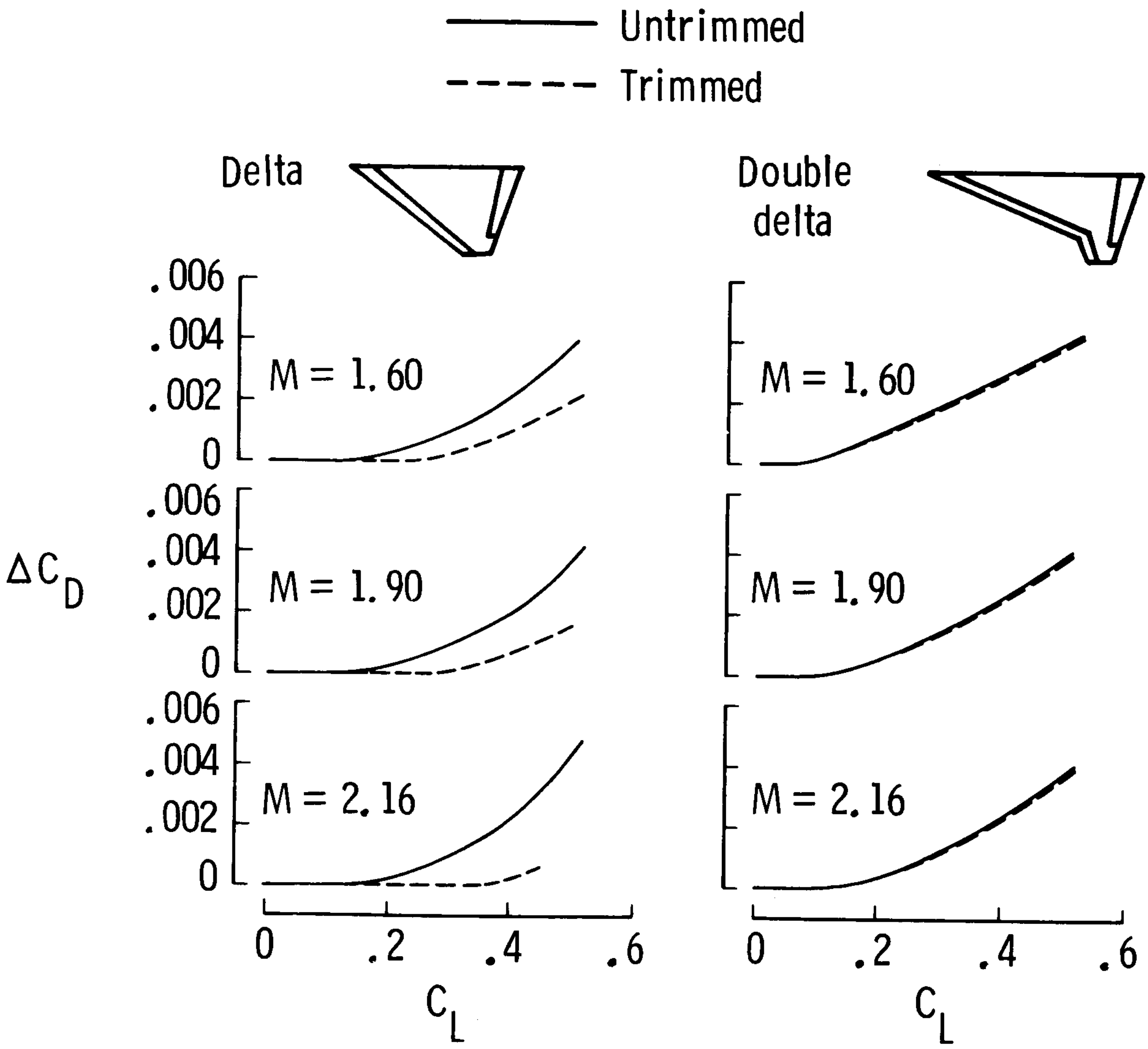


Figure 15. Effect of trimmed flight requirements on primary leading-edge flap performance for AR = 1.75 wings.

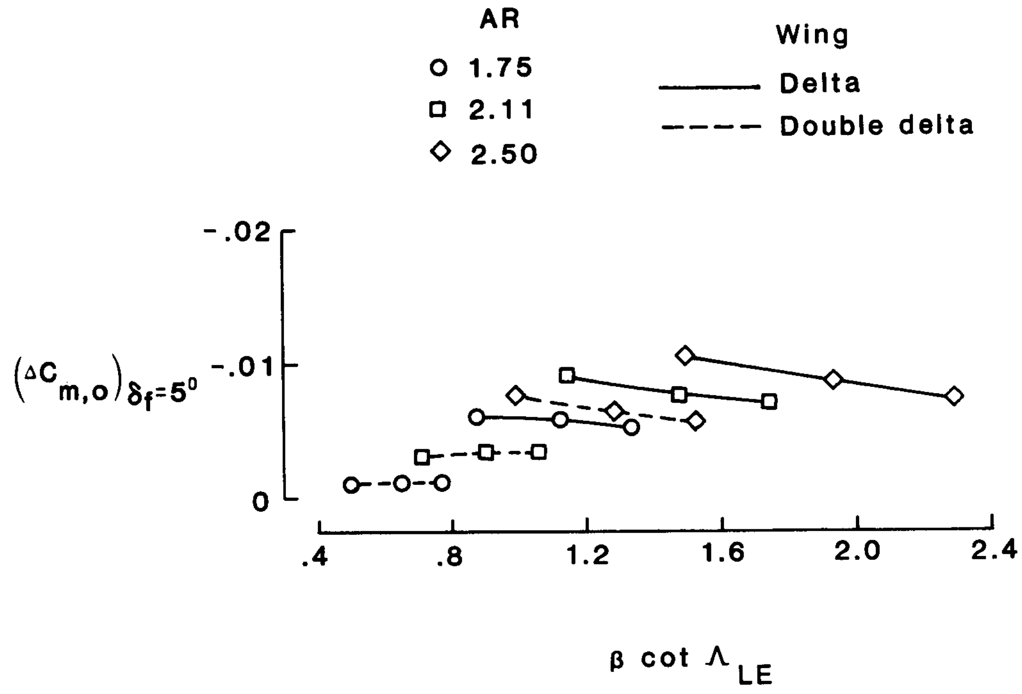


Figure 16. Pitching-moment shift due to 5° deflection of primary leading-edge flap.

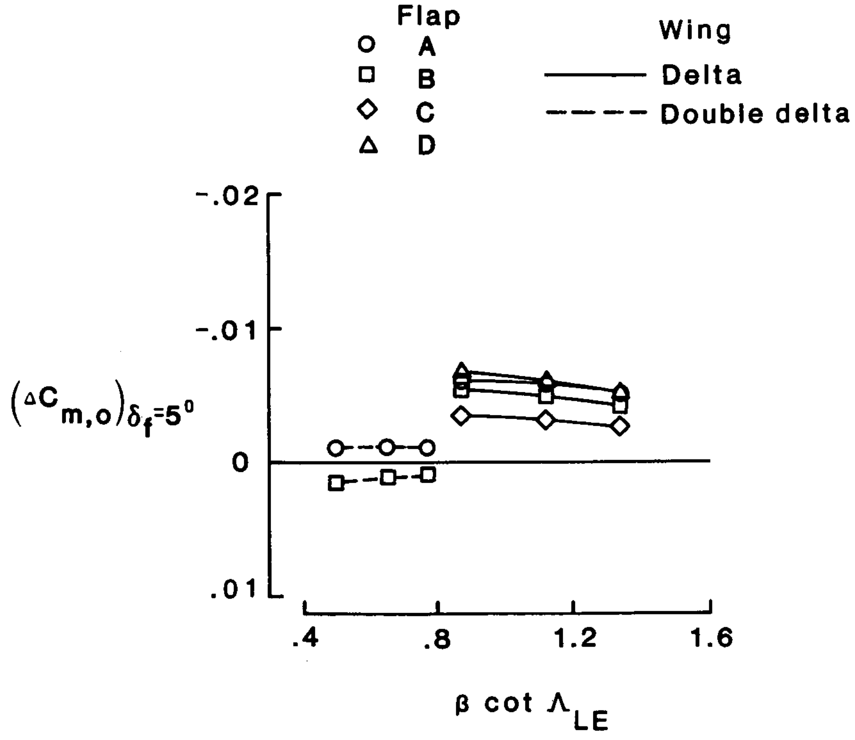
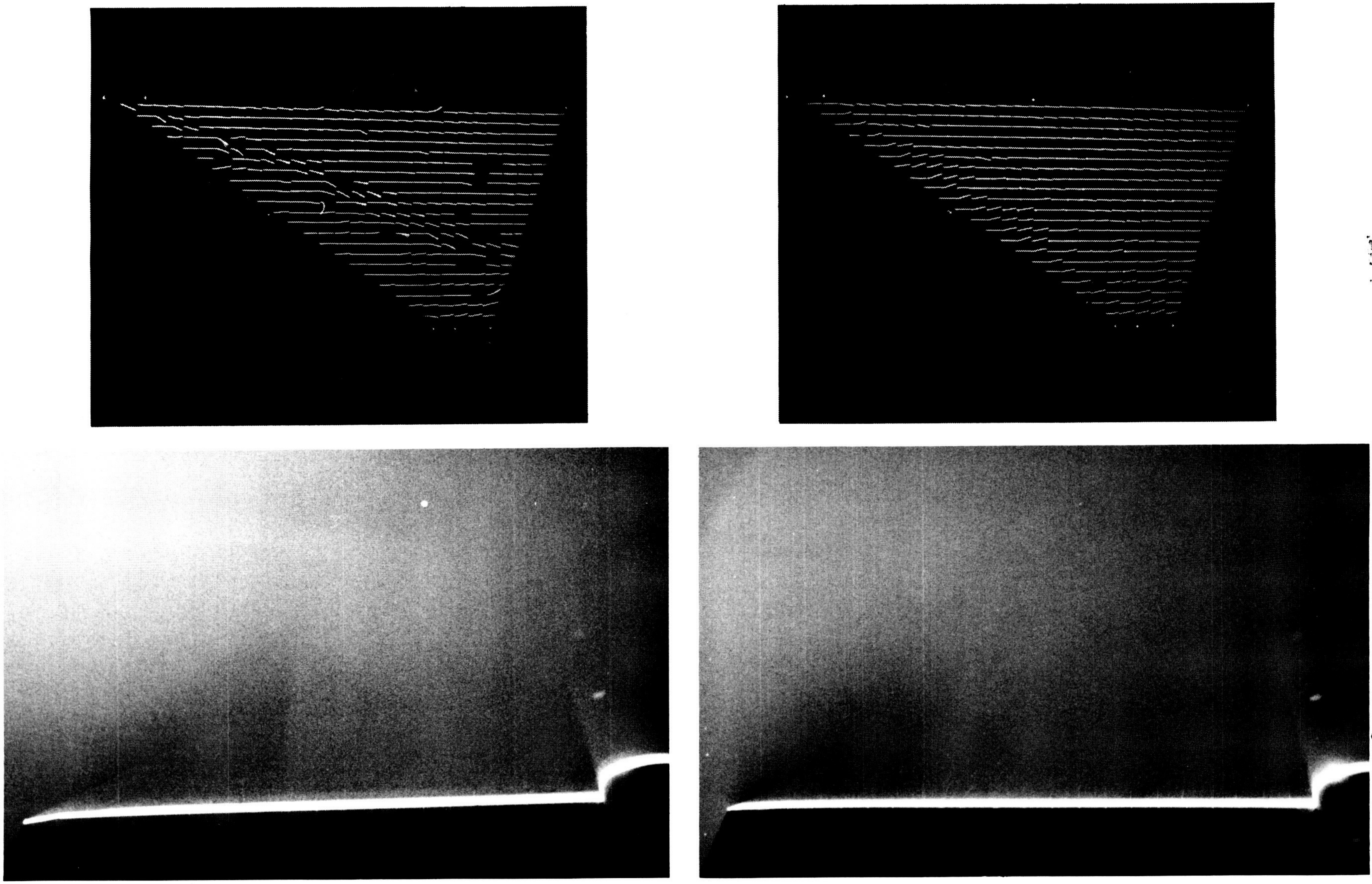


Figure 17. Pitching-moment shift due to 5° deflection of primary and alternate leading-edge flaps on AR = 1.75 wings.



$\delta_f = 0^\circ$ $\delta_f = 5^\circ$

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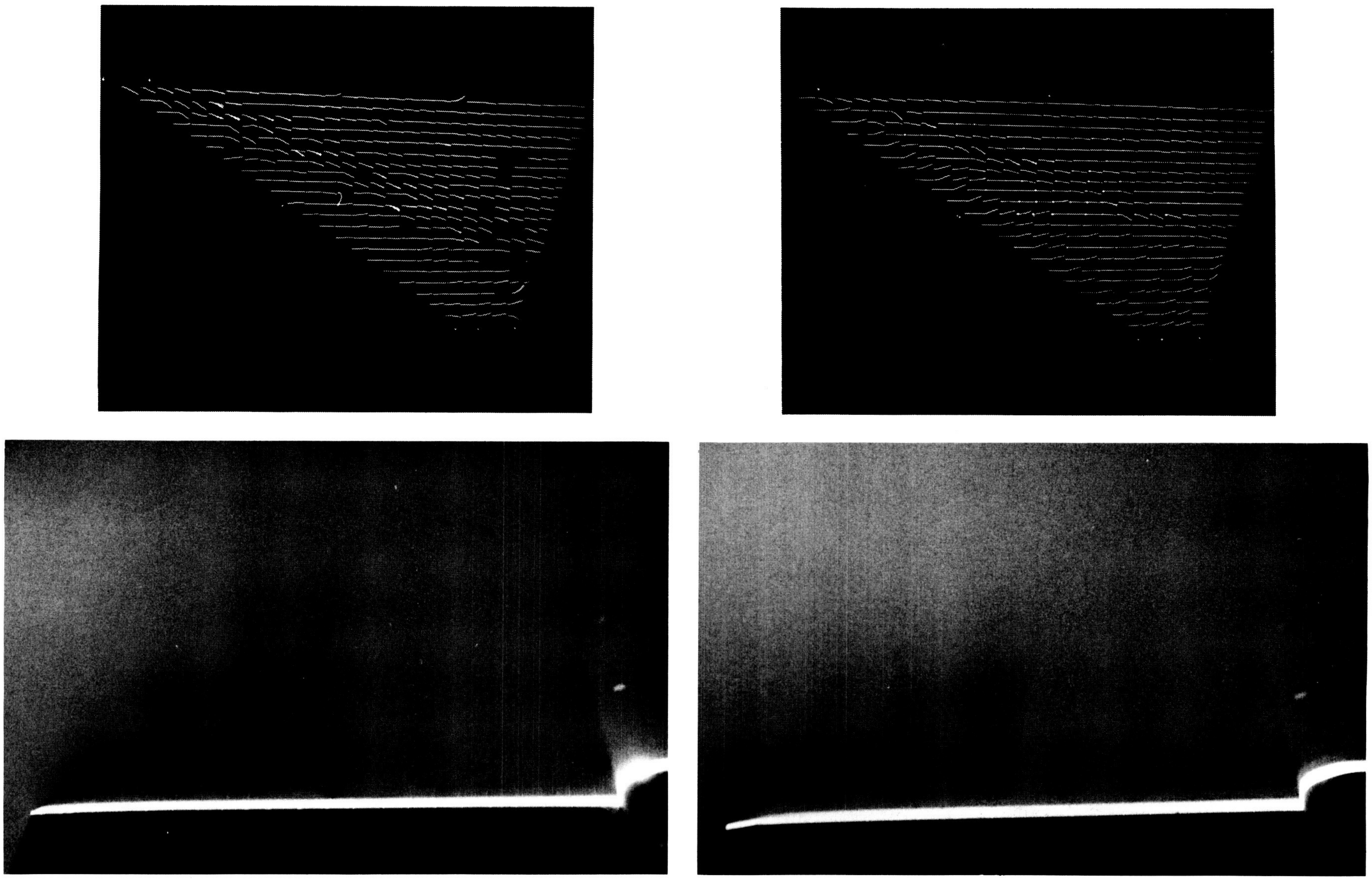
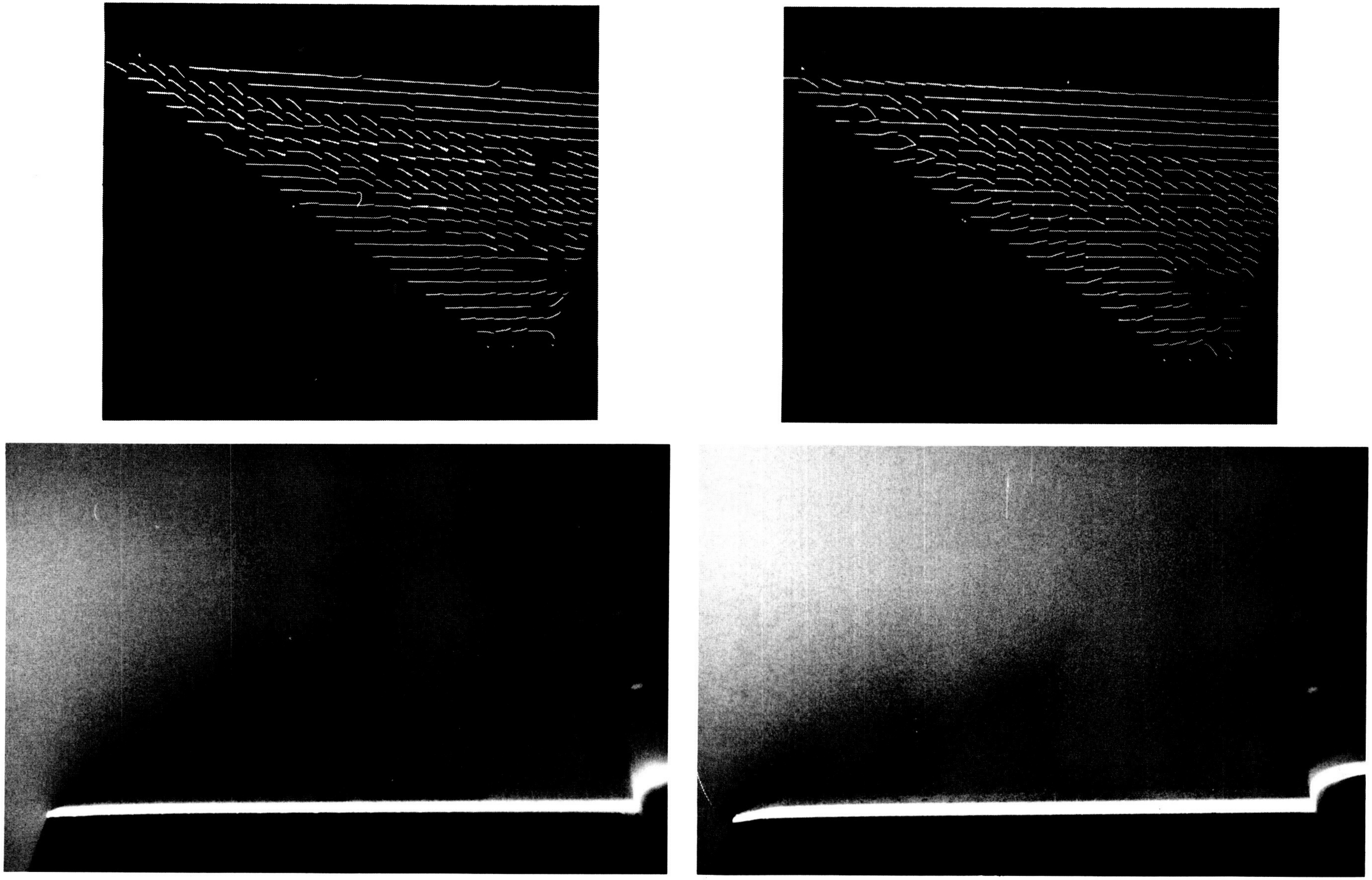
Figure 18. Tuft and vapor-screen photographs for AR = 1.75 delta wing with $C_L = 0.2$ and $M = 1.90$.



$\delta_f = 0^\circ$ $\delta_f = 5^\circ$

L-85-13,913

Figure 19. Tuft and vapor-screen photographs for AR = 1.75 delta wing with $C_L = 0.3$ and $M = 1.90$.



$\delta_f = 0^{\circ}$ $\delta_f = 5^{\circ}$

L-85-13,910

Figure 20. Tuft and vapor-screen photographs for AR = 1.75 delta wing with $C_L = 0.4$ and $M = 1.90$.

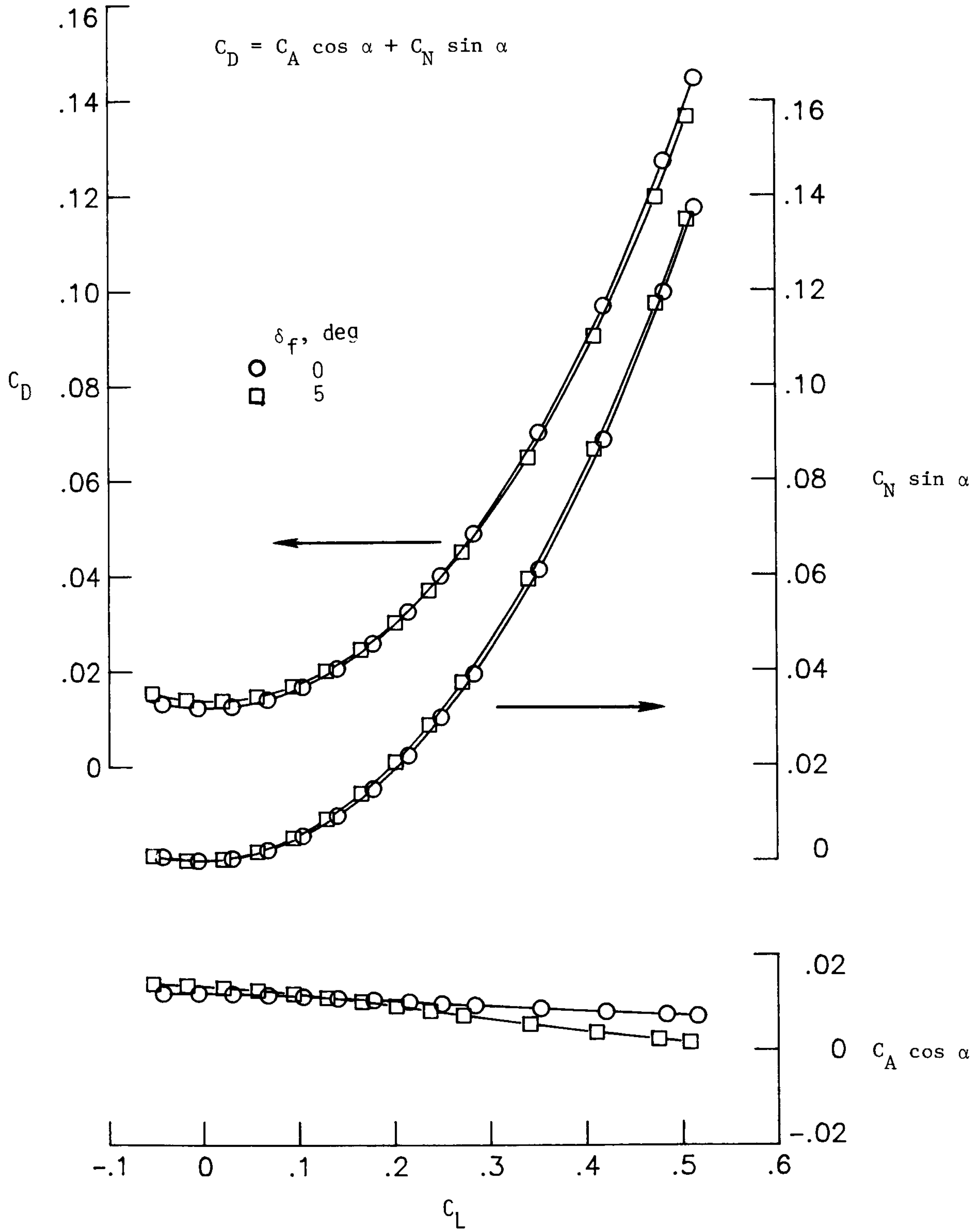


Figure 21. Breakdown of drag into normal and axial-force components for AR = 1.75 delta wing. $M = 1.90$.

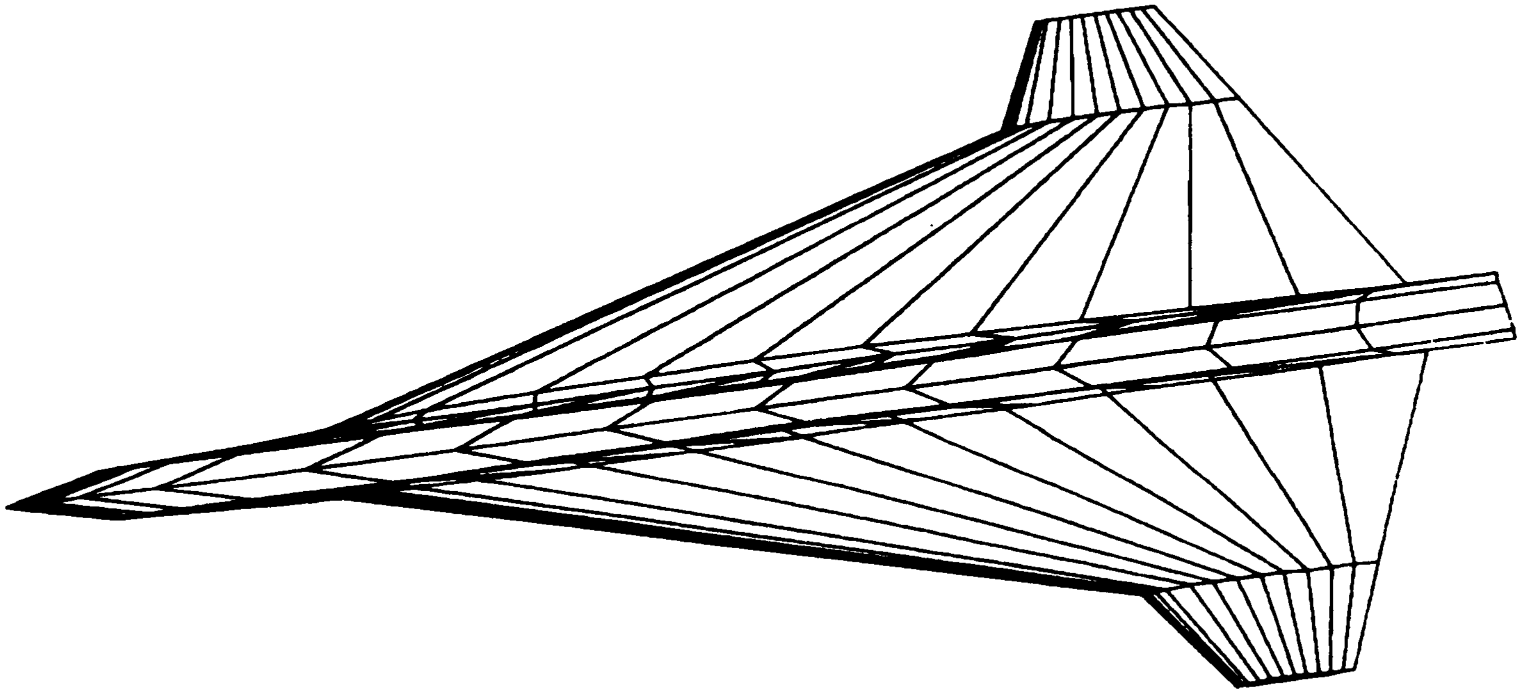


Figure 22. Input geometry for AR = 1.75 double-delta planform.

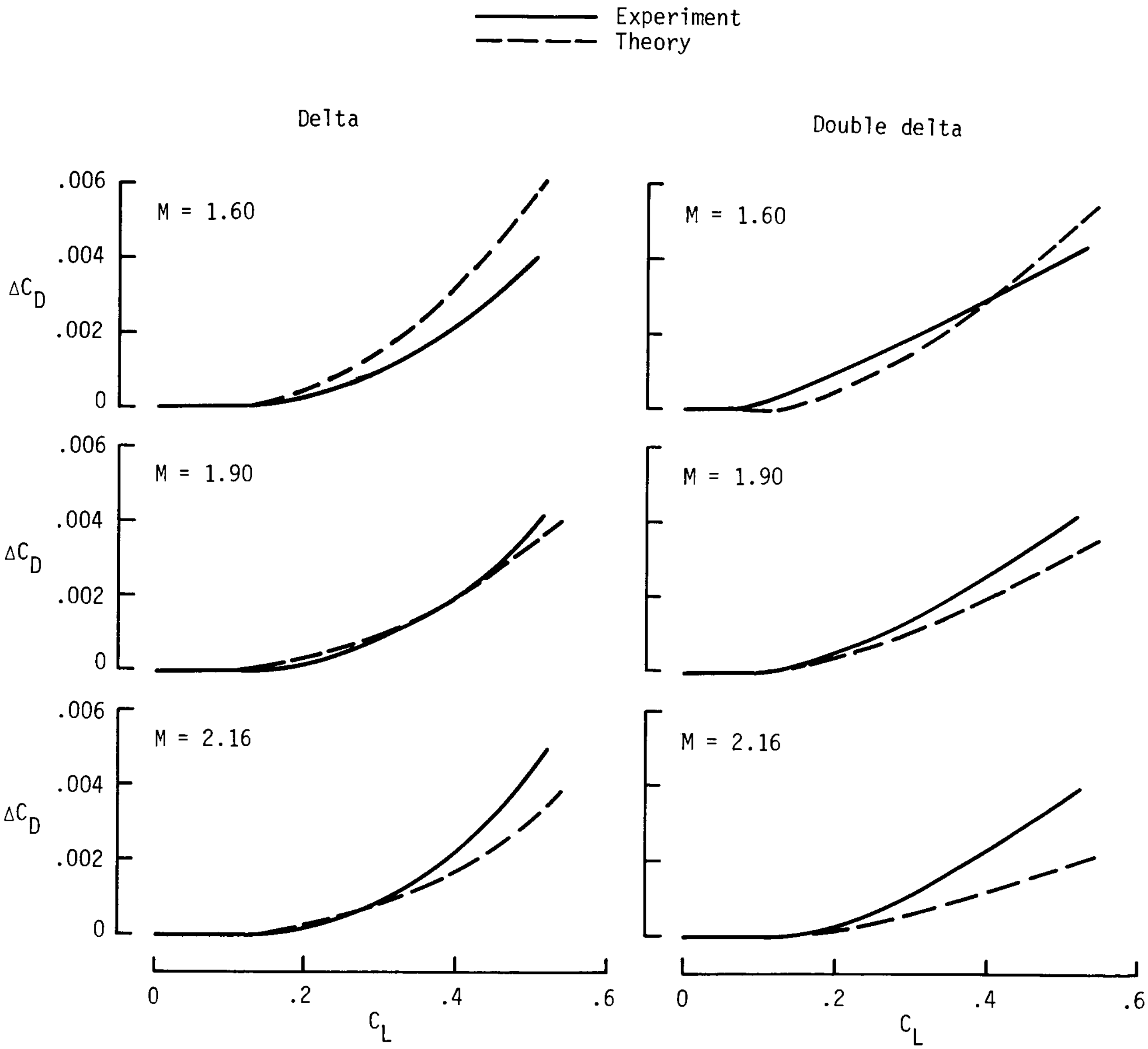


Figure 23. Theoretical and experimental drag reduction due to primary leading-edge flap deflection for AR = 1.75 wings.

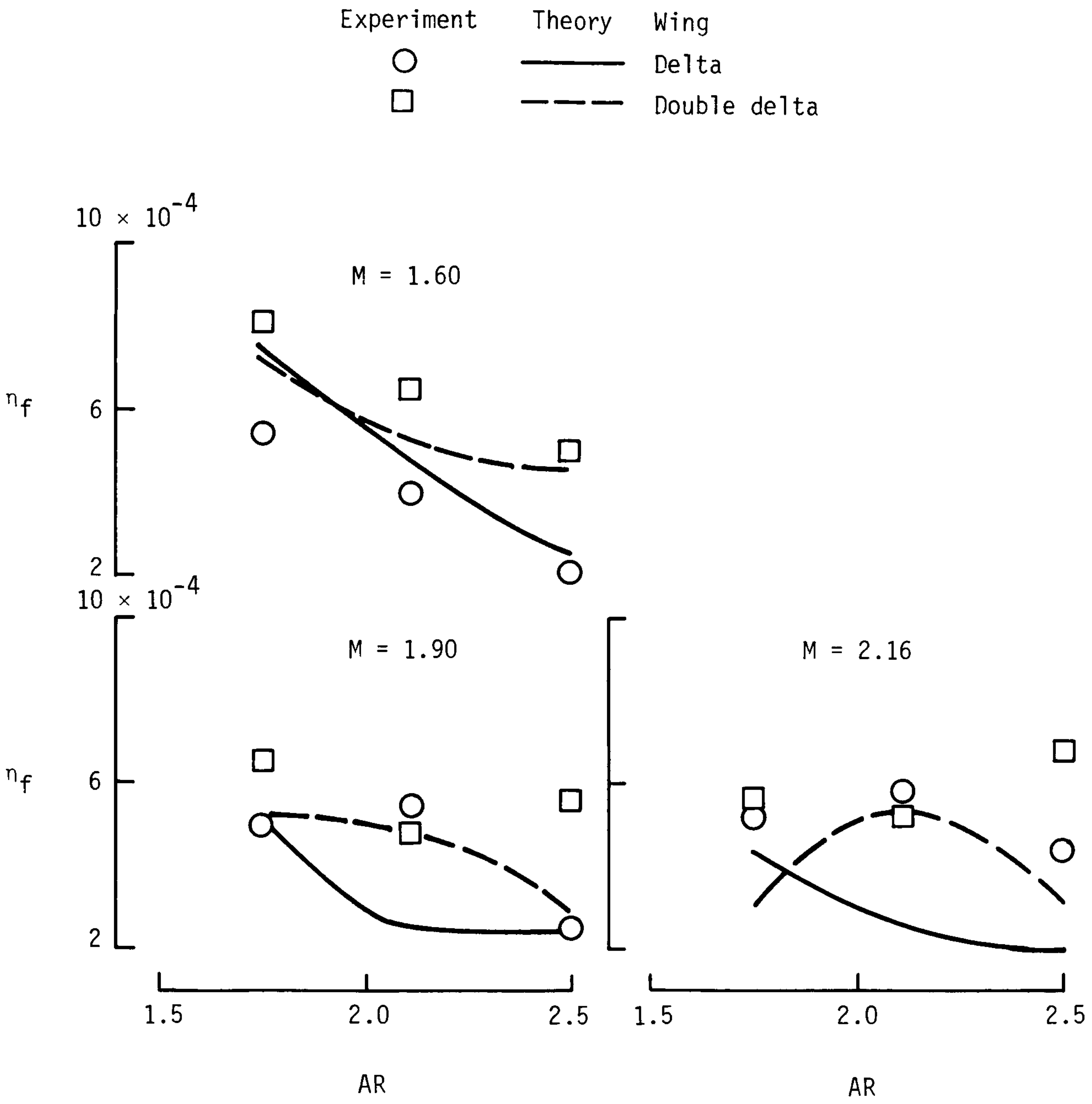


Figure 24. Theoretical and experimental flap performance parameters for primary leading-edge flaps.

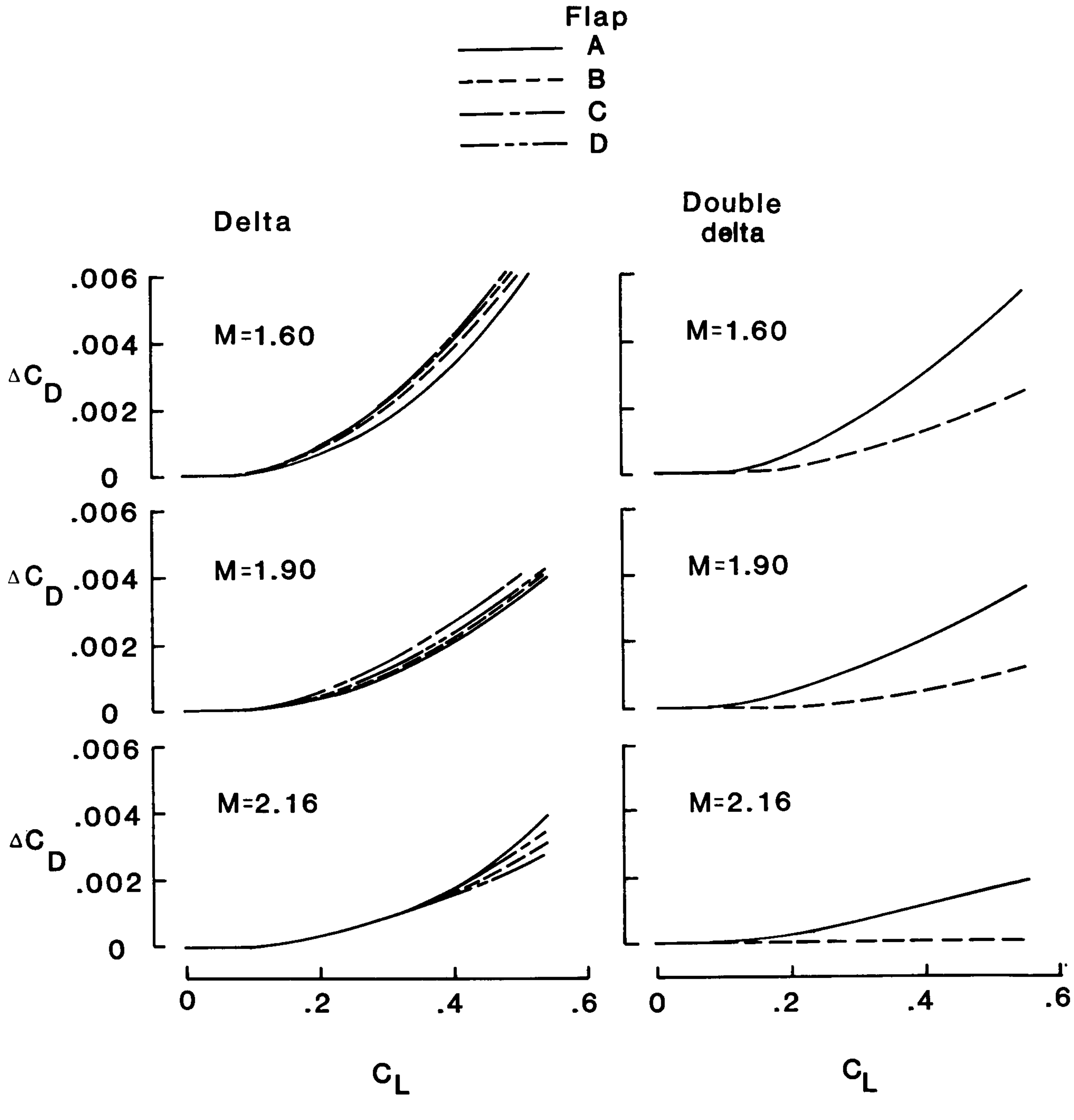


Figure 25. Theoretical comparison of primary and alternate leading-edge flap performance.

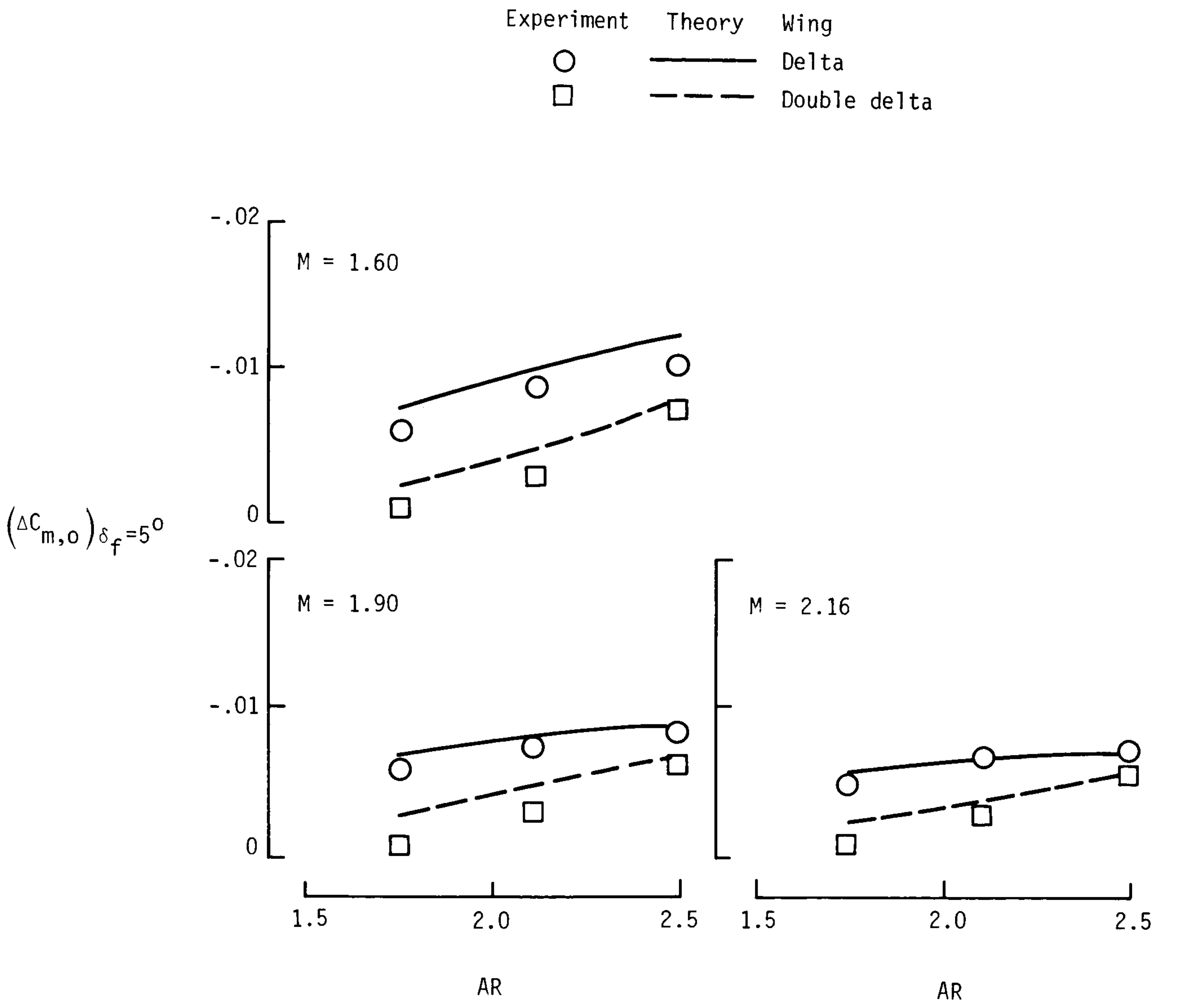


Figure 26. Theoretical and experimental pitching-moment shift due to 5° deflection of primary leading-edge flap.

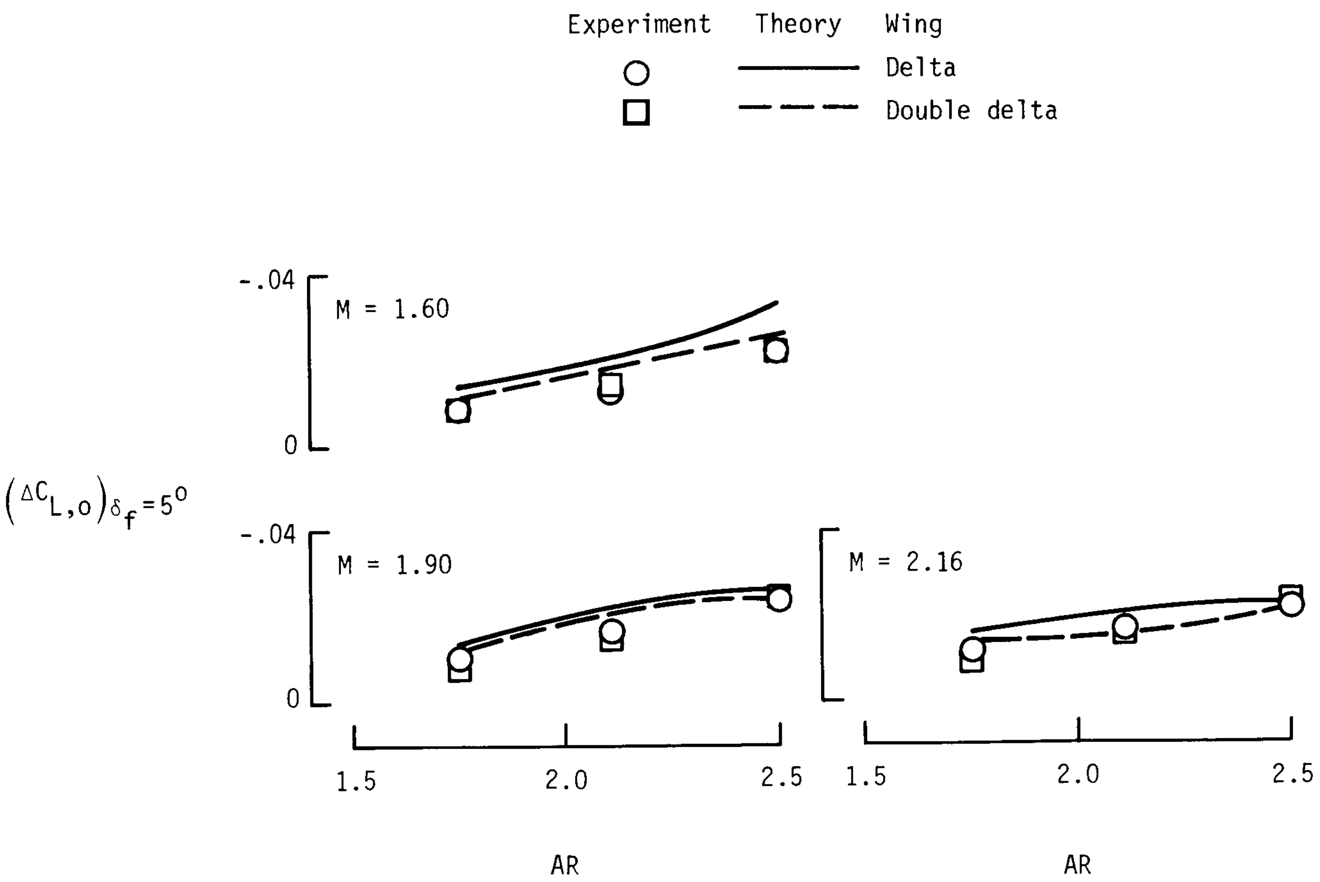


Figure 27. Theoretical and experimental lift-curve shift due to 5° deflection of primary leading-edge flap.

Appendix A

Tabulated Data

Table AI defines the symbols corresponding to the column headings that appear on the tabulated data. Table AII is an index to the tabulated force and moment data that are presented in table AIII. Note that the data were obtained in two separate wind-tunnel entries. The data from runs 15 to 237 were obtained under project 1476 of the Langley Unitary Plan Wind Tunnel (UPWT project 1476), and the data from runs 501 to 536 were obtained under UPWT project 1522. The data contained in table AIII were reduced about a moment reference center located at 35 percent of the mean aerodynamic chord.

Table AI. Tabulated Data Symbols

Tabulated Data Heading	Definition
ALPHA	α
CA	C_A
CAC	$C_{A,c}$
CD	C_D
CL	C_L
CM	C_m
CN	C_N
L/D	L/D
MACH	M

Table AII. Index to Tabulated Force and Moment Data

Page	Run	Configuration	Leading-edge flap	δ_f, deg (a)	δ_{TEF}, deg	Mach number
53	149	AR = 1.75	A	0	0	1.60
53	152	double delta		0		1.90
53	153			0		2.16
53	167			5		1.60
54	168			5		1.90
54	169			5		2.16
54	170			10		1.60
54	171			10		1.90
55	172			10		2.16
55	232			5/0		1.60
55	233			5/0		1.90
55	234			5/0		2.16
56	235			10/0		1.60
56	236			10/0		1.90
56	237			10/0	↓	2.16
56	155			0	−10	1.60
57	156			0		1.90
57	157			0		2.16
57	164			5		1.60
57	165			5		1.90
58	166			5		2.16
58	173			10		1.60
58	174			10		1.90
58	175			10	↓	2.16
59	158			0	−20	1.60
59	159			0		1.90
59	160			0		2.16
59	161			5		1.60
60	162			5		1.90
60	163			5		2.16
60	176			10		1.60
60	177			10		1.90
61	178		↓	10	↓	2.16
61	179		B	5	0	1.60
61	180		B	5		1.90
61	181		B	5	↓	2.16
62	94	AR = 1.75	A	0	0	1.60
62	98	delta		0		1.90
62	101			0		2.16
62	119			5		1.60
63	122			5		1.90
63	123			5		2.16
63	128			10		1.60
63	130			10		1.90
64	131		↓	10	↓	2.16

[a]The 5/0 and 10/0 designate the configurations where the outboard leading-edge flap is undeflected and the inboard leading-edge flap is deflected 5° or 10°, respectively, for the double-delta wing configurations.

Table AII. Continued

Page	Run	Configuration	Leading-edge flap	δ_f, deg (a)	δ_{TEF}, deg	Mach number
64	102	AR = 1.75	A	0	−10	1.60
64	103	delta	↓	0	↓	1.90
64	104			0		2.16
65	113			5		1.60
65	116			5		1.90
65	117			5		2.16
65	132			10		1.60
66	134			10		1.90
66	135			10		2.16
66	105			0	−20	1.60
66	106			0	↓	1.90
67	107			0		2.16
67	108			5		1.60
67	110			5		1.90
67	111			5		2.16
68	136			10		1.60
68	138			10		1.90
68	139			10		2.16
68	198		B	5	0	1.60
69	200		↓	5	↓	1.90
69	201			5		2.16
69	206			10		1.60
69	208			10		1.90
70	209			10		2.16
70	124		C	5		1.60
70	126		↓	5		1.90
70	127			5		2.16
71	194			10		1.60
71	196			10		1.90
71	197			10		2.16
71	202		D	5		1.60
72	204		↓	5		1.90
72	205			5		2.16
72	210			10		1.60
72	212			10		1.90
73	213			10		2.16
73	51	AR = 2.11	A	0	0	1.60
73	54	double delta	↓	0	↓	1.90
73	55			0		2.16
74	182			5		1.60
74	183			5		1.90
74	184			5		2.16
74	191			10		1.60
75	192			10		1.90

Table AII. Concluded

Page	Run	Configuration	Leading-edge flap	δ_f, deg (a)	δ_{TEF}, deg	Mach number
75	193	AR = 2.11	A	10	0	2.16
75	185	double delta	↓	5/0	↓	1.60
75	186			5/0		1.90
76	187			5/0		2.16
76	188			10/0		1.60
76	189			10/0		1.90
76	190			10/0		2.16
77	501	AR = 2.11	A	0	0	1.60
77	504	delta		0		1.90
77	505			0		2.16
77	507			5		1.60
78	508			5		1.90
78	509			5		2.16
78	510			10		1.60
78	511			10		1.90
79	512			10		2.16
79	15	AR = 2.50	A	0	0	1.60
79	18	double delta	↓	0	↓	1.90
79	19			0		2.16
80	525			5		1.60
80	526			5		1.90
80	527			5		2.16
80	522			10		1.60
81	523			10		1.90
81	524			10		2.16
81	513		C	5/0		1.60
81	516		↓	5/0		1.90
82	517			5/0		2.16
82	519			10/0		1.60
82	520			10/0		1.90
82	521			10/0		2.16 .
83	36	AR = 2.50	A	0	0	1.60
83	39	delta	↓	0	↓	1.90
83	40			0		2.16
83	528			5		1.60
84	531			5		1.90
84	532			5		2.16
84	534			10		1.60
84	535			10		1.90
85	536			10		2.16

[a]The 5/0 and 10/0 designate the configurations where the outboard leading-edge flap is undeflected and the inboard leading-edge flap is deflected 5° or 10°, respectively, for the double-delta wing configurations.

Table AIII. Force and Moment Data

UPWT PROJECT 1476 — RUN 149 — MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.11	-.200	.0261	.0326	-7.09	-.201	.0102	.0025
-4.11	-.162	.0221	.0266	-7.31	-.163	.0105	.0025
-3.04	-.120	.0171	.0200	-7.02	-.121	.0107	.0024
-2.04	-.081	.0139	.0136	-5.86	-.082	.0110	.0024
-1.09	-.044	.0120	.0075	-3.66	-.044	.0112	.0024
-.09	-.006	.0112	.0011	-.51	-.006	.0112	.0024
.94	.031	.0115	-.0052	2.75	.032	.0109	.0024
1.92	.069	.0129	-.0114	5.34	.069	.0106	.0023
2.89	.107	.0155	-.0176	6.91	.108	.0101	.0024
3.85	.145	.0194	-.0237	7.47	.146	.0096	.0024
4.92	.186	.0252	-.0304	7.39	.188	.0091	.0025
5.94	.228	.0324	-.0367	7.03	.230	.0087	.0025
6.95	.267	.0407	-.0431	6.54	.273	.0082	.0025
7.92	.305	.0502	-.0490	6.07	.309	.0076	.0025
9.94	.381	.0738	-.0617	5.16	.389	.0069	.0025
11.94	.453	.1020	-.0737	4.44	.464	.0061	.0026
13.90	.523	.1351	-.0858	3.87	.540	.0055	.0028
-.08	-.006	.0112	.0011	-.52	-.006	.0112	.0024

UPWT PROJECT 1476 — RUN 152 — MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.17	-.173	.0258	.0250	-6.70	-.174	.0101	.0025
-4.19	-.141	.0206	.0204	-6.85	-.142	.0102	.0024
-3.21	-.107	.0163	.0156	-6.57	-.108	.0103	.0024
-2.23	-.075	.0134	.0107	-5.58	-.075	.0104	.0024
-1.23	-.042	.0115	.0059	-3.62	-.042	.0106	.0023
-.22	-.008	.0107	.0008	-.72	-.008	.0106	.0023
.76	.024	.0107	-.0040	2.20	.024	.0104	.0023
1.80	.058	.0119	-.0094	4.89	.059	.0101	.0023
2.80	.093	.0143	-.0145	6.48	.093	.0098	.0023
3.82	.128	.0180	-.0197	7.11	.129	.0094	.0024
4.84	.161	.0228	-.0249	7.10	.163	.0091	.0025
5.80	.193	.0284	-.0297	6.79	.195	.0088	.0025
6.81	.226	.0356	-.0348	6.35	.229	.0085	.0025
7.85	.260	.0441	-.0400	5.88	.263	.0083	.0024
9.83	.322	.0637	-.0499	5.06	.328	.0077	.0024
11.84	.384	.0878	-.0599	4.37	.394	.0072	.0024
13.82	.442	.1155	-.0701	3.82	.457	.0067	.0025
15.80	.498	.1473	-.0800	3.38	.519	.0061	.0025
16.84	.526	.1651	-.0846	3.18	.551	.0058	.0026
-.22	-.007	.0107	.0006	-.61	-.007	.0106	.0023

UPWT PROJECT 1476 — RUN 153 — MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.18	-.155	.0242	.0200	-6.42	-.157	.0101	.0023
-4.22	-.127	.0194	.0161	-6.51	-.128	.0101	.0023
-3.20	-.096	.0155	.0120	-6.21	-.097	.0101	.0022
-2.19	-.066	.0127	.0079	-5.19	-.066	.0101	.0022
-1.17	-.035	.0110	.0037	-3.22	-.035	.0102	.0022
-.20	-.006	.0103	-.0003	-.60	-.006	.0102	.0022
.79	.024	.0104	-.0045	2.30	.024	.0101	.0022
1.78	.053	.0115	-.0087	4.63	.053	.0098	.0022
2.78	.083	.0137	-.0131	6.11	.084	.0096	.0022
3.77	.113	.0168	-.0173	6.74	.114	.0093	.0023
4.77	.143	.0211	-.0217	6.79	.145	.0091	.0023
5.77	.173	.0264	-.0260	6.55	.175	.0089	.0023
6.77	.202	.0327	-.0303	6.18	.205	.0087	.0023
7.80	.231	.0403	-.0348	5.75	.235	.0085	.0022
9.82	.289	.0582	-.0438	4.96	.294	.0081	.0022
11.80	.342	.0794	-.0525	4.31	.351	.0077	.0022
13.76	.395	.1043	-.0613	3.79	.403	.0073	.0023
15.80	.447	.1337	-.0706	3.35	.467	.0068	.0023
17.78	.498	.1663	-.0796	2.99	.525	.0063	.0023
18.82	.524	.1851	-.0846	2.83	.556	.0060	.0023
-.21	-.005	.0103	-.0005	-.47	-.005	.0103	.0022

UPWT PROJECT 1476 — RUN 167 — MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.08	-.092	.0163	.0142	-5.64	-.093	.0130	.0024
-1.13	-.056	.0138	.0083	-4.05	-.056	.0127	.0024
-.13	-.016	.0122	.0020	-1.31	-.016	.0122	.0024
.88	.020	.0119	-.0040	1.70	.020	.0116	.0024
1.92	.062	.0128	-.0110	4.83	.062	.0108	.0024
2.93	.099	.0149	-.0172	6.61	.099	.0099	.0024
3.90	.136	.0181	-.0233	7.52	.137	.0088	.0024
4.91	.177	.0228	-.0300	7.76	.178	.0076	.0025
5.94	.215	.0288	-.0364	7.48	.217	.0063	.0025
6.90	.254	.0361	-.0424	7.04	.256	.0053	.0025
7.91	.293	.0451	-.0491	6.50	.296	.0043	.0025
9.93	.369	.0673	-.0615	5.49	.375	.0026	.0025
11.92	.442	.0944	-.0733	4.68	.452	.0011	.0026
13.92	.513	.1269	-.0855	4.04	.529	-.0002	.0027
-.14	-.017	.0122	.0022	-1.42	-.017	.0122	.0024

Table AIII. Continued

UPWT PROJECT 1476 RUN 168 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.084	.0156	.0110	-5.37	-.084	.0124	.0023
-1.16	-.049	.0130	.0059	-3.74	-.049	.0120	.0023
-.17	-.014	.0116	.0009	-1.24	-.014	.0116	.0023
.83	.019	.0113	-.0040	1.65	.019	.0111	.0023
1.75	.049	.0120	-.0087	4.04	.049	.0105	.0023
2.81	.085	.0141	-.0142	6.04	.086	.0099	.0023
3.85	.119	.0172	-.0195	6.90	.120	.0092	.0024
4.75	.148	.0208	-.0243	7.11	.149	.0085	.0024
5.82	.184	.0264	-.0298	6.99	.186	.0075	.0025
6.81	.216	.0326	-.0347	6.64	.219	.0067	.0025
7.81	.248	.0399	-.0396	6.21	.251	.0059	.0024
9.80	.311	.0582	-.0496	5.34	.316	.0045	.0024
11.80	.373	.0812	-.0595	4.59	.381	.0033	.0024
13.86	.435	.1095	-.0699	3.97	.447	.0021	.0024
15.82	.493	.1408	-.0799	3.50	.513	.0011	.0026
16.82	.520	.1577	-.0851	3.30	.543	.0005	.0026
-.18	-.014	.0116	.0008	-1.23	-.014	.0116	.0023

UPWT PROJECT 1476 RUN 169 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.16	-.075	.0149	.0080	-5.03	-.075	.0120	.0022
-1.23	-.047	.0127	.0042	-3.67	-.047	.0117	.0022
-.19	-.015	.0114	-.0002	-1.34	-.015	.0114	.0022
.80	.015	.0112	-.0045	1.35	.015	.0110	.0022
1.81	.046	.0120	-.0087	3.79	.046	.0106	.0022
2.85	.076	.0139	-.0132	5.49	.077	.0101	.0022
3.82	.105	.0166	-.0175	6.34	.106	.0095	.0023
4.80	.134	.0202	-.0218	6.64	.135	.0089	.0023
5.80	.163	.0248	-.0262	6.58	.165	.0082	.0023
6.77	.192	.0303	-.0304	6.33	.194	.0075	.0023
7.80	.221	.0370	-.0348	5.96	.224	.0067	.0022
9.81	.279	.0537	-.0436	5.19	.284	.0054	.0022
11.79	.333	.0739	-.0522	4.51	.341	.0043	.0022
13.81	.388	.0989	-.0612	3.93	.401	.0034	.0022
15.81	.441	.1274	-.0704	3.46	.459	.0024	.0023
17.84	.494	.1605	-.0797	3.08	.520	.0014	.0023
18.82	.519	.1776	-.0840	2.92	.548	.0009	.0023
-.18	-.014	.0114	-.0003	-1.20	-.014	.0113	.0022

UPWT PROJECT 1476 RUN 170 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.09	-.106	.0204	.0152	-5.21	-.107	.0165	.0024
-1.07	-.065	.0170	.0087	-3.86	-.066	.0157	.0024
-.08	-.027	.0149	.0026	-1.78	-.027	.0149	.0024
.96	.013	.0141	-.0038	.94	.013	.0139	.0024
1.95	.052	.0146	-.0101	3.54	.052	.0128	.0024
2.94	.091	.0163	-.0164	5.57	.092	.0116	.0024
3.91	.127	.0192	-.0224	6.64	.128	.0104	.0025
4.90	.166	.0234	-.0289	7.09	.167	.0091	.0025
5.94	.205	.0291	-.0353	7.05	.207	.0077	.0025
6.90	.242	.0355	-.0414	6.79	.244	.0063	.0025
7.90	.281	.0436	-.0481	6.44	.284	.0046	.0025
9.90	.356	.0634	-.0609	5.61	.361	.0013	.0025
11.95	.431	.0896	-.0734	4.81	.441	-.0016	.0026
13.93	.502	.1204	-.0854	4.17	.516	-.0040	.0027
14.90	.534	.1369	-.0909	3.90	.552	-.0051	.0028
-.10	-.027	.0149	.0027	-1.80	-.027	.0149	.0024

UPWT PROJECT 1476 RUN 171 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.19	-.094	.0193	.0118	-4.87	-.095	.0157	.0024
-1.17	-.060	.0162	.0066	-3.68	-.060	.0150	.0024
-.22	-.027	.0144	.0018	-1.89	-.027	.0143	.0024
.82	.007	.0136	-.0033	.54	.008	.0135	.0024
1.80	.042	.0140	-.0083	2.97	.042	.0127	.0024
2.82	.076	.0156	-.0137	4.91	.077	.0118	.0024
3.79	.109	.0182	-.0186	5.98	.110	.0109	.0024
4.77	.141	.0218	-.0237	6.44	.142	.0101	.0025
5.75	.173	.0266	-.0287	6.50	.175	.0091	.0025
6.76	.204	.0323	-.0340	6.31	.206	.0081	.0025
7.77	.236	.0391	-.0391	6.04	.239	.0068	.0025
9.79	.300	.0560	-.0495	5.36	.305	.0041	.0025
11.82	.363	.0776	-.0596	4.68	.371	.0016	.0025
13.82	.424	.1037	-.0695	4.09	.437	-.0006	.0025
15.83	.483	.1345	-.0798	3.59	.502	-.0024	.0026
16.81	.511	.1509	-.0847	3.39	.533	-.0033	.0027
-.21	-.026	.0143	.0018	-1.78	-.026	.0142	.0024

Table AIII. Continued

UPWT PROJECT 1476 RUN 172 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.086	.0186	.0091	-4.64	-.087	.0153	.0023
-1.22	-.057	.0158	.0048	-3.57	-.057	.0146	.0023
-.21	-.026	.0141	.0006	-1.83	-.026	.0140	.0023
.77	.004	.0135	-.0037	.31	.004	.0134	.0023
1.77	.034	.0138	-.0081	2.50	.035	.0127	.0023
2.83	.066	.0154	-.0126	4.33	.067	.0121	.0023
3.80	.096	.0177	-.0169	5.40	.097	.0113	.0023
4.79	.125	.0211	-.0212	5.92	.126	.0106	.0023
5.77	.153	.0253	-.0255	6.05	.155	.0098	.0023
6.81	.183	.0307	-.0300	5.95	.185	.0088	.0023
7.79	.210	.0366	-.0343	5.73	.213	.0079	.0023
9.78	.266	.0515	-.0431	5.16	.271	.0056	.0022
11.77	.322	.0705	-.0519	4.56	.329	.0034	.0022
13.78	.377	.0939	-.0606	4.02	.389	.0014	.0022
15.78	.431	.1213	-.0696	3.55	.447	-.0004	.0023
17.78	.483	.1528	-.0788	3.16	.507	-.0021	.0024
19.82	.536	.1891	-.0879	2.83	.568	-.0037	.0024
-.22	-.025	.0141	.0005	-1.80	-.025	.0140	.0023

UPWT PROJECT 1476 RUN 232 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.08	-.082	.0150	.0115	-5.51	-.083	.0120	.0024
-1.10	-.045	.0126	.0055	-3.58	-.045	.0118	.0024
-.08	-.006	.0115	-.0008	-.48	-.006	.0115	.0024
.91	.031	.0117	-.0068	2.64	.031	.0112	.0024
1.97	.071	.0131	-.0135	5.38	.071	.0107	.0024
2.88	.105	.0154	-.0193	6.82	.106	.0101	.0024
3.87	.142	.0189	-.0255	7.52	.143	.0093	.0024
4.90	.182	.0239	-.0322	7.63	.184	.0082	.0025
5.91	.221	.0301	-.0385	7.34	.223	.0072	.0026
6.91	.259	.0378	-.0447	6.86	.262	.0063	.0026
7.92	.299	.0471	-.0510	6.34	.302	.0055	.0025
9.91	.373	.0693	-.0632	5.38	.379	.0041	.0025
11.92	.448	.0976	-.0757	4.59	.459	.0029	.0026
13.91	.518	.1302	-.0874	3.98	.534	.0019	.0027
-.11	-.009	.0115	-.0002	-.75	-.009	.0115	.0024

UPWT PROJECT 1476 RUN 233 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.19	-.077	.0144	.0092	-5.39	-.078	.0114	.0024
-1.19	-.044	.0121	.0042	-3.63	-.044	.0112	.0023
-.19	-.011	.0111	-.0007	-.97	-.011	.0110	.0023
.80	.022	.0110	-.0055	2.01	.022	.0107	.0023
1.81	.056	.0122	-.0107	4.61	.057	.0104	.0023
2.80	.090	.0144	-.0159	6.23	.090	.0100	.3023
3.81	.123	.0177	-.0211	6.96	.124	.0095	.0024
4.80	.155	.0219	-.0260	7.07	.156	.0089	.0024
5.79	.188	.0273	-.0314	6.90	.190	.0082	.0025
6.79	.221	.0338	-.0366	6.53	.223	.0075	.0025
7.80	.254	.0416	-.0416	6.09	.257	.0068	.0024
9.81	.317	.0605	-.0515	5.24	.322	.0057	.0024
11.80	.378	.0838	-.0614	4.52	.388	.0046	.0024
13.81	.439	.1117	-.0715	3.93	.453	.0037	.0024
15.82	.496	.1436	-.0815	3.46	.517	.0029	.0026
16.78	.522	.1600	-.0865	3.26	.546	.0025	.0026
-.19	-.009	.0111	-.0008	-.84	-.009	.0110	.0023

UPWT PROJECT 1476 RUN 234 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.21	-.069	.0139	.0063	-4.98	-.069	.0112	.0022
-1.20	-.039	.0118	.0023	-3.28	-.039	.0110	.0022
-.19	-.008	.0108	-.0020	-.73	-.008	.0108	.0022
.78	.021	.0109	-.0060	1.91	.021	.0106	.0022
1.80	.051	.0119	-.0104	4.31	.052	.0103	.0022
2.80	.081	.0140	-.0147	5.79	.081	.0100	.0022
3.80	.111	.0170	-.0190	6.53	.112	.0096	.0023
4.80	.140	.0208	-.0235	6.72	.141	.0091	.0023
5.81	.170	.0258	-.0279	6.58	.171	.0085	.0023
6.81	.199	.0317	-.0322	6.27	.201	.0079	.0023
7.80	.228	.0386	-.0365	5.89	.231	.0074	.0022
9.79	.284	.0555	-.0452	5.11	.289	.0064	.0022
11.81	.339	.0766	-.0540	4.43	.348	.0055	.0022
13.81	.393	.1015	-.0628	3.87	.406	.0048	.0022
15.80	.446	.1303	-.0719	3.42	.464	.0040	.0023
17.81	.496	.1628	-.0809	3.05	.522	.0032	.0023
18.80	.521	.1804	-.0854	2.89	.552	.0028	.0023
-.20	-.008	.0108	-.0021	-.73	-.008	.0108	.0022

Table AIII. Continued

UPWT PROJECT 1476 RUN 235 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.08	-.092	.0165	.0104	-5.57	-.092	.0131	.0024
-1.05	-.051	.0136	.0040	-3.74	-.051	.0127	.0024
-.07	-.014	.0122	-.0020	-1.11	-.014	.0122	.0024
.91	.025	.0120	-.0081	2.09	.025	.0116	.0024
1.91	.063	.0132	-.0142	4.61	.064	.0111	.0024
2.91	.104	.0157	-.0208	6.62	.104	.0104	.0024
3.93	.143	.0195	-.0270	7.31	.144	.0097	.0024
4.91	.179	.0243	-.0332	7.36	.180	.0089	.0025
5.91	.216	.0306	-.0398	7.13	.220	.0080	.0025
6.90	.256	.0379	-.0463	6.75	.258	.0069	.0025
7.92	.294	.0466	-.0527	6.31	.298	.0056	.0025
9.91	.369	.0677	-.0655	5.45	.375	.0032	.0025
11.91	.442	.0943	-.0777	4.68	.452	.0012	.0025
13.91	.513	.1263	-.0897	4.06	.528	-.0007	.0027
-.07	-.011	.0122	-.0021	-.91	-.011	.0122	.0024

UPWT PROJECT 1476 RUN 236 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.22	-.084	.0159	.0081	-5.27	-.084	.0126	.0024
-1.20	-.049	.0132	.0030	-3.71	-.049	.0122	.0024
-.20	-.015	.0118	-.0019	-1.27	-.015	.0118	.0024
.81	.018	.0116	-.0069	1.56	.018	.0114	.0023
1.81	.053	.0126	-.0120	4.19	.053	.0109	.0023
2.80	.088	.0147	-.0173	5.94	.088	.0104	.0024
3.81	.121	.0180	-.0225	6.71	.122	.0099	.0024
4.80	.153	.0223	-.0275	6.86	.154	.0094	.0024
5.79	.185	.0276	-.0326	6.69	.187	.0088	.0025
6.80	.217	.0340	-.0379	6.38	.219	.0081	.0025
7.82	.250	.0417	-.0433	6.00	.254	.0072	.0024
9.82	.312	.0593	-.0534	5.26	.317	.0053	.0024
11.79	.372	.0811	-.0630	4.59	.380	.0034	.0024
13.80	.433	.1082	-.0731	4.00	.446	.0018	.0024
15.82	.492	.1397	-.0832	3.52	.511	.0004	.0025
16.79	.519	.1564	-.0861	3.32	.542	-.0002	.0026
-.22	-.015	.0119	-.0019	-1.30	-.015	.0118	.0024

UPWT PROJECT 1476 RUN 237 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.073	.0152	.0055	-4.83	-.074	.0124	.0022
-1.21	-.044	.0129	.0013	-3.38	-.044	.0120	.0023
-.21	-.014	.0117	-.0028	-1.21	-.014	.0117	.0023
.82	.018	.0116	-.0072	1.54	.018	.0113	.0023
1.82	.048	.0125	-.0116	3.87	.049	.0109	.0023
2.79	.077	.0144	-.0158	5.38	.078	.0106	.0023
3.79	.107	.0173	-.0202	6.21	.108	.0102	.0023
4.78	.136	.0211	-.0245	6.44	.137	.0097	.0023
5.80	.166	.0260	-.0290	6.36	.167	.0092	.0023
6.80	.194	.0318	-.0336	6.12	.197	.0085	.0023
7.79	.222	.0383	-.0379	5.79	.225	.0079	.0022
9.82	.279	.0545	-.0470	5.11	.284	.0062	.0022
11.81	.334	.0746	-.0557	4.48	.343	.0046	.0021
13.80	.388	.0986	-.0644	3.94	.400	.0032	.0022
15.81	.442	.1272	-.0735	3.48	.460	.0019	.0022
17.81	.494	.1594	-.0825	3.10	.519	.0006	.0023
18.81	.520	.1772	-.0871	2.94	.549	.0000	.0023
-.21	-.013	.0117	-.0029	-1.11	-.013	.0117	.0023

UPWT PROJECT 1476 RUN 155 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.13	-.139	.0248	.0463	-5.62	-.140	.0196	.0033
-1.13	-.102	.0213	.0399	-4.78	-.102	.0193	.0033
-.08	-.061	.0188	.0329	-3.22	-.061	.0187	.0033
.93	-.022	.0176	.0262	-1.25	-.022	.0179	.0032
1.94	.017	.0176	.0198	.95	.017	.0171	.0032
2.96	.057	.0191	.0134	2.98	.058	.0162	.0032
3.94	.096	.0219	.0069	4.40	.098	.0152	.0032
4.91	.135	.0259	.0006	5.21	.137	.0143	.0032
5.87	.170	.0308	-.0050	5.52	.172	.0133	.0032
6.92	.212	.0380	-.0118	5.59	.215	.0121	.0032
7.96	.253	.0465	-.0187	5.44	.257	.0110	.0032
9.94	.329	.0667	-.0312	4.93	.335	.0089	.0032
11.95	.403	.0924	-.0434	4.36	.413	.0070	.0032
13.93	.472	.1225	-.0553	3.85	.488	.0053	.0032
14.94	.507	.1399	-.0615	3.63	.526	.0044	.0033
-.09	-.061	.0189	.0330	-3.25	-.061	.0188	.0033

Table AIII. Continued

UPWT PROJECT 1476 RUN 156 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.113	.0217	.0342	-5.19	-.113	.0174	.0030
-1.18	-.079	.0187	.0290	-4.23	-.079	.0170	.0030
-.19	-.046	.0167	.0239	-2.76	-.046	.0166	.0030
.84	-.012	.0157	.0186	-.77	-.012	.0159	.0030
1.84	.022	.0159	.0135	1.40	.023	.0151	.0030
2.80	.055	.0171	.0084	3.19	.055	.0144	.0030
3.91	.089	.0196	.0031	4.54	.090	.0136	.0030
4.82	.122	.0232	-.0021	5.27	.124	.0129	.0030
5.81	.155	.0279	-.0070	5.55	.157	.0121	.0030
6.80	.187	.0336	-.0120	5.56	.190	.0113	.0030
7.78	.219	.0405	-.0172	5.40	.222	.0105	.0030
9.82	.284	.0582	-.0277	4.88	.290	.0089	.0030
11.81	.344	.0796	-.0377	4.33	.353	.0074	.0030
13.85	.406	.1063	-.0481	3.82	.420	.0059	.0030
15.79	.462	.1354	-.0578	3.41	.482	.0045	.0029
17.76	.514	.1680	-.0665	3.06	.541	.0030	.0028
-.18	-.046	.0167	.0239	-2.74	-.046	.0166	.0030

UPWT PROJECT 1476 RUN 157 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.17	-.098	.0197	.0270	-4.98	-.099	.0160	.0027
-1.19	-.069	.0170	.0228	-4.03	-.069	.0156	.0027
-.22	-.040	.0154	.0187	-2.58	-.040	.0152	.0027
.82	-.007	.0145	.0139	-.52	-.007	.0146	.0027
1.78	.021	.0147	.0099	1.46	.022	.0140	.0027
2.79	.052	.0159	.0053	3.26	.052	.0134	.0027
3.79	.083	.0182	.0009	4.53	.084	.0127	.0027
4.77	.112	.0215	-.0033	5.20	.113	.0121	.0027
5.78	.141	.0258	-.0079	5.49	.143	.0114	.0027
6.80	.171	.0312	-.0123	5.49	.174	.0107	.0027
7.79	.200	.0375	-.0170	5.33	.203	.0101	.0027
9.76	.256	.0530	-.0258	4.83	.261	.0088	.0027
11.78	.312	.0729	-.0347	4.29	.321	.0076	.0026
13.78	.366	.0962	-.0436	3.80	.378	.0064	.0026
15.78	.418	.1234	-.0525	3.39	.436	.0051	.0026
17.80	.470	.1548	-.0613	3.03	.494	.0038	.0026
19.79	.519	.1895	-.0703	2.74	.553	.0025	.0026
-.24	-.039	.0154	.0185	-2.53	-.039	.0152	.0027

UPWT PROJECT 1476 RUN 164 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.10	-.150	.0271	.0468	-5.53	-.151	.0216	.0034
-1.07	-.109	.0227	.0400	-4.79	-.109	.0207	.0034
-.10	-.071	.0198	.0336	-3.57	-.071	.0197	.0034
.90	-.032	.0181	.0272	-1.77	-.032	.0186	.0033
1.92	.009	.0175	.0202	.49	.009	.0172	.0033
2.90	.045	.0182	.0140	2.48	.046	.0159	.0033
3.92	.085	.0202	.0075	4.21	.086	.0144	.0033
4.92	.125	.0234	.0009	5.33	.126	.0126	.0033
5.90	.161	.0277	-.0049	5.82	.163	.0110	.0033
6.93	.202	.0338	-.0115	5.96	.204	.0092	.0033
7.93	.241	.0414	-.0181	5.83	.245	.0077	.0032
9.91	.316	.0600	-.0305	5.26	.321	.0048	.0032
11.90	.390	.0844	-.0429	4.62	.399	.0022	.0032
13.92	.462	.1142	-.0552	4.05	.476	-.0003	.0032
15.92	.528	.1480	-.0654	3.57	.549	-.0027	.0032
-.10	-.070	.0198	.0335	-3.53	-.070	.0197	.0034

UPWT PROJECT 1476 RUN 165 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.124	.0240	.0348	-5.16	-.125	.0192	.0029
-1.20	-.090	.0203	.0296	-4.44	-.090	.0184	.0029
-.21	-.056	.0177	.0245	-3.16	-.056	.0175	.0030
.80	-.021	.0163	.0192	-1.32	-.021	.0166	.0030
1.79	.011	.0160	.0142	.69	.012	.0156	.0030
2.78	.044	.0168	.0089	2.64	.045	.0146	.0030
3.80	.079	.0187	.0035	4.23	.080	.0134	.0030
4.80	.111	.0216	-.0017	5.15	.113	.0122	.0031
5.78	.144	.0255	-.0068	5.64	.145	.0109	.0031
6.81	.178	.0308	-.0121	5.77	.180	.0095	.0031
7.78	.210	.0369	-.0172	5.68	.213	.0082	.0031
9.79	.275	.0533	-.0276	5.16	.280	.0058	.0030
11.82	.338	.0743	-.0378	4.55	.346	.0035	.0030
13.80	.398	.0992	-.0477	4.01	.410	.0015	.0030
15.83	.457	.1291	-.0580	3.54	.475	-.0005	.0030
17.82	.513	.1622	-.0675	3.16	.538	-.0024	.0029
-.21	-.055	.0177	.0243	-3.10	-.055	.0175	.0030

Table AIII. Continued

UPWT PROJECT 1476 RUN 166 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.108	.0219	.0268	-4.91	-.108	.0178	.0027
-1.20	-.076	.0185	.0224	-4.10	-.076	.0169	.0027
-.21	-.046	.0164	.0183	-2.84	-.046	.0162	.0027
.80	-.015	.0152	.0138	-.99	-.015	.0154	.0027
1.79	.015	.0151	.0095	.99	.015	.0146	.0027
2.80	.045	.0160	.0050	2.85	.046	.0137	.0027
3.79	.075	.0178	.0006	4.23	.076	.0128	.0027
4.79	.103	.0204	-.0038	5.06	.105	.0117	.0027
5.80	.133	.0242	-.0082	5.51	.135	.0106	.0027
6.79	.162	.0287	-.0125	5.63	.164	.0094	.0028
7.79	.191	.0344	-.0169	5.54	.194	.0082	.0027
9.80	.249	.0491	-.0259	5.06	.253	.0061	.0027
11.80	.305	.0680	-.0347	4.49	.313	.0041	.0027
13.80	.359	.0906	-.0435	3.96	.370	.0023	.0026
15.79	.412	.1172	-.0524	3.52	.429	.0006	.0026
17.81	.464	.1480	-.0612	3.14	.487	-.0011	.0026
19.81	.515	.1824	-.0701	2.82	.546	-.0029	.0026
-.20	-.046	.0164	.0182	-2.82	-.046	.0162	.0027

UPWT PROJECT 1476 RUN 173 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.09	-.161	.0312	.0474	-5.17	-.162	.0253	.0034
-1.09	-.122	.0262	.0409	-4.64	-.122	.0239	.0034
-.07	-.081	.0226	.0344	-3.60	-.081	.0225	.0034
.90	-.043	.0203	.0280	-2.10	-.042	.0210	.0034
1.92	-.003	.0194	.0216	-.16	-.002	.0195	.0034
2.91	.036	.0197	.0153	1.82	.037	.0179	.0034
3.93	.078	.0215	.0084	3.64	.079	.0161	.0033
4.92	.115	.0243	.0021	4.73	.116	.0143	.0033
5.93	.153	.0283	-.0044	5.42	.155	.0123	.0033
6.91	.190	.0333	-.0109	5.71	.193	.0102	.0033
7.91	.228	.0397	-.0175	5.73	.231	.0080	.0032
9.93	.305	.0569	-.0306	5.36	.310	.0035	.0032
11.94	.381	.0799	-.0432	4.76	.389	-.0006	.0032
13.90	.449	.1072	-.0549	4.19	.462	-.0039	.0032
15.92	.519	.1406	-.0661	3.69	.538	-.0072	.0032
-.08	-.082	.0227	.0346	-3.64	-.083	.0225	.0034

UPWT PROJECT 1476 RUN 174 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.135	.0279	.0356	-4.85	-.136	.0227	.0029
-1.20	-.102	.0237	.0307	-4.33	-.103	.0215	.0030
-.20	-.068	.0205	.0255	-3.31	-.068	.0203	.0030
.81	-.033	.0186	.0202	-1.77	-.033	.0191	.0030
1.80	.002	.0179	.0147	.13	.003	.0178	.0030
2.80	.037	.0183	.0094	1.99	.037	.0165	.0030
3.80	.071	.0199	.0040	3.56	.072	.0152	.0030
4.79	.103	.0225	-.0011	4.58	.105	.0138	.0031
5.79	.134	.0261	-.0062	5.14	.136	.0124	.0031
6.81	.168	.0309	-.0118	5.44	.171	.0108	.0031
7.81	.200	.0366	-.0170	5.46	.203	.0091	.0031
9.79	.262	.0508	-.0273	5.16	.267	.0054	.0031
11.81	.325	.0700	-.0374	4.64	.333	.0020	.0031
13.83	.387	.0942	-.0474	4.11	.399	-.0011	.0031
15.81	.446	.1223	-.0574	3.65	.462	-.0039	.0030
17.82	.504	.1552	-.0676	3.25	.527	-.0065	.0030
-.18	-.066	.0204	.0253	-3.23	-.066	.0202	.0030

UPWT PROJECT 1476 RUN 175 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.18	-.118	.0255	.0279	-4.62	-.119	.0210	.0027
-1.18	-.088	.0217	.0235	-4.03	-.088	.0199	.0027
-.18	-.057	.0190	.0192	-2.98	-.057	.0188	.0027
.80	-.025	.0175	.0146	-1.45	-.025	.0178	.0027
1.80	.004	.0169	.0103	.26	.005	.0168	.0027
2.80	.035	.0174	.0058	2.02	.036	.0157	.0027
3.78	.065	.0189	.0014	3.43	.066	.0146	.0027
4.80	.094	.0213	-.0031	4.42	.096	.0134	.0027
5.80	.123	.0247	-.0075	4.98	.125	.0121	.0027
6.81	.152	.0291	-.0122	5.25	.155	.0108	.0028
7.78	.180	.0341	-.0165	5.28	.183	.0094	.0027
9.81	.237	.0473	-.0256	5.01	.242	.0062	.0027
11.81	.294	.0647	-.0345	4.55	.301	.0031	.0027
13.82	.350	.0864	-.0431	4.05	.360	.0004	.0026
15.79	.402	.1114	-.0517	3.61	.417	-.0021	.0026
17.81	.456	.1415	-.0608	3.22	.477	-.0046	.0026
19.80	.507	.1753	-.0693	2.89	.537	-.0069	.0027
-.20	-.056	.0190	.0190	-2.95	-.056	.0188	.0027

Table AIII. Continued

UPWT PROJECT 1476 RUN 158 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.10	-.189	.0437	.0721	-4.32	-.190	.0368	.0039
-1.07	-.148	.0389	.0655	-3.81	-.149	.0361	.0039
-.10	-.111	.0355	.0592	-3.11	-.111	.0353	.0039
.90	-.074	.0333	.0529	-2.21	-.073	.0345	.0039
1.91	-.036	.0323	.0468	-1.12	-.035	.0335	.0039
2.94	.004	.0332	.0411	.13	.005	.0329	.0039
3.93	.041	.0349	.0355	1.17	.043	.0320	.0039
4.92	.081	.0381	.0294	2.12	.084	.0310	.0040
5.91	.120	.0422	.0232	2.83	.123	.0297	.0040
6.93	.162	.0480	.0164	3.37	.166	.0281	.0041
7.90	.199	.0545	.0099	3.64	.204	.0267	.0041
9.91	.278	.0723	-.0033	3.84	.286	.0234	.0040
11.90	.351	.0942	-.0165	3.72	.363	.0199	.0040
13.90	.421	.1216	-.0276	3.46	.438	.0169	.0041
15.93	.492	.1550	-.0405	3.18	.516	.0139	.0042
17.92	.555	.1913	-.0510	2.90	.587	.0113	.0040
19.89	.591	.2245	-.0513	2.63	.632	.0099	.0041
-.10	-.111	.0355	.0592	-3.12	-.111	.0353	.0039

UPWT PROJECT 1476 RUN 160 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.21	-.131	.0351	.0455	-3.74	-.133	.0300	.0029
-1.21	-.101	.0314	.0411	-3.22	-.102	.0292	.0030
-.20	-.070	.0287	.0366	-2.44	-.070	.0285	.0030
.80	-.039	.0271	.0320	-1.44	-.039	.0276	.0030
1.81	-.008	.0264	.0276	-.32	-.008	.0266	.0030
2.81	.022	.0266	.0231	.83	.024	.0255	.0030
3.80	.052	.0280	.0186	1.87	.054	.0245	.0031
4.78	.082	.0304	.0141	2.71	.085	.0234	.0031
5.79	.113	.0338	.0095	3.33	.115	.0223	.0031
6.80	.143	.0384	.0047	3.72	.147	.0212	.0031
7.79	.172	.0436	-.0001	3.94	.176	.0199	.0031
9.80	.229	.0572	-.0096	4.01	.236	.0174	.0031
11.79	.286	.0749	-.0190	3.82	.295	.0149	.0031
13.80	.340	.0965	-.0281	3.52	.353	.0126	.0031
15.80	.392	.1220	-.0371	3.22	.411	.0105	.0031
17.81	.444	.1513	-.0460	2.93	.469	.0084	.0030
19.80	.493	.1841	-.0548	2.68	.526	.0062	.0030
-.20	-.069	.0287	.0364	-2.42	-.069	.0285	.0030

UPWT PROJECT 1476 RUN 159 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.152	.0384	.0556	-3.95	-.153	.0325	.0033
-1.20	-.118	.0344	.0505	-3.45	-.119	.0319	.0033
-.21	-.086	.0314	.0453	-2.73	-.086	.0311	.0034
.82	-.052	.0295	.0402	-1.78	-.052	.0302	.0034
1.80	-.019	.0288	.0352	-.65	-.018	.0293	.0035
2.79	.015	.0292	.0300	.51	.016	.0285	.0035
3.80	.050	.0308	.0249	1.63	.052	.0274	.0035
4.80	.084	.0335	.0196	2.50	.086	.0264	.0035
5.81	.118	.0375	.0144	3.15	.121	.0254	.0035
6.81	.152	.0424	.0092	3.58	.156	.0241	.0036
7.80	.184	.0481	.0036	3.83	.189	.0227	.0036
9.80	.249	.0629	-.0075	3.96	.256	.0196	.0036
11.81	.312	.0824	-.0183	3.79	.323	.0167	.0037
13.80	.372	.1060	-.0283	3.51	.386	.0142	.0037
15.82	.430	.1340	-.0385	3.21	.450	.0117	.0036
17.79	.482	.1644	-.0471	2.93	.509	.0092	.0034
18.81	.511	.1824	-.0523	2.80	.542	.0079	.0034
-.21	-.084	.0314	.0452	-2.68	-.084	.0311	.0034

UPWT PROJECT 1476 RUN 161 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.09	-.198	.0464	.0729	-4.27	-.200	.0392	.0039
-1.08	-.159	.0408	.0663	-3.89	-.160	.0379	.0039
-.09	-.121	.0366	.0597	-3.31	-.121	.0364	.0039
.91	-.082	.0335	.0531	-2.44	-.081	.0348	.0039
1.94	-.042	.0317	.0464	-1.32	-.041	.0331	.0039
2.92	-.006	.0316	.0408	-.20	-.005	.0318	.0039
3.93	.033	.0329	.0351	.99	.035	.0306	.0040
4.90	.070	.0353	.0295	1.98	.073	.0292	.0041
5.90	.108	.0386	.0234	2.80	.111	.0273	.0042
6.90	.147	.0436	.0172	3.37	.151	.0256	.0043
7.90	.185	.0501	.0114	3.70	.190	.0241	.0043
9.90	.263	.0660	-.0022	3.99	.271	.0198	.0041
11.90	.339	.0872	-.0157	3.89	.350	.0153	.0040
13.91	.411	.1134	-.0270	3.62	.426	.0114	.0040
15.92	.479	.1445	-.0389	3.31	.500	.0076	.0040
17.92	.546	.1814	-.0514	3.01	.575	.0046	.0042
19.93	.591	.2172	-.0532	2.72	.629	.0029	.0041
-.10	-.120	.0366	.0598	-3.28	-.120	.0364	.0039

Table AIII. Continued

UPWT PROJECT 1476 RUN 162 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.19	-.167	.0413	.0577	-4.05	-.169	.0349	.0032
-1.21	-.134	.0365	.0525	-3.68	-.135	.0336	.0032
-.20	-.099	.0326	.0471	-3.02	-.099	.0323	.0033
.79	-.066	.0301	.0419	-2.20	-.066	.0310	.0033
1.81	-.032	.0288	.0368	-1.11	-.031	.0298	.0034
2.80	.003	.0287	.0316	.09	.004	.0285	.0034
3.82	.037	.0296	.0260	1.25	.039	.0271	.0035
4.81	.071	.0318	.0209	2.23	.073	.0257	.0035
5.78	.101	.0347	.0163	2.90	.104	.0244	.0035
6.79	.134	.0389	.0110	3.44	.138	.0228	.0036
7.79	.167	.0440	.0058	3.79	.171	.0210	.0036
8.84	.202	.0509	-.0001	3.97	.207	.0192	.0036
9.79	.234	.0579	-.0053	4.04	.240	.0173	.0036
11.81	.298	.0761	-.0165	3.92	.307	.0135	.0036
13.81	.359	.0986	-.0272	3.64	.372	.0101	.0036
15.80	.417	.1254	-.0373	3.33	.436	.0070	.0036
17.81	.474	.1567	-.0468	3.03	.499	.0041	.0035
18.80	.502	.1736	-.0514	2.89	.531	.0027	.0034
-.19	-.096	.0325	.0464	-2.94	-.096	.0322	.0033

UPWT PROJECT 1476 RUN 163 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.139	.0370	.0457	-3.76	-.140	.0317	.0029
-1.20	-.108	.0326	.0410	-3.31	-.109	.0304	.0029
-.22	-.078	.0296	.0367	-2.65	-.078	.0292	.0030
.80	-.047	.0274	.0321	-1.72	-.047	.0280	.0030
1.80	-.016	.0262	.0275	-.61	-.015	.0267	.0030
2.80	.014	.0261	.0229	.54	.015	.0254	.0030
3.79	.043	.0270	.0184	1.60	.045	.0241	.0031
4.81	.074	.0291	.0138	2.55	.076	.0227	.0031
5.80	.103	.0320	.0094	3.23	.106	.0214	.0031
6.79	.132	.0357	.0048	3.70	.136	.0199	.0031
7.79	.163	.0403	-.0002	4.04	.167	.0179	.0030
9.79	.220	.0529	-.0093	4.16	.225	.0147	.0030
11.81	.278	.0698	-.0188	3.98	.286	.0116	.0030
13.80	.332	.0906	-.0279	3.67	.344	.0087	.0030
15.81	.386	.1155	-.0370	3.34	.403	.0059	.0030
17.79	.437	.1440	-.0455	3.04	.460	.0035	.0030
19.79	.488	.1766	-.0544	2.76	.519	.0009	.0030
-.19	-.076	.0294	.0365	-2.60	-.077	.0292	.0030

UPWT PROJECT 1476 RUN 176 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.10	-.211	.0508	.0740	-4.15	-.213	.0430	.0038
-1.08	-.172	.0445	.0675	-3.86	-.173	.0412	.0038
-.08	-.132	.0396	.0608	-3.34	-.132	.0394	.0038
.92	-.092	.0360	.0542	-2.54	-.091	.0375	.0040
1.92	-.054	.0341	.0483	-1.58	-.053	.0359	.0040
2.91	-.016	.0335	.0426	-.47	-.014	.0342	.0041
3.92	.024	.0340	.0364	.69	.026	.0323	.0042
4.92	.062	.0361	.0304	1.72	.065	.0306	.0043
5.89	.098	.0388	.0242	2.53	.102	.0285	.0043
6.89	.138	.0430	.0175	3.20	.142	.0262	.0044
7.91	.176	.0486	.0111	3.63	.181	.0239	.0044
9.90	.254	.0634	-.0020	4.00	.261	.0188	.0042
11.92	.330	.0832	-.0154	3.97	.340	.0132	.0040
13.91	.405	.1083	-.0290	3.74	.419	.0078	.0041
15.92	.469	.1373	-.0386	3.42	.489	.0033	.0040
17.92	.535	.1718	-.0509	3.11	.562	-.0012	.0040
19.94	.589	.2098	-.0565	2.81	.626	-.0038	.0041
-.07	-.130	.0394	.0606	-3.30	-.130	.0393	.0038

UPWT PROJECT 1476 RUN 177 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.175	.0447	.0569	-3.92	-.177	.0379	.0032
-1.17	-.139	.0392	.0516	-3.55	-.140	.0363	.0033
-.18	-.107	.0353	.0468	-3.03	-.107	.0350	.0034
.80	-.072	.0327	.0419	-2.20	-.071	.0337	.0035
1.80	-.038	.0310	.0366	-1.24	-.037	.0322	.0035
2.80	-.003	.0303	.0310	-.10	-.001	.0304	.0036
3.80	.031	.0308	.0256	1.02	.033	.0286	.0036
4.81	.065	.0325	.0202	2.00	.067	.0269	.0036
5.78	.096	.0351	.0152	2.72	.099	.0253	.0036
6.79	.130	.0390	.0096	3.32	.133	.0234	.0036
7.79	.161	.0435	.0040	3.71	.166	.0212	.0036
9.80	.226	.0555	-.0070	4.07	.232	.0162	.0036
11.82	.291	.0725	-.0179	4.01	.300	.0113	.0037
13.80	.352	.0938	-.0282	3.75	.364	.0072	.0037
15.81	.412	.1201	-.0385	3.43	.429	.0033	.0037
17.82	.471	.1510	-.0486	3.12	.495	-.0005	.0036
18.81	.498	.1674	-.0530	2.97	.525	-.0021	.0036
-.20	-.106	.0353	.0467	-3.00	-.106	.0350	.0034

Table AIII. Continued

UPWT PROJECT 1476 RUN 178 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.19	-.151	.0406	.0470	-3.72	-.153	.0348	.0029
-1.19	-.121	.0361	.0426	-3.36	-.122	.0335	.0030
-.19	-.091	.0324	.0380	-2.80	-.091	.0321	.0030
.82	-.058	.0295	.0332	-1.98	-.058	.0304	.0031
1.81	-.027	.0279	.0284	-.98	-.026	.0287	.0031
2.80	.003	.0274	.0237	.10	.004	.0272	.0031
3.79	.033	.0280	.0193	1.16	.034	.0257	.0031
4.81	.064	.0296	.0144	2.16	.066	.0241	.0031
5.79	.092	.0319	.0099	2.88	.095	.0225	.0031
6.79	.121	.0355	.0053	3.41	.124	.0209	.0031
7.81	.150	.0399	.0005	3.77	.154	.0191	.0031
9.83	.208	.0511	-.0091	4.08	.214	.0148	.0031
11.80	.265	.0661	-.0185	4.00	.272	.0106	.0031
13.80	.320	.0857	-.0274	3.74	.331	.0068	.0031
15.81	.375	.1097	-.0365	3.42	.391	.0032	.0030
17.80	.429	.1375	-.0453	3.12	.450	-.0001	.0030
19.80	.480	.1695	-.0537	2.83	.509	-.0031	.0030
-.22	-.091	.0324	.0380	-2.79	-.091	.0321	.0030

UPWT PROJECT 1476 RUN 179 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.09	-.111	.0237	.0197	-4.67	-.112	.0197	.0025
-1.05	-.071	.0200	.0131	-3.53	-.071	.0187	.0025
-.08	-.033	.0178	.0069	-1.87	-.033	.0177	.0025
.92	.005	.0167	.0007	.28	.005	.0166	.0024
1.91	.042	.0168	-.0055	2.48	.042	.0154	.0024
2.93	.081	.0180	-.0120	4.49	.082	.0138	.0024
3.93	.119	.0201	-.0185	5.92	.120	.0119	.0025
4.93	.158	.0236	-.0248	6.68	.159	.0100	.0025
5.91	.197	.0284	-.0311	6.95	.199	.0079	.0025
6.89	.236	.0344	-.0373	6.87	.238	.0058	.0025
7.91	.277	.0424	-.0437	6.54	.280	.0038	.0025
9.91	.354	.0633	-.0561	5.59	.360	.0014	.0025
11.89	.427	.0894	-.0675	4.77	.436	-.0004	.0026
13.91	.500	.1216	-.0797	4.11	.515	-.0023	.0027
-.07	-.031	.0178	.0068	-1.74	-.031	.0178	.0025

UPWT PROJECT 1476 RUN 180 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.098	.0221	.0156	-4.46	-.099	.0183	.0023
-1.18	-.064	.0188	.0107	-3.42	-.065	.0175	.0023
-.19	-.031	.0167	.0057	-1.88	-.031	.0166	.0023
.80	.001	.0156	.0006	.05	.001	.0156	.0023
1.81	.034	.0156	-.0043	2.16	.034	.0145	.0024
2.80	.067	.0166	-.0094	4.02	.068	.0134	.0024
3.79	.100	.0188	-.0146	5.34	.101	.0121	.0025
4.81	.134	.0220	-.0199	6.10	.136	.0107	.0025
5.81	.167	.0264	-.0250	6.34	.169	.0093	.0025
6.82	.202	.0320	-.0302	6.29	.204	.0079	.0026
7.81	.235	.0388	-.0351	6.05	.238	.0065	.0025
9.81	.299	.0559	-.0451	5.35	.304	.0042	.0025
11.79	.361	.0777	-.0550	4.64	.369	.0024	.0025
13.79	.422	.1045	-.0650	4.04	.435	.0008	.0025
15.81	.482	.1359	-.0755	3.55	.501	-.0007	.0027
16.81	.510	.1527	-.0803	3.34	.533	-.0015	.0027
-.19	-.031	.0167	.0054	-1.83	-.031	.0166	.0023

UPWT PROJECT 1476 RUN 181 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.19	-.090	.0210	.0125	-4.27	-.091	.0176	.0022
-1.18	-.060	.0181	.0084	-3.35	-.061	.0168	.0022
-.20	-.031	.0161	.0043	-1.91	-.031	.0160	.0022
.79	.000	.0151	-.0001	.01	.000	.0151	.0022
1.80	.029	.0152	-.0042	1.92	.030	.0143	.0022
2.80	.059	.0163	-.0085	3.64	.060	.0134	.0022
3.80	.090	.0183	-.0130	4.90	.091	.0123	.0023
4.80	.119	.0213	-.0173	5.58	.120	.0113	.0023
5.79	.148	.0252	-.0216	5.88	.150	.0101	.0023
6.80	.179	.0303	-.0261	5.90	.181	.0089	.0023
7.79	.208	.0363	-.0304	5.73	.211	.0078	.0023
9.81	.266	.0519	-.0393	5.13	.271	.0058	.0022
11.80	.323	.0716	-.0481	4.51	.331	.0040	.0022
13.80	.378	.0955	-.0569	3.96	.390	.0025	.0023
15.80	.432	.1233	-.0660	3.50	.449	.0011	.0024
17.81	.485	.1553	-.0750	3.12	.509	-.0003	.0024
19.81	.536	.1911	-.0843	2.81	.569	-.0019	.0024
-.20	-.030	.0161	.0042	-1.83	-.030	.0160	.0022

Table AIII. Continued

UPWT PROJECT 1476 RUN 94 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.07	-.224	.0312	.0239	-7.18	-.226	.0113	.0028
-4.06	-.181	.0244	.0189	-7.41	-.182	.0116	.0028
-3.06	-.137	.0191	.0141	-7.14	-.137	.0118	.0027
-2.06	-.091	.0154	.0091	-5.95	-.092	.0121	.0027
-1.00	-.045	.0131	.0043	-3.43	-.045	.0123	.0026
-.04	-.004	.0123	-.0001	-.31	-.004	.0123	.0026
.96	.038	.0127	-.0045	2.99	.038	.0121	.0026
1.96	.081	.0144	-.0090	5.63	.082	.0116	.0026
2.97	.126	.0177	-.0140	7.11	.126	.0111	.0027
3.99	.171	.0226	-.0190	7.57	.173	.0107	.0027
4.93	.213	.0287	-.0240	7.44	.215	.0102	.0027
5.96	.258	.0367	-.0292	7.03	.260	.0098	.0027
6.92	.300	.0458	-.0343	6.55	.303	.0093	.0027
7.94	.343	.0568	-.0396	6.04	.348	.0089	.0026
9.92	.425	.0824	-.0494	5.16	.433	.0079	.0025
11.94	.503	.1136	-.0592	4.43	.516	.0071	.0024
-.03	-.002	.0123	.0000	-.17	-.002	.0123	.0026

UPWT PROJECT 1476 RUN 98 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.16	-.190	.0287	.0186	-6.61	-.192	.0115	.0028
-4.18	-.154	.0230	.0149	-6.72	-.155	.0117	.0028
-3.14	-.116	.0182	.0108	-6.35	-.116	.0119	.0027
-2.18	-.081	.0151	.0073	-5.37	-.082	.0120	.0027
-1.16	-.043	.0130	.0035	-3.32	-.043	.0121	.0026
-.17	-.006	.0121	-.0002	-.49	-.006	.0121	.0026
.85	.030	.0124	-.0038	2.40	.030	.0119	.0026
1.85	.067	.0138	-.0076	4.86	.067	.0116	.0026
2.84	.104	.0165	-.0115	6.30	.104	.0113	.0026
3.82	.140	.0203	-.0153	6.89	.141	.0110	.0026
4.82	.177	.0256	-.0194	6.93	.179	.0106	.0027
5.84	.214	.0322	-.0236	6.65	.217	.0102	.0027
6.85	.249	.0398	-.0277	6.26	.252	.0098	.0027
7.83	.284	.0487	-.0316	5.83	.288	.0095	.0026
9.82	.352	.0699	-.0394	5.03	.359	.0089	.0025
11.83	.420	.0965	-.0477	4.36	.431	.0082	.0025
13.84	.483	.1270	-.0556	3.80	.499	.0077	.0026
14.87	.515	.1445	-.0598	3.57	.535	.0075	.0025
-.16	-.004	.0121	-.0003	-.33	-.004	.0121	.0026

UPWT PROJECT 1476 RUN 101 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.19	-.168	.0270	.0144	-6.21	-.170	.0117	.0026
-4.21	-.136	.0219	.0114	-6.23	-.137	.0118	.0025
-3.21	-.103	.0177	.0083	-5.83	-.104	.0119	.0025
-2.20	-.070	.0147	.0052	-4.75	-.070	.0120	.0025
-1.18	-.037	.0128	.0021	-2.90	-.037	.0120	.0024
-.21	-.005	.0120	-.0008	-.40	-.005	.0120	.0024
.82	.027	.0123	-.0038	2.23	.029	.0119	.0024
1.79	.059	.0135	-.0069	4.36	.059	.0117	.0024
2.79	.092	.0159	-.0101	5.77	.092	.0114	.0024
3.82	.126	.0195	-.0134	6.43	.127	.0111	.0024
4.78	.156	.0239	-.0167	6.53	.157	.0108	.0024
5.79	.189	.0298	-.0201	6.36	.191	.0105	.0025
6.79	.221	.0366	-.0234	6.03	.223	.0102	.0024
7.81	.252	.0445	-.0267	5.65	.255	.0099	.0024
9.82	.313	.0636	-.0335	4.91	.319	.0094	.0024
11.77	.370	.0863	-.0403	4.29	.380	.0089	.0024
13.81	.429	.1142	-.0474	3.76	.444	.0084	.0024
15.78	.485	.1452	-.0547	3.34	.506	.0079	.0024
17.82	.542	.1818	-.0627	2.98	.571	.0072	.0024
-.17	-.002	.0121	-.0010	-.20	-.002	.0121	.0024

UPWT PROJECT 1476 RUN 119 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.05	-.102	.0181	.0051	-5.66	-.103	.0144	.0027
-1.00	-.055	.0150	-.0002	-3.71	-.056	.0140	.0026
-.07	-.014	.0136	-.0050	-1.00	-.014	.0136	.0026
.94	.030	.0135	-.0100	2.18	.030	.0131	.0026
1.93	.073	.0149	-.0147	4.92	.074	.0124	.0027
2.94	.118	.0178	-.0194	6.61	.118	.0117	.0027
3.95	.161	.0221	-.0241	7.30	.162	.0109	.0027
4.96	.202	.0274	-.0286	7.36	.203	.0099	.0027
5.95	.244	.0340	-.0332	7.19	.246	.0085	.0027
6.98	.287	.0422	-.0379	6.80	.290	.0070	.0027
7.96	.330	.0519	-.0426	6.35	.334	.0057	.0027
9.95	.414	.0761	-.0524	5.44	.421	.0034	.0026
11.96	.496	.1065	-.0622	4.66	.507	.0013	.0025
12.97	.534	.1234	-.0668	4.33	.548	.0004	.0024
-.09	-.015	.0136	-.0047	-1.12	-.015	.0136	.0026

Table AIII. Continued

UPWT PROJECT 1476 RUN 122 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.15	-.090	.0178	.0032	-5.04	-.090	.0144	.0026
-1.15	-.054	.0152	-.0009	-3.52	-.054	.0141	.0026
-.17	-.018	.0138	-.0049	-1.30	-.018	.0137	.0025
.86	.020	.0136	-.0088	1.49	.020	.0133	.0025
1.85	.056	.0145	-.0126	3.89	.057	.0127	.0026
2.86	.094	.0166	-.0163	5.64	.094	.0119	.0026
3.86	.129	.0198	-.0197	6.49	.130	.0111	.0027
4.85	.165	.0243	-.0233	6.79	.167	.0103	.0027
5.85	.201	.0300	-.0270	6.71	.203	.0093	.0027
6.83	.237	.0368	-.0306	6.44	.239	.0084	.0026
7.83	.272	.0448	-.0343	6.06	.275	.0074	.0026
9.82	.341	.0647	-.0419	5.27	.347	.0055	.0025
11.87	.410	.0902	-.0497	4.55	.420	.0038	.0025
13.84	.475	.1195	-.0574	3.97	.490	.0024	.0025
14.87	.507	.1365	-.0617	3.72	.525	.0017	.0025
-.18	-.017	.0138	-.0048	-1.26	-.018	.0138	.0025

UPWT PROJECT 1476 RUN 123 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.21	-.081	.0175	.0018	-4.60	-.081	.0144	.0025
-1.17	-.048	.0150	-.0016	-3.16	-.048	.0140	.0024
-.19	-.016	.0137	-.0048	-1.20	-.016	.0136	.0023
.81	.014	.0133	-.0077	1.08	.015	.0131	.0024
1.77	.046	.0140	-.0108	3.27	.046	.0126	.0024
2.82	.080	.0159	-.0141	5.03	.081	.0119	.0024
3.80	.112	.0187	-.0172	5.99	.113	.0113	.0024
4.84	.146	.0229	-.0203	6.36	.147	.0106	.0024
5.82	.178	.0279	-.0233	6.36	.180	.0098	.0024
6.79	.208	.0339	-.0262	6.14	.210	.0090	.0024
7.79	.240	.0411	-.0294	5.83	.243	.0082	.0024
9.81	.302	.0590	-.0358	5.12	.308	.0067	.0024
11.78	.362	.0809	-.0424	4.47	.371	.0053	.0024
13.82	.422	.1079	-.0493	3.91	.435	.0039	.0024
15.83	.479	.1387	-.0564	3.46	.499	.0026	.0024
17.85	.536	.1741	-.0639	3.08	.564	.0013	.0024
-.17	-.016	.0137	-.0048	-1.14	-.016	.0136	.0023

UPWT PROJECT 1476 RUN 128 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.04	-.115	.0225	.0035	-5.10	-.115	.0184	.0027
-1.04	-.070	.0190	-.0019	-3.69	-.071	.0178	.0026
-.07	-.029	.0172	-.0072	-1.67	-.029	.0171	.0026
.95	.017	.0167	-.0130	.99	.017	.0164	.0026
1.96	.062	.0177	-.0187	3.52	.063	.0156	.0026
2.95	.108	.0203	-.0240	5.33	.109	.0147	.0027
3.94	.151	.0241	-.0290	6.30	.153	.0136	.0027
4.95	.195	.0292	-.0338	6.66	.196	.0123	.0027
5.95	.237	.0357	-.0386	6.63	.239	.0110	.0027
6.96	.279	.0435	-.0430	6.40	.282	.0094	.0027
7.96	.317	.0523	-.0472	6.07	.322	.0078	.0026
9.94	.396	.0729	-.0559	5.44	.403	.0034	.0025
11.95	.480	.1006	-.0652	4.77	.490	-.0009	.0024
12.96	.519	.1169	-.0700	4.44	.532	-.0025	.0024
-.05	-.027	.0172	-.0072	-1.59	-.027	.0171	.0026

UPWT PROJECT 1476 RUN 130 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.16	-.099	.0226	.0010	-4.38	-.100	.0188	.0026
-1.16	-.063	.0196	-.0032	-3.24	-.064	.0183	.0026
-.16	-.026	.0178	-.0075	-1.48	-.027	.0178	.0026
.84	.007	.0171	-.0116	.40	.007	.0170	.0025
1.84	.045	.0176	-.0158	2.52	.045	.0162	.0026
2.86	.080	.0193	-.0200	4.17	.081	.0152	.0026
3.82	.115	.0220	-.0238	5.25	.117	.0142	.0027
4.86	.155	.0262	-.0278	5.89	.156	.0130	.0027
5.84	.189	.0312	-.0314	6.07	.191	.0118	.0026
6.84	.225	.0374	-.0350	6.02	.228	.0103	.0026
7.85	.259	.0446	-.0382	5.80	.262	.0089	.0025
9.85	.329	.0629	-.0451	5.23	.335	.0057	.0025
11.84	.397	.0860	-.0526	4.62	.406	.0027	.0025
13.84	.464	.1142	-.0603	4.06	.477	-.0000	.0025
15.85	.528	.1472	-.0683	3.59	.548	-.0026	.0025
-.17	-.027	.0179	-.0075	-1.50	-.027	.0178	.0026

Table AIII. Continued

UPWT PROJECT 1476 RUN 131 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.18	-.089	.0222	-.0006	-4.00	-.089	.0188	.0024
-1.18	-.057	.0194	-.0041	-2.94	-.057	.0182	.0024
-.18	-.026	.0178	-.0076	-1.46	-.026	.0177	.0024
.80	.004	.0172	-.0107	.22	.004	.0171	.0024
1.81	.035	.0174	-.0142	2.02	.036	.0163	.0023
2.83	.068	.0188	-.0176	3.62	.069	.0154	.0024
3.83	.101	.0212	-.0209	4.75	.102	.0144	.0024
4.80	.132	.0245	-.0239	5.39	.133	.0134	.0024
5.80	.163	.0288	-.0270	5.65	.165	.0122	.0024
6.80	.196	.0344	-.0302	5.69	.198	.0110	.0024
7.82	.228	.0410	-.0333	5.55	.231	.0097	.0024
9.83	.290	.0576	-.0393	5.04	.296	.0072	.0024
11.91	.351	.0782	-.0456	4.49	.360	.0047	.0024
13.81	.411	.1033	-.0523	3.98	.424	.0022	.0024
15.82	.470	.1330	-.0590	3.53	.489	-.0002	.0024
17.82	.527	.1669	-.0661	3.16	.553	-.0026	.0024
-.17	-.025	.0178	-.0075	-1.42	-.025	.0177	.0024

UPWT PROJECT 1476 RUN 102 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.04	-.145	.0257	.0399	-5.66	-.146	.0205	.0035
-1.03	-.099	.0219	.0350	-4.53	-.100	.0202	.0035
-.04	-.056	.0197	.0303	-2.85	-.056	.0197	.0035
.94	-.015	.0188	.0257	-.80	-.015	.0190	.0035
1.94	.029	.0192	.0209	1.51	.030	.0182	.0035
2.97	.077	.0213	.0156	3.62	.078	.0173	.0034
3.95	.118	.0246	.0108	4.80	.120	.0164	.0034
4.94	.161	.0295	.0058	5.46	.163	.0155	.0034
5.95	.206	.0361	.0008	5.69	.209	.0146	.0034
6.96	.247	.0440	-.0041	5.62	.251	.0137	.0034
7.96	.291	.0536	-.0094	5.44	.296	.0127	.0035
9.97	.374	.0765	-.0196	4.88	.381	.0106	.0034
11.95	.453	.1047	-.0297	4.32	.465	.0087	.0033
13.93	.528	.1379	-.0399	3.83	.545	.0068	.0033
-.04	-.055	.0198	.0302	-2.78	-.055	.0197	.0035

UPWT PROJECT 1476 RUN 103 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.17	-.119	.0233	.0299	-5.10	-.120	.0188	.0031
-1.16	-.081	.0201	.0261	-4.04	-.081	.0184	.0031
-.16	-.044	.0181	.0222	-2.44	-.044	.0180	.0031
.85	-.006	.0173	.0183	-.35	-.006	.0174	.0031
1.85	.031	.0177	.0144	1.73	.031	.0167	.0031
2.83	.068	.0194	.0104	3.51	.069	.0160	.0030
3.83	.104	.0222	.0066	4.67	.105	.0152	.0030
4.84	.140	.0263	.0026	5.31	.142	.0144	.0030
5.84	.176	.0318	-.0015	5.54	.178	.0137	.0030
6.84	.211	.0382	-.0056	5.52	.214	.0128	.0030
7.84	.247	.0461	-.0097	5.35	.251	.0120	.0030
9.82	.315	.0651	-.0176	4.84	.321	.0105	.0030
11.85	.383	.0895	-.0259	4.28	.394	.0089	.0029
13.84	.447	.1179	-.0338	3.80	.463	.0074	.0029
15.84	.510	.1509	-.0422	3.38	.532	.0059	.0028
-.14	-.042	.0181	.0221	-2.34	-.042	.0180	.0031

UPWT PROJECT 1476 RUN 104 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.18	-.099	.0215	.0230	-4.64	-.100	.0177	.0028
-1.18	-.066	.0186	.0199	-3.55	-.066	.0173	.0028
-.19	-.033	.0169	.0168	-1.97	-.033	.0168	.0027
.82	-.001	.0163	.0137	-.04	-.000	.0163	.0027
1.83	.033	.0167	.0104	1.95	.033	.0157	.0027
2.81	.064	.0183	.0073	3.53	.065	.0151	.0027
3.81	.096	.0208	.0040	4.62	.098	.0144	.0027
4.80	.128	.0244	.0007	5.22	.129	.0137	.0027
5.81	.160	.0293	-.0027	5.46	.162	.0129	.0027
6.79	.191	.0351	-.0061	5.45	.194	.0122	.0027
7.82	.223	.0422	-.0096	5.28	.227	.0115	.0027
9.81	.284	.0594	-.0164	4.79	.290	.0101	.0027
11.79	.343	.0805	-.0232	4.26	.352	.0088	.0026
13.81	.401	.1063	-.0300	3.77	.415	.0075	.0025
15.79	.457	.1356	-.0370	3.37	.476	.0062	.0025
17.82	.513	.1698	-.0444	3.02	.540	.0048	.0025
18.80	.539	.1878	-.0479	2.87	.571	.0041	.0024
-.19	-.033	.0170	.0168	-1.94	-.033	.0168	.0027

Table AIII. Continued

UPWT PROJECT 1476 RUN 113 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.08	-.158	.0287	.0365	-5.48	-.158	.0230	.0036
-1.07	-.114	.0243	.0310	-4.70	-.115	.0221	.0036
-.05	-.068	.0212	.0256	-3.21	-.068	.0211	.0036
.95	-.020	.0198	.0201	-1.03	-.020	.0201	.0036
1.96	.025	.0199	.0150	1.23	.025	.0190	.0035
2.98	.068	.0216	.0101	3.14	.069	.0180	.0035
3.97	.108	.0243	.0055	4.46	.110	.0167	.0035
4.95	.149	.0281	.0012	5.28	.150	.0152	.0035
5.95	.191	.0334	-.0035	5.73	.194	.0134	.0035
6.96	.233	.0399	-.0080	5.83	.236	.0114	.0035
7.95	.276	.0483	-.0128	5.72	.280	.0097	.0035
9.95	.361	.0698	-.0224	5.18	.368	.0063	.0034
11.97	.443	.0972	-.0320	4.56	.454	.0031	.0034
13.95	.521	.1296	-.0415	4.02	.537	.0002	.0033
-.07	-.068	.0213	.0257	-3.17	-.068	.0212	.0036

UPWT PROJECT 1476 RUN 116 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.19	-.132	.0263	.0262	-4.99	-.132	.0213	.0031
-1.16	-.094	.0224	.0218	-4.18	-.094	.0205	.0031
-.17	-.056	.0198	.0176	-2.84	-.056	.0197	.0031
.84	-.019	.0185	.0133	-1.00	-.018	.0188	.0031
1.88	.021	.0183	.0092	1.14	.022	.0176	.0031
2.87	.056	.0194	.0055	2.86	.056	.0166	.0031
3.84	.091	.0215	.0021	4.24	.093	.0154	.0030
4.82	.126	.0248	-.0014	5.09	.128	.0141	.0030
5.82	.162	.0293	-.0049	5.51	.164	.0128	.0031
6.82	.198	.0351	-.0086	5.63	.201	.0114	.0031
7.85	.235	.0423	-.0126	5.55	.238	.0099	.0030
9.83	.304	.0599	-.0202	5.08	.310	.0071	.0030
11.81	.372	.0824	-.0281	4.52	.381	.0044	.0030
13.86	.441	.1108	-.0362	3.98	.455	.0020	.0029
15.81	.502	.1421	-.0440	3.54	.522	-.0002	.0028
-.13	-.053	.0197	.0173	-2.68	-.053	.0195	.0031

UPWT PROJECT 1476 RUN 117 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.21	-.113	.0245	.0198	-4.63	-.114	.0201	.0027
-1.22	-.082	.0211	.0166	-3.87	-.082	.0193	.0027
-.19	-.048	.0186	.0131	-2.58	-.048	.0184	.0027
.82	-.015	.0173	.0096	-.84	-.014	.0175	.0027
1.79	.017	.0172	.0065	.98	.017	.0166	.0027
2.79	.050	.0181	.0034	2.75	.051	.0157	.0027
3.78	.081	.0200	.0003	4.05	.082	.0146	.0027
4.77	.112	.0230	-.0027	4.89	.114	.0136	.0027
5.83	.147	.0274	-.0059	5.37	.149	.0123	.0027
6.80	.179	.0325	-.0090	5.49	.181	.0112	.0027
7.80	.210	.0389	-.0121	5.41	.214	.0100	.0027
9.80	.273	.0549	-.0188	4.97	.279	.0076	.0027
11.78	.333	.0749	-.0252	4.44	.341	.0054	.0026
13.80	.393	.0996	-.0320	3.94	.405	.0031	.0025
15.81	.450	.1285	-.0388	3.50	.468	.0010	.0025
17.81	.507	.1618	-.0459	3.14	.533	-.0011	.0024
-.20	-.048	.0187	.0131	-2.56	-.048	.0185	.0027

UPWT PROJECT 1476 RUN 132 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.04	-.172	.0331	.0351	-5.19	-.173	.0269	.0035
-1.06	-.128	.0281	.0295	-4.56	-.129	.0258	.0035
-.07	-.081	.0247	.0235	-3.30	-.081	.0246	.0035
.96	-.034	.0228	.0174	-1.51	-.034	.0234	.0035
1.95	.010	.0224	.0117	.45	.011	.0221	.0035
2.96	.056	.0236	.0059	2.37	.057	.0207	.0035
3.97	.100	.0260	.0008	3.83	.101	.0191	.0034
4.96	.142	.0297	-.0039	4.77	.144	.0173	.0034
5.96	.185	.0349	-.0088	5.31	.188	.0154	.0034
6.96	.224	.0412	-.0131	5.45	.228	.0137	.0034
7.96	.265	.0486	-.0176	5.45	.269	.0115	.0034
9.96	.347	.0670	-.0264	5.18	.353	.0059	.0034
11.96	.430	.0920	-.0355	4.68	.440	.0008	.0033
13.95	.509	.1228	-.0446	4.15	.524	-.0036	.0032
-.05	-.081	.0247	.0236	-3.29	-.081	.0246	.0035

Table AIII. Continued

UPWT PROJECT 1476 RUN 134 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.15	-.138	.0307	.0239	-4.50	-.139	.0255	.0031
-1.16	-.103	.0267	.0194	-3.87	-.104	.0246	.0031
-.17	-.066	.0238	.0150	-2.79	-.066	.0236	.0031
.83	-.030	.0220	.0106	-1.38	-.030	.0224	.0031
1.86	.007	.0214	.0063	.34	.008	.0211	.0031
2.84	.042	.0218	.0021	1.93	.043	.0197	.0031
3.85	.078	.0236	-.0019	3.31	.080	.0183	.0030
4.84	.114	.0265	-.0058	4.32	.116	.0167	.0030
5.84	.151	.0305	-.0096	4.94	.153	.0150	.0030
6.83	.185	.0355	-.0131	5.22	.188	.0132	.0030
7.85	.222	.0420	-.0165	5.30	.226	.0112	.0030
9.84	.290	.0577	-.0234	5.03	.295	.0073	.0030
11.84	.360	.0788	-.0310	4.56	.368	.0033	.0029
13.84	.427	.1048	-.0388	4.07	.439	-.0003	.0028
15.85	.491	.1355	-.0465	3.63	.510	-.0038	.0028
16.85	.524	.1529	-.0506	3.42	.546	-.0055	.0027
-.16	-.066	.0237	.0149	-2.77	-.066	.0236	.0031

UPWT PROJECT 1476 RUN 105 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.05	-.196	.0446	.0661	-4.39	-.197	.0376	.0044
-1.07	-.152	.0398	.0614	-3.82	-.153	.0370	.0043
-.08	-.110	.0364	.0568	-3.02	-.110	.0363	.0042
.96	-.064	.0342	.0517	-1.86	-.063	.0352	.0042
1.99	-.018	.0335	.0470	-.53	-.017	.0341	.0042
2.95	.025	.0344	.0423	.72	.026	.0331	.0042
3.94	.069	.0370	.0375	1.87	.072	.0322	.0042
4.96	.114	.0416	.0329	2.74	.117	.0315	.0042
5.96	.156	.0473	.0285	3.30	.160	.0308	.0043
6.96	.198	.0540	.0238	3.66	.203	.0297	.0044
7.98	.240	.0624	.0190	3.85	.247	.0284	.0044
9.97	.322	.0824	.0090	3.91	.331	.0254	.0044
11.96	.402	.1081	-.0012	3.72	.416	.0225	.0043
13.96	.479	.1394	-.0117	3.44	.499	.0197	.0042
14.95	.516	.1565	-.0166	3.30	.539	.0181	.0041
-.03	-.105	.0363	.0564	-2.90	-.105	.0362	.0042

UPWT PROJECT 1476 RUN 135 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.19	-.121	.0290	.0180	-4.17	-.122	.0244	.0026
-1.18	-.089	.0252	.0143	-3.53	-.090	.0234	.0026
-.19	-.058	.0227	.0108	-2.58	-.059	.0225	.0026
.81	-.026	.0210	.0072	-1.26	-.026	.0214	.0026
1.82	.006	.0204	.0036	.28	.006	.0202	.0026
2.82	.038	.0209	.0002	1.80	.038	.0190	.0026
3.81	.068	.0223	-.0030	3.07	.070	.0177	.0026
4.81	.101	.0247	-.0063	4.09	.103	.0161	.0026
5.82	.134	.0283	-.0096	4.73	.136	.0146	.0026
6.81	.165	.0328	-.0127	5.04	.168	.0130	.0027
7.82	.197	.0385	-.0158	5.12	.201	.0113	.0026
9.82	.261	.0534	-.0219	4.89	.266	.0081	.0026
11.80	.321	.0721	-.0280	4.46	.329	.0048	.0025
13.81	.382	.0955	-.0346	4.00	.394	.0015	.0024
15.82	.441	.1232	-.0413	3.58	.458	-.0017	.0024
17.82	.499	.1554	-.0481	3.21	.523	-.0049	.0024
18.82	.527	.1729	-.0512	3.05	.555	-.0064	.0024
-.19	-.059	.0227	.0106	-2.58	-.059	.0225	.0026

UPWT PROJECT 1476 RUN 106 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.14	-.156	.0398	.0511	-3.93	-.158	.0340	.0035
-1.19	-.121	.0358	.0474	-3.38	-.122	.0333	.0035
-.15	-.083	.0327	.0434	-2.53	-.083	.0325	.0035
.84	-.046	.0309	.0395	-1.49	-.045	.0315	.0035
1.84	-.009	.0303	.0356	-.30	-.008	.0306	.0035
2.84	.029	.0311	.0316	.93	.030	.0296	.0036
3.85	.066	.0332	.0277	1.97	.068	.0288	.0036
4.86	.103	.0370	.0238	2.79	.106	.0281	.0036
5.84	.139	.0415	.0201	3.34	.142	.0272	.0037
6.84	.173	.0466	.0159	3.71	.177	.0257	.0037
7.84	.208	.0534	.0119	3.90	.214	.0245	.0037
9.85	.277	.0705	.0037	3.94	.285	.0220	.0037
11.83	.344	.0920	-.0048	3.74	.356	.0194	.0036
13.85	.411	.1186	-.0134	3.47	.427	.0167	.0036
15.87	.477	.1498	-.0225	3.19	.499	.0138	.0035
17.82	.535	.1834	-.0308	2.92	.566	.0108	.0034
-.16	-.081	.0327	.0433	-2.49	-.081	.0325	.0035

Table AIII. Continued

UPWT PROJECT 1476 RUN 107 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.134	.0368	.0420	-3.63	-.135	.0317	.0030
-1.18	-.100	.0330	.0387	-3.04	-.101	.0309	.0030
-.20	-.068	.0303	.0354	-2.24	-.068	.0300	.0030
.84	-.034	.0285	.0319	-1.18	-.033	.0290	.0030
1.82	-.001	.0280	.0287	-.04	-.000	.0280	.0031
2.80	.031	.0286	.0253	1.09	.032	.0271	.0031
3.82	.065	.0305	.0218	2.13	.067	.0261	.0031
4.82	.098	.0336	.0184	2.91	.100	.0252	.0031
5.81	.129	.0375	.0151	3.43	.132	.0243	.0031
6.83	.161	.0424	.0116	3.79	.164	.0230	.0032
7.80	.191	.0480	.0079	3.97	.195	.0217	.0032
9.84	.254	.0635	.0004	4.01	.262	.0190	.0032
11.80	.313	.0825	-.0067	3.80	.323	.0167	.0032
13.82	.373	.1065	-.0140	3.50	.388	.0143	.0031
15.79	.428	.1339	-.0210	3.20	.449	.0122	.0031
17.81	.484	.1658	-.0286	2.92	.511	.0099	.0030
19.81	.539	.2017	-.0358	2.67	.575	.0072	.0029
-.17	-.066	.0302	.0353	-2.20	-.067	.0300	.0030

UPWT PROJECT 1476 RUN 108 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.04	-.208	.0478	.0628	-4.35	-.210	.0404	.0043
-1.06	-.164	.0422	.0575	-3.89	-.165	.0392	.0042
-.06	-.119	.0381	.0520	-3.13	-.119	.0380	.0042
.96	-.074	.0354	.0470	-2.09	-.073	.0367	.0042
1.94	-.030	.0343	.0419	-.87	-.029	.0353	.0042
2.95	.014	.0346	.0369	.40	.016	.0339	.0042
3.96	.058	.0363	.0320	1.60	.060	.0322	.0042
4.95	.100	.0391	.0275	2.55	.103	.0303	.0042
5.93	.141	.0432	.0232	3.26	.145	.0284	.0043
6.92	.181	.0487	.0192	3.72	.186	.0265	.0044
7.96	.224	.0563	.0149	3.98	.230	.0248	.0043
9.92	.306	.0750	.0062	4.08	.314	.0212	.0043
11.96	.390	.0999	-.0036	3.90	.402	.0170	.0043
13.93	.466	.1296	-.0125	3.60	.484	.0136	.0041
15.96	.544	.1652	-.0233	3.29	.568	.0093	.0040
17.97	.617	.2055	-.0337	3.00	.650	.0052	.0040
19.97	.689	.2515	-.0447	2.74	.733	.0011	.0035
-.04	-.115	.0380	.0518	-3.03	-.115	.0379	.0042

UPWT PROJECT 1476 RUN 110 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.16	-.170	.0430	.0477	-3.95	-.171	.0365	.0035
-1.17	-.133	.0381	.0434	-3.49	-.134	.0354	.0035
-.16	-.095	.0344	.0389	-2.75	-.095	.0341	.0035
.83	-.059	.0320	.0348	-1.85	-.059	.0329	.0035
1.86	-.020	.0307	.0306	-.64	-.019	.0313	.0035
2.83	.017	.0306	.0266	.56	.019	.0297	.0036
3.84	.053	.0317	.0229	1.67	.055	.0281	.0036
4.86	.090	.0342	.0188	2.65	.093	.0264	.0037
5.84	.126	.0377	.0153	3.34	.129	.0247	.0037
6.84	.160	.0424	.0119	3.78	.164	.0231	.0037
7.83	.195	.0485	.0085	4.01	.199	.0215	.0037
9.85	.266	.0650	.0011	4.09	.273	.0185	.0037
11.83	.334	.0851	-.0073	3.93	.345	.0147	.0036
13.85	.403	.1108	-.0158	3.63	.418	.0112	.0035
15.85	.467	.1407	-.0240	3.32	.488	.0077	.0035
16.84	.498	.1569	-.0283	3.17	.522	.0059	.0035
-.14	-.093	.0343	.0388	-2.72	-.094	.0341	.0035

UPWT PROJECT 1476 RUN 111 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.147	.0398	.0391	-3.70	-.149	.0341	.0030
-1.21	-.115	.0353	.0354	-3.26	-.116	.0328	.0030
-.19	-.082	.0318	.0318	-2.57	-.082	.0315	.0030
.80	-.049	.0295	.0282	-1.67	-.049	.0302	.0030
1.83	-.015	.0282	.0246	-.52	-.014	.0286	.0031
2.82	.018	.0281	.0212	.65	.020	.0272	.0031
3.81	.051	.0291	.0178	1.74	.053	.0256	.0031
4.83	.085	.0313	.0144	2.71	.087	.0241	.0031
5.81	.117	.0346	.0113	3.37	.120	.0226	.0031
6.80	.147	.0390	.0084	3.77	.151	.0213	.0032
7.80	.178	.0447	.0054	3.99	.183	.0201	.0031
9.81	.242	.0590	-.0014	4.10	.248	.0169	.0031
11.80	.303	.0772	-.0085	3.93	.313	.0135	.0031
13.83	.366	.1002	-.0161	3.65	.379	.0099	.0031
15.84	.424	.1274	-.0233	3.33	.443	.0067	.0030
17.81	.480	.1582	-.0302	3.04	.506	.0037	.0030
19.84	.538	.1945	-.0371	2.76	.572	.0006	.0029
-.21	-.081	.0318	.0316	-2.55	-.081	.0315	.0030

Table AIII. Continued

UPWT PROJECT 1476 RUN 136 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.03	-.223	.0529	.0623	-4.21	-.225	.0450	.0042
-1.07	-.181	.0470	.0567	-3.84	-.181	.0436	.0042
-.03	-.132	.0420	.0506	-3.13	-.132	.0420	.0042
.95	-.088	.0391	.0450	-2.25	-.087	.0405	.0042
1.94	-.041	.0375	.0391	-1.11	-.040	.0389	.0042
2.92	.004	.0374	.0334	.11	.006	.0371	.0042
3.96	.049	.0387	.0278	1.27	.052	.0352	.0042
4.95	.093	.0411	.0226	2.25	.096	.0330	.0042
5.93	.133	.0448	.0181	2.97	.137	.0308	.0042
6.93	.172	.0497	.0138	3.46	.177	.0286	.0043
7.92	.212	.0558	.0097	3.79	.217	.0262	.0044
9.94	.292	.0719	.0017	4.06	.300	.0205	.0043
11.94	.374	.0944	-.0068	3.96	.385	.0150	.0043
13.98	.458	.1240	-.0159	3.70	.475	.0096	.0042
15.93	.531	.1562	-.0254	3.40	.554	.0044	.0040
17.95	.608	.1961	-.0360	3.10	.639	-.0009	.0040
19.97	.680	.2410	-.0463	2.82	.722	-.0059	.0035
-.03	-.131	.0421	.0506	-3.10	-.131	.0420	.0042

UPWT PROJECT 1476 RUN 139 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.153	.0442	.0367	-3.46	-.154	.0383	.0030
-1.22	-.123	.0396	.0330	-3.10	-.123	.0370	.0030
-.19	-.090	.0358	.0291	-2.52	-.090	.0355	.0030
.79	-.058	.0331	.0253	-1.75	-.058	.0339	.0030
1.78	-.027	.0315	.0217	-.85	-.026	.0323	.0030
2.79	.007	.0309	.0180	.21	.008	.0305	.0031
3.80	.040	.0312	.0143	1.27	.042	.0285	.0030
4.82	.073	.0328	.0107	2.23	.076	.0265	.0030
5.80	.103	.0352	.0077	2.93	.106	.0246	.0031
6.82	.136	.0390	.0044	3.49	.140	.0226	.0031
7.82	.167	.0438	.0013	3.82	.172	.0206	.0031
9.81	.230	.0569	-.0050	4.05	.237	.0168	.0031
11.79	.292	.0740	-.0113	3.94	.301	.0129	.0030
13.79	.353	.0954	-.0181	3.70	.365	.0086	.0030
15.83	.413	.1215	-.0253	3.40	.431	.0041	.0029
17.80	.472	.1513	-.0324	3.12	.495	-.0001	.0028
19.82	.529	.1863	-.0386	2.84	.561	-.0041	.0028
-.18	-.089	.0357	.0290	-2.49	-.089	.0354	.0030

UPWT PROJECT 1476 RUN 138 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.16	-.178	.0479	.0458	-3.72	-.180	.0411	.0035
-1.14	-.142	.0426	.0411	-3.34	-.143	.0398	.0035
-.13	-.105	.0386	.0365	-2.73	-.105	.0384	.0035
.84	-.070	.0357	.0322	-1.95	-.069	.0368	.0035
1.83	-.033	.0340	.0277	-.97	-.032	.0350	.0036
2.83	.004	.0334	.0234	.11	.005	.0332	.0036
3.83	.040	.0340	.0191	1.18	.042	.0313	.0036
4.82	.077	.0358	.0148	2.16	.080	.0292	.0036
5.83	.114	.0387	.0109	2.94	.117	.0269	.0036
6.85	.150	.0428	.0074	3.51	.154	.0246	.0037
7.81	.183	.0477	.0042	3.83	.188	.0224	.0037
9.82	.253	.0621	-.0027	4.08	.260	.0180	.0037
11.85	.323	.0815	-.0100	3.96	.332	.0135	.0035
13.84	.391	.1054	-.0182	3.71	.405	.0089	.0035
15.84	.457	.1339	-.0265	3.41	.476	.0042	.0034
17.84	.521	.1674	-.0350	3.11	.547	-.0004	.0033
-.15	-.106	.0387	.0365	-2.74	-.106	.0384	.0035

UPWT PROJECT 1476 RUN 198 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.03	-.117	.0208	.0075	-5.59	-.117	.0167	.0026
-1.04	-.074	.0173	.0024	-4.26	-.074	.0160	.0026
-.05	-.029	.0151	-.0027	-1.91	-.029	.0150	.0026
.95	.013	.0144	-.0074	.90	.013	.0141	.0026
1.93	.055	.0151	-.0121	3.68	.056	.0132	.0026
2.96	.103	.0174	-.0172	5.90	.103	.0121	.0027
3.93	.144	.0209	-.0219	6.90	.145	.0110	.0027
4.94	.188	.0259	-.0266	7.23	.189	.0097	.0027
5.96	.230	.0323	-.0311	7.13	.232	.0082	.0027
6.94	.271	.0396	-.0356	6.83	.274	.0066	.0027
7.97	.316	.0490	-.0403	6.45	.320	.0047	.0026
9.96	.400	.0719	-.0501	5.57	.407	.0016	.0025
11.95	.480	.1002	-.0595	4.79	.490	-.0012	.0025
12.96	.522	.1174	-.0645	4.45	.535	-.0027	.0024
-.05	-.029	.0151	-.0027	-1.93	-.029	.0151	.0026

Table AIII. Continued

UPWT PROJECT 1476 RUN 200 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.16	-.103	.0202	.0057	-5.08	-.103	.0164	.0026
-1.16	-.066	.0170	.0016	-3.88	-.067	.0157	.0026
-.17	-.031	.0152	-.0024	-2.01	-.031	.0151	.0025
.85	.007	.0144	-.0063	.46	.007	.0143	.0025
1.85	.042	.0149	-.0101	2.86	.043	.0135	.0025
2.84	.080	.0166	-.0140	4.83	.081	.0126	.0026
3.84	.117	.0195	-.0177	6.00	.118	.0116	.0026
4.84	.153	.0236	-.0213	6.48	.154	.0106	.0026
5.84	.189	.0288	-.0251	6.56	.191	.0094	.0026
6.84	.224	.0352	-.0288	6.37	.227	.0082	.0026
7.84	.260	.0429	-.0325	6.07	.263	.0070	.0026
9.85	.330	.0620	-.0400	5.33	.336	.0045	.0025
11.84	.399	.0859	-.0480	4.64	.408	.0022	.0025
13.85	.466	.1149	-.0558	4.05	.480	.0001	.0025
15.84	.528	.1480	-.0637	3.57	.549	-.0018	.0024
-.15	-.029	.0151	-.0025	-1.90	-.029	.0150	.0025

UPWT PROJECT 1476 RUN 201 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.18	-.092	.0197	.0037	-4.65	-.092	.0162	.0024
-1.19	-.059	.0169	.0005	-3.52	-.060	.0156	.0024
-.19	-.027	.0151	-.0028	-1.81	-.027	.0150	.0023
.83	.004	.0144	-.0059	.30	.005	.0144	.0023
1.81	.036	.0148	-.0092	2.42	.036	.0136	.0023
2.80	.068	.0162	-.0122	4.21	.069	.0129	.0024
3.81	.101	.0187	-.0154	5.39	.102	.0120	.0024
4.81	.133	.0223	-.0185	5.98	.135	.0111	.0024
5.83	.167	.0271	-.0217	6.14	.168	.0101	.0024
6.80	.197	.0328	-.0247	6.03	.200	.0091	.0024
7.82	.230	.0398	-.0279	5.78	.233	.0081	.0023
9.81	.291	.0565	-.0344	5.15	.297	.0061	.0023
11.83	.353	.0781	-.0410	4.52	.362	.0041	.0023
13.81	.413	.1037	-.0480	3.98	.426	.0022	.0023
15.81	.471	.1338	-.0550	3.52	.490	.0003	.0023
17.81	.528	.1679	-.0622	3.14	.554	-.0016	.0023
-.17	-.026	.0151	-.0029	-1.73	-.026	.0150	.0023

UPWT PROJECT 1476 RUN 206 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.05	-.138	.0285	.0088	-4.85	-.139	.0235	.0027
-1.06	-.093	.0240	.0036	-3.89	-.094	.0223	.0026
-.06	-.050	.0212	-.0017	-2.38	-.050	.0212	.0026
.95	-.007	.0198	-.0069	-.33	-.006	.0199	.0026
1.97	.039	.0199	-.0124	1.96	.040	.0186	.0026
2.96	.083	.0214	-.0178	3.86	.084	.0171	.0027
3.94	.126	.0244	-.0232	5.17	.127	.0157	.0027
4.95	.171	.0289	-.0287	5.94	.173	.0139	.0027
5.94	.214	.0345	-.0335	6.20	.216	.0122	.0027
6.96	.256	.0417	-.0383	6.15	.259	.0103	.0027
7.96	.298	.0501	-.0431	5.96	.302	.0083	.0027
9.96	.377	.0700	-.0516	5.38	.384	.0037	.0026
11.96	.459	.0953	-.0604	4.81	.469	-.0018	.0025
13.71	.529	.1229	-.0684	4.30	.543	-.0059	.0023
-.04	-.048	.0211	-.0017	-2.26	-.048	.0211	.0026

UPWT PROJECT 1476 RUN 208 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.15	-.116	.0272	.0058	-4.27	-.117	.0228	.0026
-1.16	-.082	.0236	.0018	-3.46	-.082	.0219	.0026
-.16	-.046	.0211	-.0023	-2.16	-.046	.0210	.0025
.R3	-.010	.0199	-.0062	-.50	-.010	.0200	.0025
1.84	.025	.0198	-.0103	1.26	.026	.0190	.0025
2.84	.061	.0210	-.0143	2.93	.062	.0179	.0026
3.84	.099	.0233	-.0186	4.24	.100	.0166	.0026
4.R4	.134	.0267	-.0225	5.03	.136	.0153	.0026
5.83	.169	.0312	-.0264	5.43	.172	.0138	.0026
6.84	.206	.0370	-.0304	5.57	.209	.0122	.0026
7.81	.239	.0434	-.0340	5.51	.243	.0105	.0026
9.85	.310	.0607	-.0413	5.11	.316	.0067	.0025
11.84	.379	.0824	-.0487	4.60	.388	.0028	.0025
13.84	.445	.1089	-.0564	4.09	.458	-.0008	.0025
15.85	.512	.1407	-.0642	3.64	.531	-.0045	.0024
-.15	-.044	.0211	-.0023	-2.08	-.044	.0209	.0025

Table AIII. Continued

UPWT PROJECT 1476 RUN 209 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.18	-.100	.0265	.0035	-3.78	-.101	.0226	.0024
-1.19	-.071	.0233	.0003	-3.04	-.071	.0218	.0024
-.19	-.039	.0210	-.0030	-1.87	-.039	.0209	.0023
.81	-.009	.0199	-.0062	-.47	-.009	.0201	.0023
1.81	.021	.0197	-.0093	1.04	.021	.0191	.0023
2.81	.052	.0206	-.0126	2.51	.053	.0180	.0024
3.82	.085	.0226	-.0160	3.75	.086	.0169	.0024
4.81	.116	.0255	-.0192	4.54	.117	.0157	.0024
5.81	.147	.0294	-.0225	5.01	.149	.0143	.0024
6.81	.179	.0344	-.0257	5.22	.182	.0129	.0024
7.81	.211	.0404	-.0289	5.23	.215	.0113	.0023
9.82	.274	.0558	-.0354	4.91	.280	.0082	.0023
11.82	.335	.0752	-.0417	4.45	.343	.0050	.0023
13.82	.395	.0990	-.0483	3.99	.407	.0018	.0023
15.81	.455	.1273	-.0553	3.57	.472	-.0014	.0023
17.82	.513	.1599	-.0626	3.21	.537	-.0047	.0024
-.19	-.039	.0211	-.0030	-1.86	-.039	.0209	.0023

UPWT PROJECT 1476 RUN 126 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.16	-.100	.0196	.0071	-5.11	-.101	.0158	.0026
-1.16	-.063	.0165	.0030	-3.85	-.064	.0152	.0025
-.18	-.027	.0145	-.0010	-1.85	-.027	.0144	.0025
.85	.010	.0138	-.0050	.70	.010	.0136	.0025
1.84	.047	.0142	-.0089	3.27	.047	.0127	.0026
2.85	.083	.0160	-.0129	5.21	.084	.0118	.0026
3.84	.119	.0189	-.0167	6.31	.120	.0109	.0026
4.85	.155	.0231	-.0204	6.72	.157	.0099	.0026
5.86	.193	.0286	-.0239	6.73	.195	.0088	.0026
6.86	.228	.0352	-.0278	6.47	.230	.0077	.0026
7.84	.262	.0428	-.0316	6.12	.265	.0067	.0026
9.83	.332	.0622	-.0396	5.34	.338	.0046	.0025
11.83	.400	.0864	-.0478	4.63	.410	.0025	.0025
13.84	.466	.1154	-.0559	4.03	.480	.0007	.0024
15.82	.527	.1484	-.0641	3.56	.548	-.0010	.0024
-.15	-.025	.0145	-.0012	-1.71	-.025	.0144	.0025

UPWT PROJECT 1476 RUN 124 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.04	-.115	.0203	.0096	-5.70	-.116	.0161	.0027
-1.05	-.072	.0167	.0042	-4.34	-.073	.0154	.0026
-.04	-.026	.0144	-.0010	-1.83	-.026	.0144	.0026
.96	.016	.0137	-.0060	1.18	.016	.0134	.0026
1.99	.062	.0145	-.0111	4.32	.063	.0123	.0026
2.96	.105	.0167	-.0158	6.32	.106	.0112	.0027
3.94	.147	.0204	-.0205	7.21	.148	.0102	.0027
4.94	.189	.0254	-.0250	7.44	.190	.0090	.0027
5.95	.232	.0318	-.0297	7.30	.234	.0075	.0027
6.95	.275	.0396	-.0343	6.95	.277	.0060	.0026
7.96	.318	.0490	-.0396	6.49	.322	.0045	.0026
9.96	.403	.0726	-.0499	5.55	.409	.0018	.0025
11.95	.483	.1017	-.0599	4.75	.494	-.0006	.0024
12.96	.523	.1186	-.0645	4.41	.537	-.0018	.0023
-.05	-.027	.0145	-.0009	-1.84	-.027	.0145	.0026

UPWT PROJECT 1476 RUN 127 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.18	-.088	.0189	.0051	-4.65	-.089	.0156	.0024
-1.20	-.057	.0162	.0018	-3.50	-.057	.0150	.0024
-.19	-.025	.0145	-.0014	-1.70	-.025	.0144	.0023
.83	.007	.0139	-.0047	.53	.008	.0137	.0023
1.81	.039	.0143	-.0078	2.77	.040	.0130	.0023
2.81	.072	.0157	-.0112	4.57	.072	.0122	.0024
3.82	.105	.0183	-.0144	5.75	.106	.0113	.0024
4.81	.136	.0219	-.0174	6.22	.138	.0104	.0024
5.81	.169	.0267	-.0205	6.32	.171	.0095	.0024
6.79	.199	.0325	-.0237	6.15	.202	.0086	.0024
7.80	.231	.0395	-.0269	5.86	.234	.0077	.0023
9.82	.295	.0571	-.0337	5.16	.300	.0060	.0023
11.81	.355	.0785	-.0407	4.52	.363	.0042	.0023
13.81	.414	.1044	-.0479	3.97	.427	.0026	.0023
15.83	.472	.1347	-.0552	3.50	.491	.0009	.0023
17.80	.527	.1685	-.0628	3.13	.554	-.0008	.0023
-.20	-.024	.0145	-.0014	-1.68	-.025	.0144	.0023

Table AIII. Continued

UPWT PROJECT 1476 RUN 194 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.06	-.134	.0252	.0112	-5.31	-.135	.0204	.0027
-1.02	-.086	.0208	.0056	-4.14	-.087	.0193	.0026
-.05	-.044	.0183	.0007	-2.42	-.044	.0182	.0026
.96	.001	.0170	-.0047	.04	.001	.0170	.0026
1.97	.044	.0173	-.0097	2.52	.044	.0158	.0026
2.96	.089	.0190	-.0151	4.70	.090	.0144	.0027
3.95	.132	.0219	-.0202	6.06	.134	.0127	.0027
4.92	.174	.0260	-.0252	6.68	.175	.0110	.0027
5.93	.218	.0321	-.0302	6.80	.220	.0094	.0027
6.93	.258	.0393	-.0345	6.58	.261	.0078	.0026
7.94	.299	.0479	-.0390	6.25	.303	.0061	.0026
9.95	.380	.0686	-.0477	5.54	.386	.0019	.0025
11.95	.463	.0954	-.0575	4.86	.473	-.0026	.0024
12.98	.505	.1117	-.0627	4.52	.517	-.0046	.0023
-.05	-.045	.0183	.0009	-2.48	-.045	.0183	.0026

UPWT PROJECT 1476 RUN 196 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.16	-.113	.0244	.0082	-4.65	-.114	.0201	.0026
-1.15	-.076	.0207	.0041	-3.70	-.077	.0191	.0025
-.16	-.041	.0183	.0001	-2.24	-.041	.0182	.0025
.86	-.004	.0171	-.0040	-.25	-.004	.0172	.0025
1.85	.031	.0172	-.0079	1.82	.032	.0162	.0025
2.87	.069	.0186	-.0121	3.74	.070	.0151	.0025
3.82	.103	.0209	-.0159	4.95	.105	.0139	.0026
4.80	.139	.0244	-.0199	5.70	.140	.0127	.0026
5.81	.176	.0291	-.0240	6.05	.178	.0111	.0026
6.84	.213	.0352	-.0279	6.05	.215	.0096	.0025
7.83	.247	.0422	-.0314	5.85	.250	.0081	.0025
9.80	.313	.0592	-.0383	5.30	.319	.0050	.0024
11.84	.385	.0823	-.0463	4.67	.393	.0017	.0024
13.83	.451	.1096	-.0542	4.11	.464	-.0013	.0024
15.87	.516	.1423	-.0627	3.63	.535	-.0042	.0023
-.15	-.040	.0183	-.0000	-2.17	-.040	.0182	.0025

UPWT PROJECT 1476 RUN 197 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.19	-.096	.0236	.0052	-4.07	-.097	.0199	.0024
-1.20	-.065	.0205	.0020	-3.19	-.066	.0191	.0023
-.22	-.035	.0184	-.0011	-1.92	-.035	.0183	.0023
.81	-.003	.0173	-.0044	-.18	-.003	.0174	.0023
1.77	.026	.0173	-.0075	1.51	.027	.0165	.0023
2.77	.058	.0183	-.0107	3.19	.059	.0154	.0023
3.81	.092	.0205	-.0142	4.49	.093	.0143	.0024
4.78	.123	.0235	-.0175	5.22	.124	.0132	.0024
5.78	.154	.0277	-.0207	5.57	.156	.0120	.0024
6.78	.186	.0328	-.0239	5.67	.189	.0106	.0023
7.80	.219	.0392	-.0271	5.58	.222	.0092	.0023
9.76	.276	.0544	-.0331	5.10	.283	.0065	.0023
11.80	.341	.0750	-.0399	4.55	.349	.0037	.0023
13.81	.401	.0996	-.0470	4.02	.413	.0010	.0023
15.79	.459	.1280	-.0541	3.58	.476	-.0016	.0023
17.82	.517	.1616	-.0618	3.20	.541	-.0042	.0023
-.21	-.034	.0184	-.0012	-1.83	-.034	.0182	.0023

UPWT PROJECT 1476 RUN 202 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.06	-.116	.0203	.0064	-5.73	-.117	.0161	.0027
-1.01	-.071	.0166	.0010	-4.27	-.071	.0153	.0026
-.05	-.028	.0145	-.0042	-1.94	-.028	.0145	.0026
.95	.016	.0139	-.0092	1.15	.016	.0137	.0026
1.96	.061	.0148	-.0142	4.13	.062	.0127	.0026
2.94	.104	.0173	-.0188	6.01	.105	.0119	.0027
3.94	.147	.0210	-.0232	6.97	.148	.0109	.0027
4.97	.189	.0261	-.0276	7.24	.191	.0097	.0027
5.96	.231	.0322	-.0321	7.16	.233	.0081	.0027
6.94	.272	.0396	-.0366	6.88	.275	.0064	.0027
7.96	.318	.0491	-.0418	6.47	.322	.0046	.0026
9.97	.403	.0725	-.0514	5.56	.409	.0017	.0025
11.95	.482	.1011	-.0609	4.77	.493	-.0010	.0024
12.94	.523	.1178	-.0655	4.44	.536	-.0022	.0024
-.05	-.027	.0145	-.0040	-1.86	-.027	.0145	.0026

Table AIII. Continued

UPWT PROJECT 1476 RUN 204 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.15	-.102	.0199	.0044	-5.14	-.103	.0160	.0026
-1.16	-.066	.0168	.0004	-3.93	-.066	.0154	.0026
-.15	-.029	.0150	-.0037	-1.95	-.029	.0149	.0025
.83	.006	.0142	-.0074	.39	.006	.0142	.0025
1.84	.043	.0146	-.0114	2.94	.044	.0132	.0026
2.85	.080	.0163	-.0153	4.95	.081	.0122	.0026
3.83	.116	.0191	-.0188	6.08	.117	.0113	.0026
4.85	.153	.0232	-.0225	6.62	.155	.0101	.0026
5.85	.189	.0284	-.0261	6.65	.191	.0090	.0026
6.83	.225	.0348	-.0297	6.47	.228	.0078	.0026
7.85	.262	.0427	-.0335	6.13	.265	.0065	.0026
9.84	.332	.0619	-.0413	5.36	.338	.0043	.0025
11.84	.401	.0863	-.0488	4.65	.410	.0021	.0025
13.83	.465	.1148	-.0568	4.05	.479	.0003	.0025
15.84	.530	.1489	-.0648	3.56	.551	-.0015	.0025
-.15	-.027	.0149	-.0038	-1.79	-.027	.0149	.0025

UPWT PROJECT 1476 RUN 205 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.18	-.089	.0192	.0026	-4.62	-.089	.0158	.0024
-1.20	-.058	.0165	-.0005	-3.51	-.058	.0153	.0024
-.19	-.026	.0148	-.0037	-1.77	-.026	.0147	.0023
.82	.005	.0141	-.0068	.37	.005	.0140	.0023
1.80	.037	.0144	-.0100	2.58	.038	.0132	.0023
2.81	.070	.0158	-.0131	4.44	.071	.0123	.0024
3.81	.102	.0183	-.0162	5.60	.103	.0114	.0024
4.82	.136	.0219	-.0194	6.19	.137	.0104	.0024
5.81	.168	.0266	-.0225	6.31	.170	.0095	.0024
6.82	.200	.0324	-.0256	6.16	.202	.0085	.0024
7.82	.231	.0393	-.0287	5.87	.234	.0075	.0023
9.80	.293	.0564	-.0351	5.20	.298	.0057	.0023
11.82	.355	.0782	-.0418	4.54	.363	.0039	.0023
13.81	.415	.1041	-.0487	3.98	.427	.0021	.0023
15.82	.472	.1343	-.0557	3.52	.491	.0004	.0023
17.83	.529	.1689	-.0631	3.13	.556	-.0013	.0023
-.20	-.026	.0148	-.0038	-1.76	-.026	.0147	.0023

UPWT PROJECT 1476 RUN 210 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.07	-.140	.0281	.0061	-4.98	-.141	.0230	.0027
-1.05	-.094	.0235	.0003	-3.99	-.094	.0218	.0026
-.03	-.049	.0208	-.0053	-2.34	-.049	.0208	.0026
.95	-.008	.0195	-.0104	-.43	-.008	.0196	.0026
2.00	.039	.0196	-.0164	2.01	.040	.0182	.0026
2.96	.083	.0210	-.0216	3.93	.083	.0167	.0027
3.95	.126	.0237	-.0271	5.33	.128	.0149	.0027
4.93	.171	.0277	-.0325	6.19	.173	.0128	.0027
5.96	.213	.0332	-.0373	6.42	.215	.0109	.0027
6.95	.254	.0402	-.0414	6.31	.257	.0092	.0026
7.94	.293	.0481	-.0454	6.09	.297	.0072	.0026
9.98	.375	.0681	-.0537	5.51	.381	.0020	.0025
11.96	.458	.0931	-.0626	4.91	.467	-.0037	.0024
12.95	.499	.1084	-.0673	4.60	.511	-.0062	.0023
-.04	-.049	.0207	-.0053	-2.39	-.049	.0207	.0026

UPWT PROJECT 1476 RUN 212 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.18	-.119	.0275	.0033	-4.32	-.120	.0229	.0026
-1.12	-.082	.0236	-.0011	-3.48	-.083	.0220	.0026
-.15	-.048	.0213	-.0053	-2.25	-.048	.0212	.0026
.86	-.014	.0201	-.0094	-.67	-.013	.0203	.0025
1.84	.021	.0198	-.0135	1.08	.022	.0191	.0025
2.83	.057	.0205	-.0177	2.77	.058	.0177	.0026
3.84	.094	.0225	-.0219	4.20	.096	.0161	.0026
4.84	.131	.0255	-.0260	5.14	.133	.0143	.0026
5.85	.167	.0296	-.0299	5.65	.169	.0124	.0026
6.84	.203	.0348	-.0335	5.82	.205	.0105	.0026
7.84	.239	.0414	-.0368	5.76	.242	.0085	.0025
9.87	.309	.0584	-.0435	5.30	.315	.0045	.0025
11.83	.378	.0798	-.0506	4.74	.386	.0007	.0025
13.86	.447	.1071	-.0587	4.17	.460	-.0031	.0025
15.85	.513	.1388	-.0668	3.69	.531	-.0065	.0025
-.18	-.049	.0214	-.0052	-2.31	-.049	.0212	.0026

Table AIII. Continued

UPWT PROJECT 1476 RUN 213 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.20	-.104	.0269	.0010	-3.87	-.105	.0228	.0024
-1.21	-.074	.0236	-.0023	-3.14	-.074	.0220	.0024
-.20	-.043	.0213	-.0056	-2.02	-.043	.0211	.0024
.82	-.013	.0199	-.0090	-.66	-.013	.0201	.0023
1.79	.017	.0195	-.0121	.85	.017	.0190	.0023
2.78	.047	.0200	-.0154	2.37	.048	.0177	.0024
3.82	.082	.0216	-.0189	3.77	.083	.0162	.0024
4.78	.112	.0240	-.0220	4.66	.114	.0146	.0024
5.79	.145	.0277	-.0252	5.22	.147	.0130	.0024
6.80	.176	.0324	-.0284	5.45	.179	.0113	.0023
7.80	.209	.0382	-.0315	5.46	.212	.0096	.0023
9.80	.272	.0533	-.0377	5.10	.277	.0062	.0023
11.78	.333	.0726	-.0439	4.59	.341	.0031	.0023
13.79	.395	.0968	-.0506	4.08	.407	-.0002	.0023
15.81	.455	.1253	-.0576	3.63	.472	-.0035	.0023
17.80	.513	.1578	-.0644	3.25	.537	-.0066	.0023
-.19	-.042	.0213	-.0058	-1.98	-.042	.0211	.0024

UPWT PROJECT 1476 RUN 51 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.04	-.223	.0316	.0309	-7.06	-.225	.0119	.0025
-4.05	-.180	.0250	.0251	-7.23	-.182	.0122	.0025
-3.06	-.137	.0198	.0188	-6.94	-.138	.0124	.0024
-2.04	-.093	.0160	.0126	-5.81	-.093	.0126	.0024
-1.06	-.050	.0137	.0066	-3.67	-.051	.0128	.0024
-.08	-.007	.0128	.0003	-.55	-.007	.0128	.0024
.98	.040	.0132	-.0062	3.02	.040	.0125	.0024
2.01	.085	.0150	-.0127	5.66	.085	.0120	.0024
2.95	.126	.0181	-.0184	6.97	.127	.0116	.0024
3.91	.167	.0226	-.0241	7.40	.168	.0111	.0025
4.99	.215	.0294	-.0307	7.31	.217	.0106	.0026
5.99	.259	.0374	-.0370	6.93	.262	.0102	.0026
6.95	.300	.0463	-.0429	6.48	.303	.0097	.0026
7.95	.340	.0569	-.0489	5.98	.345	.0093	.0026
9.95	.423	.0830	-.0614	5.10	.431	.0086	.0026
11.97	.503	.1147	-.0740	4.39	.516	.0078	.0026
-.06	-.005	.0128	.0003	-.40	-.005	.0128	.0024

UPWT PROJECT 1476 RUN 54 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.13	-.190	.0292	.0236	-6.51	-.192	.0121	.0025
-4.13	-.154	.0232	.0188	-6.61	-.155	.0121	.0024
-3.13	-.117	.0186	.0143	-6.28	-.118	.0122	.0023
-2.16	-.082	.0154	.0098	-5.30	-.082	.0123	.0023
-1.16	-.043	.0132	.0049	-3.28	-.044	.0124	.0023
-.14	-.006	.0123	.0001	-.48	-.006	.0123	.0023
.85	.031	.0126	-.0046	2.43	.031	.0121	.0023
1.89	.068	.0141	-.0096	4.83	.069	.0119	.0023
2.88	.106	.0169	-.0144	6.30	.107	.0115	.0023
3.88	.142	.0209	-.0192	6.80	.143	.0112	.0024
4.91	.181	.0266	-.0244	6.81	.183	.0110	.0024
5.86	.214	.0328	-.0288	6.53	.216	.0107	.0024
6.91	.252	.0411	-.0342	6.13	.255	.0105	.0024
7.87	.285	.0497	-.0389	5.73	.289	.0102	.0024
9.85	.352	.0709	-.0486	4.97	.359	.0096	.0024
11.85	.418	.0971	-.0585	4.31	.429	.0091	.0024
13.86	.483	.1279	-.0688	3.77	.499	.0086	.0024
15.87	.544	.1630	-.0790	3.34	.568	.0080	.0025
-.14	-.004	.0124	-.0002	-.34	-.004	.0124	.0023

UPWT PROJECT 1476 RUN 55 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.19	-.170	.0276	.0180	-6.14	-.172	.0122	.0023
-4.16	-.136	.0220	.0141	-6.18	-.137	.0121	.0023
-3.16	-.104	.0179	.0105	-5.83	-.105	.0121	.0022
-2.16	-.071	.0149	.0067	-4.79	-.072	.0122	.0022
-1.19	-.039	.0130	.0029	-2.97	-.039	.0122	.0022
-.14	-.005	.0122	-.0010	-.42	-.005	.0121	.0022
.84	.027	.0124	-.0048	2.15	.027	.0120	.0022
1.84	.059	.0137	-.0086	4.31	.060	.0118	.0022
2.88	.093	.0162	-.0129	5.76	.094	.0115	.0022
3.85	.125	.0197	-.0167	6.36	.126	.0112	.0022
4.86	.158	.0245	-.0208	6.43	.159	.0111	.0022
5.82	.188	.0301	-.0248	6.24	.190	.0109	.0022
6.84	.220	.0371	-.0290	5.92	.223	.0107	.0022
7.83	.250	.0451	-.0331	5.55	.254	.0106	.0022
9.83	.311	.0643	-.0417	4.84	.318	.0102	.0022
11.83	.370	.0875	-.0503	4.23	.380	.0098	.0022
13.86	.428	.1152	-.0592	3.72	.443	.0093	.0022
15.86	.485	.1469	-.0685	3.30	.507	.0088	.0023
17.86	.539	.1824	-.0778	2.96	.569	.0082	.0023
18.84	.567	.2016	-.0826	2.81	.601	.0079	.0024
-.12	-.003	.0122	-.0011	-.22	-.003	.0122	.0022

Table AIII. Continued

UPWT PROJECT 1476 RUN 182 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.05	-.108	.0193	.0113	-5.58	-.108	.0154	.0025
-1.07	-.065	.0161	.0054	-4.02	-.065	.0149	.0025
-.02	-.018	.0143	-.0012	-1.26	-.018	.0143	.0025
.97	.025	.0140	-.0072	1.77	.025	.0136	.0024
1.97	.068	.0152	-.0134	4.48	.069	.0128	.0025
2.93	.111	.0177	-.0197	6.24	.111	.0121	.0025
3.93	.153	.0215	-.0258	7.10	.154	.0110	.0026
4.99	.198	.0271	-.0325	7.29	.199	.0098	.0026
5.97	.242	.0337	-.0389	7.17	.244	.0084	.0027
6.97	.285	.0418	-.0448	6.83	.288	.0068	.0027
7.92	.325	.0508	-.0504	6.39	.328	.0056	.0027
9.96	.410	.0753	-.0625	5.44	.416	.0034	.0027
11.99	.491	.1056	-.0749	4.65	.502	.0013	.0027
12.96	.530	.1225	-.0810	4.33	.544	.0004	.0027
-.04	-.019	.0143	-.0009	-1.33	-.019	.0143	.0025

UPWT PROJECT 1476 RUN 183 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.13	-.094	.0186	.0083	-5.07	-.095	.0151	.0024
-1.15	-.058	.0158	.0037	-3.69	-.059	.0146	.0024
-.16	-.021	.0142	-.0012	-1.50	-.021	.0142	.0024
.84	.015	.0139	-.0059	1.08	.015	.0136	.0024
1.88	.052	.0147	-.0109	3.52	.052	.0130	.0024
2.84	.087	.0166	-.0154	5.26	.088	.0123	.0024
3.90	.125	.0200	-.0206	6.28	.127	.0114	.0025
4.88	.162	.0243	-.0254	6.65	.163	.0105	.0025
5.87	.198	.0298	-.0301	6.63	.200	.0095	.0025
6.87	.233	.0366	-.0350	6.36	.236	.0085	.0025
7.87	.268	.0447	-.0398	5.99	.272	.0076	.0025
9.87	.338	.0649	-.0493	5.21	.344	.0059	.0025
11.86	.405	.0896	-.0591	4.53	.415	.0043	.0025
13.88	.471	.1192	-.0691	3.95	.486	.0028	.0025
14.88	.504	.1360	-.0743	3.70	.522	.0021	.0025
-.15	-.021	.0142	-.0013	-1.49	-.021	.0142	.0024

UPWT PROJECT 1476 RUN 184 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.16	-.086	.0182	.0062	-4.72	-.086	.0149	.0023
-1.19	-.055	.0157	.0022	-3.49	-.055	.0145	.0023
-.12	-.020	.0141	-.0021	-1.40	-.020	.0140	.0023
.84	.010	.0137	-.0058	.76	.011	.0135	.0023
1.84	.043	.0143	-.0097	2.98	.043	.0130	.0023
2.86	.075	.0160	-.0138	4.71	.076	.0122	.0023
3.86	.109	.0189	-.0178	5.77	.110	.0115	.0023
4.84	.140	.0227	-.0218	6.17	.141	.0108	.0023
5.85	.172	.0277	-.0258	6.22	.174	.0100	.0023
6.87	.205	.0340	-.0299	6.04	.208	.0092	.0023
7.83	.235	.0409	-.0339	5.75	.238	.0084	.0023
9.83	.297	.0586	-.0423	5.07	.303	.0070	.0023
11.82	.357	.0806	-.0507	4.43	.366	.0057	.0023
13.83	.416	.1071	-.0594	3.89	.430	.0045	.0023
15.84	.474	.1379	-.0685	3.44	.494	.0032	.0024
17.87	.532	.1733	-.0778	3.07	.559	.0018	.0023
-.11	-.019	.0141	-.0021	-1.37	-.019	.0140	.0023

UPWT PROJECT 1476 RUN 191 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.06	-.125	.0251	.0109	-4.98	-.126	.0206	.0024
-1.03	-.079	.0211	.0044	-3.73	-.079	.0197	.0024
-.04	-.034	.0188	-.0019	-1.80	-.034	.0188	.0024
.95	.007	.0179	-.0080	.39	.007	.0178	.0024
1.95	.052	.0184	-.0145	2.82	.053	.0166	.0024
2.93	.096	.0204	-.0208	4.71	.097	.0155	.0024
3.94	.140	.0238	-.0272	5.89	.142	.0141	.0025
4.99	.187	.0289	-.0338	6.45	.189	.0126	.0026
5.97	.229	.0351	-.0400	6.53	.232	.0111	.0026
6.96	.269	.0423	-.0461	6.35	.272	.0094	.0026
7.96	.309	.0509	-.0521	6.08	.313	.0075	.0027
9.96	.391	.0718	-.0642	5.45	.398	.0030	.0027
11.96	.474	.0992	-.0759	4.78	.484	-.0012	.0027
12.97	.514	.1153	-.0820	4.46	.527	-.0030	.0027
-.06	-.036	.0188	-.0013	-1.92	-.036	.0188	.0024

Table AIII. Continued

UPWT PROJECT 1476 RUN 192 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.14	-.108	.0241	.0083	-4.48	-.109	.0201	.0023
-1.13	-.072	.0208	.0033	-3.44	-.072	.0194	.0023
-.14	-.035	.0188	-.0017	-1.85	-.035	.0187	.0023
.85	-.001	.0179	-.0065	-.07	-.001	.0179	.0023
1.85	.036	.0182	-.0115	2.00	.037	.0170	.0023
2.86	.073	.0197	-.0166	3.71	.074	.0161	.0023
3.86	.110	.0224	-.0215	4.90	.111	.0150	.0024
4.86	.146	.0262	-.0265	5.58	.148	.0137	.0024
5.85	.182	.0311	-.0312	5.84	.184	.0124	.0024
6.86	.217	.0371	-.0362	5.84	.220	.0110	.0024
7.85	.252	.0442	-.0408	5.69	.256	.0094	.0024
9.84	.321	.0620	-.0505	5.18	.327	.0062	.0024
11.85	.390	.0849	-.0602	4.59	.399	.0031	.0024
13.87	.457	.1132	-.0701	4.04	.471	.0003	.0024
15.86	.522	.1460	-.0798	3.57	.542	-.0022	.0024
-.15	-.036	.0188	-.0016	-1.92	-.036	.0187	.0023

UPWT PROJECT 1476 RUN 185 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.06	-.103	.0177	.0097	-5.81	-.103	.0140	.0024
-1.04	-.056	.0146	.0032	-3.87	-.057	.0136	.0024
-.03	-.011	.0132	-.0030	-.84	-.011	.0132	.0024
.94	.029	.0133	-.0089	2.21	.030	.0128	.0024
1.95	.075	.0149	-.0154	5.02	.075	.0123	.0024
2.95	.118	.0179	-.0217	6.59	.119	.0118	.0025
3.96	.161	.0223	-.0280	7.23	.162	.0111	.0025
4.96	.205	.0280	-.0343	7.32	.206	.0102	.0026
5.96	.248	.0350	-.0407	7.09	.250	.0091	.0026
6.96	.291	.0433	-.0468	6.72	.294	.0077	.0027
7.94	.332	.0530	-.0526	6.27	.336	.0066	.0027
9.96	.417	.0779	-.0647	5.35	.424	.0047	.0028
11.96	.497	.1084	-.0768	4.58	.508	.0031	.0027
12.95	.535	.1256	-.0827	4.26	.550	.0024	.0028
-.04	-.011	.0133	-.0028	-.85	-.011	.0133	.0024

UPWT PROJECT 1476 RUN 193 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.15	-.095	.0236	.0054	-4.00	-.095	.0201	.0022
-1.15	-.064	.0207	.0014	-3.09	-.064	.0194	.0022
-.15	-.033	.0187	-.0026	-1.75	-.033	.0187	.0022
.87	-.000	.0178	-.0068	-.02	-.000	.0178	.0022
1.84	.030	.0179	-.0107	1.68	.031	.0170	.0022
2.85	.062	.0191	-.0150	3.26	.063	.0160	.0022
3.85	.095	.0214	-.0191	4.44	.096	.0150	.0023
4.84	.127	.0247	-.0231	5.13	.128	.0139	.0023
5.84	.158	.0289	-.0273	5.45	.160	.0127	.0023
6.85	.191	.0344	-.0314	5.55	.194	.0114	.0022
7.85	.222	.0409	-.0355	5.43	.226	.0102	.0022
9.84	.284	.0569	-.0439	4.98	.289	.0076	.0023
11.85	.346	.0776	-.0524	4.46	.354	.0049	.0023
13.86	.405	.1026	-.0608	3.95	.418	.0025	.0023
15.85	.463	.1318	-.0695	3.51	.482	.0003	.0023
17.87	.522	.1661	-.0786	3.14	.548	-.0021	.0023
-.14	-.032	.0187	-.0028	-1.68	-.032	.0186	.0022

UPWT PROJECT 1476 RUN 186 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.16	-.089	.0172	.0069	-5.18	-.089	.0138	.0024
-1.13	-.050	.0145	.0018	-3.47	-.051	.0135	.0023
-.16	-.015	.0133	-.0027	-1.13	-.015	.0132	.0023
.86	.022	.0132	-.0074	1.68	.022	.0129	.0023
1.85	.058	.0143	-.0124	4.07	.059	.0124	.0023
2.84	.095	.0166	-.0173	5.71	.096	.0119	.0024
3.85	.131	.0202	-.0221	6.48	.132	.0113	.0024
4.86	.168	.0249	-.0269	6.75	.170	.0106	.0024
5.85	.204	.0308	-.0319	6.64	.206	.0098	.0024
6.84	.239	.0378	-.0365	6.33	.242	.0090	.0024
7.85	.276	.0464	-.0415	5.95	.280	.0083	.0024
9.84	.344	.0667	-.0510	5.16	.350	.0070	.0024
11.85	.412	.0922	-.0609	4.47	.422	.0056	.0024
13.84	.476	.1219	-.0708	3.91	.491	.0045	.0024
14.85	.509	.1390	-.0758	3.66	.528	.0039	.0024
-.14	-.014	.0133	-.0028	-1.02	-.014	.0132	.0023

Table AIII. Continued

UPWT PROJECT 1476 RUN 187 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.15	-.077	.0167	.0039	-4.59	-.077	.0138	.0023
-1.15	-.045	.0145	.0001	-3.10	-.045	.0136	.0023
-.15	-.014	.0133	-.0038	-1.02	-.014	.0133	.0022
.85	.018	.0132	-.0077	1.40	.019	.0129	.0022
1.84	.050	.0140	-.0115	3.58	.051	.0124	.0022
2.84	.083	.0160	-.0155	5.20	.084	.0119	.0023
3.84	.116	.0191	-.0196	6.04	.117	.0113	.0023
4.85	.149	.0234	-.0237	6.35	.150	.0108	.0023
5.85	.181	.0287	-.0278	6.30	.183	.0101	.0023
6.85	.213	.0352	-.0320	6.06	.216	.0095	.0022
7.85	.244	.0427	-.0360	5.72	.248	.0090	.0022
9.85	.306	.0611	-.0445	5.01	.312	.0079	.0023
11.85	.366	.0837	-.0529	4.37	.375	.0068	.0023
13.86	.425	.1108	-.0615	3.83	.439	.0059	.0023
15.87	.483	.1423	-.0707	3.39	.504	.0048	.0023
16.85	.510	.1588	-.0751	3.21	.534	.0043	.0023
-.14	-.012	.0133	-.0040	-.90	-.012	.0133	.0022

UPWT PROJECT 1476 RUN 189 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.13	-.096	.0198	.0053	-4.81	-.096	.0163	.0023
-1.16	-.061	.0171	.0004	-3.58	-.061	.0158	.0023
-.15	-.025	.0155	-.0045	-1.59	-.025	.0155	.0023
.85	.011	.0151	-.0094	.74	.011	.0149	.0022
1.86	.048	.0159	-.0147	3.02	.049	.0144	.0023
2.86	.084	.0179	-.0194	4.71	.085	.0137	.0023
3.86	.122	.0212	-.0244	5.74	.123	.0130	.0024
4.86	.159	.0258	-.0295	6.17	.161	.0122	.0024
5.85	.194	.0312	-.0344	6.20	.196	.0113	.0024
6.85	.229	.0379	-.0393	6.03	.232	.0104	.0024
7.84	.263	.0457	-.0440	5.76	.267	.0093	.0024
9.85	.333	.0648	-.0539	5.13	.339	.0070	.0024
11.84	.400	.0886	-.0636	4.52	.410	.0046	.0024
13.86	.467	.1180	-.0733	3.96	.482	.0026	.0024
15.84	.530	.1510	-.0832	3.51	.551	.0007	.0024
-.14	-.023	.0155	-.0047	-1.50	-.023	.0154	.0023

UPWT PROJECT 1476 RUN 188 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.05	-.111	.0204	.0069	-5.43	-.111	.0164	.0024
-1.05	-.066	.0171	.0007	-3.86	-.066	.0159	.0024
-.05	-.021	.0153	-.0056	-1.39	-.021	.0153	.0024
.94	.022	.0150	-.0118	1.46	.022	.0147	.0024
1.96	.067	.0163	-.0182	4.15	.068	.0140	.0024
2.93	.111	.0189	-.0246	5.90	.112	.0132	.0025
3.95	.156	.0231	-.0310	6.76	.158	.0123	.0026
4.95	.200	.0287	-.0376	6.95	.201	.0114	.0026
5.95	.242	.0358	-.0439	6.76	.244	.0105	.0027
6.95	.283	.0439	-.0502	6.44	.286	.0094	.0027
7.95	.323	.0533	-.0563	6.06	.327	.0081	.0027
9.95	.405	.0758	-.0684	5.34	.412	.0047	.0027
11.98	.489	.1050	-.0805	4.66	.500	.0013	.0028
12.96	.527	.1213	-.0866	4.34	.541	-.0000	.0028
-.06	-.023	.0154	-.0054	-1.46	-.023	.0154	.0024

UPWT PROJECT 1476 RUN 190 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.15	-.081	.0194	.0017	-4.16	-.081	.0164	.0022
-1.15	-.049	.0169	-.0023	-2.91	-.049	.0159	.0022
-.15	-.019	.0155	-.0061	-1.23	-.019	.0155	.0022
.85	.013	.0152	-.0103	.85	.013	.0150	.0022
1.85	.044	.0158	-.0143	2.79	.045	.0144	.0022
2.86	.077	.0176	-.0186	4.35	.077	.0138	.0022
3.86	.109	.0204	-.0227	5.31	.110	.0131	.0023
4.85	.140	.0244	-.0269	5.77	.142	.0124	.0023
5.84	.172	.0292	-.0309	5.88	.174	.0116	.0023
6.85	.205	.0353	-.0351	5.79	.207	.0107	.0022
7.83	.236	.0424	-.0394	5.57	.239	.0098	.0022
9.85	.299	.0599	-.0479	4.99	.305	.0079	.0022
11.86	.360	.0817	-.0565	4.41	.369	.0060	.0023
13.85	.419	.1077	-.0649	3.89	.432	.0043	.0022
15.86	.477	.1383	-.0737	3.45	.497	.0026	.0023
17.85	.533	.1725	-.0824	3.09	.560	.0008	.0023
-.14	-.019	.0155	-.0063	-1.19	-.019	.0155	.0022

Table AIII. Continued

UPWT PROJECT 1522 RUN 501 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-4.05	-.190	.0269	.0180	-7.07	-.192	.0134	.0026
-3.01	-.142	.0211	.0130	-6.73	-.143	.0136	.0025
-2.02	-.093	.0171	.0079	-5.46	-.094	.0138	.0024
-1.03	-.048	.0148	.0032	-3.22	-.048	.0139	.0024
-.04	-.002	.0139	-.0015	-.14	-.002	.0139	.0023
.98	.045	.0146	-.0063	3.11	.046	.0138	.0024
1.98	.093	.0168	-.0112	5.56	.094	.0135	.0025
2.93	.137	.0203	-.0159	6.77	.138	.0133	.0025
3.94	.184	.0256	-.0212	7.19	.186	.0129	.0026
4.93	.233	.0326	-.0266	7.14	.234	.0124	.0026
5.97	.280	.0414	-.0320	6.77	.283	.0120	.0027
7.01	.328	.0519	-.0374	6.31	.331	.0115	.0027
7.96	.370	.0630	-.0424	5.87	.375	.0112	.0028
9.94	.456	.0904	-.0527	5.04	.465	.0103	.0029
11.98	.543	.1248	-.0630	4.35	.557	.0095	.0029
12.97	.584	.1439	-.0680	4.06	.602	.0090	.0029
13.90	.621	.1625	-.0725	3.82	.642	.0087	.0028
-.04	-.001	.0139	-.0014	-.05	-.001	.0139	.0023

UPWT PROJECT 1522 RUN 504 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.04	-.195	.0309	.0171	-6.32	-.197	.0136	.0028
-4.05	-.156	.0248	.0135	-6.27	-.157	.0138	.0027
-3.06	-.118	.0202	.0096	-5.86	-.119	.0138	.0027
-2.05	-.078	.0166	.0057	-4.68	-.078	.0138	.0027
-1.09	-.041	.0146	.0020	-2.80	-.041	.0138	.0026
-.09	-.002	.0138	-.0017	-.15	-.002	.0138	.0026
.94	.037	.0144	-.0055	2.56	.037	.0137	.0026
1.99	.078	.0163	-.0095	4.79	.079	.0136	.0026
2.93	.114	.0193	-.0132	5.90	.115	.0135	.0026
3.92	.152	.0237	-.0170	6.43	.154	.0132	.0026
4.94	.192	.0296	-.0211	6.49	.194	.0130	.0026
5.92	.228	.0364	-.0248	6.27	.231	.0127	.0026
6.94	.266	.0448	-.0290	5.94	.270	.0123	.0026
7.92	.303	.0542	-.0328	5.58	.307	.0120	.0026
9.98	.376	.0776	-.0407	4.85	.384	.0112	.0027
11.94	.445	.1049	-.0484	4.24	.457	.0105	.0026
13.94	.514	.1378	-.0565	3.73	.532	.0100	.0025
15.92	.580	.1750	-.0648	3.31	.605	.0094	.0025
-.05	.000	.0139	-.0019	.00	.000	.0139	.0026

UPWT PROJECT 1522 RUN 505 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.11	-.174	.0294	.0132	-5.93	-.176	.0137	.0026
-4.12	-.140	.0239	.0101	-5.86	-.141	.0138	.0026
-3.09	-.104	.0194	.0070	-5.37	-.105	.0138	.0026
-2.09	-.070	.0163	.0039	-4.31	-.071	.0137	.0025
-1.11	-.037	.0144	.0007	-2.55	-.037	.0136	.0025
-.11	-.003	.0136	-.0023	-.22	-.003	.0136	.0024
.89	.031	.0140	-.0053	2.20	.031	.0135	.0024
1.92	.067	.0157	-.0086	4.26	.067	.0134	.0024
2.90	.101	.0185	-.0119	5.46	.102	.0133	.0024
3.89	.134	.0223	-.0151	6.00	.135	.0132	.0024
4.88	.167	.0273	-.0183	6.13	.169	.0130	.0024
5.89	.201	.0337	-.0215	5.98	.204	.0128	.0025
6.89	.234	.0409	-.0248	5.72	.237	.0125	.0025
7.88	.267	.0493	-.0280	5.41	.271	.0123	.0025
9.89	.331	.0697	-.0345	4.75	.338	.0118	.0025
11.90	.394	.0946	-.0409	4.17	.405	.0113	.0024
13.88	.454	.1233	-.0475	3.68	.470	.0108	.0024
15.89	.515	.1571	-.0547	3.28	.538	.0102	.0024
17.89	.572	.1947	-.0622	2.94	.604	.0095	.0025
19.95	.632	.2389	-.0698	2.65	.676	.0088	.0025
-.08	-.000	.0136	-.0025	-.02	-.000	.0136	.0025

UPWT PROJECT 1522 RUN 507 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.06	-.110	.0213	.0017	-5.18	-.111	.0173	.0024
-1.09	-.065	.0182	-.0037	-3.56	-.065	.0170	.0023
-.06	-.017	.0165	-.0090	-1.01	-.017	.0165	.0023
.95	.031	.0164	-.0144	1.90	.031	.0159	.0024
1.94	.079	.0178	-.0193	4.43	.080	.0151	.0025
2.95	.126	.0207	-.0240	6.09	.127	.0142	.0026
3.97	.173	.0252	-.0286	6.87	.175	.0132	.0026
4.95	.218	.0311	-.0329	7.03	.220	.0121	.0026
5.98	.266	.0388	-.0377	6.84	.268	.0109	.0027
6.91	.307	.0471	-.0422	6.53	.311	.0097	.0027
7.92	.354	.0578	-.0472	6.12	.358	.0084	.0027
9.98	.447	.0845	-.0571	5.29	.455	.0058	.0028
11.96	.533	.1162	-.0669	4.58	.545	.0034	.0028
13.94	.615	.1537	-.0762	4.00	.634	.0011	.0028
-.06	-.016	.0165	-.0088	-.96	-.016	.0165	.0023

Table AIII. Continued

UPWT PROJECT 1522 RUN 508 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.11	-.096	.0208	.0006	-4.63	-.097	.0172	.0026
-1.11	-.058	.0179	-.0033	-3.27	-.059	.0168	.0025
-.11	-.020	.0163	-.0071	-1.21	-.020	.0162	.0025
.92	.019	.0159	-.0111	1.19	.019	.0156	.0025
1.94	.060	.0170	-.0151	3.51	.060	.0149	.0025
2.96	.100	.0194	-.0190	5.17	.101	.0142	.0026
3.92	.136	.0228	-.0226	5.95	.137	.0135	.0026
4.95	.177	.0279	-.0264	6.33	.178	.0126	.0026
5.93	.213	.0339	-.0299	6.28	.216	.0117	.0026
6.92	.253	.0415	-.0336	6.09	.256	.0107	.0026
7.90	.288	.0498	-.0371	5.77	.292	.0098	.0026
9.90	.363	.0712	-.0444	5.10	.370	.0077	.0026
11.88	.435	.0974	-.0518	4.46	.445	.0058	.0026
13.91	.506	.1295	-.0595	3.91	.522	.0040	.0026
15.91	.574	.1660	-.0675	3.45	.597	.0024	.0026
-.12	-.019	.0163	-.0072	-1.19	-.019	.0163	.0025

UPWT PROJECT 1522 RUN 509 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.14	-.086	.0204	-.0013	-4.25	-.087	.0171	.0025
-1.13	-.053	.0176	-.0043	-3.02	-.054	.0166	.0025
-.14	-.020	.0161	-.0074	-1.25	-.020	.0160	.0024
.92	.015	.0156	-.0107	.99	.016	.0154	.0024
1.87	.047	.0163	-.0136	2.90	.048	.0148	.0024
2.87	.082	.0183	-.0168	4.52	.083	.0141	.0025
3.87	.117	.0214	-.0201	5.49	.118	.0134	.0025
4.89	.152	.0257	-.0233	5.90	.153	.0127	.0025
5.89	.186	.0312	-.0263	5.96	.188	.0120	.0025
6.88	.219	.0378	-.0293	5.81	.222	.0112	.0025
7.87	.253	.0454	-.0323	5.56	.256	.0104	.0025
9.86	.319	.0645	-.0386	4.95	.326	.0089	.0025
11.85	.384	.0881	-.0449	4.36	.394	.0073	.0025
13.85	.447	.1163	-.0514	3.85	.462	.0058	.0024
15.85	.509	.1489	-.0579	3.42	.530	.0043	.0024
17.87	.569	.1863	-.0649	3.05	.599	.0027	.0025
-.14	-.021	.0161	-.0072	-1.30	-.021	.0160	.0024

UPWT PROJECT 1522 RUN 510 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.08	-.125	.0293	-.0030	-4.26	-.126	.0248	.0025
-1.04	-.075	.0253	-.0090	-2.94	-.075	.0240	.0024
-.08	-.031	.0232	-.0145	-1.33	-.031	.0232	.0024
.93	.014	.0224	-.0198	.63	.014	.0221	.0024
1.95	.061	.0229	-.0255	2.67	.062	.0208	.0025
2.96	.111	.0252	-.0310	4.41	.112	.0194	.0026
3.93	.154	.0286	-.0359	5.38	.156	.0180	.0027
4.91	.199	.0335	-.0406	5.94	.201	.0164	.0027
5.91	.245	.0400	-.0451	6.12	.248	.0146	.0027
6.90	.290	.0478	-.0496	6.06	.294	.0127	.0027
7.91	.334	.0571	-.0538	5.85	.338	.0106	.0028
9.91	.423	.0801	-.0625	5.28	.431	.0061	.0028
11.96	.514	.1104	-.0717	4.66	.526	.0015	.0028
13.94	.598	.1455	-.0805	4.11	.615	-.0028	.0029
-.08	-.033	.0233	-.0143	-1.40	-.033	.0232	.0024

UPWT PROJECT 1522 RUN 511 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.13	-.111	.0282	-.0033	-3.93	-.112	.0241	.0027
-1.13	-.074	.0248	-.0076	-2.97	-.074	.0233	.0026
-.09	-.035	.0225	-.0119	-1.55	-.035	.0225	.0026
.90	.001	.0216	-.0161	.06	.002	.0216	.0025
1.87	.038	.0219	-.0199	1.75	.039	.0206	.0025
2.88	.077	.0234	-.0241	3.30	.078	.0195	.0026
3.94	.118	.0263	-.0283	4.48	.119	.0182	.0027
4.87	.153	.0300	-.0318	5.12	.155	.0168	.0027
5.85	.191	.0349	-.0355	5.46	.193	.0153	.0026
6.88	.230	.0415	-.0392	5.55	.233	.0136	.0026
7.91	.270	.0495	-.0428	5.47	.275	.0118	.0026
9.95	.347	.0692	-.0499	5.02	.354	.0081	.0026
11.94	.421	.0938	-.0567	4.49	.431	.0047	.0026
13.93	.492	.1236	-.0640	3.98	.507	.0015	.0026
15.93	.562	.1586	-.0715	3.54	.584	-.0016	.0026
-.10	-.034	.0225	-.0120	-1.52	-.034	.0225	.0026

Table AIII. Continued

UPWT PROJECT 1522 PUN 512 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.14	-.099	.0273	-.0050	-3.63	-.100	.0236	.0026
-1.15	-.067	.0241	-.0083	-2.78	-.068	.0228	.0026
-.15	-.036	.0220	-.0116	-1.62	-.036	.0219	.0025
.85	-.004	.0210	-.0148	-.17	-.003	.0210	.0024
1.85	.029	.0209	-.0180	1.41	.030	.0200	.0024
2.89	.065	.0221	-.0214	2.93	.066	.0188	.0025
3.86	.098	.0243	-.0246	4.02	.099	.0177	.0026
4.87	.132	.0277	-.0277	4.76	.134	.0164	.0025
5.85	.165	.0322	-.0309	5.13	.168	.0152	.0025
6.85	.199	.0379	-.0340	5.26	.202	.0139	.0025
7.87	.234	.0448	-.0370	5.21	.238	.0124	.0025
9.86	.301	.0622	-.0431	4.83	.307	.0098	.0025
11.85	.367	.0842	-.0494	4.36	.377	.0070	.0025
13.86	.432	.1110	-.0556	3.90	.446	.0042	.0025
15.87	.497	.1426	-.0621	3.49	.517	.0013	.0025
17.90	.561	.1793	-.0687	3.13	.589	-.0017	.0025
-.14	-.036	.0220	-.0113	-1.63	-.036	.0219	.0025

UPWT PROJECT 1476 RUN 15 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.10	-.245	.0361	.0282	-6.81	-.248	.0141	.0027
-4.09	-.198	.0285	.0227	-6.95	-.199	.0143	.0026
-3.10	-.151	.0227	.0172	-6.65	-.152	.0145	.0025
-2.12	-.104	.0185	.0117	-5.61	-.104	.0146	.0025
-1.10	-.053	.0157	.0057	-3.40	-.054	.0147	.0025
-.04	-.003	.0147	-.0002	-.18	-.003	.0147	.0025
.88	.039	.0152	-.0053	2.55	.039	.0146	.0025
1.92	.091	.0174	-.0114	5.22	.091	.0143	.0025
2.94	.139	.0211	-.0170	6.58	.140	.0140	.0025
3.93	.186	.0265	-.0226	7.02	.188	.0137	.0026
4.97	.236	.0339	-.0286	6.96	.238	.0133	.0026
5.92	.280	.0421	-.0341	6.65	.283	.0130	.0027
6.94	.326	.0524	-.0399	6.22	.330	.0126	.0027
7.95	.373	.0645	-.0459	5.79	.378	.0122	.0028
8.90	.414	.0769	-.0511	5.39	.421	.0118	.0029
9.96	.461	.0925	-.0576	4.99	.470	.0114	.0029
11.93	.545	.1259	-.0691	4.33	.560	.0104	.0030
-.10	-.005	.0147	-.0001	-.33	-.005	.0147	.0025

UPWT PROJECT 1476 RUN 18 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.04	-.198	.0319	.0205	-6.20	-.200	.0144	.0025
-4.04	-.159	.0257	.0162	-6.18	-.160	.0145	.0024
-3.08	-.122	.0211	.0123	-5.79	-.123	.0145	.0024
-2.05	-.082	.0175	.0078	-4.66	-.082	.0146	.0024
-1.06	-.042	.0154	.0036	-2.70	-.042	.0146	.0024
-.08	-.002	.0146	-.0006	-.15	-.002	.0146	.0024
.93	.036	.0150	-.0049	2.39	.036	.0144	.0024
1.97	.077	.0169	-.0093	4.54	.077	.0143	.0024
2.96	.115	.0201	-.0134	5.75	.116	.0141	.0024
3.95	.155	.0246	-.0180	6.28	.156	.0139	.0024
4.95	.193	.0305	-.0224	6.32	.195	.0137	.0024
6.00	.233	.0381	-.0271	6.13	.236	.0135	.0025
6.95	.270	.0462	-.0314	5.84	.273	.0132	.0025
7.97	.307	.0562	-.0359	5.47	.312	.0130	.0025
9.97	.381	.0796	-.0449	4.79	.389	.0124	.0026
11.93	.450	.1072	-.0539	4.20	.462	.0118	.0027
13.97	.520	.1409	-.0634	3.69	.539	.0111	.0027
-.07	-.002	.0146	-.0006	-.12	-.002	.0146	.0024

UPWT PROJECT 1476 RUN 19 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.10	-.175	.0301	.0153	-5.80	-.177	.0145	.0024
-4.12	-.141	.0247	.0120	-5.71	-.142	.0145	.0023
-3.11	-.106	.0203	.0087	-5.24	-.107	.0145	.0023
-2.11	-.072	.0171	.0053	-4.19	-.072	.0145	.0023
-1.12	-.037	.0152	.0020	-2.47	-.038	.0145	.0023
-.09	-.002	.0144	-.0015	-.17	-.002	.0144	.0023
.93	.032	.0148	-.0049	2.15	.032	.0143	.0023
1.91	.066	.0163	-.0083	4.02	.066	.0141	.0023
2.96	.102	.0193	-.0120	5.30	.103	.0140	.0023
3.93	.135	.0231	-.0156	5.84	.136	.0138	.0023
4.92	.169	.0283	-.0193	5.97	.171	.0137	.0023
5.91	.202	.0345	-.0229	5.86	.205	.0135	.0023
6.89	.236	.0419	-.0267	5.63	.239	.0133	.0023
7.91	.269	.0507	-.0306	5.31	.273	.0132	.0023
9.91	.334	.0713	-.0381	4.68	.341	.0128	.0024
11.90	.398	.0965	-.0460	4.12	.409	.0124	.0024
13.91	.459	.1260	-.0539	3.65	.476	.0119	.0025
15.90	.520	.1597	-.0622	3.25	.543	.0113	.0025
16.89	.550	.1783	-.0665	3.08	.578	.0109	.0025
-.07	-.000	.0145	-.0017	-.00	-.000	.0145	.0023

Table AIII. Continued

UPWT PROJECT 1522 RUN 525 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.02	-.120	.0232	.0064	-5.17	-.121	.0190	.0023
-1.01	-.071	.0196	.0005	-3.64	-.072	.0183	.0023
-.01	-.025	.0176	-.0052	-1.41	-.025	.0176	.0023
1.00	.023	.0172	-.0111	1.31	.023	.0168	.0024
2.04	.075	.0184	-.0171	4.07	.076	.0158	.0025
3.04	.123	.0212	-.0228	5.78	.123	.0147	.0025
4.02	.170	.0255	-.0282	6.66	.171	.0135	.0026
5.04	.217	.0314	-.0338	6.92	.219	.0122	.0027
6.02	.265	.0388	-.0393	6.81	.267	.0109	.0027
7.04	.312	.0481	-.0448	6.49	.316	.0095	.0028
7.97	.355	.0579	-.0500	6.13	.360	.0082	.0029
10.02	.448	.0849	-.0612	5.28	.456	.0057	.0030
12.01	.535	.1172	-.0726	4.57	.548	.0033	.0031
14.00	.620	.1557	-.0838	3.98	.640	.0010	.0032
.00	-.024	.0176	-.0052	-1.38	-.024	.0176	.0023

UPWT PROJECT 1522 RUN 526 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.03	-.103	.0223	.0042	-4.63	-.104	.0186	.0024
-1.06	-.066	.0192	-.0001	-3.43	-.066	.0180	.0024
-.04	-.026	.0173	-.0044	-1.53	-.026	.0172	.0024
.96	.013	.0167	-.0087	.76	.013	.0165	.0024
1.98	.054	.0175	-.0133	3.08	.055	.0156	.0024
3.00	.096	.0198	-.0177	4.86	.097	.0147	.0025
3.96	.133	.0230	-.0218	5.76	.134	.0138	.0025
4.95	.172	.0278	-.0261	6.20	.174	.0128	.0026
5.97	.212	.0340	-.0306	6.24	.215	.0118	.0026
6.95	.251	.0414	-.0348	6.06	.254	.0107	.0026
7.95	.290	.0504	-.0389	5.76	.294	.0098	.0027
9.97	.368	.0726	-.0479	5.07	.375	.0079	.0027
11.97	.439	.0994	-.0565	4.42	.450	.0061	.0028
13.99	.512	.1320	-.0655	3.88	.528	.0044	.0028
15.96	.579	.1684	-.0745	3.44	.603	.0027	.0028
-.06	-.026	.0173	-.0045	-1.52	-.026	.0173	.0024

UPWT PROJECT 1522 RUN 527 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.08	-.094	.0216	.0026	-4.33	-.095	.0182	.0024
-1.08	-.059	.0187	-.0011	-3.18	-.060	.0175	.0024
-.08	-.025	.0169	-.0047	-1.50	-.025	.0169	.0024
.97	.011	.0163	-.0084	.65	.011	.0162	.0024
1.93	.045	.0170	-.0118	2.63	.045	.0154	.0024
2.91	.079	.0188	-.0155	4.20	.080	.0147	.0024
3.91	.114	.0218	-.0192	5.24	.115	.0139	.0024
4.90	.148	.0259	-.0227	5.73	.150	.0131	.0024
5.93	.184	.0314	-.0265	5.86	.186	.0123	.0024
6.91	.218	.0379	-.0301	5.75	.221	.0114	.0024
7.91	.252	.0458	-.0339	5.51	.256	.0106	.0024
9.90	.321	.0654	-.0414	4.92	.328	.0091	.0025
11.94	.389	.0899	-.0492	4.32	.399	.0075	.0025
13.95	.455	.1192	-.0570	3.82	.470	.0061	.0025
15.94	.517	.1522	-.0648	3.39	.538	.0045	.0026
17.94	.578	.1903	-.0732	3.04	.609	.0029	.0026
19.90	.639	.2326	-.0815	2.75	.680	.0011	.0026
-.10	-.026	.0169	-.0046	-1.52	-.026	.0169	.0024

UPWT PROJECT 1522 RUN 522 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.02	-.138	.0315	.0040	-4.37	-.139	.0267	.0024
-1.02	-.093	.0274	-.0021	-3.38	-.093	.0258	.0023
-.03	-.046	.0248	-.0084	-1.85	-.046	.0248	.0023
1.03	.003	.0237	-.0148	.15	.004	.0236	.0024
2.02	.049	.0240	-.0209	2.04	.050	.0223	.0025
3.03	.099	.0261	-.0270	3.81	.101	.0208	.0025
4.00	.145	.0293	-.0329	4.95	.147	.0191	.0026
5.00	.192	.0342	-.0387	5.61	.194	.0173	.0027
6.03	.241	.0408	-.0443	5.91	.244	.0152	.0027
7.00	.286	.0483	-.0495	5.92	.290	.0130	.0028
7.96	.329	.0569	-.0546	5.78	.333	.0108	.0029
9.94	.421	.0796	-.0653	5.29	.429	.0057	.0030
12.01	.514	.1100	-.0763	4.67	.526	.0006	.0031
14.00	.603	.1465	-.0875	4.12	.621	-.0038	.0031
-.02	-.045	.0248	-.0083	-1.83	-.045	.0248	.0023

Table AIII. Continued

UPWT PROJECT 1522 RUN 523 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.07	-.119	.0309	.0016	-3.86	-.120	.0266	.0025
-1.06	-.082	.0272	-.0029	-3.02	-.083	.0257	.0025
-.04	-.045	.0247	-.0075	-1.83	-.045	.0247	.0025
.96	-.008	.0234	-.0121	-.34	-.008	.0235	.0025
2.00	.031	.0233	-.0166	1.32	.032	.0222	.0025
2.98	.070	.0244	-.0210	2.87	.071	.0207	.0026
3.96	.108	.0267	-.0254	4.07	.110	.0191	.0026
5.02	.149	.0304	-.0299	4.88	.151	.0173	.0026
5.99	.187	.0353	-.0341	5.30	.189	.0156	.0026
7.05	.229	.0420	-.0388	5.44	.232	.0136	.0027
8.04	.267	.0497	-.0429	5.37	.271	.0118	.0027
10.05	.347	.0697	-.0517	4.98	.354	.0081	.0028
11.93	.417	.0929	-.0596	4.48	.427	.0048	.0028
-.03	-.045	.0247	-.0075	-1.81	-.045	.0247	.0025

UPWT PROJECT 1522 RUN 524 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.08	-.109	.0298	.0002	-3.65	-.110	.0258	.0025
-1.08	-.076	.0262	-.0036	-2.90	-.077	.0248	.0025
-.09	-.044	.0238	-.0073	-1.86	-.044	.0237	.0025
.98	-.009	.0223	-.0112	-.40	-.009	.0225	.0024
1.93	.023	.0220	-.0148	1.04	.023	.0212	.0025
2.96	.058	.0228	-.0185	2.53	.059	.0198	.0025
3.94	.092	.0248	-.0222	3.72	.094	.0184	.0026
4.92	.125	.0278	-.0258	4.50	.127	.0170	.0025
5.94	.160	.0323	-.0294	4.97	.163	.0155	.0025
6.93	.195	.0379	-.0331	5.14	.198	.0141	.0025
7.95	.229	.0448	-.0368	5.12	.233	.0127	.0025
9.92	.296	.0618	-.0442	4.80	.302	.0098	.0025
12.10	.370	.0859	-.0524	4.30	.379	.0066	.0026
14.21	.441	.1152	-.0605	3.82	.455	.0035	.0026
15.94	.497	.1431	-.0675	3.48	.517	.0010	.0026

UPWT PROJECT 1522 RUN 513 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-4.07	-.210	.0330	.0169	-6.37	-.212	.0180	.0024
-4.06	-.208	.0328	.0166	-6.34	-.213	.0180	.0024
-3.02	-.160	.0262	.0107	-6.13	-.162	.0177	.0023
-2.05	-.114	.0214	.0051	-5.32	-.115	.0173	.0023
-1.03	-.066	.0181	-.0004	-3.67	-.067	.0169	.0022
.00	-.016	.0164	-.0067	-1.01	-.016	.0164	.0023
1.04	.032	.0164	-.0124	1.98	.033	.0158	.0023
2.02	.081	.0180	-.0185	4.52	.082	.0151	.0024
3.02	.130	.0212	-.0241	6.13	.131	.0143	.0025
4.02	.178	.0260	-.0298	6.84	.179	.0135	.0026
5.08	.229	.0329	-.0358	6.95	.231	.0125	.0026
6.04	.272	.0403	-.0409	6.74	.275	.0115	.0027
7.00	.317	.0494	-.0462	6.41	.321	.0105	.0028
8.02	.364	.0607	-.0521	6.00	.369	.0093	.0029
10.03	.456	.0880	-.0633	5.18	.464	.0073	.0030
11.99	.542	.1206	-.0745	4.49	.555	.0053	.0031
14.07	.631	.1616	-.0861	3.90	.651	.0035	.0032
-.02	-.018	.0164	-.0063	-1.08	-.018	.0164	.0023

UPWT PROJECT 1522 RUN 516 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-4.04	-.171	.0300	.0114	-5.71	-.173	.0179	.0025
-3.05	-.134	.0247	.0071	-5.44	-.135	.0175	.0025
-2.06	-.096	.0205	.0027	-4.67	-.097	.0171	.0025
-1.06	-.057	.0177	-.0017	-3.22	-.057	.0166	.0025
-.03	-.018	.0162	-.0061	-1.10	-.018	.0161	.0025
.95	.020	.0159	-.0102	1.26	.020	.0156	.0025
1.96	.060	.0171	-.0144	3.51	.060	.0150	.0025
2.92	.099	.0194	-.0189	5.11	.100	.0143	.0025
3.95	.140	.0233	-.0234	6.00	.141	.0136	.0026
4.96	.178	.0284	-.0277	6.29	.180	.0128	.0026
5.95	.219	.0349	-.0322	6.28	.221	.0120	.0026
6.96	.258	.0428	-.0364	6.03	.261	.0112	.0026
8.00	.299	.0525	-.0409	5.69	.303	.0104	.0027
10.04	.376	.0756	-.0497	4.97	.383	.0090	.0027
12.03	.446	.1029	-.0581	4.34	.458	.0077	.0027
14.00	.516	.1351	-.0668	3.82	.533	.0063	.0027
15.96	.584	.1720	-.0760	3.39	.608	.0050	.0028
-.06	-.018	.0162	-.0059	-1.09	-.018	.0162	.0025

Table AIII. Continued

UPWT PROJECT 1522 RUN 517 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-4.06	-.152	.0285	.0081	-5.34	-.154	.0177	.0025
-3.07	-.119	.0237	.0044	-5.03	-.120	.0173	.0024
-2.10	-.086	.0200	.0010	-4.32	-.087	.0168	.0025
-1.08	-.052	.0173	-.0027	-2.99	-.052	.0163	.0024
-.05	-.017	.0158	-.0063	-1.08	-.017	.0158	.0024
.91	.016	.0156	-.0096	1.01	.016	.0153	.0024
1.91	.050	.0164	-.0131	3.04	.051	.0148	.0024
2.91	.085	.0186	-.0169	4.60	.086	.0142	.0025
3.91	.120	.0218	-.0204	5.51	.121	.0136	.0025
4.93	.155	.0264	-.0241	5.88	.157	.0129	.0025
5.95	.190	.0321	-.0277	5.91	.192	.0123	.0024
6.91	.223	.0388	-.0314	5.76	.226	.0116	.0025
7.92	.257	.0469	-.0351	5.49	.261	.0110	.0025
9.94	.326	.0672	-.0428	4.86	.333	.0098	.0025
11.93	.392	.0918	-.0502	4.27	.402	.0088	.0025
13.92	.455	.1209	-.0578	3.77	.471	.0078	.0026
15.91	.517	.1541	-.0655	3.35	.539	.0066	.0026
17.89	.577	.1918	-.0737	3.01	.608	.0053	.0026
-.08	-.016	.0159	-.0062	-1.03	-.016	.0159	.0024

UPWT PROJECT 1522 RUN 519 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.01	-.123	.0265	.0008	-4.63	-.124	.0222	.0024
-.99	-.076	.0228	-.0056	-3.31	-.076	.0215	.0023
.01	-.030	.0207	-.0113	-1.42	-.030	.0207	.0023
1.01	.018	.0202	-.0174	.91	.019	.0199	.0024
2.00	.064	.0213	-.0235	3.02	.065	.0190	.0025
3.02	.114	.0240	-.0296	4.75	.115	.0179	.0026
4.04	.164	.0283	-.0357	5.77	.165	.0167	.0026
5.02	.209	.0340	-.0415	6.16	.211	.0155	.0027
6.05	.259	.0414	-.0475	6.25	.261	.0139	.0028
6.97	.301	.0493	-.0527	6.10	.304	.0125	.0028
7.98	.347	.0596	-.0584	5.82	.352	.0109	.0029
10.03	.443	.0855	-.0696	5.18	.451	.0070	.0031
12.01	.530	.1163	-.0803	4.56	.543	.0034	.0032
14.05	.619	.1548	-.0914	4.00	.638	.0001	.0032
-.04	-.031	.0208	-.0111	-1.51	-.031	.0208	.0023

UPWT PROJECT 1522 RUN 520 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.04	-.103	.0260	-.0007	-3.98	-.104	.0223	.0025
-1.07	-.069	.0229	-.0053	-2.99	-.069	.0217	.0025
-.07	-.031	.0210	-.0099	-1.49	-.031	.0210	.0024
.94	.007	.0202	-.0144	.34	.007	.0201	.0024
1.99	.047	.0207	-.0192	2.26	.047	.0191	.0024
2.95	.085	.0225	-.0236	3.77	.086	.0181	.0025
3.98	.125	.0257	-.0282	4.88	.127	.0170	.0026
5.02	.166	.0303	-.0327	5.48	.168	.0156	.0026
5.95	.202	.0355	-.0370	5.69	.205	.0144	.0026
6.95	.241	.0425	-.0413	5.67	.244	.0130	.0026
7.93	.279	.0506	-.0456	5.51	.283	.0116	.0026
9.99	.359	.0723	-.0544	4.97	.366	.0088	.0027
11.99	.434	.0987	-.0628	4.40	.445	.0064	.0027
14.01	.507	.1305	-.0718	3.88	.523	.0040	.0027
15.99	.576	.1667	-.0807	3.45	.599	.0017	.0027
-.07	-.031	.0210	-.0099	-1.48	-.031	.0209	.0024

UPWT PROJECT 1522 RUN 521 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.10	-.096	.0256	-.0027	-3.76	-.097	.0221	.0025
-1.15	-.065	.0227	-.0062	-2.88	-.066	.0214	.0025
-.07	-.030	.0207	-.0102	-1.46	-.030	.0206	.0024
.90	.002	.0199	-.0138	.11	.003	.0198	.0024
1.96	.037	.0202	-.0177	1.85	.038	.0189	.0024
2.95	.071	.0216	-.0215	3.28	.072	.0179	.0025
3.95	.106	.0242	-.0251	4.37	.107	.0168	.0025
4.97	.140	.0279	-.0289	5.02	.142	.0157	.0025
5.97	.175	.0330	-.0326	5.31	.178	.0146	.0025
6.91	.207	.0387	-.0360	5.34	.210	.0136	.0024
7.98	.244	.0466	-.0398	5.23	.248	.0123	.0025
9.94	.310	.0648	-.0473	4.79	.317	.0102	.0025
11.98	.380	.0887	-.0549	4.28	.390	.0080	.0025
14.14	.452	.1200	-.0632	3.77	.468	.0058	.0025
15.96	.511	.1502	-.0703	3.40	.532	.0039	.0025
18.26	.582	.1934	-.0792	3.01	.613	.0014	.0025
-.10	-.031	.0206	-.0097	-1.48	-.031	.0205	.0024

Table AIII. Continued

UPWT PROJECT 1476 RUN 36 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.01	-.246	.0372	.0227	-6.61	-.248	.0156	.0027
-4.05	-.200	.0300	.0181	-6.66	-.201	.0158	.0026
-3.09	-.153	.0242	.0133	-6.33	-.154	.0159	.0026
-2.08	-.103	.0198	.0082	-5.20	-.104	.0161	.0026
-1.09	-.054	.0171	.0035	-3.17	-.055	.0161	.0026
-.07	-.003	.0161	-.0018	-.19	-.003	.0161	.0025
.94	.045	.0167	-.0065	2.70	.045	.0160	.0025
1.94	.095	.0190	-.0111	4.98	.095	.0158	.0026
2.99	.146	.0231	-.0165	6.31	.147	.0155	.0026
3.94	.192	.0285	-.0213	6.76	.194	.0152	.0027
4.97	.242	.0360	-.0266	6.73	.245	.0149	.0027
5.95	.291	.0449	-.0317	6.48	.294	.0145	.0027
6.94	.338	.0554	-.0370	6.10	.342	.0141	.0028
7.94	.385	.0676	-.0421	5.70	.391	.0137	.0029
9.98	.479	.0973	-.0526	4.92	.489	.0128	.0030
11.98	.569	.1330	-.0628	4.28	.585	.0119	.0030
-.08	-.002	.0161	-.0017	-.10	-.002	.0161	.0025

UPWT PROJECT 1476 RUN 39 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.17	-.207	.0346	.0171	-5.97	-.209	.0158	.0026
-4.20	-.168	.0283	.0135	-5.95	-.170	.0159	.0026
-3.22	-.129	.0232	.0099	-5.57	-.130	.0159	.0025
-2.24	-.090	.0194	.0062	-4.65	-.091	.0159	.0025
-1.20	-.048	.0168	.0023	-2.85	-.048	.0158	.0025
-.21	-.008	.0158	-.0014	-.48	-.008	.0158	.0024
.84	.035	.0162	-.0053	2.13	.035	.0157	.0024
1.85	.075	.0181	-.0091	4.18	.076	.0156	.0025
2.86	.116	.0213	-.0130	5.45	.117	.0155	.0025
3.85	.156	.0259	-.0168	6.02	.157	.0154	.0025
4.82	.195	.0317	-.0206	6.15	.197	.0152	.0025
5.82	.235	.0390	-.0245	6.02	.238	.0150	.0025
6.81	.274	.0476	-.0284	5.75	.278	.0148	.0025
7.79	.312	.0573	-.0323	5.44	.317	.0145	.0026
9.84	.390	.0817	-.0401	4.78	.398	.0138	.0026
11.80	.462	.1099	-.0475	4.21	.475	.0130	.0026
13.80	.533	.1436	-.0553	3.71	.552	.0122	.0026
-.16	-.004	.0158	-.0018	-.24	-.004	.0158	.0024

UPWT PROJECT 1476 RUN 40 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.11	-.180	.0317	.0120	-5.68	-.182	.0155	.0025
-4.08	-.143	.0258	.0093	-5.56	-.145	.0155	.0024
-3.11	-.109	.0214	.0065	-5.11	-.110	.0154	.0023
-2.11	-.074	.0181	.0035	-4.08	-.074	.0154	.0023
-1.08	-.038	.0160	.0005	-2.35	-.038	.0153	.0023
-.09	-.003	.0152	-.0024	-.17	-.003	.0152	.0023
.91	.031	.0156	-.0053	2.01	.032	.0151	.0023
1.90	.066	.0172	-.0083	3.82	.066	.0150	.0023
2.93	.103	.0202	-.0115	5.09	.104	.0149	.0023
3.94	.139	.0244	-.0147	5.68	.140	.0149	.0023
4.91	.172	.0296	-.0178	5.81	.174	.0148	.0023
5.93	.208	.0364	-.0210	5.73	.211	.0147	.0023
6.90	.242	.0439	-.0241	5.51	.245	.0145	.0023
7.88	.276	.0527	-.0272	5.23	.280	.0144	.0023
9.90	.344	.0742	-.0335	4.64	.352	.0139	.0023
11.89	.410	.1000	-.0399	4.10	.422	.0134	.0023
13.89	.474	.1305	-.0464	3.63	.492	.0128	.0024
15.93	.538	.1664	-.0534	3.24	.563	.0122	.0024
16.95	.570	.1860	-.0569	3.06	.599	.0118	.0024
-.08	-.001	.0152	-.0025	-.05	-.001	.0152	.0023

UPWT PROJECT 1522 RUN 528 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.96	-.166	.0290	.0056	-5.71	-.167	.0204	.0026
-1.96	-.118	.0240	.0001	-4.90	-.119	.0200	.0026
-.98	-.072	.0207	-.0048	-3.47	-.072	.0195	.0025
.04	-.021	.0188	-.0101	-1.14	-.021	.0188	.0026
1.05	.027	.0185	-.0151	1.44	.027	.0181	.0026
2.04	.077	.0200	-.0202	3.84	.077	.0172	.0027
3.01	.124	.0228	-.0251	5.42	.125	.0163	.0028
4.03	.173	.0275	-.0301	6.28	.174	.0153	.0028
5.01	.221	.0336	-.0346	6.57	.223	.0142	.0029
6.02	.270	.0415	-.0395	6.52	.273	.0129	.0029
7.02	.318	.0509	-.0444	6.25	.322	.0116	.0030
8.06	.367	.0622	-.0489	5.89	.372	.0102	.0031
10.07	.462	.0898	-.0585	5.14	.470	.0076	.0032
12.05	.554	.1235	-.0678	4.49	.568	.0051	.0033
13.04	.599	.1426	-.0725	4.20	.615	.0039	.0034
.03	-.021	.0188	-.0099	-1.14	-.021	.0188	.0026

Table AIII. Continued

UPWT PROJECT 1522 RUN 531 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-3.05	-.143	.0277	.0034	-5.16	-.144	.0201	.0027
-2.03	-.103	.0232	-.0005	-4.46	-.104	.0195	.0027
-1.02	-.064	.0200	-.0044	-3.20	-.064	.0188	.0026
-.00	-.024	.0182	-.0082	-1.30	-.024	.0182	.0026
1.02	.017	.0177	-.0121	.96	.017	.0174	.0026
2.01	.056	.0186	-.0159	3.01	.057	.0167	.0026
3.01	.098	.0210	-.0199	4.65	.099	.0158	.0027
4.00	.138	.0247	-.0235	5.58	.139	.0150	.0027
4.98	.176	.0295	-.0271	5.95	.178	.0142	.0027
5.96	.215	.0358	-.0308	6.01	.218	.0133	.0027
6.96	.255	.0437	-.0345	5.84	.259	.0124	.0027
8.03	.297	.0534	-.0384	5.56	.302	.0114	.0028
10.03	.376	.0761	-.0457	4.94	.383	.0094	.0028
11.98	.451	.1034	-.0526	4.36	.463	.0075	.0029
14.01	.527	.1371	-.0600	3.84	.544	.0056	.0029
15.99	.597	.1751	-.0674	3.41	.623	.0037	.0029
-.03	-.023	.0182	-.0082	-1.29	-.024	.0182	.0026

UPWT PROJECT 1522 RUN 532 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-5.08	-.198	.0383	.0079	-5.16	-.200	.0207	.0027
-4.07	-.164	.0318	.0049	-5.14	-.165	.0201	.0026
-3.09	-.129	.0265	.0018	-4.87	-.130	.0195	.0026
-2.05	-.093	.0222	-.0015	-4.21	-.094	.0188	.0026
-1.10	-.060	.0193	-.0045	-3.11	-.060	.0182	.0025
-.07	-.024	.0175	-.0077	-1.37	-.024	.0174	.0025
.96	.012	.0169	-.0108	.73	.013	.0167	.0025
1.95	.047	.0176	-.0139	2.65	.047	.0160	.0025
2.94	.082	.0195	-.0170	4.21	.083	.0152	.0025
3.94	.118	.0226	-.0201	5.21	.119	.0145	.0025
4.97	.154	.0272	-.0234	5.68	.156	.0137	.0025
5.94	.187	.0326	-.0263	5.75	.190	.0130	.0025
6.93	.223	.0394	-.0294	5.66	.226	.0122	.0025
7.92	.258	.0475	-.0325	5.43	.262	.0115	.0025
9.93	.329	.0677	-.0387	4.85	.335	.0100	.0025
11.91	.396	.0925	-.0450	4.29	.407	.0087	.0026
13.91	.465	.1224	-.0513	3.80	.480	.0071	.0026
15.94	.531	.1573	-.0577	3.37	.553	.0056	.0026
17.99	.597	.1978	-.0644	3.02	.629	.0039	.0026
-.06	-.022	.0174	-.0077	-1.26	-.022	.0174	.0025

UPWT PROJECT 1522 RUN 534 MACH 1.60

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-1.96	-.137	.0341	-.0063	-4.01	-.138	.0294	.0026
-.98	-.091	.0300	-.0120	-3.05	-.092	.0285	.0025
.01	-.044	.0274	-.0174	-1.60	-.044	.0274	.0025
1.05	.004	.0262	-.0231	.17	.005	.0262	.0025
2.02	.051	.0267	-.0283	1.89	.051	.0249	.0026
3.03	.101	.0288	-.0339	3.52	.103	.0234	.0027
4.07	.151	.0325	-.0390	4.65	.153	.0217	.0028
5.03	.199	.0374	-.0439	5.31	.201	.0198	.0028
6.06	.248	.0441	-.0488	5.62	.251	.0177	.0029
7.07	.295	.0522	-.0533	5.66	.300	.0155	.0030
8.05	.343	.0618	-.0581	5.55	.348	.0132	.0031
10.07	.441	.0868	-.0667	5.08	.450	.0084	.0031
12.09	.536	.1181	-.0754	4.54	.549	.0033	.0032
13.05	.582	.1358	-.0793	4.28	.597	.0009	.0033
.03	-.044	.0274	-.0174	-1.61	-.044	.0274	.0025

UPWT PROJECT 1522 RUN 535 MACH 1.90

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-1.98	-.122	.0325	-.0062	-3.77	-.123	.0282	.0027
-1.04	-.086	.0288	-.0101	-3.00	-.087	.0273	.0027
-.03	-.048	.0262	-.0143	-1.83	-.049	.0262	.0026
.99	-.008	.0246	-.0182	-.34	-.008	.0249	.0025
1.96	.030	.0246	-.0221	1.20	.031	.0236	.0026
3.00	.071	.0259	-.0262	2.76	.073	.0221	.0027
4.03	.112	.0286	-.0301	3.92	.114	.0206	.0027
5.01	.151	.0324	-.0338	4.65	.153	.0191	.0027
5.98	.191	.0376	-.0376	5.08	.194	.0175	.0027
6.99	.231	.0443	-.0414	5.22	.235	.0159	.0027
7.99	.271	.0523	-.0449	5.18	.276	.0141	.0027
10.00	.353	.0727	-.0520	4.85	.360	.0104	.0027
11.99	.430	.0983	-.0591	4.38	.441	.0068	.0029
14.00	.510	.1304	-.0664	3.91	.527	.0031	.0029
16.01	.585	.1674	-.0734	3.50	.609	-.0005	.0028
.01	-.045	.0260	-.0144	-1.74	-.045	.0260	.0026

Table AIII. Concluded

UPWT PROJECT 1522 RUN 536 MACH 2.16

ALPHA	CL	CD	CM	L/D	CN	CA	CAC
-2.09	-.115	.0314	-.0063	-3.67	-.116	.0272	.0026
-1.06	-.080	.0275	-.0096	-2.92	-.081	.0260	.0025
-.06	-.047	.0249	-.0129	-1.89	-.047	.0249	.0025
.93	-.014	.0234	-.0160	-.58	-.013	.0237	.0024
1.94	.021	.0230	-.0193	.93	.022	.0223	.0024
2.93	.056	.0238	-.0224	2.33	.057	.0210	.0025
3.92	.091	.0259	-.0256	3.53	.093	.0196	.0026
4.95	.128	.0292	-.0288	4.37	.130	.0181	.0025
5.92	.162	.0336	-.0319	4.83	.165	.0167	.0025
6.95	.199	.0396	-.0352	5.03	.203	.0152	.0025
7.94	.234	.0465	-.0380	5.02	.238	.0138	.0025
9.96	.306	.0650	-.0443	4.71	.313	.0110	.0025
11.94	.376	.0880	-.0507	4.27	.386	.0084	.0026
13.94	.446	.1164	-.0570	3.83	.461	.0055	.0026
15.94	.515	.1496	-.0635	3.44	.536	.0026	.0026
17.97	.584	.1886	-.0700	3.09	.613	-.0007	.0026
-.05	-.046	.0248	-.0128	-1.85	-.046	.0248	.0025

Appendix B

Flow-Visualization Photographs

The tuft and vapor-screen photographs were taken using standard flow-visualization techniques for the Langley Unitary Plan Wind Tunnel. A detailed description of the vapor-screen technique is contained in reference 17. The tuft photographs were taken of the upper surface of the left wing panel. The vapor-screen photographs were taken of the flow field above the upper surface of the left wing panel. The vapor-screen light plane was located at the intersection of the leading edge and the wingtip, except for the AR = 1.75 wing at $M = 2.16, C_L = 0.4$, and $\delta_f = 0^\circ$ for which the light plane was located at the trailing edge and wingtip intersection. Also, the light plane is orientated normal to the free-stream flow direction. Table BI is an index to the flow-visualization photographs contained in figures B1 to B18.

Table BI. Flow-Visualization Data

Page	Figure	Configuration	δ_f, deg	M
88	B1	AR = 1.75 delta with	0	1.60
90	B2	primary leading-edge flap	5	1.60
92	B3		10	1.60
94	B4		0	1.90
96	B5		5	1.90
98	B6		10	1.90
100	B7		0	2.16
102	B8		5	2.16
104	B9		10	2.16
106	B10	AR = 2.50 delta with	0	1.60
108	B11	primary leading-edge flap	5	1.60
110	B12		10	1.60
112	B13		0	1.90
114	B14		5	1.90
116	B15		10	1.90
118	B16		0	2.16
120	B17		5	2.16
122	B18		10	2.16

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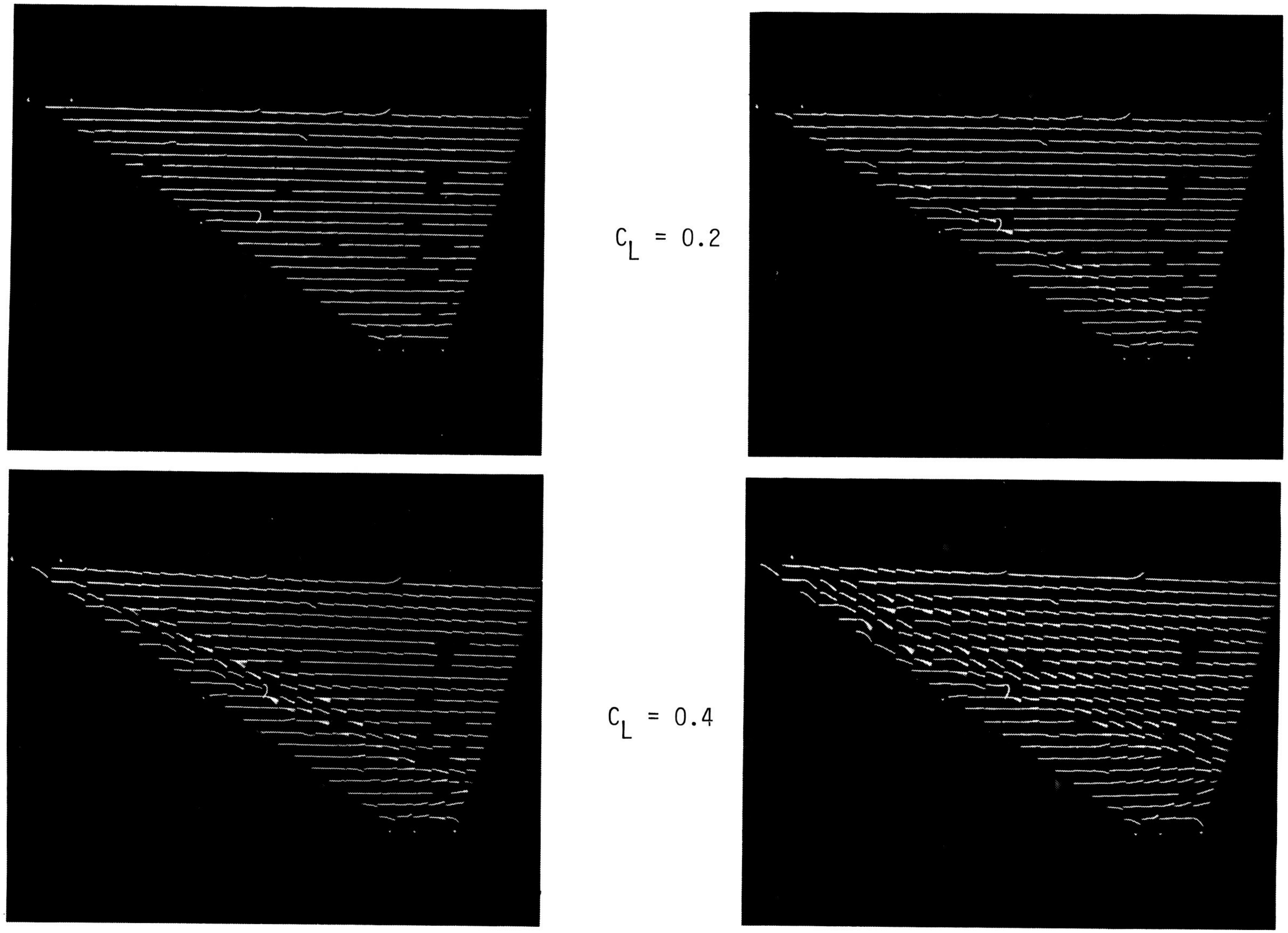
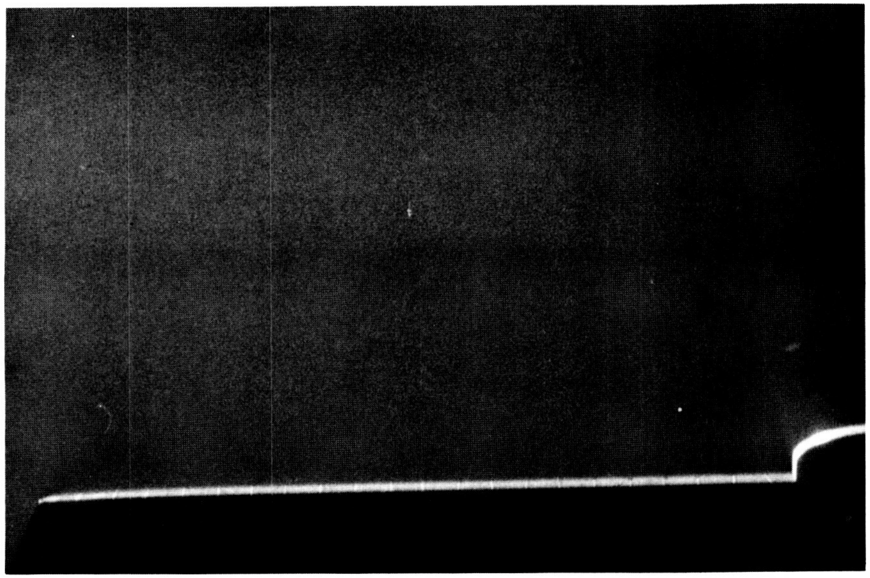
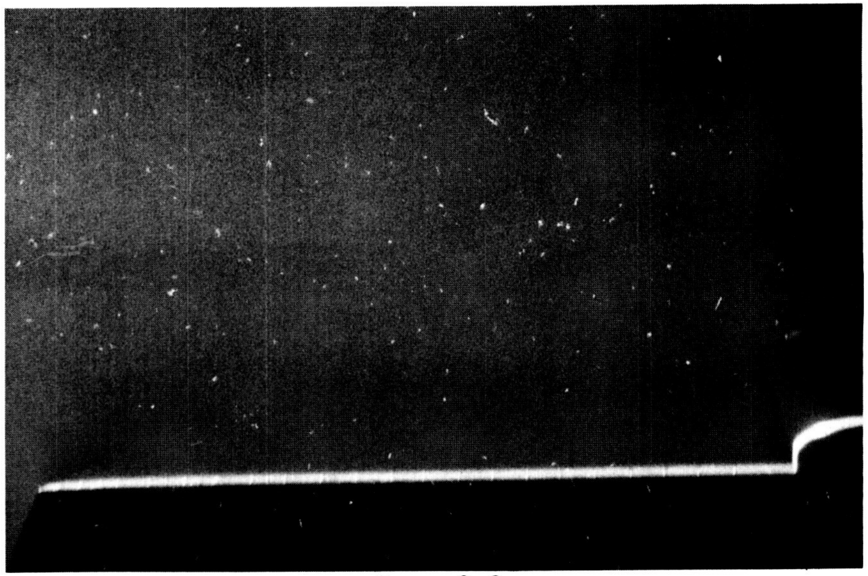


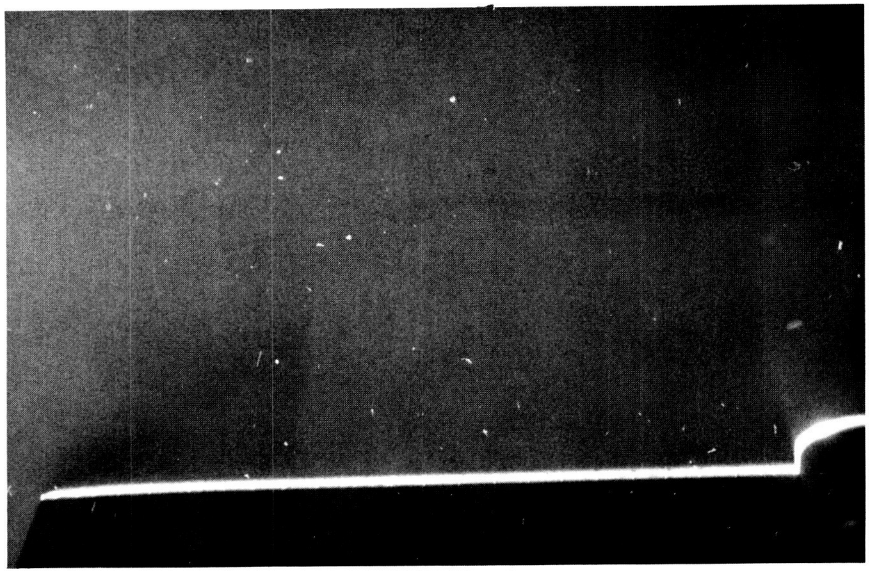
Figure B1. Flow-visualization photographs for AR = 1.75 delta wing with primary leading-edge flap at $M = 1.60$ and $\delta_f = 0°$.



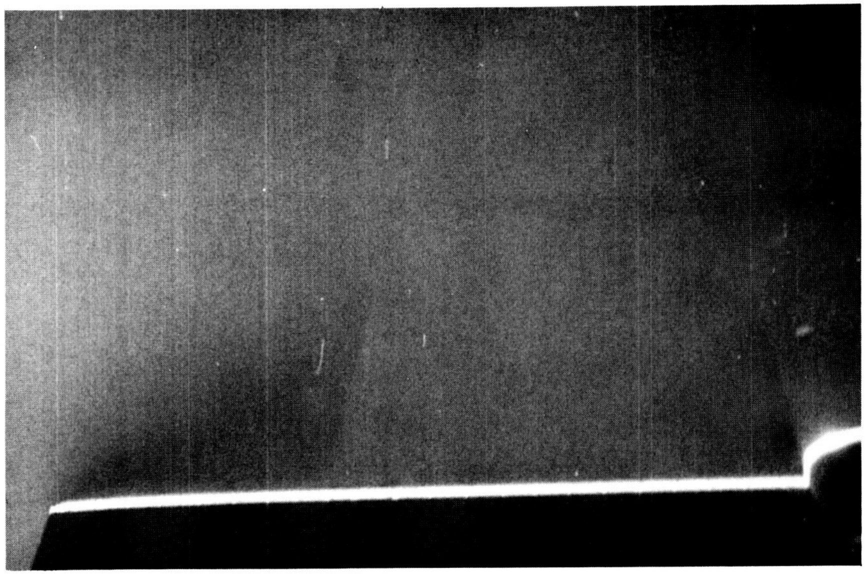
$C_L = 0.1$



$C_L = 0.2$



$C_L = 0.3$

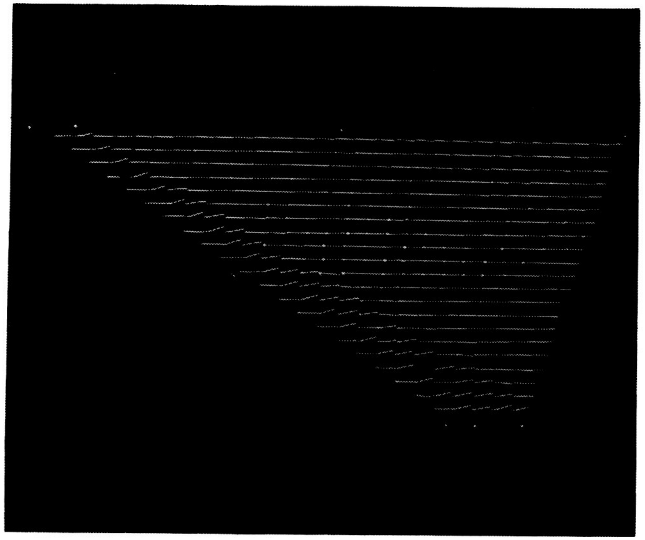


$C_L = 0.4$

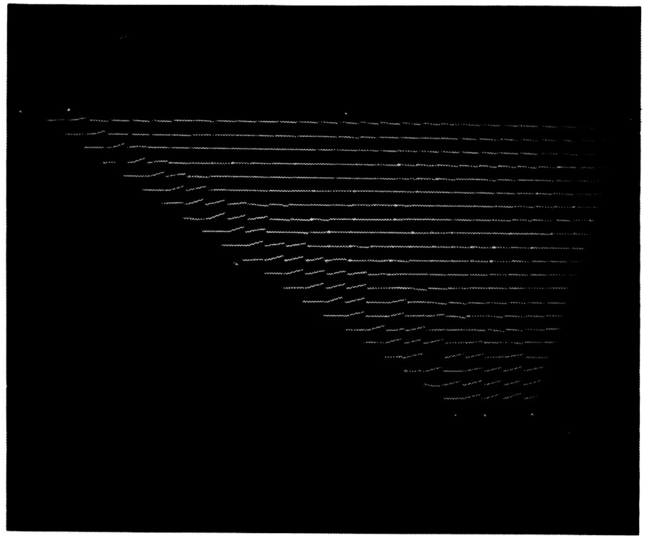
L-87-502

Figure B1. Concluded.

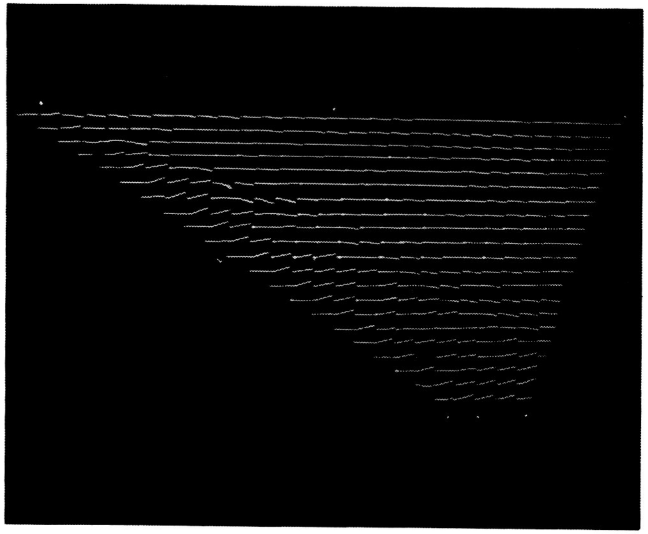
$C_L = 0.1$



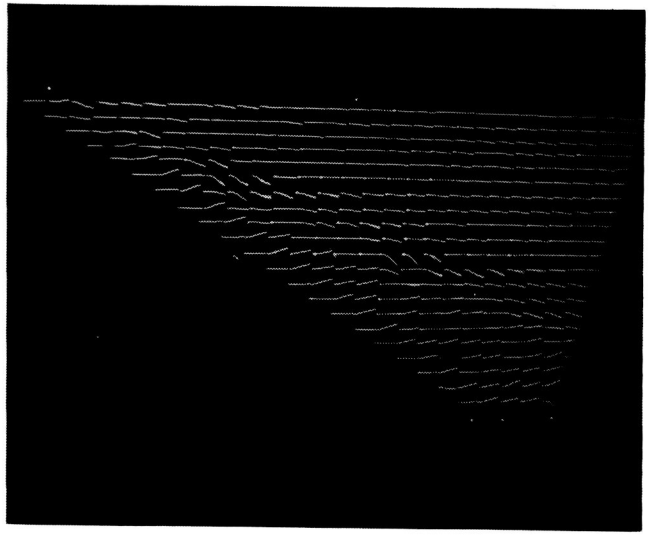
$C_L = 0.2$



$C_L = 0.3$



$C_L = 0.4$



L-87-503

Figure B2. Flow-visualization photographs for AR = 1.75 delta wing with primary leading-edge flap at $M = 1.60$ and $\delta_f = 5°$.

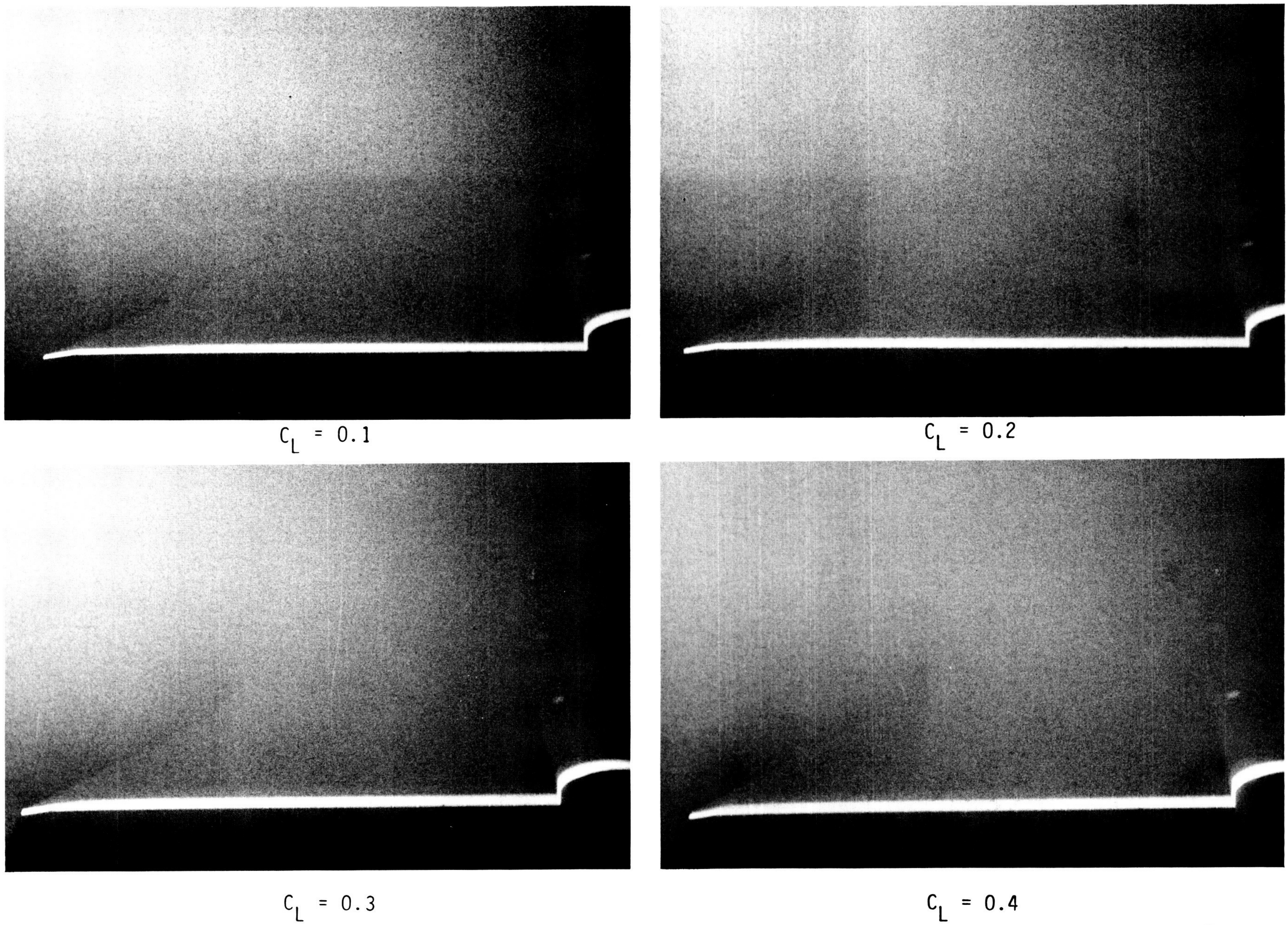
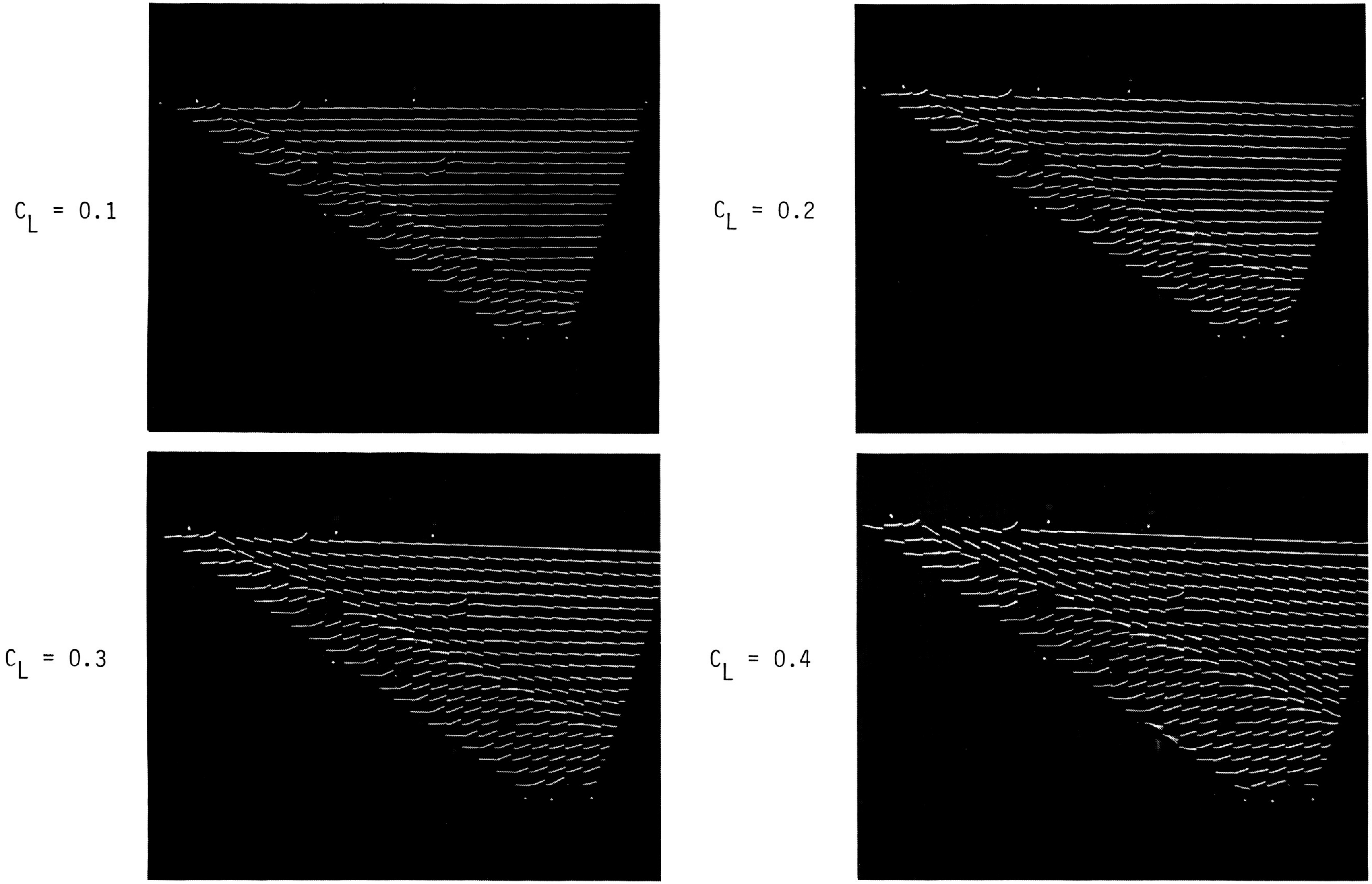
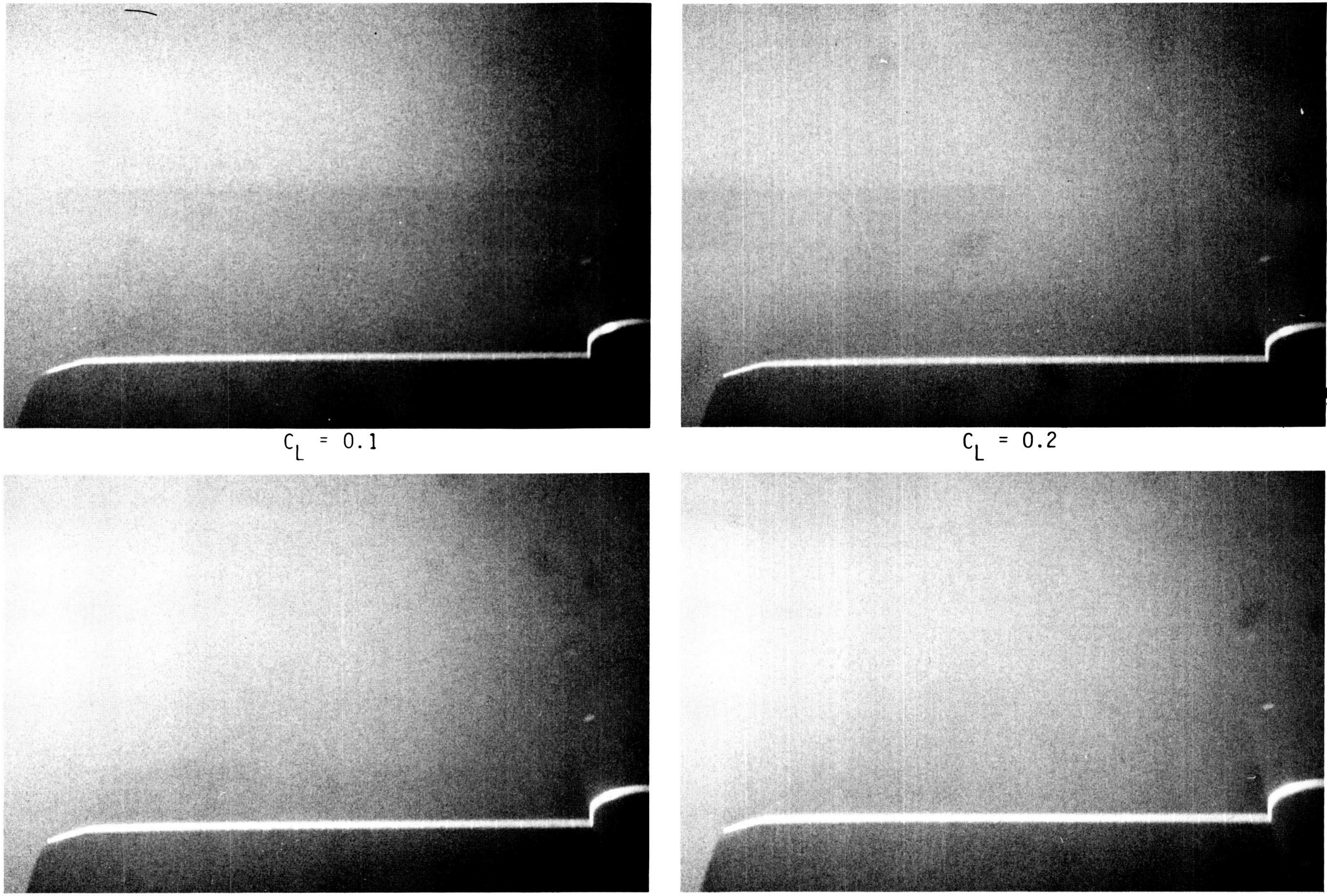


Figure B2. Concluded.



L-87-505

Figure B3. Flow-visualization photographs for AR = 1.75 delta wing with primary leading-edge flap at $M = 1.60$ and $\delta_f = 10°$.



C_L = 0.1

C_L = 0.2

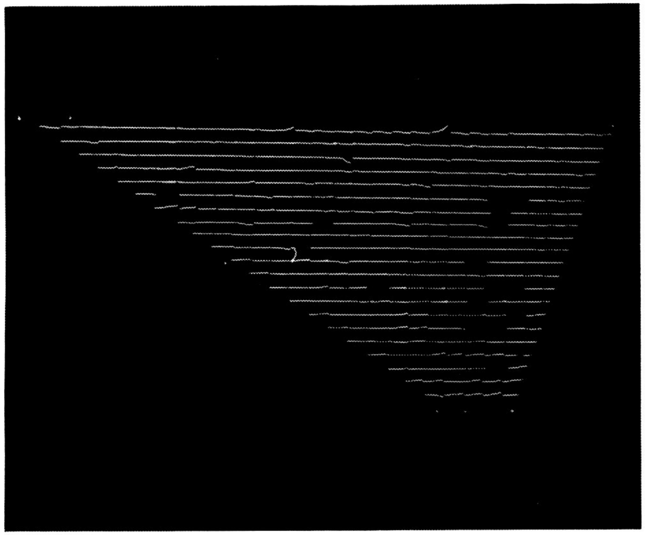
C_L = 0.3

C_L = 0.4

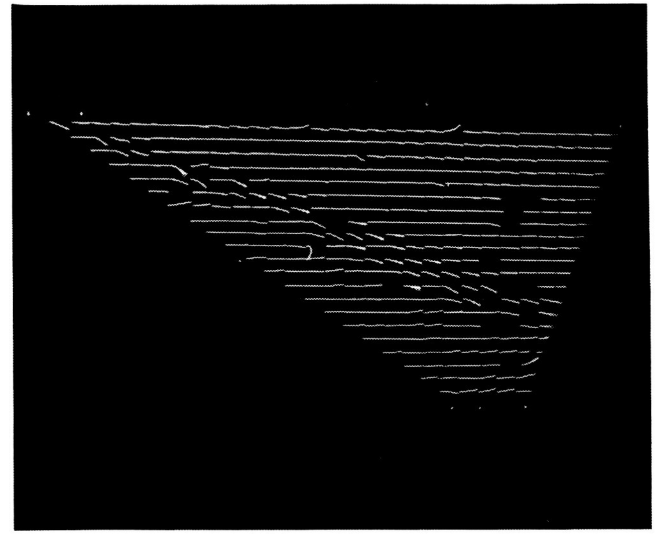
L-87-506

Figure B3. Concluded.

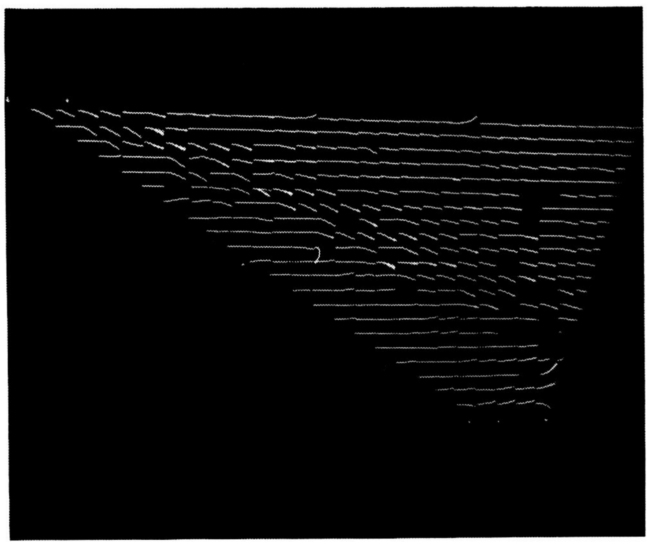
$C_L = 0.1$



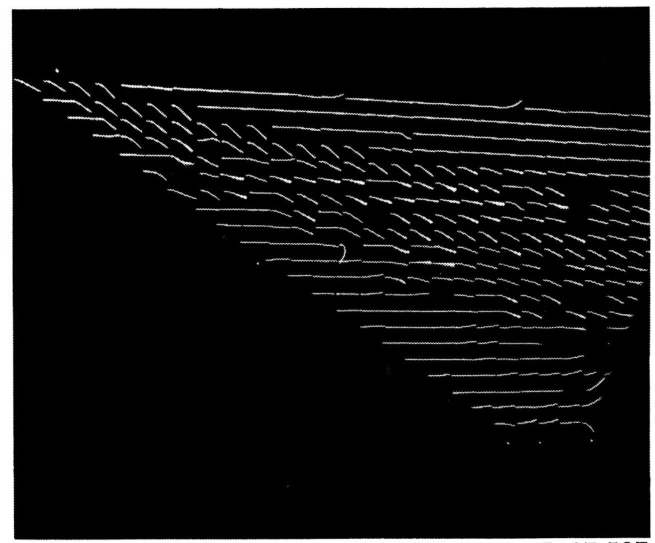
$C_L = 0.2$



$C_L = 0.3$

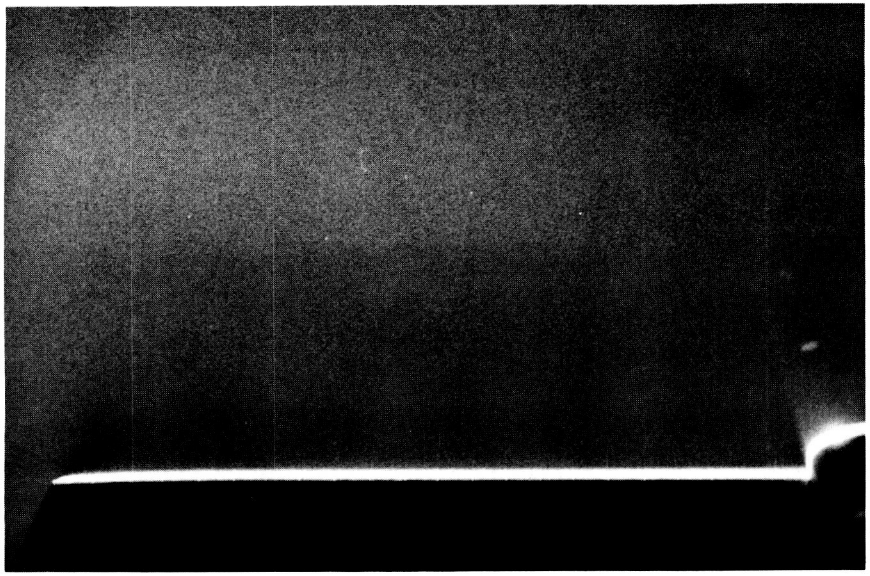


$C_L = 0.4$

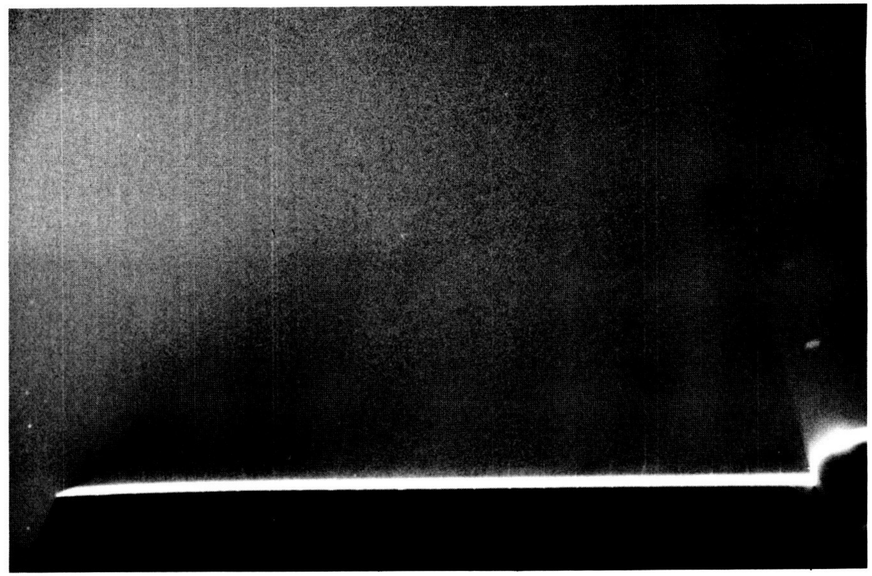


L-87-507

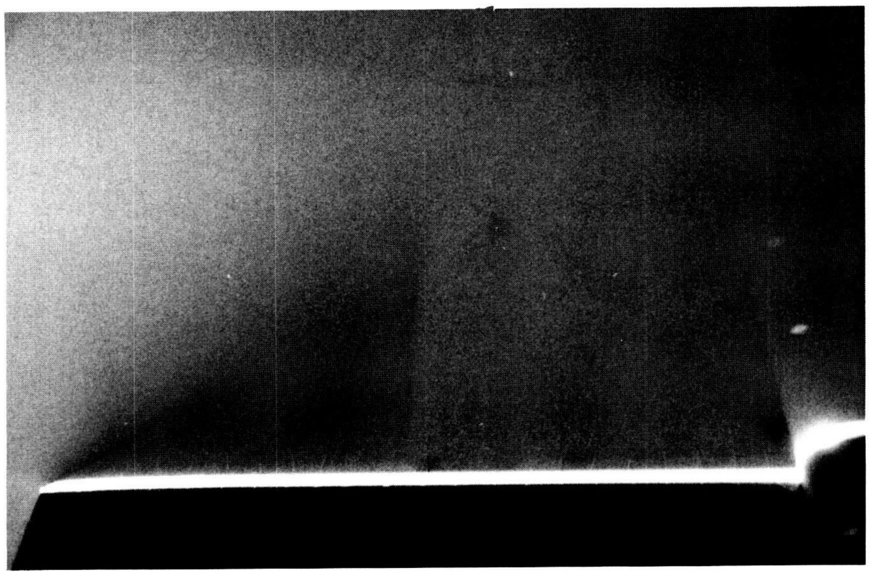
Figure B4. Flow-visualization photographs for AR = 1.75 delta wing with primary leading-edge flap at $M = 1.90$ and $\delta_f = 0°$.



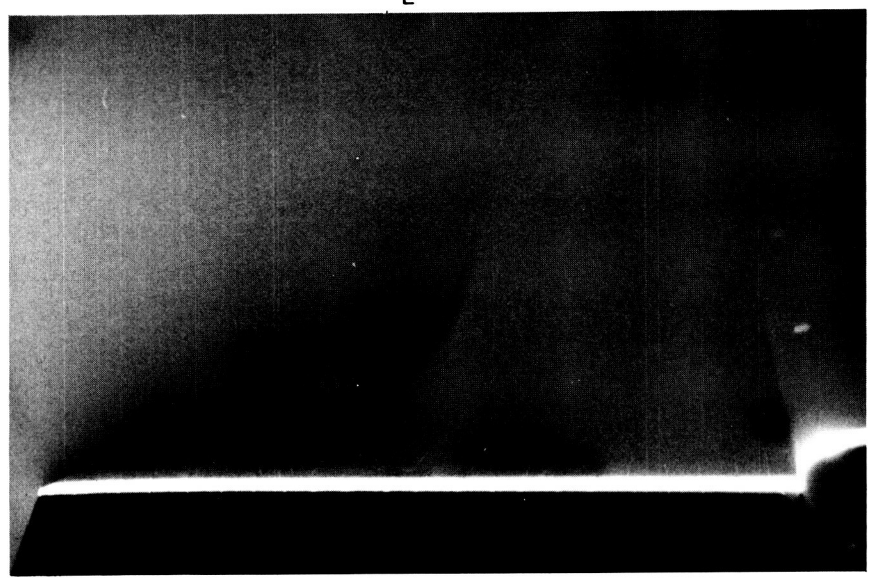
$C_L = 0.1$



$C_L = 0.2$



$C_L = 0.3$

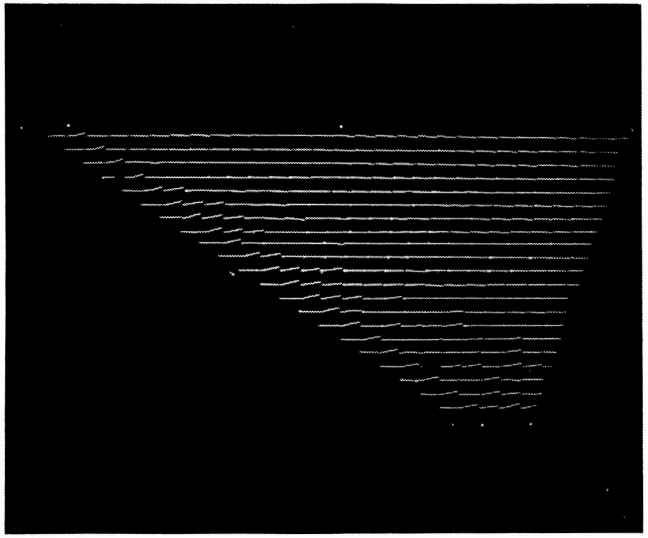


$C_L = 0.4$

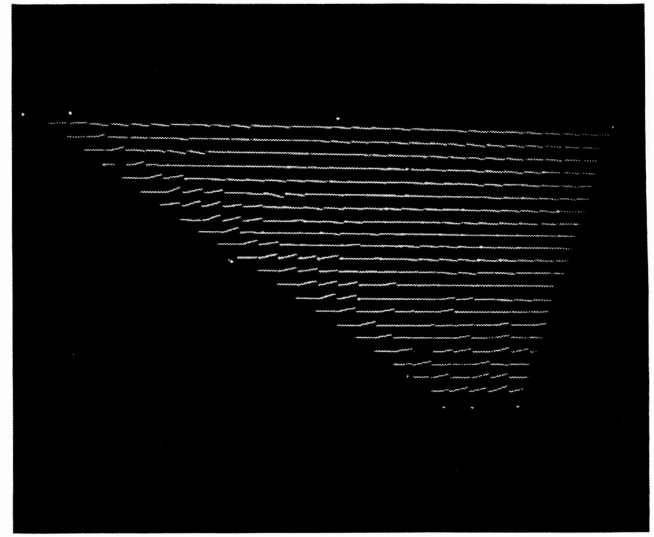
L-87-508

Figure B4. Concluded.

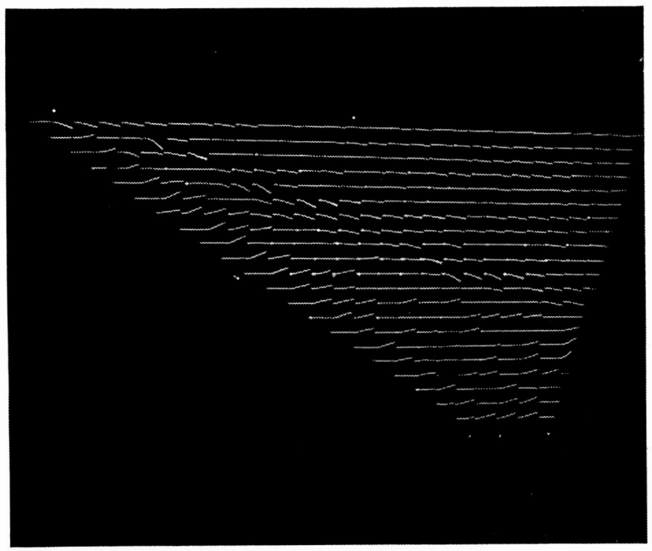
$C_L = 0.1$



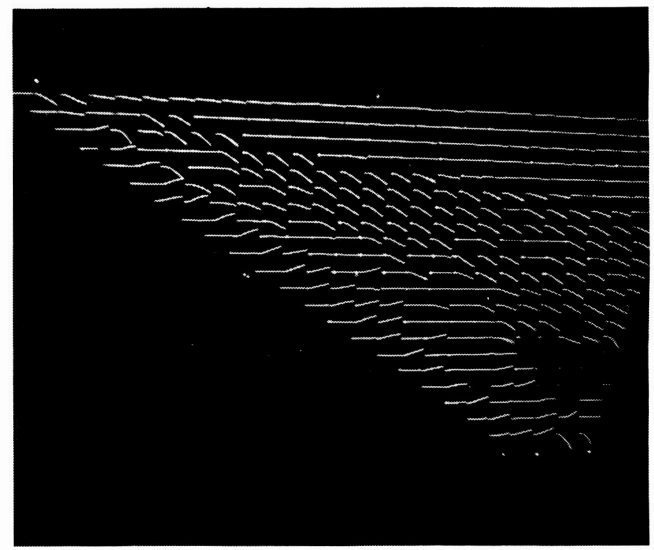
$C_L = 0.2$



$C_L = 0.3$



$C_L = 0.4$



L-87-509

Figure B5. Flow-visualization photographs for AR = 1.75 delta wing with primary leading-edge flap at $M = 1.90$ and $\delta_f = 5°$.

e-2

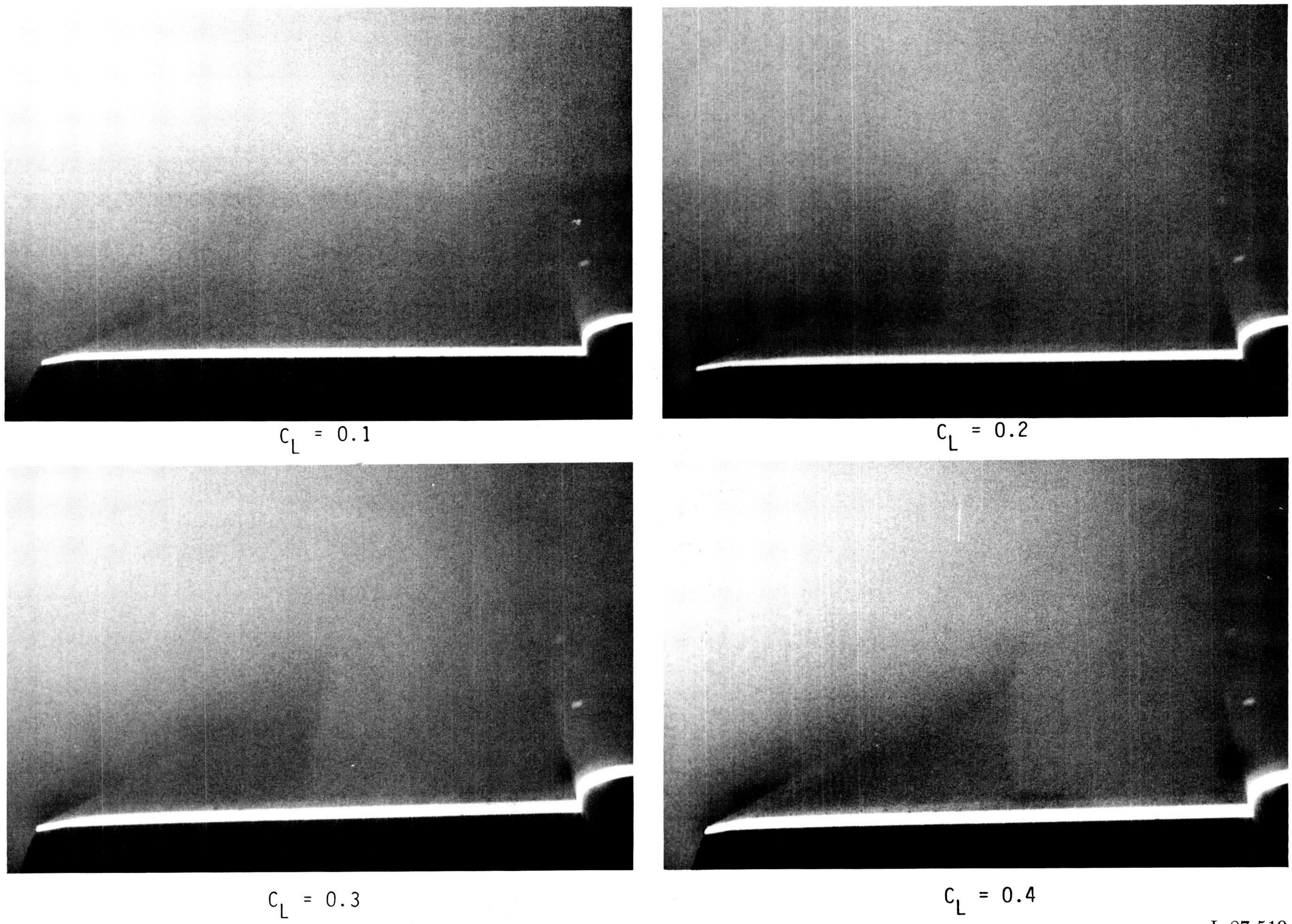
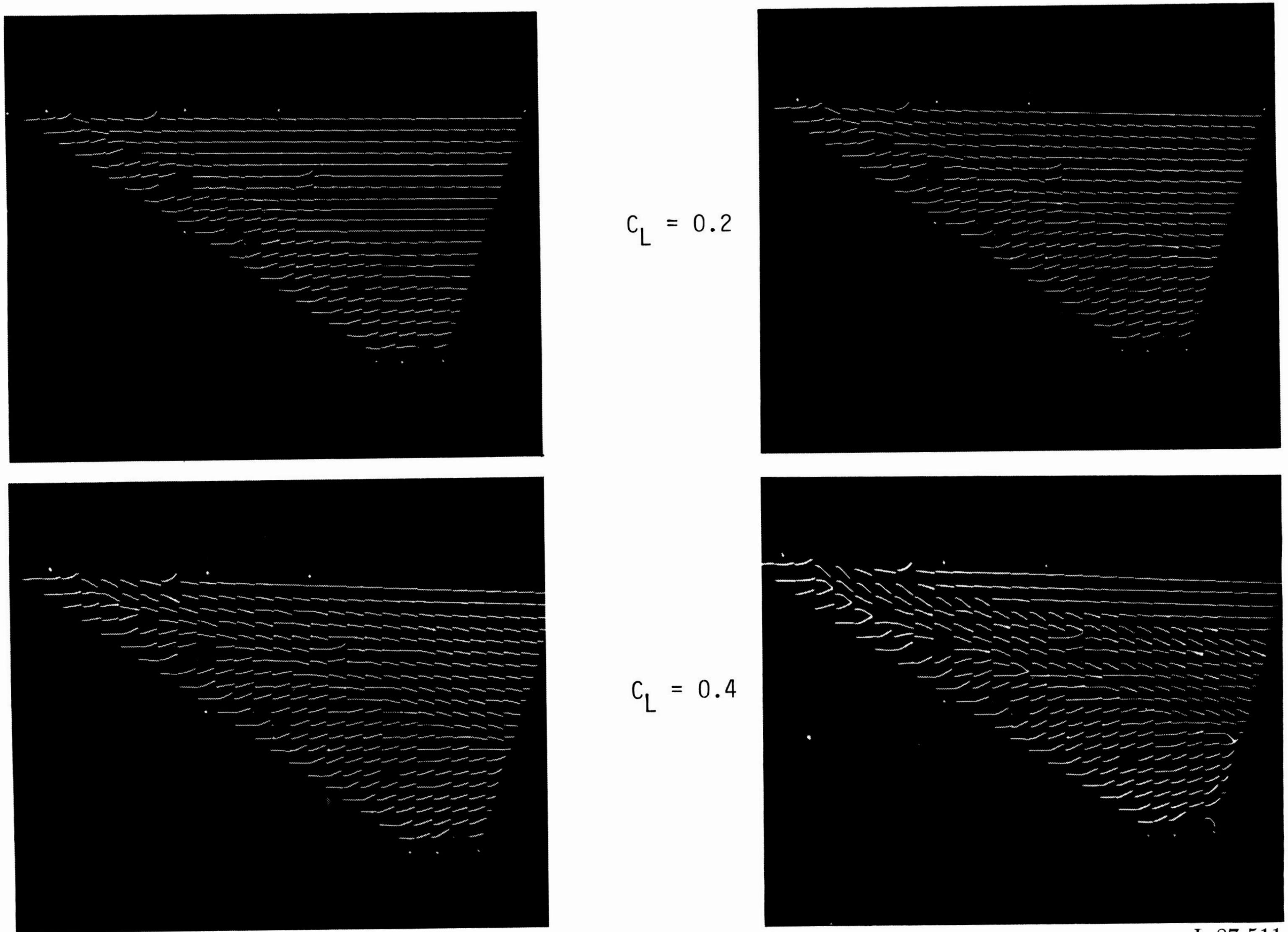


Figure B5. Concluded.

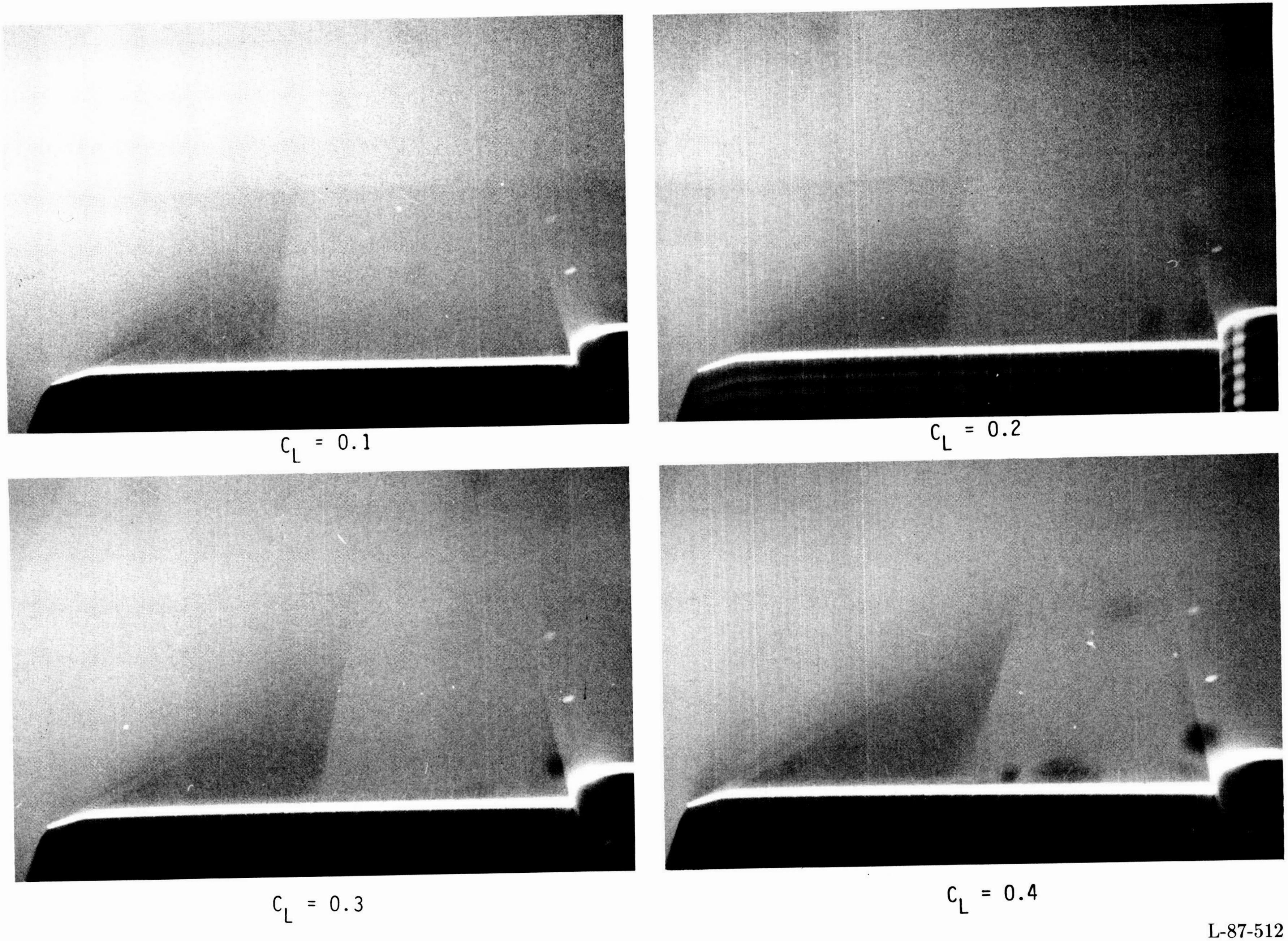
$C_L = 0.1$ $C_L = 0.2$

$C_L = 0.3$ $C_L = 0.4$



L-87-511

Figure B6. Flow-visualization photographs for AR = 1.75 delta wing with primary leading-edge flap at $M = 1.90$ and $\delta_f = 10°$.



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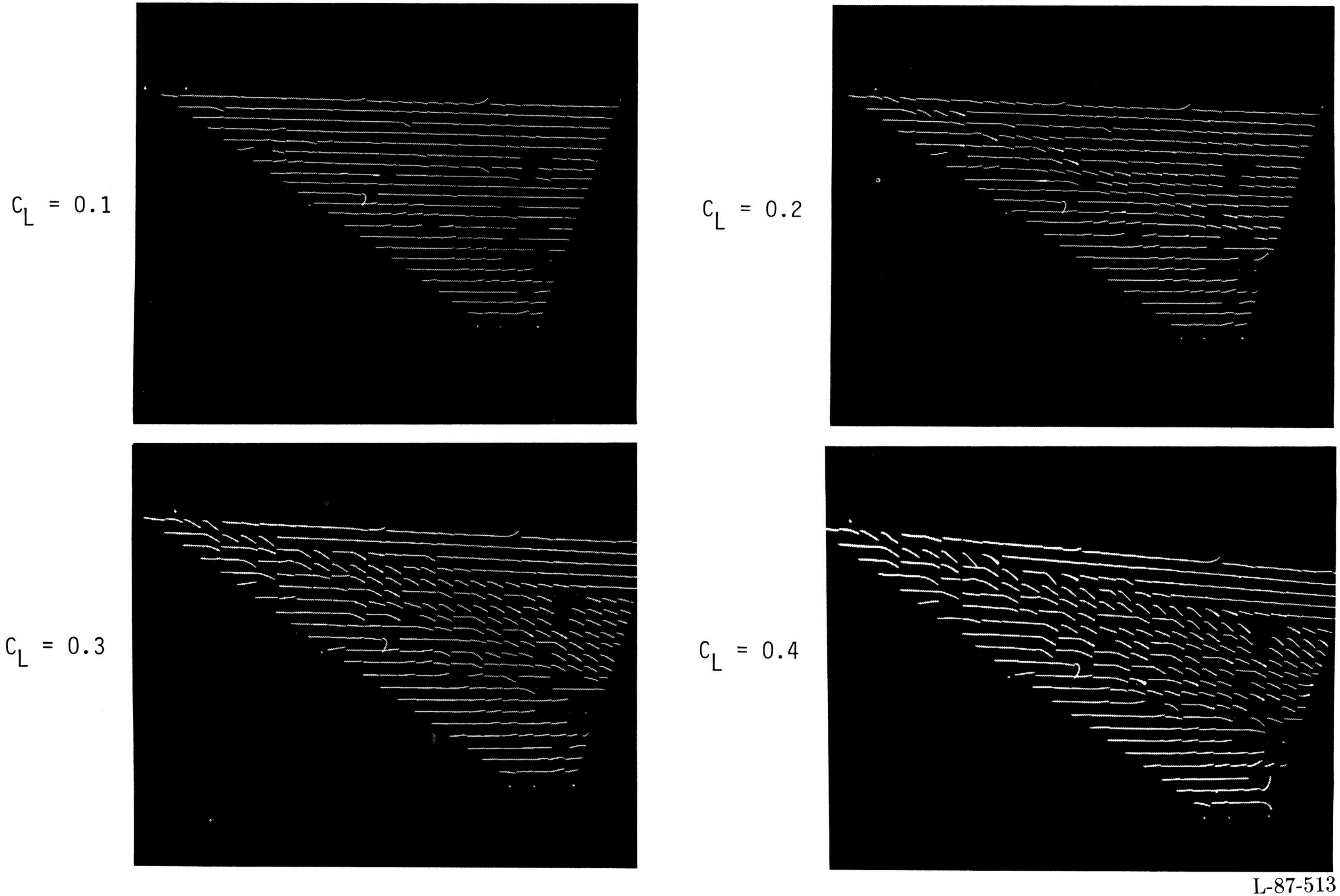
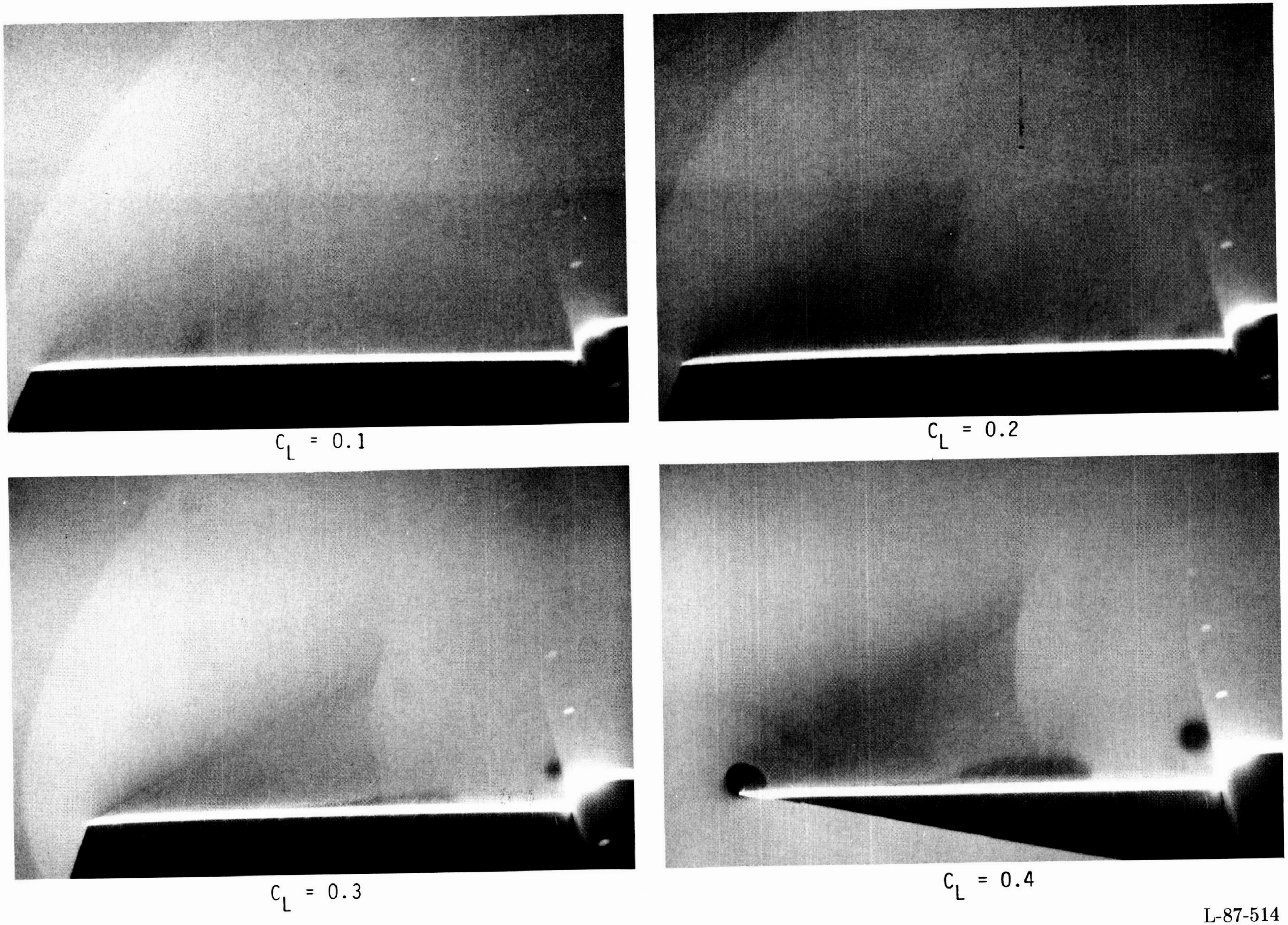


Figure B7. Flow-visualization photographs for AR = 1.75 delta wing with primary leading-edge flap at $M = 2.16$ and $\delta_f = 0°$.



L-87-514

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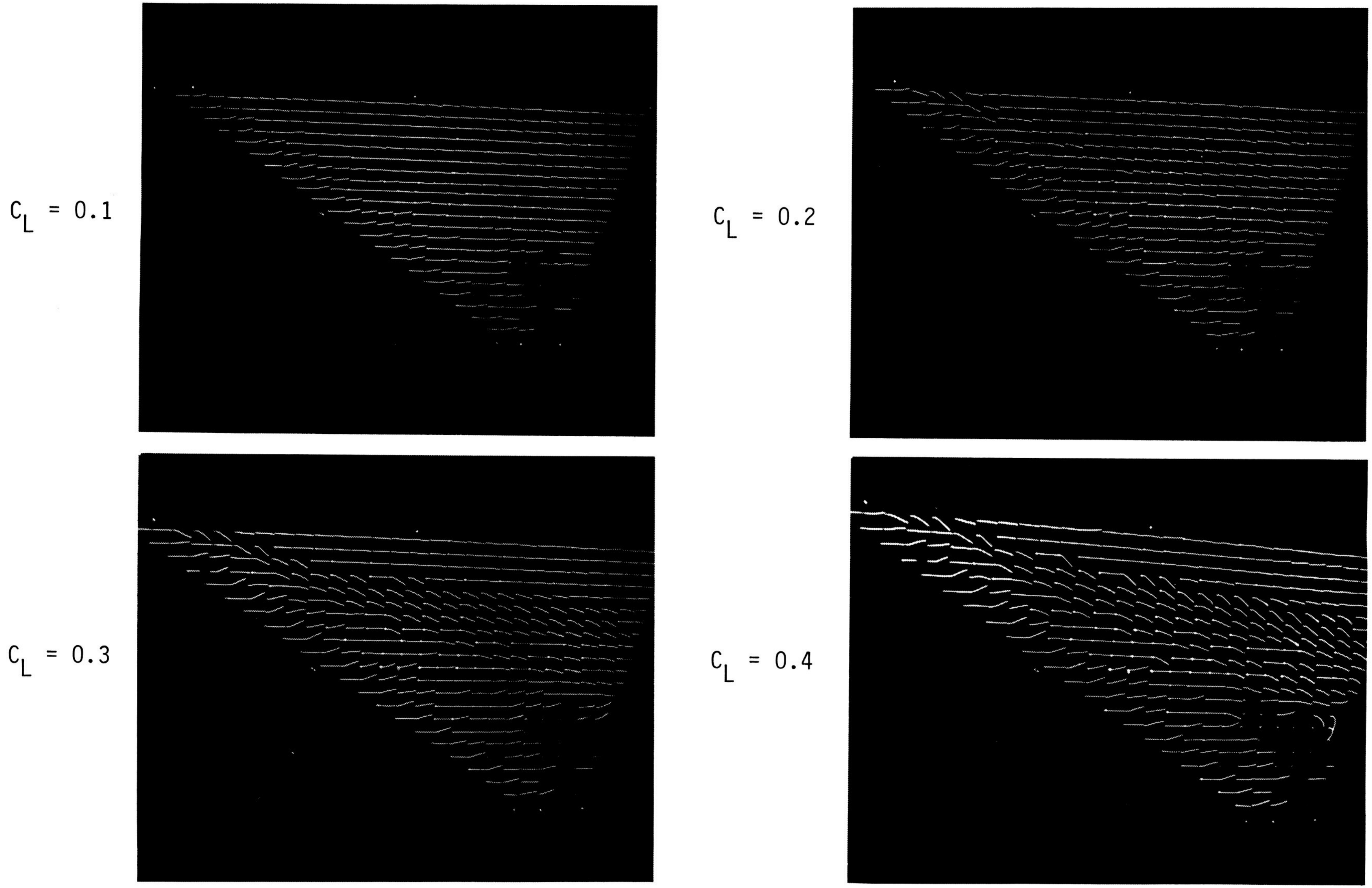
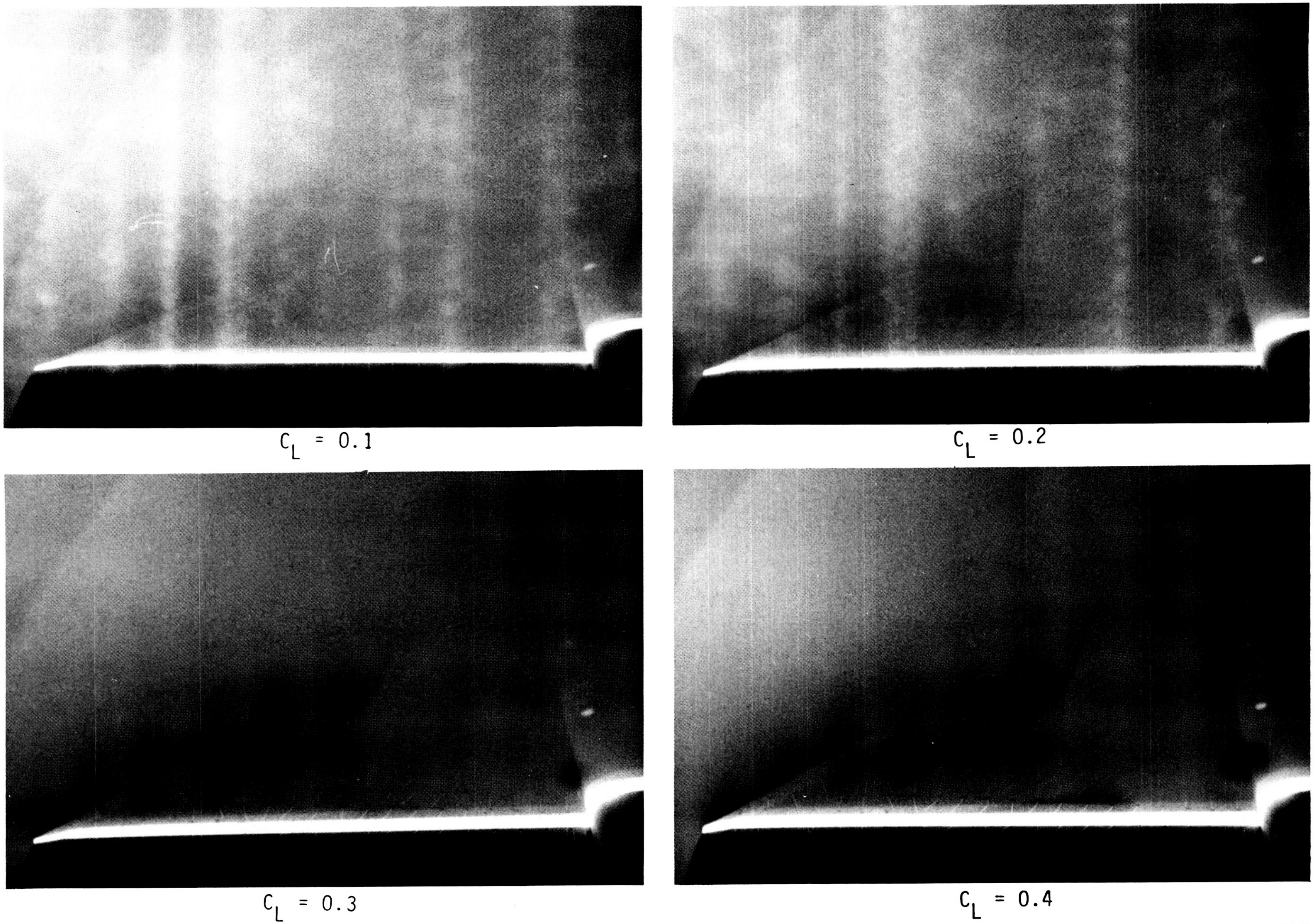


L-87-515

Figure B8. Flow-visualization photographs for AR = 1.75 delta wing with primary leading-edge flap at $M = 2.16$ and $\delta_f = 5°$.



L-87-516

Figure B8. Concluded.

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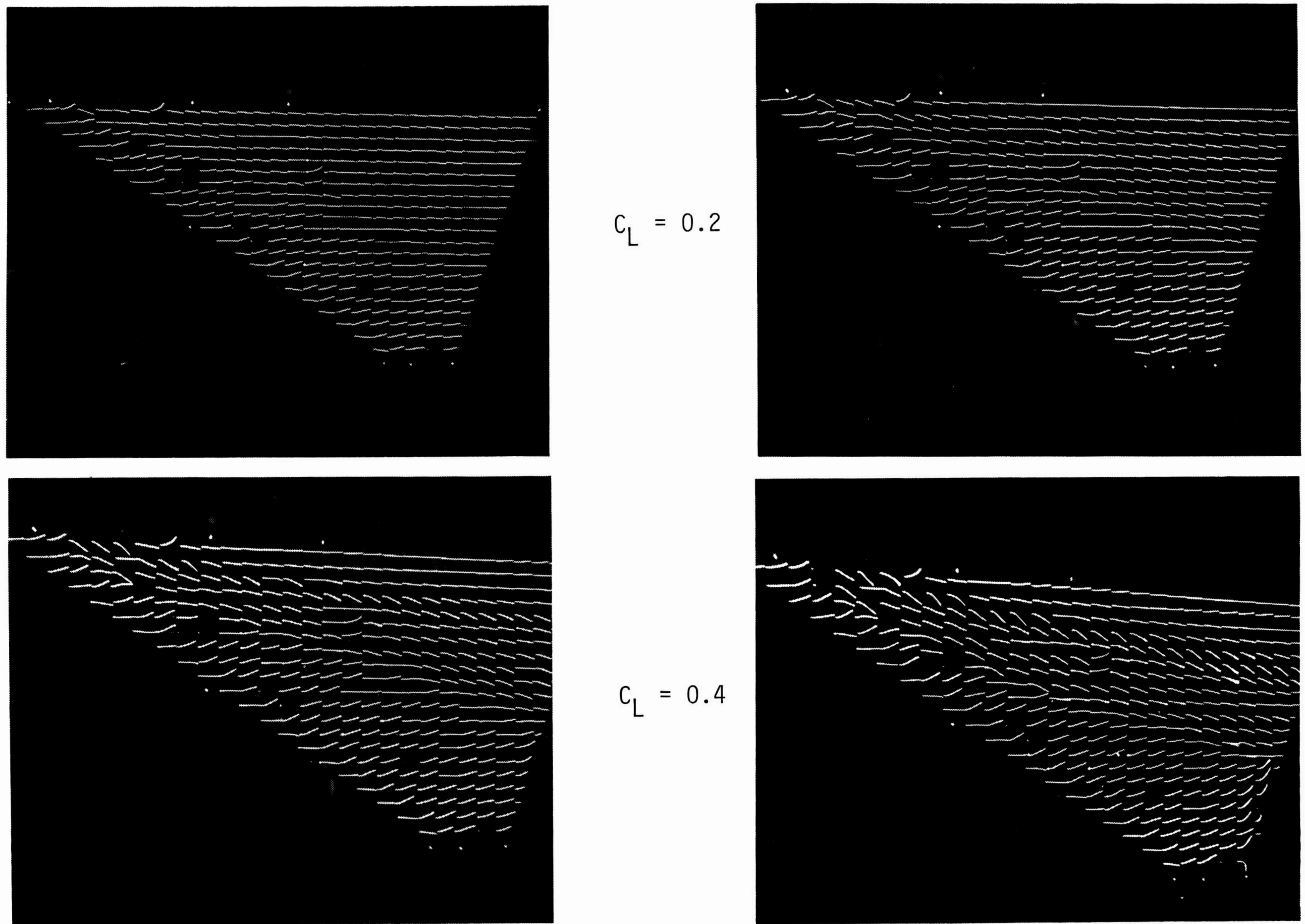
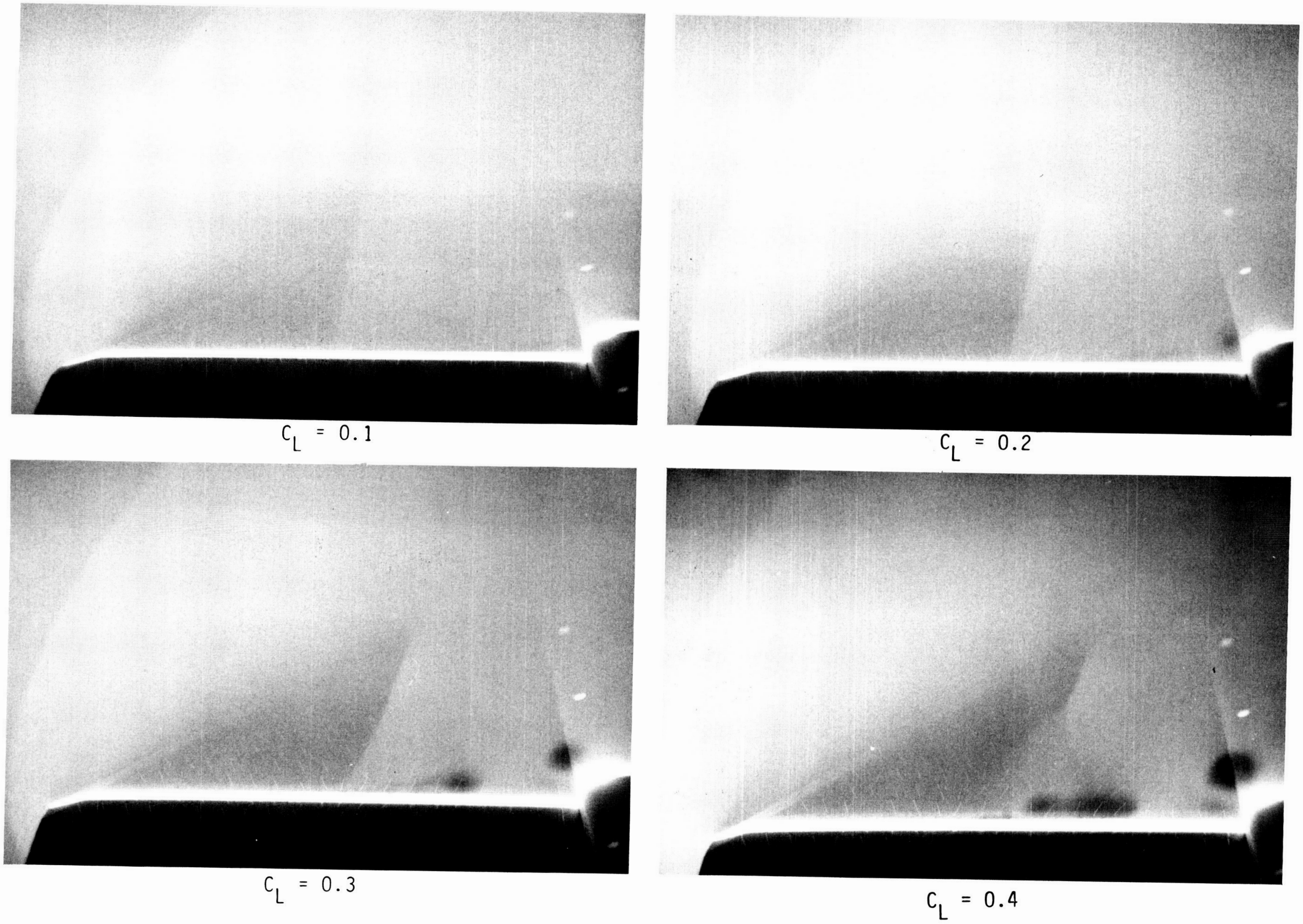
$C_L = 0.3$ $C_L = 0.4$



L-87-517

Figure B9. Flow-visualization photographs for AR = 1.75 delta wing with primary leading-edge flap at $M = 2.16$ and $\delta_f = 10°$.



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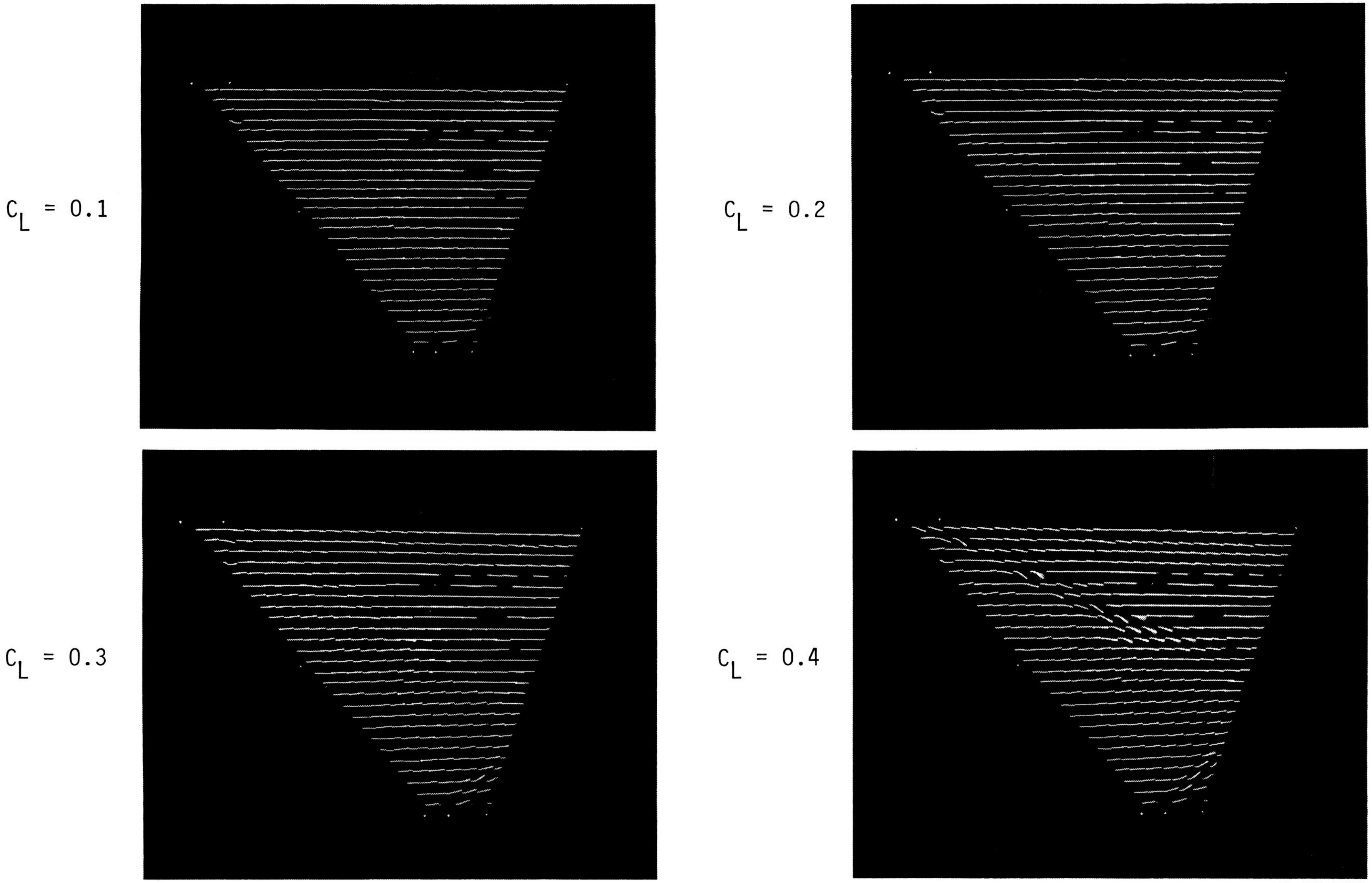
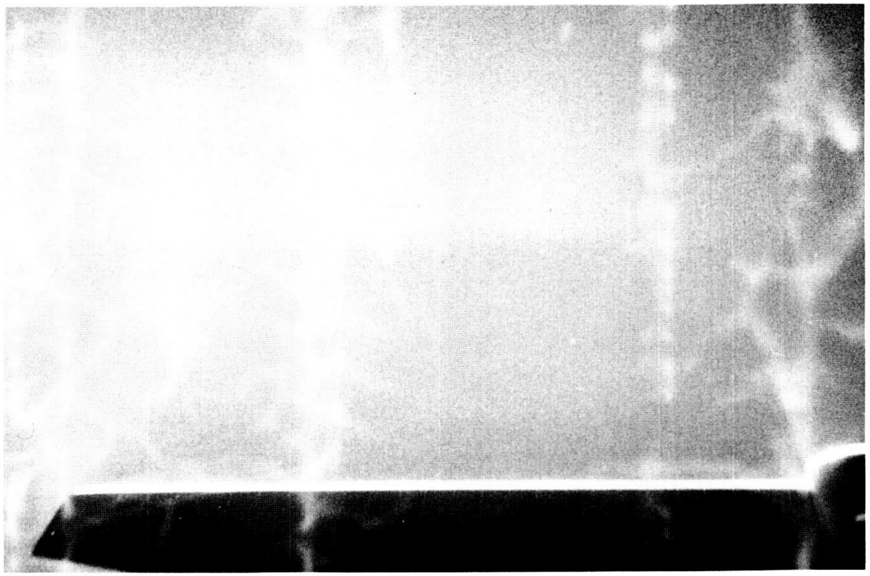


L-87-519

Figure B10. Flow-visualization photographs for AR = 2.50 delta wing with primary leading-edge flap at $M = 1.60$ and $\delta_f = 0°$.



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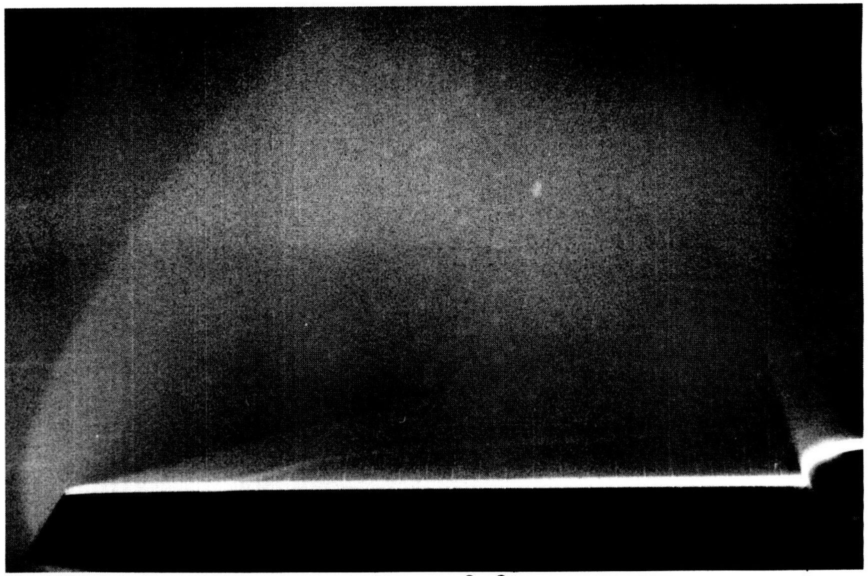

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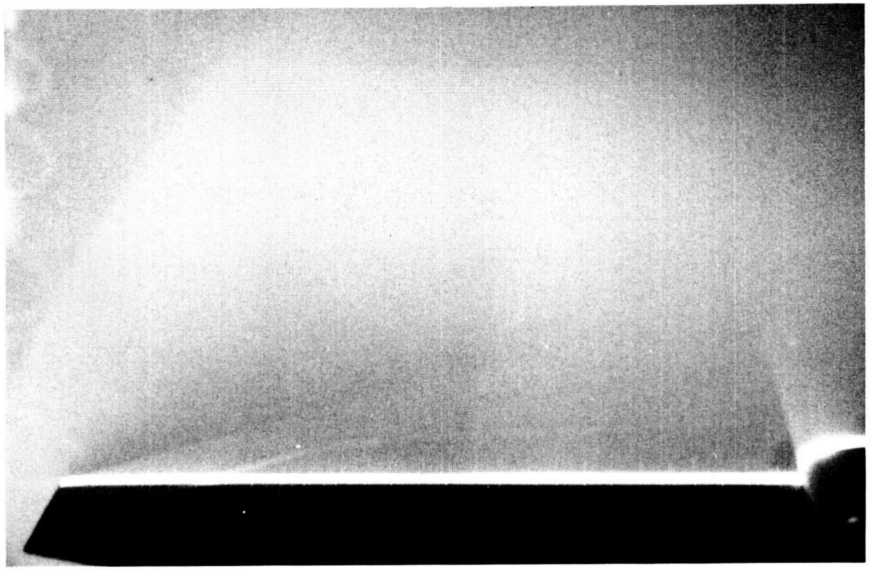

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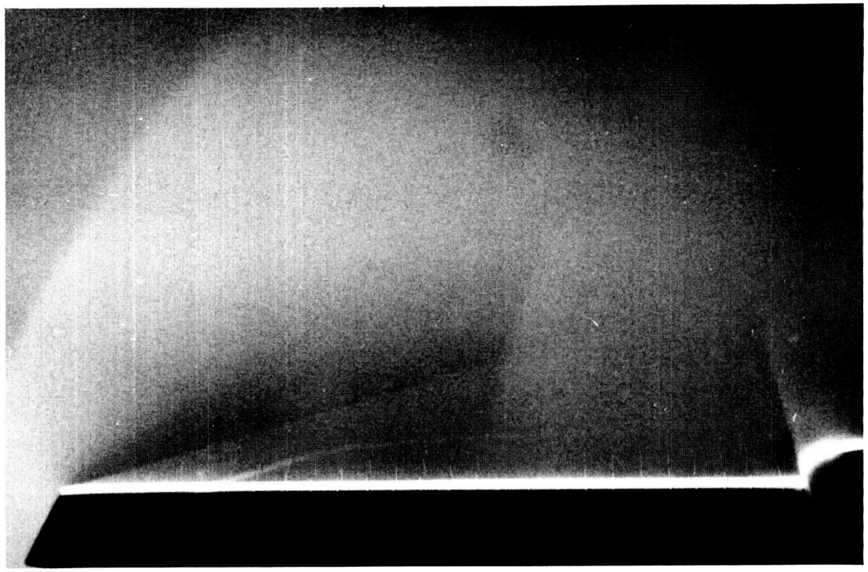

$C_L = 0.4$

L-87-520

Figure B10. Concluded.

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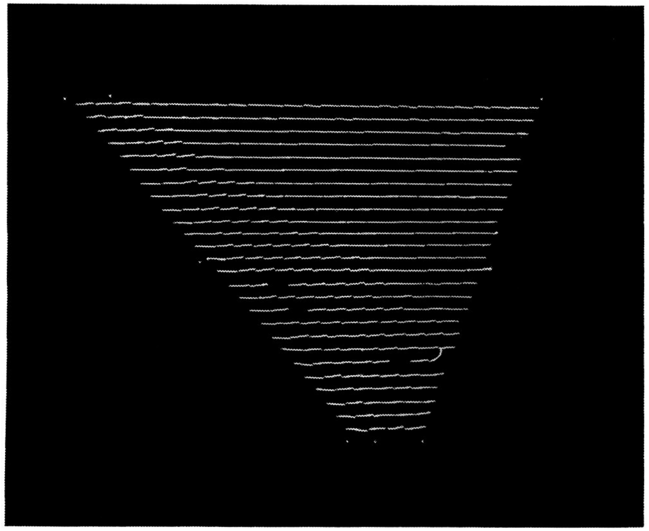

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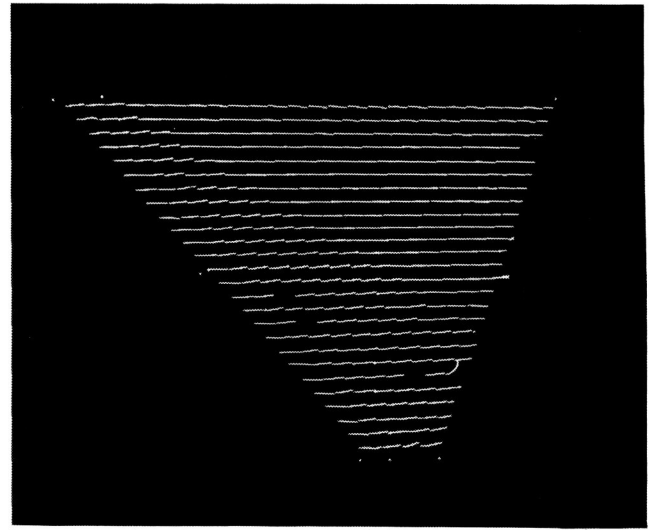

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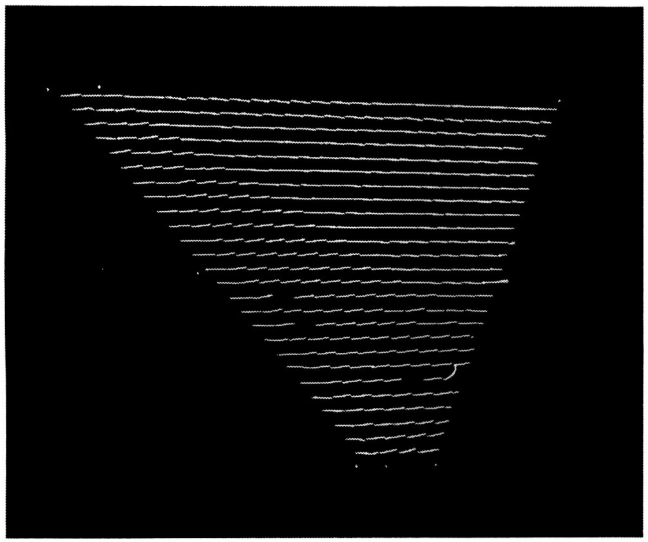

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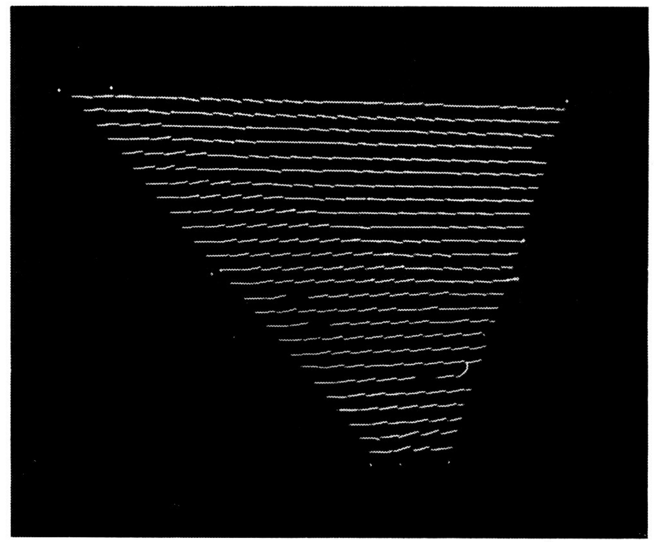

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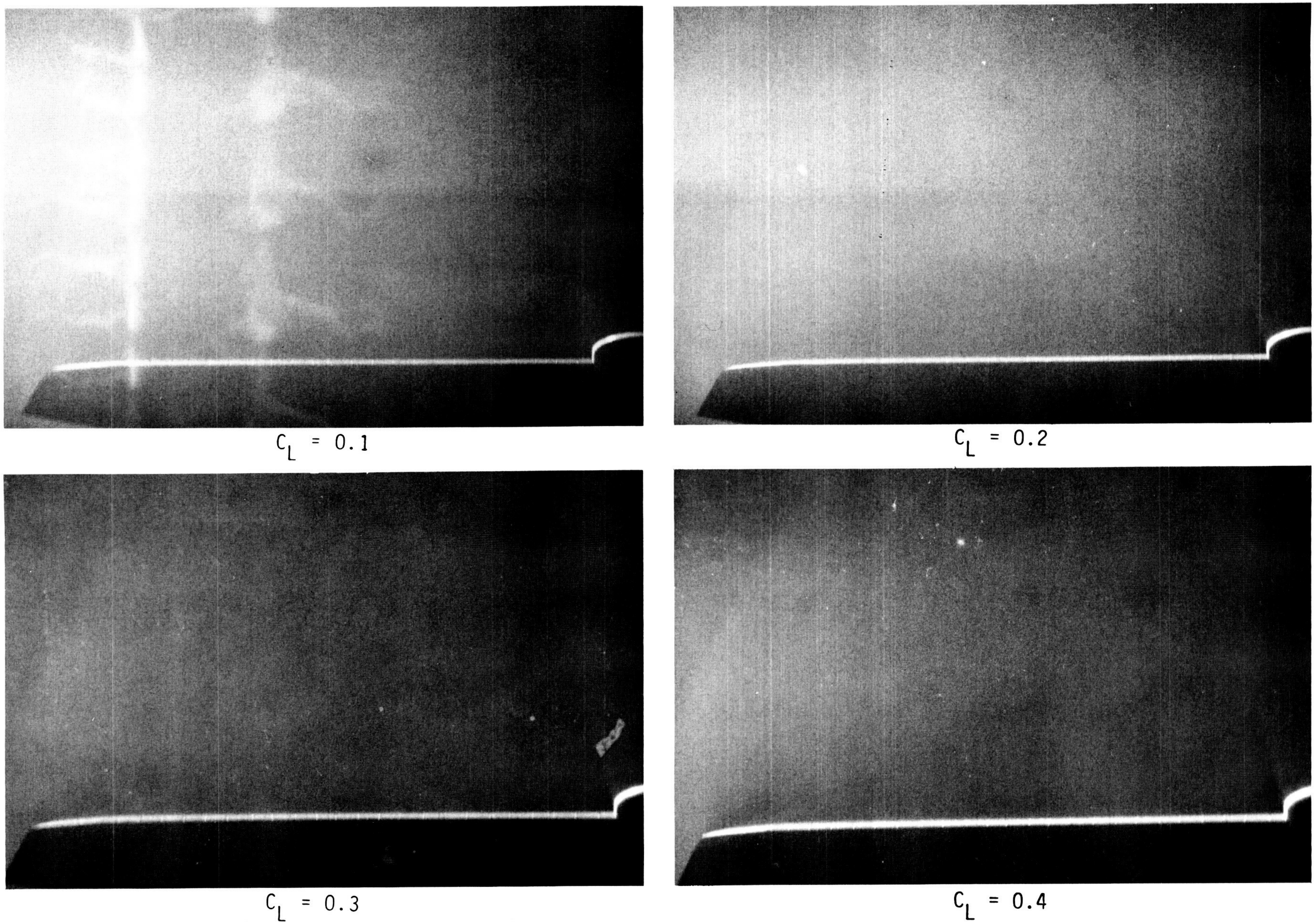
Figure B11. Flow-visualization photographs for AR = 2.50 delta wing with primary leading-edge flap at $M = 1.60$ and $\delta_f = 5°$.



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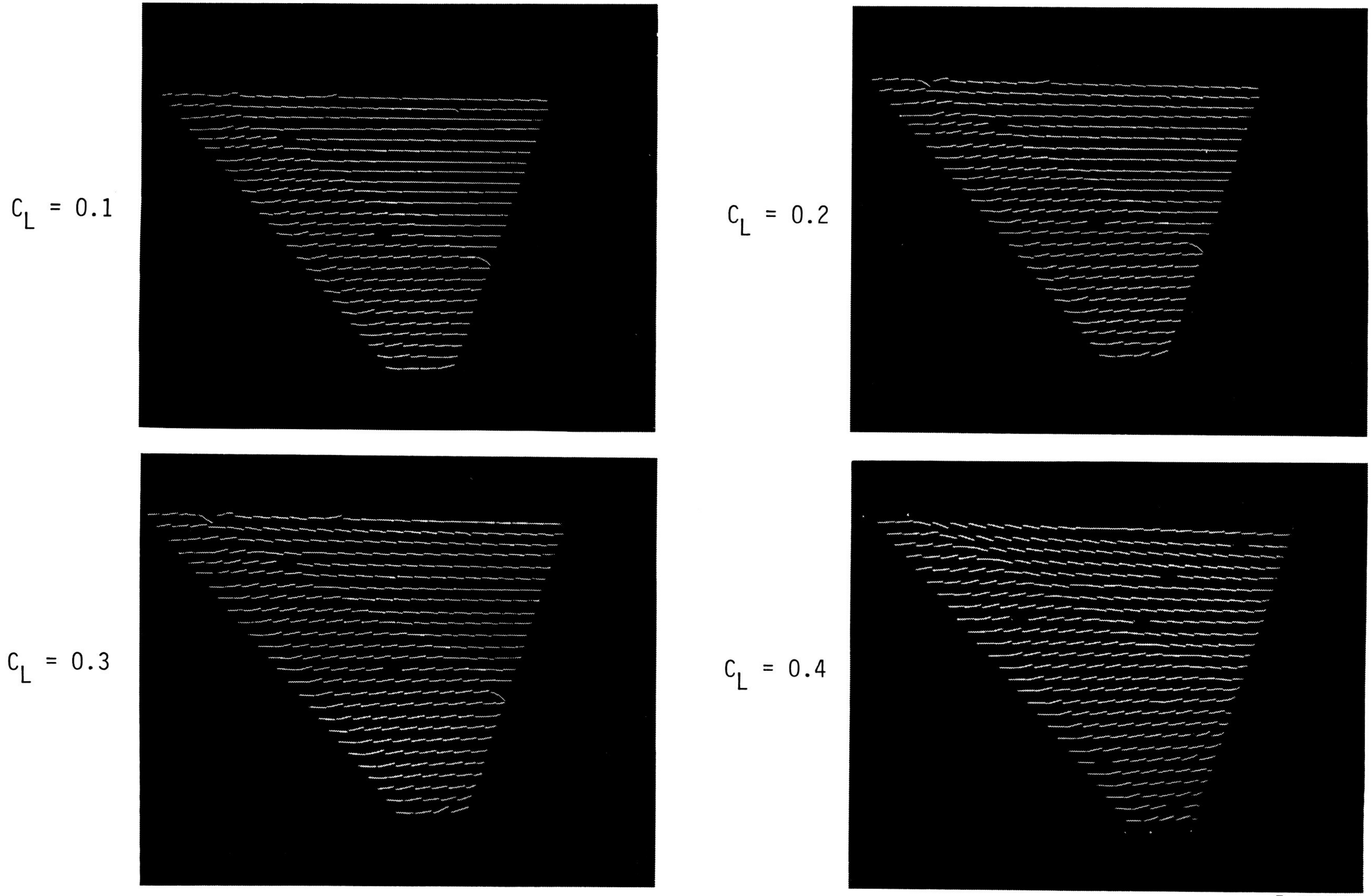
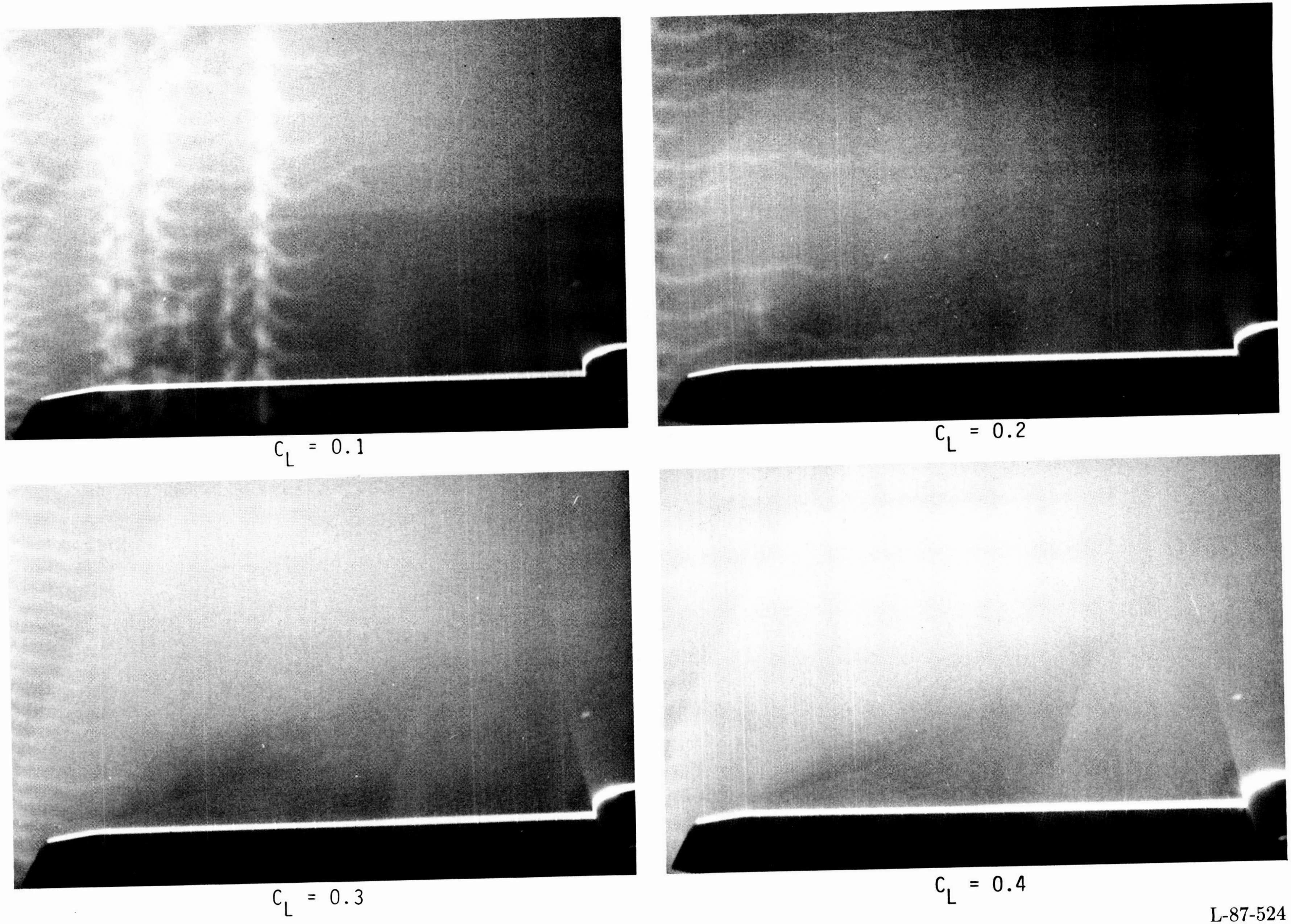


Figure B12. Flow-visualization photographs for AR = 2.50 delta wing with primary leading-edge flap at $M = 1.60$ and $\delta_f = 10°$.



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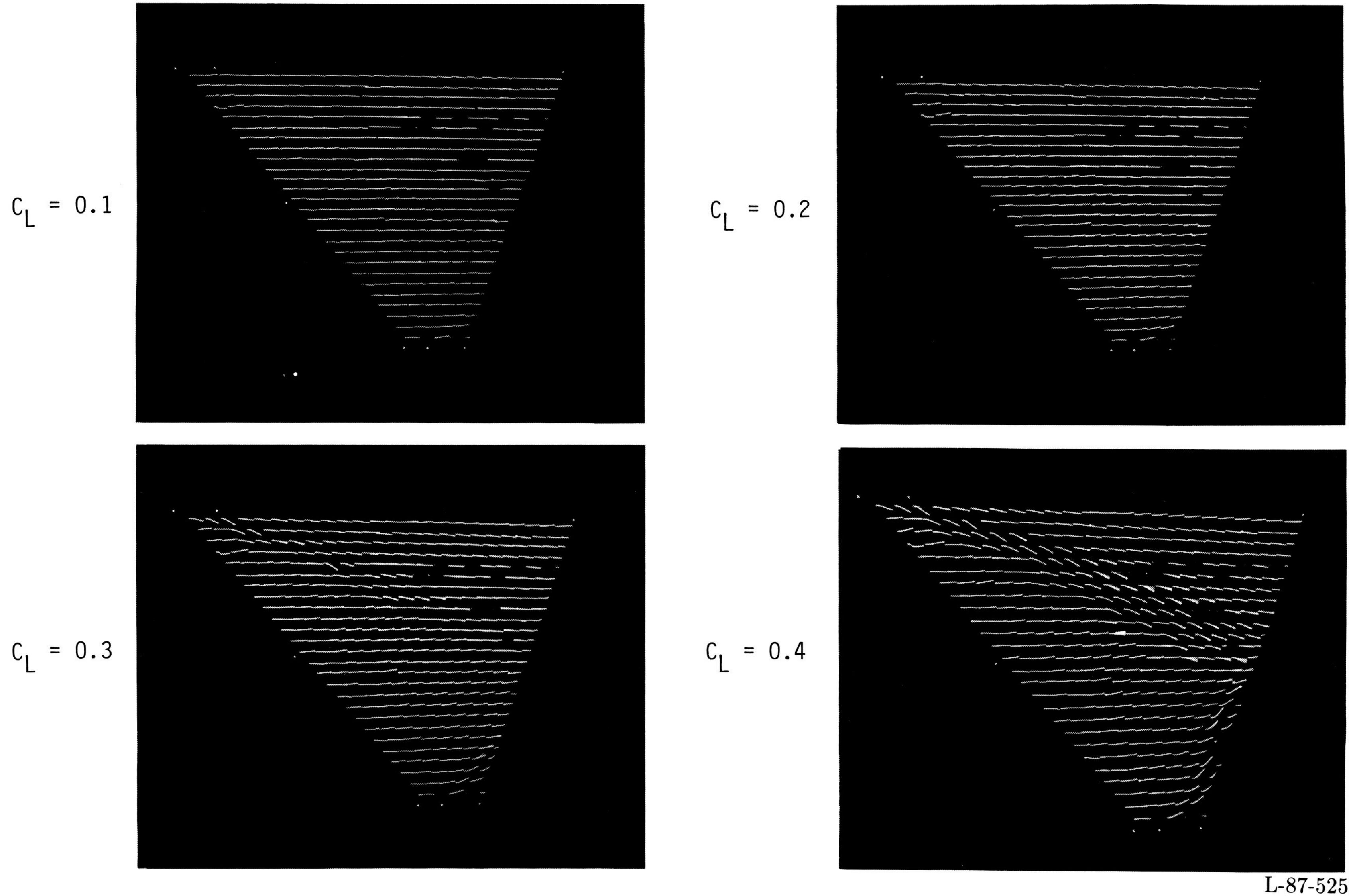
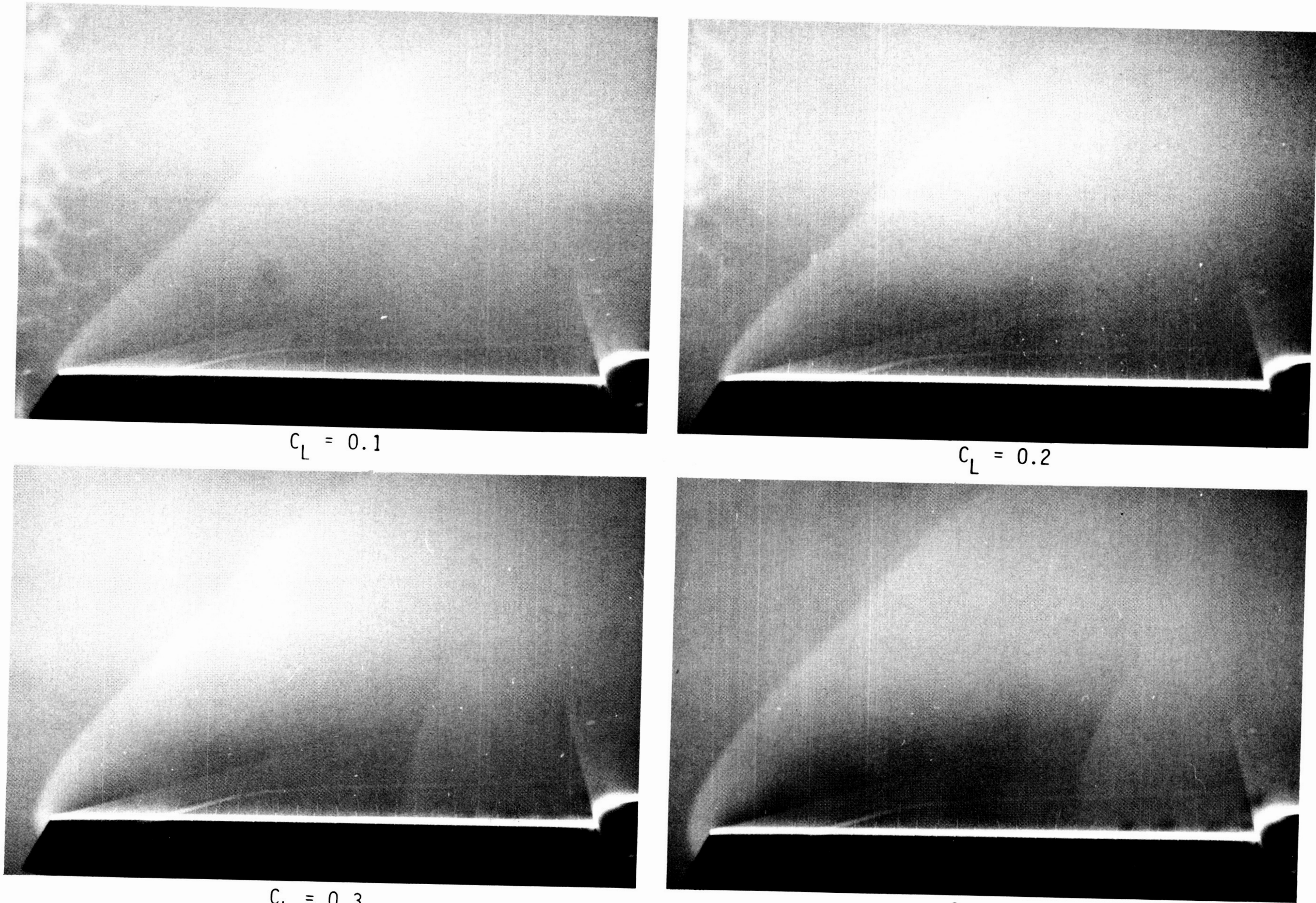


Figure B13. Flow-visualization photographs for AR = 2.50 delta wing with primary leading-edge flap at $M = 1.90$ and $\delta_f = 0°$.



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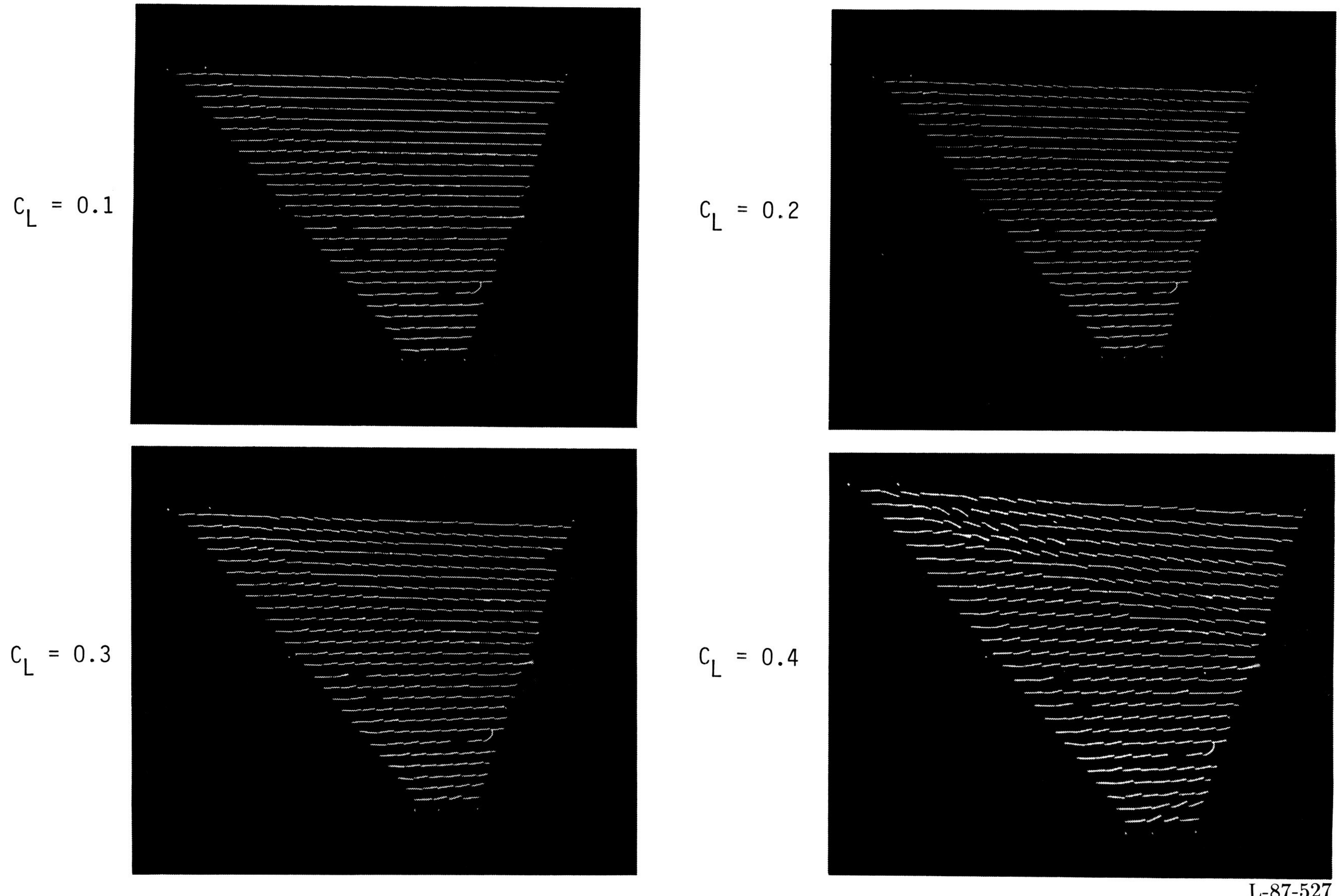
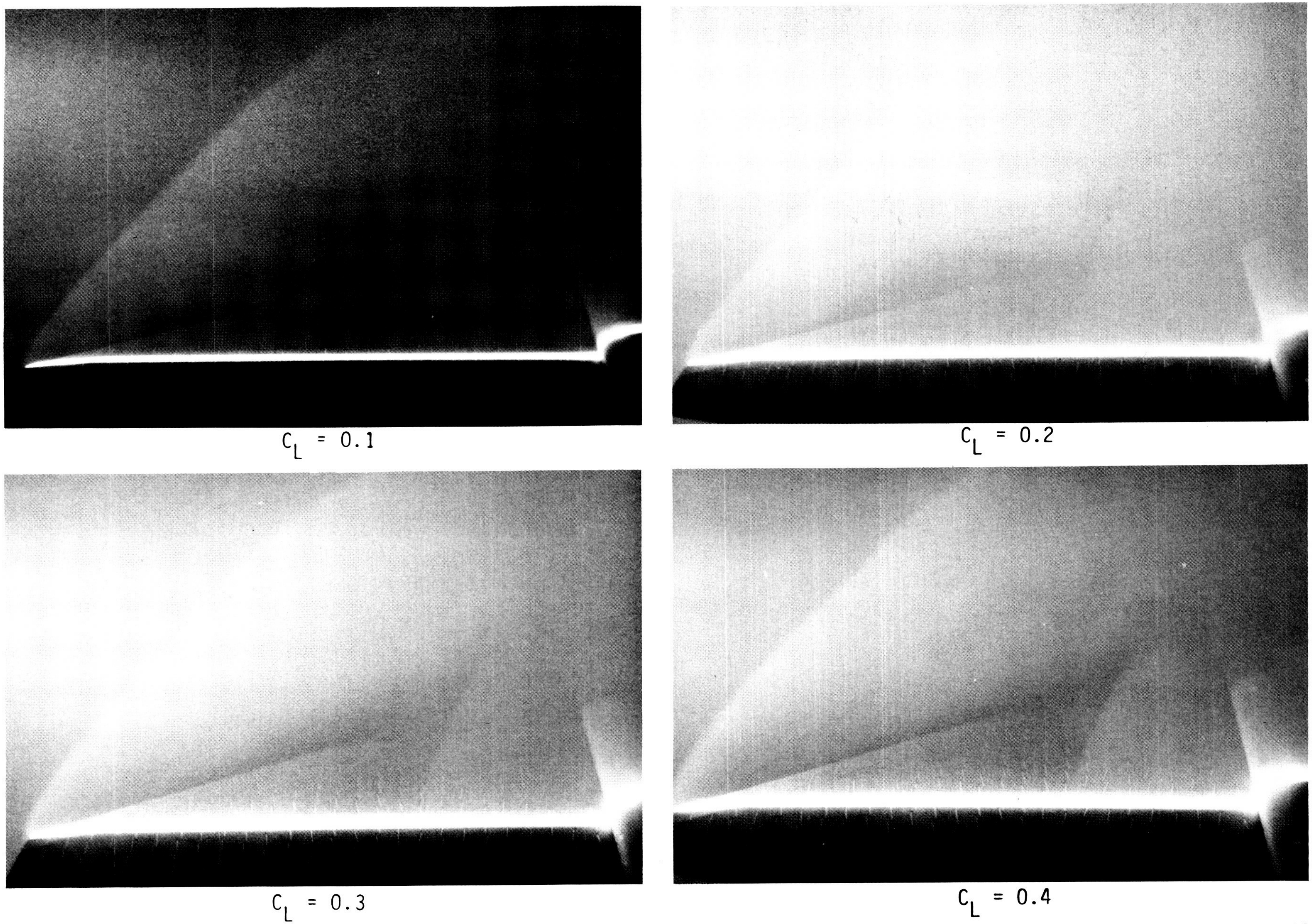


Figure B14. Flow-visualization photographs for AR = 2.50 delta wing with primary leading-edge flap at $M = 1.90$ and $\delta_f = 5°$.



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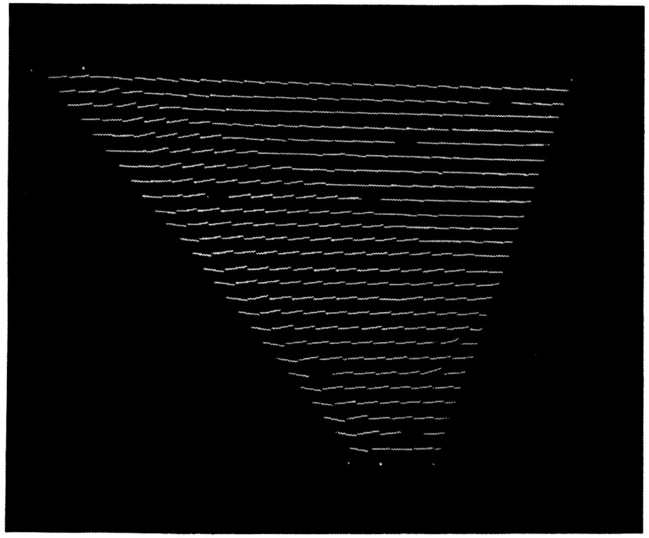

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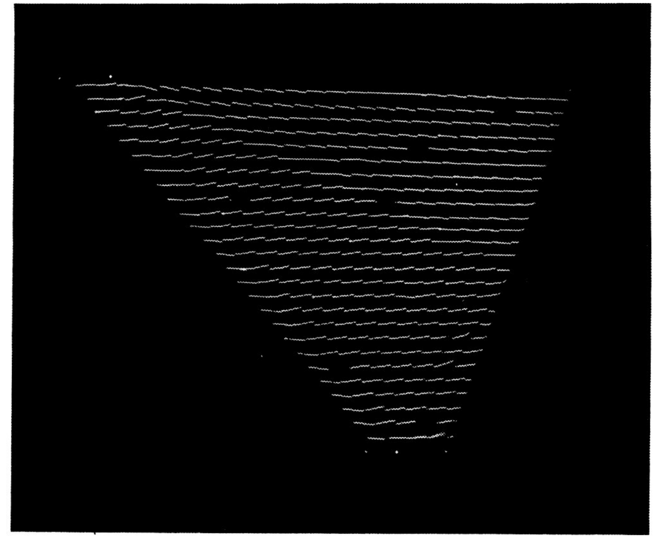

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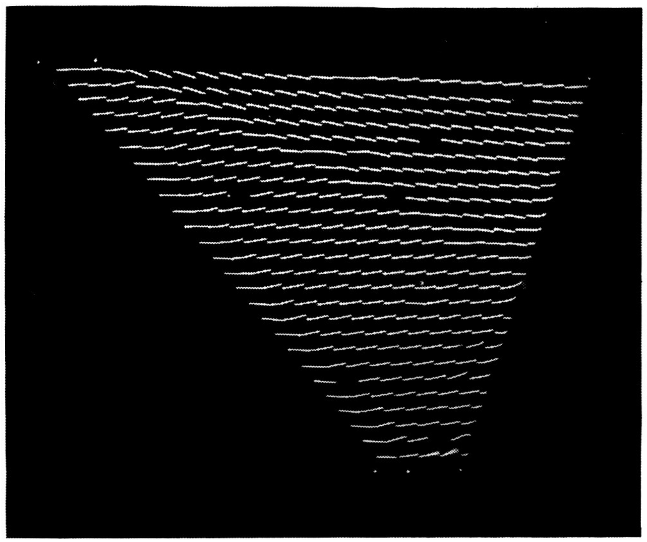

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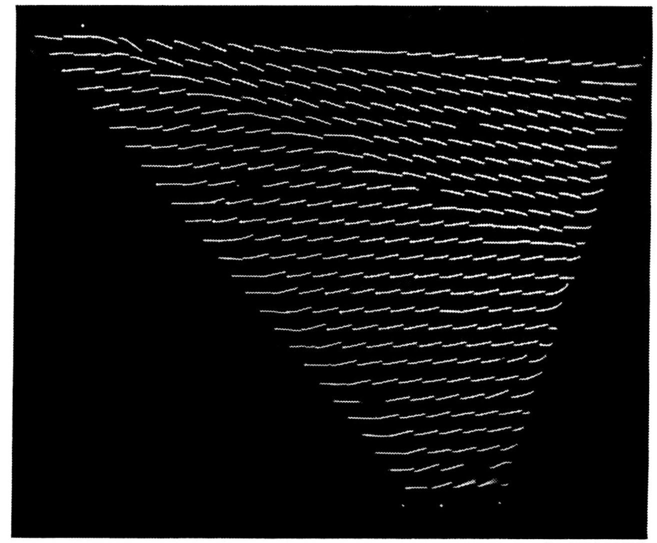
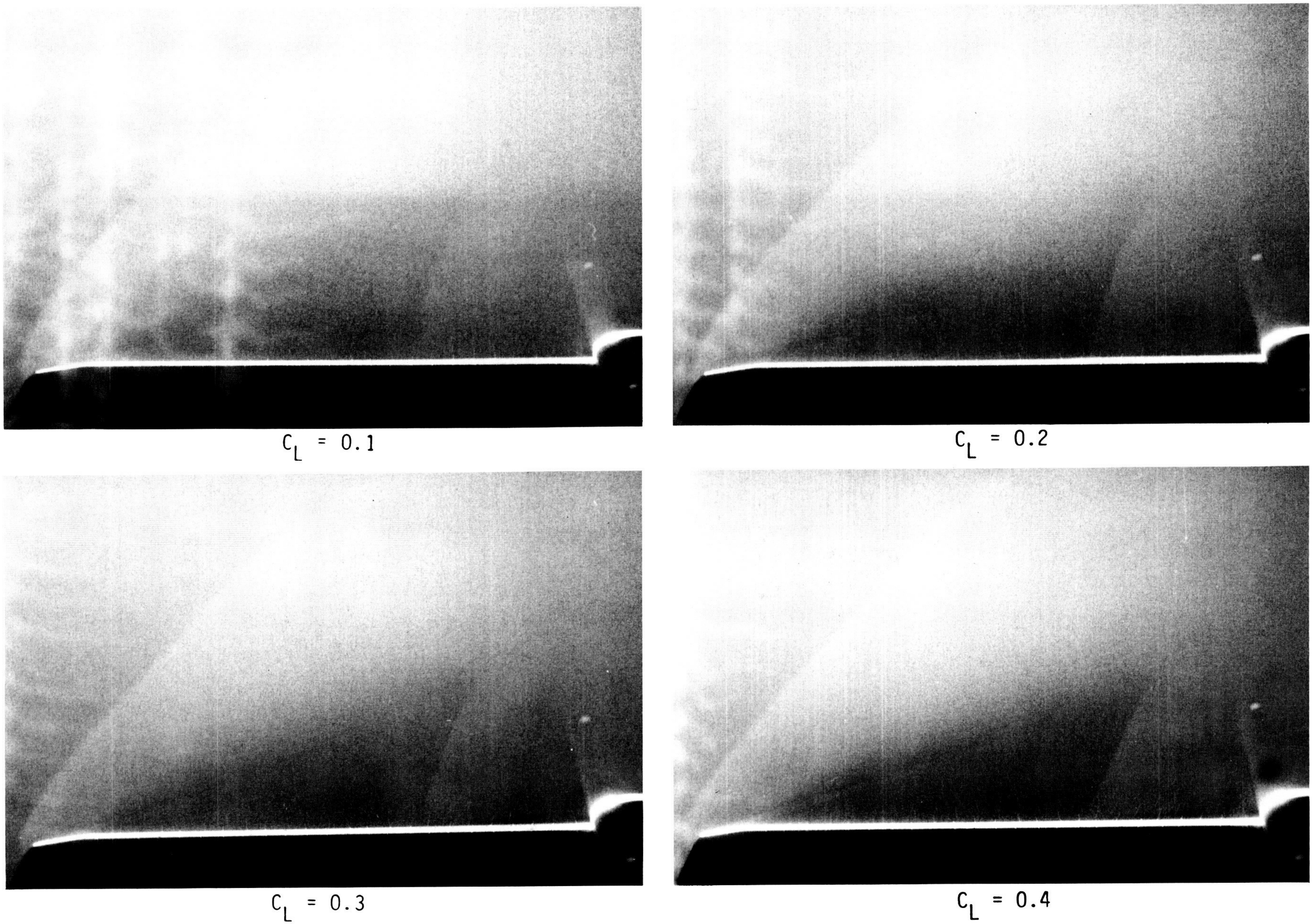


L-87-529

Figure B15. Flow-visualization photographs for AR = 2.50 delta wing with primary leading-edge flap at $M = 1.90$ and $\delta_f = 10^\circ$.



$C_L = 0.1$ $C_L = 0.2$

$C_L = 0.3$ $C_L = 0.4$

L-87-530

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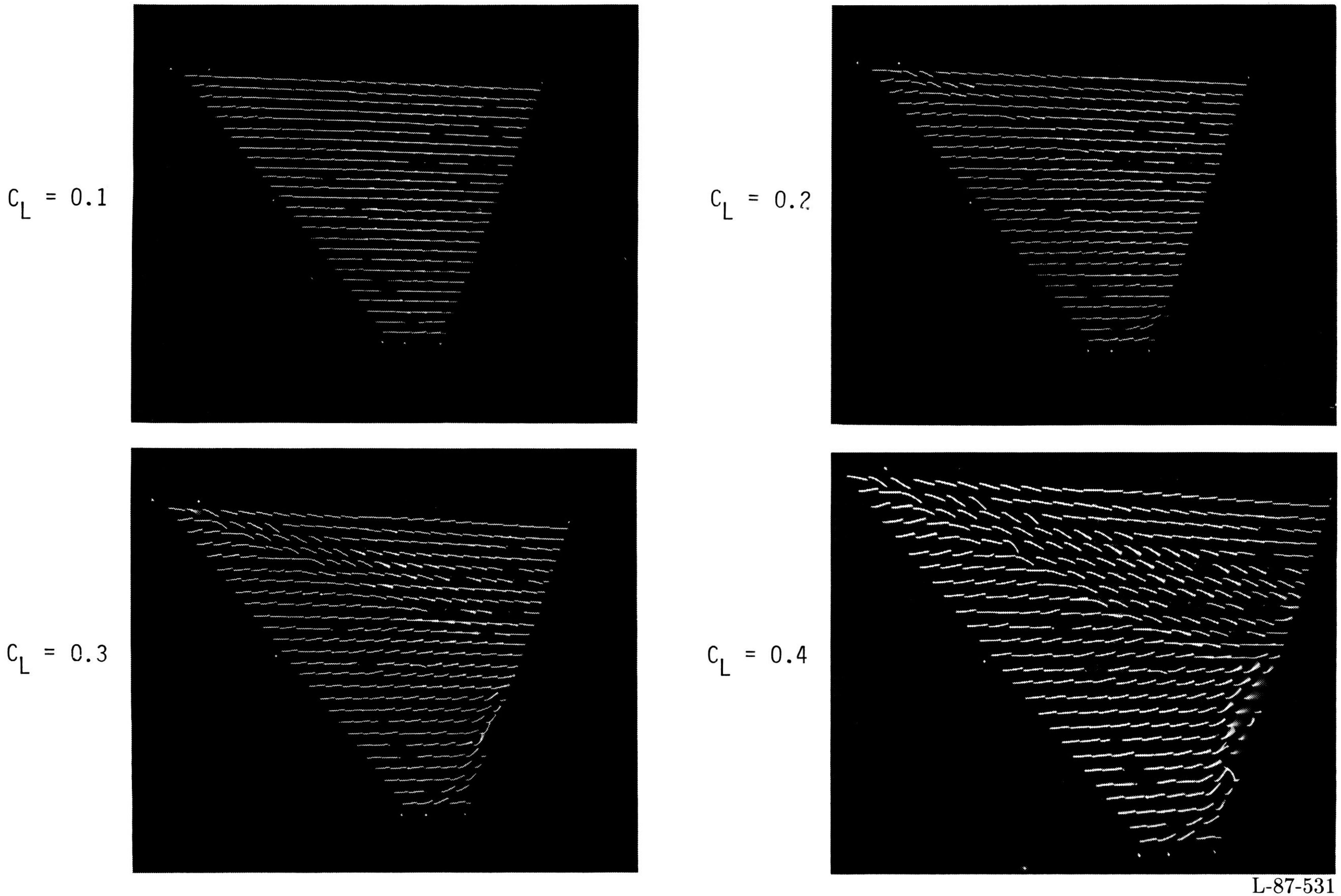
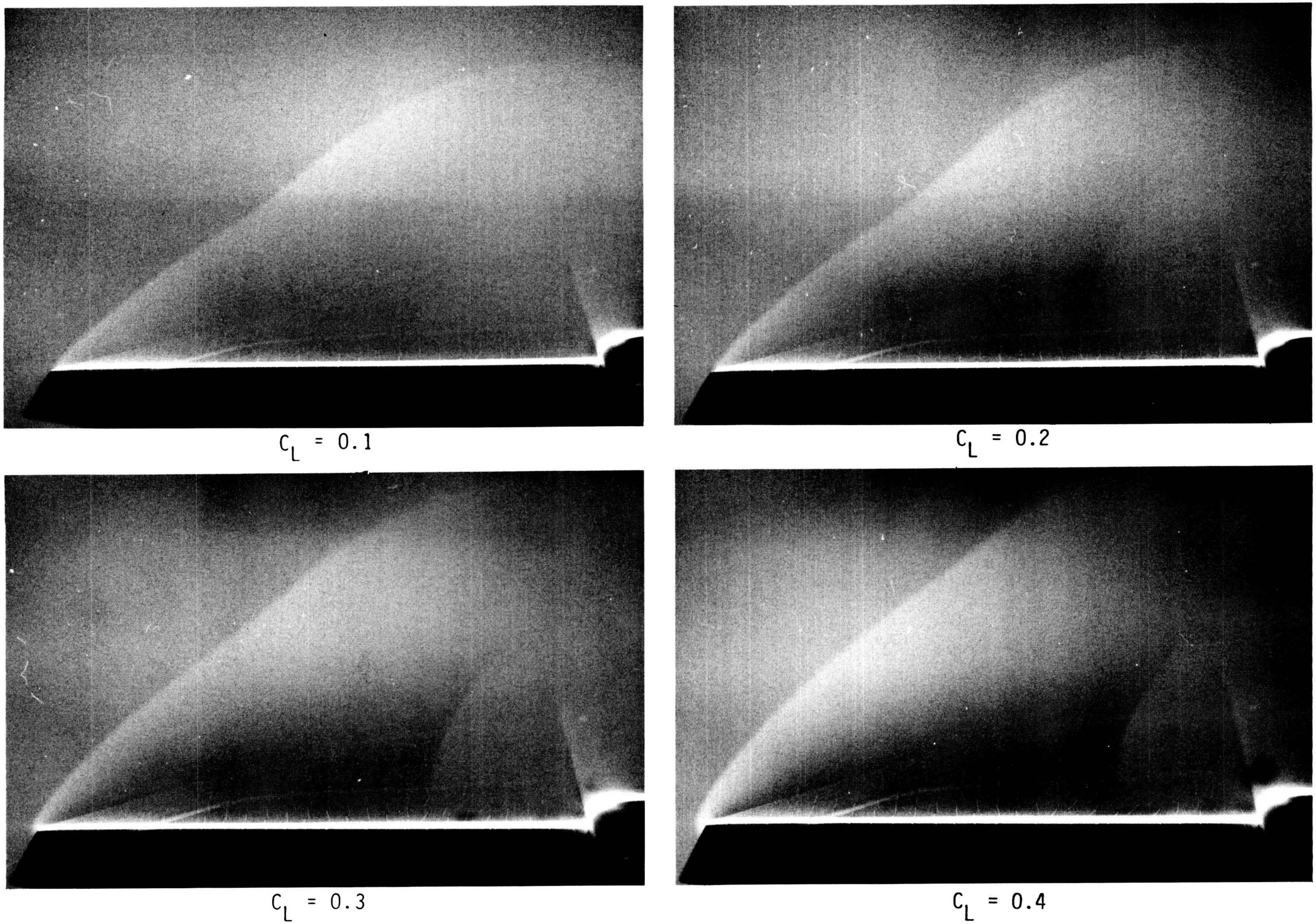


Figure B16. Flow-visualization photographs for AR = 2.50 delta wing with primary leading-edge flap at $M = 2.16$ and $\delta_f = 0°$.



L-87-532

Figure B16. Concluded.

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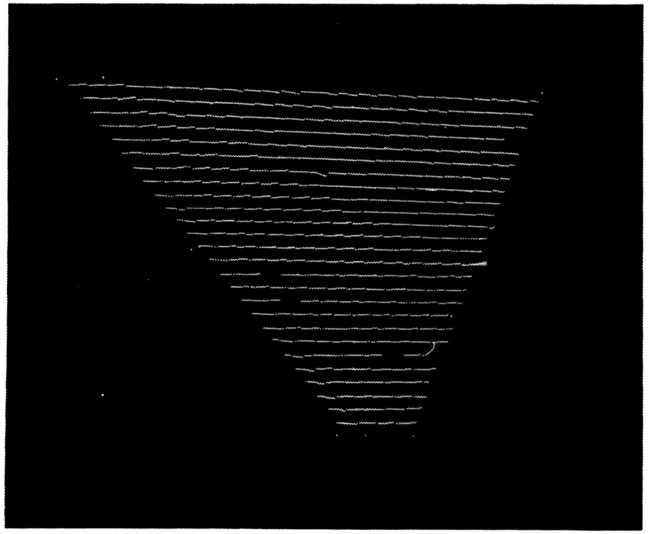

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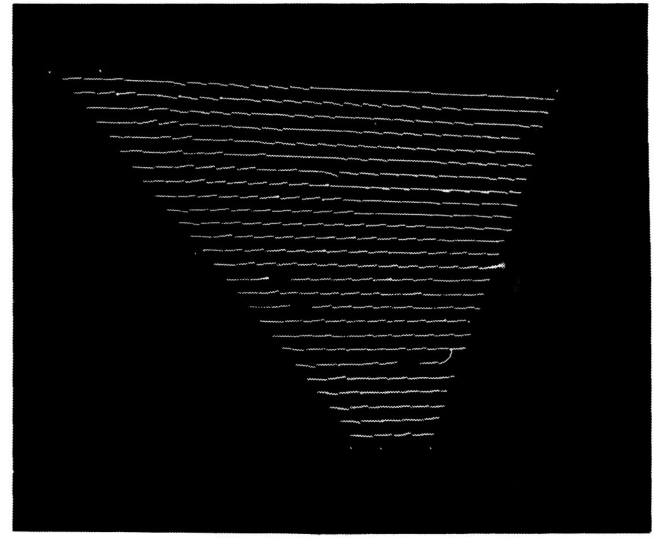

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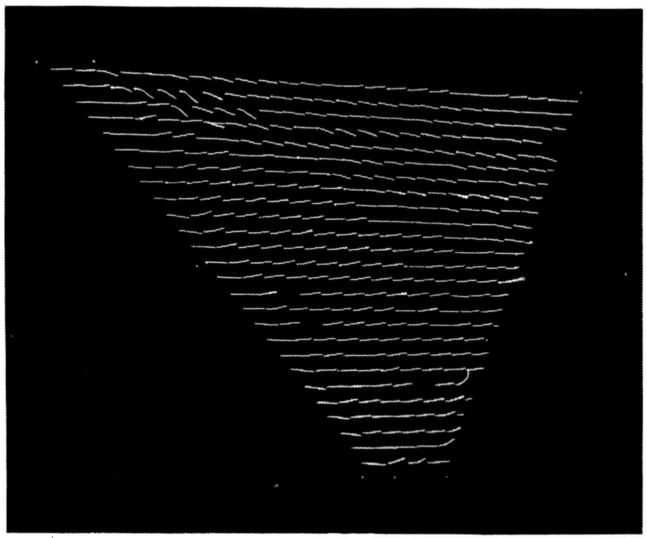

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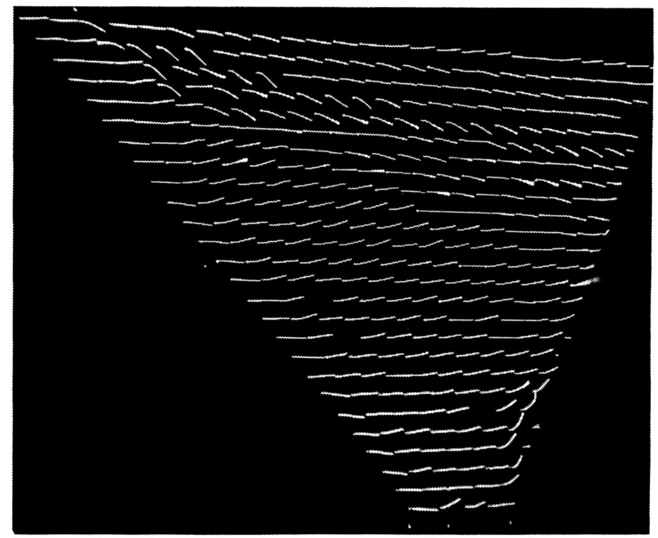
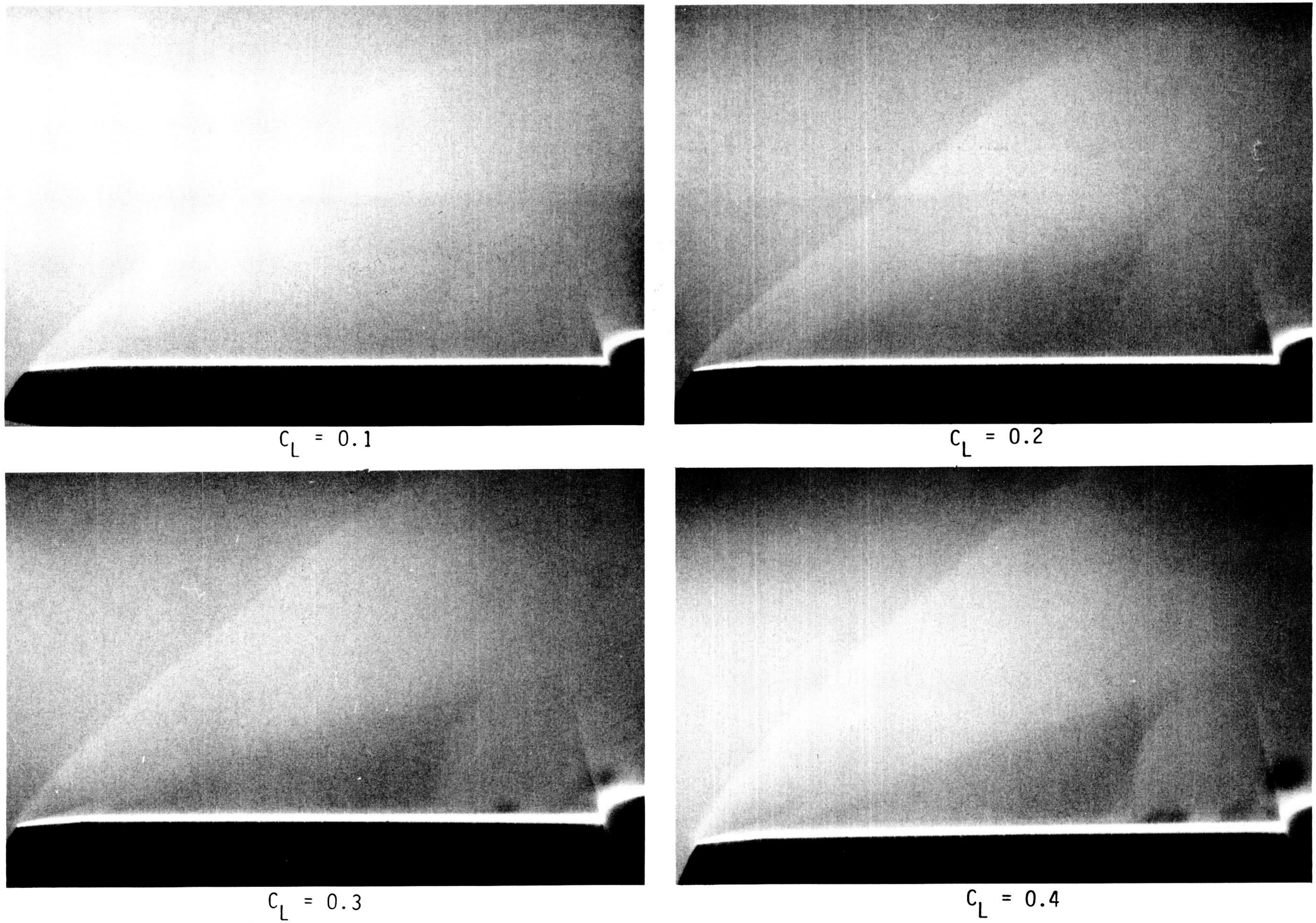


L-87-533

Figure B17. Flow-visualization photographs for AR = 2.50 delta wing with primary leading-edge flap at $M = 2.16$ and $\delta_f = 5°$.



L-87-534

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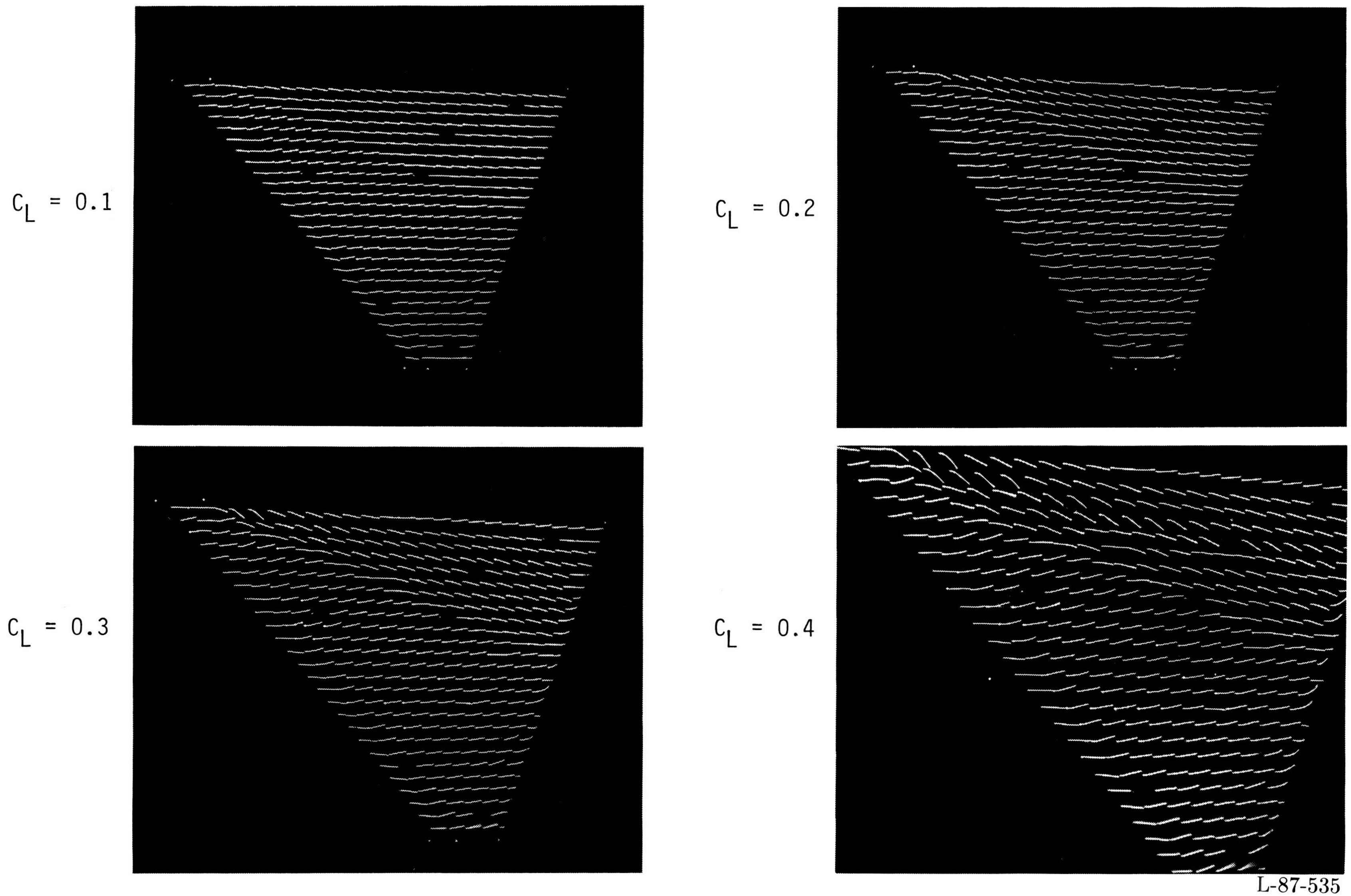
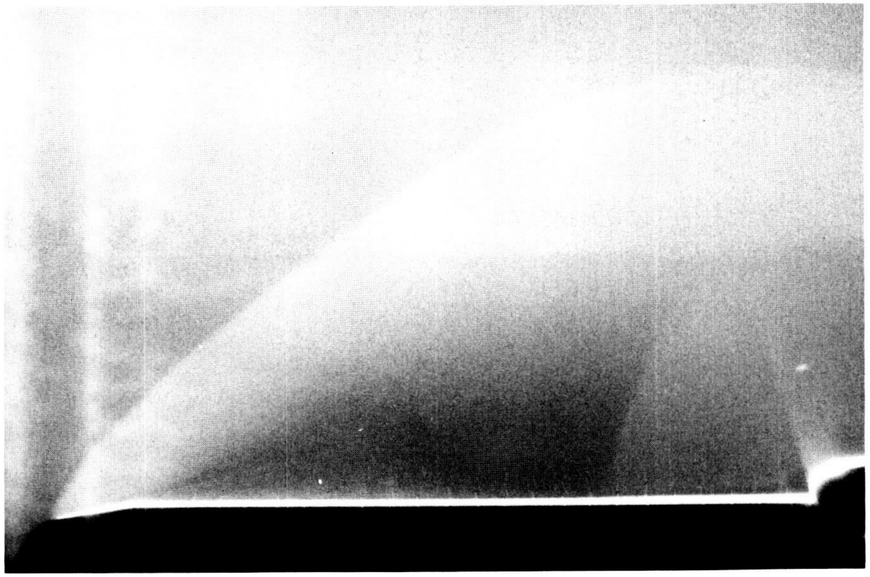


Figure B18. Flow-visualization photographs for AR = 2.50 delta wing with primary leading-edge flap at $M = 2.16$ and $\delta_f = 10°$.



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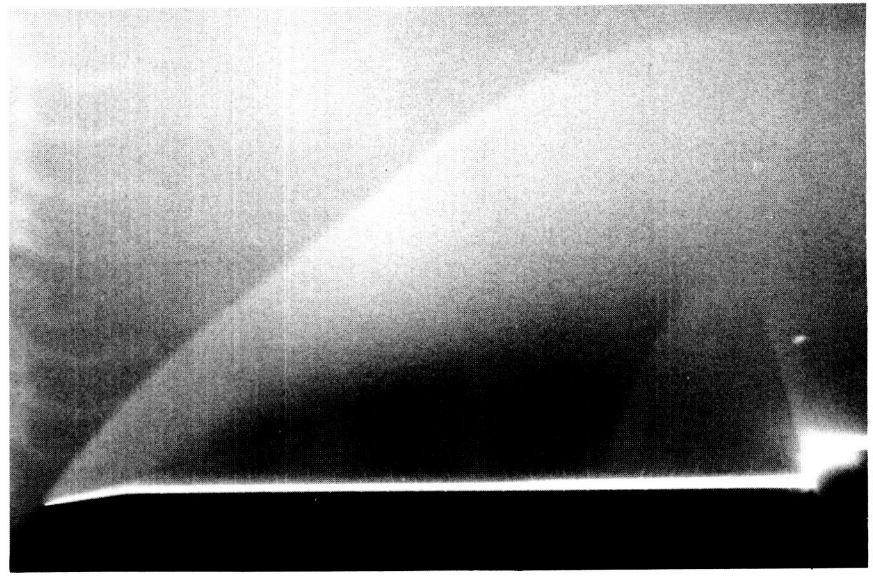

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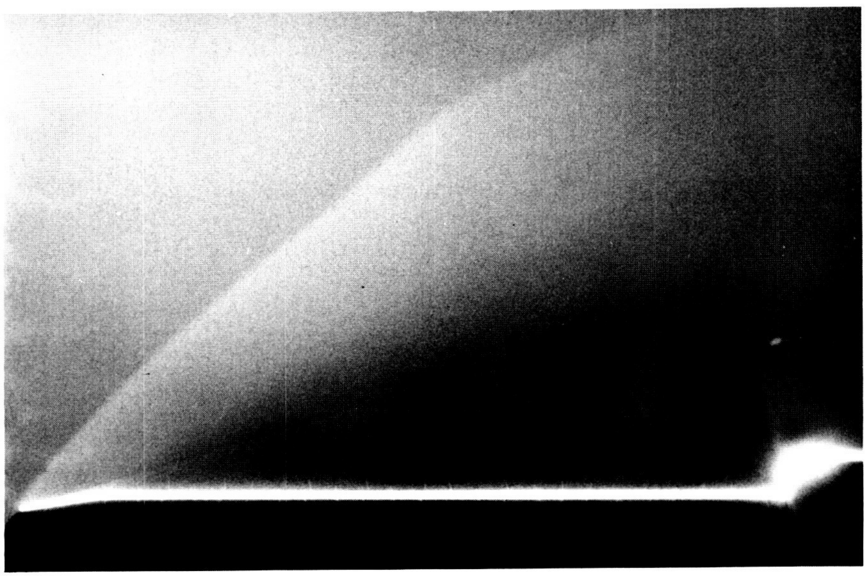

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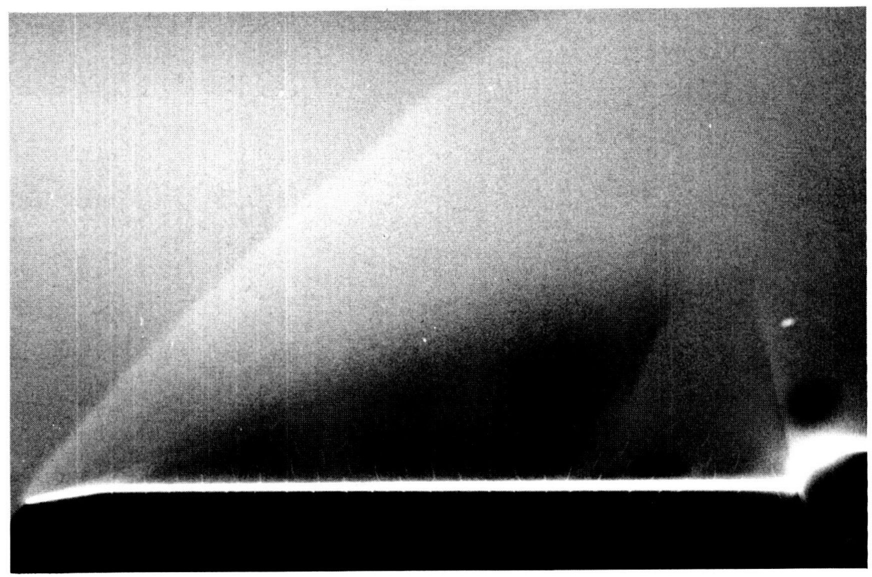

$C_L = 0.4$

L-87-536

Figure B18. Concluded.

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16. Abstract

An experimental investigation of the aerodynamic performance of leading-edge flaps on three clipped delta and three clipped double-delta wing planforms with aspect ratios of 1.75, 2.11, and 2.50 has been conducted in the Langley Unitary Plan Wind Tunnel at Mach numbers of 1.60, 1.90, and 2.16. A primary set of full-span leading-edge flaps with similar root and tip chords were investigated on each wing, and several alternate flap planforms were investigated on the aspect-ratio-1.75 wings. All leading-edge flap geometries were effective in reducing the drag at lifting conditions over the range of wing aspect ratios and Mach numbers tested. Application of a primary flap resulted in better flap performance with the double-delta planform than with the delta planform. The primary flap geometry generally yielded better performance than the alternate flap geometries tested. Trim drag due to flap-induced pitching moments was found to reduce the leading-edge flap performance more for the delta planform than for the double-delta planform. Flow-visualization techniques showed that leading-edge flap deflection reduces crossflow shock-induced separation effects. Finally, an analytic investigation showed that modified linear theory consistently predicts only the effects of leading-edge flap deflection as related to pitching moment and lift trends.

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