NASA CR-132415

AN EXPERIMENTAL INVESTIGATION OF LEADING-EDGE VORTEX AUGMENTATION BY BLOWING

By R. G. Bradley, W. O. Wray,
and C. W. Smith

Prepared under Contract No. NAS1-12682 by
GENERAL DYNAMICS CORPORATION
Convair Aerospace Division
Fort Worth, Texas

for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONTENTS

AN EXPERIMENTAL INVESTIGATION OF LEADING-EDGE-VORTEX AUGMENTATION BY BLOWING

By R. G. Bradley, W. O. Wray,
and C. W. Smith

SUMMARY

A wind tunnel test has been conducted to determine the effects of over-the-wing blowing as a means of augmenting the leading-edge vortex flow of several pointed-tip, sharp-edged planforms. Arrow, delta, and diamond wings with leading-edge sweeps of 30 and 45 degrees were mounted on a body-of-revolution fuselage and tested in General Dynamics' Convair Aerospace Division's Low-Speed Wind Tunnel at a Mach number of 0.2. Nozzle location data, pitch data, and flow-visualization pictures were obtained for a range of blowing rates. Results show pronounced increases in vortex lift due to the blowing.

INTRODUCTION

One of the classic aeronautical design challenges revolves around the contradictory requirements for low-aspect-ratio thin wings for efficient supersonic performance and for higher-aspect-ratio thicker wings for subsonic performance, e.g., take-off and landing and/or maneuver. These conflicting requirements have led recently to innovative aerodynamic design concepts that take advantage of the strong leading-edge vortex shed from thin slender wings and strakes at angle of attack. For example, the British-French supersonic transport "Concorde" takes advantage of the wing vortex flow to augment high-lift devices, and the YF-16 lightweight fighter prototype relies upon the strong vortex flow generated by a maneuver strake to enhance high-angle-of-attack maneuverability.

Practical utilization of leading-edge vortex flow is limited by the combination of angle-of-attack and wing planform that results in vortex burst occurring above the wing surface. Wentz has shown (Reference 1), for example, that for slender wings vortex burst moves progressively from the wing trailing edge to the vertex with increasing angle of attack. The net effect is a reduction in the vortex lift and, eventually, wing stall as angle of attack increases. Thin wings with low-leading-edge sweep experience vortex burst at low angles of attack so that vortex-induced effects are virtually non-existent. Polhamus (Reference 2) has developed an accurate suction-analogy method for predicting vortex-induced effects for thin wings with fully developed leading-edge vortex flow. The analytical results show that, if vortex burst can be avoided, large aerodynamic improvements are possible for sharp-edged wings of moderate leading-edge sweep as well as for slender wings with high sweep.

Concentrated blowing over the wing upper surface in a direction roughly parallel to the leading-edge-vortex core has recently been shown to enhance the vortex flow, e.g., see References 3, 4, and 5. The conceptual tests reported in Reference 5 show that blowing intensifies the leading-edge vortex, thus delaying the deleterious effect of vortex burst to higher angles of attack, which permits fully developed-vortex aerodynamic gains to be realized. If blowing rates are high, further improvement beyond the fully developed-vortex levels may accrue in the form of effective wing camber that results from the added mass flow over the wing upper surface and/or in the form of an effective aspect-ratio increase as the augmented leading-edge vortex is forced to be shed outboard from the wing tip.

The subject investigation is designed to provide experimental data to quantify the effects of vortex augmentation for a family of pointed-tip planforms. The principal objective of the investigation is to verify the effectiveness of blowing vortex enhancement for wings of moderate to high aspect ratio for which the payoff in improved aerodynamics with fully developed vortex flow is expected to be significant. Delta, arrow, and diamond wing planforms with leading-edge sweep angles of 30 and 45 degrees were tested on a wing-body model. Details of the test are presented along with test results in the form of force and moment data and wing oil-flow photographs. A detailed analysis of the data is beyond the scope of the present investigation so that the results are presented in summary plot and tabulated form with only a minimum of discussion.

SYMBOLS

b	model wing span
C_D	aerodynamic drag force coefficient
$C_{D_{C\mu=0}}$	aerodynamic drag force coefficient without blowing
C_{D_L}	aerodynamic drag-due-to-lift coefficient
C_{D_T}	total drag force coefficient, including nozzle thrust components
$C_{D_{T_o}}$	total drag force coefficient, including nozzle thrust components at zero angle of attack
C_L	aerodynamic lift force coefficient
C_{L_p}	potential flow lift contribution
$C_{L_{C\mu=0}}$	aerodynamic lift force coefficient without blowing
C_{L_T}	total lift force coefficient, including nozzle thrust components
C_m	aerodynamic pitching moment coefficient
C_{m_T}	total pitching moment coefficient, including nozzle thrust components
C_T	nozzle thrust coefficient
C_{T_m}	pitching moment coefficient due to nozzle thrust
$C\mu$	nozzle momentum coefficient
$\bar{c}$	wing mean aerodynamic chord
D	nozzle diameter
$\bar{H}_n$	average of left and right nozzle exit total pressure
H_{n_L}, H_{n_R}	left and right nozzle exit total pressure, respectively
L_N	longitudinal location of nozzle in percent chord
M_o	freestream Mach number
P_{BAR}	ambient, wind-off, static pressure
P_L, P_R	left and right plenum static pressures, respectively
P_o	freestream static pressure
Q_o, q_o	freestream dynamic pressure
R_{E_L}	freestream Reynolds number based on reference fuselage length

S	reference wing area
T_m	wind-off pitching moment due to nozzle thrust
T_{t_N}	left plenum total temperature
T_X	wind-off axial force due to nozzle thrust
V_J	jet velocity reached by isentropic expansion from the stagnation pressure at the nozzle exit to free-stream pressure
V_N	vertical location of nozzle in nozzle diameters
$\dot{w}$	measured weight flow rate from the long-radius flow nozzle
α	wing angle of attack
Λ_N	sweep angle of nozzle, equal to leading-edge sweep of wing

TEST INFORMATION

Test Conditions

The experimental investigation was conducted in the General Dynamics Low-Speed Wind Tunnel (GDLST). This facility, of the closed-return atmospheric type, has an 8-foot by 12-foot test section. The tunnel is powered by a 2250-hp synchronous motor driving a six-bladed propeller and capable of speeds of up to Mach 0.38. The sting support system consists of a remote-controlled pitch strut extending through the tunnel floor to which the model support is attached. The model installation in the test section is shown in Figure 1.

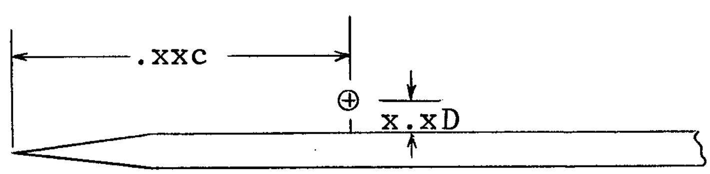
The wind-tunnel tests were conducted at a nominal free-stream dynamic pressure of 2873 N/m^2 (60 psf) corresponding to a Mach number of 0.20 and body-length Reynolds number of 7.0×10^6. One run was made at a dynamic pressure of 958 N/m^2 (20 psf) to investigate the effects of high blowing coefficients. Tunnel conditions were held constant while pitch range or nozzle pressure ratio (H_n/P_o) was varied and data recorded at each point. The pitch range was from -2 to 34 degrees, and nozzle pressure ratios were varied from 1.0 to 32.0.

Model Description and Installation

A simple wing-body model was constructed to provide blowing-over-the-wing capability. A drawing of the basic configuration is shown in Figure 2. The fuselage is a body of revolution featuring movable nozzle blocks to permit testing of a variety of nozzle locations. Six wings consisting of 30- and 45-degree delta, diamond, and arrow planforms were studied. The wings were flat plates with sharpened leading edges. Geometric details are shown in Figure 3.

High-pressure air was supplied continually to the sting-mounted model from an external source. Air flow was piped through the flow-through balance into two plenums in the nose and then to the convergent nozzles positioned on each side of the fuselage. A schematic of the air supply and details of the convergent nozzles are given in Figure 4.

Nozzle position variations were tested on the delta wing panels only. Vertical height above the wing surface and longitudinal position along the wing root chord were varied. The nozzle sweep-back angle corresponded to the wing sweep-back, so that the nozzle discharge was always directed parallel to the wing leading edge and to the upper surface. The delta-wing nozzle position results were used to select the position for the arrow and diamond wing tests. The wing-nozzle positions tested are listed below.



Wing	Test Positions		
	0.20c[a]	0.30c[a]	0.40c[a]
45° Delta, W1	1.0,1.5 & 2.0D	1.0,1.5 & 2.0D	1.0,1.5 & 2.0D
45° Arrow, W2			1.5D
45° Diamond, W3			1.5D
30° Delta, W4	1.0,1.5 & 2.0D	1.0,1.5 & 2.0D	1.0,1.5 & 2.0D
30° Arrow, W5			1.5D
30° Diamond, W6			1.5D

[a] $\pm$.01c at wing-fuselage juncture.

Boundary-layer transition on the model was fixed by narrow grit strips located on the nose and wing leading edges. Silicon-carbide grains (No. 80) were located approximately 3.8 cm aft of the nose and 2.5 cm aft of the wing leading edge.

Instrumentation and Calibration

Six-component force and moment data were recorded by use of a Convair flow-through balance. The balance was developed in response to the need for accurate force measurement for powered-lift testing. Three internal air-supply passages were separated by a unique bellows system. Only the largest air-supply system, capable of supplying up to 3.175 kg/sec (7 pps) mass flow, was required for the present tests. A check calibration of the balance was made before testing to ensure accurate aerodynamic loads measurements with varying air supplies.

Left and right nozzle plenum pressures were recorded with pressure transducers mounted within the model, one in each plenum. A single thermocouple mounted in the left-hand plenum was used to determine nozzle air temperature. Nozzle air weight flow, $\dot{w}$, was determined from a 1-inch, long-radius flow nozzle located external to the model, as illustrated in Figure 4.

The jet momentum coefficient, C_μ, is defined as

$$C_\mu = \dot{w} V_J / g \, q_o \, S$$

where $\dot{w}$ is the measured weight-flow rate and V_J is the jet velocity reached by isentropic expansion from the stagnation pressure at the nozzle exit to freestream pressure, given by

$$V_J = 109.6 \sqrt{T_{t_N} \left[1 - (P_o / \overline{H}_n)^{2/7} \right]}$$

Pretest runs were made to determine the correlation between right and left plenum pressures and to calibrate the nozzle exit pressures with plenum pressures. The results of these runs are shown in Figure 5. An excellent balance in nozzle flow between left and right sides is apparent.

Wind-off model-weight-tare and thrust-calibration runs were made in the wind tunnel for each significant configuration change, and wind-on data were corrected accordingly. Fuselage base-cavity pressures were measured during the test, and the drag coefficients were corrected to a zero-base-drag condition.

Data Reduction

Forces and moments were non-dimensionalized by the respective wing reference areas, spans, and mean aerodynamic chords listed below. The model angle of attack was referenced

Reference Fuselage Length = 1.524 m

Wing	S m^2	b m	$\bar{c}$ m
45° Delta, W1	.47907	1.3843	.46144
45° Arrow, W2	.35931		.34608
45° Diamond, W3	.59884		.57678
30° Delta, W4	.41184	1.6891	.32507
30° Arrow, W5	.30887		.24381
30° Diamond, W6	.51480		.40632

to the wing reference chord plane along the balance centerline. The origin of the stability axes is defined at 25 percent of the mean aerodynamic chord for each respective wing.

Standard data reduction equations were applied to the balance data to obtain the total force and moment coefficients, C_{L_T}, C_{D_T}, and C_{m_T}. These coefficients include the components of nozzle thrust.

The wind-off thrust and moment coefficients, C_T and C_{T_m}, were determined from static calibrations of the measured axial force, T_x, and the measured pitching moment due to thrust, T_m, as functions of the nozzle exit pressure ratio, $\bar{H}_n/P_o$:

$$C_T = \frac{T_x}{q_o\ S\ \sin \Lambda_N}$$

$$C_{T_m} = \frac{T_m}{q_o\ S\ \bar{c}}$$

where Λ_N is the nozzle sweep angle.

An estimate of the blowing effects on power-off aerodynamic coefficients was made by subtracting the static (wind-off) thrust effects from the measured data. Aerodynamic coefficients are thus defined as

$$C_L = C_{L_T} - C_T \sin \Lambda_N \sin \alpha$$

$$C_{D_L} = C_{D_T} - C_{D_{TO}} + C_T \sin \Lambda_N (\cos \alpha - 1)$$

(where $C_{D_{TO}}$ is drag coefficient at $\alpha = 0$)

$$C_D = C_{D_T} + C_T \sin \Lambda_N \cos \alpha$$

$$C_m = C_{m_T} - C_{T_m}$$

Angle of attack, corrected for sting deflections, is estimated to be accurate to within $\pm.05$ degree. All model forces and moments were corrected for model weight tares. Corrections for the tunnel/model effective streamline curvature have been applied to the values of angle of attack, drag coefficient, and pitching moment coefficient from standard wall interference equations. The accuracy in setting and maintaining dynamic pressure (q_o) is estimated to be within $\pm 7\ N/m^2$. The accuracies of the total force and moment coefficients are approximately

$$C_{L_T},\quad \pm.0031$$

C_{D_T}, $\pm.0010$

C_{m_T}, $\pm.0008$

Flow Visualization

Oil-flow photographs were taken at selected α and C_μ values to supplement and aid in the analysis of the force data. Tunnel lighting was provided by sixteen 40-W ultraviolet florescence lights. The oil mixture consisted of equal parts of No. 600W oil and Zyglo inspection fluid. The mixture was thinned by the addition of SAE 10W lubricating oil to obtain the proper viscosity. The final oil mixture was estimated to contain approximately 20 percent of 10W oil. The wing panel was painted white to provide a suitable background for the luminescent oil. Photographs of the oil-flow traces were taken with type-52 Polaroid film and a K-3 filter.

TEST RESULTS

Force Data Results

The force tests were accomplished in two steps. First, nozzle position studies were made for the delta wings at a 21-degree angle of attack. A nozzle position was selected from these studies and, then, pitch data were taken over an angle-of-attack range. The selected nozzle position in percent wing chord was retained for the arrow and diamond planforms of the same sweep family, and the pitch studies were completed.

Analysis of the data has not been accomplished, so that the data are simply presented in the form of summary plots with a minimum of discussion. Complete data tabulations are given in the Appendix.

<u>Nozzle location studies</u>.— Results of the nozzle position studies are plotted in Figures 6 and 7 for the 45- and 30-degree delta wings. The 40-percent-chord horizontal position at a vertical height of 1.5 nozzle diameters provides the

greater increase in lift of those tested for the 45-degree delta (Figure 6). The data for the 30-degree delta (Figure 7) also show the 40-percent-chord horizontal position to be the better, although the best vertical position is not as well defined. The 30-degree delta-wing data indicate a vertical-position dependence on C_μ, with a low position desired for low C_μ and a higher position for high C_μ. The 1.5-nozzle-diameter location is a good compromise position and matches the location for the 45-degree wing. Thus, the 40-percent-chord, 1.5-nozzle-diameter vertical position was chosen for the remainder of the test for both wing-sweep families.

It is possible, especially for the 30-degree-sweep case, that a more effective horizontal position would be more aft than 40-percent-chord, since there is a significant increase in blowing efficiency between the 30- and 40-percent locations (e.g., see Figure 7). Future studies should include further-aft nozzle location investigations.

Pitch studies.– Total lift, drag, and pitching moment are plotted for each of the six planforms in Figures 8-13. Blowing vortex-augmentation effects are quite pronounced in all cases. The increase in lift at the higher angles of attack is seen to be quite significant. The total drag includes the nozzle thrust components, thus the drag polars are seen to shift with increasing C_μ .

Aerodynamic coefficients with the static thrust contribution extracted are plotted in Figures 14 through 19. For reference, theoretical predictions for lift and drag due to lift are sketched on the plots. The vortex-lift predictions are based on the well-known Polhamus suction-analogy method (Refer-2) as adapted in the Convair procedure of Reference 6. At high angles of attack the blowing augments the leading-edge vortex so that breakdown is avoided and full-vortex lift is realized. In addition, the blowing produces an apparent "camber" effect, which is clearly evident at low angle of attack. The effect appears to increase with angle of attack. The drag data are noted to fall between the full-suction polar, $C_L{}^2/\pi AR$, and the no-suction vortex-lift polar for moderate angles of attack. It is interesting to note that at low C_L the wings apparently develop a significant leading-edge suction force without blowing. Although the wings have beveled sharp leading edges the thickness of the flat plate apparently permits leading-edge thrust recovery. The blowing effect is noted to be somewhat detrimental to polar shape at low lift but results in dramatic improvement at high lift.

Cross plots of lift, drag due to lift, and pitching moment as a function of momentum coefficient are given in Figures 20 through 25. The cross plots are presented at selected angles of attack to provide a ready measure of the blowing effectiveness. Increases in lift of the order of 80 percent are noted at the highest C_μ values and high angles of attack (e.g., Figure 24).

One run was made at a low dynamic pressure (Q_o = 958 N/m^2) to provide a high momentum coefficient, $C_\mu = 0.797$. The results are plotted in Figures 26 and 27. The no-blowing data taken at the higher dynamic pressure are replotted for comparison. The favorable effects of blowing are seen to continue to this high-blowing condition. Lift increases of the order of 125 percent are observed in Figure 27.

Flow Visualization Results

Luminescent oil-flow photographs were taken for each configuration at four angles of attack and at three values of C_μ, including the no-blowing case. The results are shown in Figures 28 through 33. The photographs provide a valuable supplement to the force data. Even though a detailed analysis of these patterns is beyond the scope of this study, a cursory examination of the photographs reveals that complicated vortex flow patterns are generated when blowing is applied. The need for detailed analysis of the patterns and correlation with the force data is apparent.

CONCLUDING REMARKS

Low-speed wind tunnel tests have been conducted for a series of pointed-tip, flat-plate wing planforms with leading-edge-sweep angles of 30 and 45 degrees. Delta, arrow, and diamond wings were mounted on a body of revolution fuselage with provision for concentrated blowing over the wing to augment the leading-edge vortex system. Analysis and detailed evaluation of the data have not been accomplished. However, cursory examination of the test results lead to the following conclusions:

> Blowing vortex augmentation results in significant improvements in aerodynamic forces and moments. All the wings reflected continued high-α aerodynamic improvement with increased blowing rate throughout the C_μ range tested.
>
> Delta wing nozzle position studies at a 21-degree angle of attack indicate that the best nozzle longitudinal position may be aft of the 40-percent wing chord position and that the best vertical position may be a function of blowing rate for low wing sweep.
>
> The oil-flow photographs indicate that a complex vortex flow field is produced by the concentrated blowing.

The results presented here provide quantative insight into the potential benefits of leading-edge vortex augmentation. Detailed analysis of these data is obligatory. Further work should include analytical and experimental investigations of the augmented vortex flow phenomena so that the technology may be applied to advanced aircraft.

APPENDIX

TABULATED FORCE DATA

Nozzle Position Data – 45° Delta Wing, V_N = 1.0D

LAMDA N (DEGREES)	WING NO.	CμAVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
45.00	1.	.1403	20.	1.0	60.00	2873.	.201	7.02

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.73	.9564	.3885	.0940-	.0000	.0000	.9564	.3885	.0940-	1.0000	1.0000
20.87	1.1572	.3975	.0505-	.0639	.0581	1.1426	.4359	.0492-	1.1947	1.1219
20.94	1.2670	.3917	.0586-	.1376	.1154	1.2378	.4679	.0550-	1.2943	1.2043
21.01	1.3803	.3838	.0670-	.2050	.1765	1.3356	.5003	.0617-	1.3965	1.2876
21.08	1.5007	.3756	.0745-	.2947	.2384	1.4401	.5329	.0684-	1.5058	1.3715

LAMDA N (DEGREES)	WING NO.	CμAVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
45.00	1.	.1436	30.	1.0	60.00	2873.	.201	7.02

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.72	.9366	.3832	.0910-	.0000	.0000	.9366	.3832	.0910-	1.0000	1.0000
20.90	1.2030	.4205	.0449-	.0661	.0578	1.1884	.4587	.0436-	1.2689	1.1970
20.96	1.2969	.4060	.0554-	.1399	.1155	1.2677	.4823	.0519-	1.3535	1.2586
21.01	1.3892	.3922	.0625-	.2071	.1759	1.3446	.5084	.0572-	1.4356	1.3267
21.06	1.4603	.3703	.0759-	.3048	.2380	1.3998	.5273	.0697-	1.4946	1.3761

LAMDA N (DEGREES)	WING NO.	CμAVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
45.00	1.	.1434	40.	1.0	60.00	2873.	.201	7.02

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.73	.9619	.3886	.0929-	.0000	.0000	.9619	.3886	.0929-	1.0000	1.0000
20.93	1.2488	.4412	.0758-	.0632	.0581	1.2342	.4796	.0744-	1.2831	1.2341
20.98	1.3297	.4273	.0823-	.1399	.1155	1.3005	.5036	.0787-	1.3520	1.2959
21.02	1.3997	.4082	.0875-	.2072	.1762	1.3550	.5245	.0822-	1.4087	1.3496
21.07	1.4846	.3865	.1022-	.3066	.2380	1.4241	.5435	.0961-	1.4806	1.3987

Nozzle Position Data — 45° Delta Wing, V_N = 1.5D

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
45.00	1.	.1365	20.	1.5	60.00	2873.	.201	7.02

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.74	.9684	.3947	.0939-	.0000	.0000	.9684	.3947	.0939-	1.0000	1.0000
20.86	1.1526	.3994	.0501-	.0616	.0582	1.1380	.4379	.0483-	1.1751	1.1094
20.94	1.2673	.3928	.0512-	.1360	.1189	1.2373	.4713	.0465-	1.2776	1.1941
21.00	1.3706	.3797	.0607-	.1960	.1819	1.3245	.4998	.0537-	1.3677	1.2662
21.05	1.4597	.3616	.0716-	.2888	.2463	1.3971	.5241	.0616-	1.4427	1.3279

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
45.00	1.	.1369	30.	1.5	60.00	2873.	.201	7.02

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.73	.9516	.3847	.0936-	.0000	.0000	.9516	.3847	.0936-	1.0000	1.0000
20.89	1.1949	.4152	.0449-	.0618	.0583	1.1801	.4538	.0431-	1.2402	1.1796
20.97	1.3106	.4122	.0544-	.1368	.1189	1.2805	.4907	.0497-	1.3456	1.2756
21.02	1.4045	.3986	.0661-	.1982	.1818	1.3583	.5186	.0591-	1.4274	1.3481
21.07	1.4860	.3776	.0825-	.2876	.2464	1.4233	.5402	.0726-	1.4957	1.4043

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
45.00	1.	.1403	40.	1.5	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.73	.9575	.3884	.0950-	.0000	.0000	.9575	.3884	.0950-	1.0000	1.0000
20.93	1.2511	.4431	.0764-	.0642	.0585	1.2363	.4817	.0745-	1.2912	1.2402
20.98	1.3314	.4259	.0800-	.1383	.1185	1.3014	.5042	.0753-	1.3592	1.2980
21.03	1.4131	.4093	.0880-	.2015	.1810	1.3672	.5288	.0811-	1.4279	1.3613
21.08	1.5115	.3907	.1089-	.2974	.2460	1.4490	.5530	.0990-	1.5133	1.4236

Nozzle Position Data – 45^{o} Delta Wing, V_N = 2.0D

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
45.00	1.	.1396	20.	2.0	60.00	2873.	.201	7.02

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.73	.9564	.3882	.0938-	.0000	.0000	.9564	.3882	.0938-	1.0000	1.0000
20.87	1.1573	.4005	.0525-	.0631	.0582	1.1427	.4390	.0507-	1.1948	1.1307
20.93	1.2557	.3889	.0517-	.1411	.1191	1.2257	.4675	.0469-	1.2815	1.2044
21.00	1.3704	.3790	.0621-	.2086	.1819	1.3243	.4991	.0545-	1.3847	1.2857
21.05	1.4525	.3638	.0710-	.2854	.2387	1.3918	.5214	.0603-	1.4553	1.3430

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
45.00	1.	.1366	30.	2.0	60.00	2873.	.201	7.02

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.74	.9622	.3866	.0919-	.0000	.0000	.9622	.3866	.0919-	1.0000	1.0000
20.89	1.1900	.4136	.0423-	.0620	.0581	1.1754	.4520	.0405-	1.2216	1.1691
20.96	1.3020	.4090	.0520-	.1360	.1194	1.2718	.4879	.0472-	1.3218	1.2620
21.02	1.3982	.3968	.0640-	.1964	.1813	1.3522	.5165	.0563-	1.4054	1.3360
21.08	1.4960	.3803	.0841-	.2883	.2467	1.4333	.5431	.0728-	1.4896	1.4048

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
45.00	1.	.1430	40.	2.0	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.74	.9623	.3905	.0945-	.0000	.0000	.9623	.3905	.0945-	1.0000	1.0000
20.93	1.2484	.4437	.0756-	.0617	.0582	1.2337	.4822	.0738-	1.2821	1.2347
20.97	1.3209	.4287	.0815-	.1404	.1189	1.2909	.5072	.0767-	1.3415	1.2988
21.02	1.4004	.4131	.0915-	.2088	.1811	1.3545	.5327	.0839-	1.4076	1.3640
21.09	1.5137	.4052	.1172-	.3040	.2460	1.4511	.5675	.1060-	1.5080	1.4532

Nozzle Position Data – 30° Delta Wing, $V_N = 1.0D$

LAMDA N (DEGREES)	WING NO.	CµAVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
30.00	4.	.1640	20.	1.0	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cµ	CT	CL	CD	CM	CL/CLCµ	CD/CDCµ
20.62	.9372	.3992	.0745-	.0000	.0000	.9372	.3992	.0745-	1.0000	1.0000
20.79	1.2248	.4516	.0270-	.0727	.0655	1.2132	.4822	.0241-	1.2945	1.2080
20.85	1.3343	.4391	.0310	.1641	.1344	1.3103	.5019	.0369	1.3982	1.2575
20.93	1.4771	.4456	.0364	.2356	.2053	1.4405	.5415	.0450	1.5371	1.3567
21.00	1.6255	.4521	.0296	.3477	.2812	1.5751	.5833	.0407	1.6807	1.4614

LAMDA N (DEGREES)	WING NO.	CµAVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
30.00	4.	.1653	30.	1.0	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cµ	CT	CL	CD	CM	CL/CLCµ	CD/CDCµ
20.62	.9449	.4004	.0728-	.0000	.0000	.9449	.4004	.0728-	1.0000	1.0000
20.77	1.2159	.4488	.0062-	.0799	.0662	1.2041	.4798	.0033-	1.2743	1.1983
20.86	1.3649	.4575	.0388	.1495	.1345	1.3410	.5203	.0447	1.4191	1.2995
20.94	1.5106	.4680	.0428	.2527	.2056	1.4739	.5641	.0514	1.5597	1.4088
21.00	1.6306	.4684	.0356	.3446	.2816	1.5802	.5999	.0466	1.6722	1.4982

LAMDA N (DEGREES)	WING NO.	CµAVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
30.00	4.	.1667	40.	1.0	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cµ	CT	CL	CD	CM	CL/CLCµ	CD/CDCµ
20.62	.9432	.3991	.0721-	.0000	.0000	.9432	.3991	.0721-	1.0000	1.0000
20.82	1.3063	.4863	.0323-	.0733	.0655	1.2947	.5169	.0295-	1.3727	1.2952
20.90	1.4429	.4963	.0090	.1639	.1344	1.4190	.5591	.0149	1.5044	1.4009
[illegible]	1.5990	.5188	.0071	.2516	.2054	1.5622	.6147	.0157	1.6563	1.5404
[illegible]	[illegible]	.5234	.0033-	.3447	.2808	1.6659	.6544	.0077	1.7662	1.6399

Nozzle Position Data — 30° Delta Wing, V_N = 1.5D

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
30.00	4.	.1613	20.	1.5	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.63	.9509	.4037	.0731-	.0000	.0000	.9509	.4037	.0731-	1.0000	1.0000
20.78	1.2265	.4432	.0133-	.0740	.0661	1.2147	.4741	.0110-	1.2774	1.1743
20.86	1.3664	.4446	.0282	.1612	.1343	1.3425	.5073	.0340	1.4117	1.2565
20.94	1.5191	.4549	.0371	.2320	.2055	1.4823	.5509	.0460	1.5588	1.3644
21.00	1.6423	.4540	.0294	.3395	.2812	1.5919	.5853	.0425	1.6740	1.4497

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
30.00	4.	.1573	30.	1.5	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.63	.9533	.4032	.0719-	.0000	.0000	.9533	.4032	.0719-	1.0000	1.0000
20.78	1.2173	.4535	.0089-	.0675	.0654	1.2057	.4841	.0066-	1.2648	1.2007
20.86	1.3631	.4616	.0397	.1577	.1349	1.3391	.5246	.0455	1.4048	1.3012
20.95	1.5297	.4805	.0419	.2249	.2053	1.4930	.5764	.0509	1.5661	1.4297
21.01	1.6501	.4818	.0323	.3365	.2812	1.5997	.6131	.0454	1.6781	1.5207

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)	M0	REL (MILLION)
30.00	4.	.1597	40.	1.5	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.62	.9487	.4010	.0727-	.0000	.0000	.9487	.4010	.0727-	1.0000	1.0000
20.81	1.2864	.4803	.0253-	.0732	.0656	1.2748	.5110	.0230-	1.3437	1.2744
20.89	1.4268	.4936	.0175	.1578	.1343	1.4029	.5563	.0233	1.4788	1.3874
20.98	1.5982	.5208	.0127	.2293	.2052	1.5615	.6166	.0216	1.6460	1.5377
21.05	1.7243	.5284	.0070-	.3381	.2811	1.6738	.6596	.0062	1.7644	1.6451

Nozzle Position Data — 30^{o} Delta Wing, V_N = 2.0D

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)	MO	REL (MILLION)
30.00	4.	.1593	20.	2.0	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.62	.9442	.3997	.0736-	.0000	.0000	.9442	.3997	.0736-	1.0000	1.0000
20.77	1.2103	.4355	.0238	.0765	.0656	1.1986	.4662	.0270	1.2695	1.1664
20.87	1.3838	.4539	.0358	.1514	.1348	1.3598	.5169	.0435	1.4401	1.2933
20.95	1.5318	.4643	.0372	.2324	.2059	1.4950	.5604	.0492	1.5833	1.4022
21.01	1.6561	.4652	.0353	.3361	.2808	1.6058	.5963	.0518	1.7007	1.4919

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)	MO	REL (MILLION)
30.00	4.	.1609	30.	2.0	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.62	.9382	.3988	.0787-	.0000	.0000	.9382	.3988	.0787-	1.0000	1.0000
20.77	1.2070	.4513	.0030	.0788	.0655	1.1954	.4819	.0062	1.2741	1.2085
20.86	1.3750	.4654	.0407	.1607	.1345	1.3510	.5283	.0484	1.4400	1.3246
20.94	1.5224	.4778	.0426	.2299	.2055	1.4857	.5738	.0545	1.5836	1.4387
21.01	1.6493	.4824	.0325	.3353	.2812	1.5989	.6137	.0490	1.7043	1.5388

LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)	MO	REL (MILLION)
30.00	4.	.1581	40.	2.0	60.00	2873.	.201	7.03

ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM	CL/CLCμ	CD/CDCμ
20.62	.9430	.3999	.0744-	.0000	.0000	.9430	.3999	.0744-	1.0000	1.0000
20.80	1.2651	.4727	.0104-	.0770	.0658	1.2534	.5035	.0072-	1.3291	1.2589
20.89	1.4241	.4931	.0245	.1551	.1343	1.4001	.5558	.0322	1.4847	1.3898
20.99	1.6062	.5217	.0125	.2266	.2058	1.5693	.6178	.0244	1.6641	1.5447
21.07	1.7576	.5377	.0125-	.3319	.2813	1.7070	.6690	.0040	1.8101	1.6727

Pitch Data — 45° Delta Wing, $C_{\mu} = 0.0$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	1.	.0000	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000	.08	.0077	.0339	.0014-	.0000	.0000	.0077	.0339	.0014-
.0009	1.99-	.1209-	.0348	.0112	.0000	.0000	.1209-	.0348	.0112
.0031	2.19	.1349	.0371	.0134-	.0000	.0000	.1349	.0371	.0134-
.0104	4.26	.2647	.0444	.0247-	.0000	.0000	.2647	.0444	.0247-
.0283	6.36	.4003	.0622	.0334-	.0000	.0000	.4003	.0622	.0334-
.0597	8.45	.5168	.0936	.0347-	.0000	.0000	.5168	.0936	.0347-
.0963	10.50	.6109	.1302	.0289-	.0000	.0000	.6109	.1302	.0289-
.1395	12.56	.7067	.1734	.0297-	.0000	.0000	.7067	.1734	.0297-
.1882	14.61	.7947	.2222	.0325-	.0000	.0000	.7947	.2222	.0325-
.2419	16.67	.8697	.2759	.0391-	.0000	.0000	.8697	.2759	.0391-
.3033	18.71	.9330	.3372	.0704-	.0000	.0000	.9330	.3372	.0704-
.3530	20.73	.9571	.3869	.0958-	.0000	.0000	.9571	.3869	.0958-
.3972	22.73	.9688	.4311	.1040-	.0000	.0000	.9688	.4311	.1040-
.4404	24.75	.9739	.4744	.1160-	.0000	.0000	.9739	.4744	.1160-
.4866	26.75	.9819	.5205	.1229-	.0000	.0000	.9819	.5205	.1229-
.5446	28.77	1.0107	.5786	.1232-	.0000	.0000	1.0107	.5786	.1232-
.5986	30.78	1.0245	.6325	.1265-	.0000	.0000	1.0245	.6325	.1265-
.6442	32.79	1.0203	.6782	.1348-	.0000	.0000	1.0203	.6782	.1348-
.6892	34.78	1.0114	.7231	.1482-	.0000	.0000	1.0114	.7231	.1482-

Pitch Data — 45° Delta Wing, C_{μ} = 0.0355

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (O/D C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	1.	.0355	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.10	.0173	.0110	.0006-	.0362	.0348	.0172	.0356	.0003
.0002	2.00-	.1126-	.0113	.0121	.0366	.0348	.1117-	.0359	.0130
.0036	2.19	.1467	.0147	.0126-	.0362	.0347	.1457	.0392	.0117-
.0115	4.27	.2777	.0226	.0242-	.0348	.0348	.2759	.0472	.0233-
.0312	6.36	.4162	.0424	.0332-	.0357	.0348	.4135	.0668	.0322-
.0641	8.46	.5391	.0754	.0347-	.0357	.0348	.5355	.0997	.0337-
.1009	10.51	.6334	.1123	.0298-	.0357	.0348	.6290	.1365	.0289-
.1476	12.58	.7451	.1593	.0336-	.0357	.0348	.7398	.1832	.0327-
.2069	14.66	.8599	.2187	.0425-	.0358	.0348	.8537	.2425	.0416-
.2760	16.75	.9840	.2881	.0518-	.0353	.0348	.9770	.3116	.0508-
.3493	18.82	1.0947	.3617	.0604-	.0349	.0348	1.0867	.3849	.0594-
.4247	20.87	1.1818	.4374	.0686-	.0353	.0348	1.1730	.4604	.0677-
.4859	22.90	1.2066	.4989	.0701-	.0349	.0348	1.1971	.5215	.0691-
.5531	24.92	1.2321	.5664	.1017-	.0339	.0348	1.2217	.5887	.1008-
.6128	26.92	1.2452	.6266	.1201-	.0353	.0348	1.2340	.6485	.1192-
.6364	28.89	1.1895	.6505	.1398-	.0358	.0348	1.1776	.6721	.1388-
.6812	30.88	1.1738	.6957	.1484-	.0358	.0348	1.1612	.7169	.1475-
.7228	32.88	1.1518	.7377	.1584-	.0354	.0348	1.1384	.7584	.1575-
.7635	34.86	1.1282	.7790	.1672-	.0358	.0348	1.1141	.7992	.1663-

Pitch Data — 45^{o} Delta Wing, $C_{\mu} = 0.1075$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)
.201	7.03	45.00	1.	.1075	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.11	.0285	.0320-	.0045-	.1083	.0937	.0283	.0343	.0010-
.0001	1.97-	.1021-	.0319-	.0081	.1093	.0938	.0998-	.0344	.0117
.0041	2.20	.1563	.0279-	.0166-	.1079	.0938	.1538	.0384	.0130-
.0129	4.29	.2943	.0189-	.0288-	.1078	.0938	.2894	.0472	.0252-
.0333	6.38	.4338	.0017	.0377-	.1073	.0937	.4264	.0676	.0342-
.0673	8.47	.5590	.0361	.0395-	.1073	.0938	.5493	.1016	.0360-
.1068	10.52	.6636	.0759	.0374-	.1068	.0938	.6515	.1411	.0339-
.1598	12.63	.7950	.1294	.0468-	.1078	.0938	.7805	.1941	.0433-
.2283	14.71	.9513	.1985	.0613-	.1074	.0939	.9345	.2627	.0577-
.3060	16.82	1.0969	.2768	.0708-	.1065	.0939	1.0777	.3404	.0672-
.3792	18.87	1.1895	.3508	.0691-	.1074	.0939	1.1681	.4136	.0655-
.4636	20.95	1.2898	.4360	.0798-	.1064	.0938	1.2661	.4979	.0763-
.5564	23.02	1.3975	.5297	.0908-	.1078	.0938	1.3715	.5907	.0872-
.6390	25.06	1.4521	.6133	.0945-	.1074	.0938	1.4240	.6734	.0910-
.7176	27.09	1.4752	.6929	.1186-	.1064	.0938	1.4450	.7519	.1150-
.7777	29.07	1.4605	.7541	.1506-	.1074	.0938	1.4282	.8121	.1470-
.8262	31.04	1.4323	.8037	.1634-	.1074	.0938	1.3981	.8605	.1599-
.8512	33.01	1.3687	.8299	.1870-	.1078	.0937	1.3325	.8855	.1834-
.8505	34.95	1.2721	.8305	.1948-	.1073	.0937	1.2342	.8848	.1912-

Pitch Data — 45° Delta Wing, $C_\mu = 0.1994$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	1.	.1994	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.11	.0442	.0823-	.0112-	.1997	.1687	.0439	.0370	.0046-
.0002	1.98-	.0905-	.0821-	.0023	.1995	.1686	.0863-	.0371	.0089
.0046	2.20	.1760	.0776-	.0234-	.1986	.1686	.1714	.0415	.0168-
.0145	4.29	.3185	.0675-	.0362-	.1990	.1686	.3096	.0514	.0296-
.0376	6.39	.4618	.0440-	.0454-	.1986	.1687	.4485	.0745	.0388-
.0730	8.48	.5916	.0081-	.0489-	.1991	.1687	.5740	.1099	.0423-
.1172	10.55	.7193	.0369	.0527-	.1990	.1686	.6975	.1541	.0461-
.1753	12.66	.8751	.0959	.0673-	.1995	.1685	.8490	.2122	.0607-
.2483	14.76	1.0415	.1699	.0840-	.1995	.1685	1.0112	.2851	.0774-
.3327	16.88	1.2051	.2555	.0978-	.1989	.1684	1.1705	.3695	.0912-
.4171	18.96	1.3287	.3412	.0996-	.1990	.1684	1.2900	.4538	.0931-
.4911	21.00	1.3860	.4167	.0883-	.1994	.1683	1.3434	.5278	.0817-
.5852	23.08	1.4829	.5124	.0980-	.1979	.1683	1.4362	.6219	.0915-
.6869	25.13	1.5758	.6159	.1097-	.1984	.1683	1.5252	.7236	.1032-
.7874	27.19	1.6515	.7183	.1215-	.1994	.1683	1.5971	.8241	.1150-
.8795	29.22	1.6822	.8123	.1407-	.1990	.1685	1.6240	.9163	.1341-
.9339	31.18	1.6358	.8688	.1798-	.2010	.1685	1.5741	.9707	.1732-
.9872	33.17	1.6034	.9242	.1972-	.2008	.1682	1.5383	1.0238	.1906-
1.0164	35.12	1.5380	.9557	.2143-	.2014	.1683	1.4695	1.0531	.2077-

Pitch Data — 45° Delta Wing, C_{μ} = 0.3089

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/D C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	1.	.3089	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.12	.0592	.1392-	.0182-	.3043	.2456	.0588	.0344	.0083-
.0027	1.96-	.0773-	.1364-	.0039-	.3008	.2457	.0714-	.0372	.0060
.0054	2.23	.2002	.1337-	.0318-	.3034	.2457	.1935	.0399	.0219-
.0164	4.31	.3429	.1224-	.0448-	.3038	.2456	.3298	.0508	.0349-
.0410	6.40	.4908	.0971-	.0555-	.3068	.2450	.4715	.0751	.0456-
.0783	8.50	.6357	.0590-	.0626-	.3084	.2458	.6099	.1129	.0527-
.1257	10.60	.7776	.0106-	.0709-	.3094	.2458	.7456	.1603	.0610-
.1883	12.71	.9449	.0533	.0874-	.3093	.2458	.9067	.2228	.0775-
.2642	14.81	1.1211	.1307	.1059-	.3102	.2457	1.0767	.2987	.0960-
.3527	16.93	1.2942	.2210	.1213-	.3108	.2458	1.2435	.3873	.1114-
.4447	19.03	1.4367	.3150	.1285-	.3104	.2458	1.3801	.4793	.1186-
.5238	21.07	1.5084	.3962	.1158-	.3113	.2459	1.4459	.5585	.1059-
.6032	23.11	1.5555	.4779	.1081-	.3109	.2459	1.4872	.6378	.0982-
.7081	25.18	1.6502	.5854	.1213-	.3119	.2460	1.5763	.7428	.1114-
.8226	27.25	1.7463	.7027	.1427-	.3114	.2459	1.6667	.8572	.1328-
.9242	29.29	1.8031	.8071	.1535-	.3104	.2457	1.7181	.9587	.1436-
1.0062	31.29	1.8004	.8923	.1747-	.3119	.2460	1.7101	1.0409	.1648-
1.0580	33.26	1.7471	.9472	.2032-	.3126	.2457	1.6518	1.0925	.1933-
1.1230	35.24	1.7232	1.0156	.2240-	.3117	.2456	1.6230	1.1575	.2141-

Pitch Data — 45° Arrow Wing, C_{μ} = 0.0

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	2.	.0000	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000	.09	.0048	.0434	.0028-	.0000	.0000	.0048	.0434	.0028-
.0009	1.96-	.1318-	.0443	.0146	.0000	.0000	.1318-	.0443	.0146
.0034	2.17	.1491	.0467	.0216-	.0000	.0000	.1491	.0467	.0216-
.0092	4.24	.2893	.0526	.0384-	.0000	.0000	.2893	.0526	.0384-
.0261	6.31	.4371	.0694	.0504-	.0000	.0000	.4371	.0694	.0504-
.0611	8.38	.5635	.1045	.0474-	.0000	.0000	.5635	.1045	.0474-
.0981	10.42	.6534	.1415	.0335-	.0000	.0000	.6534	.1415	.0335-
.1437	12.47	.7535	.1871	.0283-	.0000	.0000	.7535	.1871	.0283-
.1950	14.52	.8449	.2384	.0256-	.0000	.0000	.8449	.2384	.0256-
.2515	16.56	.9231	.2949	.0269-	.0000	.0000	.9231	.2949	.0269-
.3135	18.58	.9743	.3568	.0511-	.0000	.0000	.9743	.3568	.0511-
.3725	20.59	1.0164	.4159	.0795-	.0000	.0000	1.0164	.4159	.0795-
.4215	22.61	1.0328	.4649	.0824-	.0000	.0000	1.0328	.4649	.0824-
.4686	24.61	1.0422	.5119	.0842-	.0000	.0000	1.0422	.5119	.0842-
.5136	26.62	1.0437	.5570	.0910-	.0000	.0000	1.0437	.5570	.0910-
.5751	28.65	1.0716	.6184	.0993-	.0000	.0000	1.0716	.6184	.0993-
.6357	30.65	1.0950	.6791	.1018-	.0000	.0000	1.0950	.6791	.1018-
.6777	32.65	1.0790	.7211	.1151-	.0000	.0000	1.0790	.7211	.1151-
.7144	34.64	1.0521	.7578	.1361-	.0000	.0000	1.0521	.7578	.1361-

Pitch Data — 45^{o} Arrow Wing, C_{μ} = 0.0481

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	2.	.0481	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.10	.0206	.0102	.0016-	.0482	.0463	.0205	.0429	.0000
.0001	1.97-	.1215-	.0103	.0170	.0499	.0464	.1204-	.0431	.0186
.0035	2.18	.1618	.0137	.0193-	.0482	.0463	.1606	.0465	.0176-
.0106	4.26	.3103	.0208	.0362-	.0488	.0463	.3079	.0535	.0346-
.0297	6.32	.4542	.0401	.0471-	.0477	.0463	.4506	.0726	.0455-
.0666	8.40	.5904	.0771	.0446-	.0482	.0463	.5856	.1095	.0430-
.1064	10.45	.6924	.1171	.0341-	.0482	.0463	.6864	.1493	.0324-
.1594	12.51	.8155	.1703	.0361-	.0482	.0463	.8084	.2022	.0345-
.2276	14.57	.9638	.2388	.0474-	.0476	.0463	.9556	.2705	.0458-
.2985	16.63	1.0888	.3100	.0484-	.0476	.0463	1.0795	.3414	.0468-
.3680	18.68	1.1830	.3799	.0425-	.0482	.0462	1.1725	.4108	.0409-
.4416	20.73	1.2584	.4539	.0406-	.0482	.0462	1.2468	.4845	.0389-
.5053	22.74	1.2825	.5180	.0413-	.0476	.0463	1.2699	.5482	.0396-
.5771	24.75	1.3016	.5903	.0565-	.0488	.0462	1.2879	.6200	.0549-
.6534	26.78	1.3373	.6671	.0686-	.0476	.0462	1.3226	.6963	.0670-
.7221	28.78	1.3559	.7363	.0770-	.0476	.0462	1.3401	.7649	.0753-
.7547	30.77	1.3123	.7694	.0951-	.0476	.0462	1.2956	.7975	.0935-
.7944	32.75	1.2809	.8098	.1060-	.0482	.0462	1.2632	.8373	.1043-
.8405	34.74	1.2570	.8565	.1222-	.0476	.0462	1.2384	.8833	.1206-

Pitch Data — 45° Arrow Wing, C_{μ} = 0.1430

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)
.201	7.03	45.00	2.	.1430	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.10	.0280	.0455-	.0041-	.1447	.1250	.0278	.0428	.0022
.0003-	1.98-	.1173-	.0457-	.0137	.1449	.1251	.1143-	.0427	.0200
.0035	2.17	.1712	.0419-	.0218-	.1430	.1252	.1679	.0465	.0154-
.0112	4.25	.3242	.0340-	.0384-	.1448	.1260	.3176	.0548	.0320-
.0338	6.33	.4769	.0112-	.0498-	.1436	.1252	.4671	.0767	.0434-
.0720	8.41	.6161	.0274	.0494-	.1420	.1248	.6032	.1147	.0431-
.1173	10.46	.7459	.0732	.0480-	.1433	.1248	.7298	.1600	.0416-
.1802	12.54	.9174	.1368	.0651-	.1435	.1250	.8982	.2231	.0588-
.2588	14.63	1.0987	.2162	.0854-	.1429	.1250	1.0763	.3018	.0791-
.3414	16.71	1.2503	.2996	.0918-	.1429	.1250	1.2249	.3842	.0855-
.4166	18.76	1.3390	.3758	.0735-	.1435	.1250	1.3106	.4595	.0671-
.4892	20.79	1.4020	.4494	.0582-	.1434	.1250	1.3706	.5321	.0519-
.5708	22.82	1.4730	.5322	.0538-	.1429	.1249	1.4387	.6136	.0475-
.6530	24.86	1.5250	.6157	.0580-	.1422	.1250	1.4879	.6959	.0517-
.7346	26.88	1.5504	.6987	.0646-	.1422	.1249	1.5105	.7775	.0582-
.8233	28.89	1.5787	.7888	.0739-	.1410	.1250	1.5360	.8661	.0676-
.9087	30.90	1.5974	.8758	.0905-	.1423	.1250	1.5520	.9517	.0841-
.9827	32.91	1.5990	.9514	.1058-	.1422	.1250	1.5510	1.0256	.0995-
1.0025	34.87	1.5194	.9729	.1340-	.1416	.1249	1.4688	1.0454	.1276-

Pitch Data — 45° Arrow Wing, C_{μ} = 0.2628

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	2.	.2628	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.11	.0475	.1178-	.0118-	.2631	.2246	.0472	.0410	.0001-
.0003-	1.95-	.0986-	.1180-	.0059	.2624	.2247	.0932-	.0408	.0176
.0046	2.20	.1974	.1131-	.0291-	.2624	.2247	.1913	.0456	.0174-
.0144	4.27	.3515	.1030-	.0462-	.2618	.2246	.3397	.0554	.0345-
.0396	6.34	.5120	.0773-	.0596-	.2612	.2247	.4944	.0806	.0479-
.0806	8.43	.6708	.0355-	.0655-	.2619	.2248	.6475	.1218	.0538-
.1321	10.51	.8333	.0170	.0764-	.2606	.2248	.8043	.1733	.0647-
.2008	12.60	1.0252	.0868	.0987-	.2613	.2248	.9905	.2419	.0870-
.2812	14.68	1.2074	.1686	.1201-	.2620	.2249	1.1672	.3224	.1084-
.3715	16.76	1.3774	.2604	.1328-	.2767	.2251	1.3315	.4128	.1211-
.4594	18.83	1.4949	.3501	.1249-	.2634	.2251	1.4436	.5007	.1132-
.5408	20.86	1.5662	.4334	.0995-	.2621	.2250	1.5095	.5821	.0878-
.6141	22.89	1.6020	.5089	.0742-	.2621	.2250	1.5401	.6554	.0625-
.7082	24.93	1.6737	.6052	.0748-	.2625	.2246	1.6067	.7492	.0631-
.8080	26.98	1.7413	.7074	.0789-	.2625	.2246	1.6692	.8490	.0672-
.9042	28.98	1.7811	.8063	.0810-	.2612	.2245	1.7042	.9452	.0693-
.9993	31.00	1.8030	.9042	.0876-	.2605	.2245	1.7212	1.0403	.0759-
1.0906	33.01	1.8067	.9985	.1149-	.2626	.2247	1.7201	1.1317	.1032-
1.1520	34.99	1.7721	1.0629	.1362-	.2622	.2242	1.6812	1.1928	.1246-

Pitch Data — 45^{o} Arrow Wing, C_{μ} = 0.3849

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)
.201	7.03	45.00	2.	.3849	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.12	.0646	.1898-	.0202-	.3848	.3274	.0642	.0418	.0026-
.0009-	1.99-	.0889-	.1905-	.0022-	.3904	.3277	.0808-	.0411	.0154
.0055	2.20	.2129	.1841-	.0372-	.3865	.3279	.2040	.0476	.0196-
.0171	4.28	.3761	.1720-	.0550-	.3860	.3280	.3588	.0593	.0374-
.0451	6.36	.5515	.1432-	.0721-	.3853	.3280	.5258	.0873	.0545-
.0896	8.45	.7238	.0976-	.0840-	.3839	.3279	.6897	.1317	.0664-
.1460	10.54	.9052	.0398-	.1016-	.3845	.3278	.8628	.1880	.0840-
.2166	12.63	1.0992	.0325	.1268-	.3838	.3278	1.0485	.2586	.1092-
.3010	14.72	1.2940	.1188	.1509-	.3853	.3279	1.2351	.3431	.1333-
.3937	16.81	1.4702	.2138	.1656-	.3848	.3281	1.4031	.4359	.1480-
.4868	18.88	1.6001	.3095	.1621-	.3846	.3278	1.5251	.5288	.1446-
.5777	20.92	1.6872	.4032	.1458-	.3844	.3276	1.6045	.6196	.1282-
.6546	22.94	1.7297	.4832	.1085-	.3845	.3276	1.6394	.6965	.0909-
.7390	24.97	1.7694	.5709	.0924-	.3838	.3275	1.6717	.7808	.0748-
.8465	27.01	1.8464	.6820	.1002-	.3839	.3276	1.7412	.8884	.0827-
.9534	29.04	1.9089	.7927	.1068-	.3840	.3278	1.7964	.9954	.0892-
1.0581	31.07	1.9475	.9016	.1063-	.3854	.3278	1.8279	1.1002	.0887-
1.1685	33.09	1.9738	1.0163	.1239-	.3832	.3275	1.8474	1.2103	.1063-
1.2386	35.06	1.9327	1.0909	.1493-	.3840	.3277	1.7996	1.2805	.1317-

Pitch Data — 45° Diamond Wing, $C_\mu = 0.0$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	3.	.0000	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000	.10	.0097	.0270	.0017-	.0000	.0000	.0097	.0270	.0017-
.0011	2.00-	.1056-	.0281	.0069	.0000	.0000	.1056-	.0281	.0069
.0029	2.19	.1254	.0299	.0098-	.0000	.0000	.1254	.0299	.0098-
.0108	4.30	.2441	.0378	.0174-	.0000	.0000	.2441	.0378	.0174-
.0290	6.41	.3656	.0559	.0235-	.0000	.0000	.3656	.0559	.0235-
.0595	8.51	.4806	.0865	.0252-	.0000	.0000	.4806	.0865	.0252-
.0936	10.58	.5689	.1206	.0233-	.0000	.0000	.5689	.1206	.0233-
.1354	12.66	.6639	.1624	.0268-	.0000	.0000	.6639	.1624	.0268-
.1846	14.73	.7561	.2115	.0332-	.0000	.0000	.7561	.2115	.0332-
.2382	16.80	.8372	.2652	.0440-	.0000	.0000	.8372	.2652	.0440-
.2971	18.86	.8954	.3241	.0761-	.0000	.0000	.8954	.3241	.0761-
.3415	20.87	.9126	.3685	.1046-	.0000	.0000	.9126	.3685	.1046-
.3901	22.88	.9352	.4171	.1215-	.0000	.0000	.9352	.4171	.1215-
.4241	24.88	.9246	.4511	.1330-	.0000	.0000	.9246	.4511	.1330-
.4792	26.91	.9558	.5062	.1408-	.0000	.0000	.9558	.5062	.1408-
.5243	28.91	.9595	.5513	.1477-	.0000	.0000	.9595	.5513	.1477-
.5780	30.93	.9774	.6050	.1546-	.0000	.0000	.9774	.6050	.1546-
.6247	32.93	.9808	.6517	.1614-	.0000	.0000	.9808	.6517	.1614-
.6751	34.93	.9830	.7021	.1683-	.0000	.0000	.9830	.7021	.1683-

Pitch Data — 45° Diamond Wing, C_μ = 0.0297

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	3.	.0297	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.10	.0170	.0086	.0011-	.0301	.0280	.0170	.0284	.0005-
.0008	2.02-	.1012-	.0095	.0079	.0301	.0280	.1005-	.0292	.0085
.0036	2.21	.1359	.0122	.0097-	.0298	.0280	.1351	.0320	.0091-
.0120	4.32	.2585	.0206	.0175-	.0298	.0280	.2570	.0403	.0169-
.0314	6.42	.3794	.0401	.0237-	.0298	.0280	.3772	.0598	.0231-
.0626	8.53	.4959	.0714	.0258-	.0298	.0280	.4930	.0910	.0252-
.0980	10.60	.5897	.1069	.0244-	.0298	.0280	.5861	.1264	.0238-
.1419	12.68	.6934	.1510	.0298-	.0298	.0280	.6891	.1703	.0292-
.1962	14.77	.7944	.2054	.0376-	.0295	.0280	.7893	.2246	.0370-
.2603	16.87	.9067	.2698	.0483-	.0298	.0280	.9009	.2887	.0478-
.3333	18.97	1.0191	.3429	.0646-	.0298	.0280	1.0127	.3616	.0640-
.4116	21.05	1.1182	.4215	.0771-	.0298	.0280	1.1111	.4400	.0765-
.4693	23.07	1.1390	.4794	.0916-	.0298	.0280	1.1312	.4977	.0910-
.5339	25.10	1.1713	.5444	.1333-	.0294	.0280	1.1629	.5623	.1327-
.5613	27.05	1.1258	.5721	.1542-	.0298	.0280	1.1168	.5897	.1536-
.6011	29.05	1.1088	.6122	.1628-	.0295	.0280	1.0992	.6295	.1622-
.6391	31.03	1.0873	.6506	.1717-	.0295	.0280	1.0770	.6676	.1711-
.6802	33.01	1.0753	.6920	.1770-	.0295	.0280	1.0646	.7086	.1764-
.7233	35.02	1.0611	.7355	.1810-	.0298	.0280	1.0497	.7517	.1804-

Pitch Data — 45° Diamond Wing, C_{μ} = 0.0887

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (O/D C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	3.	.0887	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.11	.0285	.0271-	.0045-	.0888	.0750	.0284	.0259	.0022-
.0006	1.98-	.0943-	.0265-	.0047	.0893	.0751	.0925-	.0266	.0070
.0041	2.22	.1483	.0230-	.0133-	.0881	.0750	.1463	.0299	.0110-
.0132	4.33	.2726	.0138-	.0215-	.0888	.0750	.2686	.0391	.0192-
.0336	6.43	.3976	.0068	.0280-	.0888	.0750	.3916	.0595	.0257-
.0662	8.55	.5169	.0397	.0295-	.0889	.0751	.5090	.0922	.0272-
.1027	10.61	.6159	.0764	.0303-	.0888	.0751	.6062	.1286	.0280-
.1518	12.72	.7335	.1259	.0381-	.0889	.0751	.7218	.1777	.0358-
.2150	14.84	.8741	.1897	.0493-	.0881	.0751	.8605	.2410	.0470-
.2820	16.94	.9923	.2571	.0561-	.0885	.0751	.9769	.3079	.0538-
.3561	19.03	1.0917	.3318	.0638-	.0889	.0751	1.0744	.3821	.0615-
.4437	21.13	1.2129	.4202	.0847-	.0889	.0751	1.1938	.4697	.0825-
.5391	23.22	1.3266	.5163	.1012-	.0885	.0752	1.3056	.5651	.0989-
.6221	25.28	1.3825	.6001	.1203-	.0889	.0752	1.3598	.6482	.1180-
.6907	27.29	1.3963	.6694	.1564-	.0889	.0751	1.3720	.7167	.1541-
.7352	29.26	1.3627	.7149	.1839-	.0871	.0751	1.3367	.7612	.1816-
.7562	31.19	1.2968	.7368	.1999-	.0897	.0751	1.2693	.7822	.1976-
.7556	33.13	1.2036	.7371	.2057-	.0885	.0751	1.1746	.7816	.2034-
.7882	35.10	1.1674	.7707	.2072-	.0881	.0750	1.1369	.8141	.2049-

Pitch Data — 45° Diamond Wing, C_μ = 0.1640

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	3.	.1640	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.12	.0432	.0675-	.0099-	.1640	.1347	.0430	.0277	.0057-
.0005	2.01-	.0811-	.0670-	.0002-	.1651	.1347	.0778-	.0282	.0040
.0049	2.24	.1663	.0626-	.0191-	.1648	.1348	.1625	.0326	.0148-
.0146	4.34	.2951	.0527-	.0278-	.1640	.1347	.2879	.0423	.0236-
.0364	6.45	.4219	.0305-	.0344-	.1640	.1347	.4112	.0641	.0302-
.0695	8.56	.5413	.0030	.0362-	.1644	.1347	.5271	.0972	.0320-
.1102	10.65	.6594	.0443	.0405-	.1638	.1349	.6418	.1380	.0363-
.1631	12.76	.7936	.0979	.0519-	.1638	.1349	.7725	.1910	.0477-
.2294	14.88	.9434	.1651	.0639-	.1631	.1349	.9189	.2573	.0597-
.3047	17.02	1.0839	.2413	.0718-	.1638	.1349	1.0559	.3326	.0676-
.3830	19.11	1.1931	.3207	.0753-	.1642	.1349	1.1619	.4109	.0711-
.4645	21.19	1.2816	.4034	.0842-	.1642	.1349	1.2472	.4924	.0800-
.5629	23.29	1.3946	.5031	.1032-	.1642	.1348	1.3569	.5907	.0990-
.6665	25.38	1.4994	.6081	.1247-	.1638	.1348	1.4586	.6943	.1204-
.7651	27.44	1.5710	.7083	.1457-	.1645	.1348	1.5271	.7928	.1414-
.8356	29.44	1.5646	.7803	.1846-	.1641	.1348	1.5178	.8633	.1804-
.8818	31.41	1.5229	.8282	.2136-	.1634	.1348	1.4732	.9096	.2094-
.9012	33.33	1.4462	.8494	.2311-	.1649	.1347	1.3939	.9290	.2269-
.8993	35.24	1.3473	.8492	.2361-	.1615	.1347	1.2923	.9270	.2319-

Pitch Data — 45° Diamond Wing, $C_{\mu} = 0.2475$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	45.00	3.	.2475	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.13	.0557	.1128-	.0148-	.2473	.1966	.0553	.0262	.0085-
.0001-	1.97-	.0706-	.1128-	.0049-	.2483	.1967	.0658-	.0262	.0015
.0051	2.24	.1811	.1076-	.0245-	.2478	.1967	.1757	.0314	.0182-
.0158	4.35	.3102	.0966-	.0335-	.2478	.1967	.2996	.0421	.0271-
.0398	6.46	.4422	.0720-	.0410-	.2479	.1969	.4265	.0663	.0346-
.0735	8.57	.5636	.0377-	.0440-	.2475	.1969	.5429	.0999	.0377-
.1172	10.68	.6949	.0069	.0513-	.2479	.1968	.6691	.1436	.0450-
.1741	12.81	.8448	.0648	.0636-	.2475	.1968	.8139	.2005	.0573-
.2427	14.94	1.0001	.1346	.0761-	.2468	.1968	.9642	.2690	.0698-
.3227	17.07	1.1563	.2160	.0870-	.2472	.1967	1.1154	.3490	.0807-
.4072	19.18	1.2855	.3022	.0927-	.2468	.1968	1.2398	.4336	.0864-
.4814	21.23	1.3442	.3781	.0890-	.2475	.1967	1.2938	.5077	.0827-
.5755	23.32	1.4407	.4741	.1045-	.2479	.1967	1.3857	.6018	.0982-
.6853	25.41	1.5508	.5860	.1264-	.2471	.1966	1.4912	.7115	.1200-
.7894	27.49	1.6354	.6923	.1471-	.2467	.1966	1.5713	.8156	.1407-
.8869	29.54	1.6847	.7922	.1733-	.2479	.1965	1.6162	.9131	.1669-
.9521	31.52	1.6639	.8598	.2092-	.2475	.1966	1.5912	.9783	.2029-
1.0011	33.48	1.6224	.9114	.2373-	.2482	.1966	1.5457	1.0273	.2310-
1.0342	35.44	1.5604	.9471	.2539-	.2467	.1965	1.4798	1.0603	.2476-

Pitch Data — 30^{o} Delta Wing, $C_{\mu} = 0.0$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	30.00	4.	.0000	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000	.09	.0086	.0479	.0013-	.0000	.0000	.0086	.0479	.0013-
.0013	2.00-	.1606-	.0492	.0088	.0000	.0000	.1606-	.0492	.0088
.0036	2.19	.1734	.0514	.0104-	.0000	.0000	.1734	.0514	.0104-
.0100	4.27	.3421	.0578	.0180-	.0000	.0000	.3421	.0578	.0180-
.0239	6.38	.5186	.0718	.0267-	.0000	.0000	.5186	.0718	.0267-
.0647	8.45	.6519	.1126	.0269-	.0000	.0000	.6519	.1126	.0269-
.1112	10.49	.7435	.1590	.0226-	.0000	.0000	.7435	.1590	.0226-
.1622	12.56	.8265	.2100	.0280-	.0000	.0000	.8265	.2100	.0280-
.2154	14.58	.8827	.2632	.0491-	.0000	.0000	.8827	.2632	.0491-
.2598	16.58	.8992	.3076	.0631-	.0000	.0000	.8992	.3076	.0631-
.3063	18.61	.9242	.3542	.0677-	.0000	.0000	.9242	.3542	.0677-
.3535	20.62	.9467	.4014	.0724-	.0000	.0000	.9467	.4014	.0724-
.3864	22.61	.9293	.4342	.0850-	.0000	.0000	.9293	.4342	.0850-
.4303	24.61	.9408	.4781	.0966-	.0000	.0000	.9408	.4781	.0966-
.4918	26.64	.9813	.5397	.1040-	.0000	.0000	.9813	.5397	.1040-
.5476	28.66	1.0064	.5954	.0995-	.0000	.0000	1.0064	.5954	.0995-
.5957	30.66	1.0080	.6435	.0981-	.0000	.0000	1.0080	.6435	.0981-
.6491	32.67	1.0154	.6969	.1022-	.0000	.0000	1.0154	.6969	.1022-
.6909	34.67	1.0049	.7388	.1080-	.0000	.0000	1.0049	.7388	.1080-

Pitch Data — 30^{o} Delta Wing, $C_{\mu} = 0.0432$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)
.201	7.03	30.00	4.	.0432	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.10	.0219	.0267	.0012-	.0432	.0391	.0219	.0463	.0000
.0007	1.99-	.1475-	.0275	.0080	.0431	.0391	.1468-	.0470	.0093
.0047	2.19	.1844	.0315	.0107-	.0437	.0392	.1836	.0511	.0095-
.0129	4.29	.3589	.0397	.0187-	.0437	.0391	.3575	.0592	.0175-
.0296	6.39	.5353	.0564	.0271-	.0432	.0391	.5332	.0759	.0259-
.0735	8.48	.6766	.1004	.0271-	.0437	.0392	.6737	.1198	.0258-
.1226	10.52	.7795	.1496	.0167-	.0437	.0393	.7759	.1689	.0155-
.1833	12.60	.9128	.2105	.0112-	.0432	.0393	.9085	.2296	.0100-
.2521	14.67	1.0531	.2794	.0046-	.0433	.0392	1.0482	.2984	.0034-
.3050	16.70	1.1009	.3325	.0017	.0433	.0393	1.0953	.3513	.0029
.3687	18.73	1.1483	.3965	.0187-	.0433	.0394	1.1420	.4151	.0174-
.4400	20.77	1.2084	.4680	.0360-	.0433	.0393	1.2014	.4864	.0348-
.4880	22.76	1.1994	.5163	.0400-	.0434	.0394	1.1918	.5344	.0388-
.5276	24.75	1.1683	.5561	.0599-	.0431	.0390	1.1602	.5738	.0587-
.5787	26.76	1.1718	.6076	.0726-	.0426	.0390	1.1630	.6250	.0713-
.6350	28.77	1.1785	.6641	.0838-	.0432	.0391	1.1691	.6812	.0826-
.6779	30.75	1.1576	.7074	.1023-	.0432	.0391	1.1476	.7242	.1011-
.6968	32.70	1.0912	.7266	.1235-	.0427	.0391	1.0806	.7430	.1223-
.7425	34.71	1.0804	.7727	.1310-	.0427	.0392	1.0693	.7888	.1298-

Pitch Data — 30^{o} Delta Wing, C_{μ} = 0.1251

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	30.00	4.	.1251	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.11	.0345	.0051-	.0060-	.1264	.1066	.0344	.0482	.0016-
.0002	2.02-	.1393-	.0049-	.0037	.1281	.1067	.1374-	.0484	.0081
.0052	2.21	.2013	.0002	.0157-	.1247	.1065	.1992	.0534	.0113-
.0152	4.30	.3774	.0103	.0239-	.1258	.1065	.3734	.0634	.0195-
.0353	6.40	.5646	.0306	.0338-	.1252	.1065	.5586	.0835	.0294-
.0834	8.50	.7195	.0790	.0346-	.1247	.1065	.7117	.1316	.0302-
.1377	10.56	.8604	.1335	.0261-	.1247	.1065	.8507	.1859	.0217-
.2067	12.67	1.0254	.2029	.0264-	.1246	.1064	1.0137	.2548	.0220-
.2846	14.75	1.1867	.2813	.0227-	.1240	.1063	1.1732	.3327	.0183-
.3598	16.80	1.2956	.3570	.0048-	.1240	.1063	1.2802	.4079	.0004-
.4218	18.84	1.3319	.4196	.0136	.1249	.1069	1.3146	.4702	.0180
.4849	20.84	1.3536	.4834	.0079	.1255	.1068	1.3346	.5332	.0123
.5789	22.90	1.4424	.5780	.0342-	.1254	.1066	1.4216	.6271	.0298-
.6466	24.91	1.4568	.6465	.0456-	.1248	.1067	1.4343	.6949	.0412-
.7091	26.91	1.4549	.7098	.0531-	.1248	.1066	1.4308	.7573	.0487-
.7374	28.88	1.3819	.7390	.0896-	.1254	.1065	1.3562	.7856	.0853-
.7777	30.85	1.3391	.7802	.1088-	.1253	.1066	1.3118	.8259	.1044-
.7722	32.78	1.2193	.7756	.1451-	.1236	.1065	1.1905	.8204	.1407-
.8088	34.76	1.1876	.8133	.1557-	.1258	.1064	1.1572	.8570	.1513-

Pitch Data — 30° Delta Wing, C_{μ} = 0.2278

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)
.201	7.03	30.00	4.	.2278	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.12	.0513	.0515-	.0125-	.2287	.1914	.0511	.0442	.0042-
.0005-	1.97-	.1220-	.0520-	.0028-	.2303	.1914	.1187-	.0437	.0056
.0066	2.22	.2228	.0449-	.0224-	.2272	.1909	.2191	.0505	.0140-
.0181	4.31	.4027	.0332-	.0311-	.2273	.1912	.3955	.0622	.0228-
.0408	6.41	.5914	.0101-	.0406-	.2280	.1913	.5807	.0849	.0323-
.0908	8.51	.7664	.0404	.0423-	.2282	.1916	.7523	.1351	.0339-
.1520	10.61	.9391	.1021	.0398-	.2269	.1913	.9215	.1961	.0314-
.2255	12.72	1.1220	.1763	.0422-	.2267	.1911	1.1009	.2695	.0338-
.3092	14.80	1.3000	.2608	.0422-	.2276	.1914	1.2756	.3534	.0338-
.3971	16.89	1.4431	.3497	.0284-	.2282	.1914	1.4153	.4412	.0200-
.4816	18.94	1.5310	.4352	.0057-	.2274	.1910	1.5000	.5256	.0026
.5577	20.97	1.5680	.5125	.0155	.2281	.1912	1.5338	.6018	.0238
.6228	22.96	1.5716	.5788	.0146	.2279	.1918	1.5342	.6671	.0230
.7270	25.03	1.6617	.6845	.0254-	.2287	.1913	1.6212	.7711	.0171-
.8068	27.04	1.6723	.7657	.0511-	.2274	.1911	1.6289	.8508	.0427-
.8700	29.02	1.6522	.8305	.0616-	.2282	.1912	1.6058	.9141	.0533-
.9165	30.99	1.5966	.8786	.0984-	.2291	.1910	1.5474	.9605	.0901-
.9232	32.92	1.4845	.8870	.1298-	.2260	.1915	1.4324	.9674	.1215-
.8893	34.83	1.3148	.8550	.1724-	.2270	.1913	1.2602	.9335	.1641-

Pitch Data — 30^{o} Delta Wing, C_{μ} = 0.3385

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	30.00	4.	.3385	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.12	.0654	.0950-	.0187-	.3335	.2809	.0651	.0454	.0055-
.0013-	2.01-	.1127-	.0962-	.0082-	.3331	.2810	.1078-	.0442	.0049
.0072	2.23	.2401	.0877-	.0281-	.3332	.2812	.2346	.0528	.0150-
.0204	4.31	.4224	.0742-	.0374-	.3338	.2812	.4118	.0660	.0242-
.0481	6.43	.6241	.0460-	.0487-	.3414	.2811	.6084	.0937	.0356-
.1011	8.54	.8111	.0076	.0516-	.3399	.2814	.7902	.1468	.0384-
.1644	10.64	1.0020	.0718	.0528-	.3404	.2813	.9760	.2100	.0396-
.2431	12.75	1.1996	.1516	.0576-	.3403	.2811	1.1686	.2887	.0444-
.3320	14.84	1.3893	.2417	.0604-	.3411	.2813	1.3533	.3777	.0472-
.4281	16.94	1.5533	.3392	.0524-	.3403	.2810	1.5124	.4736	.0393-
.5206	19.01	1.6601	.4333	.0312-	.3405	.2812	1.6143	.5662	.0180-
.6114	21.05	1.7226	.5258	.0081-	.3410	.2811	1.6721	.6570	.0050
.6899	23.06	1.7435	.6061	.0036	.3402	.2807	1.6885	.7352	.0167
.7792	25.09	1.7760	.6975	.0309-	.3381	.2810	1.7164	.8247	.0178-
.8751	27.11	1.8080	.7955	.0693-	.3385	.2806	1.7441	.9205	.0562-
.9484	29.09	1.7929	.8712	.0817-	.3398	.2809	1.7246	.9939	.0686-
1.0117	31.10	1.7672	.9369	.0910-	.3402	.2807	1.6947	1.0571	.0779-
1.0516	33.05	1.6984	.9792	.1162-	.3382	.2801	1.6221	1.0966	.1031-
1.0479	34.98	1.5665	.9782	.1503-	.3386	.2799	1.4863	1.0928	.1372-

Pitch Data — 30^{o} Arrow Wing, $C_{\mu} = 0.0$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	30.00	5.	.0000	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000	.09	.0053	.0619	.0025-	.0000	.0000	.0053	.0619	.0025-
.0013	2.01-	.1742-	.0632	.0088	.0000	.0000	.1742-	.0632	.0088
.0032	2.17	.1820	.0651	.0128-	.0000	.0000	.1820	.0651	.0128-
.0097	4.24	.3647	.0716	.0233-	.0000	.0000	.3647	.0716	.0233-
.0192	6.32	.5574	.0811	.0335-	.0000	.0000	.5574	.0811	.0335-
.0589	8.39	.7063	.1208	.0278-	.0000	.0000	.7063	.1208	.0278-
.1067	10.41	.7906	.1686	.0093-	.0000	.0000	.7906	.1686	.0093-
.1619	12.45	.8637	.2238	.0036	.0000	.0000	.8637	.2238	.0036
.2147	14.46	.9204	.2766	.0056-	.0000	.0000	.9204	.2766	.0056-
.2631	16.49	.9413	.3250	.0138-	.0000	.0000	.9413	.3250	.0138-
.3132	18.49	.9717	.3751	.0144-	.0000	.0000	.9717	.3751	.0144-
.3678	20.50	1.0058	.4297	.0135-	.0000	.0000	1.0058	.4297	.0135-
.4226	22.53	1.0367	.4844	.0113-	.0000	.0000	1.0367	.4844	.0113-
.4731	24.54	1.0500	.5350	.0122-	.0000	.0000	1.0500	.5350	.0122-
.5203	26.54	1.0557	.5822	.0313-	.0000	.0000	1.0557	.5822	.0313-
.5773	28.56	1.0726	.6392	.0337-	.0000	.0000	1.0726	.6392	.0337-
.6363	30.56	1.0884	.6982	.0351-	.0000	.0000	1.0884	.6982	.0351-
.6744	32.54	1.0714	.7363	.0540-	.0000	.0000	1.0714	.7363	.0540-
.7271	34.54	1.0714	.7889	.0677-	.0000	.0000	1.0714	.7889	.0677-

Pitch Data — 30° Arrow Wing, $C_{\mu} = 0.0543$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	30.00	5.	.0543	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.10	.0196	.0365	.0010	.0564	.0523	.0196	.0626	.0032
.0000-	2.00-	.1628-	.0365	.0109	.0564	.0523	.1619-	.0626	.0131
.0057	2.19	.2013	.0422	.0096-	.0564	.0522	.2003	.0683	.0075-
.0129	4.25	.3869	.0494	.0197-	.0557	.0521	.3849	.0754	.0176-
.0261	6.33	.5780	.0628	.0298-	.0549	.0521	.5751	.0887	.0276-
.0706	8.41	.7315	.1073	.0204-	.0556	.0521	.7277	.1331	.0182-
.1224	10.44	.8445	.1594	.0113	.0542	.0520	.8398	.1849	.0135
.1840	12.49	.9779	.2211	.0307	.0535	.0519	.9723	.2465	.0329
.2540	14.56	1.1260	.2914	.0468	.0540	.0528	1.1194	.3169	.0490
.3157	16.58	1.1976	.3532	.0625	.0554	.0527	1.1900	.3785	.0646
.3747	18.59	1.2202	.4126	.0555	.0525	.0527	1.2118	.4376	.0577
.4522	20.62	1.2716	.4904	.0468	.0517	.0527	1.2623	.5150	.0490
.5224	22.64	1.3120	.5609	.0502	.0553	.0526	1.3018	.5852	.0524
.5905	24.65	1.3363	.6294	.0504	.0545	.0526	1.3253	.6533	.0525
.6254	26.63	1.2871	.6647	.0215	.0546	.0526	1.2753	.6882	.0237
.6833	28.64	1.2921	.7230	.0330	.0486	.0526	1.2795	.7461	.0352
.7401	30.63	1.2863	.7803	.0175	.0547	.0527	1.2729	.8030	.0197
.7929	32.62	1.2715	.8335	.0235-	.0532	.0527	1.2573	.8557	.0213-
.8465	34.61	1.2613	.8876	.0566-	.0538	.0525	1.2463	.9093	.0545-

Pitch Data — 30° Arrow Wing, C_μ = 0.1688

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)
.201	7.03	30.00	5.	.1688	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.10	.0356	.0107-	.0048-	.1669	.1426	.0355	.0606	.0030
.0008-	2.00-	.1544-	.0115-	.0058	.1691	.1427	.1519-	.0598	.0137
.0070	2.18	.2155	.0036-	.0150-	.1677	.1427	.2128	.0677	.0072-
.0167	4.27	.4032	.0062	.0241-	.1712	.1427	.3979	.0774	.0163-
.0355	6.34	.6038	.0253	.0333-	.1705	.1426	.5959	.0961	.0255-
.0837	8.43	.7758	.0738	.0229-	.1676	.1425	.7654	.1443	.0150-
.1408	10.47	.9346	.1313	.0017-	.1690	.1425	.9217	.2014	.0061
.2108	12.55	1.1055	.2019	.0086	.1675	.1425	1.0901	.2714	.0164
.2951	14.61	1.2929	.2868	.0171	.1704	.1425	1.2749	.3557	.0249
.3734	16.68	1.4138	.3658	.0424	.1631	.1424	1.3934	.4340	.0503
.4480	18.70	1.4818	.4411	.0752	.1697	.1424	1.4590	.5085	.0830
.5149	20.71	1.5003	.5088	.0953	.1674	.1423	1.4751	.5754	.1031
.5828	22.71	1.4991	.5776	.0904	.1703	.1423	1.4716	.6432	.0982
.6666	24.74	1.5463	.6624	.0770	.1703	.1423	1.5166	.7270	.0849
.7576	26.76	1.5957	.7545	.0617	.1689	.1422	1.5637	.8180	.0695
.8417	28.77	1.6162	.8398	.0569	.1644	.1421	1.5820	.9021	.0647
.8947	30.76	1.5797	.8941	.0283	.1702	.1421	1.5433	.9551	.0361
.9513	32.74	1.5472	.9519	.0047	.1709	.1421	1.5088	1.0116	.0125
.9690	34.71	1.4724	.9710	.0443-	.1716	.1421	1.4319	1.0294	.0365-

Pitch Data — 30^{o} Arrow Wing, C_{μ} = 0.2872

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)
.201	7.03	30.00	5.	.2872	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.11	.0516	.0662-	.0116-	.2863	.2555	.0514	.0615	.0033
.0023-	1.96-	.1354-	.0685-	.0011-	.2849	.2558	.1310-	.0593	.0138
.0085	2.20	.2314	.0576-	.0198-	.2862	.2553	.2265	.0699	.0050-
.0202	4.27	.4279	.0456-	.0306-	.2845	.2551	.4184	.0816	.0157-
.0427	6.34	.6351	.0227-	.0396-	.2836	.2549	.6210	.1040	.0247-
.0925	8.44	.8373	.0276	.0346-	.2878	.2552	.8186	.1538	.0197-
.1565	10.50	1.0233	.0924	.0225-	.2852	.2550	1.0001	.2178	.0076-
.2317	12.60	1.2157	.1685	.0169-	.2888	.2555	1.1879	.2932	.0021-
.3242	14.66	1.4228	.2621	.0116-	.2854	.2552	1.3905	.3856	.0032
.4167	16.73	1.5825	.3559	.0097	.2868	.2550	1.5458	.4780	.0246
.5036	18.77	1.6851	.4442	.0435	.2890	.2559	1.6439	.5653	.0584
.5846	20.81	1.7326	.5268	.0845	.2889	.2556	1.6872	.6462	.0994
.6581	22.81	1.7397	.6018	.1175	.2878	.2553	1.6902	.7195	.1324
.7351	24.82	1.7369	.6806	.1202	.2877	.2550	1.6834	.7964	.1350
.8256	26.82	1.7713	.7731	.1065	.2890	.2545	1.7139	.8867	.1213
.9273	28.84	1.8178	.8769	.0834	.2889	.2555	1.7561	.9888	.0983
1.0095	30.85	1.8101	.9614	.0583	.2903	.2553	1.7447	1.0709	.0732
1.0684	32.83	1.7687	1.0225	.0409	.2901	.2550	1.6996	1.1297	.0557
1.1105	34.81	1.7055	1.0671	.0058	.2858	.2547	1.6328	1.1716	.0206

Pitch Data — 30° Arrow Wing, $C_{\mu} = 0.4512$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CμAVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	30.00	5.	.4512	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.12	.0712	.1248-	.0197-	.4522	.3747	.0709	.0626	.0036
.0030-	1.95-	.1206-	.1277-	.0088-	.4598	.3758	.1142-	.0601	.0147
.0094	2.20	.2621	.1153-	.0288-	.4522	.3752	.2549	.0722	.0054-
.0224	4.27	.4453	.1019-	.0378-	.4507	.3751	.4313	.0852	.0144-
.0499	6.36	.6713	.0737-	.0472-	.4517	.3754	.6505	.1128	.0238-
.0996	8.45	.8794	.0231-	.0451-	.4505	.3748	.8519	.1622	.0217-
.1676	10.54	1.0923	.0460	.0397-	.4532	.3752	1.0579	.2305	.0163-
.2535	12.62	1.3147	.1332	.0386-	.4488	.3744	1.2738	.3159	.0153-
.3473	14.69	1.5245	.2286	.0342-	.4508	.3752	1.4770	.4101	.0108-
.4520	16.78	1.7078	.3353	.0222-	.4523	.3751	1.6536	.5148	.0011
.5559	18.83	1.8508	.4412	.0002	.4499	.3750	1.7903	.6186	.0235
.6441	20.88	1.9255	.5316	.0446	.4500	.3751	1.8587	.7068	.0680
.7241	22.88	1.9365	.6141	.0932	.4520	.3745	1.8637	.7866	.1165
.7962	24.88	1.9133	.6887	.1272	.4505	.3742	1.8346	.8585	.1505
.8846	26.88	1.9260	.7801	.1258	.4501	.3751	1.8413	.9473	.1492
.9785	28.90	1.9438	.8771	.1019	.4515	.3749	1.8532	1.0412	.1253
1.0792	30.91	1.9546	.9811	.0689	.4498	.3749	1.8583	1.1419	.0923
1.1729	32.91	1.9594	1.0782	.0675	.4482	.3748	1.8576	1.2355	.0908
1.2415	34.90	1.9232	1.1505	.0466	.4484	.3750	1.8160	1.3043	.0700

Pitch Data — 30^o Diamond Wing, $C_\mu = 0.0$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	30.00	6.	.0000	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000	.11	.0138	.0387	.0023-	.0000	.0000	.0138	.0387	.0023-
.0011	2.00-	.1419-	.0398	.0040	.0000	.0000	.1419-	.0398	.0040
.0037	2.21	.1659	.0425	.0083-	.0000	.0000	.1659	.0425	.0083-
.0106	4.32	.3212	.0493	.0132-	.0000	.0000	.3212	.0493	.0132-
.0269	6.44	.4850	.0657	.0176-	.0000	.0000	.4850	.0657	.0176-
.0658	8.52	.6158	.1045	.0197-	.0000	.0000	.6158	.1045	.0197-
.1096	10.59	.7128	.1484	.0235-	.0000	.0000	.7128	.1484	.0235-
.1599	12.66	.7982	.1987	.0340-	.0000	.0000	.7982	.1987	.0340-
.2113	14.70	.8554	.2501	.0591-	.0000	.0000	.8554	.2501	.0591-
.2557	16.72	.8779	.2944	.0760-	.0000	.0000	.8779	.2944	.0760-
.3028	18.74	.9102	.3415	.0828-	.0000	.0000	.9102	.3415	.0828-
.3279	20.71	.8745	.3666	.1000-	.0000	.0000	.8745	.3666	.1000-
.3732	22.71	.8954	.4119	.1050-	.0000	.0000	.8954	.4119	.1050-
.4259	24.76	.9269	.4646	.1115-	.0000	.0000	.9269	.4646	.1115-
.4792	26.76	.9542	.5179	.1131-	.0000	.0000	.9542	.5179	.1131-
.5313	28.79	.9766	.5700	.1115-	.0000	.0000	.9766	.5700	.1115-
.5829	30.80	.9861	.6216	.1112-	.0000	.0000	.9861	.6216	.1112-
.6219	32.79	.9742	.6606	.1145-	.0000	.0000	.9742	.6606	.1145-
.6594	34.79	.9575	.6981	.1173-	.0000	.0000	.9575	.6981	.1173-

Pitch Data — 30° Diamond Wing, C_{μ} = 0.0366

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	30.00	6.	.0366	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.01	.0113	.0225	.0017-	.0363	.0314	.0113	.0382	.0009-
.0013	1.99-	.1377-	.0238	.0046	.0370	.0313	.1372-	.0395	.0053
.0000-	.11	.0204	.0226	.0022-	.0369	.0312	.0204	.0382	.0014-
.0044	2.22	.1800	.0270	.0086-	.0373	.0312	.1794	.0426	.0079-
.0130	4.33	.3326	.0356	.0136-	.0365	.0312	.3314	.0511	.0128-
.0309	6.43	.4955	.0535	.0186-	.0369	.0313	.4938	.0691	.0179-
.0729	8.54	.6321	.0956	.0212-	.0365	.0313	.6298	.1111	.0204-
.1200	10.61	.7375	.1429	.0215-	.0362	.0313	.7347	.1583	.0207-
.1769	12.69	.8576	.1999	.0190-	.0365	.0313	.8541	.2151	.0183-
.2413	14.79	.9904	.2644	.0183-	.0365	.0314	.9864	.2795	.0175-
.2936	16.82	1.0367	.3168	.0201-	.0366	.0314	1.0321	.3318	.0193-
.3576	18.86	1.0967	.3810	.0449-	.0366	.0315	1.0916	.3959	.0441-
.4162	20.88	1.1283	.4398	.0599-	.0366	.0314	1.1227	.4545	.0591-
.4583	22.88	1.1112	.4821	.0836-	.0365	.0314	1.1051	.4966	.0828-
.4970	24.86	1.0915	.5210	.1032-	.0365	.0313	1.0849	.5352	.1025-
.5440	26.87	1.0888	.5682	.1215-	.0361	.0313	1.0817	.5822	.1208-
.5848	28.86	1.0750	.6093	.1254-	.0365	.0312	1.0675	.6230	.1246-
.6157	30.83	1.0430	.6405	.1257-	.0360	.0312	1.0350	.6539	.1249-
.6613	32.83	1.0355	.6864	.1304-	.0365	.0312	1.0271	.6995	.1296-
.7093	34.83	1.0334	.7347	.1349-	.0367	.0311	1.0245	.7474	.1341-

Pitch Data — 30° Diamond Wing, $C_{\mu} = 0.0987$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)
.201	7.03	30.00	6.	.0987	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.02	.0243	.0034-	.0055-	.1021	.0853	.0243	.0392	.0027-
.0004	2.00-	.1261-	.0030-	.0008	.1002	.0852	.1246-	.0396	.0036
.0000-	.11	.0309	.0035-	.0059-	.0993	.0851	.0309	.0391	.0031-
.0055	2.24	.1925	.0020	.0127-	.0993	.0850	.1908	.0445	.0099-
.0150	4.34	.3538	.0116	.0182-	.0981	.0854	.3506	.0541	.0154-
.0355	6.47	.5228	.0323	.0239-	.0972	.0853	.5180	.0746	.0211-
.0802	8.56	.6635	.0772	.0282-	.0971	.0851	.6571	.1193	.0254-
.1316	10.64	.7928	.1288	.0270-	.0995	.0854	.7849	.1708	.0242-
.1941	12.75	.9382	.1916	.0277-	.0986	.0854	.9288	.2332	.0249-
.2690	14.86	1.0979	.2669	.0277-	.0972	.0852	1.0869	.3081	.0249-
.3416	16.93	1.2073	.3399	.0190-	.0971	.0851	1.1949	.3807	.0162-
.4022	18.96	1.2497	.4010	.0153-	.0977	.0854	1.2358	.4413	.0125-
.4773	21.02	1.3098	.4766	.0455-	.0973	.0854	1.2945	.5165	.0427-
.5478	23.04	1.3429	.5477	.0693-	.0987	.0854	1.3262	.5870	.0665-
.6050	25.05	1.3442	.6055	.0826-	.0995	.0854	1.3262	.6442	.0798-
.6250	26.99	1.2625	.6262	.1293-	.0987	.0854	1.2431	.6642	.1265-
.6611	28.97	1.2219	.6630	.1443-	.0991	.0853	1.2012	.7003	.1415-
.6743	30.91	1.1456	.6769	.1486-	.0987	.0854	1.1236	.7135	.1458-
.7097	32.89	1.1232	.7131	.1524-	.0991	.0853	1.1000	.7489	.1496-
.7643	34.89	1.1205	.7685	.1568-	.0995	.0853	1.0961	.8034	.1540-

Pitch Data — 30° Diamond Wing, $C_\mu = 0.1797$

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	Cμ AVG	LN (0/0 C)	VN (DIA.)	Q0 (PSF)	Q0 (NSM)
.200	7.04	30.00	6.	.1797	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	Cμ	CT	CL	CD	CM
.0000-	.03	.0399	.0375-	.0121-	.1801	.1533	.0399	.0392	.0067-
.0002-	1.98-	.1104-	.0376-	.0052-	.1795	.1531	.1077-	.0389	.0001
.0000-	.13	.0500	.0372-	.0126-	.1807	.1536	.0499	.0396	.0072-
.0059	2.24	.2094	.0313-	.0198-	.1796	.1533	.2064	.0453	.0144-
.0173	4.37	.3798	.0196-	.0259-	.1795	.1531	.3740	.0567	.0205-
.0402	6.48	.5534	.0035	.0327-	.1799	.1530	.5447	.0795	.0274-
.0879	8.59	.7070	.0516	.0374-	.1798	.1529	.6955	.1272	.0321-
.1426	10.69	.8558	.1067	.0350-	.1795	.1531	.8416	.1820	.0297-
.2091	12.80	1.0152	.1738	.0370-	.1798	.1528	.9983	.2484	.0316-
.2889	14.93	1.1849	.2543	.0385-	.1804	.1531	1.1652	.3283	.0331-
.3741	17.03	1.3260	.3403	.0331-	.1798	.1528	1.3036	.4134	.0277-
.4530	19.08	1.4082	.4200	.0206-	.1800	.1532	1.3831	.4924	.0153-
.5269	21.12	1.4559	.4949	.0206-	.1794	.1530	1.4283	.5662	.0152-
.6143	23.17	1.5219	.5832	.0614-	.1798	.1528	1.4918	.6535	.0560-
.6893	25.19	1.5387	.6594	.0876-	.1801	.1533	1.5061	.7288	.0823-
.7442	27.16	1.5162	.7155	.1049-	.1795	.1531	1.4813	.7836	.0995-
.7723	29.12	1.4406	.7448	.1490-	.1799	.1529	1.4034	.8116	.1437-
.7850	31.05	1.3485	.7588	.1627-	.1788	.1527	1.3091	.8242	.1573-
.7744	32.98	1.2344	.7495	.1741-	.1796	.1526	1.1929	.8135	.1688-
.8166	34.96	1.2093	.7932	.1772-	.1791	.1532	1.1654	.8560	.1718-

Pitch Data — 30° Diamond Wing, C_μ = 0.2666

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (0/0 C)	VN (DIA.)	QO (PSF)	QO (NSM)
.200	7.04	30.00	6.	.2666	40.	1.5	60.00	2873.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.04	.0589	.0708-	.0186-	.2707	.2248	.0588	.0416	.0102-
.0008-	1.97-	.0943-	.0715-	.0116-	.2673	.2245	.0904-	.0407	.0032-
.0000-	.15	.0711	.0705-	.0191-	.2663	.2244	.0708	.0418	.0108-
.0068	2.25	.2300	.0636-	.0261-	.2669	.2243	.2256	.0485	.0177-
.0203	4.38	.4036	.0498-	.0326-	.2662	.2251	.3950	.0624	.0242-
.0452	6.49	.5784	.0245-	.0394-	.2662	.2249	.5657	.0872	.0310-
.0947	8.63	.7456	.0256	.0433-	.2660	.2247	.7287	.1366	.0349-
.1532	10.73	.9102	.0847	.0420-	.2666	.2248	.8892	.1951	.0336-
.2240	12.85	1.0850	.1563	.0460-	.2665	.2246	1.0600	.2658	.0376-
.3079	14.97	1.2658	.2412	.0502-	.2662	.2248	1.2367	.3498	.0418-
.3989	17.09	1.4188	.3334	.0473-	.2666	.2248	1.3858	.4408	.0389-
.4916	19.16	1.5320	.4274	.0366-	.2660	.2245	1.4952	.5334	.0282-
.5734	21.20	1.5797	.5106	.0284-	.2663	.2249	1.5391	.6154	.0200-
.6551	23.24	1.6273	.5937	.0439-	.2661	.2246	1.5830	.6969	.0355-
.7520	25.29	1.6791	.6923	.0926-	.2661	.2245	1.6311	.7938	.0843-
.8183	27.27	1.6655	.7603	.1151-	.2663	.2248	1.6140	.8602	.1067-
.8593	29.22	1.6051	.8031	.1459-	.2652	.2245	1.5503	.9011	.1375-
.8979	31.19	1.5452	.8437	.1664-	.2662	.2247	1.4871	.9398	.1581-
.8704	33.09	1.4010	.8181	.1832-	.2682	.2247	1.3396	.9122	.1748-
.8569	35.03	1.2871	.8068	.1940-	.2659	.2250	1.2225	.8989	.1856-

Pitch Data — 30° Diamond Wing, C_μ = 0.7973

MO	REL (MILLION)	LAMDA N (DEGREES)	WING NO.	CU AVG	LN (O/O C)	VN (DIA.)	QO (PSF)	QO (NSM)
.116	4.06	30.00	6.	.7973	40.	1.5	20.00	958.

CDL	ALFA	CLT	CDT	CMT	CU	CT	CL	CD	CM
.0000-	.08	.1607	.2943-	.0429-	.8075	.6757	.1602	.0436	.0177-
.0034-	1.90-	.0022-	.2975-	.0358-	.8013	.6747	.0089	.0397	.0105-
.0000-	.17	.1700	.2950-	.0442-	.7987	.6753	.1690	.0426	.0189-
.0102	2.28	.3509	.2846-	.0508-	.7957	.6749	.3375	.0526	.0255-
.0276	4.37	.5326	.2664-	.0568-	.7970	.6748	.5069	.0700	.0316-
.0602	6.46	.7204	.2326-	.0621-	.7970	.6747	.6825	.1026	.0369-
.1167	8.57	.9269	.1745-	.0693-	.7995	.6764	.8766	.1599	.0440-
.1851	10.68	1.1355	.1040-	.0749-	.7980	.6759	1.0729	.2281	.0496-
.2691	12.78	1.3514	.0175-	.0844-	.7915	.6751	1.2767	.3116	.0592-
.3696	14.91	1.5736	.0860	.0944-	.7975	.6753	1.4867	.4123	.0692-
.4922	17.03	1.8068	.2120	.1034-	.7957	.6752	1.7079	.5348	.0782-
.6214	19.13	2.0205	.3451	.1139-	.7962	.6755	1.9098	.6642	.0886-
.7645	21.24	2.2158	.4925	.1213-	.7948	.6756	2.0934	.8074	.0961-
.9101	23.32	2.3803	.6427	.1157-	.7959	.6749	2.2468	.9526	.0905-
1.0081	25.32	2.3882	.7456	.0868-	.7971	.6747	2.2439	1.0505	.0616-
1.0879	27.30	2.3249	.8306	.0755-	.7976	.6753	2.1700	1.1306	.0503-
1.1986	29.32	2.3534	.9469	.0898-	.7978	.6754	2.1880	1.2413	.0646-
1.3189	31.32	2.3792	1.0731	.1528-	.7944	.6746	2.2039	1.3612	.1276-
1.4324	33.33	2.3816	1.1929	.2019-	.7977	.6752	2.1961	1.4750	.1766-
1.5028	35.29	2.3276	1.2699	.2426-	.7950	.6754	2.1325	1.5455	.2173-

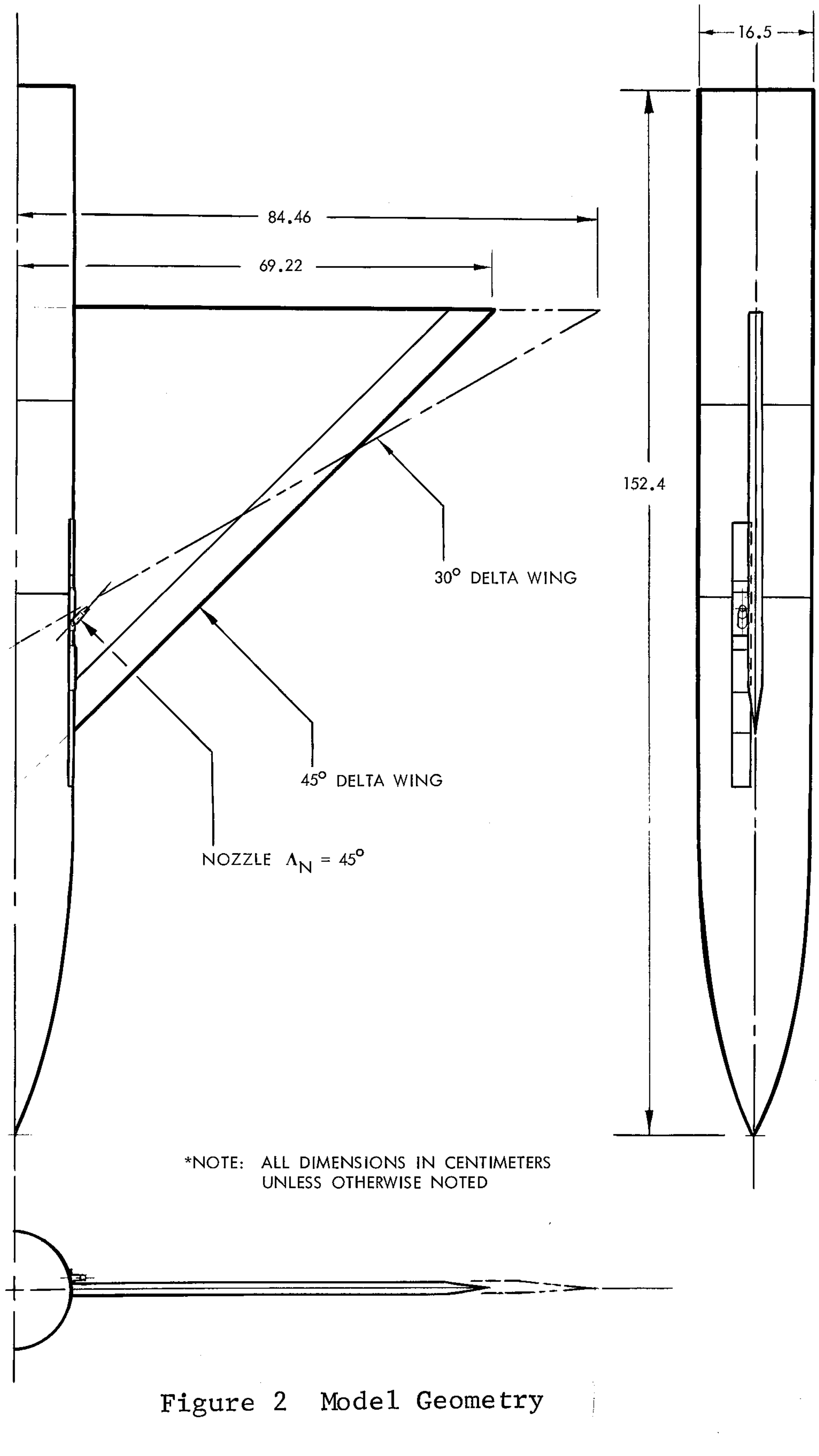
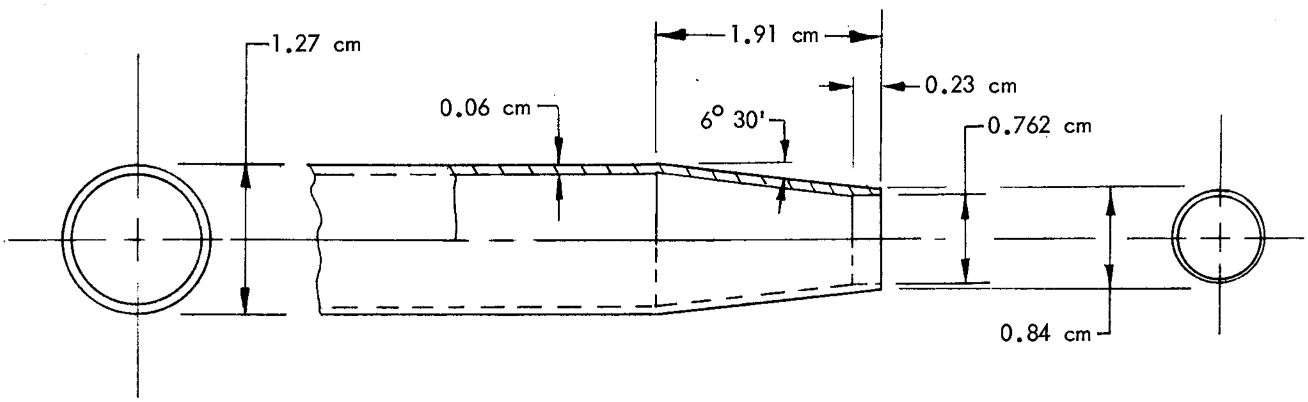
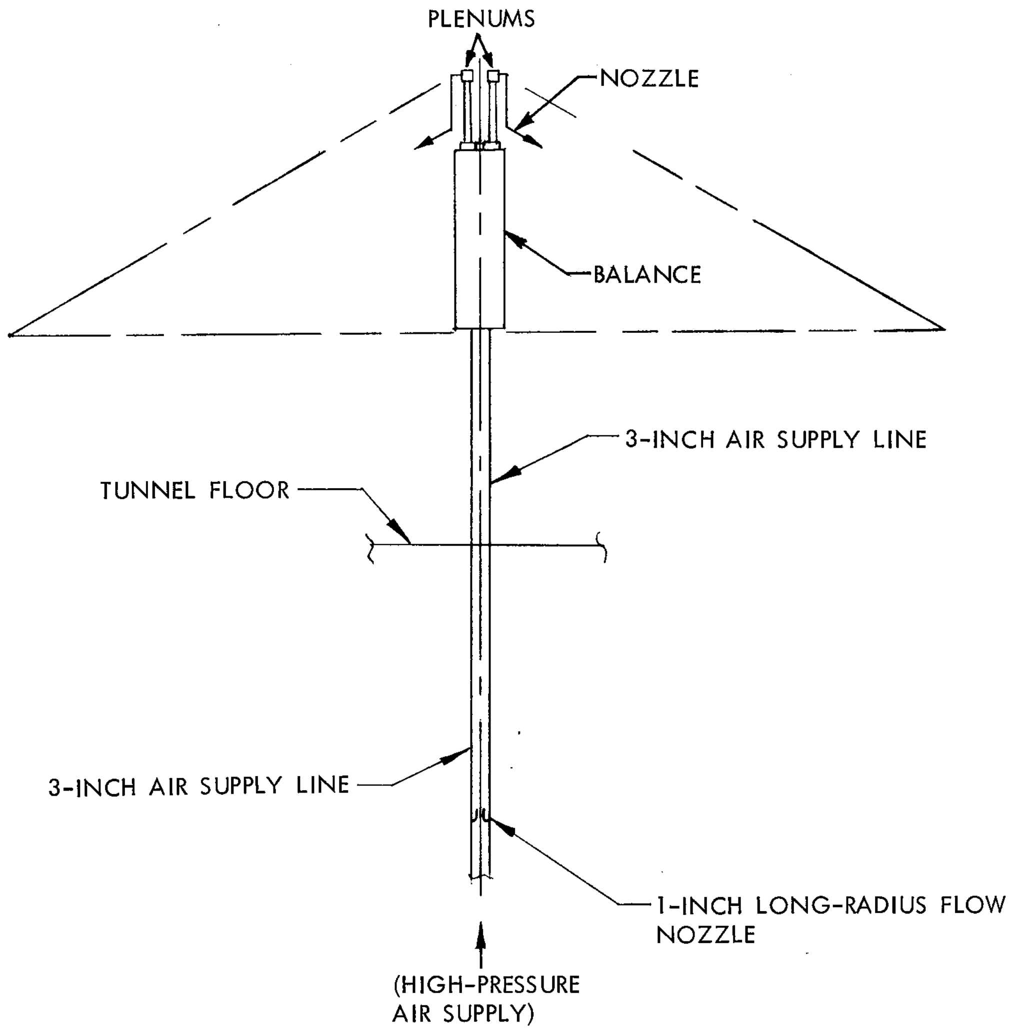


Figure 2 Model Geometry



(a) CONVERGENT NOZZLE DETAILS



(b) NOZZLE AIR SUPPLY SCHEMATIC

Figure 4 Air Supply Features

Luminescent-Oil Photographs

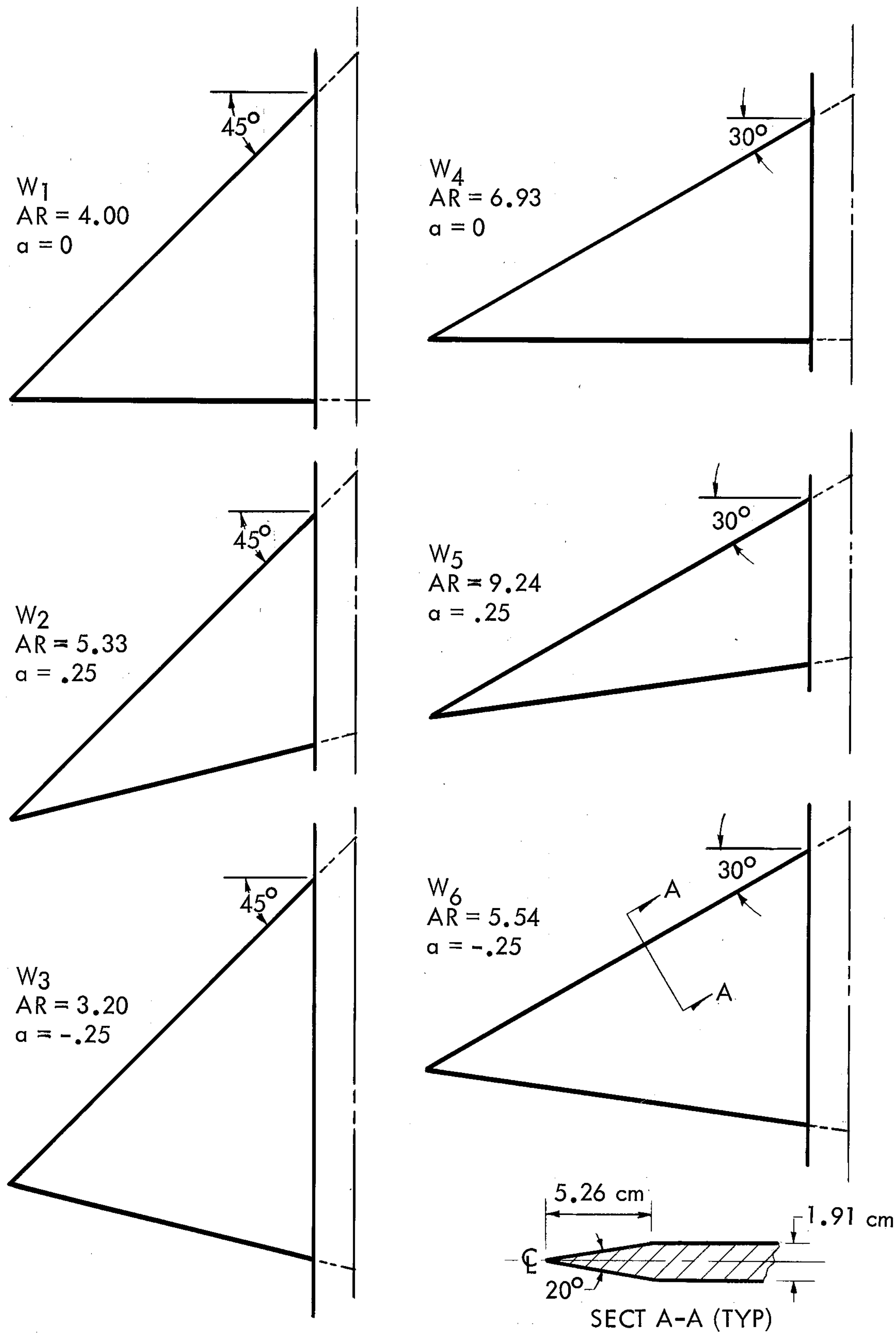


Figure 3 Wing Geometries

REFERENCES

1. Wentz, W. H., Jr.; and Kohlman, D. L.: Wind Tunnel Investigations of Vortex Breakdown on Slender Sharp-Edged Wings, NASA CR 98737, November 1968.

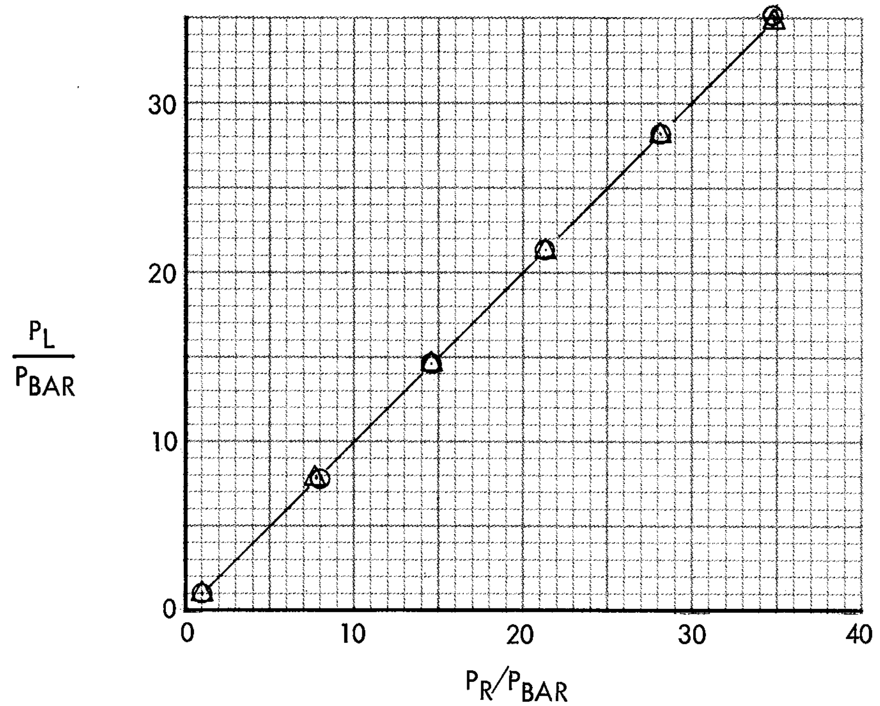
2. Polhamus, E. C.: Predictions of Vortex-Lift Characteristics by a Leading-Edge Suction Analogy, Journal of Aircraft, vol. 8, no. 4, April 1971, pp. 193-199.

3. Cornish, J. J., III: High Lift Applications of Spanwise Blowing, ICAS Paper No. 70-09, September 1970.

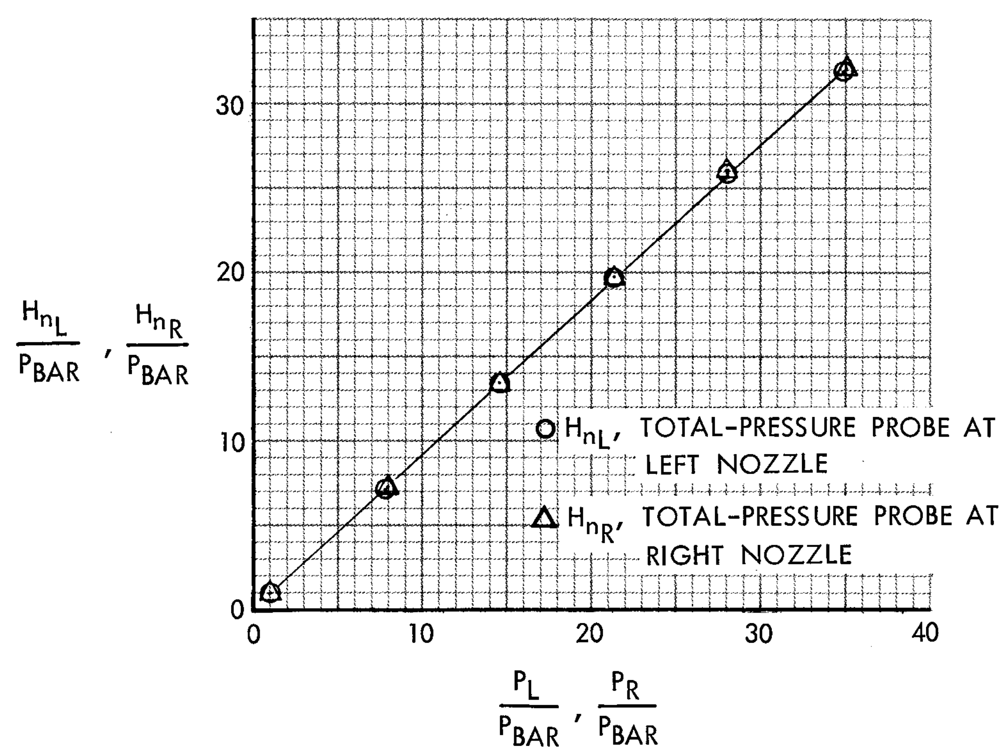
4. Werle, H.: On Vortex Bursting, Office National d'Etudes et de Recherches, Chatillon, France, Note Technique No. 175, 1971.

5. Bradley, R. G.; and Wray, W. O.: A Conceptual Study of Leading-Edge-Vortex Enhancement by Blowing, AIAA Paper No. 73-656, July 1973.

6. Bradley, R. G.; Smith, C. W.; and Bhateley, I. C.: Vortex Lift Prediction for Complex Planforms, Journal of Aircraft, vol. 10, no. 6, June 1973, pp. 379-381.



(a) LEFT AND RIGHT SIDE PLENUM PRESSURE CORRELATIONS



(b) PLENUM/NOZZLE-EXIT PRESSURE CALIBRATION

Figure 5 Nozzle Total-Pressure Calibrations