

SPACE SHUTTLE

**LOW SPEED STABILITY AND  
CONTROL CHARACTERISTICS OF  
THE NORTH AMERICAN ROCKWELL  
DELTA WING ORBITER -134D  
AND -134C CONFIGURATIONS**

**BY  
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NR LOW SPEED  
WIND TUNNEL

NORTH AMERICAN ROCKWELL

SADSAC SPACE SHUTTLE  
AEROTHERMODYNAMIC  
DATA MANAGEMENT SYSTEM

CONTRACT NAS8-4016  
AMENDMENT 149  
DRL 184-58  
MARSHALL SPACE FLIGHT CENTER



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SADSAC/SPACE SHUTTLE  
WIND TUNNEL TEST DATA REPORT

CONFIGURATION: NR - .00763 Scale Model Delta Wing Orbiter

TEST PURPOSE: Determine Low Speed Stability and Control Characteristics  
of -134D and -134C Configurations

TEST FACILITY: NR - Low Speed Wind Tunnel

TESTING AGENCY: NR

TEST NO. & DATE: NAAL - 633, November 4, 1970

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PROJECT ENGINEER(S): O. M. Sokolsky - NR  
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## ABSTRACT

Experimental aerodynamics investigations were conducted during November, 1970 on the North American Rockwell .00763 scale model delta wing orbiter (-134D and -134C configurations). These tests were run at the corporation's low speed wind tunnel at a Mach number of 0.26 ( $Re/L = 1.85 \times 10^6$ ) over an angle of attack range from  $0^\circ$  to  $40^\circ$  at zero degrees sideslip and from  $-5^\circ$  to  $10^\circ$  sideslip angle at  $0^\circ$ ,  $10^\circ$ ,  $20^\circ$ ,  $30^\circ$  and  $40^\circ$  angle of attack. Various combinations of elevons and elevon deflections and rudder deflections were tested. Plotted data are presented in the stability axis system for longitudinal results and in stability and body axis for lateral-directional results.

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## SUMMARY

Low speed longitudinal, directional and lateral static stability characteristics of the 0.00763 scale model delta wing orbiter (-134D and -134C configurations) were determined at a Mach number of 0.26 and a Reynolds number of  $1.85 \times 10^6$ /ft. in the NAAL 7.75 x 11 foot low speed wind tunnel during November, 1970. Primary test emphasis was on determining control effectiveness. Various elevons, elevon deflections and rudder deflections were tested over an angle of attack range from  $0^\circ$  to  $40^\circ$  at zero degrees sideslip. The basic configuration was also tested over a sideslip range from  $-5^\circ$  to  $+10^\circ$  at angle of attack of  $0^\circ$ ,  $10^\circ$ ,  $20^\circ$ ,  $30^\circ$  and  $40^\circ$ . Data are presented herein in the stability axis for longitudinal results and in the stability and body axis for lateral-directional results.



TABLE I SADSAC NOMENCLATURE FOR AERODYNAMIC COEFFICIENTS

COEFFICIENT	COEFFICIENT NAME	SADSAC NOMENCLATURE		
		BODY AXIS	STABILITY AXIS	WIND AXIS
CA	Total Axial Force	CA	-	-
CAB	Base Axial Force	CAB	--	-
CAF	Forebody Axial Force	CAF	-	-
CD	Total Drag Force	-	CD	CDTOTL
CDB	Base Drag Force	-	CDB	CDBASE
CDF	Forebody Drag Force	-	CDF	CDFORE
CL	Lift Force	-	CL	CL
CN	Normal Force	CN	-	-
CY	Side Force	CY	CY	CC
C <sub>l</sub>	Rolling Moment	CBL	CSL	CWL
C <sub>m</sub>	Pitching Moment	CLM	CLM	CPM
C <sub>n</sub>	Yawing Moment	CYN	CLN	CLN
L/D	Lift-To-Drag Force Ratio	-	L/D	CL/CD
L/D	Lift-To-Forebody Drag Force Ratio	-	L/DF	CL/CDF
N/A	Normal-To-Axial Force Ratio	N/A	-	-
N/A	Normal-To-Forebody Axial Force Ratio	CN/CAF	-	-

## CONFIGURATIONS INVESTIGATED

The following components were tested in various combinations during this test. Dimensional data for these components is given in tabular form in the section entitled Model Component Description Sheets. The dataset collations sheets which follow ( Page 7 ) show the various combinations of configurations investigated.

### MODEL COMPONENTS

- B<sub>4</sub> Basic delta wing orbiter fuselage contour including canopy and body-wing fairing. Model scale = 0.00763
- W<sub>8</sub> Delta wing with -5 deg. twist and clipped tips for twin vertical tail installation. Wing blended into body. Follows NR lines 9992-134B. Model scale = 0.00763
- W<sub>16</sub> Delta wing with -5° twist and rounded wing tips. Wing blends into body. Follows NR lines 9992-134D. Model scale = 0.00763. Span 93% of theoretical delta wing span
- E<sub>4</sub> Full span, swept hingeline elevon located on delta wing W<sub>8</sub>. Model scale = 0.00763
- E<sub>7</sub> Full span, constant chord elevon located on wing W<sub>16</sub>. Deflection noted as left side/right side. Model scale = 0.00763
- E<sub>8</sub> Outboard, constant chord, split elevon located on wing W<sub>16</sub>. Deflection noted as upper surface/lower surface. Model scale = 0.00763
- E<sub>9</sub> Inboard, constant chord elevon located on wing W<sub>16</sub>. Model scale = 0.00763
- V<sub>10</sub> Twin vertical tail mounted outboard of the wing tip chord at 1.82° toe-out, 20° outboard cant angle. Model scale = 0.00763
- V<sub>23</sub> Centerline vertical on delta wing configuration with double wedge airfoil and rounded leading edge. Model scale = 0.00763
- V<sub>24</sub> Centerline vertical on delta wing configuration with 10° wedge airfoil, with leading edge radius and blunt trailing edge. Same planform as vertical tail V<sub>23</sub>. Model scale = 0.00763

CONFIGURATIONS INVESTIGATED  
(Continued)

- V<sub>25</sub> Same as V<sub>24</sub> except entire vertical tail is movable. Model scale = 0.00763
- R<sub>3</sub> Rudder panel of twin vertical tail V<sub>10</sub> on delta wing orbitér. Model scale = 0.00763
- R<sub>7</sub> Rudder used with centerline vertical tail V<sub>23</sub>, sharp trailing edge. Model scale = 0.00763.
- R<sub>8</sub> Rudder used with centerline vertical tail V<sub>24</sub>. Same side panels as rudder R<sub>7</sub>, except drag brake deflected. Model scale = 0.00763
- J Drag brake J is the deflectable side panels of vertical tail V<sub>24</sub> hinged at the 60% element line and extending to the trailing edge. Deflections of J change the vertical tail projected planform. Model scale = 0.00763
- t<sub>r2</sub> Transition Grit
- t<sub>r3</sub> Transition Grit

TEST NAAL 633 DATA SET COLLATION SHEET

PRETEST  
 POSTTEST

Upper/ Left/  
 Lower Right

DATA SET IDENTIFIER	CONFIGURATION	SCHD.		PARAMETERS/VALUES			NO. of RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE)													
		$\alpha$	$\beta$	$\delta E_8$	$\delta E_7$	$\delta E_9$		.26													
RCJ 001	B4W16	A	0°	-	-	-		1													
002		0°	C	-	-	-		2													
003		10°		-	-	-		3													
004		20°		-	-	-		4													
005		30°		-	-	-		5													
006	Y	40°	Y	-	-	-		6													
007	B4W16V23	A	0°	-	-	-		7													
008		0°	C	-	-	-		8													
009		10°		-	-	-		9													
010		20°		-	-	-		10													
011		30°		-	-	-		11													
012	Y	40°	Y	-	-	-		12													
013	B4W16E8V23	A	0°	-10°/4.5°	-	-		13													
014	Y			-20°/4.10°	-	-		14													
015	B4W16E8E7V23			-20°/4.10°	-5°	-		15													
016	B4W16E8E9V23			-20°/4.10°	-	-5°		16													
017	Y			-20°/4.10°	-	-10°		17													
018	B4W16E7V23			-10°/4.10°	-	-		18													
019				-20°/4.20°	-	-		19													
Y 020	Y	Y	Y	-5°/4.5°	-	-		20													

1      7      13      19      25      31      37      43      49      55      61      67      75 76

CL    CDF    CLM    CN    CAF    CLN    CSL    CY    CLM/CN,L/D

COEFFICIENTS:  $\alpha$  (A) = 0,2,4,6,8,10,12,14,16,18,20,24,28,32,36,40 IDPVAR(1) IDPVAR(2) NDV  
 $\alpha$  (B) = 0,2,4,6,8,10,12,14,16,18,20  
 SCHEDULES  $\beta$  (C) = -5,-4,-3,-2,-1,0,+1,2,3,4,5,6,8,10

Left/  
Right

PRETEST  
 POSTTEST

DATA SET IDENTIFIER	CONFIGURATION	SCHD.		PARAMETERS/VALUES				NO. of RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE)																
		$\alpha$	$\beta$	$\delta R$	$\delta V$	$\delta E7$	$\delta J$		.26																
RCJ 021	B4W16E7V23	A	0°	—	—	-5%	0°		21																
022				—	—	-10%	0°		22																
023				—	—	-20%	0°		23																
024				—	—	+5%	0°		24																
025				—	—	+10%	0°		25																
026	Y			—	—	+20%	0°		26																
027	B4W16V23R7			-10°	—	—			27																
028				-20°	—	—			28																
029	Y			-30°	—	—			29																
030	B4W16V23			—	—	—			30																
031	B4W16V24			—	—	—			31																
032	B4W16V24J			—	—	—	15°		32																
033	B4W16V25J			—	-10°	—			33																
034				—	-20°	—			34																
035	Y			—	-30°	—			35																
036	B4W16V24R8J			-10°	—	—			36																
037				-20°	—	—			37																
038	Y			-30°	—	—	Y		38																
039	B4W16V24J	Y		—	—	—	30°		39																
Y 040	B4tz3W16tr3V23tr3	B	Y	—	—	—			40																

1      7      13      19      25      31      37      43      49      55      61      67      75 76

COEFFICIENTS:  $\alpha$  (A) = 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 24, 28, 32, 36, 40  $\rightarrow$  IDPVAR(1) IDPVAR(2) NDV  
 $\alpha$  or  $\beta$   $\alpha$  (B) = 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20  
 SCHEDULES  $\beta$  (C) = -5, -4, -3, -2, -1, 0, +1, 2, 3, 4, 5, 6, 8, 10

TEST NAAL 633 DATA SET COLLATION SHEET

PRETEST  
 POSTTEST

DATA SET IDENTIFIER	CONFIGURATION	SCHD.		L.H. R.H. PARAMETERS/VALUES			NO. of RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE)												
		$\alpha$	$\beta$	$\delta E_L$	$\delta E_R$	$\delta R$		.26												
RCJ 041	B4tr3W16tr3V23tr3	B	0°	-	-	-		41												
042	B4tr2W16tr2V23tr2			-	-	-		42												
043	↓			-	-	-		43												
044	B4tr2W8tr2V10tr2			-	-	-		44												
045	B4tr3W8tr3V10tr3			-	-	-		45												
046	B4W8V10	Y		-	-	-		46												
047	B4W8E4V10	A		-15°	+15°	-		47												
048	↓			-5°	+5°	-		48												
049	↓			-5°	+5°	-		49												
050	↓			-5°	-5°	-		50												
051	B4W8E4V10R3			-5°	-5°	-10°		51												
052	↓			+15°	-15°	-10°		52												
053	B4W8E4V10			+15°	-15°	-		53												
054	↓			-15°	-15°	-		54												
055	↓			-15°	+15°	-		55												
↓ 056	↓	↓	↓	-30°	-30°	-		56												

1      7      13      19      25      31      37      43      49      55      61      67      75 76

COEFFICIENTS:  $\alpha$  (A) = 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 24, 28, 32, 36, 40  
 $\alpha$  (B) = 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20  
 SCHEDULES  $\beta$  (C) = -5, -4, -3, -2, -1, 0, +1, 2, 3, 4, 5, 6, 8, 10

## TEST FACILITY DESCRIPTION

The North American Rockwell Aerodynamics Laboratory (NAAL) 7.75 x 11 foot Wind Tunnel (located at the International Airport, Los Angeles, California) is a continuous flow, closed circuit single return type tunnel, capable of speeds up to 220 miles per hour. The test section is vented to atmospheric pressure and is 7.75 feet high by 11 feet wide by 12 feet in length. Power is supplied by a 1250 horsepower nacelle mounted synchronous motor driving a 19 foot seven blade laminated birch propeller. The airspeed is controlled by varying the degree of coupling between the motor and propeller by means of a magnetic clutch. A damping screen and honeycomb section have been installed in the settling chamber upstream from the contraction cone (ratio 7.53 to 1) to minimize turbulence in the test section. The NAAL Wind Tunnel has been in operation since June 1943 and calibrations are available over a wide range of test conditions.

Tests may be conducted using a variety of mounting systems, e.g., a single strut, double strut, sting strut, reflection plane, cable suspension, and two dimensional wall. Aerodynamic data may be measured by a planar type external balance system or sting mounted internal balances. Instrumentation is available for recording 24 channels of force data on strip chart recorders and for photographically recording multiple pressures on manometer boards. These data are rapidly reduced and plotted by automatic data processing equipment. Additional information about this facility is presented in the Users Manual for the North American Aviation, Inc., NAAL 7.75 x 11 foot Wind Tunnel (NA-60-1346).





## DATA REDUCTION

The aerodynamic forces and moments measured by the internal strain gage balance have been reduced to coefficient form utilizing the following reference values:

$$S_{REF} = \text{wing } (W_9) \text{ planform area} = .3542 \text{ ft}^2$$

$$l_{REF} = \text{wing } (W_9) \text{ mean aerodynamic chord, } \bar{c} = 6.266 \text{ inches}$$

$$b_{REF} = \text{wing } (W_9) \text{ span} = 10.856 \text{ inches}$$

Moments are about a reference c.g. location which is:

Fus. Sta.	10.854
Water Line	0.992
Butt Line	0.0

The initial measured data were referenced to the body axis system. Dynamic pressures were corrected for blockage effects due to the models. Measured axial force data were corrected for balance chamber, base pressures, and sting cavity pressures. Normal force data were corrected for sting effects and sting exit area and the pitching moment data were corrected as a function of normal force correction. The above corrected body axis data were then transferred to the stability axis system and corrected for wall interference and tunnel blockage effects. Wind tunnel wall interference corrections were applied to angle of attack,  $C_D$ , and  $C_{LM}$ , and final body axis data were computed from the corrected stability axis data. Lift to drag ratios ( $L/D$ ) herein are based on uncorrected drag values.

SUMMARY DATA PLOT INDEX

TITLE	PLOTTED COEFFICIENTS SCHEDULE	CONDITIONS VARYING	PAGES
Effect of Angle of Attack on B <sub>4</sub> W <sub>16</sub> Configuration	(A)	Angle of Attack	1-5
Effect of Angle of Attack on B <sub>4</sub> W <sub>16</sub> V <sub>23</sub> Configuration	(A)	Angle of Attack	6-10
Split Elevon Effectiveness, L. H. Outboard Only	(B)	ELVN8U ELVN8L	11-18
Combination Split and Regular Elevon, L. H. Side Only	(B)	ELVN8U ELVN8L ELVN9	19-26
Effect of Centerline Vert. Tail Config. With Drag Brake Deflection in Pitch	(C)	SPD BK	27-32
Elevator Effectiveness	(D)	Elevon Deflection	33-37
Aileron Effectiveness, L. H. Side Only	(E)	ELVN7L	38-47
Rudder Effectiveness, B <sub>4</sub> W <sub>16</sub> V <sub>23</sub> R <sub>7</sub> Con- figuration	(E)	Rudder	48-52
Rudder Effectiveness, B <sub>4</sub> W <sub>16</sub> V <sub>24</sub> R <sub>8</sub> J Configuration	(E)	Rudder	53-57
Vertical Tail Effectiveness, B <sub>4</sub> W <sub>16</sub> V <sub>25</sub> J Configuration	(E)	Vertical Tail	58-62
Effect of Grit Size on B <sub>4</sub> W <sub>16</sub> V <sub>23</sub>	(D)	Grit Size	63-67
Effect of Grit Size on B <sub>4</sub> W <sub>8</sub> V <sub>10</sub>	(D)	Grit Size	68-72
Aileron Effectiveness, B <sub>4</sub> W <sub>8</sub> V <sub>10</sub> EL <sub>4</sub> Configuration	(E)	ELVN <sup>4</sup> L ELVN <sup>4</sup> R	73-77

SUMMARY DATA PLOT INDEX  
(Continued)

TITLE	PLOTTED COEFFICIENTS SCHEDULE	CONDITIONS VARYING	PAGES
Rudder Effectiveness, B <sub>4</sub> W <sub>8</sub> V <sub>10</sub> E <sub>4</sub> R <sub>3</sub> Configuration	(E)	ELVN <sup>4</sup> L, ELVN <sup>4</sup> R Rudder	78-82
Elevon Effectiveness, B <sub>4</sub> W <sub>8</sub> V <sub>10</sub> E <sub>4</sub> Configuration	(D)	ELVN <sup>4</sup> L ELVN <sup>4</sup> R	83-87

PLOTTED COEFFICIENTS SCHEDULE:

- (A) CSL, CLN, CY, CBL, CYN vs. Beta
- (B) CL, CSL, CLN, CY, CBL, CYN vs. Alpha  
CL vs. CIM, CL vs. CDF
- (C) CL, CDF, L/D vs. Alpha  
CL vs. CIM, CL vs. CDF, CL vs. L/D
- (D) CL, L/D vs. Alpha  
CL vs. CIM, CL vs. CDF, CL vs. L/D
- (E) CSL, CLN, CY, CBL, CYN vs. Alpha

FIGURES

Notes:

1. Positive directions of force coefficients, moment coefficients, and angles are indicated by arrows.
2. For clarity, origins of wind and stability axes have been displaced from the center of gravity.

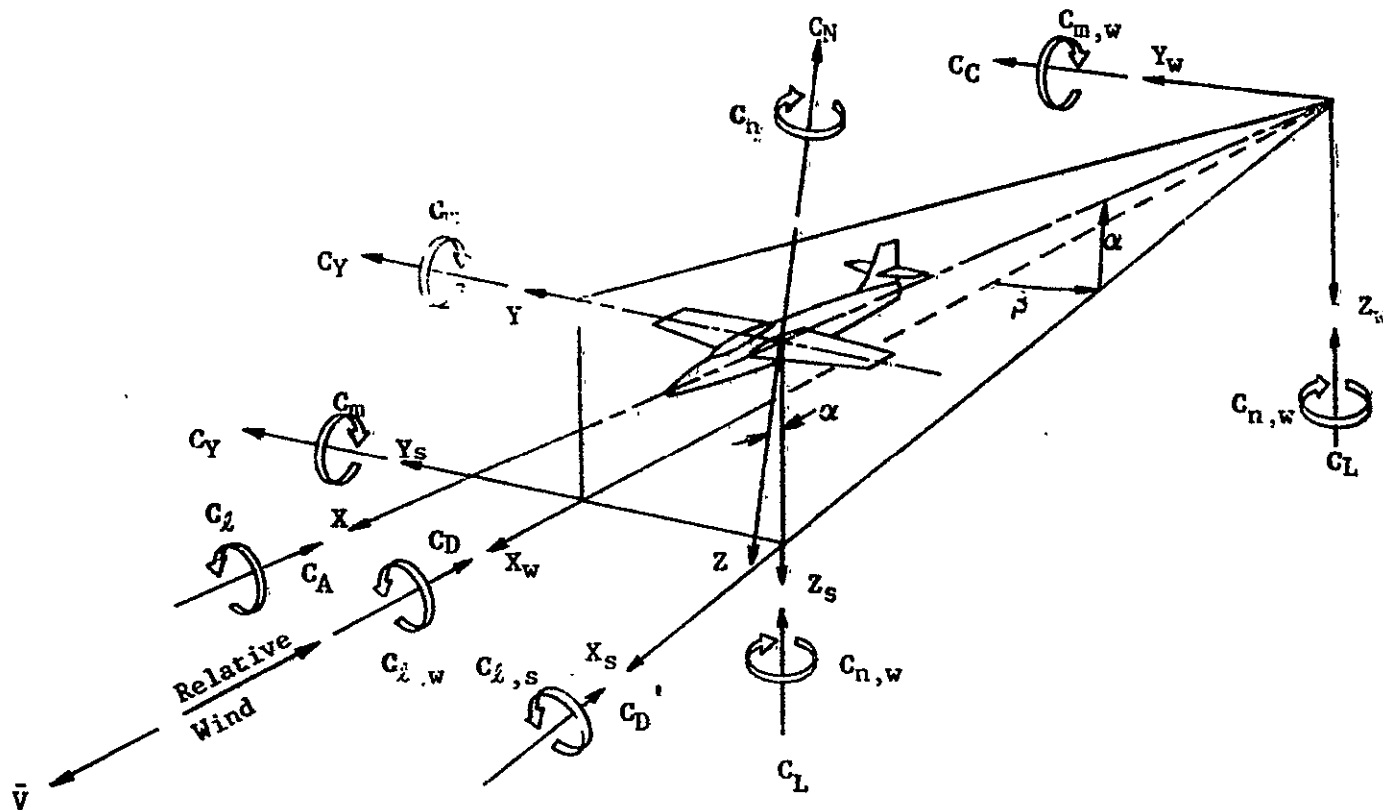
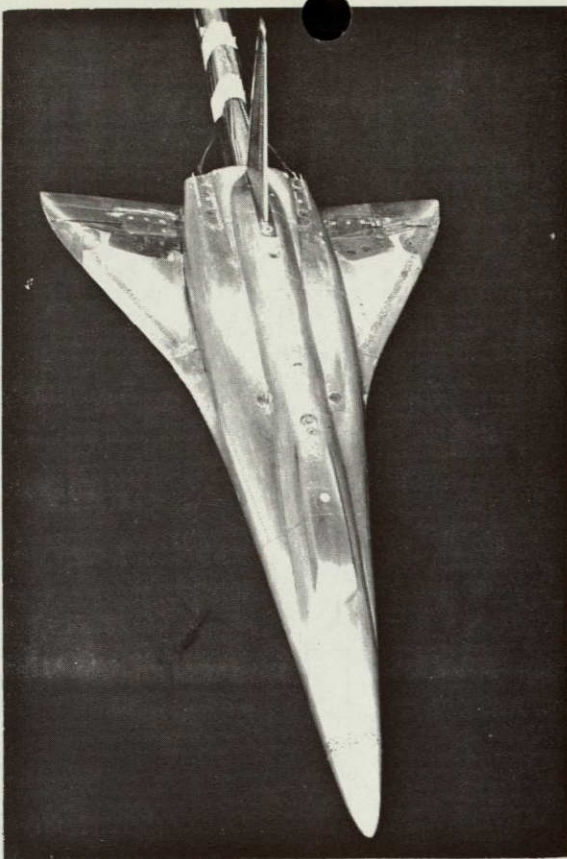
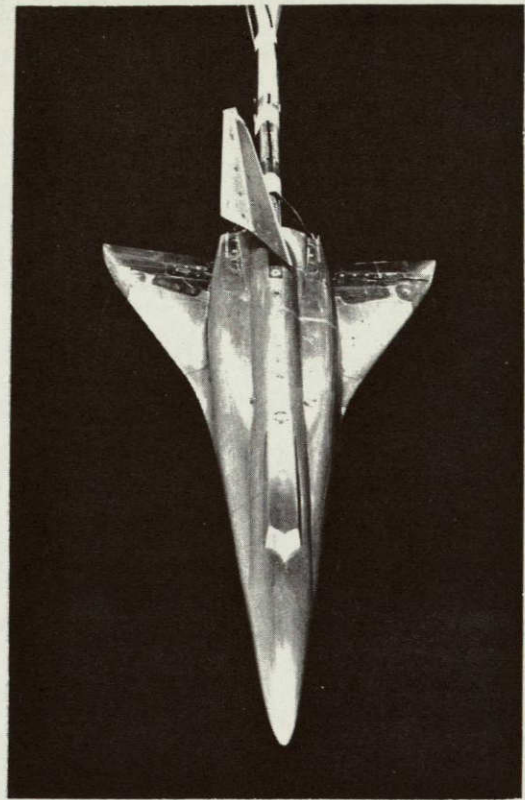


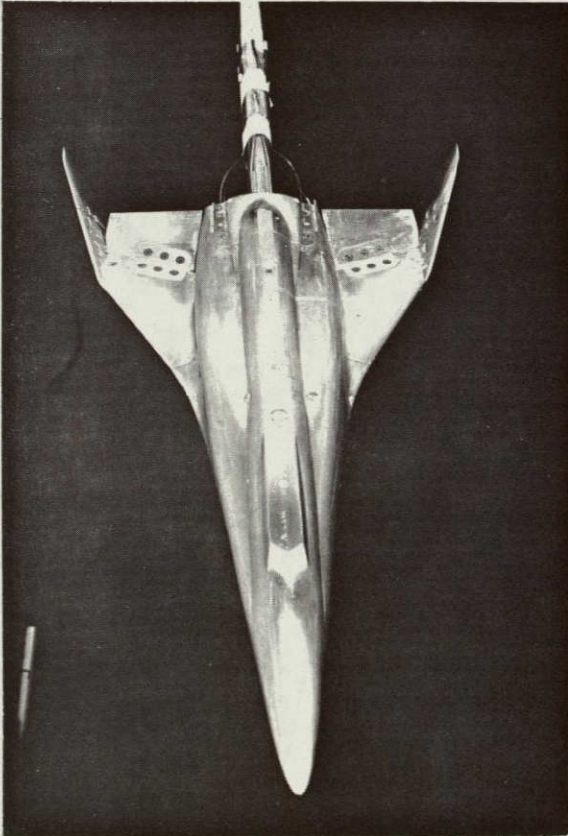
Figure 1. Axis systems, showing direction and sense of force and moment coefficients, angle of attack, and sideslip angle



a) B<sub>4</sub> W<sub>16</sub> V<sub>23</sub>



b) B<sub>4</sub> W<sub>16</sub> V<sub>25</sub> J



c) B<sub>4</sub> W<sub>8</sub> E<sub>4</sub> V<sub>10</sub>



d) B<sub>4</sub> W<sub>16</sub> E<sub>8</sub> V<sub>23</sub>

FIGURE 2. MODEL PHOTOGRAPHS



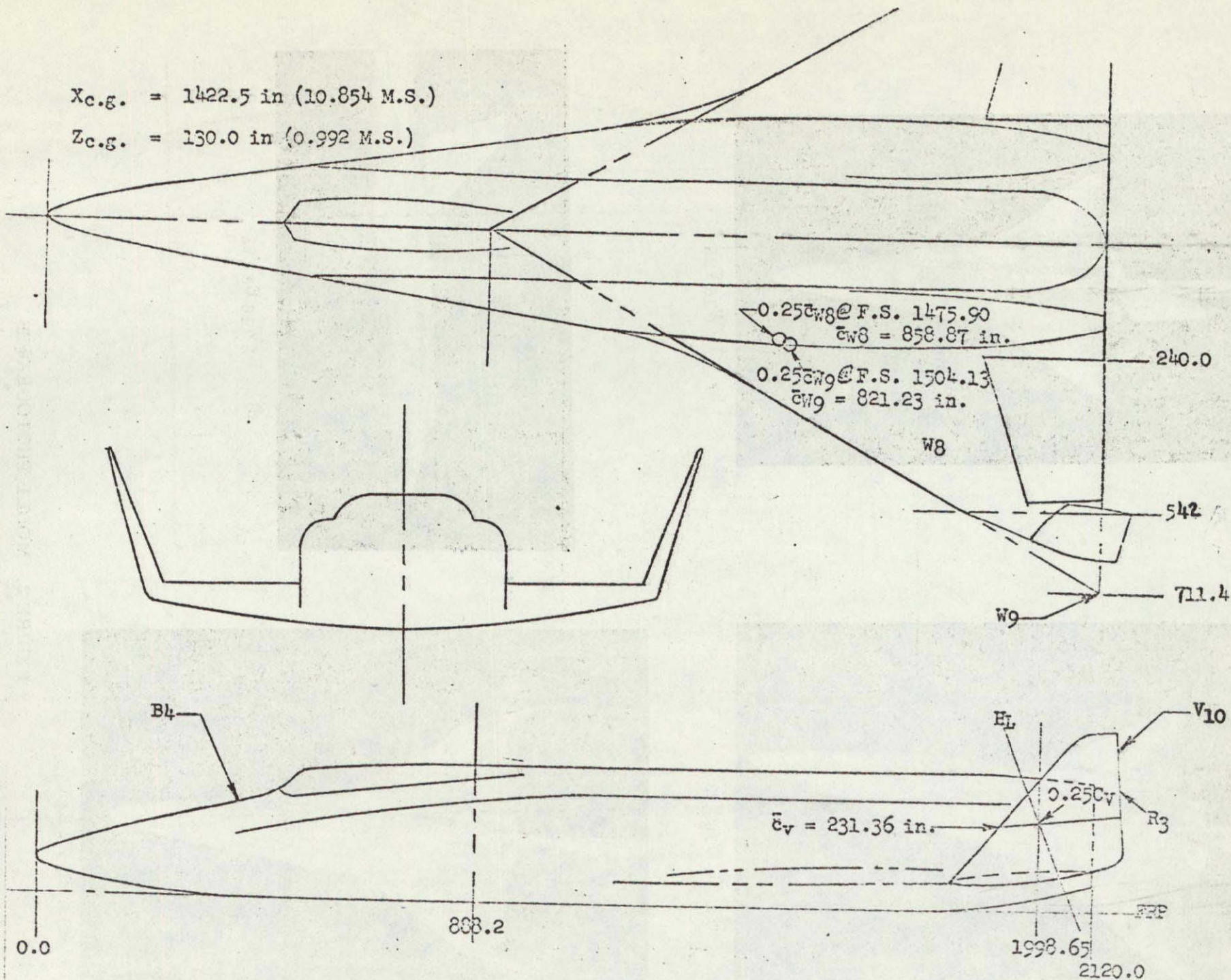


FIGURE 3. DELTA WING ORBITER WITH TWIN TAILS

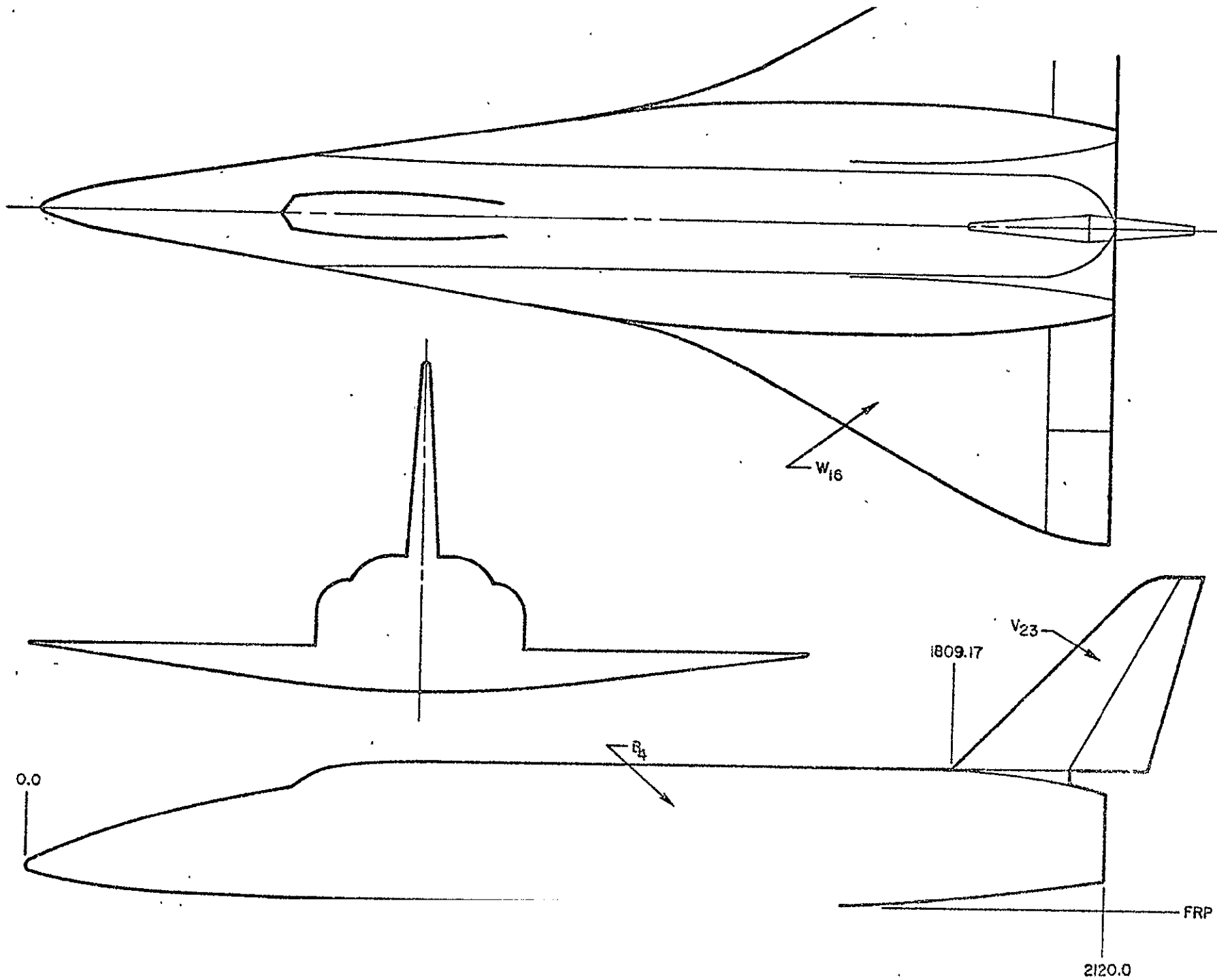


FIGURE 4. DELTA WING ORBITER WITH CENTERLINE VERTICAL TAIL



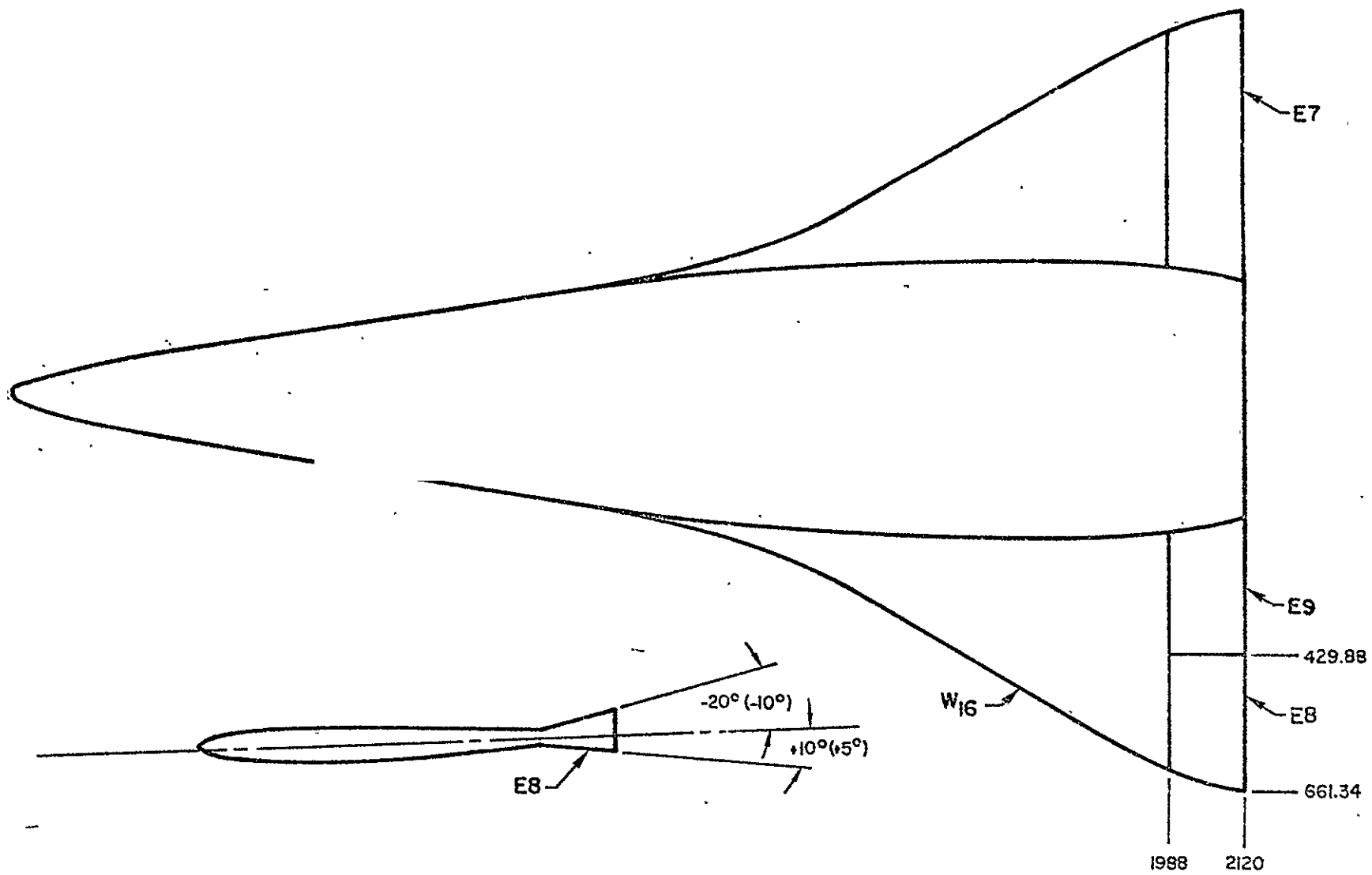


FIGURE 5. ELEVONS USED WITH WING W16

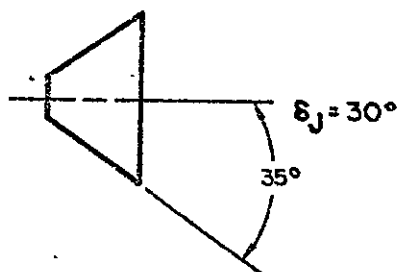
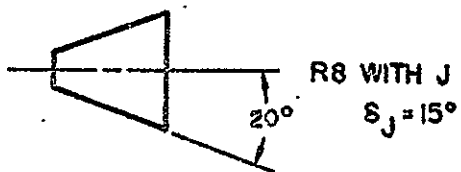
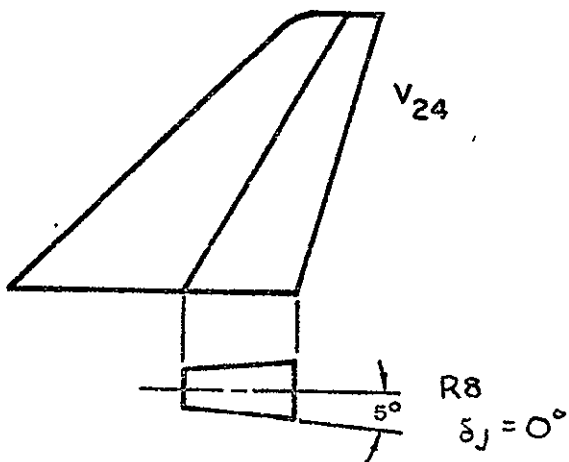
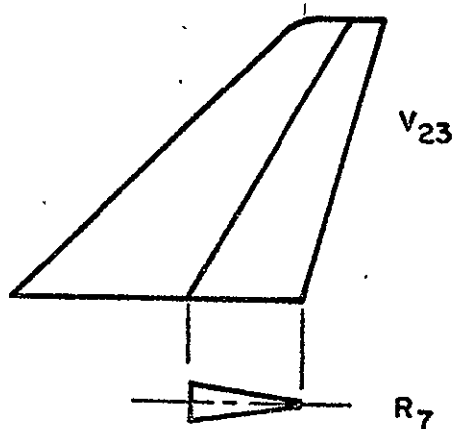


FIGURE 6. TRAILING EDGES OF VERTICAL TAILS AND RUDDERS

MODEL COMPONENT DESCRIPTION SHEETS

MODEL COMPONENT: BODY - B4

GENERAL DESCRIPTION: Basic delta wing orbiter fuselage contour including canopy and body-wing pairing.

Model scale = 0.00763

DRAWING NUMBER: S-828; Lines 9992-129

<u>DIMENSIONS:</u>	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Length, in.	<u>2120.00</u>	<u>16.176</u>
Max. Width, in.	<u>465.27</u>	<u>3.550</u>
Max. Depth, in.	<u>271.95</u>	<u>2.075</u>
Fineness Ratio*	<u>6.181</u>	<u>6.181</u>
Area, ft. <sup>2</sup>		
Max. Cross-Sectional	<u>641.65</u>	<u>0.03735</u>
Planform	<u>DNA</u>	<u>DNA</u>
Wetted	<u>DNA</u>	<u>DNA</u>
Base	<u>DNA</u>	<u>DNA</u>

MODEL COMPONENT: Wing W8

GENERAL DESCRIPTION: Delta Wing with -5 deg. twist and clipped tips for  
twin vertical tail installation. Wing blended into body. Follows

NR lines 9992-134B.

Model Scale = 0.00763

DRAWING NUMBER: S-877-4, -5, -6, -7

DIMENSIONS: FULL-SCALE MODEL SCALE

TOTAL DATA

Area, ft <sup>2</sup>		
Planform	<u>5740.</u>	<u>0.334</u>
Wetted		
Span (equivalent), in.	<u>1084.00</u>	<u>8.27</u>
Aspect Ratio	<u>1.411</u>	<u>1.411</u>
Rate of Taper	<u>1.719</u>	<u>1.719</u>
Taper Ratio	<u>0.238</u>	<u>0.238</u>
Dihedral Angle, degrees	<u>7.0</u>	<u>7.0</u>
Incidence Angle, degrees	<u>0.0</u>	<u>0.0</u>
Aerodynamic Twist, degrees (about T.E.)	<u>-5.0</u>	<u>-5.0</u>
Incidence, Root (B.P. 240.00)	<u>0.0</u>	<u>0.0</u>
Incidence, Tip (B.P. 542.00)	<u>-5.0</u>	<u>-5.0</u>
Sweep Back Angles, degrees		
Leading Edge	<u>60.0</u>	<u>60.0</u>
Trailing Edge	<u>0.0</u>	<u>0.0</u>
0.25 Element Line	<u>52.20</u>	<u>52.20</u>
Chords: in.		
Root (Wing Sta. 0.0)	<u>1231.85</u>	<u>9.399</u>
Tip, (equivalent)(W.S. 546.01)	<u>293.44</u>	<u>2.239</u>
MAC (W.S. 217.02)	<u>858.87</u>	<u>6.553</u>
Fus. Sta. of .25 MAC	<u>1475.90</u>	<u>11.261</u>
W.P. of .25 MAC	<u>63.83</u>	<u>0.487</u>
B.L. of .25 MAC	<u>215.40</u>	<u>1.644</u>
Airfoil Section		
Root (Wing Sta. 241.77)	<u>NACA 0009-64</u>	
Tip (Wing Sta. 546.01)	<u>NACA 0012-64</u>	

EXPOSED DATA

Area, ft <sup>2</sup>	<u>2526.</u>	<u>0.147</u>
Span, (equivalent), in.	<u>638.41</u>	<u>4.871</u>
Aspect Ratio	<u>1.112</u>	<u>1.112</u>
Taper Ratio	<u>0.347</u>	<u>0.347</u>
Chords: in.		
Root, (Equiv.) (W.S. 224.41)	<u>846.17</u>	<u>6.456</u>
Tip, (Equiv.) (W.S. 546.01)	<u>293.44</u>	<u>2.239</u>
MAC (W.S. 359.21)	<u>614.48</u>	<u>4.689</u>
Fus. Sta. of .25 MAC	<u>1659.19</u>	<u>12.660</u>
W.P. of .25 MAC	<u>81.15</u>	<u>0.619</u>
B.L. of .25 MAC	<u>356.53</u>	<u>2.720</u>
<u>LEADING EDGE CUFF</u>		
Planform Area, ft <sup>2</sup>	<u>53.39</u>	<u>0.00311</u>
Leading edge intersects Fus.M. @ Sta., in.	<u>1019.27</u>	<u>7.777</u>
Leading edge intersects wing L.E. @ Sta., in.	<u>1425.29</u>	<u>10.875</u>

MODEL COMPONENT: Wing - W16

GENERAL DESCRIPTION: Delta wing with -5° twist and rounded wing tips. Wing blends into body. Follows NR lines 9992-134D

Model Scale = 0.00763 Span 93% of theoretical delta wing span.

DRAWING NUMBER: S-877-4, -5; S-888-9, -10

DIMENSIONS: FULL-SCALE MODEL SCALE

TOTAL DATA

Area ft <sup>2</sup>		
Planform	6020.	0.35050
Wetted		
Span (equivalent), in.	1275.61	9.733
Aspect Ratio	1.863	1.863
Rate of Taper	1.719	1.719
Taper Ratio	0.103	0.103
Diehedral Angle, degrees	7.000	7.000
Incidence Angle, degrees	0.000	0.000
Aerodynamic Twist, degrees (about T.E.)	-5.000	-5.000
Incidence, Root (B.P. 240.00)	0.000	0.000
Incidence, Tip (B.P. 542.00)	-5.000	-5.000
Sweep Back Angles, degrees.		
Leading Edge	60.00	60.00
Trailing Edge	0.000	0.000
0.25 Element Line	52.20	52.20
Chords: in.		
Root (Wing Sta. 0.0)	1231.85	9.399
Tip, (equivalent) (W.S. 642.60)	127.44	0.972
MAC (W.S. 234.28)	829.20	6.327
Fus. Sta. of .25 MAC	1498.15	11.431
W.P. of .25 MAC	65.93	0.503
B.L. of .25 MAC	232.53	1.774
Airfoil Section		
Root (Wing Sta. 241.77)	NACA 0009-64	NACA 0009-64
Tip (Wing Sta. 546.01)	NACA 00012-64	NACA 0012-64

EXPOSED DATA

Area, ft <sup>2</sup>	2806.0	0.16335
Span, (equivalent), in.	830.14	6.334
Aspect Ratio	1.693	1.693
Taper Ratio	0.151	0.151
Chords: in.		
Root (Equiv.) (W.S. 224.41)	846.17	6.456
Tip (Equiv.) (W.S. 642.60)	127.44	0.972
MAC (W.S. 382.05)	575.23	4.389
Fus. Sta. of .25 MAC	1688.63	12.884
W.P. of .25 MAC	83.94	0.640
B.L. of .25 MAC	379.20	2.893

Leading Edge Cuff

Planform Area, ft <sup>2</sup>	53.39	0.00311
Leading edge intersects Fus. M. Sta., in.	1019.27	7.777
Leading edge intersects wing L.E. Sta., in.	1425.29	10.875

MODEL COMPONENT: ELEVON - E4 (Data for one of two sides)

GENERAL DESCRIPTION: Full span, swept hingeline elevon located on delta wing W8.

Model Scale = 0.00763

DRAWING NUMBER: S-877-4, -5; Lines 9992-1343

DIMENSIONS:

	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area (true), ft <sup>2</sup>	<u>422.74</u>	<u>0.02461</u>
Span (equivalent), in.	<u>302.73</u>	<u>2.310</u>
Inb'd equivalent chord, in. (W.S. 223.92)	<u>250.38</u>	<u>1.910</u>
Outb'd equivalent chord, in. (W.S. 526.65)	<u>151.78</u>	<u>1.158</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>0.296</u>	<u>0.296</u>
At Outb'd equiv. chord	<u>0.465</u>	<u>0.465</u>
Sweep Back Angles, degrees		
Leading Edge	<u>18.041</u>	<u>18.041</u>
Tailing Edge	<u>0.000</u>	<u>0.000</u>
Hingeline	<u>18.041</u>	<u>18.041</u>
Area Moment (Normal to hinge line), ft <sup>3</sup> (Product of area and mean chord)	<u>7302.70</u>	<u>0.00324</u>

MODEL COMPONENT: ELEVON - E7 (Data for one of two sides)

GENERAL DESCRIPTION: Full span, constant chord elevon located on wing

W16. Deflection noted as left side/ right side.

Model scale = 0.00763

DRAWING NUMBER: S-888-6, -7, -8

DIMENSIONS:

	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area, (true), ft <sup>2</sup>	<u>392.83</u>	<u>0.02287</u>
Span (equivalent), in.	<u>428.61</u>	<u>3.270</u>
Inb'd equivalent chord, in. (W.S. 220.14)	<u>132.00</u>	<u>1.007</u>
Outb'd equivalent chord, in. (W.S. 648.75)	<u>132.00</u>	<u>1.007</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>0.155</u>	<u>0.155</u>
At Outb'd equiv. chord	<u>1.129</u>	<u>1.129</u>
Sweep Back Angles, degrees		
Leading Edge	<u>0.000</u>	<u>0.000</u>
Tailing Edge	<u>0.000</u>	<u>0.000</u>
Hingeline	<u>0.000</u>	<u>0.000</u>
Area Moment (Normal to hinge line) ft <sup>3</sup> (Product of area and mean chord)	<u>4320.43</u>	<u>0.00192</u>



MODEL COMPONENT: ELEVON - E8 (Data for left side only)

GENERAL DESCRIPTION: Outboard, constant chord, split elevon located on wing W16. Deflection noted as upper surface/ lower surface.

Model scale = 0.00763

DRAWING NUMBER: S-888-30 or -31

<u>DIMENSIONS:</u>	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area(true), ft <sup>2</sup>	<u>197.64</u>	<u>0.01151</u>
Span (equivalent), in.	<u>215.64</u>	<u>1.645</u>
Inb'd equivalent chord, in. (W.S. 433.11)	<u>132.00</u>	<u>1.007</u>
Outb'd equivalent chord, in. (W.S. 648.75)	<u>132.00</u>	<u>1.007</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>0.271</u>	<u>0.271</u>
At Outb'd equiv. chord	<u>1.129</u>	<u>1.129</u>
Sweep Back Angles, degrees		
Leading Edge	<u>0.000</u>	<u>0.000</u>
Trailing Edge	<u>0.000</u>	<u>0.000</u>
Hingeline	<u>0.000</u>	<u>0.000</u>
Area Moment (Normal to hinge line), ft <sup>3</sup> (Product of area and mean chord)	<u>2173.71</u>	<u>0.00097</u>

MODEL COMPONENT: ELEVON - E9 (Data for left side only)

GENERAL DESCRIPTION: Inboard, constant chord elevon located on wing WL6.

Model Scale = 0.00763

DRAWING NUMBER: S-888-7

DIMENSIONS:

	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area (true), ft <sup>2</sup>	<u>195.19</u>	<u>0.01136</u>
Span (equivalent), in.	<u>212.97</u>	<u>1.625</u>
Inb'd equivalent chord, in. (W.S. 220.14)	<u>132.00</u>	<u>1.007</u>
Outb'd equivalent chord, in. (W.S. 433.11)	<u>132.00</u>	<u>1.007</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>0.155</u>	<u>0.155</u>
At Outb'd equiv. chord	<u>0.271</u>	<u>0.271</u>
Sweep Back Angles, degrees		
Leading Edge	<u>0.000</u>	<u>0.000</u>
Tailing Edge	<u>0.000</u>	<u>0.000</u>
Hingeline	<u>0.000</u>	<u>0.000</u>
Area Moment (Normal to hinge line), ft <sup>3</sup> (Product of area and mean chord)	<u>2146.71</u>	<u>0.00095</u>

MODEL COMPONENT: Vertical Tail - V10

GENERAL DESCRIPTION: Twin vertical tail mounted outboard of the wing tip chord, at 1.82° toe-out, 20° outboard cant angle.

Model Scale = 0.00763

DRAWING NUMBER: S-877-10, -11; Lines 9992-134B

DIMENSIONS:

FULL-SCALE

MODEL SCALE

TOTAL DATA

Area, ft <sup>2</sup>		
Planform (includes 0.0 ft <sup>2</sup> blanketed)	424.46	0.02471
Void (included above)	0.00	0.00000
Span (equivalent), in.	302.21	2.306
Aspect Ratio	1.494	1.494
Rate of Taper	0.879	0.879
Taper Ratio	0.207	0.207
Dihedral Angle, degrees	-	-
Incidence Angle, degrees	-	-
Aerodynamic Twist, degrees	-	-
Toe-In Angle, deg.	- 1.817	-1.817
Cant Angle, deg. (tip outboard)	20.000	20.000
Sweep Back Angles, degrees		
Leading Edge	38.801	38.801
Trailing Edge	-4.700	-4.700
0.25 Element Line	30.152	30.152
Chords: in.		
Root (W.P. 94.59)	335.14	2.557
Tip, (equivalent), (W.P. 378.71)	69.36	0.529
MAC, (W.P. 205.53)	231.36	1.765
Fus. Sta. of .25 MAC	1998.65	15.250
W.P. of .25 MAC	205.53	1.568
B.L. of .25 MAC	582.63	4.446
Airfoil Section		
Root Parallel to wing tip chord	NACA 0012-64	NACA 0012-64
Tip line	NACA 0012-64	NACA 0012-64

EXPOSED DATA

Area		
Span, (equivalent)		
Aspect Ratio		
Taper Ratio		
Chords		
Root		
Tip		
MAC		
Fus. Sta. of .25 MAC		
W.P. of .25 MAC		
B.L. of .25 MAC		

MODEL COMPONENT: Vertical Tail - V23

GENERAL DESCRIPTION: Centerline vertical on delta wing configuration with double wedge airfoil and rounded leading edge.

Model Scale = 0.00763

DRAWING NUMBER: S-877-33; S-888-33

DIMENSIONS:

FULL-SCALE

MODEL SCALE

TOTAL DATA

Area, ft<sup>2</sup>

Planform, Total  
Blanketed

669.78

0.03900

Span (equivalent), in.

1.21

0.00007

Aspect Ratio

377.46

2.880

Rate of Taper

1.480

1.480

Taper Ratio

0.718

0.718

Dihedral Angle, degrees

0.306

0.306

Incidence Angle, degrees

-

-

Aerodynamic Twist, degrees

-

-

Toe-In Angle, degrees

-

-

Cant Angle, degrees

0.000

0.000

Sweep Back Angles, degrees

0.000

0.000

Leading Edge

45.000

45.000

Trailing Edge

15.750

15.750

0.25 Element Line

39.369

39.369

Chords: in.

Root (W.P. 269.99)

390.56

2.980

Tip, (equivalent) (W.P. 647.45)

119.56

0.912

MAC (W.P. 425.29)

279.06

2.129

Fus. Sta. of .25 MAC

2034.25

15.521

W.P. of .25 MAC

425.29

3.245

B.L. of .25 MAC

0.00

0.000

Airfoil Section

Root

5° half angle double wedge

Tip

with rounded L. E.

L.E. Radius, %c

1.60

1.600

Thickness, %c

10.50

10.500

Area

Span, (equivalent)

Aspect Ratio

Taper Ratio

Chords

Root

Tip

MAC

Fus. Sta. of .25 MAC

W.P. of .25 MAC

B.L. of .25 MAC

MODEL COMPONENT: Vertical Tail - V24

GENERAL DESCRIPTION: Centerline vertical on delta wing configuration with 10° wedge airfoil, with leading edge radius and blunt trailing edge. Same planform as vertical tail V23

Model Scale = 0.00763

DRAWING NUMBER: S-877-33, -34

DIMENSIONS:

FULL-SCALE

MODEL SCALE

TOTAL DATA

Area, ft <sup>2</sup>		
Planform	669.78	0.03900
Blanketed	1.21	0.00007
Span (equivalent), in.	377.46	2.880
Aspect Ratio	1.480	1.480
Rate of Taper	0.718	0.718
Taper Ratio	0.306	0.306
Dihedral Angle, degrees	-	-
Incidence Angle, degrees	-	-
Aerodynamic Twist, degrees	-	-
Toe-In Angle, degrees	0.000	0.000
Cant Angle, degrees	0.000	0.000
Sweep Back Angles, degrees		
Leading Edge	45.000	45.000
Trailing Edge	15.750	15.750
0.25 Element Line	39.369	39.369
Chords: in.		
Root (W.P. 269.99)	390.56	2.980
Tip, (equivalent), (W.P. 647.45)	119.56	0.912
MAC, (W.P. 425.29)	279.06	2.129
Fus. Sta. of .25 MAC	2034.25	15.521
W.P. of .25 MAC	425.29	3.245
B.L. of .25 MAC	0.00	0.000
Airfoil Section		
Root		
Tip	5° half angle wedge with blunt T.E.	

EXPOSED DATA

Leading Edge Radius, % Chord	1.60	1.600
Area		
Span, (equivalent)		
Aspect Ratio		
Taper Ratio		
Chords		
Root		
Tip		
MAC		
Fus. Sta. of .25 MAC		
W.P. of .25 MAC		
B.L. of .25 MAC		

MODEL COMPONENT: Vertical Tail - V25

GENERAL DESCRIPTION: Same as V24 Except Entire Vertical Tail is Movable.

Model Scale = 0.00763

DRAWING NUMBER: S-877-33, -34

DIMENSIONS: FULL-SCALE MODEL SCALE

TOTAL DATA

Area, ft <sup>2</sup>		
Planform, Total	669.78	0.03900
Blanketed	1.21	0.00007
Span (equivalent), in.	377.46	2.880
Aspect Ratio	1.480	1.480
Rate of Taper	0.718	0.718
Taper Ratio	0.306	0.306
Dihedral Angle, degrees	-	-
Incidence Angle, degrees	-	-
Aerodynamic Twist, degrees	-	-
Toe-In Angle, degrees	0.000	0.000
Cant Angle, degrees	0.000	0.000
Sweep Back Angles, degrees		
Leading Edge	45.000	45.000
Trailing Edge	15.750	15.750
0.25 Element Line	39.369	39.369
Chords: in.		
Root, (W.P. 269.99)	390.56	2.890
Tip, (equivalent), (W.P. 647.45)	119.56	0.912
MAC (W.P. 425.29)	279.06	2.129
Fus. Sta. of .25 MAC	2034.25	15.521
W.P. of .25 MAC	425.29	3.245
B.L. of .25 MAC	0.00	0.000
Airfoil Section		
Root 5° half angle wedge with blunt T.E.		
Tip		
Fus. Sta. of Hingeline, in.	1920.58	14.654
Area		
Span, (equivalent)		
Aspect Ratio		
Taper Ratio		
Chords		
Root		
Tip		
MAC		
Fus. Sta. of .25 MAC		
W.P. of .25 MAC		
B.L. of .25 MAC		

MODEL COMPONENT: Rudder, R3

GENERAL DESCRIPTION: Rudder panel of twin vertical tail V10 on delta wing orbiter.

Model Scale = 0.00763

DRAWING NUMBER: 9992-134B  
S-877-10, -11

<u>DIMENSIONS:</u> (Data for 1 of 2 sides in vertical Ref. plane)	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area (aft of hingeline), ft <sup>2</sup>	<u>296.07</u>	<u>0.017</u>
Span (equivalent), in.	<u>292.41</u>	<u>2.231</u>
Inb'd equivalent chord, in. (W.P. 103.81)	<u>138.72</u>	<u>1.058</u>
Outb'd equivalent chord, in. (W.P. 378.71)	<u>69.36</u>	<u>0.529</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>0.425</u>	<u>0.425</u>
At Outb'd equiv. chord	<u>1.000</u>	<u>1.000</u>
Sweep Back Angles, degrees		
Leading Edge	<u>38.801</u>	<u>38.801</u>
Tailing Edge	<u>- 4.700</u>	<u>-4.700</u>
Hingeline	<u>-19.70</u>	<u>-19.70</u>
Area Moment (Normal to hinge line), ft <sup>3</sup> (Product of area and mean chord)	<u>4101.58</u>	<u>0.00182</u>
Hingeline passes thru the following two points, in.		
Fus. Sta.	<u>2044.87</u>	<u>15.602</u>
B.P.	<u>541.94</u>	<u>4.135</u>
W.P.	<u>97.34</u>	<u>0.743</u>
AND		
Fus. Sta.	<u>1984.07</u>	<u>15.138</u>
B.P.	<u>601.56</u>	<u>4.590</u>
W.P.	<u>256.45</u>	<u>1.957</u>

MODEL COMPONENT: Rudder - R7

GENERAL DESCRIPTION: Rudder used with centerline vertical tail V23,  
sharp trailing edge.

Model Scale = 0.00763

DRAWING NUMBER: S-888-33

DIMENSIONS:

	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area (Aft of Hingeline), ft <sup>2</sup>	<u>268.34</u>	<u>0.01562</u>
Span (equivalent), in.	<u>380.21</u>	<u>2.901</u>
Inb'd equivalent chord, in. (W.P. 269.99)	<u>156.23</u>	<u>1.192</u>
Outb'd equivalent chord, in. (W.P. 650.20)	<u>47.03</u>	<u>0.359</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>0.400</u>	<u>0.400</u>
At Outb'd equiv. chord	<u>0.400</u>	<u>0.400</u>
Sweep Back Angles, degrees		
Leading Edge	<u>29.650</u>	<u>29.650</u>
Trailing Edge	<u>15.750</u>	<u>15.750</u>
Hingeline	<u>29.650</u>	<u>29.650</u>
Area Moment (Normal to hinge line), ft <sup>3</sup> (Product of area and mean chord)	<u>2399.87</u>	<u>0.00107</u>



MODEL COMPONENT: Rudder - R8

GENERAL DESCRIPTION: Rudder used with centerline vertical tail V24. Same side panels as rudder R7 except drag brake J deflected. (Dimensions listed are with drag brake undeflected)

Model Scale = 0.00763

DRAWING NUMBER: S-877-35

<u>DIMENSIONS:</u>	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area (Aft of Hingeline), ft <sup>2</sup>	<u>268.34</u>	<u>0.01562</u>
Span (equivalent), in.	<u>380.21</u>	<u>2.901</u>
Inb'd equivalent chord, in. (W.P. 269.99)	<u>156.23</u>	<u>1.192</u>
Outb'd equivalent chord, in. (W.P. 650.20)	<u>47.03</u>	<u>0.359</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>0.400</u>	<u>0.400</u>
At Outb'd equiv. chord	<u>0.400</u>	<u>0.400</u>
Sweep Back Angles, degrees		
Leading Edge	<u>29.650</u>	<u>29.650</u>
Tailing Edge	<u>15.750</u>	<u>15.750</u>
Hingeline	<u>29.650</u>	<u>29.650</u>
Area Moment (Normal to hinge line), ft <sup>3</sup> (Product of area and mean chord)	<u>2399.87</u>	<u>0.00107</u>

MODEL COMPONENT: Drag Brake - J (Data for one of two sides)

GENERAL DESCRIPTION: Drag brake J is the deflectable side panels of vertical tail V24 hinged at the 60% element line and extending to the trailing edge. Deflections of J change the vertical tail projected planform.

Model Scale = 0.00763

DRAWING NUMBER: (S-877-34) or (S-877-35) or (S-888-34)

All dimensions are measured in the drag brake reference plane

DIMENSIONS:

	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area (True), ft <sup>2</sup>	<u>270.64</u>	<u>0.01576</u>
Span (equivalent), in.	<u>382.02</u>	<u>2.915</u>
Inb'd equivalent chord, in. (W.P. 269.99)	<u>156.82</u>	<u>1.197</u>
Outb'd equivalent chord, in. (W.P. 650.20)	<u>47.21</u>	<u>0.360</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>-</u>	<u>-</u>
At Outb'd equiv. chord	<u>-</u>	<u>-</u>
Sweep Back Angles, degrees		
Leading Edge	<u>29.257</u>	<u>29.257</u>
Tailing Edge	<u>15.283</u>	<u>15.283</u>
Hingeline	<u>29.257</u>	<u>29.257</u>
Area Moment (Normal to hinge line), ft <sup>3</sup> (Product of area and mean chord)	<u>2437.47</u>	<u>0.00108</u>

MODEL COMPONENT: Transition Grit - tr?

GENERAL DESCRIPTION: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

DRAWING NUMBER: NONE

DIMENSIONS: (In model scale only)

Fuselage

Mean Diameter, in.	<u>0.0106</u>
Distance of L.E. Aft of Nose, in.	<u>1.500</u>
Width of Strip, in.	<u>0.250</u>

Wing and Tails

Mean Diameter, in.	<u>0.0063</u>
Distance of Strip L.E. from Airfoil L.E., in.	<u>*</u>
Width of Strip, in.	<u>0.125</u>

\* 10% of local chord measured perpendicular to airfoil leading edge.

MODEL COMPONENT: Transition Grit - tr3

GENERAL DESCRIPTION: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

DRAWING NUMBER: NONE

DIMENSIONS: (In model scale only)

Fuselage

Mean Diameter, in.	<u>0.0127</u>
Distance of L.E. Aft of Nose, in.	<u>1.500</u>
Width of Strip, in.	<u>0.250</u>

Wing and Tails

Mean Diameter, in.	<u>0.009</u>
Distance of Strip L.E. from Airfoil L.E., in.	<u>*</u>
Width of Strip, in.	<u>0.125</u>

\* 10% of local chord measured perpendicular to airfoil leading edge

NOMENCLATURE

(General)

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
$\alpha$	ALPHA	angle of attack, angle between the projection of the wind $X_w$ -axis on the body X, Z-plane and the body X-axis; degrees
$\beta$	BETA	sideslip angle, angle between the wind $X_w$ -axis and the projection of this axis on the body X-Z-plane; degrees
$\psi$	PSI	yaw angle, angle of rotation about the body Z-axis, positive when the positive X-axis is rotated toward the positive Y-axis; degrees
$\phi$	PHI	roll angle, angle of rotation about the body X-axis, positive when the positive Y-axis is rotated toward the positive Z-axis; degrees
$\rho$		air density; $K_g/m^3$ , slugs/ft <sup>3</sup>
$a$		speed of sound; m/sec, ft/sec
$V$		speed of vehicle relative to surrounding atmosphere; m/sec, ft/sec
$q$	Q(PSI) Q(PSF)	dynamic pressure; $1/2\rho V^2$ , psi, psf
$M$	MACH	Mach number; $V/a$
RN/L	RN/L	Reynolds number per unit length; million/ft
$p$		static pressure; psi
$P$		total pressure; psi
$C_p$	CP	pressure coefficient; $(p-p_\infty)/q$

NOMENCLATURE (Continued)

Reference & C. G. Definitions

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
S		wing area; $m^2$ , $ft^2$
S	SREF	reference area; $m^2$ , $ft^2$
$\bar{c}$		wing mean aerodynamic chord or reference chord; m, ft, in (see $l_{ref}$ or LREF)
$l_{ref}$	LREF	reference length; m, ft, in.; (see $\bar{c}$ )
$b_{ref}$	BREF	wing span or reference span; m, ft, in
$A_b$		base area; $m^2$ , $ft^2$ , $in^2$
c. g.		center of gravity
MRP	MRP	abbreviation for moment reference point
	XMRP	abbreviation for moment reference point on X-axis
	YMRP	abbreviation for moment reference point on Y-axis
	ZMRP	abbreviation for moment reference point on Z-axis

## NOMENCLATURE (Continued)

### Axis System General

<u>SYMBOL</u>	<u>DEFINITION</u>
F	force; F, lbs
M	moment; M, in-lb

<u>Subscript</u>	<u>Definition</u>
N	normal force
A	axial force
L	lift force
D	drag force
Y	force or moment about the Y axis
Z	moment about the Z axis
X	moment about the X axis
s	stability axis system
w	wind axis system
ref	reference conditions
$\infty$	free stream conditions
t	total conditions
b	base

NOMENCLATURE (Continued)  
Body & Stability Axis System

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
<u>Body Axis System</u>		
$C_N$	CN	normal force coefficient; $F_N/qS$
$C_A$	CA	axial force coefficient; $F_A/qS$
$C_{A_b}$	CAB	base axial force coefficient; $\begin{bmatrix} -1 \\ \end{bmatrix} \begin{bmatrix} (P_b - P_\infty)/q \end{bmatrix} (A_b/S)$
$C_{A_f}$	CAF	forebody axial force coefficient; $C_A - C_{A_b}$
$C_n$	CYN	yawing moment coefficient; $M_Z/qS b_{ref}$
$C_l$	CBL	rolling moment coefficient; $M_X/qS b_{ref}$
<u>Common to Both Axis Systems</u>		
$C_m$	CLM	pitching moment coefficient; $M_Y/qS l_{ref}$
$C_y$	CY	side force coefficient; $F_Y/qS$
<u>Stability Axis System</u>		
$C_L$	CL	lift force coefficient; $F_L/qS$
$C_D$	CD	drag force coefficient; $F_D/qS$
$C_{D_b}$	CDB	base drag coefficient
$C_{D_f}$	CDF	forebody drag coefficient; $C_D - C_{D_b}$
$C_n$	CLN	yawing moment coefficient; $M_{Z,s}/qS b_{ref}$
$C_l$	CSL	rolling moment coefficient; $M_{X,s}/qS b_{ref}$
L/D	L/D	lift-to-drag ratio; $C_L/C_D$
L/D <sub>f</sub>	L/DF	lift to forebody drag ratio; $C_L/C_{D_f}$



NOMENCLATURE (Continued)

Surface Definitions

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
$i_t$	HORIZT	horizontal tail incidence; positive when trailing edge down; degrees
$\delta$		symmetrical surface deflection angle; degrees; positive deflections are:
	AILRON	aileron - total aileron deflection; (left aileron - right aileron)/2
	CANARD	canard - trailing edge down
	ELEVON	elevon - trailing edge down
	ELEVTR	elevator - trailing edge down
	FLAP	flap - trailing edge down
	RUDDER	rudder - trailing edge to the left
	SPOILER	spoiler - trailing edge down
	TAB	tab - trailing edge down with respect to control surface
$\delta$		antisymmetrical surface deflection angle, degrees; positive trailing edge down:
	AIL-L	left aileron - trailing edge down
	AIL-R	right aileron - trailing edge down
	ELVN-L	left elevon - trailing edge down
	ELVN-R	right elevon - trailing edge down
	SPLR-L	left spoiler - trailing edge down
	SPLR-R	right spoiler - trailing edge down

<u>SURFACE SUBSCRIPTS</u>	<u>DEFINITION</u>
a	aileron
b	base
c	canard
e	elevator or elevon
f	flap
r	rudder or ruddervator
s	spoiler
t	tail

ADDITIONS TO STANDARD NOMENCLATURE

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
$t_{r2}, t_{r3}$	GRIT	Boundary layer flow trip
$\delta_J$	SPD EK	Drag brake deflection angle, degrees; see Fig. 6 for determination
$\delta_{E4}$ (L. H.)	ELVN4L	Deflection angle of left side of full span, swept hingeline elevon, degrees; positive with trailing edge down
$\delta_{E4}$ (R. H.)	ELVN4R	Deflection angle of right side of full span, swept hingeline elevon, degrees; positive with trailing edge down
$\delta_{E7}$	ELVN7L, ELVN7R	Deflection angle of full span constant chord elevon - noted as left side and right side deflections, degrees; positive with trailing edge down
$\delta_{E8}$	ELVN8U, ELVN8L	Deflection angle of outboard, constant chord split elevon - noted as upper surface and lower surface deflections, degrees; positive with trailing edge down
$\delta_{E9}$	ELVN9	Deflection angle of inboard, constant chord elevon, degrees; positive with trailing edge down

## TABULATED DATA LISTING

A tabulated data listing, consisting of all aero data sets, both original and those created in arriving at the plotted material to be presented subsequently, is available as an addendum to this report. The tabular listing is made up in two sections:

- (a) a brief summary list of all data sets containing the identifier, the descriptor, and the resident dependent variables.
- (b) a full list of all data sets containing all resident or selected aerodynamic coefficients of the data sets as well as the above mentioned information.

The listing is currently sent on limited distribution to the following organizations:

NASA AMES	Mr. V. Stevens
NASA MSC	Mr. Ray Nelson
NR	Mr. Bruce Cameron

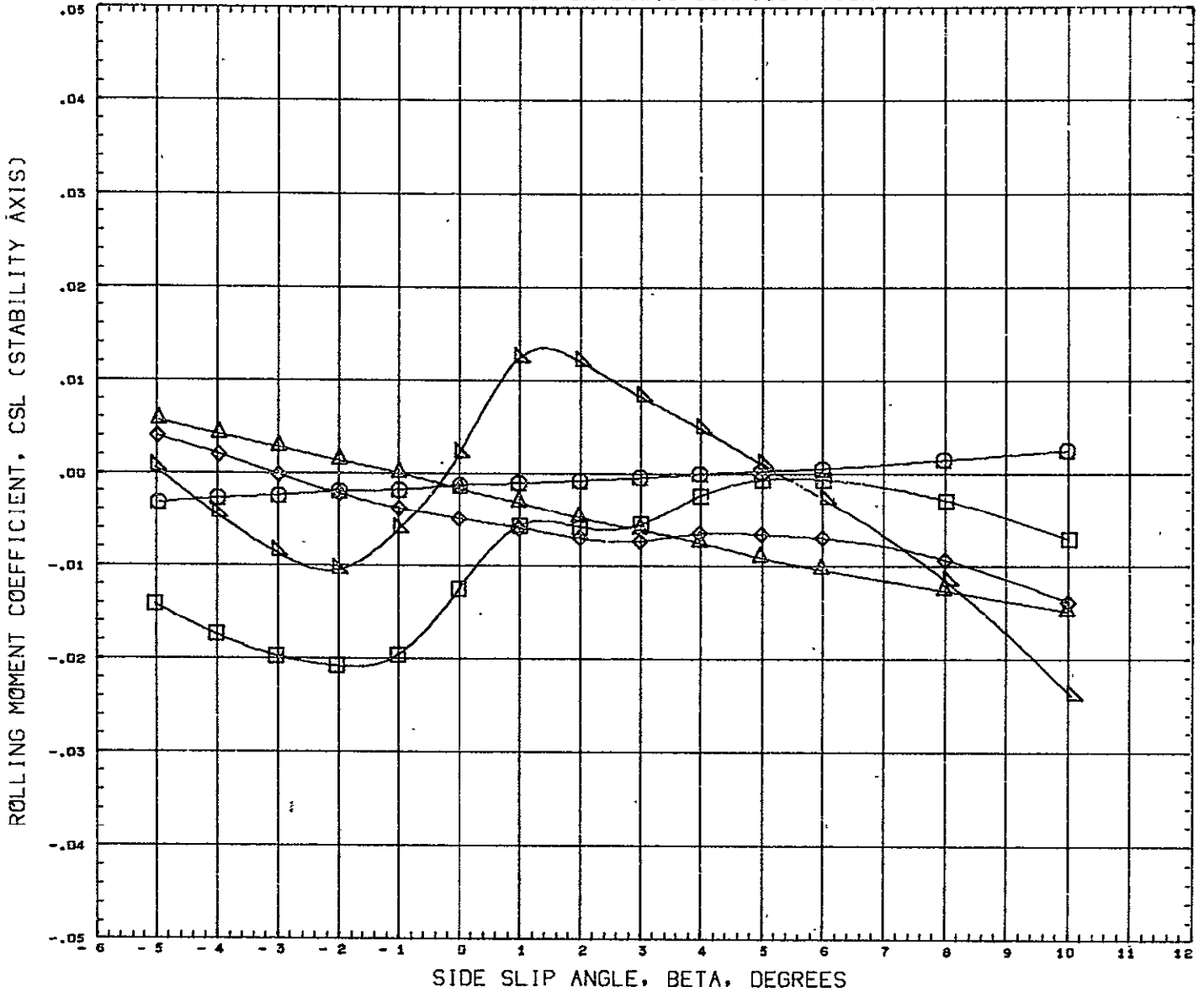
If copies of this listing are desired, please contact the above or the cognizant SADSAC personnel who, for this data, is:

B. J. Fricken  
Department 2780  
Chrysler Corporation Space Division  
New Orleans, La. 70129

(504) 255-2304

PLOTTED DATA

# EFFECT OF ANGLE OF ATTACK ON B4W16 CONFIGURATION



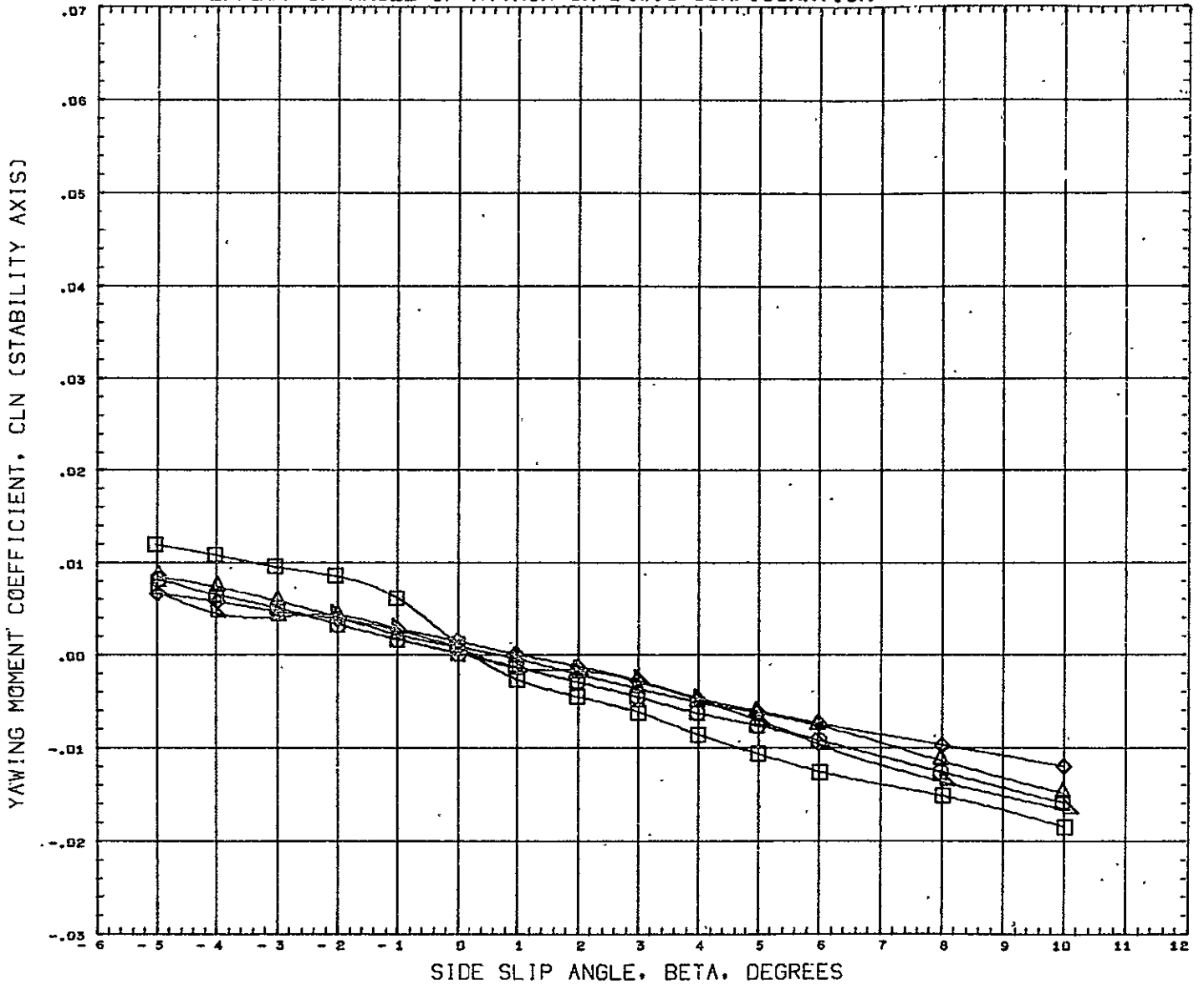
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(RCJ003)	NAAL 633 NAR DELTA ORB. W16 B4
(RCJ004)	NAAL 633 NAR DELTA ORB. W16 B4
(RCJ005)	NAAL 633 NAR DELTA ORB. W16 B4
(RCJ006)	NAAL 633 NAR DELTA ORB. W16 B4

ALPHA
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20.000
30.000
40.000

REFERENCE INFORMATION		
REFS	0.3542	SQ. FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8519	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

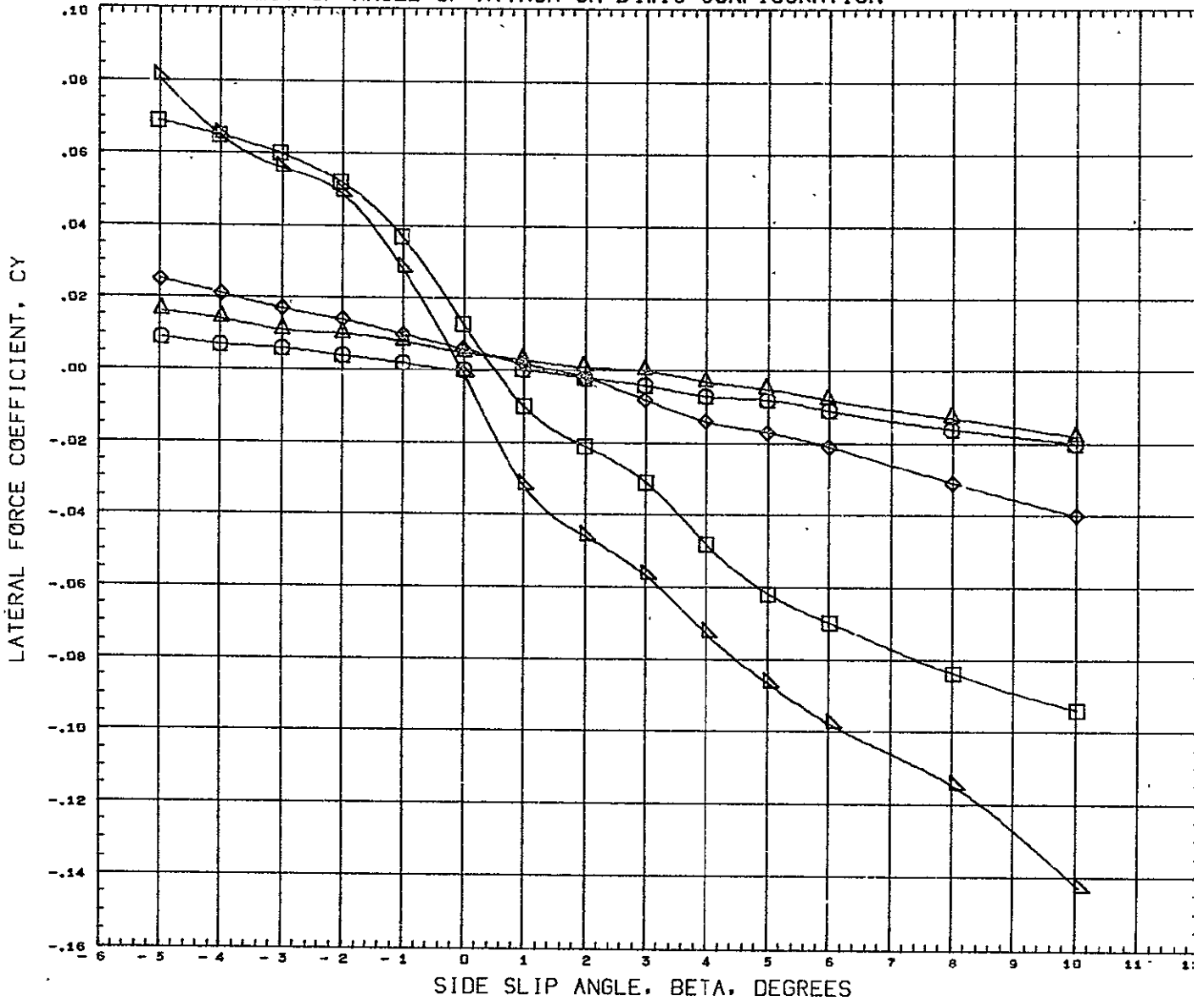
# EFFECT OF ANGLE OF ATTACK ON B4W16 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	REFERENCE INFORMATION
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(RCJ004)	NAAL 633 NAR DELTA ORB. W16 B4	20.000	REFB 10.8560 INCHES
(RCJ005)	NAAL 633 NAR DELTA ORB. W16 B4	30.000	XMRP 10.8544 INCHES
(RCJ006)	NAAL 633 NAR DELTA ORB. W16 B4	40.000	YMRP 0.0000 INCHES
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			SCALE 0.0076 SCALE

MACH 0.259

# EFFECT OF ANGLE OF ATTACK ON B4W16 CONFIGURATION

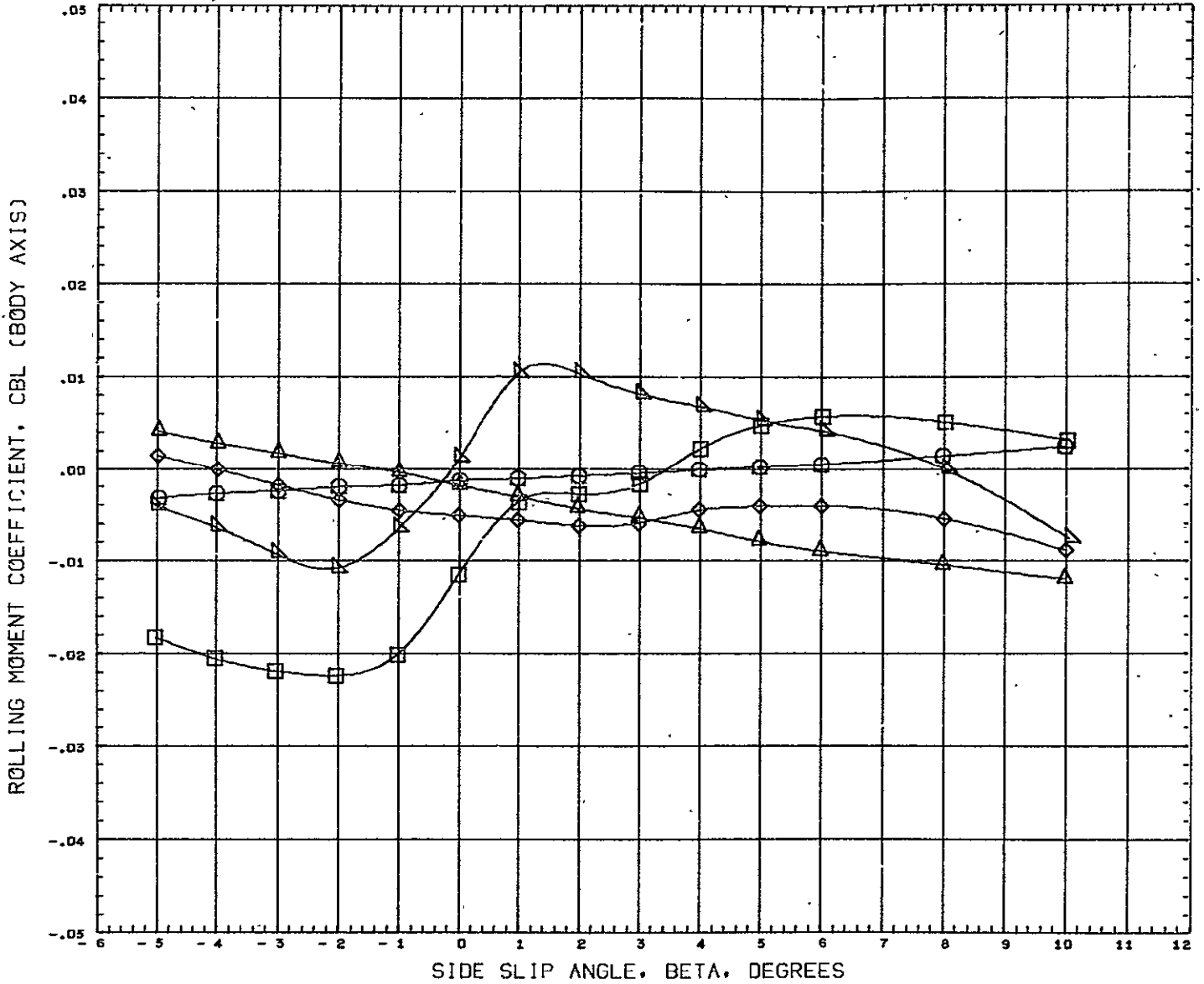


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(RCJ006)	NAAL 633 NAR DELTA ORB. W16 B4	40.000

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ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.255

# EFFECT OF ANGLE OF ATTACK ON B4W16 CONFIGURATION



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(BCJ004)	NAAL 633 NAR DELTA ORB. W16 B4
(BCJ005)	NAAL 633 NAR DELTA ORB. W16 B4
(BCJ006)	NAAL 633 NAR DELTA ORB. W16 B4

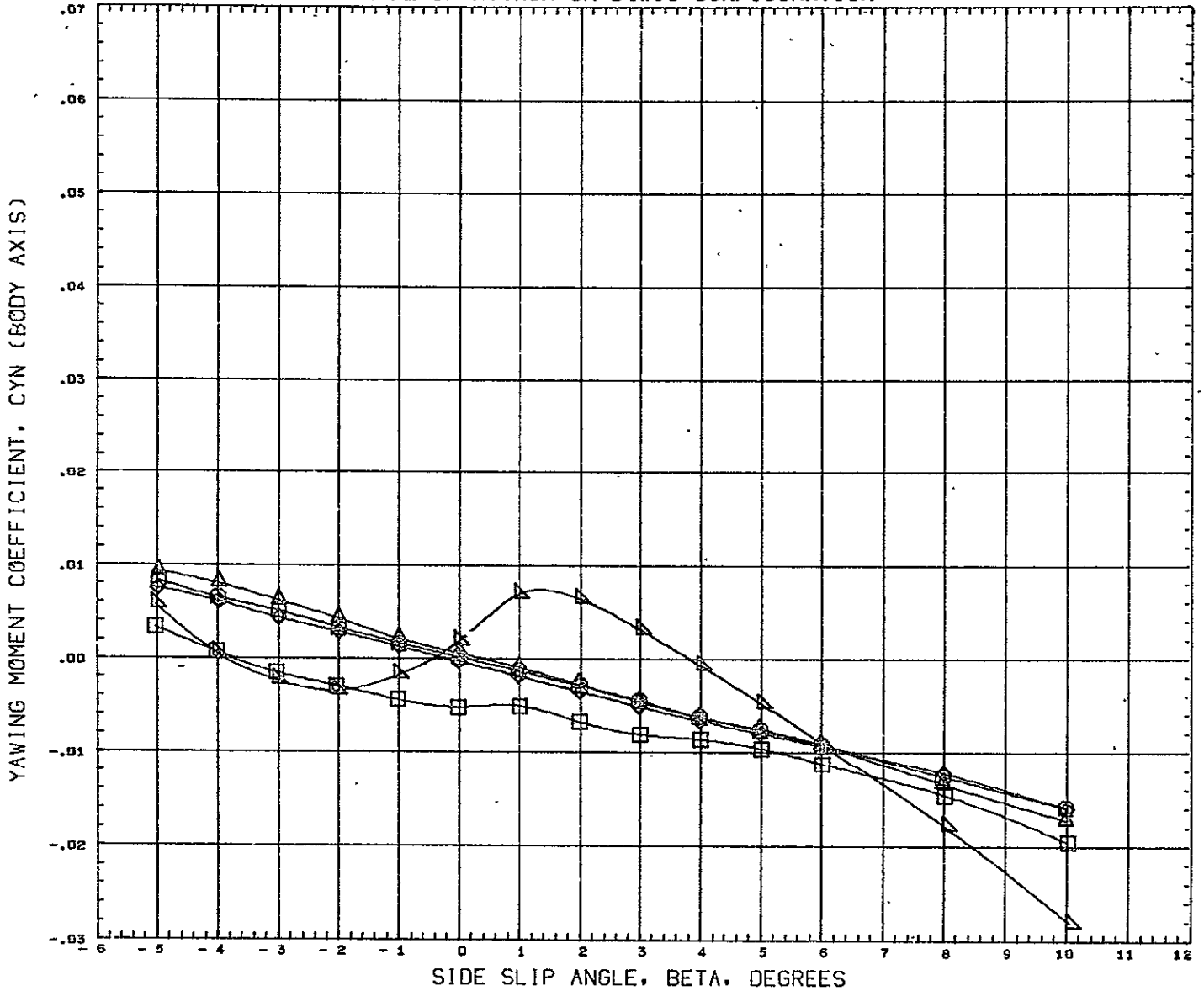
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YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259



# EFFECT OF ANGLE OF ATTACK ON B4W16 CONFIGURATION



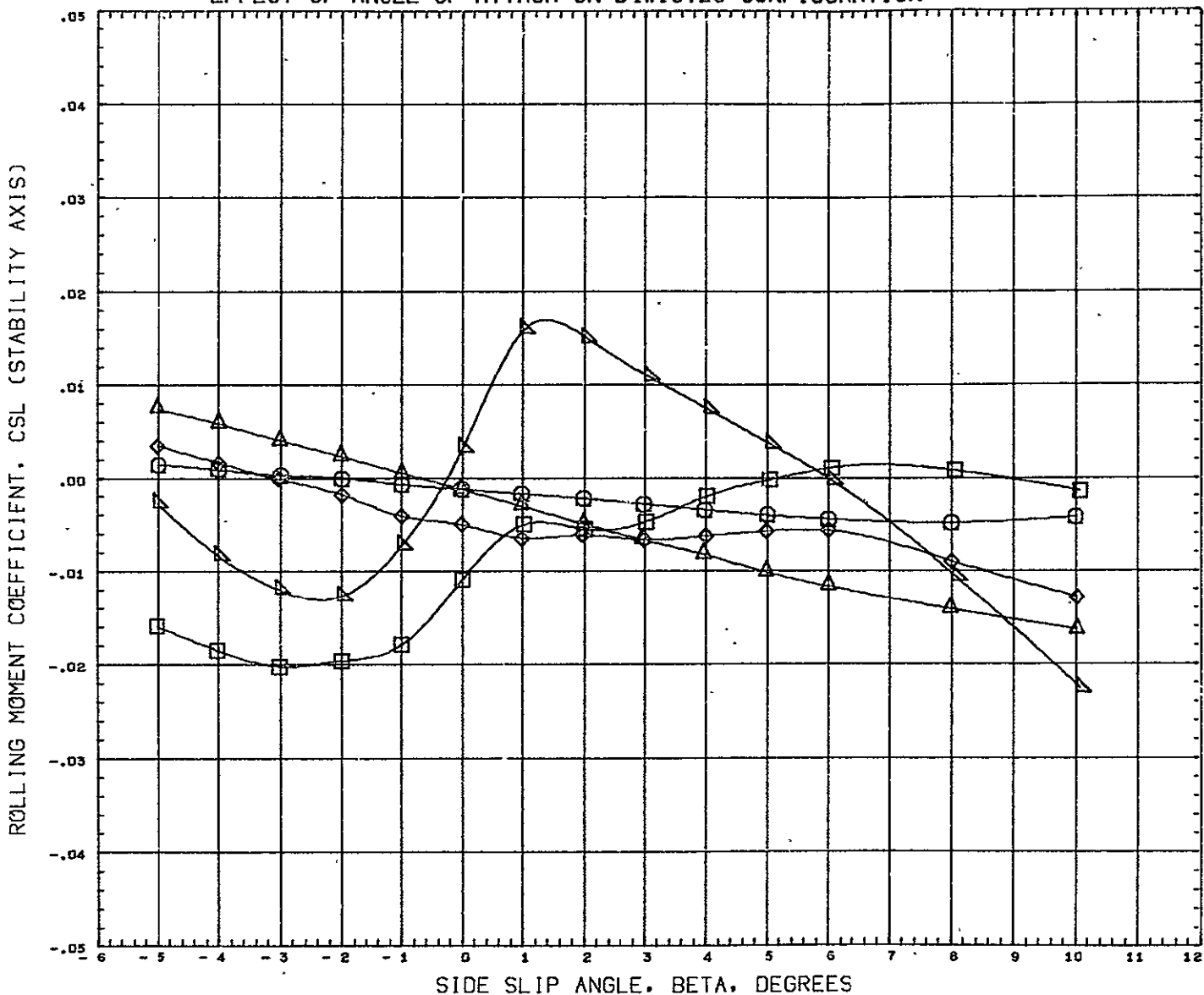
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(BCJ004)	NAAL 633 NAR DELTA ORB. W16 B4
(BCJ005)	NAAL 633 NAR DELTA ORB. W16 B4
(BCJ006)	NAAL 633 NAR DELTA ORB. W16 B4

ALPHA
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20.000
30.000
40.000

REFERENCE INFORMATION		
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REFB	10.8560	INCHES
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ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

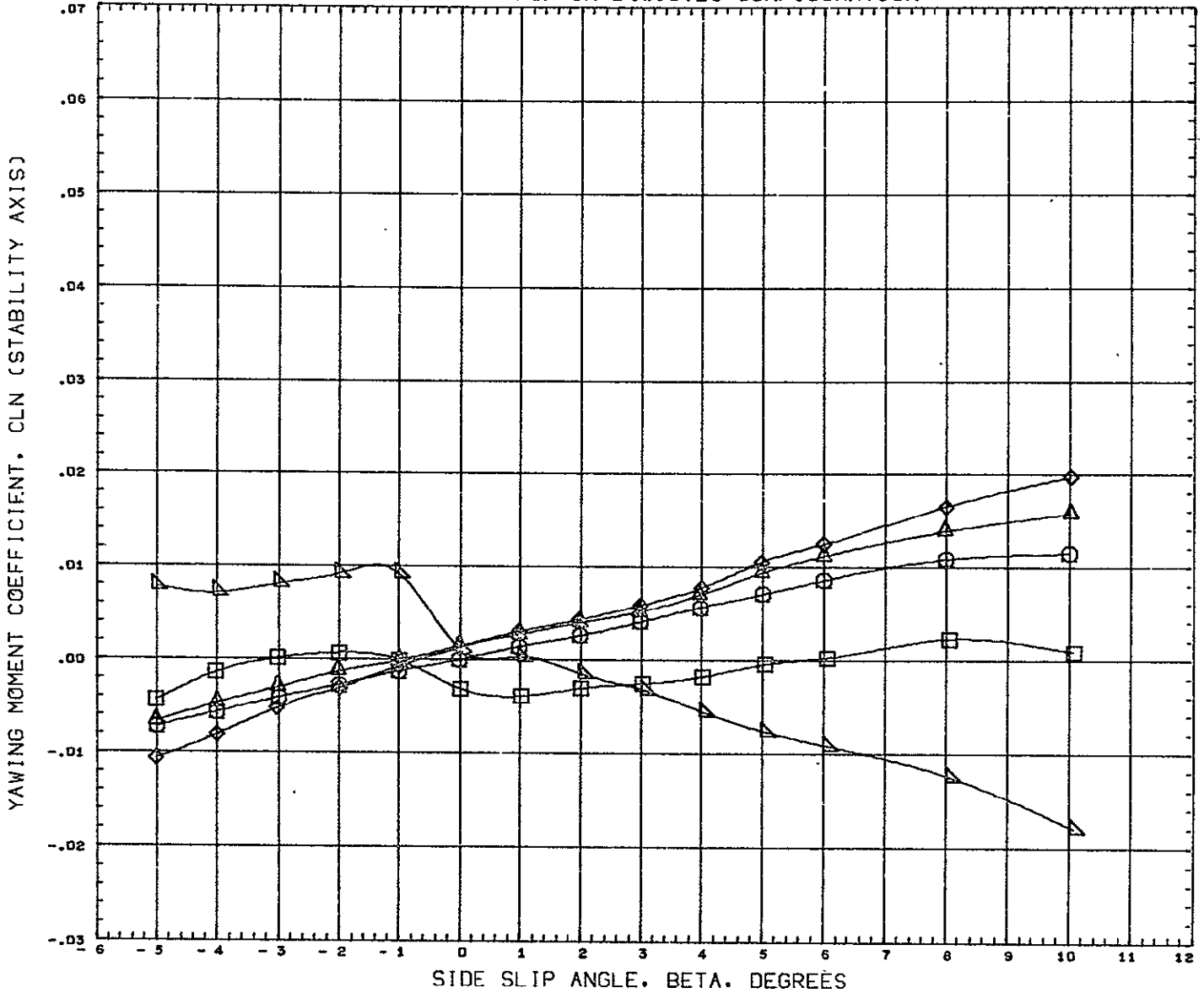
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(RCJD09)	NAAL 633 NAR DELTA ORB. W16 B4 V23	10.000	REFL 6.2656 INCHES
(RCJD10)	NAAL 633 NAR DELTA ORB. W16 B4 V23	20.000	REFB 10.8560 INCHES
(RCJD11)	NAAL 633 NAR DELTA ORB. W16 B4 V23	30.000	XMRP 10.8543 INCHES
(RCJD12)	NAAL 633 NAR DELTA ORB. W16 B4 V23	40.000	YMRP 0.0000 INCHES
			ZMRP 0.9920 INCHES
			SCALE 0.0076 SCALE

MACH 0.259

# EFFECT OF ANGLE OF ATTACK ON B4W16V23 CONFIGURATION

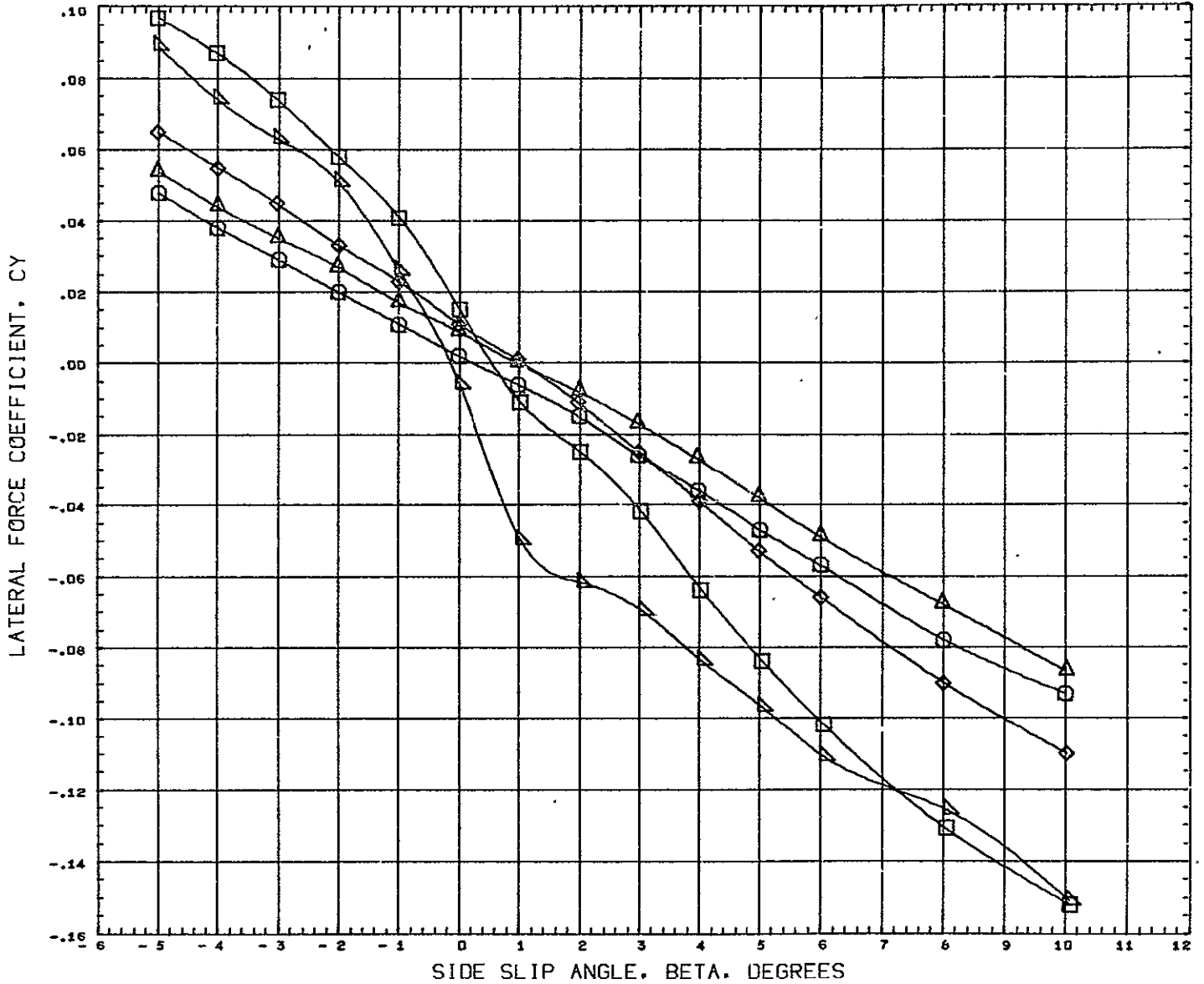


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA
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(RCJ009)	NAAL 633 NAR DELTA ORB. W16 B4 V23	10.000
(RCJ010)	NAAL 633 NAR DELTA ORB. W16 B4 V23	20.000
(RCJ011)	NAAL 633 NAR DELTA ORB. W16 B4 V23	30.000
(RCJ012)	NAAL 633 NAR DELTA ORB. W16 B4 V23	40.000

REFERENCE INFORMATION		
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REFB	10.8560	INCHES
XMRP	10.8542	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

### EFFECT OF ANGLE OF ATTACK ON B4W16V23 CONFIGURATION

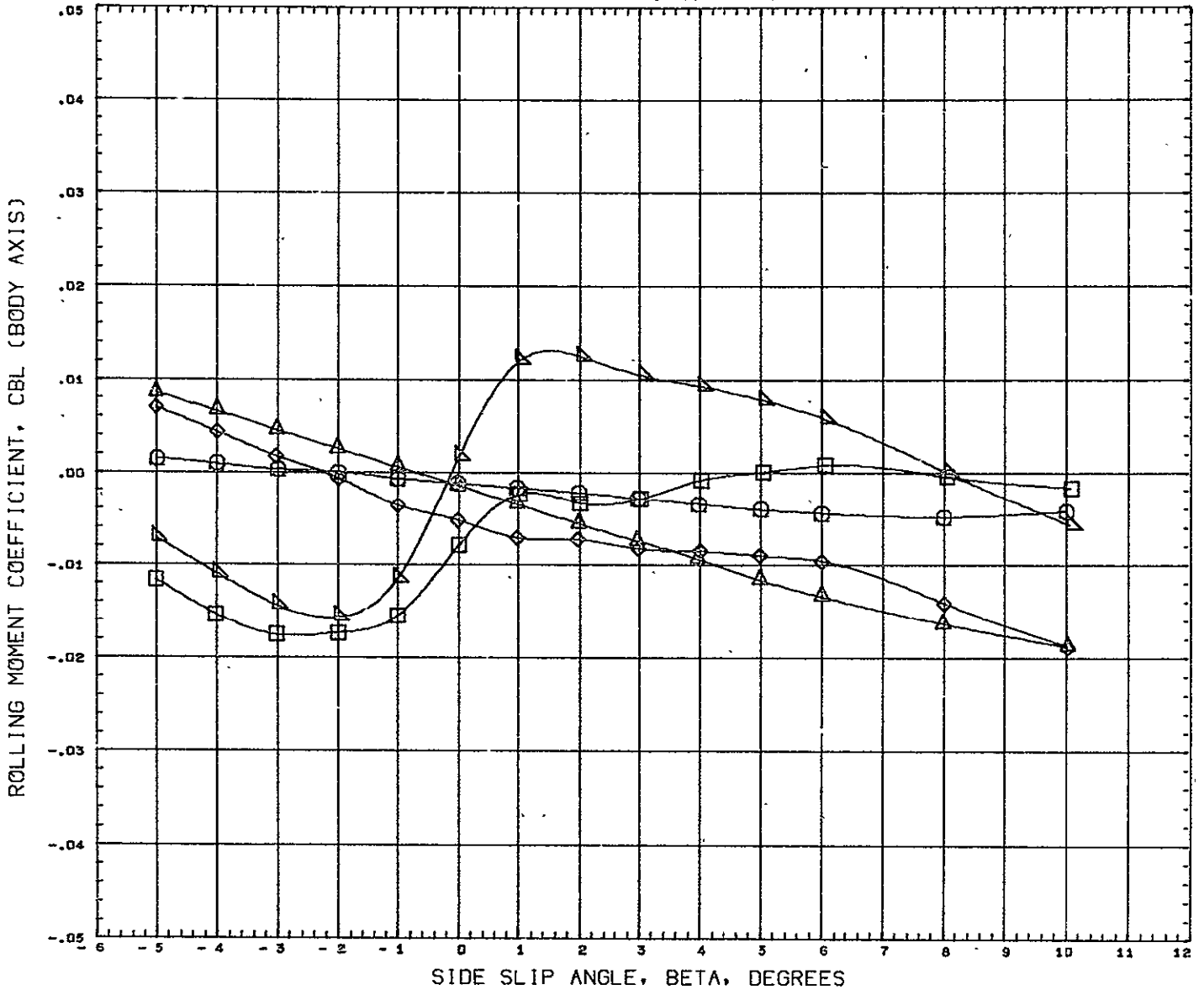


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA
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(RCJ010)	NAAL 633 NAR DELTA ORB. W16 B4 V23	20.000
(RCJ011)	NAAL 633 NAR DELTA ORB. W16 B4 V23	30.000
(RCJ012)	NAAL 633 NAR DELTA ORB. W16 B4 V23	40.000

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REFB	10.8560	INCHES
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YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

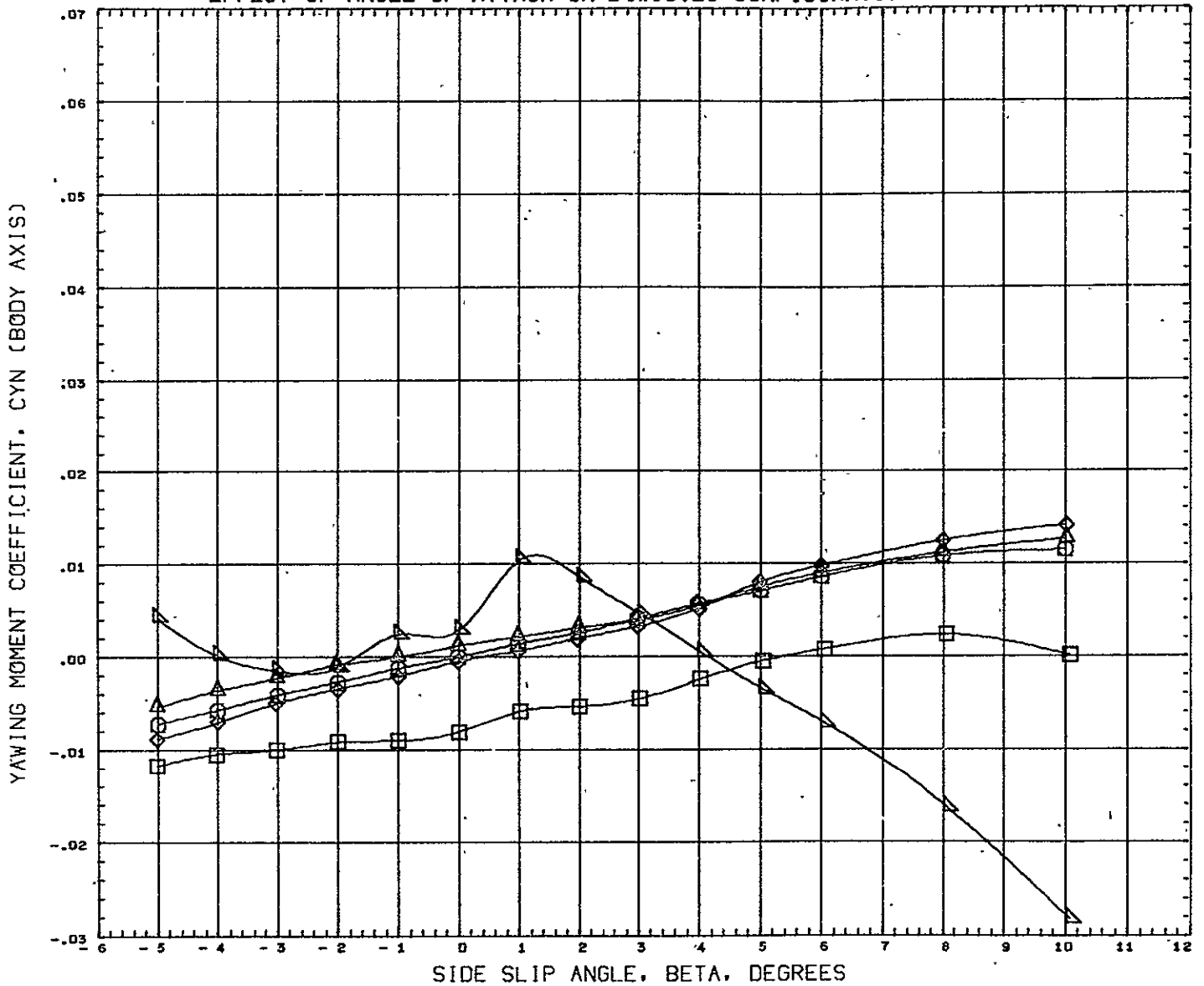
### EFFECT OF ANGLE OF ATTACK ON B4W16V23 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	REFERENCE INFORMATION
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(BCJ009)	NAAL 633 NAR DELTA ORB. W16 B4 V23	10.000	REFL 6.2656 INCHES
(BCJ010)	NAAL 633 NAR DELTA ORB. W16 B4 V23	20.000	REFB 10.8560 INCHES
(BCJ011)	NAAL 633 NAR DELTA ORB. W16 B4 V23	30.000	ZMRP 10.8560 INCHES
(BCJ012)	NAAL 633 NAR DELTA ORB. W16 B4 V23	40.000	YMRP 0.0000 INCHES
			ZMRP 0.9920 INCHES
			SCALE 0.0076 SCALE

MACH 0.259

# EFFECT OF ANGLE OF ATTACK ON B4W16V23 CONFIGURATION



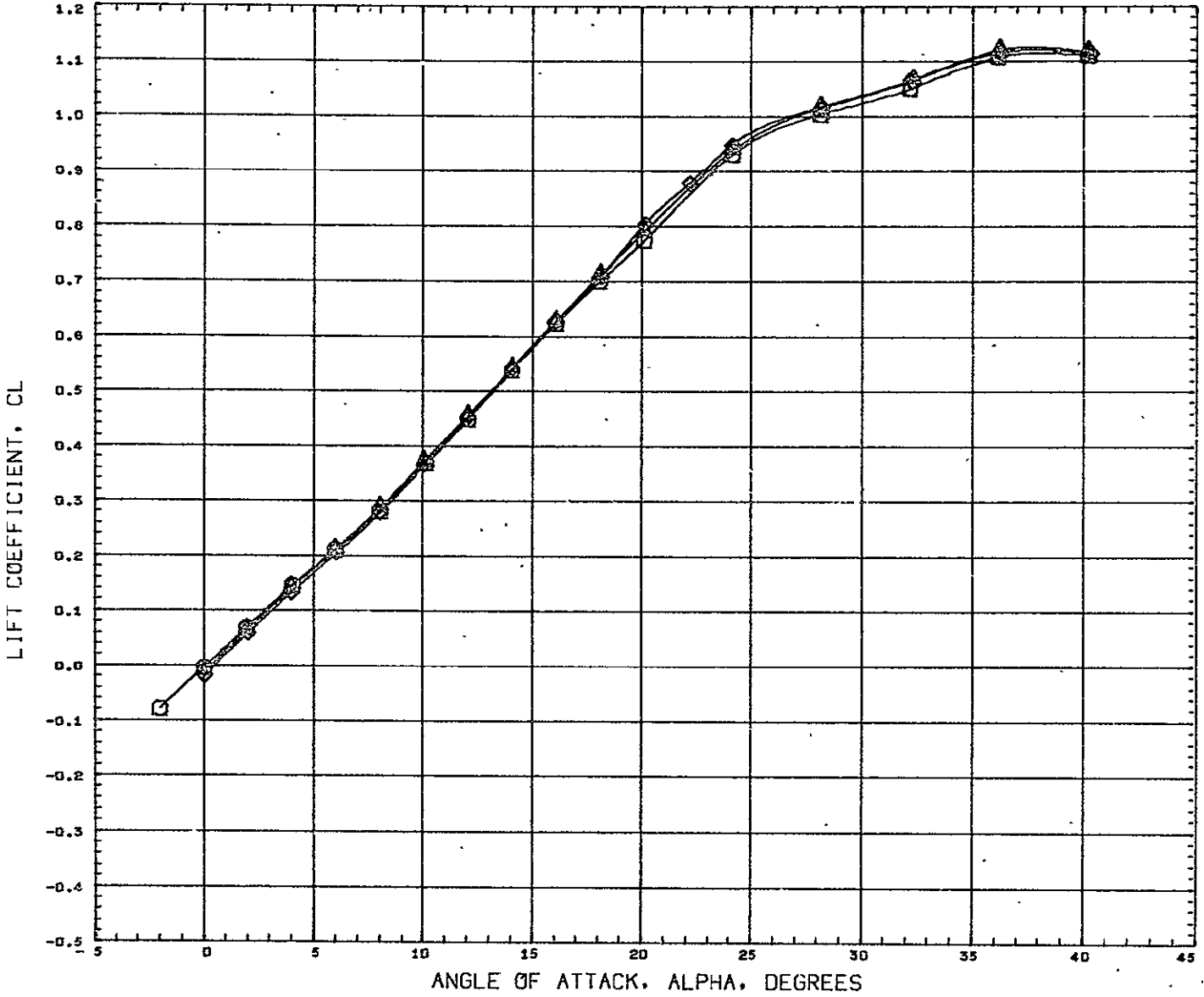
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(BCJ010)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(BCJ011)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(BCJ012)	NAAL 633 NAR DELTA ORB. W16 B4 V23

ALPHA
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10.000
20.000
30.000
40.000

REFERENCE INFORMATION		
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YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# SPLIT ELEVON EFFECTIVENESS, L.H. OUTBOARD ONLY



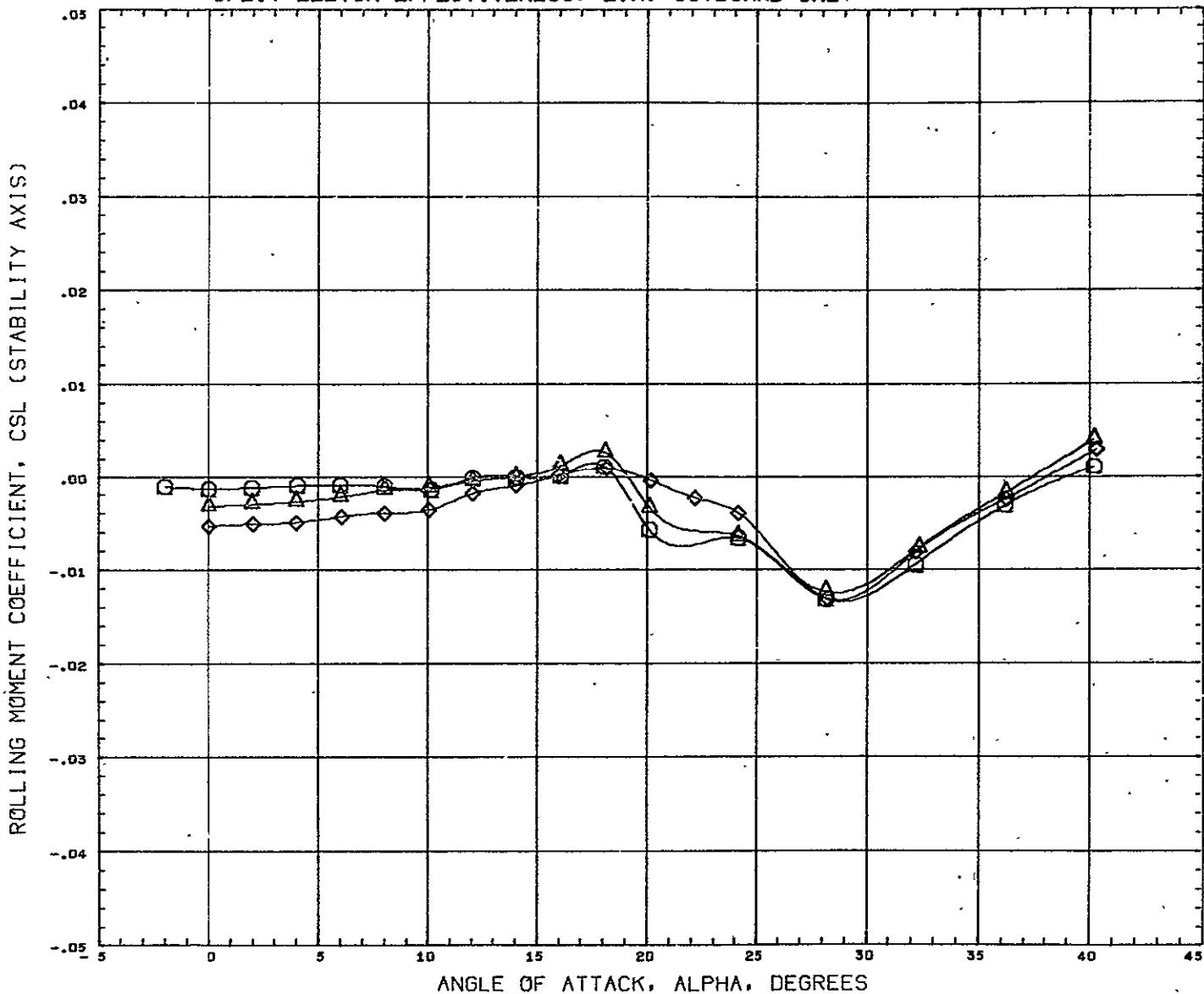
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
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(RCJ013)	△ NAAL 633 NAR DELTA ORB. W16E8 B4 V23
(CCJ014)	◇ NAAL 633 NAR DELTA ORB. W16E8 B4 V23

BETA	ELVN8U	ELVN8L
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0.000	-10.000	5.000
0.000	-20.000	10.000

REFERENCE INFORMATION		
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REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.85+0	INCHES
YMRP	0.1000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# SPLIT ELEVON EFFECTIVENESS, L.H. OUTBOARD ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ013)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23
(CCJ014)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23

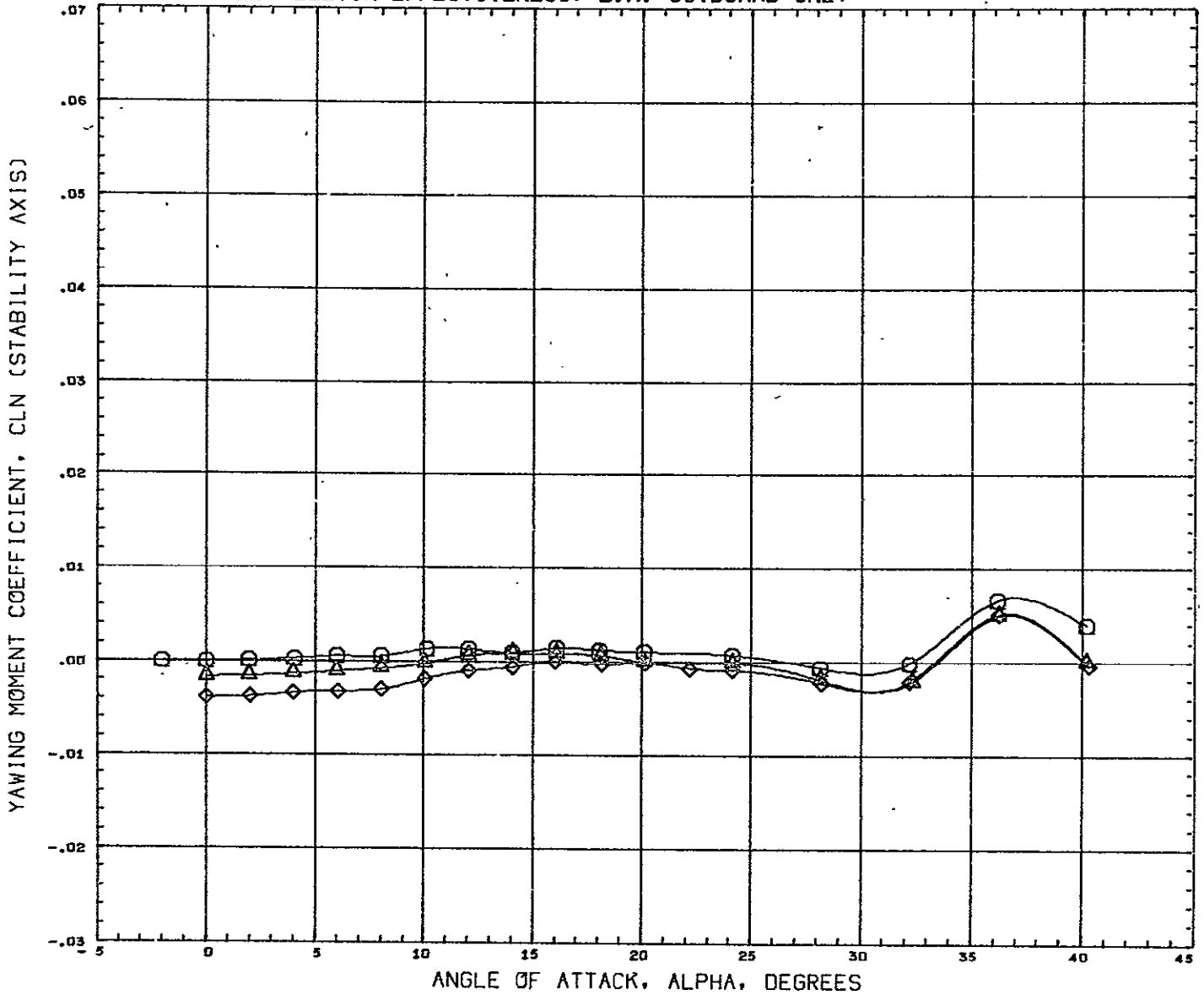
BETA	ELVN8U	ELVN8L
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0.000	-10.000	5.000
0.000	-20.000	10.000

REFERENCE INFORMATION		
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REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8543	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259



# SPLIT ELEVON EFFECTIVENESS, L.H. OUTBOARD ONLY



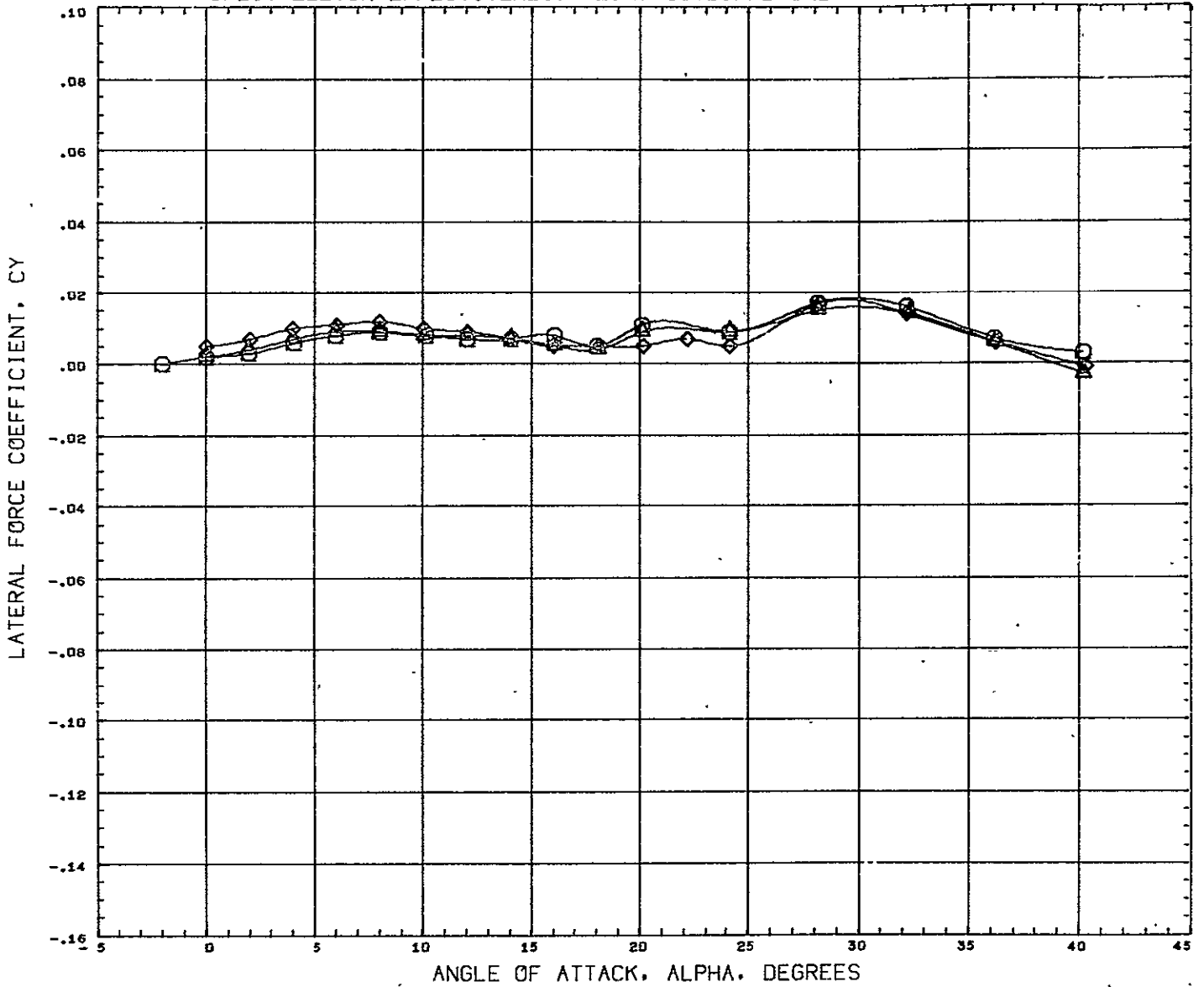
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ013)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23
(CCJ014)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23

BETA	ELVN8U	ELVN8L
0.000		
0.000	-10.000	5.000
0.000	-20.000	10.000

REFERENCE INFORMATION		
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REFL	6.2656	INCHES
REFB	10.8560	INCHES
XHRP	10.8540	INCHES
YMRP	0.0500	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

HACH 0.259

# SPLIT ELEVON EFFECTIVENESS, L.H. OUTBOARD ONLY



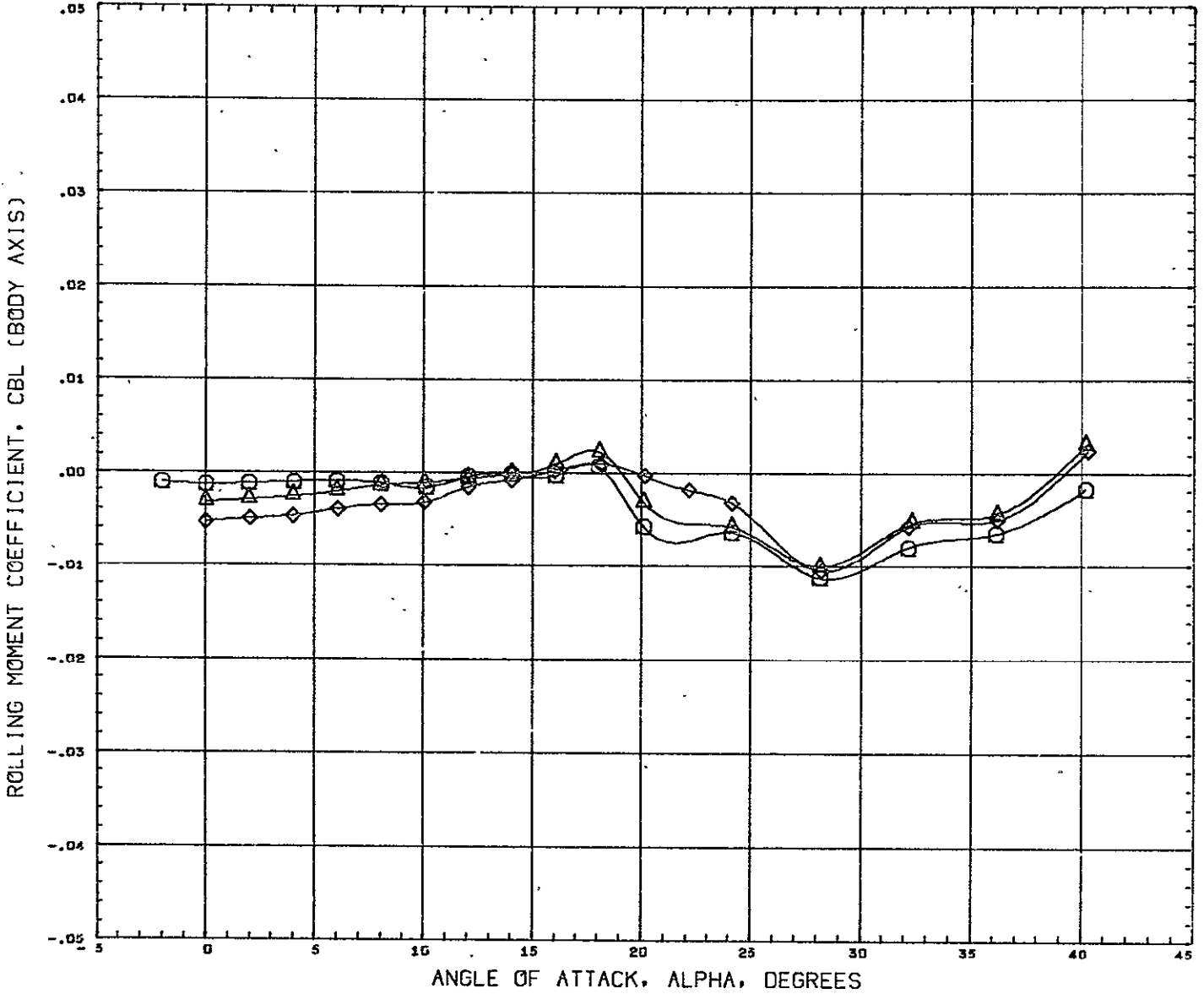
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(RCJ013)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23
(CCJ014)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23

BETA °	ELVN8U	ELVN8L
0.000	-10.000	5.000
0.000	-20.000	10.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
AMRF	10.8540	INCHES
YMRF	0.3000	INCHES
ZMRF	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# SPLIT ELEVON EFFECTIVENESS, L.H. OUTBOARD ONLY



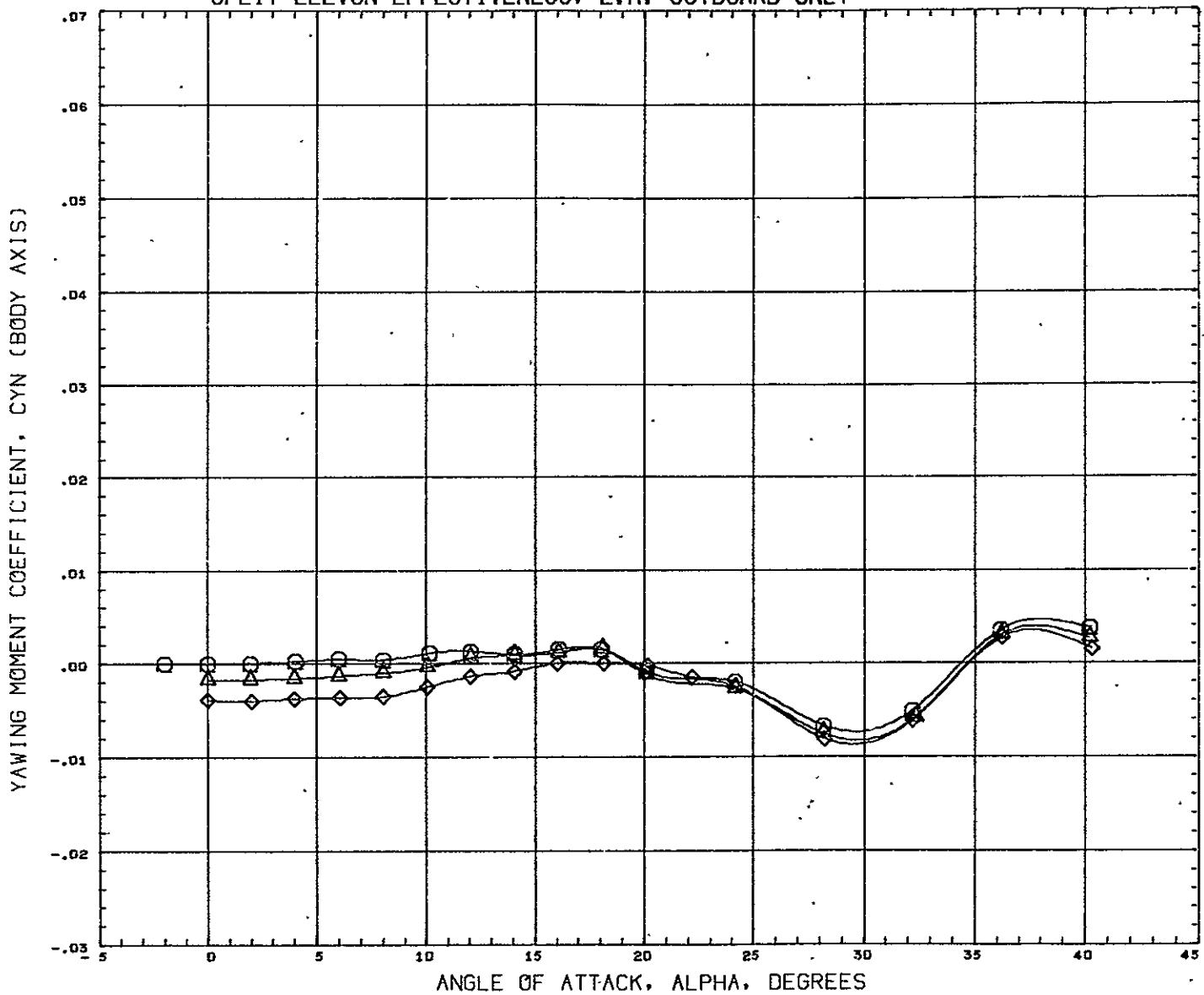
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(BCJD07) ○	NAAL 633 NAR DELTA ORB. W16 B4 V23
(BCJD13) △	NAAL 633 NAR DELTA ORB. W16E8 B4 V23
(BCJD14) ◇	NAAL 633 NAR DELTA ORB. W16E8 B4 V23

BETA	ELVN8U	ELVN8L
0.000		
0.000	-10.000	5.000
0.000	-20.000	10.000

REFERENCE INFORMATION		
REFS	0.3542	SG.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8540	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

### SPLIT ELEVON EFFECTIVENESS, L.H. OUTBOARD ONLY



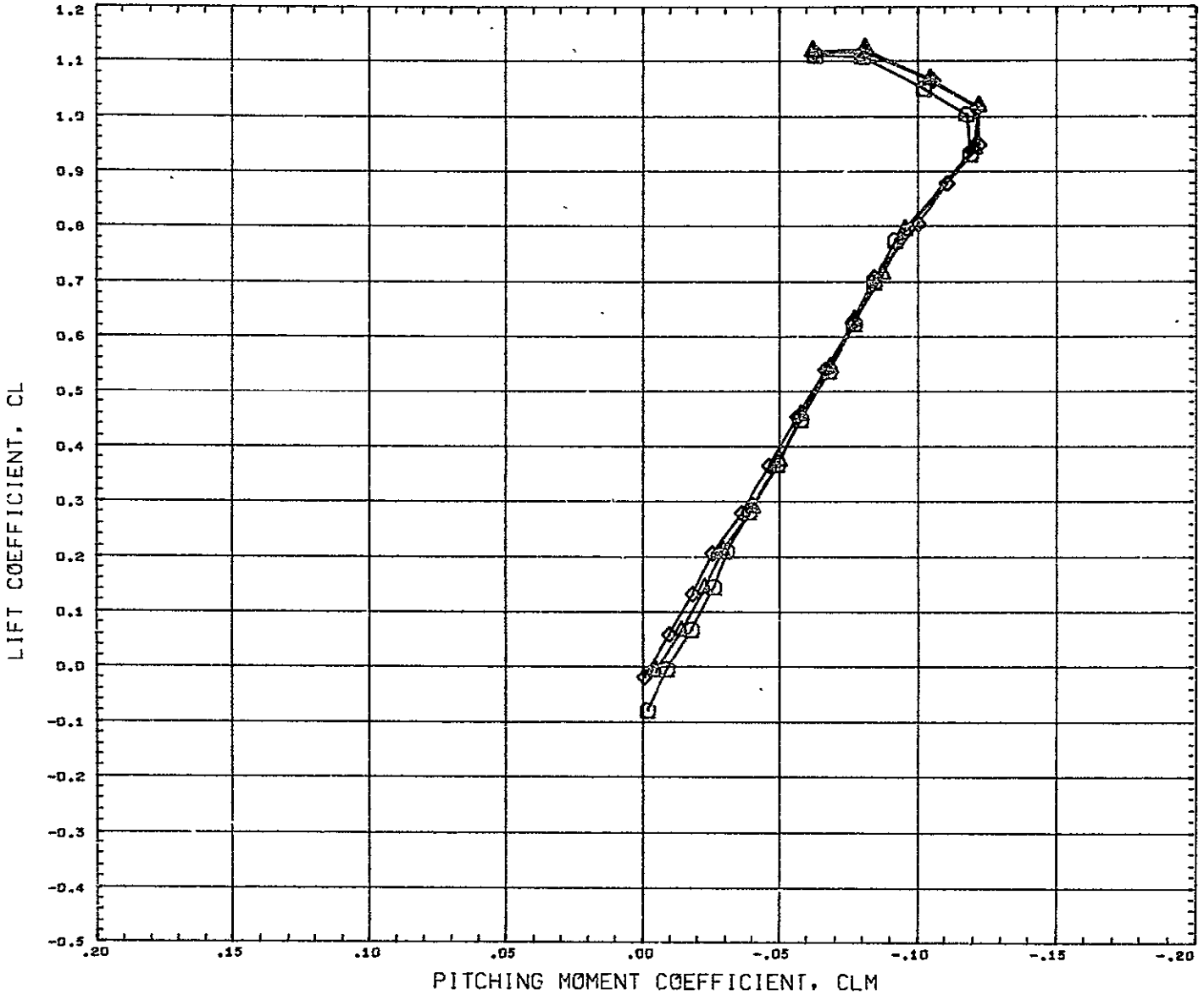
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(BCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(BCJ013)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23
(BCJ014)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23

BETA	ELVN8U	ELVN8L
0.000		
0.000	-10.000	5.000
0.000	-20.000	10.000

REFERENCE INFORMATION		
REFS	0.3542	SG.FT.
REFL	6.2656	INCHES
REFB	10.8540	INCHES
YMRP	10.8440	INCHES
ZMRP	0.9000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

### SPLIT ELEVON EFFECTIVENESS, L.H. OUTBOARD ONLY



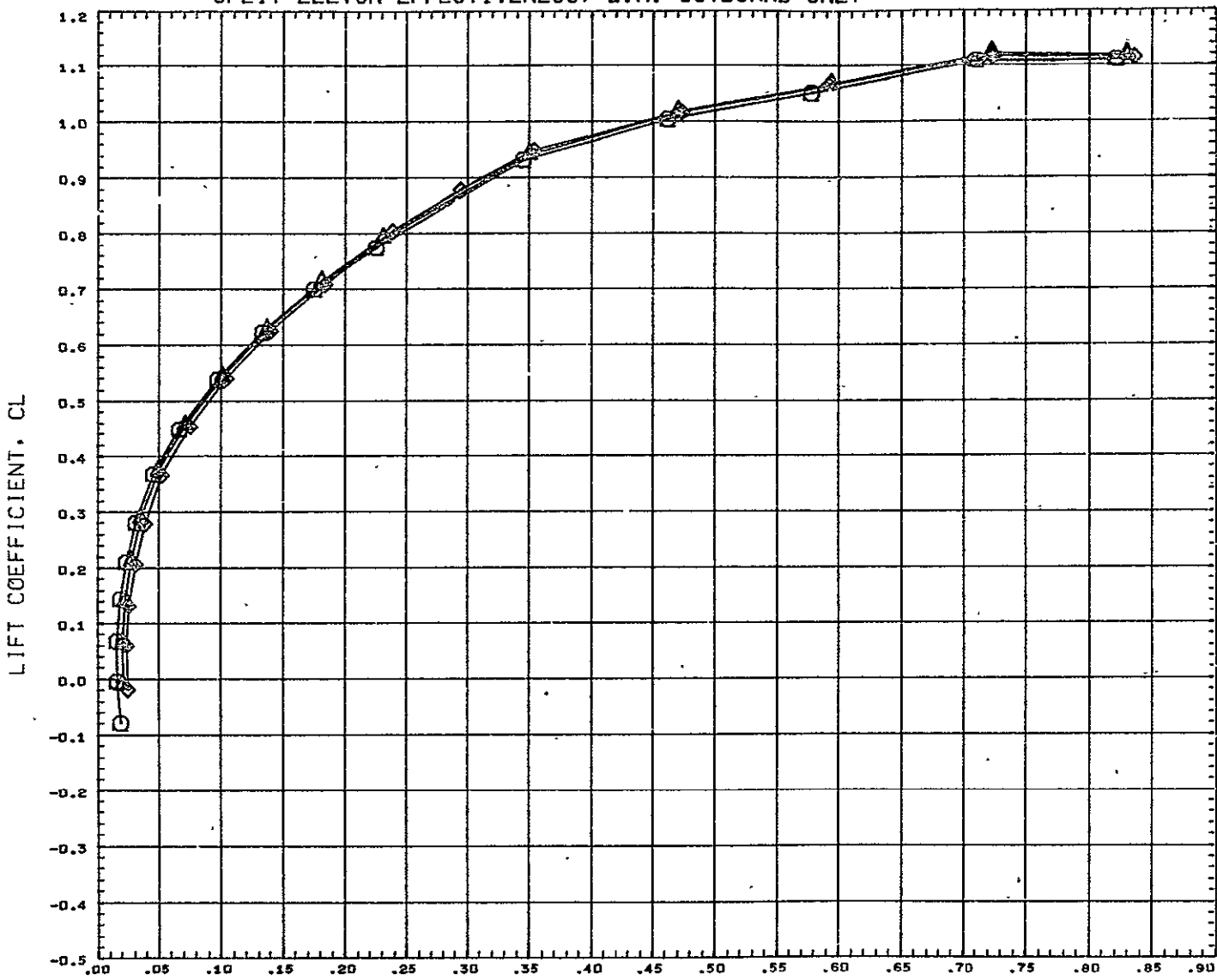
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ013)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23
(CCJ014)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23

BETA	ELVN8U	ELVN8L
0.000		
0.000	-10.000	5.000
0.000	-20.000	10.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
YNRP	10.8.40	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH      0.259

### SPLIT ELEVON EFFECTIVENESS, L.H. OUTBOARD ONLY



#### FOREBODY DRAG COEFFICIENT, CDF

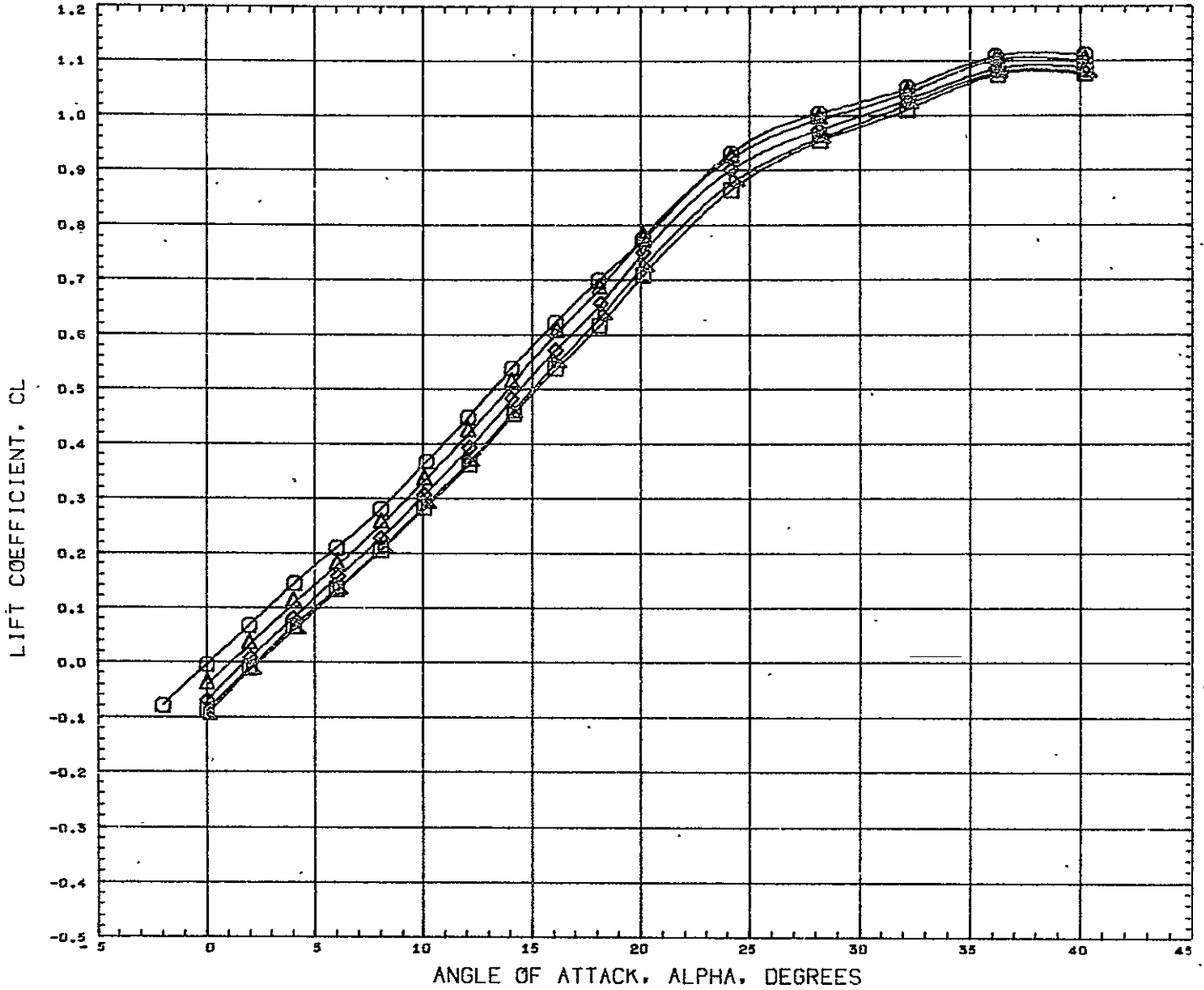
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ013)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23
(CCJ014)	NAAL 633 NAR DELTA ORB. W16E8 B4 V23

BETA	ELVN8U	ELVN8L
0.000		
0.000	-10.000	5.000
0.000	-20.000	10.000

REFERENCE INFORMATION		
REFS	0.3542	SQ. FT.
REFL	6.2656	INCHES
REFB	10.8562	INCHES
XMRP	10.8540	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH            0.259

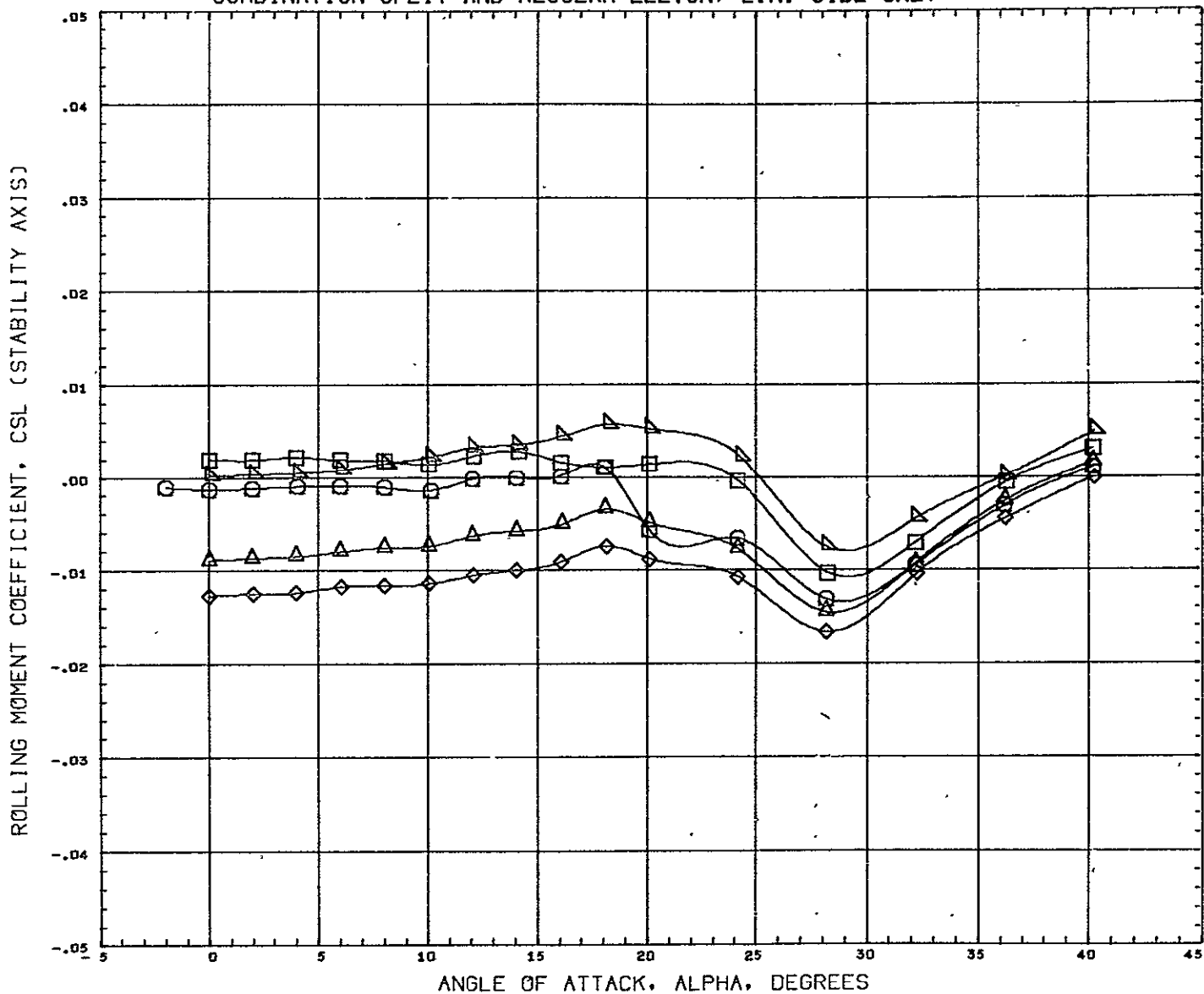
### COMBINATION SPLIT AND REGULAR ELEVON, L.H. SIDE ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ELEVON	ELVN8U	ELVN8L	ELVN9	REFERENCE INFORMATION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23					REFS 0.3542 SQ.FT.
(RCJ016)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23		-20.000	10.000	-5.000	REFL 6.2656 INCHES
(RCJ017)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23		-20.000	10.000	-10.000	REFB 10.8540 INCHES
(RCJ020)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23	-5.000				XMRP 10.8540 INCHES
(RCJ015)	NAAL 633 NAR DELTA ORB. W16 E8 E9 E7 B4. V23		-20.000	10.000	-5.000	YMRP 0.0000 INCHES
						ZMRP 0.9920 INCHES
						SCALE 0.0076 SCALE

MACH 0.259

### COMBINATION SPLIT AND REGULAR ELEVON, L.H. SIDE ONLY

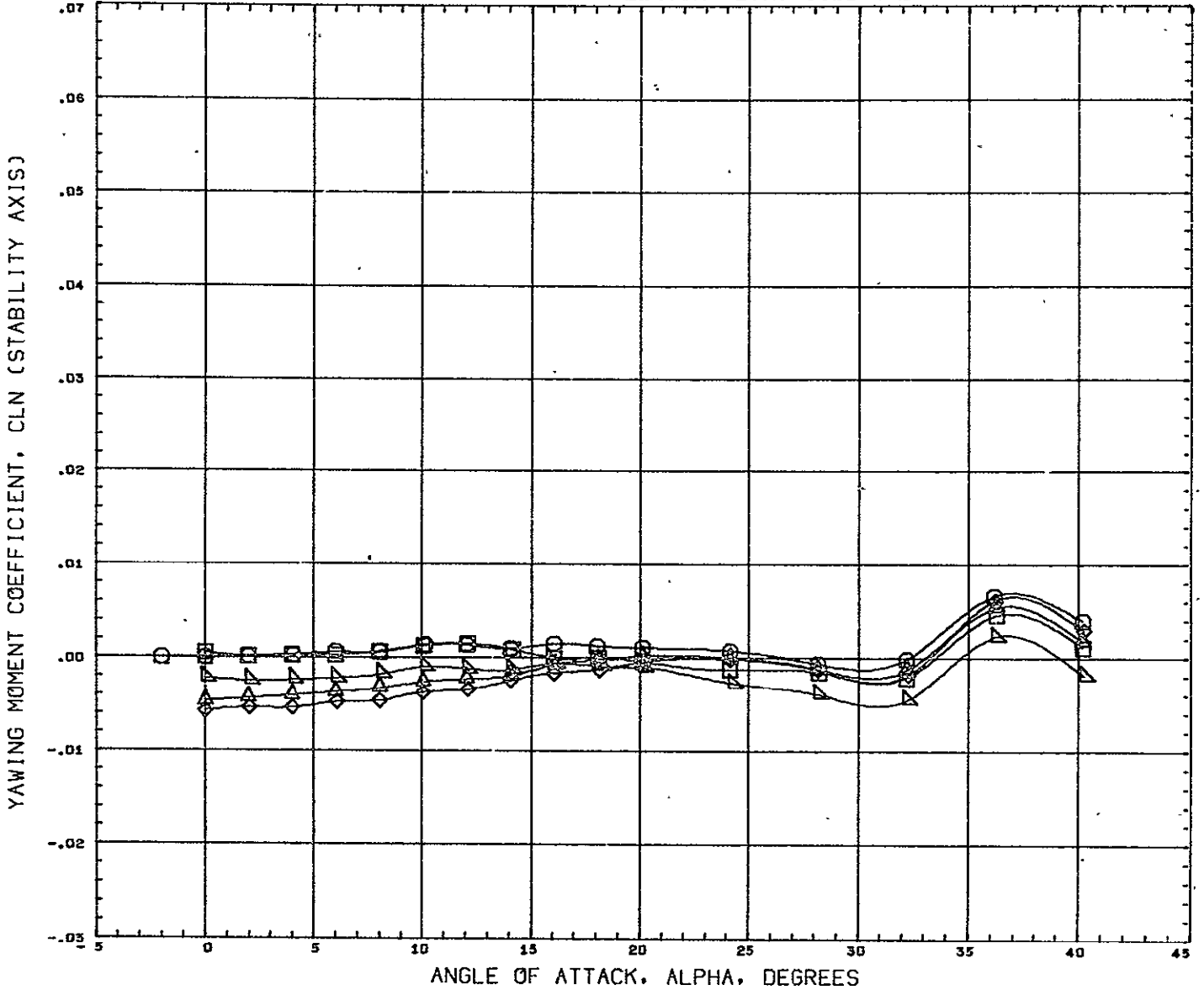


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ELEVON	ELVN8U	ELVN8L	ELVN9	REFERENCE INFORMATION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23					REFS 0.3542 SQ.FT.
(RCJ016)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23		-20.000	10.000	-5.000	REFL 6.2656 INCHES
(RCJ017)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23		-20.000	10.000	-10.000	REFB 10.8560 INCHES
(RCJ020)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23	-5.000				XMRP 10.8540 INCHES
(RCJ015)	NAAL 633 NAR DELTA ORB. W16 E8 E9 E7 B4 V23		-20.000	10.000	-5.000	YMRP 0.0000 INCHES
						ZMRP 0.9920 INCHES
						SCALE 0.0076 SCALE

MACH 0.259



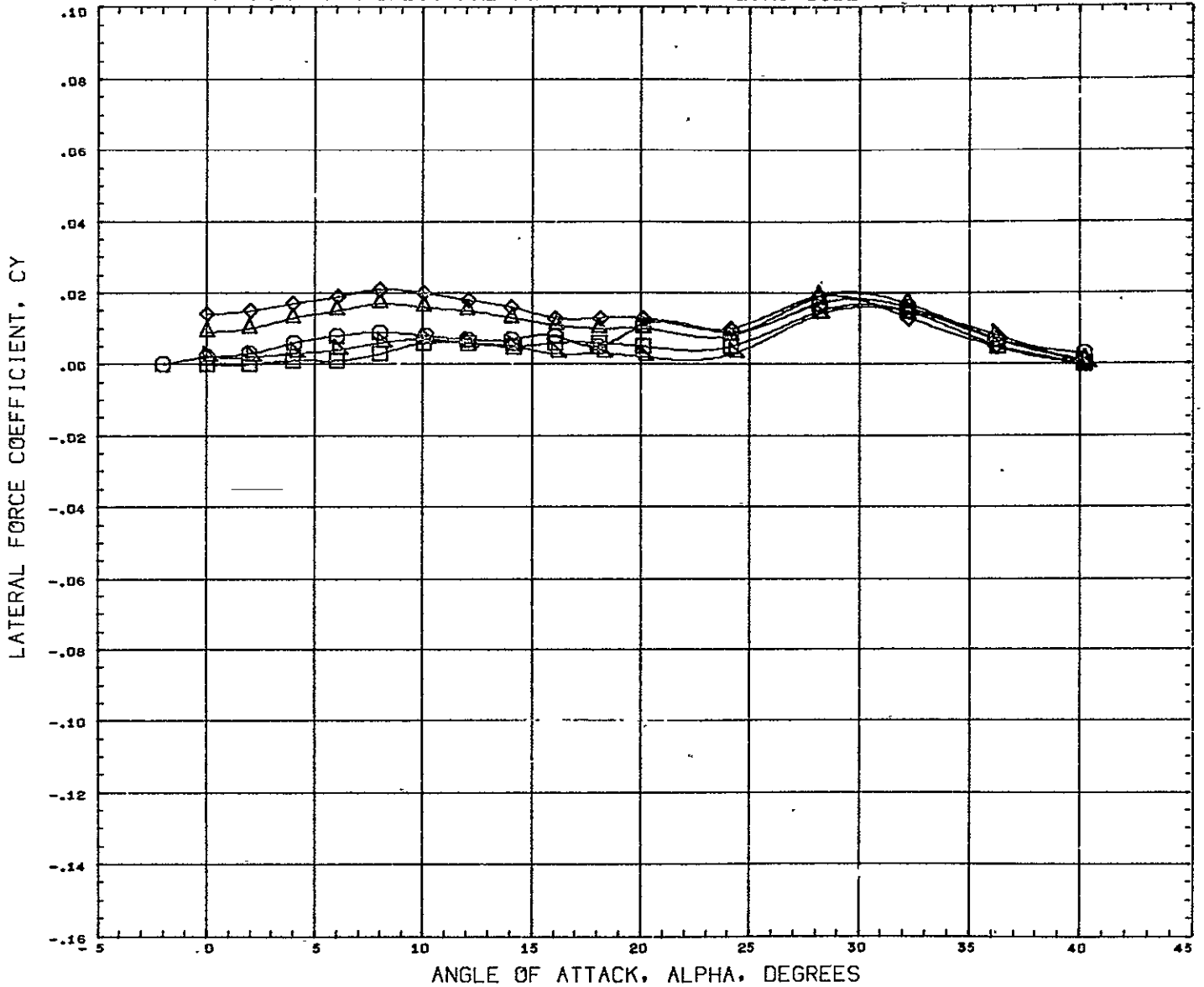
COMBINATION SPLIT AND REGULAR ELEVON, L.H. SIDE ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ELEVON	ELVN8U	ELVN8L	ELVN9	REFERENCE INFORMATION
(RCJD07)	NAAL 633 NAR DELTA ORB. W16 B4 V23					REFS 0.3542 SQ.FT.
(RCJD16)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23		-20.000	10.000	-5.000	REFL 6.2656 INCHES
(RCJD17)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23		-20.000	10.000	-10.000	REFB 10.8564 INCHES
(RCJD20)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23	-5.000				XMRP 10.8564 INCHES
(RCJD15)	NAAL 633 NAR DELTA ORB. W16 E8 E9 E7 B4 V23		-20.000	10.000	-5.000	YMRP 0.0000 INCHES
						ZMRP 0.9920 INCHES
						SCALE 0.0076 SCALE.

MACH 0.256

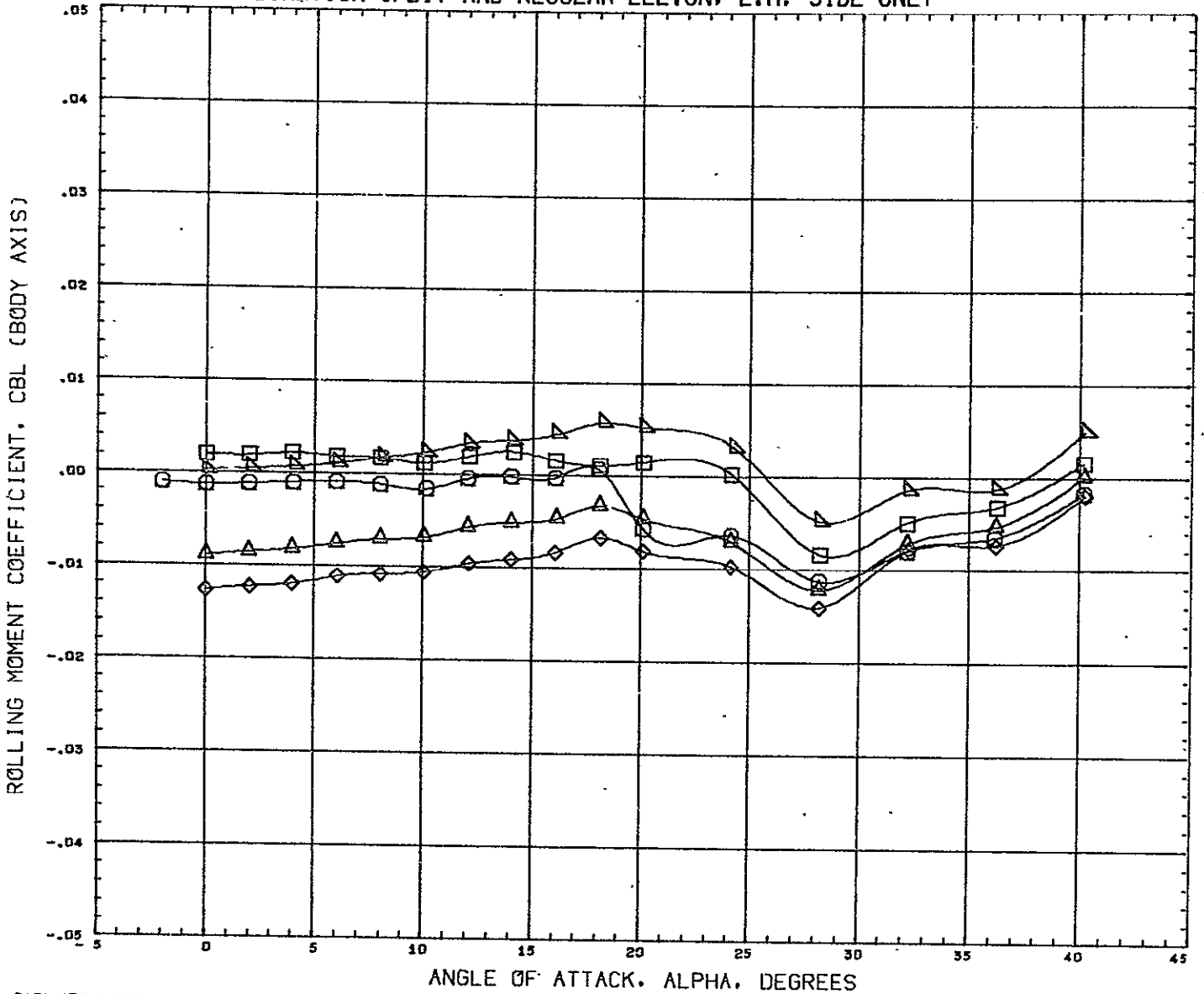
COMBINATION SPLIT AND REGULAR ELEVON, L.H. SIDE ONLY



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ELEVON	ELVN8U	ELVN8L	ELVN9	REFERENCE INFORMATION
(RCJ007)	□	NAAL 633 NAR DELTA ORG. W16 B4 V23					REFS 0.3542 SQ.FT.
(RCJ016)	△	NAAL 633 NAR DELTA ORG. W16 E8 E9 B4 V23	-20.000	10.000	-5.000	REFL 6.2656 INCHES	
(RCJ017)	◇	NAAL 633 NAR DELTA CRB. W16 E8 E9 B4 V23	-20.000	10.000	-10.000	REFB 10.8590 INCHES	
(RCJ020)	○	NAAL 633 NAR DELTA ORG. W16 E7 B4 V23	-5.000			XMRP 10.8440 INCHES	
(RCJ015)	□	NAAL 633 NAR DELTA ORG. W16 E8 E9 E7 B4 V23	-20.000	10.000	-5.000	YMRP 0.0000 INCHES	
						ZMRP 6.9920 INCHES	
						SCALE 0.0076 SCALE	

MACH 0.259

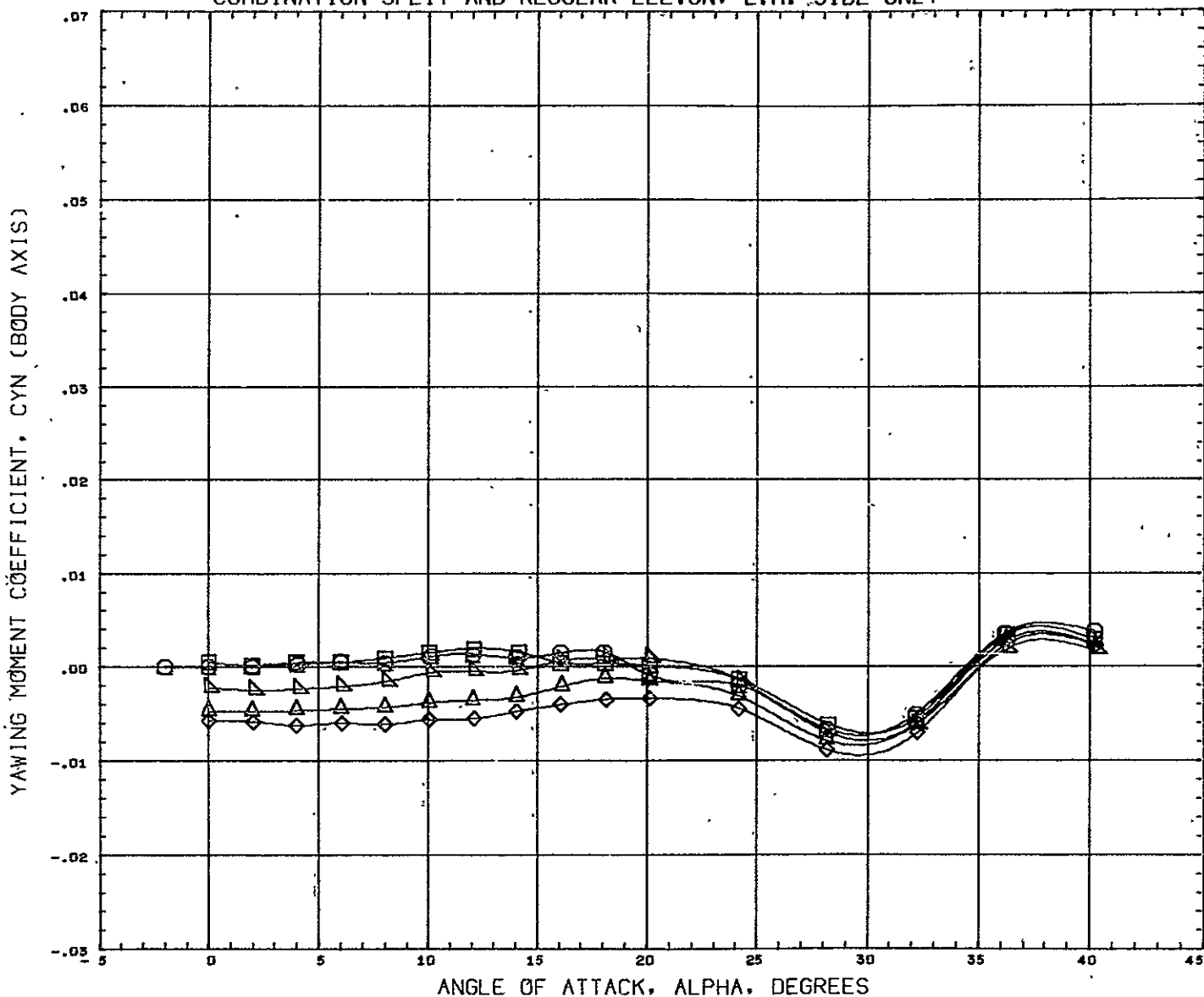
# COMBINATION SPLIT AND REGULAR ELEVON, L.H. SIDE ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ELEVON	ELVN8U	ELVN8L	ELVN9	REFERENCE INFORMATION
(BCJD07)	NAAL 633 F1AR DELTA ORB. W16 B4 V23					REFS 0.3542 SQ.FT.
(BCJD16)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23	-20.000	10.000	-5.000		REFL 6.2656 INCHES
(BCJD17)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23	-20.000	10.000	-10.000		REFB 10.8560 INCHES
(BCJD20)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23					XHRP 10.8140 INCHES
(BCJD15)	NAAL 633 NAR DELTA ORB. W16 E8 E9 E7 B4 V23	-5.000	-20.000	10.000	-5.000	YHRP 0.0000 INCHES
						ZMRP 0.9920 INCHES
						SCALE 0.0076 SCALE

MACH 0.259

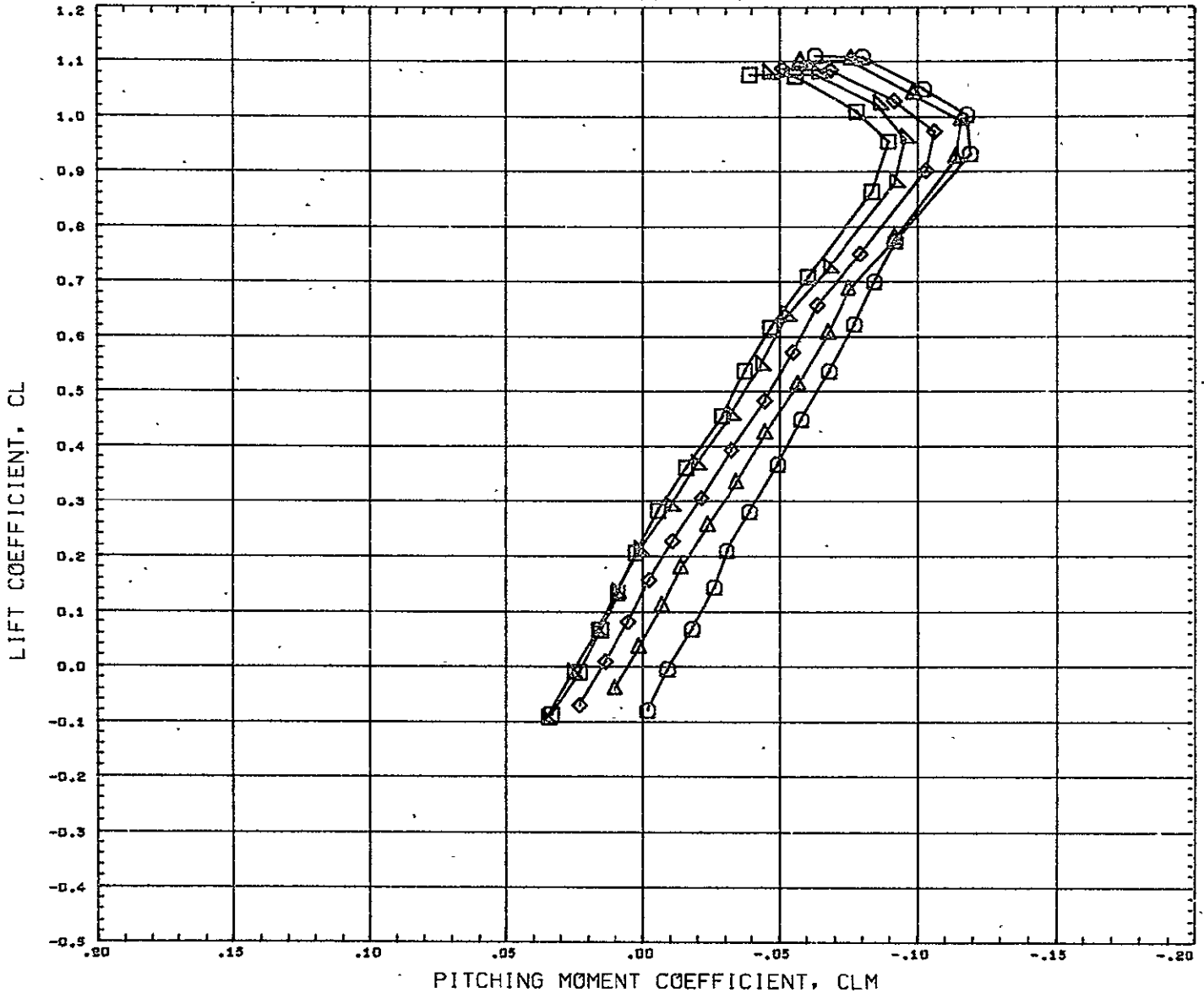
COMBINATION SPLIT AND REGULAR ELEVON, L.H. SIDE ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ELEVON	ELVN8U	ELVN8L	ELVN9	REFERENCE INFORMATION
(BCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23					REFS 0.3542 SQ.FT.
(BCJ016)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23		-20.000	10.000	-5.000	REFL 6.2656 INCHES
(BCJ017)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23		-20.000	10.000	-10.000	REFB 10.8560 INCHES
(BCJ020)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23	-5.000				XMRP 10.8540 INCHES
(BCJ015)	NAAL 633 NAR DELTA ORB. W16 E8 E9 E7 B4 V23		-20.000	10.000	-5.000	YMRP 0.0000 INCHES
						ZMRP 0.9920 INCHES
						SCALE 0.0076 SCALE

MACH 0.259

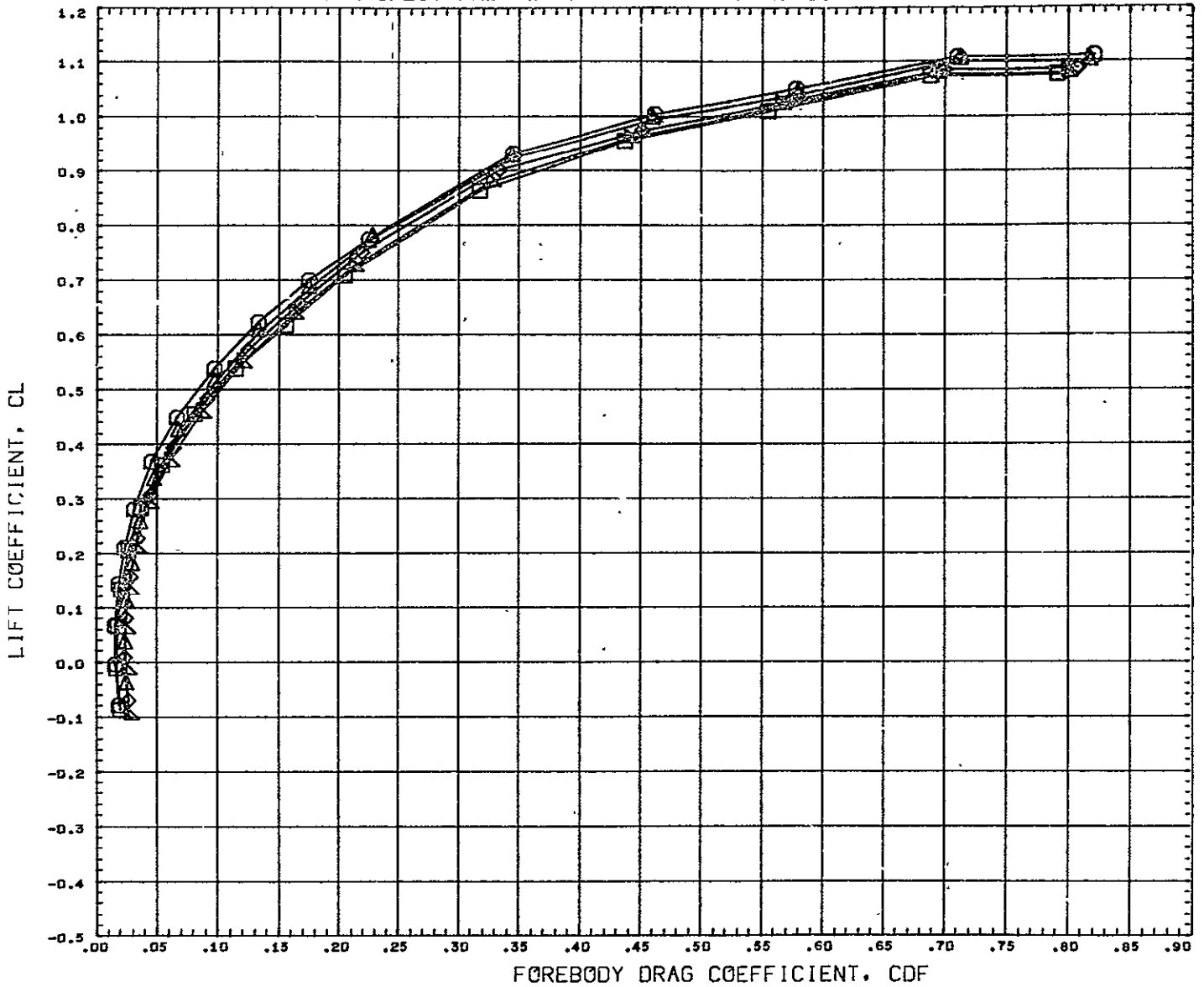
COMBINATION SPLIT AND REGULAR ELEVON, L.H. SIDE ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ELEVON	ELVN8U	ELVN8L	ELVN9	REFERENCE INFORMATION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23					REFS 0.3542 SQ.FT.
(RCJ016)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23		-20.000	10.000	-5.000	REFL 6.2656 INCHES
(RCJ017)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23		-20.000	10.000	-10.000	REFB 10.8561 INCHES
(RCJ020)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23	-5.000				XMRP 10.8540 INCHES
(RCJ015)	NAAL 633 NAR DELTA ORB. W16 E8 E9 E7 B4 V23		-20.000	10.000	-5.000	YMRP 0.0000 INCHES
						ZMRP 0.9920 INCHES
						SCALE 0.0076 SCALE

MACH 0.259

COMBINATION SPLIT AND REGULAR ELEVON, L.H. SIDE ONLY



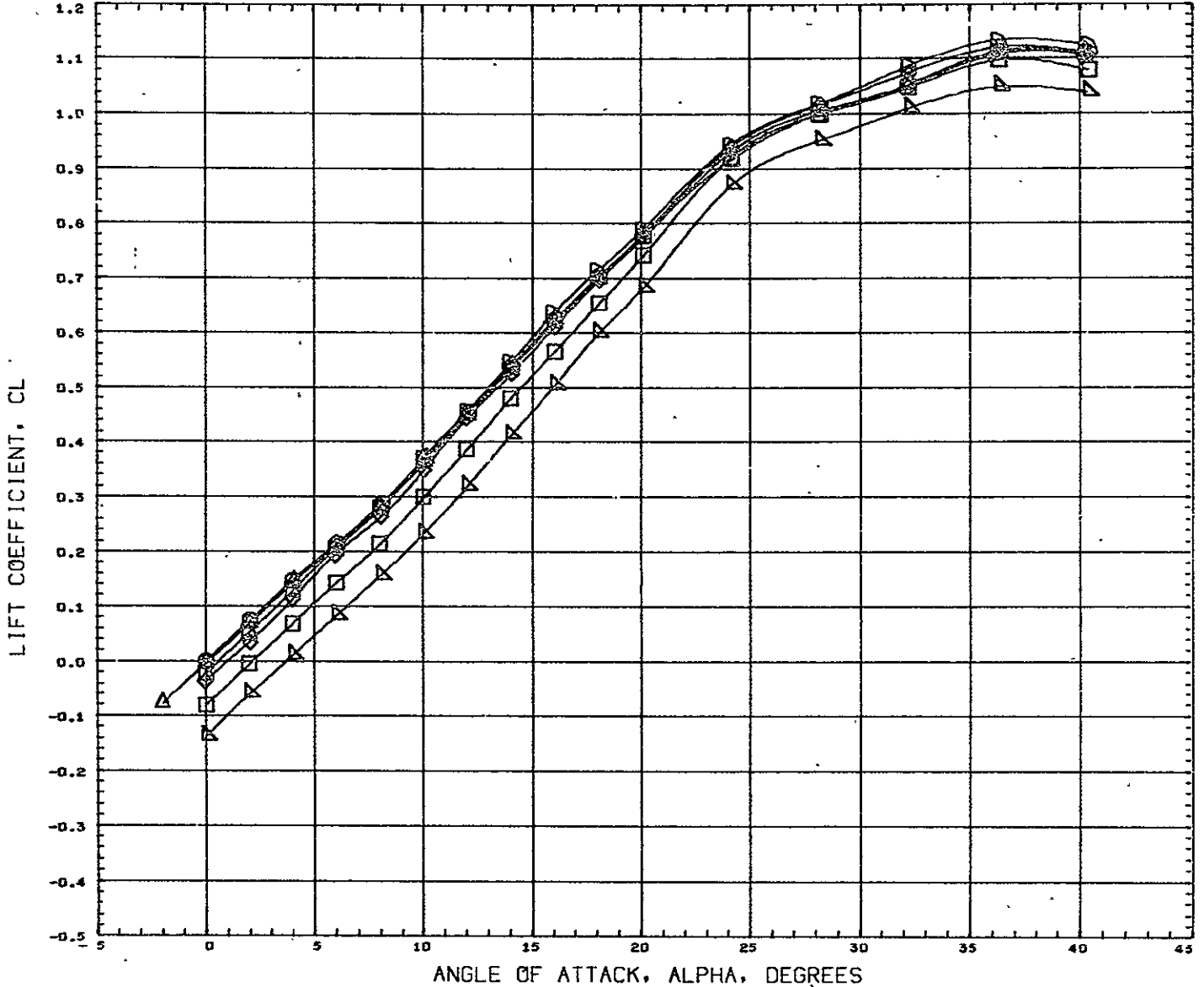
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ016)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23
(RCJ017)	NAAL 633 NAR DELTA ORB. W16 E8 E9 B4 V23
(RCJ020)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ015)	NAAL 633 NAR DELTA ORB. W16 E8 E9 E7 B4 V23

ELEVON	ELVN8U	ELVN8L	ELVN9
	-20.000	10.000	-5.000
	-20.000	10.000	-10.000
-5.000	-20.000	10.000	-5.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.854C	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

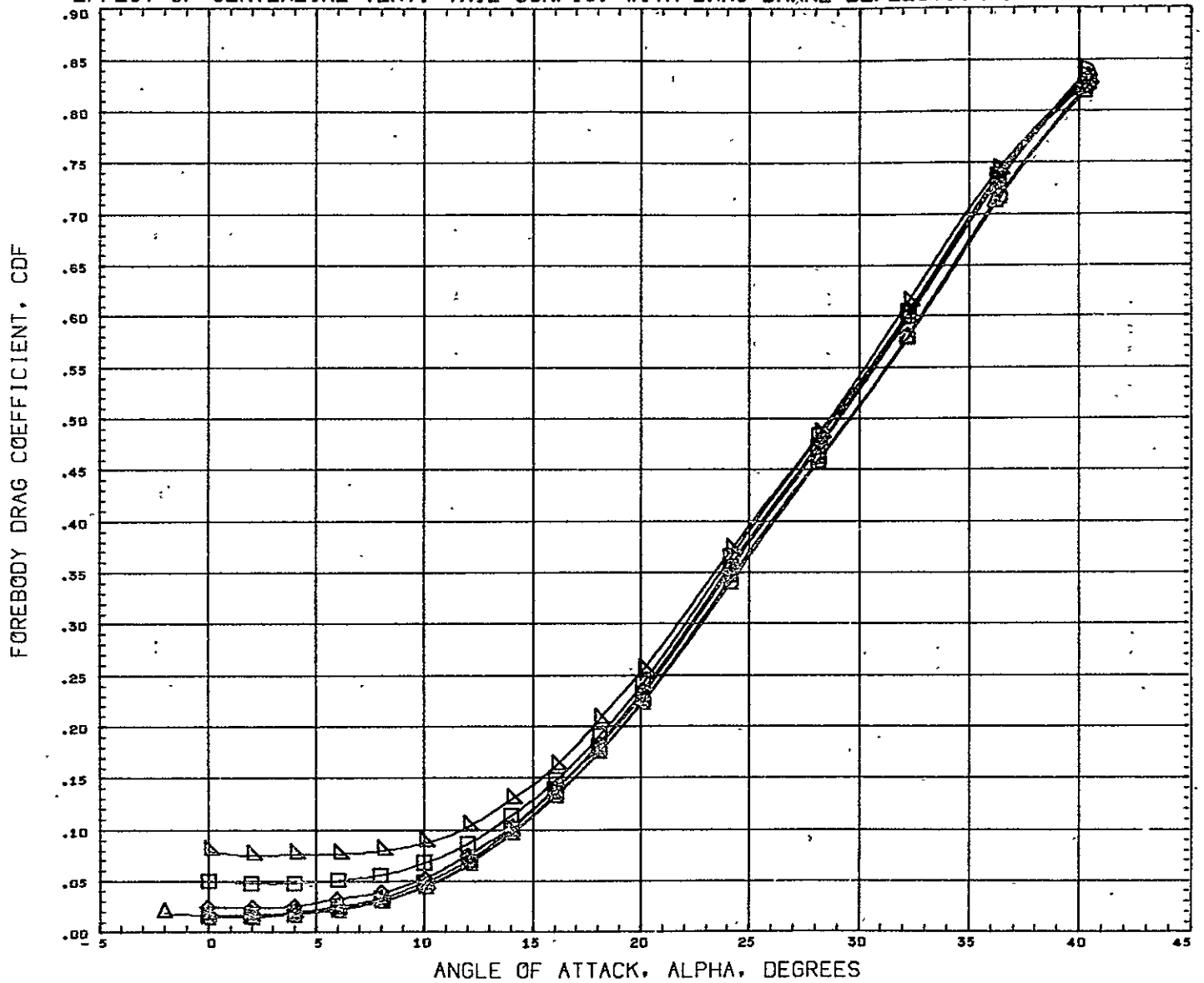
EFFECT OF CENTERLINE VERT. TAIL CONFIG. WITH DRAG BRAKE DEFLECTION IN PITCH



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	SPD BK	REFERENCE INFORMATION
(RCJ001)	NAAL 633 NAR DELTA ORB. W16 B4	0.000		REFS 0.3542 SQ.FT.
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		REFL 6.2656 INCHES
(RCJ031)	NAAL 633 NAR DELTA ORB. W16 B4 V24	0.000	0.000	REFB 10.8569 INCHES
(RCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	15.000	XMRP 10.8530 INCHES
(RCJ039)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	30.000	YMRP 0.0000 INCHES
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		ZMRP 0.9920 INCHES
		0.000		SCALE 0.0076 SCALE

MACH 0.259

# EFFECT OF CENTERLINE VERT. TAIL CONFIG. WITH DRAG BRAKE DEFLECTION IN PITCH

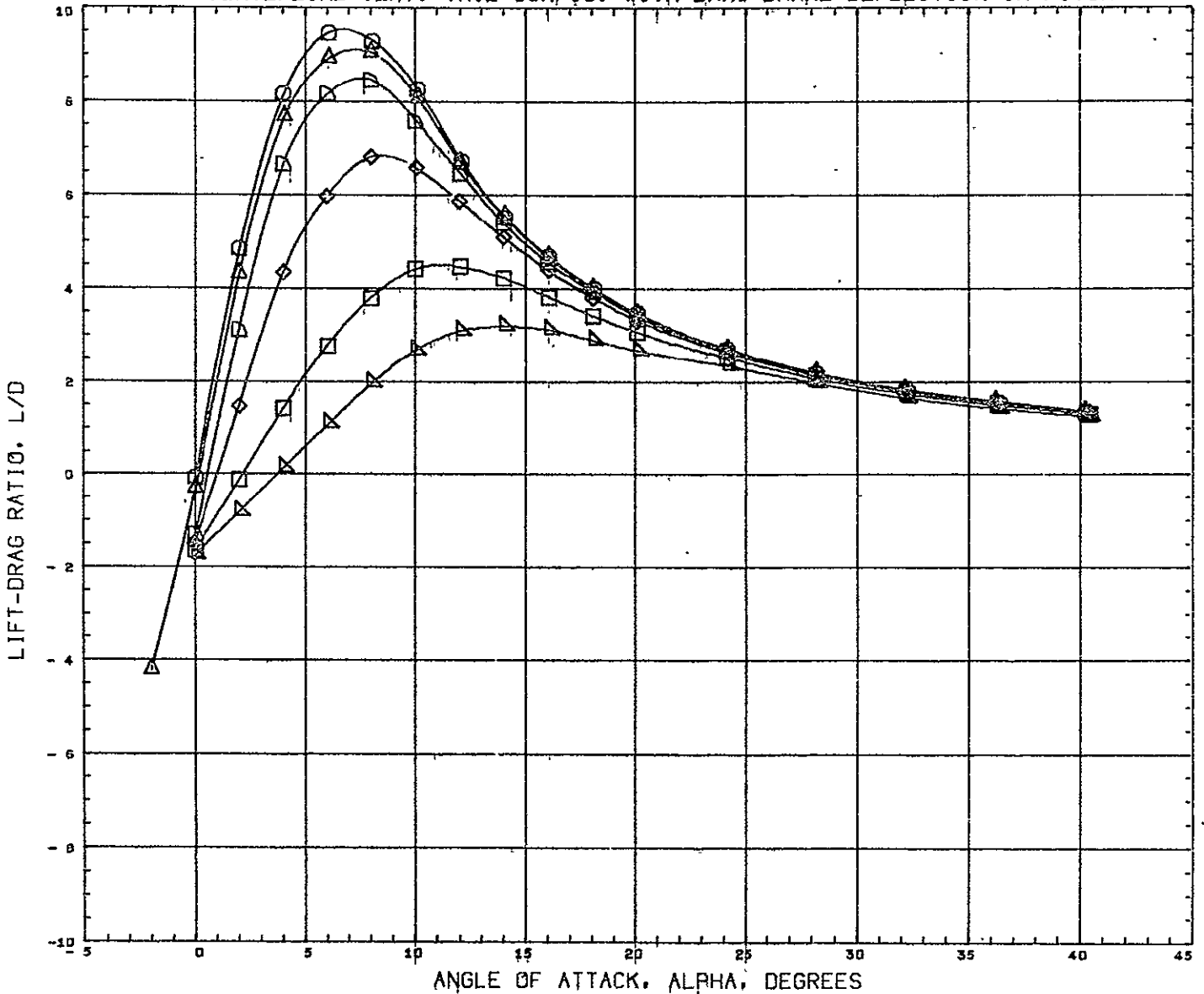


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	SPD BK	REFERENCE INFORMATION
(RCJ001)	NAAL 633 NAR DELTA ORB. W16 B4	0.000		REFS 0.3542 SQ.FT.
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		REFL 6.2656 INCHES
(RCJ031)	NAAL 633 NAR DELTA ORB. W16 B4 V24	0.000	0.000	REFB 10.8560 INCHES
(RCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	15.000	XNRP 10.8.40 INCHES
(RCJ039)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	30.000	YNRP 0.0000 INCHES
(RCJ039)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		ZNRP 0.9920 INCHES
				SCALE 0.0076 SCALE

MACH 0.259

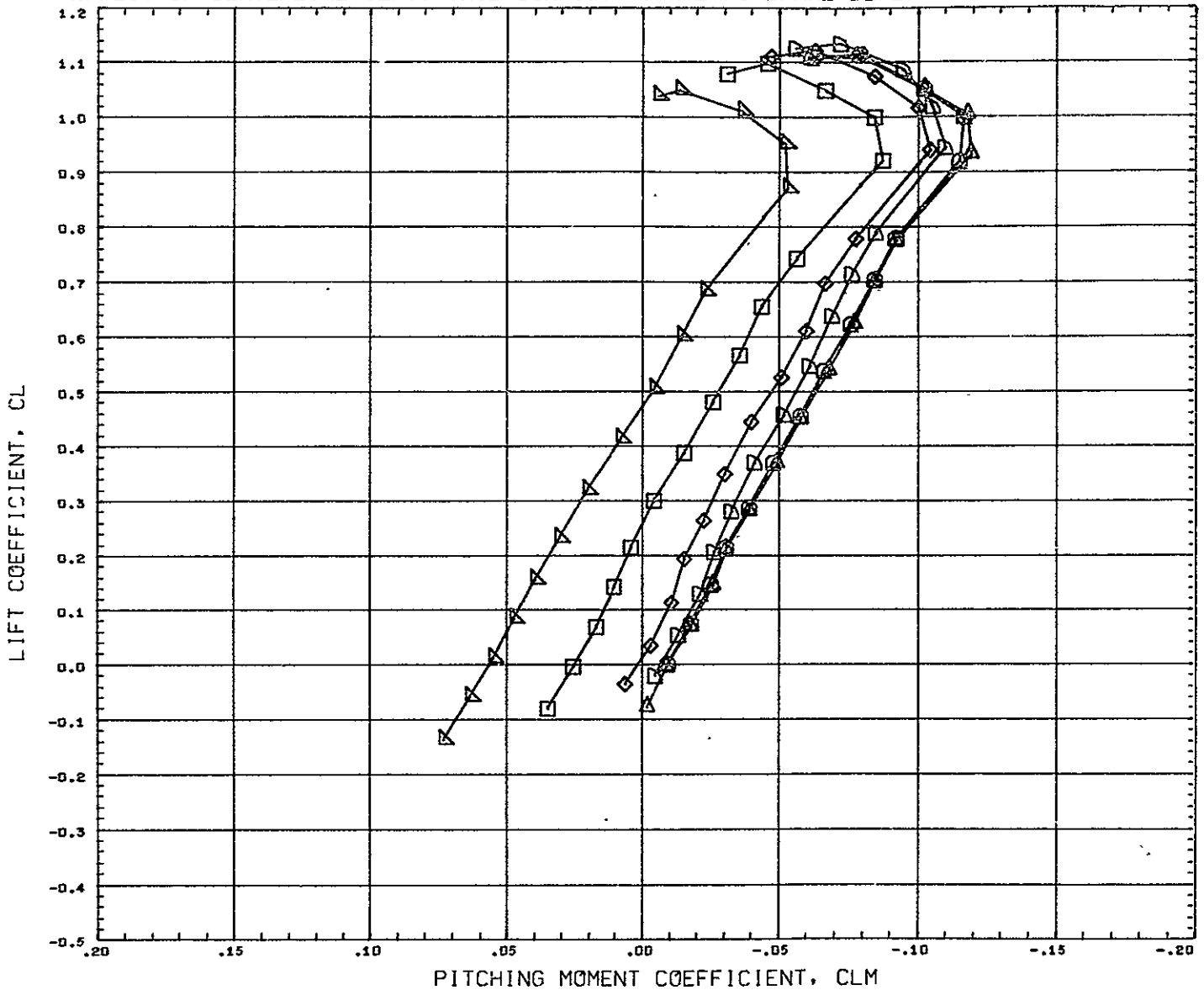


EFFECT OF CENTERLINE VERT. TAIL CONFIG. WITH DRAG BRAKE DEFLECTION IN PITCH



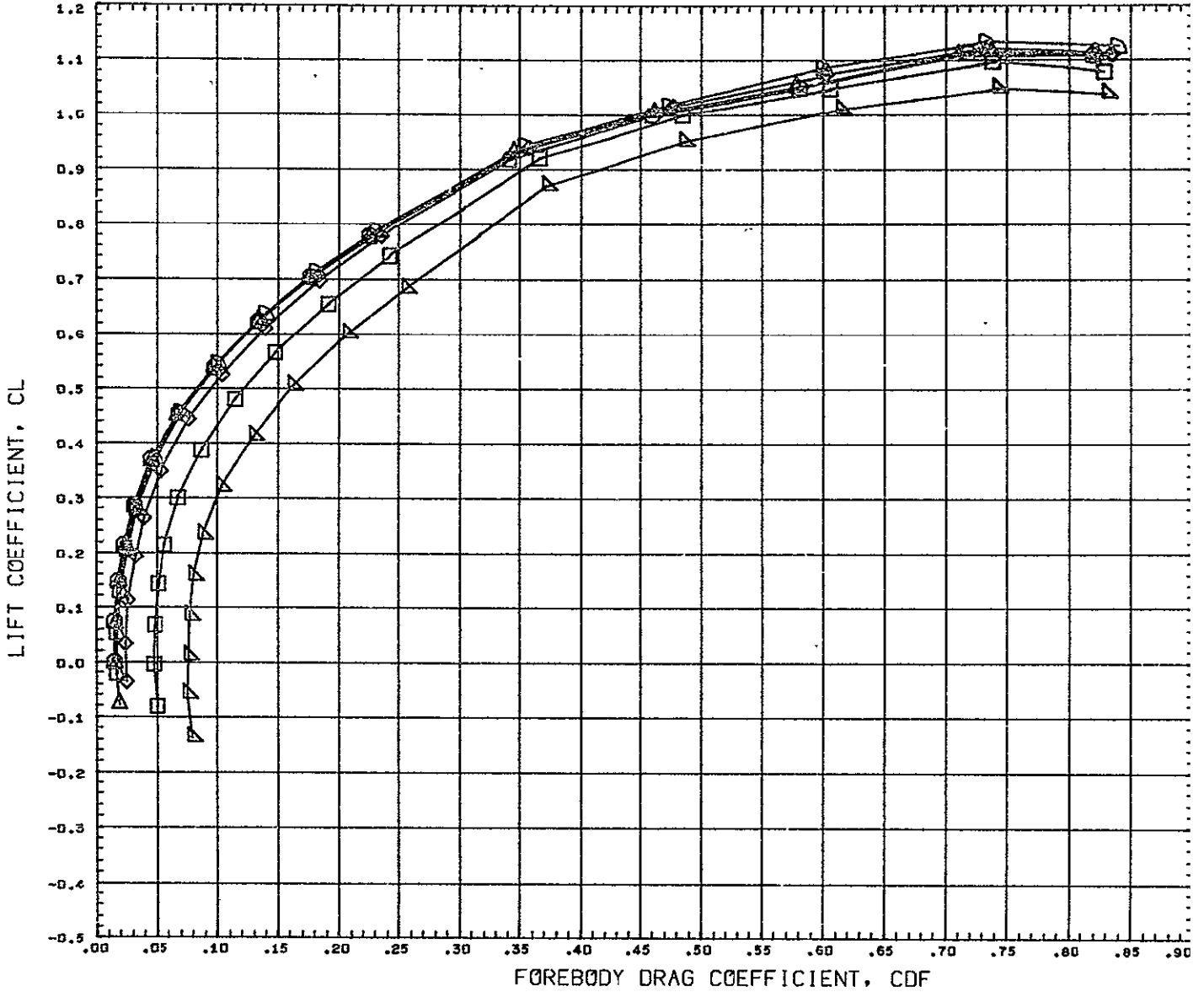
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	SPD BK	REFERENCE INFORMATION
(RCJ001)		NAAL 633 NAR DELTA ORB. W16 B4	0,000		REFS 0.3542 SQ.FT.
(RCJ007)		NAAL 633 NAR DELTA ORB. W16 B4 V23	0,000		REFL 6.2656 INCHES
(RCJ031)		NAAL 633 NAR DELTA ORB. W16 B4 V24	0,000	0,000	REFB 10.8560 INCHES
(RCJ032)		NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0,000	15,000	XMRP 10.8560 INCHES
(RCJ039)		NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0,000	30,000	YMRP 0.0000 INCHES
(RCJ030)		NAAL 633 NAR DELTA ORB. W16 B4 V23	0,000		ZMRP 0.9920 INCHES
MACH		0.259			SCALE 0.0076 SCALE

# EFFECT OF CENTERLINE VERT. TAIL CONFIG. WITH DRAG BRAKE DEFLECTION IN PITCH



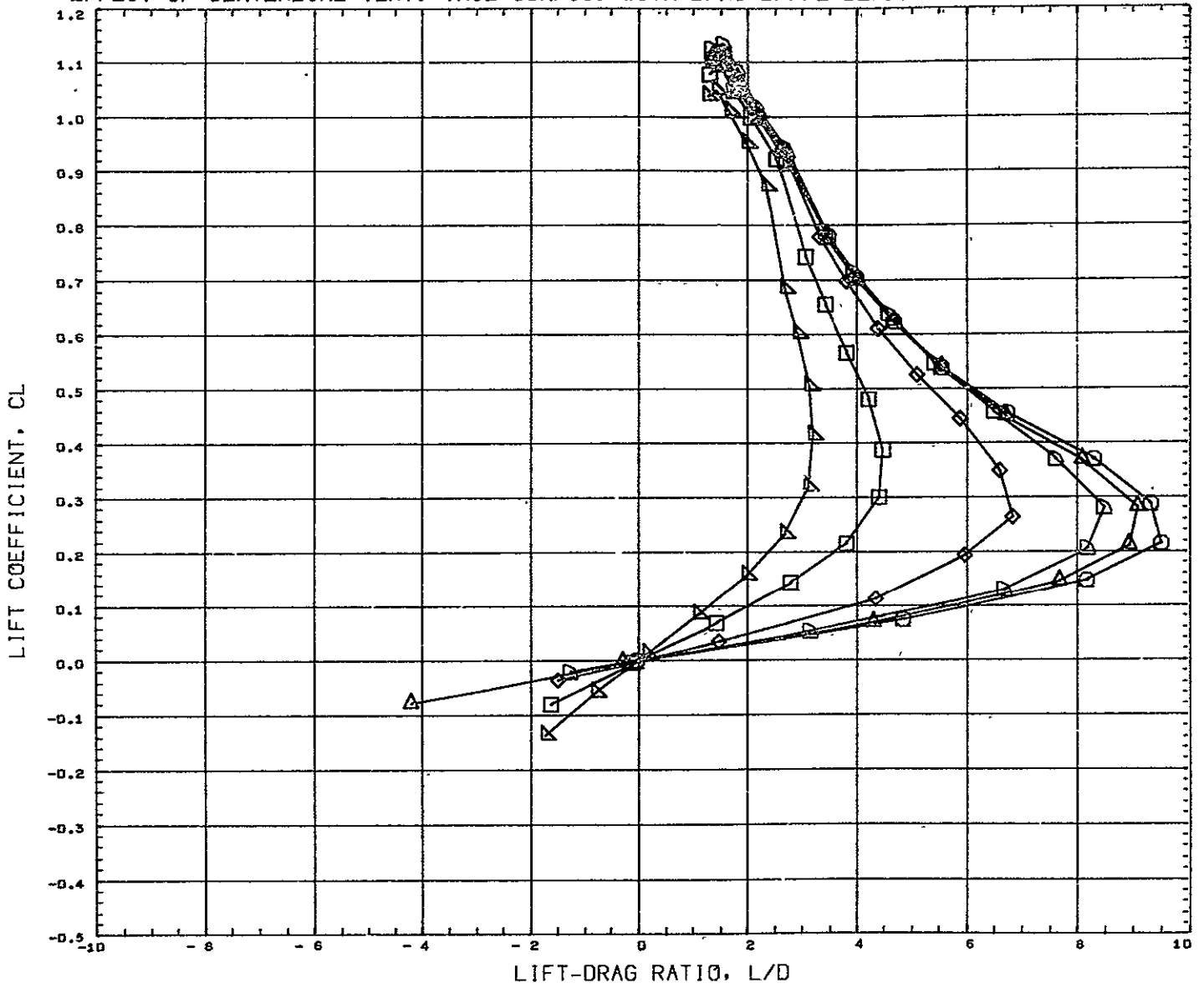
DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	SPD BK	REFERENCE INFORMATION
(RCJ001)	NAAL 633 NAR DELTA ORB. W16 B4	0.000		REFS 0.3542 SQ.FT.
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		REFL 6.2656 INCHES
(RCJ031)	NAAL 633 NAR DELTA ORB. W16 B4 V24	0.000	0.000	REFB 10.8560 INCHES
(RCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	15.000	XMRP 10.8579 INCHES
(RCJ039)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	30.000	YMRP 0.0000 INCHES
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		ZMRP 0.9920 INCHES
		0.259		SCALE 0.0076 INCHES

# EFFECT OF CENTERLINE VERT. TAIL CONFIG. WITH DRAG BRAKE DEFLECTION IN PITCH



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	SPD BK	REFERENCE INFORMATION
(RCJ001)	NAAL 633 NAR DELTA ORB. W16 B4	0.000		REFS 0.3542 SQ.FT.
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		REFL 6.2656 INCHES
(RCJ031)	NAAL 633 NAR DELTA ORB. W16 B4 V24	0.000	0.000	REFB 10.8560 INCHES
(RCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	15.000	XMRP 10.8540 INCHES
(RCJ039)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	30.000	YNRP 0.0000 INCHES
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		ZNRP 0.9920 INCHES
	MACH 0.259			SCALE 0.0076 SCALE

# EFFECT OF CENTERLINE VERT. TAIL CONFIG. WITH DRAG BRAKE DEFLECTION IN PITCH



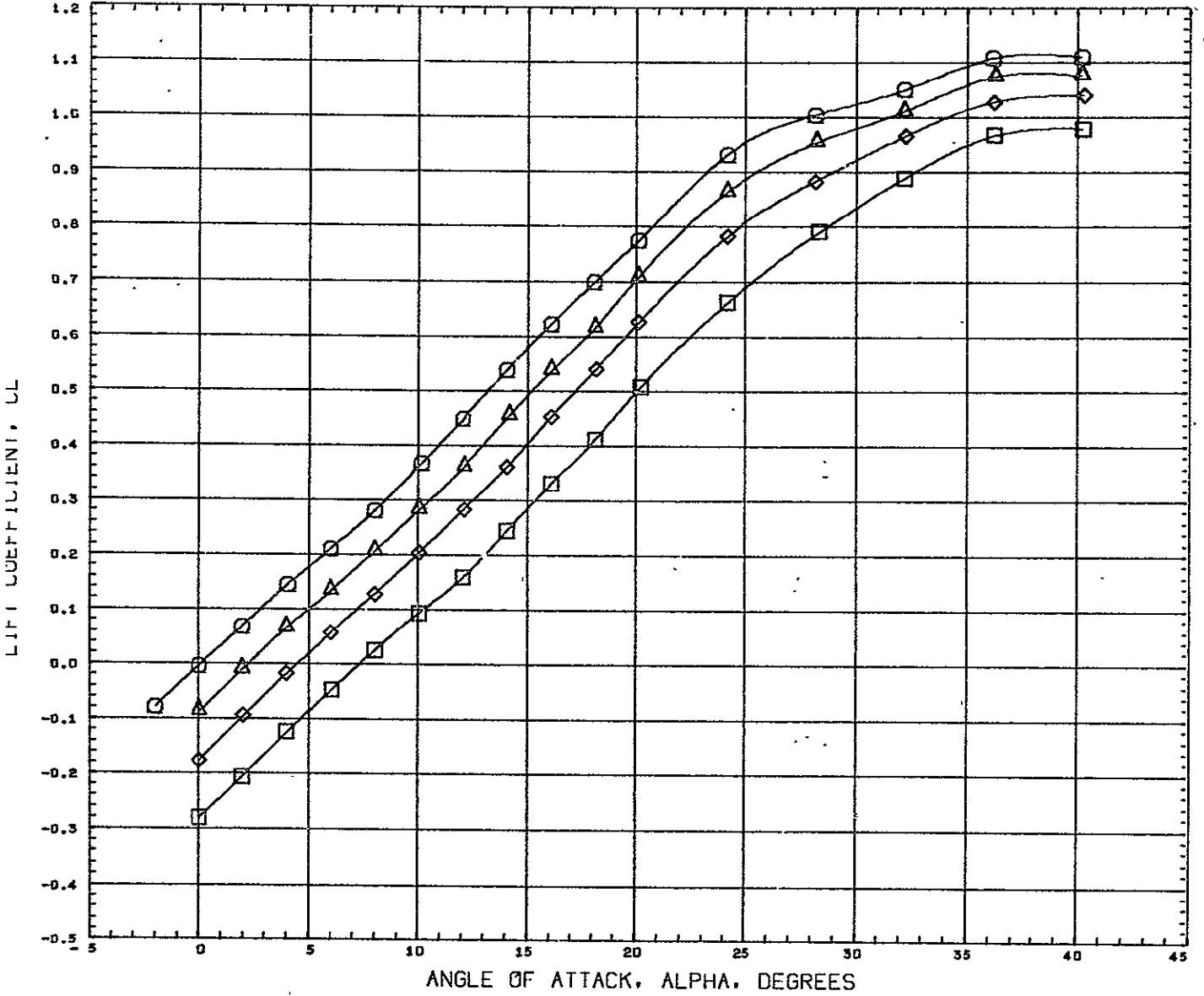
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ001)	NAAL 633 NAR DELTA ORB. W16 B4
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ031)	NAAL 633 NAR DELTA ORB. W16 B4 V24
(RCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J
(RCJ039)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23

BETA	SPD BK
0.000	
0.000	
0.000	0.000
0.000	15.000
0.005	30.000
0.000	

REFERENCE INFORMATION	
REFS	0.3542 SQ.FT.
REFL	6.2656 INCHES
REFB	10.8569 INCHES
XMRP	10.8569 INCHES
YMRP	0.0000 INCHES
ZMRP	0.9920 INCHES
SCALE	0.0076 SCALE

MACH 0.259

# ELEVATOR EFFECTIVENESS



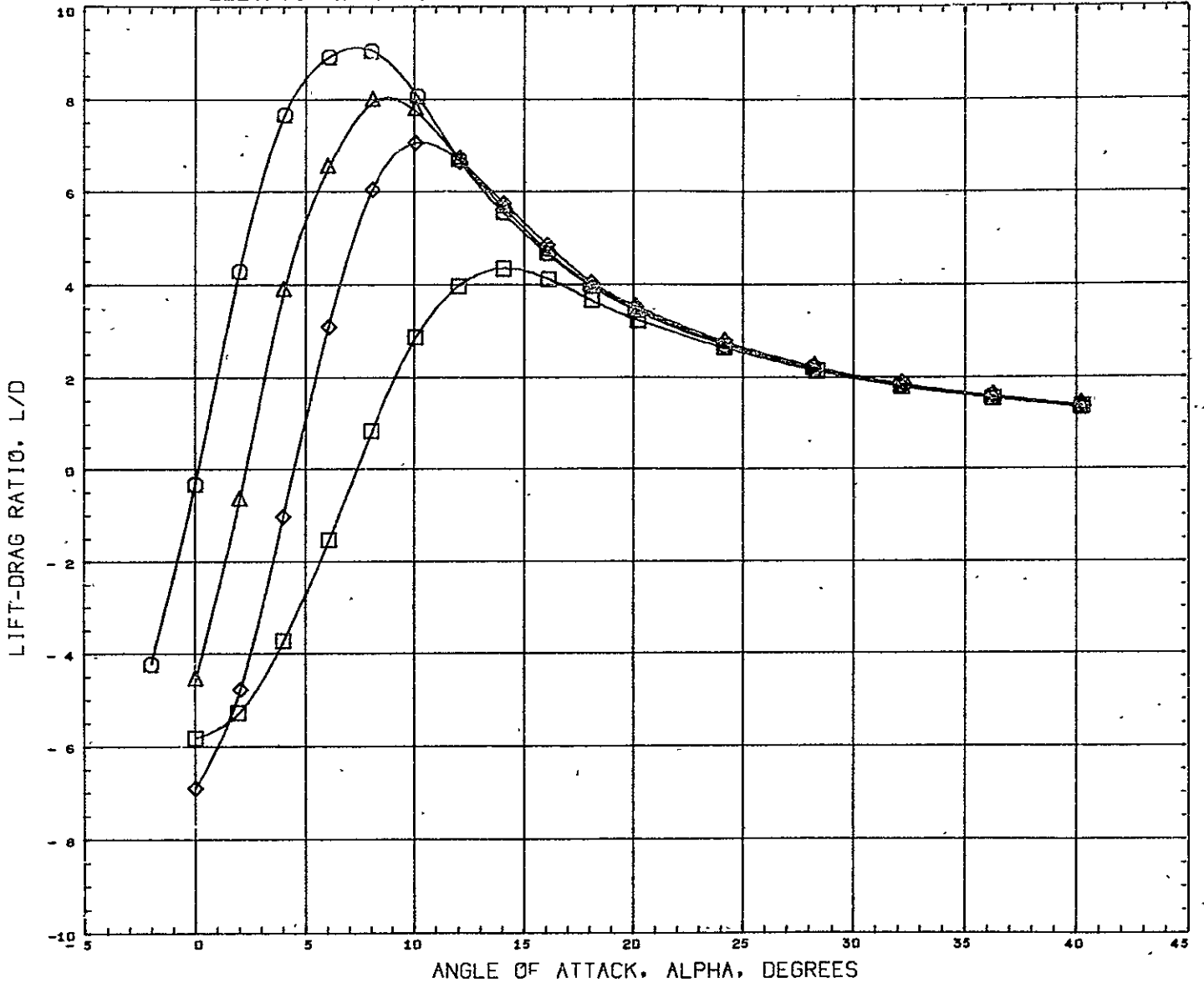
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ020)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ018)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ019)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23

BETA	ELEVON
0.000	0.000
0.000	-5.000
0.000	-10.000
0.000	-20.000

REFERENCE INFORMATION		
REFS	0.3542	SG.FT.
REFL	6.2656	INCHES
REFB	10.8561	INCHES
XHRP	10.8540	INCHES
YHRP	0.0000	INCHES
ZHRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# ELEVATOR EFFECTIVENESS



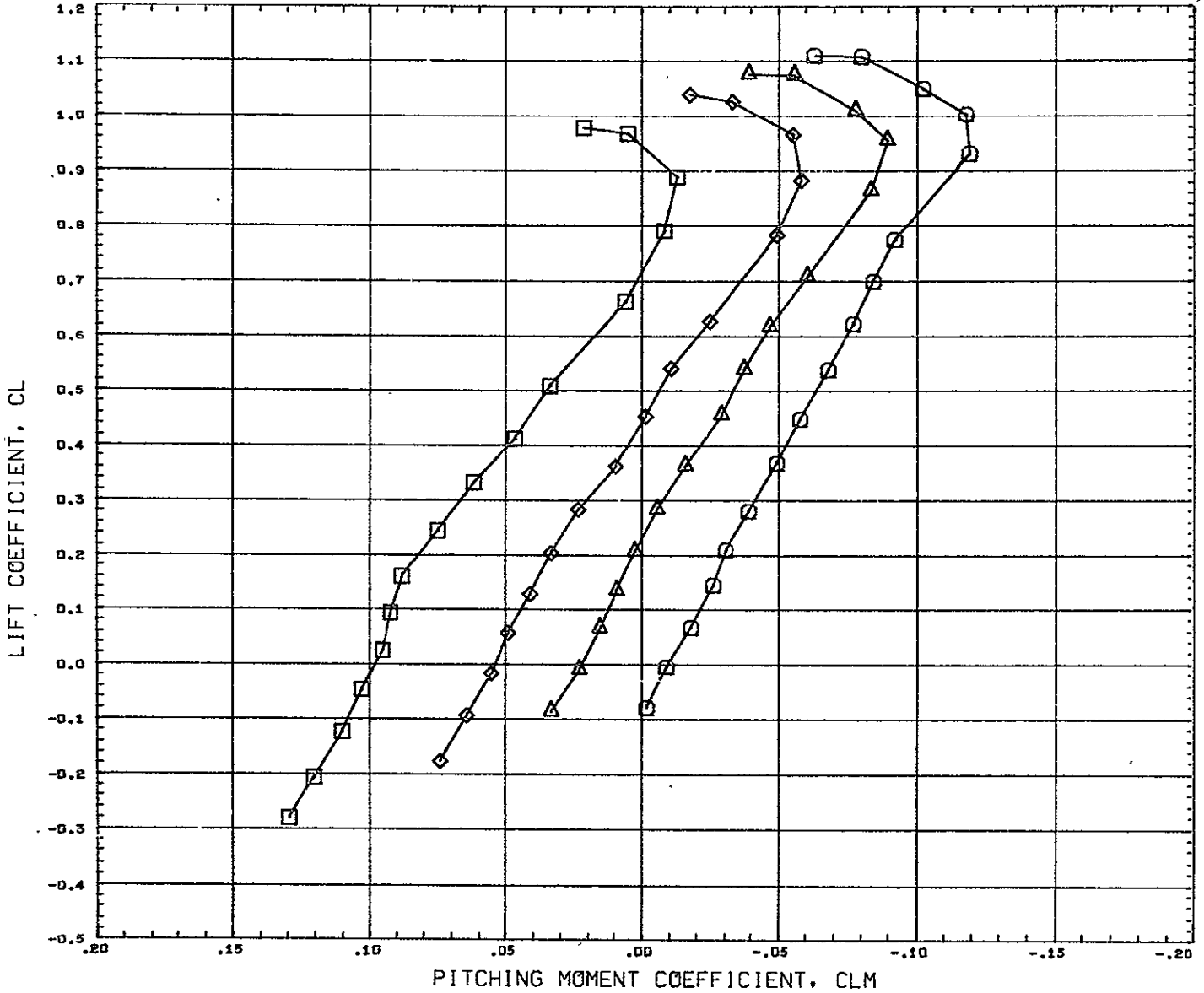
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ020)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ018)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ019)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23

BETA	ELEVON
0.000	
0.000	-5.000
0.000	-10.000
0.000	-20.000

REFERENCE INFORMATION	
REFS	0.3542 SQ.FT.
REFL	6.2656 INCHES
REFB	10.8560 INCHES
XMRP	10.82 * D INCHES
YMRP	0.0000 INCHES
ZMRP	0.9920 INCHES
SCALE	0.0076 SCALE

MACH 0.259

# ELEVATOR EFFECTIVENESS



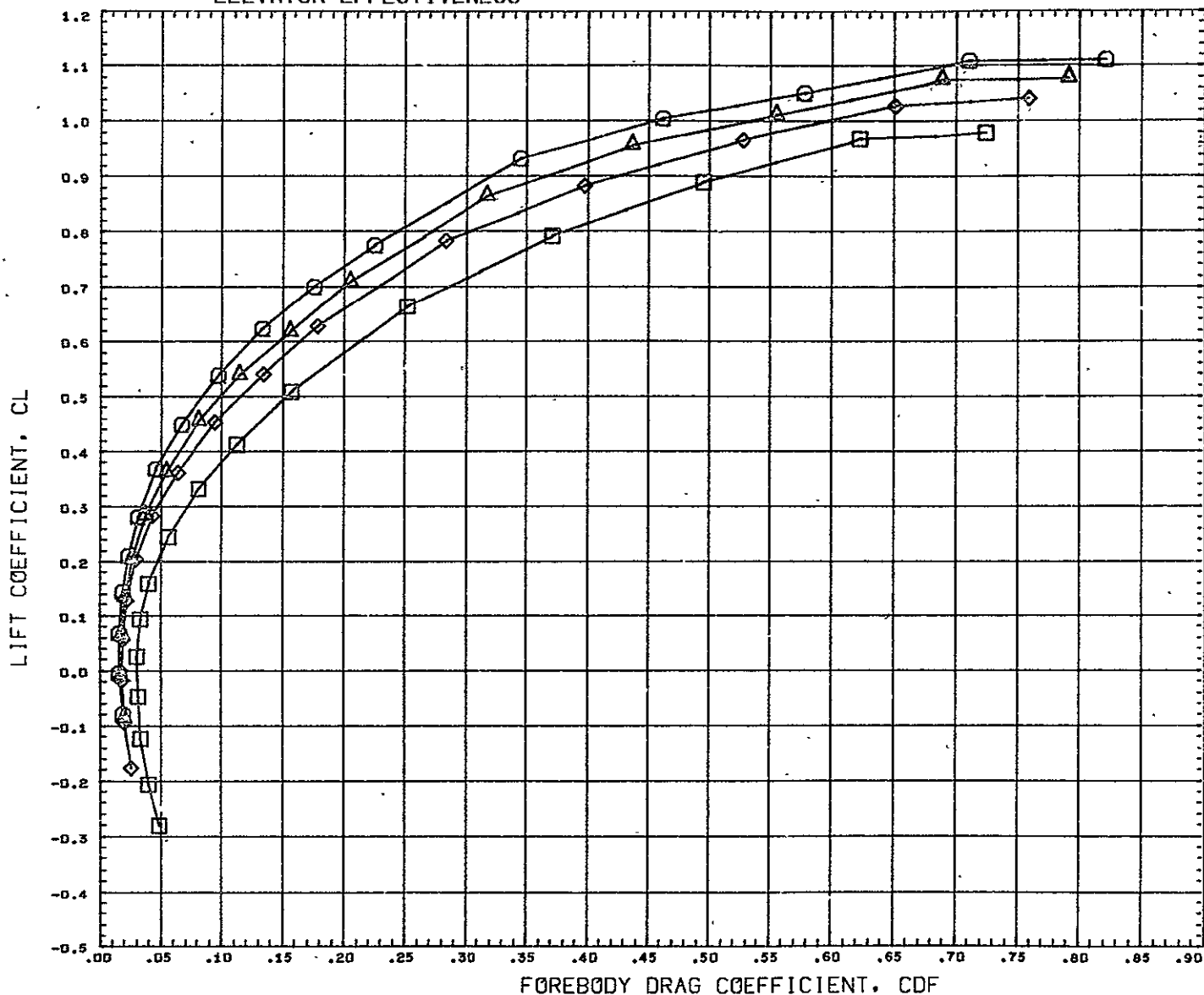
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ020)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ018)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ019)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23

BETA	ELEVON
0.000	0.000
0.000	-5.000
0.000	-10.000
0.000	-20.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8569	INCHES
XMRP	10.8540	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# ELEVATOR EFFECTIVENESS



DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ020)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ018)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ019)	NAAL 633 NAR DELTA ORB. W16E7 B4 V23

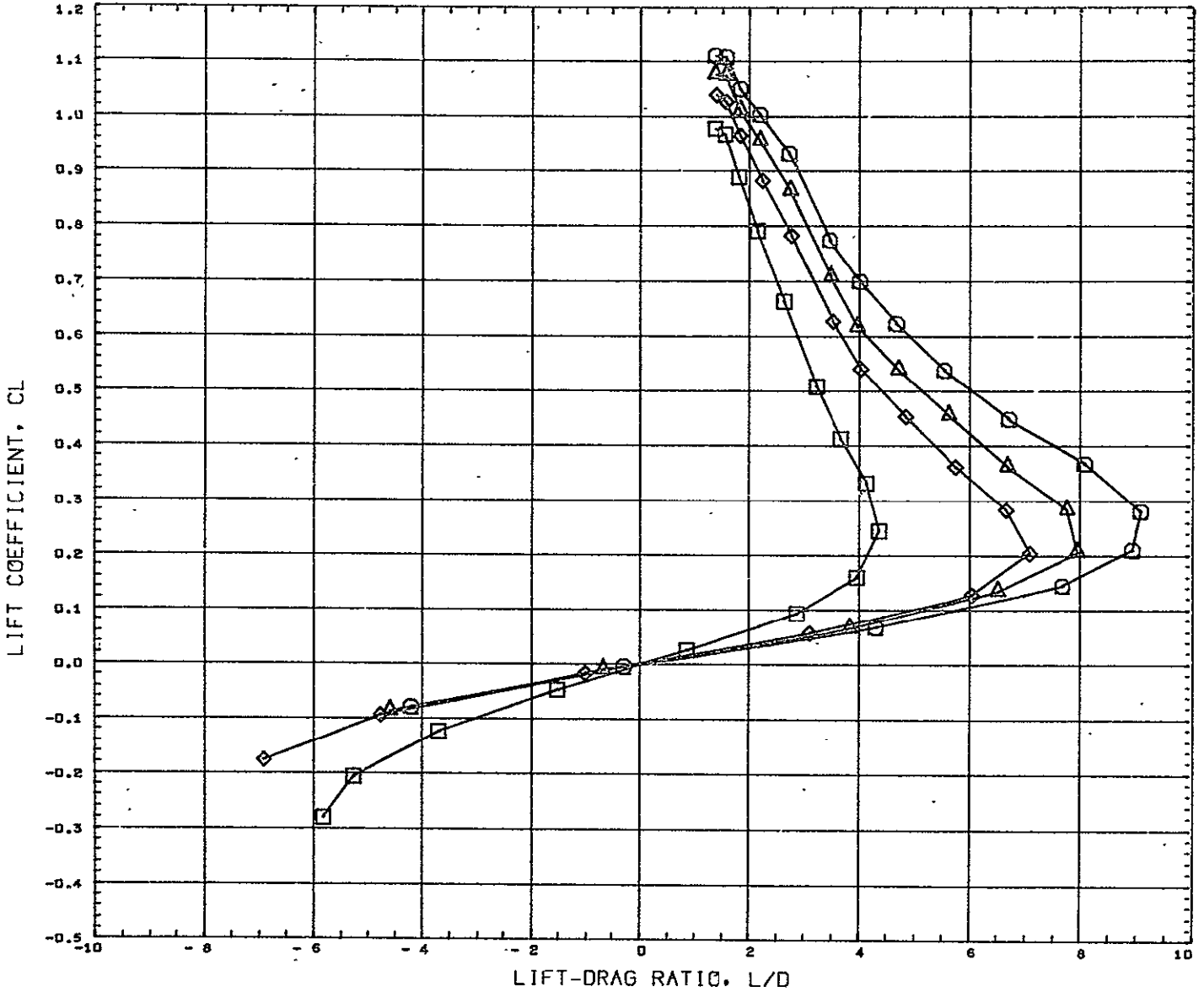
BETA	ELEVON
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0.000	-10.000
0.000	-20.000

REFERENCE INFORMATION	
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REFL	6.2656 INCHES
REFB	10.8570 INCHES
XMRP	10.8540 INCHES
YMRP	0.0000 INCHES
ZMRP	0.9920 INCHES
SCALE	0.0076 SCALE

MACH 0.259



# ELEVATOR EFFECTIVENESS



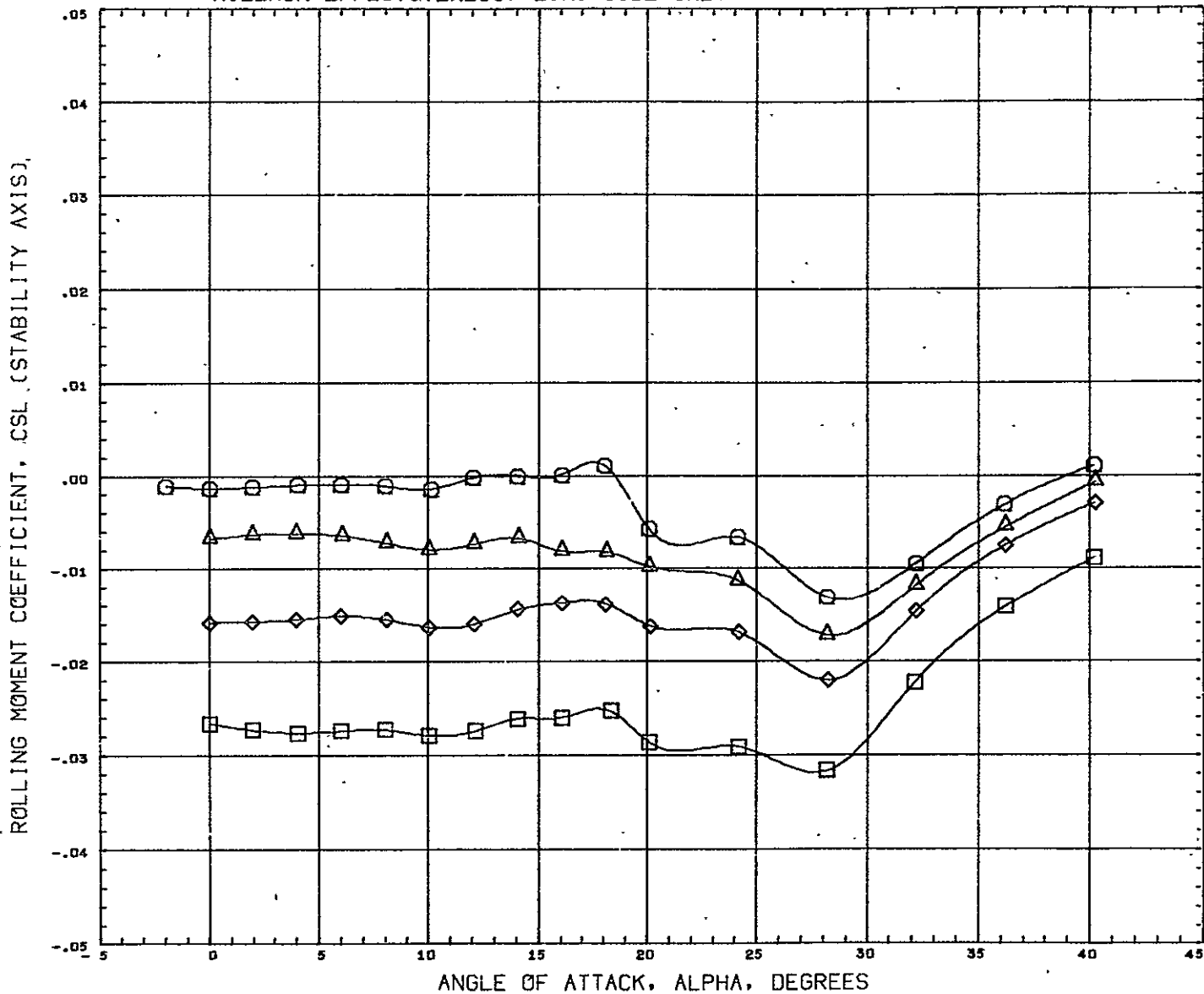
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	○	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ020)	△	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ018)	◇	NAAL 633 NAR DELTA ORB. W16E7 B4 V23
(RCJ019)	□	NAAL 633 NAR DELTA ORB. W16E7 B4 V23

BETA	ELEVON
0.000	0.000
0.000	-5.000
0.000	-10.000
0.000	-20.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8540	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# AILERON EFFECTIVENESS, L.H. SIDE ONLY



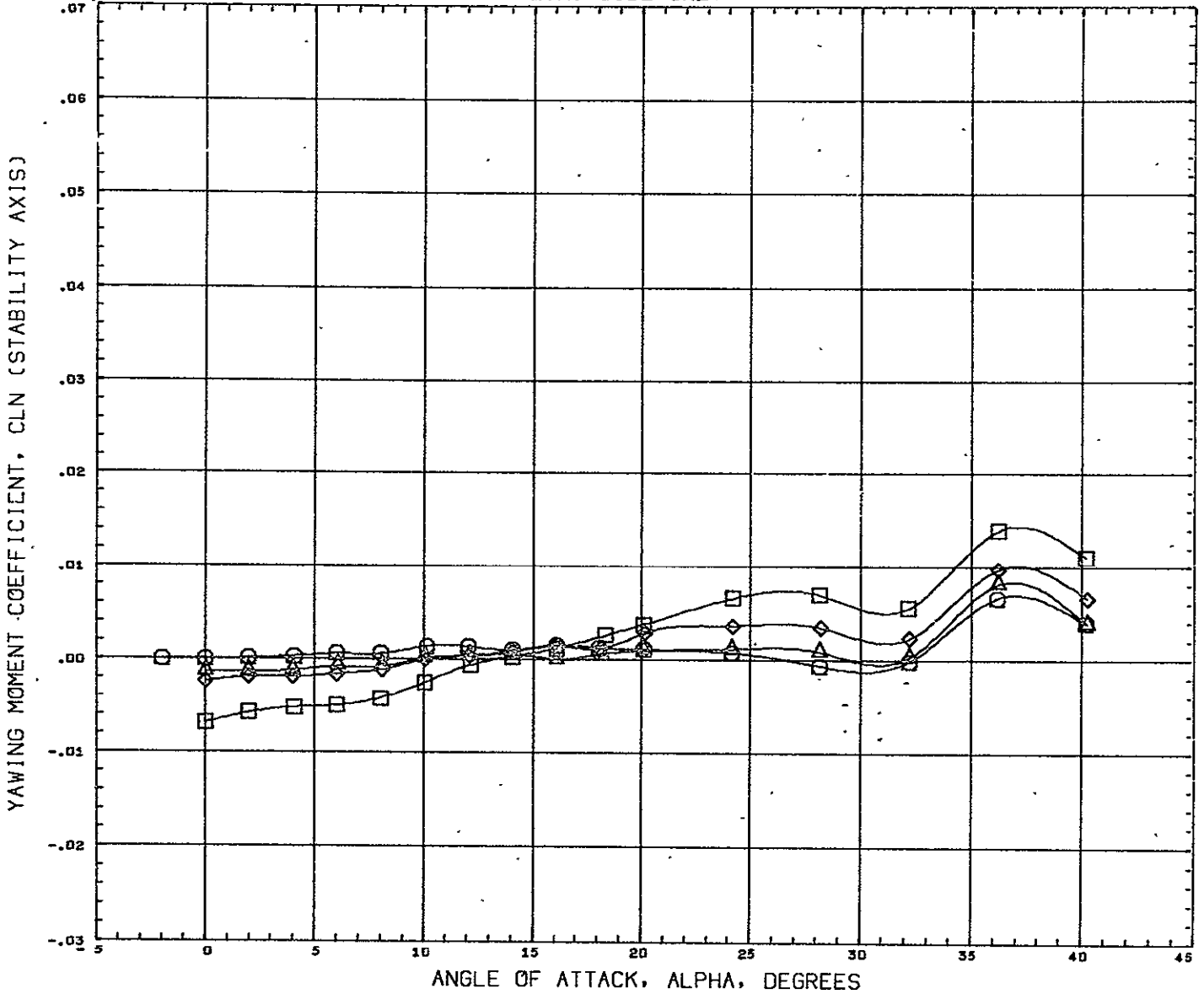
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ021)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23
(RCJ022)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23
(RCJ023)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23

BETA	ELVN7L	ELVN7R
0.000	-5.000	0.000
0.000	-10.000	0.000
0.000	-20.000	0.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8545	INCHES
YMRP	0.0900	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# AILERON EFFECTIVENESS, L.H. SIDE ONLY



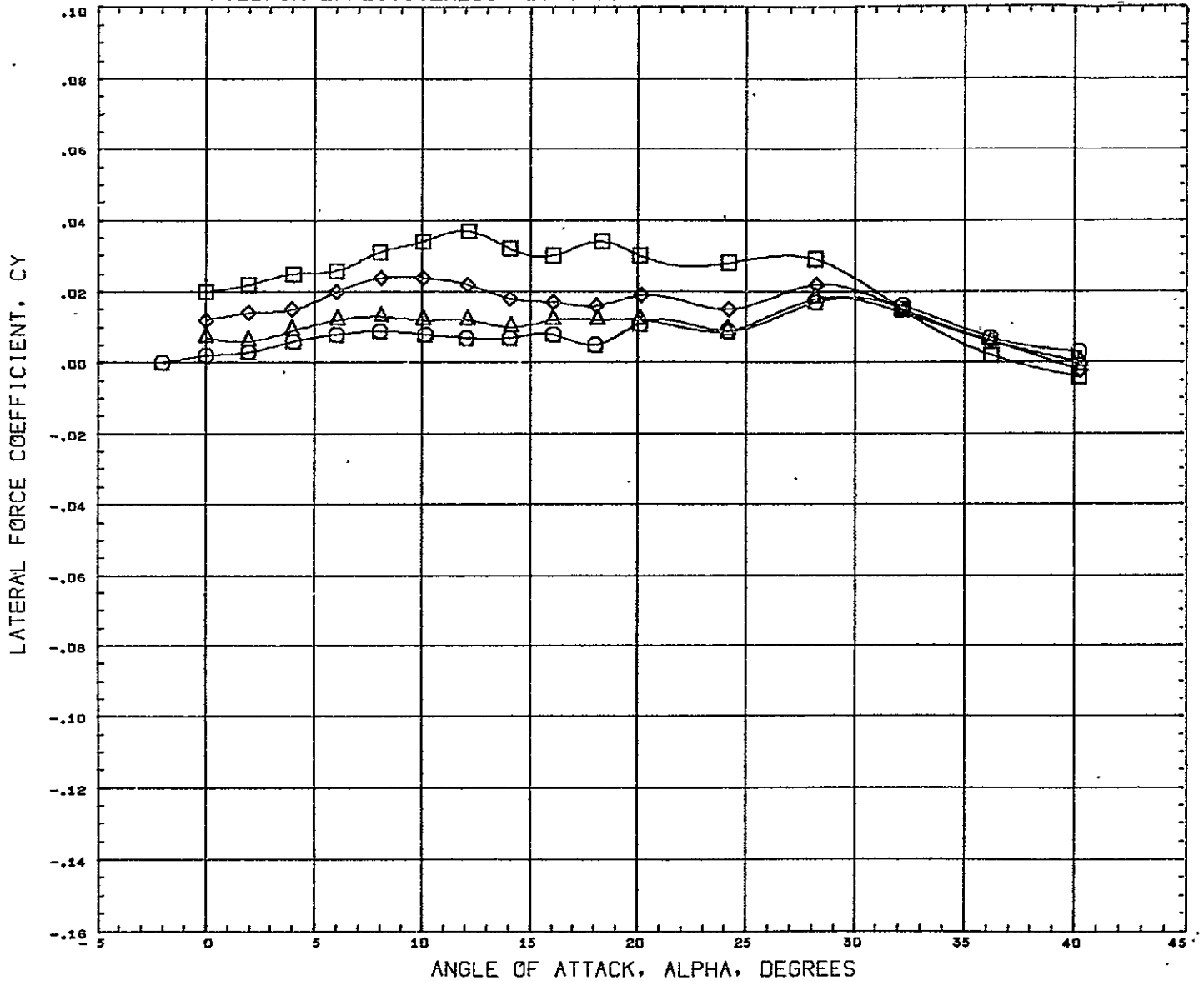
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ021)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23
(RCJ022)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23
(RCJ023)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23

BETA	ELVN7L	ELVN7R
0.000	-5.000	0.000
0.000	-10.000	0.000
0.000	-20.000	0.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8569	INCHES
XMRP	15.8510	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# AILERON EFFECTIVENESS, L.H. SIDE ONLY



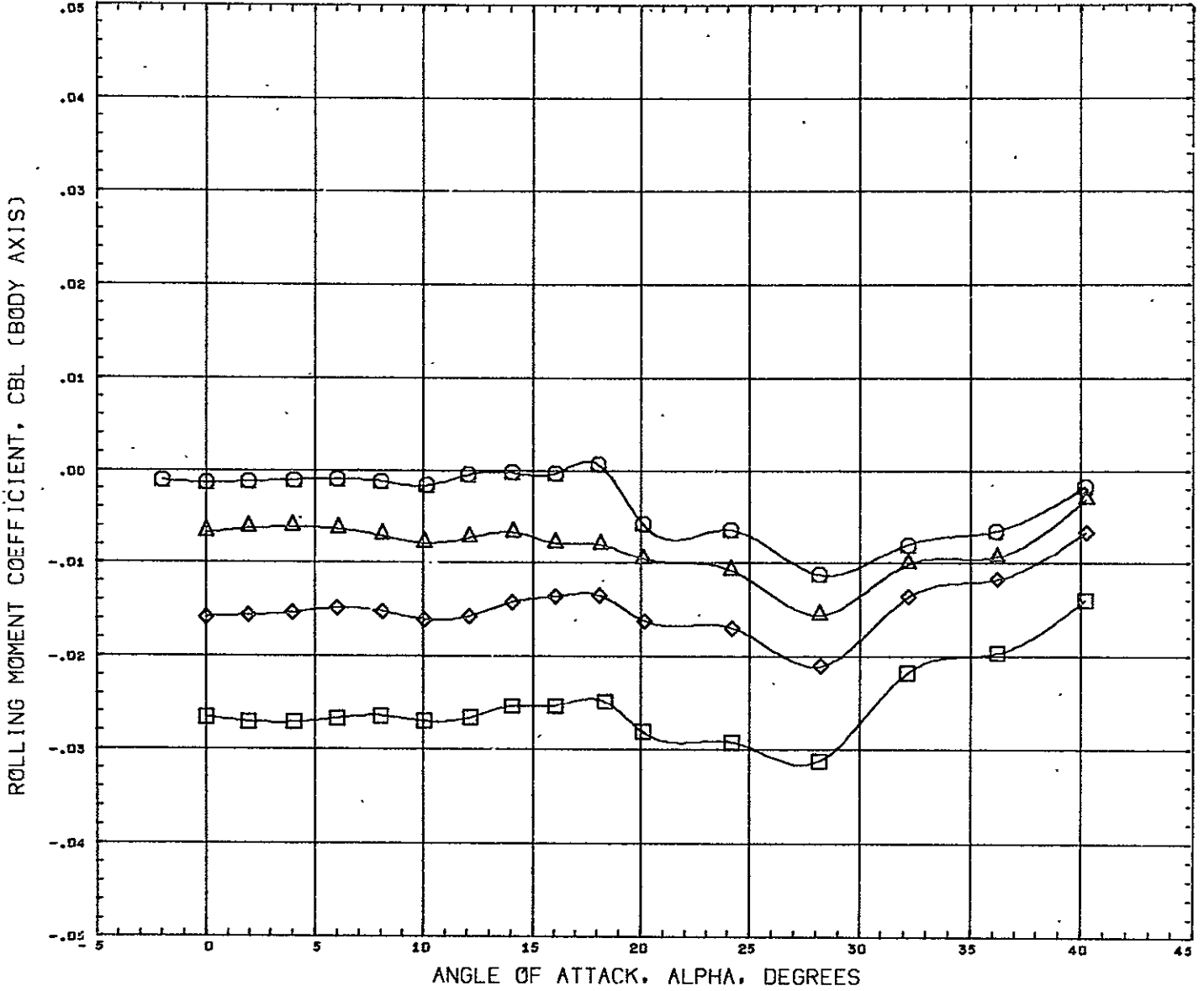
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ021)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23
(RCJ022)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23
(RCJ023)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23

BETA	ELVN7L	ELVN7R
0.000	-5.000	0.000
0.000	-10.000	0.000
0.000	-20.000	0.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8569	INCHES
XHRP	10.8500	INCHES
YHRP	0.0000	INCHES
ZHRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

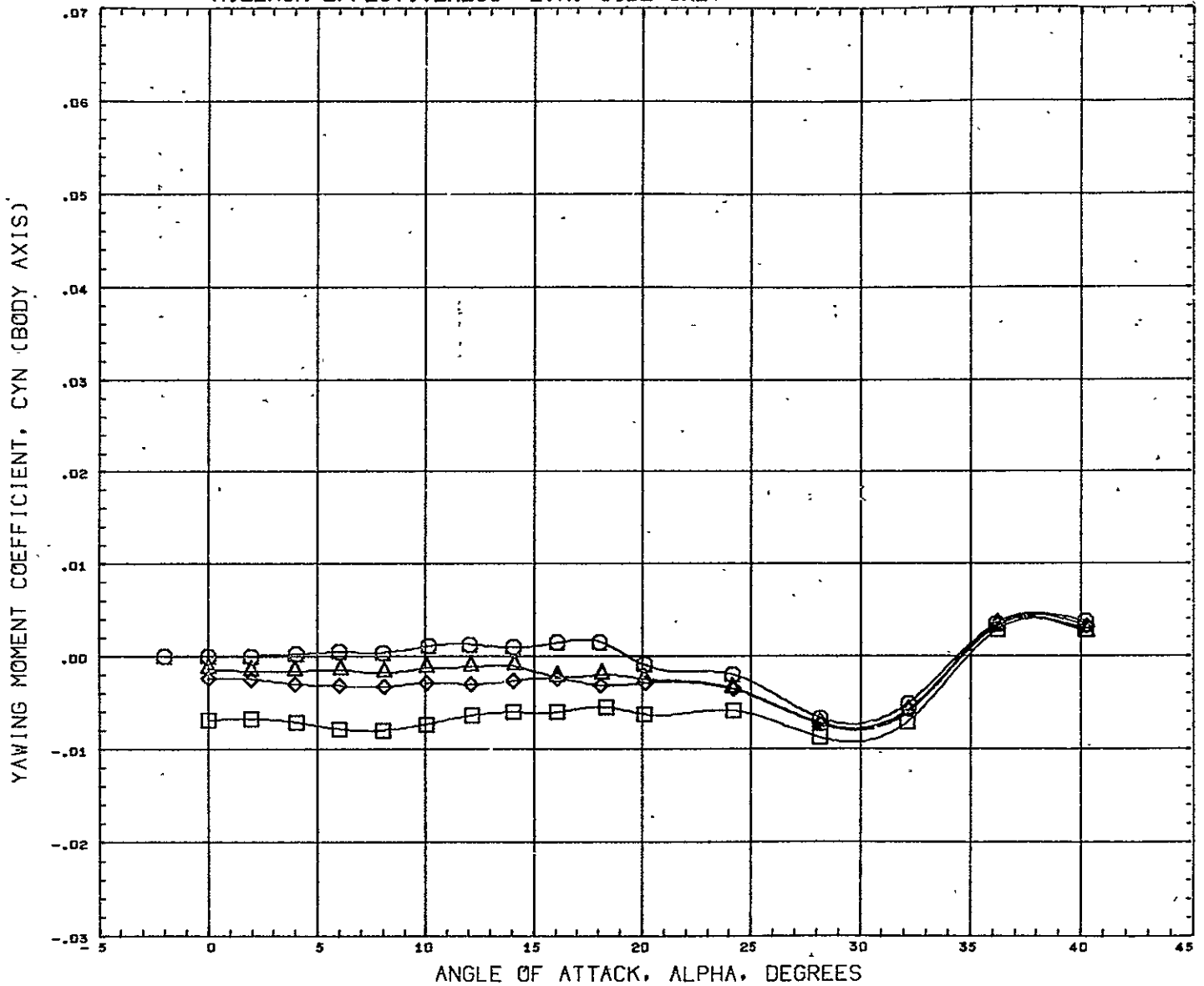
# AILERON EFFECTIVENESS, L.H. SIDE ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN7L	ELVN7R	REFERENCE INFORMATION
(BCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000			REFS 0.3542 SQ.FT.
(BCJ021)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	-5.000	0.000	REFL 6.2656 INCHES
(BCJ022)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	-10.000	0.000	REFB 10.8560 INCHES
(BCJ023)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	-20.000	0.000	XMRP 10.8540 INCHES
					YMRP 0.0000 INCHES
					ZMRP 0.9920 INCHES
					SCALE 0.0076 SCALE

MACH 0.259

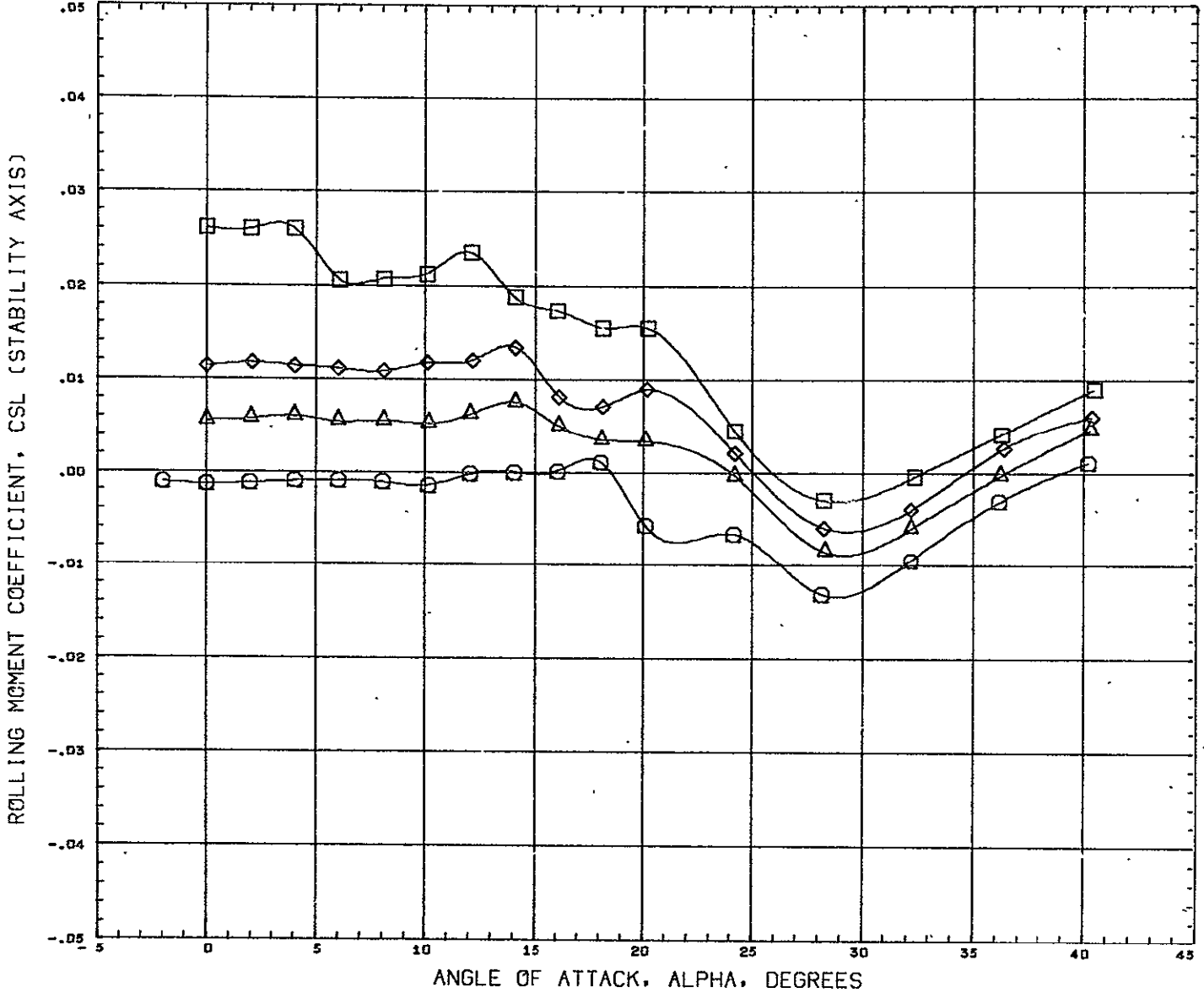
# AILERON EFFECTIVENESS, L.H. SIDE ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN7L	ELVN7R	REFERENCE INFORMATION
(BCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000			REFS 0.3542 SQ.FT.
(BCJ021)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	-5.000	0.000	REFL 6.2656 INCHES
(BCJ022)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	-10.000	0.000	REFB 10.8560 INCHES
(BCJ023)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	-20.000	0.000	XMRP 10.8540 INCHES
					YMRP 0.0000 INCHES
					ZMRP 0.9920 INCHES
					SCALE 0.0076 SCALE

MACH 0.259

# AILERON EFFECTIVENESS, L.H. SIDE ONLY



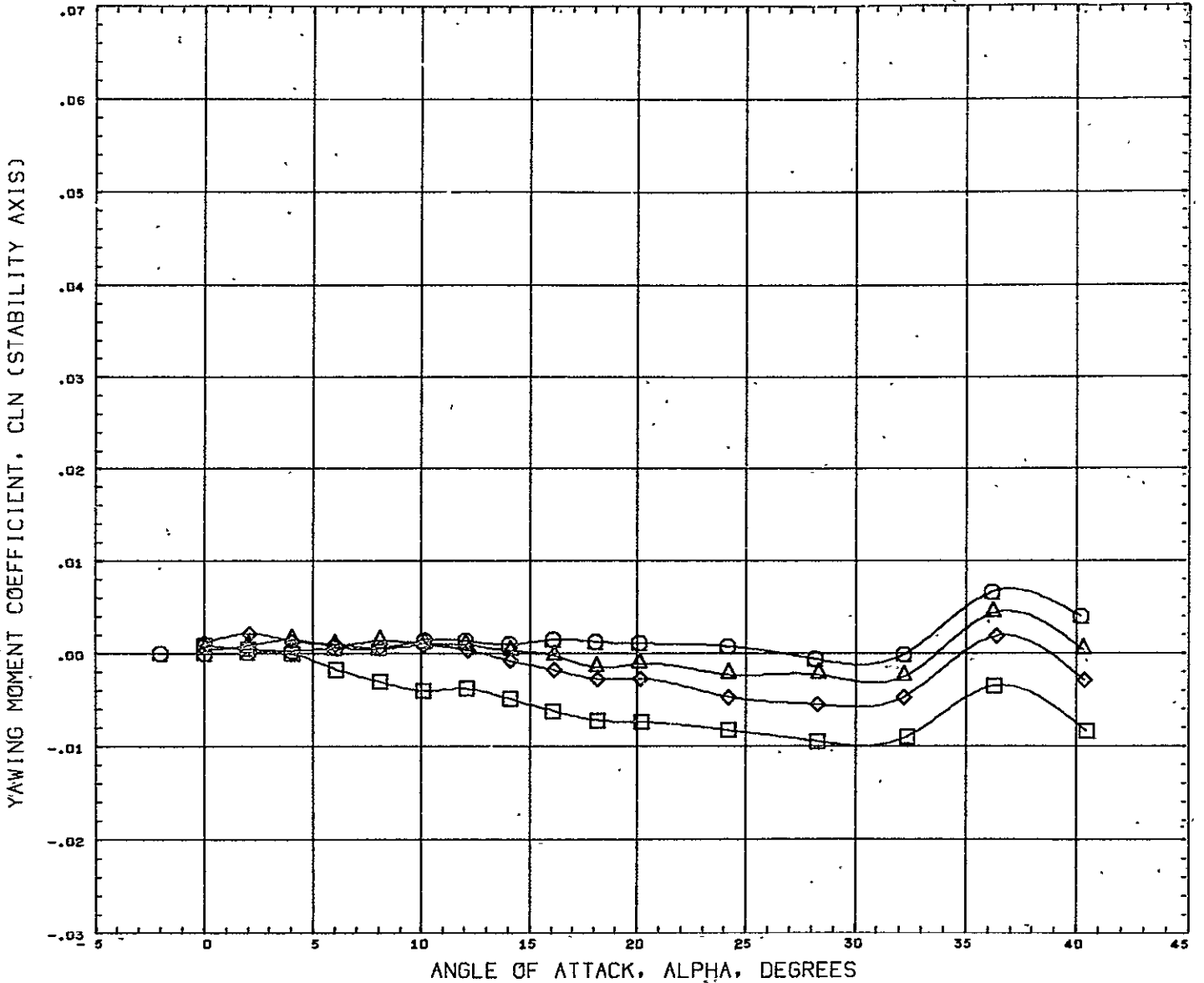
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23
(RCJ024)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23
(RCJ025)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23
(RCJ026)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23

BETA	ELVN7L	ELVN7R
0.000		
0.000	5.000	0.000
0.000	10.000	0.000
0.000	20.000	0.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRF	10.8240	INCHES
YMRF	0.0000	INCHES
ZMRF	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# AILERON EFFECTIVENESS, L.H. SIDE ONLY

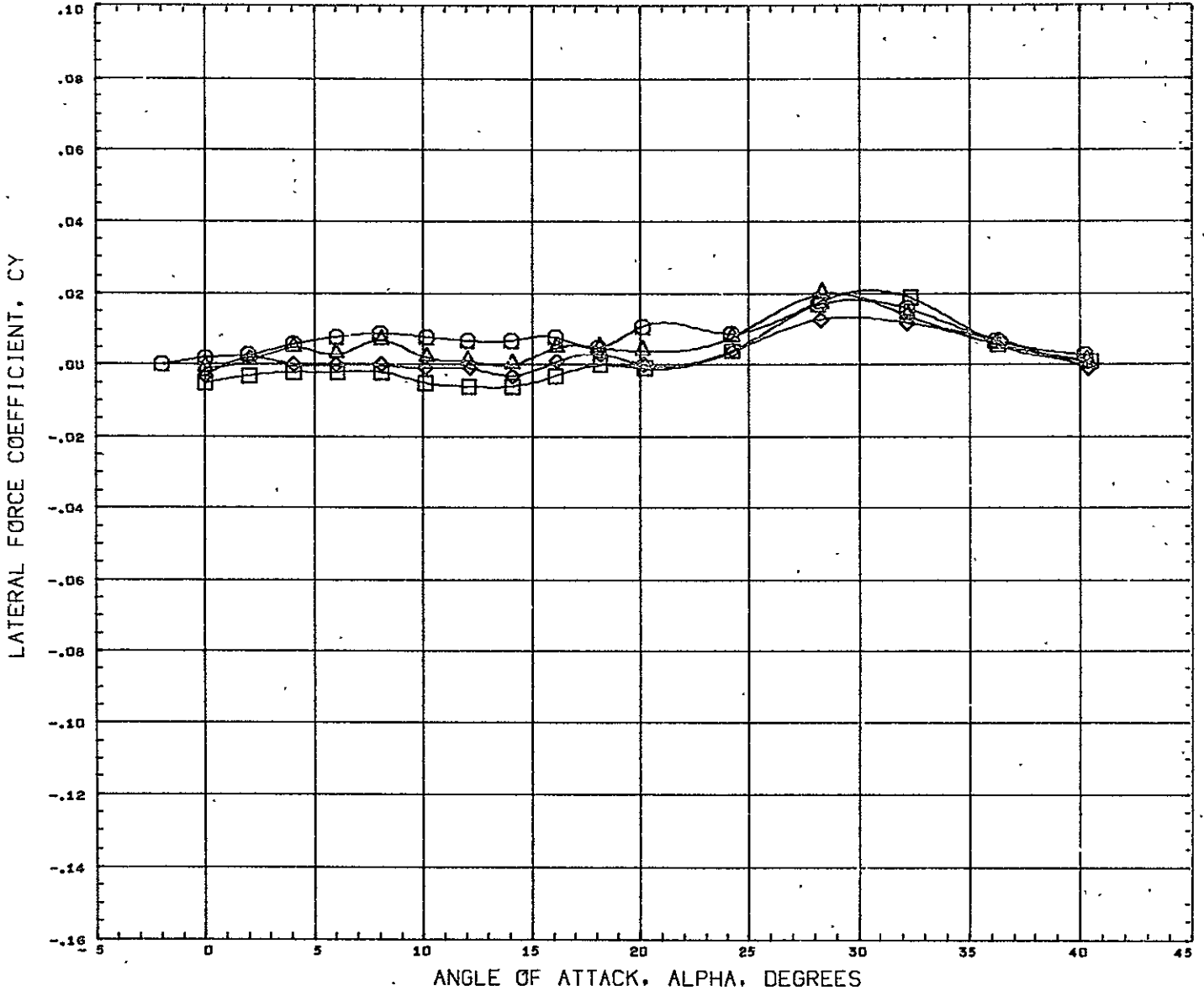


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN7L	ELVN7R	REFERENCE INFORMATION	
(RCJ007)	○	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000			REFS	0.3542 SQ.FT.
(RCJ024)	△	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	5.000	0.000	REFL	6.2656 INCHES
(RCJ025)	◇	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	10.000	0.000	REFB	10.8530 INCHES
(RCJ026)	□	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	20.000	0.000	XMRP	10.8530 INCHES
						YMRP	0.0000 INCHES
						ZMRP	0.9920 INCHES
						SCALE	0.0076 SCALE

MACH 0.259



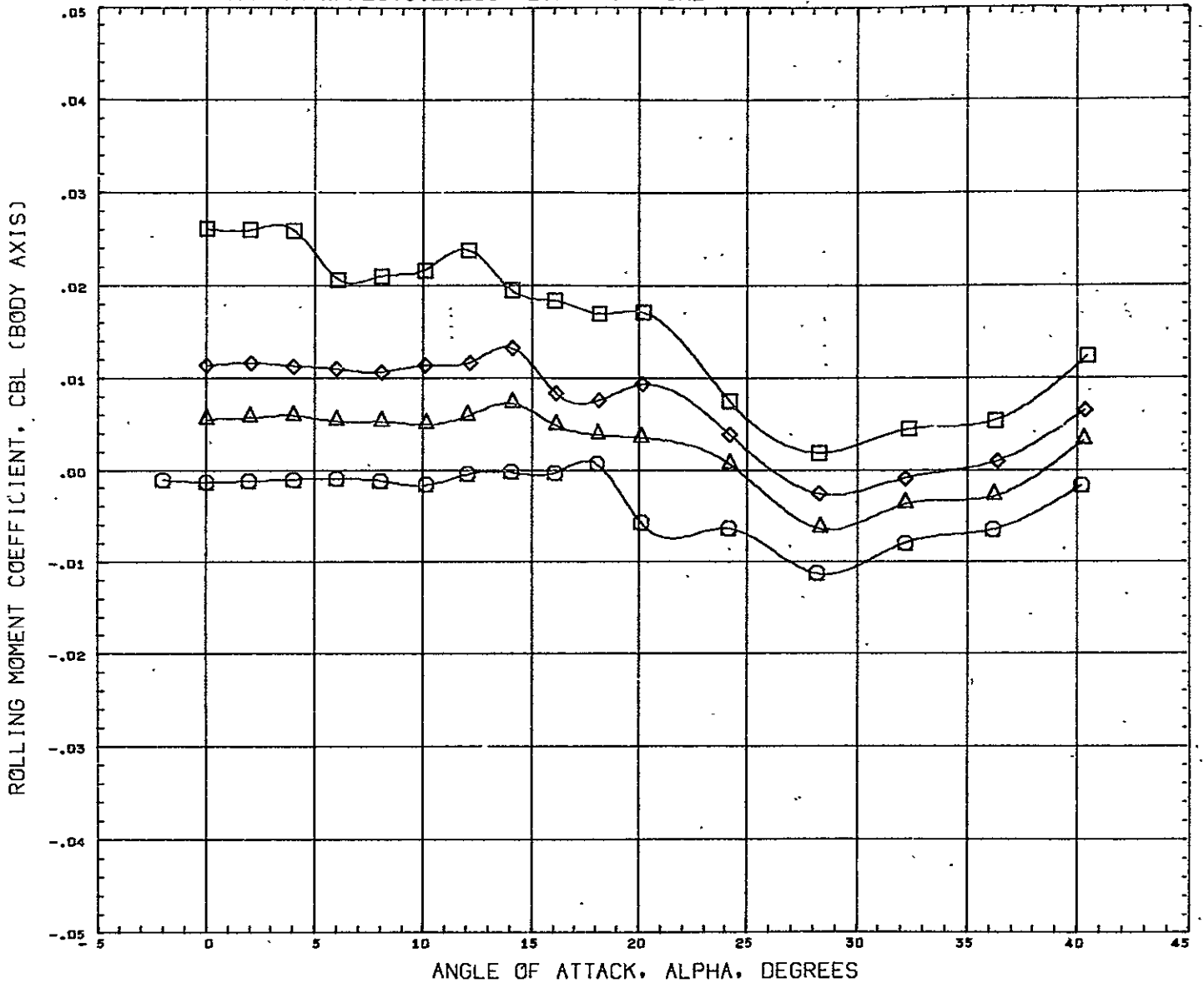
# AILERON EFFECTIVENESS, L.H. SIDE ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN7L	ELVN7R	REFERENCE INFORMATION	
(RCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000			REFS	0.3542 SQ.FT.
(RCJ024)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	5.000	0.000	REFL	6.2656 INCHES
(RCJ025)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	10.000	0.000	REFB	10.8560 INCHES
(RCJ026)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	20.000	0.000	XMRP	19.8240 INCHES
					YMRP	0.0000 INCHES
					ZMRP	0.9920 INCHES
					SCALE	0.0076 SCALE

MACH . 0.259

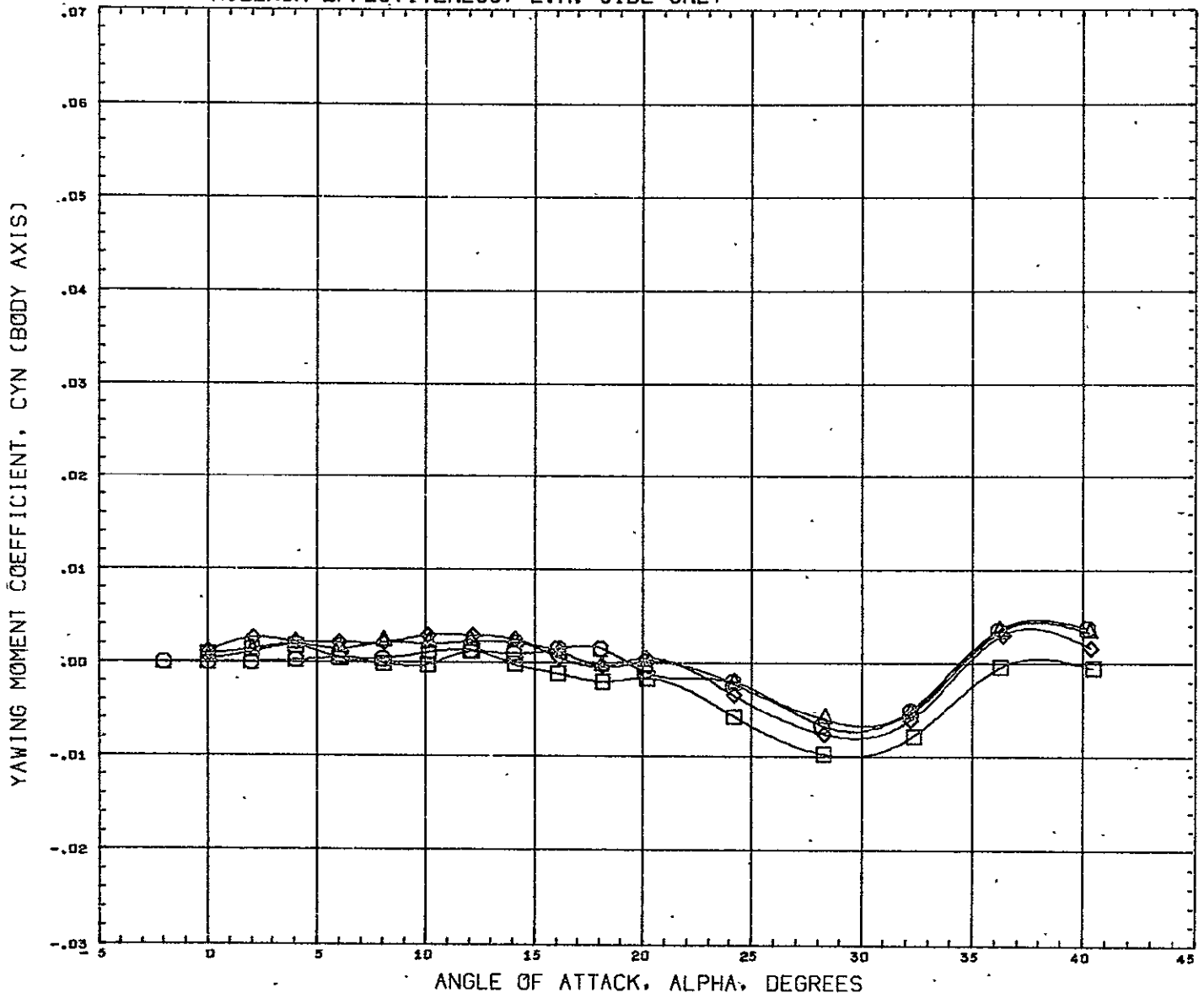
# AILERON EFFECTIVENESS, L.H. SIDE ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN7L	ELVN7R	REFERENCE INFORMATION	
(BCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000			REFS	0.3542 SQ.FT.
(BCJ024)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	5.000	0.000	REFL	6.2656 INCHES
(BCJ025)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	10.000	0.000	REFB	10.8550 INCHES
(BCJ026)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	20.000	0.000	XMRP	10.8540 INCHES
					YMRP	0.0000 INCHES
					ZMRP	0.9920 INCHES
					SCALE	0.0076 SCALE

MACH 0.259

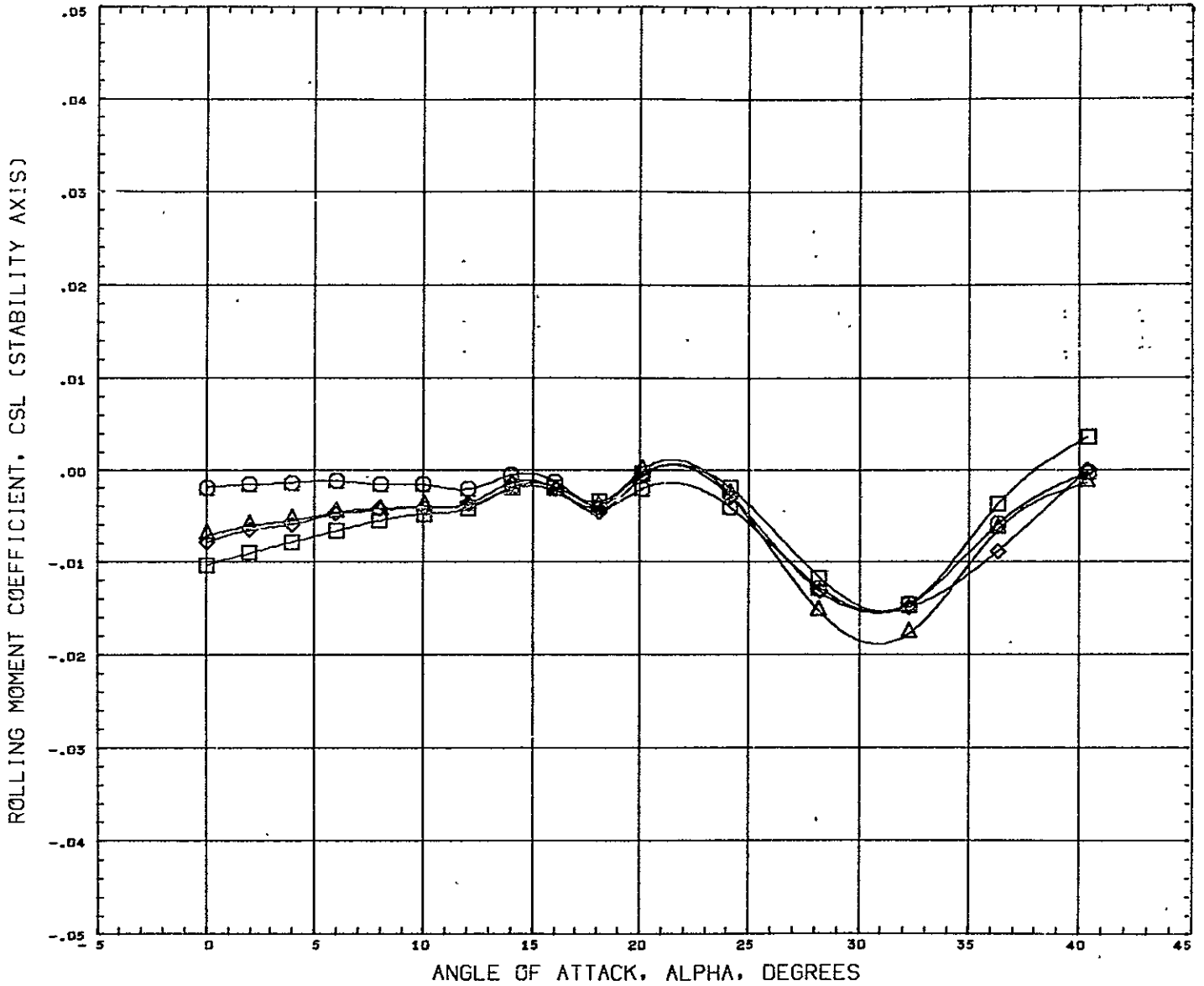
# AILERON EFFECTIVENESS, L.H. SIDE ONLY



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN7L	ELVN7R	REFERENCE INFORMATION
(BCJ007)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000			REFS 0.3542 SQ.FT.
(BCJ024)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	5.000	0.000	REFL 6.2656 INCHES
(BCJ025)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	10.000	0.000	REFB 10.8560 INCHES
(BCJ026)	NAAL 633 NAR DELTA ORB. W16 E7 B4 V23	0.000	20.000	0.000	XMRP 10.8.40 INCHES
					YMRF 0.0000 INCHES
					ZMRP 0.9920 INCHES
					SCALE 0.0076 SCALE

MACH 0.259

### RUDDER EFFECTIVENESS, B4W16V23R7 CONFIGURATION

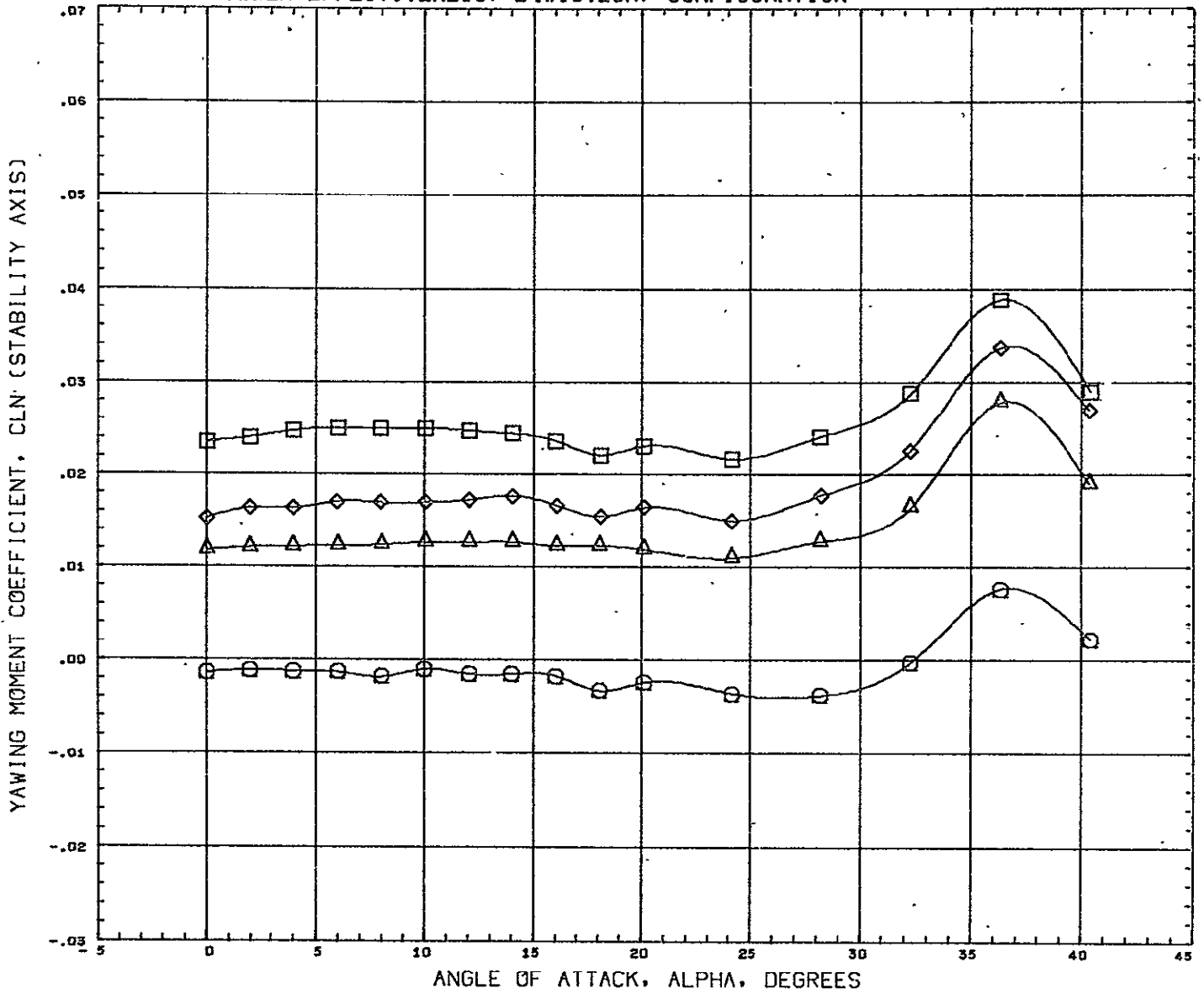


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	RUDDER
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000	0.000
(RCJ027)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-10.000
(RCJ028)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-20.000
(RCJ029)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-30.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8519	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

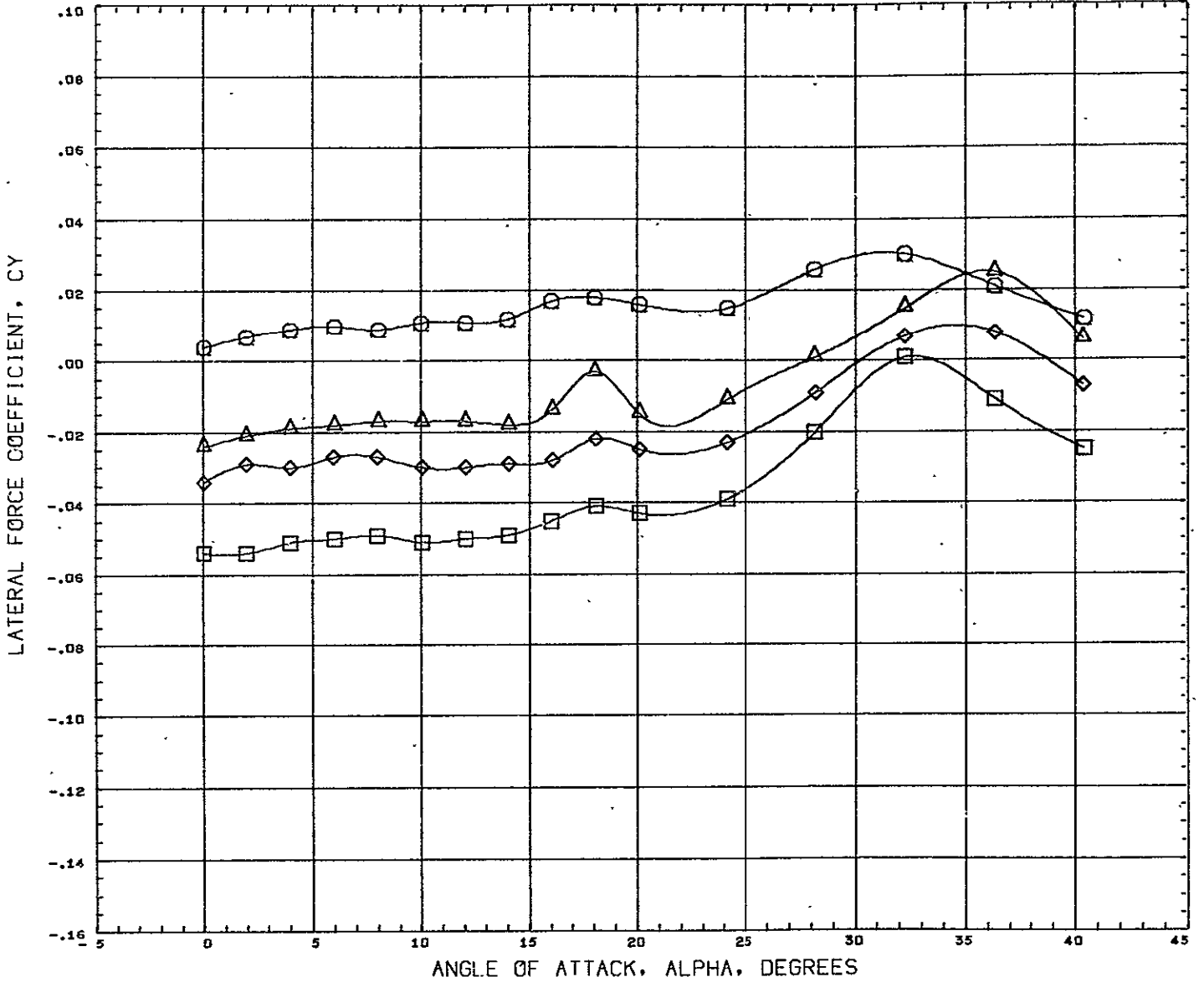
# RUDDER EFFECTIVENESS, B4W16V23R7 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	RUDDER	REFERENCE INFORMATION
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		REFS 0.3542 SQ.FT.
(RCJ027)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-10.000	REFL 6.2656 INCHES
(RCJ028)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-20.000	REFB 10.8561 INCHES
(RCJ029)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-30.000	XMRP 10.8540 INCHES
				YMRP 0.0000 INCHES
				ZMRP 0.9920 INCHES
				SCALE 0.0076 SCALE

MACH 0.259

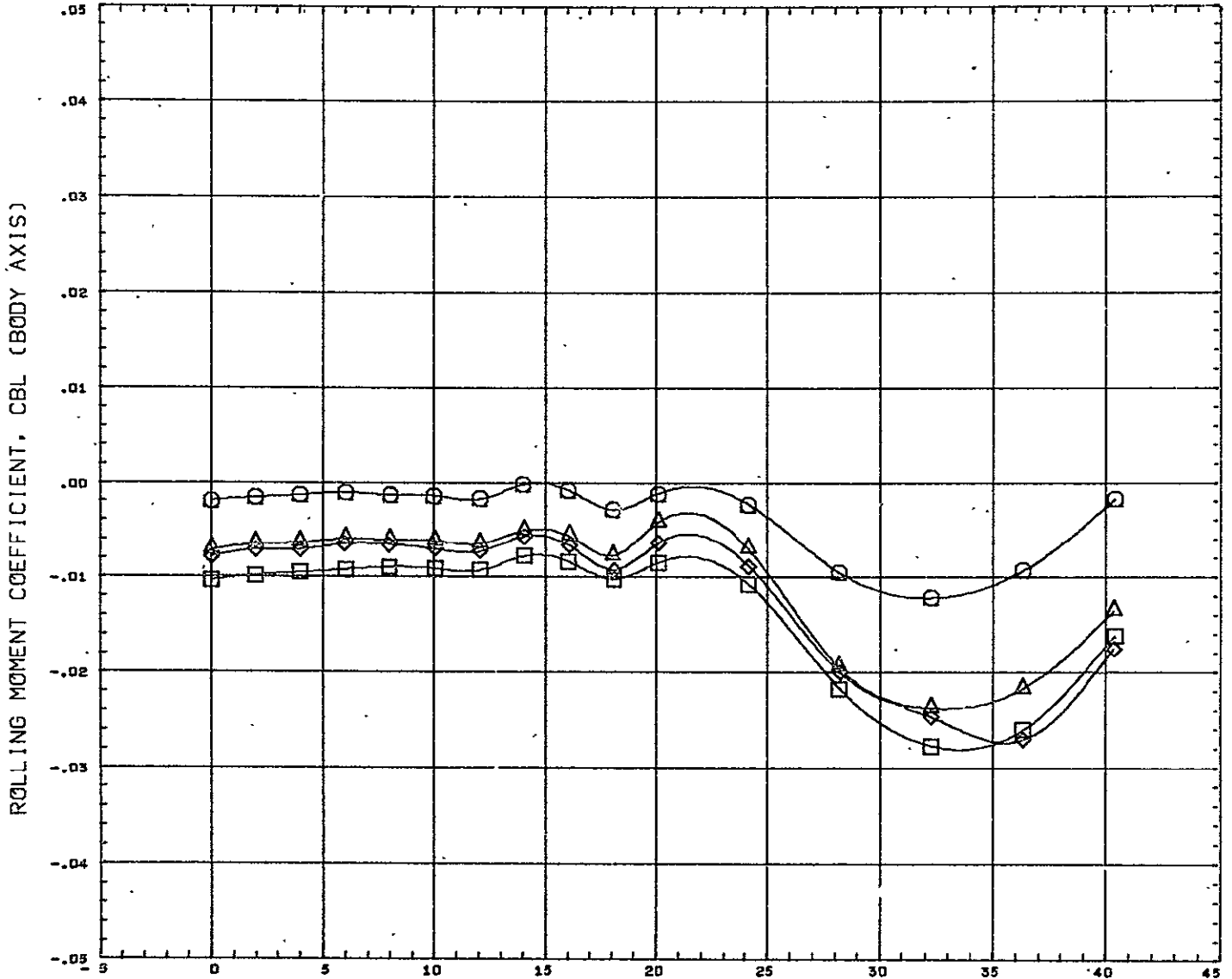
### RUDDER EFFECTIVENESS, B4W16V23R7 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	RUDDER	REFERENCE INFORMATION
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		REFS 0.3542 SQ.FT.
(RCJ027)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-10.000	REFL 6.2656 INCHES
(RCJ028)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-20.000	REFB 10.8500 INCHES
(RCJ029)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-30.000	XMRP 10.8500 INCHES
				YMRP 0.0000 INCHES
				ZMRP 0.9920 INCHES
				SCALE 0.0076 SCALE

MACH 0.259

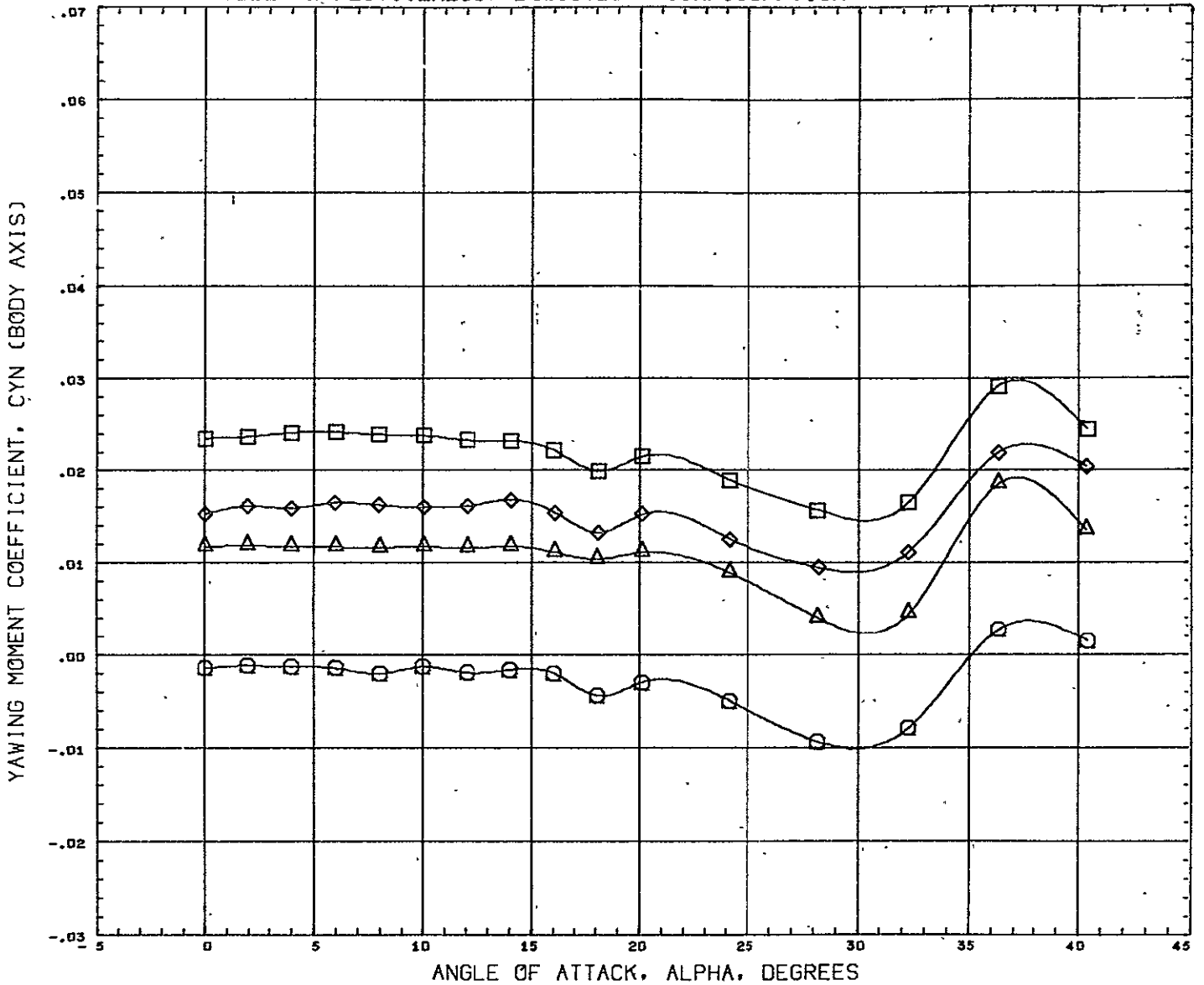
### RUDDER EFFECTIVENESS, B4W16V23R7 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	RUDDER	REFERENCE INFORMATION
(BCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000		REFS 0.3542 SQ.FT.
(BCJ027)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-10.000	REFL 6.2656 INCHES
(BCJ028)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-20.000	REFB 10.8550 INCHES
(BCJ029)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-30.000	XMRP 10.8540 INCHES
				YMRP 0.0000 INCHES
				ZMRP 0.9920 INCHES
				SCALE 0.0076 SCALE

MACH 0.259

# RUDDER EFFECTIVENESS, B4W16V23R7 CONFIGURATION



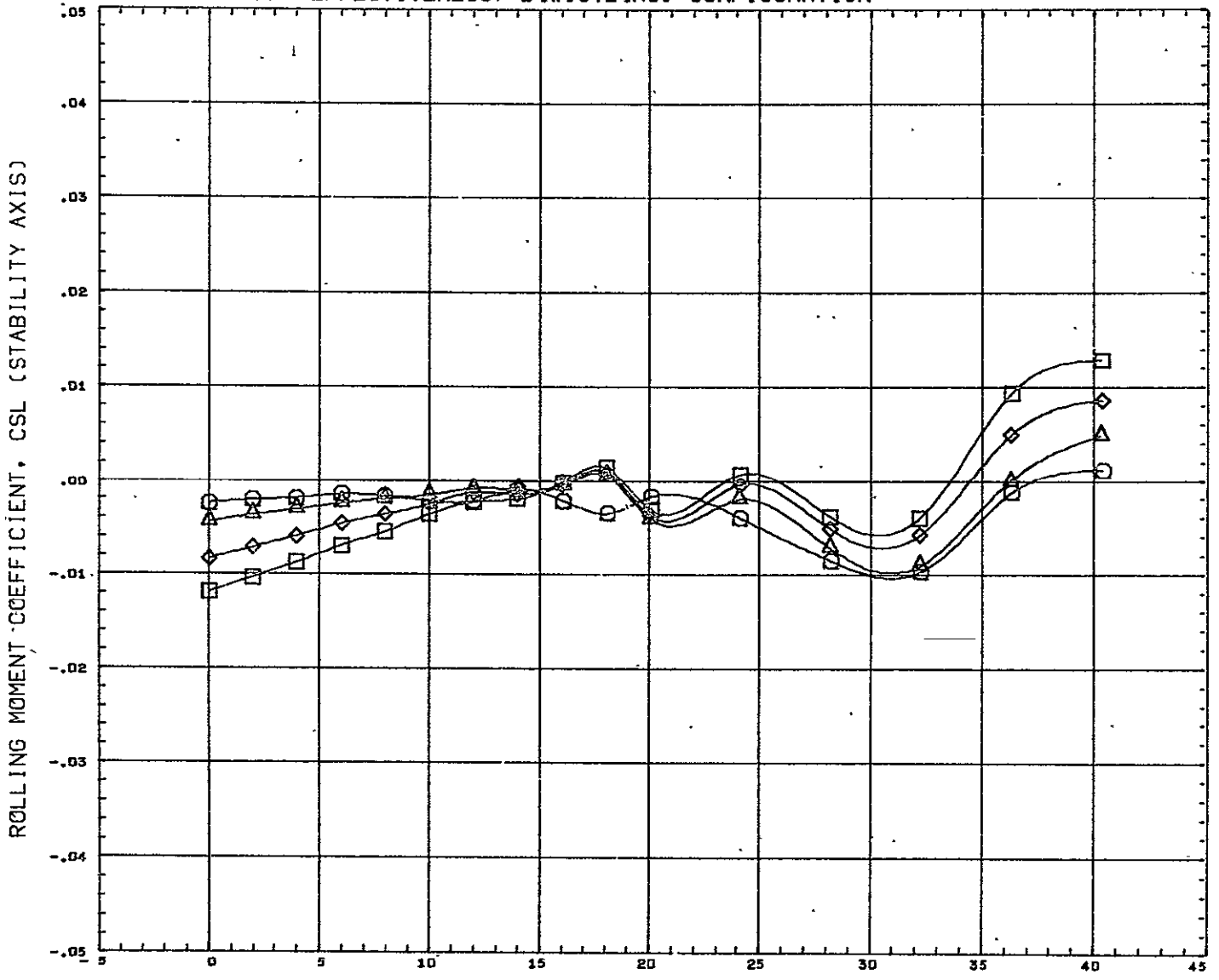
DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	RUDDER
(BCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000	0.000
(BCJ027)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-10.000
(BCJ028)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-20.000
(BCJ029)	NAAL 633 NAR DELTA ORB. W16 B4 V23 R7	0.000	-30.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8563	INCHES
XMRP	13.8510	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259



### RUDDER EFFECTIVENESS, B4W16V24R8J CONFIGURATION

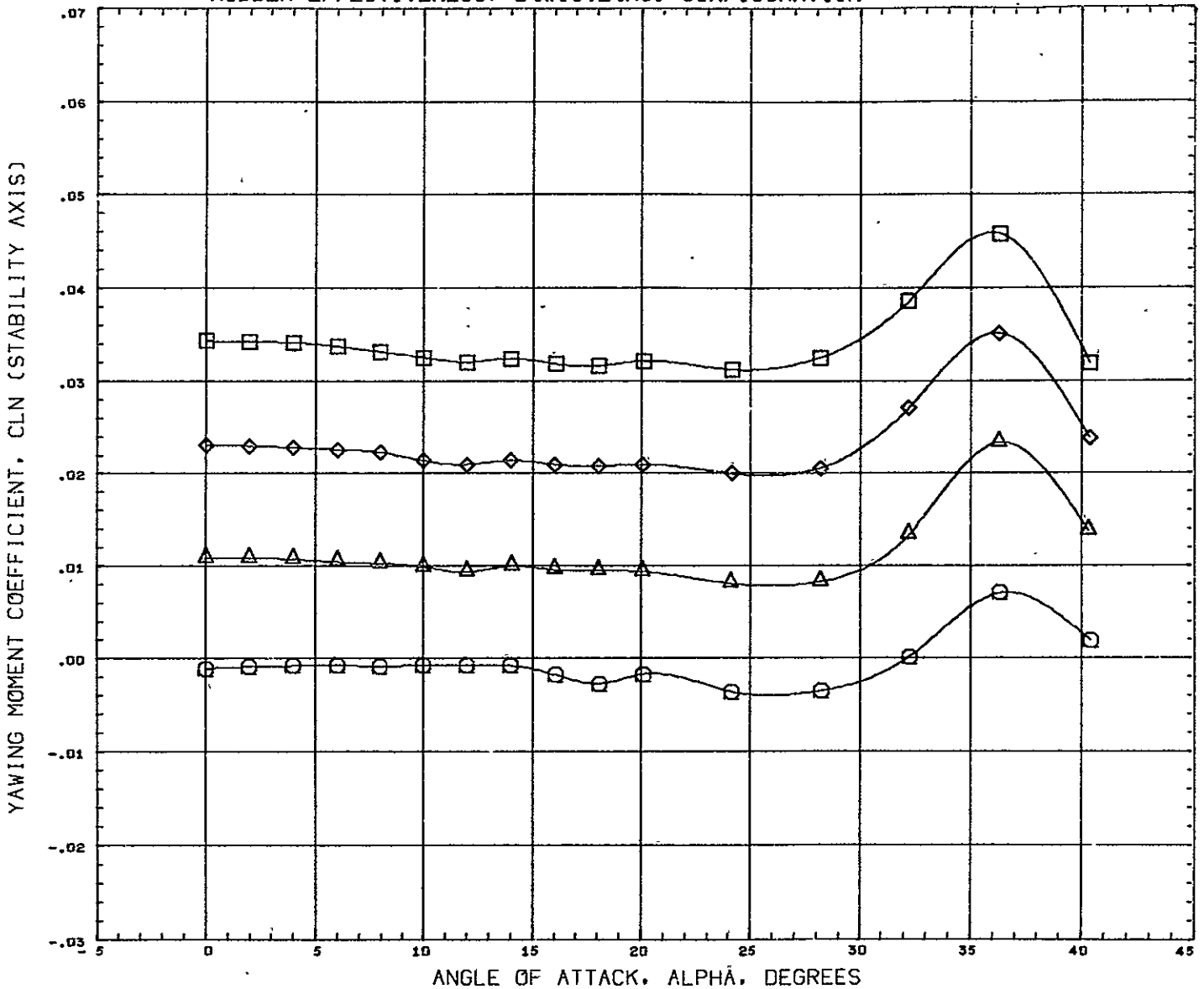


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	SPD BK	RUDDER
(RCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	15.000	
(RCJ036)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J	0.000	15.000	-10.000
(RCJ037)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J	0.000	15.000	-20.000
(RCJ038)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J	0.000	15.000	-30.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8566	INCHES
XMRP	10.8566	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# RUDDER EFFECTIVENESS, B4W16V24R8J CONFIGURATION



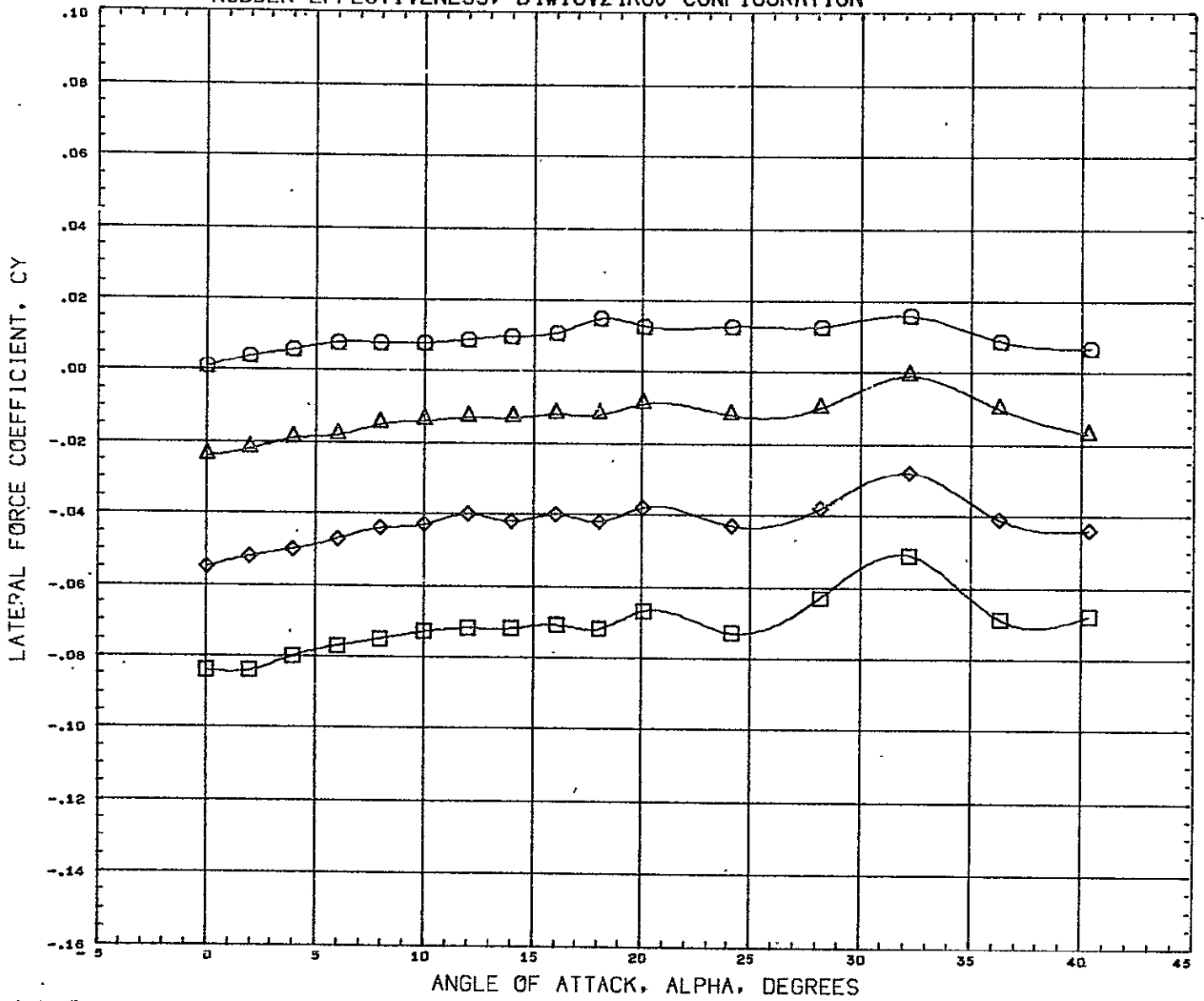
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J
(RCJ036)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J
(RCJ037)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J
(RCJ038)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J

BETA	SPD BK	RUDDER
0.000	15.000	
0.000	15.000	-10.000
0.000	15.000	-20.000
0.000	15.000	-30.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8563	INCHES
XMRP	10.8540	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

### RUDDER EFFECTIVENESS, B4W16V24R8J CONFIGURATION



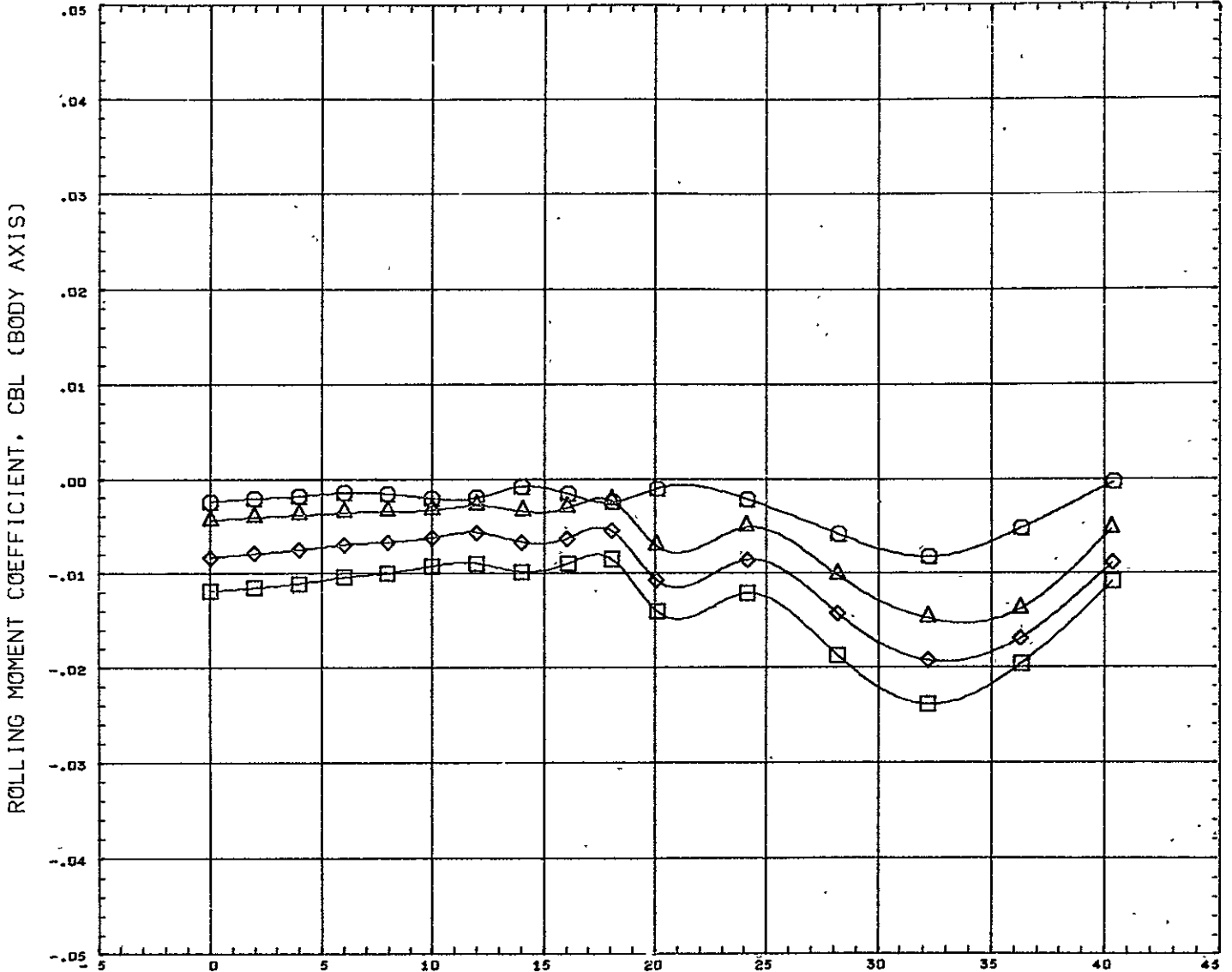
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J
(RCJ036)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J
(RCJ037)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J
(RCJ038)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J

BETA	SPD BK	RUDDER
0.000	15.000	0.000
0.000	15.000	-10.000
0.000	15.000	-20.000
0.000	15.000	-30.000

REFERENCE INFORMATION	
REFS	0.3542 SQ.FT.
REFL	6.2656 INCHES
REFB	10.8560 INCHES
XMRP	15.8510 INCHES
YHRP	0.0000 INCHES
ZMRP	0.9920 INCHES
SCALE	0.0076 SCALE

MACH 0.259

RUDDER EFFECTIVENESS, B4W16VZ4R8J CONFIGURATION



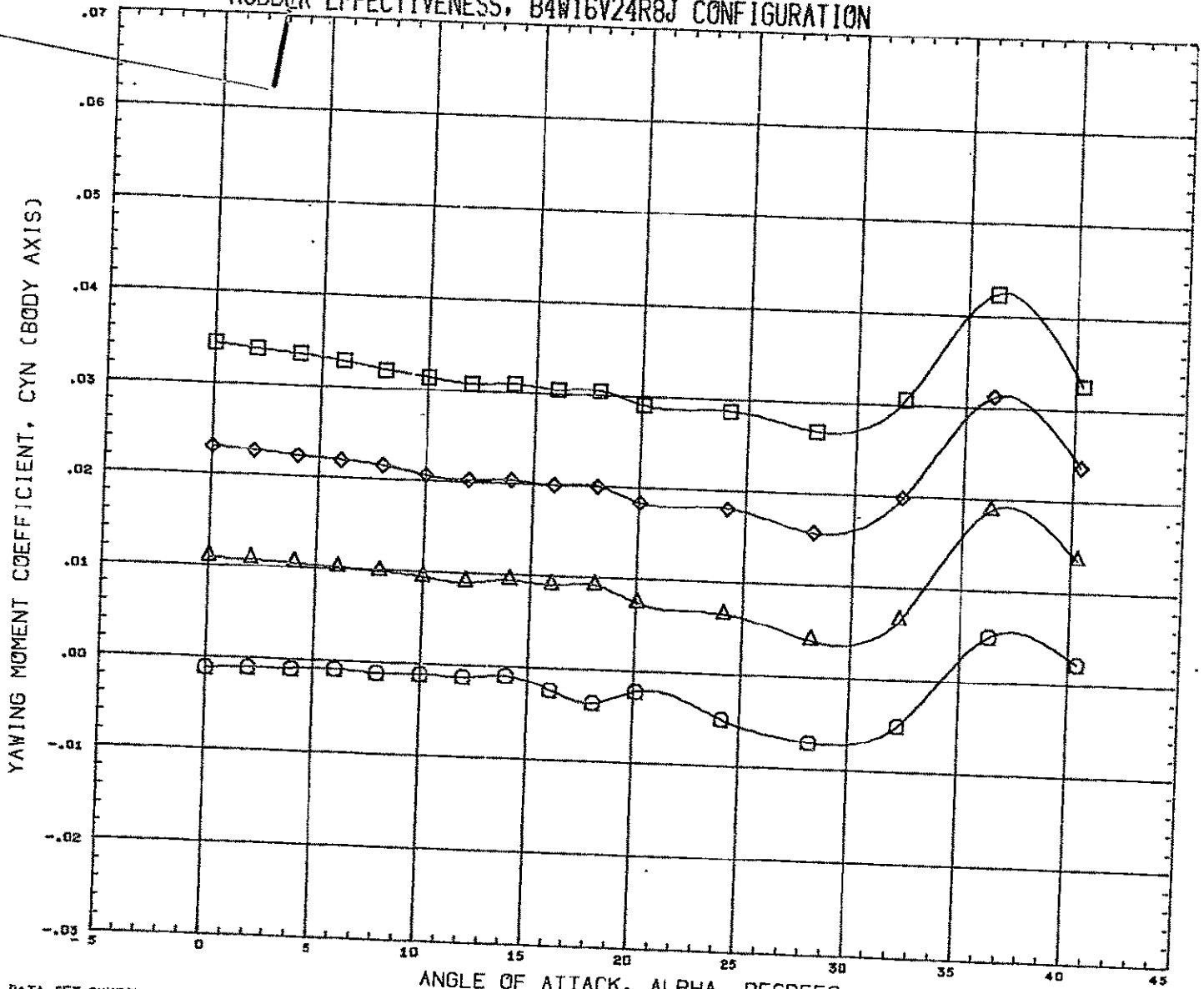
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(BCJ032)	○	NAAL 633 NAR DELTA ORB. W16 B4 V24 J
(BCJ036)	△	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J
(BCJ037)	◇	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J
(BCJ038)	□	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J

BETA	SPD BK	RUDDER
0.000	15.000	
0.000	15.000	-10.000
0.000	15.000	-20.000
0.000	15.000	-30.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8540	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

# RUDDER EFFECTIVENESS, B4W16V24R8J CONFIGURATION



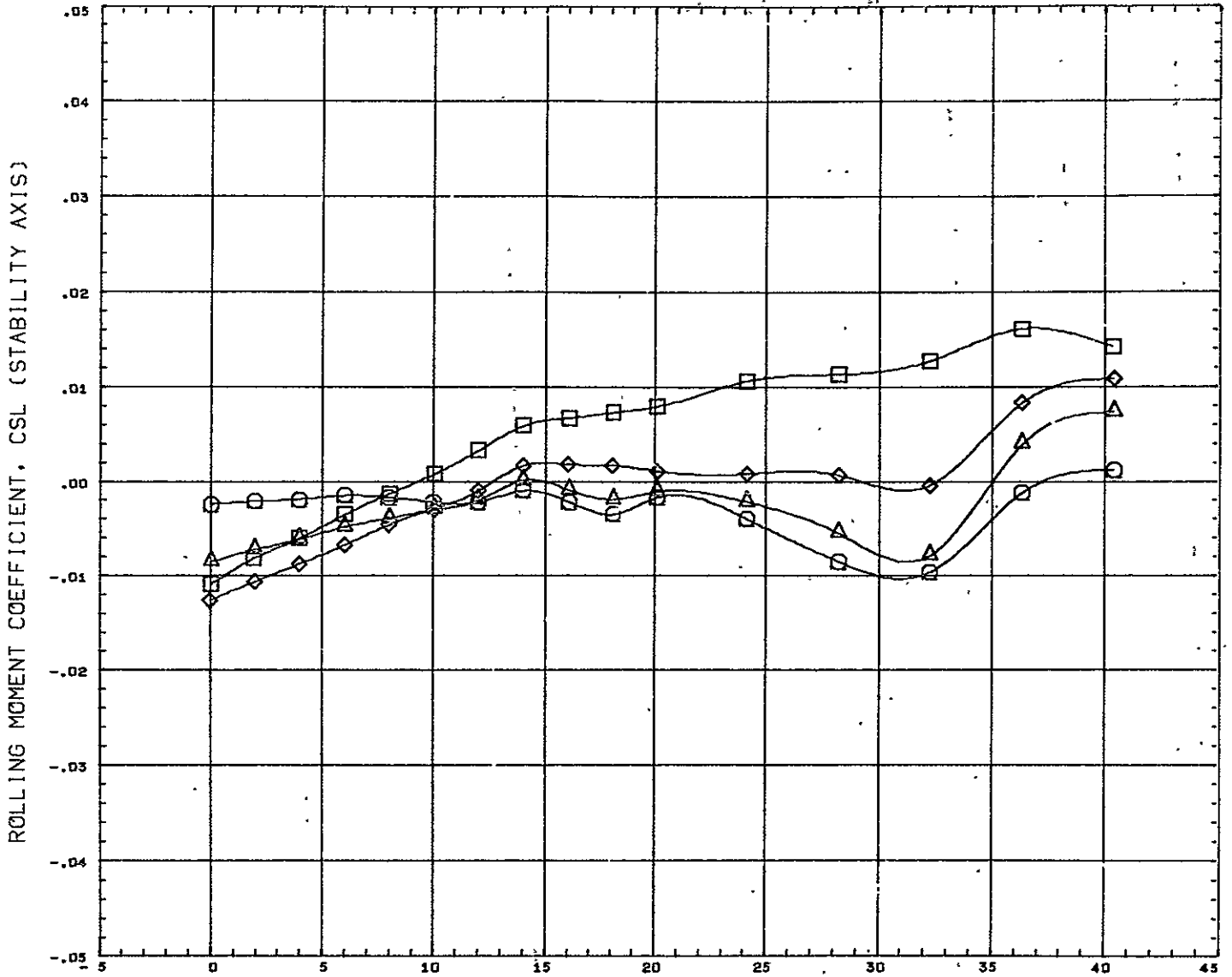
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(BCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J
(BCJ036)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J
(BCJ037)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J
(BCJ038)	NAAL 633 NAR DELTA ORB. W16 B4 V24R8J

BETA	SPD BK	RUDDER
0.000	15.000	
0.000	15.000	-10.000
0.000	15.000	-20.000
0.000	15.000	-30.000

REFERENCE INFORMATION	
REFS	0.3542 SQ.FT.
REFL	6.2656 INCHES
REFB	10.8560 INCHES
XMRP	13.8540 INCHES
YMRP	0.0000 INCHES
ZMRP	0.9920 INCHES
SCALE	0.0076 SCALE

MACH 0.259

# VERTICAL TAIL EFFECTIVENESS, B4W16V25J CONFIGURATION



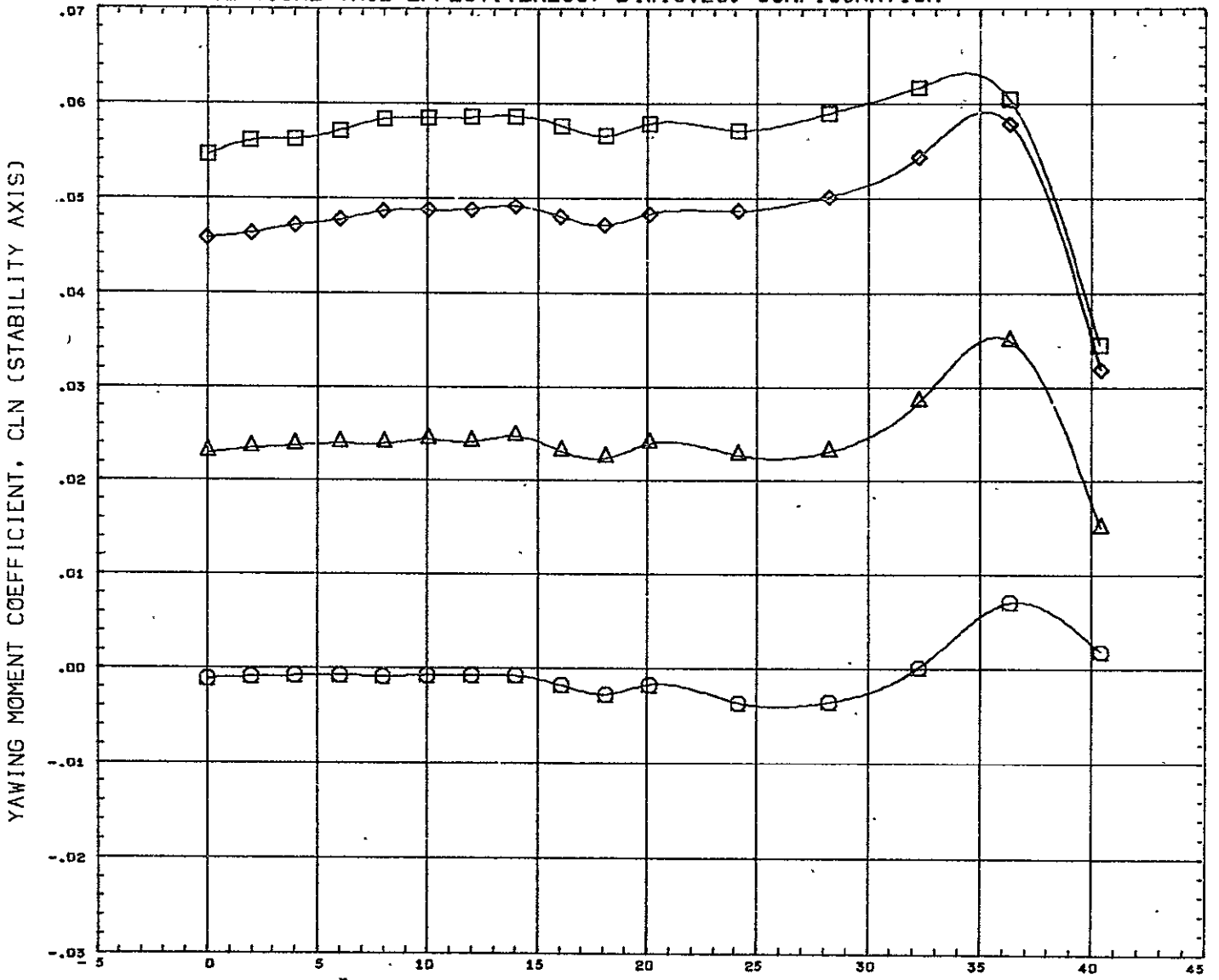
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(RCJ032)	○	NAAL 633 NAR DELTA ORB. W16 B4 V24 J
(RCJ033)	△	NAAL 633 NAR DELTA ORB. W16 B4 V25 J
(RCJ034)	◇	NAAL 633 NAR DELTA ORB. W16 B4 V25 J
(RCJ035)	□	NAAL 633 NAR DELTA ORB. W16 B4 V25 J

BETA	SPD BK	VERT
0.000	15.000	-10.000
0.000	15.000	-20.000
0.000	15.000	-30.000

REFERENCE INFORMATION	
REFS	0.3542 SQ.FT.
REFL	6.2656 INCHES
REFB	10.8530 INCHES
XMRP	10.8740 INCHES
YMRP	0.0000 INCHES
ZMRP	0.9926 INCHES
SCALE	0.0076 SCALE

MACH 0.259

### VERTICAL TAIL EFFECTIVENESS, B4W16V25J CONFIGURATION



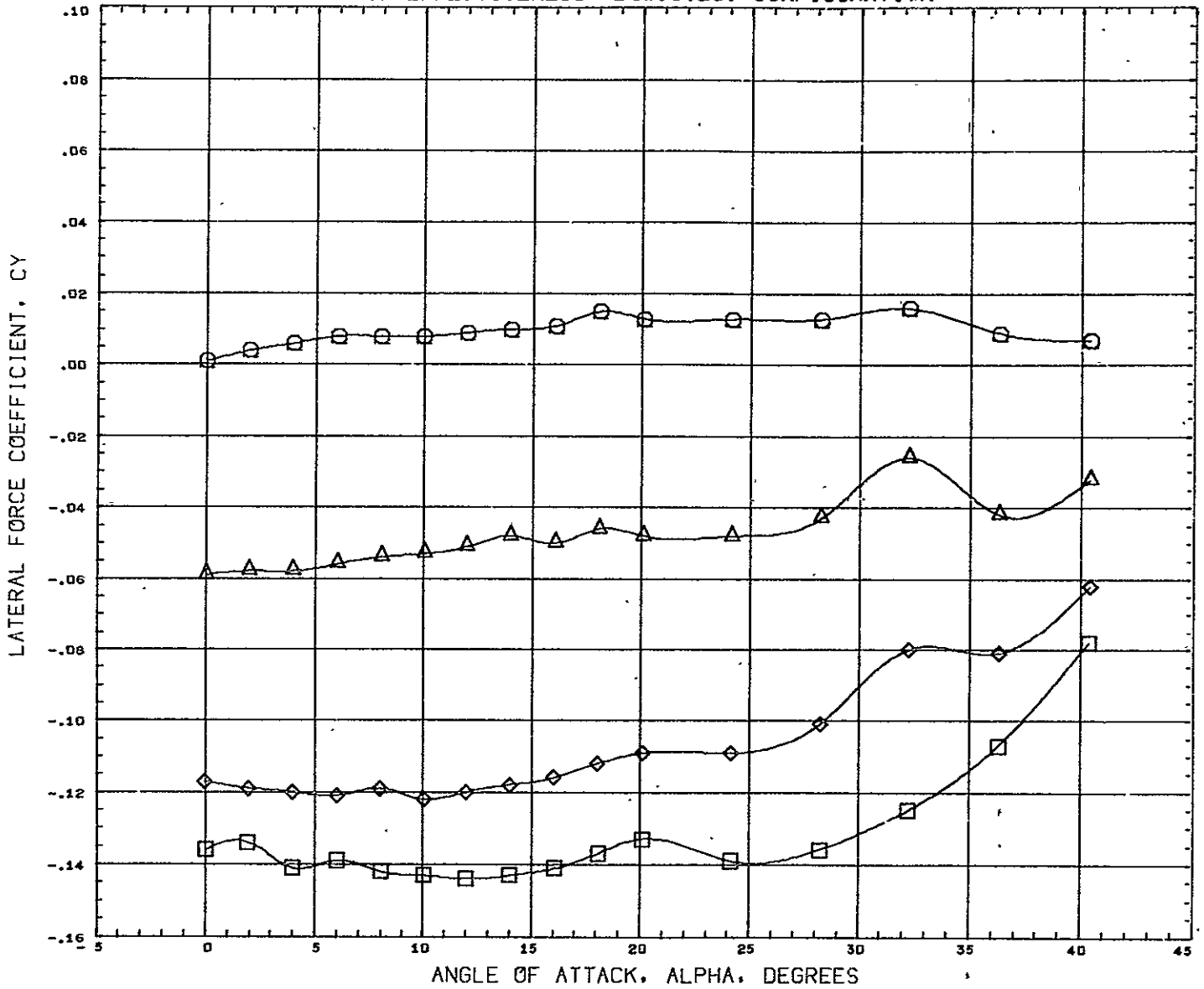
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J
(RCJ033)	NAAL 633 NAR DELTA ORB. W16 B4 V25 J
(RCJ034)	NAAL 633 NAR DELTA ORB. W16 B4 V25 J
(RCJ035)	NAAL 633 NAR DELTA ORB. W16 B4 V25 J

BETA	SPD BK	VERT
0.000	15.000	
0.000	15.000	-10.000
0.000	15.000	-20.000
0.000	15.000	-30.000

REFERENCE INFORMATION	
REFS	0.3542 SQ.FT.
REFL	6.2656 INCHES
REFB	10.8569 INCHES
XMRP	10.8500 INCHES
YMRP	0.0000 INCHES
ZMRP	0.9920 INCHES
SCALE	0.0076 SCALE

MACH 0.255

### VERTICAL TAIL EFFECTIVENESS, B4W16V25J CONFIGURATION

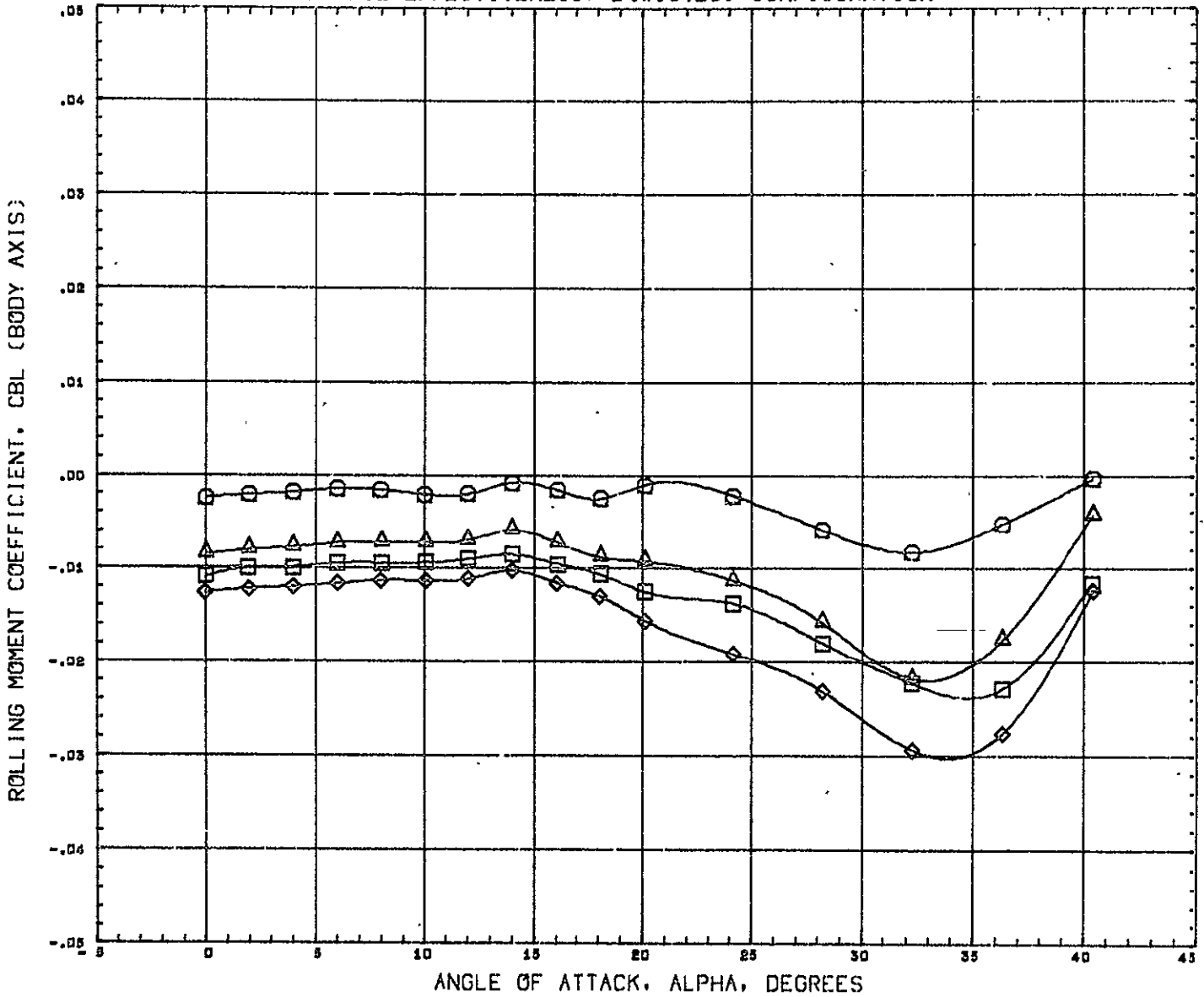


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	SPD BK	VERT	REFERENCE INFORMATION
(RCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	15.000		REFS 0.3542 SQ.FT.
(RCJ033)	NAAL 633 NAR DELTA ORB. W16 B4 V25 J	0.000	15.000	-10.000	REFL 6.2656 INCHES
(RCJ034)	NAAL 633 NAR DELTA OR3. W16 B4 V25 J	0.000	15.000	-20.000	REFB 10.8560 INCHES
(RCJ035)	NAAL 633 NAR DELTA ORB. W16 B4 V25 J	0.000	15.000	-30.000	XMRP 10.85-3 INCHES
					YMRP 0.0000 INCHES
					ZMRP 0.9920 INCHES
					SCALE 0.0076 INCHES

MACH 0.259



# VERTICAL TAIL EFFECTIVENESS, B4W16V25J CONFIGURATION



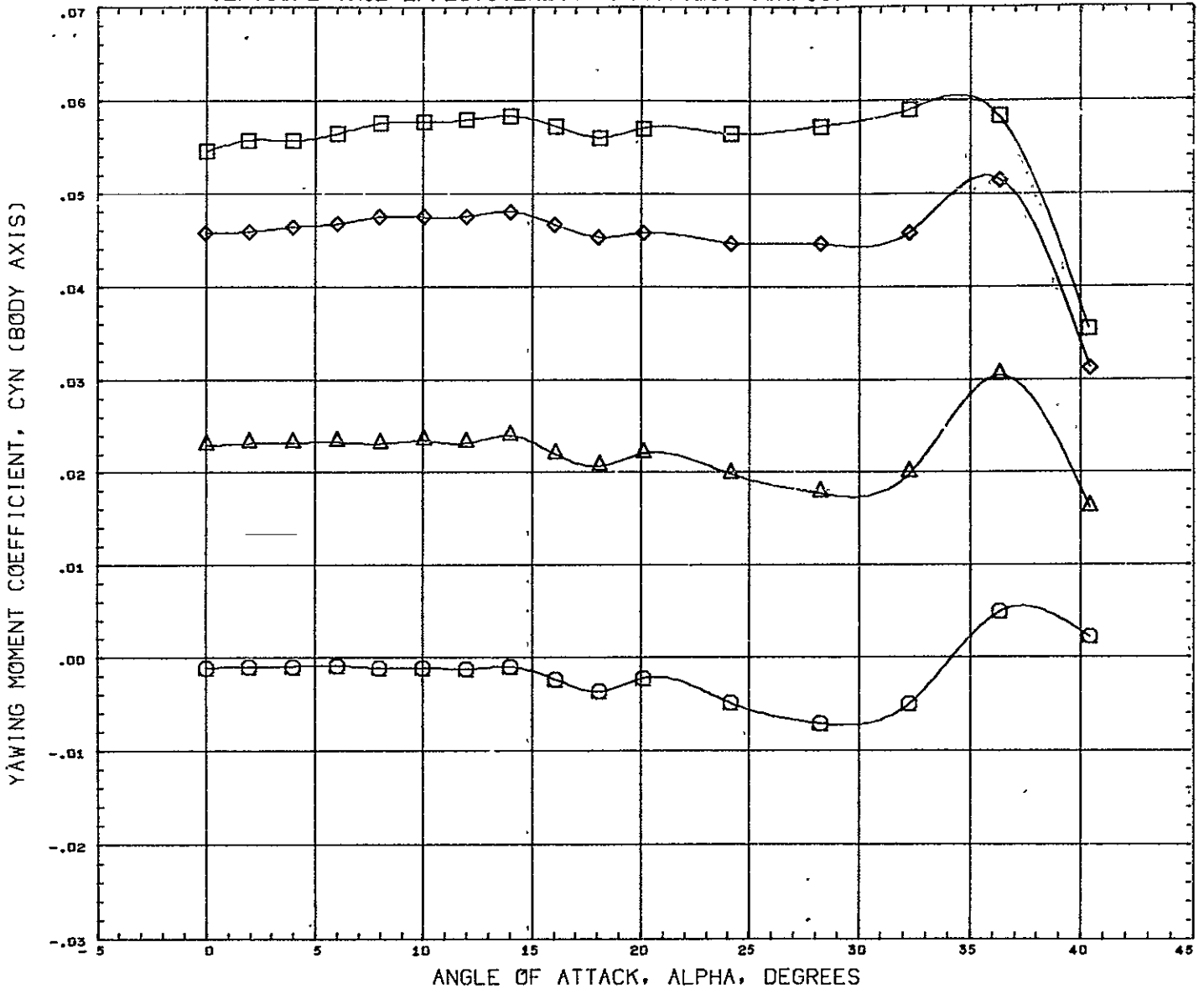
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(BCJ032)	○	NAAL 633 NAR DELTA ORB. W16 B4 V24 J
(BCJ033)	△	NAAL 633 NAR DELTA ORB. W16 B4 V25 J
(BCJ034)	◇	NAAL 633 NAR DELTA ORB. W16 B4 V25 J
(BCJ035)	□	NAAL 633 NAR DELTA ORB. W16 B4 V25 J

BETA	SPD BK	VERT
0.000	15,000	
0.000	15,000	-10,000
0.000	15,000	-20,000
0.000	15,000	-30,000

REFERENCE INFORMATION	
REFS	0.3542 80.FT.
REFL	6.2656 INCHES
REFB	10.8560 INCHES
XMRP	10.854J INCHES
YMRP	0.0100 INCHES
ZMRP	0.9920 INCHES
SCALE	0.0076 SCALE

MACH 0.250

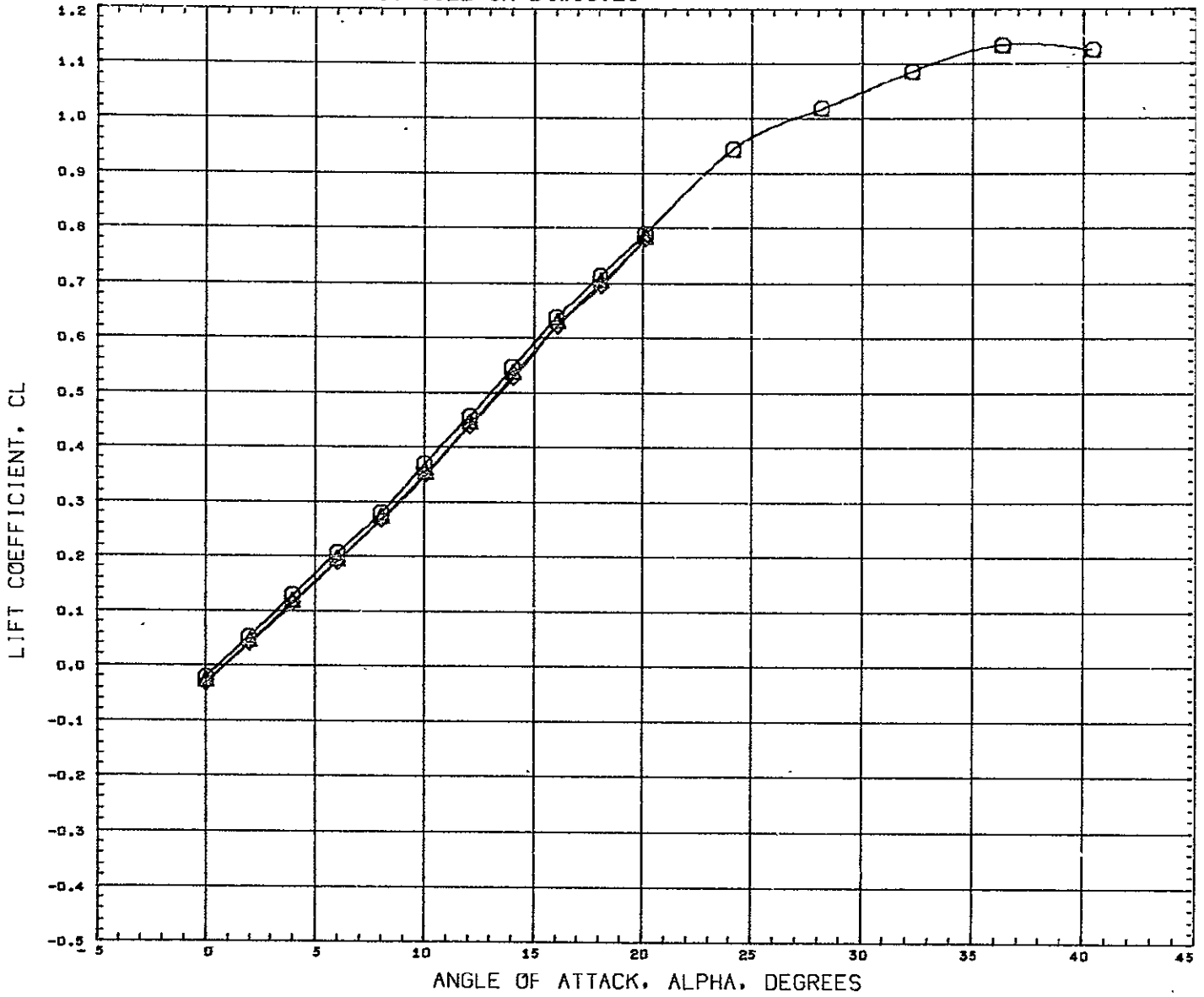
### VERTICAL TAIL EFFECTIVENESS, B4W16V25J CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	SPD BK	VERT	REFERENCE INFORMATION
(BCJ032)	NAAL 633 NAR DELTA ORB. W16 B4 V24 J	0.000	15.000		REFS 0.3542 SQ.FT.
(BCJ033)	NAAL 633 NAR DELTA ORB. W16 B4 V25 J	0.000	15.000	-10.000	REFL 6.2656 INCHES
(BCJ034)	NAAL 633 NAR DELTA ORB. W16 B4 V25 J	0.000	15.000	-20.000	REFB 10.8561 INCHES
(BCJ035)	NAAL 633 NAR DELTA ORB. W16 B4 V25 J	0.000	15.000	-30.000	XMRP 10.8540 INCHES
					YMRP 0.0000 INCHES
					ZMRP 0.9920 INCHES
					SCALE 0.0076 SCALE

MACH 0.259

### EFFECT OF GRIT SIZE ON B4W16V23

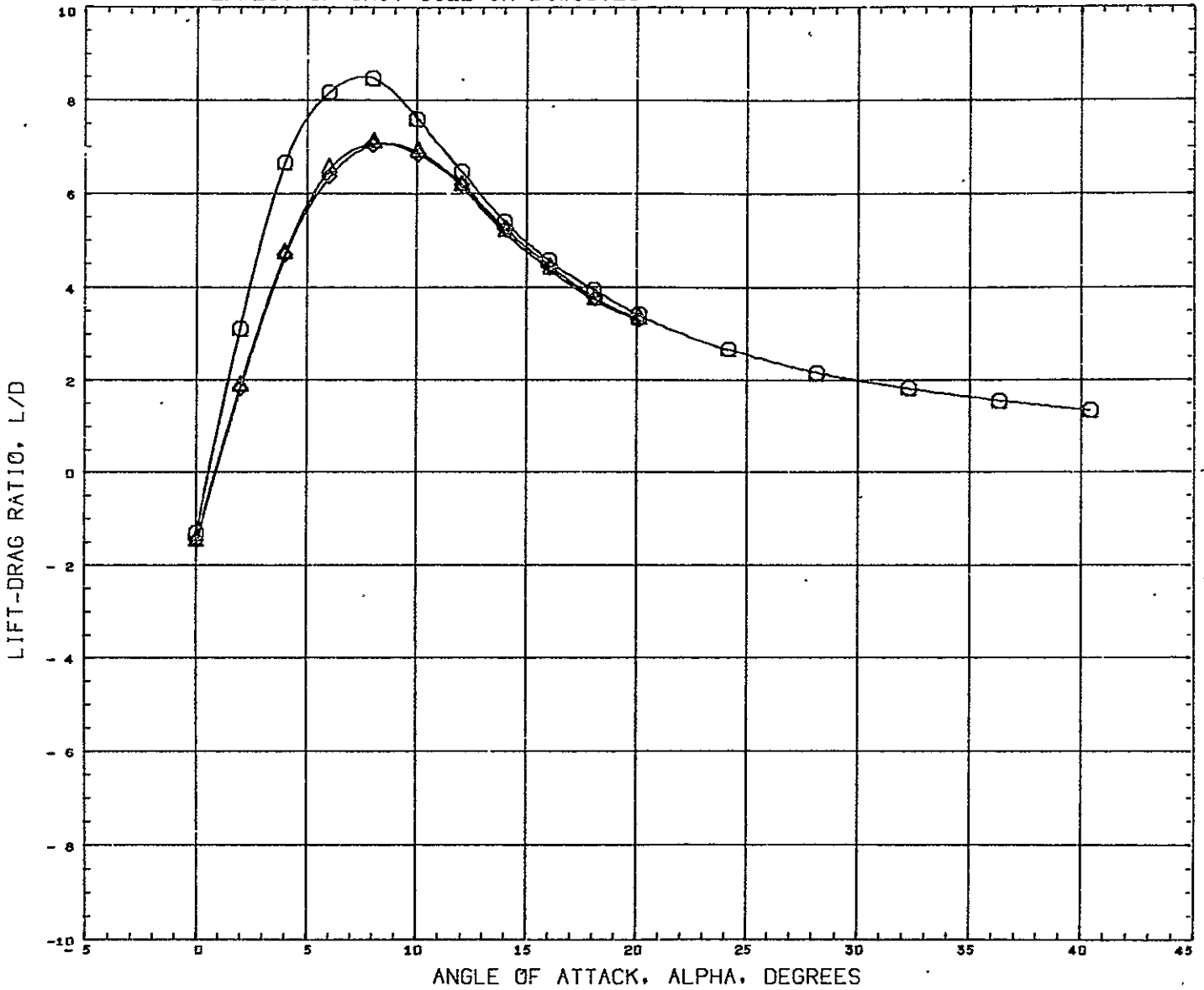


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000
(RCJ043)	NAAL 633 NAR DELTA ORB. W16 TR2 B4 TR2 V23 TR2	0.000
(RCJ041)	NAAL 633 NAR DELTA ORB. W16 TR3 B4 TR3 V23 TR3	0.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	19.8540	INCHES
YMRF	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.269

# EFFECT OF GRIT SIZE ON B4W16V23

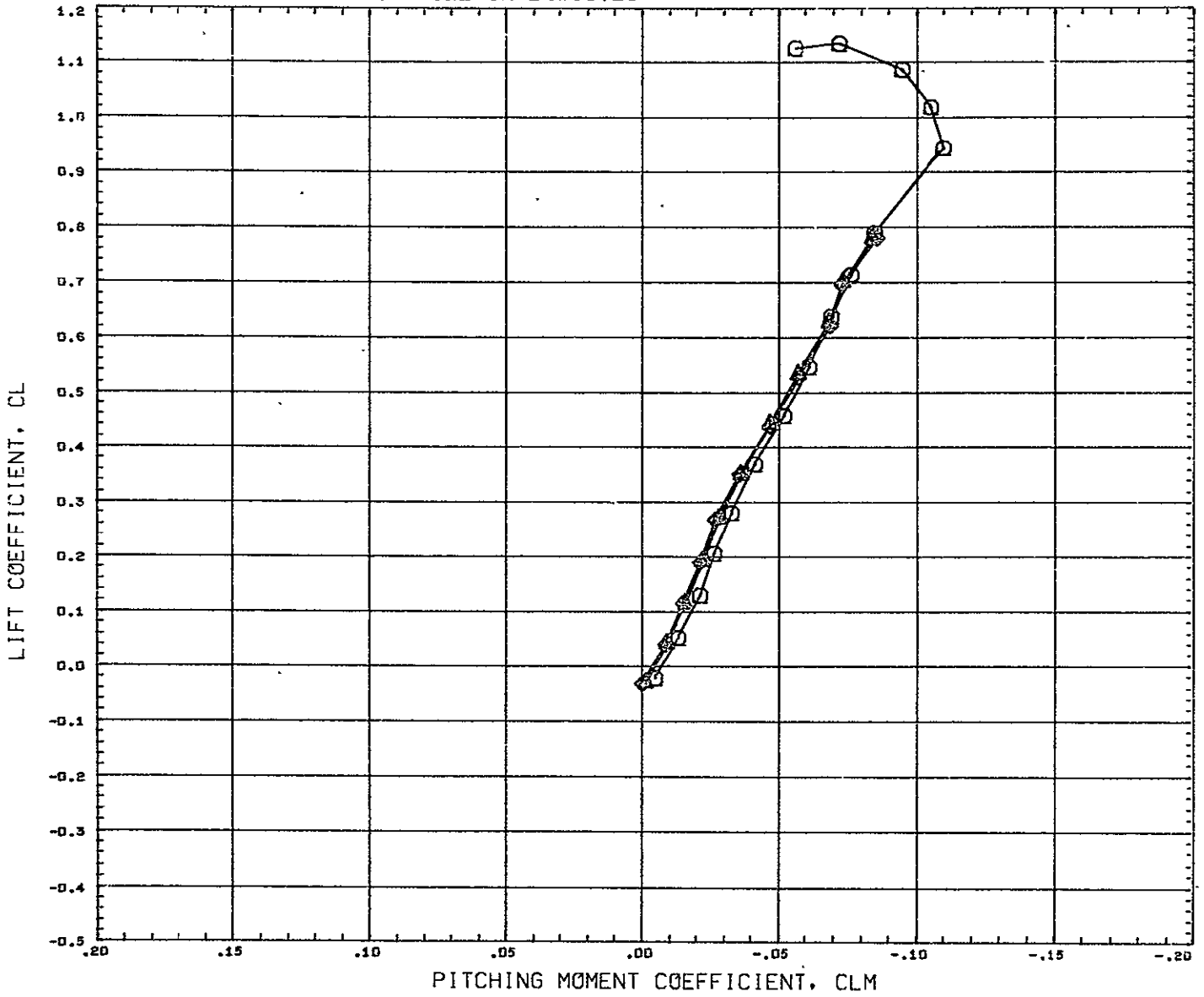


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000
(RCJ043)	NAAL 633 NAR DELTA ORB. W16 TR2 B4 TR2 V23 TR2	0.000
(RCJ041)	NAAL 633 NAR DELTA ORB. W16 TR3 B4 TR3 V23 TR3	0.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8500	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

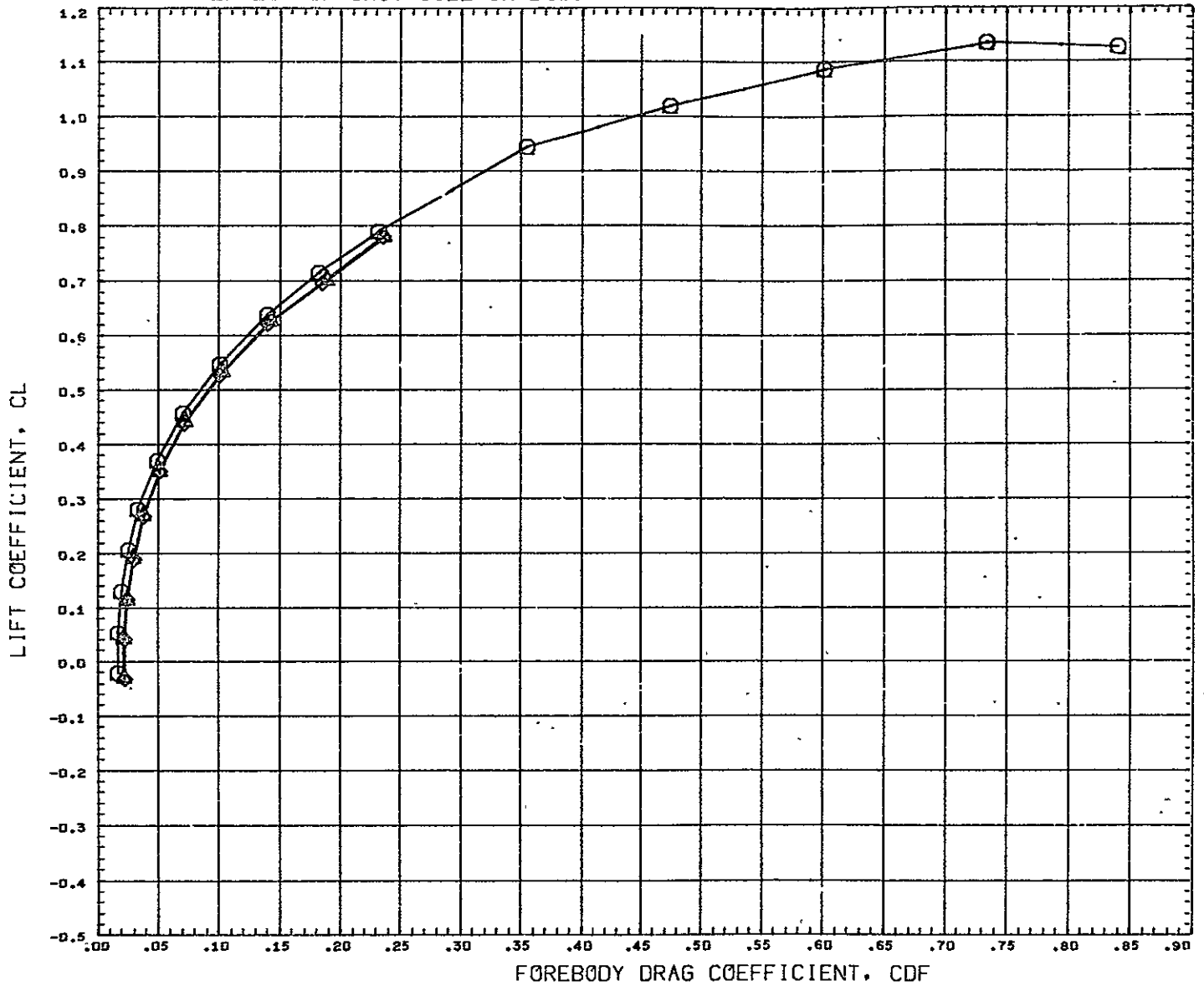
### EFFECT OF GRIT SIZE ON B4W16V23



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	REFERENCE INFORMATION
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000	REFS 0.3542 SQ.FT.
(RCJ043)	NAAL 633 NAR DELTA ORB. W16 TR2 B4 TR2 V23 TR2	0.000	REFL 6.2656 INCHES
(RCJ041)	NAAL 633 NAR DELTA ORB. W16 TR3 B4 TR3 V23 TR3	0.000	REFB 10.8560 INCHES
			XMRP 19.8110 INCHES
			YMRP 0.0000 INCHES
			ZMRP 0.9920 INCHES
			SCALE 0.0076 SCALE

MACH 0.259

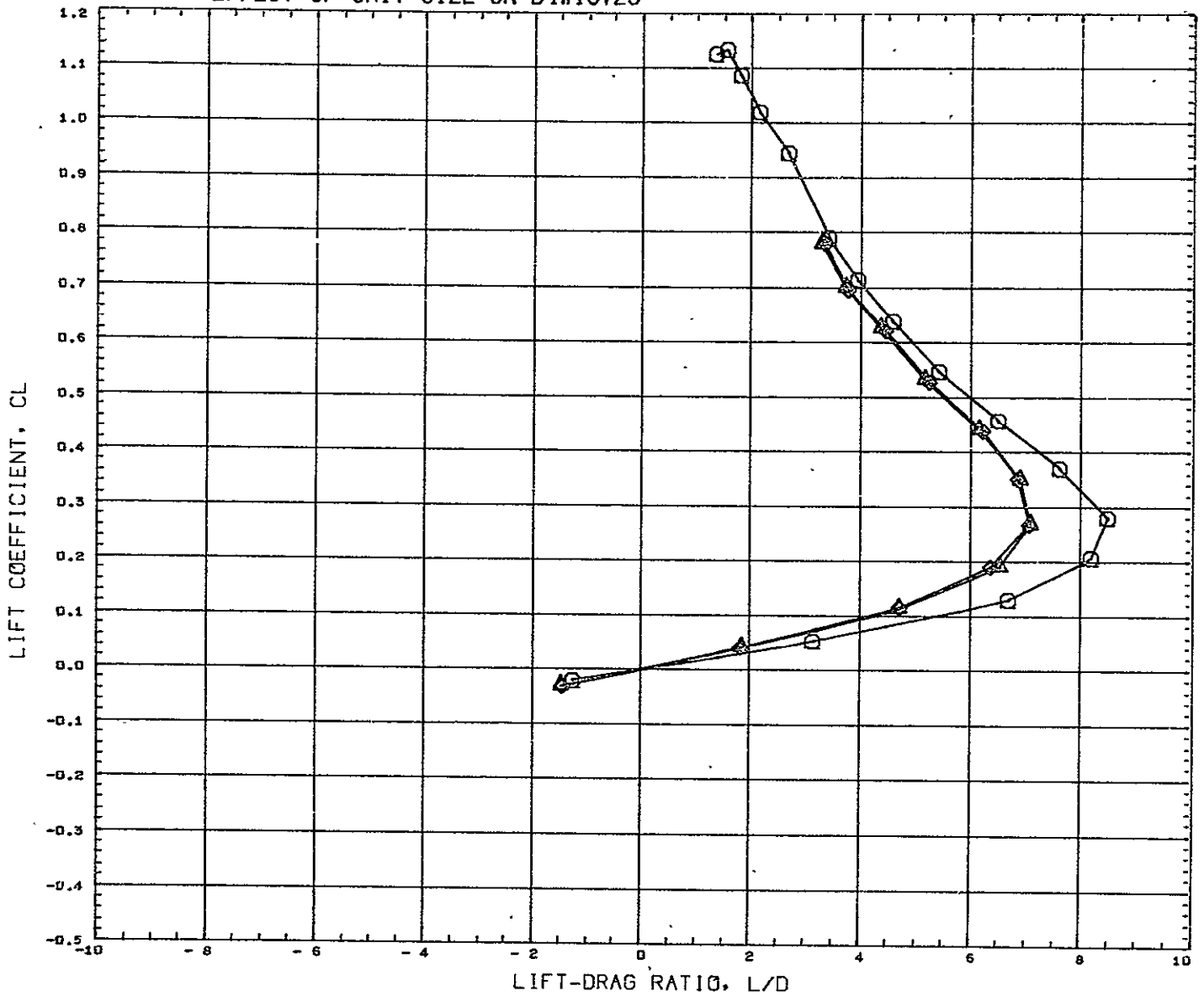
### EFFECT OF GRIT SIZE ON B4W16V23



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	REFERENCE INFORMATION
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000	REFS 0.3542 SQ.FT.
(RCJ043)	NAAL 633 NAR DELTA ORB. W16 TR2 B4 TR2 V23 TR2	0.000	REFL 6.2656 INCHES
(RCJ041)	NAAL 633 NAR DELTA ORB. W16 TR3 B4 TR3 V23 TR3	0.000	REFB 10.8568 INCHES
			XMRP 10.8140 INCHES
			YMRP 0.0000 INCHES
			ZMRP 0.9920 INCHES
			SCALE 0.0076 SCALE

MACH 0.259

# EFFECT OF GRIT SIZE ON B4W16V23

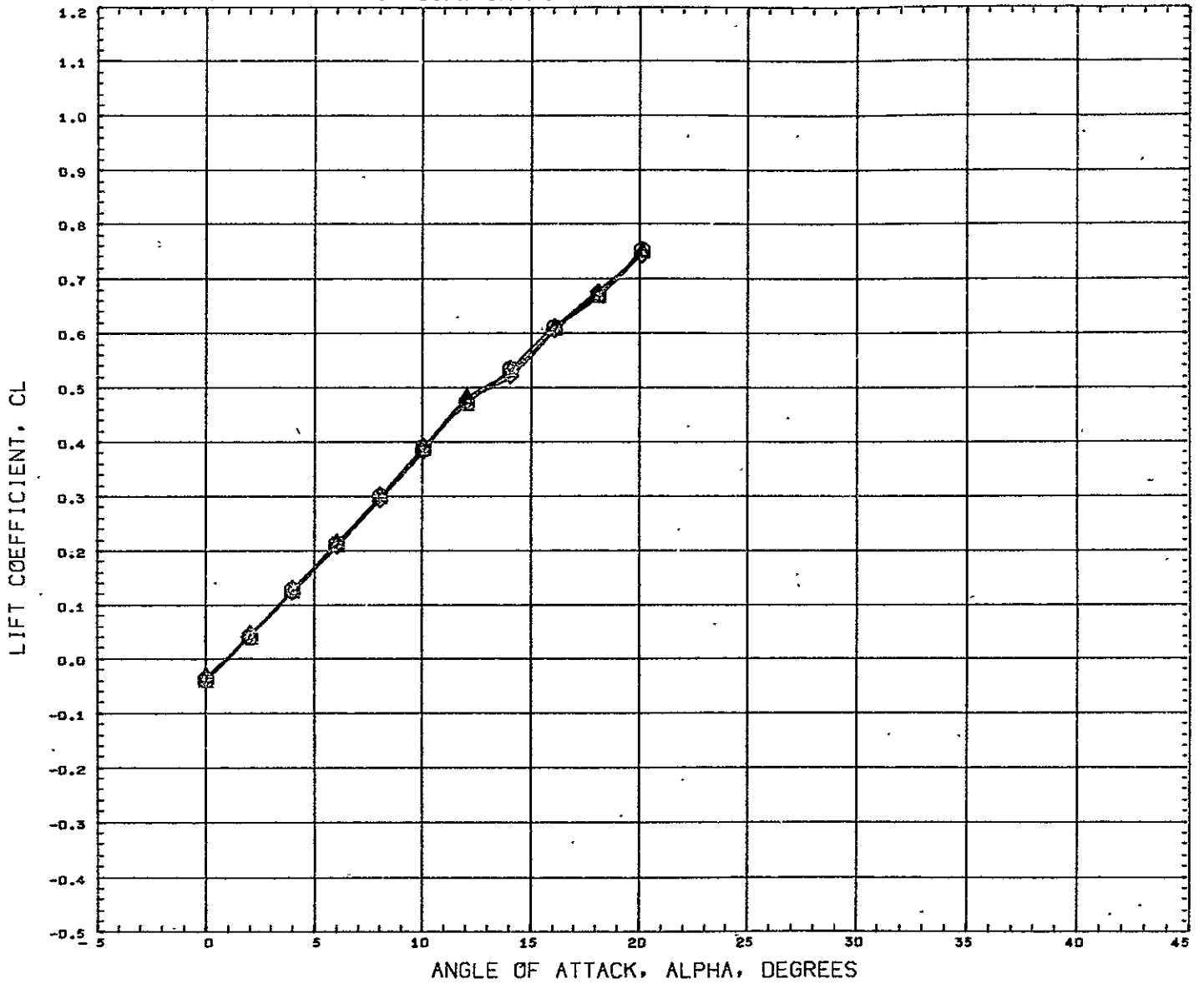


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA
(RCJ030)	NAAL 633 NAR DELTA ORB. W16 B4 V23	0.000
(RCJ043)	NAAL 633 NAR DELTA ORB. W16 TR2 B4 TR2 V23 TR2	0.000
(RCJ041)	NAAL 633 NAR DELTA ORB. W16 TR3 B4 TR3 V23 TR3	0.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8510	INCHES
YHRF	0.0000	INCHES
ZHRF	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

### EFFECT OF GRIT SIZE ON B4W8V10

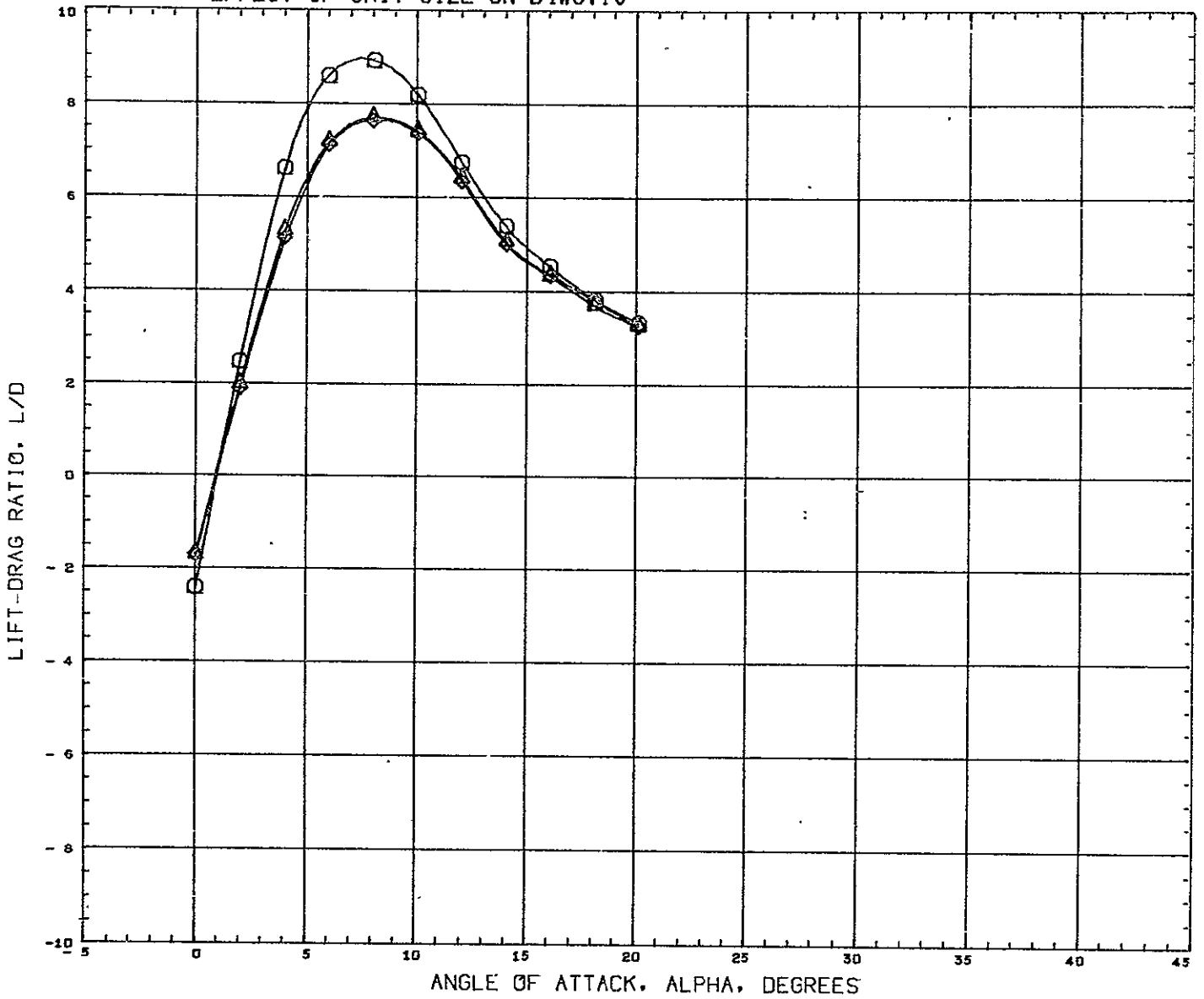


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	REFERENCE INFORMATION
(RCJD46)	○ NAAL 633 NAR DELTA ORB. W8 B4 V10	0.000	REFS 0.3542 SQ.FT.
(RCJD44)	△ NAAL 633 NAR DELTA ORB. W8 TR2 B4 TR2 V10 TR2	0.000	REFL 6.2656 INCHES
(RCJD45)	◇ NAAL 633 NAR DELTA ORB. W8 TR B4 TR V10 TR	0.000	REFB 10.8560 INCHES
			ZMRP 10.8540 INCHES
			YMRP 0.0000 INCHES
			ZMRP 0.9920 INCHES
			SCALE 0.0076 SCALE

MACH 0.259



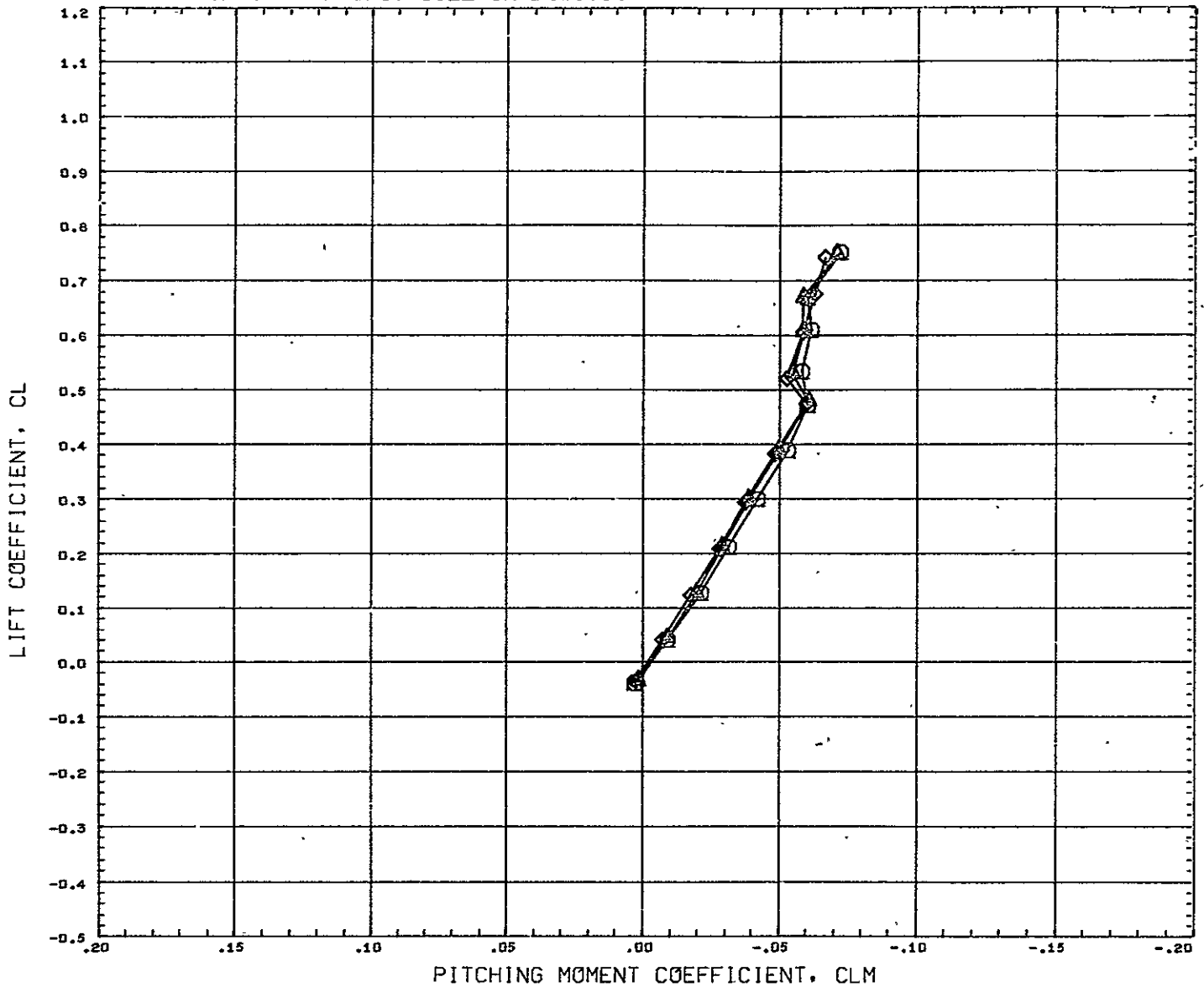
### EFFECT OF GRIT SIZE ON B4W8V10



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	REFERENCE INFORMATION	
(RCJD46)	○ NAAL 633 NAR DELTA ORB. W8 B4 V10	0.000	REFS	0.3542 SQ.FT.
(RCJD44)	△ NAAL 633 NAR DELTA ORB. W8 TR2 B4 TR2 V10 TR2	0.000	REFL	6.2656 INCHES
(RCJD45)	◇ NAAL 633 NAR DELTA ORB. W8 TR B4 TR V10 TR	0.000	REFB	10.8560 INCHES
			WHRP	10.8560 INCHES
			YHRP	0.9000 INCHES
			ZHRP	0.9920 INCHES
			SCALE	0.0076 SCALE

MACH            0.259

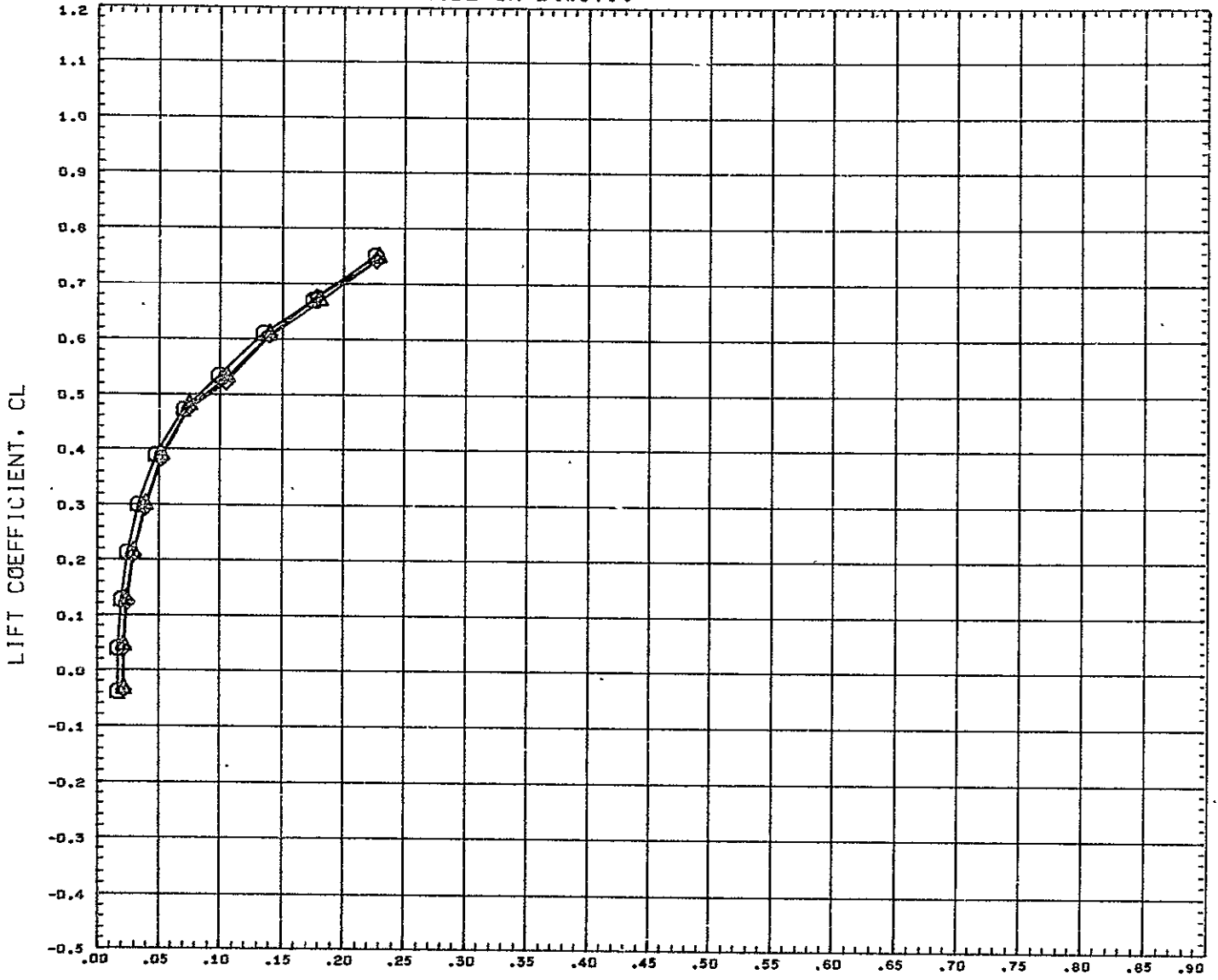
### EFFECT OF GRIT SIZE ON B4W8V10



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	REFERENCE INFORMATION
(RCJ046)	⊙ NAAL 633 NAR DELTA ORB. W8 B4 V10	0.000	REFS 0.3542 SQ.FT.
(RCJ044)	△ NAAL 633 NAR DELTA ORB. W8 TR2 B4 TR2 V10 TR2	0.000	REFL 6.2656 INCHES
(RCJ045)	◇ NAAL 633 NAR DELTA ORB. W8 TR B4 TR V10 TR	0.000	REFB 10.8560 INCHES
			XMRP 10.8560 INCHES
			YMRP 0.0000 INCHES
			ZMRP 0.9920 INCHES
			SCALE 0.0076 SCALE

MACH 0.259

### EFFECT OF GRIT SIZE ON B4W8V10



DATA SET SYMBOL      CONFIGURATION DESCRIPTION

(RCJD46)	○	NAAL 633 NAR DELTA ORB. W8 B4 V10
(RCJD44)	△	NAAL 633 NAR DELTA ORB. W8 TR2 B4 TR2 V10 TR2
(RCJD45)	◇	NAAL 633 NAR DELTA ORB. W8 TR B4 TR V10 TR

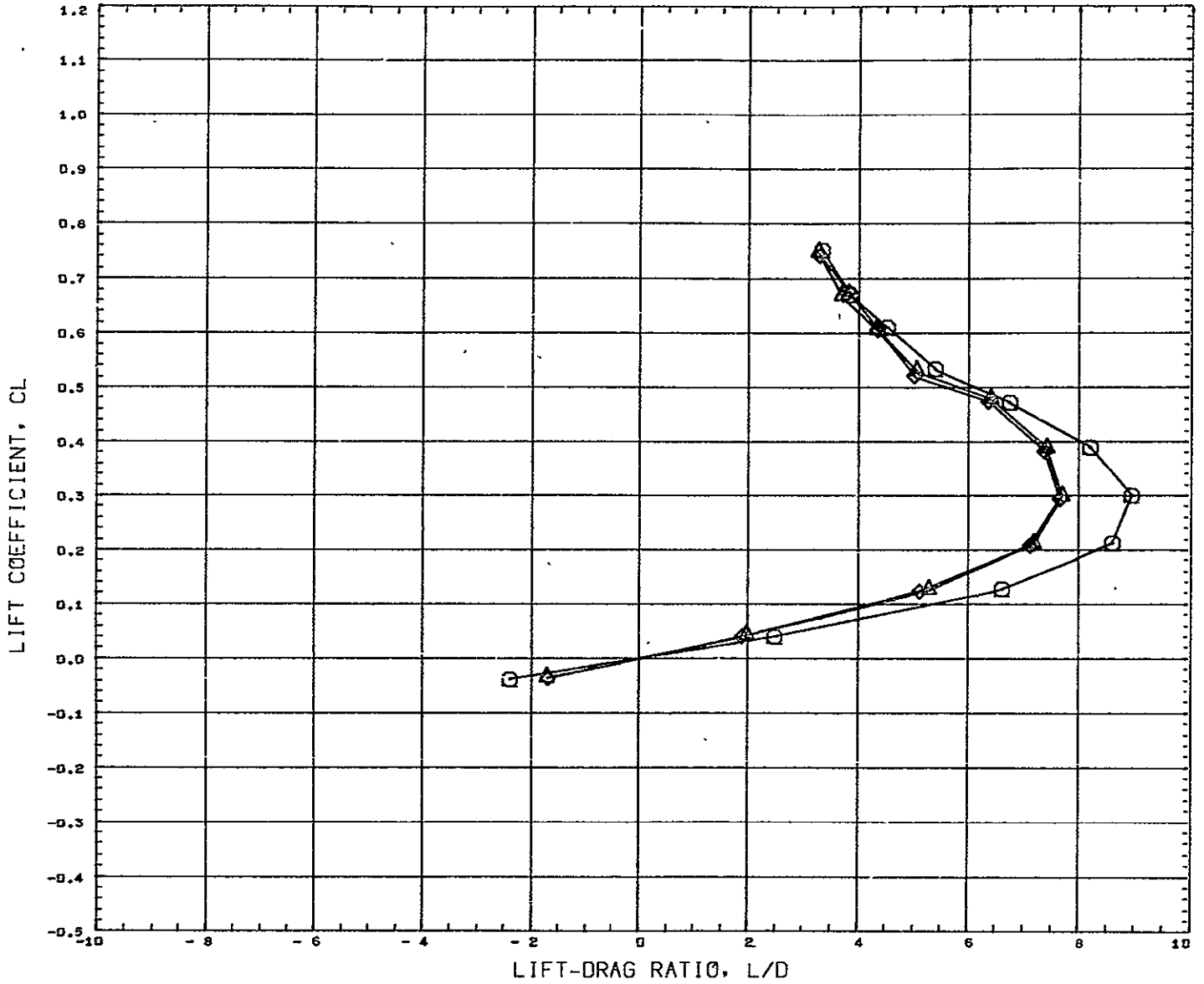
BETA  
0.000  
0.000  
0.000

REFERENCE INFORMATION

REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8000	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH            0.259

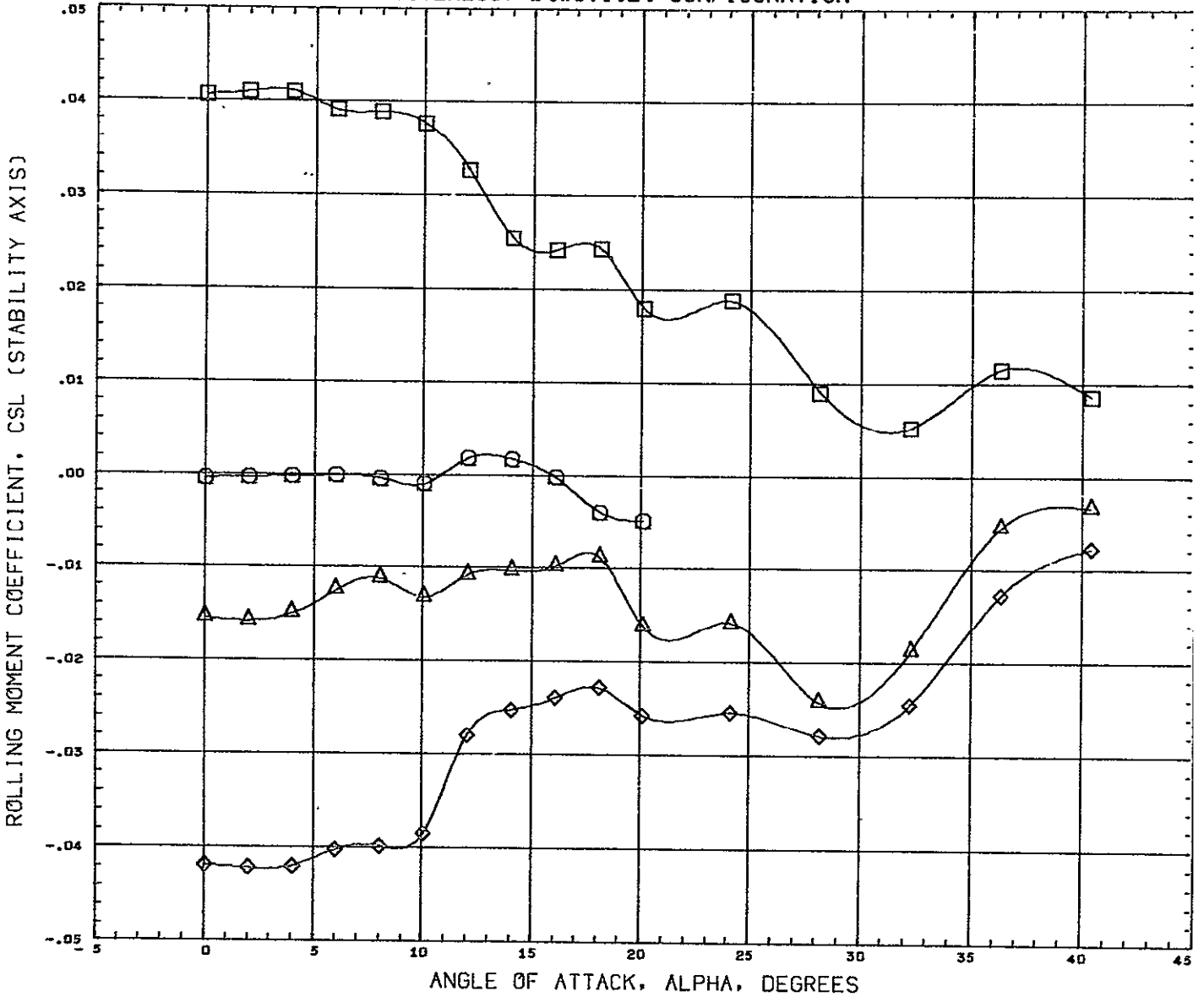
# EFFECT OF GRIT SIZE ON B4W8V10



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	REFERENCE INFORMATION
(RCJ046)	NAAL 633 NAR DELTA ORB. W8 B4 V10	0.000	REFS 0.3542 SQ.FT.
(RCJ044)	NAAL 633 NAR DELTA ORB. W8 TR2 B4 TR2 V10 TR2	0.000	REFL 6.2656 INCHES
(RCJ045)	NAAL 633 NAR DELTA ORB. W8 TR B4 TR V10 TR	0.000	REFB 10.8560 INCHES
			XMRF 10.8565 INCHES
			YMRF 0.0000 INCHES
			ZMRF 0.9920 INCHES
			SCALE 0.0076 SCALE

MACH 0.259

# AILERON EFFECTIVENESS, B4W8V10E4 CONFIGURATION



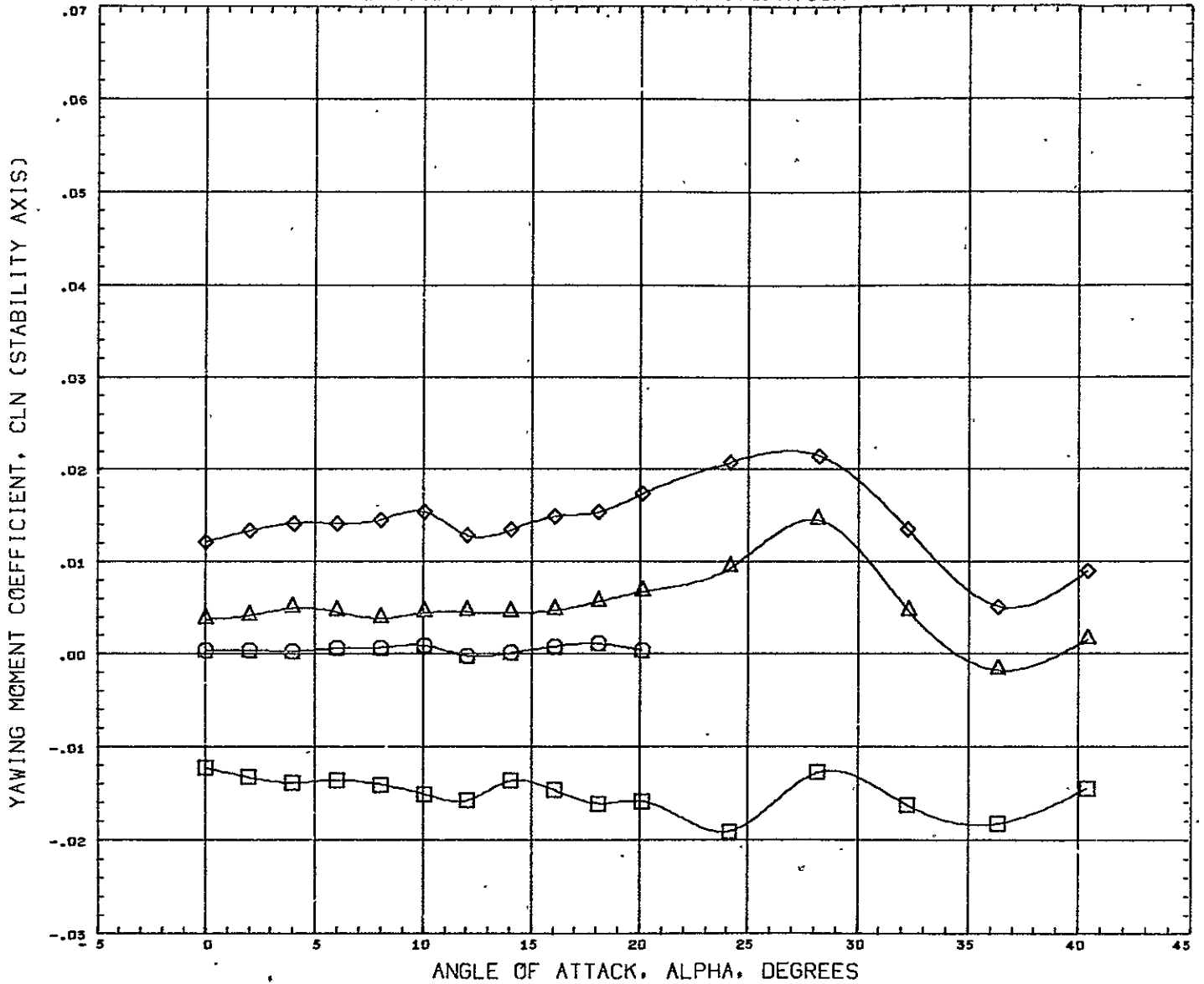
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJ046)	NAAL 633 NAR DELTA ORB. W8 B4 V10
(RCJ049)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10
(RCJ055)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10
(RCJ053)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10

BETA	ELVN4L	ELVN4R
0.000		
0.000	-5.000	5.000
0.000	-15.000	15.000
0.000	15.000	-15.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8569	INCHES
XMRP	10.8540	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

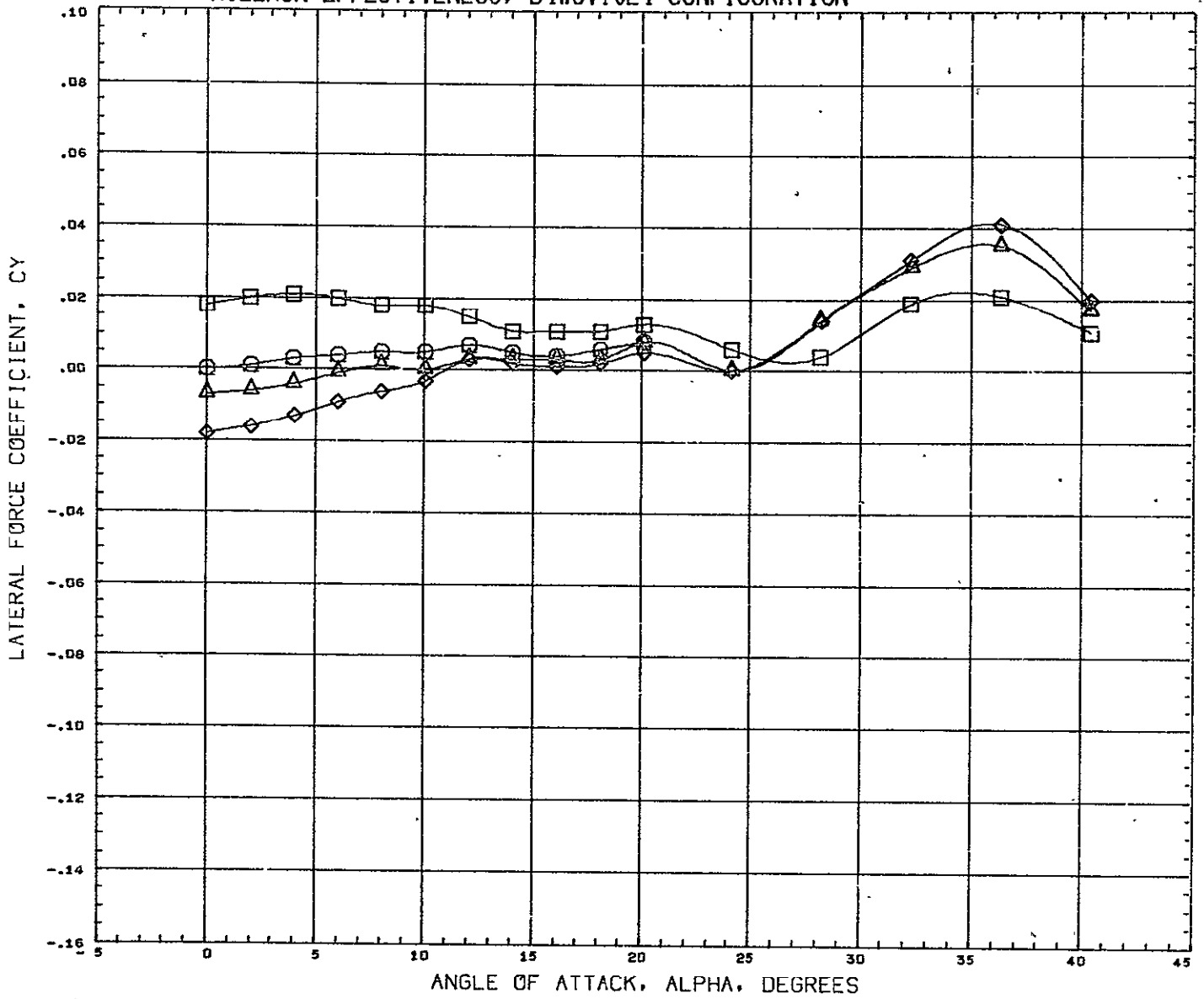
# AILERON EFFECTIVENESS, B4W8V10E4 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN4L	ELVN4R	REFERENCE INFORMATION
(RCJD46)	NAAL 633 NAR DELTA ORB. W8 B4 V10	0.000			REFS 0.3542 SQ.FT.
(RCJD49)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-5.000	5.000	REFL 6.2656 INCHES
(RCJD55)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-15.000	15.000	REFB 10.8560 INCHES
(RCJD53)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	15.000	-15.000	XMRP 10.8440 INCHES
					YMRP 0.0000 INCHES
					ZMRP 0.9920 INCHES
					SCALE 0.0076 SCALE

MACH 0.259

# AILERON EFFECTIVENESS, B4W8V10E4 CONFIGURATION



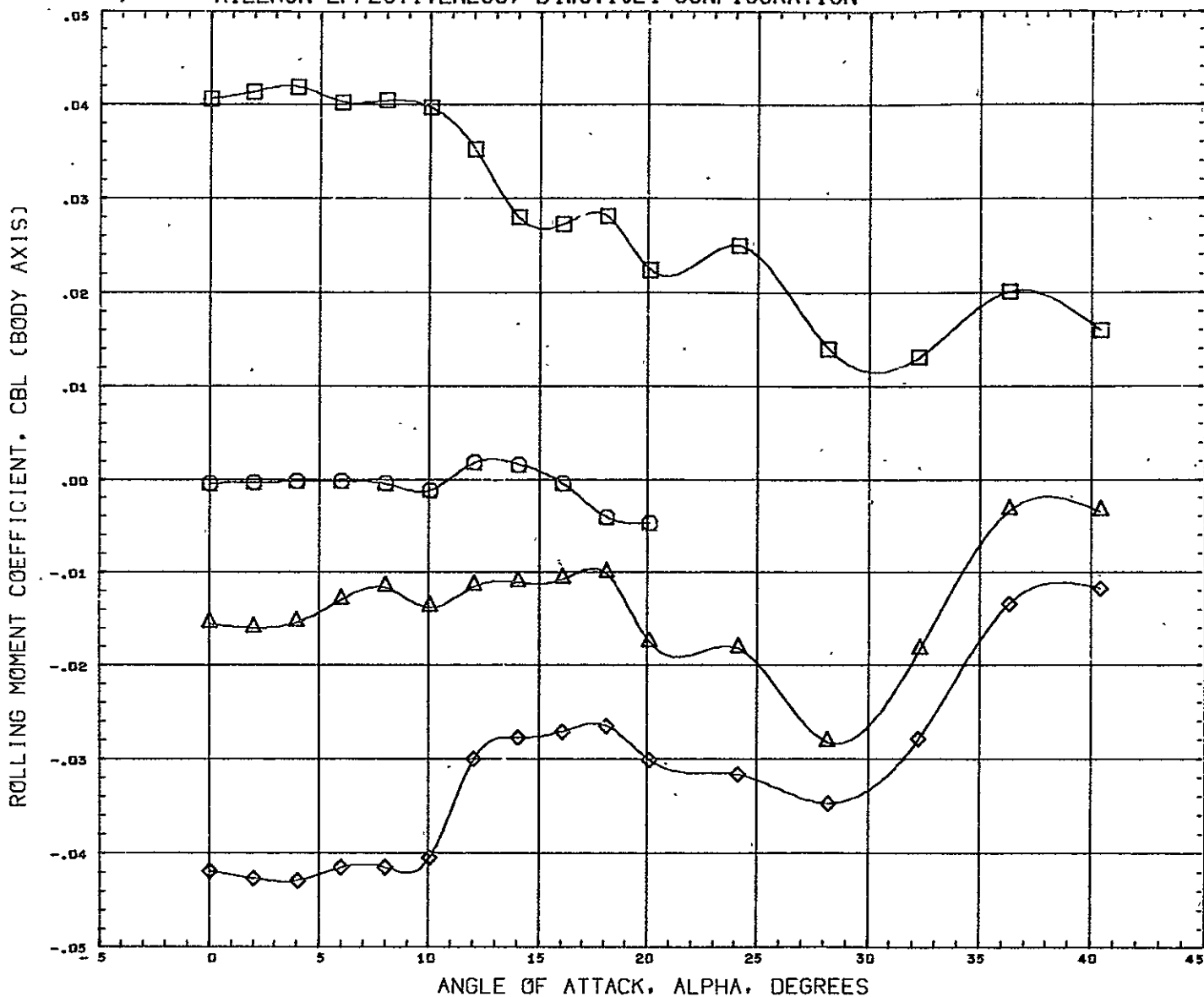
DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(RCJD46)	NAAL 633 NAR DELTA ORB. W8 B4 V10
(RCJD49)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10
(RCJD55)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10
(RCJD53)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10

BETA	ELVN4L	ELVN4R
0.000		
0.000	-5.000	5.000
0.000	-15.000	15.000
0.000	15.000	-15.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8740	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.250

# AILERON EFFECTIVENESS, B4W8V10E4 CONFIGURATION



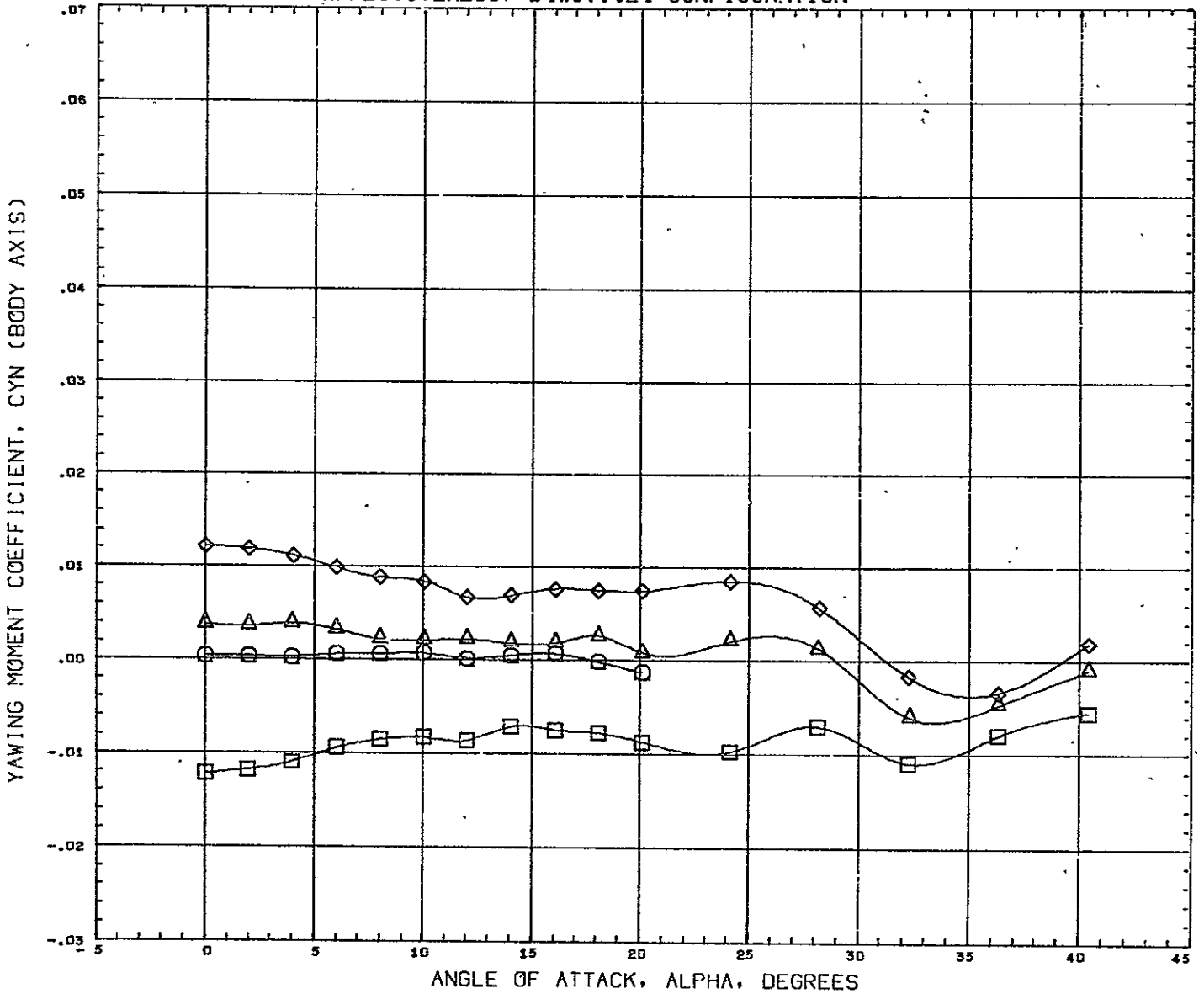
DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN4L	ELVN4R
(BCJD46)	NAAL 633 NAR DELTA ORB. W8 B4 V10	0.000		
(BCJD49)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-5.000	5.000
(BCJD55)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-15.000	15.000
(BCJD53)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	15.000	-15.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	10.8540	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259



# AILERON EFFECTIVENESS, B4W8V10E4 CONFIGURATION



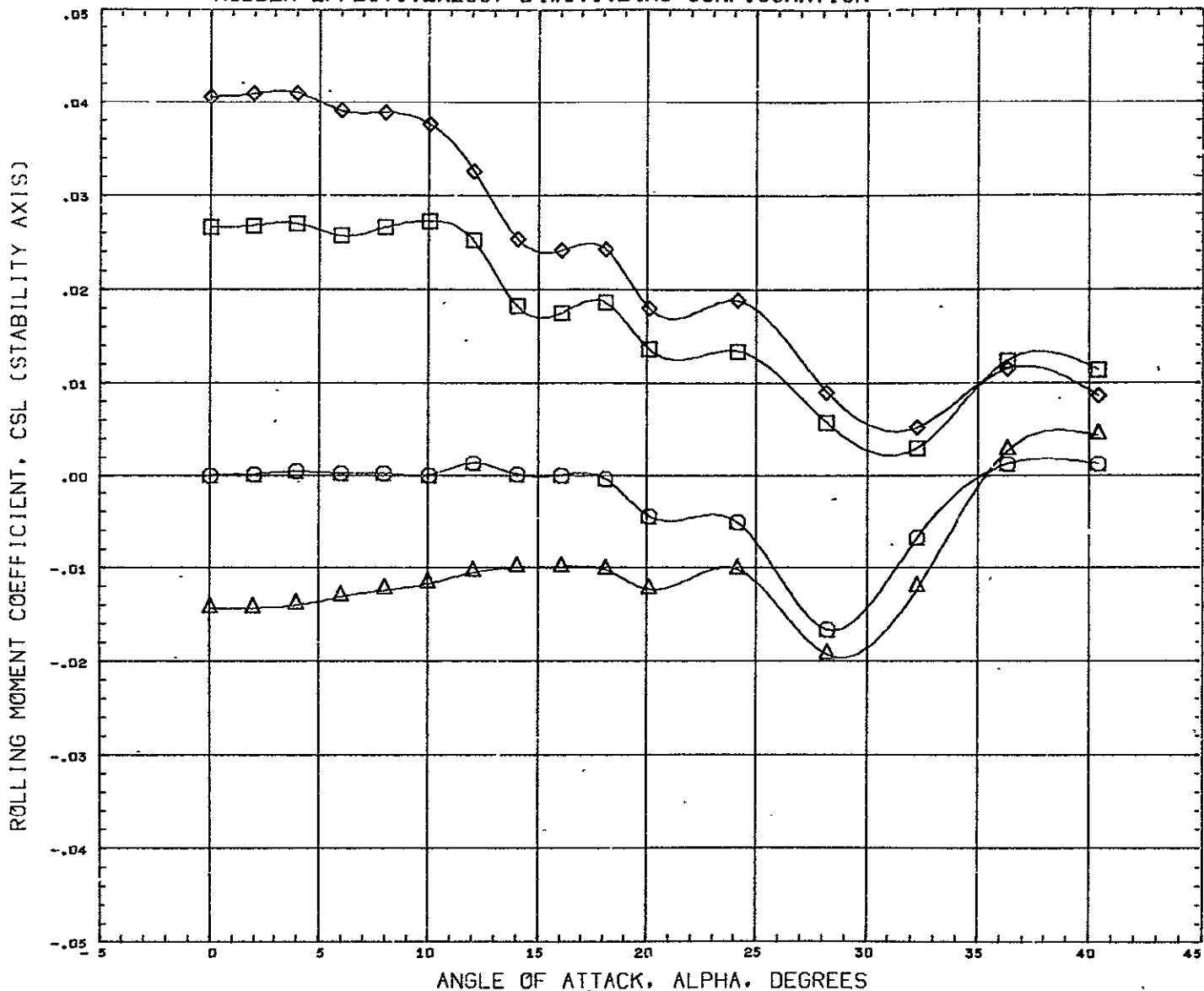
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(BCJD46)	○	NAAL 633 NAR DELTA ORB. W8 B4 V10
(BCJD49)	△	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10
(BCJD55)	◇	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10
(BCJD53)	□	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10

BETA	ELVN4L	ELVN4R
0.000		
0.000	-5.000	5.000
0.000	-15.000	15.000
0.000	15.000	-15.000

REFERENCE INFORMATION	
REFS	0.3542 SQ.FT.
REFL	6.2656 INCHES
REFB	10.8560 INCHES
XMRP	19.8740 INCHES
YMRP	0.0000 INCHES
ZMRP	0.9920 INCHES
SCALE	0.0076 SCALE

HACH 0.259

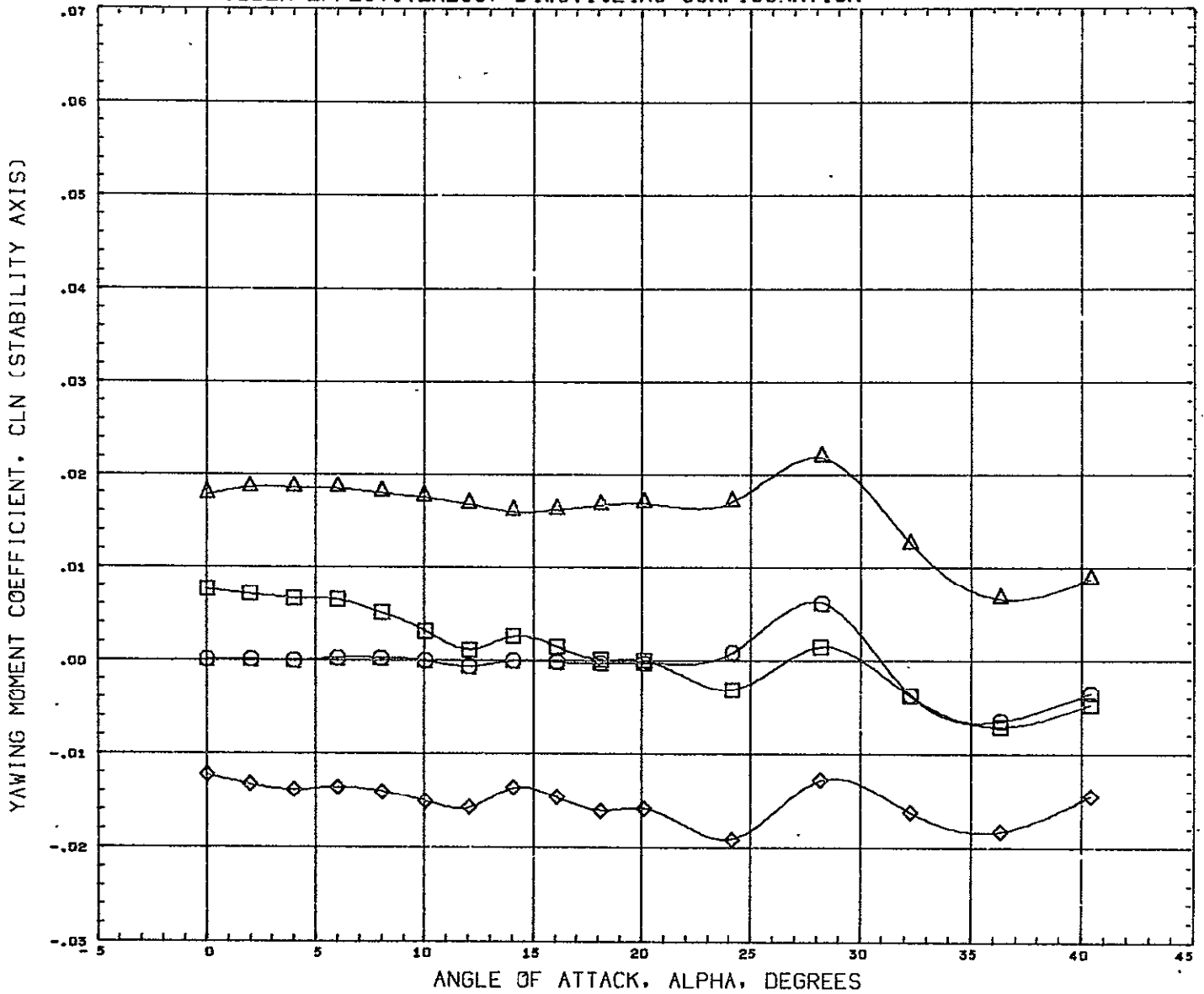
### RUDDER EFFECTIVENESS, B4W8V10E4R3 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN4L	ELVN4R	RUDDER	REFERENCE INFORMATION
(RCJ050)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-5.000	-5.000		REFS 0.3542 SQ.FT.
(RCJ051)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10 R3	0.000	-5.000	-5.000	-10.000	REFL 6.2656 INCHES
(RCJ053)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	15.000	-15.000	0.000	REFB 10.8563 INCHES
(RCJ052)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10 R3	0.000	15.000	-15.000	-10.000	XMRP 10.8563 INCHES
						YMRP 0.0000 INCHES
						ZMRP 0.9920 INCHES
						SCALE 0.0076 SCALE

MACH 0.259

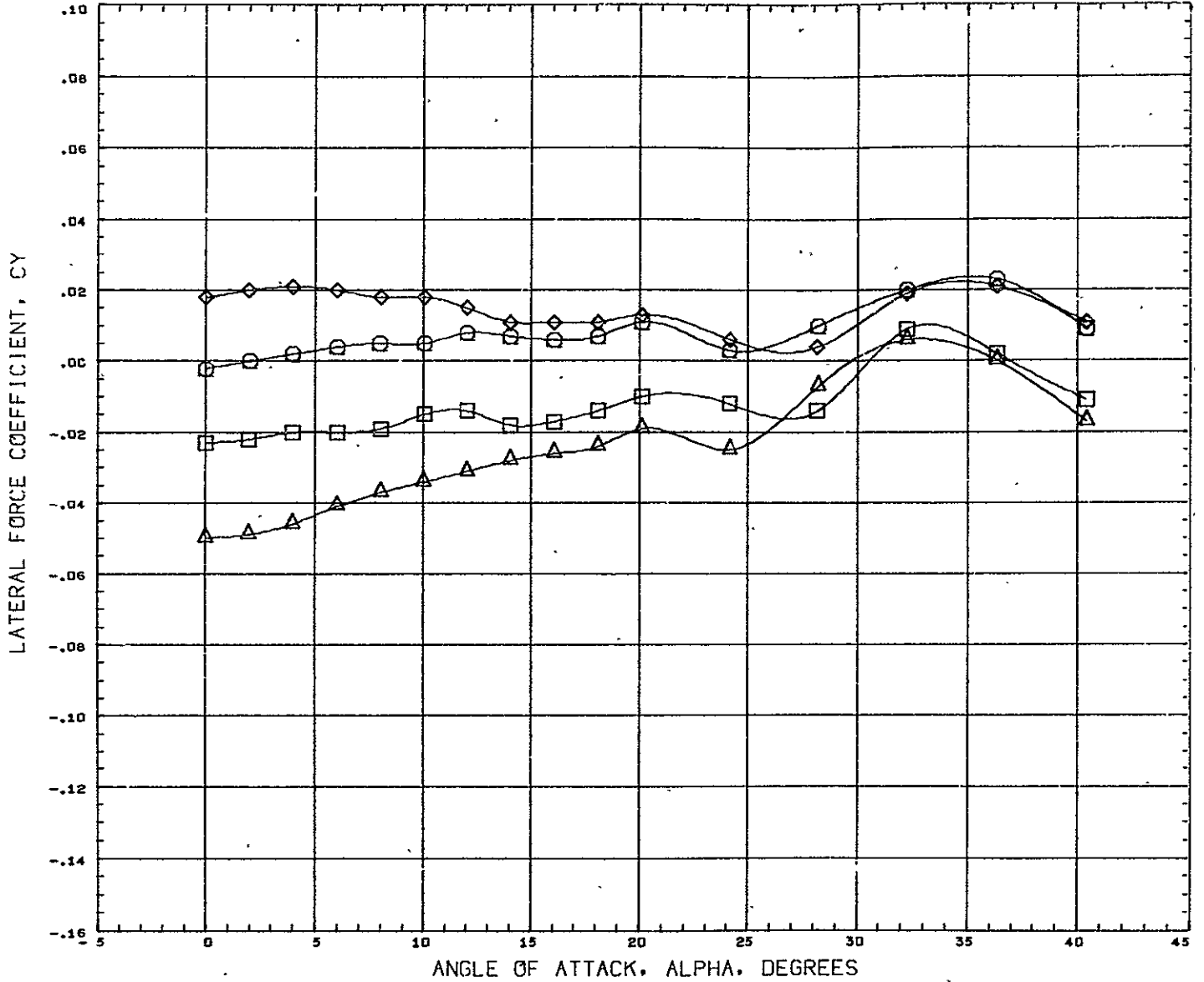
### RUDDER EFFECTIVENESS, B4W8V10E4R3 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN4L	ELVN4R	RUDDER	REFERENCE INFORMATION
(RCJ050)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-5.000	-5.000		REFS 0.3542 SQ.FT.
(RCJ051)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10 R3	0.000	-5.000	-5.000	-10.000	REFL 6.2656 INCHES
(RCJ053)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	15.000	-15.000	0.000	REFB 10.8560 INCHES
(RCJ052)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10 R3	0.000	15.000	-15.000	-10.000	XMRP 10.6340 INCHES
						YMRP 0.0000 INCHES
						ZMRP 0.9920 INCHES
						SCALE 0.0076 SCALE

MACH . 0.259

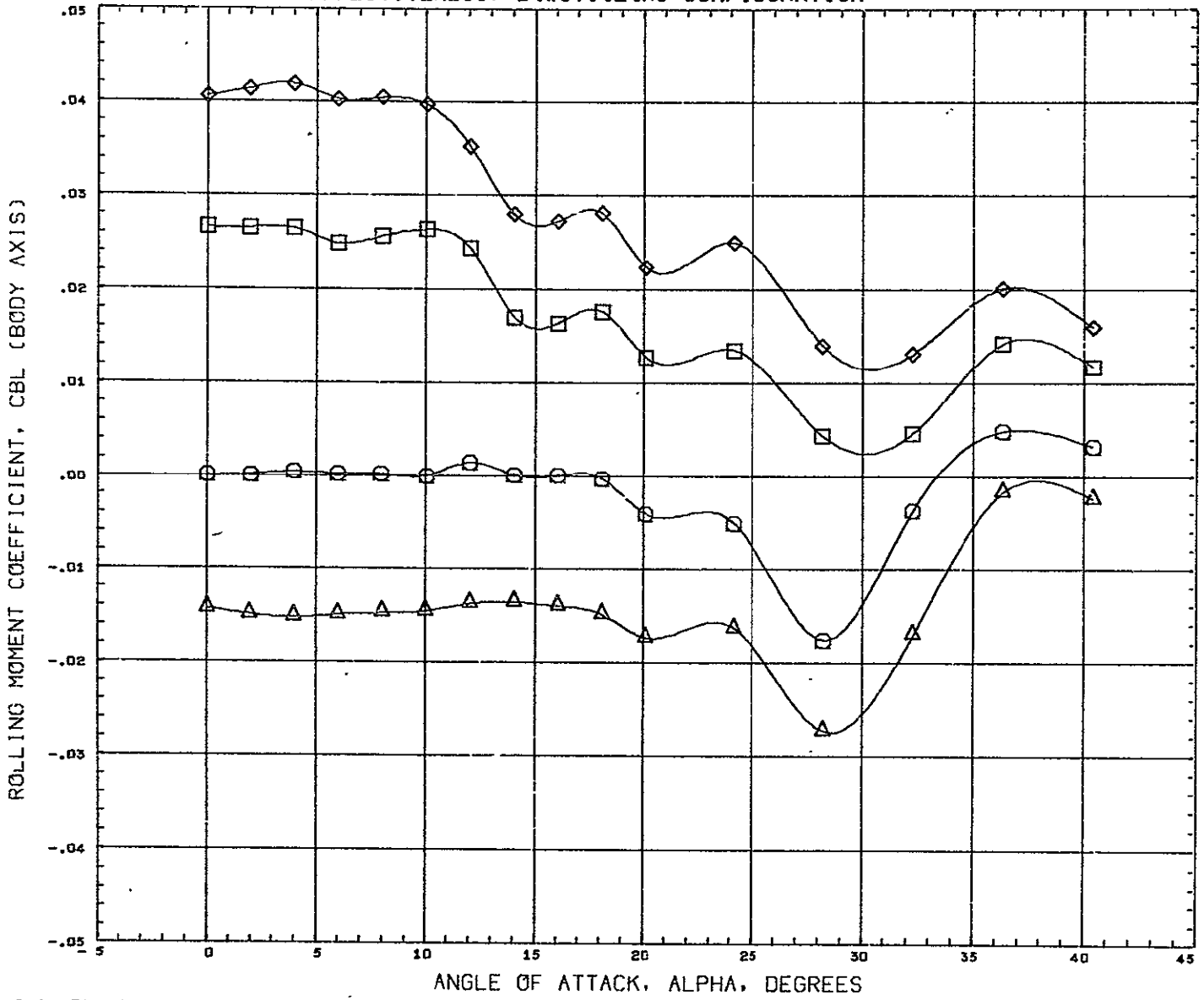
### RUDDER EFFECTIVENESS, B4W8V10E4R3 CONFIGURATION



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN4L	ELVN4R	RUDDER	REFERENCE INFORMATION
(RCJ050)	○	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-5.000	-5.000		REFS 0.3542 Sq.FT.
(RCJ051)	△	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10 R3	0.000	-5.000	-5.000	-10.000	REFL 6.2656 INCHES
(RCJ053)	◇	NAAL 633 NAR DELTA CRB. W8 E4 B4 V10	0.000	15.000	-15.000	0.000	REFB 10.8560 INCHES
(RCJ052)	□	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10 R3	0.000	15.000	-15.000	-10.000	XMRP 10.8740 INCHES
							YMRP 0.0000 INCHES
							ZMRP 0.9920 INCHES
							SCALE 0.0076 SCALE

MACH 0.259

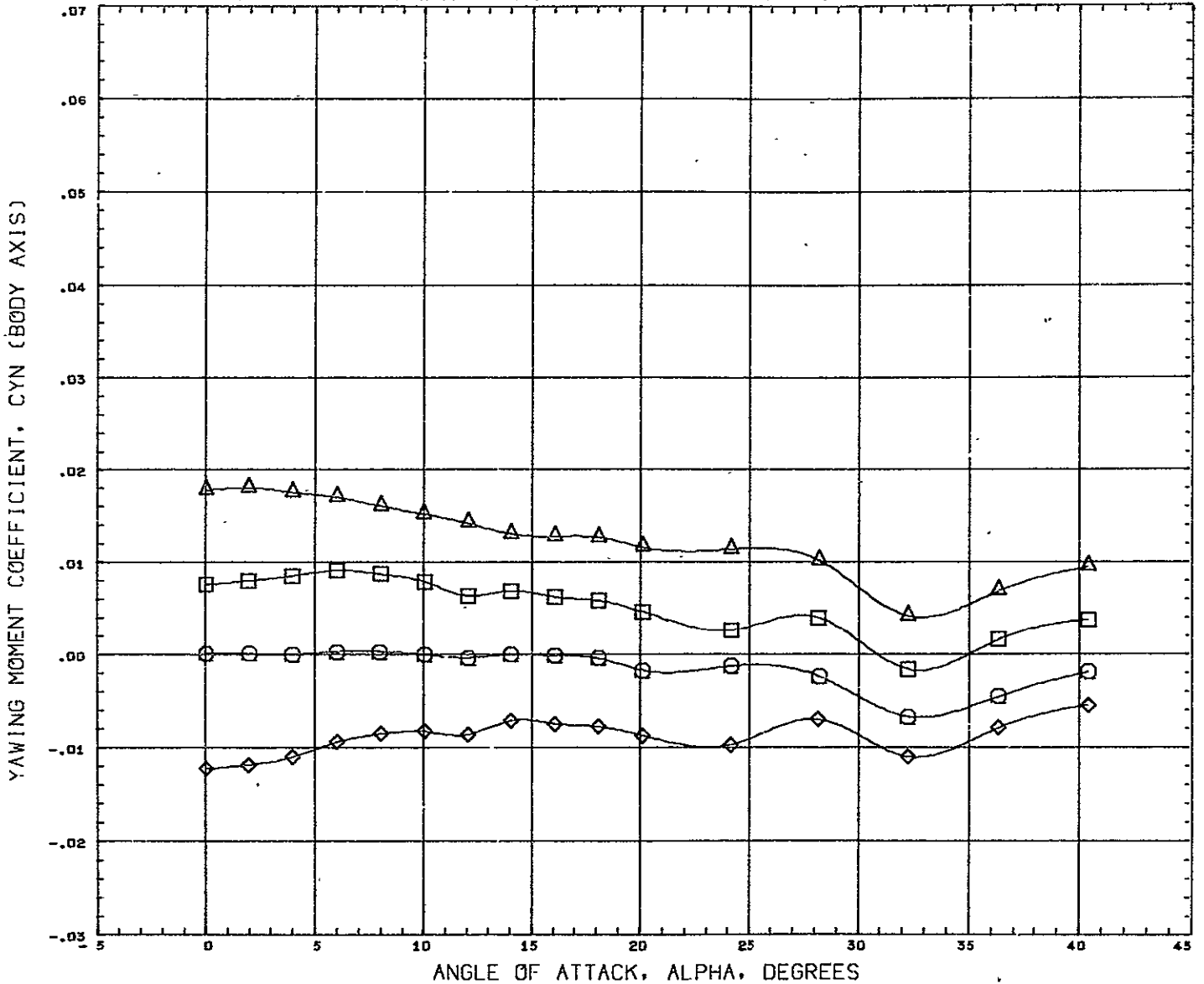
### RUDDER EFFECTIVENESS, B4W8V10E4R3 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN4L	ELVN4R	RUDDER	REFERENCE INFORMATION
(BCJ050)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-5.000	-5.000		REFS 0.3542 SQ.FT.
(BCJ051)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10 R3	0.000	-5.000	-5.000	-10.000	REFL 6.2656 INCHES
(BCJ053)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	15.000	-15.000	0.000	REFB 10.8561 INCHES
(BCJ052)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10 R3	0.000	15.000	-15.000	-10.000	XMRP 10.8540 INCHES
						YMRP 0.0000 INCHES
						ZMRP 0.9920 INCHES
						SCALE 0.0076 SCALE

MACH 0.259

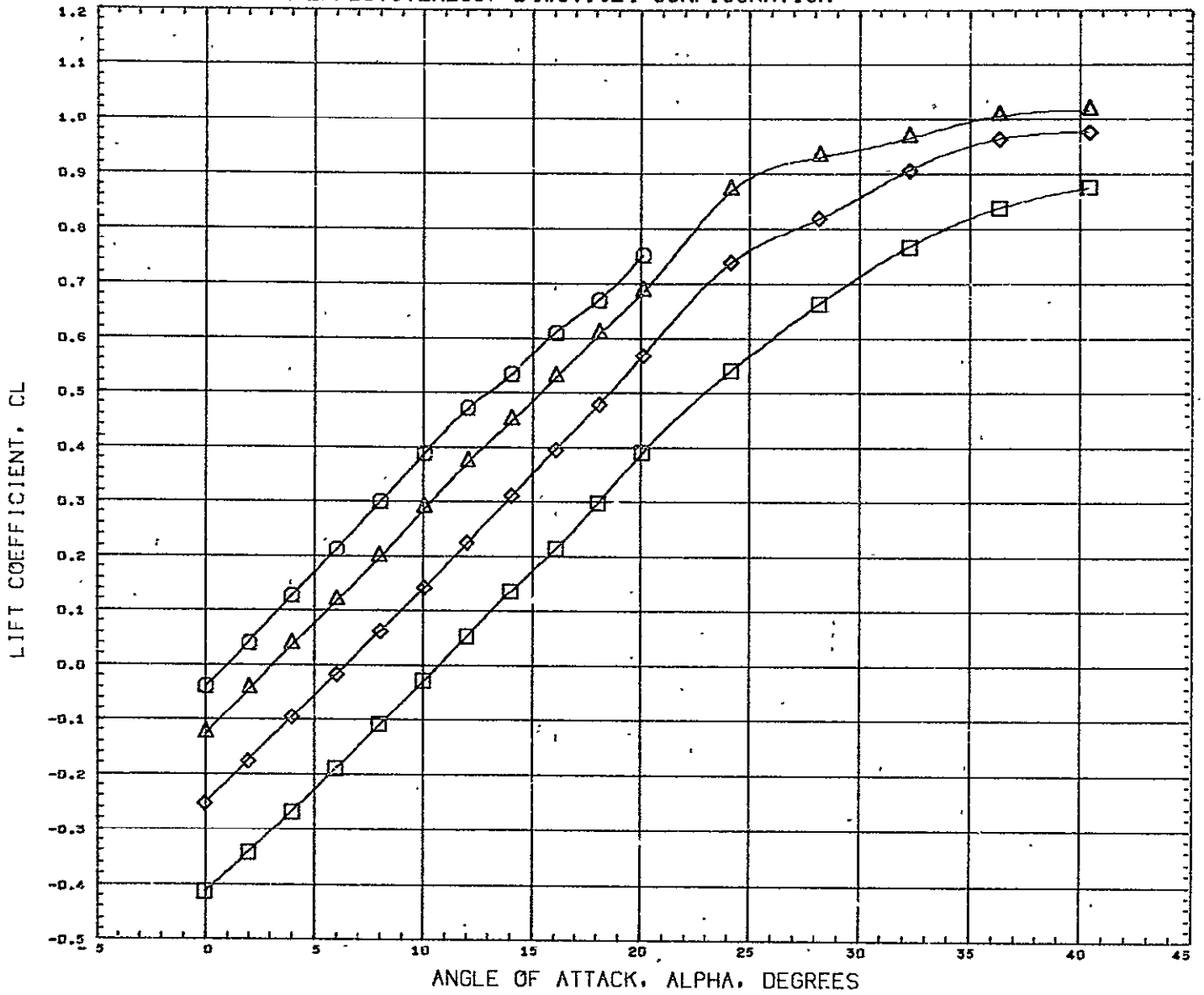
# RUDDER EFFECTIVENESS, B4W8V10E4R3 CONFIGURATION



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN4L	ELVN4R	RUDDER	REFERENCE INFORMATION
(BCJ050)	△	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-5.000	-5.000		REFS 0.3542 SQ.FT.
(BCJ051)	△	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10 R3	0.000	-5.000	-5.000	-10.000	REFL 6.2656 INCHES
(BCJ053)	◇	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	15.000	-15.000	0.000	REFB 10.8540 INCHES
(BCJ052)	□	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10 R3	0.000	15.000	-15.000	-10.000	XMRP 10.8540 INCHES YMRP 0.0000 INCHES ZMRP 0.9920 INCHES SCALE 0.0076 SCALE

MACH 0.259

### ELEVON EFFECTIVENESS, B4W8V10E4 CONFIGURATION



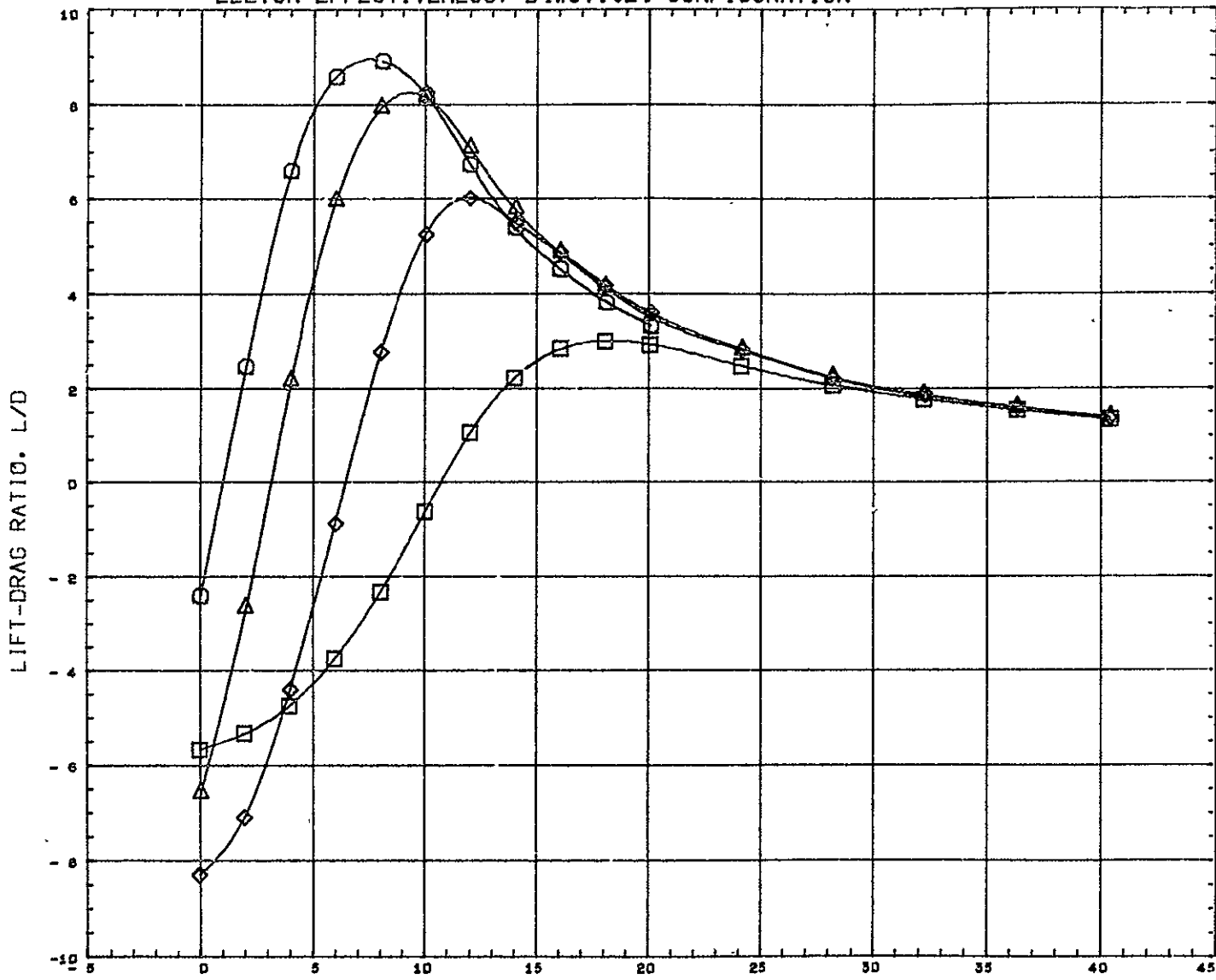
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(RCJ046)	○	NAAL 633 NAR DELTA ORB. W8 B4 V10
(RCJ050)	△	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10
(RCJ054)	◇	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10
(RCJ056)	□	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10

BETA	ELVN4L	ELVN4R
0.000		
0.000	-5.000	-5.000
0.000	-15.000	-15.000
0.000	-30.000	-30.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8569	INCHES
XMRP	10.8510	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

MACH 0.259

### ELEVON EFFECTIVENESS, B4W8V10E4 CONFIGURATION

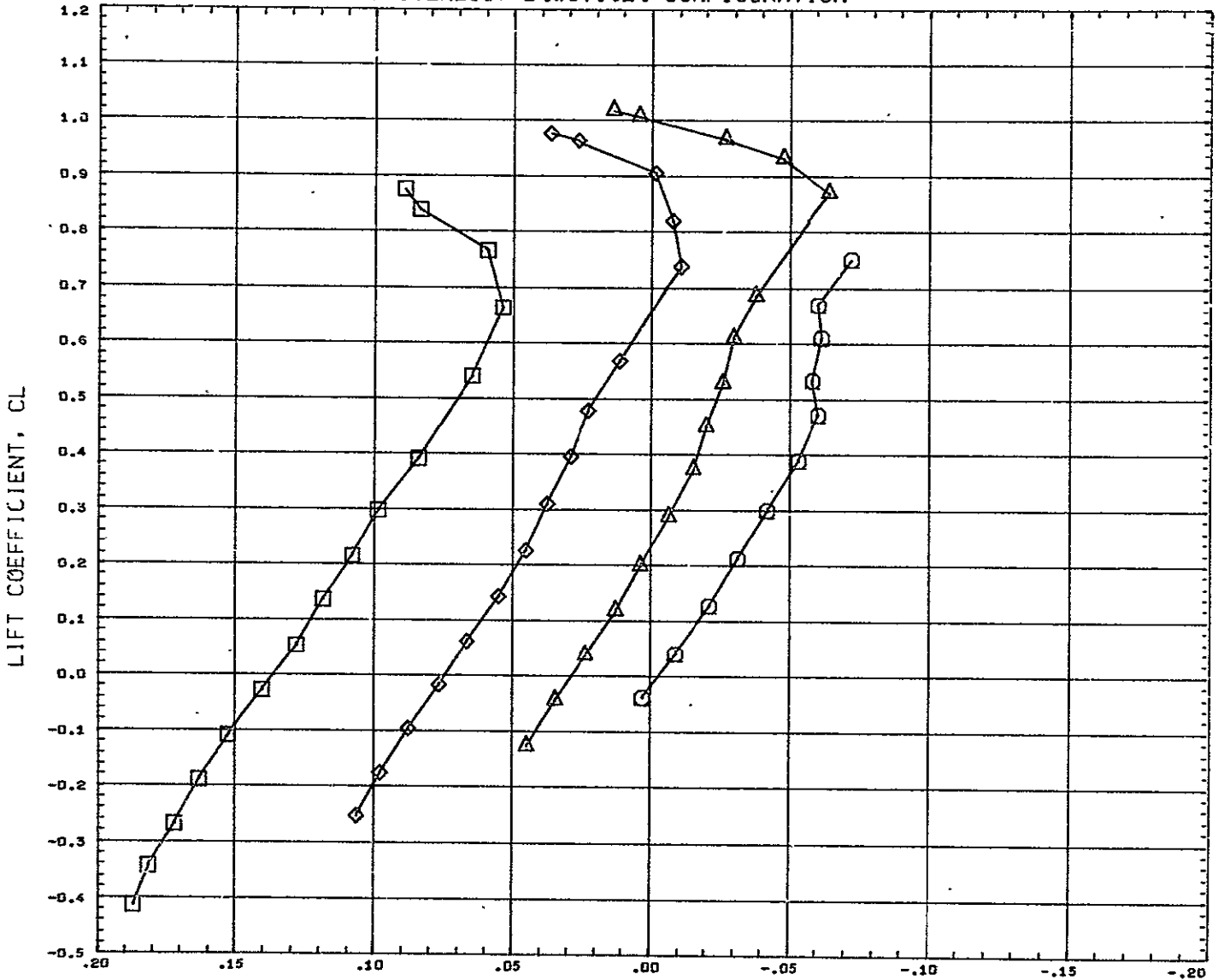


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN4L	ELVN4R	REFERENCE INFORMATION
(RCJD46)	○	NAAL 633 NAR DELTA ORB, W8 B4 V10	0.000			REFS 0.3542 SQ.FT.
(RCJD50)	△	NAAL 633 NAR DELTA ORB, W8 E4 B4 V10	0.000	-5.000	-5.000	REFL 6.2656 INCHES
(RCJD54)	◇	NAAL 633 NAR DELTA ORB, W8 E4 B4 V10	0.000	-15.000	-15.000	REFB 10.8560 INCHES
(RCJD56)	□	NAAL 633 NAR DELTA ORB, W8 E4 B4 V10	0.000	-30.000	-30.000	XHRP 10.8.40 INCHES
						YHRP 0.0000 INCHES
						ZHRP 0.9920 INCHES
						SCALE 0.0076 SCALE

MACH 0.259



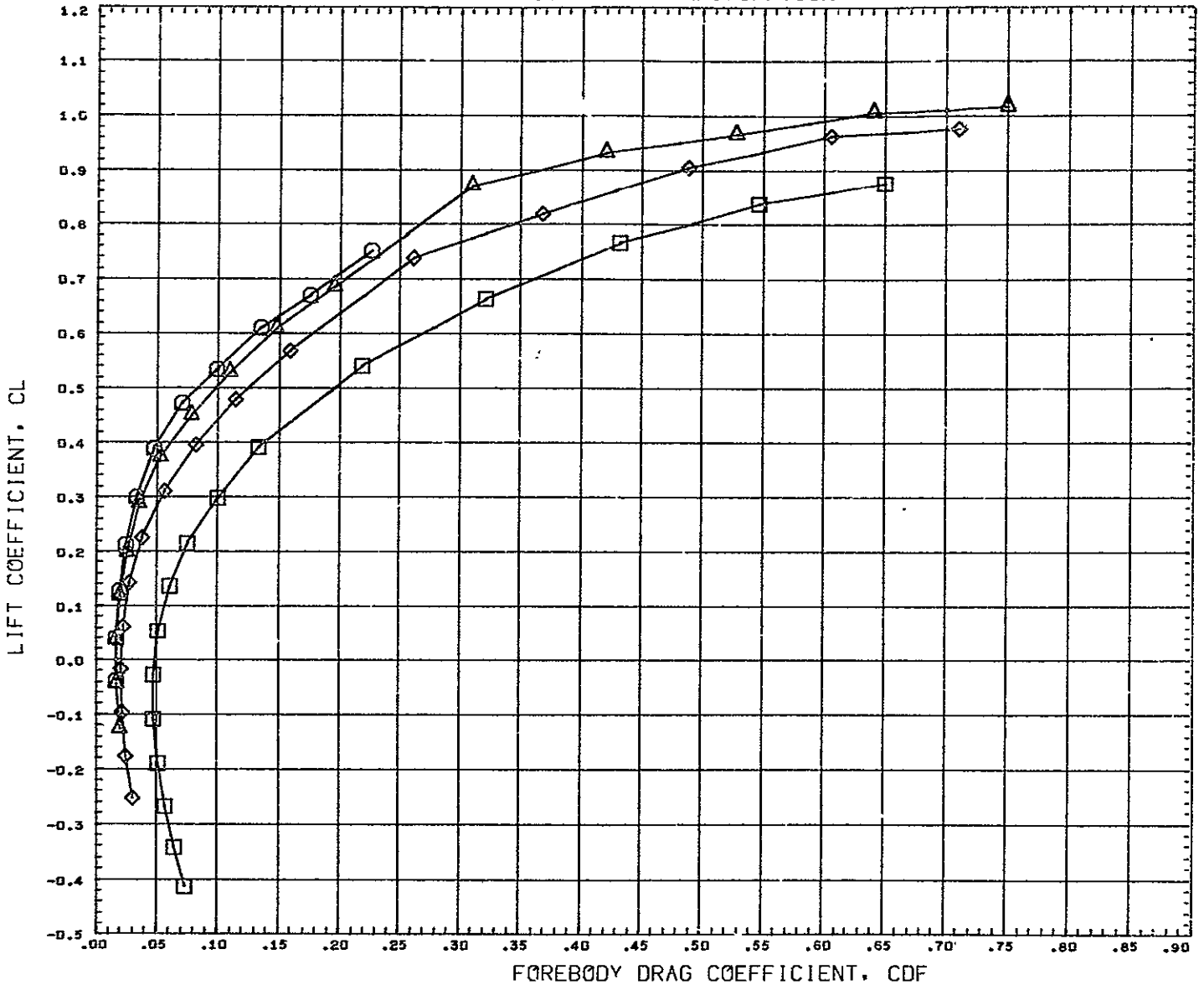
# ELEVON EFFECTIVENESS, B4W8V10E4 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN4L	ELVN4R	REFERENCE INFORMATION
(RCJ046)	□ NAAL 633 NAR DELTA ORB. W8 B4 V10	0.000			REFS 0.3542 SQ.FT.
(RCJ050)	△ NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-5.000	-5.000	REFL 6.2656 INCHES
(RCJ054)	◇ NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-15.000	-15.000	REFB 10.9560 INCHES
(RCJ056)	○ NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-30.000	-30.000	XMRP 10.8240 INCHES
					YMRP 0.9000 INCHES
					ZMRP 0.9920 INCHES
					SCALE 0.0076 SCALE

MACH 0.259

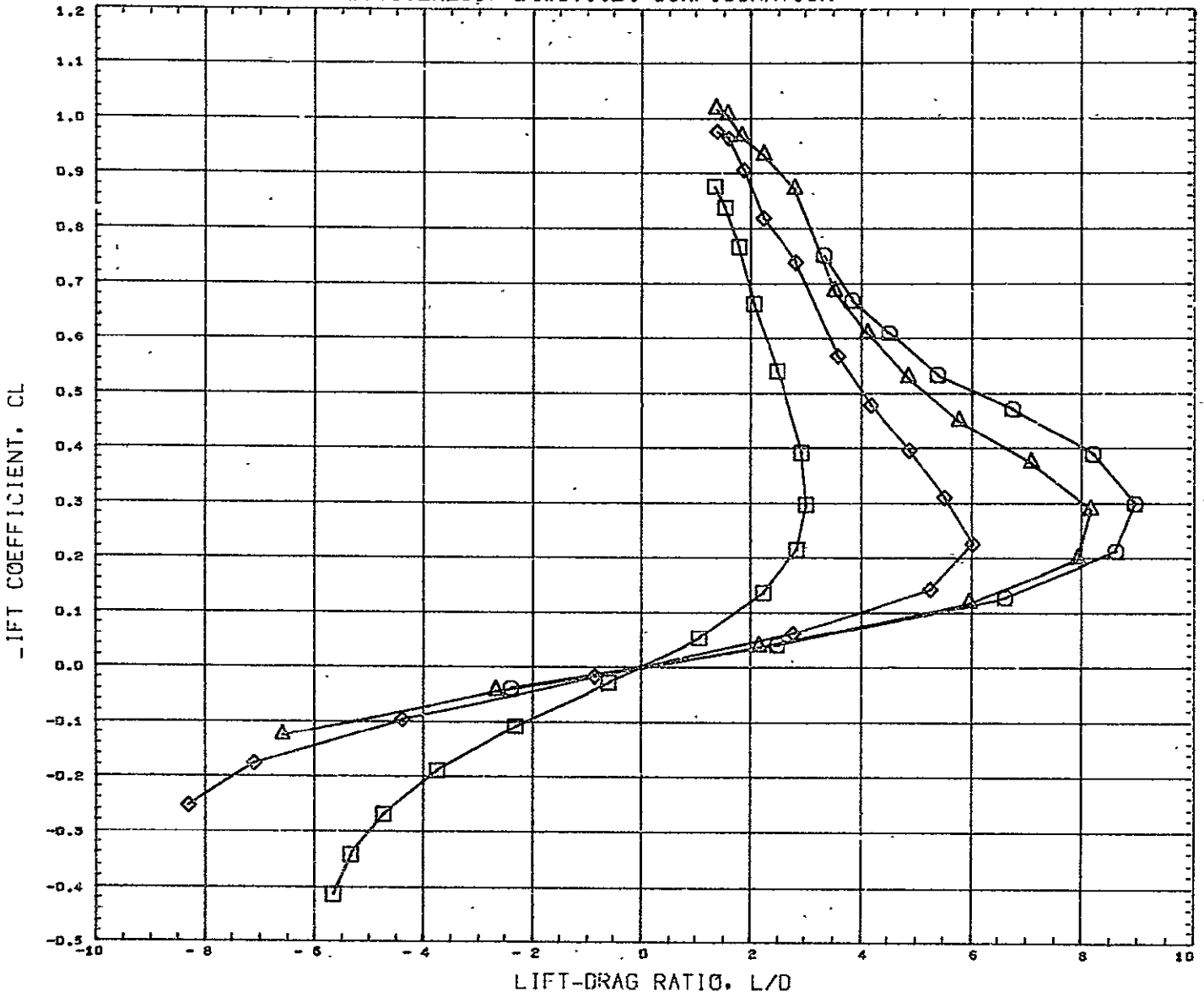
# ELEVON EFFECTIVENESS, B4W8V10E4 CONFIGURATION



DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	ELVN4L	ELVN4R	REFERENCE INFORMATION
(RCJ046)	NAAL 633 NAR DELTA ORB. W8 B4 V10	0.000			REFS 0.3542 SQ.FT.
(RCJ050)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-5.000	-5.000	REFL 6.2656 INCHES
(RCJ054)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-15.000	-15.000	REFB 10.8561 INCHES
(RCJ056)	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10	0.000	-30.000	-30.000	XHRP 10.8540 INCHES
					YHRP 0.0000 INCHES
					ZHRP 0.9920 INCHES
					SCALE 0.0076 SCALE

MACH 0.259

# ELEVON EFFECTIVENESS, B4W8V10E4 CONFIGURATION



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
RCJ046)	○	NAAL 633 NAR DELTA ORB. W8 B4 V10
RCJ050)	△	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10
RCJ054)	◇	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10
RCJ056)	□	NAAL 633 NAR DELTA ORB. W8 E4 B4 V10

BETA	ELVN4L	ELVN4R
0.000		
0.000	-5.000	-5.000
0.000	-15.000	-15.000
0.000	-30.000	-30.000

REFERENCE INFORMATION		
REFS	0.3542	SQ.FT.
REFL	6.2656	INCHES
REFB	10.8560	INCHES
XMRP	19.8040	INCHES
YMRP	0.0000	INCHES
ZMRP	0.9920	INCHES
SCALE	0.0076	SCALE

HACH 0.259