NASA TECHNICAL MEMORANDUM

NASA TM X-62,478

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TRANSONIC WIND-TUNNEL TESTS OF AN F-8 AIRPLANE MODEL EQUIPPED WITH 12- AND 14-PERCENT-THICK OBLIQUE WINGS

(NASA-TM-X-62478) TRANSONIC WIND-TUNNEL TESTS OF AN F-8 AIRPLANE MODEL EQUIPPED WITH 12 AND 14-PERCENT THICK OBLIQUE WINGS (NASA) 158 p HC $6.75 CSCL 01C
N76-19142
Unclas
G3/05 18553

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October 1975

1. Report No.: TM X-62,478

2. Government Accession No.:

3. Recipient's Catalog No.:

4. Title and Subtitle: Transonic Wind Tunnel Tests of an F-8 Airplane Model Equipped with 12- and 14-Percent-Thick Oblique Wings

5. Report Date: OCTOBER 1975

6. Performing Organization Code:

7. Author(s): Ronald C. Smith, Robert T. Jones, and James L. Summers

8. Performing Organization Report No.: A-6259

9. Performing Organization Name and Address: Ames Research Center, Moffett Field, California 94035

10. Work Unit No.: 505-11-12

11. Contract or Grant No.:

12. Sponsoring Agency Name and Address: Ames Research Center, NASA, Moffett Field, California 94035

13. Type of Report and Period Covered: Technical Memorandum

14. Sponsoring Agency Code:

15. Supplementary Notes: National Aeronautics and Space Administration, Washington, D.C. 20546

16. Abstract

An experimental investigation was conducted in the Ames 14-Foot Transonic Wind Tunnel to study further the aerodynamic performance and stability characteristics of a 0.087-scale model of an F-8 airplane fitted with an oblique wing. Two elliptical planform (axis ratio = 8:1) wings, each having a maximum thickness of 12 and 14 percent, were tested. Longitudinal stability data were obtained with no wing and with each of the two wings set at sweep angles of 0°, 45°, and 60°. Lateral-directional stability data were obtained for the 12-percent wing only. Test Mach numbers ranged from 0.6 to 1.2 in the unit Reynolds number range from 11.2 to 13.1 million per meter. Angles of attack were between -6° and 22° at zero sideslip. Angles of sideslip were between -6° and +6° for two angles of attack, depending upon the wing configuration.

17. Key Words (Suggested by Author(s)): Wing-Fuselage-Tail Combinations-Airplanes; Stability, Static; Performance, Aerodynamic

18. Distribution Statement: Unlimited (STAR Category 02 & 05)

19. Security Classif. (of this report): Unclassified

20. Security Classif. (of this page): Unclassified

21. No. of Pages: 156

22. Price*: $6.25

*For sale by the National Technical Information Service, Springfield, Virginia 22151

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EQUIPPED WITH 12- AND 14-PERCENT-THICK OBLIQUE WINGS

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SUMMARY

An experimental investigation was conducted in the Ames 14-Foot Transonic Wind Tunnel to study further the aerodynamic performance and stability characteristics of a 0.087-scale model of an operational F-8 airplane fitted with an oblique wing. Two elliptical planform (axis ratio = 8:1) wings, each having a maximum thickness of 12 and 14 percent, were tested. All other external geometric features of the model were scaled to the basic full size airplane with the engine inlet faired closed.

Longitudinal stability data were obtained with no wing and with each of the two wings set at sweep angles of 0°, 45°, and 60°. Lateral-directional stability data were obtained for the 12-percent wing only. Test Mach numbers ranged from 0.6 to 1.2 in the unit Reynolds number range from 11.2 to 13.1 million per meter. Angles of attack were between -6° and 22° at zero sideslip. Angles of sideslip were between ±6° for two angles of attack, depending upon the wing configuration.

The lift-drag ratios for the 12-percent-thick wing indicate no performance penalty relative to a reference 10-percent-thick oblique wing and a small but significant penalty for the 14-percent-thick wing. The static longitudinal data show both configurations to be generally stable over the lift range of the investigation. The data indicate that the lateral-directional stability characteristics for the 12-percent-thick wing configuration are generally good.

INTRODUCTION

An experimental investigation was conducted in the Ames 14-Foot Transonic Wind Tunnel as part of a continuing study of the aerodynamic performance and stability characteristics of a 0.087-scale model of an operational F-8 airplane fitted with an oblique wing. In a previous investigation (ref. 1), this model was tested with a 10:1 (span-to-chord ratio) elliptic wing with 10-percent maximum thickness. This is the wing referred to by R. T. Jones in ref. 2. Preliminary design studies reported in ref. 3 indicated that the 10:1 wing was structurally heavy and that an 8:1 planform with between 12- and 14-percent maximum thickness would improve overall performance. It [illegible]ted that a 14-percent-thick wing would be lighter and have a slightly higher cruise drag than a 12-percent-thick wing.

The present investigation was motivated by the need to define the performance and stability characteristics of the aircraft configuration with a structurally more efficient wing planform. In order to provide the drag data necessary for evaluating the weight-drag trade-off, two 8:1 elliptical wings having maximum thicknesses of 12- and 14-percent chord were built and tested. The center section airfoils were NACA 3612-02, 40 and NACA 3614-02, 40. All other external geometric features of the model were scaled to the operational airplane except the engine inlet, which was closed with a smooth fairing beginning ahead of the original nose station.

The tests reported herein were made over the Mach number range from 0.6 to 1.2 in the unit Reynolds number range from 11.2 to 13.1 million per meter. Six-component force and moment measurements were made on the model in pitch at zero sideslip for both wings set in three wing sweep positions and for the wing-off configuration. Additional measurements were made on the model with the 12-percent-thick wing in sideslip for two angles of attack typical of cruise flight.

A complete set of results are provided in this report with essentially no analysis.

NOMENCLATURE

The axis systems and sign conventions are shown in figure 1. Lift, drag, and pitching moment are presented in the stability-axis coordinate system and all other forces and moments are presented in the body-axis coordinate system. Because the data were computer-plotted, the corresponding plot symbol (where used) is given together with the conventional symbol.

Symbol	Plot Symbol	Definition
b		wing span
C_D	CD	drag coefficient, drag/qS
C_L	CL	lift coefficient, lift/qS
C_ℓ	CBL	rolling-moment coefficient, rolling moment/qSb
C_m	CLM	pitching-moment coefficient, pitching moment/qSc_{root}

Symbol	Plot Symbol	Definition
C_n	CYN	yawing-moment coefficient, yawing moment/qSb
C_Y	CY	side-force coefficient, side force/qS
c		wing chord
c_{root}		wing root chord
H		vertical distance from wing reference plane to wing base line at 0.4c
(L/D)	L/D	lift-drag ratio
M	MACH	free-stream Mach number
q		free-stream dynamic pressure
S		wing area
t		wing thickness
x		Cartesian coordinate
Y-Lo		maximum distance from wing base line to wing lower surface measured perpendicular to the wing base line
Y-Up		maximum distance from wing base line to wing upper surface measured perpendicular to the wing base line
Z-Lo		vertical distance from wing chord to wing lower surface
Z-Up		vertical distance from wing chord to wing upper surface
z		Cartesian coordinate
α	ALPHA	angle of attack
β	BETA	angle of sideslip
Λ	LAMBDA	wing skew angle measured between a perpendicular to the body longitudinal axis and the 0.25 chord line of the wing in a horizontal plane

Subscripts

max		maximum value

Configuration Code

B_2	B2	body with pointed inlet fairing
T	T	tail
W_5	W5	wing with 12-percent maximum thickness
W_6	W6	wing with 14-percent maximum thickness

TEST FACILITY

The tests were conducted in the Ames 14-Foot Transonic Wind Tunnel which is a sea-level-density, closed-return, continuous-flow facility. This tunnel has an adjustable nozzle (two flexible walls) and a slotted test section to permit transonic testing over a Mach number range continuously variable from 0.6 to 1.2.

MODEL DESCRIPTION

The model consisted of either of two elliptical planform wings mounted on top of the fuselage of a 0.087-scale model of an operational F-8 fighter type airplane as shown in fig. 2. Pertinent dimensions of the wing are shown in tables 1, 2 and in fig. 2. A photograph of the model mounted in the wind tunnel is shown in figure 2(g). The wing was pivoted in the horizontal plane about the 0.4 root-chord point to obtain angles of 0°, 45°, and 60°. The wings had an elliptical planform with an elliptic axis ratio of 8:1 (unswept aspect ratio of 10.2) and a straight 25-percent chord line. The wings had the airfoil sections NACA 3612-02, 40 and NACA 3614-02, 40 at the center, perpendicular to the unswept chord line. The maximum thickness varied along the span as shown in figure 2(f). The horizontal and vertical tail surfaces had NACA 65A006 airfoil sections and a 45° swept quarter-chord line. The horizontal tail was set at -1 1/2° incidence relative to the body center line. All external geometric features of the model, other than the wing, were 0.087 scale of the full size operational fighter-type airplane, except that the engine inlet was faired closed as shown in figure 2(a). Model body contours are shown in figure 2(b).

TESTING AND PROCEDURE

The model was sting-supported through the base of the model body shown in figure 2(a) and force and moment data were obtained from an internally mounted six-component strain-gage balance. The moment center was located longitudinally at the wing pivot point ($0.4c_{root}$) and 0.442 cm. above the model center line (fig. 2(a)). Tests were conducted at a atmospheric total pressure giving a unit Reynolds number range from 11.2 million to 13.1 million per meter over the test Mach number range from 0.6 to 1.2. Angle of attack ranged from -6° to 22° at zero sideslip. Angles of sideslip were set between ±6° for two angles of attack, 3° and 5°. These angles of attack correspond approximately to $(L/D)_{max}$ for 0° and 45° sweep, respectively.

Six-component force and moment data were obtained for the wing at sweep angles of 0°, 45°, and 60° rotated left wing forward.

Boundary layer transition was not fixed on the model. It is known from flow visualization studies made on the 12-percent-thick wing that natural transition occurred between 60- and 70-percent chord for $\Lambda = 0$ and between 10- and 20-percent chord for $\Lambda = 45°$ and 60°.

The measured balance data were adjusted to a condition corresponding to free-stream static pressure on the model base. The Mach number range for each sweep angle tested is shown in table 3.

A complete index of the data figures is given in table 4.

RESULTS AND DISCUSSION

Lift-Drag-Ratio

The maximum L/D ratios for the two wings reported herein are summarized in fig. 3. The horizontal tail incidence used was -1 1/2°, which trims the model at lift coefficients well beyond that for $(L/D)_{max}$. These L/D values then, while comparable with each other, are not comparable to those reported in ref. 1 which used zero tail incidence. Results of later tests made on the 12-percent-thick wing configuration with zero tail incidence are compared to the 10-percent-thick wing of reference 1 in figure 3(b). These data indicate no loss in $(L/D)_{max}$ for the 12-percent, 8:1 wing. It is noted that the inlet fairings for the two sets of data are different, the ref. 1 fairing being somewhat blunter and resulting in higher drag at supersonic speeds. The reduction in the L/D due to increasing the wing thickness ratio from 0.12 to 0.14 is two units, about 10 percent, at M = 0.6 and decreases with increasing wing sweep to 4 percent for $\Lambda = 60°$. It thus appears that a 12-percent-thick wing provides a definite aerodynamic advantage over a 14-percent-thick wing and that the structural benefit of a 14-percent-thick wing would have to overcome a significant performance penalty. It is known that the flow over the wing sections normal to the span axis is subcritical at M = 1.2 for Λ = 60° and therefore higher L/D ratios would be exhibited at Mach numbers up to 1.2 if a somewhat smaller sweep (e.g., 55°) had been used to provide higher aspect ratio.

Aerodynamic Characteristics in Pitch

The aerodynamic characteristics in pitch for the 12- and 14-percent-thick wings are plotted in fig. 4. The differences in aerodynamic characteristics other than drag and L/D are generally not large. There are, however, some differences in rolling moment for Λ = 45° which appear to be related to nonuniform shock-induced separation, which become fairly large at M = 0.98 and 1.05 (see fig. 4(f)). In practice, the wing sweep would be increased to avoid such separation. Also, the nonlinearities in the pitching moments are worse for the 14-percent-thick wing, indicating a stronger effect of the nonuniform separation.

Both configurations generally have adequate longitudinal static margin at all test Mach numbers for the chosen moment center location and are trimmed at lift coefficients between 0.5 and 0.8 with -1 1/2° tail incidence.

The results for 45° and 60° sweep exhibit substantial rolling and yawing moment variations with changes in lift. These variations are typical of rigid oblique wings and should not be viewed as representative of flexible wing characteristics.

Wing-off - The aerodynamic characteristics in pitch for the wing-off configuration are plotted in fig. 5 for all eight test Mach numbers. These data have been reduced using the same reference lengths and area so that they may be used in combination with the fig. 4 data to estimate the wing contribution to the forces and moments.

Aerodynamic Characteristics in Sideslip

The aerodynamic characteristics in sideslip for the 12-percent-thick wing are plotted in fig. 6. The lateral-directional characteristics are essentially linear with sideslip except for cases where the flow over the wing is supercritical (e.g. see fig. 6(f)); Λ = 45°). As in the case of the previously noted wing sweep effect on rolling moment, the cause appears to be related to nonuniform shock-induced separation.

The model has good directional stability and positive dihedral effect for all conditions for which the model was tested in sideslip. The model exhibits unsymmetrical lift and drag changes with sideslip which are typical for oblique wings. Such changes result from the unsymmetrical changes in effective wing sweep angle due to sideslip.

CONCLUDING REMARKS

The lift-drag ratios measured on 12- and 14-percent-thick oblique wings indicate no performance penalty for the 12-percent wing and a small but significant penalty for the 14-percent-thick wing compared to the 10-percent thick, higher aspect ratio wing reported in reference 1. The model has adequate longitudinal and lateral-directional stability characteristics. Pitch-induced roll and yaw which are typical of rigid oblique wings are present throughout the data for 45° and 60° sweep. These moments however, should not be viewed as deleterious for a real airplane because of the large expected stable influence of wing flexibility on these moments.

Ames Research Center
National Aeronautics and Space Administration
Moffett Field, California 94035 September 11 1975

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1. Graham, Lawrence A.; Jones, Robert T.; and Summers, James L.: Wind Tunnel Test of an F-8 Airplane Model Equipped with An Oblique Wing. NASA TM X-62,273, June 1973.

2. Jones, Robert T.: New Design Goals and a New Shape for the SST. Astronautics & Aeronautics, Dec. 1972, pp. 66-70.

3. Kulfan, Robert M.; et al: High Transonic Speed Transport Aircraft Study-Final Report. NASA CR-114658, Sept. 1973.

TABLE 1. - MODEL GEOMETRY

Wings		W_5	W_6
Planform	8:1 ellipse about c/4		
Span (reference)		136.30 cm	136.30 cm
Area (reference)		1823.87 cm^2	1823.87 cm^2
Root chord		17.04 cm	17.04 cm
Aspect ratio		10.2	10.2
Maximum t/c		0.12	0.14
Incidence		0°	0°
0.25c sweep		0°	0°
Section		NACA 3612-02,40	NACA 3614-02,40
Maximum thickness location		0.40c	0.40c
Leading-edge nose radius		0.0288c	0.0392c

Horizontal tail	
Planform	trapezoidal
Span	48.16 cm
Area	333.55 cm^2
Root chord	23.80 cm
Tip chord	3.56 cm
Aspect ratio	6.95
Maximum t/c	0.06
Incidence	-1.5°
0.25c sweep	45°
Section	NACA 65A006

Vertical tail	
Planform	trapezoidal
Span	31.93 cm
Area	697.42 cm^2
Root chord	34.80 cm
Tip chord	8.90 cm
Aspect ratio	1.46
Maximum t/c	0.06
0.25c sweep	52.5°
Section	NACA 65A006

TABLE 2. - WING DIMENSIONAL DATA[a]

(a) 12-Percent-Thick Wing

Semi-Span	Chord	Z-Up	Z-Lo	H
0	17.038	1.491	0.650	0
2.54	17.028	1.488	.650	0.0025
5.08	16.992	1.483	.647	.013
7.62	16.931	1.476	.643	.025
10.16	16.848	1.465	.635	.048
12.70	16.741	1.450	.625	.076
15.24	16.606	1.430	.614	.109
17.78	16.449	1.409	.602	.152
20.32	16.264	1.384	.587	.200
22.86	16.053	1.356	.569	.259
25.40	15.811	1.323	.551	.322
27.109	15.634	1.300	.538	.368
28.877	15.433	1.272	.523	.421
30.503	15.237	1.247	.508	.475
32.009	15.042	1.222	.493	.523
33.409	14.851	1.199	.480	.574
34.722	14.661	1.176	.467	.622
35.954	14.475	1.150	.455	.670
37.114	14.290	1.127	.442	.716
38.214	14.109	1.107	.429	.762
39.253	13.929	1.084	.416	.805
40.244	13.751	1.064	.406	.848
41.183	13.576	1.041	.394	.891
42.080	13.403	1.021	.383	.932
42.936	13.233	1.003	.373	.972
43.754	13.063	0.983	.363	1.013
44.539	12.898	.962	.353	1.051
45.288	12.733	.945	.343	1.089
46.007	12.570	.927	.335	1.125
47.722	12.164	.881	.312	1.214
48.979	11.849	.848	.295	1.282
50.142	11.542	.815	.279	1.349
51.222	11.239	.785	.264	1.409
52.222	10.947	.754	.249	1.468
53.157	10.663	.726	.236	1.524
54.028	10.386	.698	.223	1.577
54.841	10.117	.673	.213	1.626
55.603	9.852	.647	.200	1.674
56.314	9.596	.625	.190	1.719
56.982	9.347	.602	.180	1.760
57.609	9.106	.579	.170	1.800
58.196	8.867	.559	.162	1.841
58.748	8.638	.538	.155	1.877

[a] All dimensions are centimeters

TABLE 2.(a). - Concluded.[a]

Semi-Span	Chord	Z-Up	Z-Lo	H
59.268	8.4[illegible]2	0.518	0.145	1.910
59.756	8.194	.500	.139	1.943
60.216	7.980	.582	.132	1.976
60.647	7.775	.467	.124	2.004
61.056	7.572	.449	.119	2.032
61.440	7.376	.434	.114	2.060
61.803	7.183	.419	.109	2.083
62.143	6.998	.406	.102	2.108
62.466	6.815	.391	.099	2.131
62.771	6.637	.378	.094	2.151
63.058	6.464	.366	.089	2.[illegible]1
63.329	6.297	.353	.084	2.19[illegible]
63.586	6.134	.343	.081	2.209
64.196	5.722	.315	.071	2.253
64.625	5.413	.292	.063	2.283
65.009	5.118	.274	.05[illegible]	2.311
65.346	4.841	.256	.053	2.337
65.649	4.577	.239	.048	2.359
65.918	4.331	.223	.046	2.379
66.157	4.094	.211	.041	2.397
66.373	3.873	.198	.038	2.413
66.563	3.662	.185	.035	2.425
66.733	3.464	.173	.033	2.438
66.883	3.276	.162	.030	2.451
67.139	2.931	.145	.025	2.468
67.394	2.542	.124	.020	2.489
67 648	2.077	.099	.017	2.507
67.902	1.470	.071	.010	2.527
68.156	0	0	0	2.548

[a] All dimensions are centimeters

TABLE 2. - WING DIMENSIONAL DATA[a]
(b) 14-Percent-Thick Wing

Semi-Span	Chord	Z-Up	Z-Lo	H
0	17.038	1.659	0.803	0
2.54	17.028	1.659	.800	0.0025
5.08	16.992	1.651	.797	.015
7.62	16.931	1.643	.789	.033
10.16	16.848	1.628	.782	.058
12.70	16.741	1.613	.772	.094
15.24	16.606	1.590	.757	.135
17.78	16.449	1.567	.742	.185
20.32	16.264	1.537	.723	.244
22.86	16.053	1.504	.701	.312
25.40	15.811	1.468	.678	.386
27.109	15.634	1.443	.663	.442
28.877	15.433	1.412	.645	.503
30.503	15.237	1.384	.625	.564
32.009	15.042	1.354	.609	.622
33.409	14.851	1.328	.592	.678
34.772	14.661	1.300	.574	.737
35.954	14.475	1.275	.559	.789
37.114	14.290	1.249	.543	.843
38.214	14.109	1.224	.528	.897
39.253	13.929	1.199	.513	.947
40.244	13.751	1.176	.500	.996
41.183	13.576	1.151	.585	1.044
42.080	13.403	1.128	.472	1.092
42.936	13.233	1.105	.459	1.138
43.754	13.063	1.084	.447	1.184
44.539	12.898	1.062	.434	1.227
45.288	12.733	1.041	.424	1.270
46.007	12.570	1.021	.411	1.310
47.722	12.164	.970	.383	1.415
48.979	11.849	.932	.363	1.491
50.142	11.542	.896	.343	1.565
51.222	11.239	.861	.325	1.636
52.222	10.947	.828	.307	1.702
53.157	10.663	.795	.292	1.765
54.028	10.386	.764	.277	1.824
54.841	10.117	.736	.262	1.882
55.603	9.852	.708	.249	1.935
56.314	9.596	.681	.233	1.986
56.982	9.347	.655	.223	2.034
57.609	9.106	.632	.211	2.080
58.196	8.867	.609	.200	2.123
58.748	8.638	.581	.190	2.164

[a] All dimensions are centimeters

TABLE 2.(b). Concluded.[a]

Semi-Span	Chord	Z-Up	Z-Lo	H
59.268	8.412	0.564	0.180	2.205
59.756	8.194	.543	.173	2.240
60.216	7.981	.526	.162	2.276
60.647	7.775	.505	.155	2.311
61.056	7.572	.487	.147	2.312
61.463	3.376	.469	.139	2.372
61.803	7.183	.455	.132	2.400
62.144	6.998	.439	.127	2.428
62.466	6.815	.424	.122	2.454
62.771	6.637	.409	.114	2.476
63.058	6.464	.396	.109	2.502
63.482	6.297	.381	.104	2.522
63.586	6.134	.368	.099	2.542
64.196	5.723	.338	.089	2.593
64.625	5.413	.315	.081	2.629
65.009	5.118	.295	.074	2.659
65.346	4.841	.274	.066	2.687
65.649	4.577	.265	.061	2.713
65.918	4.331	.241	.056	2.735
66.157	4.094	.226	.051	2.756
66.373	3.873	.211	.048	2.774
66.563	3.663	.198	.043	2.789
66.733	3.464	.185	.041	2.804
66.883	3.277	.175	.038	2.817
66.139	2.931	.155	.033	2.839
67.394	2.542	.132	.028	2.860
67.648	2.078	.107	.020	2.883
67.902	1.471	.074	.015	2.906
68.156	0	0	0	2.926

[a] All dimensions are centimeters

TABLE [illegible] - TEST CONDITIONS

Configuration	[illegible] (deg)	[illegible] Numbers / Reynolds numbers (million/meter) 0.60 / 11.2	0.70 / 11.8	0.80 / 12.5	0.95 / 13.1	0.98 / 12.8	1.05 / 12.5	1.1 / 12.1	1.2 / 11.8	Schedule α	Schedule β
W_5B_2T	0	x	x	x						-6 +22	0
	0	x	x	x						5	-6 +6
	45		x	x	x	x	x			-6 +15	0
	45		x	x	x	x	x			5	-6 +6
	45		x	x	x	x	x			3	-6 +6
	60			x	x	x	x	x	x	-6 +18	0
	60			x	x	x	x	x	x	5	-6 +6
	60			x	x	x	x	x	x	3	-6 +6
W_6B_2T	0	x	x	x						-6 +22	0
	45		x	x	x	x	x			-6 +15	0
	60			x	x	x	x	x	x	-6 +18	0
B_2T	—	x	x	x	x	x	x	x	x	-6 +20	0

TABLE 4. - INDEX TO DATA FIGURES

Note: Positive directions of force coefficients, moment coefficients, and angles are indicated by arrows.

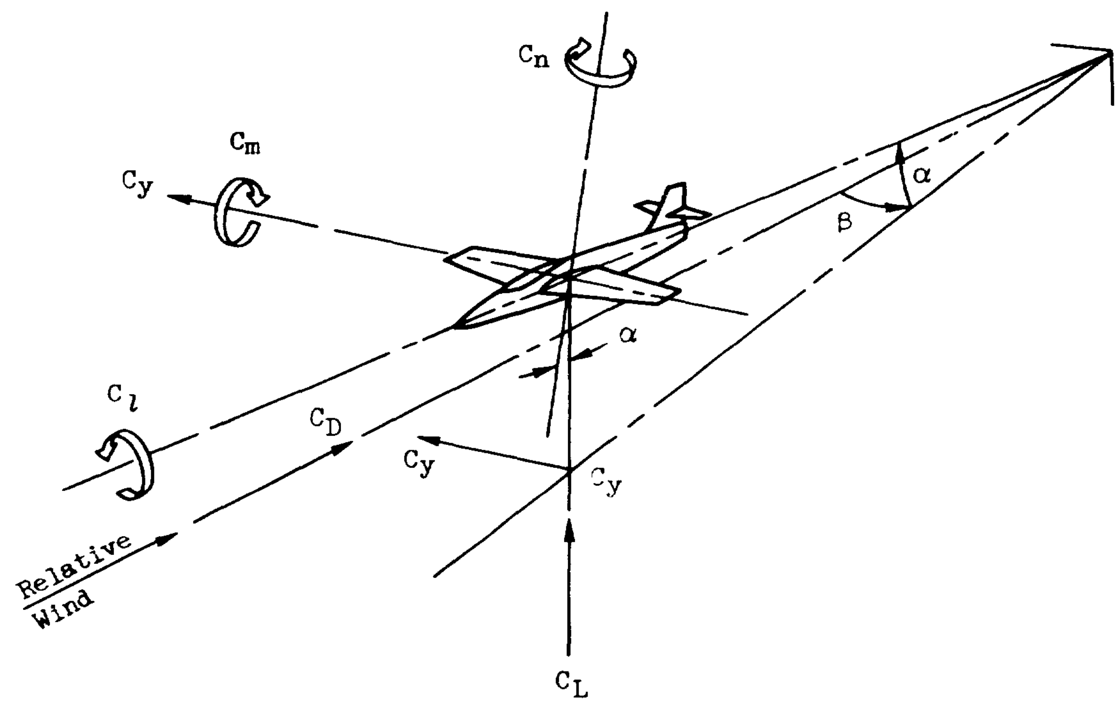
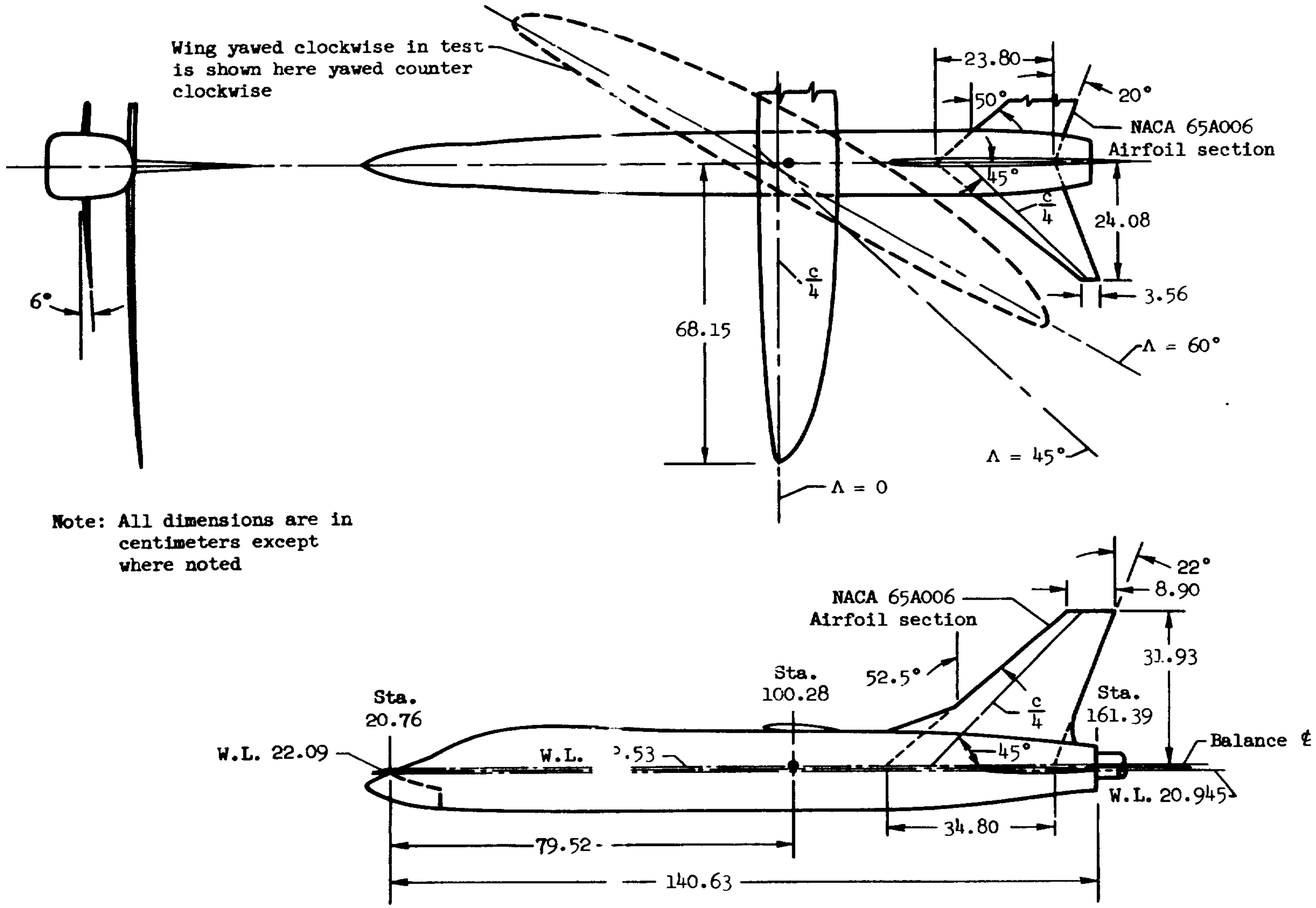
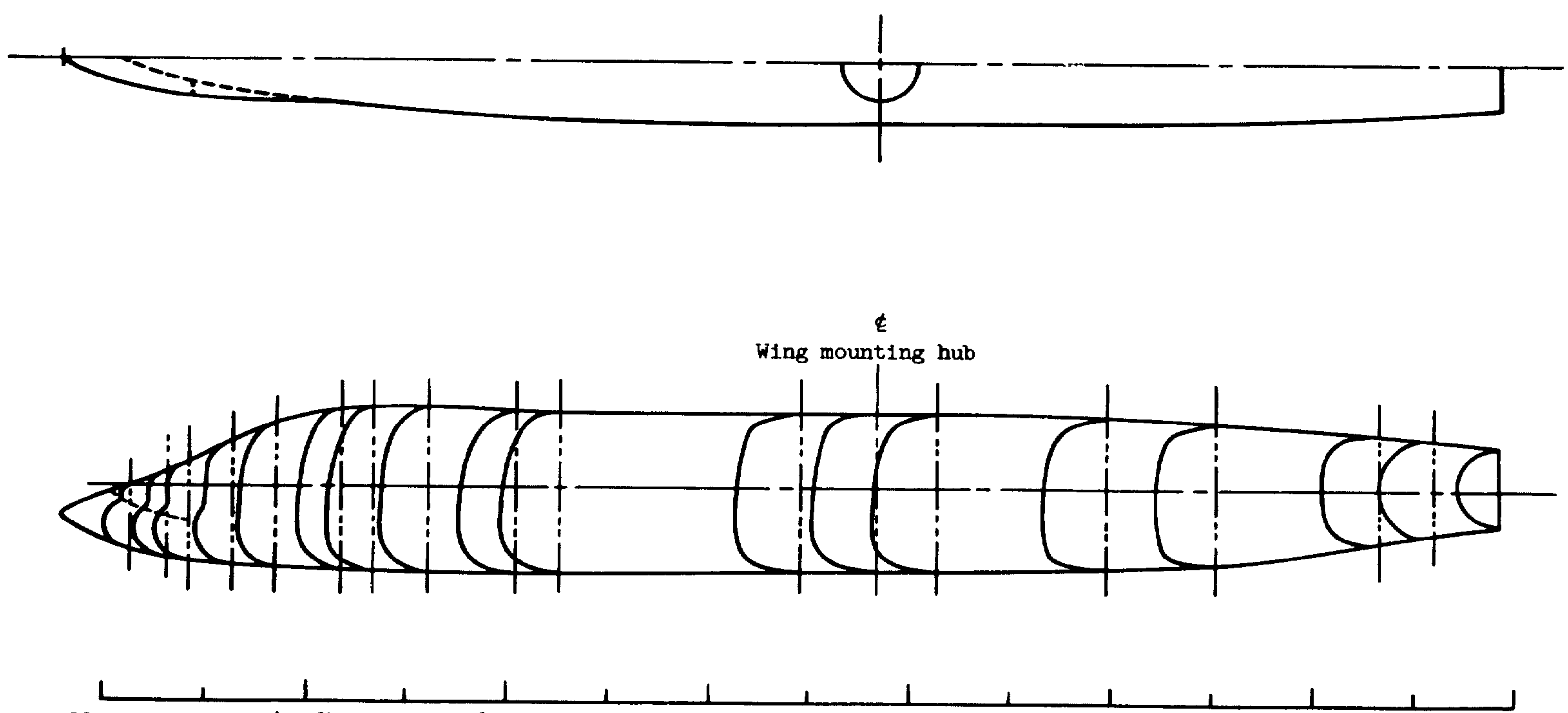


Figure 1. - Axis systems, showing direction and sense of force and moment coefficients, angle of attack, and sideslip angle.



(a) Three-view

Figure 2.- Oblique-wing model details and photograph.

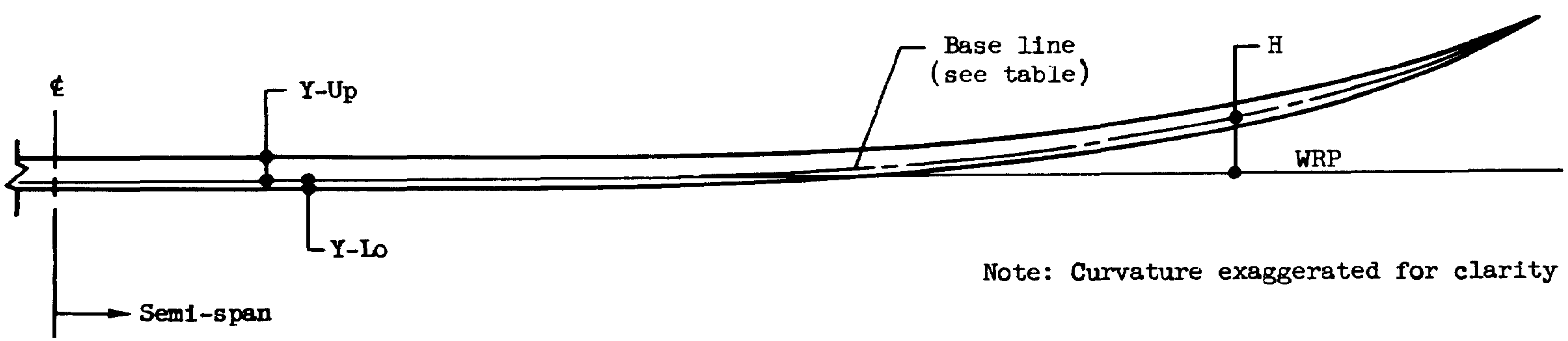


(b) Fuselage contours.

Figure 2.- Continued.

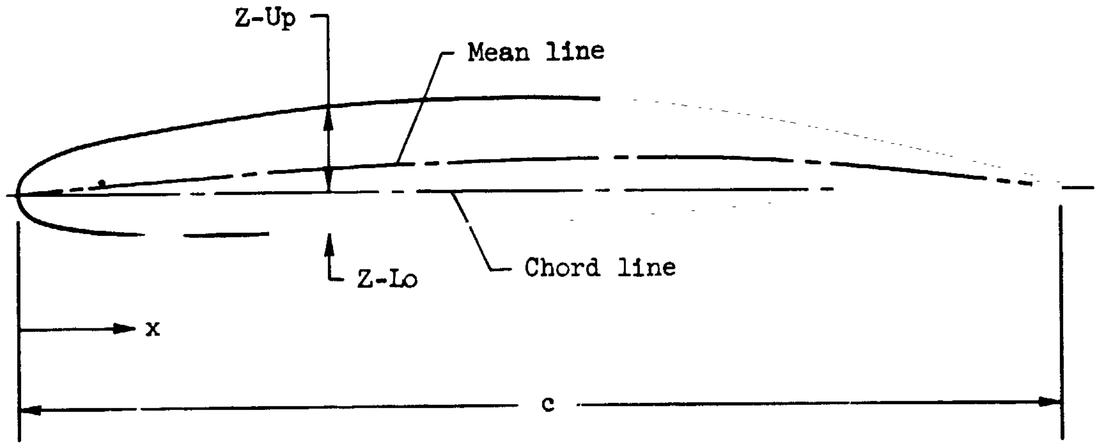
(b) Fuselage contours

Figure 2. - Continued.



(c) Wing curvature.

Figure 2. - Continued.

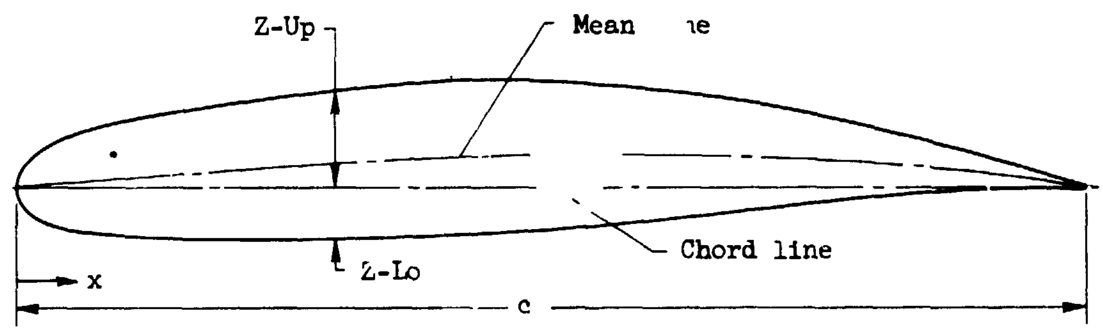


x/c	t/c	Camber/c	Z-Up/c	Z-Lo/c
0.001	.01444	.00008	.00730	-.00714
0.010	.04072	.00078	.02114	-.01958
0.025	.05819	.00195	.03104	-.02715
0.050	.07343	.00389	.04060	-.03282
0.075	.08269	.00582	.04716	-.03553
0.100	.08934	.00772	.05239	-.03695
0.150	.09899	.01144	.06093	-.03806
0.200	.10622	.01498	.06808	-.03813
0.300	.11625	.02129	.07942	-.03683
0.400	.11997	.02621	.08619	-.03378
0.500	.11571	.02925	.08711	-.02861
0.600	.10263	.02995	.08127	-.02136
0.700	.08144	.02785	.06856	-.01287
0.800	.05467	.02246	.04980	-.00487
0.900	.02687	.01334	.02677	-.00009
1.000	.00456	.0	.00228	-.00228

$\frac{\text{L.E. radius}}{c} = .0288$

(d) Wing section drawing and tabulated geometry at wing span station $\eta = 0$; 12-percent thick wing, W_5

Figure 2. - Continued.

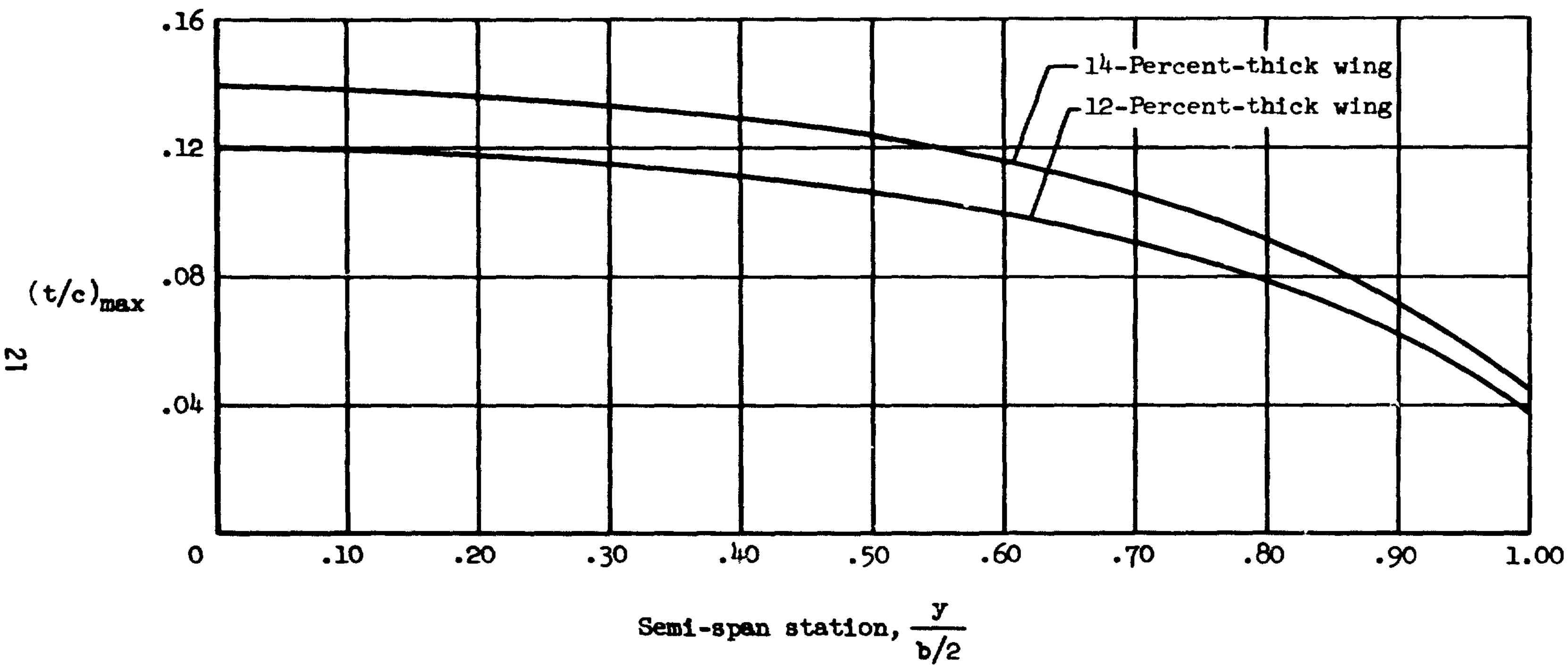


x/c	t/c	[illegible]	Z-Up/c	Z-Lo/c
0.001	.01685	[illegible]	.00850	-.00834
0.010	.04751	[illegible]	.02454	-.02298
0.025	.06789	[illegible]	.03589	-.03199
0.050	.08567	[illegible]	.04672	-.03894
0.075	.09647	[illegible]	.05405	-.04242
0.100	.10423	[illegible]	.05984	-.04440
0.160	.11549	[illegible]	.06918	-.04631
0.200	.12392	.01498	.07694	-.04698
0.300	.13562	02129	.08911	-.04652
0.400	.13996	2621	.09619	-.04377
0.500	.13500	2925	.09675	-.03825
0.600	.11974	.[illegible]2995	.08982	-.02992
0.700	.09501	.02785	.07535	-.01966
0.800	.06379	.02246	.05436	-.00943
0.900	.03134	.01334	.02901	-.00233
1.000	.00532	.0	.00266	-.00266

$\frac{\text{L.E. radius}}{c} = .0392$

(e) Wing section drawing and tabulated geometry at wing span station $\eta = 0$; 14-percent thick wing, W_6

Figure 2. - Continued.

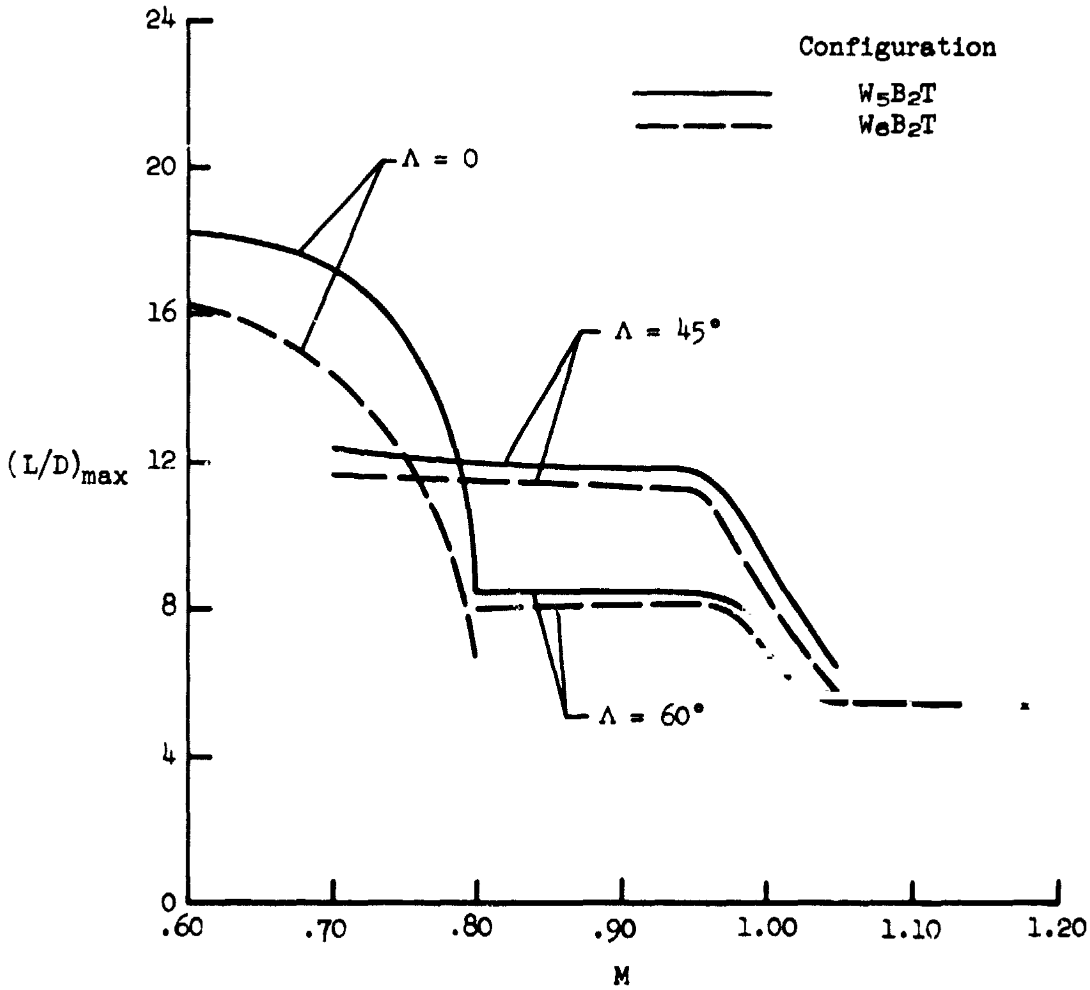


(f) Wing maximum thickness distributions.

Figure 2. - Continued.

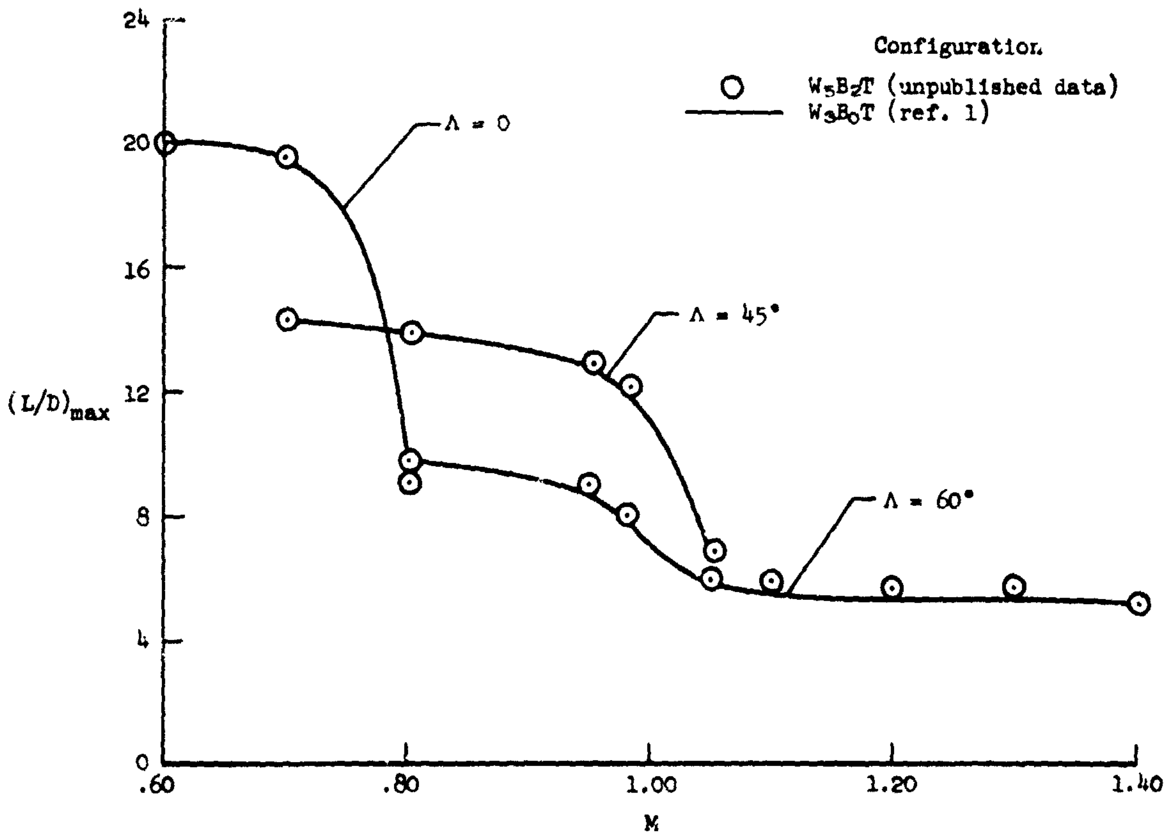
(g) Photograph of model in the Ames 14-Foot Transonic Wind Tunnel

Figure 2. - Concluded.



(a) Tail incidence = -1.5°; Re ≈ 13.2X10^6 per meter

Figure 3. - Variation of maximum lift-to-drag ratio with Mach number for three wing sweep angles.



(b) Tail incidence = 0°; Re = 20.0X10^6 per meter

Figure 3. - Concluded.

DATA

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RFJ001)	○	V5 B2 T	.000	.000
(RFJ002)	□	V6 BC	.000	.000
(RFJ003)	◇	DATA NOT AVAILABLE	45.000	.000
(RFJ004)	△	DATA NOT AVAILABLE	45.000	.000
(RFJ005)	⊿	DATA NOT AVAILABLE	60.000	.000
(RFJ006)	◁	DATA NOT AVAILABLE	60.000	.000

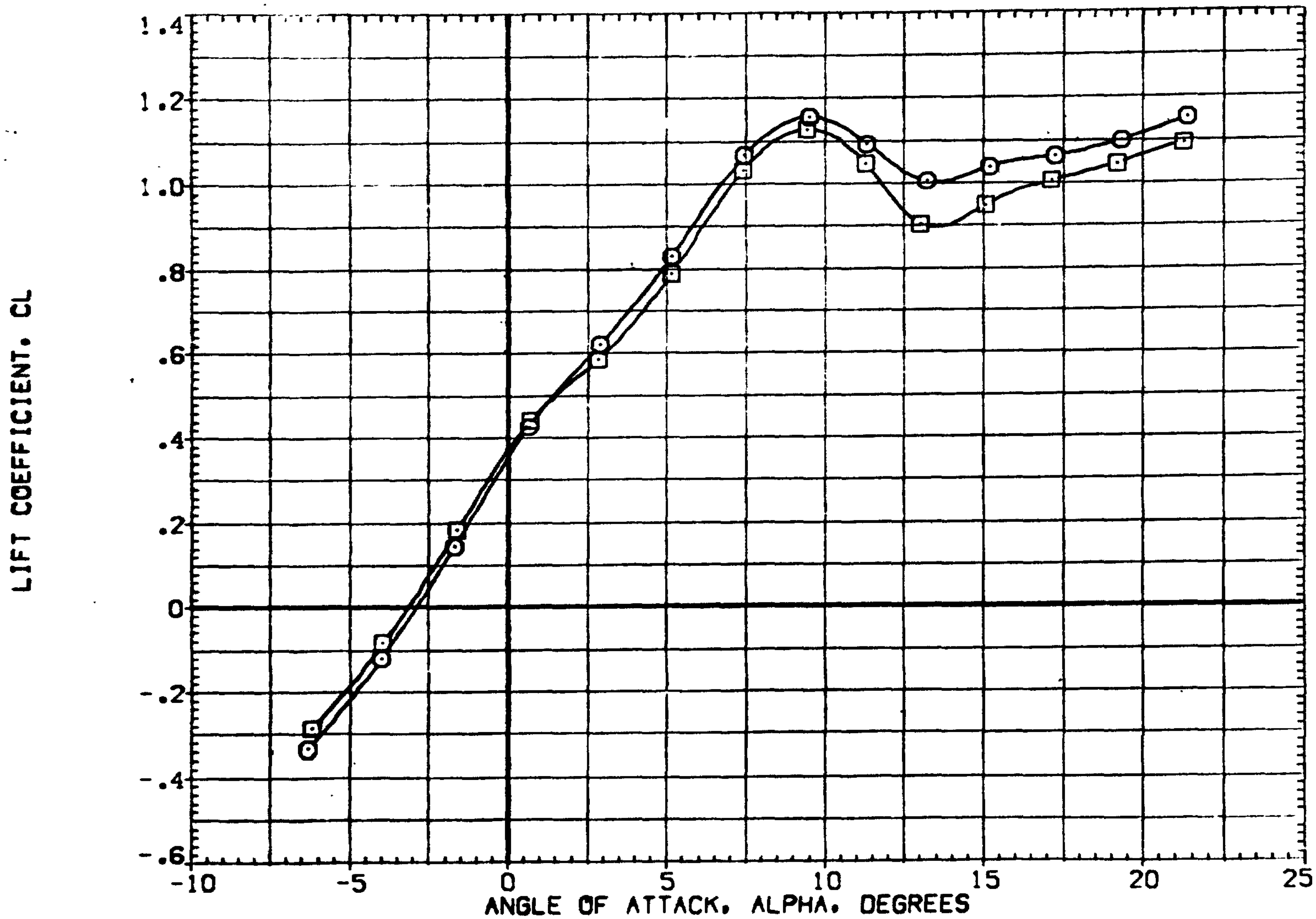


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(A)MACH = .60

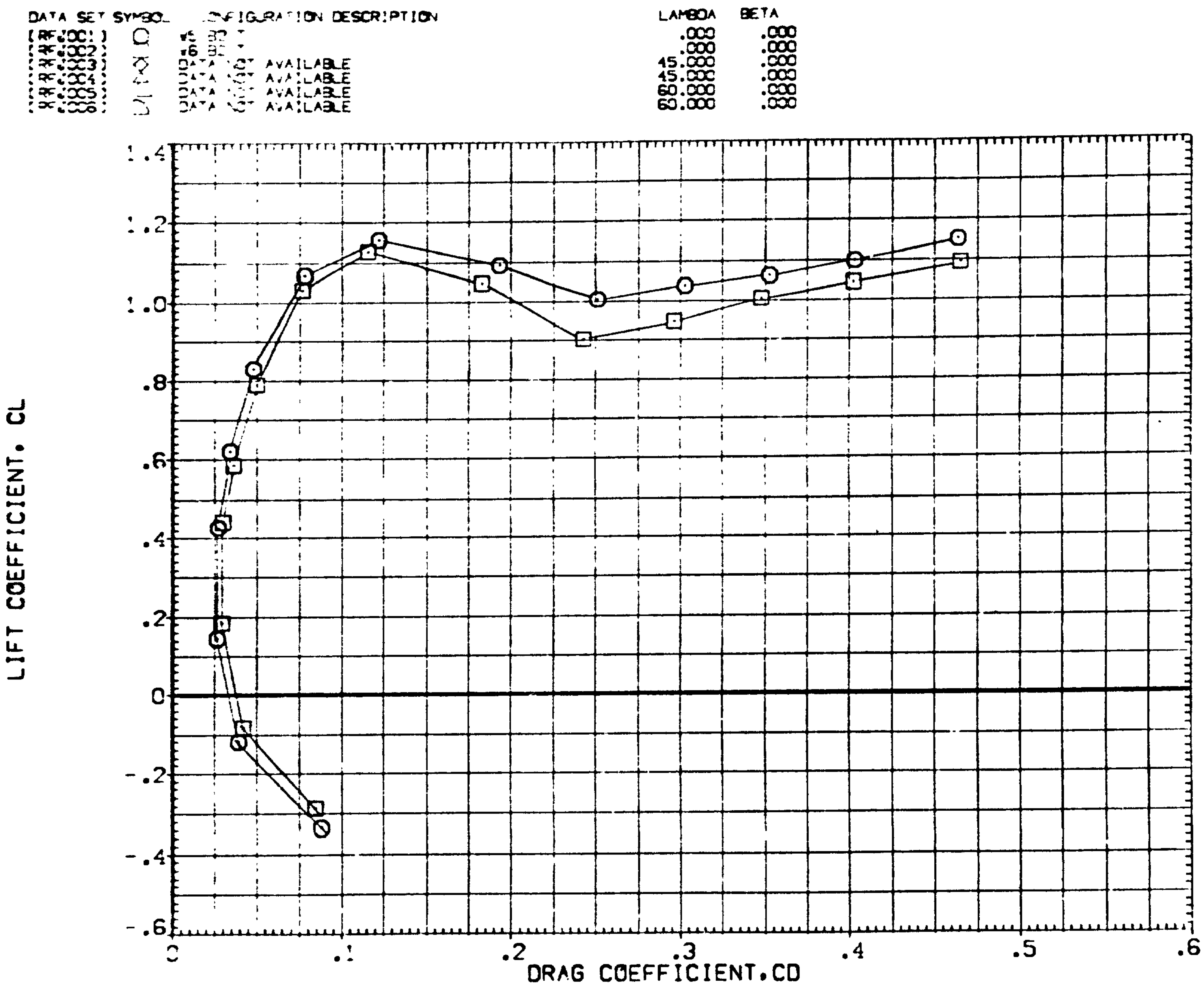


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(A)MACH = .60

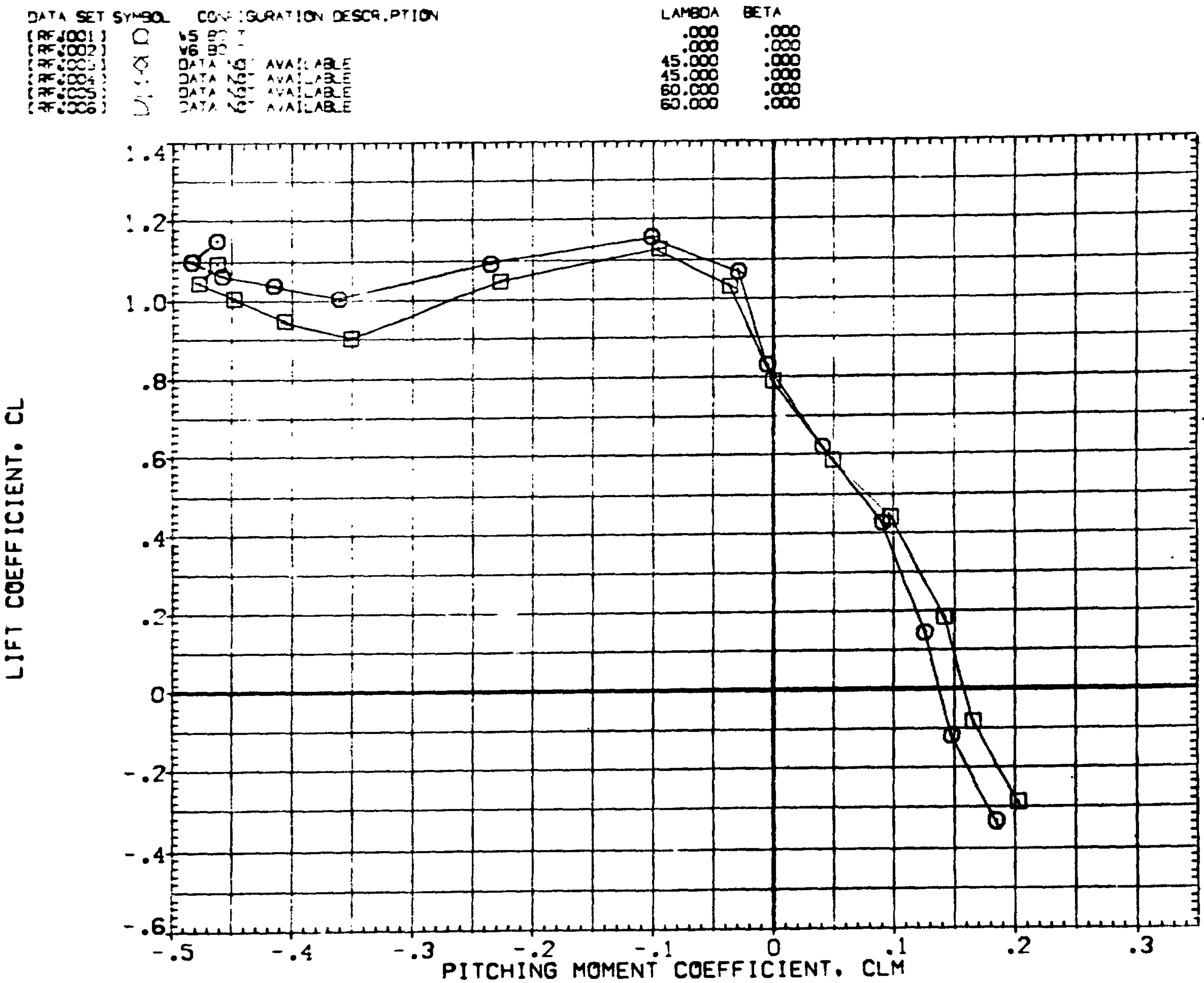


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(A)MACH = .60

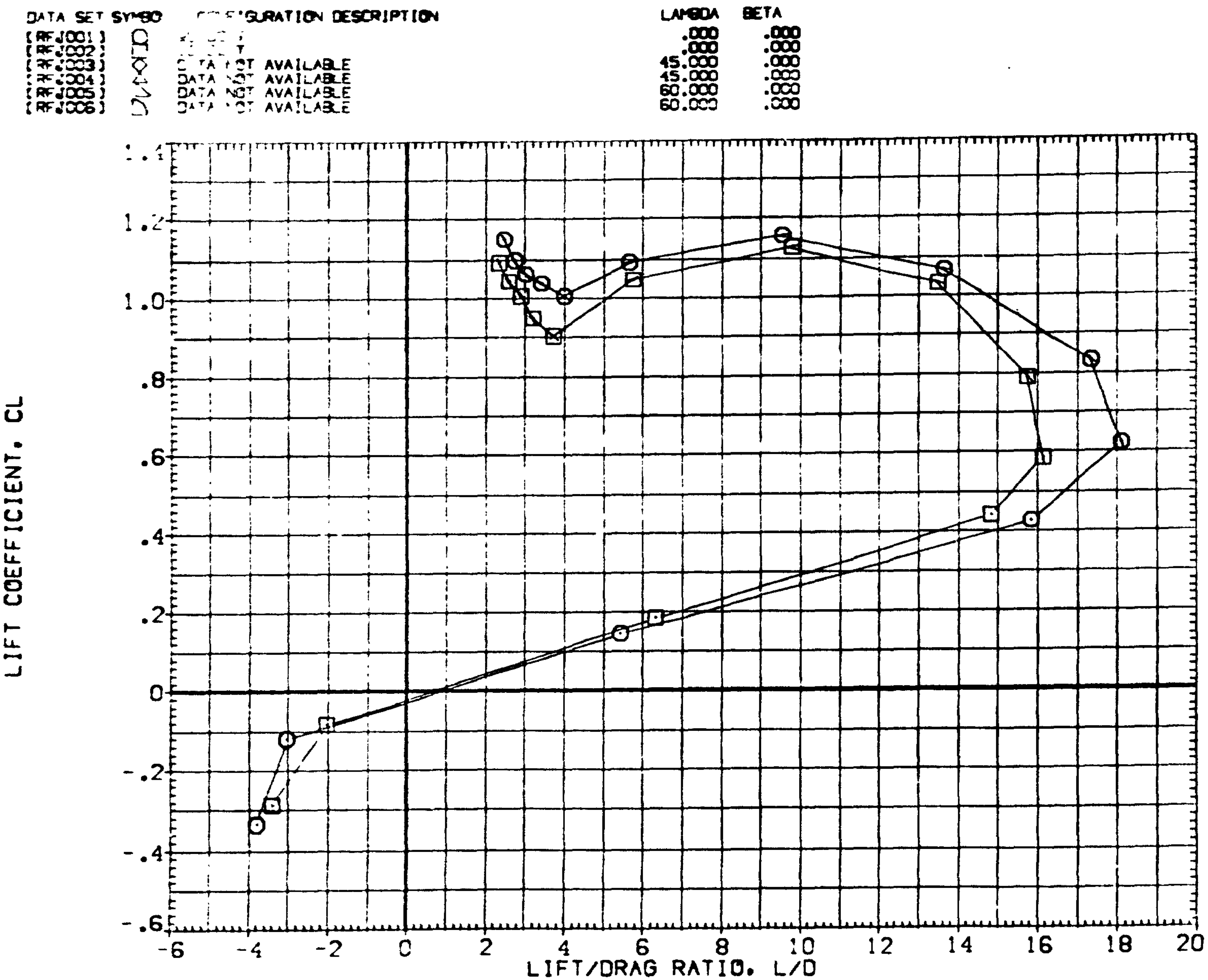


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(A)MACH = .60

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RFJ001)	○	V5 B2 T	.000	.000
(RFJ002)	□	V6 B2 T	.000	.000
(RFJ003)	◇	DATA NOT AVAILABLE	45.000	.000
(RFJ004)	△	DATA NOT AVAILABLE	45.000	.000
(RFJ005)	⊿	DATA NOT AVAILABLE	60.000	.000
(RFJ006)	⊡	DATA NOT AVAILABLE	60.000	.000

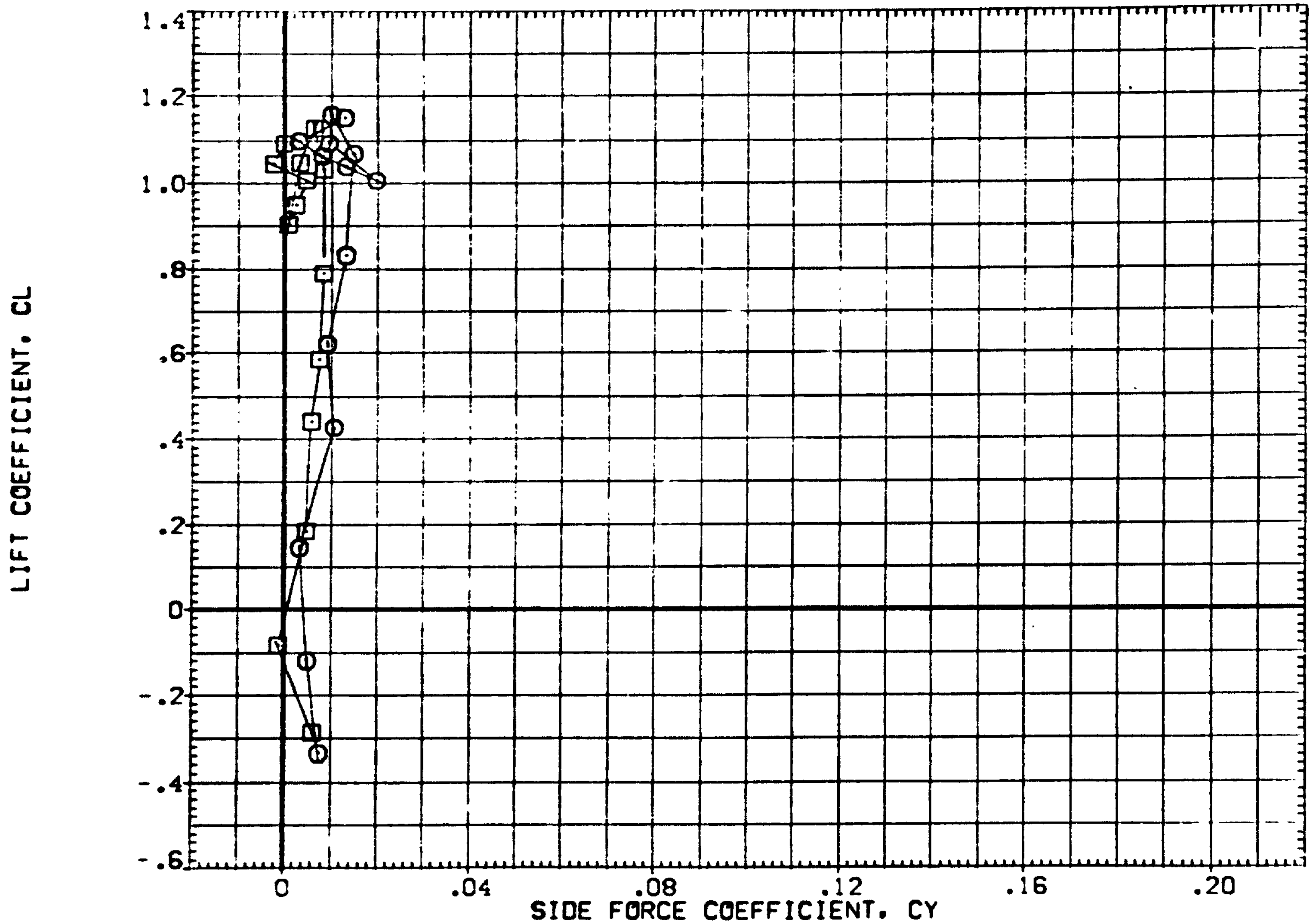


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(A)MACH = .60

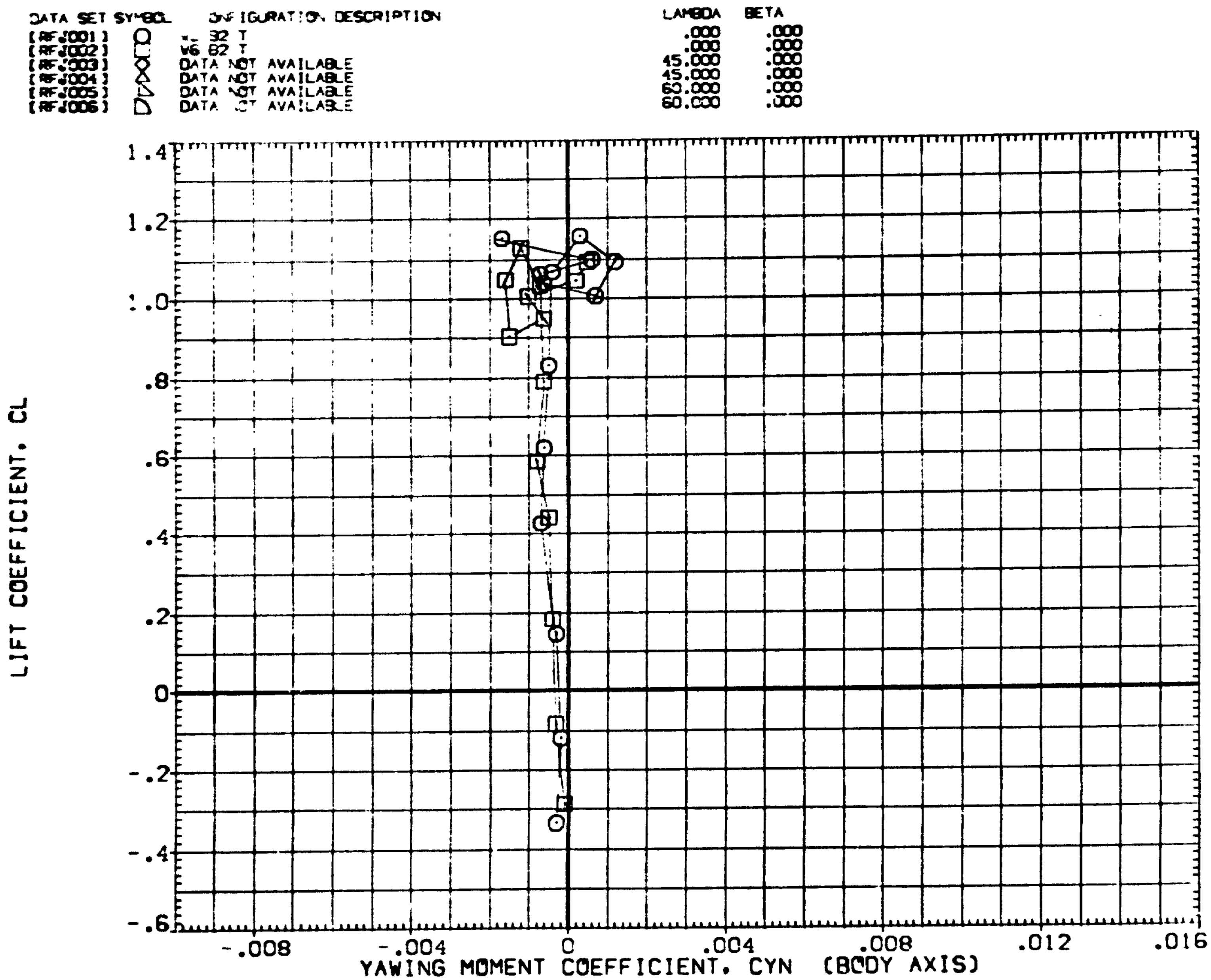


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(A)MACH = .60

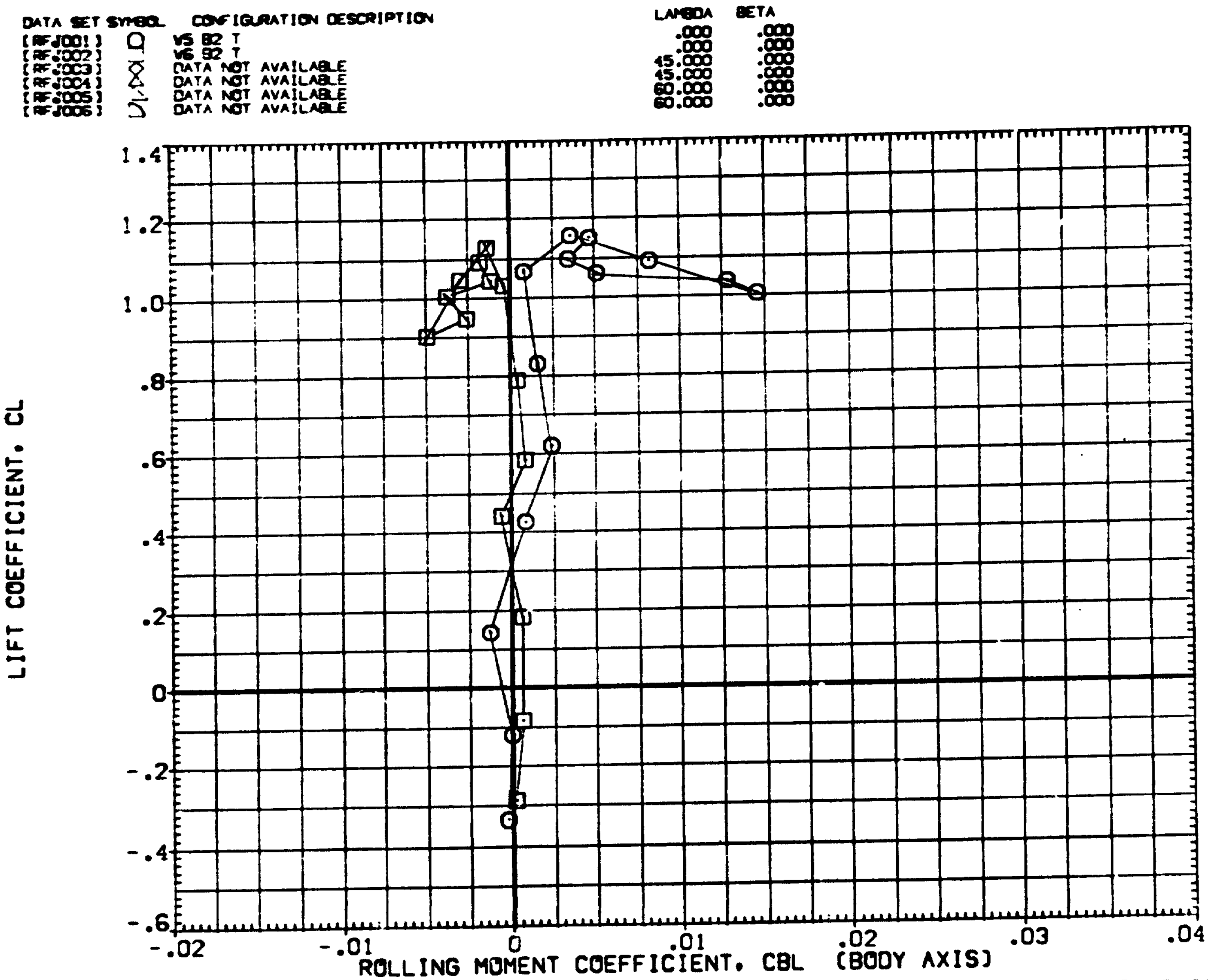


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(A)MACH = .60

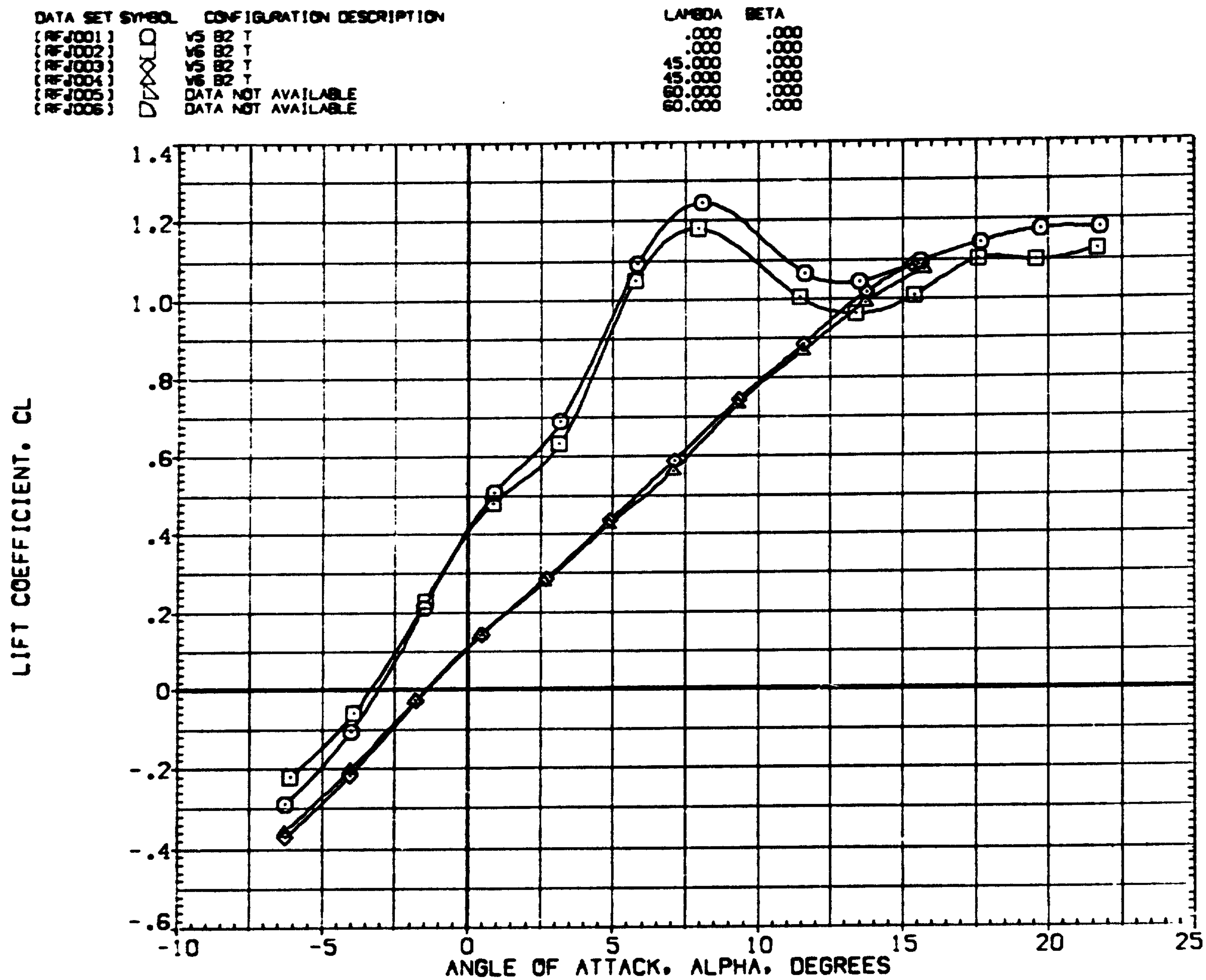


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.
(B)MACH = .70

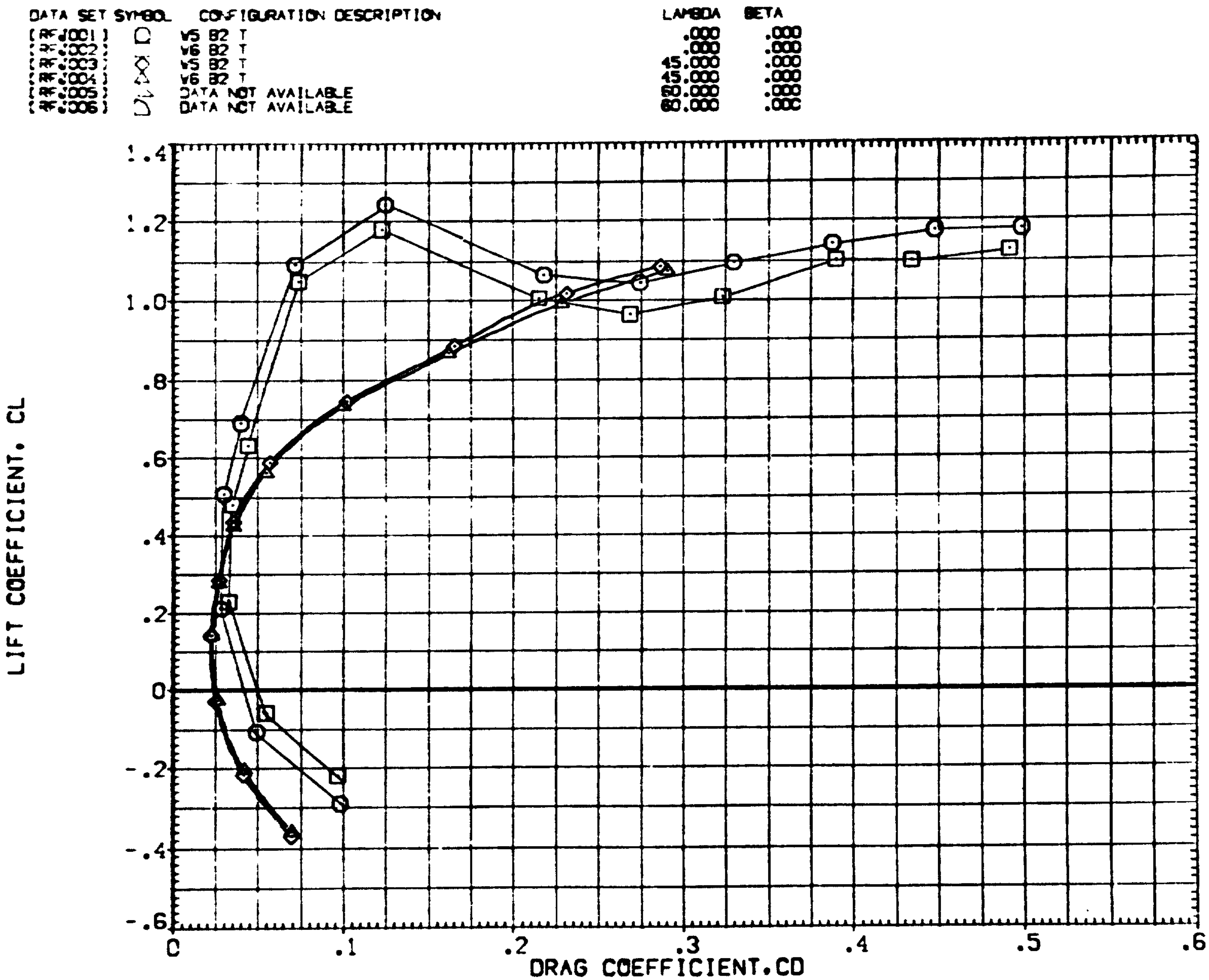


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(B)MACH = .70

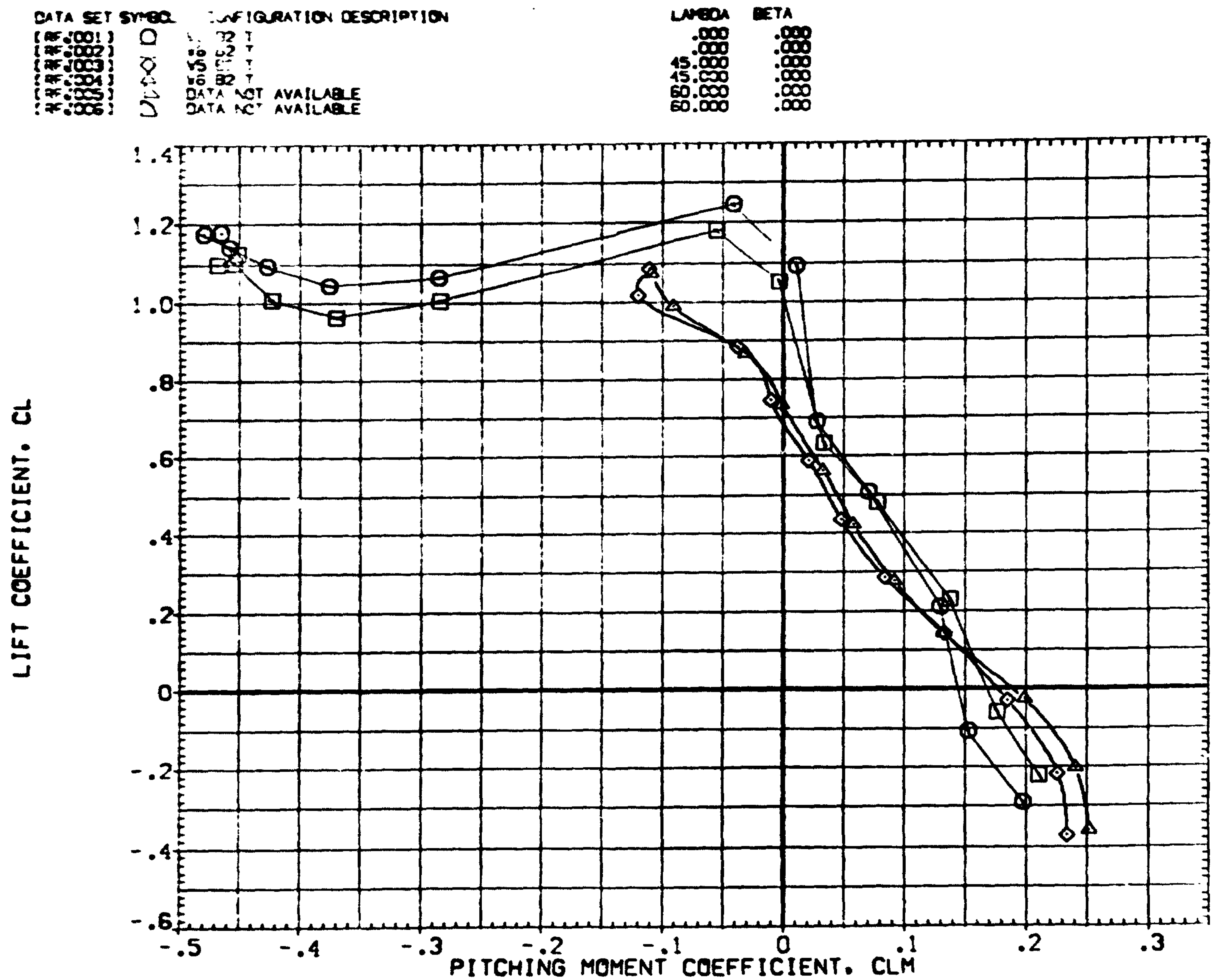


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(B) MACH = .70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
[RFJ001]	○	V5 B2 T	.000	.000
[RFJ002]	□	V6 B2 T	.000	.000
[RFJ003]	◇	V5 B2 T	45.000	.000
[RFJ004]	△	V6 B2 T	45.000	.000
[RFJ005]	▷	DATA NOT AVAILABLE	60.000	.000
[RFJ006]	◁	DATA NOT AVAILABLE	60.000	.000

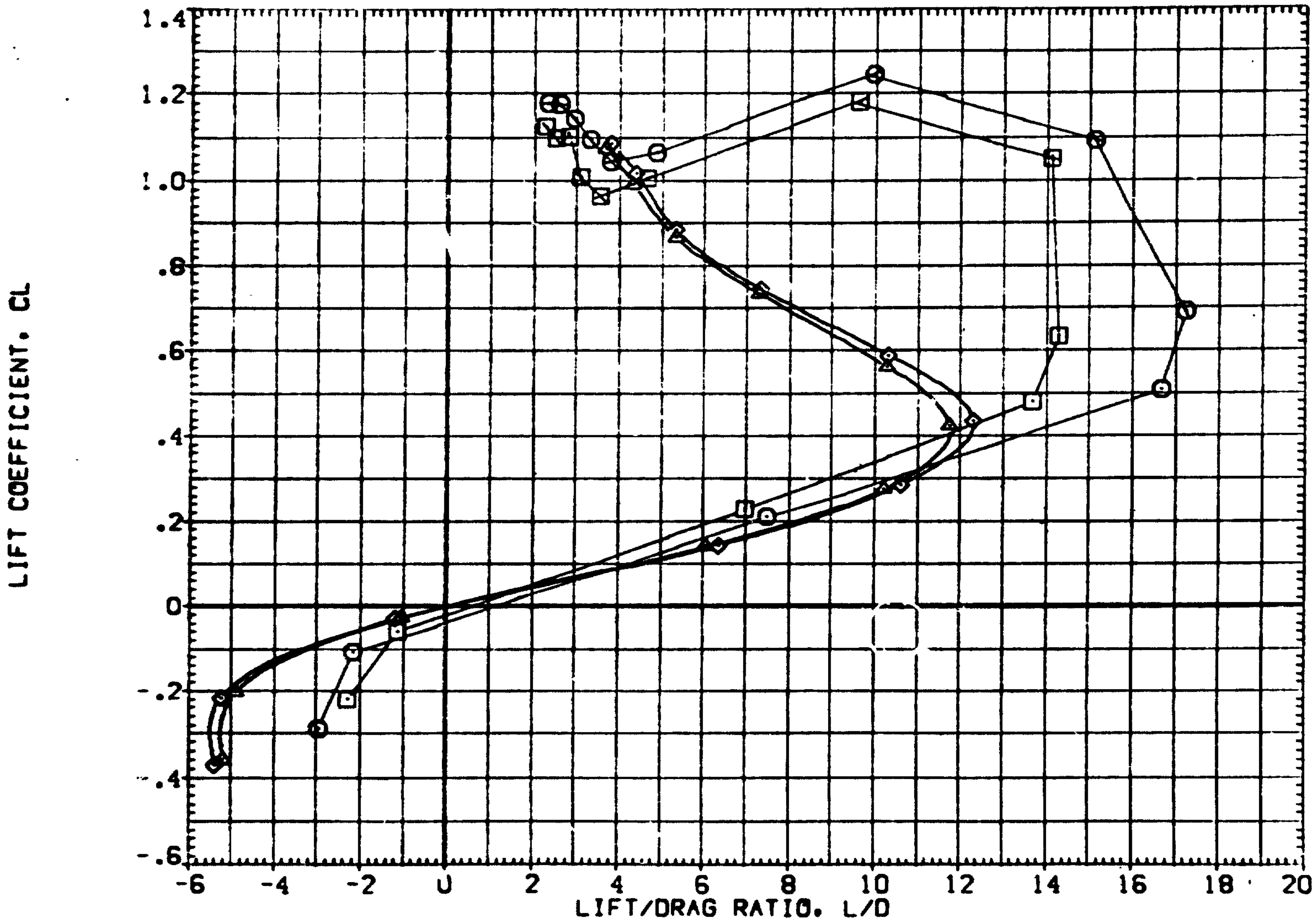


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(B) MACH = .70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
[RFJ001]	○	V5 B2 T	.000	.000
[RFJ002]	□	V6 B2 T	.000	.000
[RFJ003]	◇	V5 B2 T	45.000	.000
[RFJ004]	△	V6 B2 T	45.000	.000
[RFJ005]		DATA NOT AVAILABLE	60.000	.000
[RFJ006]		DATA NOT AVAILABLE	60.000	.000

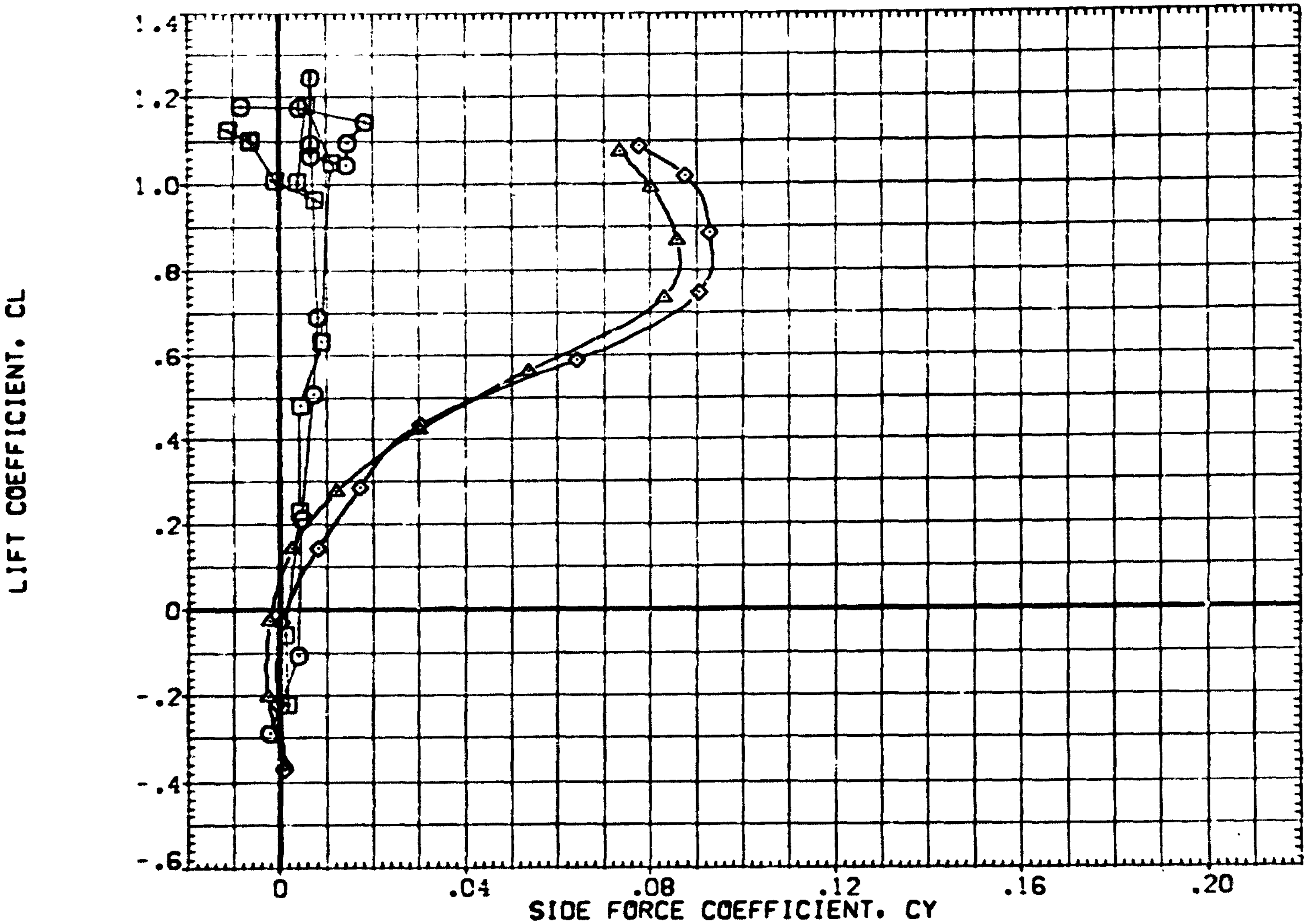


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(B)MACH = .70

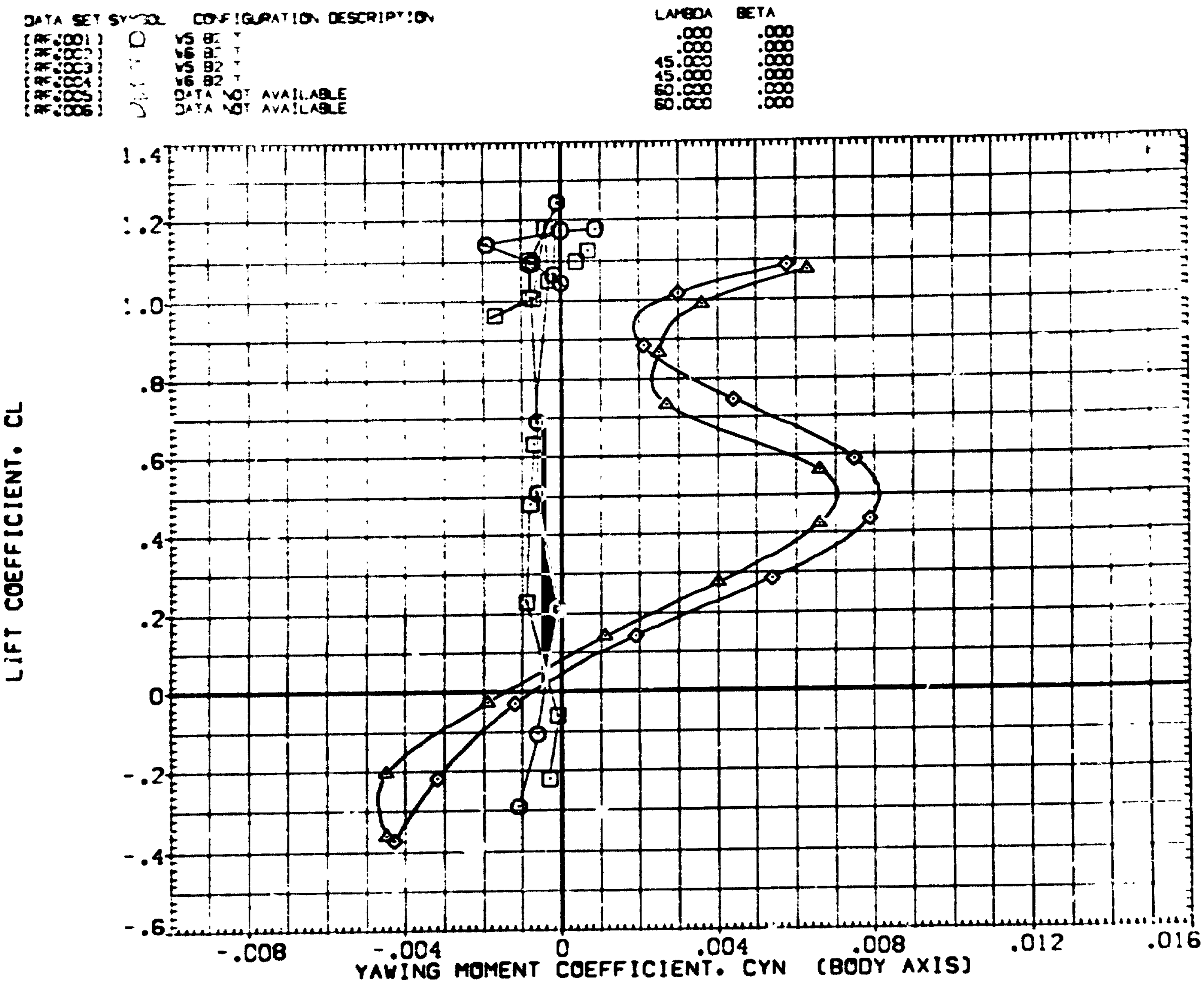


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(B)MACH = .70

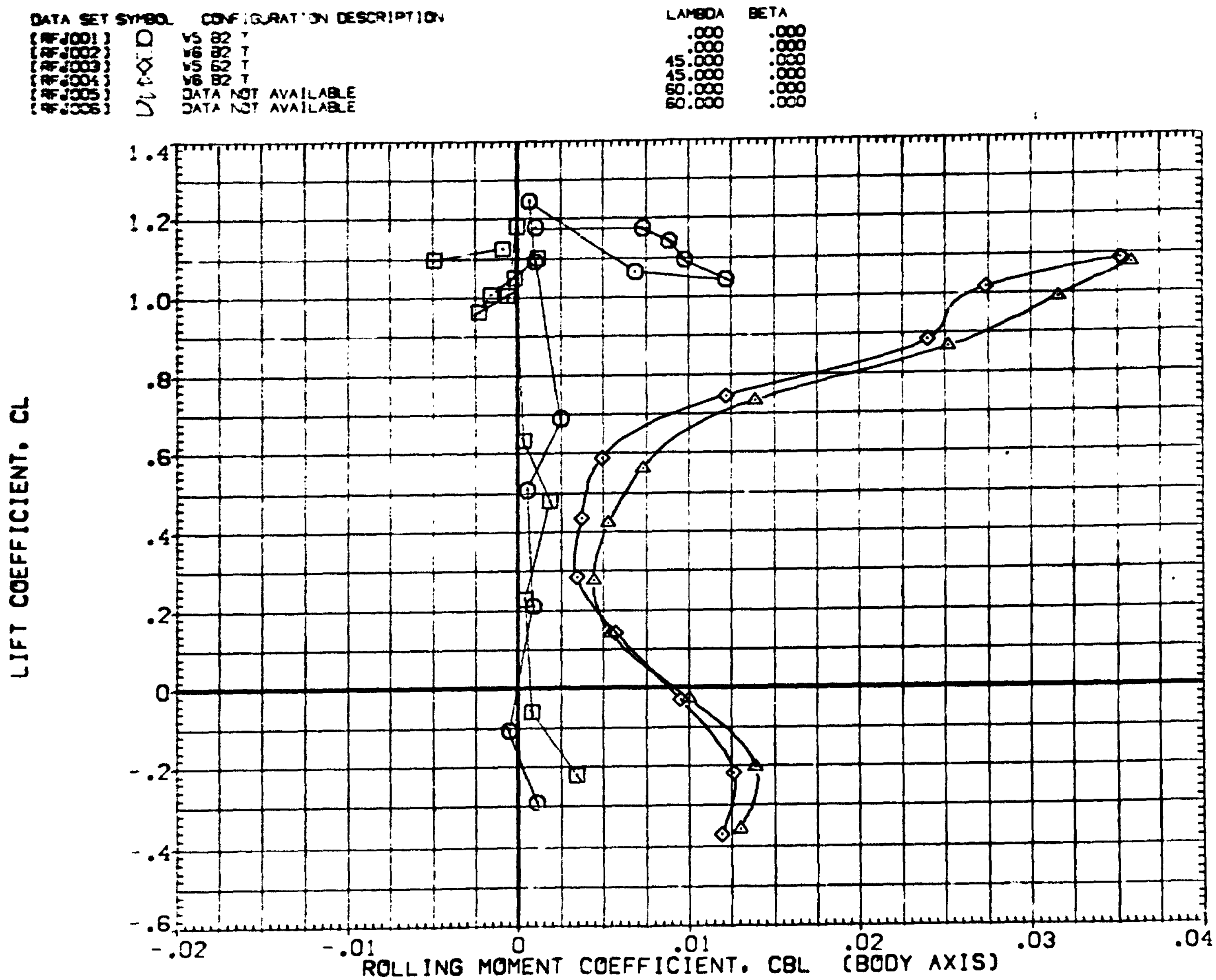


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.
(B)MACH = .70

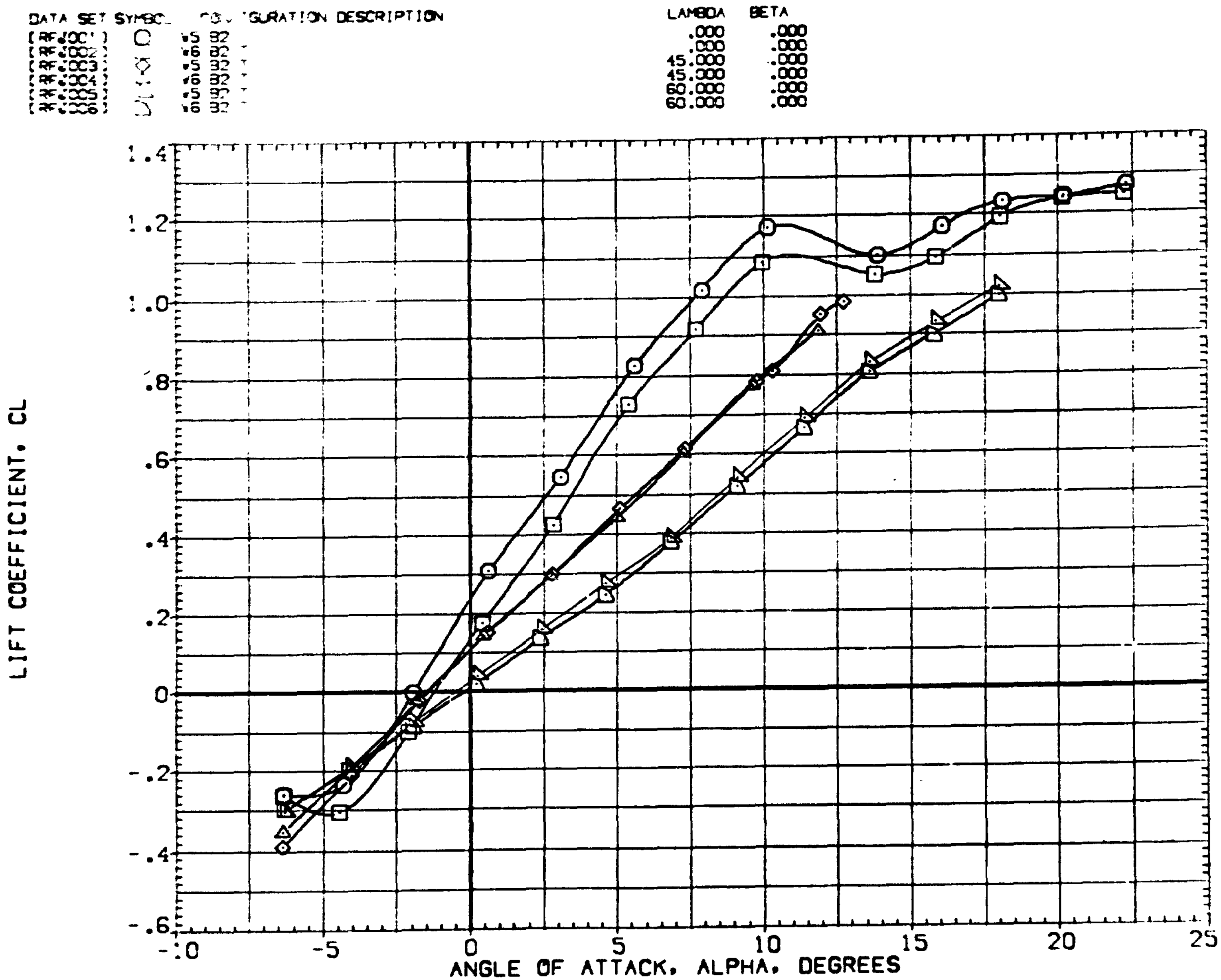


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(C)MACH = .80

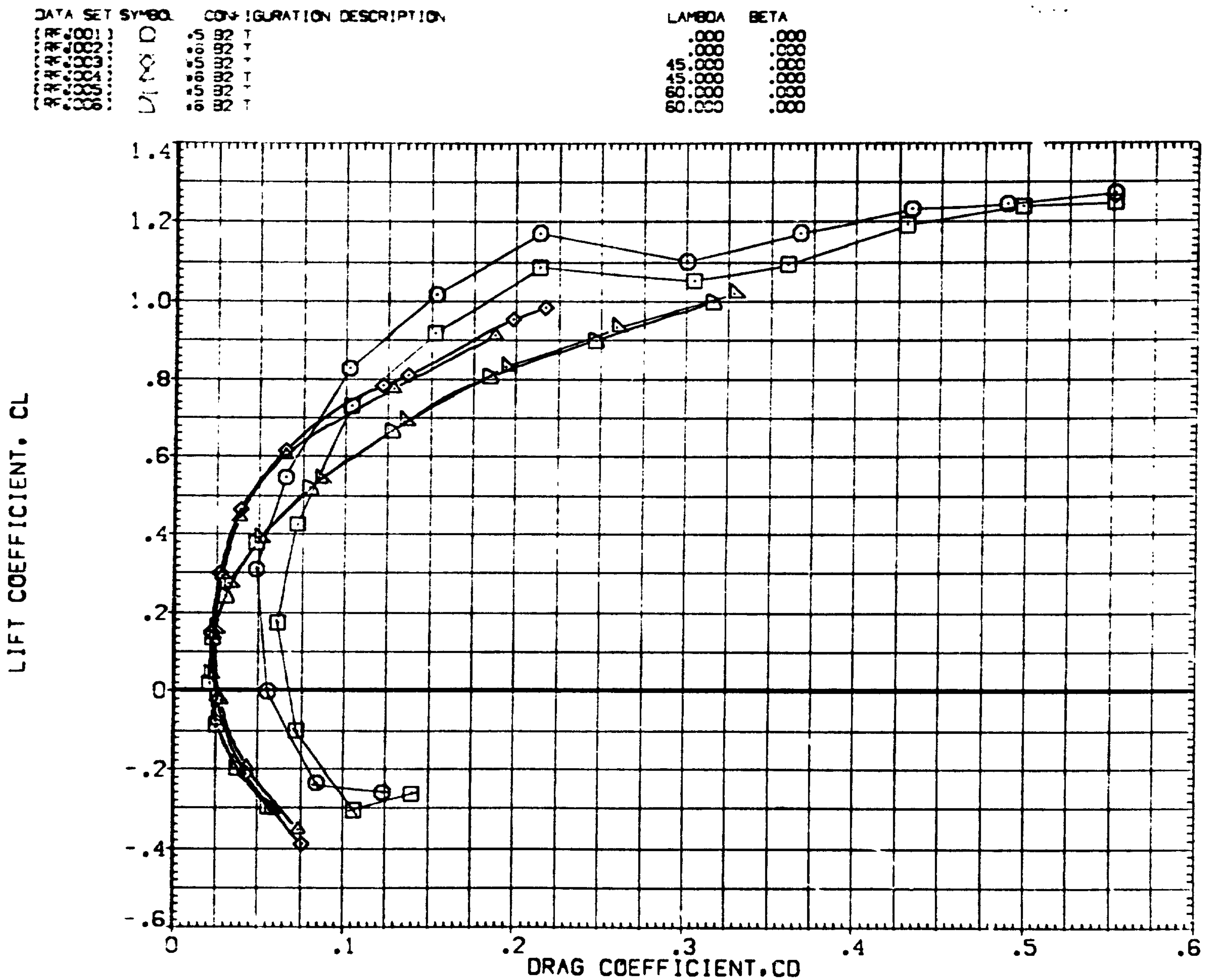


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.
(C)MACH = .80

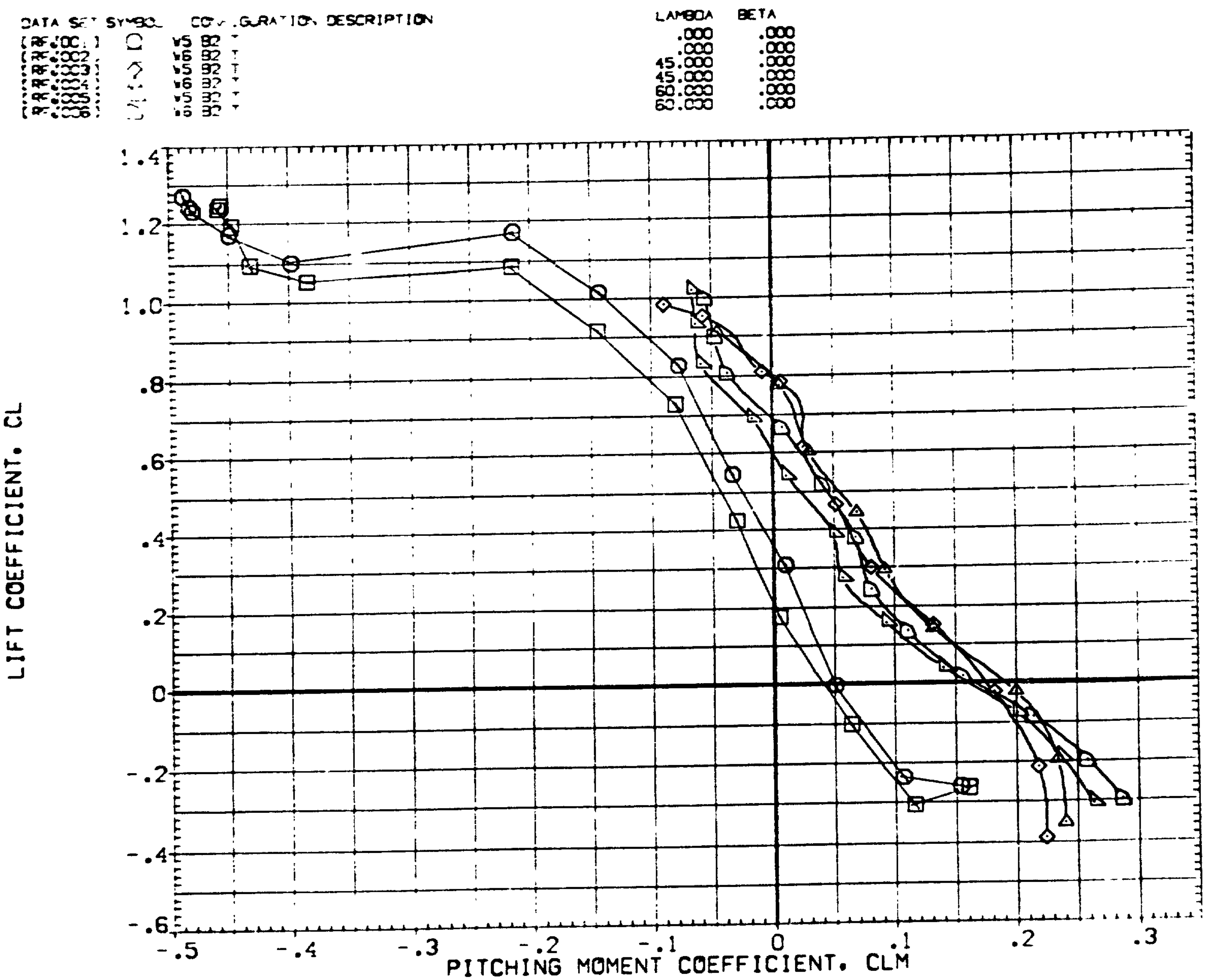


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(C)MAC- = .80

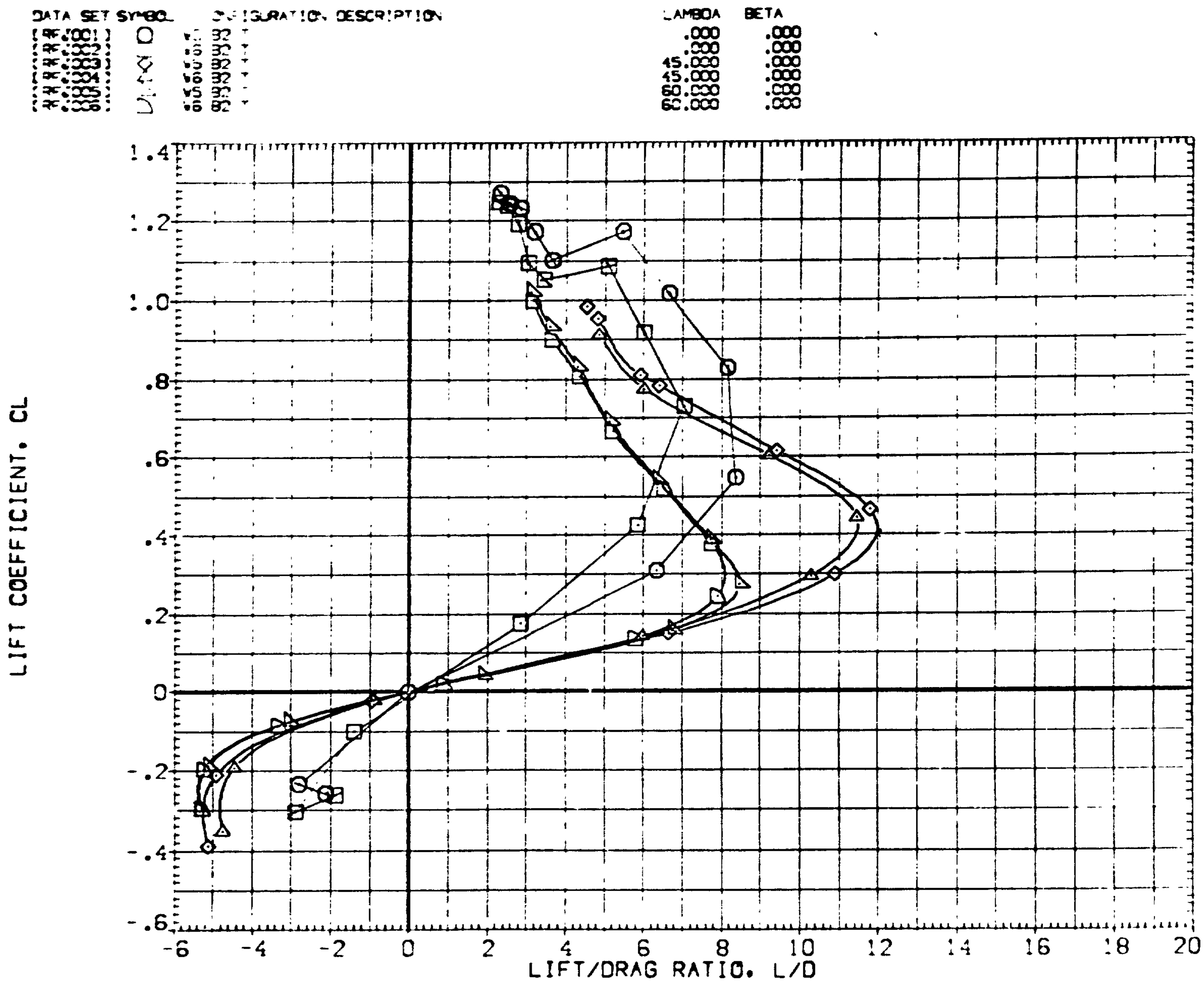


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(C)MACH = .80

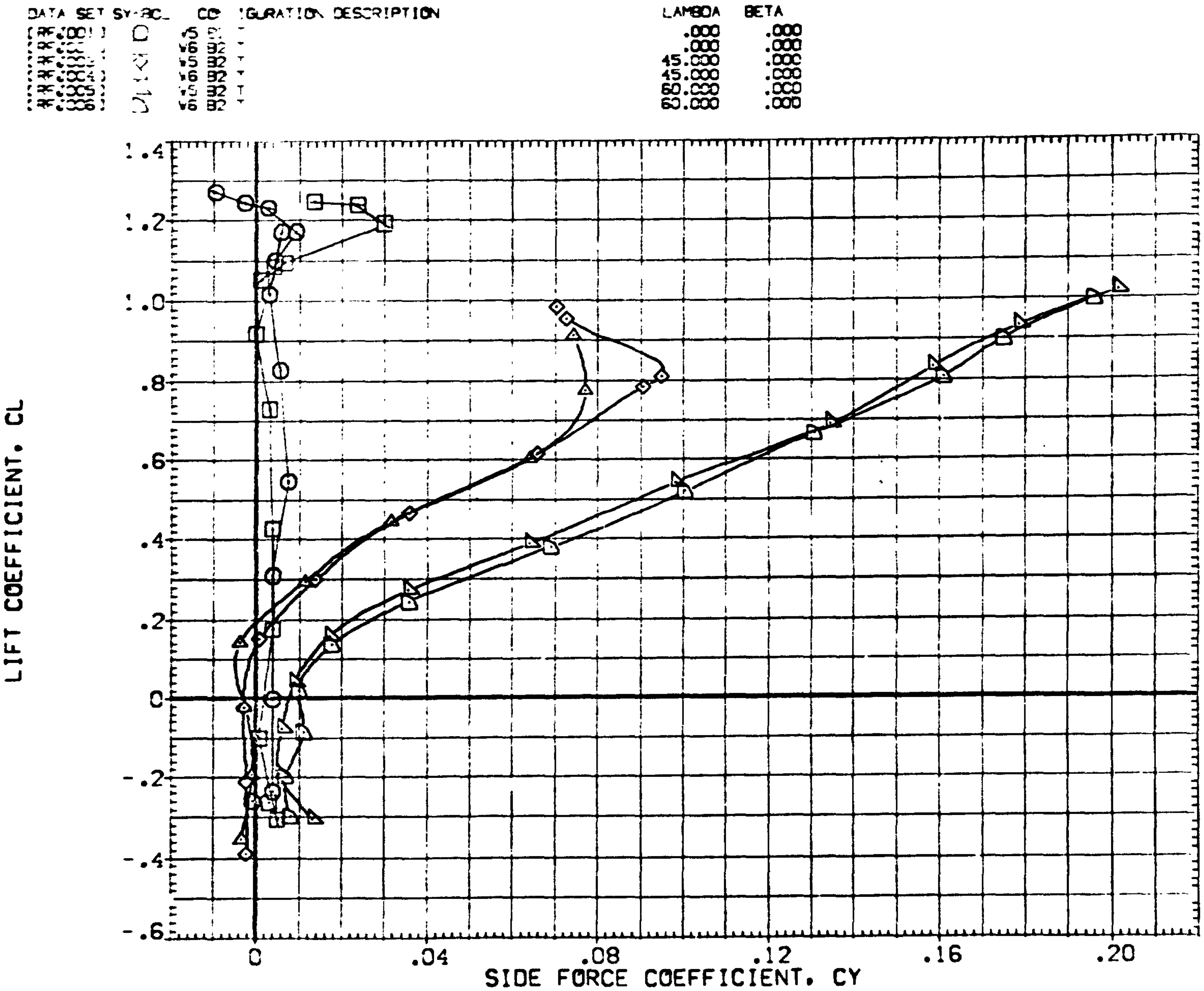


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(C)MACH = .80

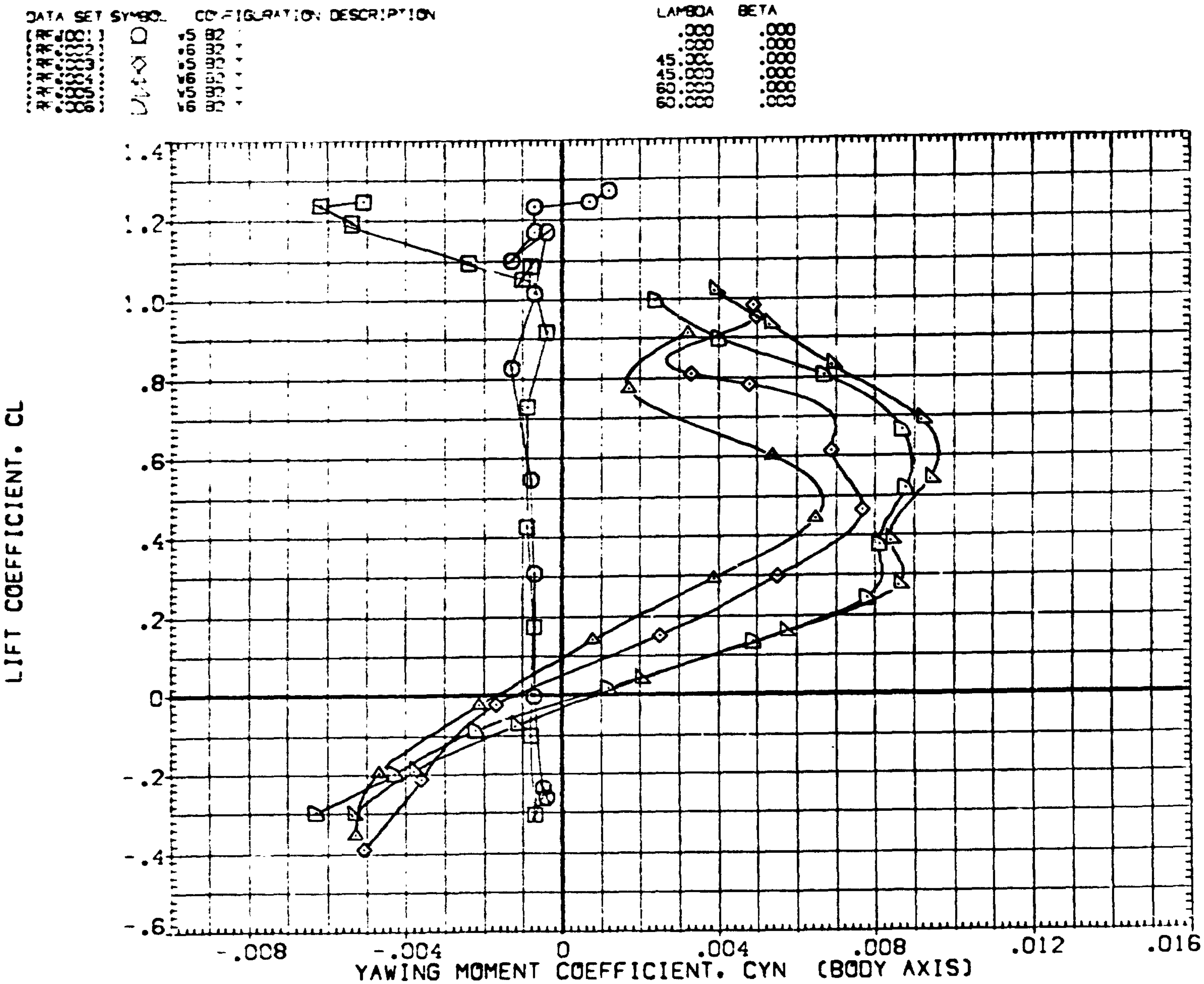


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(C)MACH = .80

DATA SET SYMBOL CONFIGURATION DESCRIPTION LAMBDA BETA

			LAMBDA	BETA
		W5 B2	.000	.000
		W6 B2	.000	.000
		W5 B2 T	45.000	.000
		W6 B2 T	45.000	.000
		W5 B2 T	60.000	.000
		W6 B2 T	60.000	.000

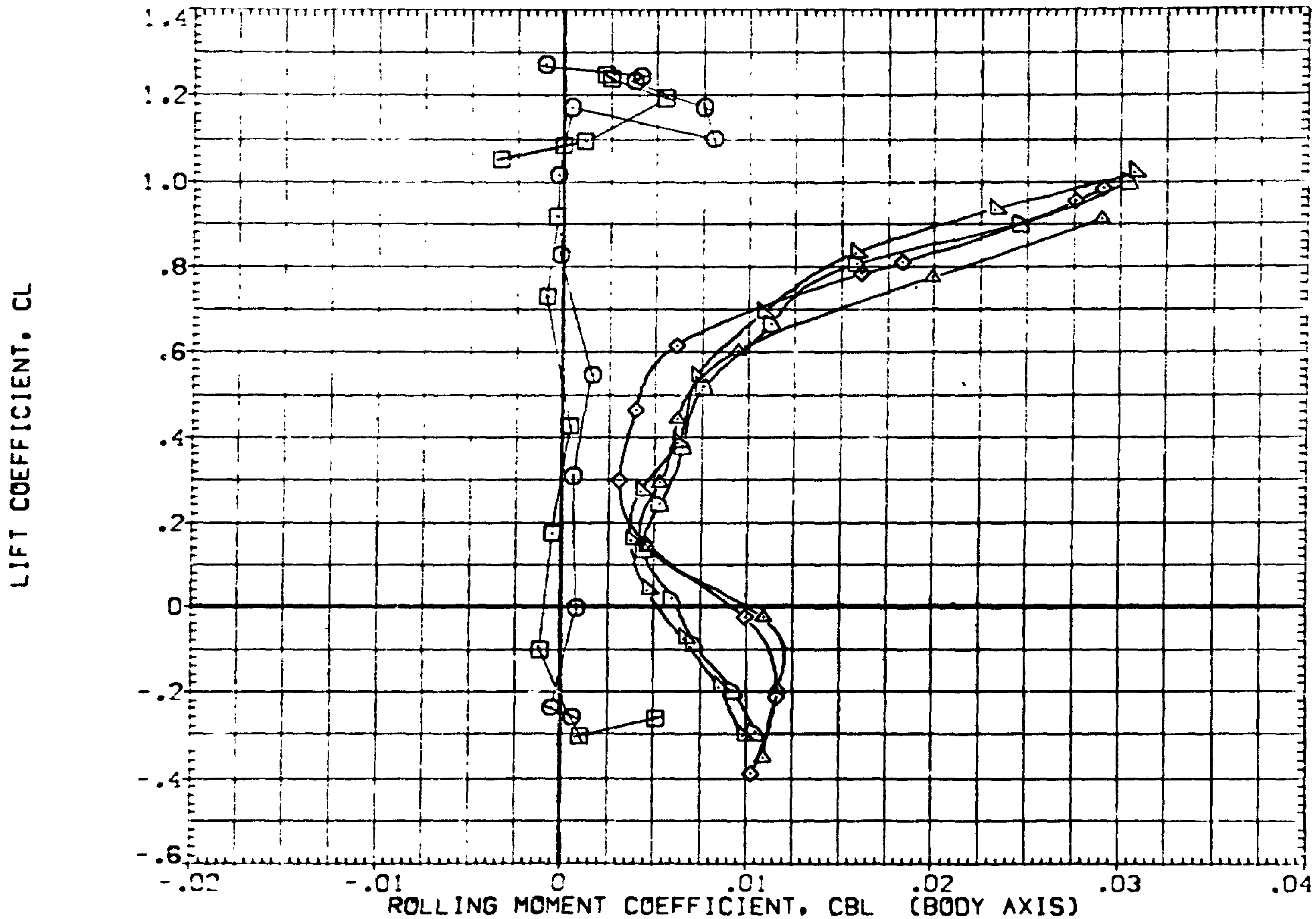


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(C)MACH = .80

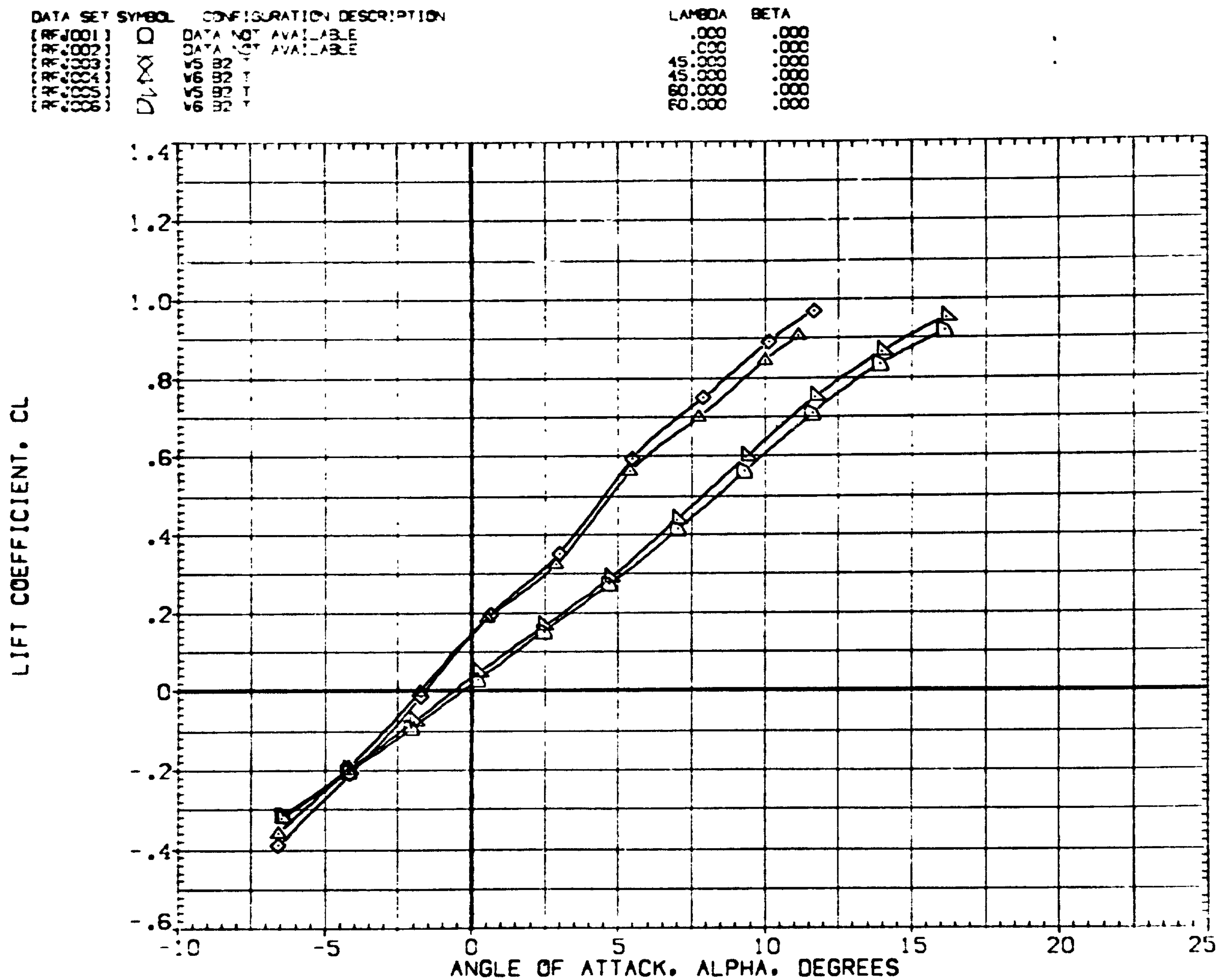


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(D)MACH = .95

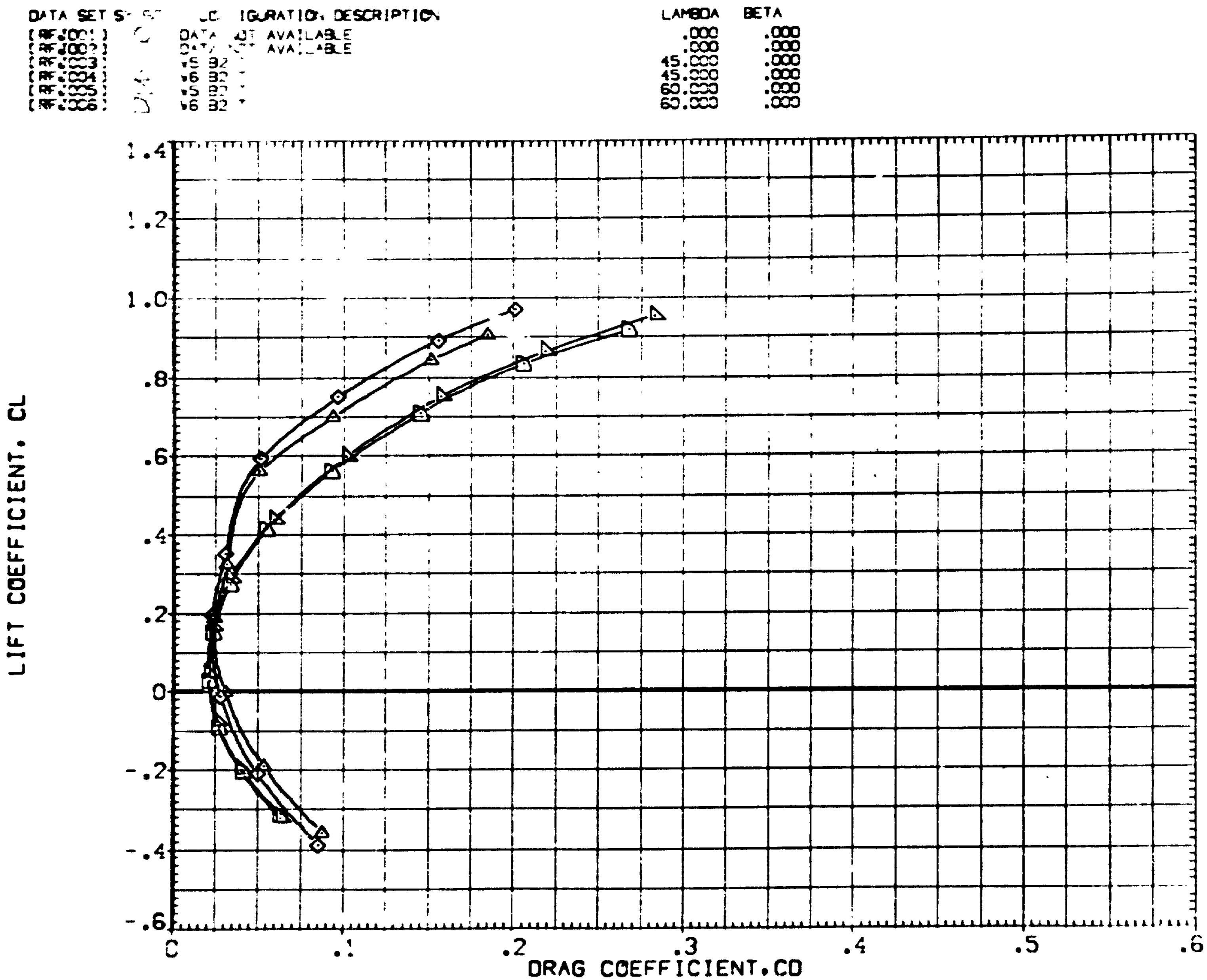


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(C)MACH = .95

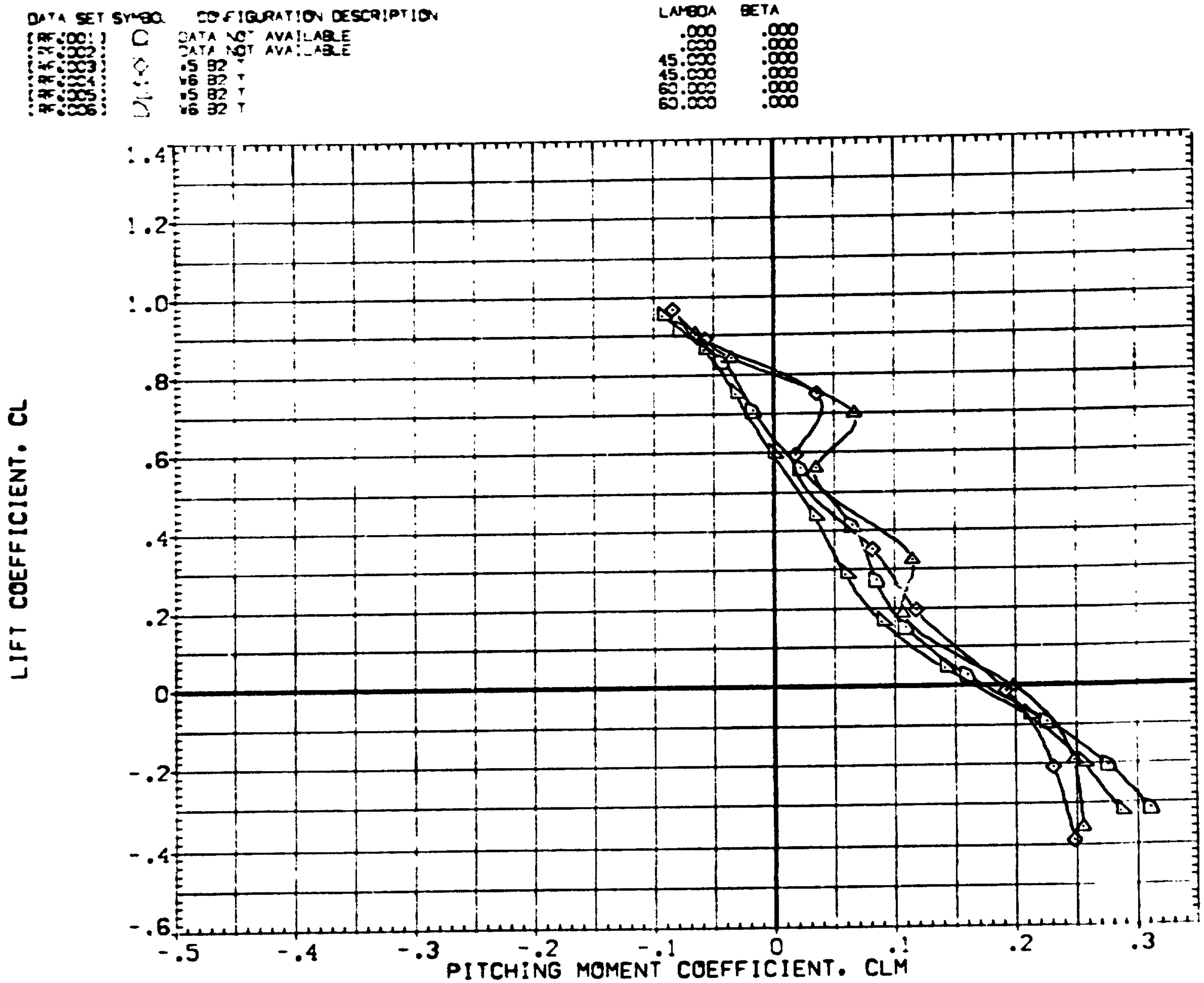


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(D)MAC- = .95

DATA SET SYMBOL CONFIGURATION DESCRIPTION LAMBDA BETA

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RFJ001)		DATA NOT AVAILABLE	.000	.000
(RFJ002)		DATA NOT AVAILABLE	.000	.000
(RFJ003)		.5 B2	45.000	.000
(RFJ004)		.6 B2	45.000	.000
(RFJ005)		.5 B2	60.000	.000
(RFJ006)		.6 B2	60.000	.000

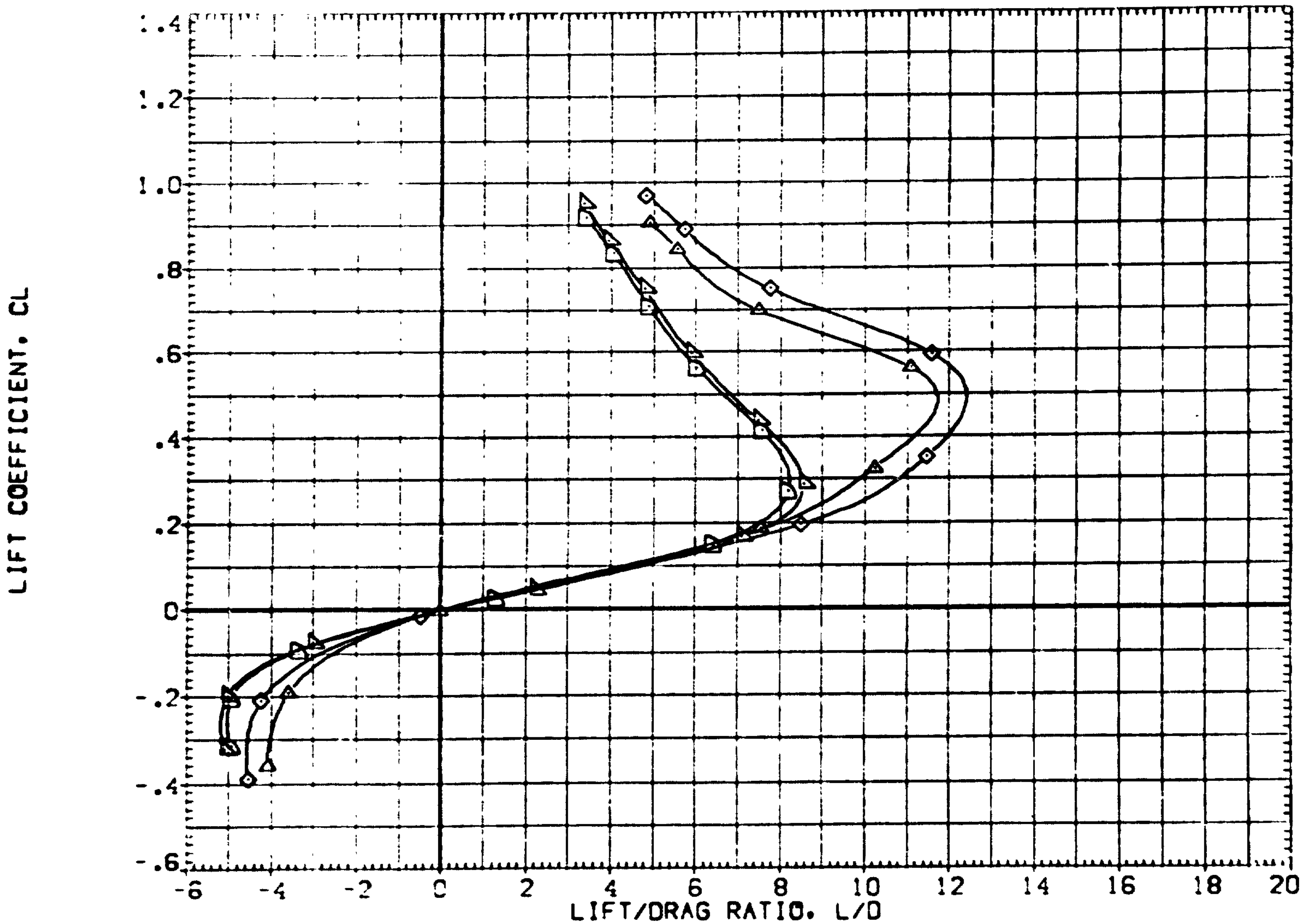


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(D)MAC- = .95

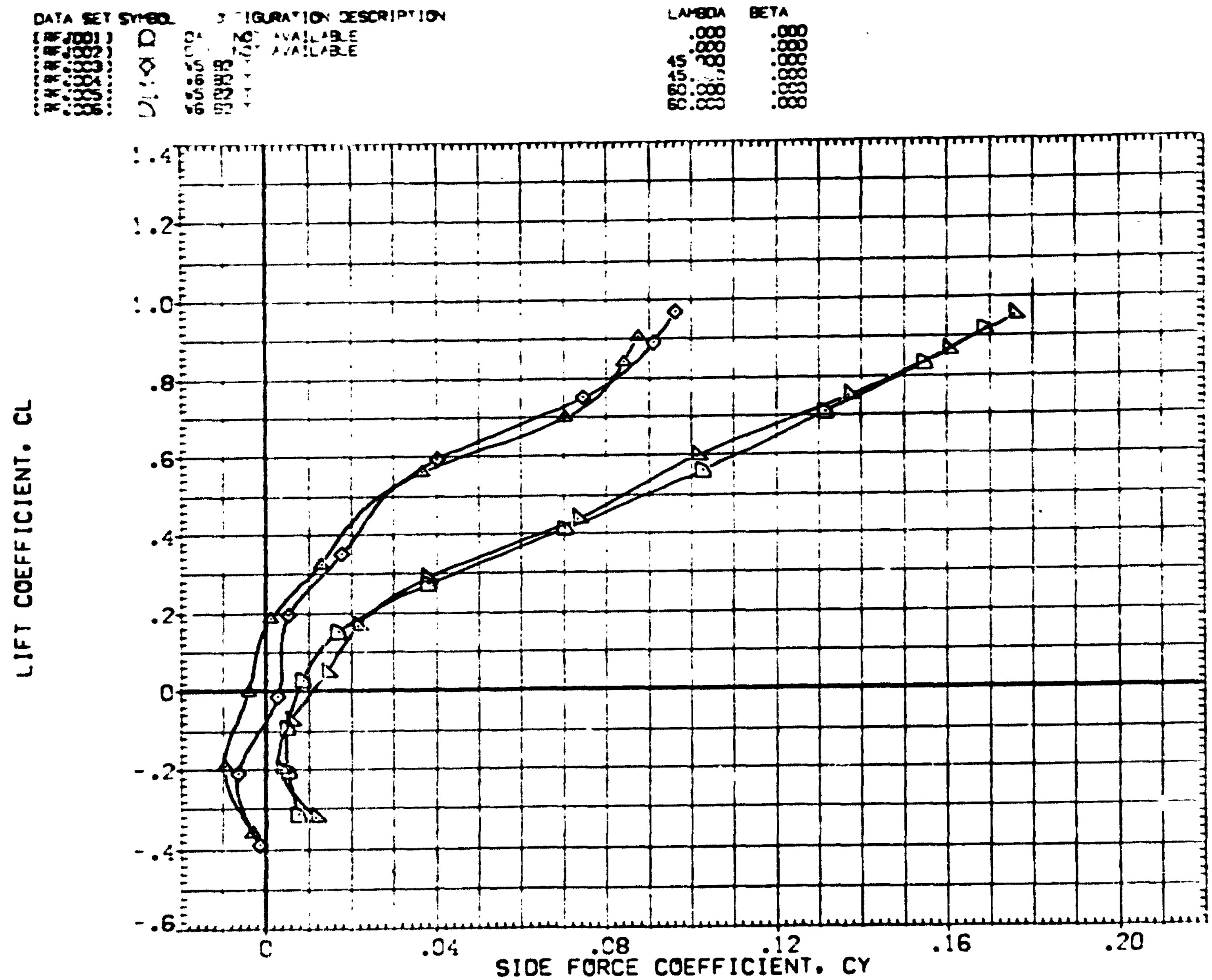


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(D)MACH = .95

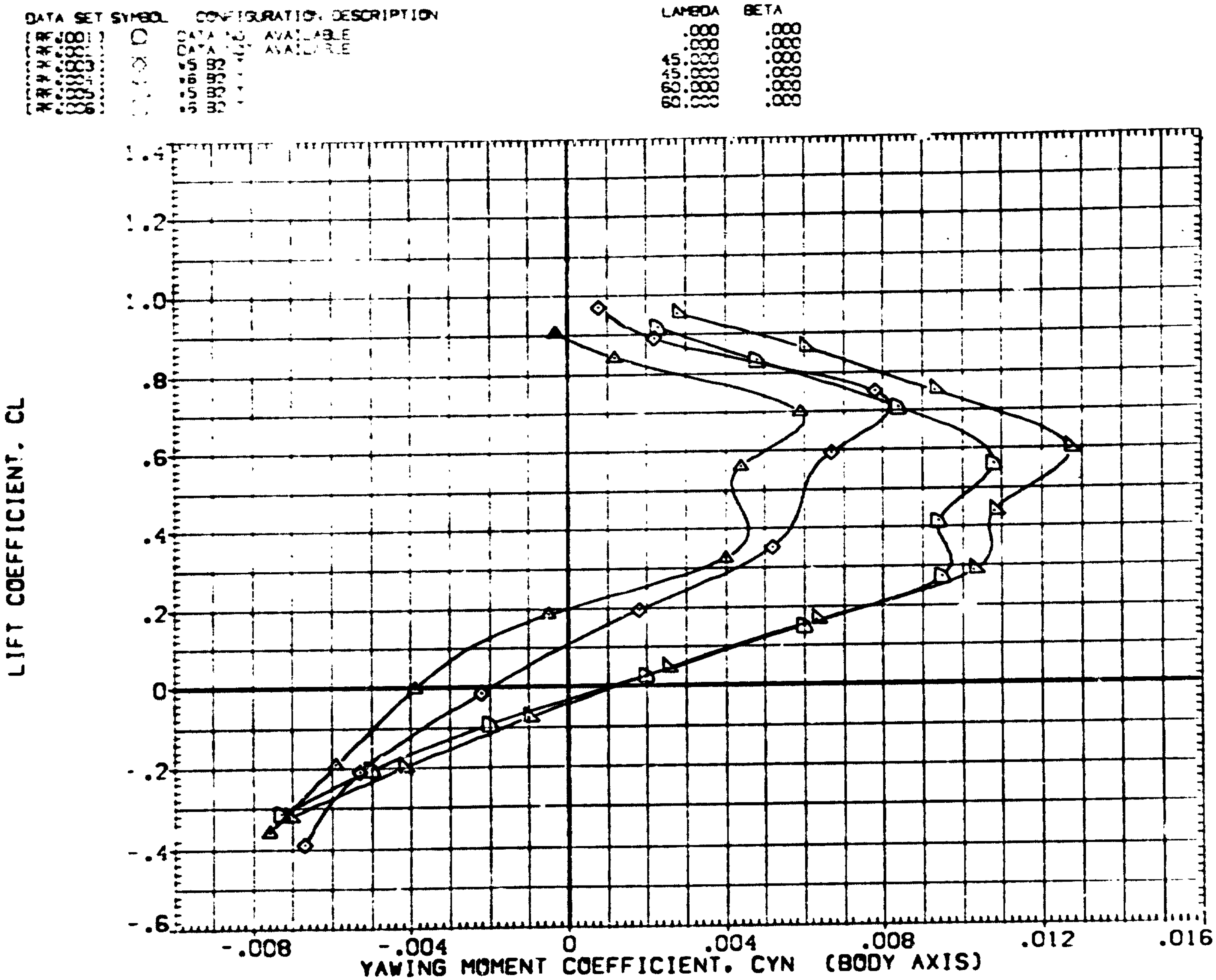


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(D)MACH = .95

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
[RFJ001]	○	DATA NOT AVAILABLE	.000	.000
[RFJ002]	□	DATA NOT AVAILABLE	.000	.000
[RFJ003]	◇	W5 B2 T	45.000	.000
[RFJ004]	△	W6 B2 T	45.000	.000
[RFJ005]	◁	W5 B2 T	60.000	.000
[RFJ006]	▷	W6 B2 T	60.000	.000

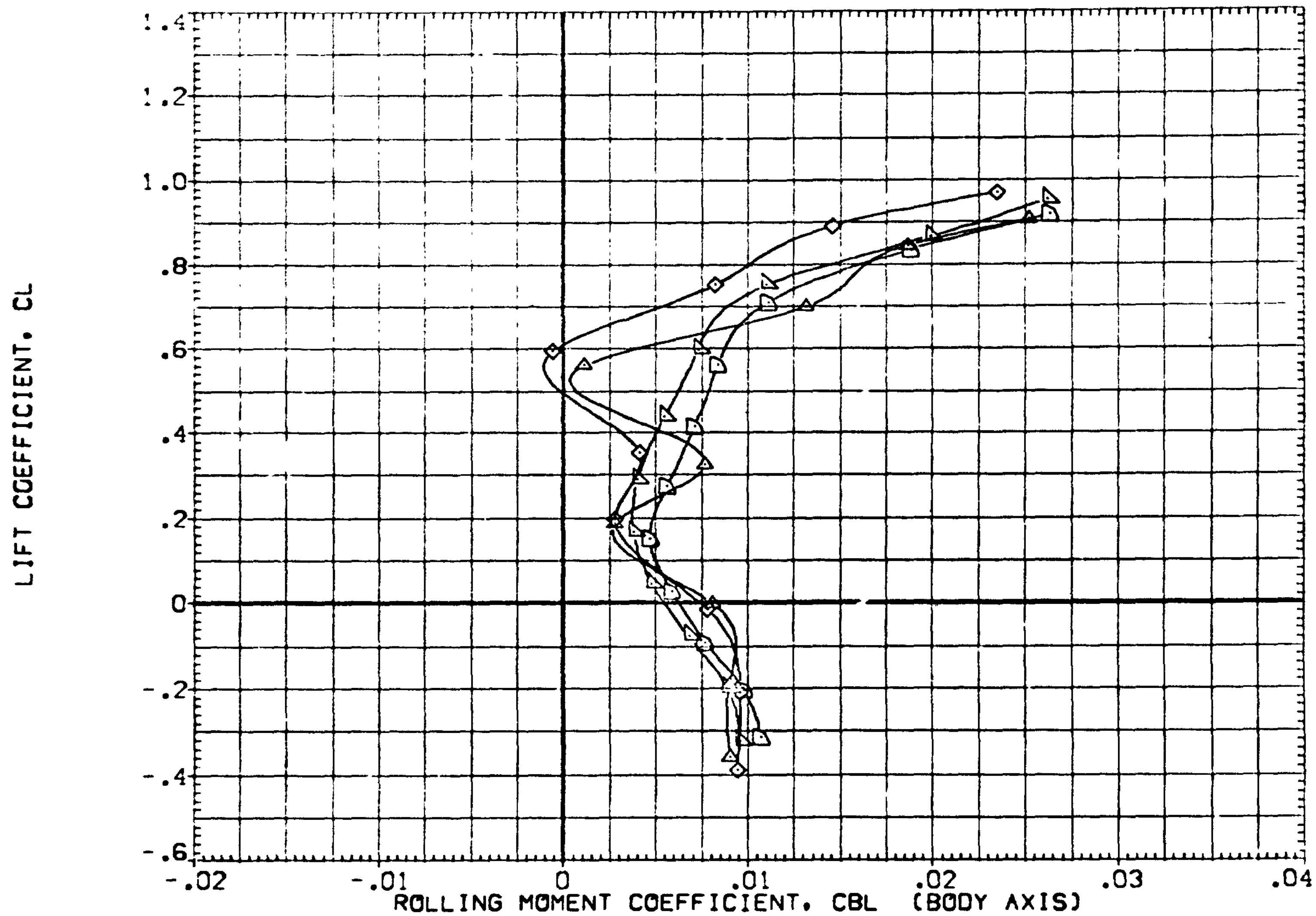


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(D)MACH = .95

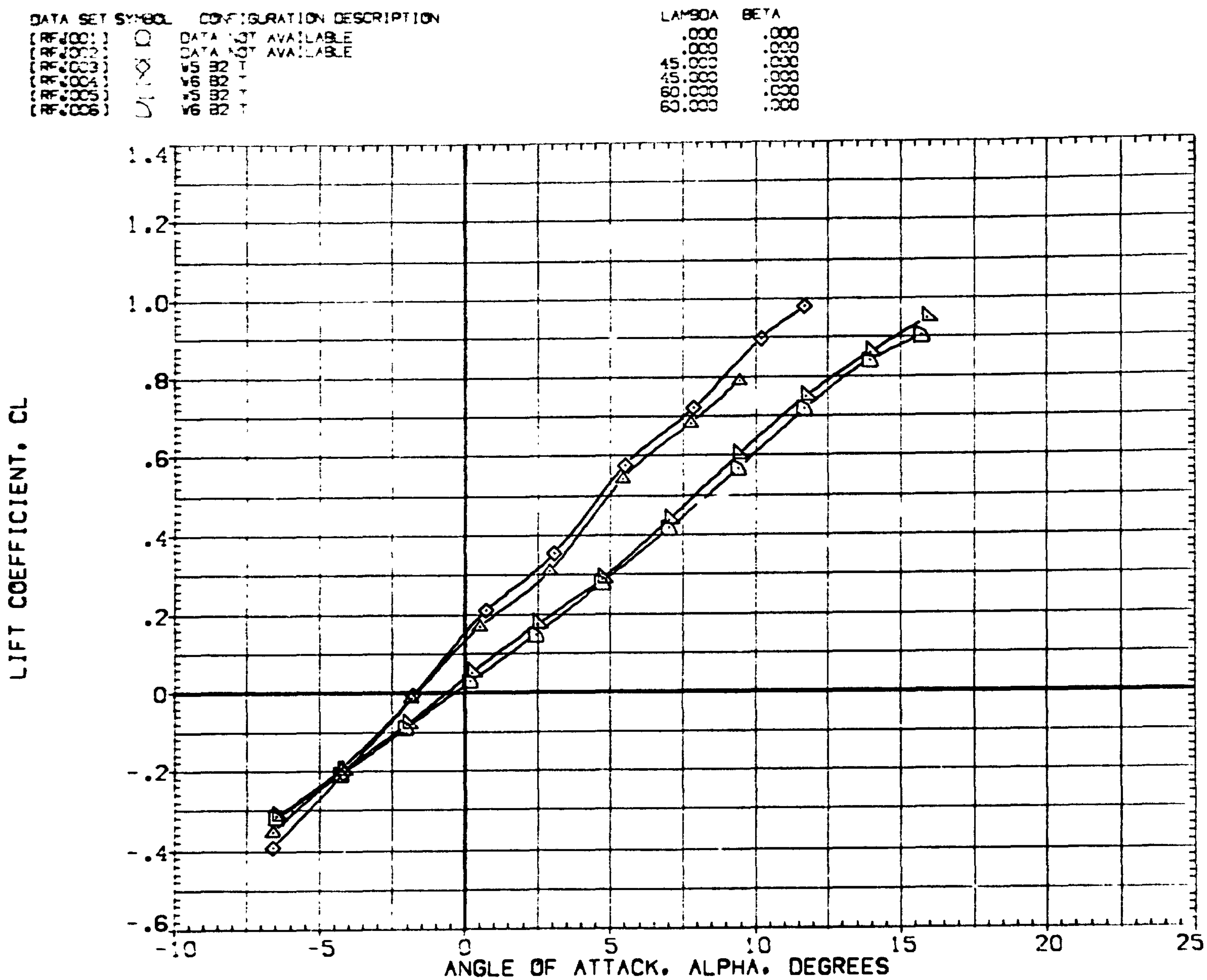


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(E)MACH = .98

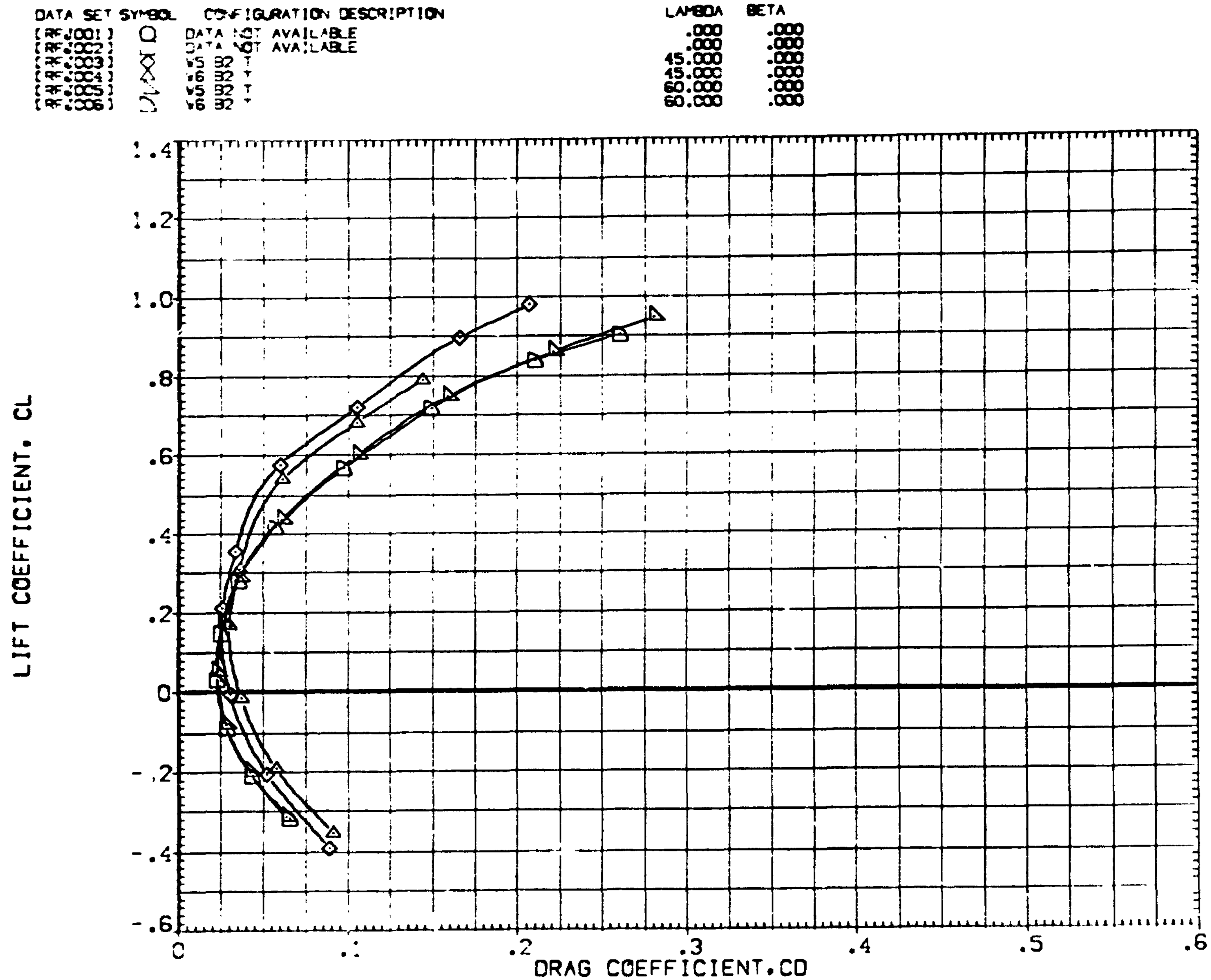


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(E)MACH = .98

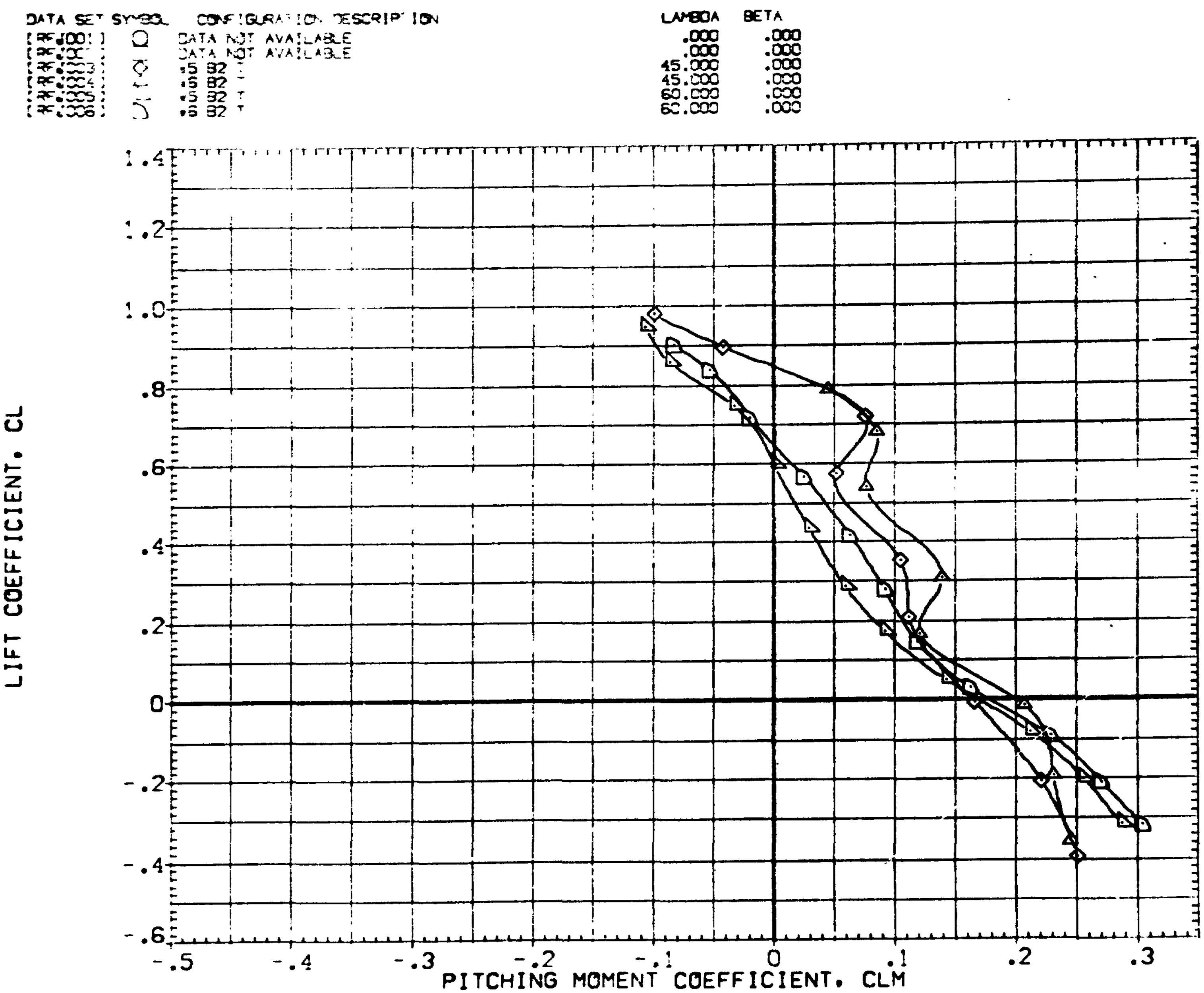


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(E)MACH = .98

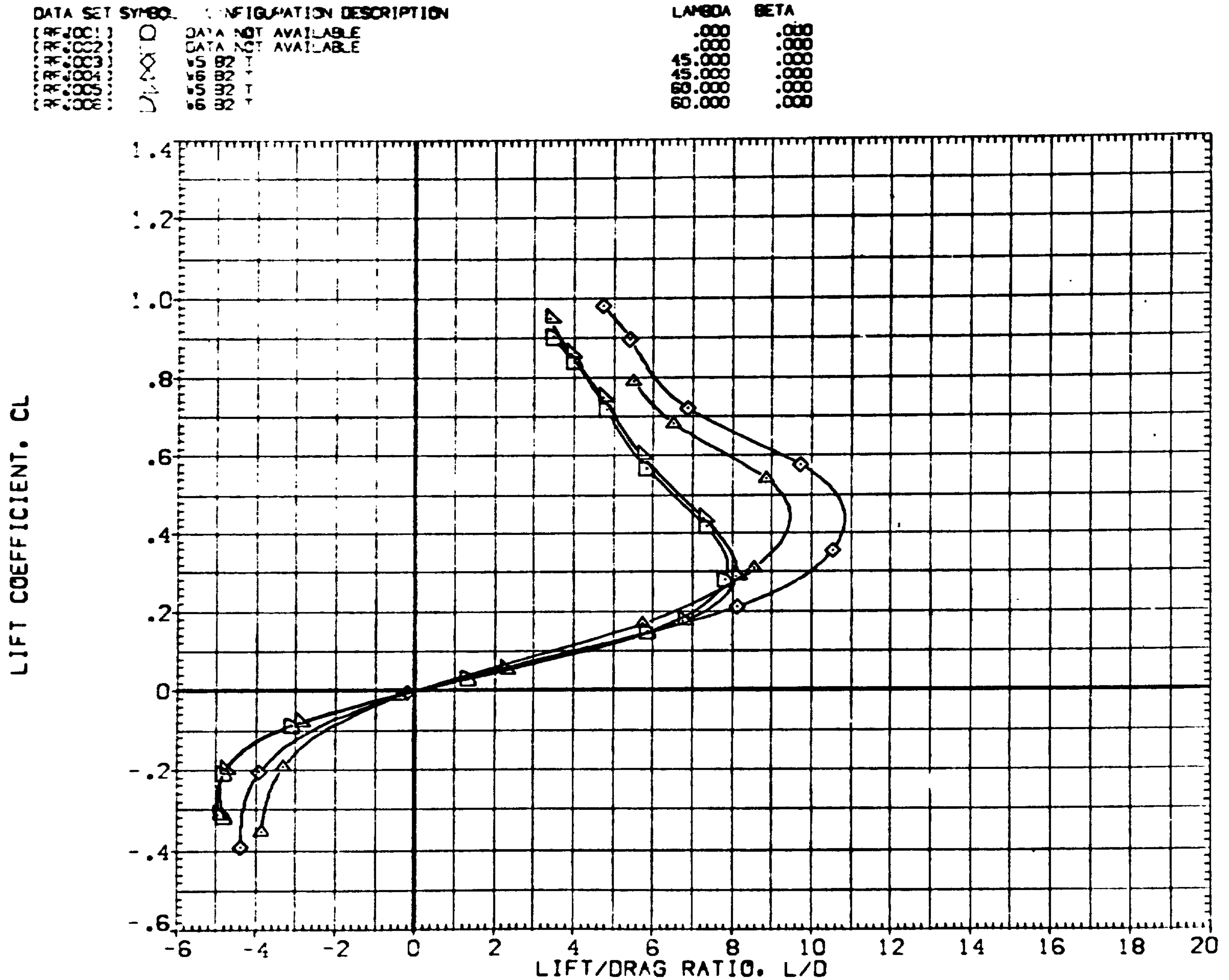


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(E)MACH = .98

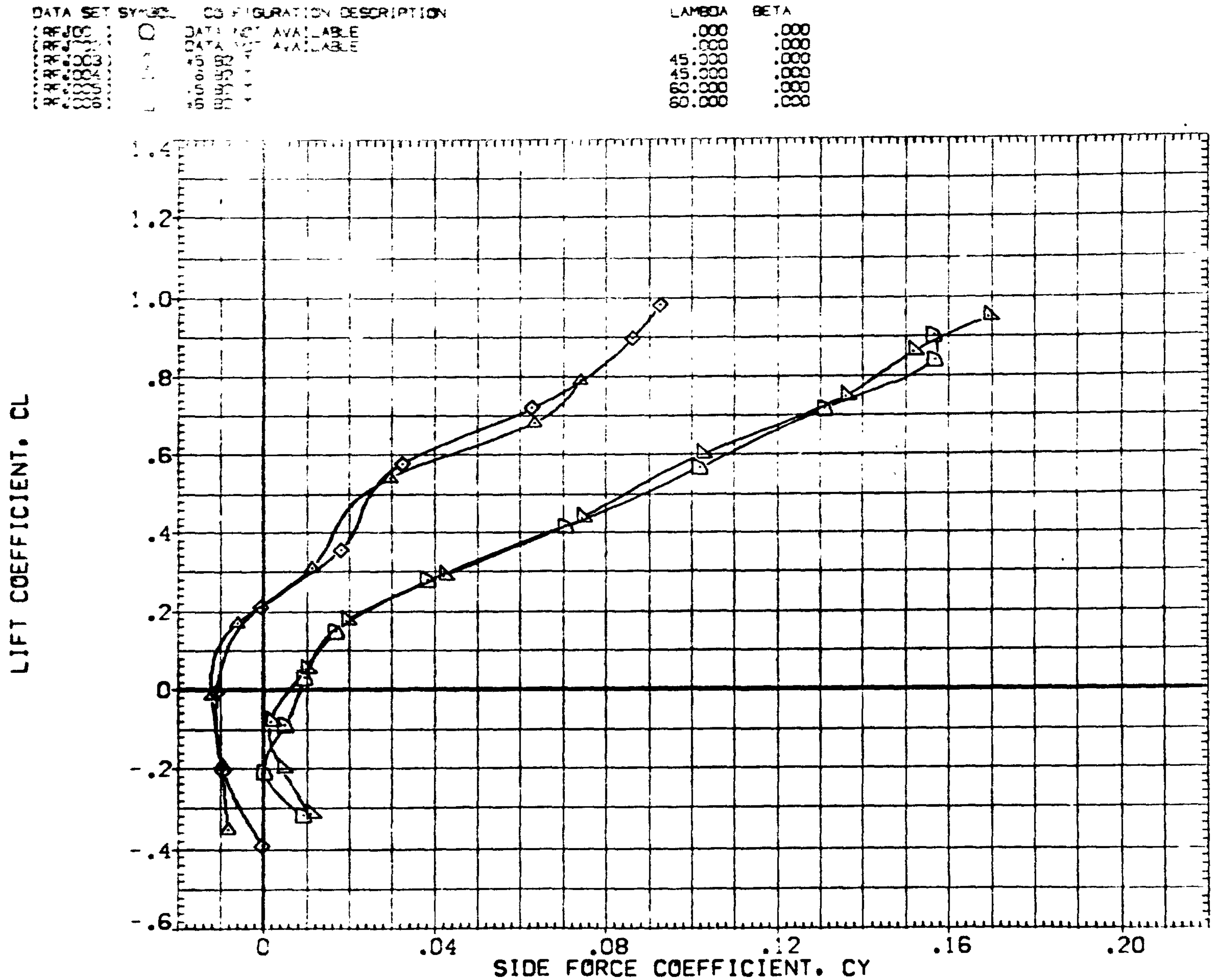


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(E)MACH = .98

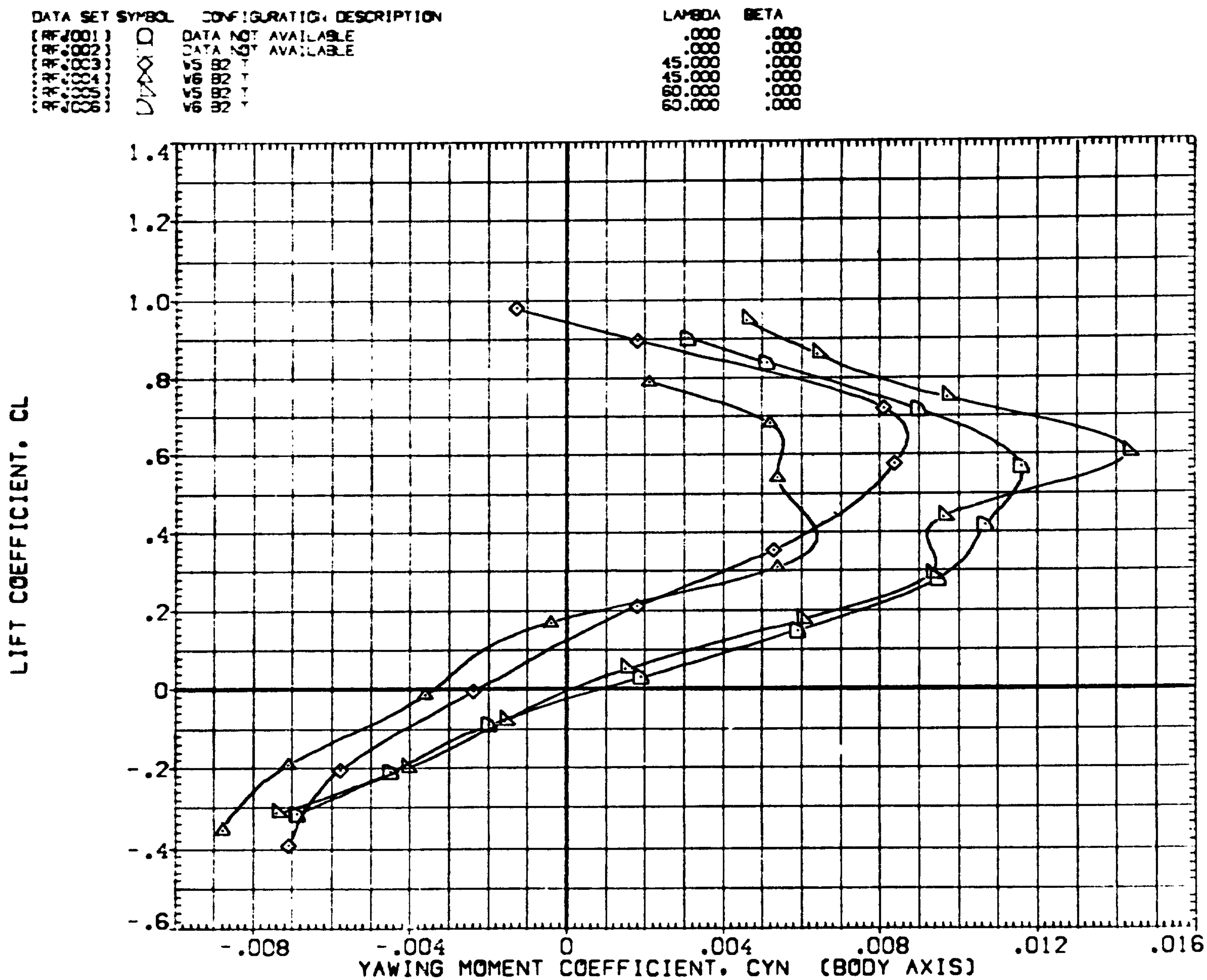


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(E)MACH = .98

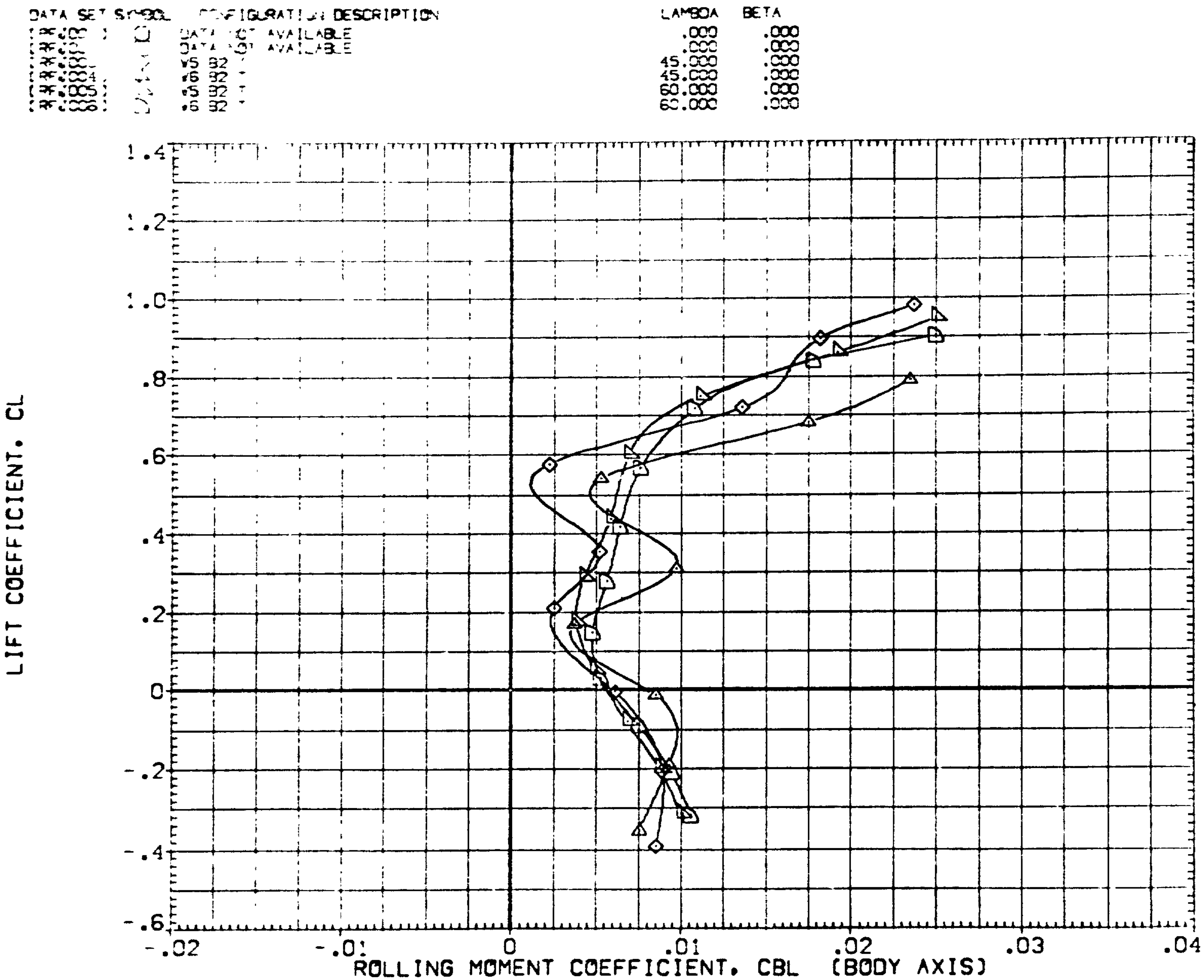


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(E)MACH = .98

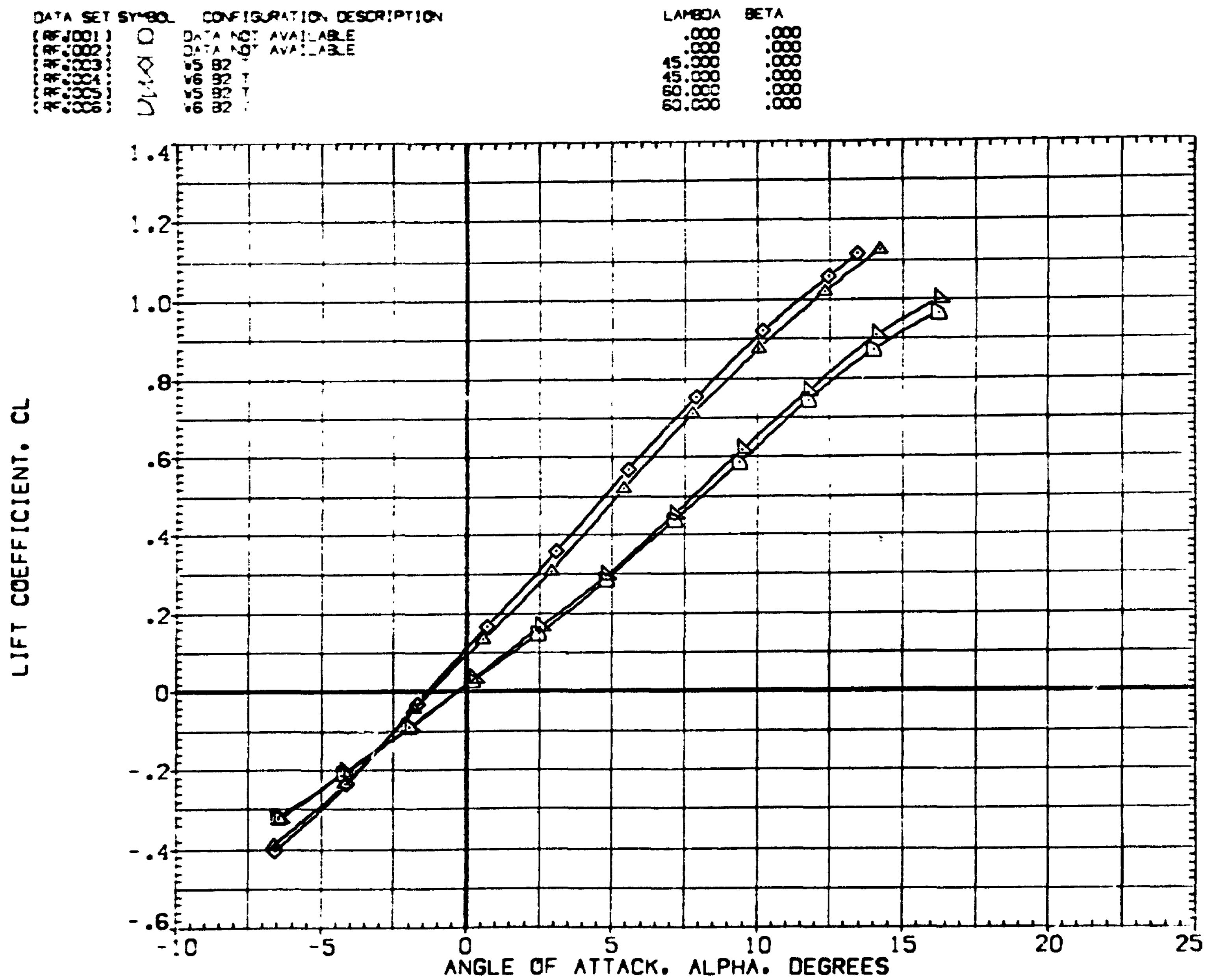


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(F)MACH = 1.05

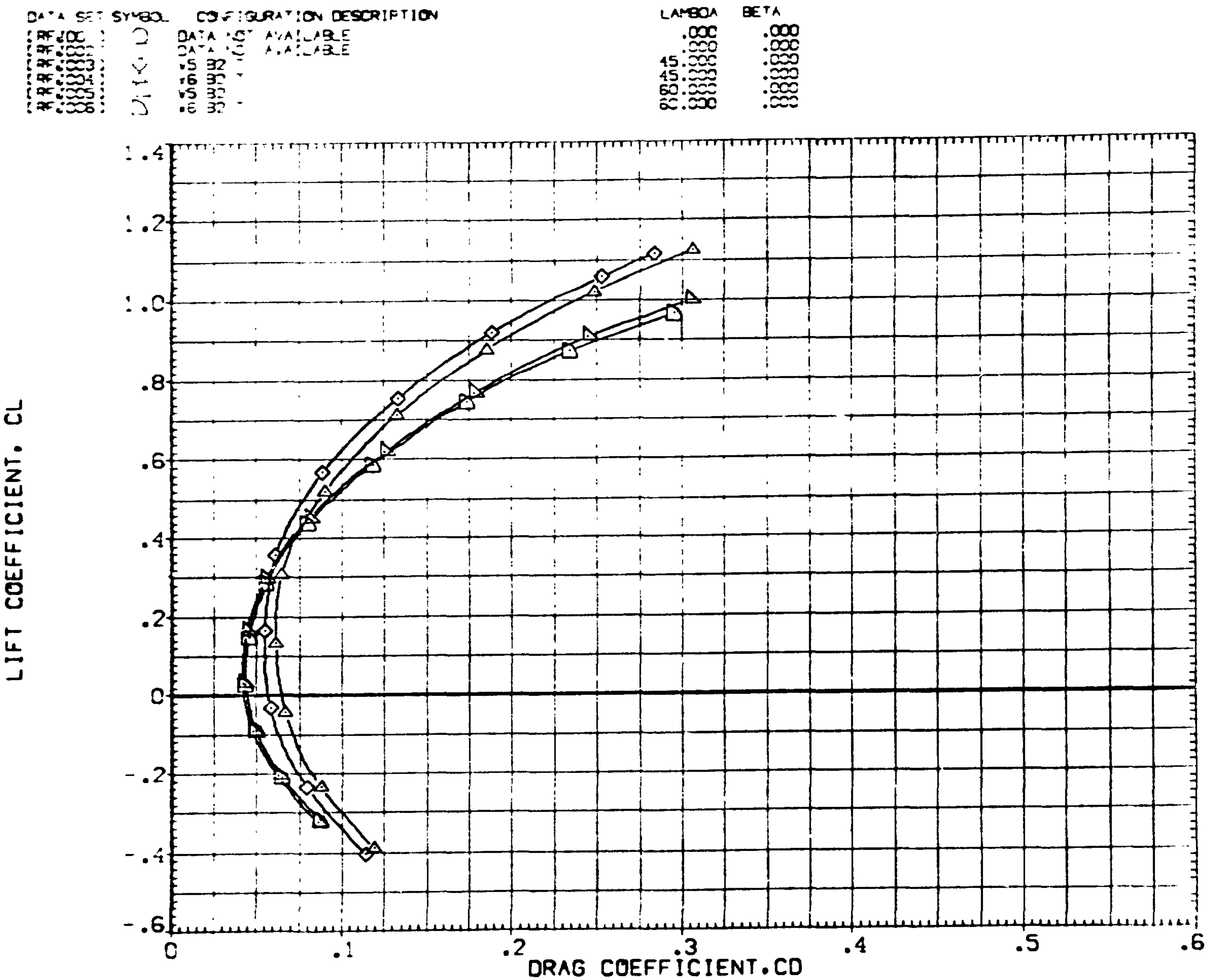


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(F)MACH = 1.05

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RFJ001)	◻	DATA NOT AVAILABLE	.000	.000
(RFJ002)	◻	DATA NOT AVAILABLE	.000	.000
(RFJ003)	◇	V5 B2 T	45.000	.000
(RFJ004)	◇	V6 B2 T	45.000	.000
(RFJ005)	△	V5 B2 T	60.000	.000
(RFJ006)	△	V6 B2 T	60.000	.000

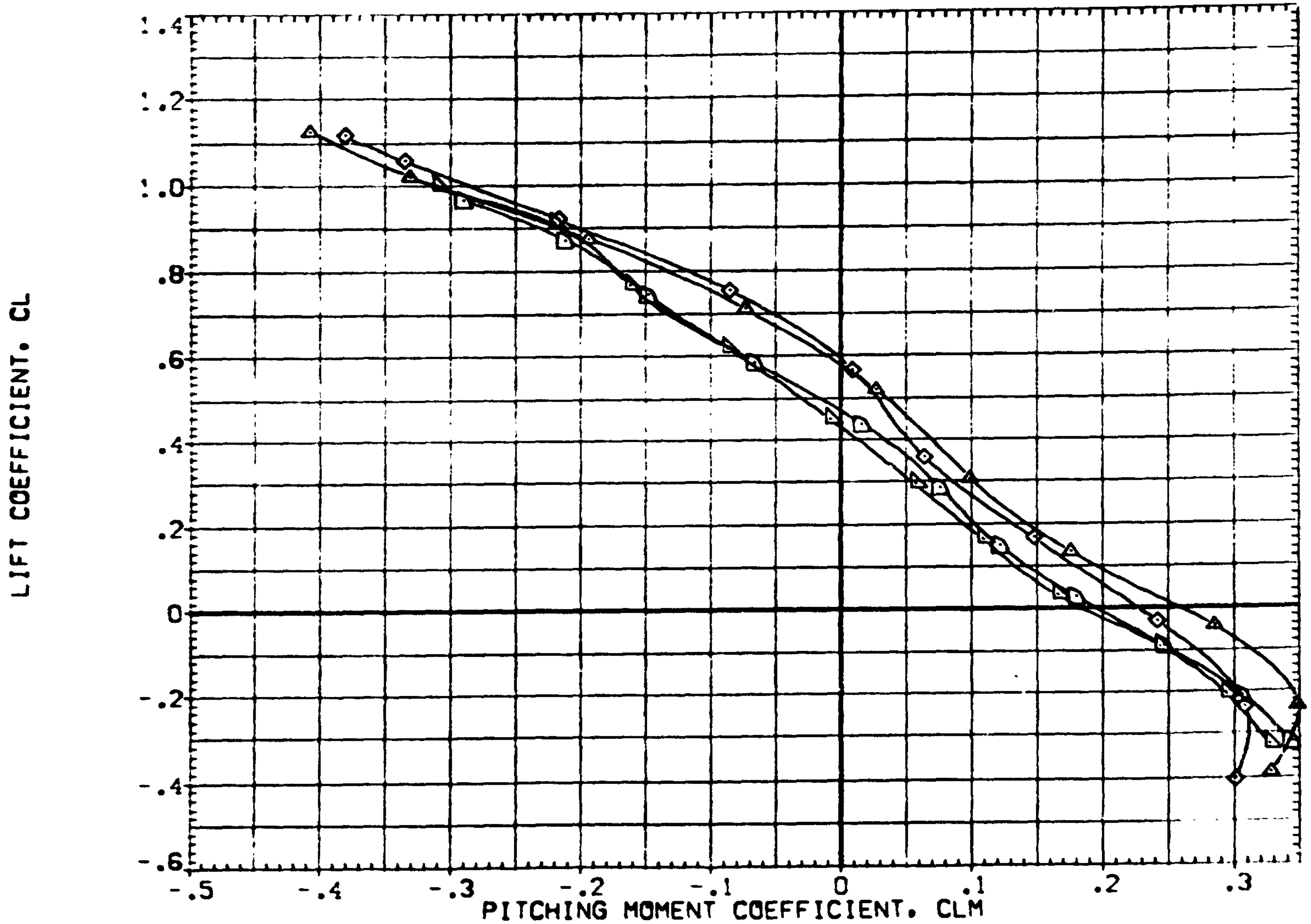


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(F)MACH = 1.05

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RFJ001)	◻	DATA NOT AVAILABLE	.000	.000
(RFJ002)	⊙	DATA NOT AVAILABLE	.000	.000
(RFJ003)	◇	V5 B2 T	45.000	.000
(RFJ004)	△	V6 B2 T	45.000	.000
(RFJ005)	◁	V5 B2 T	60.000	.000
(RFJ006)	◻	V6 B2 T	60.000	.000

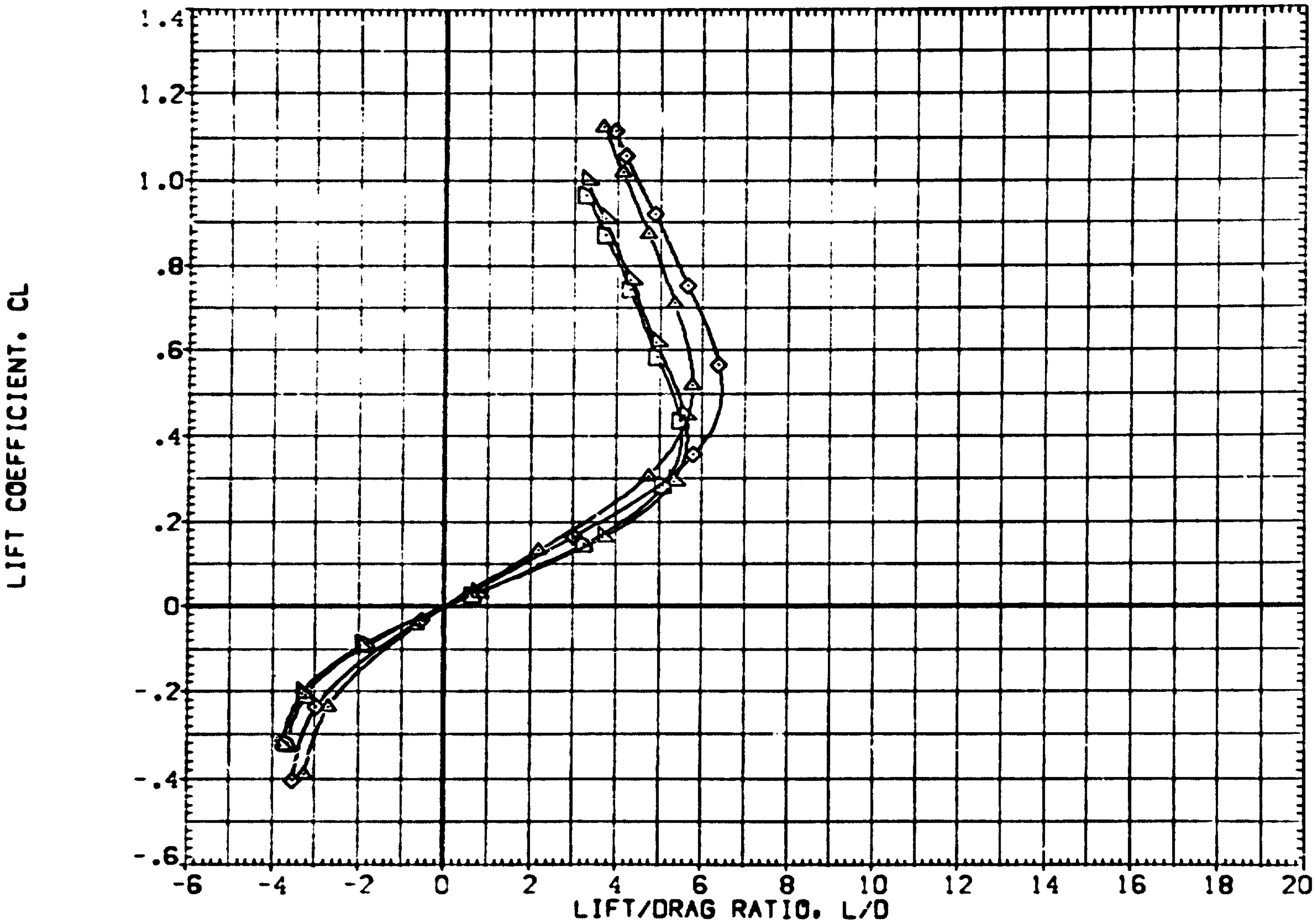


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(F)MACH = 1.05

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RFJ001)	◻	DATA NOT AVAILABLE	.000	.000
(RFJ002)	◇	DATA NOT AVAILABLE	.000	.000
(RFJ003)	◇	W5 B2 T	45.000	.000
(RFJ004)	△	W6 B2 T	45.000	.000
(RFJ005)	△	W5 B2 T	60.000	.000
(RFJ006)	◻	W6 B2 T	60.000	.000

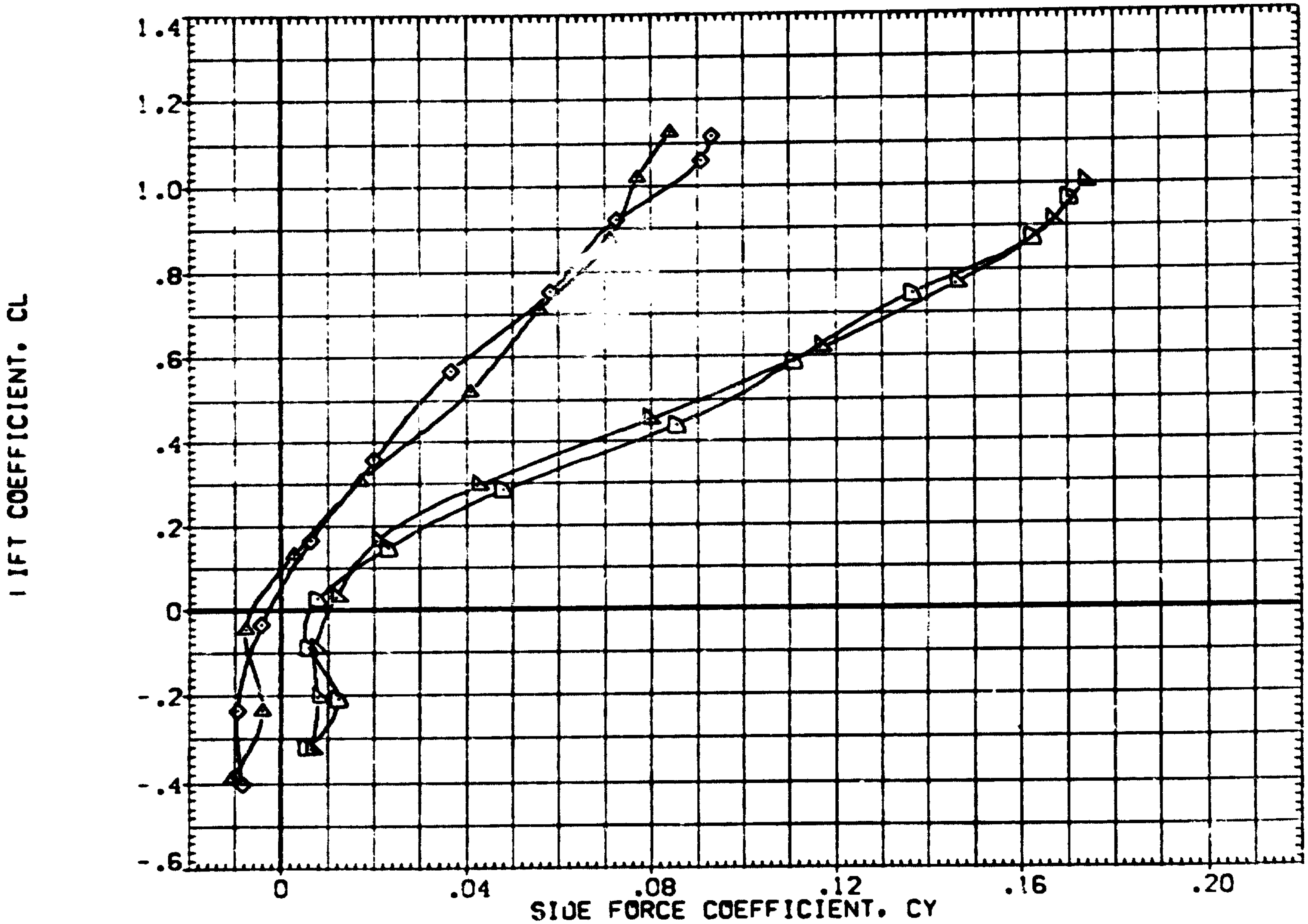


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(F)MACH = 1.05

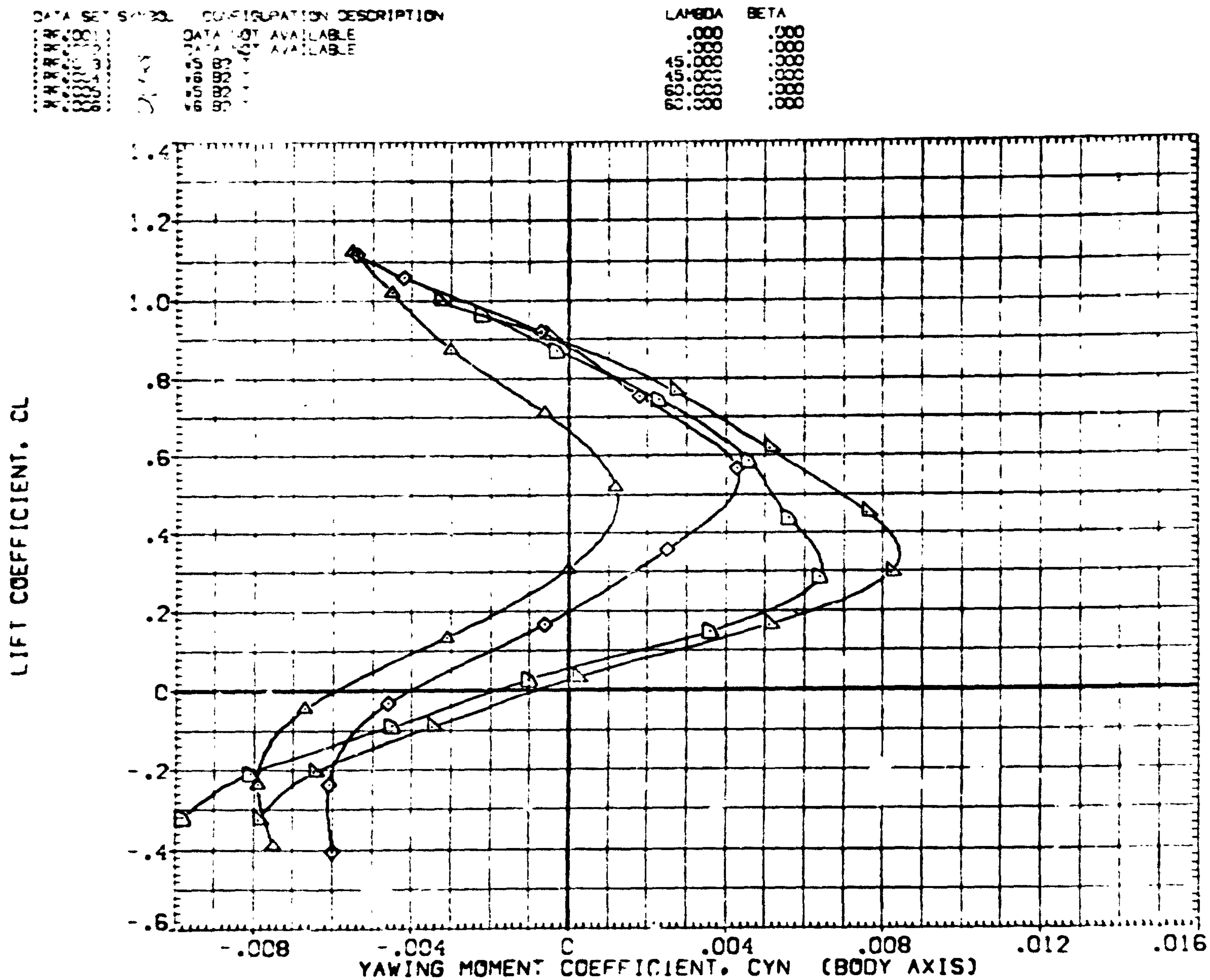


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(F)MACH = 1.05

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
[RFJ001]	○	DATA NOT AVAILABLE	.000	.000
[RFJ002]	□	DATA NOT AVAILABLE	.000	.000
[RFJ003]	◇	W5 B2 T	45.000	.000
[RFJ004]	◁	W6 B2 T	45.000	.000
[RFJ005]	△	W5 B2 T	60.000	.000
[RFJ006]	▷	W6 B2 T	60.000	.000

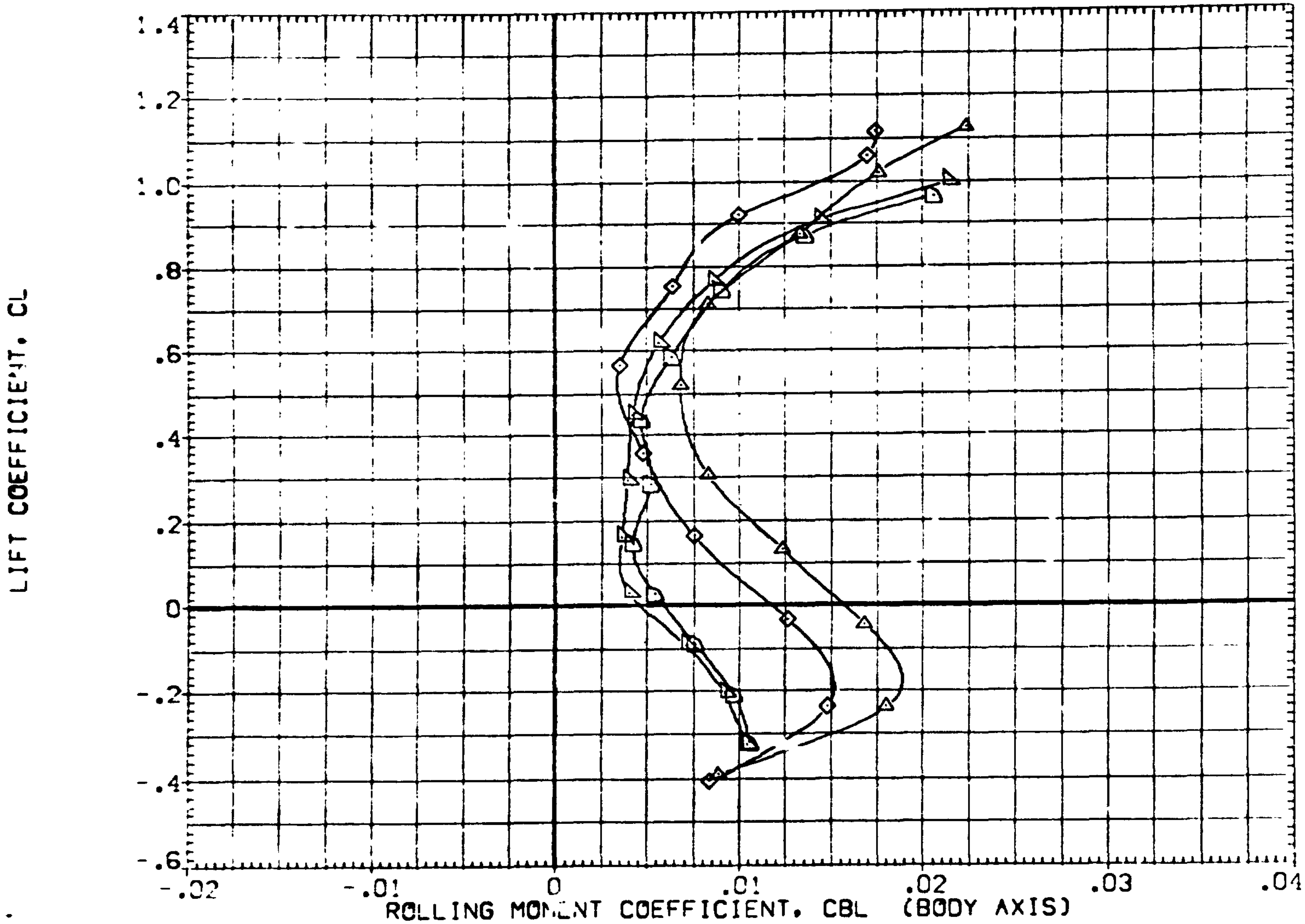


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(F)MACH = 1.05

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RPJ001)	○	DATA NOT AVAILABLE	.000	.000
(RFJ002)	⊠	DATA NOT AVAILABLE	.000	.000
(RFJ003)	◇	DATA NOT AVAILABLE	45.000	.000
(RFJ004)	✕	DATA NOT AVAILABLE	45.000	.000
(RFJ005)	△	V5 B2	60.000	.000
(RFJ006)	◁	V6 B2	60.000	.000

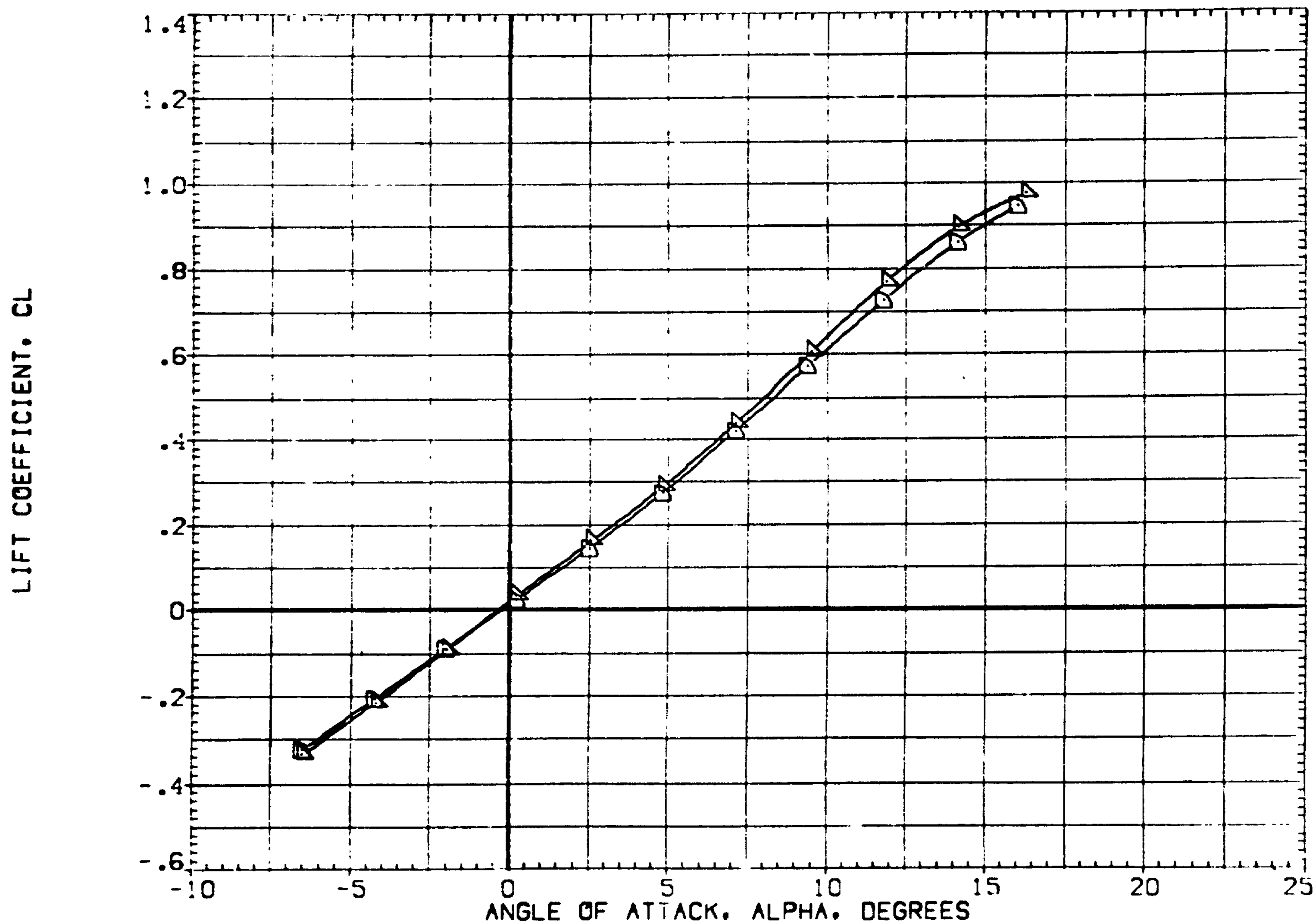


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(G)MACH = 1.10

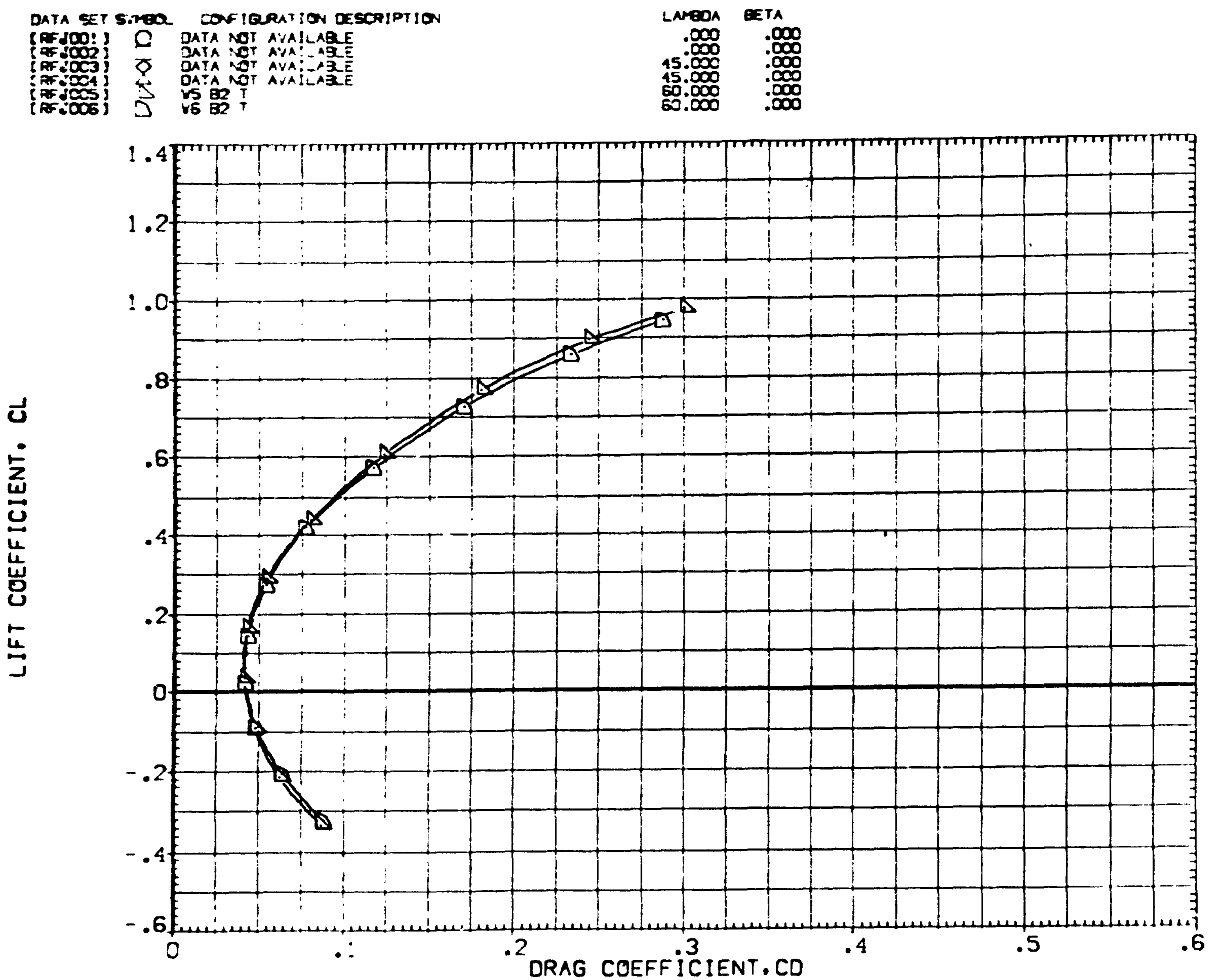


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(G)MACH = 1.10

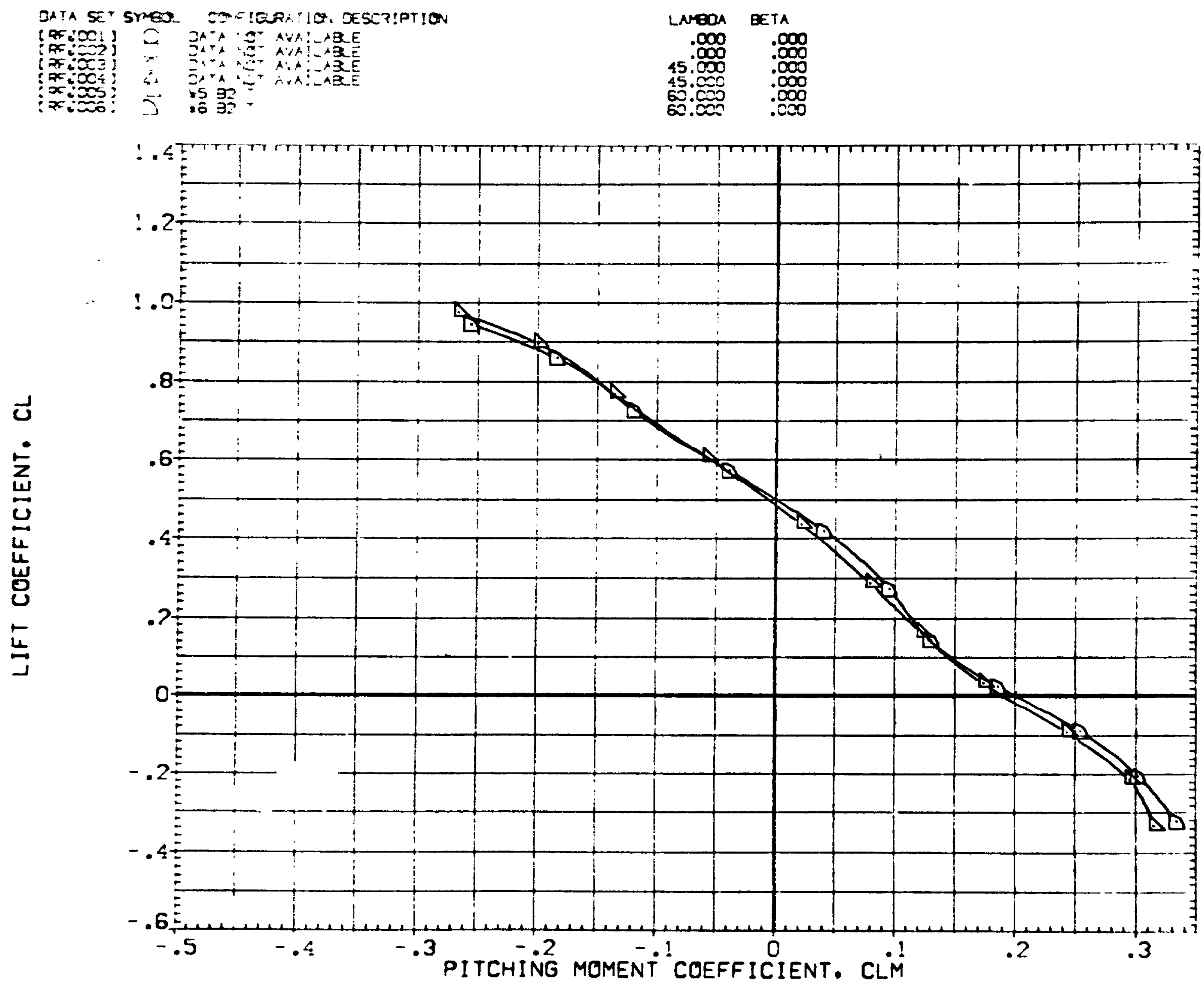


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(G)MAC- = 1.10

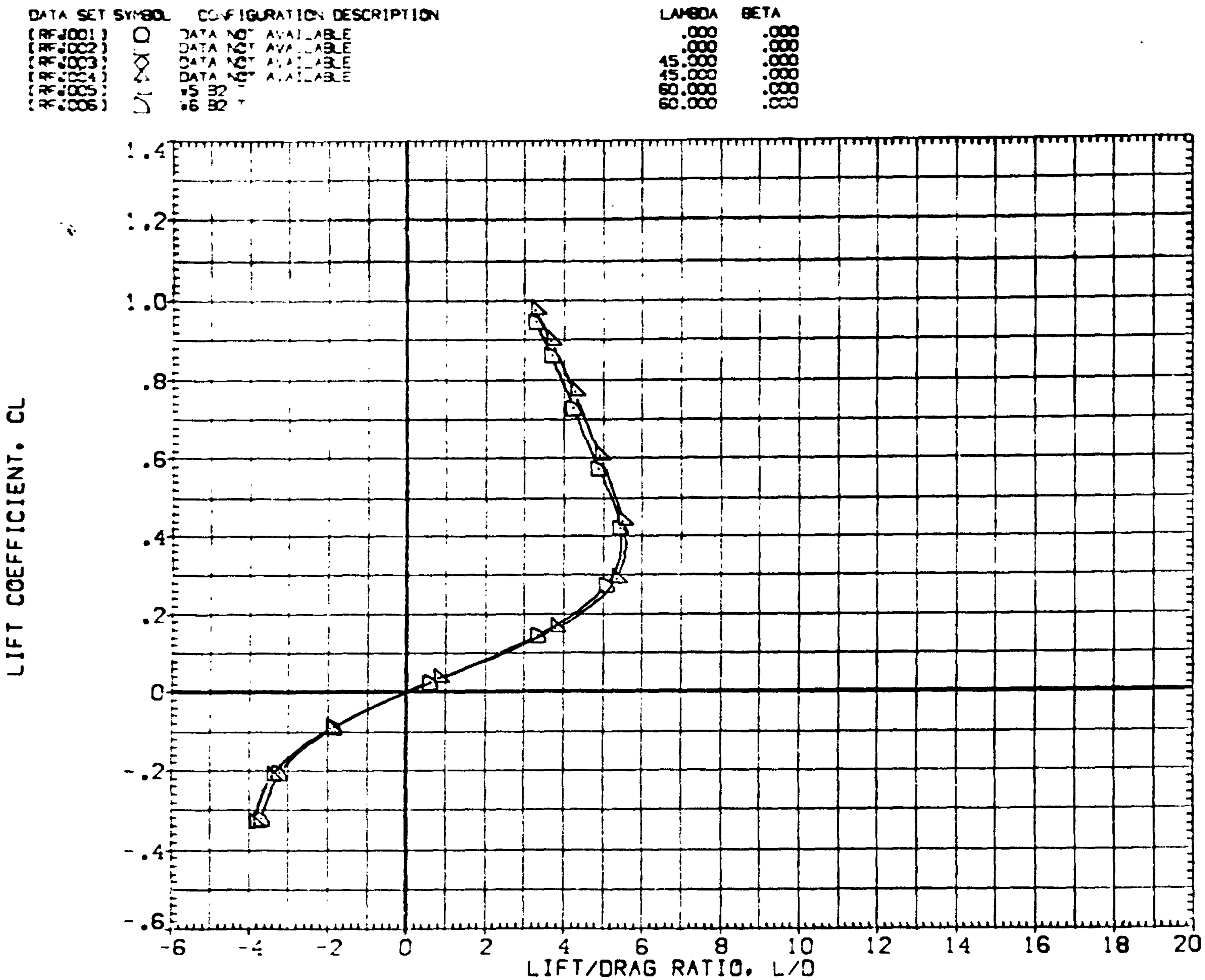


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(G)MACH = 1.10

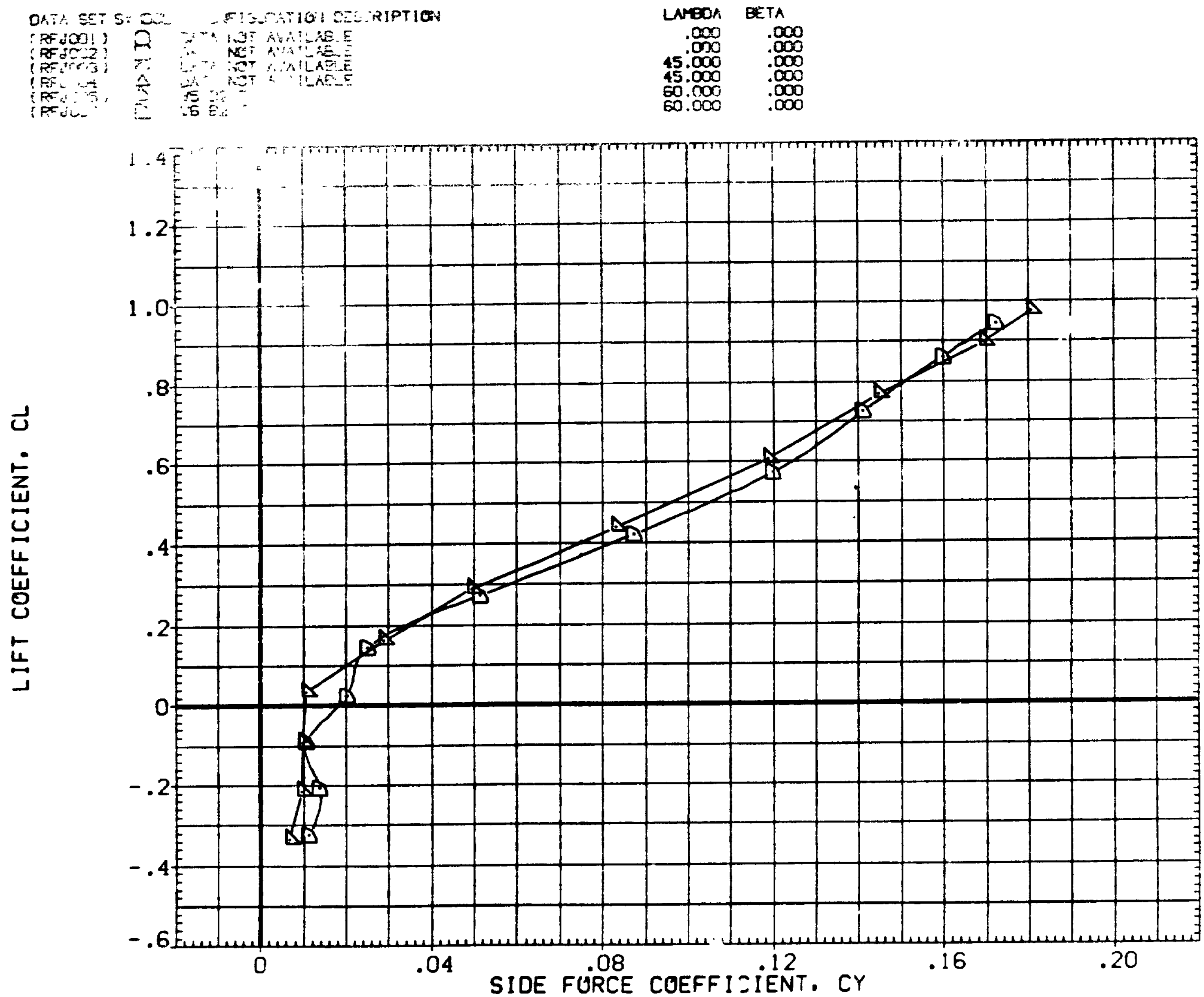


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.
(G)MACH = 1.10

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RFJ001)	◻	DATA NOT AVAILABLE	.000	.000
(RFJ002)		DATA NOT AVAILABLE	.000	.000
(RFJ003)	◇	DATA NOT AVAILABLE	45.000	.000
(RFJ004)		DATA NOT AVAILABLE	45.000	.000
(RFJ005)	△	VS B2 T	60.000	.000
(RFJ006)	◺	V6 B2 T	60.000	.000

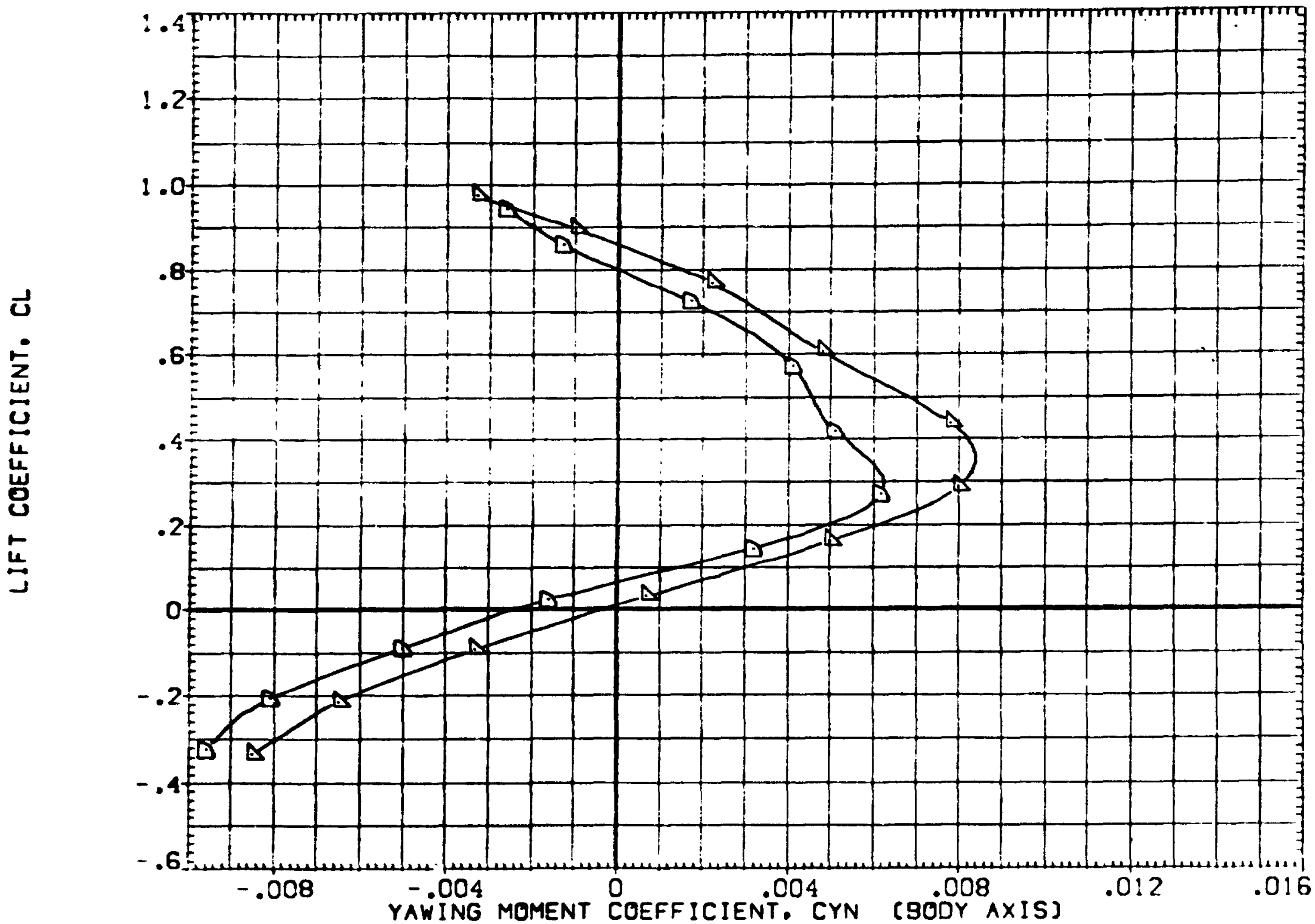


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(G)MACH = 1.10

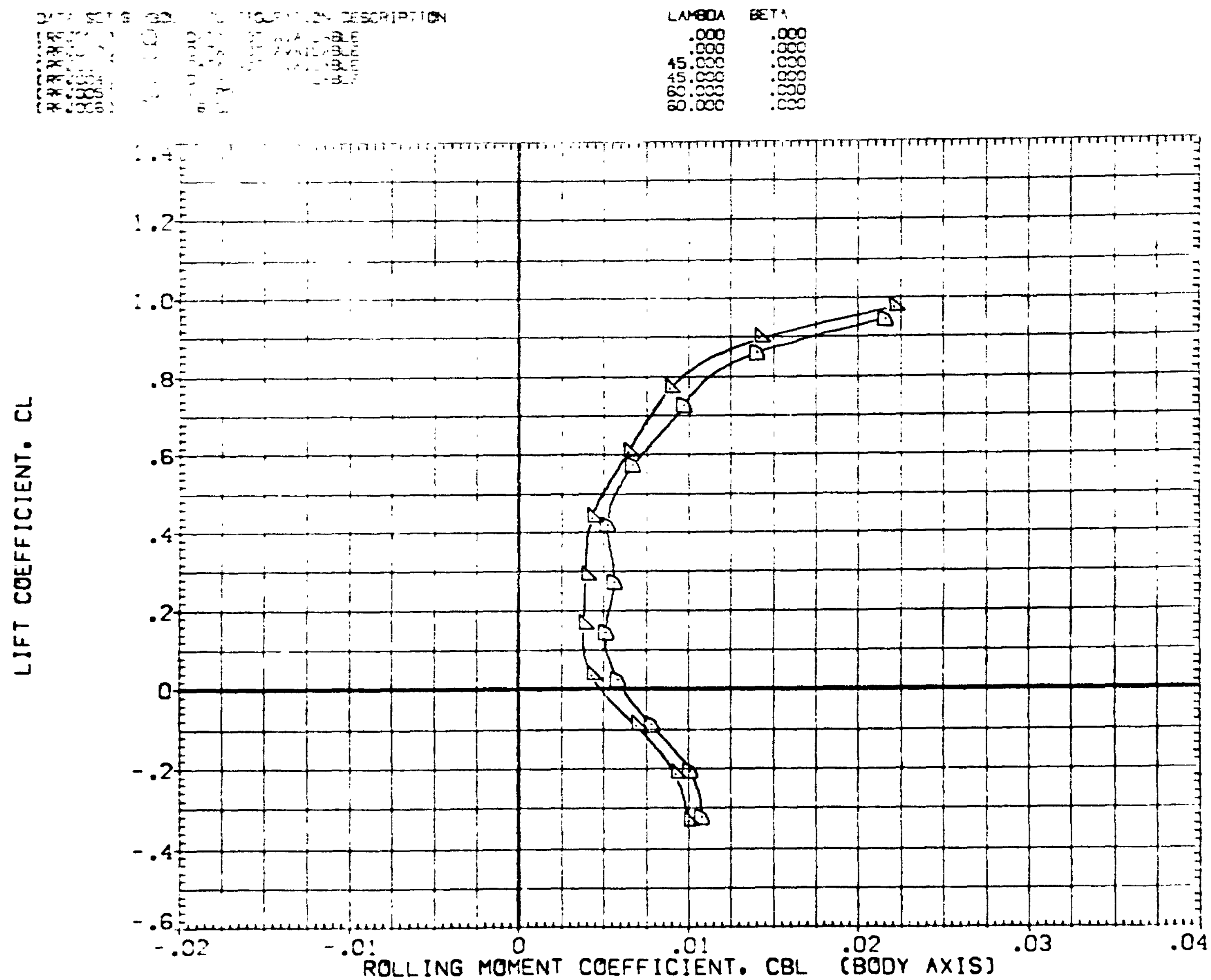


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(G)MACH = 1.10

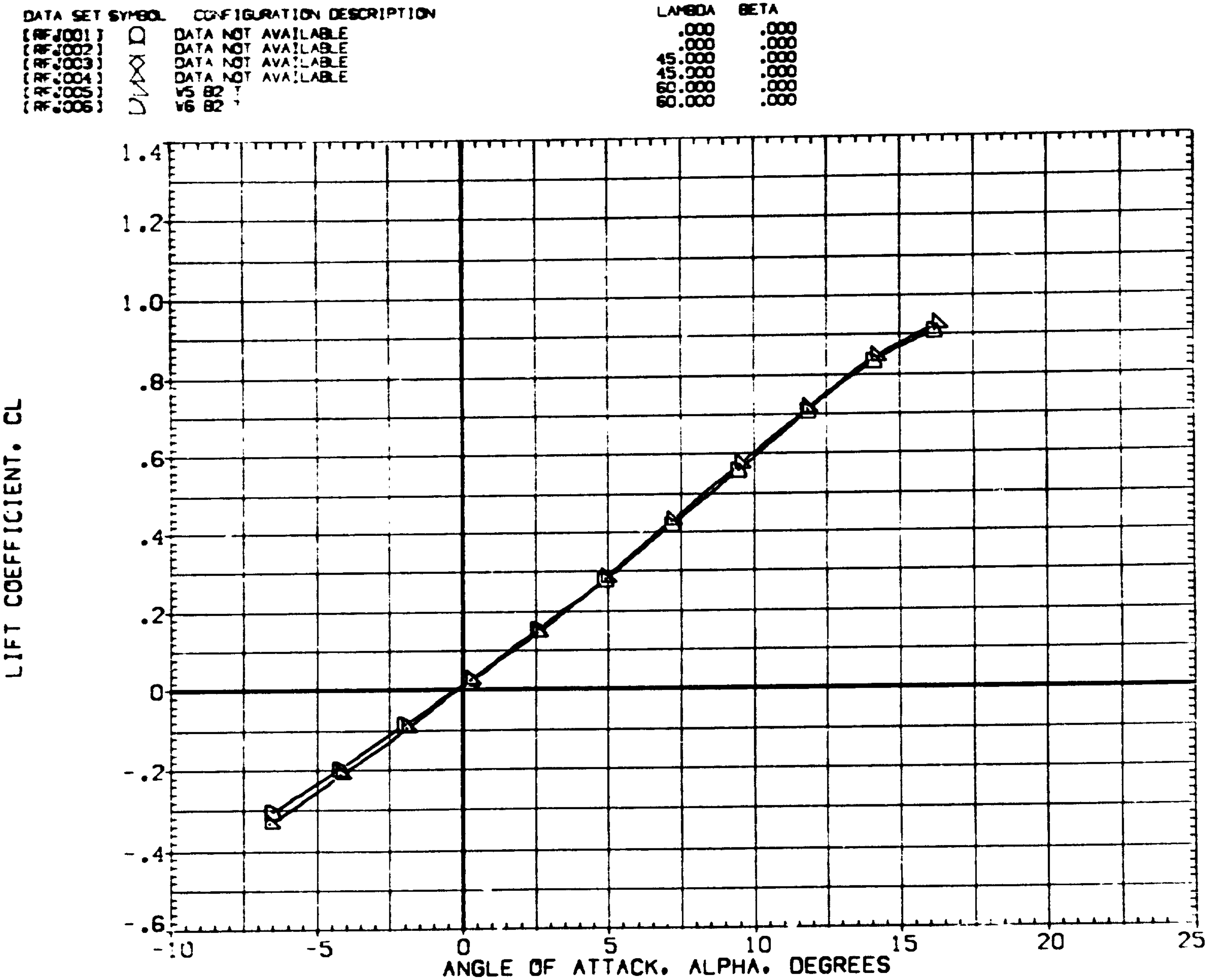


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(H)MACH = 1.20

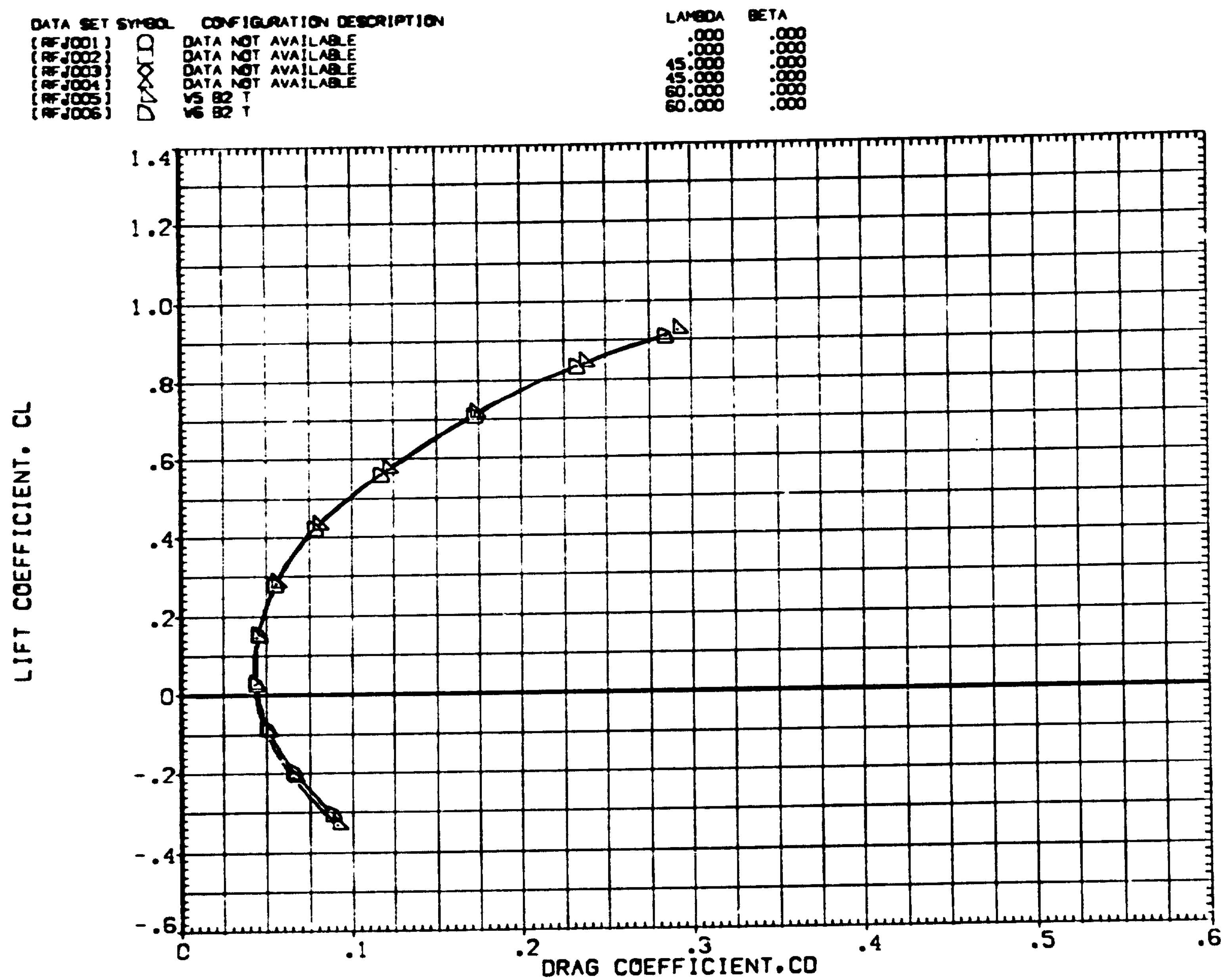


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(H)MACH = 1.20

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RFJ001)	○	DATA NOT AVAILABLE	.000	.000
(RFJ002)	□	DATA NOT AVAILABLE	.000	.000
(RFJ003)	◇	DATA NOT AVAILABLE	45.000	.000
(RFJ004)	▽	DATA NOT AVAILABLE	45.000	.000
(RFJ005)	△	V5 B2 T	60.000	.000
(RFJ006)	⊿	V6 B2 T	60.000	.000

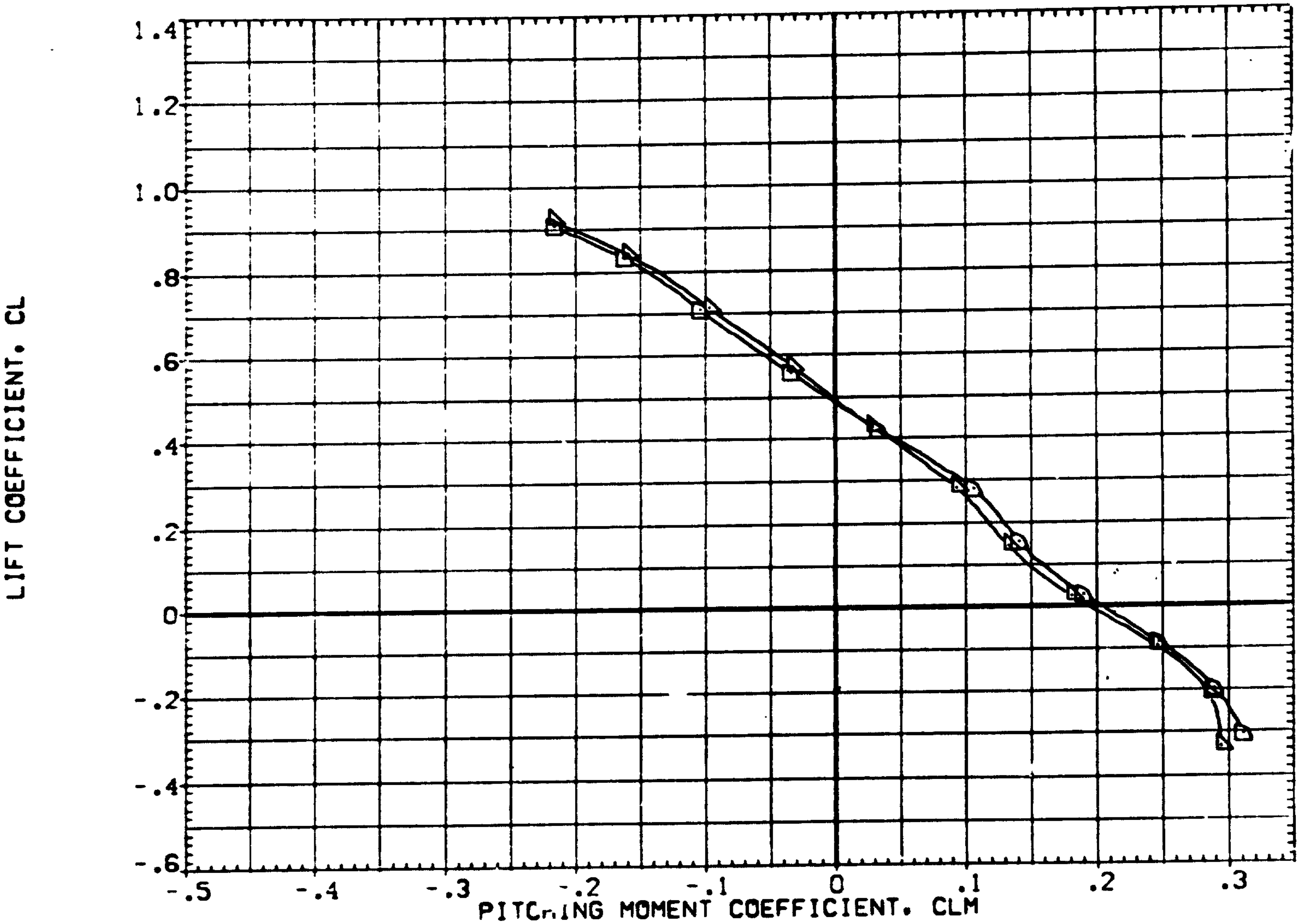


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(H)MACH = 1.20

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RFJ001)	○	DATA NOT AVAILABLE	.000	.000
(RFJ002)		DATA NOT AVAILABLE	.000	.000
(RFJ003)		DATA NOT AVAILABLE	45.000	.000
(RFJ004)		DATA NOT AVAILABLE	45.000	.000
(RFJ005)		15 B2	60.000	.000
(RFJ006)		16 B2	60.000	.000

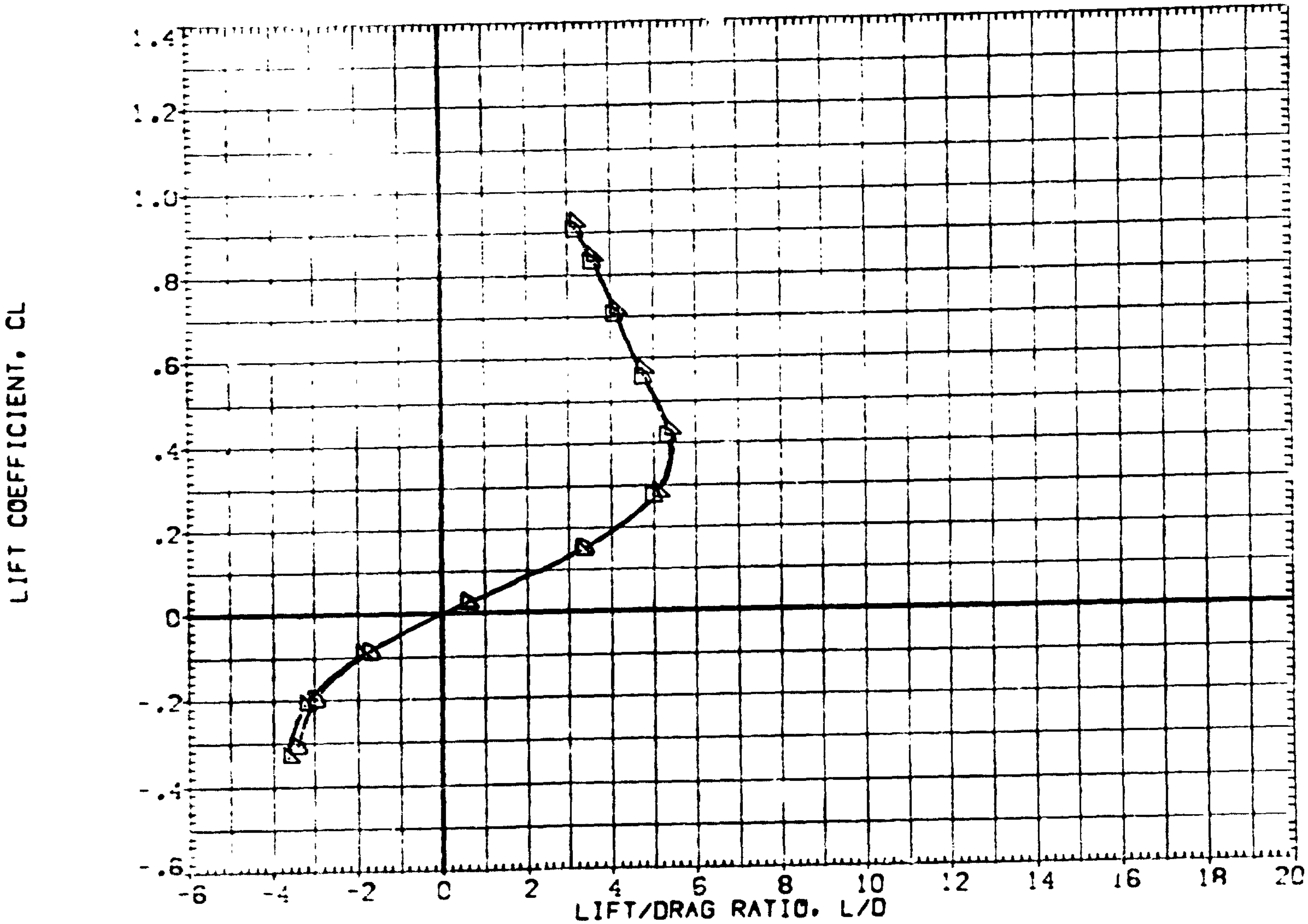


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(H)MACH = 1.20

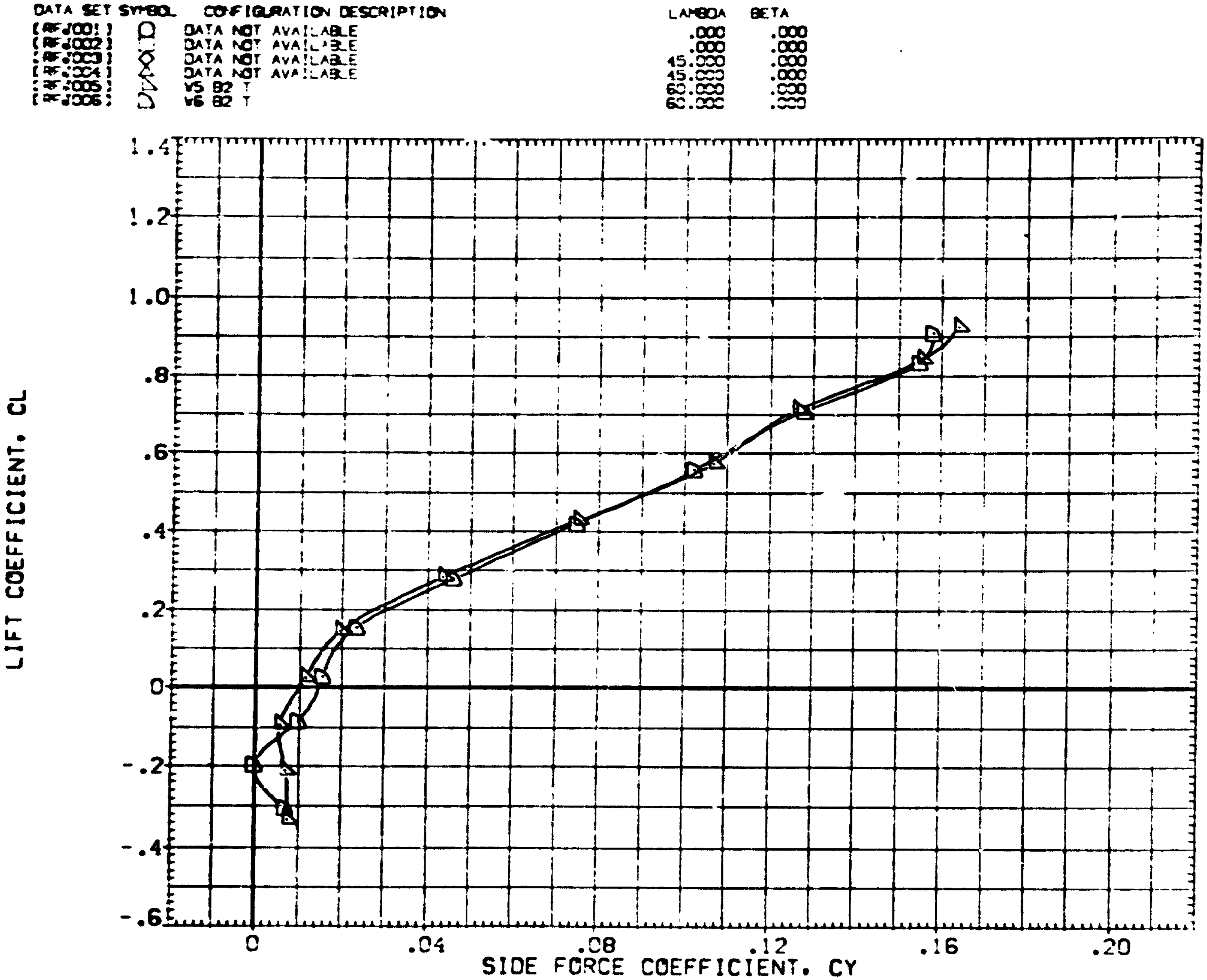


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(H)MACH = 1.20

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	BETA
(RFJ001)	◻	DATA NOT AVAILABLE	.000	.000
(RFJ002)	○	DATA NOT AVAILABLE	.000	.000
(RFJ003)	◇	DATA NOT AVAILABLE	45.000	.000
(RFJ004)	△	DATA NOT AVAILABLE	45.000	.000
(RFJ005)	◺	V5 B2 T	60.000	.000
(RFJ006)	◻	V6 B2 T	60.000	.000

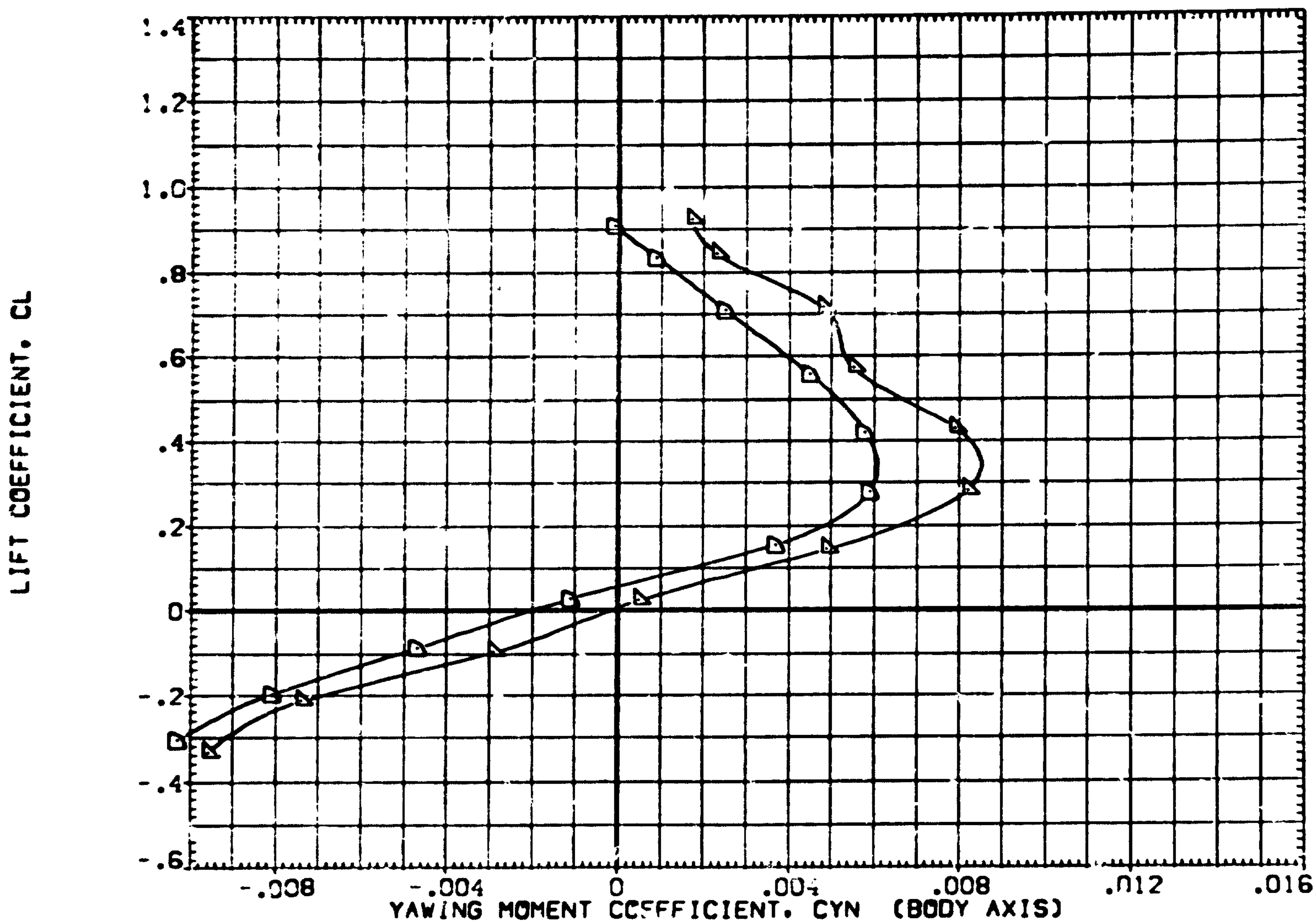


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(H)MACH = 1.20

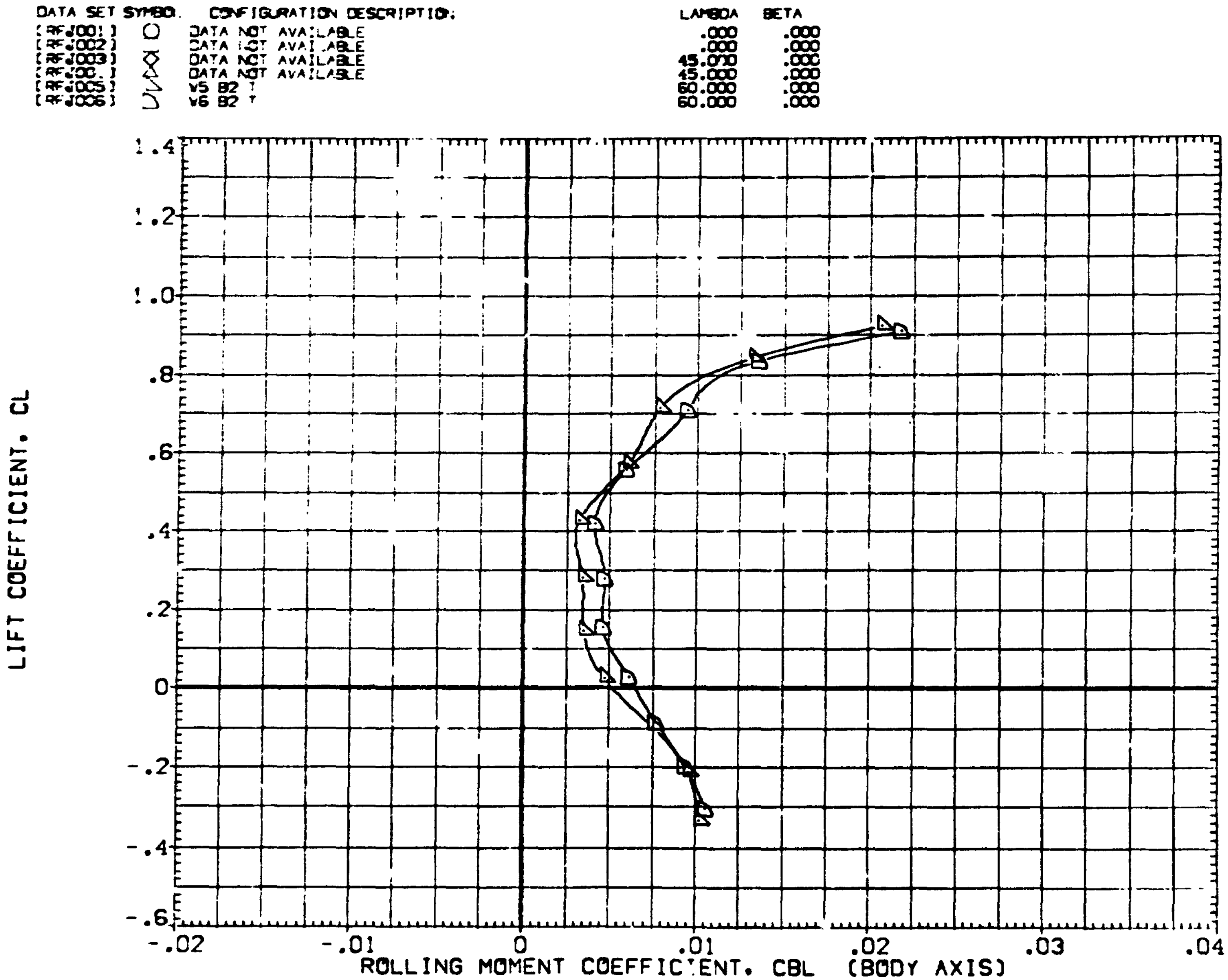


FIGURE 4. AERO. CHARACTERISTICS IN PITCH- COMPARISON OF 12 AND 14-PERCENT WINGS.

(H)MACH = 1.20

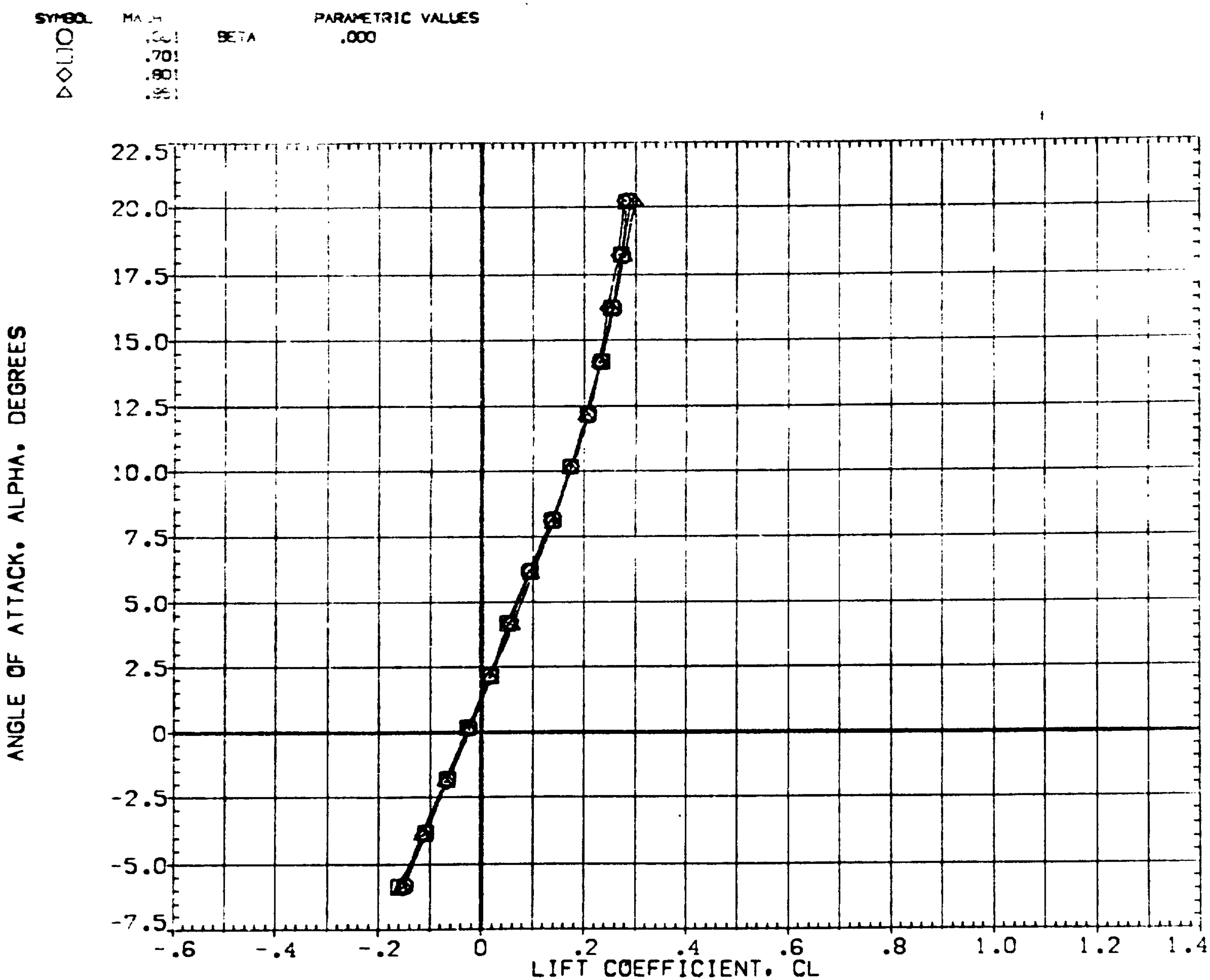


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

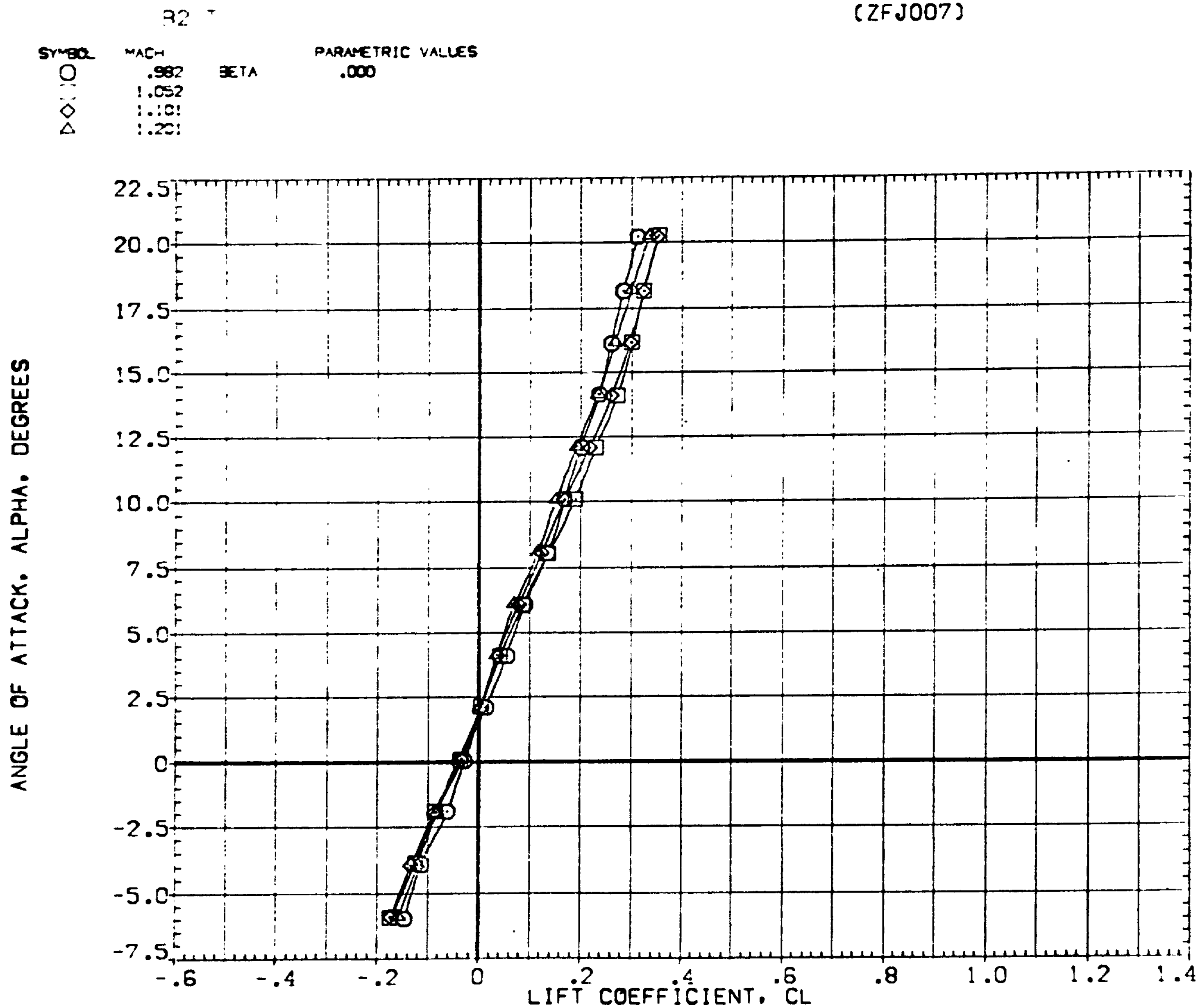


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WINC OFF.

B2 (ZFJ007)

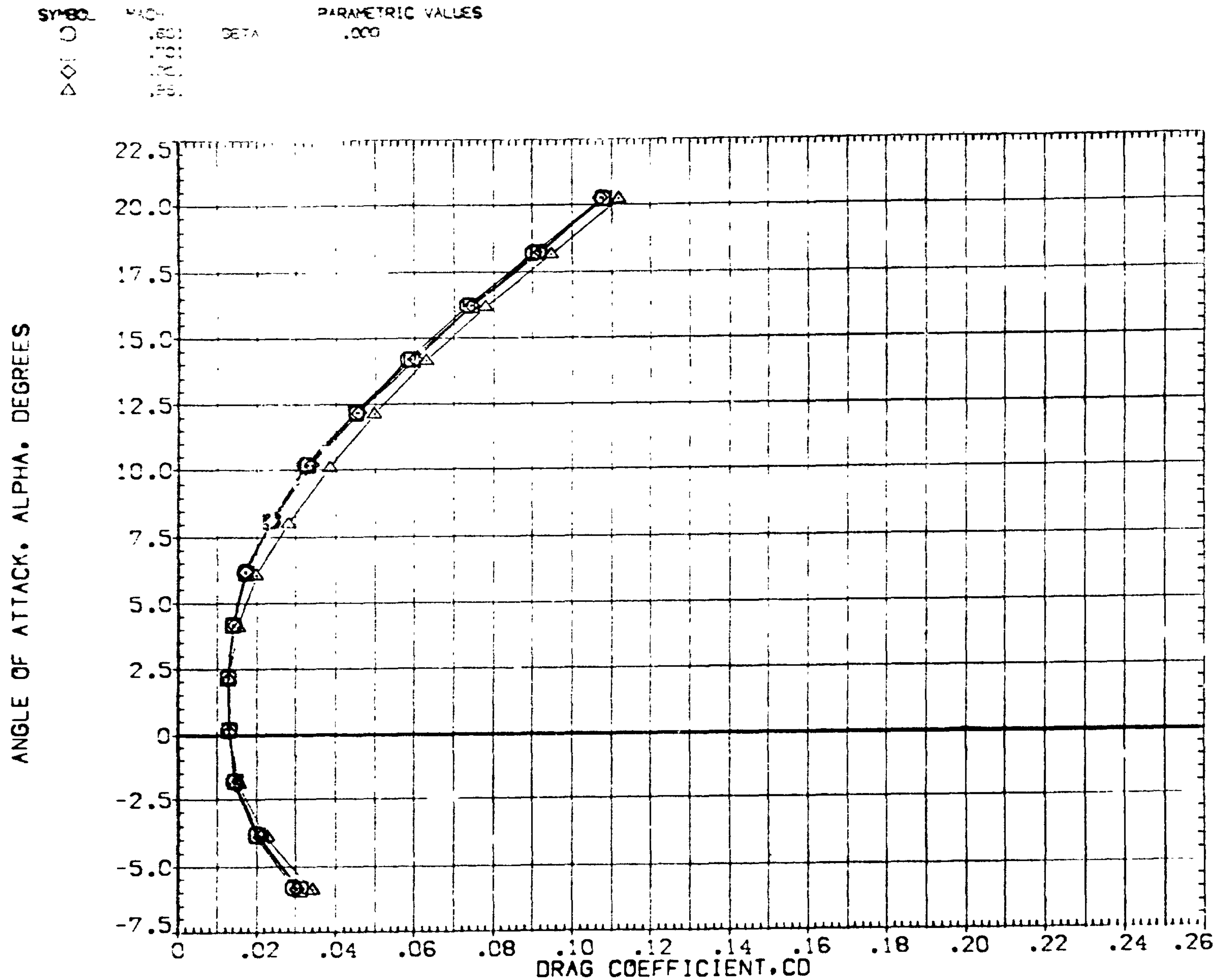


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

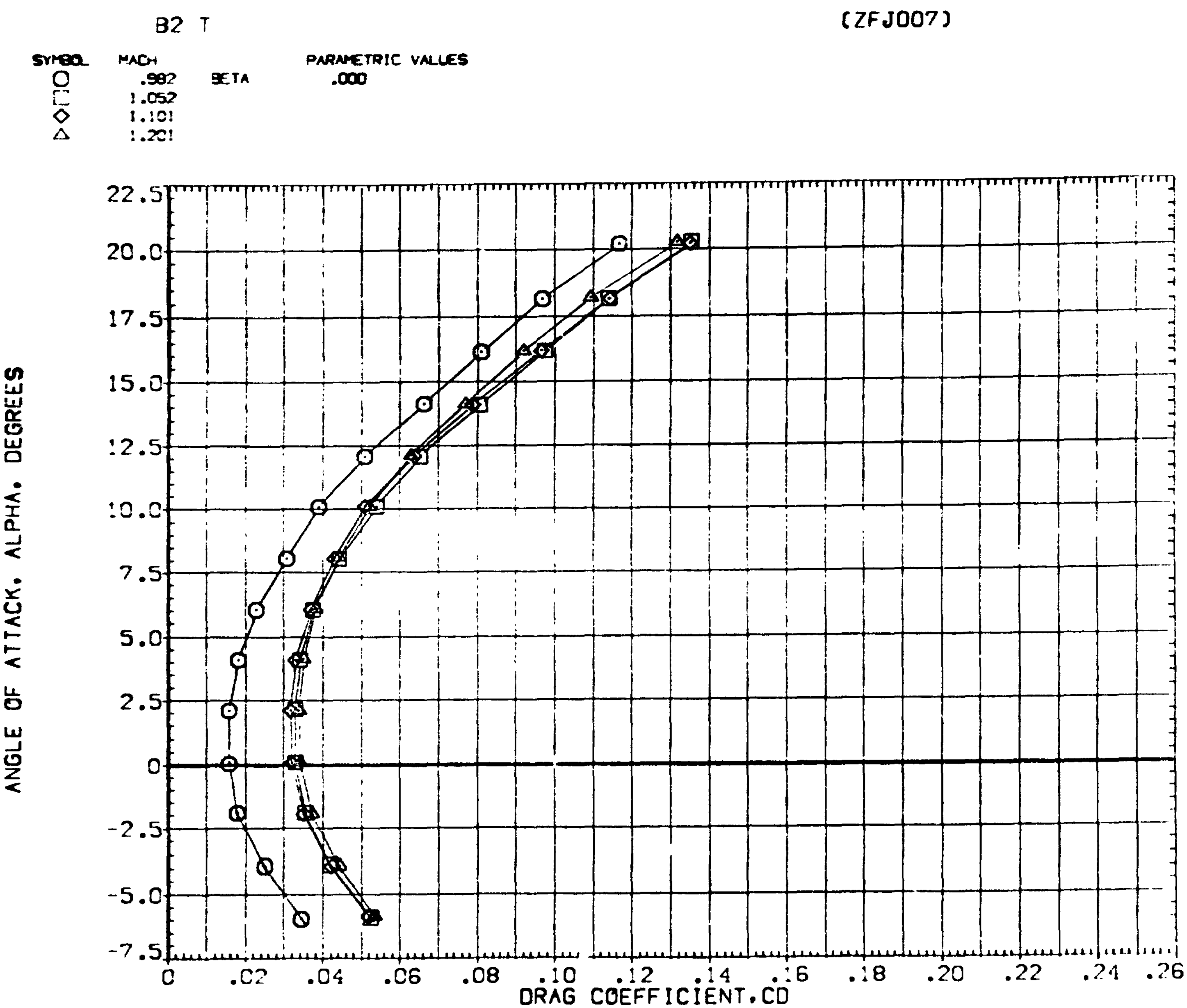


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

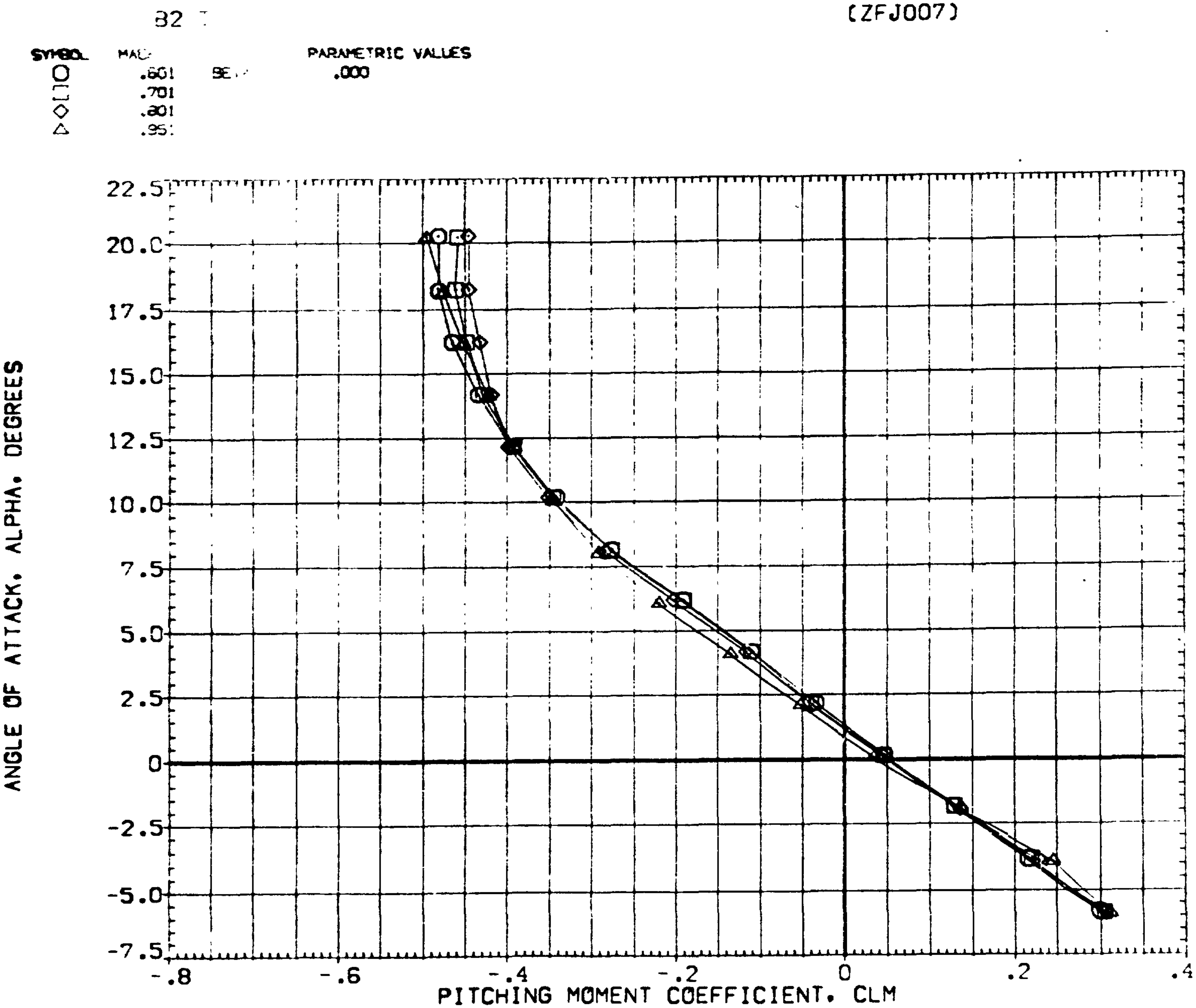


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

SYMBOL	MACH		PARAMETRIC VALUES
○	.982	BETA	.000
□	1.052		
◇	1.101		
△	1.201		

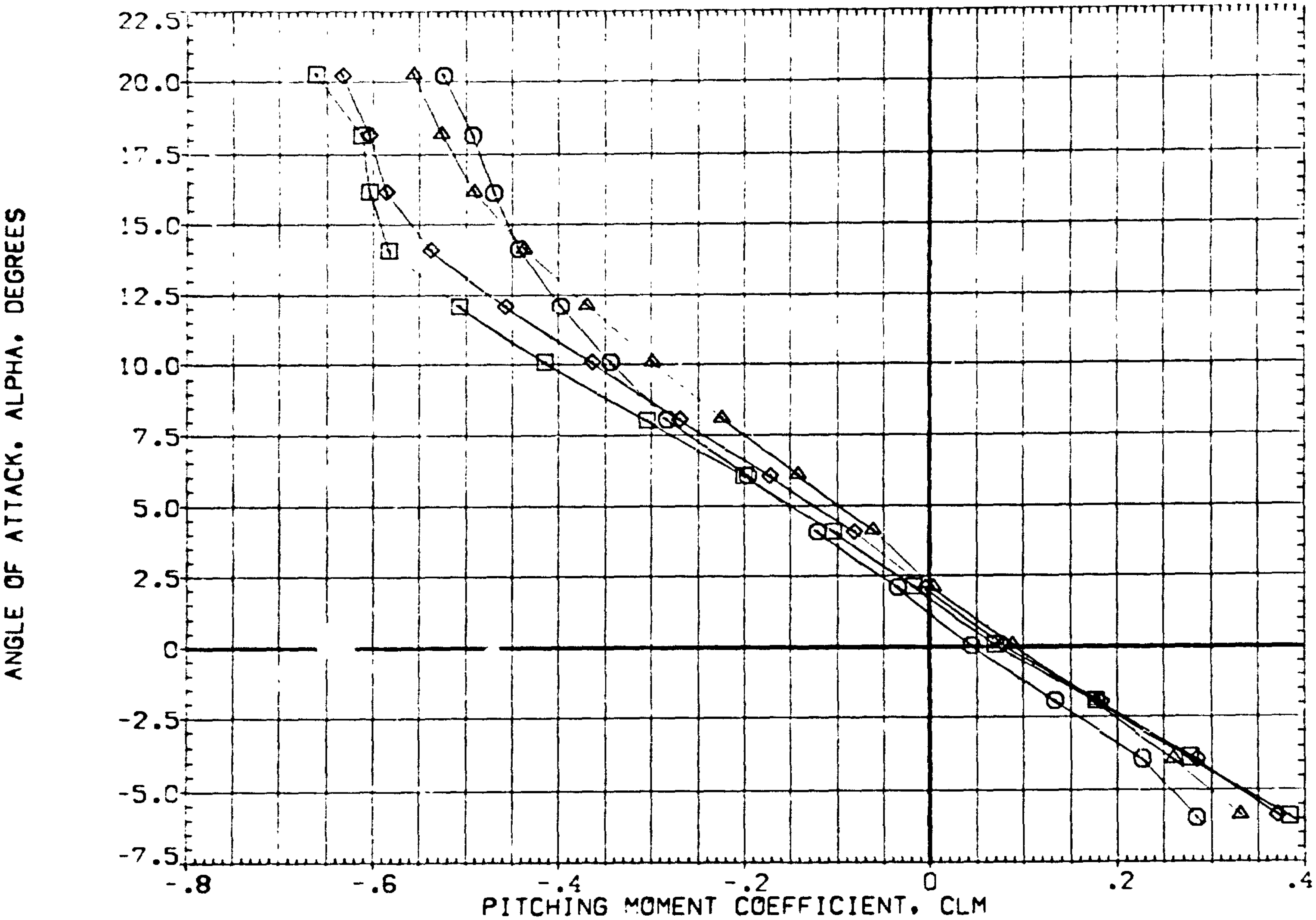


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

(ZFJ007)

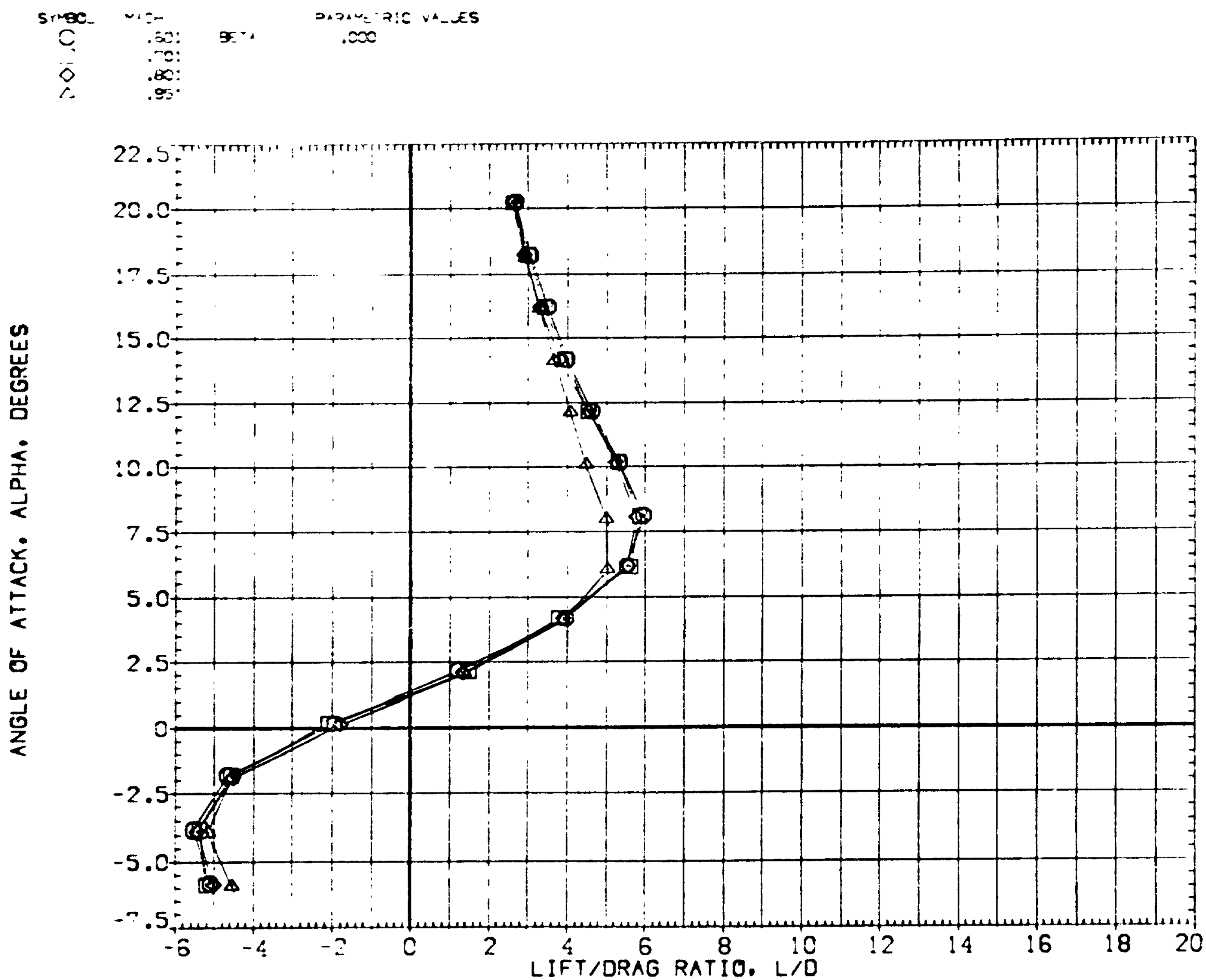


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

SYMBOL	MACH		PARAMETRIC VALUES
○	.982	BETA	.000
□	1.052		
◇	1.101		
△	1.201		

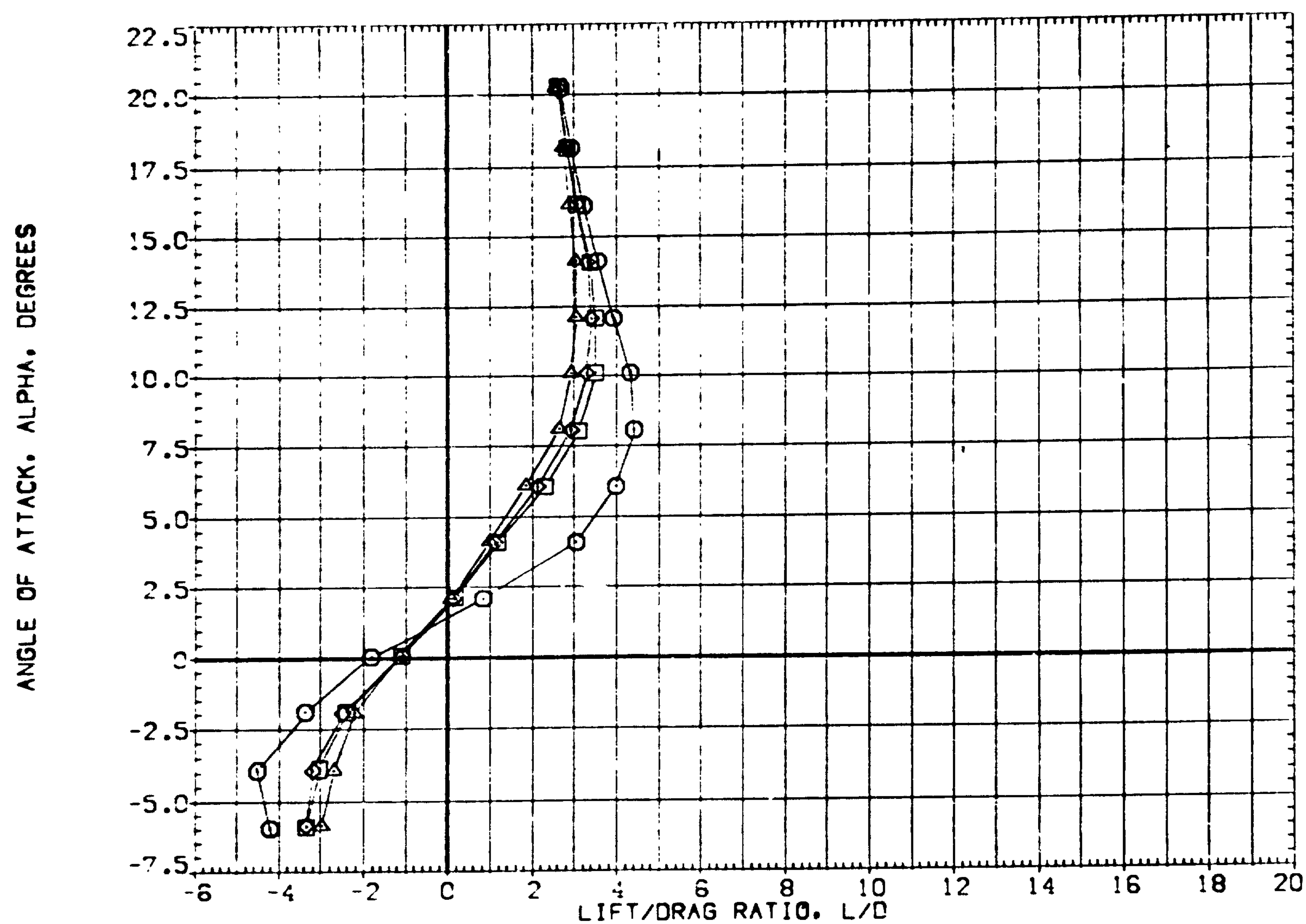


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

32 (ZFJ007)

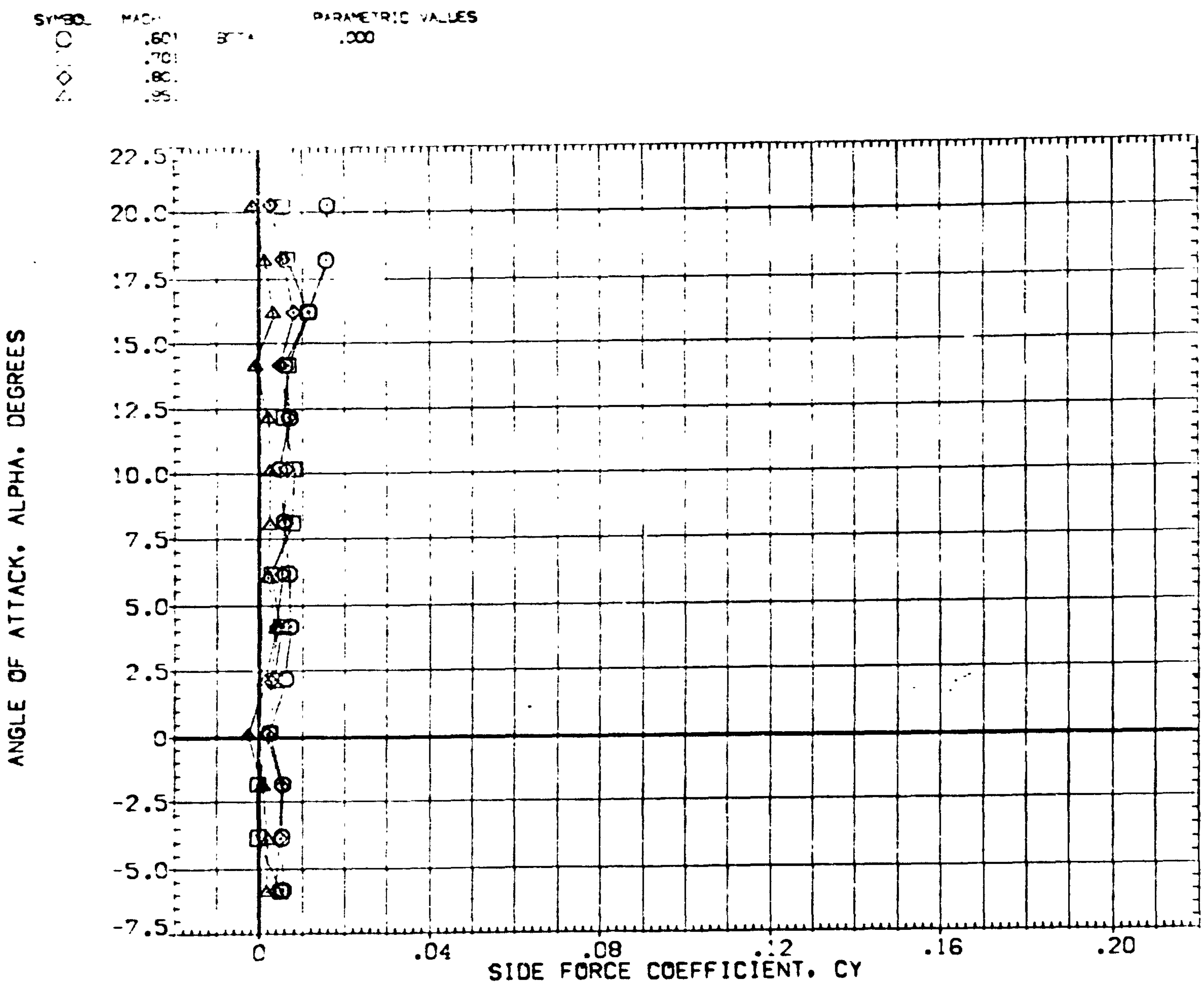


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

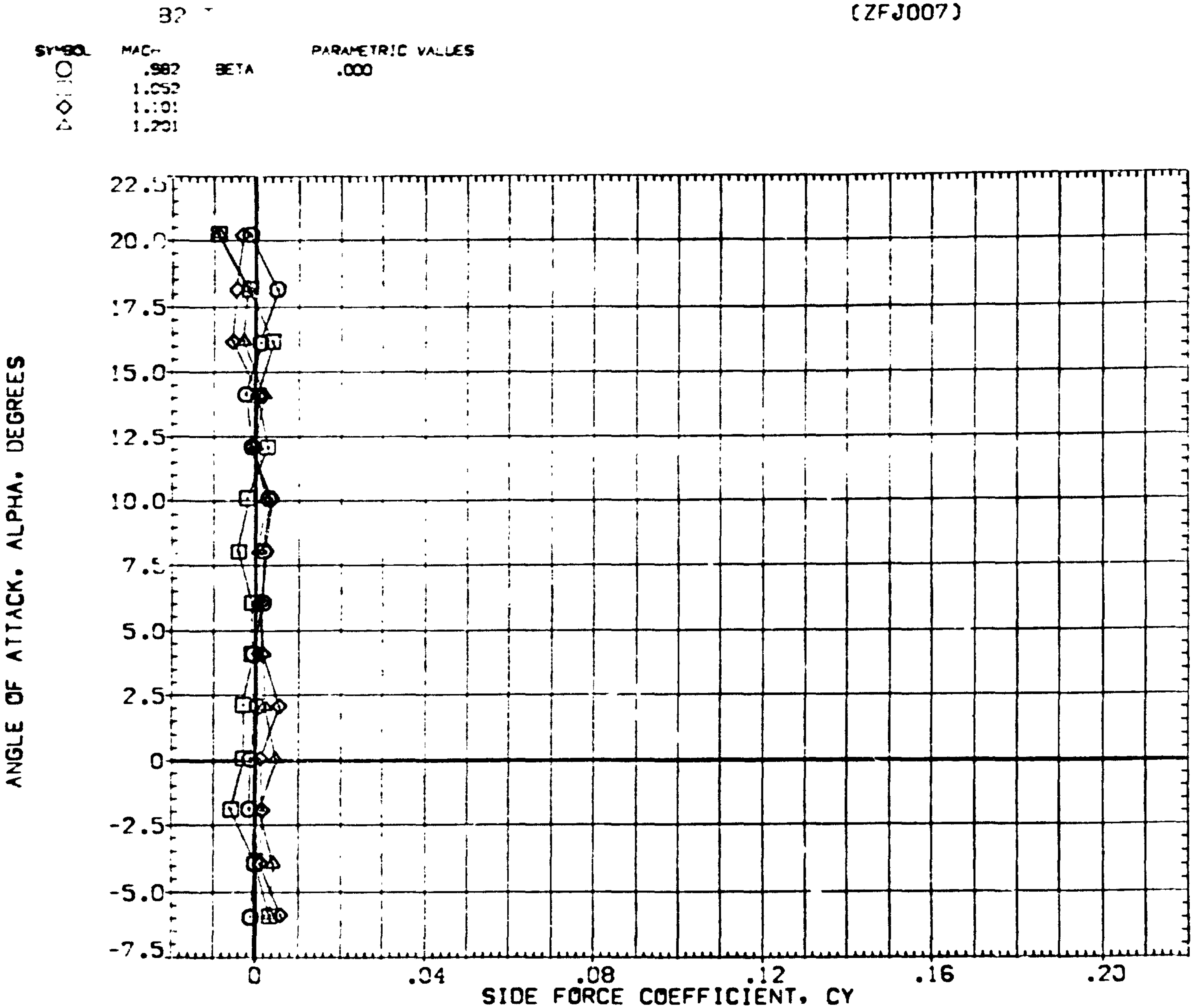


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

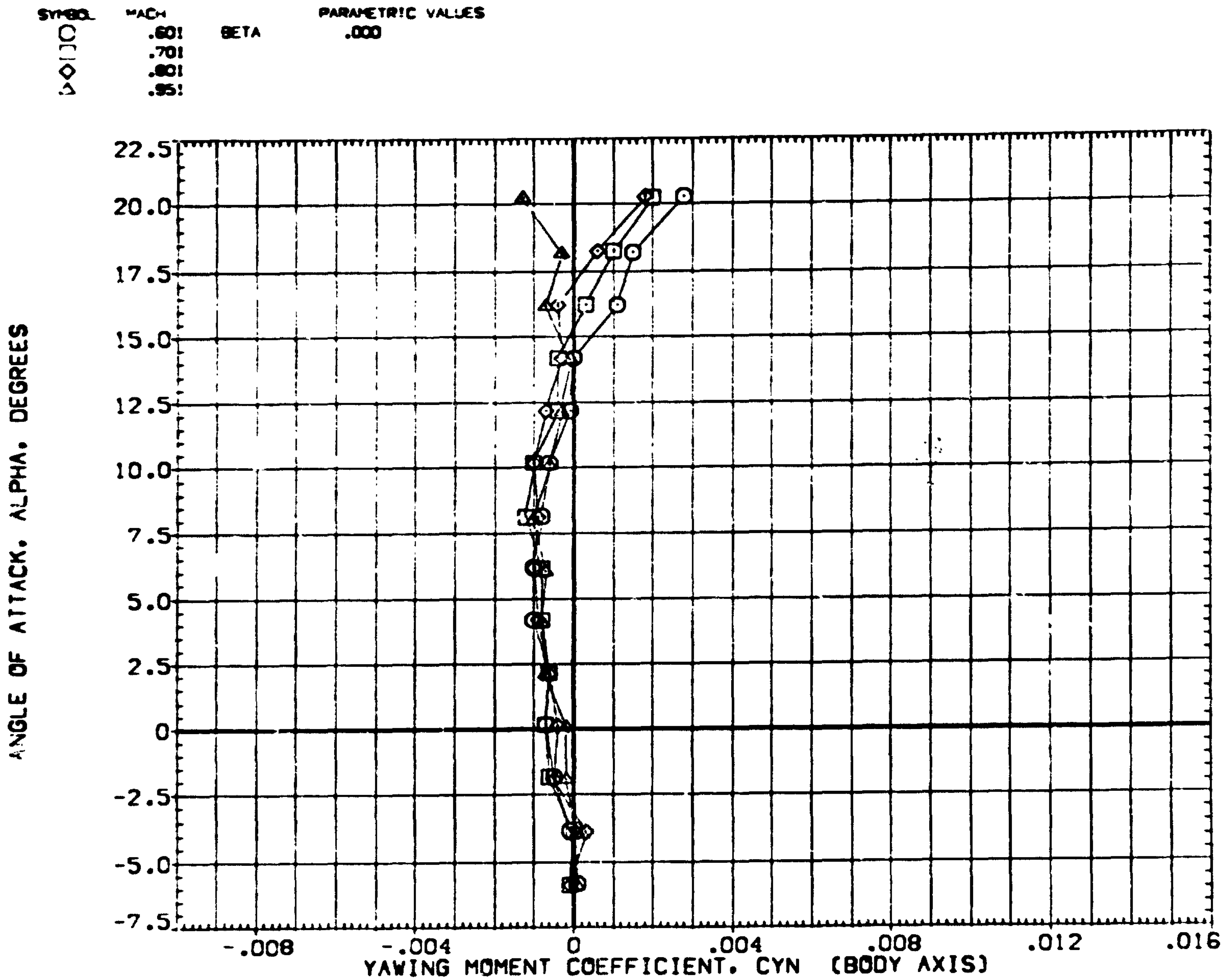


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

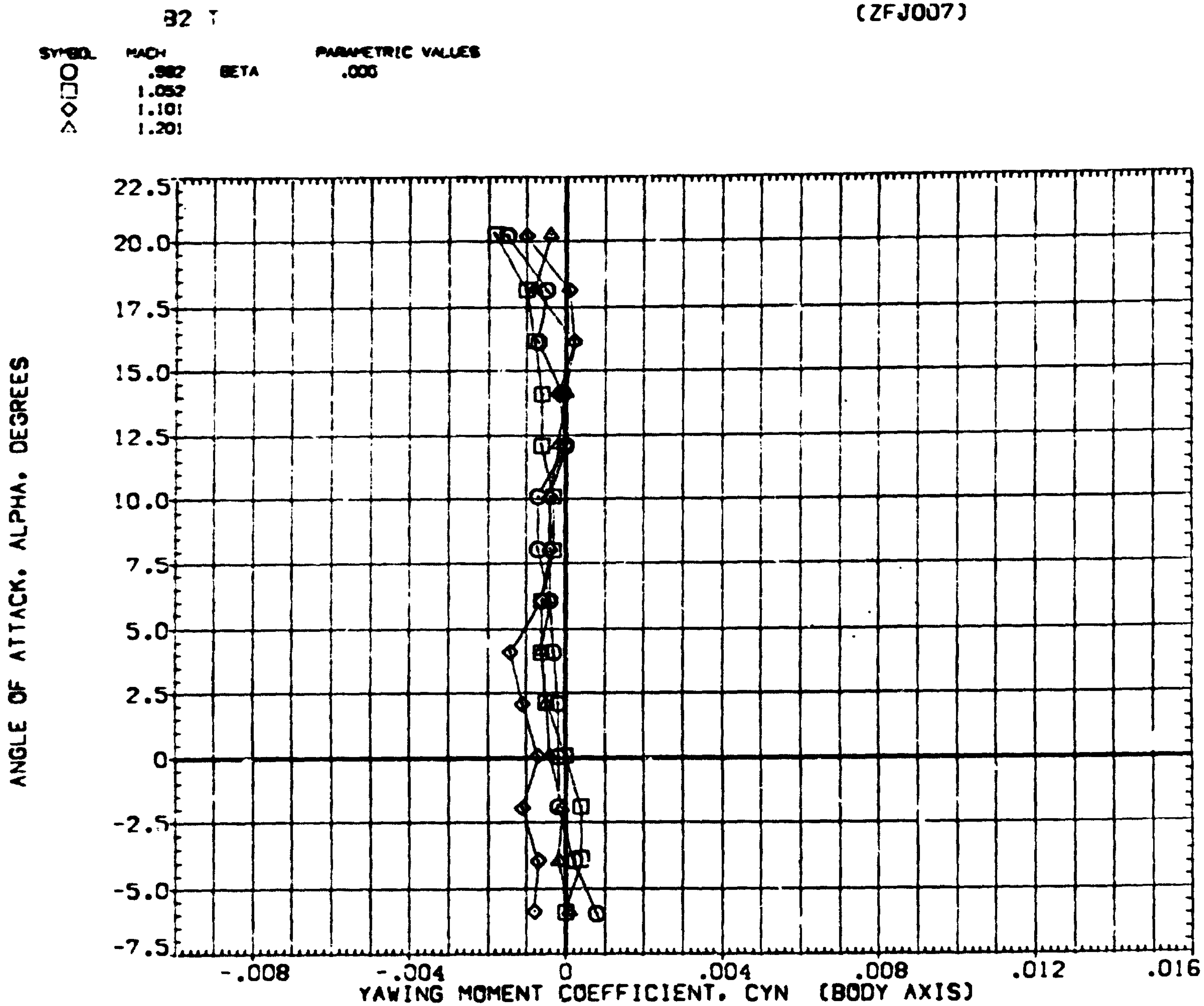


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

(ZFJ007)

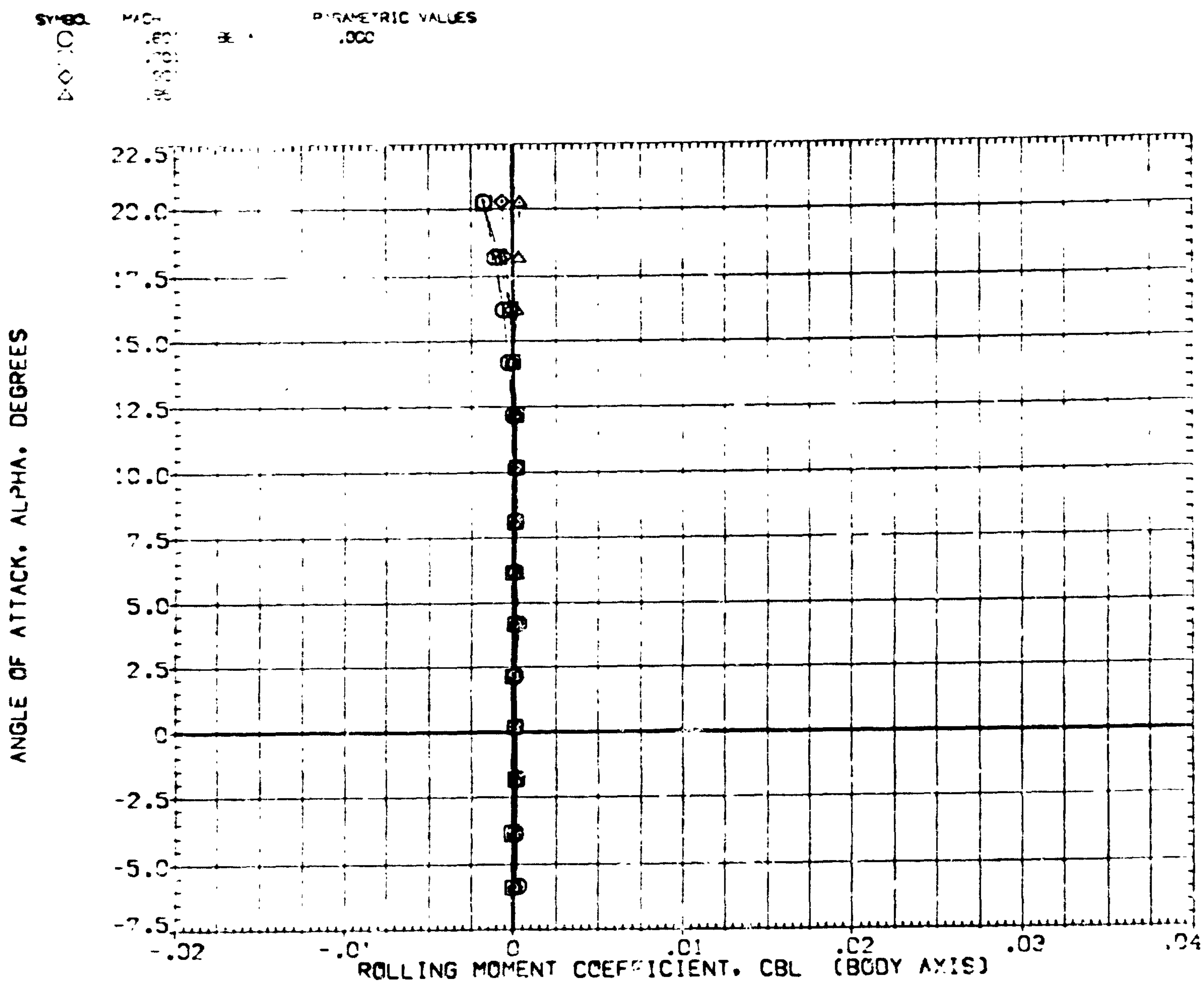


FIGURE J. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

(ZFJ007)

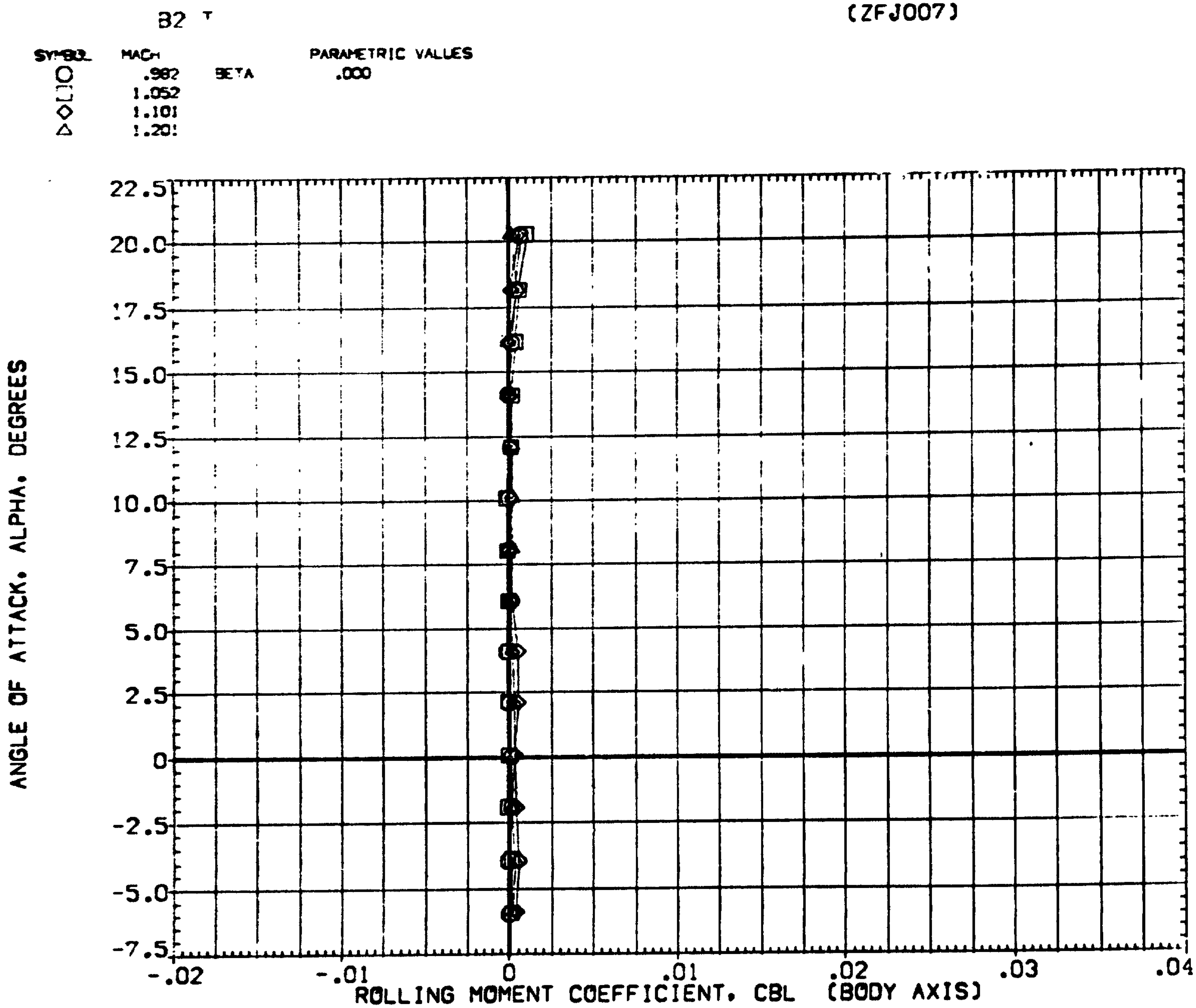


FIGURE 5. AERODYNAMIC CHARACTERISTICS IN PITCH WITH WING OFF.

C.2

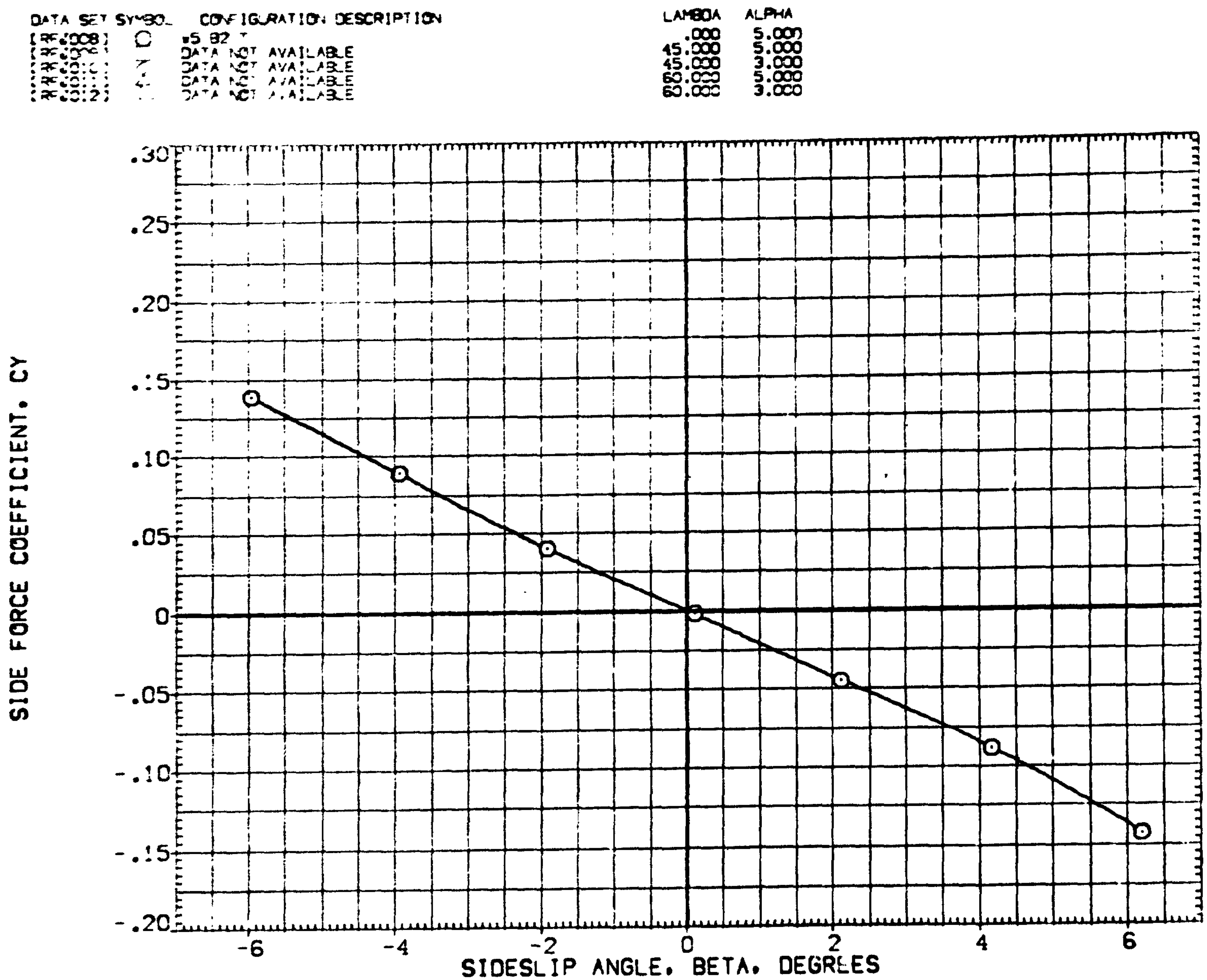


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(A) MACH = .60

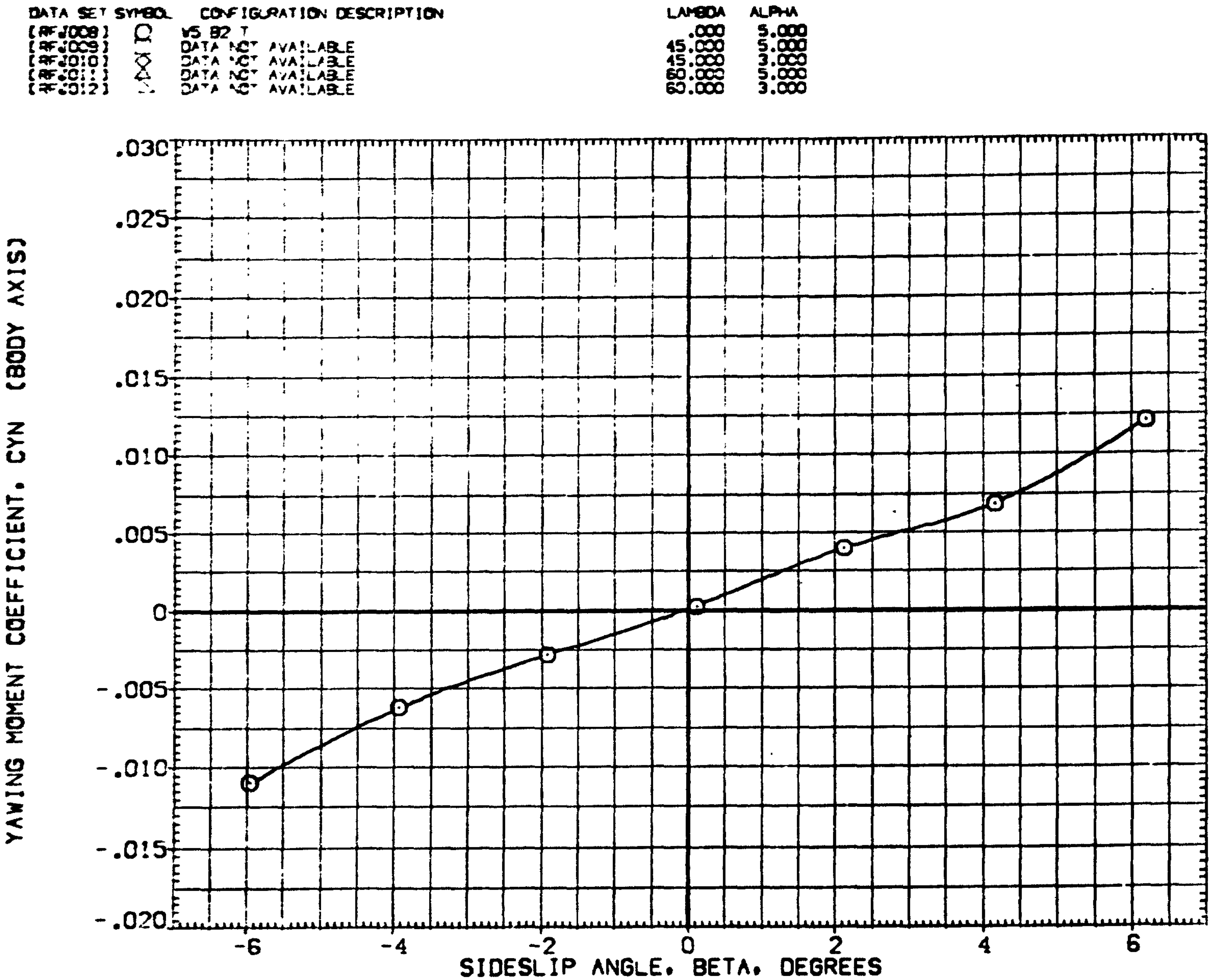


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.
(A)MACH = .60

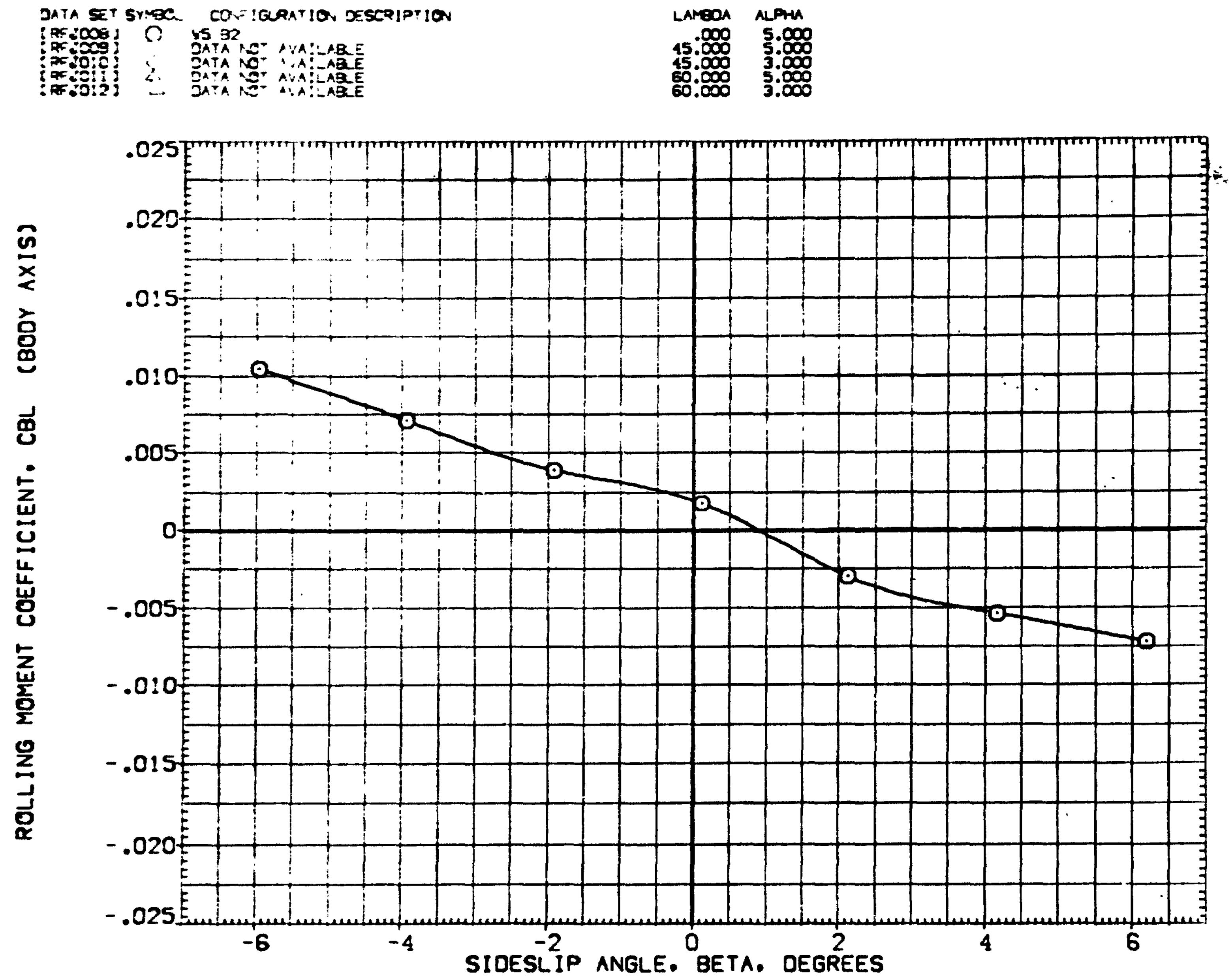


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(A)MAC- = .60

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	VS B2 T	.000	5.000
[RFJ009]	□	DATA NOT AVAILABLE	45.000	5.000
[RFJ010]	◇	DATA NOT AVAILABLE	45.000	3.000
[RFJ011]	△	DATA NOT AVAILABLE	60.000	5.000
[RFJ012]	▽	DATA NOT AVAILABLE	60.000	3.000

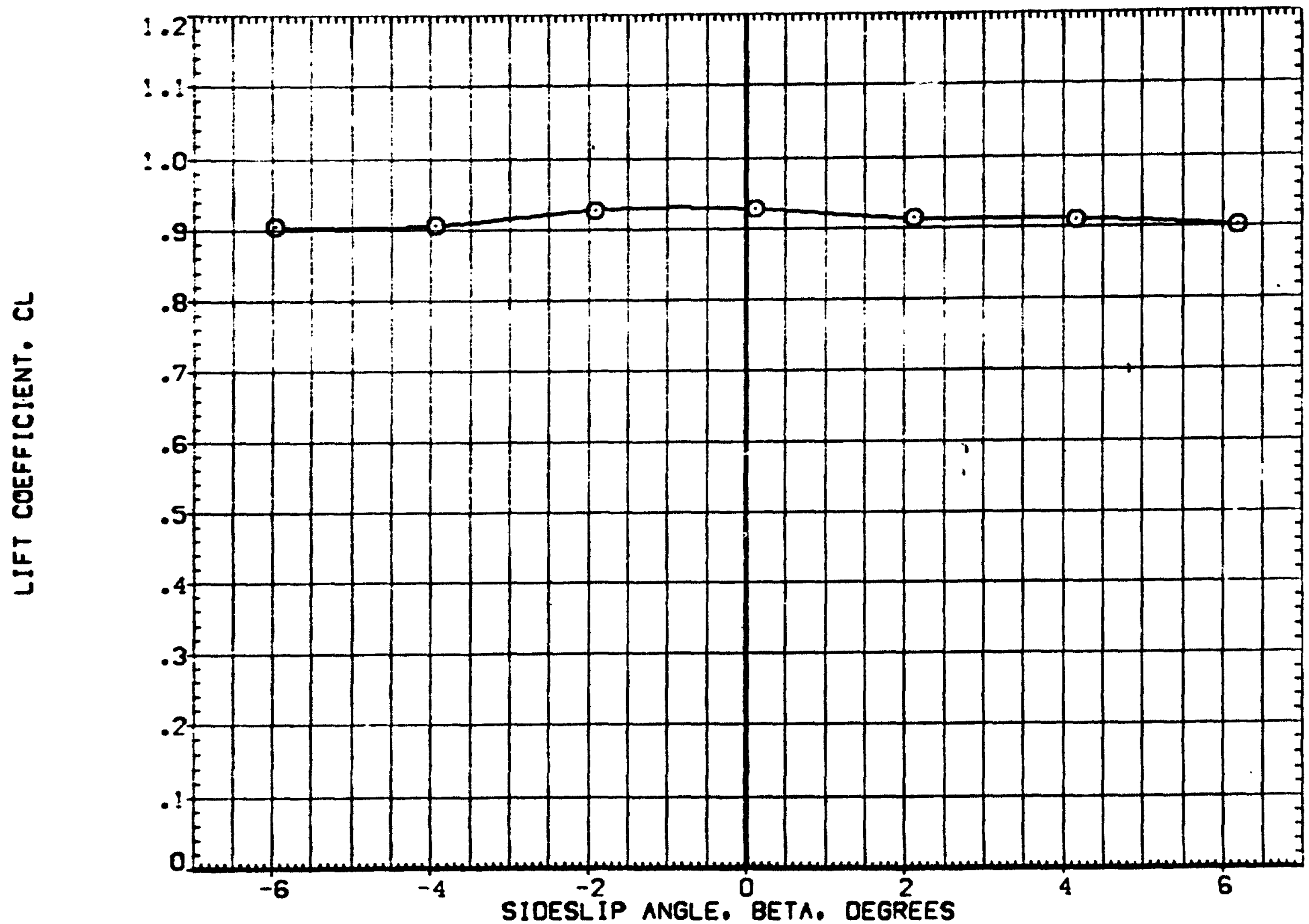


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(A) MACH = .60

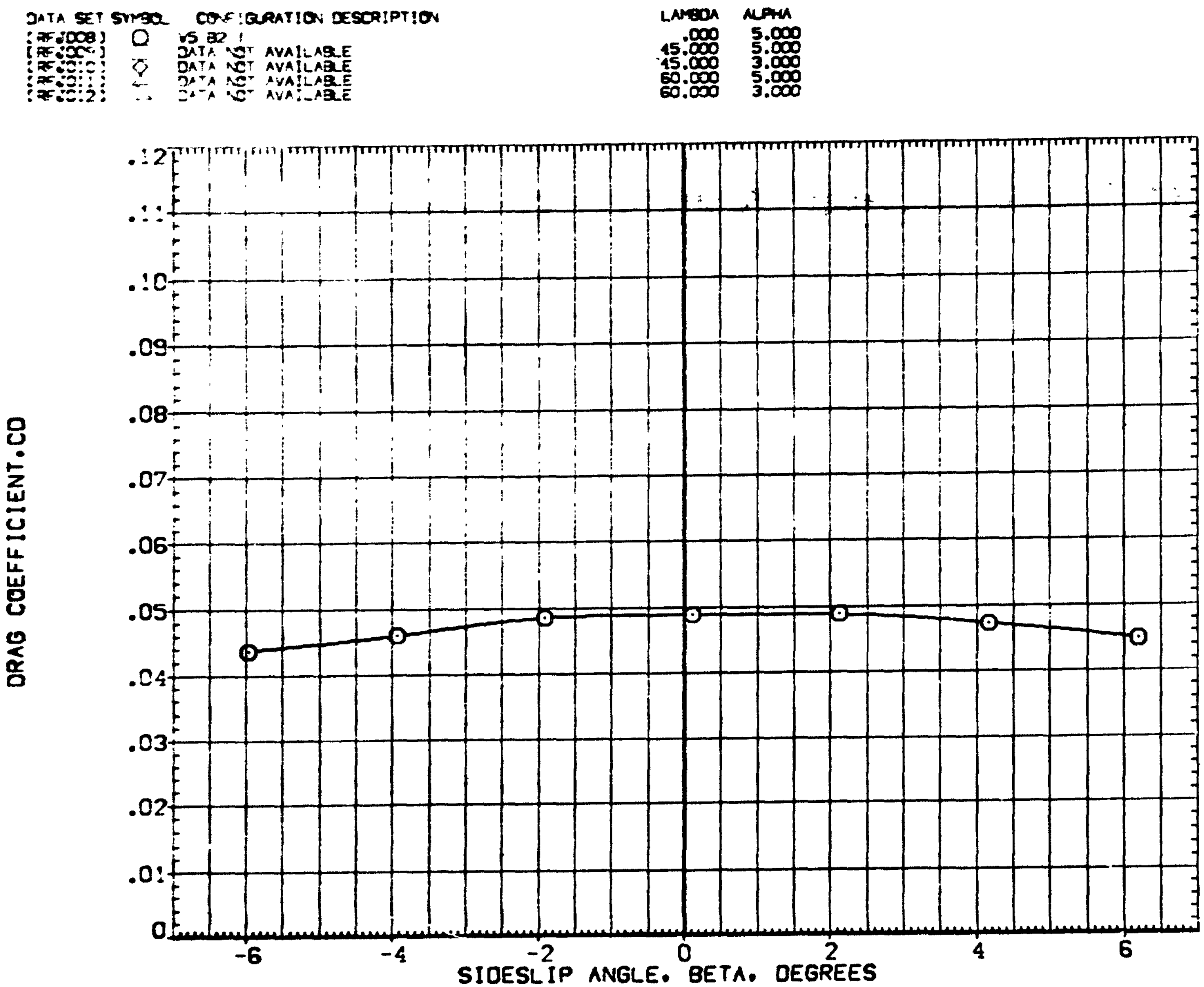


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(A)MACH = .60

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	VS B2 T	.000	5.000
[RFJ009]	□	DATA NOT AVAILABLE	45.000	5.000
[RFJ010]	◇	DATA NOT AVAILABLE	45.000	3.000
[RFJ011]	△	DATA NOT AVAILABLE	60.000	5.000
[RFJ012]	◁	DATA NOT AVAILABLE	60.000	3.000

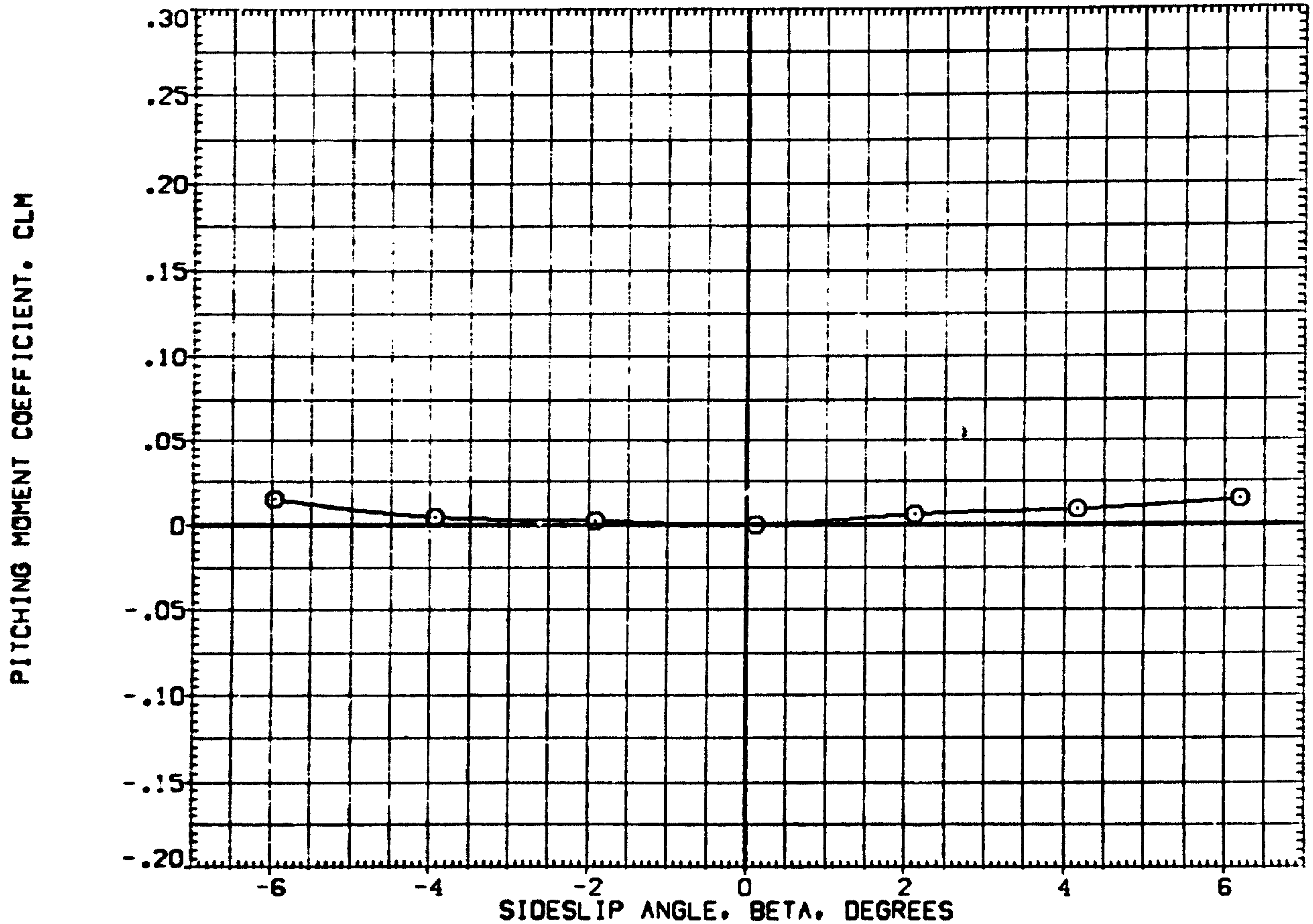


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(A)MACH = .60

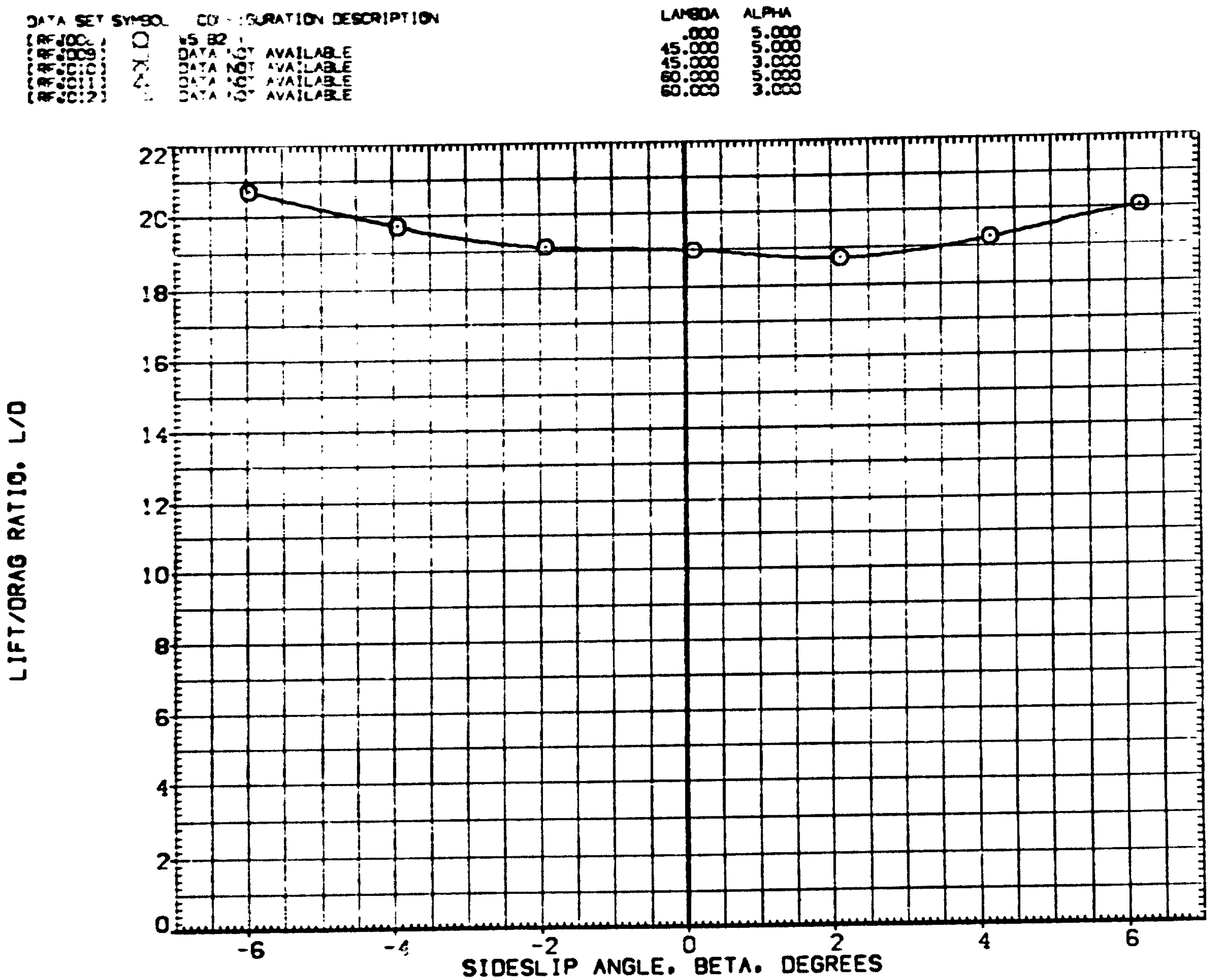


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(A)MACH = .60

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	□	V5 B2 T	.000	5.000
[RFJ009]	◇	V5 B2 T	45.000	5.000
[RFJ010]	○	V5 B2 T	45.000	3.000
[RFJ011]		DATA NOT AVAILABLE	60.000	5.000
[RFJ012]		DATA NOT AVAILABLE	60.000	3.000

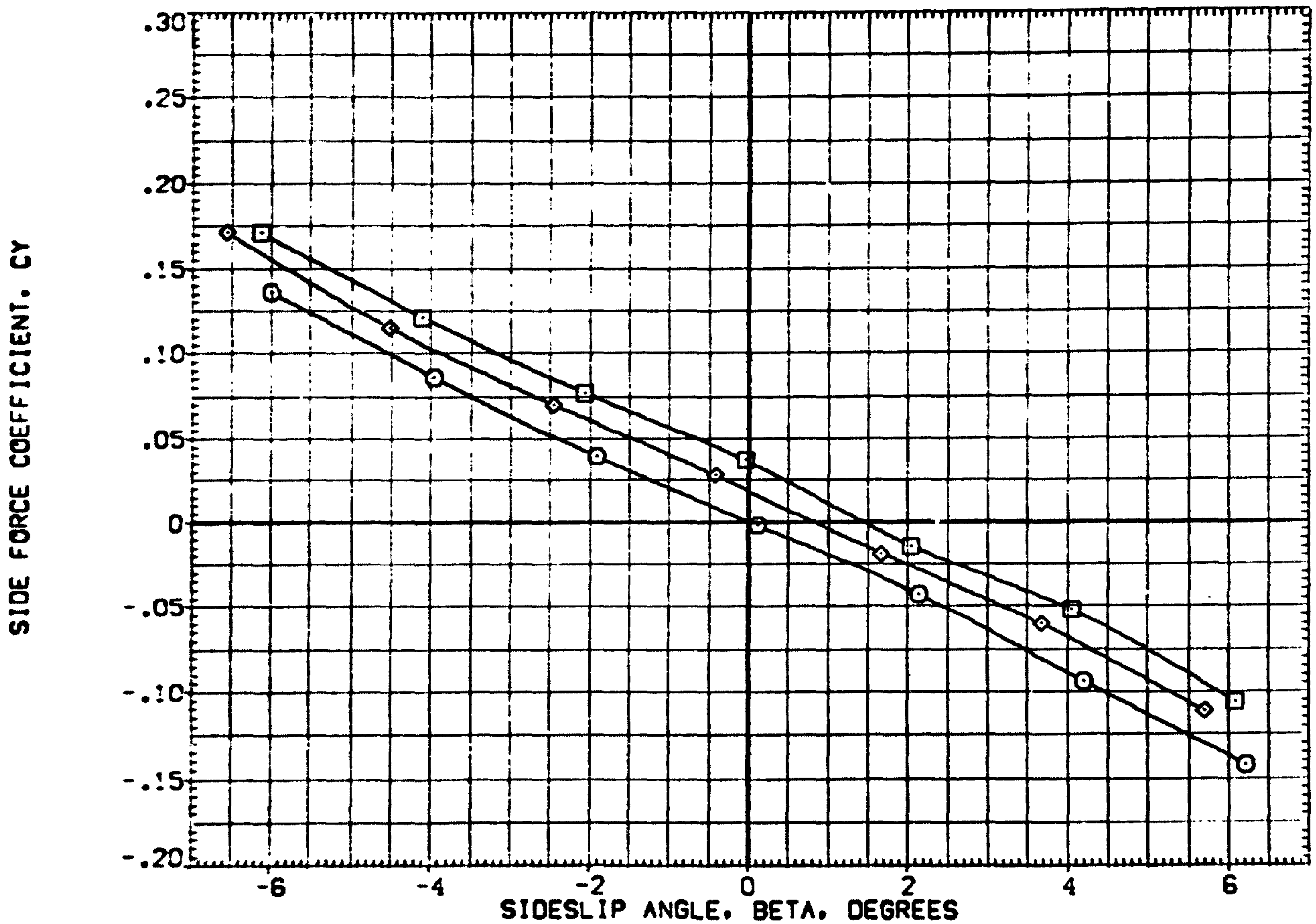


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(B)MACH = .70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	□	VS B2	.000	5.000
[RFJ009]		VS B2	45.000	5.000
[RFJ010]	◇	VS B2	45.000	3.000
[RFJ011]		DATA NOT AVAILABLE	60.000	5.000
[RFJ012]		DATA NOT AVAILABLE	60.000	3.000

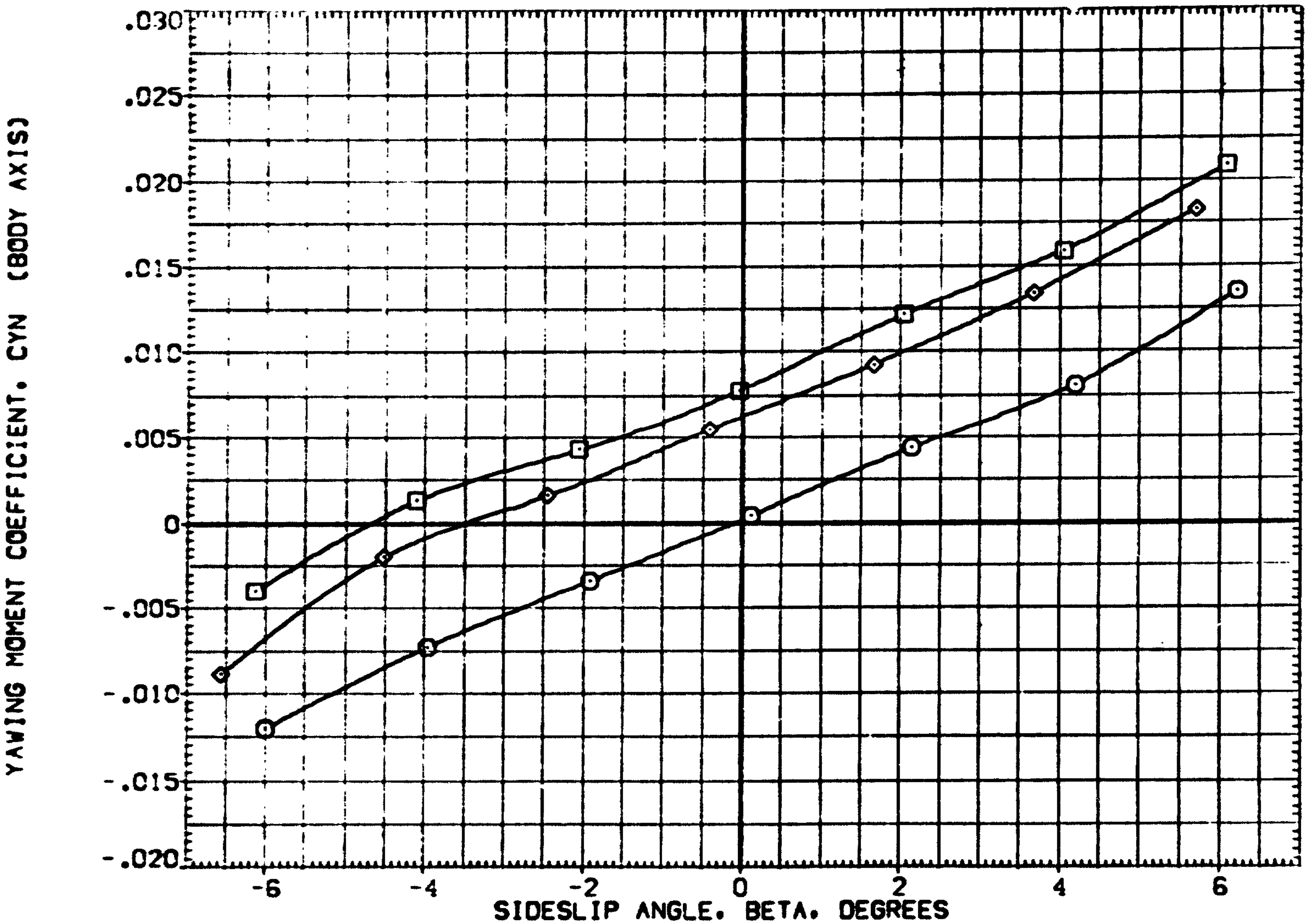


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(B)MACH = .70

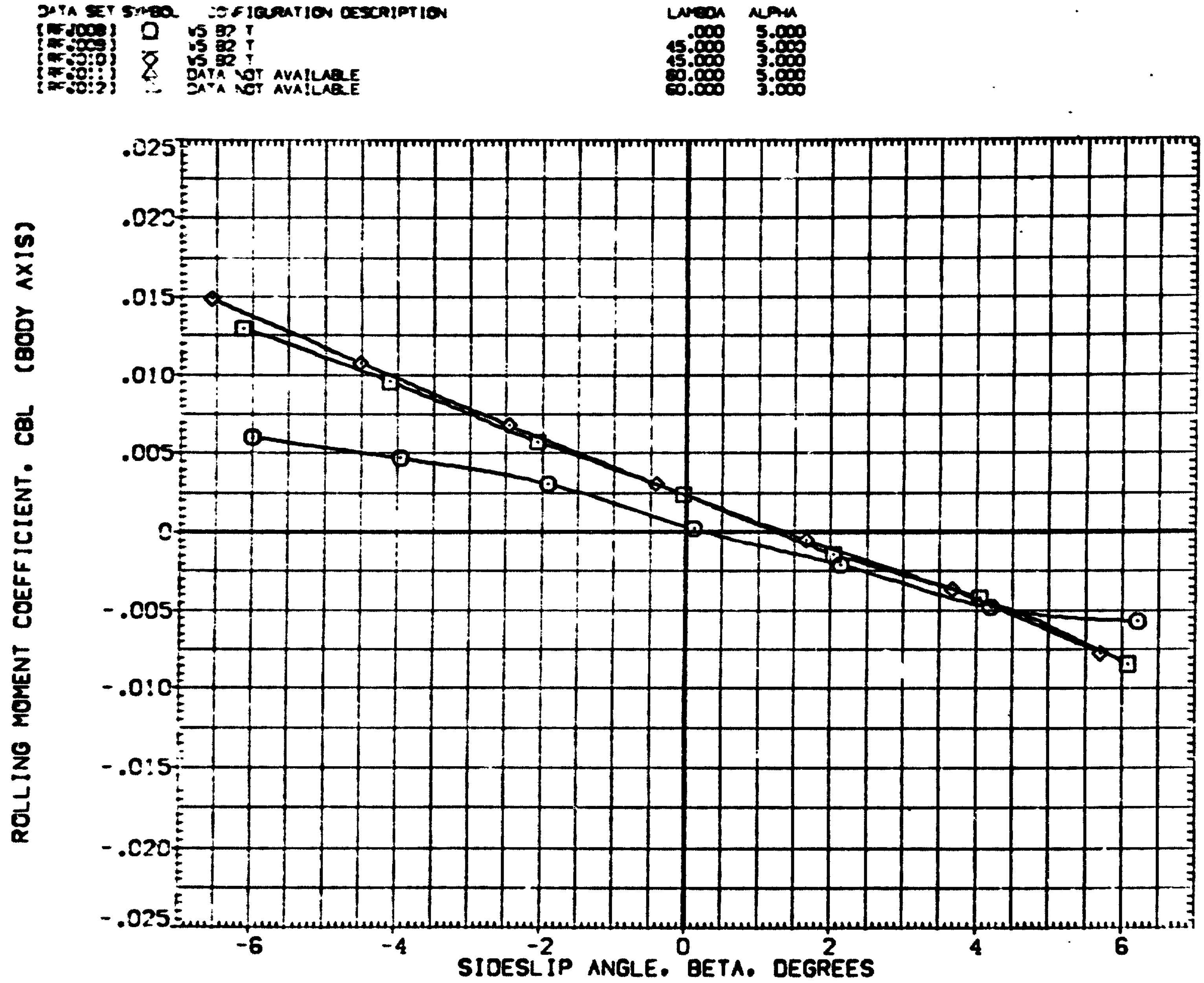


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(B)MACH = .70

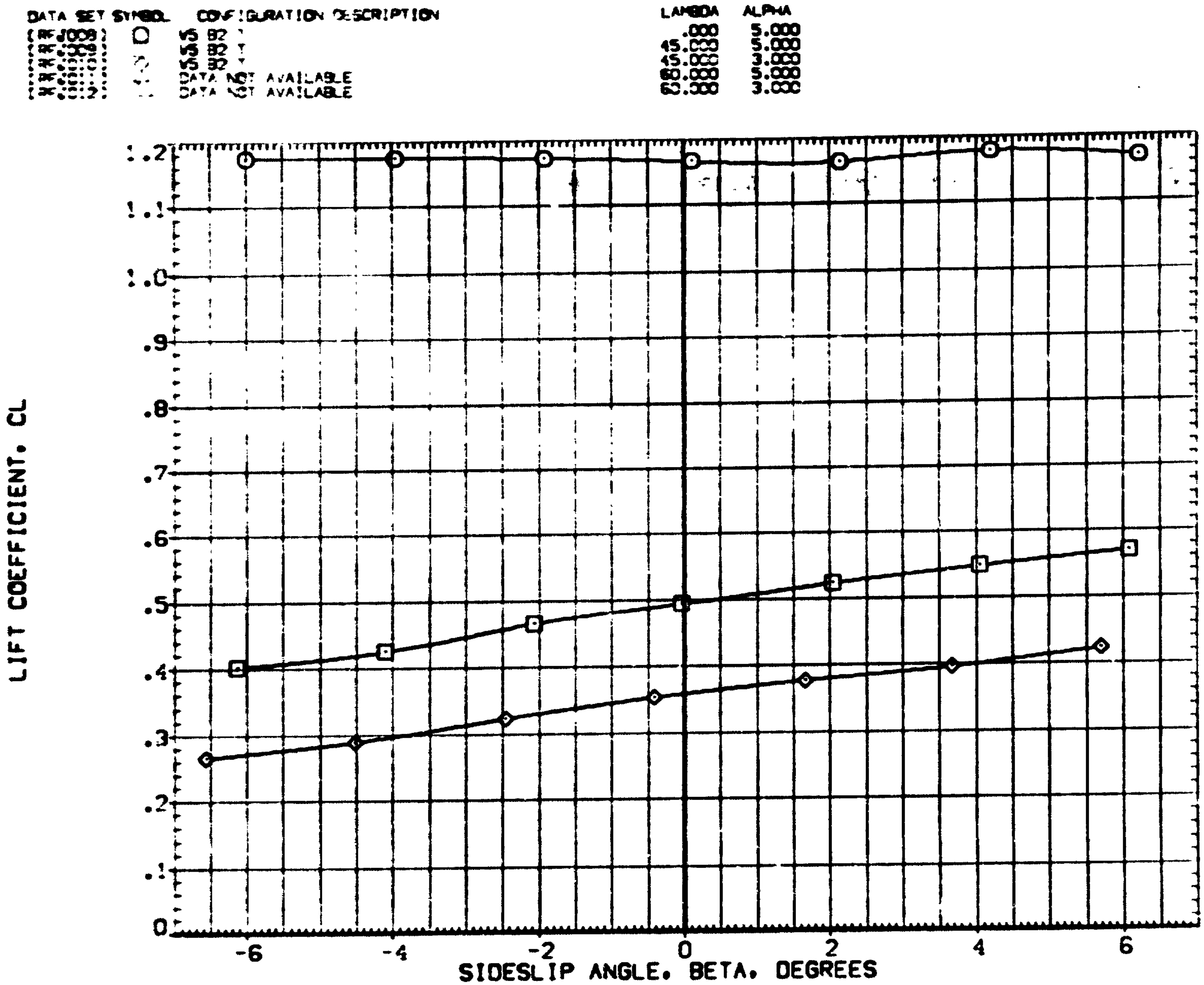


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(B)MACH = .70

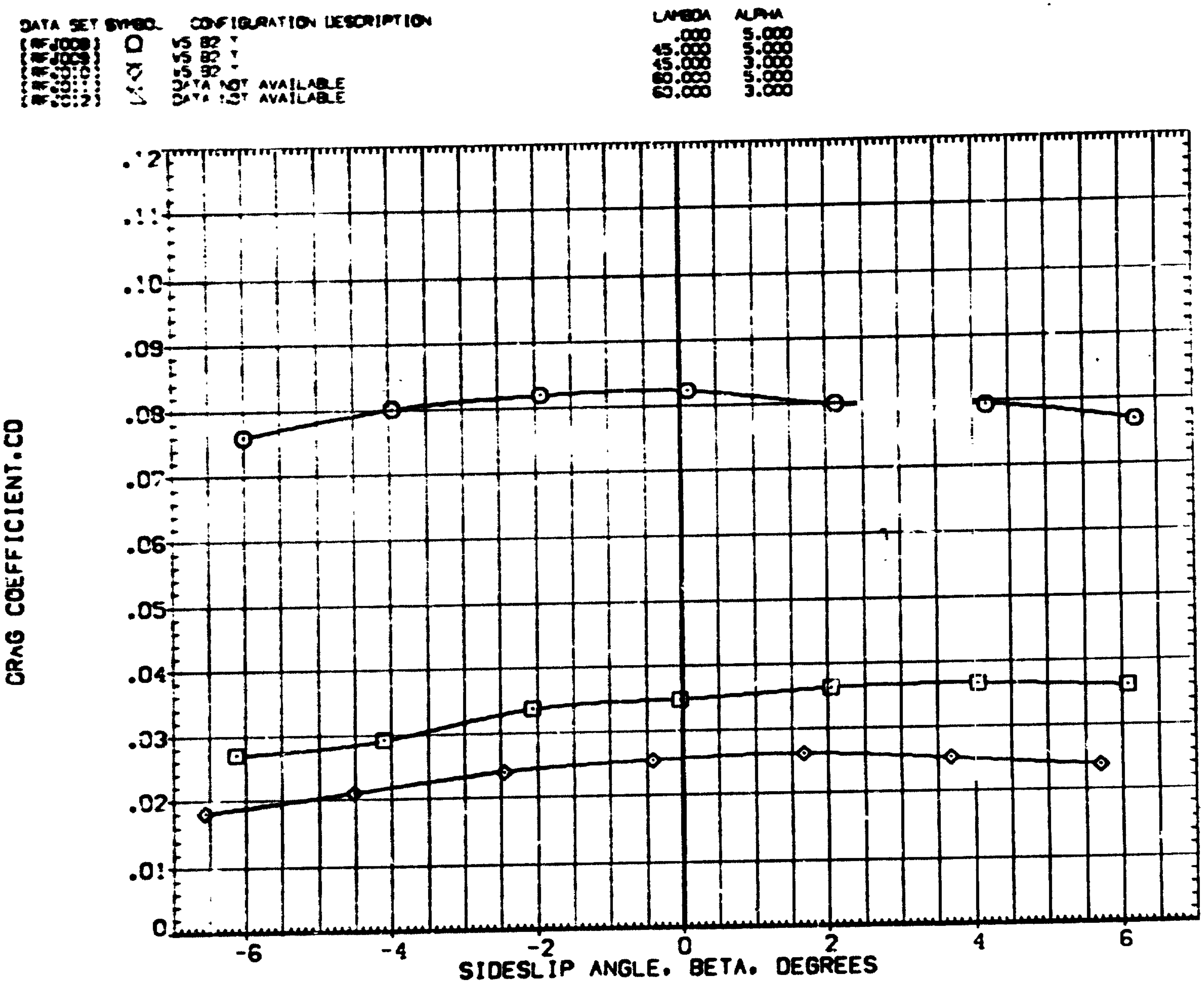


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.
(B) MACH = .70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	V5 B2 T	.000	5.000
[RFJ009]	◇	V5 B2 T	45.000	5.000
[RFJ010]	◇	V5 B2 T	45.000	3.000
[RFJ011]		DATA NOT AVAILABLE	60.000	5.000
[RFJ012]		DATA NOT AVAILABLE	60.000	3.000

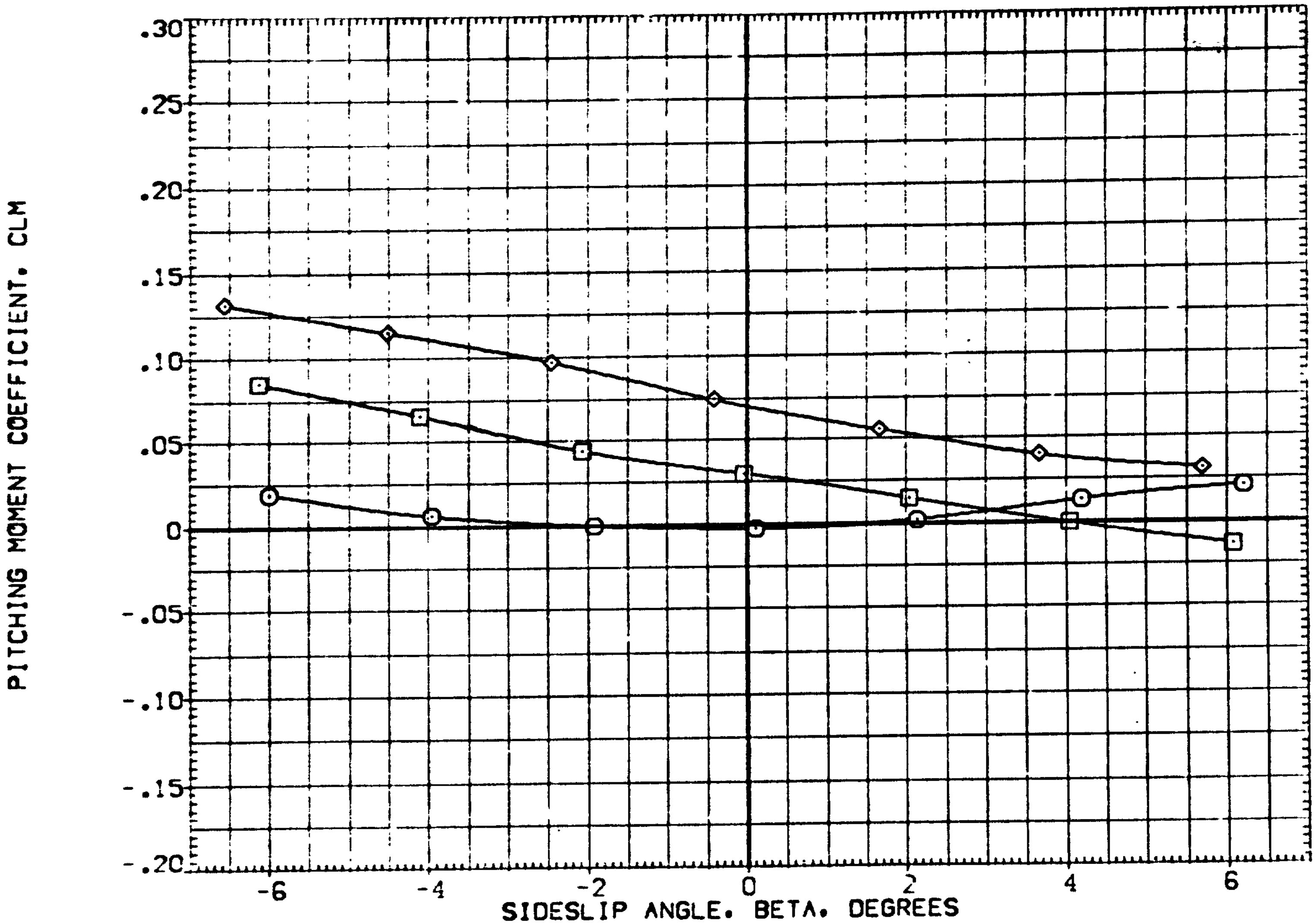


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(B)MACH = .70

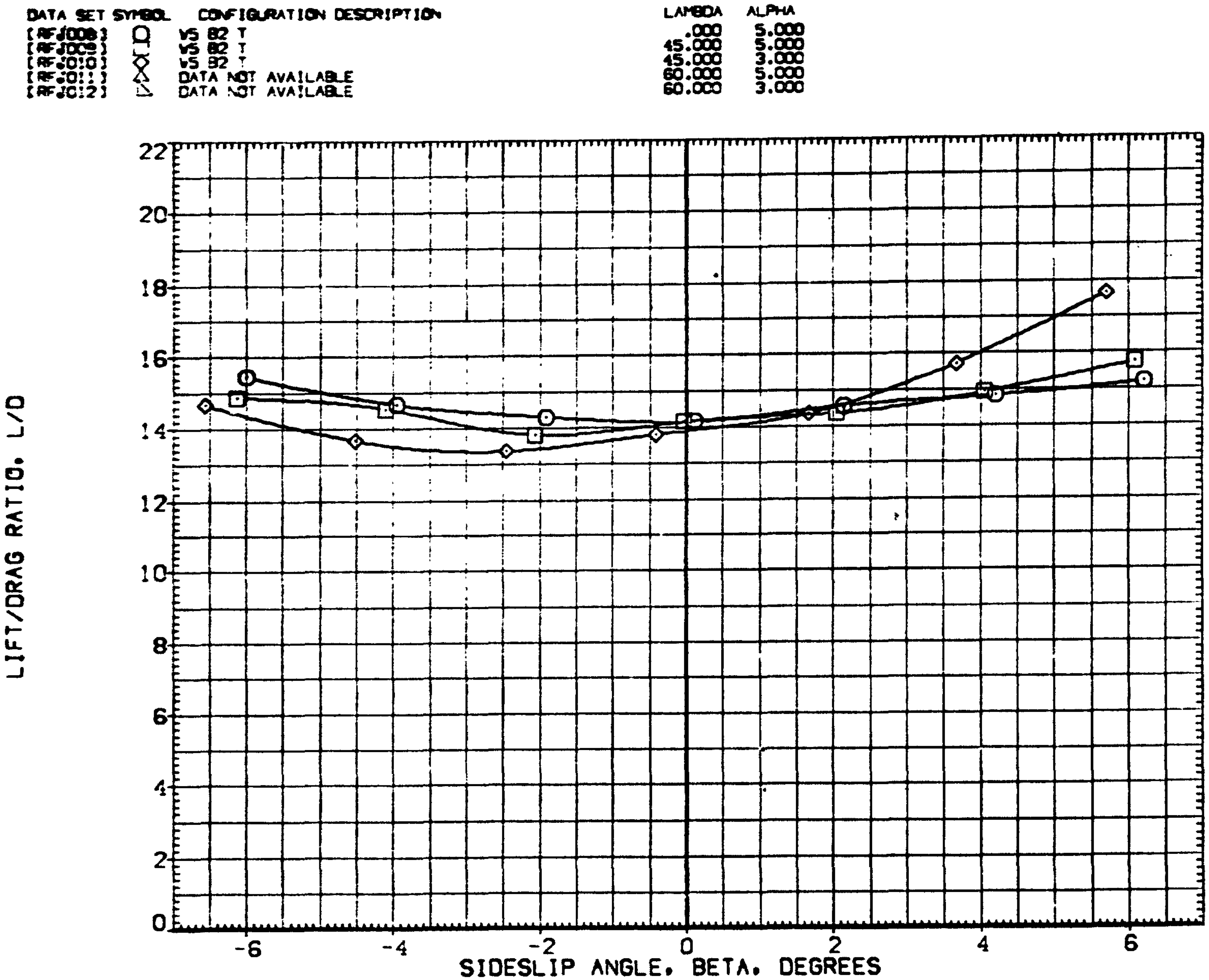


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(B)MACH = .70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)	○	V5 B2 T	.000	5.000
(RFJ009)	□	V5 B2 T	45.000	5.000
(RFJ010)	◇	V5 B2 T	45.000	3.000
(RFJ011)	△	V5 B2 T	60.000	5.000
(RFJ012)	⊿	V5 B2 T	60.000	3.000

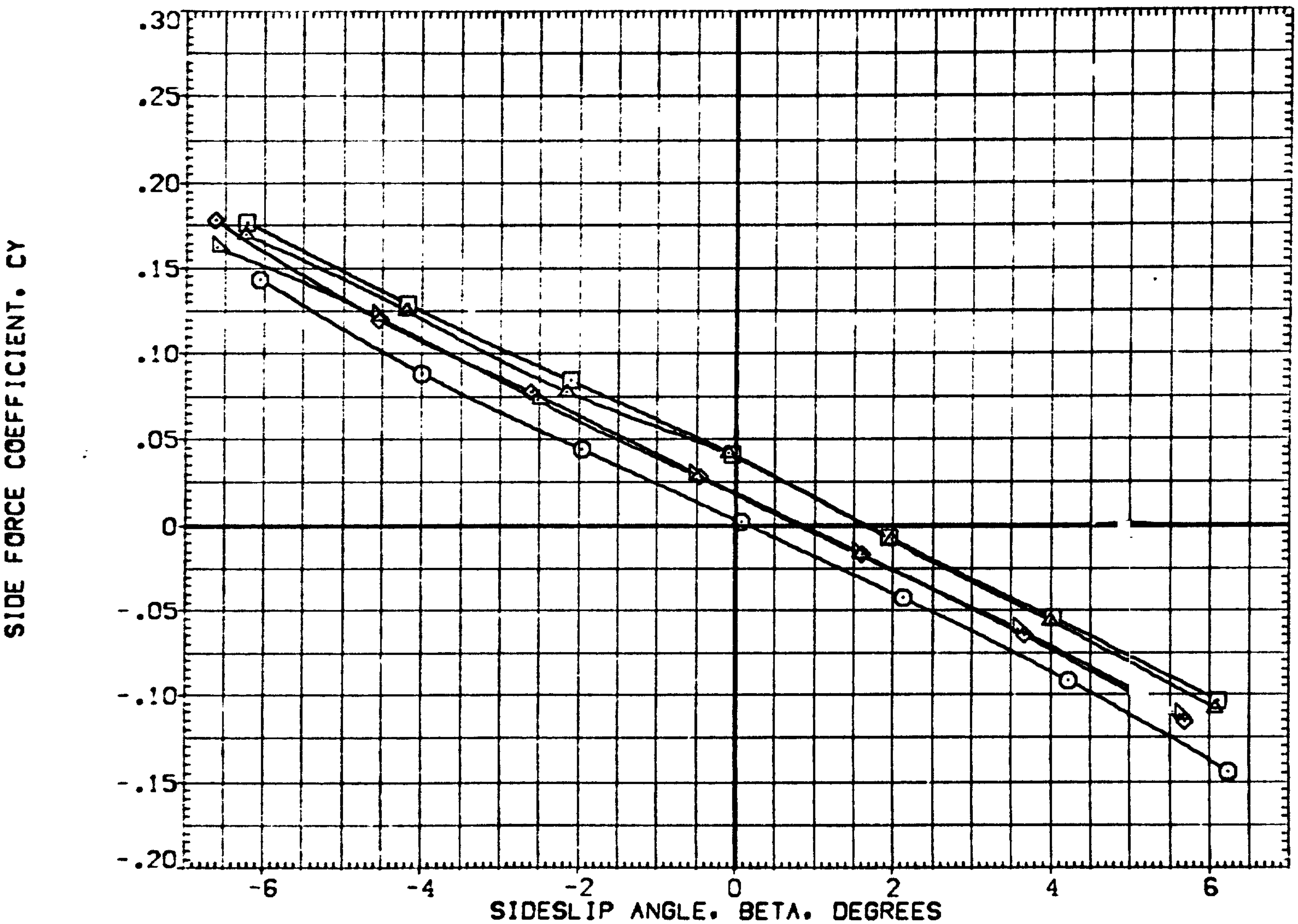


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(C)MAC- = .80

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	VS B2 T	.000	5.000
[RFJ009]	□	VS B2 T	45.000	5.000
[RFJ010]	◇	VS B2 T	45.000	3.000
[RFJ011]	△	VS B2 T	60.000	5.000
[RFJ012]	△	VS B2 T	60.000	3.000

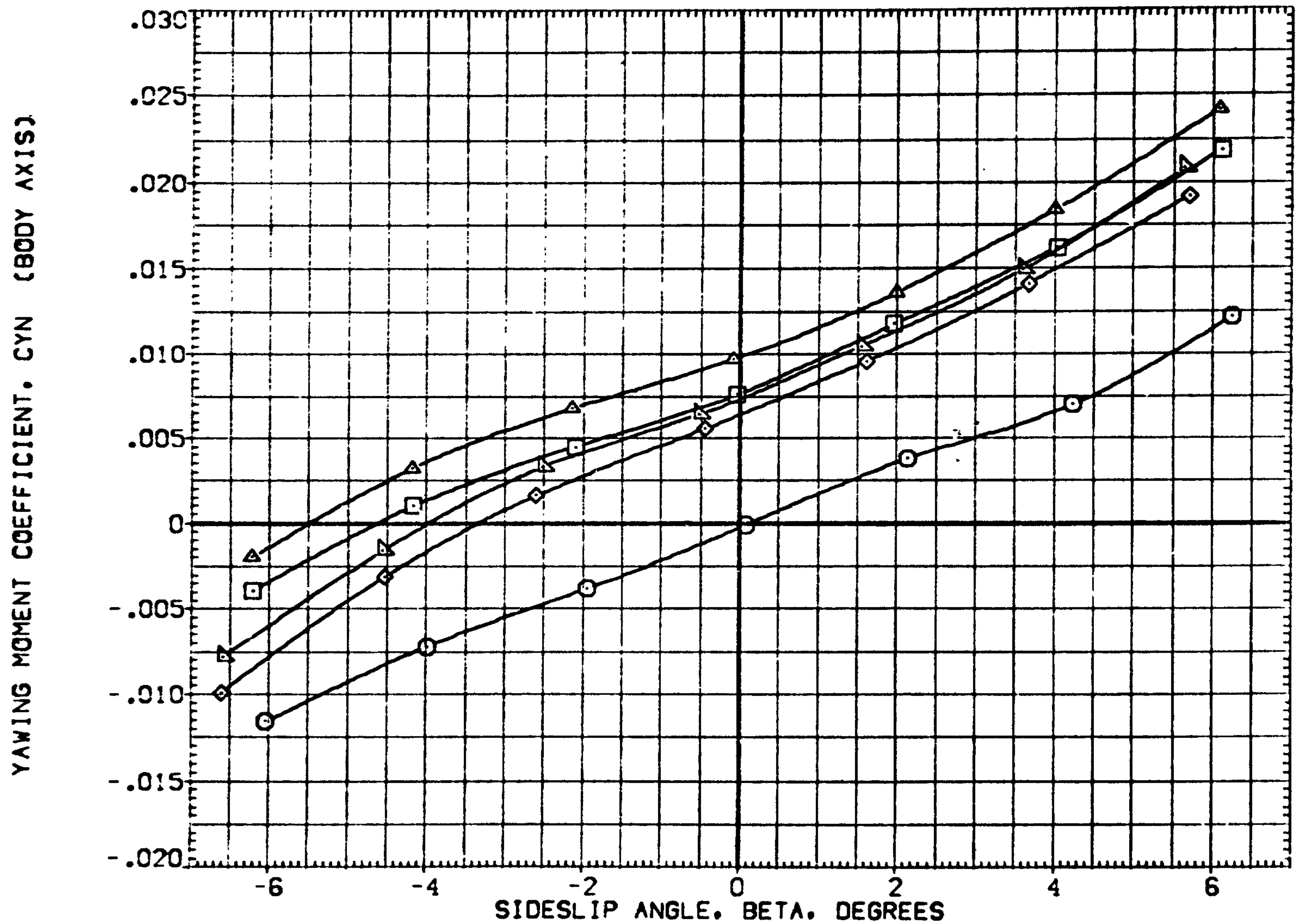


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(C)MACH = .80

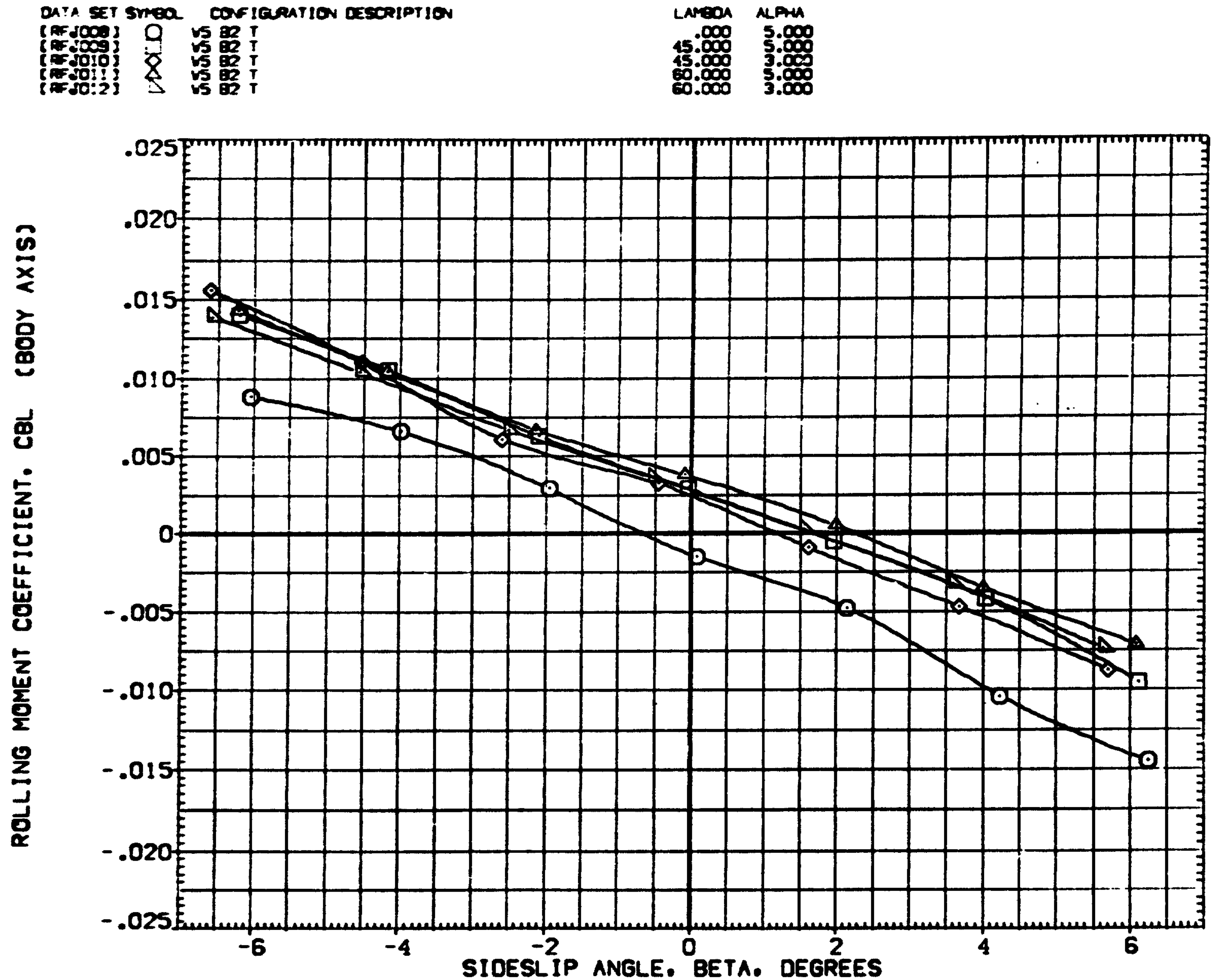


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(C)MACH = .80

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)	○	V5 B2 T	.000	5.000
(RFJ009)	□	V5 B2 T	45.000	5.000
(RFJ010)	◇	V5 B2 T	45.000	3.000
(RFJ011)	△	V5 B2 T	60.000	5.000
(RFJ012)	◺	V5 B2 T	60.000	3.000

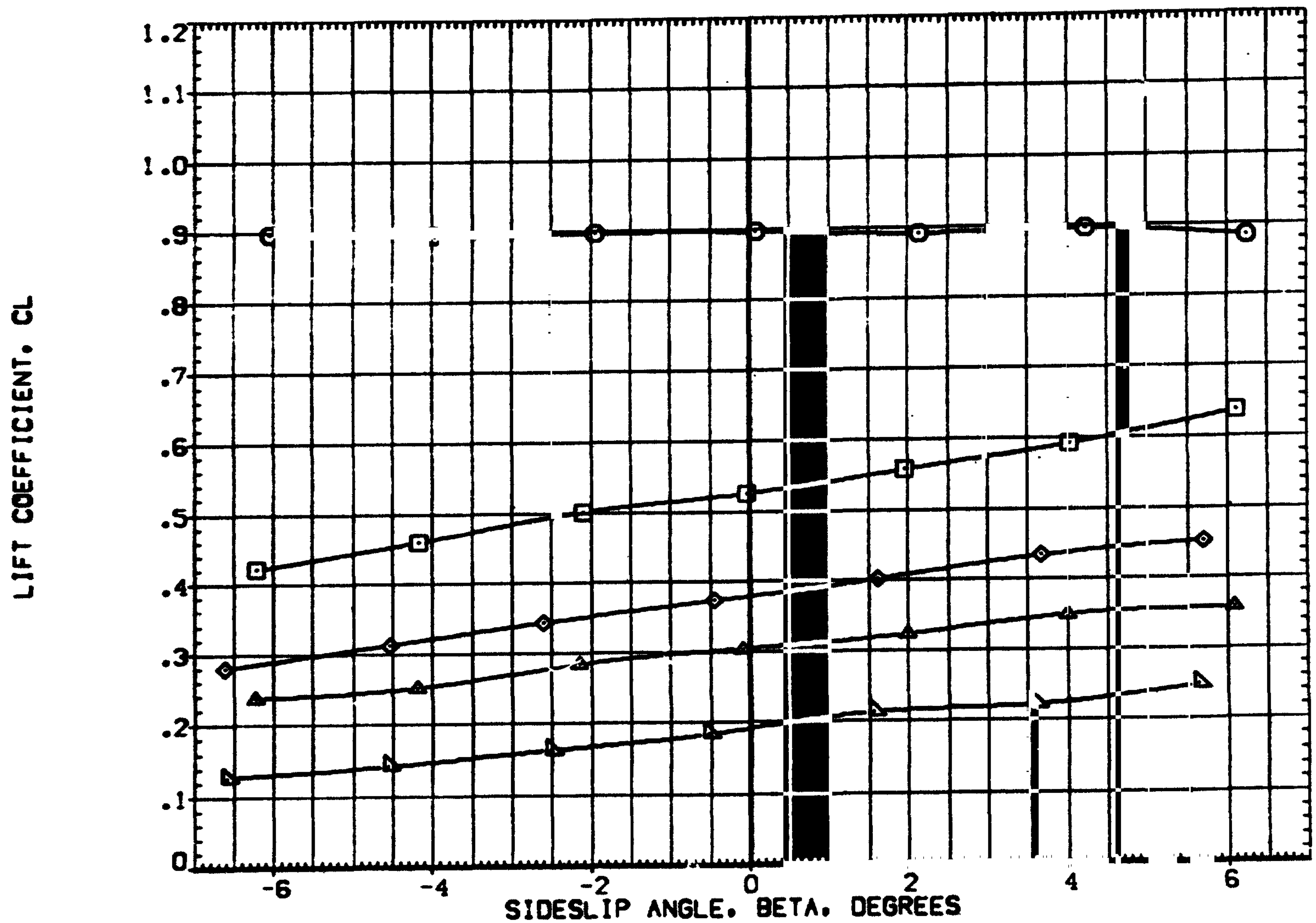


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(C)MACH = .80

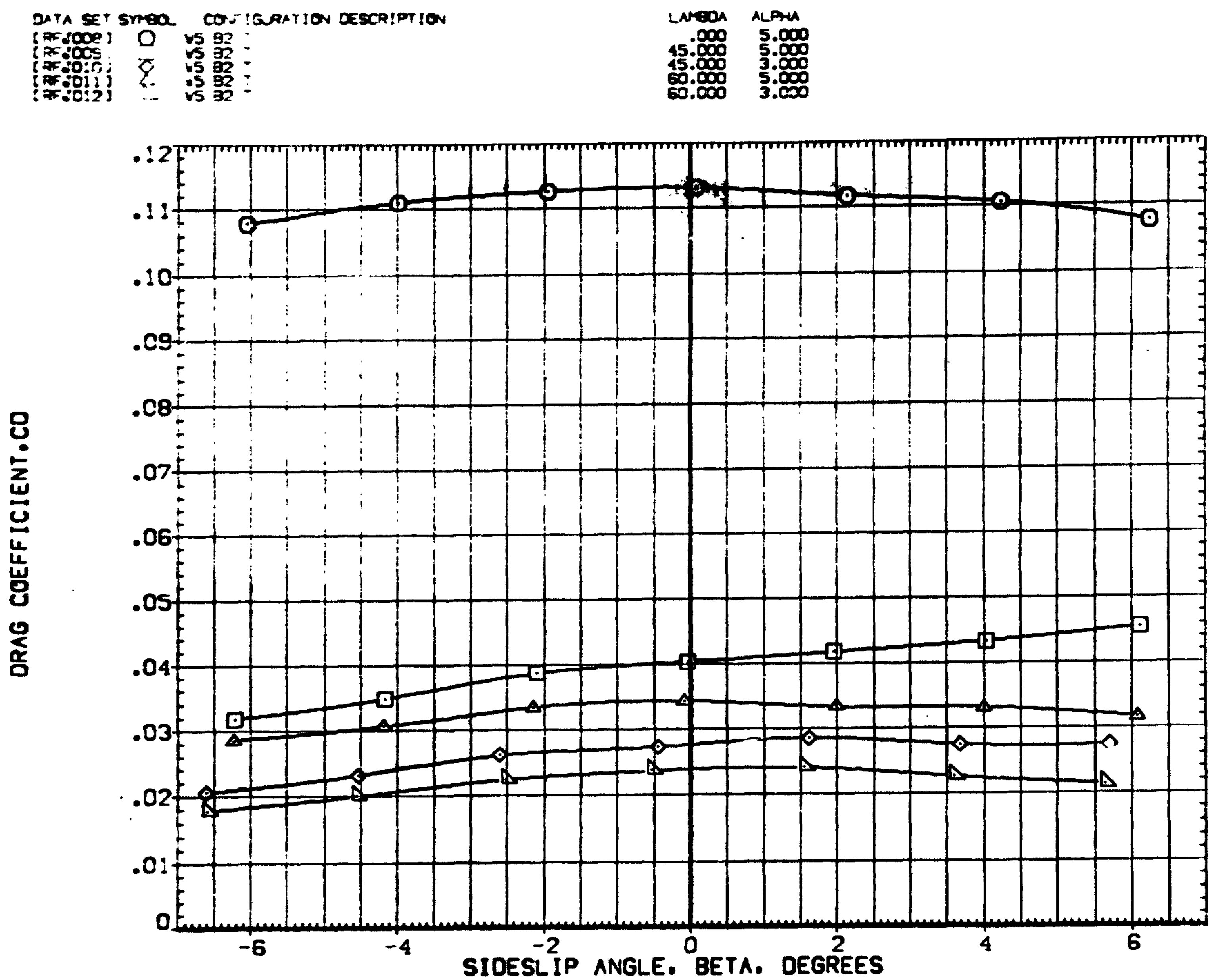


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(C)MAC = .8C

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)	○	VS B2 T	.000	5.000
(RFJ009)	□	VS B2 T	45.000	5.000
(RFJ010)	◇	VS B2 T	45.000	3.000
(RFJ011)	△	VS B2 T	60.000	5.000
(RFJ012)	◁	VS B2 T	60.000	3.000

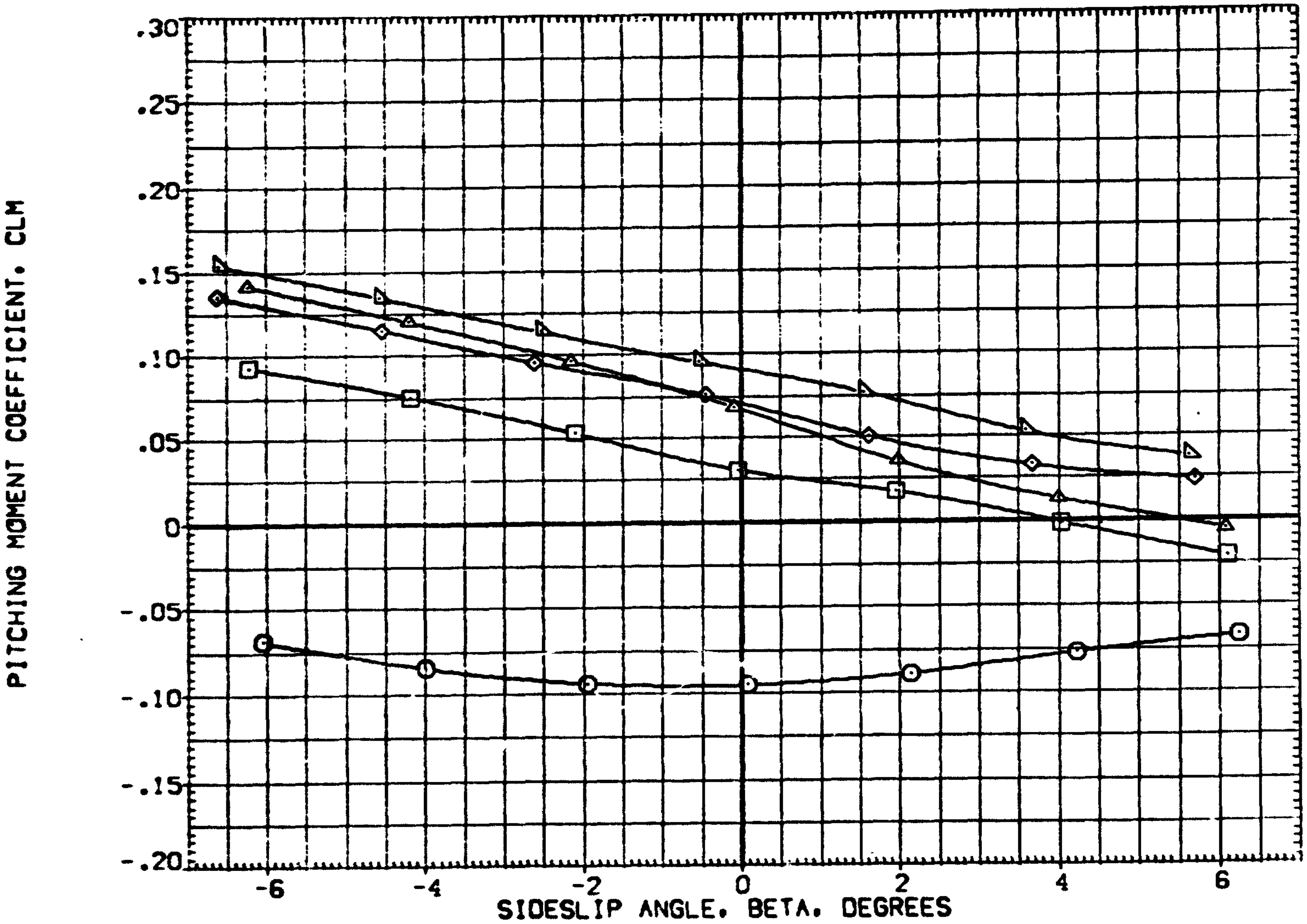


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(C)MACH = .80

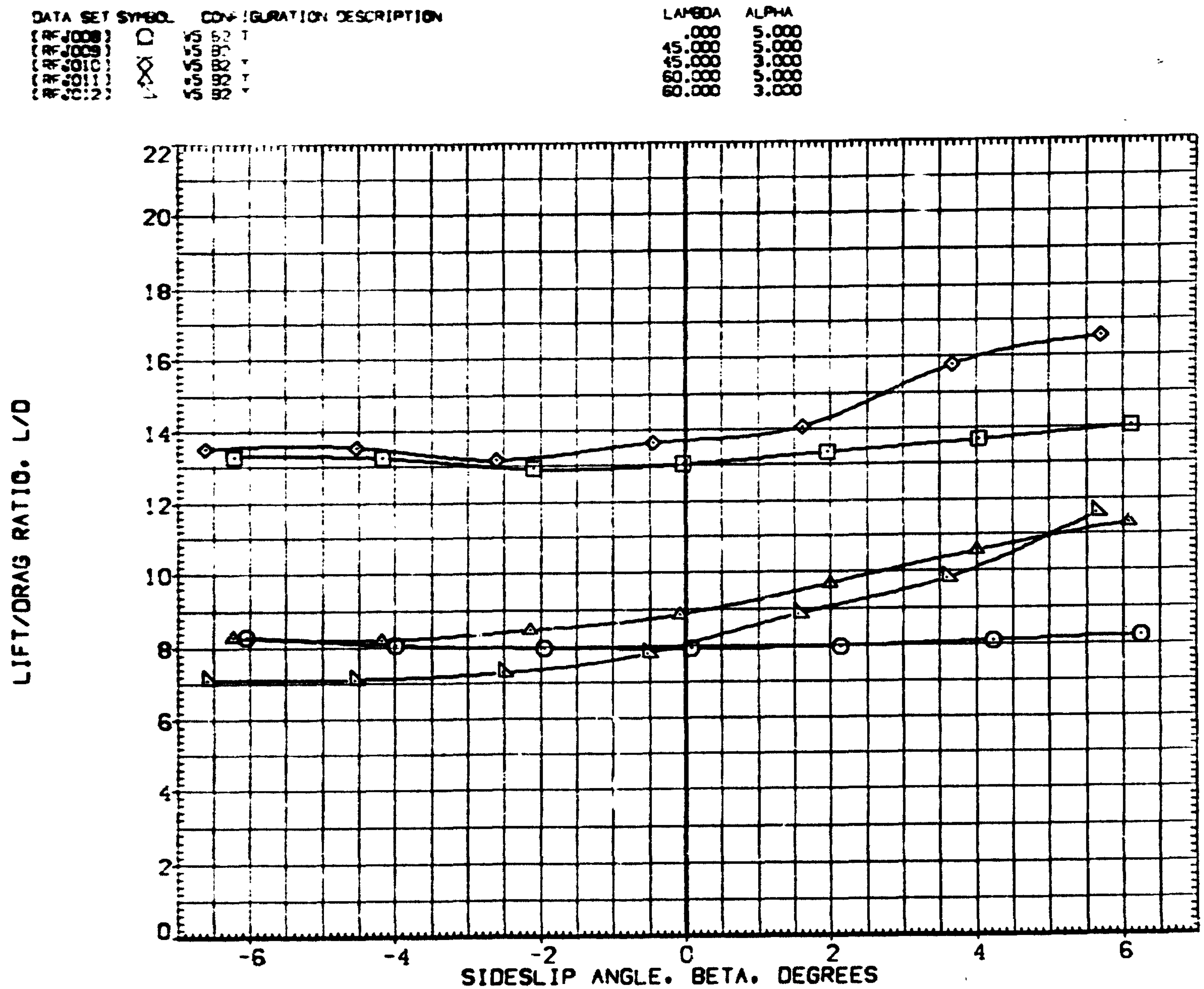


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(C)MACH = .80

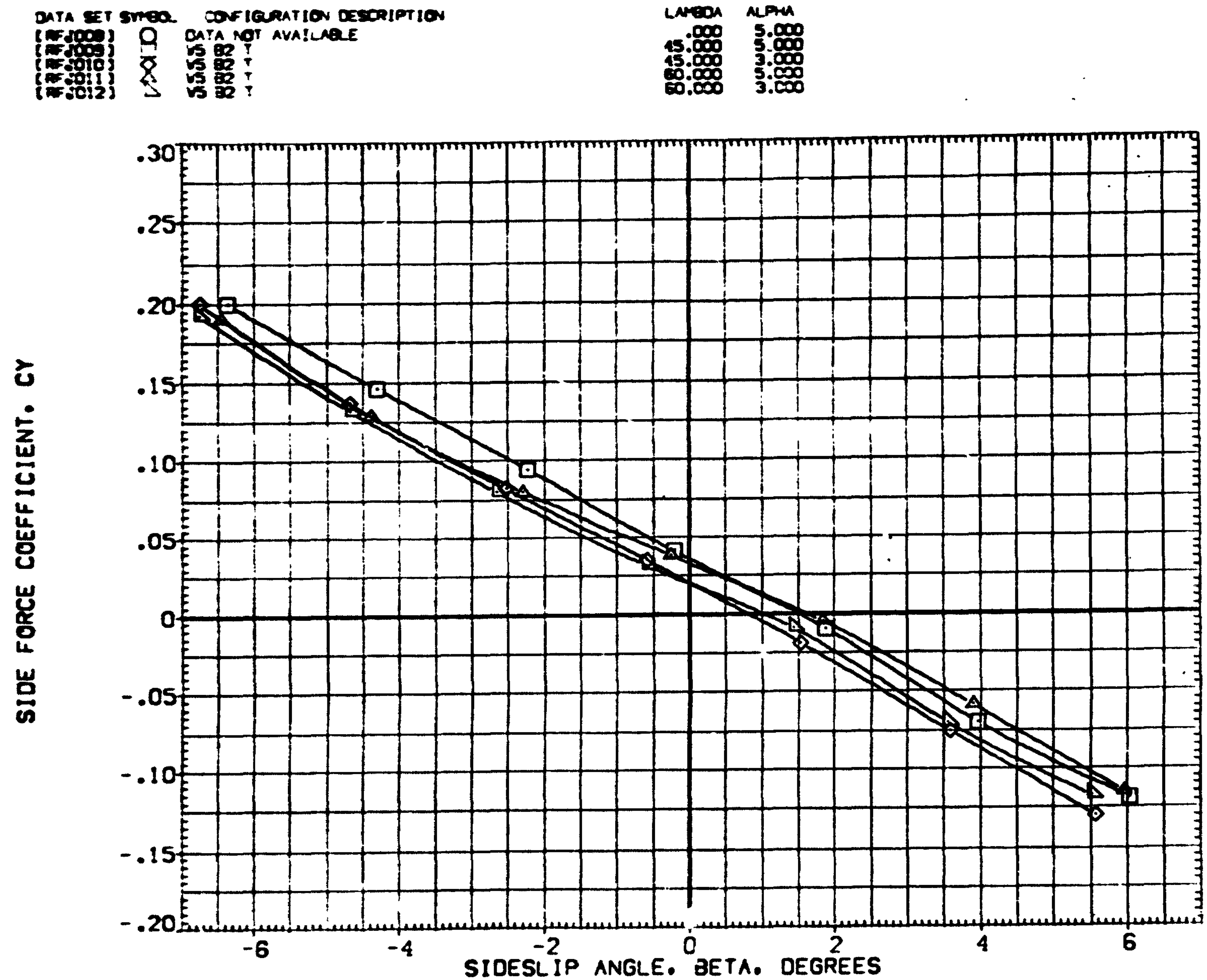


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(D)MACH = .95

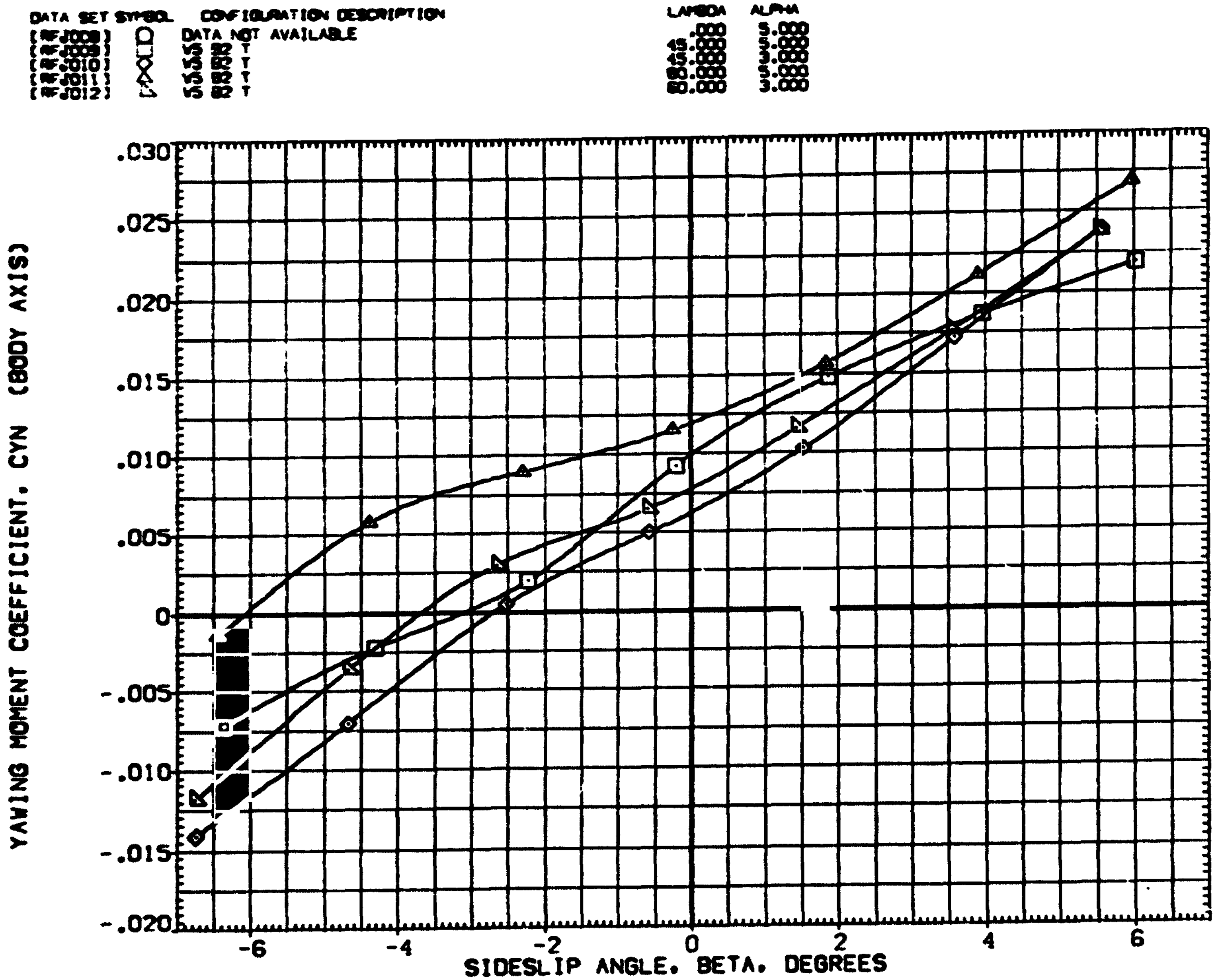


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(D)MACH = .95

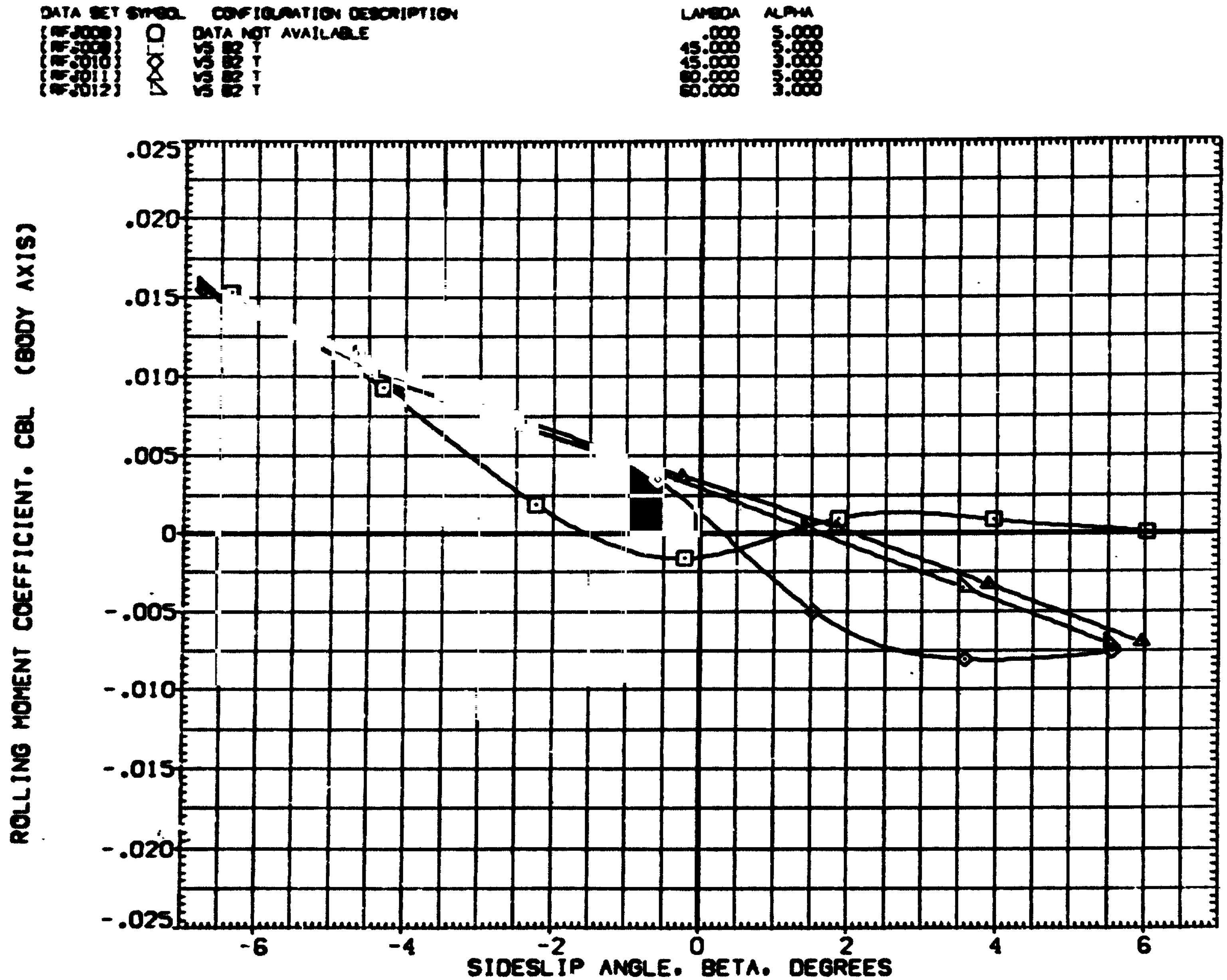


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.
(D)MACH = .95

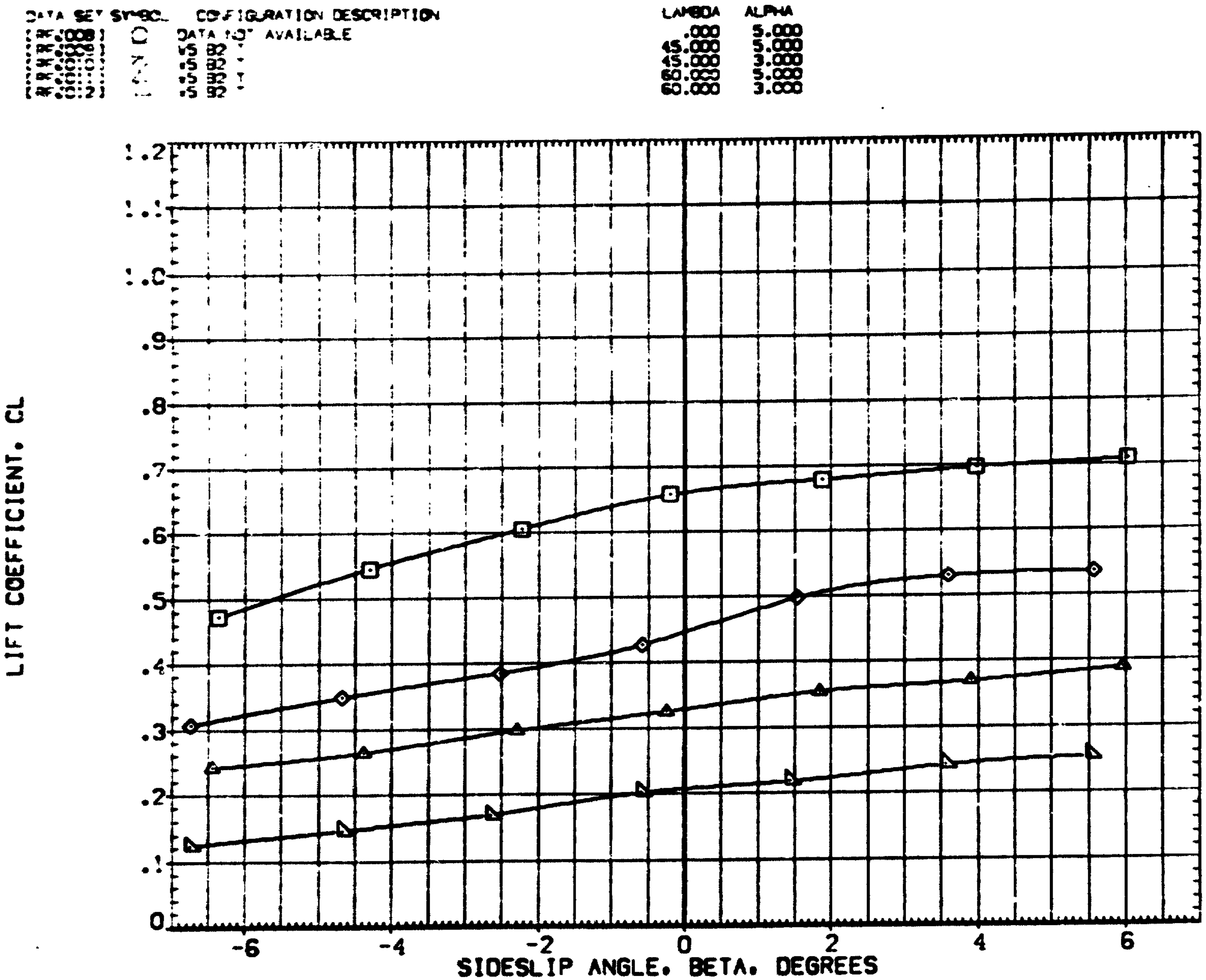


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(C)MACH = .95

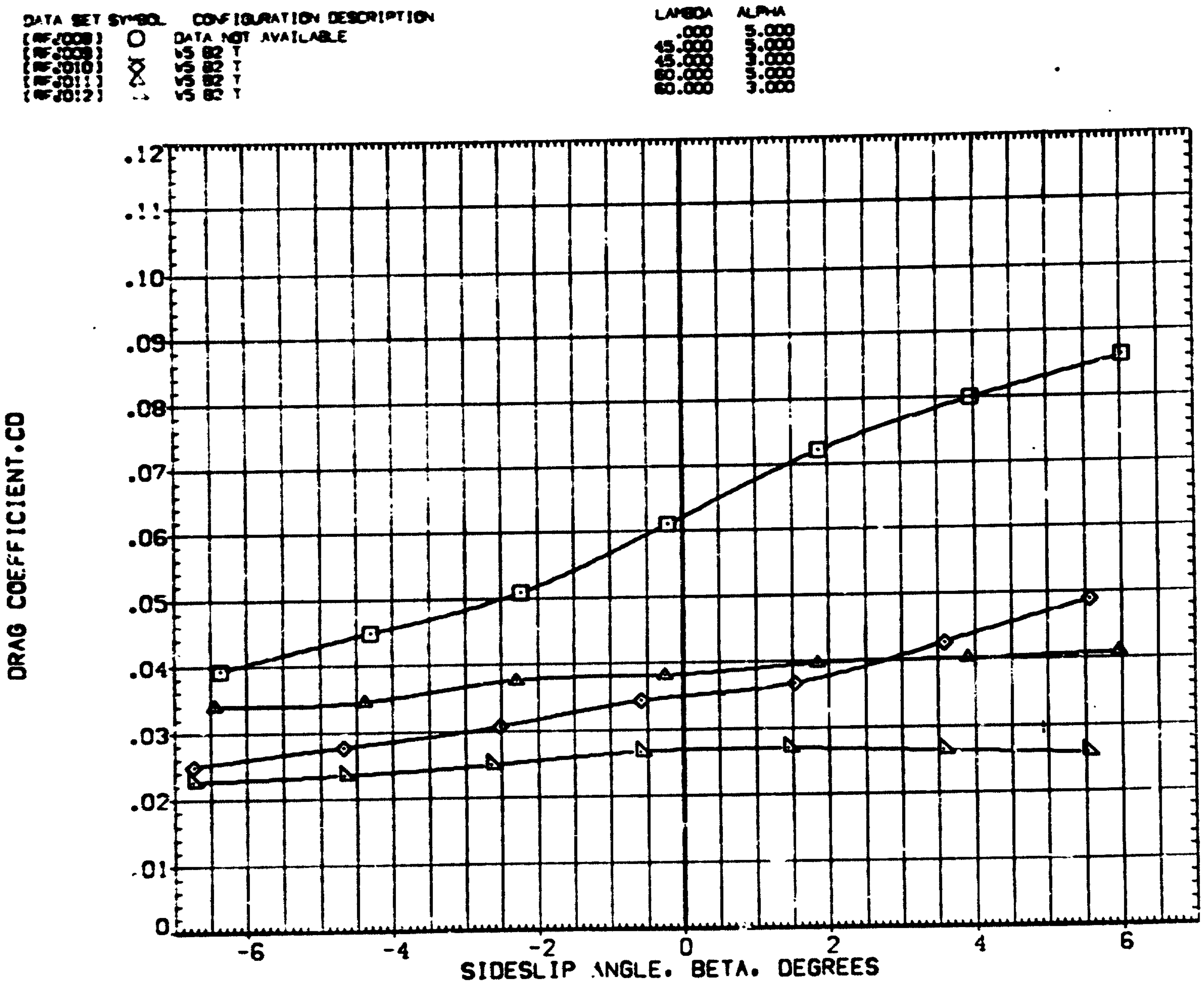


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(D)MACH = .95

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)	○	DATA NOT AVAILABLE	.000	5.000
(RFJ009)	◇	V5 B2	45.000	5.000
(RFJ010)	◇	V5 B2	45.000	3.000
(RFJ011)	△	V5 B2	60.000	5.000
(RFJ012)		V5 B2	60.000	3.000

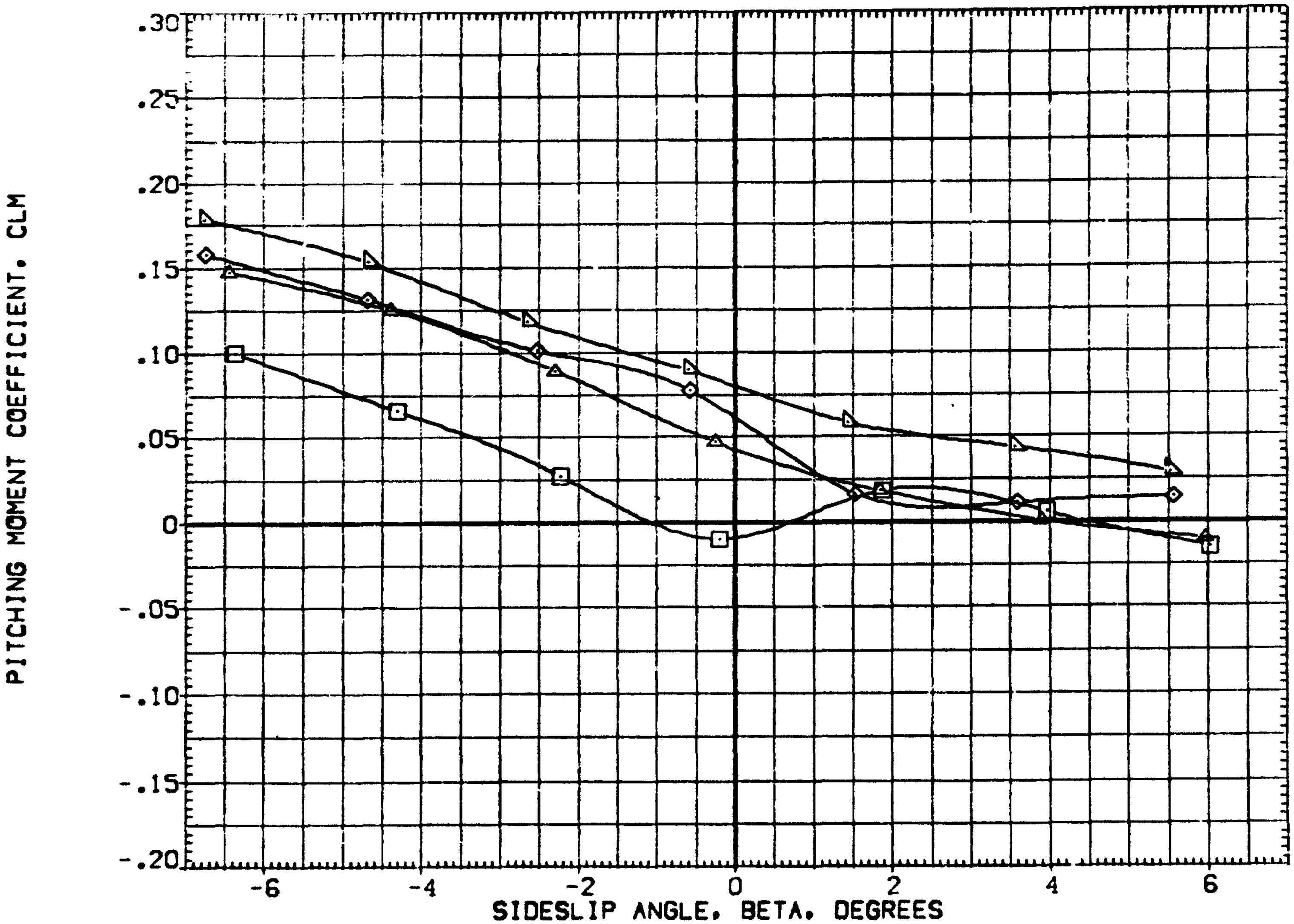


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(D)MACH = .95

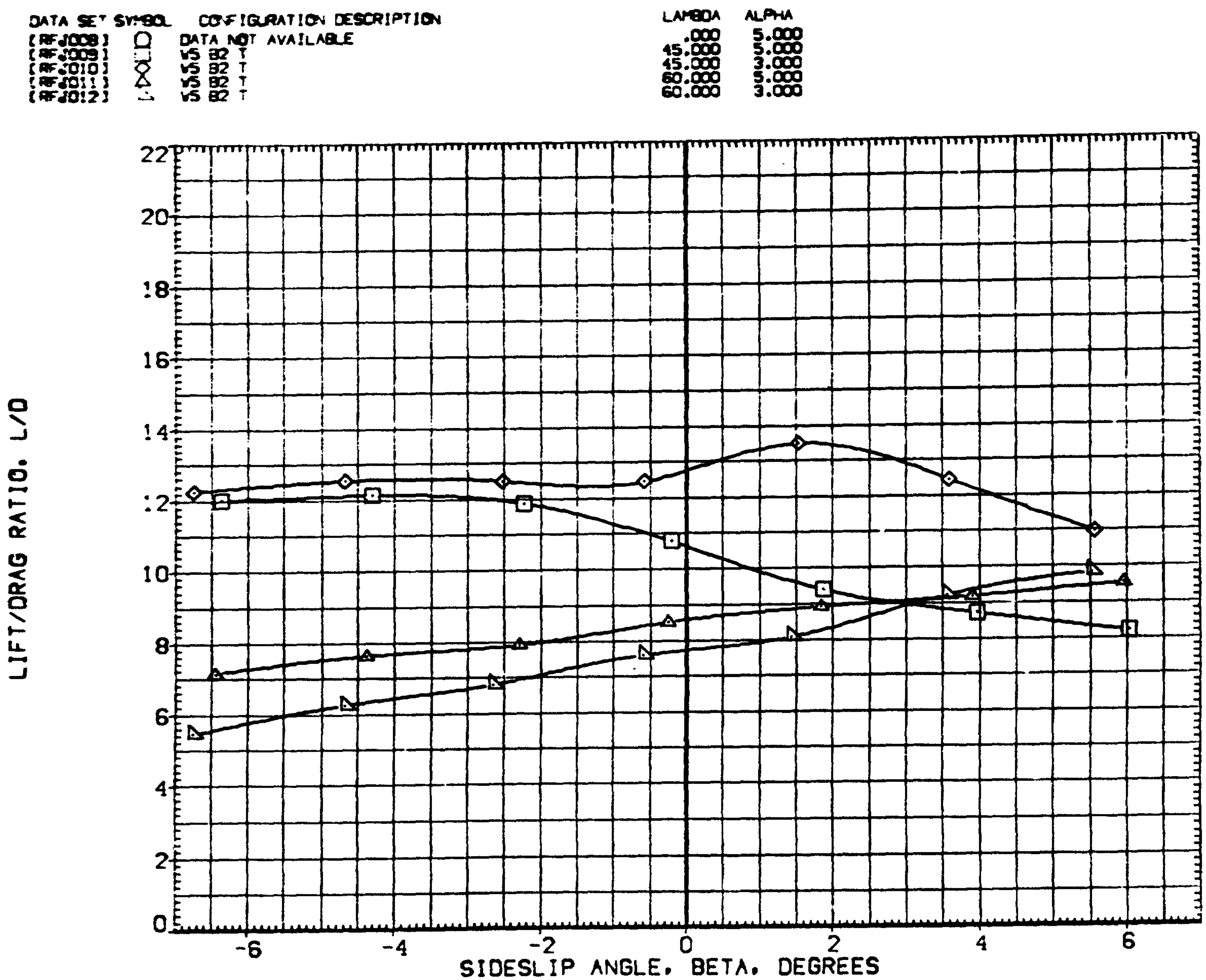


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(D) MACH = .95

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	DATA NOT AVAILABLE	.000	5.000
[RFJ009]	□	W5 B2 T	45.000	5.000
[RFJ010]	◇	W5 B2 T	45.000	3.000
[RFJ011]	△	W5 B2 T	60.000	5.000
[RFJ012]	⊿	W5 B2 T	60.000	3.000

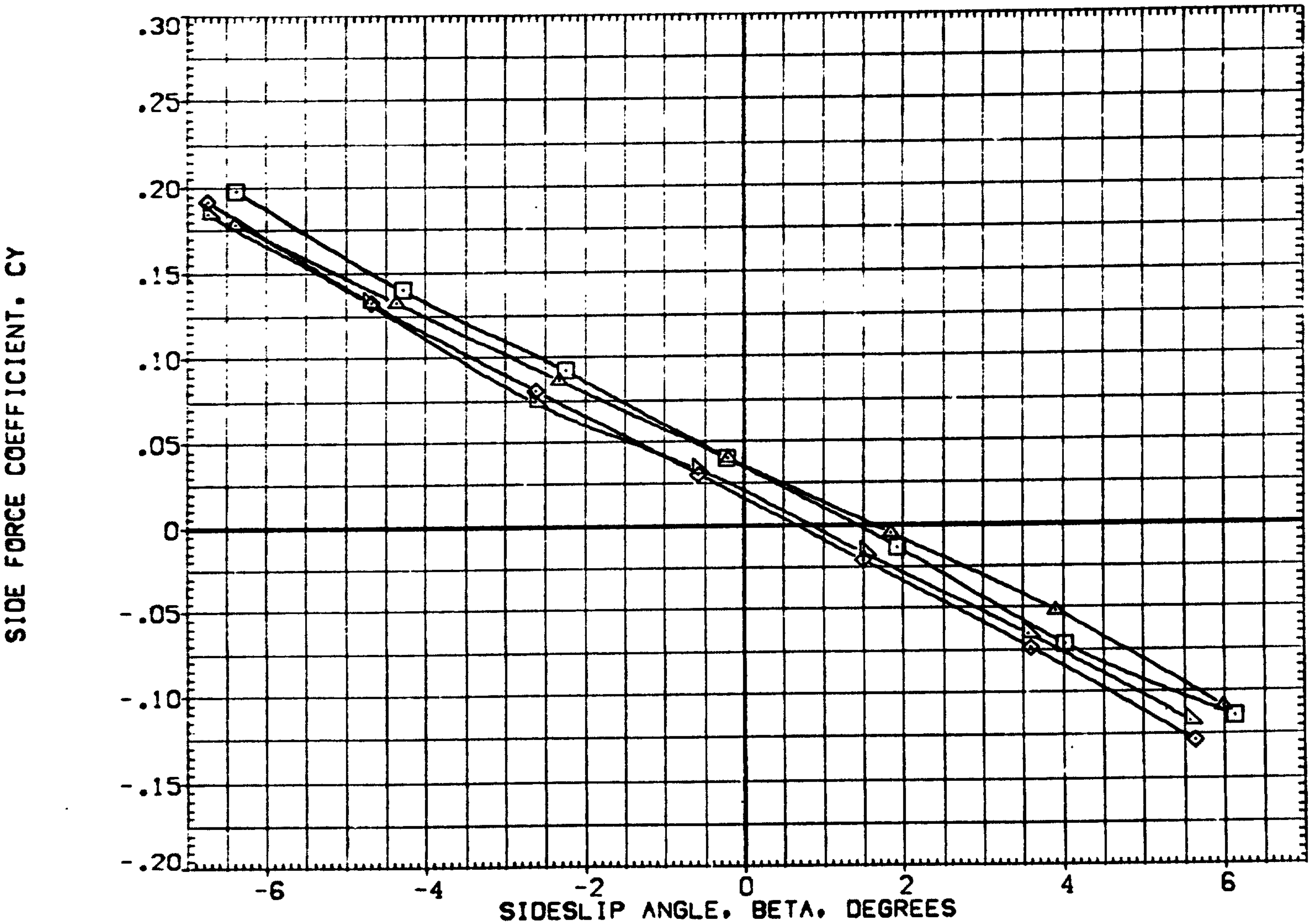


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(E)MACH = .98

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)	□	DATA NOT AVAILABLE	.000	5.000
(RFJ009)	◇	VS B2 T	45.000	5.000
(RFJ010)	◇	VS B2 T	45.000	3.000
(RFJ011)	△	VS B2 T	60.000	5.000
(RFJ012)	⊿	VS B2 T	60.000	3.000

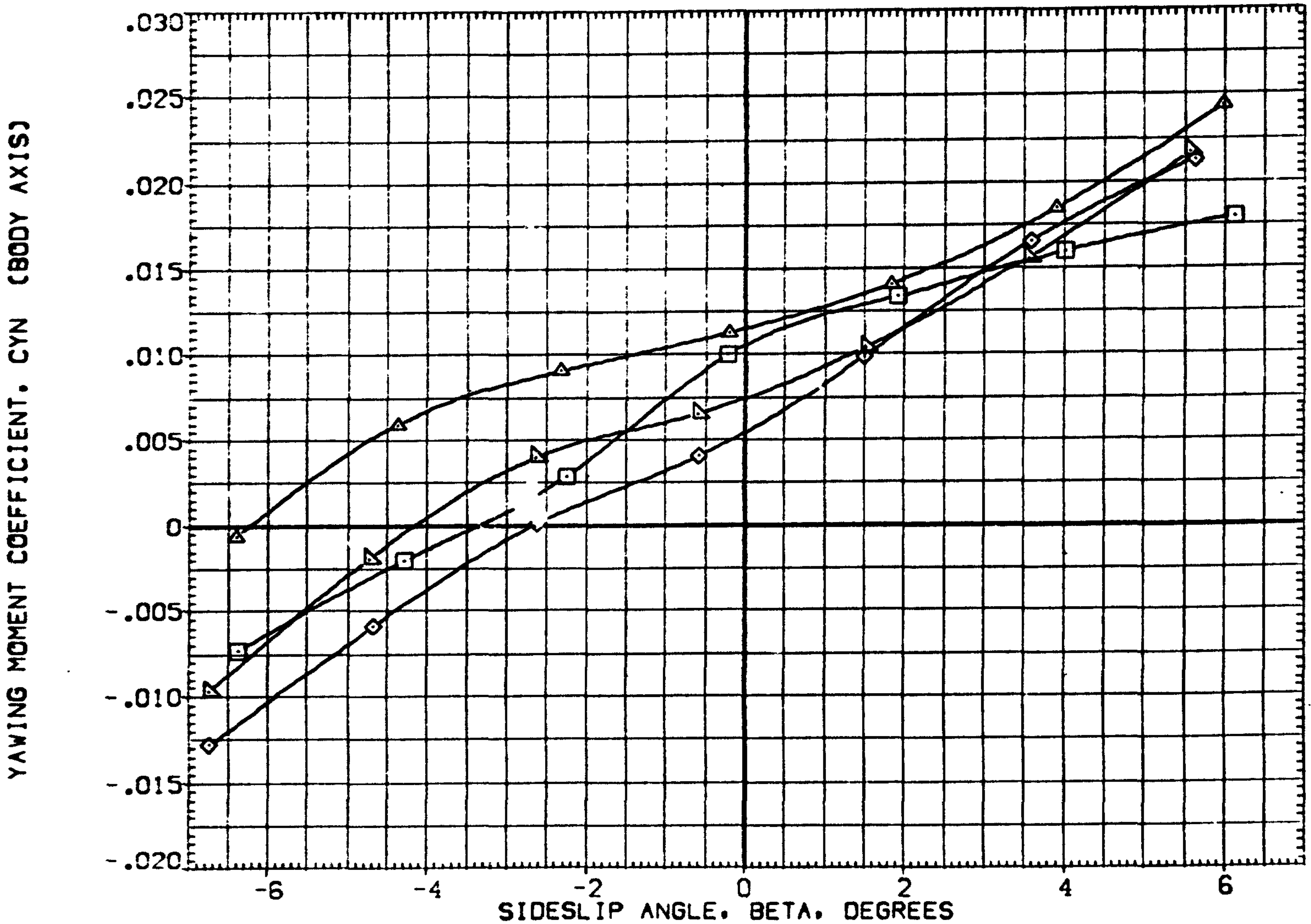


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(E)MACH = .98

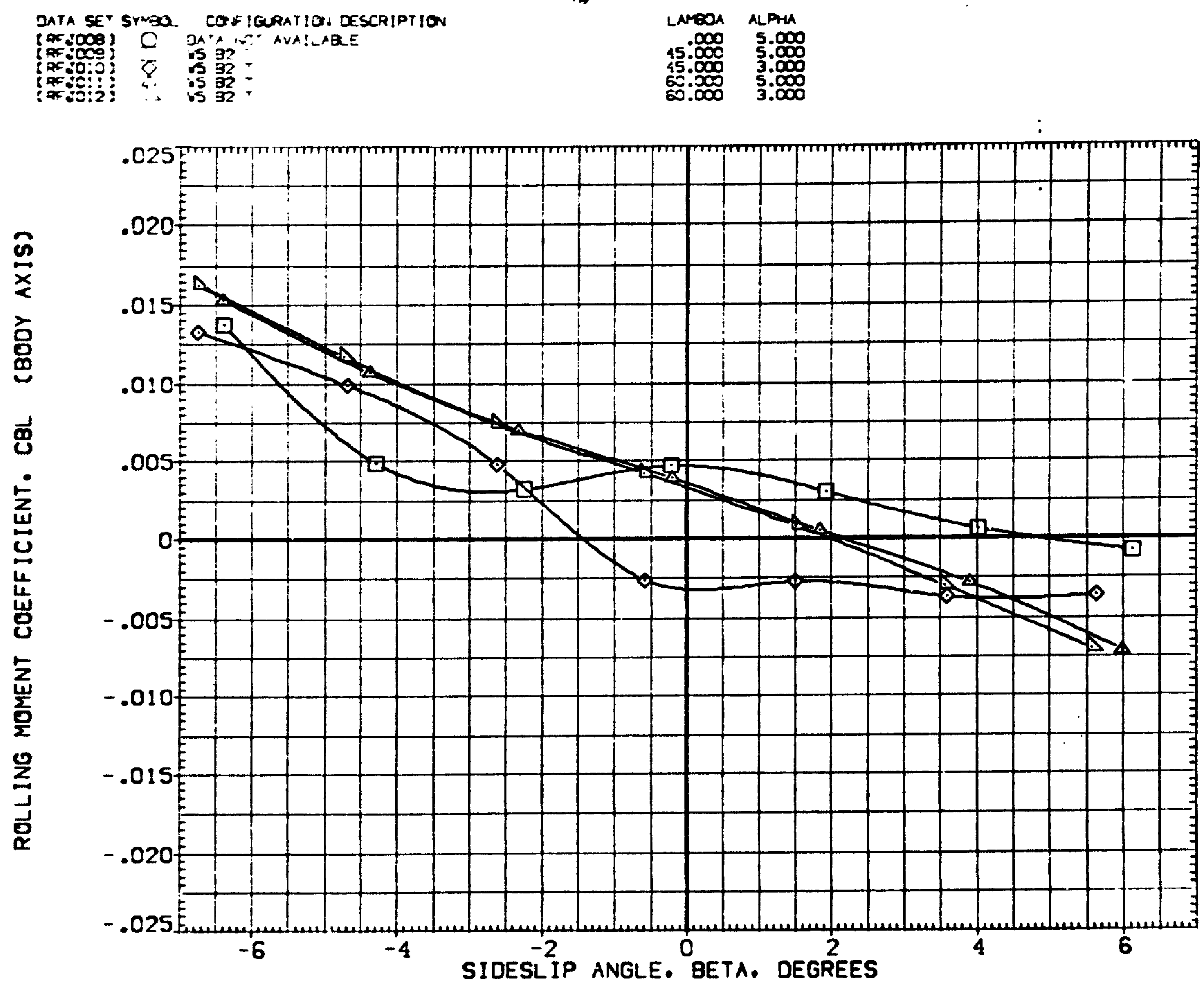


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(E)MACH = .98

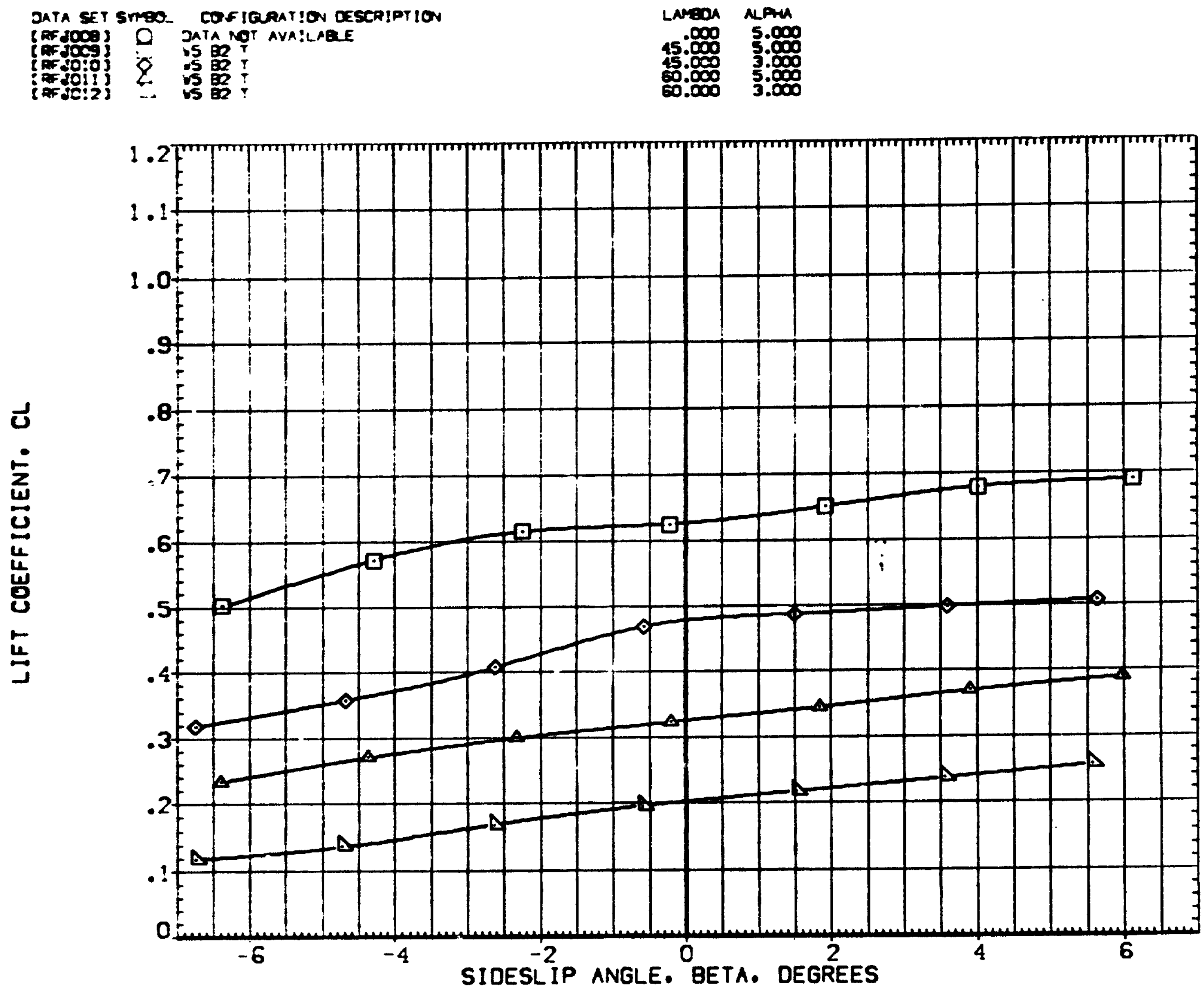


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(E)MACH = .98

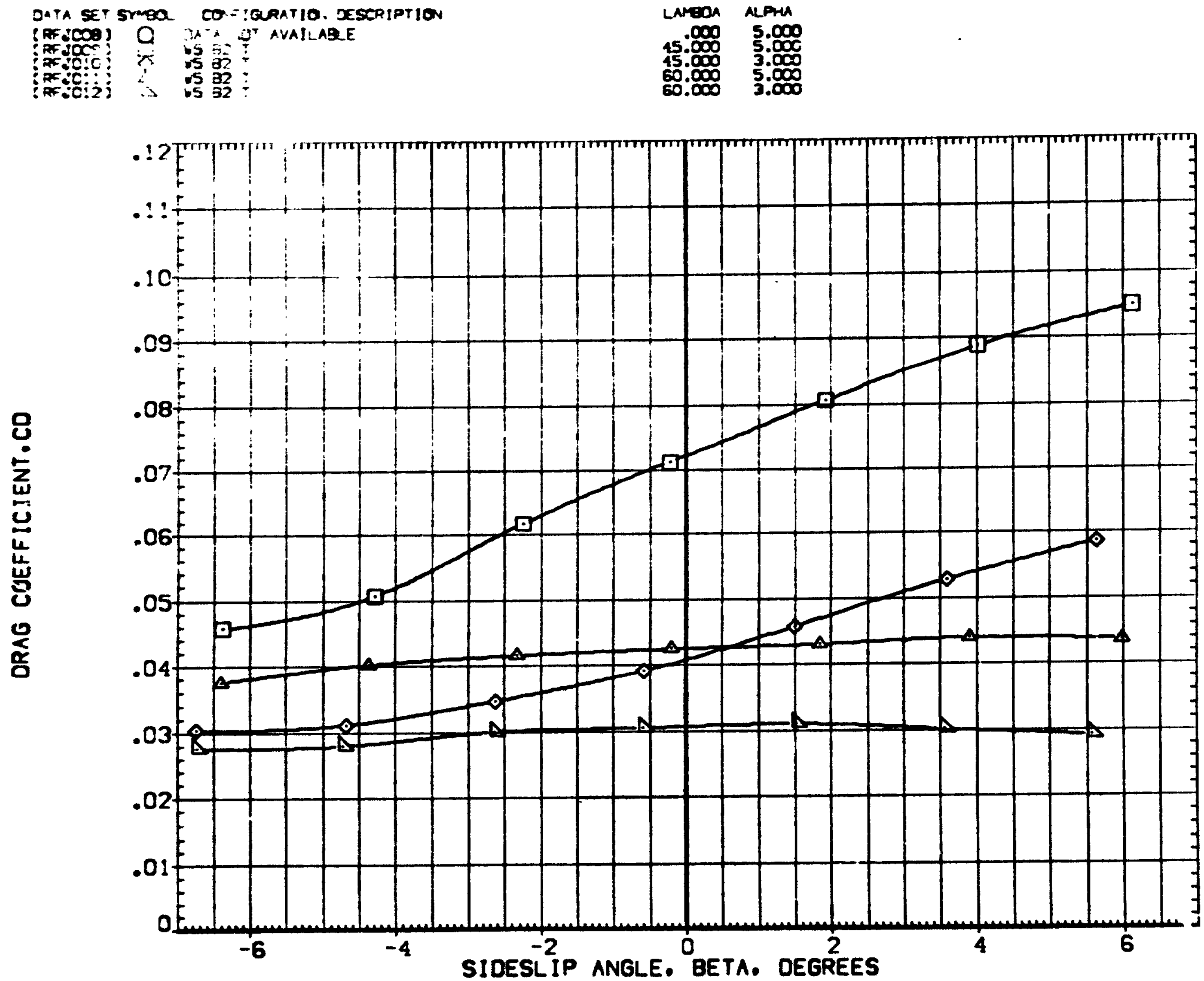


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(E)MACH = .98

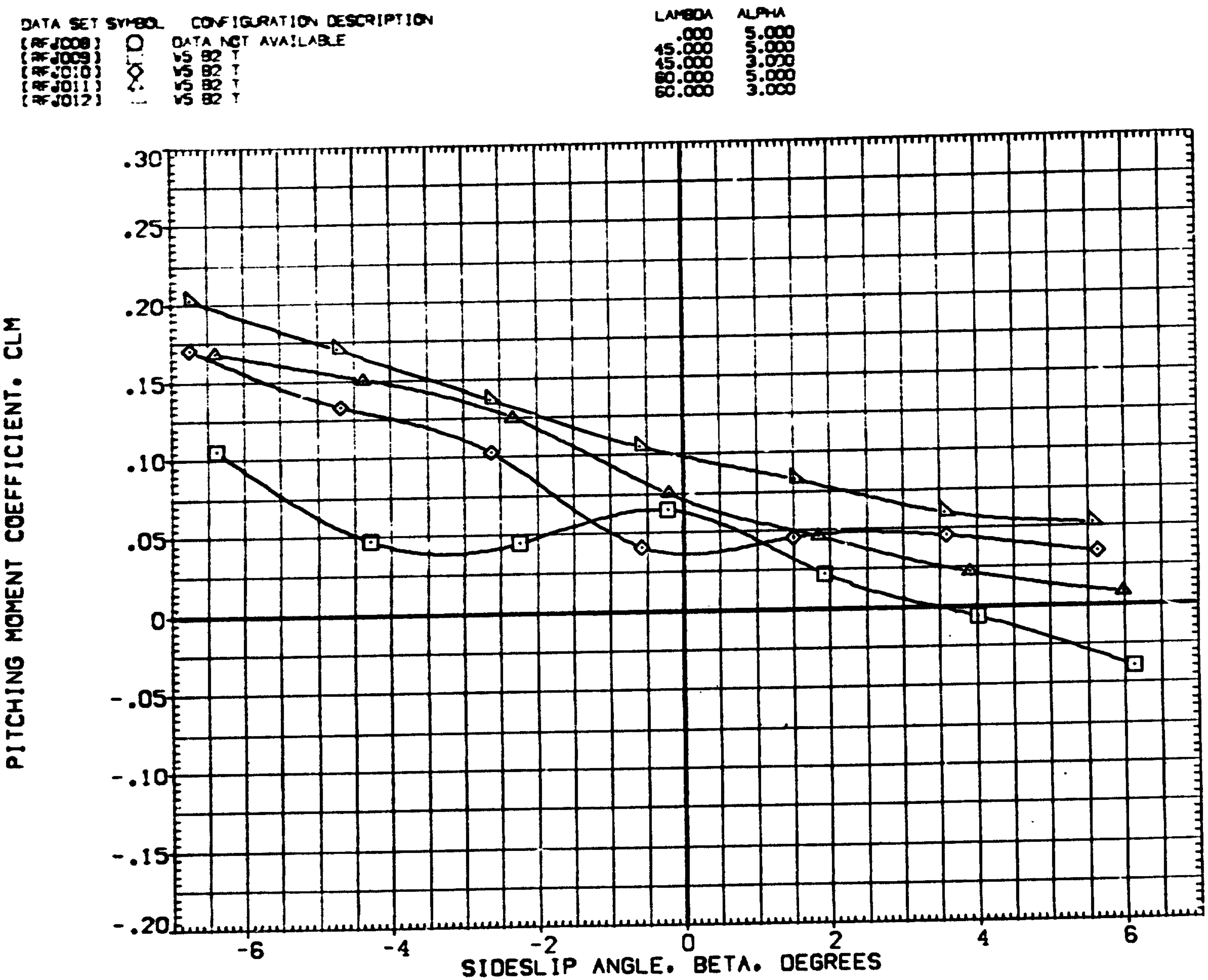


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(E)MACH = .98

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJOO8]	○	DATA NOT AVAILABLE	.000	5.000
[RFJOO9]		WS B2 T	45.000	5.000
[RFJO10]	◇	WS B2 T	45.000	3.000
[RFJO11]	△	WS B2 T	60.000	5.000
[RFJO12]		WS B2 T	60.000	3.000

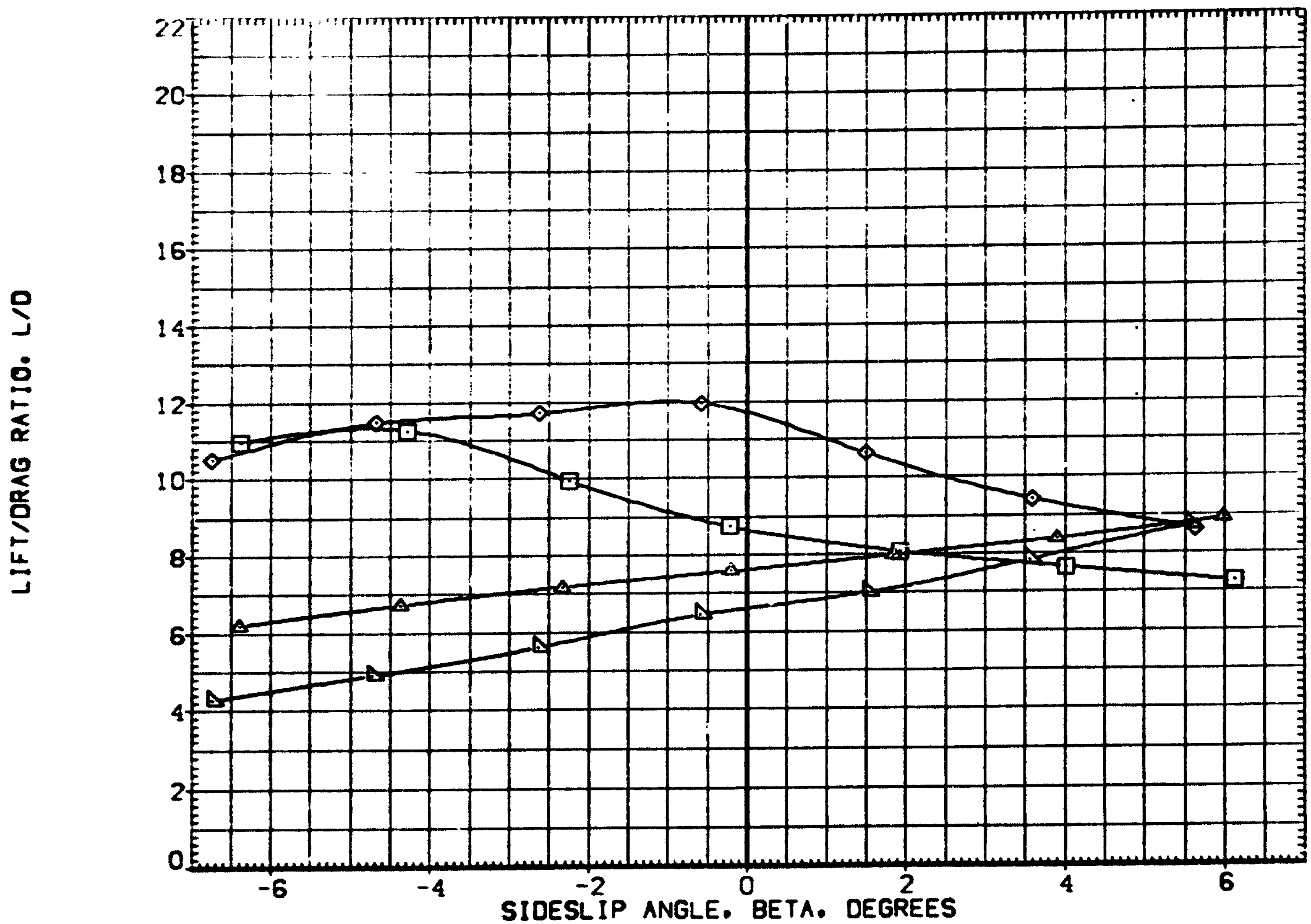


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(E)MACH = .98

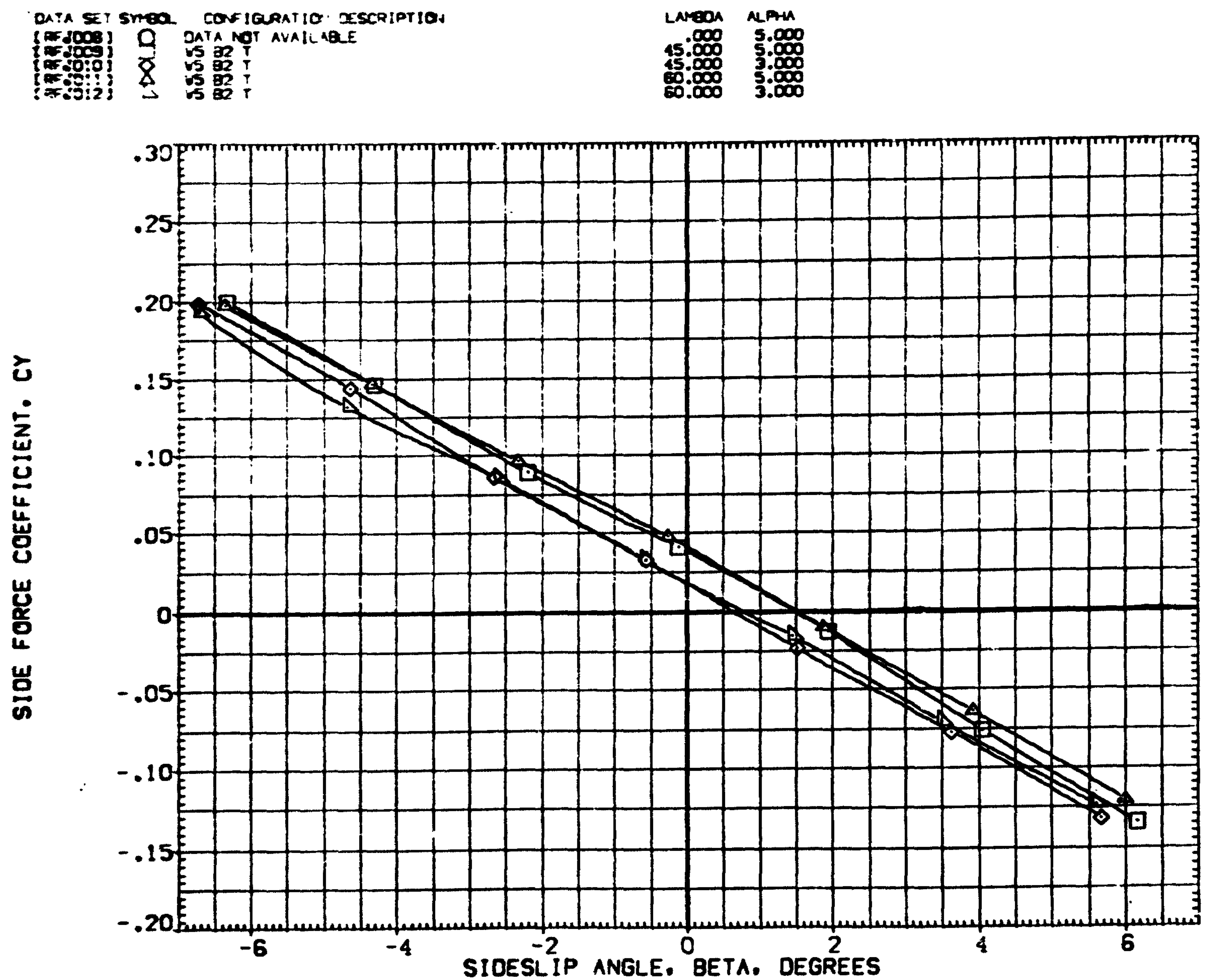


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(F)MACH = 1.05

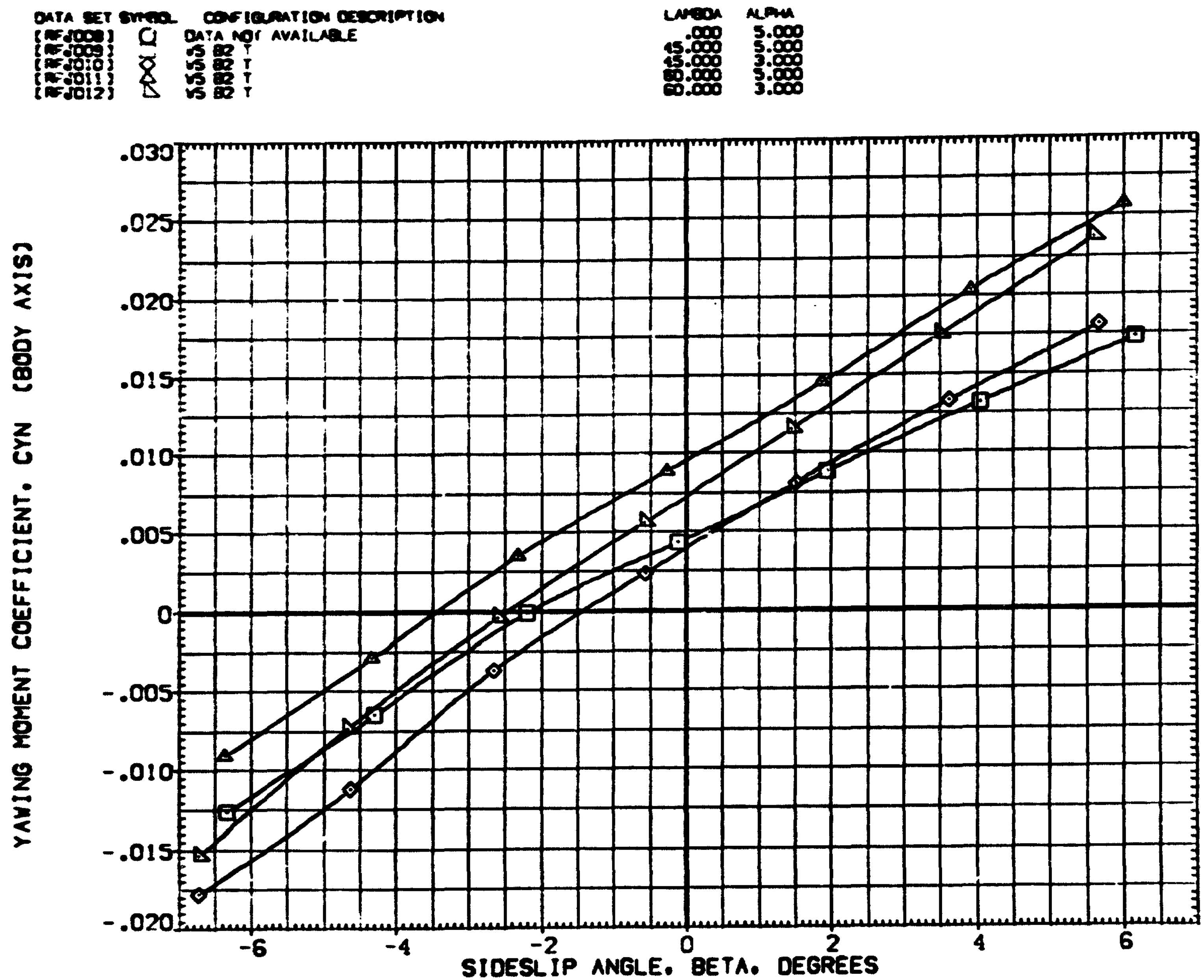


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(F)MACH = 1.05

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)	○	DATA NOT AVAILABLE	.000	5.000
(RFJ009)	□	V5 B2 T	45.000	5.000
(RFJ010)	◇	V5 B2 T	45.000	3.000
(RFJ011)	△	V5 B2 T	60.000	5.000
(RFJ012)	◁	V5 B2 T	60.000	3.000

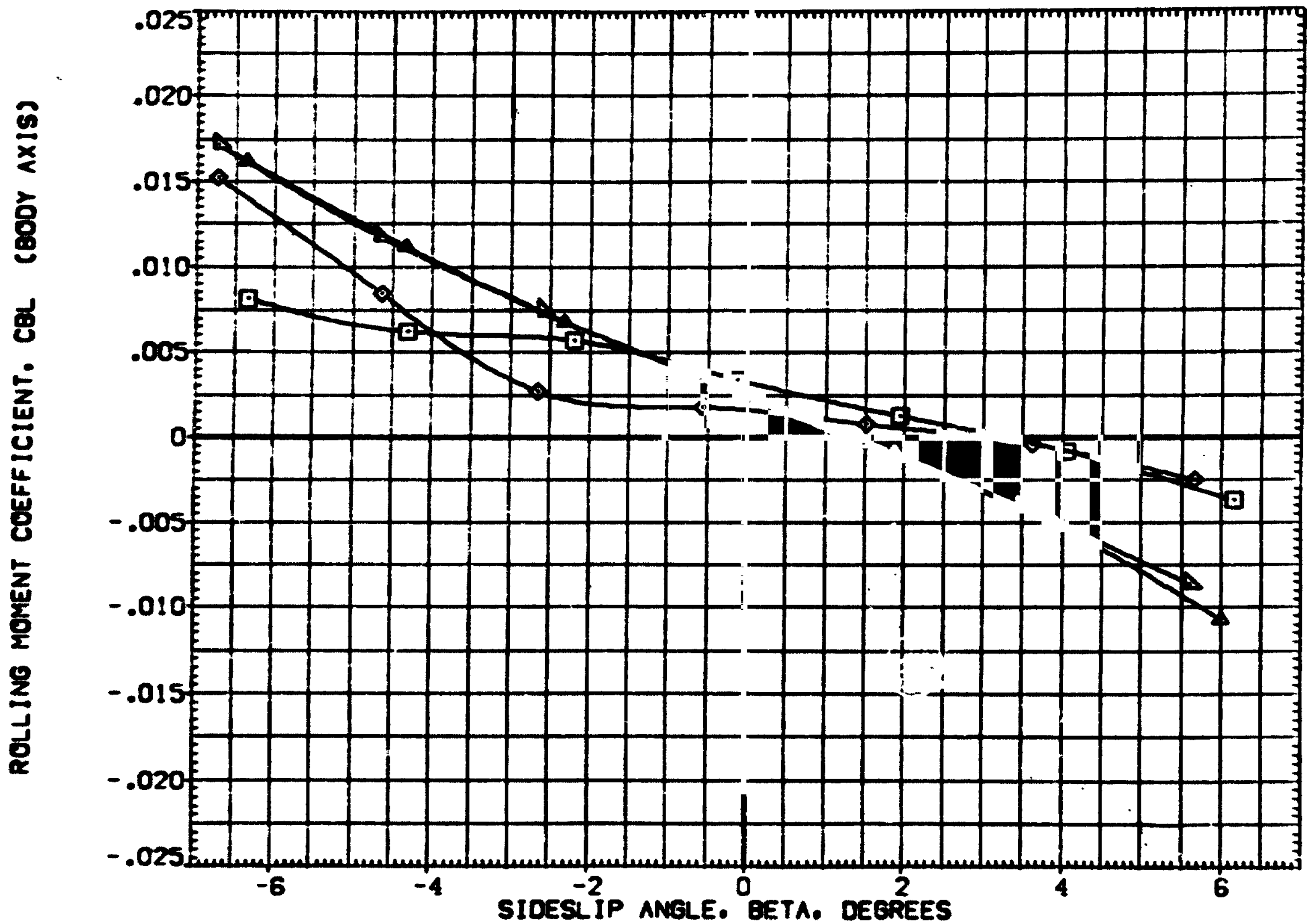


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(F)MACH = 1.05

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)	□	DATA NOT AVAILABLE	.000	5.000
(RFJ009)	◇	W5 B2 T	45.000	5.000
(RFJ010)	◇	W5 B2 T	45.000	3.000
(RFJ011)	△	W5 B2 T	60.000	5.000
(RFJ012)	△	W5 B2 T	60.000	3.000

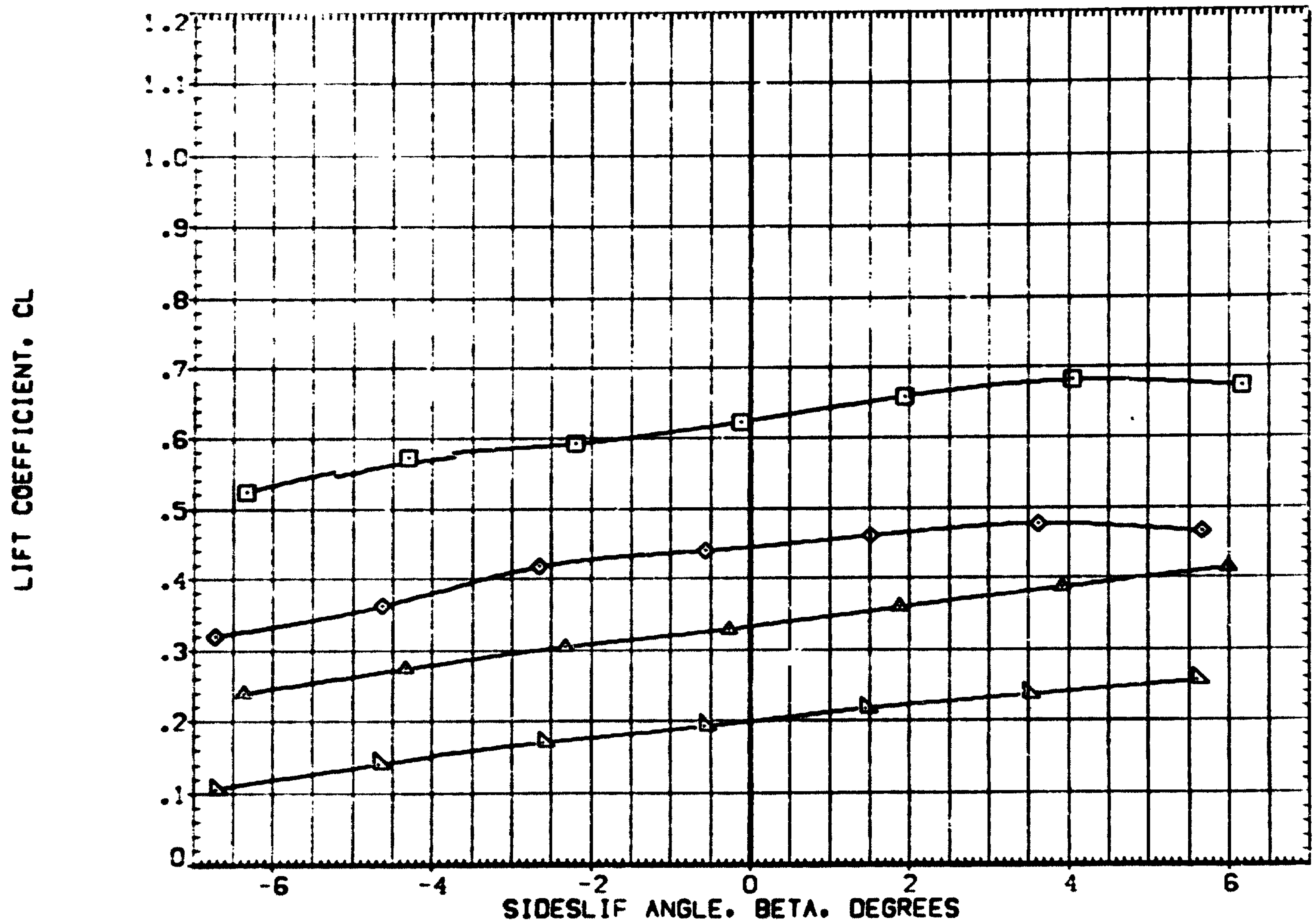


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(F)MACH = 1.05

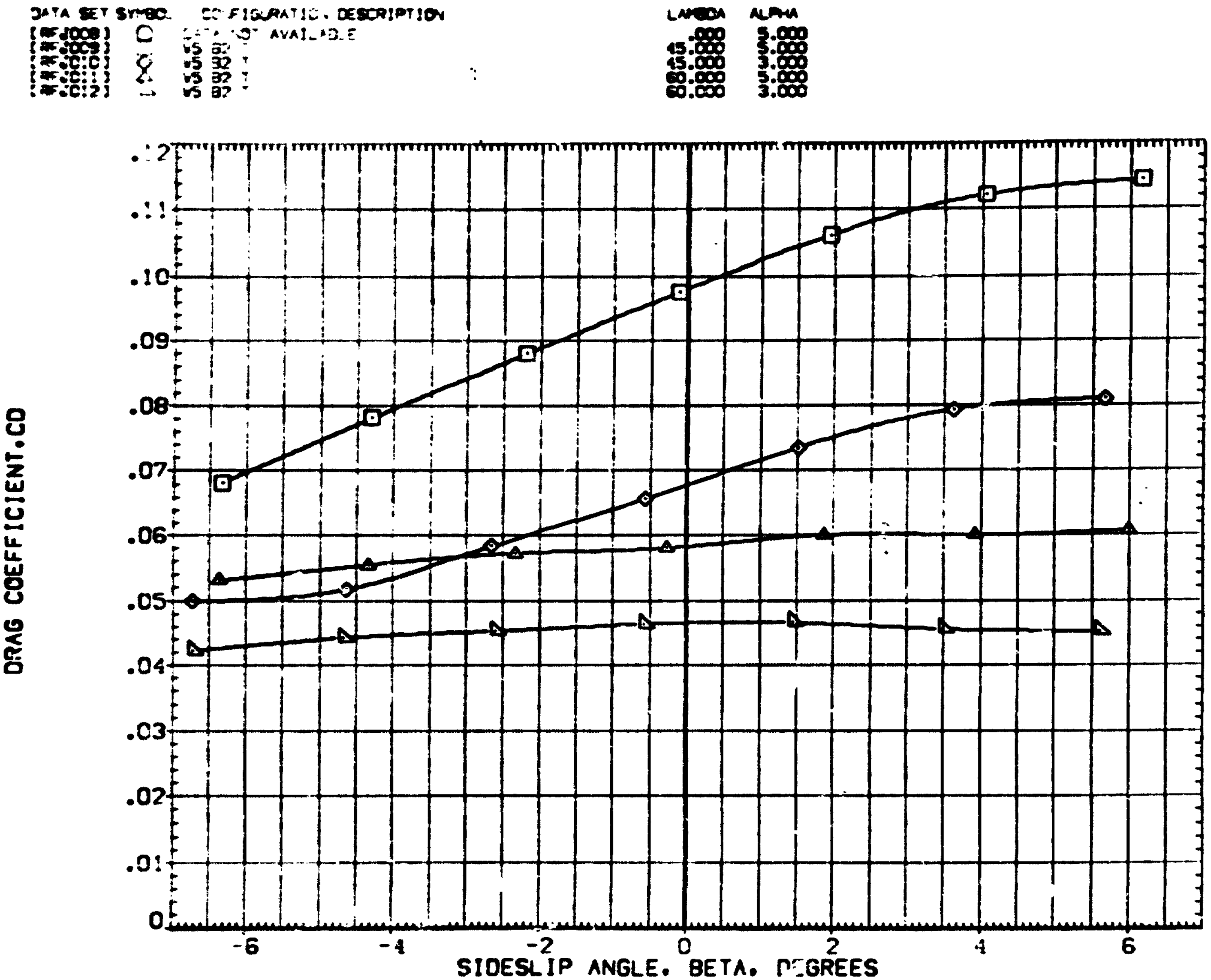


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(F)MACH = 1.05

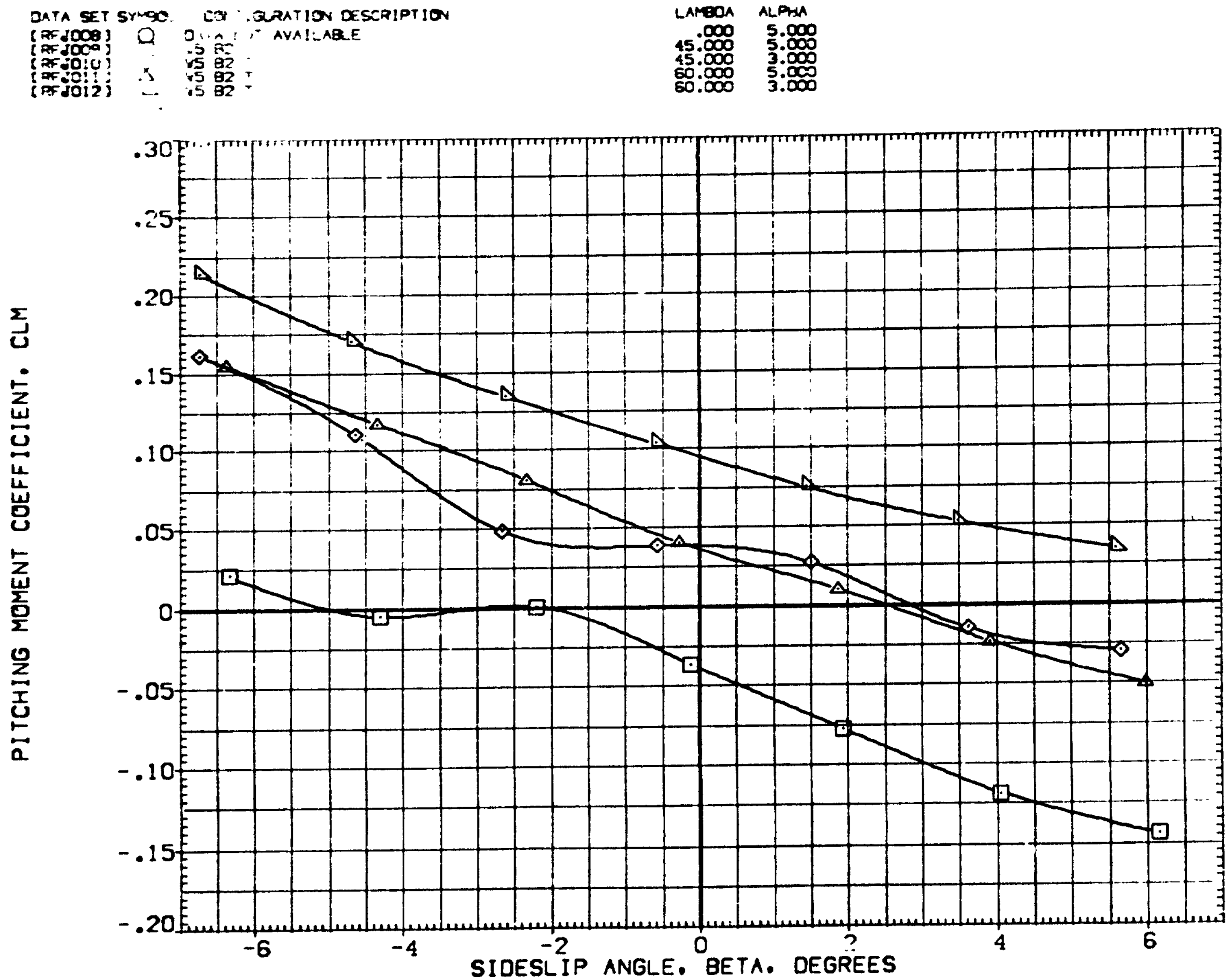


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(F)MACH = 1.05

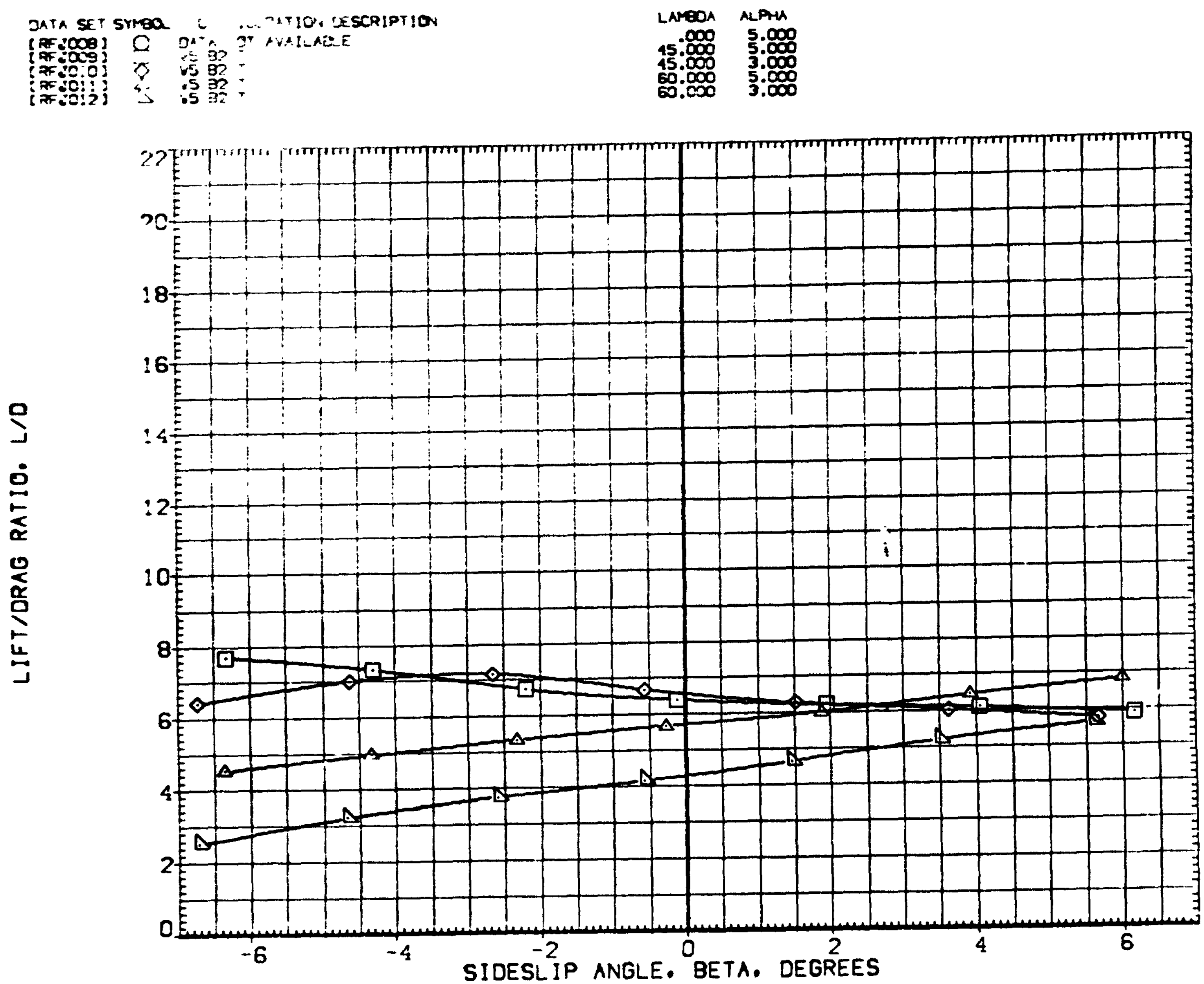


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(F)MACH = 1.05

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	DATA NOT AVAILABLE	.000	5.000
[RFJ009]	▽	DATA NOT AVAILABLE	45.000	5.000
[RFJ010]	⧖	DATA NOT AVAILABLE	45.000	3.000
[RFJ011]	△	*5 B2 T	60.000	5.000
[RFJ012]	▷	*5 B2 T	60.000	3.000

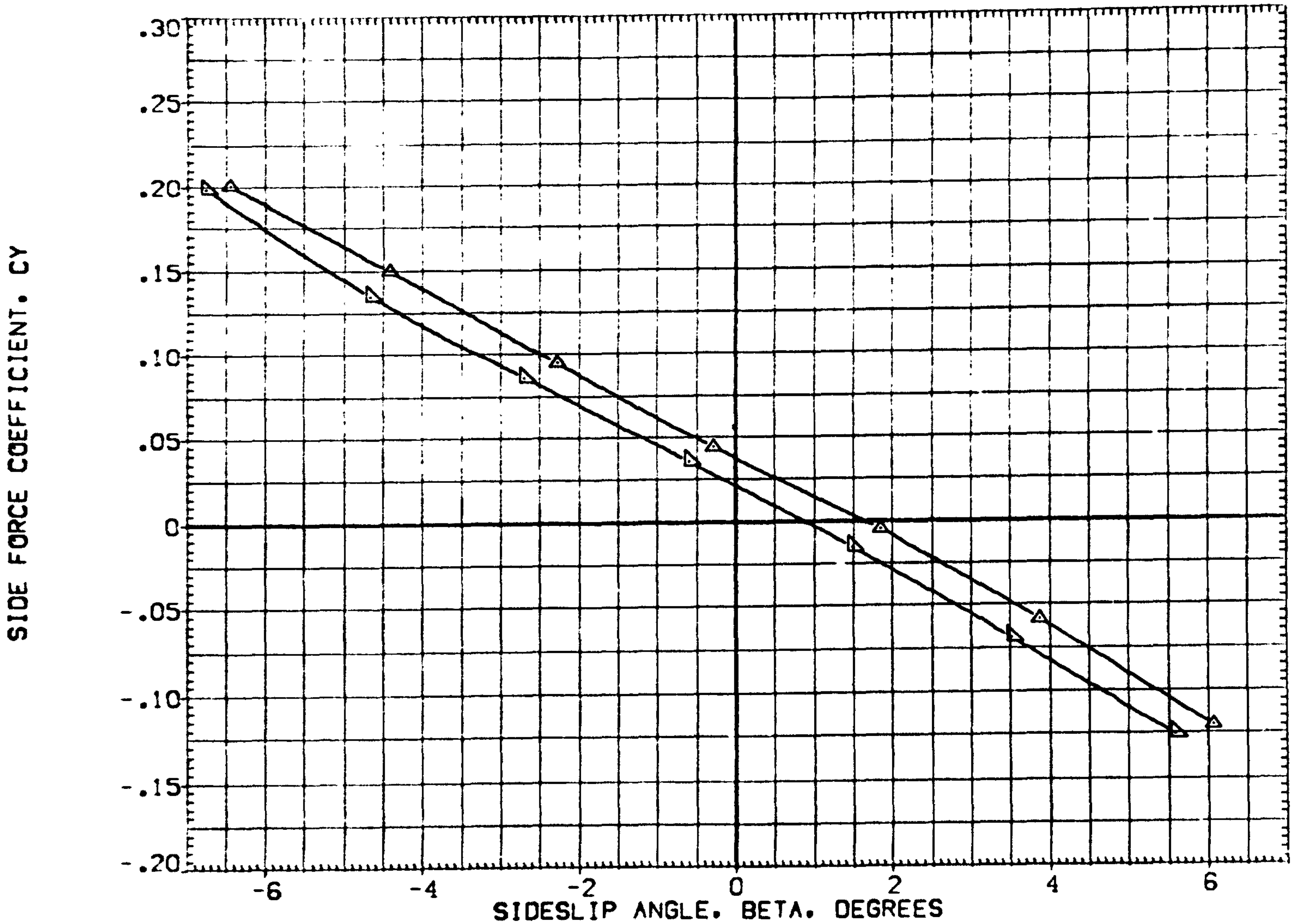


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(G)MACH = 1.10

DATA SET	SYMBOL	DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	DATA NOT AVAILABLE	.000	5.000
[RFJ009]		DATA NOT AVAILABLE	45.000	5.000
[RFJ010]		DATA NOT AVAILABLE	45.000	3.000
[RFJ011]		V5 B2 T	60.000	5.000
[RFJ012]		V5 B2 T	60.000	3.000

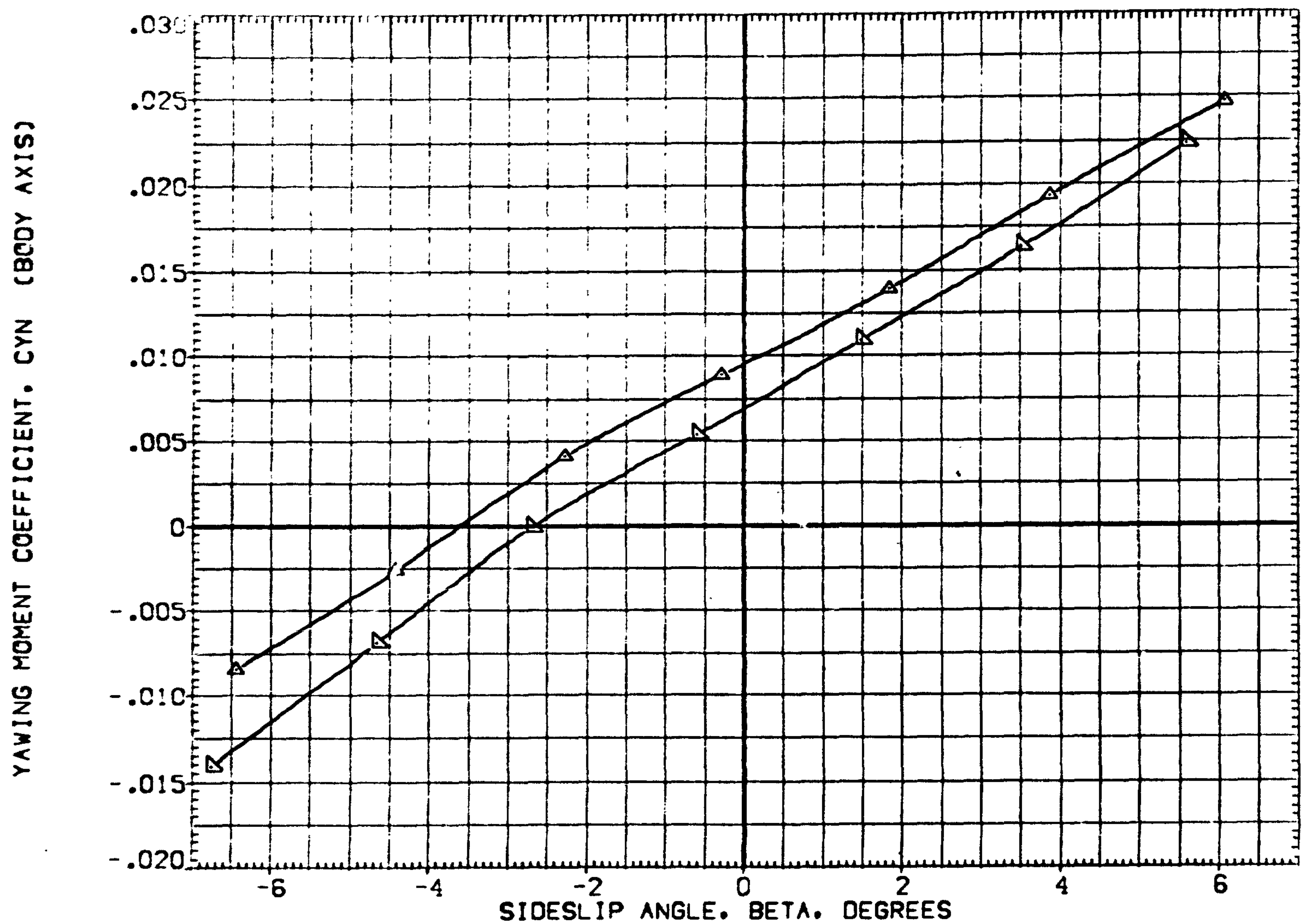


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.
(G)MACH = 1.10

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)		DATA NOT AVAILABLE	.000	5.000
(RFJ009)		DATA NOT AVAILABLE	45.000	5.000
(RFJ010)		DATA NOT AVAILABLE	45.000	3.000
(RFJ011)		V5 B2 T	60.000	5.000
(RFJ012)		V5 B2 T	60.000	3.000

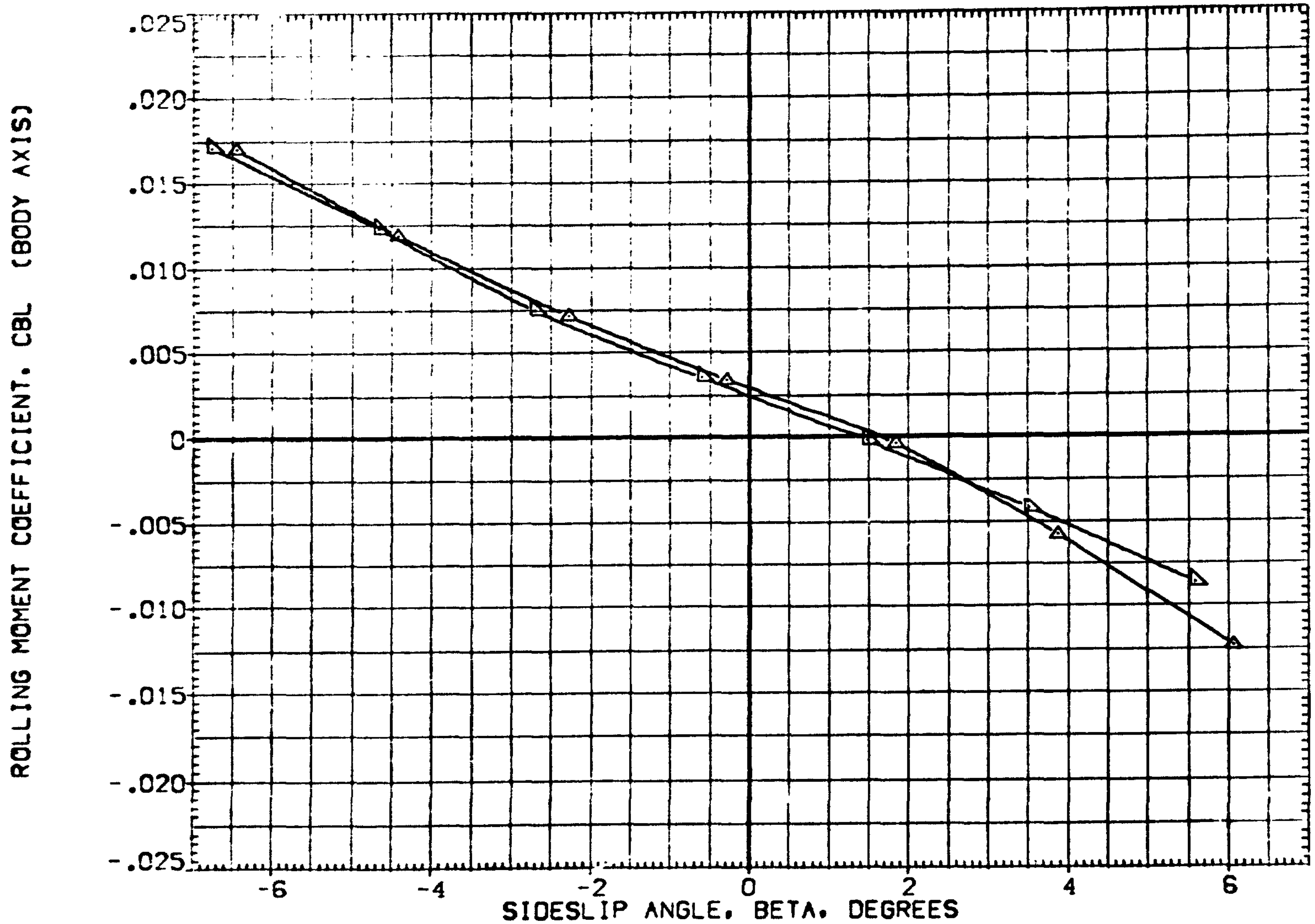


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(G)MACH = 1.10

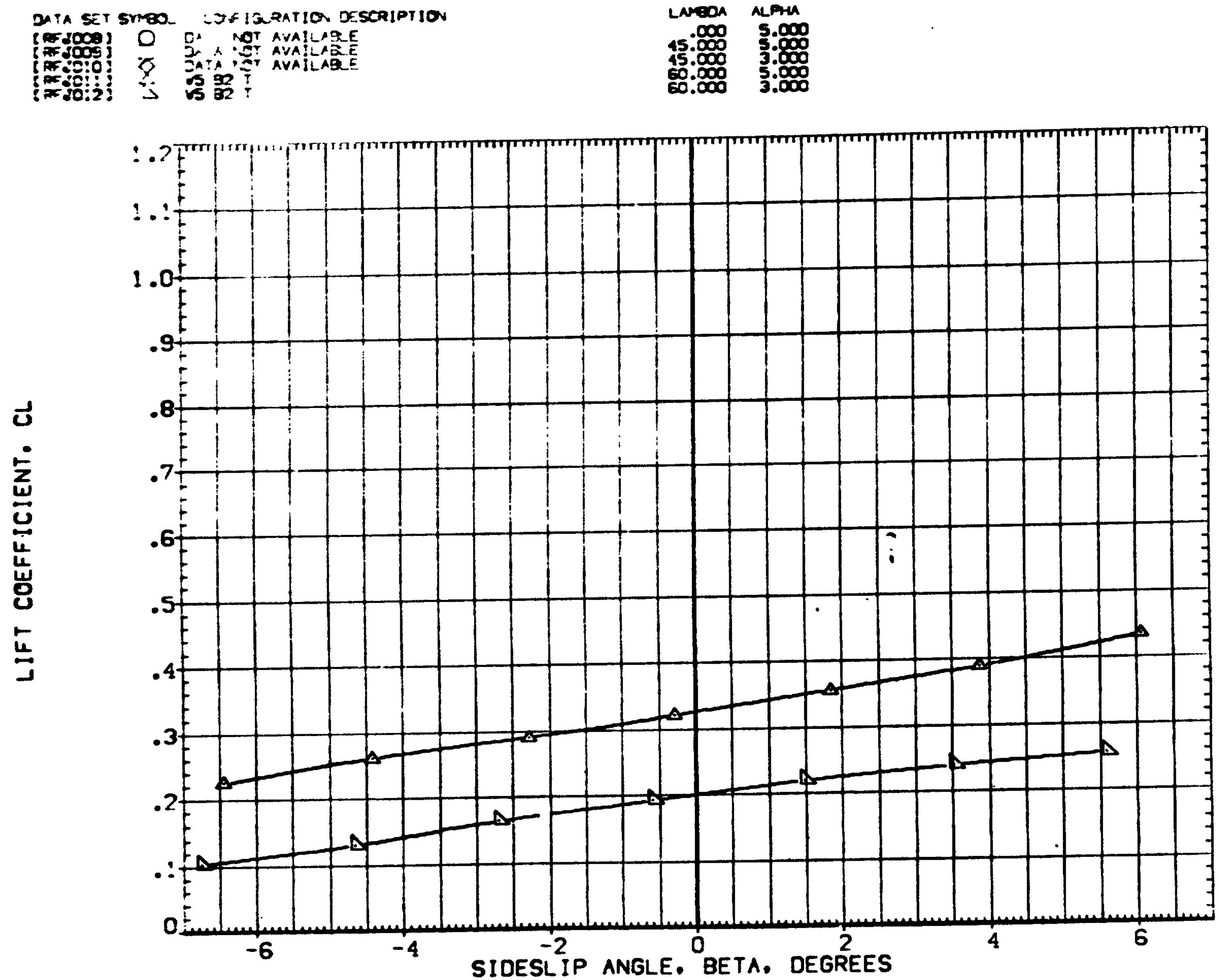


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.
(G)MACH = 1.10

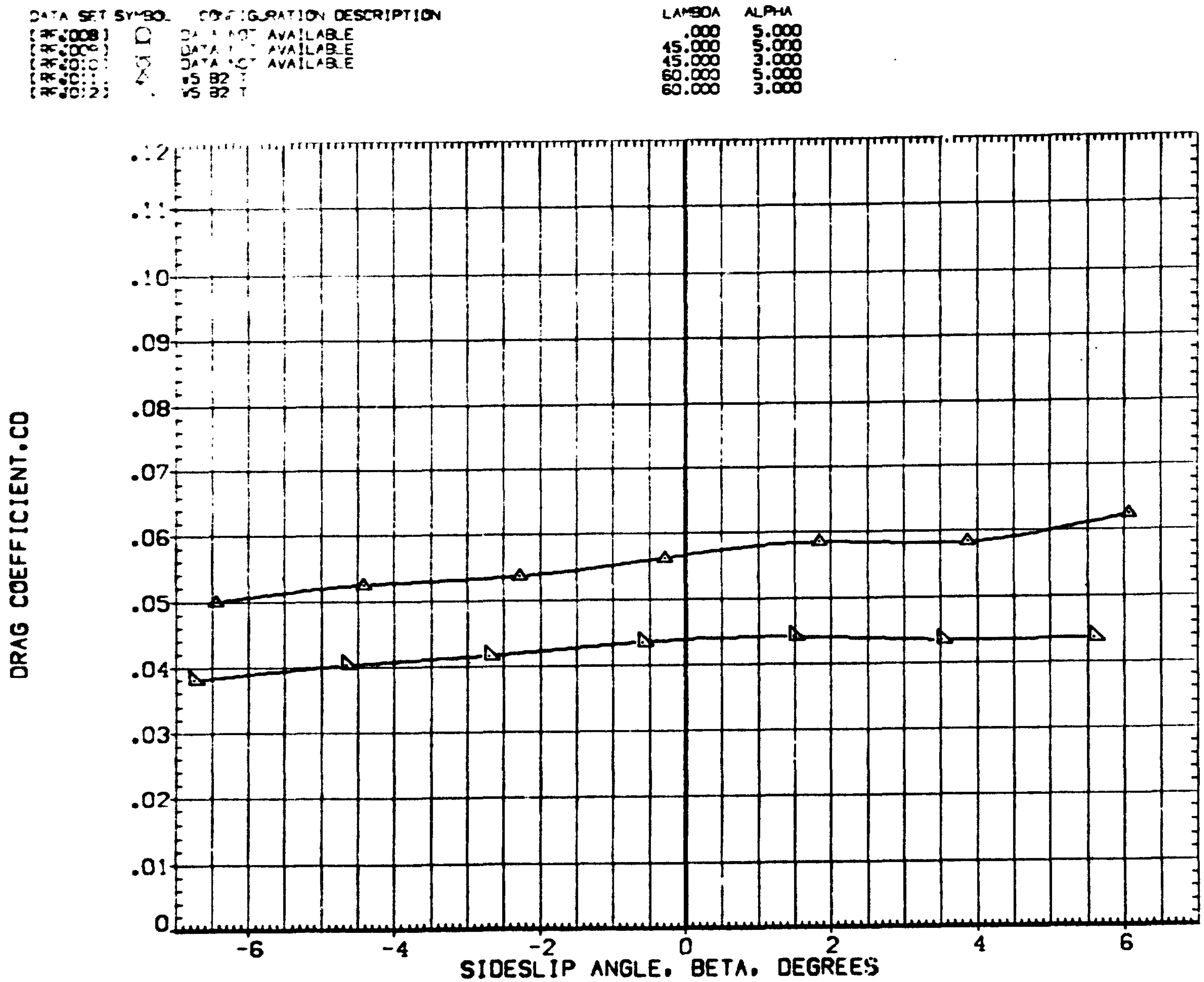


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(G)MACH = 1.10

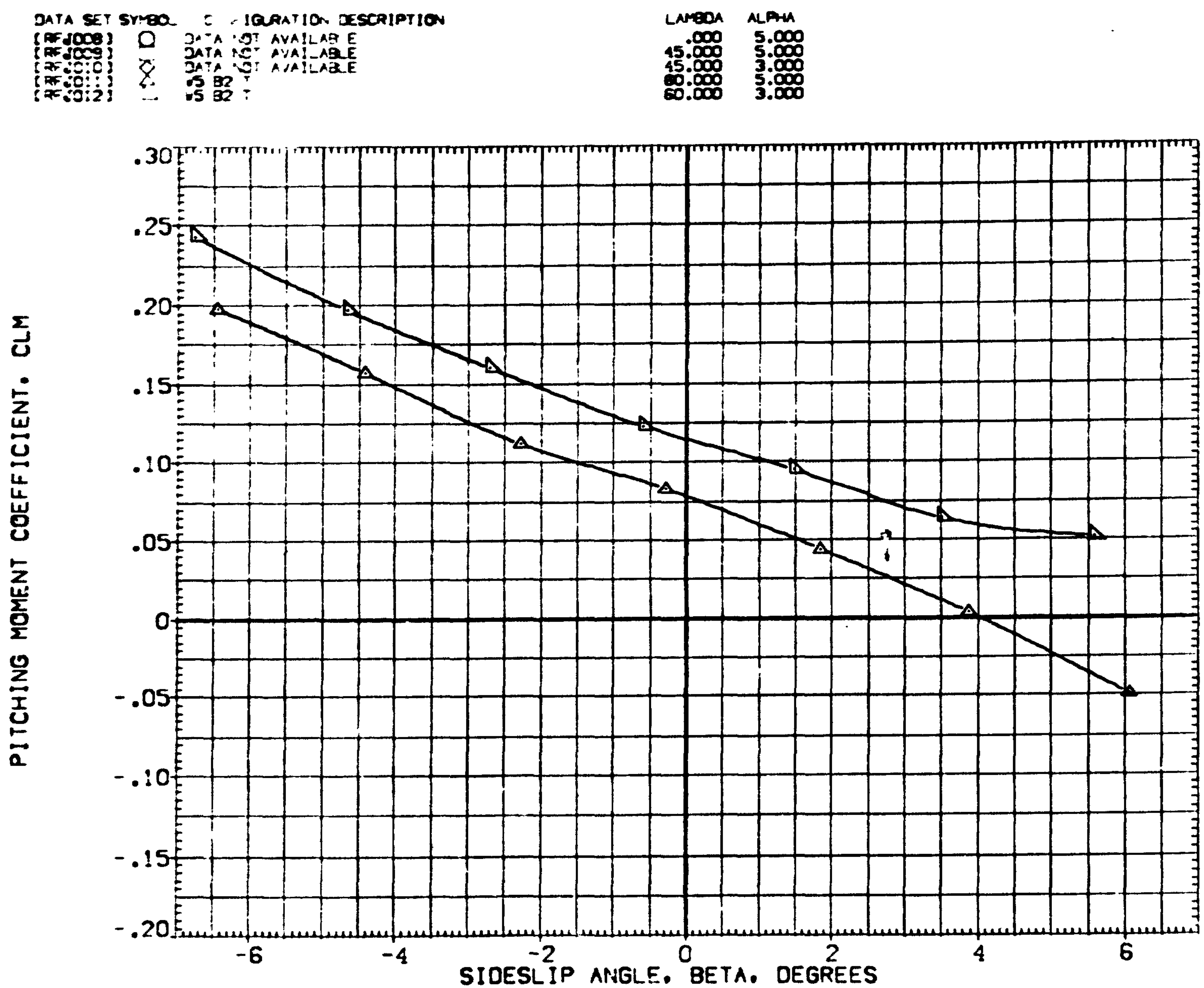


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(G)MACH = 1.10

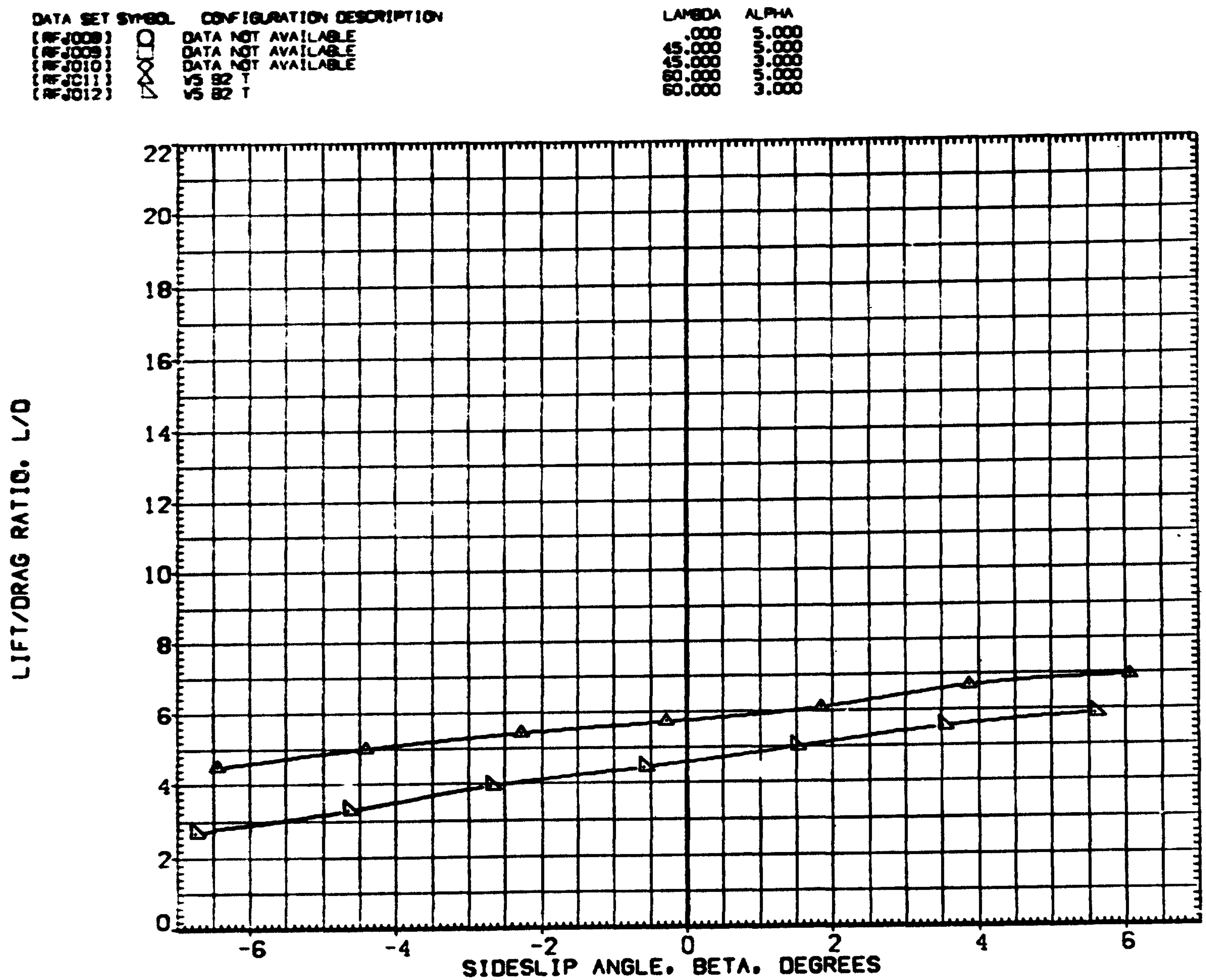


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(G)MACH = 1.10

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)	○	DATA NOT AVAILABLE	.000	5.000
(RFJ009)	⊡	DATA NOT AVAILABLE	45.000	5.000
(RFJ010)	◇	DATA NOT AVAILABLE	45.000	3.000
(RFJ011)	△	VS B2 T	60.000	5.000
(RFJ012)	⊿	VS B2 T	60.000	3.000

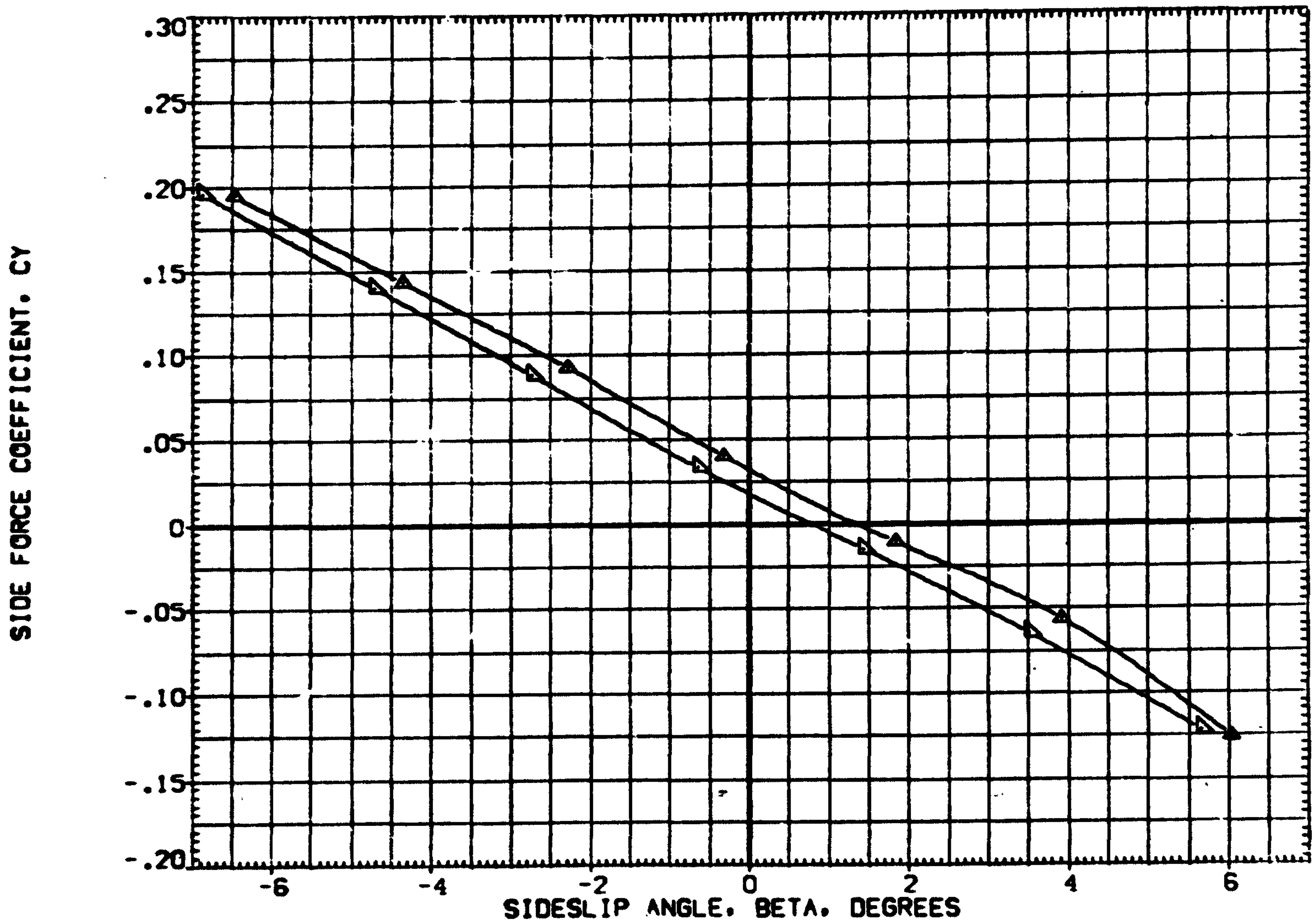


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(H)MACH = 1.20

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	DATA NOT AVAILABLE	.000	5.000
[RFJ009]	◇	DATA NOT AVAILABLE	45.000	5.000
[RFJ010]	☿	DATA NOT AVAILABLE	45.000	3.000
[RFJ011]	△	VS B2 T	60.000	5.000
[RFJ012]	▷	VS B2 T	60.000	3.000

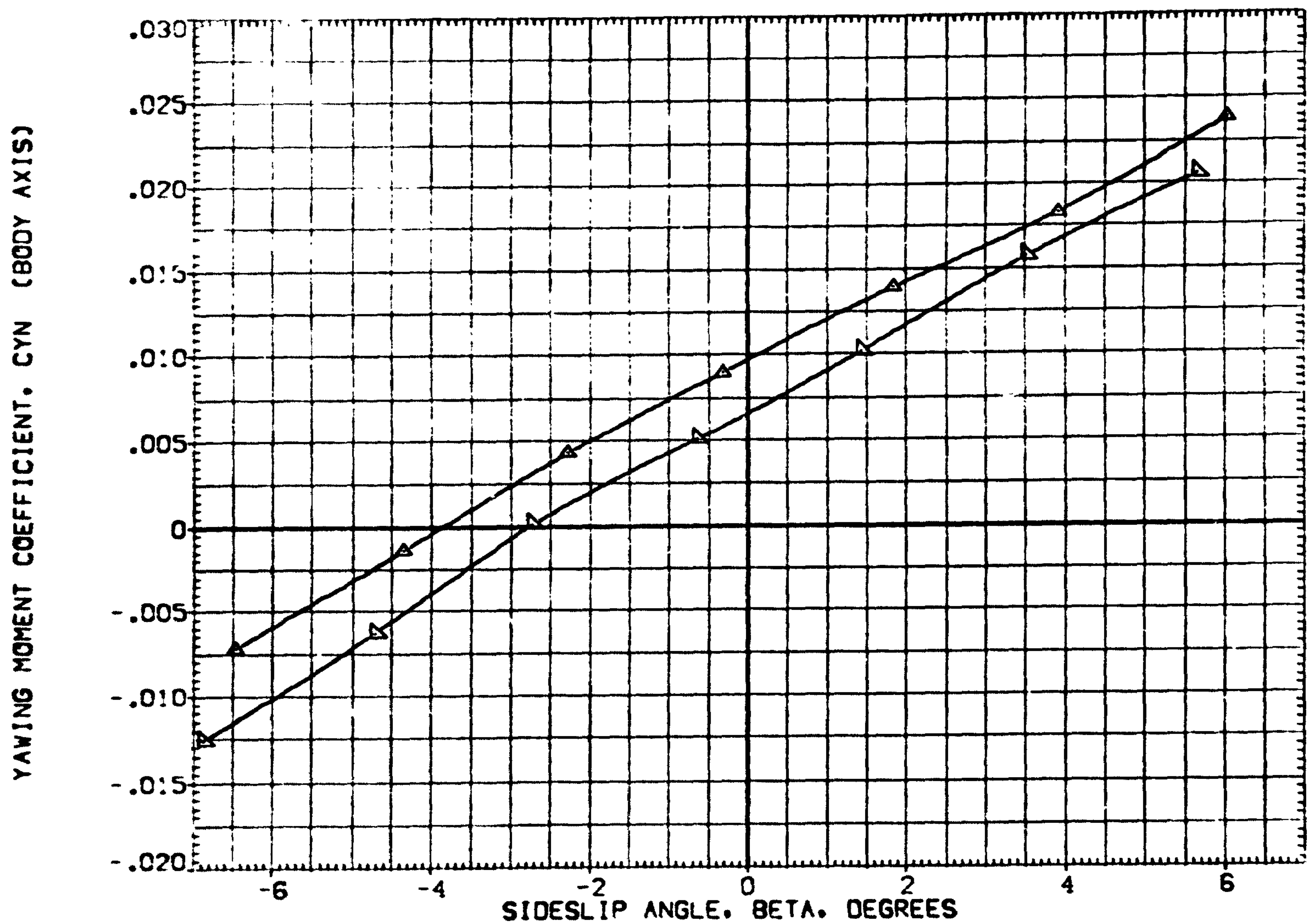


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(H)MACH = 1.20

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	DATA NOT AVAILABLE	.000	5.000
[RFJ009]	◇	DATA NOT AVAILABLE	45.000	5.000
[RFJ010]	◇	DATA NOT AVAILABLE	45.000	3.000
[RFJ011]	△	W5 B2	60.000	5.000
[RFJ012]	△	W5 B2	60.000	3.000

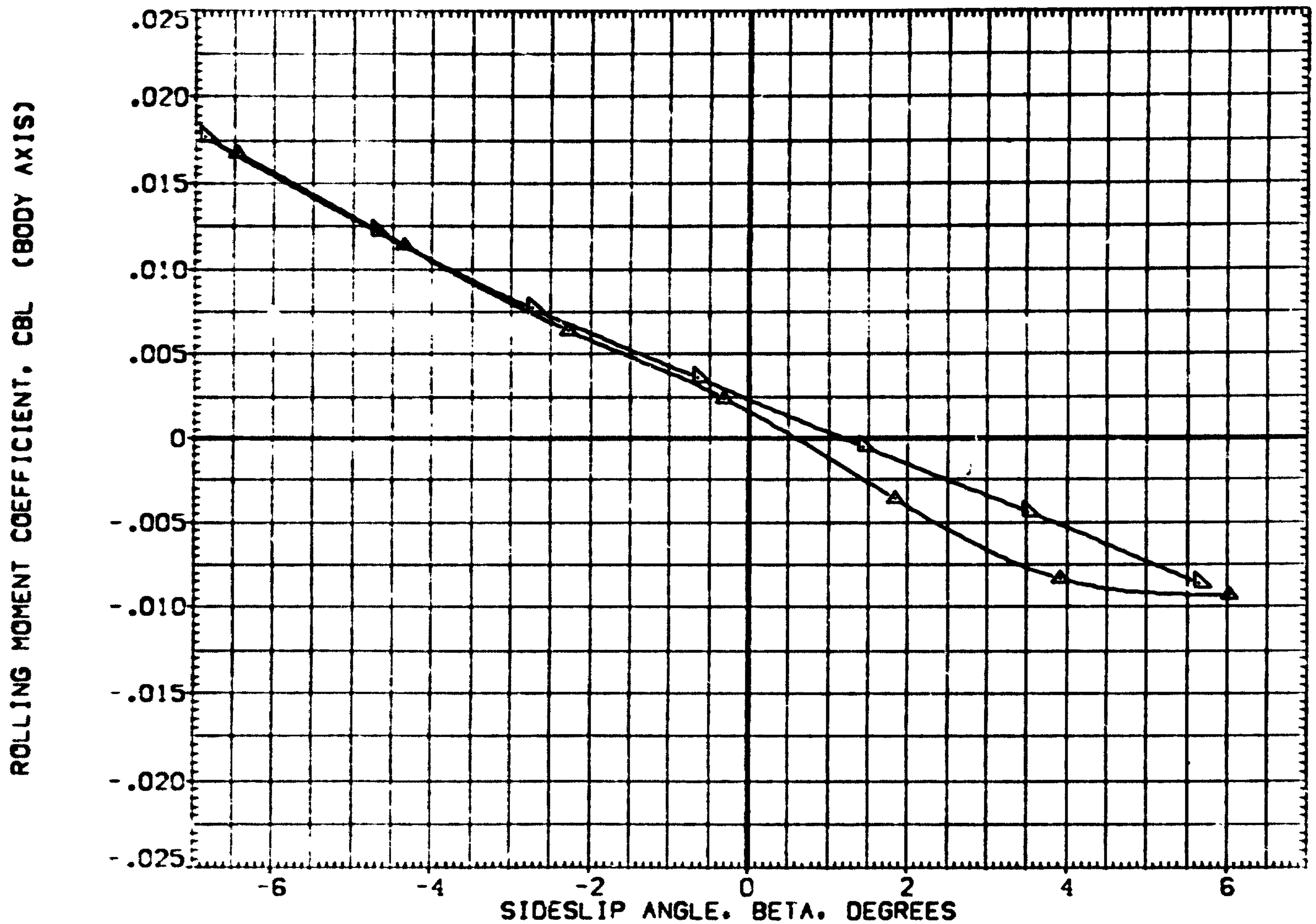


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(H)MACH = 1.20

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	DATA NOT AVAILABLE	.000	5.000
[RFJ009]		DATA NOT AVAILABLE	45.000	5.000
[RFJ010]	◇	DATA NOT AVAILABLE	45.000	3.000
[RFJ011]	△	W5 B2 T	60.000	5.000
[RFJ012]	⊿	W5 B2 T	60.000	3.000

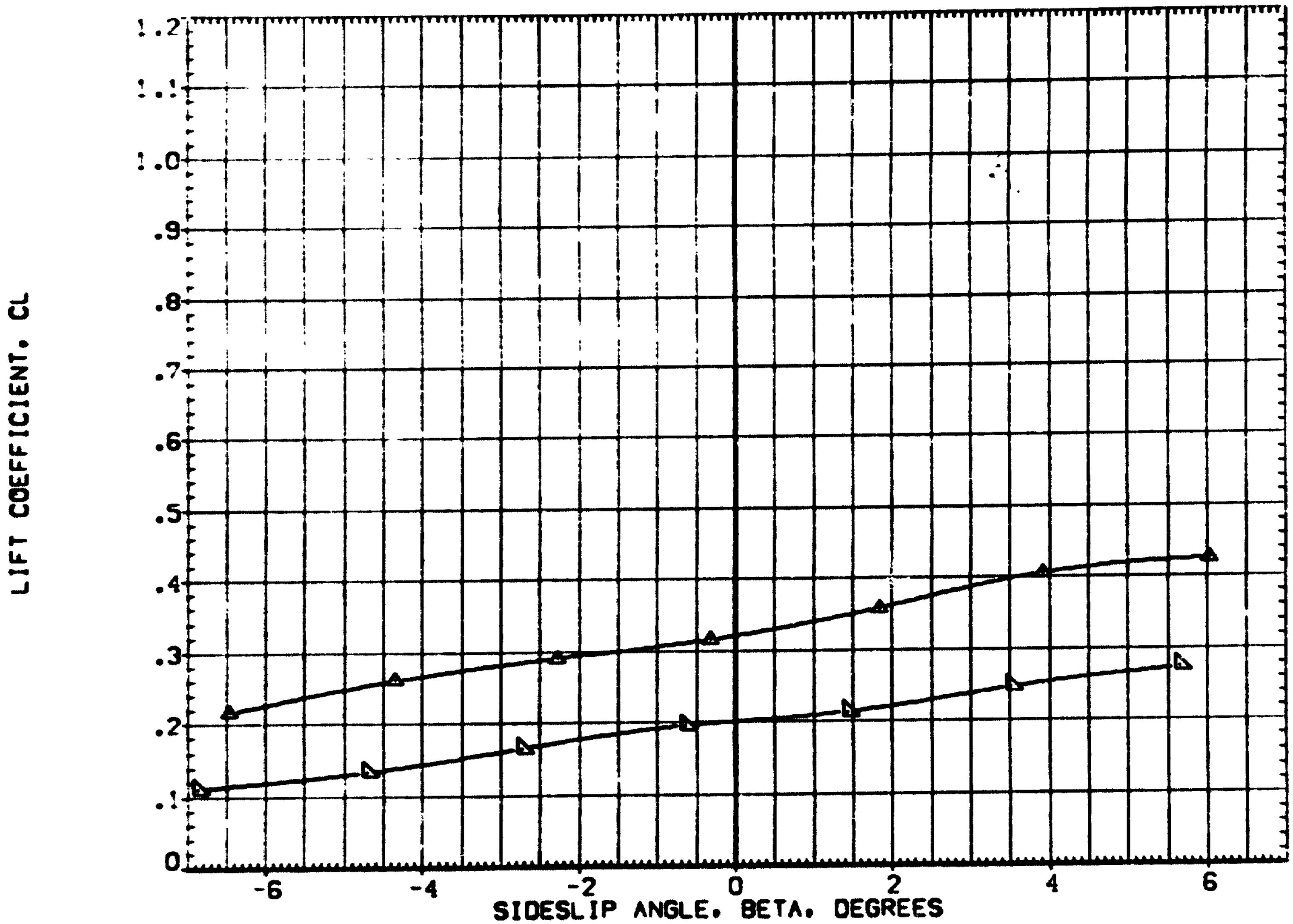


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(H)MACH = 1.20

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)	◻	DATA NOT AVAILABLE	.000	5.000
(RFJ009)	◇	DATA NOT AVAILABLE	15.000	5.000
(RFJ010)	⌛	DATA NOT AVAILABLE	45.000	3.000
(RFJ011)	◬	VS B2 T	60.000	5.000
(RFJ012)	△	VS B2 T	60.000	3.000

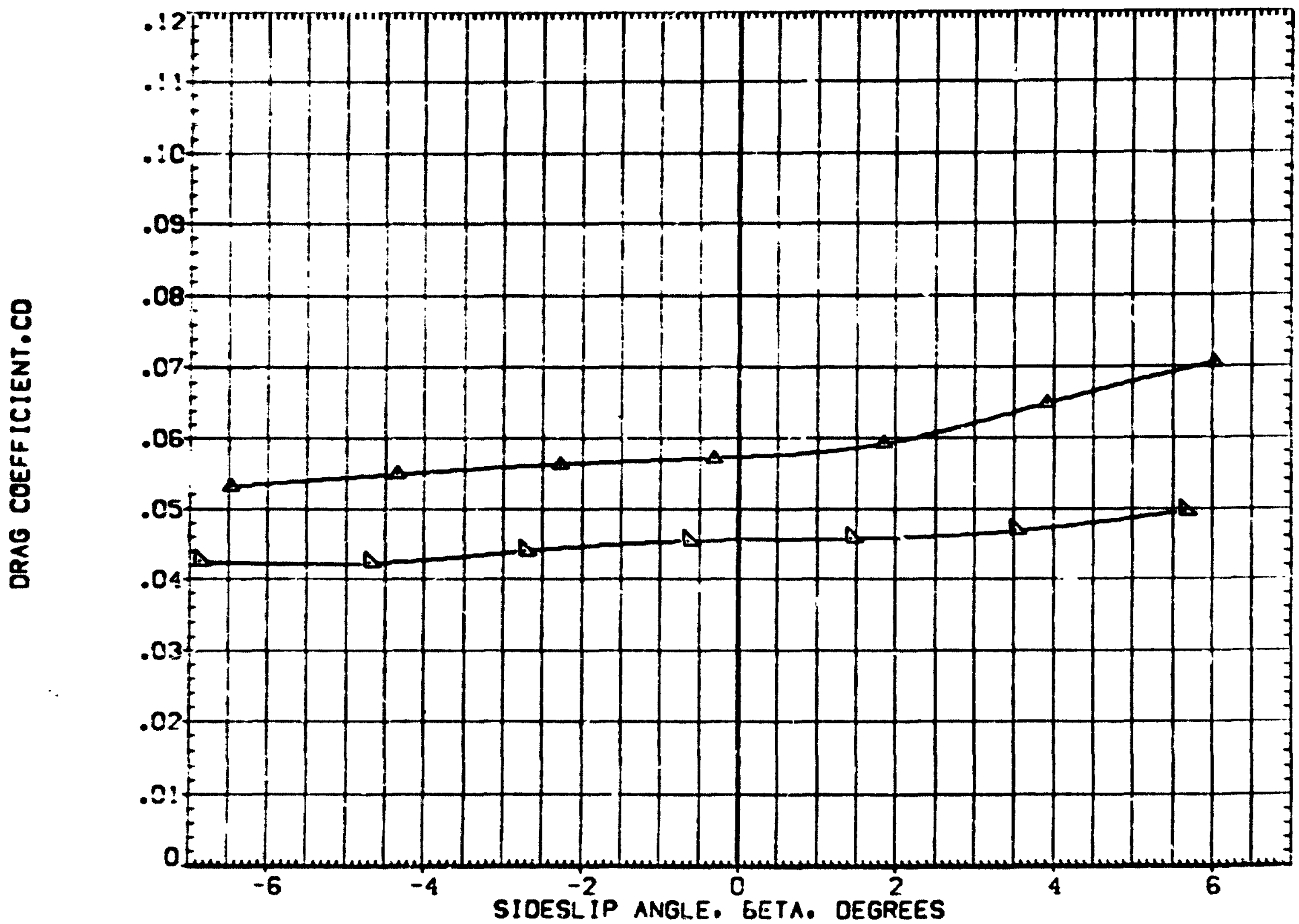


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(H)MACH = 1.20

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
(RFJ008)	○	DATA NOT AVAILABLE	.000	5.000
(RFJ009)	□	DATA NOT AVAILABLE	45.000	5.000
(RFJ010)	◇	DATA NOT AVAILABLE	45.000	3.000
(RFJ011)	△	•5 B2 T	60.000	5.000
(RFJ012)	◺	V5 B2 T	60.000	3.000

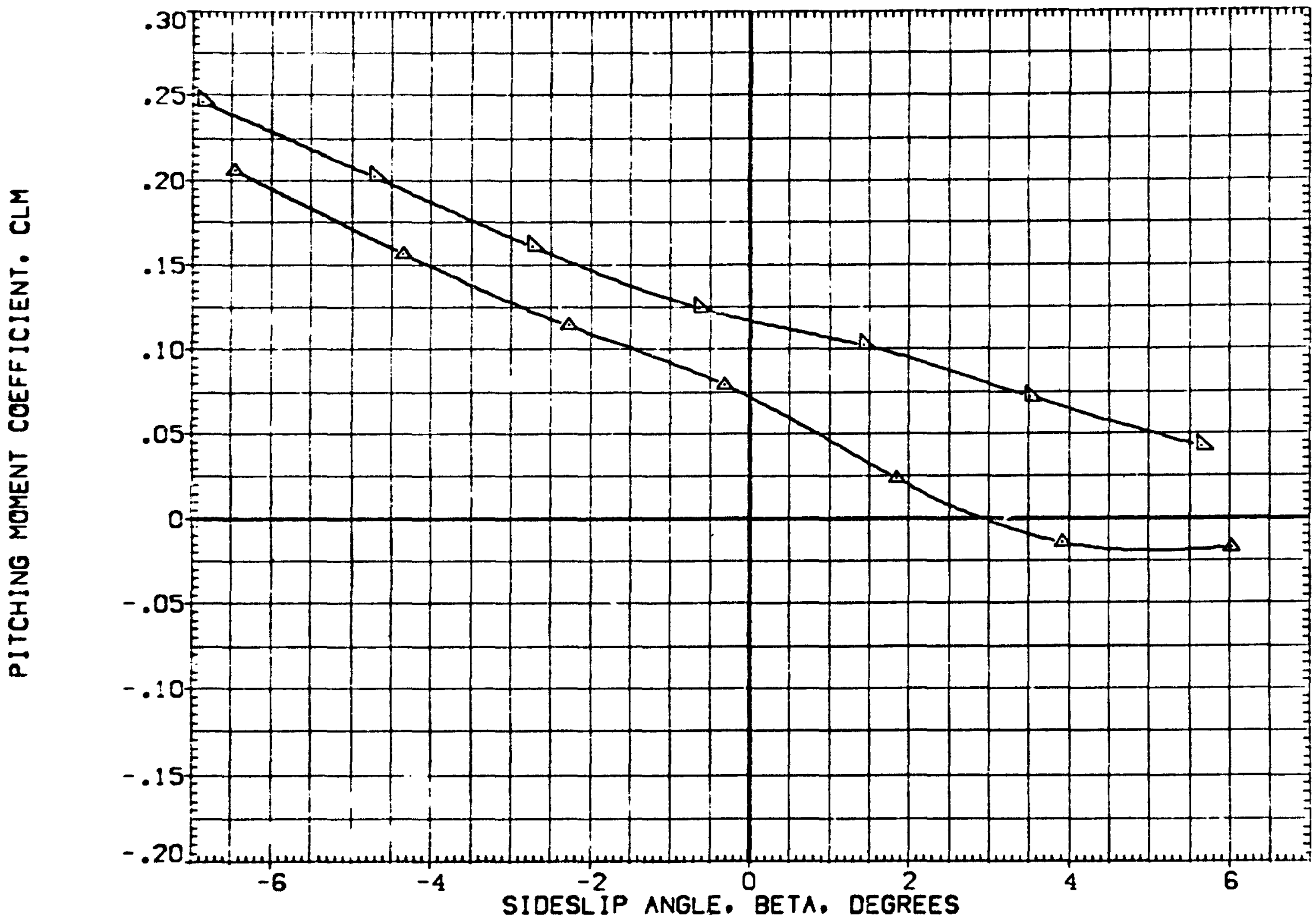


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(H)MACH = 1.20

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	LAMBDA	ALPHA
[RFJ008]	○	DATA NOT AVAILABLE	.000	5.000
[RFJ009]	□	DATA NOT AVAILABLE	45.000	5.000
[RFJ010]	◇	DATA NOT AVAILABLE	45.000	3.000
[RFJ011]	△	VS B2 T	60.000	5.000
[RFJ012]	◺	VS B2 T	60.000	3.000

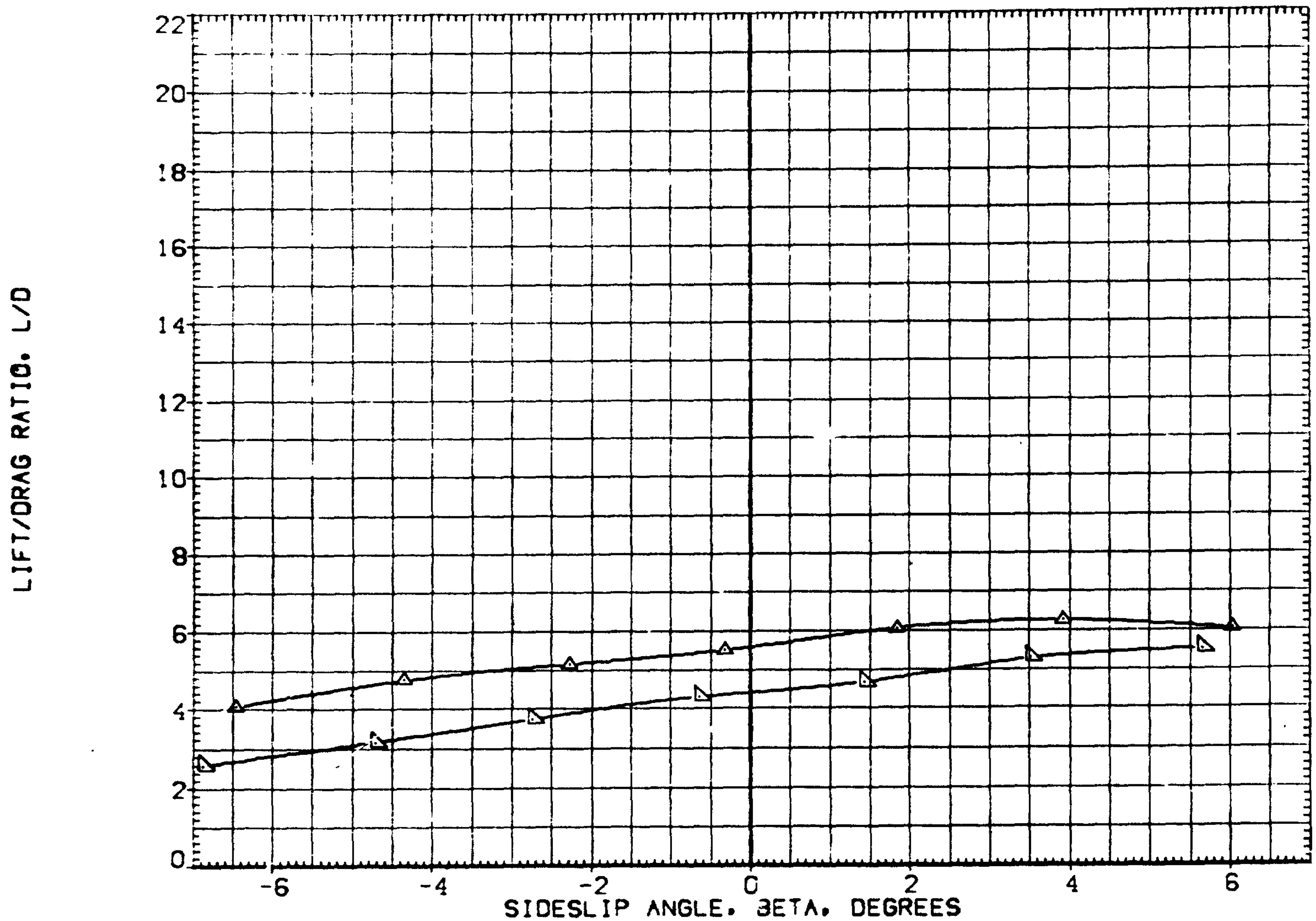


FIGURE 6. AERODYNAMIC CHARACTERISTICS IN SIDESLIP- 12-PERCENT-THICK WING.

(H)MACH = 1.20