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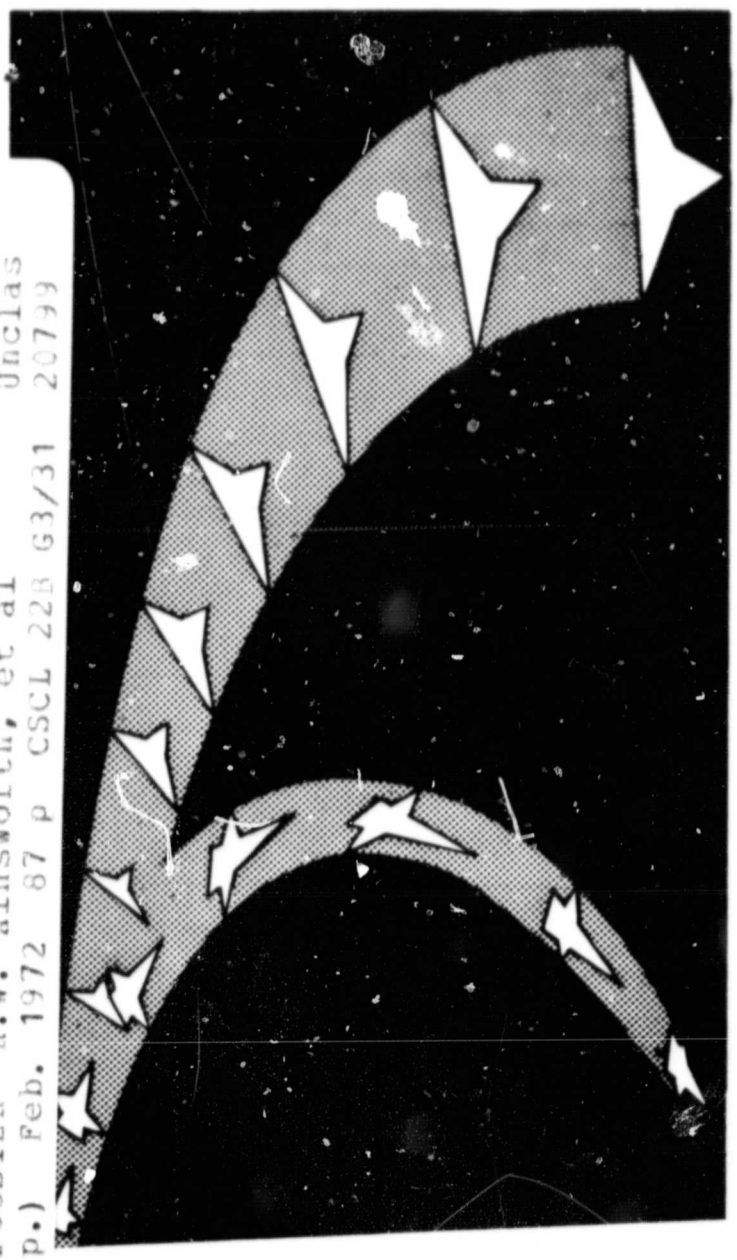
FEBRUARY 1972



—SPACE SHUTTLE—

AERODYNAMIC CHARACTERISTICS OF A COMPOSITE BOOSTER/040A ORBITER LAUNCH CONFIGURATION WITH FIN AND BOOSTER BODY CONFIGURATION EFFECT CONTRIBUTION

by

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L.L. Watts, TBC

MSFC 14-INCH
TRISONIC WIND TUNNEL

Marshall
Space Flight Center
N A S A

SADSAC SPACE SHUTTLE
AEROTHERMODYNAMIC
DATA MANAGEMENT SYSTEM

CONTRACT NAS8-4016
MARSHALL SPACE FLIGHT CENTER

SPACE DIVISION CHRYSLER CORPORATION

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February, 1972

SADSAC/SPACE SHUTTLE

WIND TUNNEL TEST DATA REPORT

CONFIGURATION: Composite Booster/040A Orbiter Launch Configuration

TEST PURPOSE: To Investigate Forebody and Fin Configuration Effects on Longitudinal and Directional Stability of a Booster/Orbiter Launch Configuration.

TEST FACILITY: MSFC 14-Inch Trisonic Tunnel

TESTING AGENCY: NASA/MSFC

TEST NO. & DATE: MSFC TWT - 523

FACILITY COORDINATOR: J. Weaver - NASA/MSFC

PROJECT ENGINEER(S): R. W. Ainsworth - TBC

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SUMMARY

This was an investigation of the fin configuration and booster body configuration effects on a composite booster/040A orbiter launch configuration. Aerodynamic performance and stability characteristics in pitch and yaw were obtained.

The test was conducted at the MSFC 14-inch trisonic tunnel starting Thursday, January 27, 1972, and continued through Thursday, February 3, 1972, for a total of 64 occupancy hours. Configurations tested included two stepped cylindrical bodies of different lengths with a conical nose, four fin shapes of various sizes and aspect ratios mounted in different positions around the base of the bodies, two base flare angles and three 040A orbiter configurations. The orbiter variations included a tailless configuration and two tail sizes. A tailless booster launch configuration with deflected petals (expanded flare sectors) was also tested. The model scale was 0.003366.

Data were converted to coefficient form in near real time, punched on cards, and tabulated. The cards used in conjunction with a Benson-Lehner plotter were used to provide plotted data. At the end of the test, tabulated input forms were completed for the SADSAC computer program to aid in publishing the final test data report.

NOMENCLATURE

(General)

SYMBOL	SADSAC SYMBOL	DEFINITION
α	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
β	BETA	sideslip angle, angle between the wind X_w-axis and the projection of this axis on the body X-Z-plane; degrees
ψ	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
ϕ	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
ρ		air density; K_g/m^3, slugs/ft^3
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

SYMBOL	SADSAC SYMBOL	DEFINITION
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

SYMBOL	DEFINITION
F	force; F, lbs
M	moment; M, in-lb

Subscript	Definition
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
∞	free stream conditions
t	total conditions
b	base

NOMENCLATURE (Continued)
Body & Stability Axis System

SYMBOL	SADSAC SYMBOL	DEFINITION
		Body Axis System
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; $\left[-1\right]\ \left[(p_b - p_\infty)/q\right]\ (A_b/S)$
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; $M_X/qS\ b_{ref}$
		Common to Both Axis Systems
C_m	CLM	pitching moment coefficient; $M_Y/qS\ \ell_{ref}$
C_y	CY	side force coefficient; F_Y/qS
		Stability Axis System
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_f	L/DF	lift to forebody drag ratio; C_L/C_{D_f}

NOMENCLATURE (Continued)

Surface Definitions

SYMBOL	SADSAC SYMBOL	DEFINITION
i_t	HORIZT	horizontal tail incidence; positive when trailing edge down; degrees
δ		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
	SPOILR	spoiler - trailing edge down
	TAB	tab - trailing edge down with respect to control surface
δ		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

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

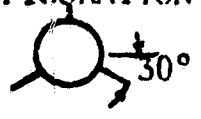
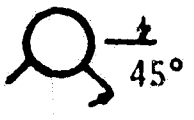
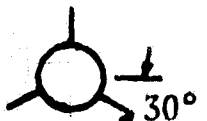
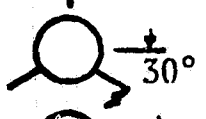
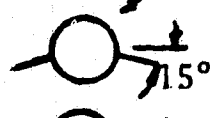
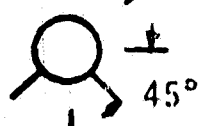
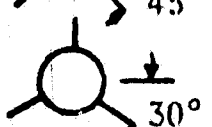
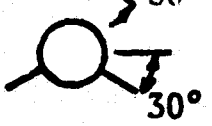
CONFIGURATION INVESTIGATED

BOOSTER BODY: Model 979-160

BODY: Cylindrical Booster and Tank Plus Cone Frustum Nose

	ℓ	d	ℓ/d
B_5	10.877"	1.333" (Booster)	8.15
B_6	8.706"	1.333" (Booster)	6.53

FINS:

	CONFIGURATION	EXPOSED AREA PER FIN	AR	SHROUD CONFIG.
$V_{3.3}$		445 sq. ft. (Nominal)	1.14	Small Base Area 38.32 ft. dia. 5° 43' Flare
V_5		675 sq. ft. (Nominal)	1.746	
V_6		675 sq. ft.	1.746	Large Base Area 47.53 ft. dia. 12° 54' Flare
$V_{6.1}$		675 sq. ft.	1.746	
$V_{6.2}$		675 sq. ft.	1.746	
$V_{6.3}$		675 sq. ft.	1.746	
$V_{6.4}$		675 sq. ft.	1.746	
V_7		445 sq. ft.	1.21	
$V_{7.2}$		445 sq. ft.	1.21	

CONFIGURATION INVESTIGATED (Continued)

ORBITER: MSC-040A

	LENGTH	SPAN	INCIDENCE ANGLE	CONFIGURATION
$\phi_1{}^{-2}$	109.58 ft.	73.5 ft.	-2°	040A S_V = 380 sq. ft.
$\phi_2{}^{-2}$	109.58 ft.	73.5 ft.	-2°	040A S_V = 485 sq. ft.
$\phi_3{}^{-2}$	109.58 ft.	73.5 ft.	-2°	040A Vert. Off

ORBITER LOCATION BEHIND TANK NOSE:

B_5	B_6
23.0 ft.	3.94 ft.

PETALS (BRAKES): Six at 60° on and about the vertical centerline

	LENGTH	δ_F	WIDTH AT BASE EACH
P_1	26.5 ft.	15°	12.9 ft.

Pertinent geometric dimensions of the model and component parts are presented in Table 3.

TEST FACILITY DESCRIPTION

The Marshall Space Flight Center 14" x 14" Trisonic Wind Tunnel is an intermittent blowdown tunnel which operates by high pressure air flowing from storage to either vacuum or atmospheric conditions. A Mach number range from .2 to 5.85 is covered by utilizing two interchangeable test sections. The transonic section permits testing at Mach 0.20 through 2.50, and the supersonic section permits testing at Mach 2.74 through 5.85. Mach numbers between .2 and .9 are obtained by using a controllable diffuser. The range from .95 to 1.3 is achieved through the use of plenum suction and perforated walls. Mach numbers of 1.44, 1.93 and 2.50 are produced by interchangeable sets of fixed contour nozzle blocks. Above Mach 2.50 a set of fixed contour nozzle blocks are tilted and translated automatically to produce any desired Mach number in .25 increments.

Air is supplied to a 6000 cubic foot storage tank at approximately $-40^{\circ}F$ dew point and 500 psi. The compressor is a three-stage reciprocating unit driven by a 1500 hp motor.

The tunnel flow is established and controlled with a servo actuated gate valve. The controlled air flows through the valve diffuser into the stilling chamber and heat exchanger where the air temperature can be controlled from ambient to approximately $180^{\circ}F$. The air then passes through the test section which contains the nozzle blocks and test region.

Downstream of the test section is a hydraulically controlled pitch sector that provides a total angle of attack range of 20° ($\pm 10^{\circ}$). Sting offsets are available for obtaining various maximum angles of attack up to 25°.

DATA REDUCTION

Six component aerodynamic force and moment data were recorded using an internal strain gage balance. Base pressures ($C_{pb\#1}$ and $C_{pb\#2}$) and chamber pressure (C_{p_C}) were recorded and utilized to correct the axial force measured data (C_{A_T}) to a condition corresponding to free stream pressure acting at the base region.

$$C_{A_T} = C_{A_F} + C_{A_B}$$

$$C_{A_B} = \left(\frac{C_{P_{B_1}} + C_{P_{B_2}}}{2} \frac{A_B}{S_{ref}}\right) + \left(C_{P_C} \times \frac{A_C}{S_{ref}}\right)$$

$$C_{P_B} = \frac{\Delta P_B}{q}$$

$$C_{P_C} = \frac{\Delta P_C}{q}$$

C_L and C_D were computed based on C_{A_F}.

DATA REDUCTION DETAILS (Continued)

1. MOMENT REFERENCE CENTER LOCATION

x = 5.753 inches from booster base for B_5

x = 4.353 inches from booster base for B_6

y = 0 inches from centerline of model

z = 0 inches from centerline of model

2. MODEL BASE AREAS

A_B = 2.2868 square inches A_C = .60821 square inches

3. REFERENCE AREAS

Orbiter Wing = 5.1478 square inches

4. REFERENCE LENGTH

Longitudinal	Lateral
4.426"	2.969"
(Orbiter Length)	(Orbiter Span)

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 MSFC	Mr. J. Weaver
NASA AMES	Mr. V. Stevens
TBC	Mr. R. W. Ainsworth

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

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

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TABLE 1

TEST TVT #523 DATA SET COLLATION SHEET

☐ PRETEST
☑ POSTTEST

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α	SCHD. β	PARAMETERS/VALUES	NO. of RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE) 2.6	3.7	4.1	4.46	2.74	3.72
R5705A	$B_5\Phi_1^{-2}V_6$	A	0°	-2°			034 / 0	032 / 0	069 / 0		
05C	✓	0°	C				001 / 0	003 / 0	068 / 0		
07C	$B_5\Phi_1^{-2}V_{6.2}$	✓	✓			033 / 0	004 / 0	003 / 0	063 / 0	071 / 0	076 / 0
07A	✓	A	0°			031 / 0	033 / 0	037 / 0	067 / 0	074 / 0	073 / 0
24A	$E_5\Phi_1^{-2}P_1$	✓	✓						153 / 0		
06B	$B_5\Phi_1^{-2}V_{6.1}$	0°	B				005 / 0	006 / 0			
08B	$B_5\Phi_1^{-2}V_{6.3}$	✓	✓				008 / 0	007 / 0			
08A	✓	A	0°				121 / 0				
09A	$B_5\Phi_1^{-2}V_{6.4}$	A	0°			056 / 0	030 / 0	031 / 0	077 / 0	091 / 0	092 / 0
04C	✓	0°	C			057 / 0	029 / 0	016 / 0	076 / 0	070 / 0	069 / 0
10C	$B_5\Phi_1^{-2}V_7$	✓	✓			058 / 0	012 / 0	011 / 0	070 / 0	098 / 0	097 / 0
24C	$B_5\Phi_1^{-2}P_1$	✓	C						153 / 0		
03A	$B_5\Phi_1^{-2}$	A	0°			038 / 0	032 / 0	036 / 0	081 / 0	086 / 0	085 / 0
03C	✓	0°	C			013 / 0	014 / 0	015 / 0	080 / 0	087 / 0	055 / 0
01A	B_5	A	0°			039 / 0	040 / 0	041 / 0	082 / 0	083 / 0	084 / 0
13A	B_5V_6	✓	✓				043 / 0	033 / 0	066 / 0		
13C	✓	0°	C				017 / 0	016 / 0	067 / 0		
14C	$B_5V_{6.2}$	✓	✓				045 / 0	019 / 0	064 / 0		
14A	✓	A	0°				047 / 0	045 / 0	065 / 0		

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

ELM	EN	CY	EEL	EYN	CAF	CAB	CPC	CL	CDF			
										IDPVAR(1)	IDPVAR(2)	NDV

COEFFICIENTS: $\alpha A = -10°, -8°, -4°, -2°, 0°, +2°, +4°, +6°, +8°, +10°$

α or β SCHEDULES $\beta B = -4°, -2°, 0°, +2°, +4°, +6°, +8°, +10°$

TABLE 1 (Continued)

SHEET 2

TEST TWT #523 DATA SET COLLATION SHEET

☐ PRETEST
☑ POSTTEST

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α	SCHD. β	PARAMETERS/VALUES	NO. of RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE) 0.6	0.7	1.1	1.46	2.74	4.96
857153	B5V6.3	C°	B	—							
16C	B5V6.4	✓	C				021 0	020 0			
16A	✓	A	C°				022 0	023 0	077 0		
18A	B5V7.2	✓	✓				024 0	046 0	078 0		
17C	B5V7	C°	C	7		045 0	049 0	050 0	073 0	103 0	104 0
19C	B5Φ1^-2V7.2	C°	✓	-2		039 0	025 0	027 0	071 0	101 0	105 0
19A	✓	A	C°	✓		034 0	026 0	027 0	075 0	099 0	100 0
18C	B5V7.2	C°	C	—		055 0	029 0	028 0	074 0	102 0	101 0
19G	B5Φ1^-2V7.2	-6	✓	-2		053 0	057 0	057 0	072 0	106 0	105 0
07G1	B5Φ1^-2V6.2	✓	✓	✓		117 0	116 0	115 0	114 0	110 0	107 0
20C	B5Φ2^-2V7.2	C°	✓	✓		118 0	119 0	120 0	113 0	111 0	112 0
21C	B5Φ3^-2V7.2	✓	✓			134 0	135 0	136 0	144 0	143 0	142 0
						133 0	138 0	137 0	145 0	140 0	141 0
12C	B6Φ1^-2V5	C°	C	-2			125 0	124 0	150 0		
12A	✓	A	C°	✓			123 0	123 0	149 0		
11A	B6Φ1^-2V3.3	✓	✓				129 0	128 0	148 0		
11C	✓	C°	C				126 0	127 0	147 0		
22C	B6Φ2^-2V3.3	✓	✓				130 0	121 0	146 0		
23C	B6Φ2^-2V5	✓	✓	✓			133 0	132 0	151 0		

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

COEFFICIENTS: SEE SHEET No. 1

α or β

SCHEDULES

IDPVAR(1) | IDPVAR(2) | NDV

TEST CONDITIONS

Table 2 presents the range of test conditions for which data were recorded. The model was mounted on an internal balance and supported on a straight sting. An offset sting was used to obtain fixed angles of α for some sideslip runs. Pitch runs were made with the model upright, while sideslip runs were made in the pitch plane with the model, balance, and sting rolled 90°. Pitch data were obtained from α = -10° to +10° at zero angle of sideslip, and yaw data were obtained from β = -10° to +10° at zero degrees and -6 degrees angle of attack.

Boundary layer trip strips were located on the model as shown in Figure . No. 180 grit (0.0035") was used for all Mach numbers. Schlieren and shadowgraph photographs were taken for selected Mach numbers.

Base pressures were measured for two positions at the base of the model located approximately 4 o'clock and 10 o'clock when viewing the model from the rear. Whenever possible one tube was placed behind a fin location. Balance chamber pressure was also measured. The orbiter was set at -2 degrees incidence for all launch configurations. MSFC Balance #227 was used throughout the test.

TABLE 2

TEST CONDITIONS
TEST TWT # 523

MACH NUMBER	REYNOLDS NUMBER per unit length	DYNAMIC PRESSURE (pounds/sq. inch)	STAGNATION TEMPERATURE (degrees Fahrenheit)
0.60	5.0	4.3	100°F (Nominal)
0.90	6.3	7.4	"
1.1	6.7	8.7	"
1.46	7.4	10.8	"
2.74	4.6	6.4	140°F (Nominal)
4.96	5.2	3.2	"

BALANCE UTILIZED: #227

	CAPACITY:	ACCURACY:	COEFFICIENT TOLERANCE:
NF	125 lbs (at gages)		
SF	45 lbs		
AF	25 lbs		
PM	300 in.lbs.		
YM	100 in.lbs.		
RM	50 in.lbs.		

COMMENTS:

TABLE 3

MODEL COMPONENT: BODY - B_5

GENERAL DESCRIPTION: 0.003366 SCALE BOOSTER BODY

DRAWING NUMBER:

DIMENSIONS:	THEORETICAL		ACTUAL MEASURED
	FULL-SCALE FT/FT²	MODEL SCALE IN/IN²	MODEL SCALE IN/IN²
Length	269.29	10.877	10.878
Max. Width	47.5	1.919	1.917
Max. Depth	47.5	1.919	1.917
Fineness Ratio (Flare Dia)	5.66	5.66	5.67
Area			
Max. Cross-Sectional	177.14	2.89	2.88
Planform			
Wetted			
Base			

TABLE 3 (Continued)

MODEL COMPONENT: BODY - B6

GENERAL DESCRIPTION: 0.003366 SCALE BOOSTER BODY

DRAWING NUMBER:

DIMENSIONS:

	THEORETICAL		ACTUAL MEASURED
	FULL-SCALE FT/FT²	MODEL SCALE IN/IN²	MODEL SCALE IN/IN²
Length	215.54	8.706	8.709
Max. Width	38.32	1.548	1.543
Max. Depth	38.32	1.548	1.543
Fineness Ratio (Flare Dia)	5.624	5.624	5.642
Area			
Max. Cross-Sectional	115.23	1.88	1.869
Planform			
Wetted			
Base			

TABLE 3 (Continued)

MODEL COMPONENT: ORBITER - O1

GENERAL DESCRIPTION: 0.003366 Scale Model of MSC Orbiter 040A

DRAWING NUMBER:

DIMENSIONS:	THEORETICAL		ACTUAL MEASURED
	FULL-SCALE	MODEL SCALE	MODEL SCALE
Area			
Span (equivalent)	73.5 ft	2.969 in	2.998 in
Inb'd Exposed chord	58.35 ft	2.357 in	2.357 in
Outb'd equivalent chord			
Body length	109.58 ft	4.443 in	4.503 in
Body width	16.76 ft.	0.677 in	0.677 in
Sweep Back Angles, degrees			
Leading Edge	60°	60°	60°
Tailing Edge	-10.5°	-10.5°	-10.5°
Incidence angle	+2°	+2°	+2°
Vertical tail area	380 ft^2	0.62 in^2	0.62 in^2

TABLE 3 (Continued)

MODEL COMPONENT: ORBITER - O_2

GENERAL DESCRIPTION: 0.003366 SCALE MODEL OF MSC ORBITER 040A (Modified)

DRAWING NUMBER:

DIMENSIONS:

	THEORETICAL		ACTUAL MEASURED
	FULL-SCALE	MODEL SCALE	MODEL SCALE
Area			
Span (equivalent)	73.5 ft	2.969 in	2.998 in
Inb'd exposed chord	58.35 ft	2.357 in	2.357 in
Outb'd equivalent chord			
Body Length	109.58 ft	4.443 in.	4.503 in
Body Width	16.76 ft	0.677 in	0.677 in
Sweep Back Angles, degrees			
Leading Edge	60°	60°	60°
Tailing Edge	0°	0°	0°
Incidence angle	+2°	+2°	+2°
Vertical tail area	485 ft^2	0.7913 in^2	0.776 in^2

TABLE 3 (Continued)

MODEL COMPONENT: ORBITER - O_3

GENERAL DESCRIPTION: 0.003366 SCALE MODEL OF MSC ORBITER 040A (MODIFIED) (Same as Orbiter O_2 with Vertical Tail Removed)

DRAWING NUMBER:

DIMENSIONS:	THEORETICAL		ACTUAL MEASURED
	FULL-SCALE	MODEL SCALE	MODEL SCALE
Area			
Span (equivalent)	73.5 ft	2.969 in	2.998 in
Inb'd Exposed Chord	58.35 ft	2.357 in	2.357 in
Outb'd equivalent chord			
Body length	109.58 ft	4.443 in	4.503 in
Body width	16.76 ft	0.677 in	0.677 in
Sweep Back Angles, degrees			
Leading Edge	60°	60°	60°
Tailing Edge	0°	0°	0°
Incidence angle	+2°	+2°	+2°
Vertical tail area	0	0	0

TABLE 3 (Continued)

MODEL COMPONENT: FIN $V_{3.3}$

GENERAL DESCRIPTION: Three Trapezoidal Fins, Conical Leading Edge, Flat Constant t/c Section Tapered to Tip, 120° Apart, One Fin Up

DRAWING NUMBER: AX 1233-5, -8

DIMENSIONS:	THEORETICAL		ACTUAL MEASURED
TOTAL DATA	FULL-SCALE	MODEL SCALE	MODEL SCALE
Area			
Planform			
Wetted			
Span (equivalent)			
Aspect Ratio			
Rate of Taper			
Taper Ratio			
Dihedral Angle, degrees			
Incidence Angle, degrees			
Aerodynamic Twist, degrees			
Toe-In Angle			
Cant Angle			
Sweep Back Angles, degrees			
Leading Edge	37°30'	37°30'	37°30'
Trailing Edge	0°	0°	0°
0.25 Element Line			
Chords:			
Root (Wing Sta. 0.0)			
Tip, (equivalent)			
MAC			
Fus. Sta. of .25 MAC			
W.P. of .25 MAC			
B.L. of .25 MAC			
Airfoil Section			
Root			
Tip			
EXPOSED DATA (Each)			
Area sq. ft./sq. in.	418	0.6826	0.686
Span, (equivalent)	23.99	0.969	0.976
Aspect Ratio		1.14	
Taper Ratio			
Chords			
Root	28.12	1.136	1.142
Tip	9.73	0.393	0.385
MAC			
Fus. Sta. of .25 MAC			
W.P. of .25 MAC			
B.L. of .25 MAC			

NOTE: Fin Trailing Edge Aligned with Body Base Station

TABLE 3 (Continued)

MODEL COMPONENT: Fin V_5 (V_6 Fin with Small Base Flare)

GENERAL DESCRIPTION: Two Trapezoidal Fins, Conical Leading Edge, Flat Constant t/c Section Tapered to Tip, 45° Below the Horizontal on Each Side of the Base Flare

DRAWING NUMBER: AX 1233-20-5

DIMENSIONS:	THEORETICAL		ACTUAL MEASURED
TOTAL DATA	FULL-SCALE	MODEL SCALE	MODEL SCALE
Area			
Planform			
Wetted			
Span (equivalent)			
Aspect Ratio			
Rate of Taper			
Taper Ratio			
Dihedral Angle, degrees			
Incidence Angle, degrees			
Aerodynamic Twist, degrees			
Toe-In Angle			
Cant Angle			
Sweep Back Angles, degrees			
Leading Edge	30°	30°	30°
Trailing Edge	0°	0°	0°
0.25 Element Line			
Chords:			
Root (Wing Sta. 0.0)			
Tip, (equivalent)			
MAC			
Fus. Sta. of .25 MAC			
W.P. of .25 MAC			
B.L. of .25 MAC			
Airfoil Section			
Root			
Tip			
EXPOSED DATA (Each)			
Area sq.ft./sq. in.	750	1.2242	1.235
Span, (equivalent)	37.95	1.533	1.535
Aspect Ratio		1.746	
Taper Ratio			
Chords			
Root	31.66	1.279	1.282
Tip	9.75	0.394	0.403
MAC			
Fus. Sta. of .25 MAC			
W.P. of .25 MAC			
B.L. of .25 MAC			

NOTE: Fin Trailing Edge Aligned with Body Base Station

TABLE 3 (Continued)

MODEL COMPONENT: FIN V_6 ($V_{6.1}$, $V_{6.2}$, $V_{6.3}$, $V_{6.4}$)

GENERAL DESCRIPTION: Trapezoidal Fin, Conical Leading Edge, Flat Contoured t/c Section Tapered to Tip

(See Configuration Nomenclature for Fin Arrangements)

DRAWING NUMBER: AX 1233-16, -20

DIMENSIONS:	THEORETICAL		ACTUAL MEASURED
TOTAL DATA	FULL-SCALE	MODEL SCALE	MODEL SCALE
Area			
Planform			
Wetted			
Span (equivalent)			
Aspect Ratio			
Rate of Taper			
Taper Ratio			
Diehedral Angle, degrees			
Incidence Angle, degrees			
Aerodynamic Twist, degrees			
Toe-In Angle			
Cant Angle			
Sweep Back Angles, degrees			
Leading Edge	30°	30°	30°15'
Trailing Edge	0°	0°	0°
0.25 Element Line			
Chords:			
Root (Wing Sta. 0.0)			
Tip, (equivalent)			
MAC			
Fus. Sta. of .25 MAC			
W.P. of .25 MAC			
B.L. of .25 MAC			
Airfoil Section			
Root			
Tip			
EXPOSED DATA (Each)			
Area sq. ft./sq. in.	.668	1.0906	1.105
Span, (equivalent)	37.95	1.533	1.534
Aspect Ratio		1.746	
Taper Ratio			
Chords			
Root	31.66	1.279	1.284
Tip	9.75	0.394	0.402
MAC			
Fus. Sta. of .25 MAC			
W.P. of .25 MAC			
B.L. of .25 MAC			

NOTE: Fin Trailing Edge Aligned with Body Base Station

TABLE 3 (Continued)

MODEL COMPONENT: Fin V_7 ($V_{7.2}$)

GENERAL DESCRIPTION: Trapezoidal Fins, Conical Leading Edge, Flat Constant t/c Section Tapered to Tip

V_7 = 3 fins 120° apart one vertical up

$V_{7.2}$ = V_7 less top vertical fin (2)

DRAWING NUMBER: AX 1233-17, -20

DIMENSIONS:	THEORETICAL		ACTUAL MEASURED
TOTAL DATA	FULL-SCALE	MODEL SCALE	MODEL SCALE
Area			
Planform			
Wetted			
Span (equivalent)			
Aspect Ratio			
Rate of Taper			
Taper Ratio			
Dihedral Angle, degrees			
Incidence Angle, degrees			
Aerodynamic Twist, degrees			
Toe-In Angle			
Cant Angle			
Sweep Back Angles, degrees			
Leading Edge	43°22'	43°22'	44°15'
Trailing Edge	0°	0°	0°
0.25 Element Line			
Chords:			
Root (Wing Sta. 0.0)			
Tip, (equivalent)			
MAC			
Fus. Sta. of .25 MAC			
W.P. of .25 MAC			
B.L. of .25 MAC			
Airfoil Section			
Root			
Tip			
EXPOSED DATA (Each)			
Area sq.ft./sq.in.	363	0.592	0.584
Span, (equivalent)	23.19	0.937	0.932
Aspect Ratio		1.210	
Taper Ratio			
Chords			
Root	31.66	1.279	1.270
Tip	9.75	0.394	0.386
MAC			
Fus. Sta. of .25 MAC			
W.P. of .25 MAC			
B.L. of .25 MAC			

NOTE: Fin Trailing Edge Aligned with Body Base Station

TABLE 4 INDEX OF MODEL FIGURES

FIGURE 1	Axis System
FIGURE 2	Press Feb Booster/040A Orbiter 0.003366 Scale AX 1233 Model
FIGURE 3	MSC-040A Orbiter 0.003366 Scale Model
FIGURE 4	Body, B_6
FIGURE 5	Shroud/Fin Details 0.003366 Scale AX 1233I-1 Model
FIGURE 6	Shroud/Fin Details 0.003366 Scale AX 1233I-1 Model
FIGURE 7	Petal Details 0.003366 Scale AX 1233I-1 Model
FIGURE 8	Trip Strip 0.003366 Scale Model AX 1233I-1

TABLE 5 INDEX OF DATA FIGURES

TABLE 5 INDEX OF DATA FIGURES
(Continued)

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.

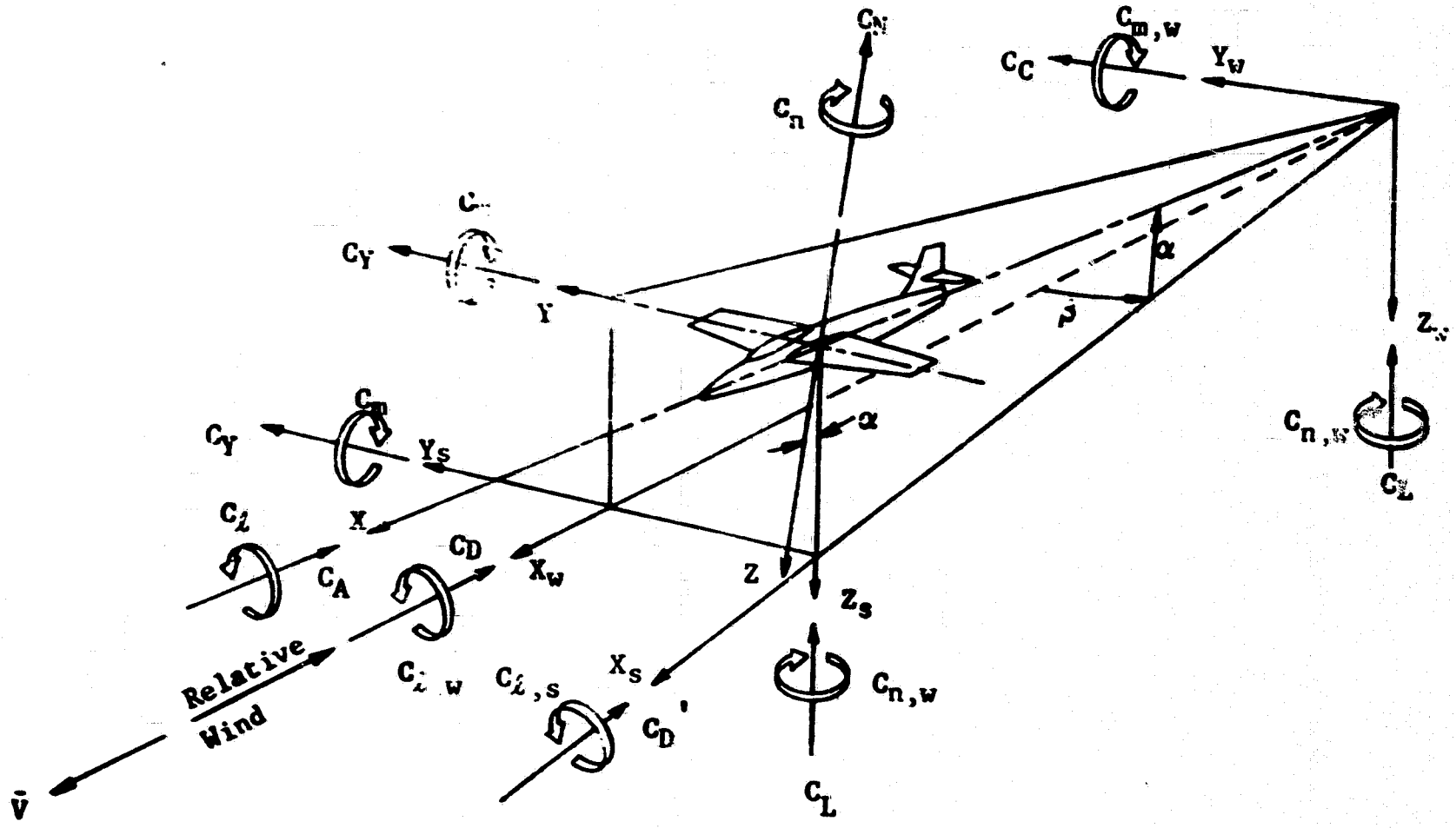
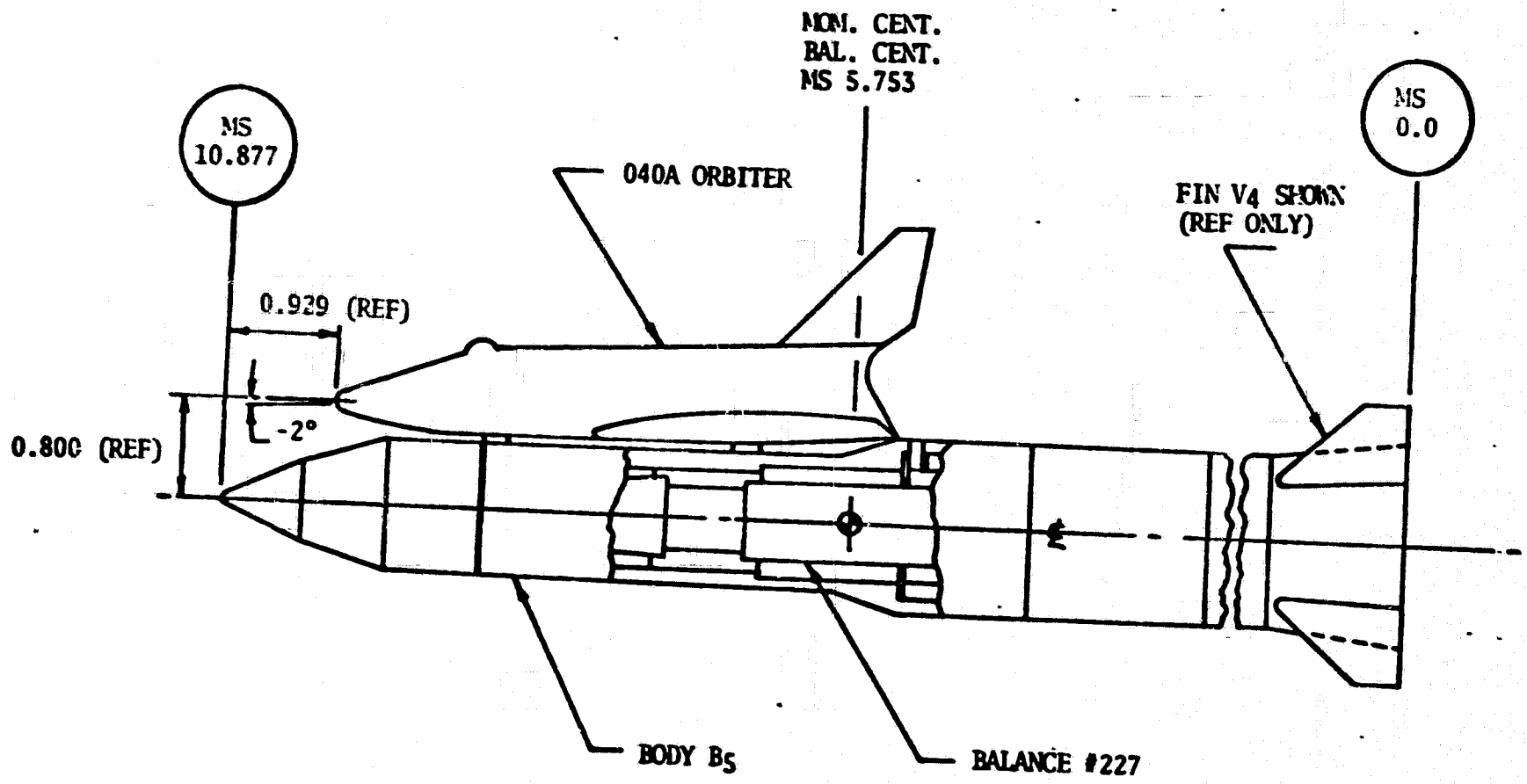
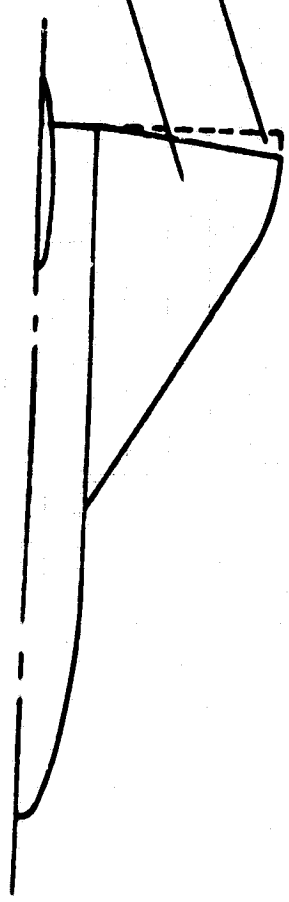


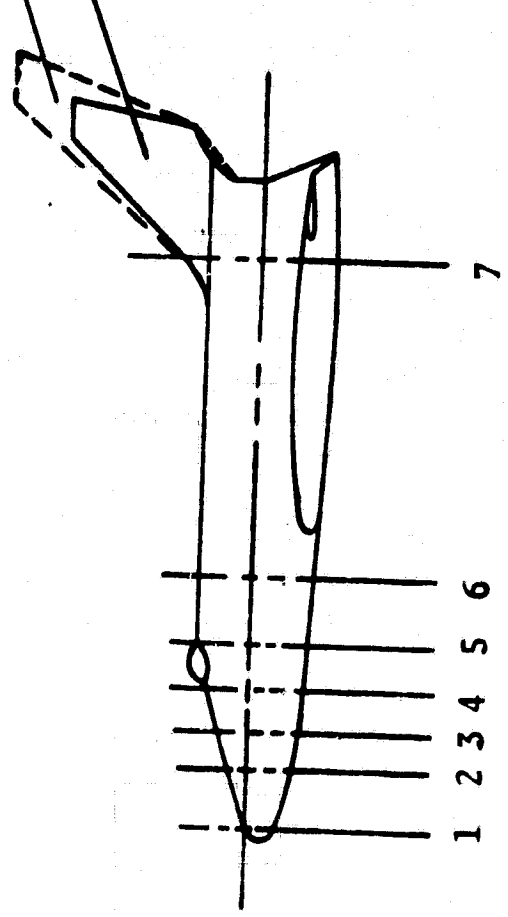
Figure 1. Axis systems, showing direction and sense of force and moment coefficients, angle of attack, and sideslip angle



S = 5.1478 sq.in. (3155.3 sq.ft.)
ℓ_{LONG} = 4.426 in. (109.58 ft)
b_{LAT} = 2.969 in. (73.5 ft)

FIGURE 2 - PRESSURE FED BOOSTER/040A ORBITER
0.003366 SCALE AX 1233 MODEL





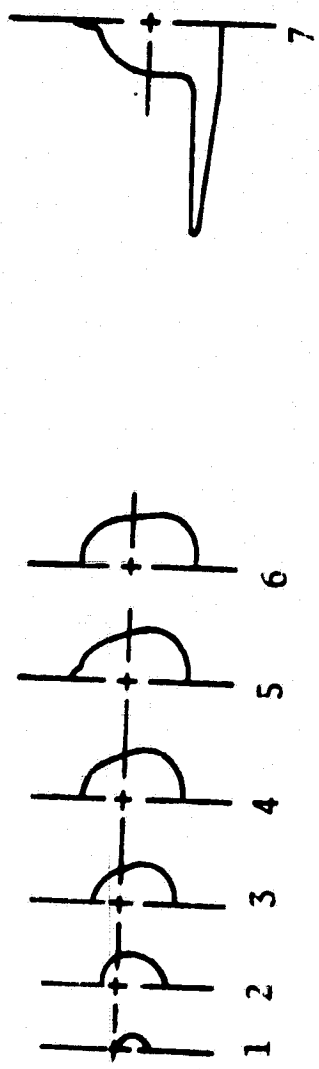
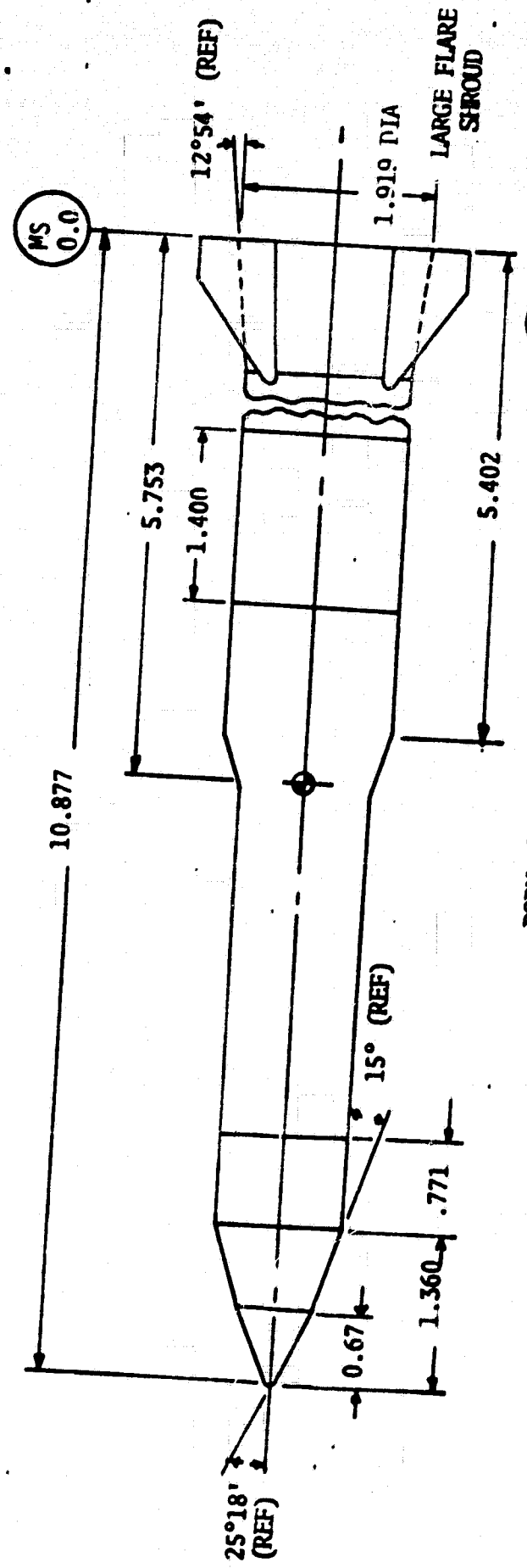
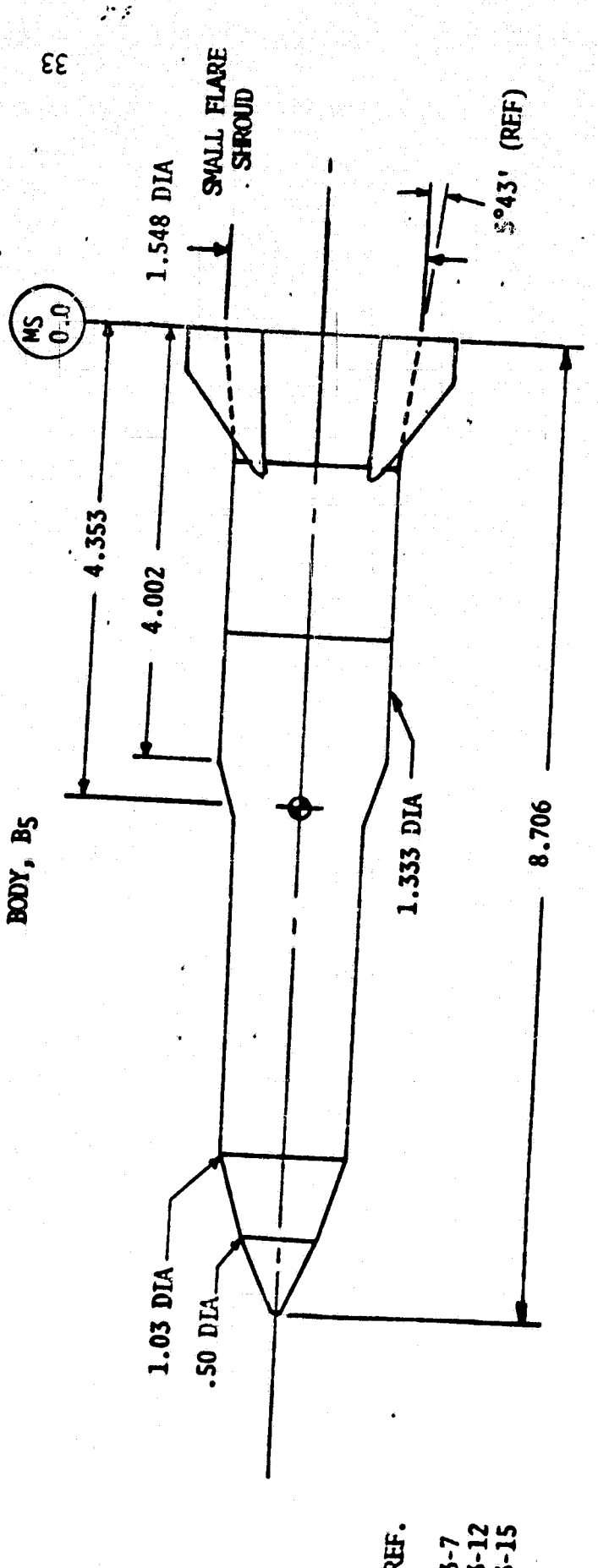


FIGURE 3 - MSC-040A ORBITER
0.003366 Scale Model



BODY, B_5



BODY, B_6

FIGURE 4 - BODY, B_5, B_6

DWG. REF.

1233-7
1233-12
1233-15

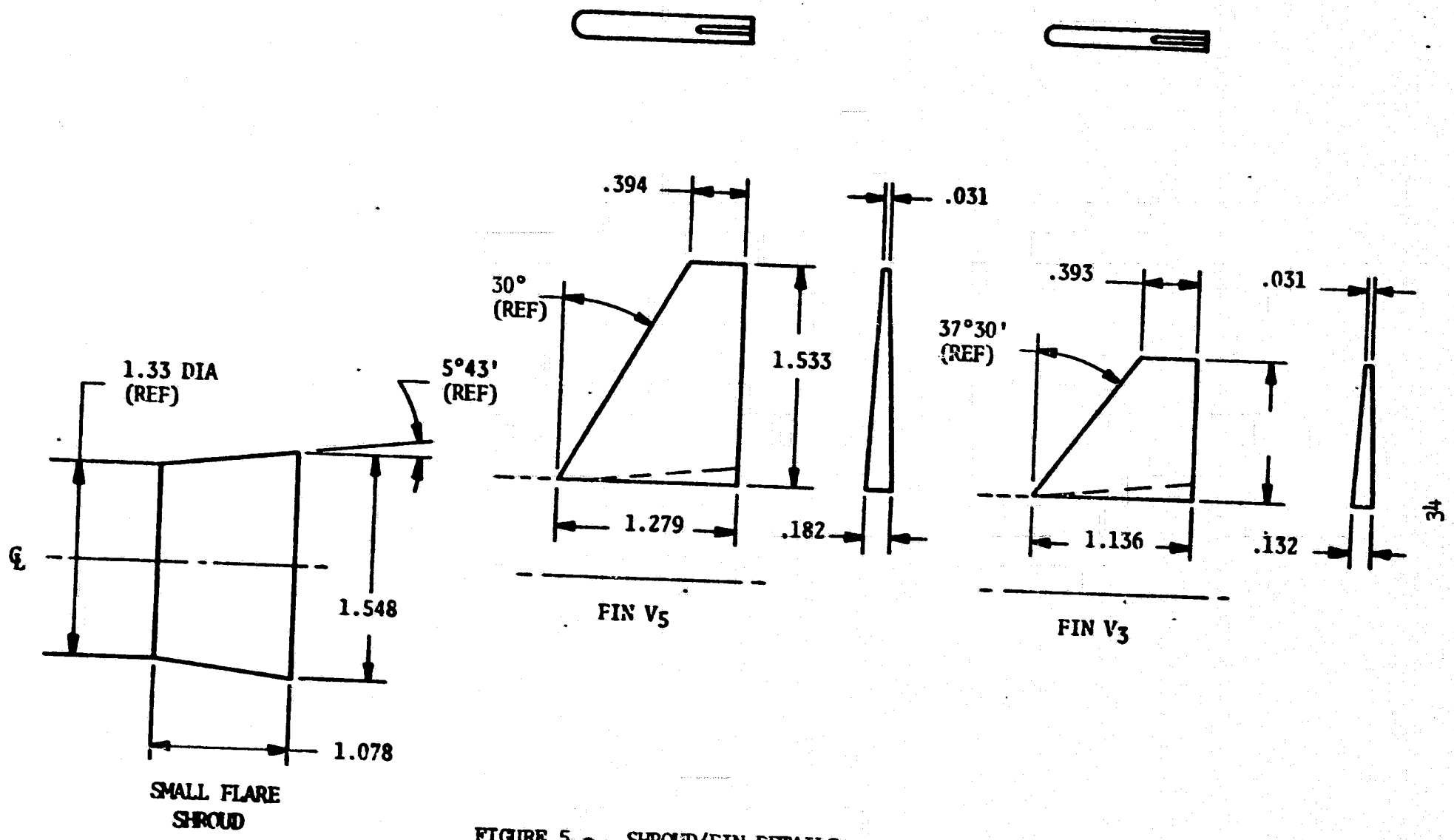
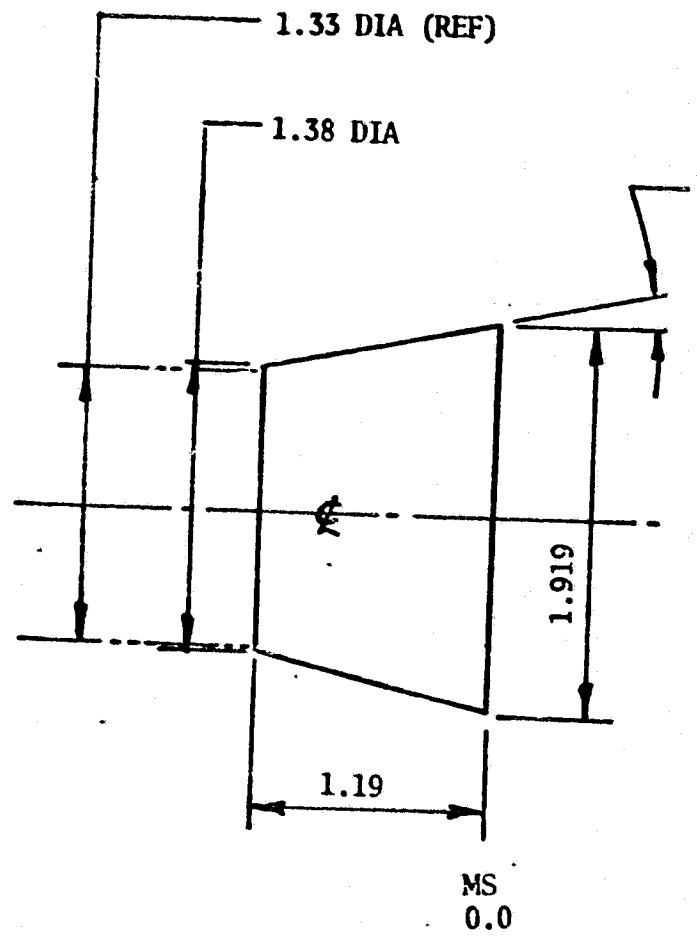
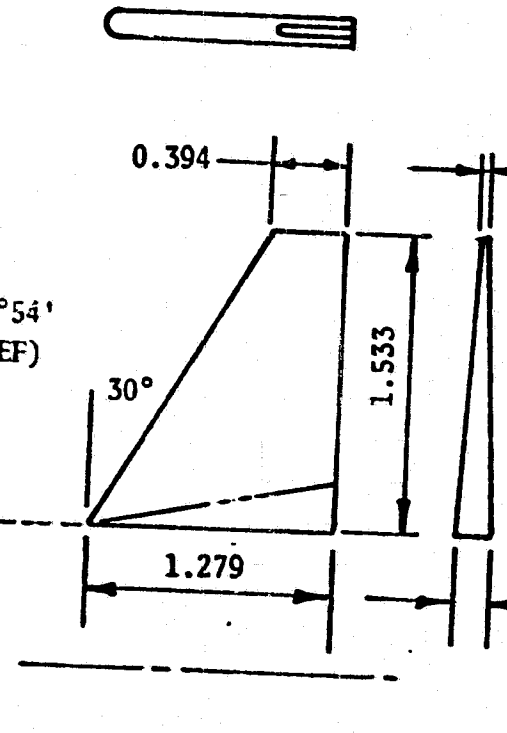


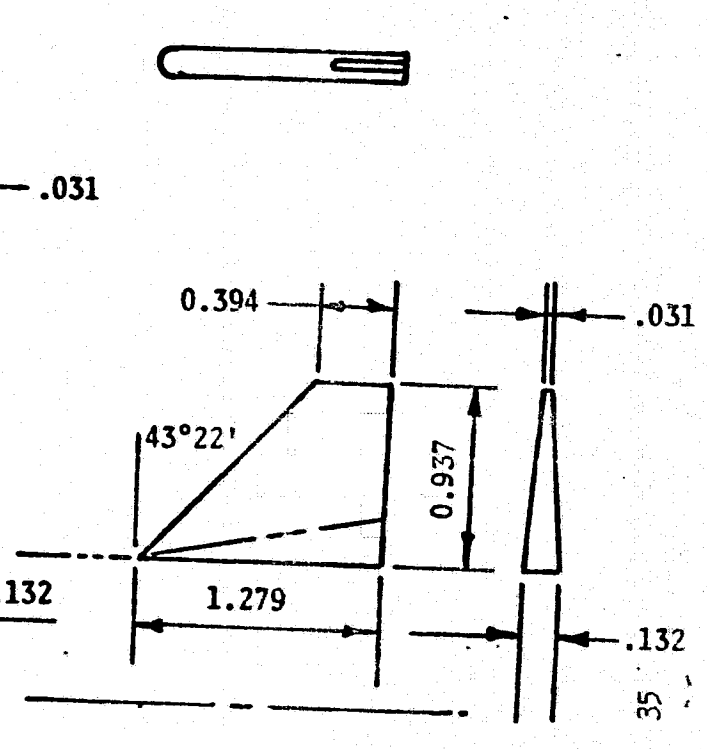
FIGURE 5 - SHROUD/FIN DETAILS
0.003366 SCALE AX 1233I-1 MODEL



LARGE FLARE
SHROUD



FIN V_6



FIN V_7

FIGURE 6 - SHROUD/FIN DETAILS
0.003366 SCALE AX 12331-1 MODEL

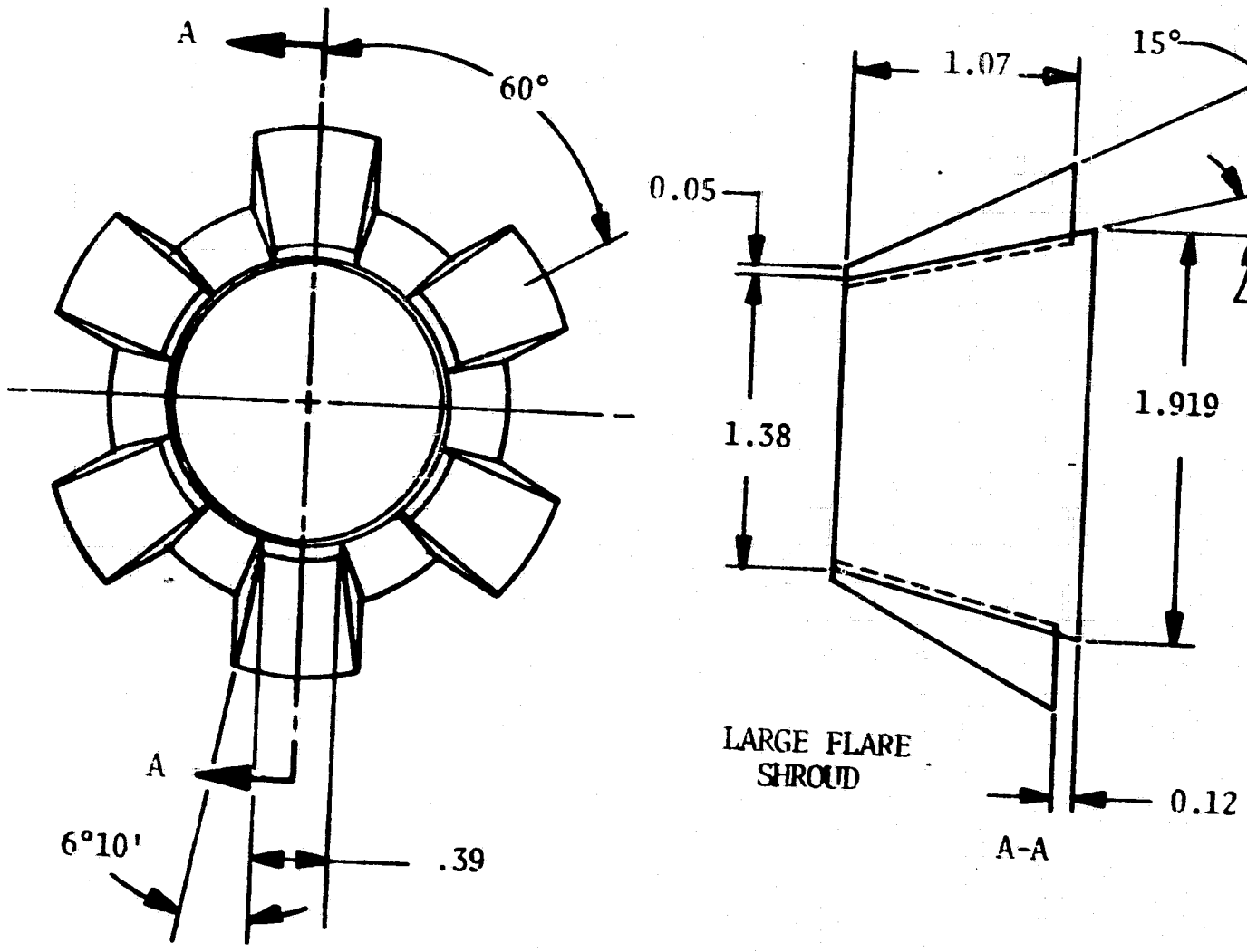
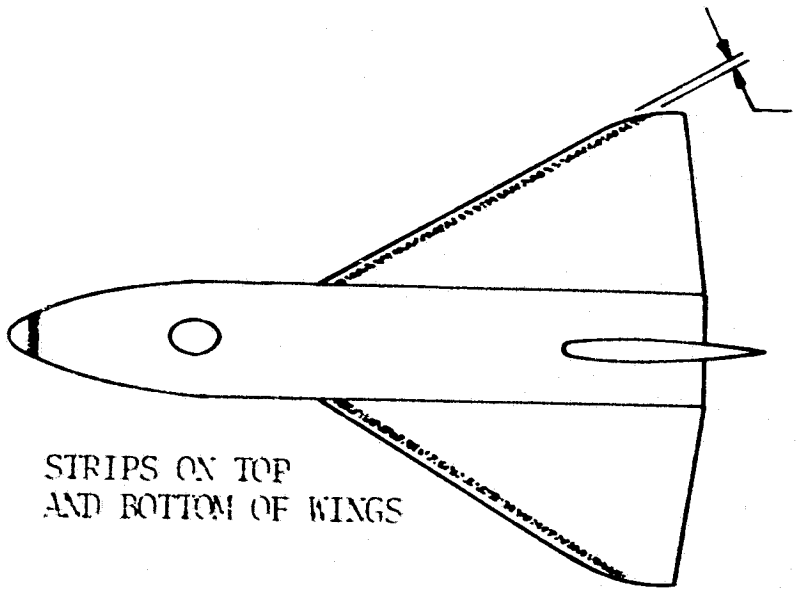
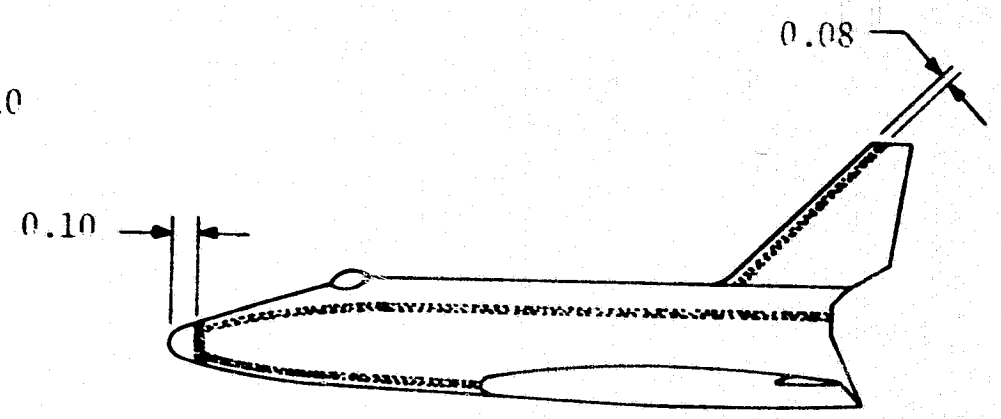
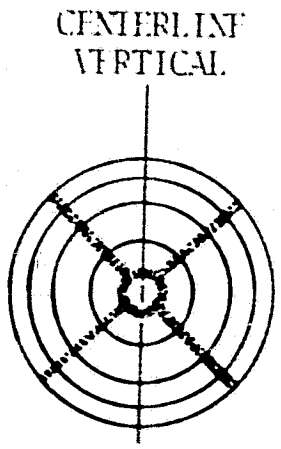


FIGURE 7 - PETAL DETAILS
0.003366 SCALE AX 1233I-1 MODEL





NO. 180 GRIT USED FOR ALL TRIP STRIPS
ALL STRIPS 0.05 TO 0.07 WIDE



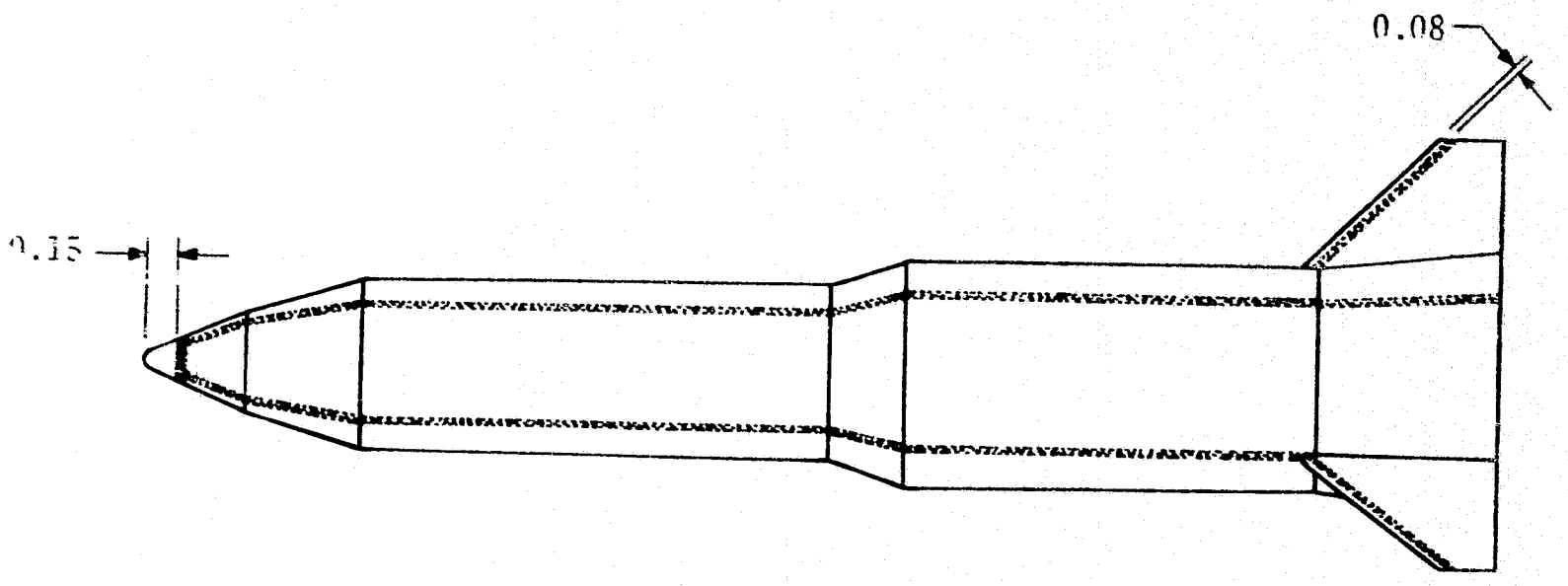
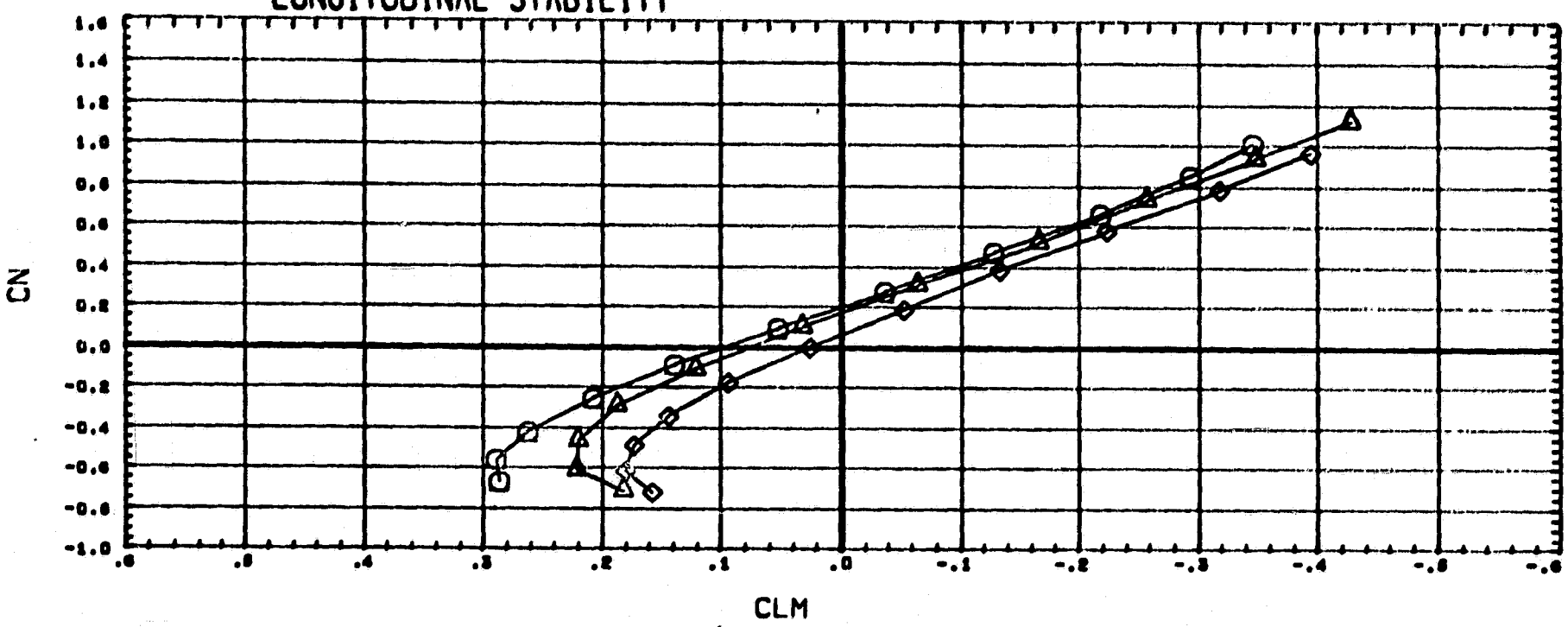
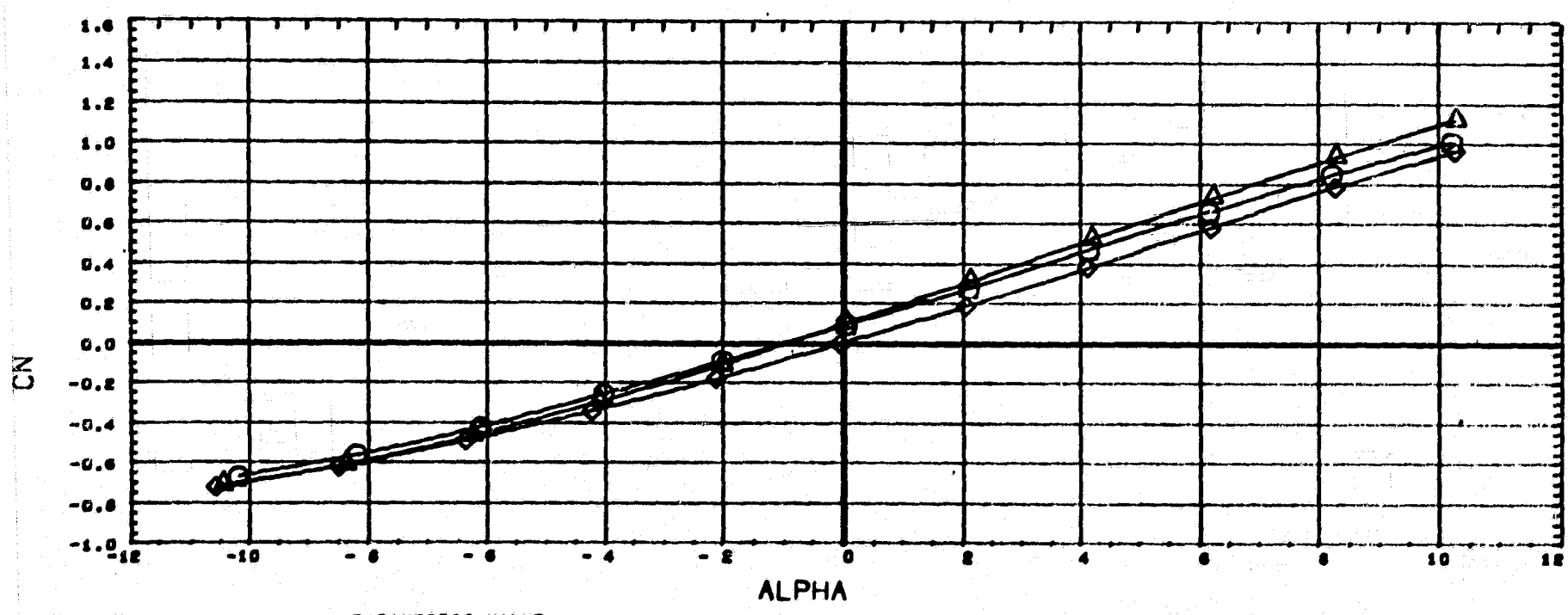


FIGURE 8 - TRIP STRIP CHART
0.003366 SCALE MODEL AX 12331-1

DATA FIGURES

LONGITUDINAL STABILITY





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△	1.102				
◇	1.462				

DATA HIST. CODE CGR

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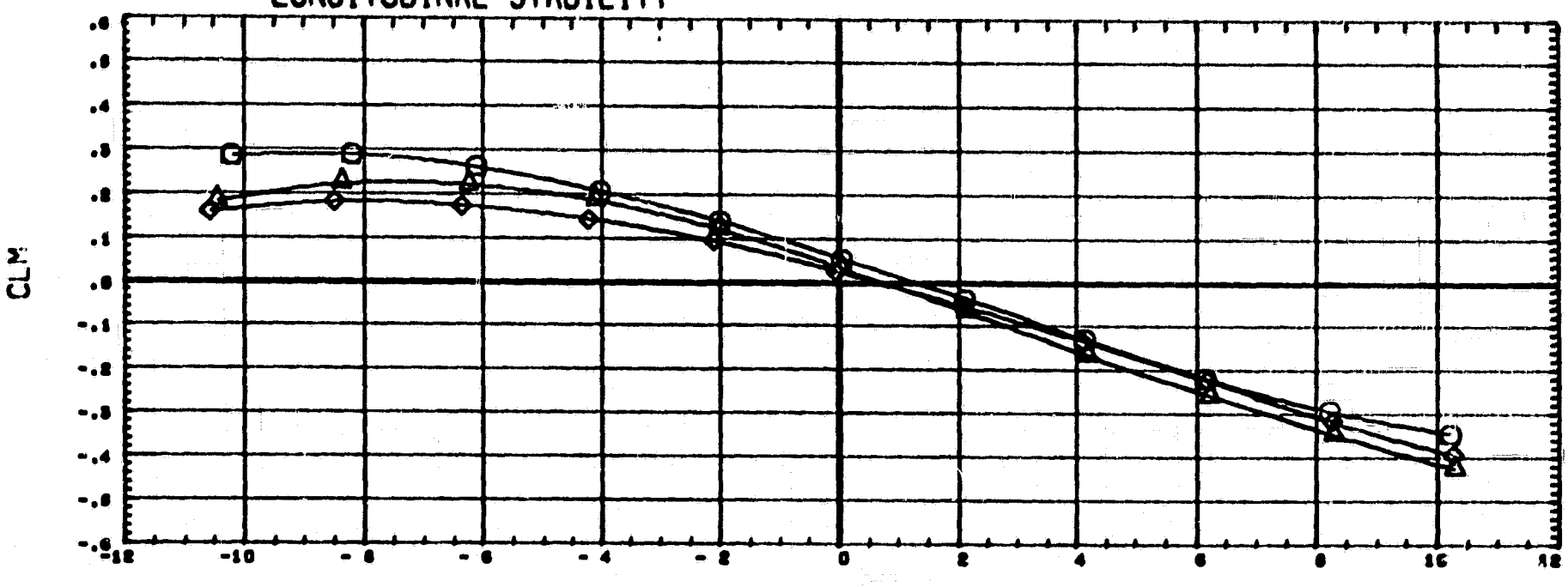
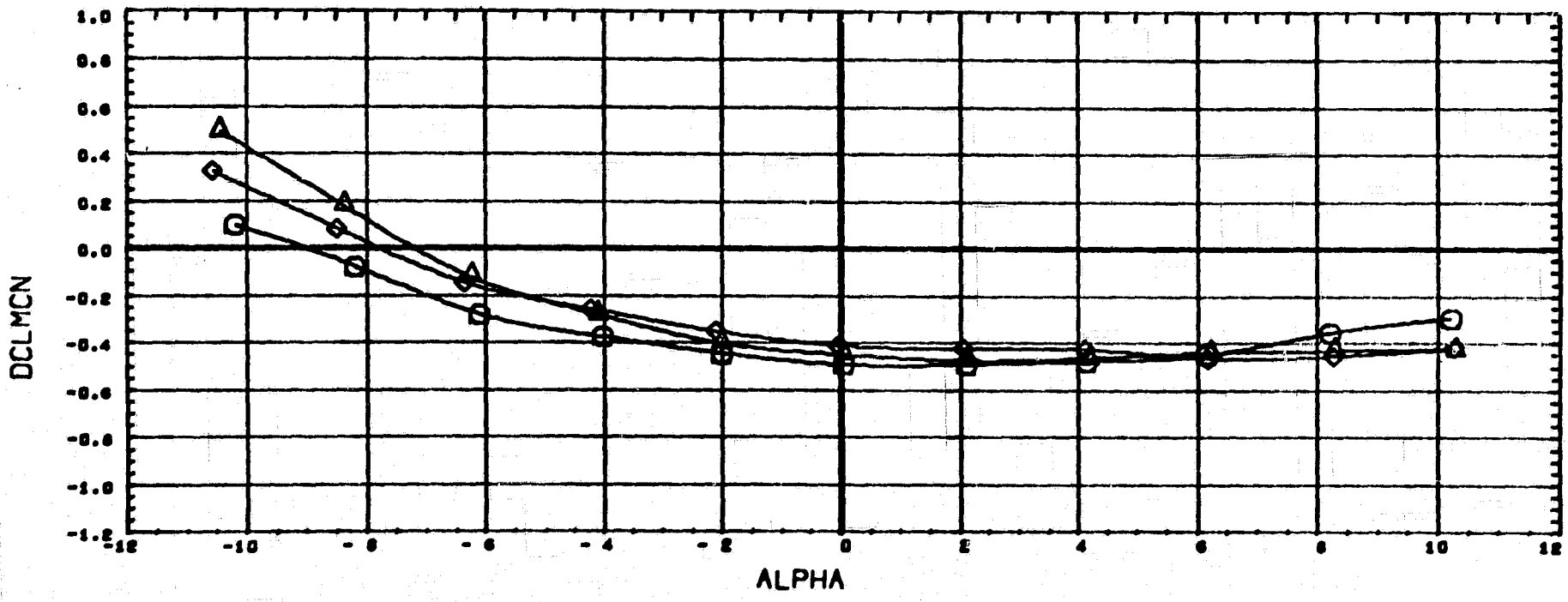
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0054	

LONGITUDINAL STABILITY





SYMBOL	MACH	PARAMETRIC VALUES		
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△	1.102			
◇	1.462			

DATA HIST. CODE C6R

REFERENCE INFORMATION

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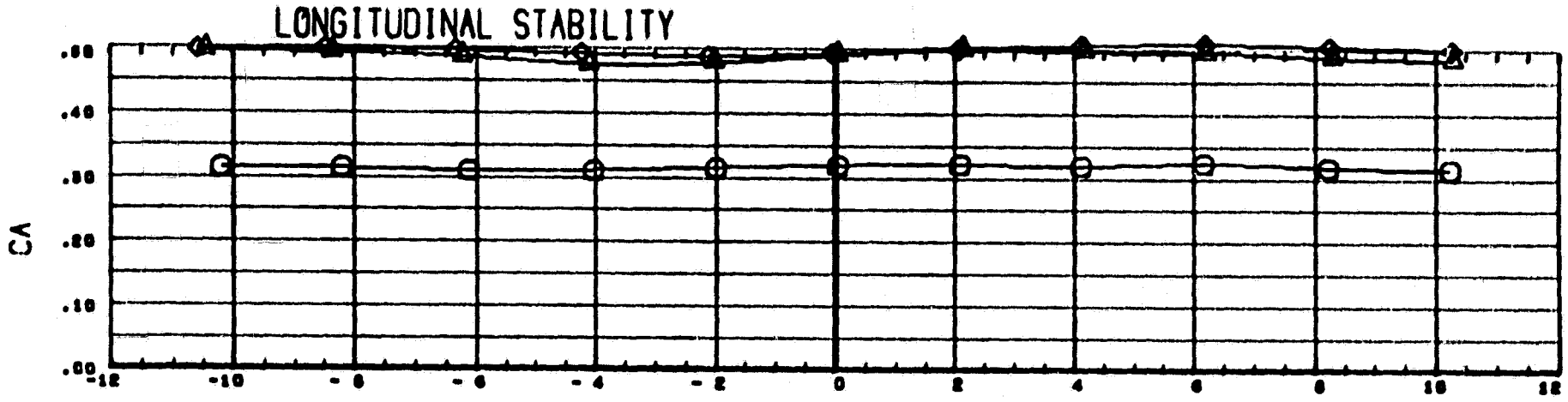
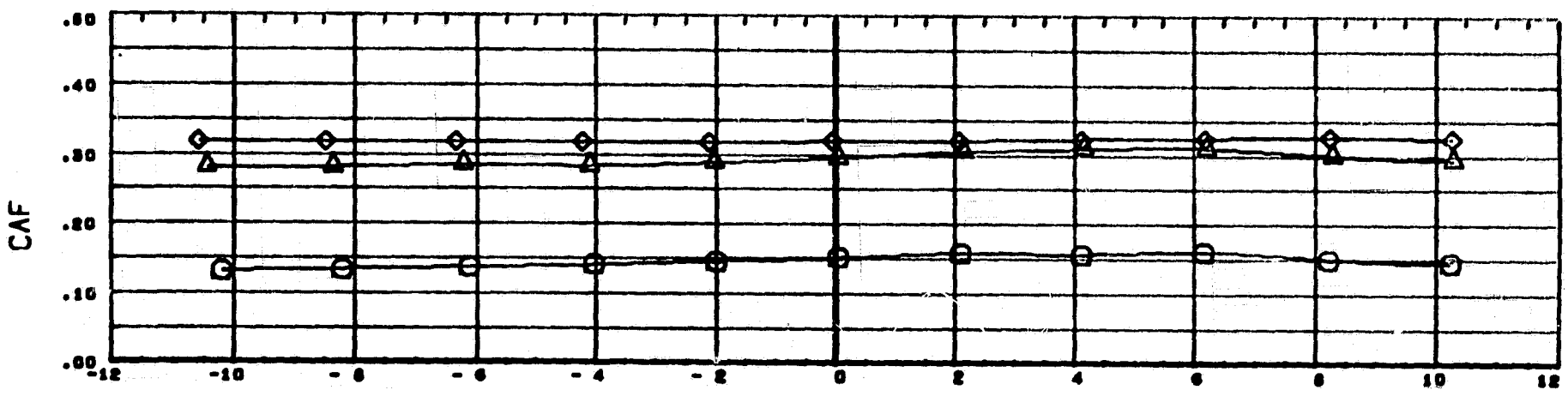
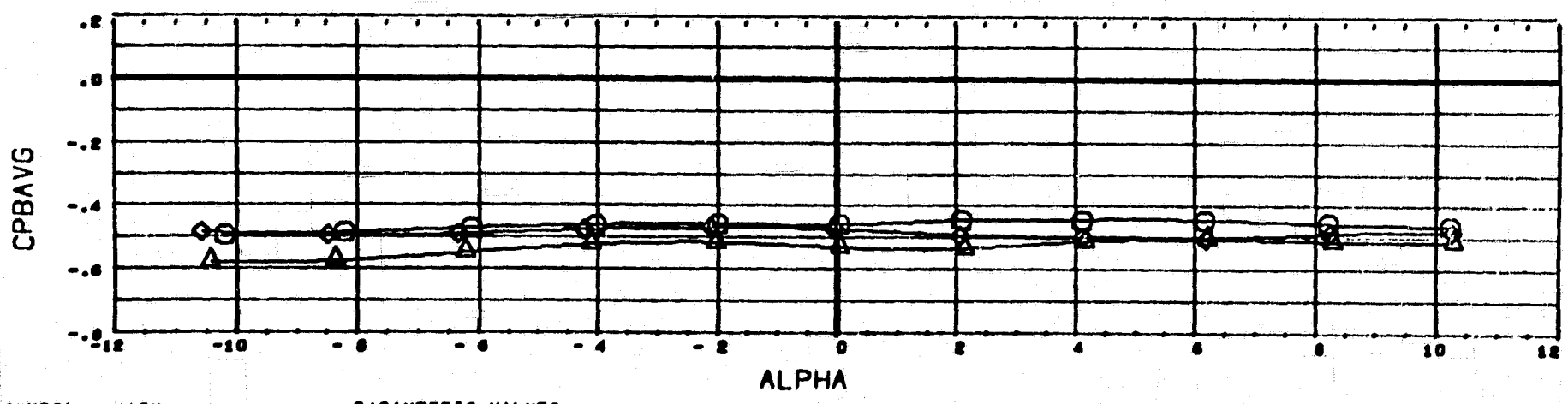
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY







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◇	1.462			

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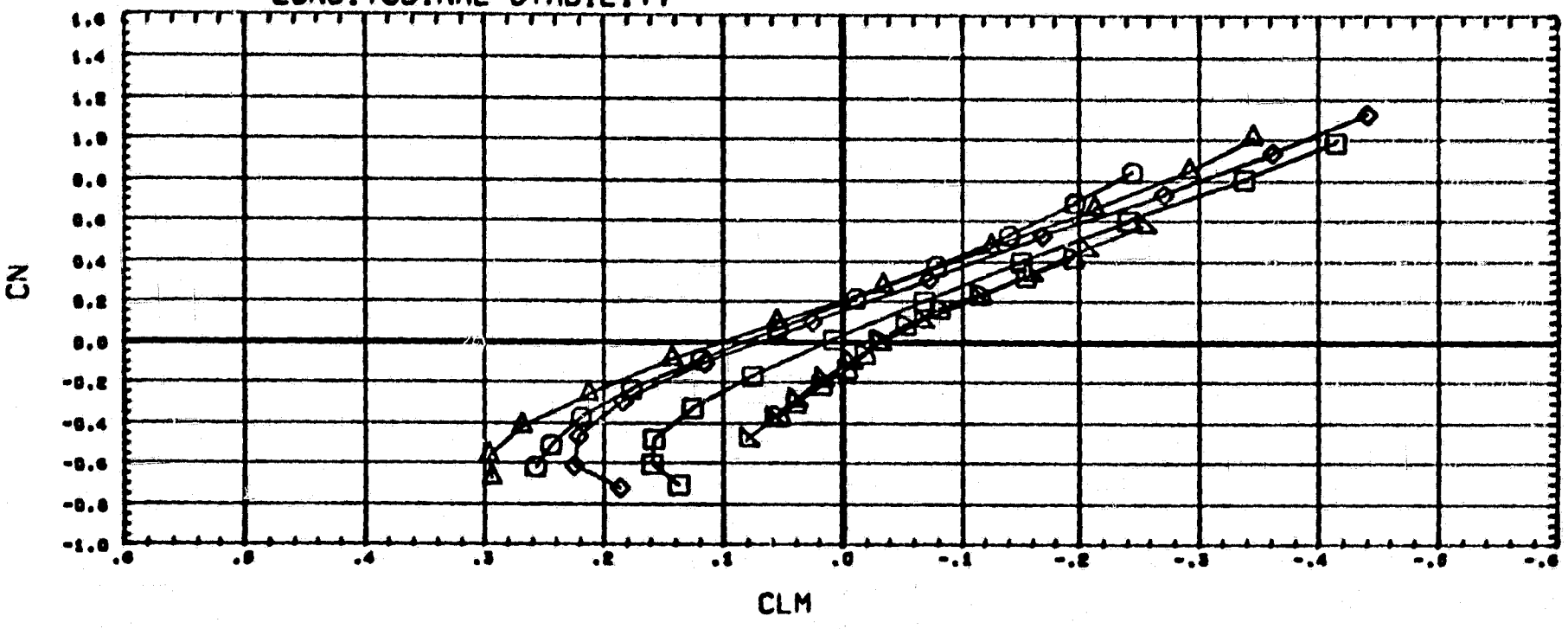
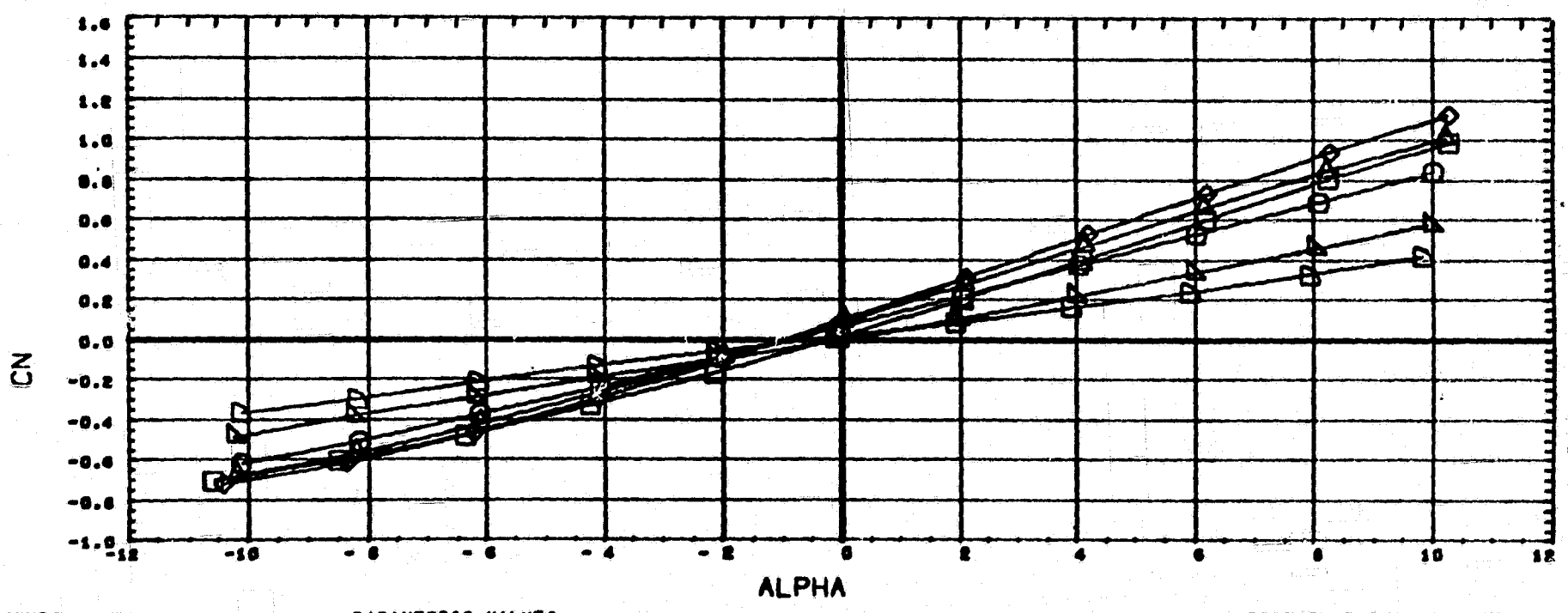
LONGITUDINAL STABILITY





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□	1.457				
▽	2.740				
D	4.959	DATA HIST. CODE	CGR		

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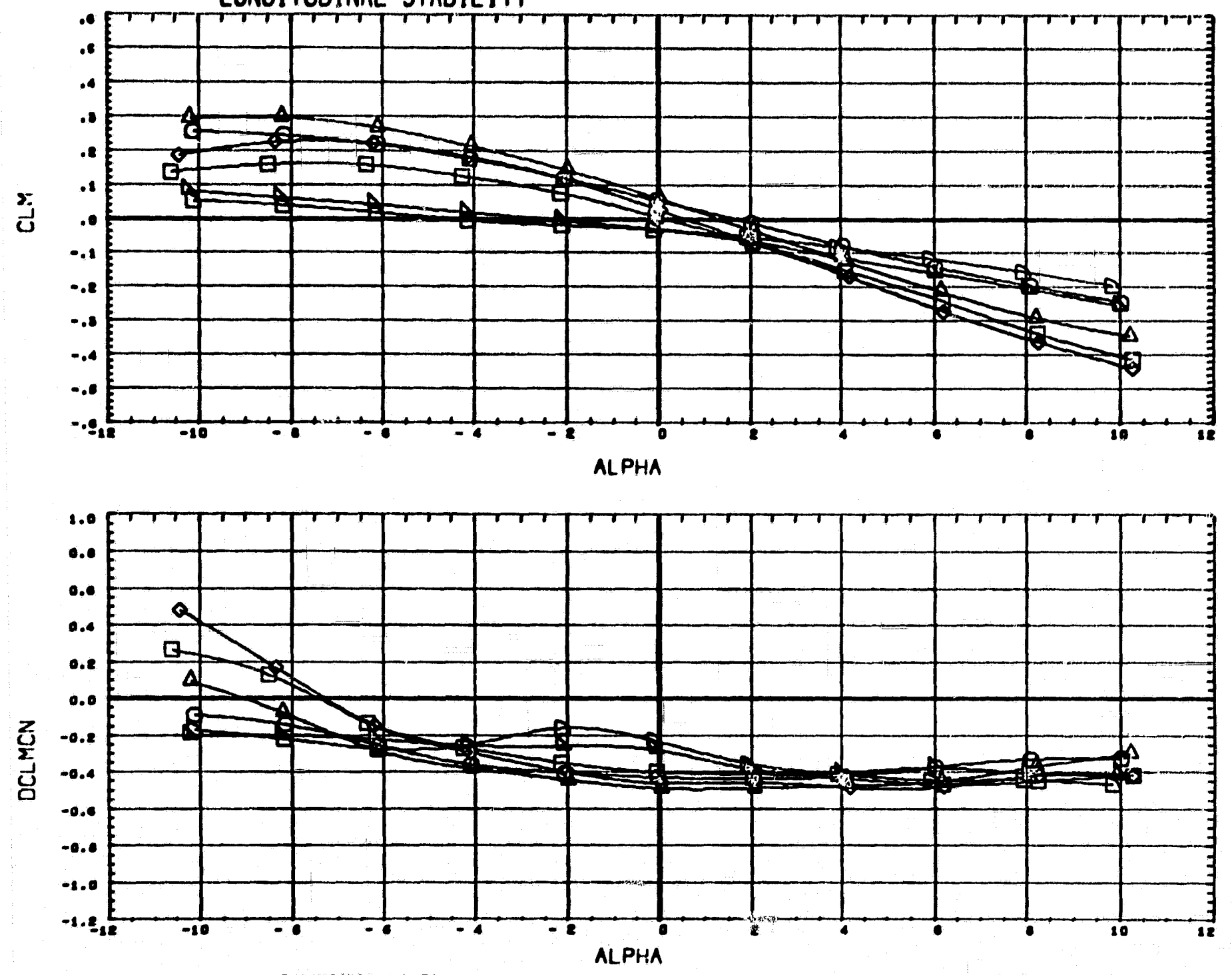
LONGITUDINAL STABILITY



SYMBOL	MACH		PARAMETRIC VALUES		
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△	0.899				
◇	1.104				
□	1.457				
▽	2.740				
◁	4.959	DATA HIST. CODE	CGR		

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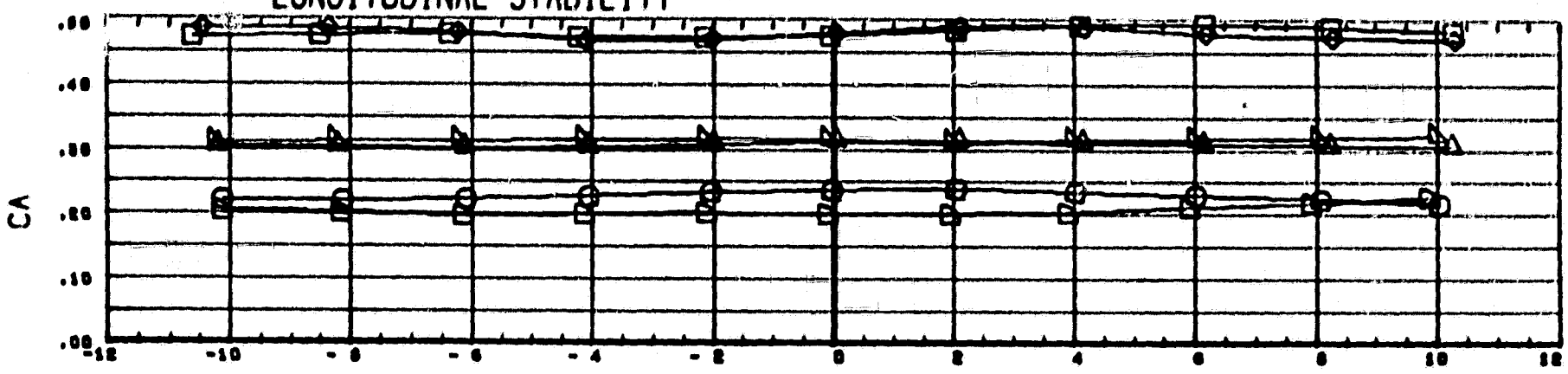
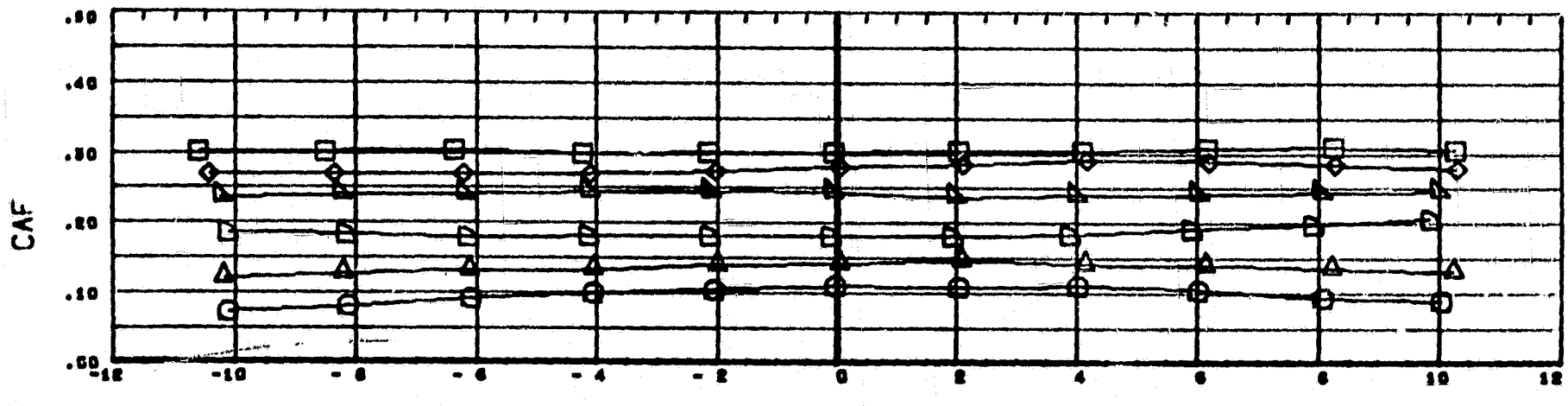
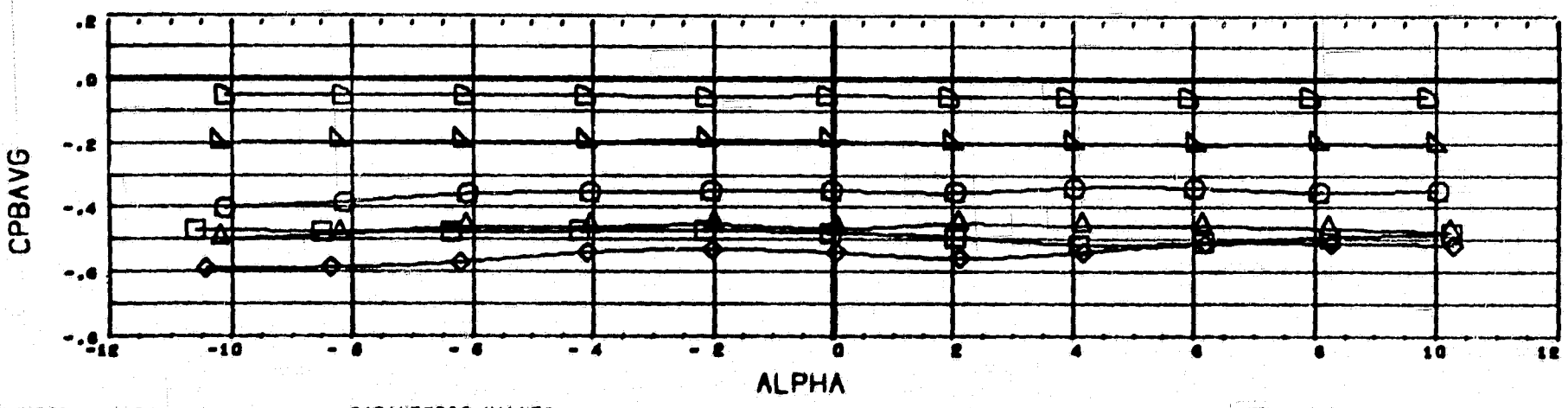
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES			REFERENCE INFORMATION		
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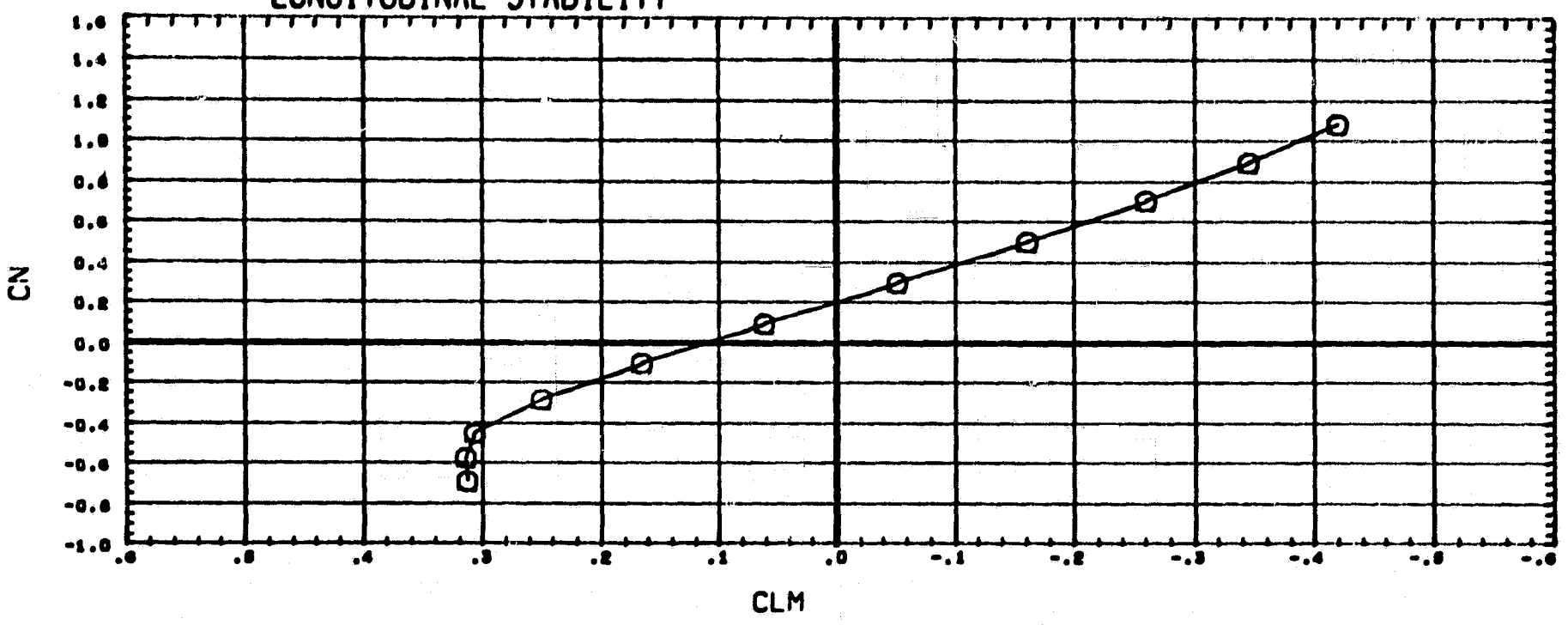
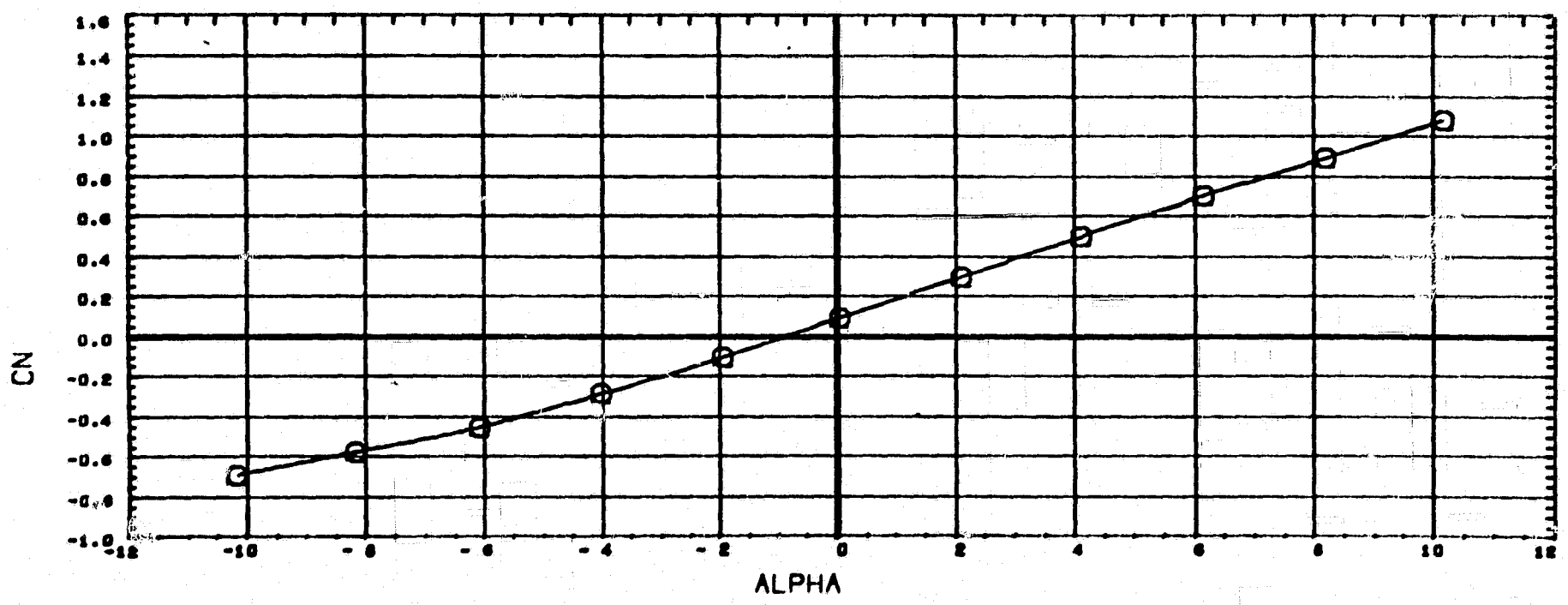
△	0.899				LREF	4.4260	IN.
◇	1.104				BREF	2.9690	IN.
□	1.457				XMRP	5.7550	IN.
▽	2.740				YMRP	0.0000	IN.
⬠	4.959	DATA HIST. CODE	C6R		ZMRP	0.0000	IN.
					SCALE	0.0034	

LONGITUDINAL STABILITY





SYMBOL	MACH		PARAMETRIC VALUES		
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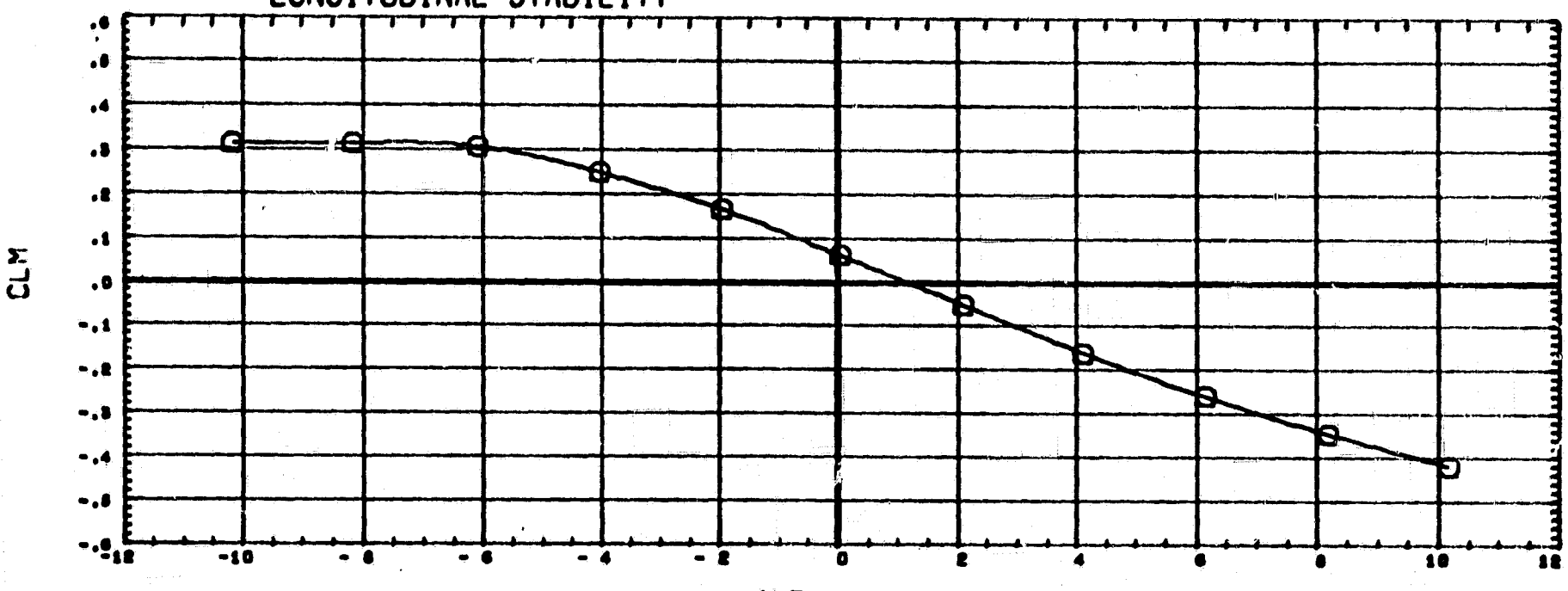
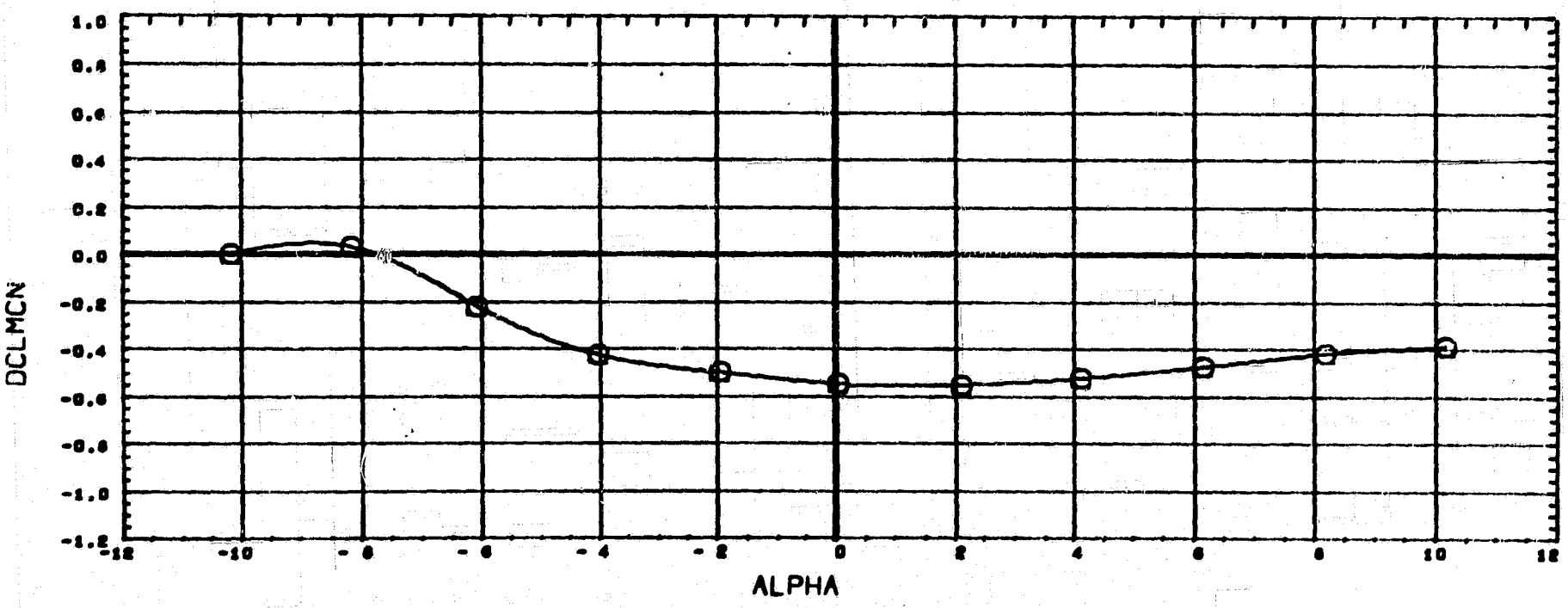
REFERENCE INFORMATION		
SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0054	

DATA HIST. CODE CGR

LONGITUDINAL STABILITY





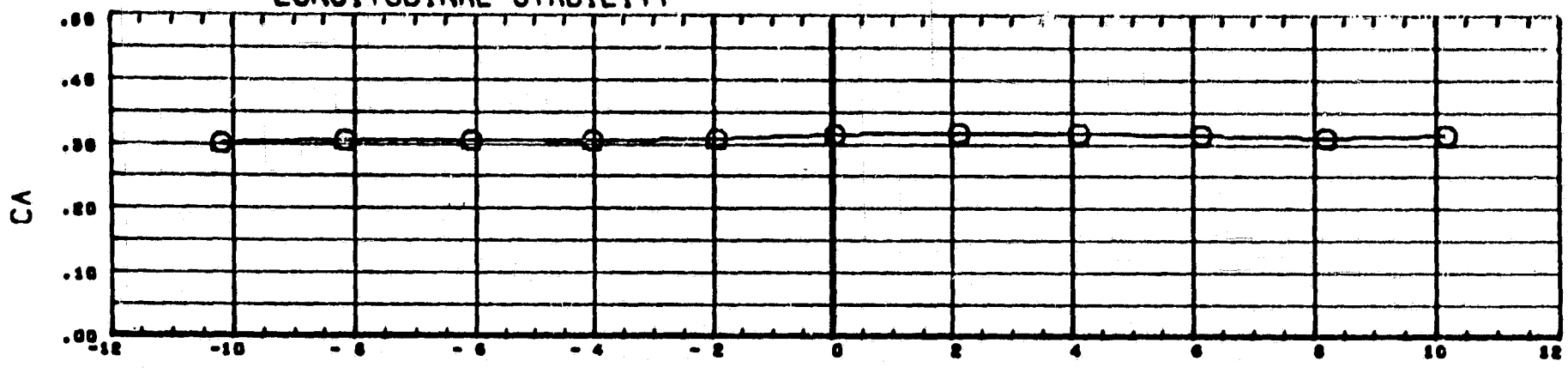
SYMBOL	MACH		PARAMETRIC VALUES		
O	0.901	BETA	0.000	ORBINC -	2.000

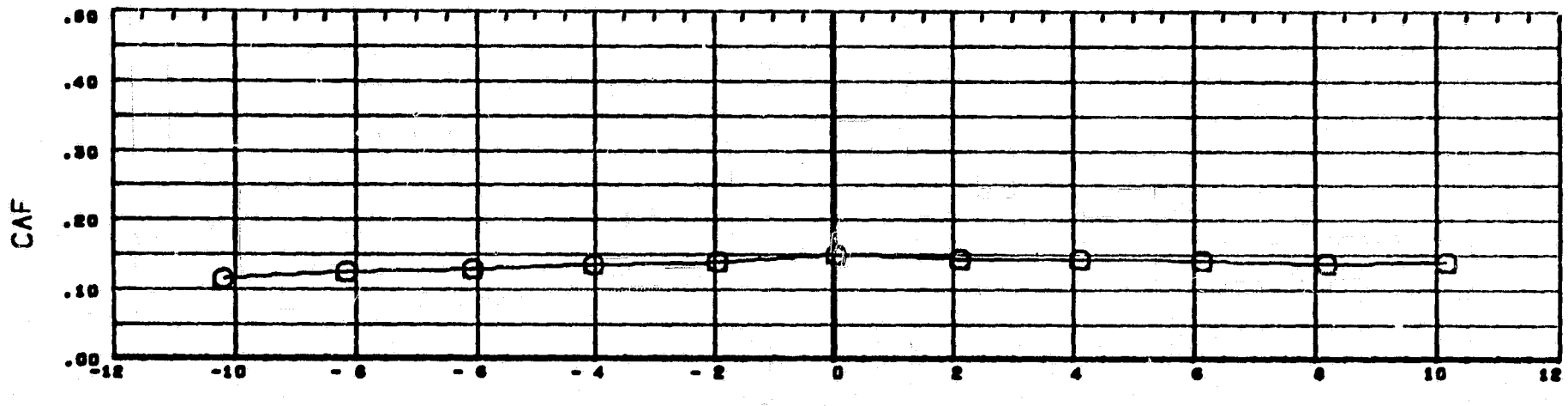
DATA HIST. CODE C6R

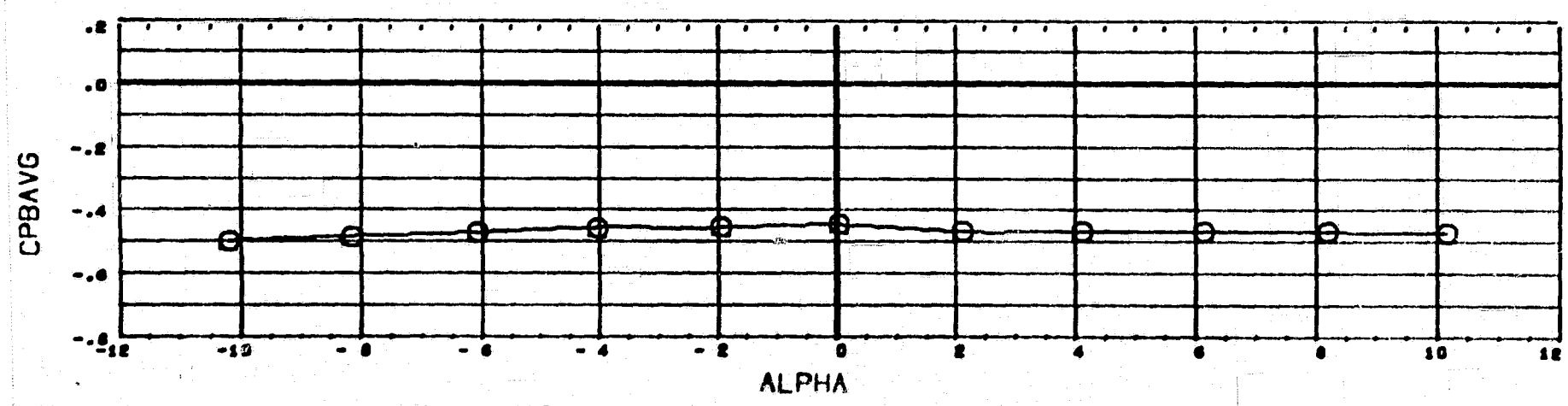
REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY







SYMBOL MACH PARAMETRIC VALUES

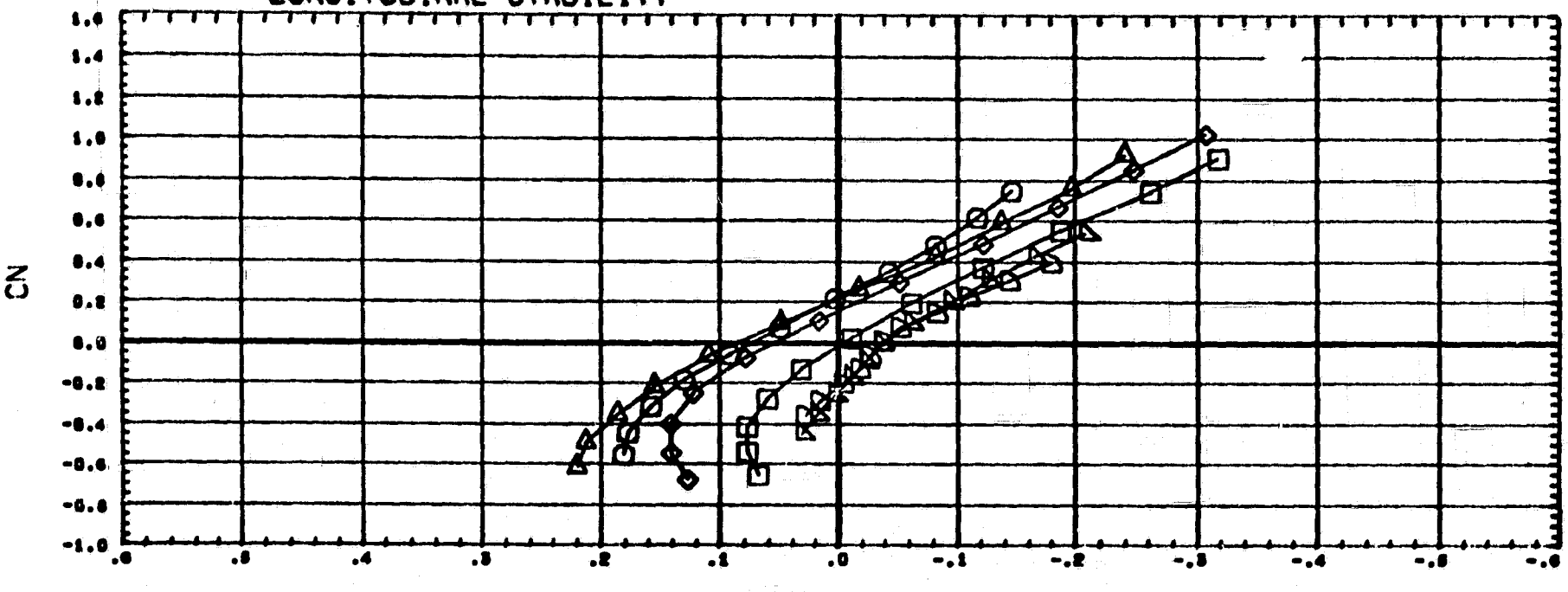
O 0.901 BETA 0.000 ORBINC - 2.000

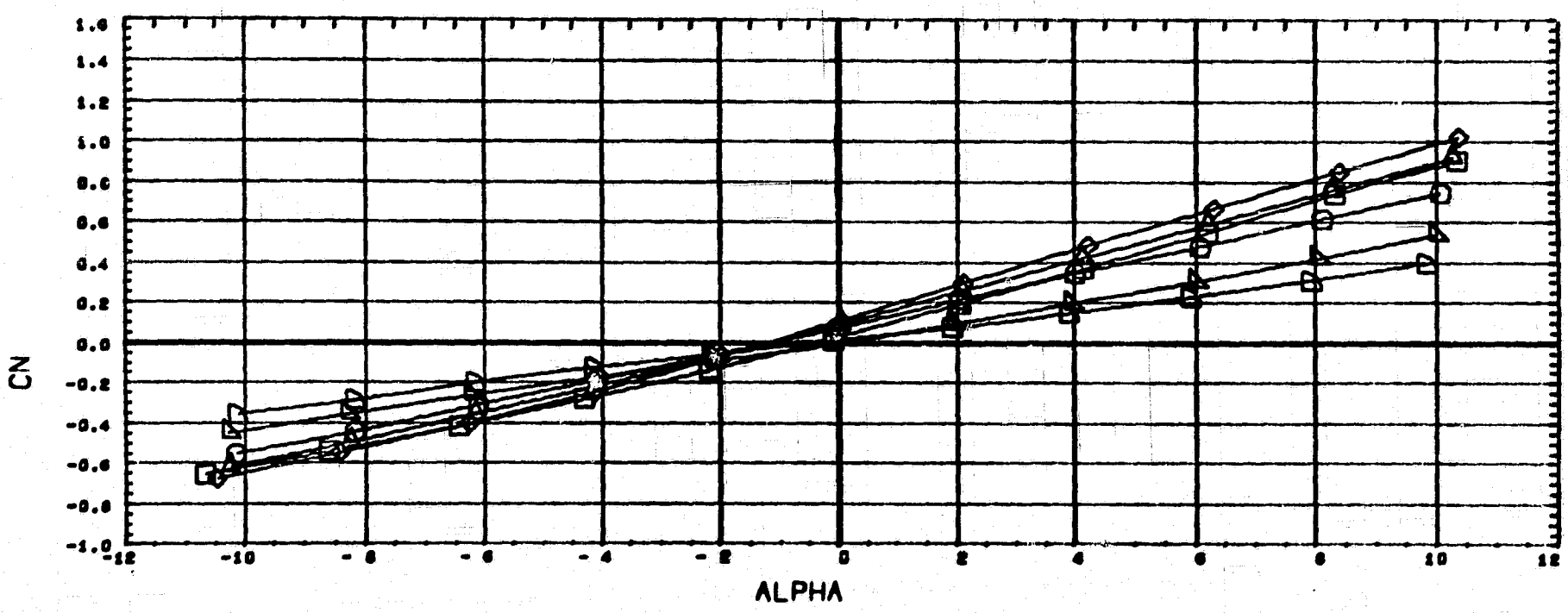
REFERENCE INFORMATION

SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE CGR

LONGITUDINAL STABILITY





SYMBOL	MACH		PARAMETRIC VALUES		
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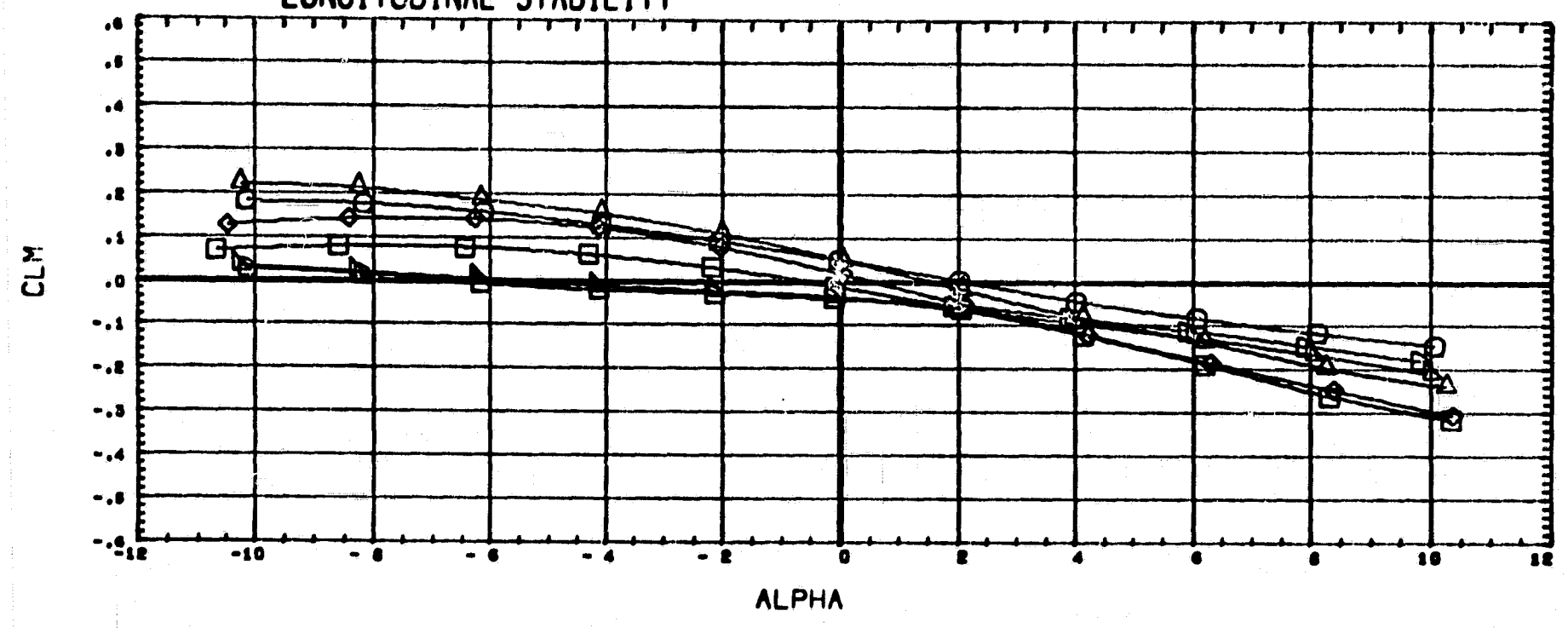
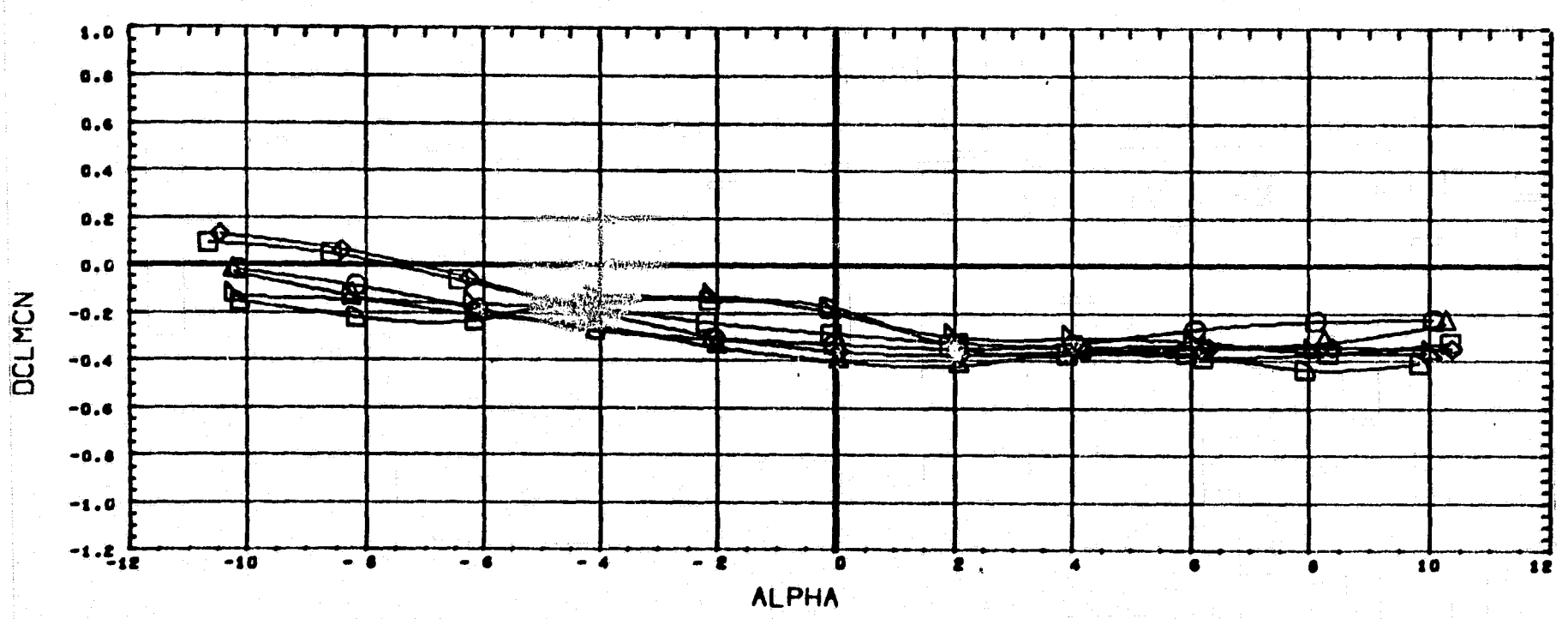
	0.897				
	1.100				
	1.459				
	2.740				
	4.959	DATA HIST. CODE	C6R		

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY

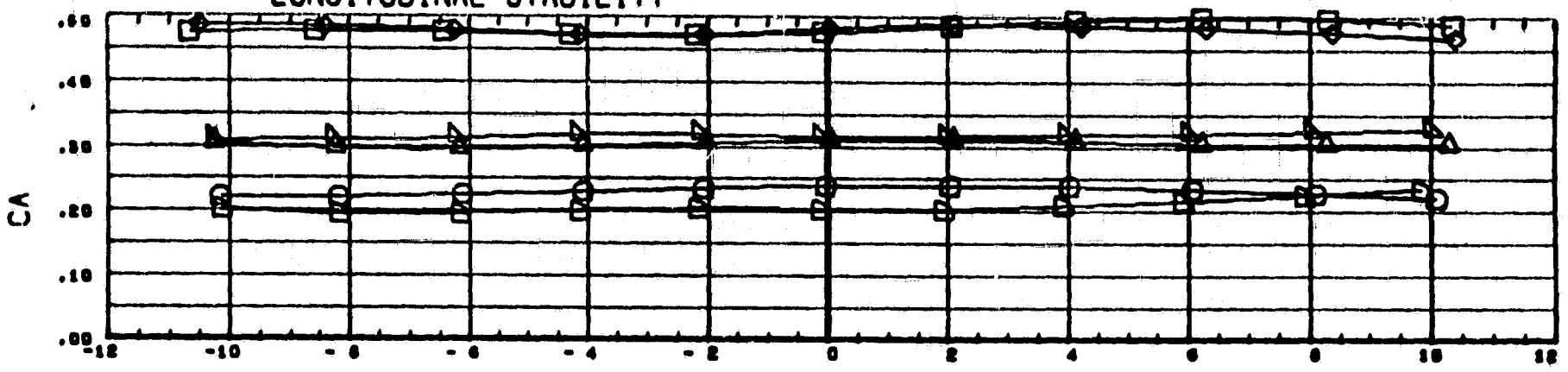


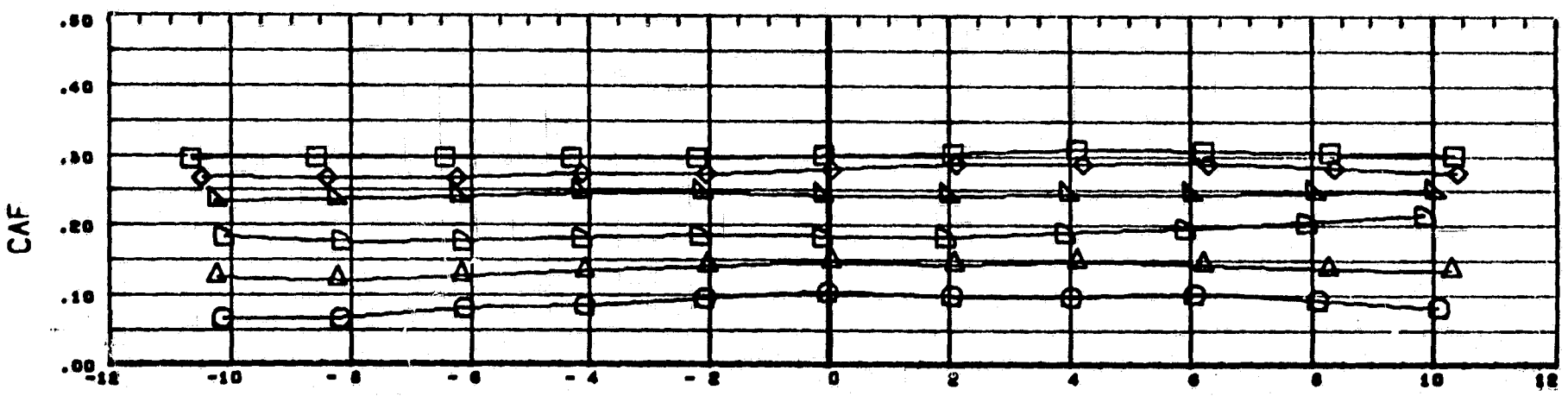


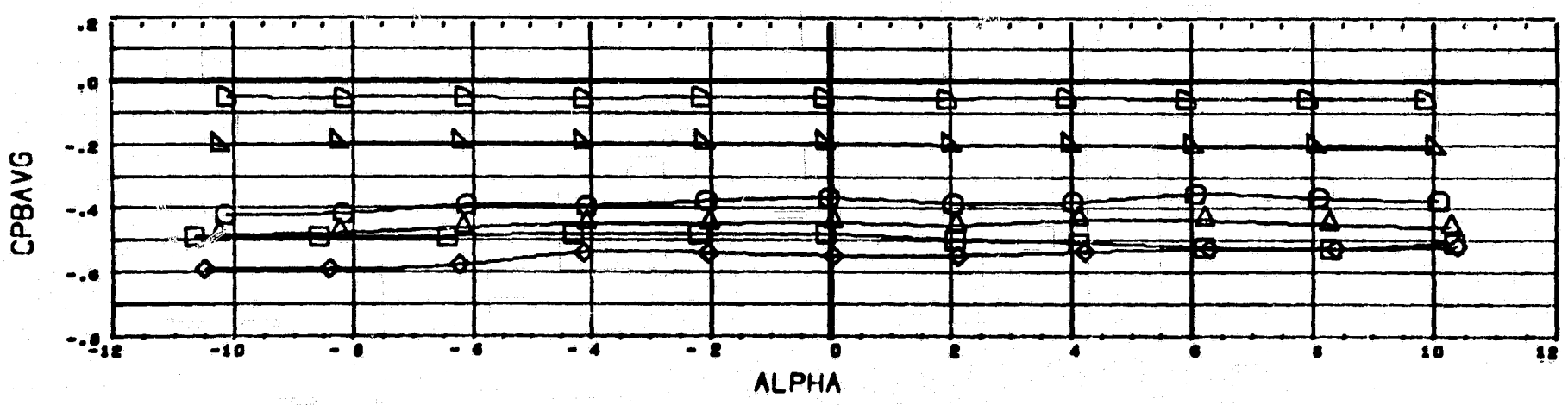
SYMBOL	MACH		PARAMETRIC VALUES		
○	0.599	BETA	0.000	ORBINC -	2.000
△	0.897				
◇	1.100				
□	1.459				
▽	2.740				
⬠	4.959	DATA HIST. CODE	CGR		

REFERENCE INFORMATION		
SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY





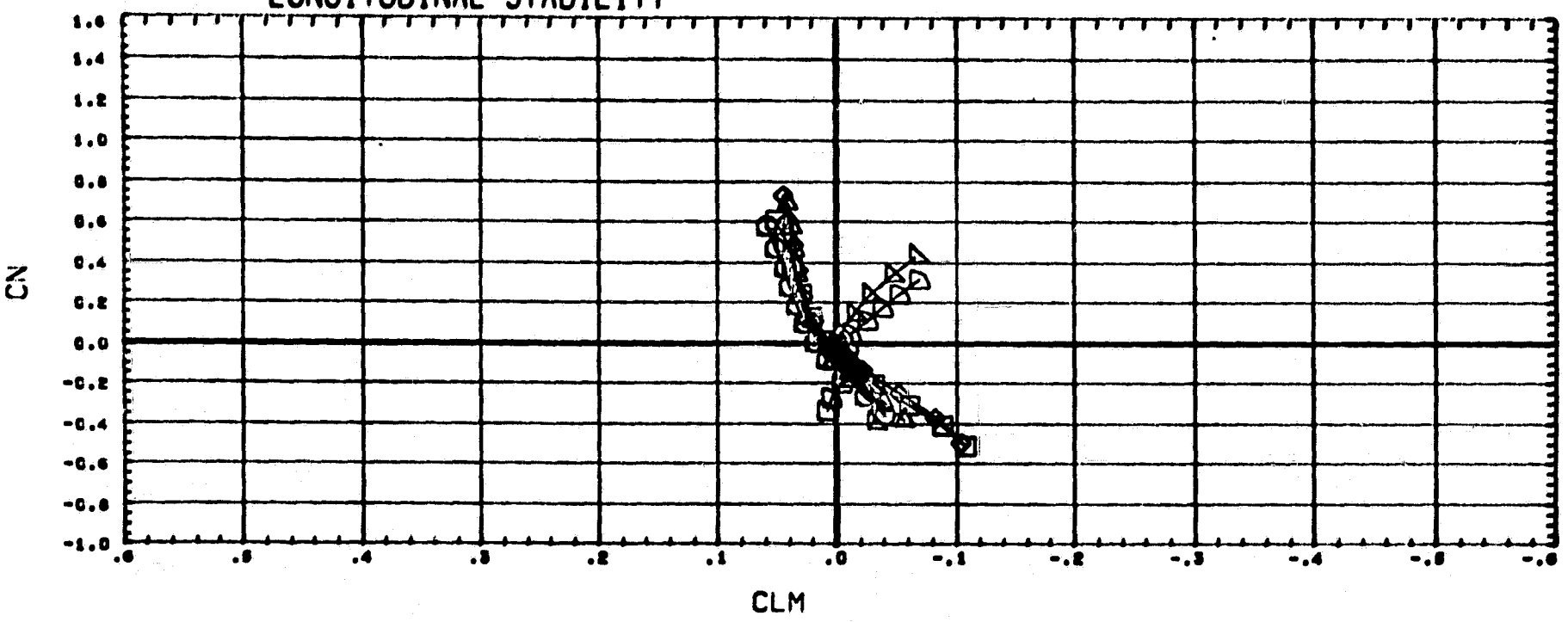


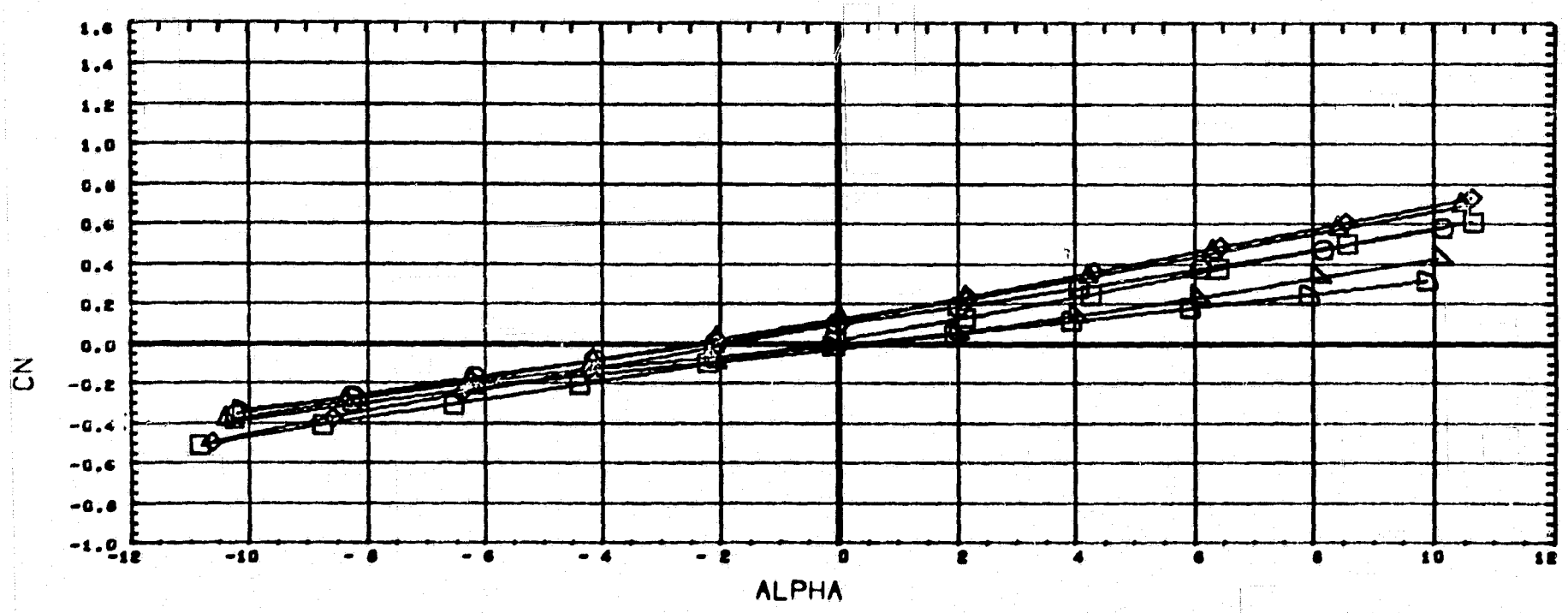
SYMBOL	MACH		PARAMETRIC VALUES		
○	0.599	BETA	0.000	ORBINC -	2.000
△	0.897				
◇	1.100				
□	1.459				
▽	2.740				
D	4.959	DATA HIST. CODE	CGR		

REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7850	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY

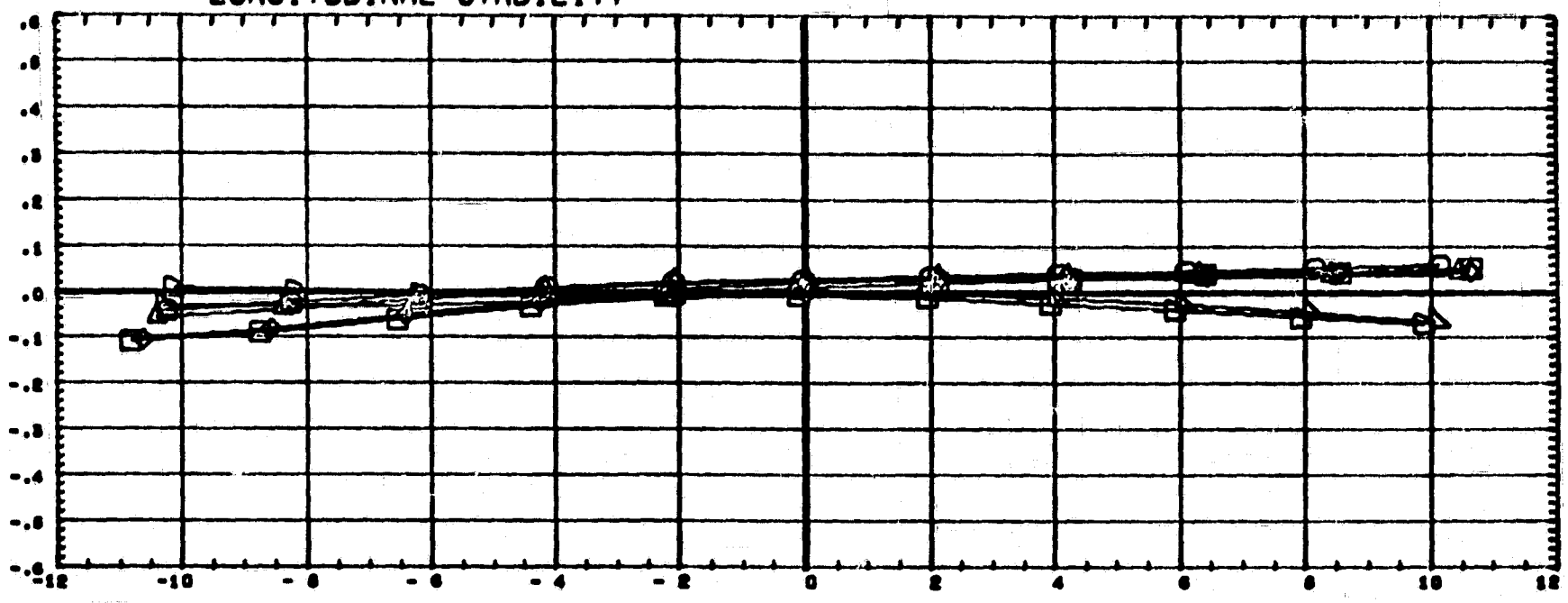


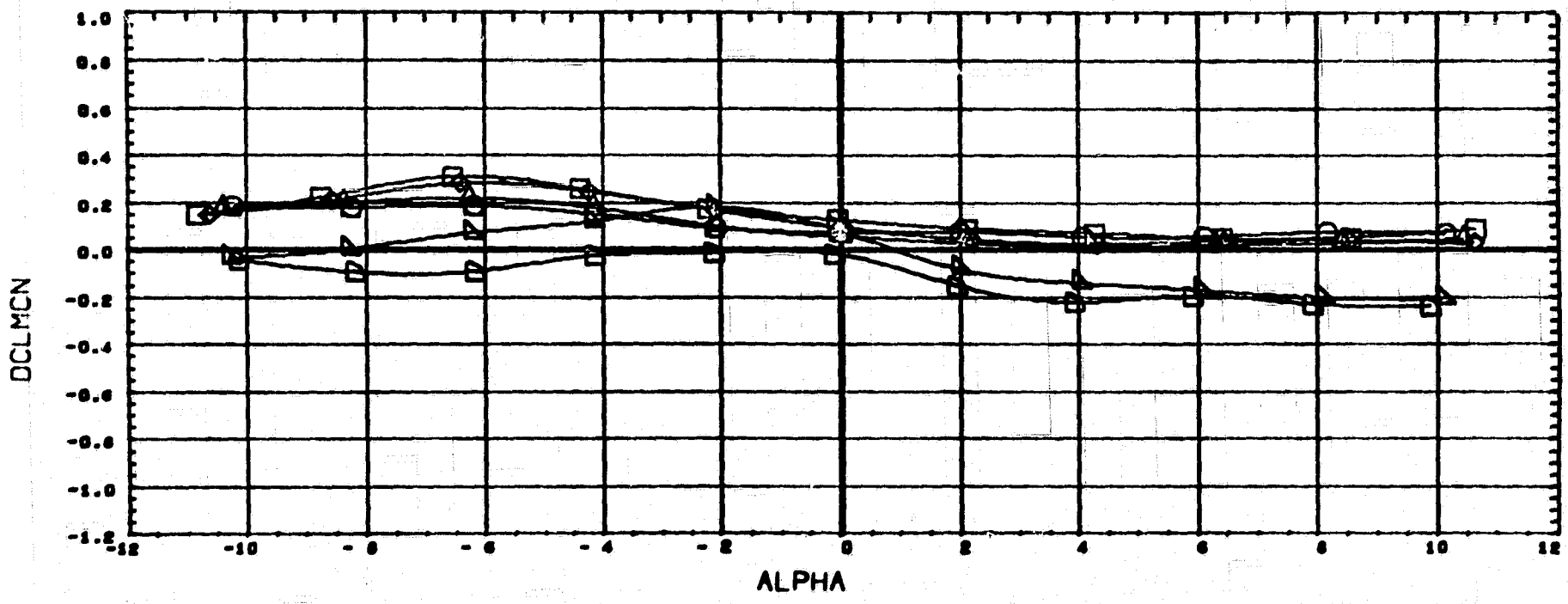


SYMBOL	MACH	PARAMETRIC VALUES			
○	0.599	BETA	0.000	ORBINC -	2.000
△	0.899				
◇	1.100				
▽	1.460				
□	2.740				
◁	4.959	DATA HIST. CODE	CGR		

REFERENCE INFORMATION		
SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY

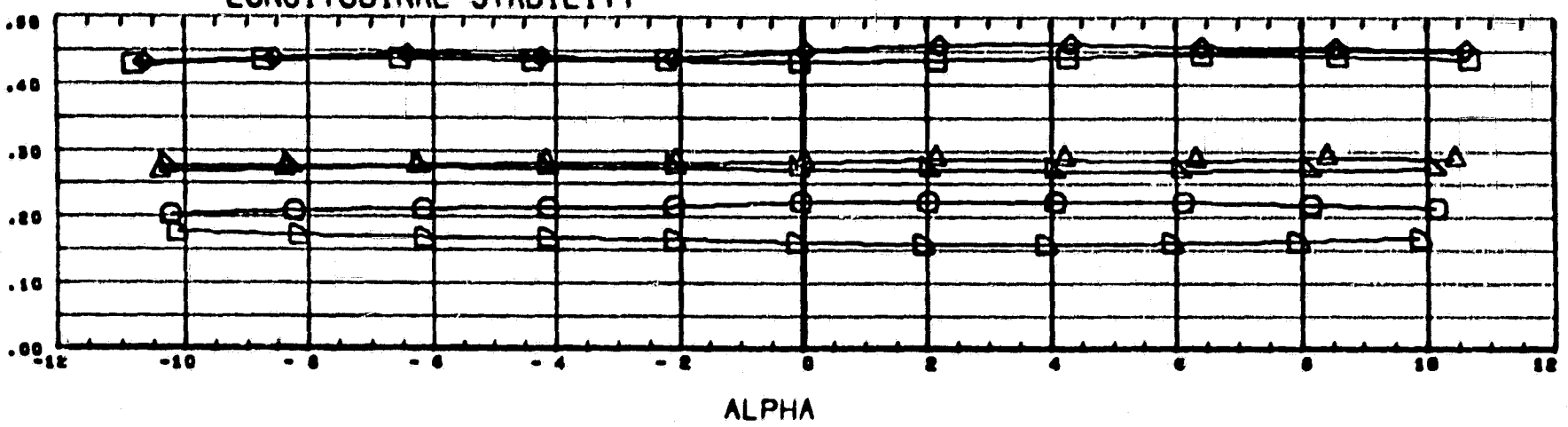




SYMBOL	MACH	PARAMETRIC VALUES			
○	0.599	BETA	0.000	ORBINC	- 2.000
△	0.899				
◇	1.100				
□	1.460				
◸	2.740				
▷	4.959	DATA HIST. CODE	CGR		

REFERENCE INFORMATION		
SREF	5.1470	SQ.IN.
LREF	4.4260	IN.
BREF	2.0690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0094	

LONGITUDINAL STABILITY



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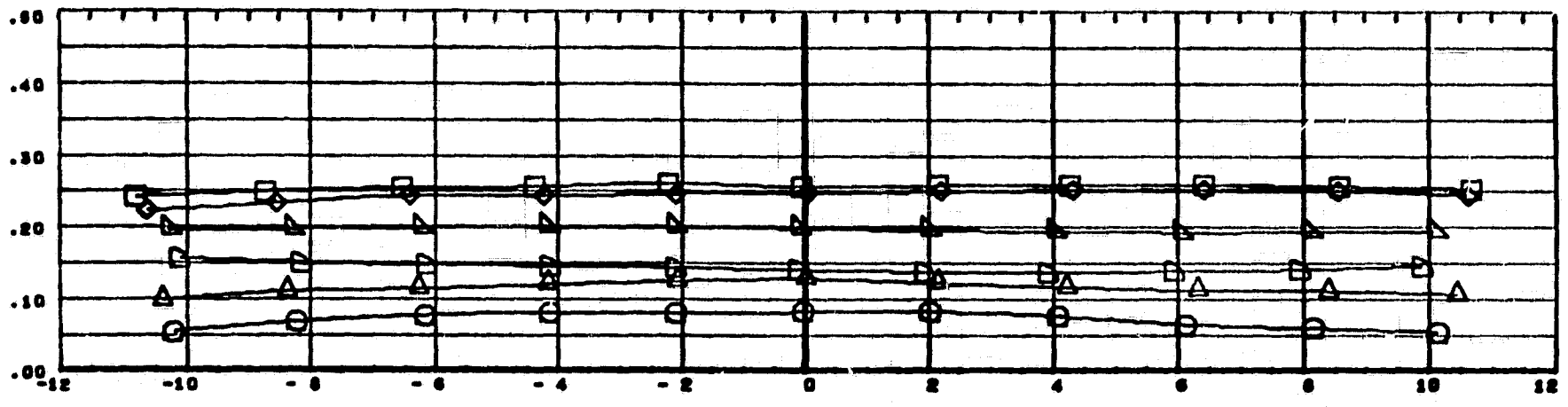
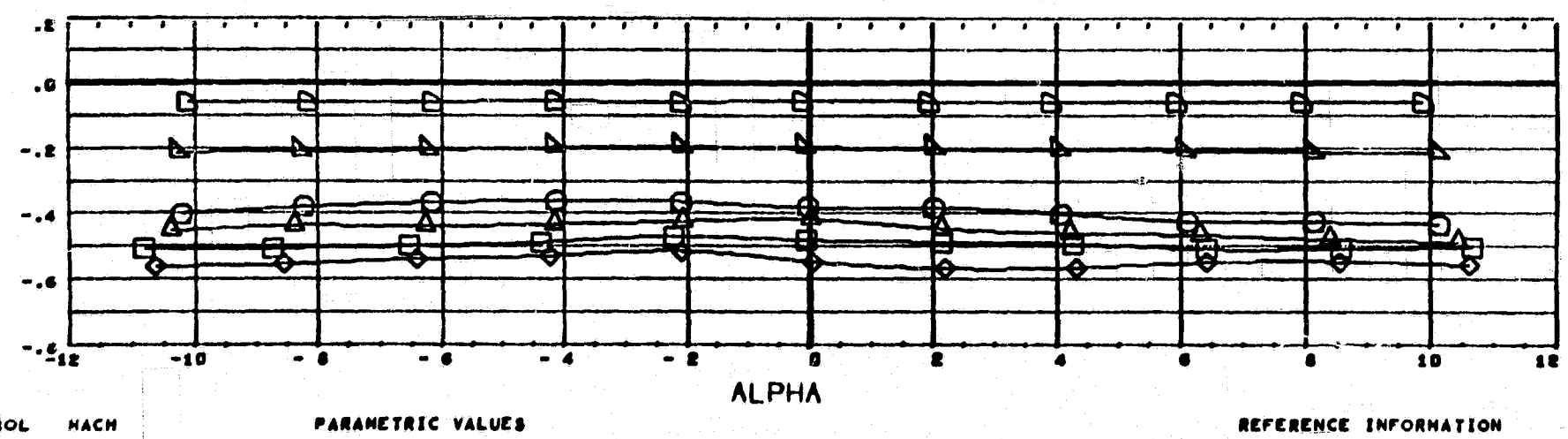


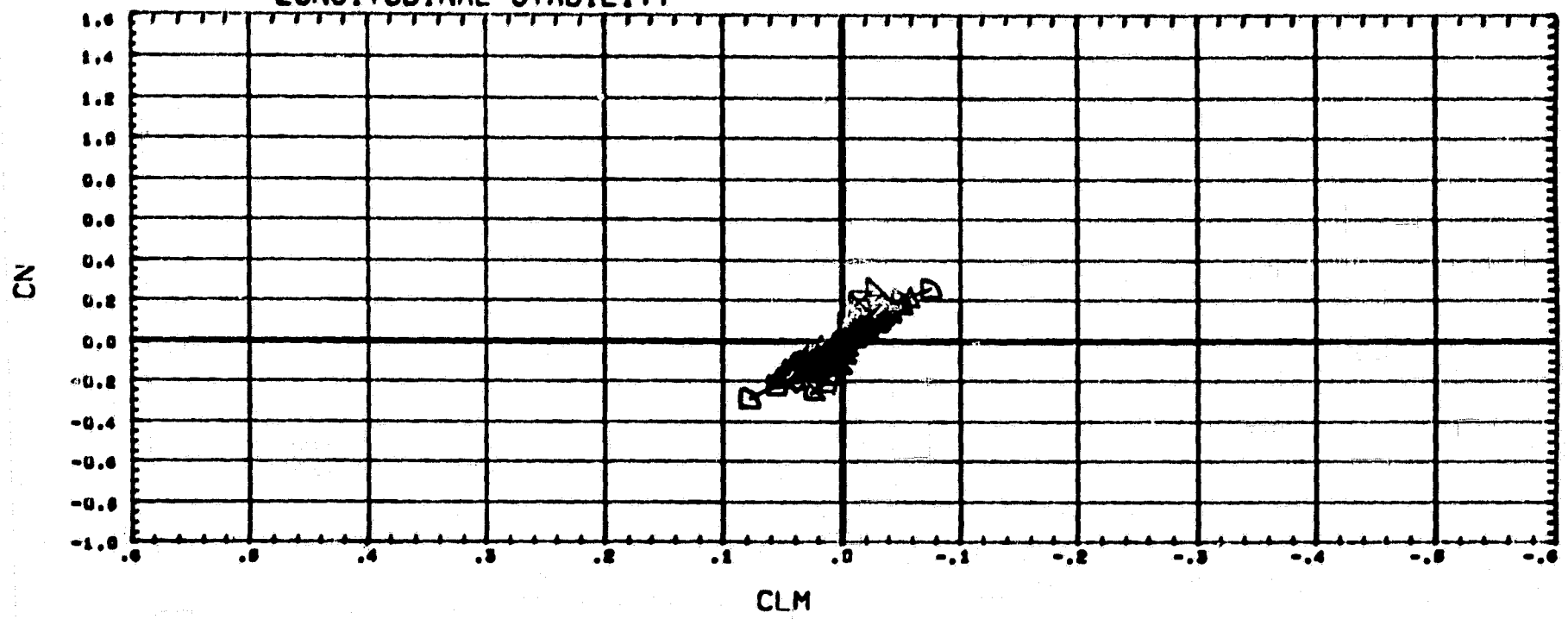
CPBAVG

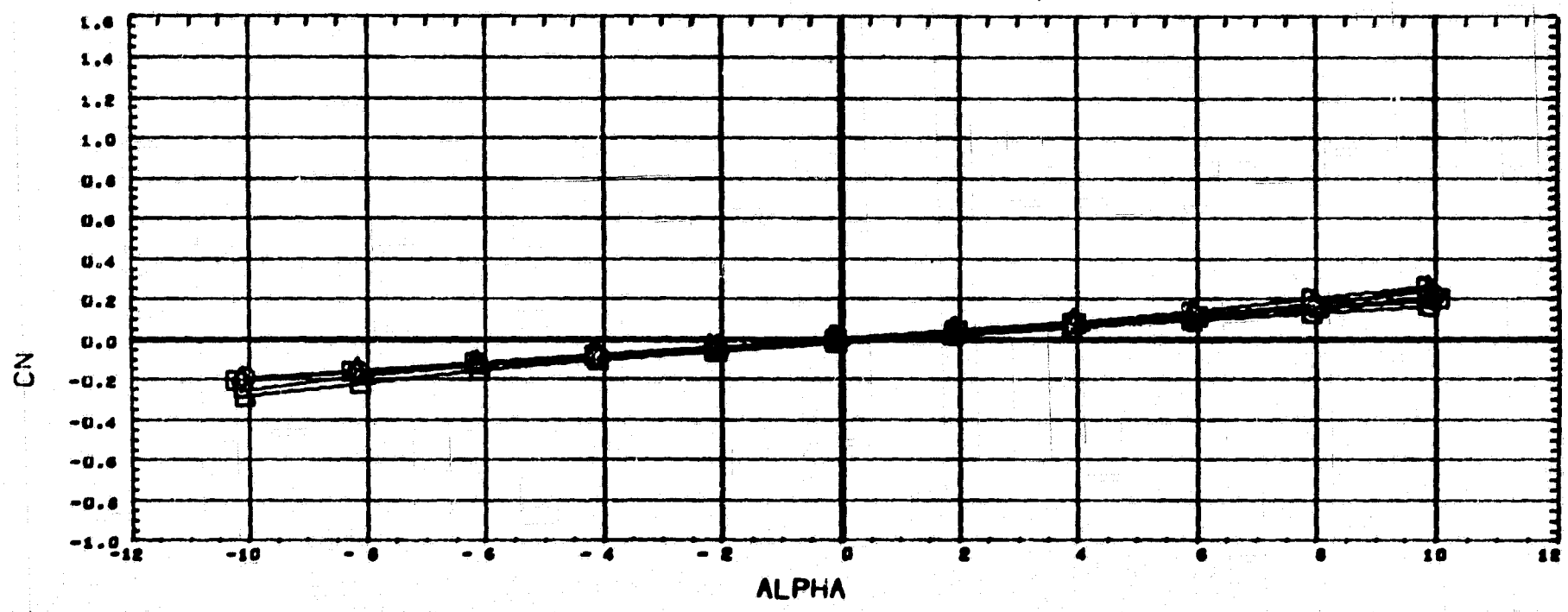


SYMBOL	MACH	PARAMETRIC VALUES			
	0.599	BETA	0.000	ORBINC -	2.000
	0.899				
	1.100				
	1.460				
	2.740				
	4.959	DATA HIST. CODE	CGR		

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7830	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY





SYMBOL	MACH		PARAMETRIC VALUES
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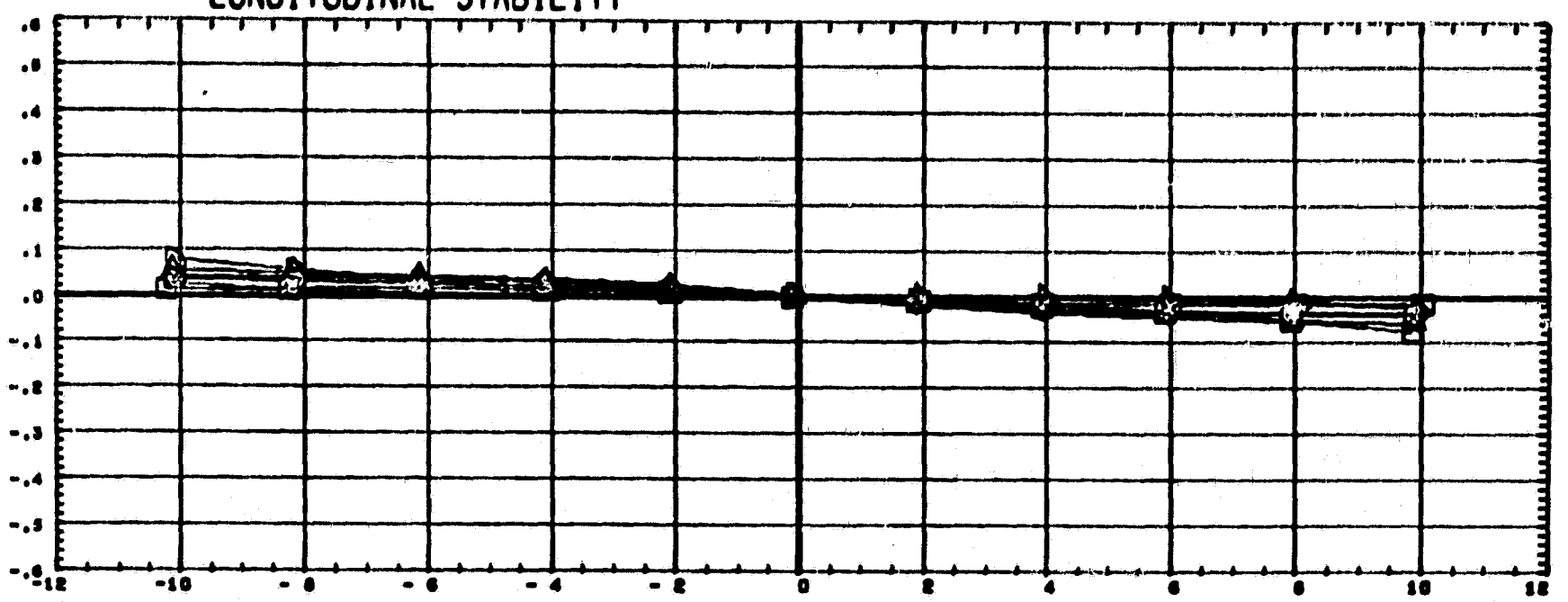
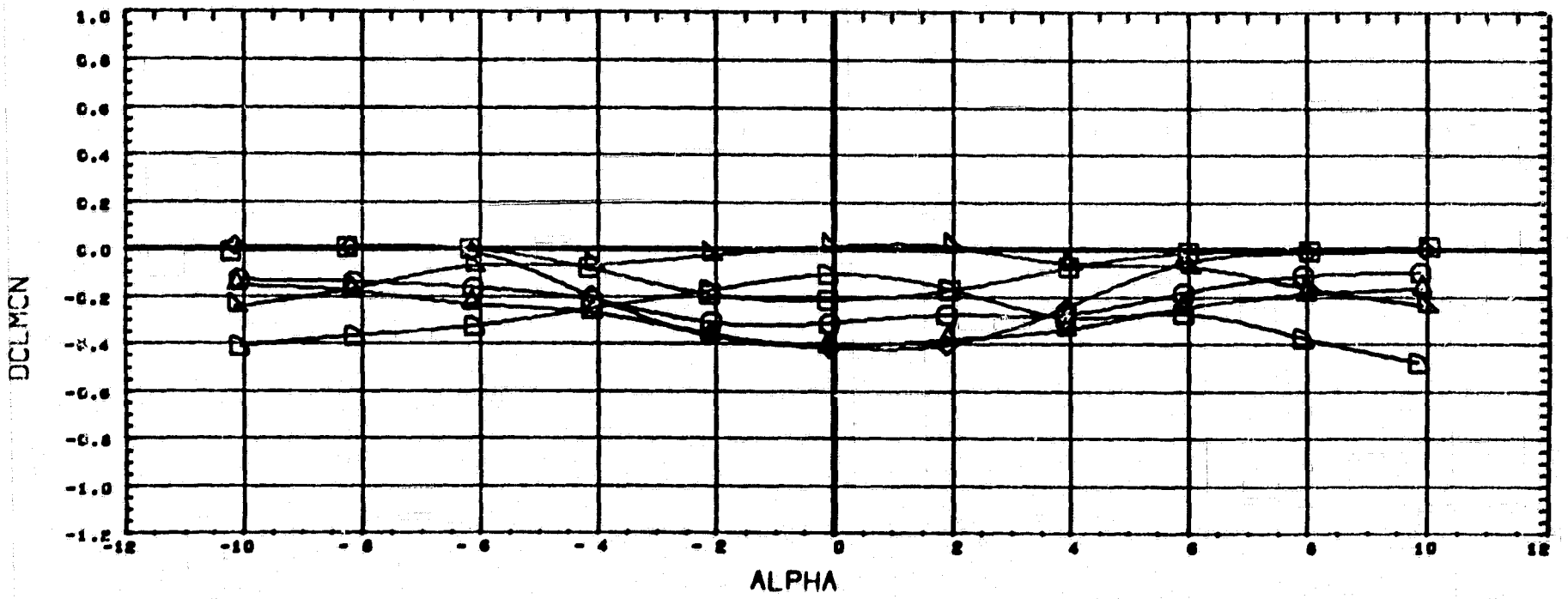
△	0.901		
◇	1.104		
□	1.459		
◸	2.740		
D	4.859	DATA HIST. CODE	CGR

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9600	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0053	

LONGITUDINAL STABILITY



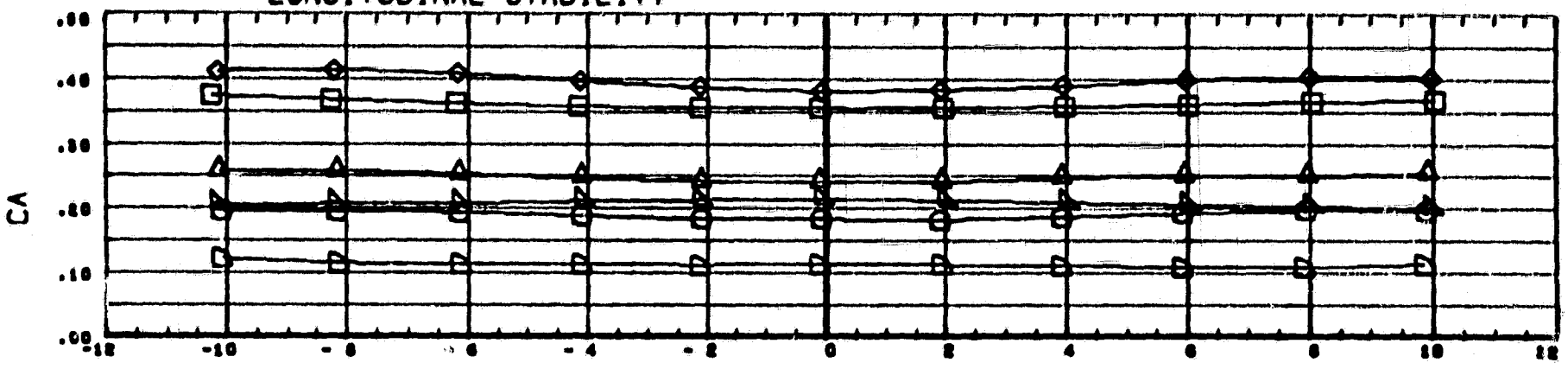


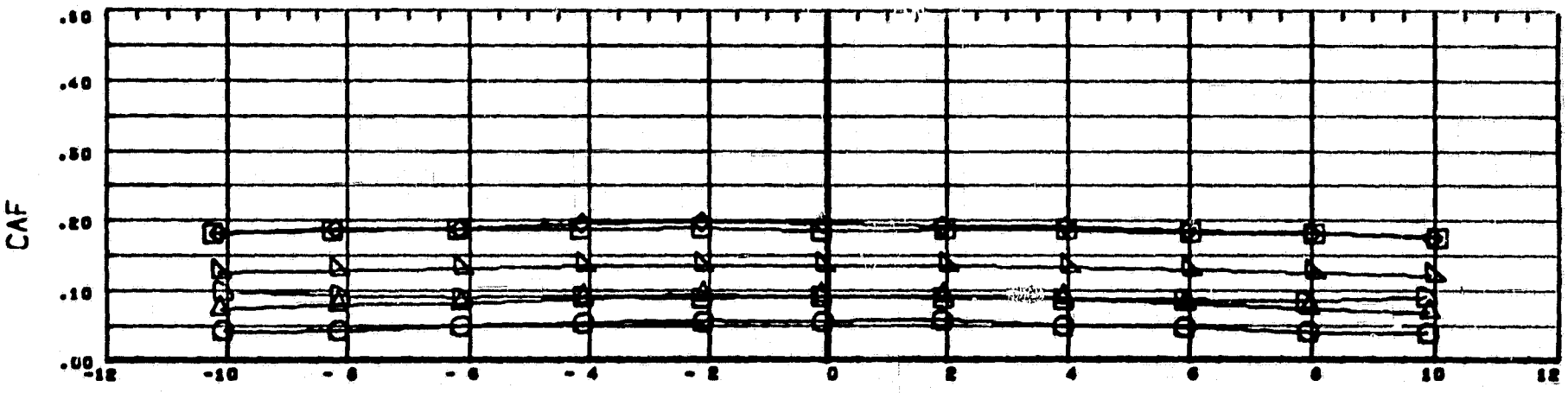
SYMBOL	MACH		PARAMETRIC VALUES
○	0.599	BETA	0.000
△	0.901		
◇	1.104		
□	1.459		
◸	2.740		
▷	4.959	DATA HIST. CODE	CGR

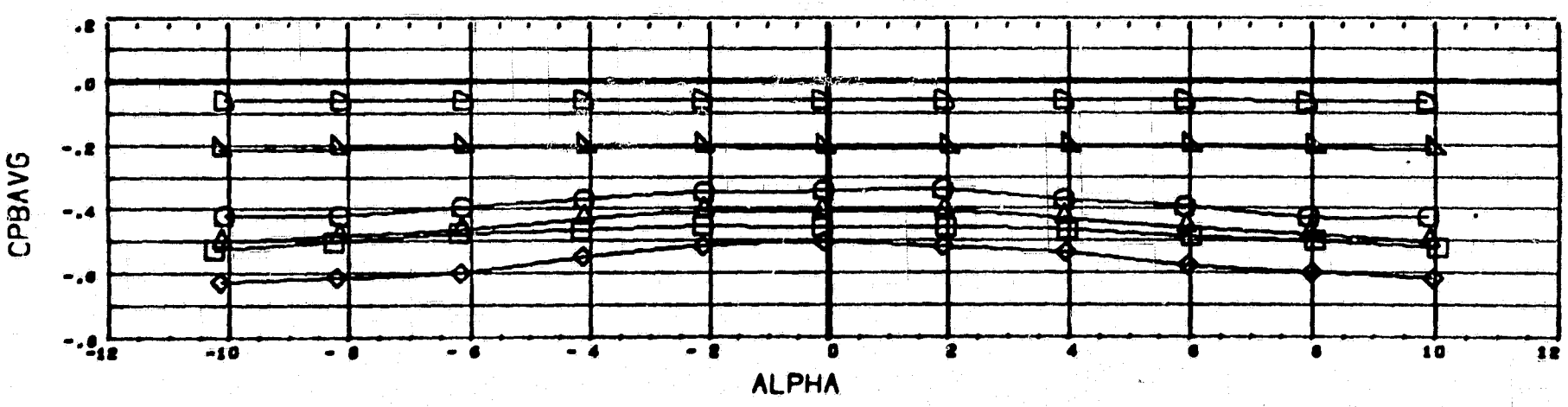
REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0033	

LONGITUDINAL STABILITY



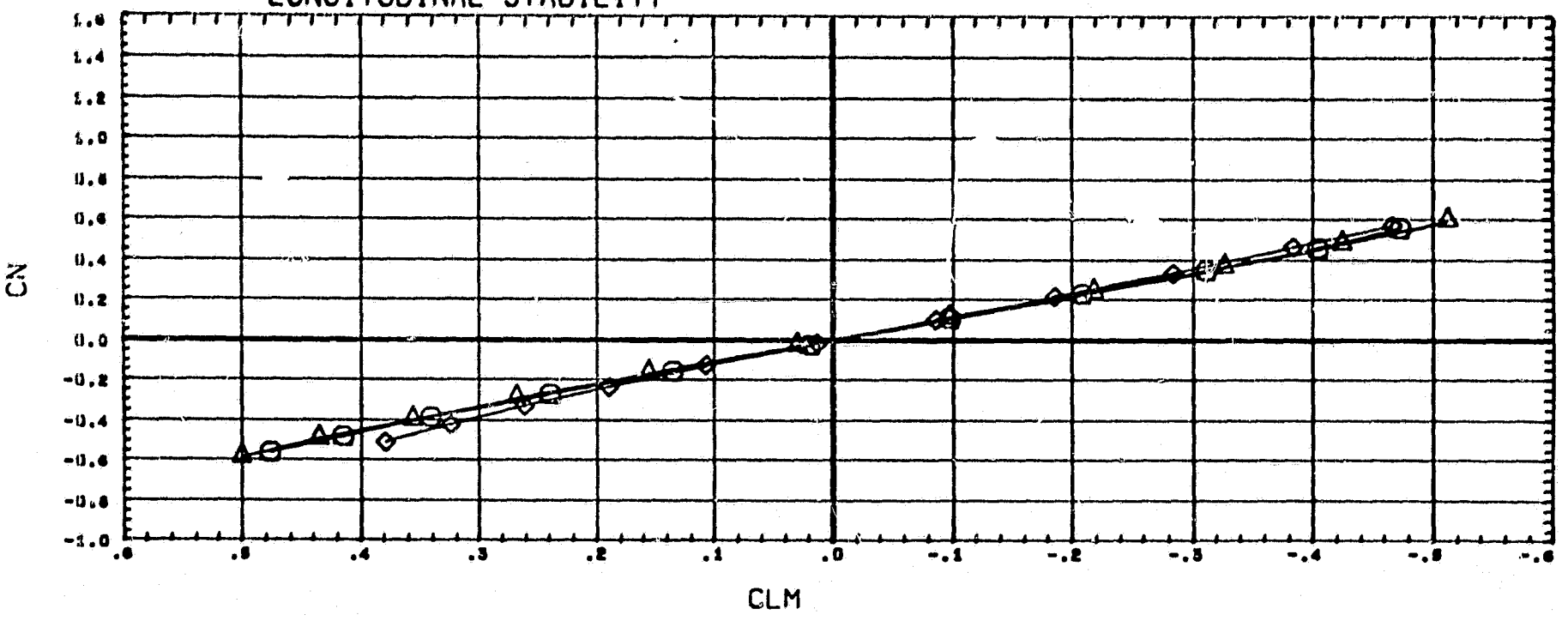


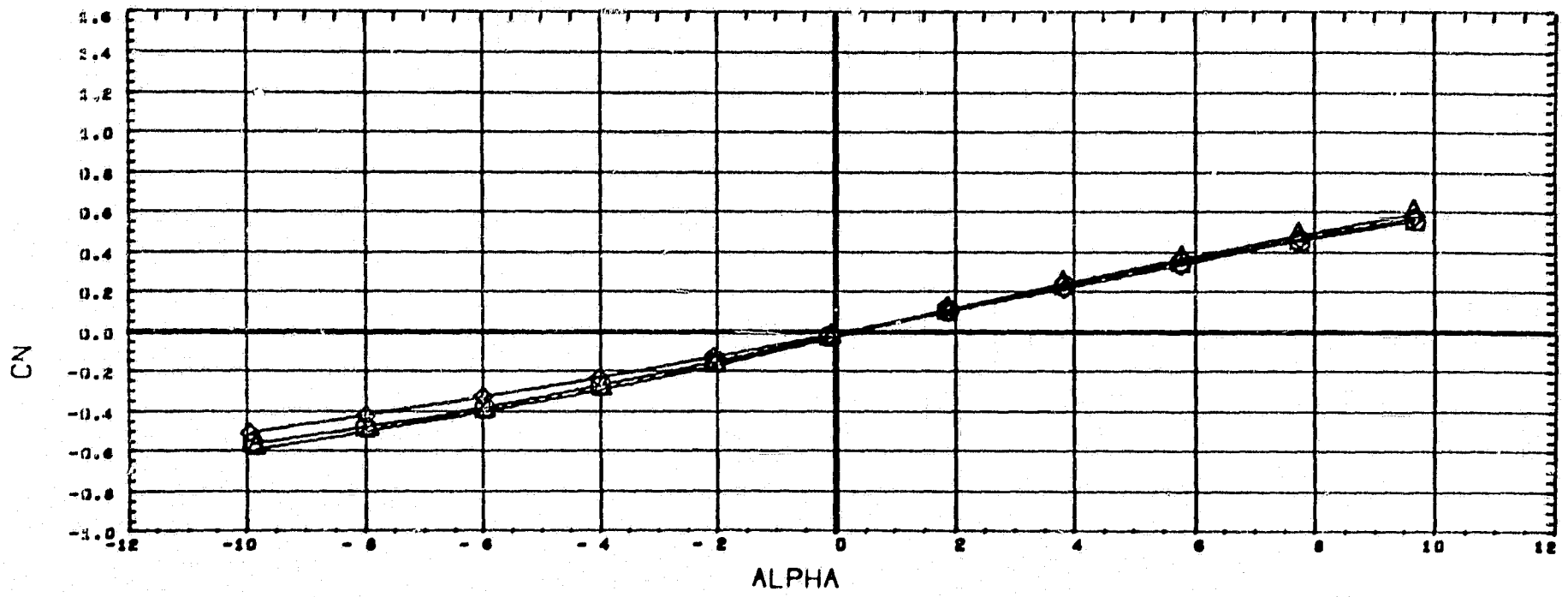


SYMBOL	MACH		PARAMETRIC VALUES
◇	0.599	BETA	0.000
▽	0.901		
◇	1.104		
□	1.459		
◇	2.740		
D	4.959	DATA HIST. CODE	CGR

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0033	

LONGITUDINAL STABILITY





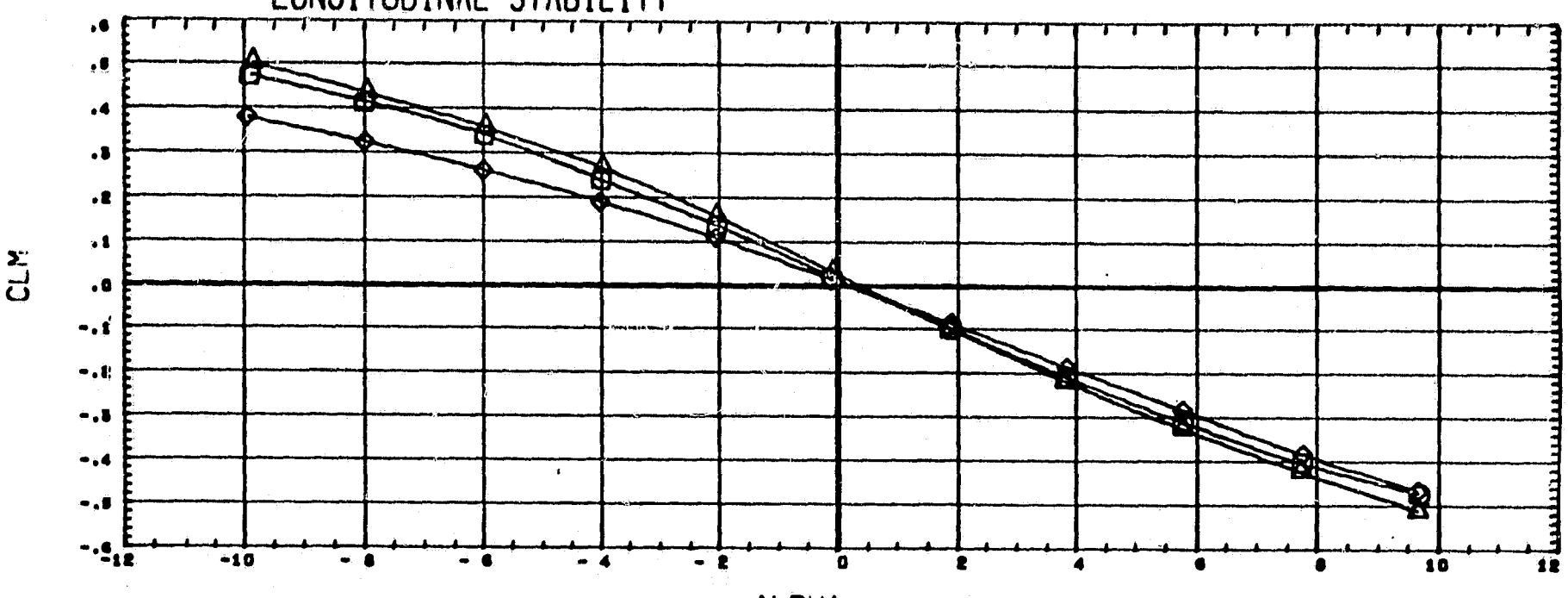
SYMBOL	MACH		PARAMETRIC VALUES
○	0.698	BETA	0.000
△	1.106		
◇	1.458		

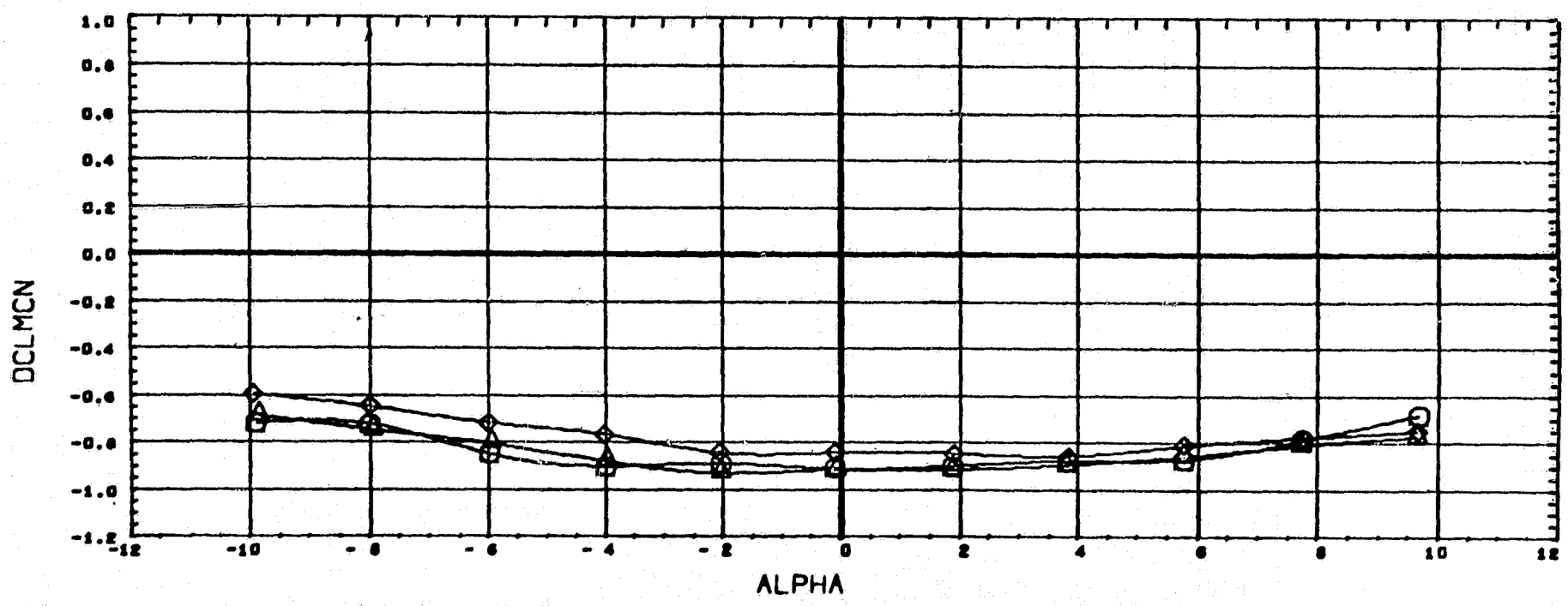
REFERENCE INFORMATION

SREF	5.1478	88.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7850	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE CGR

LONGITUDINAL STABILITY





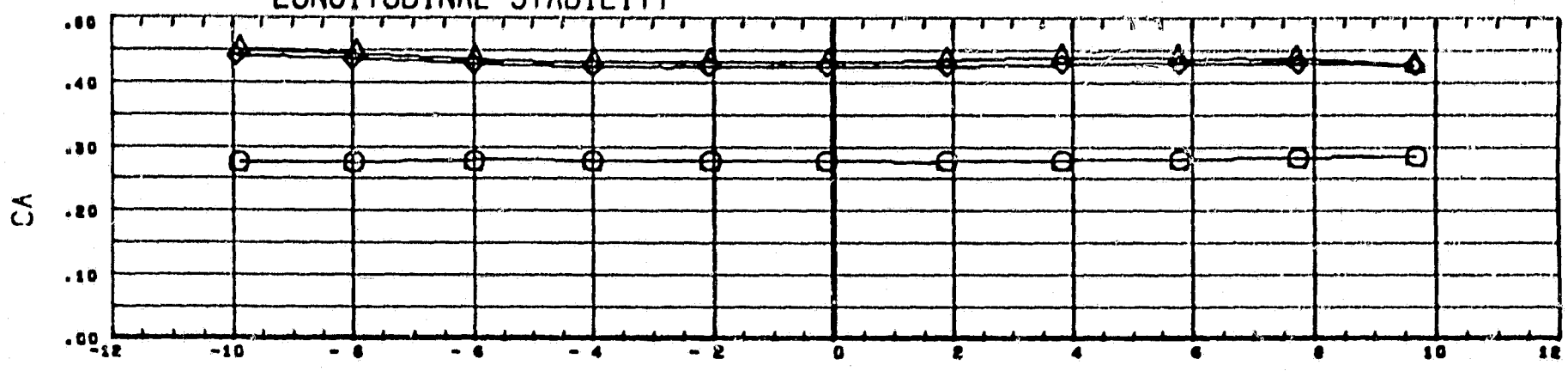
SYMBOL	MACH		PARAMETRIC VALUES
○	0.898	BETA	0.000
△	1.108		
◇	1.458		

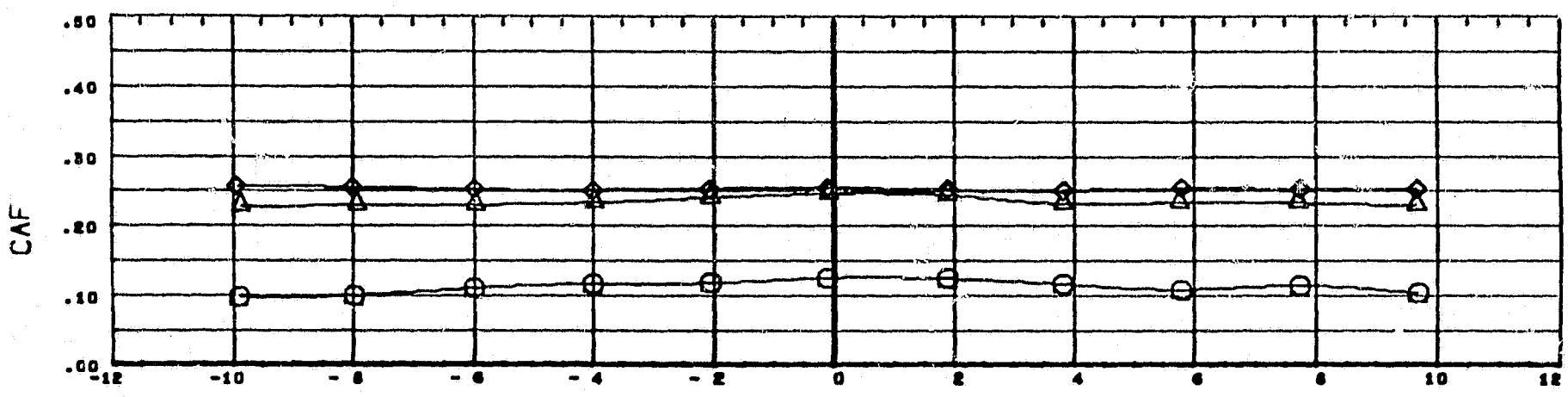
REFERENCE INFORMATION

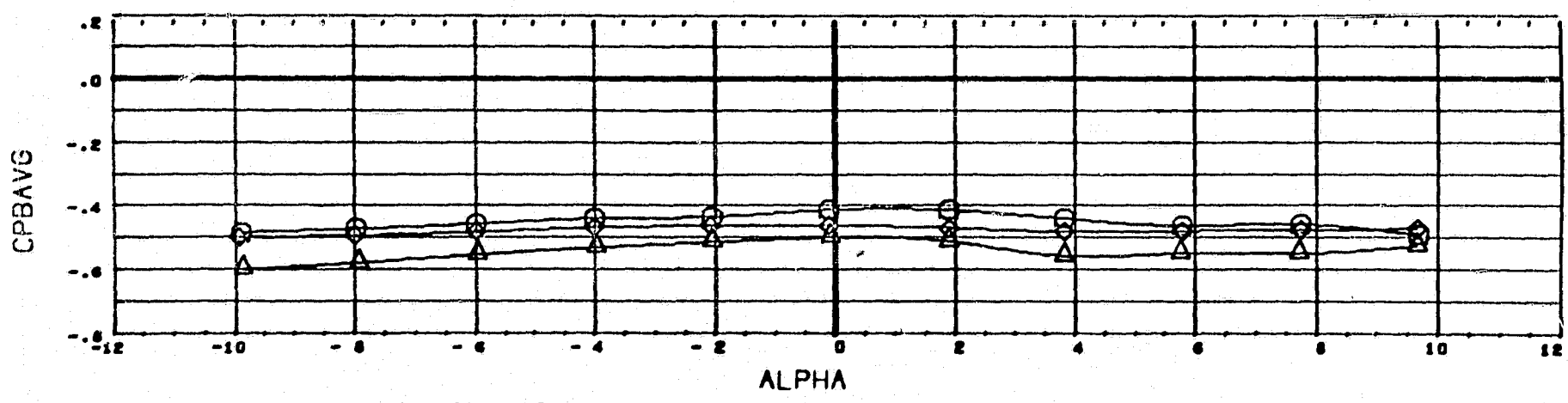
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	8.7510	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE CGR

LONGITUDINAL STABILITY







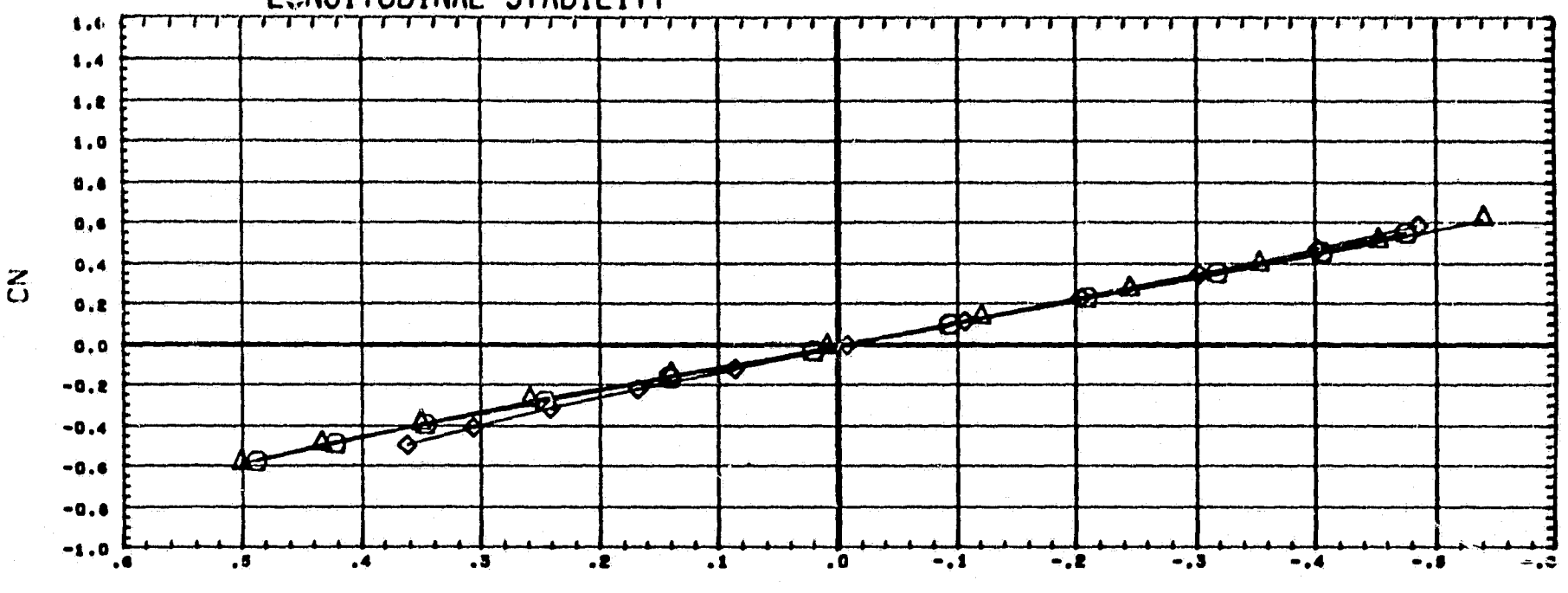
SYMBOL	MACH	PARAMETRIC VALUES	
○	0.898	BETA	0.000
△	1.106		
◇	1.458		

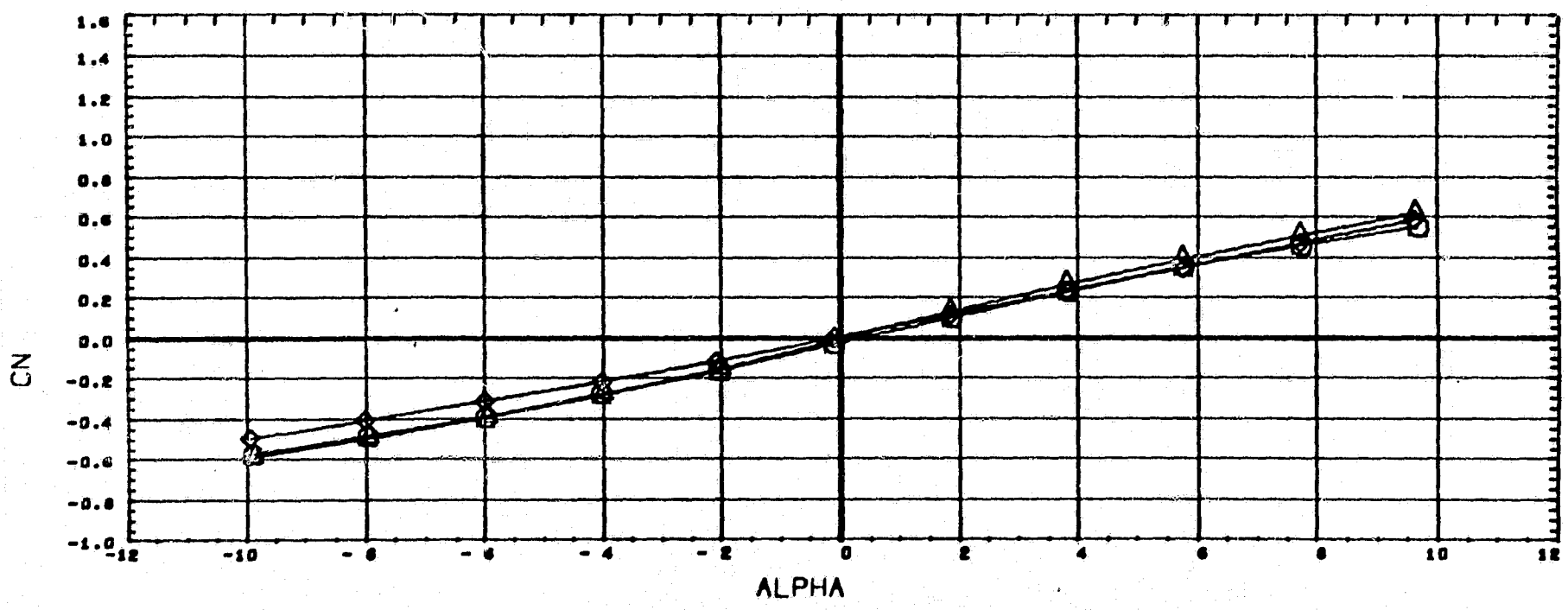
REFERENCE INFORMATION

SREF	3.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7550	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE CGR

LONGITUDINAL STABILITY





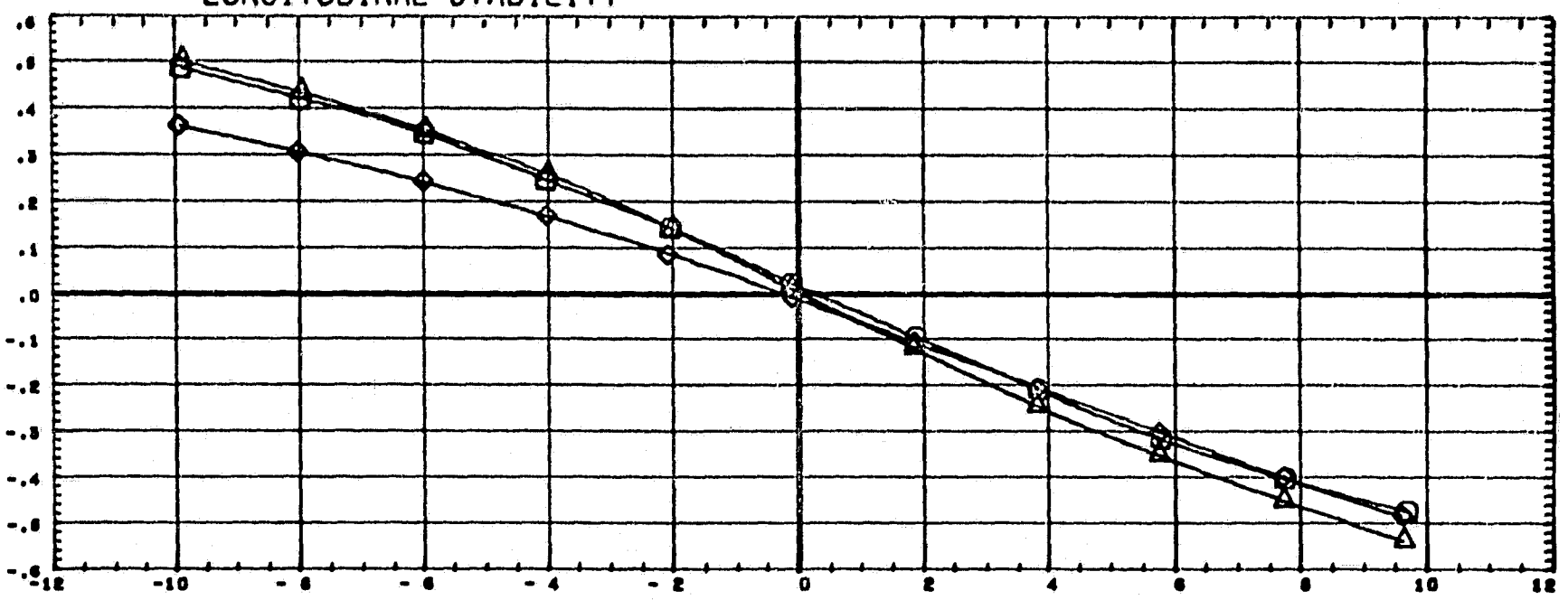
SYMBOL	MACH		PARAMETRIC VALUES
○	0.897	BETA	0.000
△	1.104		
◇	1.460		

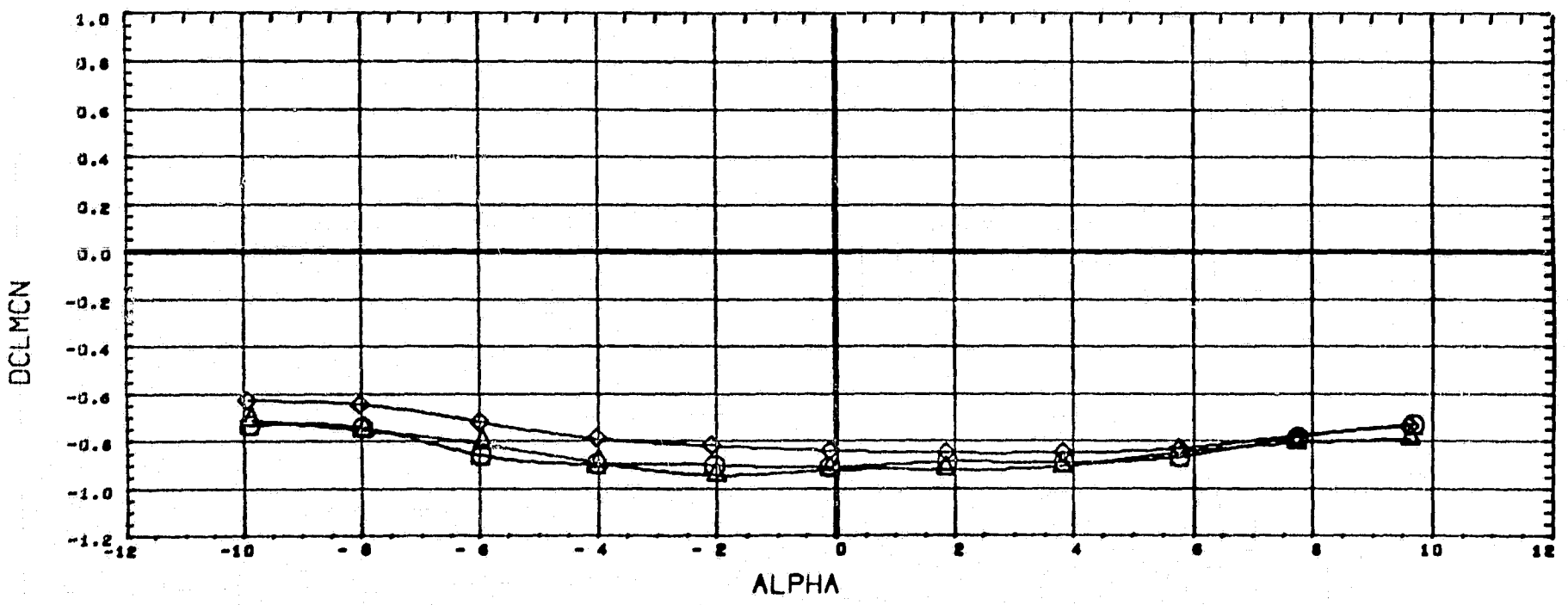
REFERENCE INFORMATION

SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	8.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA MEST. CODE CGR

LONGITUDINAL STABILITY





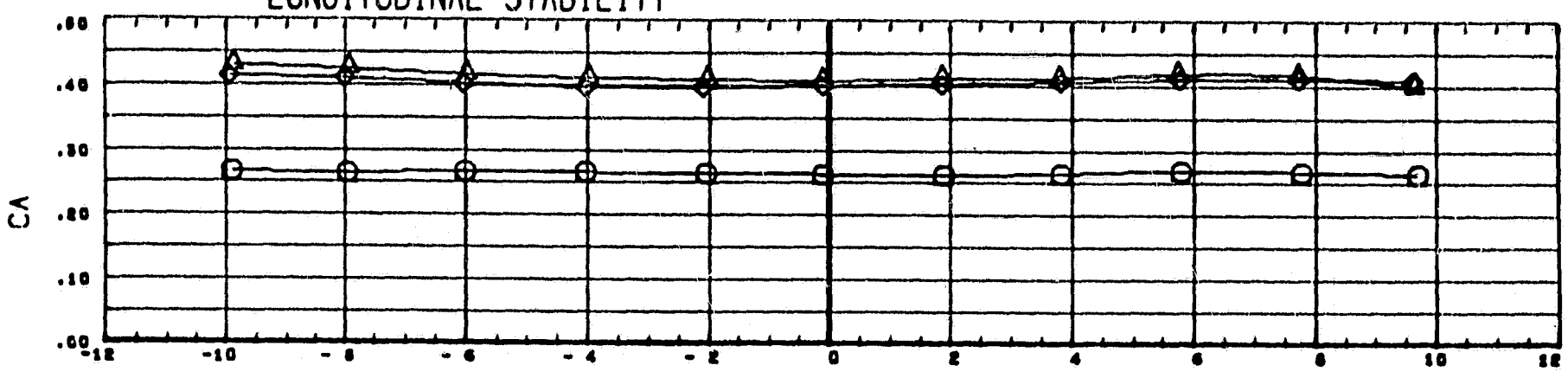
SYMBOL	MACH		PARAMETRIC VALUES
○	0.897	BETA	0.000
△	1.104		
◇	1.460		

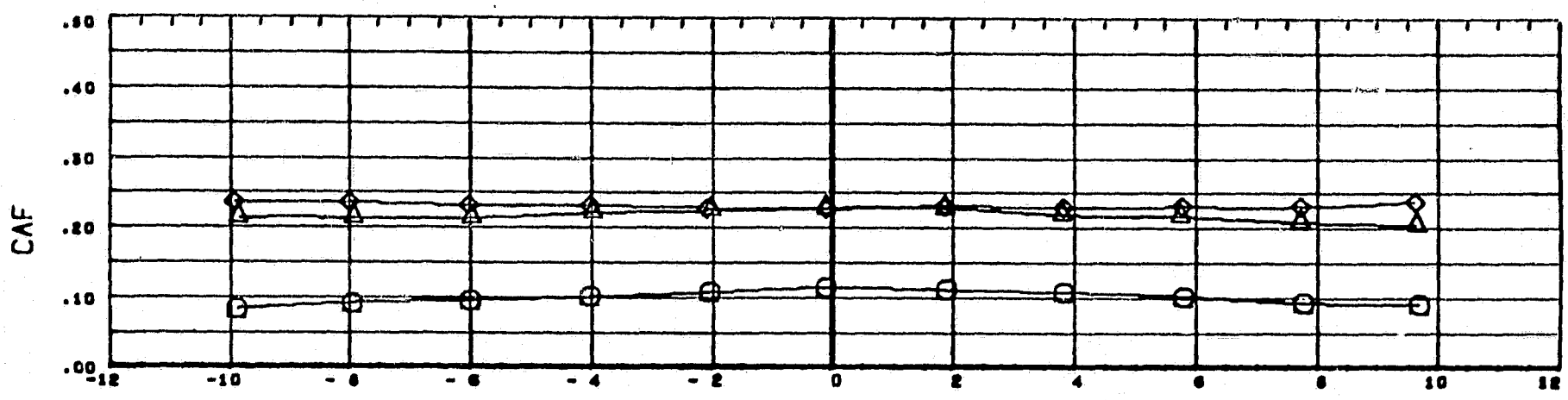
REFERENCE INFORMATION

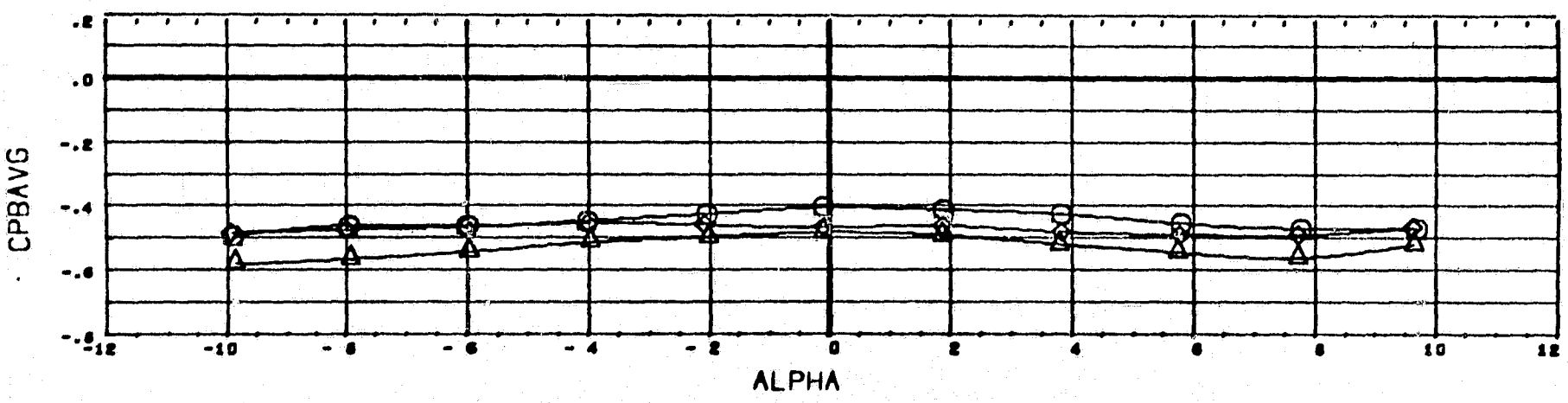
SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE CGR

LONGITUDINAL STABILITY







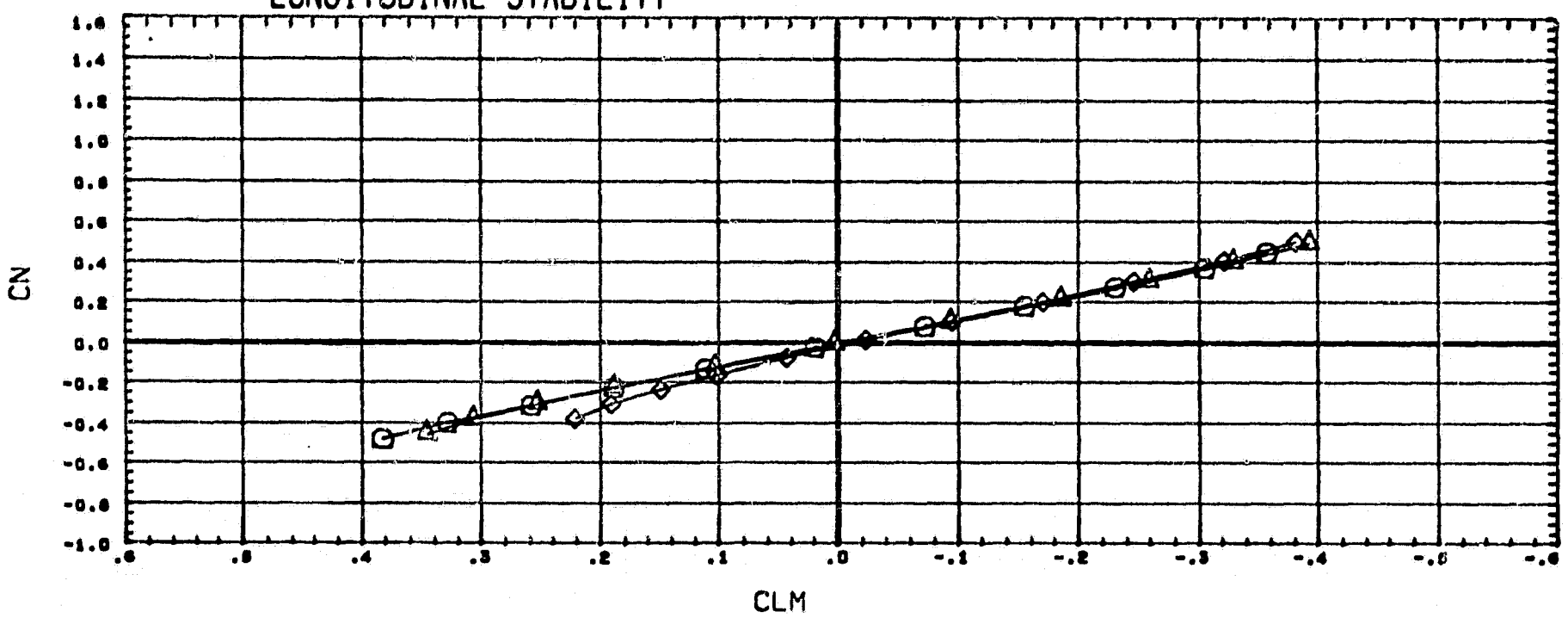
SYMBOL	MACH		PARAMETRIC VALUES
○	0.897	BETA	0.000
△	1.104		
◇	1.460		

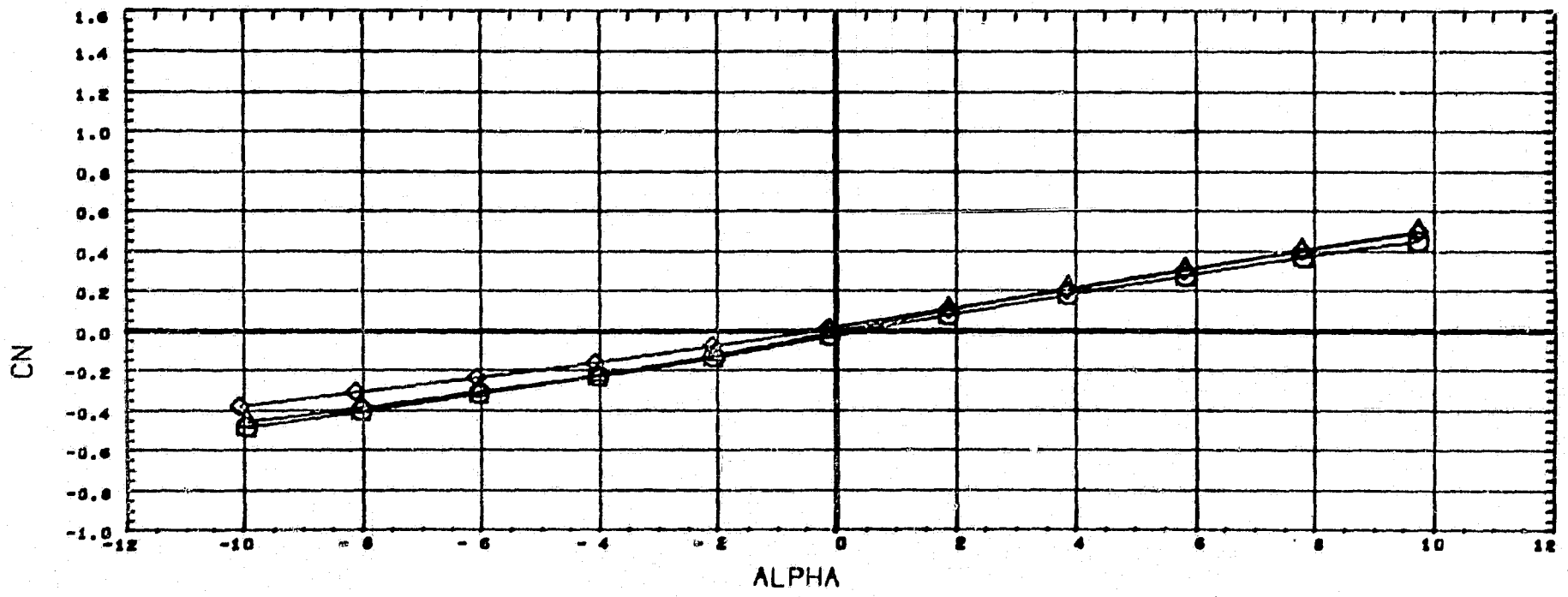
DATA HIST. CODE CGR

REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY





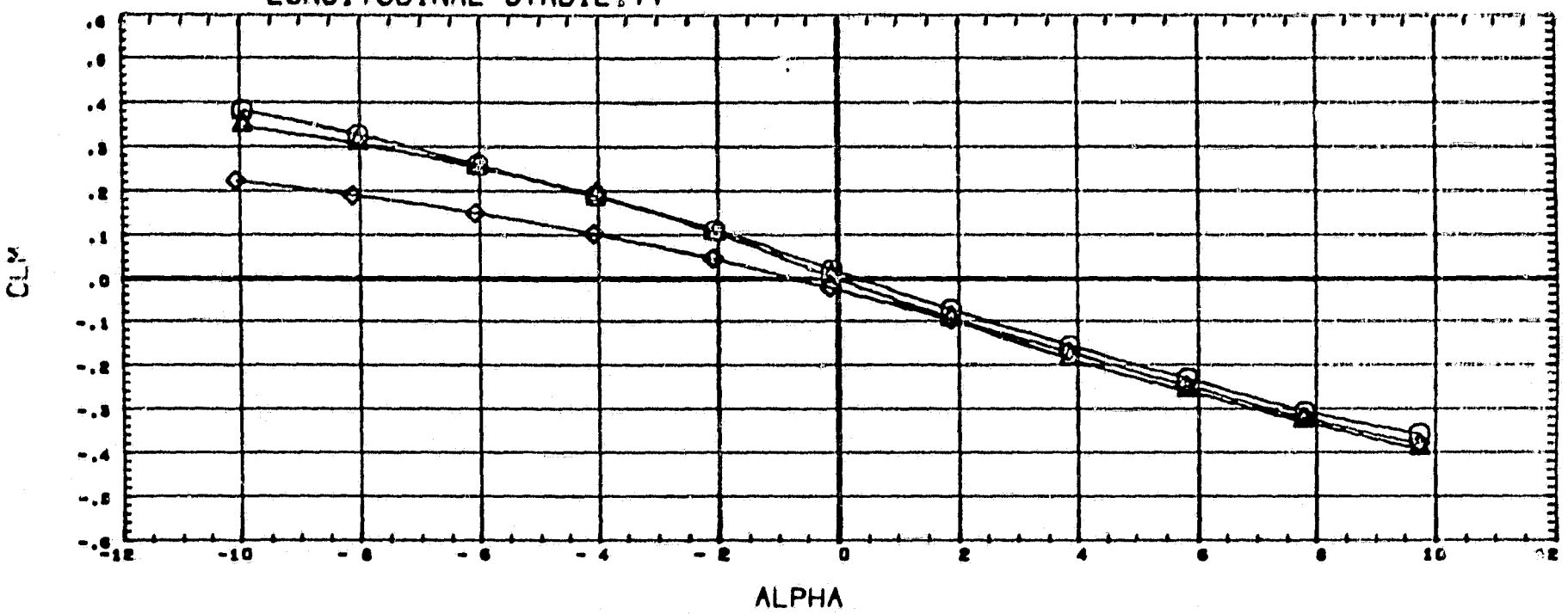
SYMBOL	MACH		PARAMETRIC VALUES
○	0.600	BETA	0.000
△	1.100		
◇	1.456		

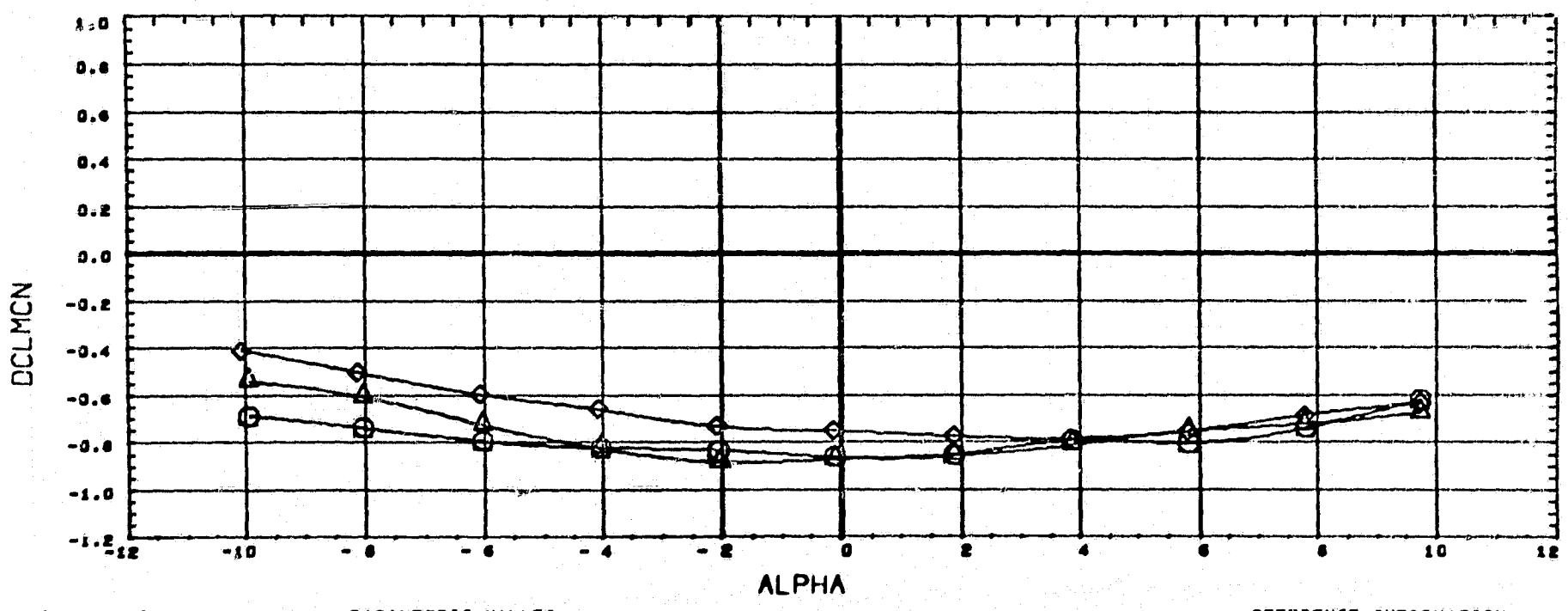
DATA HIST. CODE CGR

REFERENCE INFORMATION

SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY





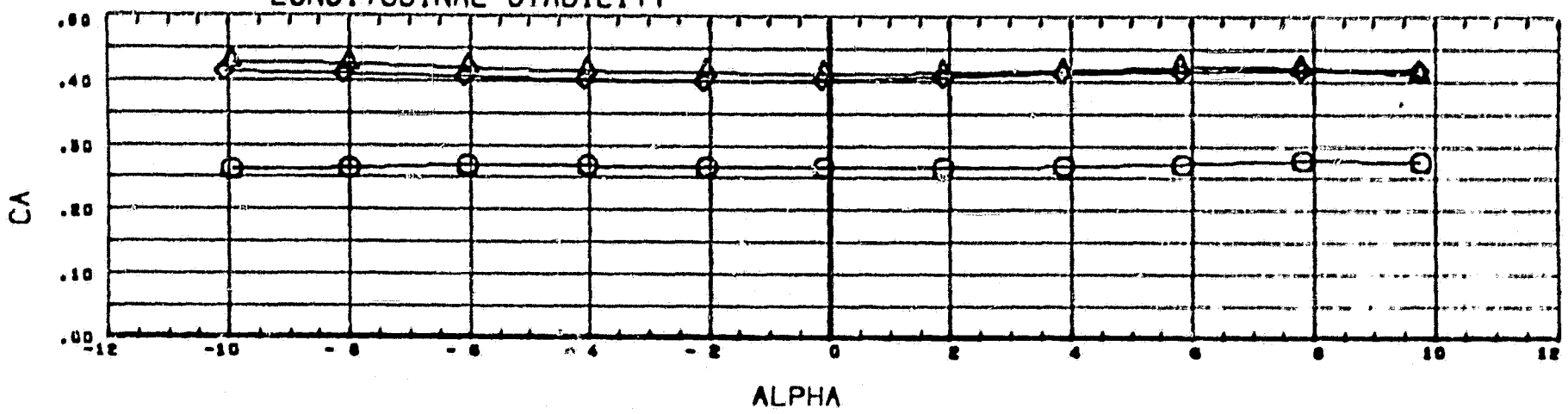
SYMBOL	MACH		PARAMETRIC VALUES
○	0.899	BETA	0.000
△	1.100		
◇	1.458		

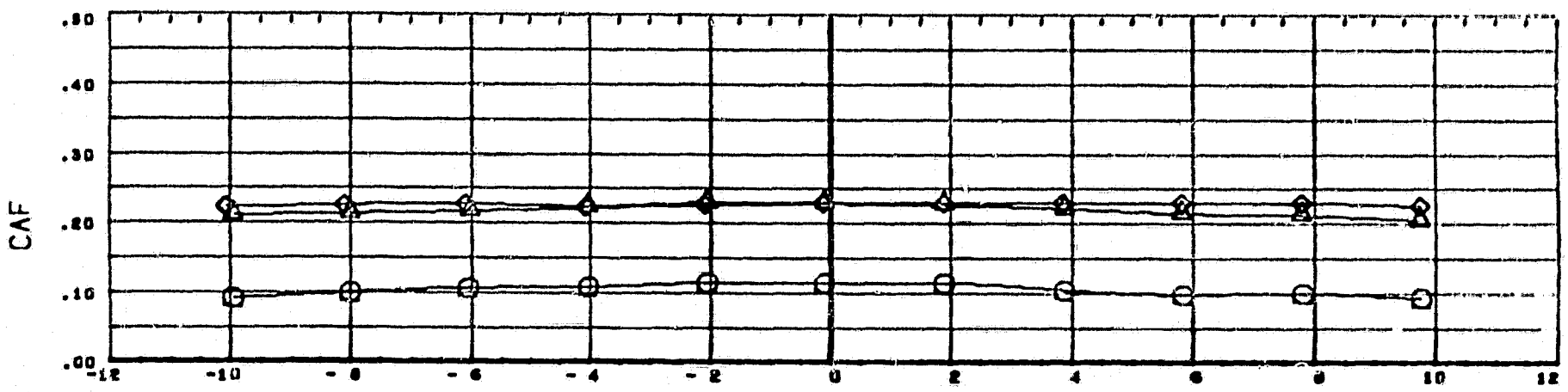
DATA HIST. CODE CGR

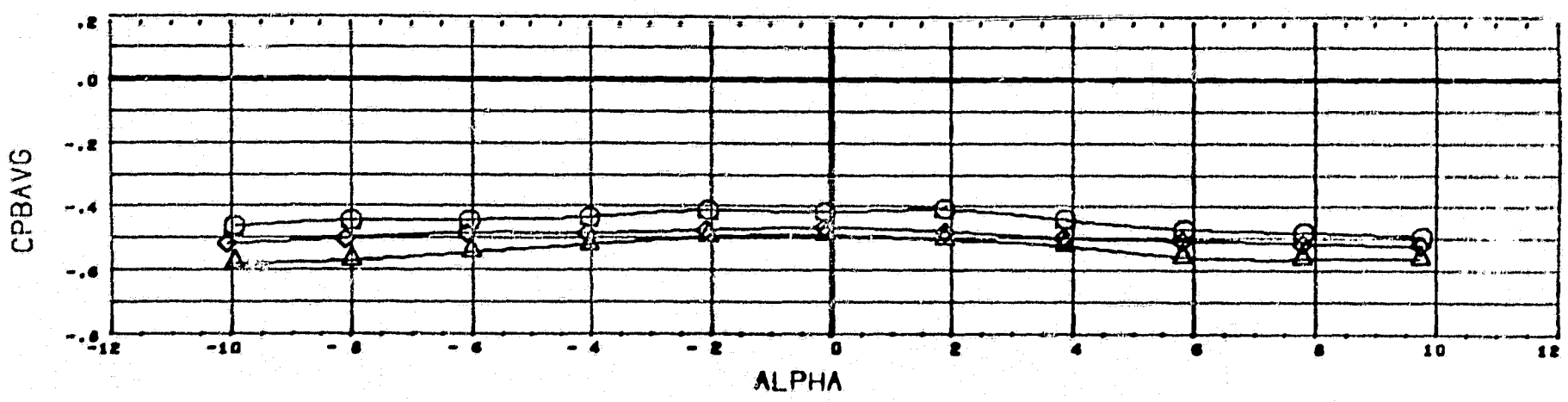
REFERENCE INFORMATION

SREF	5.1474	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY







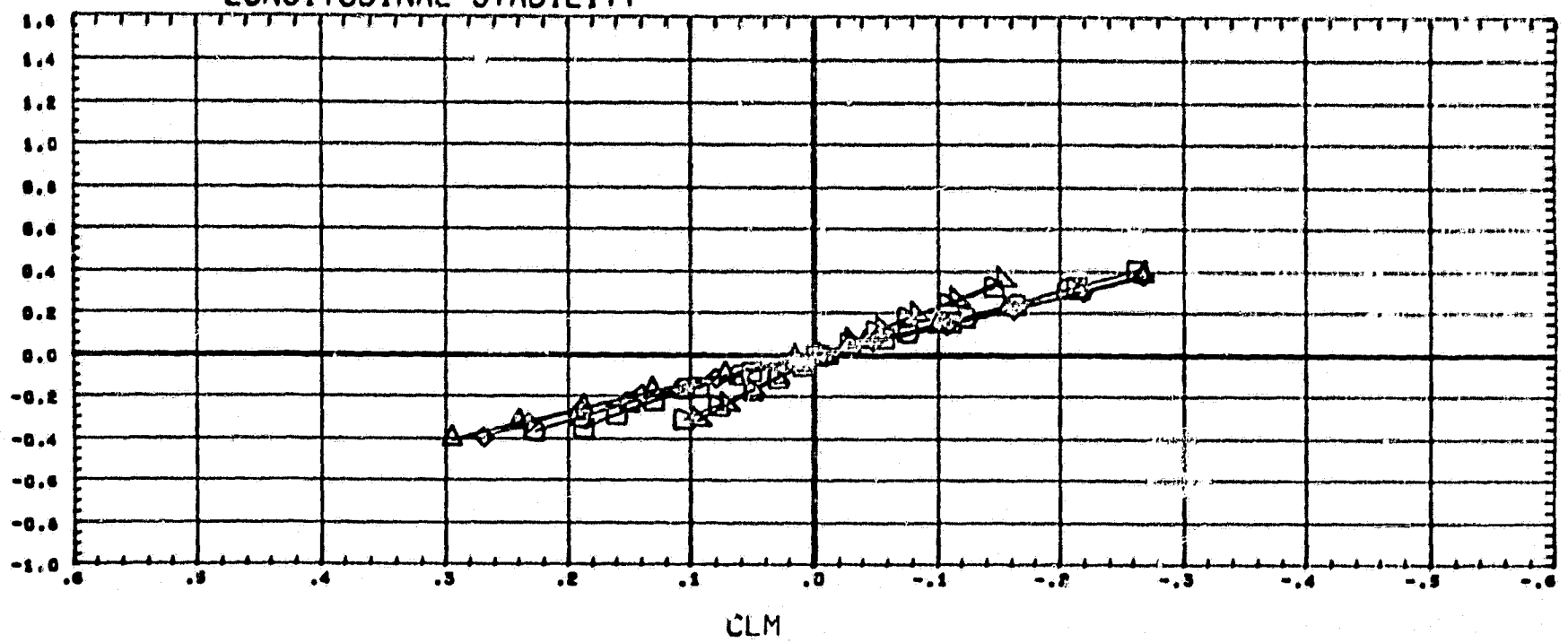
SYMBOL	MACH		PARAMETRIC VALUES
○	0.899	BETA	0.000
△	1.100		
◇	1.458		

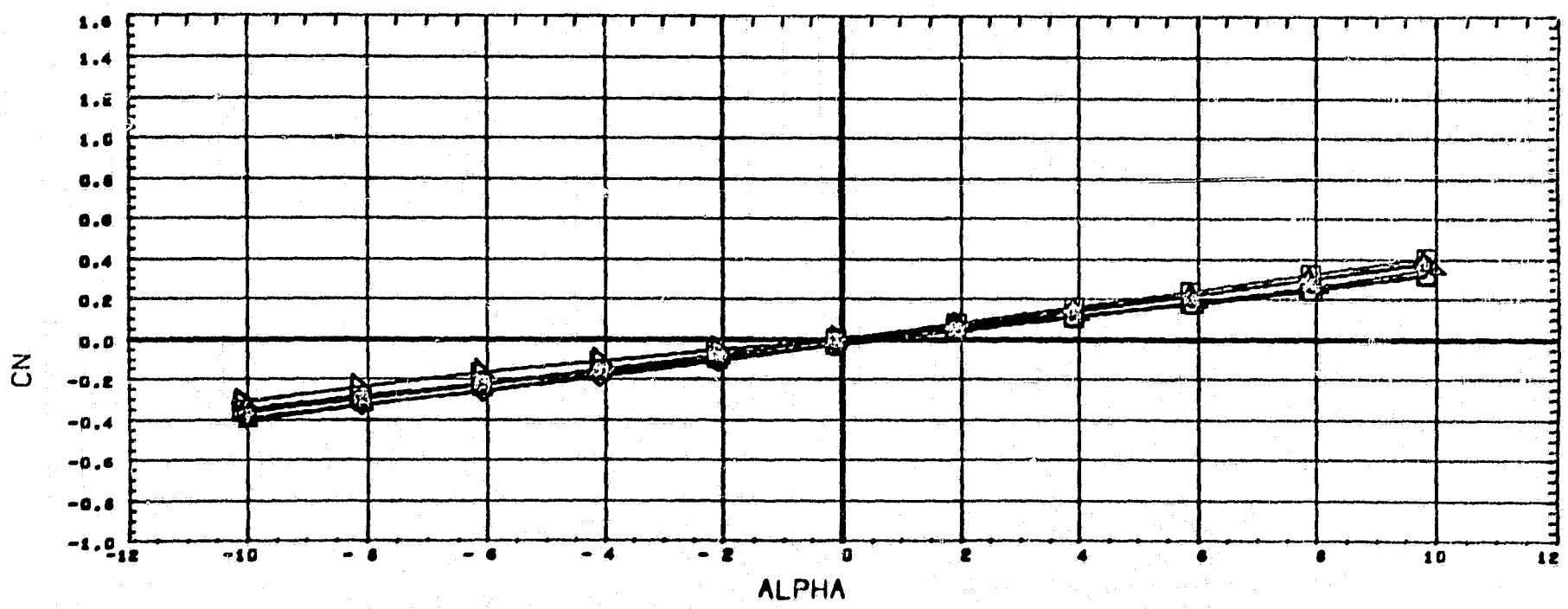
DATA HIST. CODE CGR

REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	9.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY



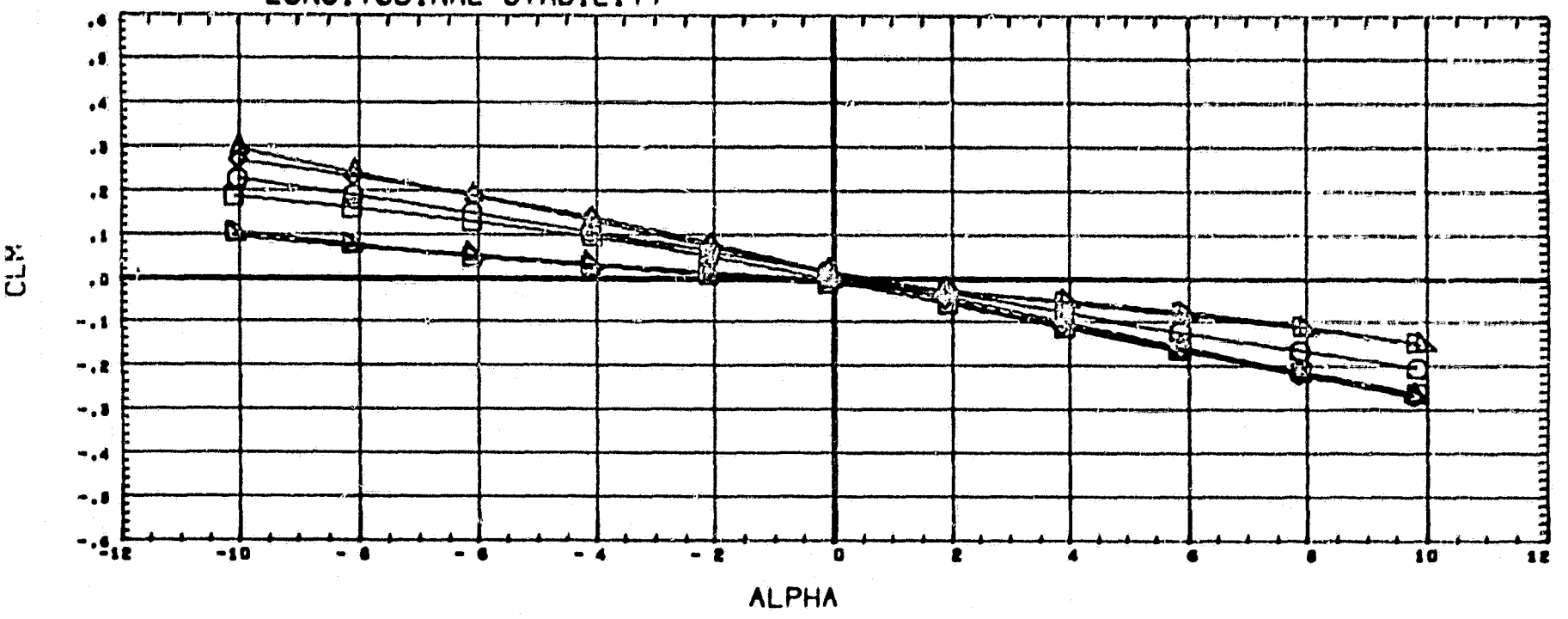


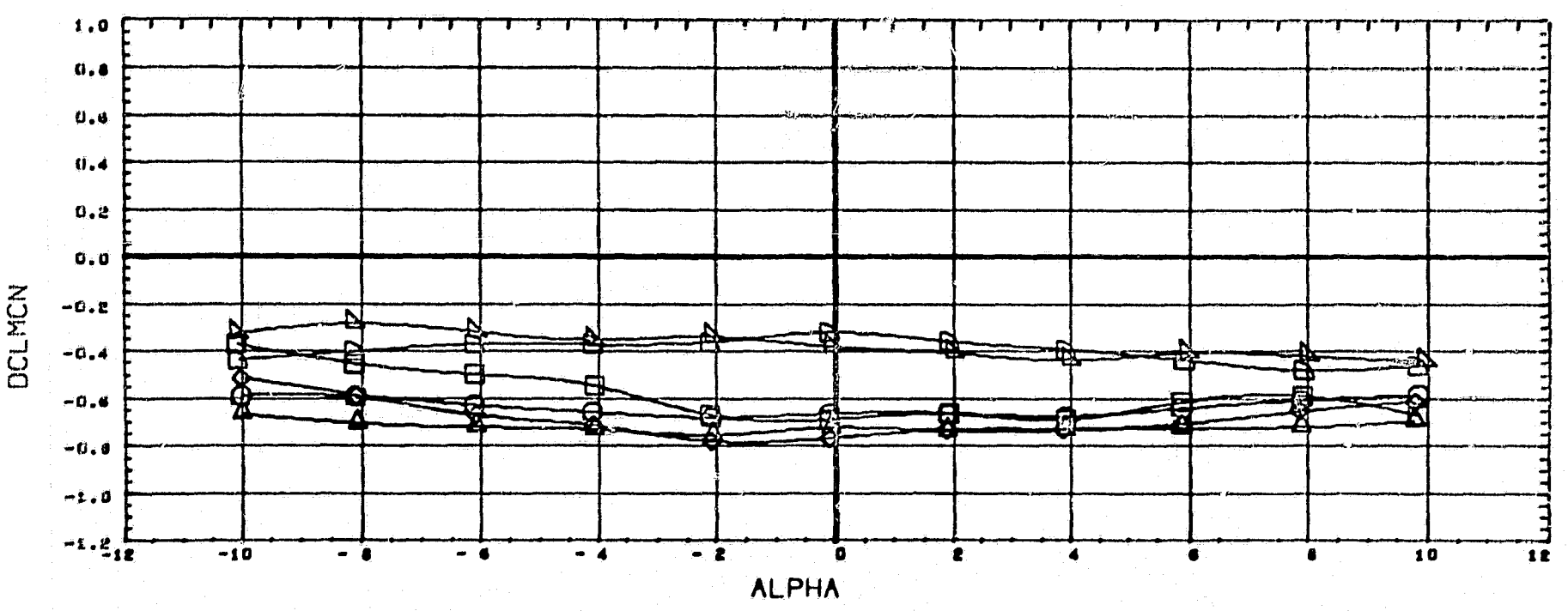
SYMBOL	MACH		PARAMETRIC VALUES
○	0.597	BETA	0.000
△	0.900		
◇	1.099		
□	1.460		
▽	2.740		
▷	4.959	DATA HIST. CODE	CGR

REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY

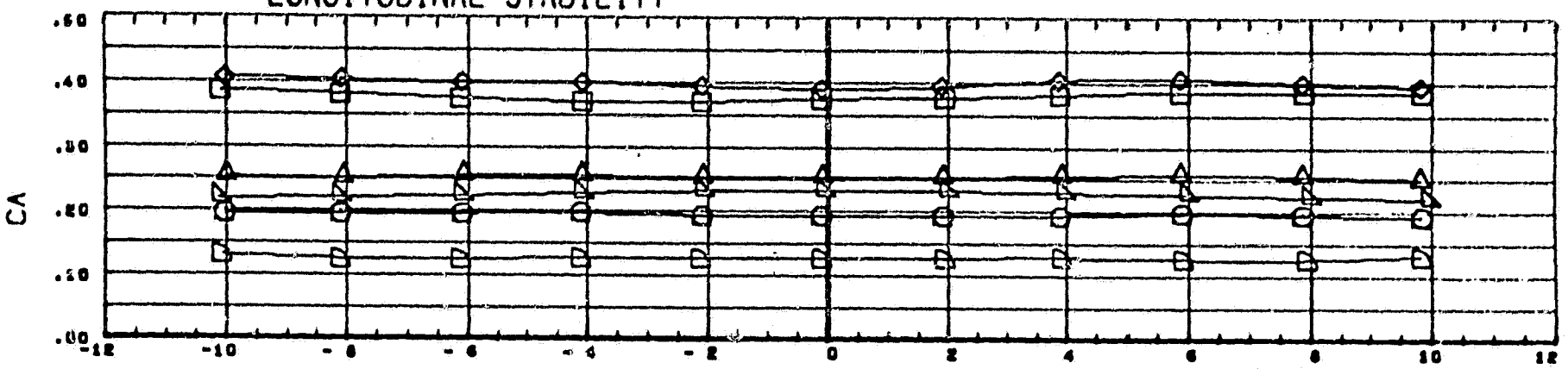


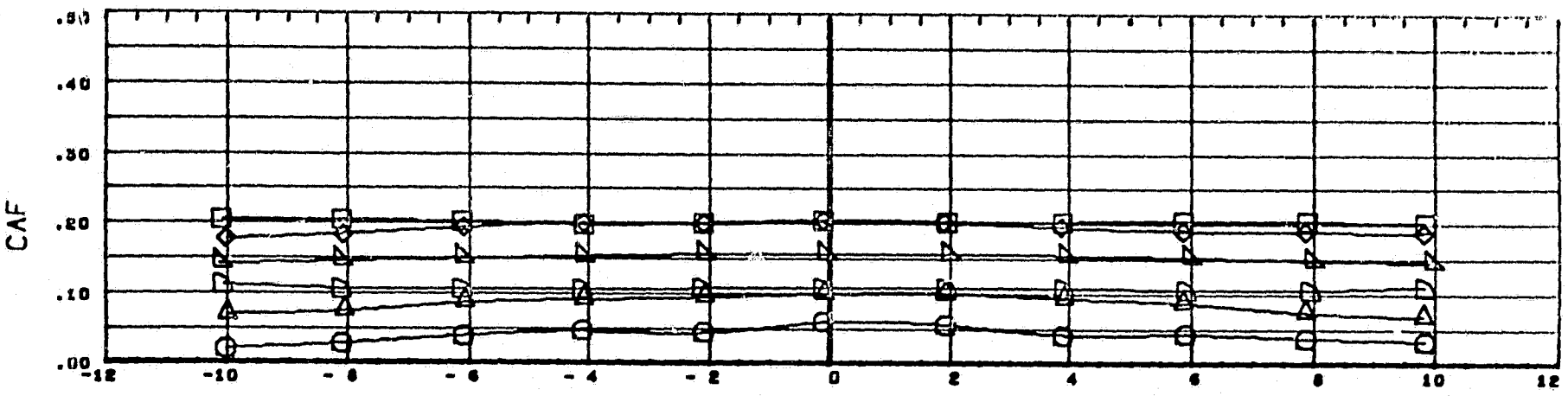


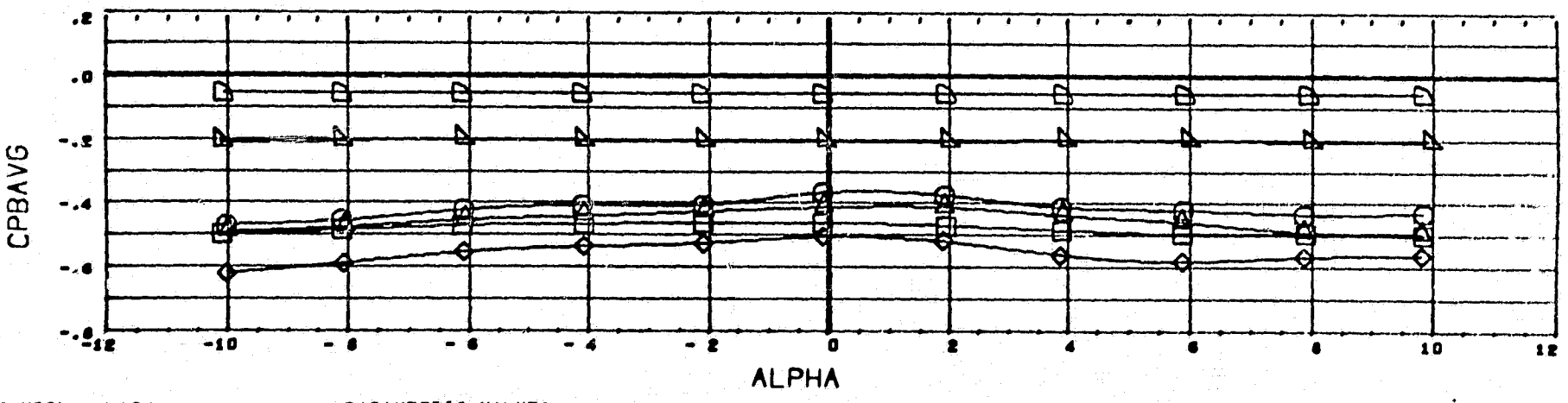
SYMBOL	MACH		PARAMETRIC VALUES
○	0.597	BETA	0.000
△	0.900		
◇	1.099		
□	1.460		
▷	2.740		
D	4.959	DATA HIST. CODE	CGR

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY





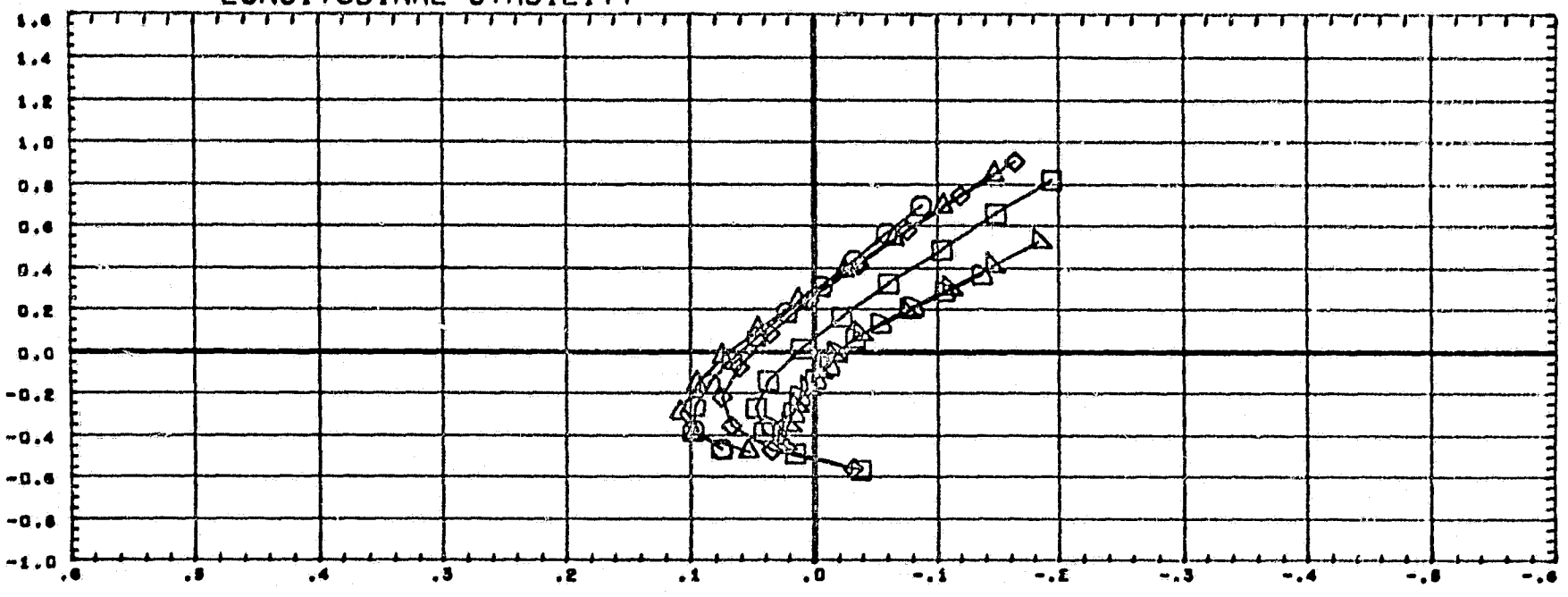


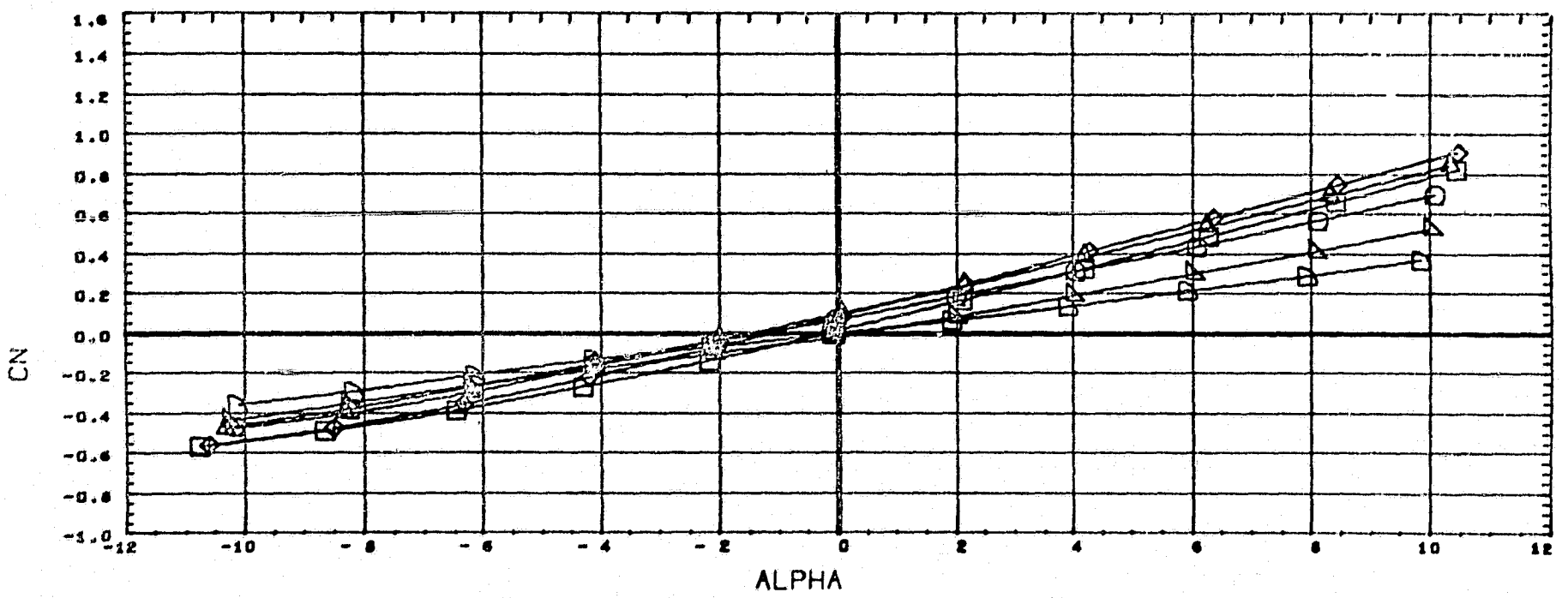
SYMBOL	MACH	PARAMETRIC VALUES
○	0.597	BETA 0.000
△	0.900	
◇	1.099	
□	1.460	
◸	2.740	
D	4.959	DATA HIST. CODE CGR

REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY

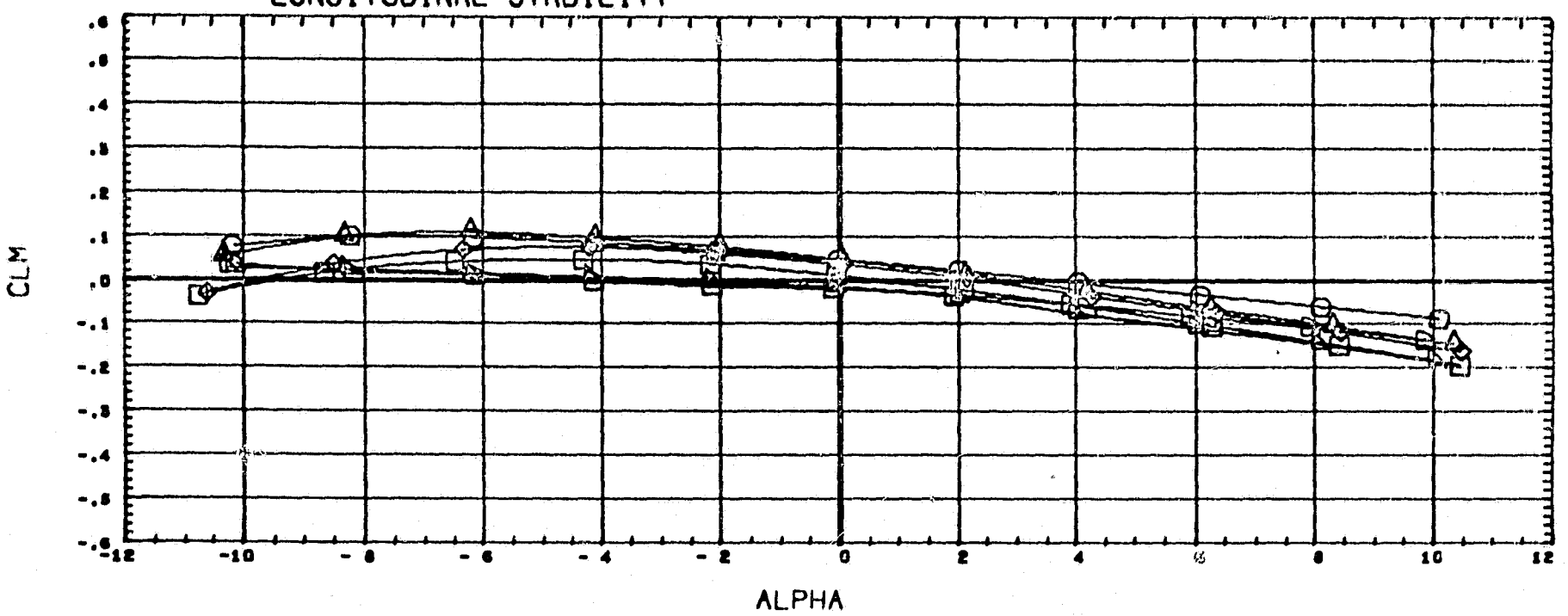


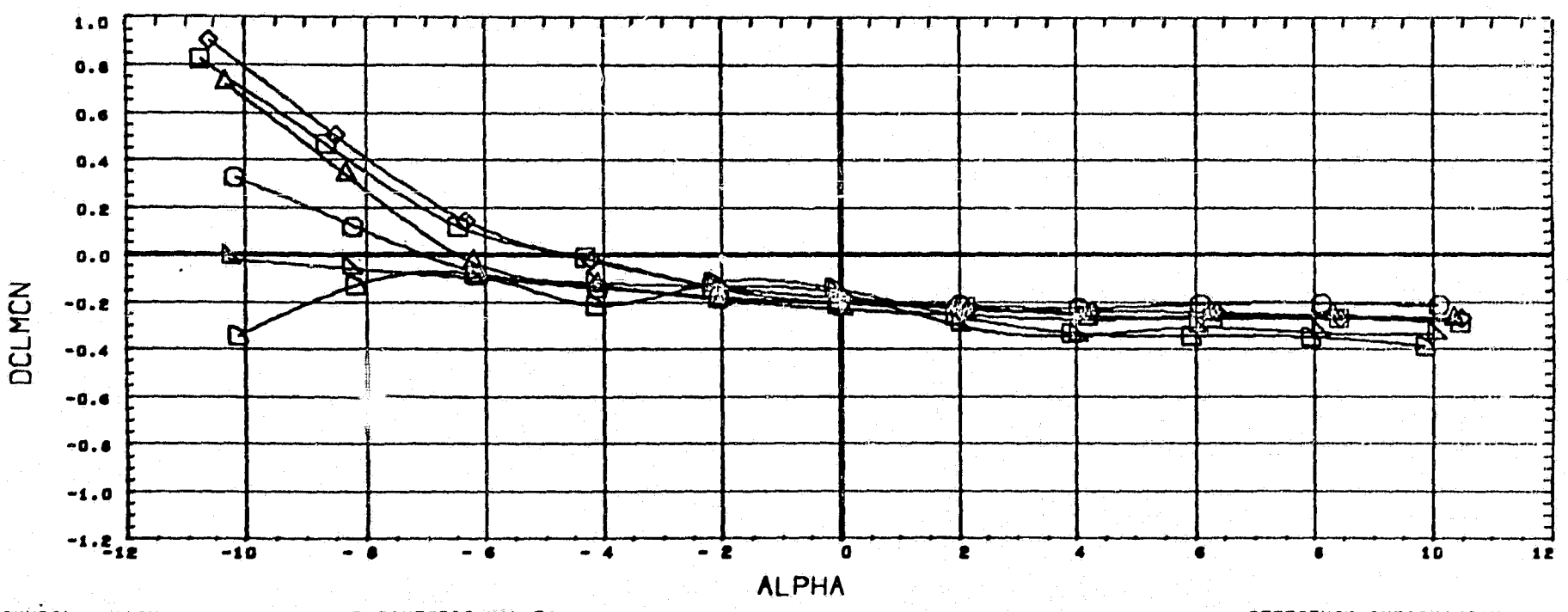


SYMBOL	MACH	PARAMETRIC VALUES			
○	0.599	BETA	0.000	ORBINC	- 2.000
△	0.898				
◇	1.103				
□	1.457				
◸	2.740				
▷	4.959	DATA HIST. CODE	CGR		

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY





SYMBOL	MACH		PARAMETRIC VALUES		
○	0.599	BETA	0.000	ORBINC	- 2.000
△	0.898				
◇	1.103				
□	1.457				
◸	2.740				
D	4.958	DATA HIST. CODE	CGR		

REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
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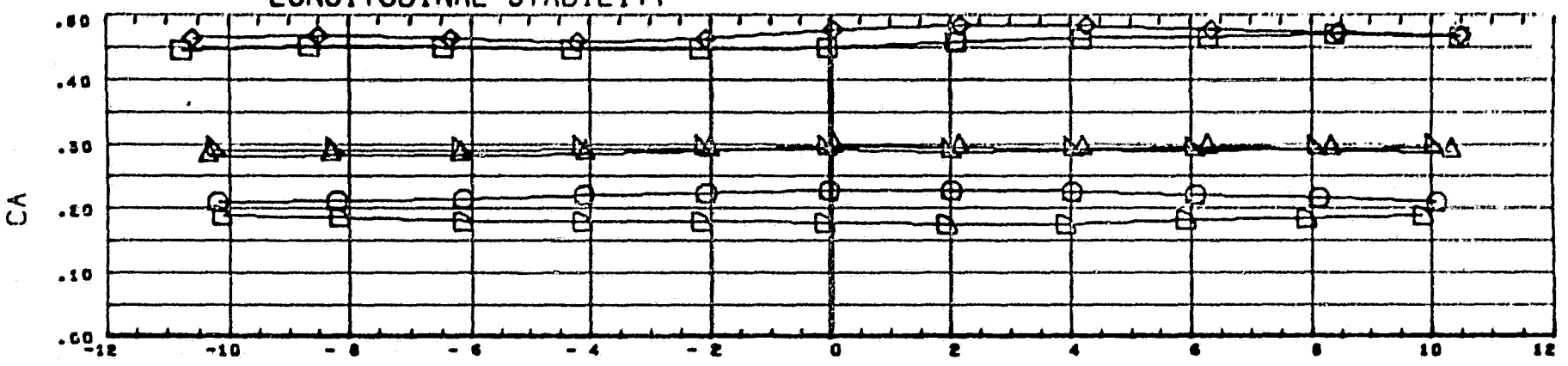
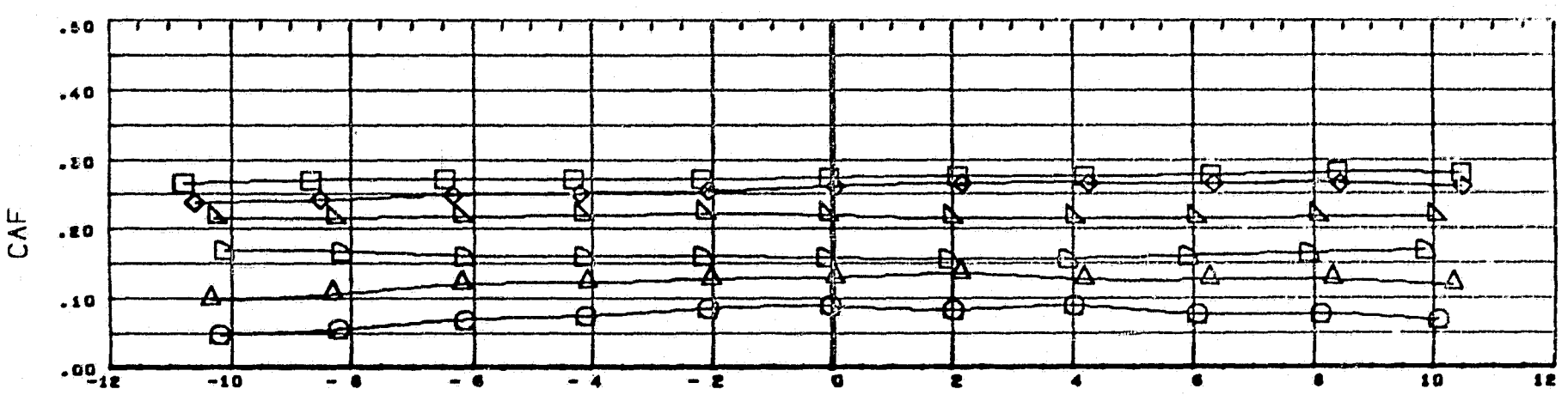
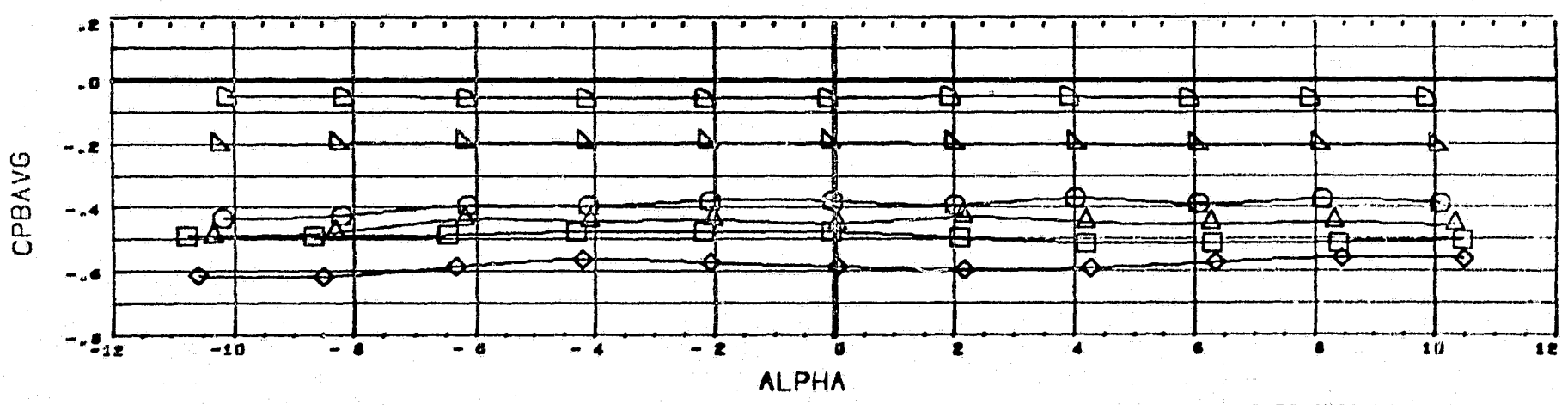
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY



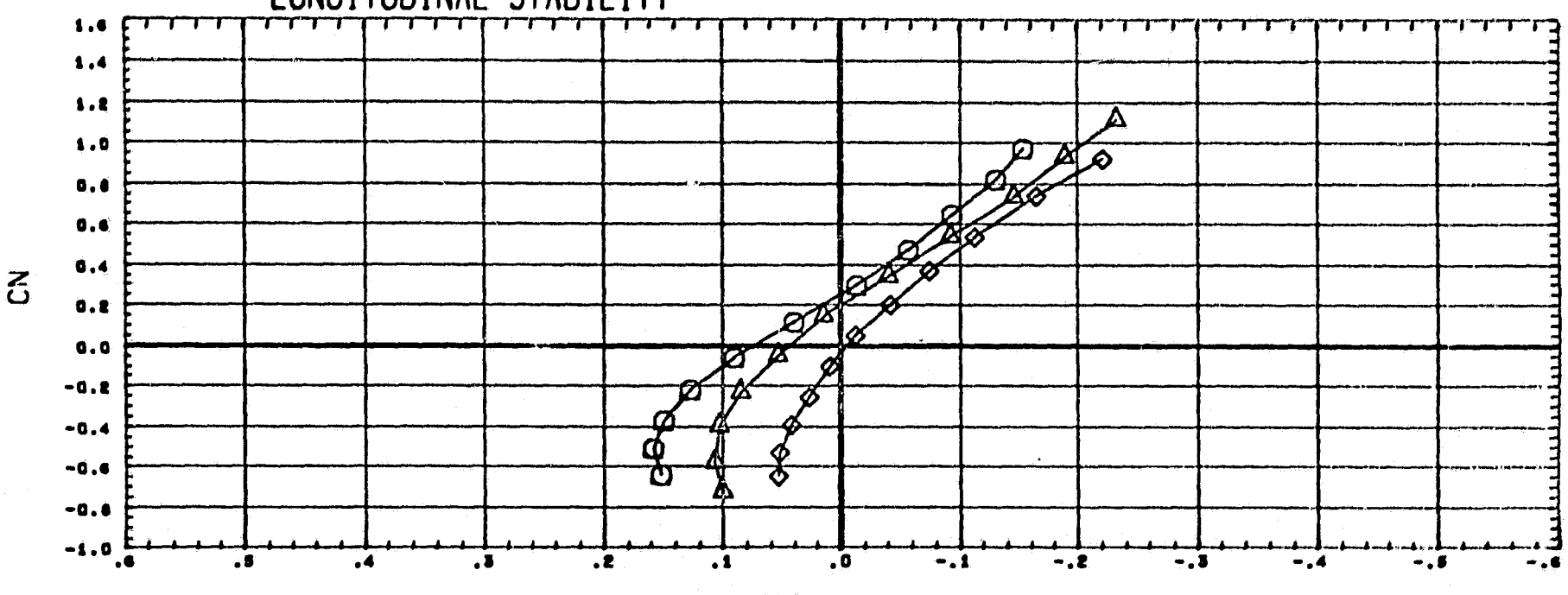


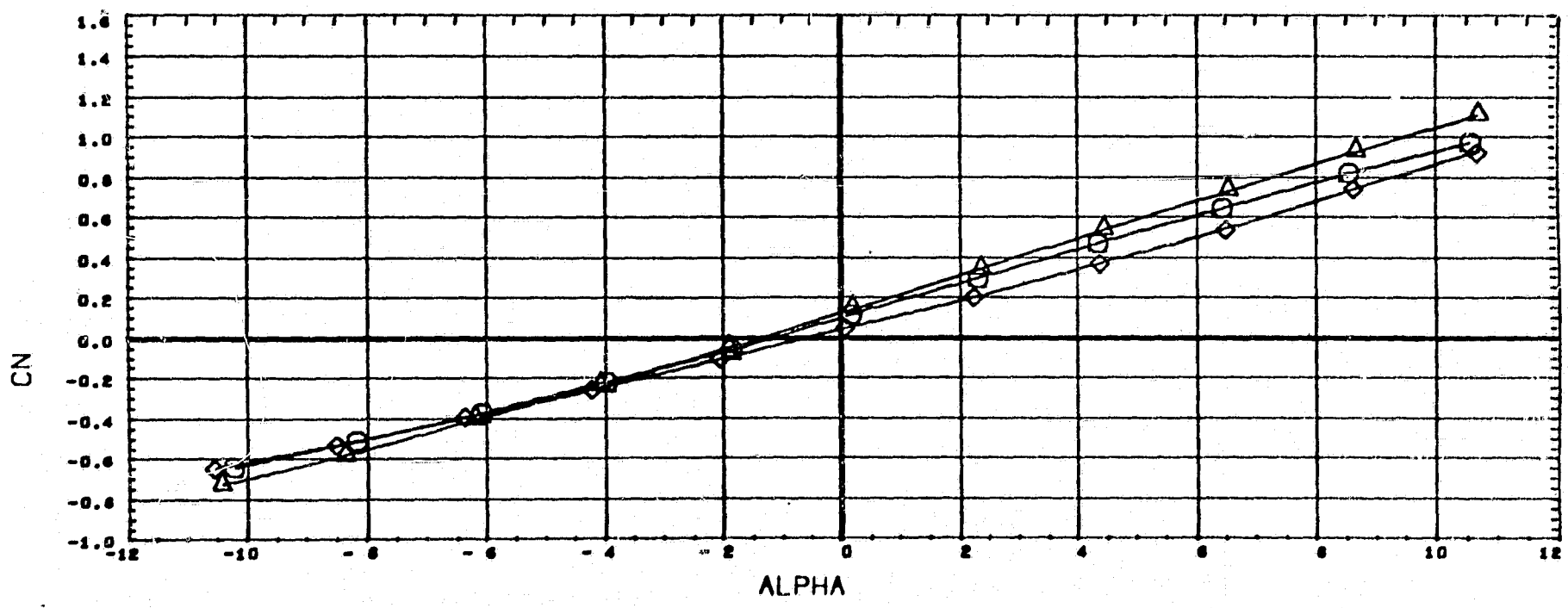


SYMBOL	MACH	PARAMETRIC VALUES			
○	0.599	BETA	0.000	ORBINC -	2.000
△	0.698				
◇	1.103				
□	1.457				
▽	2.740				
▷	4.859	DATA HIST. CODE	CGR		

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY



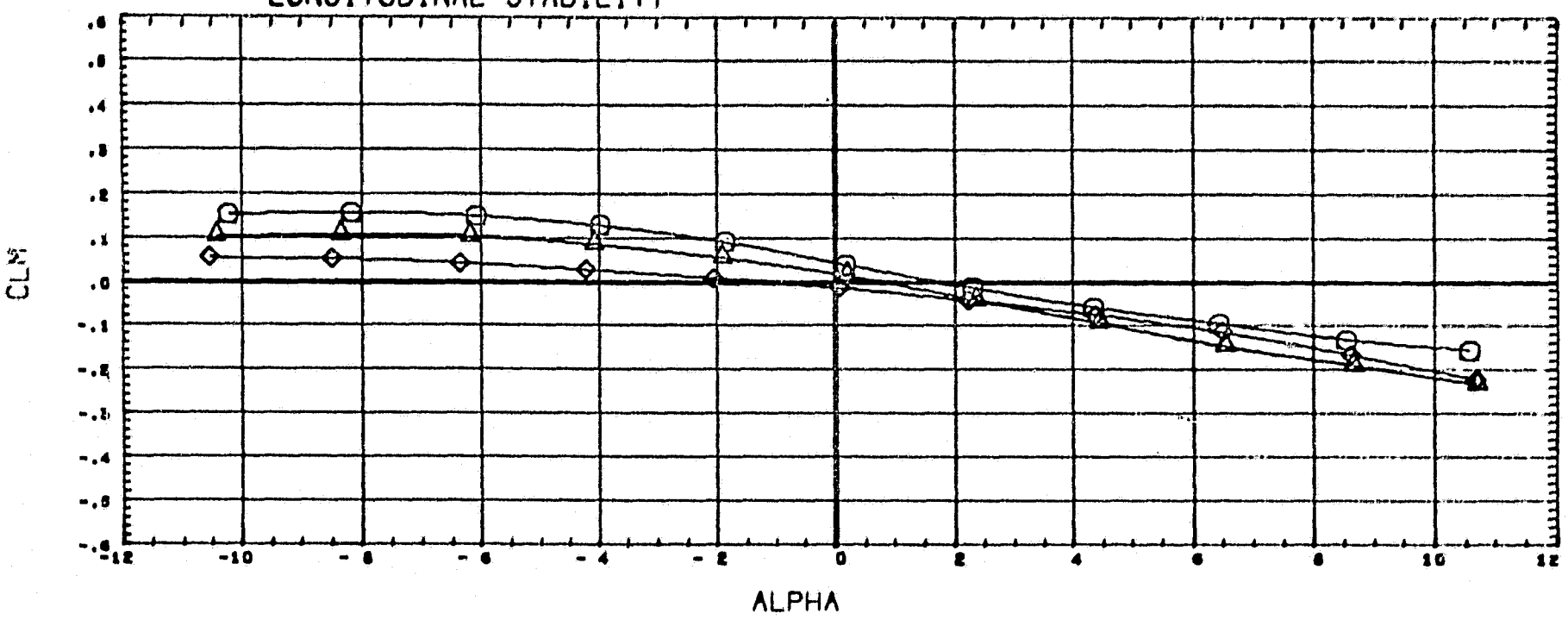


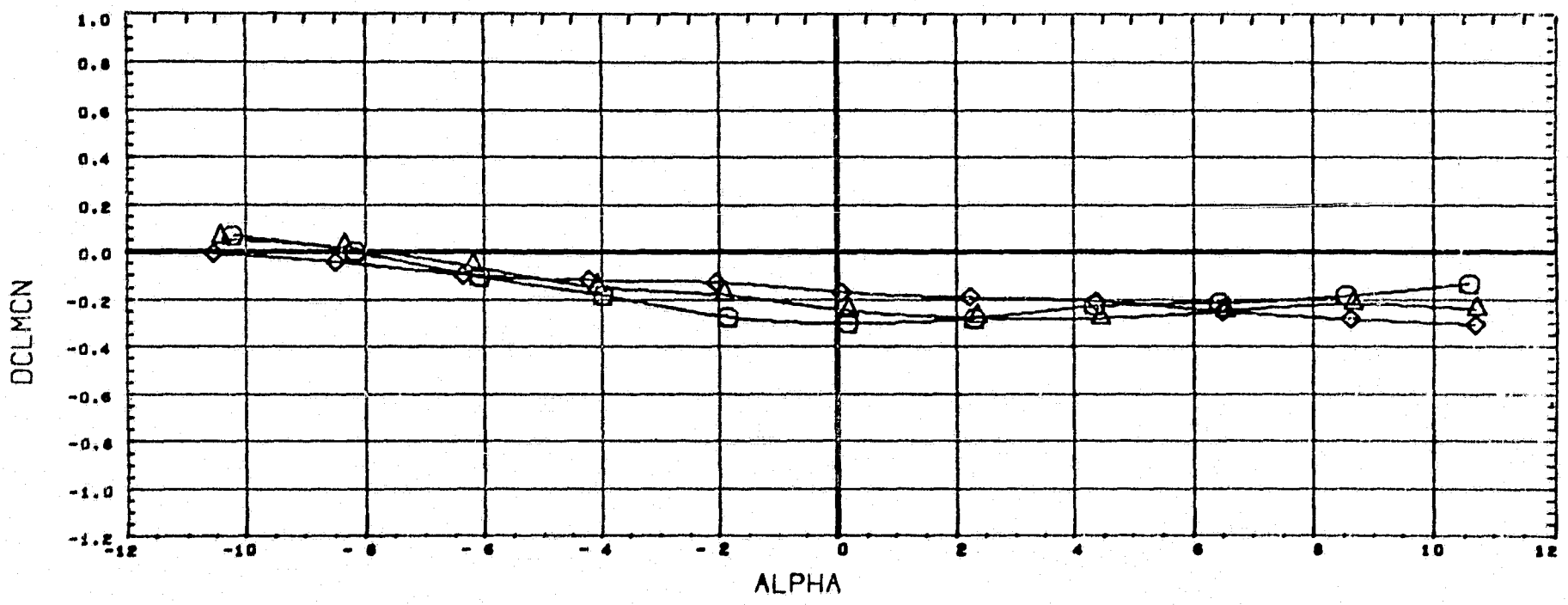
SYMBOL	MACH		PARAMETRIC VALUES		
○	0.900	BETA	0.000	ORBINC -	2.000
△	1.103				
◇	1.460				

DATA HIST. CODE CGR

REFERENCE INFORMATION		
SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3550	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY



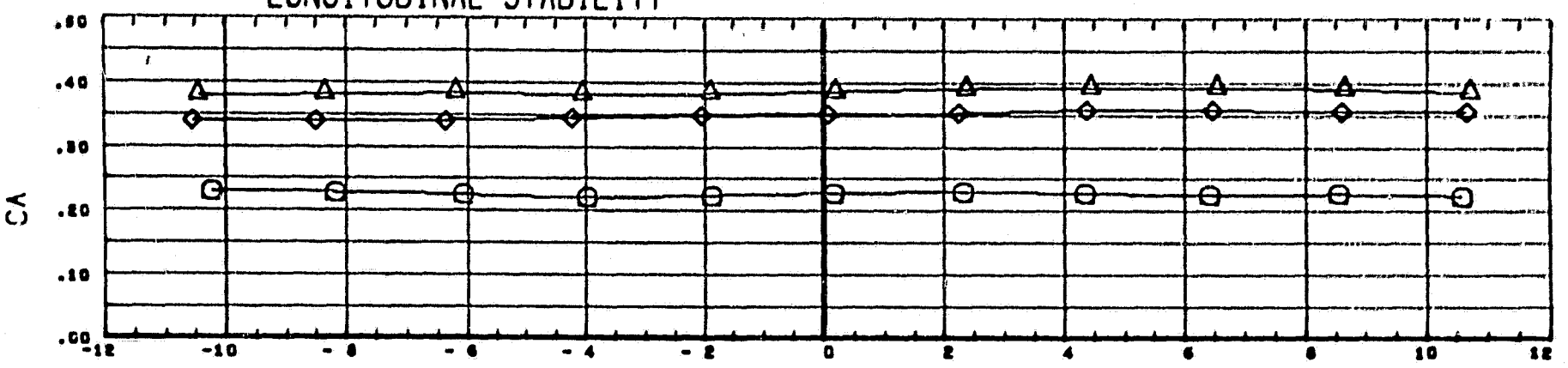


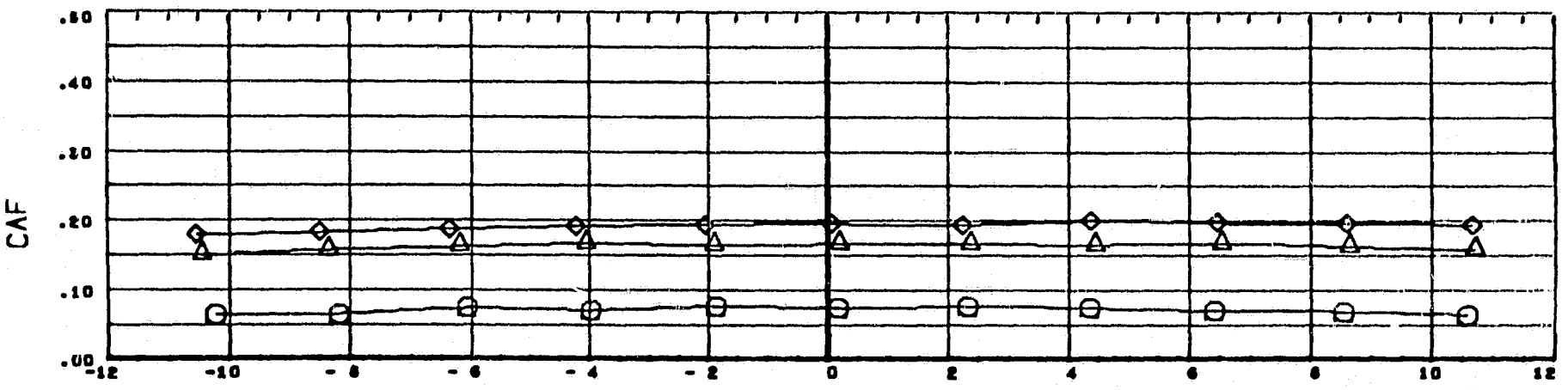
SYMBOL	MACH		PARAMETRIC VALUES		
○	0.900	BETA	0.000	ORBINC	- 2.000
△	1.103				
◇	1.460				

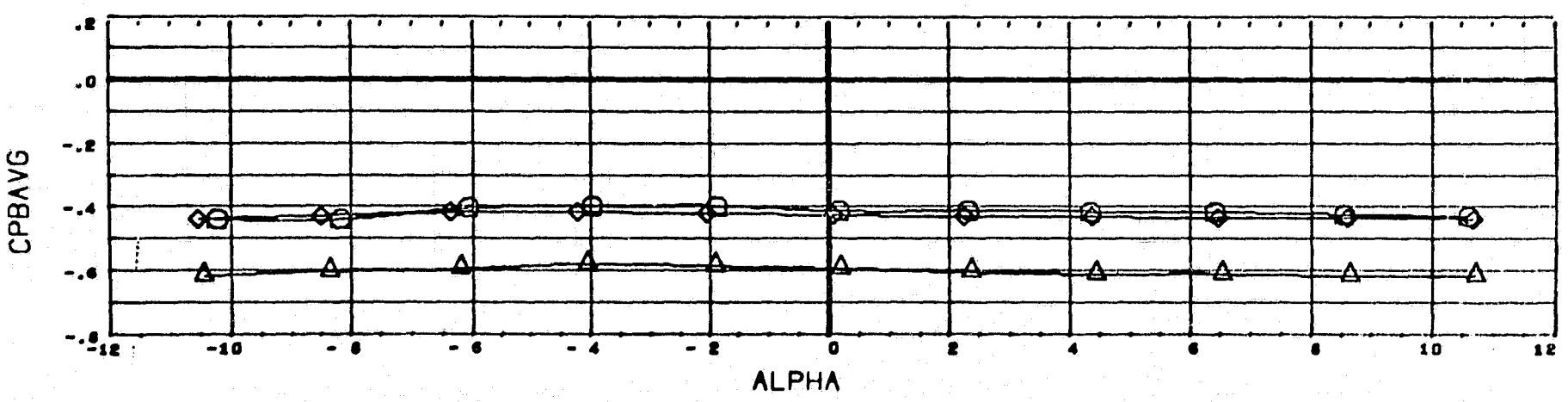
DATA HIST. CODE CGR

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3550	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY







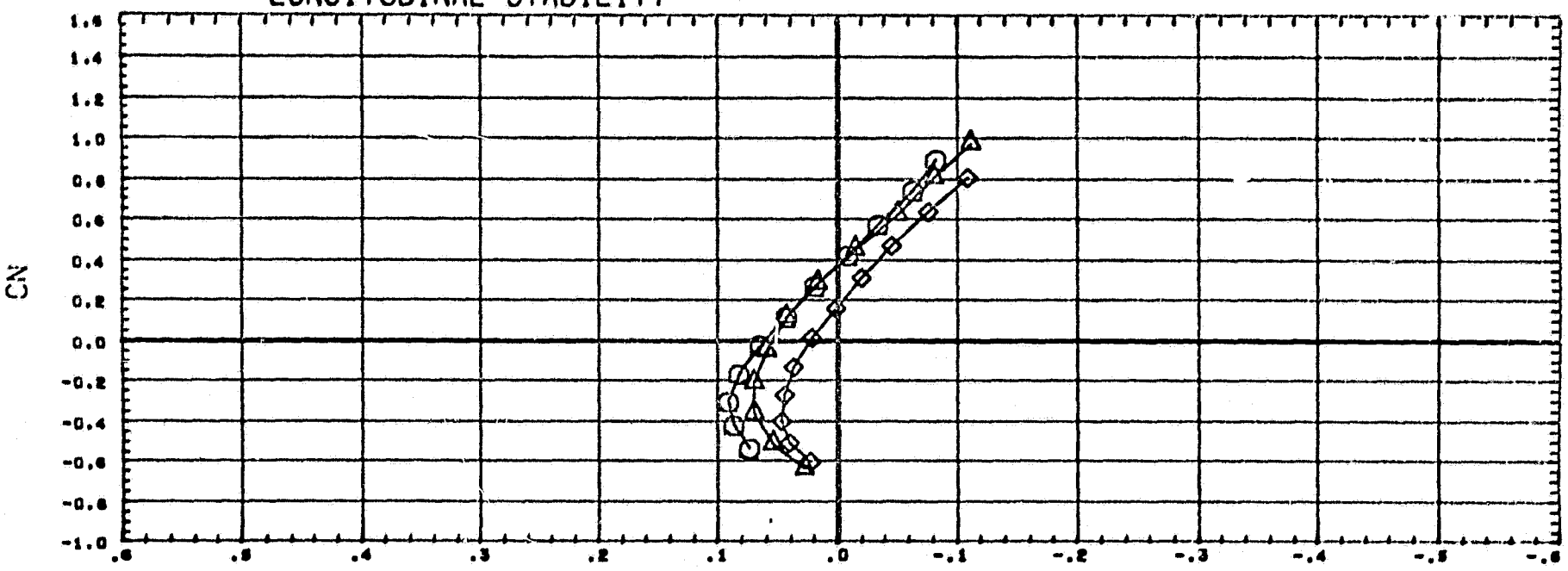
SYMBOL	MACH		PARAMETRIC VALUES		
○	0.900	BETA	0.000	ORGINC	- 2.000
△	1.103				
◇	1.460				

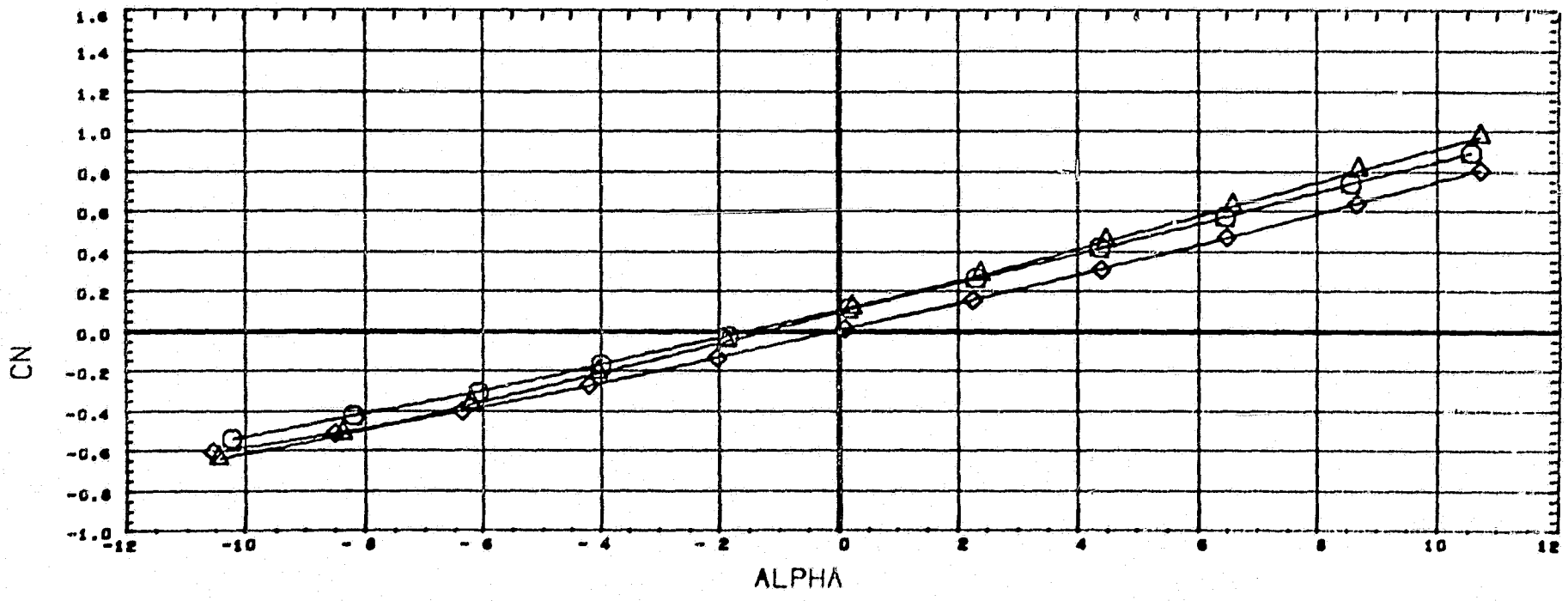
DATA HIST. CODE CGR

REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3550	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY



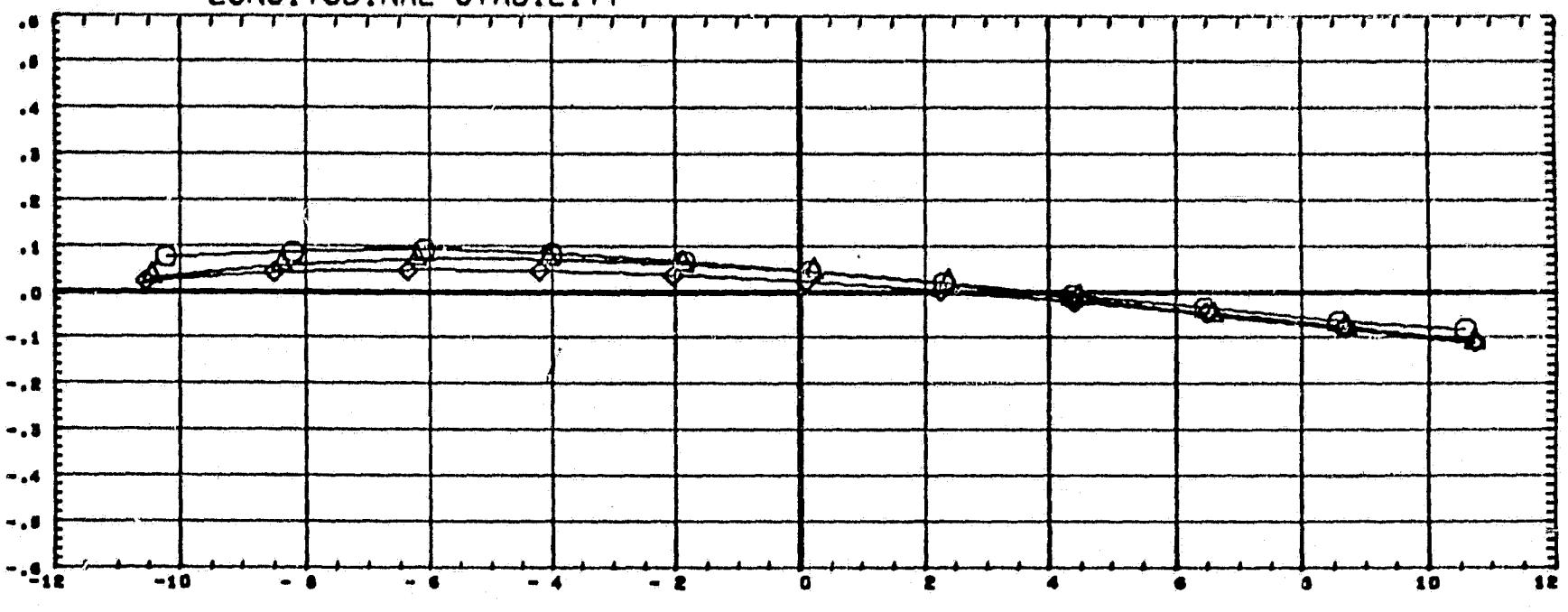


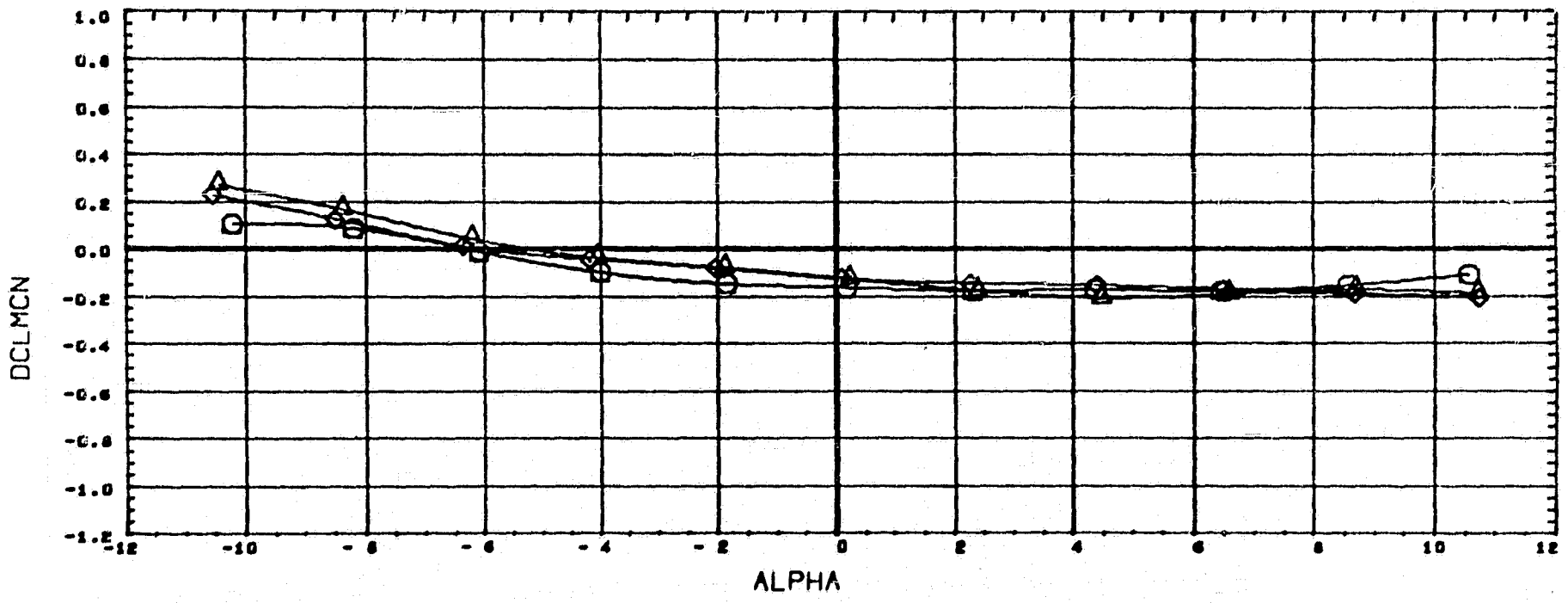
SYMBOL	MACH		PARAMETRIC VALUES		
○	0.897	BETA	0.000	ORBINC	- 2.000
△	1.099				
◇	1.460				

DATA HIST. CODE CGR

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3550	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0033	

LONGITUDINAL STABILITY



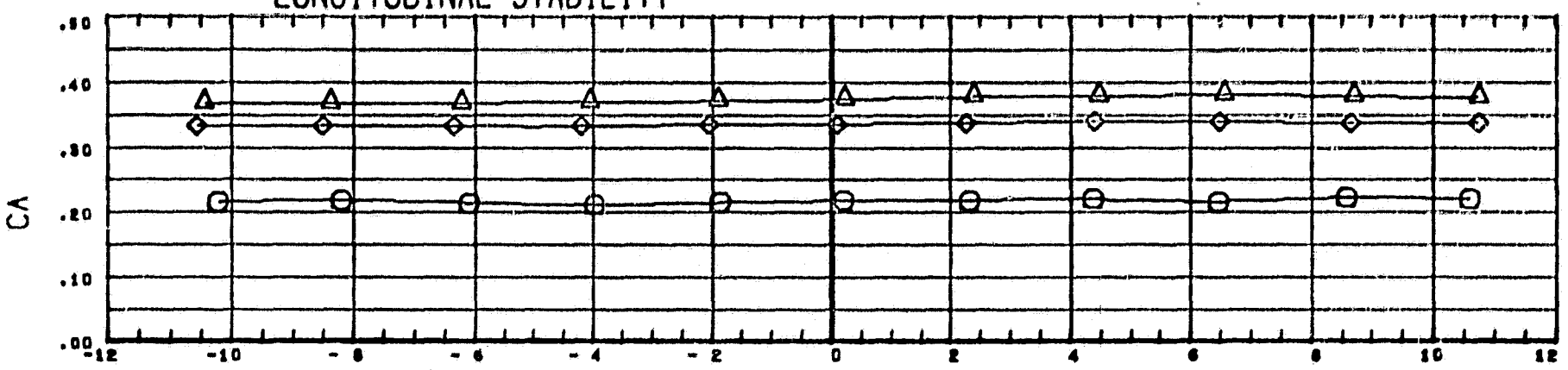


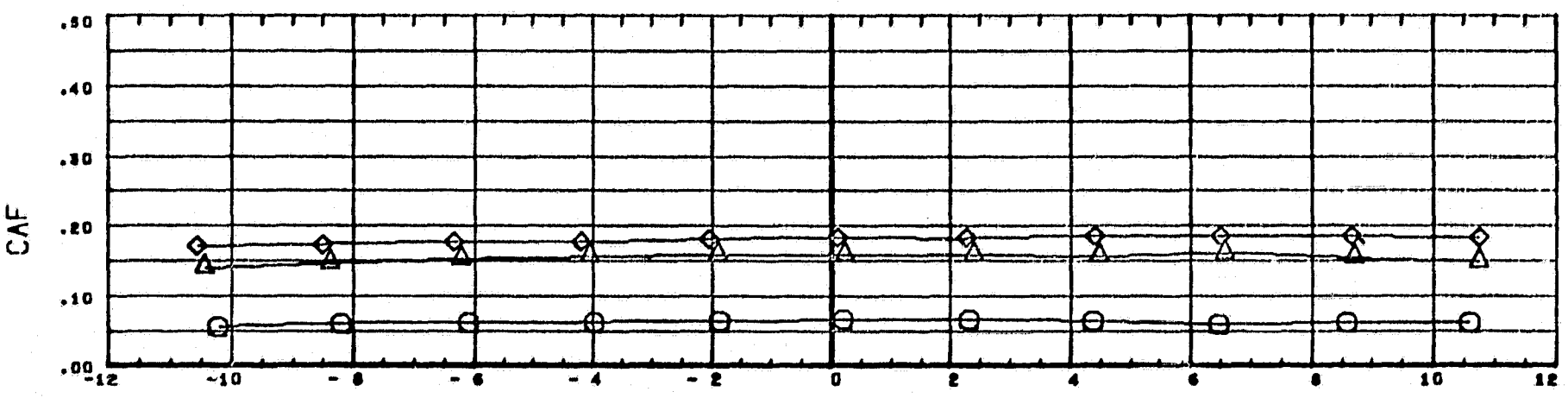
SYMBOL	MACH	PARAMETRIC VALUES			
○	0.897	BETA	0.000	ORBINC -	2.000
△	1.099				
◇	1.460				

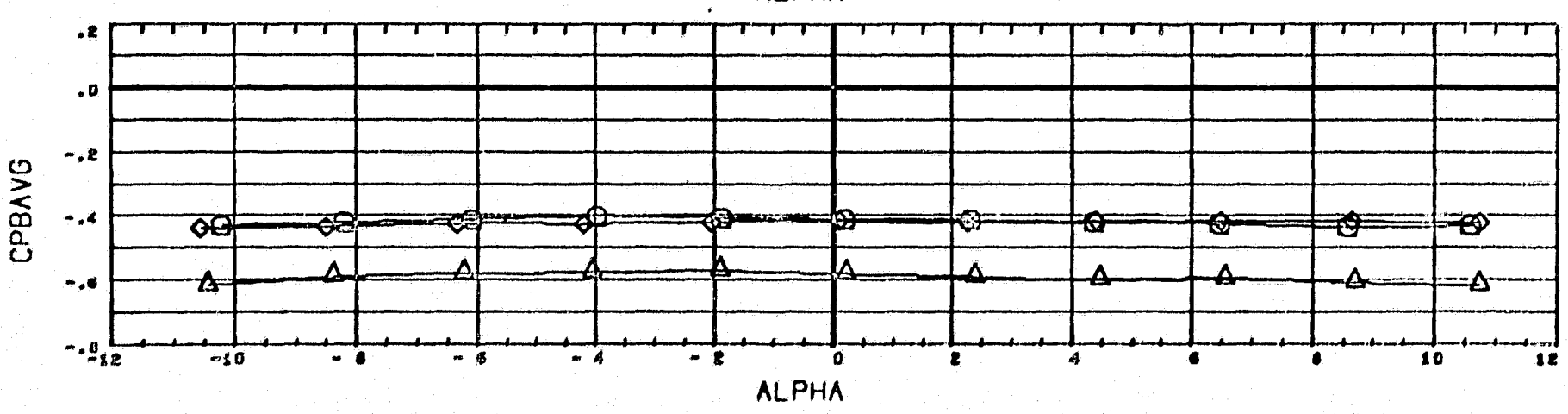
DATA HIST. CODE CGR

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0033	

LONGITUDINAL STABILITY







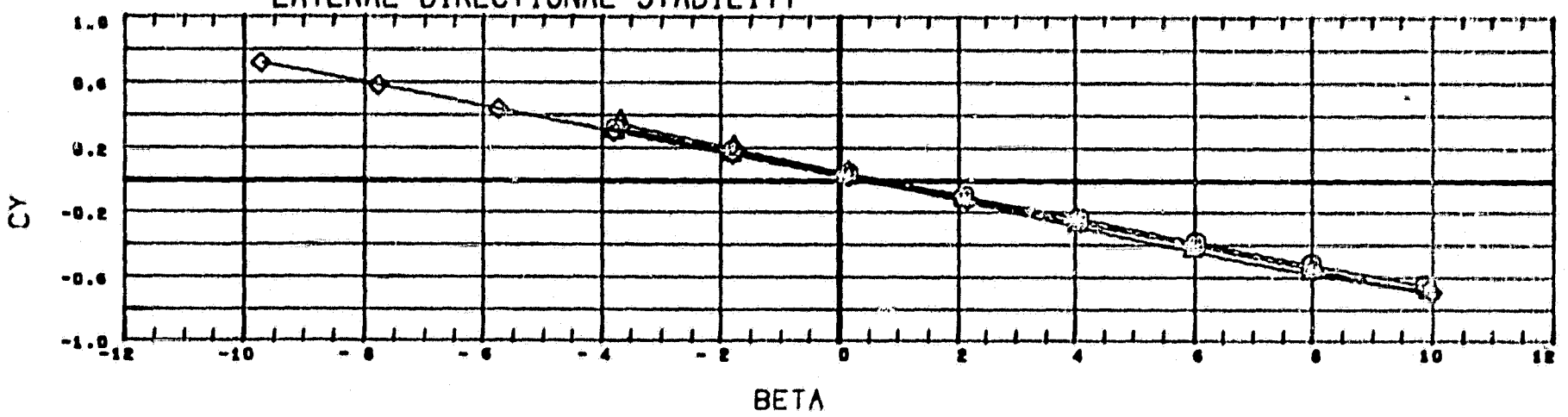
SYMBOL	MACH	PARAMETRIC VALUES			
○	0.897	BETA	0.000	ORBINC -	2.000
△	1.098				
◇	1.460				

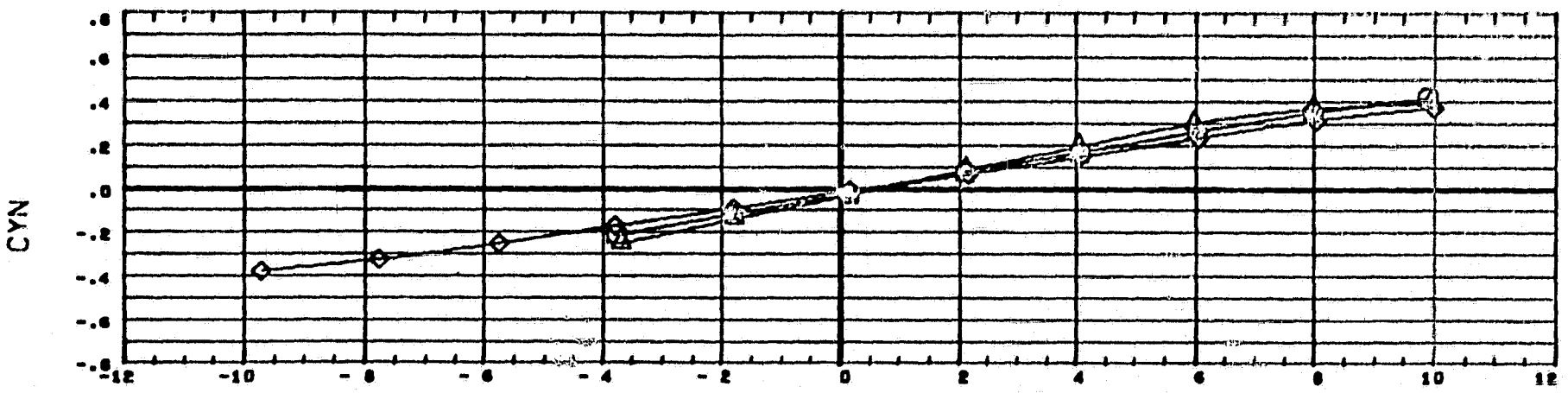
REFERENCE INFORMATION

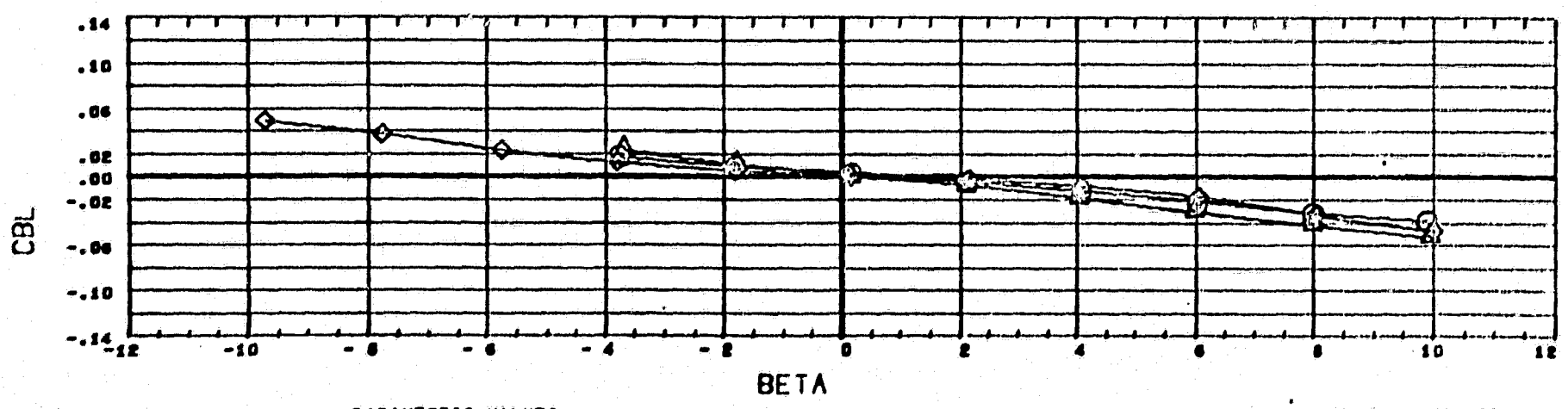
SREF	6.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0033	

DATA HIST. CODE CGR

LATERAL-DIRECTIONAL STABILITY







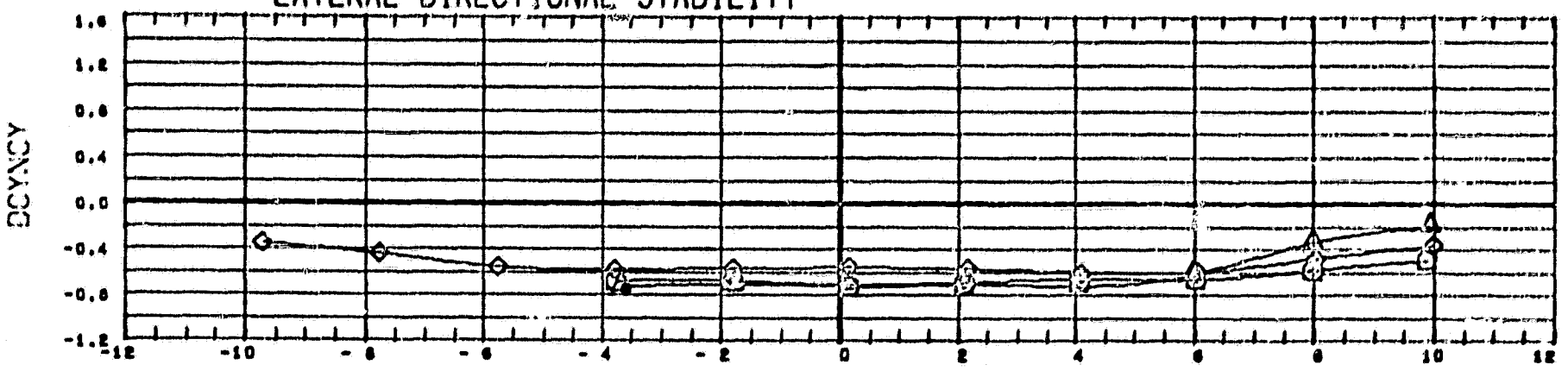
SYMBOL	MACH	PARAMETRIC VALUES		
○	0.899	ALPHA	0.000	ORBINC - 2.000
△	1.104			
◇	1.463			

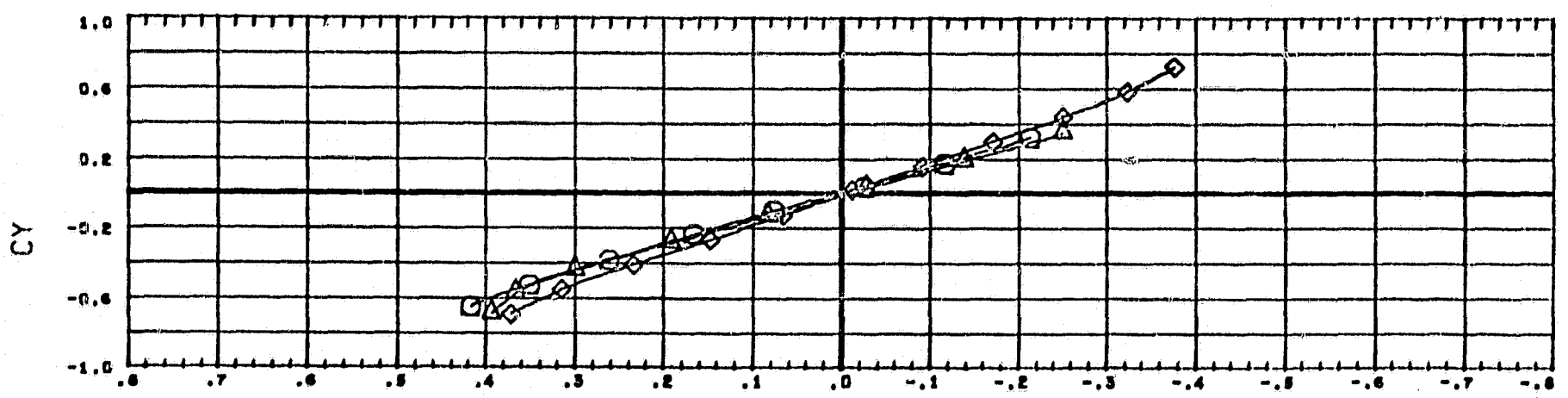
REFERENCE INFORMATION

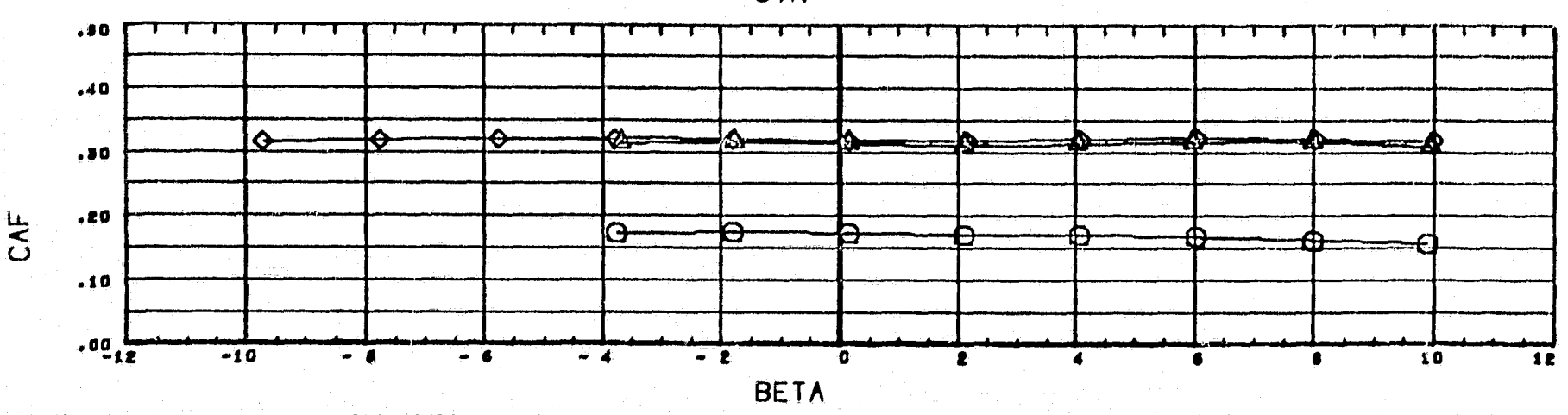
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES			
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◇	1.463				

DATA HIST. CODE GR

REFERENCE INFORMATION

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LREF	4.4260	IN.
BREF	2.8690	IN.
XMRP	5.7530	IN.
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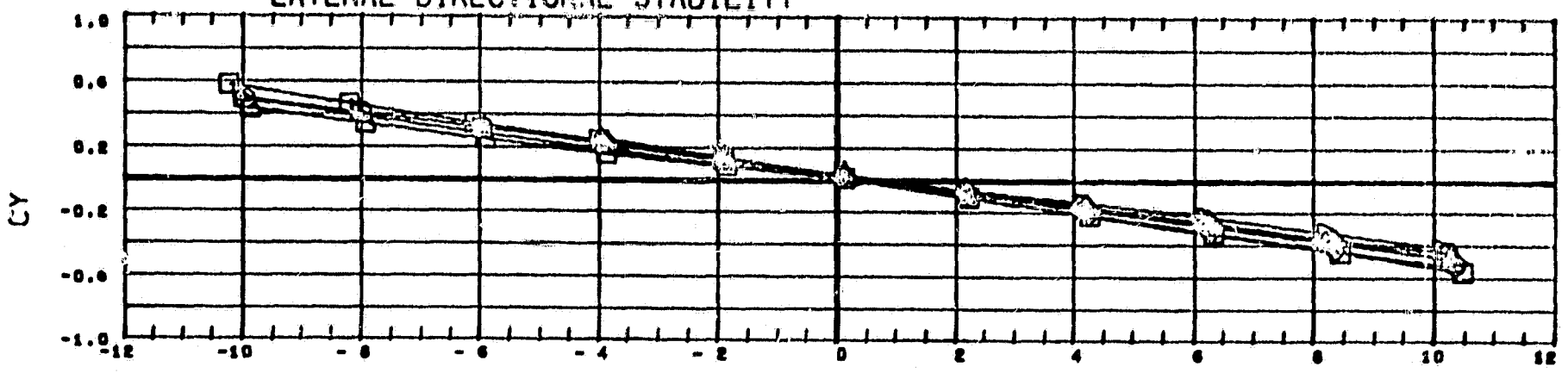
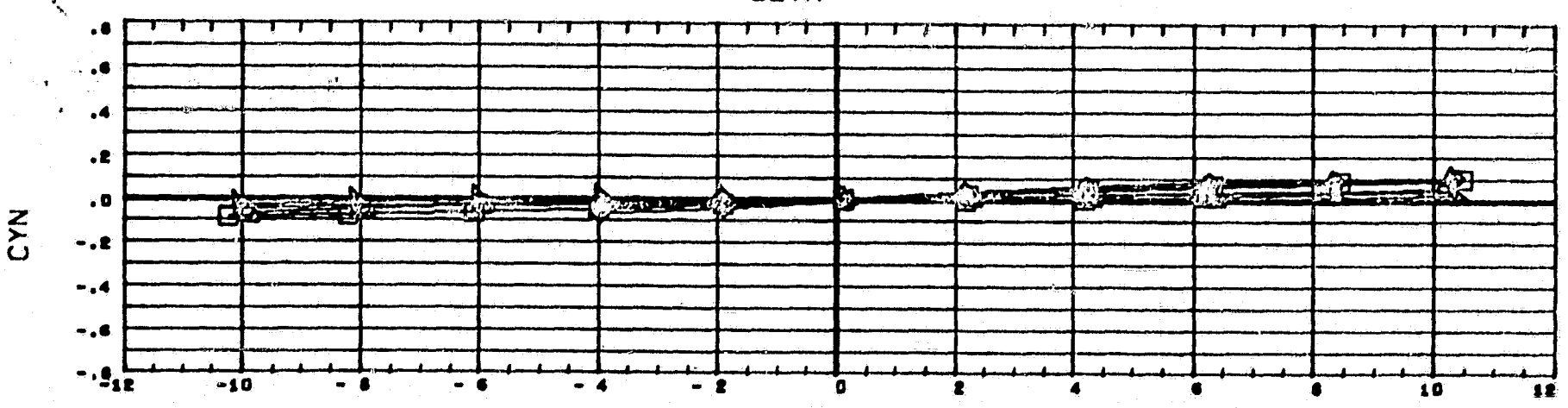
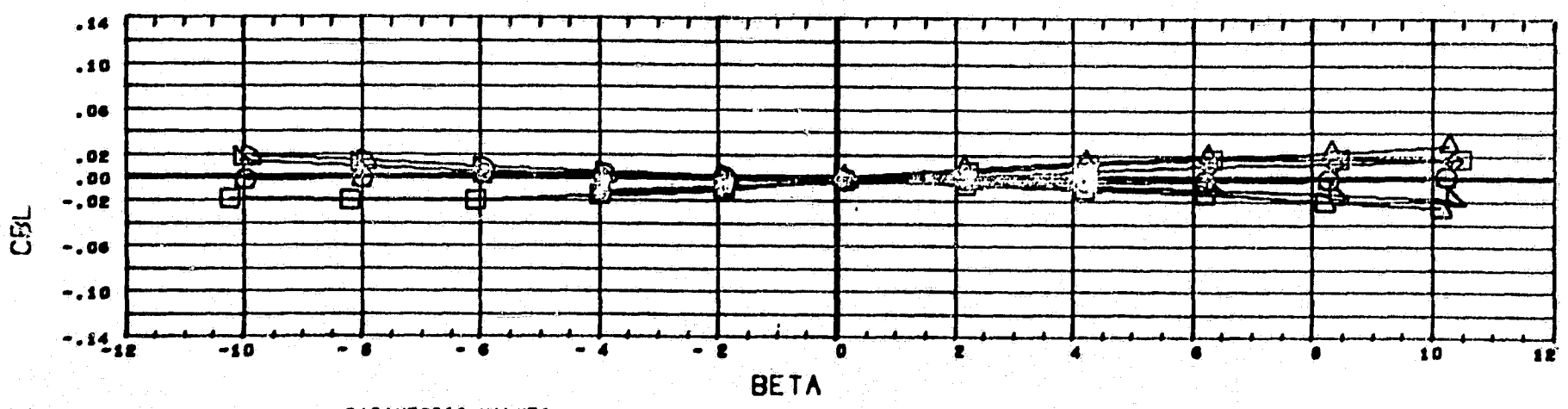
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY





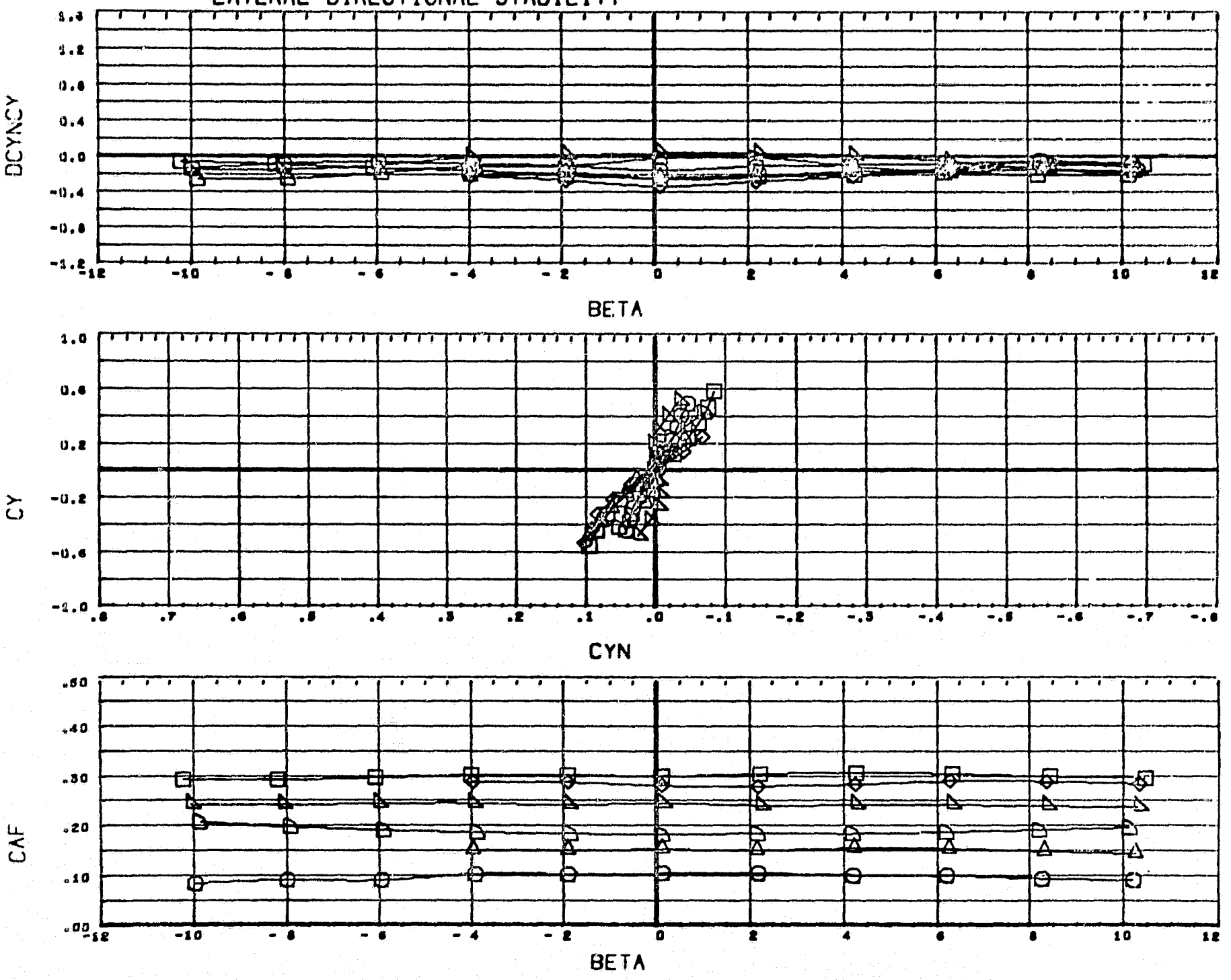


SYMBOL	MACH	PARAMETRIC VALUES			
○	0.599	ALPHA	0.000	ORBINC -	2.000
△	0.903				
◇	1.097				
□	1.459				
▽	2.740				
▷	4.959	DATA HIST. CODE	GR		

REFERENCE INFORMATION

SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES			
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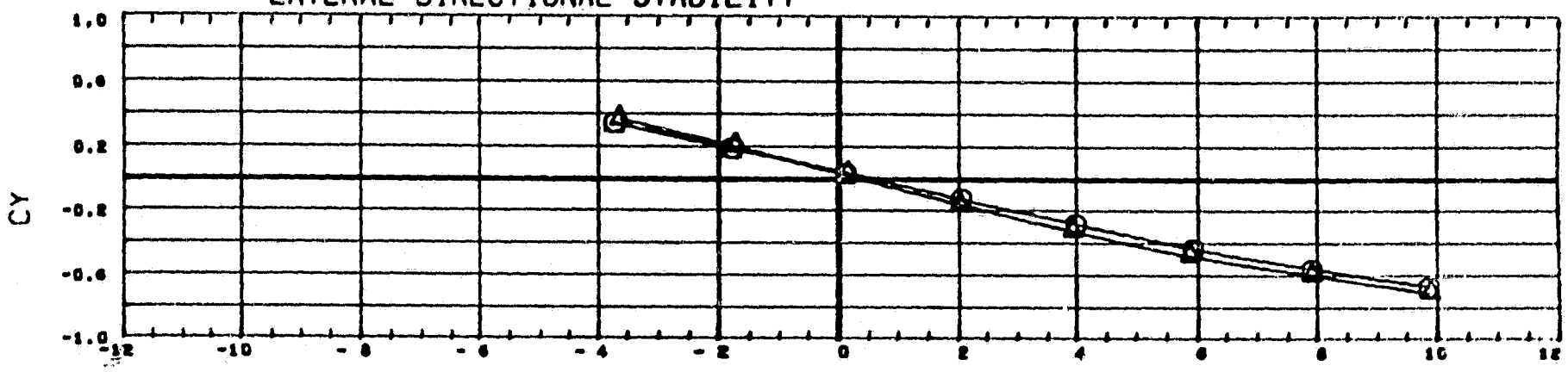
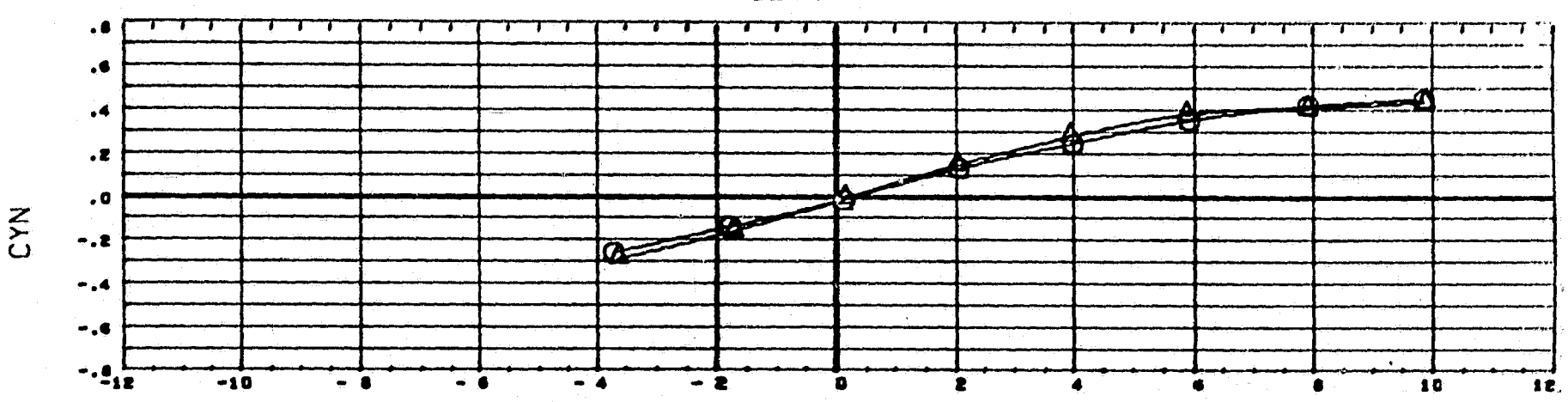
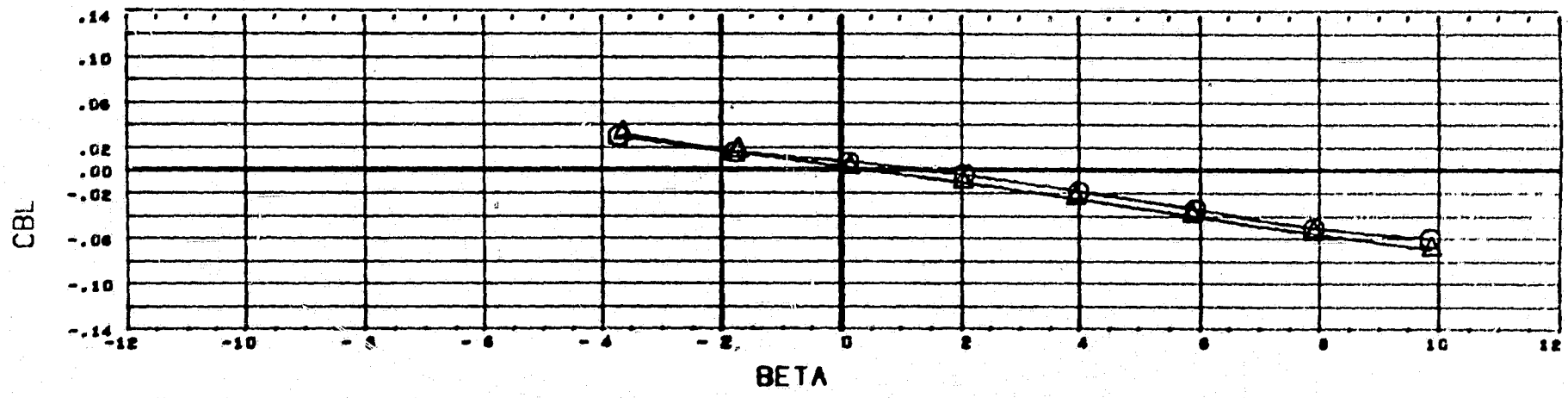
△	0.903				
◇	1.097				
□	1.459				
◸	2.740				
D	4.959	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES		
○	0.900	ALPHA 0.000	ORBINC - 2.000	
△	1.102			

REFERENCE INFORMATION

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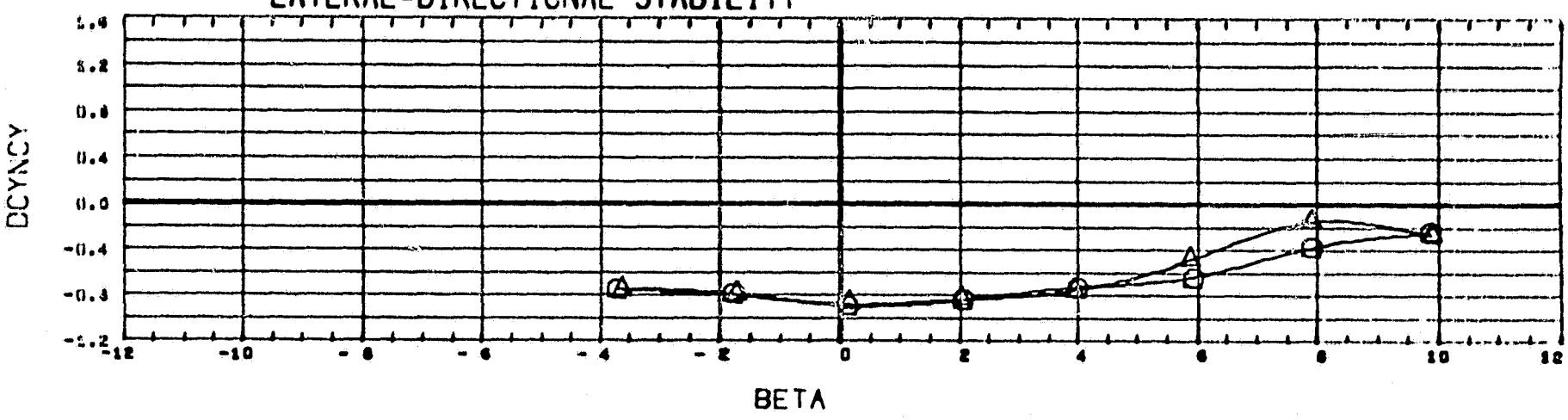
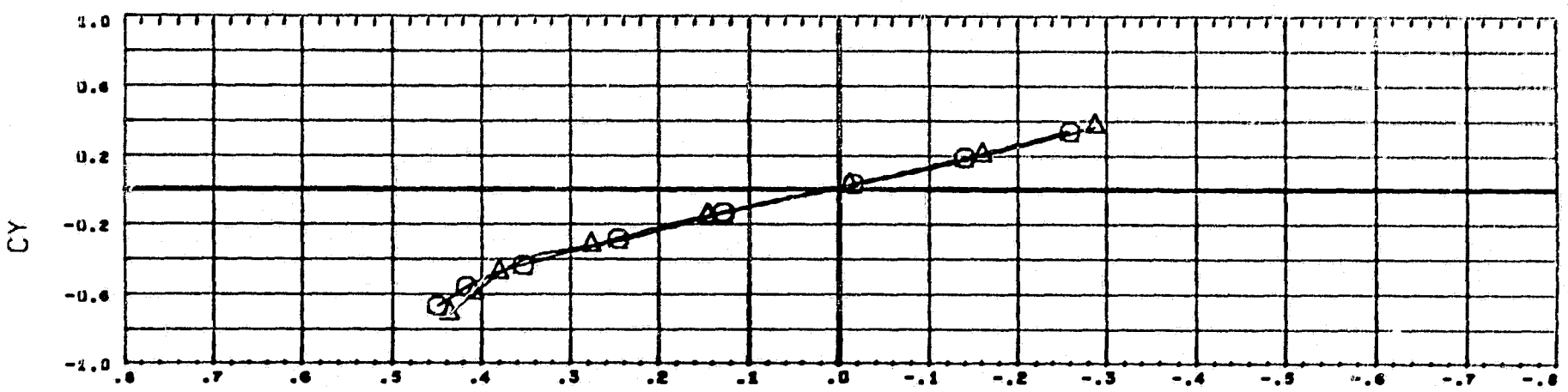
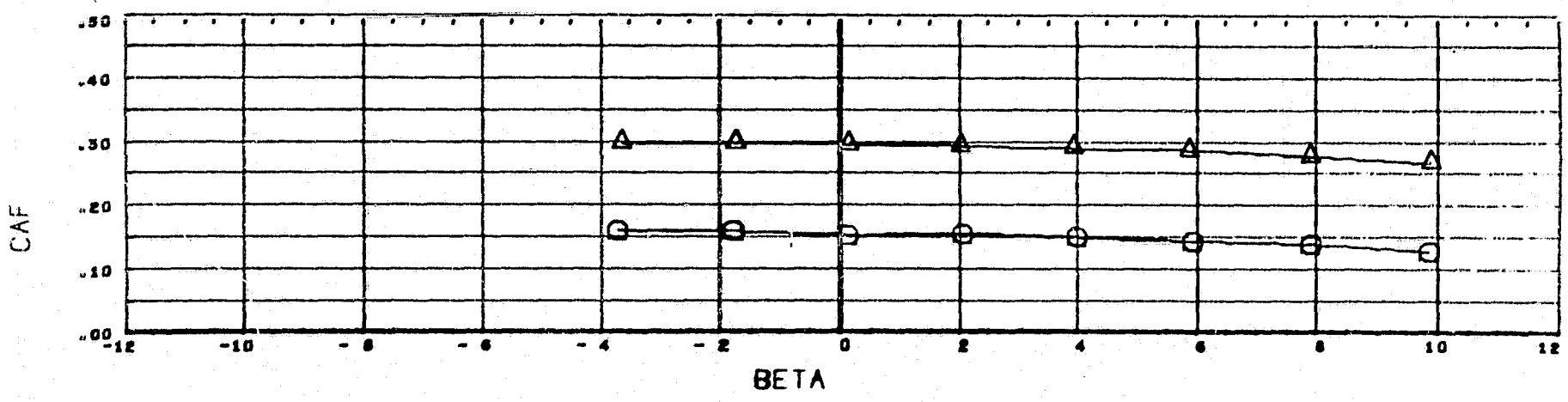
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES		REFERENCE INFORMATION		
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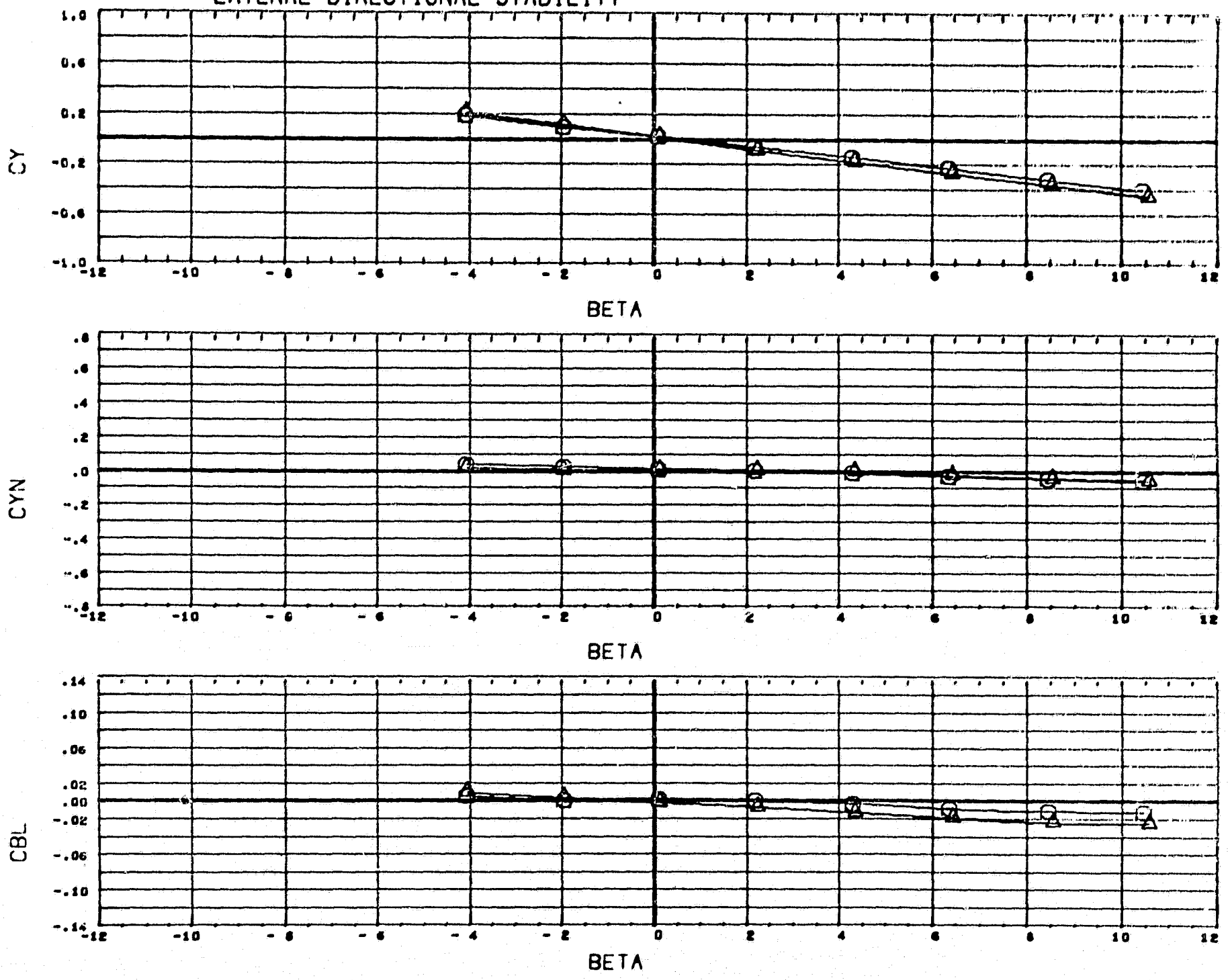
△	1.102			LREF	4.4260	IN.
				BREF	2.9690	IN.
				XMRP	5.7530	IN.
				YMRP	0.0000	IN.
				ZMRP	0.0000	IN.
				SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY



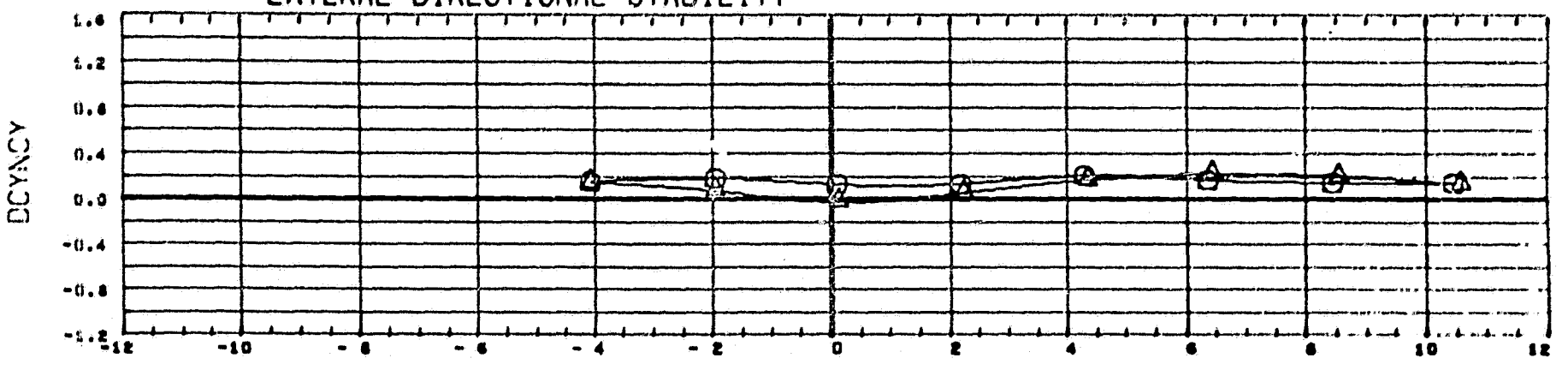
SYMBOL	MACH	PARAMETRIC VALUES			
◇	0.903	ALPHA	0.000	ORBINC -	2.000
△	1.102				

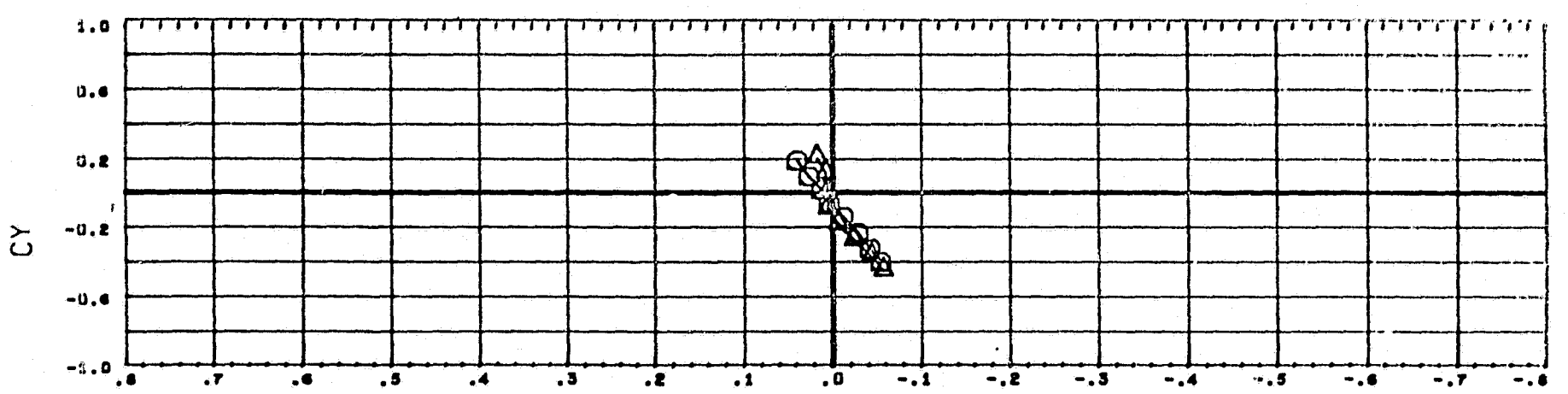
REFERENCE INFORMATION

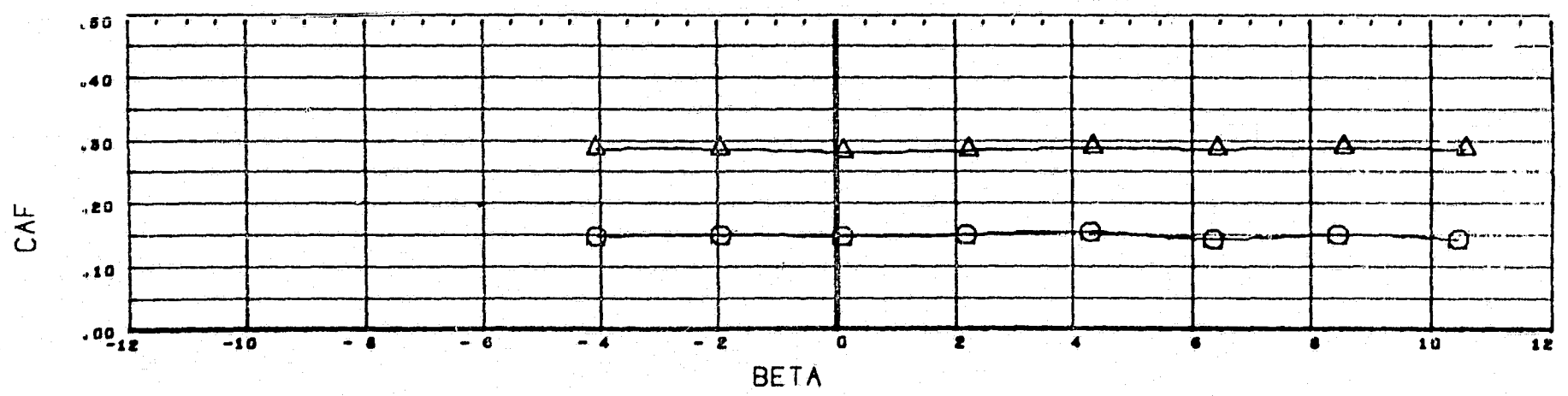
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES			
○	0.903	ALPHA	0.000	ORBINC	- 2.000
△	1.102				

DATA HIST. CODE GR

REFERENCE INFORMATION

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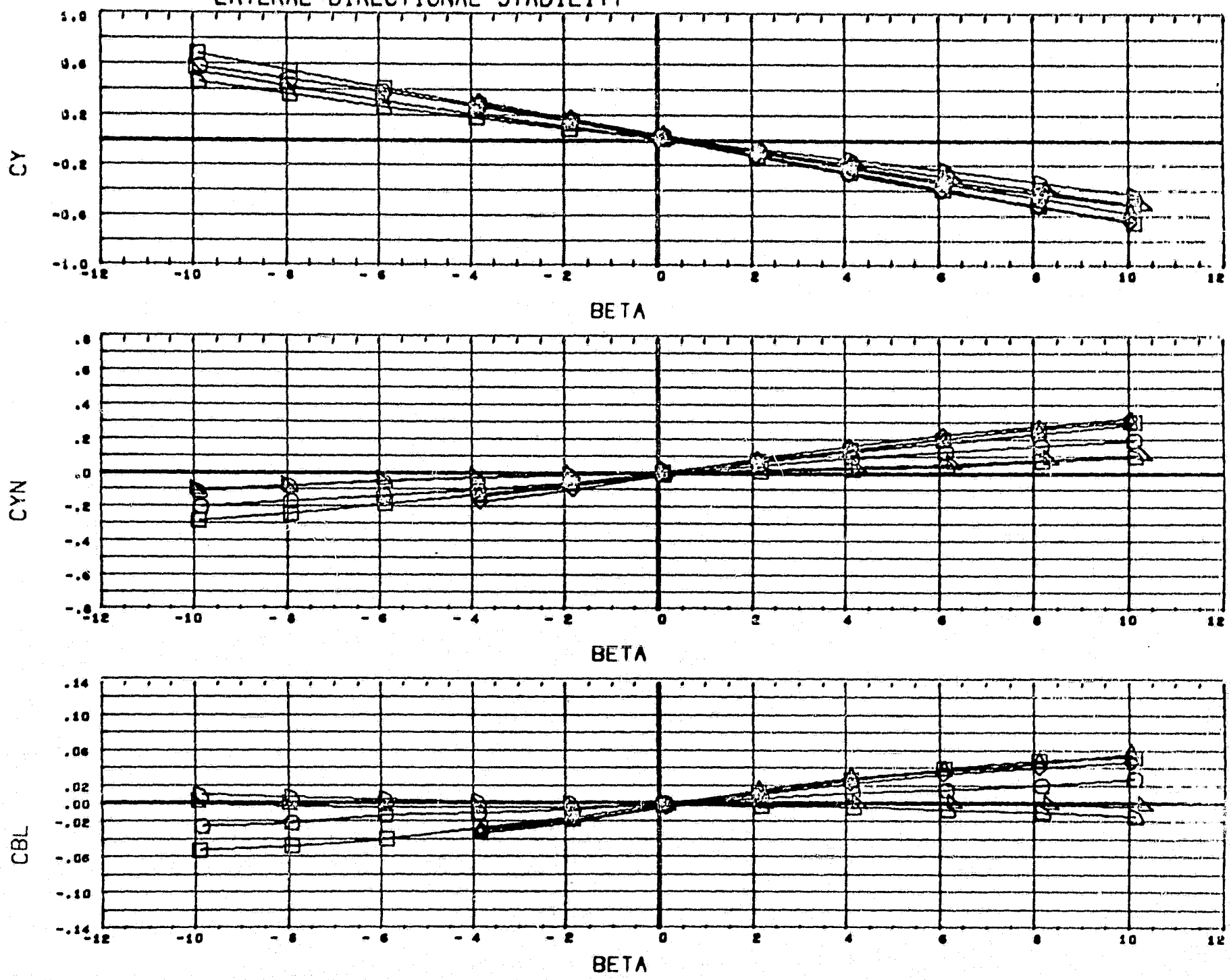
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES			
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□	1.461				
▽	2.740				
⬠	4.959	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
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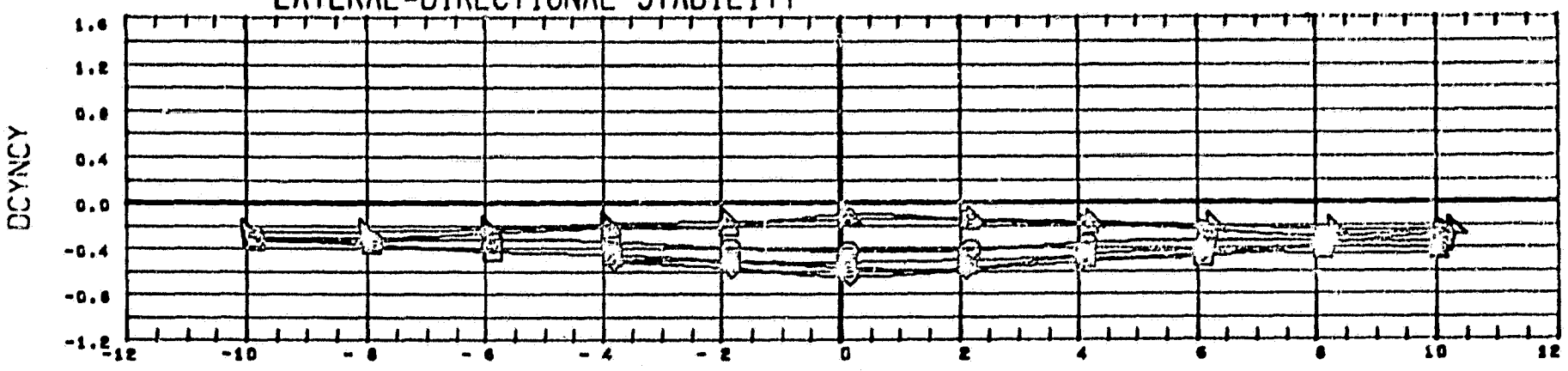
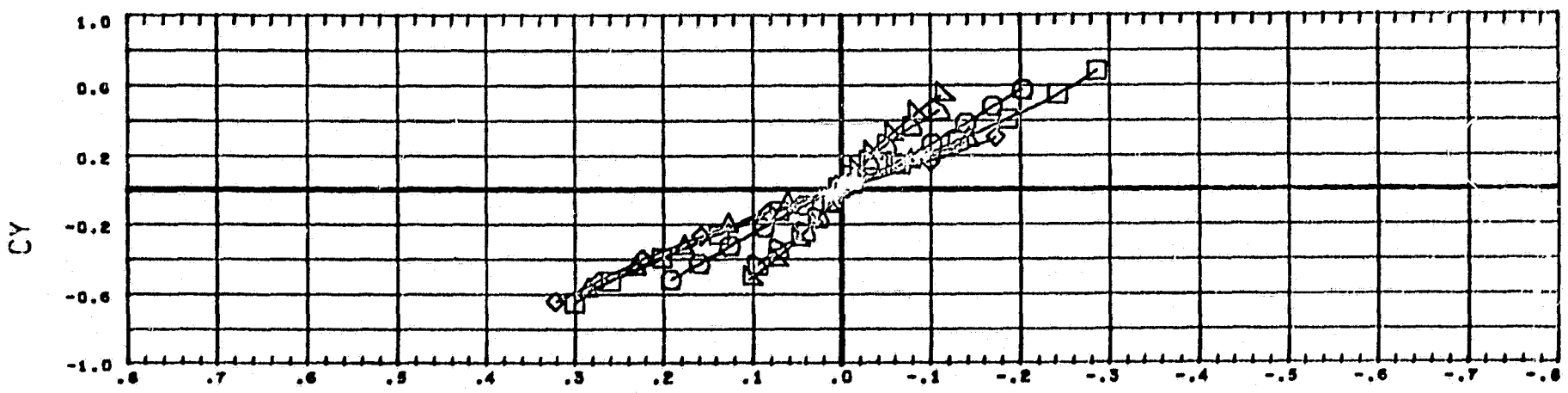
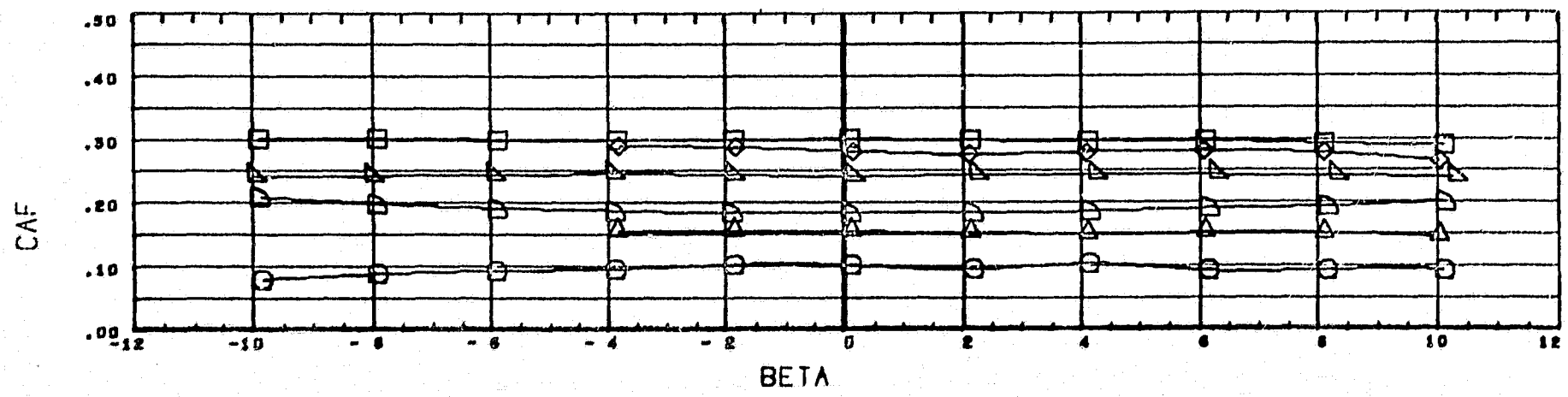
BREF	2.9690	IN.
XMRP	3.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES			REFERENCE INFORMATION		
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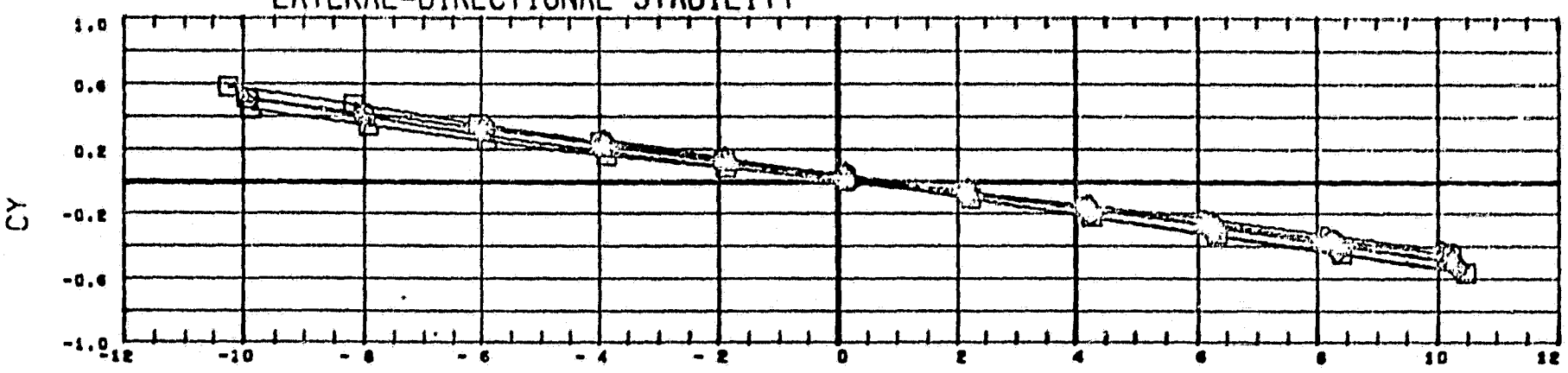
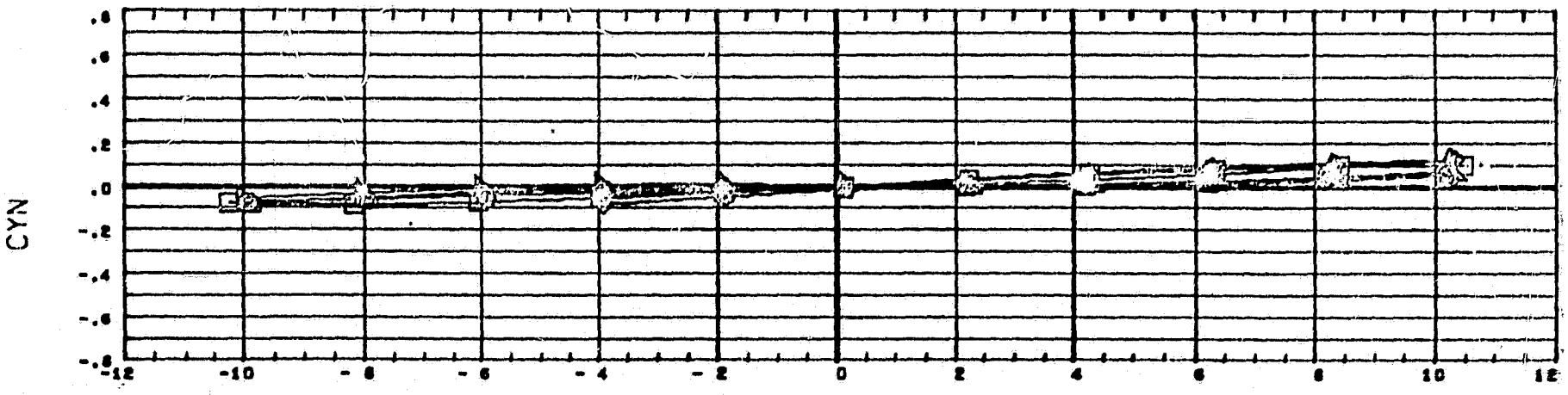
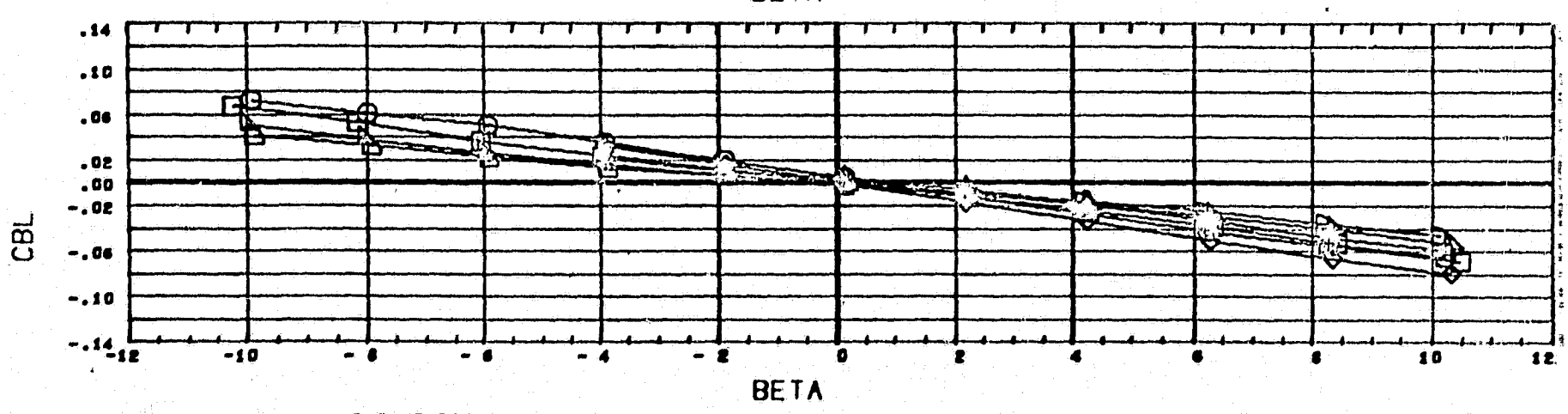
△	0.900				LREF	4.4260	IN.
◇	1.103				BREF	2.9690	IN.
□	1.461				XMRP	5.7530	IN.
▽	2.740				YMRP	0.0000	IN.
D	4.959	DATA HIST. CODE	GR		ZMRP	0.0000	IN.
					SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES			
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◇	1.097				
□	1.463				
▽	2.740				
D	4.959	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
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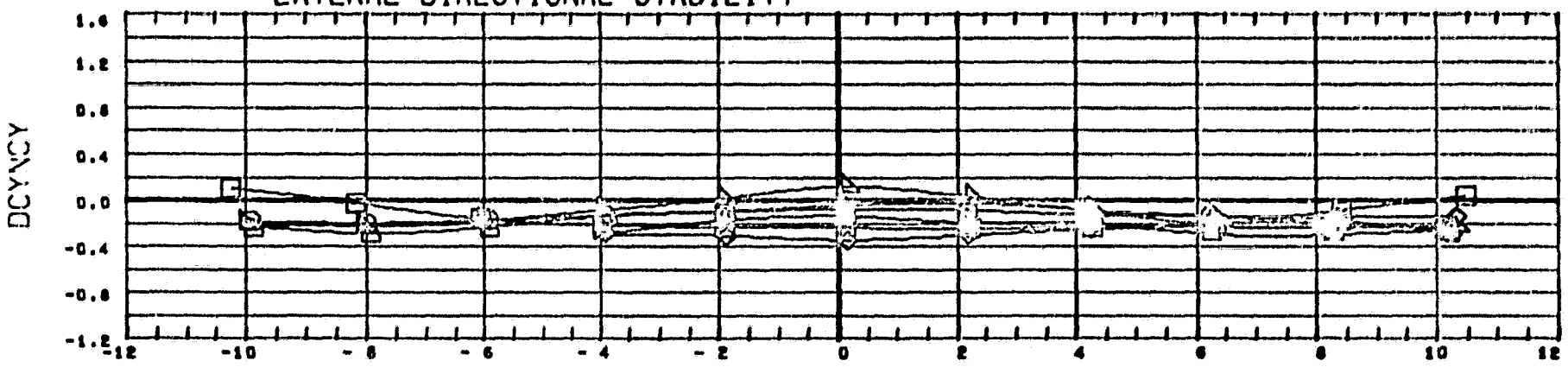
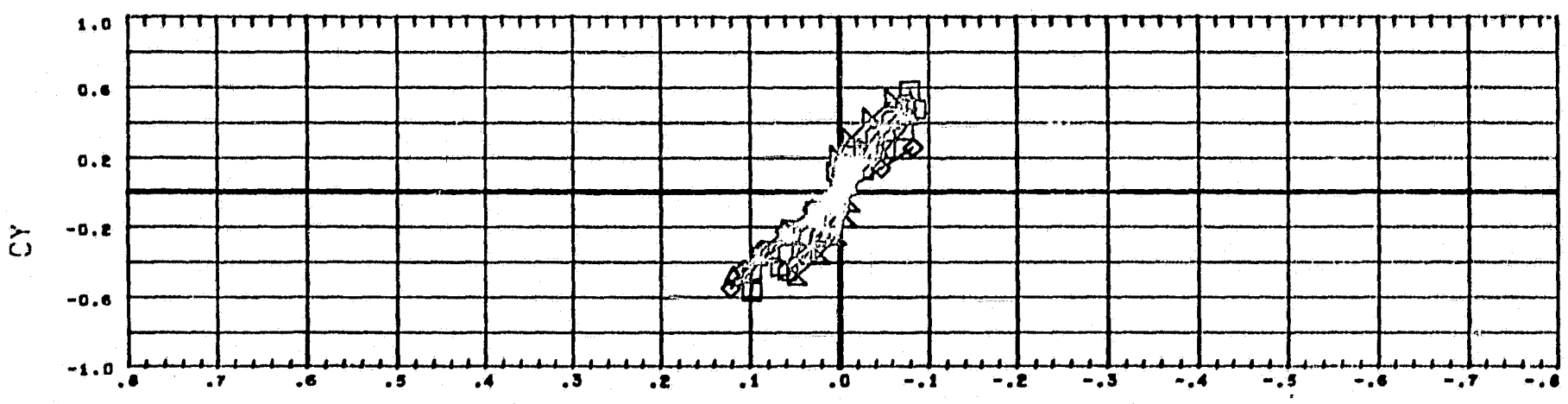
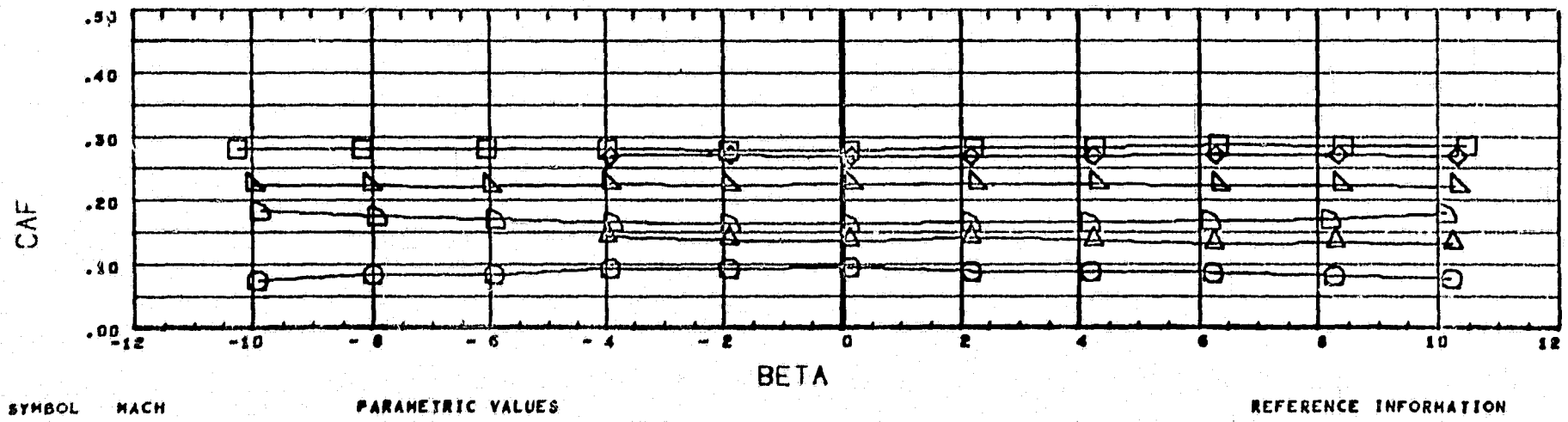
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES			
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◁	4.959	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
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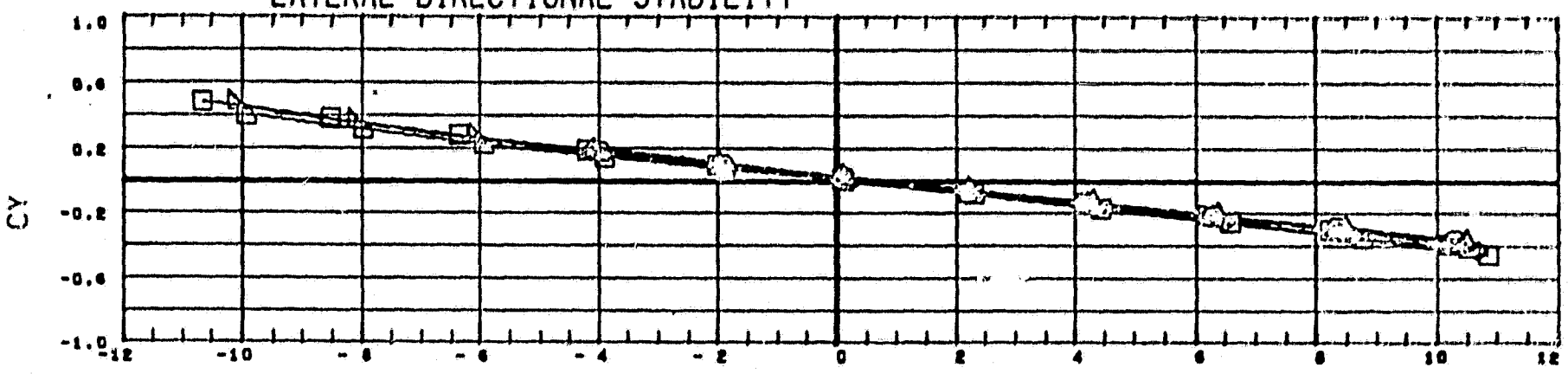
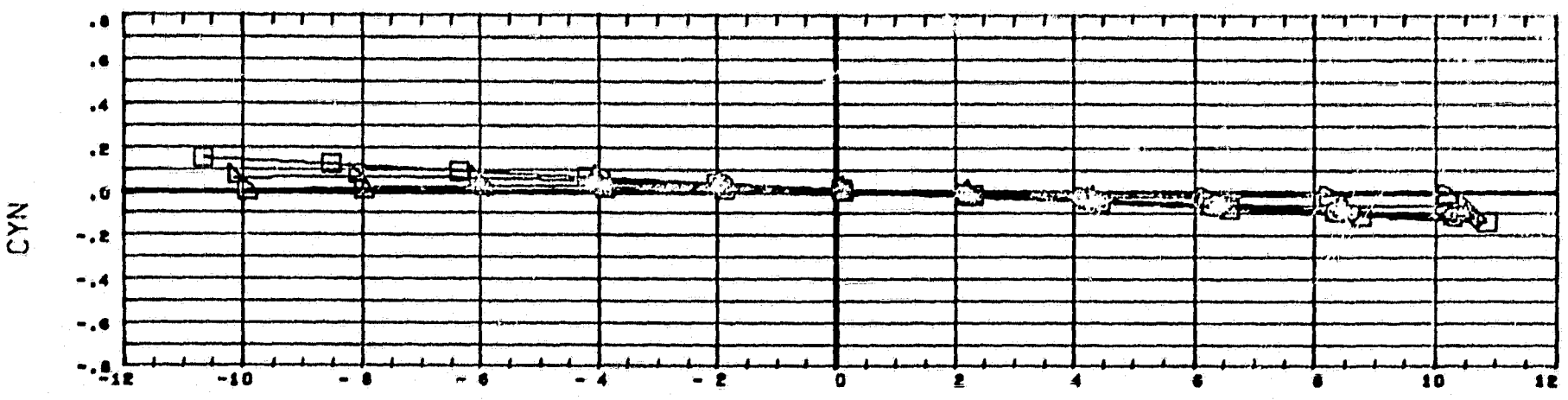
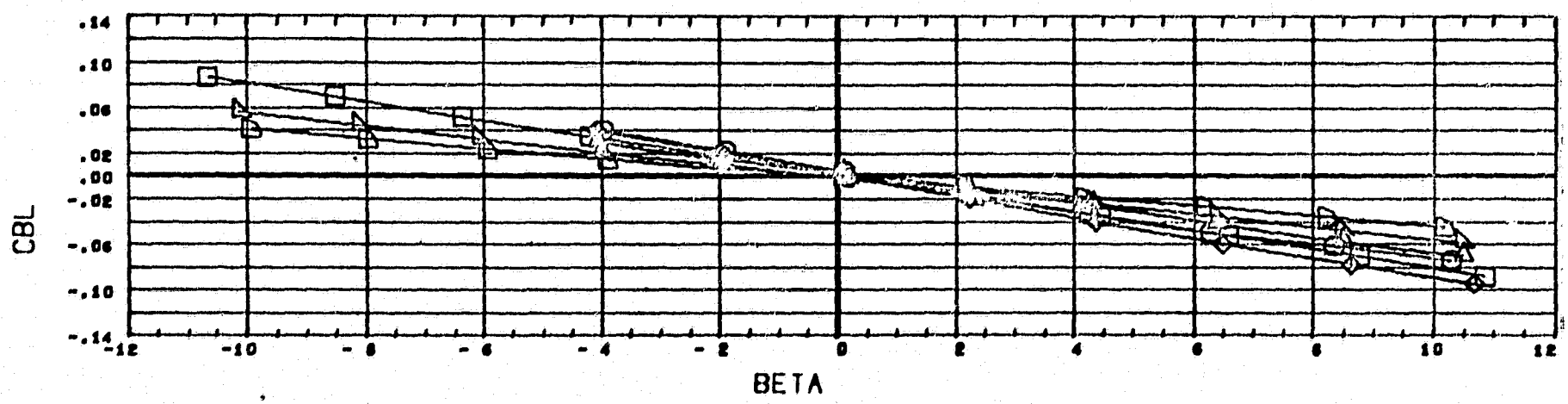
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES		
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□	1.460			
▽	2.740			
◁	4.959	DATA HIST. CODE	GR	

REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
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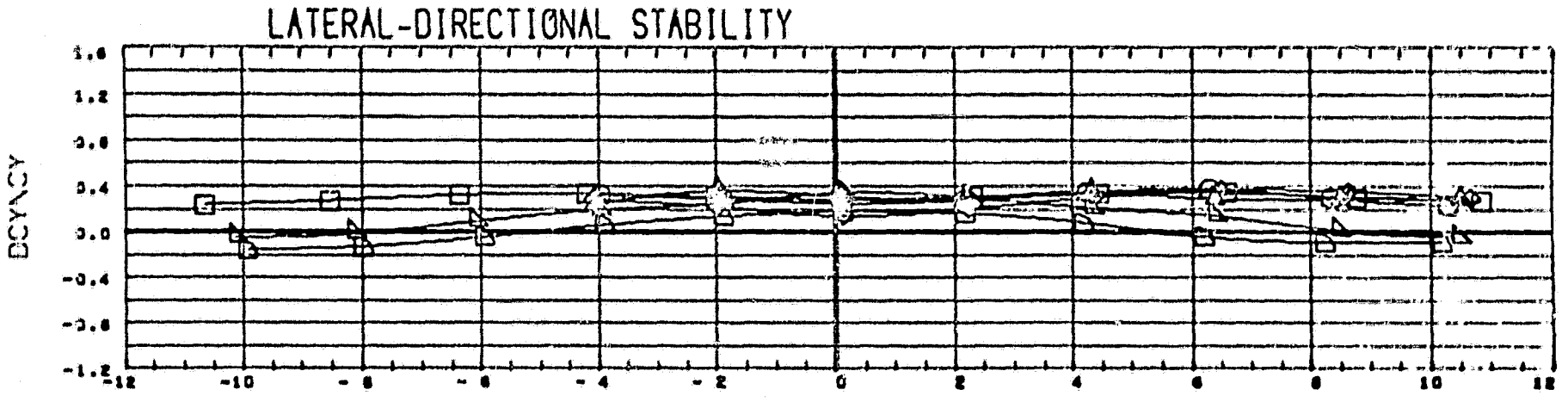
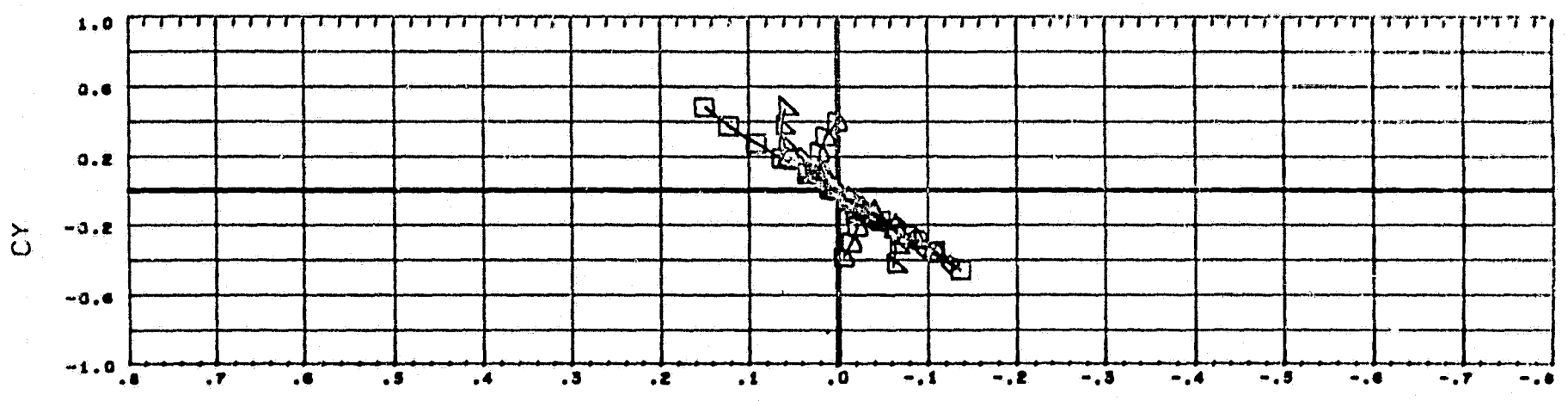
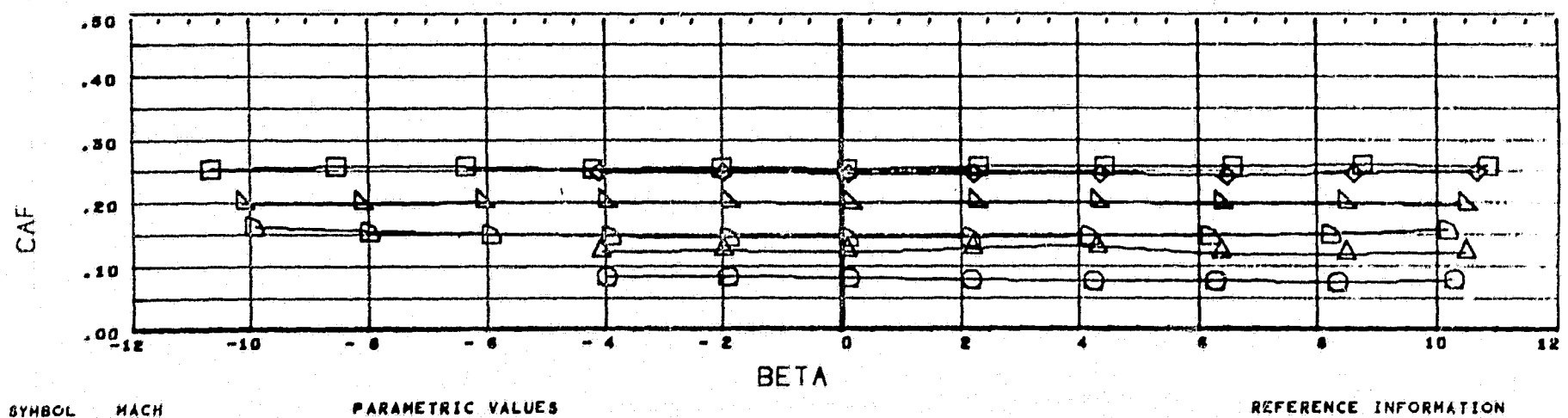
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES			
○	0.596	ALPHA	0.000	ORBINC -	2.000
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◇	1.102				
□	1.460				
▽	2.740				
◁	4.958	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
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LREF	4.4260	IN.
BREF	2.9690	IN.
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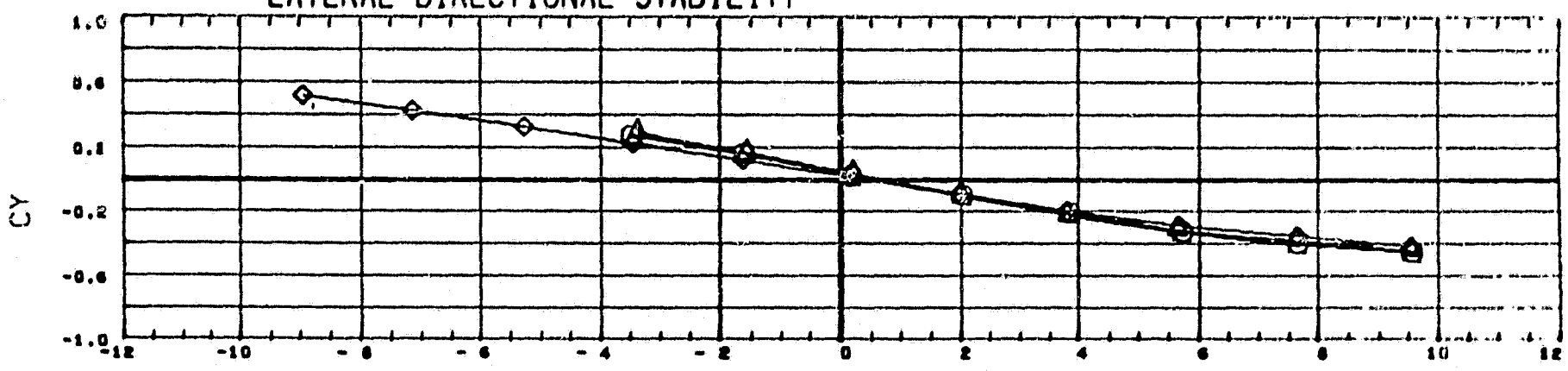
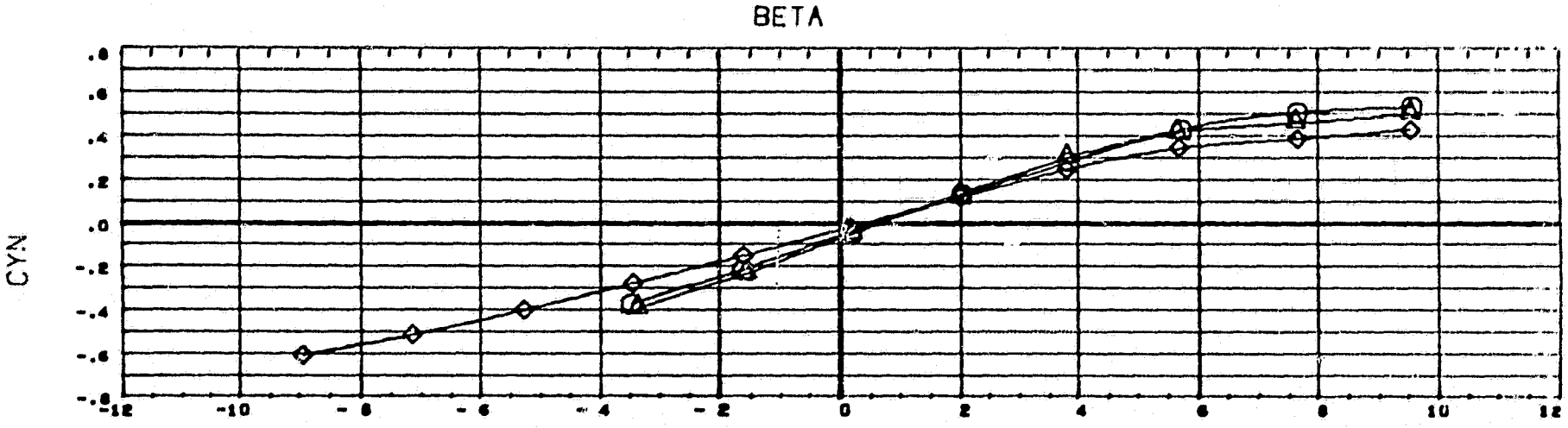
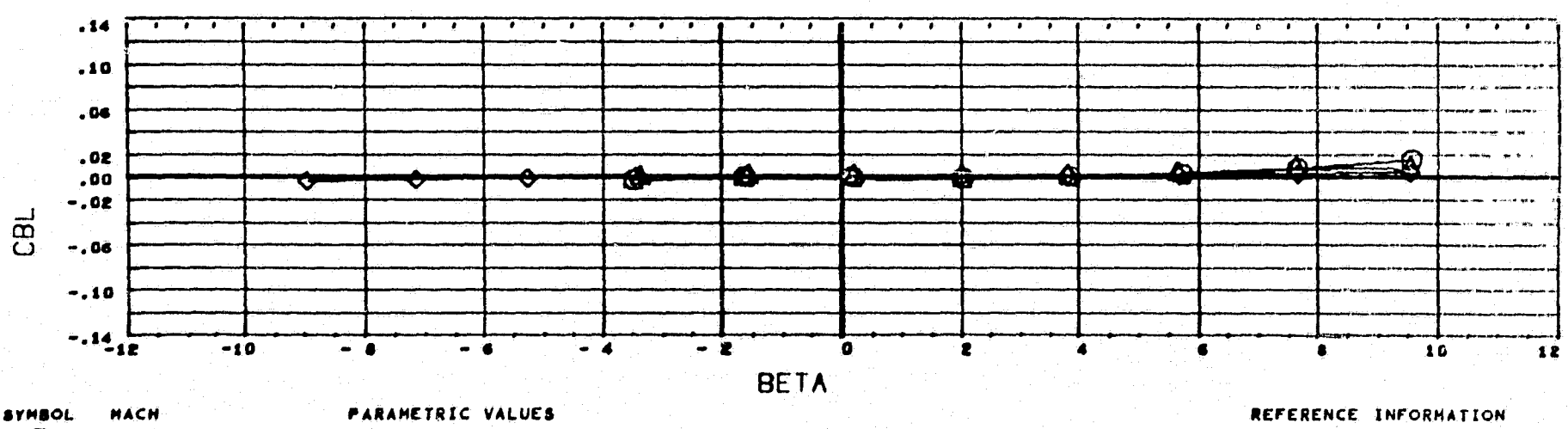
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH		PARAMETRIC VALUES
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△	1.105		
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REFERENCE INFORMATION

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LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
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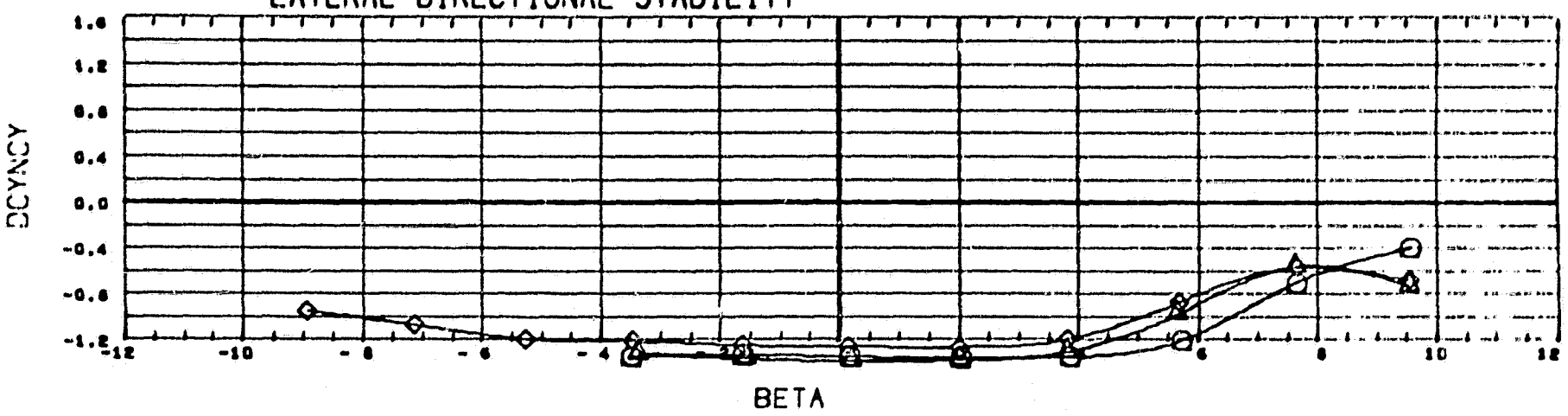
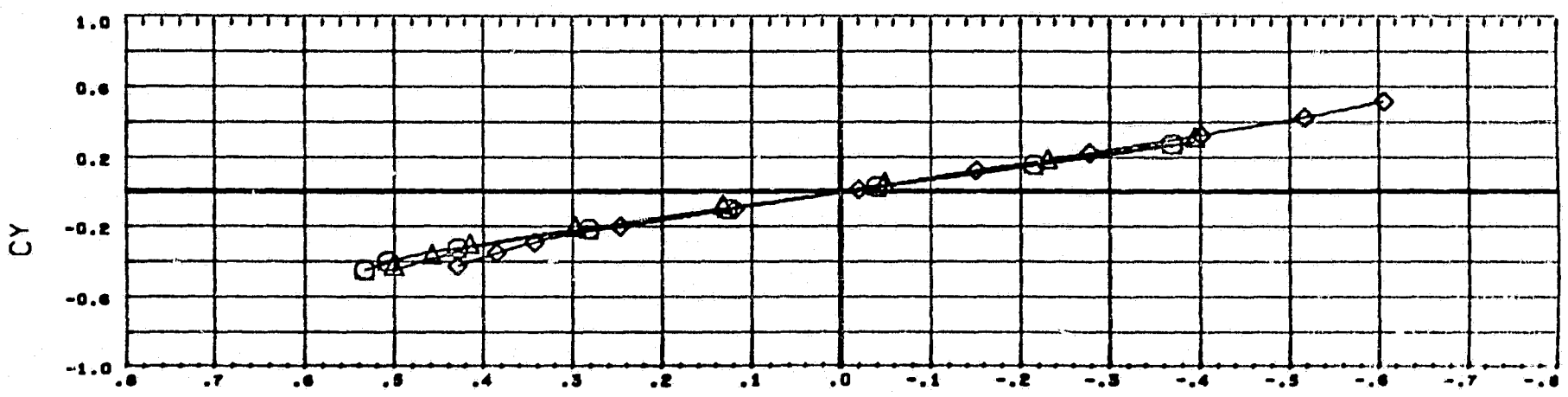
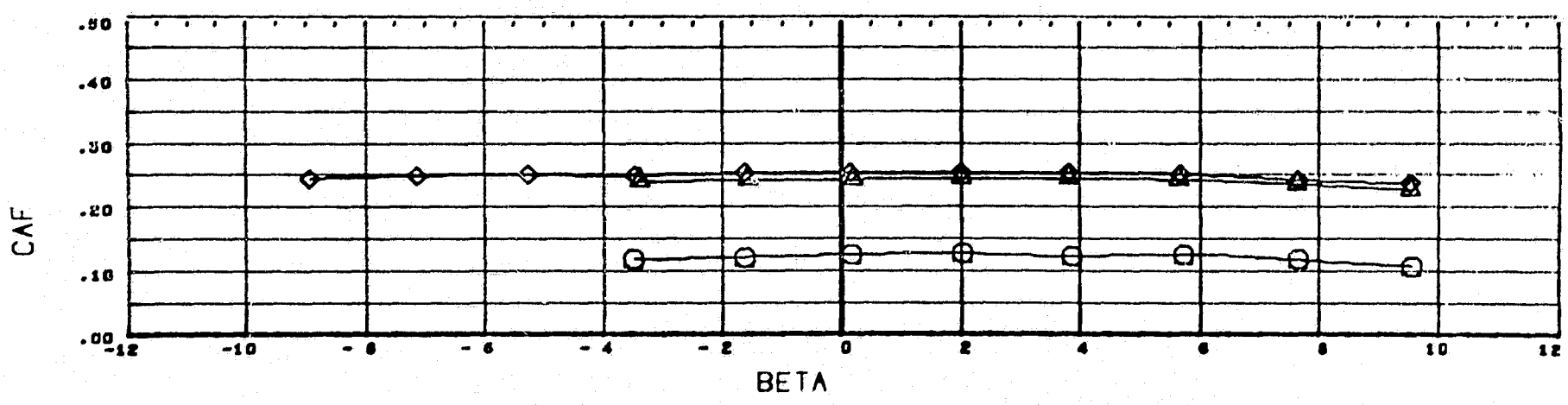
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY







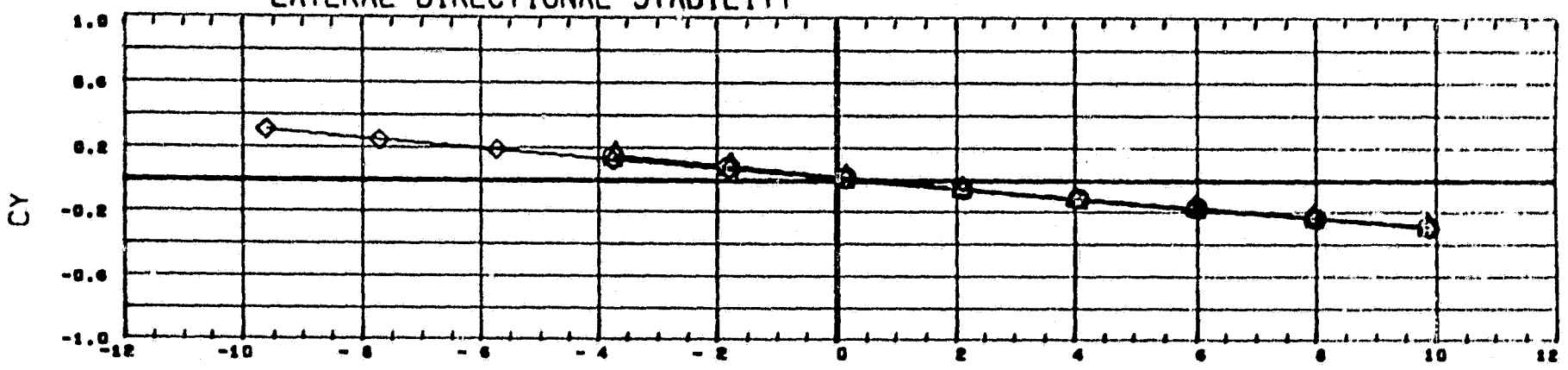
SYMBOL	MACH		PARAMETRIC VALUES
○	0.900	ALPHA	0.000
△	1.103		
◇	1.461		

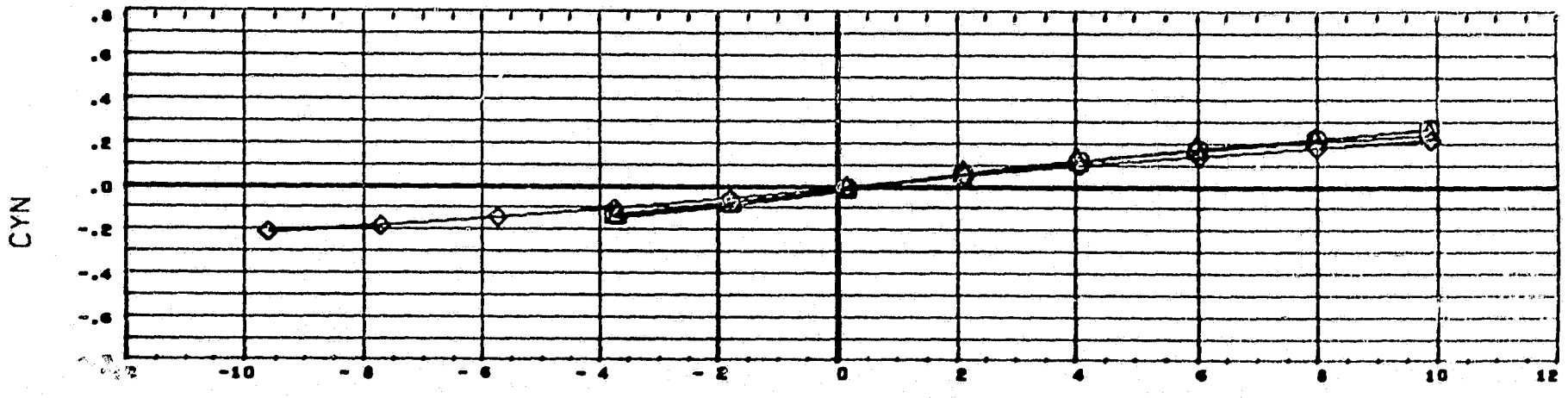
DATA HIST. CODE GR

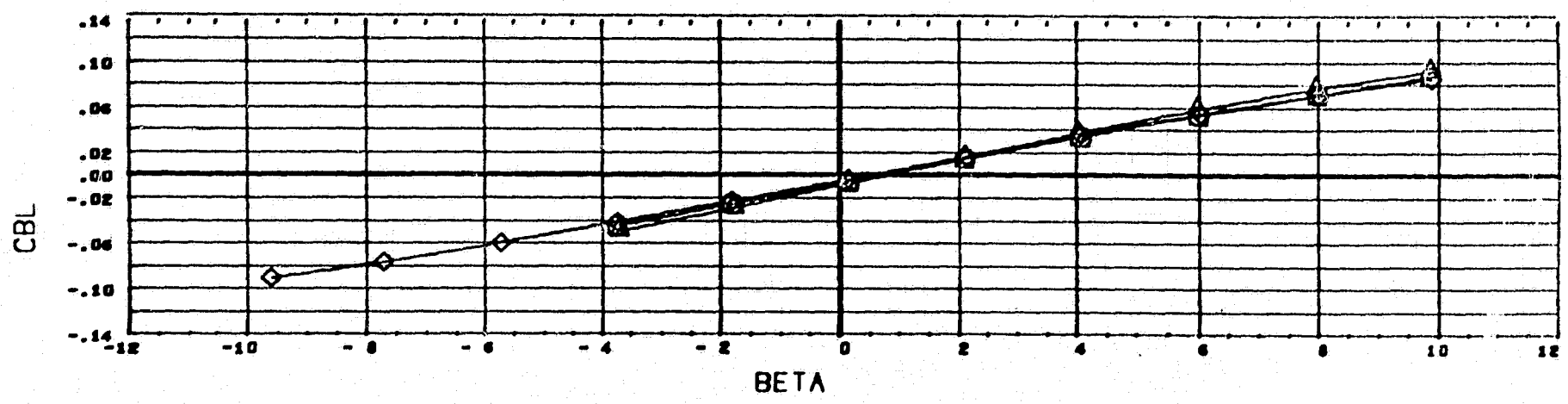
REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES	
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△	1.103		
◇	1.458		

REFERENCE INFORMATION

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BREF	2.9690	IN.
XMRP	5.7530	IN.
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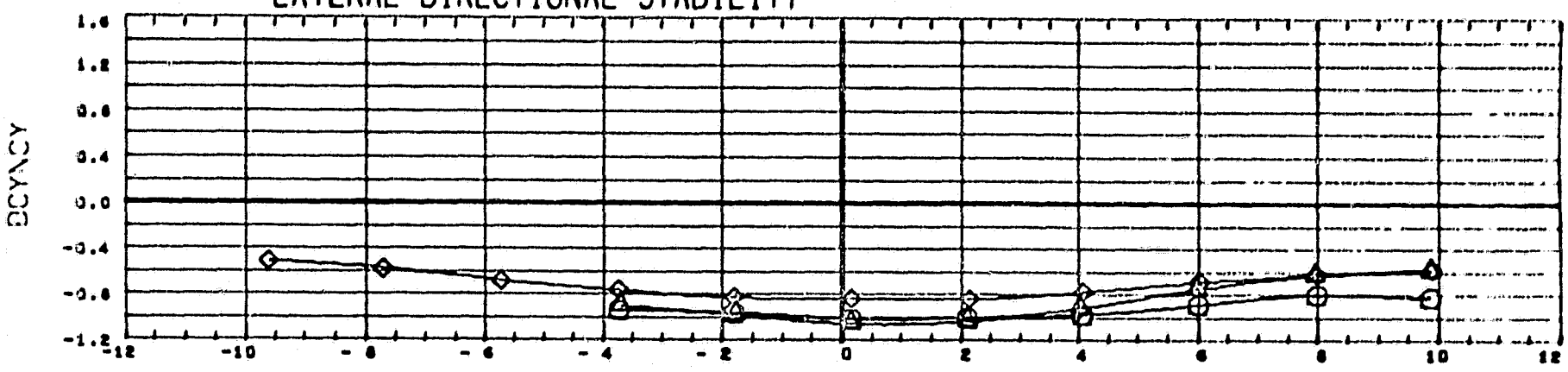
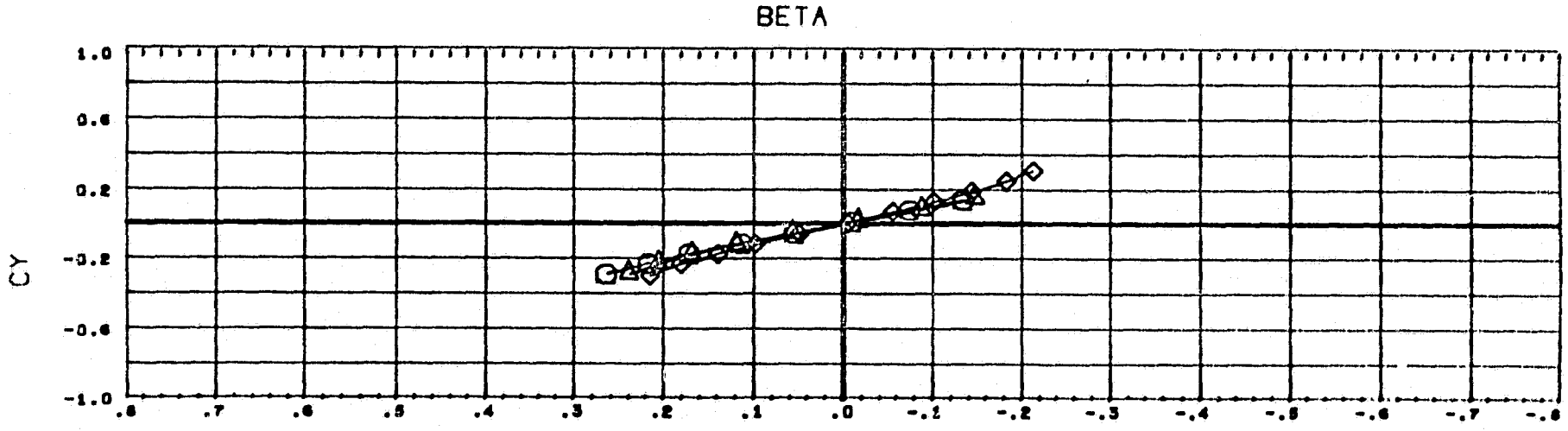
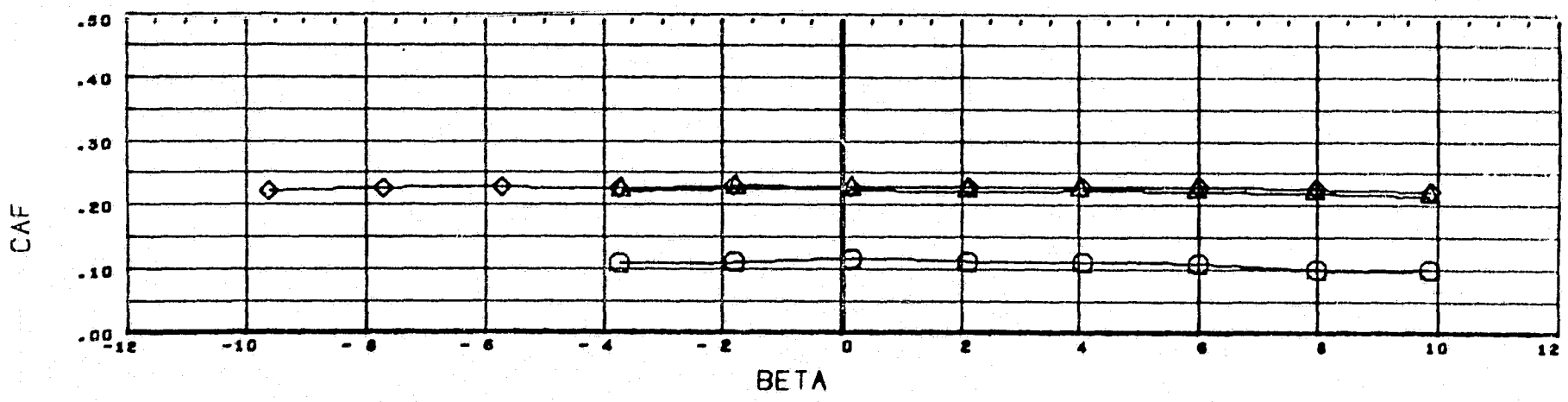
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH		PARAMETRIC VALUES
○	0.899	ALPHA	0.000
△	1.103		
◇	1.458		

REFERENCE INFORMATION

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LREF	4.4260	IN.
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XMRP	5.7530	IN.
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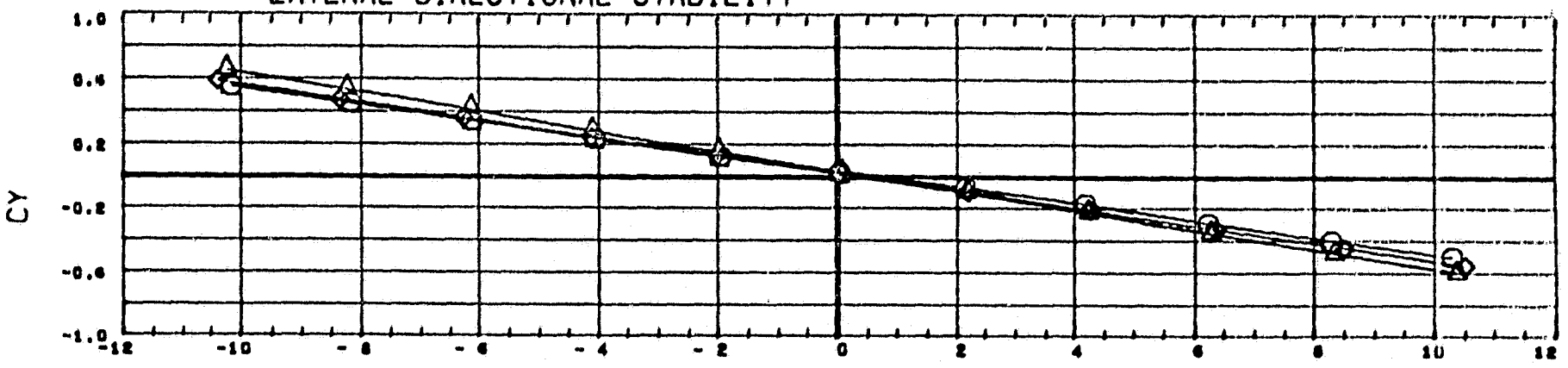
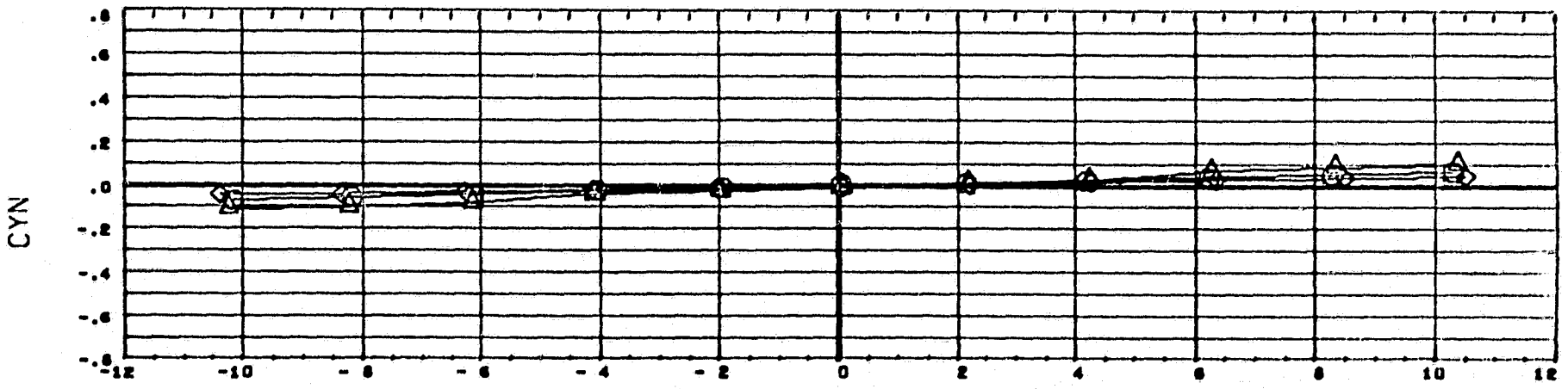
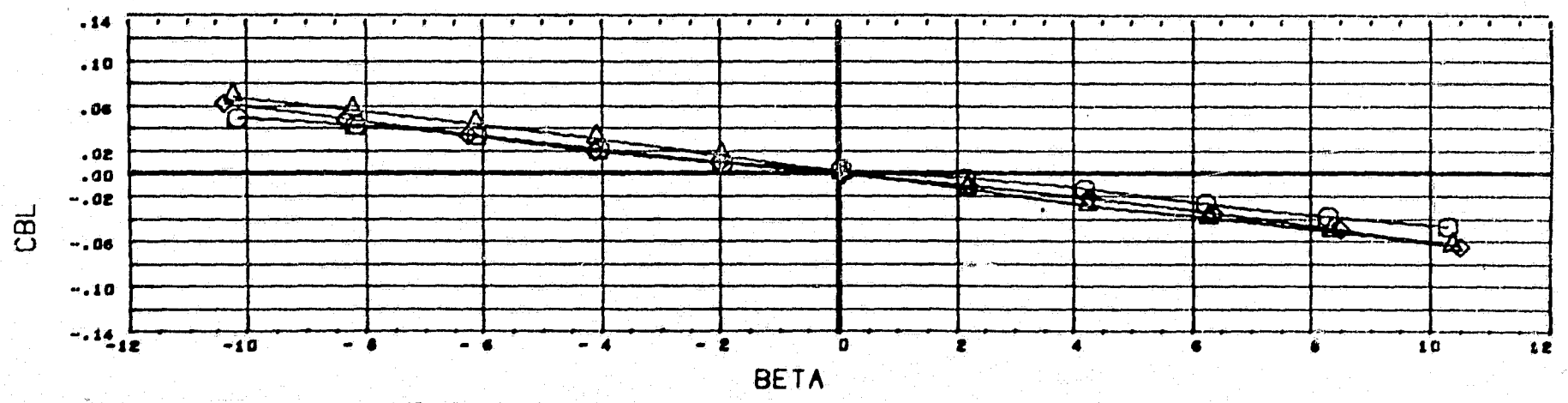
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH		PARAMETRIC VALUES		
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◇	1.460				

REFERENCE INFORMATION

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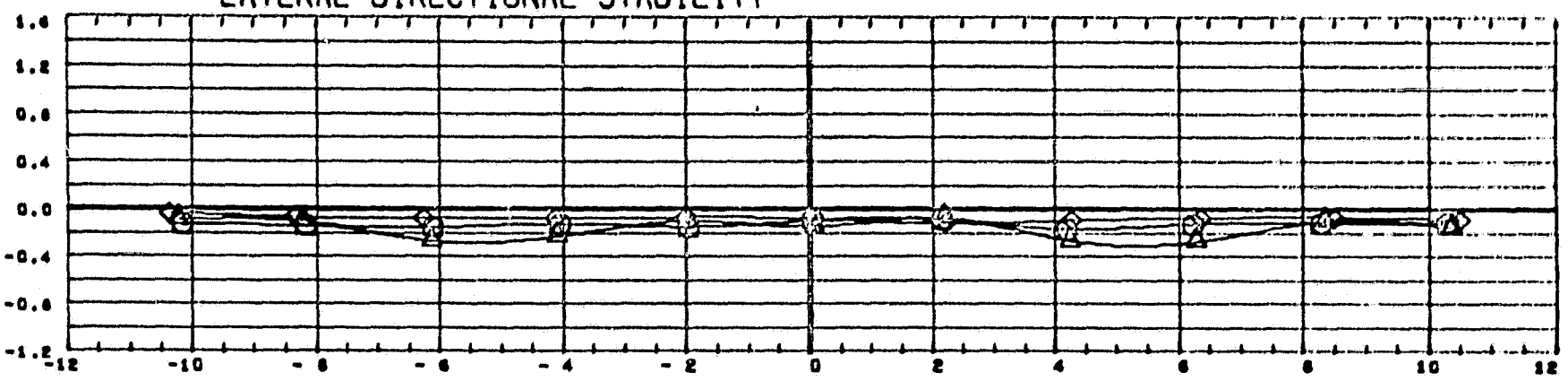
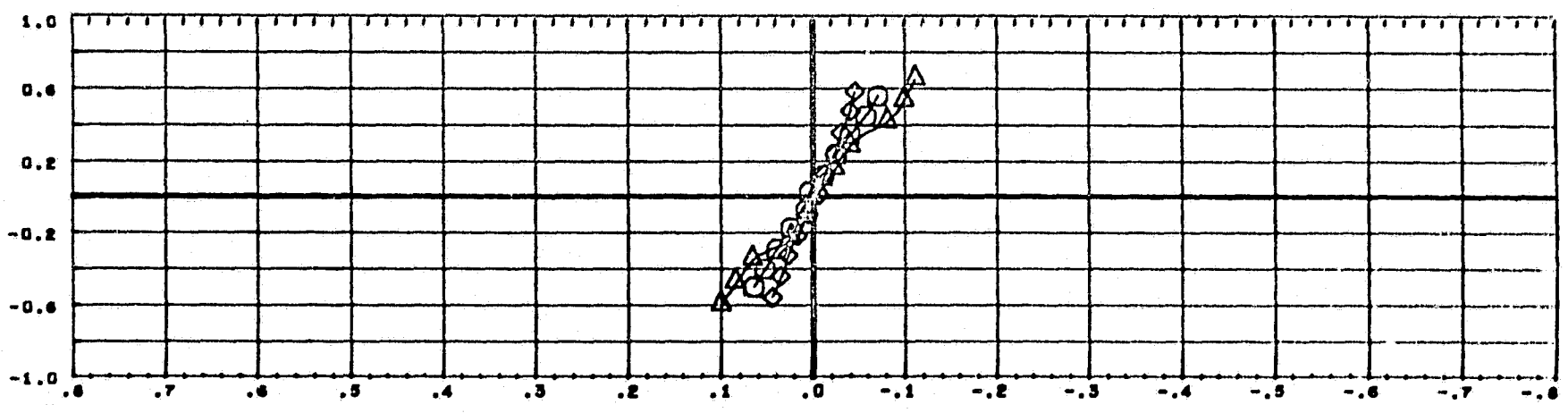
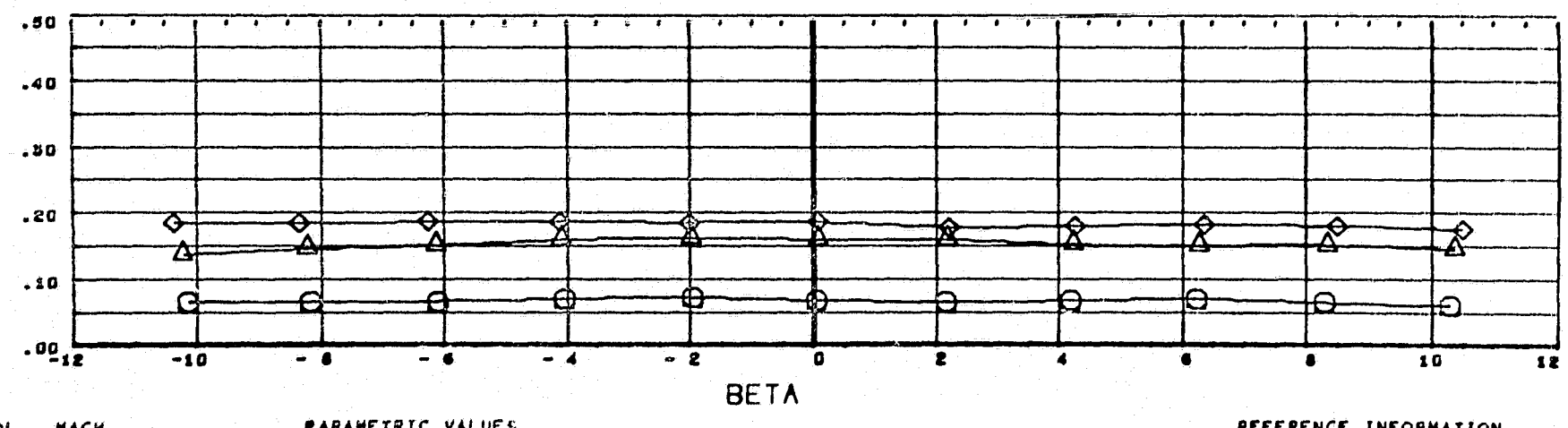
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES			
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△	1.099				
◇	1.460				

DATA HIST. CODE GR

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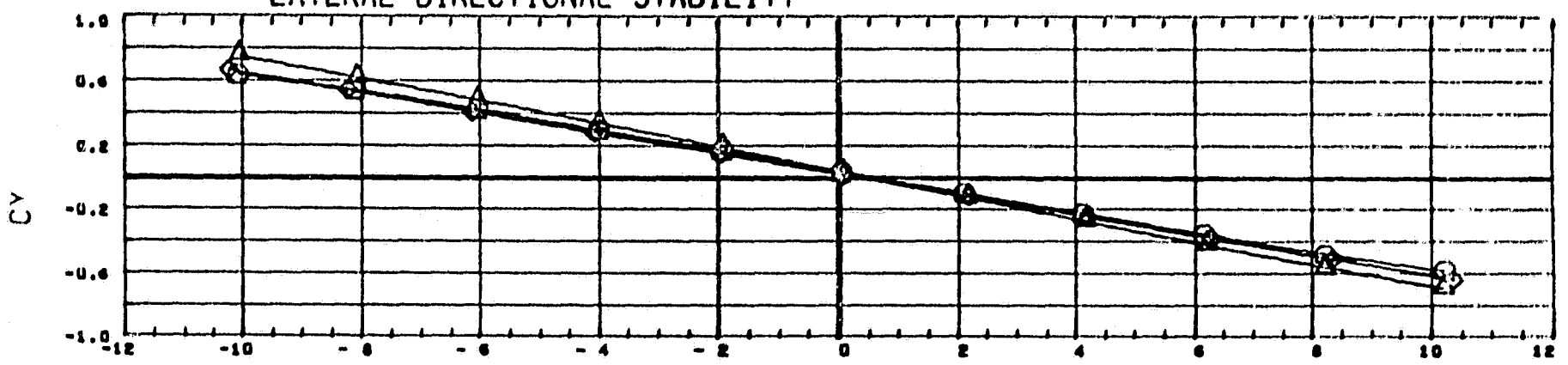
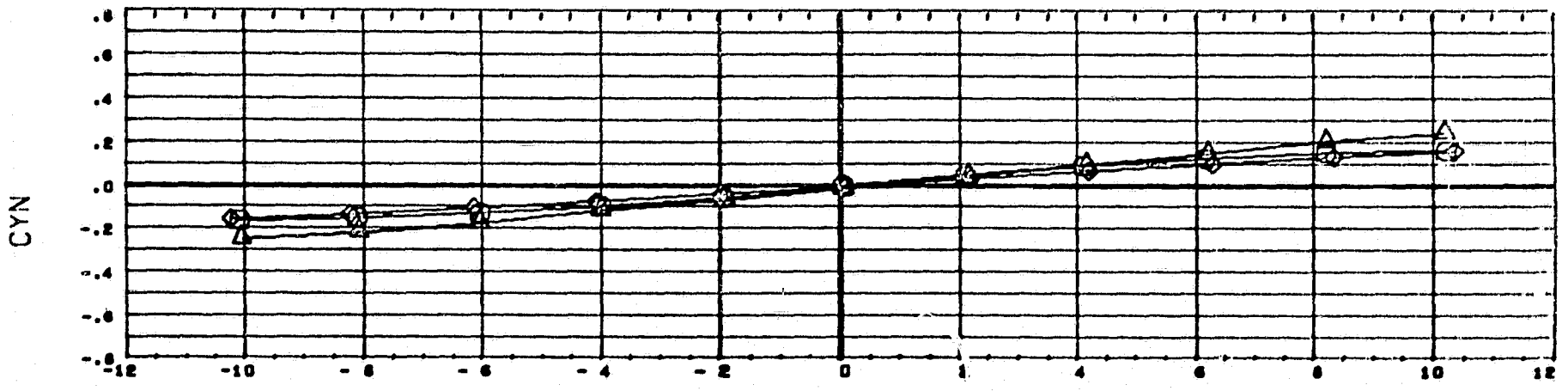
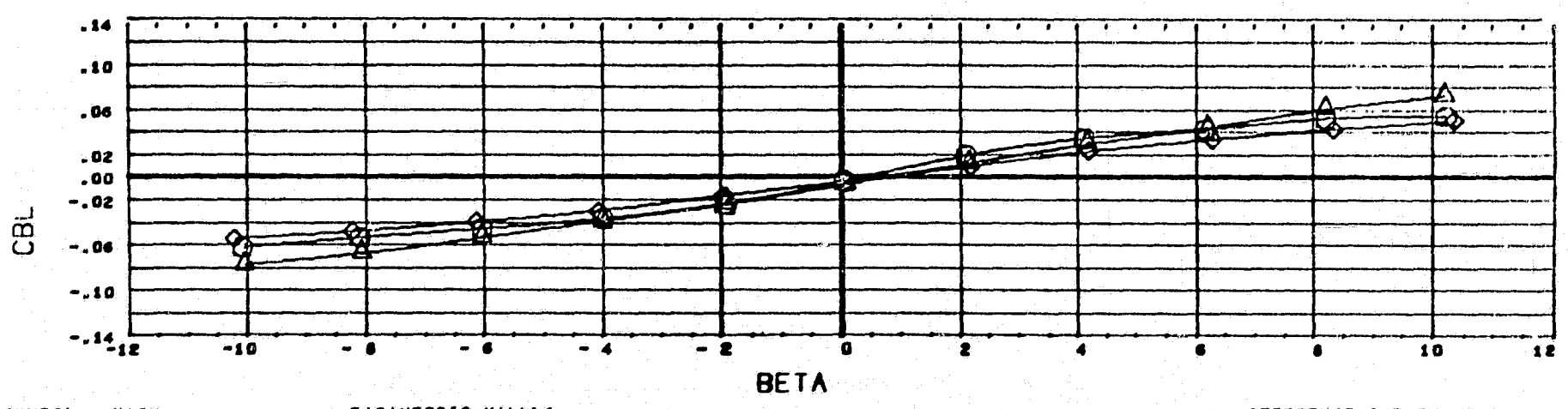
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES		
○	0.900	ALPHA	0.000	ORBINC - 2.000
△	1.100			
◇	1.461			

REFERENCE INFORMATION

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LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3530	IN.
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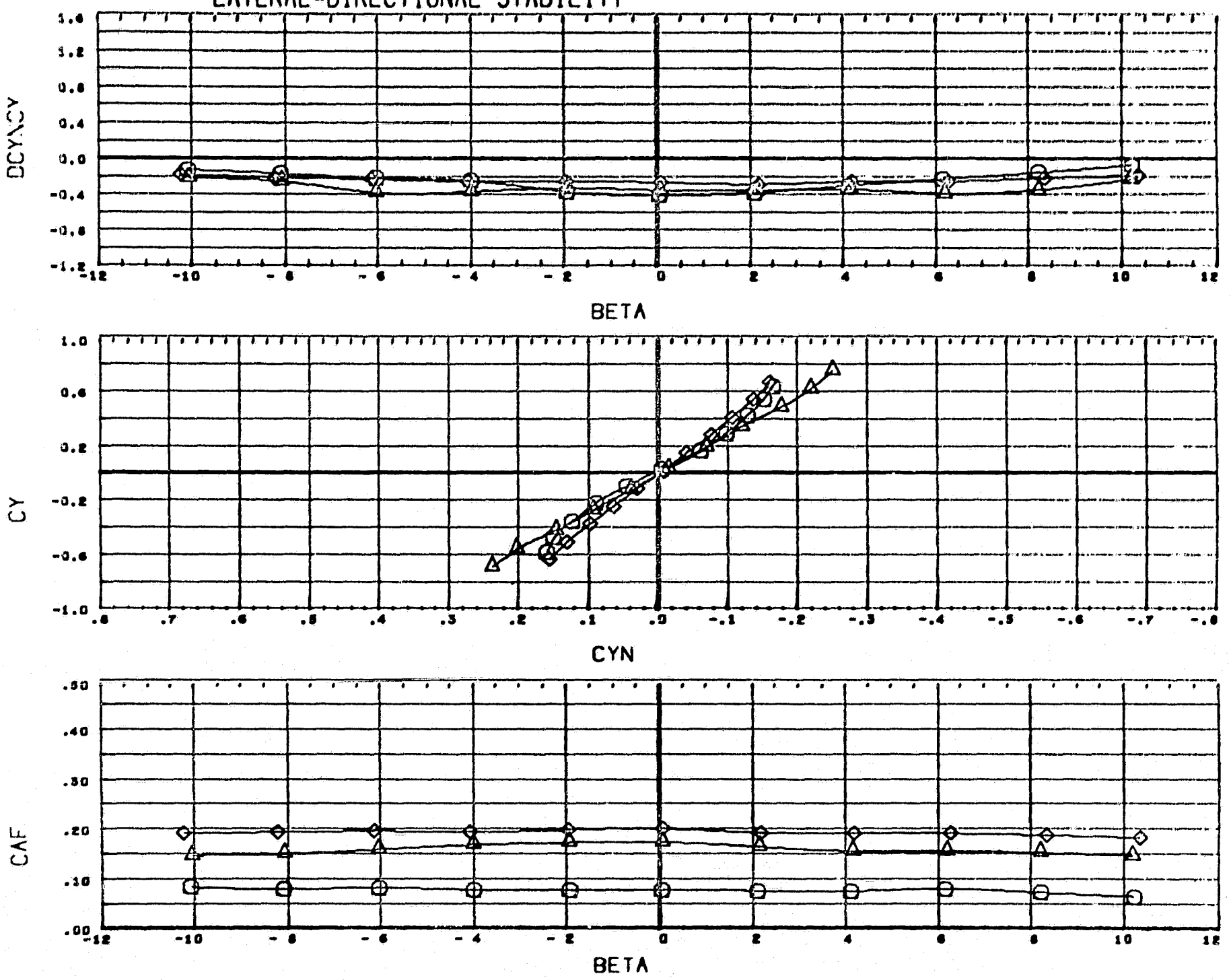
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH		PARAMETRIC VALUES		
○	0.900	ALPHA	0.000	ORBINC -	2.000
△	1.100				
◇	1.461				

DATA HIST. CODE GR

REFERENCE INFORMATION		
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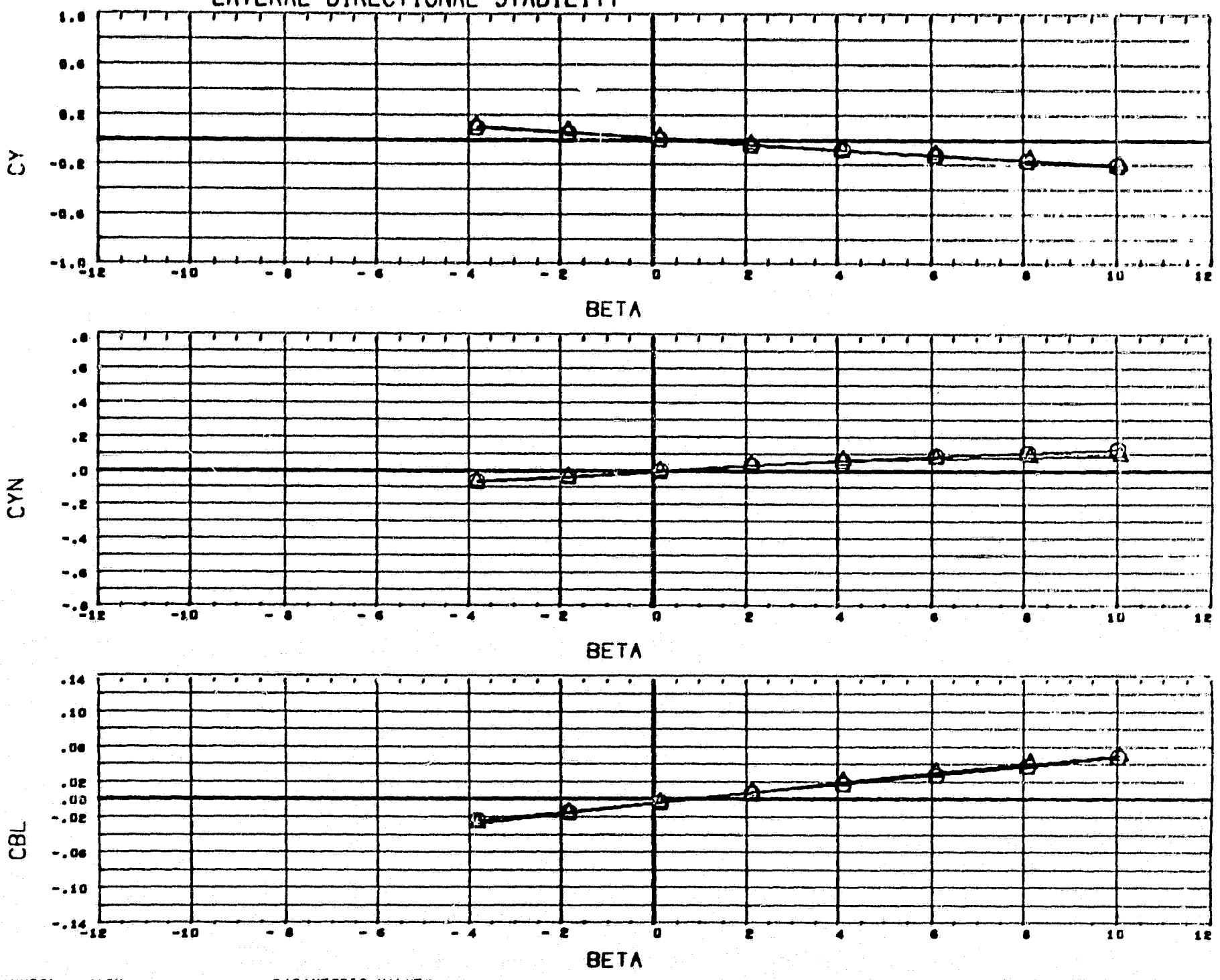
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH		PARAMETRIC VALUES
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△	1.105		

REFERENCE INFORMATION

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BREF	2.9690	IN.
XMRP	5.7530	IN.
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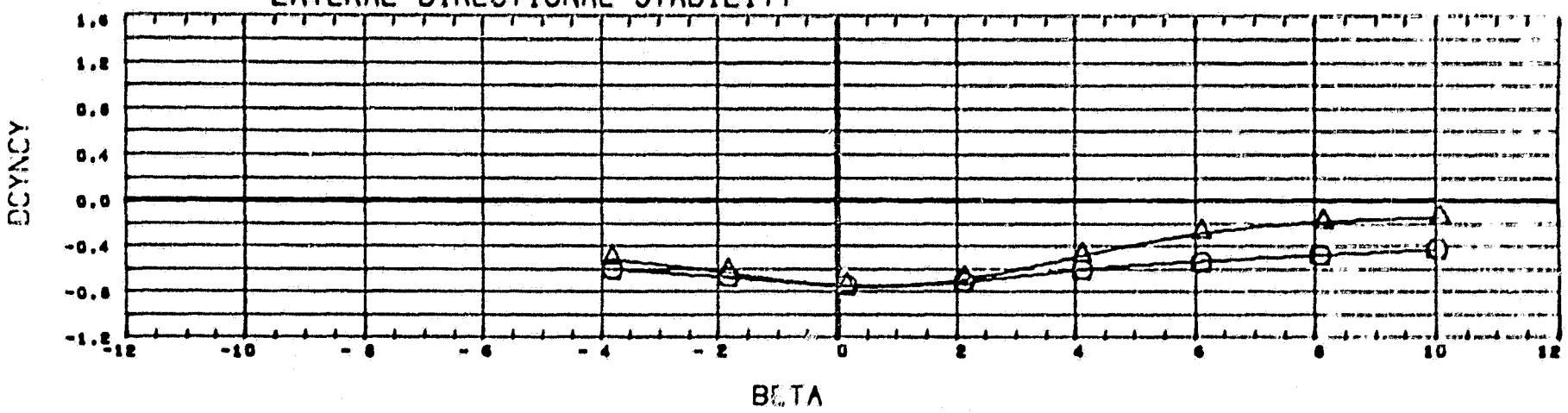
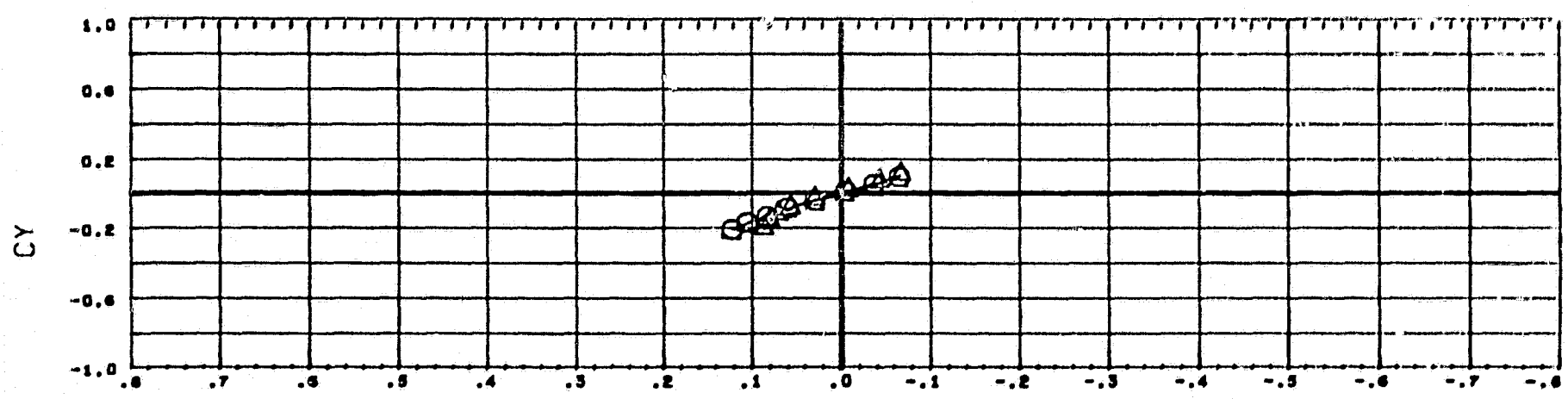
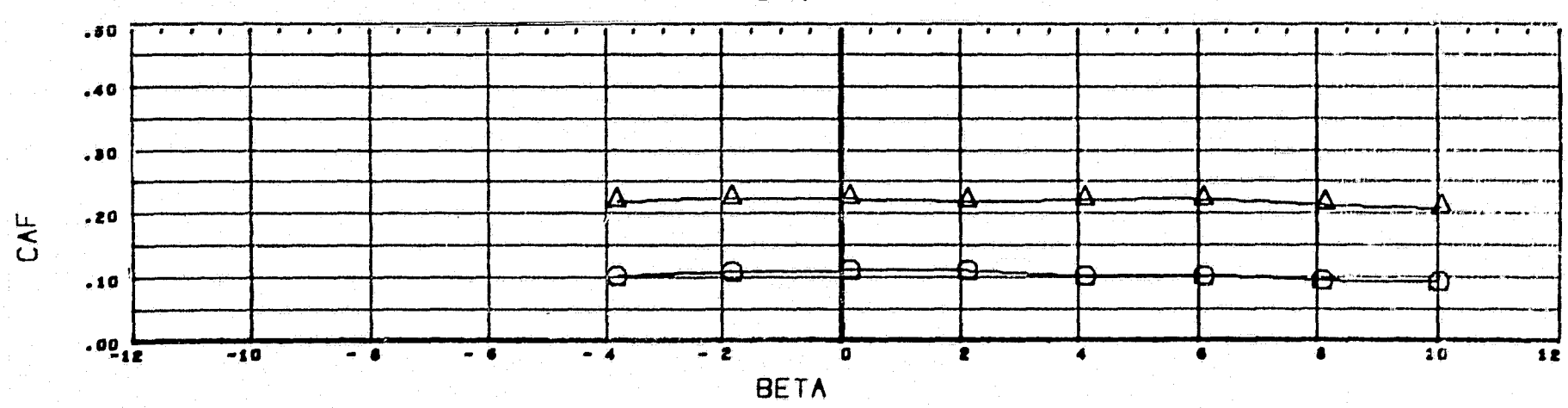
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH		PARAMETRIC VALUES
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△	1.105		

DATA HIST. CODE GR

REFERENCE INFORMATION

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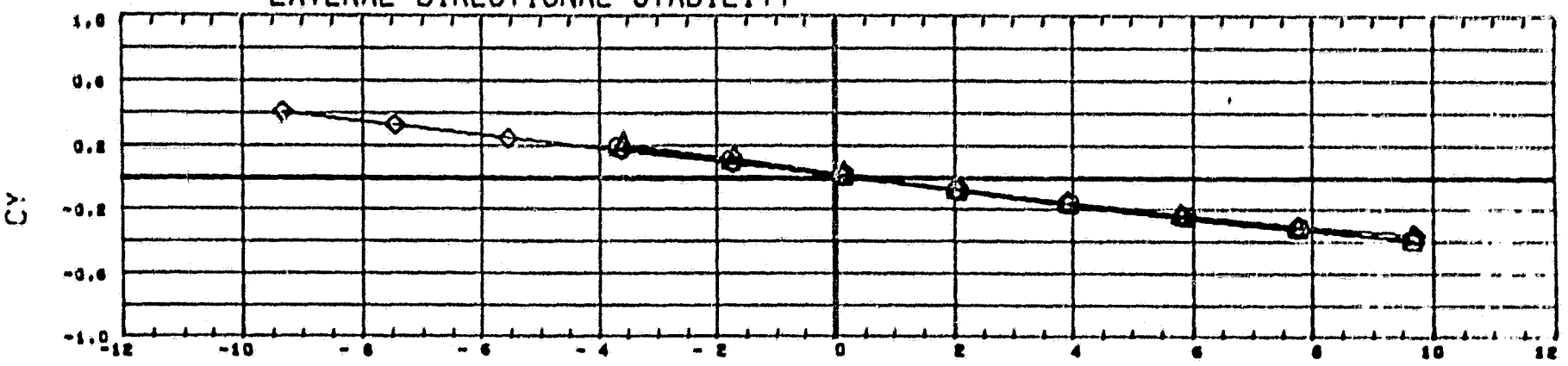
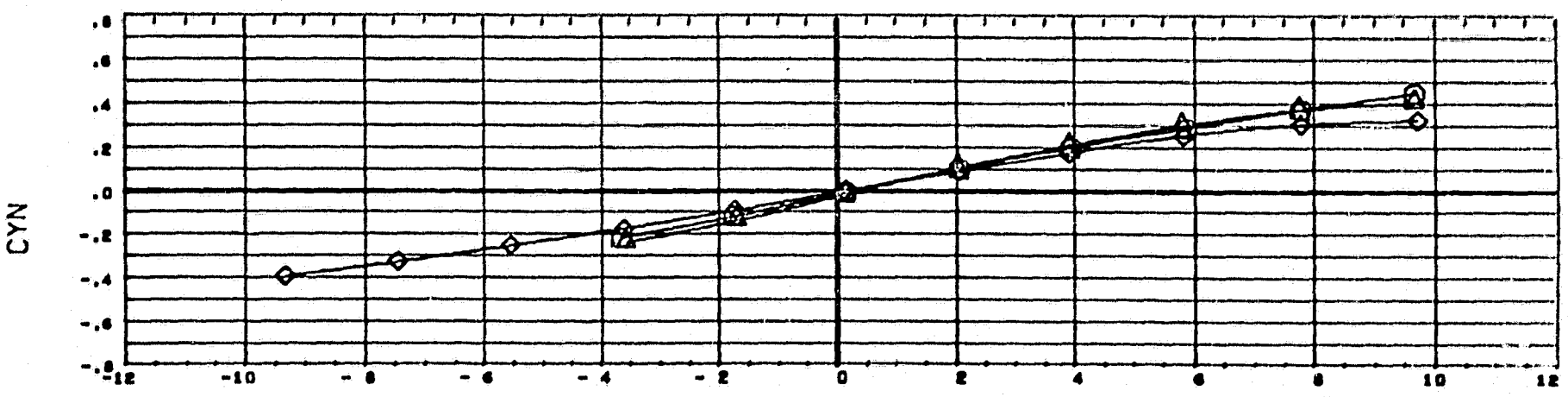
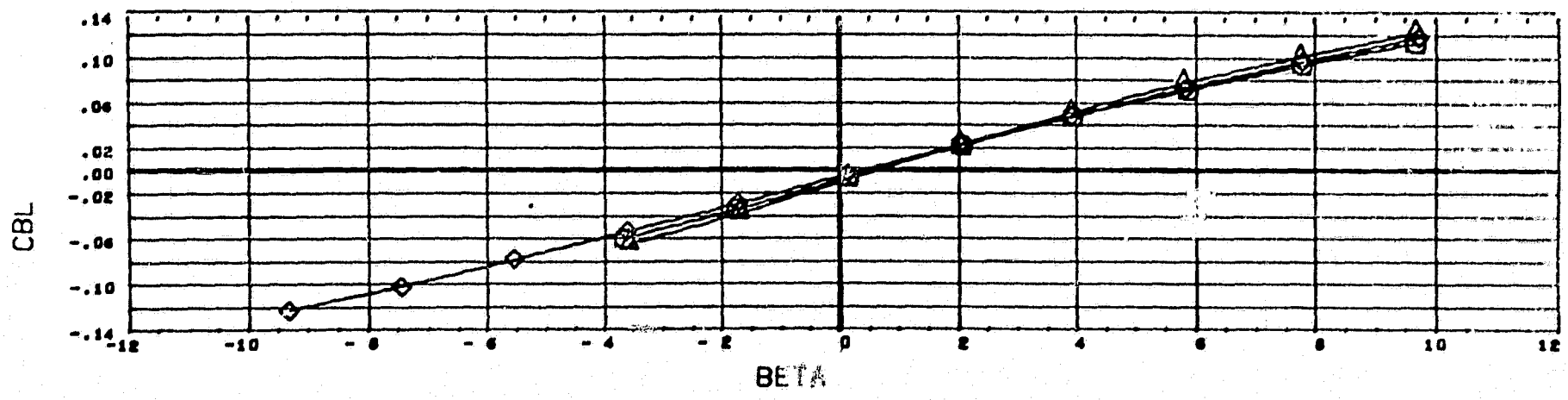
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH		PARAMETRIC VALUES
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DATA HIST. CODE GR

REFERENCE INFORMATION

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BREF	2.9690	IN.
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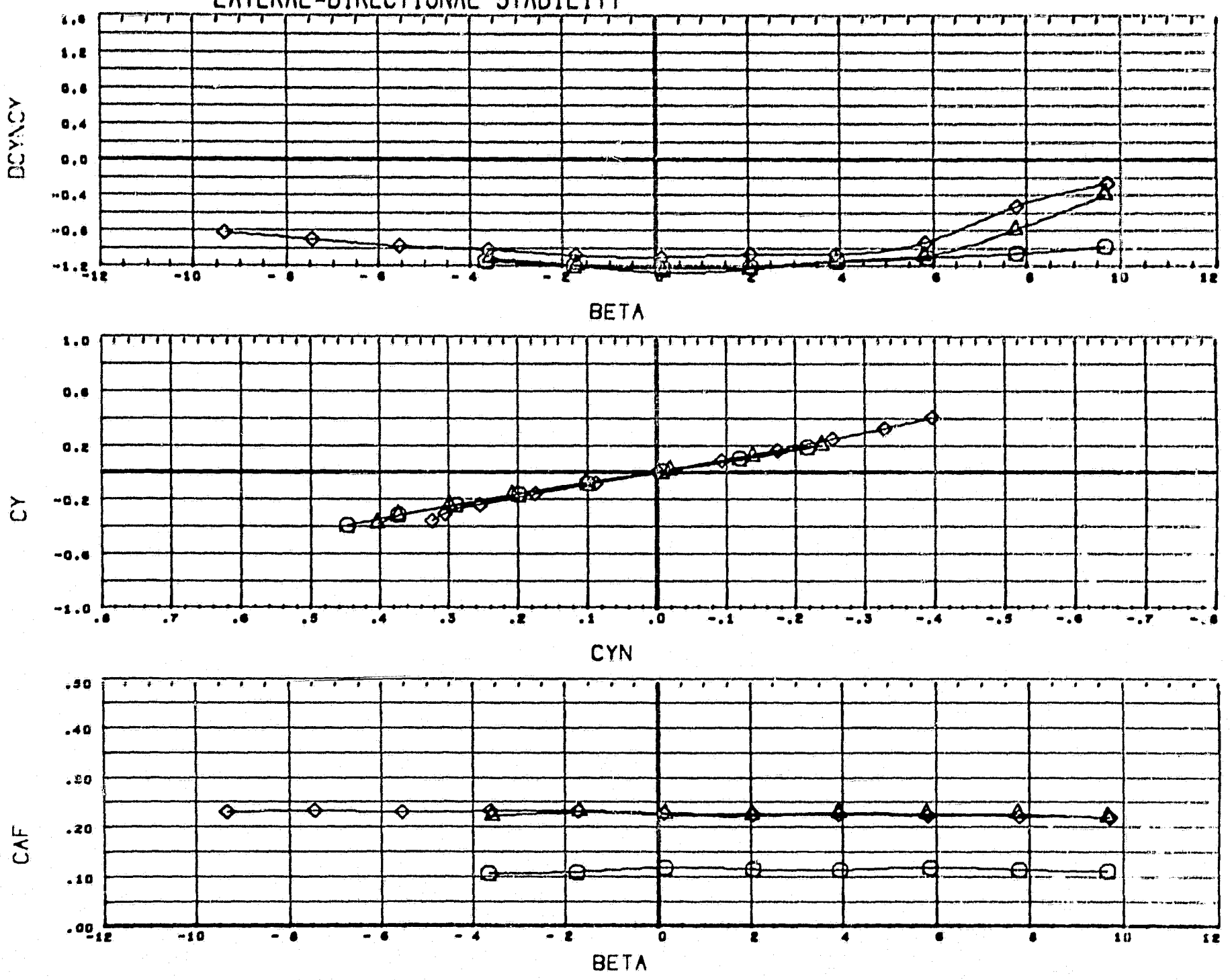
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH		PARAMETRIC VALUES
○	0.900	ALPHA	0.000
△	1.103		
◇	1.456		

DATA HIST. CODE GR

REFERENCE INFORMATION

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BREF	2.9690	IN.
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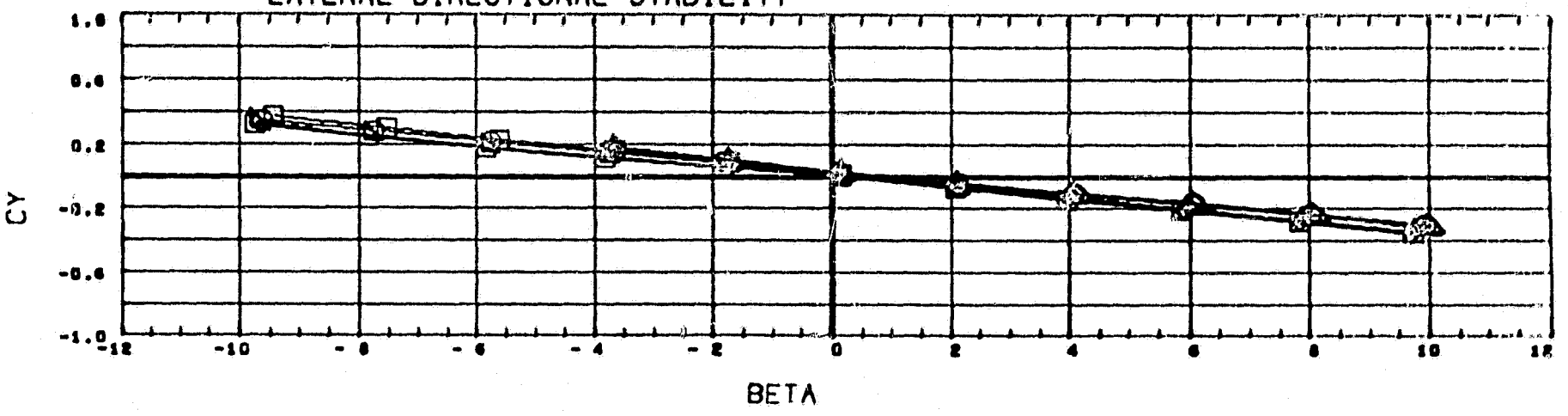
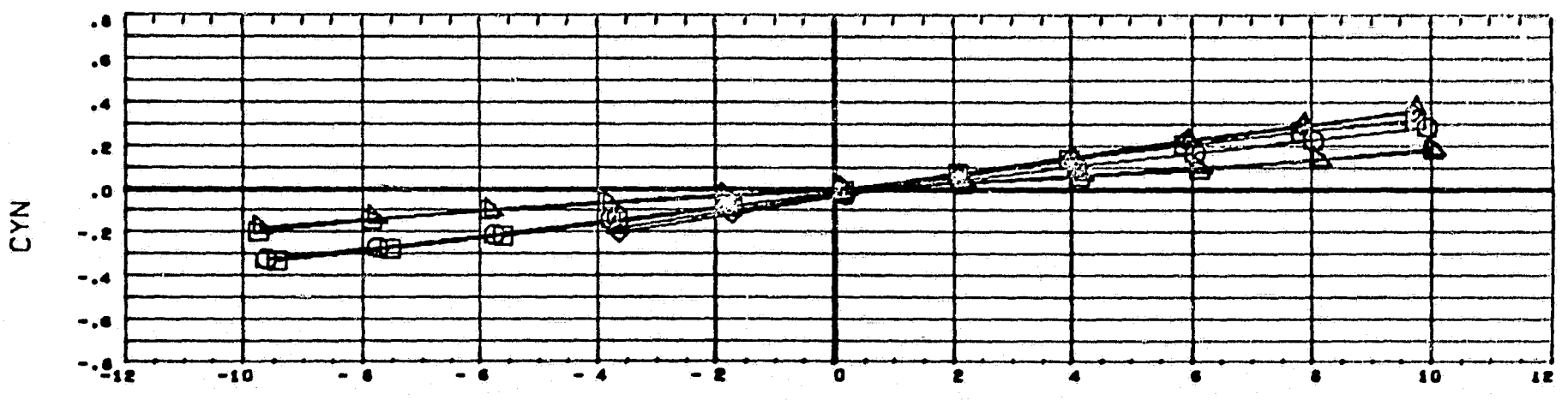
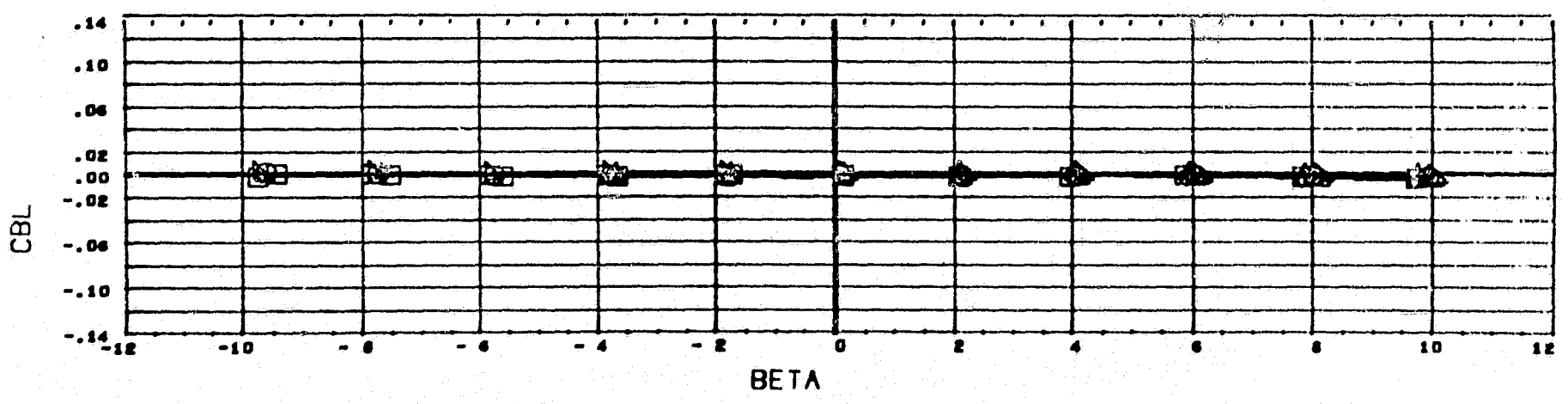
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES	
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◇	1.102		
□	1.462		
◸	2.740		
◸	4.959	DATA HIST. CODE	GR

REFERENCE INFORMATION		
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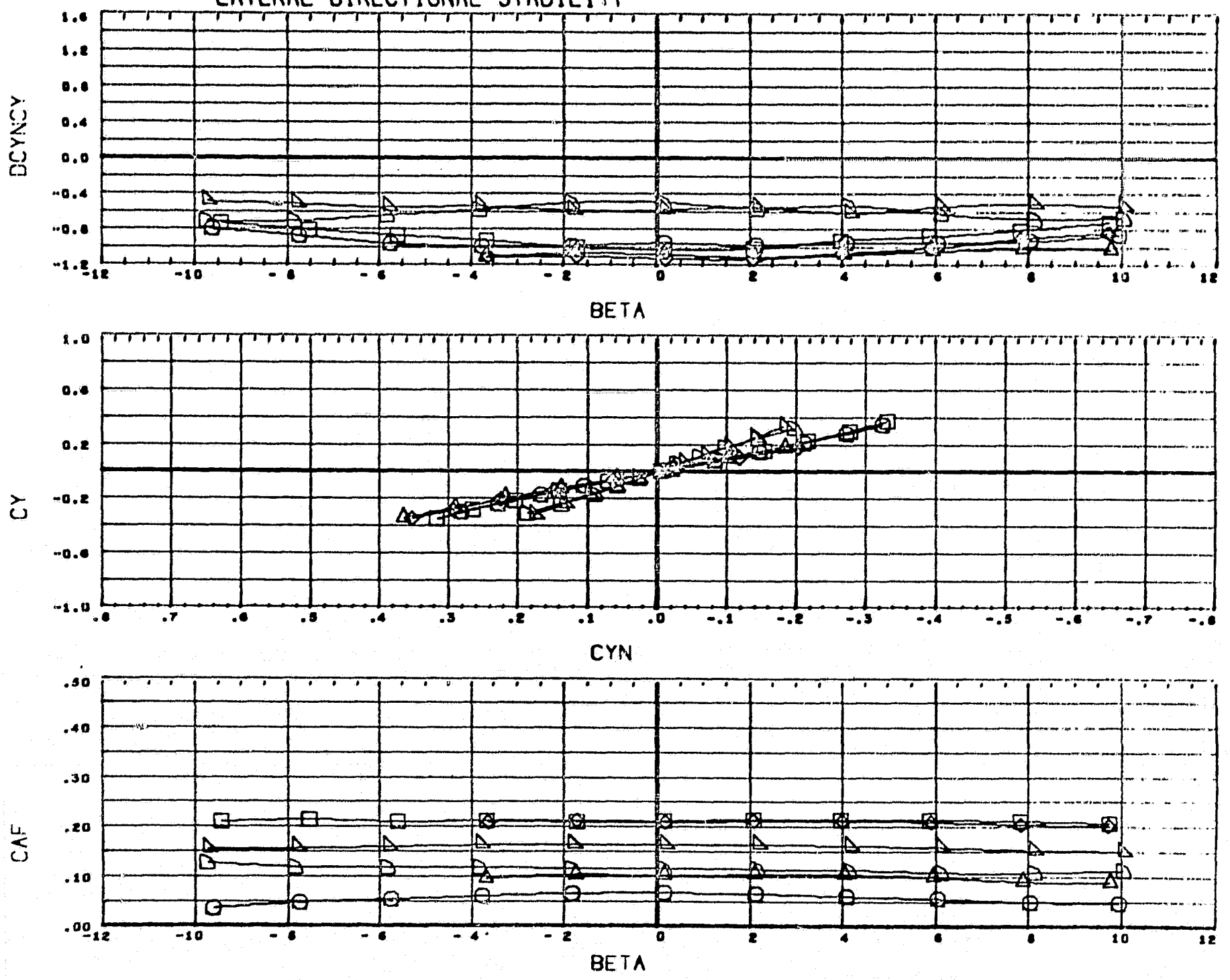
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES	
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◇	1.102		
□	1.462		
◸	2.740		
D	4.959	DATA HIST. CODE	GR

REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
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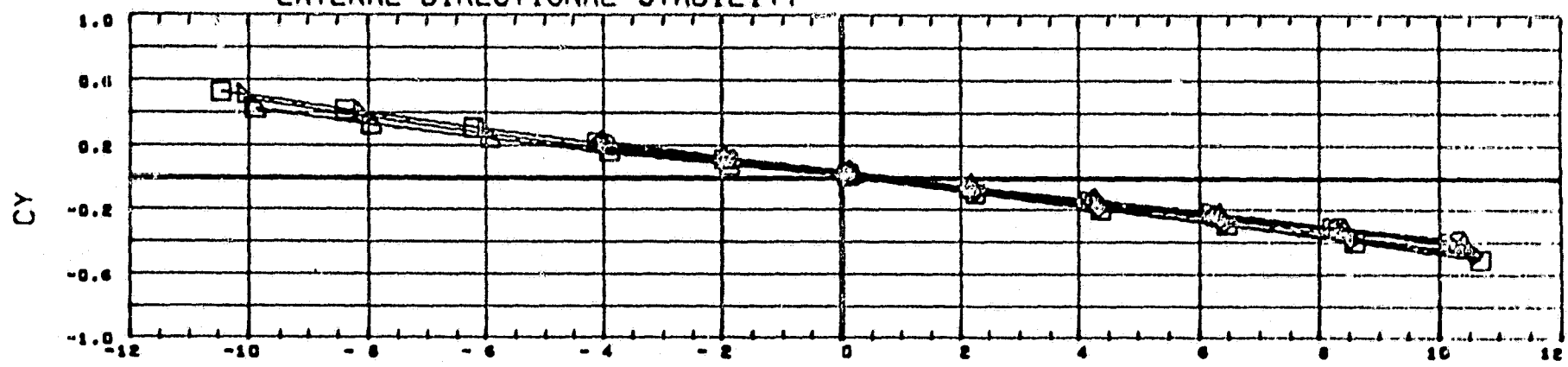
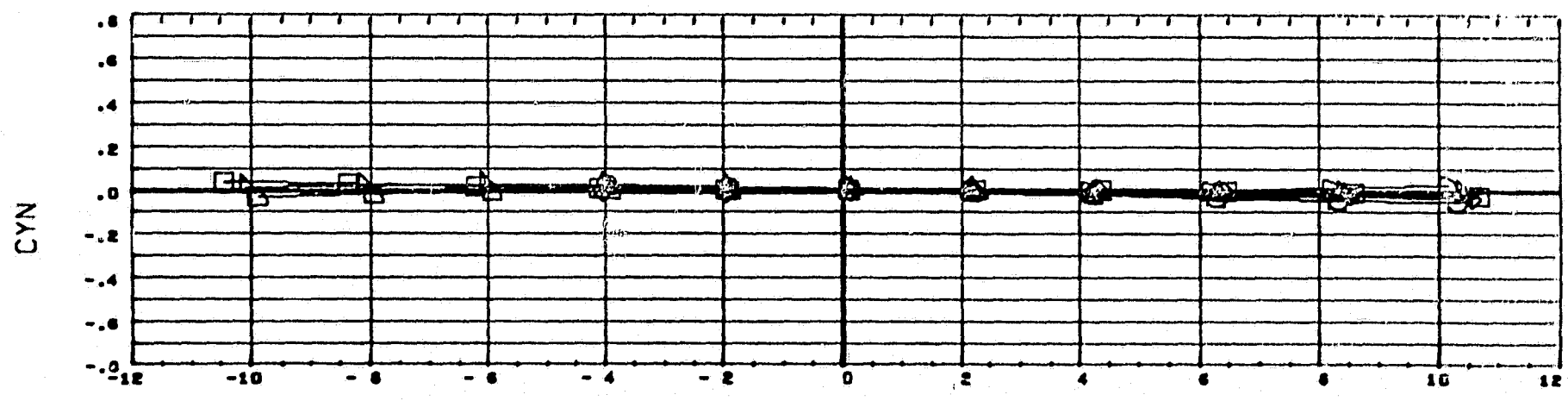
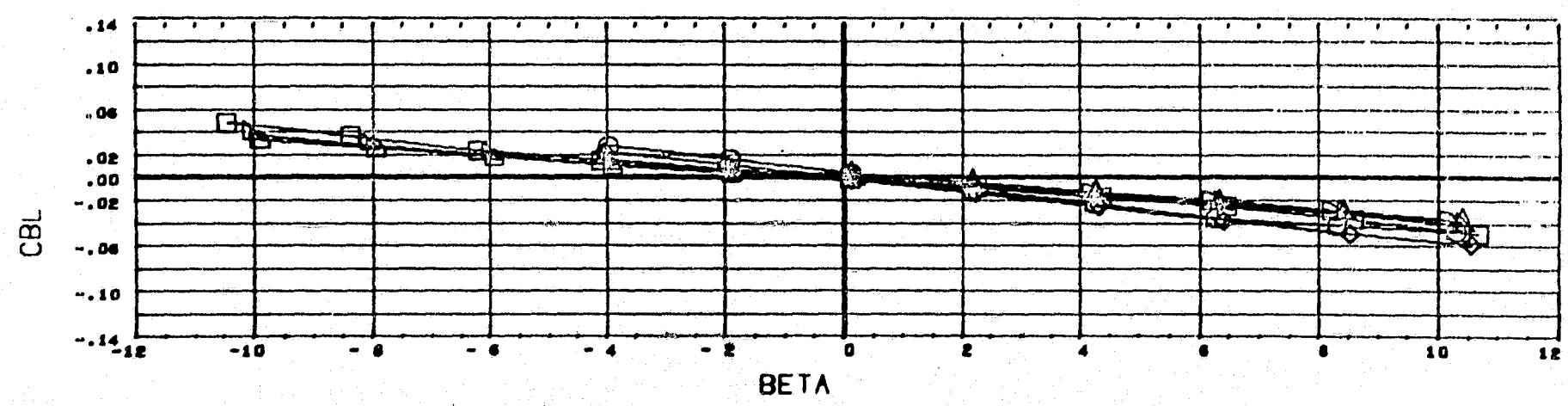
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH	PARAMETRIC VALUES		
○	0.600	ALPHA	0.000	ORBINC - 2.000
△	0.899			
◇	1.102			
□	1.462			
◸	2.740			
D	4.959	DATA HIST. CODE	GR	

REFERENCE INFORMATION

SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
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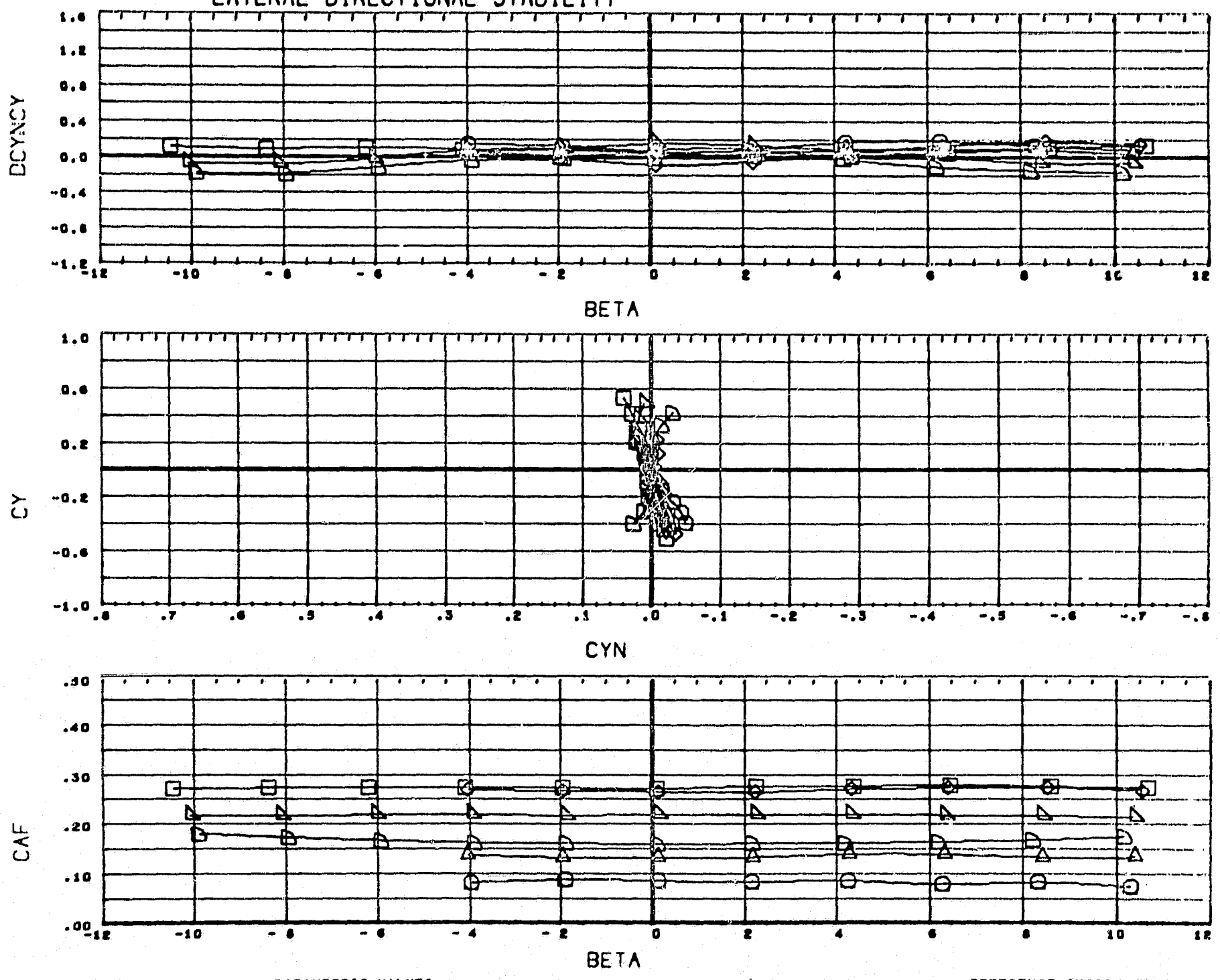
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES			REFERENCE INFORMATION		
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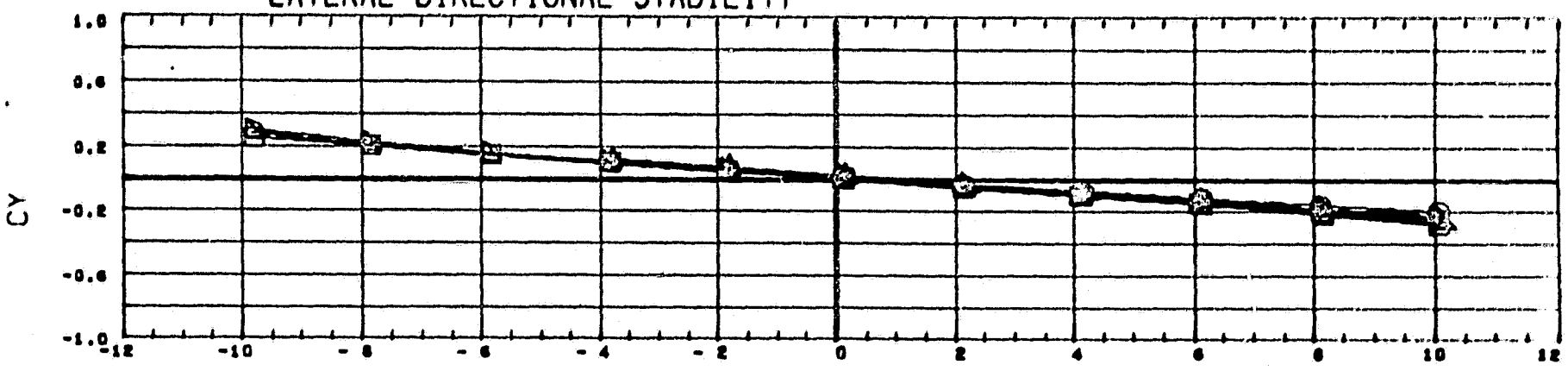
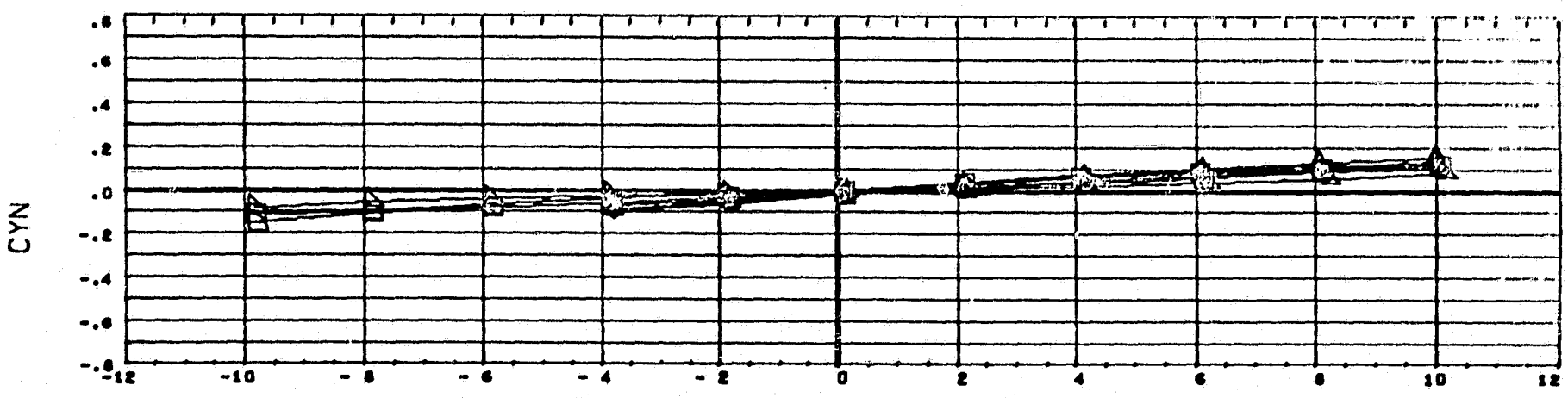
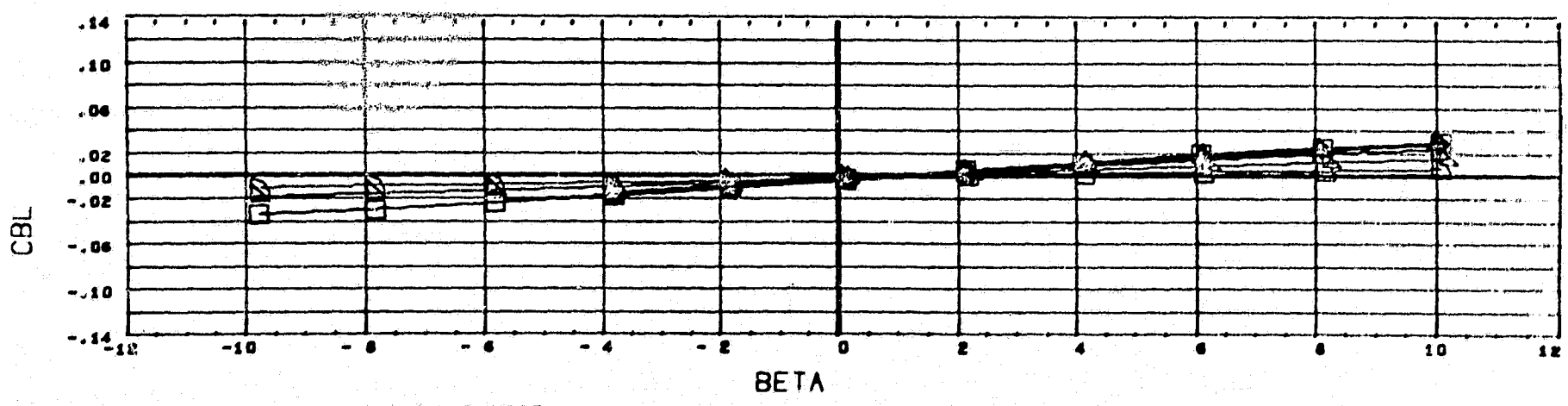
◇	1.102				BREF	2.9690	IN.
□	1.462				XMRP	5.7530	IN.
◸	2.740				YMRP	0.0000	IN.
D	4.959	DATA HIST. CODE	GR		ZMRP	0.0000	IN.
					SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY





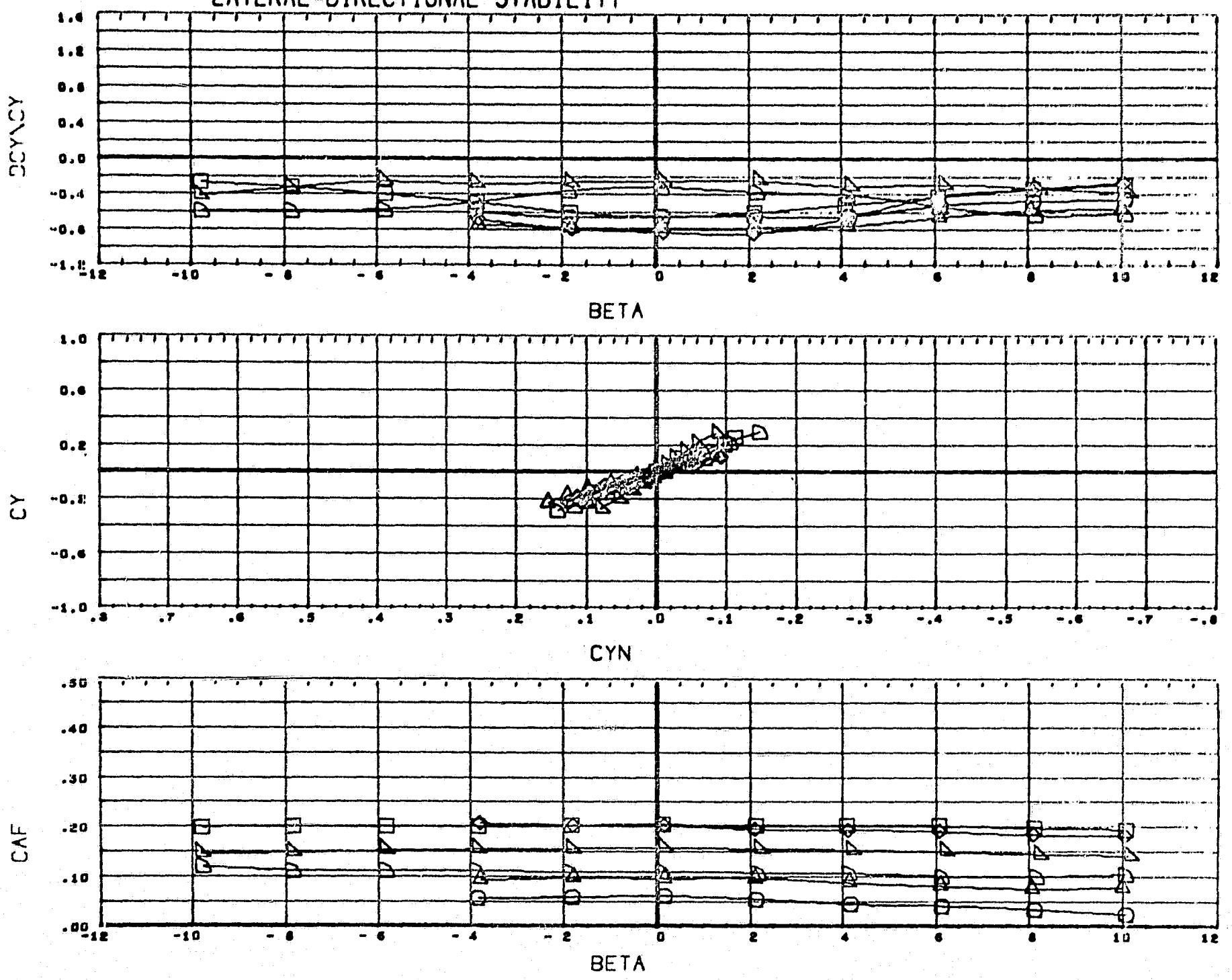


SYMBOL	MACH	PARAMETRIC VALUES	
○	0.598	ALPHA	0.000
△	0.900		
◇	1.098		
□	1.461		
◸	2.740		
▱	4.959	DATA HIST. CODE	GR

REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES	
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△	0.900		
◇	1.098		
□	1.461		
◸	2.740		
D	4.958	DATA HIST. CODE	GR

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
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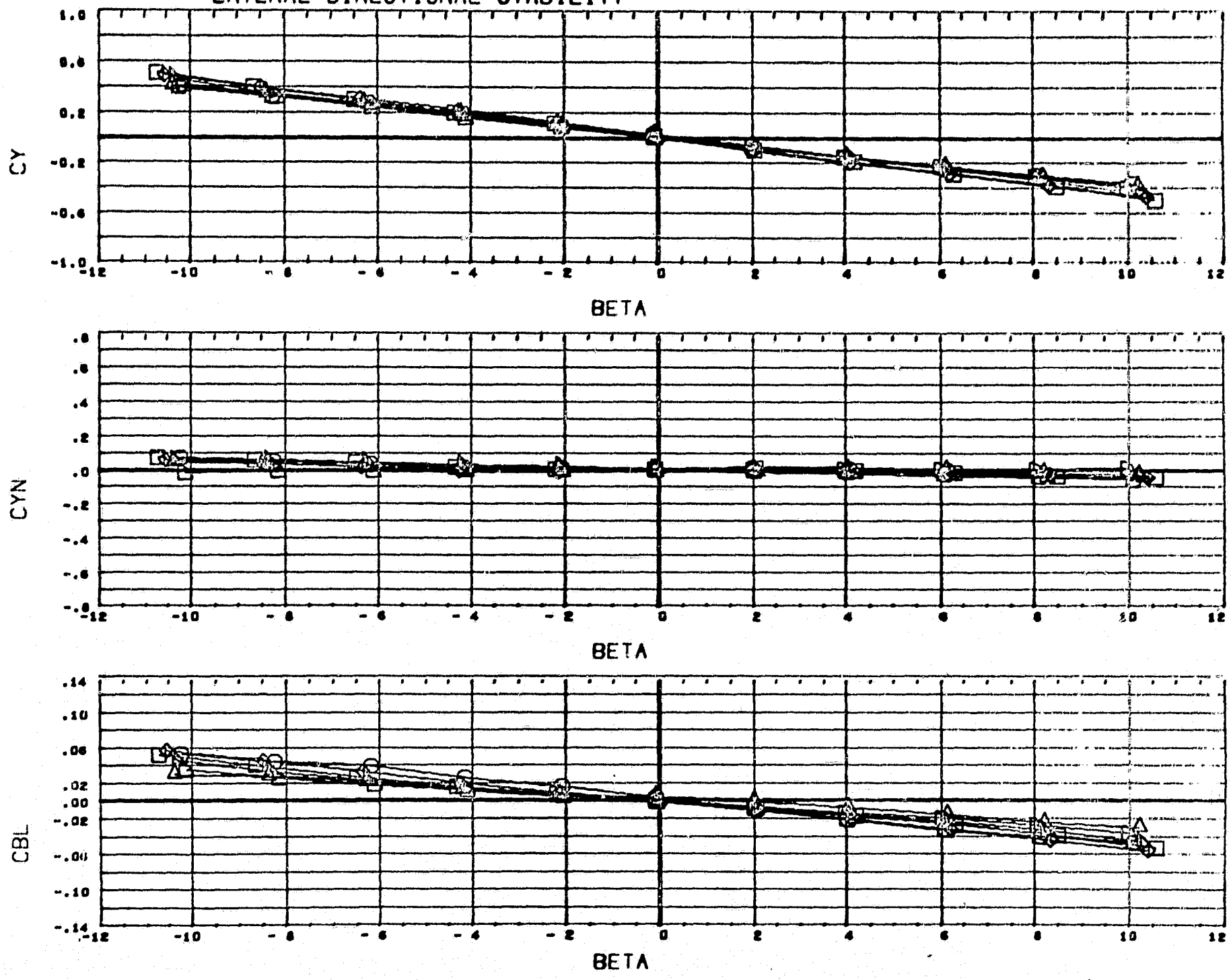
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

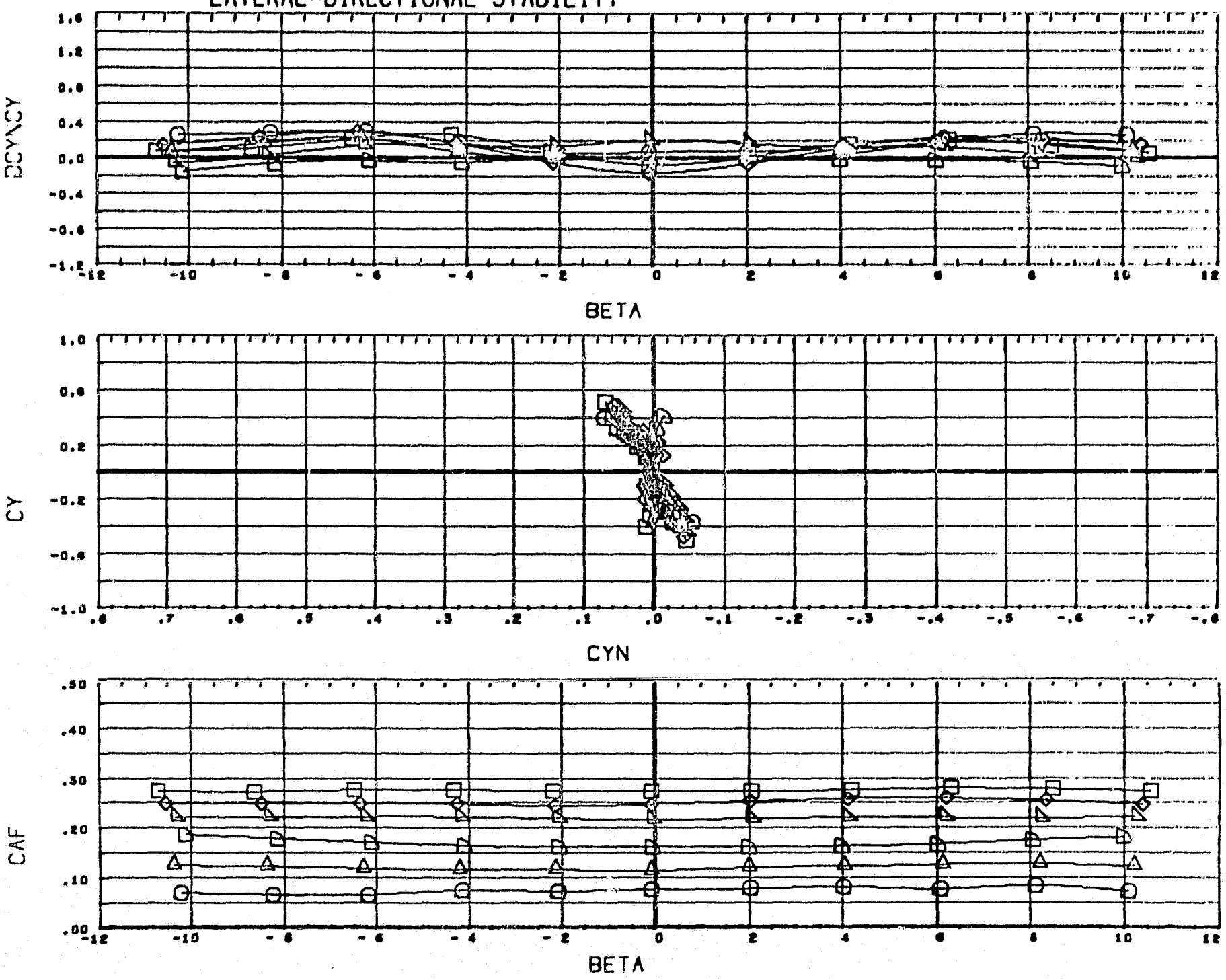
LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES			
○	0.569	ALPHA	- 6.000	ORBINC	- 2.000
△	0.897				
◇	1.094				
□	1.460				
▽	2.740				
D	4.959	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

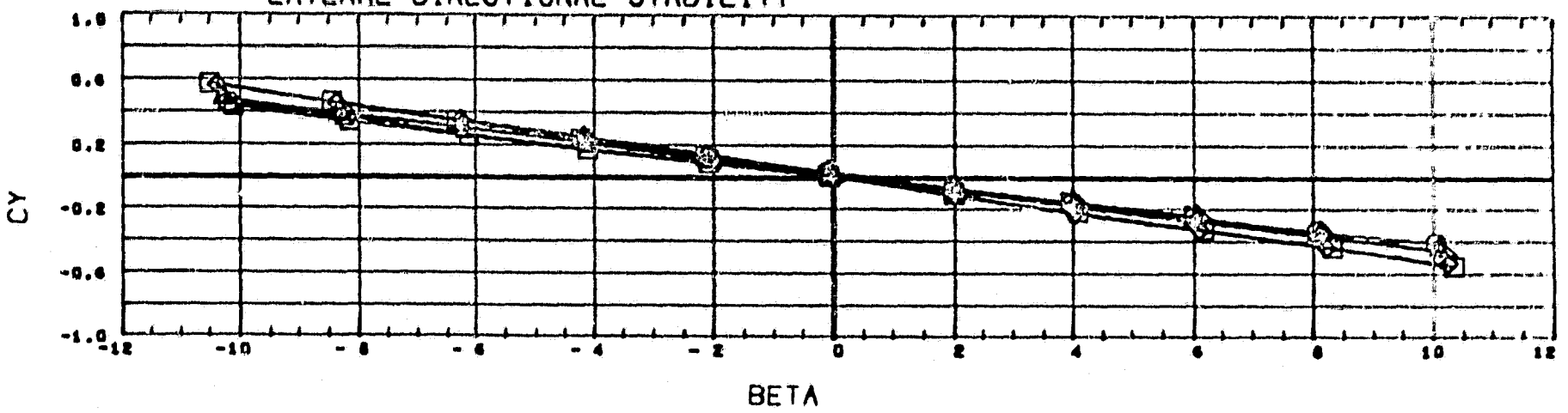
LATERAL-DIRECTIONAL STABILITY

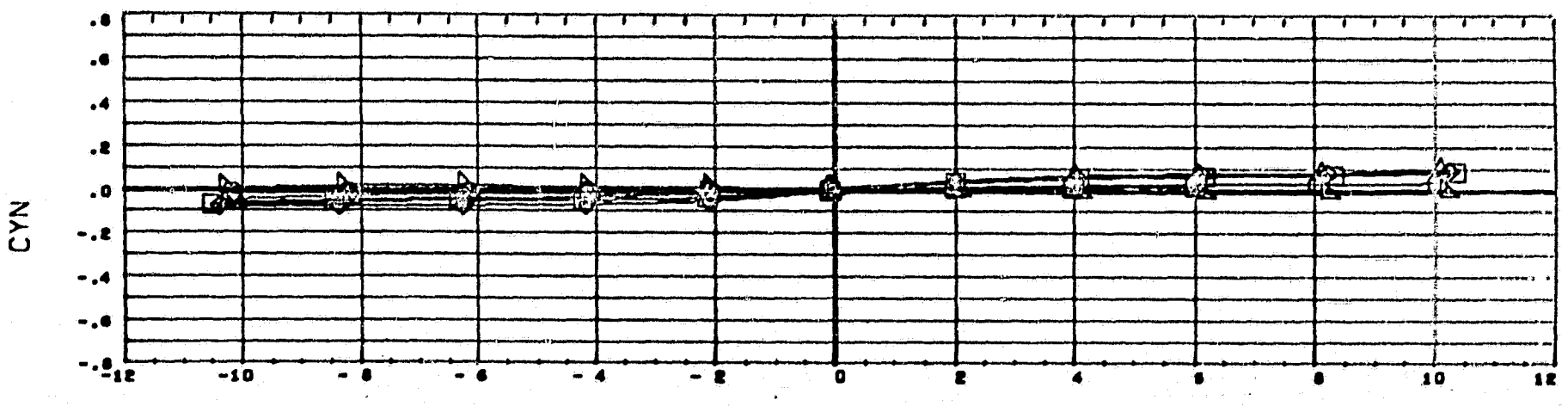


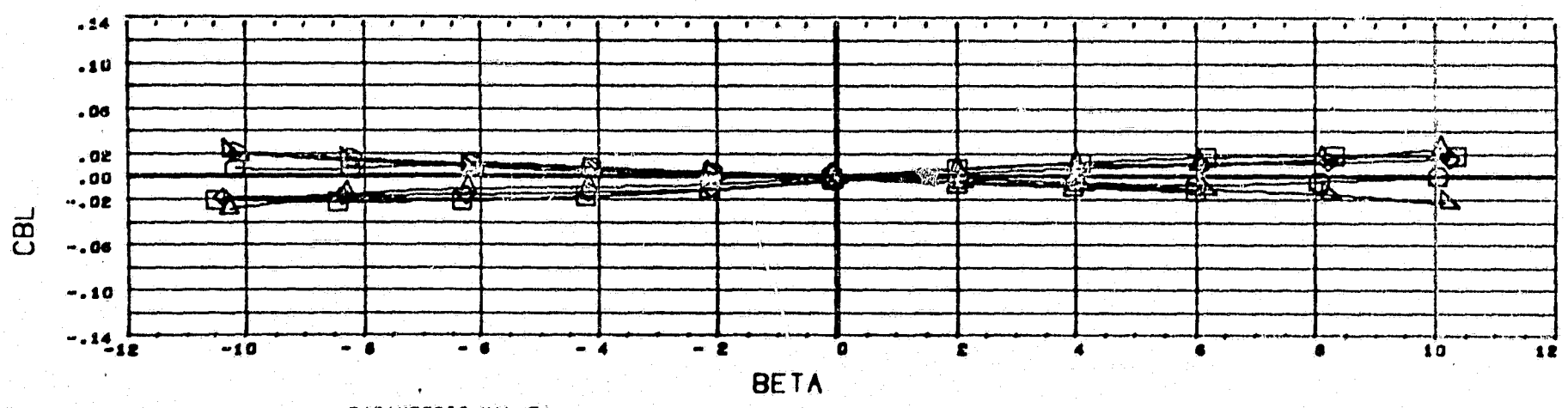
SYMBOL	MACH	PARAMETRIC VALUES			
○	0.589	ALPHA	- 6.000	ORBINC	- 2.000
△	0.897				
◇	1.084				
□	1.460				
◸	2.740				
▷	4.959	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY





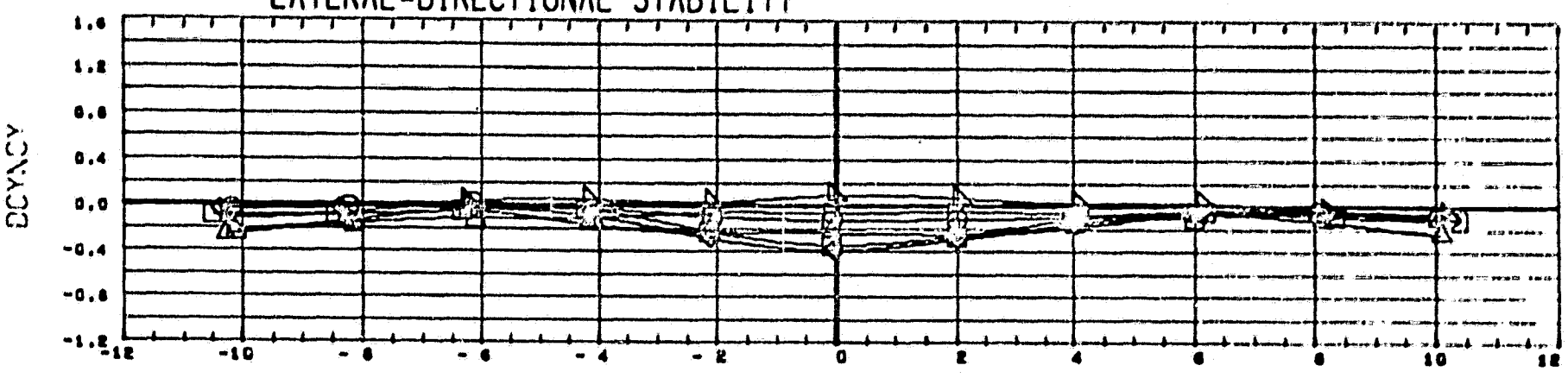


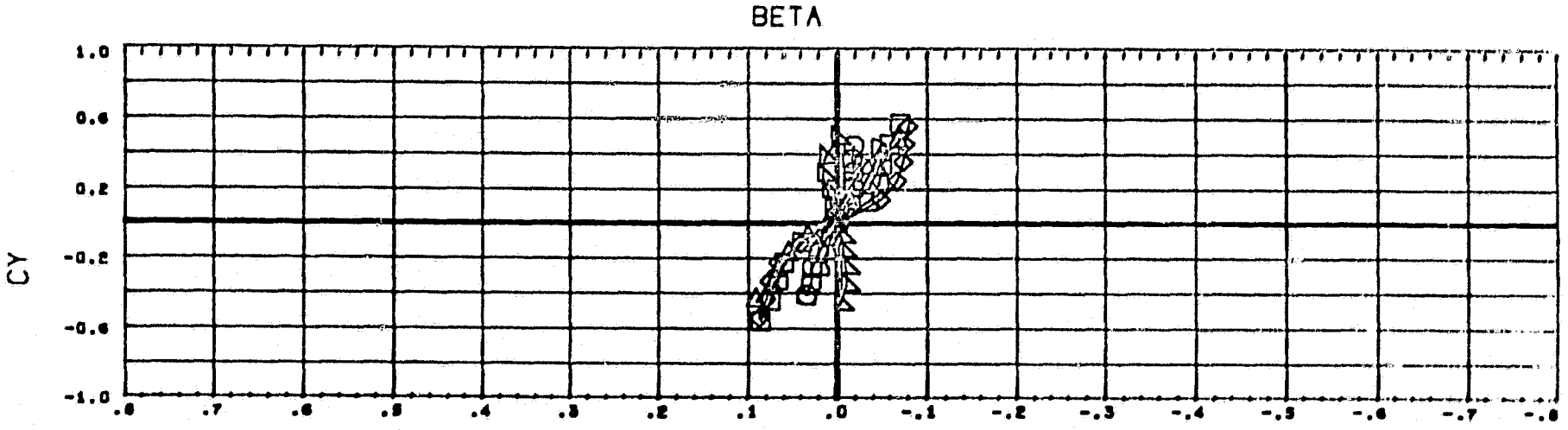
SYMBOL	MACH	PARAMETRIC VALUES	
○	0.599	ALPHA - 6.000	ORBINC - 2.000
△	0.901		
◇	1.102		
□	1.460		
◸	2.740		
D	4.960	DATA HIST. CODE	GR

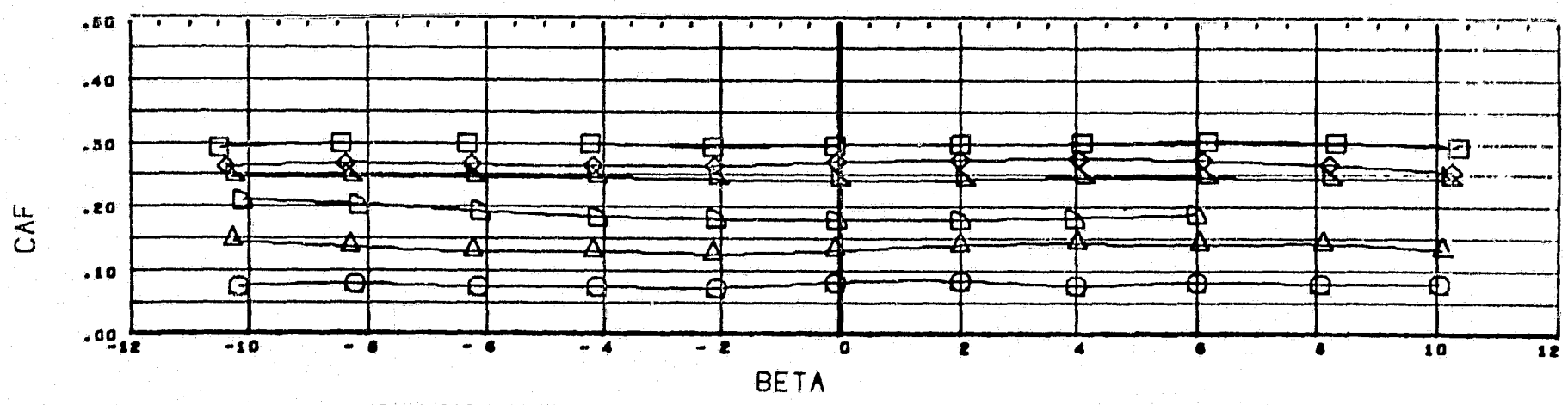
REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



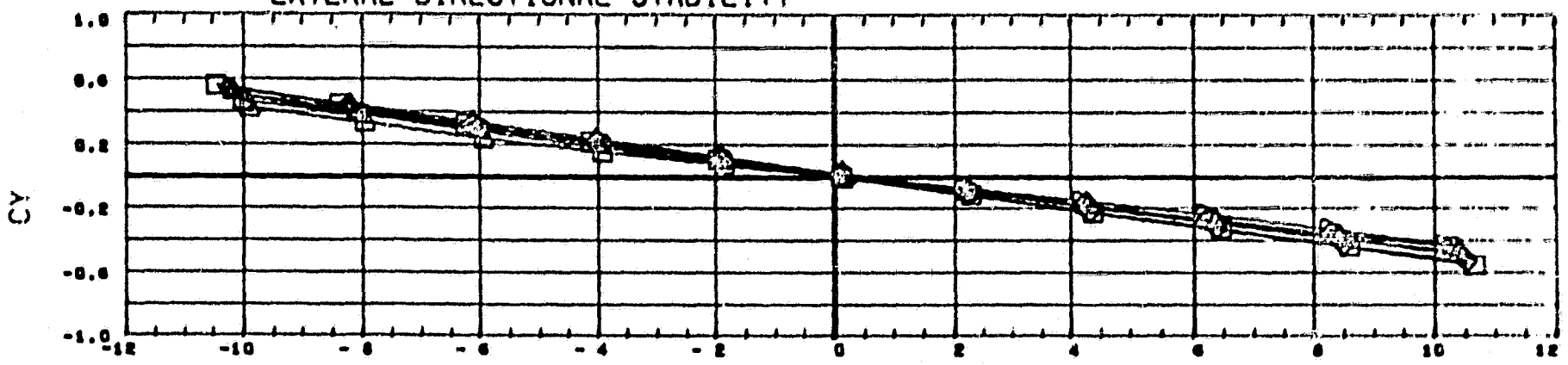


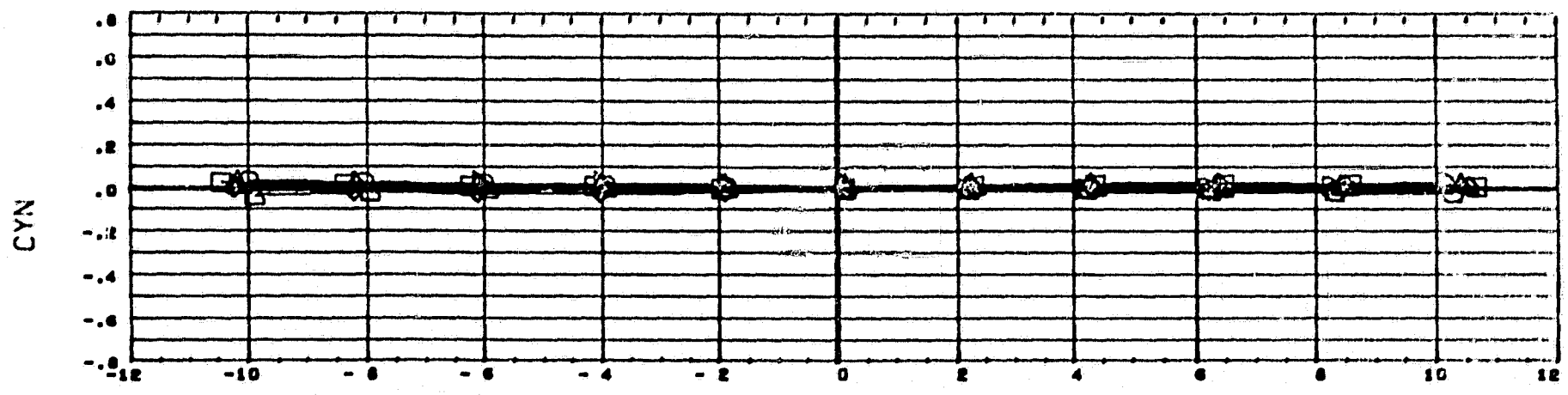


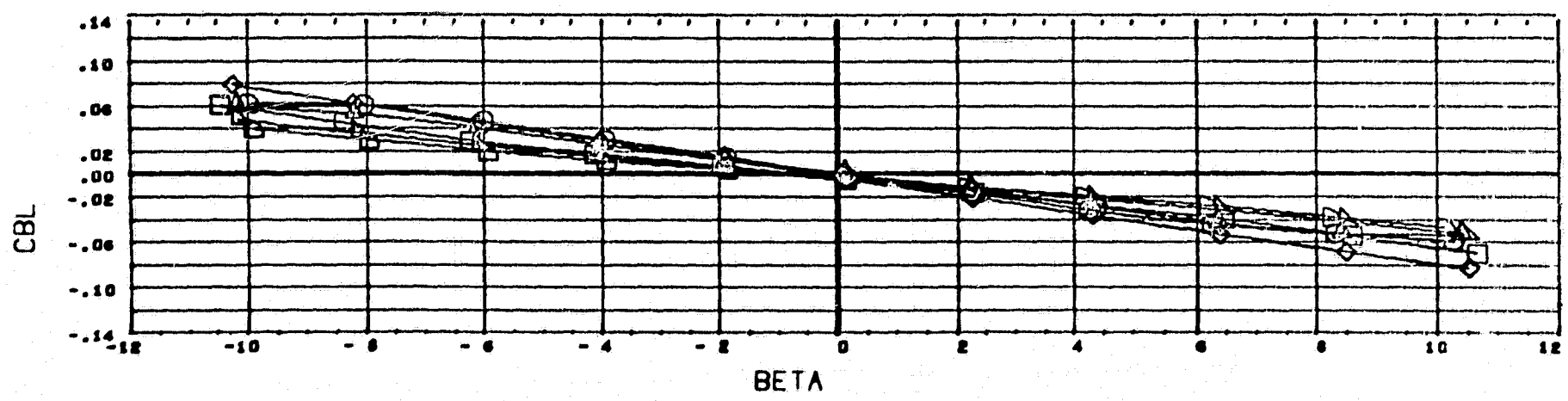
SYMBOL	MACH	PARAMETRIC VALUES			
○	0.599	ALPHA	- 6.000	ORBINC	- 2.000
△	0.901				
◇	1.102				
□	1.460				
◸	2.740				
D	4.960	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



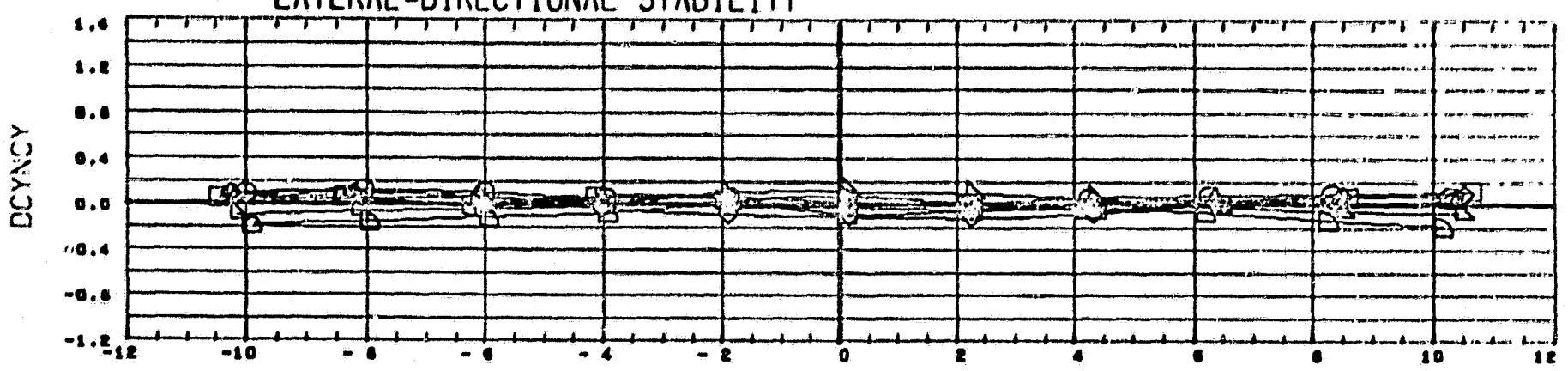


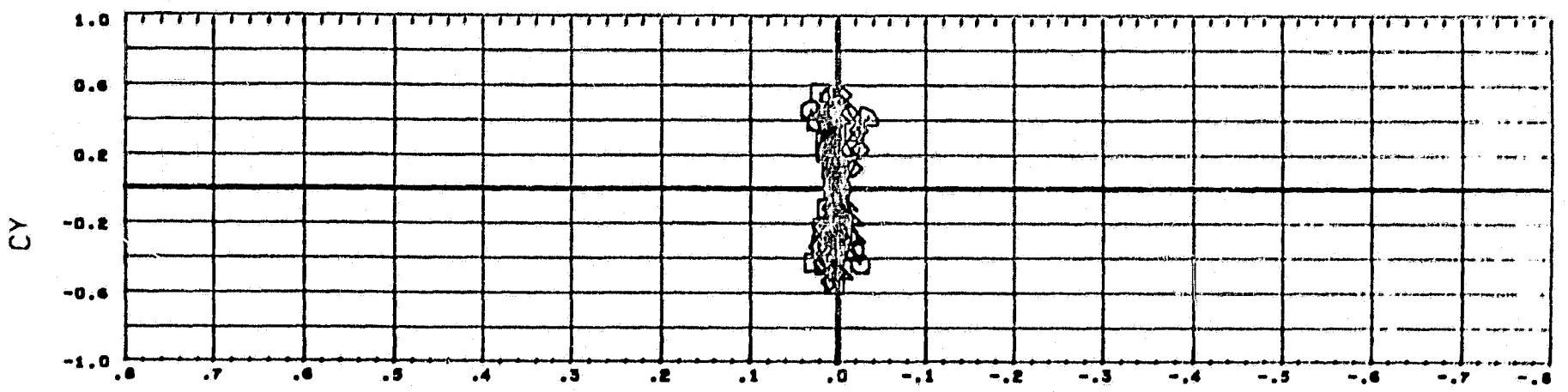


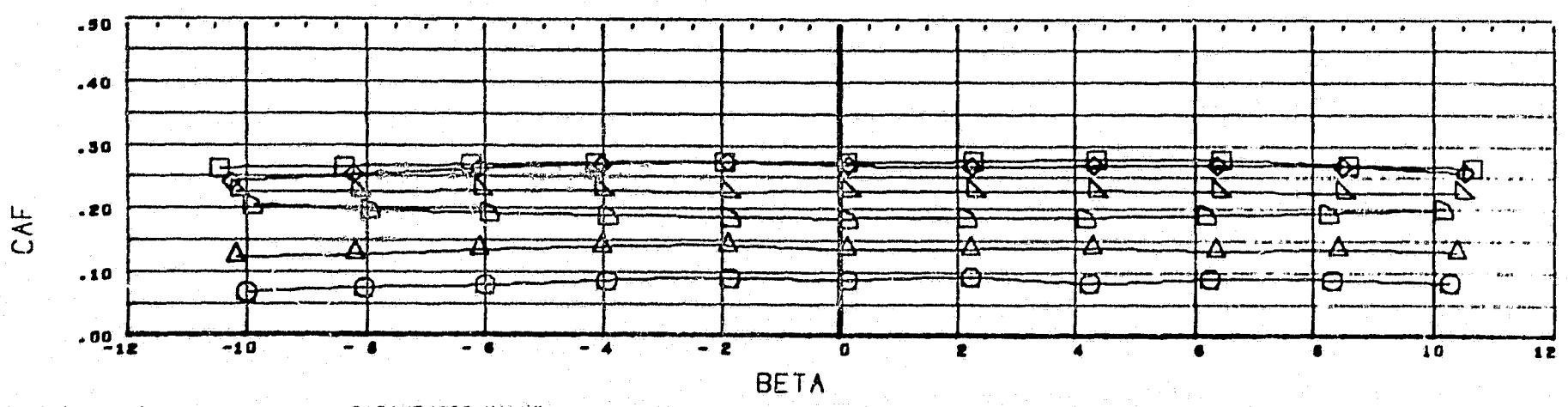
SYMBOL	MACH	PARAMETRIC VALUES			
	0.599	ALPHA	0.000	ORBINC	- 2.000
	0.901				
	1.102				
	1.464				
	2.740				
	4.959	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.0690	IN.
XMRP	8.7550	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY





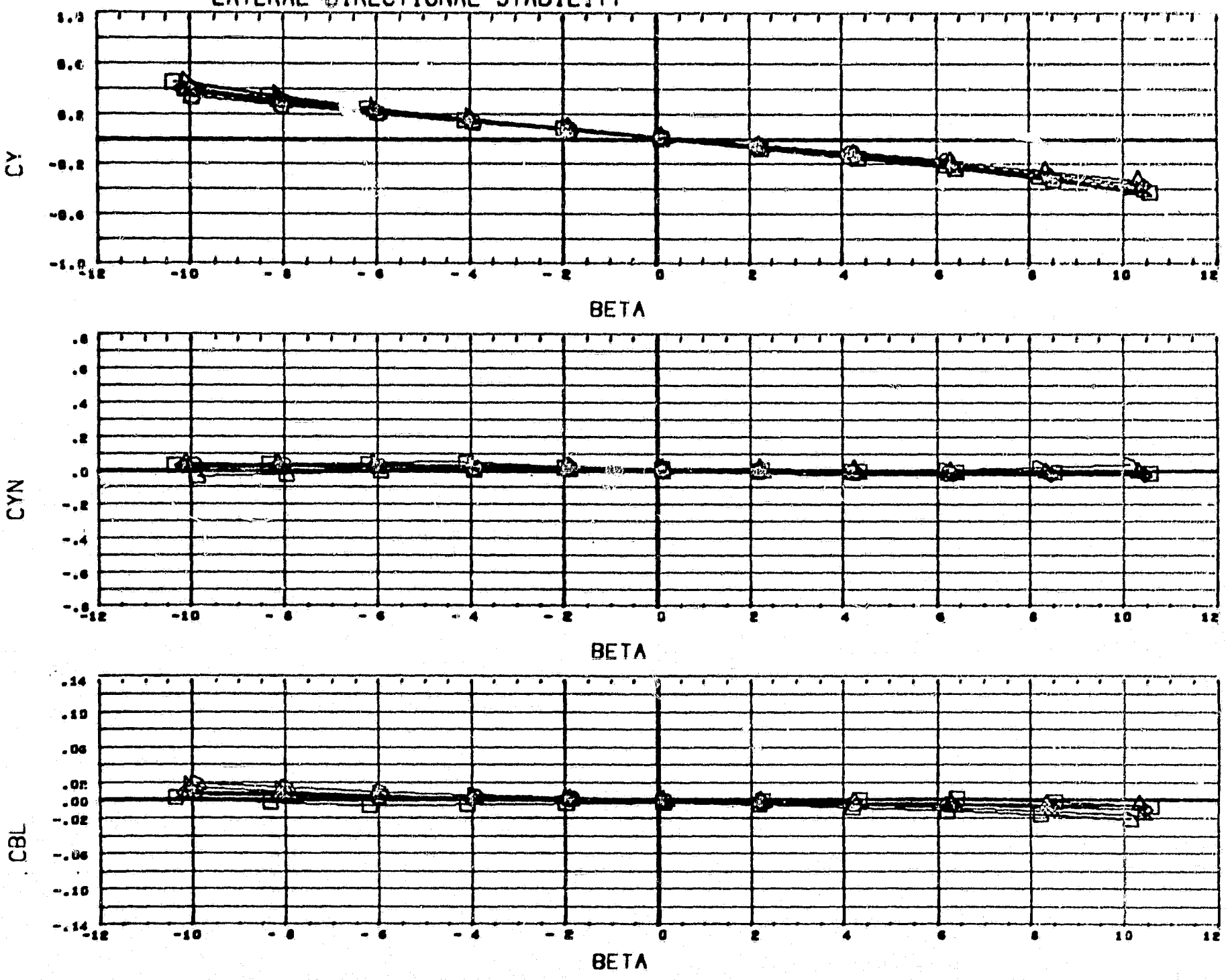


SYMBOL	MACH	PARAMETRIC VALUES			
○	0.599	ALPHA	0.000	ORBINC -	2.000
△	0.901				
◇	1.102				
□	1.494				
▽	2.740				
D	4.959	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

3

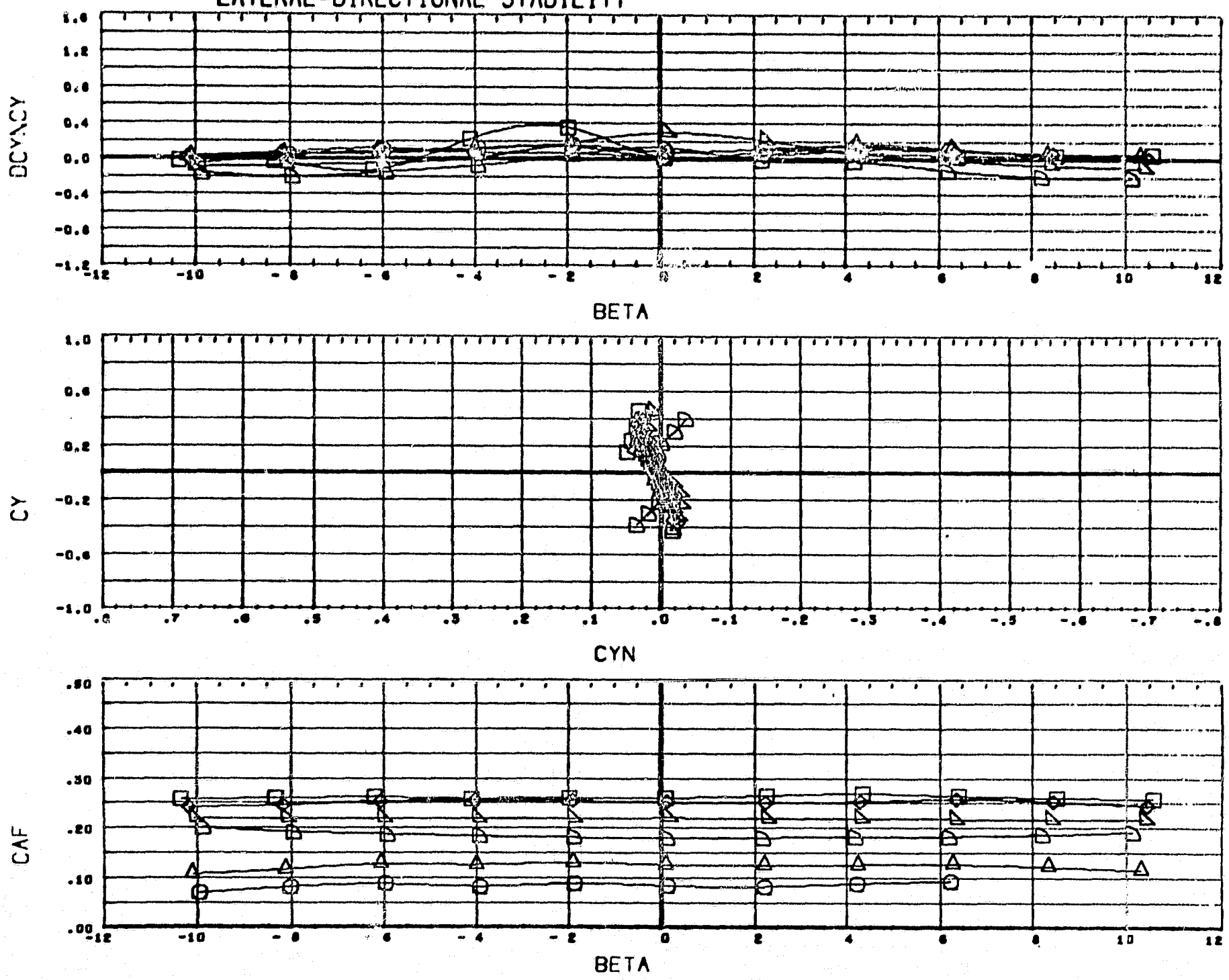
LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH		PARAMETRIC VALUES			
○	0.599	ALPHA	0.000	ORBINC	-	2.000
△	0.900					
◇	1.101					
□	1.458					
▽	2.740					
D	4.959	DATA HIST. CODE	GR			

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4230	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

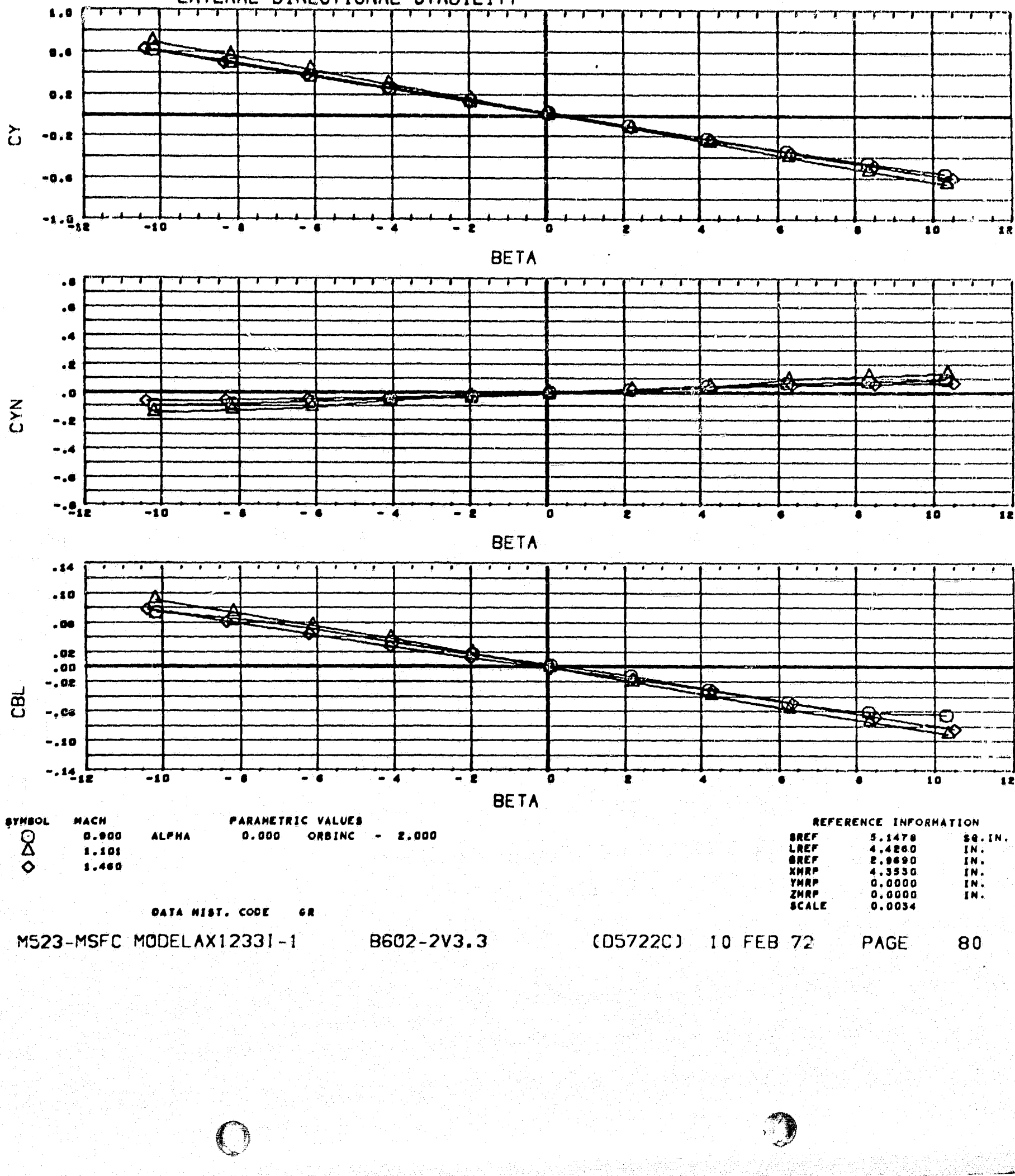
LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES			
○	0.599	ALPHA	0.000	ORBINC -	2.000
△	0.900				
◇	1.101				
□	1.456				
▽	2.740				
D	4.959	DATA HIST. CODE	GR		

REFERENCE INFORMATION		
SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY

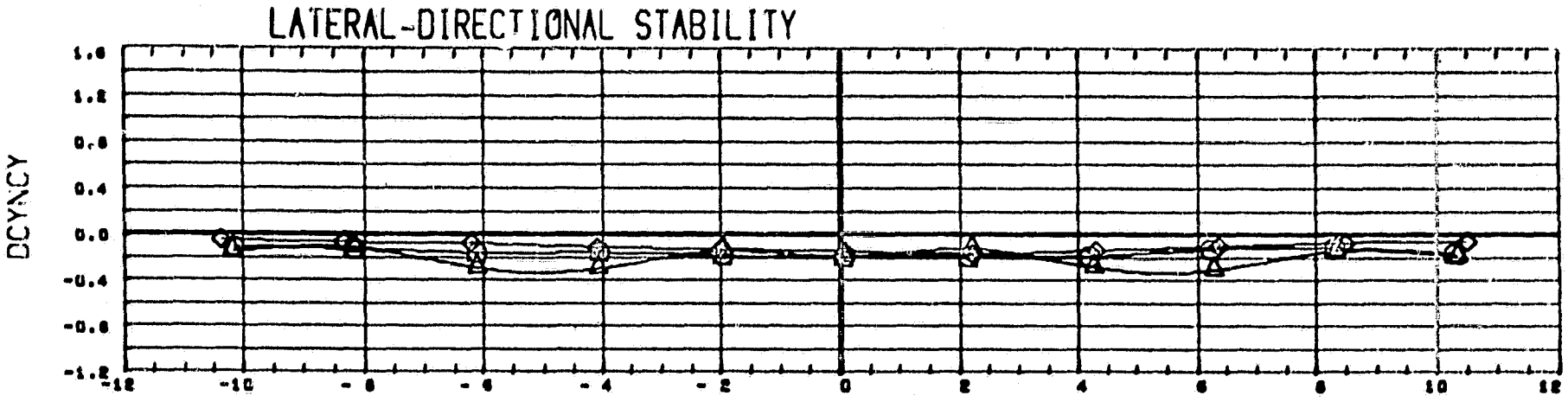


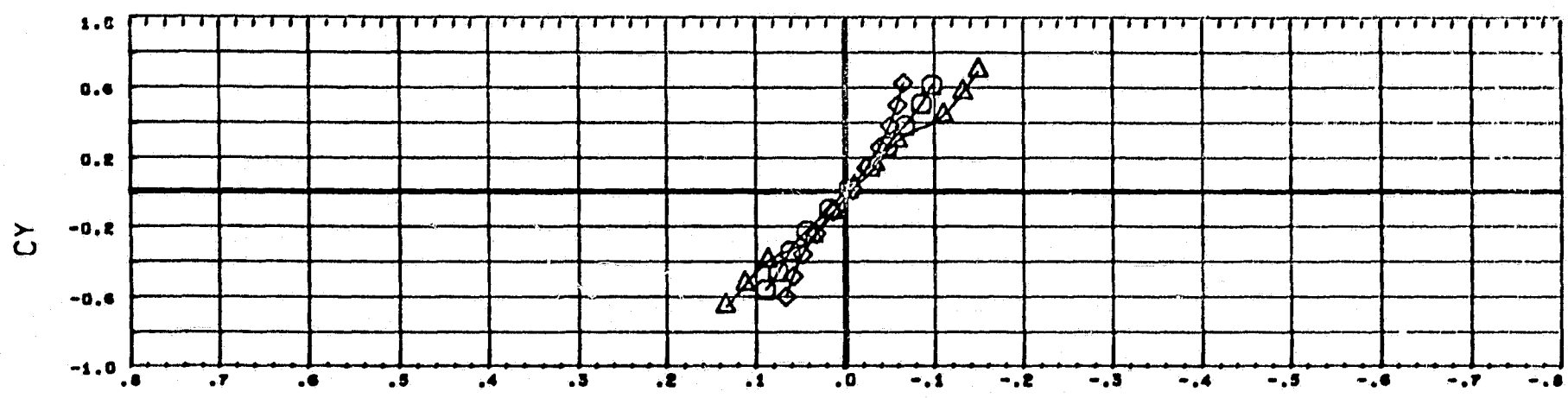
SYMBOL	MACH	PARAMETRIC VALUES			
○	0.900	ALPHA	0.000	ORBINC	- 2.000
△	1.101				
◇	1.460				

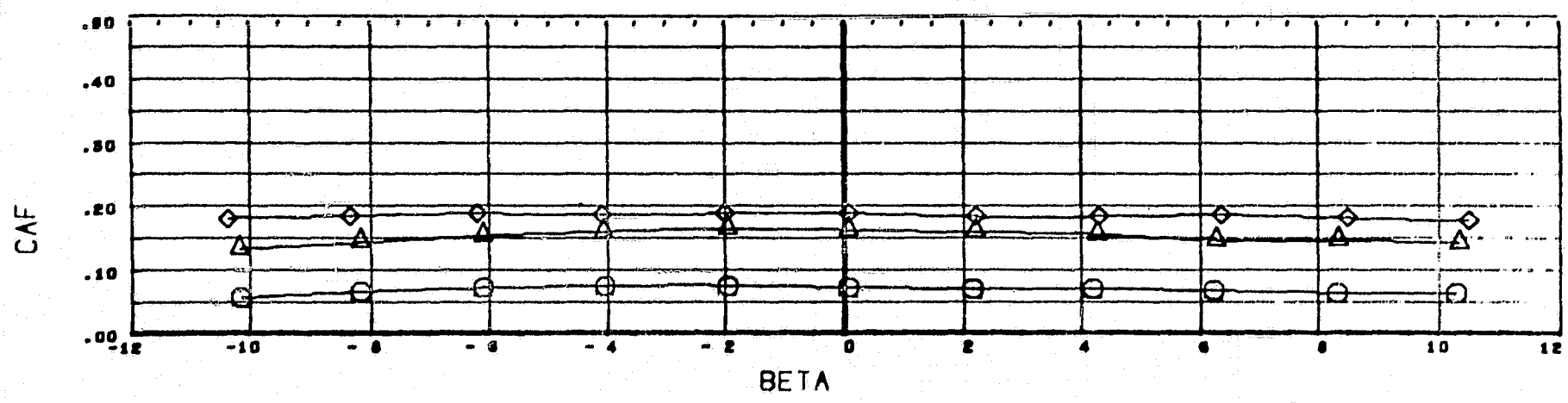
REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3550	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY





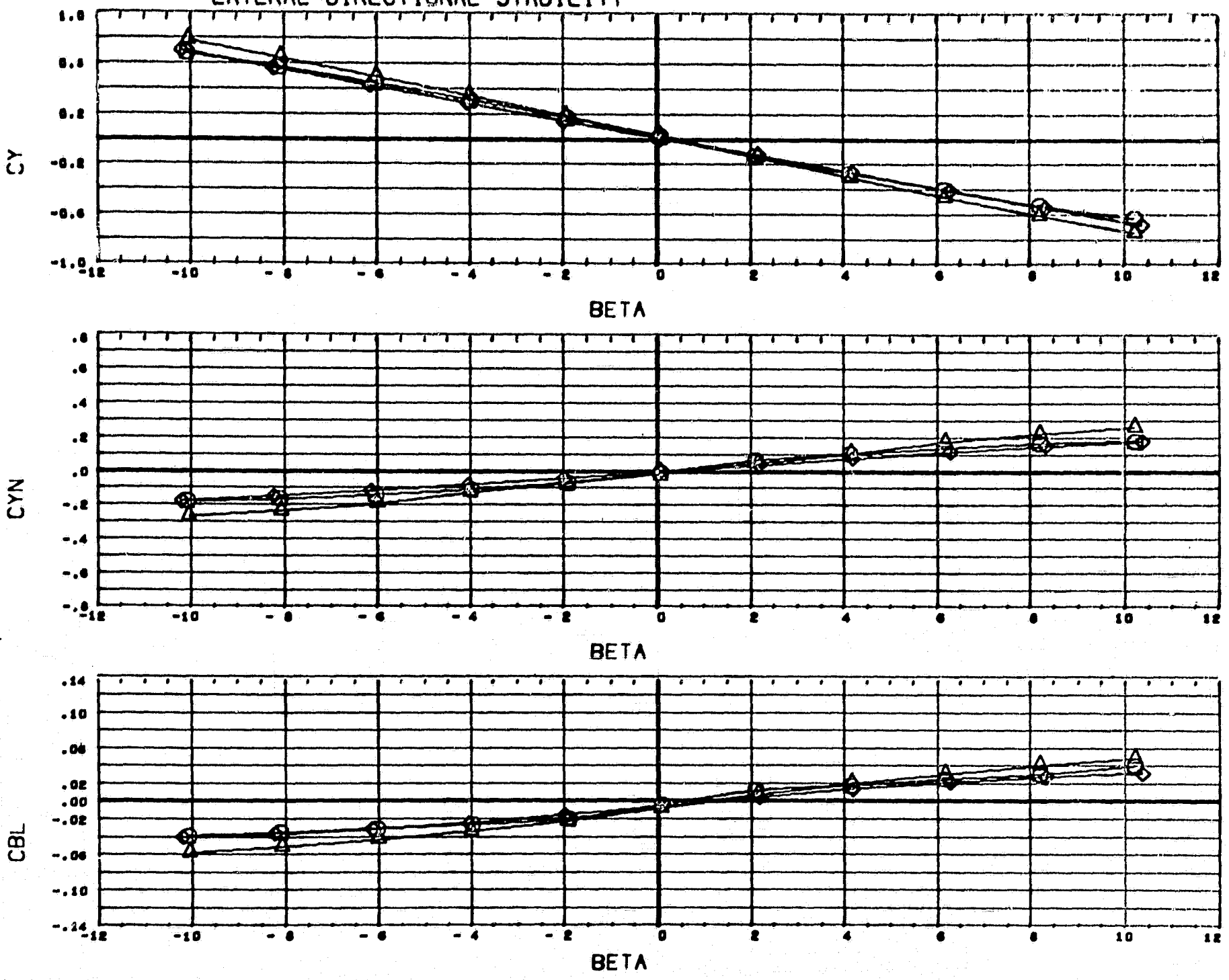


SYMBOL	MACH		PARAMETRIC VALUES		
○	0.900	ALPHA	0.000	ORBINC	- 2.000
△	1.101				
◇	1.460				

DATA HIST. CODE GR

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY

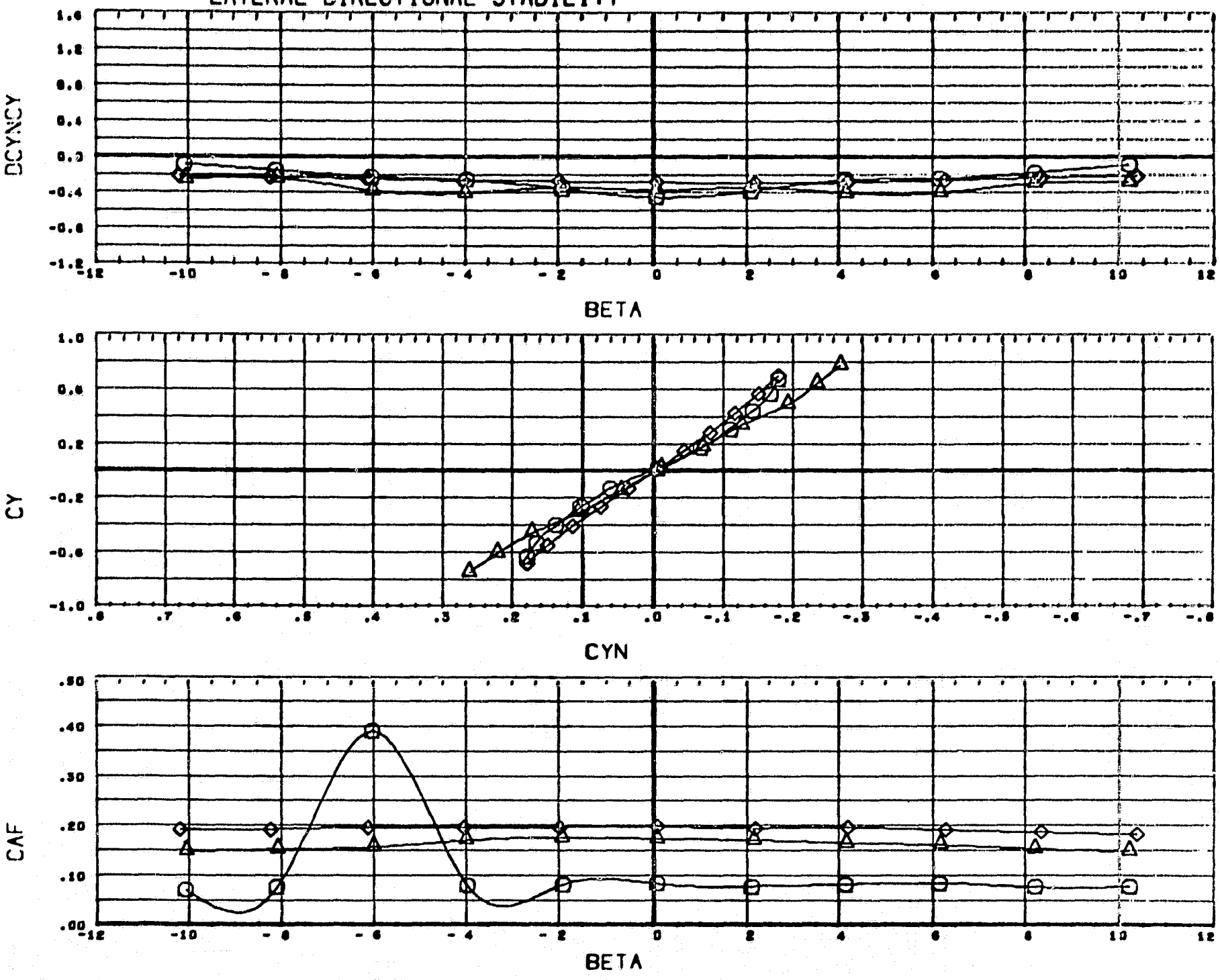


SYMBOL	MACH	PARAMETRIC VALUES		
◇	0.900	ALPHA	0.000	ORBINC - 2.000
△	1.105			
◇	1.460			

DATA HIST. CODE GR

REFERENCE INFORMATION		
SREF	5.1476	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	4.3530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES			REFERENCE INFORMATION		
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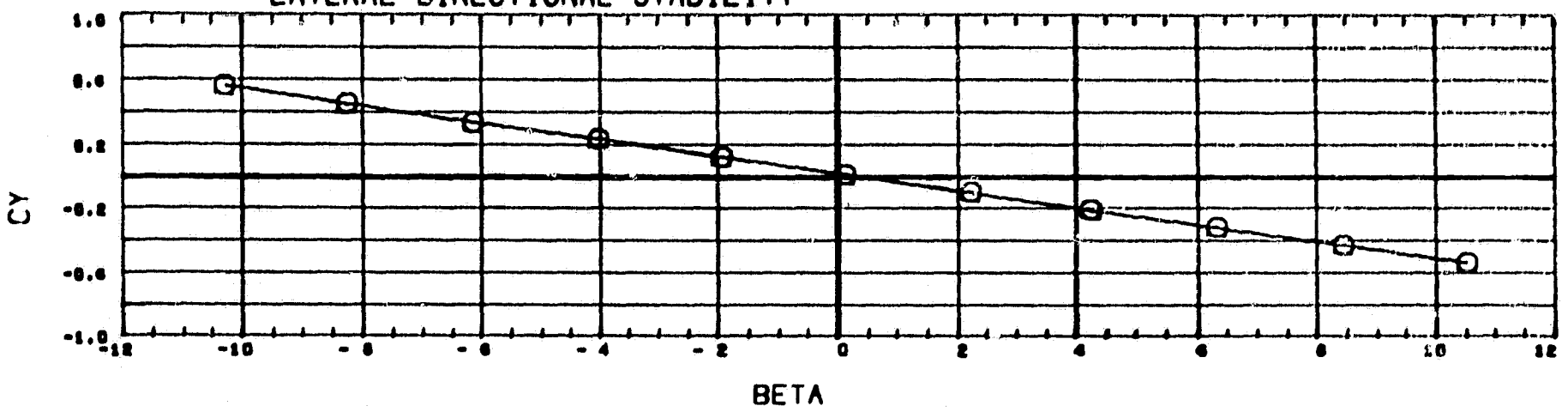
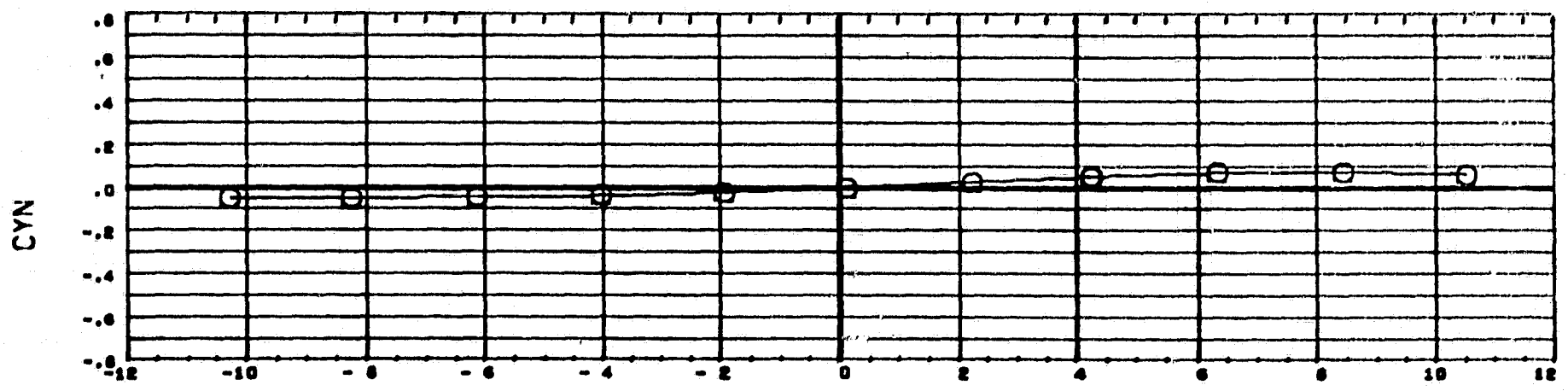
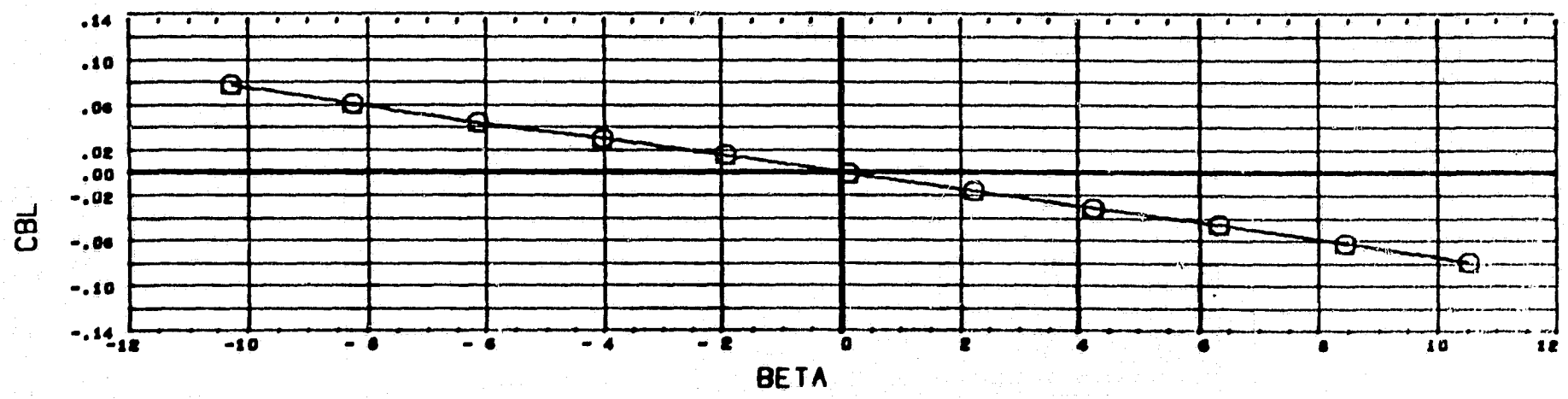
△	1.103				LREF	4.4260	IN.
◇	1.460				BREF	2.9690	IN.
					XMRP	4.3530	IN.
					YMRP	0.0000	IN.
					ZMRP	0.0000	IN.
					SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY







SYMBOL	MACH		PARAMETRIC VALUES		
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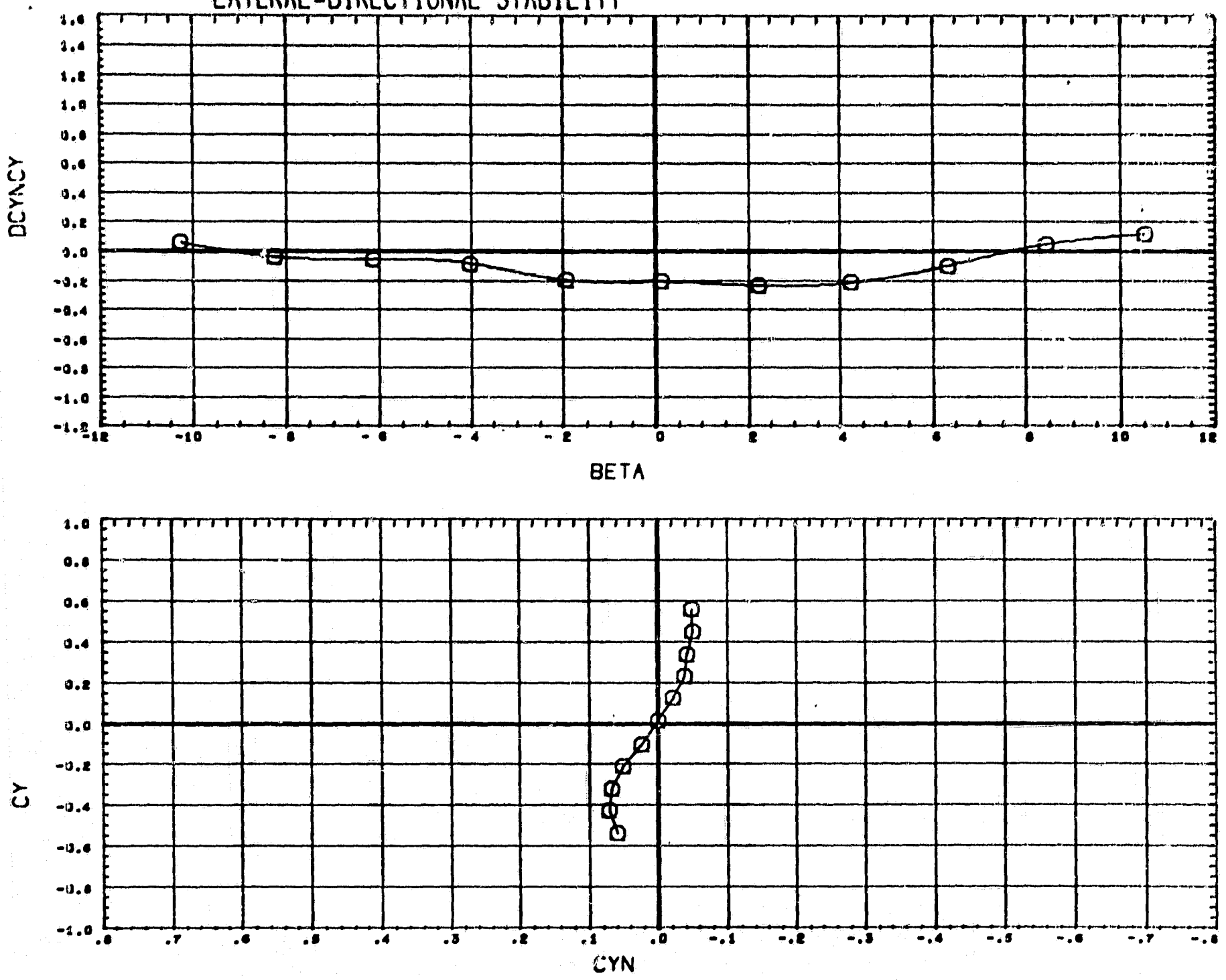
REFERENCE INFORMATION

SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE GR

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH		PARAMETRIC VALUES		
○	1.461	ALPHA	0.000	ORBINC -	2.000

REFERENCE INFORMATION		
SREF	5.1478	SQ.IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7550	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE GR