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DMS-DR-1227

FEBRUARY 1972

-SPACE SHUTTLE-

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

by

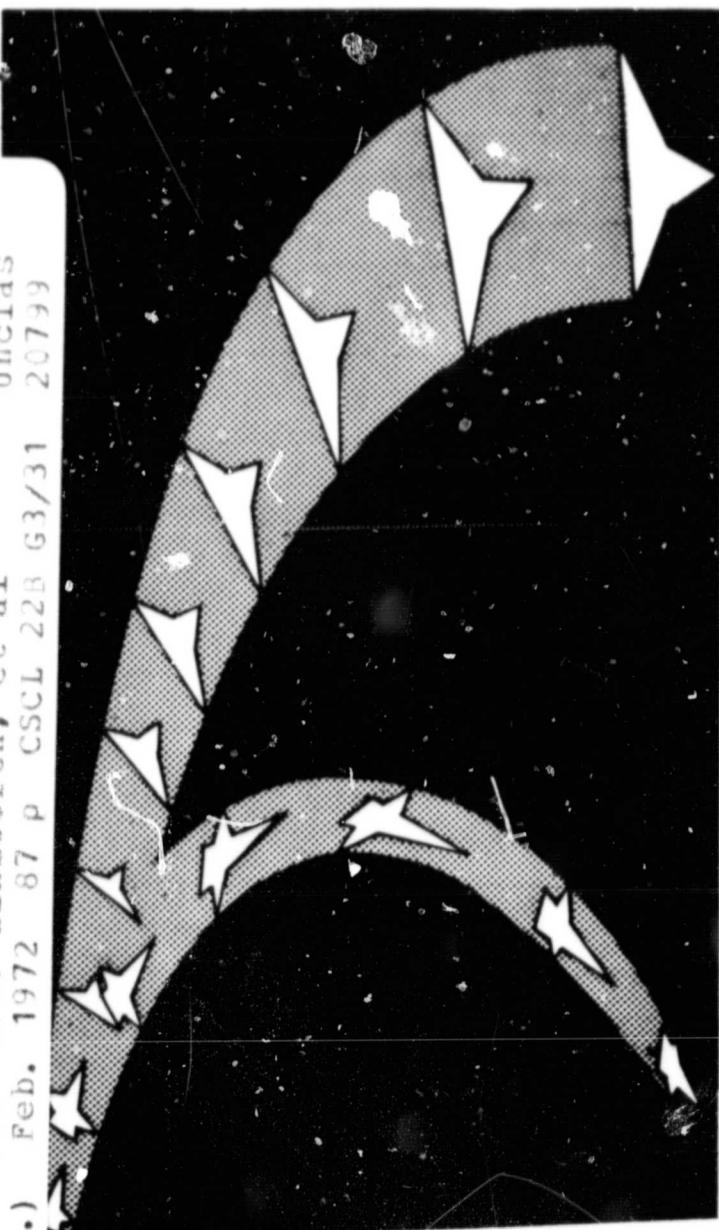
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MSFC 14-INCH
TRISONIC WIND TUNNEL

Marshall
Space Flight Center
NASA



This document should be
referenced as
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N72-20824

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AEROTHERMODYNAMIC
DATA MANAGEMENT SYSTEM

CONTRACT NAS8-4016
MARSHALL SPACE FLIGHT CENTER

SPACE DIVISION  CHRYSLER
CORPORATION

NASA Series Number: S-0675

DMS-DR-1227
February, 1972

SADSAC/SPACE SHUTTLE

WIND TUNNEL TEST DATA REPORT

CONFIGURATION: Composite Booster/O4OA 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

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CONTRACT NAS 8-4016

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This report has been prepared by Chrysler Corporation Space Division under a Data Management Contract to the NASA. Chrysler assumes no responsibility for the data presented herein other than its display characteristics.

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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)

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
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; kg/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

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
S		wing area; m^2 , ft^2
S	SREF	reference area; m^2 , ft^2
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 c)
b _{ref}	BREF	wing span or reference span; m, ft, in
A _b		base area; m^2 , ft^2 , in ²
c. g.		center of gravity
MRP	MRP	abbreviation for moment reference point
	XMRP	abbreviation for moment reference point on X-axis
	YMRP	abbreviation for moment reference point on Y-axis
	ZMRP	abbreviation for moment reference point on Z-axis

NOMENCLATURE (Continued)

Axis System General

<u>SYMBOL</u>	<u>DEFINITION</u>
F	force; F, lbs
M	moment; M, in-lb
<u>Subscript</u>	<u>Definition</u>
N	normal force
A	axial force
L	lift force
D	drag force
Y	force or moment about the Y axis
Z	moment about the Z axis
X	moment about the X axis
s	stability axis system
w	wind axis system
ref	reference conditions
∞	free stream conditions
t	total conditions
b	base

NOMENCLATURE (Continued)
Body & Stability Axis System

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
<u>Body Axis System</u>		
C_N	C_N	normal force coefficient; F_N/qS
C_A	C_A	axial force coefficient; F_A/qS
C_{A_b}	C_{AB}	base axial force coefficient; $[-1] \left[(p_b - p_\infty)/q \right] (A_b/S)$
C_{A_f}	C_{AF}	forebody axial force coefficient; $C_A - C_{A_b}$
C_n	C_{ZN}	yawing moment coefficient; $M_Z/qS b_{ref}$
C_l	C_{BL}	rolling moment coefficient; $M_X/qS b_{ref}$
<u>Common to Both Axis Systems</u>		
C_m	C_{LM}	pitching moment coefficient; $M_Y/qS l_{ref}$
C_y	C_Y	side force coefficient; F_Y/qS
<u>Stability Axis System</u>		
C_L	C_L	lift force coefficient; F_L/qS
C_D	C_D	drag force coefficient; F_D/qS
C_{D_b}	C_{DB}	base drag coefficient
C_{D_f}	C_{DF}	forebody drag coefficient; $C_D - C_{D_b}$
C_p	C_{ZS}	yawing moment coefficient; $M_{Z,S}/qS b_{ref}$
C_l	C_{XS}	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

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
it	HORIZT	horizontal tail incidence; positive when trailing edge down; degrees
δ		symmetrical surface deflection angle; degrees; positive deflections are:
	AILRDN	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: left aileron - trailing edge down right aileron - trailing edge down left elevon - trailing edge down right elevon - trailing edge down left spoiler - trailing edge down right spoiler - trailing edge down

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

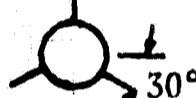
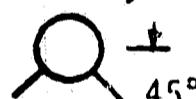
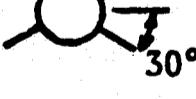
CONFIGURATION INVESTIGATED

BOOSTER BODY: Model 979-160

BODY: Cylindrical Booster and Tank Plus Cone Frustum Nose

	<i>l</i>	<i>d</i>	<i>l/d</i>
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	
V ₅		675 sq. ft. (Nominal)	1.746	Small Base Area 38.32 ft. dia. 5° 43' Flare
V ₆		675 sq. ft.	1.746	
V _{6.1}		675 sq. ft.	1.746	
V _{6.2}		675 sq. ft.	1.746	
V _{6.3}		675 sq. ft.	1.746	Large Base Area 47.53 ft. dia. 12° 54' Flare
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
ϕ_1^{-2}	109.58 ft.	73.5 ft.	-2°	040A $S_V = 380$ sq. ft.
ϕ_2^{-2}	109.58 ft.	73.5 ft.	-2°	040A $S_V = 485$ sq. ft.
ϕ_3^{-2}	109.58 ft.	73.5 ft.	-2°	040A Vert. Off

ORBITER LOCATION BEHIND TANK NOSE:

<u>B5</u>	<u>B6</u>
23.0 ft.	3.94 ft.

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

	LENGTH	δF	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°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°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_{AT}) to a condition corresponding to free stream pressure acting at the base region.

$$C_{AT} = C_{AF} + C_{AB}$$

$$C_{AB} = \left(\frac{C_{PB1} + C_{PB2}}{2} - \frac{A_B}{S_{ref}} \right) + (C_p_c \times \frac{A_c}{S_{ref}})$$

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

$$C_p_c = \frac{\Delta P_c}{q}$$

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

DATA REDUCTION DETAILS (Continued)

1. MOMENT REFERENCE CENTER LOCATION

$x = 5.753$ inches from booster base for B5

$x = 4.353$ inches from booster base for B6

$y = 0$ 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

<u>Longitudinal</u>	<u>Lateral</u>
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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TEST TIVT #522 DATA SET COLLATION SHEET

PRETEST
 POSTTEST

DATA SET IDENTIFIER	CONFIGURATION	SCHED.	PARAMETERS/VALUES		NO. of RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE)		IDPVAR(1) IDPVAR(2) NDV
			a	b		c	d	
R5705A	B5 $\phi_i^{-2} V_6$	A	0°	-2°	26	0.7	1.1	1.46 2.74
05C	✓	C	C		26	0.7	1.1	1.46 2.74
07C	B5 $\phi_i^{-2} V_{6.2}$	✓	✓		26	0.7	1.1	1.46 2.74
07A	✓	A	0°		26	0.7	1.1	1.46 2.74
24A	E5 $\phi_i^{-2} P_i$	✓	✓		26	0.7	1.1	1.46 2.74
06B	B5 $\phi_i^{-2} V_{6.1}$	O	B		26	0.7	1.1	1.46 2.74
08B	B5 $\phi_i^{-2} V_{6.3}$	✓	✓		26	0.7	1.1	1.46 2.74
08A	✓	A	0°		26	0.7	1.1	1.46 2.74
09A	B5 $\phi_i^{-2} V_{6.4}$	A	C		26	0.7	1.1	1.46 2.74
09C	✓	O	C		26	0.7	1.1	1.46 2.74
10C	B5 $\phi_i^{-2} V_7$	✓	✓		26	0.7	1.1	1.46 2.74
24C	B5 $\phi_i^{-2} P_i$	✓	C		26	0.7	1.1	1.46 2.74
03A	B5 ϕ_i^{-2}	A	C°		26	0.7	1.1	1.46 2.74
03C	✓	O°	C		26	0.7	1.1	1.46 2.74
01A	B5	A	O°		26	0.7	1.1	1.46 2.74
13A	B5 V ₆	✓	✓		26	0.7	1.1	1.46 2.74
13C	✓	O°	C		26	0.7	1.1	1.46 2.74
14C	B5 V _{6.2}	✓	✓		26	0.7	1.1	1.46 2.74
14A	✓	A	O°		26	0.7	1.1	1.46 2.74

C_L^M , E_N , $I_C Y$, $E_E L$, $C_Y N$, $C_A S$, $C_P C$, $C_D F$
COEFFICIENTS:
 $A = AC = -10^\circ - 5^\circ - 1^\circ - 4^\circ - 2^\circ + 0^\circ + 1^\circ + 0^\circ + 1^\circ$
 $a \text{ or } b$
 $BB = -4^\circ - 2^\circ + 2^\circ + 4^\circ - 2^\circ + 0^\circ + 0^\circ + 0^\circ$
SCHEDULES

TABLE 1 (Continued)

TEST T_H/T 523 DATA SET COLLATION SHEET

54/E-E-2

PRETEST
 POST TEST

DATA SET IDENTIFIER	CONFIGURATION	SCHD.	PARAMETERS / VALUES	NO. of RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE)							
					a	b	c	d	e	f	g	h
257/53	$B_4 V_{1.2}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
16C	$B_5 V_{6.4}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
16A		✓		1	0.6	0.7	1.1	1.4	2.74	4.96		
18A	$B_5 V_{7.2}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
17C	$B_5 V_7$			1	0.6	0.7	1.1	1.4	2.74	4.96		
19C	$B_5 \phi_1^{-2} V_{7.2}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
19A		✓		1	0.6	0.7	1.1	1.4	2.74	4.96		
16C	$B_5 V_{7.2}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
19A	$B_5 \phi_1^{-2} V_{7.2}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
07C	$B_5 \phi_1^{-2} V_{6.2}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
20C	$B_5 \phi_1^{-2} V_{7.2}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
21C	$B_5 \phi_3^{-2} V_{7.2}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
12C	$B_6 \phi_1^{-2} V_5$			1	0.6	0.7	1.1	1.4	2.74	4.96		
12A		✓		1	0.6	0.7	1.1	1.4	2.74	4.96		
11A	$B_6 \phi_1^{-2} V_{3.3}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
11C				1	0.6	0.7	1.1	1.4	2.74	4.96		
22C	$B_6 \phi_2^{-2} V_{3.3}$			1	0.6	0.7	1.1	1.4	2.74	4.96		
23C	$B_6 \phi_2^{-2} V_5$			1	0.6	0.7	1.1	1.4	2.74	4.96		

COEFFICIENTS: SEE SHEET No. 1
 a or b
 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 $\alpha = -10^\circ$ to $+10^\circ$ at zero angle of sideslip, and yaw data were obtained from $\beta = -10^\circ$ to $+10^\circ$ 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

BALANCE UTILIZED: #227

CAPACITY:

ACCURACY:

COEFFICIENT TOLERANCE:

NF	<u>125 lbs (at gages)</u>
SF	<u>45 lbs</u>
AF	<u>25 lbs</u>
PM	<u>300 in. lbs.</u>
YM	<u>100 in. lbs.</u>
RM	<u>50 in. lbs.</u>

COMMENTS:

TABLE 3

MODEL COMPONENT: BODY - B5GENERAL DESCRIPTION: 0.003366 SCALE BOOSTER BODYDRAWING NUMBER:

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

TABLE 3 (Continued)

MODEL COMPONENT: BODY - B6GENERAL DESCRIPTION: 0.003366 SCALE BOOSTER BODYDRAWING NUMBER:

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

TABLE 3 (Continued)

MODEL COMPONENT: ORBITER - O1GENERAL DESCRIPTION: 0.003366 Scale Model of MSC Orbiter 040A

DRAWING NUMBER: _____

DIMENSIONS: THEORETICAL ACTUAL MEASURED

	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>	<u>MODEL SCALE</u>
Area	_____	_____	_____
Span (equivalent)	<u>73.5 ft</u>	<u>2.969 in</u>	<u>2.998 in</u>
Inb'd Exposed chord	<u>53.35 ft</u>	<u>2.357 in</u>	<u>2.357 in</u>
Outb'd equivalent chord	_____	_____	_____
Body length	<u>109.58 ft</u>	<u>4.443 in</u>	<u>4.503 in</u>
Body width	<u>16.76 ft.</u>	<u>0.677 in</u>	<u>0.677 in</u>
Sweep Back Angles, degrees			
Leading Edge	<u>60°</u>	<u>60°</u>	<u>60°</u>
Tailing Edge	<u>-10.5°</u>	<u>-10.5°</u>	<u>-10.5°</u>
Incidence angle	<u>+2°</u>	<u>+2°</u>	<u>+2°</u>
Vertical tail area	<u>380 ft²</u>	<u>0.62 in²</u>	<u>0.62 in²</u>

TABLE 3 (Continued)

MODEL COMPONENT: ORBITER - O₂GENERAL 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:	<u>ORBITER - O3</u>																																																	
GENERAL DESCRIPTION:	<u>0.003366 SCALE MODEL OF MSC ORBITER 040A</u>																																																	
	<u>(MODIFIED) (Same as Orbiter O2 with Vertical Tail Removed)</u>																																																	
DRAWING NUMBER:	<u></u>																																																	
DIMENSIONS:	<table> <thead> <tr> <th></th><th><u>THEORETICAL</u></th><th><u>ACTUAL MEASURED</u></th></tr> <tr> <th></th><th><u>FULL-SCALE</u></th><th><u>MODEL SCALE</u></th></tr> </thead> <tbody> <tr> <td>Area</td><td><u></u></td><td><u></u></td></tr> <tr> <td>Span (equivalent)</td><td><u>73.5 ft</u></td><td><u>2.969 in</u></td></tr> <tr> <td>Inb'd Exposed Chord</td><td><u>58.35 ft</u></td><td><u>2.357 in</u></td></tr> <tr> <td>Outb'd equivalent chord</td><td><u></u></td><td><u></u></td></tr> <tr> <td> </td><td> </td><td> </td></tr> <tr> <td>Body length</td><td><u>109.58 ft</u></td><td><u>4.443 in</u></td></tr> <tr> <td>Body width</td><td><u>16.76 ft</u></td><td><u>0.677 in</u></td></tr> <tr> <td>Sweep Back Angles, degrees</td><td colspan="3"></td></tr> <tr> <td>Leading Edge</td><td><u>60°</u></td><td><u>60°</u></td><td><u>60°</u></td></tr> <tr> <td>Tailing Edge</td><td><u>0°</u></td><td><u>0°</u></td><td><u>0°</u></td></tr> <tr> <td>Incidence angle</td><td><u>+2°</u></td><td><u>+2°</u></td><td><u>+2°</u></td></tr> <tr> <td>Vertical tail area</td><td><u>0</u></td><td><u>0</u></td><td><u>0</u></td></tr> </tbody> </table>				<u>THEORETICAL</u>	<u>ACTUAL MEASURED</u>		<u>FULL-SCALE</u>	<u>MODEL SCALE</u>	Area	<u></u>	<u></u>	Span (equivalent)	<u>73.5 ft</u>	<u>2.969 in</u>	Inb'd Exposed Chord	<u>58.35 ft</u>	<u>2.357 in</u>	Outb'd equivalent chord	<u></u>	<u></u>	 	 	 	Body length	<u>109.58 ft</u>	<u>4.443 in</u>	Body width	<u>16.76 ft</u>	<u>0.677 in</u>	Sweep Back Angles, degrees				Leading Edge	<u>60°</u>	<u>60°</u>	<u>60°</u>	Tailing Edge	<u>0°</u>	<u>0°</u>	<u>0°</u>	Incidence angle	<u>+2°</u>	<u>+2°</u>	<u>+2°</u>	Vertical tail area	<u>0</u>	<u>0</u>	<u>0</u>
	<u>THEORETICAL</u>	<u>ACTUAL MEASURED</u>																																																
	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>																																																
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Leading Edge	<u>60°</u>	<u>60°</u>	<u>60°</u>																																															
Tailing Edge	<u>0°</u>	<u>0°</u>	<u>0°</u>																																															
Incidence angle	<u>+2°</u>	<u>+2°</u>	<u>+2°</u>																																															
Vertical tail area	<u>0</u>	<u>0</u>	<u>0</u>																																															

TABLE 3 (Continued)

MODEL COMPONENT: FIN V3.3GENERAL DESCRIPTION: Three Trapezoidal Fins, Conical Leading Edge, Flat Constant t/c Section Tapered to Tip, 120° Apart, One Fin UpDRAWING NUMBER: AX 1233-5, -8

<u>DIMENSIONS:</u>	<u>THEORETICAL</u>		<u>ACTUAL MEASURED</u>
	<u>TOTAL DATA</u>	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
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	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 V₅ (V₆ 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:

TOTAL DATATHEORETICALACTUAL MEASUREDFULL-SCALEMODEL SCALEMODEL 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

Trailing Edge

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)

30°

0°

30°

0°

30°

0°

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 V₆ (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:

<u>TOTAL DATA</u>	<u>THEORETICAL</u>		<u>ACTUAL MEASURED</u>
	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>	<u>MODEL SCALE</u>
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			
<u>EXPOSED DATA</u> (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 V₇ (V_{7.2})

GENERAL DESCRIPTION: Trapezoidal Fins, Conical Leading Edge, Flat Constant

t/c Section Tapered to TipV₇ = 3 fins 120° apart one vertical upV_{7.2} = V₇ less top vertical fin (2)

DRAWING NUMBER: AX 1233-17, -20

DIMENSIONS:

TOTAL DATA	THEORETICAL		ACTUAL MEASURED
	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	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

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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, B₆

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

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Notes:

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

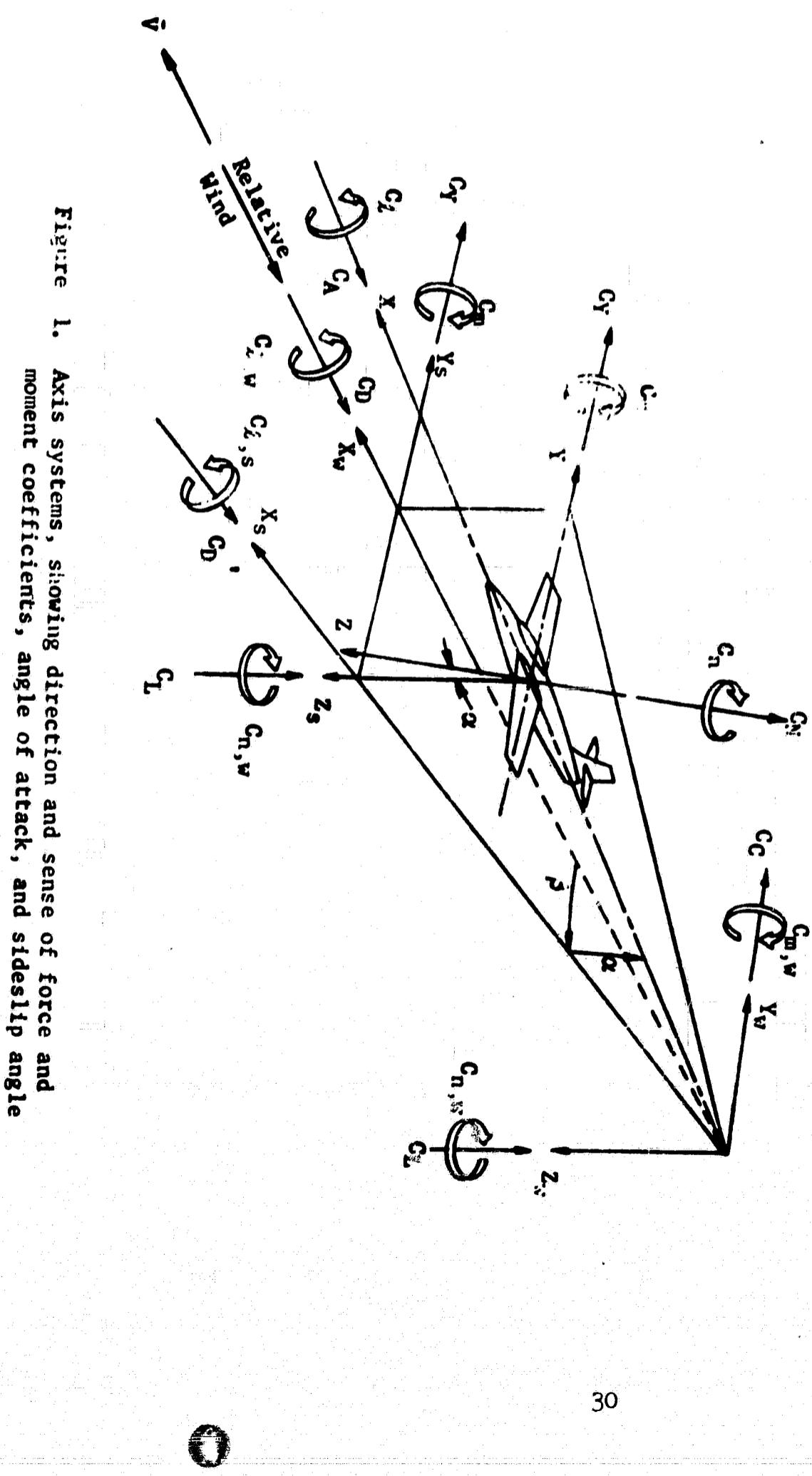
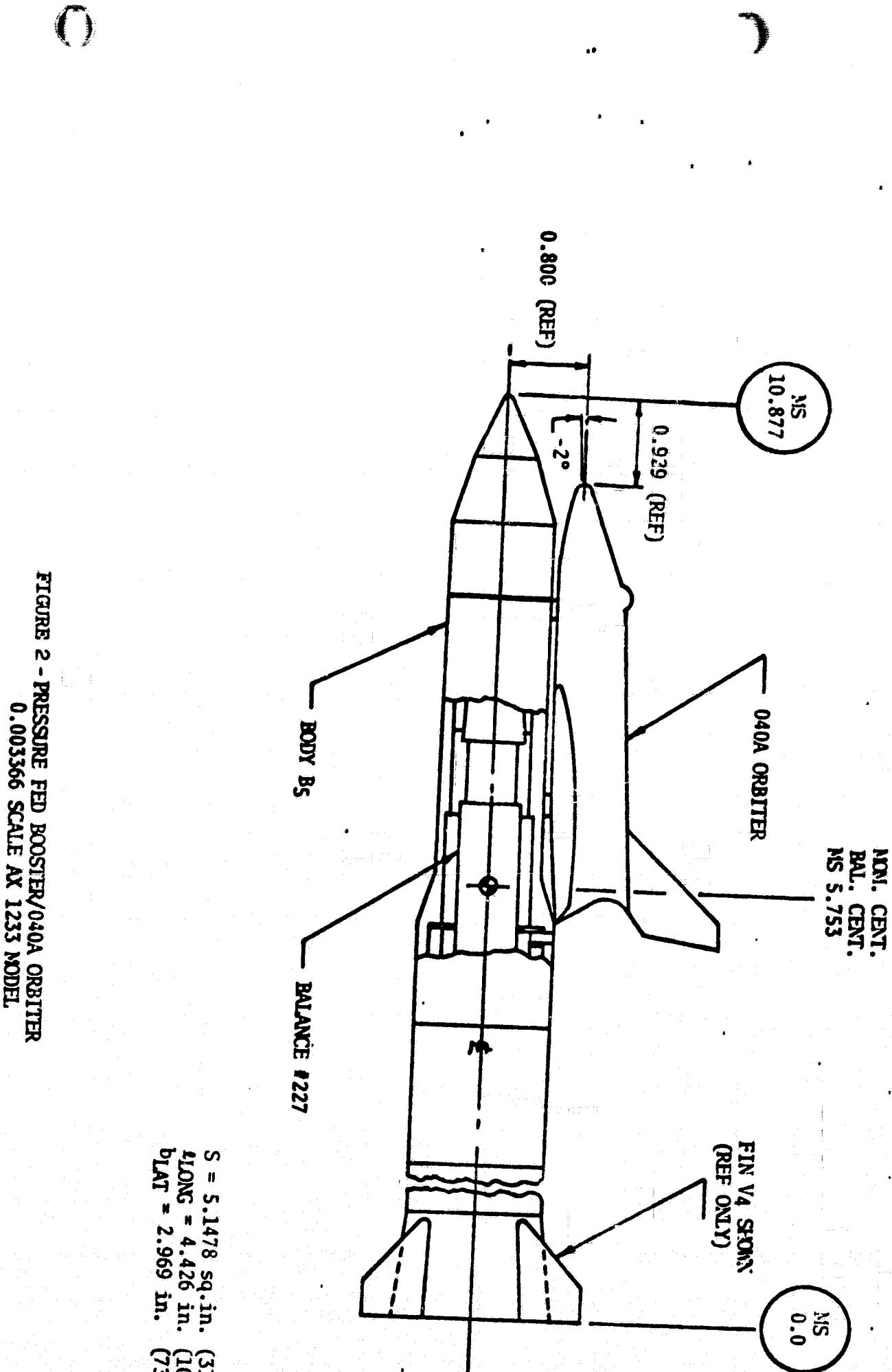


Figure 1. Axis systems, showing direction and sense of force and moment coefficients, angle of attack, and sideslip angle



$S = 5.1478 \text{ sq.in. (3155.3 sq.ft.)}$
 $a_{\text{LONG}} = 4.426 \text{ in. (109.58 ft)}$
 $b_{\text{LAT}} = 2.969 \text{ in. (73.5 ft)}$

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

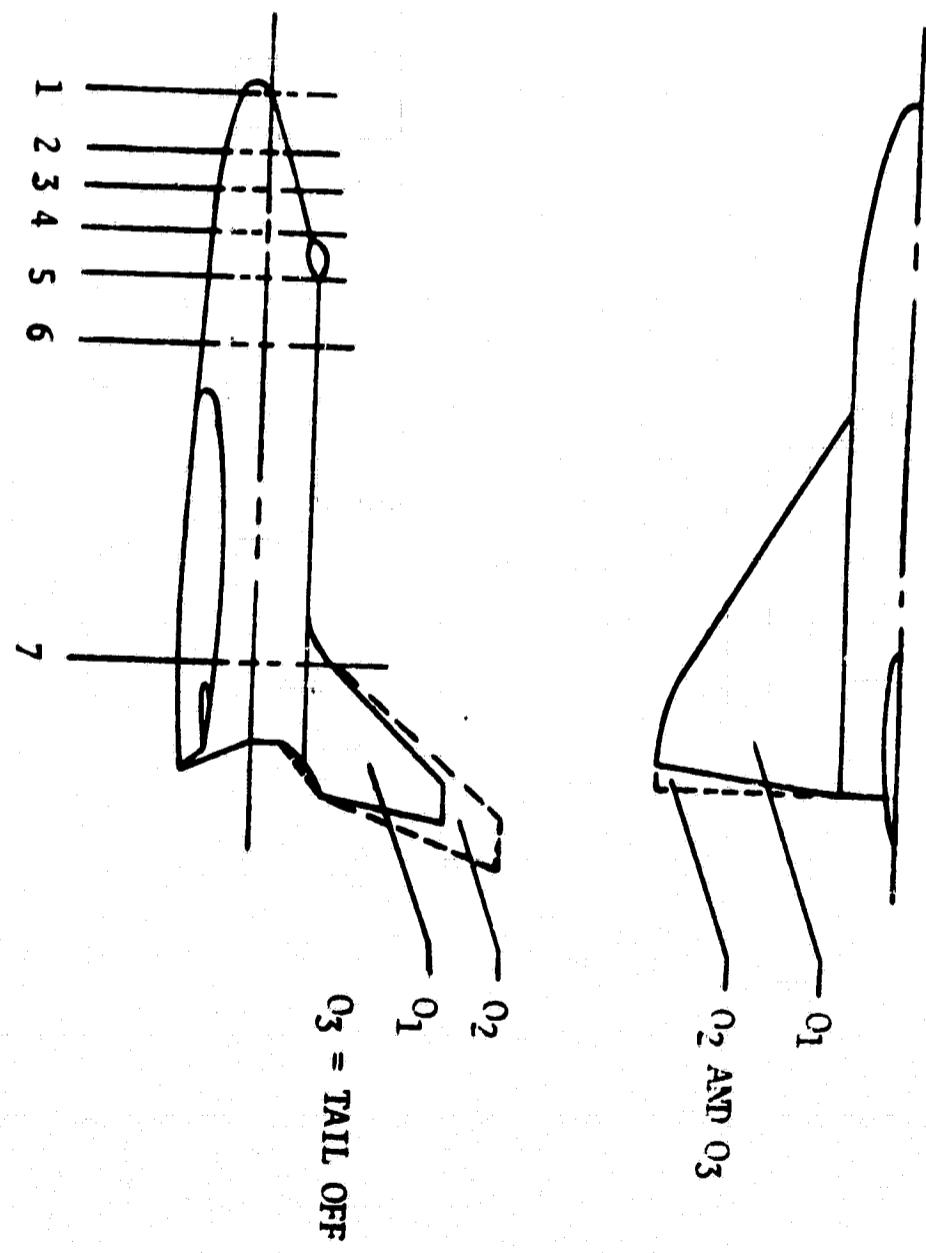
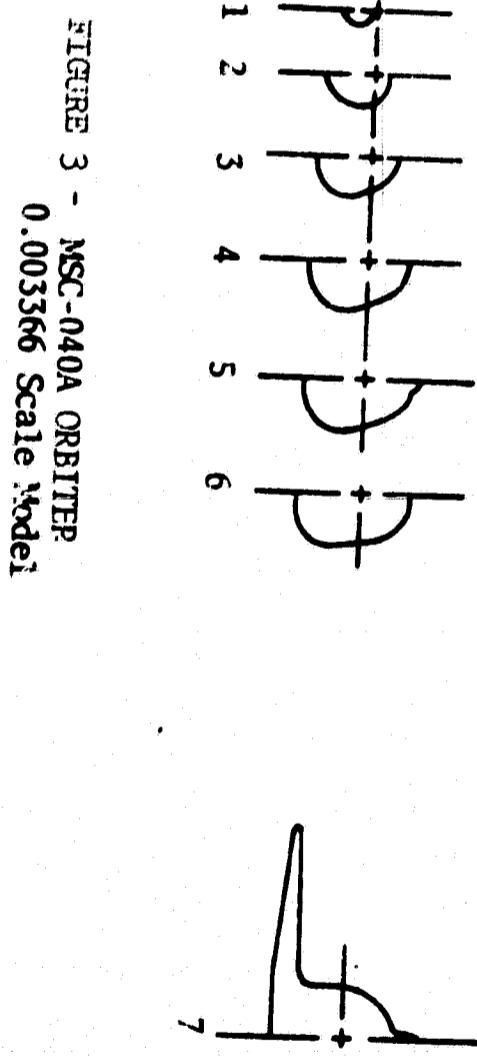


FIGURE 3 - MSC-040A ORBITER
0.003366 Scale Model

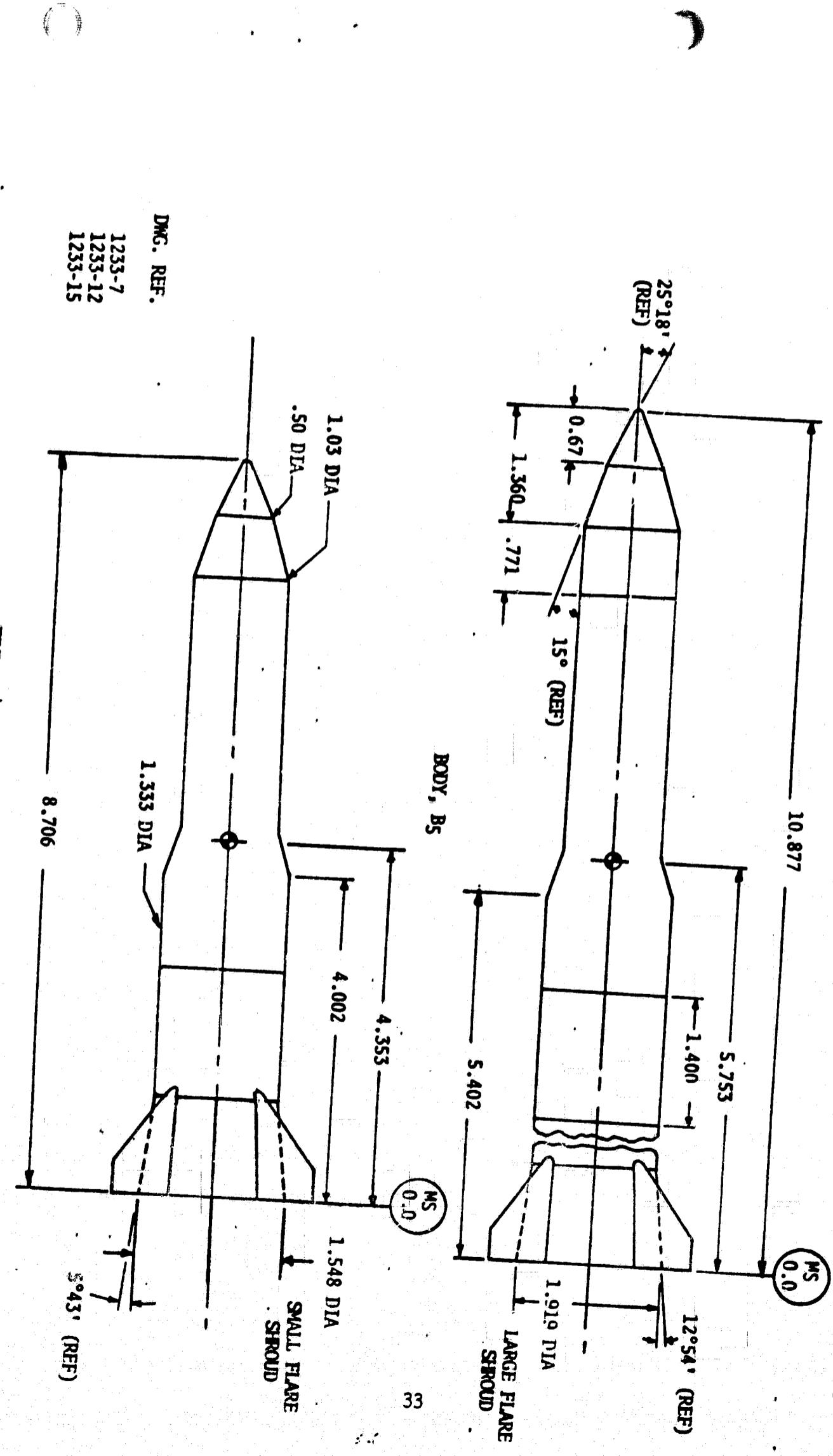


FIGURE 4 - BODY, B₆

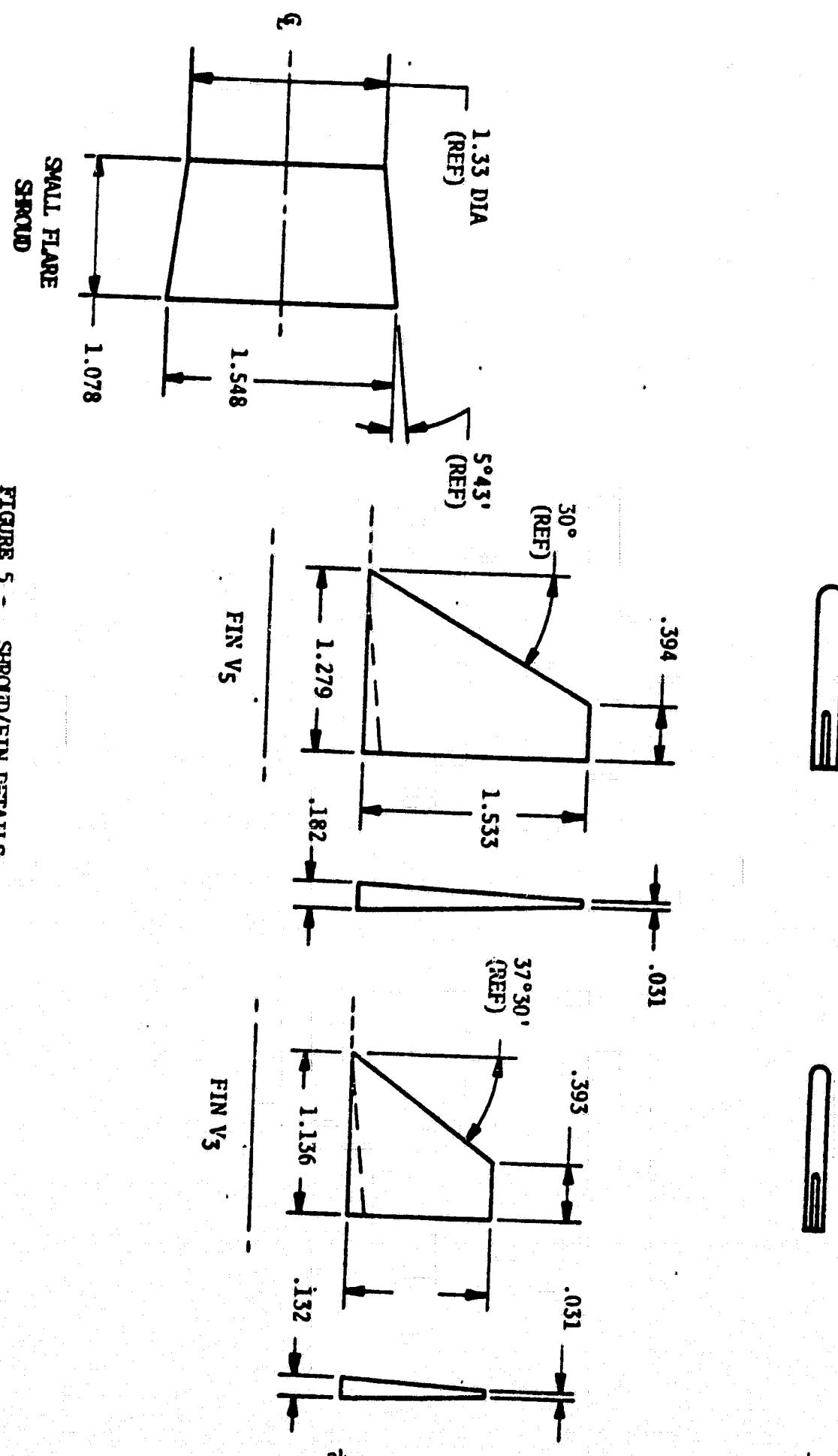


FIGURE 5 - SHROUD/FIN DETAILS
 0.003366 SCALE AX 12331-1 MODEL

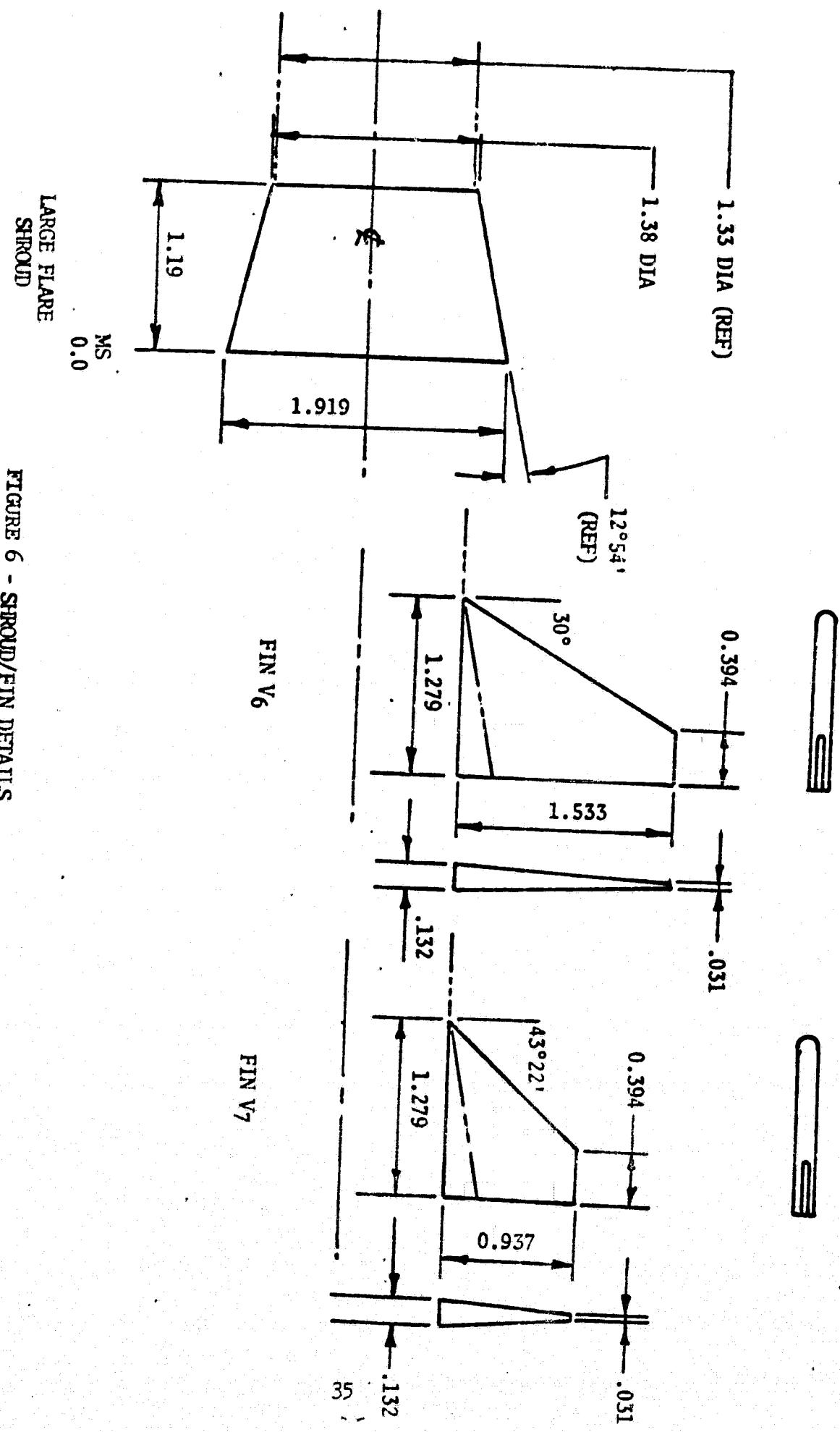
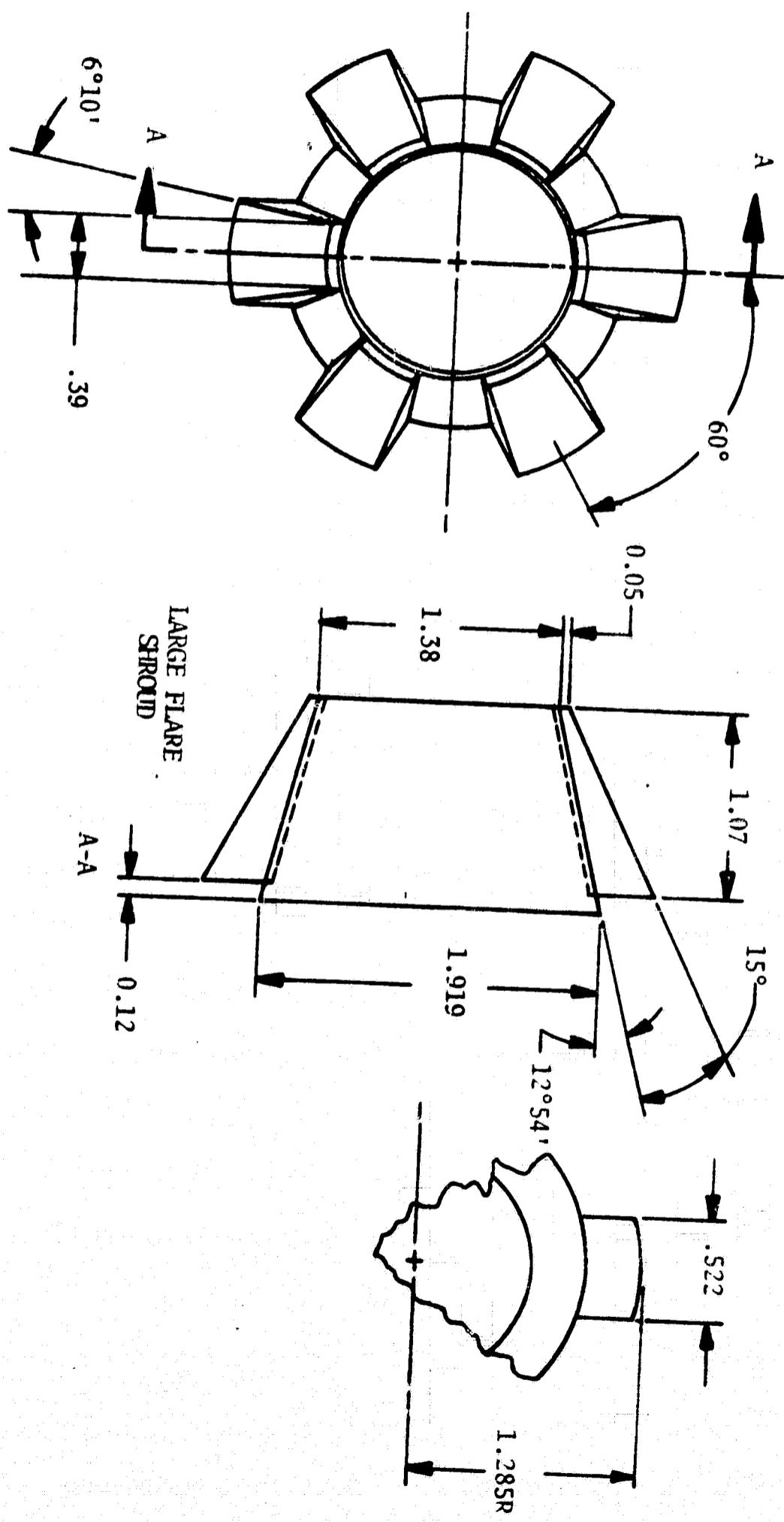


FIGURE 6 - SHROUD/FIN DETAILS
 0.003366 SCALE AX 1233I-1 MODEL

LARGE FLARE
SHROUD

FIGURE 7 - PETAL DETAILS
0.003366 SCALE AX 12351-1 MODEL



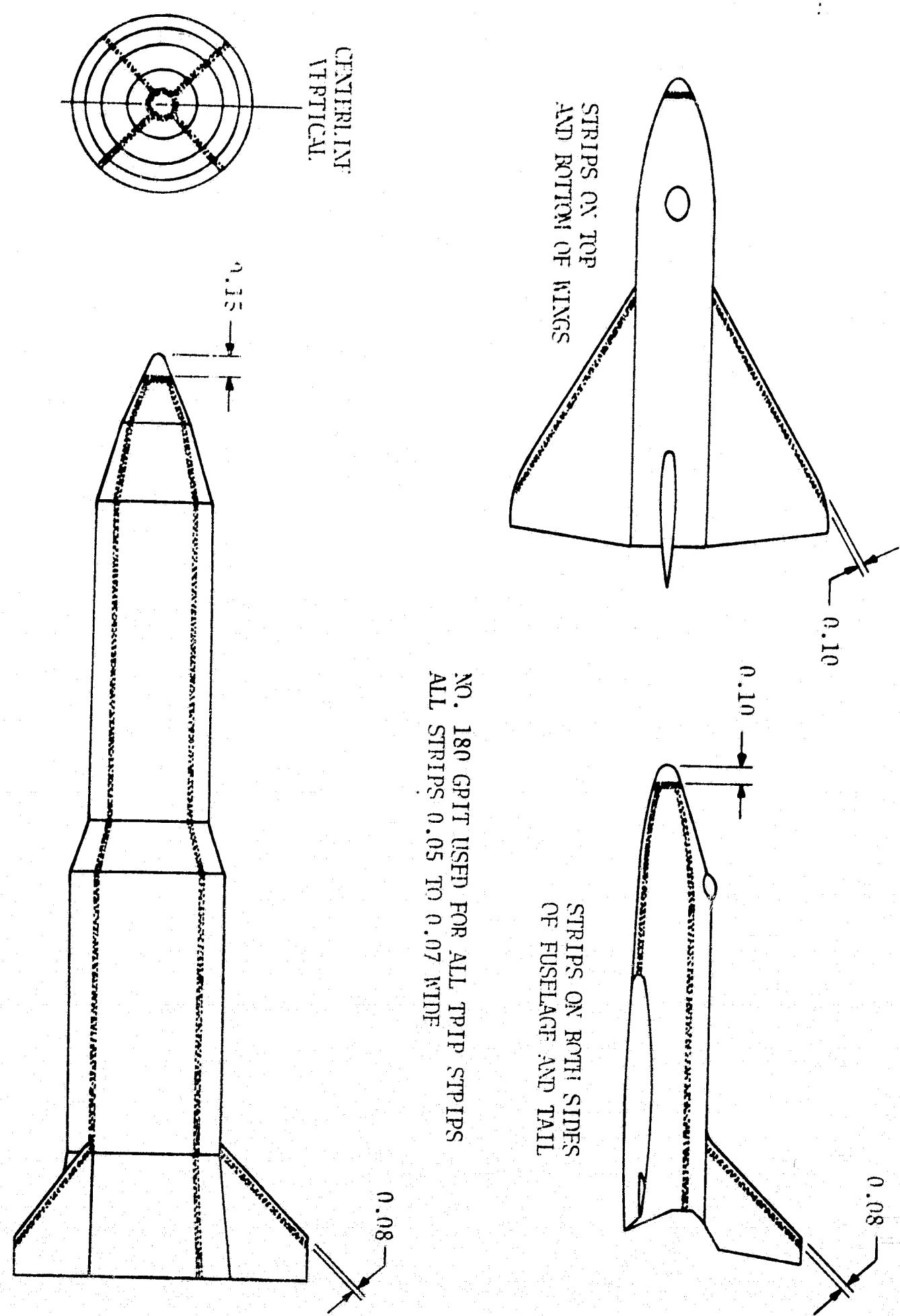
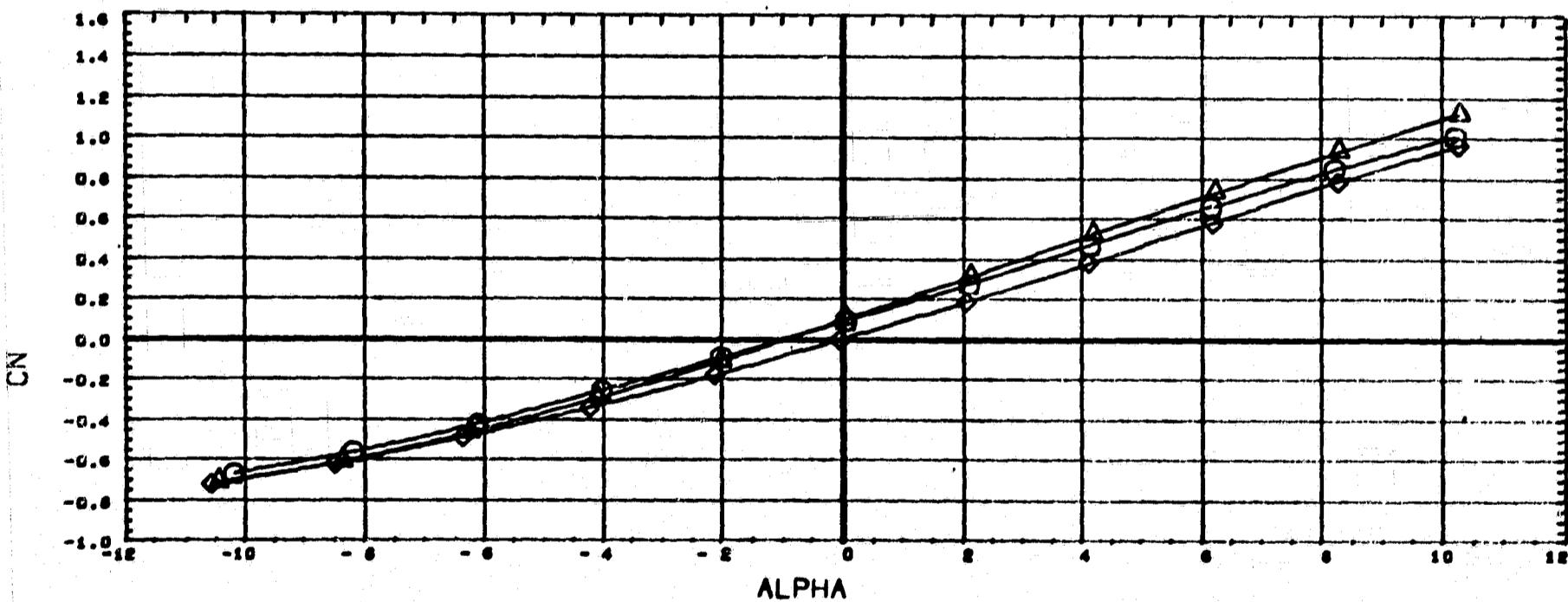
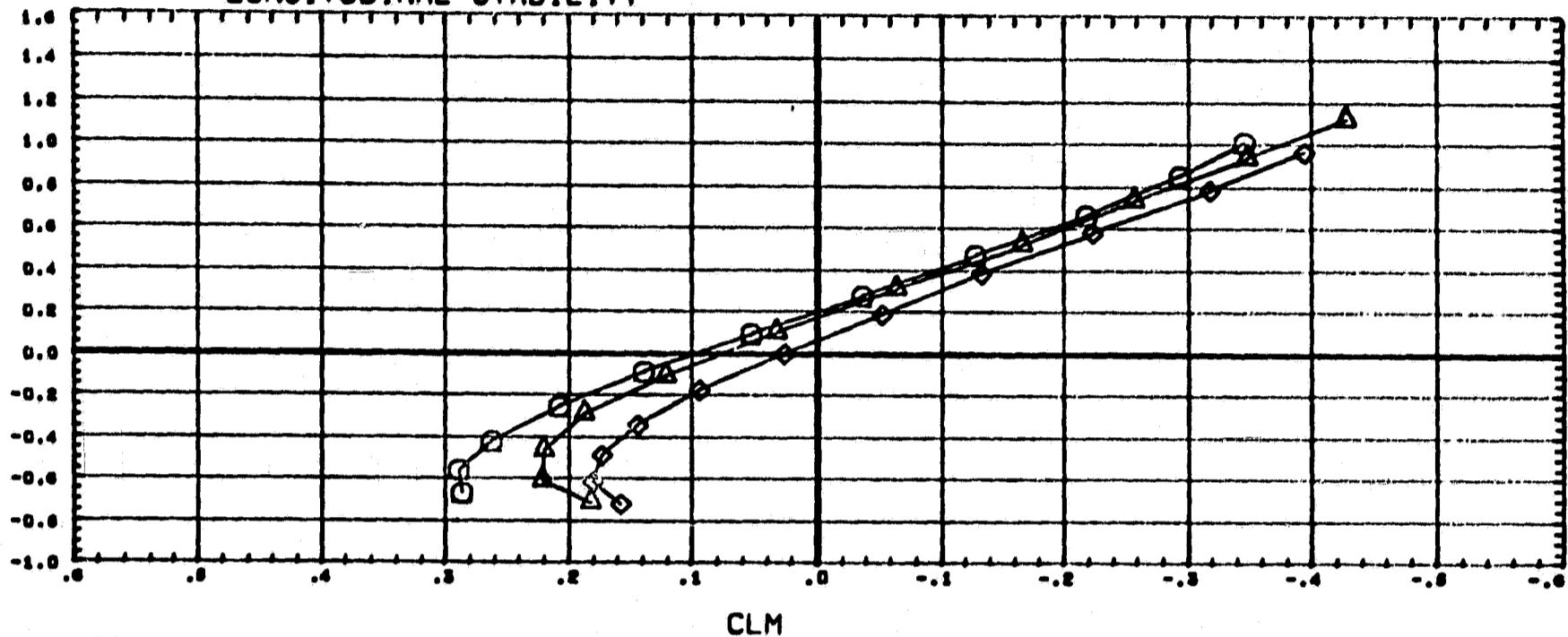


FIGURE 8 - TRIP STRIP CHART
0.005366 SCALE MODEL AX 12551-1

DATA FIGURES

LONGITUDINAL STABILITY



SYMBOL	MACH	BETA	PARAMETRIC VALUES
O	0.698		0.000 ORBINC - 2.000
A	1.102		
△	1.452		

REFERENCE INFORMATION		
BREF	5.1476	IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XHRP	5.7330	IN.
YHRP	0.0000	IN.
ZHRP	0.0000	IN.
SCALE	0.0034	

DATA MIST. CODE CCR

M523-MSFC MODEL AX1233I-1

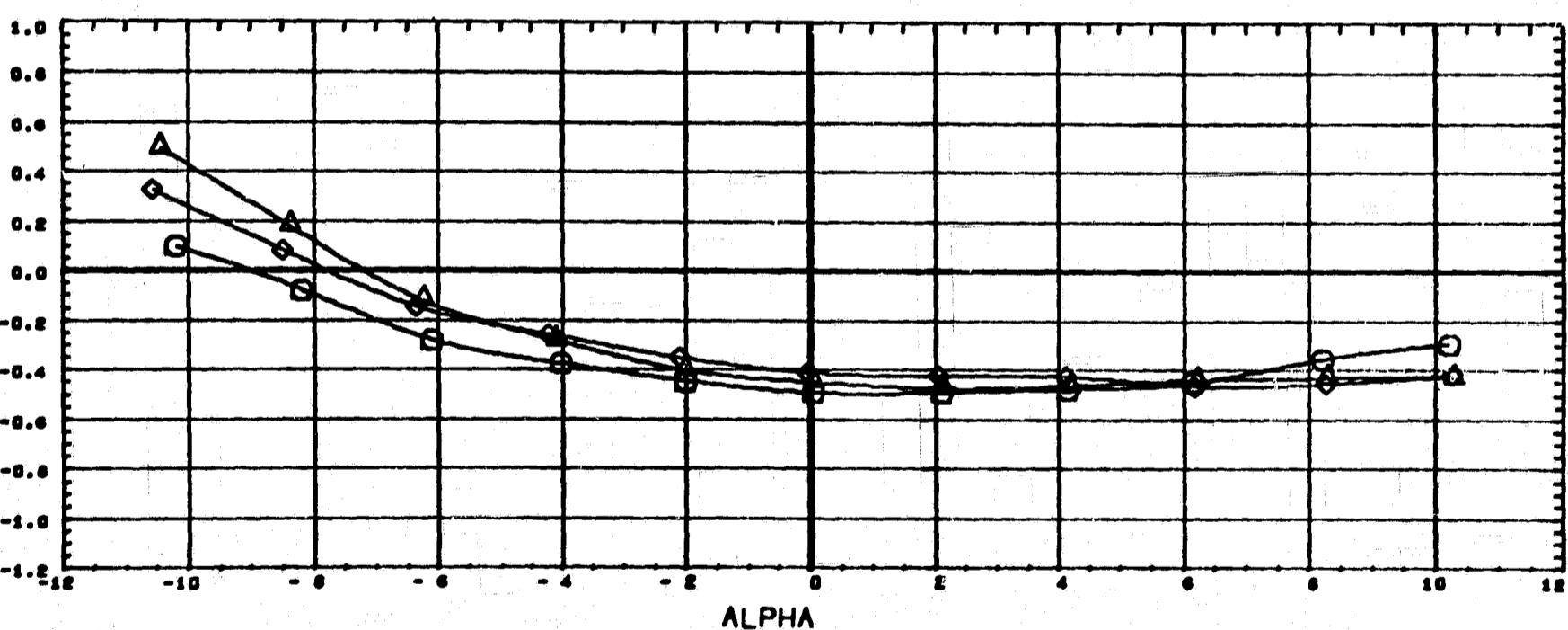
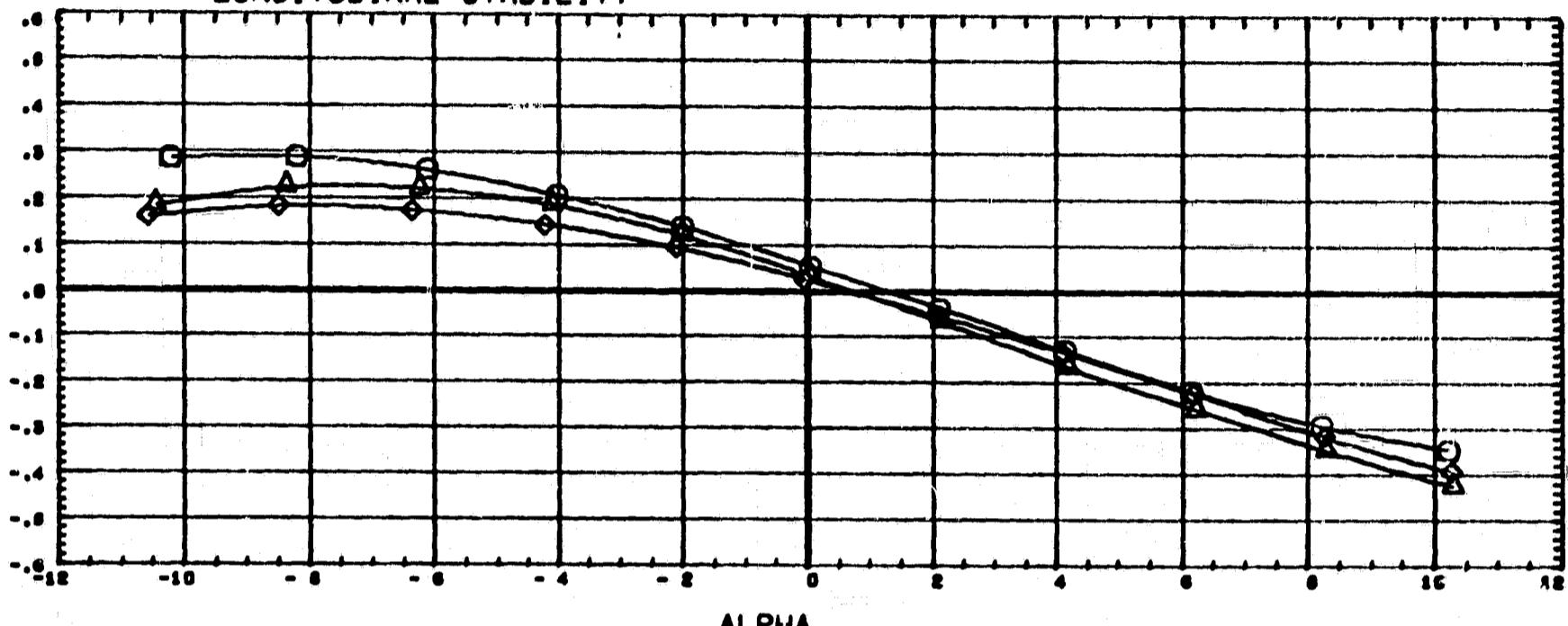
B501-2V6

(D5705A) 10 FEB 72

PAGE

1

LONGITUDINAL STABILITY



SYMBOL	MACH	BETA	PARAMETRIC VALUES
	0.696		0.000 ORBINC - 2.000
	1.302		
	1.462		

REFERENCE INFORMATION		
SREF	5.1476	SG. IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XHRP	5.7530	IN.
THRP	0.0000	IN.
ZHRP	0.0000	IN.
SCALE	0.0034	

DATA MIBT, CODE CGR

M523-MSFC MODEL AX1233I-1

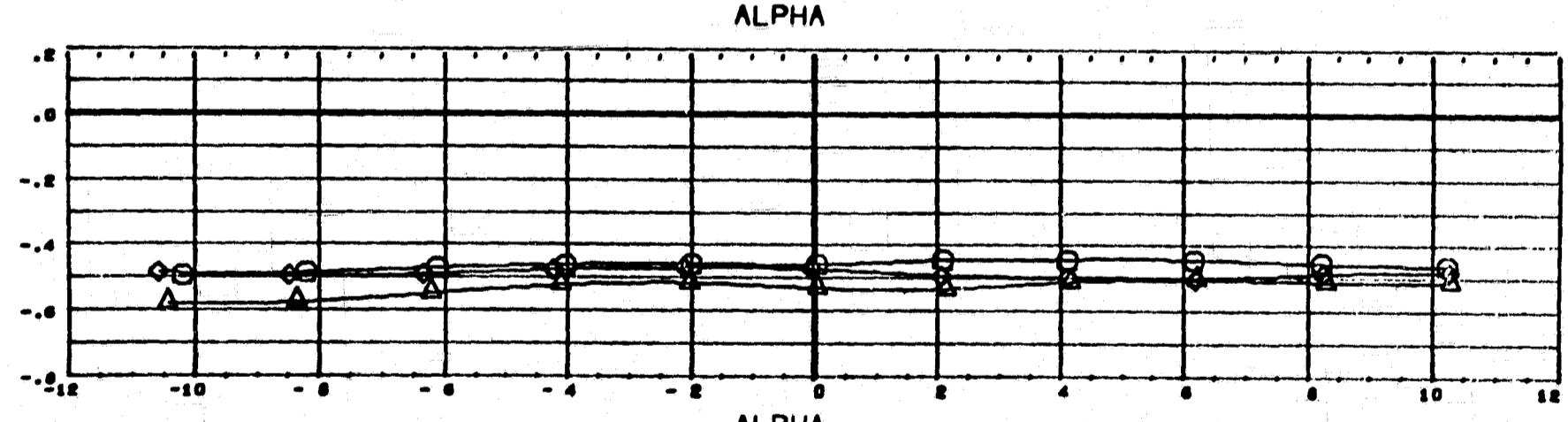
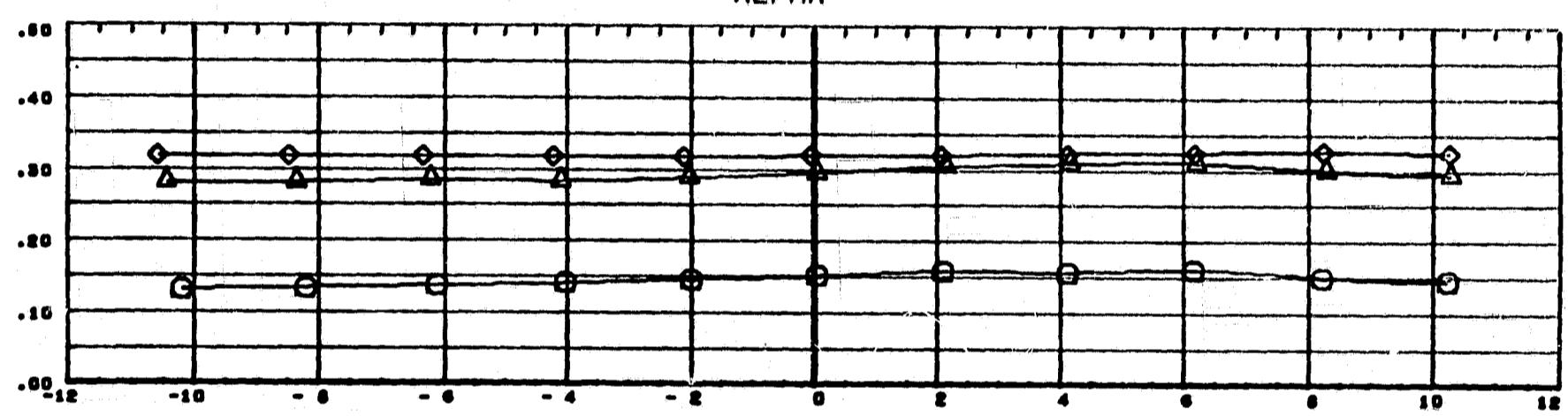
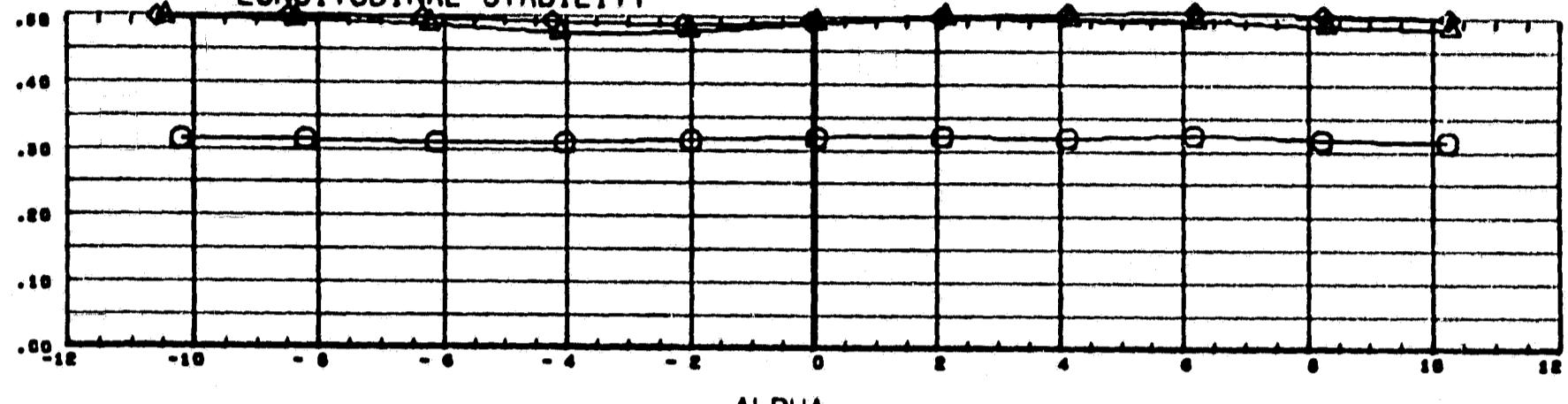
B501-2V6

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PAGE

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LONGITUDINAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
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	1.102	

ALPHA

REFERENCE INFORMATION

SREF	5.1478	IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7930	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALING	0.0000	IN.

M522 MSEC MODEL AX12331

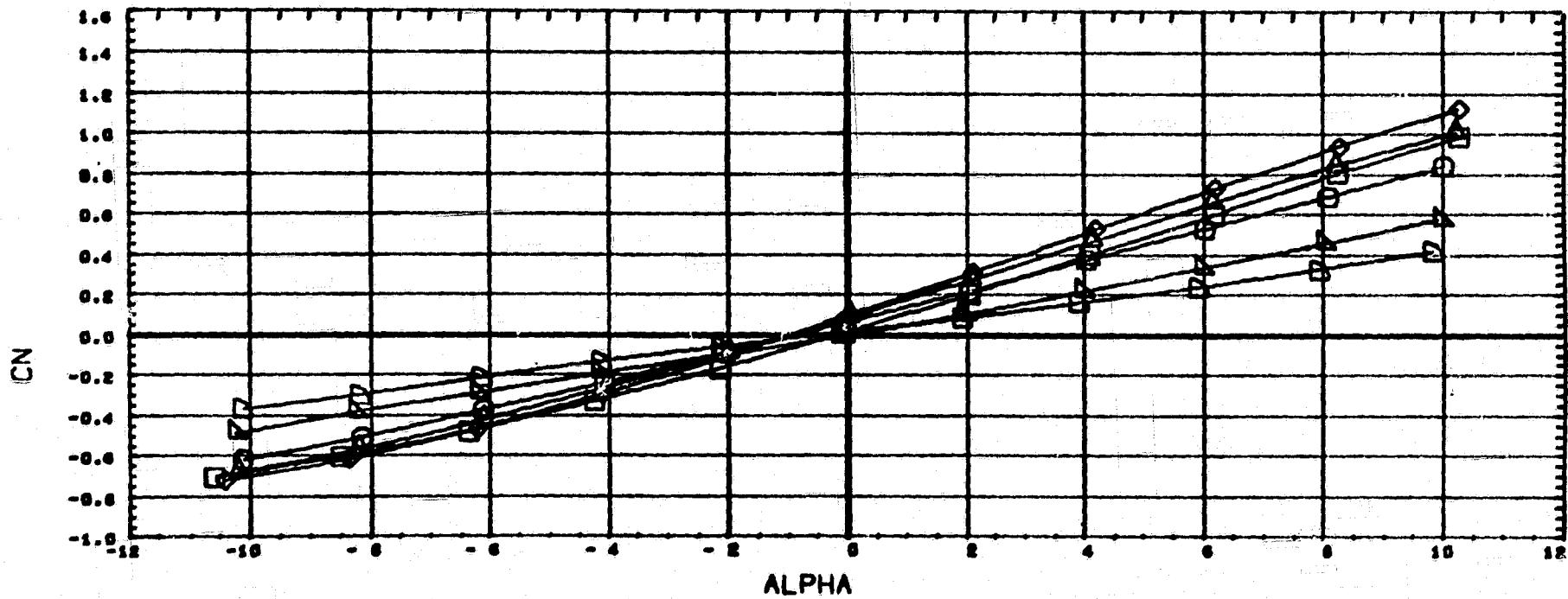
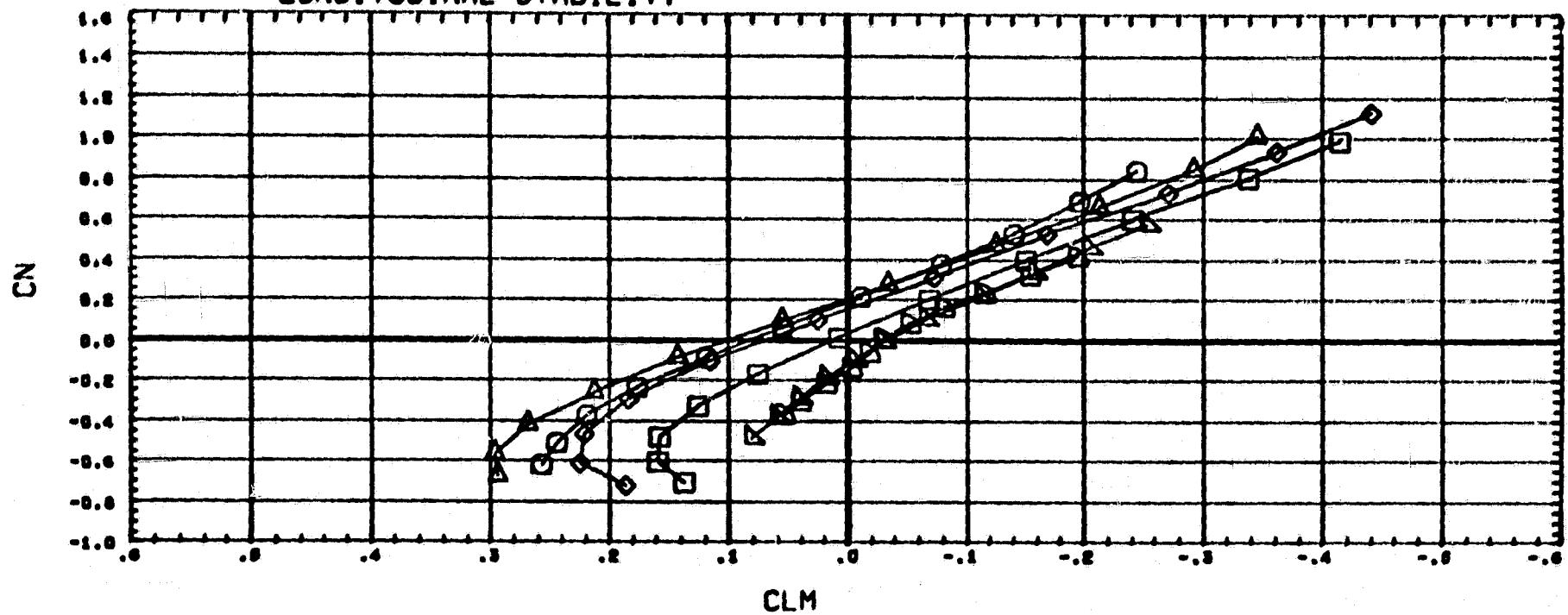
REGI 3VC

6DEZ05A2 12 FEB 52

BASE

1

LONGITUDINAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
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	0.699	
	1.104	
	1.457	
	2.740	
	4.059	DATA HIST. CODE CCR

REFERENCE INFORMATION		
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LREF	4.4260	IN.
BREF	2.8690	IN.
XMRP	3.7980	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

M523-MSFC MODEL AX1233 I - 1

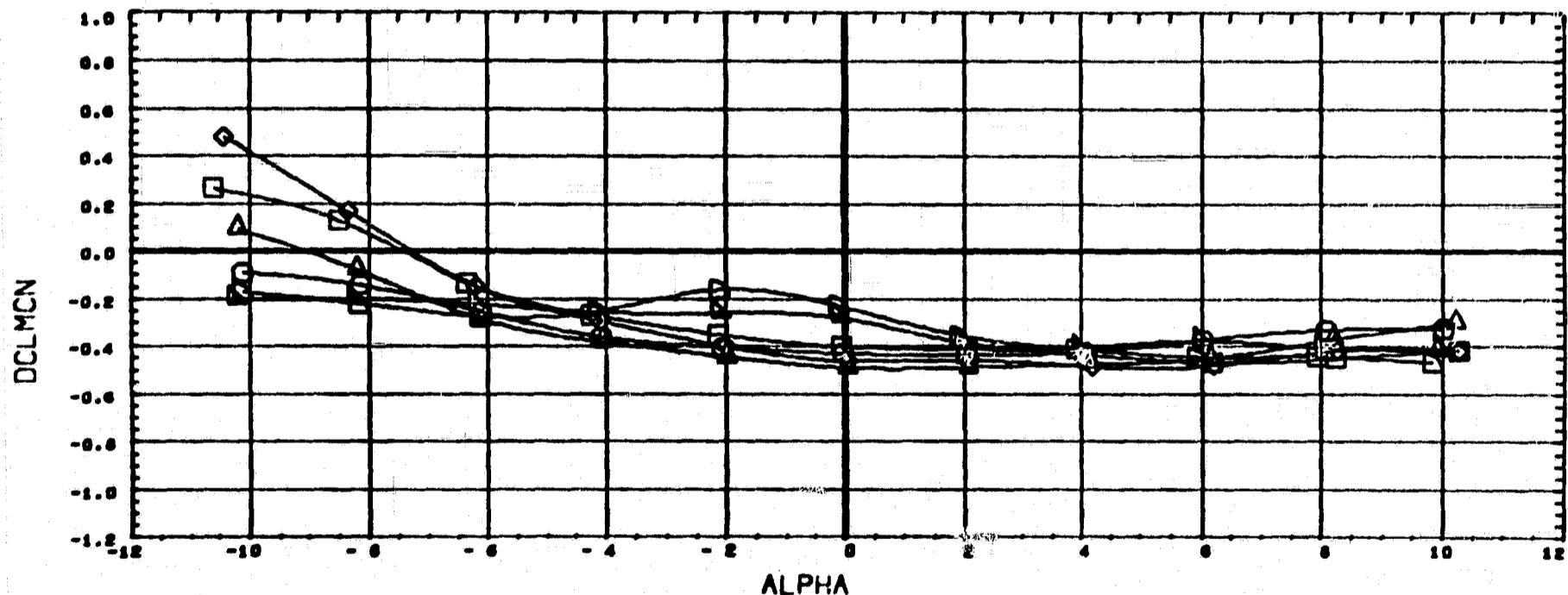
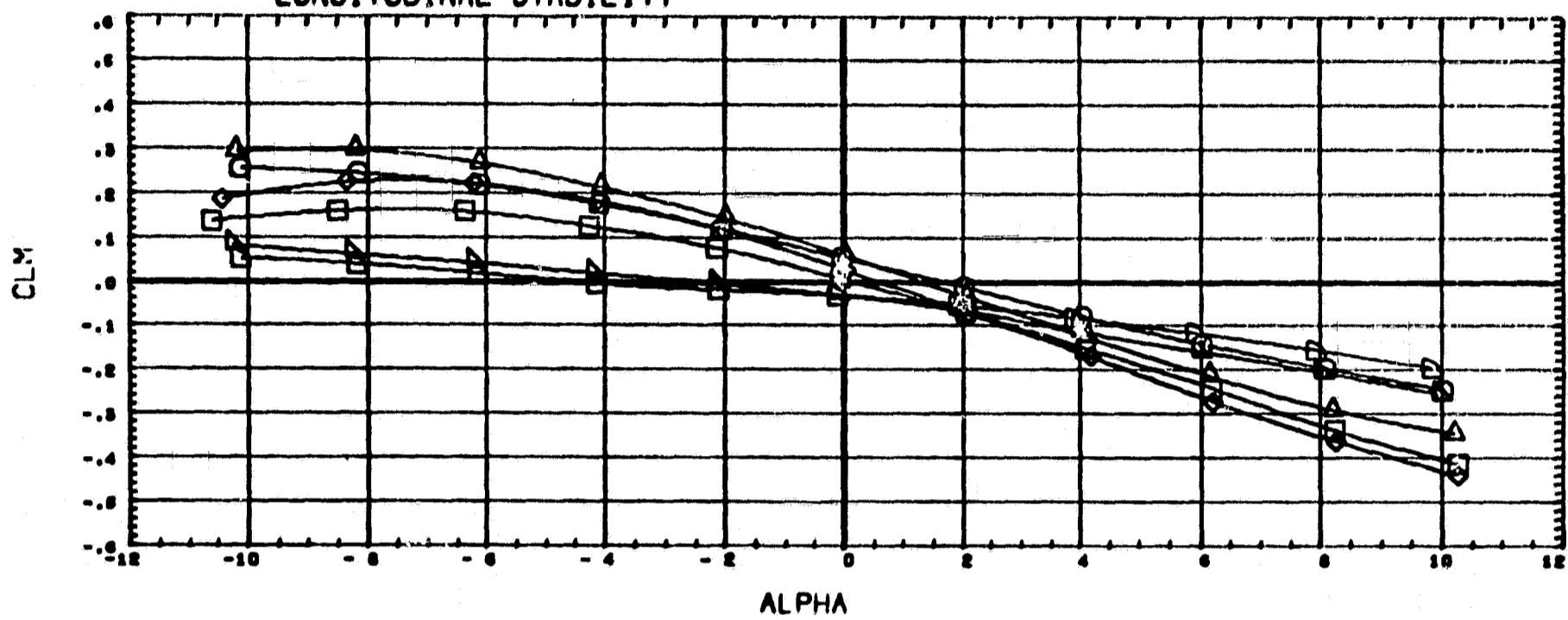
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LONGITUDINAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
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	0.899	0.000 ORBINC - 2.000
	1.104	
	1.457	
	2.740	
	4.959	DATA MIST. CODE CGR

REFERENCE INFORMATION		
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LREF	4.4260	IN.
BREF	2.8696	IN.
XMRP	8.7930	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

M523-MSFC MODEL AX12331-1

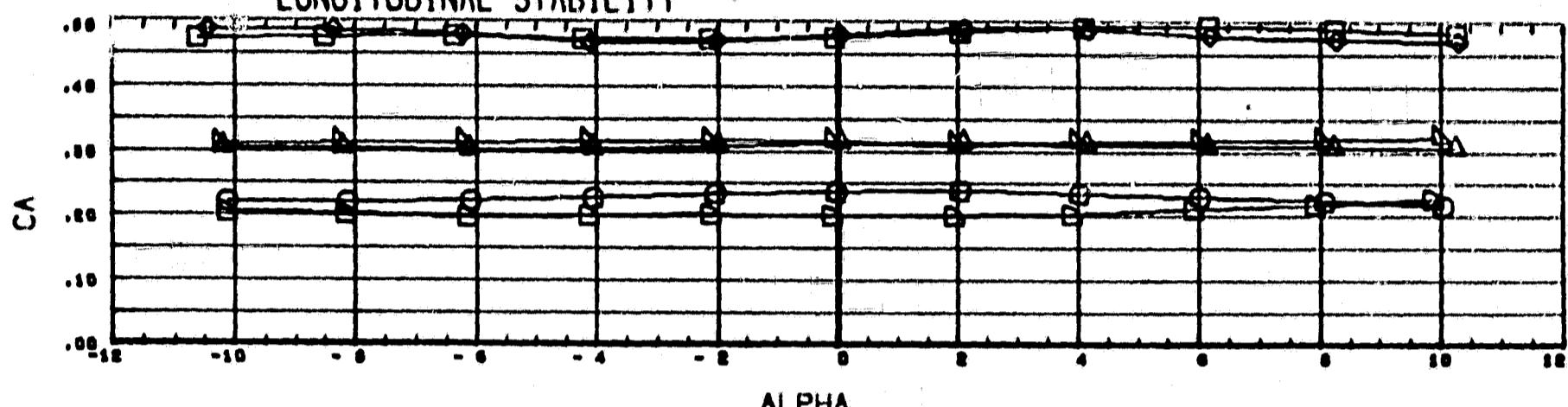
B501-2V6.2

(05707A) 10 FEB 72

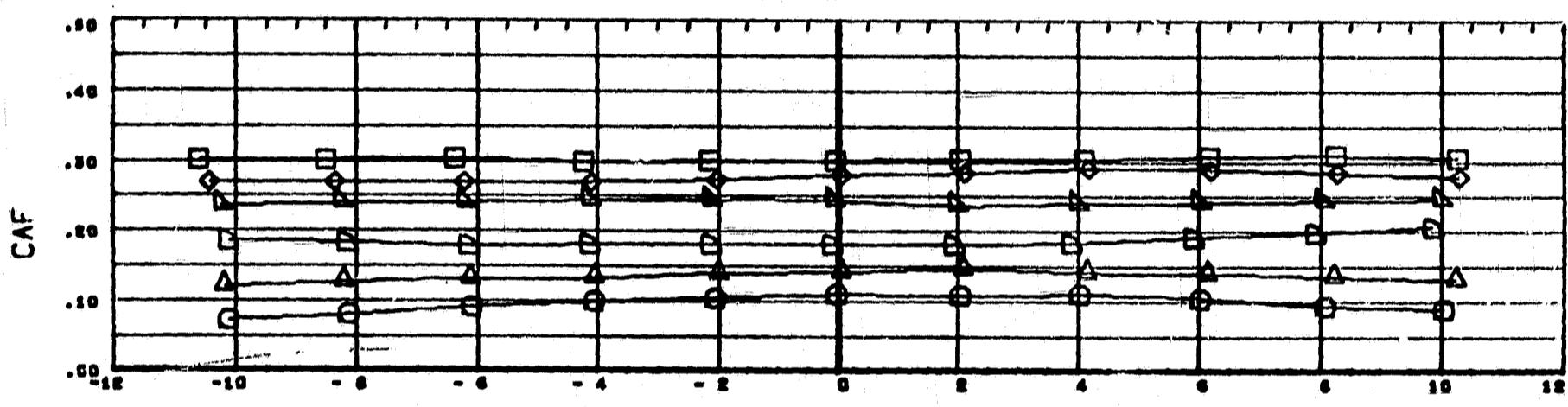
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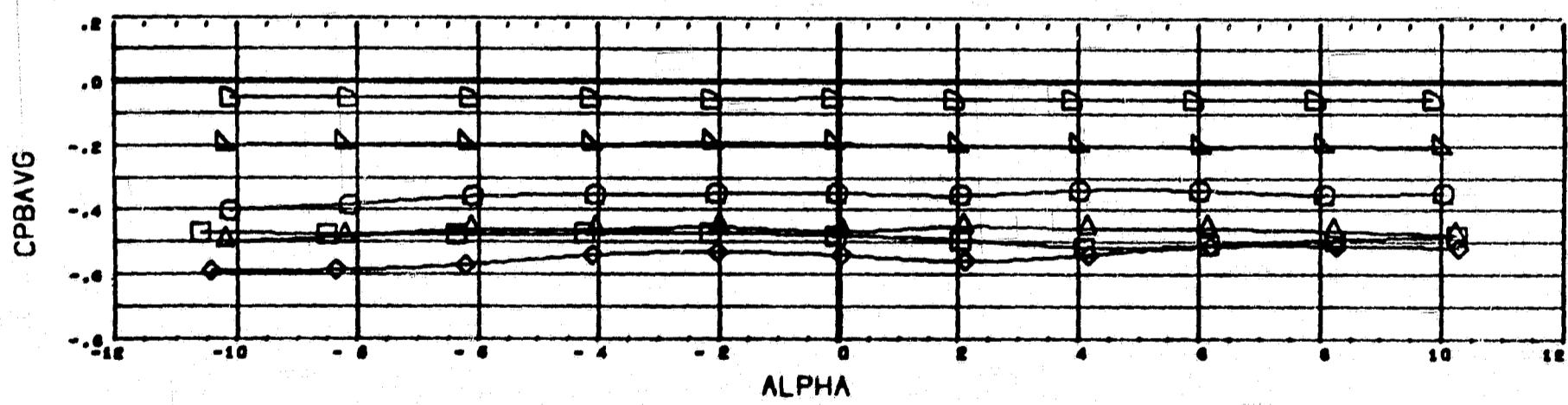
LONGITUDINAL STABILITY



ALPHA



ALPHA

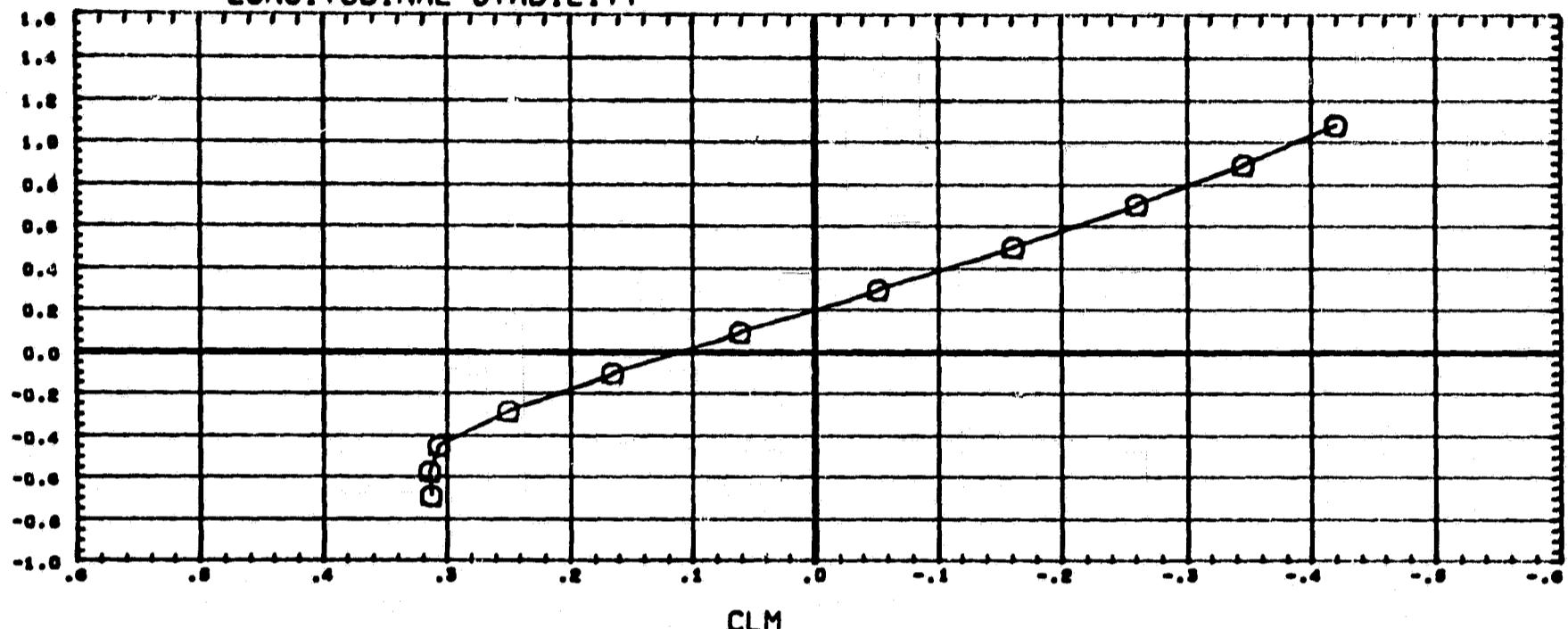


ALPHA

SYMBOL	MACH	BETA	PARAMETRIC VALUES
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\square	1.104		
\triangle	1.457		
\circ	2.740		
\square	4.950	DATA MEST. CODE	CCR

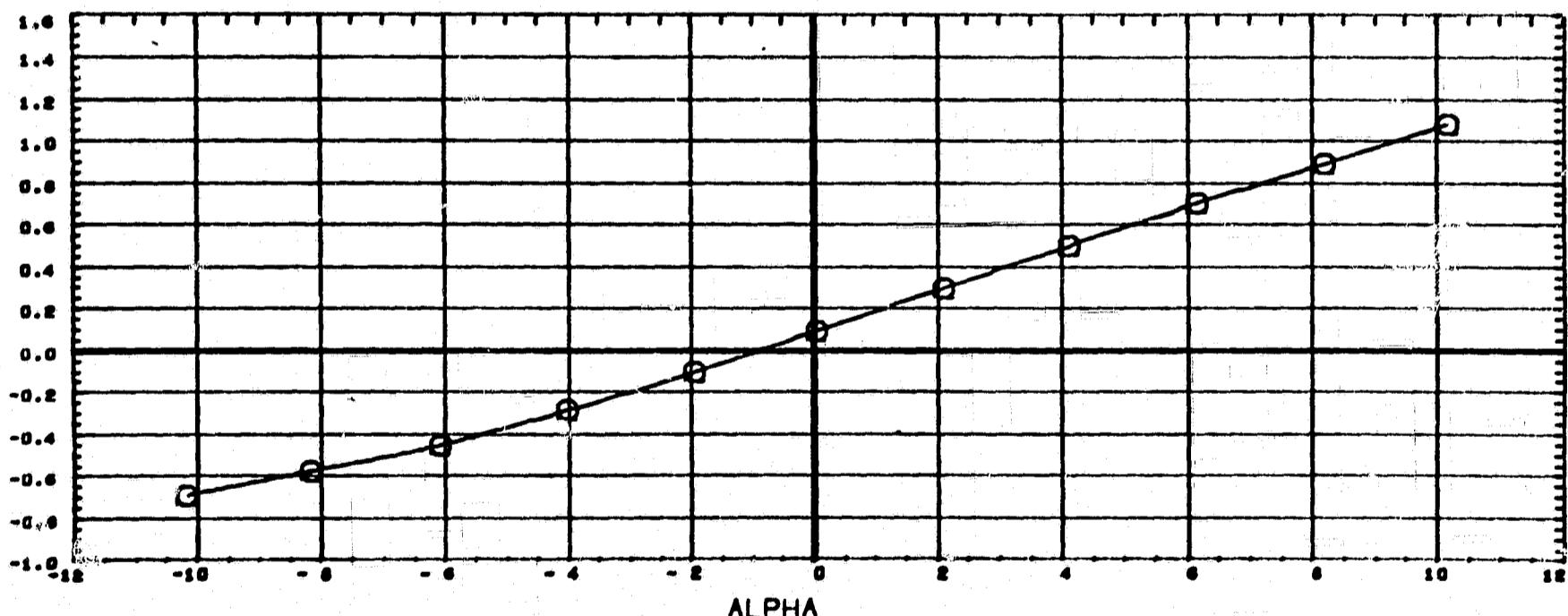
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ZHFP	0.0000	IN.
SCALE	0.0034	IN.

LONGITUDINAL STABILITY



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ALPHA

SYMBOL MACH PARAMETRIC VALUES
 \circ 0.901 BETA 0.000 ORBINC - 2.000

REFERENCE INFORMATION
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 LREF 4.4260 IN.
 BREF 2.9690 IN.
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 SCALE 0.0034 IN.

DATA HIST. CODE CCR

MS23-MSFC MODELAX1233I-1

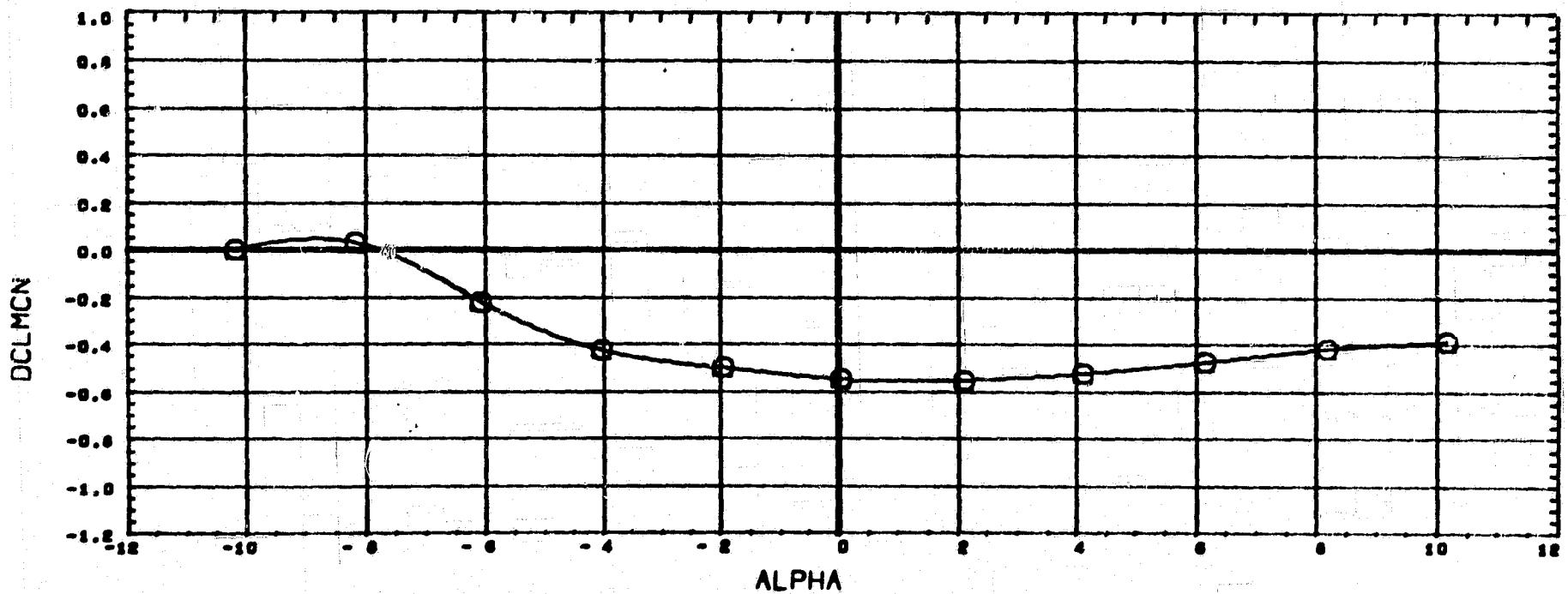
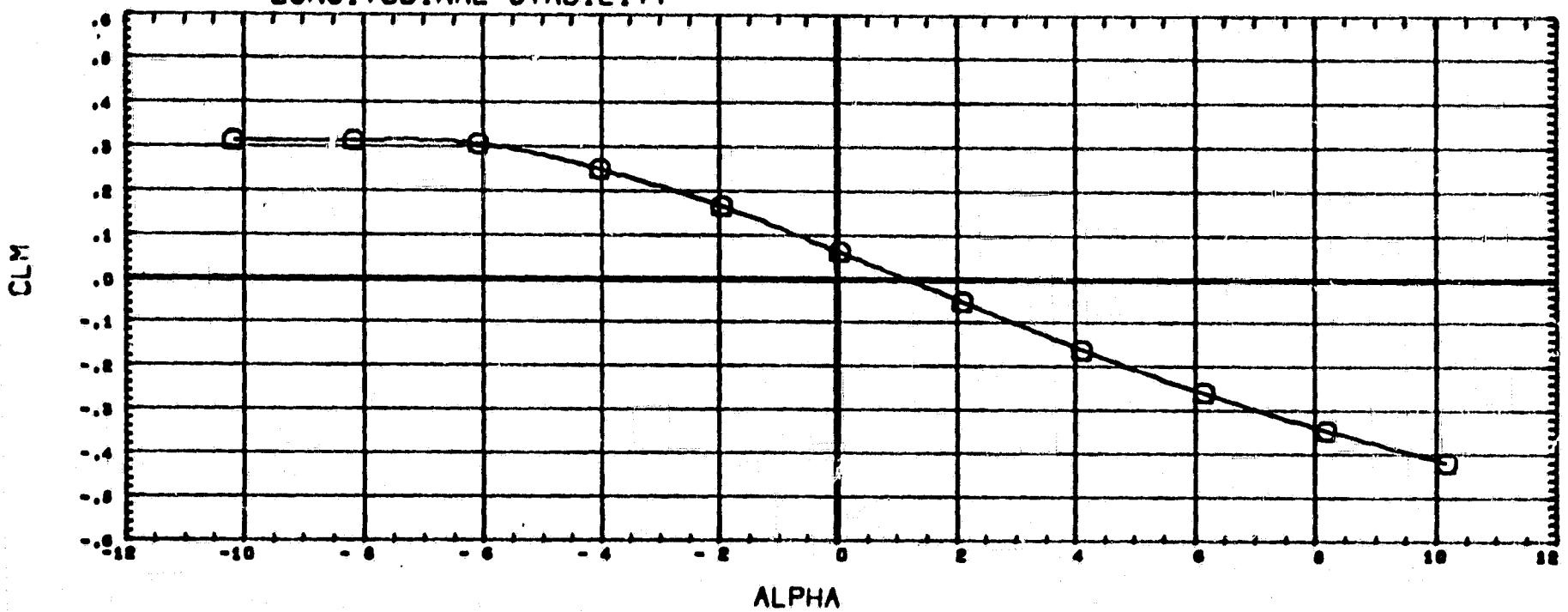
B501-2V6.3

(D5708A) 10 FEB 72

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7

LONGITUDINAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
 O 0.001 BETA 0.000 ORBINC - 2.000

REFERENCE INFORMATION
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 BREF 2.9690 IN.
 XMRP 8.7530 IN.
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 SCALE 0.0034

DATA HIST. CODE CCR

M523-MSFC MODELAX1233I-1

B501-2V6.3

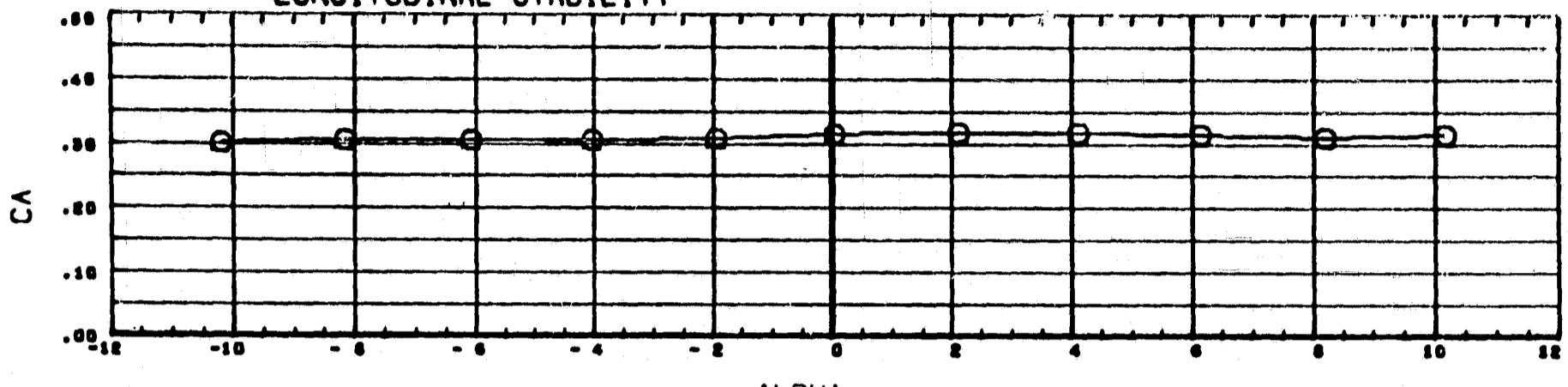
(D5708A)

10 FEB 72

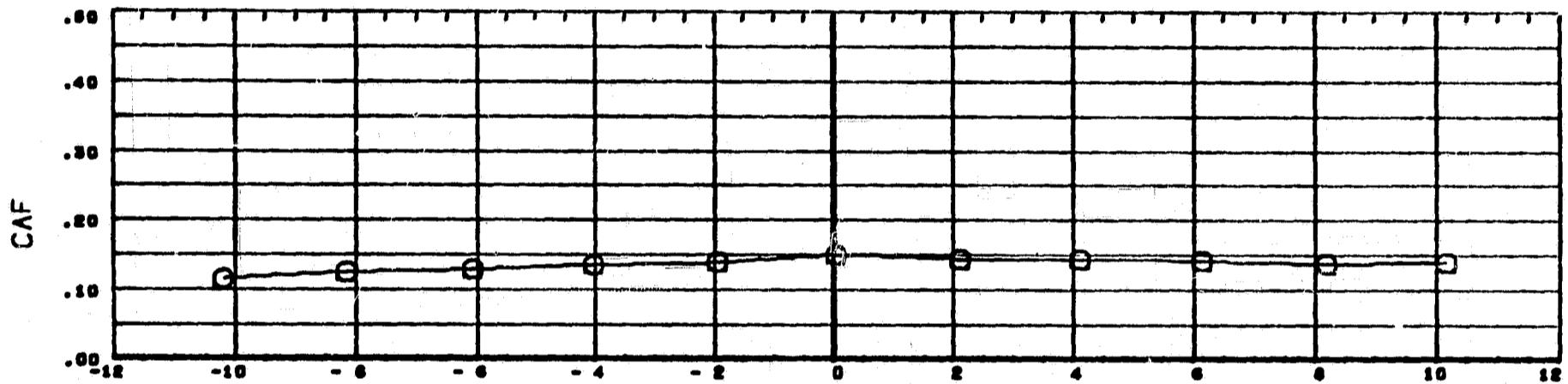
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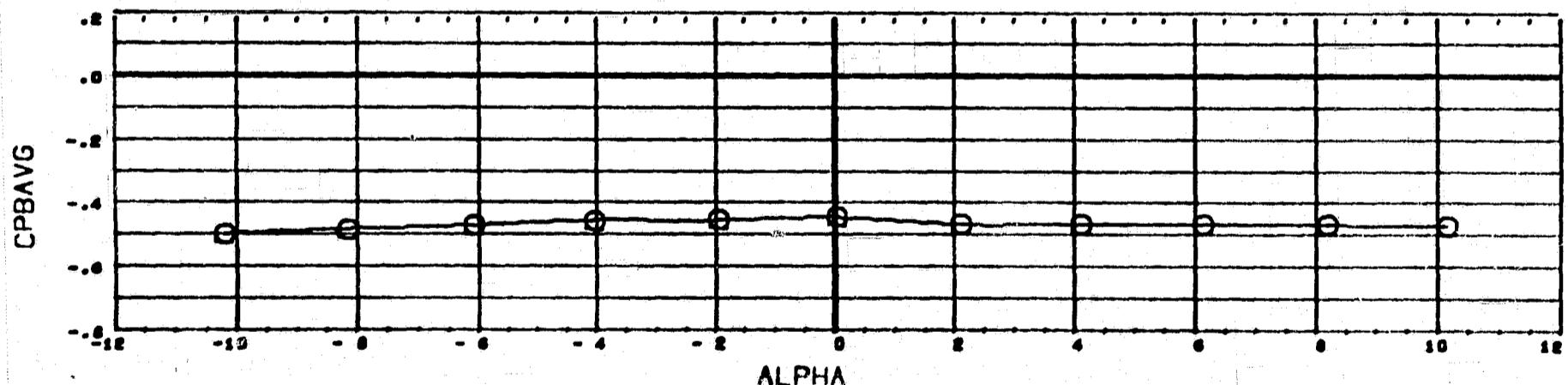
LONGITUDINAL STABILITY



ALPHA



ALPHA



ALPHA

SYMBOL MACH PARAMETRIC VALUES
O 0.901 BETA 0.000 ORBINC - 2.000

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BREF 2.9690 IN.
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SCALE 0.0034

DATA MIST. CODE CGR

M523-MSFC MODEL AX1233I-1

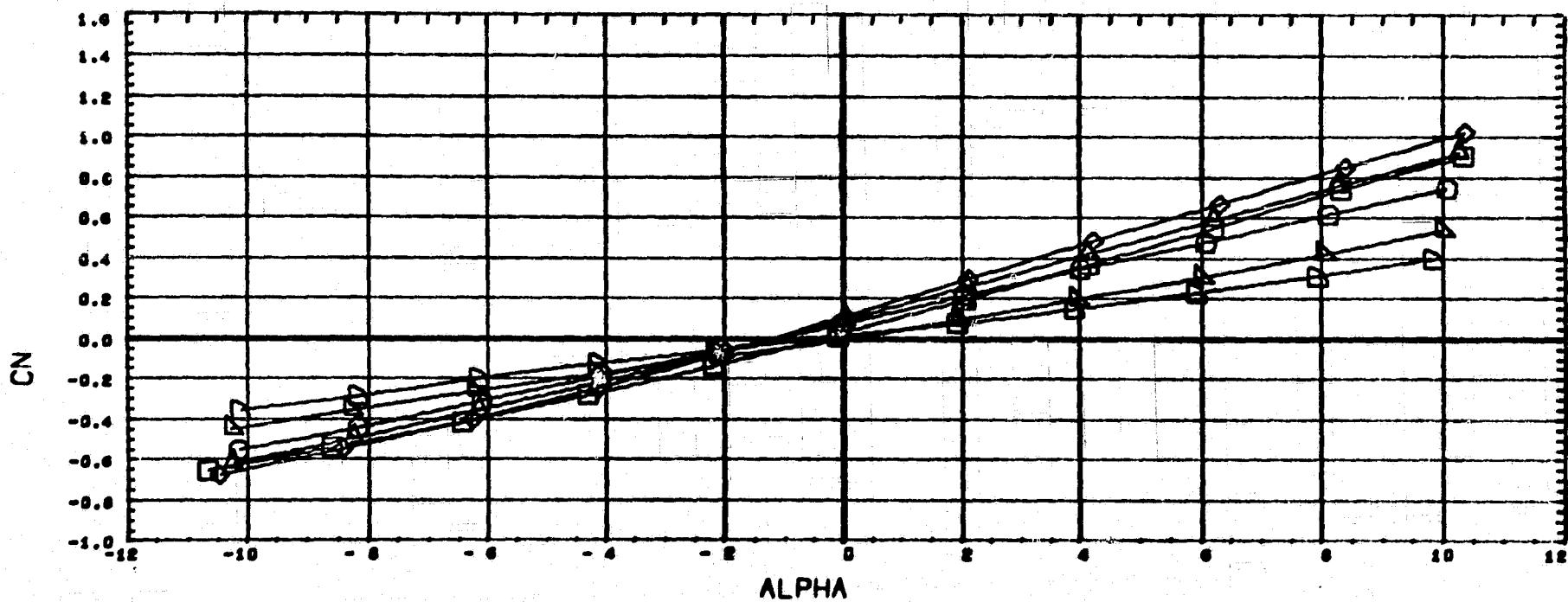
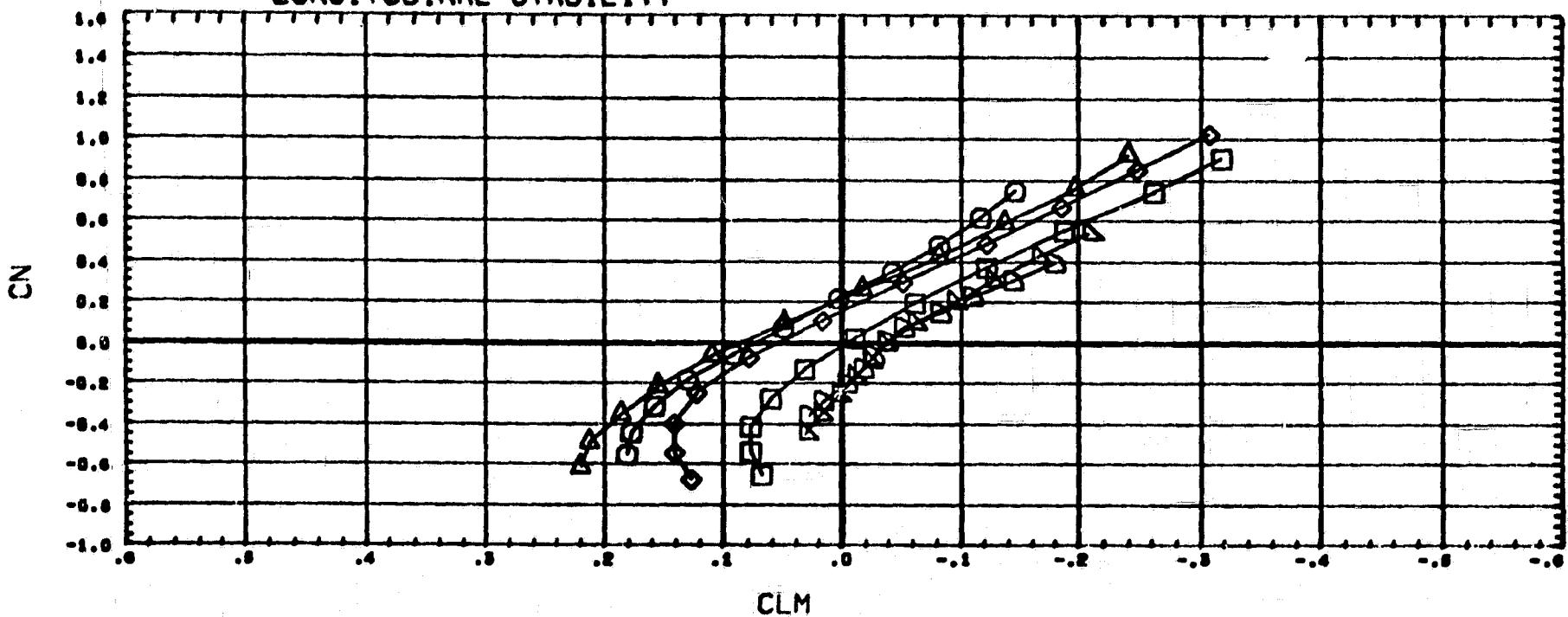
B501-2V6.3

(D5708A) 10 FEB 72

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9

LONGITUDINAL STABILITY



SYMBOL	MACH	BETA	PARAMETRIC VALUES
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\square	1.100		
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\square	2.740		
\square	4.950		

DATA MIST. CODE CGR

M523-MSFC MODELAX1233I-1

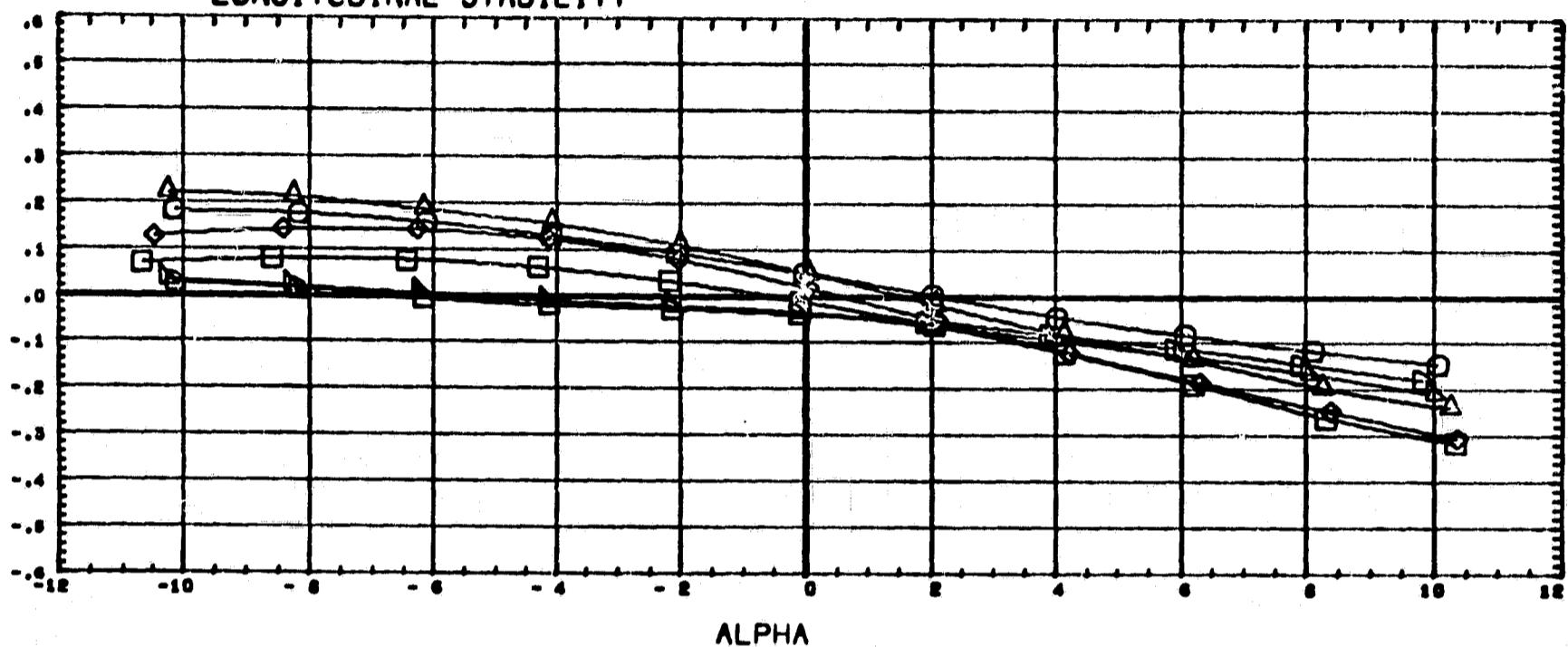
B501-2V6.4

(D5709A) 10 FEB 72

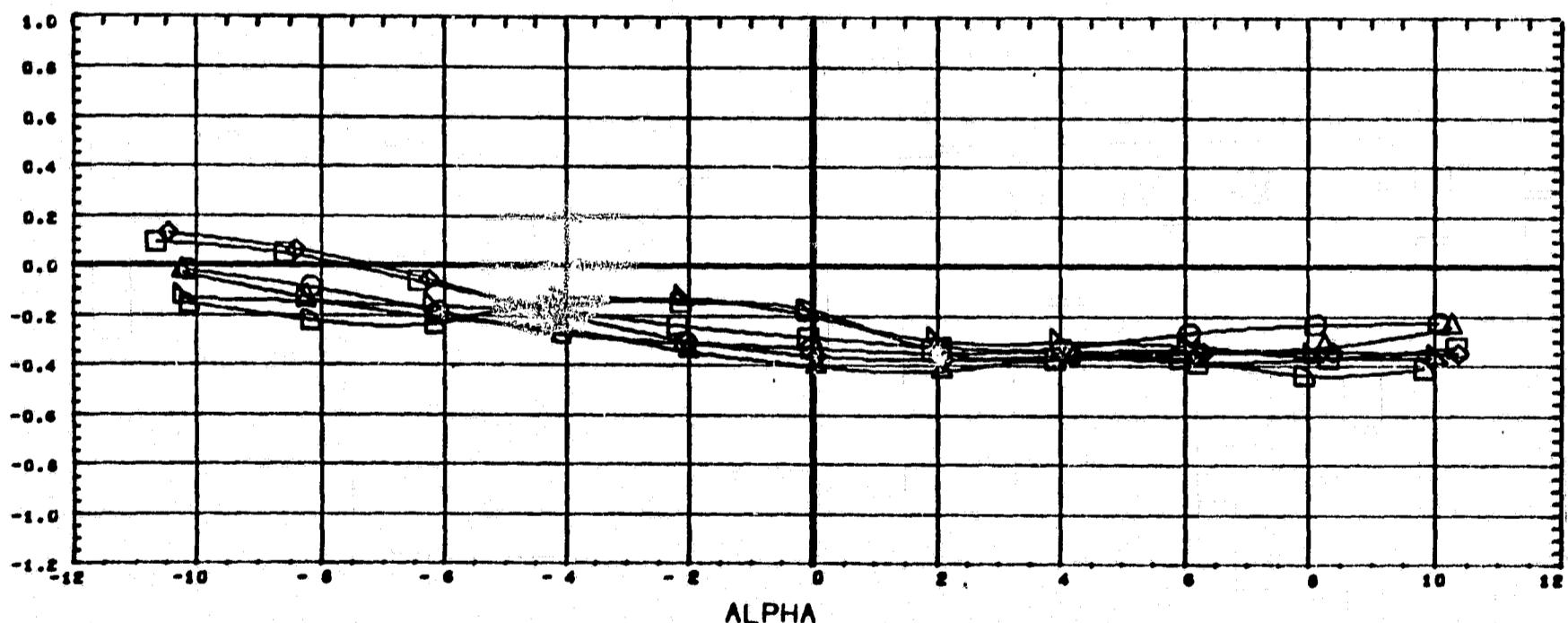
PAGE 10

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LREF	4.4260	IN.
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YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	IN.

LONGITUDINAL STABILITY



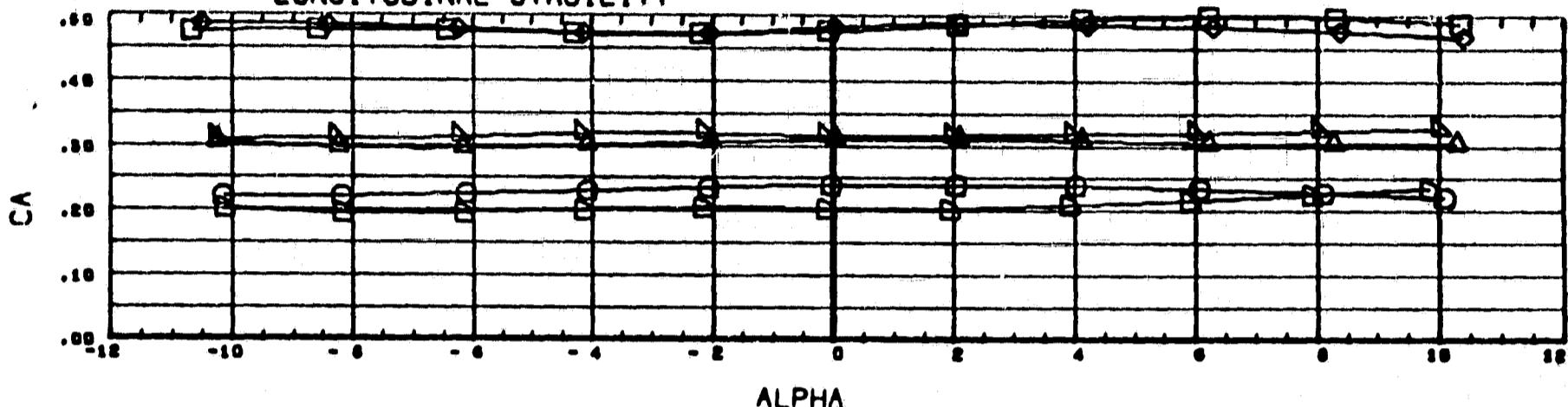
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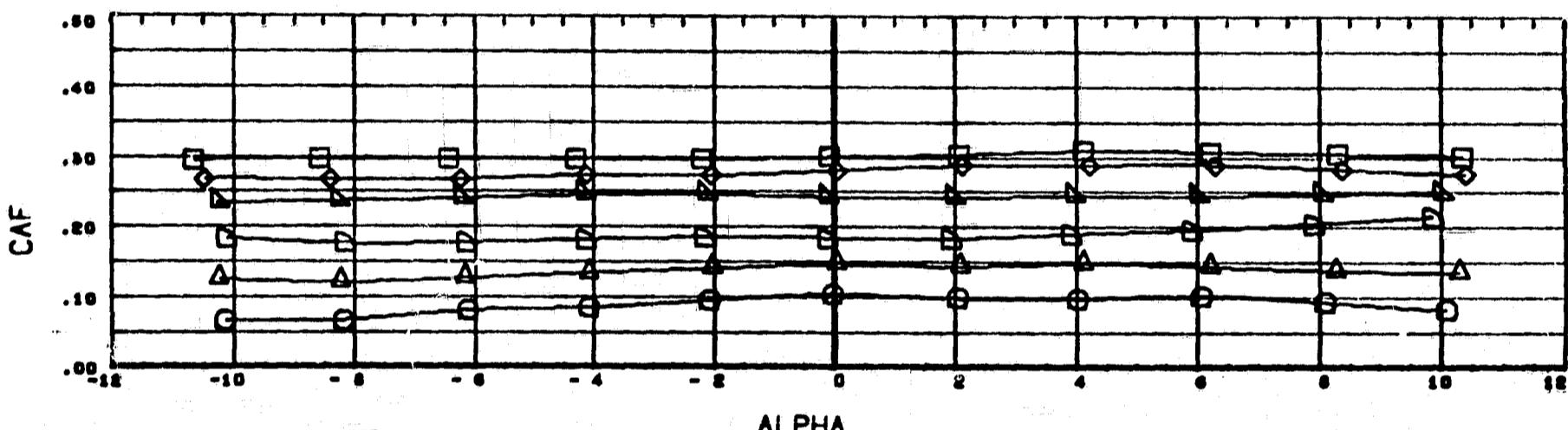
SYMBOL MACH PARAMETRIC VALUES
 D 0.599 BETA 0.000 ORBINC - 2.000
 D 0.697
 D 1.100
 D 1.459
 D 2.740
 D 4.999 DATA HIST. CODE - CGR

REFERENCE INFORMATION
 SREF 5.1476 80. IN.
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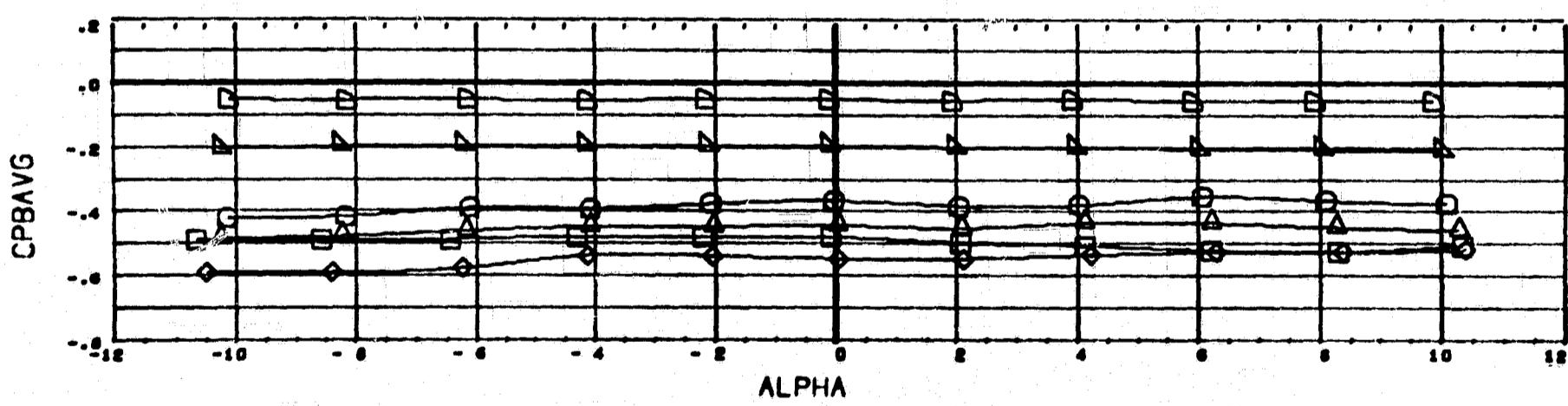
LONGITUDINAL STABILITY



ALPHA



ALPHA

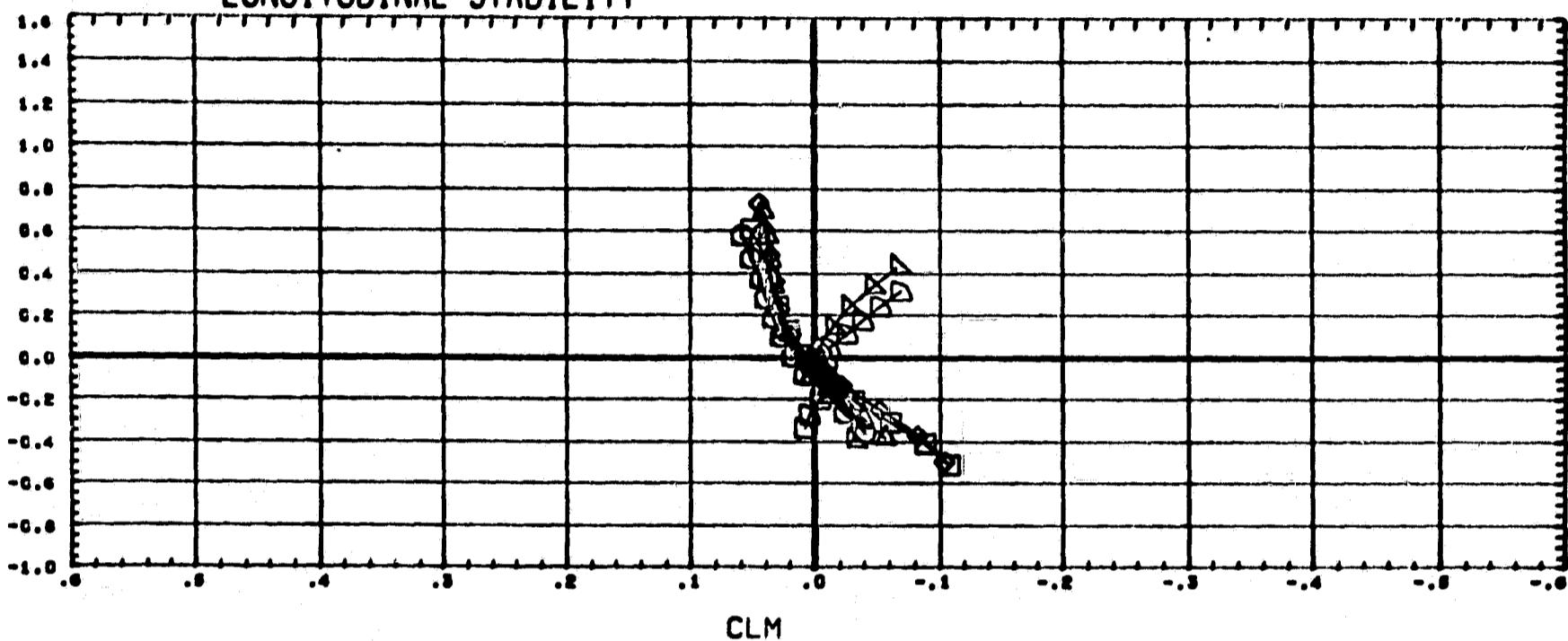


ALPHA

SYMBOL	MACH	PARAMETRIC VALUES
	0.599	BETA 0.000 ORBINC - 2.000
	0.897	
	1.100	
	1.459	
	2.740	
	4.999	DATA HIST. CODE CCR

REFERENCE INFORMATION		
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LREF	4.4260	IN.
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XMRP	5.7930	IN.
YMRP	0.0000	IN.
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SCALE	0.0034	

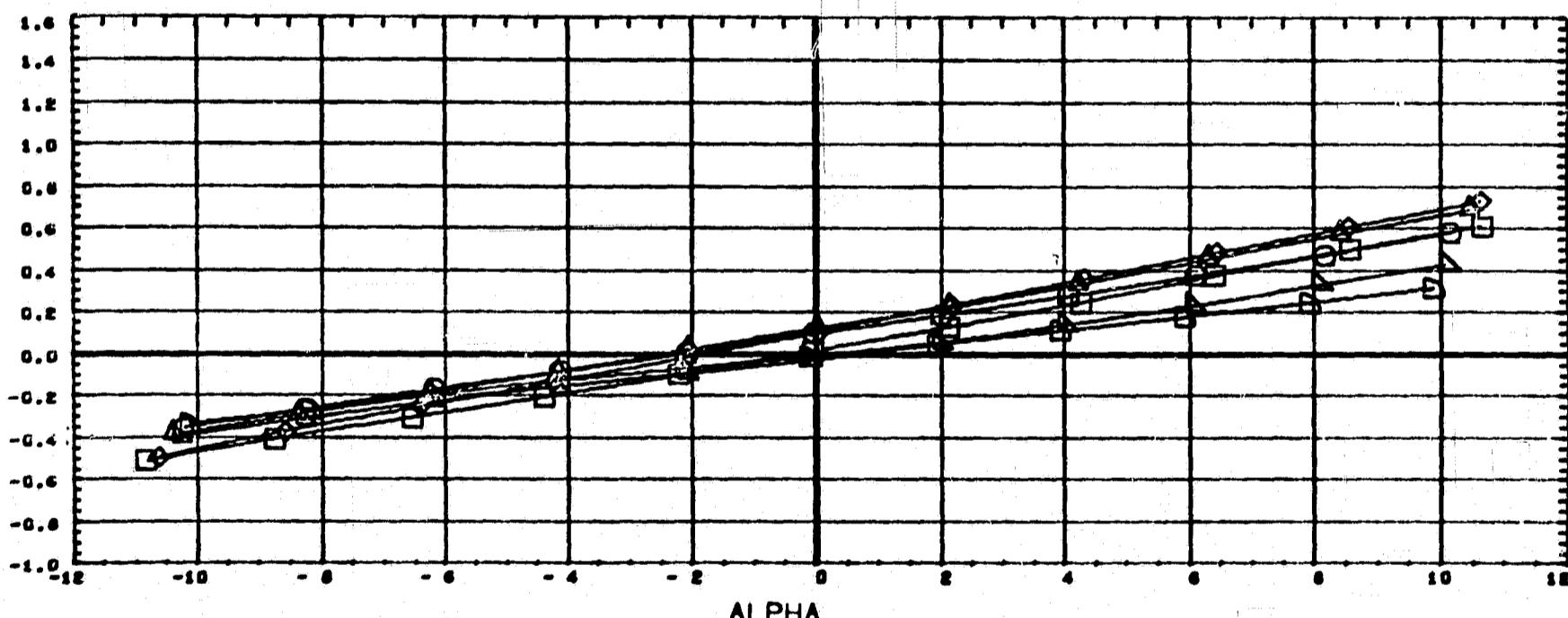
LONGITUDINAL STABILITY



CLM

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ALPHA

SYMBOL MACH

	MACH	BETA	PARAMETRIC VALUES
Δ	0.599	0.000	ORBINC = 2.000
\diamond	0.899		
\circ	1.100		
\triangle	1.460		
\square	2.740		
\times	4.859		
DATA HIST. CODE CGR			

REFERENCE INFORMATION		
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LREF	4.4260	IN.
BREF	2.9690	IN.
XHRP	5.7530	IN.
YHRP	0.0000	IN.
ZHRP	0.0000	IN.
SCALE	0.0034	IN.

M523-MSFC MODELAX1233I-1

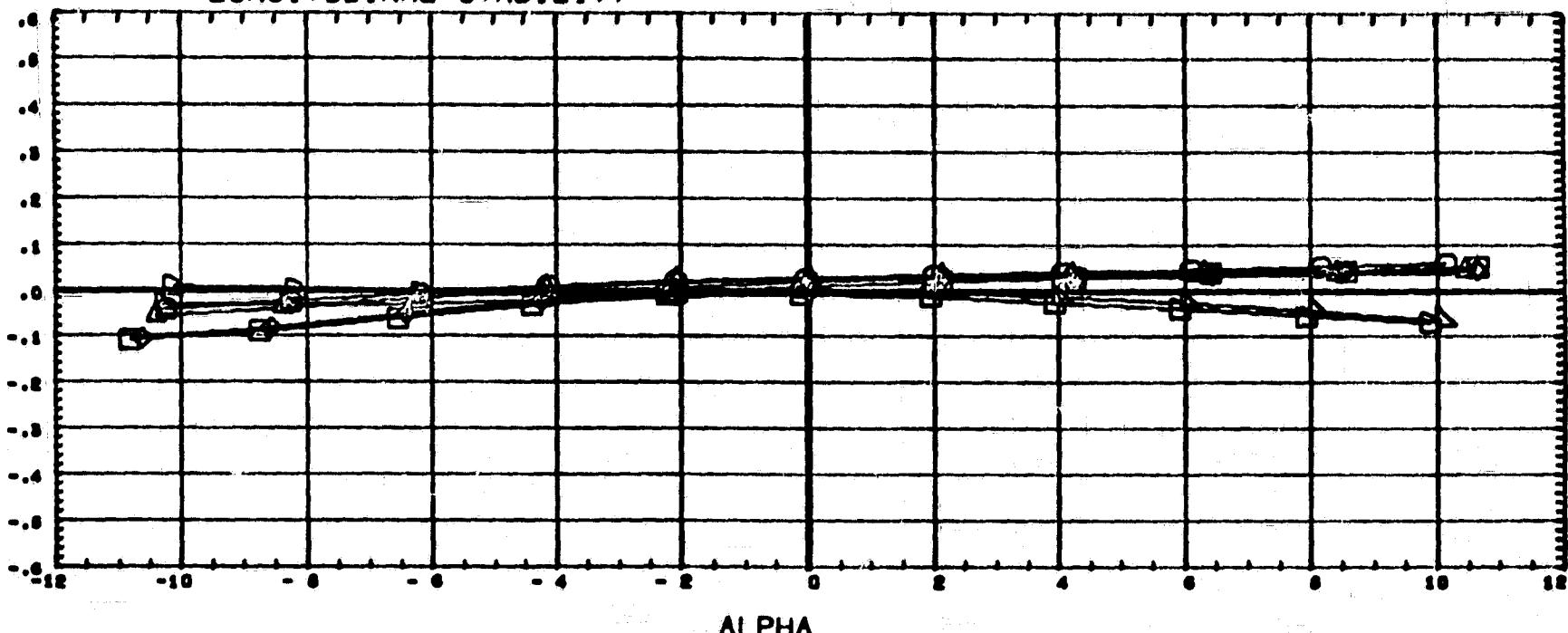
B501-2

(05703A) 10 FEB 72

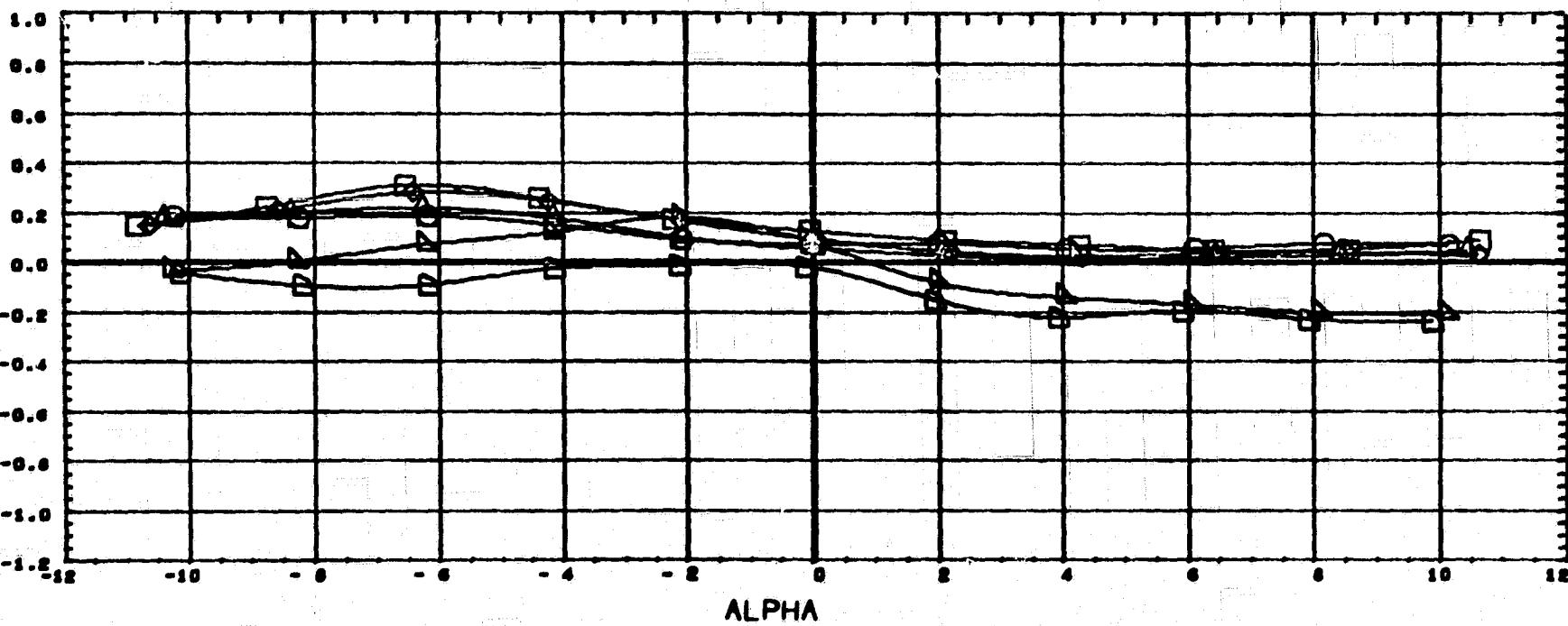
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LONGITUDINAL STABILITY



ALPHA

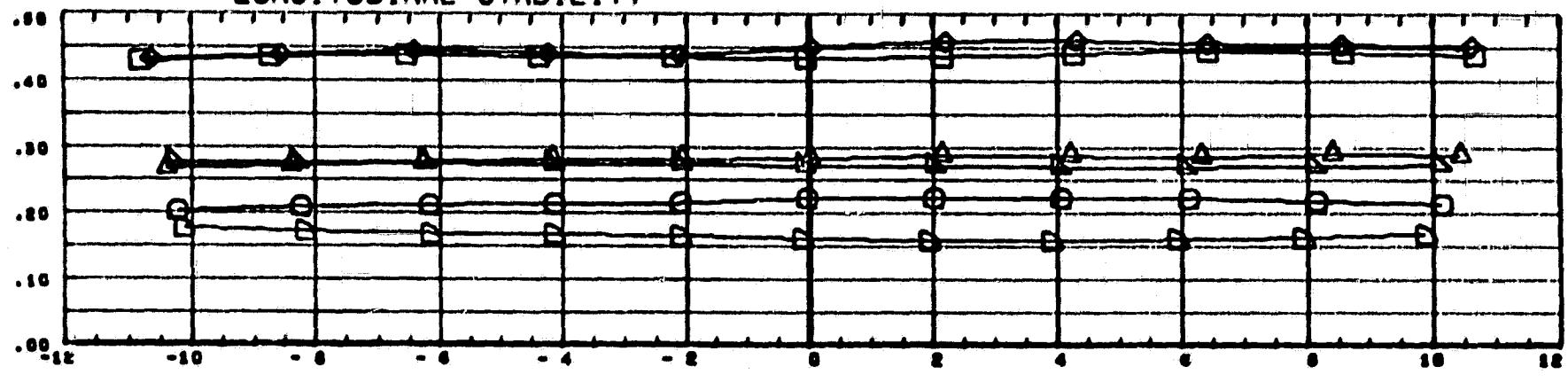


ALPHA

SYMBOL	MACH	PARAMETRIC VALUES
C	0.599	BETA 0.000 ORBINC - 2.000
△	0.899	
◊	1.100	
□	1.460	
▽	2.740	
□	4.059	DATA MEST. CODE CGR

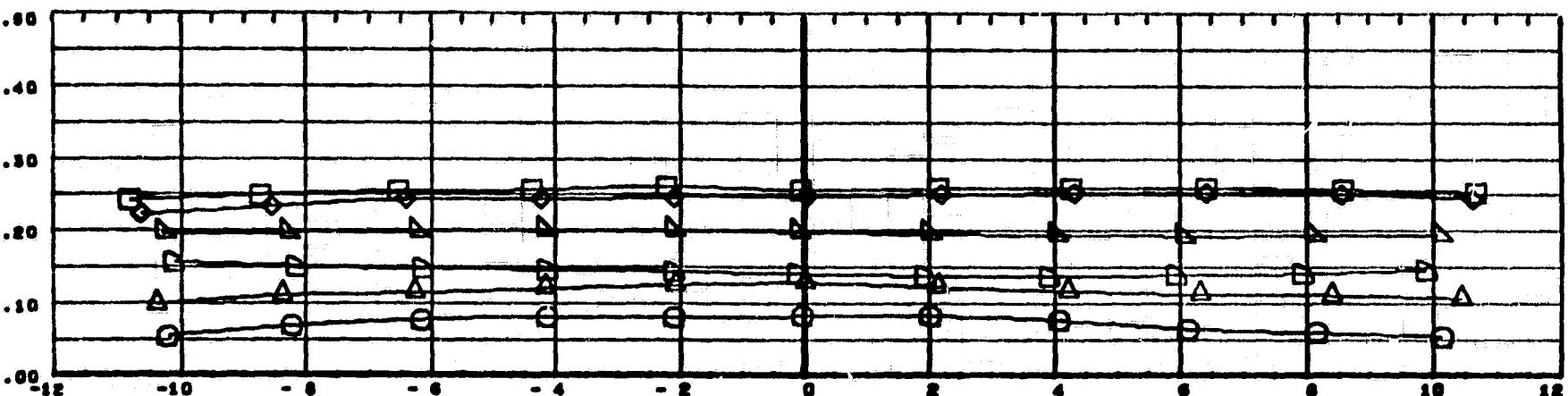
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SCALE	0.0034	

LONGITUDINAL STABILITY



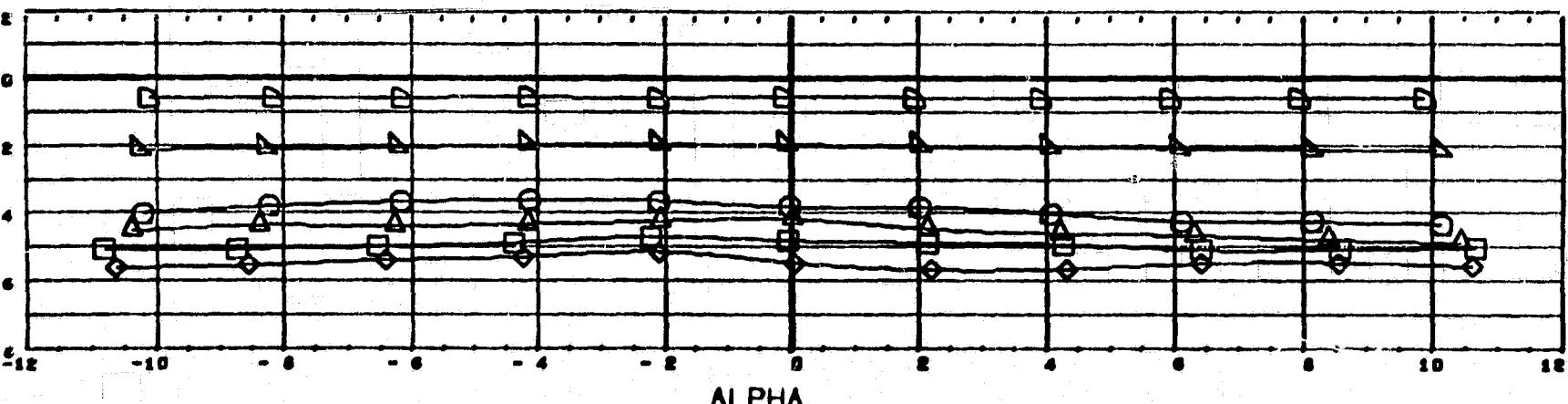
ALPHA

CAF



ALPHA

CPBAVS

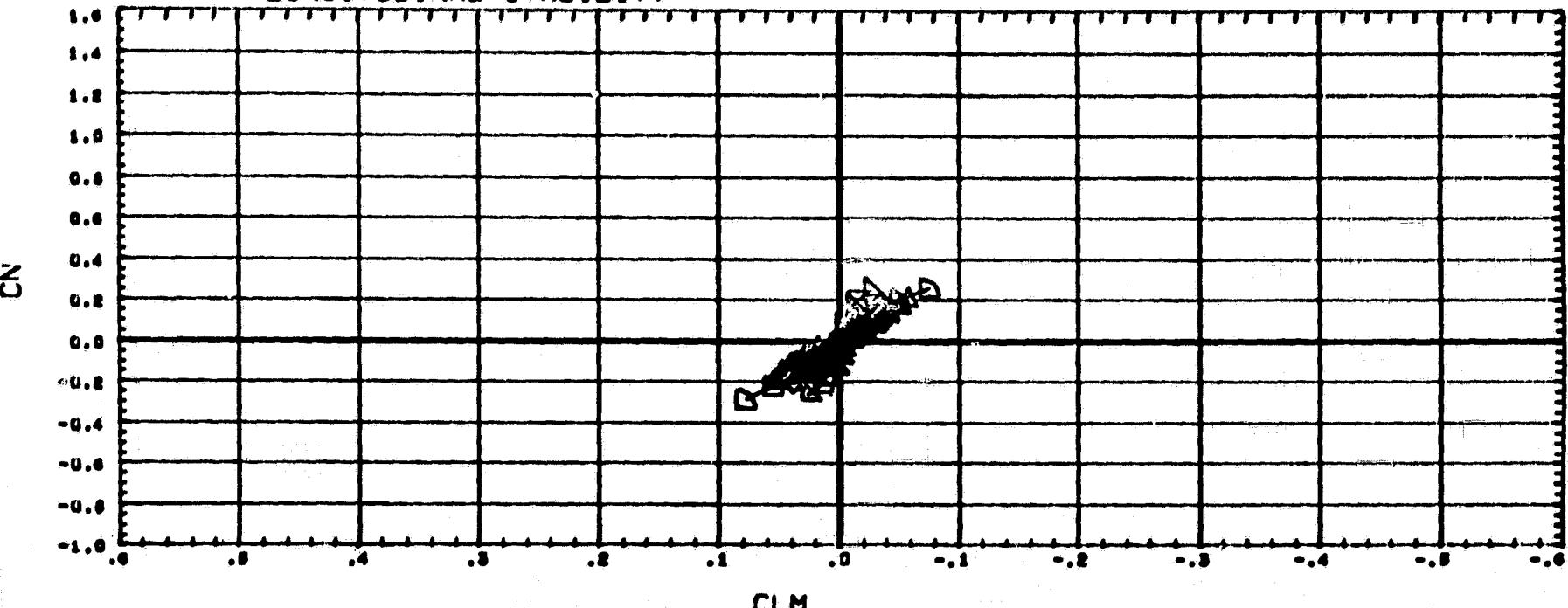


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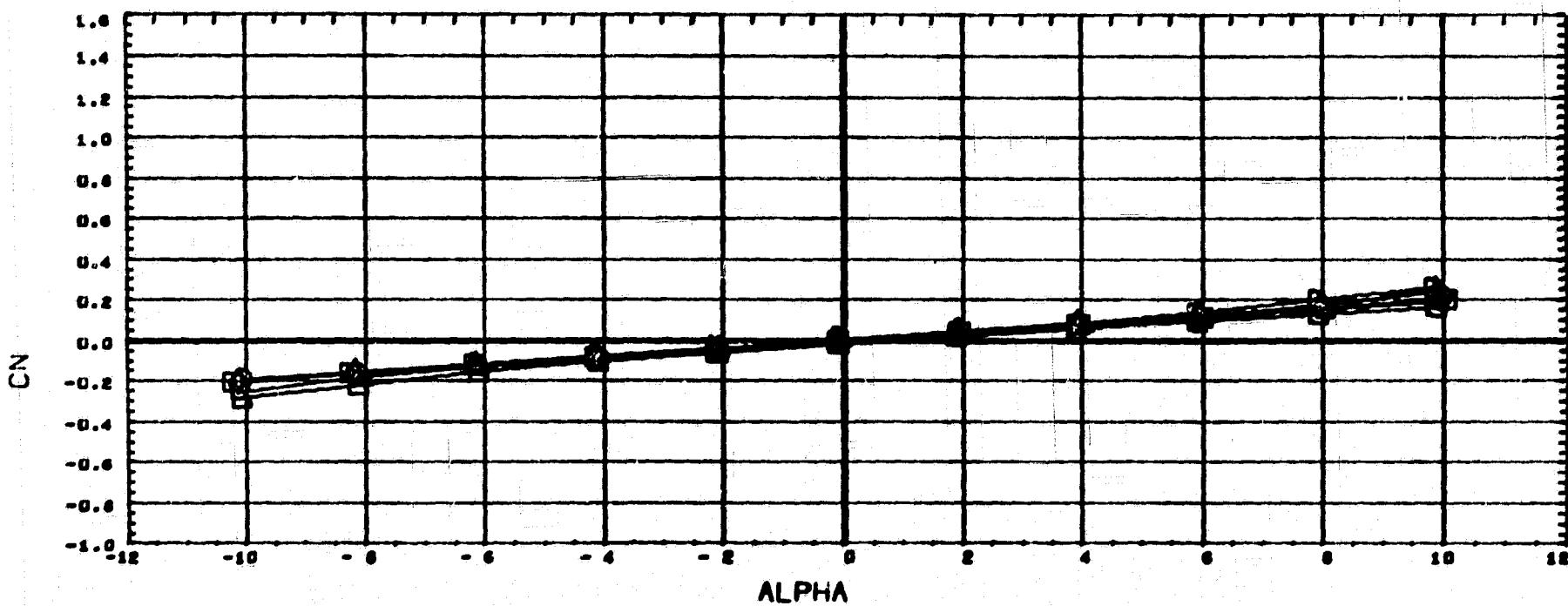
SYMBOL MACH PARAMETRIC VALUES
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 △ 0.699
 ▲ 1.100
 ▽ 1.460
 ▽ 2.740
 △ 4.999 DATA HIST. CODE CGR

REFERENCE INFORMATION
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 YHRP 0.0000 IN.
 ZHRP 0.0000 IN.
 SCALE 0.0034

LONGITUDINAL STABILITY



CLM

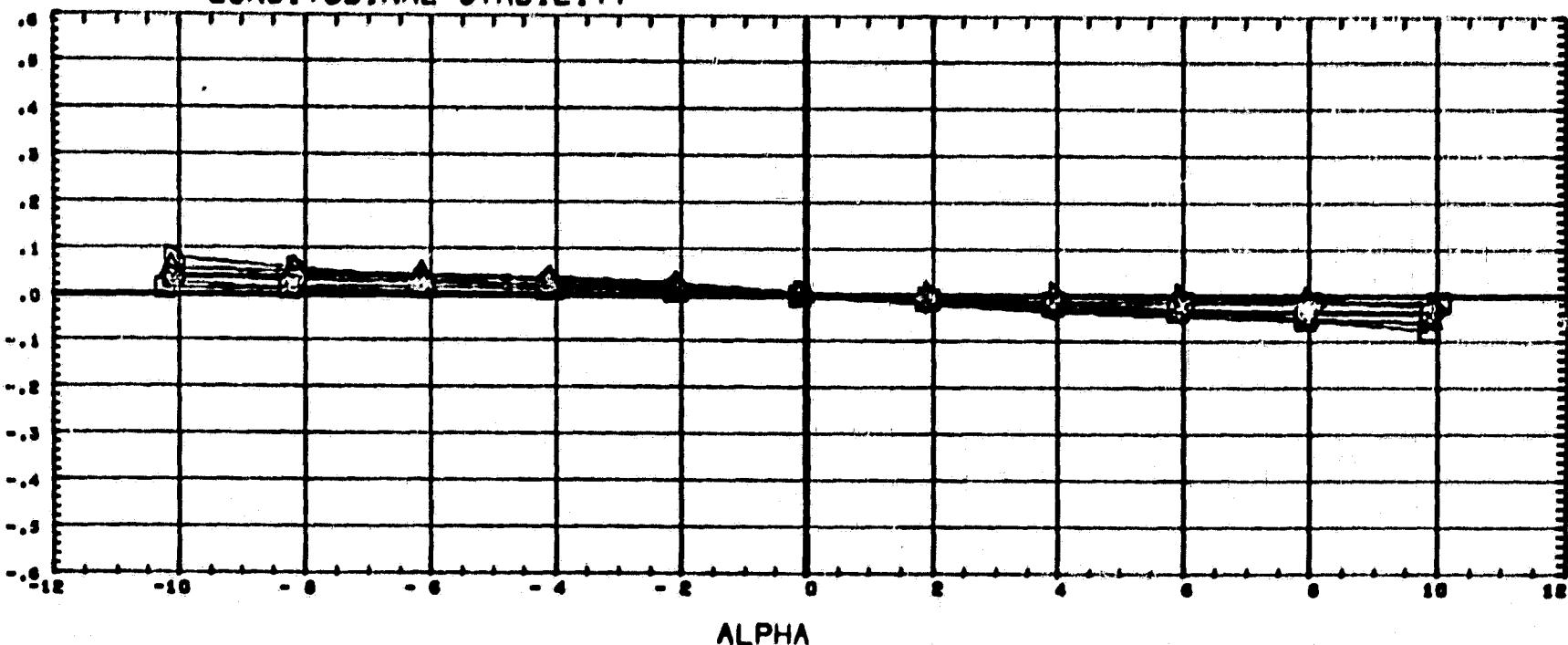


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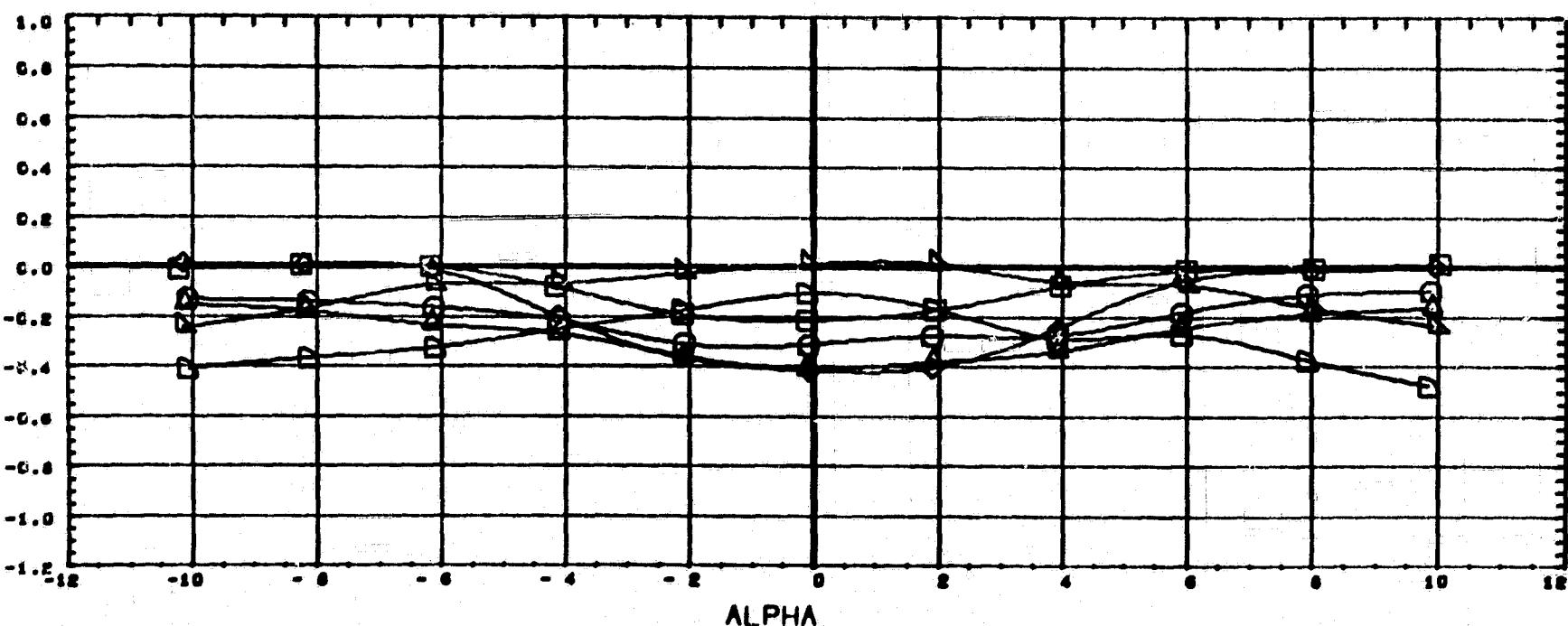
SYMBOL	MACH	PARAMETRIC VALUES
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\square	1.104	
\times	1.459	
\times	2.740	
\square	4.059	DATA MIST. CODE CCR

REFERENCE INFORMATION		
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LREF	4.4260	IN.
SREF	2.9690	IN.
XHRP	8.7530	IN.
YHRP	0.0000	IN.
ZHRP	0.0000	IN.
SCALE	0.0033	

LONGITUDINAL STABILITY



DCL MCN



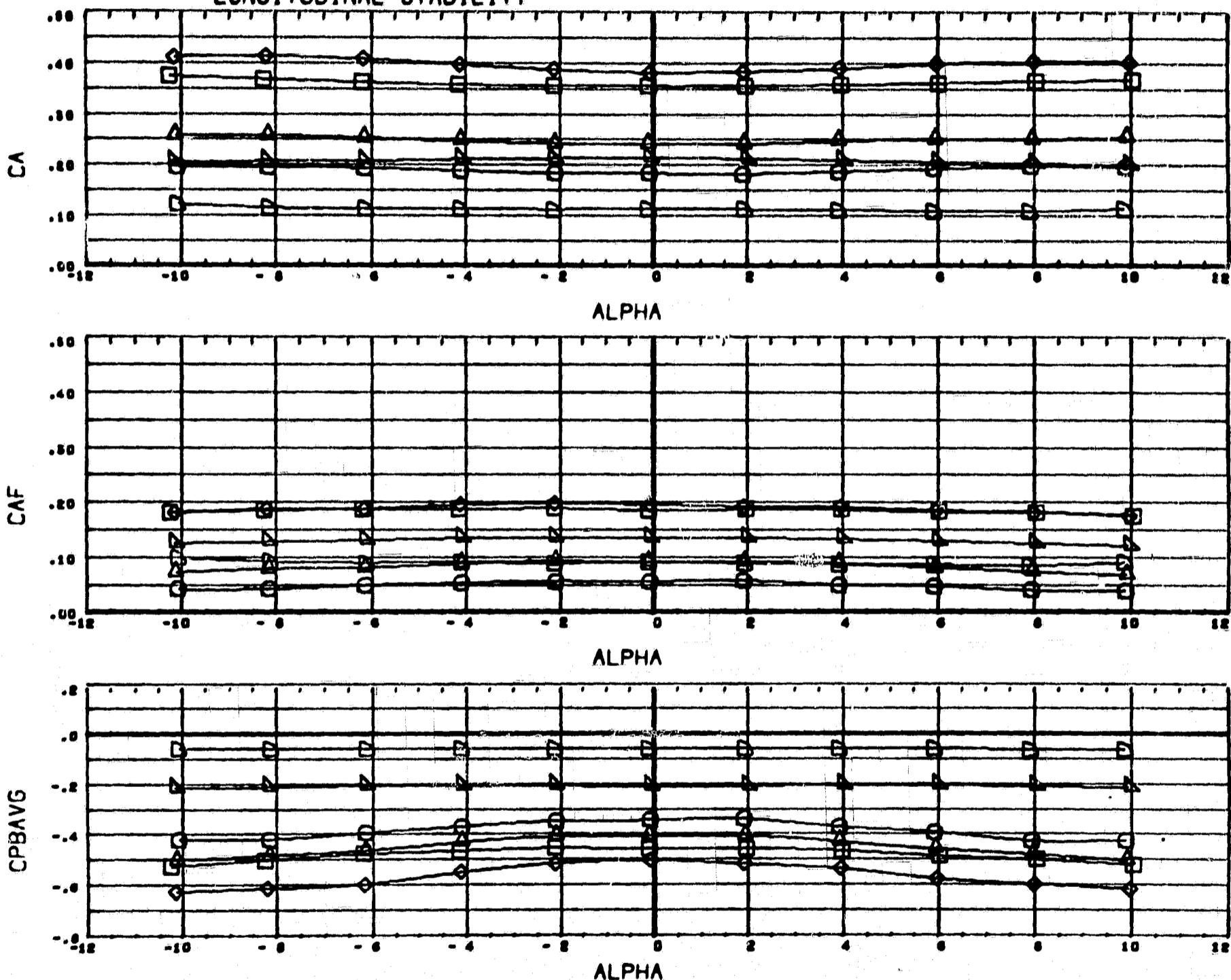
SYMBOL MACH PARAMETRIC VALUES
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 \diamond 1.104
 \diamond 1.459
 \diamond 2.740
 \square 4.959 DATA MIST. CODE CGR

REFERENCE INFORMATION
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 YHRP 0.0000 IN.
 ZHRP 0.0000 IN.
 BSCALE 0.0093

M523-MSFC MODELAX1233I-1 . BS

(D5701A) 10 FEB 72 PAGE 17

LONGITUDINAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
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	0.901	0.000
	1.104	
	1.459	
	2.740	
	4.889	DATA MIST. CODE CCR

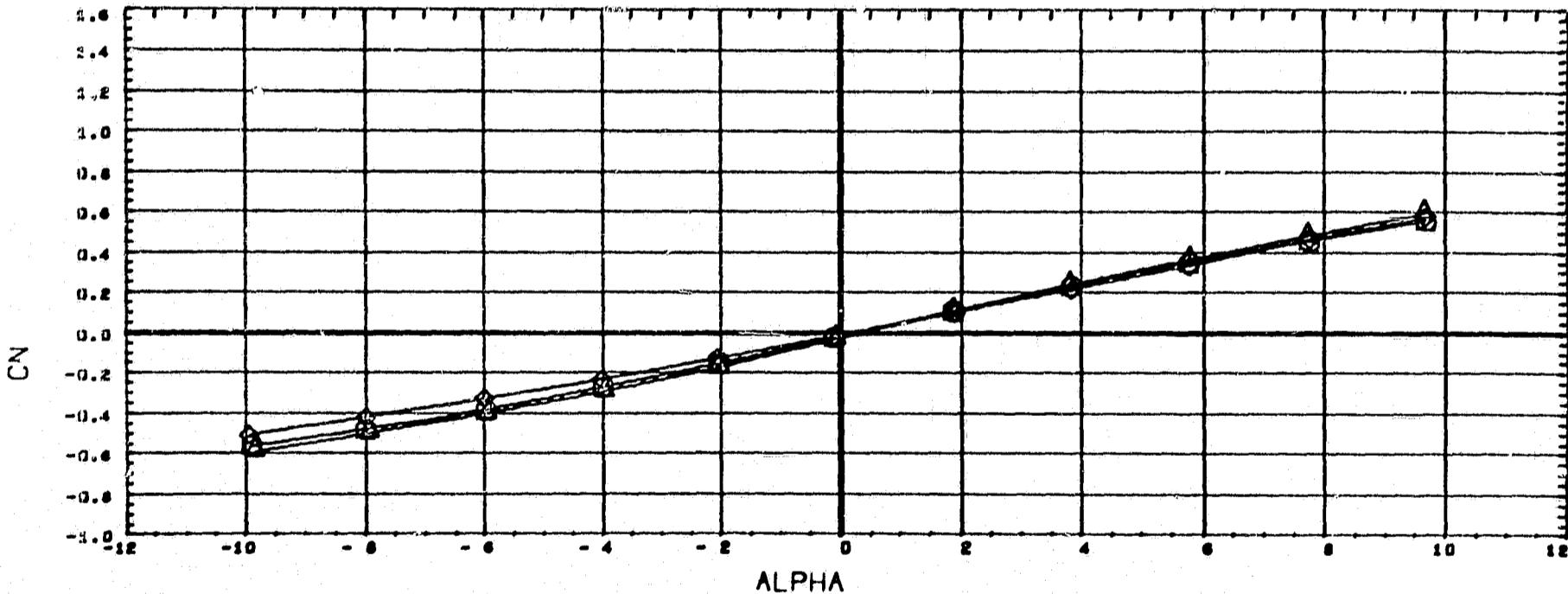
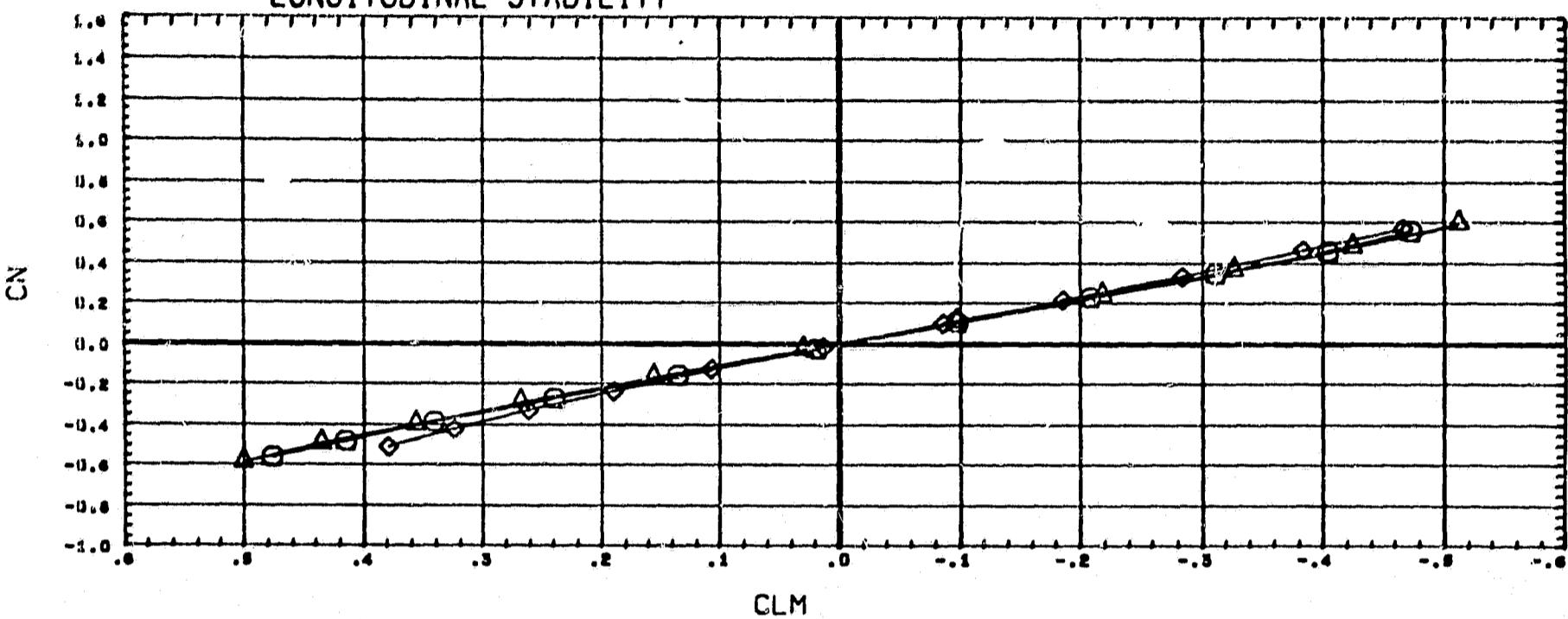
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BREF	2.9690	IN.
XHRF	5.7530	IN.
YHRF	0.0000	IN.
ZHRF	0.0000	IN.
SCALE	0.0033	

M523-MSFC MODEL AX12331-1

B5

(D5701A) 10 FEB 72 PAGE 18

LONGITUDINAL STABILITY



SYMBOL MACH PARAMETRIC VALUES

0.898 BETA 0.000

Δ 1.106

◊ 1.458

REFERENCE INFORMATION

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LREF	4.4260	IN.
BREF	2.9690	IN.
XHRP	5.7530	IN.
YHRP	0.0000	IN.
ZHRP	0.0000	IN.
SCALE	0.0034	

DATA HIST. CODE CGR

M523-MSFC MODEL A X1233I-1

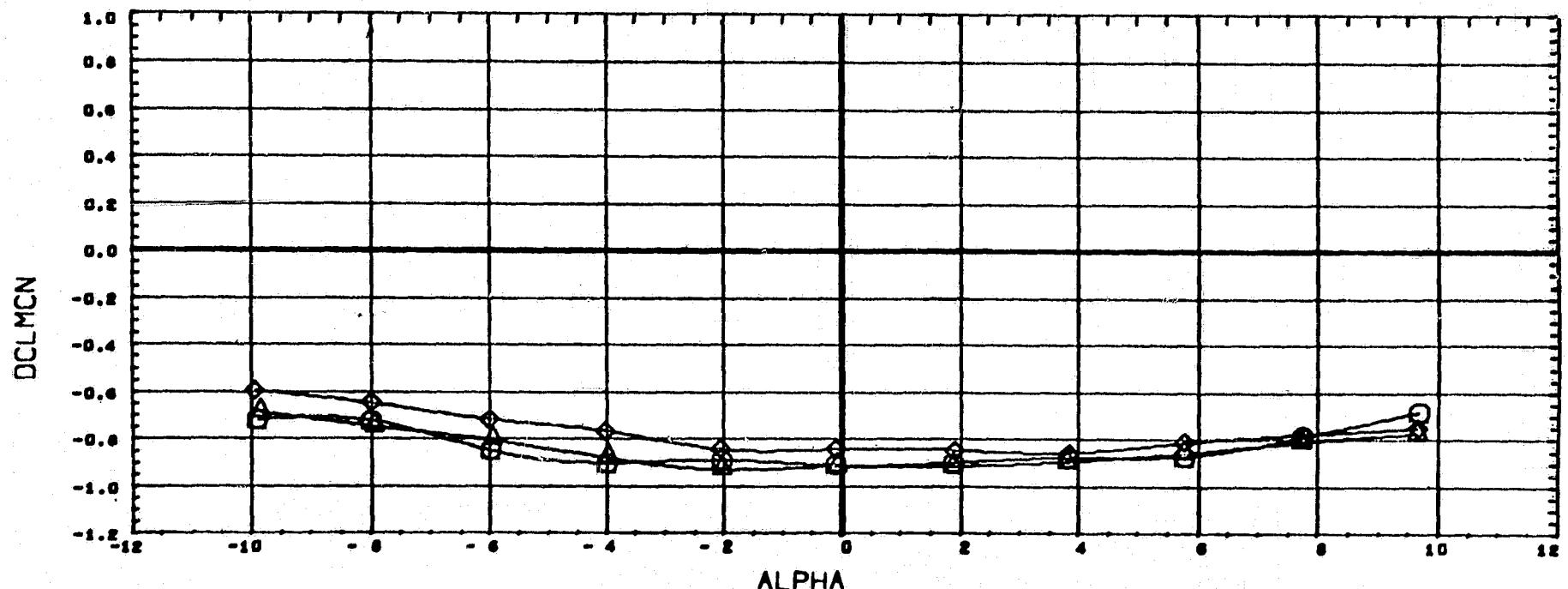
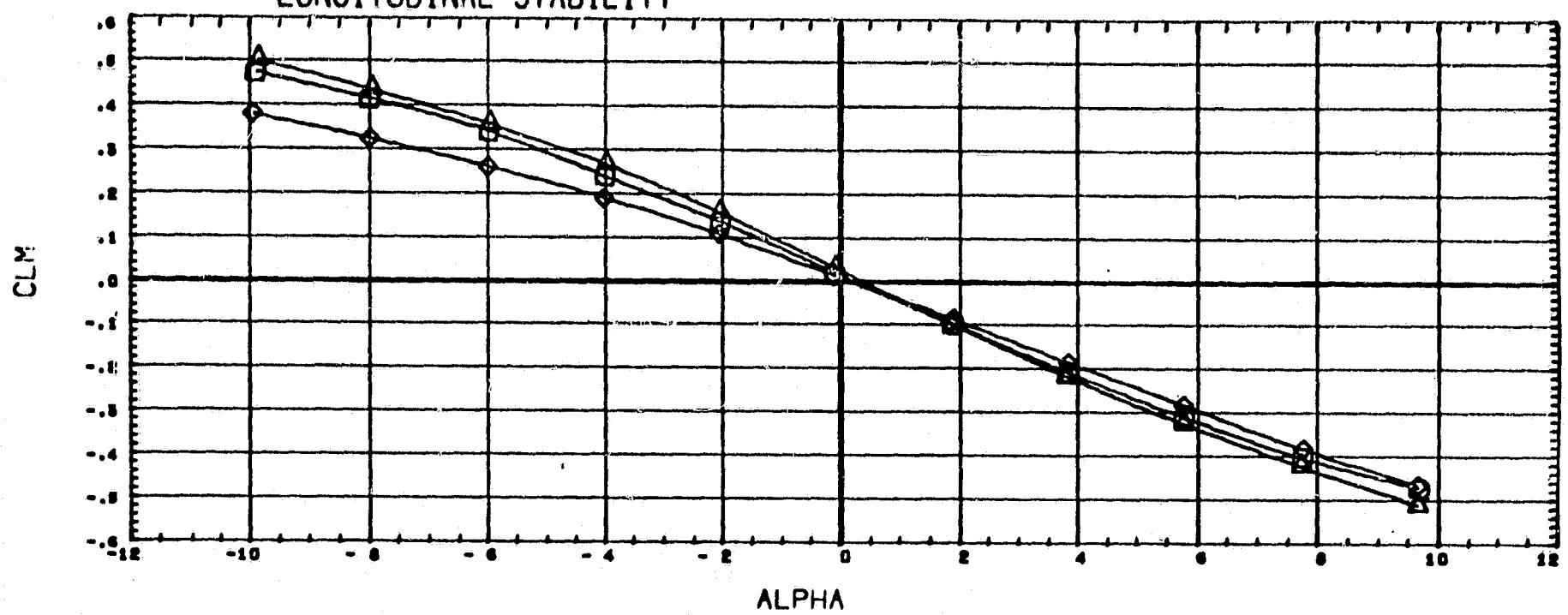
B5V6

(D5713A) 10 FEB 72

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LONGITUDINAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
 0.896 BETA 0.000
 1.106
 1.458

REFERENCE INFORMATION
 SREF 5.1476 SQ. IN.
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 OREF 2.9690 IN.
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 ZMRP 0.0000 IN.
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DATA MIST. CODE CGR

M523-MSFC MODELAX12331-1

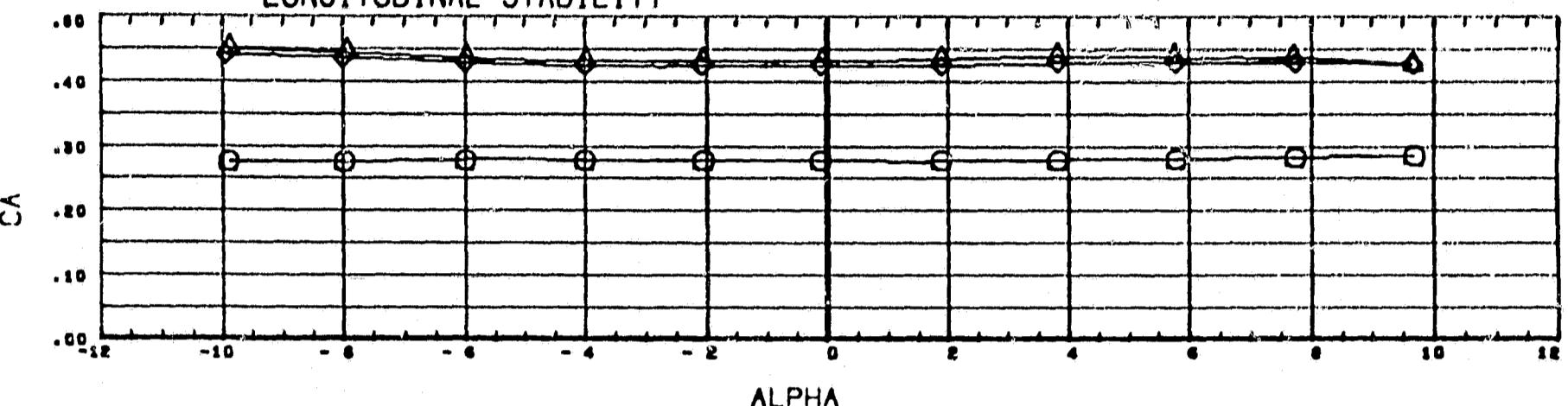
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(D5713A) 10 FEB 72

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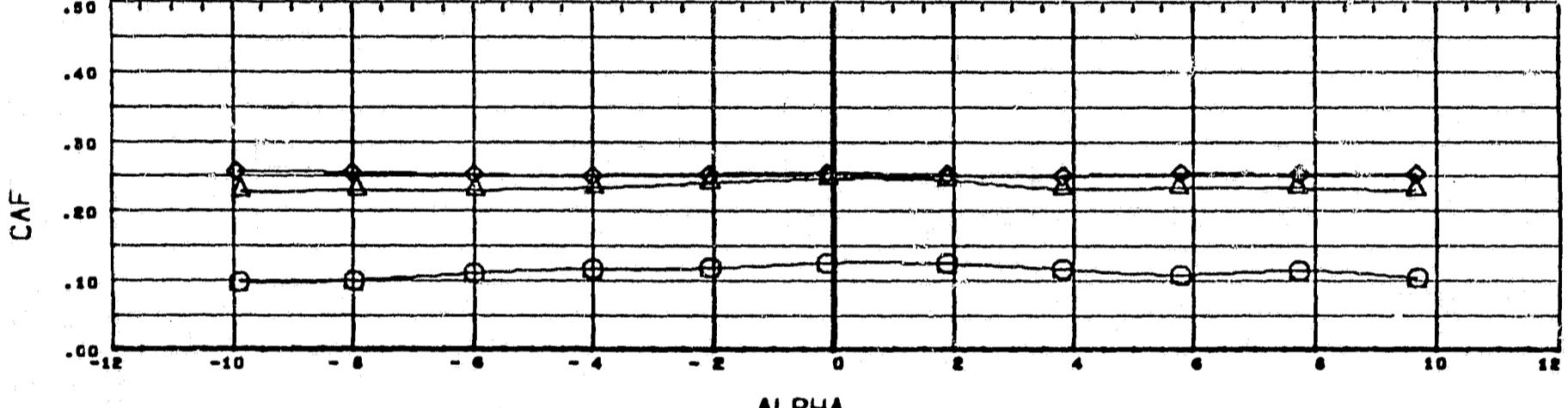
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LONGITUDINAL STABILITY



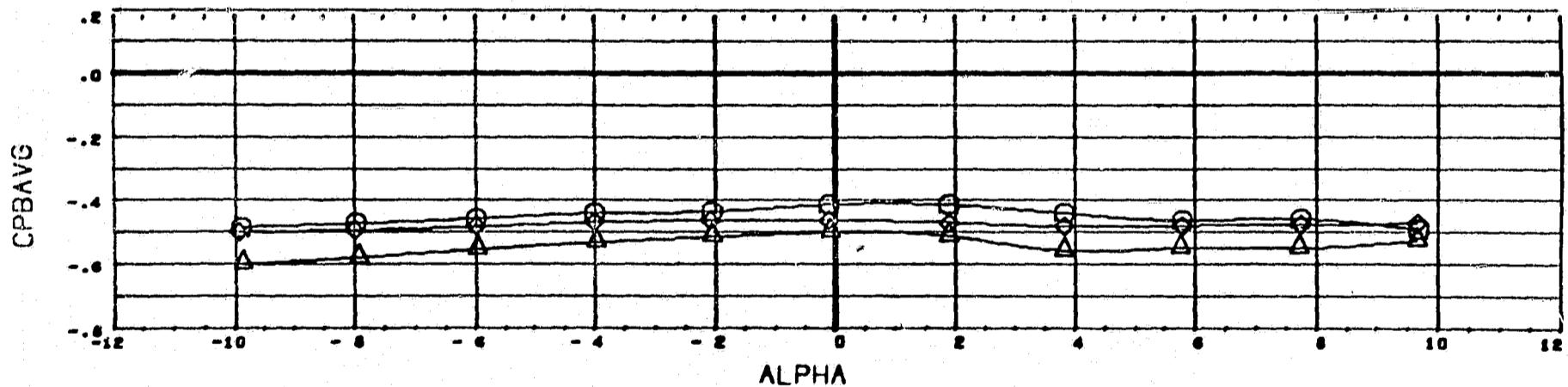
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ALPHA



CAF

ALPHA



CPB AVG

ALPHA

SYMBOL MACH PARAMETRIC VALUES

\triangle 0.898 BETA 0.000
 \square 1.106
 \diamond 1.458

REFERENCE INFORMATION

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BREF	2.9690	IN.
XHRF	5.7530	IN.
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ZHRF	0.0000	IN.
SCALE	0.0034	

DATA MIST. CODE CGR

M523-MSFC MODEL A/X1233I-1

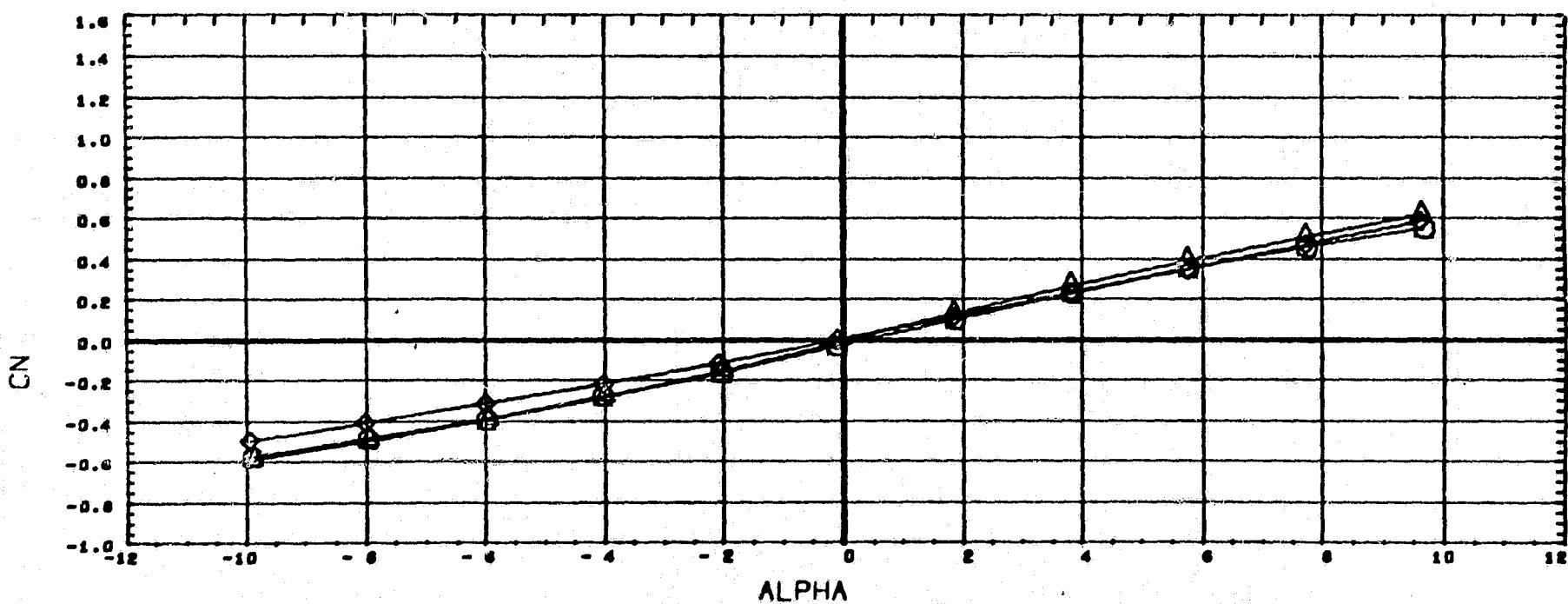
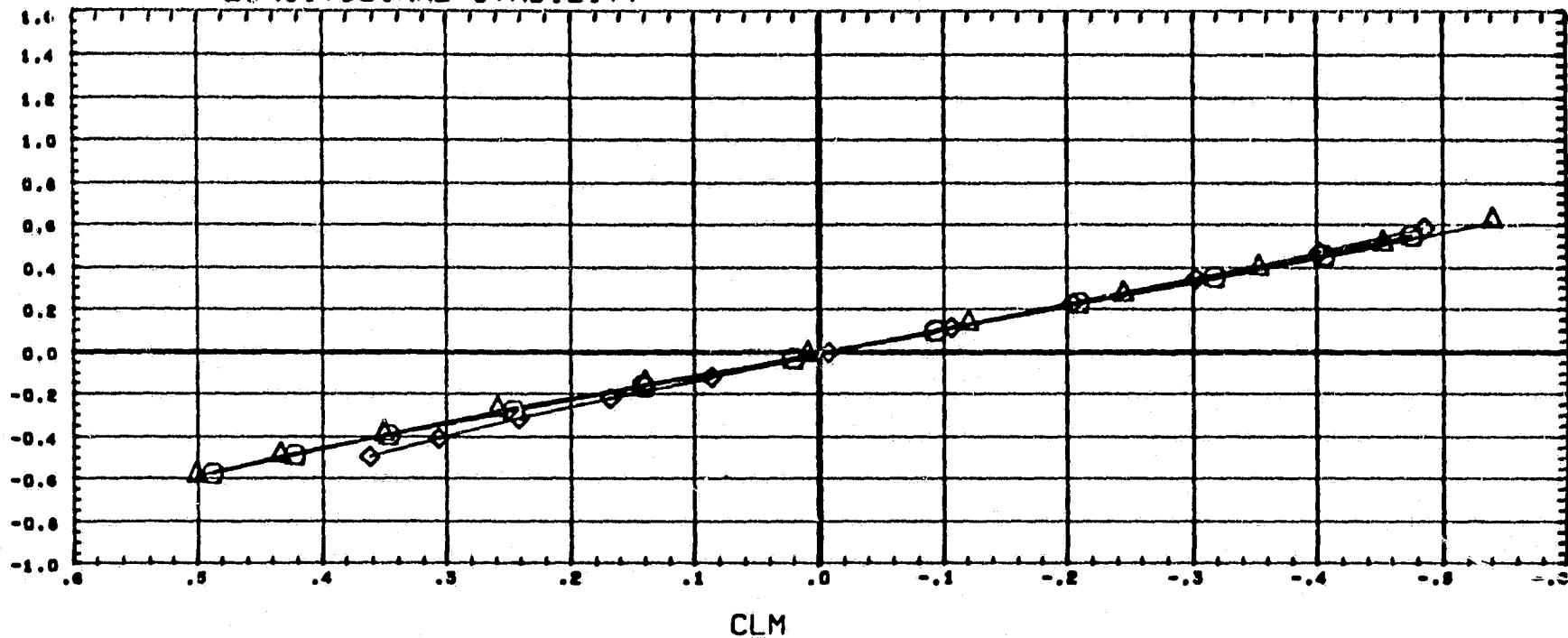
B5V6

(D5713A) 10 FEB 72

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LONGITUDINAL STABILITY



SYMBOL	MACH	BETA	PARAMETRIC VALUES
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A	1.104		
D	1.460		

DATA MEST. CODE CCR

M523-MSFC MODELAX1233I-1

B5V6.2

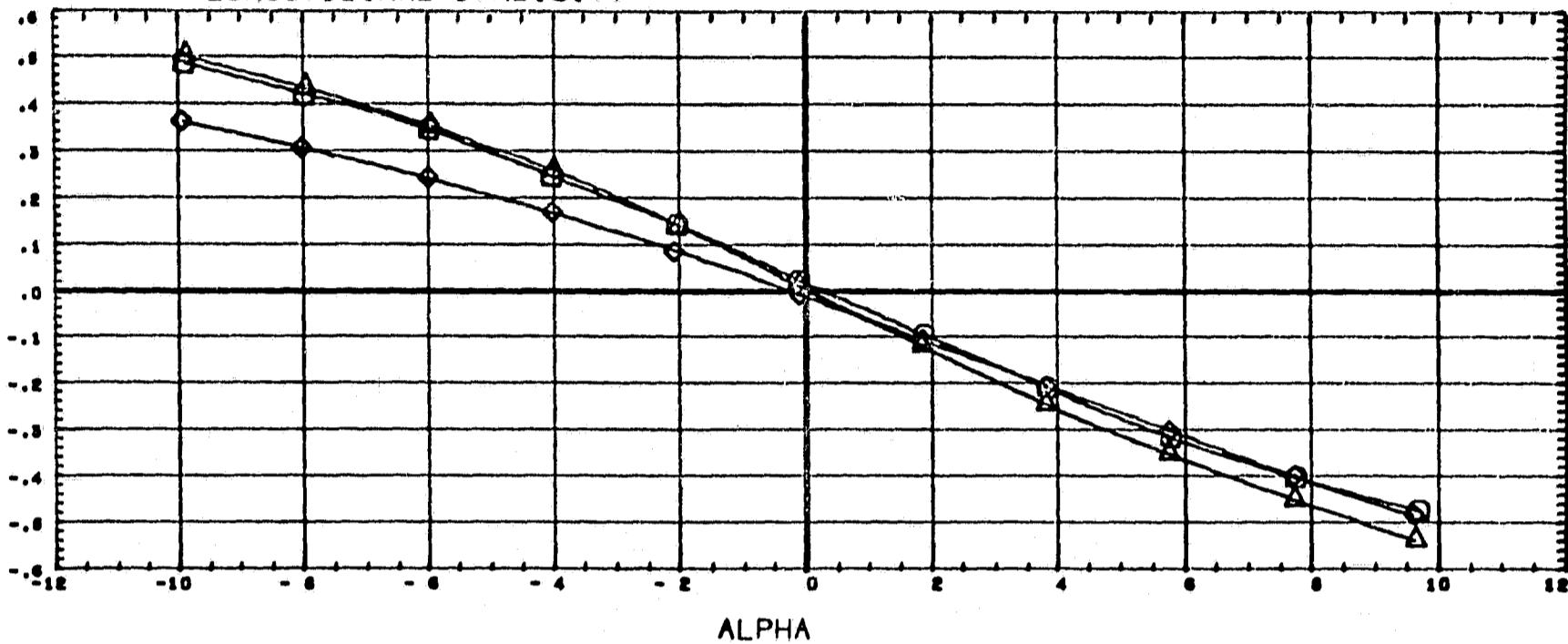
(D5714A) 10 FEB 72

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REFERENCE INFORMATION		
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BREF	2.9690	IN.
XHRF	8.7930	IN.
YHRF	0.0000	IN.
ZHRF	0.0000	IN.
SCALE	0.0034	

LONGITUDINAL STABILITY



CLM

ALPHA

DCLMCN

ALPHA

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

DATA HIST. CODE CCR

M523-MSFC MODELAX1233I-1

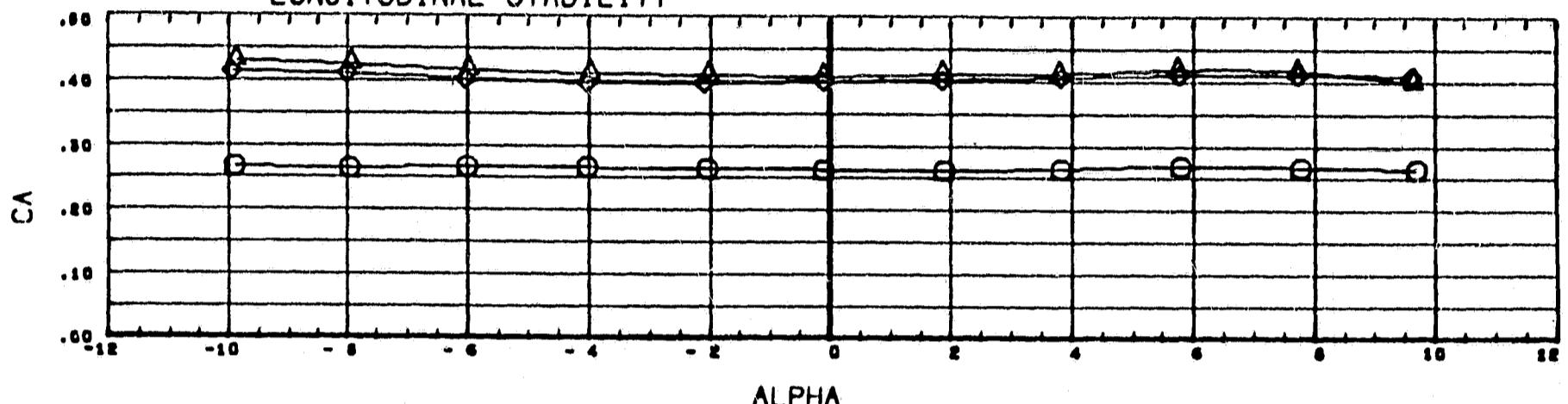
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(D5714A) 10 FEB 72

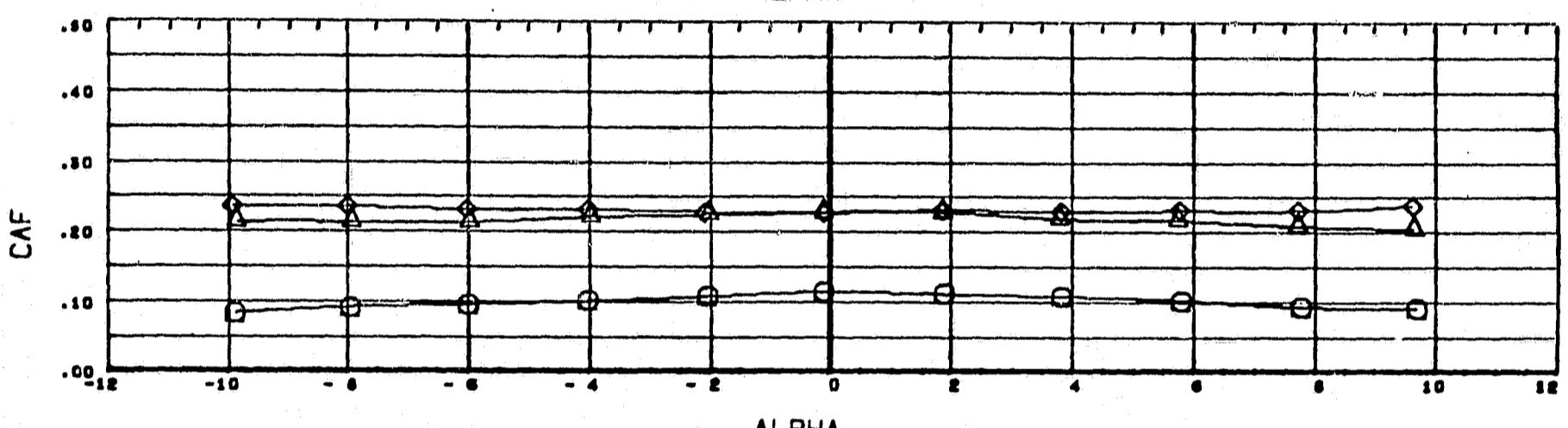
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YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

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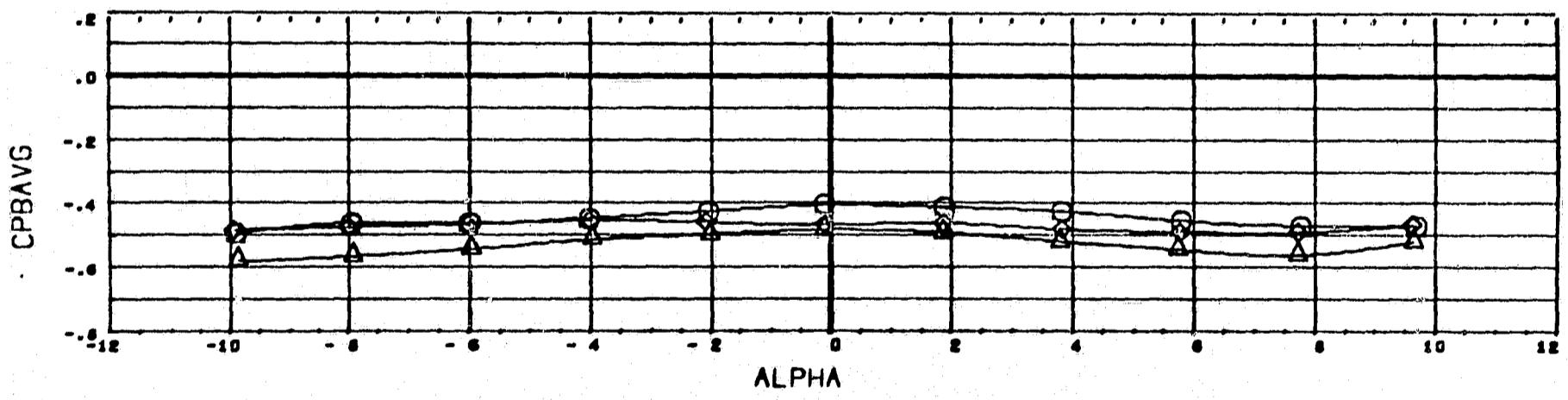
LONGITUDINAL STABILITY



ALPHA



ALPHA



ALPHA

SYMBOL MACH BETA PARAMETRIC VALUES
 Δ 0.897 0.000
 \square 1.104
 \circ 1.460

REFERENCE INFORMATION
SREF 5.1478 IN.
LREF 4.4260 IN.
BREF 2.9690 IN.
XHRF 9.7530 IN.
YHRF 0.0000 IN.
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SCALE 0.0034

DATA MIST. CODE CGR

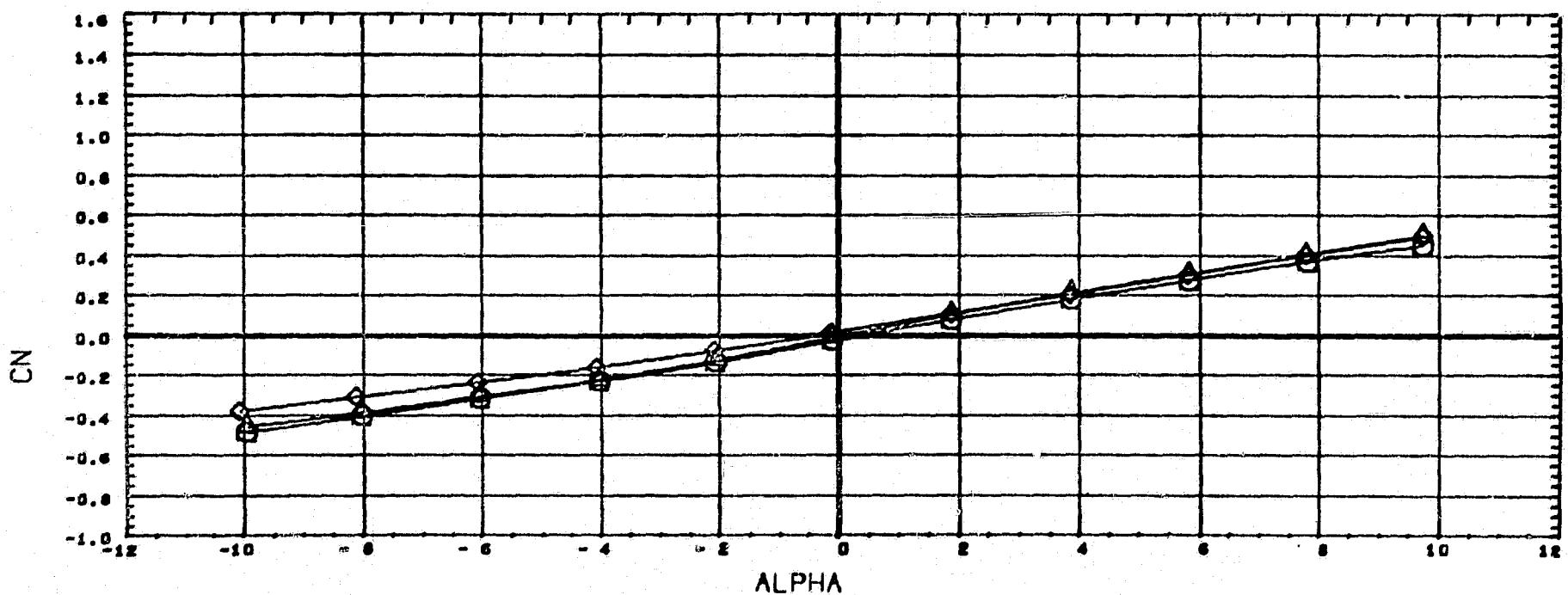
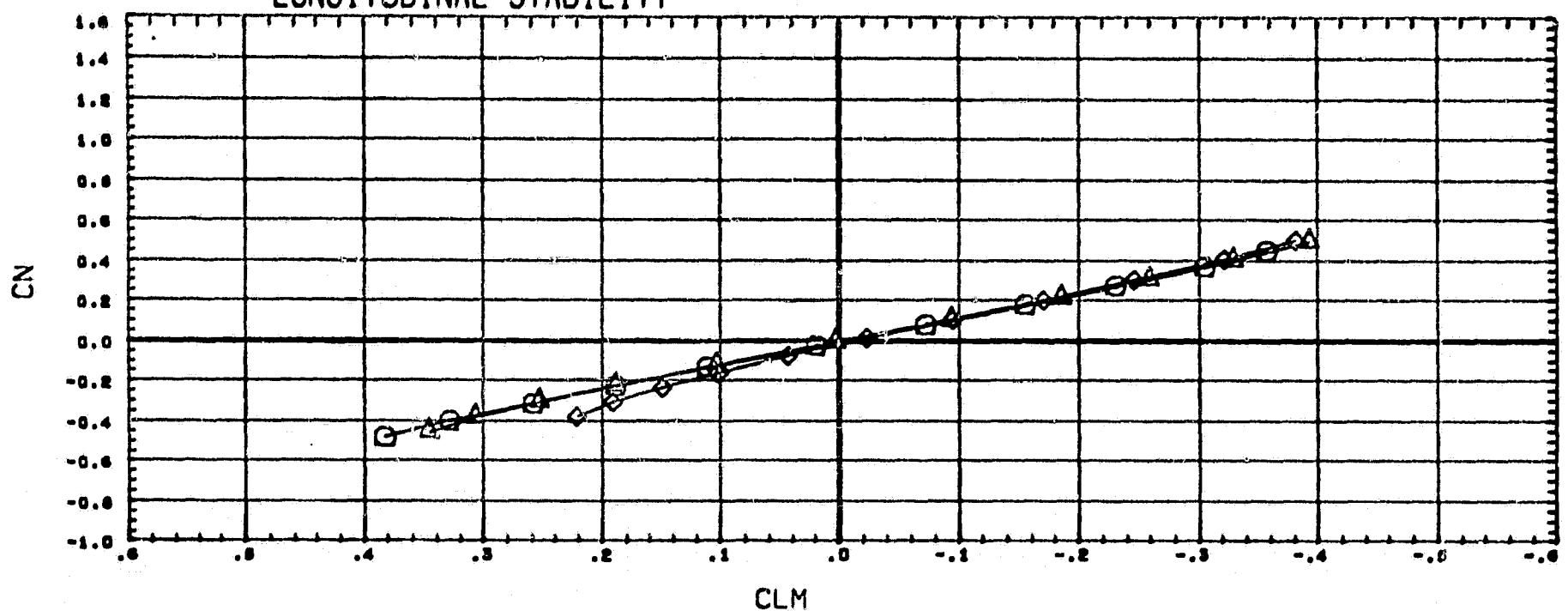
M523-MSFC MODEL ALEX1233I-1

B5V6.2

(D5714A) 10 FEB 72

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LONGITUDINAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
	0.699 1.300	DETA 0.000

REFERENCE INFORMATION		
SREF	5.1478	IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
ZHMRP	5.7930	IN.
YHMRP	0.0000	IN.
ZHMRP	0.0000	IN.
SCALE	0.0034	

DATA MIST-CODE CCR

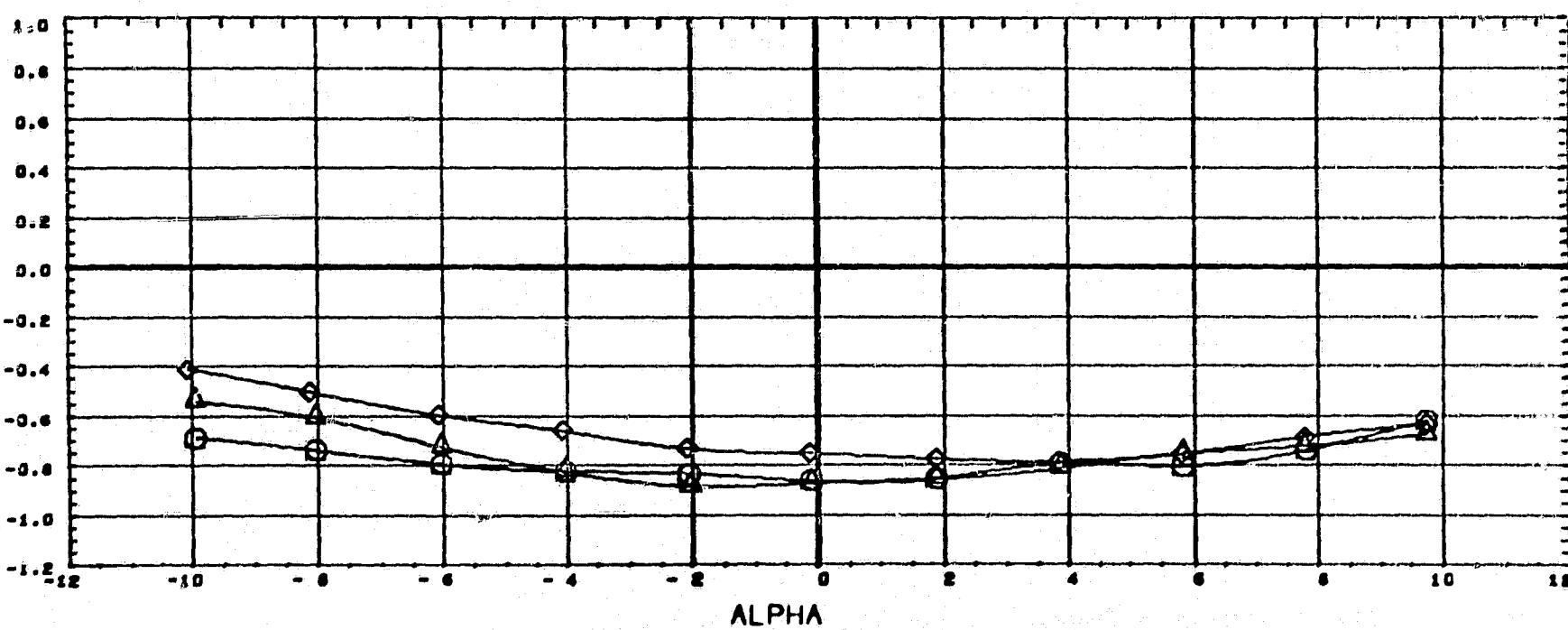
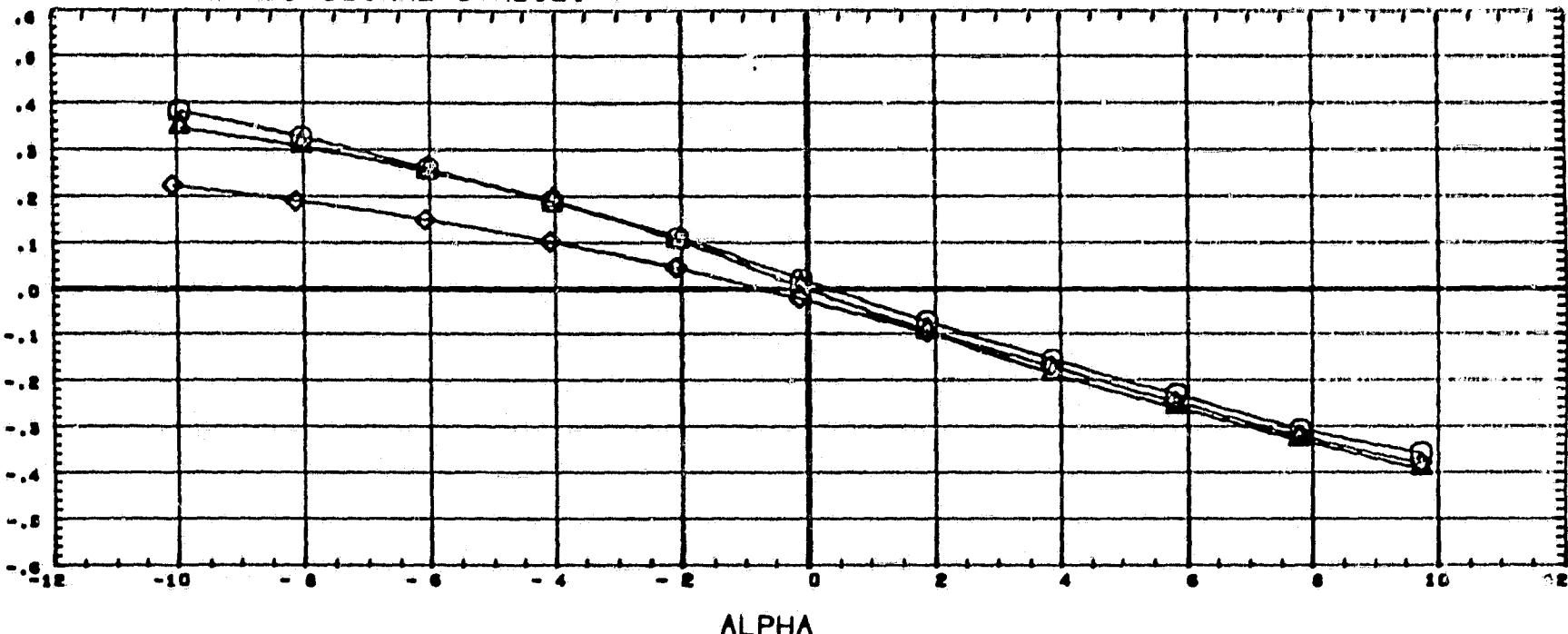
M523-MSEC MODEL AX12331-1

B5V6.4

(D5716A) 10 FEB 72

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LONGITUDINAL STABILITY



SYMBOL	MACH	BETA	PARAMETRIC VALUES
	0.899		0.000
	1.100		
	1.498		

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

DATA MIST. CODE CCR

M523-MSFC MODEL AX1233I - 1

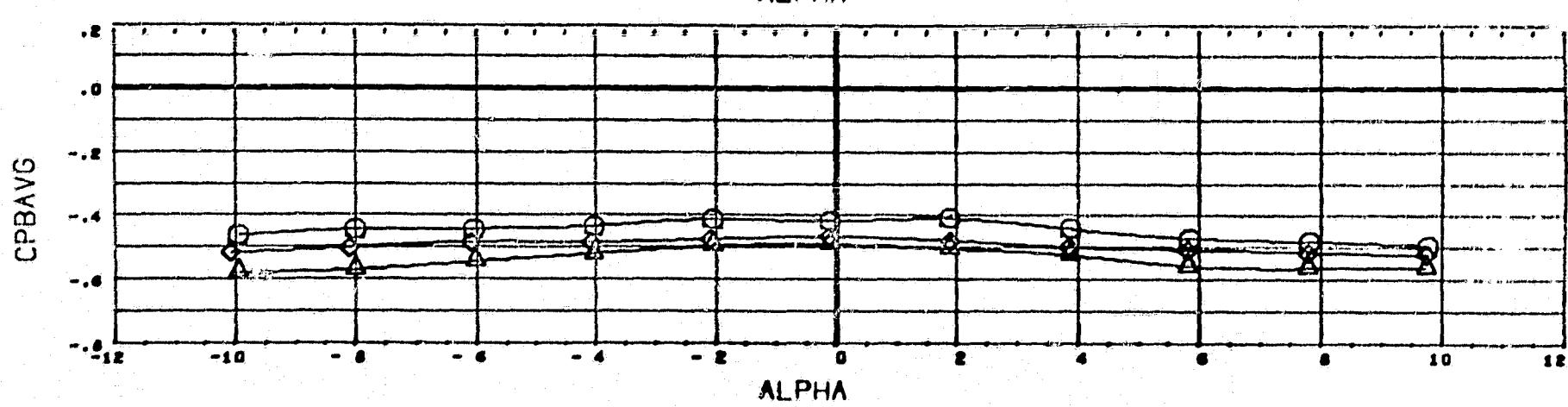
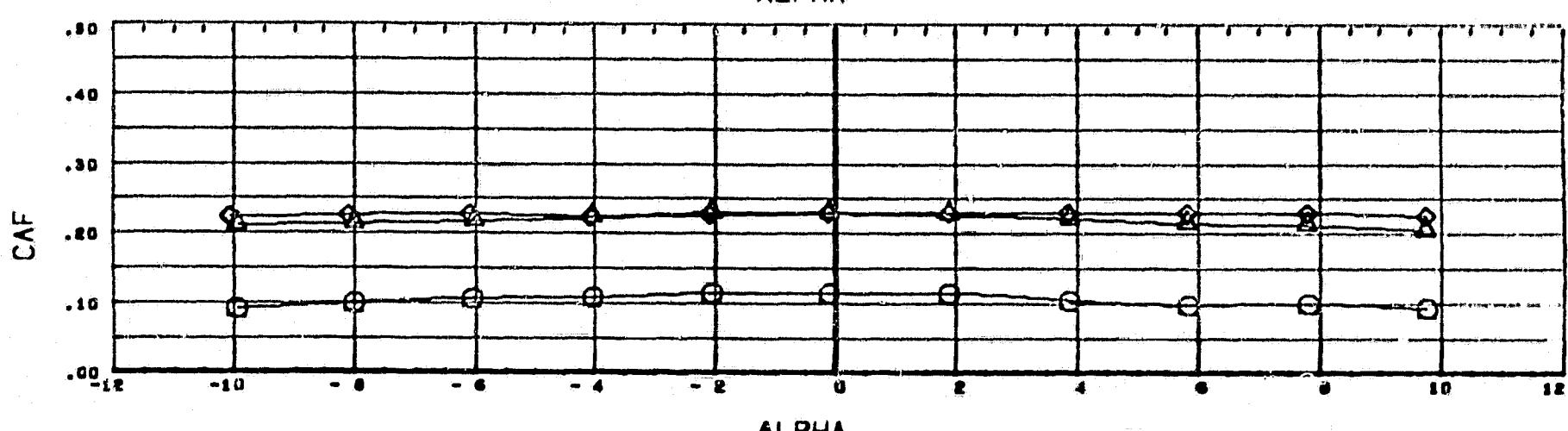
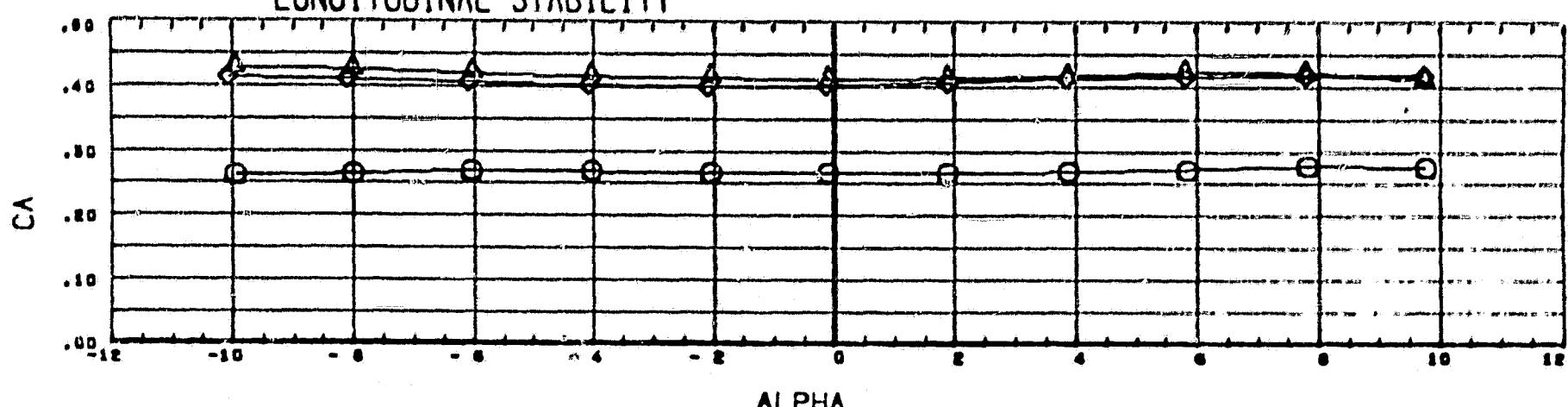
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(D5716A) 10 FEB 72

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LONGITUDINAL STABILITY

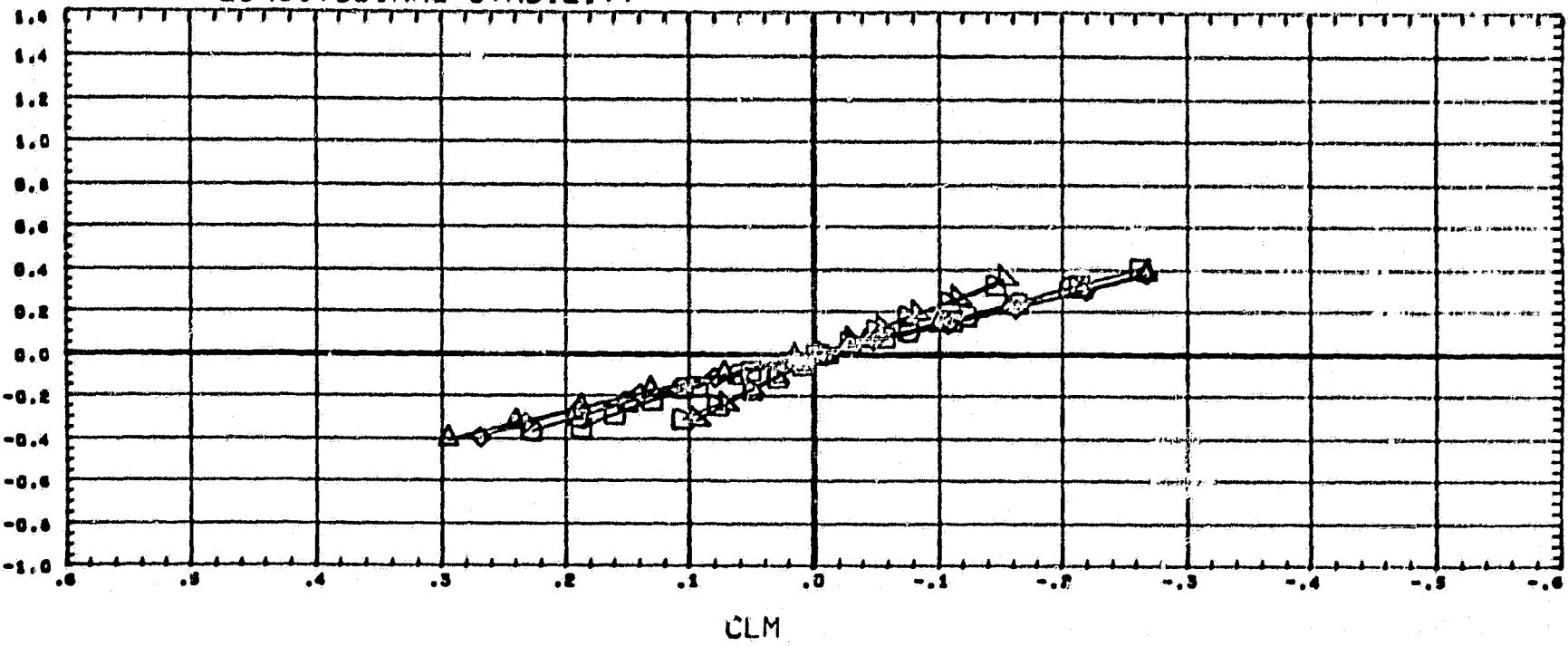


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 ◇ 1.100
 △ 1.458

DATA MIST. CODE CGR

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 LREF 4.4260 IN.
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 SCALE 0.0034 IN.

LONGITUDINAL STABILITY

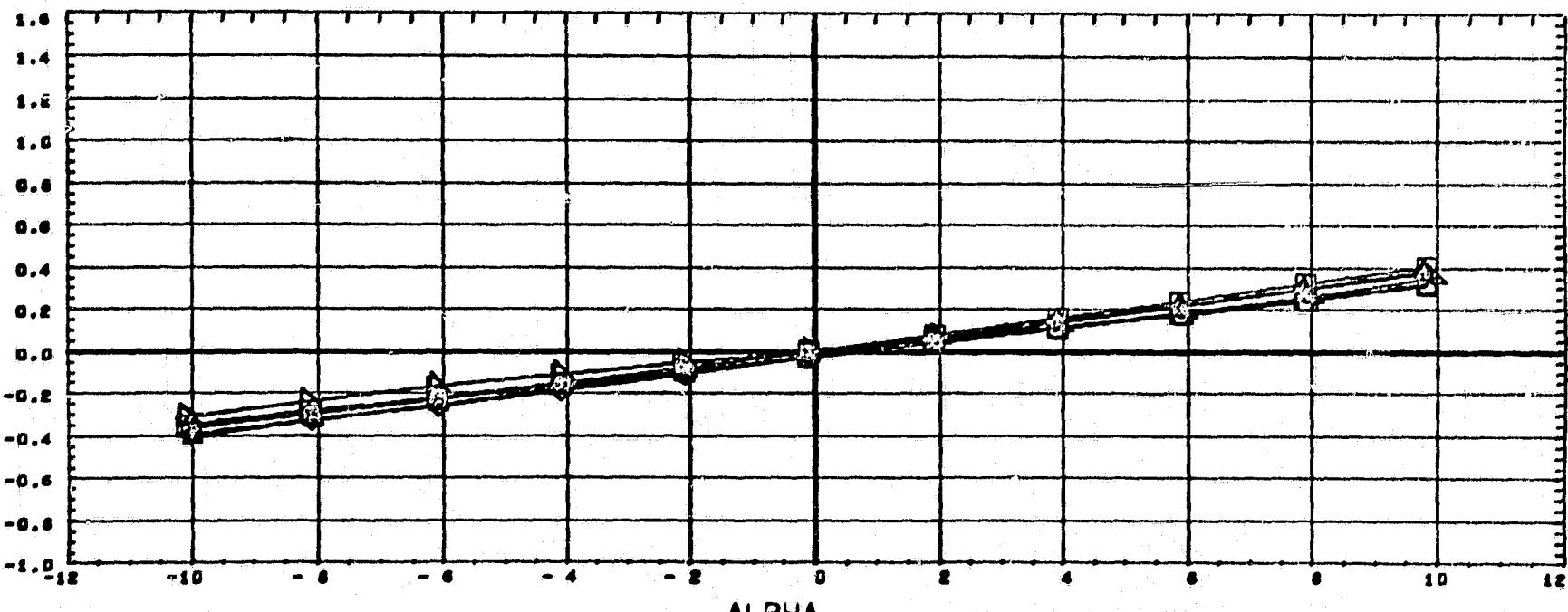


CN

CLM

CN

ALPHA



CN

ALPHA

SYMBOL MACH PARAMETRIC VALUES
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 ◇ 1.099
 □ 1.460
 △ 2.740
 □ 4.959 DATA HIST. CODE CCR

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 LREF 4.4260 IN.
 BREF 2.9690 IN.
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 SCALE 0.0034

M523-MSFC MODEL ALEX1233I-1

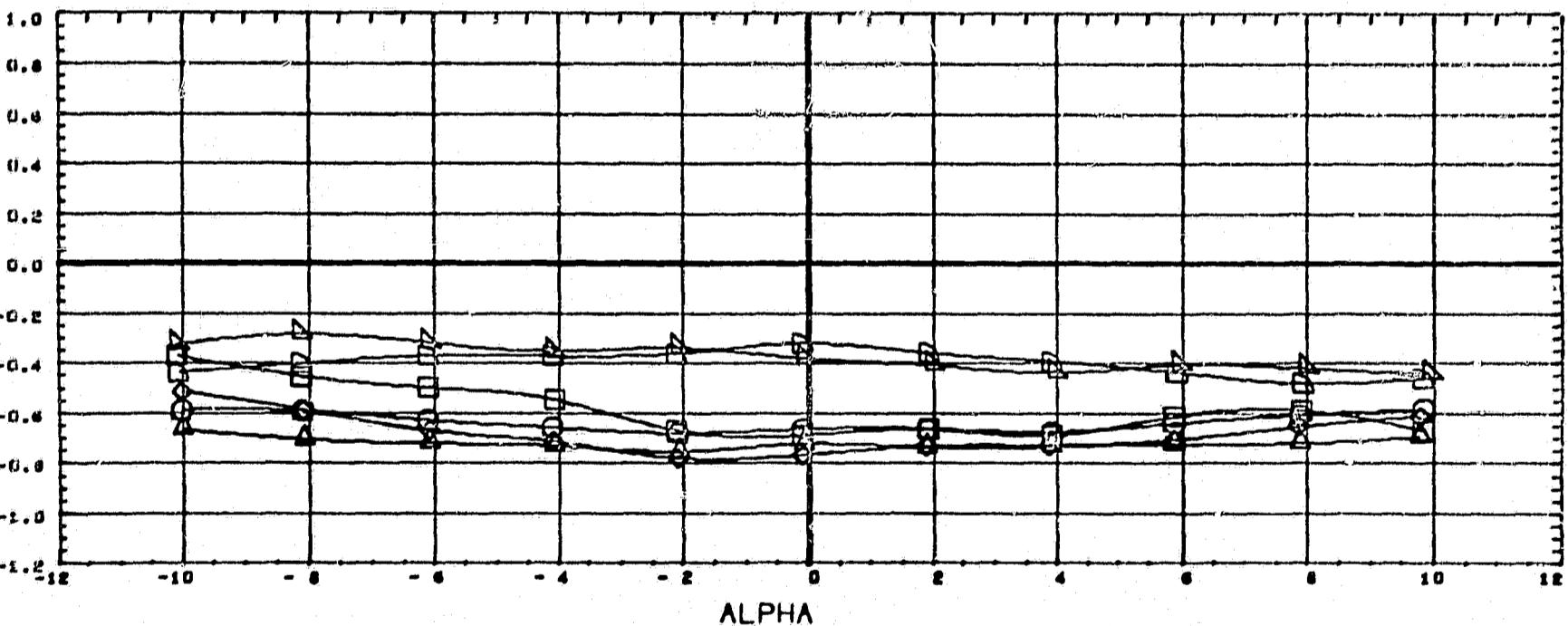
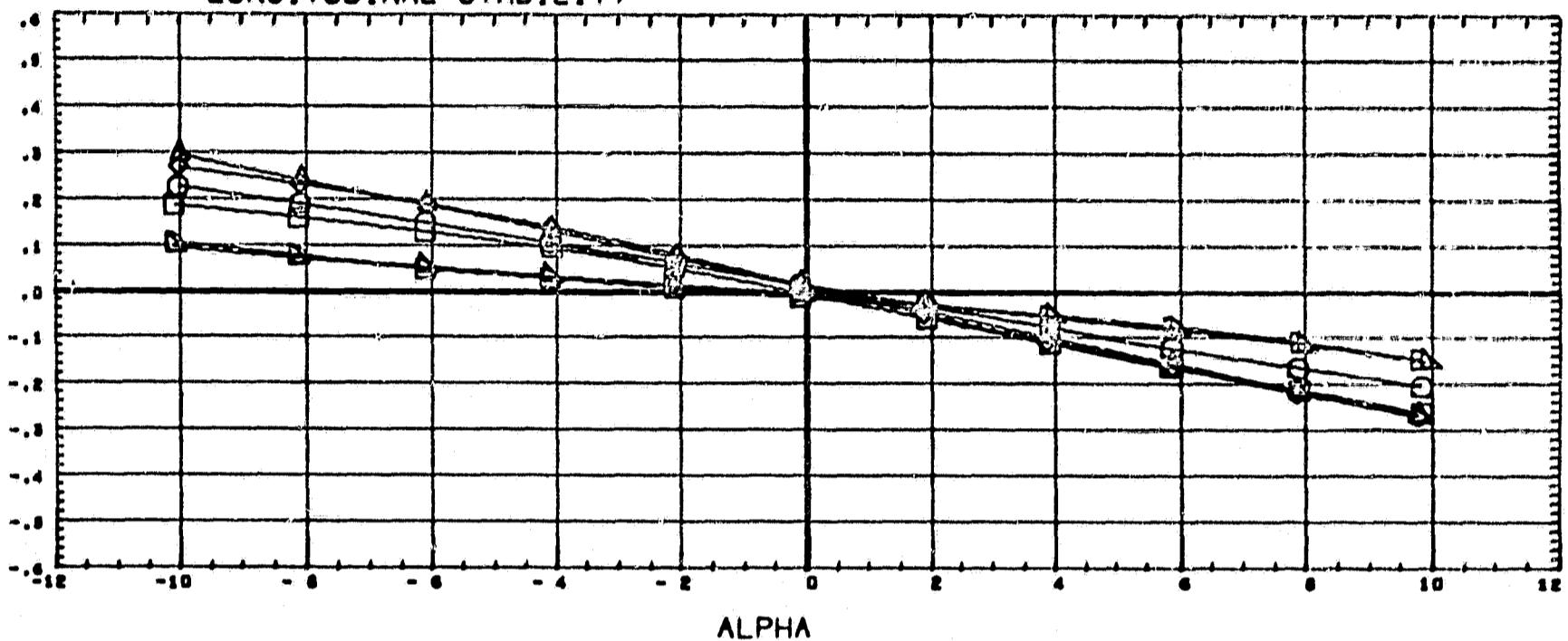
B5V7.2

(D5718A) 10 FEB 72

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28

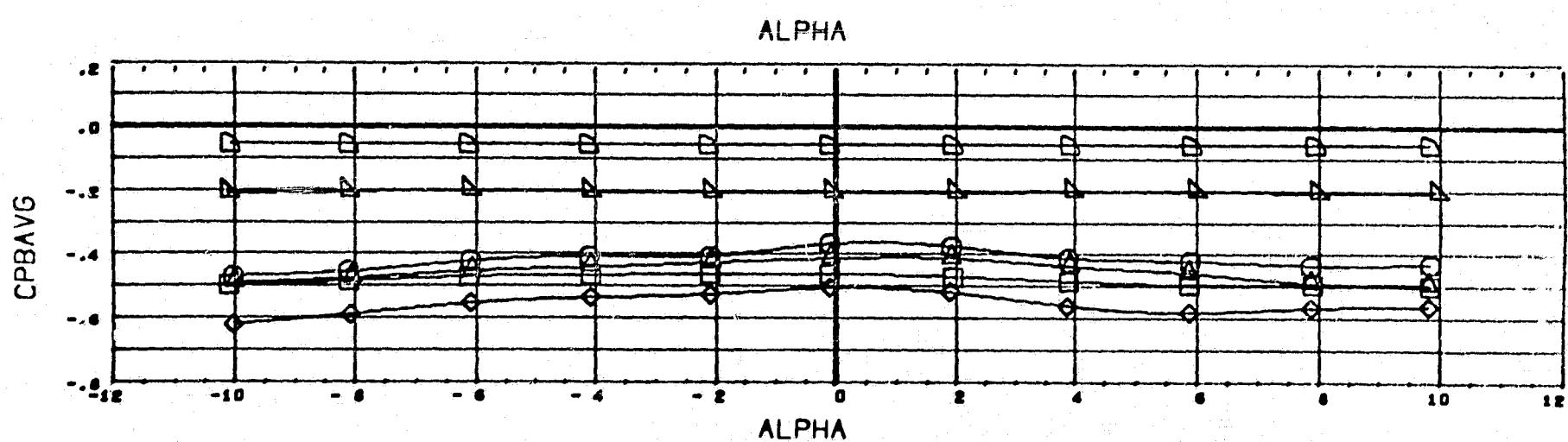
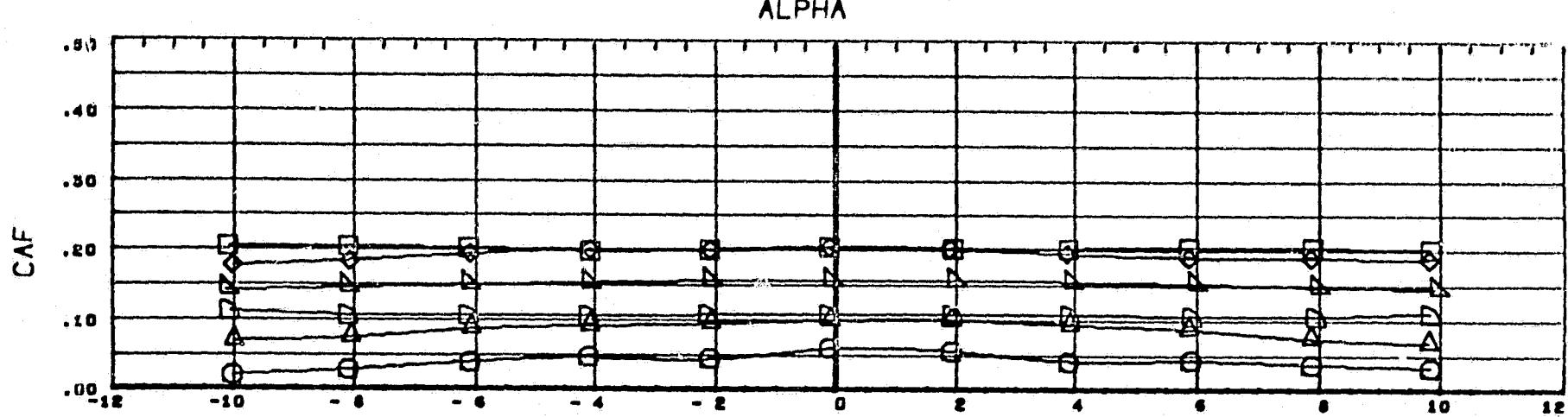
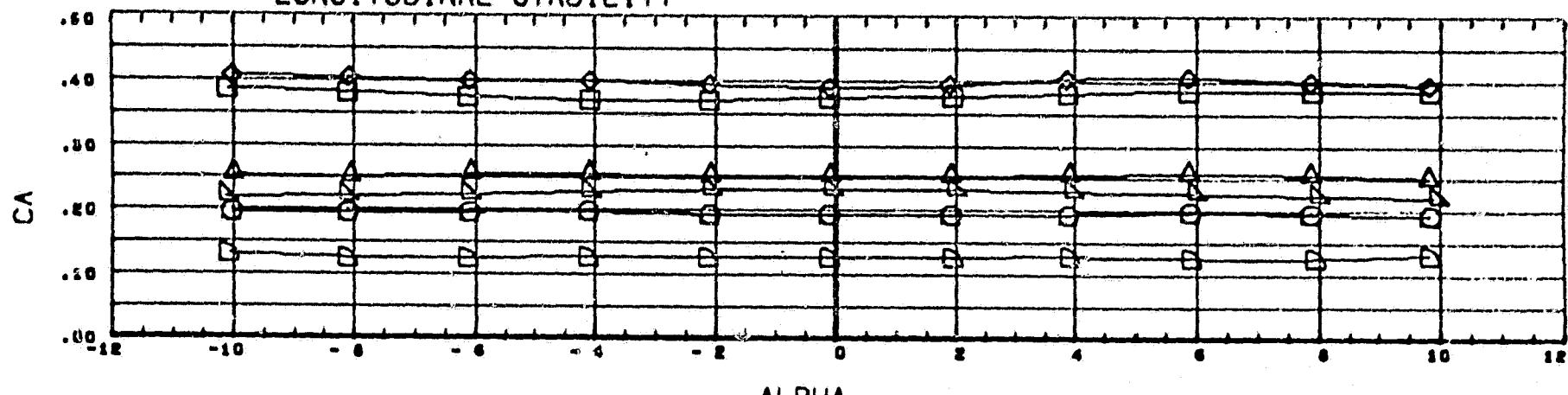
LONGITUDINAL STABILITY



SYMBOL	PARAMETRIC VALUES	
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□	0.800	
△	1.099	
◇	1.460	
◆	2.740	
▲	4.859	DATA MIST. CODE CCR

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XMRP	5.7530	IN.
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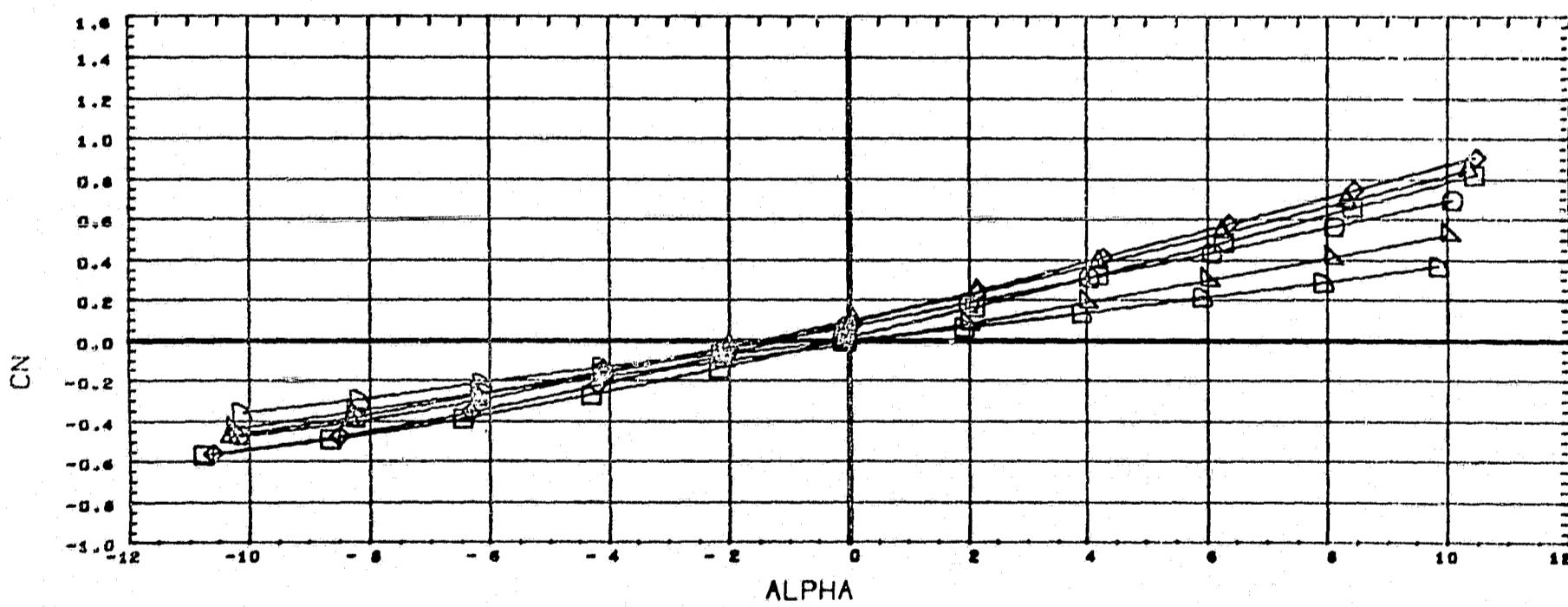
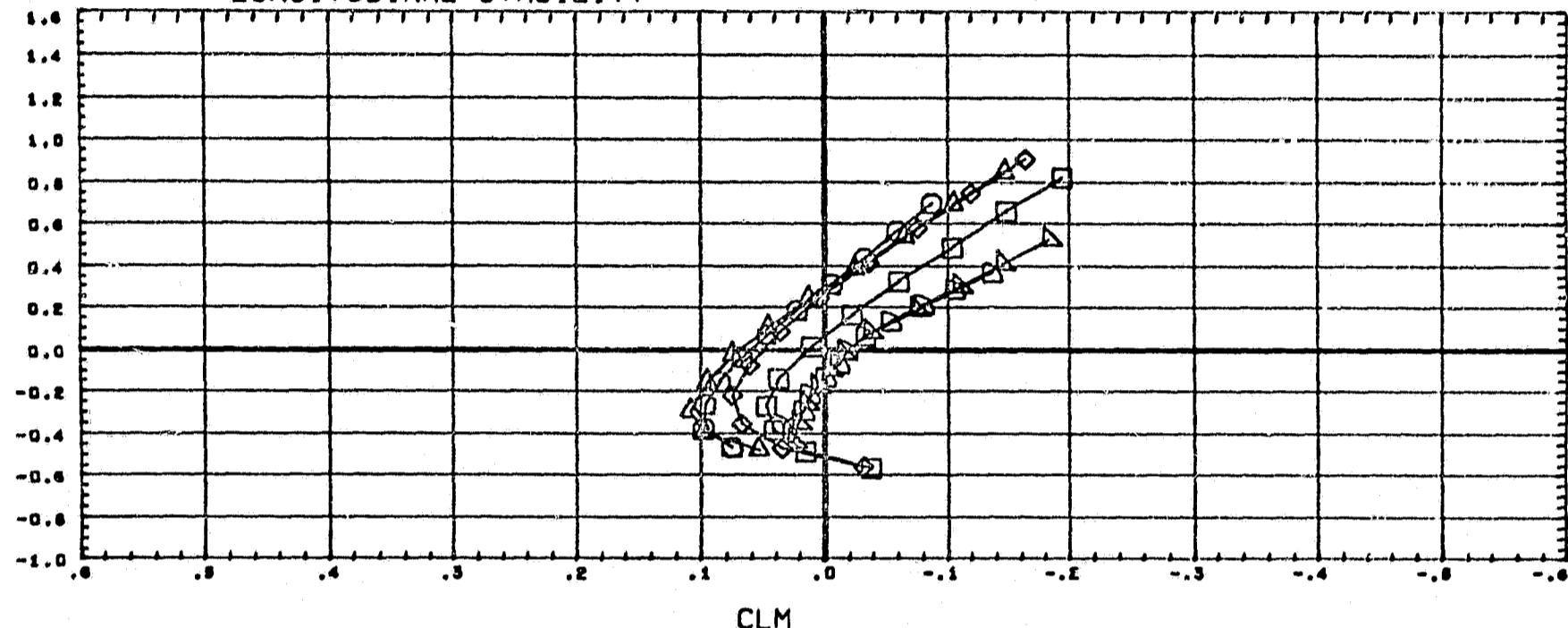
LONGITUDINAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
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 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		
C	0.599	BETA	0.000	ORBINC - 2.000
△	0.698			
◊	1.103			
□	1.457			
▽	2.740			
D	4.959	DATA HIST. CODE	CGR	

REFERENCE INFORMATION

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REF	2.9690	IN.
H.R.P	5.7530	IN.
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H.R.P	0.0000	IN.
CALE	0.0034	

MS23-MSFC MODEL AX1233I-1

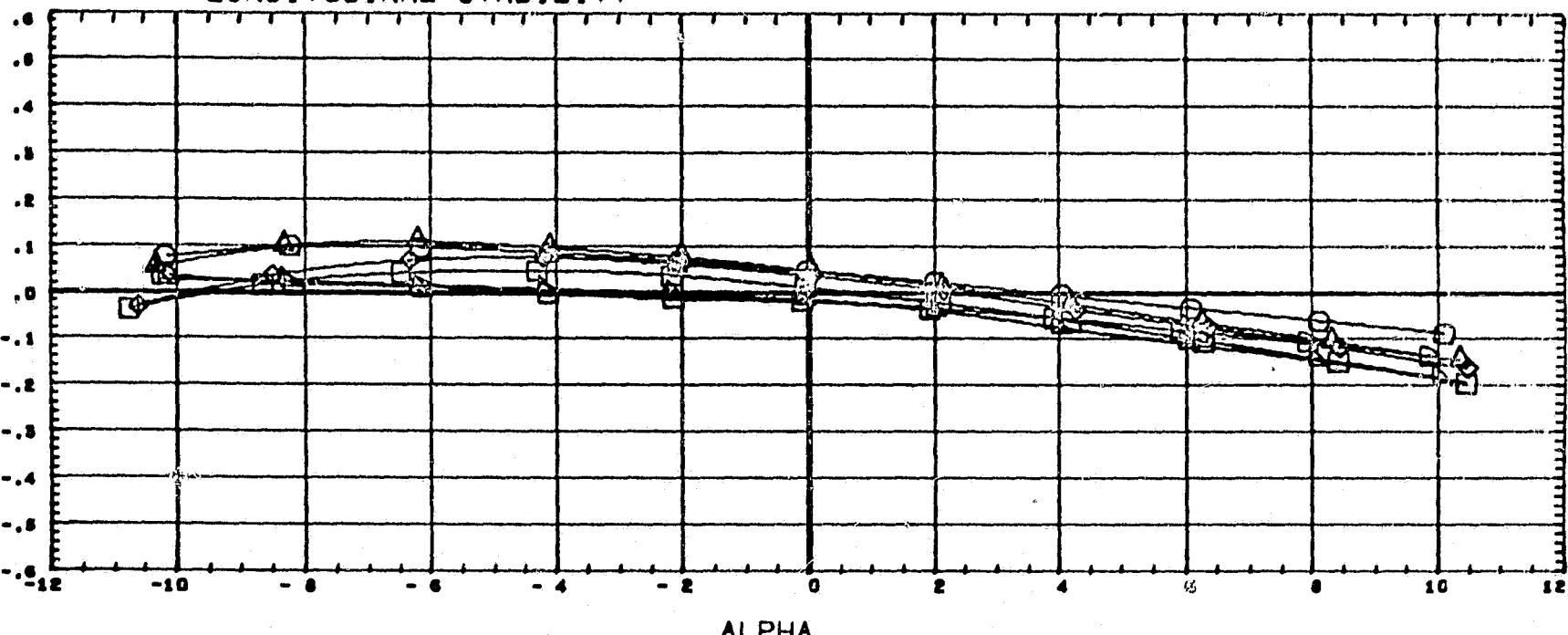
B501-2V7.2

(D5719A) 10 FEB 72

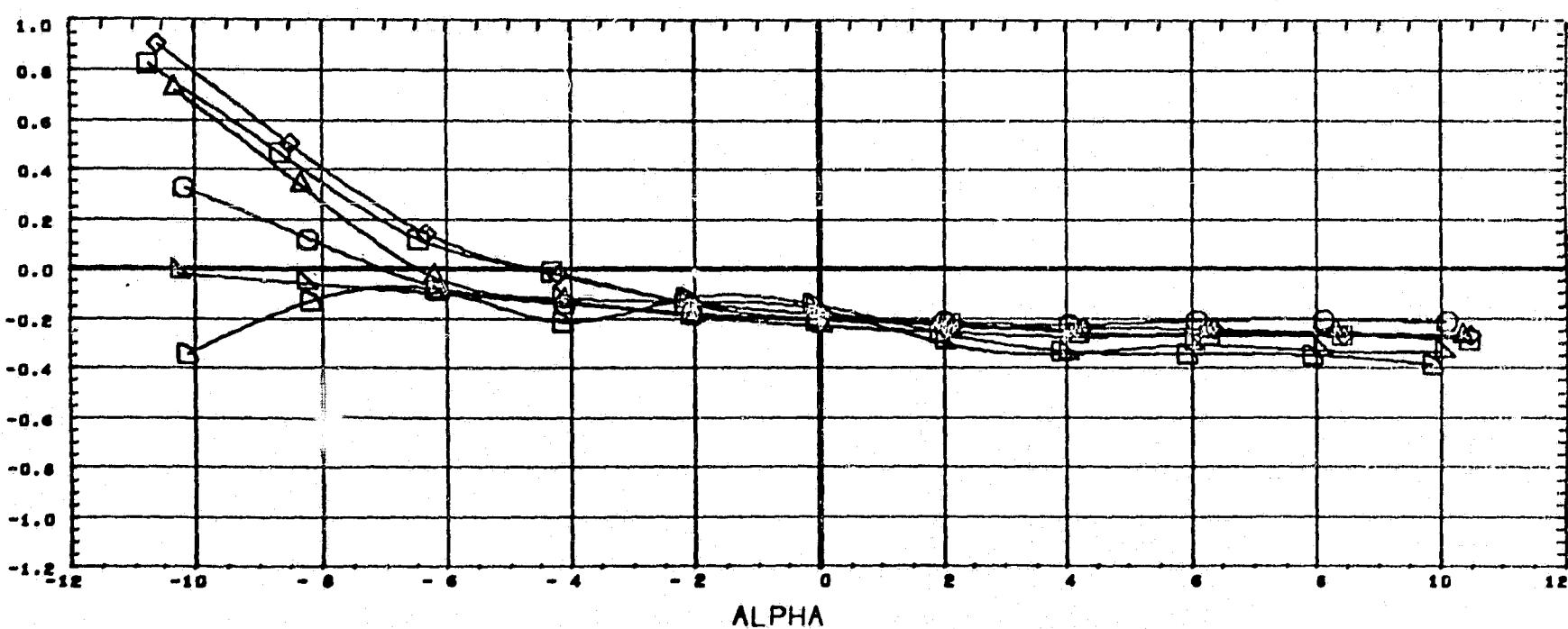
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LONGITUDINAL STABILITY



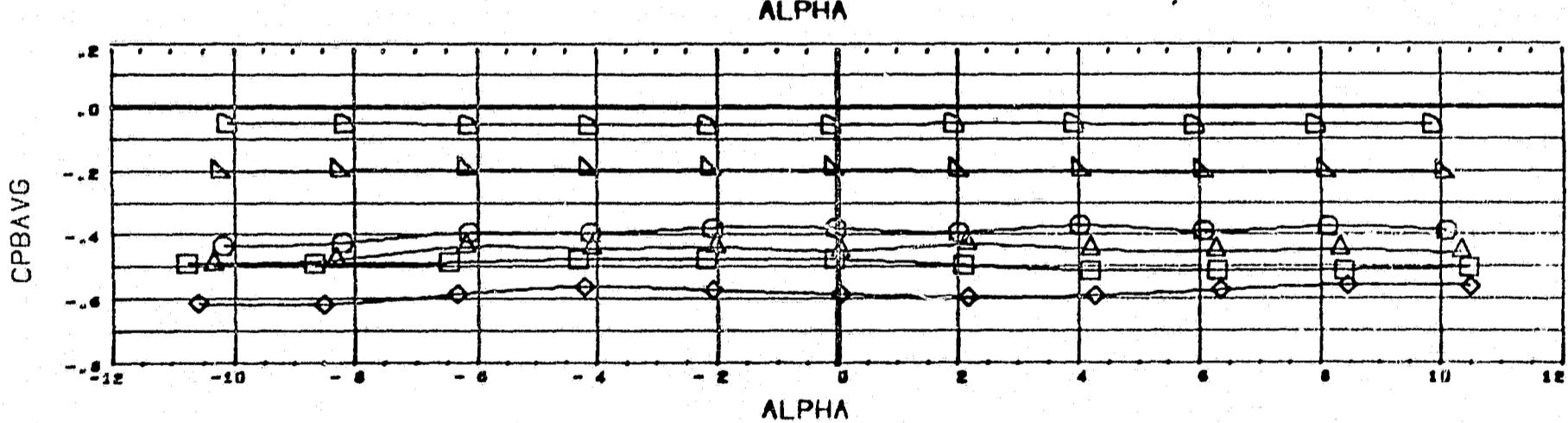
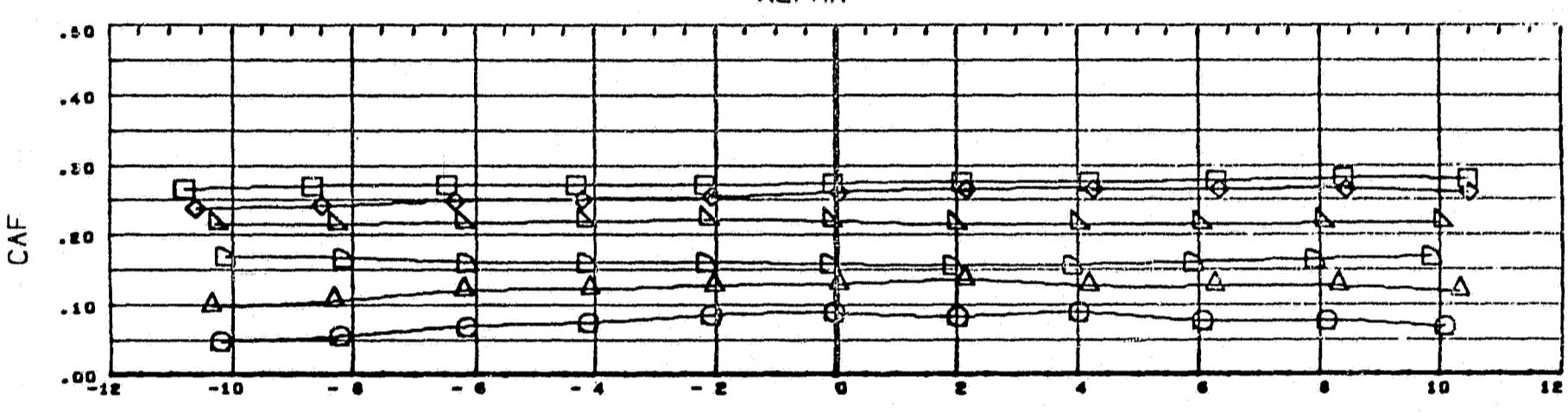
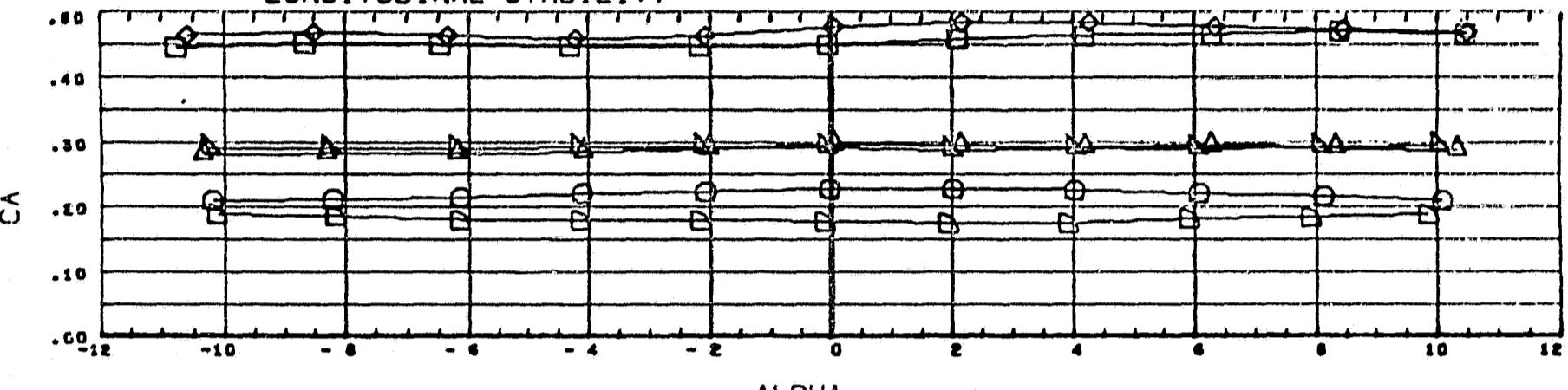
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SYMBOL MACH PARAMETRIC VALUES
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 D 0.898
 D 1.103
 D 1.457
 D 2.740
 D 4.958 DATA HIST. CODE CGR

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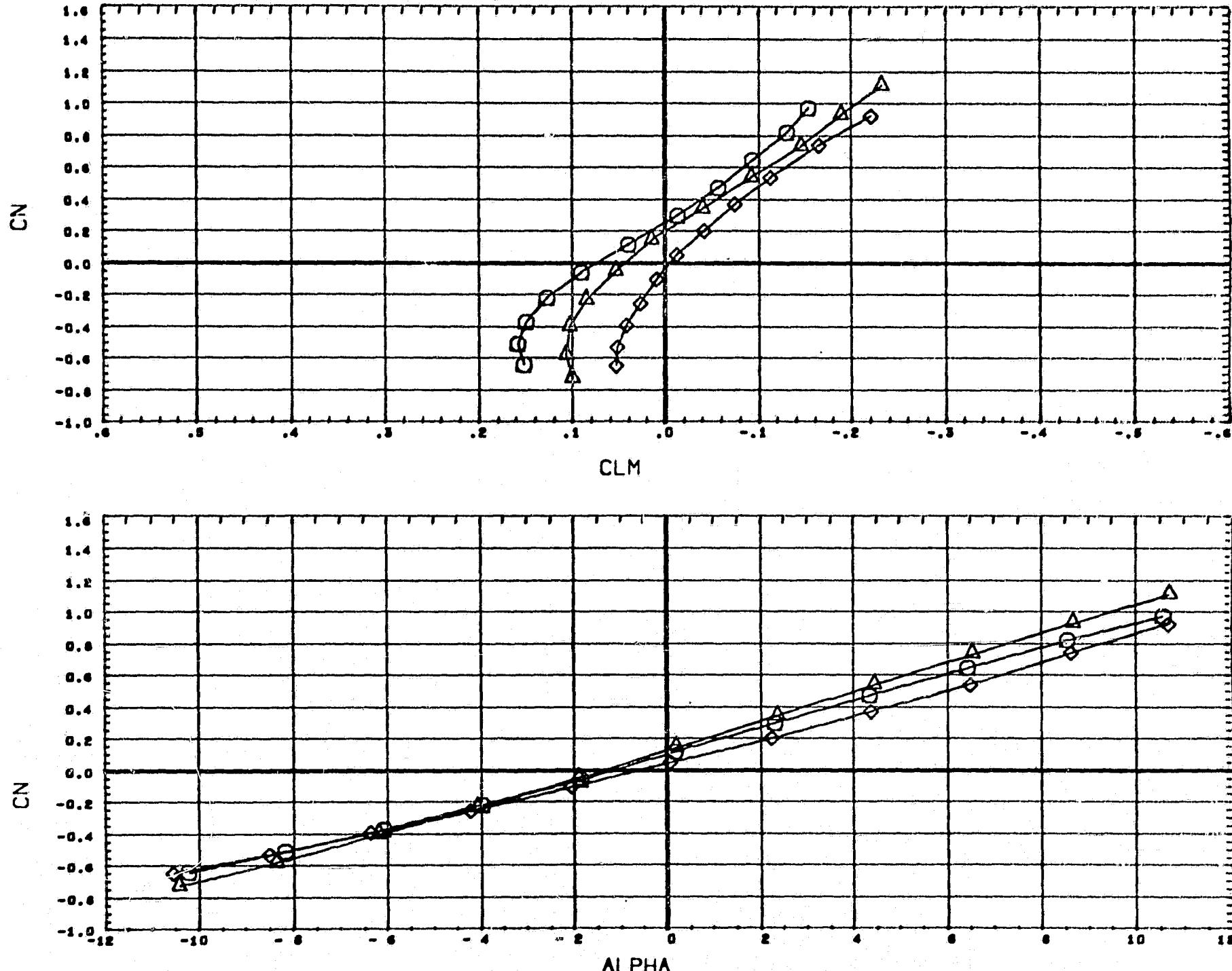
LONGITUDINAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
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 0.898
 1.103
 1.457
 2.740
 4.859 DATA HIST. CODE CGR

REFERENCE INFORMATION
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 LREF 4.4260 IN.
 BREF 2.9690 IN.
 XHRP 5.7530 IN.
 YHRP 0.0000 IN.
 ZHRP 0.0000 IN.
 SCALE 0.0034

LONGITUDINAL STABILITY



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

REFERENCE INFORMATION		
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XHRF	4.3530	
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SCALE	0.0034	

DATA MIST. CODE CGR

M523-MSFC MODEL AX1233I-1

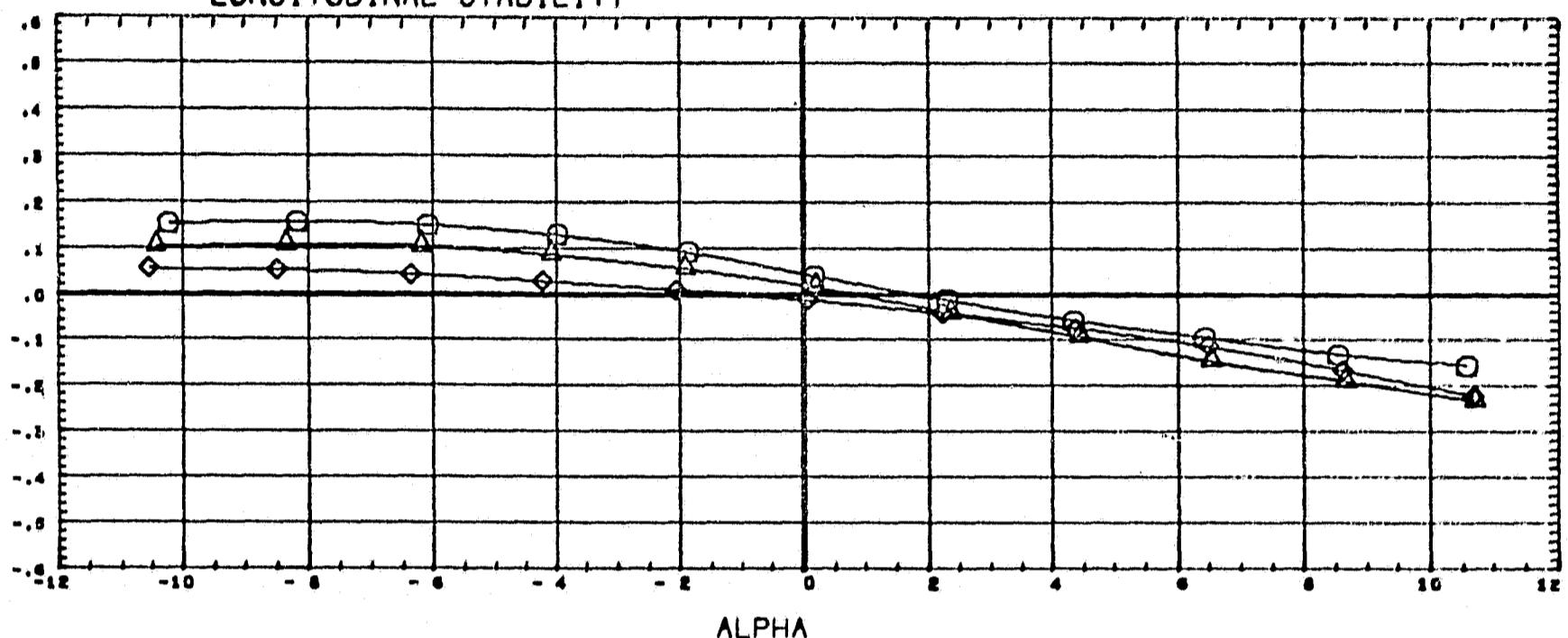
B601-2V5

(D5712A) 10 FEB 72

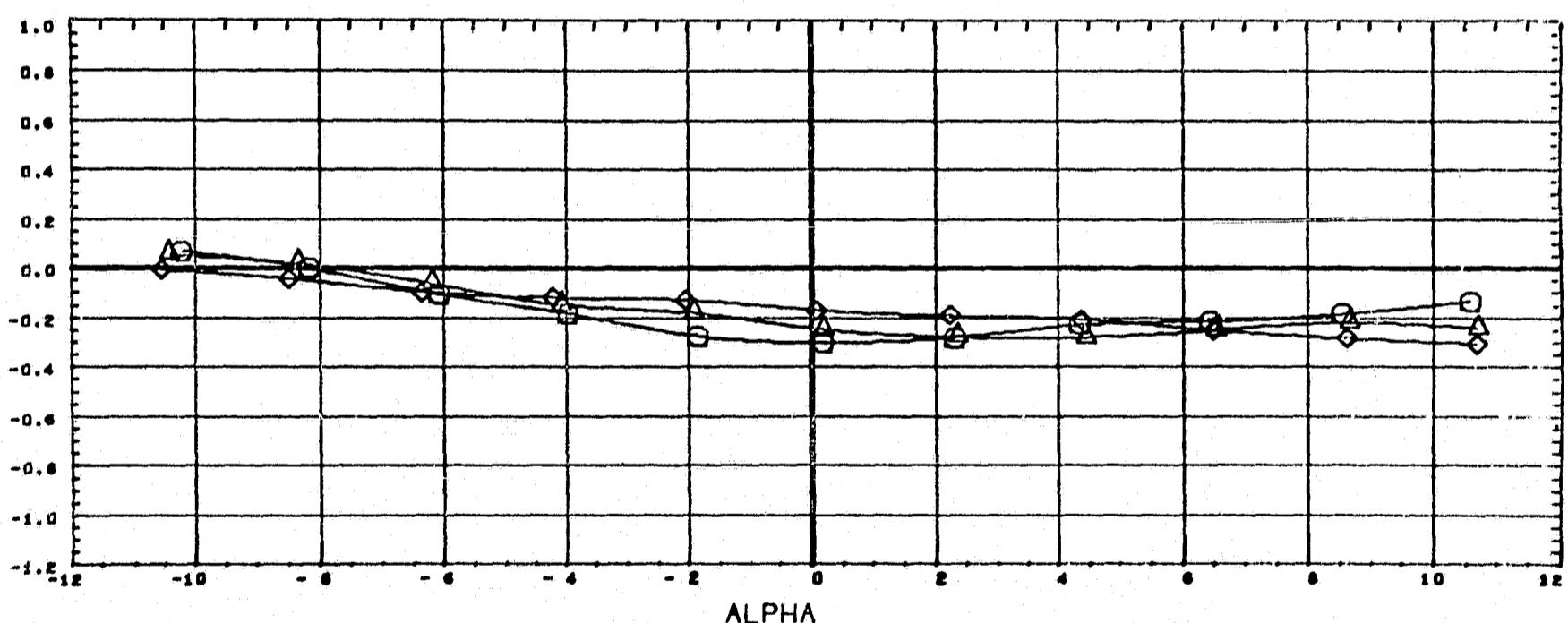
PAGE

34

LONGITUDINAL STABILITY



DCLMCN



SYMBOL MACH PARAMETRIC VALUES
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△ 1.103
 ♦ 1.460

DATA MIST. CODE CCR

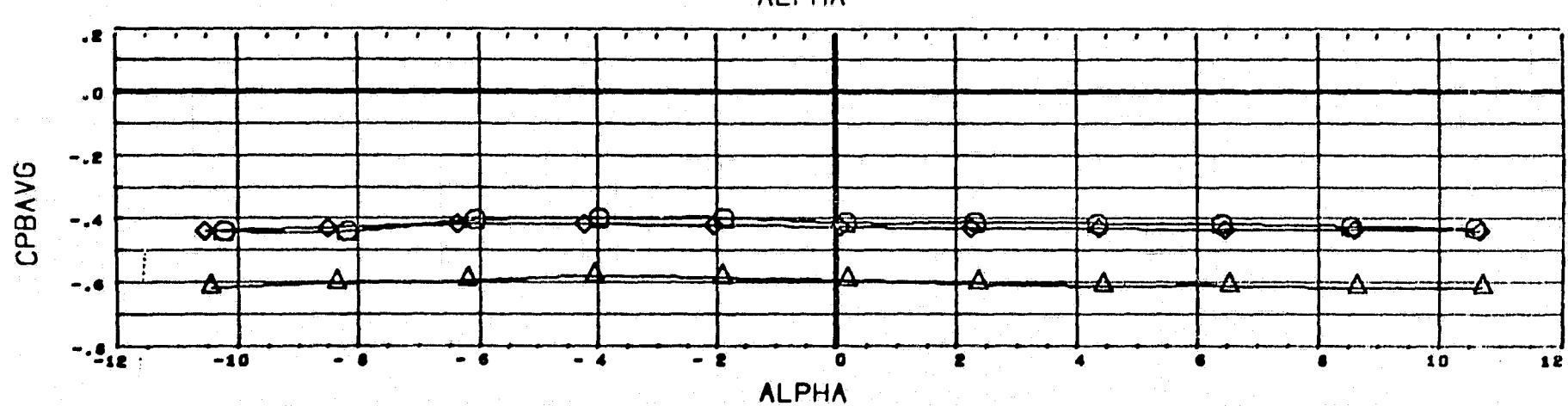
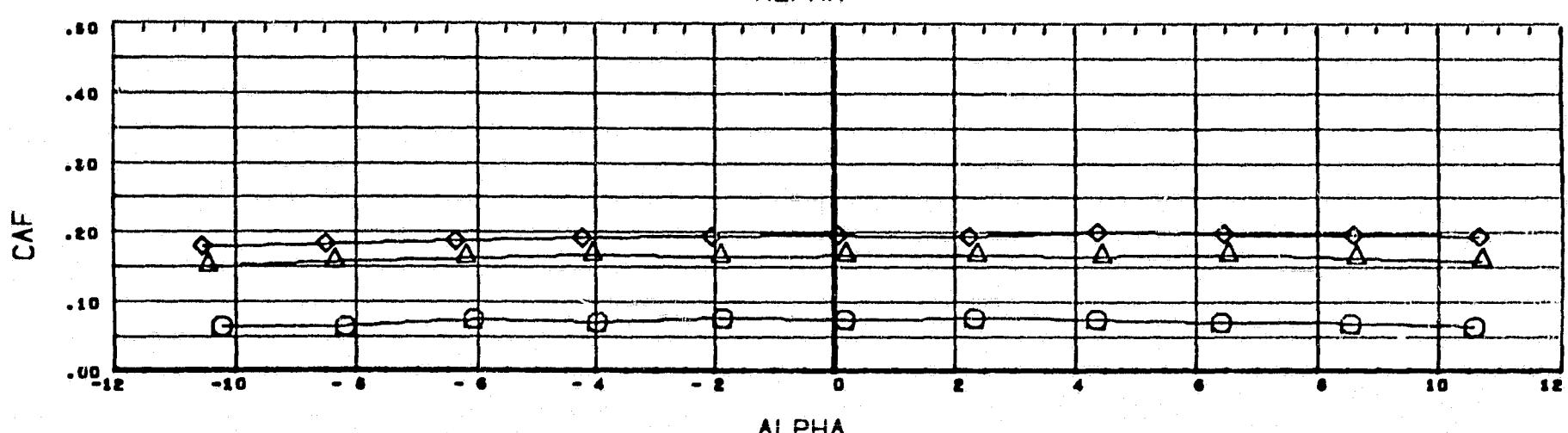
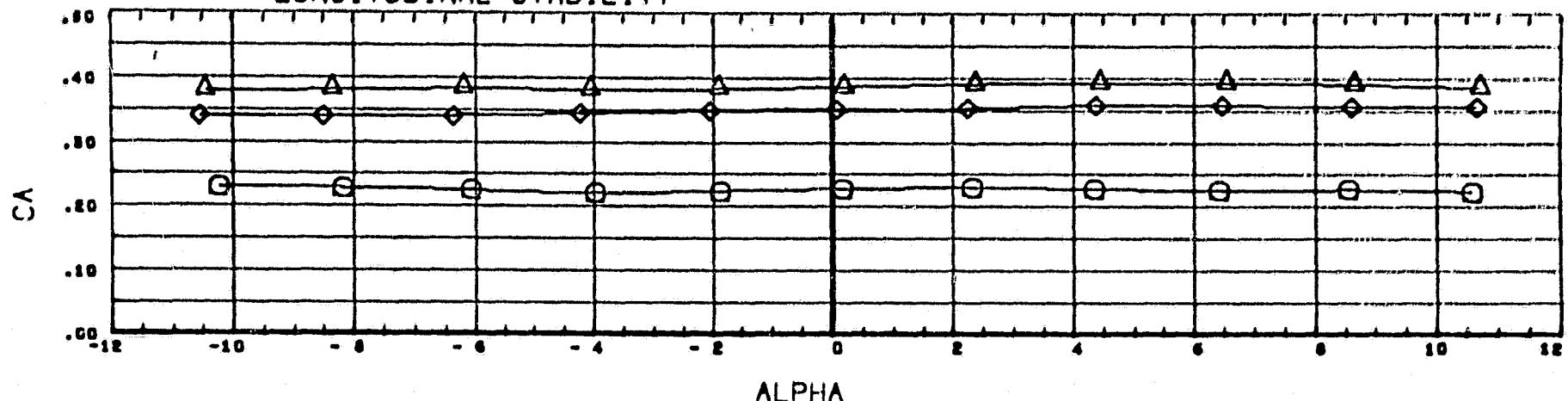
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B601-2V5

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

(D5712A) 10 FEB 72 PAGE 35

LONGITUDINAL STABILITY



SYMBOL	MACH	BETA	PARAMETRIC VALUES
	0.800		0.000 ORBINC - 2.000
	1.103		
	1.460		

REFERENCE INFORMATION		
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LREF	4.4260	IN.
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XHMR	4.3530	IN.
YHMR	0.0000	IN.
ZHMR	0.0000	IN.
SCALE	0.0034	

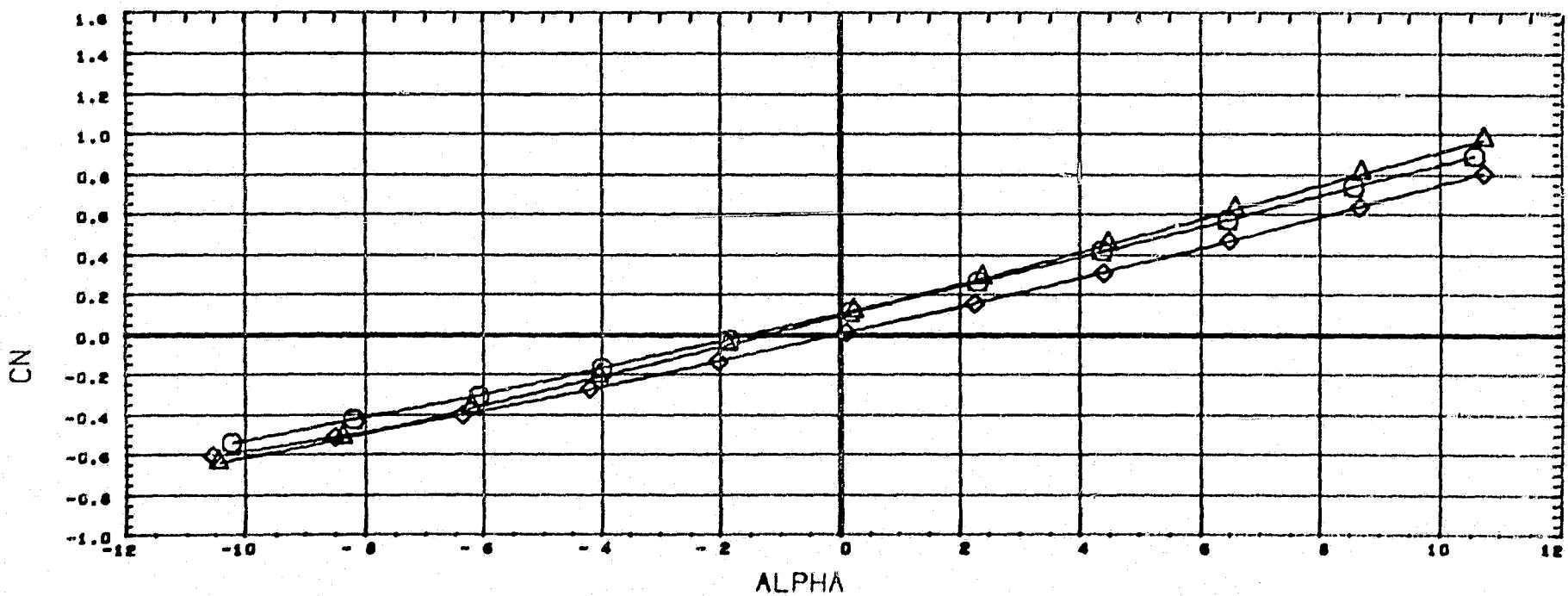
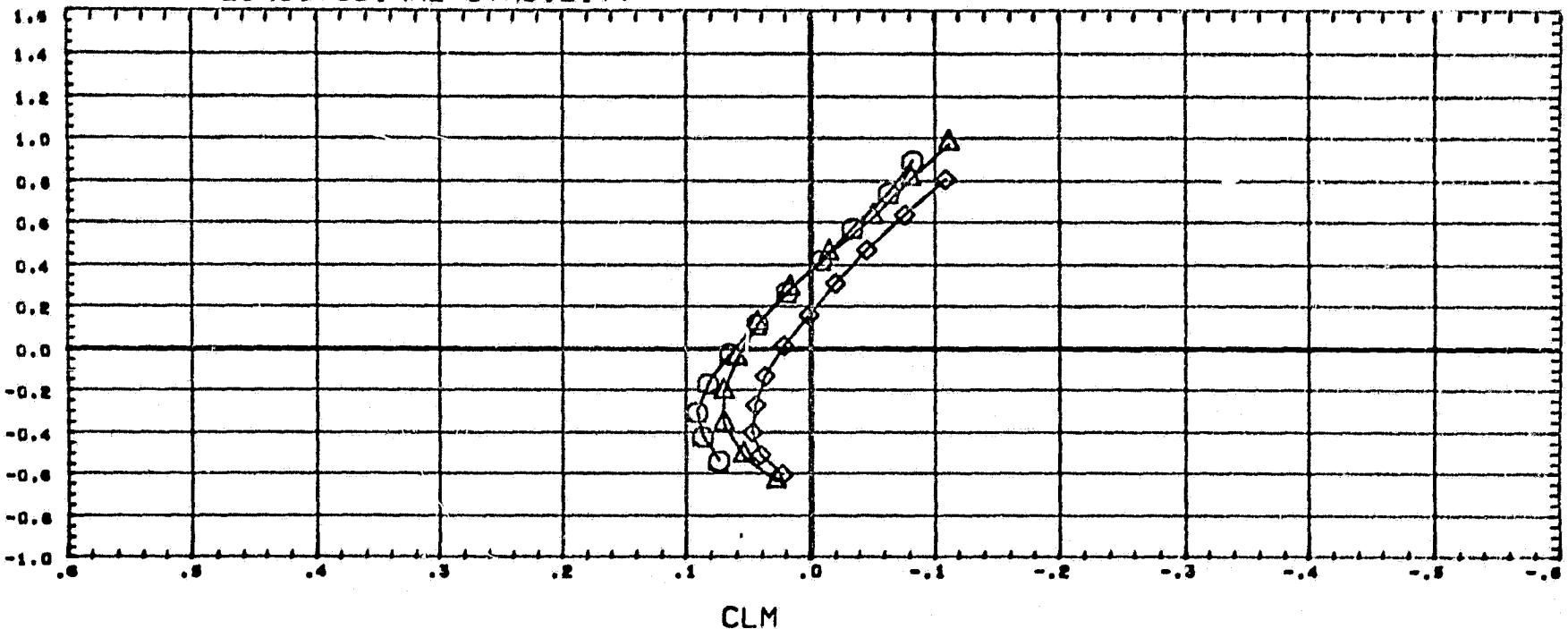
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DSG1-2MF

605212A1 18 FEB 73 PAGE

26

LONGITUDINAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
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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	0.0033	

M622 MSEC MODEL AX12331-1

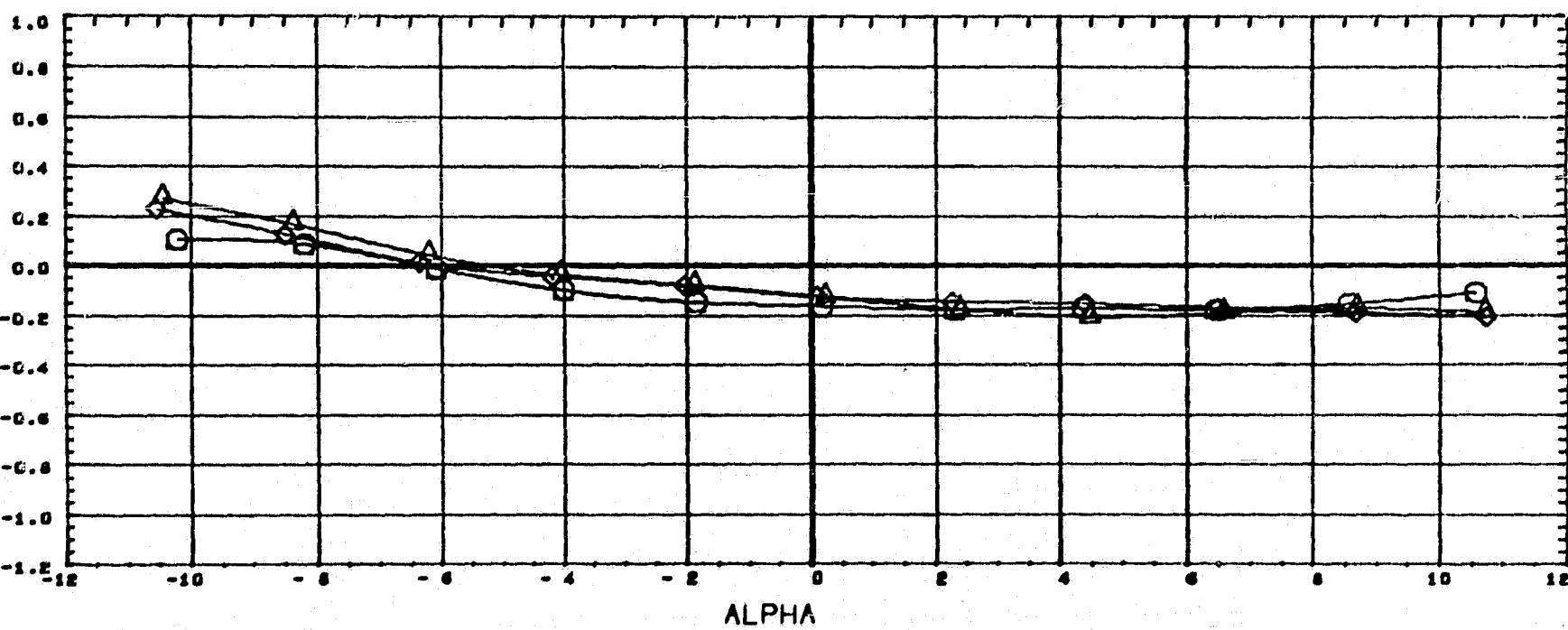
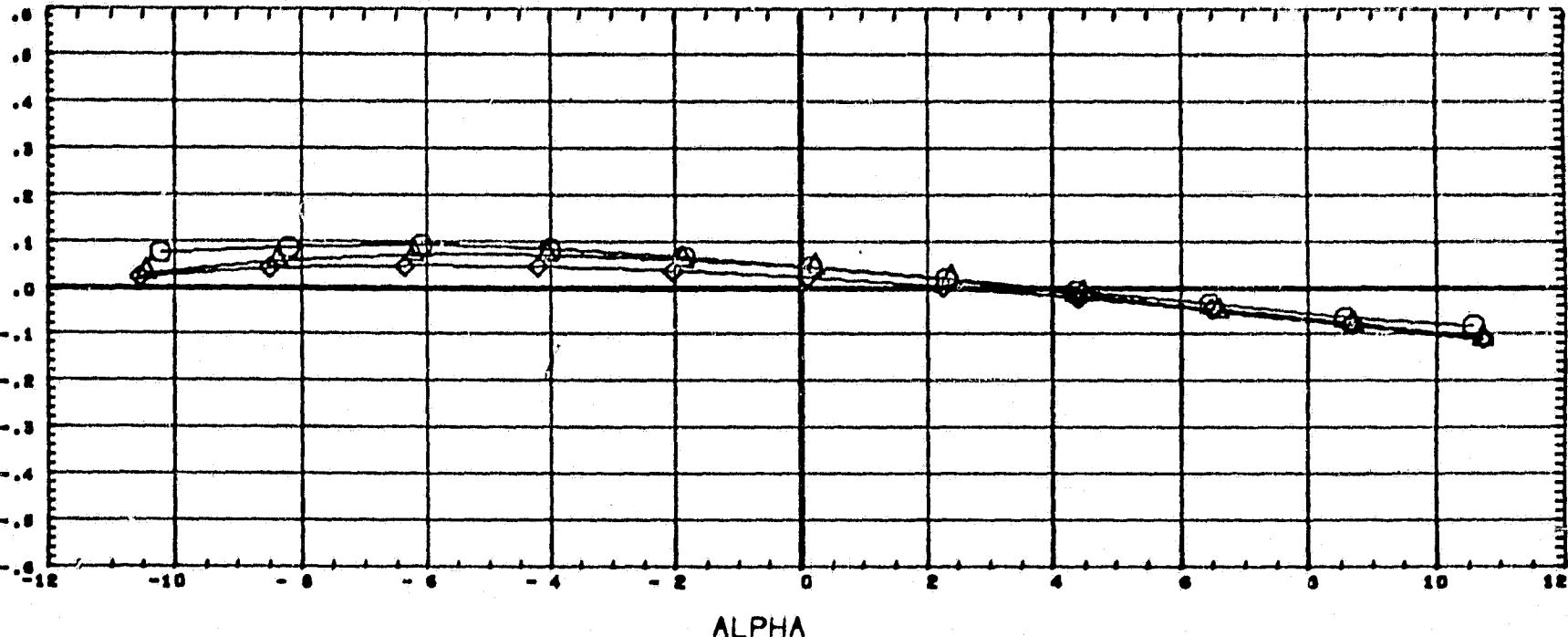
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(05711A) 10 FEB 72

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27

LONGITUDINAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
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	1.099	
	1.460	

ALPHA

REFERENCE INFORMATION		
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EF	4.4260	in.
EF	2.9690	in.
RP	4.3530	in.
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PATA MIST. CODE CG

M523-MSFC MODEL A X1233 I-1

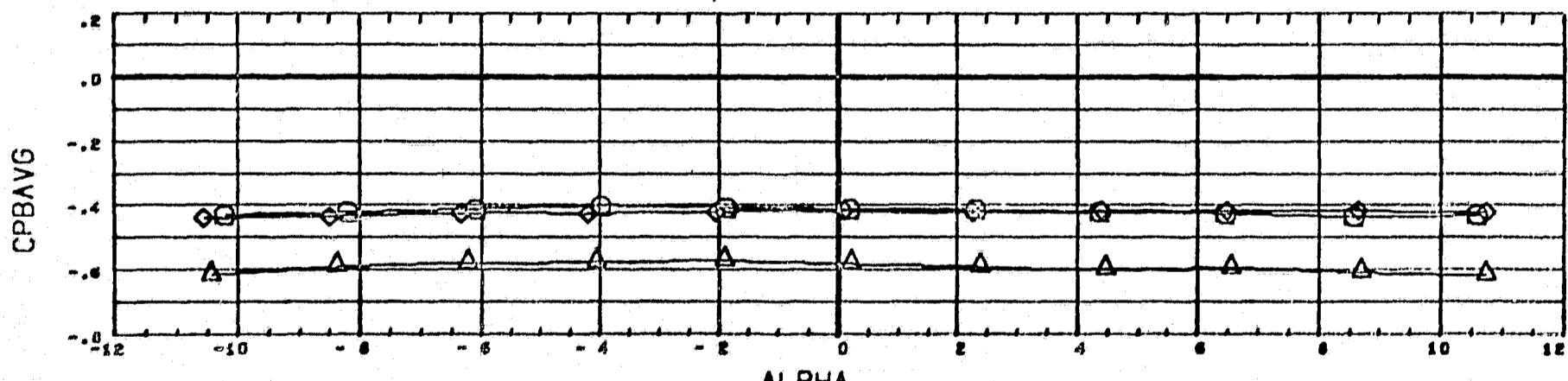
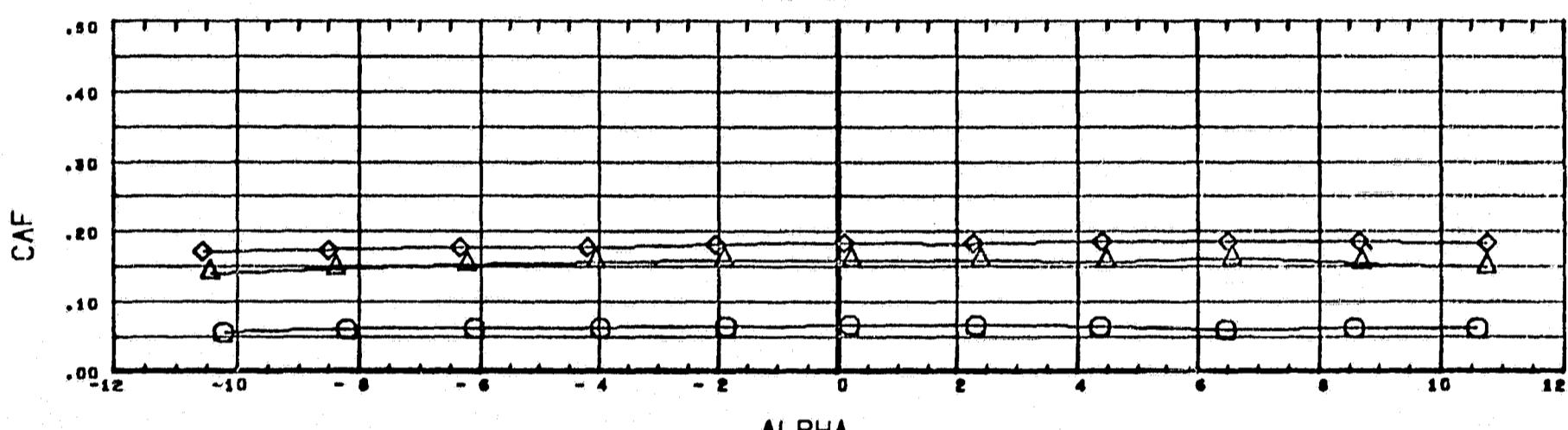
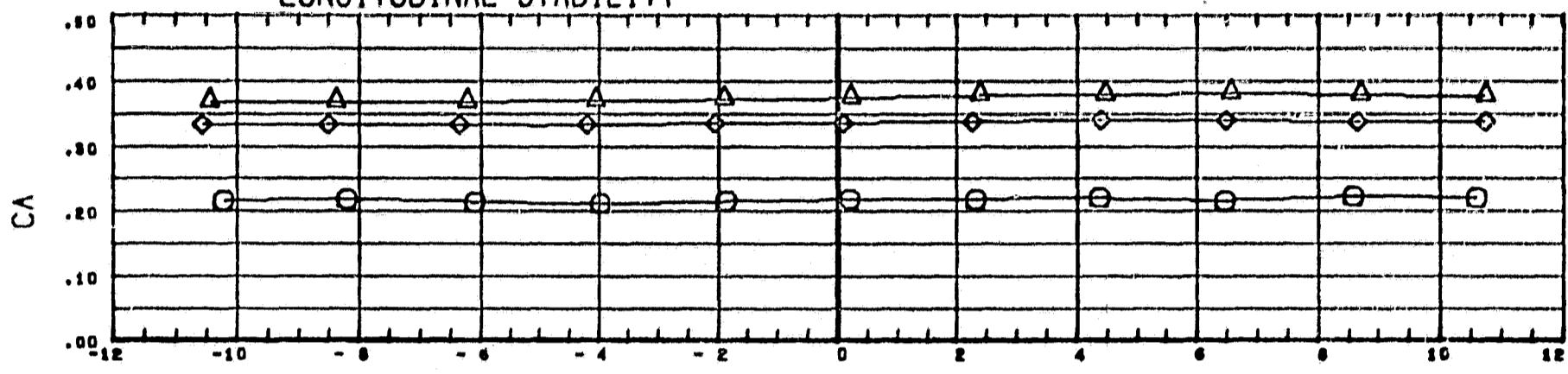
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(D5711A) 10 FEB 72

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LONGITUDINAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
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	1.099	
	1.450	

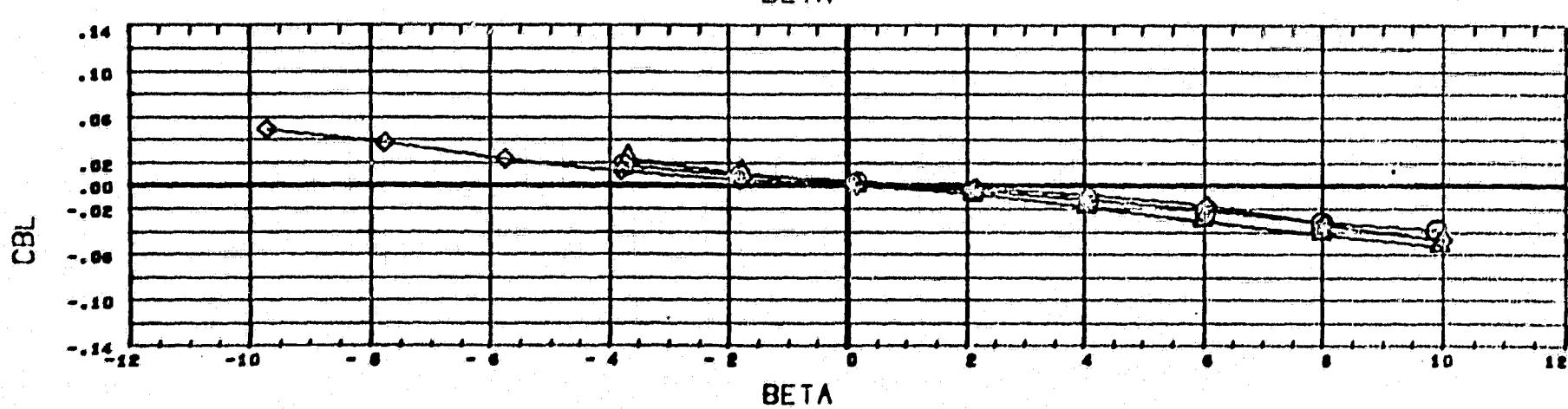
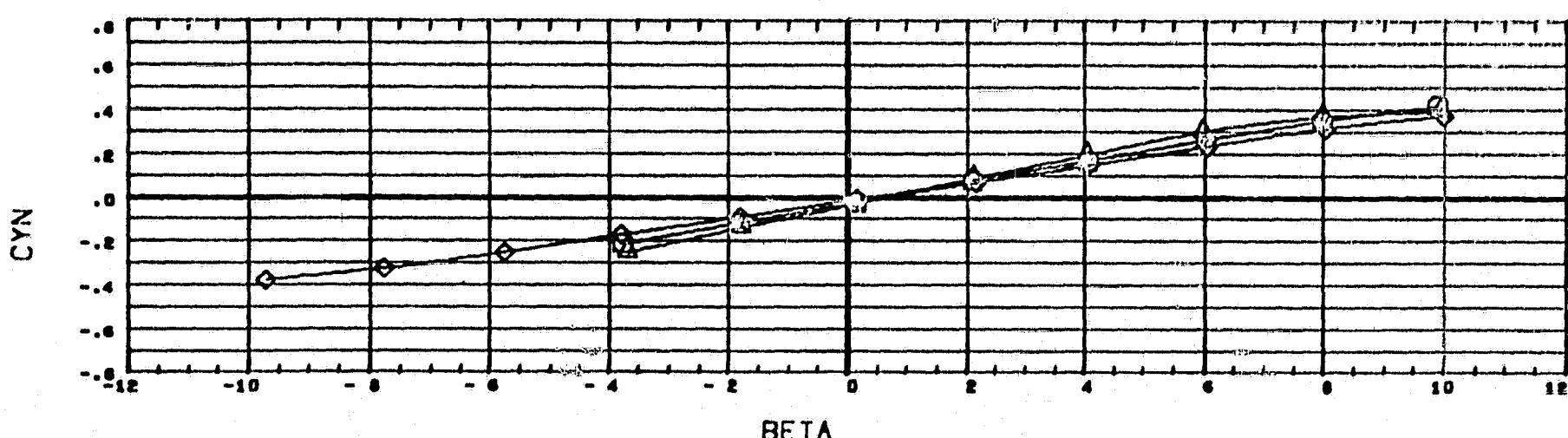
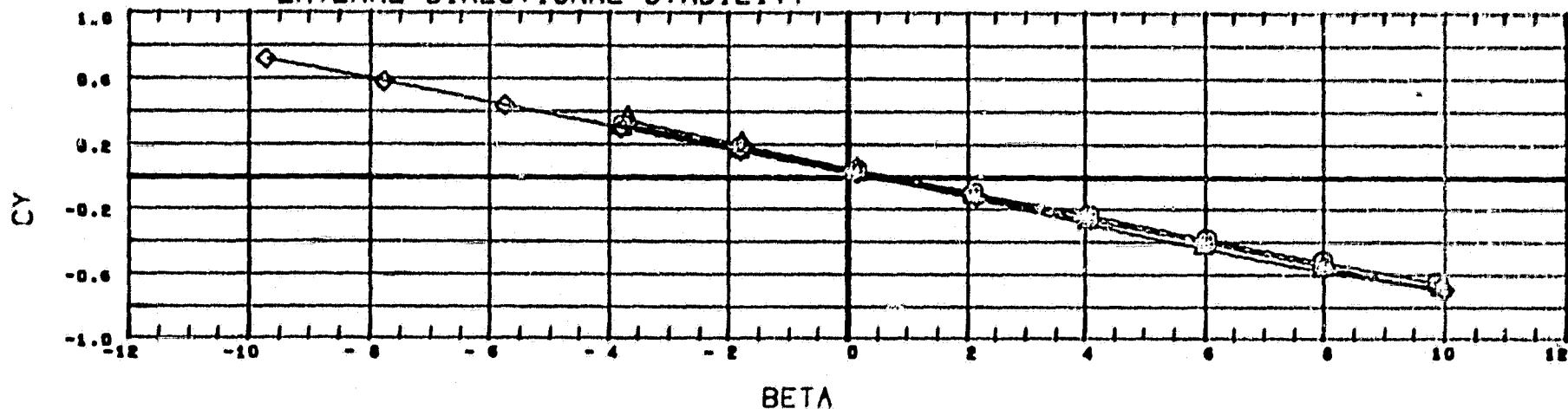
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ZMRP	0.0000	IN.
SCALE	0.0033	

DATA HIST. CODE CCR

5.503

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
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	1.463	

BATA WEST. CODE 68

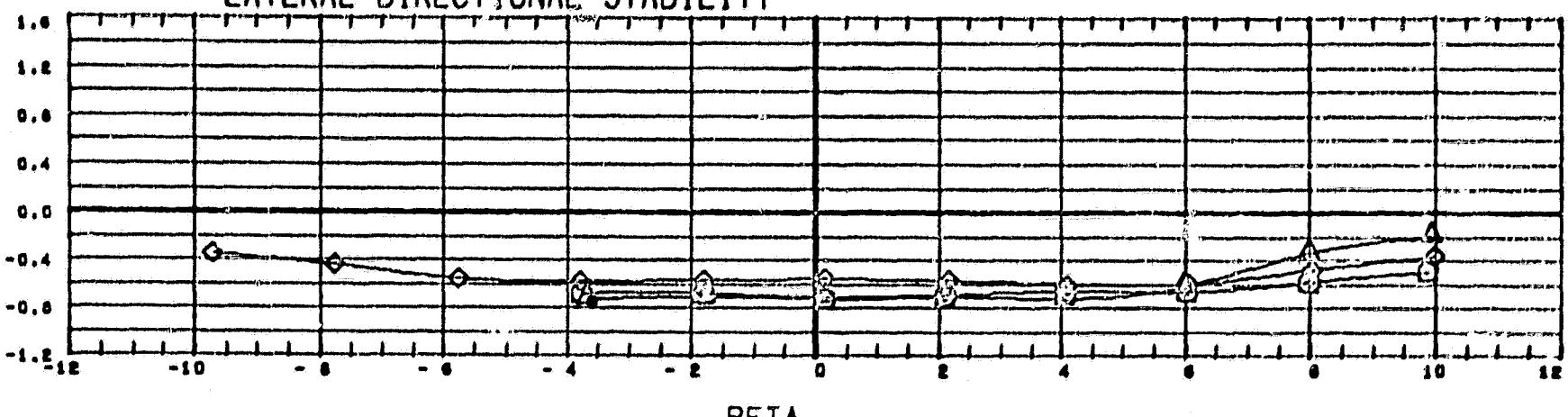
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B501-2V6

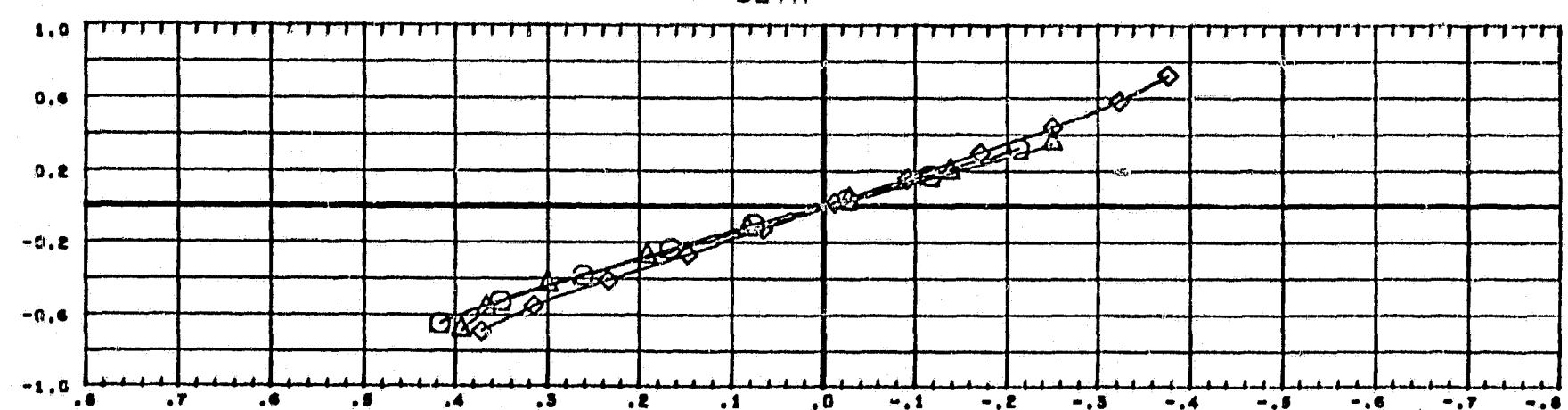
(D5705C) 10 FEB 72

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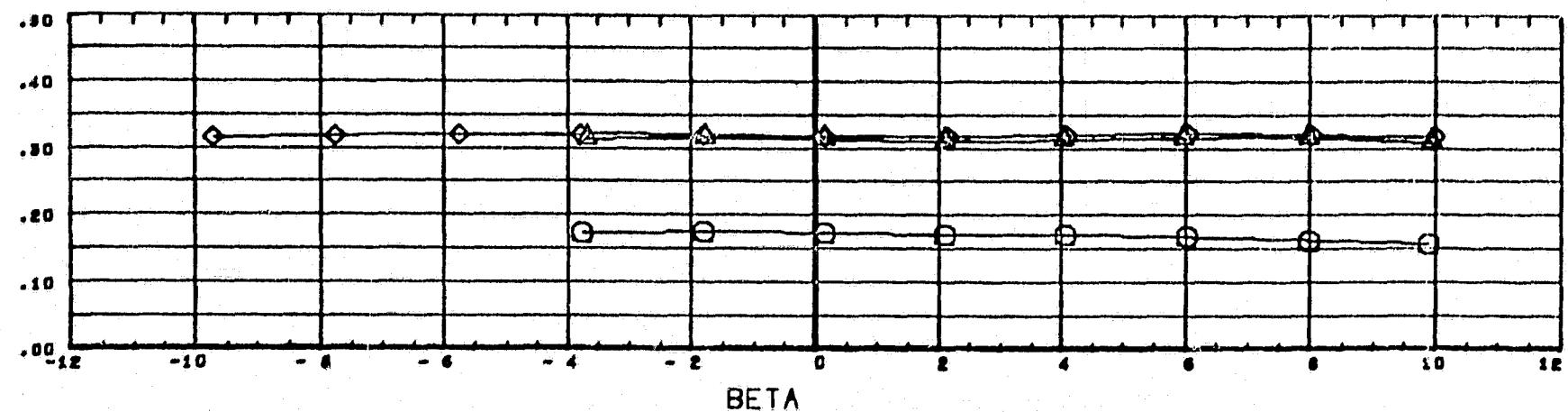
LATERAL-DIRECTIONAL STABILITY



BETA



CYN



BETA

SYMBOL MACH PARAMETRIC VALUES
 0.699 ALPHA 0.000 ORBINC - 2.000
 1.104
 1.463

DATA HIST. CODE GR

REFERENCE INFORMATION
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 SCALE 0.0034

M523-MSFC MODEL ALEX1233I-1

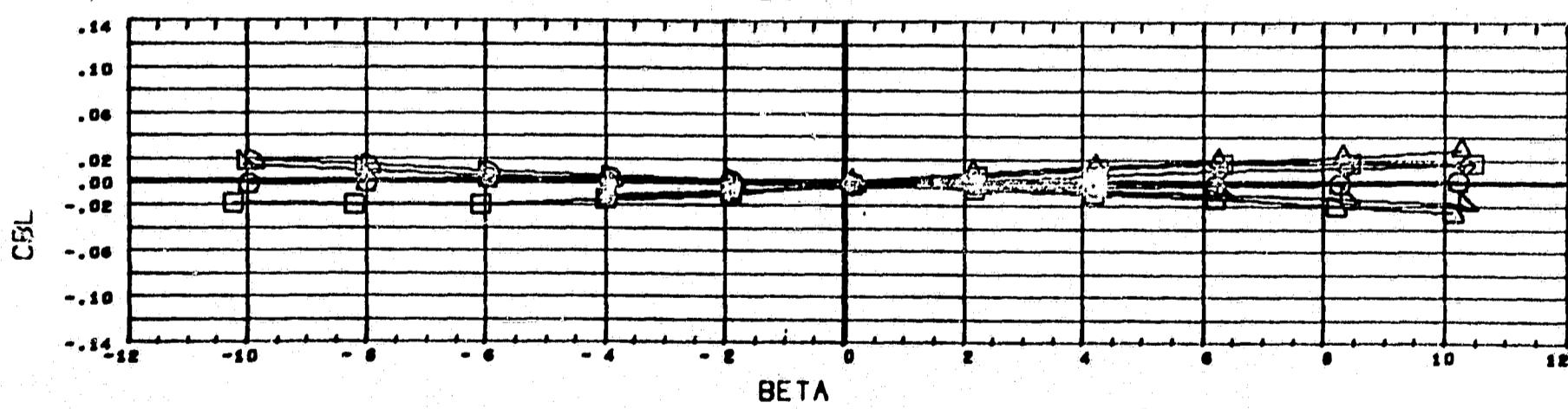
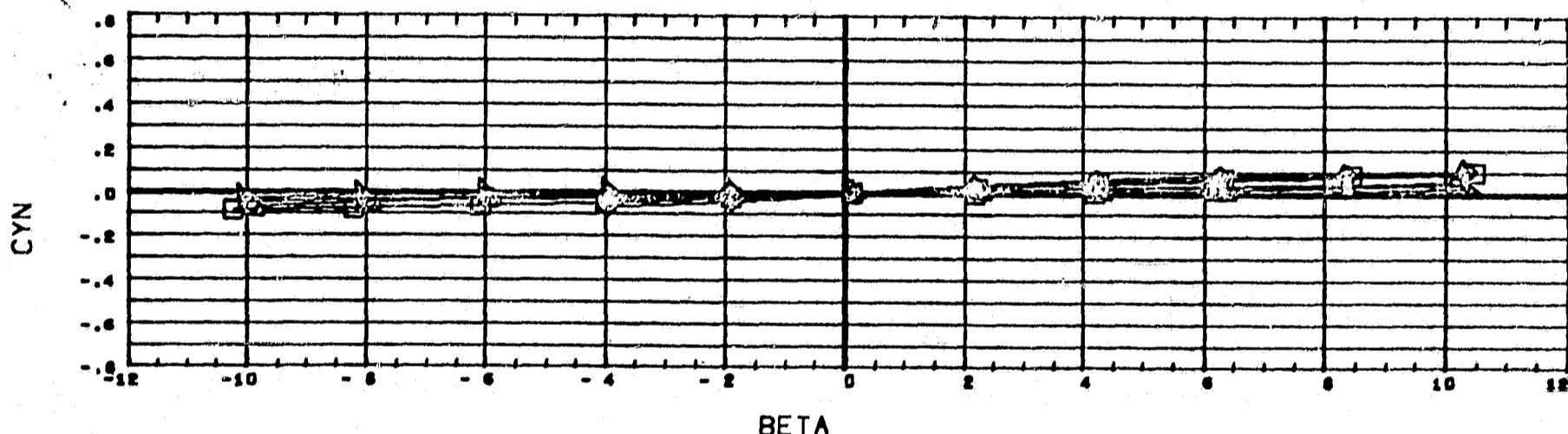
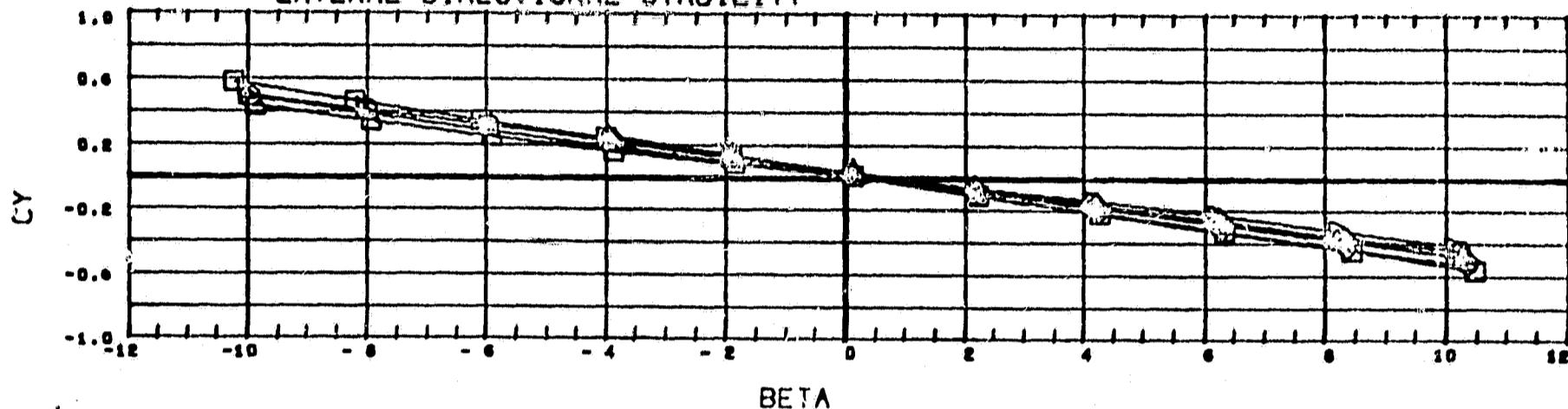
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(D5705C) 10 FEB 72

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41

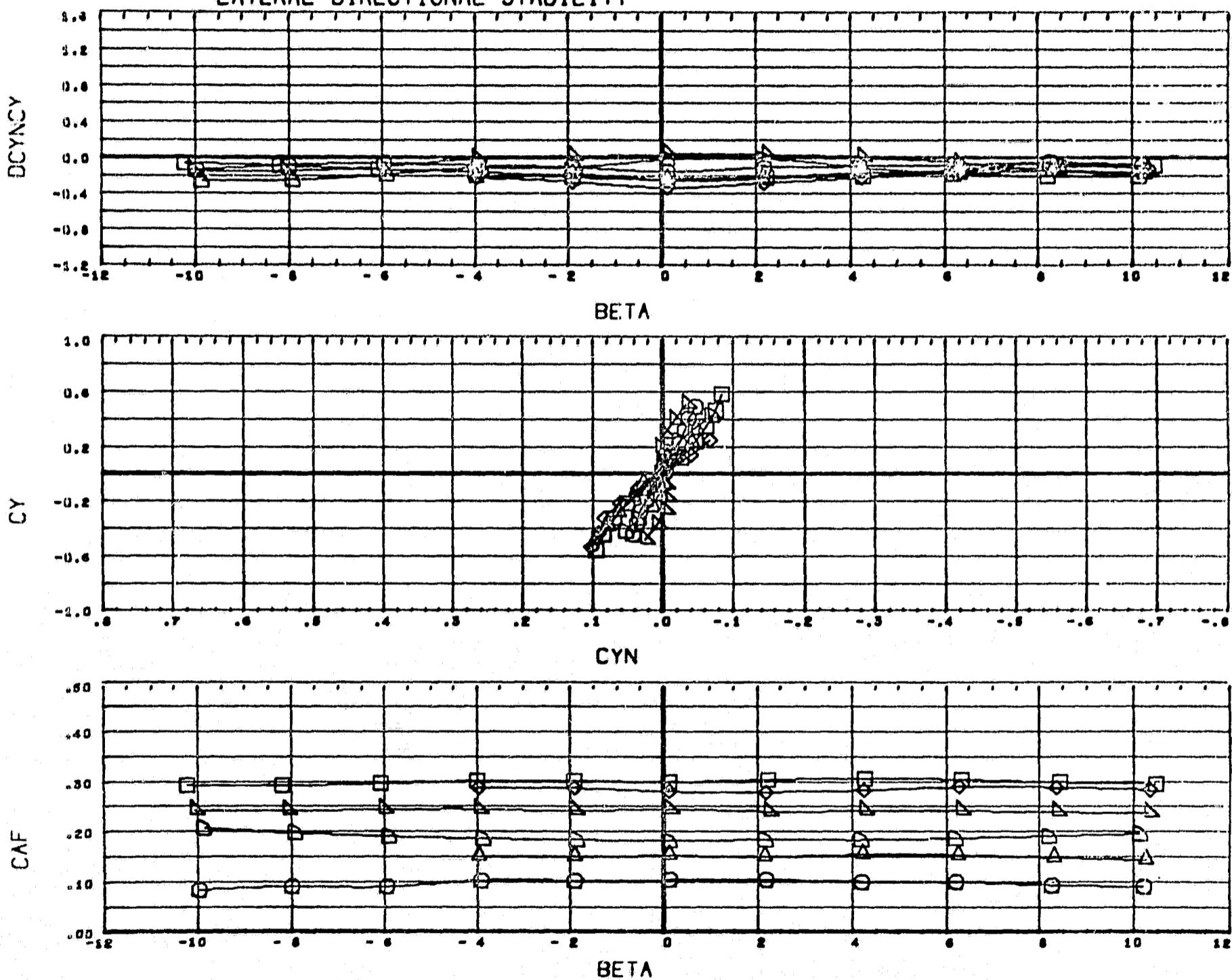
LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
 O 0.889 ALPHA 0.000 ORBINC = 2.000
 △ 0.903
 □ 1.097
 ▲ 1.459
 ▽ 2.740
 ▨ 4.889 DATA HIST. CODE GR

REFERENCE INFORMATION
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 LREF 4.4260 IN.
 BREF 2.9690 IN.
 XHREF 5.7530 IN.
 YHREF 0.0000 IN.
 ZHREF 0.0000 IN.
 SCALE 0.0034

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES		REFERENCE INFORMATION
		ALPHA	ORBINC	
△	0.599	0.000	ORBINC - 2.000	SREF 5.1478 SQ. IN.
◇	0.903			LREF 4.4260 IN.
□	1.097			BREF 2.9690 IN.
□	1.459			XHRP 5.7530 IN.
□	2.740			YHRP 0.0000 IN.
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				SCALE 0.0034 IN.

M523-MSFC MODEL ALEX1233I-1

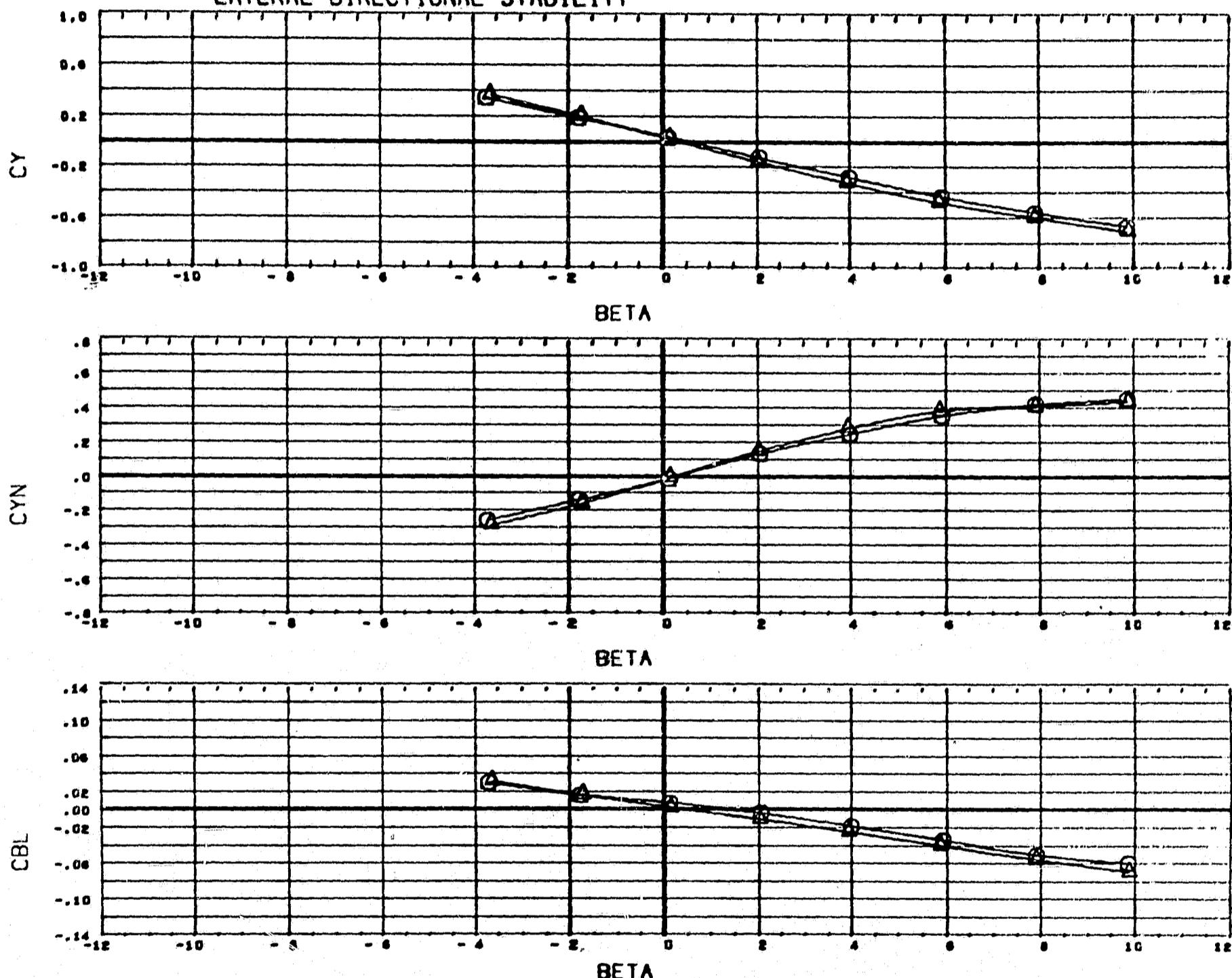
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(D5707C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
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 1.102

DATA MIST. CODE GR

M523-MSFC MODELAX1233I-1

B501-2V6.1

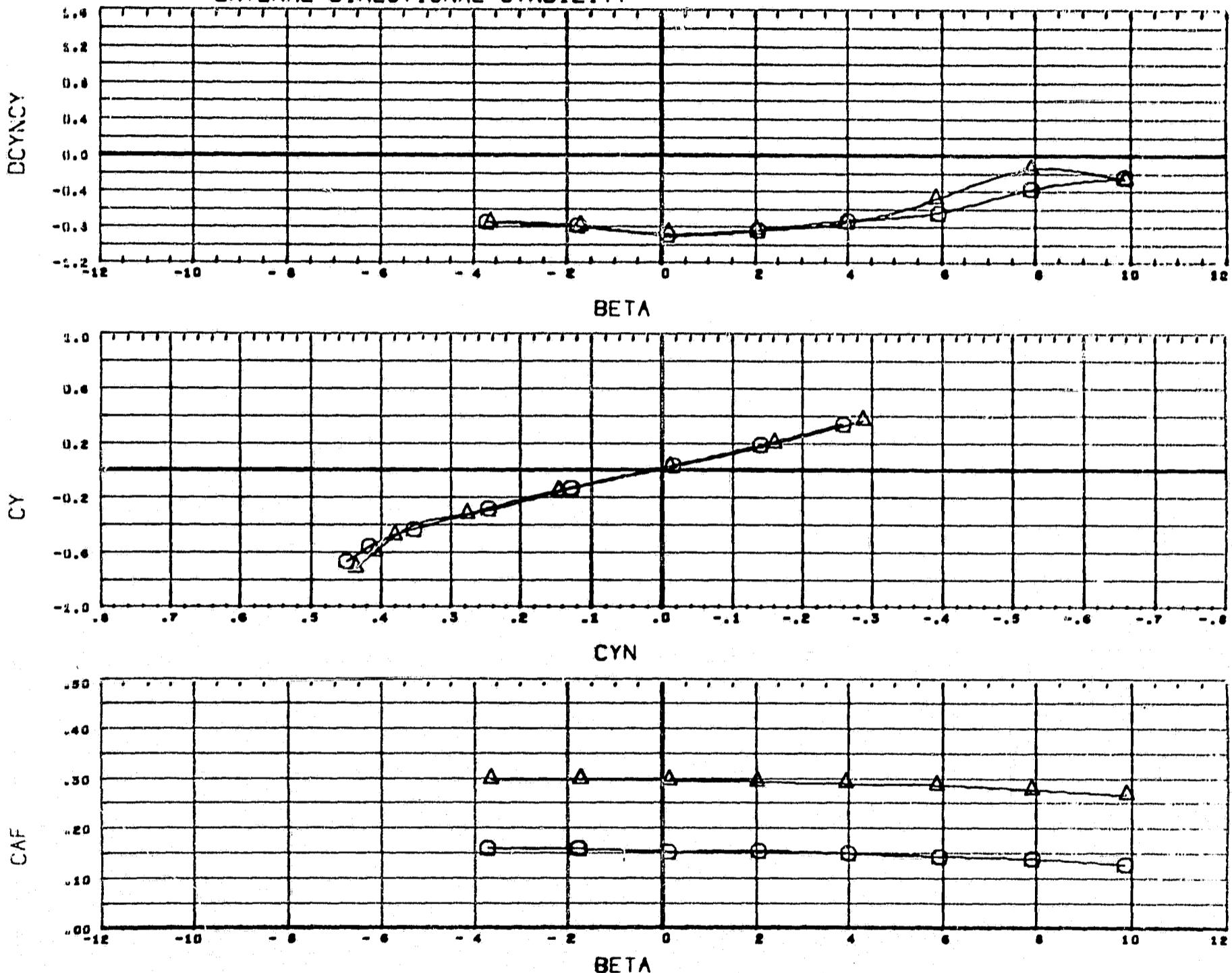
(D5706B) 10 FEB 72

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44

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BREF	2.9690
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YMRP	0.0000
ZMRP	0.0000
SCALE	0.0034

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES	REFERENCE INFORMATION
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			BREF 2.9690 IN.
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			YMRP 0.0000 IN.
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			SCALE 0.0034

DATA MIST. CODE GR

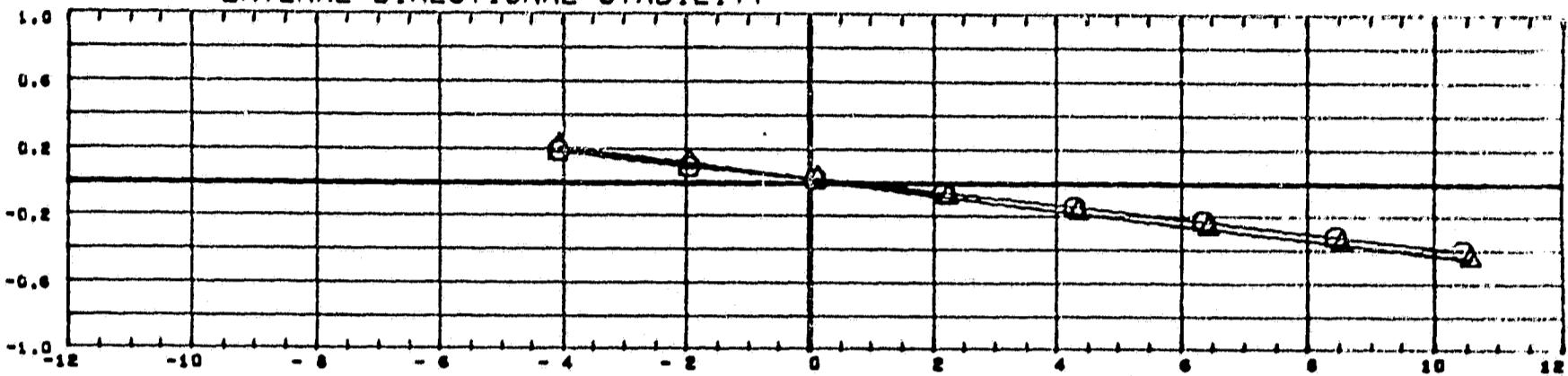
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B501-2V6.1

(D5706B) 10 FEB 72

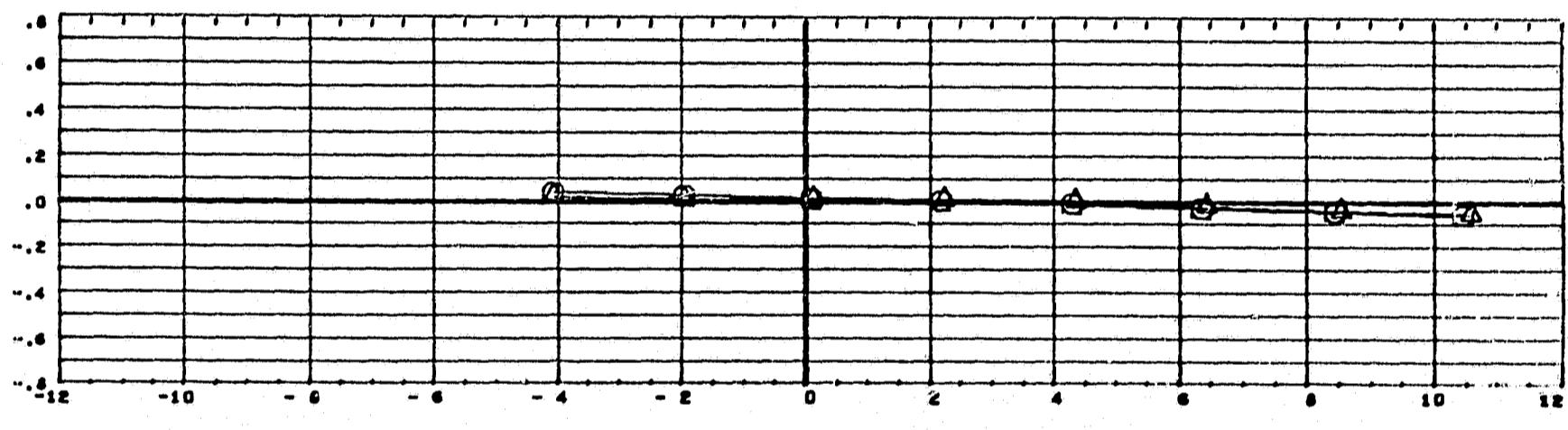
PAGE 45

LATERAL-DIRECTIONAL STABILITY



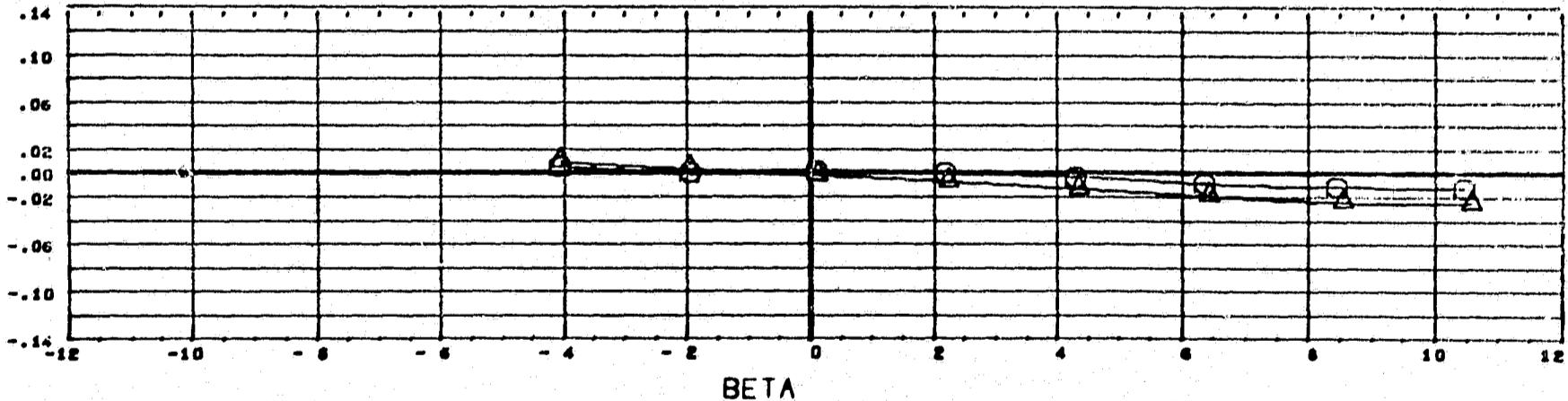
BETA

CYN



BETA

CBL



BETA

SYMBOL MACH . PARAMETRIC VALUES
 Δ 0.903 ALPHA 0.000 ORBINC - 2.000
 \square 1.102

REFERENCE INFORMATION
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 SCALE 0.0034

DATA MIST. CODE GR

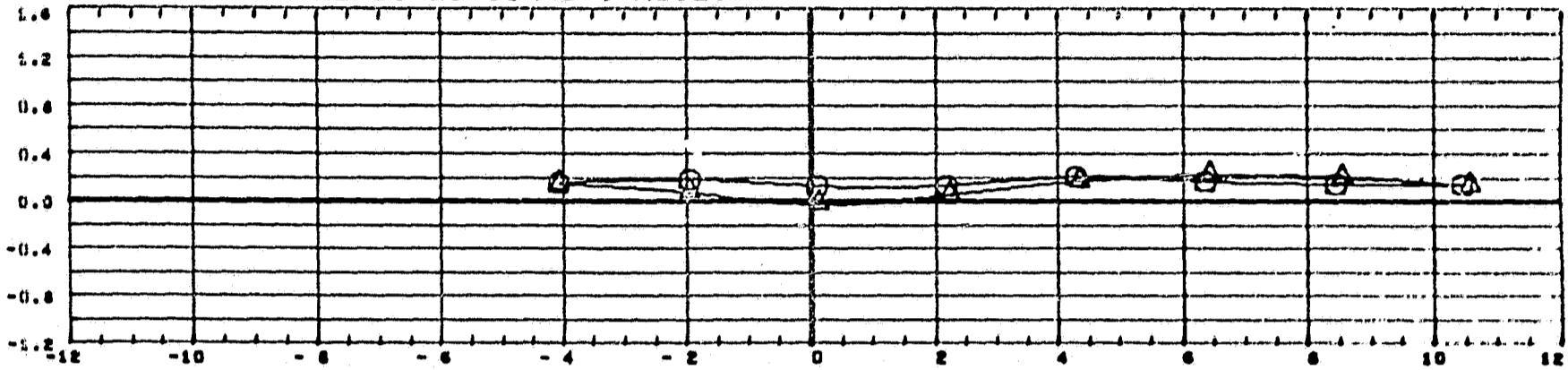
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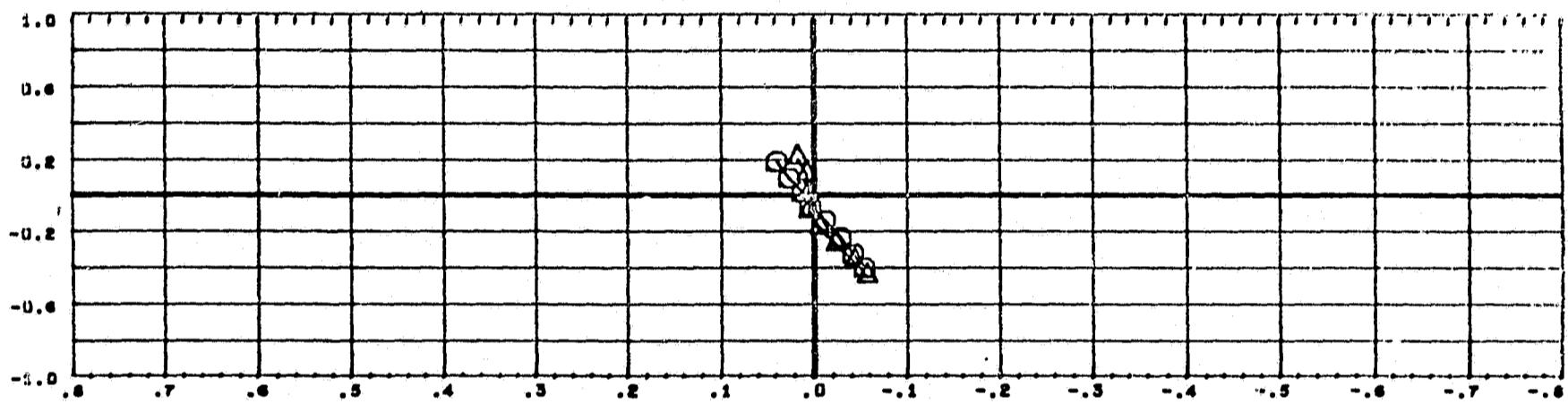
(D5708B) 10 FEB 72

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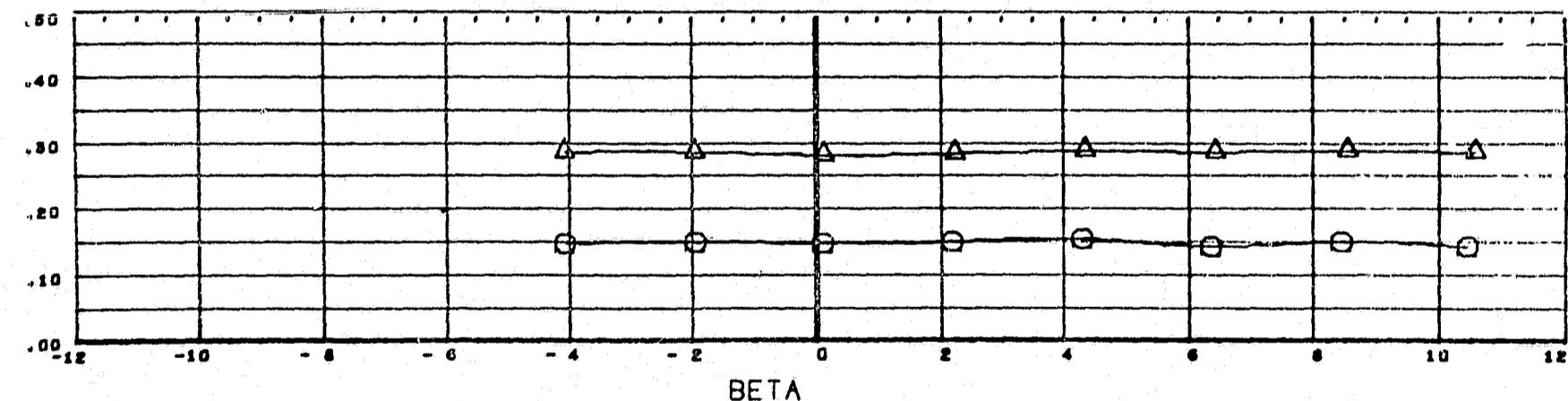
LATERAL-DIRECTIONAL STABILITY



BETA



CYN



BETA

SYMBOL MACH PARAMETRIC VALUES
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 Δ 1.102

DATA HIST. CODE GR

REFERENCE INFORMATION
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 BREF 2.9690 IN.
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 SCALE 0.0034 IN.

M523-MSFC MODEL ALEX1233I-1

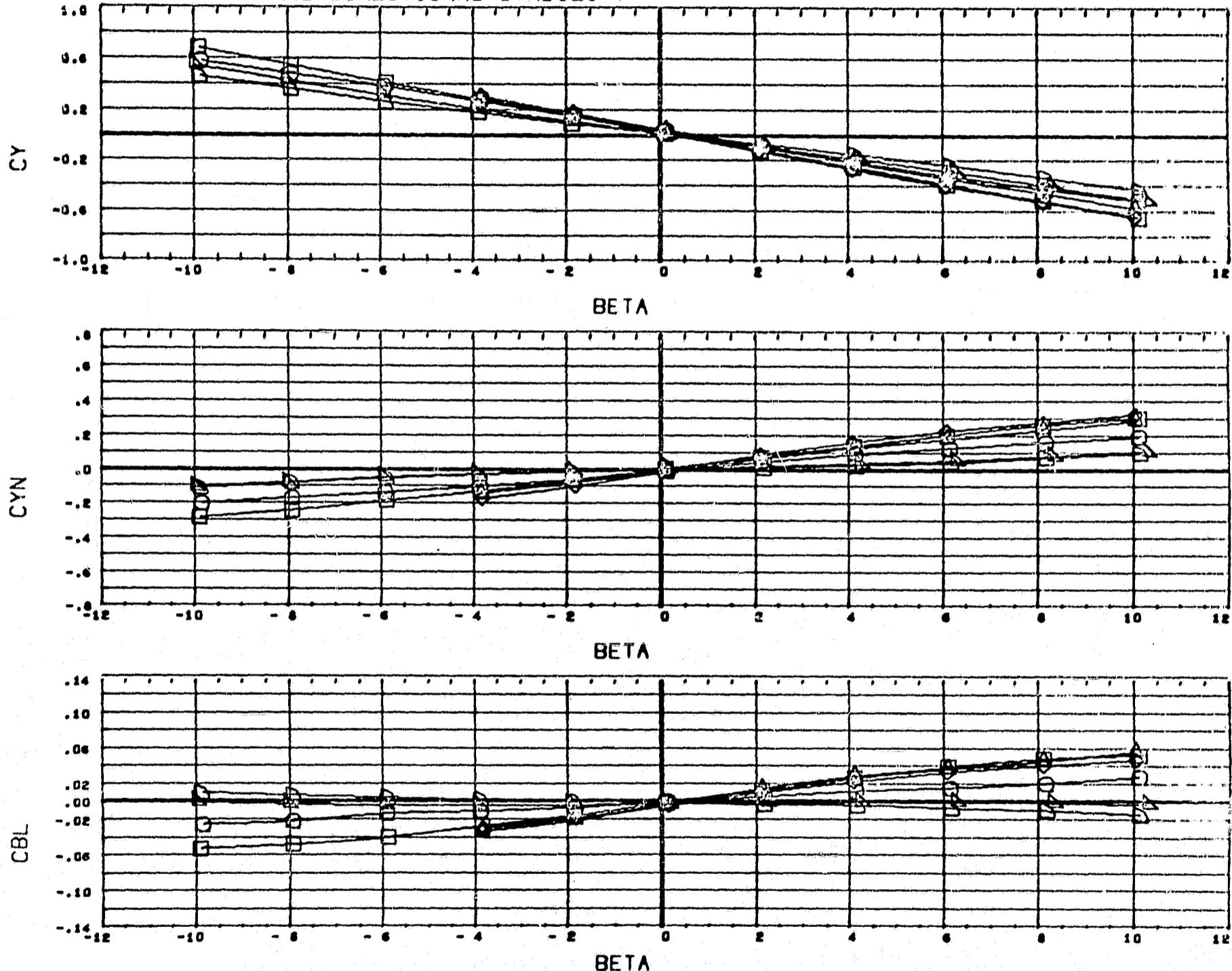
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(D5708B) 10 FEB 72

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47

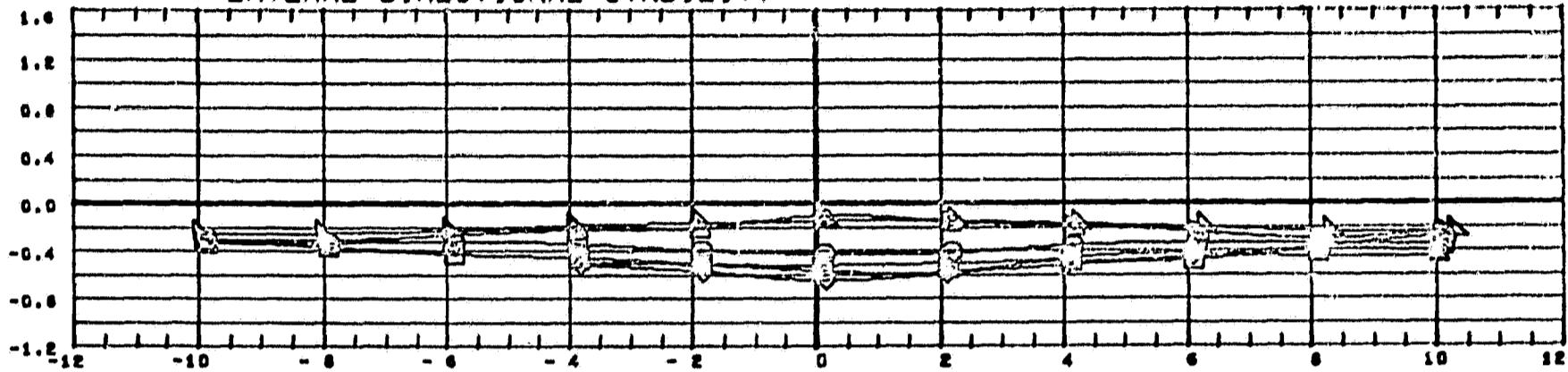
LATERAL-DIRECTIONAL STABILITY



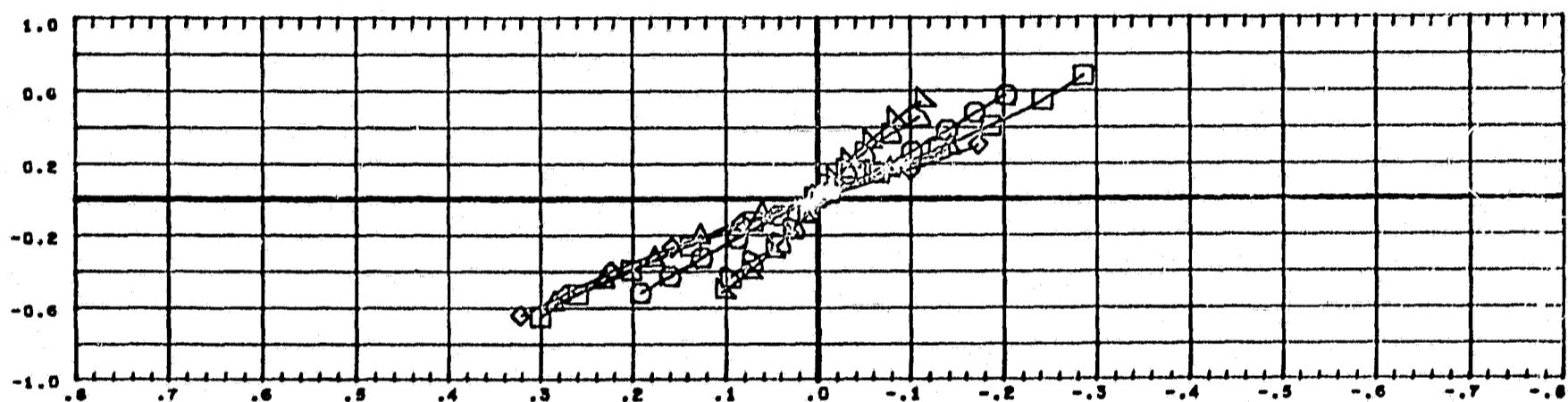
SYMBOL **MACH** **PARAMETRIC VALUES**
○ 0.598 ALPHA 0.000 ORBINC - 2.000
◊ 0.900
□ 1.103
△ 1.461
▽ 2.740
□ 4.959 DATA HIST. CODE GR

REFERENCE INFORMATION
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 YHRP 0.0000 IN.
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 SCALE 0.0034

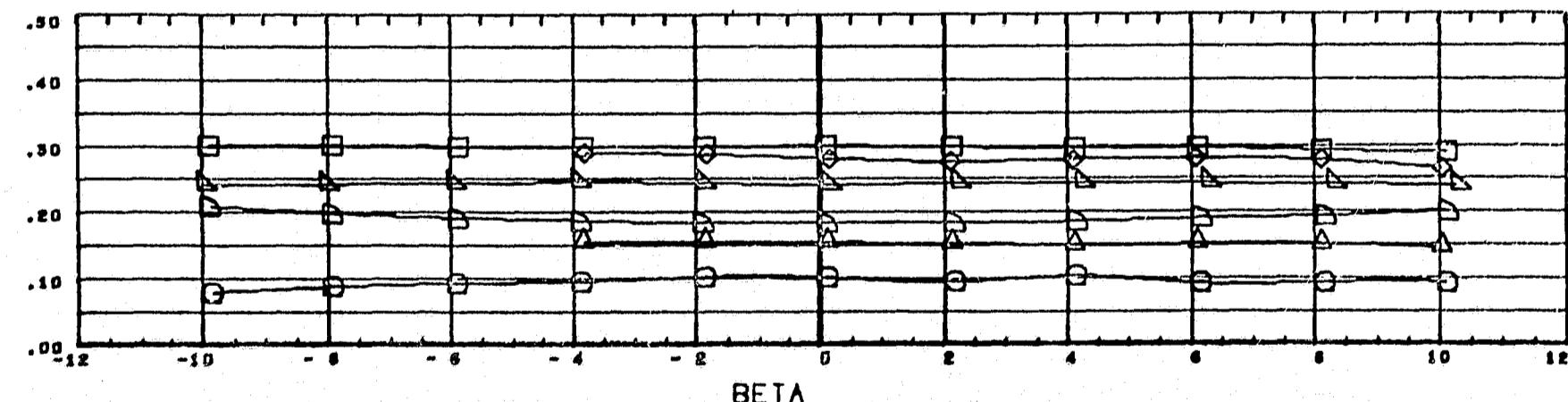
LATERAL-DIRECTIONAL STABILITY



BETA



CYN

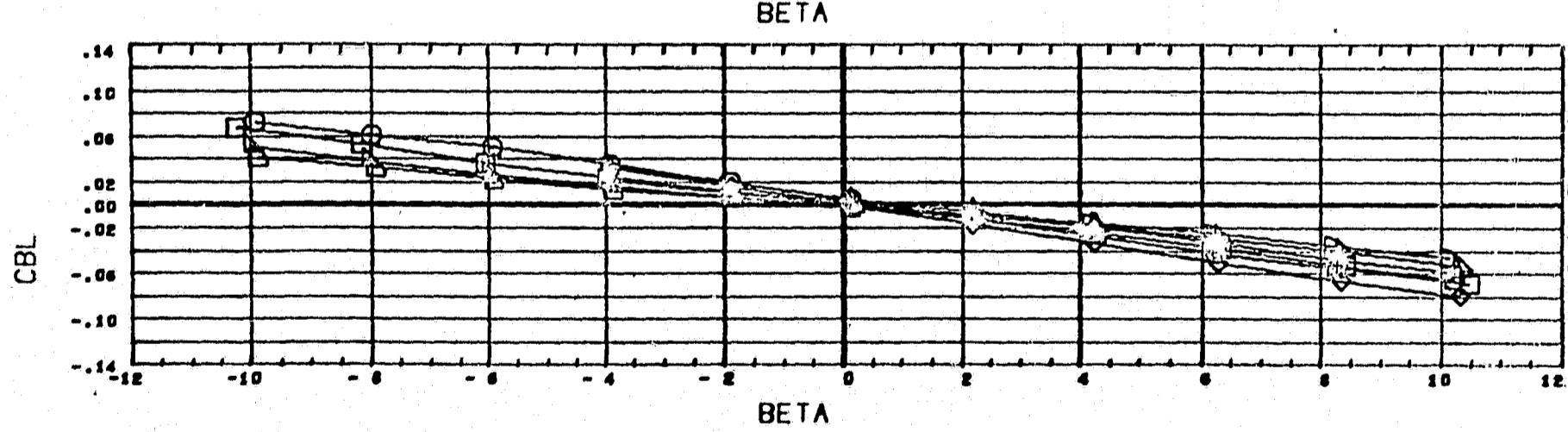
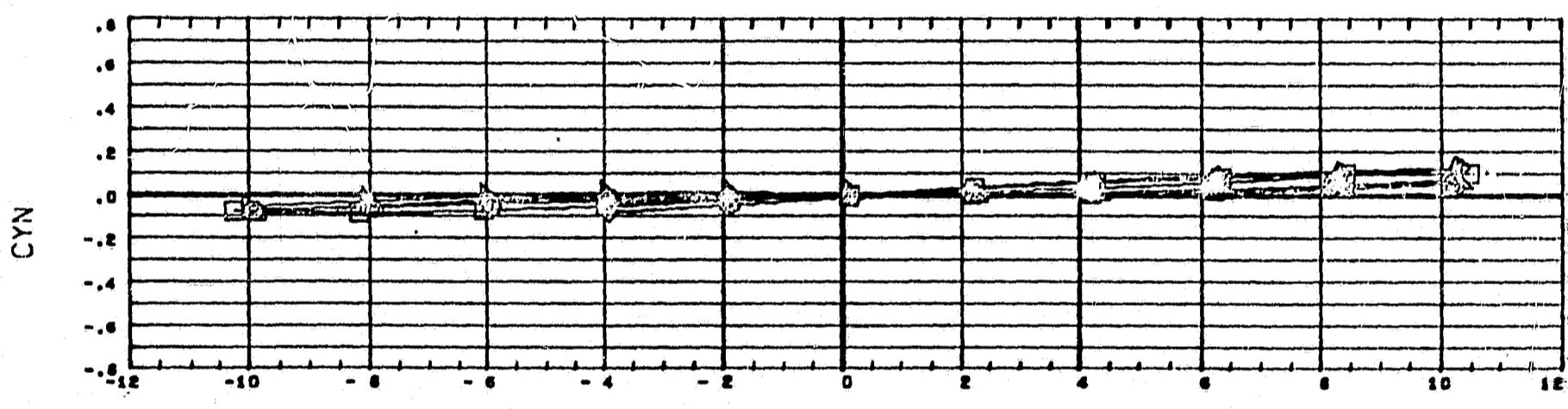
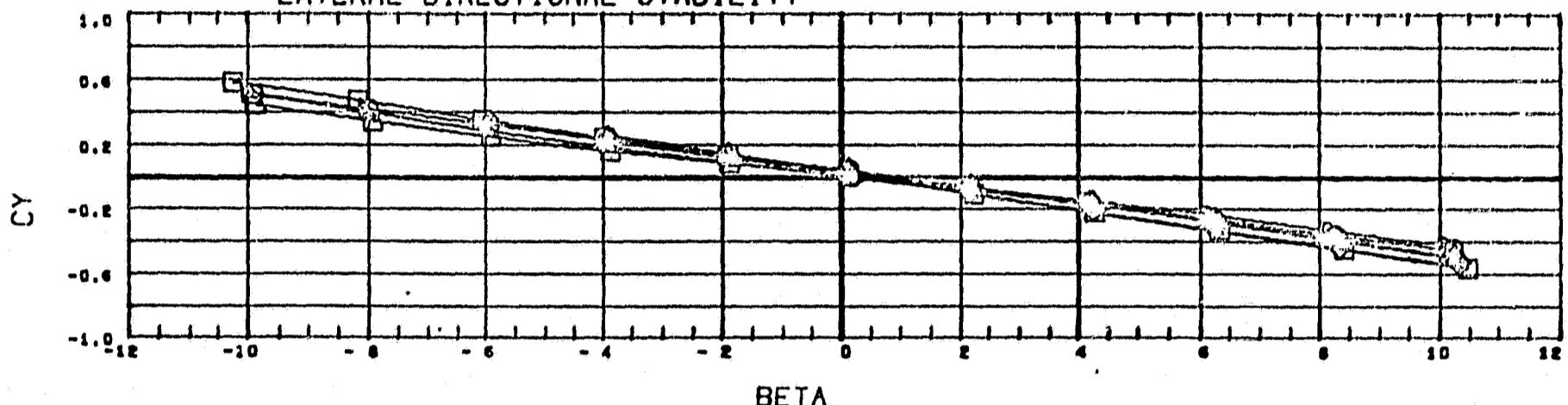


BETA

SYMBOL MACH PARAMETRIC VALUES
 0.598 ALPHA 0.000 ORBINC - 2.000
 0.900
 1.103
 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.
 XHREF 5.7630 IN.
 YHREF 0.0000 IN.
 ZHREF 0.0000 IN.
 SCALE 0.0034

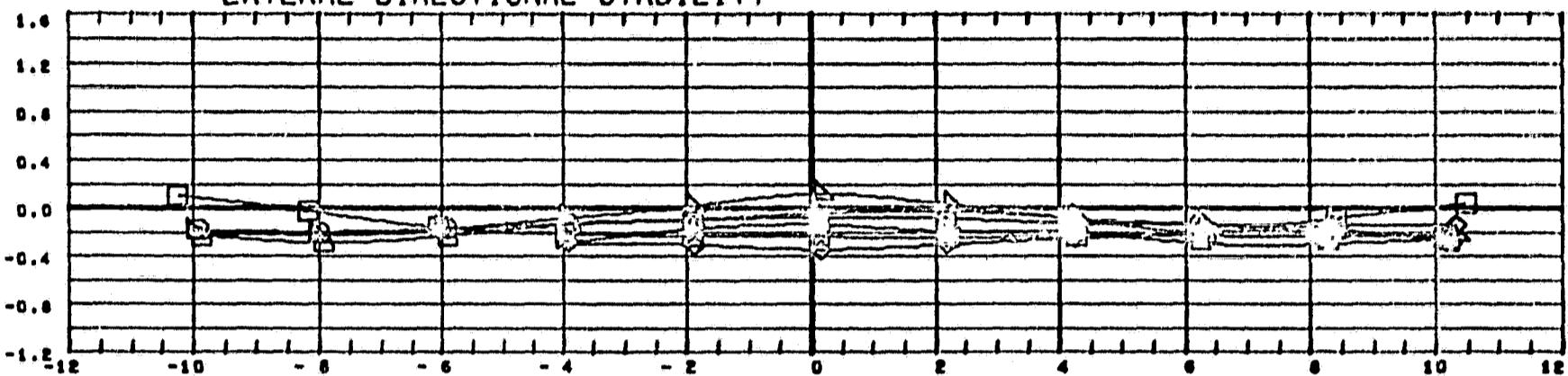
LATERAL-DIRECTIONAL STABILITY



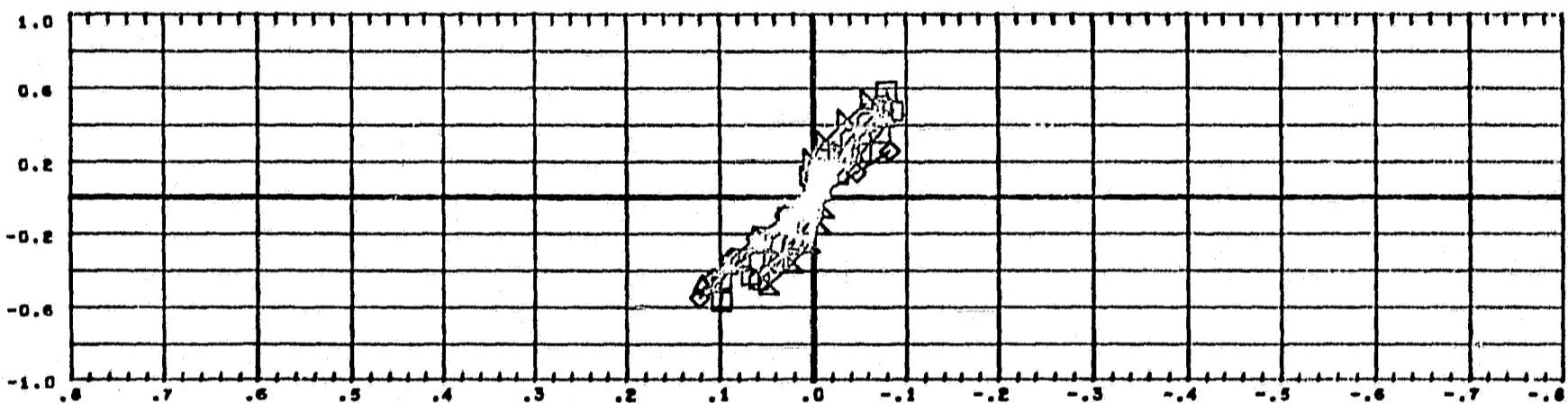
SYMBOL	MACH	PARAMETRIC VALUES
Δ	0.599	ALPHA 0.000 ORBINC - 2.000
\diamond	0.905	
\square	1.097	
\square	1.463	
\square	2.740	
\square	4.059	DATA MIST. CODE GR

REFERENCE INFORMATION		
BREF	8.1478	IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XHRF	8.7930	IN.
YHRF	0.0000	IN.
ZHRF	0.0000	IN.
SCALE	0.0034	

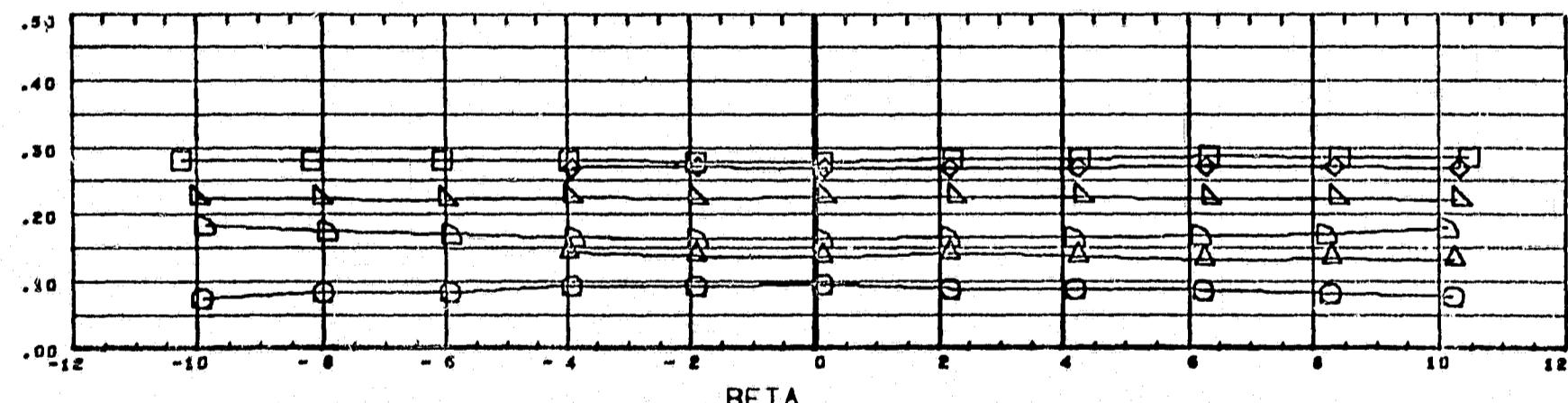
LATERAL-DIRECTIONAL STABILITY



BETA



CYN



BETA

DATA HIST. CODE 48

SYMBOL	MACH	PARAMETRIC VALUES	REFERENCE INFORMATION
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0.903			LREF 4.4260 IN.
1.097			BREF 2.9690 IN.
1.403			XHRP 5.7330 IN.
2.740			YHRP 0.6000 IN.
4.959			ZHRP 0.0000 IN.
			SCALE 0.0034

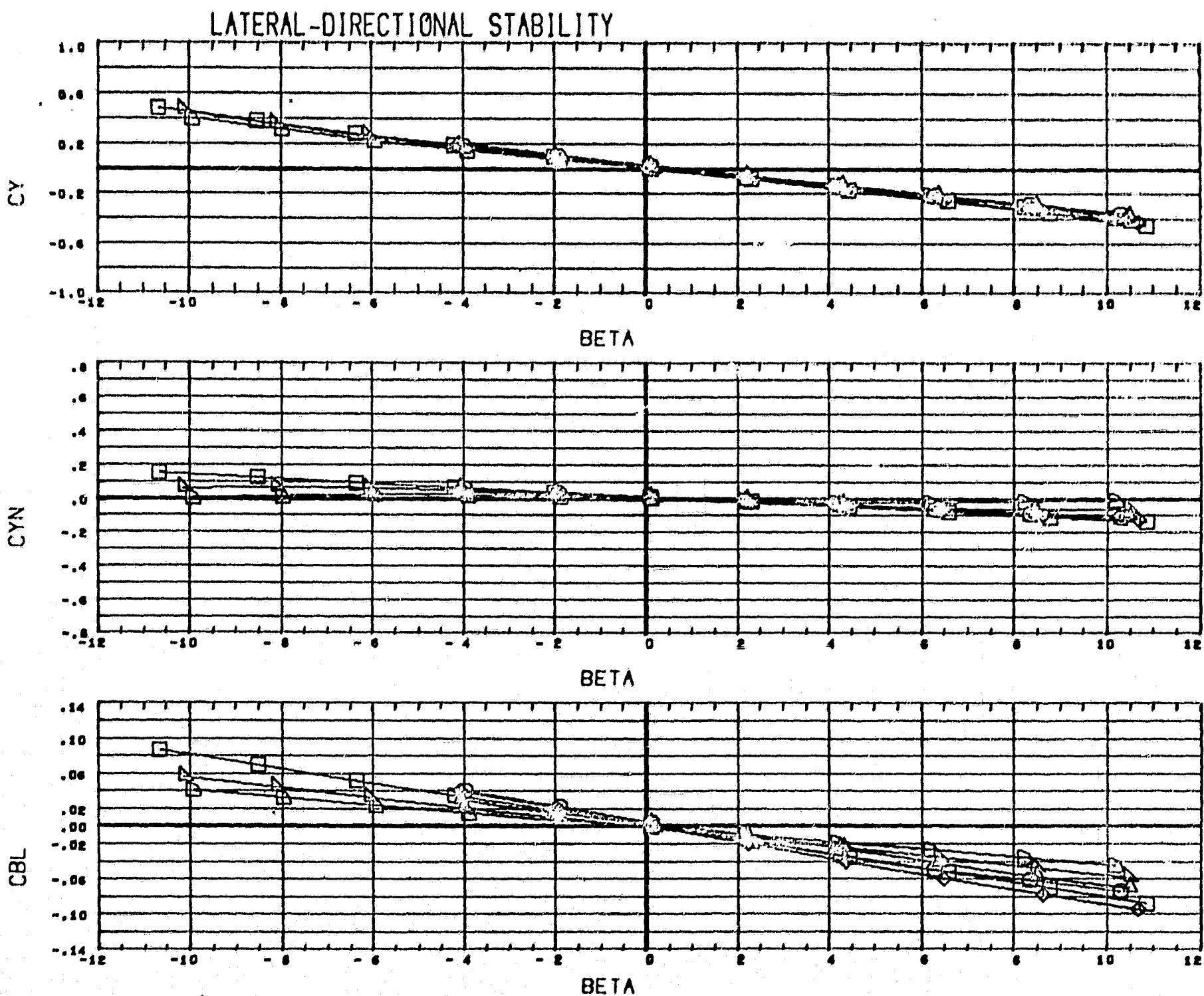
M523-MSFC MODELAX1233I-1

B501-2V7

(DS5710C) 10 FEB 72

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SYMBOL	MACH	PARAMETRIC VALUES
	0.896	ALPHA 0.000 ORBINC - 2.000
	0.900	
	1.102	
	1.460	
	2.740	
	4.959	CATA MIST. CODE 68

REFERENCE INFORMATION		
SREF	5.1476	8Q. IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XHRP	5.7530	IN.
YHRP	0.0000	IN.
ZHRP	0.0000	IN.
SCALE	0.0034	

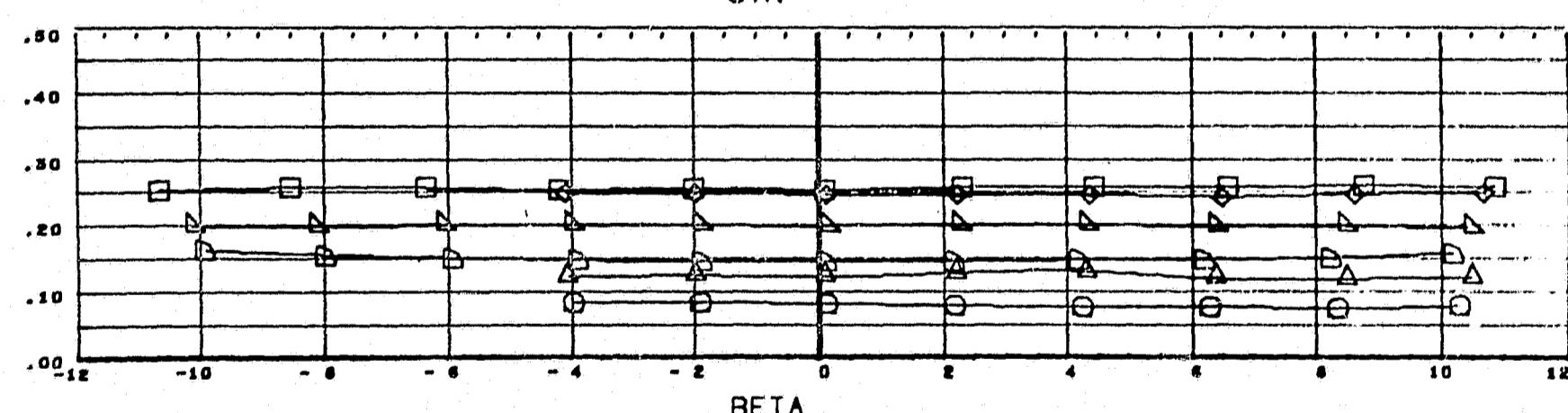
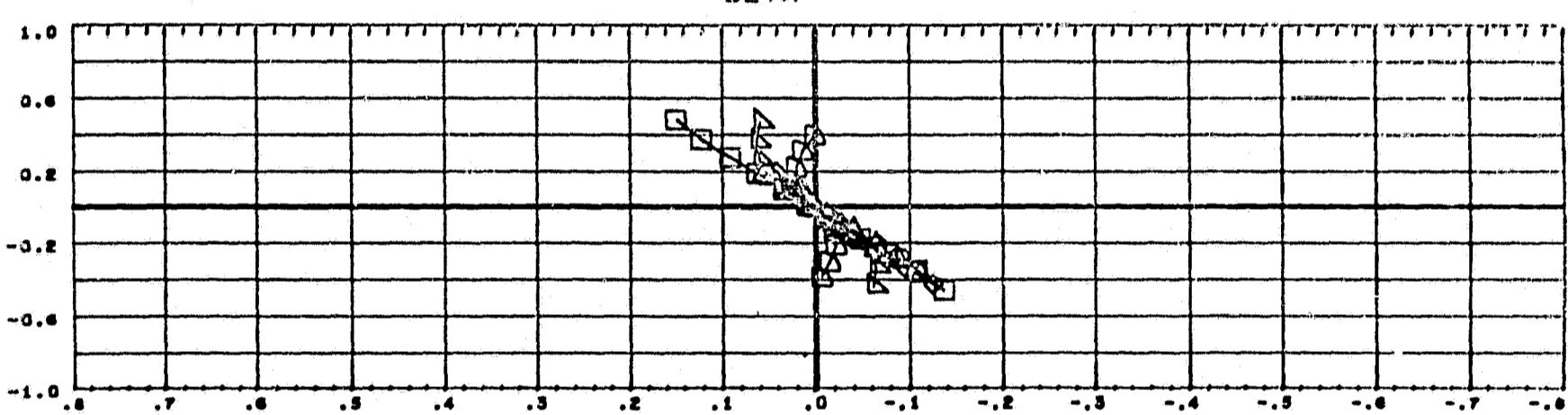
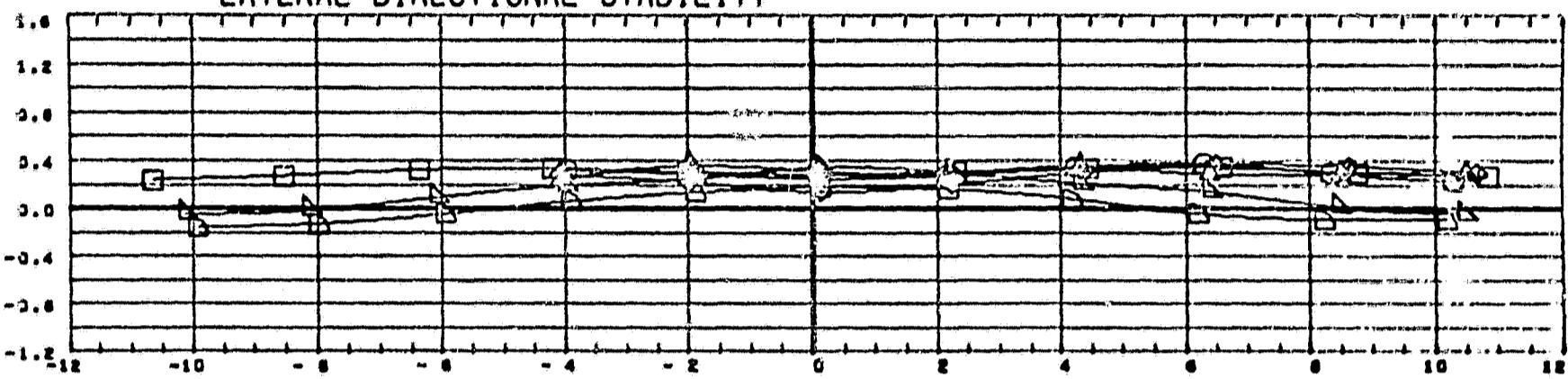
M523-MSFC MODEL AX12331-1

B501-2

(D5703C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



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SYMBOL	MACH	PARAMETRIC VALUES			REFERENCE INFORMATION	
		ALPHA	0.000	ORBINC		
△	0.596		- 2.000	SREF	5.1478	sq.in.
○	0.900			LREF	4.4260	IN.
□	1.102			BREF	2.9690	IN.
■	1.460			XHAP	5.7530	IN.
□	2.740			YMRP	0.0000	IN.
□	4.958	DATA HIST. CODE	GR	ZHAP	0.0000	IN.
				SCALE	0.0034	

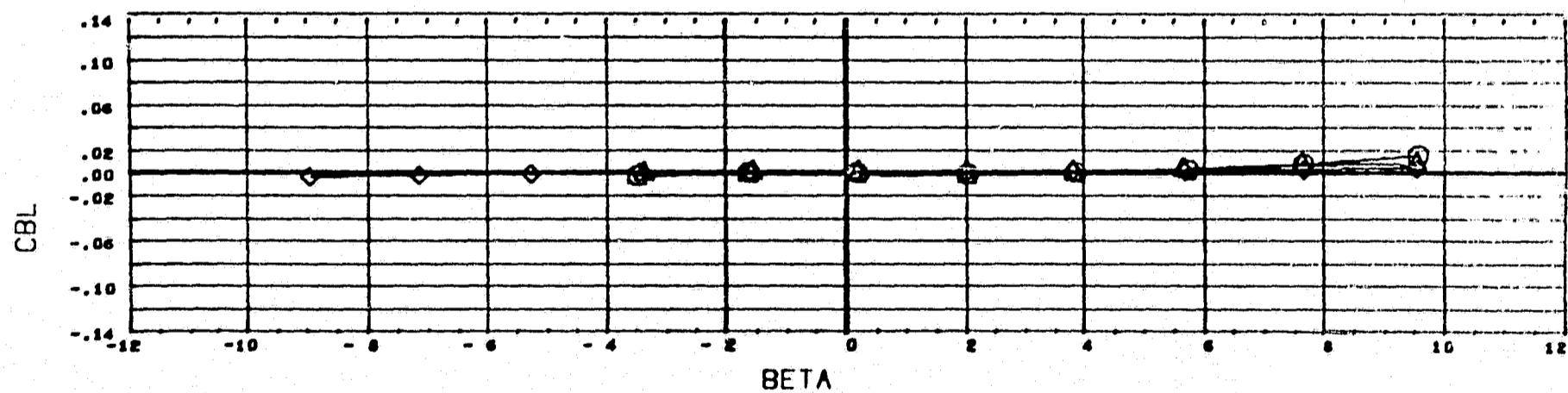
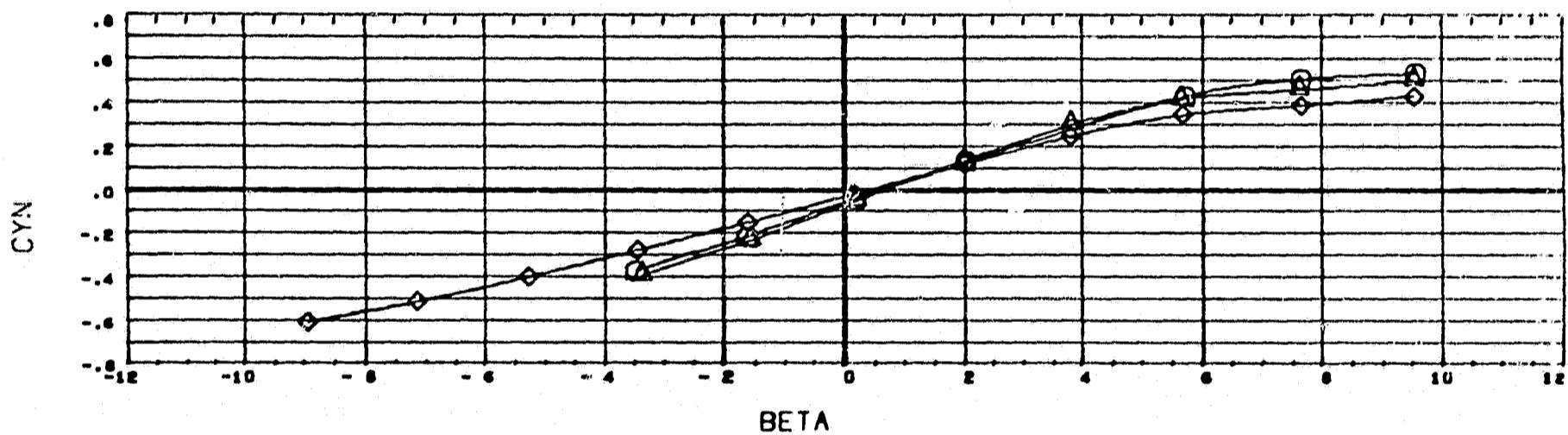
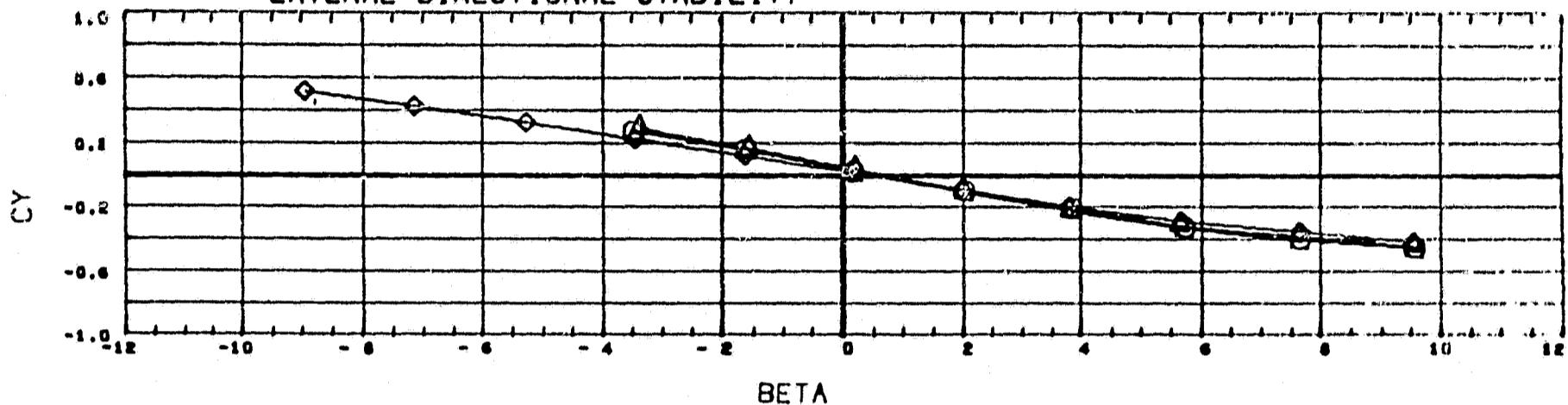
MS23-MSFC MODEL AX1233 I - 1

B501-2

(D5703C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH ALPHA PARAMETRIC VALUES
 0.900 1.103 1.461 0.000

DATA MIST. CODE GR

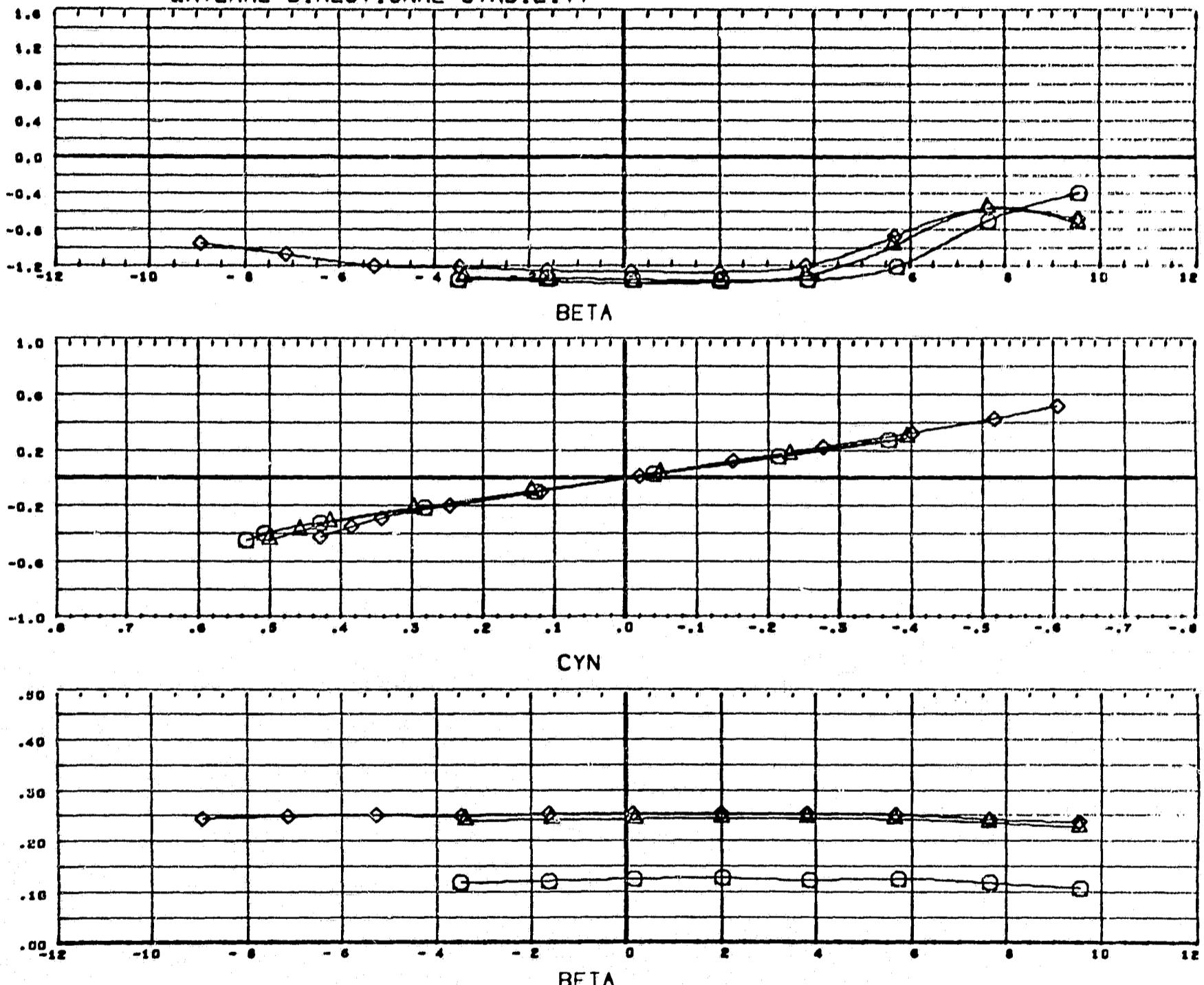
M523-MSFC MODEL ALEX1233I-1

B5V6

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

(D5713C) 10 FEB 72 PAGE 54

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
	0.900	ALPHA 0.000
	1.103	

REFERENCE INFORMATION		
SREF	5.1476	SQ. IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XHMRP	5.7530	IN.
YHMRP	0.0000	IN.
ZHMRP	0.0000	IN.
SCALE	0.0034	

DATA MIST. CODE GR

M523-MSFC MODEL AX1233I-1

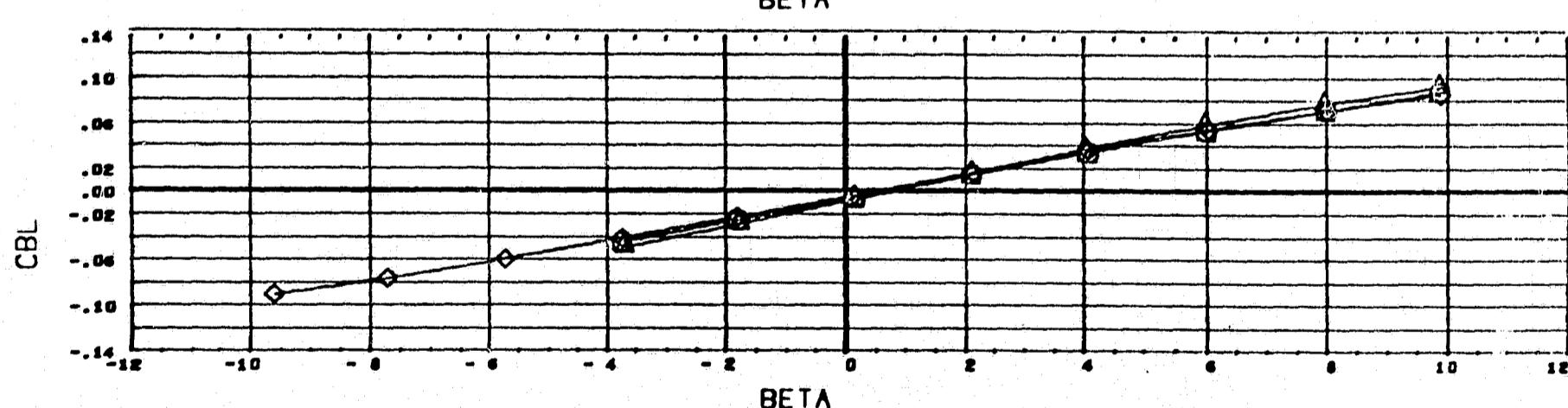
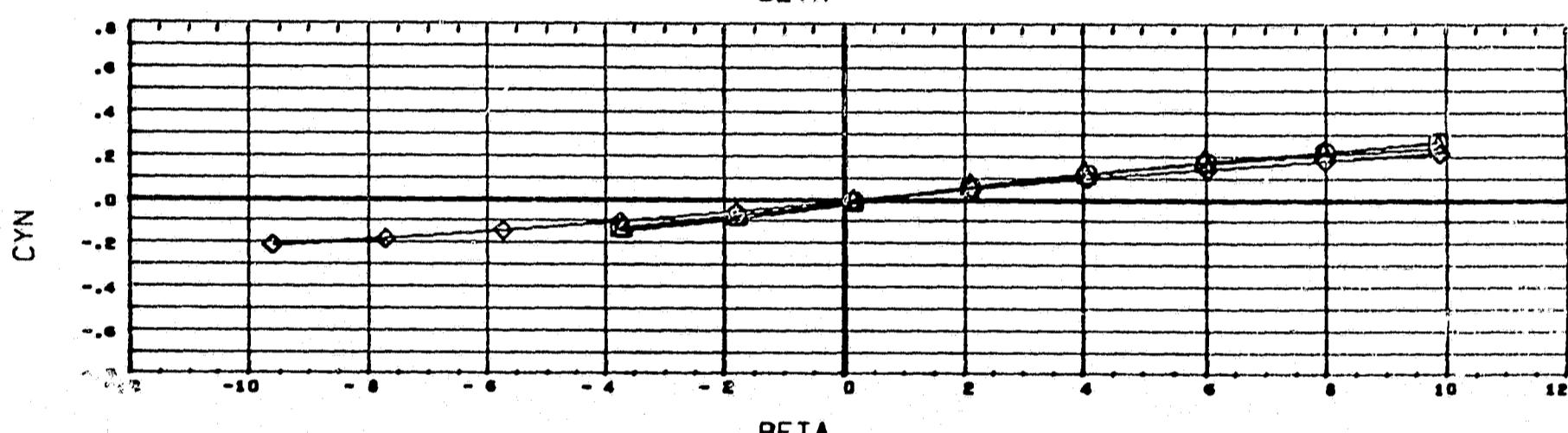
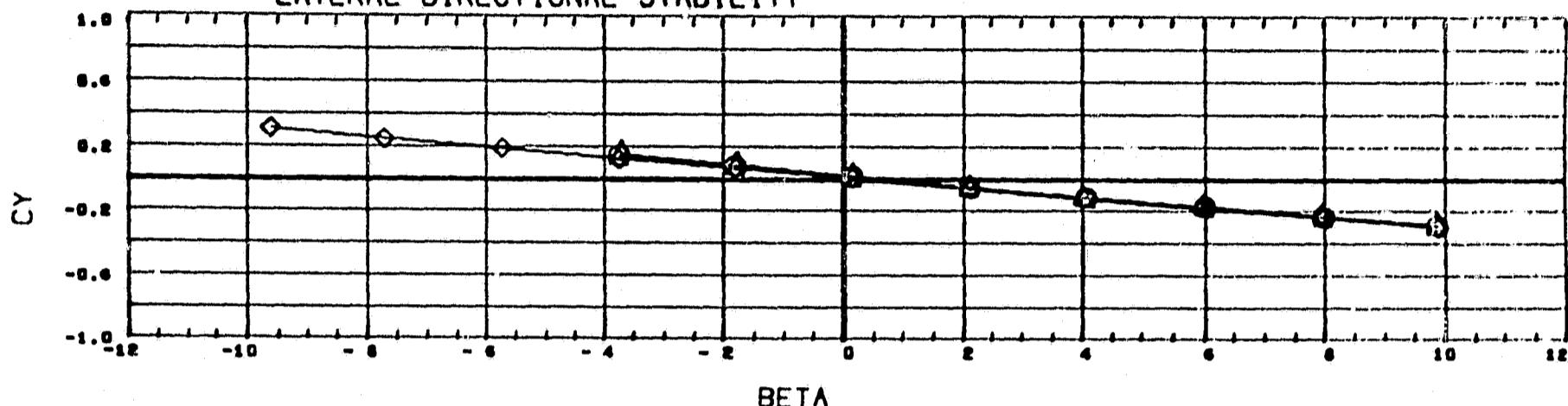
B5V6

(05713C) 10 FEB 72

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55

LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH
 O 0.899
 A 1.103
 D 1.458

PARAMETRIC VALUES
 ALPHA 0.000

REFERENCE INFORMATION
 SREF 5.1478 80. IN.
 LREF 4.4260 IN.
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 YMRP 0.0000 IN.
 ZMRP 0.0000 IN.
 SCALE 0.0034

DATA HIST. CODE CR

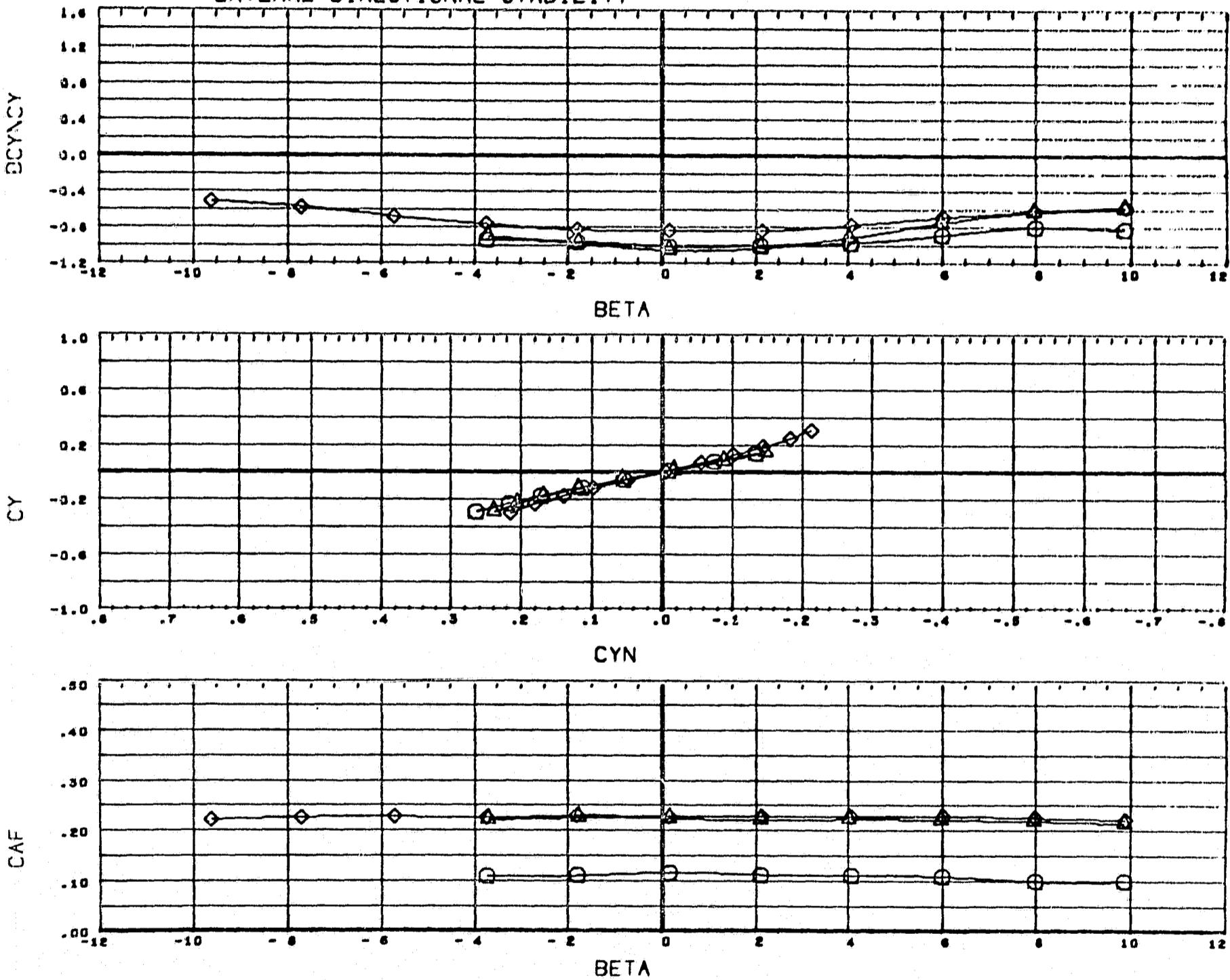
M523-MSFC MODELAX1233I-1

B5V6.2

(D5714C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH PARAMETRIC VALUES

○ 0.899 ALPHA 0.000
△ 1.103
◊ 1.458

DATA HIST. CODE GR

M523-MSFC MODEL AX1233I-1

B5V6.2

(D5714C) 10 FEB 72

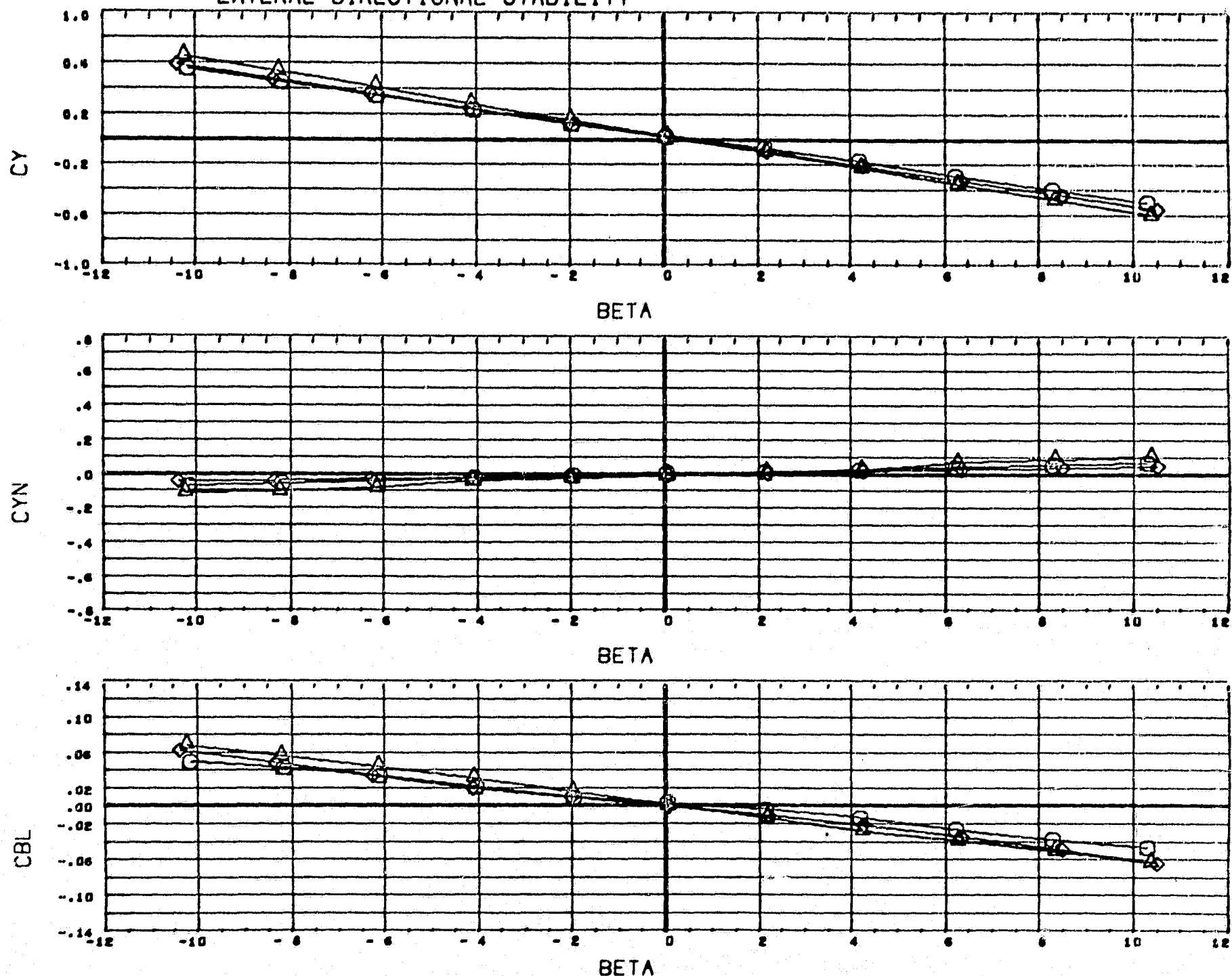
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REFERENCE INFORMATION

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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		
	0.695	ALPHA	0.000	ORBINC	- 2.000
	1.099				
	1.460				

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

DATA MIST. CODE : CR

M523-MSFC MODEL AX12331-1

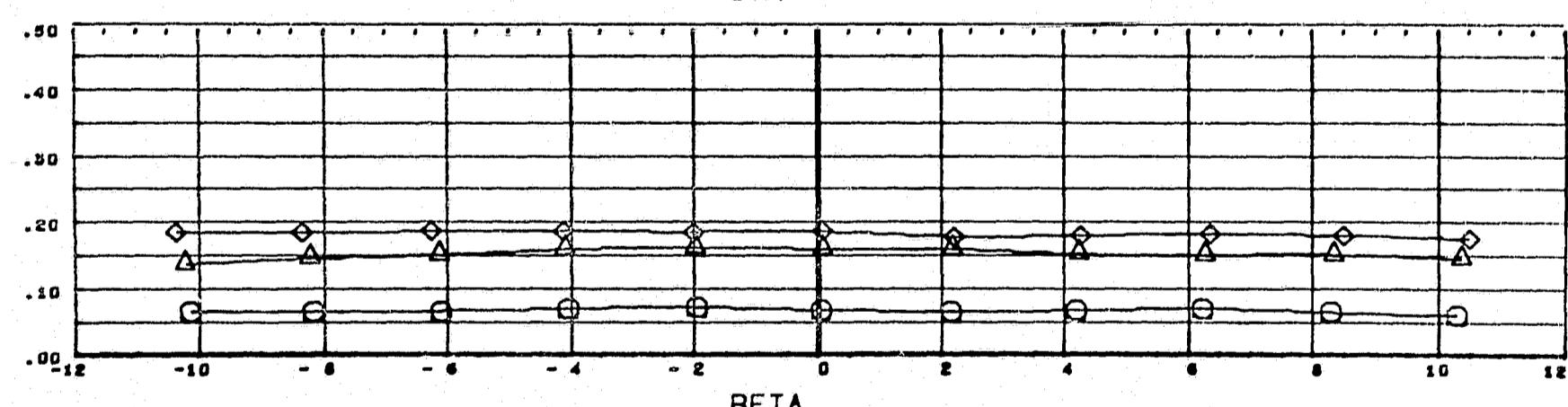
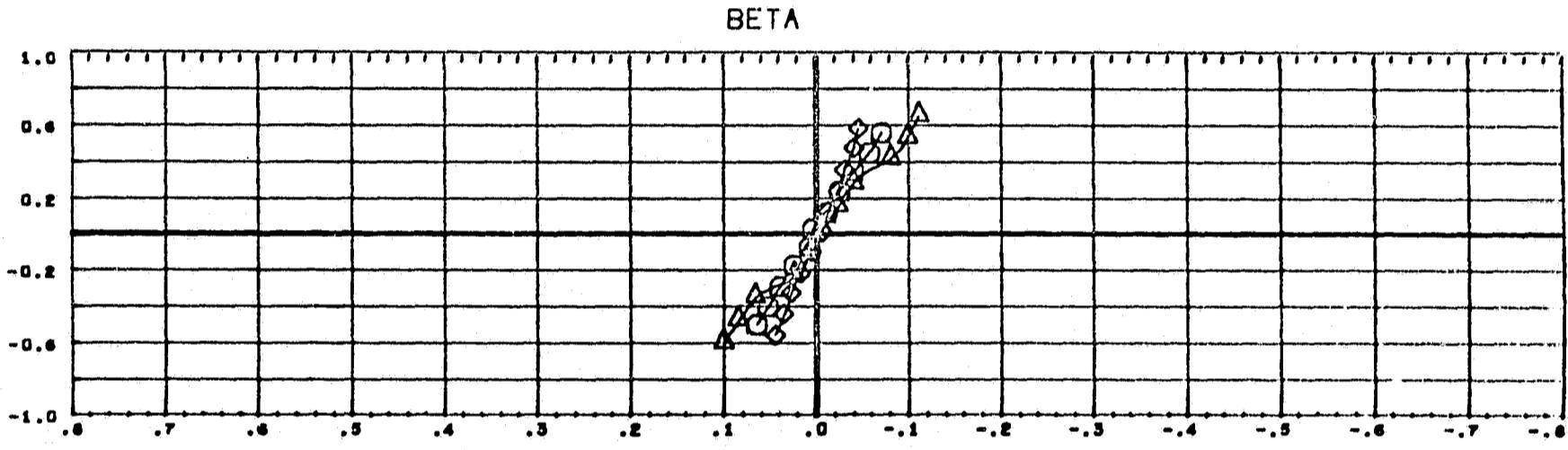
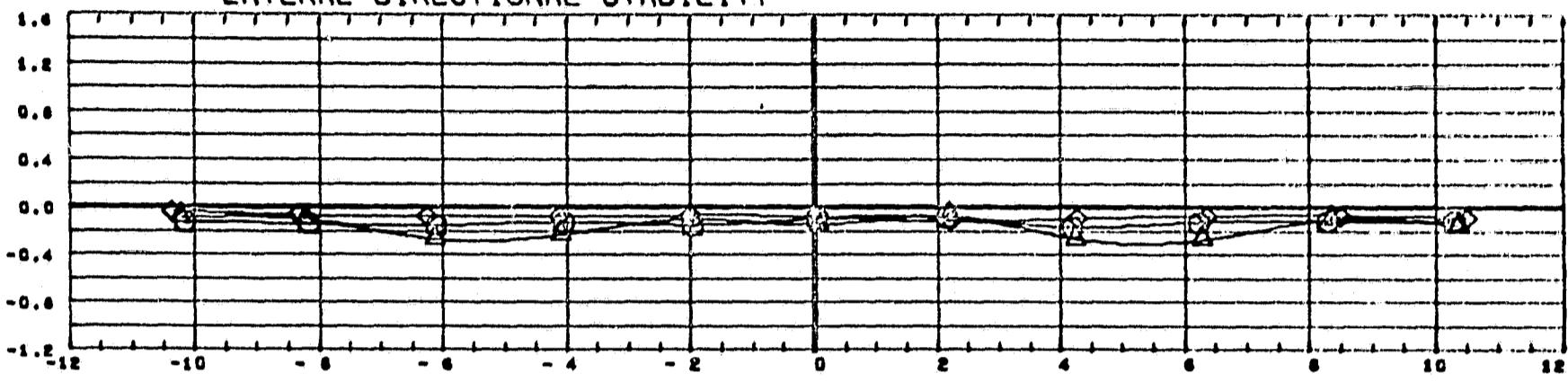
B601-2V3.3

(D5711C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES		
	0.695	ALPHA	0.000	ORBINC - 2,000
	1.099			
	1.460			

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.
ASCALE	0.0034	

DATA MIST. CODE 64

M523-MSFC MODEL AX1233I-1

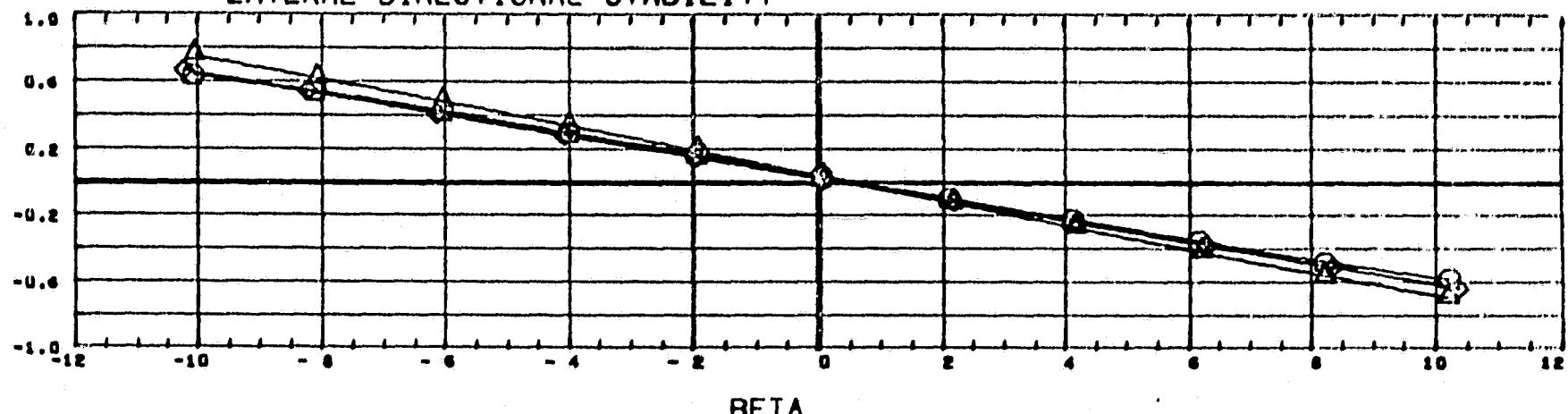
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(D5711C) 10 FEB 72

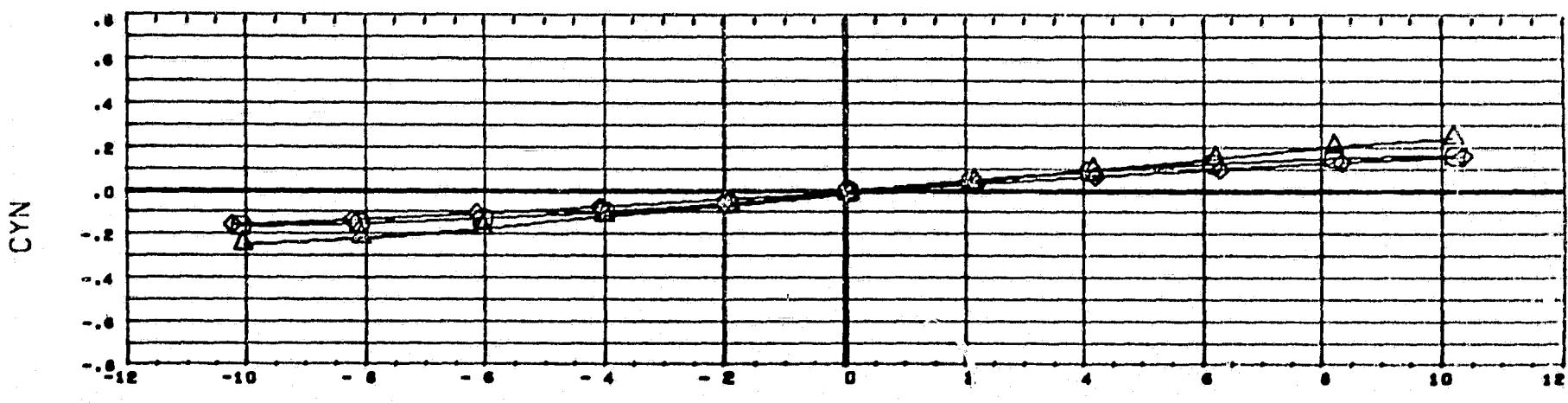
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59

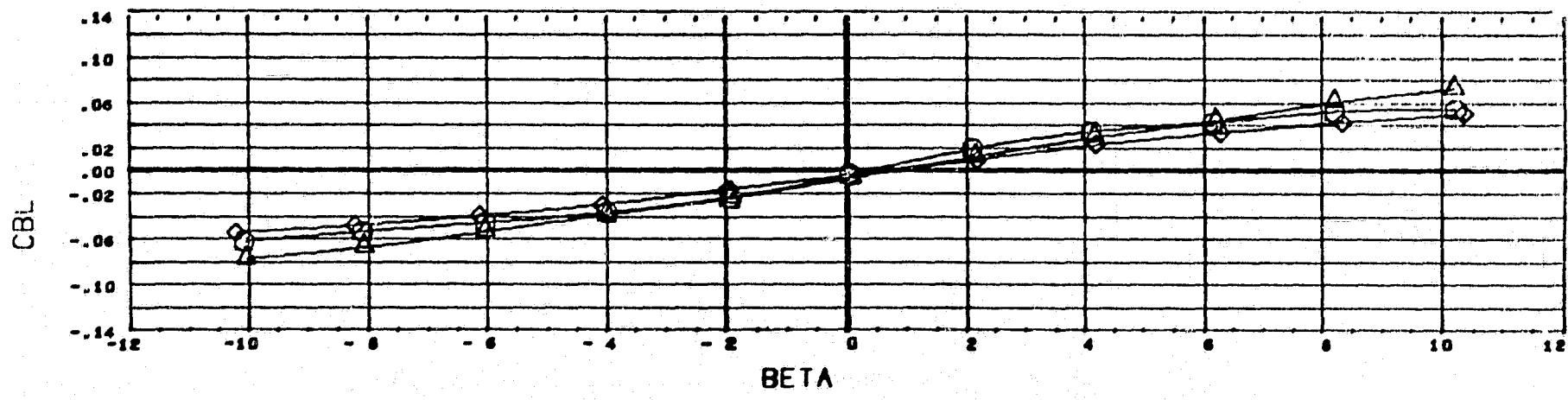
LATERAL-DIRECTIONAL STABILITY



BETA



BETA



BETA

SYMBOL MACH PARAMETRIC VALUES
○ 0.900 ALPHA 0.000 ORBINC - 2.000
◊ 1.100
◆ 1.461

DATA MIST. CODE GR

M523-MSFC MODELAX1233I-1

B601-2V5

(D5712C)

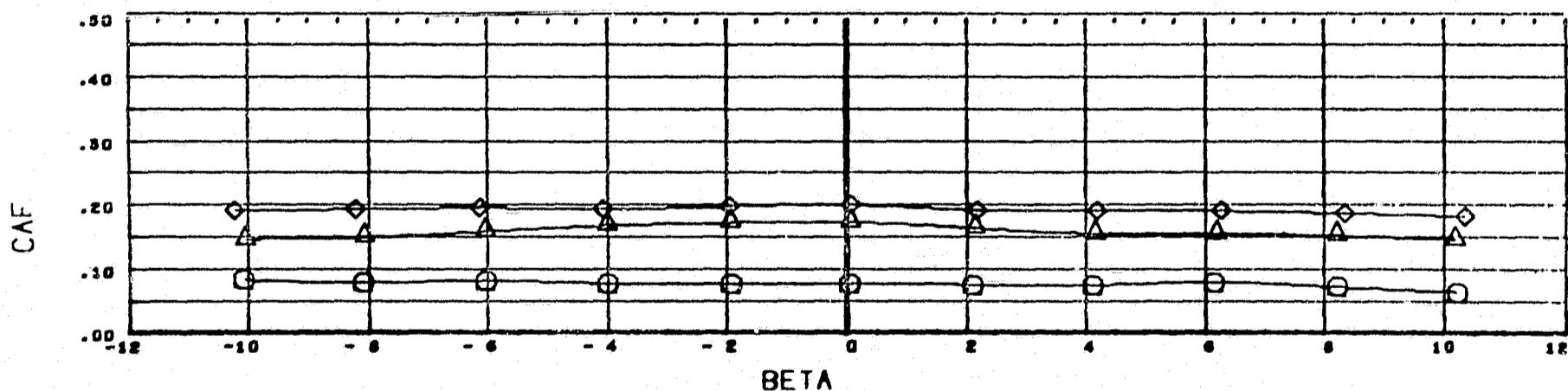
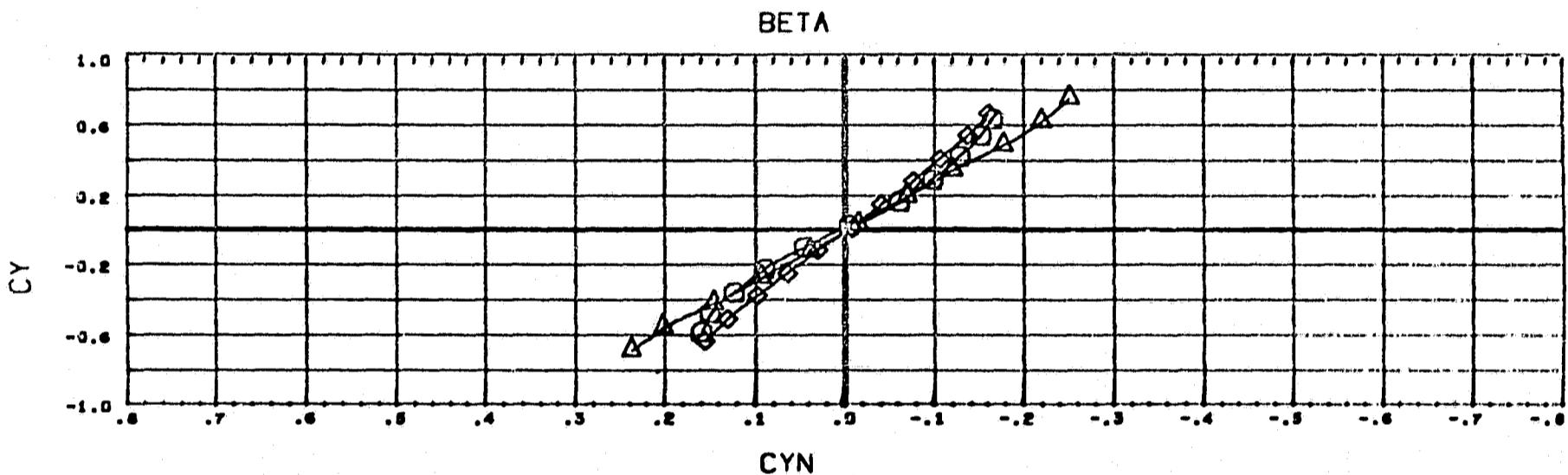
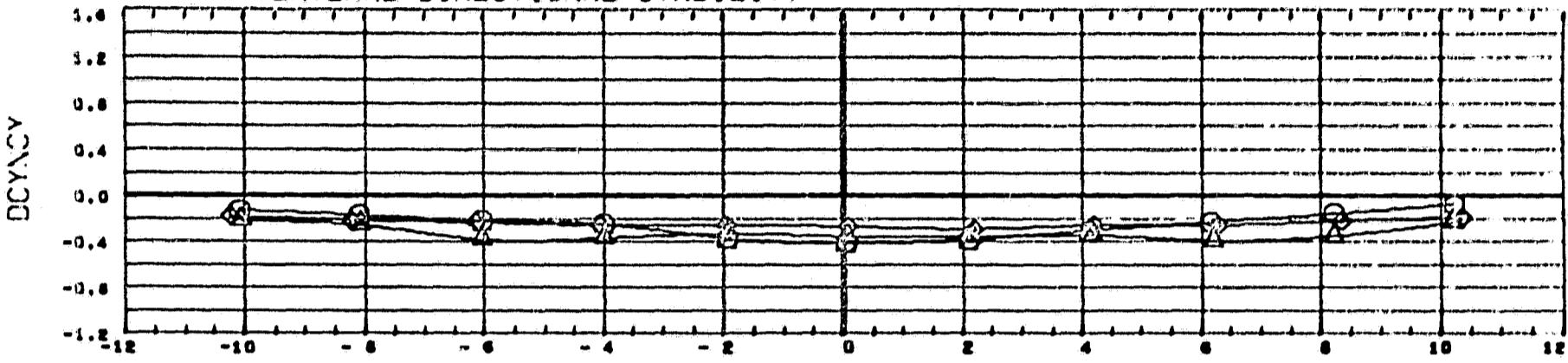
10 FEB 72

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60

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BREF	2.8690	IN.
XHRF	4.3530	IN.
YMRP	0.0000	IN.
ZHRF	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



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

REFERENCE INFORMATION		
SREF	5.1476	SG. IN.
LREF	4.4260	IN.
BREF	2.9693	IN.
XMRP	4.3530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

DATA LIST CODE 68

M523-MSFC MODEL AX12331-1

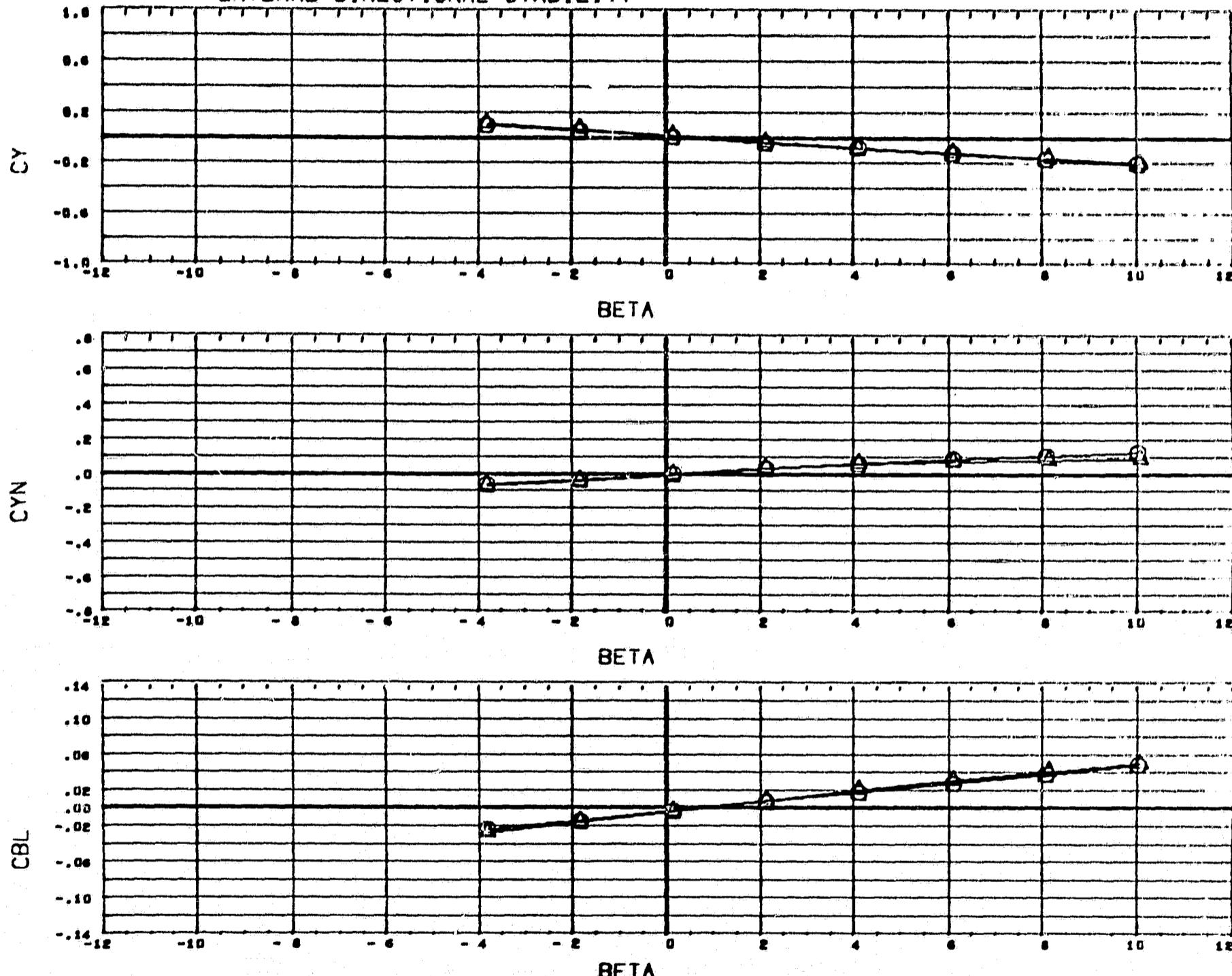
B601-2V5

(D5712C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
	0.899	ALPHA 0.000
	1.107	

REFERENCE INFORMATION		
SREF	5.1478	SG. 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 MIST: CODE GR

M523-MSFC MODEL AX12331-1

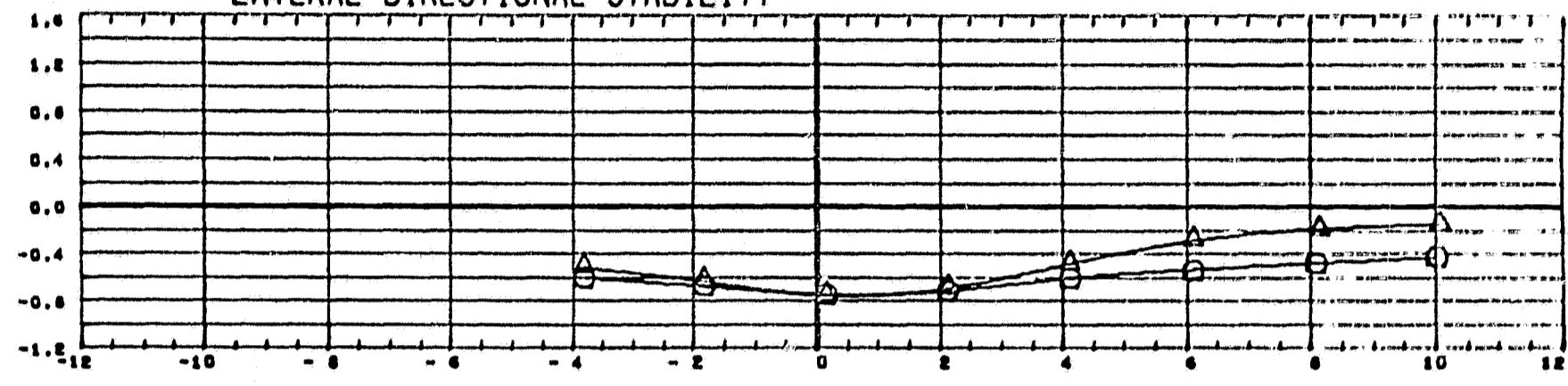
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(D5715B) 10 FEB 72

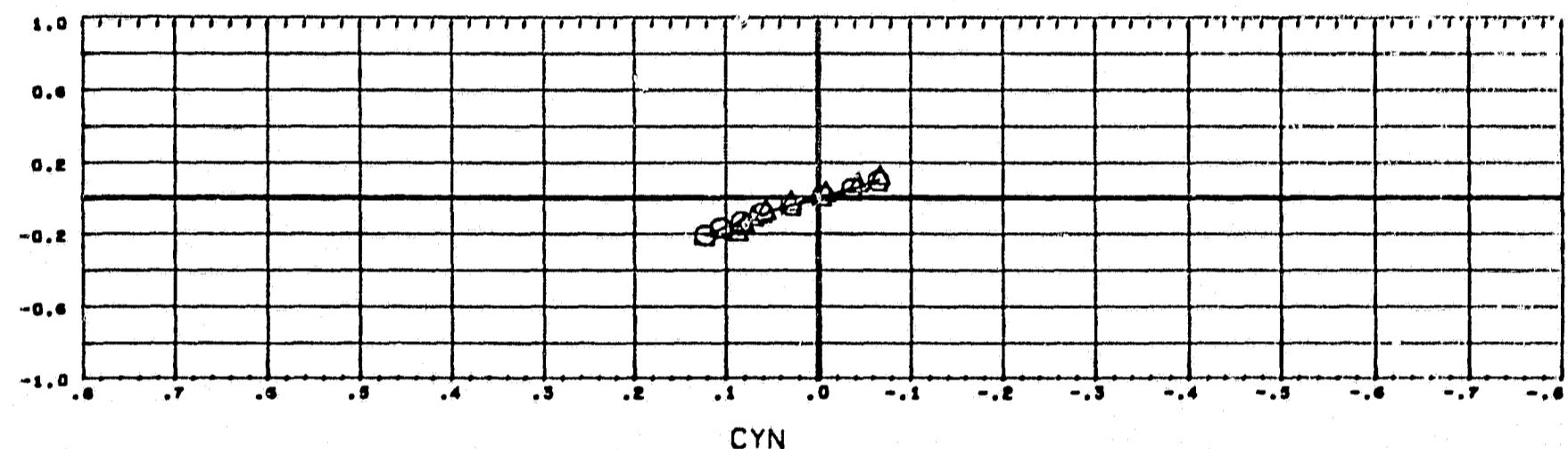
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62

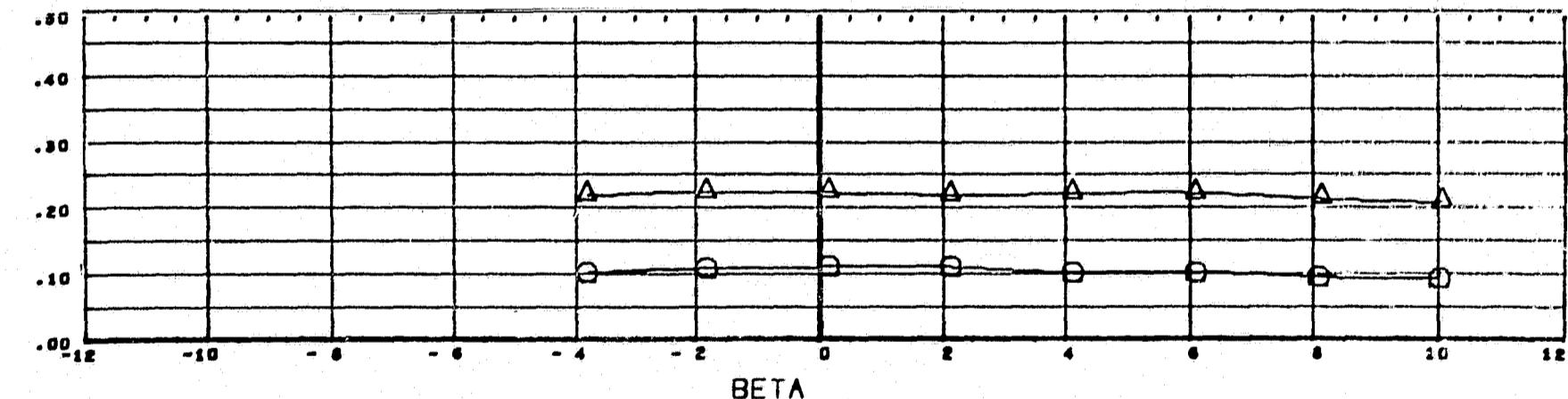
LATERAL-DIRECTIONAL STABILITY



BETA



CYN



BETA

SYMBOL MACH PARAMETRIC VALUES
 Δ 0.899 ALPHA 0.000
 \square 1.105

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

DATA HIST. CODE CR

M523-MSFC MODEL AX1233I-1

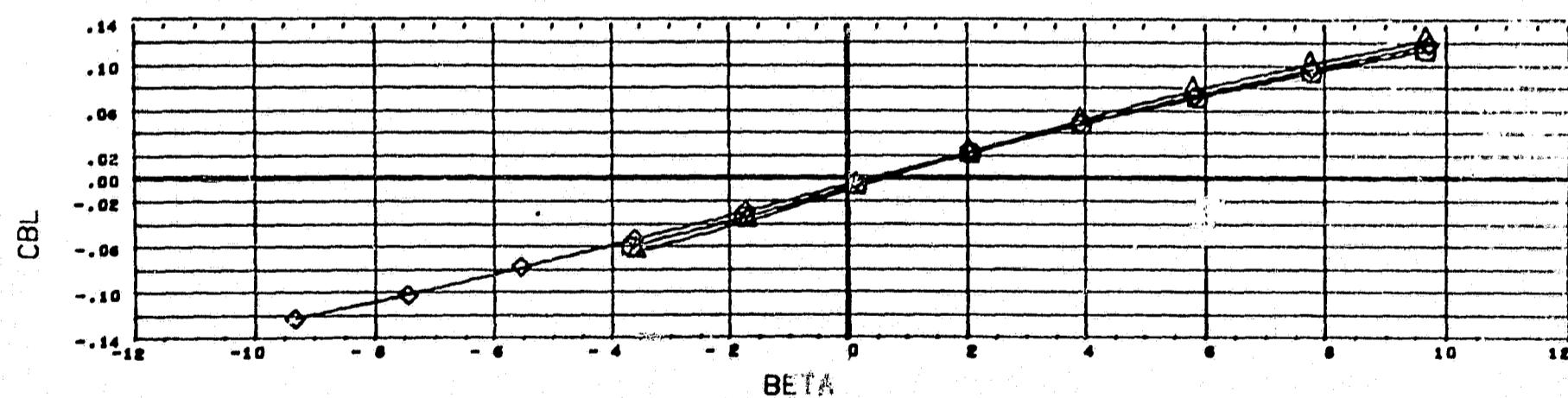
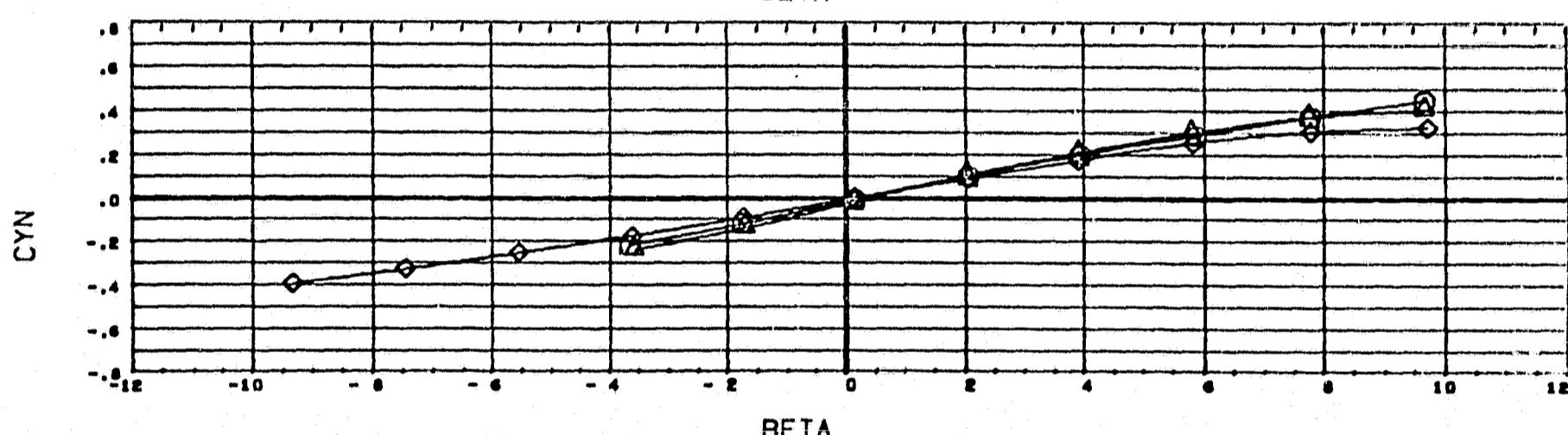
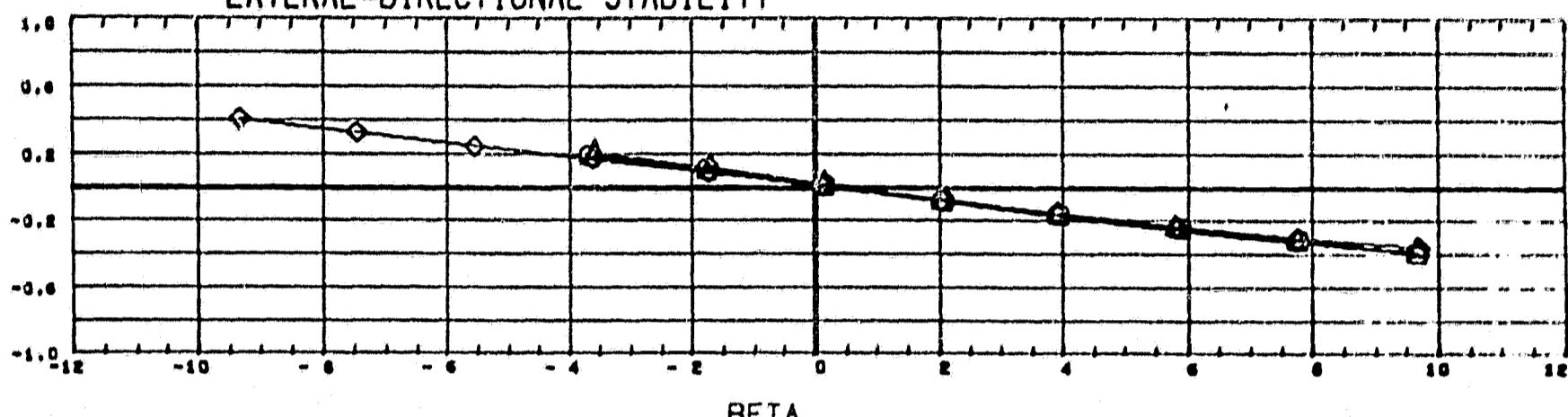
B5V6.3

(D5715B) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
 Δ 0.900 ALPHA 0.000
 Δ 1.103
 Δ 1.458

REFERENCE INFORMATION
 BREF 5.1478 50. IN.
 LREF 4.4260 IN.
 BREF 2.9690 IN.
 XMRP 5.7530 IN.
 YMRP 0.0000 IN.
 ZMRP 0.0000 IN.
 SCALE 0.0034 IN.

DATA HIST. CODE GR

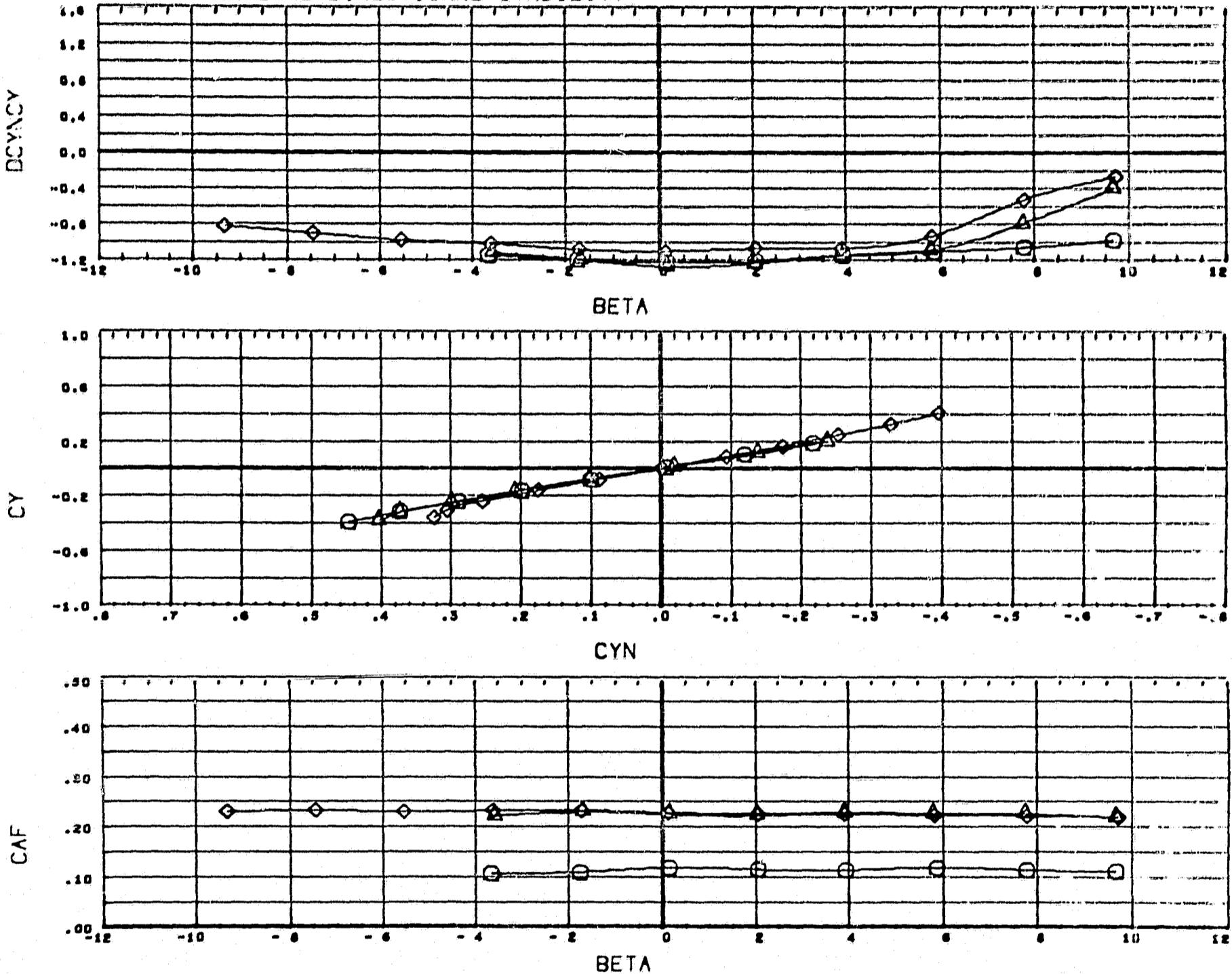
M523-MSFC MODELAX1233I-1

B5V6.4

(D5716C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
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 △ 1.103
 ◇ 1.458

DATA HIST. CODE GR

M523-MSFC MODEL ALEX1233I-1

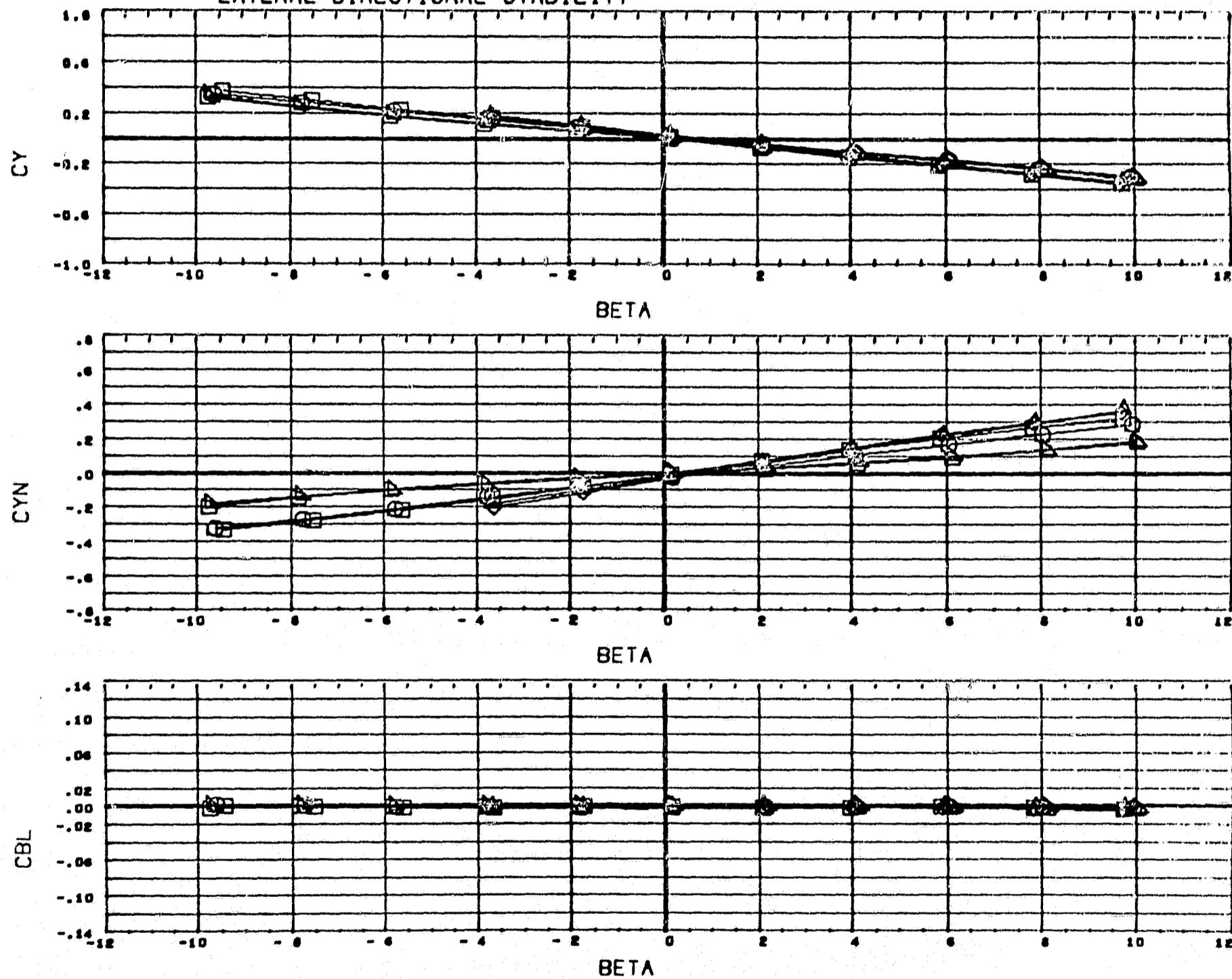
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LREF	4.4260	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

(D5716C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
\square	0.599	ALPHA 0.000
\triangle	0.801	
\diamond	1.102	
\square	1.462	
\square	2.740	
\square	4.959	DATA MIST. CODE GR

M523-MSFC MODEL A X1233I-1

B5V7

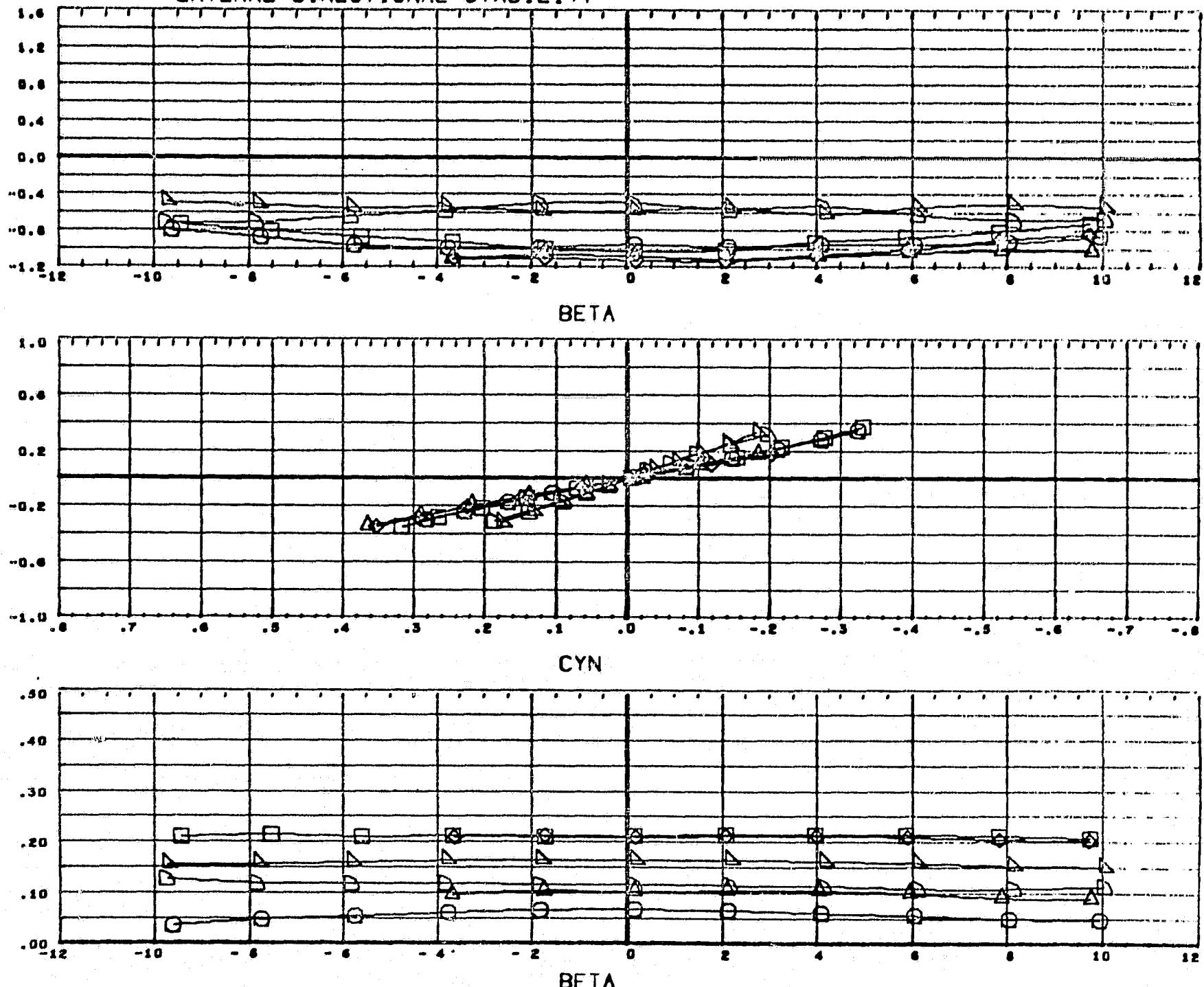
(D5717C) 10 FEB 72

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REFERENCE INFORMATION		
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LREF	4.4260	IN.
BREF	2.9690	IN.
XHRP	5.7530	IN.
YHRP	0.0000	IN.
ZHRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
	0.599	ALPHA 0.000
	0.901	
	1.102	
	1.462	
	2.740	
	4.959	DATA HIST. CODE GR

REFERENCE INFORMATION		
BREF	5.1478	SQ. IN.
BREF	4.4260	IN.
BREF	2.9690	IN.
MRP	5.7530	IN.
MRP	0.0000	IN.
MRP	0.0000	IN.
SCALE	0.0034	

M523-MSFC MODEL AX1233I-1

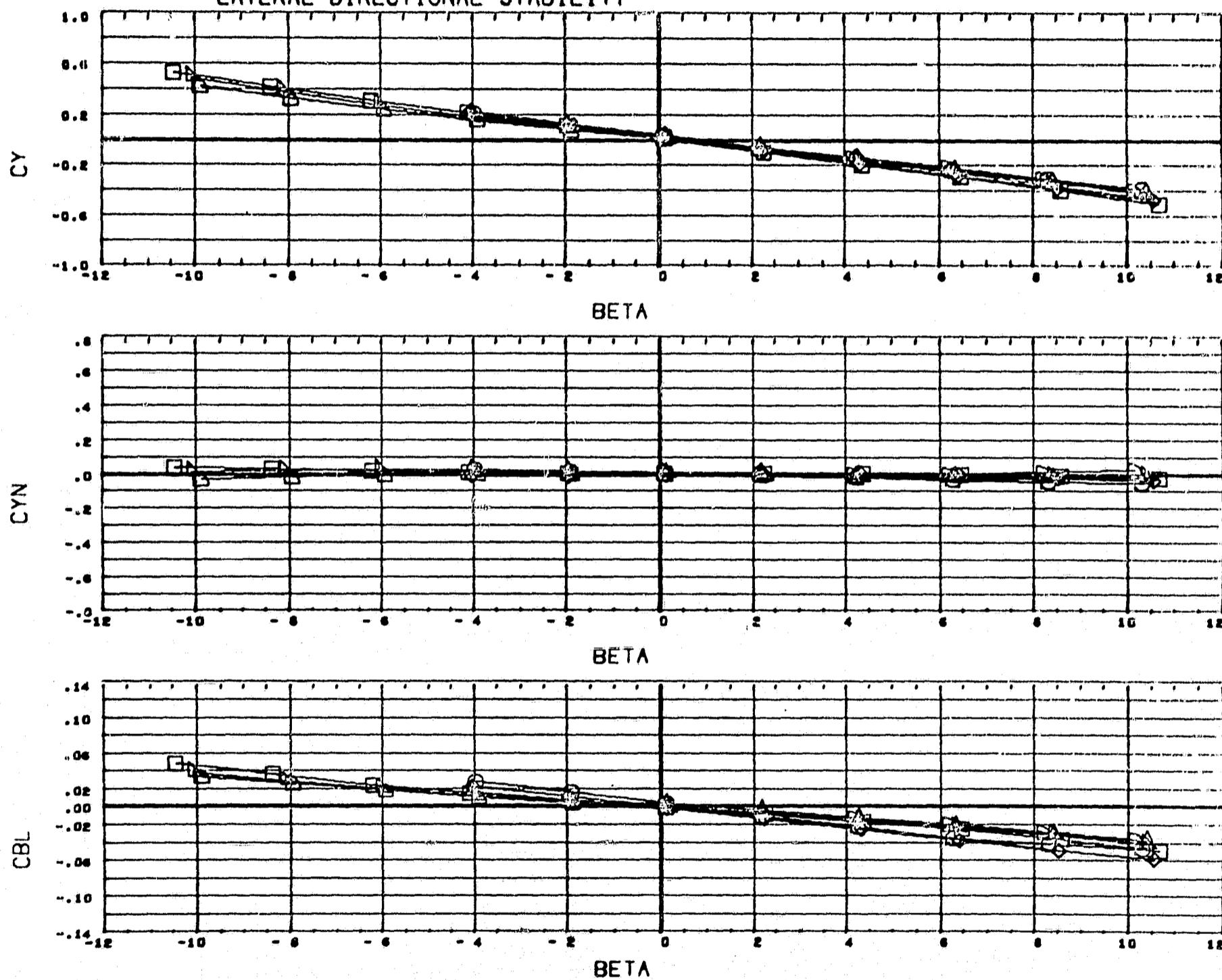
B5V7

(05717C) 10 FEB 72

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67

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
	0.600	ALPHA 0.000 ORB INC - 2,000
	0.899	
	1.102	
	1.462	
	2.740	
	4.959	DATA HIST. CODE GR

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

M523-MSFC MODEL AX1233 I-1

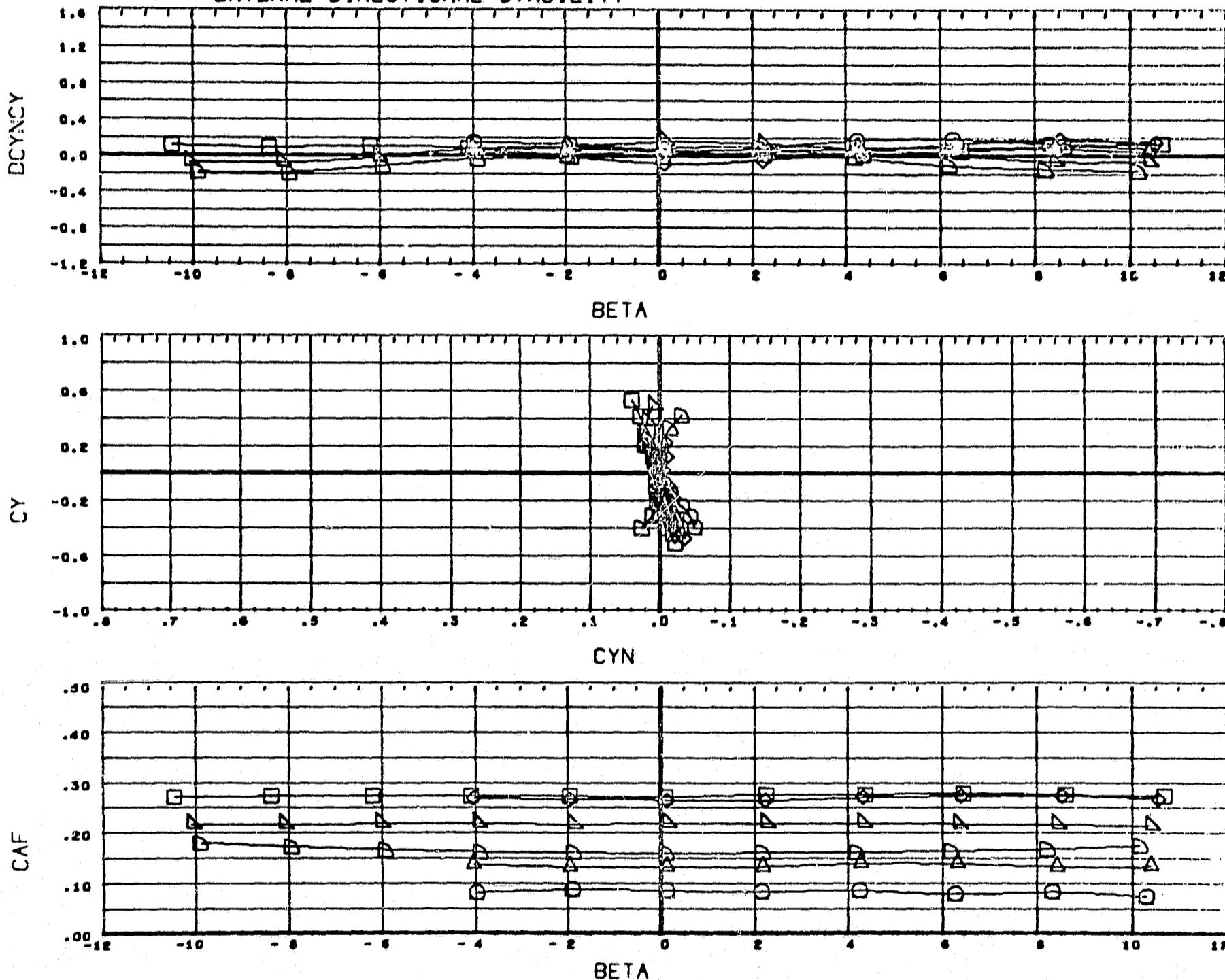
B501-2V7.2

(D5719C) 10 FEB 72

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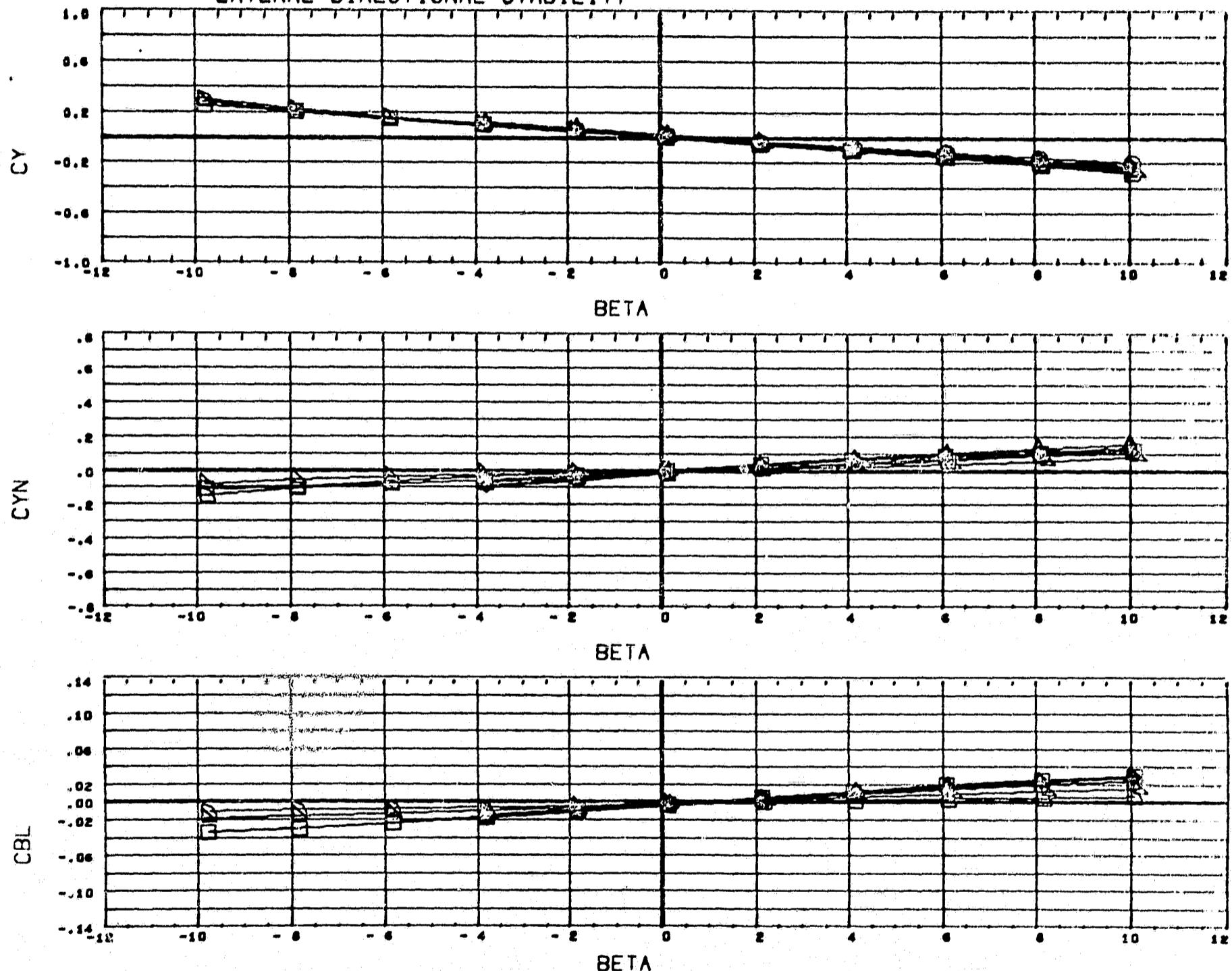
LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
	0.600	ALPHA 0.000 ORBINC ~ 2.000
	0.899	
	1.102	
	1.462	
	2.740	
	4.959	DATA HIST. CODE GR

REFERENCE INFORMATION		
SREF	5.1478	IN.
LREF	4.4260	IN.
BREF	2.9690	IN.
XHRF	9.7530	IN.
YHRF	0.0000	IN.
ZHRF	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	ALPHA	PARAMETRIC VALUES
○	0.598		0.000
△	0.900		
◊	1.098		
□	1.461		
▽	2.740		
▷	4.959	DATA MIST. CODE	GR

M523-MSFC MODEL AX12331-1

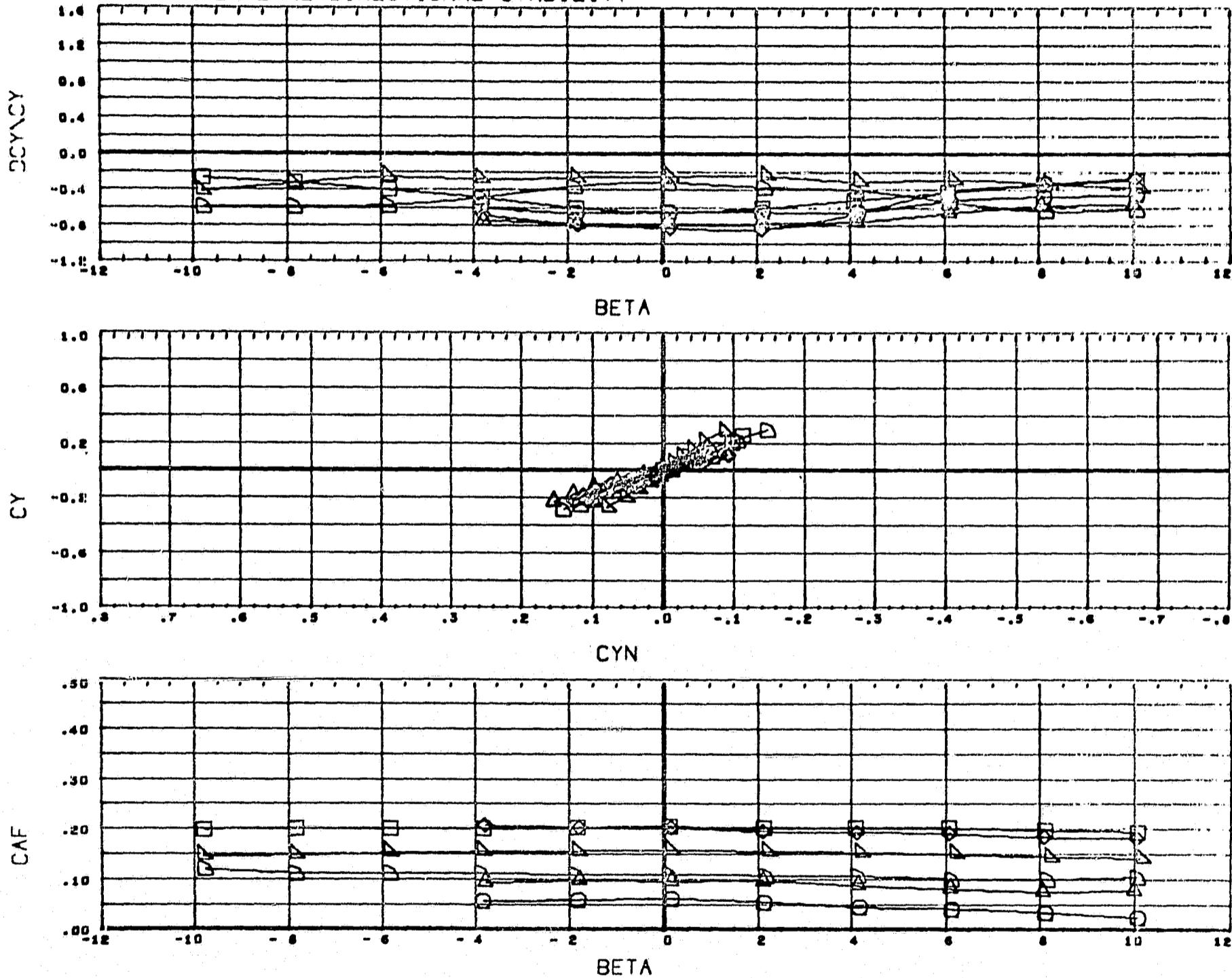
B5V7.2

(D5718C) 10 FEB 72

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REFERENCE INFORMATION		
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LREF	4.4260	IN.
BREF	2.9690	IN.
XHRP	5.7530	IN.
YMRP	0.0000	IN.
ZHRP	0.0000	IN.
SCALE	0.0034	

LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	ALPHA	PARAMETRIC VALUES
	0.598		0.000
	0.900		
	1.098		
	1.461		
	2.740		
	4.958	DATA HIST. CODE	GR

REFERENCE INFORMATION		
REF	5.1478	SQ. IN.
REF	4.4260	IN.
REF	2.9690	IN.
H.R.P	5.7530	IN.
H.R.P	0.0000	IN.
H.R.P	0.0000	IN.
CALE	0.0034	

M523-MSFC MODEL AX12331-1

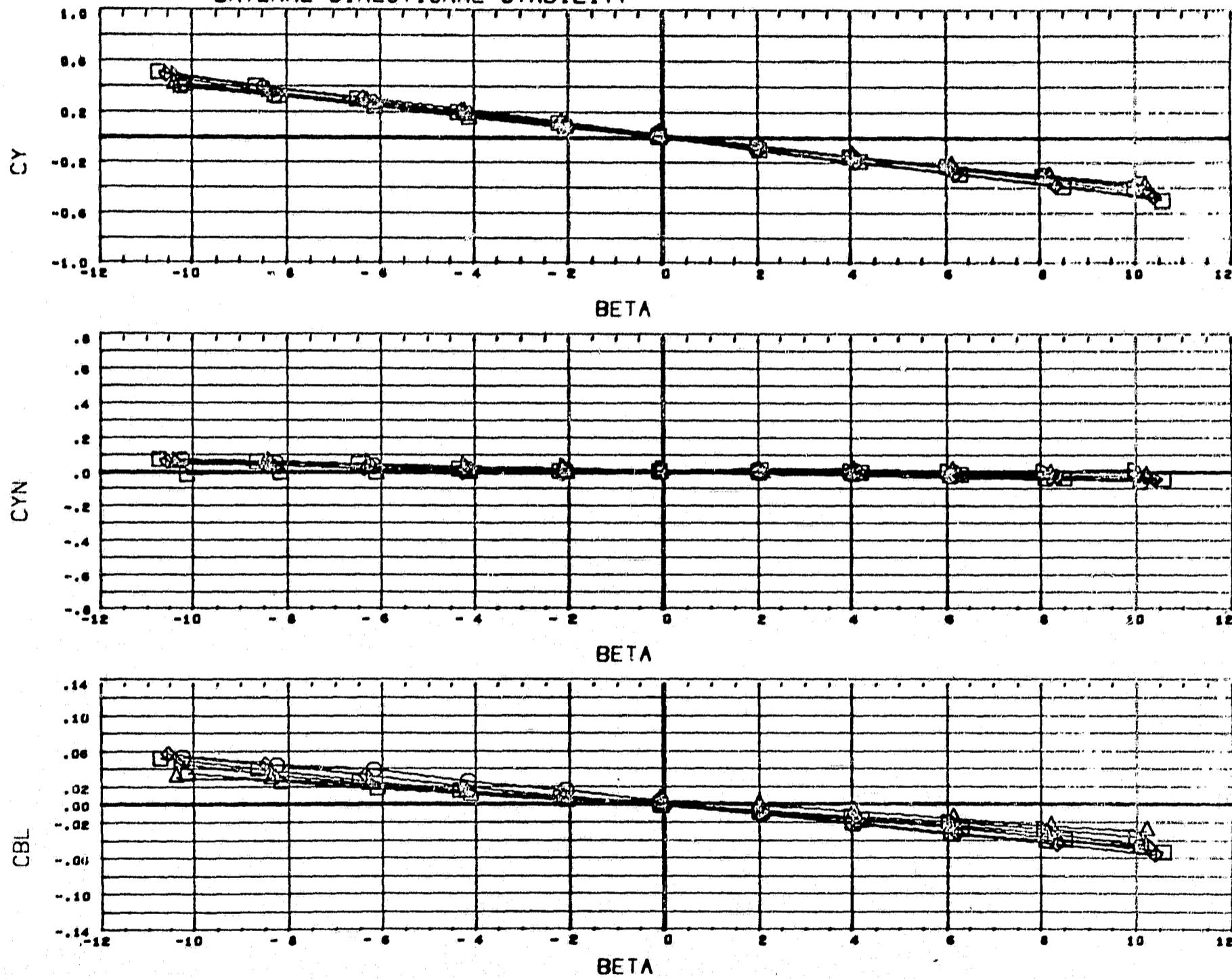
B5V7.2

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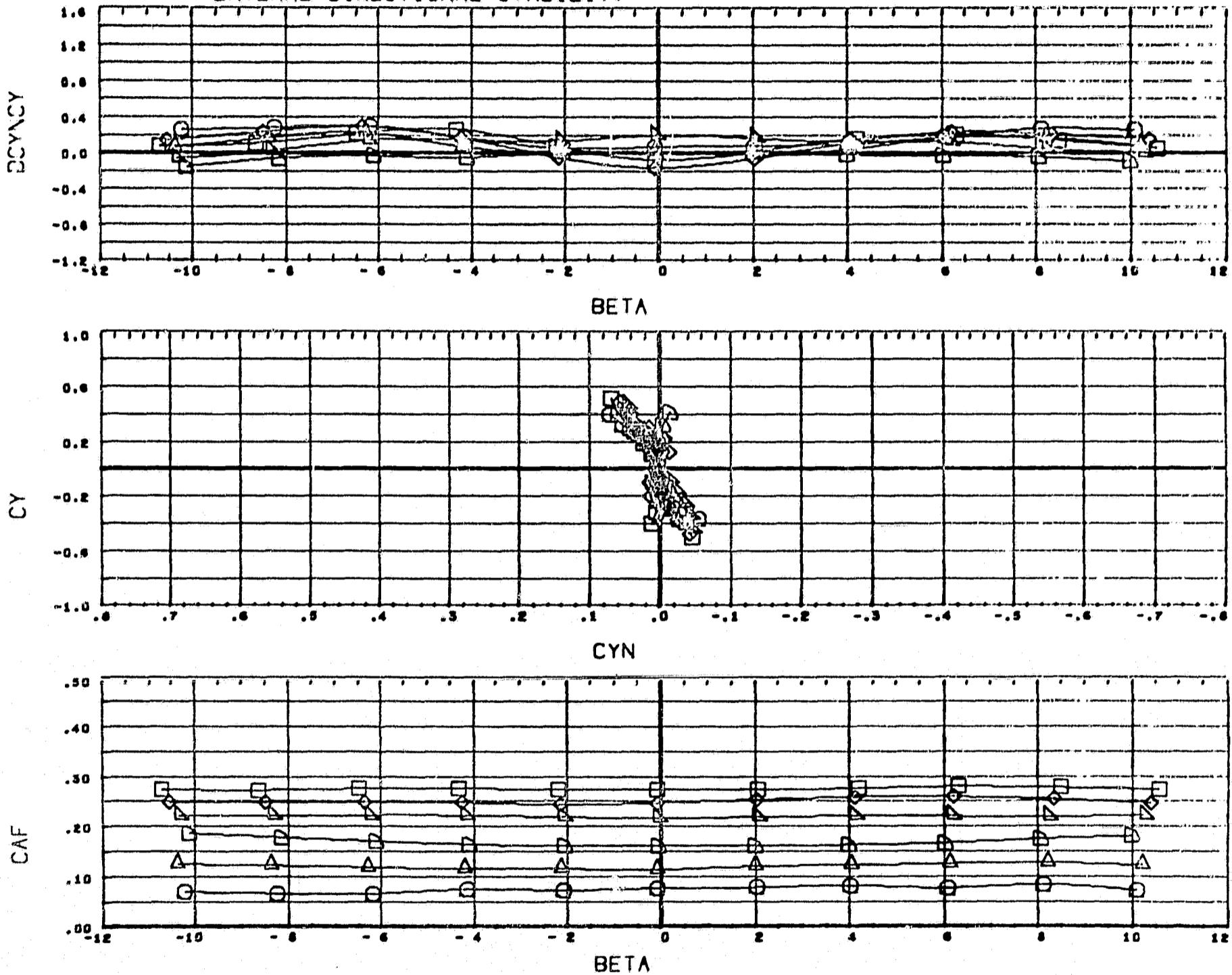
LATERAL-DIRECTIONAL STABILITY



SYMBOL **MACH** **PARAMETRIC VALUES**
 □ 0.589 ALPHA - 6.000 ORBINC - 2.000
 △ 0.697
 ◇ 1.094
 ▽ 1.460
 ▲ 2.740
 ▵ 4.050 DATA MIST. 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

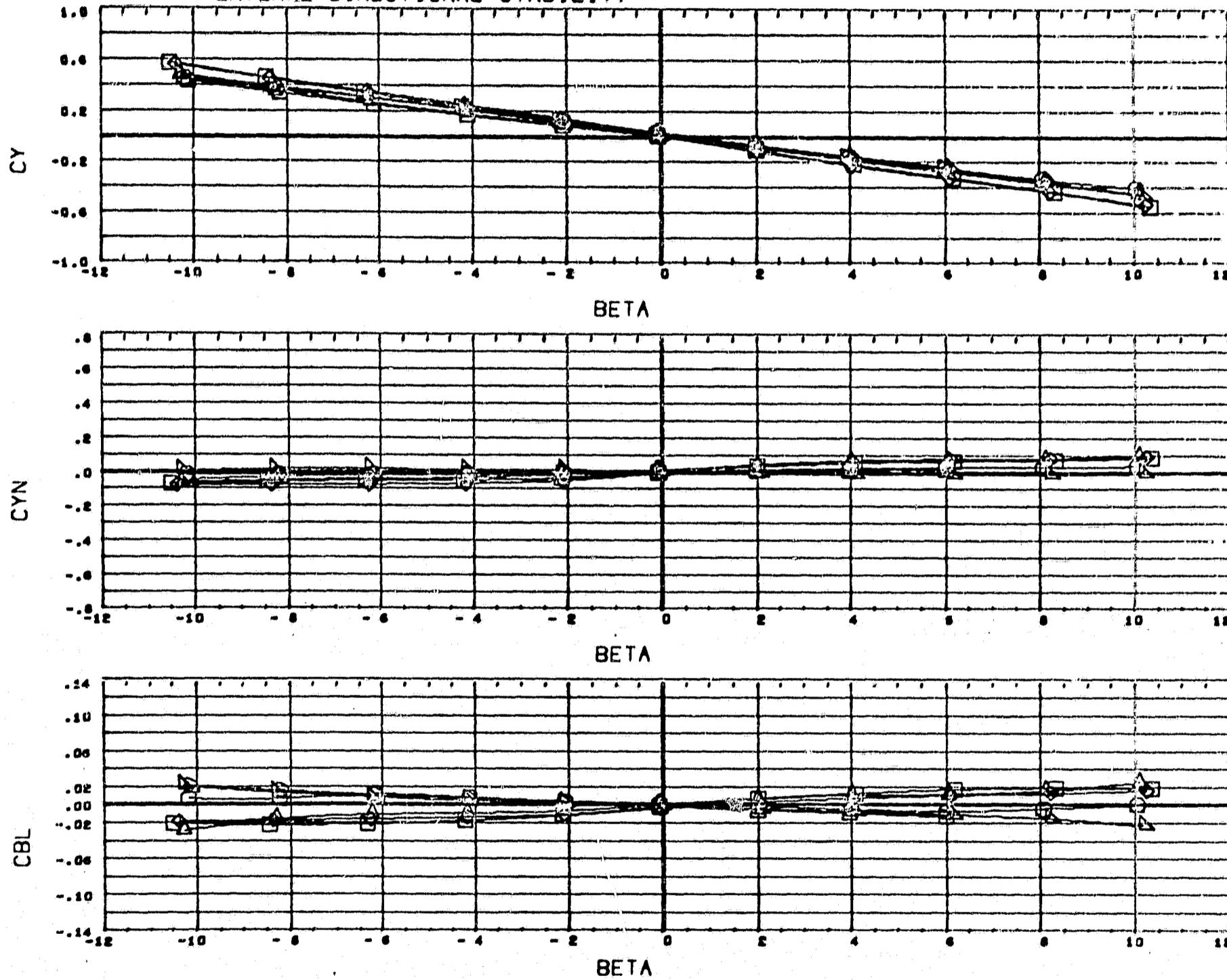
LATERAL-DIRECTIONAL STABILITY



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
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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
	0.500	ALPHA = 6.000 ORBINC = 2.000
	0.901	
	1.102	
	1.460	
	2.740	
	6.960	DATA MIST. CODE 68

REFERENCE INFORMATION		
SREF	5.1478	80. IN
LREF	4.4260	IN.
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XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

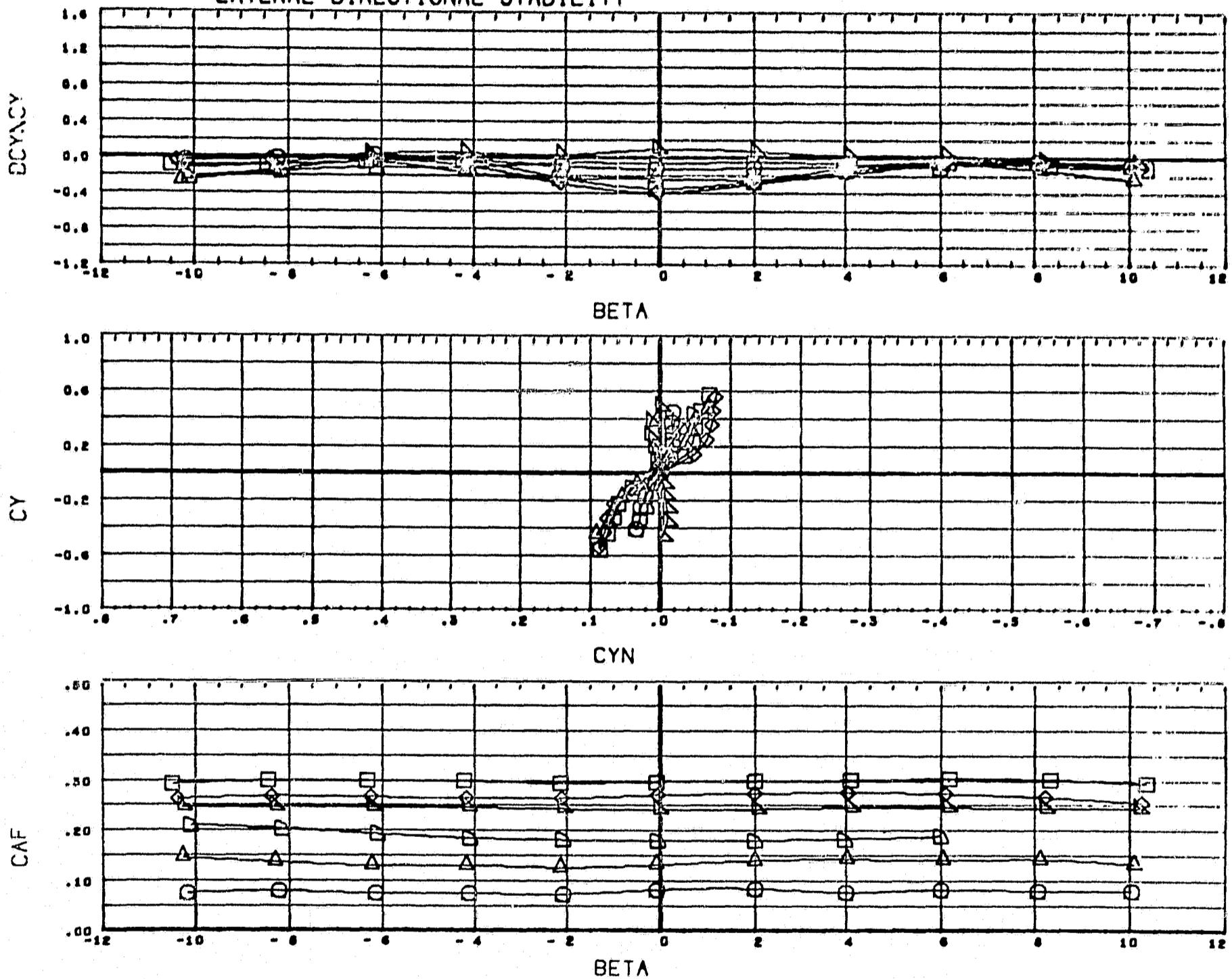
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B501-2V6.2

(DS707G) 10 FEB 72

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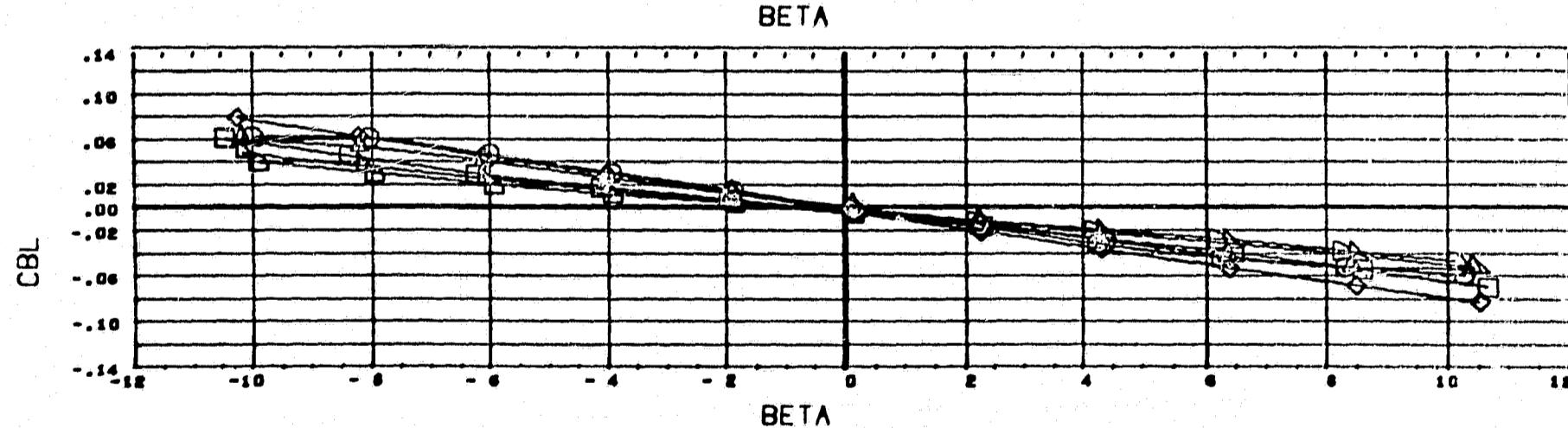
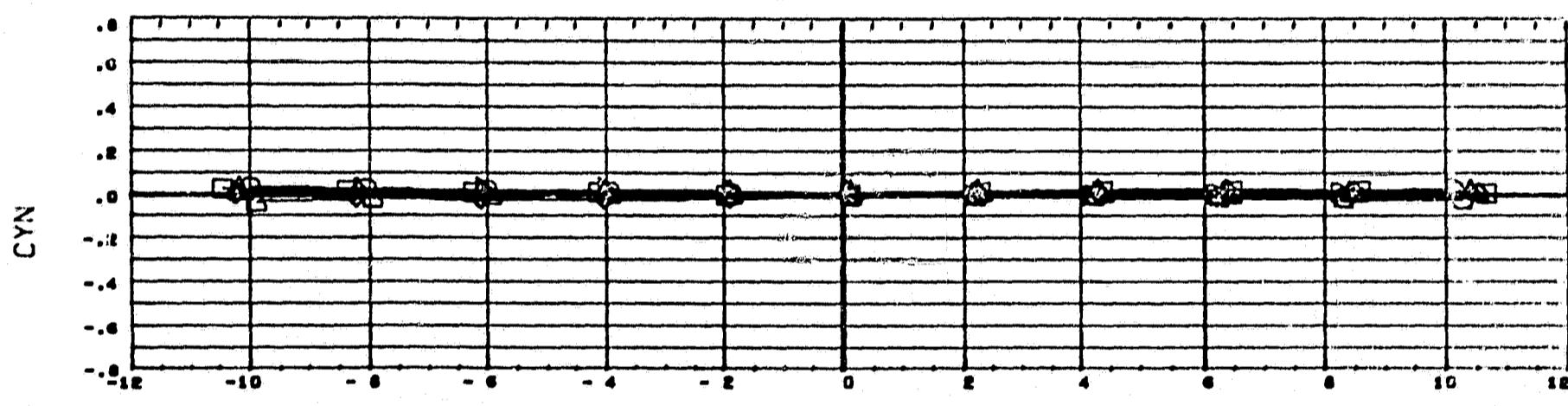
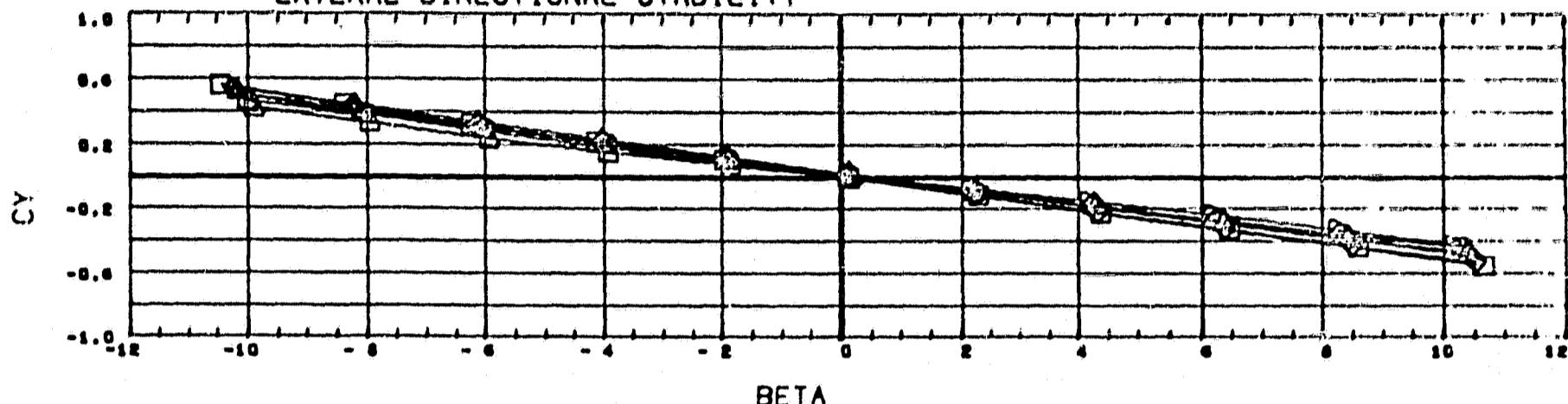
LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
 0.599 ALPHA = 6.000 ORBINC = 2.000
 0.801
 1.102
 1.460
 2.740
 4.960 DATA HIST. CODE GR

REFERENCE INFORMATION
 SREF 5.1476 SQ. IN.
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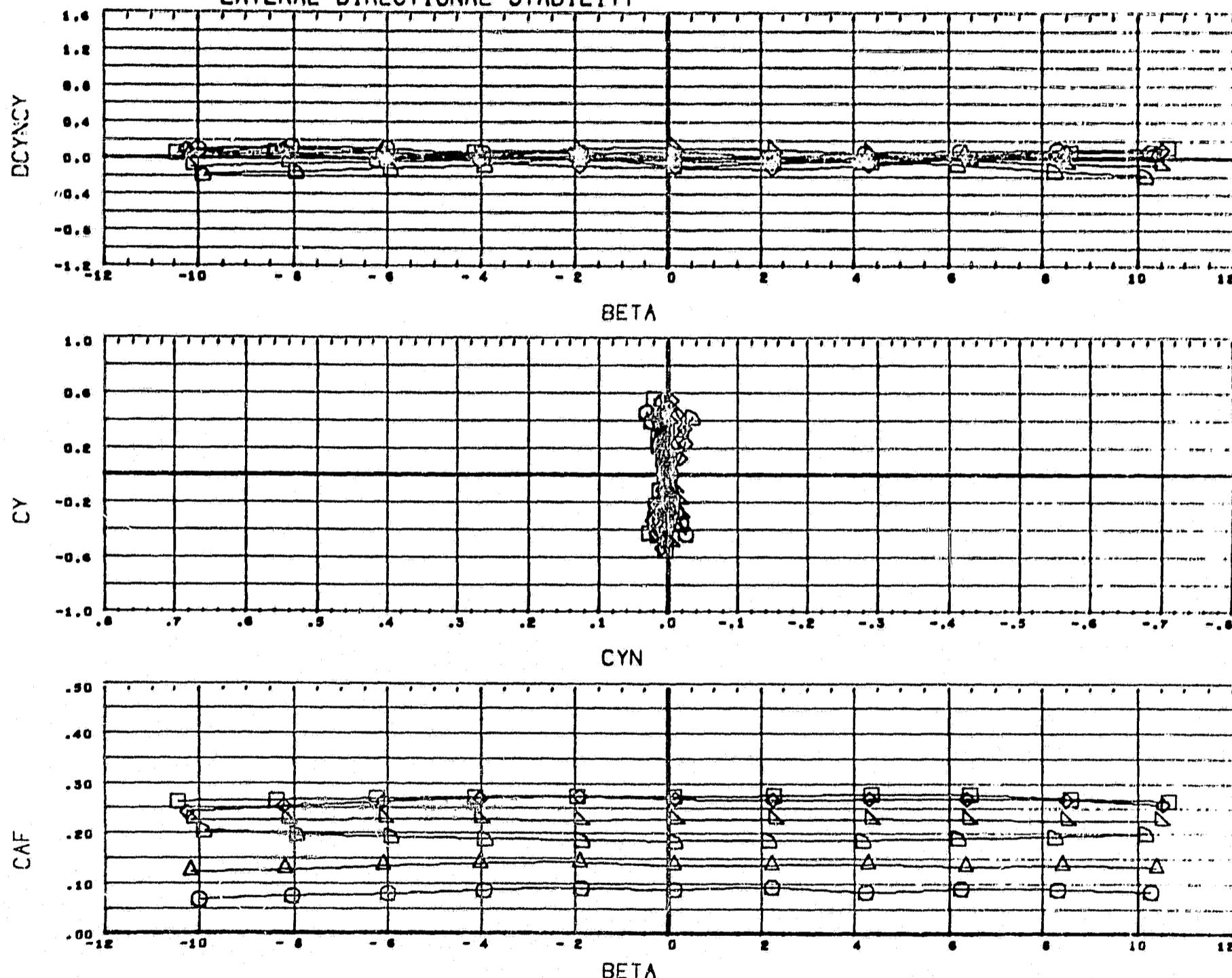
LATERAL-DIRECTIONAL STABILITY



SYMBOL **MACH** **PARAMETRIC VALUES**
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 △ 0.901
 ▲ 1.102
 × 1.464
 ◻ 2.740
 ◇ 4.999 DATA HIST. CODE GR

REFERENCE INFORMATION
 SREF 5.1476 89. IN.
 LREF 4.4260 IN.
 BREF 2.9690 IN.
 XMRP 8.7530 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	
□	1.494	
▽	2.740	
D	4.858	DATA MIST CODE 68

REFERENCE INFORMATION		
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LREF	4.4260	IN.
BREF	2.9690	IN.
XHMRP	5.7530	IN.
YHMRP	0.0000	IN.
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SCALE	0.0034	

M523-MSFC MODEL AX12331-1

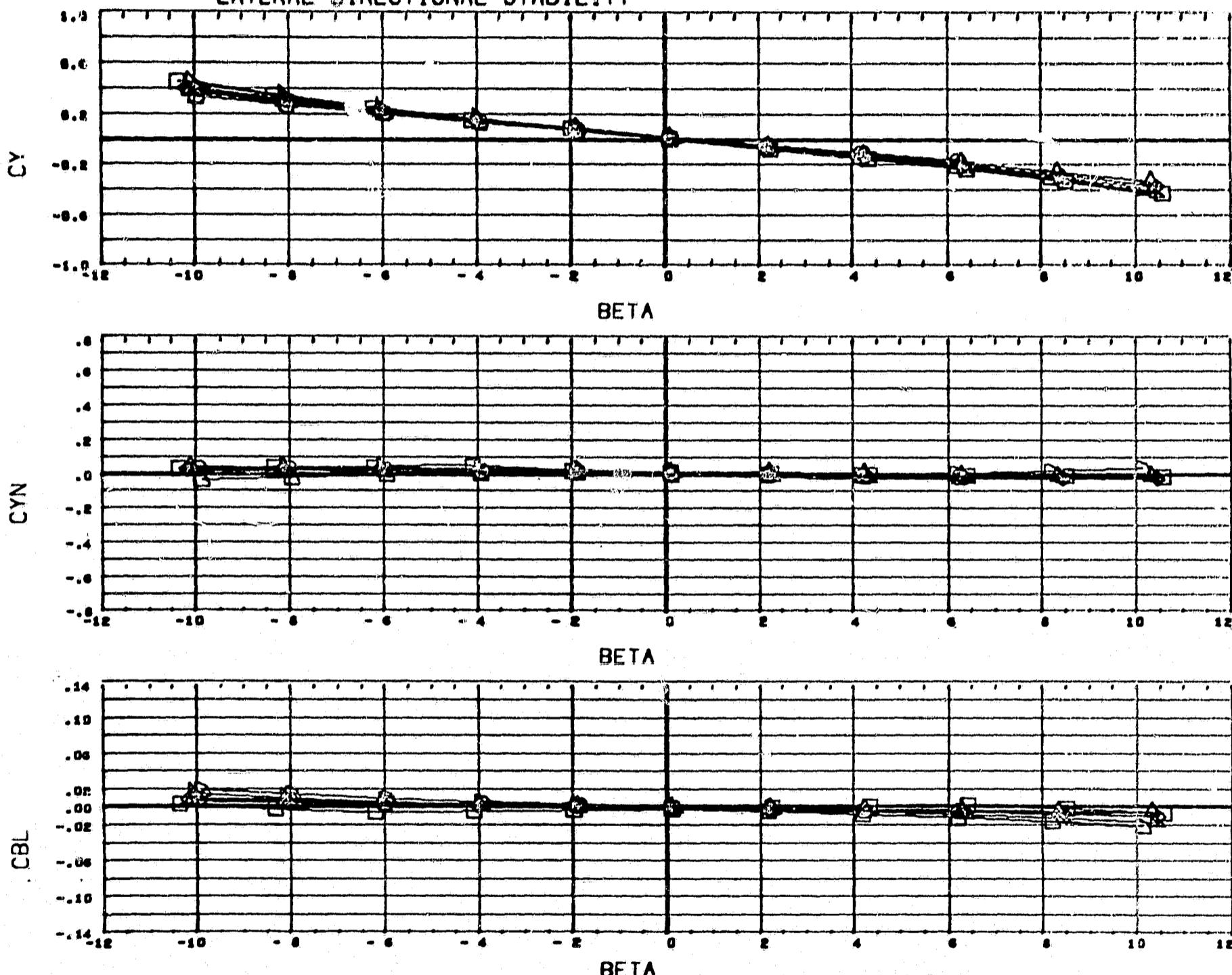
B502-2V7.2

(D5720C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL	MACH	PARAMETRIC VALUES
	0.599	ALPHA 0.000 ORBINC - 2.000
	0.900	
	1.101	
	1.458	
	2.740	
	4.999	DATA MIST. COCE GR

REFERENCE INFORMATION		
BREF	5.1476	IN.
LREF	4.4280	IN.
BREF	2.9690	IN.
XMRP	5.7530	IN.
YMRP	0.0000	IN.
ZMRP	0.0000	IN.
SCALE	0.0034	

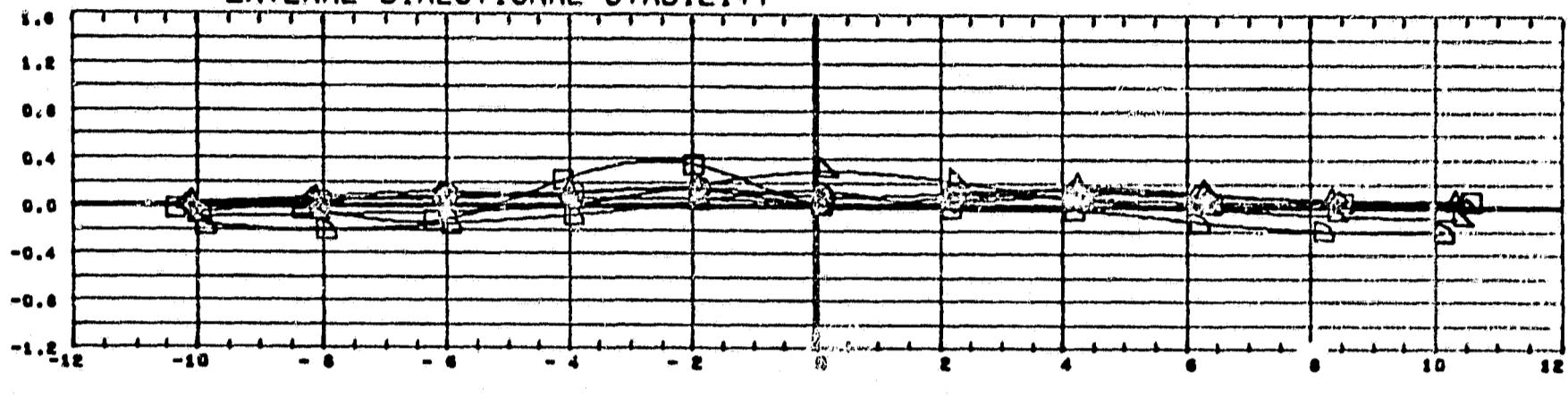
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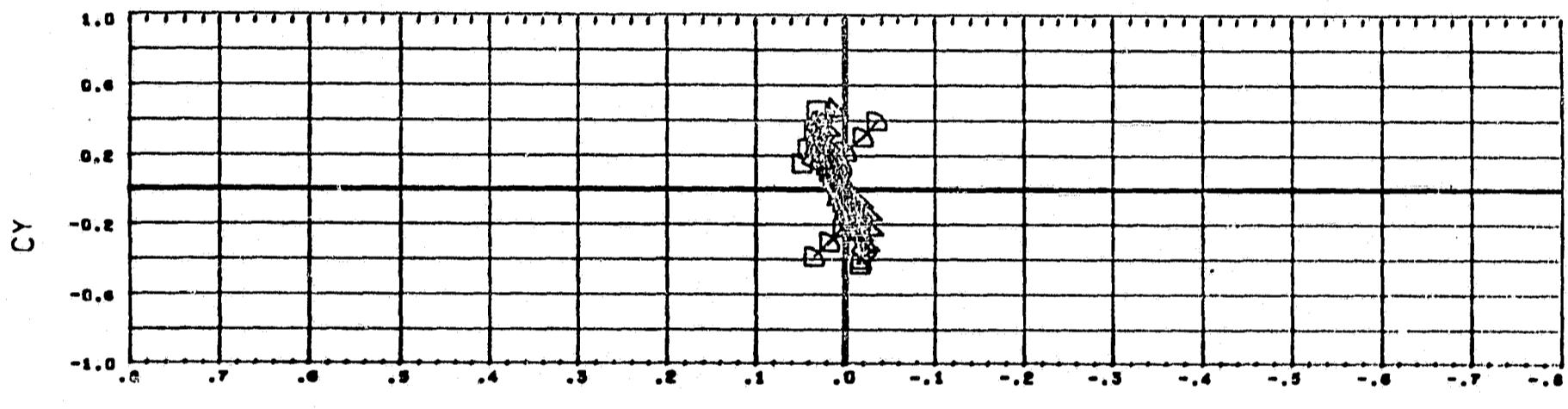
(DS721C) 10 FEB 72

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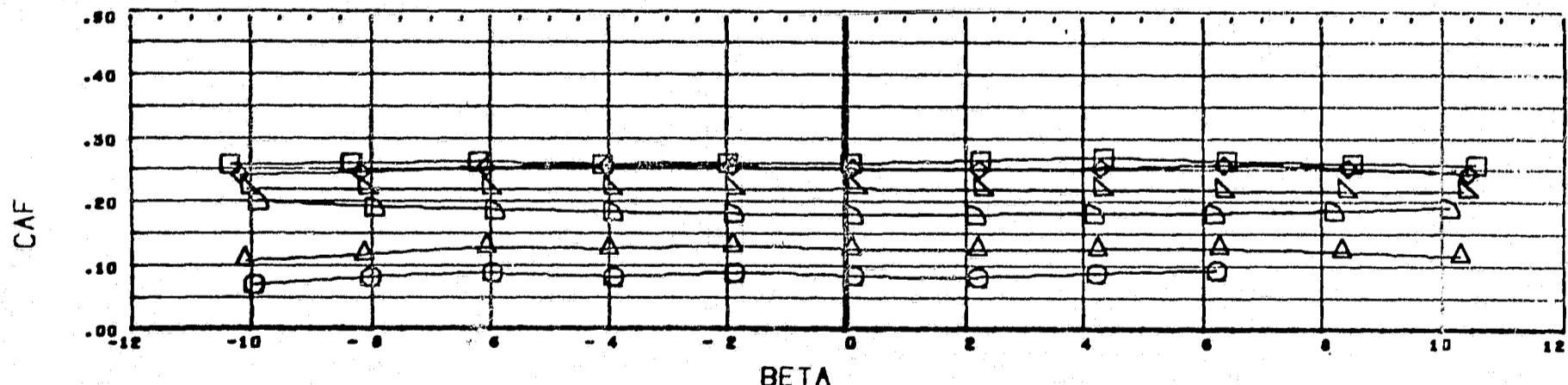
LATERAL-DIRECTIONAL STABILITY



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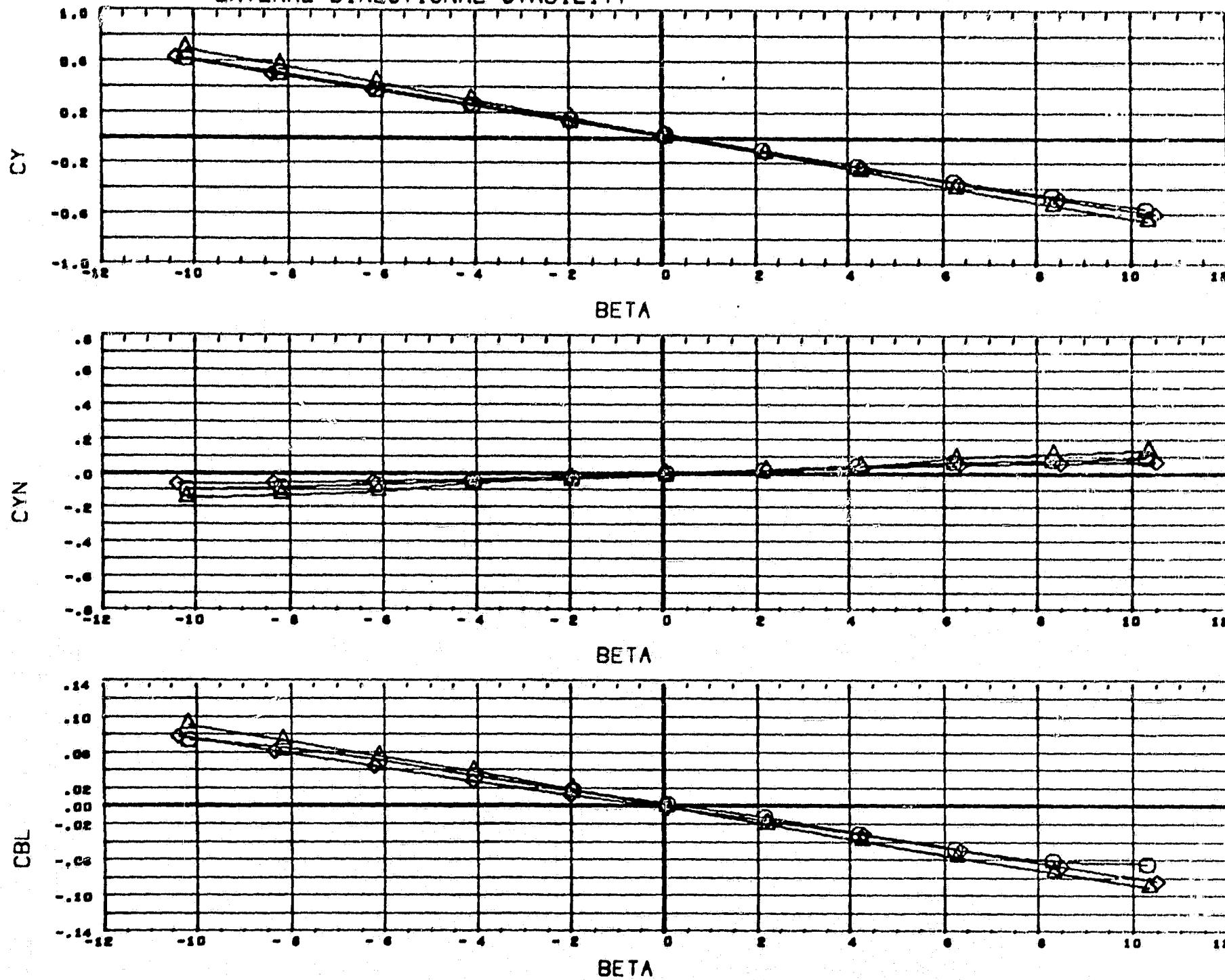


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SYMBOL	MACH	PARAMETRIC VALUES
	0.599	ALPHA 0.000 ORBINC - 2.000
	0.900	
	1.101	
	1.458	
	2.740	
	4.999	DATA HIST. CODE GR

REFERENCE INFORMATION		
BREF	5.1478	50. 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		
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EF	4.4260	IN.
EF	2.9690	IN.
RP	4.3530	IN.
RP	0.0000	IN.
RP	0.0000	IN.
ALE	0.0034	

DATA MIAT. CODE 68

M523-MSFC MODEL AX12331-1

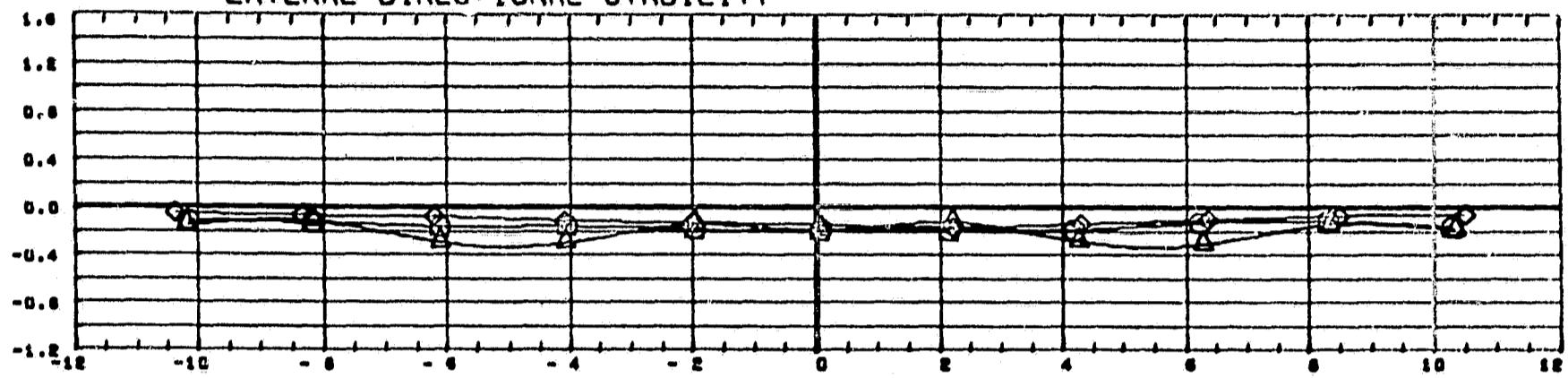
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(D5722C) 10 FEB 72

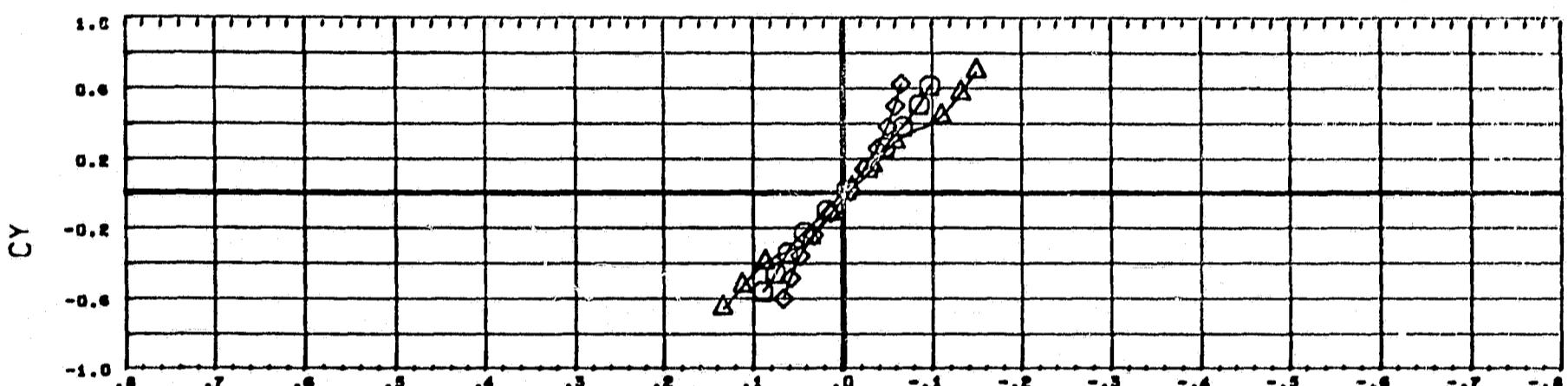
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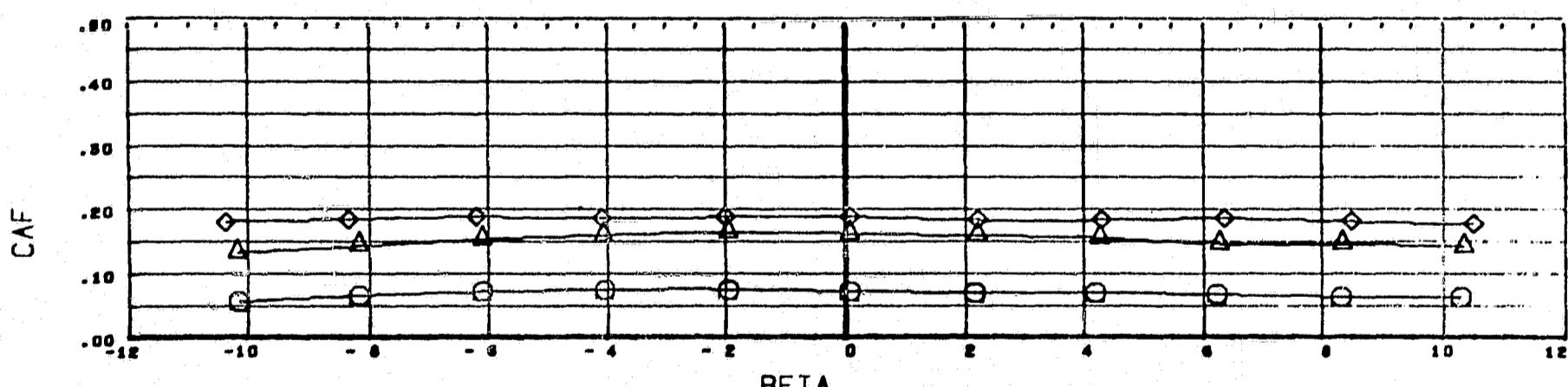
LATERAL-DIRECTIONAL STABILITY



BETA



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BETA

SYMBOL MACH PARAMETRIC VALUES
 O 0.900 ALPHA 0.000 ORBINC - 2.000
 □ 1.101
 △ 1.460

REFERENCE INFORMATION
 BREF 5.1476 SQ. IN.
 LREF 4.4260 IN.
 BREF 2.9690 IN.
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 YMRF 0.0000 IN.
 ZMRF 0.0000 IN.
 SCALE 0.0034

DATA MIST. CODE GR

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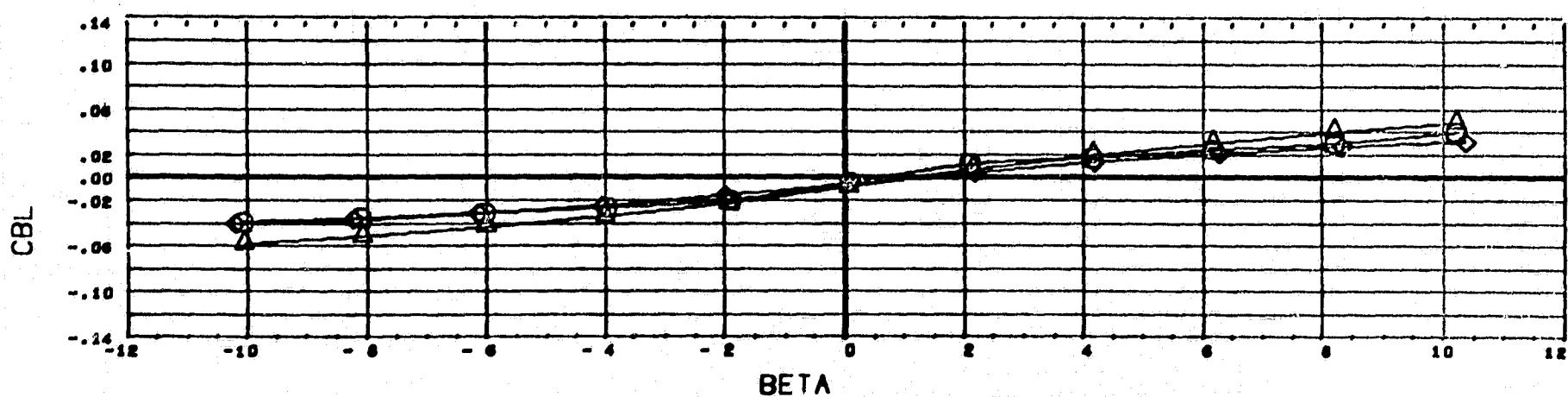
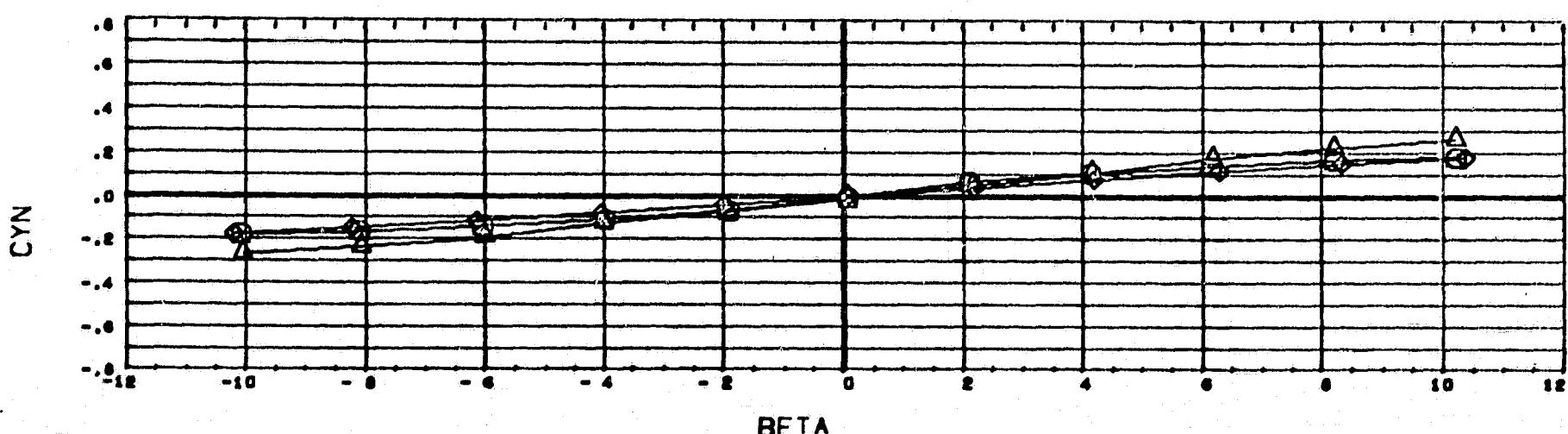
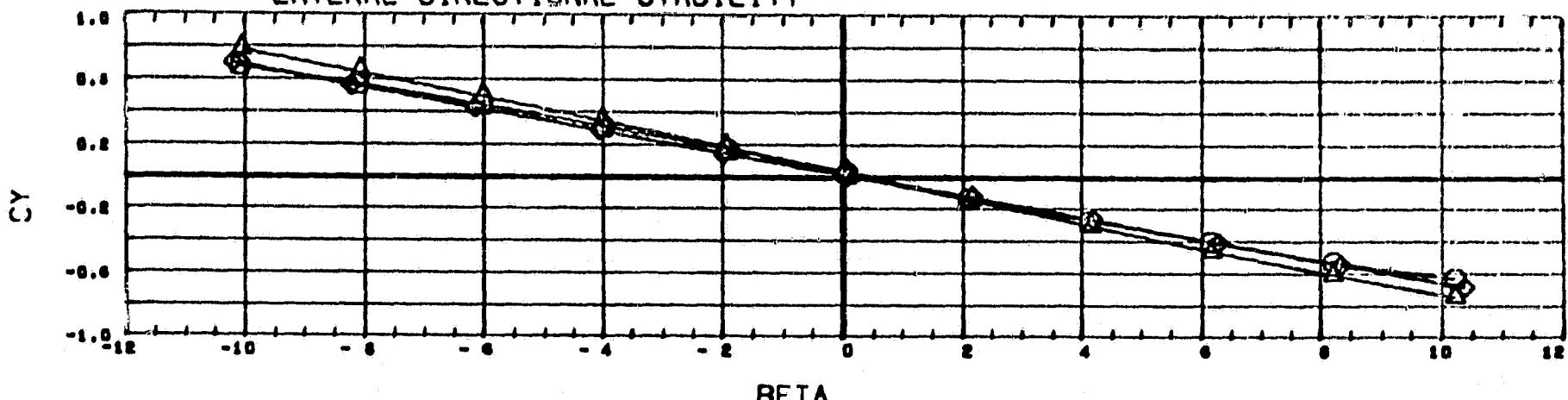
8602-2V3.3

(D5722C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
 0.000 ALPHA 0.000 ORBINC - 2.000
 1.103
 1.460

REFERENCE INFORMATION
 SREF 5.1478 SQ. IN.
 LREF 4.4260 IN.
 BREF 2.9680 IN.
 XHREF 4.3530 IN.
 YHREF 0.0000 IN.
 ZHREF 0.0000 IN.
 SCALE 0.0034

DATA HIST. CODE GR

M523-MSFC MODEL ALEX1233I-1

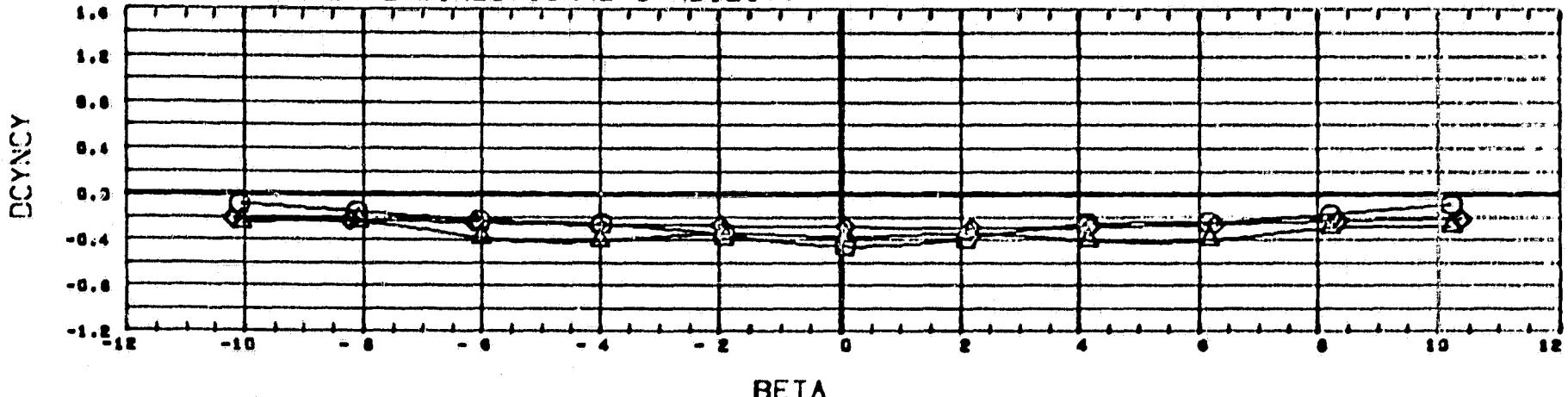
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(D5723C) 10 FEB 72

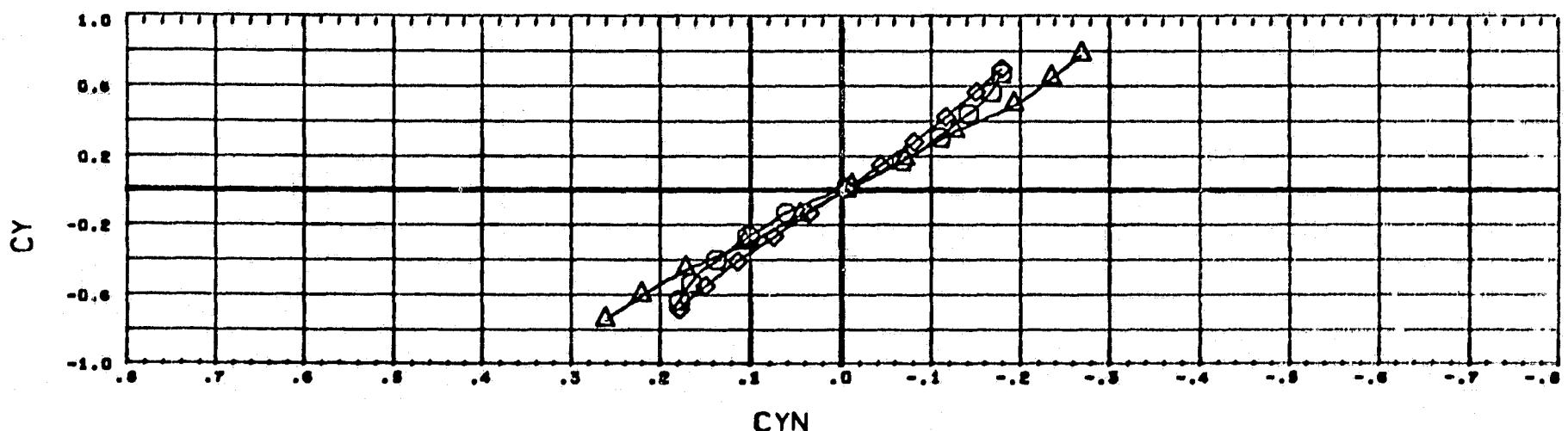
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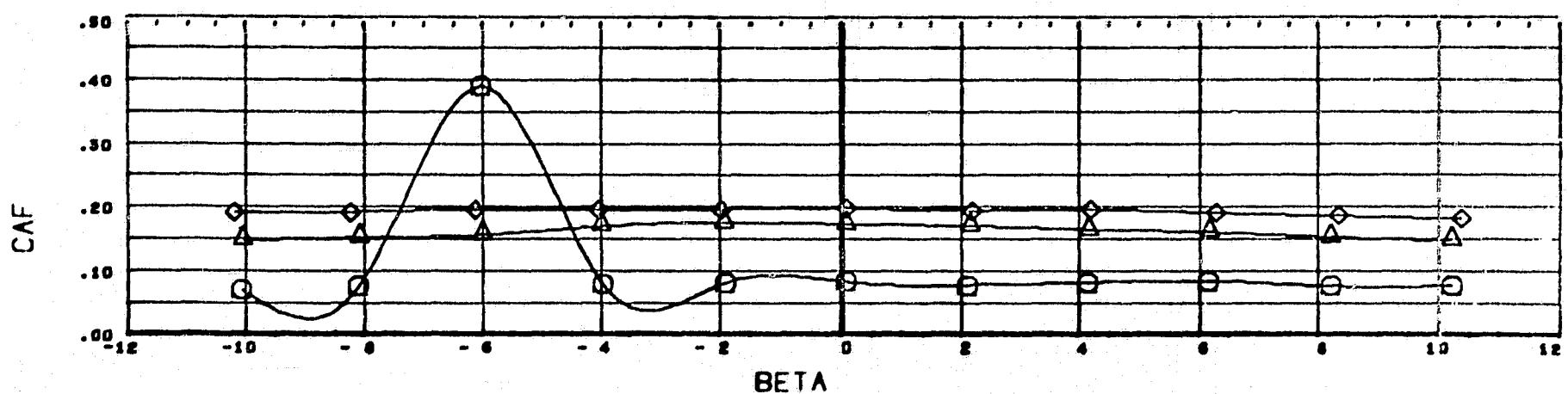
LATERAL-DIRECTIONAL STABILITY



BETA



CYN



BETA

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

REFERENCE INFORMATION
 SREF 5.1478 SQ. IN.
 LREF 4.4260 IN.
 BREF 2.9690 IN.
 XHRP 4.3530 IN.
 YHRP 0.0000 IN.
 ZHRP 0.0000 IN.
 SCALE 0.0034

DATA HIST. CODE GR

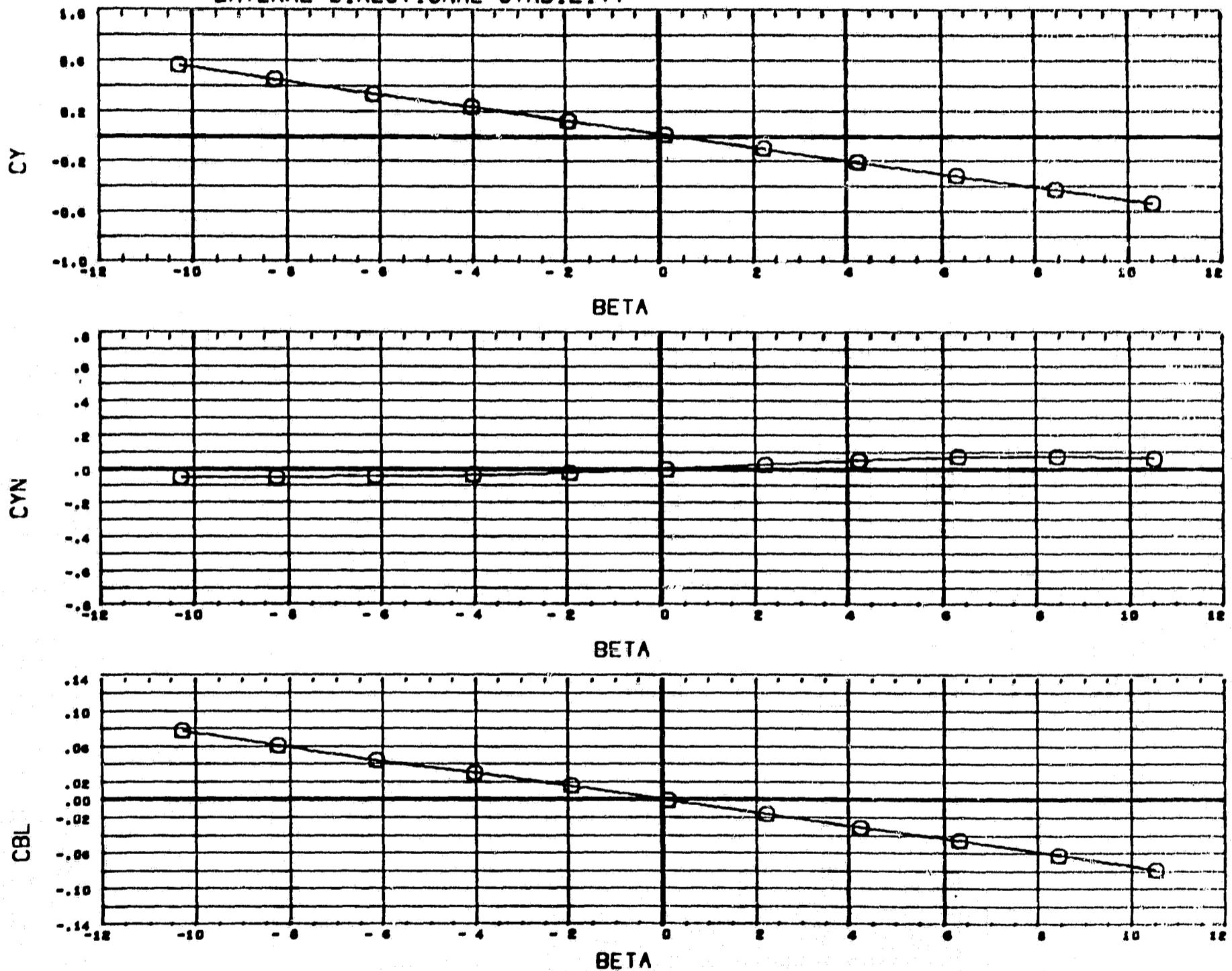
M523-MSFC MODEL AX1233I-1

8602-2V5

(D5723C) 10 FEB 72

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LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
 \circ 1.461 ALPHA 0.000 ORBINC - 2.000

REFERENCE INFORMATION
 SREF 5.1478 86. IN.
 LREF 4.4260 IN.
 BREF 2.8690 IN.
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 ZHLP 0.0000 IN.
 SCALE 0.0034

DATA HIST. CODE GR

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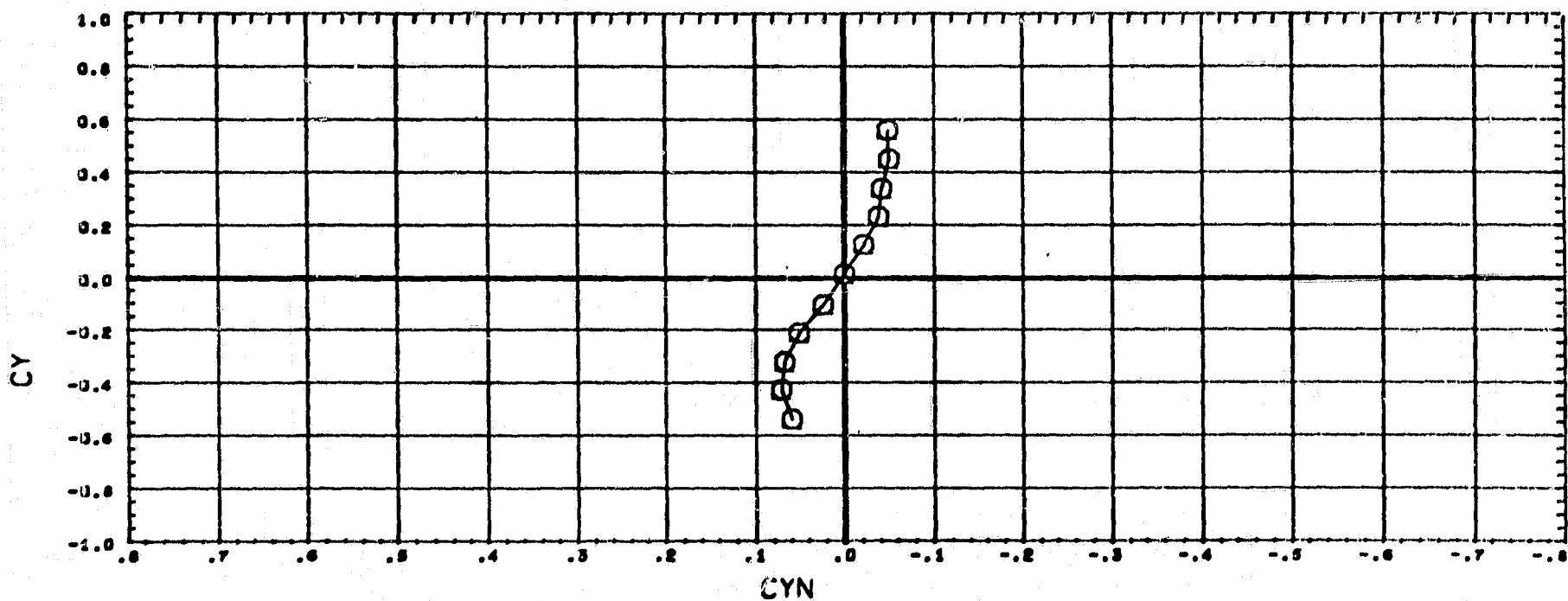
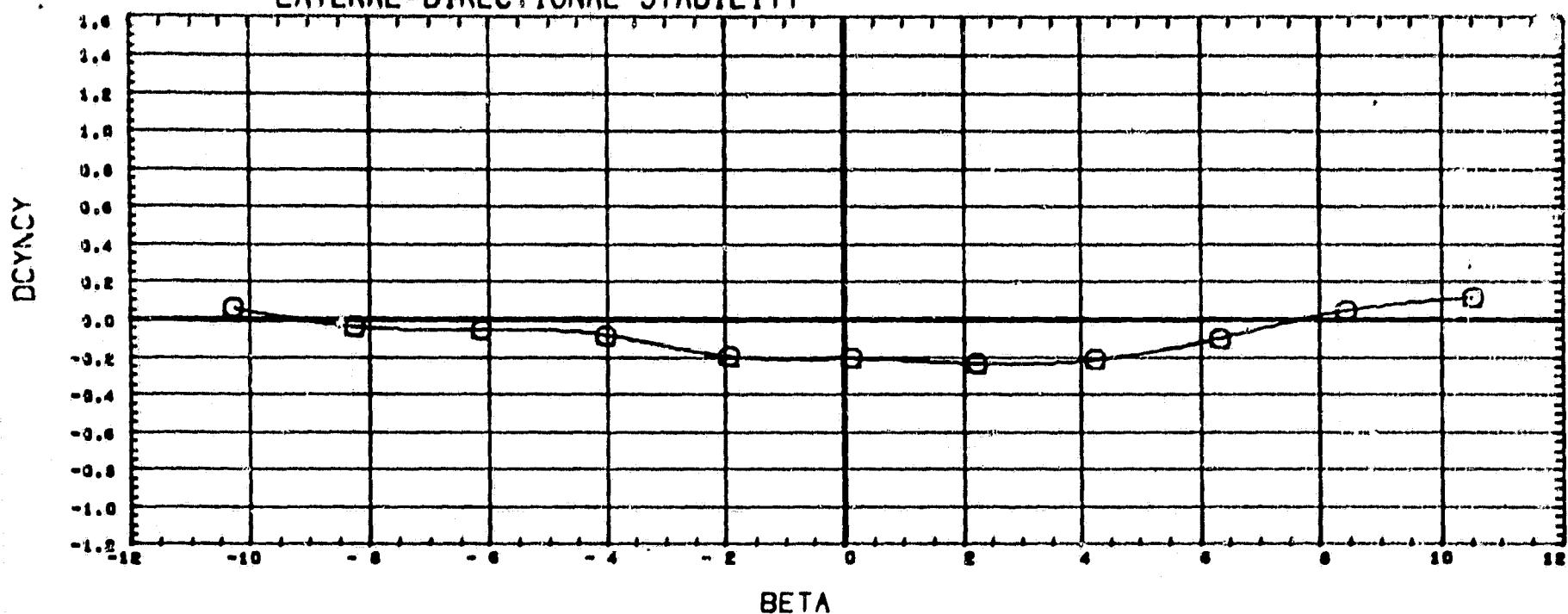
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(D5724C) 10 FEB 72

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84

LATERAL-DIRECTIONAL STABILITY



SYMBOL MACH PARAMETRIC VALUES
 ○ 1.461 ALPHA 0.000 ORBINC - 2.000

REFERENCE INFORMATION
 SREF 5.1470 38. IN.
 LREF 4.4260 IN.
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 ZMRP 0.0000 IN.
 SCALE 0.0034

DATA MIST. CODE GR

M523-MSFC MODELAX1233I-1

B501-2P1

(D5724C) 10 FEB 72

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