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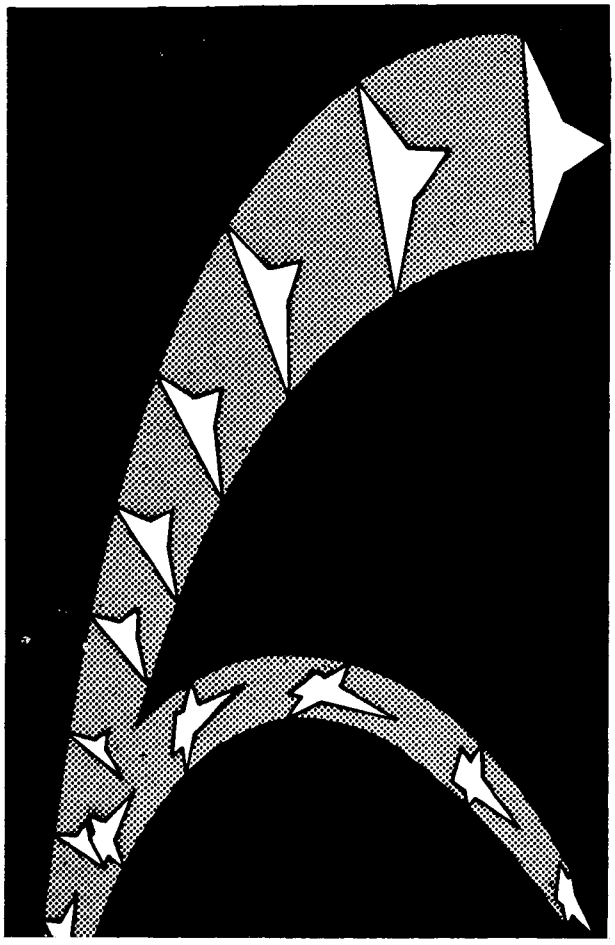

—SPACE SHUTTLE—

AERODYNAMIC CHARACTERISTICS OF THE NORTH AMERICAN ROCKWELL SPACE SHUTTLE DELTA-WING ORIBITER (110C) ALONE AND WITH BELLY-MOUNTED EXTERNAL OXYGEN/HYDROGEN TANKS (M=0.6 TO 5.0)

By

E.C. Allen, NR

... INCH ... TUNNEL

Marshall Spaceflight Center

NASA

SADSAC SPACE SHUTTLE
AEROTHERMODYNAMIC
DATA MANAGEMENT SYSTEM

CONTRACT NAS8-4016
MARSHALL SPACE FLIGHT CENTER

SPACE DIVISION CHRYSLER CORPORATION

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235

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SADSAC/SPACE SHUTTLE

WIND TUNNEL TEST DATA REPORT

CONFIGURATION: NR-110C Orbiter Alone and with Belly Tanks

TEST PURPOSE: Static Stability and Control Investigation

TEST FACILITY: NASA/MSFC 14 x 14 Inch Trisonic Wind Tunnel

TESTING AGENCY: North American Rockwell Corporation

TEST NO. & DATE: MSFC TWT 509; Oct 18-21, 1971

FACILITY COORDINATOR: Jim Weaver, NASA, MSFC

PROJECT ENGINEER(S): E. C. Allen, NR.

DATA MANAGEMENT SERVICES

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CONTRACT NAS 8-4016 AMENDMENT 153 DRL 184-58

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AERODYNAMIC CHARACTERISTICS OF THE NORTH AMERICAN ROCKWELL SPACE SHUTTLE DELTA WING ORBITER (110C) ALONE AND WITH BELLY MOUNTED EXTERNAL OXYGEN/HYDROGEN TANKS (M = 0.6 TO 5.0)

SUMMARY

Experimental aerodynamic investigations were conducted during October 1971 at the MSFC 14 x 14 Inch Trisonic Wind Tunnel on a .0044 scale model of the North American Rockwell Space Shuttle Orbiter, 110C. The test configurations included the orbiter alone and with external oxygen/hydrogen belly tanks. The six component aerodynamic force and moment data obtained cover a Mach number range from 0.6 to 4.96 at angles of attack from -10^{o} to 60^{o} at 0^{o} sideslip angle and -10^{o} to 10^{o} at -6^{o} sideslip angle. Reynolds number per unit length varied somewhat with Mach number but was a nominal 6.8×10^{6} per foot.

NOMENCLATURE

(General)

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

NOMENCLATURE (Continued)

Reference & C. G. Definitions

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

NOMENCLATURE (Continued)

Axis System General

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

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

NOMENCLATURE (Continued)

Body & Stability Axis System

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

NOMENCLATURE (Continued)

Surface Definitions

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

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

CONFIGURATIONS INVESTIGATED

0.0044 scale model components of the NR110C delta wing orbiter tested included:

B_{12} - basic orbiter fuselage

B_{13} - same fuselage as B_{12} except nose is drooped

B_{14} - same fuselage as B_{12} except nose is uniform and has no canopy

K_3 - bubble shaped pilots enclosure (canopy) used with B_{14}

W_{26} - delta wing with 5^o twist and rounded wing tips

E_{16} - elevons used with wing W_{26}

V_{36} - centerline mounted vertical tail

T_2 - oxygen/hydrogen tanks

The Data Set Collations, Table I, show the various combinations of the above components tested. Pertinent dimensional information for the components is given in Table III, Model Component Descriptions Sheets, while the figures show the overall configuration lines.

TEST FACILITY DESCRIPTION

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

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

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

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

REDUCTION OF DATA

The aerodynamic loads on the model were recorded by a six component internal strain gage balance. The balance measured loads were corrected for tare loads and reduced to coefficient form using the following reference dimensions:

S_{REF} = wing planform area = 9.442 sq. inches

$\ell_{REF} = \bar{c}$ = wing mean aerodynamic chord = 2.693 inches

b_{REF} = wing span = 4.678 inches

Aerodynamic moments are referenced to a c.g. location at fuselage station 3.608 on waterline -0.096, see Figure D.

Static pressure was measured at two locations on the orbiter base and at one point in the sting cavity regions. These pressures were utilized to correct the balance measured axial force to a condition corresponding to free-stream pressure acting on the base and cavity area. The equations utilized for this correction were:

$$C_{AF} = C_A - (C_{A_B} - C_{AC})$$

where

$$C_{A_B} = -\left[\frac{(0.5)\ (P_{B_1} + P_{B_2}) - P_\infty}{q_\infty}\right]\ (A_B/S_{REF})$$

and

$$C_{AC} = -\left[(P_C - P_\infty)/q_\infty\right]\ (A_C/S_{REF})$$

The areas affected were:

A_B = orbiter base area = 0.497 sq. inches

A_C = balance cavity area = 0.503 sq. inches

The center of pressure locations on the plots are shown as a percent of fuselage reference length and where computed by the equation.

$$XCP/L = XCG/L - (CLM/CN)\ (\bar{C}/L)$$

where

XCP/L = center of pressure location as % body length
XCG/L = reference center of gravity location as % body length
CLM = aerodynamic pitching moment coefficient
CN = aerodynamic normal force coefficient
$\bar{C}$ = mean aerodynamic chord
L = reference body length = 5.9048 inches

TABULATED DATA LISTING

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

(a) a brief summary list of all data sets containing the identifier, the descriptor, and the resident dependent variables.

(b) a full list of all data sets containing all resident or selected aerodynamic coefficients of the data sets as well as the above mentioned information.

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

NASA AMES	Mr. V. Stevens
NASA MSFC	Mr. J. Weaver
NR	Mr. C. Leef

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

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

(504) 255-2304

TABLE I. TEST TWT-509 DATA SET COLLATION SHEET

Force- 110C ORBITER ALONE AND ORBITER + BELLY TANK,
0.0044-SCALE

☐ PRETEST
☒ POSTTEST

DATA SET IDENTIFIER	CONFIGURATION	SCHED. α	SCHED. β	CONTROL DEFLECTION				NO. of RUNS	MACH NUMBERS 0.6	0.9	1.2	1.96	2.99	4.96
RS101A	B12W26E16V36	A	0					6	020/0	019/0	019/0	027/0	003/0	004/0
01B		B						6	015/0	016/0	017/0	038/0	014/0	012/0
01C		C						2					048/0	047/0
02A		A	-6					6	061/0	062/0	063/0	054/0	049/0	050/0
03A	B13W26E16V36	A	0					6	032/0	031/0	030/0	041/0	006/0	005/0
03B		B						6	027/0	028/0	029/0	042/0	007/0	008/0
03C		C						2					044/0	043/0
04A	B14k3W26E16V36	A						6	021/0	022/0	023/0	040/0	011/0	012/0
04B		B						6	026/0	025/0	024/0	039/0	010/0	009/0
04C		C						2					045/0	044/0
05A		A	-6					6	060/0	059/0	058/0	057/0	052/0	051/0
06A	B12W26E16V36+T2							6	066/0	065/0	064/0	055/0	053/0	054/0
07A			0					6	033/0	034/0	035/0	036/0	002/0	001/0

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

L/D ICLM KY KD KDB CSL CLN CL CPBI CN 1 0

IDPVAR(1) | IDPVAR(2) | NDV

COEFFICIENTS:

α or β SCHEDULES

αA = -10, -8, -6, -4, -2, 0, 2, 4, 6, 8, 10

αB = 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30

αC = 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60

TABLE II

TEST CONDITIONS
TEST TWT-509

MACH NUMBER	REYNOLDS NUMBER per unit length	DYNAMIC PRESSURE (pounds/sq. inch)	STAGNATION TEMPERATURE (degrees Fahrenheit)
0.6	6.5×10^6	5.58	97
0.9	6.9×10^6	7.96	95
1.2	6.6×10^6	8.98	97
1.96	6.8×10^6	9.90	96
2.99	4.4×10^6	4.95	98
4.96	6.1×10^6	3.40	99

BALANCE UTILIZED: Task 0.7-inch MK 1-A Six Component

	CAPACITY:	ACCURACY:	COEFFICIENT TOLERANCE:
NF	400 lbs		0.3%
SF	100 lbs		0.3%
AF	15 lbs		0.3%
PM			
YM			
RM	70 in lbs		0.3%

COMMENTS:

No satisfactory method is known for determining the absolute accuracy of the final data coefficients.

TABLE III. MODEL COMPONENT DESCRIPTIONS

MODEL COMPONENT: BODY .. B12

GENERAL DESCRIPTION: Basic fuselage of delta wing orbiter per NR lines dwg. 9992-110C hybrid configuration. Symmetrical nose pilots enclosure is included.

Model Scale = 0.0044

DRAWING NUMBER: S-980-10,-11,-14, (-26 or -27), (-28 or -29)

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Length, in.	1355.00	5.955
Max. Width, in.	277.27	1.220
Max. Depth,	231.82	1.020
Fineness Ratio	4.898	4.898
Area, ft^2		
Max. Cross-Sectional	416.41	0.00806
Planform	DNA	DNA
Wetted	DNA	DNA
Base	DNA	DNA

TABLE III. (con't)

MODEL COMPONENT: BODY - B13

GENERAL DESCRIPTION: Basic fuselage of delta wing orbiter per NR lines Dwg. 9992-110C with 110C2 nose. Same as B12 except nose is drooped. Pilots enclosure is included.

Model Scale = 0.0044

DRAWING NUMBER: S-980-11,-15,-17,(-26 or -27), (-28 or -29), -38

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Length, in.	1355.0	5.955
Max. Width, in.	277.27	1.220
Max. Depth, in.	231.82	1.020
Fineness Ratio	4.898	4.898
Area, ft^2		
Max. Cross-Sectional	416.41	0.00806
Planform	DNA	DNA
Wetted	DNA	DNA
Base	DNA	DNA

TABLE III. (con't)

MODEL COMPONENT: BODY - B14

GENERAL DESCRIPTION: Basic fuselage of delta wing orbiter per NR lines Dwg. 9992-110C; approximating NASA 040A configuration. Same as B12 except nose is uniform with no canopy.

Model Scale = 0.0044

DRAWING NUMBER: S-980-10,-11,-14, (-26 or -27), (-28 or -29), -36

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Length, in.	1355.0	5.955
Max. Width, in.	277.27	1.220
Max. Depth, in.	231.82	1.020
Fineness Ratio,	4.898	4.898
Area, ft^2		
Max. Cross-Sectional	416.41	0.00806
Planform	DNA	DNA
Wetted	DNA	DNA
Base	DNA	DNA

TABLE III. (con't)

MODEL COMPONENT: BODY - CANOPY - K3

GENERAL DESCRIPTION: Bubble shaped pilots enclosure used with delta wing orbiter Body B14. Canopy extends above fuselage upper mold line and is located between Fus. Sta. 238.64 and 368.18. Follows NASA 040A Dwg. Model Scale = 0.0044

DRAWING NUMBER: S-980-37

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Length		
Max. Width		
Max. Depth		
Fineness Ratio		
Area		
Max. Cross-Sectional		
Planform		
Wetted		
Base		

TABLE III. (con't)

MODEL COMPONENT: WING - W26

GENERAL DESCRIPTION: Delta wing with -5° twist and rounded wing tips. Follows NR lines Dwg. 9992-110B.

Model Scale = 0.0044

DRAWING NUMBER: S-980-2,-3,-4,-7,-13

DIMENSIONS:	**FULL-SCALE**	**MODEL SCALE**
TOTAL DATA		
Area, ft^2		
Planform	3753.00	0.07266
Wetted	-	-
Span (equivalent), in.	972.44	4.279
Aspect Ratio	1.737	1.737
Rate of Taper	1.719	1.719
Taper Ratio	0.138	0.138
Diehedral Angle, degrees	7.000	7.000
Incidence Angle, degrees	0.000	0.000
Aerodynamic Twist, degrees (about T.E.)	-5.000	-5.000
Incidence, Root(B.P. 120.00)	0.000	0.000
Incidence, Tip (B.P. 493.50)	-5.000	-5.000
Sweep Back Angles, degrees		
Leading Edge	60.000	60.000
Trailing Edge	0.000	0.000
0.25 Element Line	52.410	52.410
Chords: in.		
Root (Wing Sta. 0.0)	976.84	4.298
Tip, (equivalent)(W.S. 489.87)	134.72	0.593
MAC (W.S. 183.08)	662.11	2.913
Fus. Sta. of .25 MAC	862.01	3.793
W.P. of .25 MAC	-86.42	-0.380
B.L. of .25 MAC	181.72	0.800
Airfoil Section		
Root (W.S. 120.90)	NACA 0006-64	
Tip (W.S. 497.20)	NACA 0009-64	
EXPOSED DATA		
Area, ft^2	2378.	0.04604
Span, (equivalent), in.	747.24	3.288
Aspect Ratio	1.618	1.618
Taper Ratio	0.172	0.172
Chords: in.		
Root (Equiv.)(W.S. 113.44)	781.82	3.440
Tip (Equiv.)(W.S. 489.87)	134.72	0.593
MAC (W.S. 257.36)	534.41	2.351
Fus. Sta. of .25 MAC	957.78	4.214
W.P. of .25 MAC	-77.37	-0.340
B.L. of .25 MAC	255.44	1.124
Leading Edge Cuff		
Planform Area, ft^2	43.65	0.00085
L.E. Intersects Fus. ML at Sta. in.	420.45	1.850
L.E. Intersects Wing L.E. at Sta., in.	715.91	3.150

TABLE III. (con't)

MODEL COMPONENT: ELEVON - E16 (Data for one of two sides)

GENERAL DESCRIPTION: Full-span, constant chord elevon located on Delta Wing W26.

Model Scale = 0.0044

DRAWING NUMBER: S-980-30, -31 or -32, -33

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Area (True), ft^2	330.87	0.00641
Span (equivalent), in.	377.73	1.662
Inb'd equivalent chord (W.S. 114.85)	126.14	0.555
Outb'd equivalent chord (W.S. 492.59)	126.14	0.555
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	0.162	0.162
At Outb'd equiv. chord	0.970	0.970
Sweep Back Angles, degrees		
Leading Edge	0.000	0.000
Tailing Edge	0.000	0.000
Hingeline	0.000	0.000
Area Moment (Normal to hinge line) (Product of area and mean chord)	3480.26	0.00030

TABLE III. (con't)

MODEL COMPONENT: VERTICAL TAIL - V36

GENERAL DESCRIPTION: Centerline vertical on delta wing configuration with 10° wedge airfoil, leading edge radius and blunt trailing edge. Follows NR lines Dwg. 9992-110C.

Model Scale = 0.0044

DRAWING NUMBER: S-980-12

DIMENSIONS:	**FULL-SCALE**	**MODEL SCALE**
TOTAL DATA		
Area	323.95	0.00627
*Void (INCLUDED ABOVE)	0.46	0.00001
Blanketed	0.00	0.00000
Span (equivalent), in.	251.51	1.107
Aspect Ratio	1.356	1.356
Rate of Taper	0.718	0.718
Taper Ratio	0.345	0.345
Diehedral Angle, degrees	-	-
Incidence Angle, degrees	-	-
Aerodynamic Twist, degrees	-	-
Toe-In Angle	0.000	0.000
Cant Angle	0.000	0.000
Sweep Back Angles, degrees		
Leading Edge	50.000	50.000
Trailing Edge	25.350	25.350
0.25 Element Line	45.349	45.349
Chords: in.		
Root (W.P. 113.61)	275.77	1.213
Tip, (equivalent)(W.P. 365.12)	95.19	0.419
MAC (W.P. 218.96)	200.13	0.881
Fus. Sta. of .25 MAC	1232.28	5.422
W.P. of .25 MAC	218.96	0.963
B.L. of .25 MAC	0.00	0.000
Airfoil Section 5° half angle wedge with blunt T.E.		
L.E.R.(W.P. 115.00), % chord	1.572	1.572
L.E.R.(W.P. 282.89), % chord	1.654	1.654
EXPOSED DATA		
Area		
Span, (equivalent)		
Aspect Ratio		
Taper Ratio		
Chords		
Root		
Tip		
MAC		
Fus. Sta. of .25 MAC		
W.P. of .25 MAC		
B.L. of .25 MAC		

*This area is the void area located at the lower aft portion of the surface.

TABLE III. (concl'd)

MODEL COMPONENT: BODY - TANK - T2

GENERAL DESCRIPTION: Body of revolution with 20° half angle nose cone attached to lower surface of Body B12 by means of a hex shaped pylon. Pylon is included.

Model Scale = 0.0044

DRAWING NUMBER: S-980-34, -39

DIMENSIONS: (Tank)	FULL-SCALE	MODEL SCALE
Length, in.	1742.58	7.667
Max. Width, in.	275.45	1.212
Max. Depth, in.	275.45	1.212
Fineness Ratio	6.326	6.326
Area, ft^2		
Max. Cross-Sectional	413.84	0.00801
Nose Cone L.E.R., in.	15.91	0.070
Wetted	DNA	DNA
Base	DNA	DNA
PYLON		
Length, in	740.91	3.260
Width, in	90.91	0.400
Section, % Hex	13.497 - 86.503	

TABLE IV. INDEX OF MODEL FIGURES

TABLE V. INDEX OF DATA FIGURES

TITLE	PLOTTED COEFFICIENT SCHEDULE	CONDITIONS VARYING	PAGES
Effect of Body Nose Shape on Basic Longitudinal Characteristics	A	Configuration and Mach	1-48
Effect of Body Nose Shape on Design Functions at Maximum L/D	B	Configuration	49-51
Effect of Belly Tanks on Basic Longitudinal Characteristics	A	Configuration and Mach	52-99
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Effect of Sideslip on Basic Lateral-Directional Characteristics	C	Mach, Beta	103-120
Effect of Sideslip on Basic Lateral-Directional Characteristics	D	Mach, Beta	121-132
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Effect of Sideslip on Basic Lateral-Directional Characteristics	D	Mach, Beta	151-162
Effect of Sideslip on Basic Lateral-Directional Characteristics	C	Mach, Beta	163-180
Effect of Sideslip on Basic Lateral-Directional Characteristics	D	Mach, Beta	181-192

PLOTTED COEFFICIENTS SCHEDULE:

(A) CN, CAF, CAB, CIM, CL, CDF, L/DF, XCP/L vs. ALPHA

(B) L/DFMX, ALLDFX, CLLDFX vs. MACH

(C) CY, CYN, CBL vs. ALPHA

(D) CLN, CSL vs. ALPHA

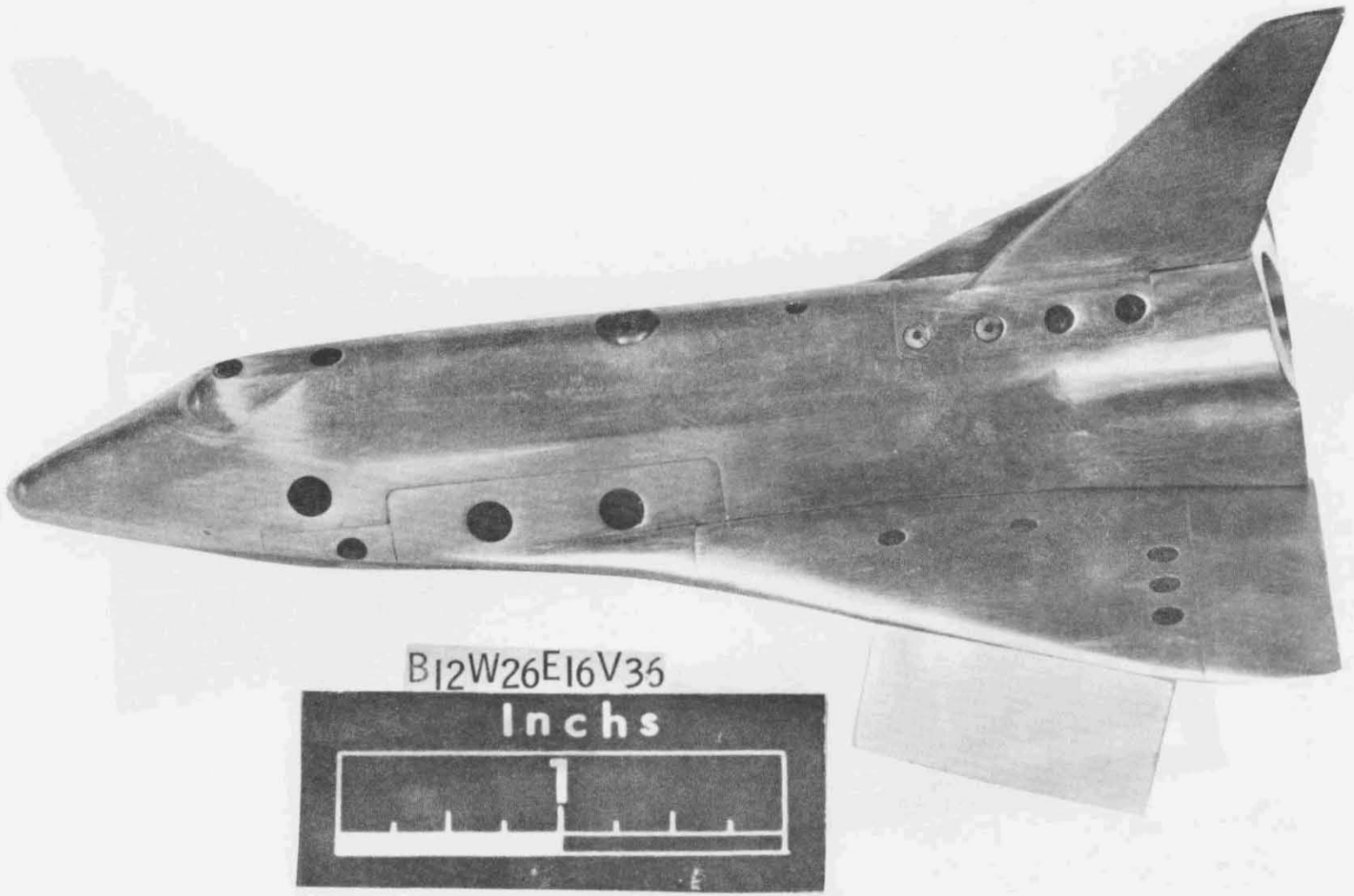


FIGURE A. PHOTOGRAPH OF CONFIGURATION $B_{12}W_{26}E_{16}V_{36}$

FIGURE B. PHOTOGRAPH OF CONFIGURATION $B_{14}K_3W_{26}E_{16}V_{36}$

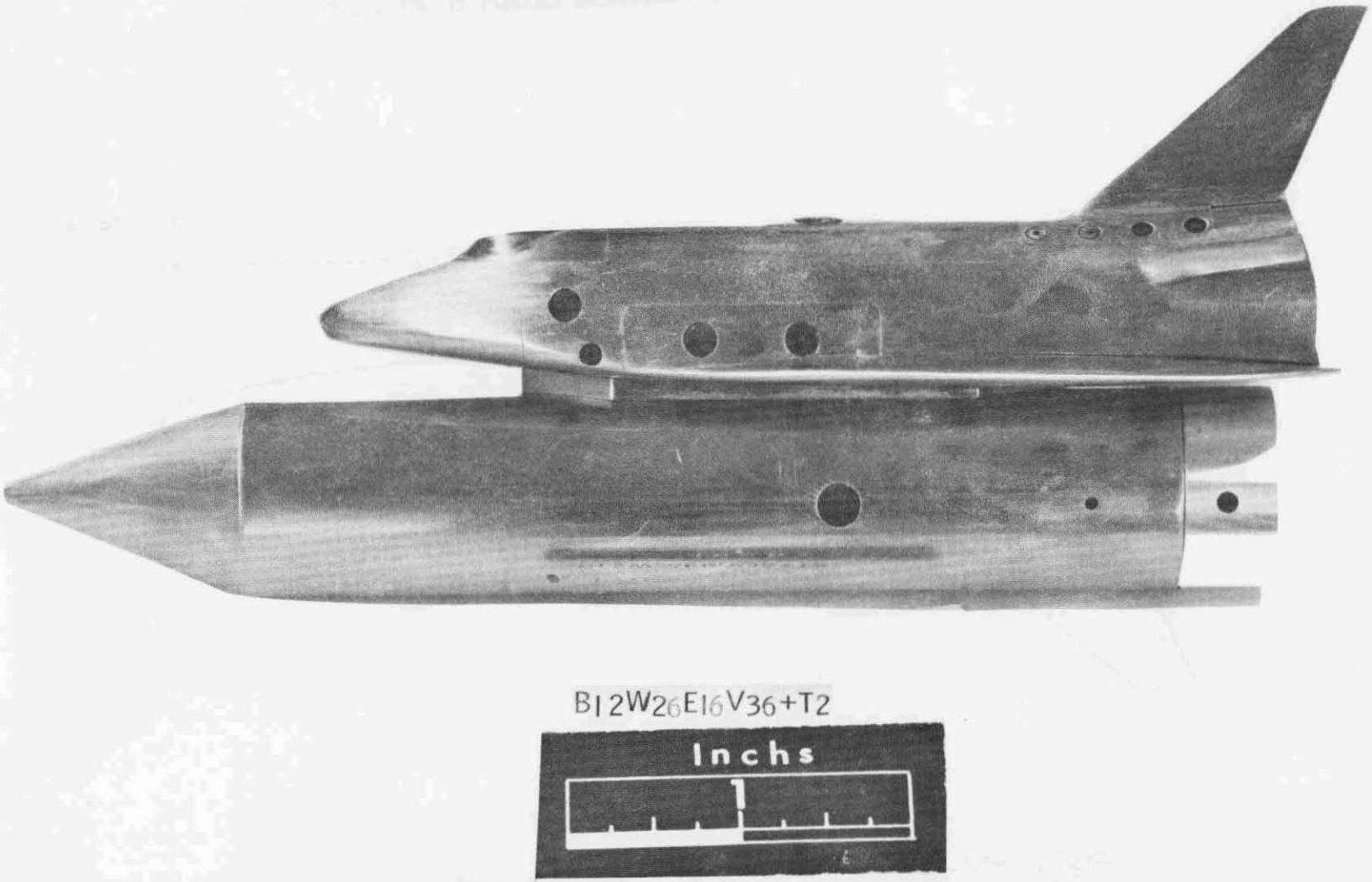


FIGURE C. PHOTOGRAPH OF CONFIGURATION $B_{12}W_{26}E_{16}V_{36}+T_2$

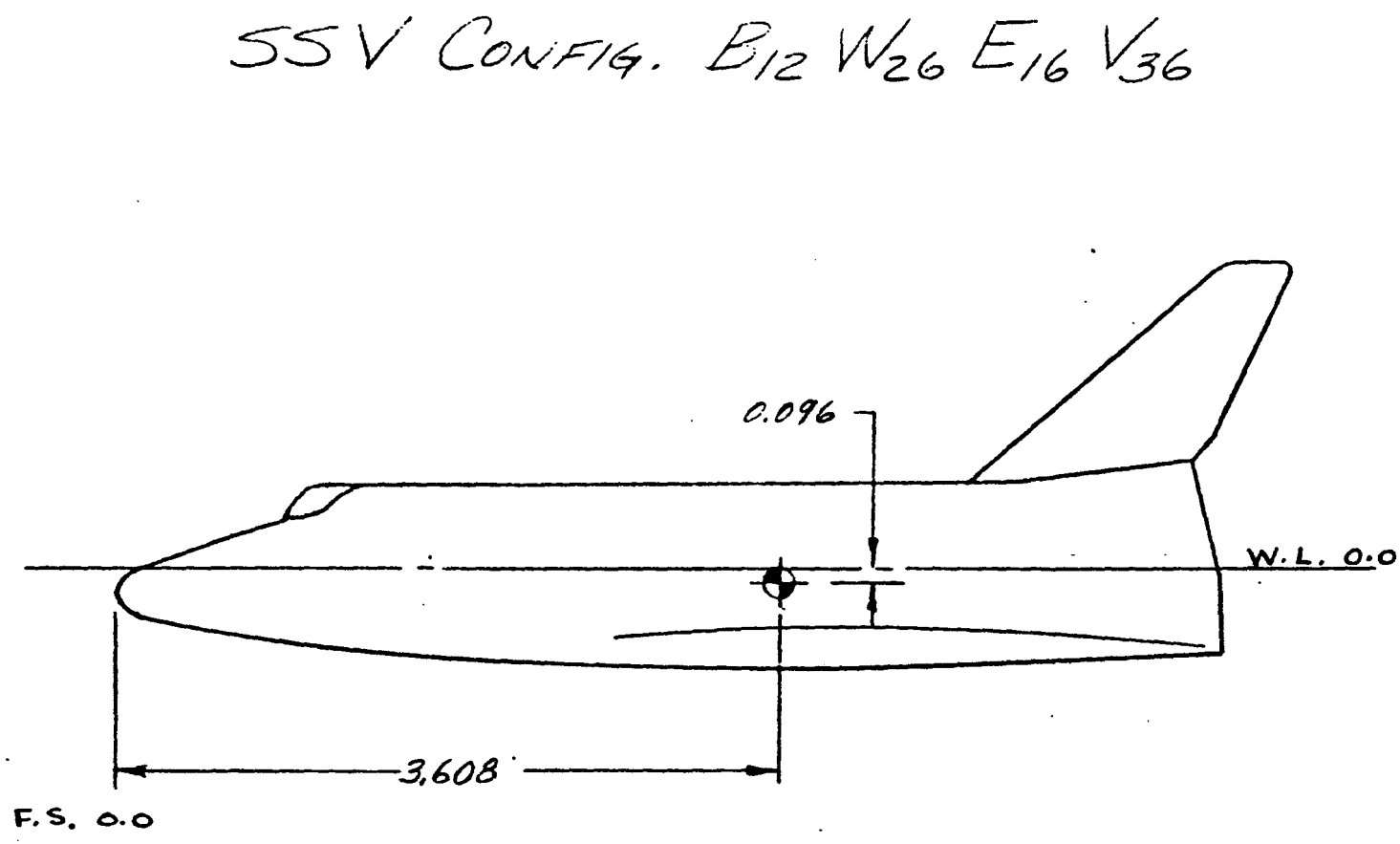


Figure D. LOCATION OF MOMENT REFERENCE POINT
1) Configuration $B_{12}W_{26}E_{16}V_{36}$

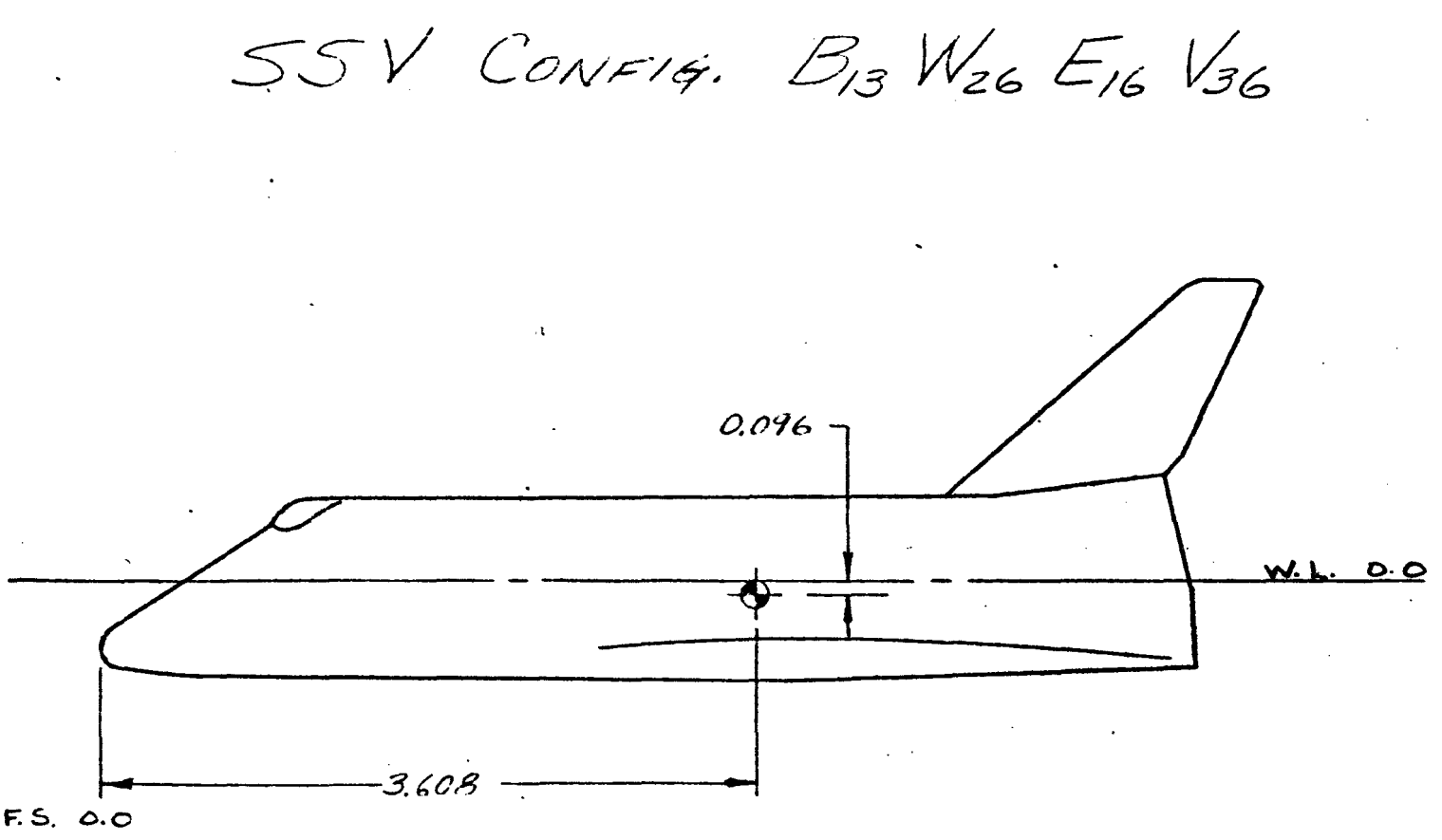


FIGURE D. LOCATION OF MOMENT REFERENCE POINT (Continued)
2) Configuration $B_{13}W_{26}E_{16}V_{36}$

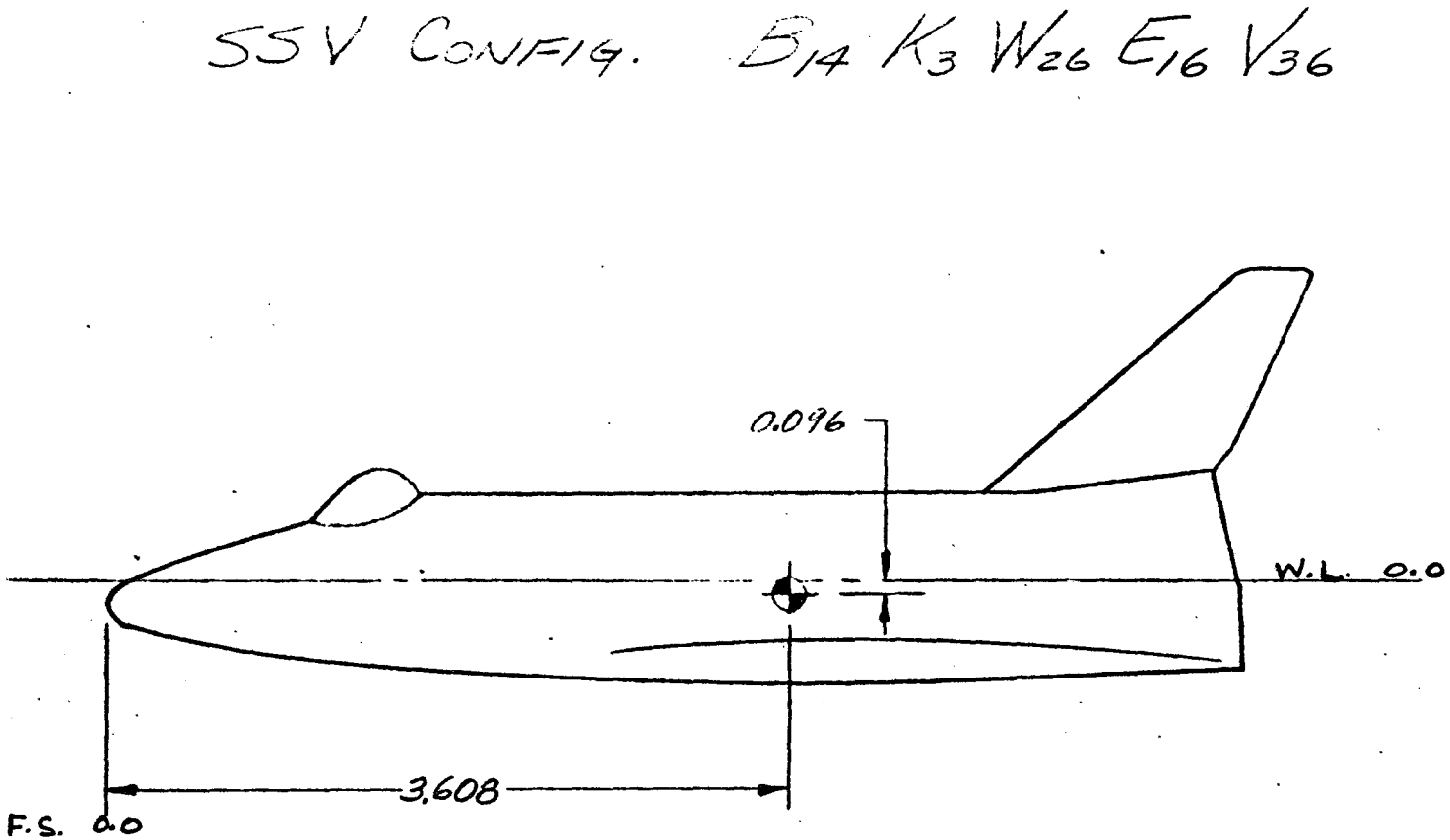


FIGURE D. LOCATION OF MOMENT REFERENCE POINT (Continued)
3) Configuration $B_{14}K_3W_{26}E_{16}V_{36}$

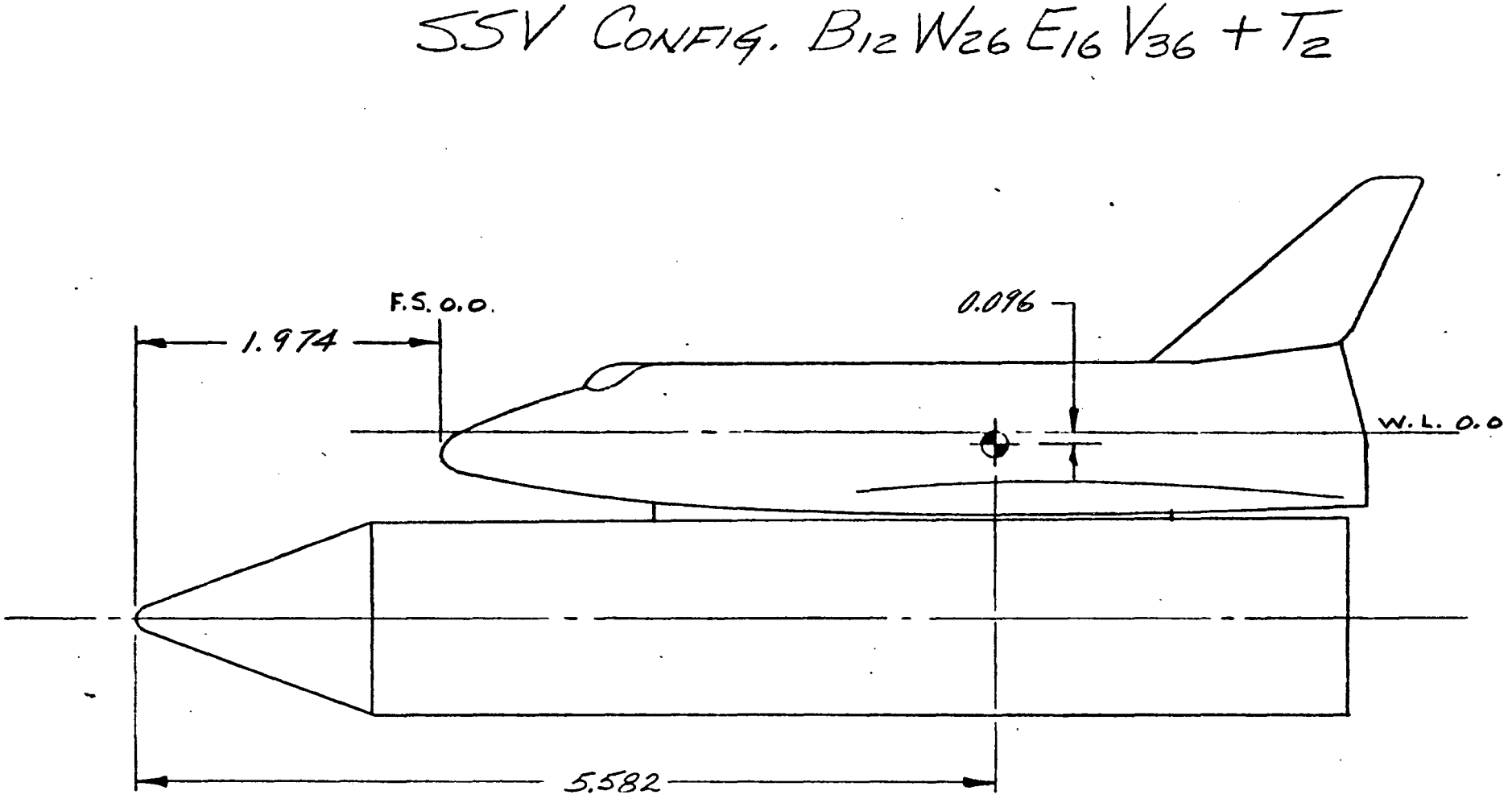


FIGURE D. LOCATION OF MOMENT REFERENCE POINT (Continued)
4) Configuration $B_{12}W_{26}E_{16}V_{36}+T_2$

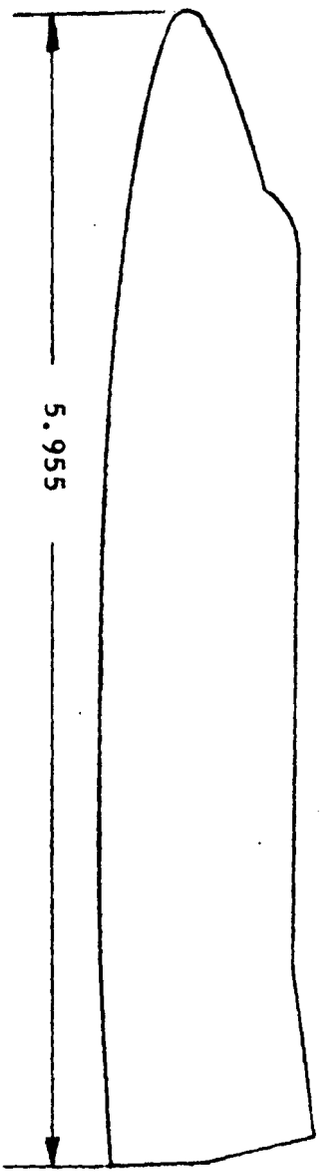


FIGURE E. BODY - B12

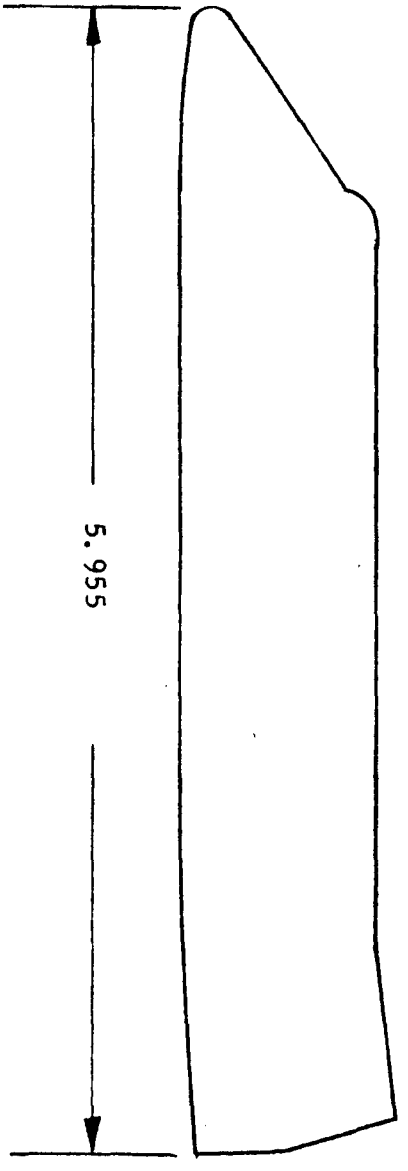


FIGURE F. BODY - B13

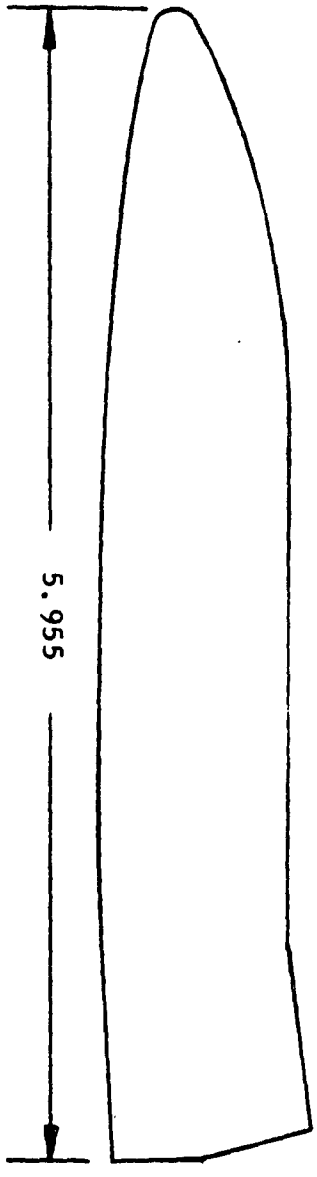


FIGURE G. BODY - B14

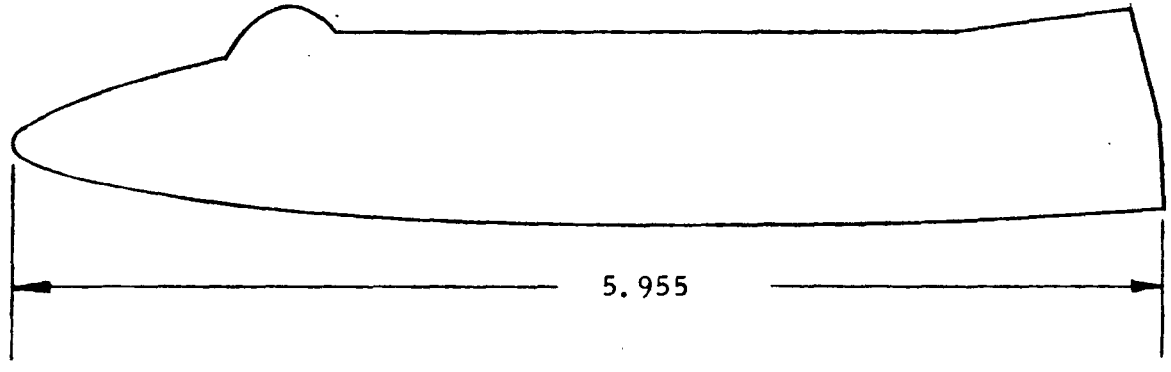


FIGURE H. **BODY - B14 + K3**

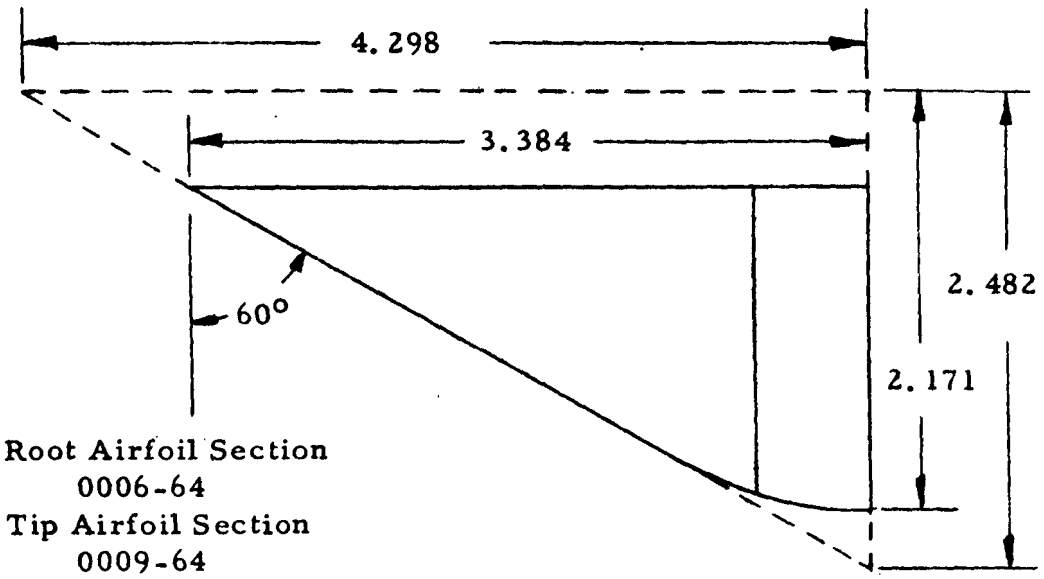


FIGURE I. WING - W26

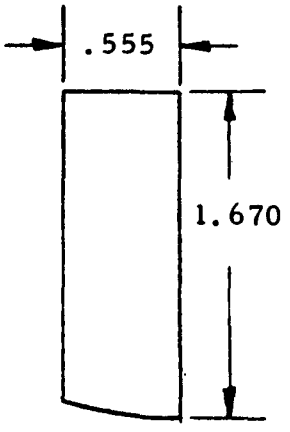


FIGURE J. ELEVON - E16

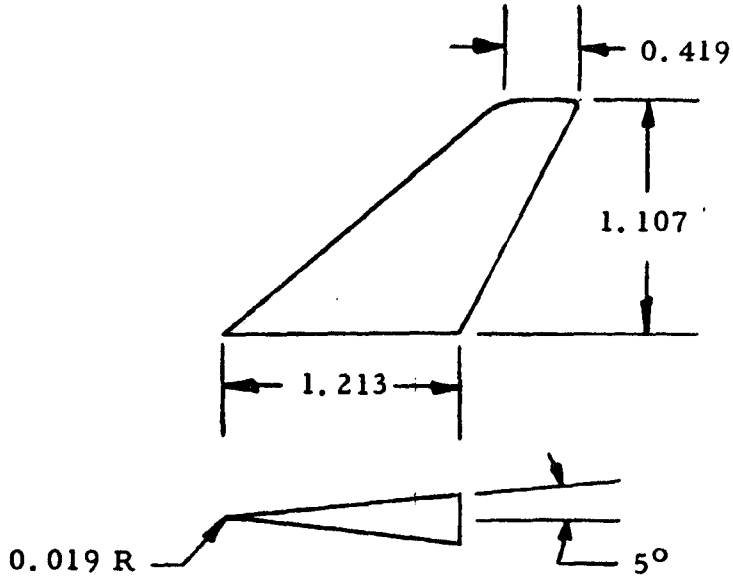


FIGURE K. VERTICAL TAIL - V36

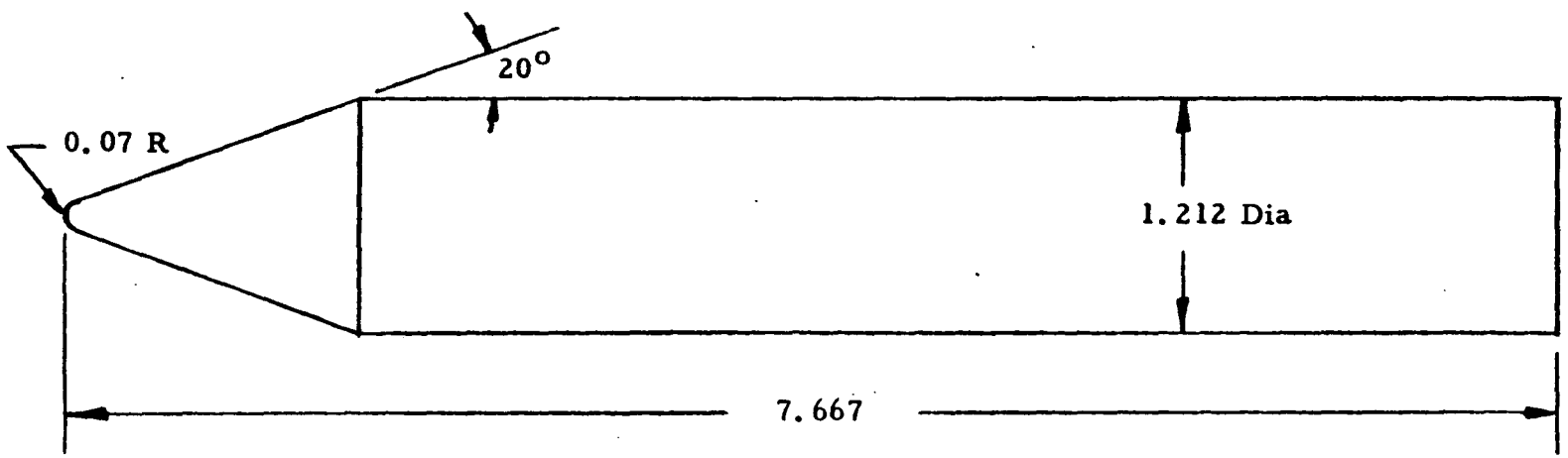


FIGURE L. TANK - T2

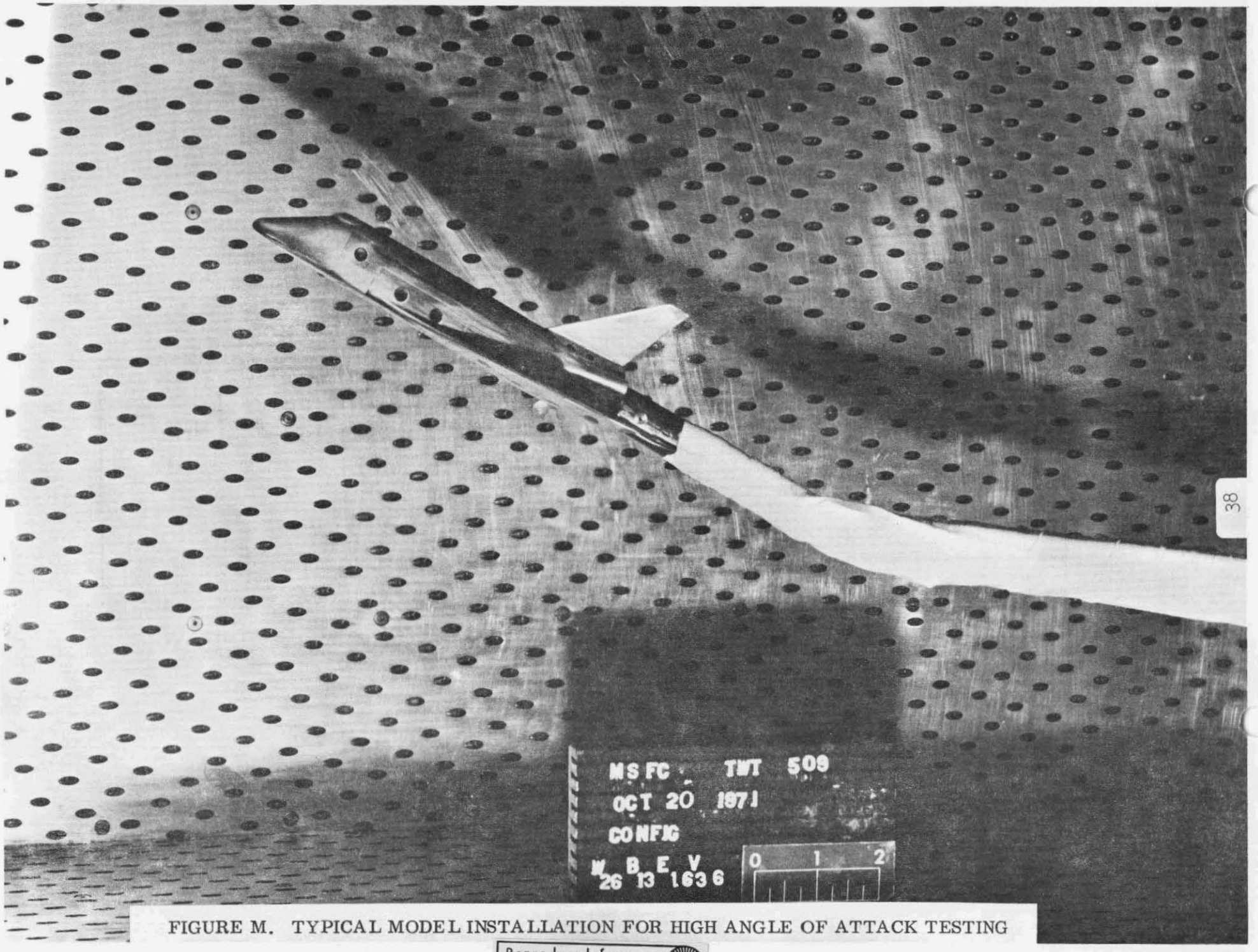


FIGURE M. TYPICAL MODEL INSTALLATION FOR HIGH ANGLE OF ATTACK TESTING

Notes:

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

2. For clarity, origins of wind and stability axes have been displaced from the center of gravity.

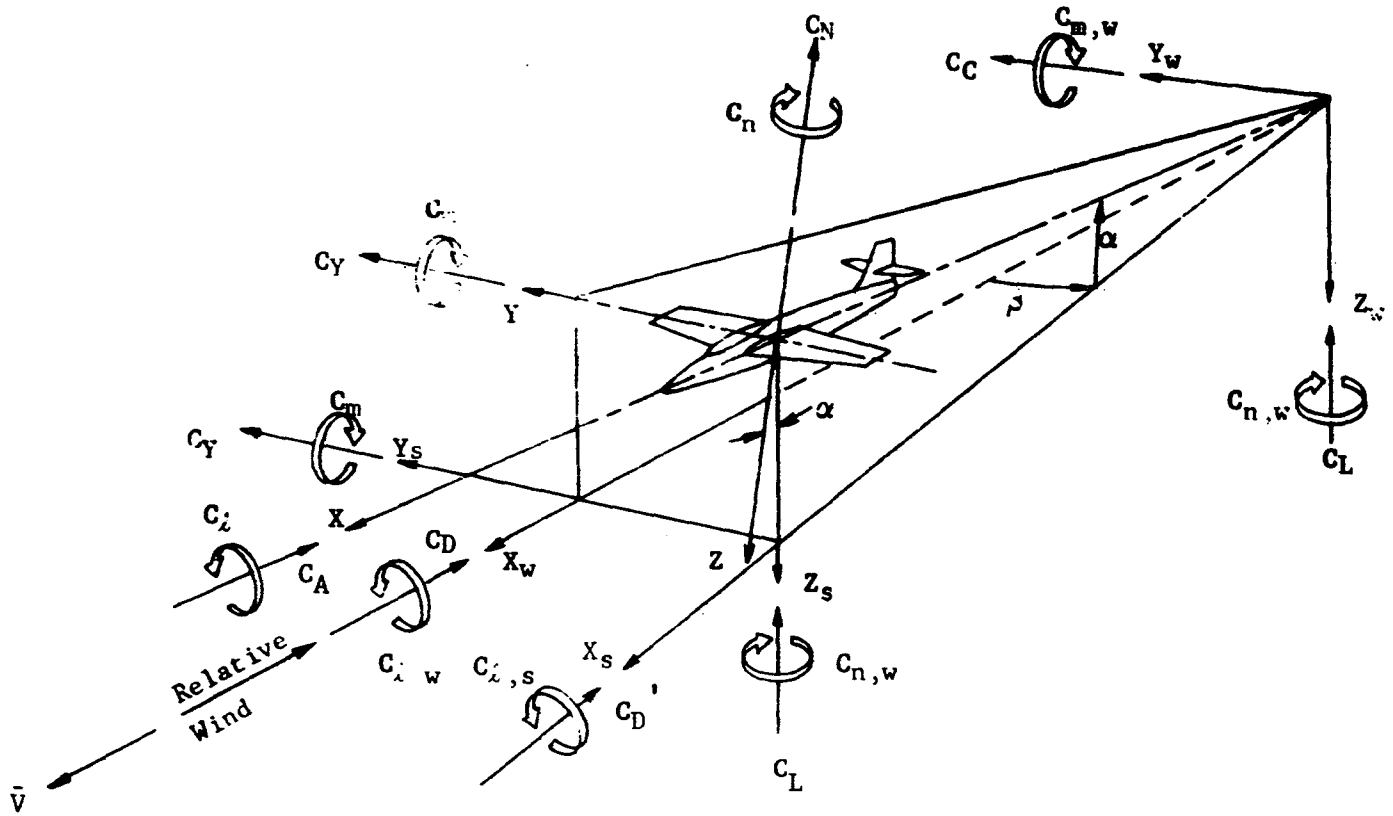
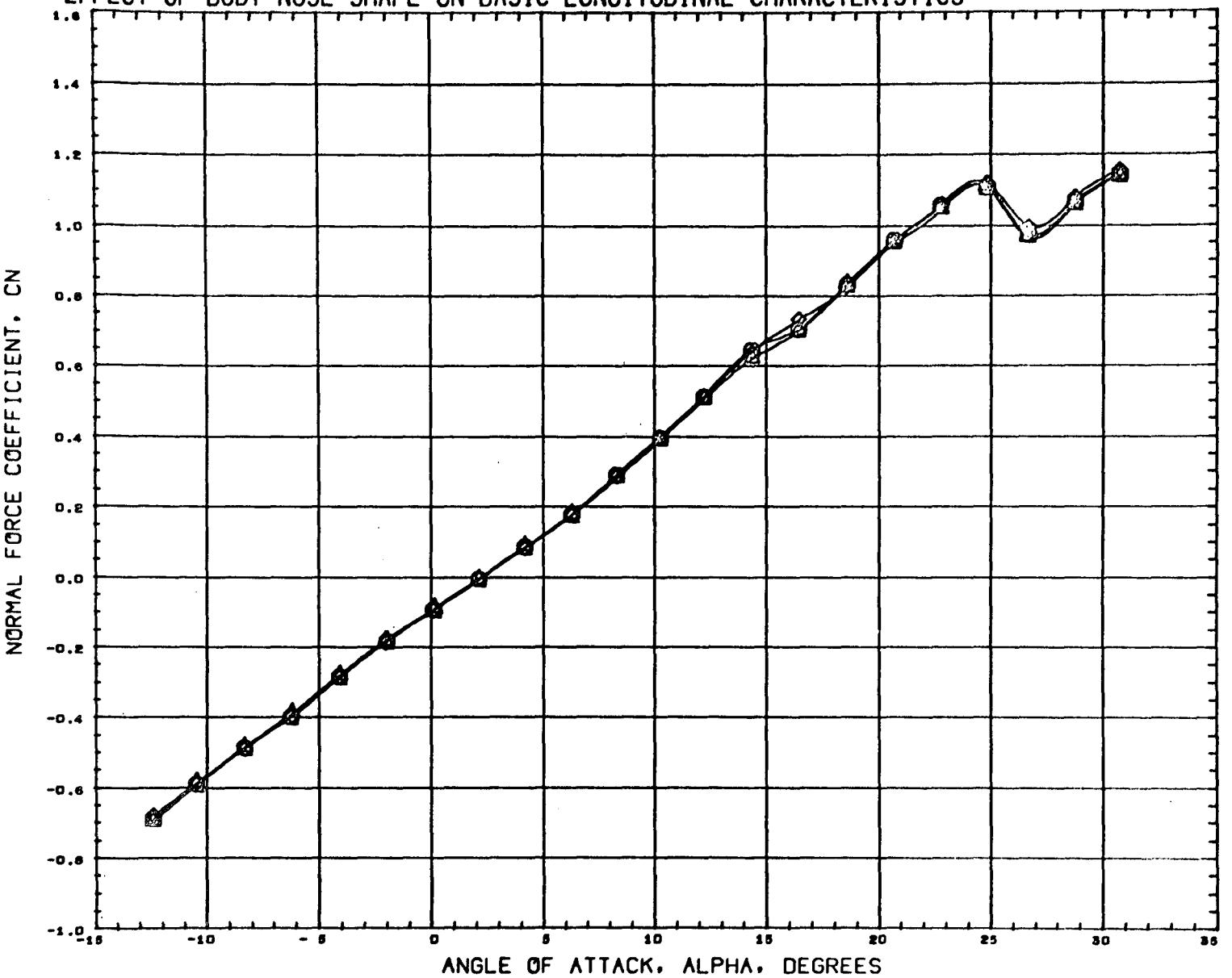


Figure N. Axis systems, showing direction and sense of force and moment coefficients, angle of attack, and sideslip angle

D A T A F I G U R E S

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
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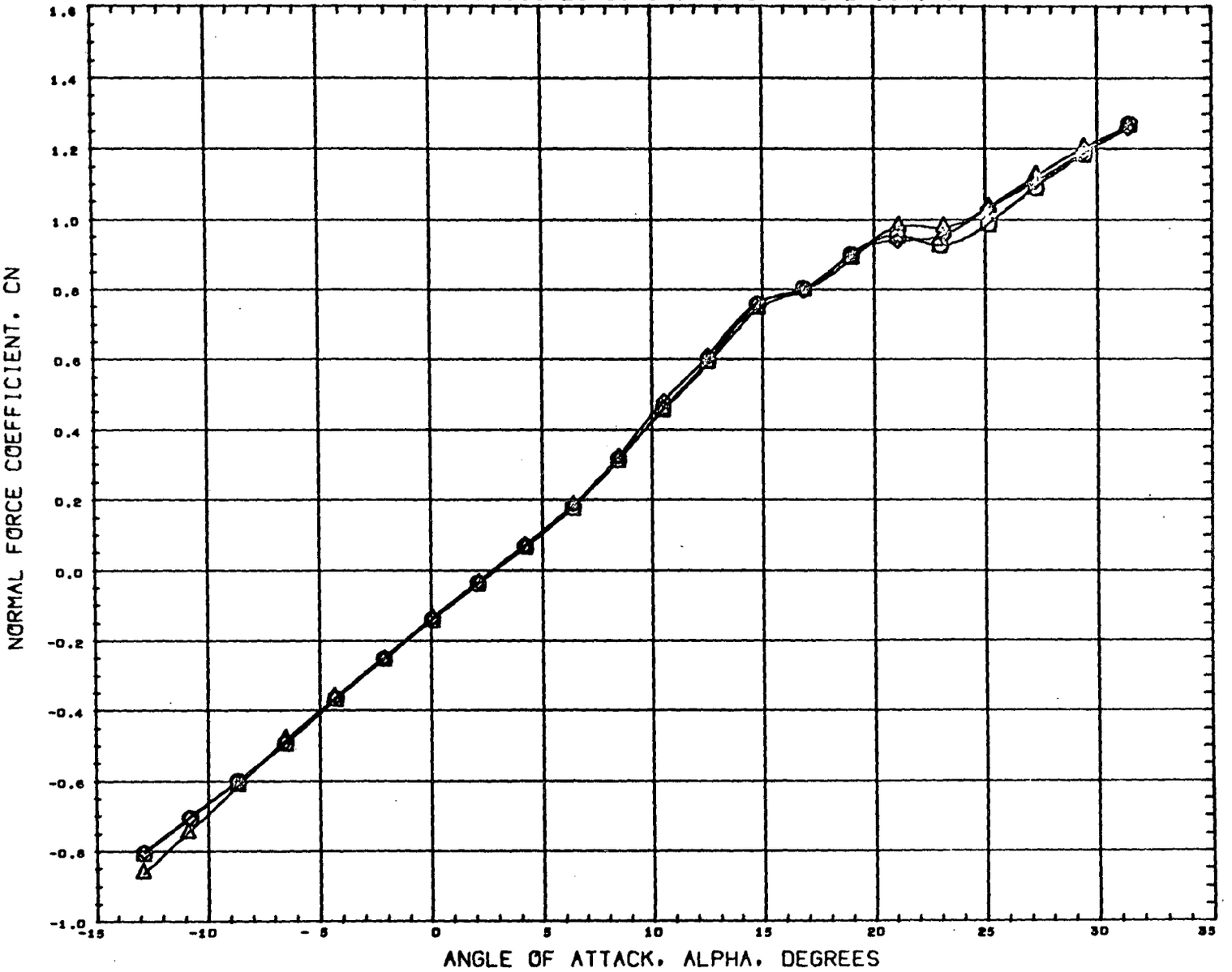
(C91038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C91048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION		
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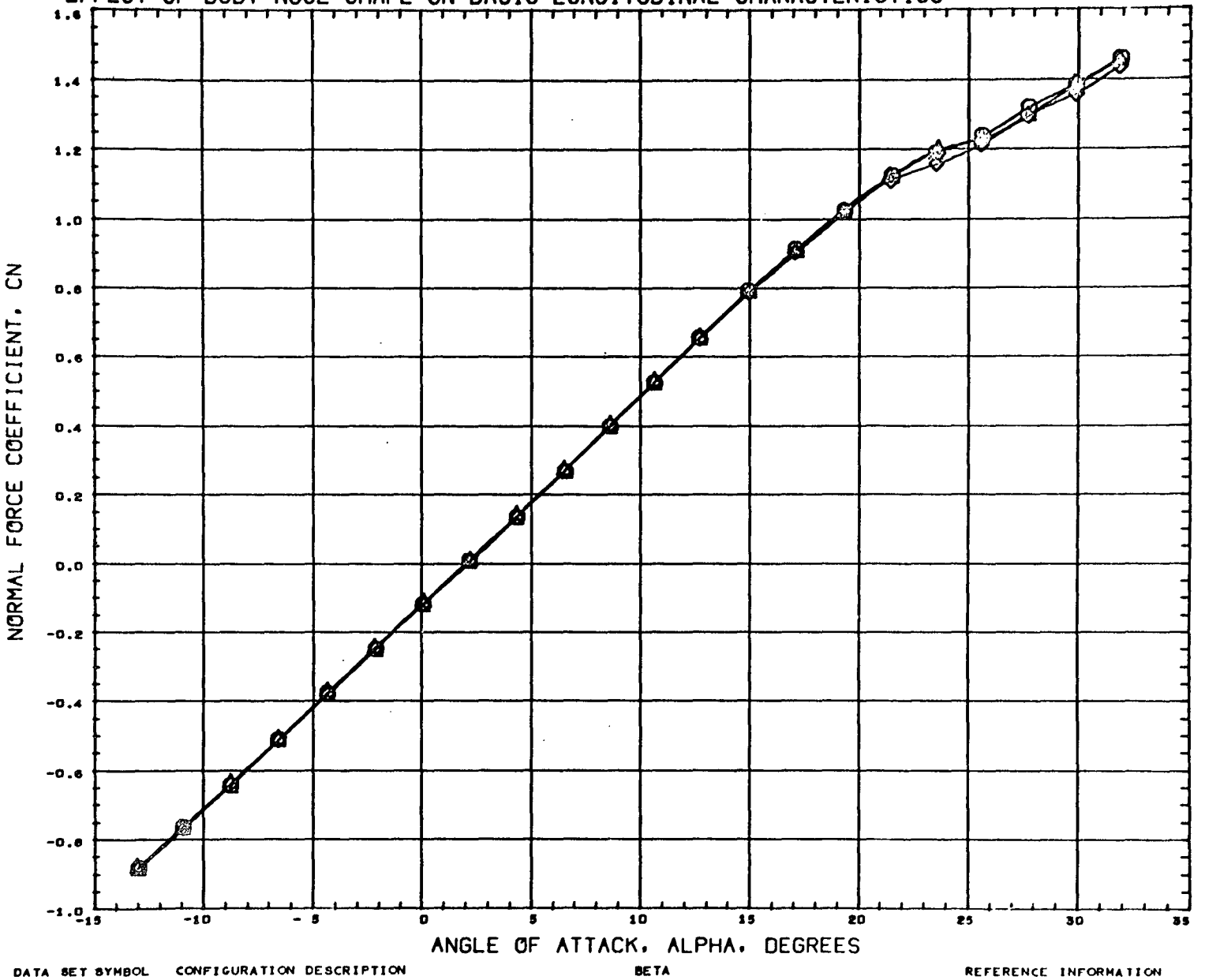
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION		
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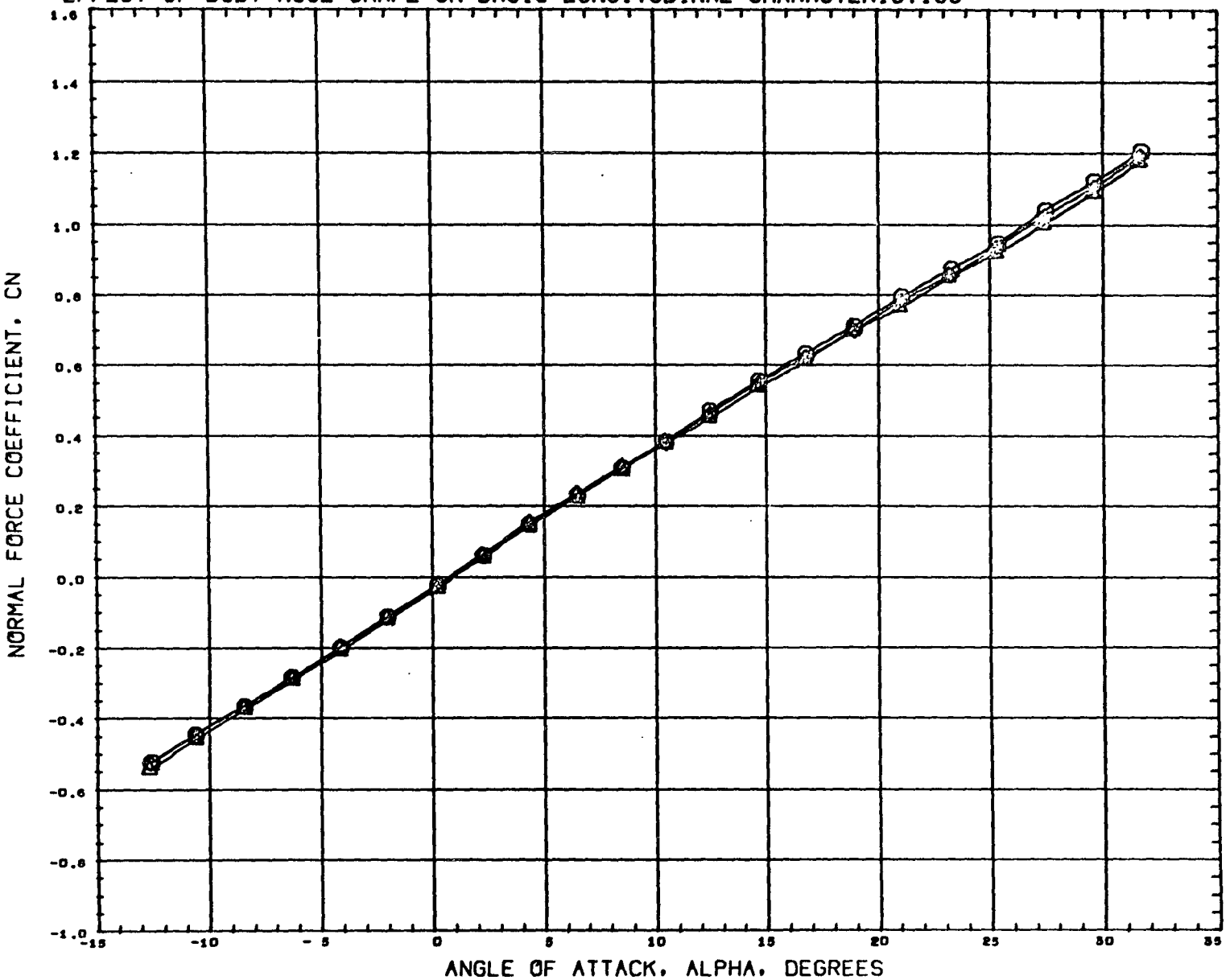
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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(C5103S)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C5104S)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION

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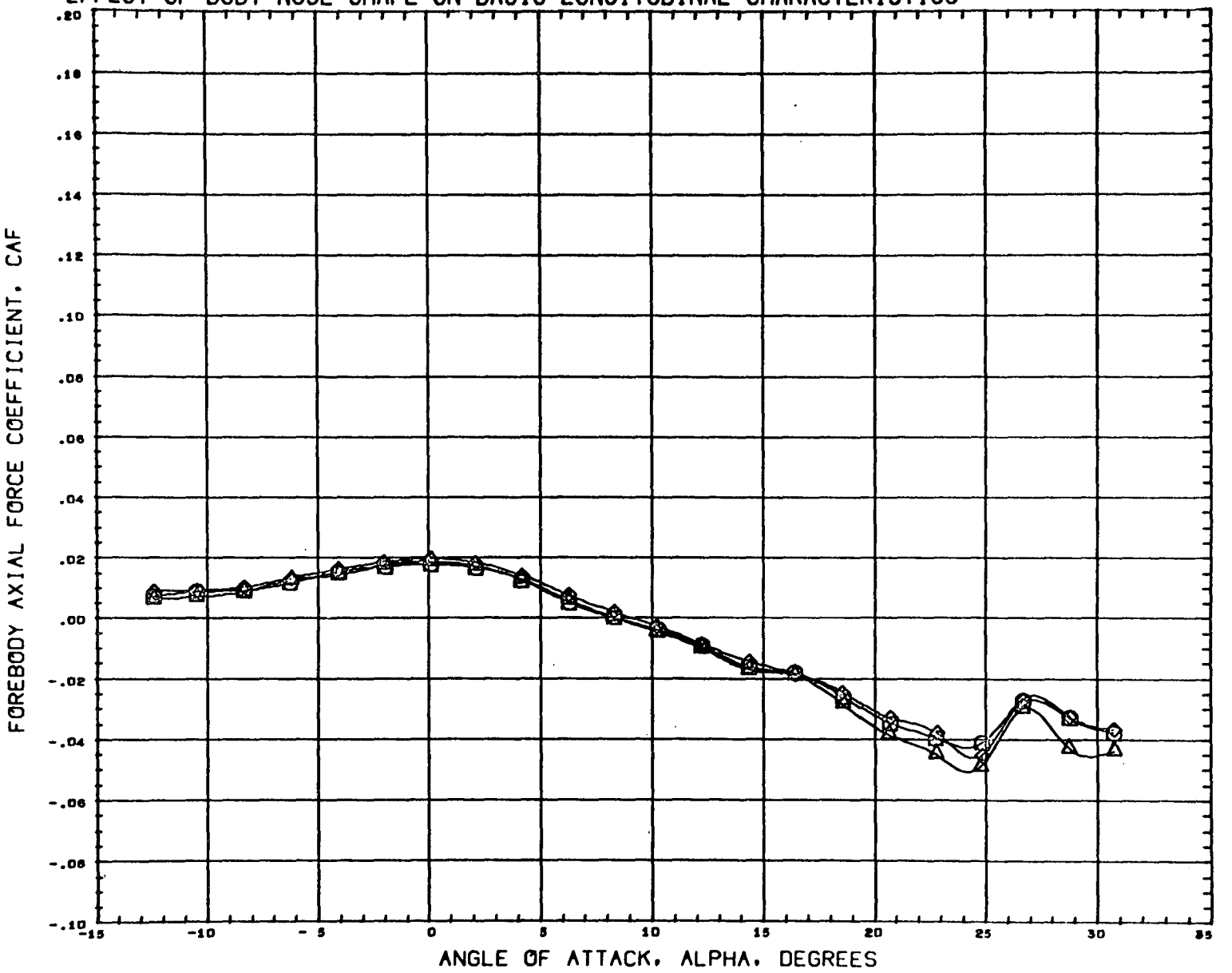
EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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MACH 0.605

REFERENCE INFORMATION

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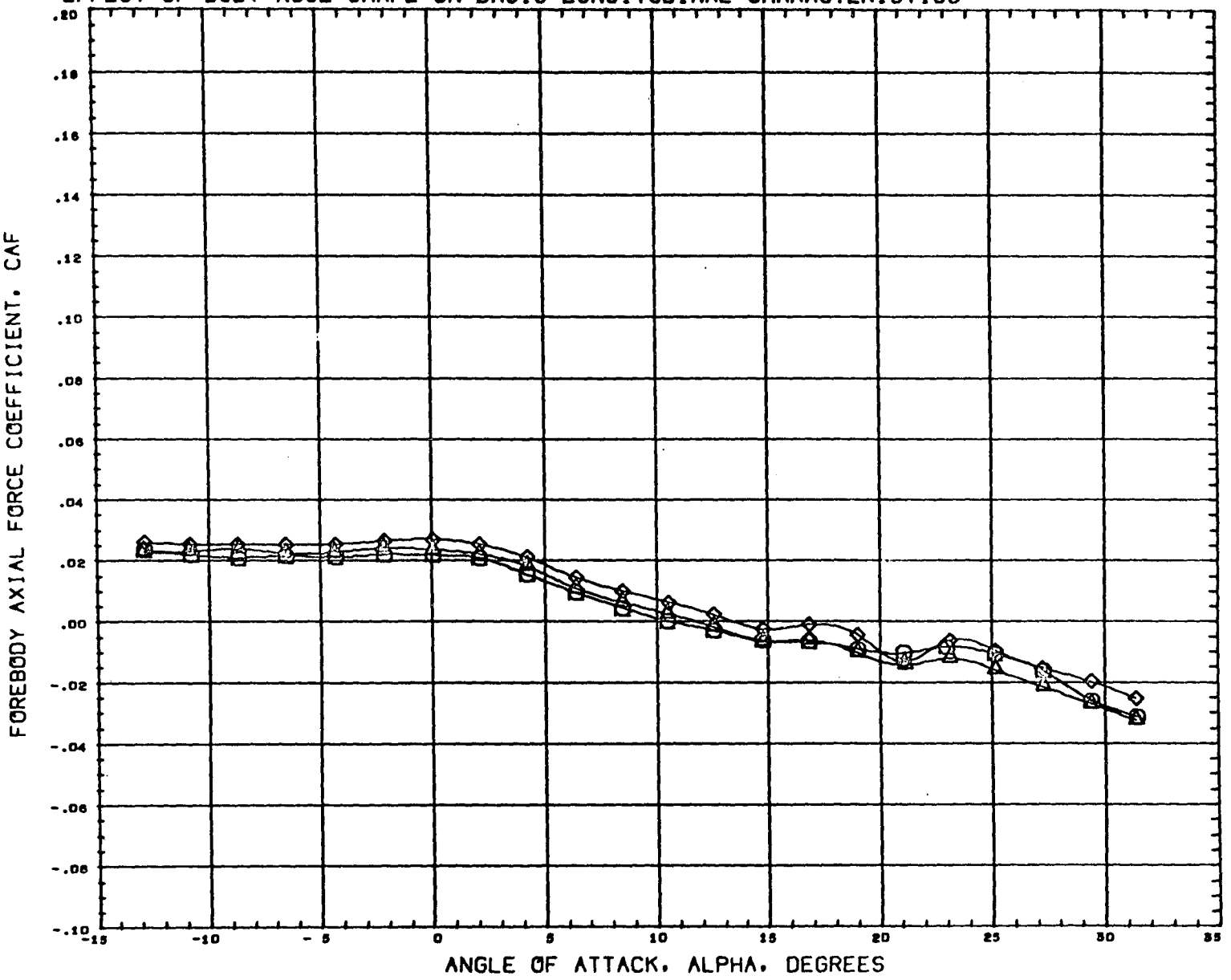
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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MACH 0.898

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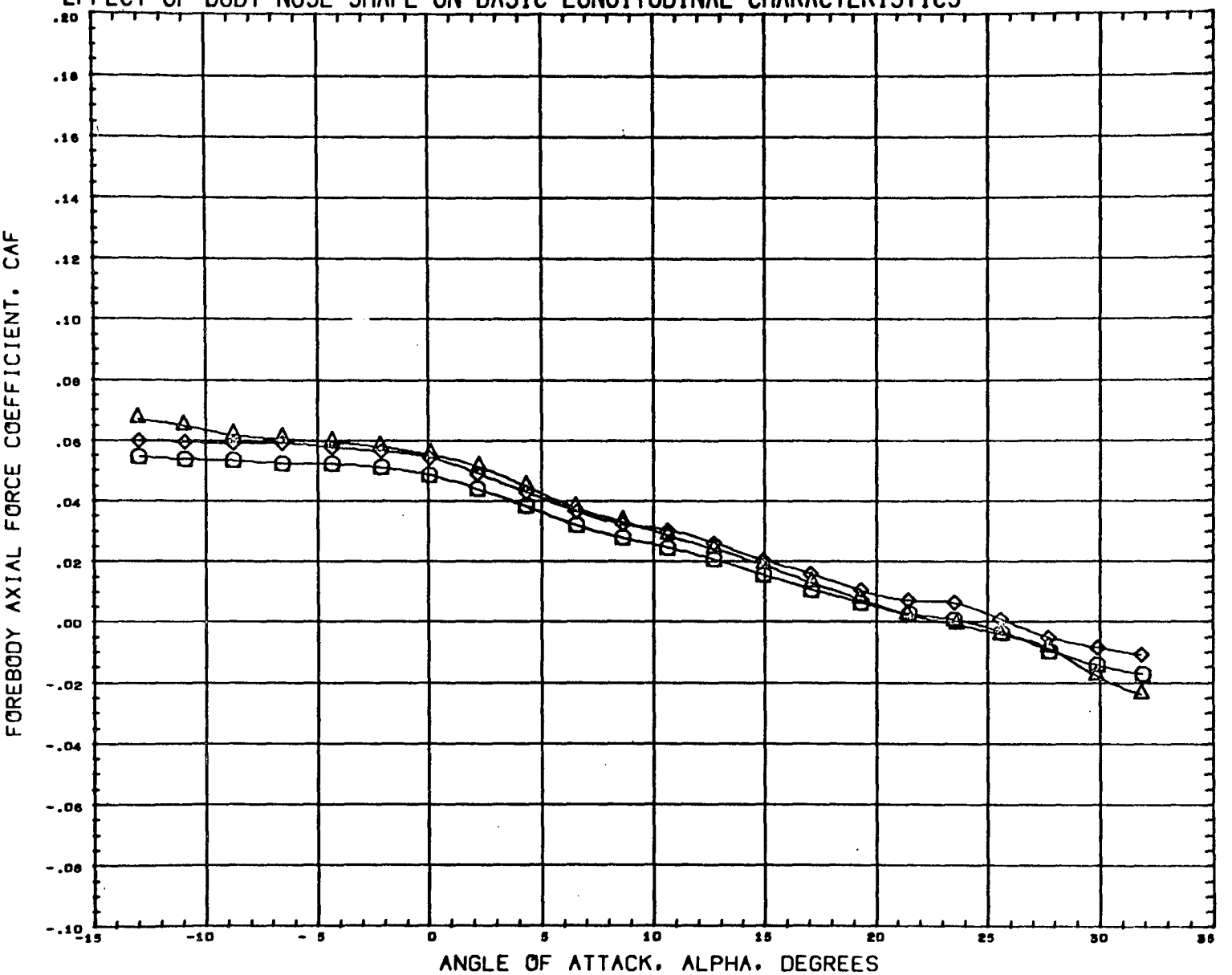
EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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MACH 1.194

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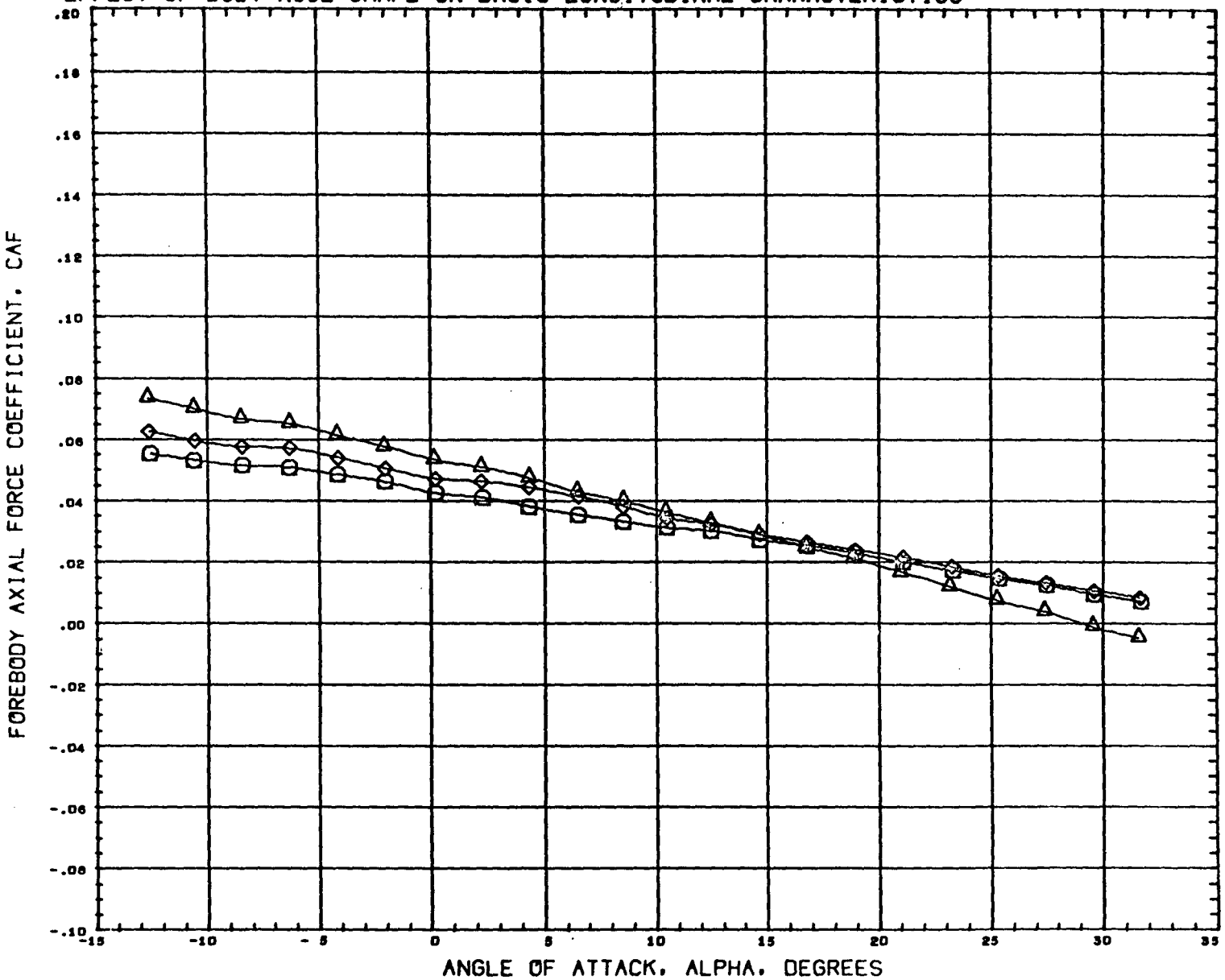
EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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MACH 1.961

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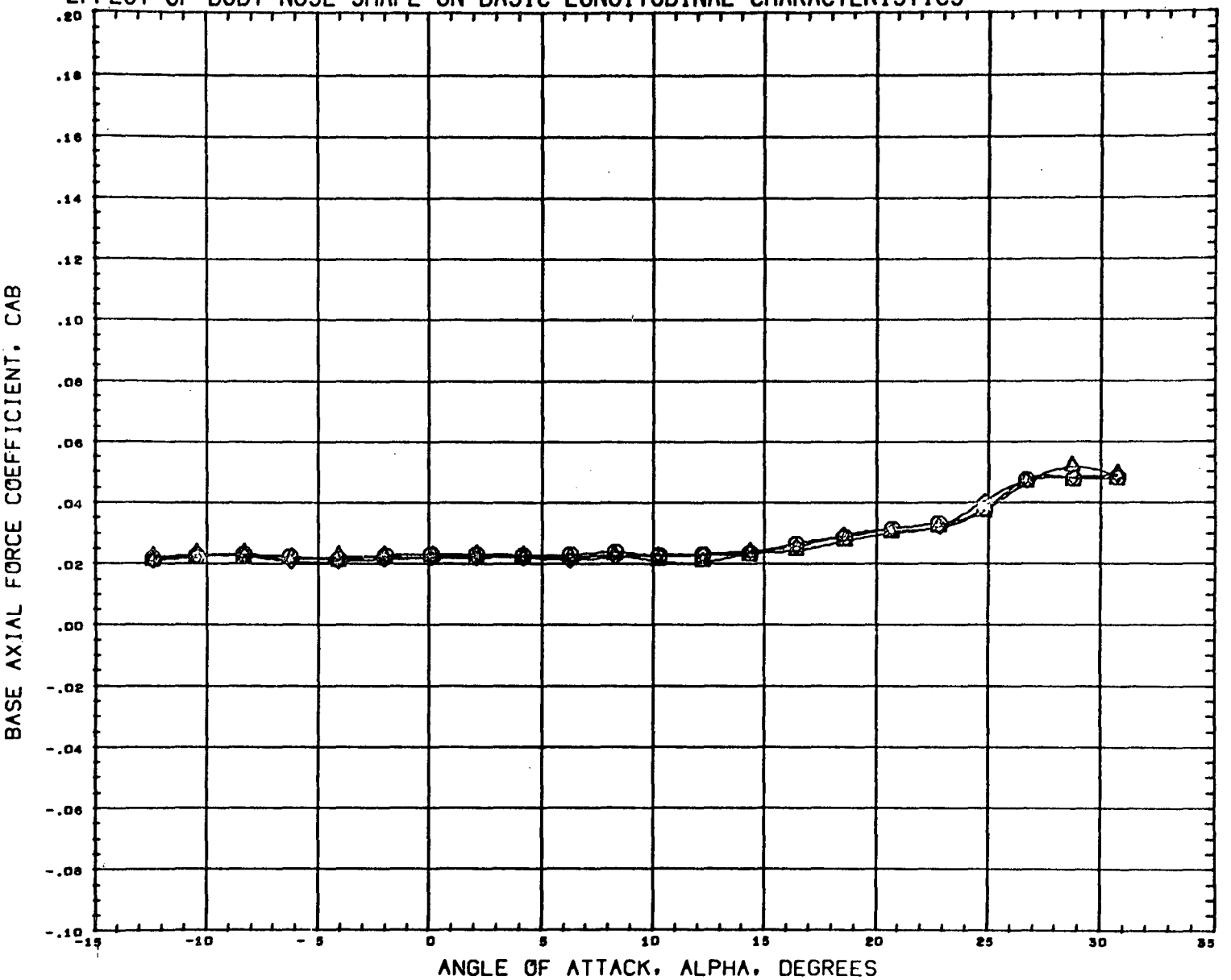
EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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(C5104S)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.605

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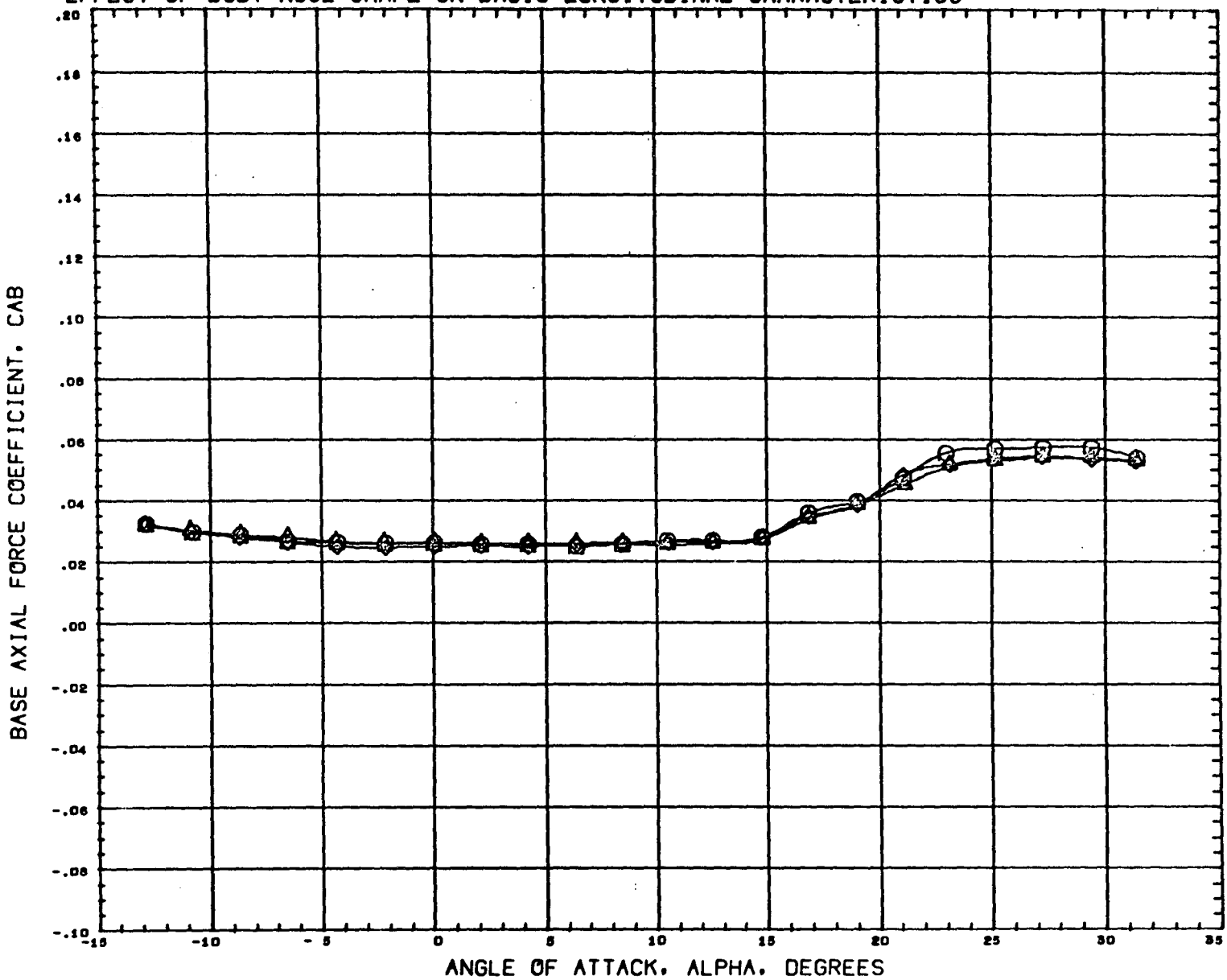
EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.898

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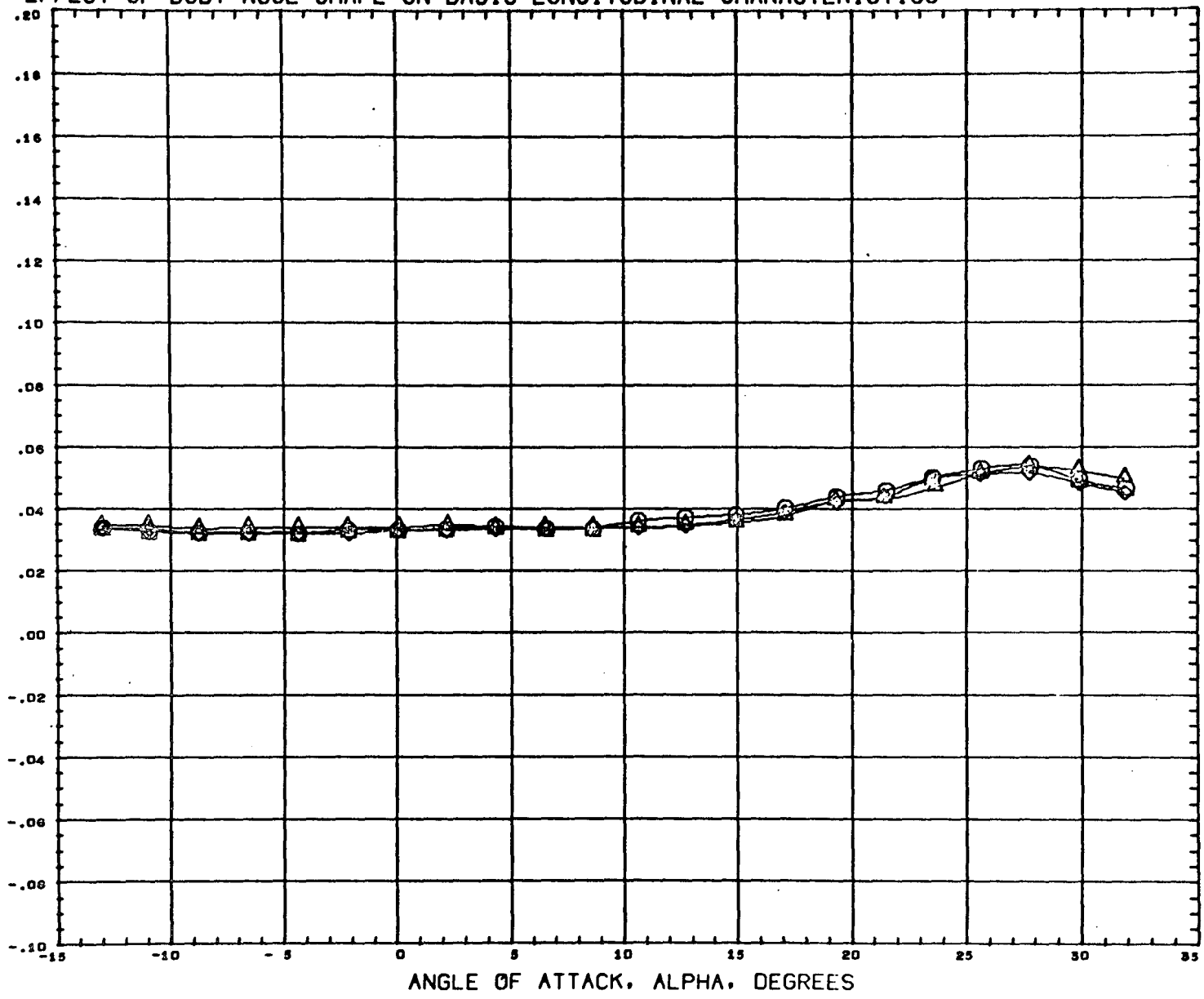
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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MACH 1.194

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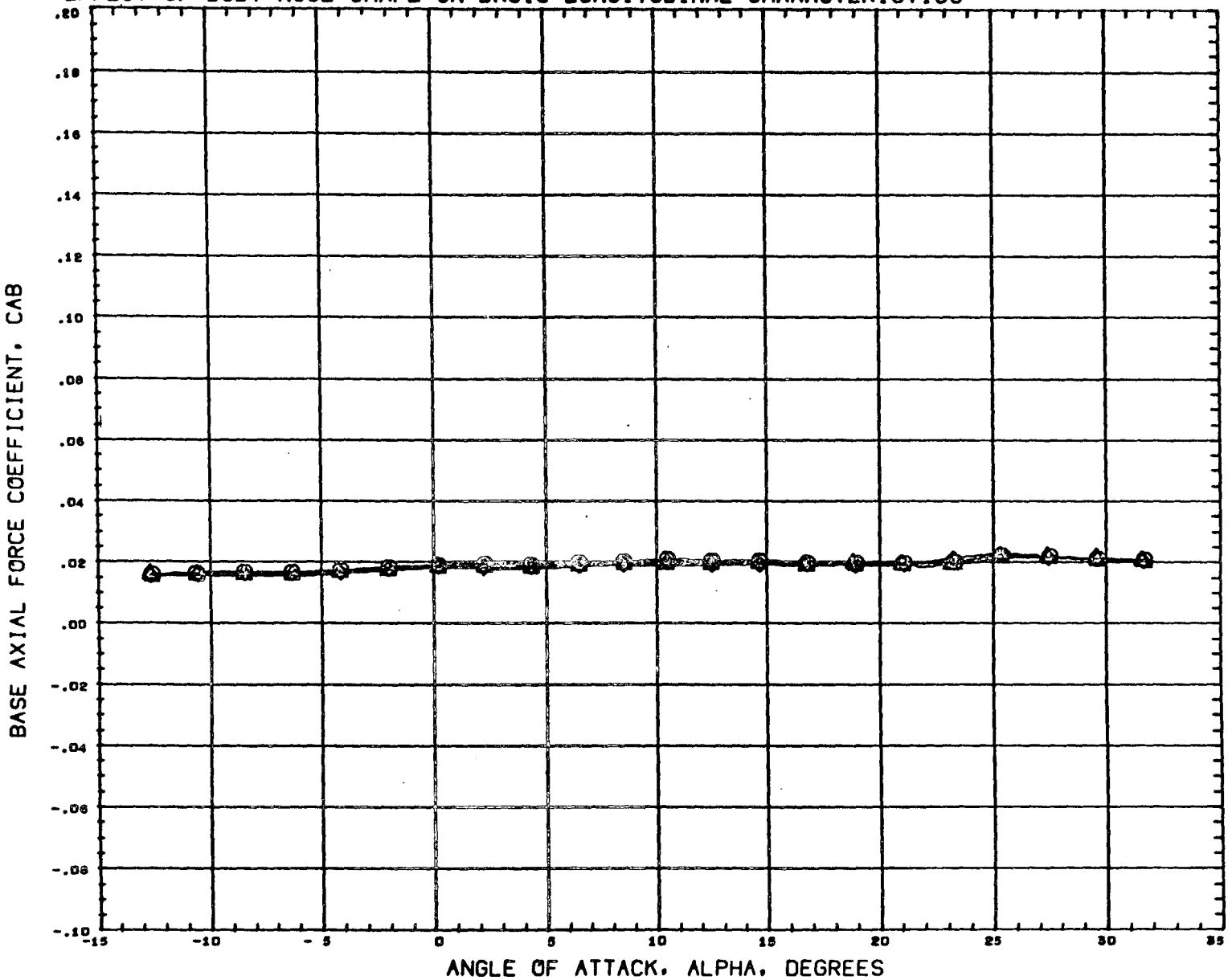
EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.961

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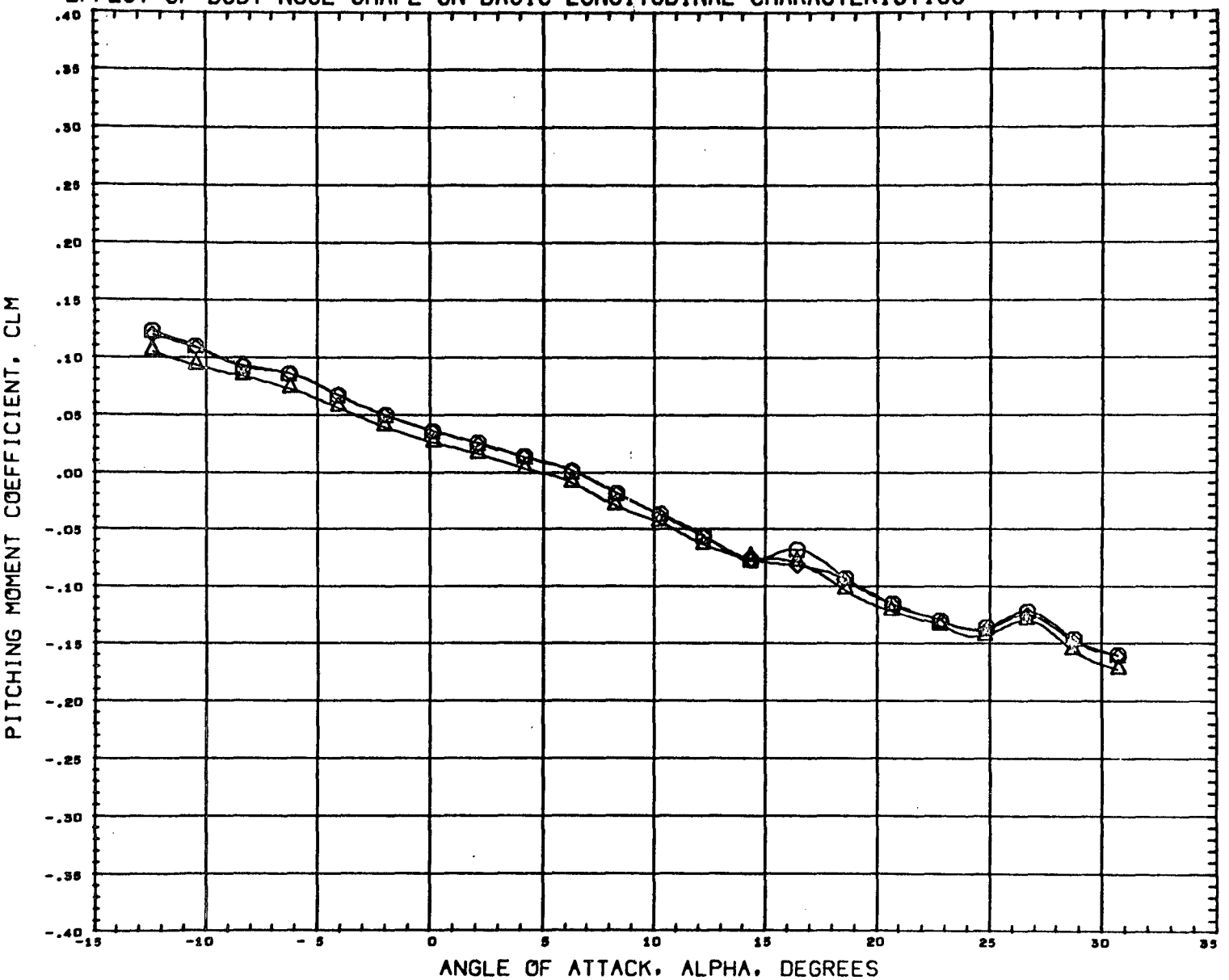
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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(C5104S)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.605

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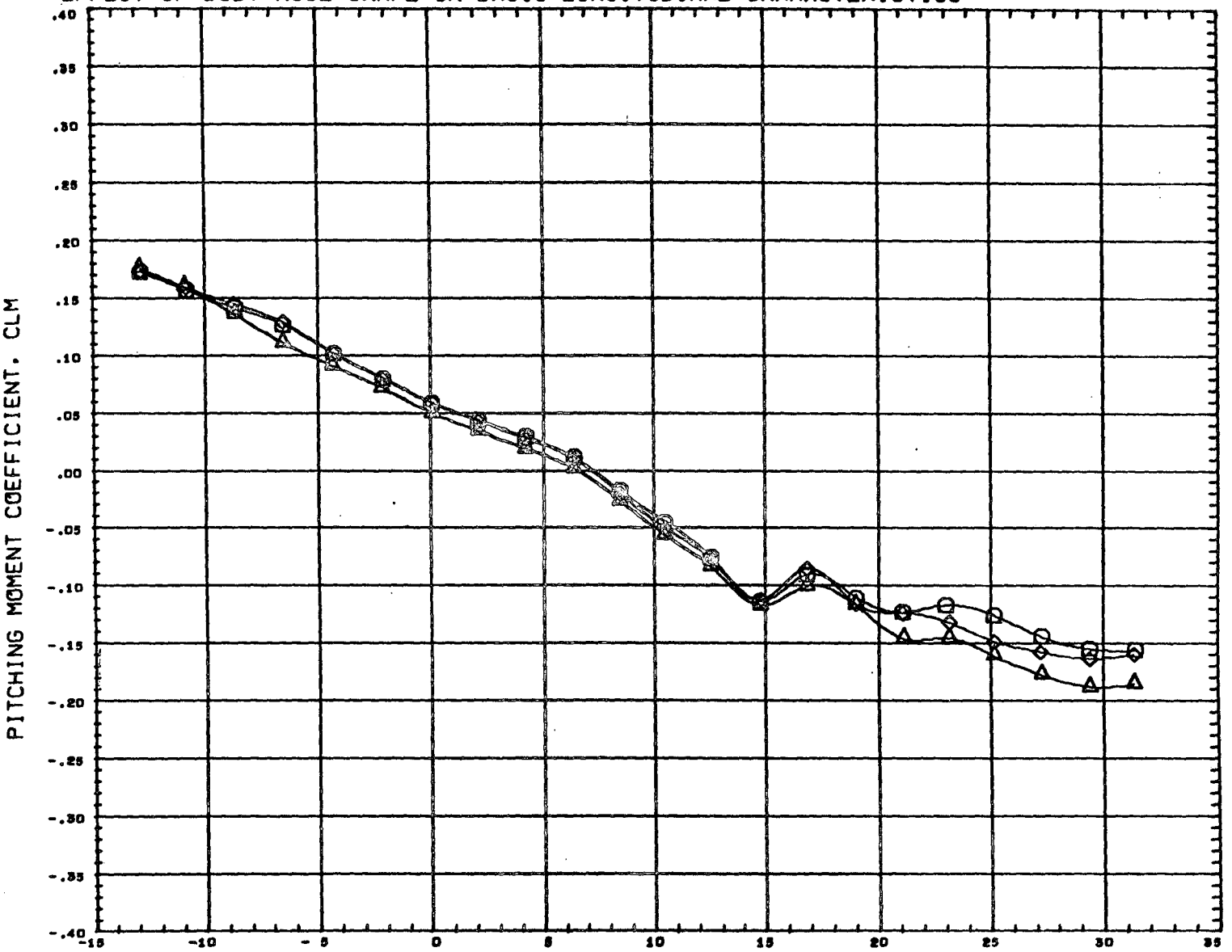
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION		
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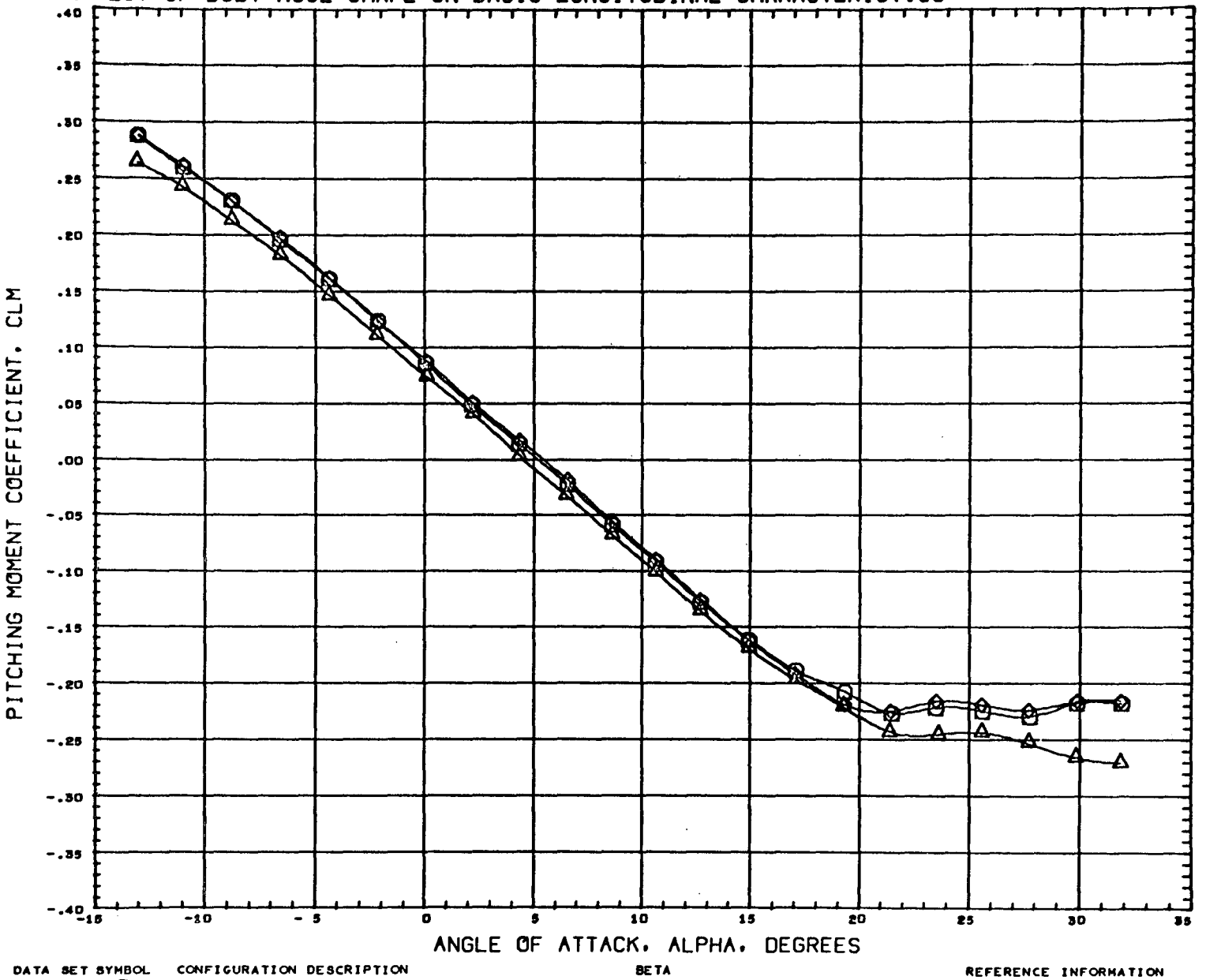
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



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MACH 1.194

REFERENCE INFORMATION

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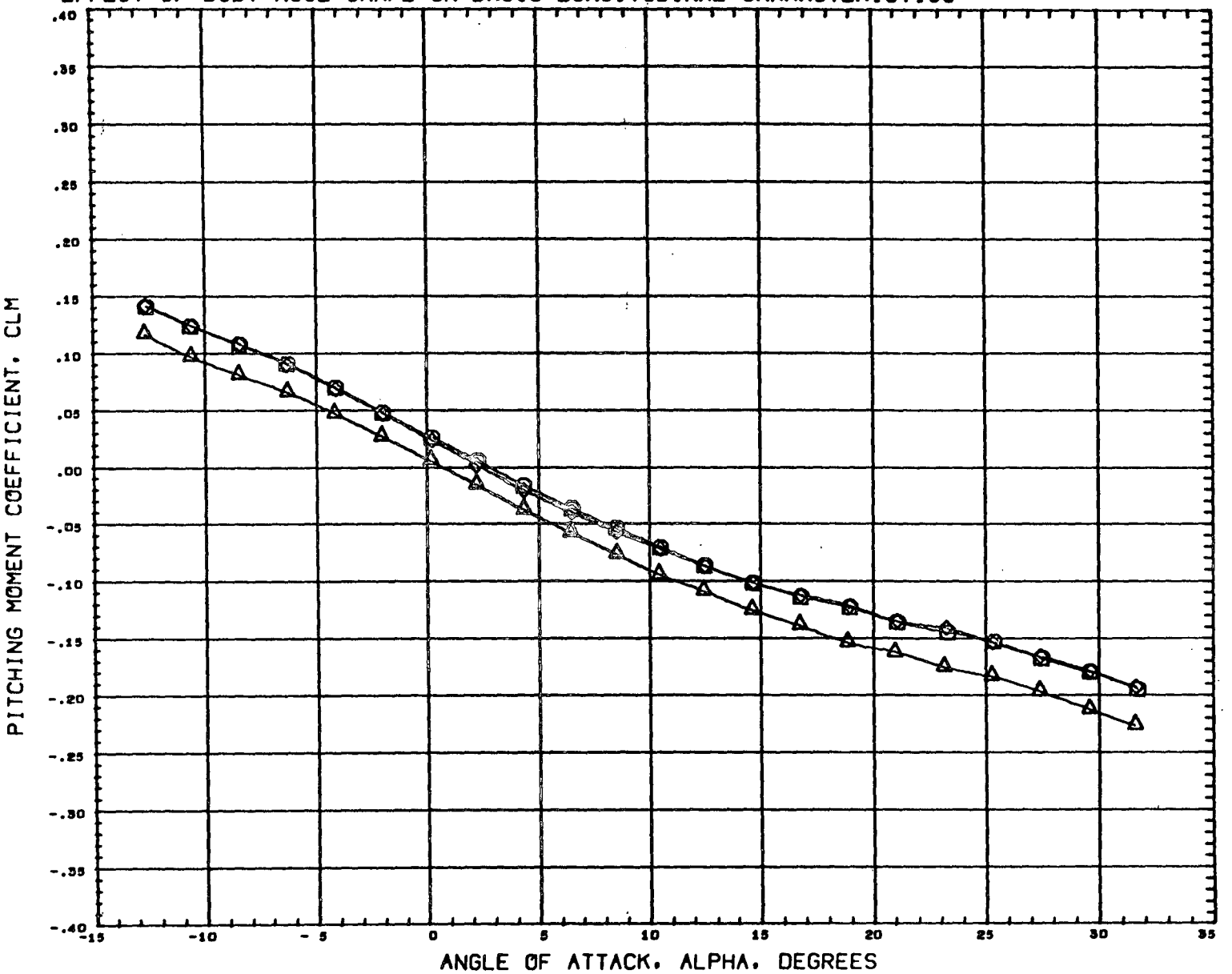
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

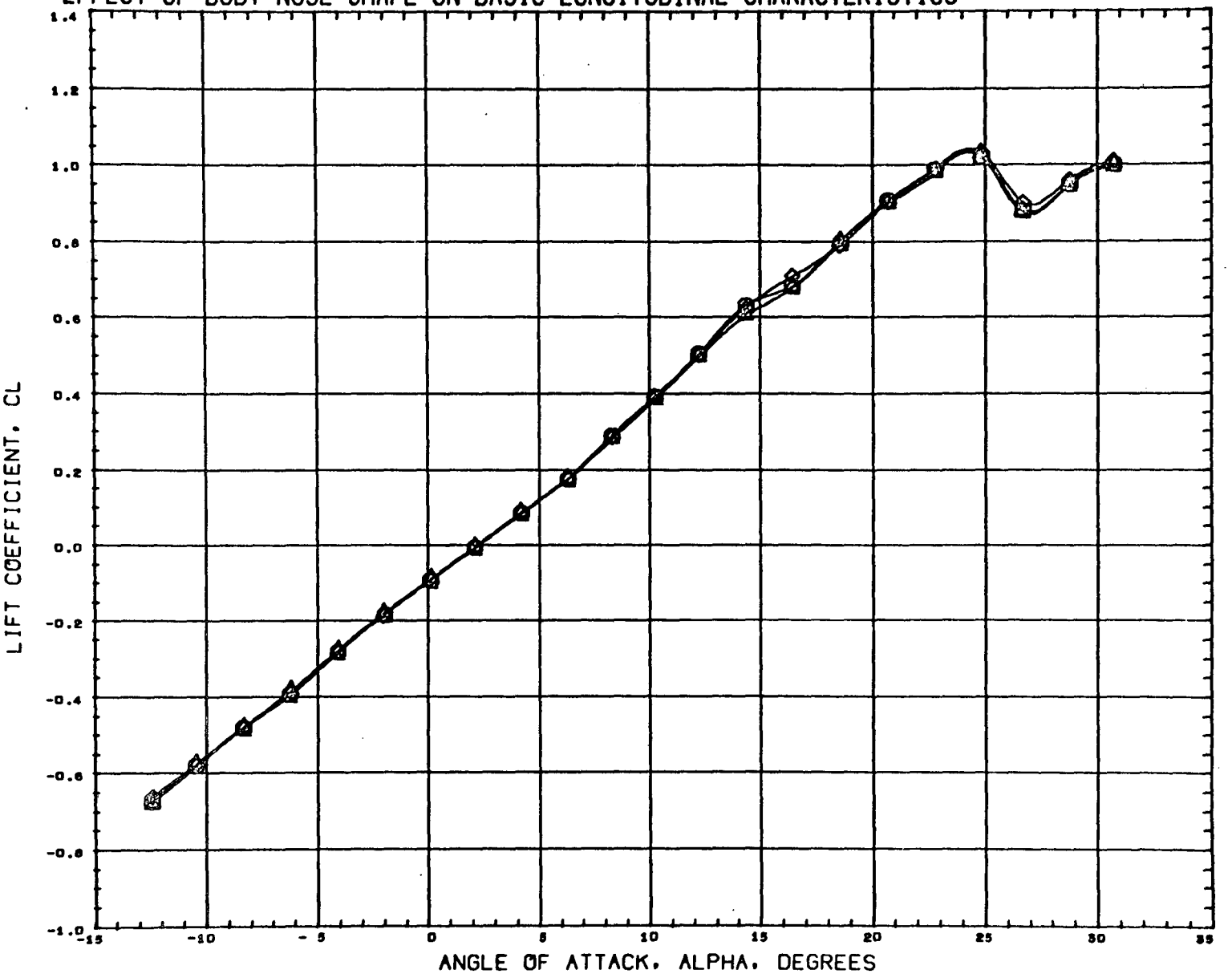


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C5101S)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C5103S)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C5104S)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

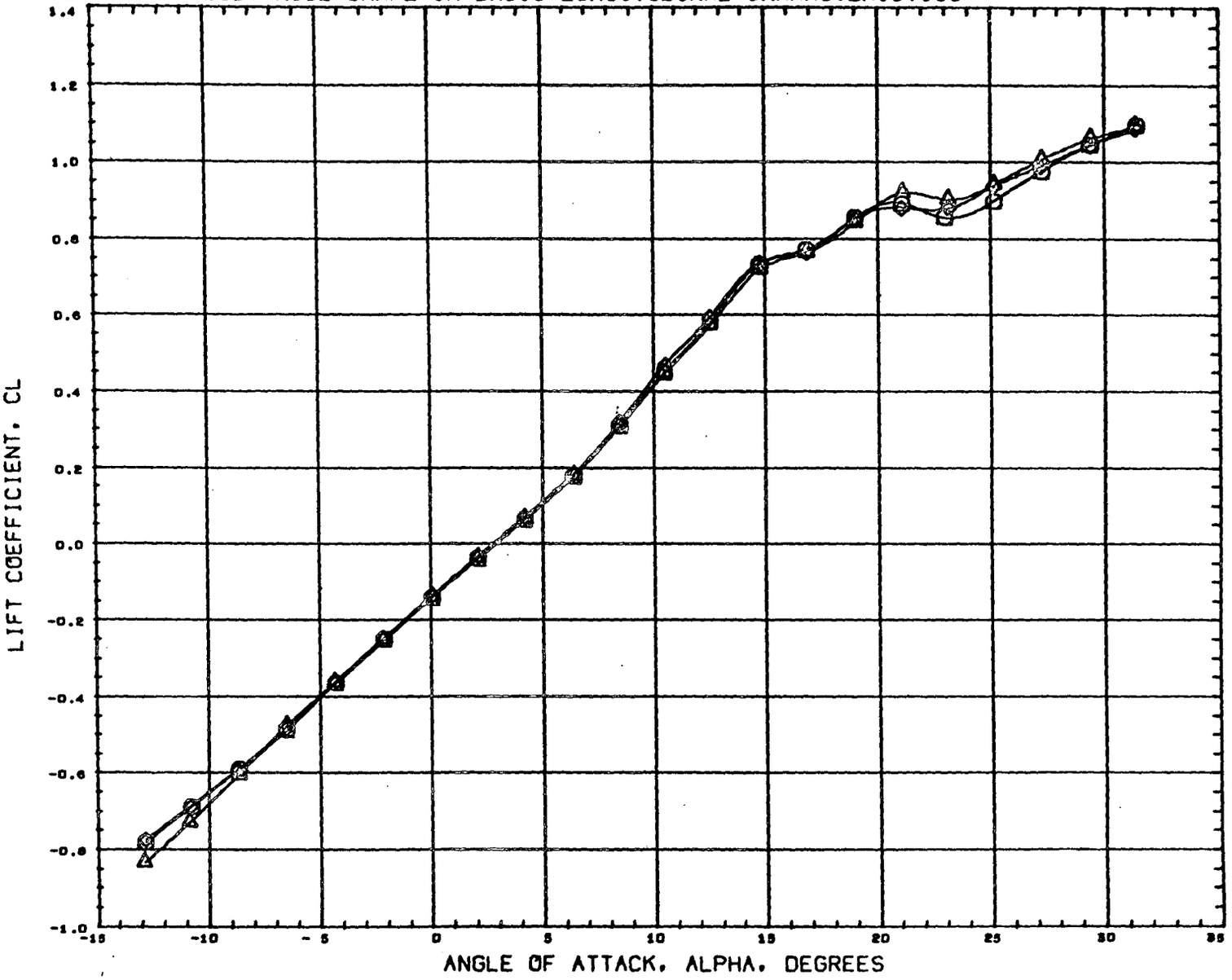


DATA SET SYMBOL		CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 11OC ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 11OC ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 11OC ORBITER B14K3W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



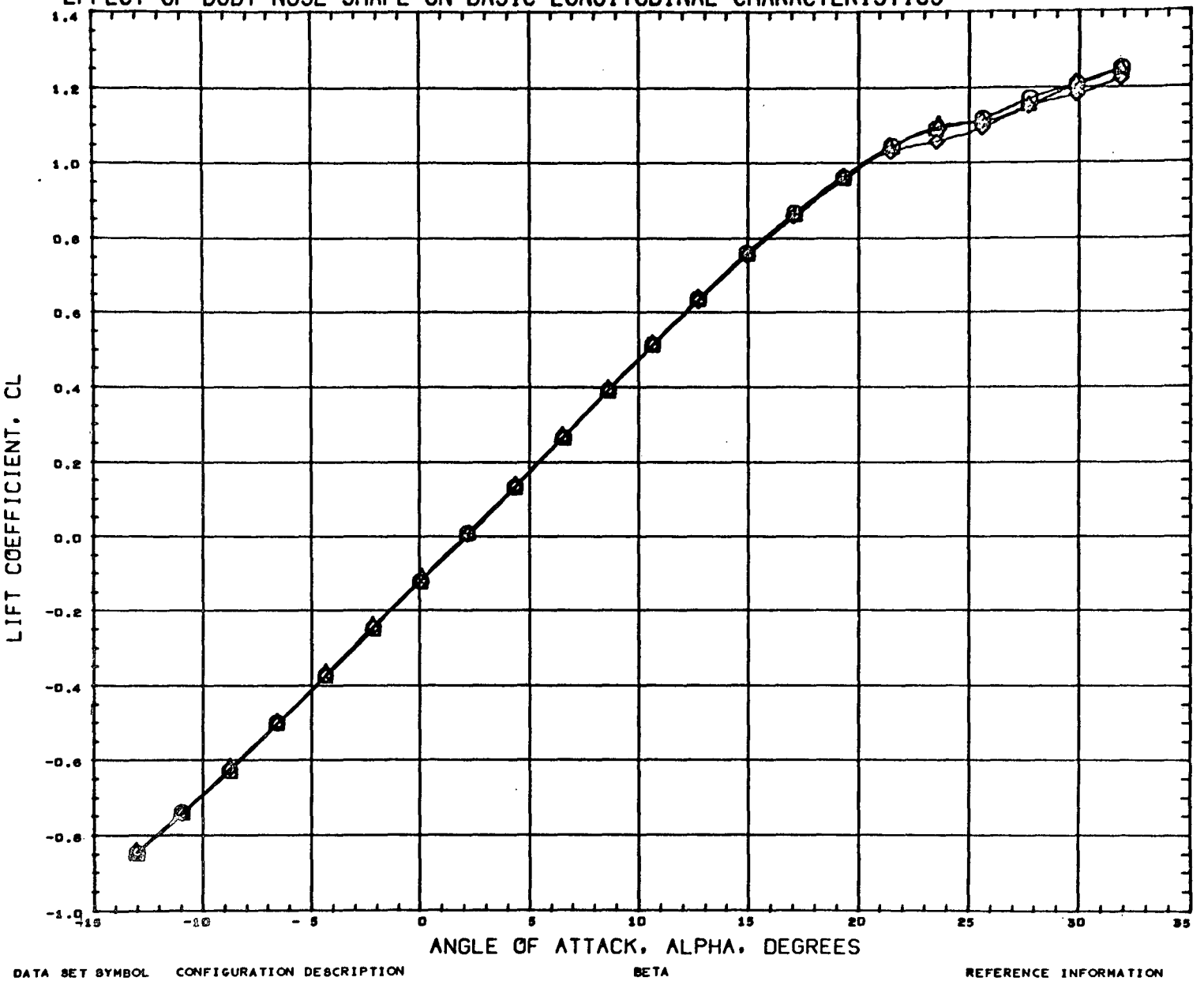
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



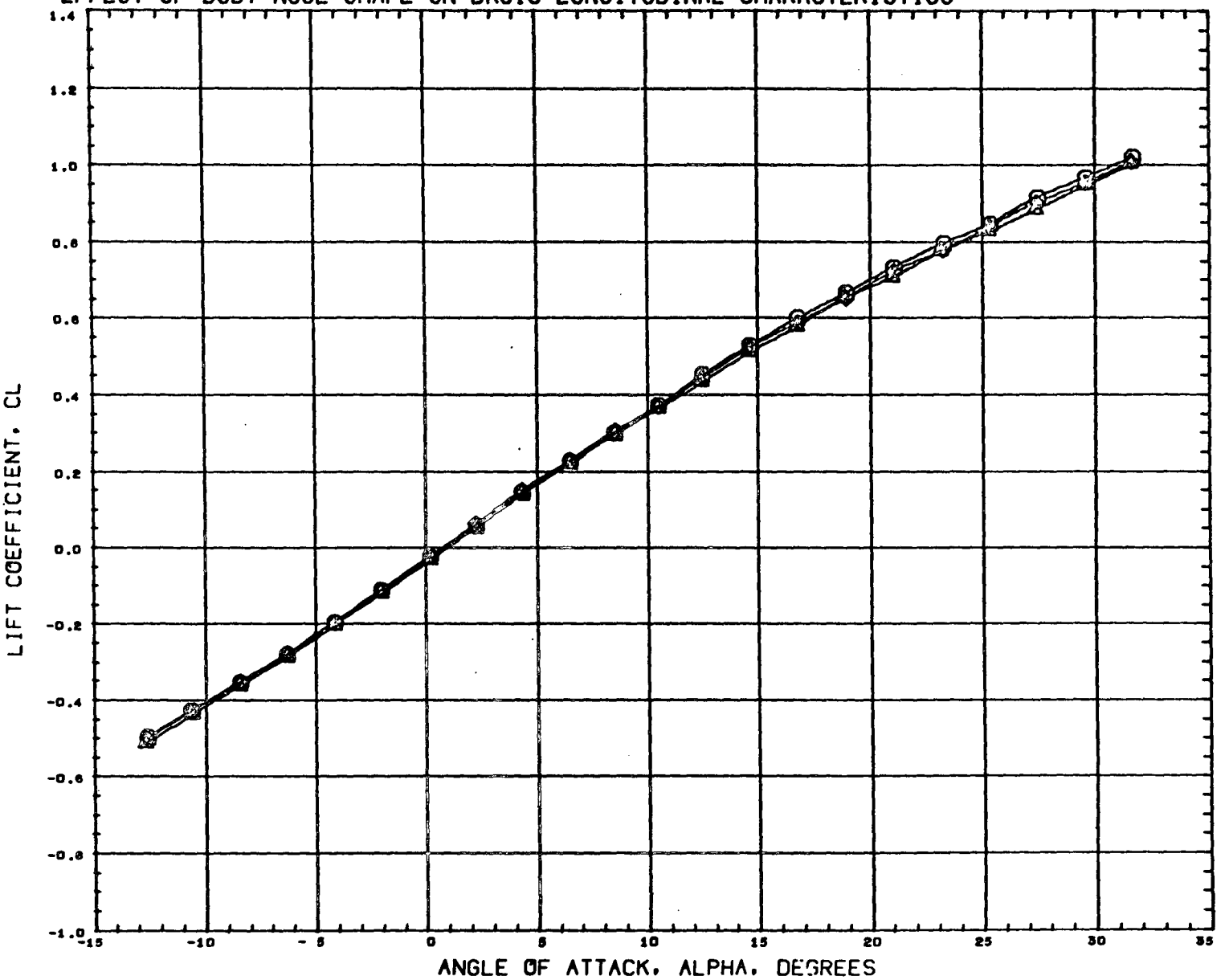
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51019)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

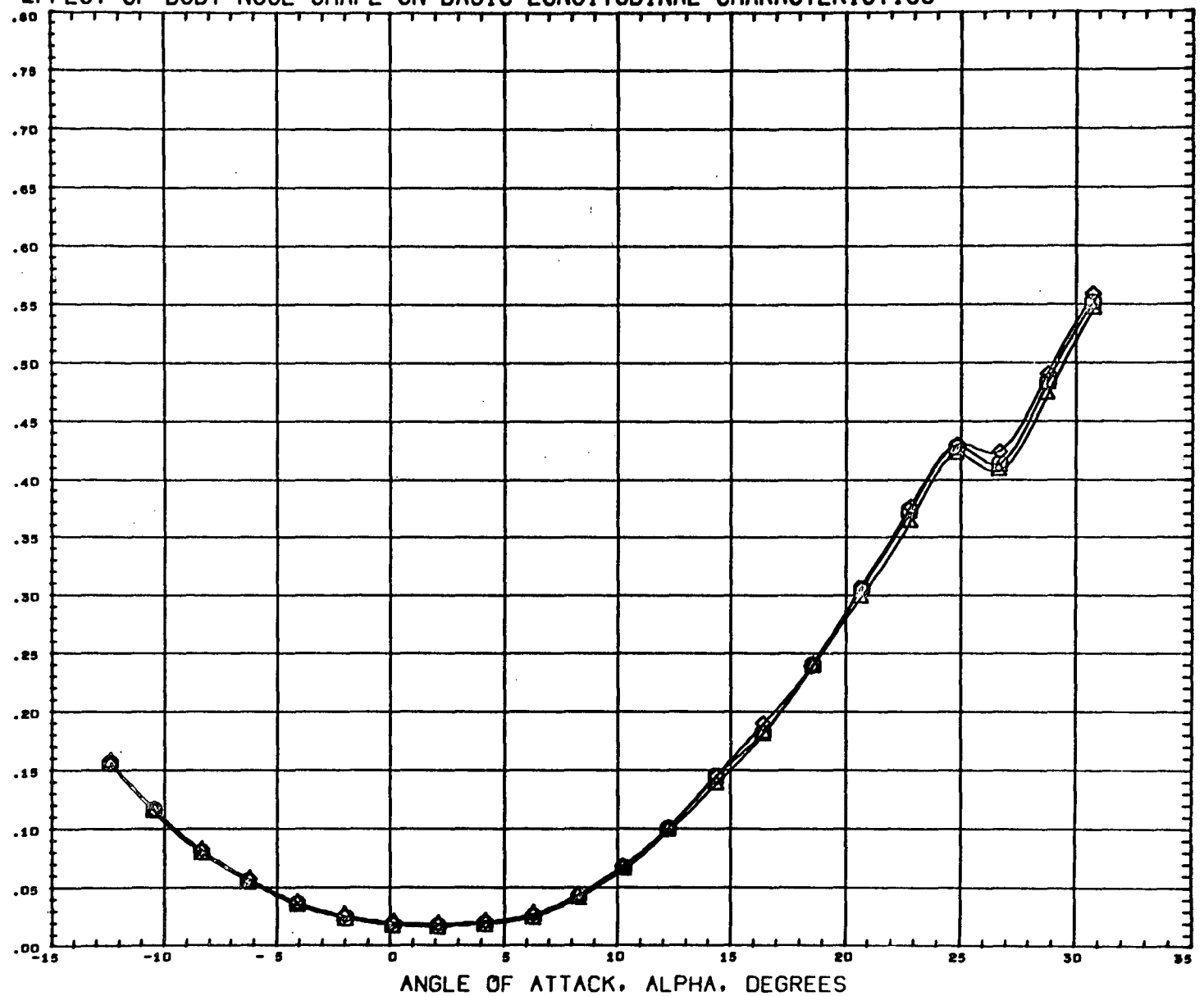


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

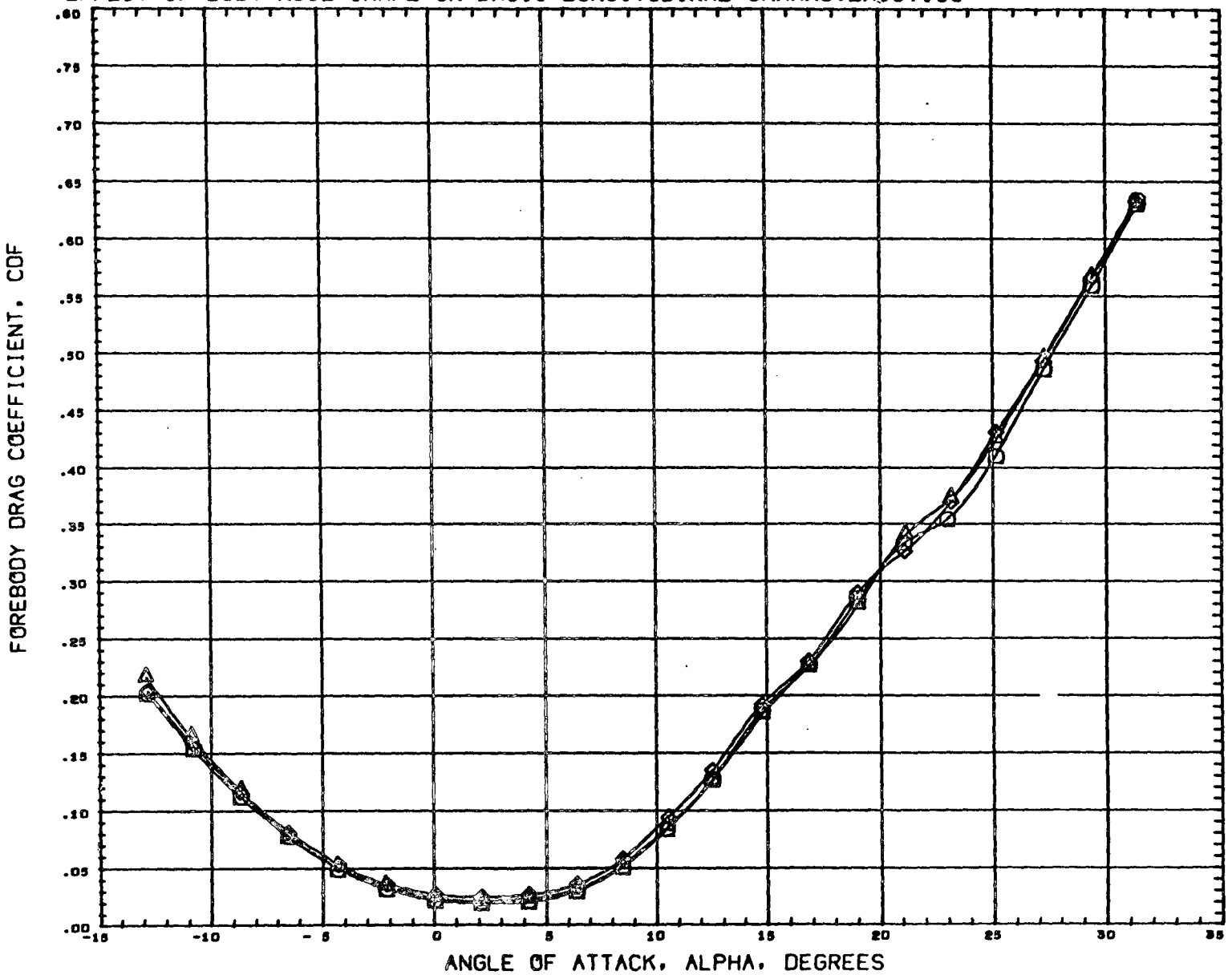


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



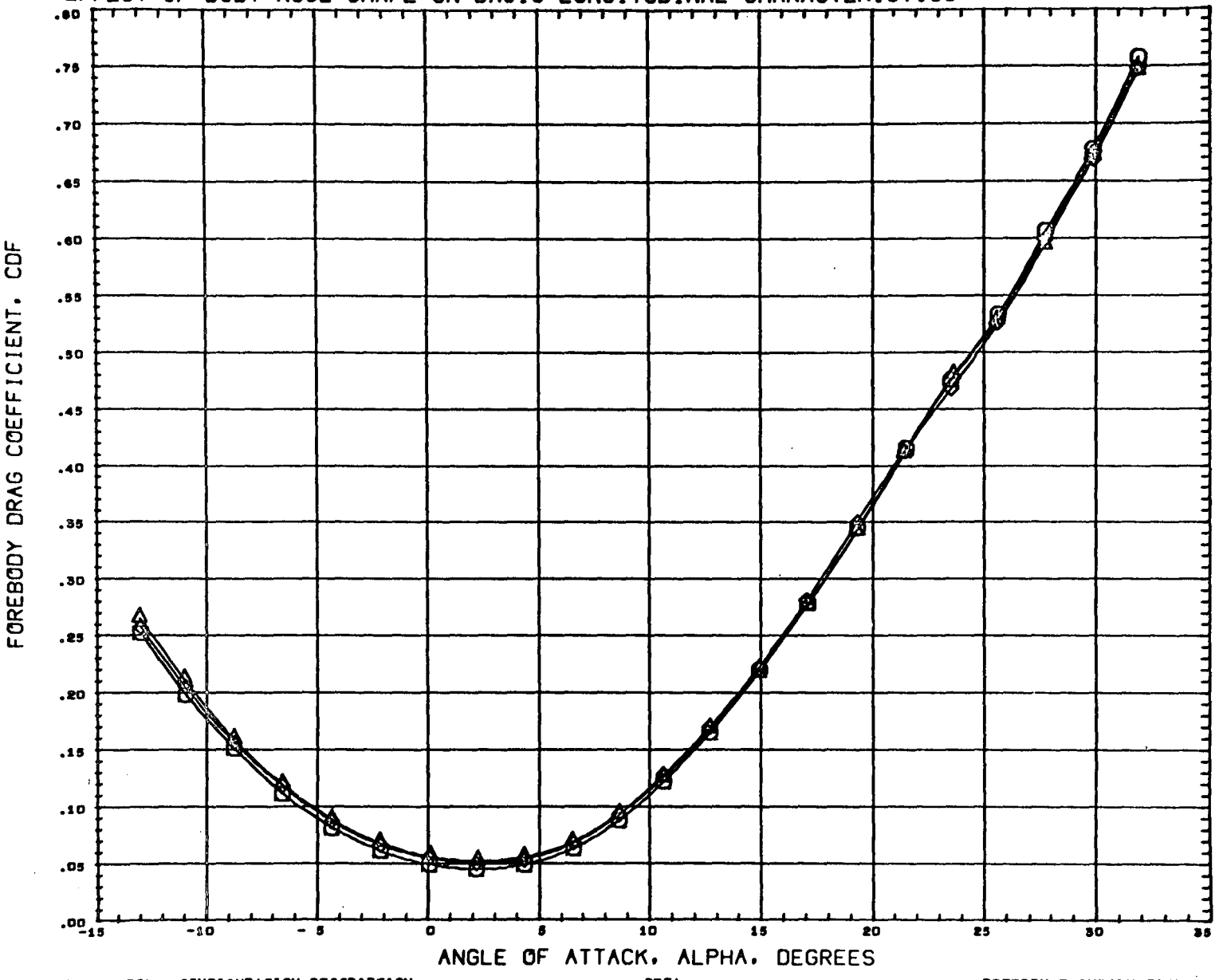
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51015)	○	M8FC509 NR 110C ORBITER B12W26E16V36	0.000
(C51035)	△	M8FC509 NR 110C ORBITER B13W26E16V36	0.000
(C51045)	◇	M8FC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

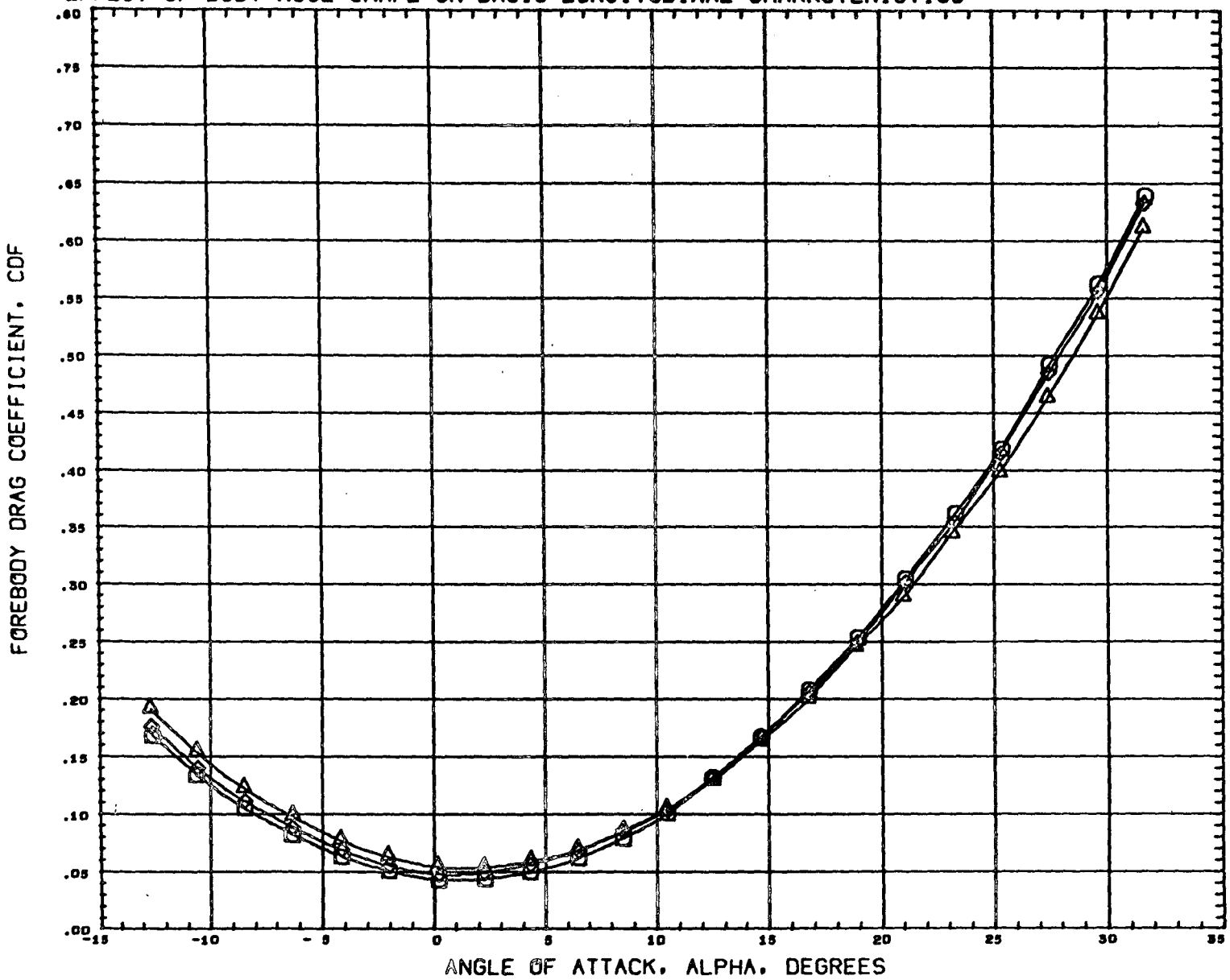


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



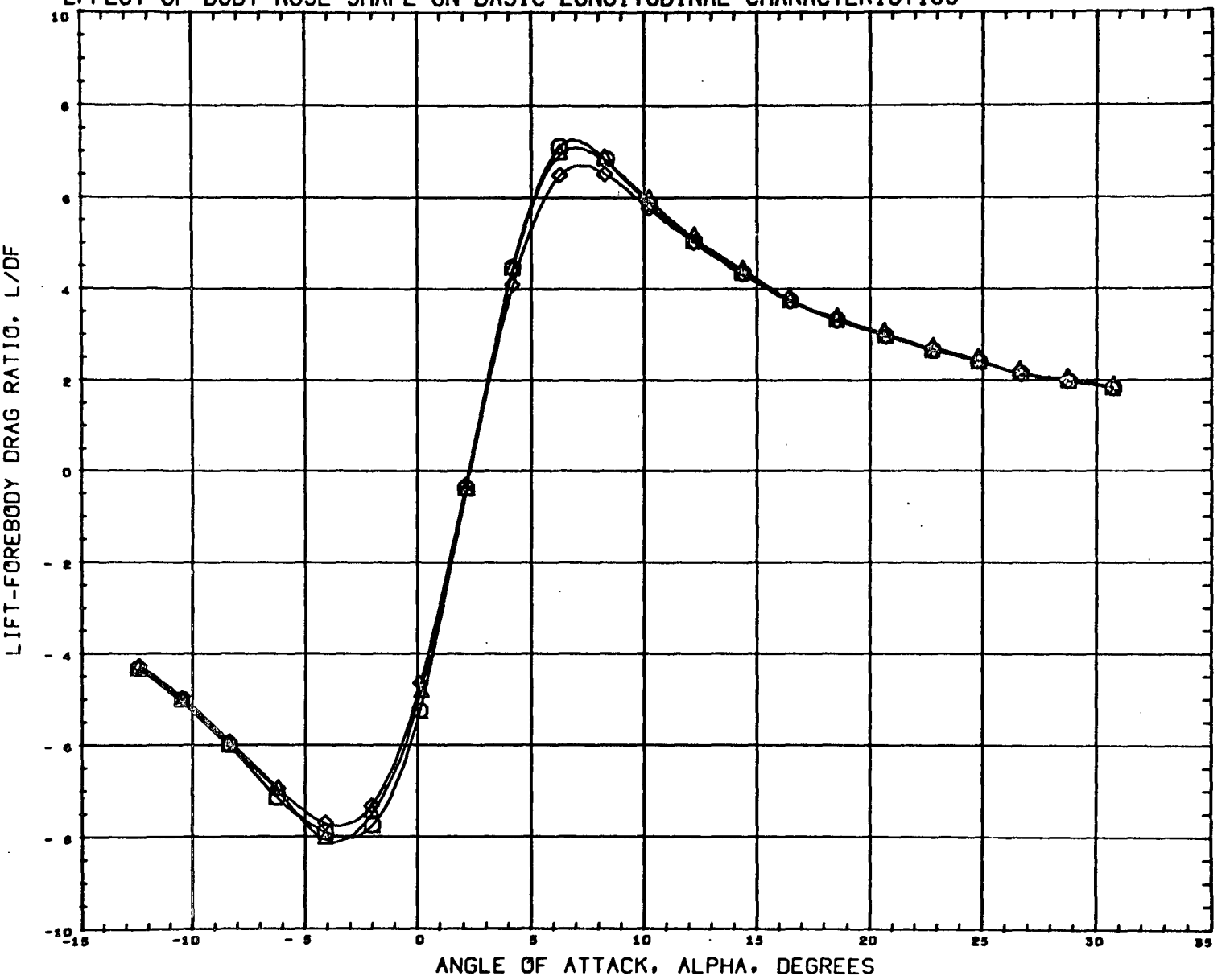
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.961

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

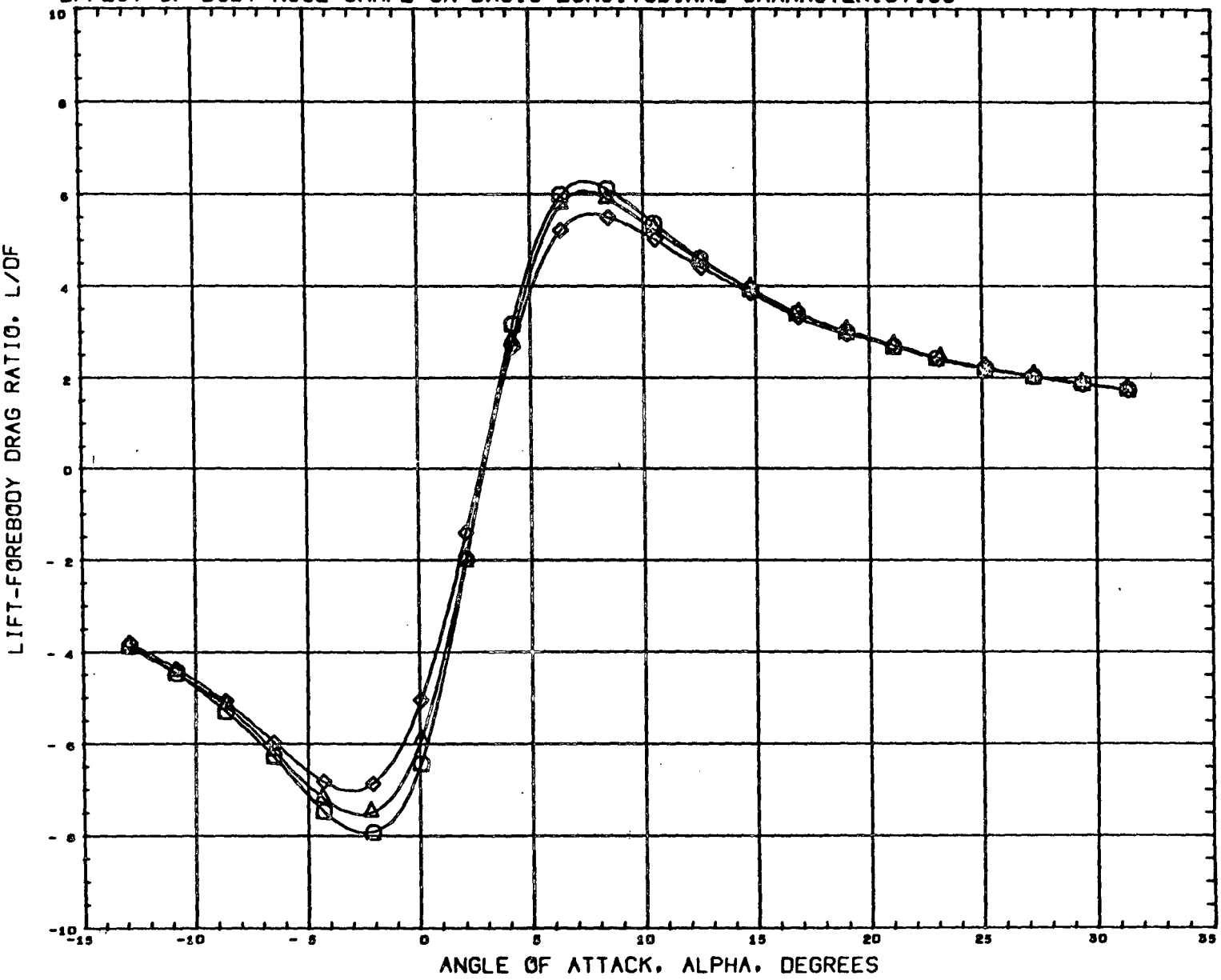


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51039)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



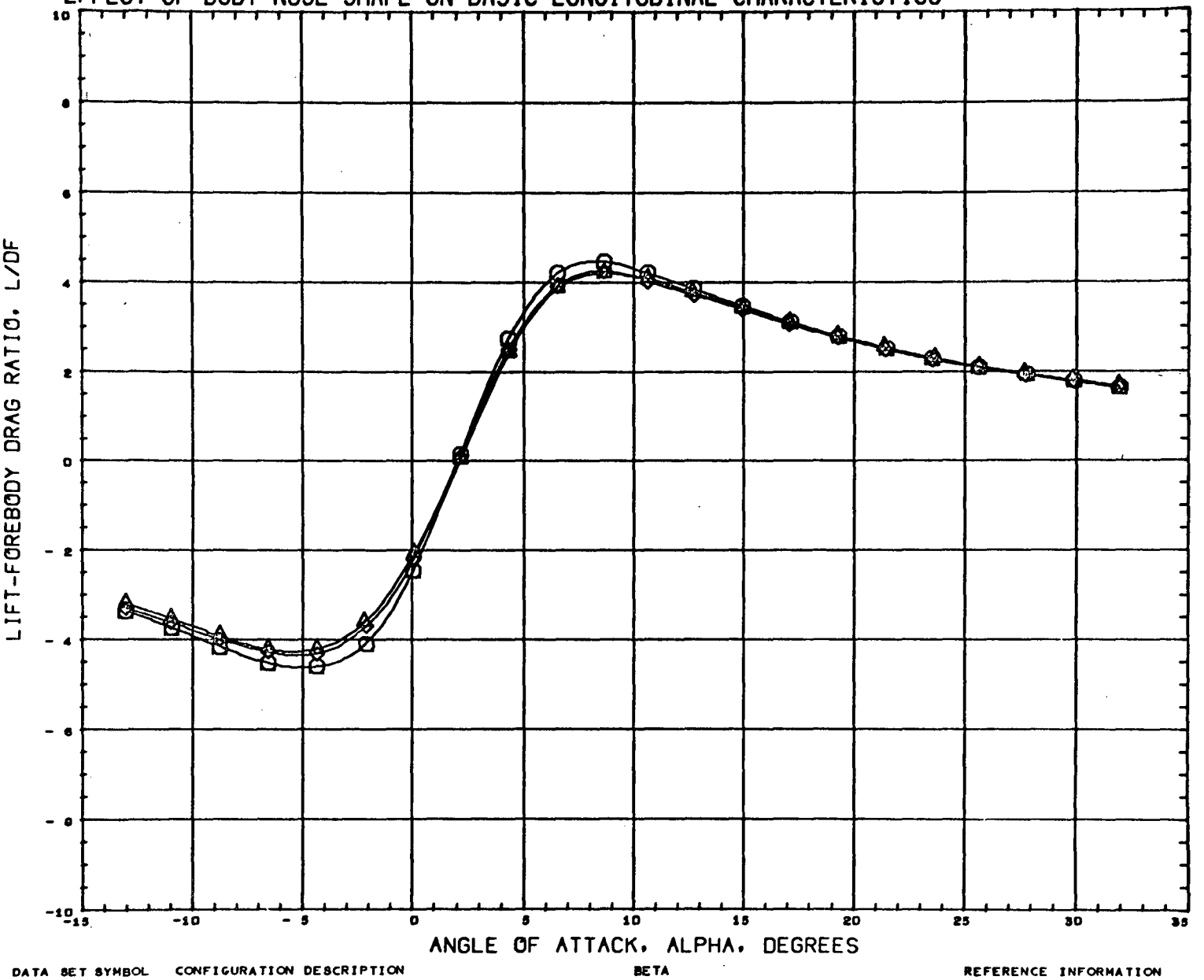
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



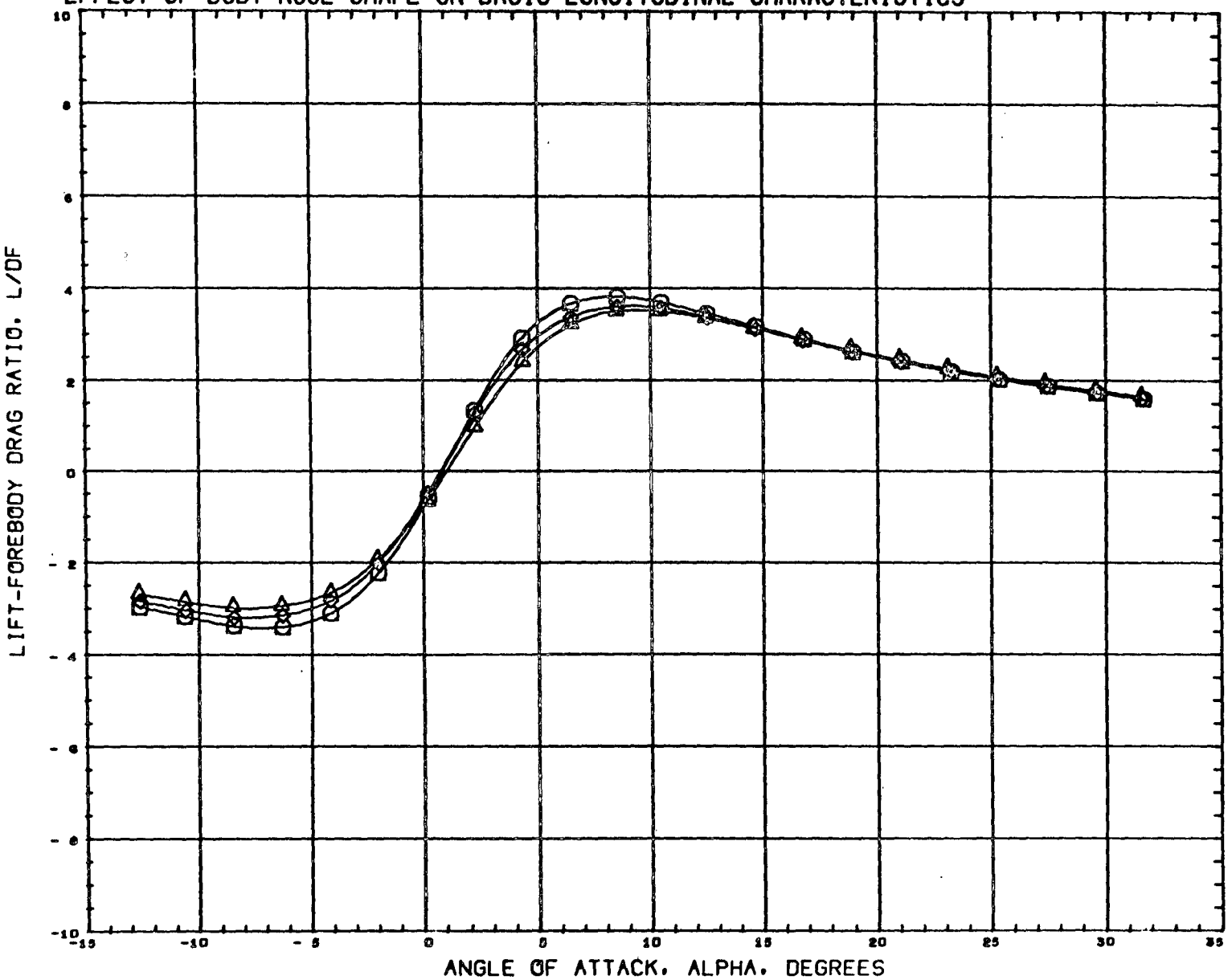
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51015)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



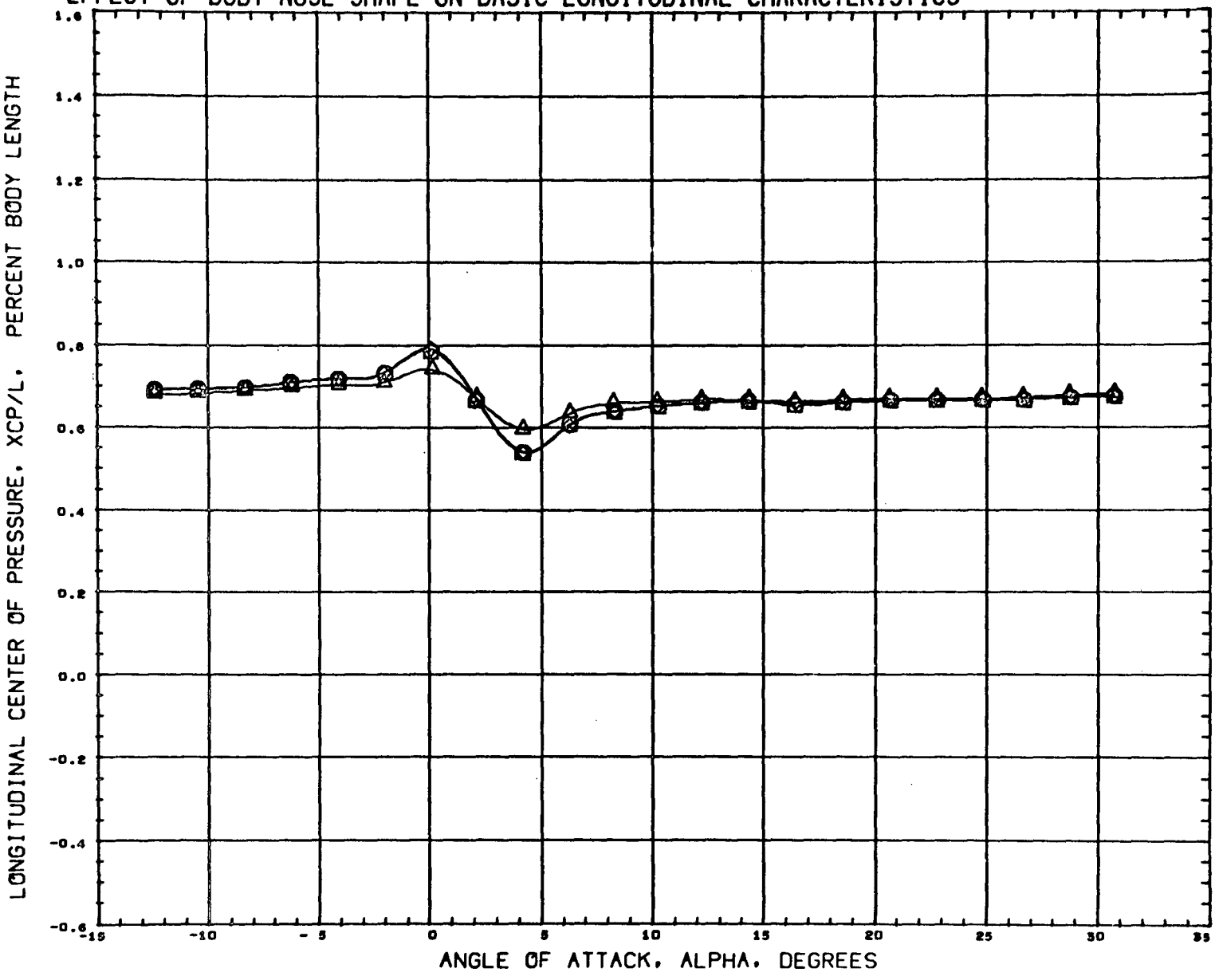
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

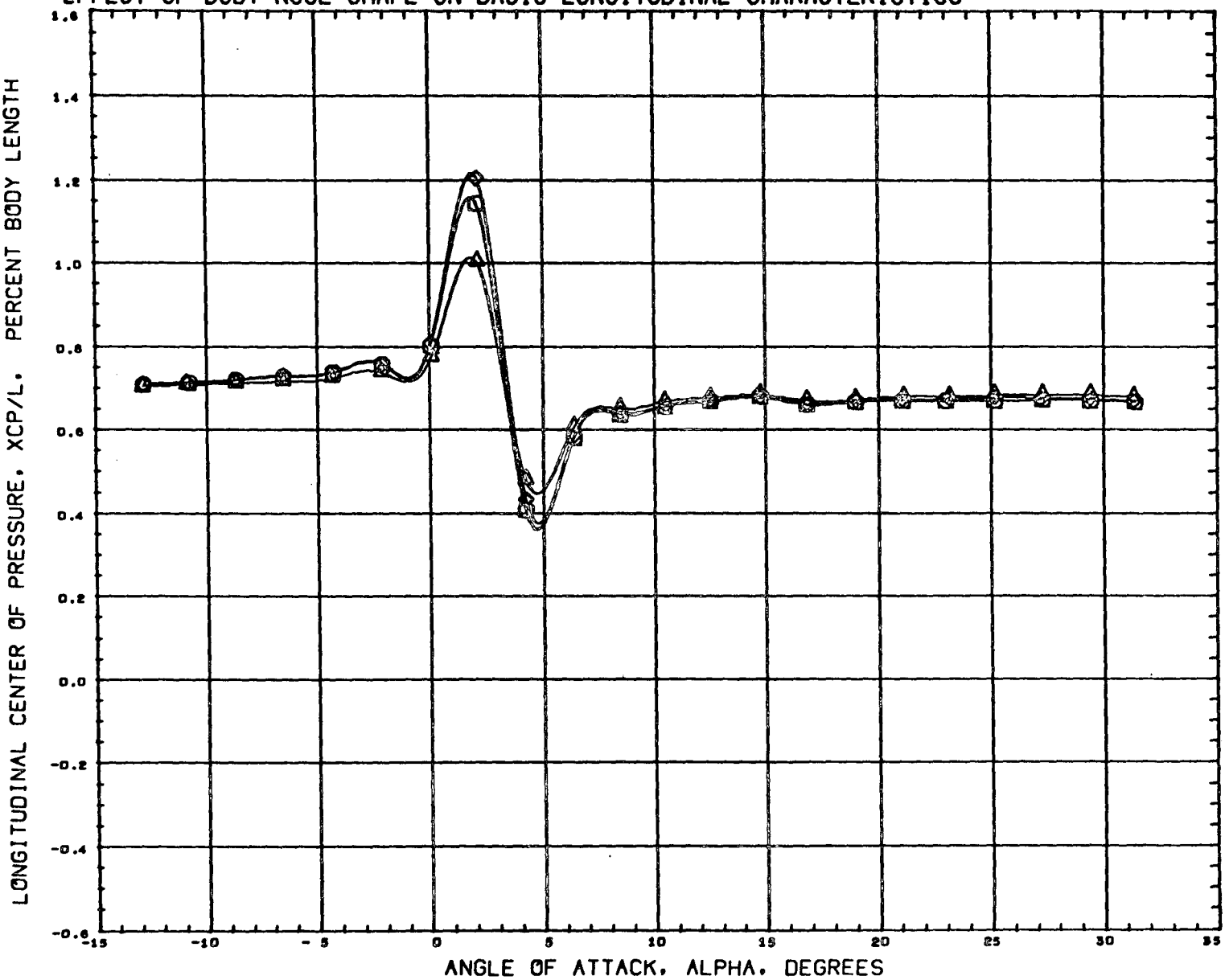


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C5103S)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C5104S)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

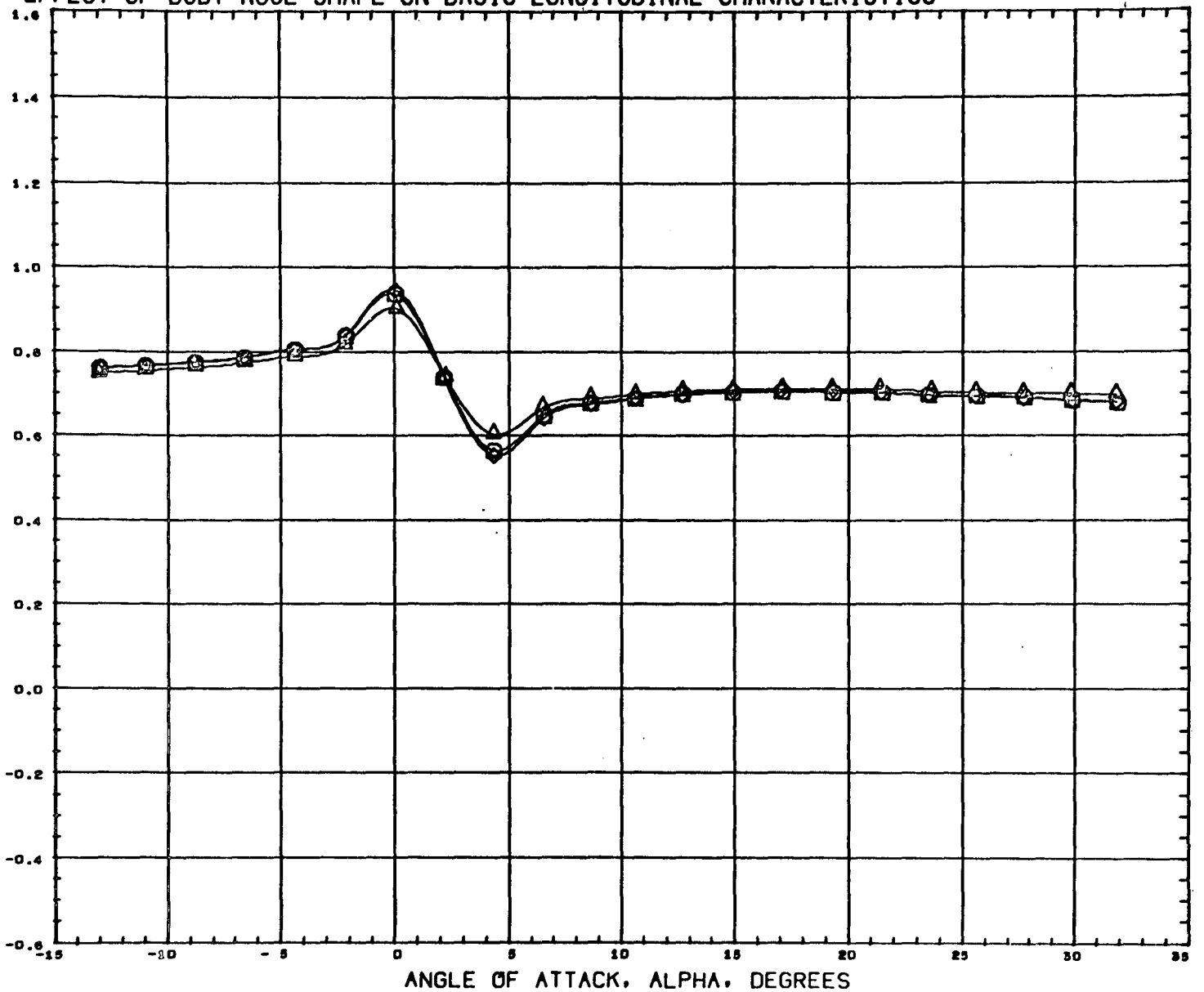


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

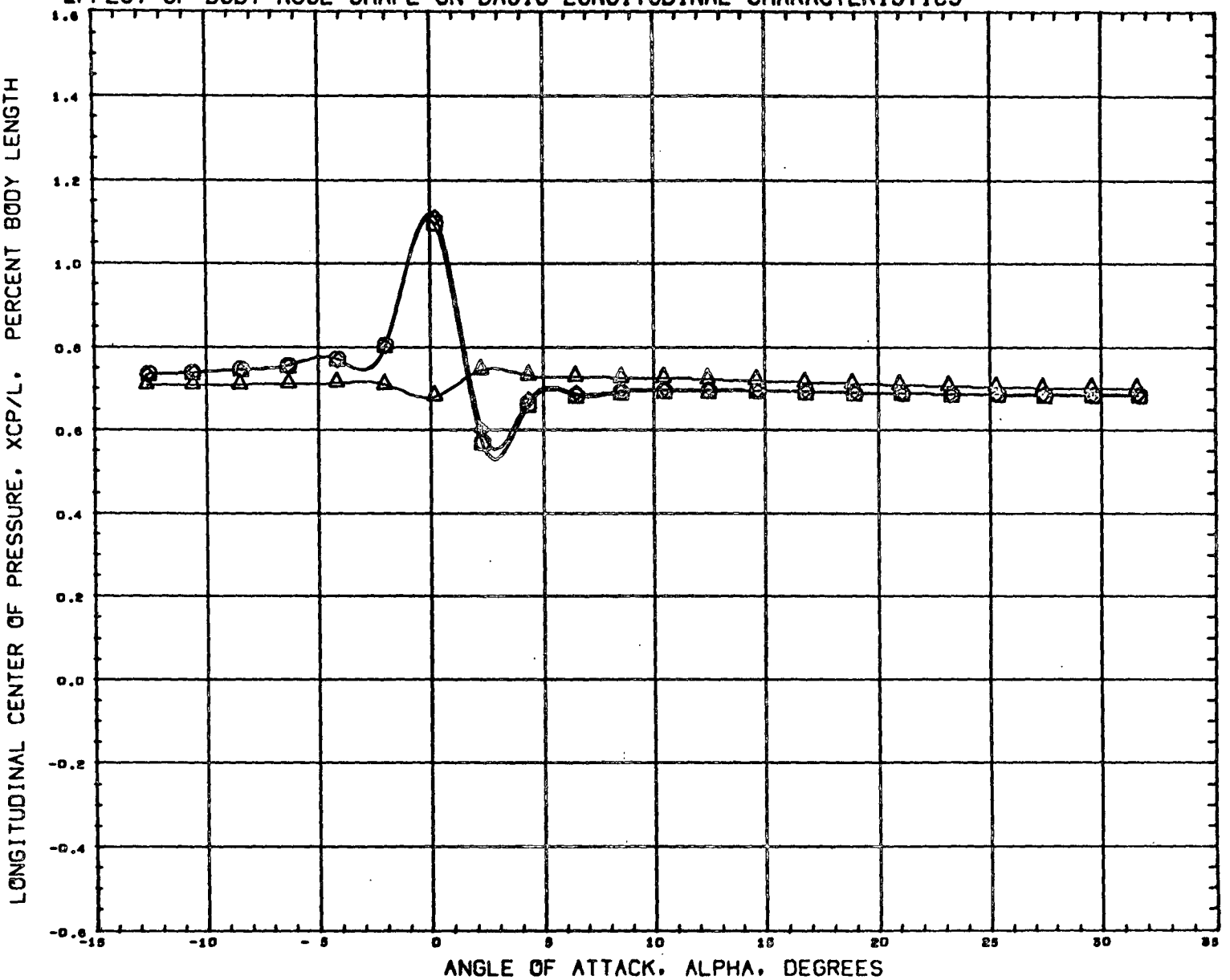


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51015)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

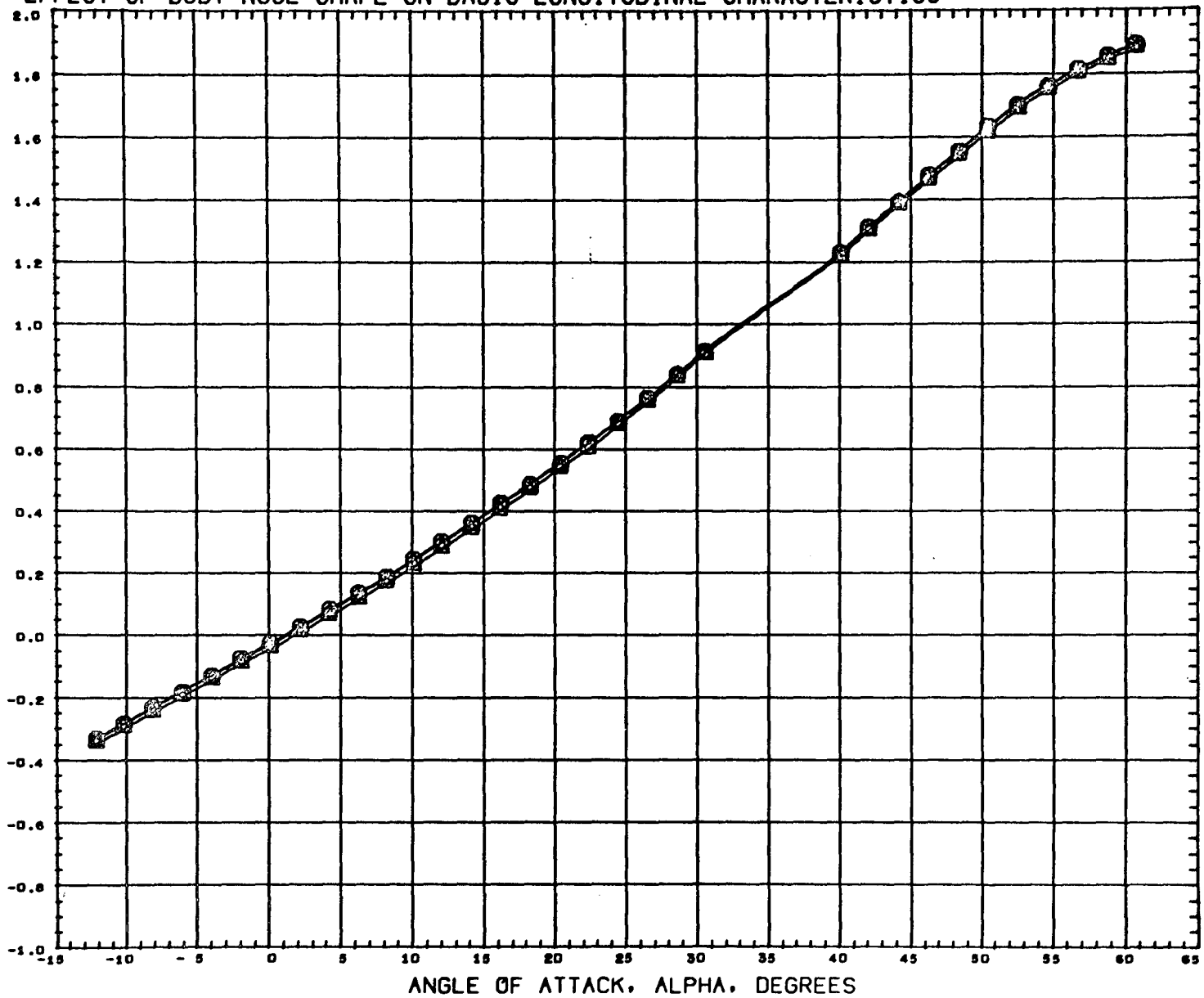


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(C51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(C51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(C51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

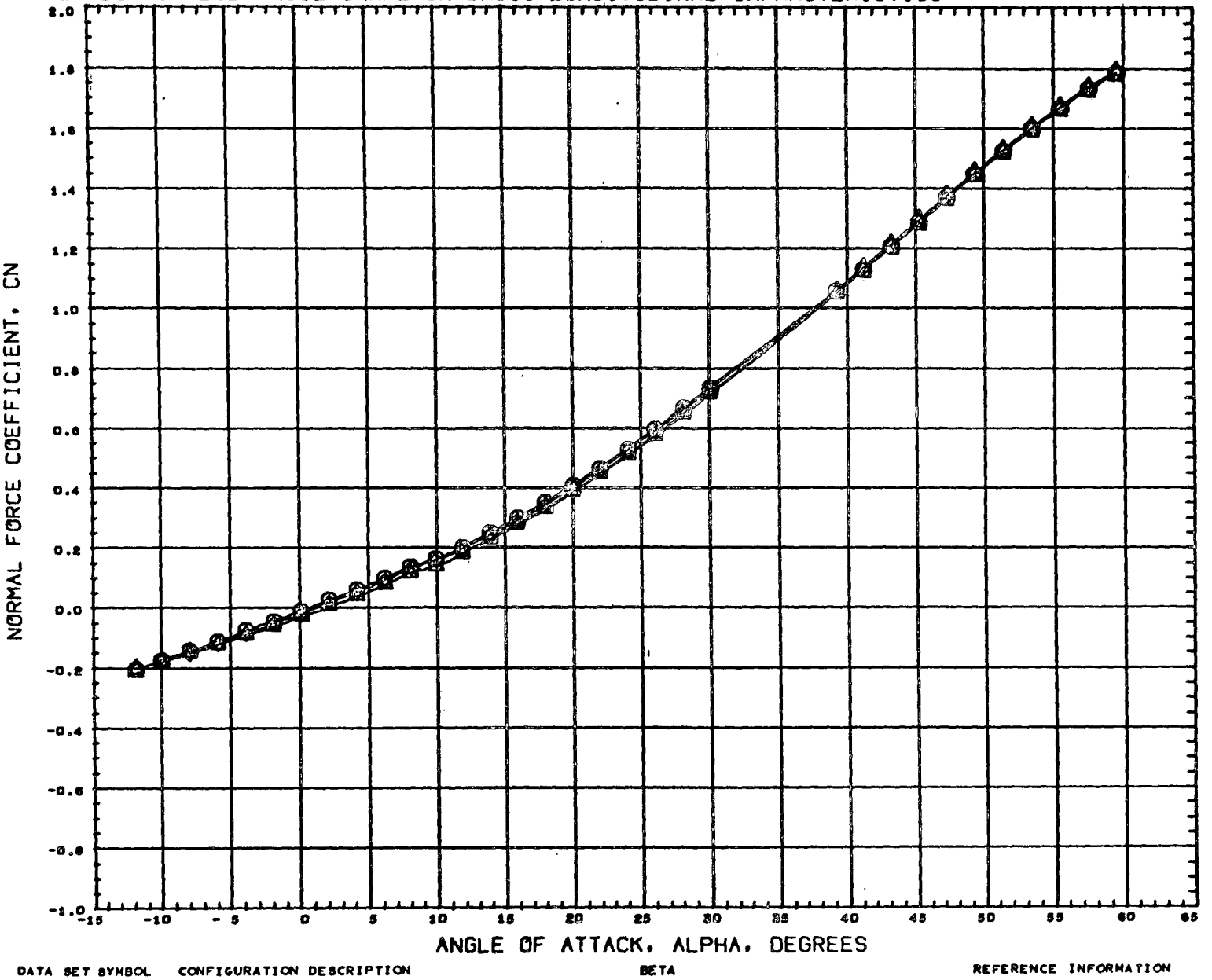


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



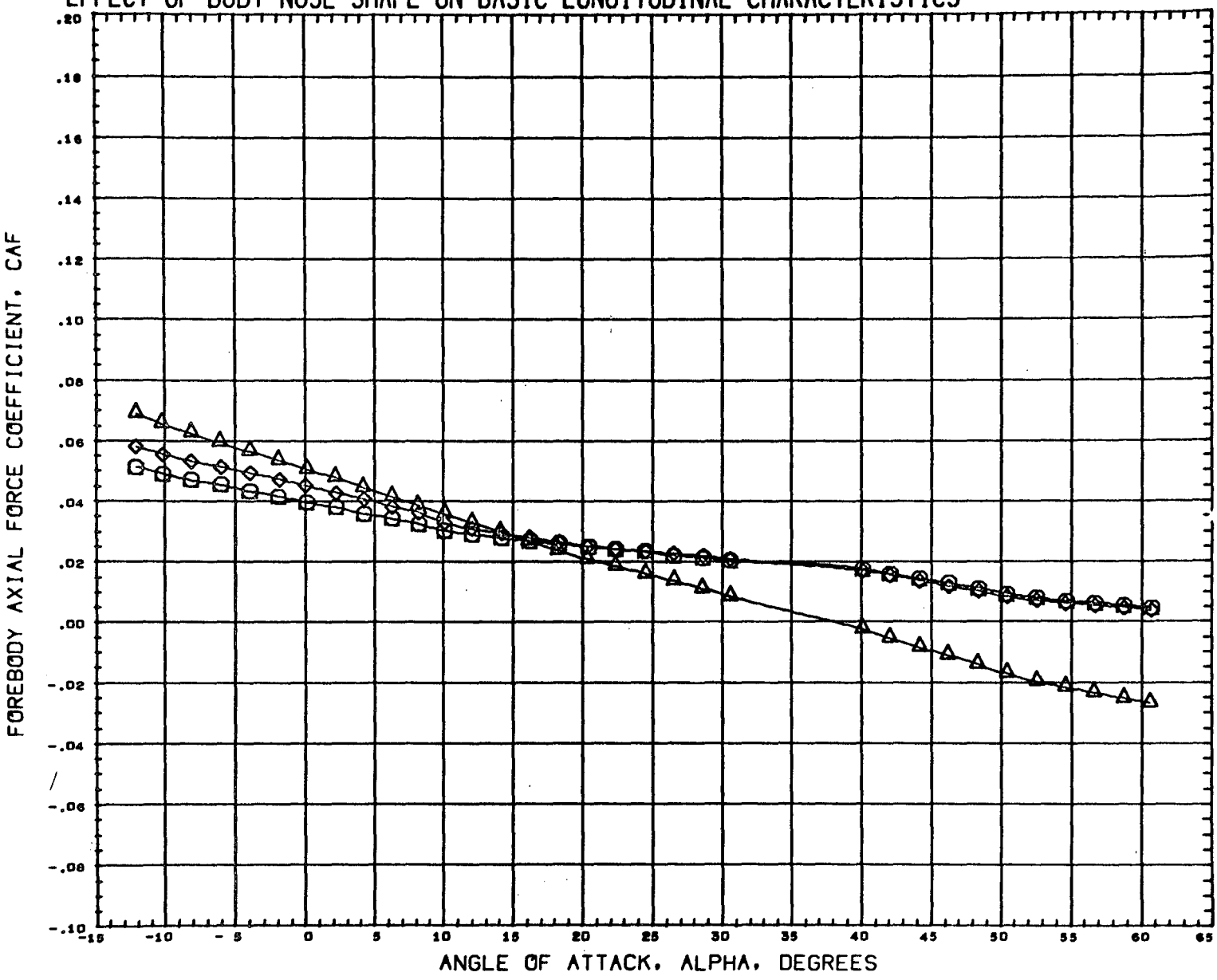
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



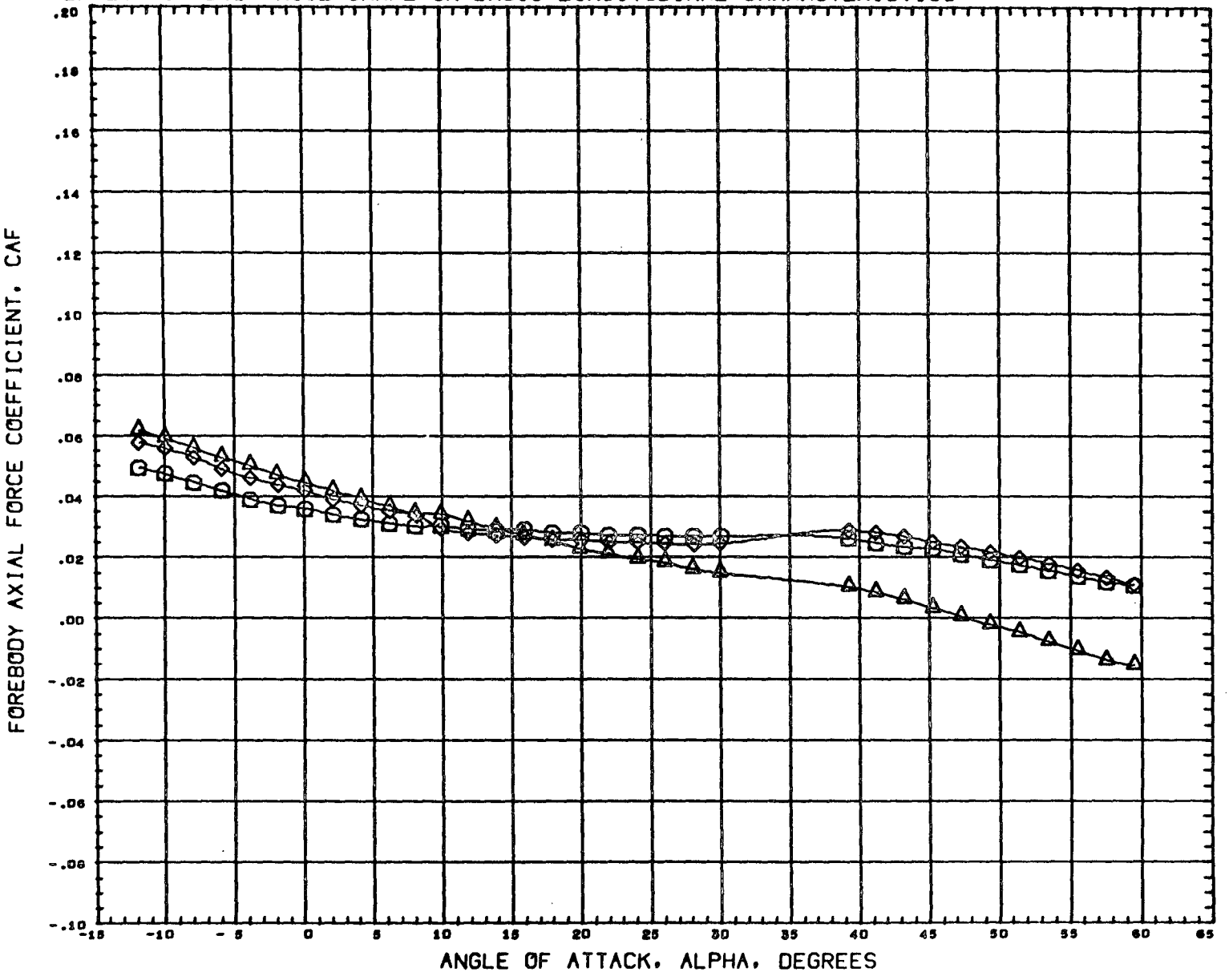
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

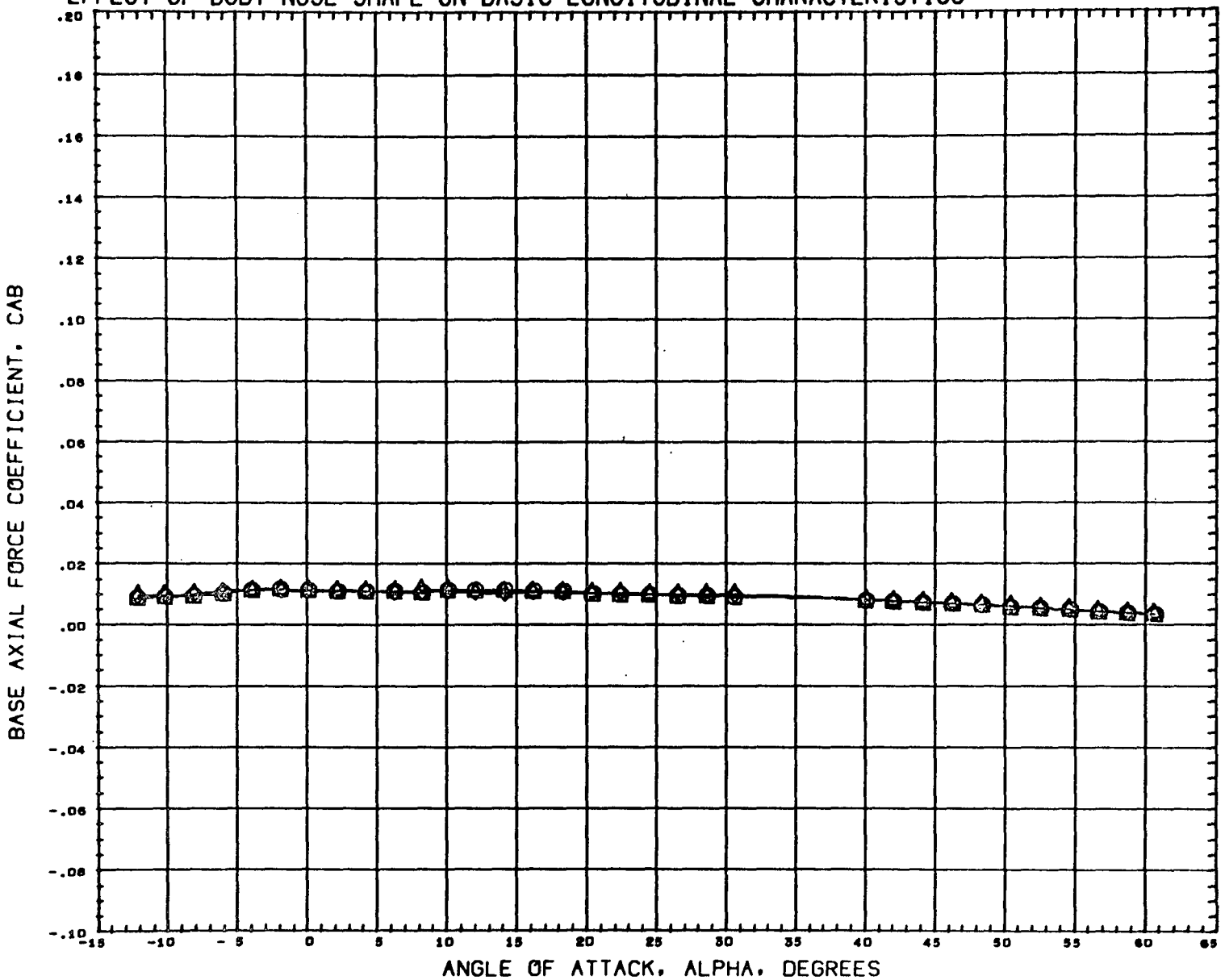


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	M8FC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	M8FC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	M8FC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



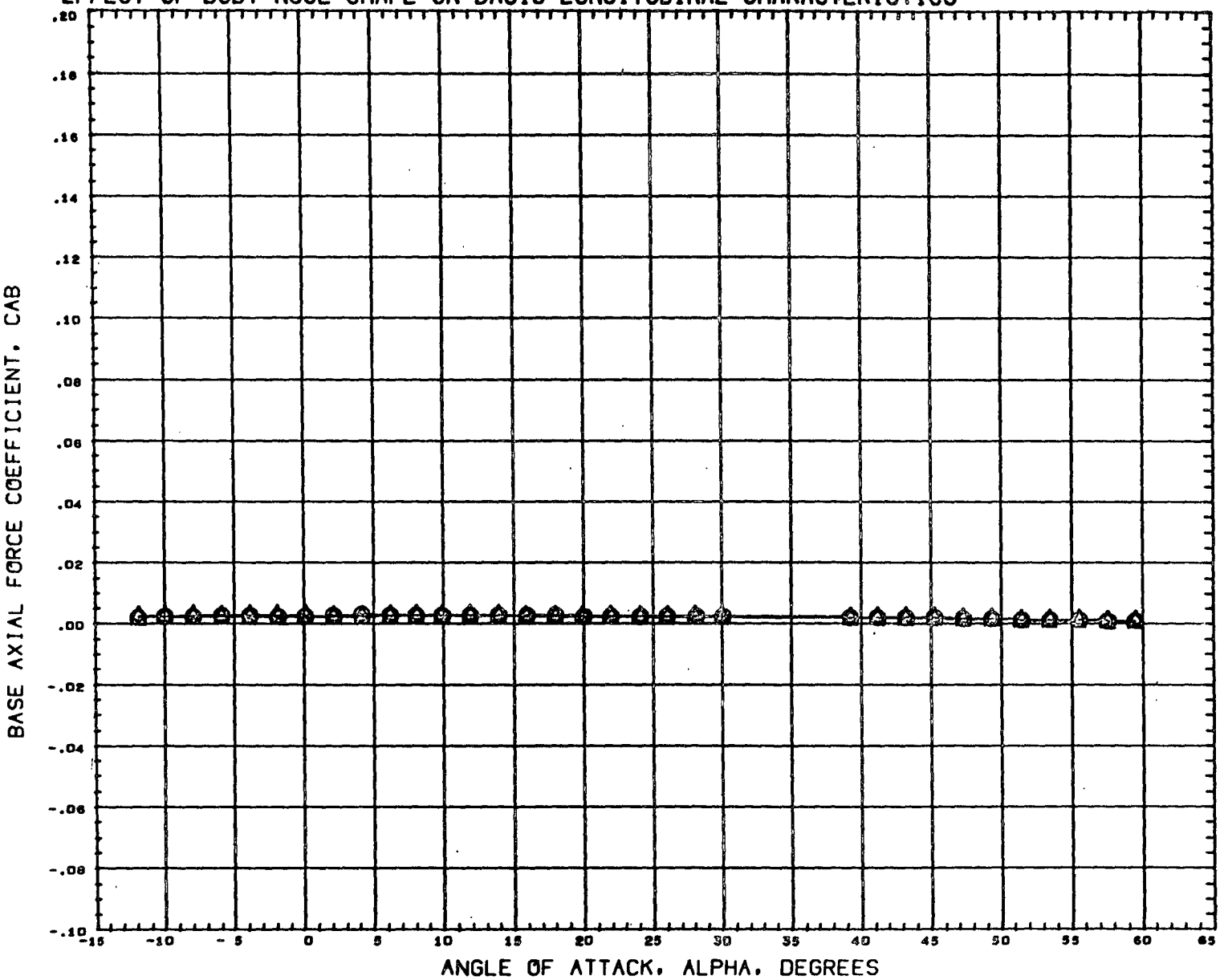
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)		MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)		MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

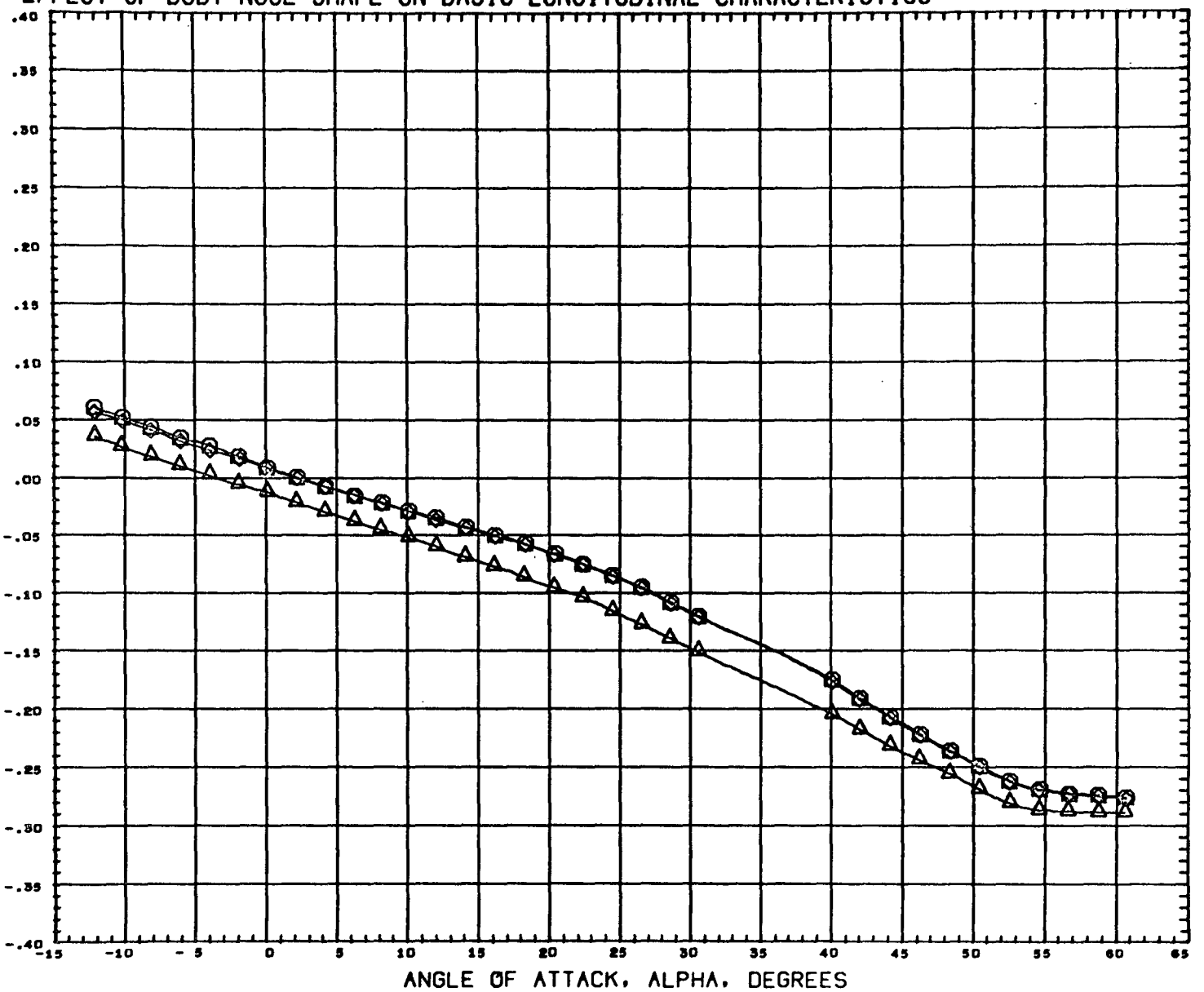


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

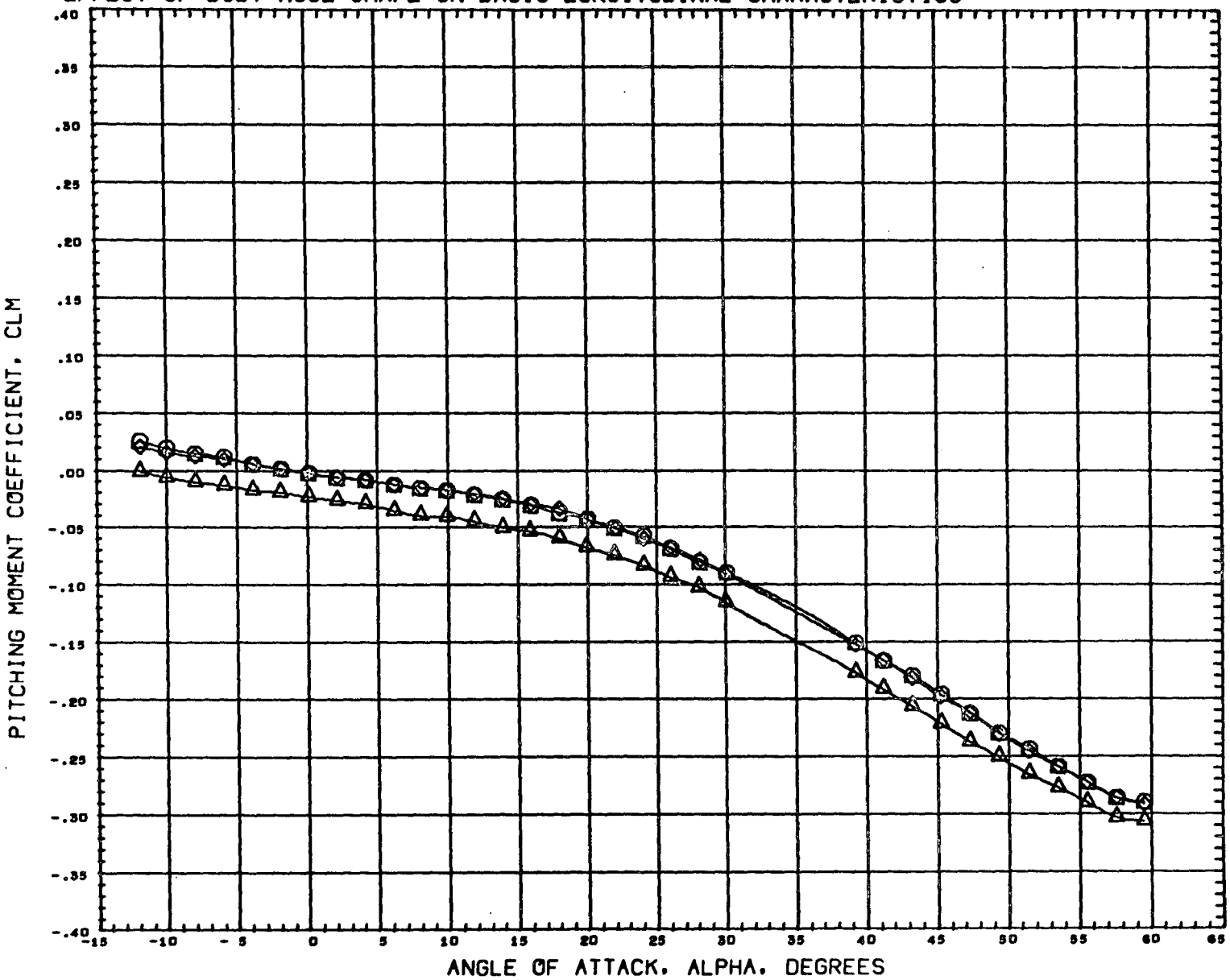


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

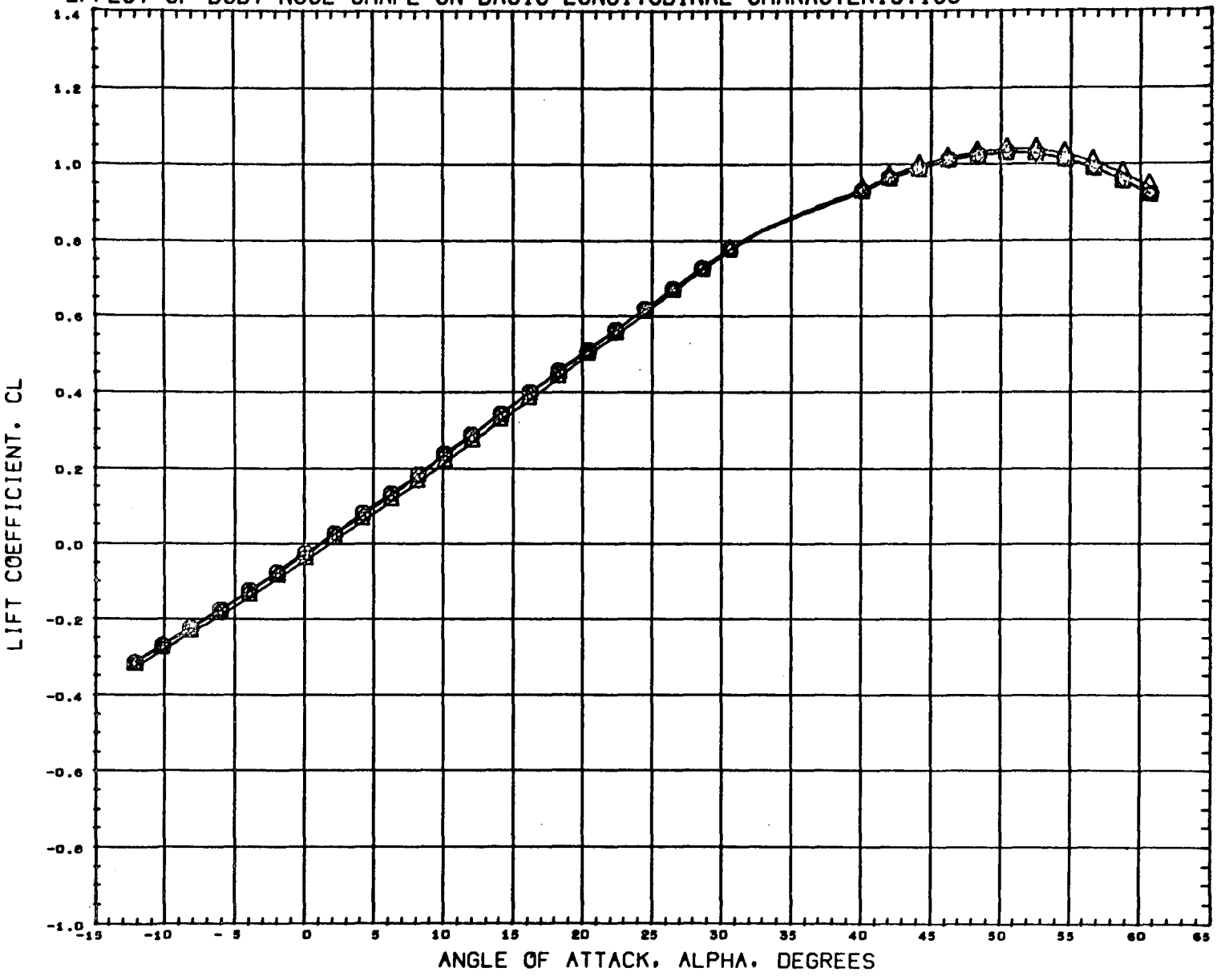


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION			
SREF		9.4420	SQ IN
LREF		2.6930	INCHES
BREF		4.6760	INCHES
XMRP		3.6060	INCHES
YMRP		0.0000	
ZMRP	-	0.0990	INCHES
SCALE		0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

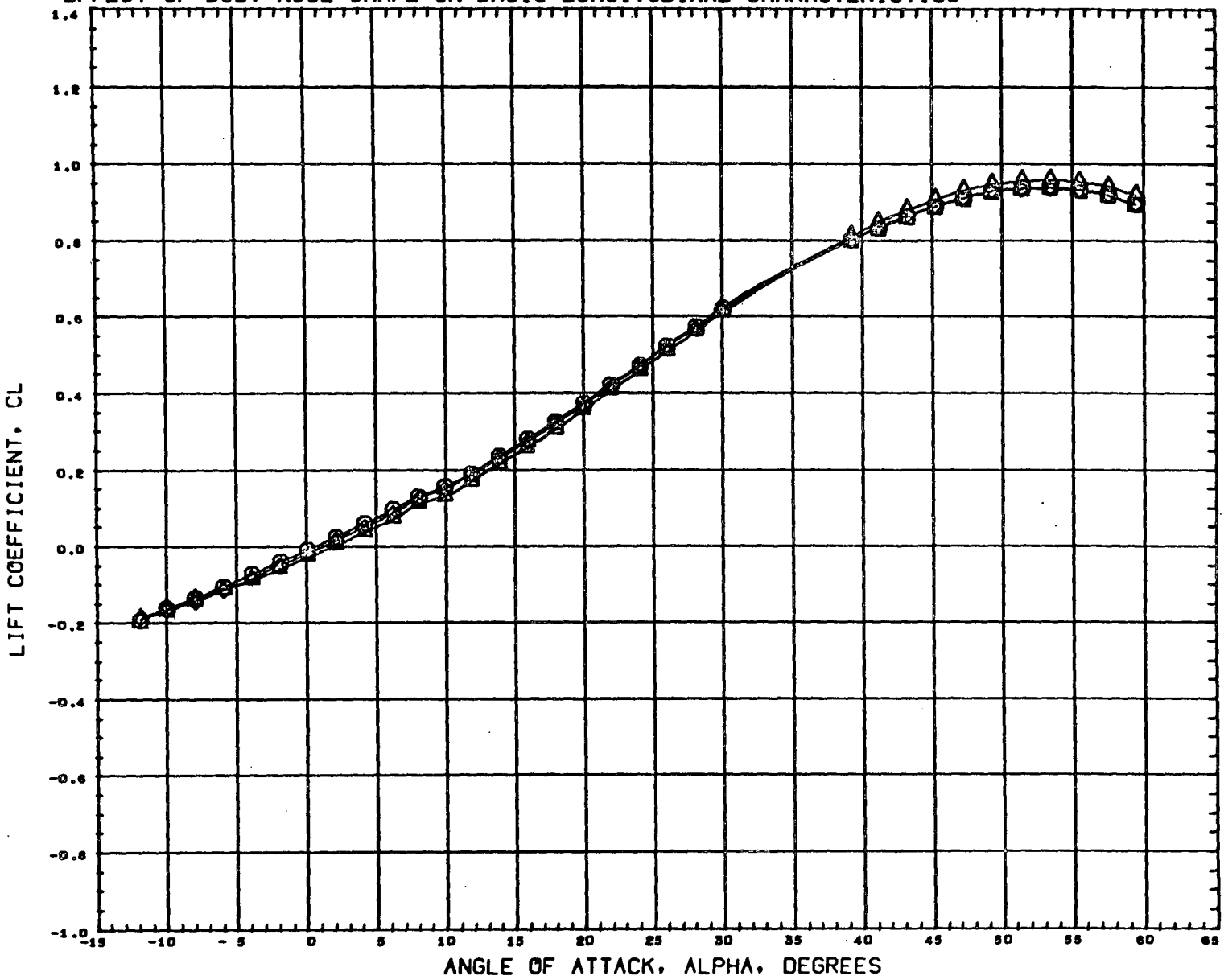


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51039)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



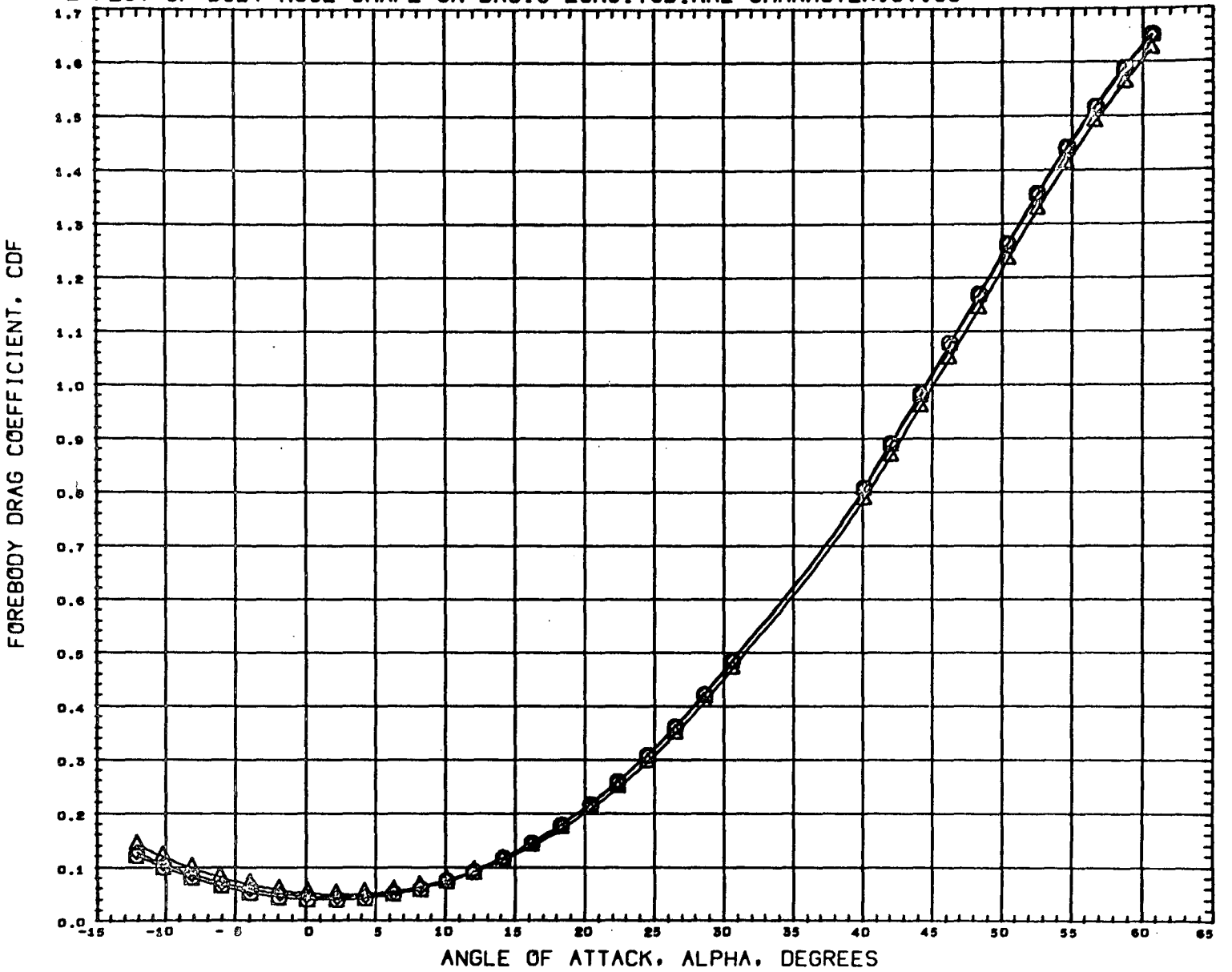
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

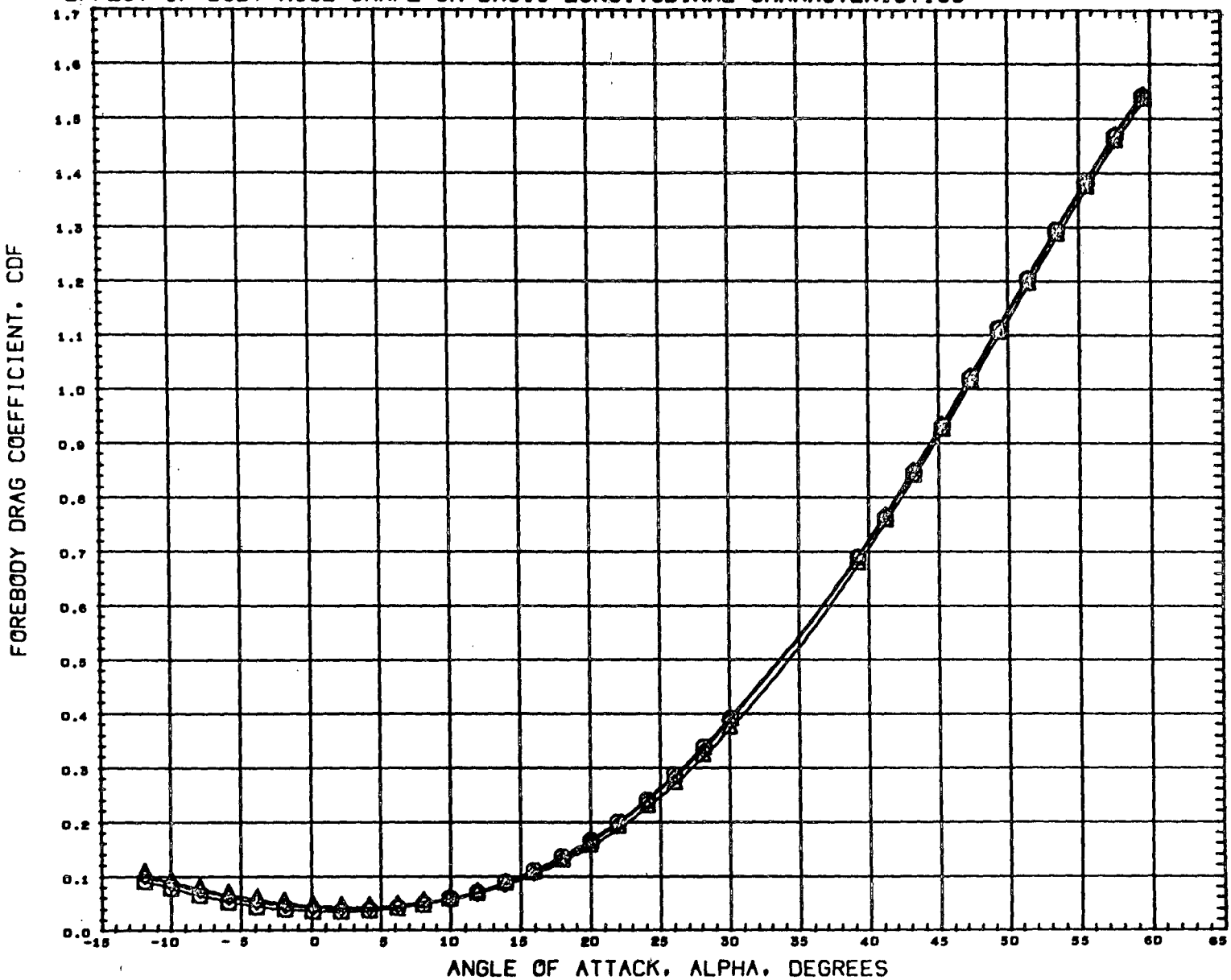


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS



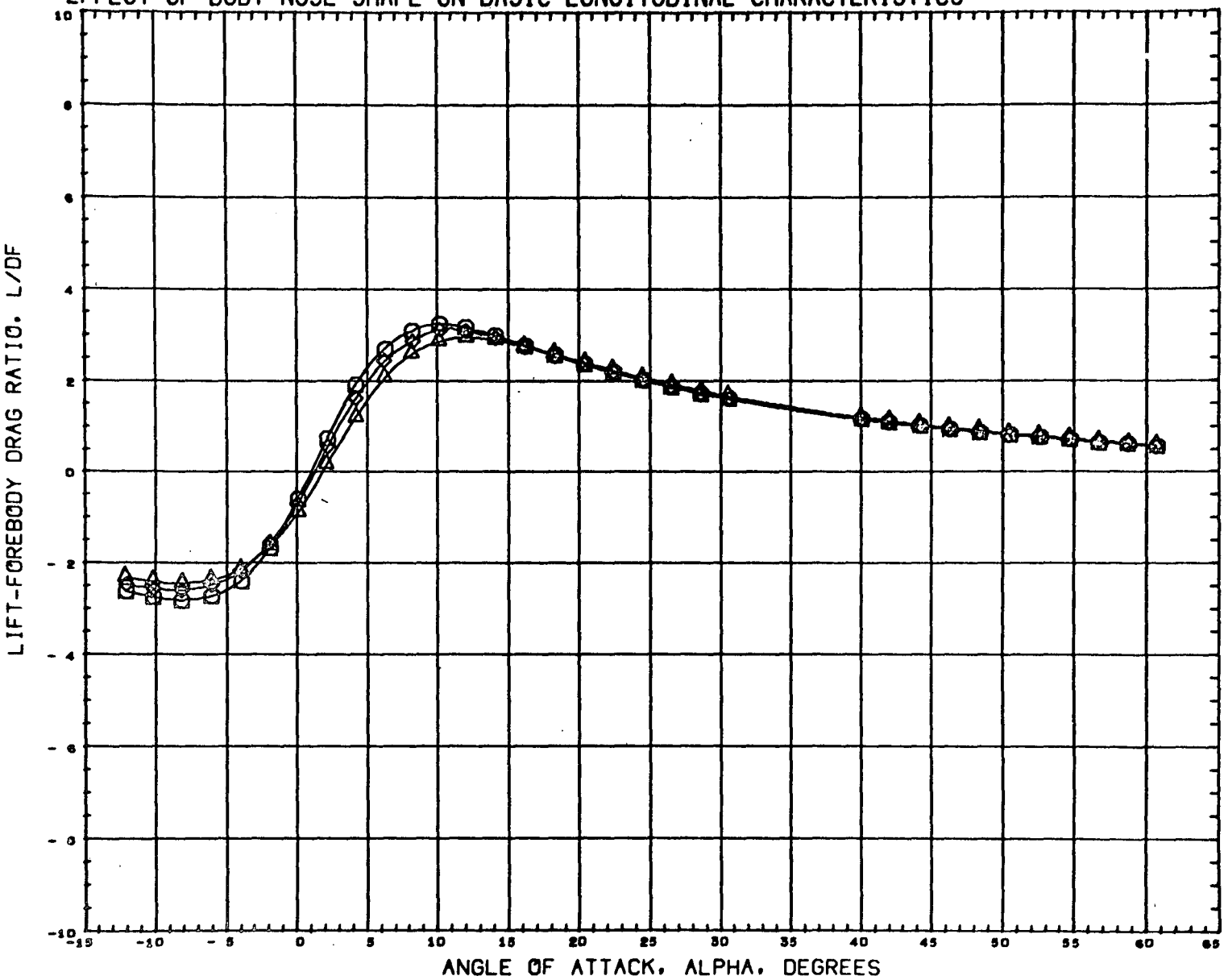
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(051018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(051038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(051048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

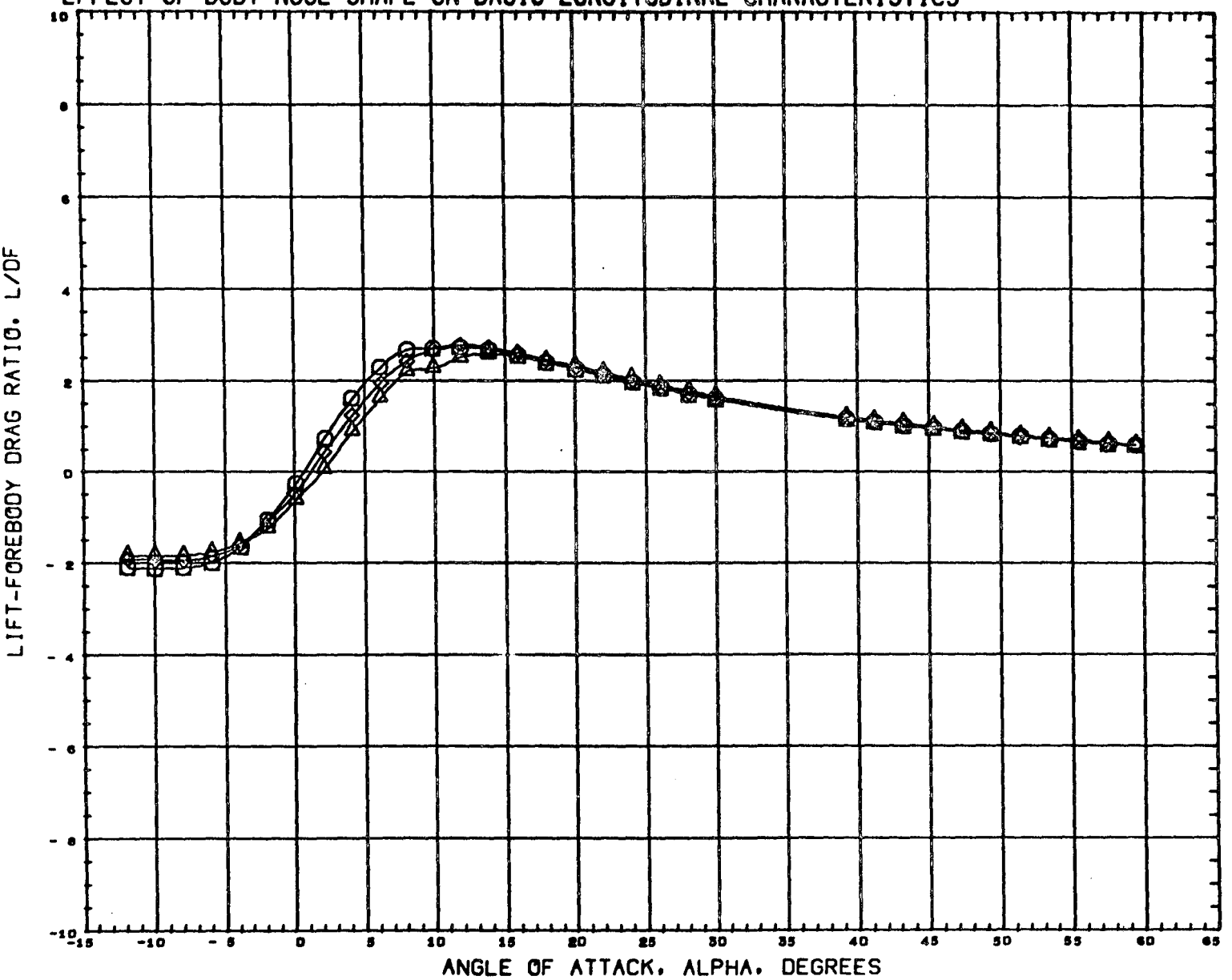


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

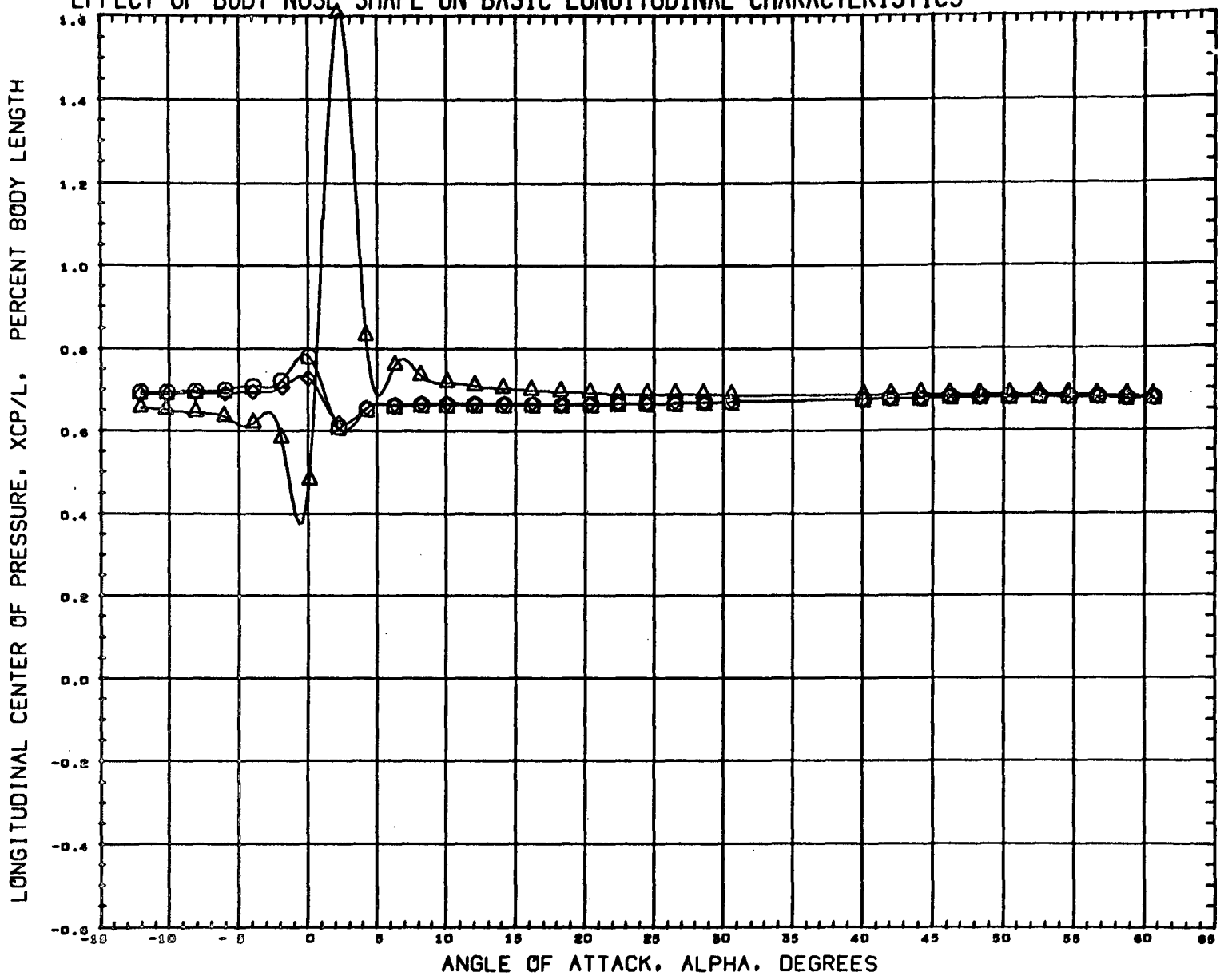


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

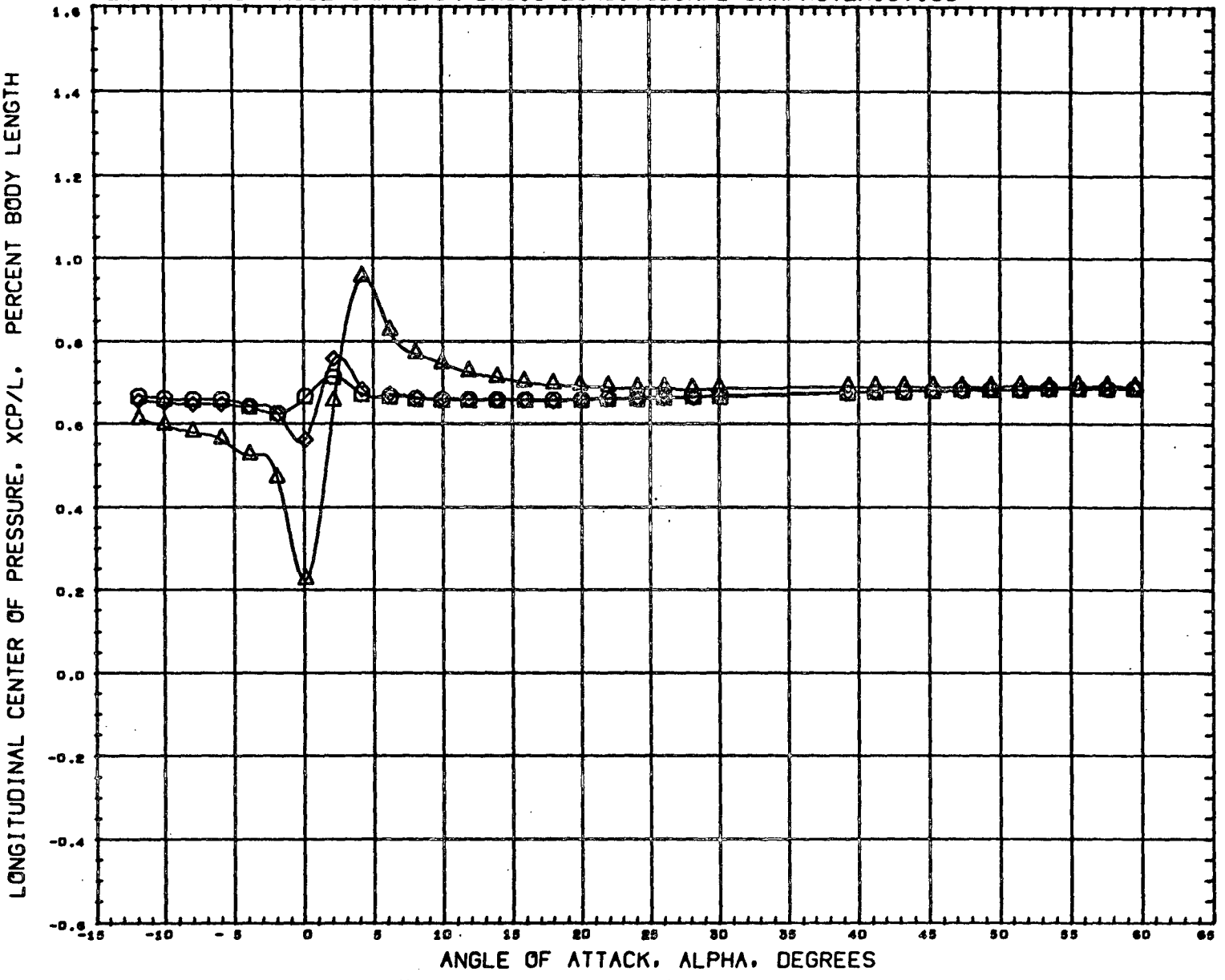


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51030)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51040)	◇	MSFC900 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BODY NOSE SHAPE ON BASIC LONGITUDINAL CHARACTERISTICS

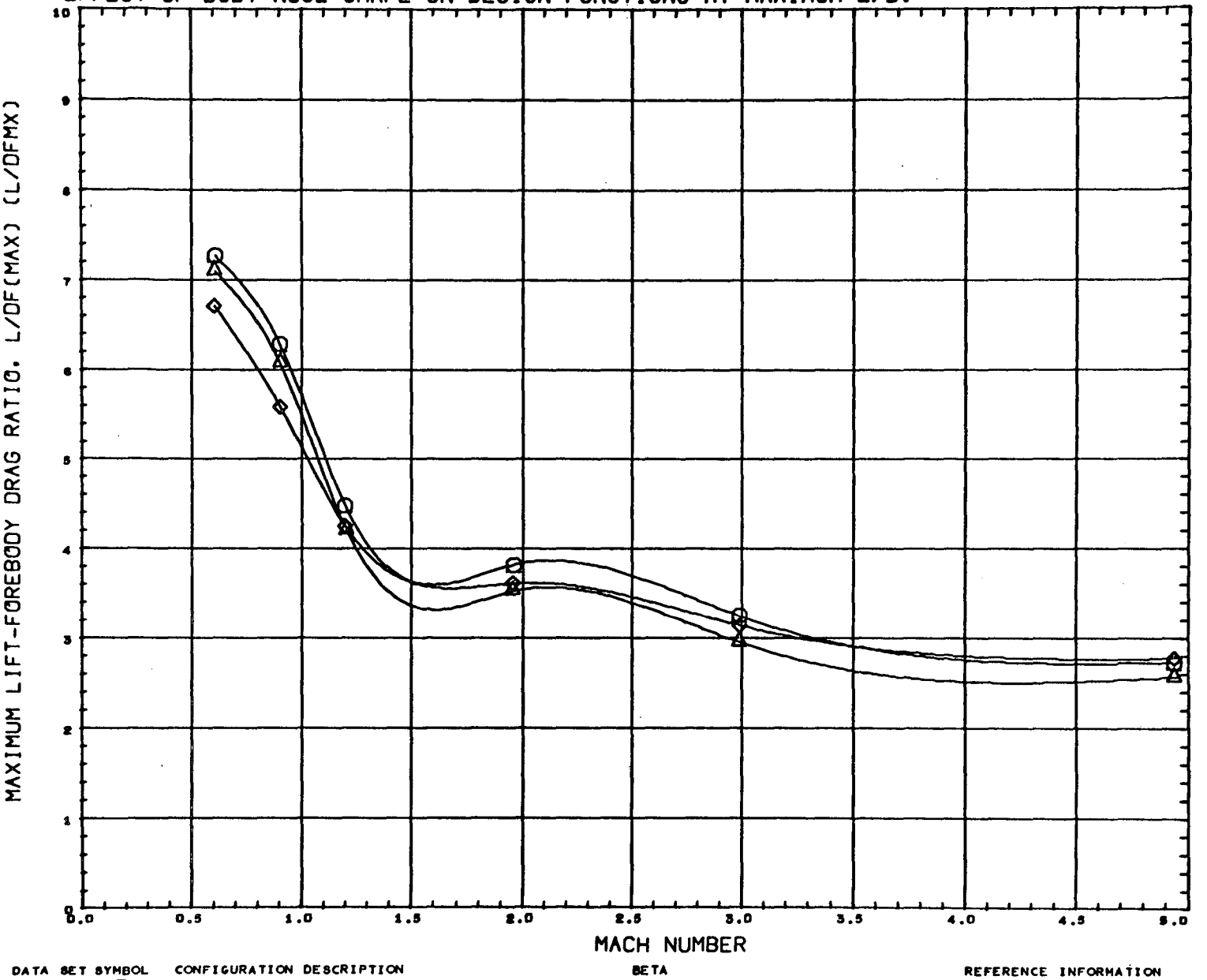


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(D51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(D51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(D51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

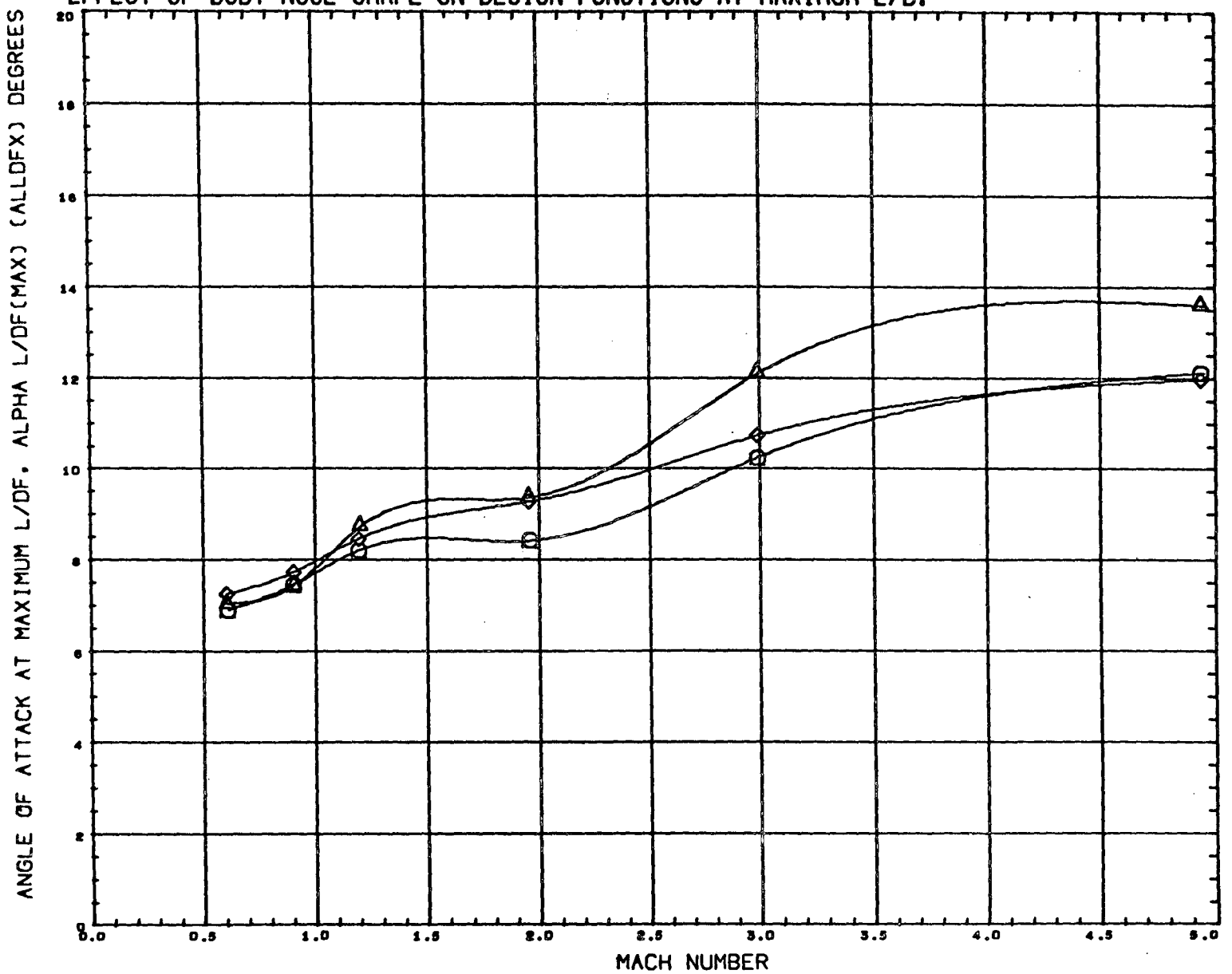
EFFECT OF BODY NOSE SHAPE ON DESIGN FUNCTIONS AT MAXIMUM L/D.



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(851018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(851038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(851048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

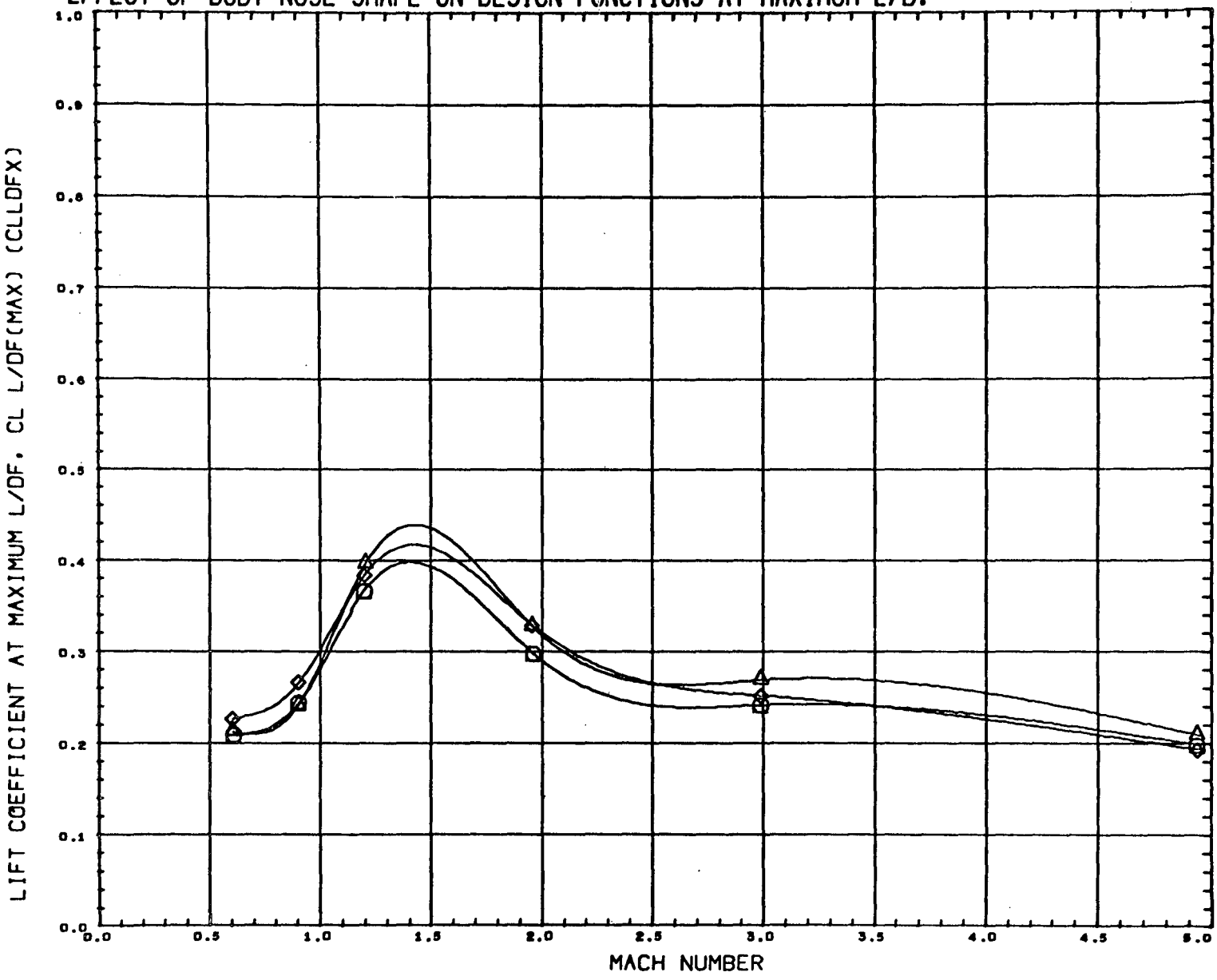
EFFECT OF BODY NOSE SHAPE ON DESIGN FUNCTIONS AT MAXIMUM L/D.



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(851018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(851038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(851048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

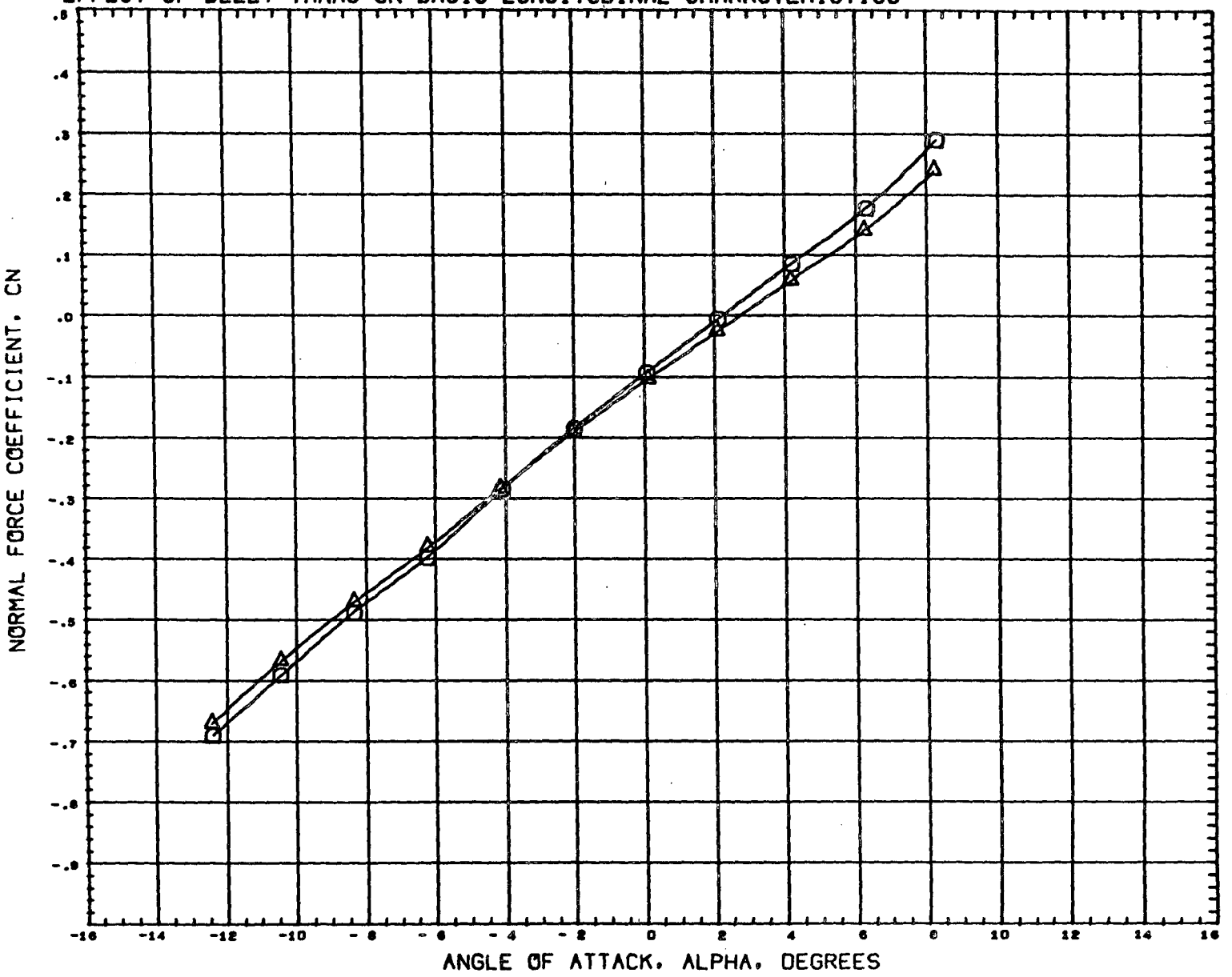
EFFECT OF BODY NOSE SHAPE ON DESIGN FUNCTIONS AT MAXIMUM L/D.



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B51018)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B51038)	△	MSFC509 NR 110C ORBITER B13W26E16V36	0.000
(B51048)	◇	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

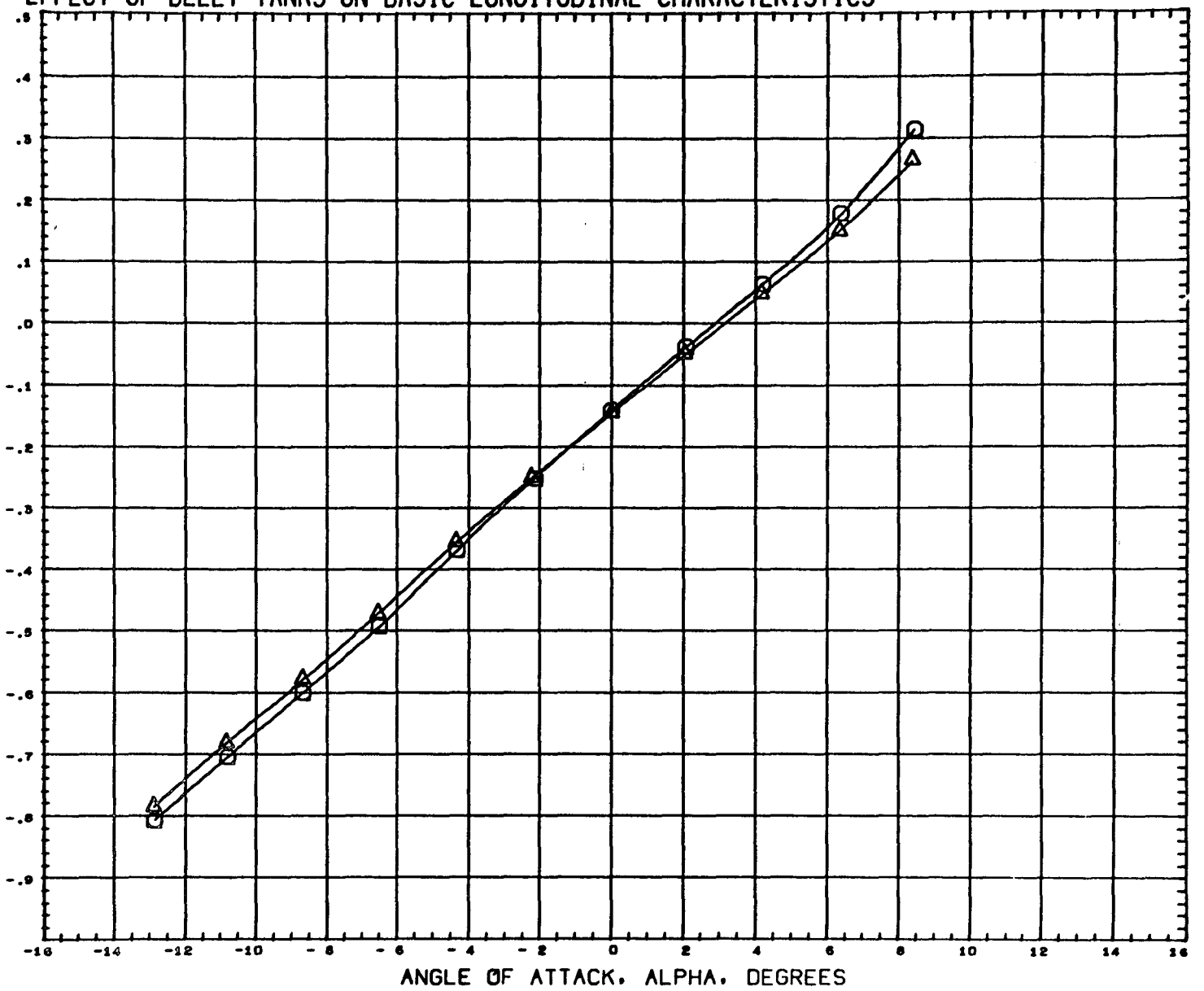


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		M8FC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		M8FC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



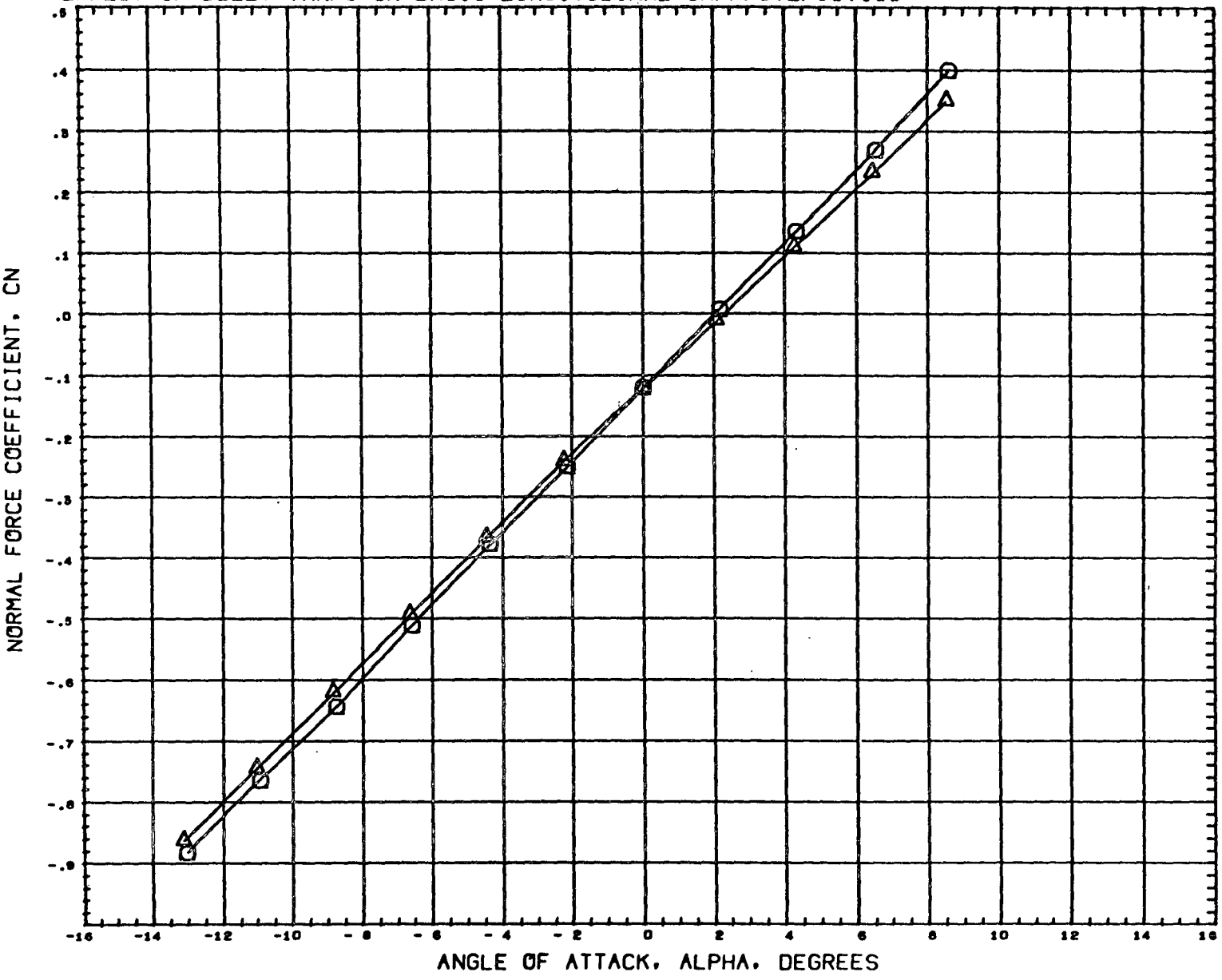
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.698

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



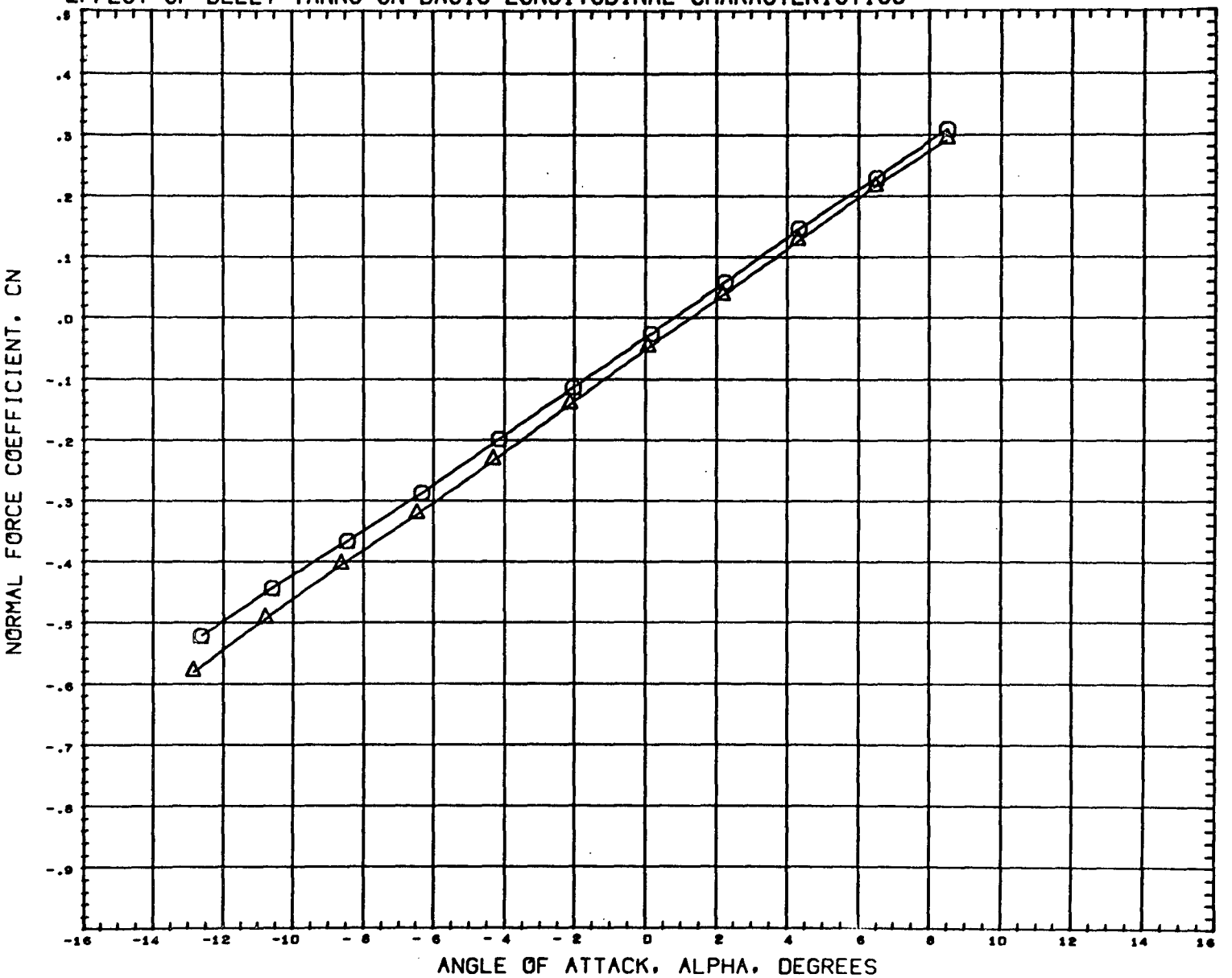
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



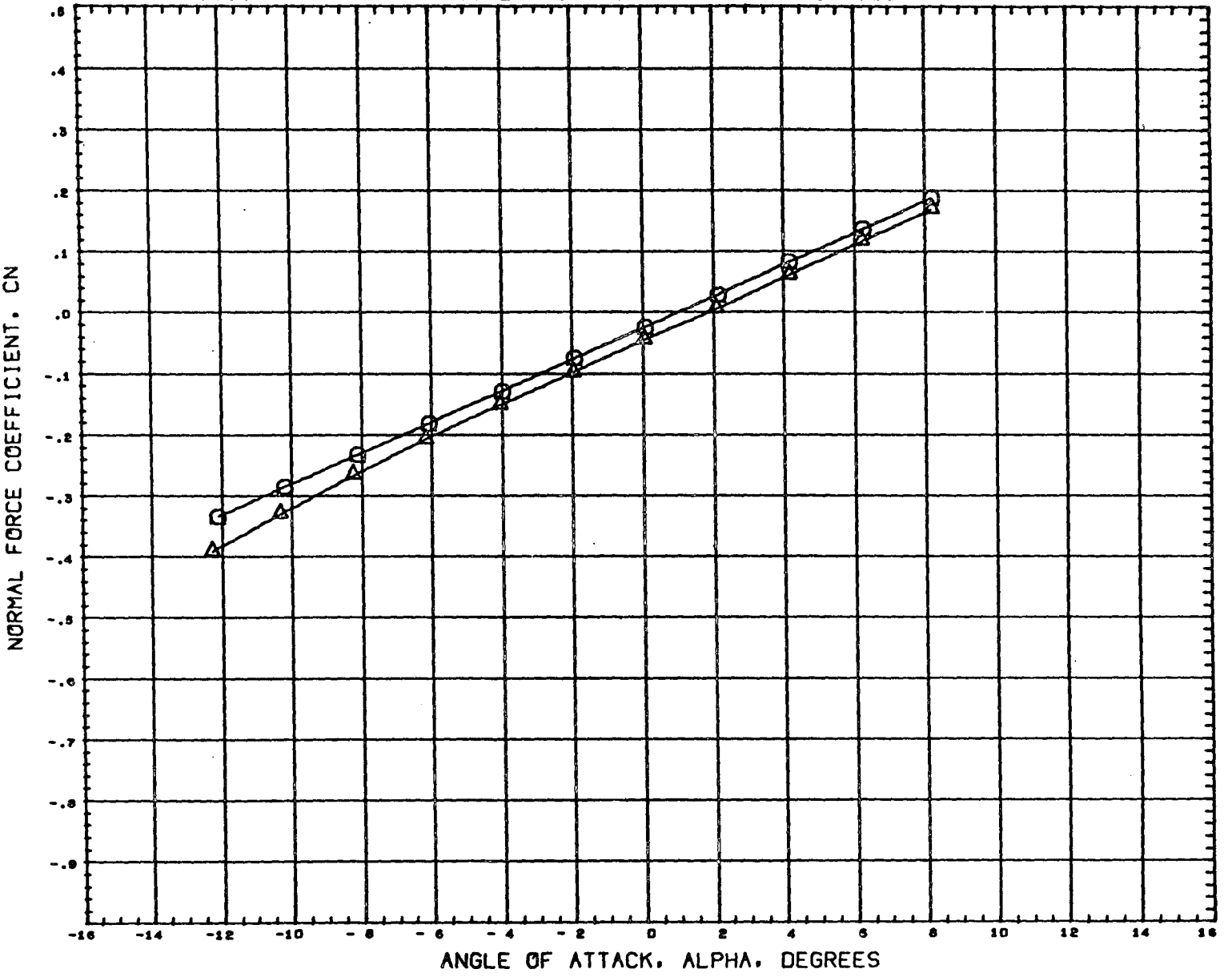
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



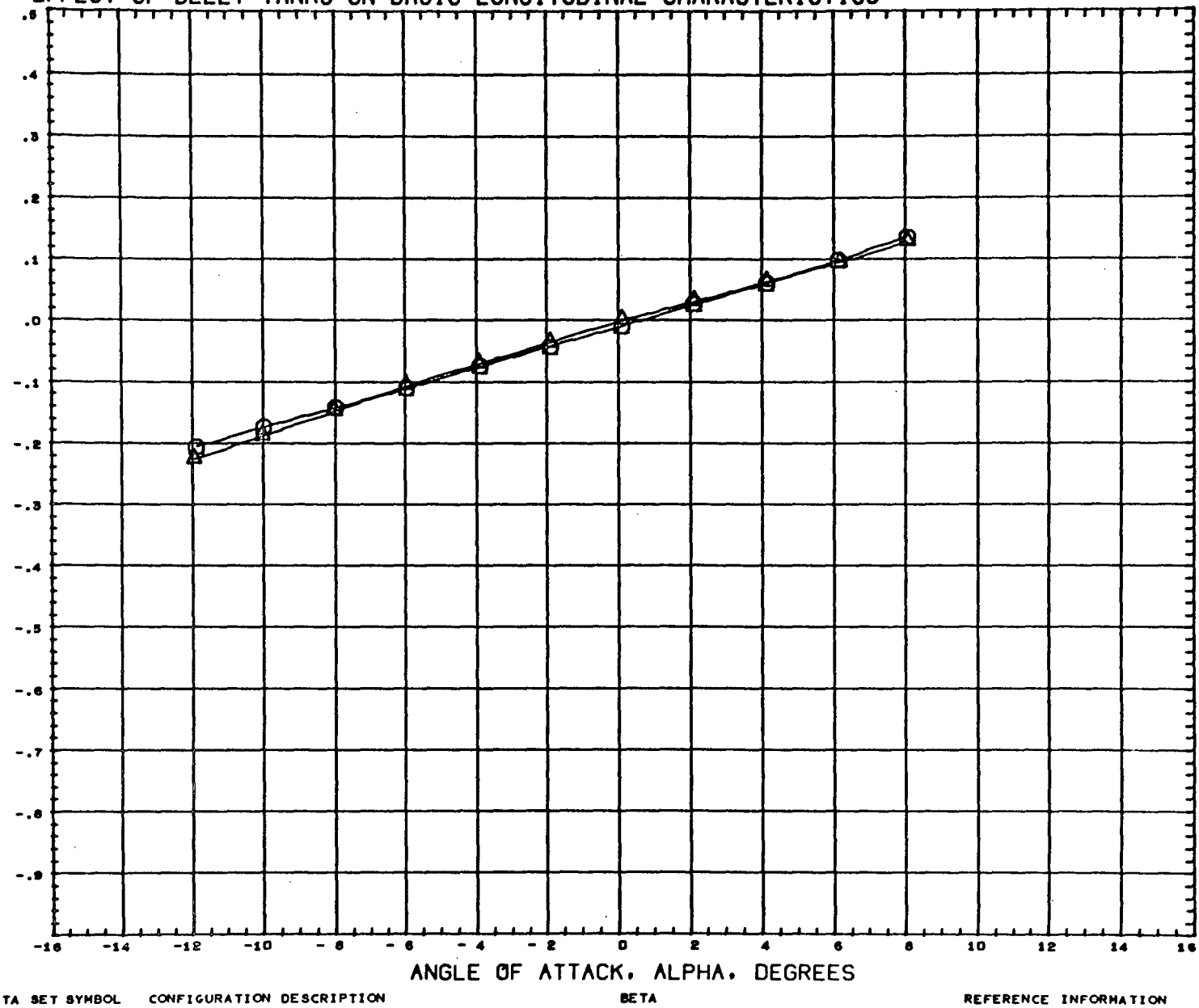
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

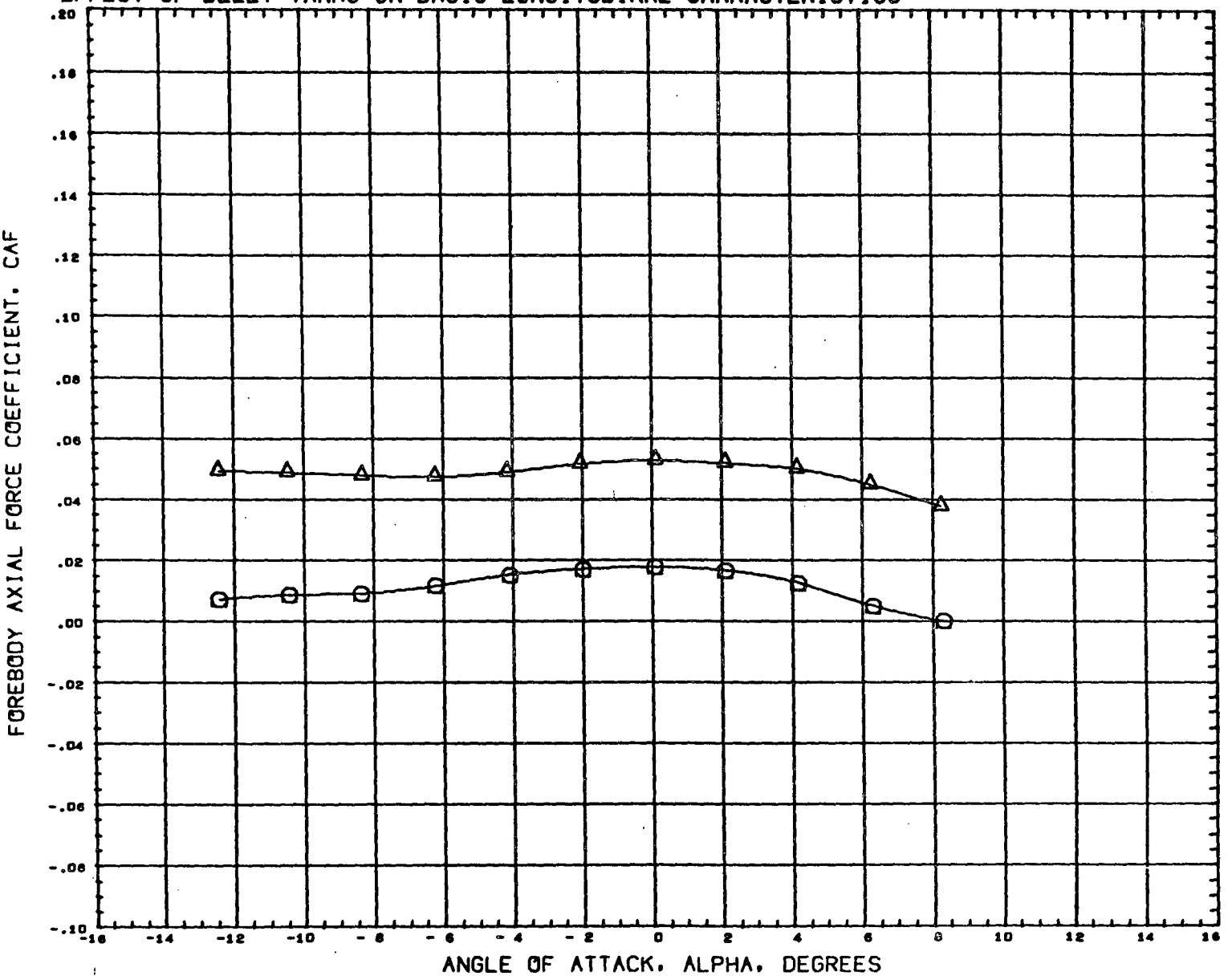


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



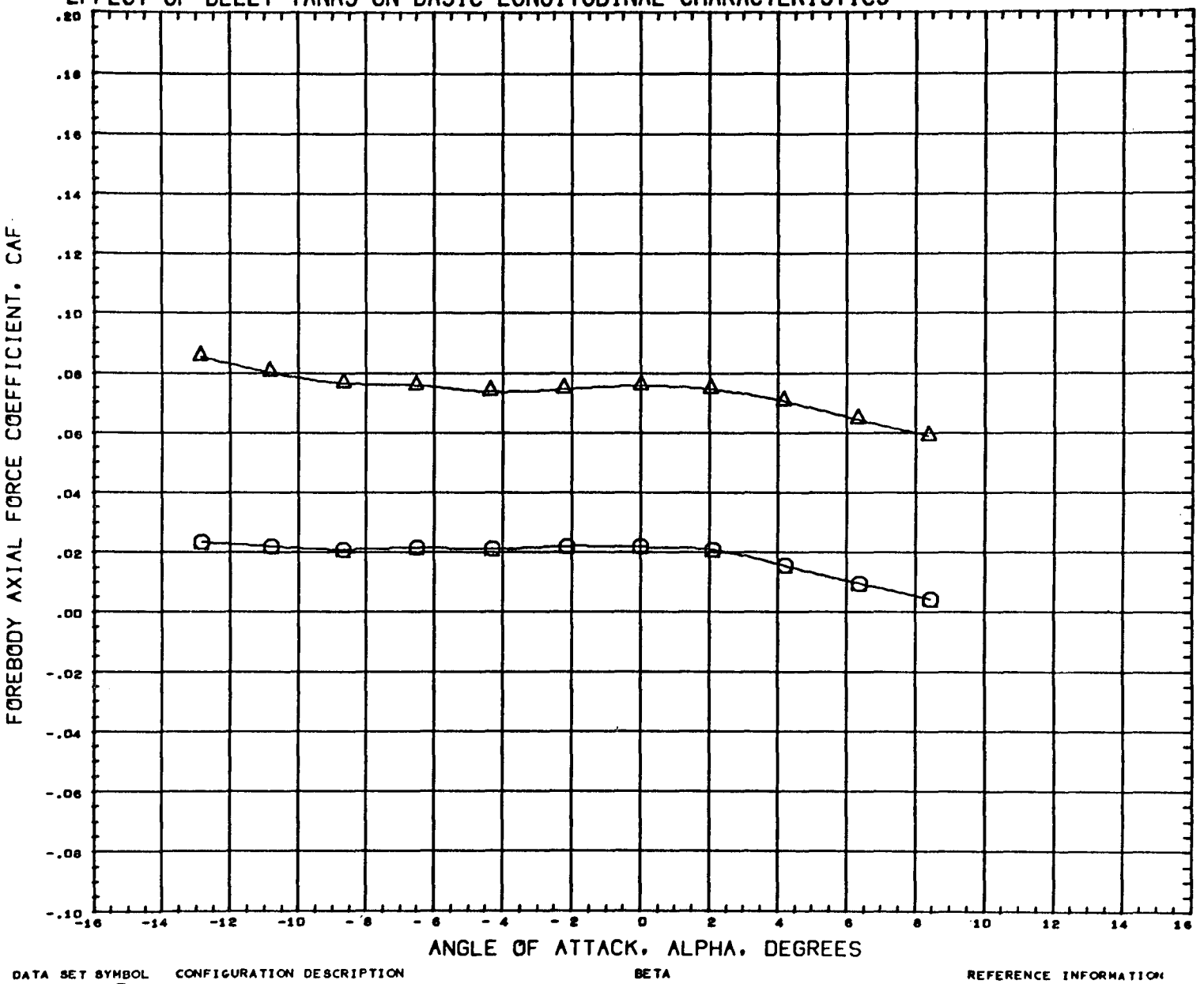
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

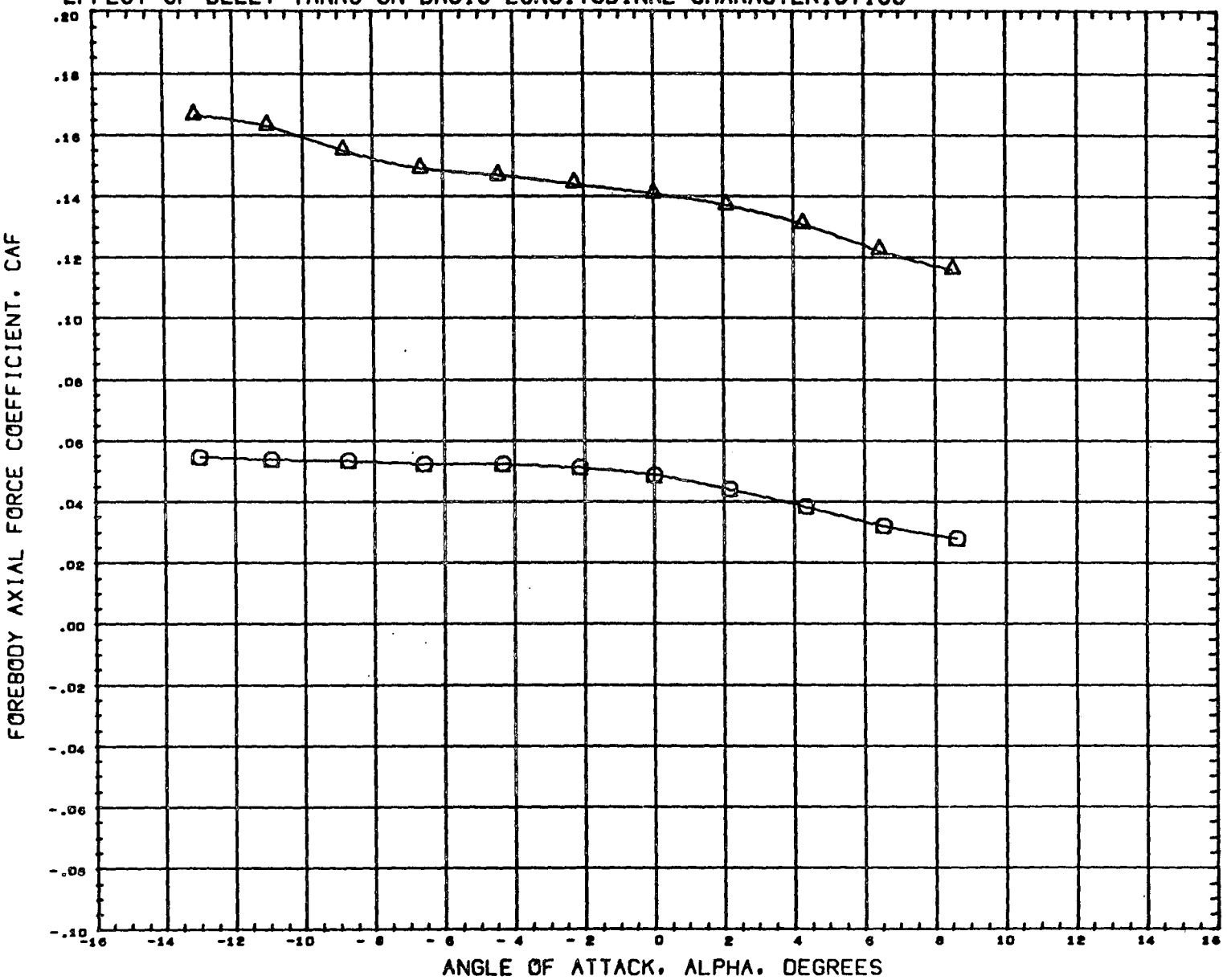


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



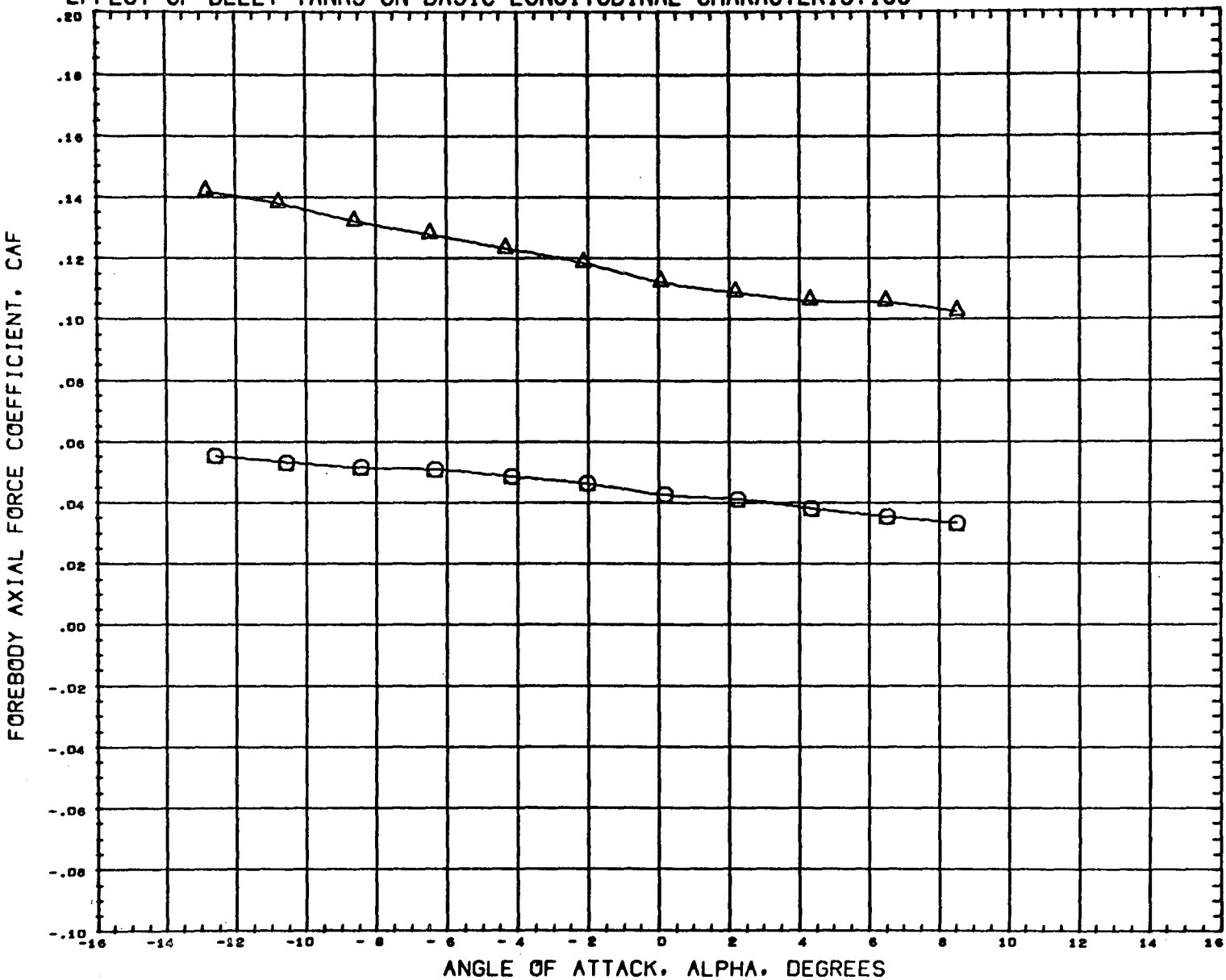
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

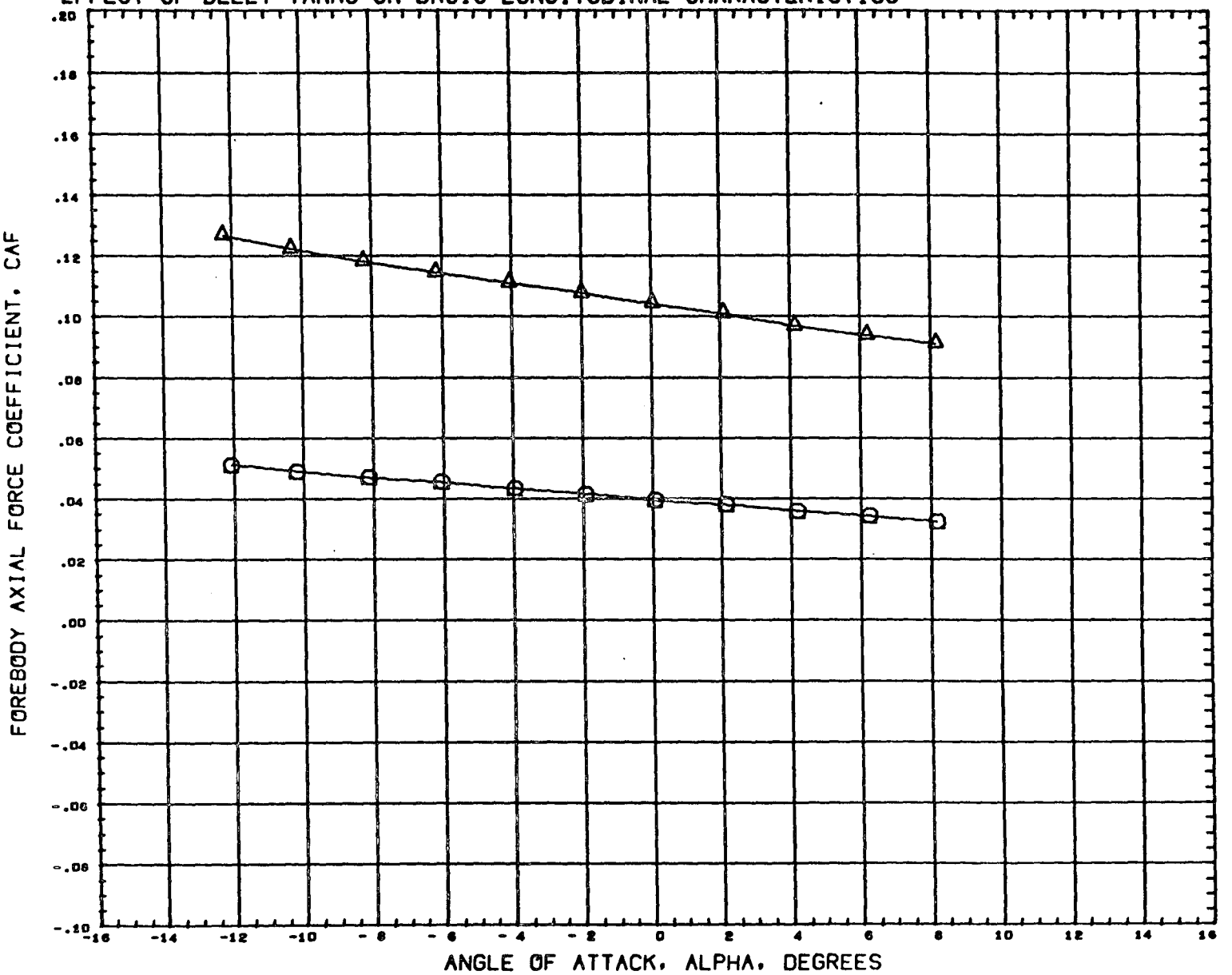


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



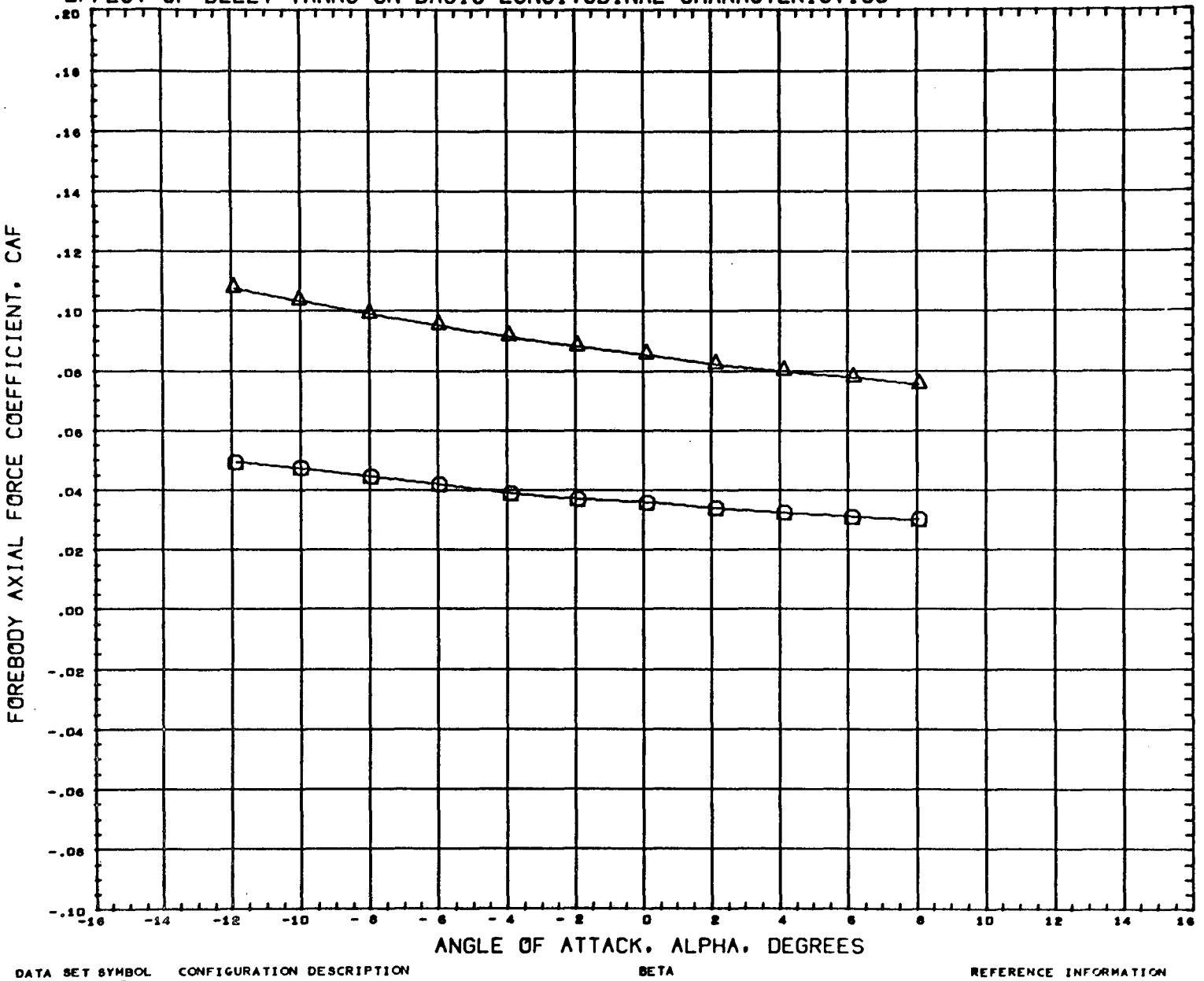
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

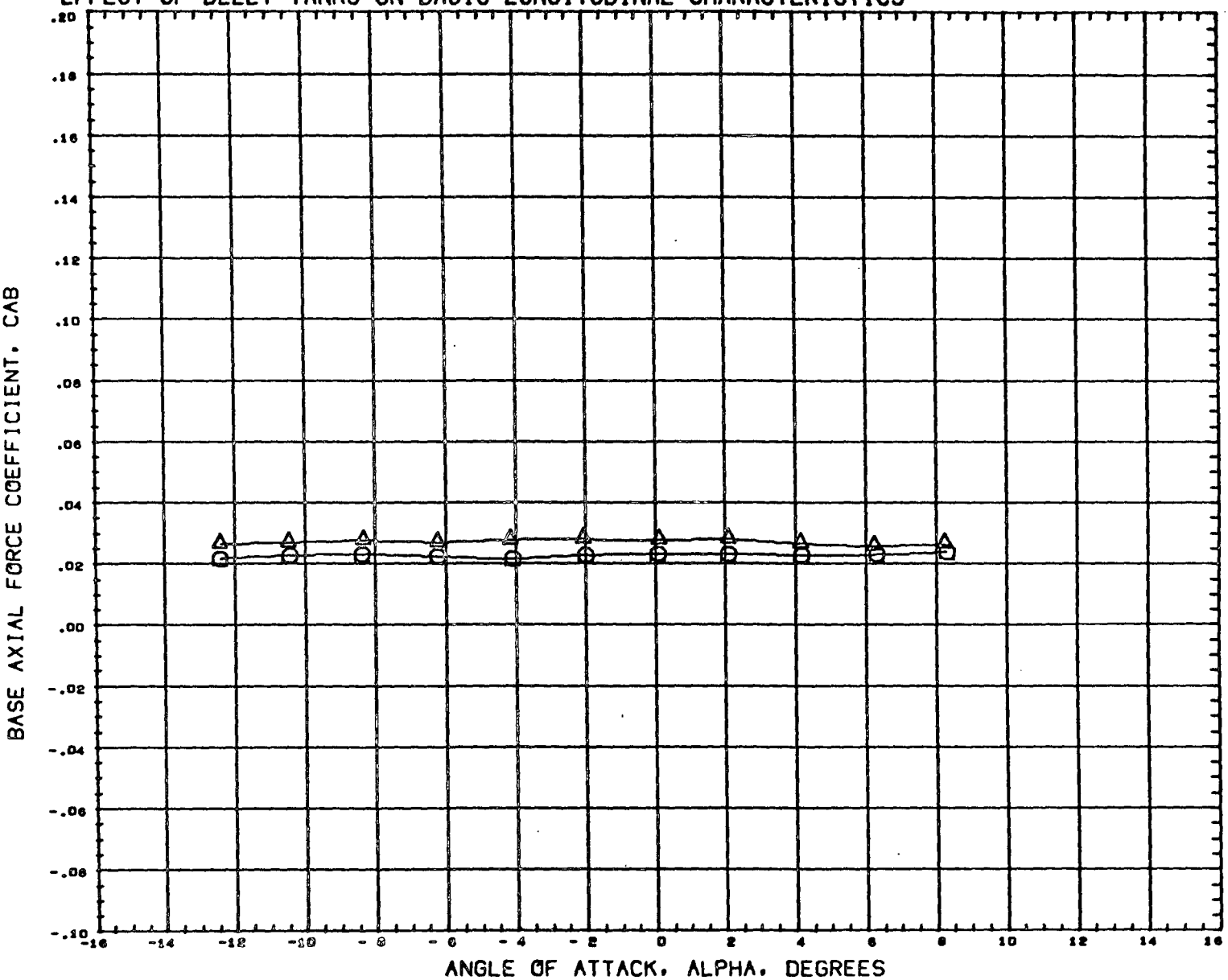


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

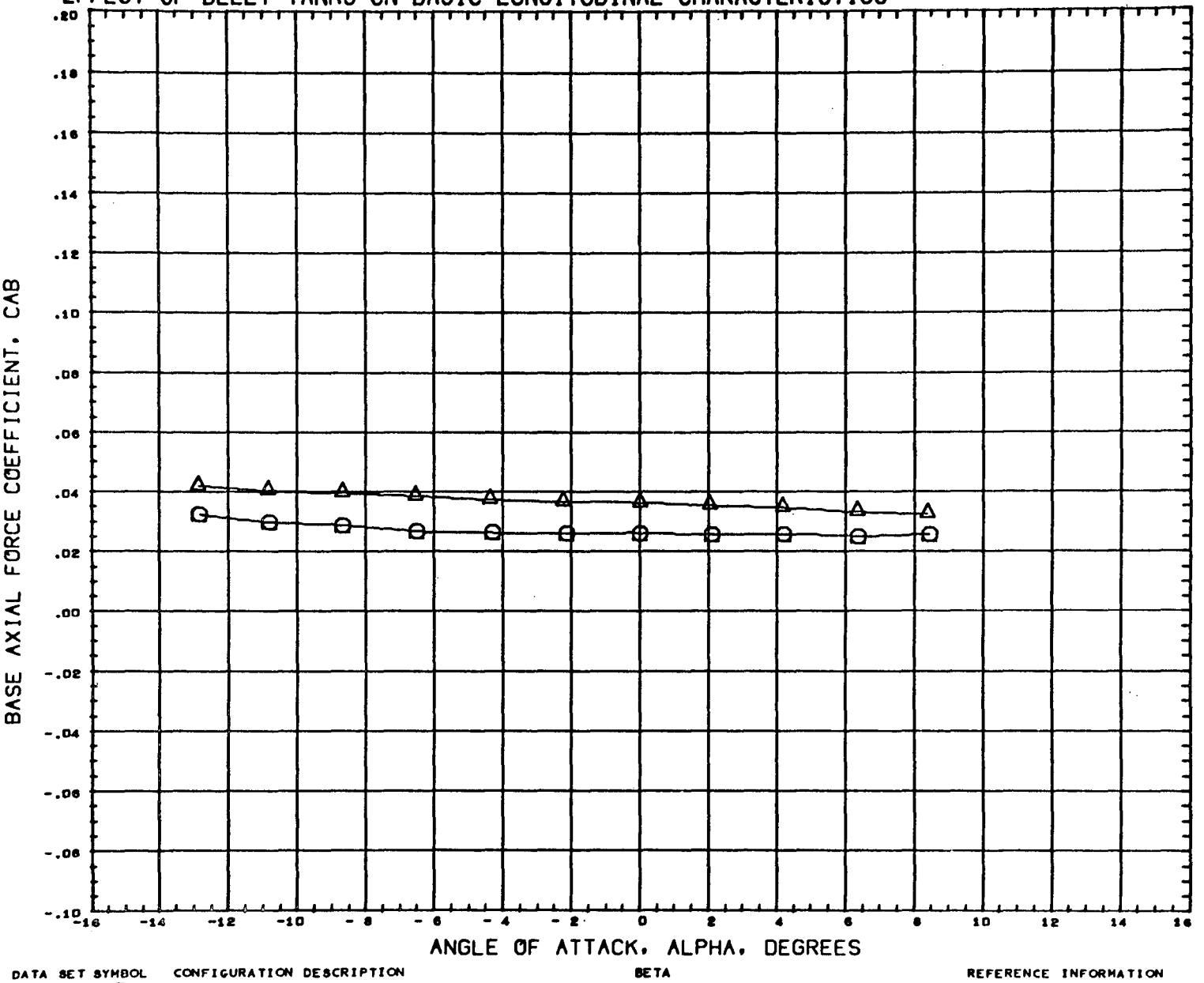


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.003

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



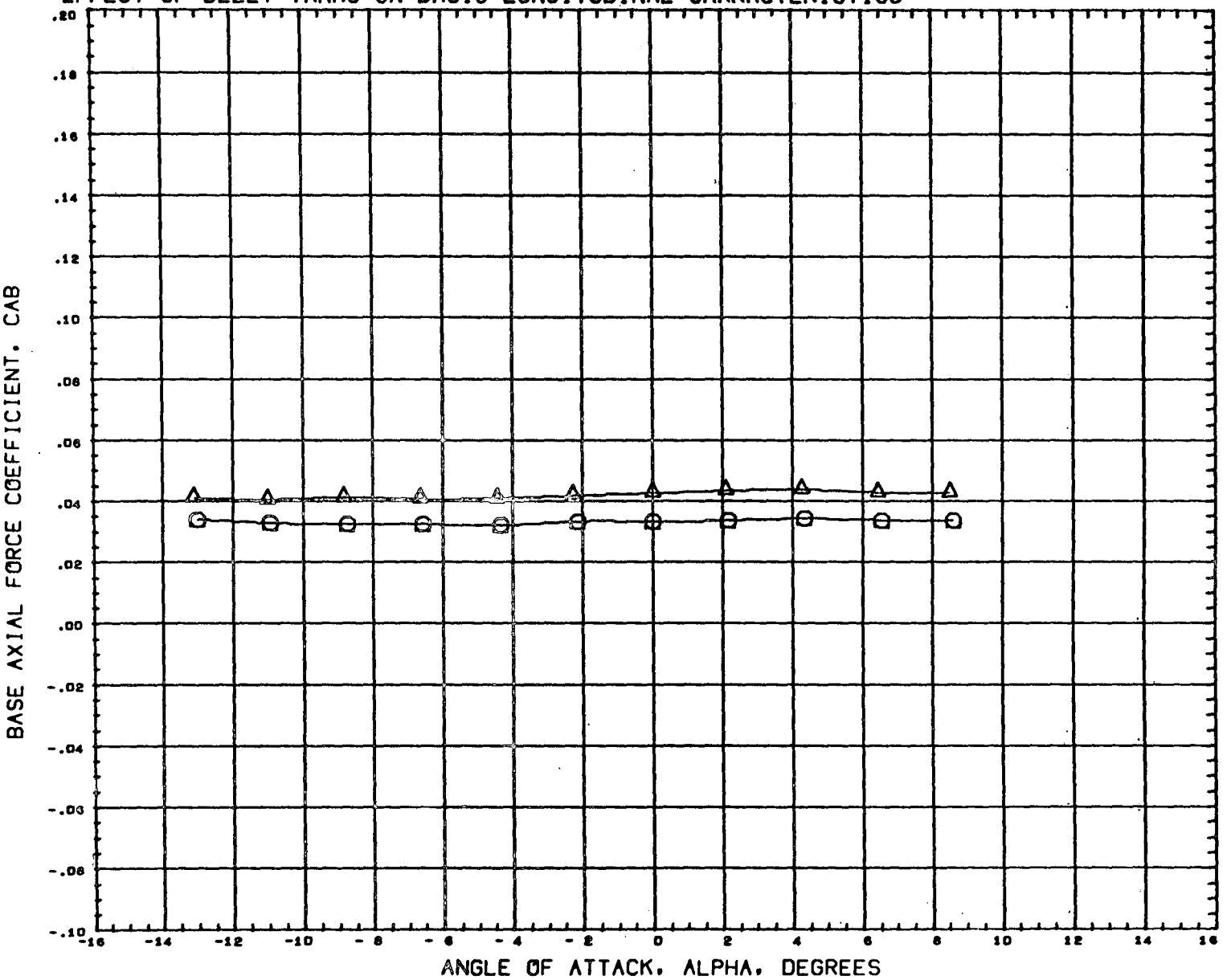
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

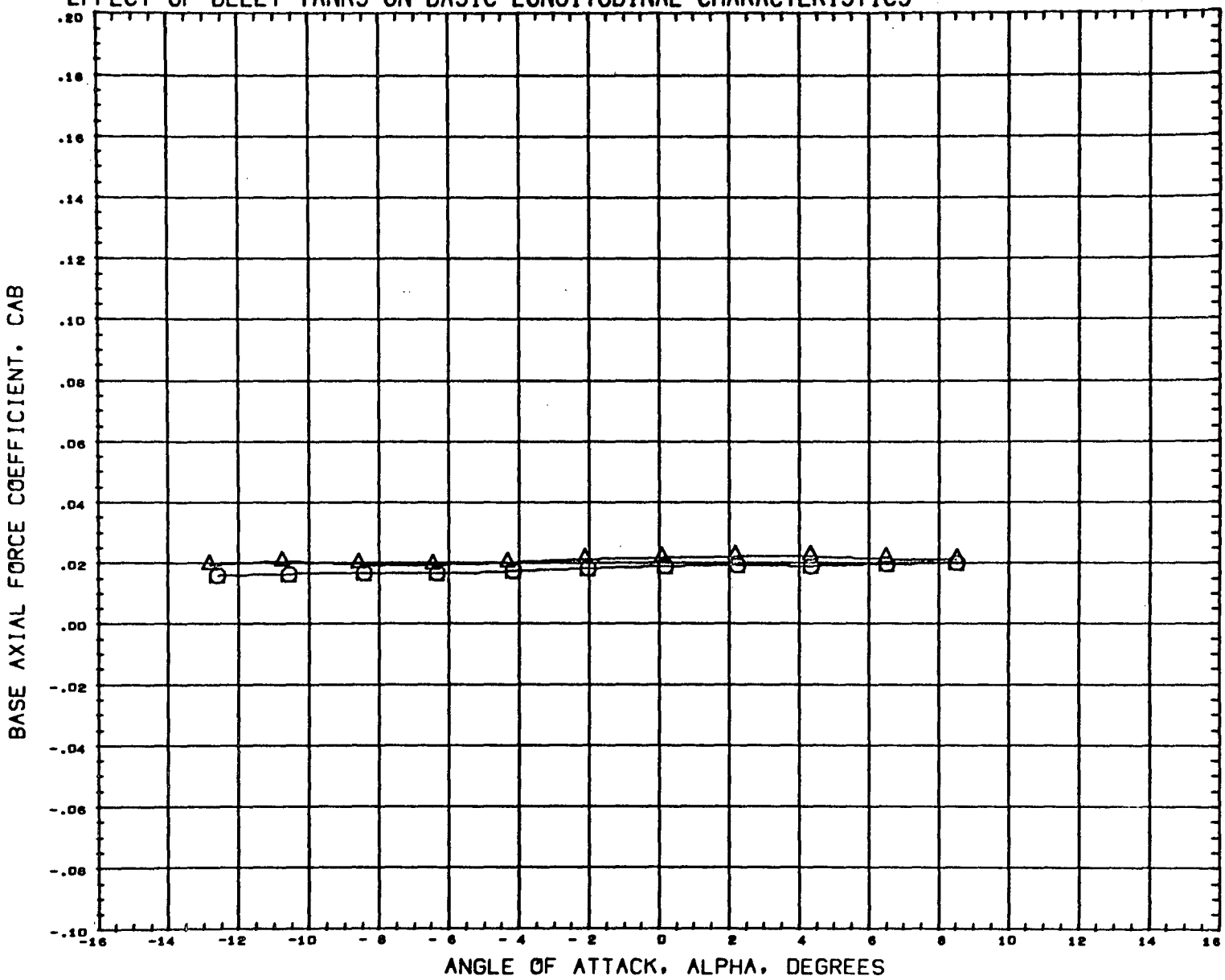


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

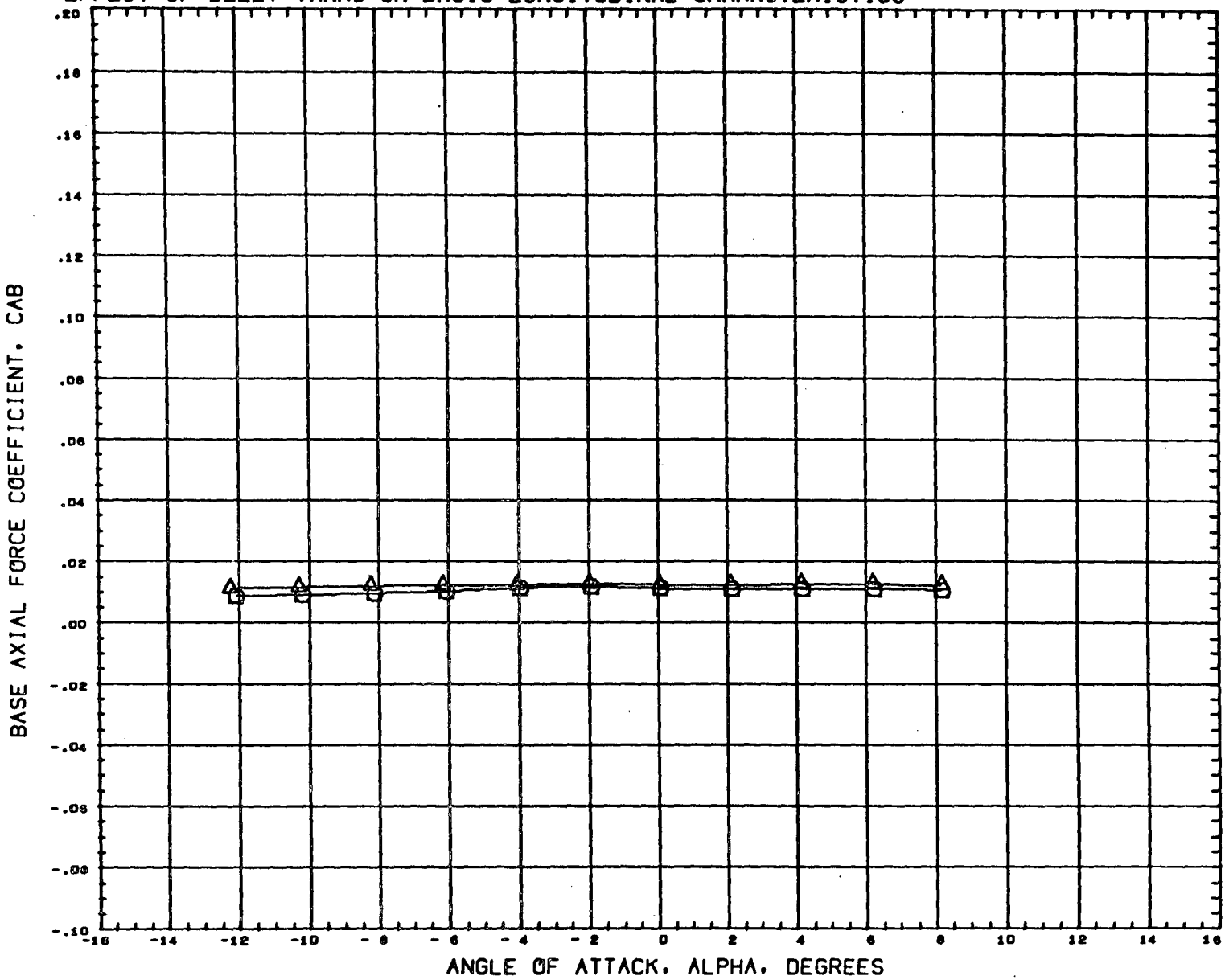


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



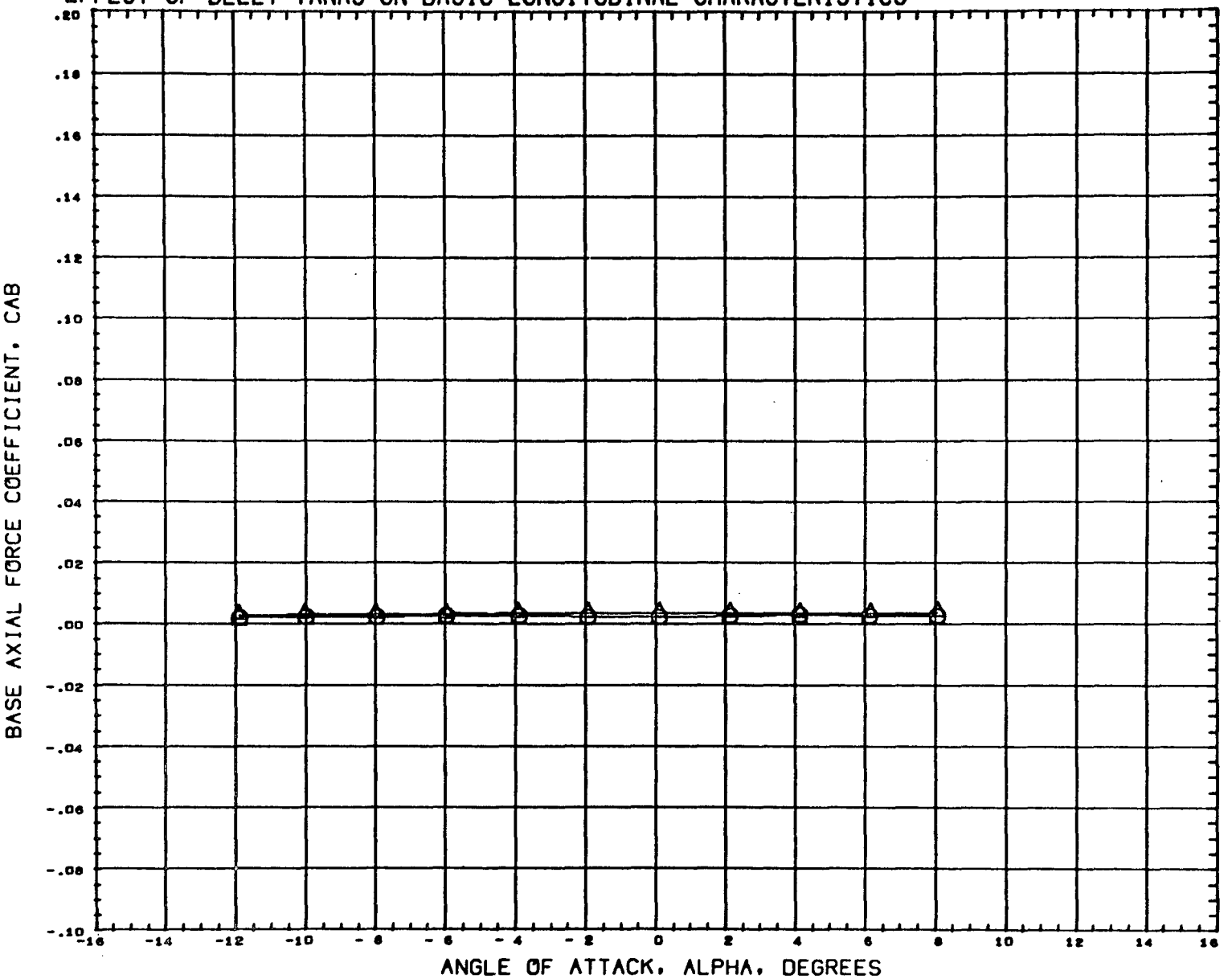
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



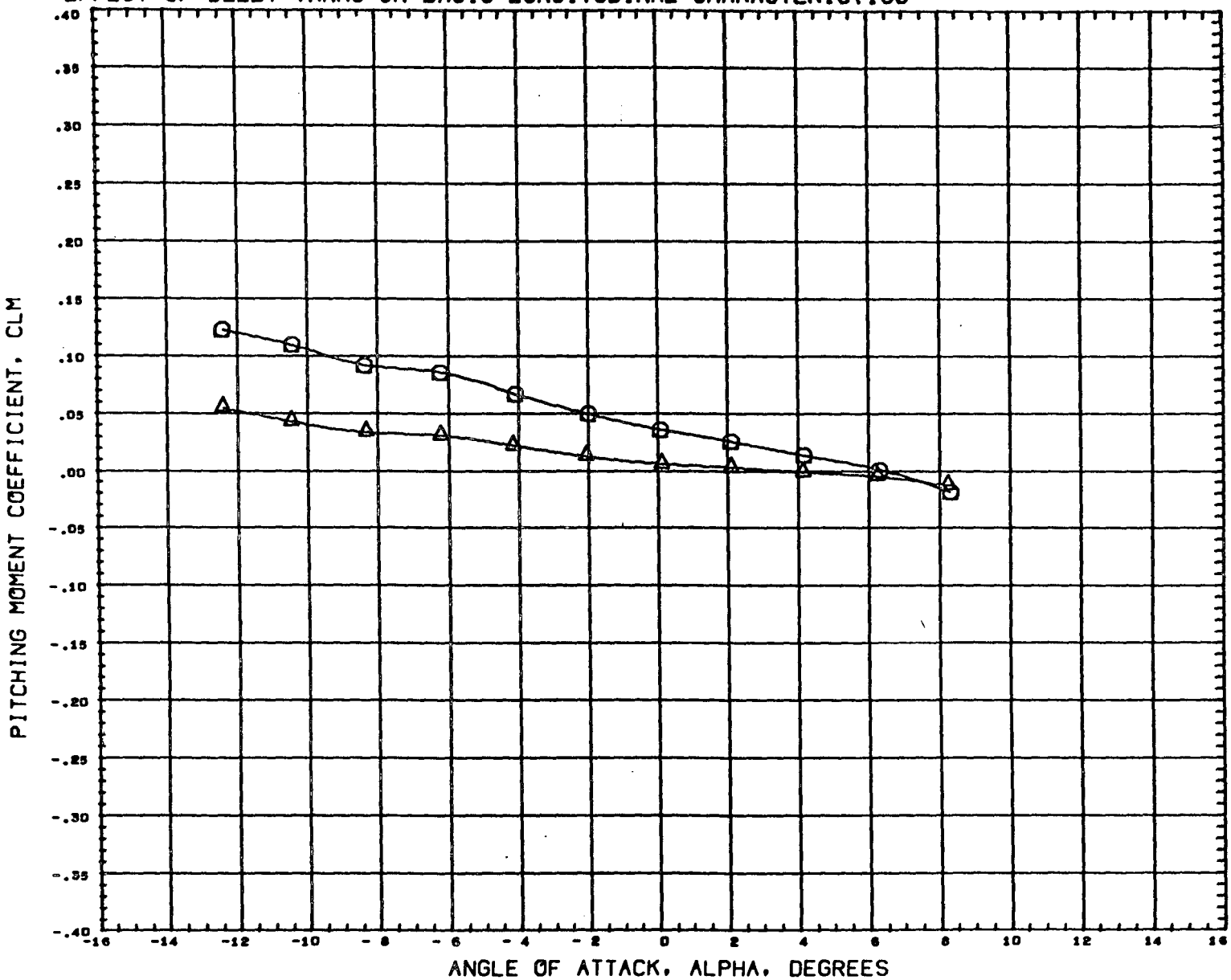
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



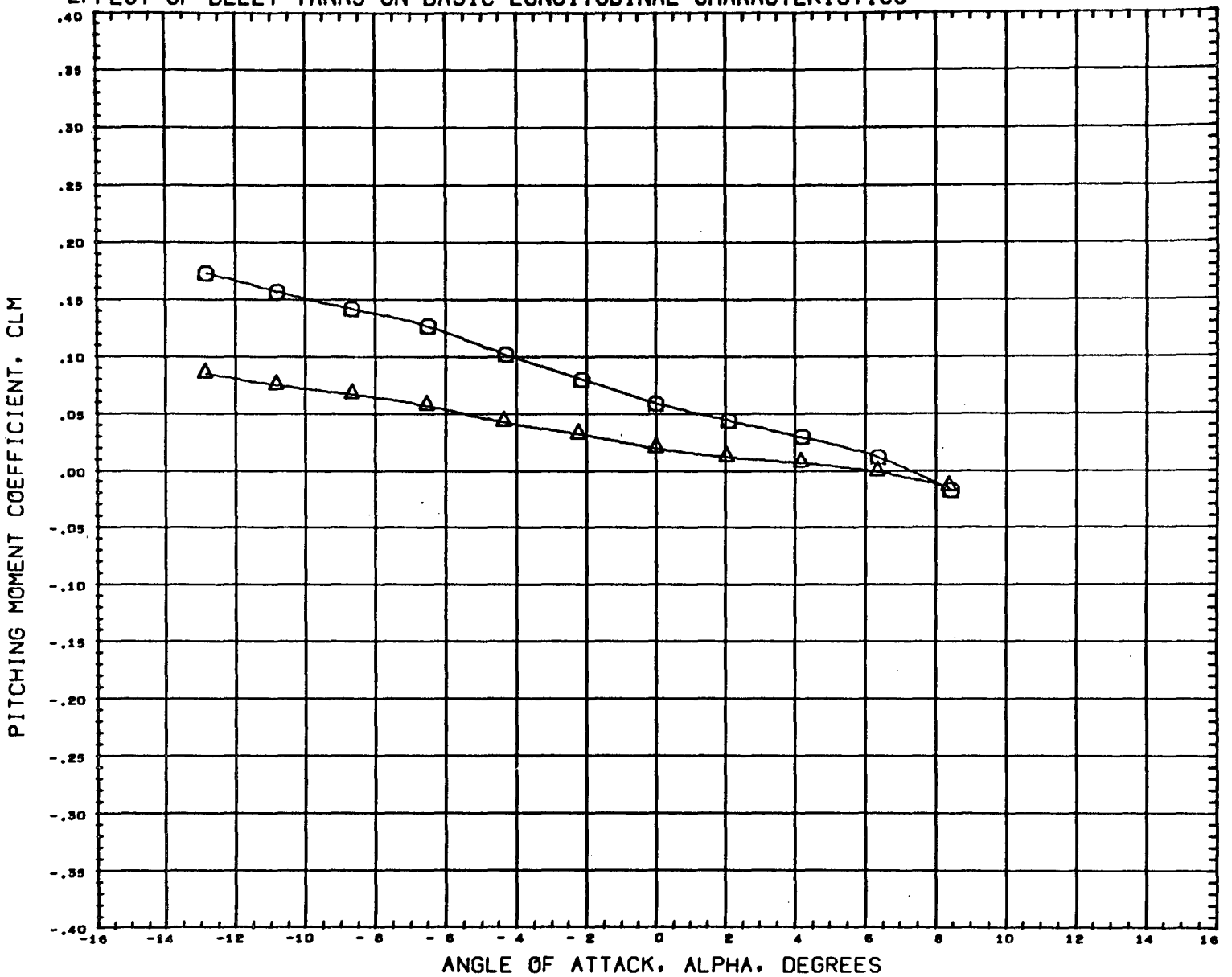
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

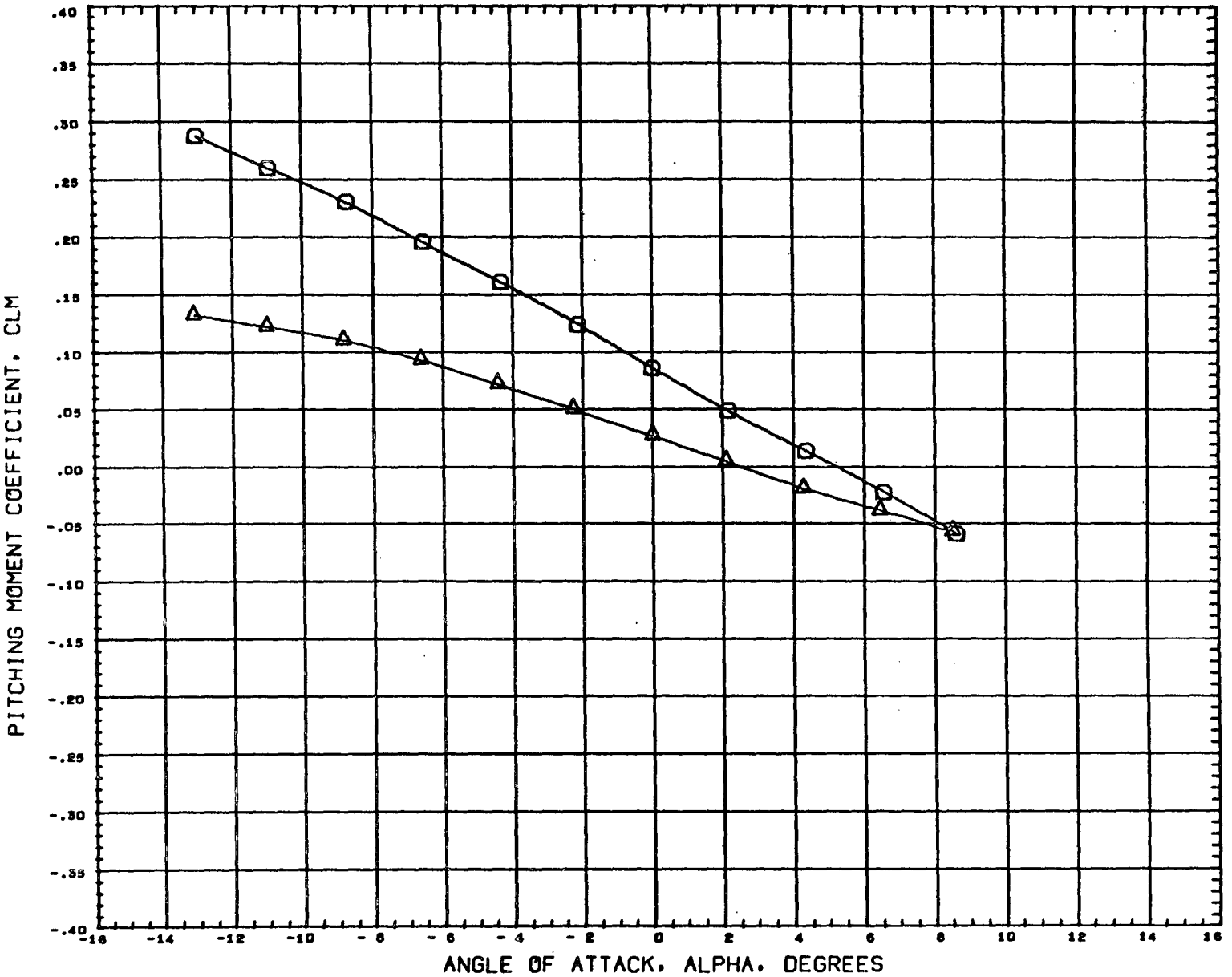


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



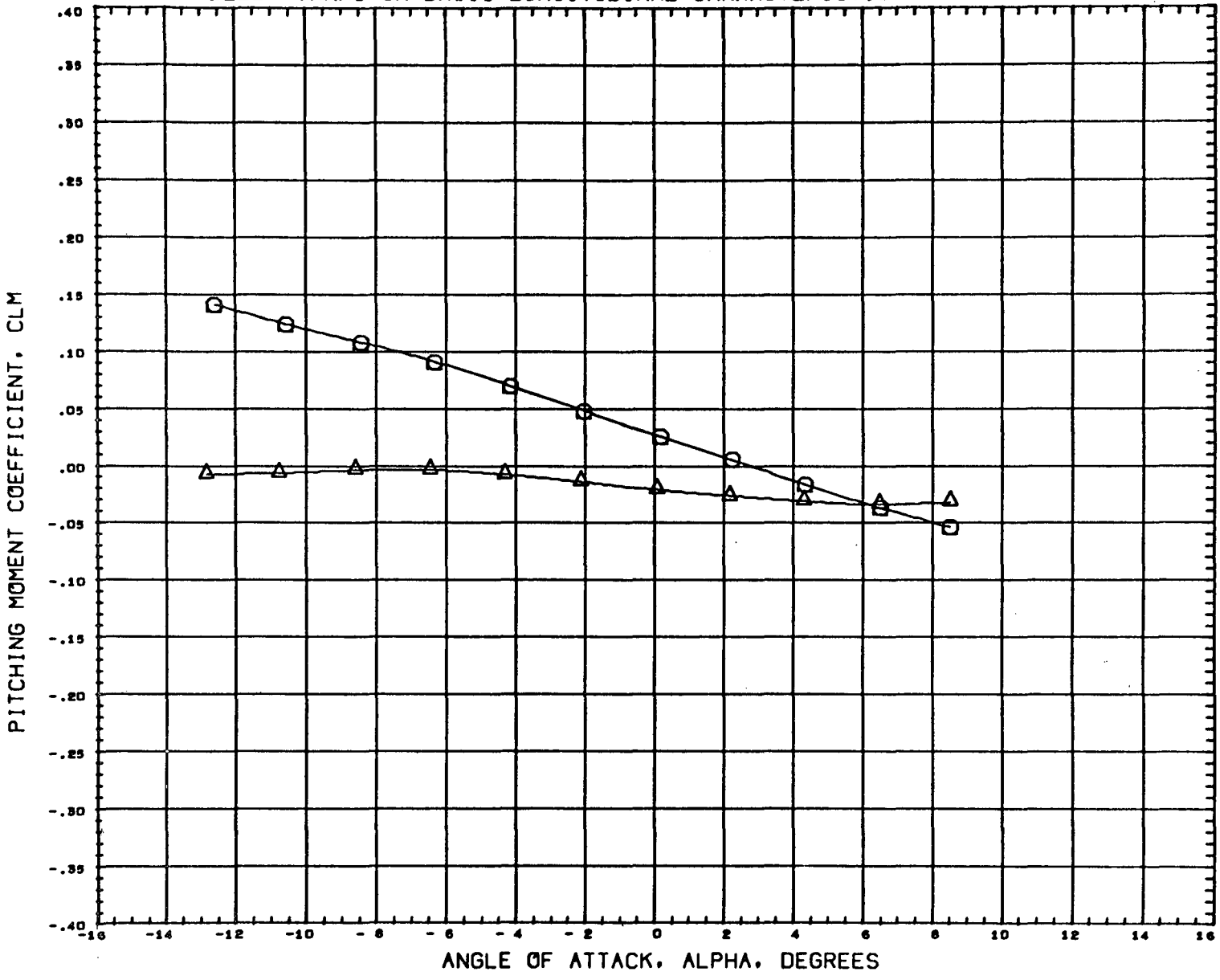
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

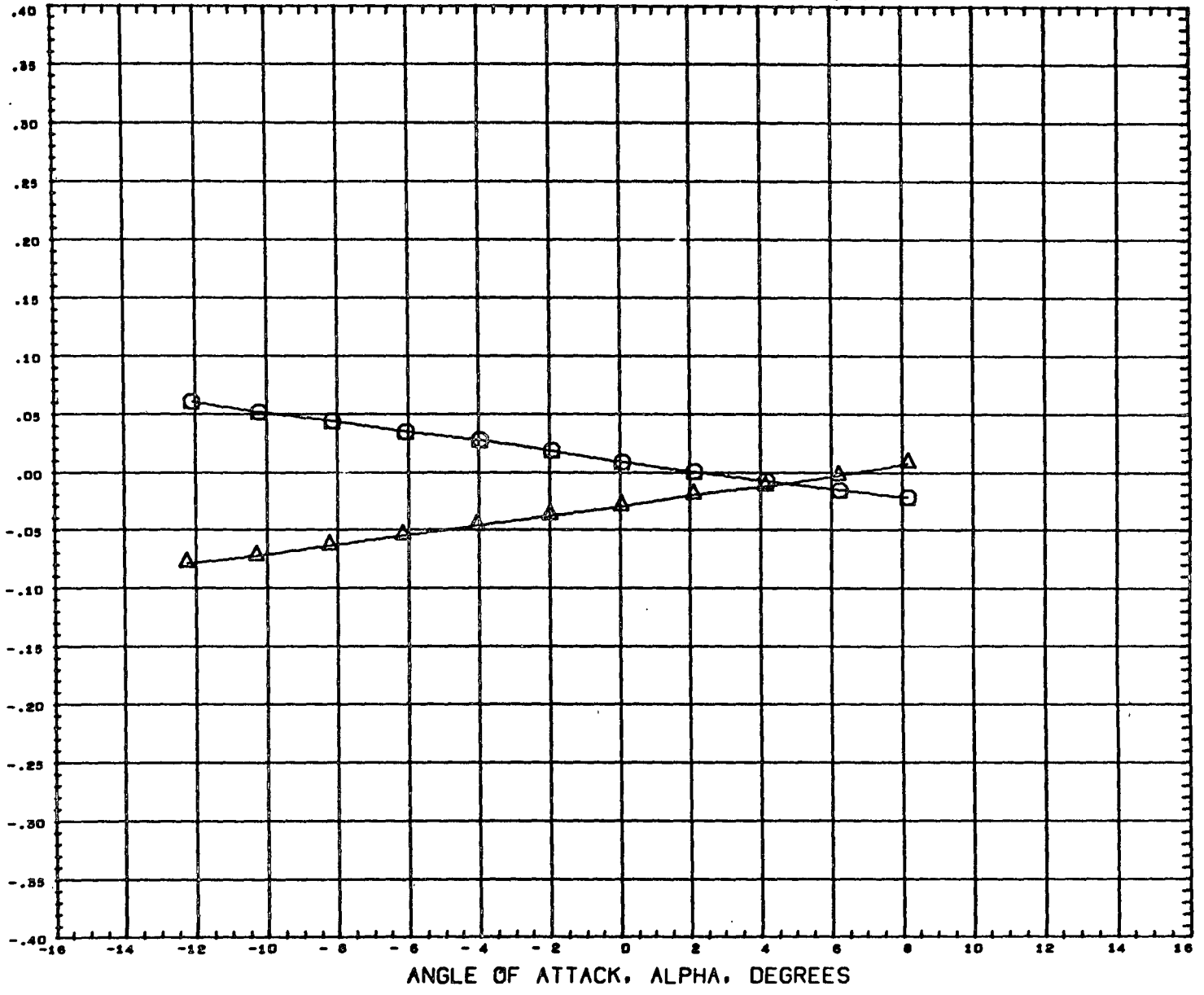


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

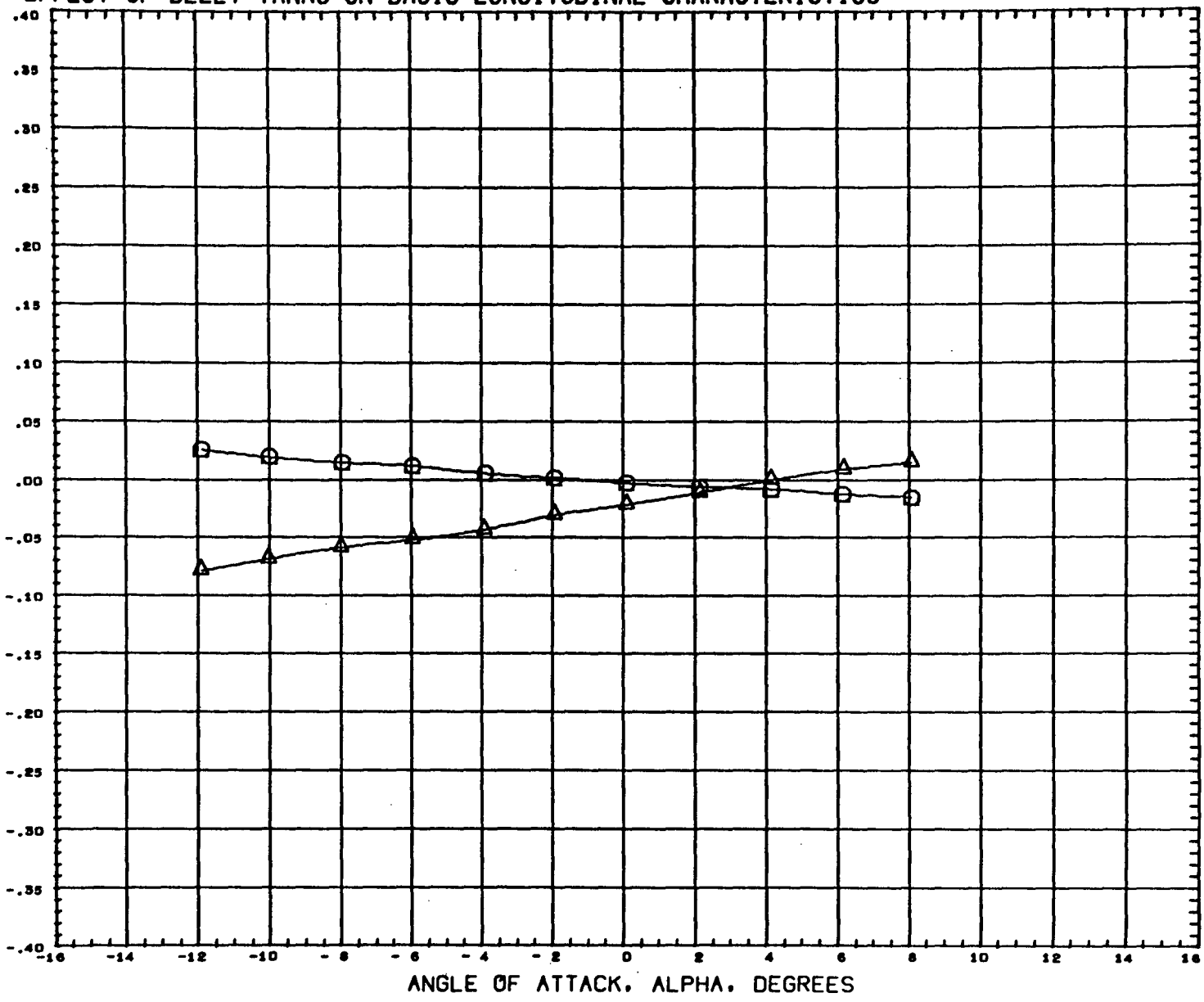


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

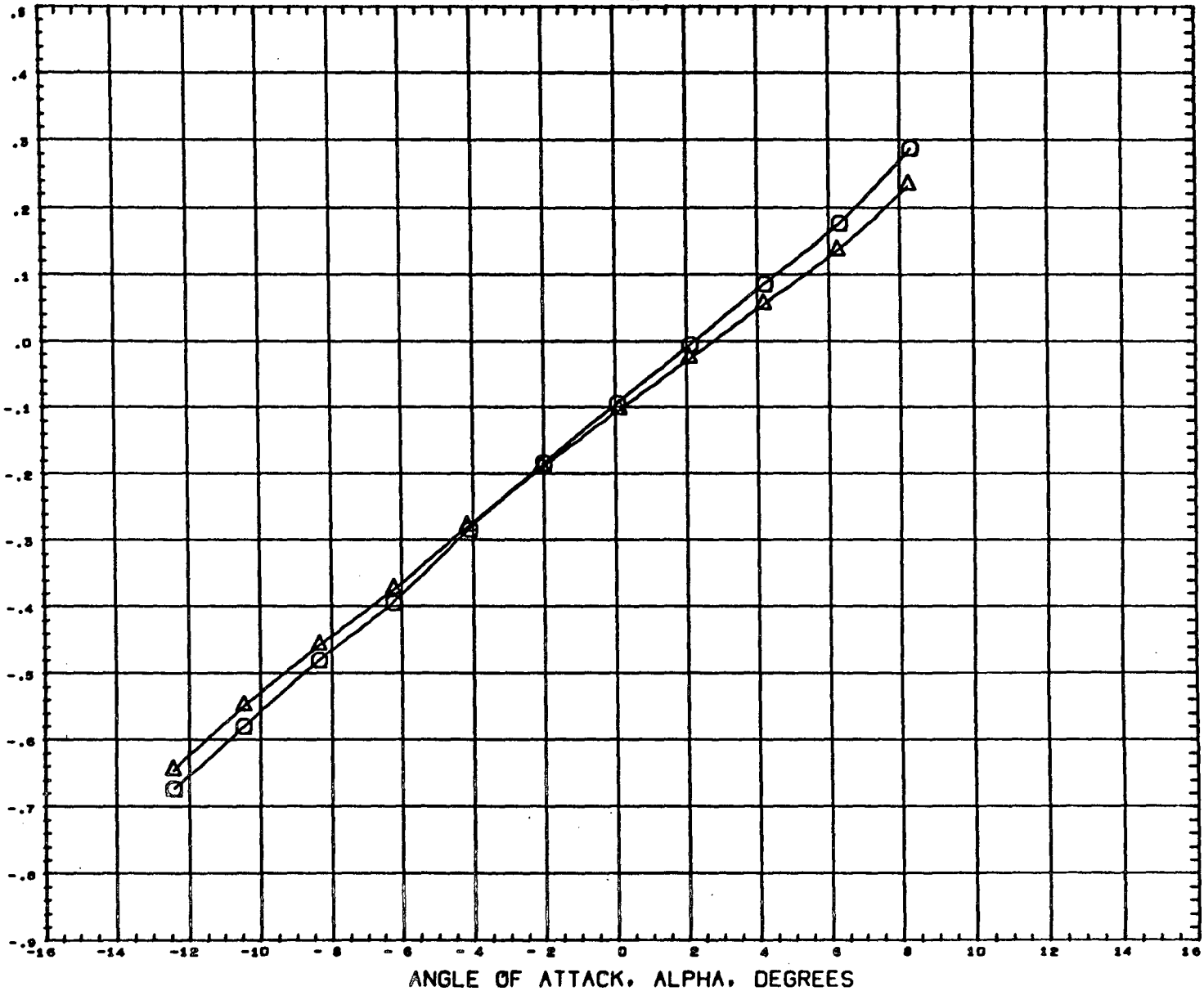


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

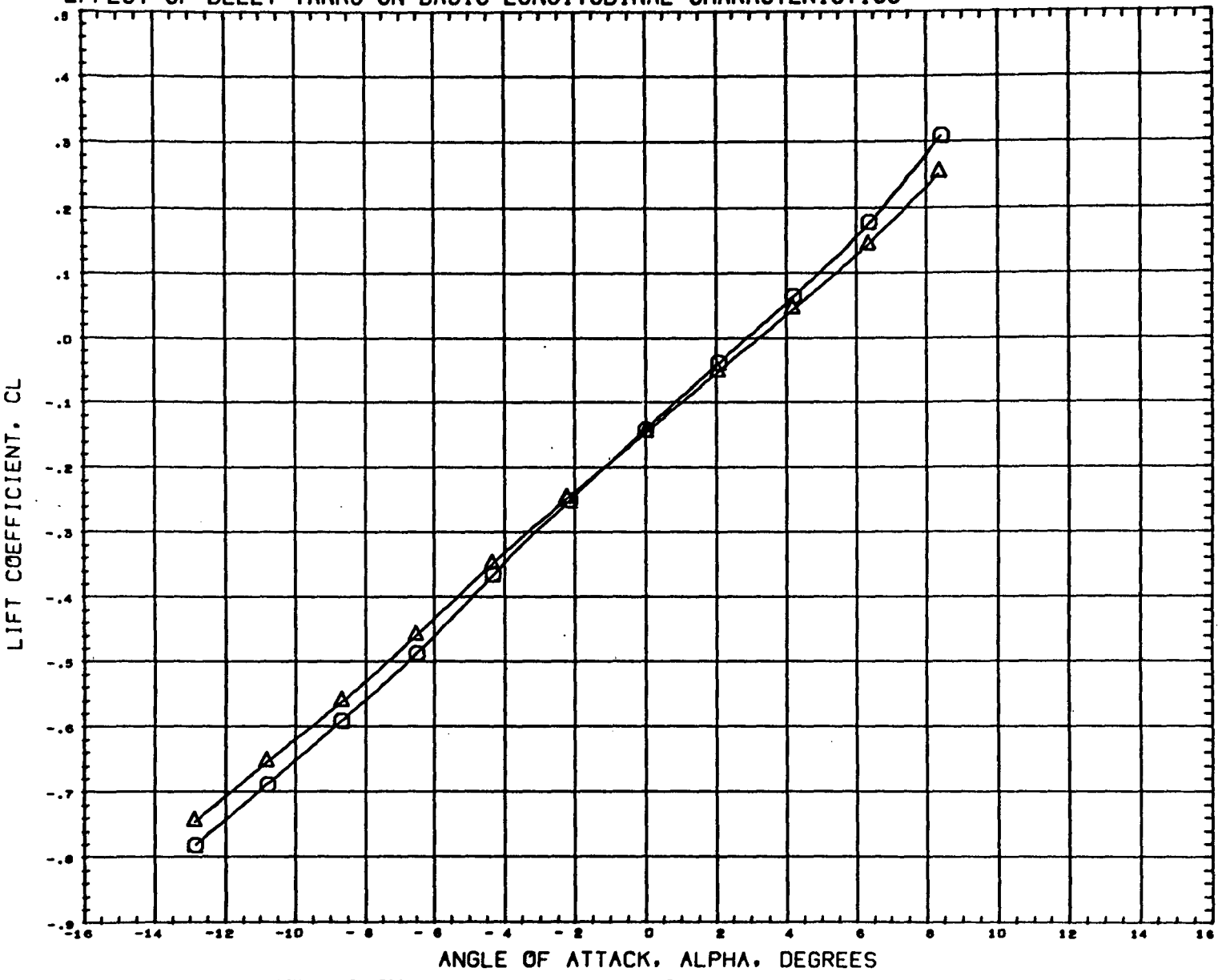


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



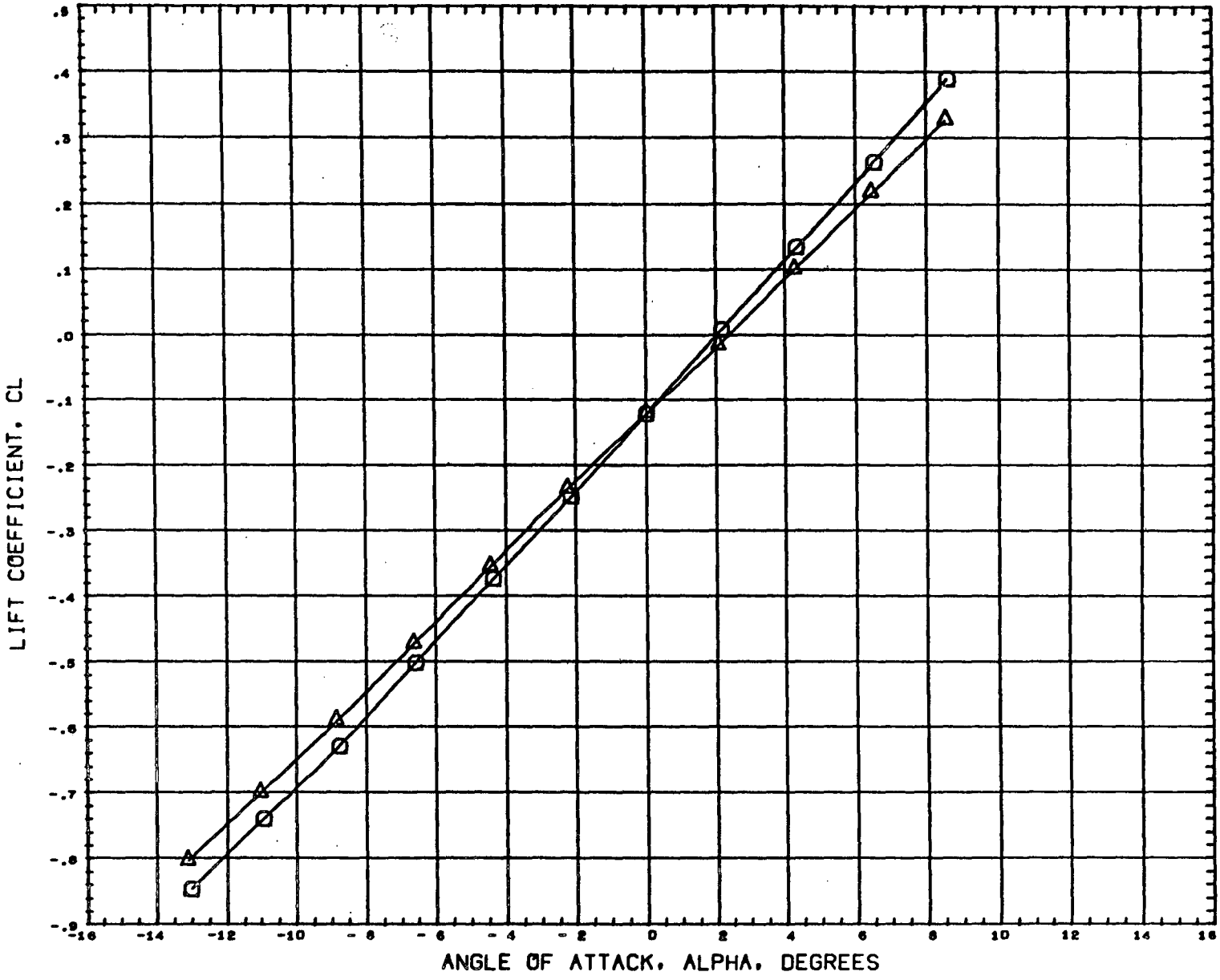
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

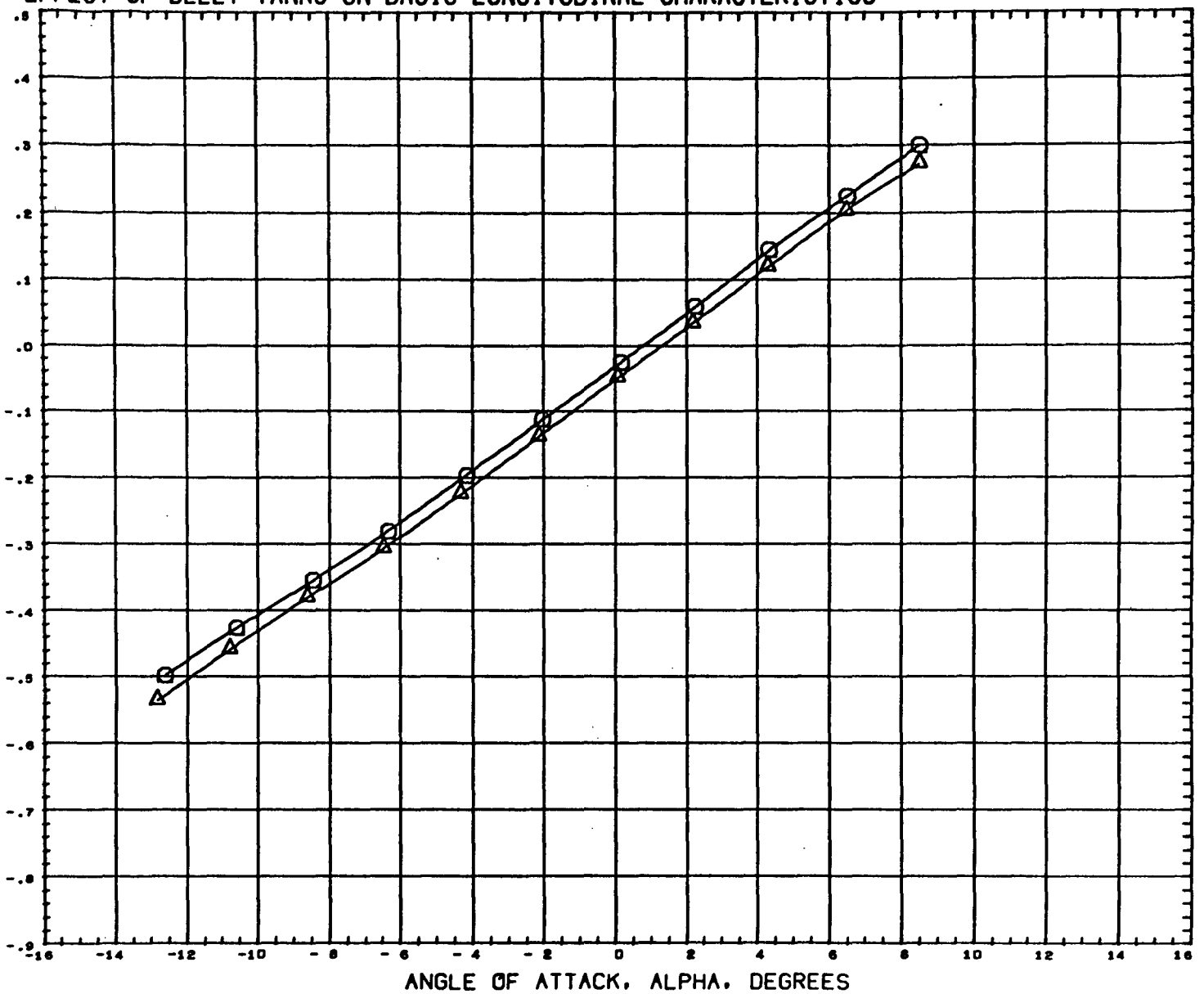


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

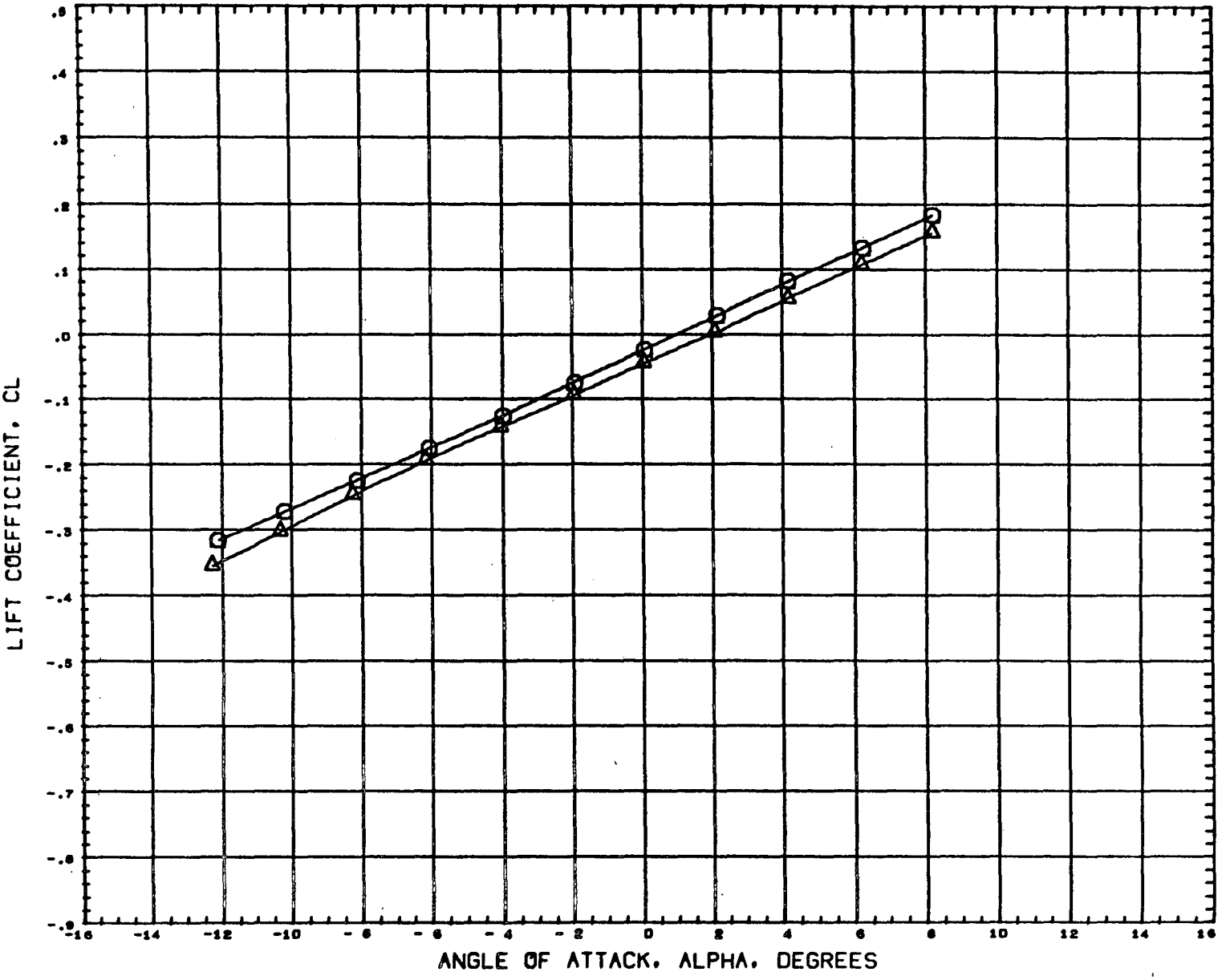


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

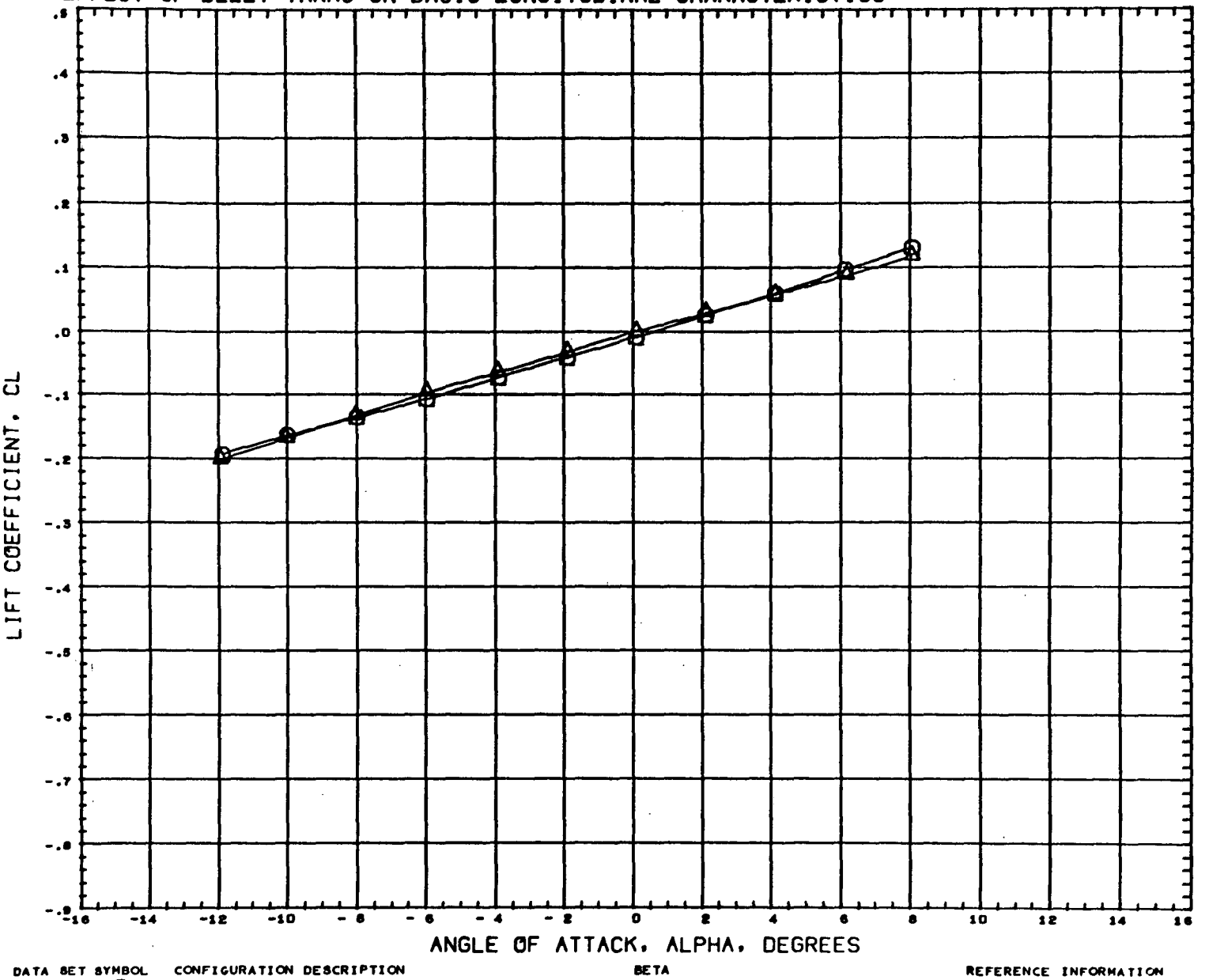


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(JS101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(JS107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

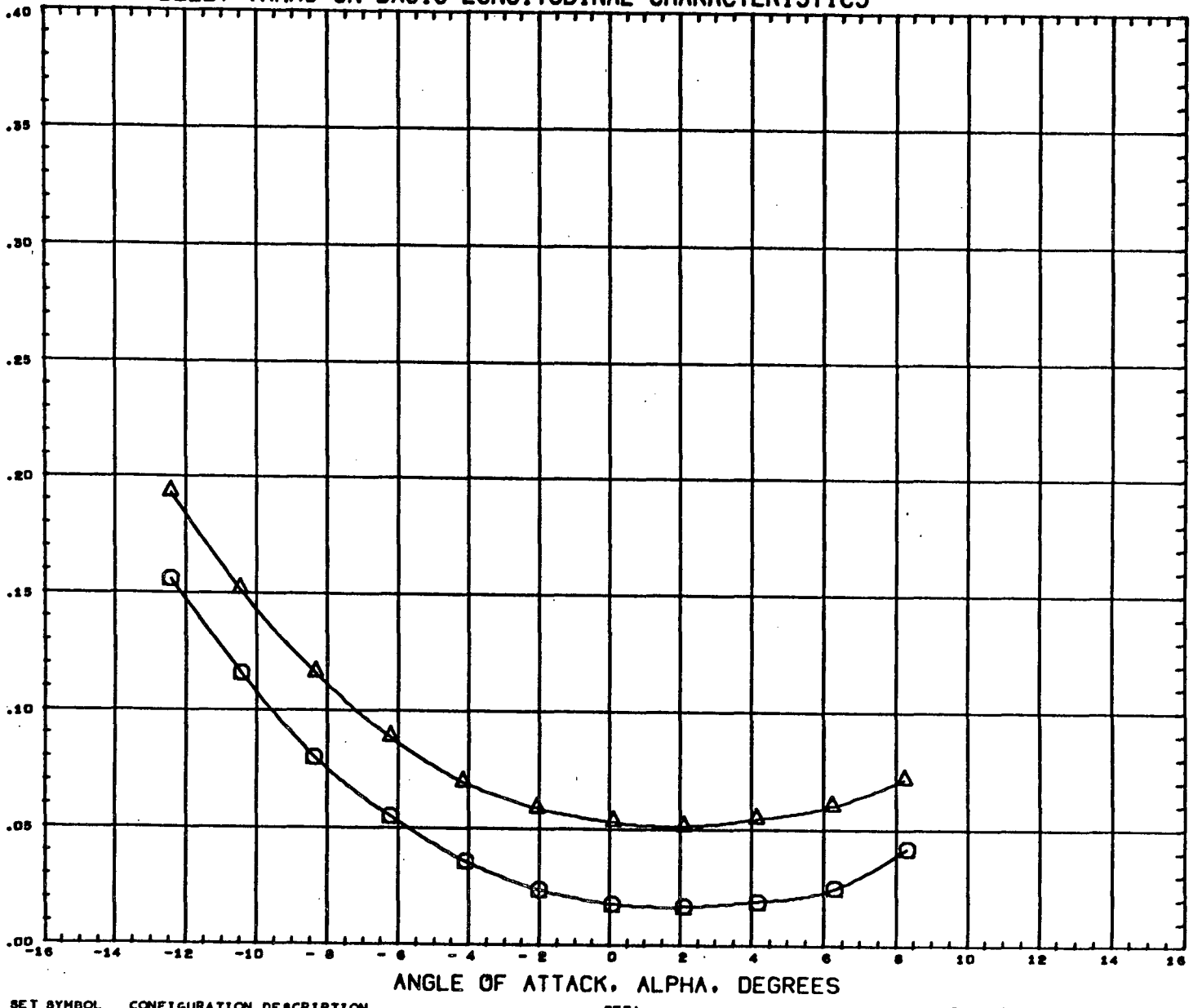


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

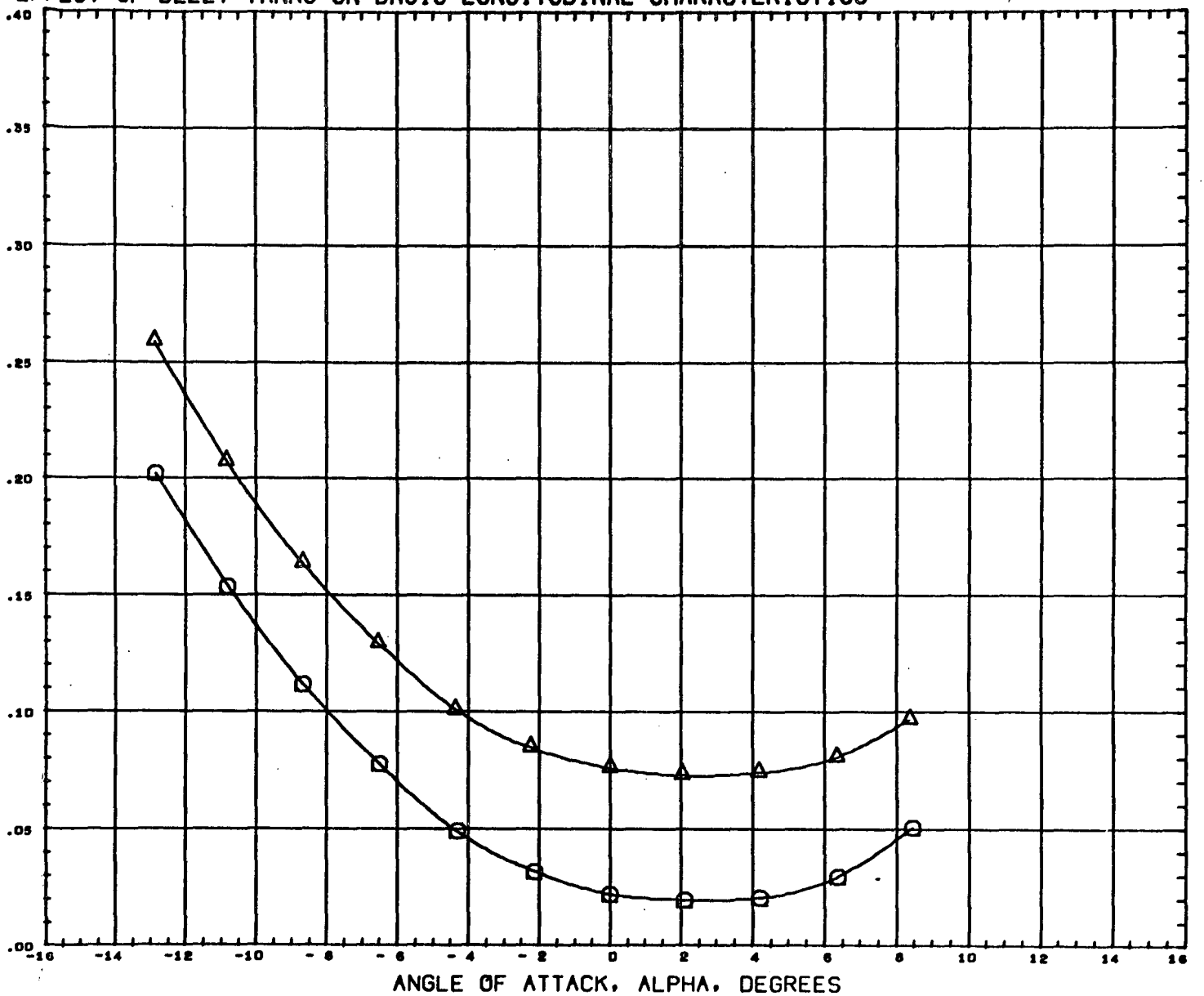


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	M8FC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	M8FC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

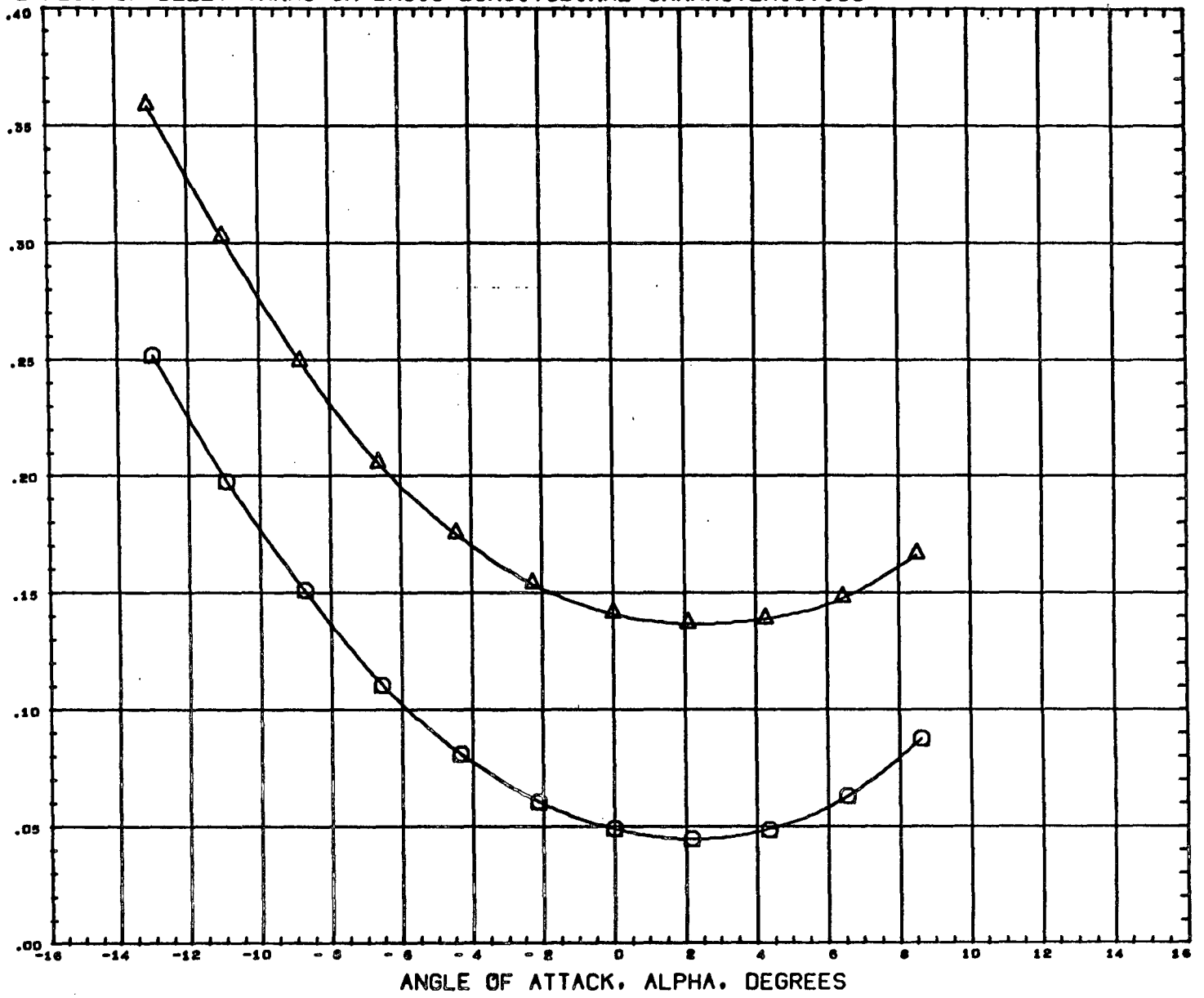


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.698

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

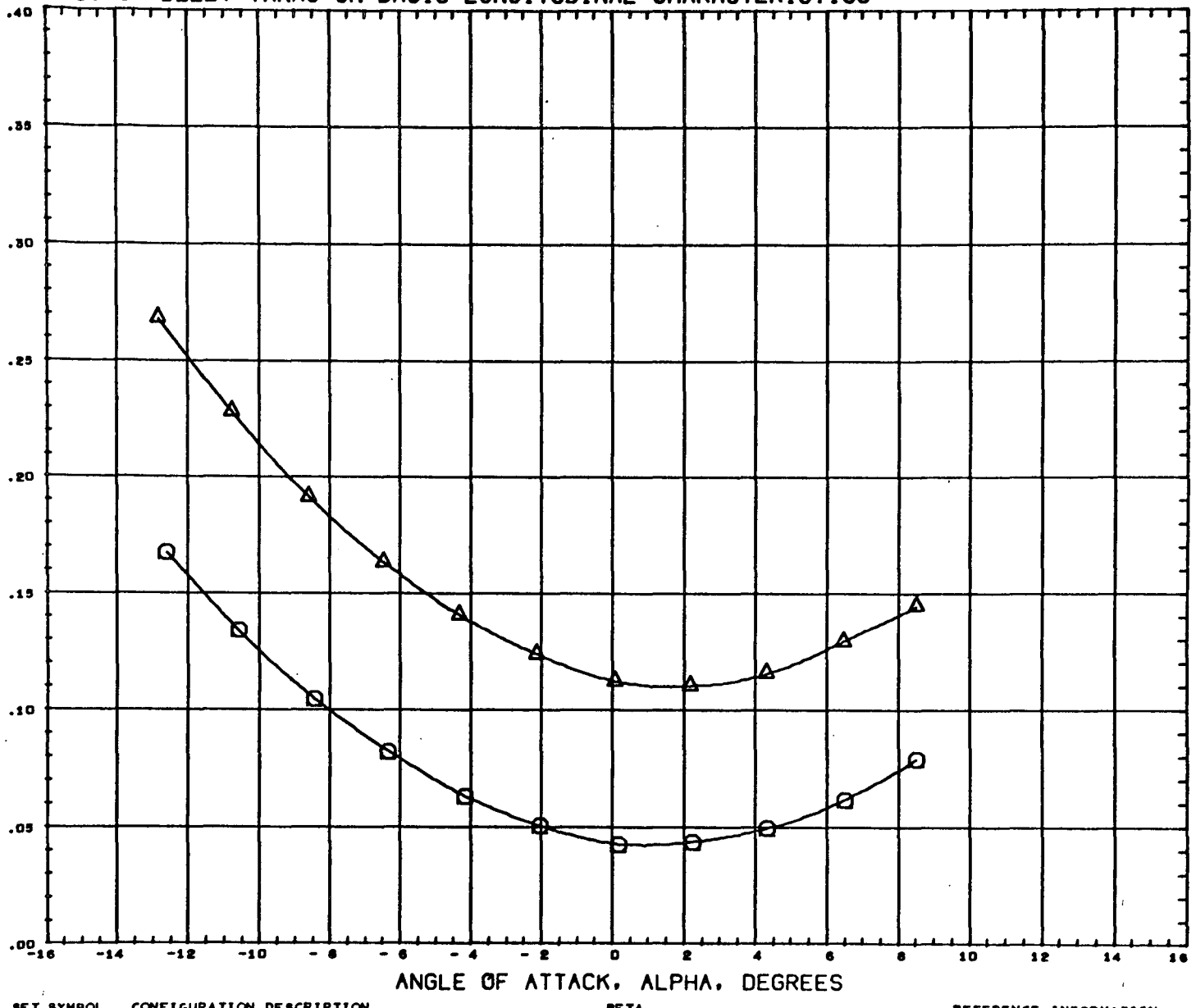


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 3.194

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



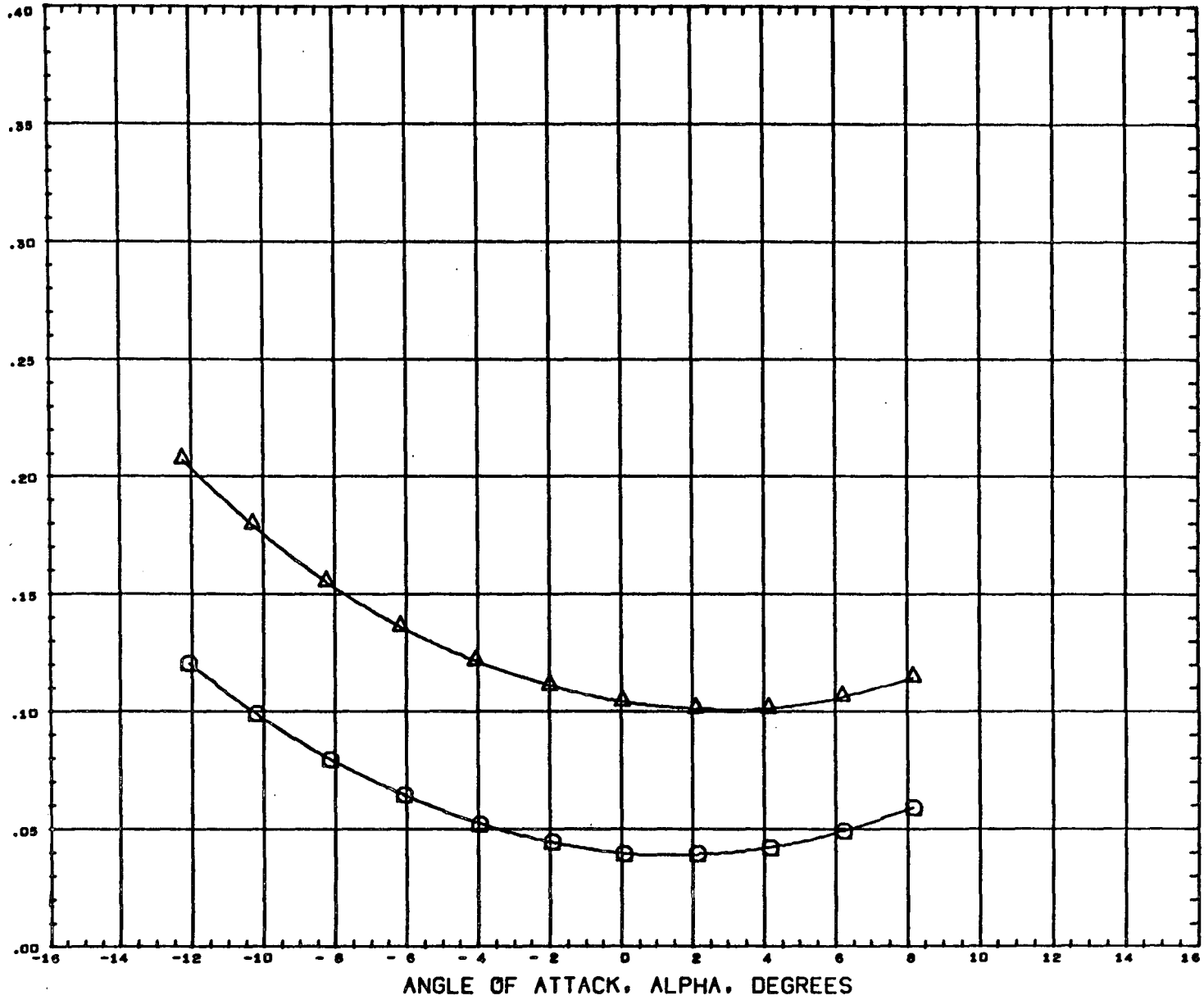
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

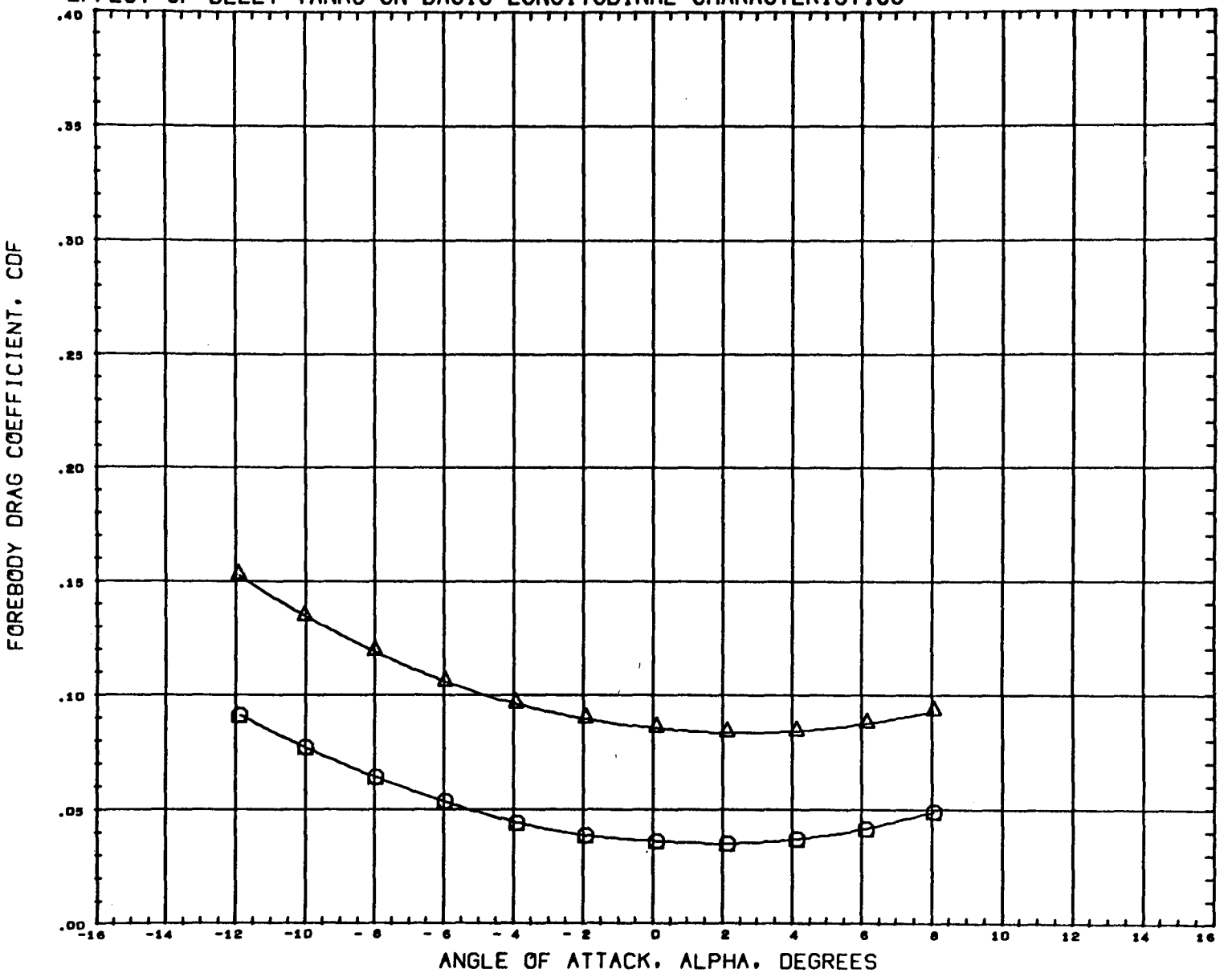


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	5.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

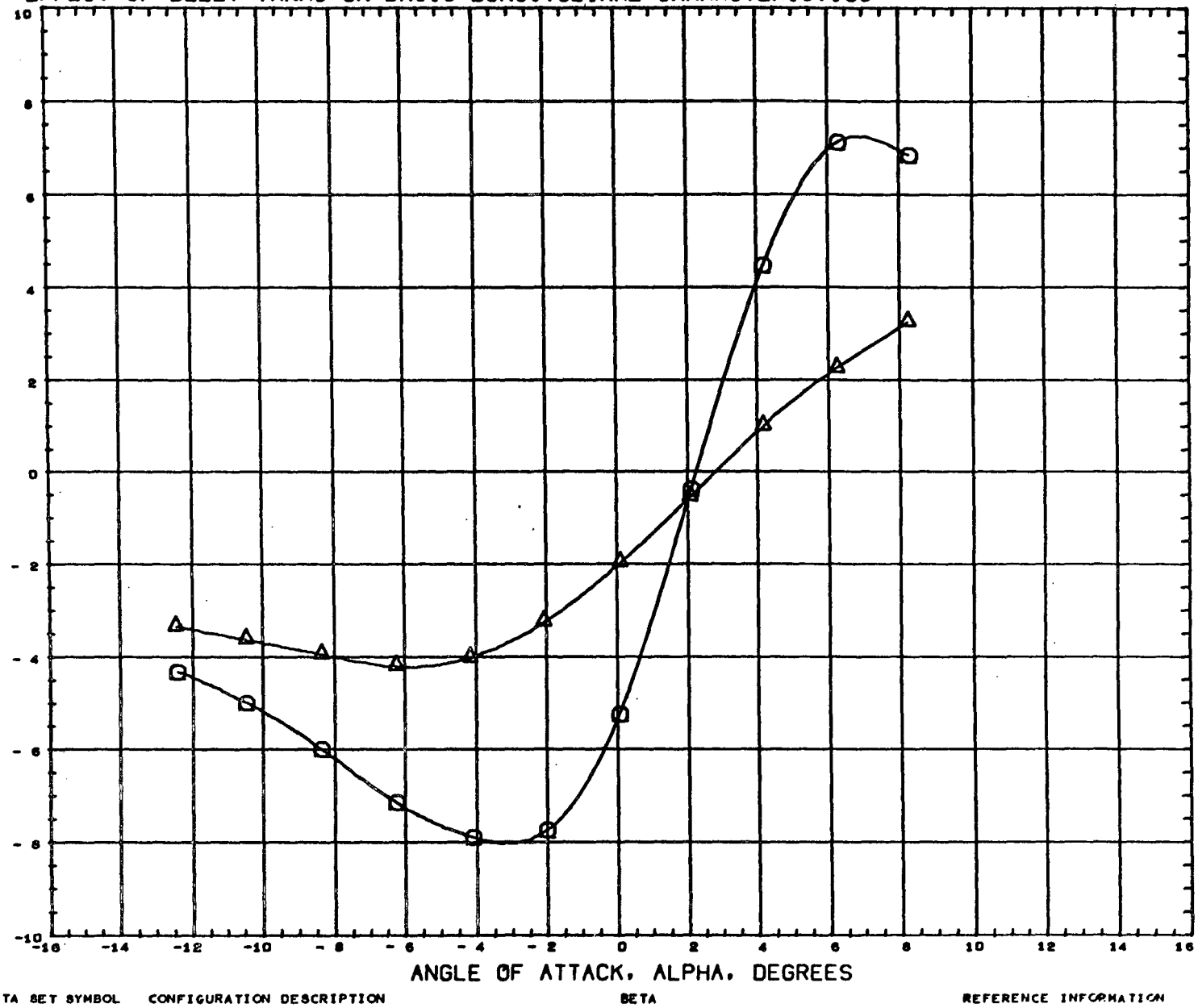


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

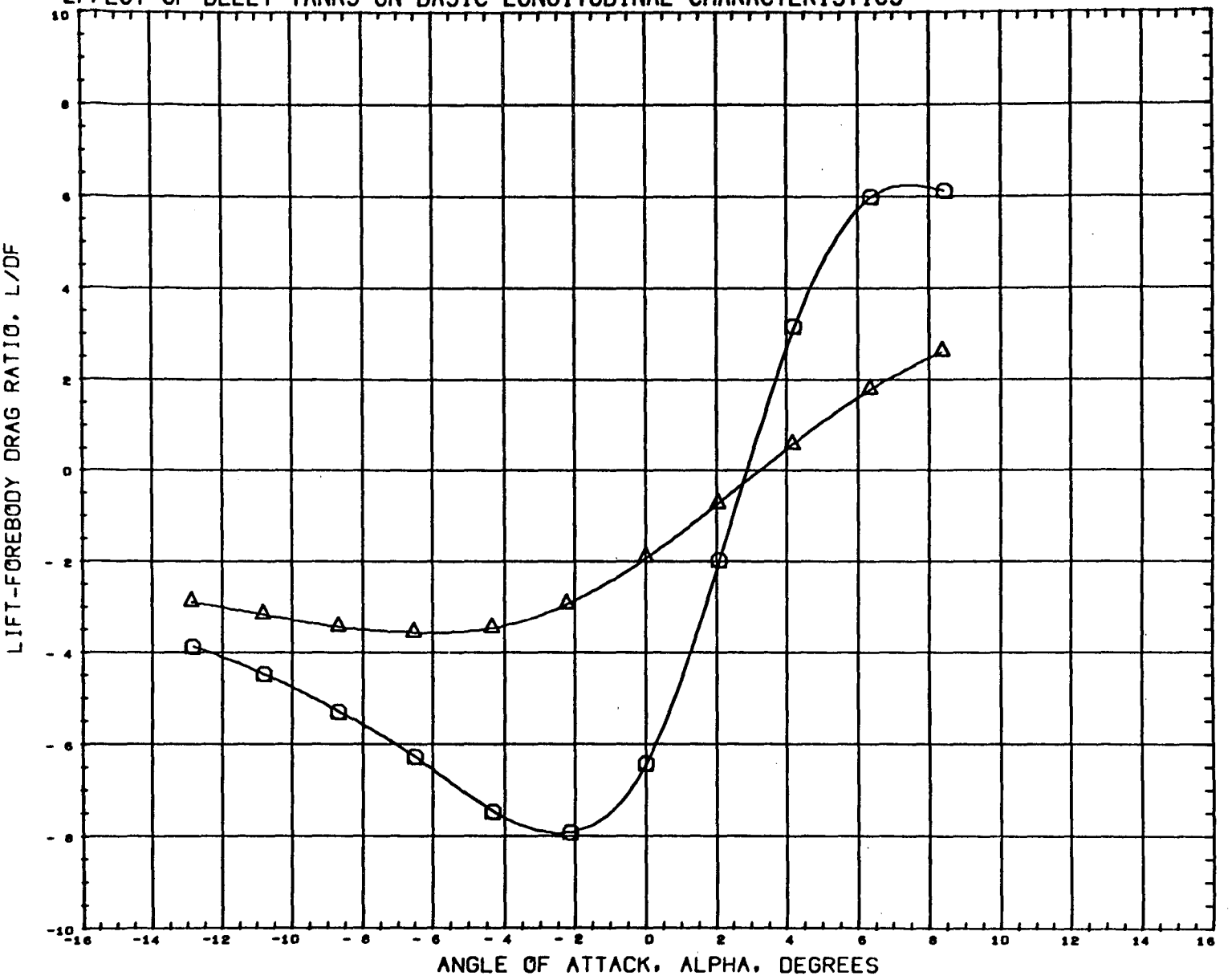


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		M8FC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		M8FC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

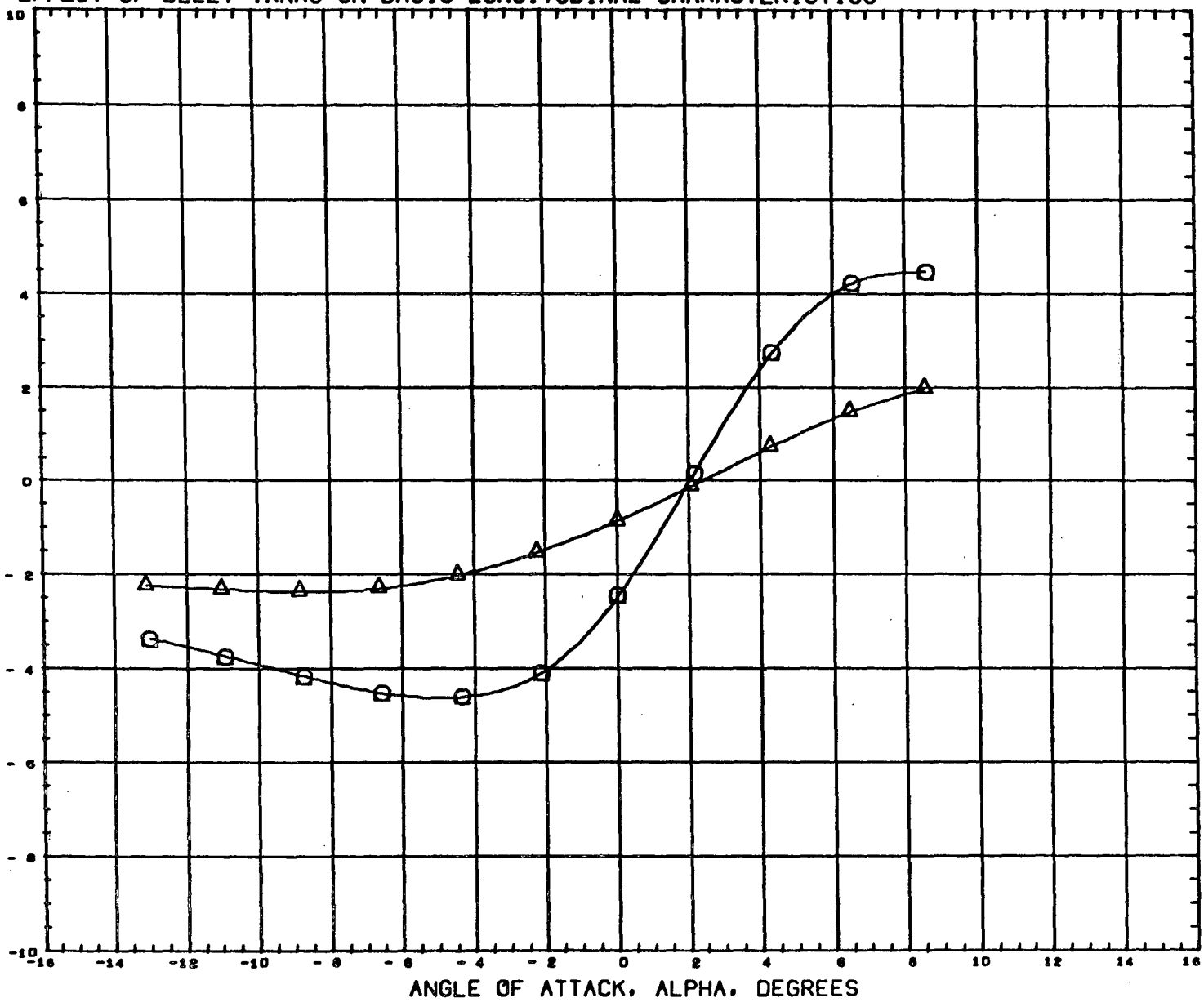


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

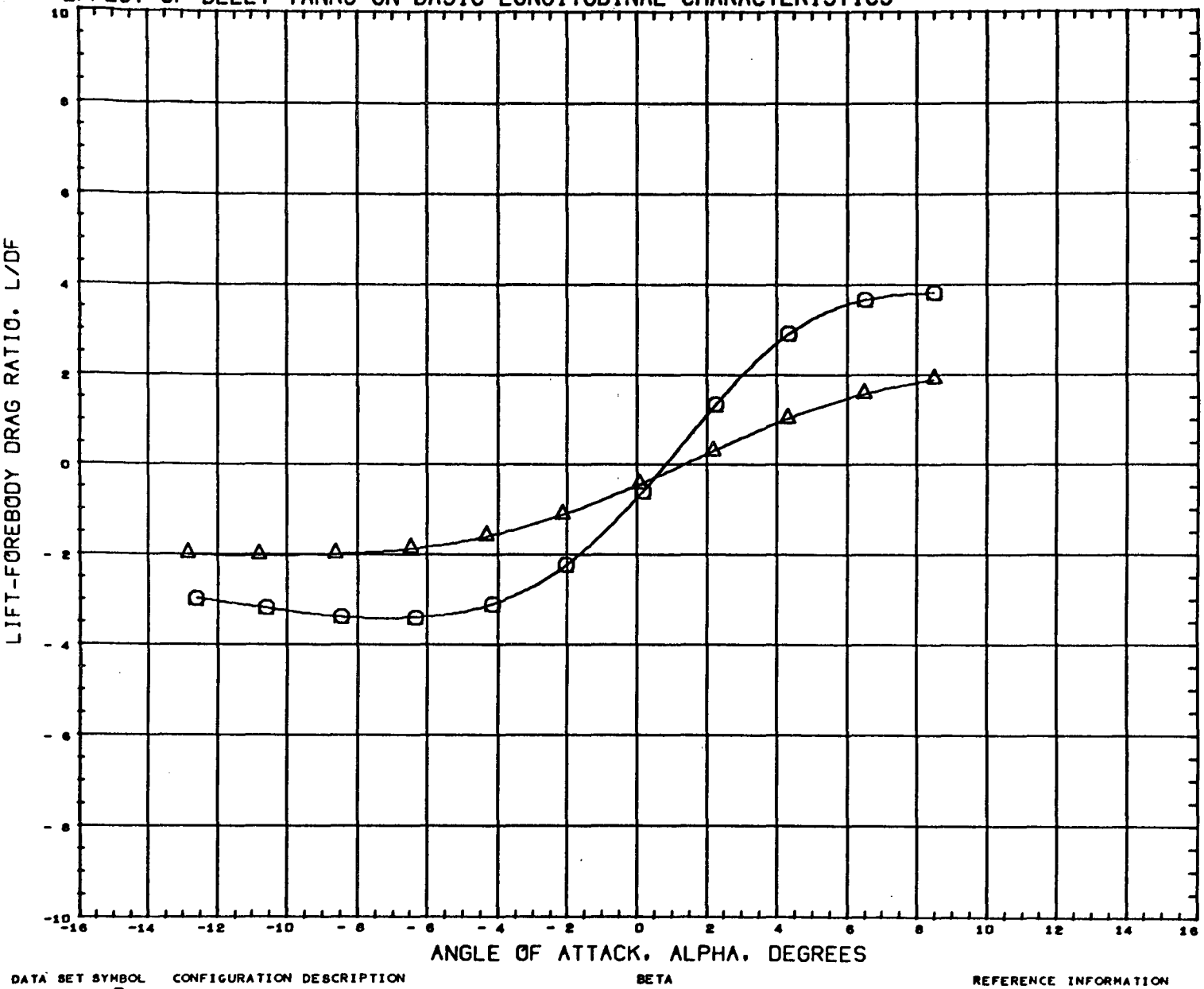


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 8.194

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



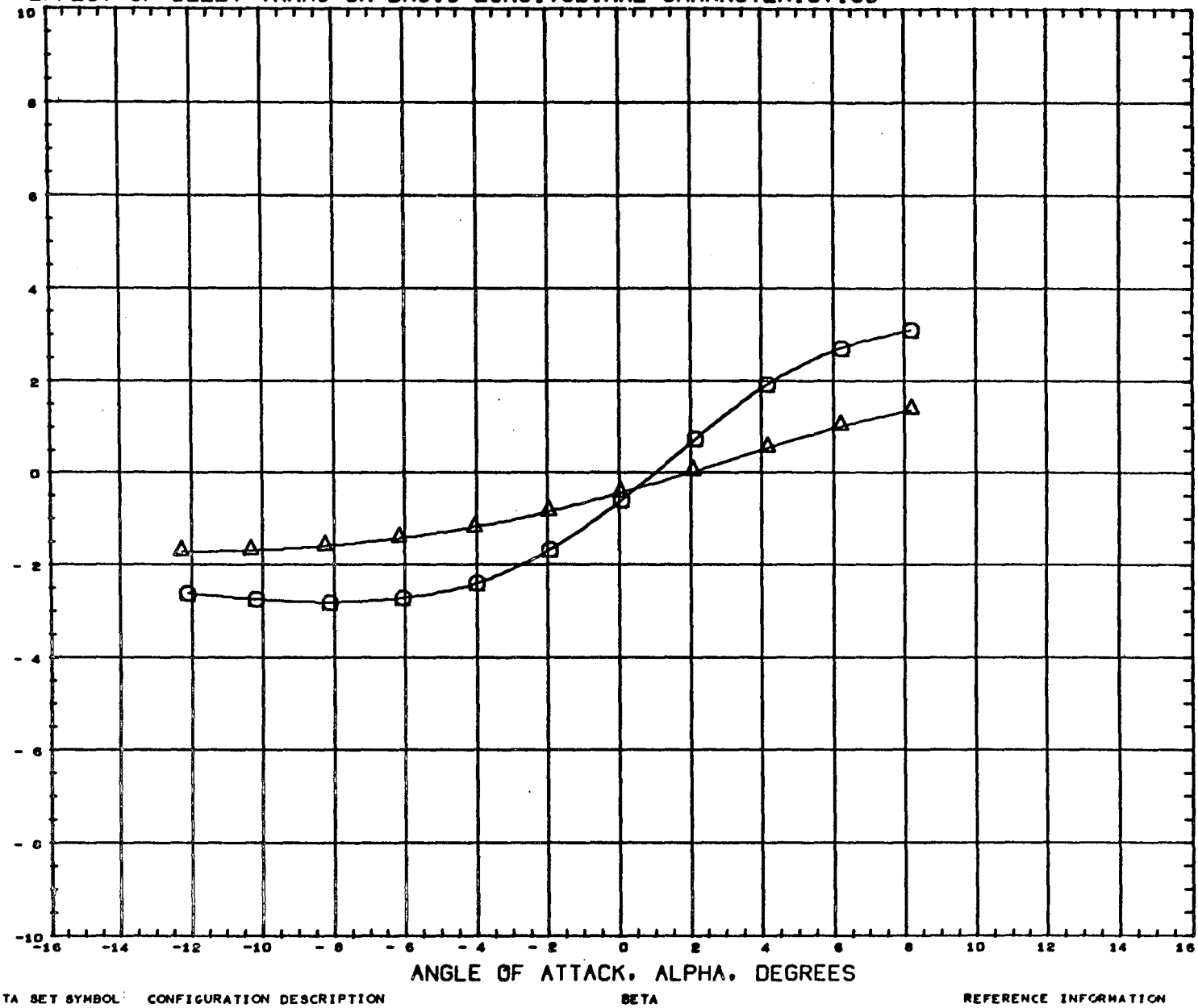
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

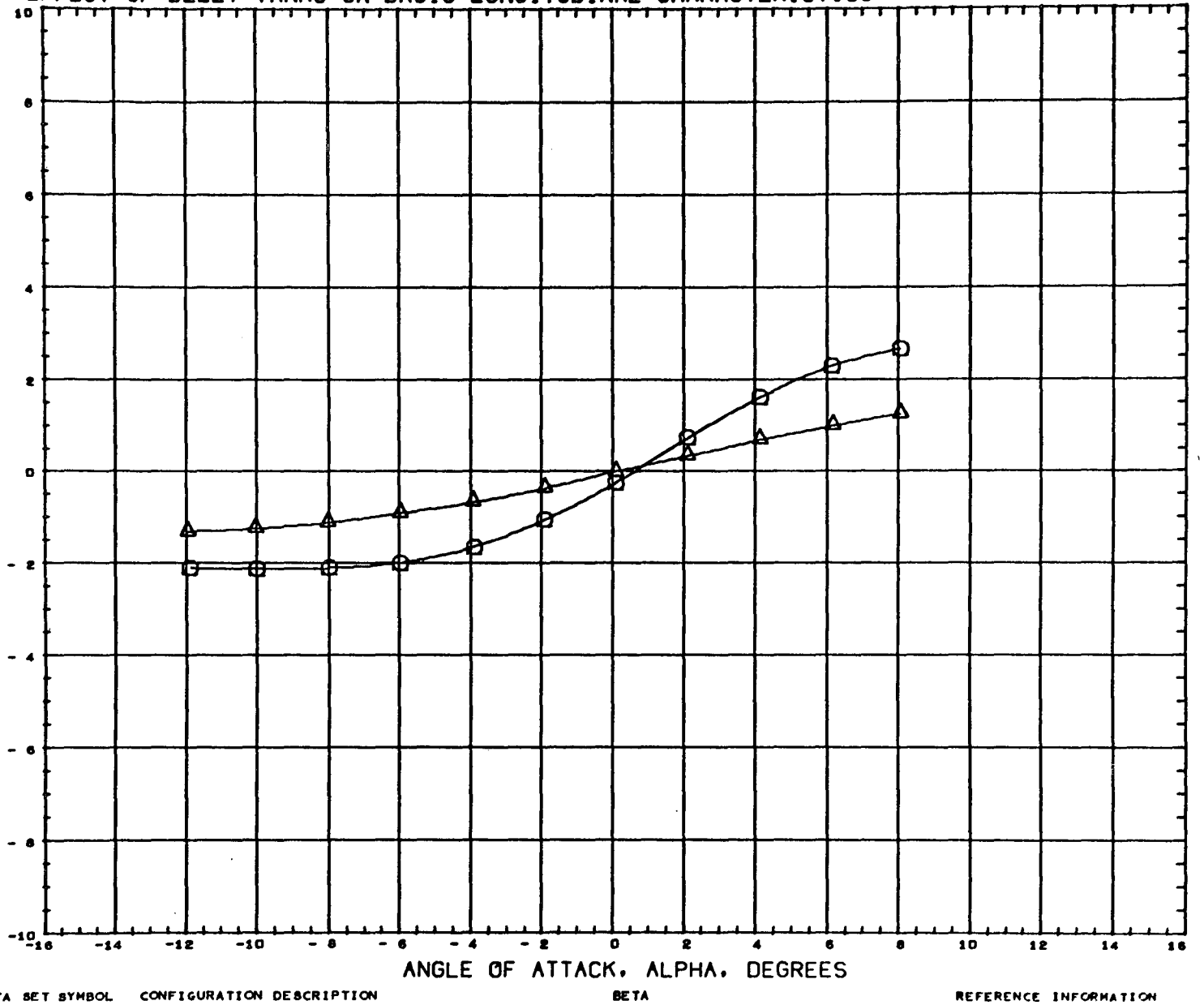


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

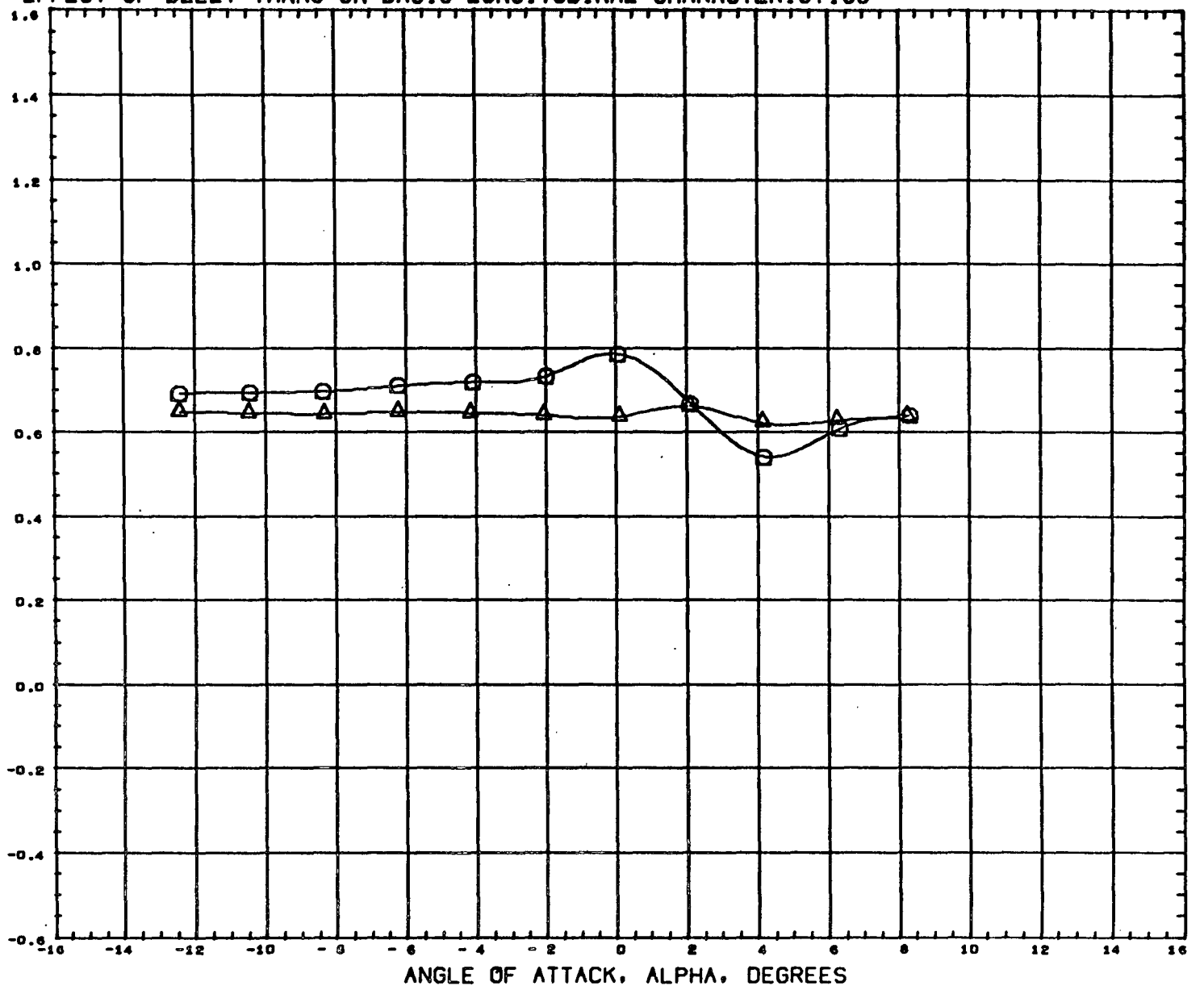


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



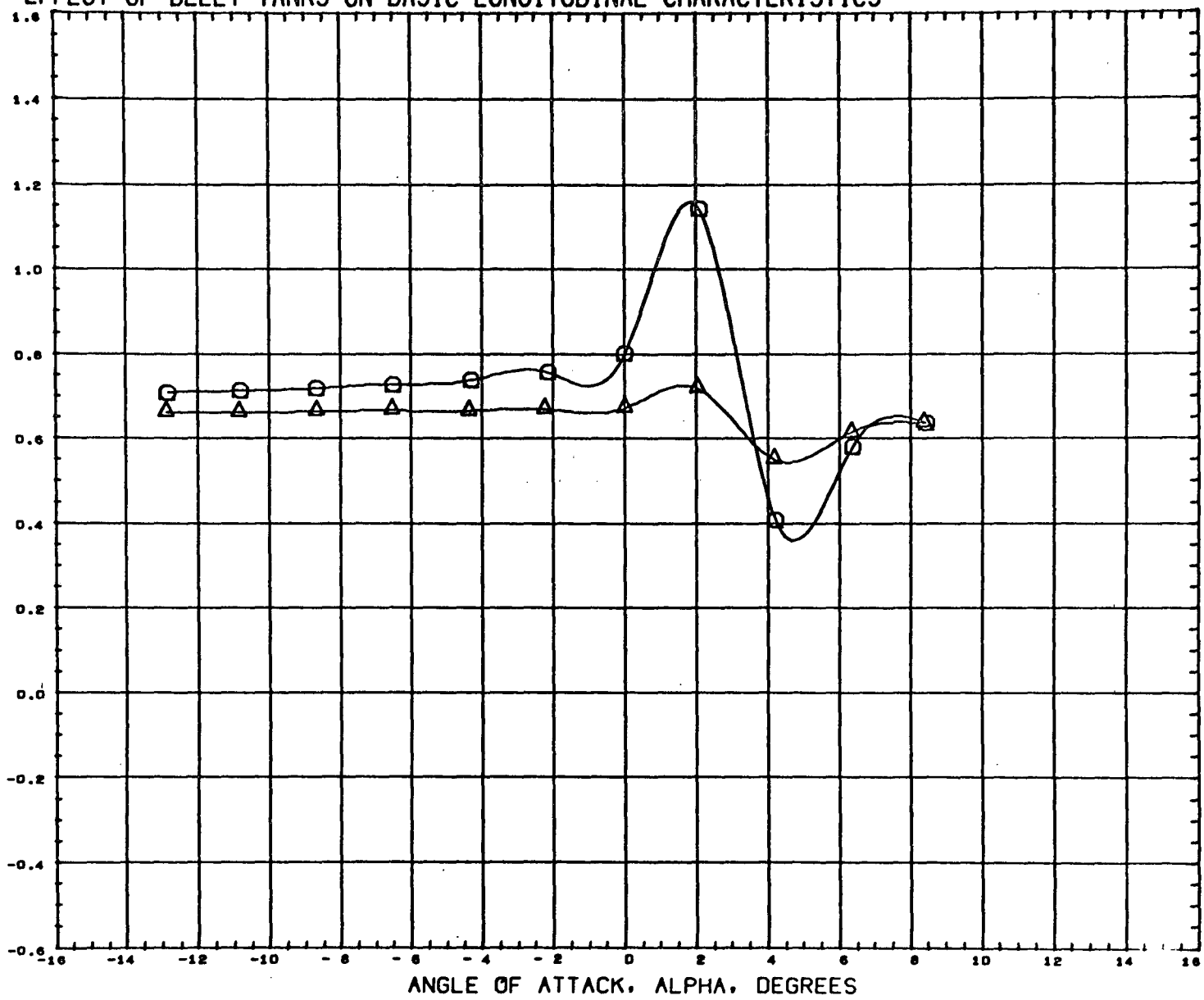
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.605

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



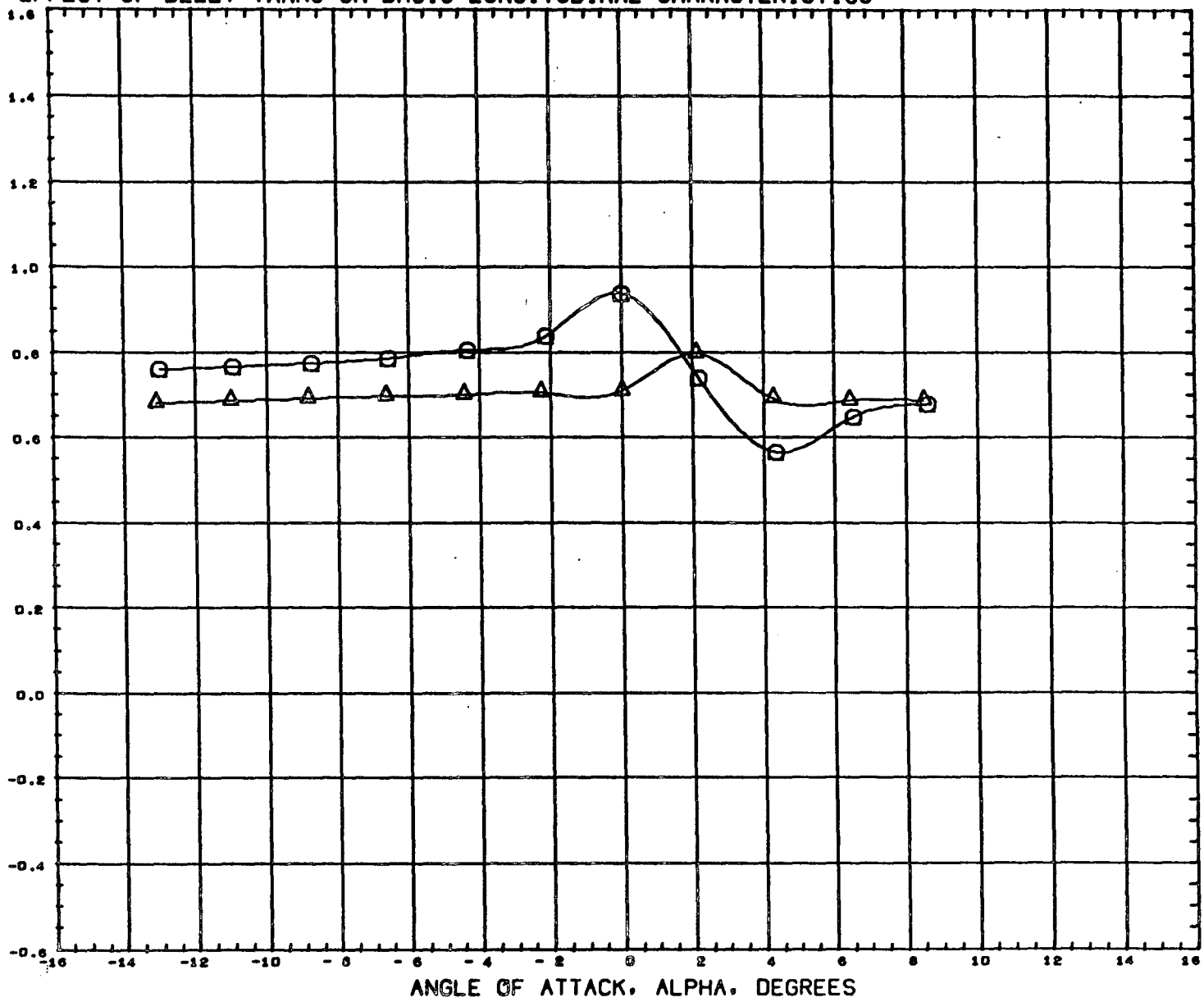
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 0.898

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



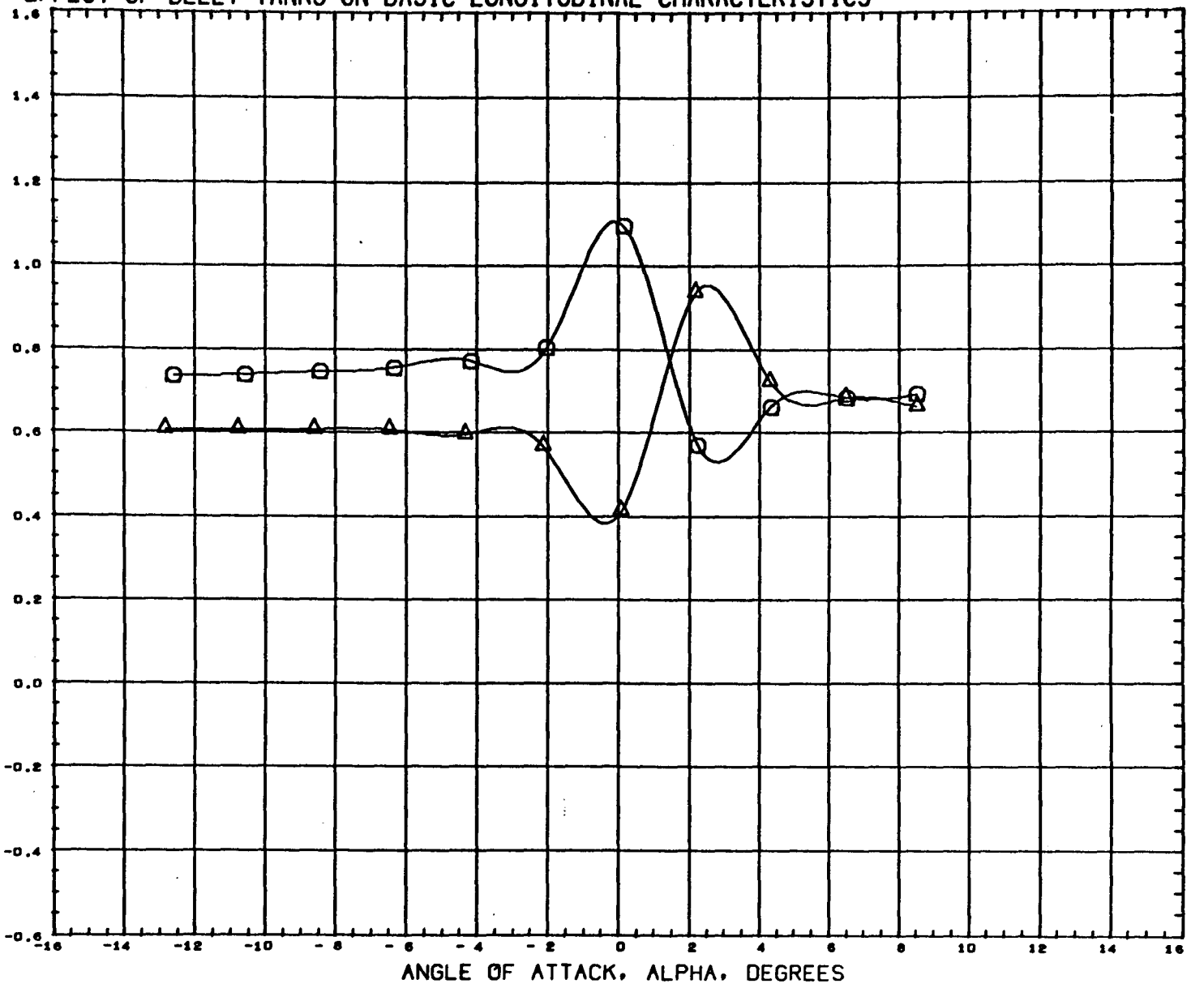
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.194

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



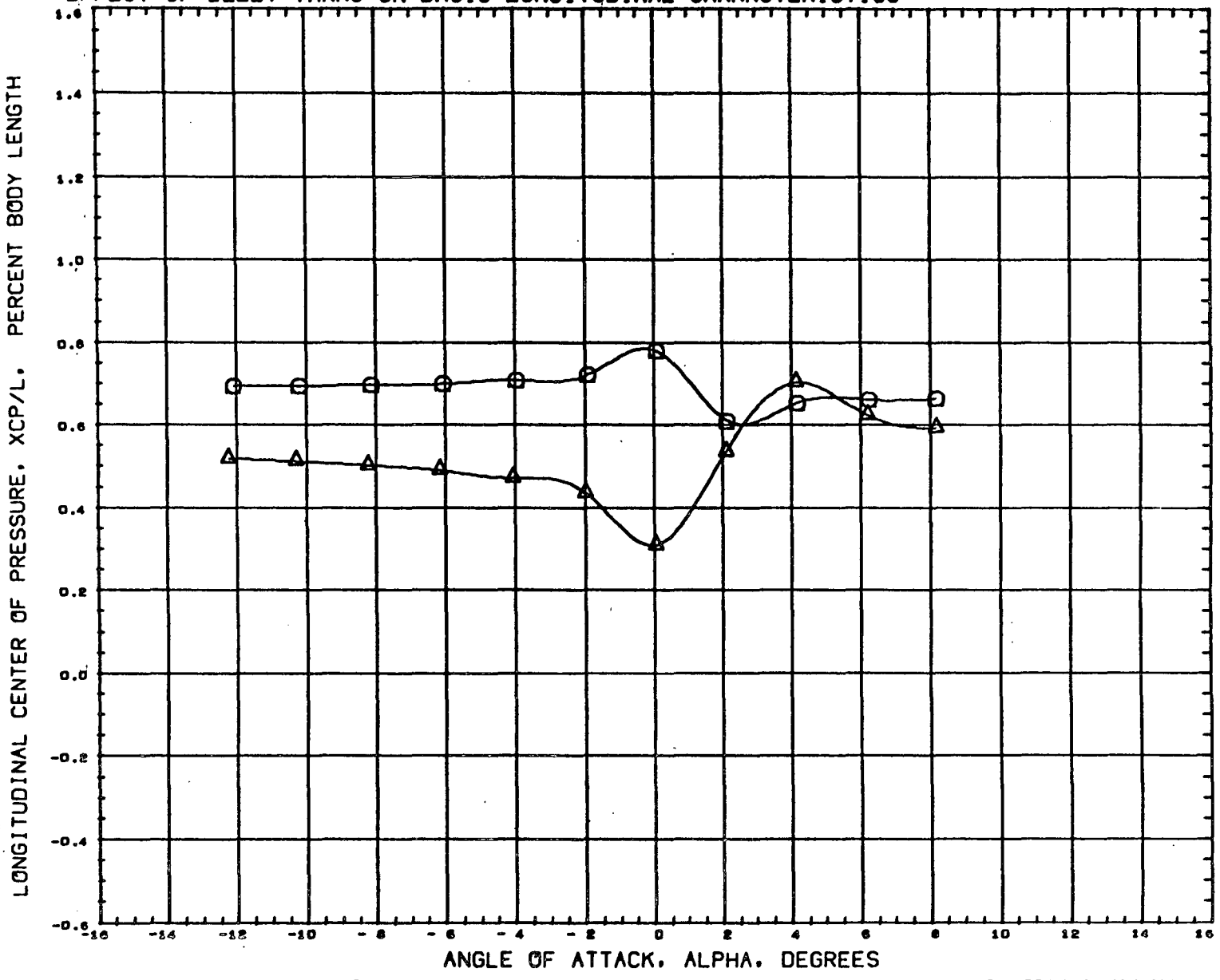
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 1.961

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS

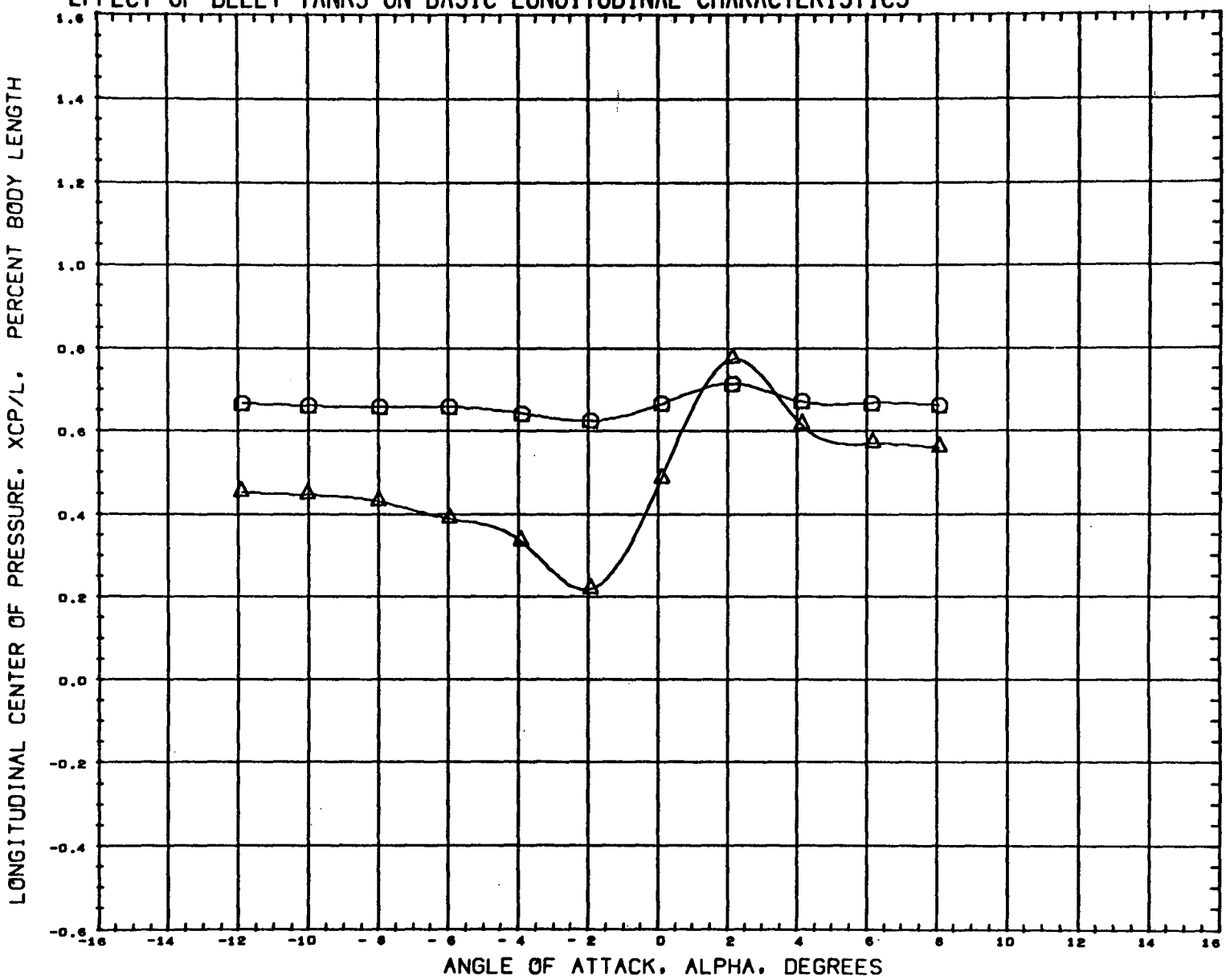


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON BASIC LONGITUDINAL CHARACTERISTICS



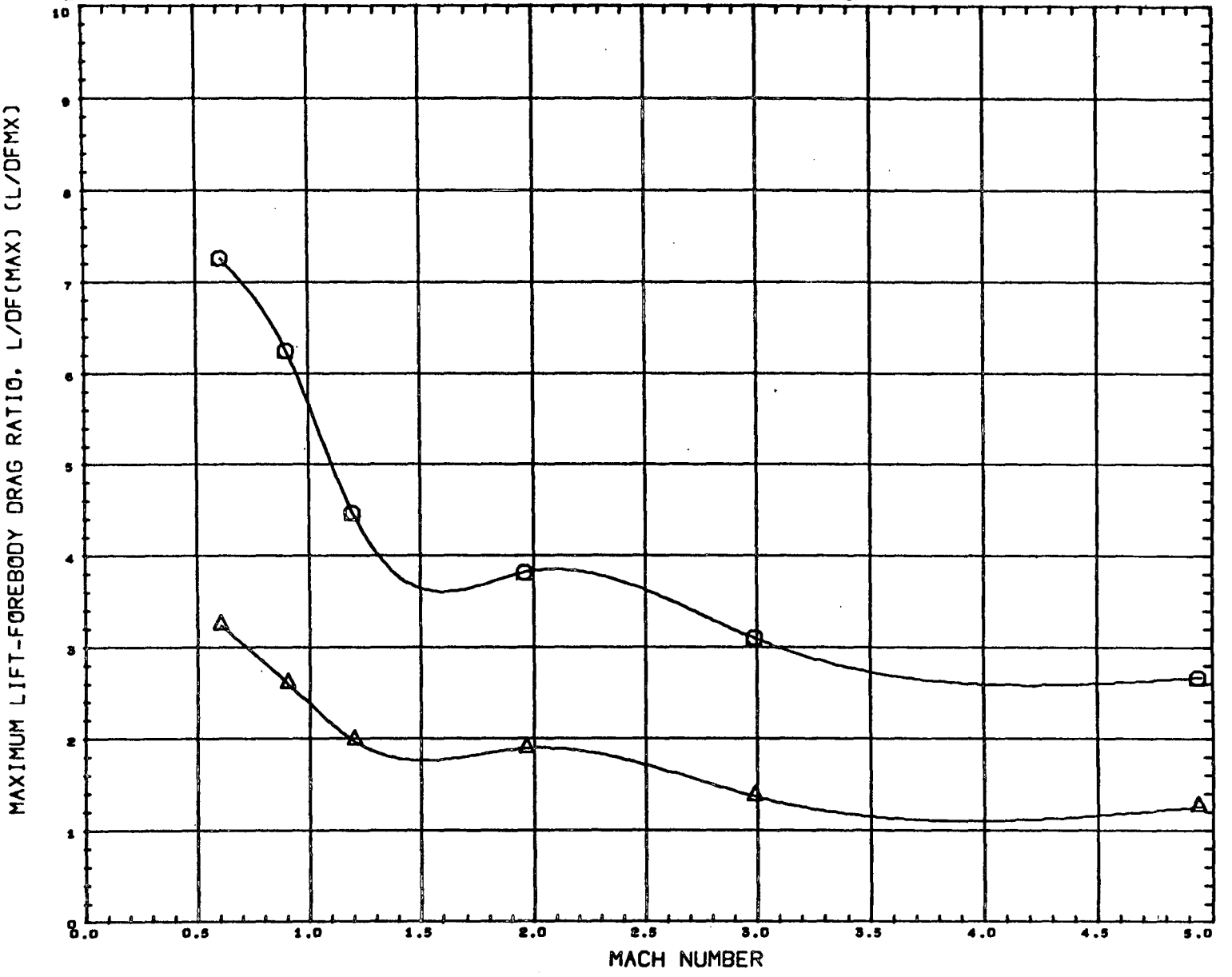
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(J5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(J5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

MACH 4.959

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON DESIGN FUNCTIONS AT MAXIMUM L/D

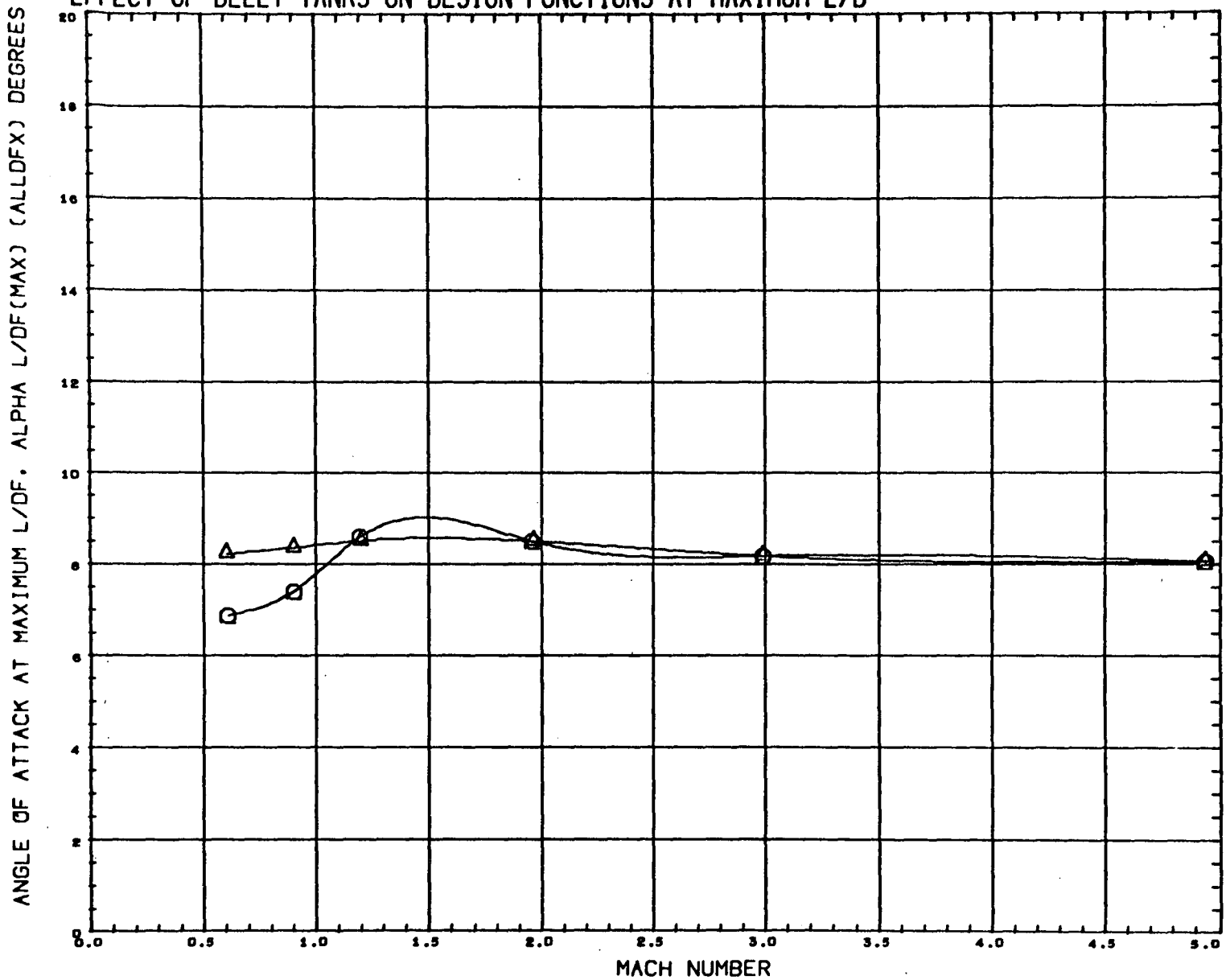


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(K5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(K5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

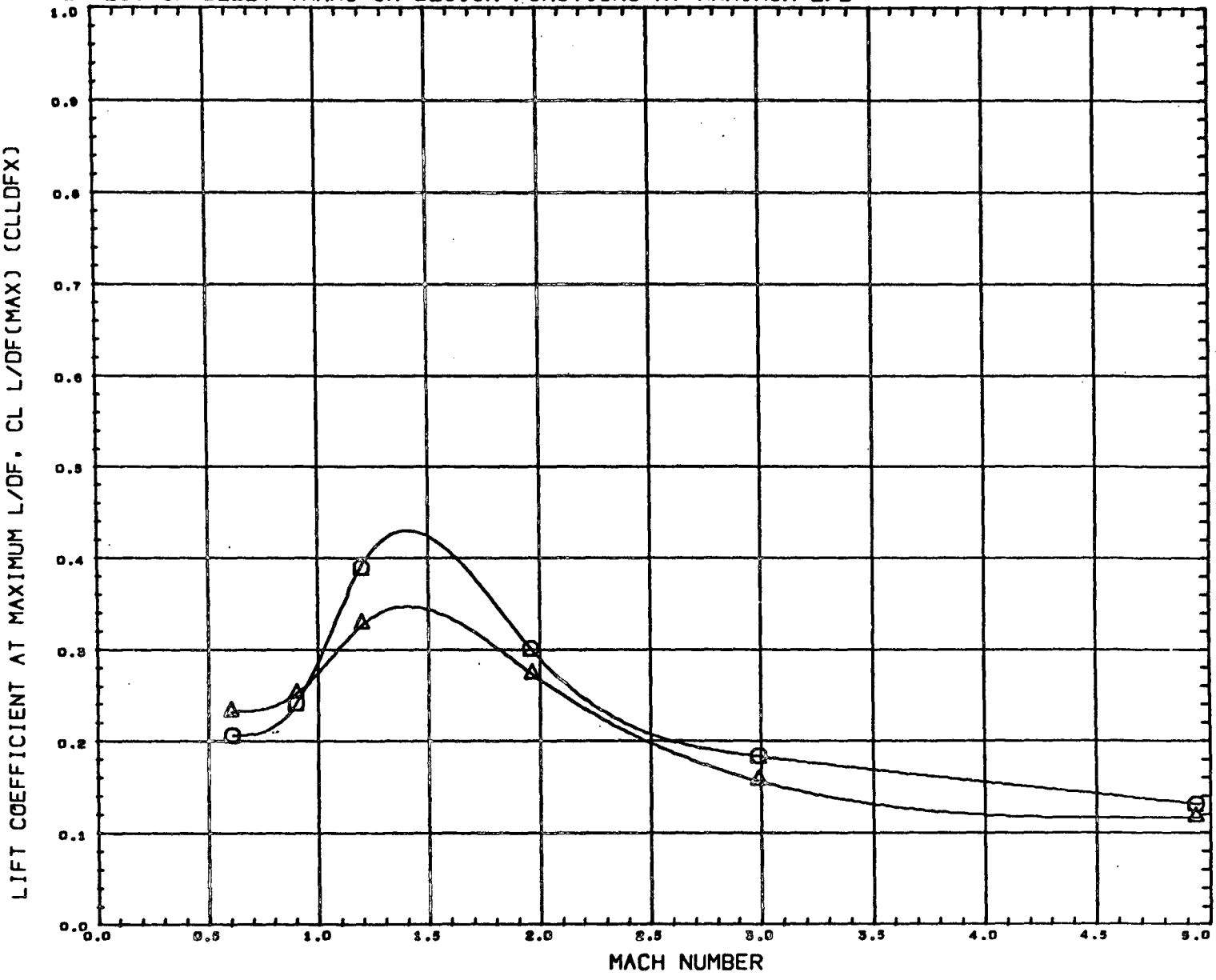
EFFECT OF BELLY TANKS ON DESIGN FUNCTIONS AT MAXIMUM L/D



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(K5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(K5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF BELLY TANKS ON DESIGN FUNCTIONS AT MAXIMUM L/D

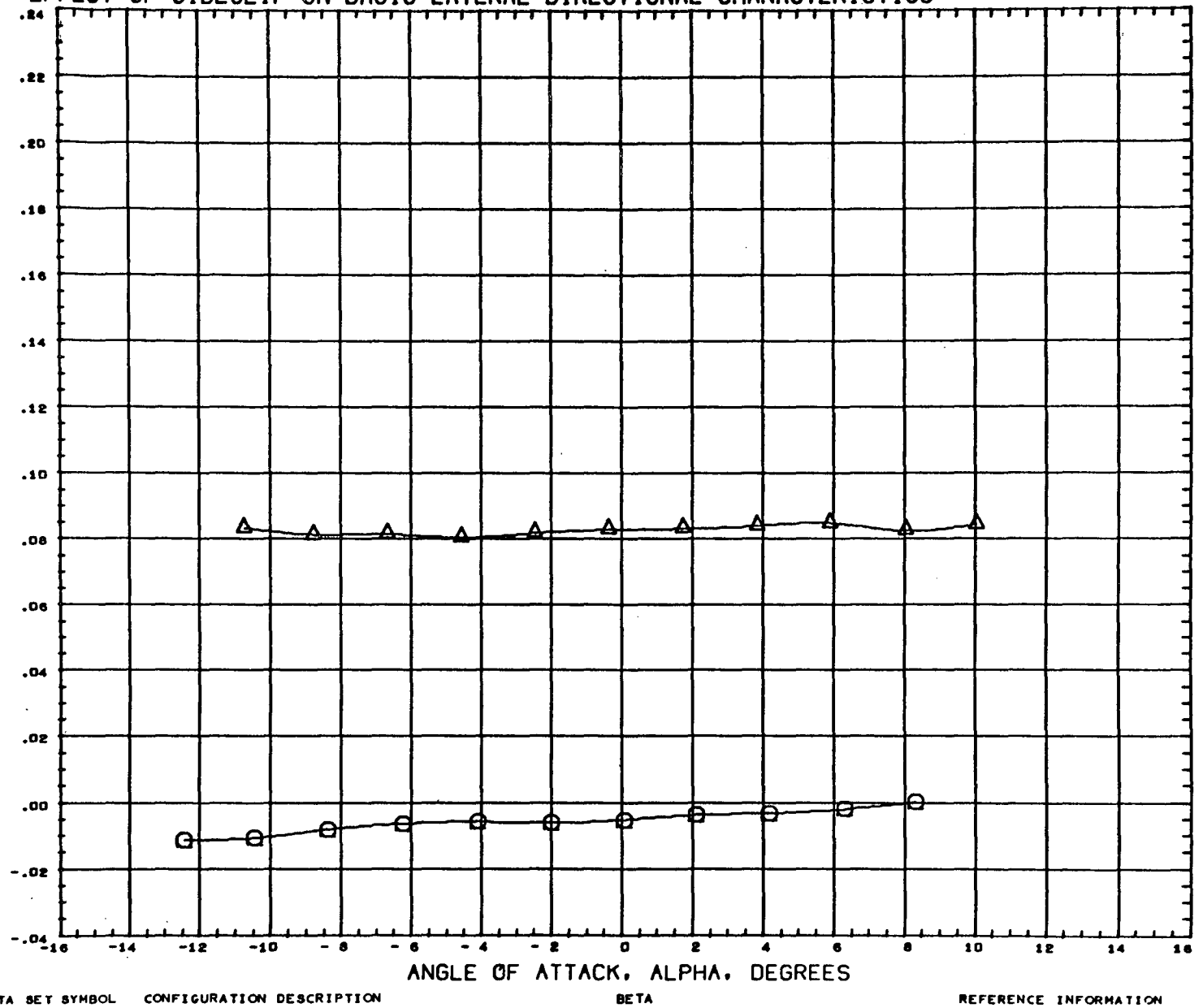


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(K5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(K5107A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
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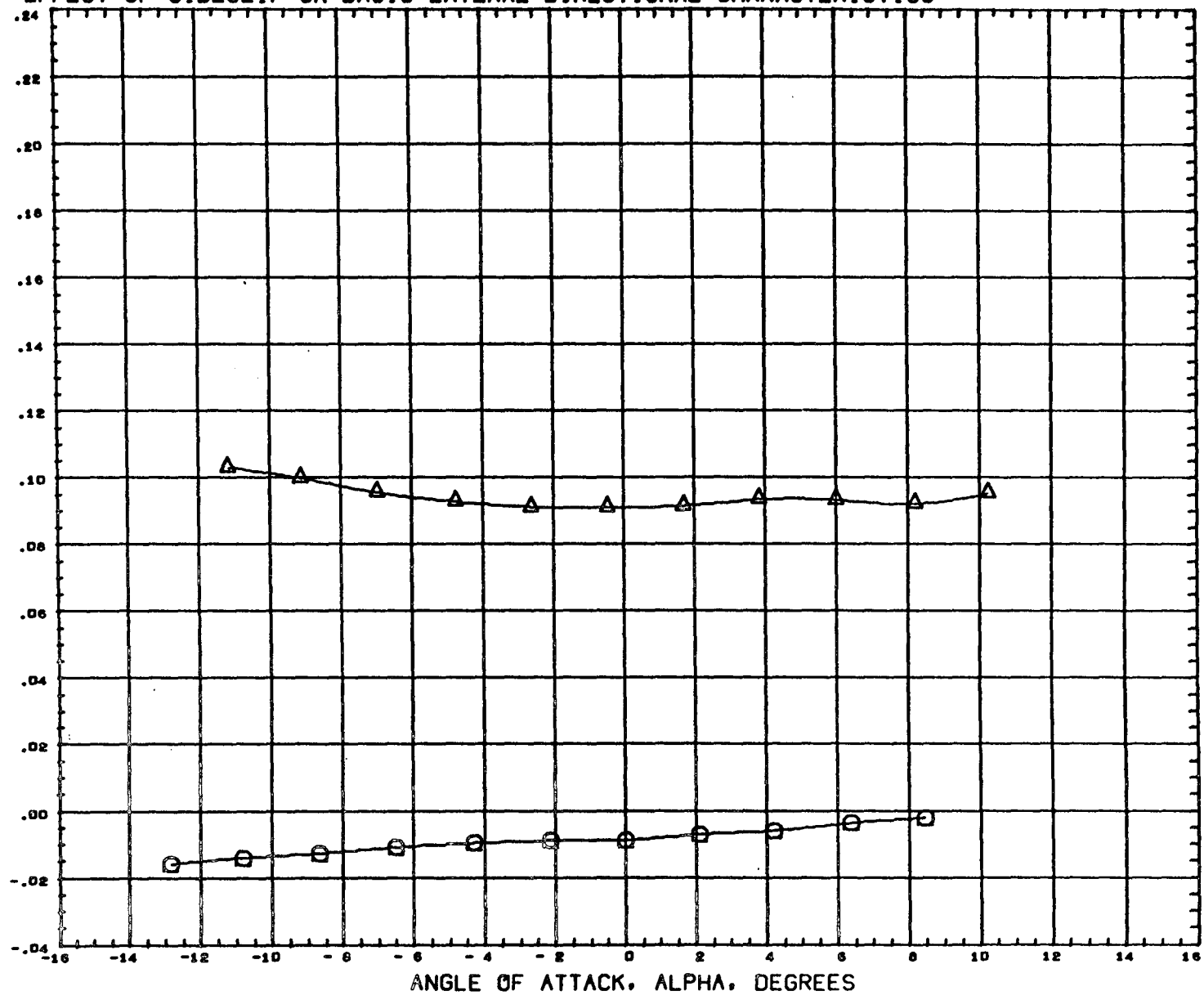
(B5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 0.605

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
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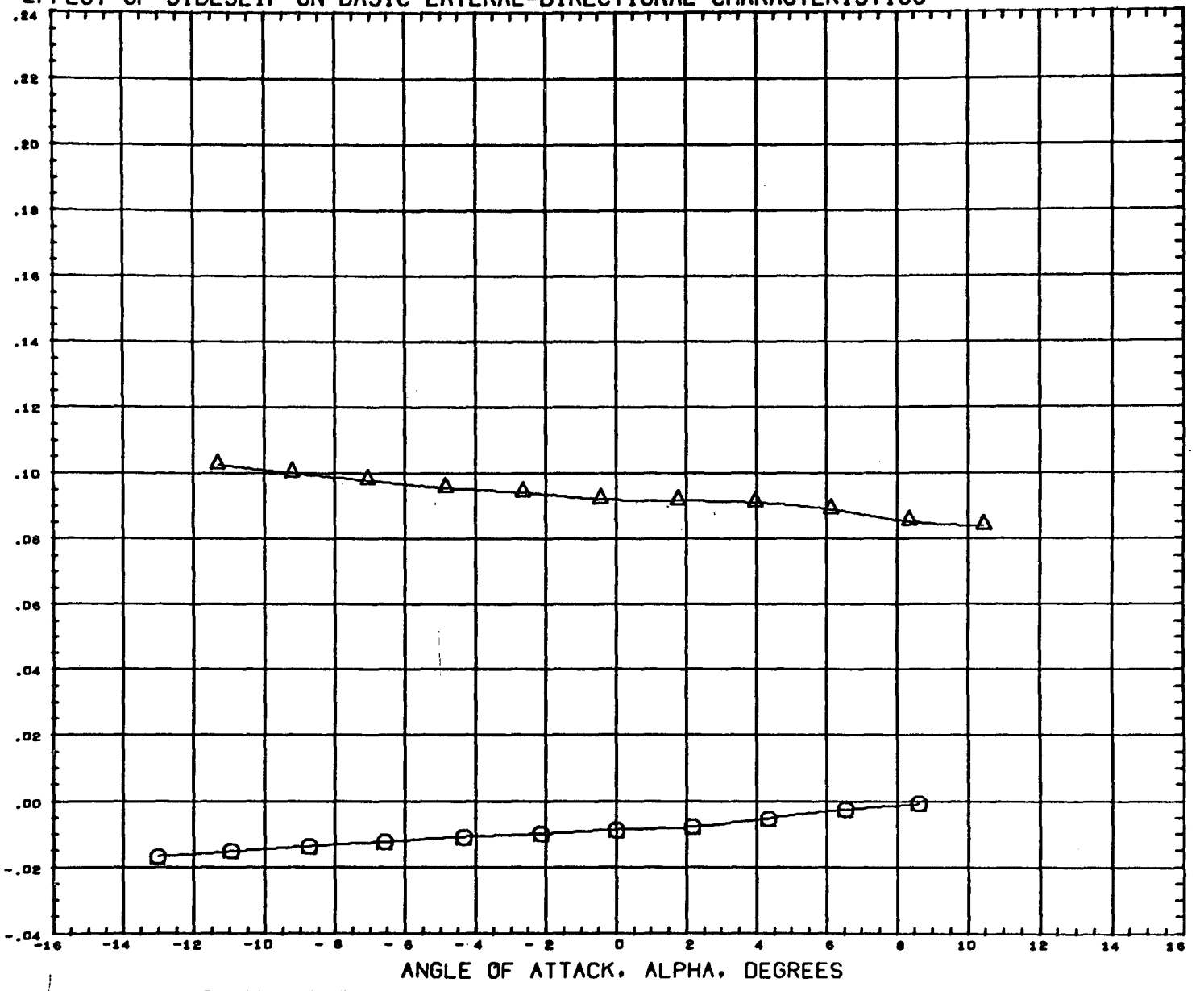
(85102A)		MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 0.898

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

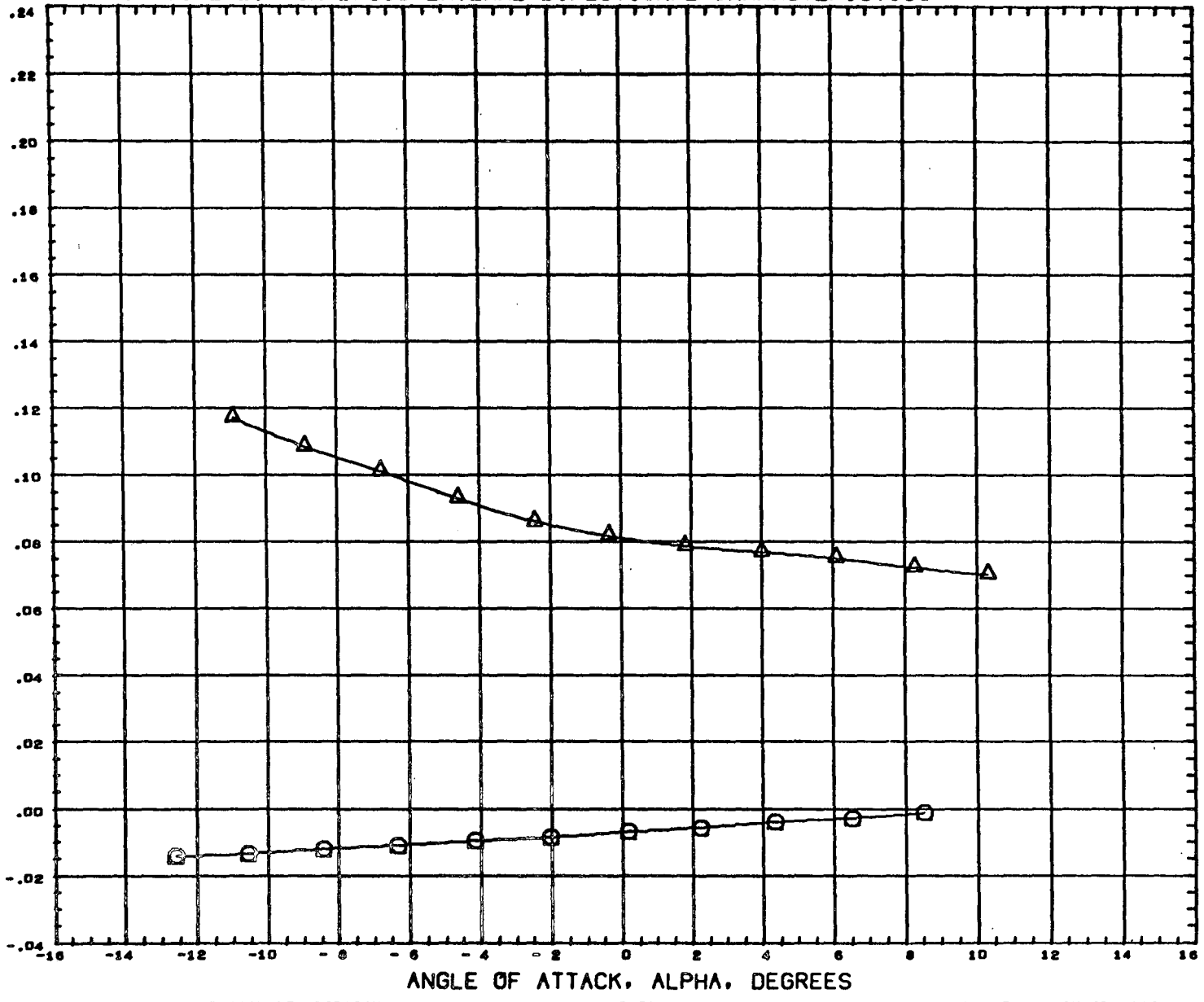


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(85102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 1.194

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B5102A)		MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 1.961

REFERENCE INFORMATION		
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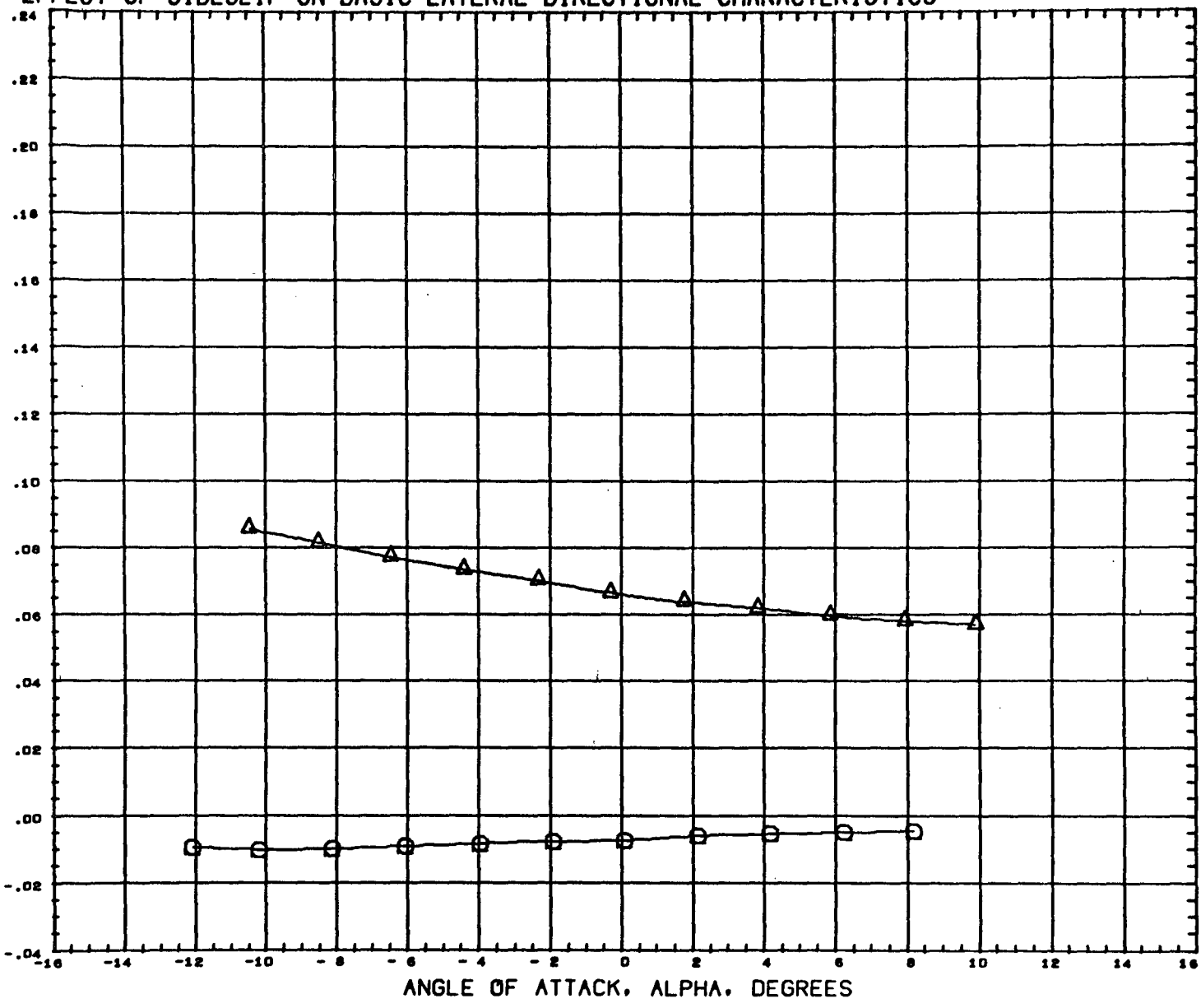
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION		
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LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
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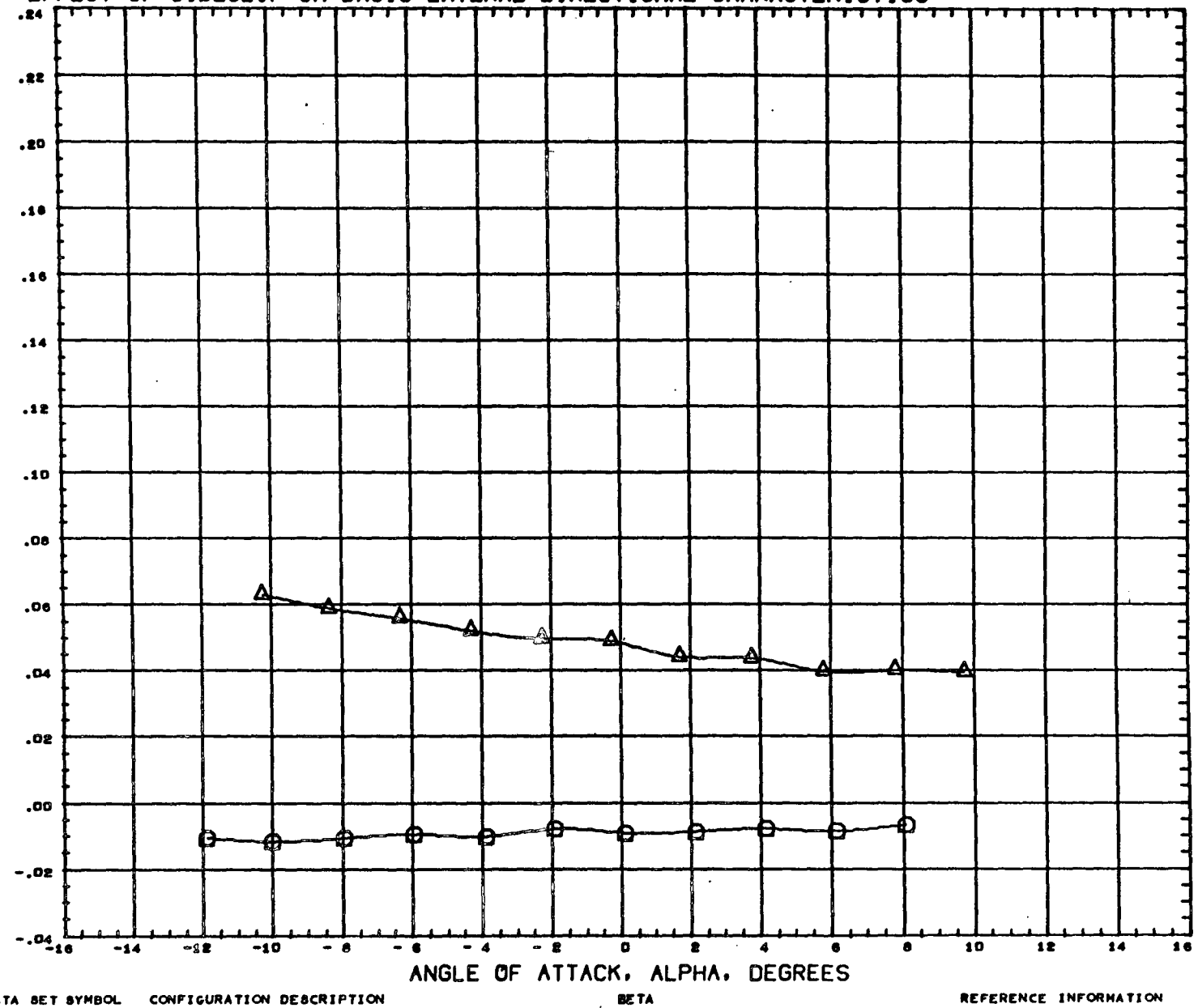
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

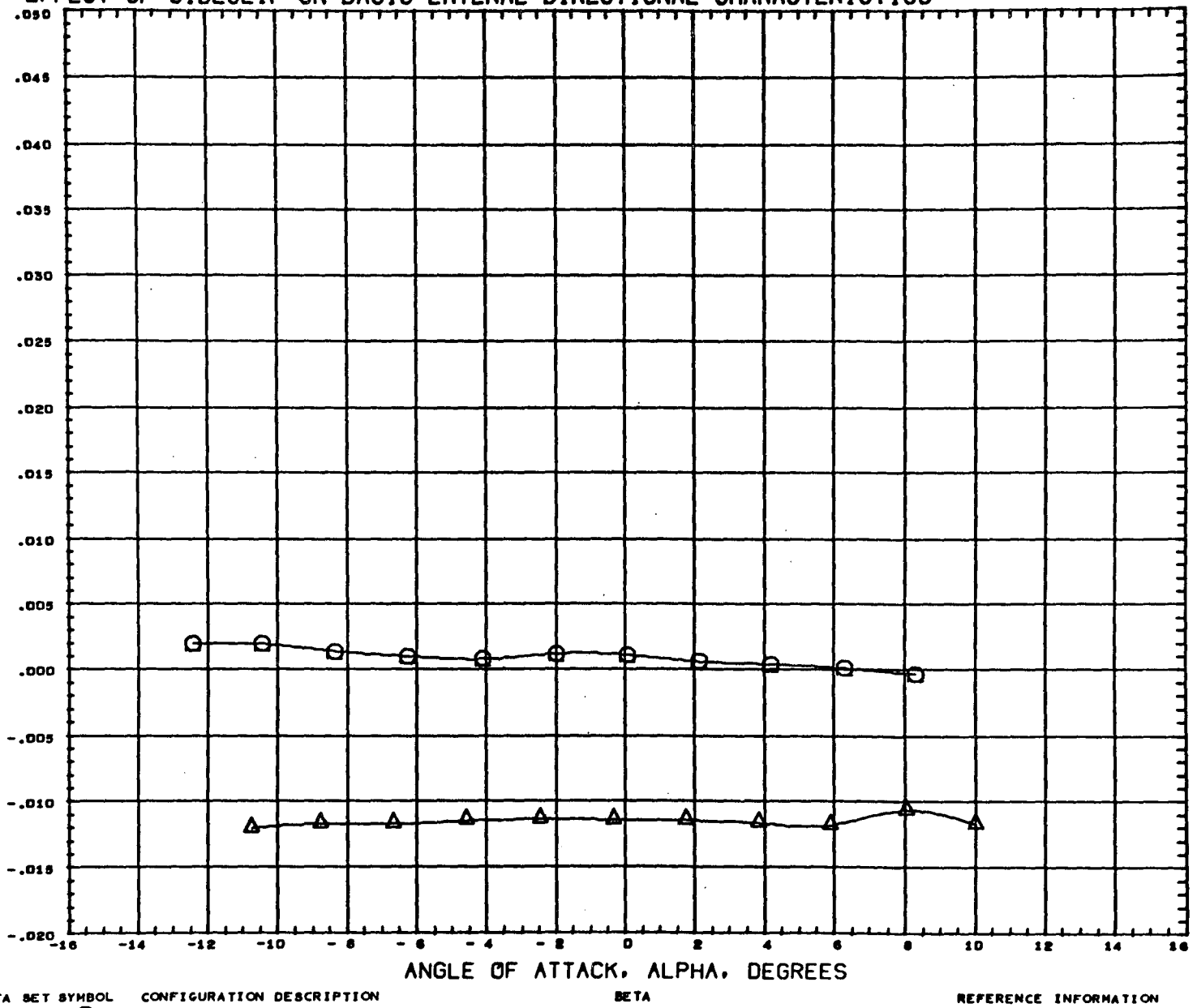


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

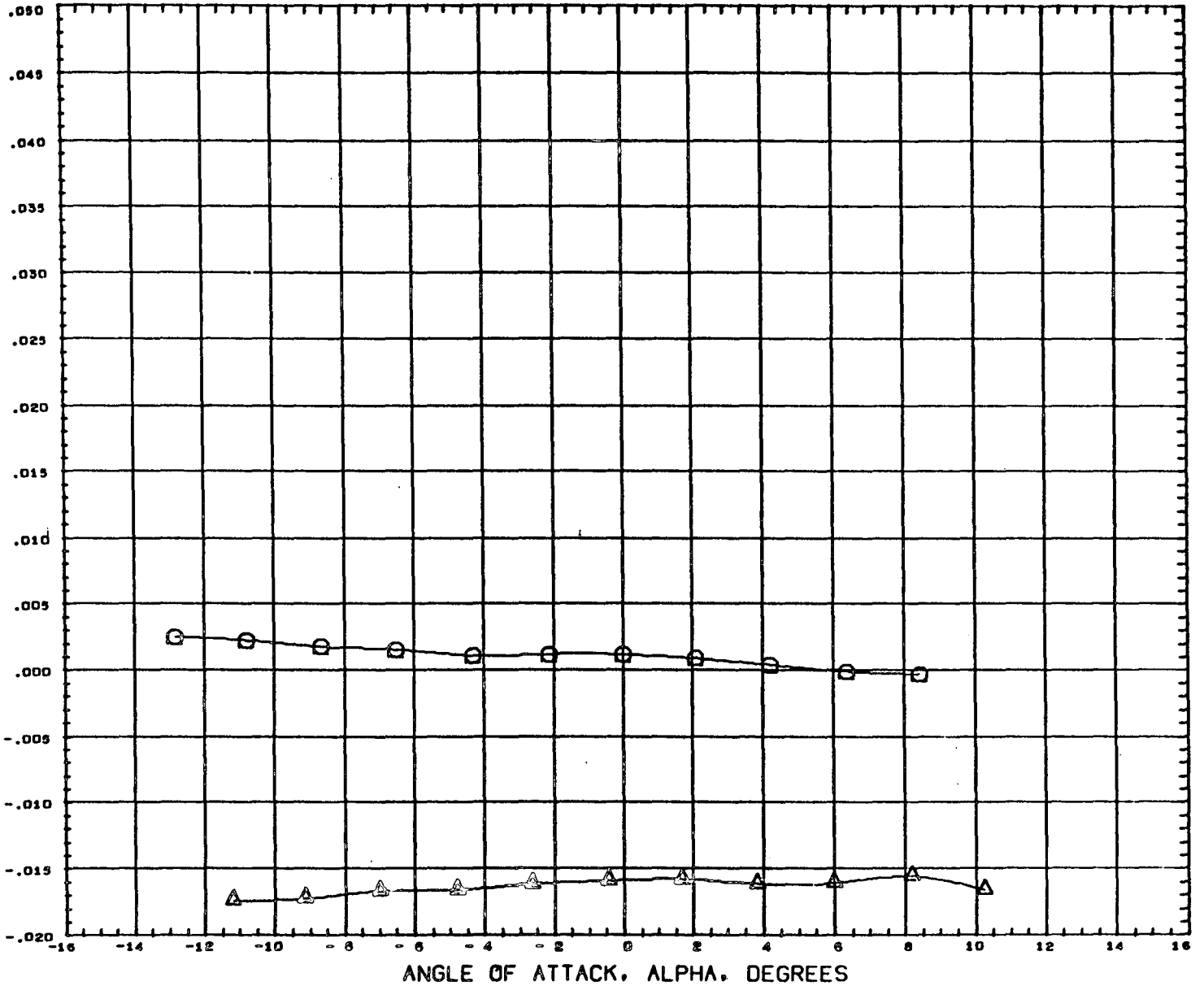


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



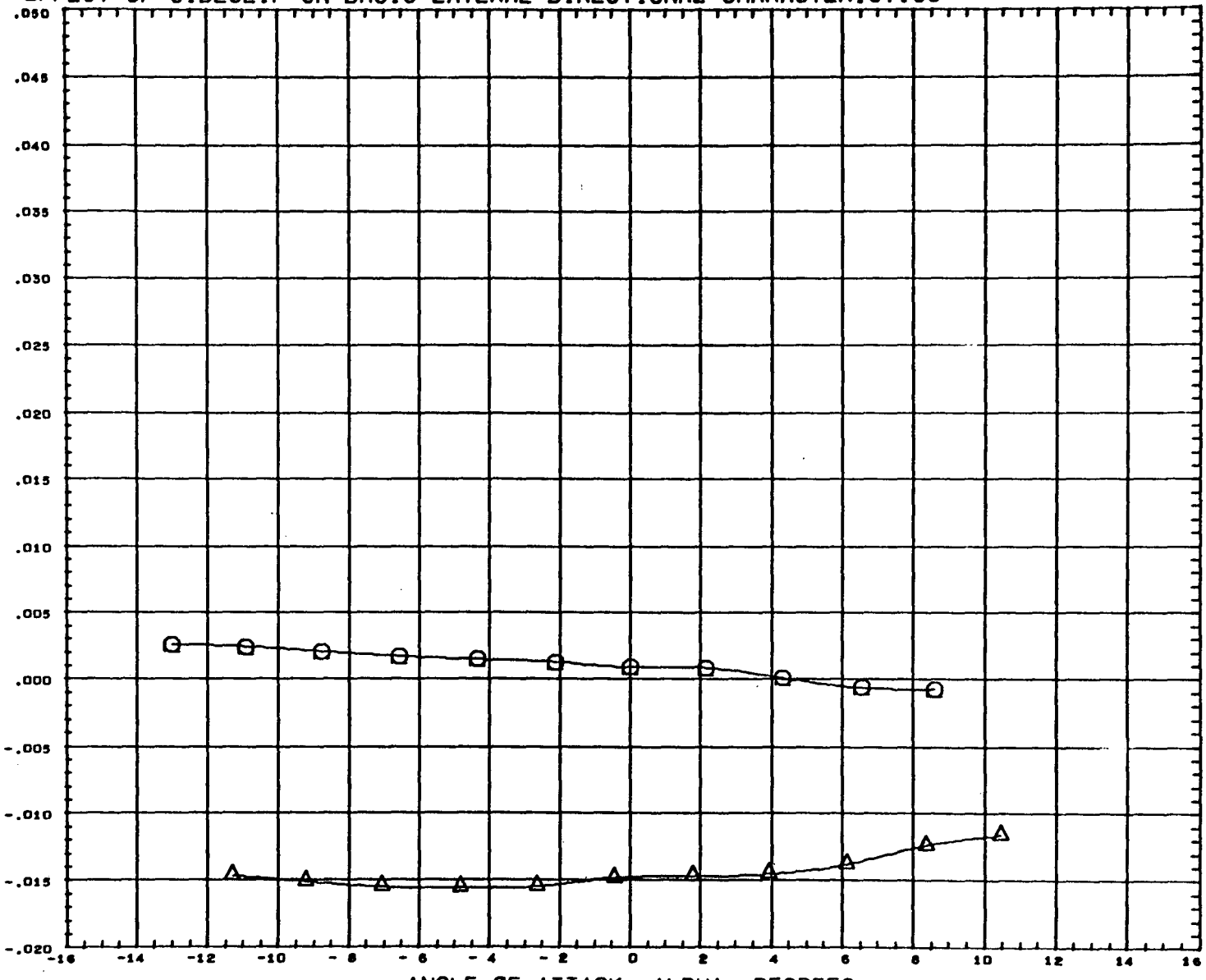
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 0.698

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	5.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

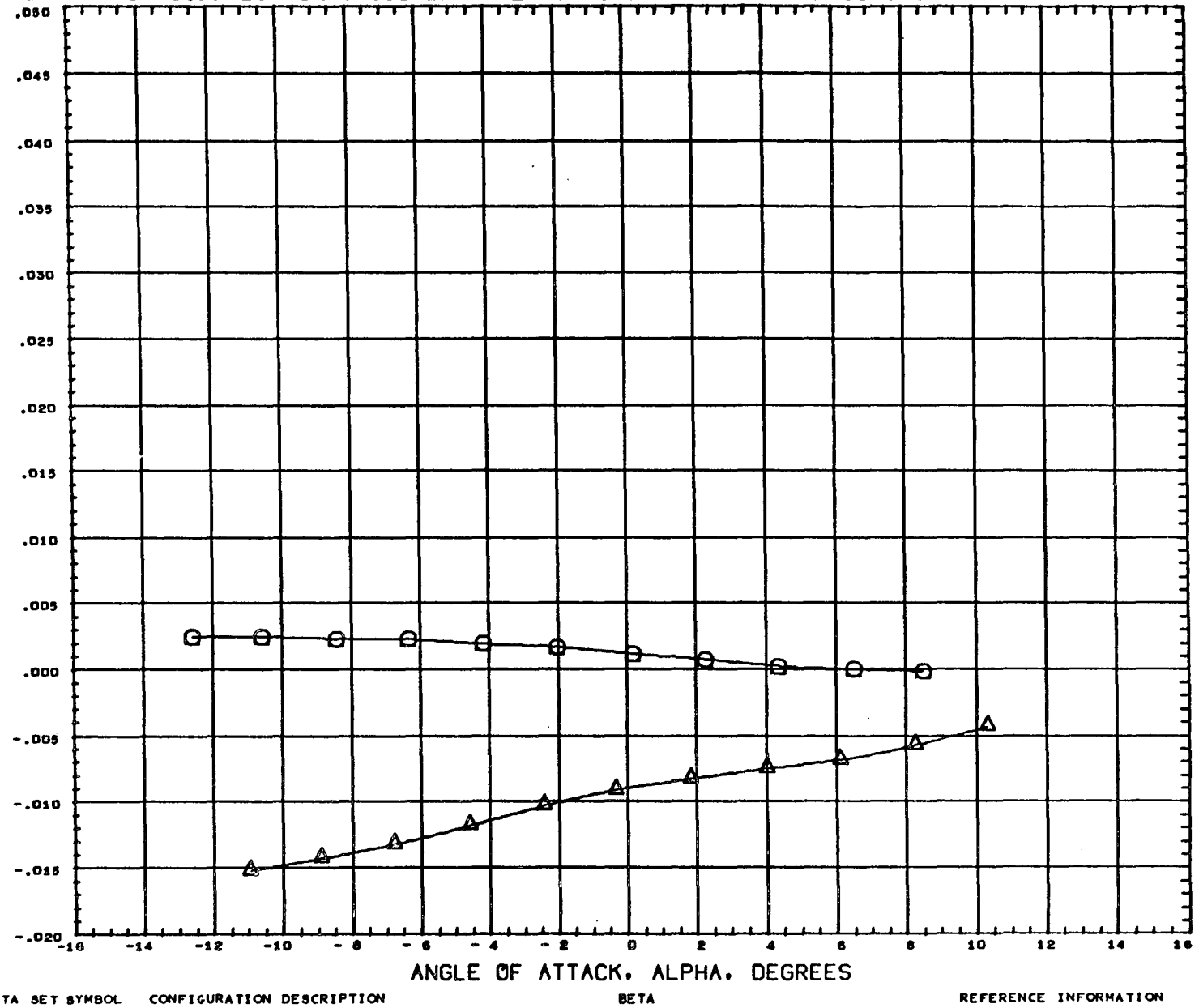


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 1.194

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

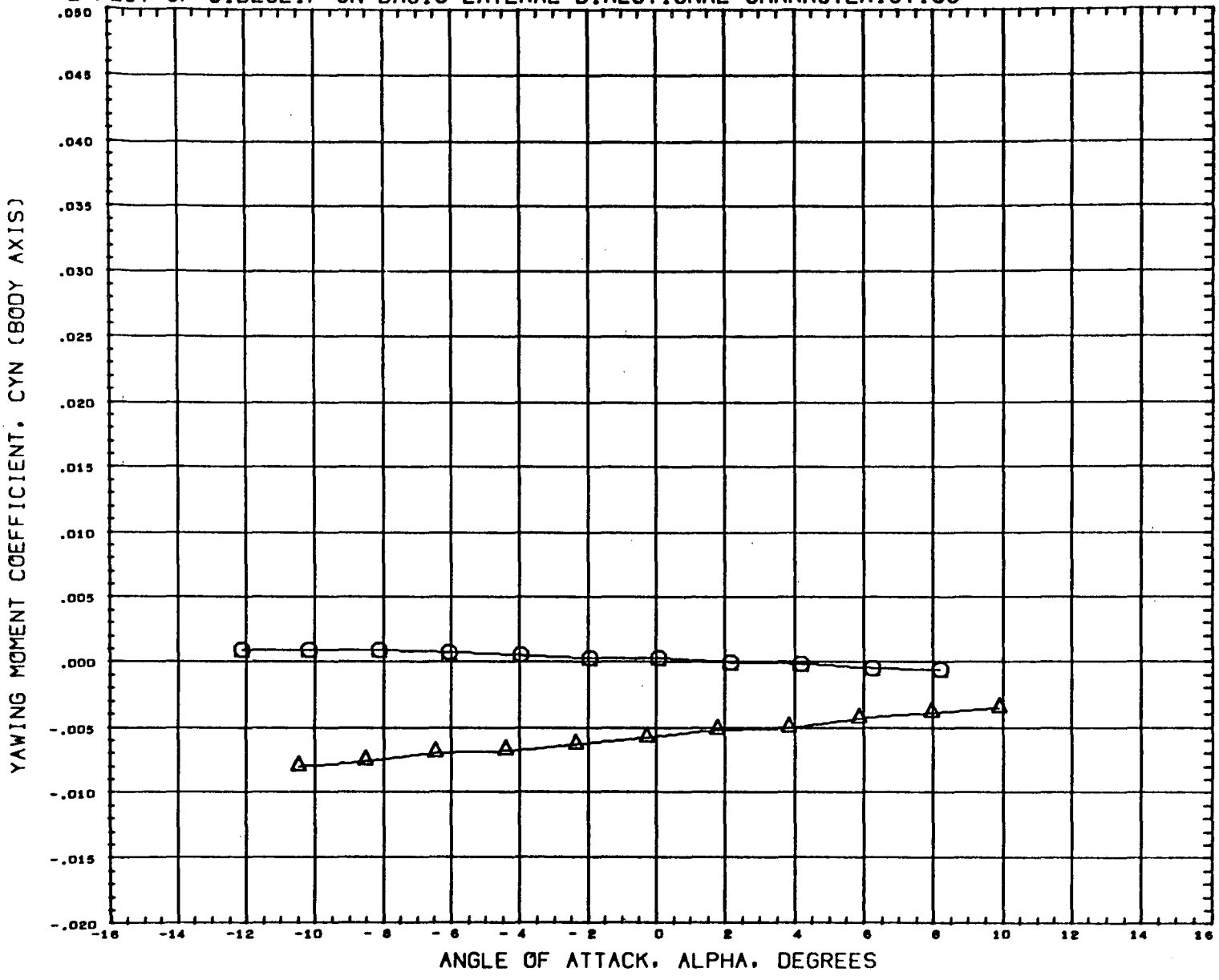


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(85102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 1.961

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



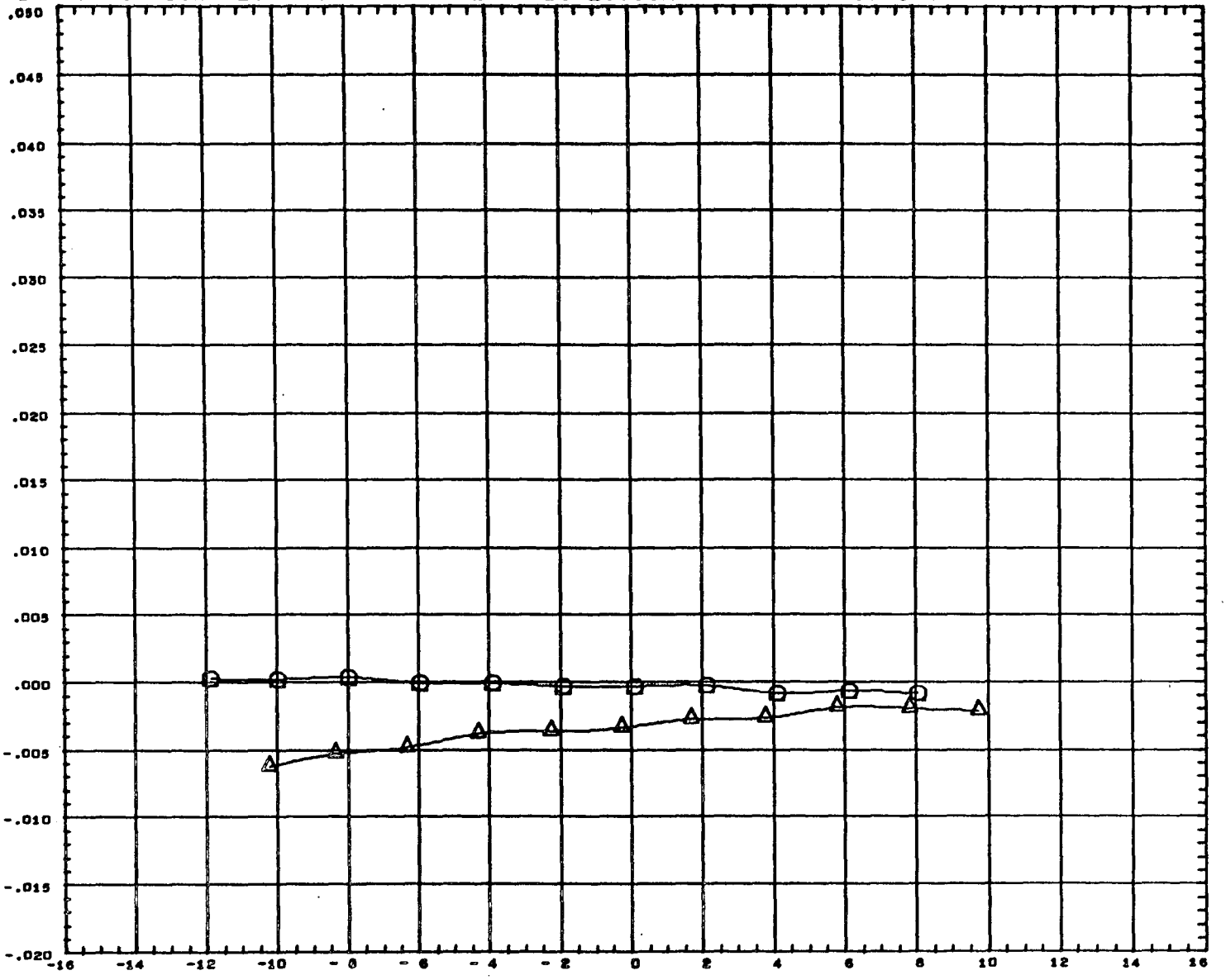
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

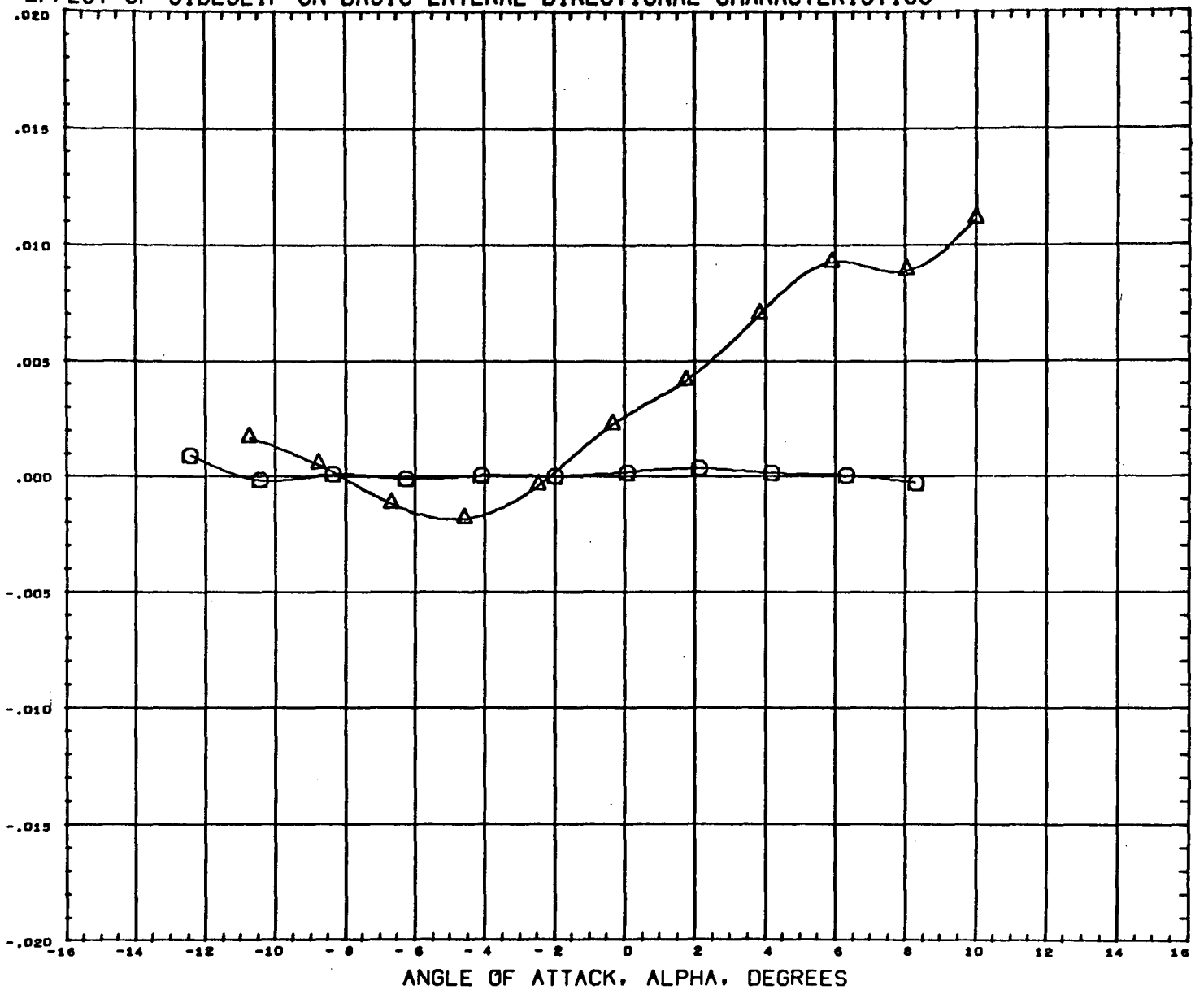


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(85102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 4.050

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

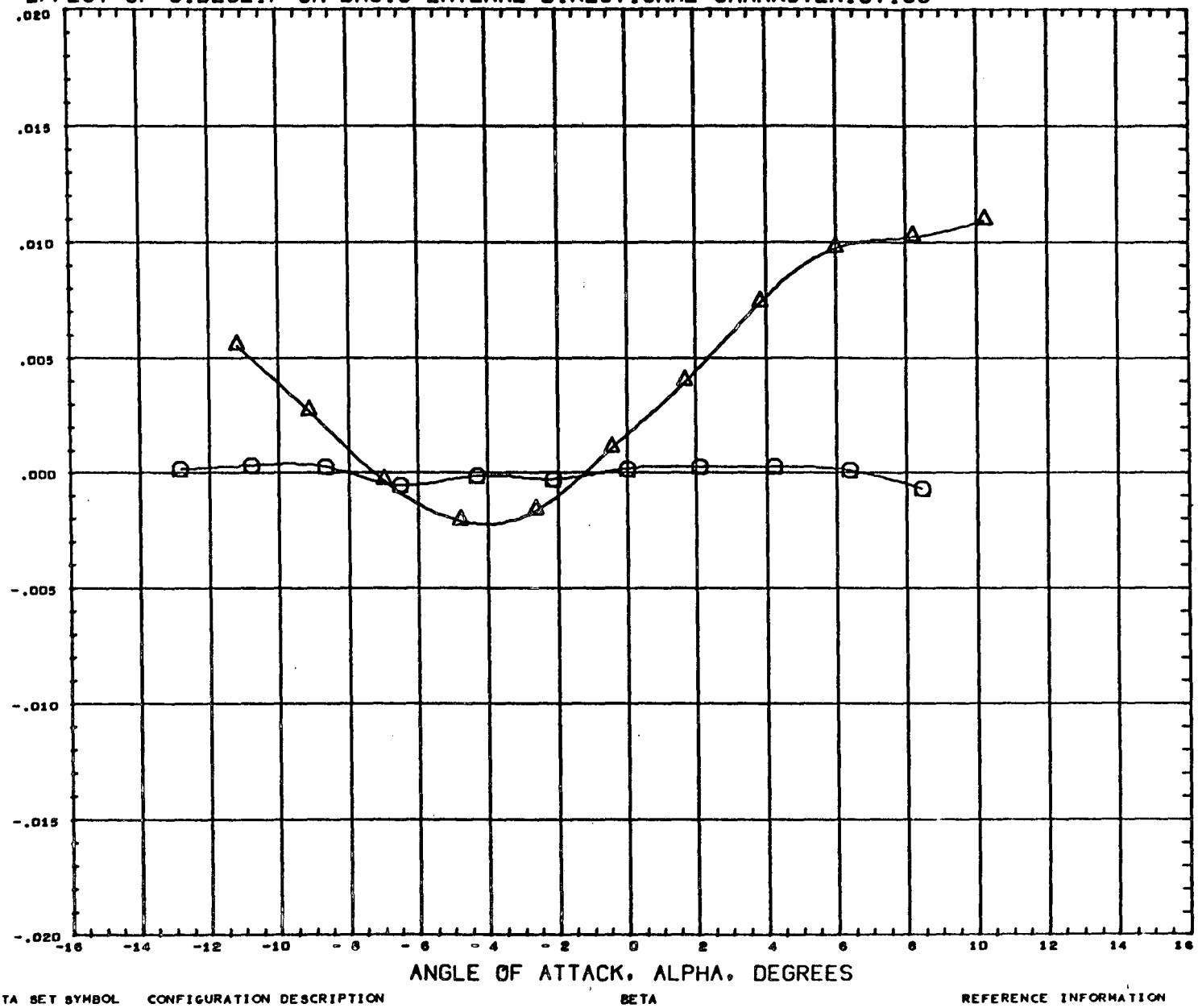


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

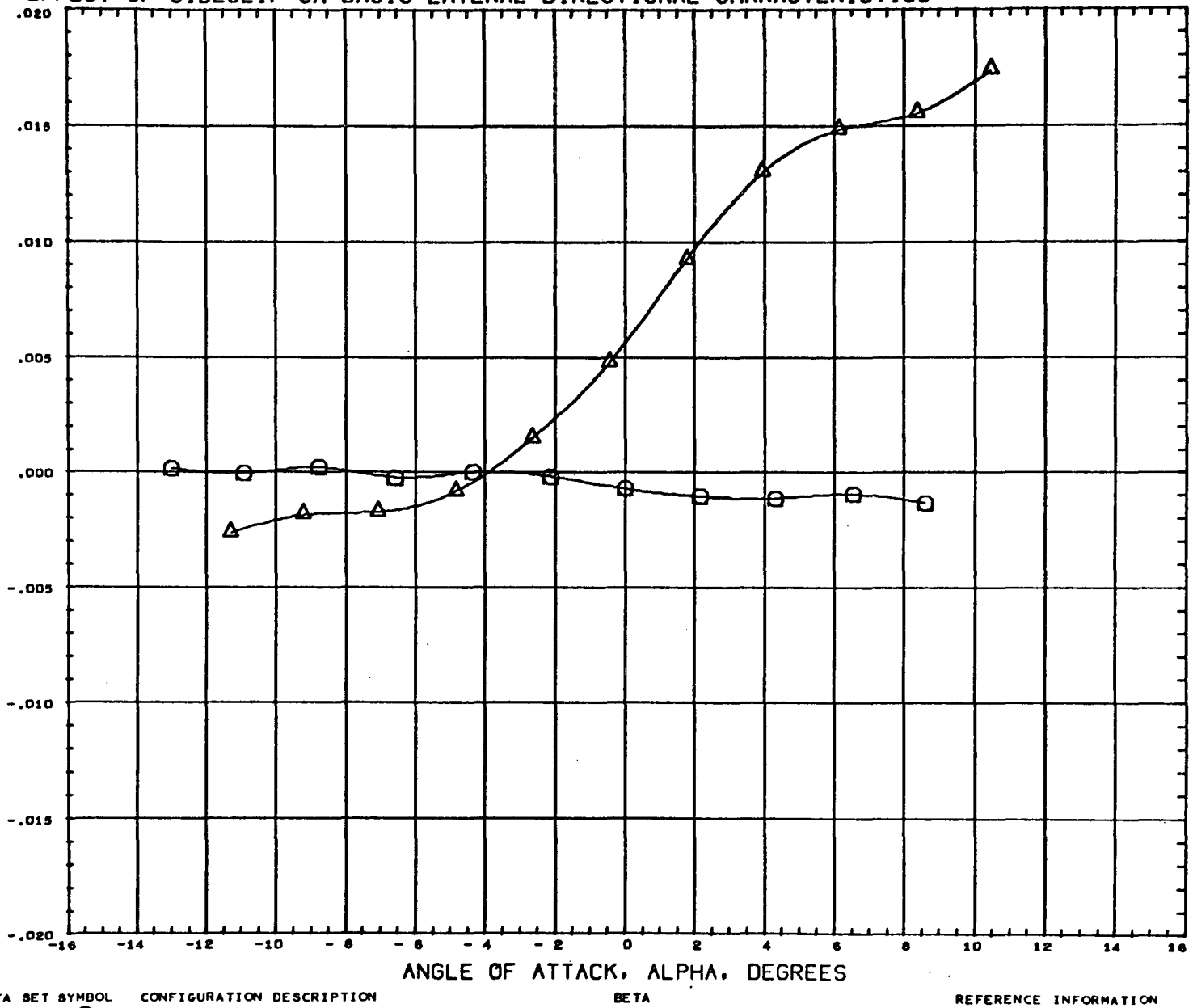


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85101A)	○	M8FC509 NR 110C ORBITER B12W26E16V36	0.000
(85102A)	△	M8FC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 0.898

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



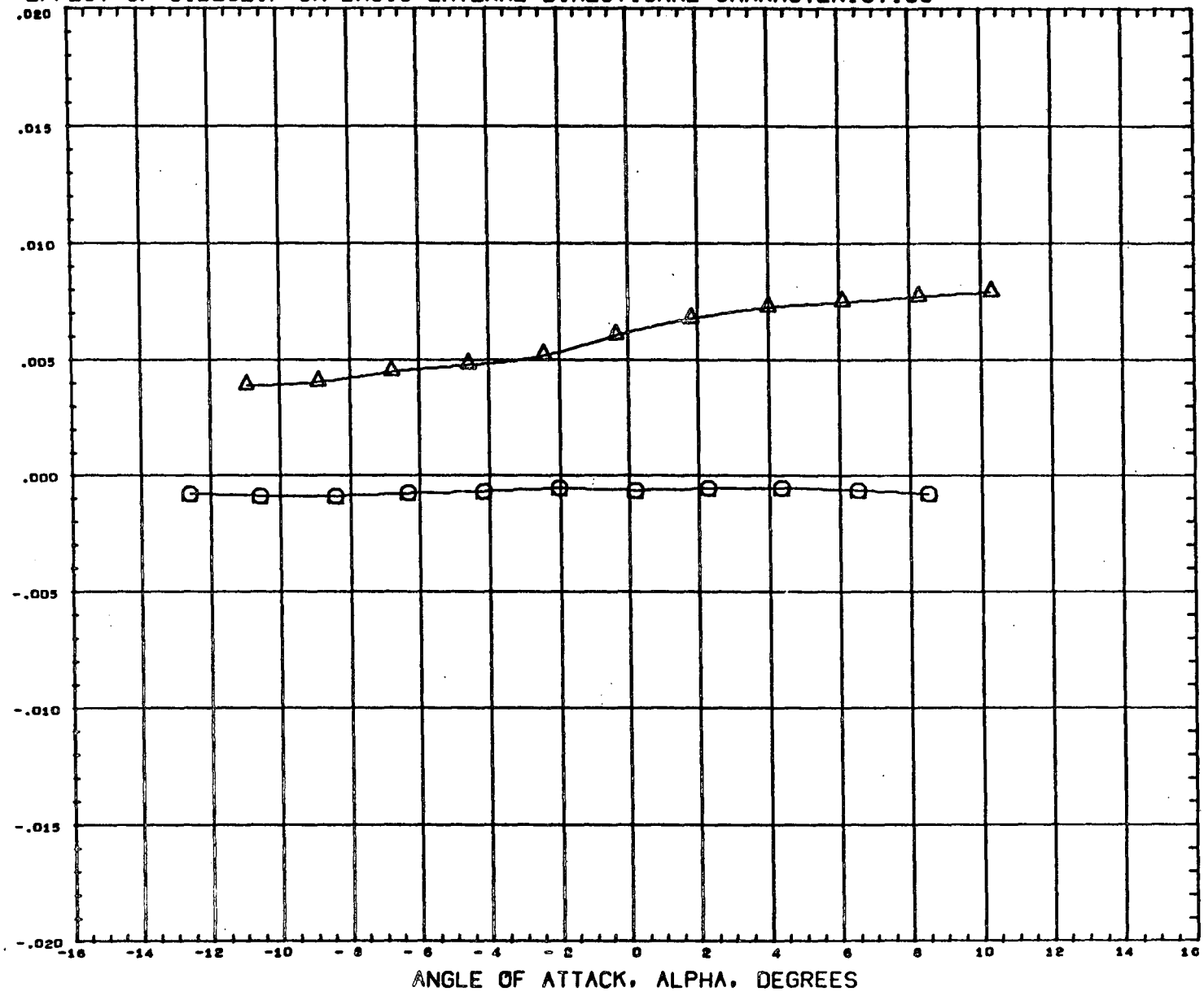
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B5102A)		MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 1.194

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

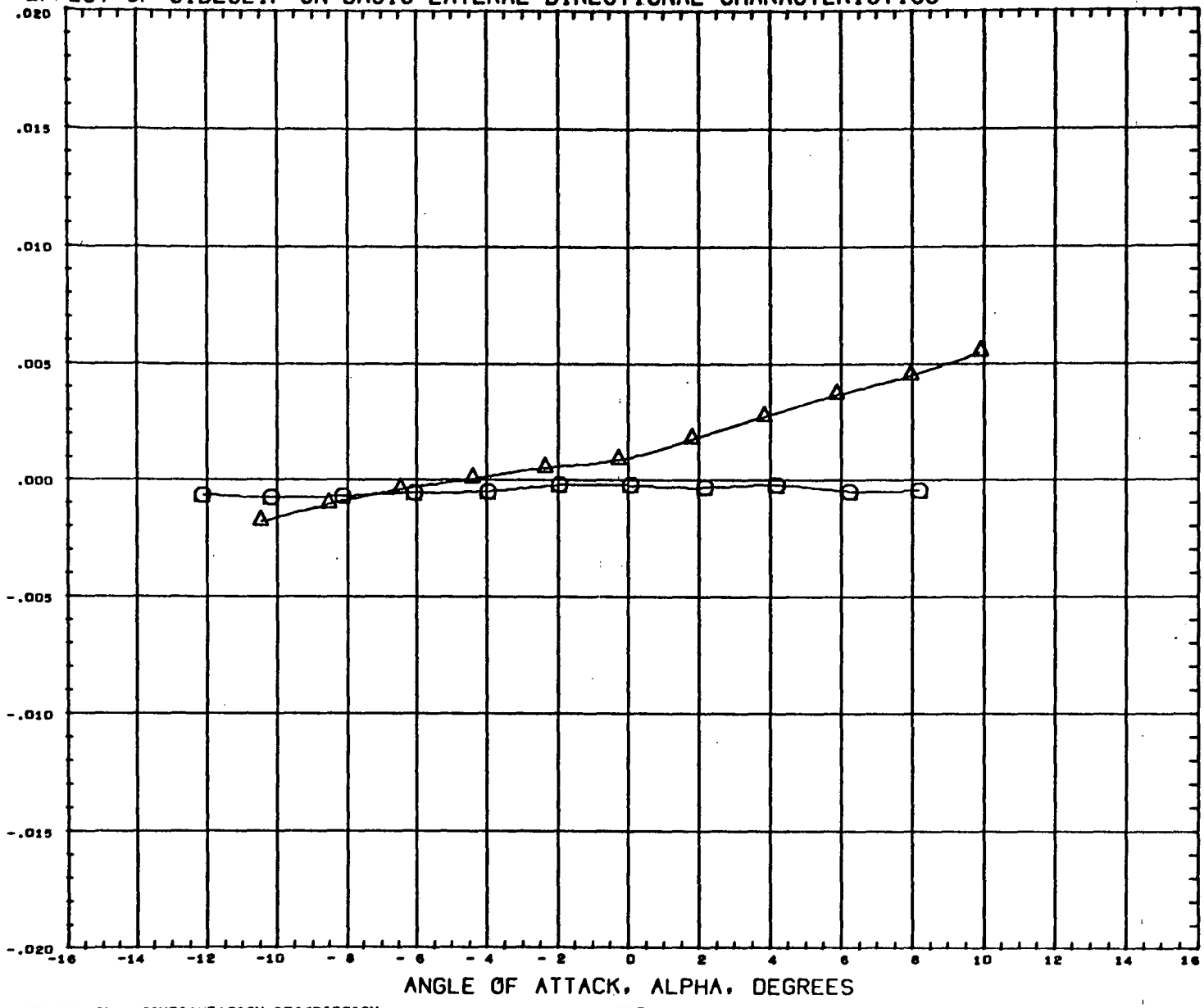


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(85102A)		MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 2.961

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

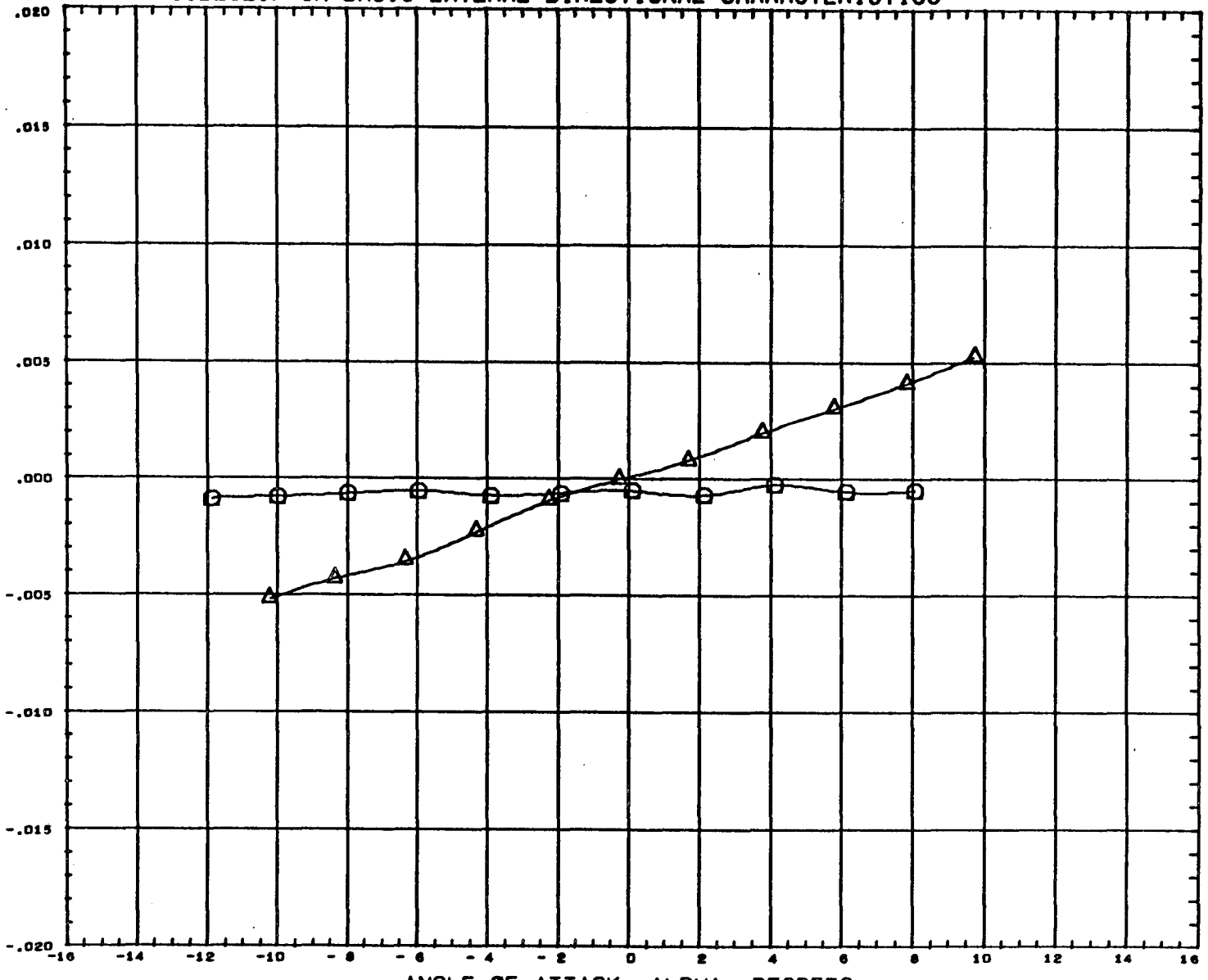


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)	○	MSFC509 NR 11OC ORBITER B12W26E16V36	0.000
(B5102A)	△	MSFC509 NR 11OC ORBITER B12W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

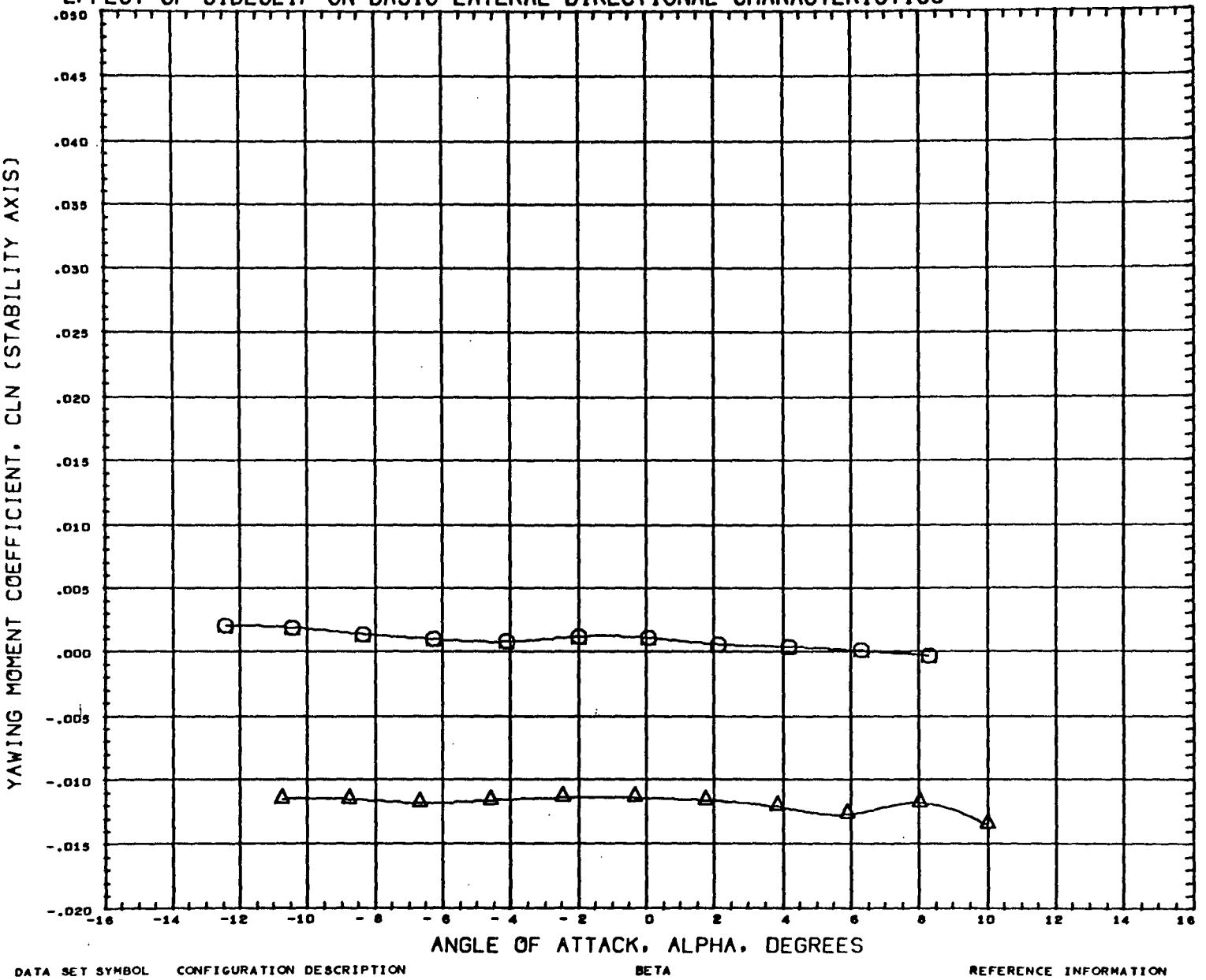


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(B5102A)		MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

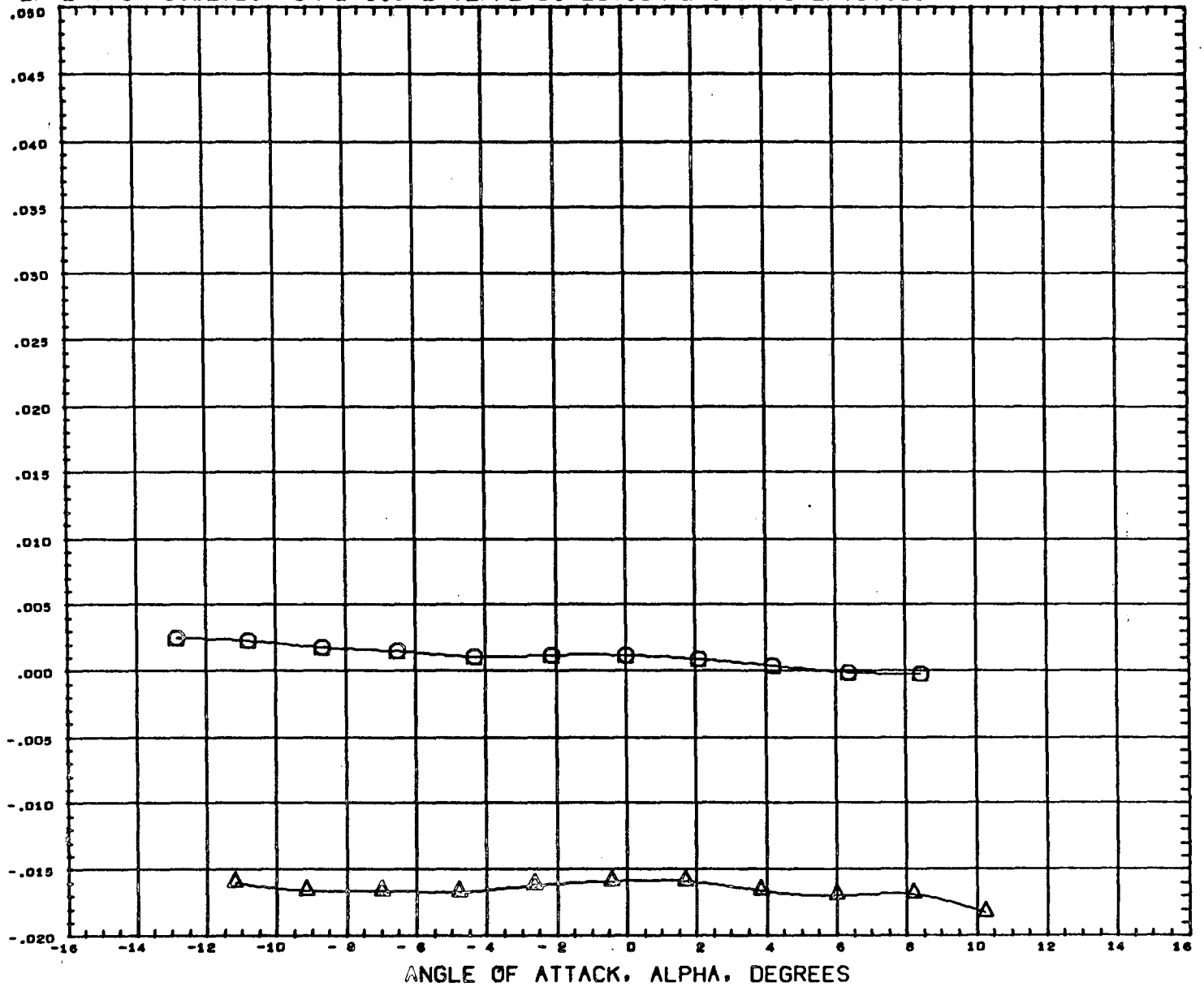


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 0.605

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

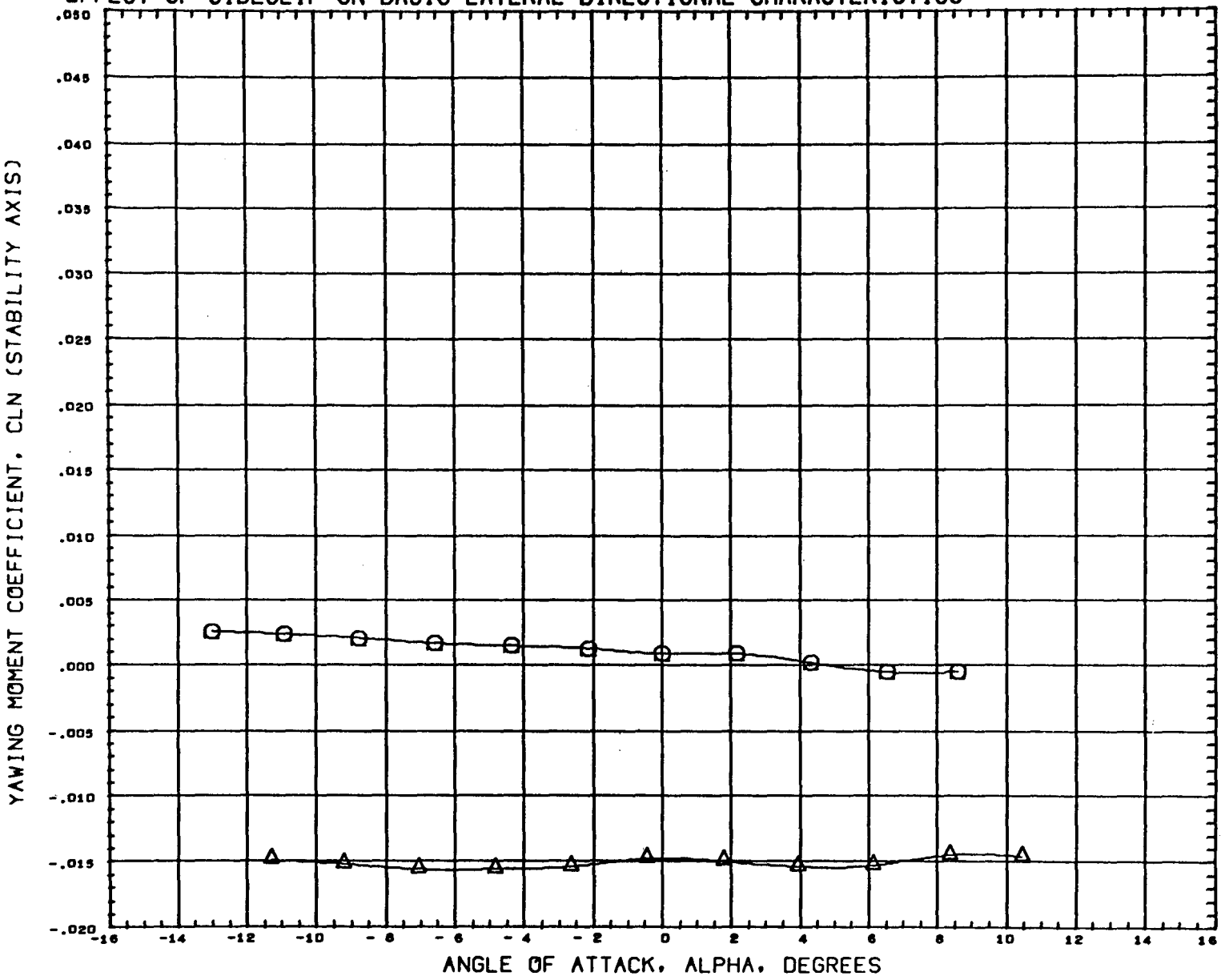


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 0.898

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



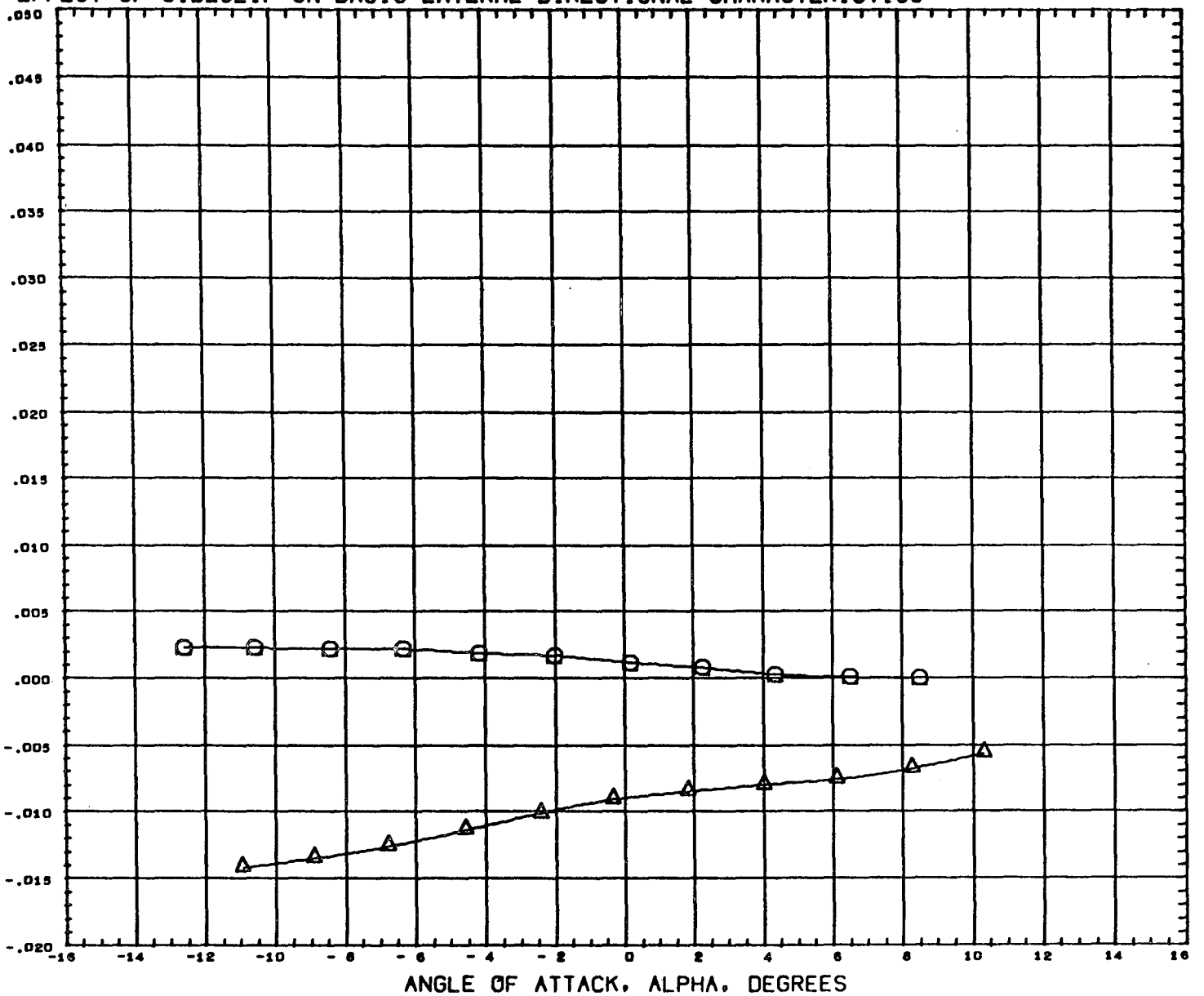
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)		MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 1.194

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



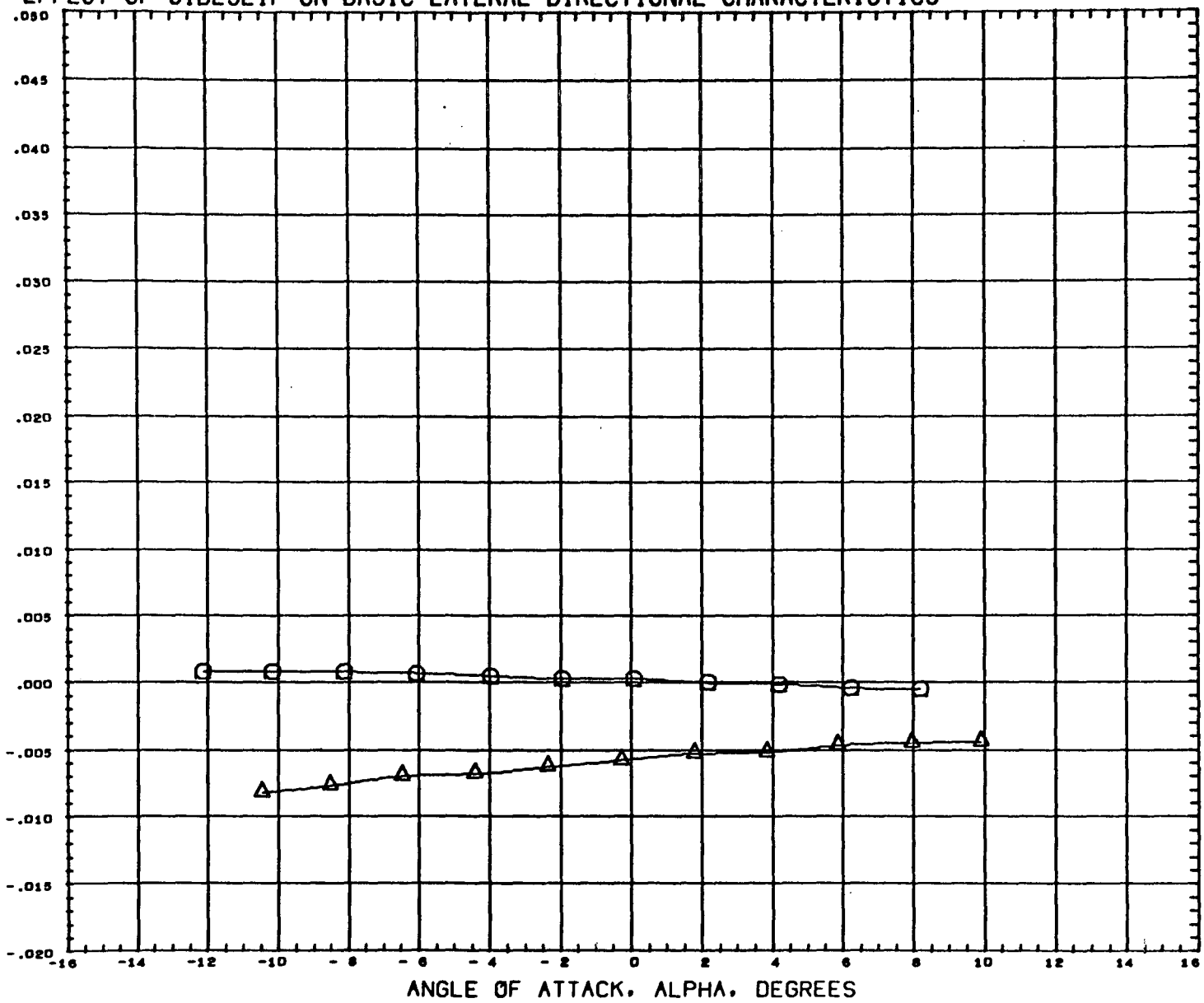
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 1.961

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	5.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



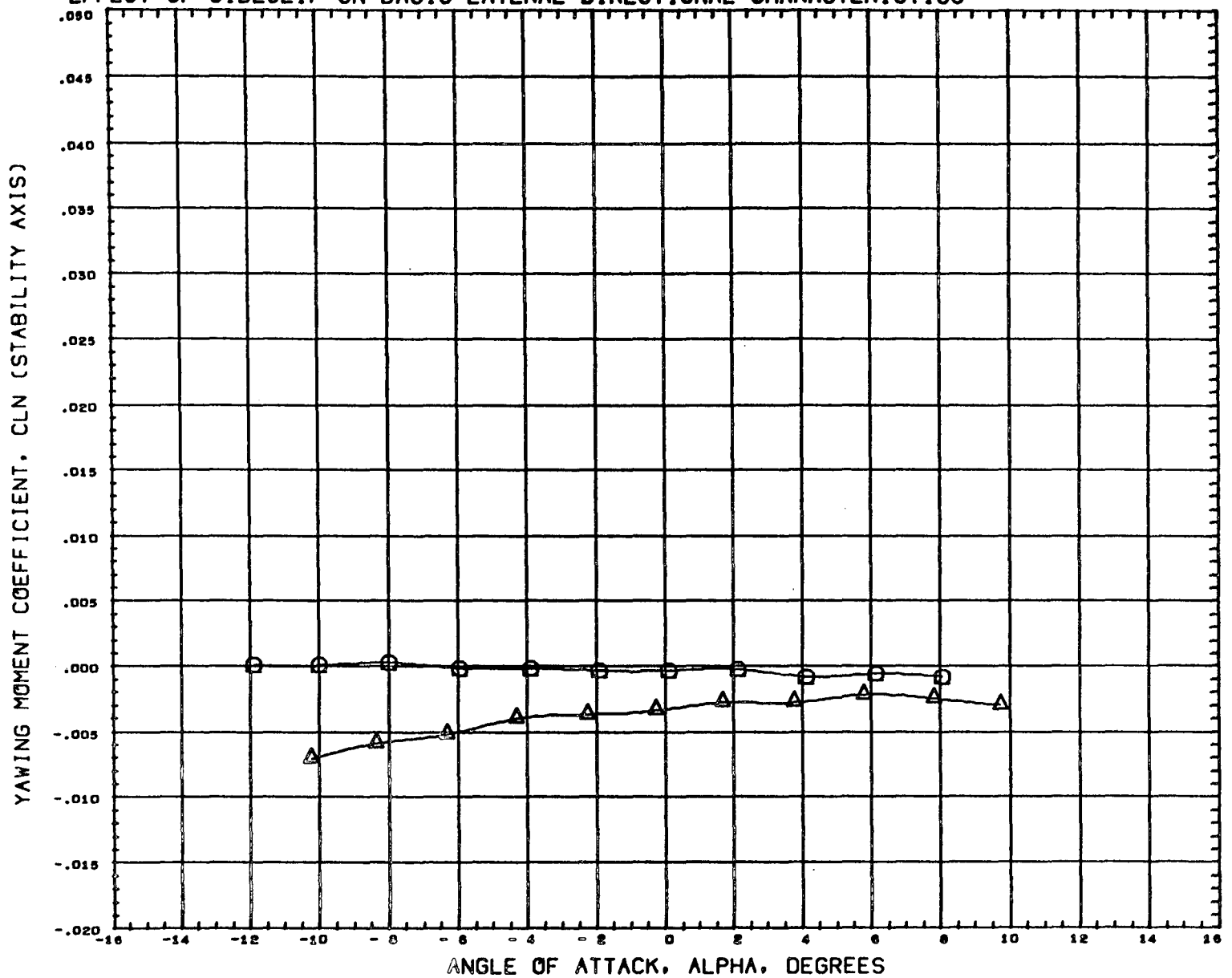
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

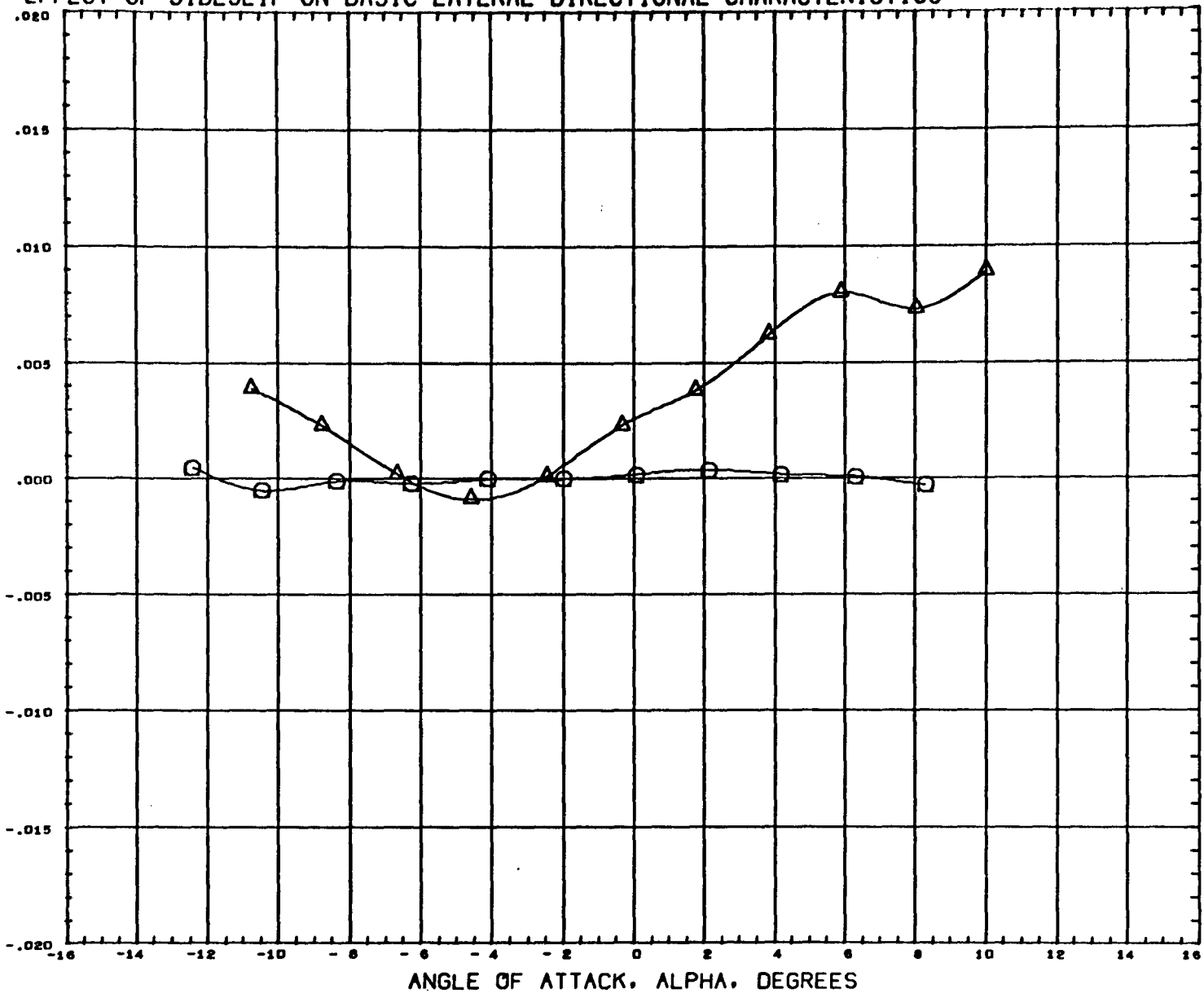


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	5.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



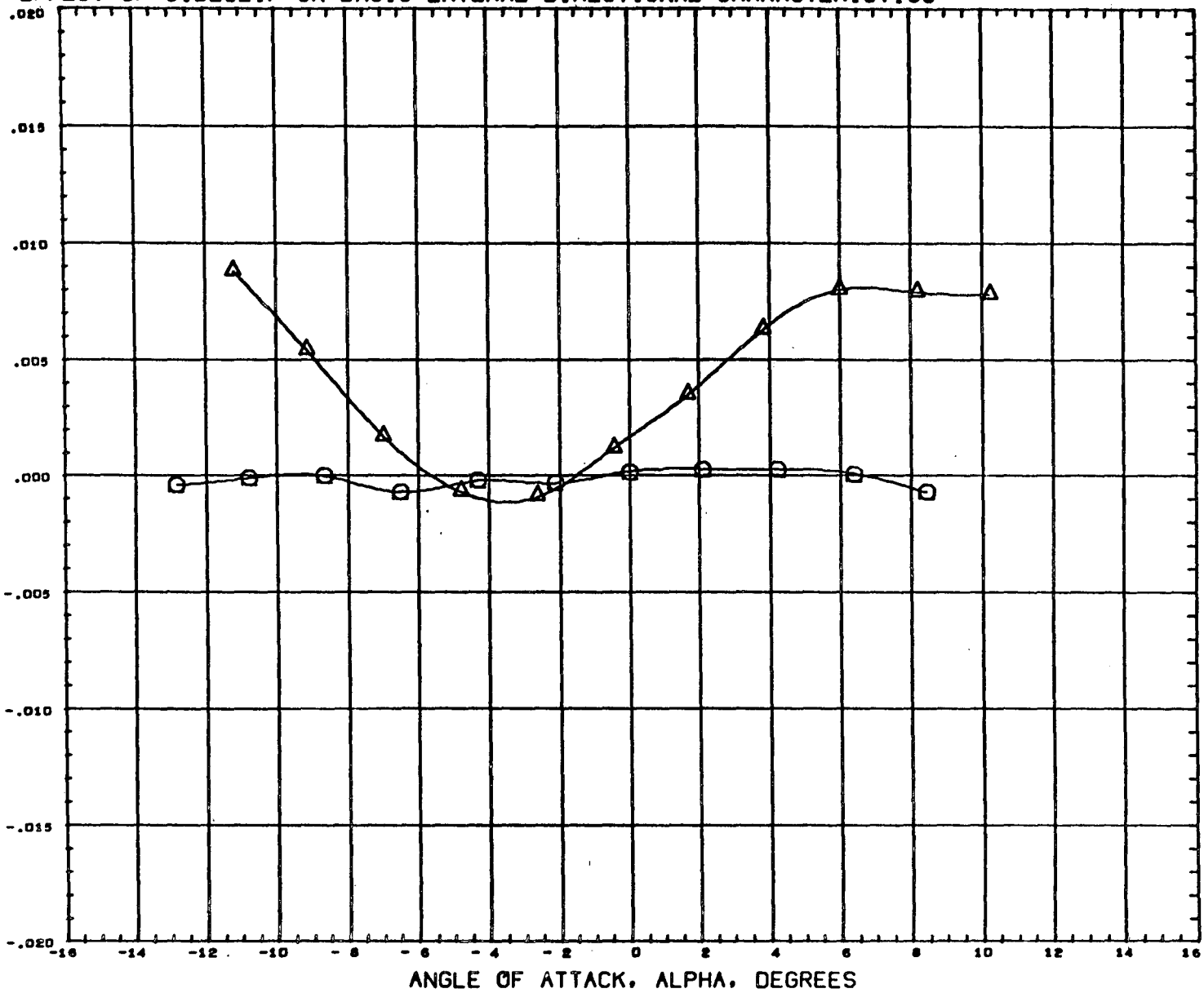
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)		MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 0.605

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

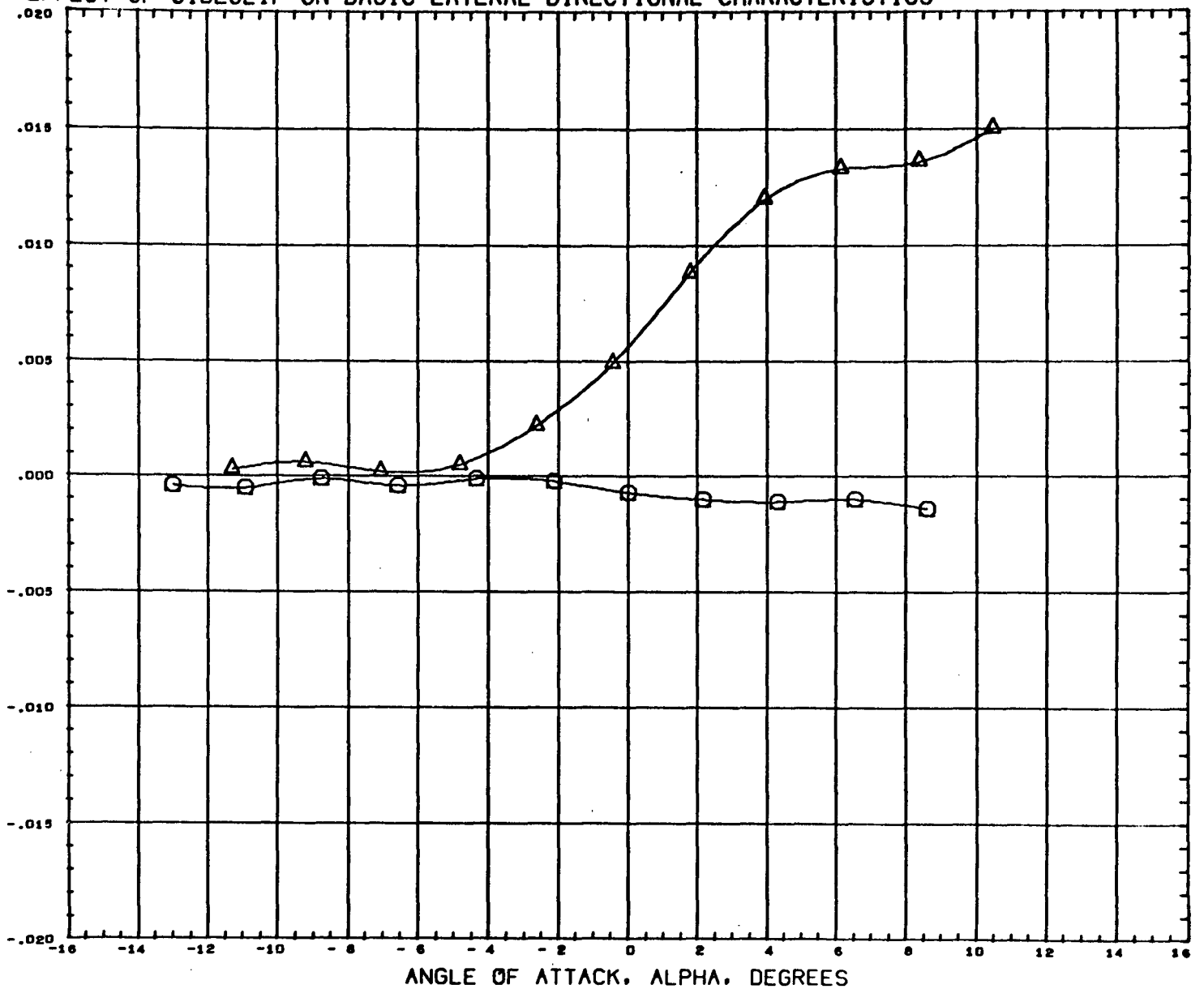


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-8.000

MACH 0.098

REFERENCE INFORMATION			
SREF		9.4420	SQ IN
LREF		2.6930	INCHES
BREF		4.6780	INCHES
XMRP		3.6080	INCHES
YMRP		0.0000	
ZMRP	-	0.0990	INCHES
SCALE		0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

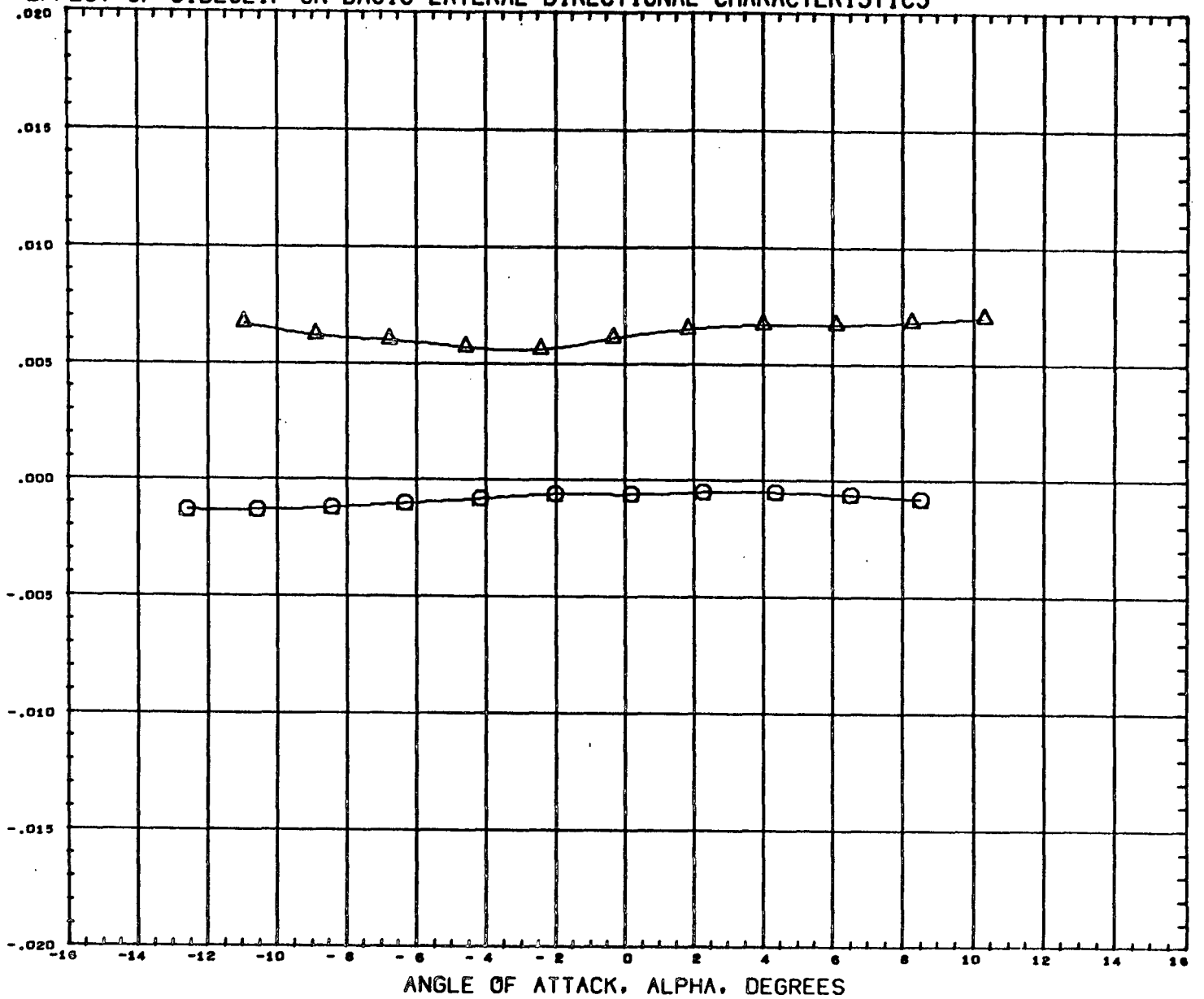


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)		MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 1.194

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

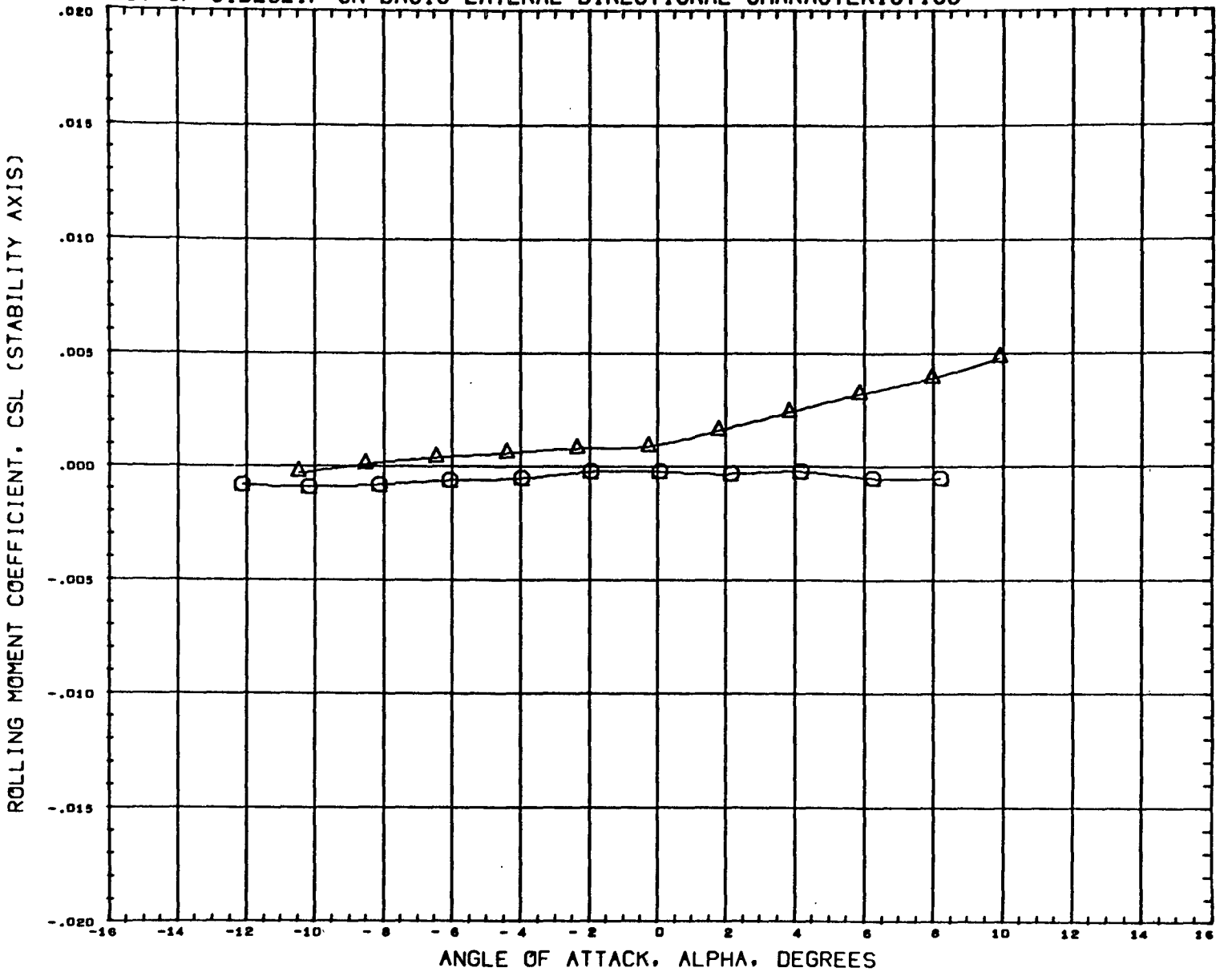


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)	○	M8FC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)	△	M8FC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 1.061

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

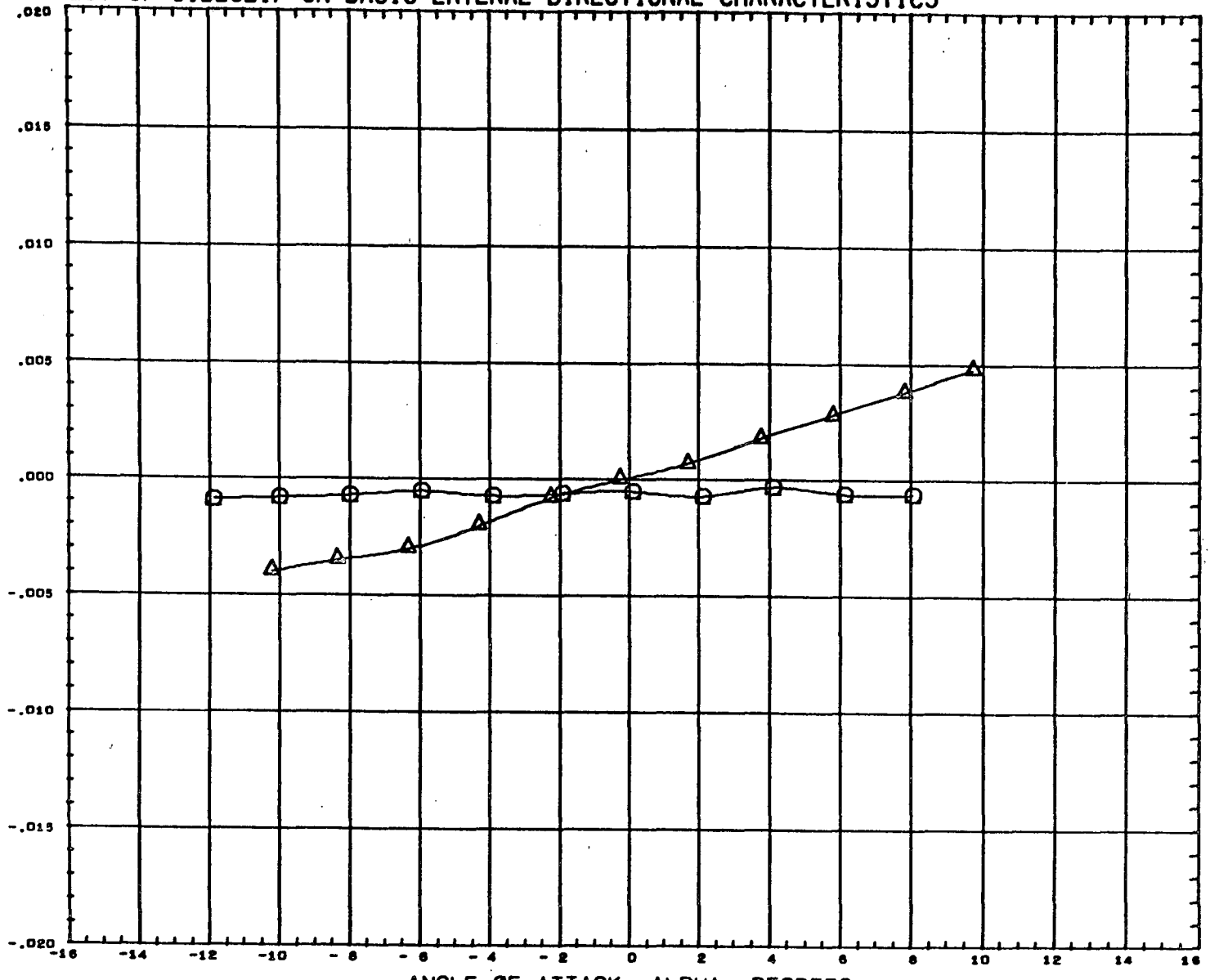


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)	○	MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)	△	MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



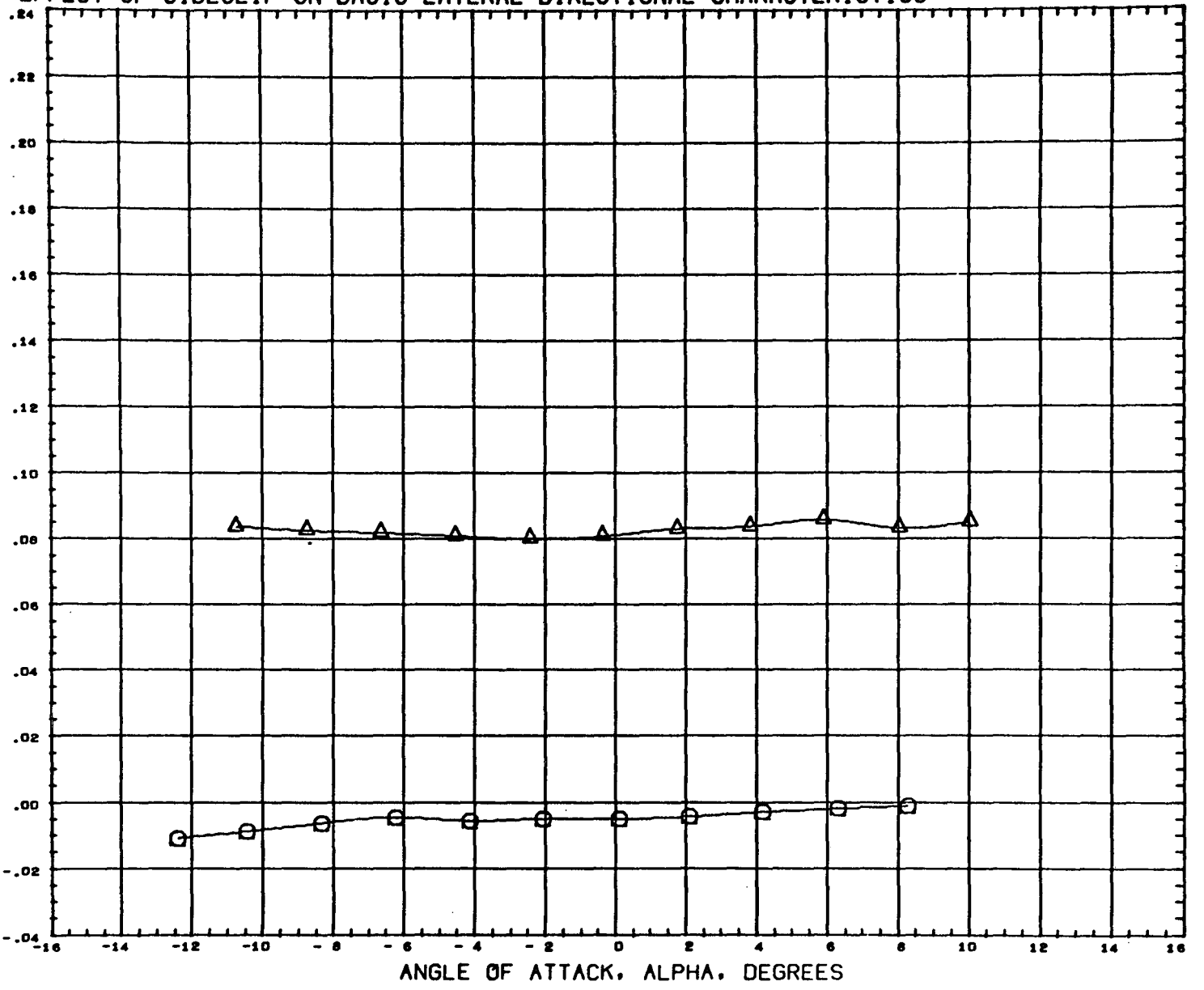
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5101A)		MSFC509 NR 110C ORBITER B12W26E16V36	0.000
(A5102A)		MSFC509 NR 110C ORBITER B12W26E16V36	-6.000

MACH 4.059

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

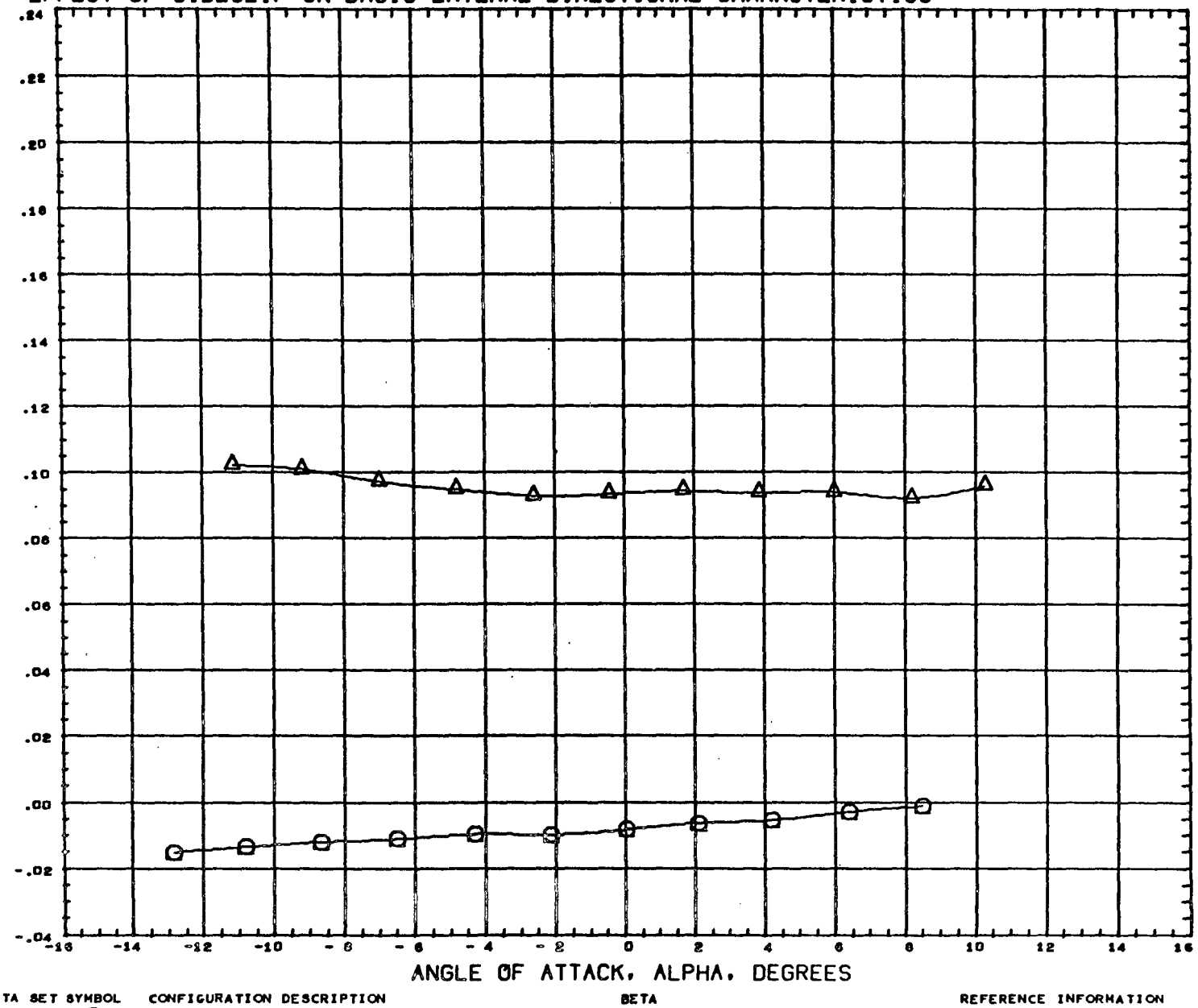


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 0.601

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

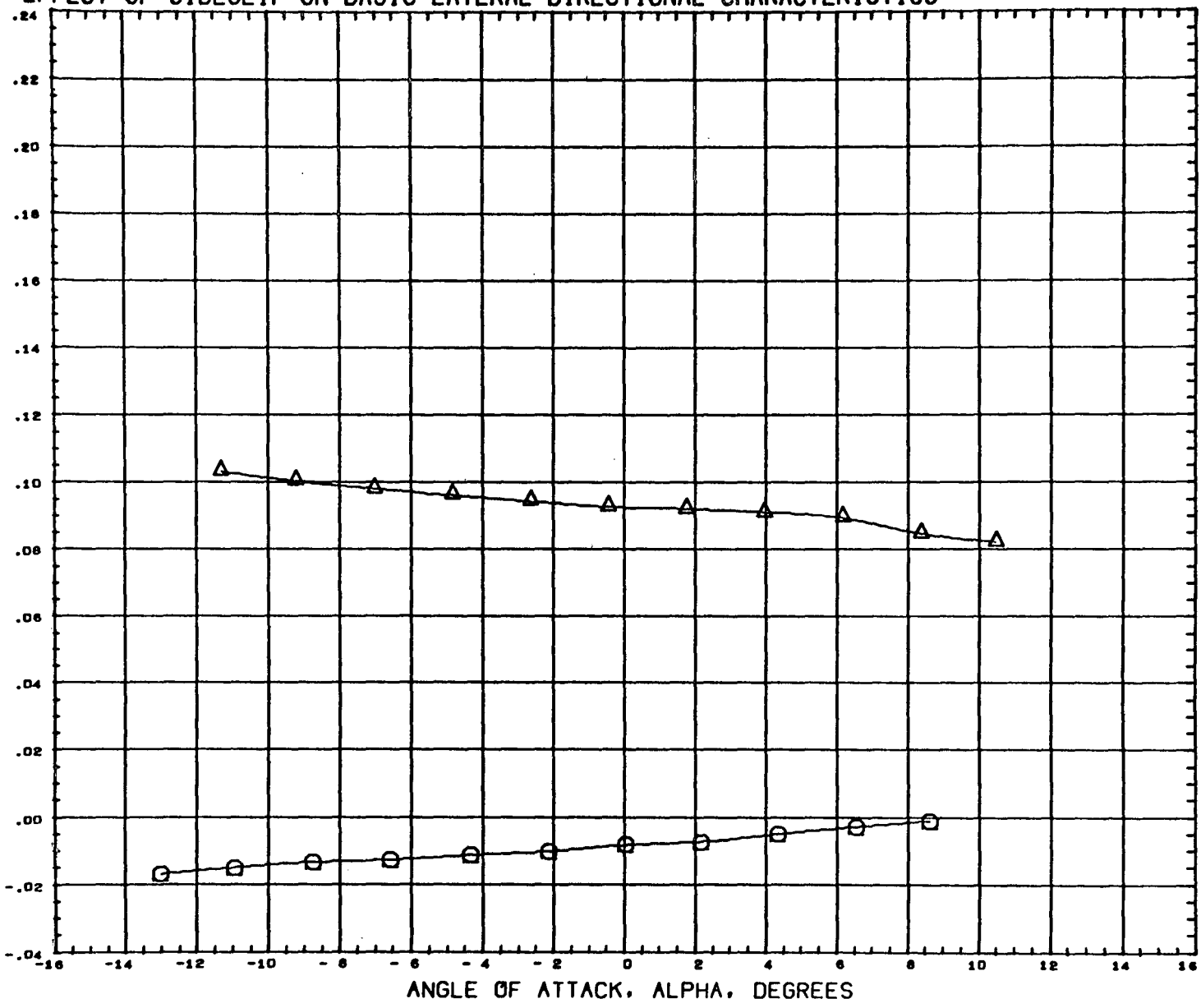


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 0.901

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

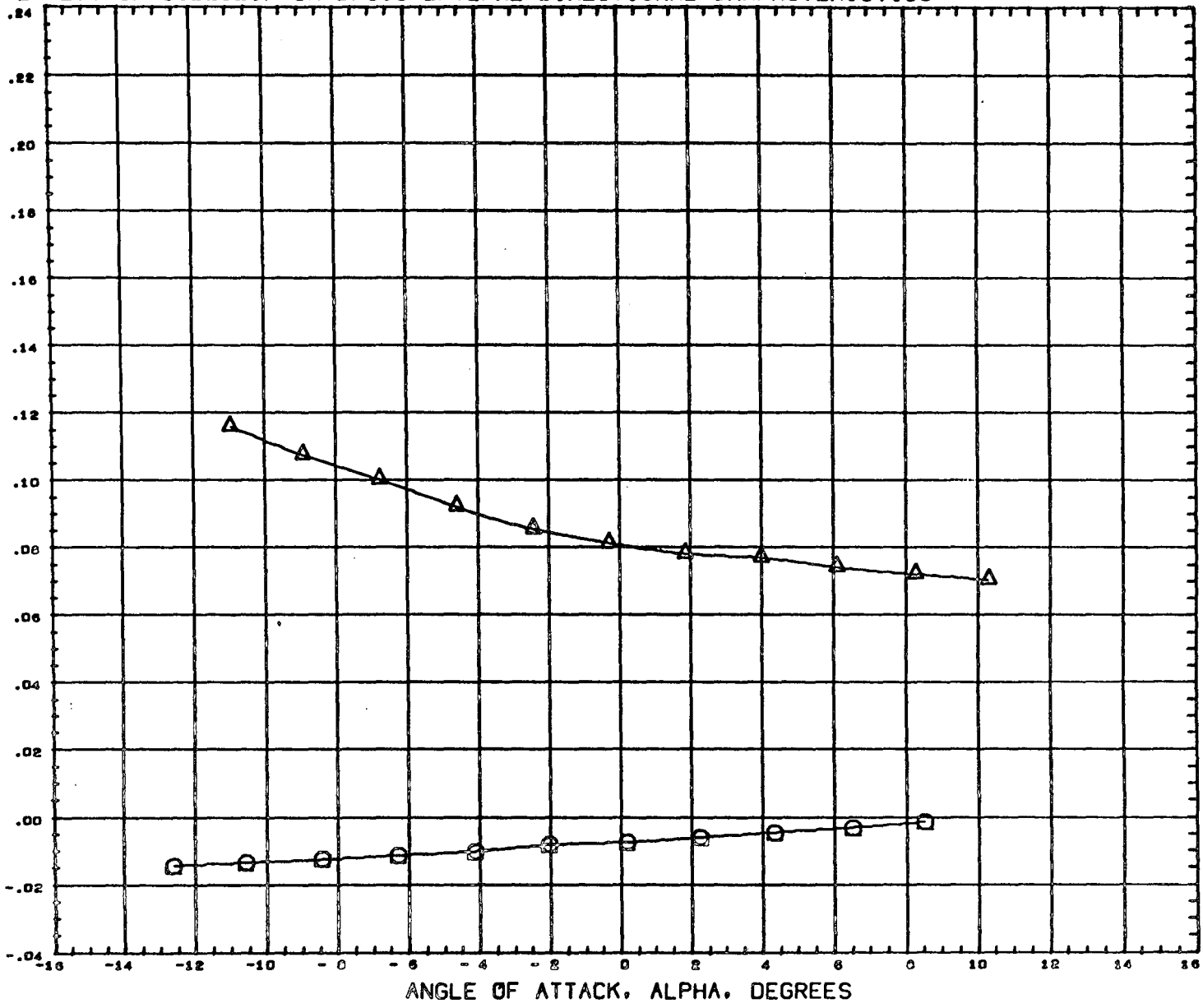


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)	○	MSFC5D9 NR 11OC ORBITER B14K3W26E16V36	0.000
(B5105A)	△	MSFC5D9 NR 11OC ORBITER B14K3W26E16V36	-6.000

MACH 1.195

REFERENCE INFORMATION		
SREF	9.442D	SQ IN
LREF	2.693D	INCHES
BREF	4.678D	INCHES
XMRP	3.606D	INCHES
YMRP	0.0000	
ZMRP	0.099D	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

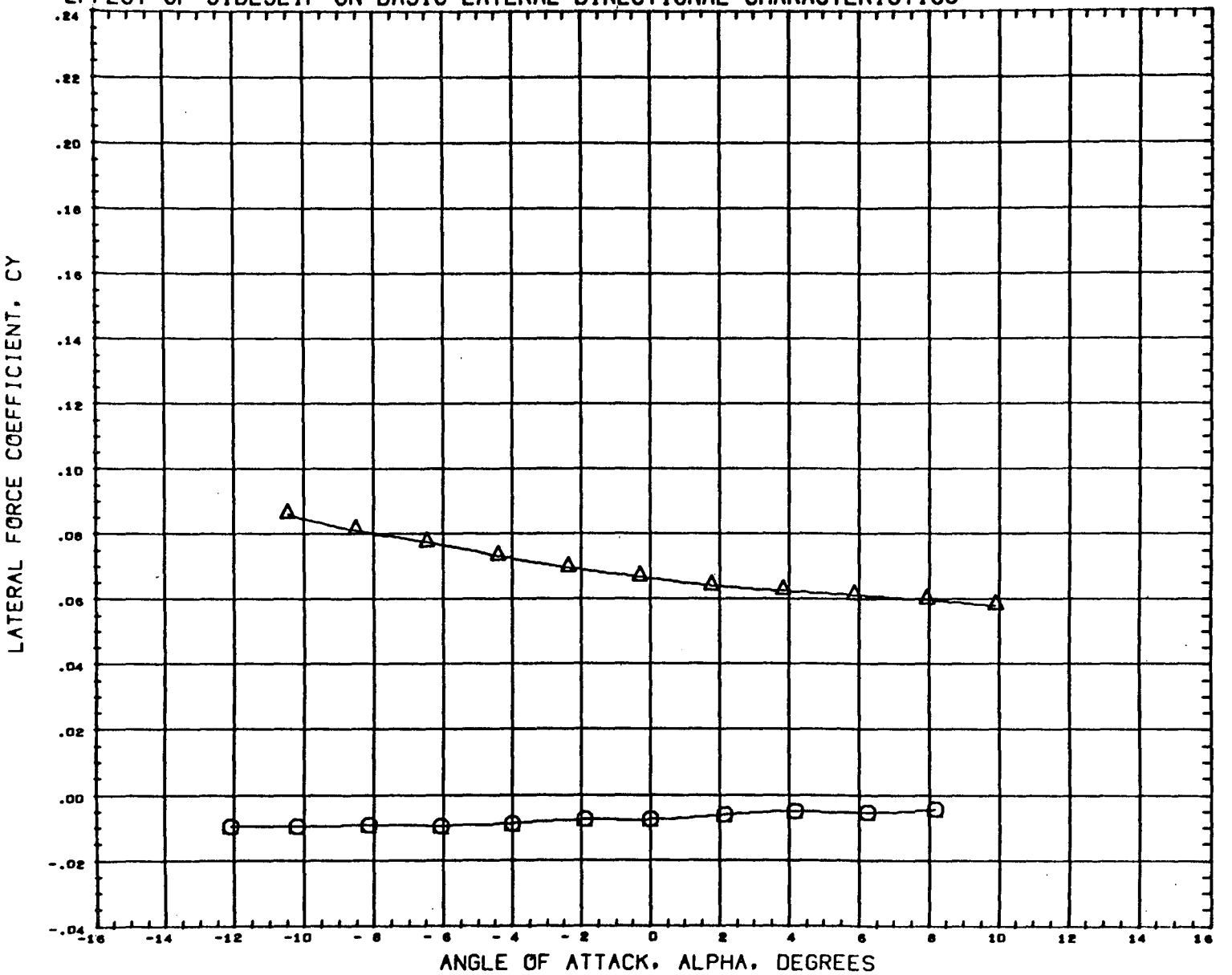


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	-8.000

MACH 0.956

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	5.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

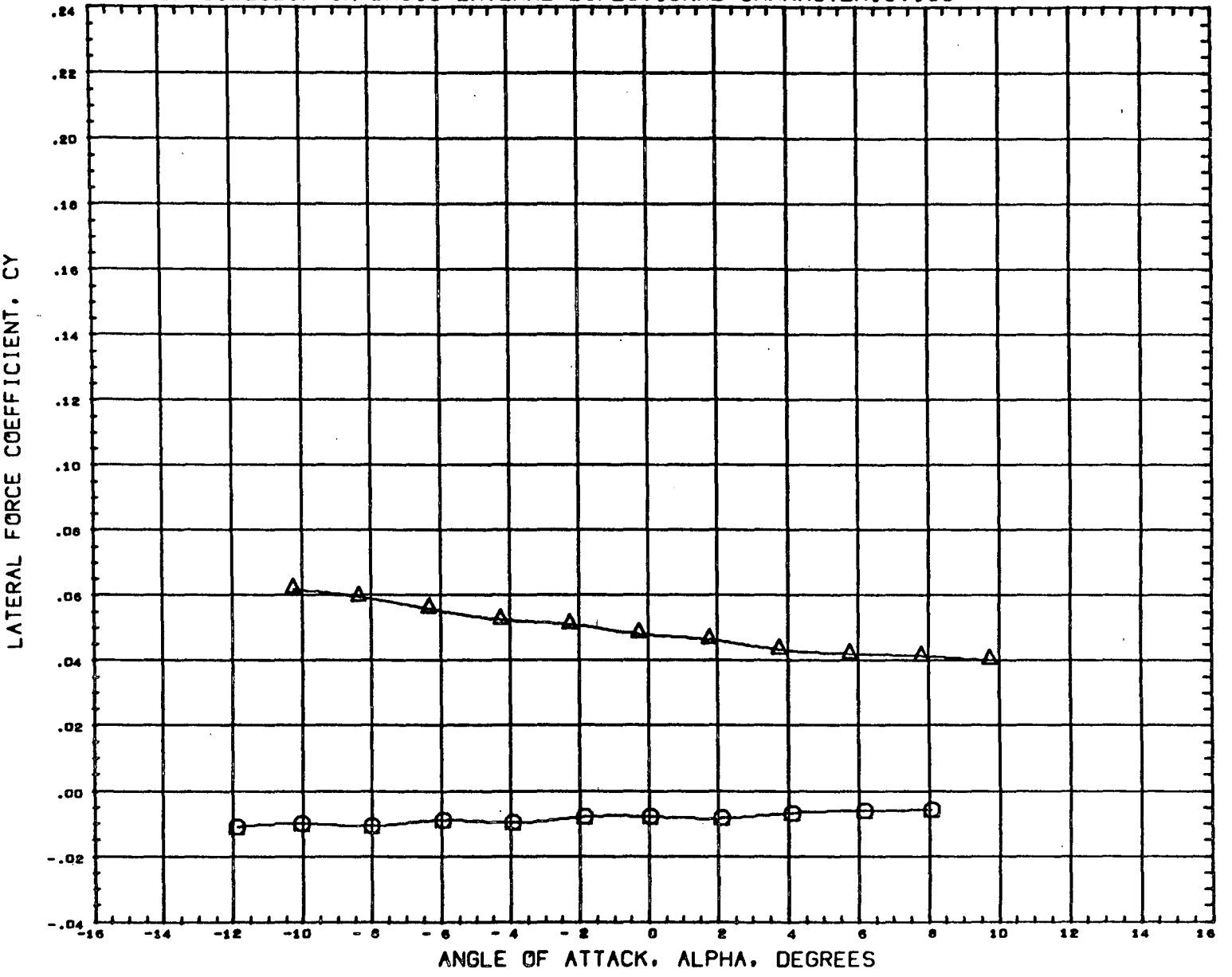


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION			
SREF		9.4420	SQ IN
LREF		2.6930	INCHES
BREF		4.6780	INCHES
XMRP		3.6080	INCHES
YMRP		0.0000	
ZMRP	-	0.0990	INCHES
SCALE		0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

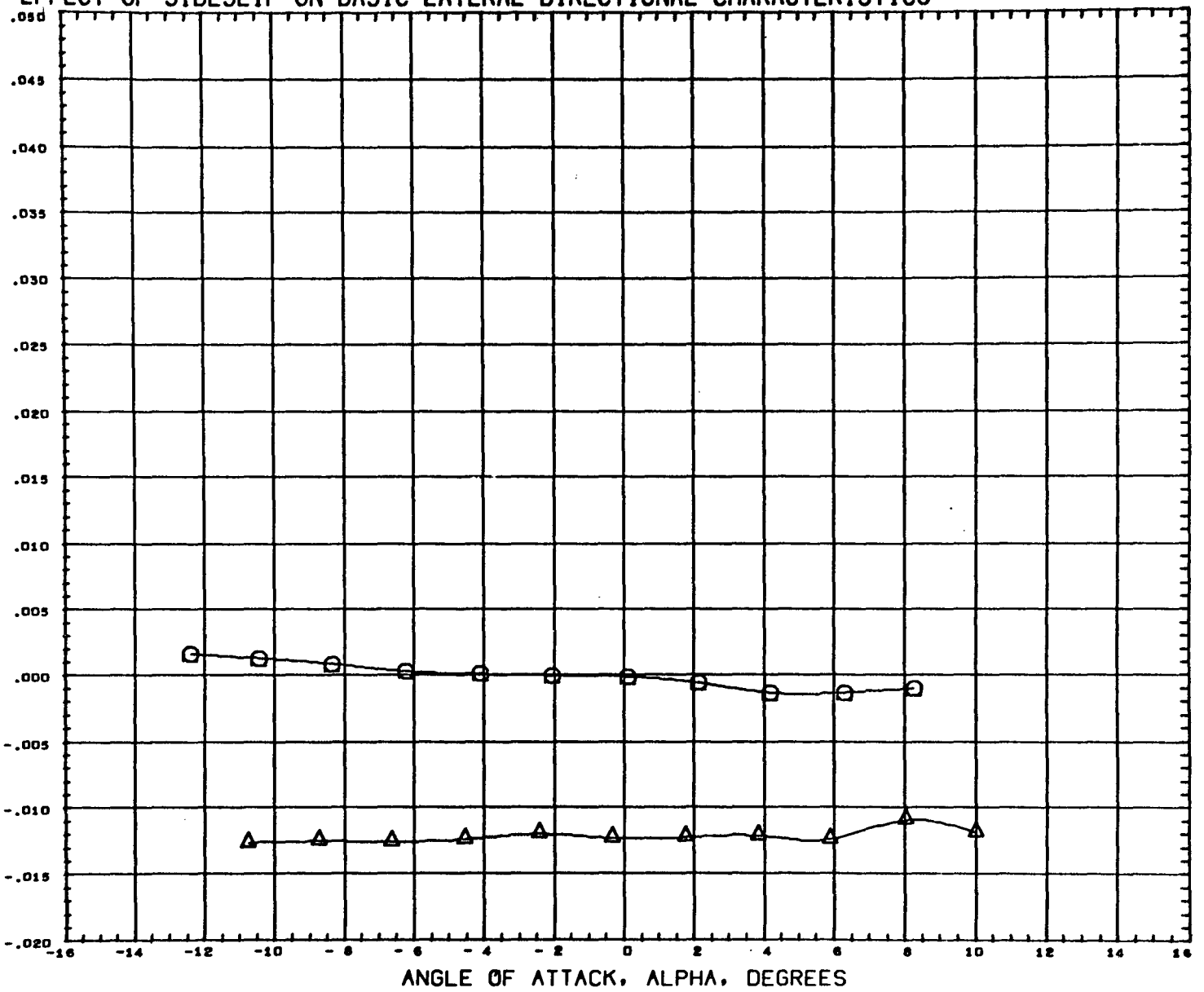


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



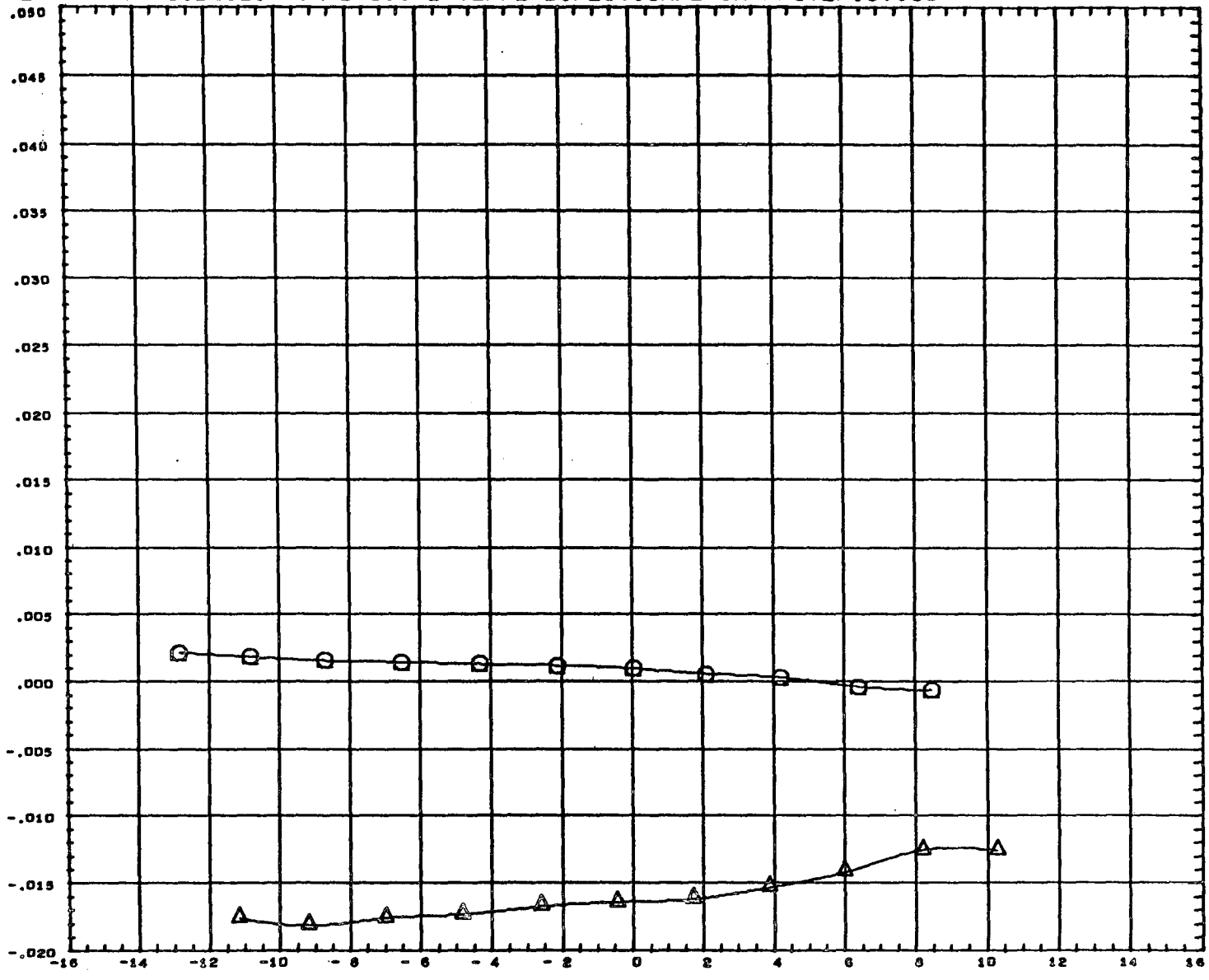
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 0.601

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

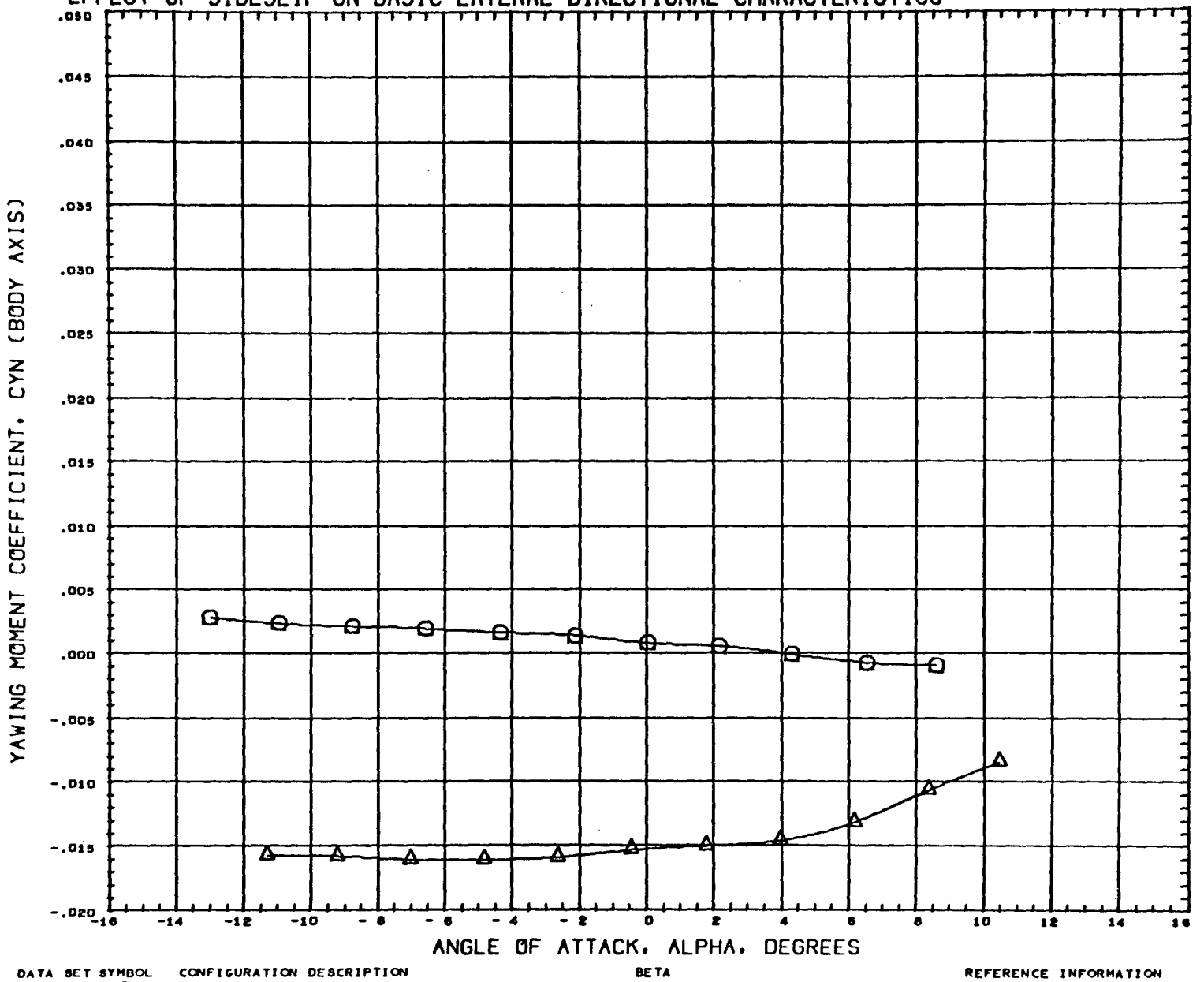


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85104A)		MSFC509 NR 11OC ORBITER B14K3W26E16V36	0.000
(85105A)		MSFC509 NR 11OC ORBITER B14K3W26E16V36	-6.000

MACH 0.901

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	5.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

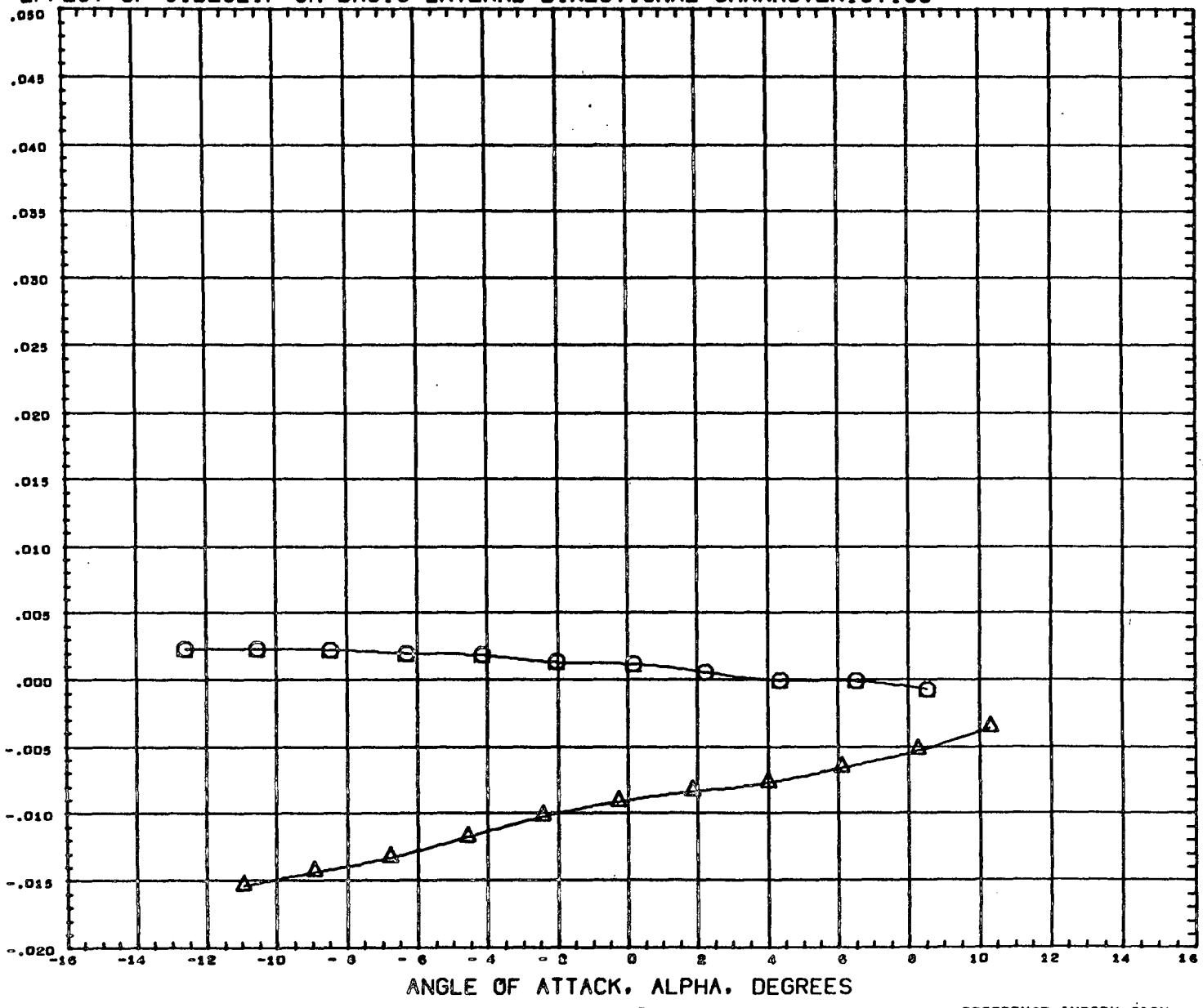


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 1.195

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	-0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

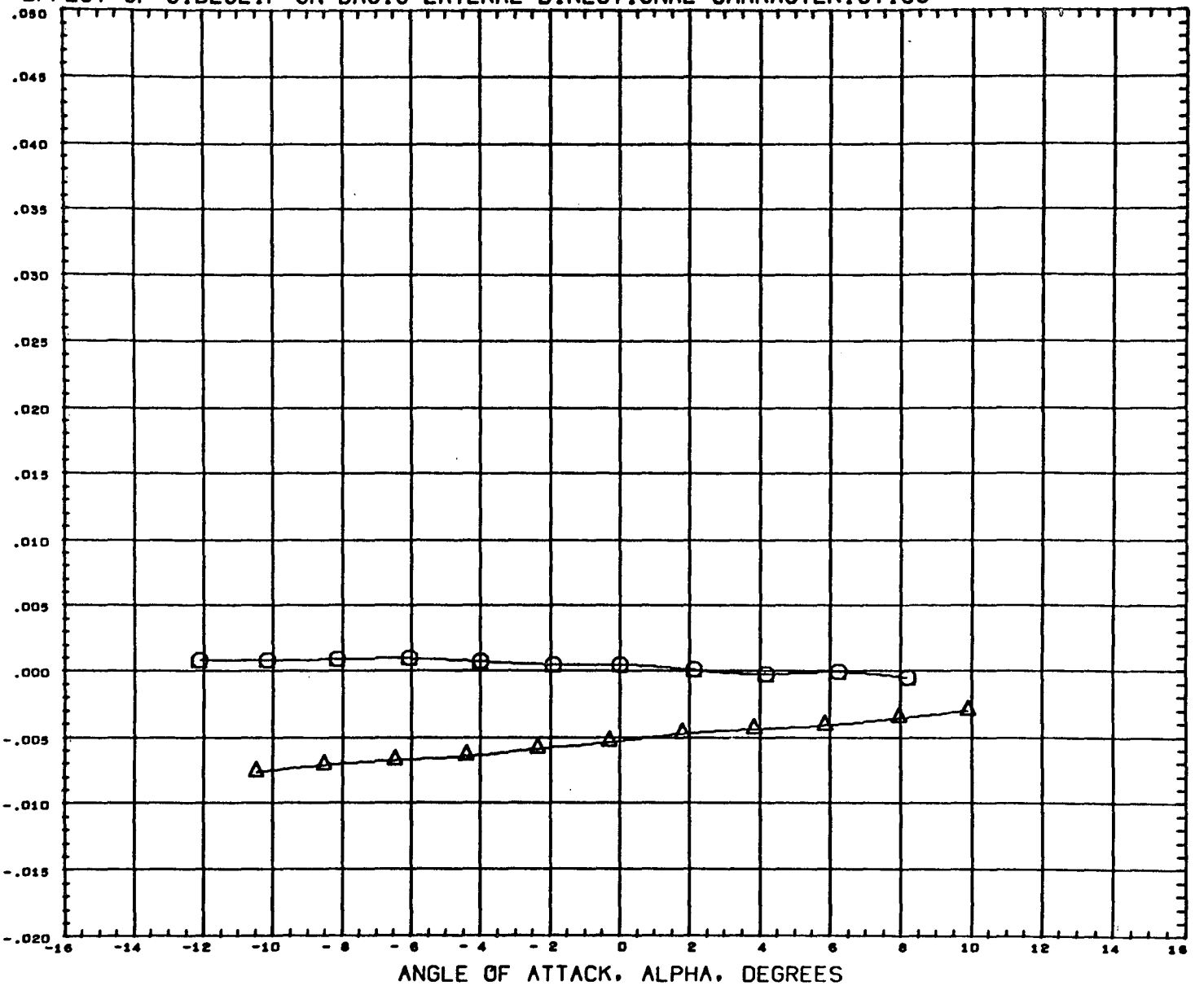


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 0.936

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



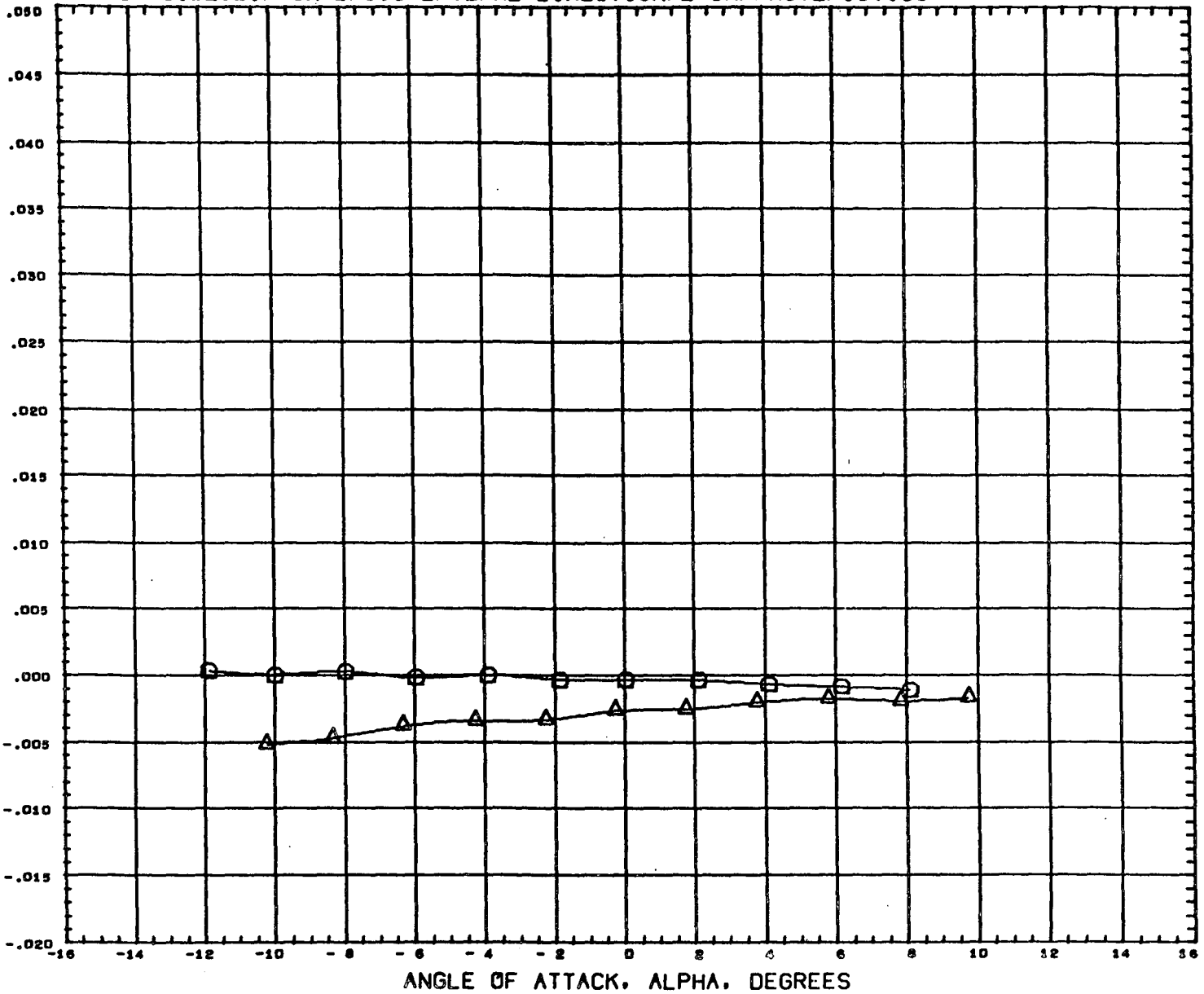
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(85105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	-0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



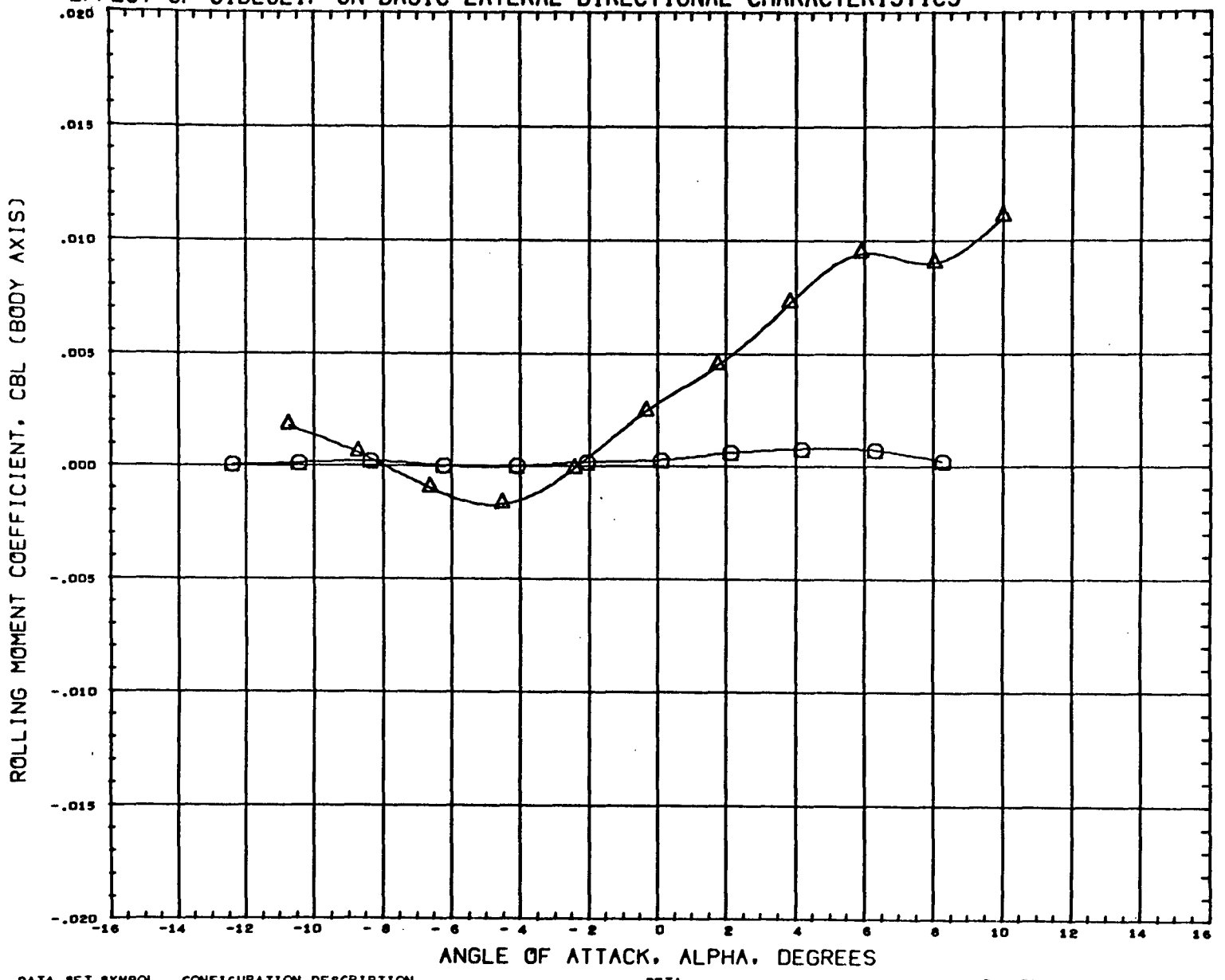
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-3.000

MACH 4.959

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



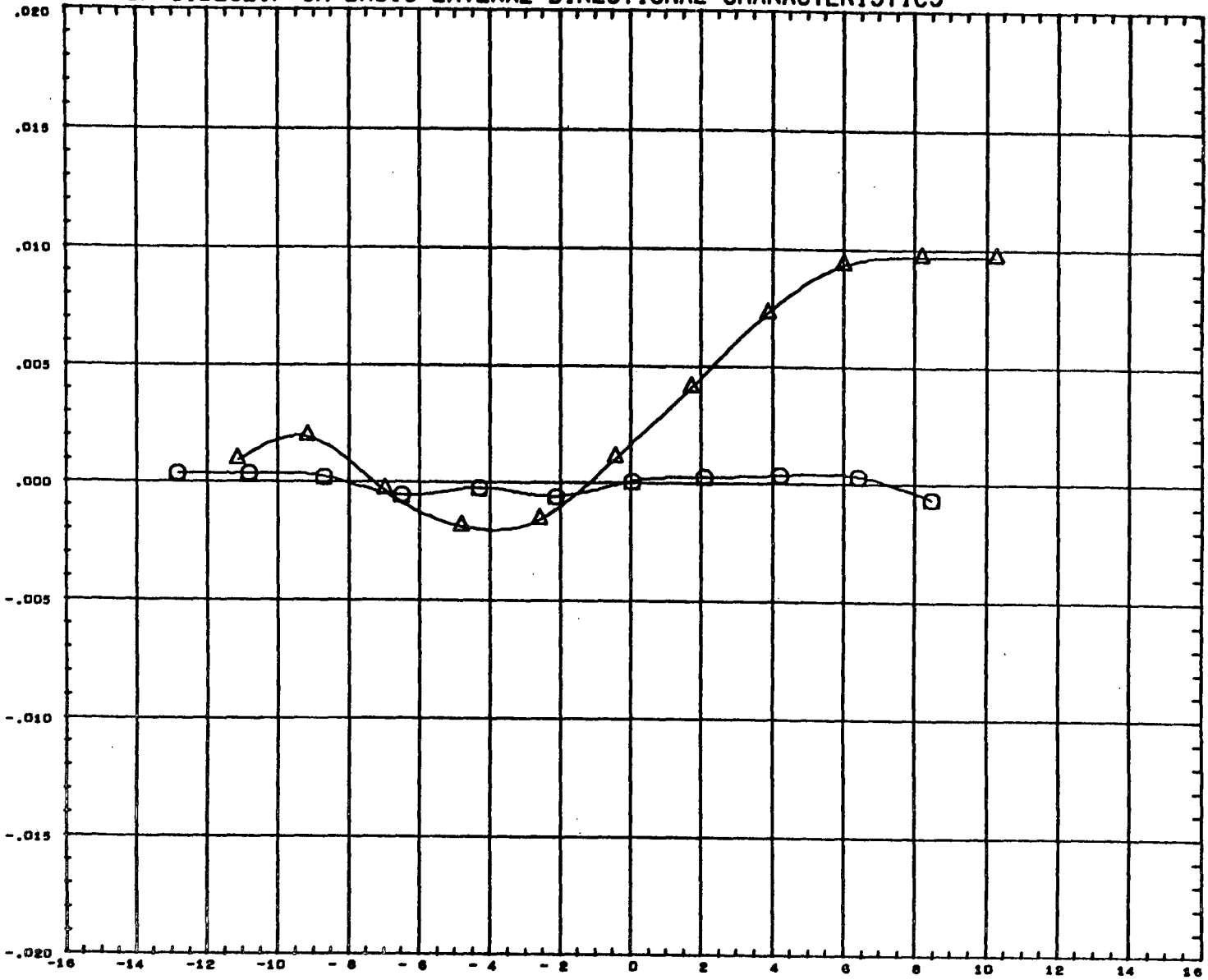
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 0.601

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

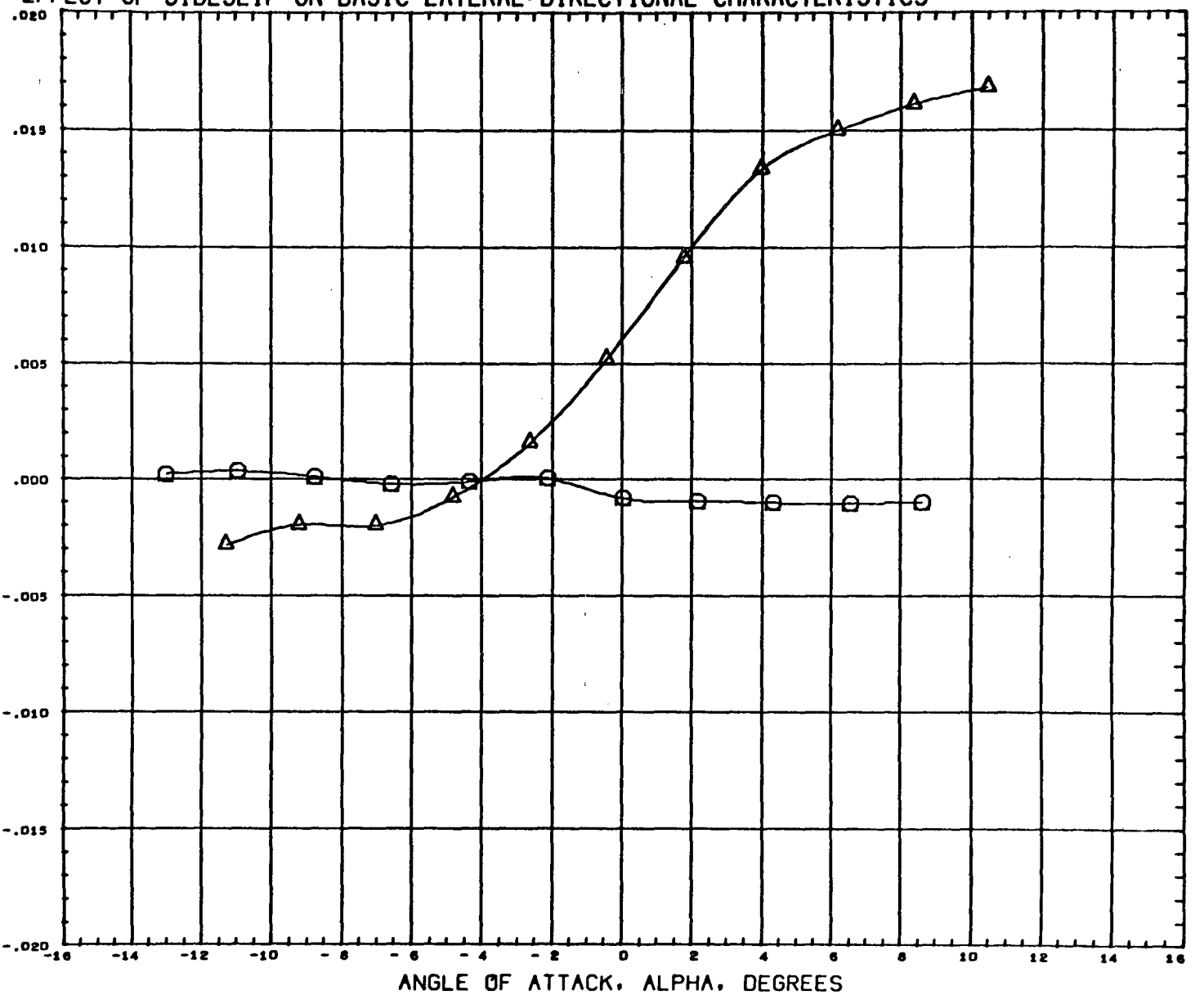


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(85105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 0.901

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

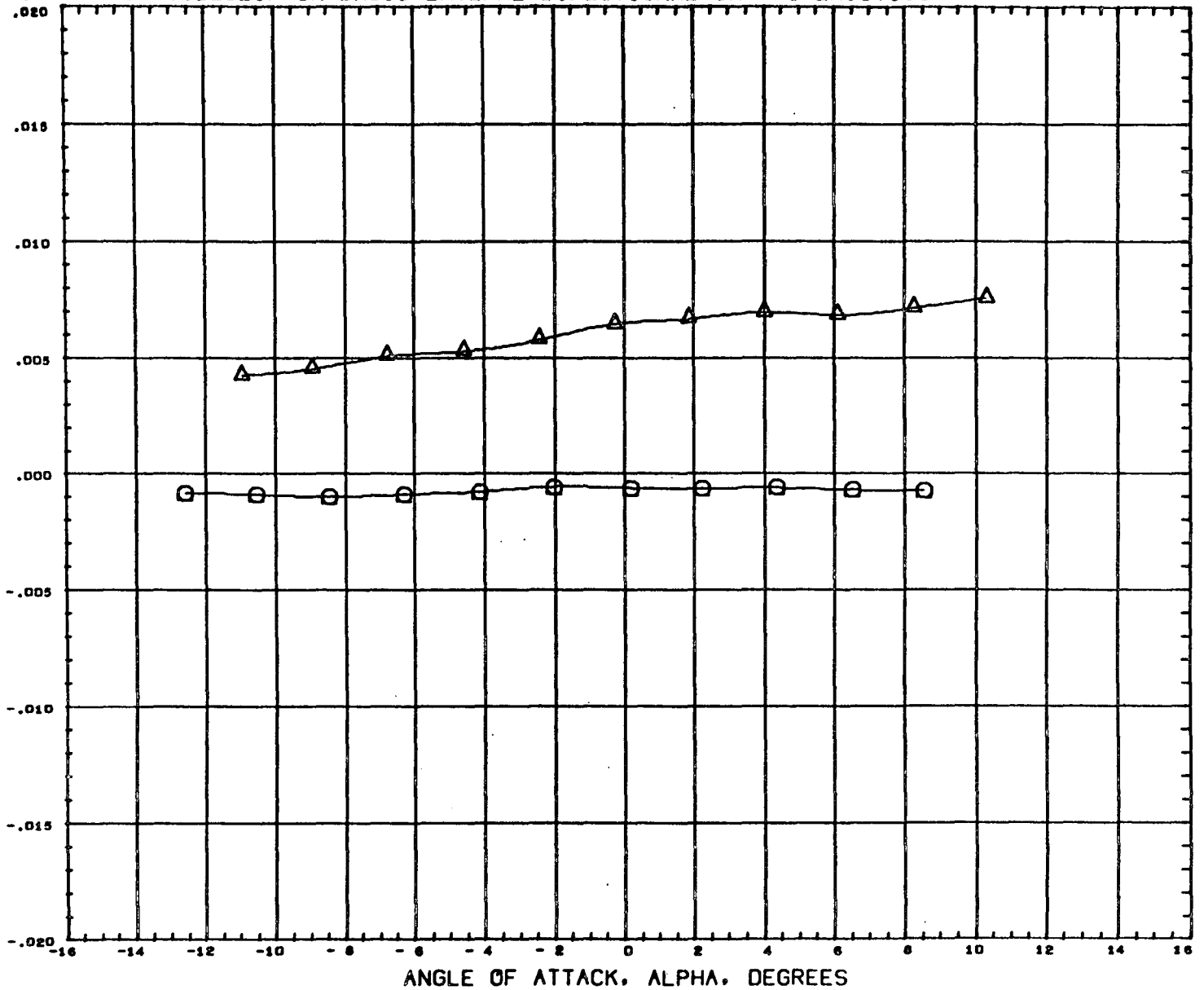


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 1.195

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

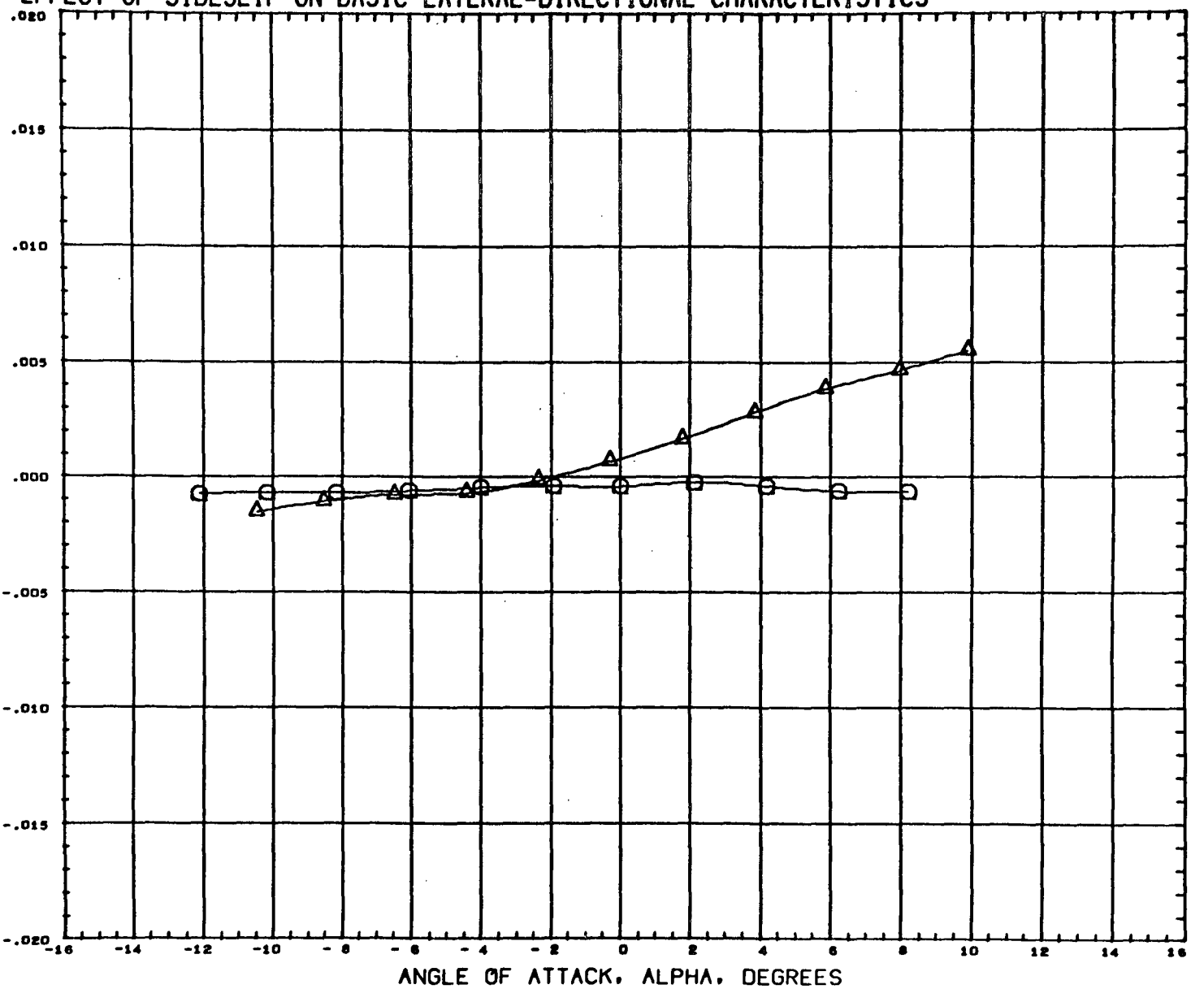


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(B5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 1.056

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



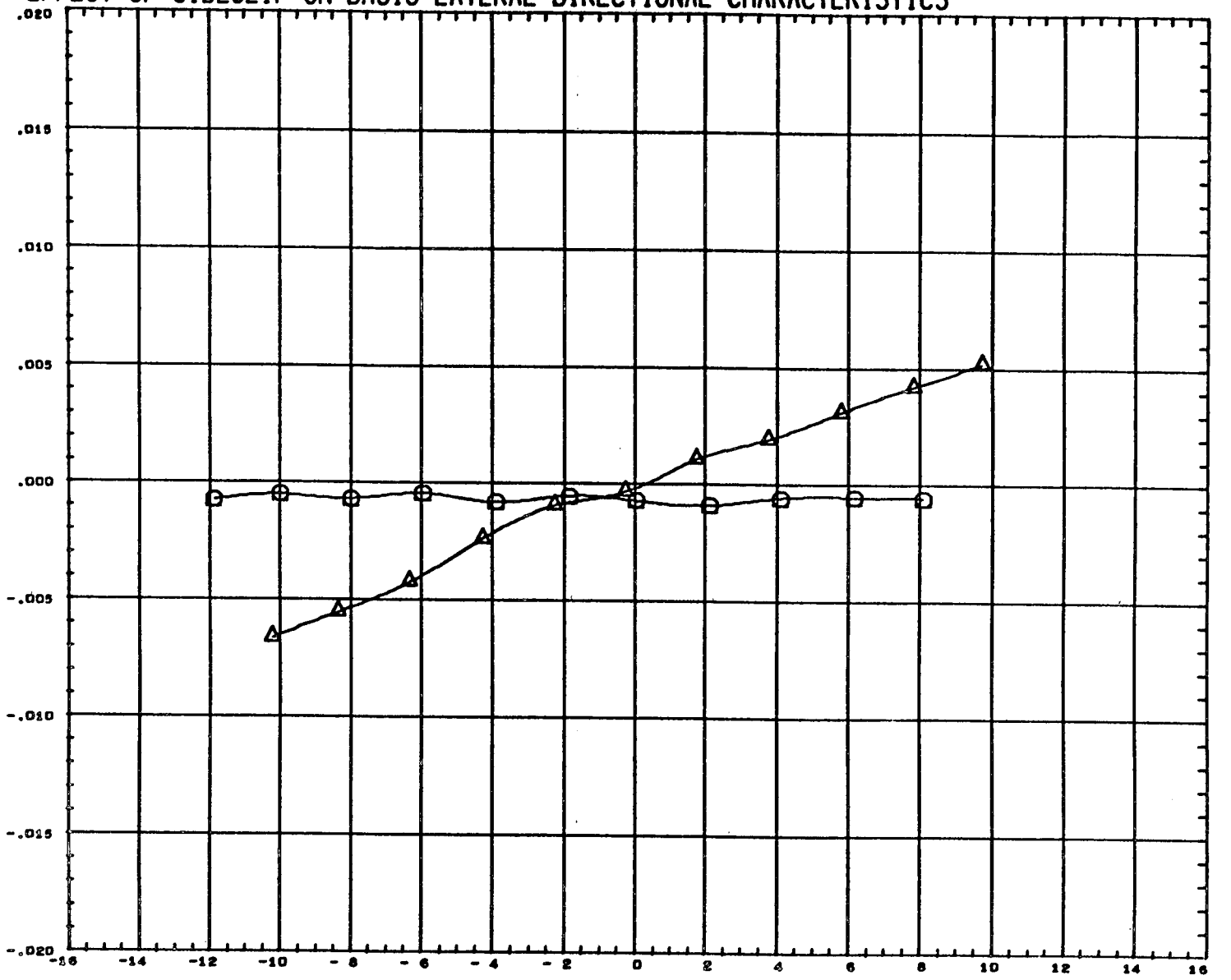
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85104A)		M8FC509 NR 11OC ORBITER B14K3W26E16V36	0.000
(85105A)		M8FC509 NR 11OC ORBITER B14K3W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

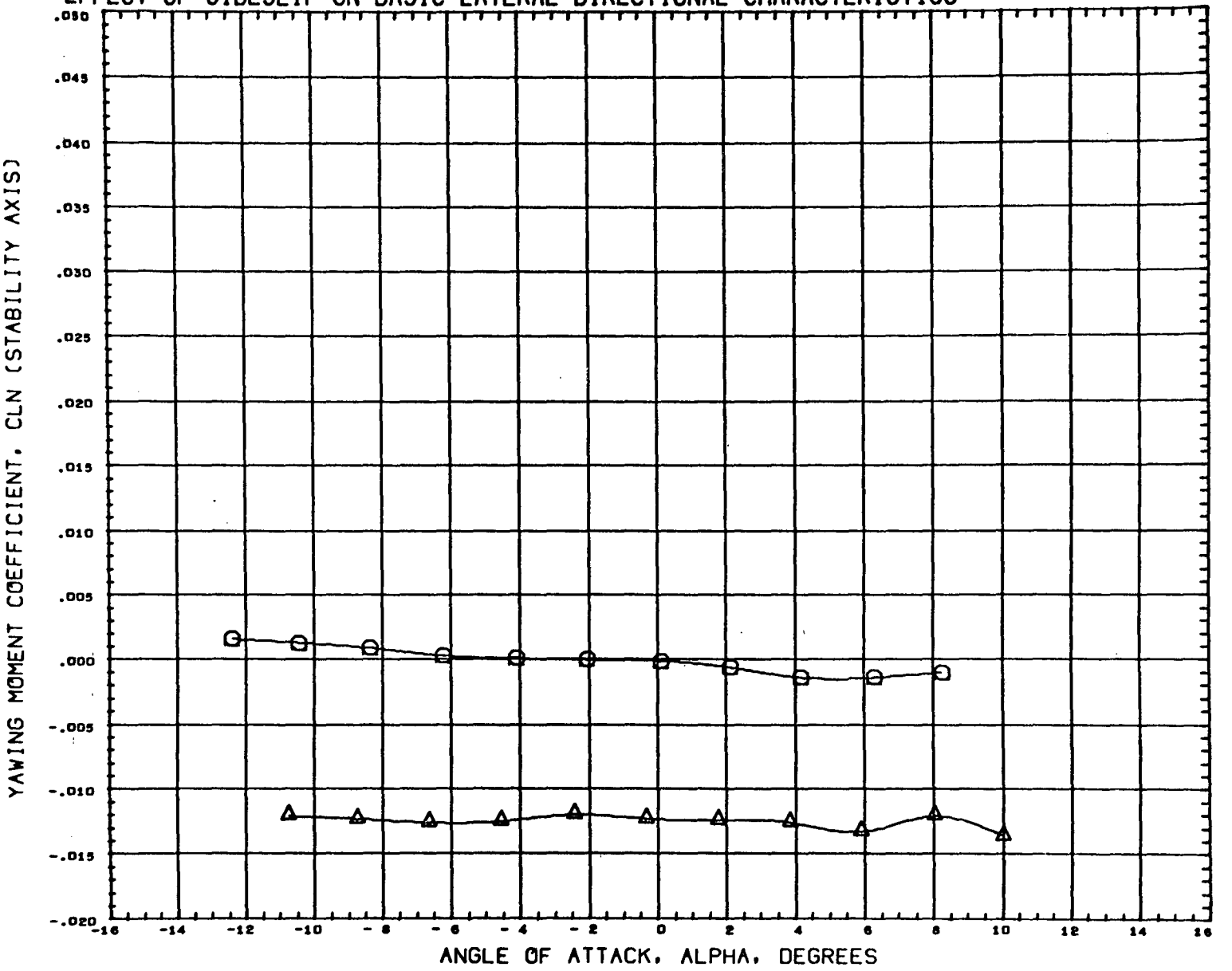


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85104A)		M8FC509 NR 110C ORBITER B14K3W26E16V36	0.000
(85105A)		M8FC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 4.859

REFERENCE INFORMATION			
SREF		9.4420	SQ IN
LREF		2.6930	INCHES
BREF		4.6760	INCHES
XMRP		3.6080	INCHES
YMRP		0.0000	
ZMRP	-	0.0990	INCHES
SCALE		0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

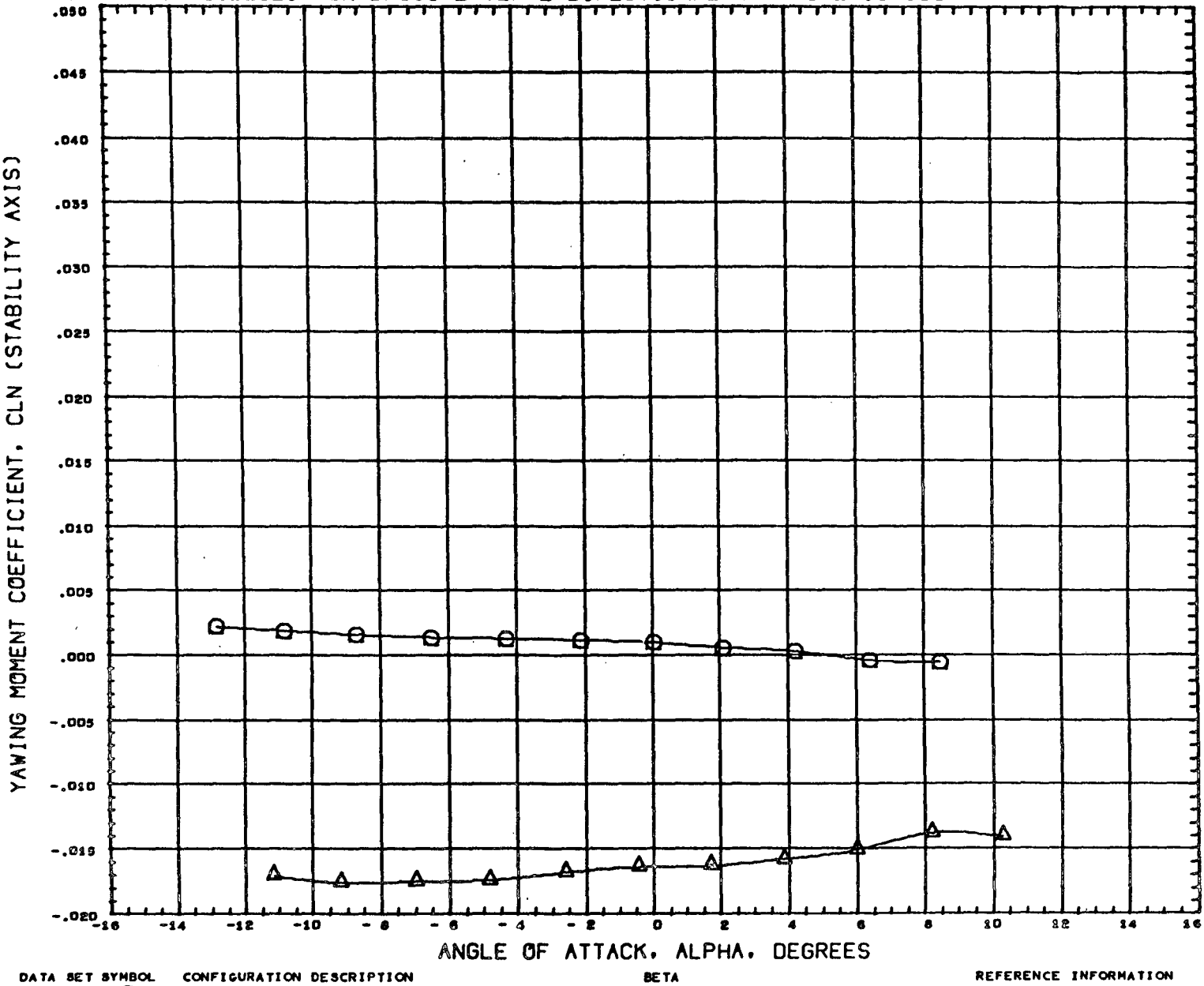


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 0.601

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

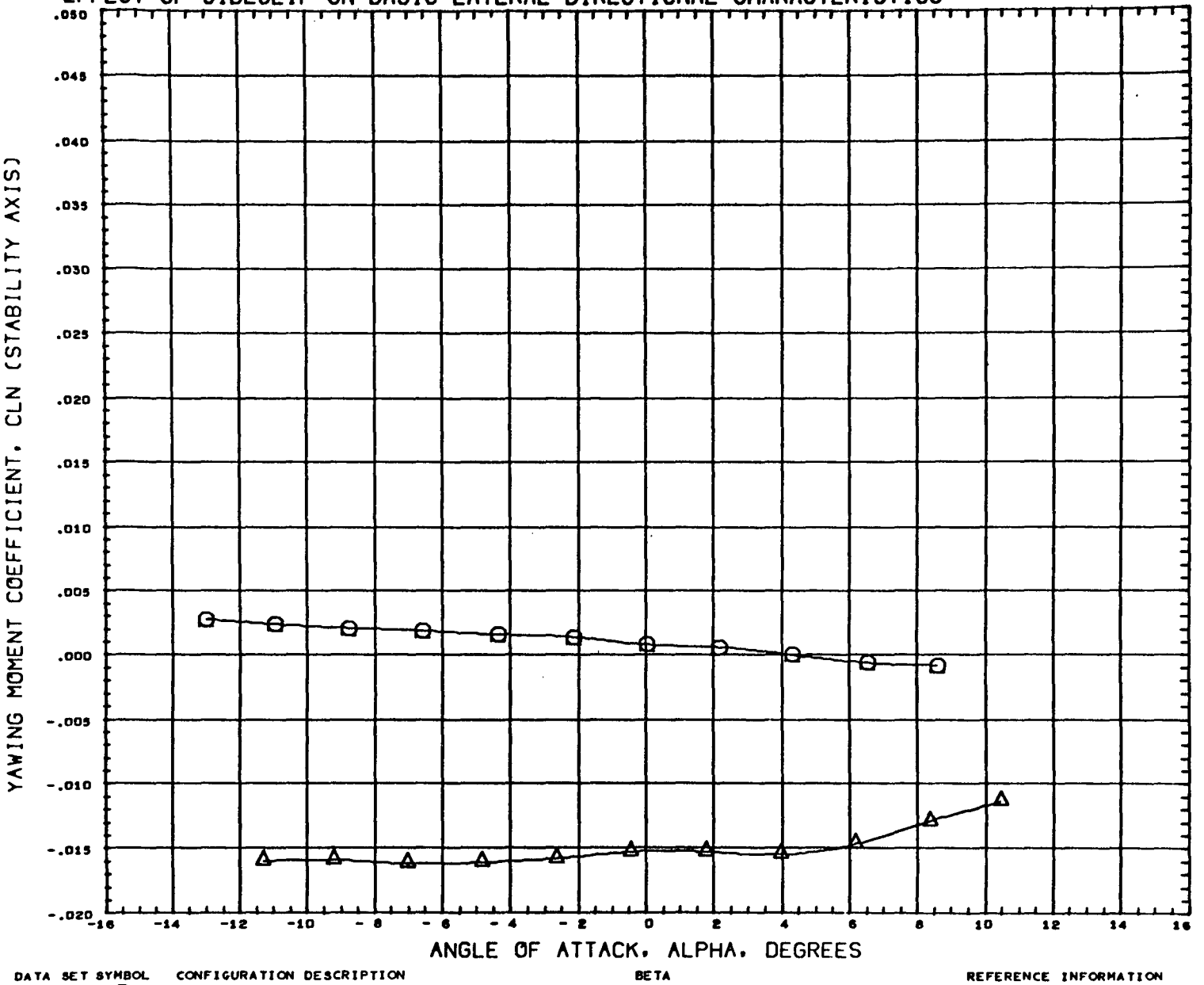


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 0.901

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

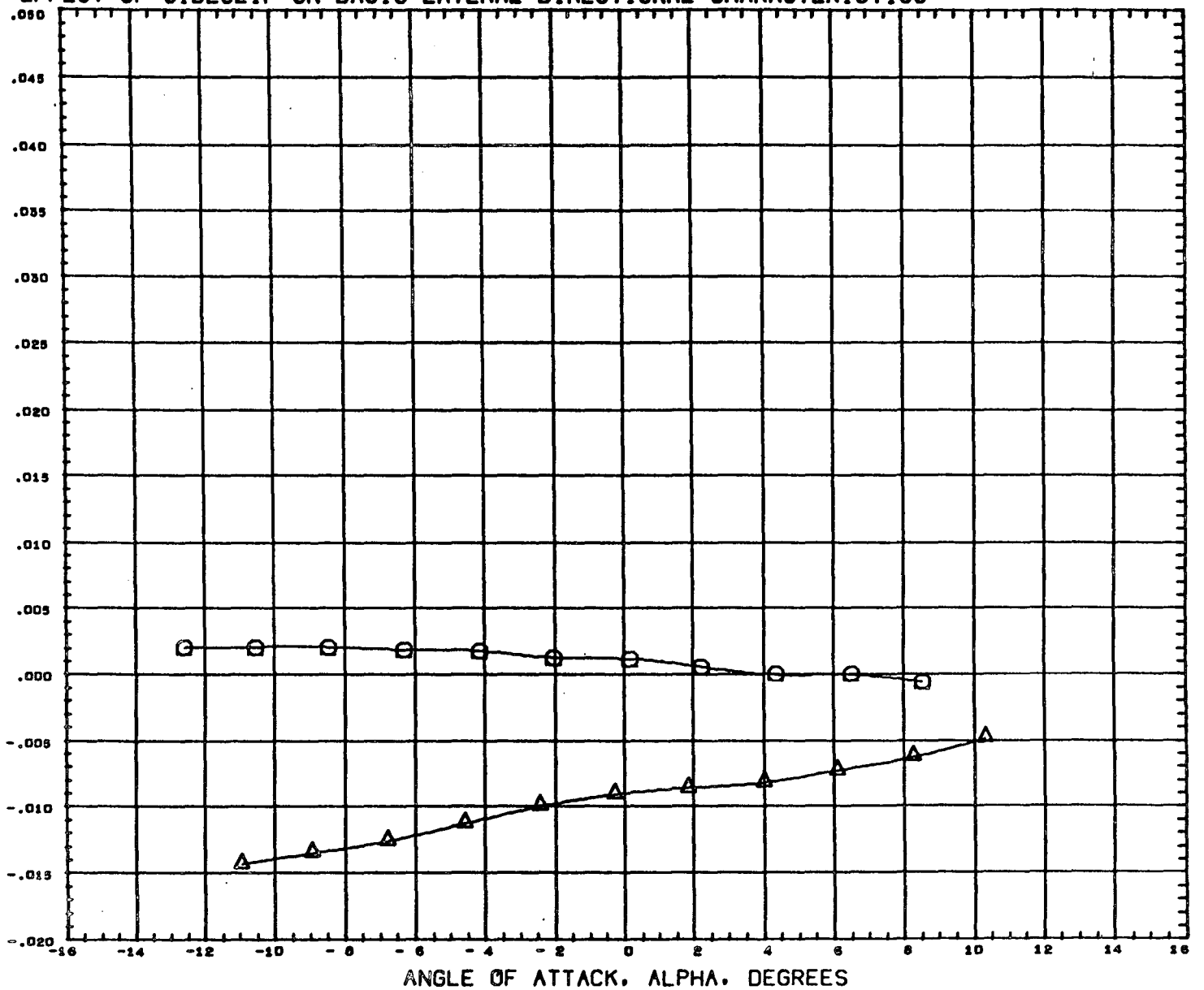


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 1.195

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

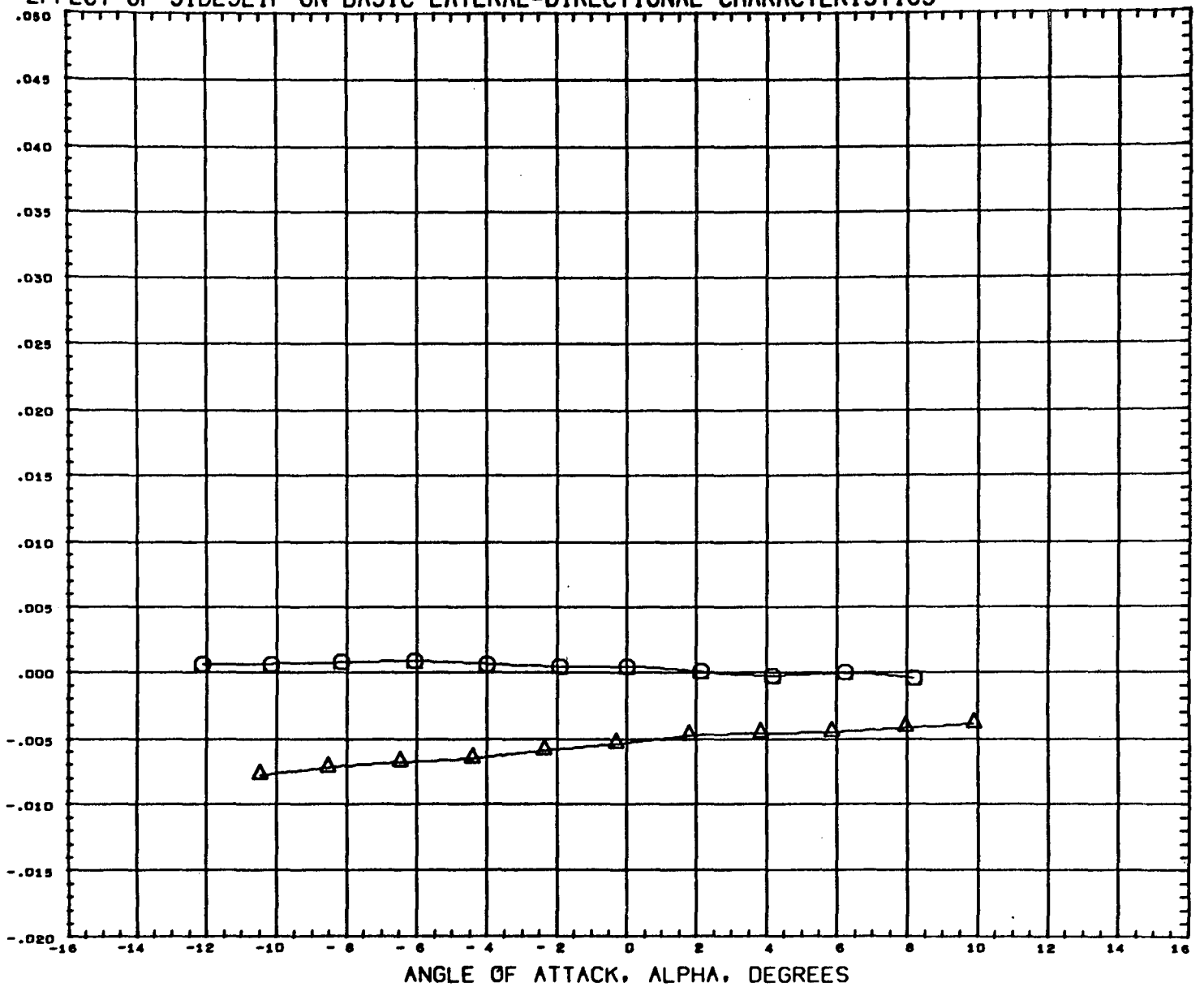


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 8.056

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

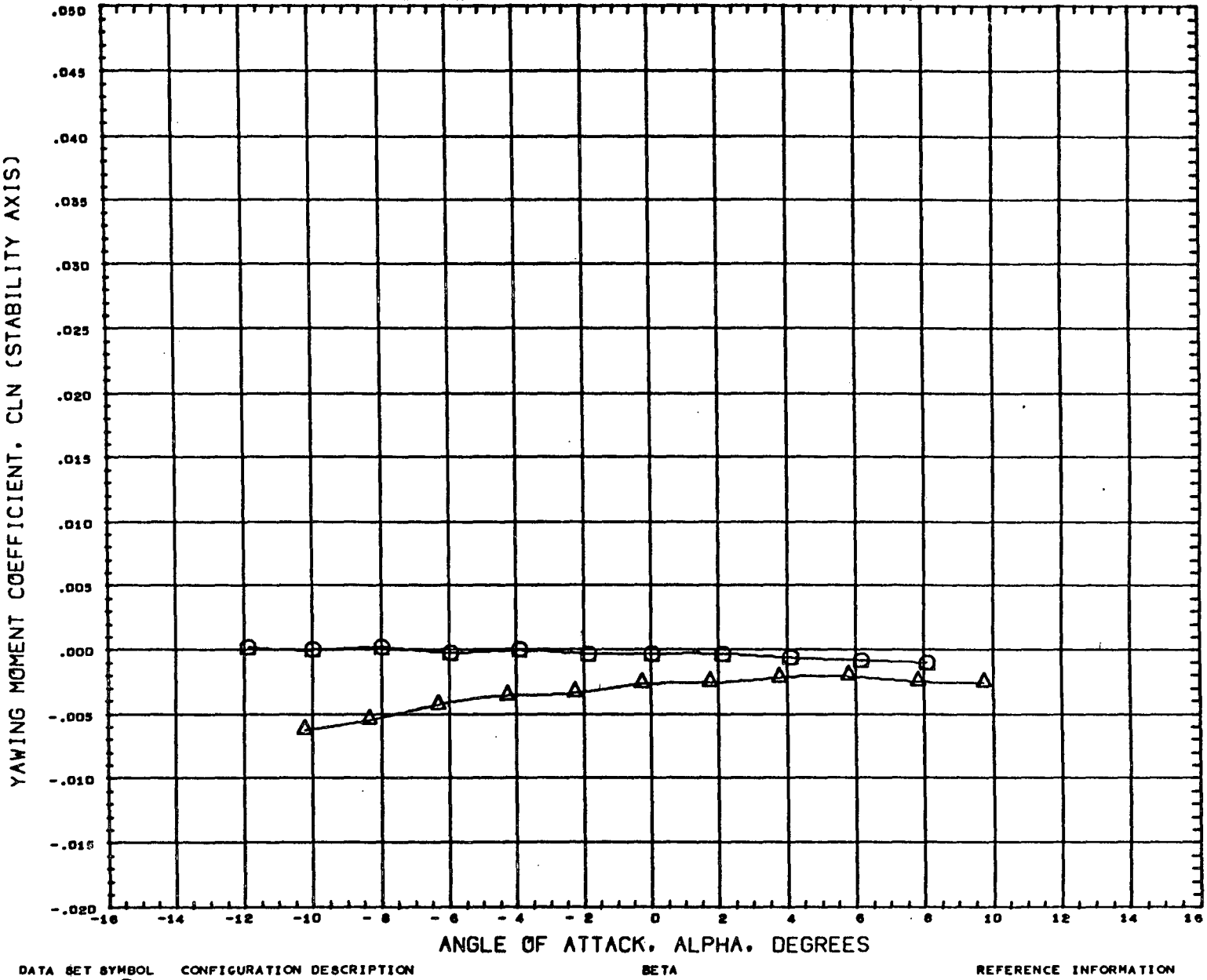


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

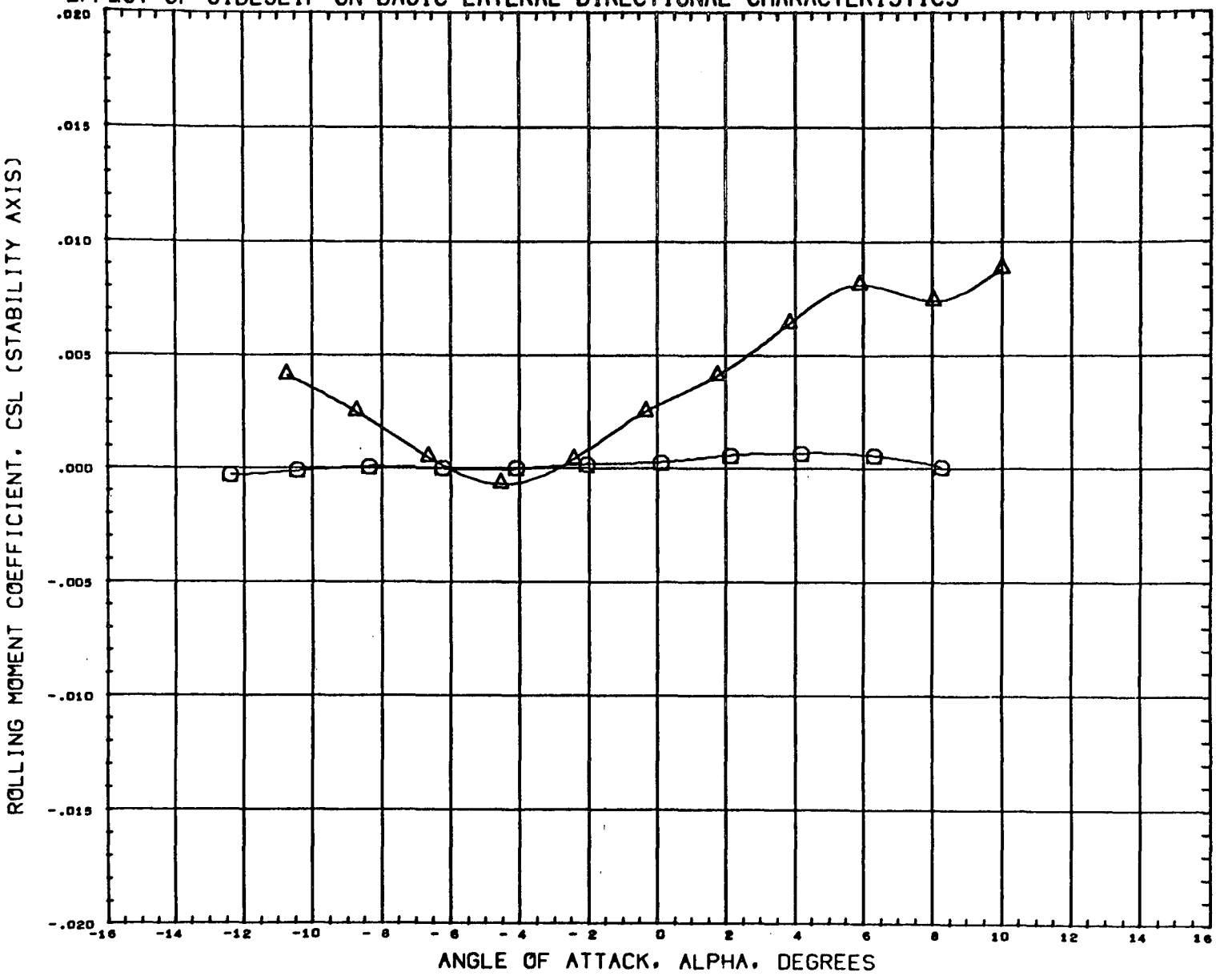


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

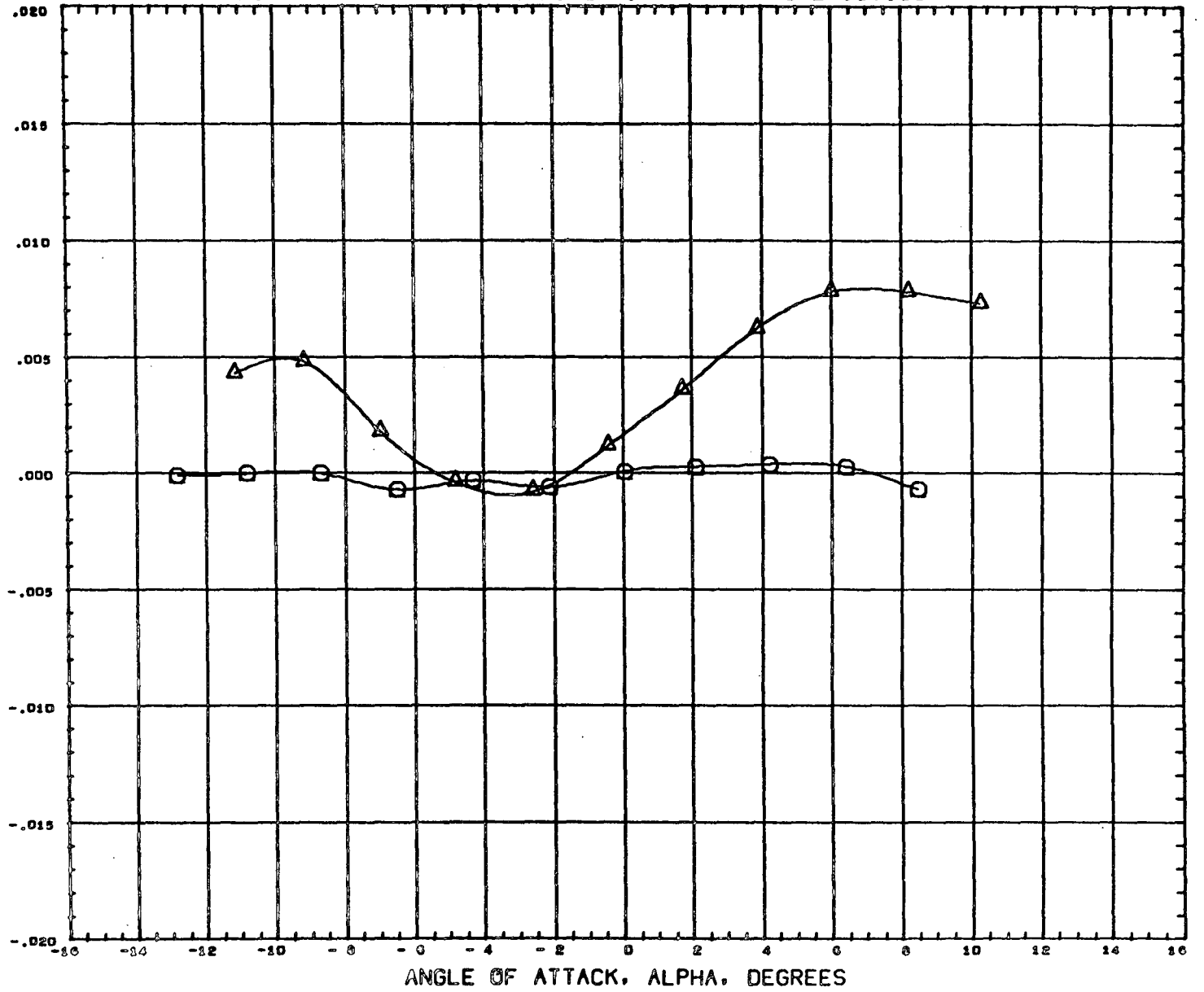


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 0.601

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

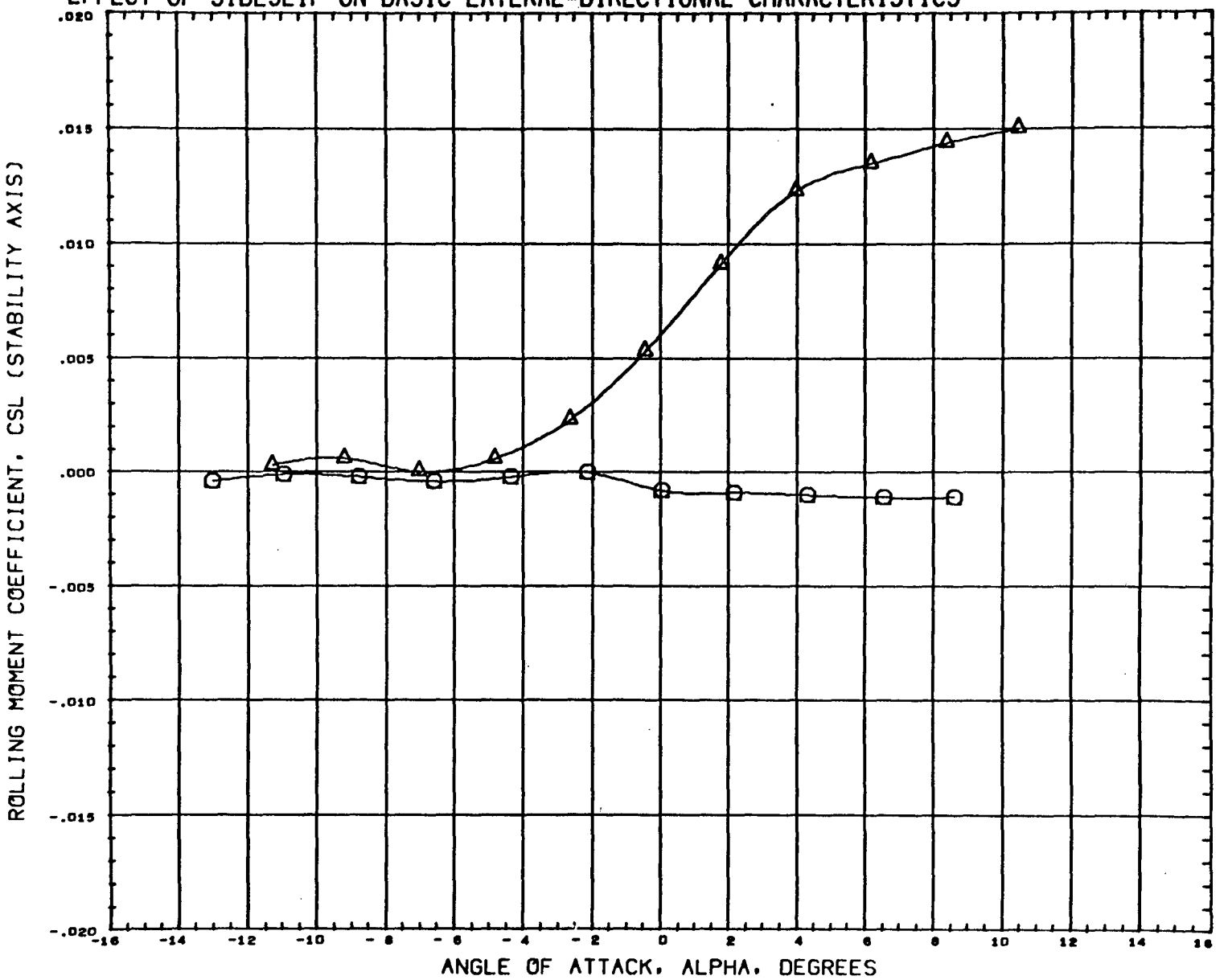


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)		MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 0.801

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

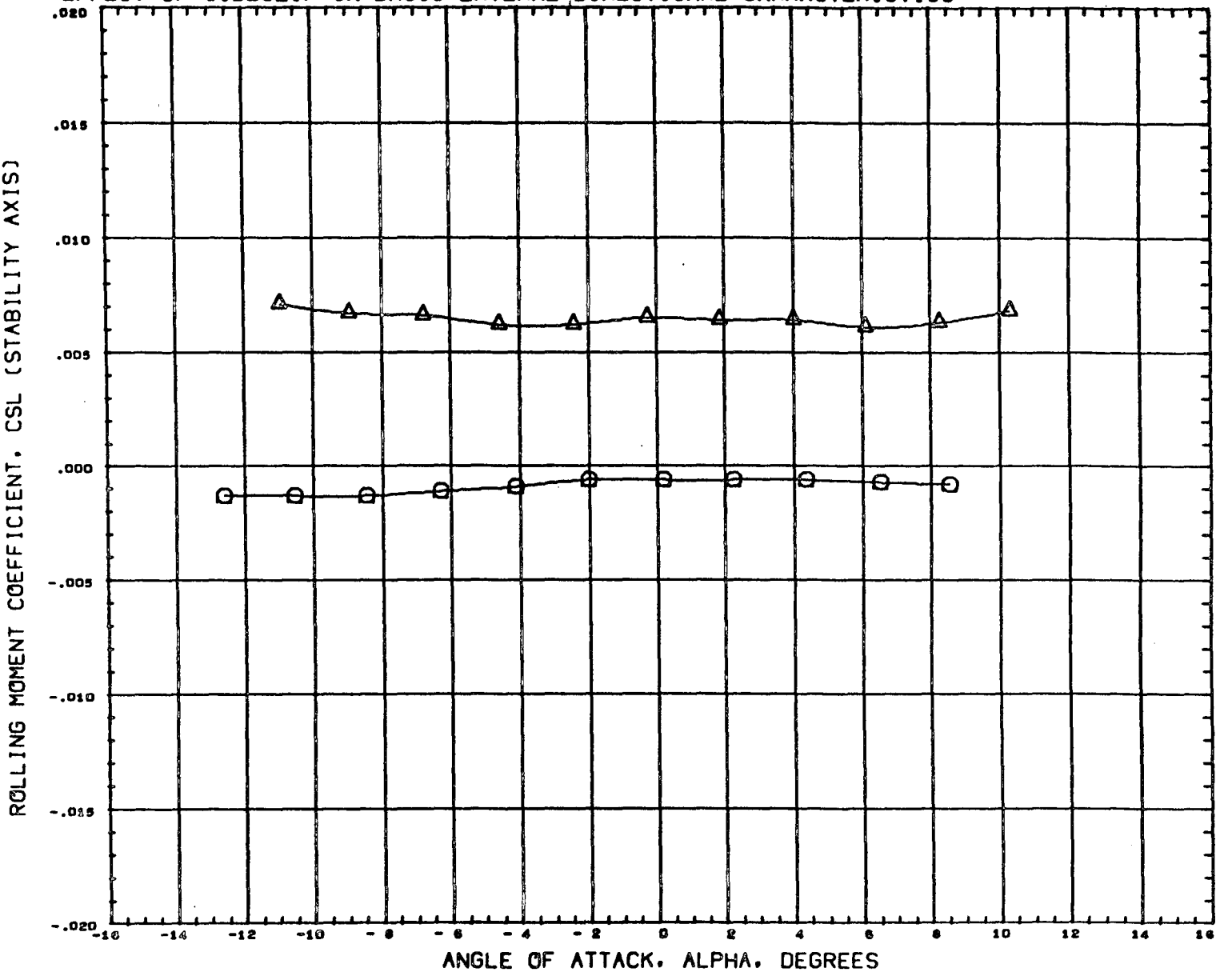


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 1.195

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

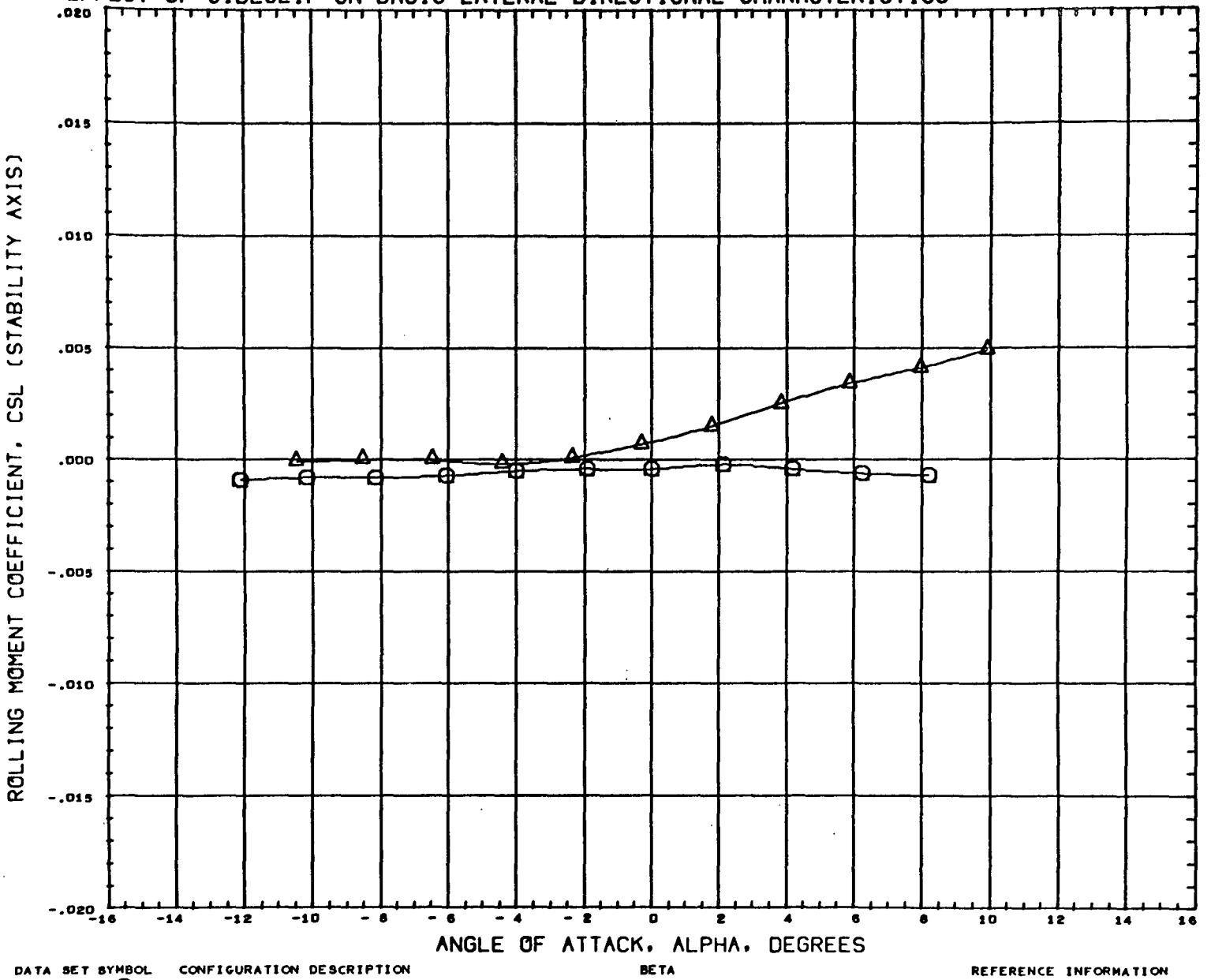


DATA SET SYMBOL		CONFIGURATION DESCRIPTION	BETA
(A5104A)	Ω	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)	⧖	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 1.950

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

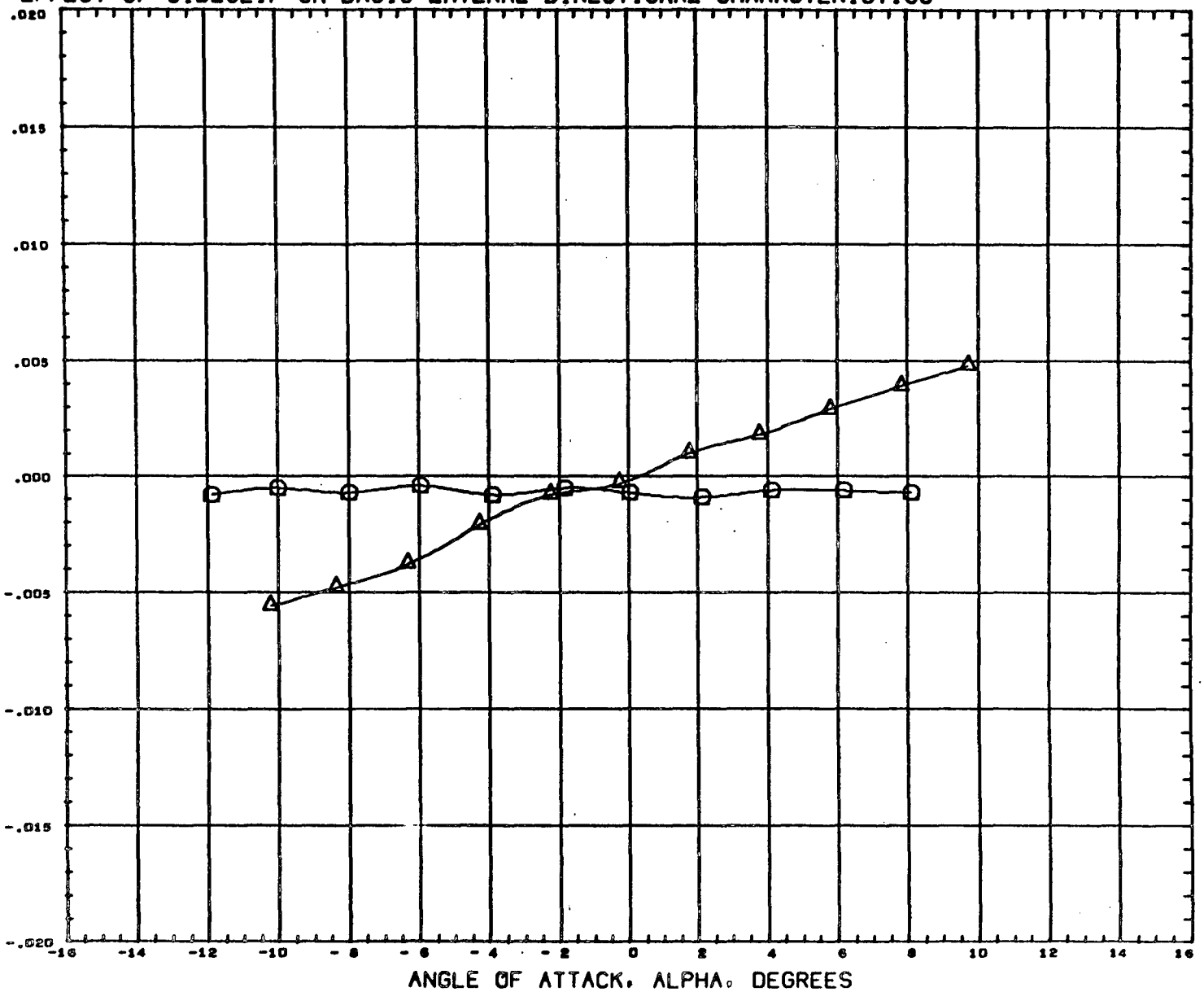


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

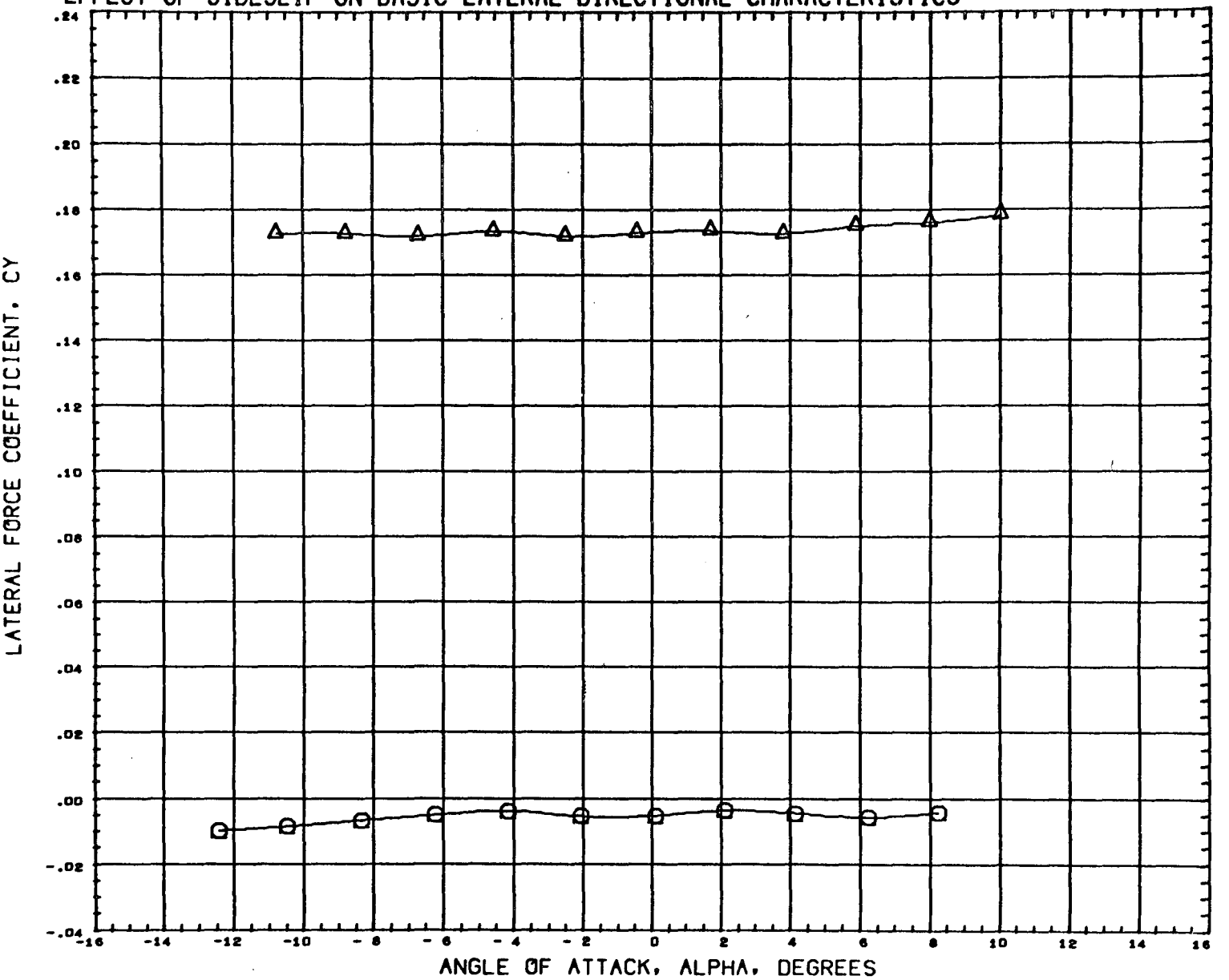


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5104A)	○	MSFC509 NR 110C ORBITER B14K3W26E16V36	0.000
(A5105A)	△	MSFC509 NR 110C ORBITER B14K3W26E16V36	-8.000

MACH 4.089

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

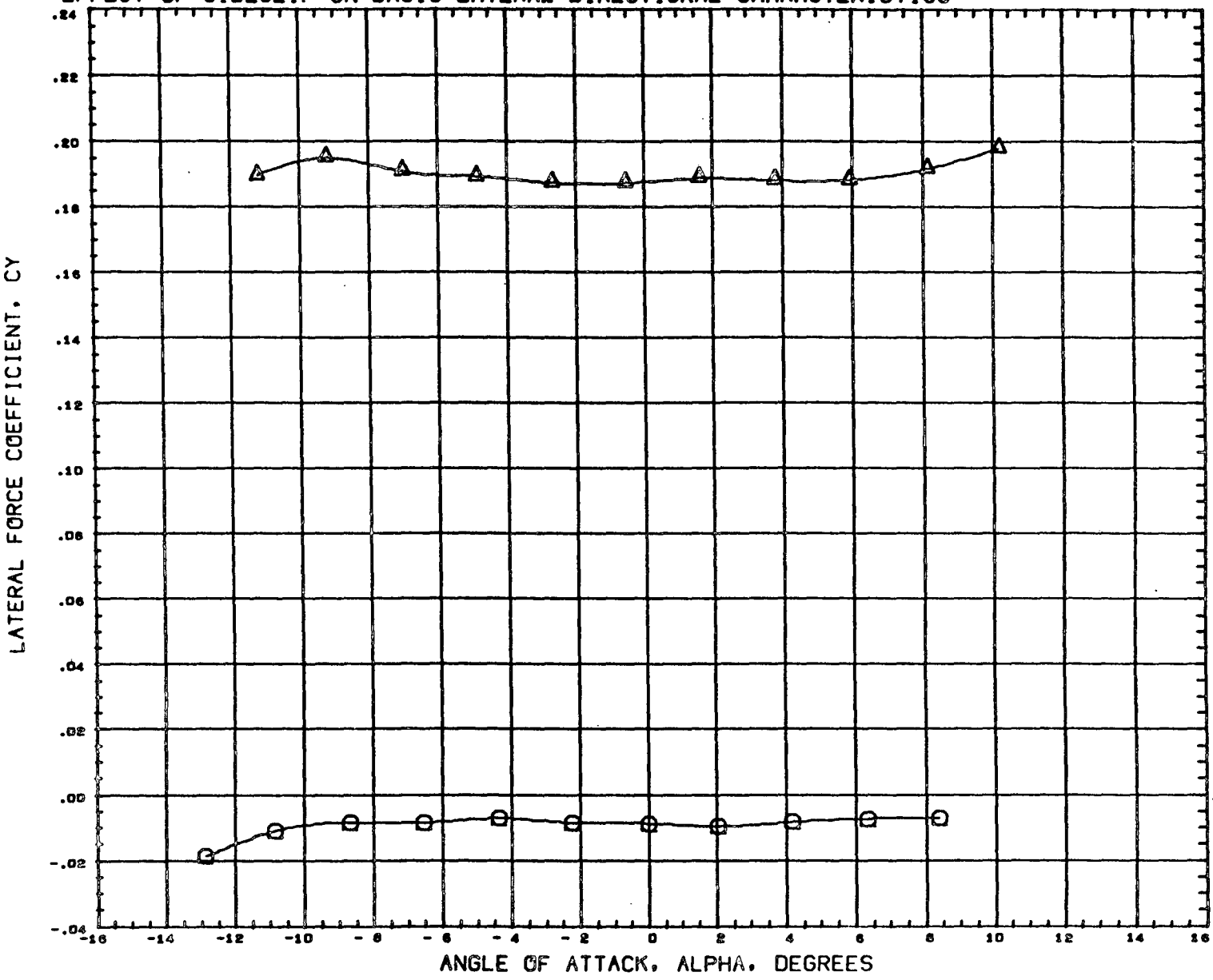


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(85106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 0.602

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

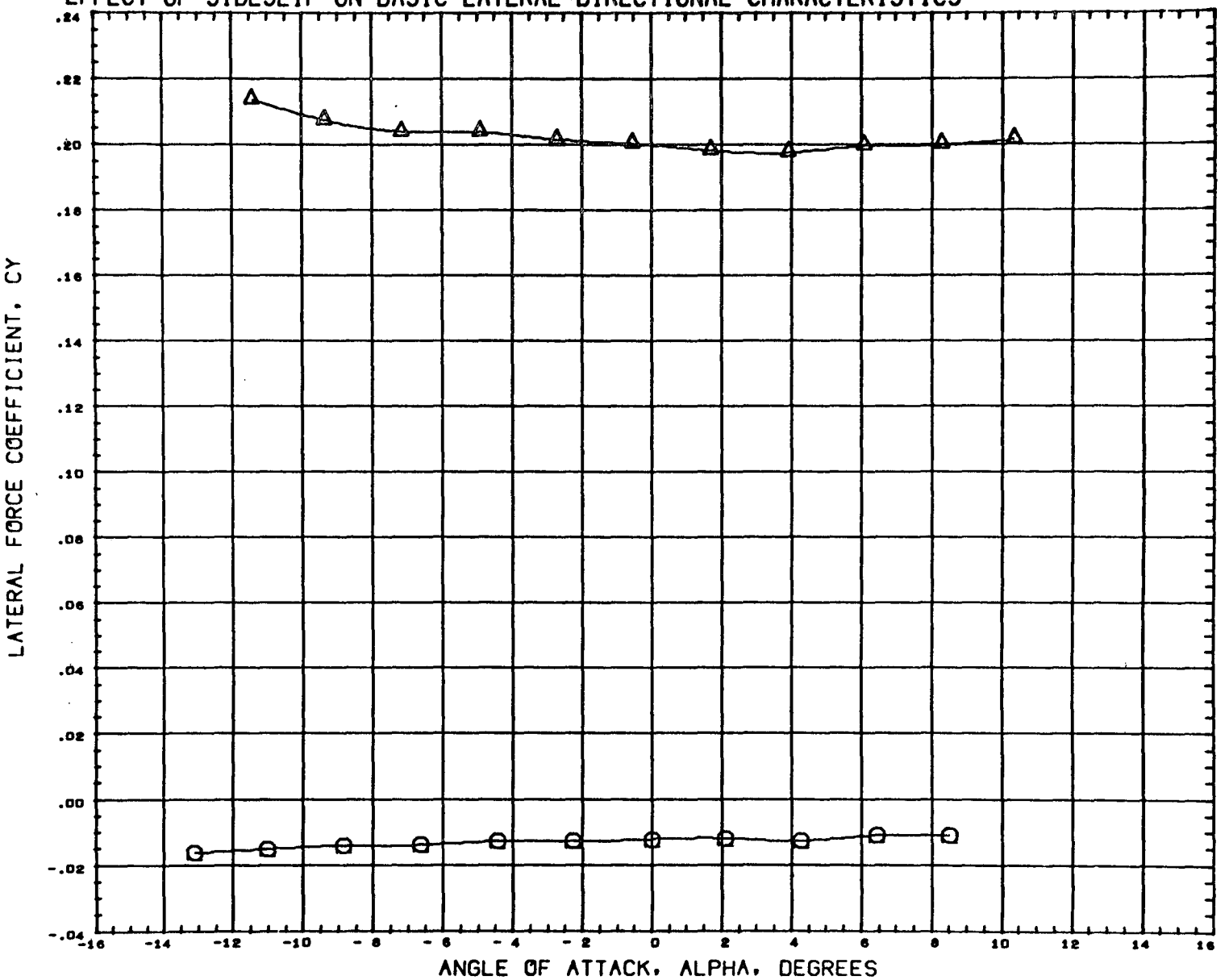


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(85106A)	△	MSFC509 NR 110C ORBITER ◇ TANK B12W26Z16V36	-6.000

MACH 0.900

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



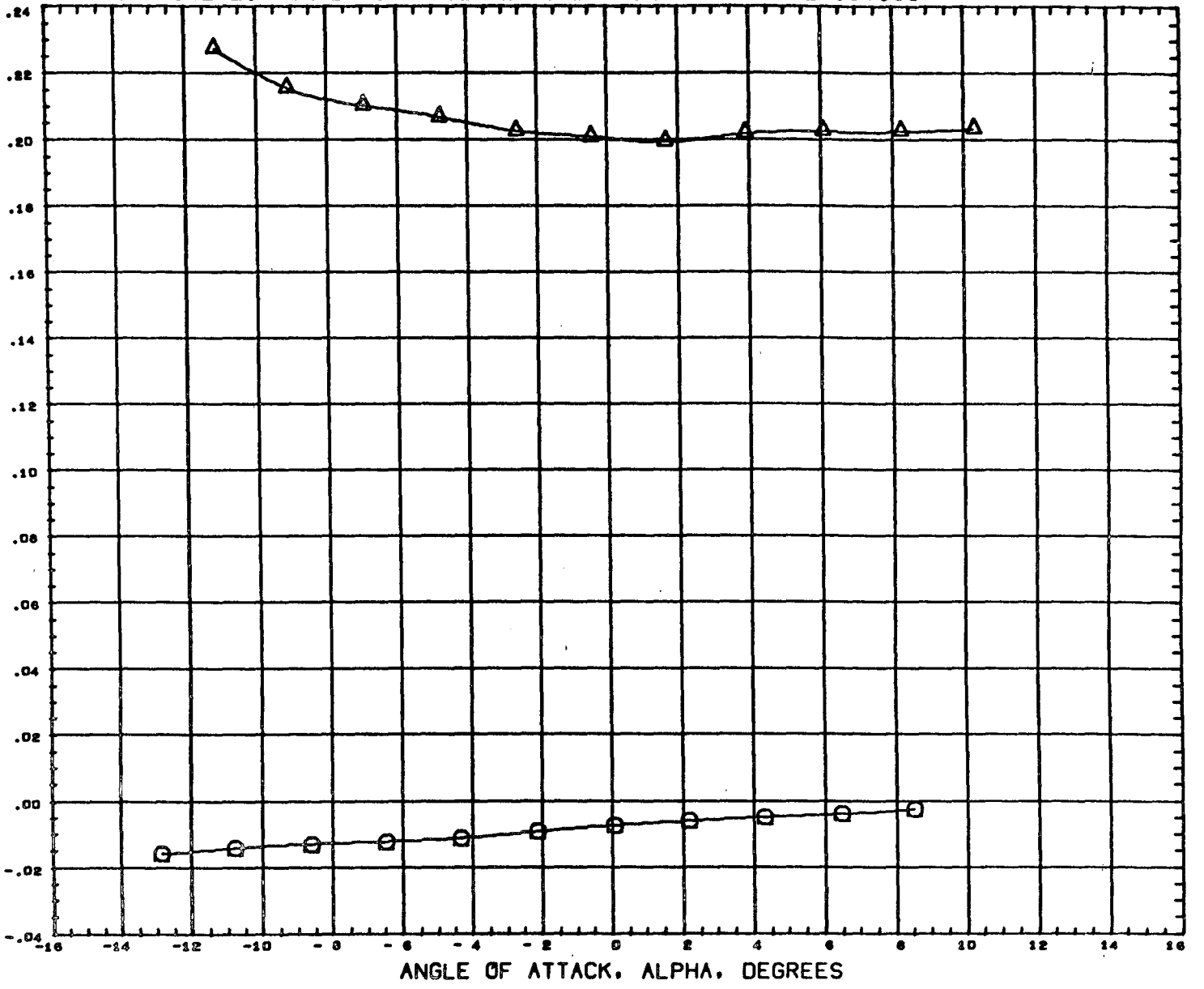
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 1.198

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

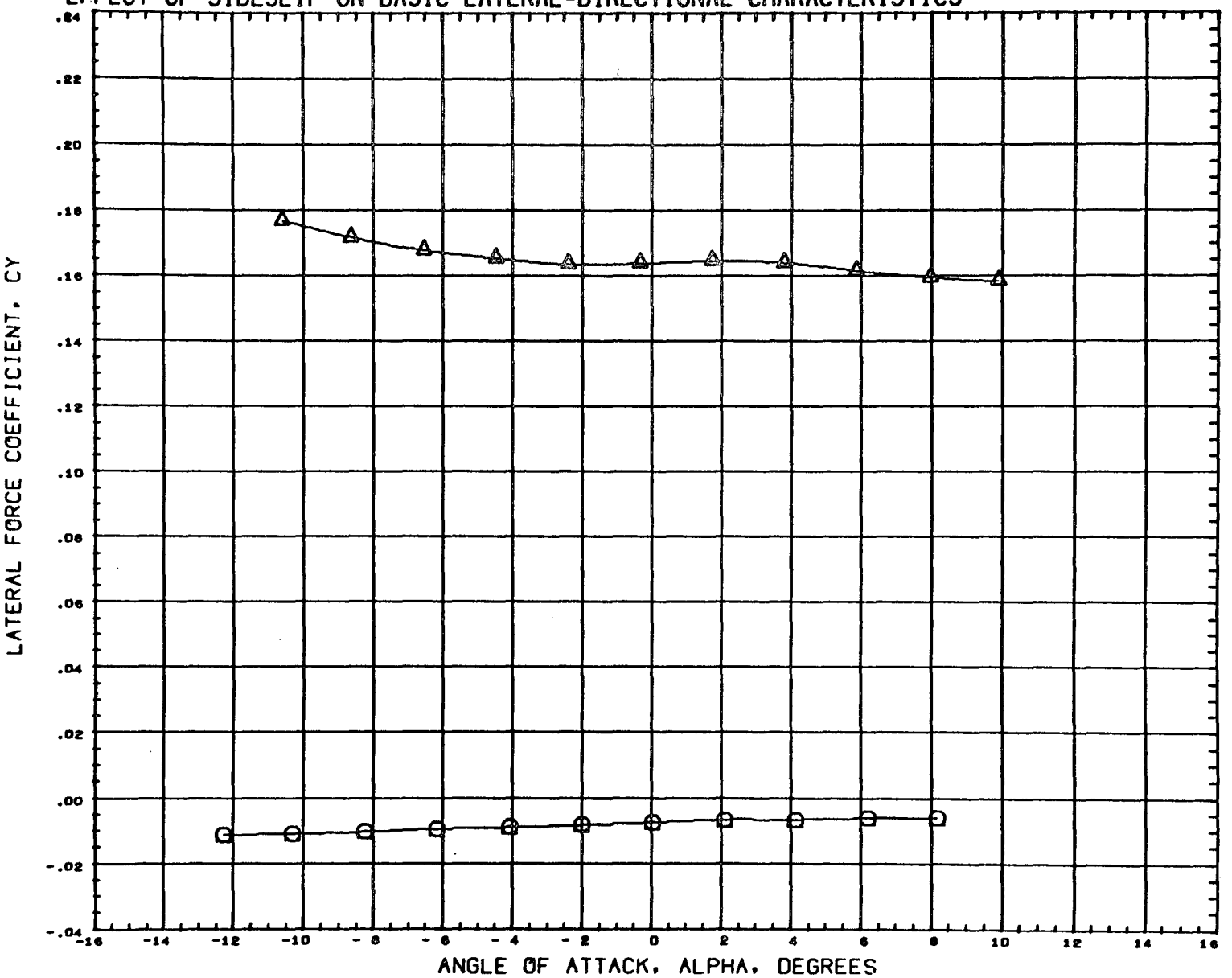


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(85106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 3.965

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



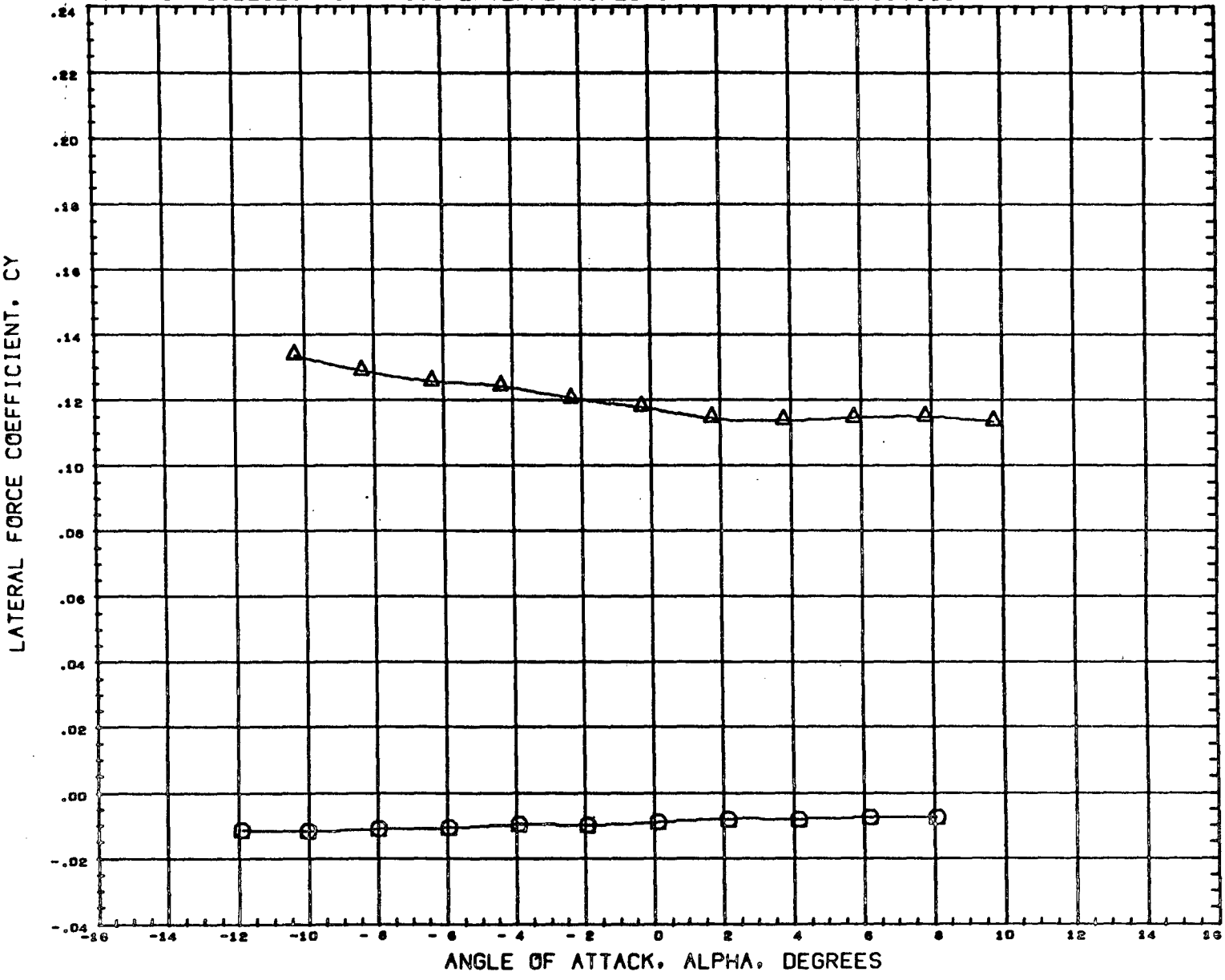
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(85106A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



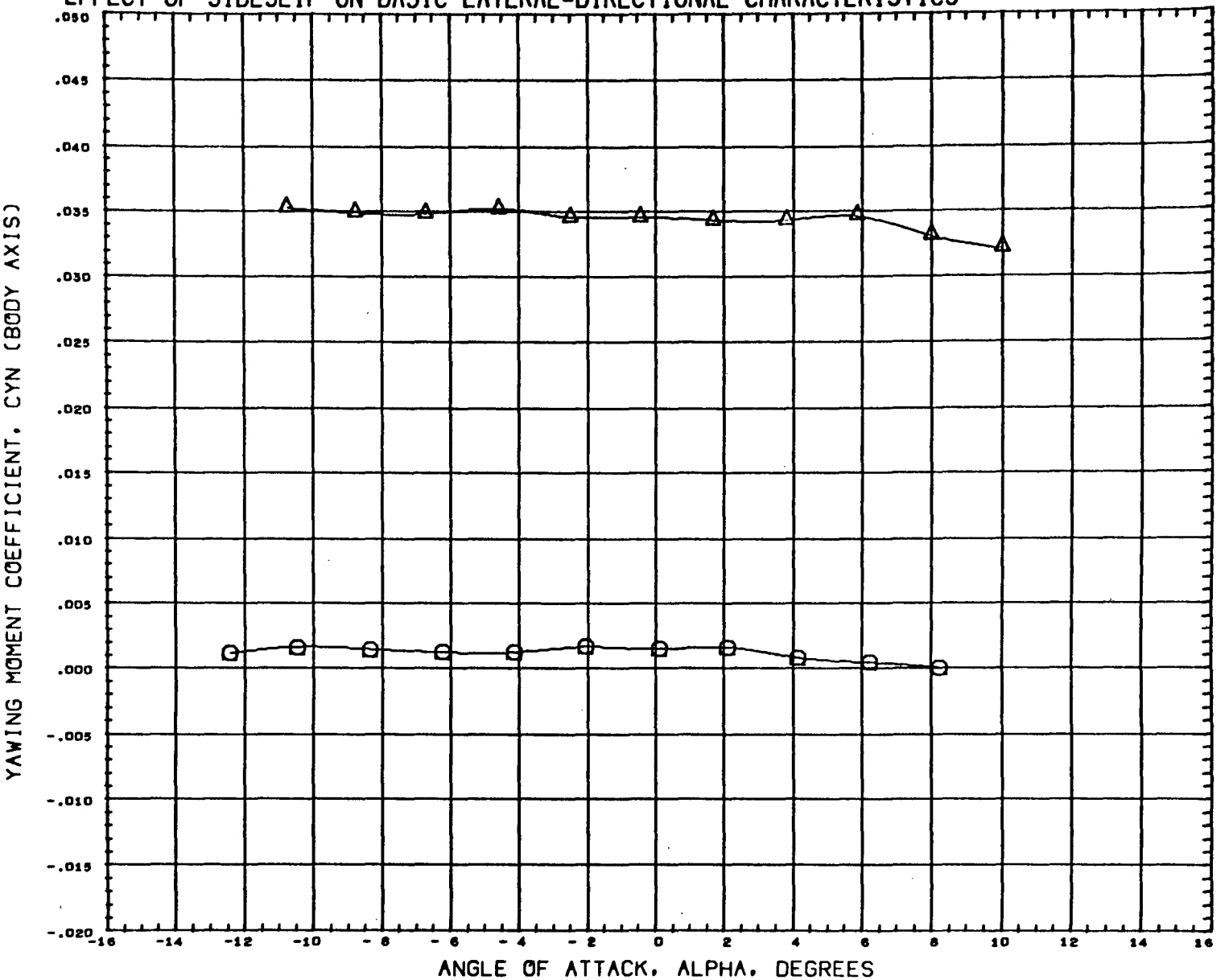
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 4.959

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



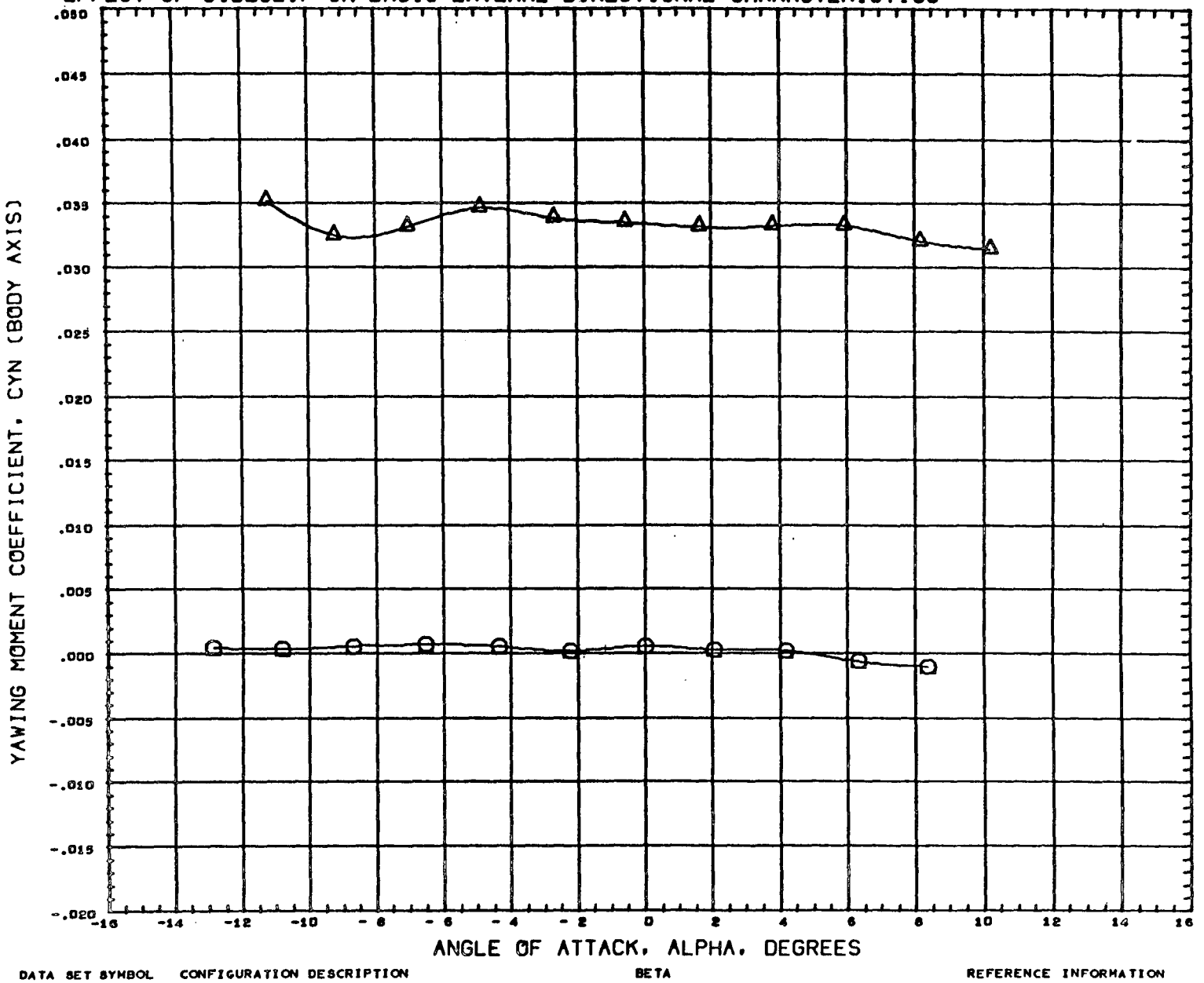
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 0.602

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

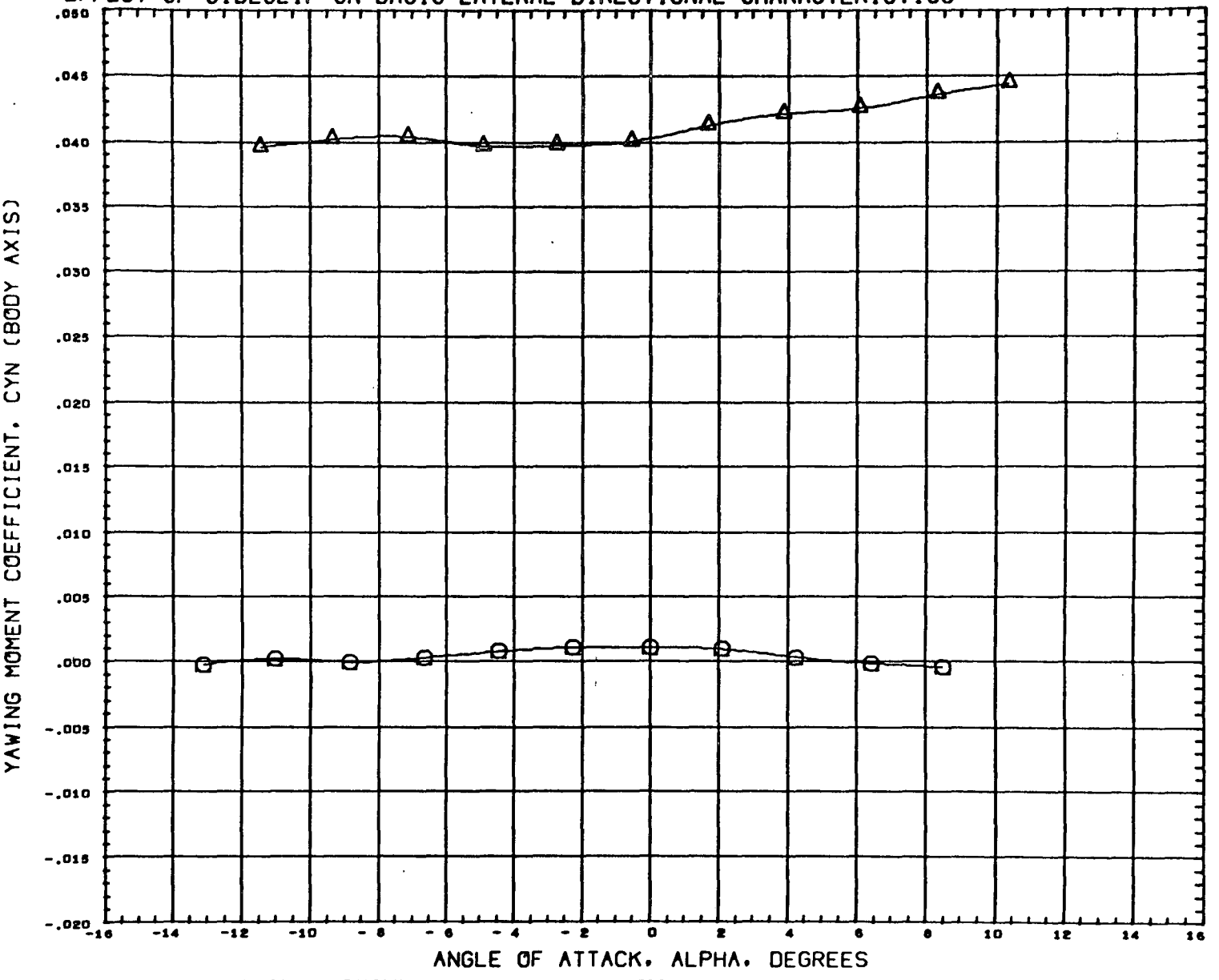


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 0.900

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	-0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

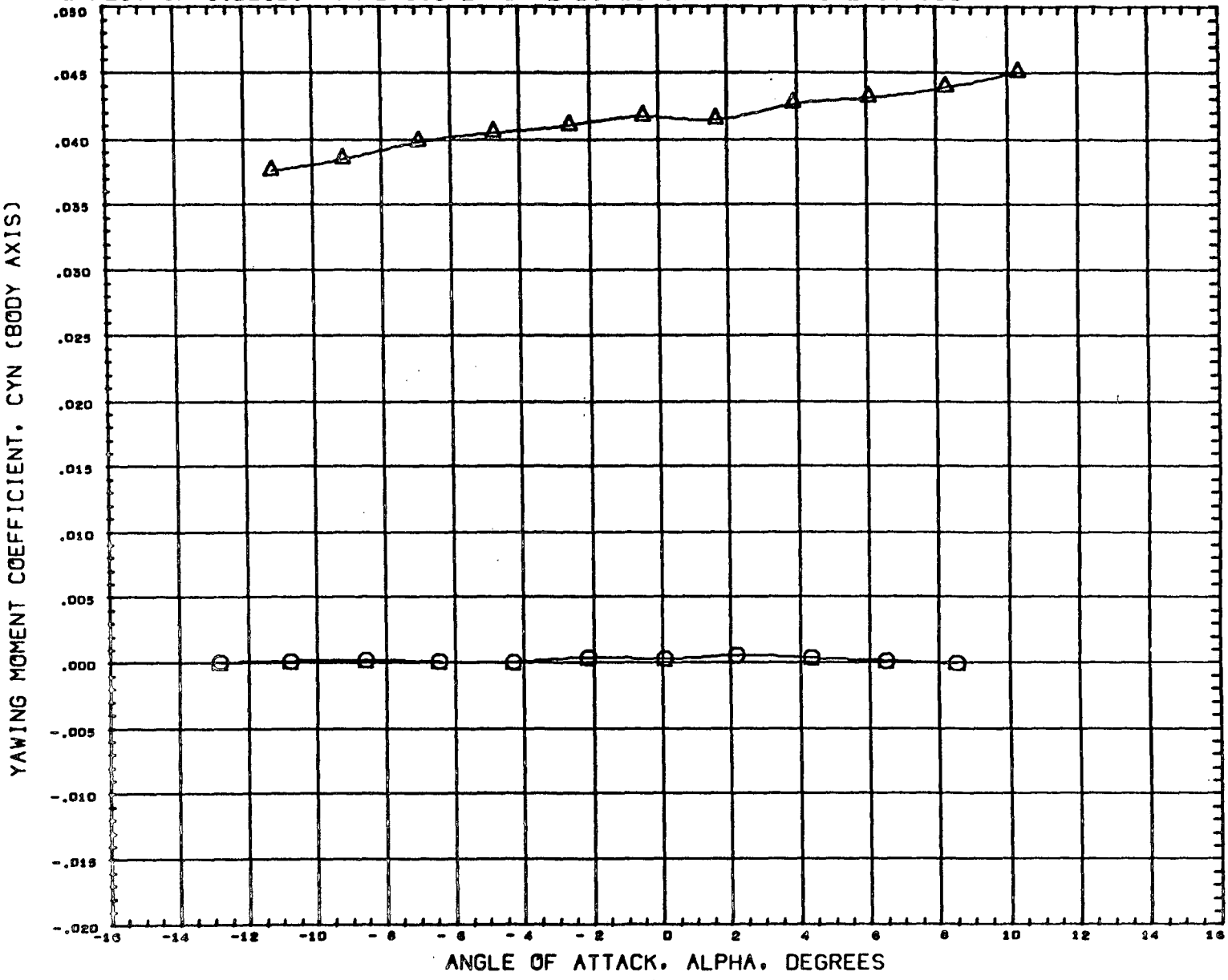


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 1.198

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

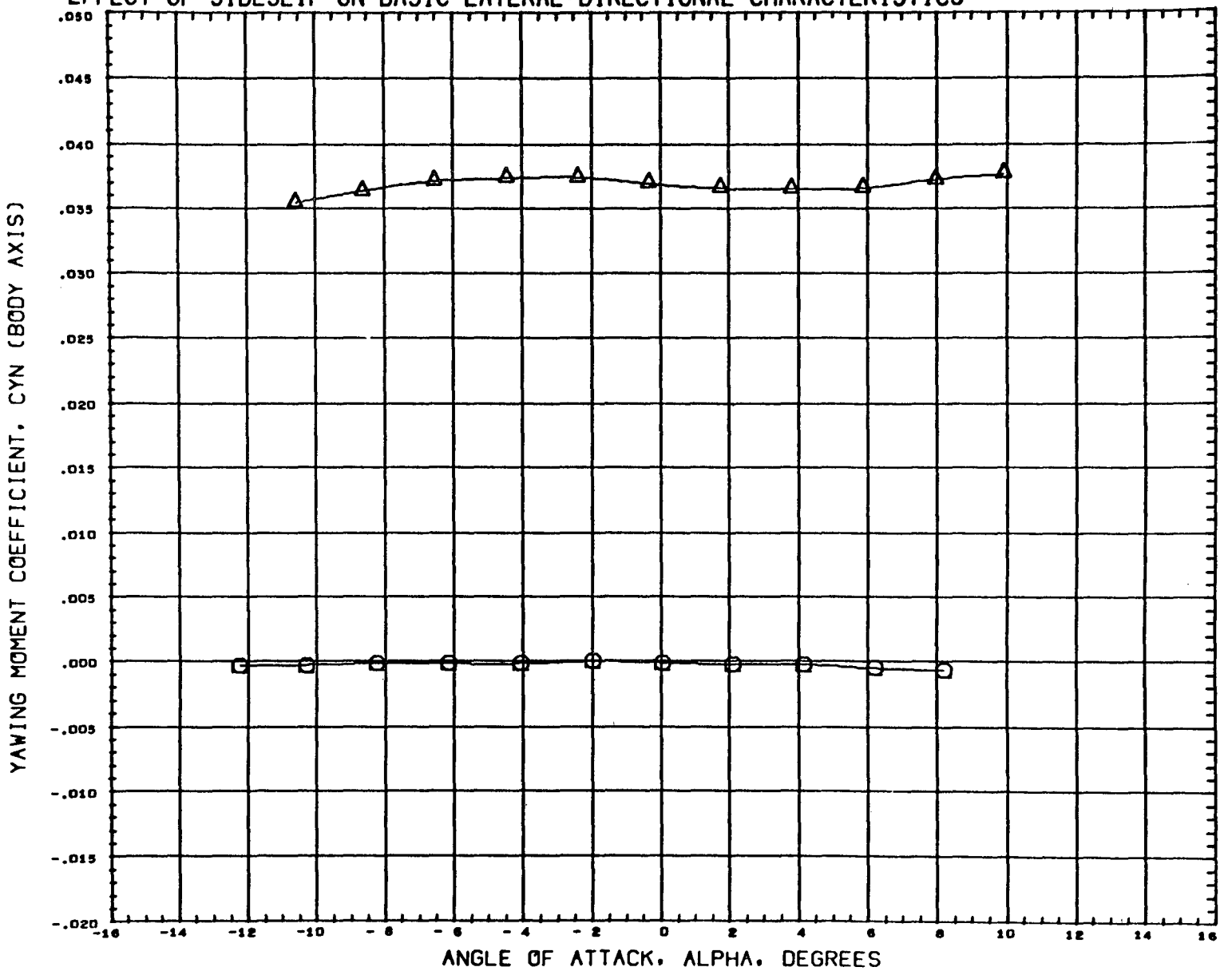


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 1.965

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

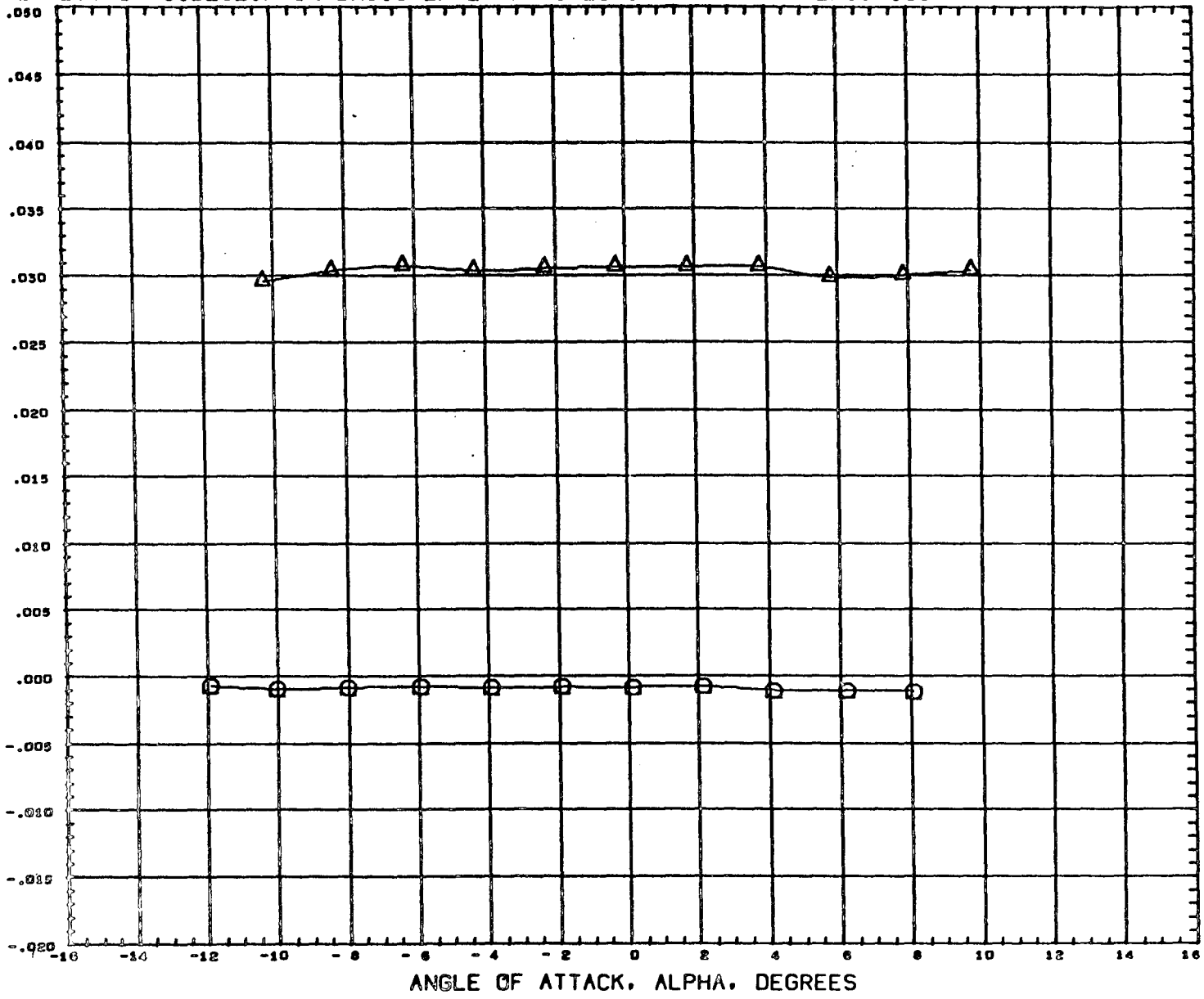


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

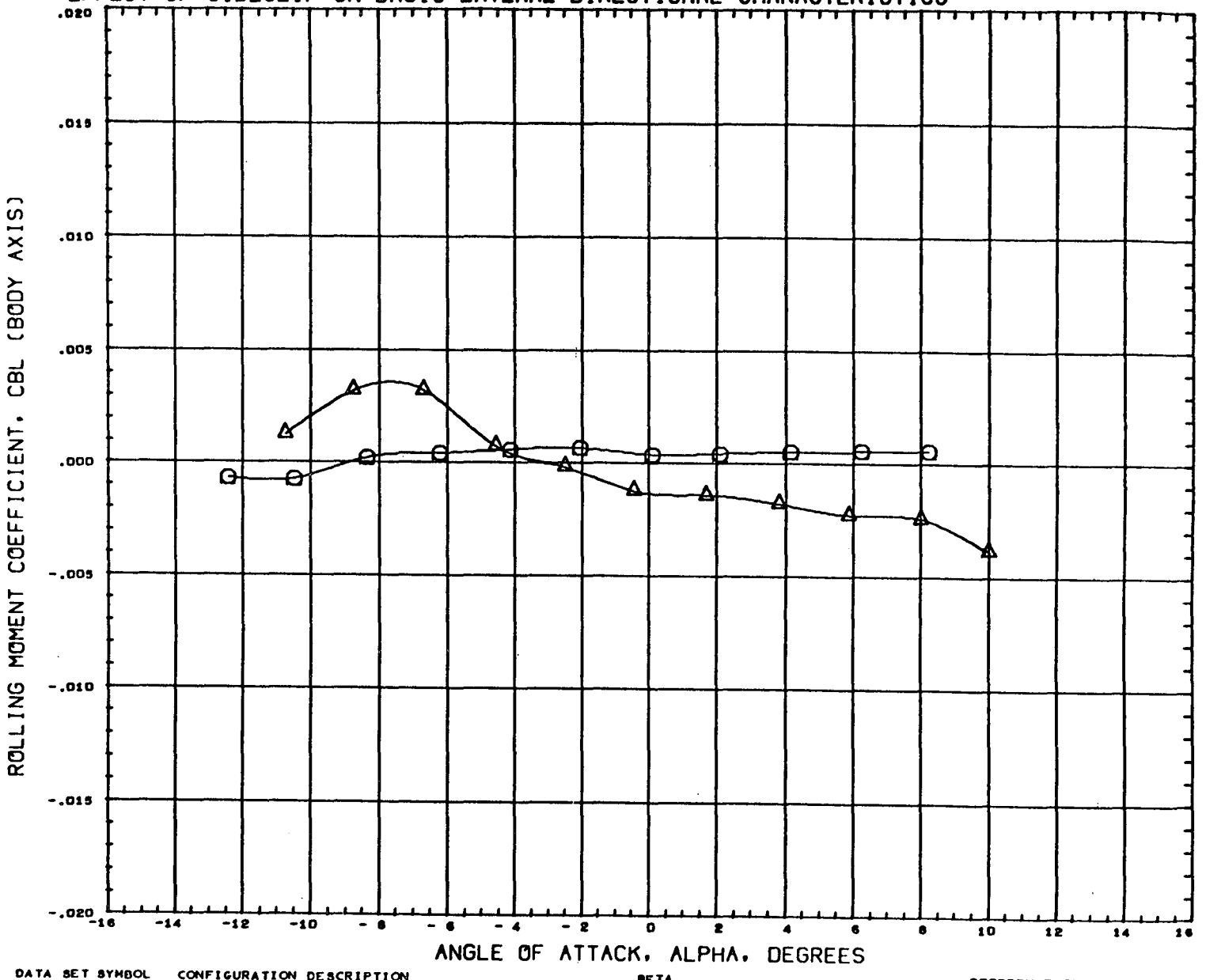


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 4.039

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.0930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

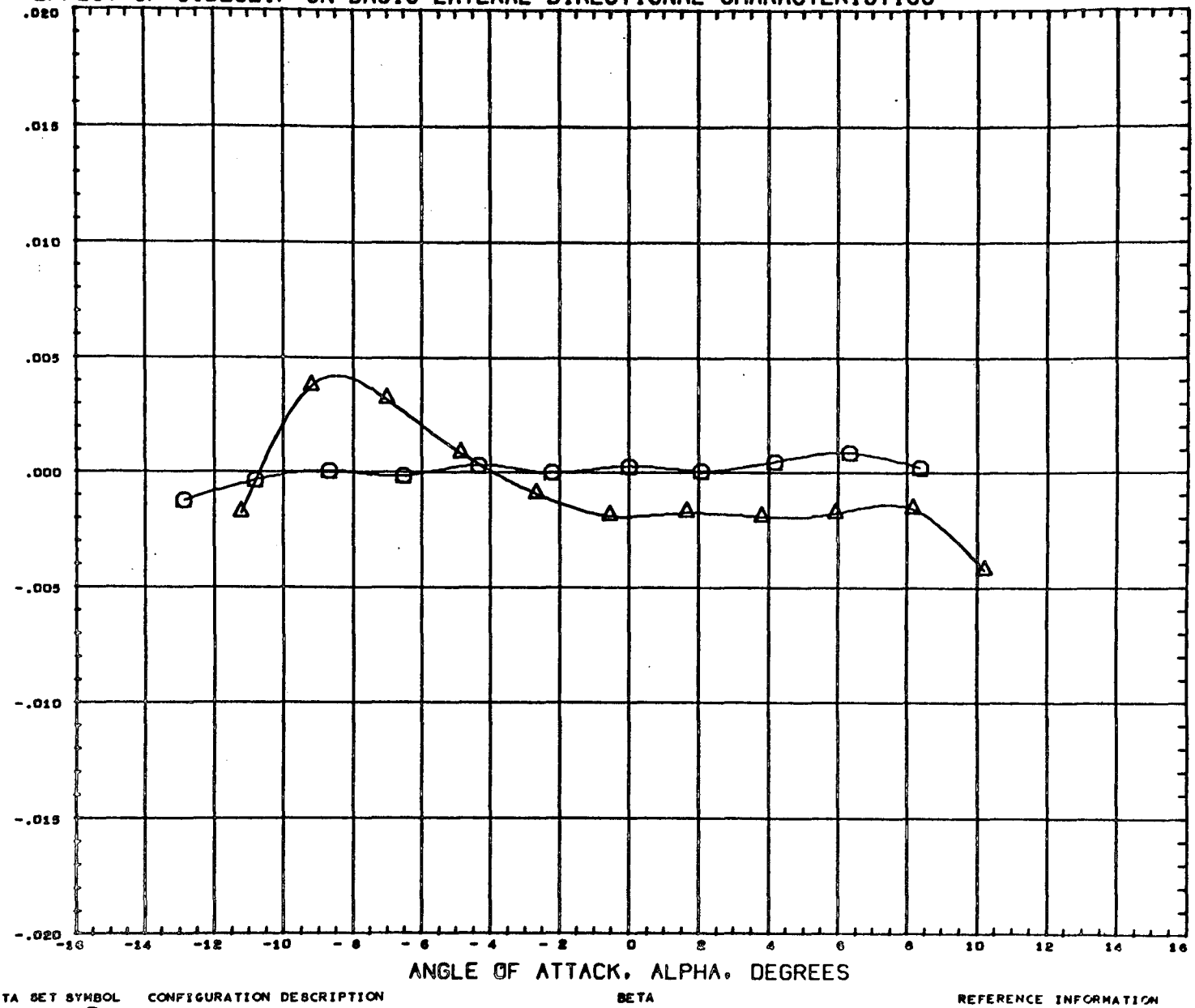


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 0.602

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

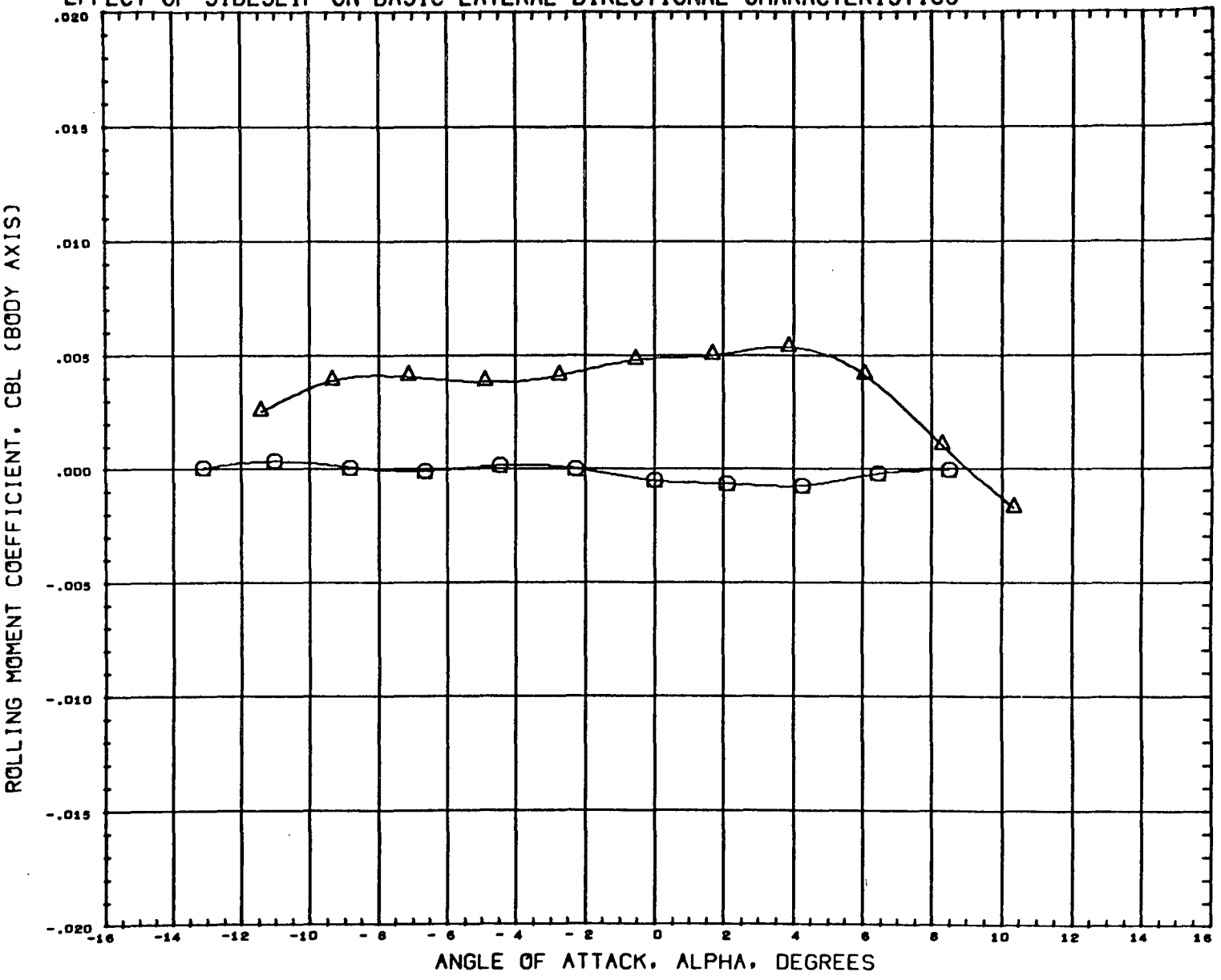


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 0.000

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

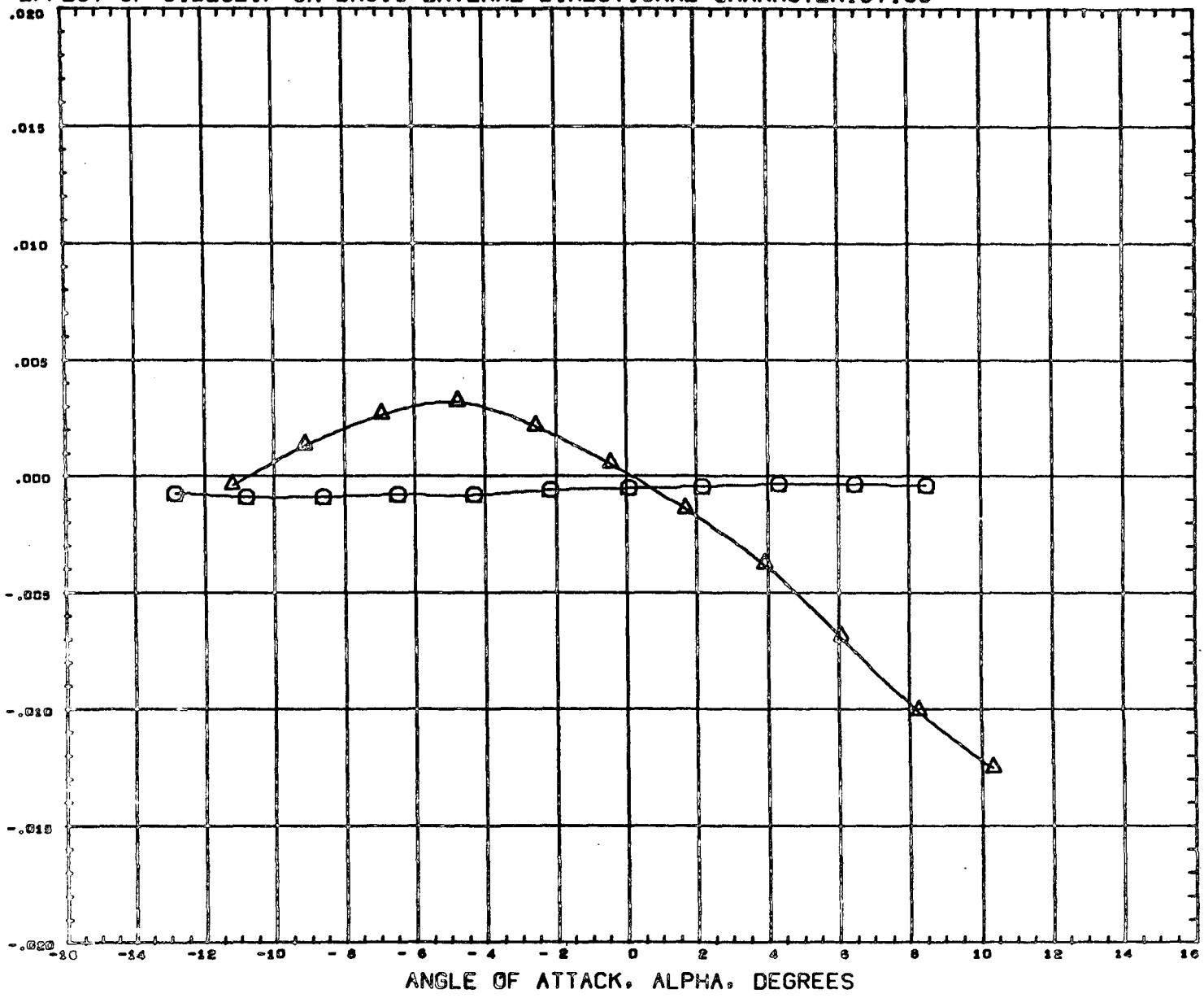


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 1.196

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

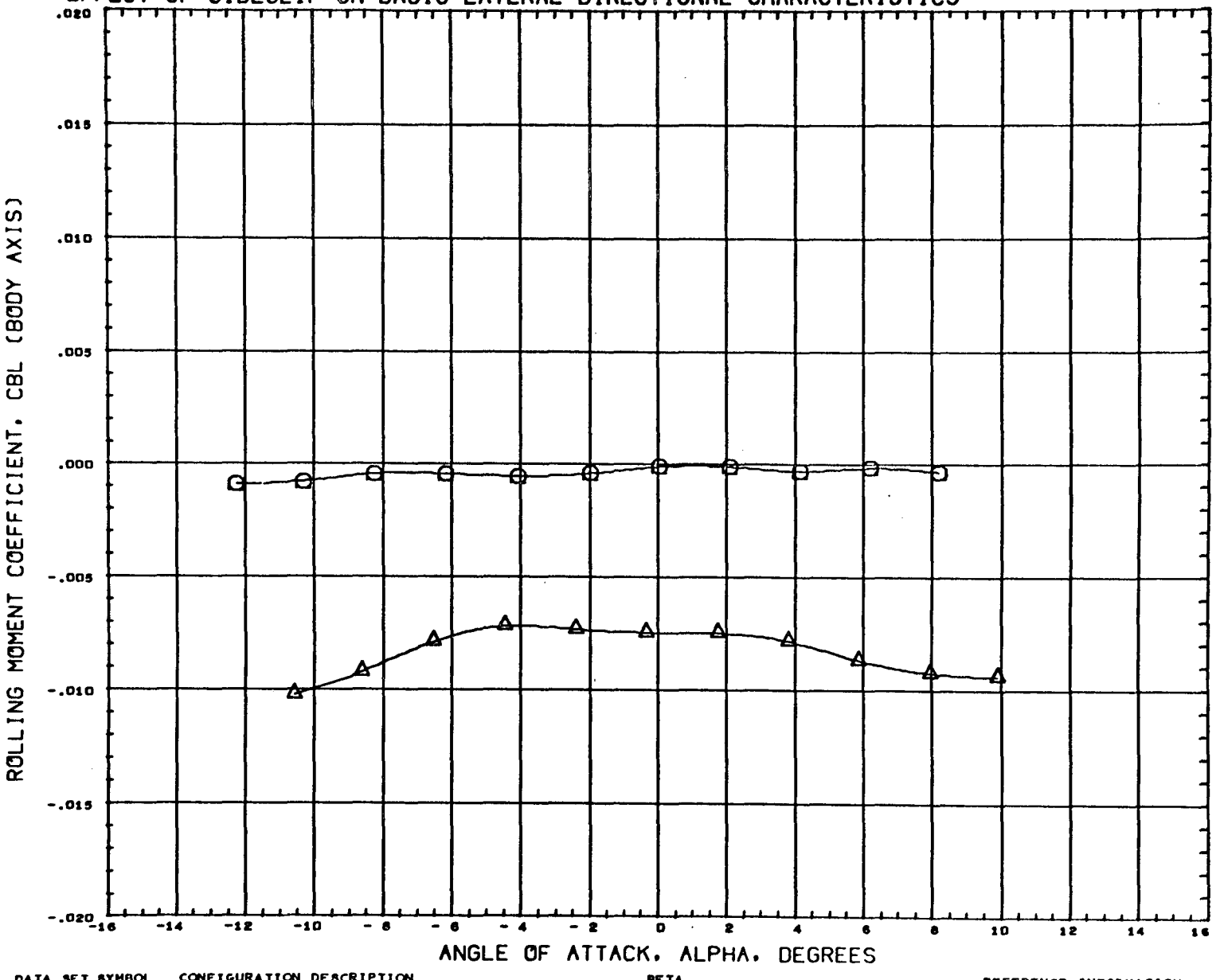


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(85107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(85106A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 1.060

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

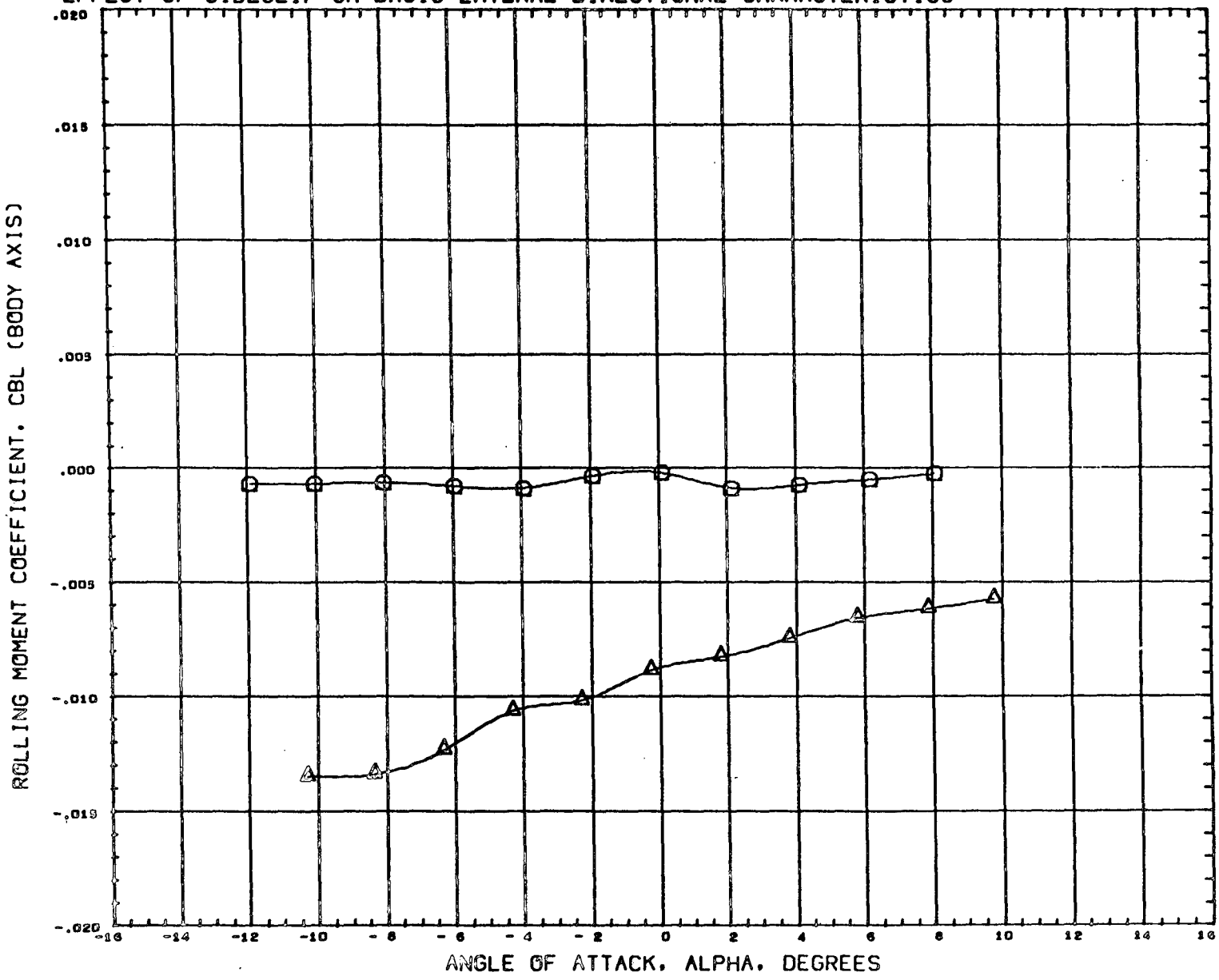


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(B5106A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	80 IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

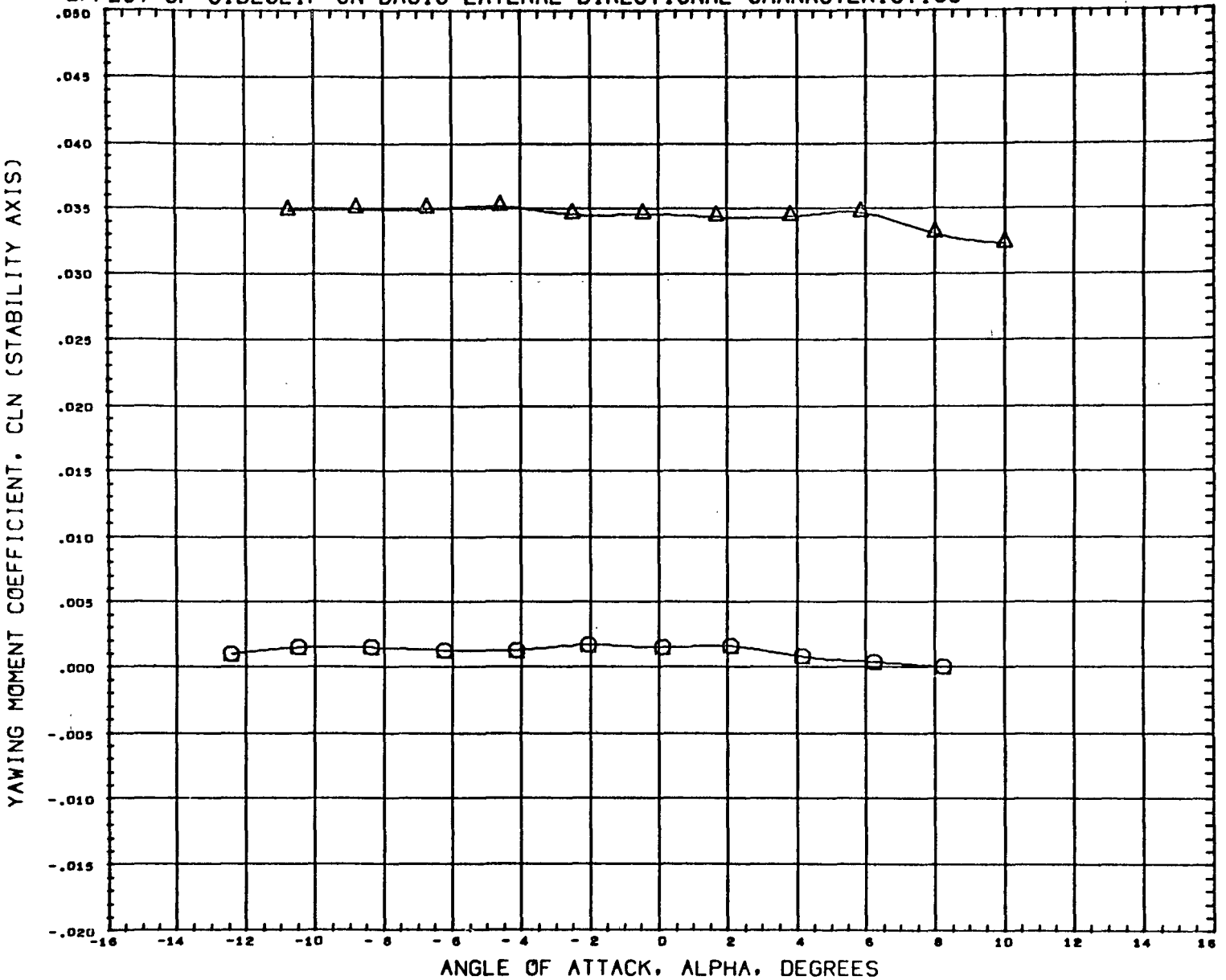


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(B5107A)	○	MSFC509 NR 110C ORBITER ◇ TANK B12W26E16V36	0.000
(B5109A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 4.950

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6000	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

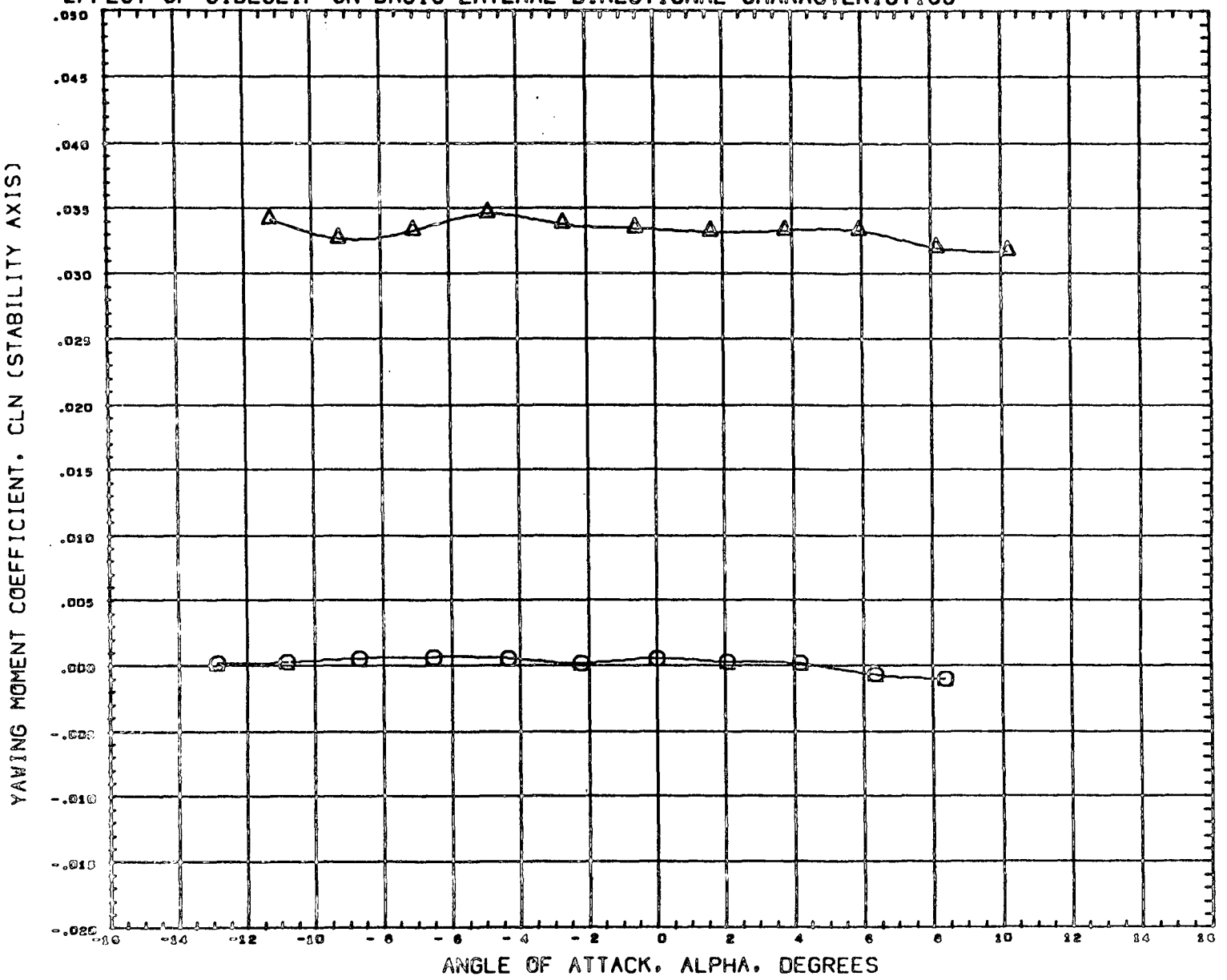


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(A5106A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 0.602

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

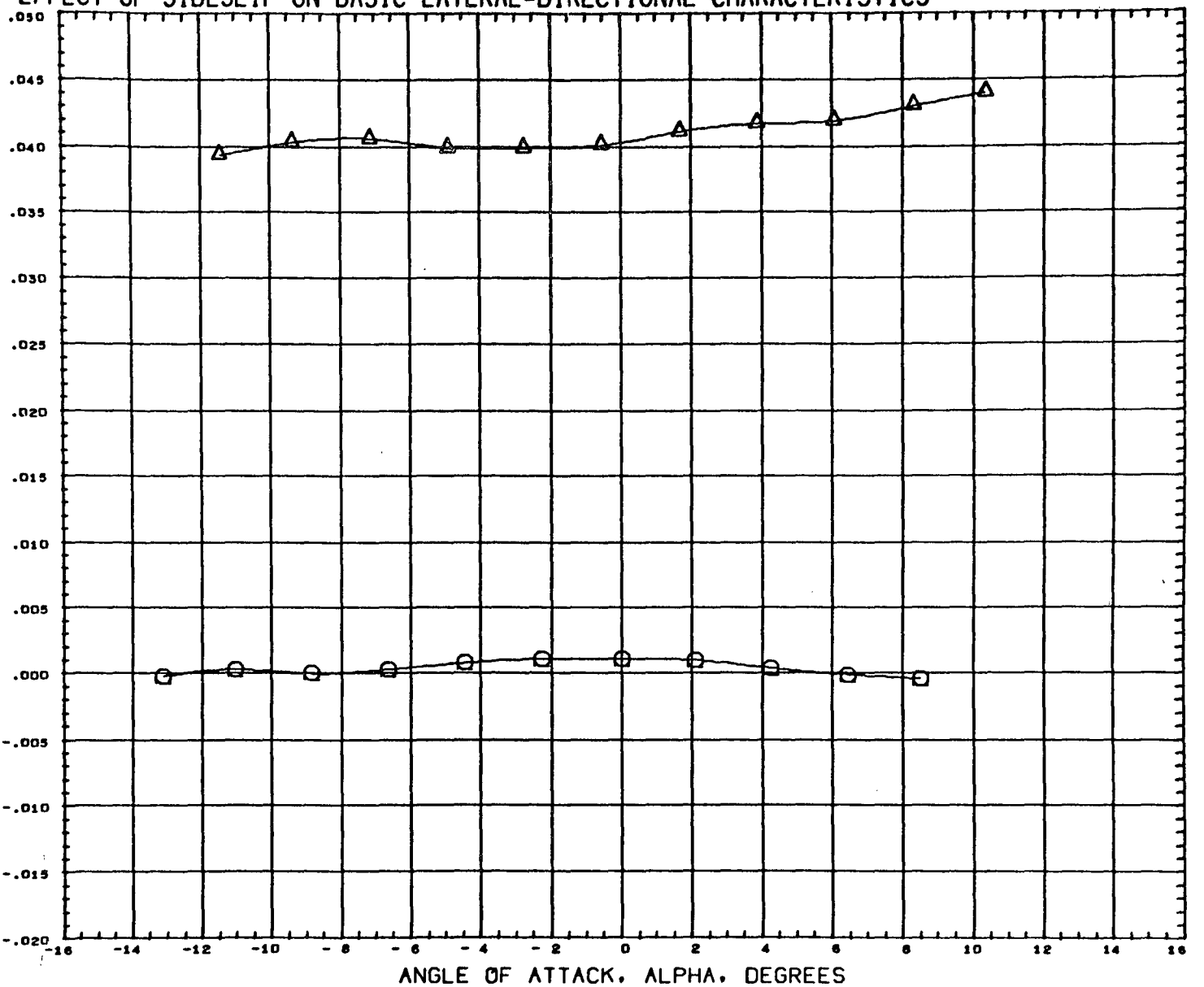


DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A9107A)	MSFC509 NR 110C ORBITER + TANK 812W26E16V36	0.000
(A9108A)	MSFC509 NR 110C ORBITER + TANK 812W26E16V36	-6.000

REFERENCE INFORMATION		
SREF	9.4420	80 IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

MACH 0.000

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



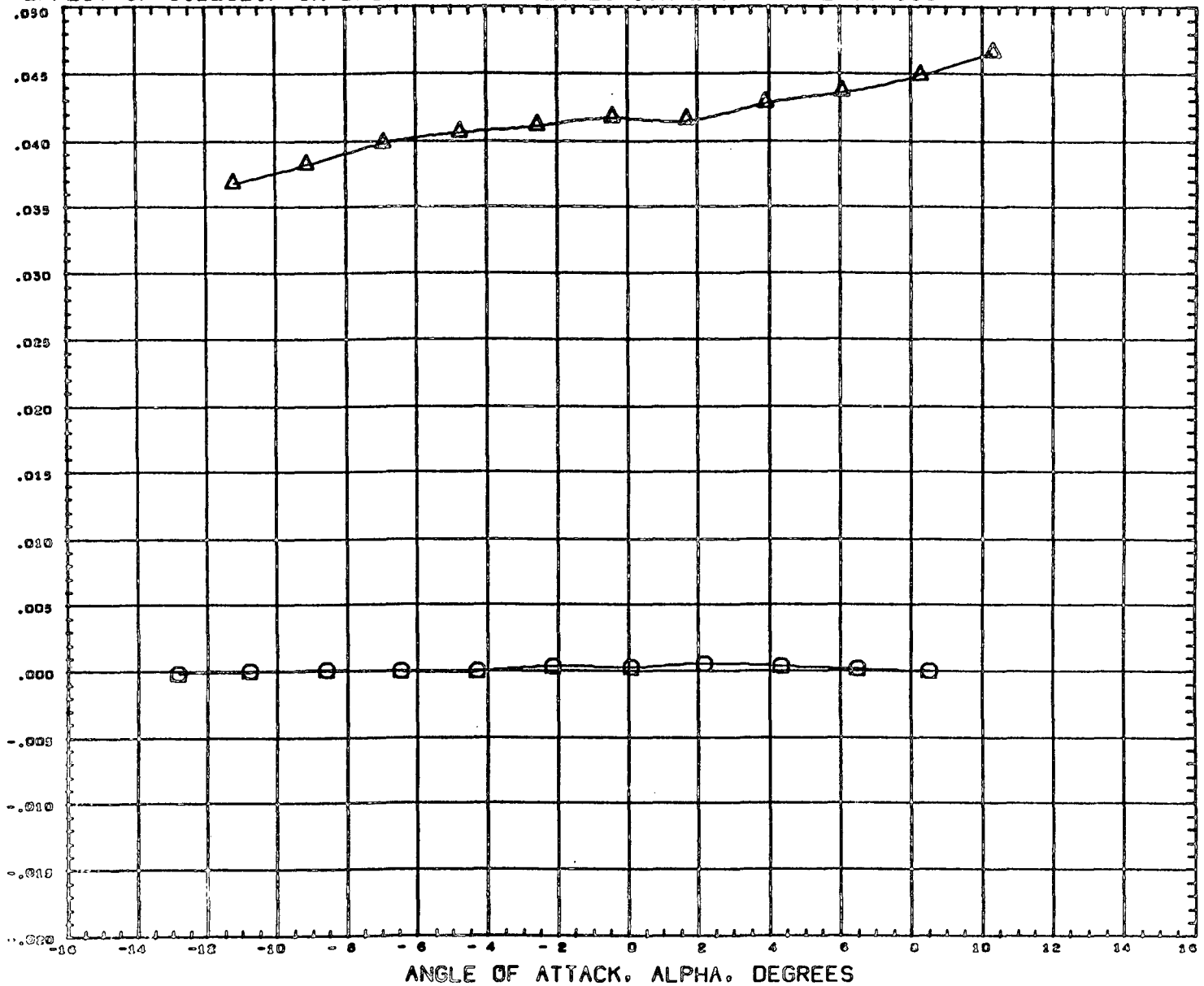
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(A5106A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 1.198

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



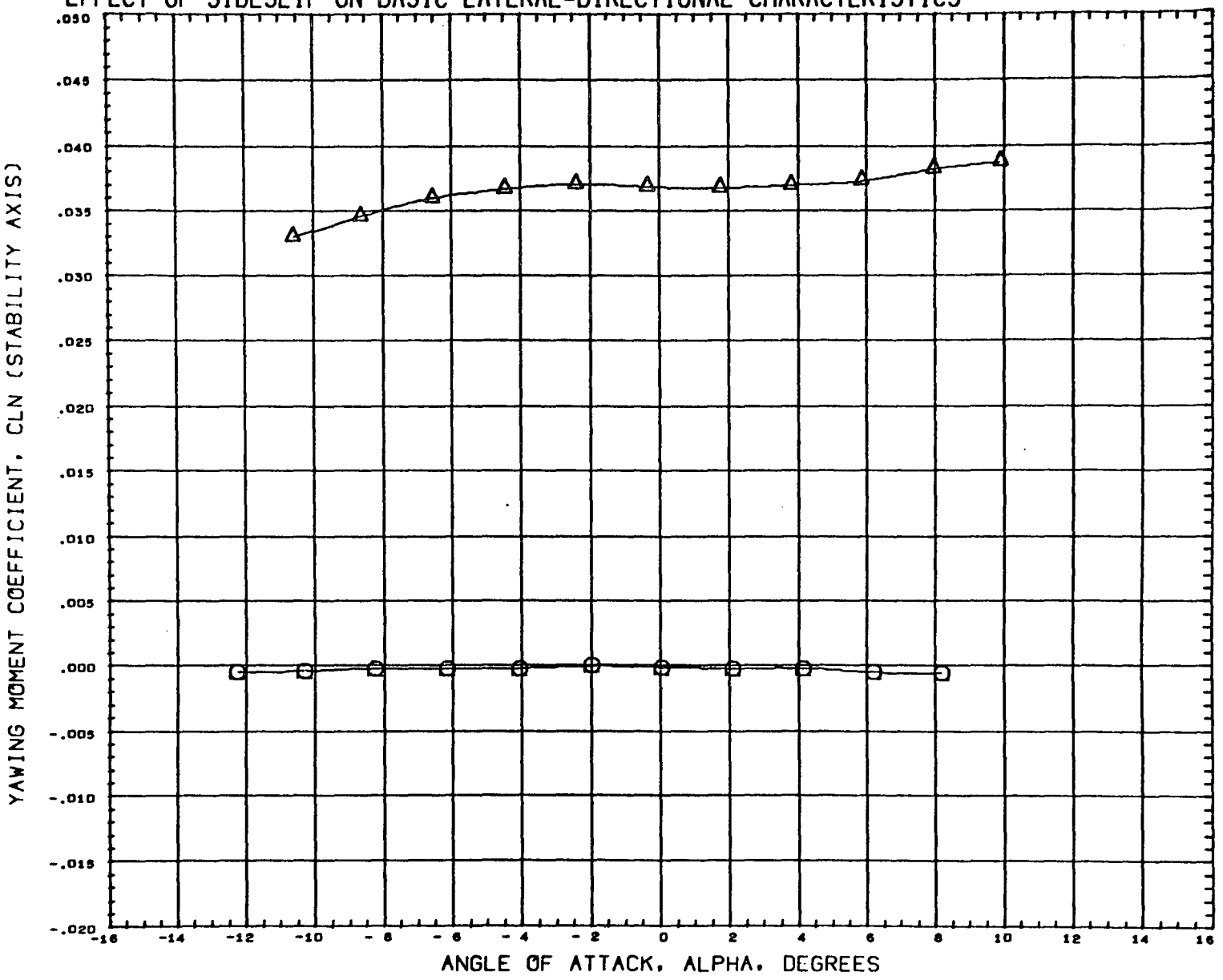
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A9107A)		MDFC909 NR 110C ORBITER + TANK B12W26E16V36	0.000
(A9106A)		MDFC909 NR 110C ORBITER + TANK B12W26E16V36	-0.000

MACH 1.003

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



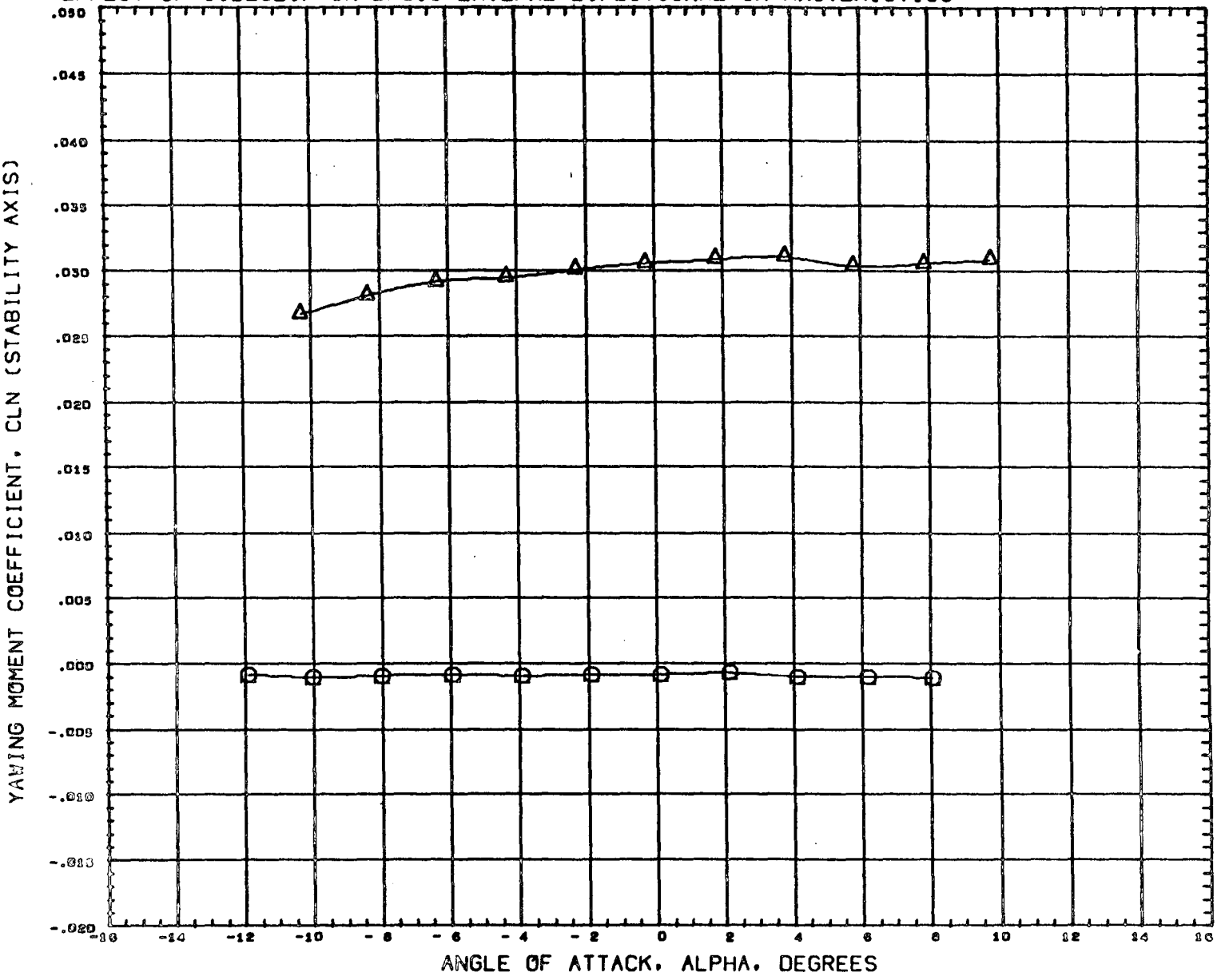
DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(A5106A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION

SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

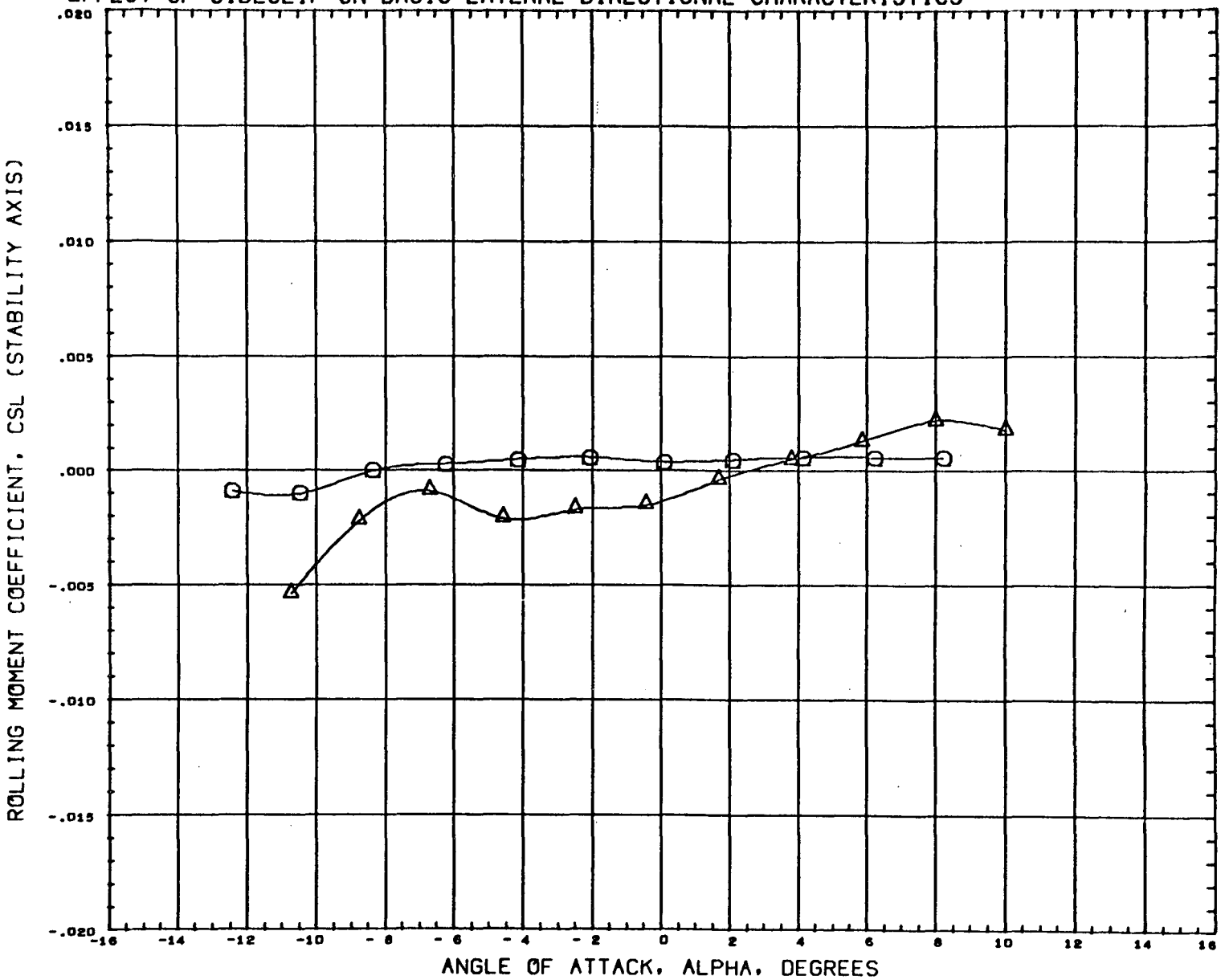


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A9107A)		MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(A9100A)		MSFC909 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 4.959

REFERENCE INFORMATION		
SREF	0.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6700	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

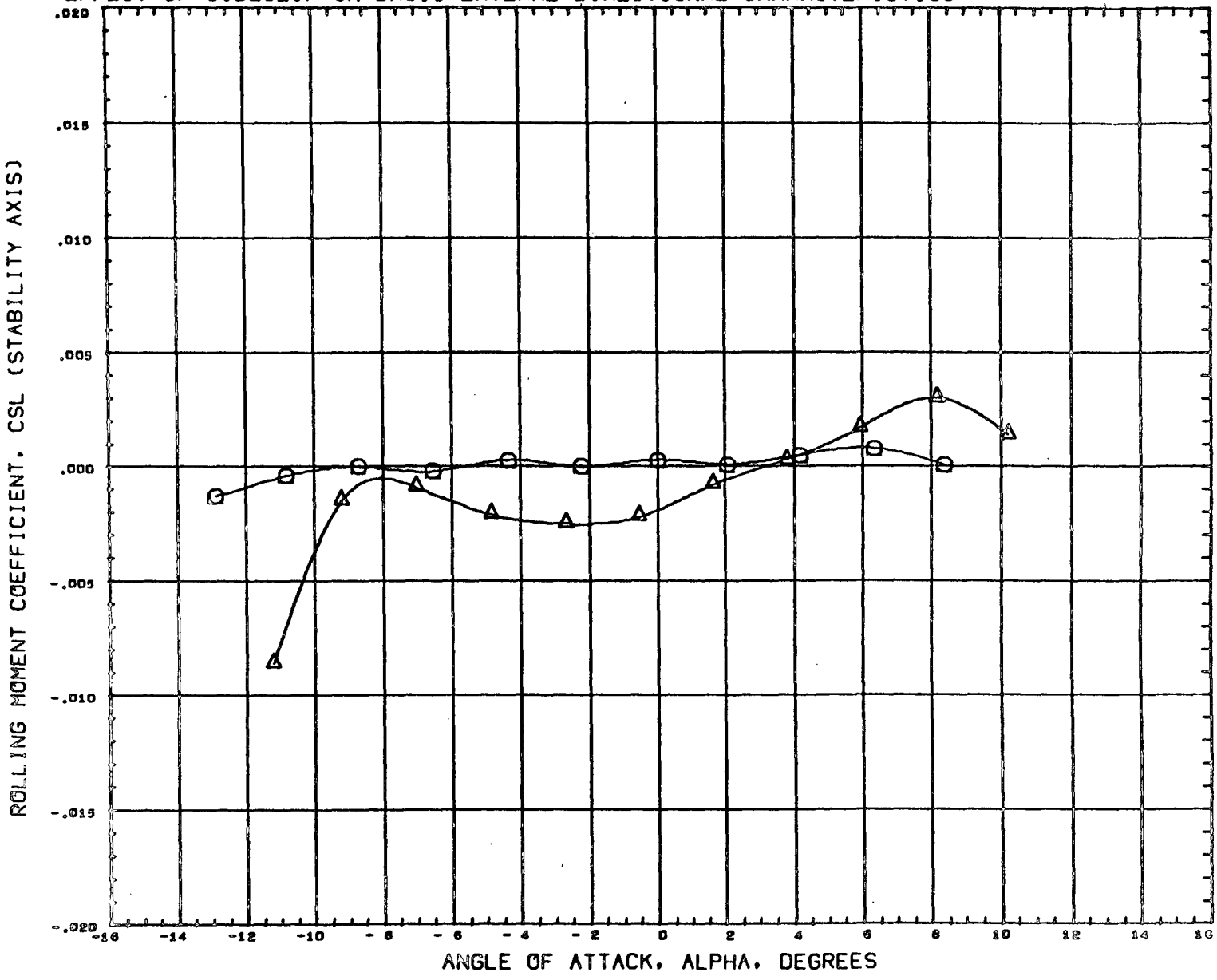


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5107A)	○	M8FC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(A5106A)	△	M8FC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 0.602

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6760	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

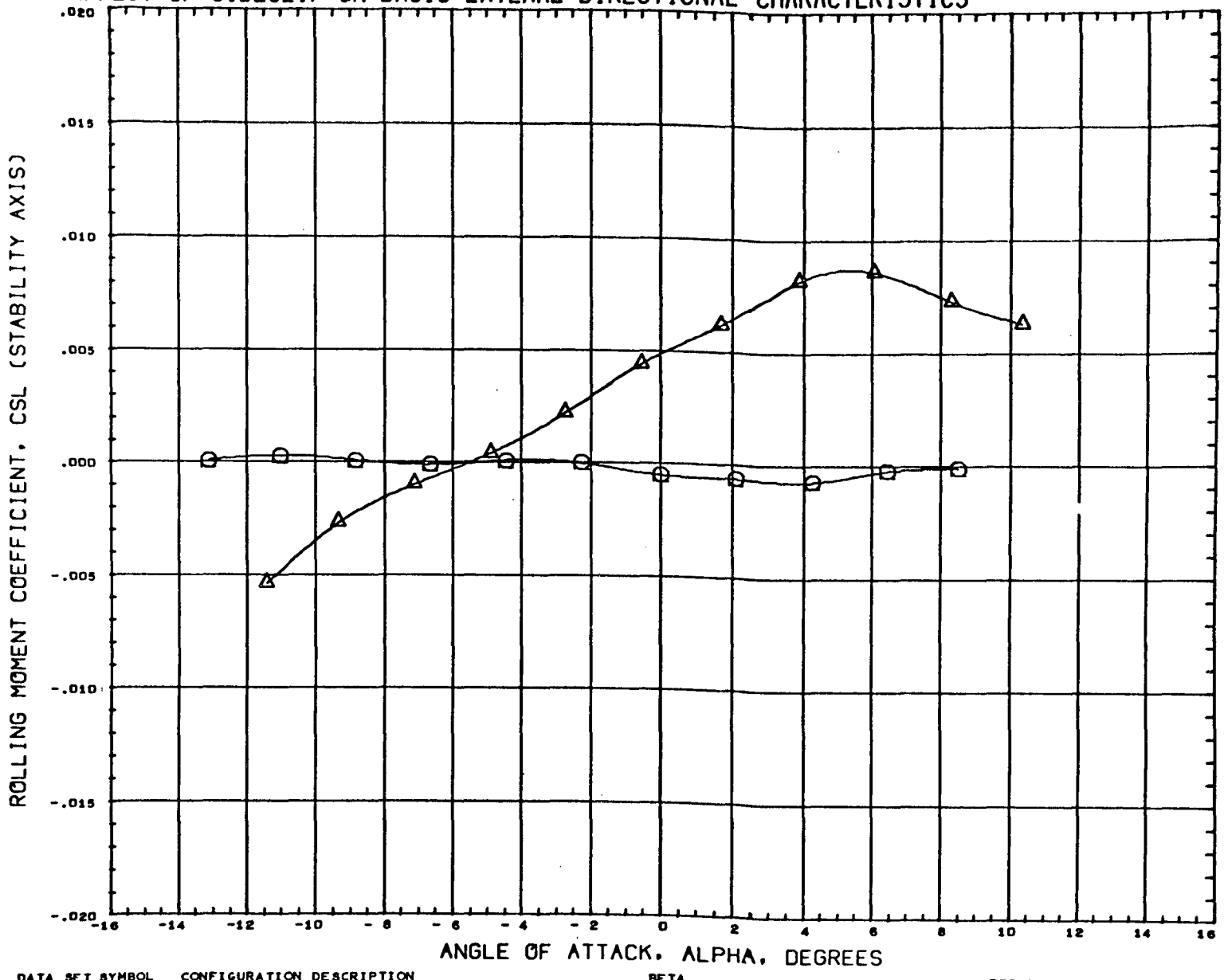


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(AS107A)	○	MSFC909 NR 110C ORBITER + TANK B12W26E16V36	0.000
(AS106A)	△	MSFC909 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 0.000

REFERENCE INFORMATION		
SREF	0.4420	SQ IN
LREF	2.6030	INCHES
BREF	4.6780	INCHES
XMRP	3.6060	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

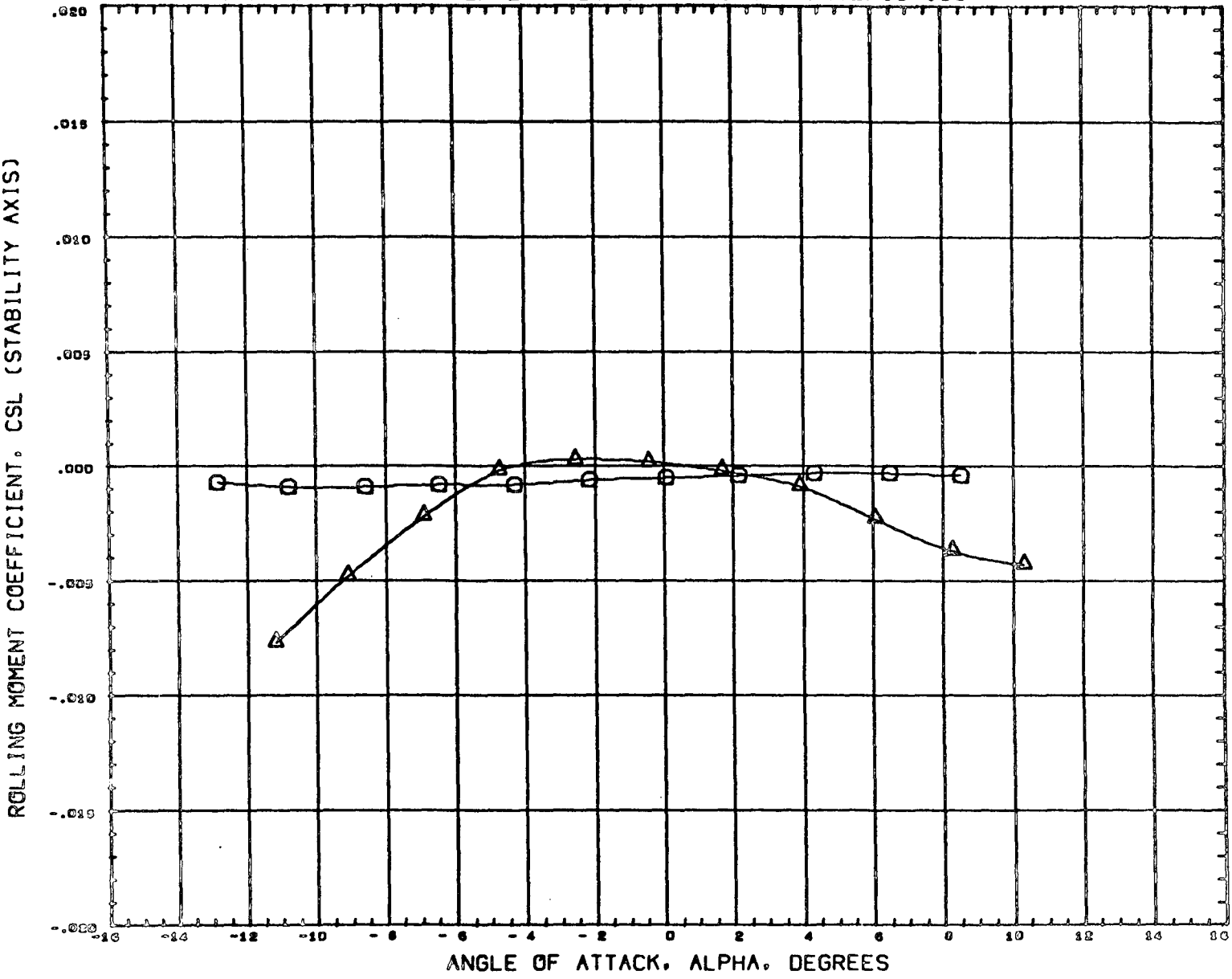


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(A5106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 1.198

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

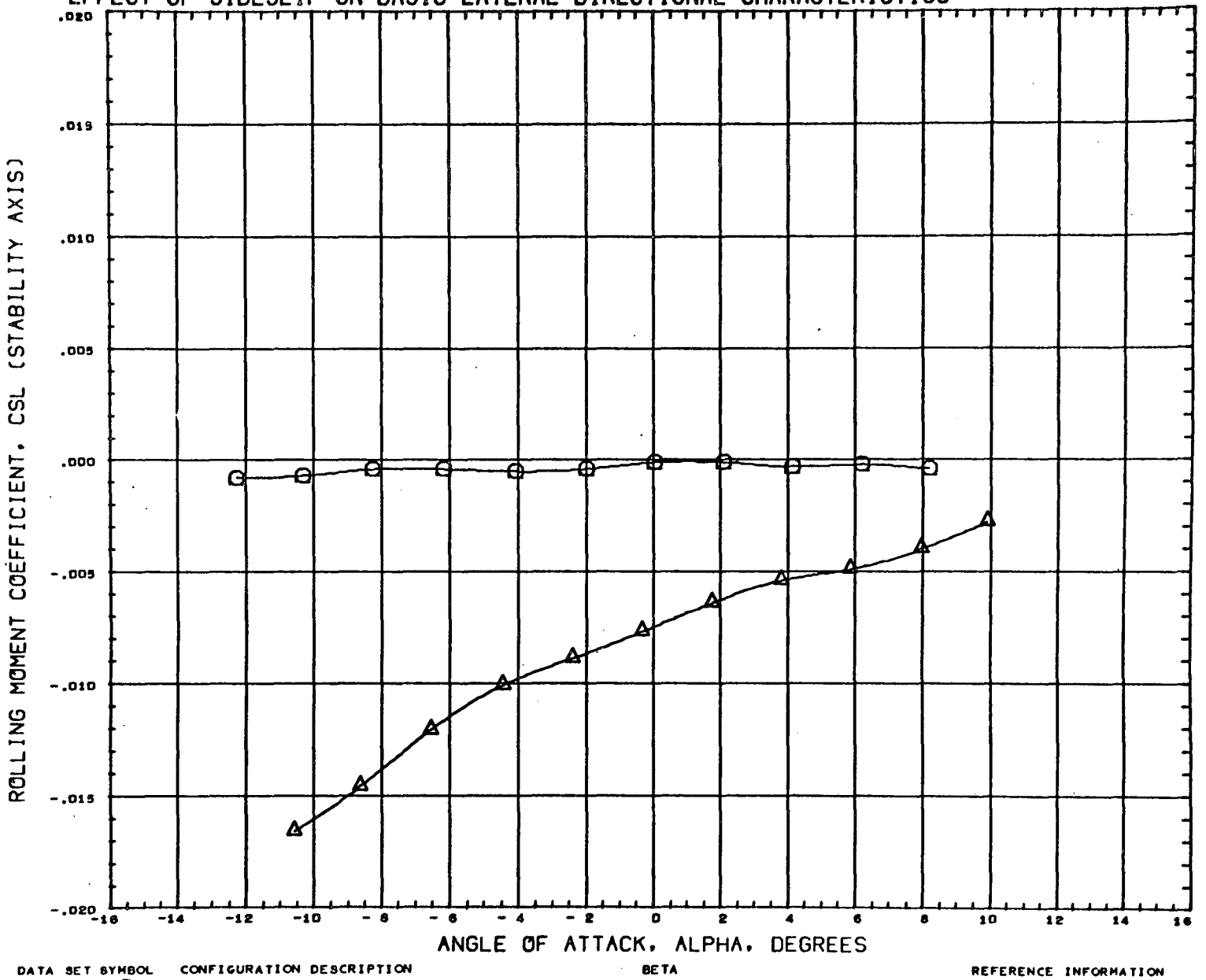


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A9107A)	○	M8FC5D9 NR 11OC ORBITER + TANK B12W26E16V36	0.000
(A9100A)	△	M0FC9DD NR 11OC ORBITER + TANK B12W26E16V36	-6.000

MACH 1.965

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	8.6930	INCHES
BREF	4.6700	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS

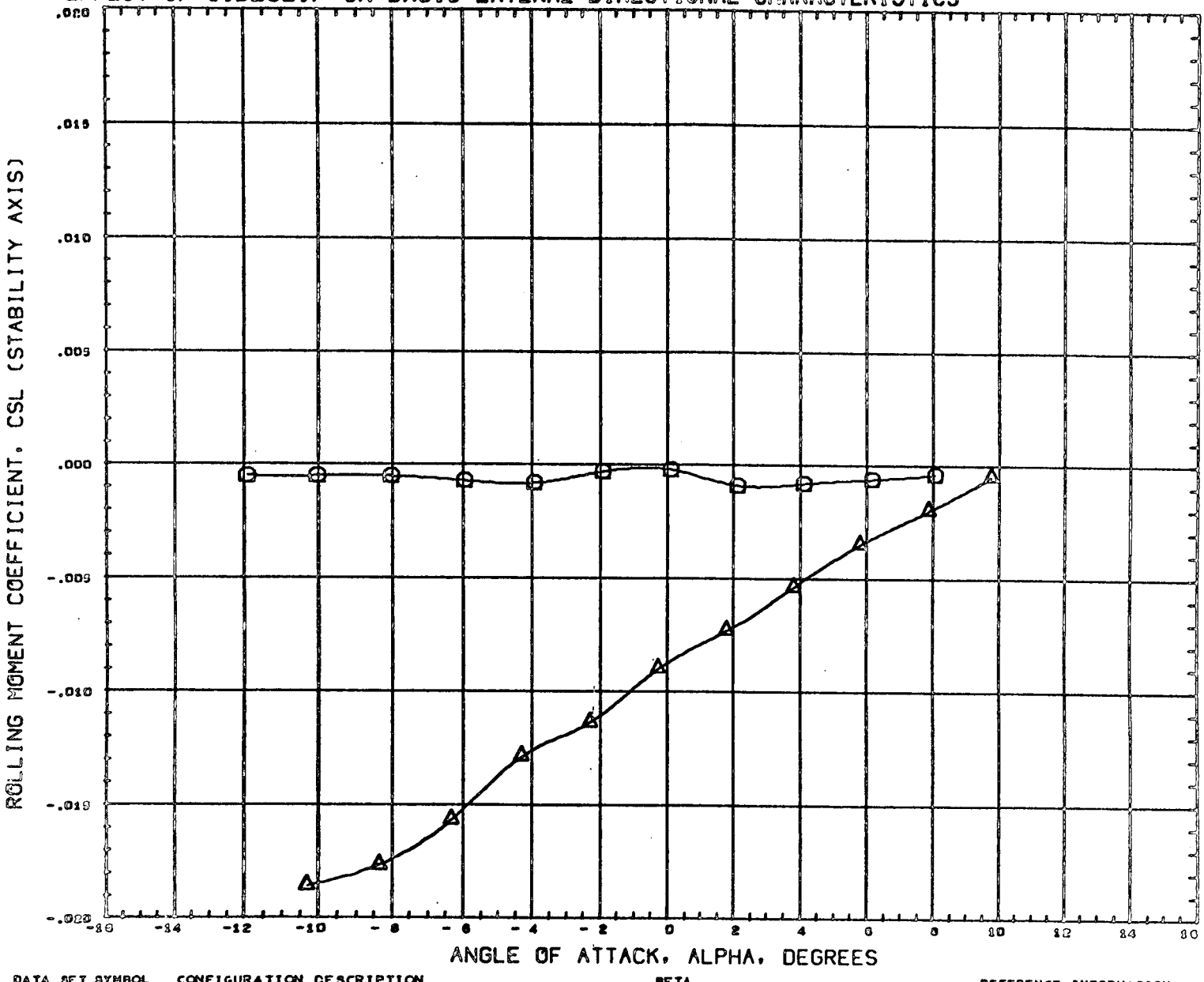


DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A5107A)	○	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	0.000
(A5106A)	△	MSFC509 NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 2.990

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.6930	INCHES
BREF	4.6780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP	- 0.0990	INCHES
SCALE	0.0044	SCALE

EFFECT OF SIDESLIP ON BASIC LATERAL-DIRECTIONAL CHARACTERISTICS



DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA
(A91G7A)		MDFC90D NR 110C ORBITER + TANK B12W26E16V36	0.000
(A91G0A)		MDFC90D NR 110C ORBITER + TANK B12W26E16V36	-6.000

MACH 4.959

REFERENCE INFORMATION		
SREF	9.4420	SQ IN
LREF	2.0930	INCHES
DREF	4.0780	INCHES
XMRP	3.6080	INCHES
YMRP	0.0000	
ZMRP -	0.0000	INCHES
SCALE	0.0044	SCALE