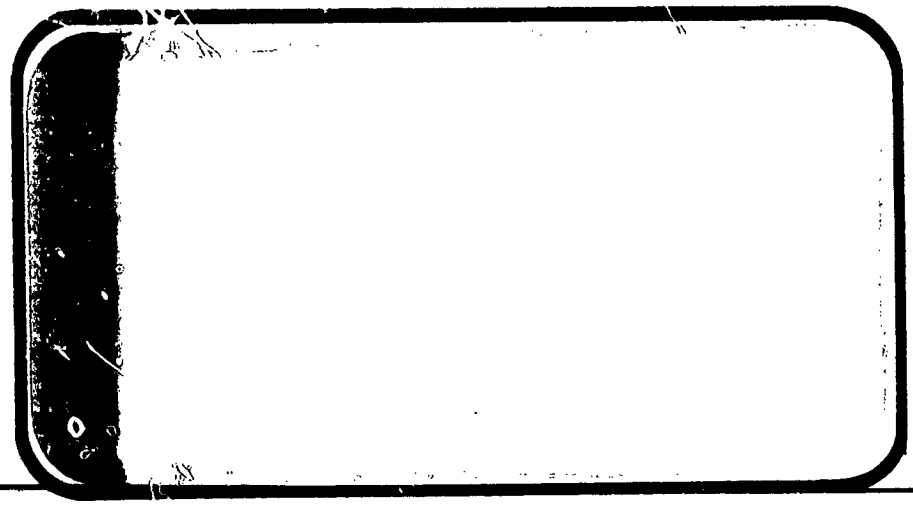
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION



(NASA-CR-128795) WIND TUNNEL TEST OF THE 0.010-SCALE SPACE SHUTTLE INTEGRATED VEHICLE IN THE NASA-AMES 3.5 FOOT HYPERSONIC WIND TUNNEL (IA10) (Chrysler Corp.) 138 p HC $9.00 CSCL 22B

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SPACE SHUTTLE

AEROTHERMODYNAMIC DATA REPORT

JOHNSON SPACE CENTER

HOUSTON, TEXAS

DATA MANagement services

SPACE DIVISION CHRYSLER CORPORATION

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WIND TUNNEL TEST OF THE 0.010-SCALE SPACE SHUTTLE INTEGRATED VEHICLE IN THE NASA-AMES 3.5-FOOT HYPERSONIC WIND TUNNEL (IA10)

By

F. F. Fitzgerald and M. T. Petrozzi, Rockwell International
J. W. Cleary and J. A. Mellenthin, NASA Ames

By

Data Management Services
Chrysler Corporation Space Division
New Orleans, La. 70189

for

Engineering Analysis Division

Johnson Space Center
National Aeronautics and Space Administration
Houston, Texas

WIND TUNNEL TEST SPECIFICS:

Test Number: ARC 3.5-169

NASA Series No.: IA10

Test Dates: 1 thru 3 August 1973

FACILITY COORDINATOR:

C. R. Nysmith
Mail Stop 229-5
Ames Research Center
Moffett Field, California 94035
Phone: (415) 965-5274

PROJECT ENGINEERS:

F. F. Fitzgerald, M. T. Petrozzi
Rockwell International Space Div.
12214 Lakewood Blvd.
Mail Code AC07
Downey, California 90241
Phone: ~~(213) 922-4898~~

J. W. Cleary, J. A. Mellenthin
NASA/Ames Research Center
Mail Stop 229-1
Moffett Field, California 94035
Phone: (415) 965-6211

DATA MANAGEMENT SERVICES:

This document has been prepared by:

D. A. Sarver

M. J. Lanfranco
Liaison Operations

B. W. Myers
Data Operations

This document has been reviewed and is approved for release.

N. D. Kemp
Data Management Services

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WIND TUNNEL TEST OF THE 0.010-SCALE SPACE SHUTTLE INTEGRATED VEHICLE IN THE NASA-AMES 3.5-FOOT HYPERSONIC WIND TUNNEL (IA10)

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ABSTRACT

Experimental aerodynamic investigations were conducted in the NASA Ames Research Center 3.5-Foot Hypersonic Wind Tunnel from August 1, 1973 to August 3, 1973 on a 0.010-scale model of the Space Shuttle Vehicle orbiter and external tank (model no. 32 OT).

The purpose of the test was to evaluate the basic hypersonic stability characteristics of the external tank and orbiter and to define orbiter plume effects on aero characteristics using solid plumes.

The test was conducted at angles of attack from -10° to 30° and angles of sideslip of -10° thru 10°. Six component force data and static base pressures were recorded during the test.

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COEFFICIENTS SCHEDULE:

A: CA, CN, CLM, vs. ALPHA

CN vs. CLM

B: CY, CBL, CYN vs. BETA

CY vs. CYN

C: CY, CBL, CYN vs. ALPHA

D: CN/A, CLM/A, XAC/L vs. ALPHA

DCY/DA, DCBLDA, DCYNDA, DCN/DA, DCLMDA, DCA/DA vs. ALPHA

E: DCY/DB, DCBLDB, DCYNDB vs. ALPHA

NOMENCLATURE
General

SYMBOL	PLOT SYMBOL	DEFINITION
a		speed of sound; m/sec, ft/sec
C_p	CP	pressure coefficient; $(p_1 - p_\infty)/q$
M	MACH	Mach number; V/a
p		pressure; N/m^2, psf
q	Q(NSM)	dynamic pressure; $1/2\rho V^2$, N/m^2, psf
RN/L	RN/L	unit Reynolds number; per m, per ft
V		velocity; m/sec, ft/sec
α	ALPHA	angle of attack, degrees
β	BETA	angle of sideslip, degrees
ψ	PSI	angle of yaw, degrees
ϕ	PHI	angle of roll, degrees
ρ		mass density; kg/m^3, $slugs/ft^3$
		Reference & C.G. Definitions
c.g.		center of gravity
ℓ_{REF}	LREF	reference length or wing mean aerodynamic chord; m, ft
S	SREF	wing area or reference area; m^2, ft^2
	MRP	moment reference point
	XMRP	moment reference point on X axis
	YMRP	moment reference point on Y axis
	ZMRP	moment reference point on Z axis

SUBSCRIPTS

b	base
l	local
s	static conditions
t	total conditions
	free stream

Body-Axis System

Symbol	Plot Symbol	Definition
C_N	CN	normal-force coefficient; normal force/qS
C_A	CA	axial-force coefficient; axial force/qS
C_Y	CY	side-force coefficient; side force/qS
C_m	CLM	pitching-moment coefficient; pitching moment/qSℓ
C_n	CYN	yawing-moment coefficient; yawing moment/qSℓ
C_ℓ	CBL	rolling-moment coefficient; rolling moment/qSℓ

Stability-Axis System

C_L	CL	lift coefficient; lift/qS
C_D	CD	drag coefficient; drag/qS
L/D	L/D	lift-to-drag ratio; C_L/C_D

ADDITIONS TO NOMENCLATURE

$C_{N_{\alpha_{local}}}$	CN/A	local normal force coefficient derivative with alpha; per degree.
$C_{m_{\alpha_{local}}}$	CLM/A	local pitching moment coefficient derivative with alpha; per degree.
	XAC/L	local longitudinal center of pressure.

NOMENCLATURE (Continued)

Symbol	Plot Symbol	Definition
$Cy_{\delta a}$	DCY/DA	side force coefficient derivative with respect to total aileron deflection. Algebraic difference of the side force coefficients of two runs divided by the algebraic difference of the total aileron deflection angle of the runs; per degree.
$Cl_{\delta a}$	DCBLDA	rolling moment coefficient derivative with respect to total aileron deflection. Algebraic difference of the rolling moment coefficient of two runs divided by the algebraic difference of the total aileron deflection angle of the runs; body axis system; per degree.
$C_{n_{\delta a}}$	DCYNDA	yawing moment coefficient derivative with respect to total aileron deflection. Algebraic difference of the yawing moment coefficient of two runs divided by the algebraic difference of the total aileron deflection angle of the runs; body axis system; per degree
$C_{N_{\delta a}}$	DCN/DA	normal force coefficient derivative with respect to aileron deflection. Algebraic difference of normal coefficient of two runs divided by the algebraic difference of the total aileron deflection of the runs; body axis system; per degree.
$C_{m_{\delta a}}$	DCLMDA	pitching moment coefficient derivative with respect to aileron deflection. Algebraic difference of pitching moment coefficient of two runs divided by the algebraic difference of the total aileron deflection of the runs; body axis system; per degree.
$C_{A_{\delta a}}$	DCA/DA	axial force coefficient derivative with respect to aileron deflection. Algebraic difference of axial force of two runs divided by the algebraic difference of total aileron deflection of the runs; body axis system; per degree.
C_{Y_β}	DCY/DB	side force coefficient derivative with respect to beta. Algebraic difference of the side force coefficient of two runs divided by the algebraic difference of the side slip angle of the runs; per degree.

NOMENCLATURE (Continued)

Symbol	Plot Symbol	Definition
C_{l_β}	DCBLDB	rolling moment coefficient derivative with respect to beta. Algebraic difference of the rolling moment coefficient of two runs divided by the algebraic difference of the side slip angle of the runs; body axis system; per degree.
$C_{n_{\delta r}}$	DCYNDB	yawing moment coefficient derivative with respect to beta. Algebraic difference of the yawing moment coefficient of two runs divided by the algebraic difference of the side slip angle of the runs; per degree.
$C_{N_{\delta r}}$	DCN/DR	normal force coefficient derivative with respect to rudder deflection. Algebraic difference of normal force coefficient of two runs divided by algebraic difference of rudder deflection of two runs; per degree.
$C_{Y_{\delta r}}$	DCY/DR	side force coefficient derivative with respect to rudder deflection. Algebraic difference of the side force coefficient of two runs divided by the algebraic difference of the rudder deflection angle of the runs; body axis system; per degree.
$C_{n_{\delta r}}$	DCYNDR	yawing moment coefficient derivative with respect to rudder deflection. Algebraic difference of the yawing moment coefficient of two runs divided by the algebraic difference of the rudder deflection angle of the runs; body axis system; per degree.
$C_{l_{\delta r}}$	DCBLDR	rolling moment coefficient derivative with respect to rudder deflection. Algebraic difference of the rolling moment coefficient of two runs divided by the algebraic difference of the rudder deflection angle of the runs; body axis system; per degree.
$C_{A_{\delta r}}$	DCA/DR	axial force coefficient derivative with respect to rudder deflection. Algebraic difference of axial force coefficient of two runs divided by the algebraic difference of rudder deflection of two runs; per degree.

NOMENCLATURE (Continued)

Symbol	Plot Symbol	Definition
$C_{m_{\delta_r}}$	DCLMDR	pitching moment coefficient derivative with respect to rudder deflection. Algebraic difference of pitching moment coefficient of two runs divided by algebraic difference of rudder deflection of two runs; per degree.
	YAC/L	lateral center of pressure. Yawing moment coefficient derivative divided by side force coefficient derivative.
$C_{A_{\alpha = 0}}$	CAAFO	axial force coefficient at zero angle of attack (ALPHA = 0).
$C_{N_{\alpha = 0}}$	CNAFO	normal force coefficient at zero angle of attack (ALPHA = 0).
$C_{m_{\alpha = 0}}$	CLMAFO	pitching moment coefficient at zero angle of attack (ALPHA = 0).
δ_{e_L}		left elevon surface deflection angle, positive deflection trailing edge down; degrees.
δ_{e_R}		right elevon surface deflection angle, positive deflection trailing edge down; degrees.
δ_e	ELEVON	elevon, surface deflection angle, positive deflection trailing edge down; degrees, $(\delta_{e_L} + \delta_{e_R})/2$.
δ_a	AILRON	aileron, surface deflection angle, positive deflection trailing edge down; degrees $(\delta_{e_L} + \delta_{e_R})/2$.
δ_r	RUDDER	rudder, surface deflection angle, positive deflection trailing edge to the left; degrees.
A_{BC}		external tank balance cavity area, 3.999 in^2.
A_{ET}		external tank base area, 4.255 in^2 model scale.

NOMENCLATURE (Concluded)

Symbol	Plot Symbol	Definition
A_{ME}		orbiter main engine nozzle base area, 2.081 in^2 model scale.
A_{OB}		orbiter base area, 2.010 in^2 model scale.
A_{OM}		OMS pod base area, 1.362 in^2 model scale.
C_{A_b}	CAB	orbiter base axial-force coefficient.
$C_{A_{b_{ET}}}$	CABET	external tank base axial-force coefficient.
$C_{p_{BC}}$	CPBC	external tank balance cavity pressure coefficient.
$C_{p_{ET}}$	CPET	external tank base pressure coefficient.
$C_{p_{OB}}$	CPOB	orbiter base pressure coefficient.
$C_{p_{OM}}$	CPOM	OMS pod base pressure coefficient.
$C_{p_{ME}}$	CPME	main engine nozzle base pressure coefficient.

CONFIGURATIONS INVESTIGATED

The model for this test was an 0.010-scale representation of the Space Shuttle Vehicle configuration 3 Space Shuttle (model no. 32 OT). The model consisted of the orbiter, external tank and simulated engine plumes. The model was constructed of stainless steel except the orbiter body which was constructed of aluminum.

A six component 1.5-inch MK II balance was mounted in the external tank.

The model was tested with and without non-metric main engine solid exhaust plume simulators. Figure 2(c) shows the model with plume simulation installed.

The various model components tested are listed below:

$O_9 = B_{19}\ C_7\ E_{23}\ F_5\ M_4\ N_{24}\ N_8\ R_5\ V_7\ W_{107}$

B_{19} = VL70 - 000139B (lines) body

C_7 = VL70 - 000139B (lines) canopy

E_{23} = VL70 - 000139B (lines) elevon

F_5 = VL70 - 000139B (lines) body flap

M_4 = VL70 - 000139B (lines) OMS pod

N_{24} = VL70 - 000140A (lines) main engine nozzle

N_8 = VL70 - 000140A (lines) OMS nozzle

R_5 = VL70 - 000139B and VL70 - 000095 rudder

V_7 = VL70 - 000139B (lines) vertical tail

W_{107} = VL70 - 000139B (lines) wing

T_{10} = VL78 - 000041 (lines) external tank

AT_2 = VL72 - 000089 (lines) attach structure

Base pressure data acquired during runs 1 thru 6 are invalid. Tygon tubing, used in measuring these pressures was melted by the tunnel heat during these runs. Prior to run five two external pressure tubes were added. The location of these pressure tubes is shown in figure 2(b).

Pressure tap #16 has an area value of 4.378 in^2 and pressure tap #17 has an area value of 2.010 in^2. Subsequent to run 006 tygon tubing was replaced, in the orbiter, with a high temperature resistant flexible tubing. With the exception of tap #4 which was inoperative, the data acquired from that time to the end of the run series are considered reliable.

TEST FACILITY DESCRIPTION

The NASA-Ames 3.5-Foot Hypersonic Wind Tunnel is a closed-circuit, blowdown-type tunnel capable of operating at nominal Mach numbers of 5, 7, and 10 at pressures to 1800 psia and temperatures to 3400°R for run times to four minutes. The major components of the facility include a gas storage system where the test gas is stored at 3000 psi, a storage heater filled with aluminum-oxide pebbles capable of heating the test gas to 3400°R, axisymmetric contoured nozzles with exit diameters of 42 inches for generating the desired Mach number, and a 900,000 ft^3 vacuum storage system which operates to pressures of 0.3 psia. The test section itself is an open-jet type enclosed within a chamber approximately 12-feet in diameter and 40-feet in length, arranged transversally to the flow direction.

A model support system is provided that can pitch models through an angle-of-attack range of -20 to +18 degrees, in a vertical plane, about a fixed point of rotation on the tunnel centerline. This rotation point is adjustable from 1 to 5 feet from the nozzle exit plane. The model normally is out of the test stream (strut centerline 37-inches from tunnel centerline) until the tunnel test conditions are established after which it is inserted. Insertion time is adjustable to as little as 1/2 second and models may be inserted at any strut angle.

A high-speed, analog-to-digital data acquisition system is used to record test data on magnetic tape. The present system is equipped to measure and record the outputs from 80 transducers in addition to 20 channels of tunnel parameters.

DATA REDUCTION

The aerodynamic force data presented were measured by the Task Corporation 1.5- inch MK II strain gage balance and the moment data were transferred to the external tank centerline at a point 6.80 in (model scale) from the tank nose.

Base pressure axial-force coefficients were calculated for the individual regions as follows:

1. Orbiter Base Axial Force

$$C_{A_b} = -(A_{ME}C_{p_{ME}} + A_{OB}C_{p_{OB}} + A_{OM}C_{p_{OM}})/S$$

2. External Tank Base Axial Force

$$C_{A_{b_{ET}}} = -(A_{ET}C_{p_{ET}} + A_{BC}C_{p_{BC}})/S$$

where S is the theoretical wing area (0.269 ft^2 model scale).

These base pressure axial-force coefficients were calculated and plotted but were not used to correct the measured axial-force coefficient data.

The following reference dimensions were used for data reduction:

Symbol	Description	Value (model scale)	Applicable Data
A_{ME}	Orbiter main engine nozzle base area	2.081 in^2	Pressure tap nos. 3 and 4
A_{OB}	Orbiter base area	2.010 in^2	Pressure tap nos. 5 and 6 or 17
A_{OM}	OMS pod base area	1.362 in^2	Pressure tap nos. 1 and 2

DATA REDUCTION (Concluded)

Symbol	Description	Value (model scale)	Applicable Data
A_{ET}	ET base area	4.255 in^2	Pressure tap nos. 7 and 8 or 16
A_{BC}	ET balance cavity area	3.990 in^2	Pressure tap no. 15
S	Reference area	0.269 ft^2	Force and moment data
ℓ_r	Reference length	12.90 in	Moment data

Also see discussion in section "CONFIGURATIONS INVESTIGATED" concerning the use of external pressure taps 16 and 17.

TABLE 1.

TEST : IA10 DATE :

TEST CONDITIONS

MACH NUMBER	REYNOLDS NUMBER (per unit length)	DYNAMIC PRESSURE (pounds/sq. inch)	STAGNATION TEMPERATURE (degrees Fahrenheit)
5.3	5,550,000	10.37	740.4
7.4	3,830,000	3.83	740.4

BALANCE UTILIZED: TASK MK II

	CAPACITY:	ACCURACY:	COEFFICIENT TOLERANCE:
NF	500 lb	1/2 %	
SF			
AF	300 lb	1/2 %	
PM			
RM	800 in-lb	1/2 %	
YM			

COMMENTS:

TABLE 2.

TEST: IA-10 — DATA SET/RUN NUMBER COLLATION SUMMARY — DATE:

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α	SCHD. β	PARAMETERS/VALUES δe_L	δe_R	δR	Runge	NO. OF RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE) 5.3	7.3	TEST RUN NUMBERS
RB7 001	$0_9\ T_{10}\ AT_2$	A	0	0	0	0	Off	1		1	
RB7 002	$0_9\ T_{10}\ AT_2$	C	5	0	0	0	Off	2	18	2	
RB7 003	$0_9\ T_{10}\ AT_2$	C	5	0	0	0	Off	1		3	
RB7 004	$0_9\ T_{10}\ AT_2$	C	0	0	0	0	Off	1		4	
RB7 005	$0_9\ T_{10}\ AT_2$	C	0	10	-10	0	Off	2	17	5	
RB7 006	$0_9\ T_{10}\ AT_2$	0	B	0	0	0	Off	2	15	6	
RB7 007	$0_9\ T_{10}\ AT_2$	0	B	0	0	10	Off	2	14	7	
RB7 008	$0_9\ T_{10}\ AT_2$	0	B	0	0	10	On	2	13	8	
RB7 009	$0_9\ T_{10}\ AT_2$	0	B	0	0	0	On	2	12	9	
RB7 010	$0_9\ T_{10}\ AT_2$	A	0	0	0	0	On	2	11	10	
RB7 011	$0_9\ T_{10}\ AT_2$	D	0	0	0	0	Off	1	16		

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

IDVAR (1) IDVAR (2) NDV

α OR β SCHEDULES

COEFFICENTS

A: α = -10° to 10° in 2° increments

B: β = -10° to 10° in 2° increments

C: α = 0° 5° 10° 15° 20° 30°

D: α = -8° to 10° in 2° increments then 15° 20° 30°

TABLE 3. - MODEL COMPONENT DESCRIPTIONS

MODEL COMPONENT: BODY - B19

GENERAL DESCRIPTION: Fuselage, Configuration 3, per Rockwell Lines VL70-000139B.

NOTE: Identical to B_{17} except forebody.

Model Scale = .010

DRAWING NUMBER: VL70-000139B

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Length - IN.	1290.3	12.903
Max. Width - IN.	267.6	2.676
Max. Depth - IN.	244.5	2.445
Fineness Ratio	4.82175	4.82175
Area - FT^2		
Max. Cross-Sectional	386.67	0.03867
Planform		
Wetted		
Base		

TABLE 3. - Continued.

MODEL COMPONENT: Canopy - C7

GENERAL DESCRIPTION: Configuration 3 per Rockwell Lines VL70-000139

Model Scale = .010

DRAWING NUMBER VL70-000139

DIMENSION:	FULL SCALE	MODEL SCALE
Length (X_o = 433 to X_o = 670) - in. FS	237	2.37
Max Width		
Max Depth (Z_o = to Z_o = 501) - in FS		
Fineness Ratio		
Area		
Max Cross-Sectional		
Planform		
Wetted		
Base		

TABLE 3. - Continued.

MODEL COMPONENT: ELEVON - E23

GENERAL DESCRIPTION: Configuration 3 per W107 Rockwell Lines

VL70-000139B, data for (1) of (2) sides

Model Scale = .010

DRAWING NUMBER: VL70-000139B

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Area - FT^2	205.52	0.02055
Span (equivalent) - IN.	353.34	3.5334
Inb'd equivalent chord	114.78	1.1478
Outb'd equivalent chord	55.00	0.550
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	.208	.208
At Outb'd equiv. chord	.400	.400
Sweep Back Angles, degrees		
Leading Edge	0.00	0.00
Tailing Edge	-10.24	-10.24
Hingeline	0.00	0.00
Area Moment (Normal to hinge line)- FT^3 Product of Area Moment	1548.07	0.00155

TABLE 3. - Continued.

MODEL COMPONENT: F5 Body Flap

GENERAL DESCRIPTION: 3 Configuration per Rockwell Lines VL70-000139

Scale Model = .010

DRAWING NUMBER VL70-000139

DIMENSION:	FULL SCALE	MODEL SCALE
Length - in	84.70	0.8470
Max Width - in	267.6	2.676
Max Depth		
Fineness Ratio		
Area - Ft^2		
Max Cross-Sectional		
Planform	142.00	0.0142
Wetted		
Base	38.0958	0.00381

TABLE 3. - Continued.

MODEL COMPONENT: OMS Pod - M_4

GENERAL DESCRIPTION: Configuration 3 per Rockwell Lines VL70-000139

NOTE: M_4 identical to M3, except intersection to fuselage.

Model Scale = .010.

DRAWING NUMBER VL70-000139

DIMENSION:	FULL SCALE	MODEL SCALE
Length - IN	346.0	3.460
Max Width - IN	108.0	1.080
Max Depth - IN	113.0	1.130
Fineness Ratio		
Area - FT^2		
Max Cross-Sectional		
Planform		
Wetted		
Base		

TABLE 3. - Continued.

MODEL COMPONENT: Attach Structure - AT_2

GENERAL DESCRIPTION: Attach Structure for Orbiter-Tank Configuration 3 per Rockwell Lines VL70-000139B, VL78-000041

MODEL SCALE = 0.010

DRAWING NO. SS-A00060

DIMENSIONS:	FULL SCALE	MODEL SCALE
FORWARD ATTACH POINTS		
Orbiter to Tank		
Number of Struts	1	1
Diameter in.	25.000	0.250
Location in.		
X_o	382.000	3.820
X_T	1077.000	10.770
Orbiter to SRB		
Number of Struts		
Diameter in.		
Location in.		
X_o		
X_s		
Tank to SRB		
Number of Struts		
Diameter in.		
Location in.		
X_T		
X_s		
AFT ATTACH POINTS		
Orbiter to Tank		
Number of Struts /Side	3	3
Diameter in.	15.000	0.150
Location in.		
X_o	1292,1308,1308	12.92, 13.08, 13.08
X_T	1859,2061,2061	18.59, 20.61, 20.61
Orbiter to SRB		
Number of Struts		
Diameter in.		
Location in.		
X_o		
X_s		
Tank to SRB		
Number of Struts		
Diameter in.		
Location in.		
X_T		
X_s		

TABLE 3. - Continued.

MODEL COMPONENT: NOZZLES - N g

GENERAL DESCRIPTION: Basic OMS nozzle of Configuration 2A per Rockwell Lines VL70-008306 and VL70-000089"B". Intersection of nozzle exit plane and nozzle centerline at X_o = 1570.75, Y_o = ±99.25, Z_o = 507.25

MODEL SCALE = .010

DRAWING NO. VL70-008306, VL70-000089"B", SS-A00092

DIMENSIONS	FULL SCALE	MODEL SCALE
Mach No.		
Length ~ in.		
Gimbal Point to Exit Plane		
Throat to Exit Plane		
Diameter ~ in.		
Exit	50.00	0.500
Throat	N/A	N/A
Inlet	28.00	0.280
Area ~ ft^2./Nozzle		
Exit	13.635	0.00136
Throat		
Gimbal Point (station) ~ in.		
X	1518.0	15.18
Y	±88.0	±0.88
Z	492.0	4.92
Null Position ~ deg.		
Pitch	15°49'	15°49'
Yaw (Outb'd)	±12°17'	±12°17'

TABLE 3. - Continued.

MODEL COMPONENT: MPS NOZZLES - N 24

GENERAL DESCRIPTION: Configuration 3A MPS Nozzles

MODEL SCALE = .010

DRAWING NO. VL70-000140A, VL70-005030A

DIMENSIONS	FULL SCALE	MODEL SCALE
Mach No.		
Length~in.		
Gimbal Point to Exit Plane		
Throat to Exit Plane		
Diameter~in.		
Exit	91.000	0.910
Throat		
Inlet		
Area~ft^2. /Nozzle		
Exit	45.16585	0.00453
Throat		
Gimbal Point (station)~in.		
Upper Nozzle		
X	1445	14.45
Y	0	0
Z	443	4.43
Lower Nozzles		
X	1468.16996	14.68170
Y	53.00000	0.53000
Z	342.63988	3.42640
Null Position~deg.		
Upper Nozzle		
Pitch	16°	16°
Yaw	0°	0°
Lower Nozzles		
Pitch	10°	10°
Yaw (outb'd)	3.5°	3.5°

TABLE 3. - Continued.

MODEL COMPONENT: Solid Plume - PL 1

GENERAL DESCRIPTION: SSME simulated plumes from N24 nozzles to represent all 3 engines at M= 5.5 during exit trajectory

MODEL SCALE = .010

DRAWING NUMBER:

COORDINATES:

Ratio of local plume radius to nozzle exit plane internal radius	Ratio of local axial distance from nozzle exit plane to nozzle exit plane internal radius
1.053	0.057
1.943	1.122
2.772	2.250
3.497	3.341
4.450	4.912
5.421	6.642
5.905	7.566
6.389	8.529
7.321	10.496
7.861	11.699
8.136	12.330
8.672	13.602
8.937	14.367
9.204	14.912
9.464	15.569

DIMENSIONS:	FULL SCALE	MODEL SCALE
Nozzle Exit Radius, in.	45.2	0.452

TABLE 3. - Continued.

MODEL COMPONENT: EXTERNAL TANK - T10

GENERAL DESCRIPTION: External Oxygen Hydrogen Tank, 3 Configuration, per Rockwell Lines VL78-000041 and VL72-000088

Model Scale = .010

DRAWING NUMBER VL72-000088 VL78-000041

DIMENSION:	FULL SCALE	MODEL SCALE
Length - IN (Nose @ X_T = 309)	1865	18.65
Max Width (Dia) - IN.	324	3.24
Max Depth	-	-
Fineness Ratio	5.75617	5.75617
Area - FT^2		
Max Cross-Sectional	572.555	0.05726
Planform		
Wetted		
Base		
WP of Tank Centerline (X_T) IN.	400.0	4.00

TABLE 3. - Continued.

MODEL COMPONENT: RUDDER - R5

GENERAL DESCRIPTION: 2A, 3 and 3A Configuration per Rockwell Lines VL70-000095

Model Scale = .010

DRAWING NUMBER: VL70-000095

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Area - FT^2	106.38	0.01064
Span (equivalent) - IN.	201.0	2.010
Inb'd equivalent chord	91.585	0.91585
Outb'd equivalent chord	50.833	0.50833
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	0.400	0.400
At Outb'd equiv. chord	0.400	0.400
Sweep Back Angles, degrees		
Leading Edge	34.83	34.83
Tailing Edge	26.25	26.25
Hingeline	34.83	34.83
Area Moment (Normal to hinge line)- FT^3 Product of Area and Mean Chord	526.13	0.00053

TABLE 3. - Continued.

MODEL COMPONENT: VERTICAL - V 7

GENERAL DESCRIPTION: Centerline vertical tail, doublewedge airfoil with rounded leading edge.

NOTE: Same as V5, but with manipulator housing removed.

Model Scale = .010

DRAWING NUMBER: VL70-000139

DIMENSIONS:	FULL-SCALE	MODEL SCALE
TOTAL DATA		
Area (Theo) Ft^2 Planform	425.92	0.04259
Span (Theo) In	315.72	3.157
Aspect Ratio	1.675	1.675
Rate of Taper	0.507	0.507
Taper Ratio	0.404	0.404
Sweep Back Angles, degrees		
Leading Edge	45.000	45.000
Trailing Edge	26.249	26.249
0.25 Element Line	41.130	41.130
Chords:		
Root (Theo) WP	268.50	2.6850
Tip (Theo) WP	108.47	1.0847
MAC	199.81	1.9981
Fus. Sta. of .25 MAC	1463.50	14.6350
W. P. of .25 MAC	635.522	6.3552
B. L. of .25 MAC	0.00	0.00
Airfoil Section		
Leading Wedge Angle Deg	10.000	10.000
Trailing Wedge Angle Deg	14.920	14.920
Leading Edge Radius	2.0	0.020
Void Area - Ft^2	13.17	0.00132
Blanketed Area	0.00	0.00

TABLE 3. - Concluded.

MODEL COMPONENT: WING-W 107

GENERAL DESCRIPTION: Configuration 3 per Rockwell Lines VL70-000139B

NOTE: Same as W103, except cuff, airfoil and incidence angle.

Model Scale = .010

TEST NO. DWG. NO. VL70-000139B

DIMENSIONS:	FULL-SCALE	MODEL SCALE
TOTAL DATA		
Area (Theo.) Ft^2 Planform	2690.00	0.2690
Span (Theo In.	936.68	9.3668
Aspect Ratio	2.265	2.265
Rate of Taper	1.177	1.177
Taper Ratio	0.200	0.200
Dihedral Angle, degrees (@ TE of Elevon)	3.500	3.500
Incidence Angle, degrees	0.500	0.500
Aerodynamic Twist, degrees	+3.000	+3.000
Sweep Back Angles, degrees		
Leading Edge	45.000	45.000
Trailing Edge	-10.24	-10.24
0.25 Element Line	35.209	35.209
Chords:		
Root (Theo) B.P.0.0.	689.24	6.8924
Tip, (Theo) B.P.	137.85	1.3785
MAC	474.81	4.7481
Fus. Sta. of .25 MAC	1136.89	11.3689
W.P. of .25 MAC	299.20	2.9920
B.L. of .25 MAC	182.13	1.8213
EXPOSED DATA		
Area (Theo) Ft^2	1752.29	0.17523
Span, (Theo) In. BP108	720.68	7.2068
Aspect Ratio	2.058	2.058
Taper Ratio	0.2451	0.2451
Chords		
Root BP108	562.40	5.6240
Tip 1.00 $\frac{b}{2}$	137.85	1.3785
MAC	393.03	3.9303
Fus. Sta. of .25 MAC	1185.31	11.8531
W.P. of .25 MAC	300.20	3.0020
B.L. of .25 MAC	251.76	2.5176
Airfoil Section (Rockwell Mod NASA) XXXX-64		
Root $\frac{b}{2}$ =	0.10	0.10
Tip $\frac{b}{2}$ =	0.12	0.12
Data for (1) of (2) Sides		
Leading Edge Cuff Planform Area Ft^2	118.333	0.01183
Leading Edge Intersects Fus M. L. @ Sta	500	5.000
Leading Edge Intersects Wing @ Sta	1083.4	10.834

Notes:

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

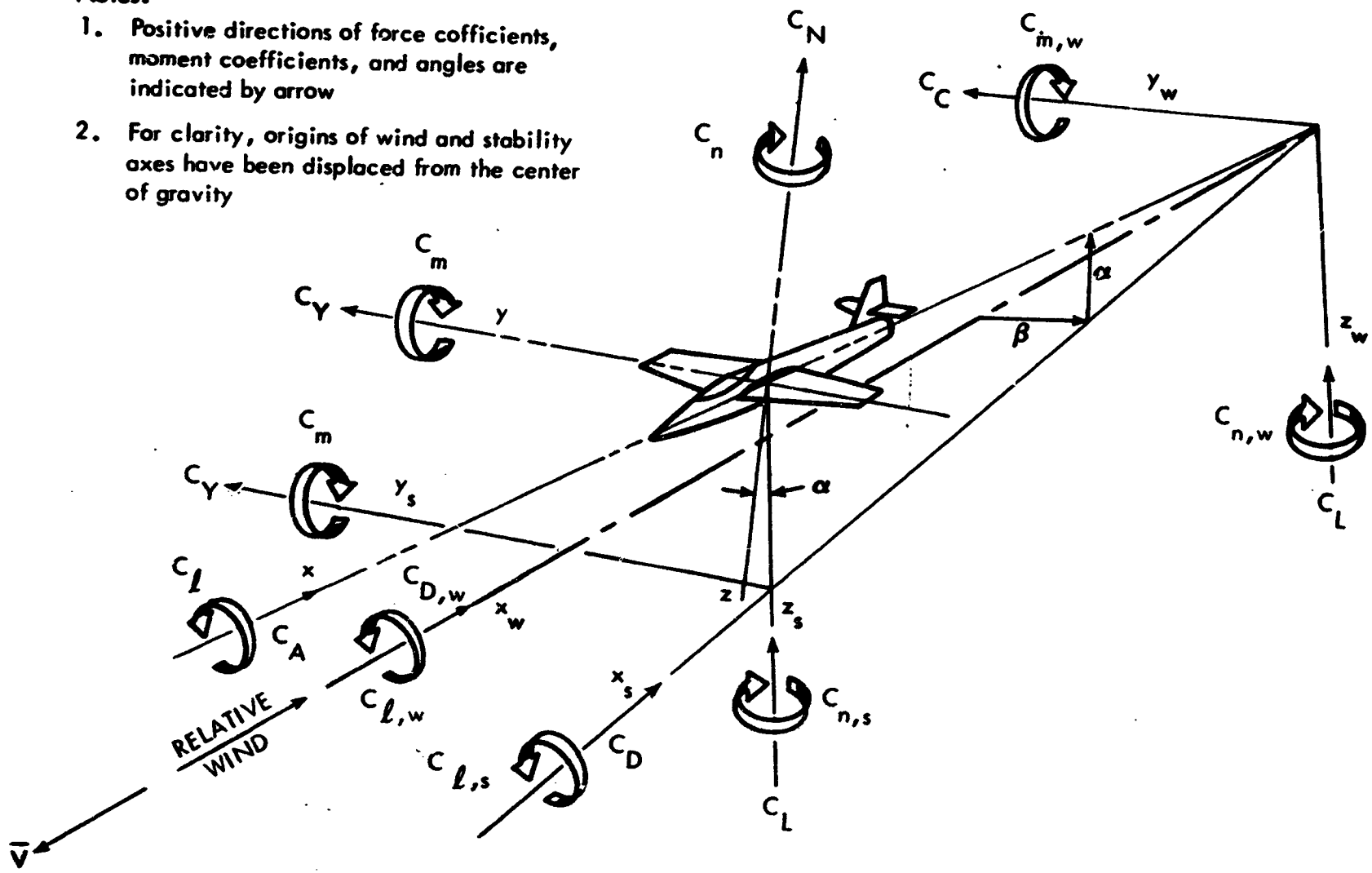


Figure 1. - Axis Systems.

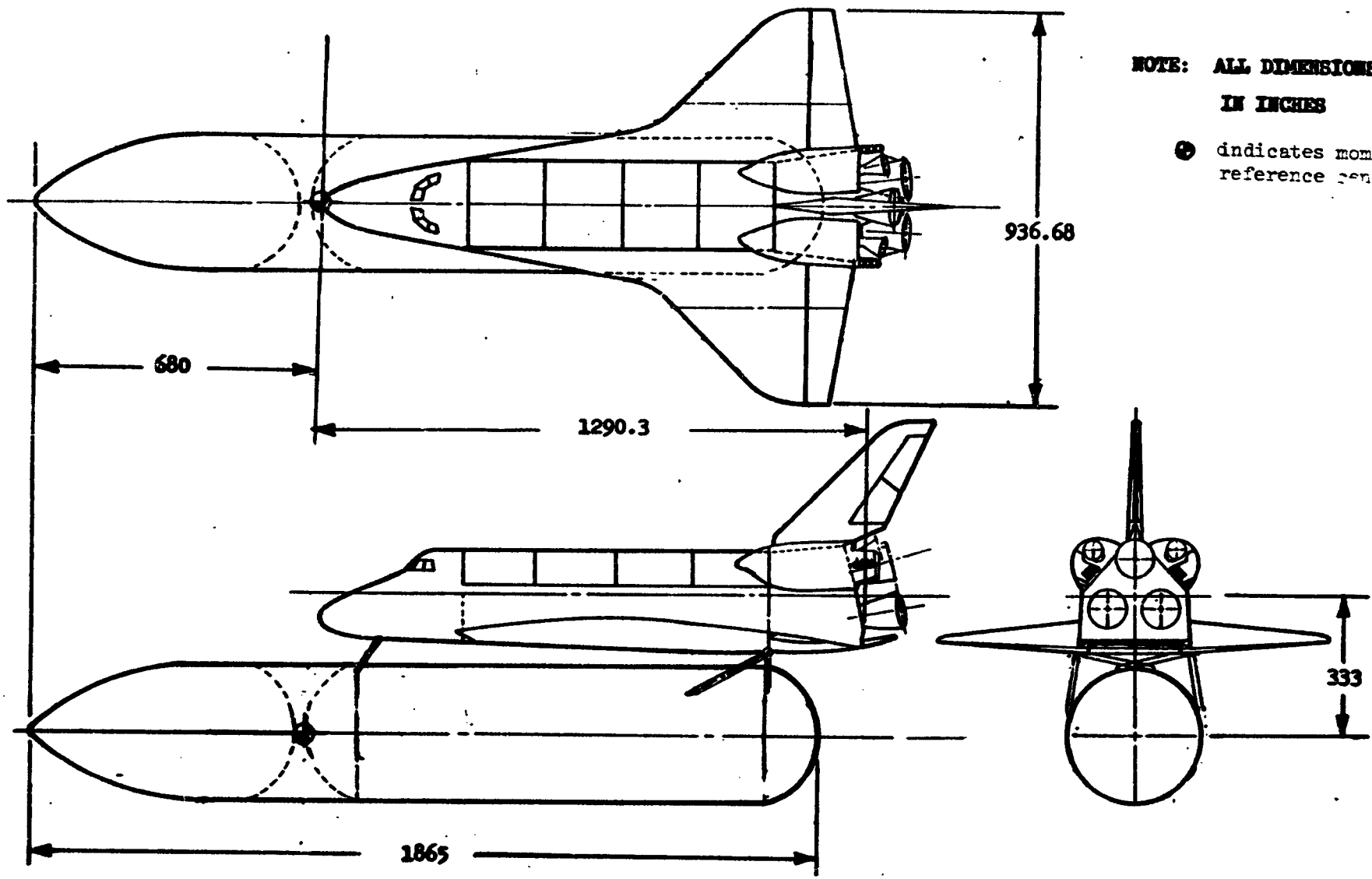
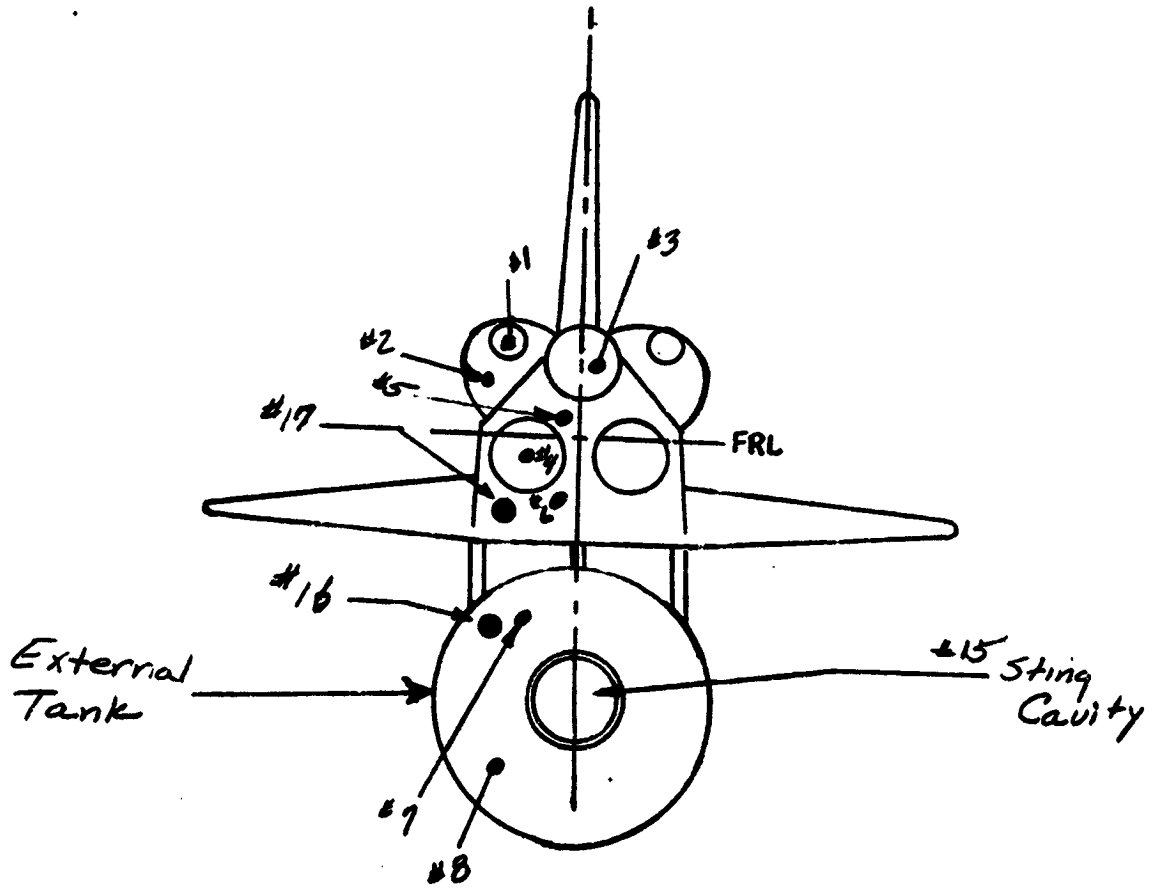


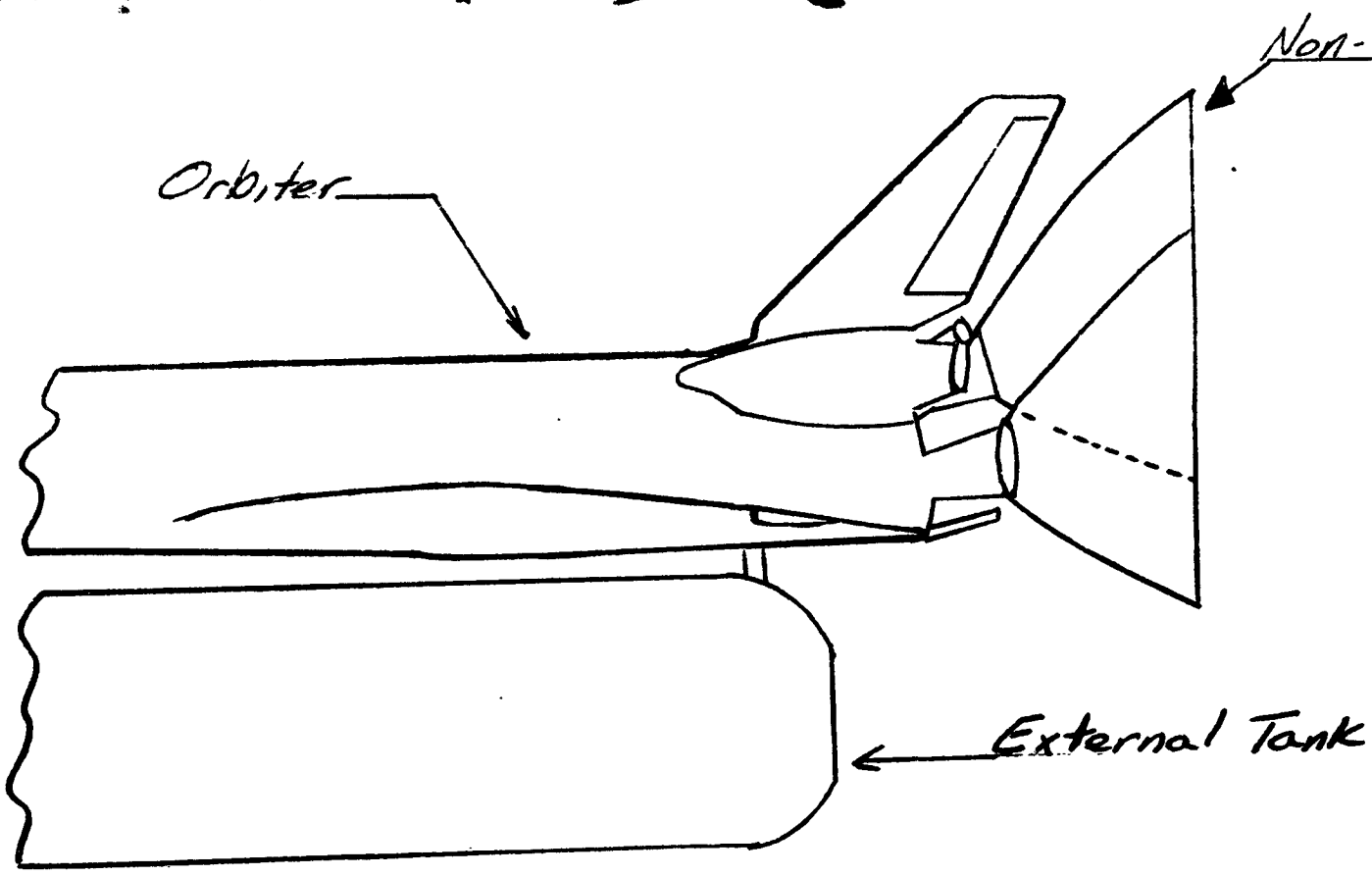
Figure 2. Model Sketches.

a. Orbiter Tank General Arrangement, O_9T_{10}



b. Base Pressure Orifice Locations

Figure 2. - Continued.



C. Plume Simulators

Figure 2. - Concluded.

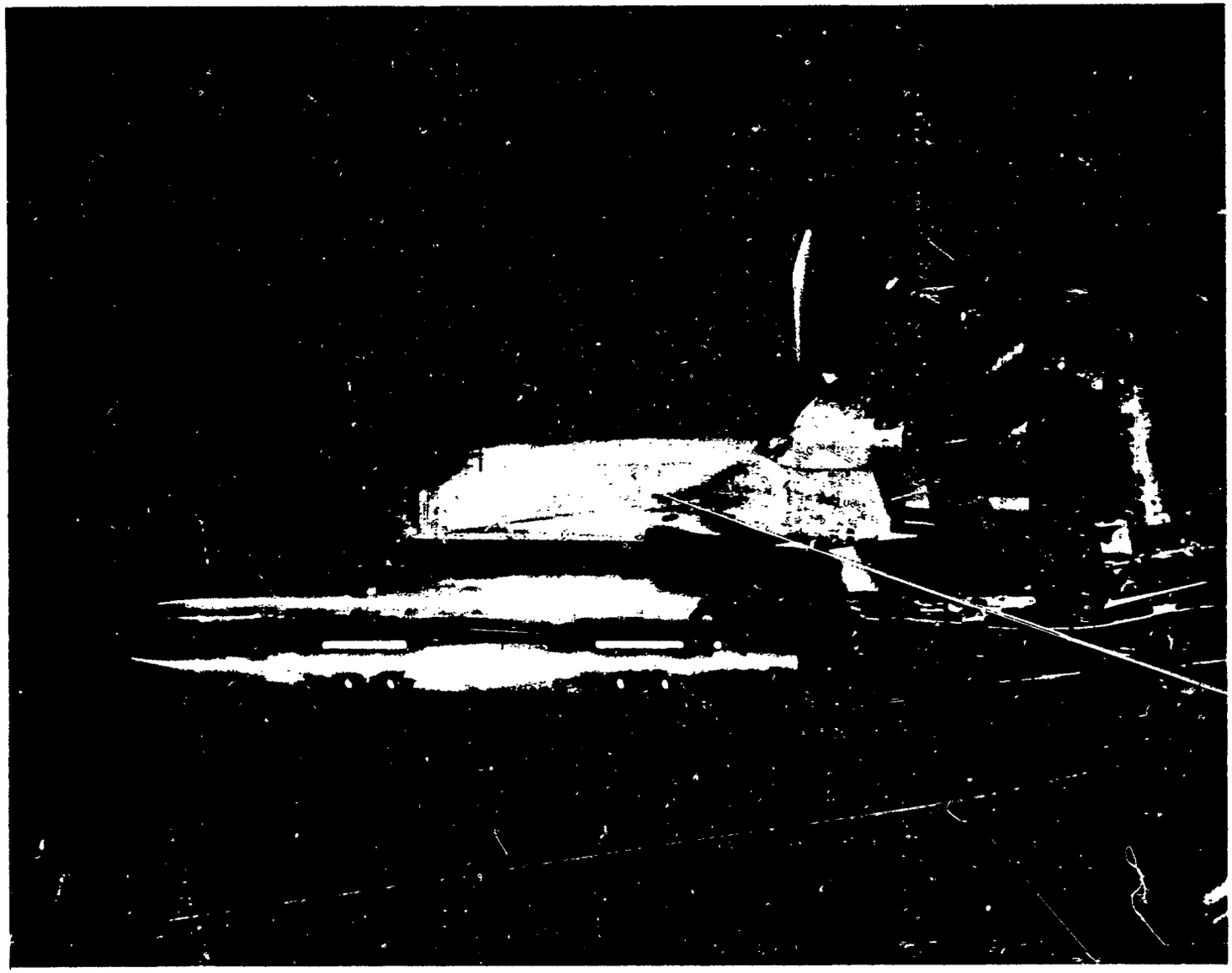


Figure 3. - Model installation photograph.

DATA FIGURES

DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(SB7010) ○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON
(DB7011) □	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

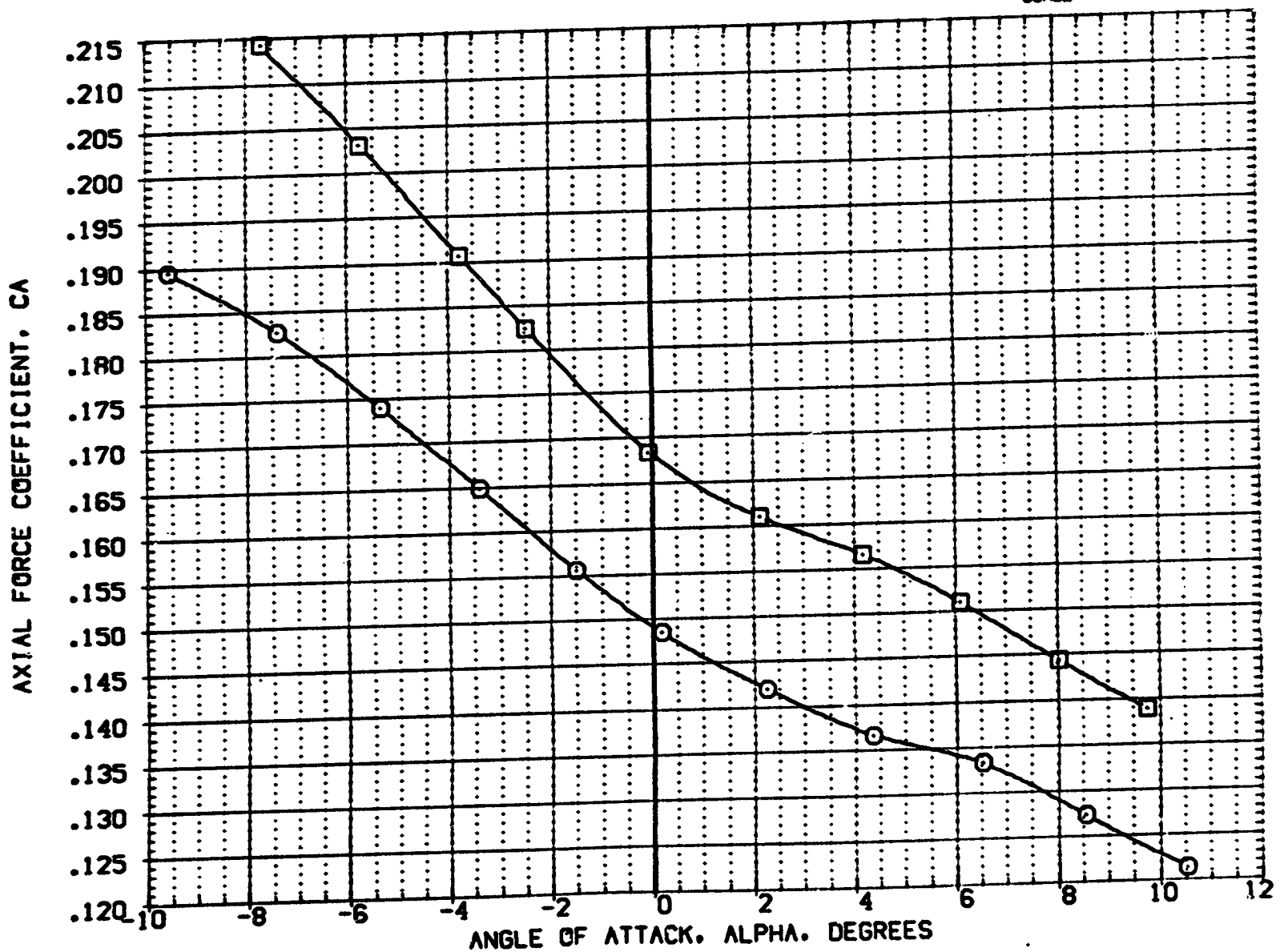


FIG. 4 EFFECTS OF SOLID PLUMES ON LONGITUDINAL CHARACTERISTICS.

(A)MACH = 5.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(SB7010)	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(DB7011)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	995.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

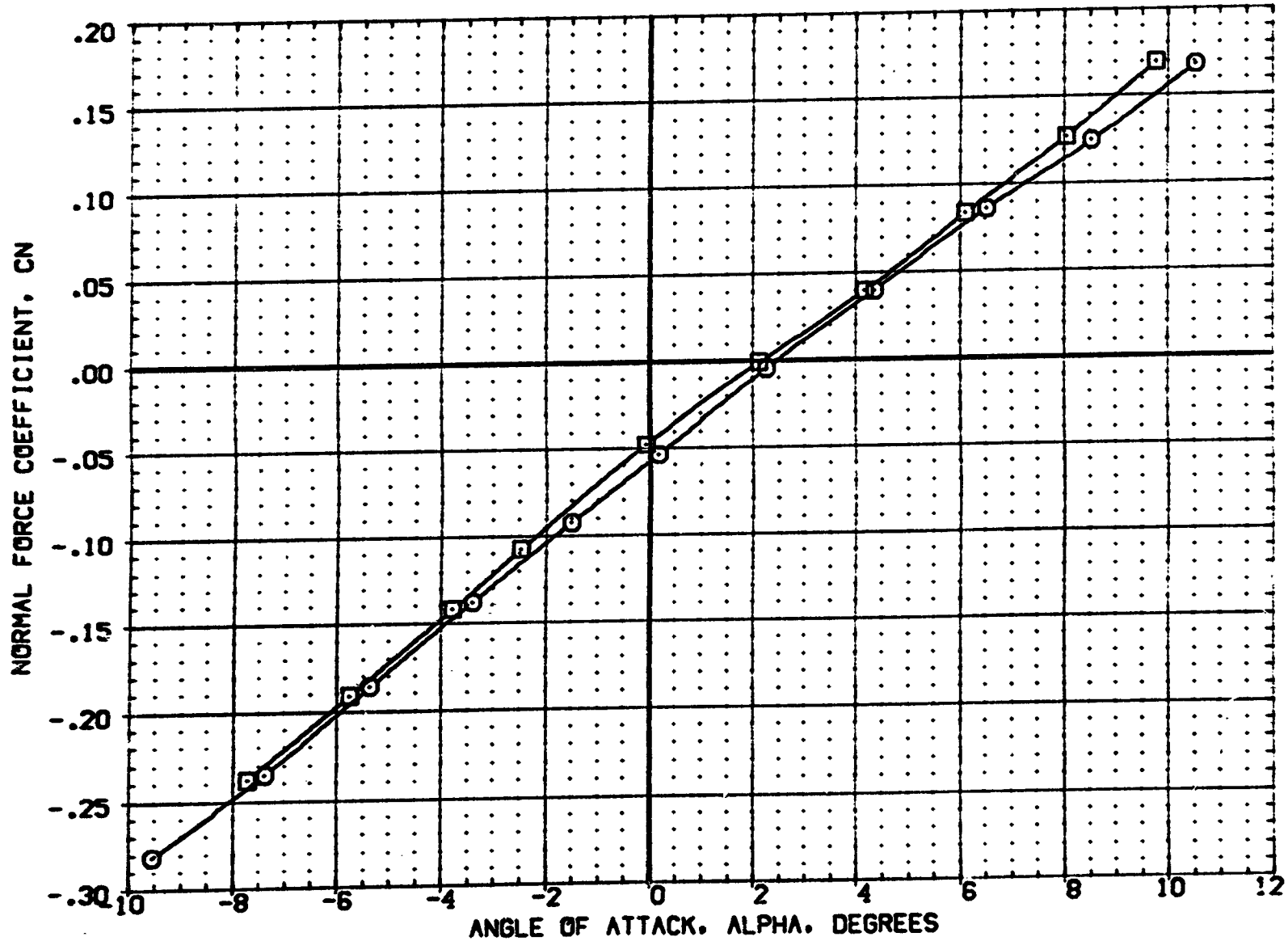


FIG. 4 EFFECTS OF SOLID PLUMES ON LONGITUDINAL CHARACTERISTICS.

(A)MACH = 5.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(SB7010) ○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(DB7011) □	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

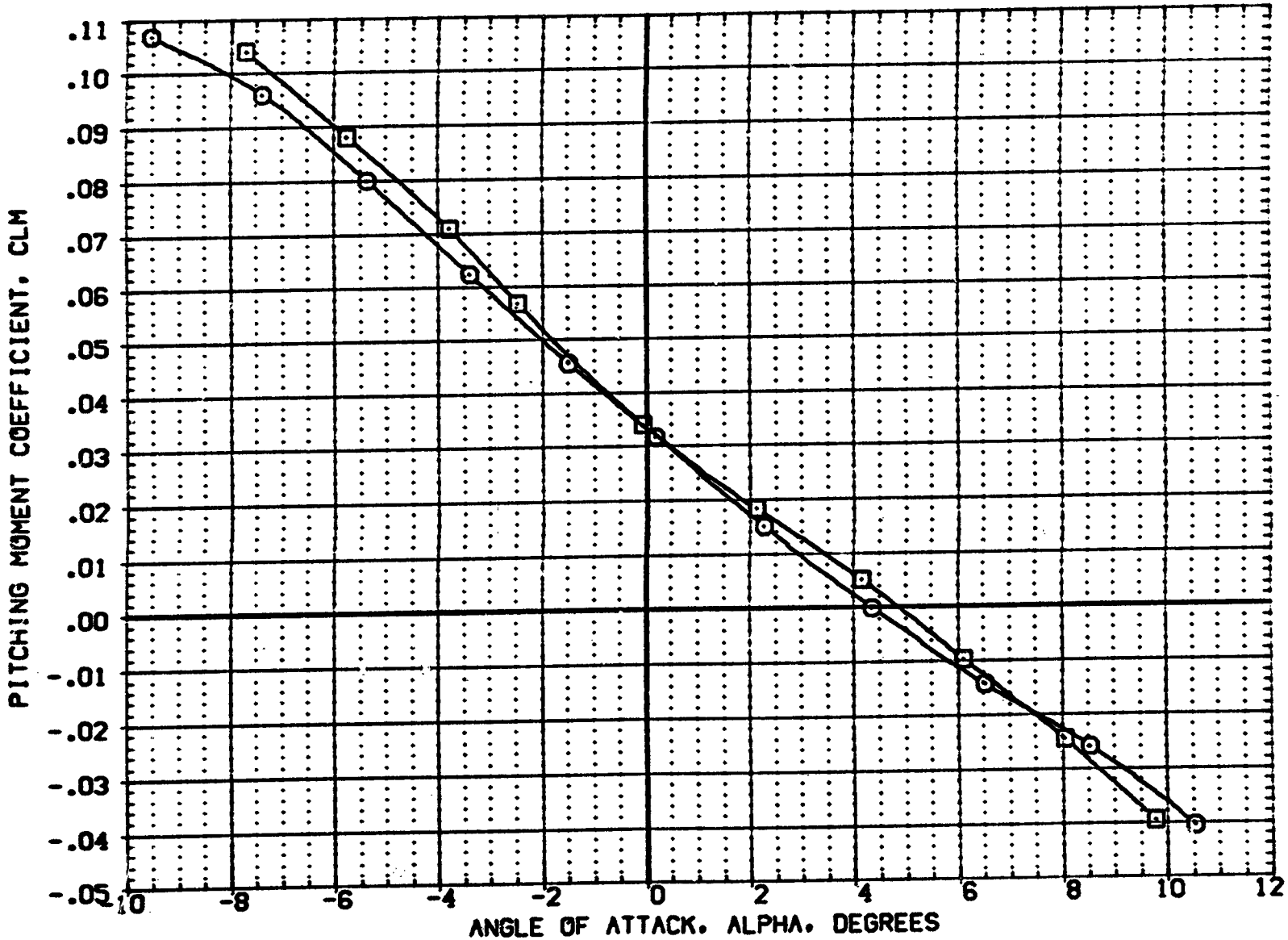


FIG. 4 EFFECTS OF SOLID PLUMES ON LONGITUDINAL CHARACTERISTICS.

(A)MACH = 5.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(S87010)	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(D87011)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2090.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

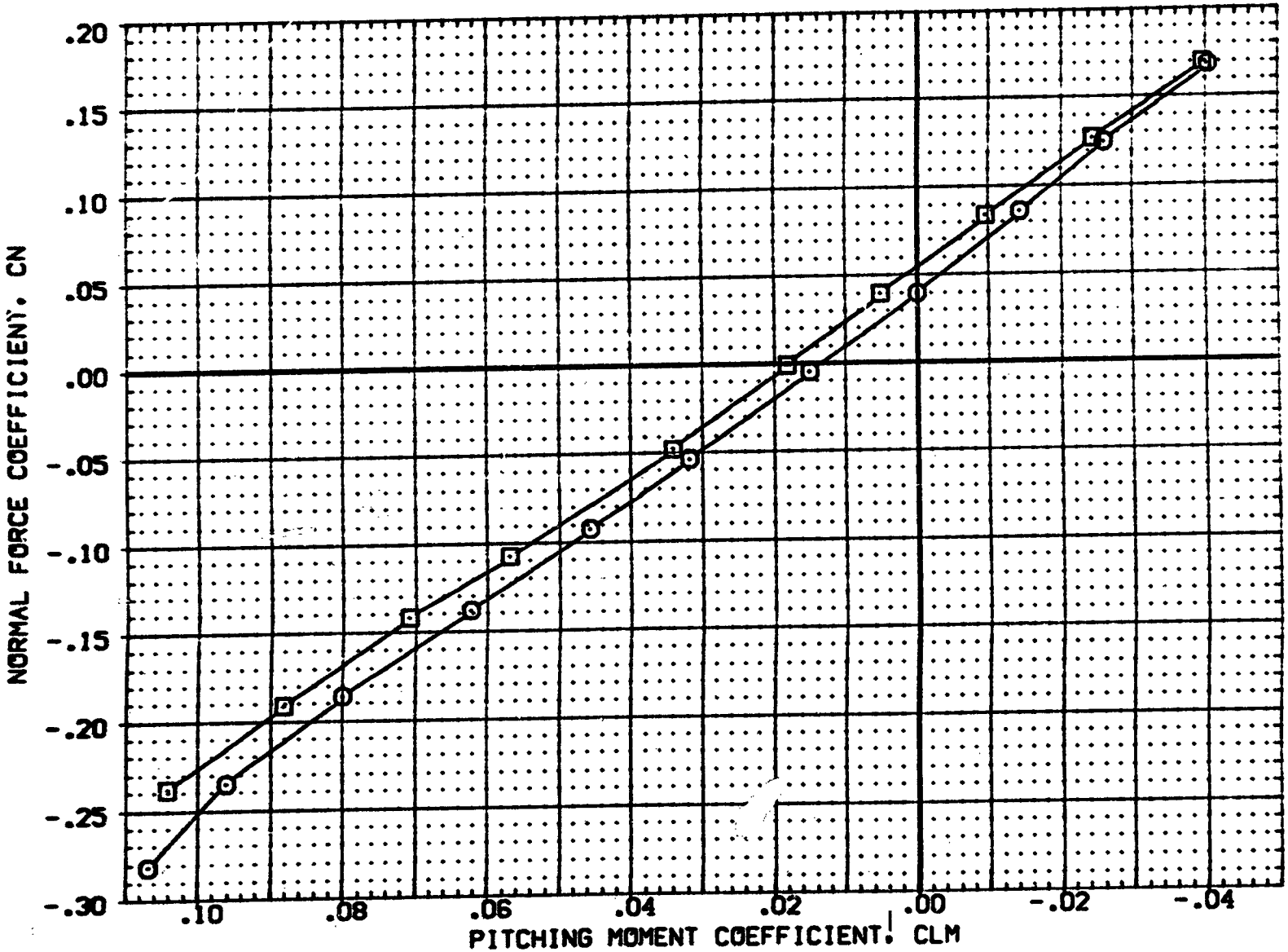


FIG. 4 EFFECTS OF SOLID PLUMES ON LONGITUDINAL CHARACTERISTICS.

(A)MACH = 5.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(T97010)	AMES 3.5-169 1A10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(R87001)	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

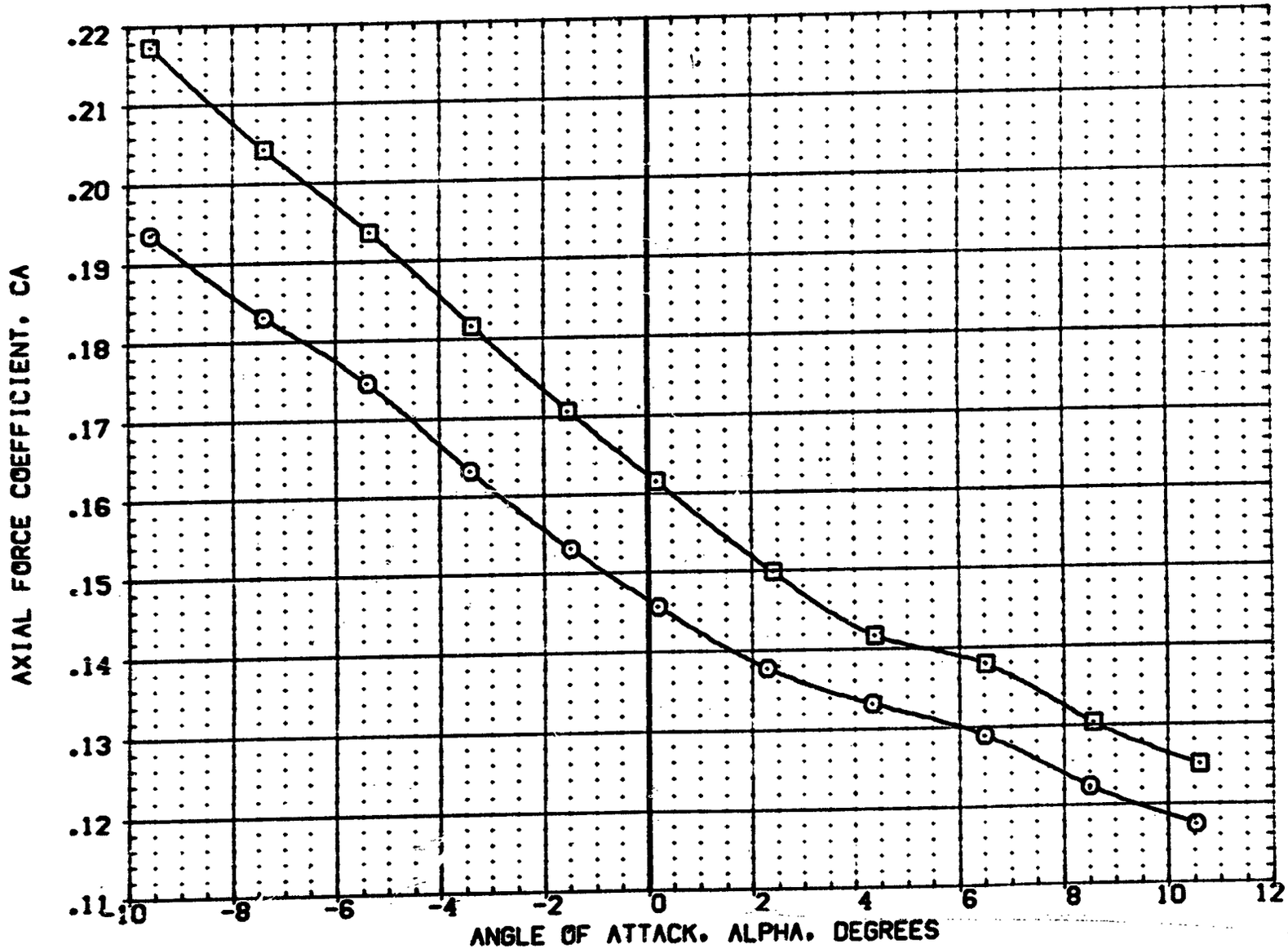


FIG. 4 EFFECTS OF SOLID PLUMES ON LONGITUDINAL CHARACTERISTICS.

(A)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
[TB7010]	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
[RB7001]	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

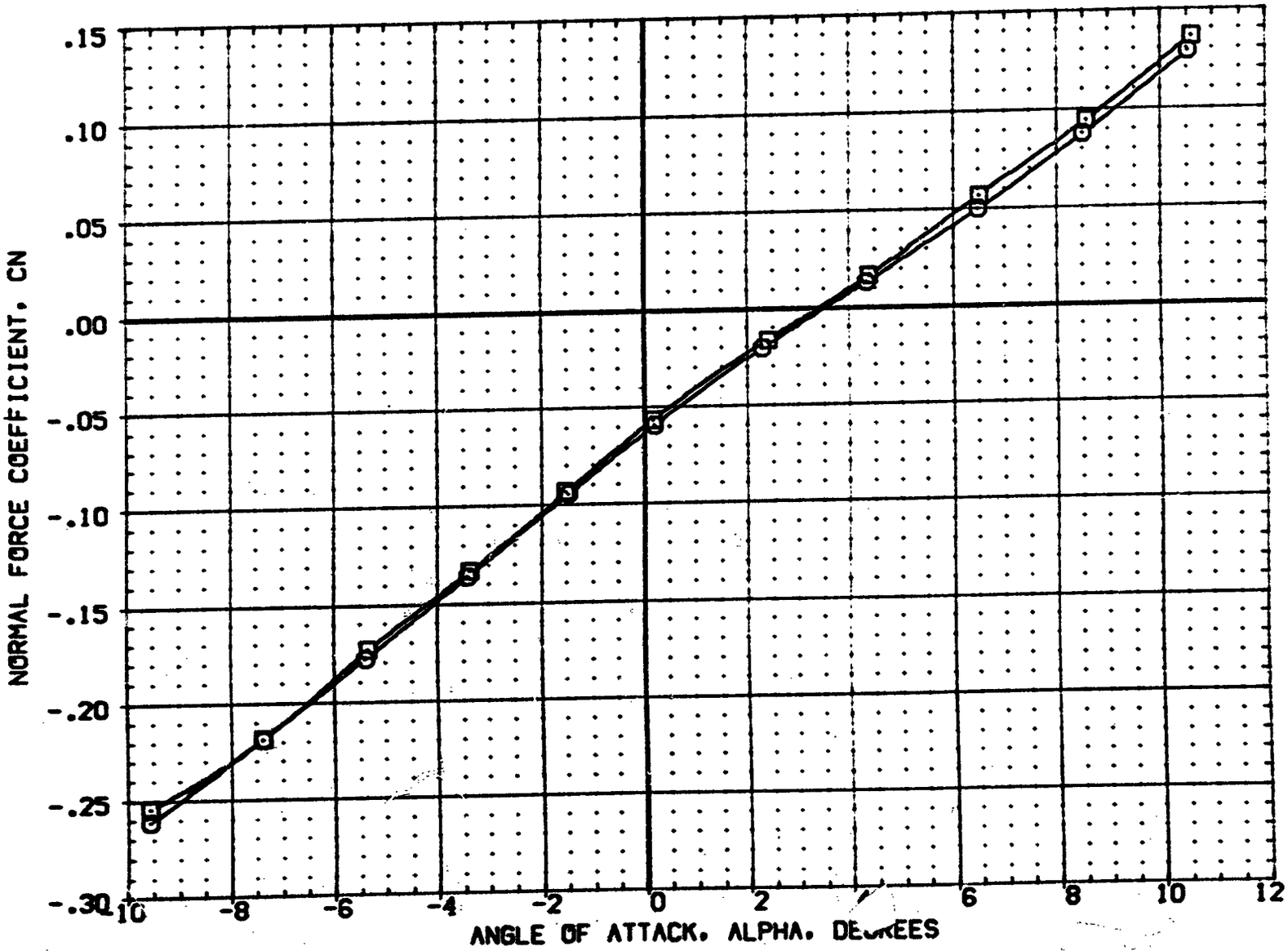


FIG. 4 EFFECTS OF SOLID PLUMES ON LONGITUDINAL CHARACTERISTICS.

(A)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(TB7010) ○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7001) □	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

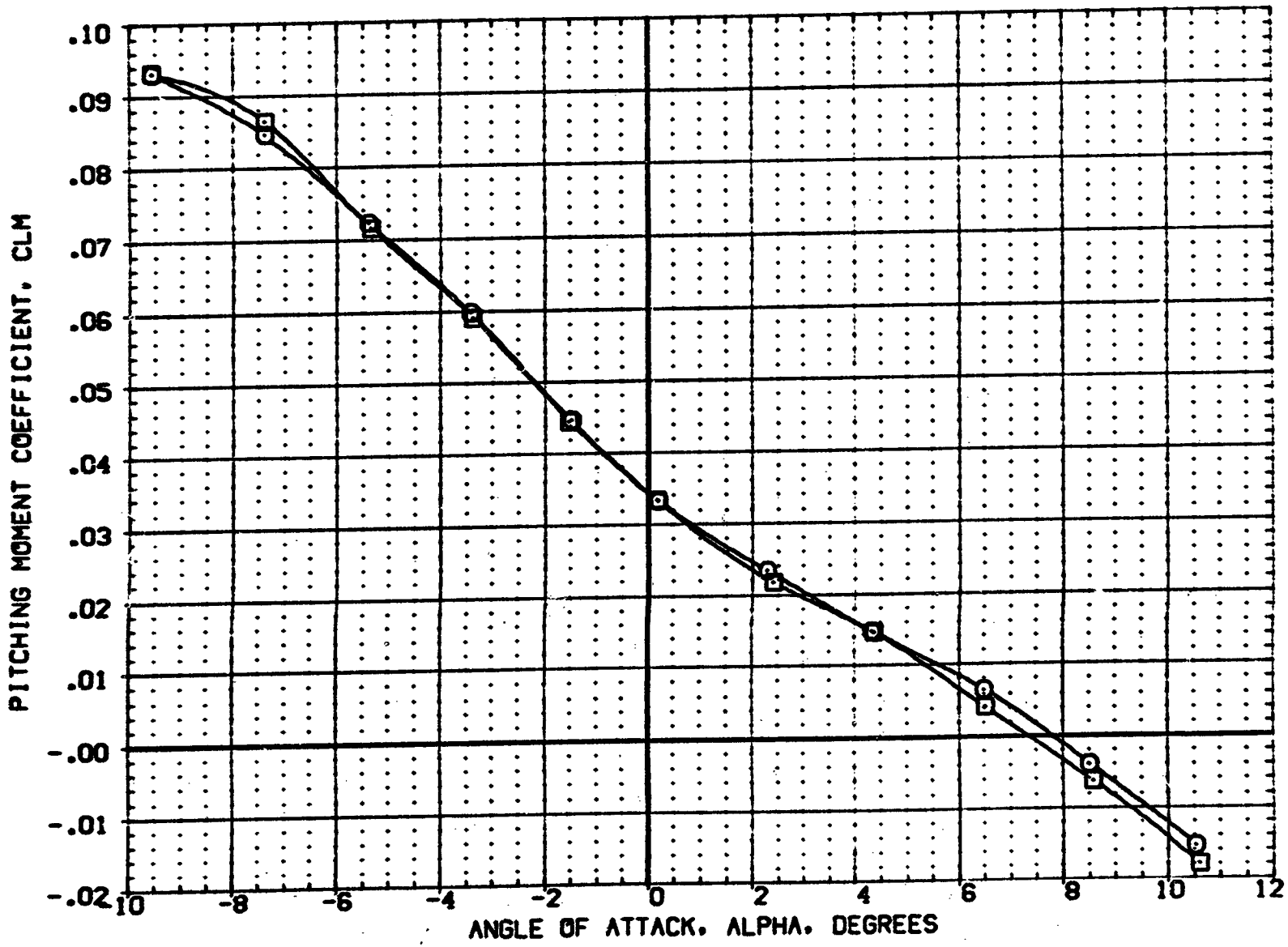


FIG. 4 EFFECTS OF SOLID PLUMES ON LONGITUDINAL CHARACTERISTICS.

(A)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(TB7010)	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7001)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

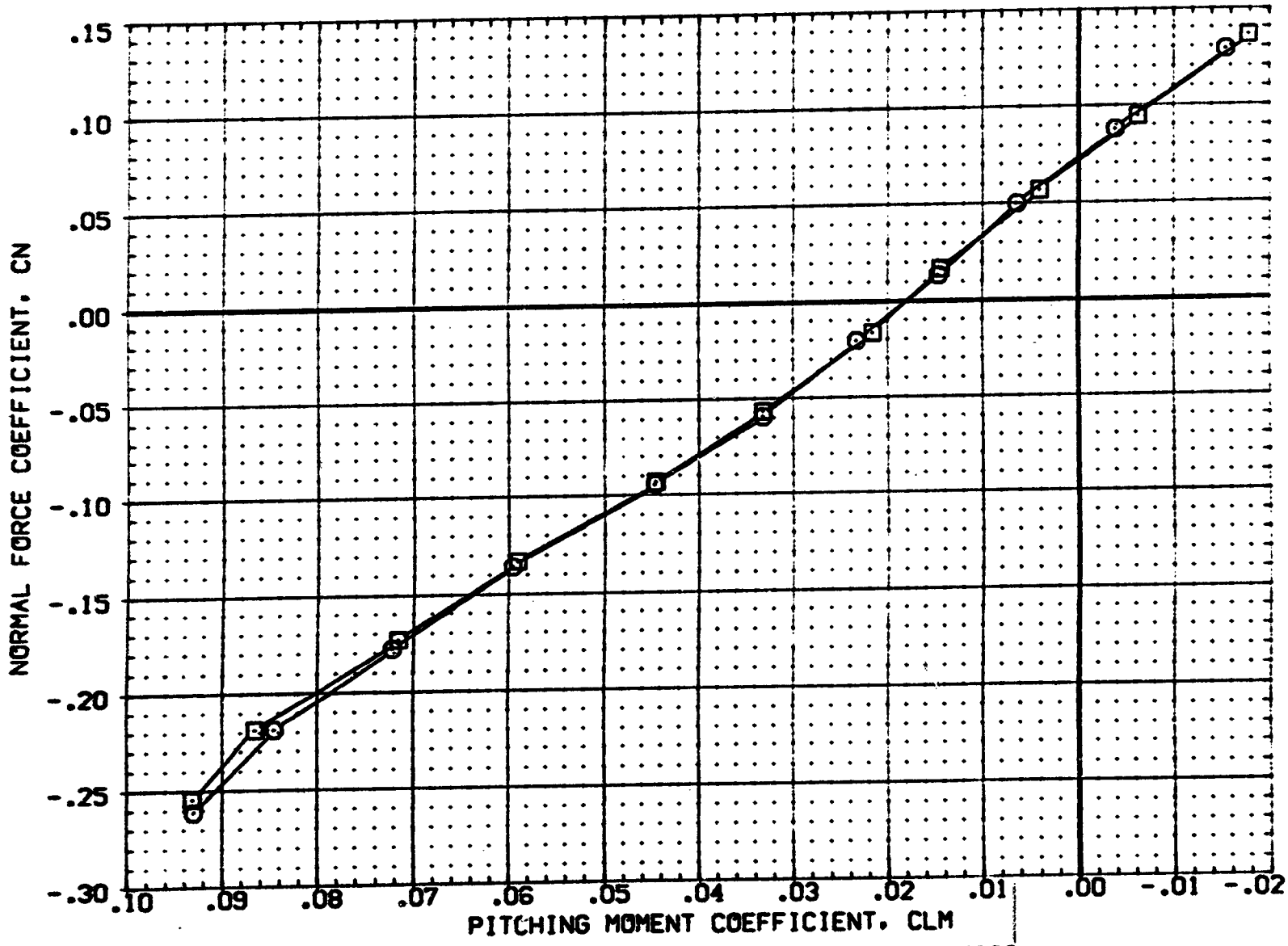


FIG. 4 EFFECTS OF SOLID PLUMES ON LONGITUDINAL CHARACTERISTICS.

(A)MACH = 7.32

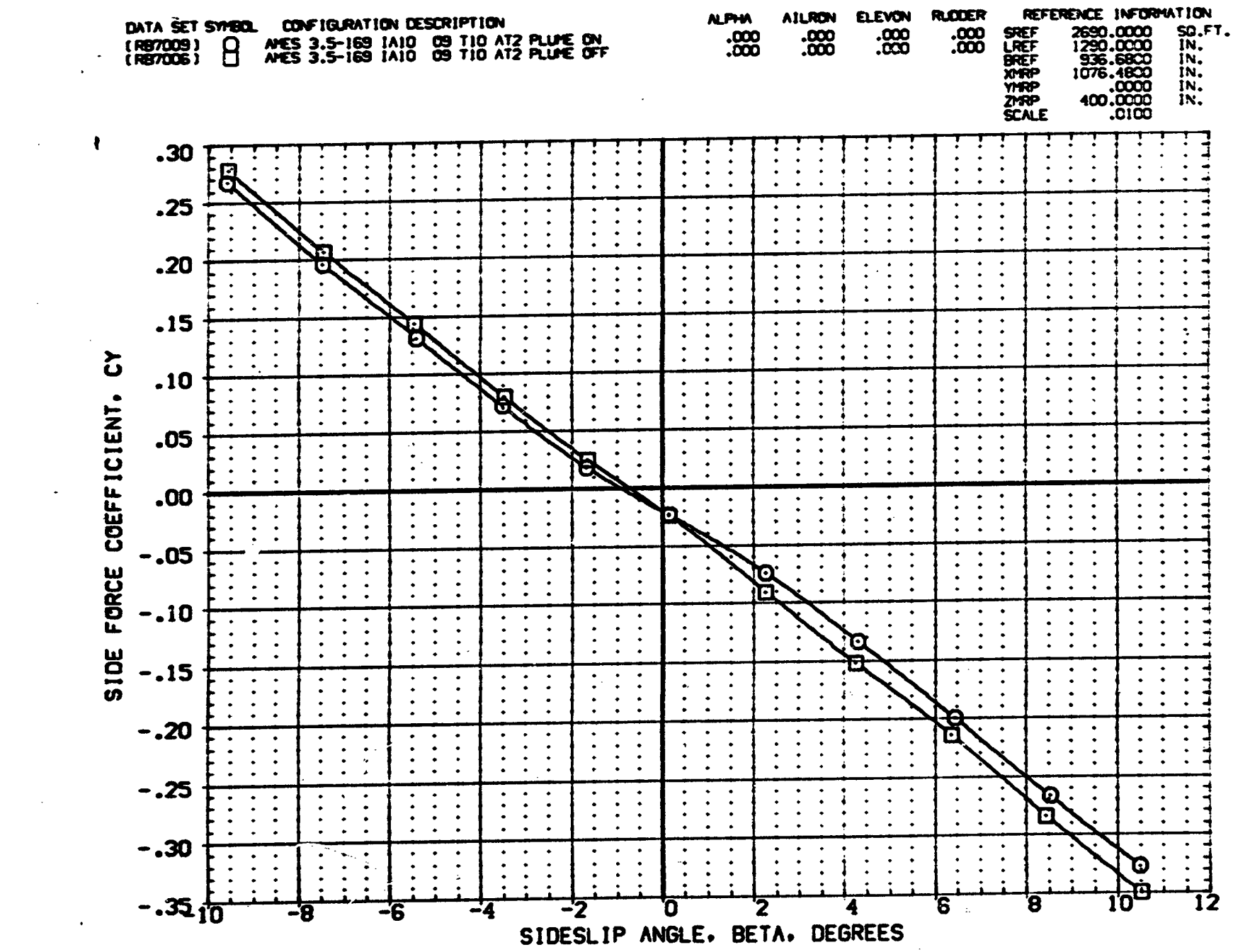


FIG. 5 EFFECTS OF SOLID PLUMES ON LATERAL-DIRECTIONAL CHARACTERISTICS.

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7009)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7006)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

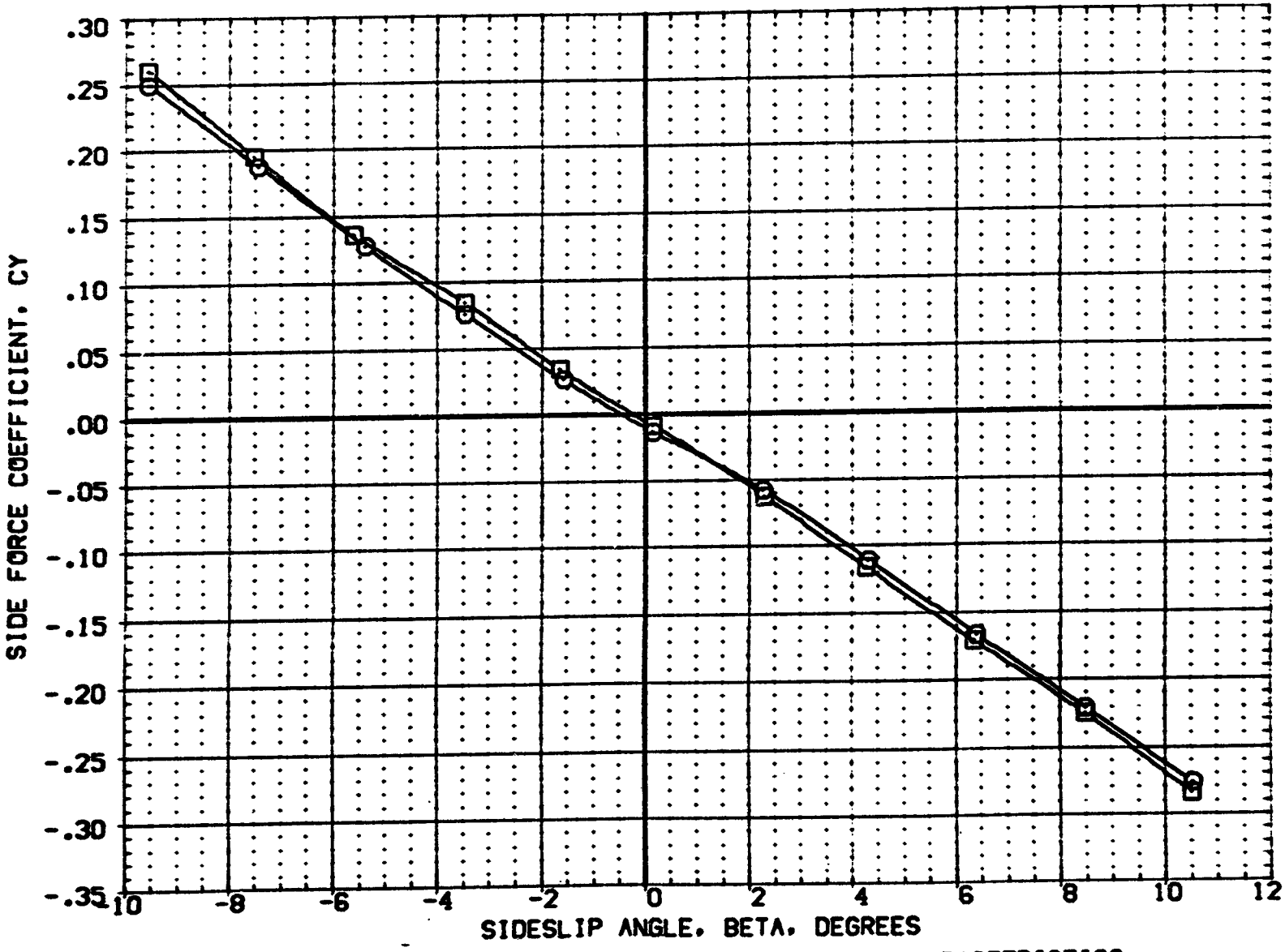


FIG. 5 EFFECTS OF SOLID PLUMES ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7009) ○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7006) □	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

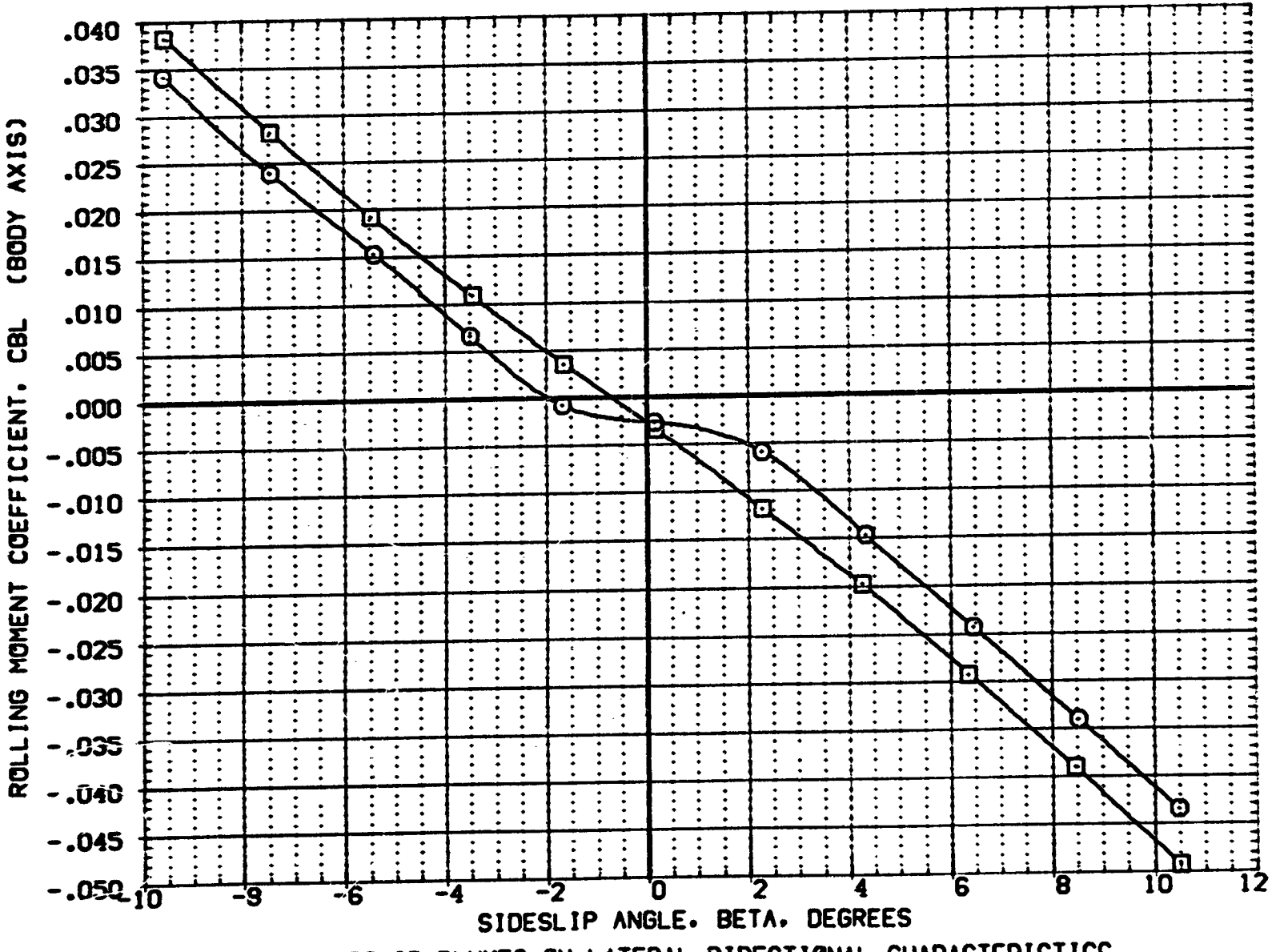


FIG. 5 EFFECTS OF SOLID PLUMES ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7009) ○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7006) □	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

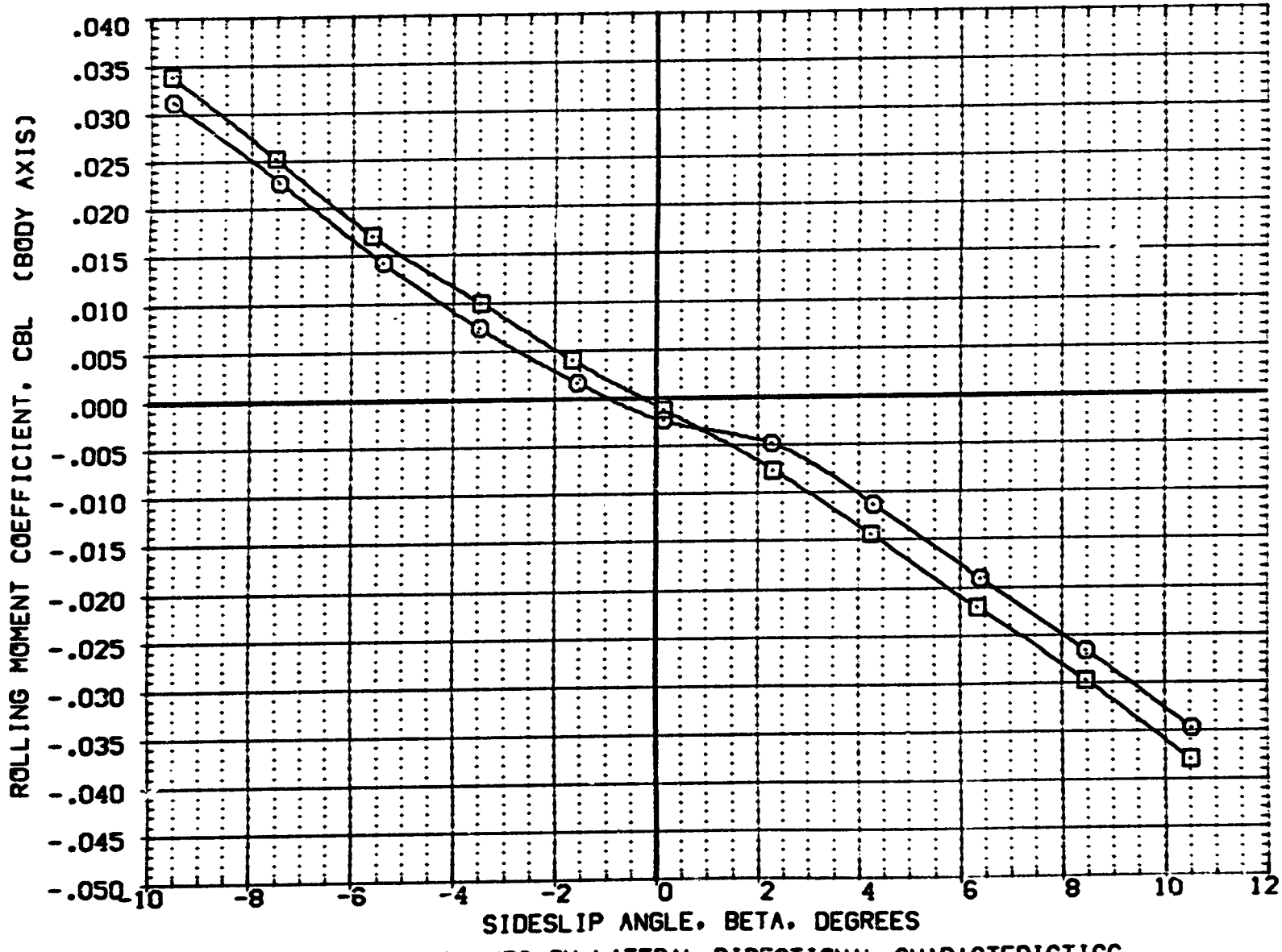


FIG. 5 EFFECTS OF SOLID PLUMES ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7009) ○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.300	.000	.000	.000
(RB7006) □	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

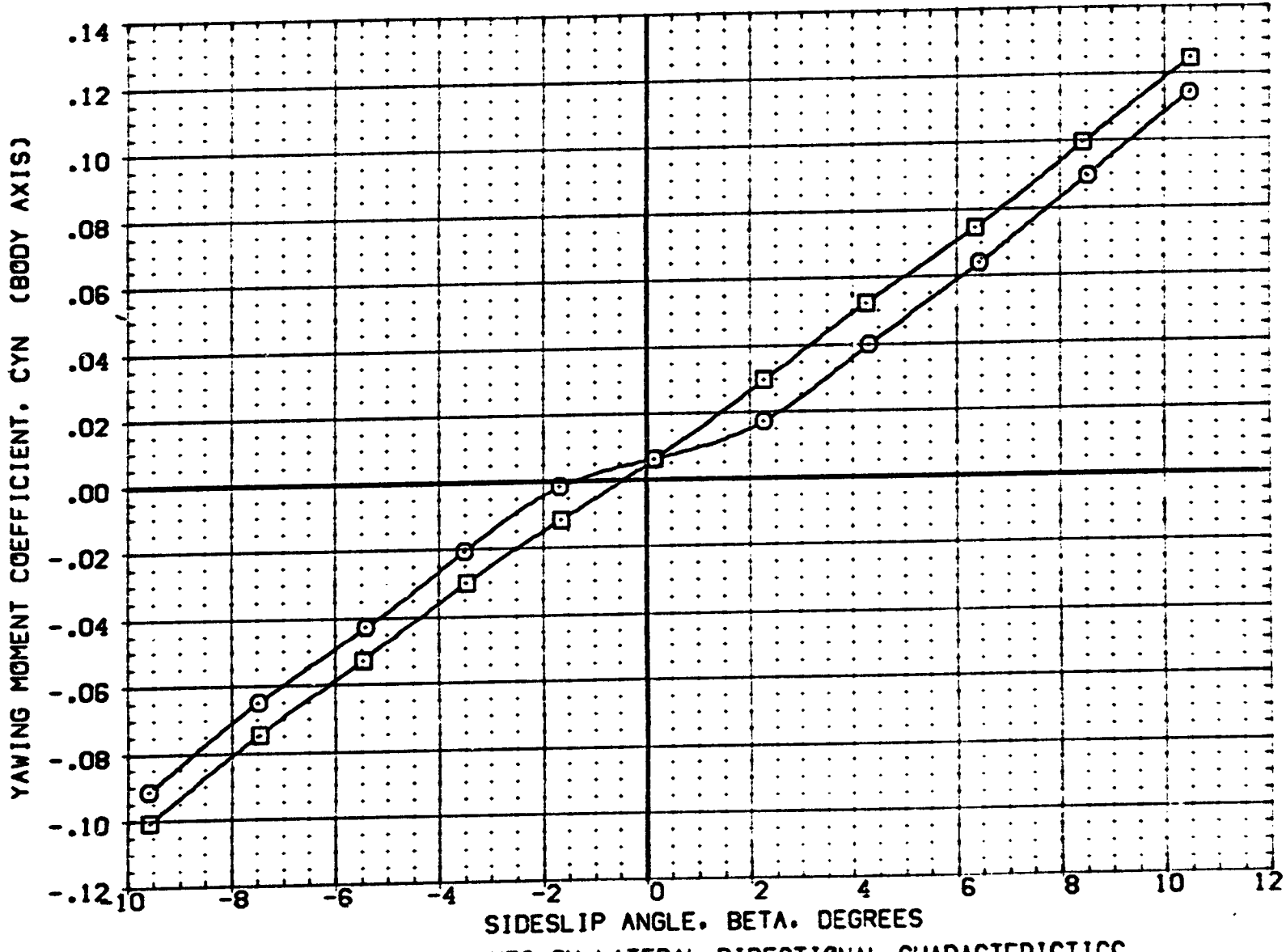


FIG. 5 EFFECTS OF SOLID PLUMES ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(R87009)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(R87006)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

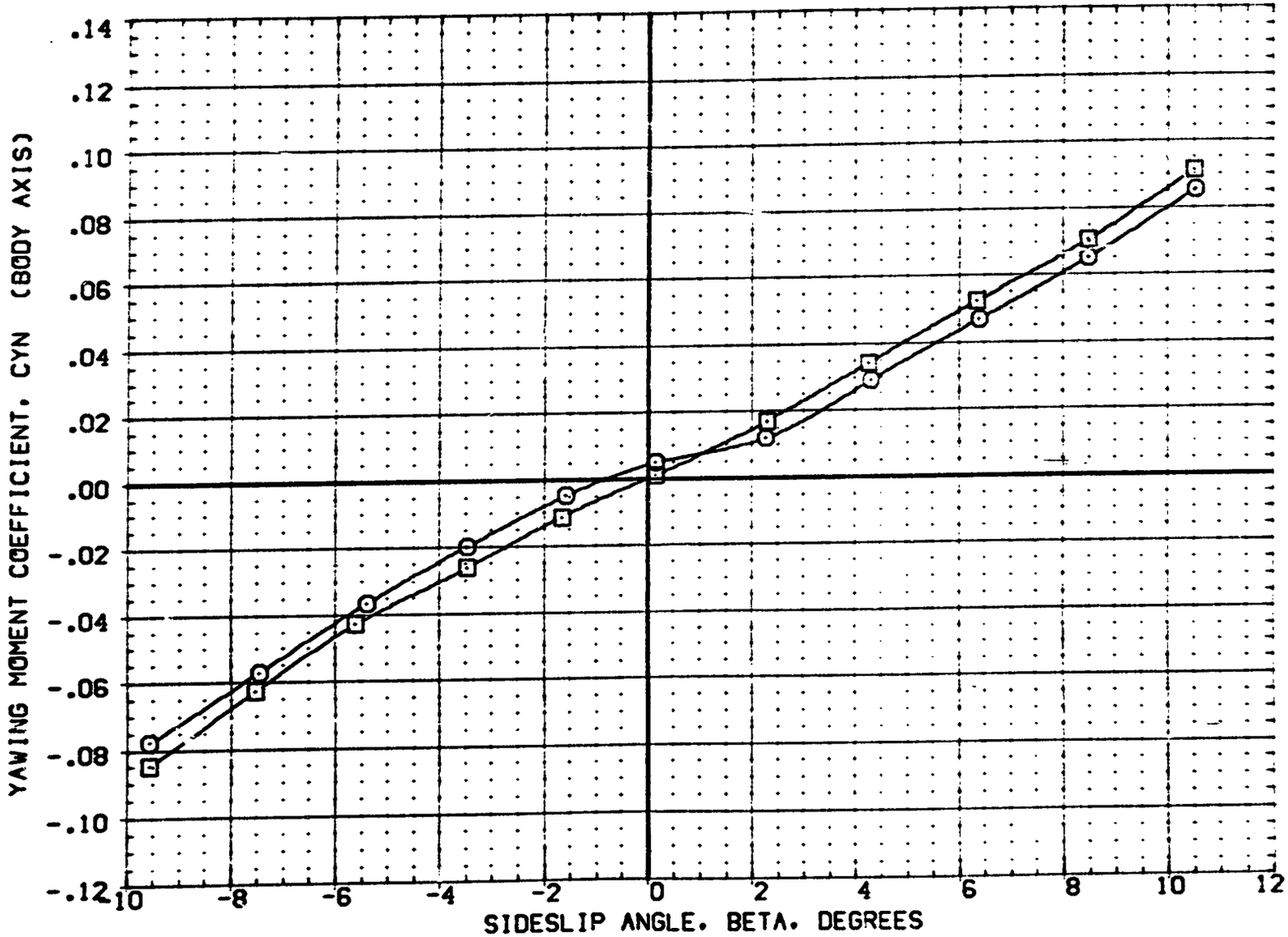


FIG. 5 EFFECTS OF SOLID PLUMES ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7009)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7006)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

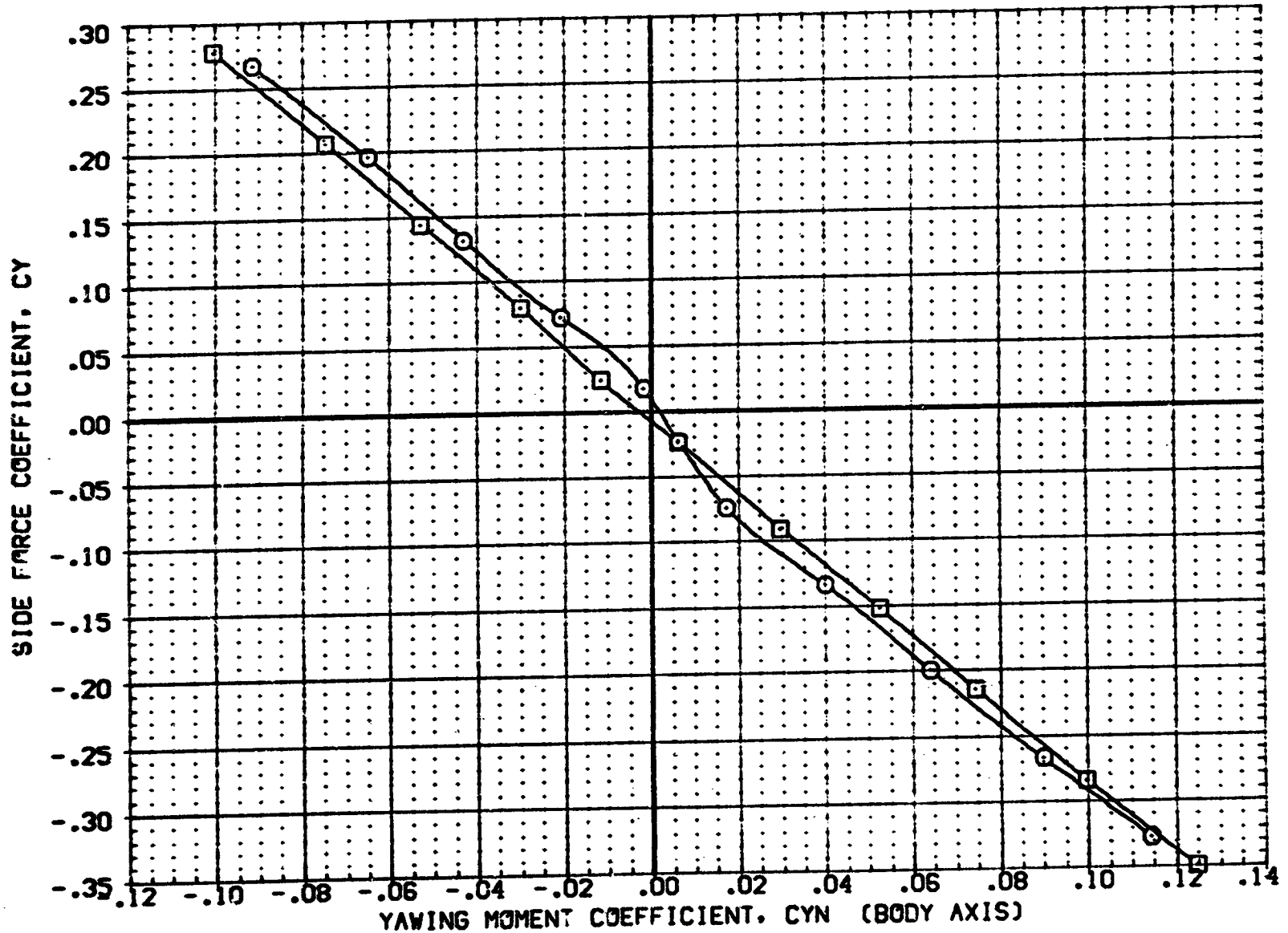


FIG. 5 EFFECTS OF SOLID PLUMES ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7009)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7006)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

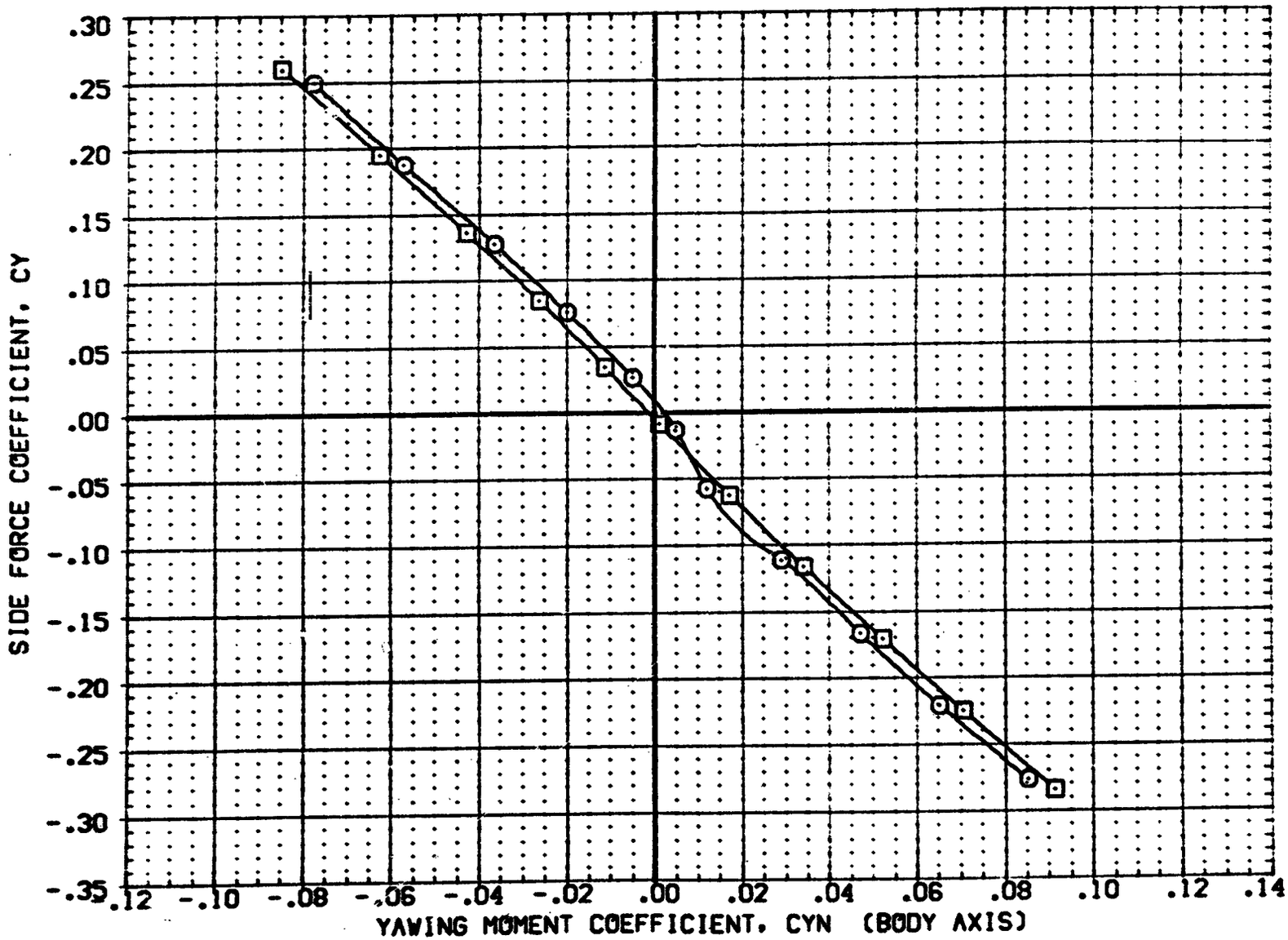


FIG. 5 EFFECTS OF SOLID PLUMES ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7008)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000
(RB7007)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000
(RB7009)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7006)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

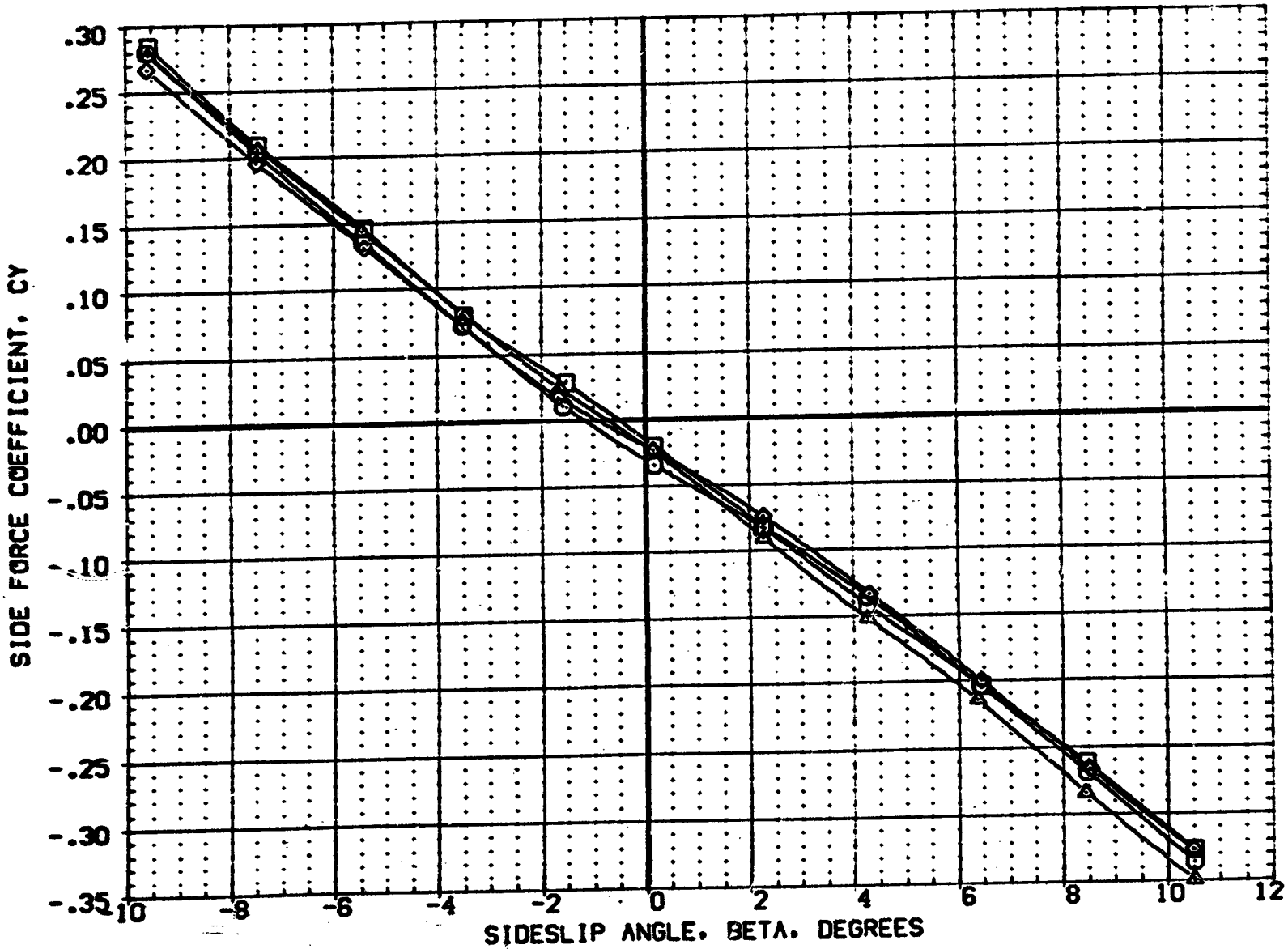


FIG. 6 EFFECTS OF SOLID PLUMES ON RUDDER EFFECTIVENESS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(R87008)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000
(R87007)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000
(R87009)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(R87006)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

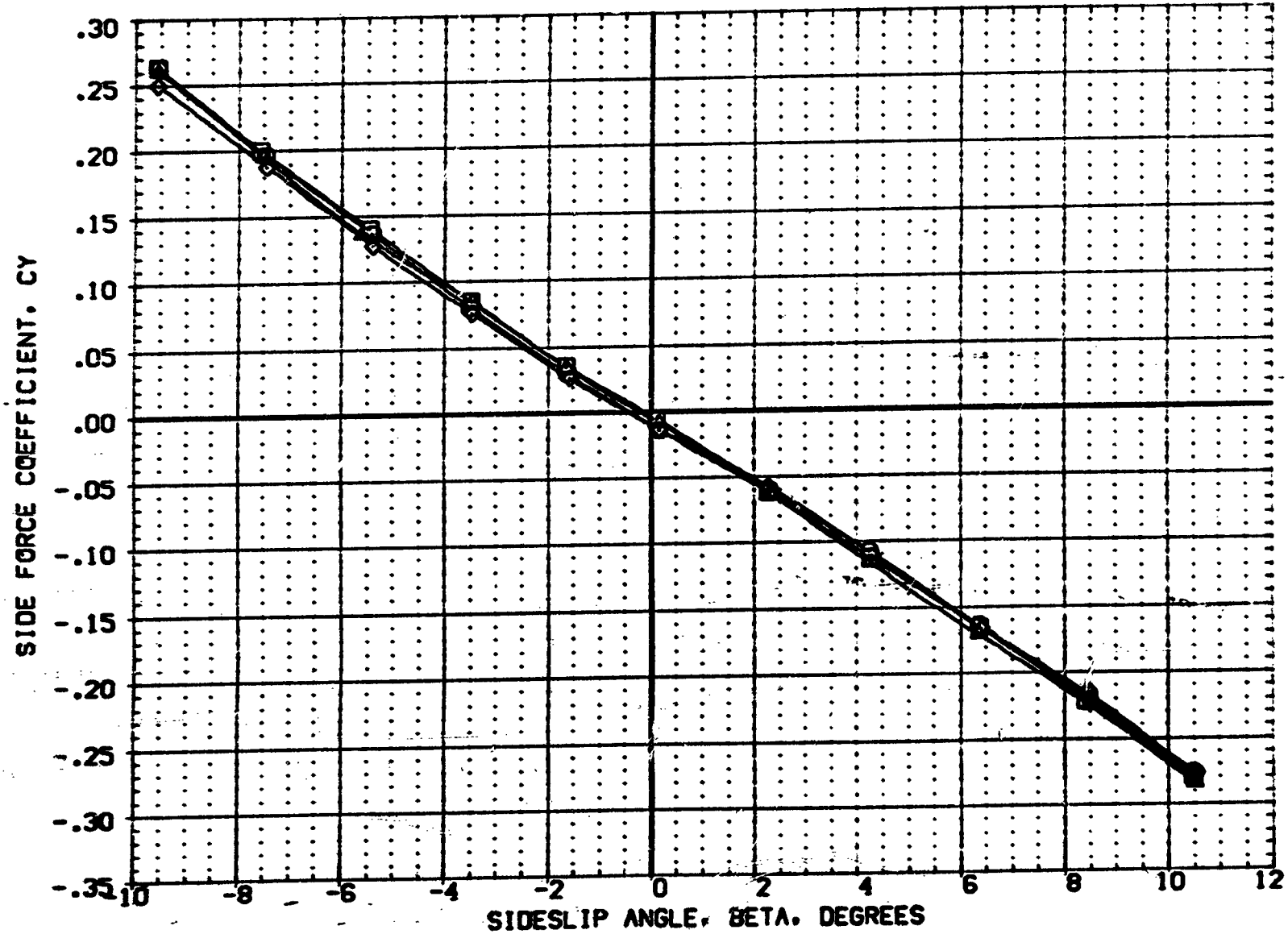


FIG. 6 EFFECTS OF SOLID PLUMES ON RUDDER EFFECTIVENESS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7008)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000
(RB7007)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000
(RB7009)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7006)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

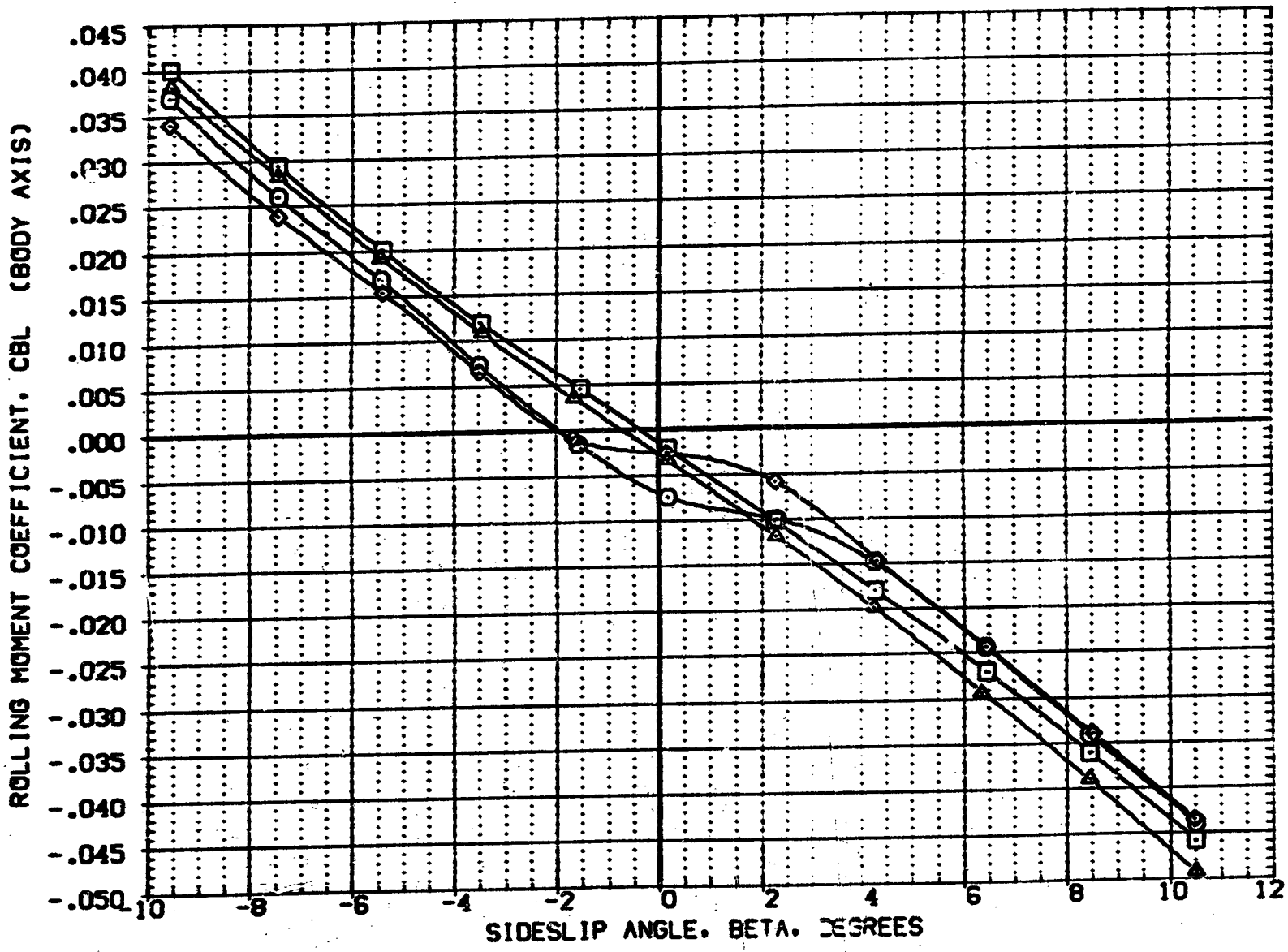


FIG. 6 EFFECTS OF SOLID PLUMES ON RUDDER EFFECTIVENESS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(B87008)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000
(B87007)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000
[illegible]	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(B87006)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

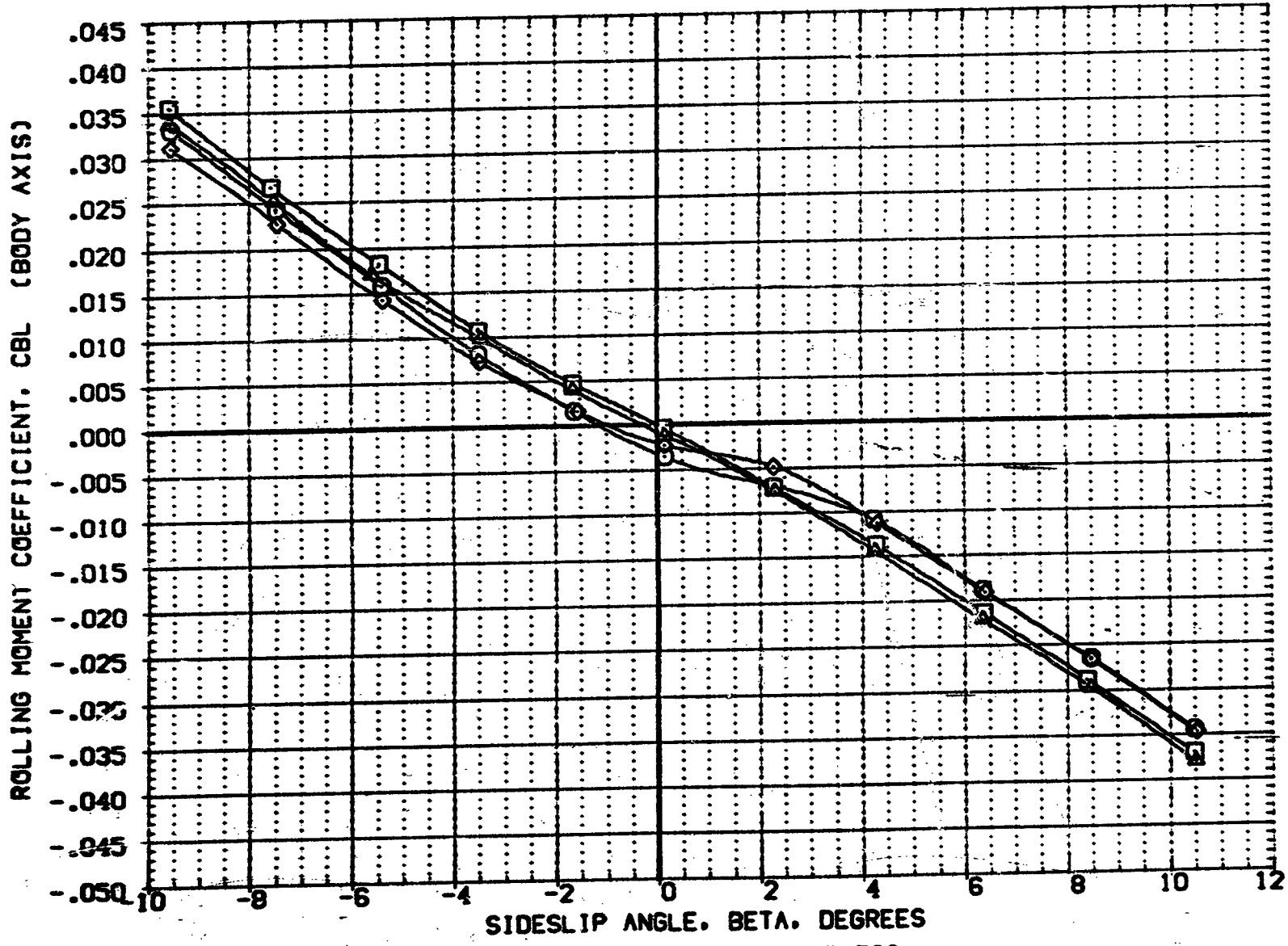


FIG. 6 EFFECTS OF SOLID PLUMES ON RUDDER EFFECTIVENESS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(R87008)	○	AMES 3.5-169 1A10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000
(R87007)	□	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000
(R87009)	◇	AMES 3.5-169 1A1C 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(R87006)	△	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

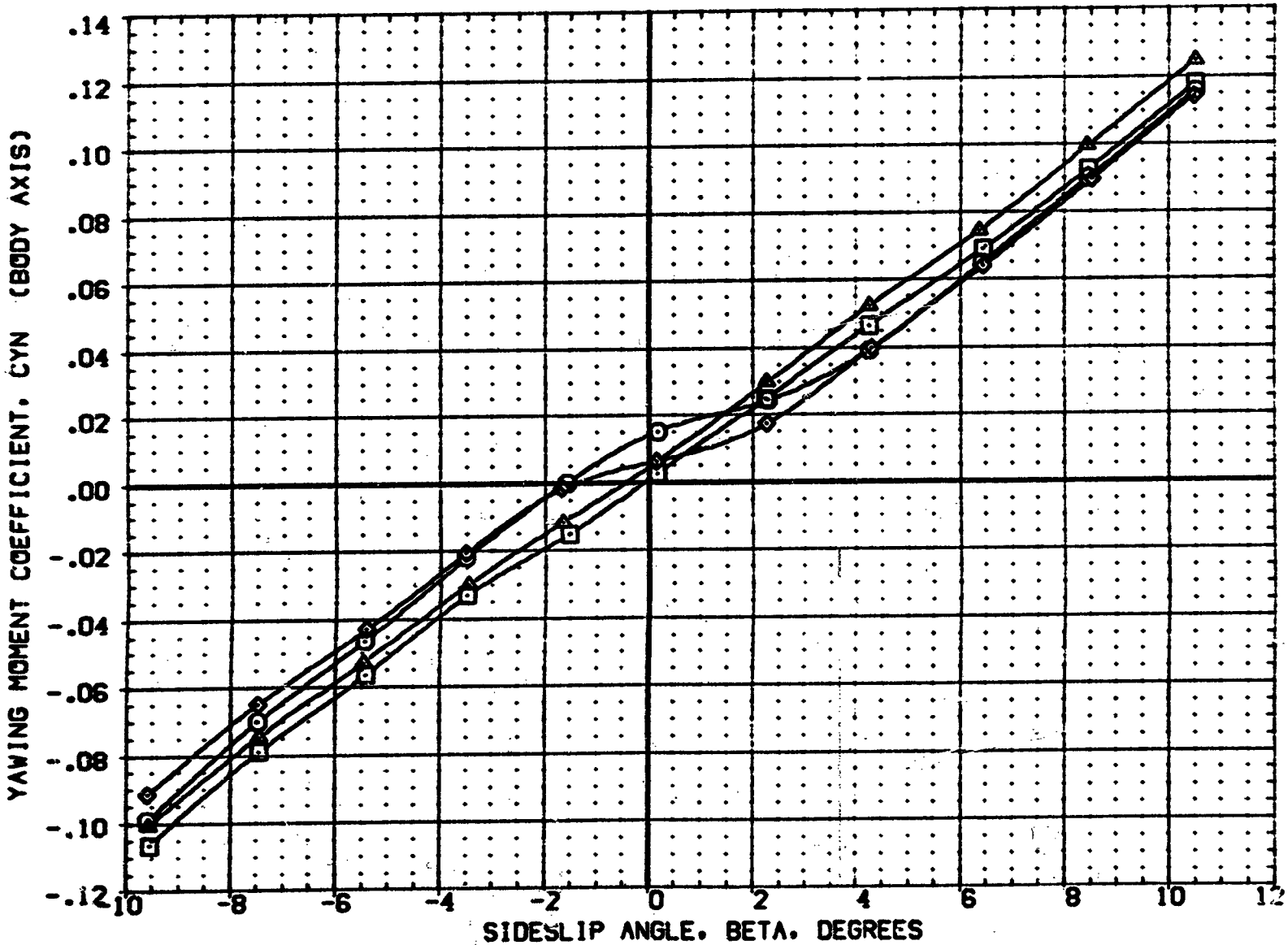


FIG. 6 EFFECTS OF SOLID PLUMES ON RUDDER EFFECTIVENESS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7008)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000
(RB7007)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000
(RB7009)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7006)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

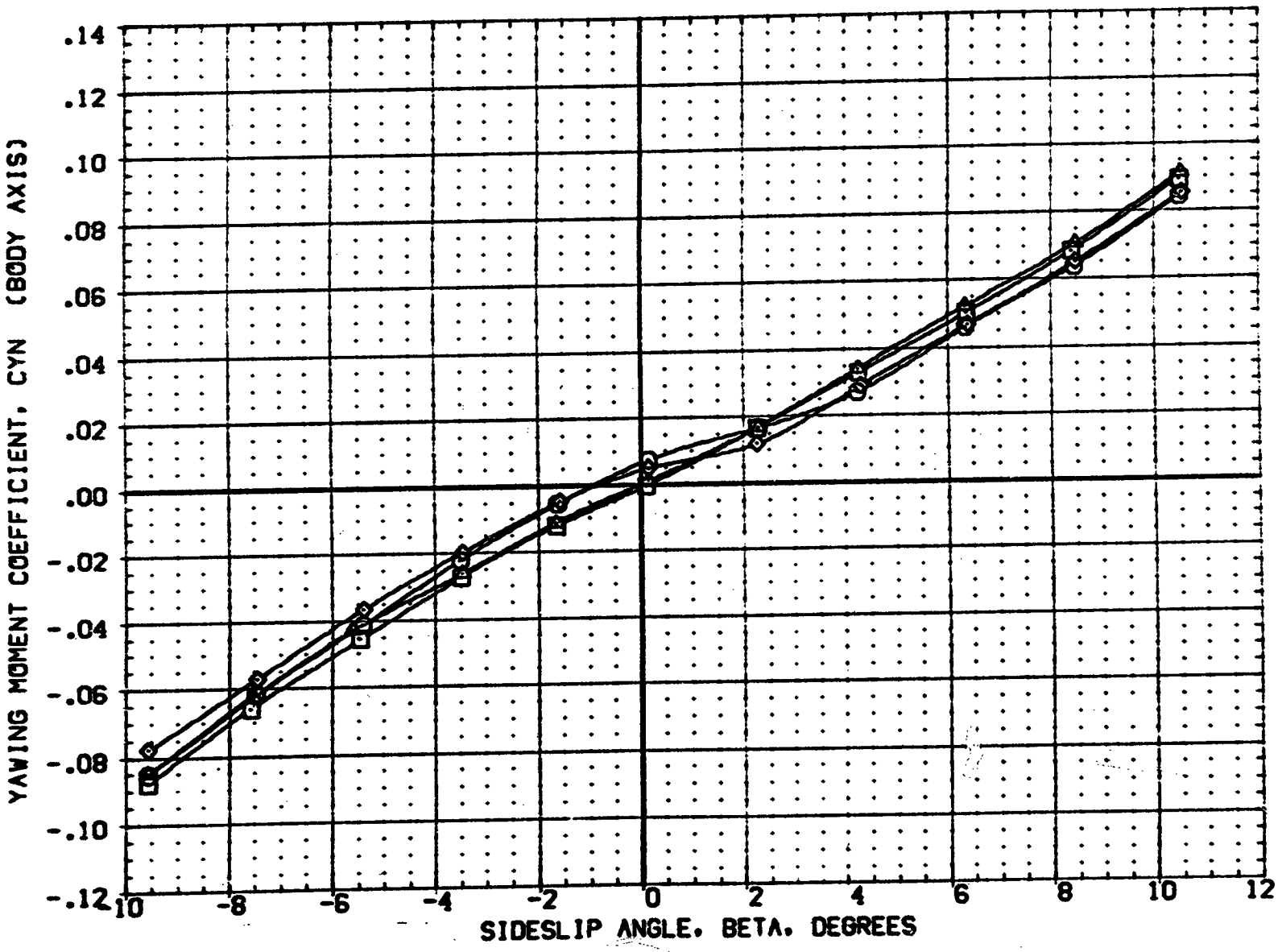


FIG. 6 EFFECTS OF SOLID PLUMES ON RUDDER EFFECTIVENESS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7008)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000
(RB7007)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000
(RB7009)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7006)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

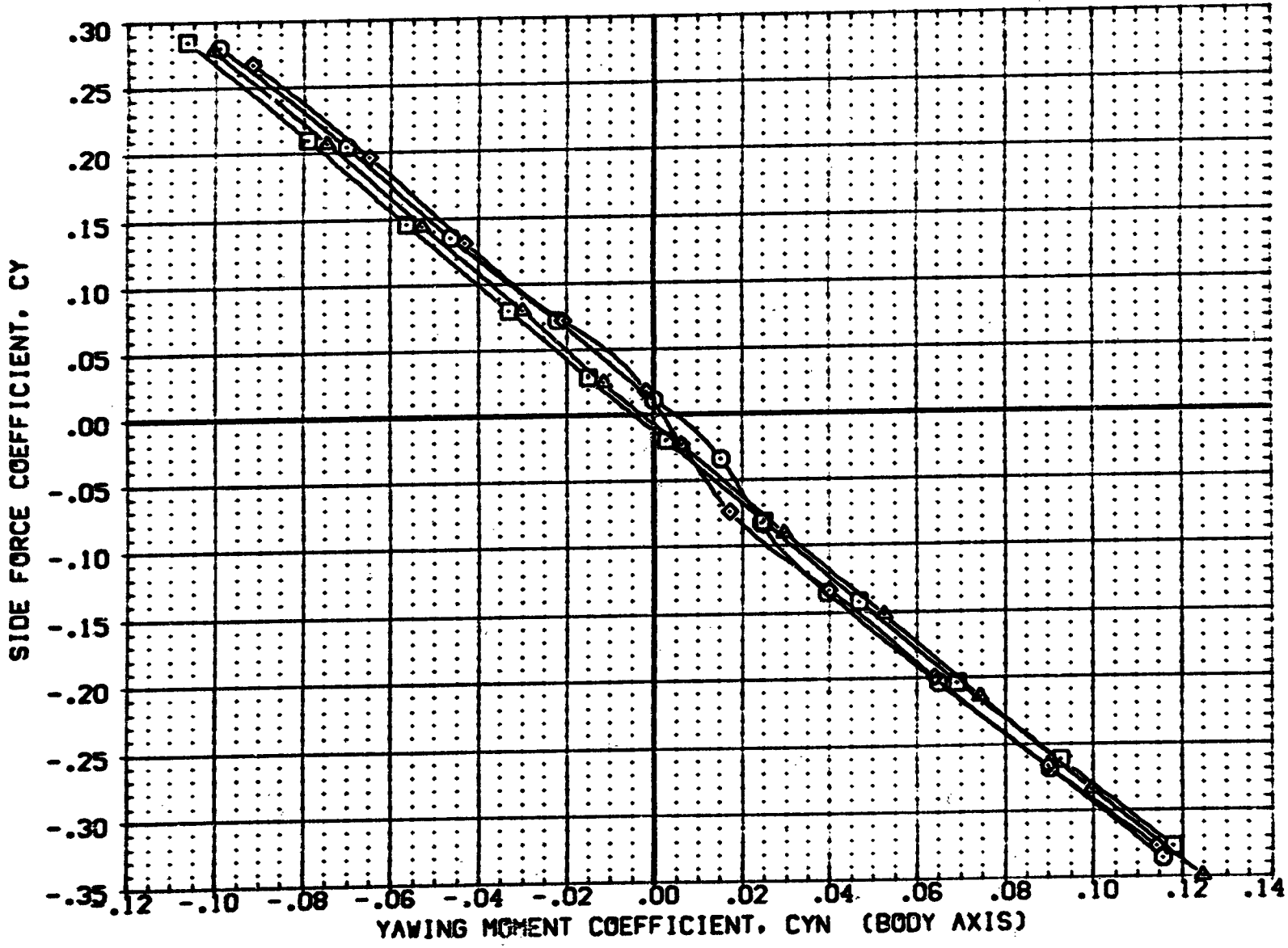


FIG. 6 EFFECTS OF SOLID PLUMES ON RUDDER EFFECTIVENESS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7006)	□	AMES 3.5-169 IA10 89 T10 AT2 PLUME ON	.000	.000	.000	10.000
(RB7007)	◇	AMES 3.5-169 IA10 89 T10 AT2 PLUME OFF	.000	.000	.000	10.000
(RB7009)	⊠	AMES 3.5-169 IA10 89 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7006)	△	AMES 3.5-169 IA10 89 T10 AT2 PLUME OFF	.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

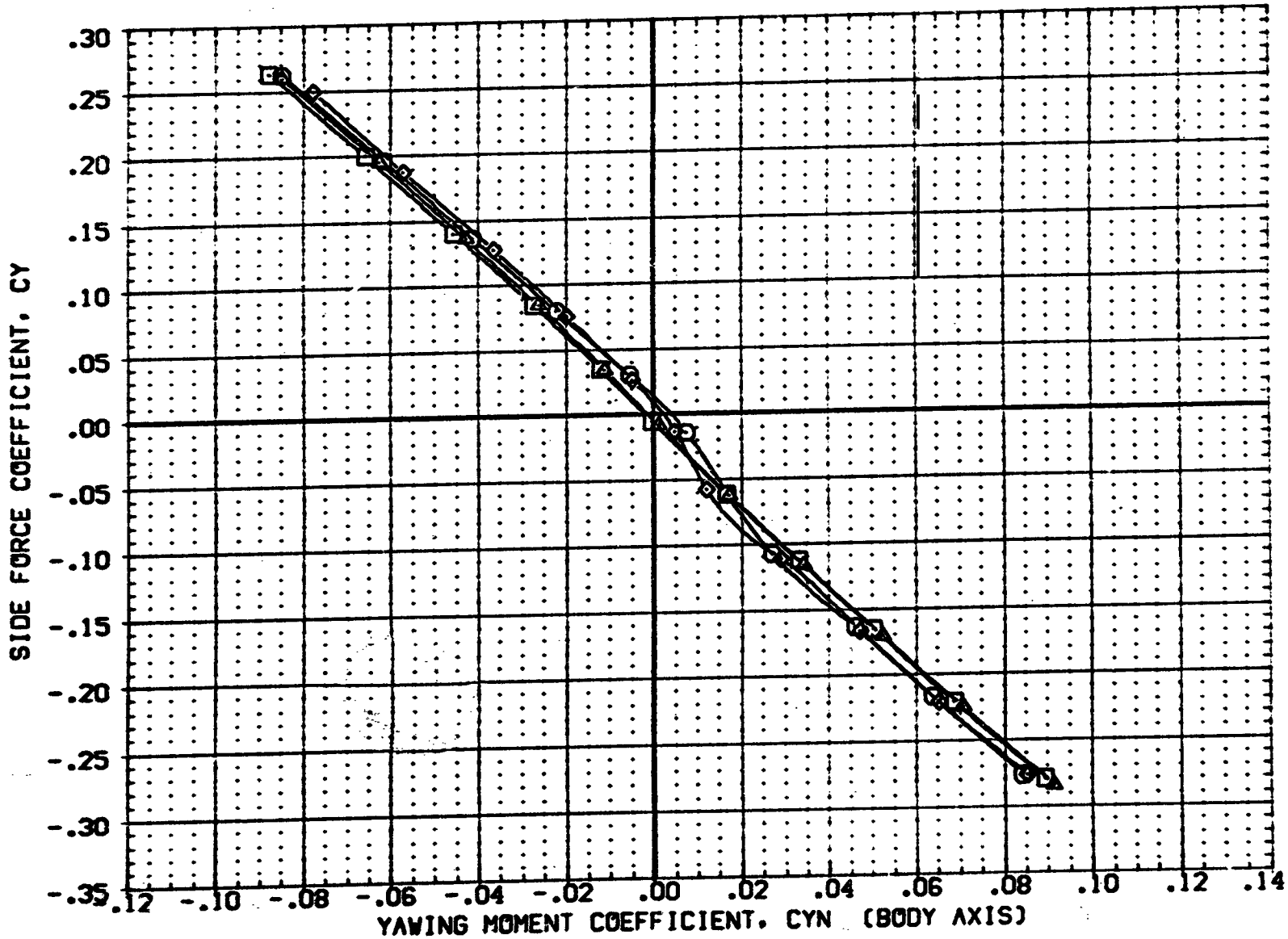


FIG. 6 EFFECTS OF SOLID PLUMES ON RUDDER EFFECTIVENESS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(D87011)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(S87005)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000
(R87001)	◇	DATA NOT AVAILABLE	.000	.000	.000	.000
(T87005)	△	DATA NOT AVAILABLE	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

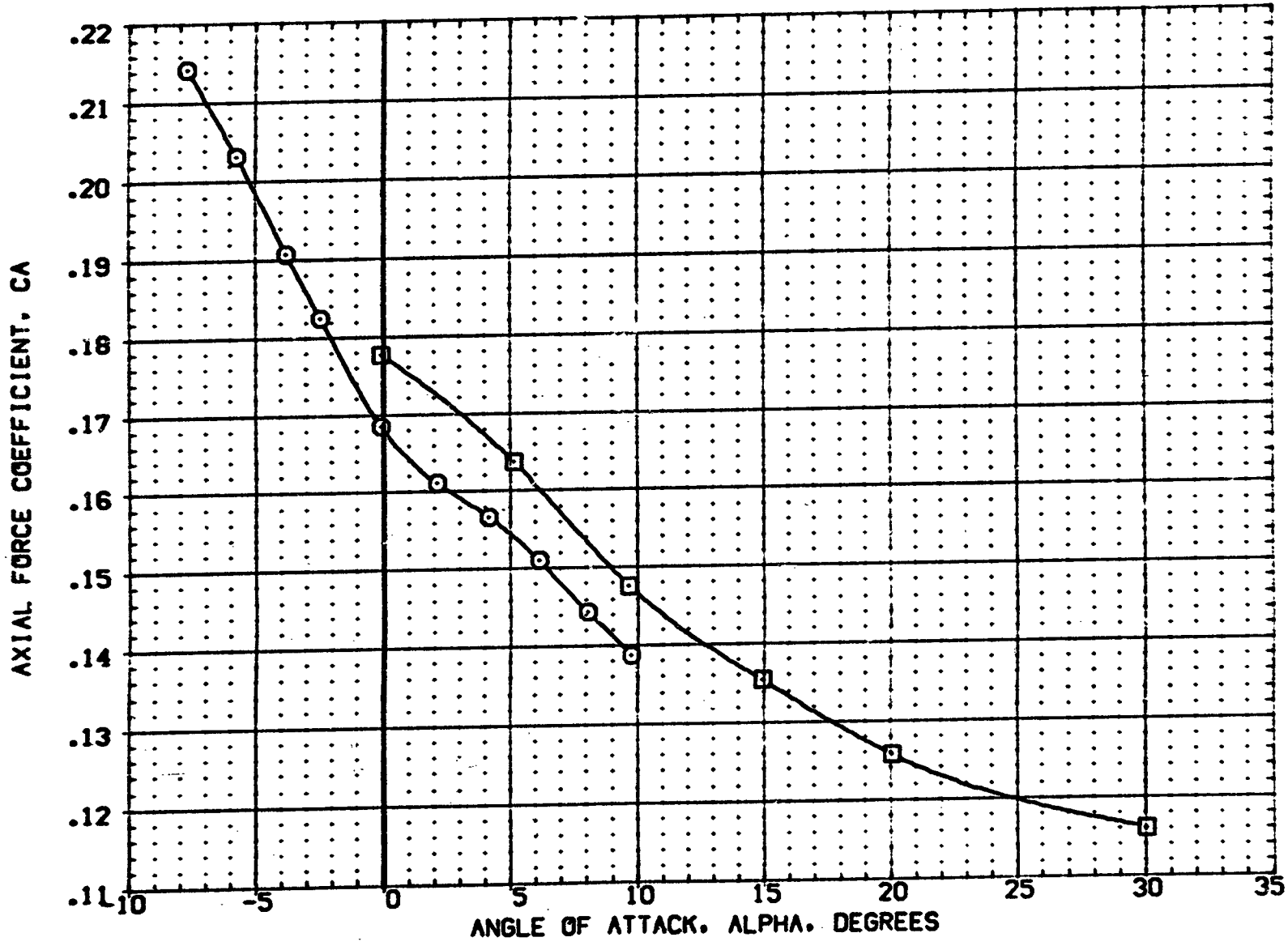


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(A)MACH = 5.26

DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(B7011)	DATA NOT AVAILABLE
(SB7005)	DATA NOT AVAILABLE
(RB7001)	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(TB7005)	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
.000	10.000	.000	.000
.000	.000	.000	.000
.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

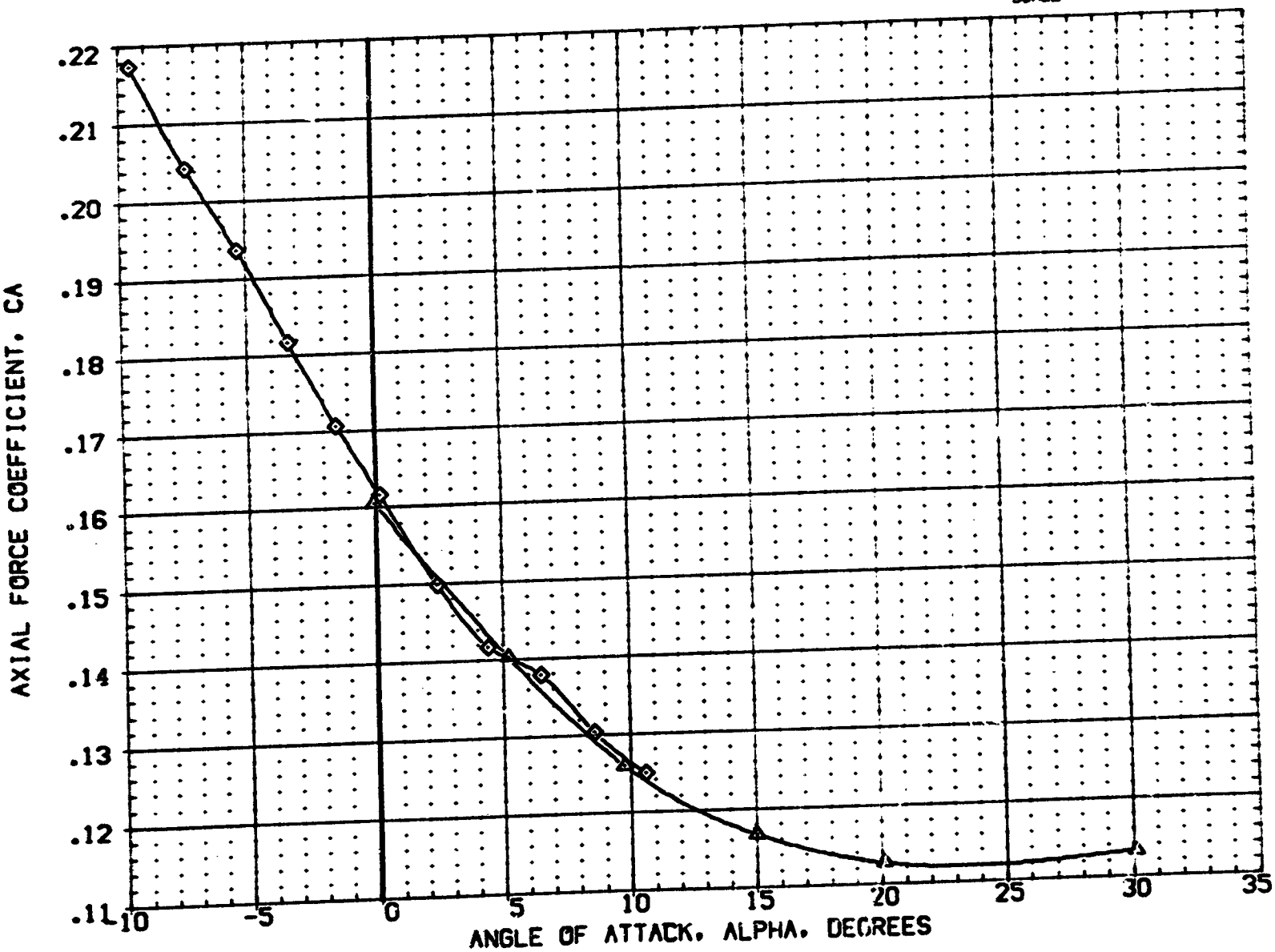


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(B)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(B87011)	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(S87005)	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(R87001)	DATA NOT AVAILABLE
(T87005)	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
.000	10.000	.000	.000
.000	.000	.000	.000
.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

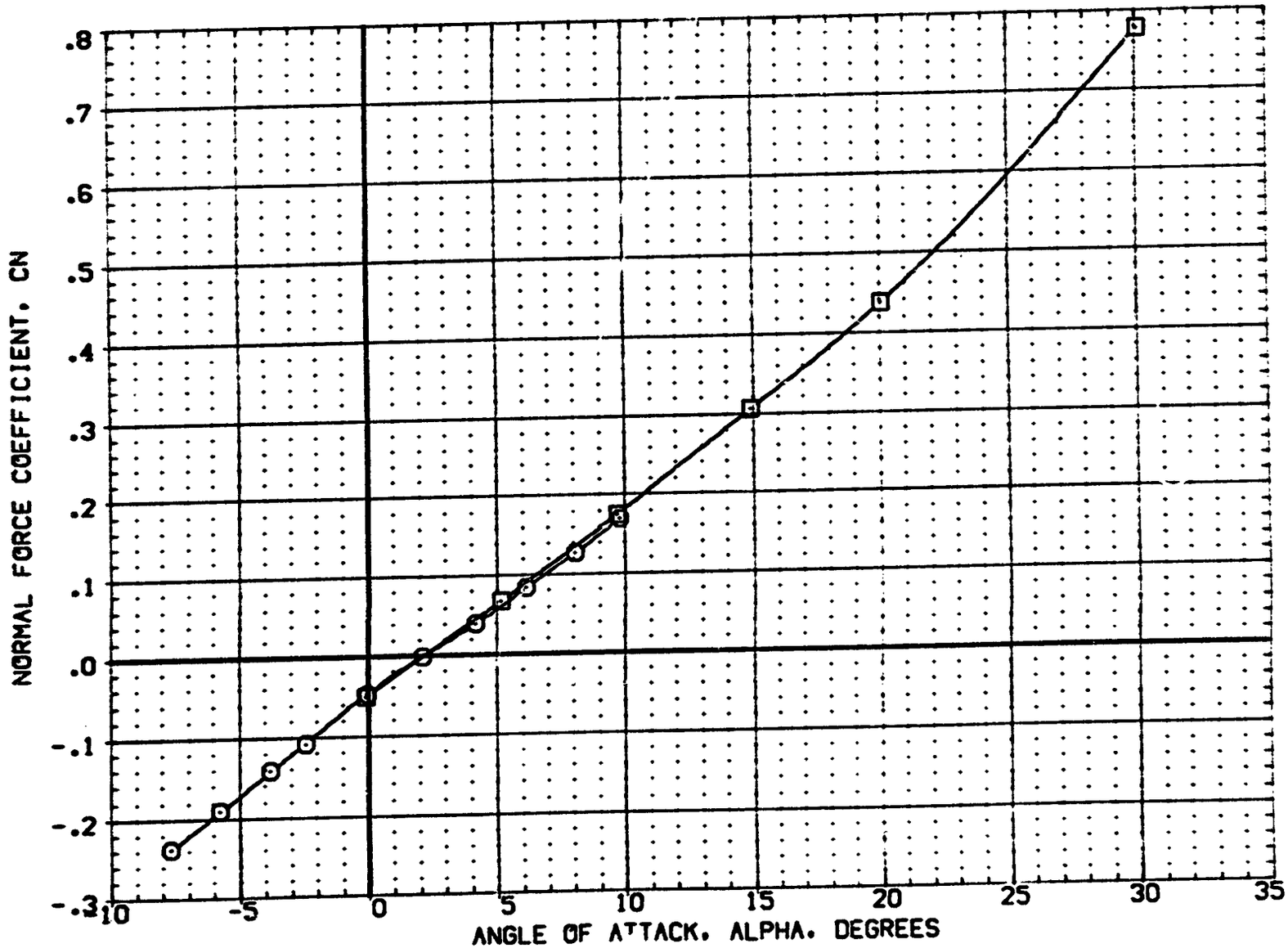


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(A)MACH = 5.26

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
[D87011]	○	DATA NOT AVAILABLE	.000	.000	.000	.000
[S87005]	□	DATA NOT AVAILABLE	.000	10.000	.000	.000
[R87001]	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
[T87005]	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

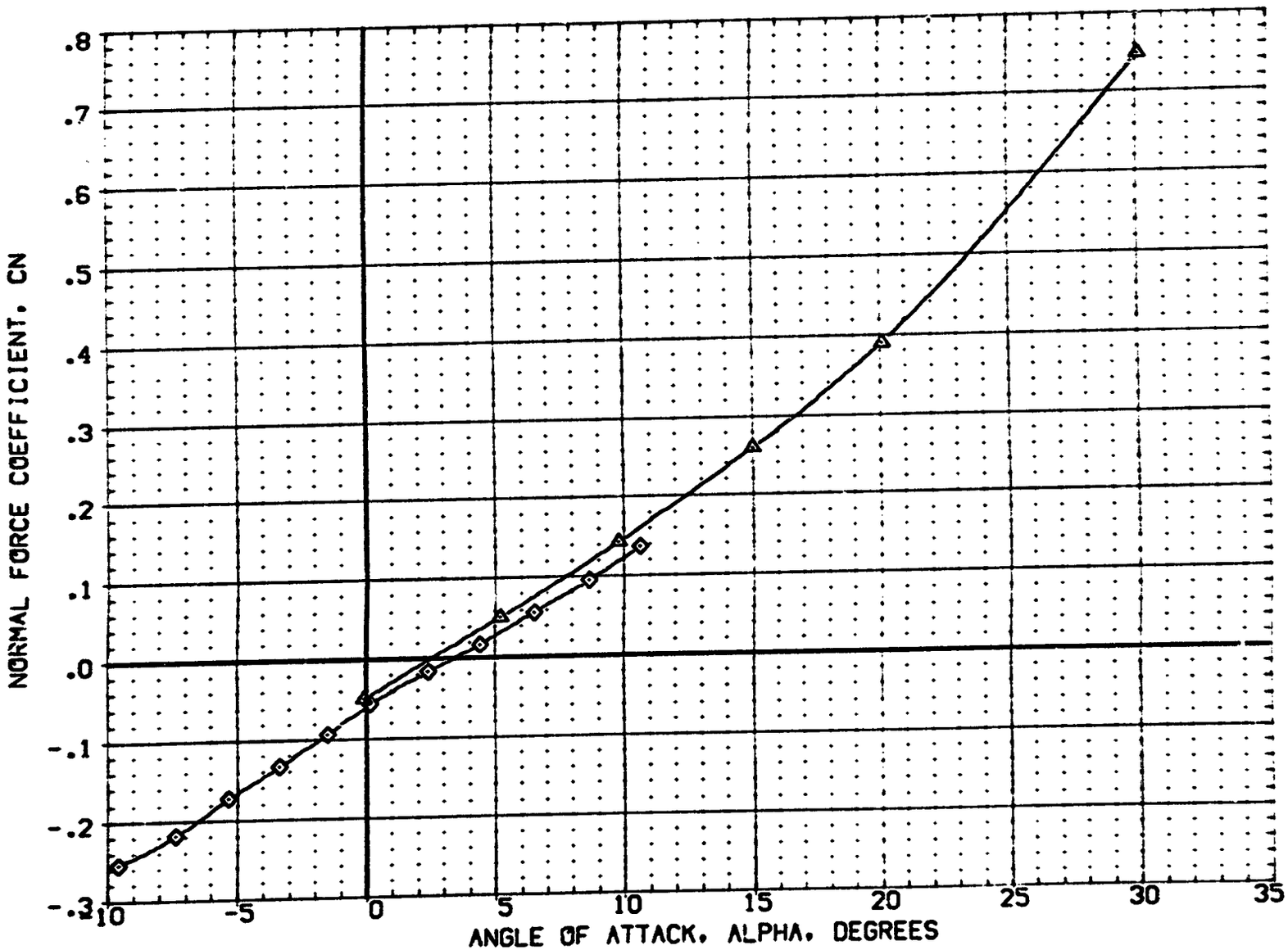


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(D87011)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(S87005)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000
(R87001)	◇	DATA NOT AVAILABLE	.000	.000	.000	.000
(T87005)	△	DATA NOT AVAILABLE	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

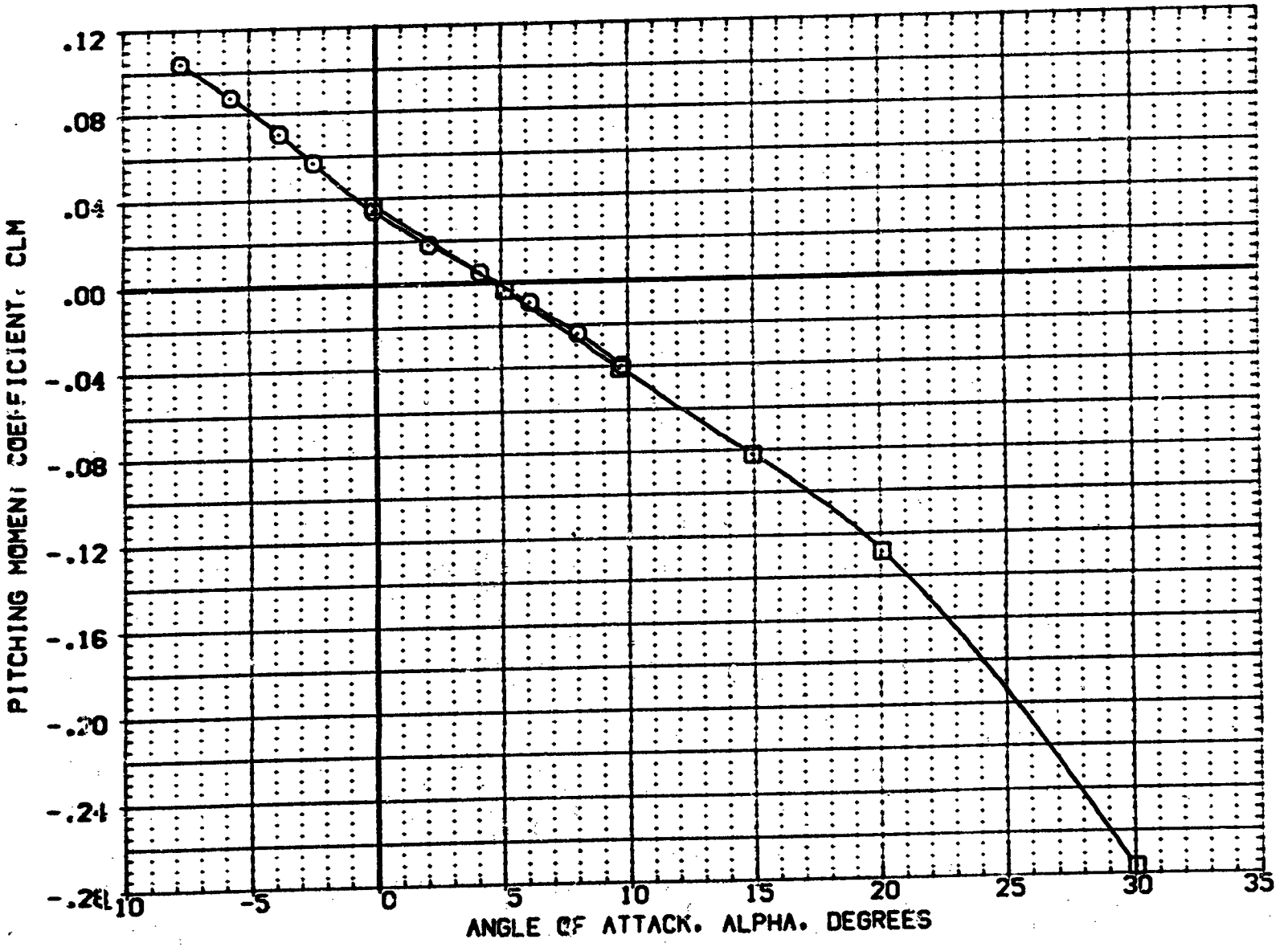


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(A) MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	BETA	ELEVON	CODE
(DB7001)	□	DATA NOT AVAILABLE	.000	.000	.000	.000
(SB7001)	□	DATA NOT AVAILABLE	.000	10.000	.000	.000
(RB7001)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(TB7001)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

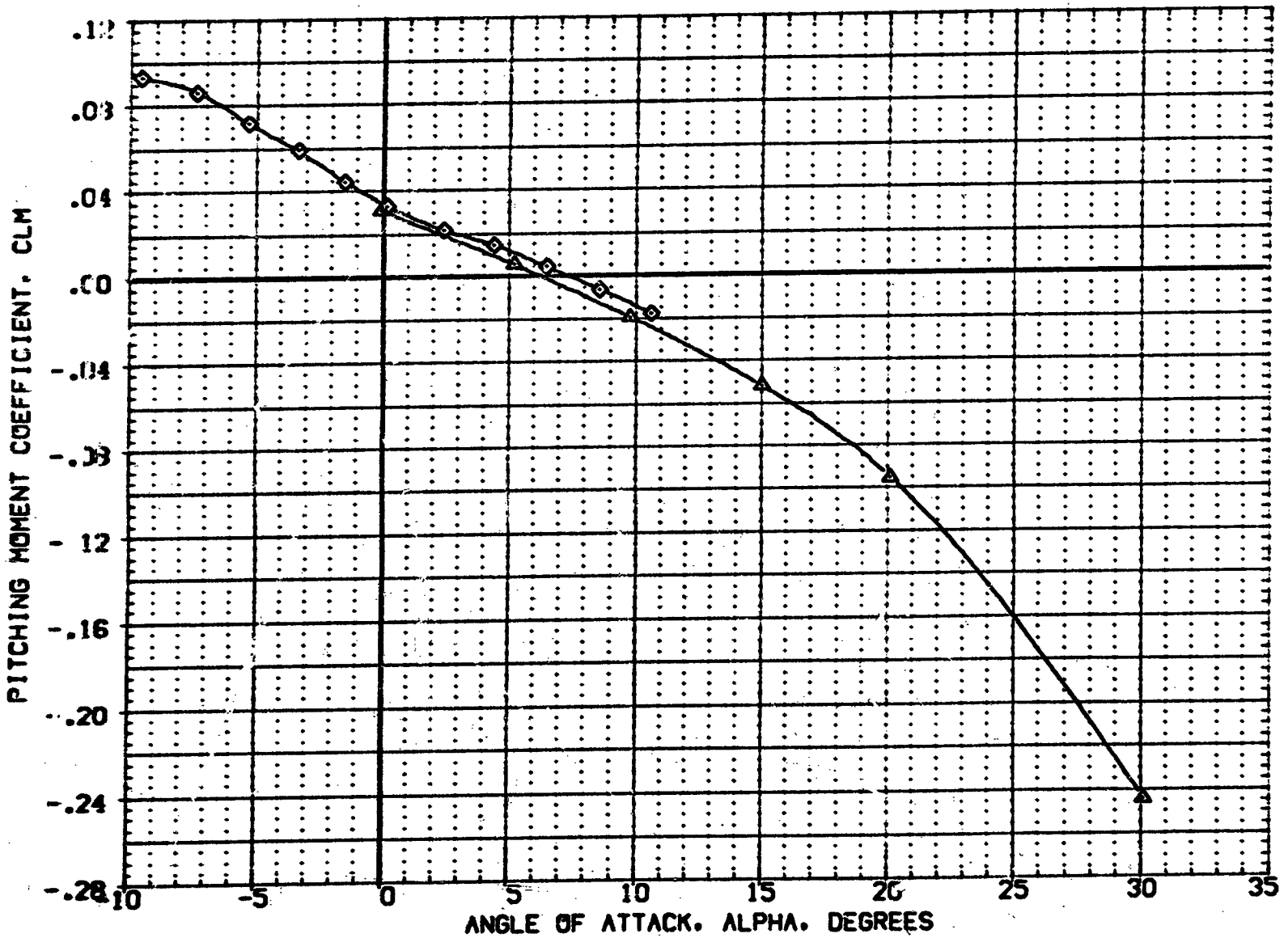


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(DB7011)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF
(SB7005)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF
(RB7001)	◇	DATA NOT AVAILABLE
(TB7005)	△	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
.000	10.000	.000	.000
.000	.000	.000	.000
.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

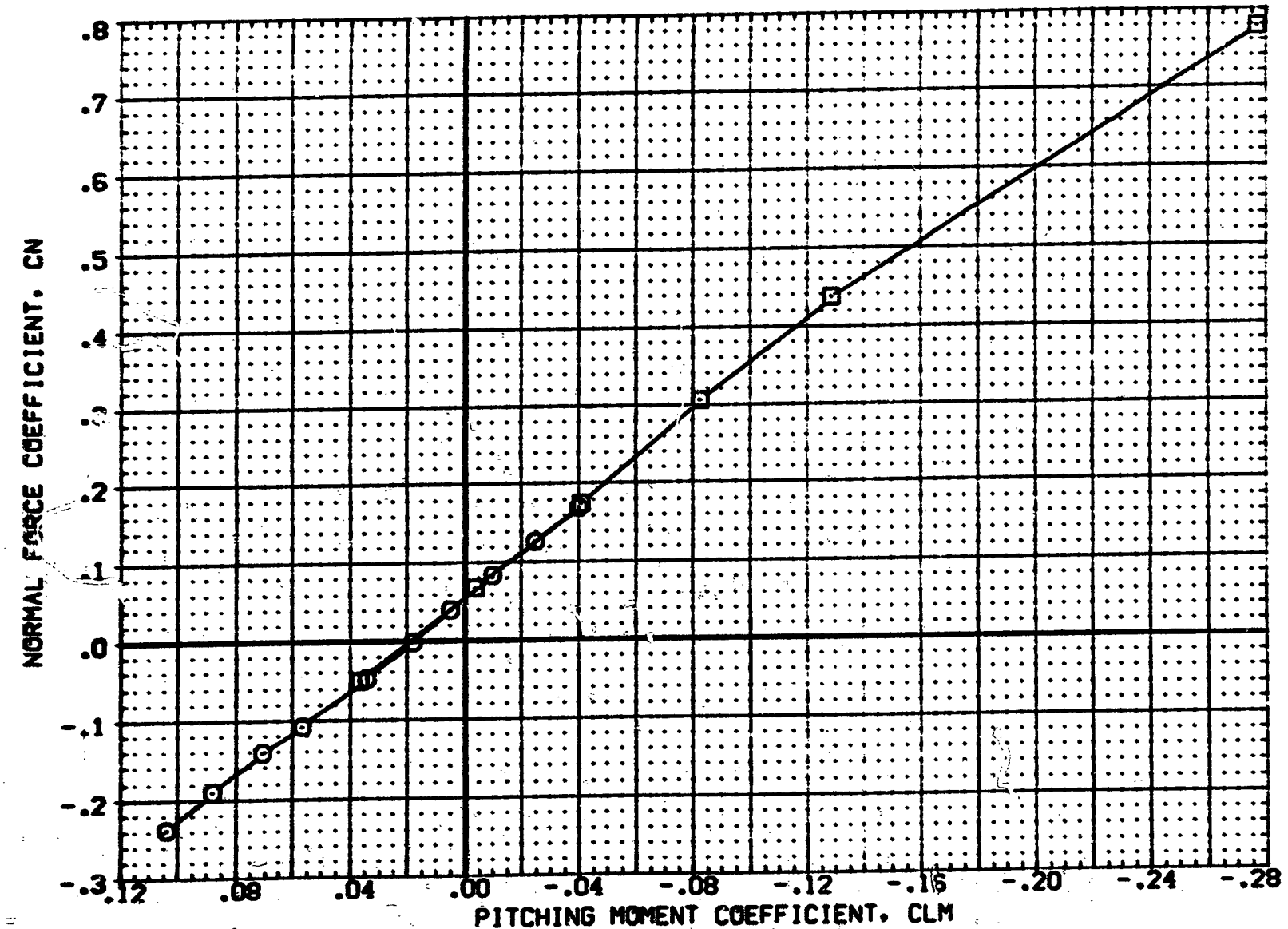


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(A)MACH = 5.26

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(D87011)	○	DATA NOT AVAILABLE	.000	.000	.000	.000
(S87005)	□	DATA NOT AVAILABLE	.000	10.000	.000	.000
(R87001)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(T87005)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

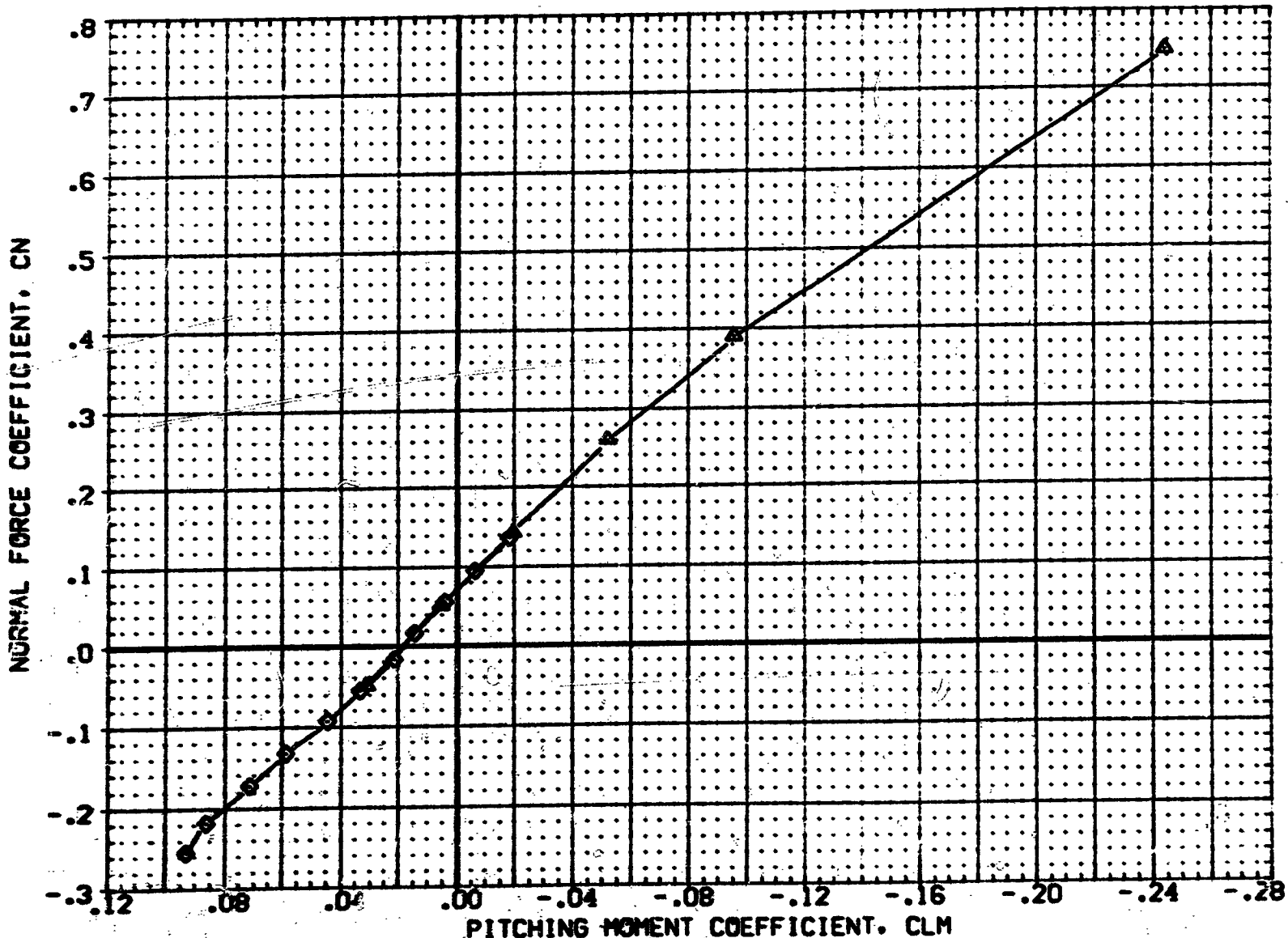


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(B)MACH = 7.32

DATA SET SYMBOL		CONFIGURATION DESCRIPTION
(D87011)	○	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(S87005)	□	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(R87001)	◇	DATA NOT AVAILABLE
(T87005)	△	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
.000	10.000	.000	.000
.000	.000	.000	.000
.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

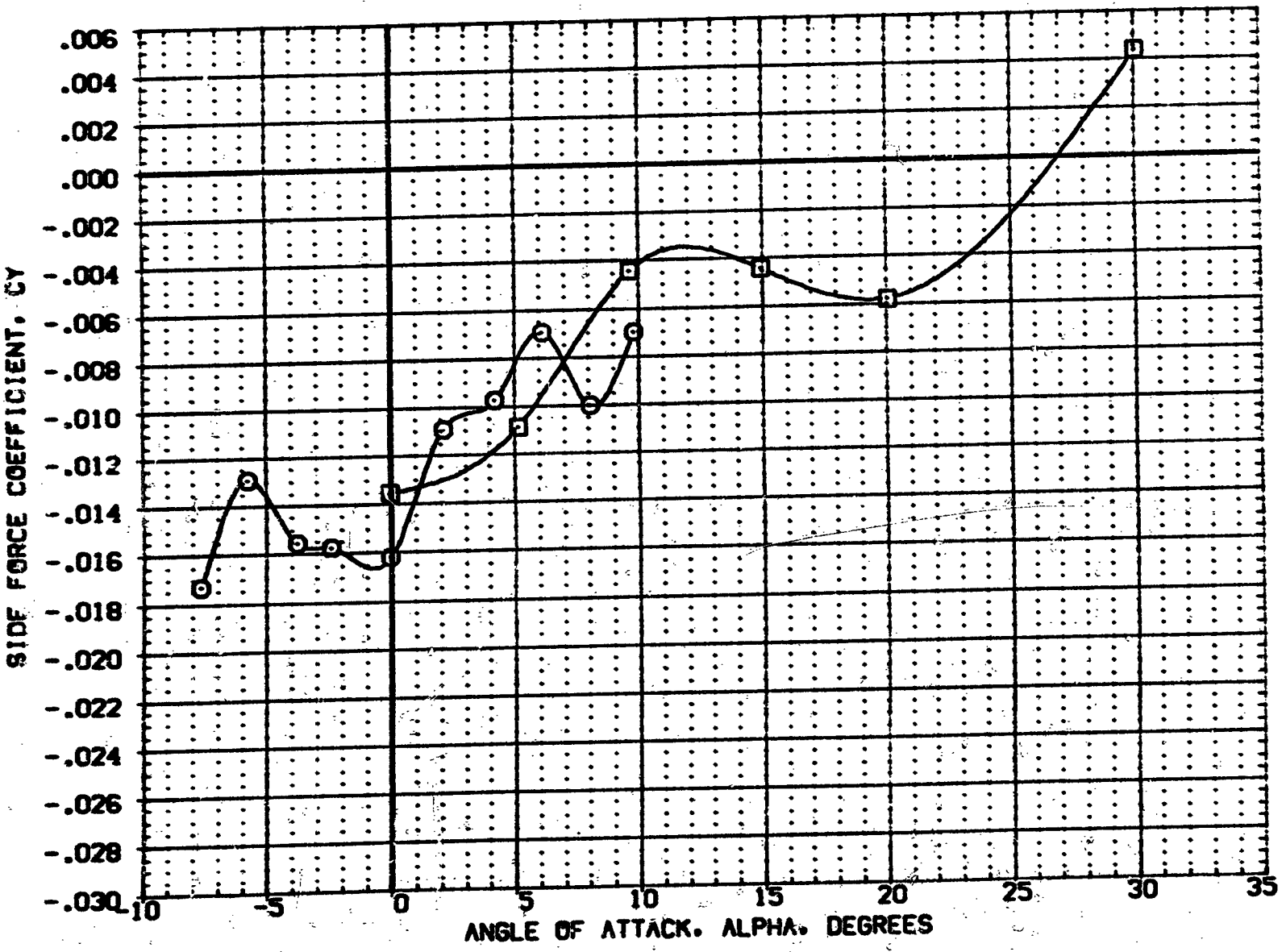


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(A)MACH = 5.26

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(OB7011) ○	DATA NOT AVAILABLE	.000	.000	.000	.000
(SB7005) □	DATA NOT AVAILABLE	.000	10.000	.000	.000
(RB7001) ◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(TB7005) △	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

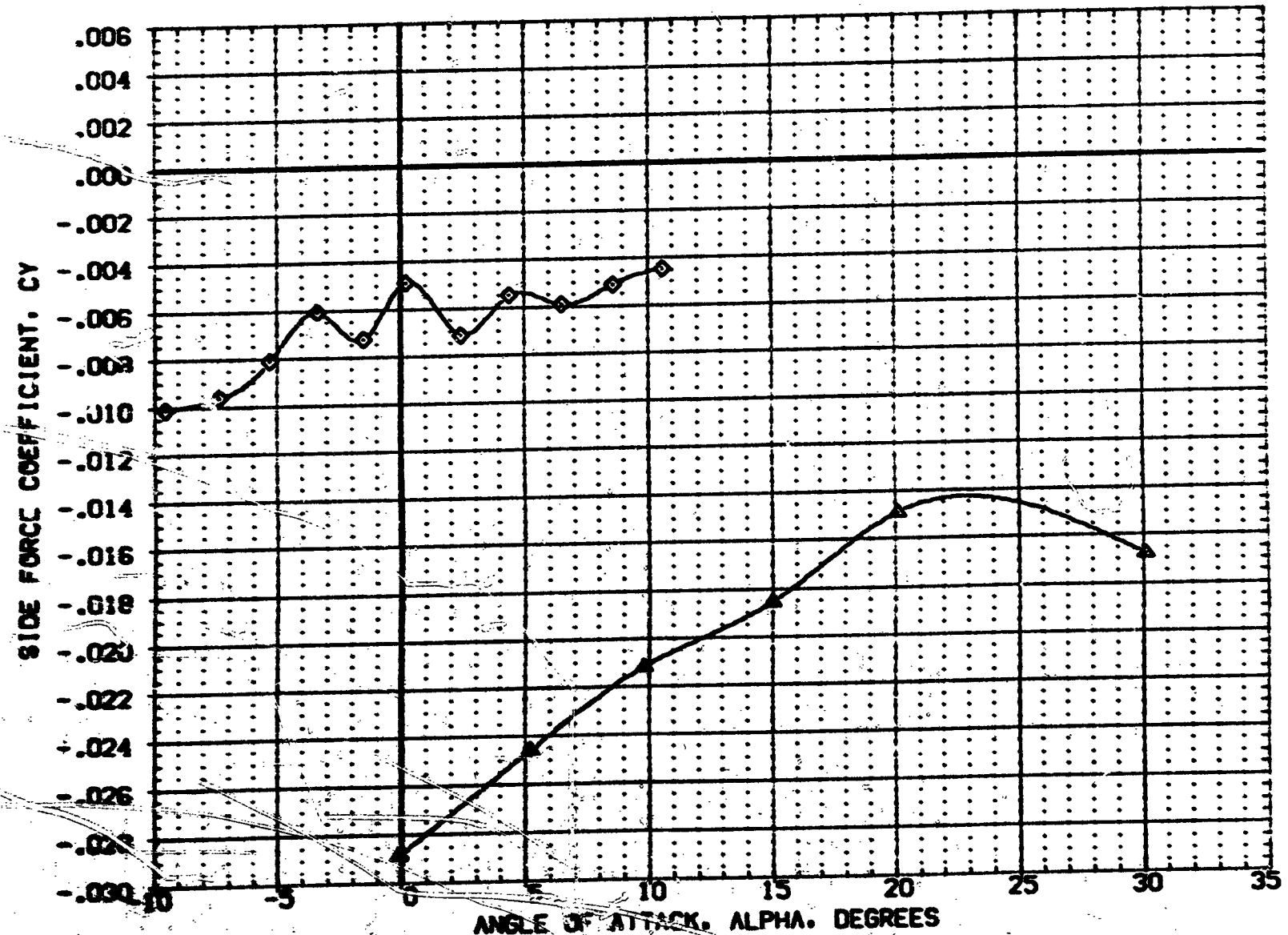


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(OB7011)	□	AMES 3.5-169 IA10 OB T10 AT2 PLUME OFF	.000	[illegible]	.000	.000
(SB7005)	□	AMES 3.5-169 IA10 OB T10 AT2 PLUME OFF	.000	10.[illegible]	.000	.000
(RB7001)	⊠	DATA NOT AVAILABLE	.000	[illegible]	.000	.000
(TB7005)	△	DATA NOT AVAILABLE	.000	10.[illegible]	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

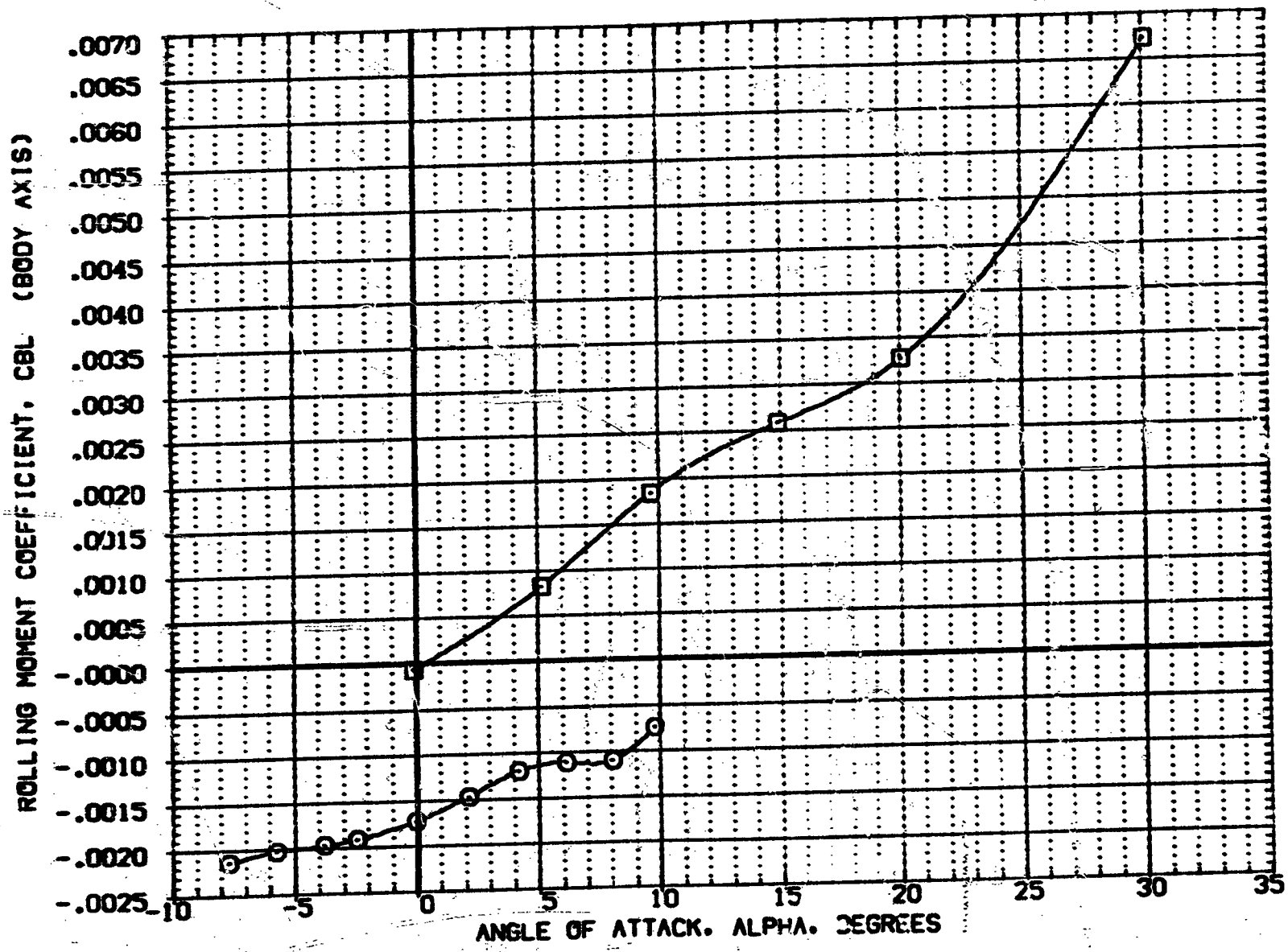


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(A)MACH = 5.26

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(DB7011)	DATA NOT AVAILABLE	.000	.000	.000	.000
(SB7005)	DATA NOT AVAILABLE	.000	10.000	.000	.000
(RB7001)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(TB7005)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

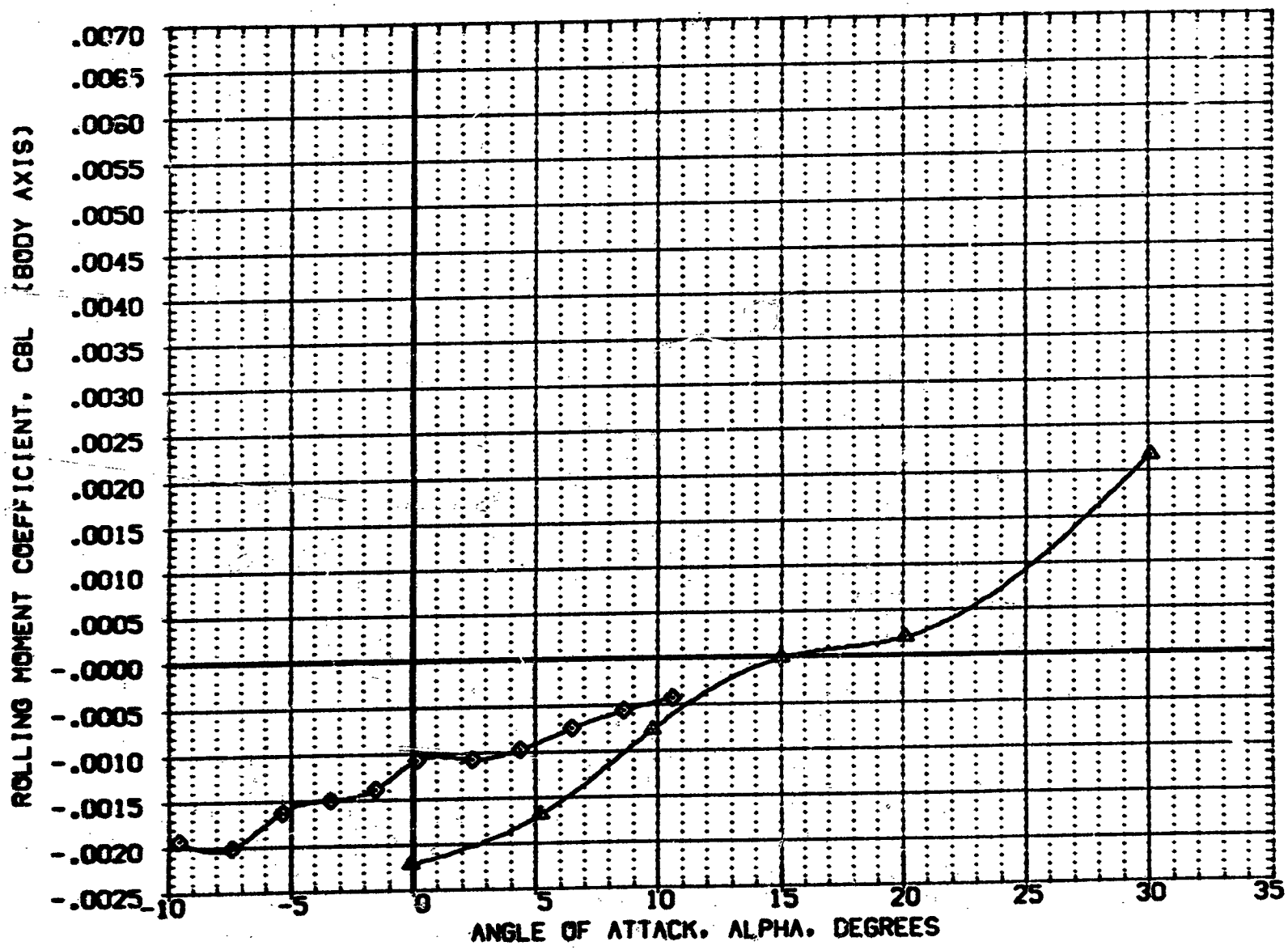


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(DB7011)	○	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(SB7005)	□	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000
(RB7001)	◇	DATA NOT AVAILABLE	.000	.000	.000	.000
(TB7005)	△	DATA NOT AVAILABLE	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0300	IN.
SCALE	.0100	

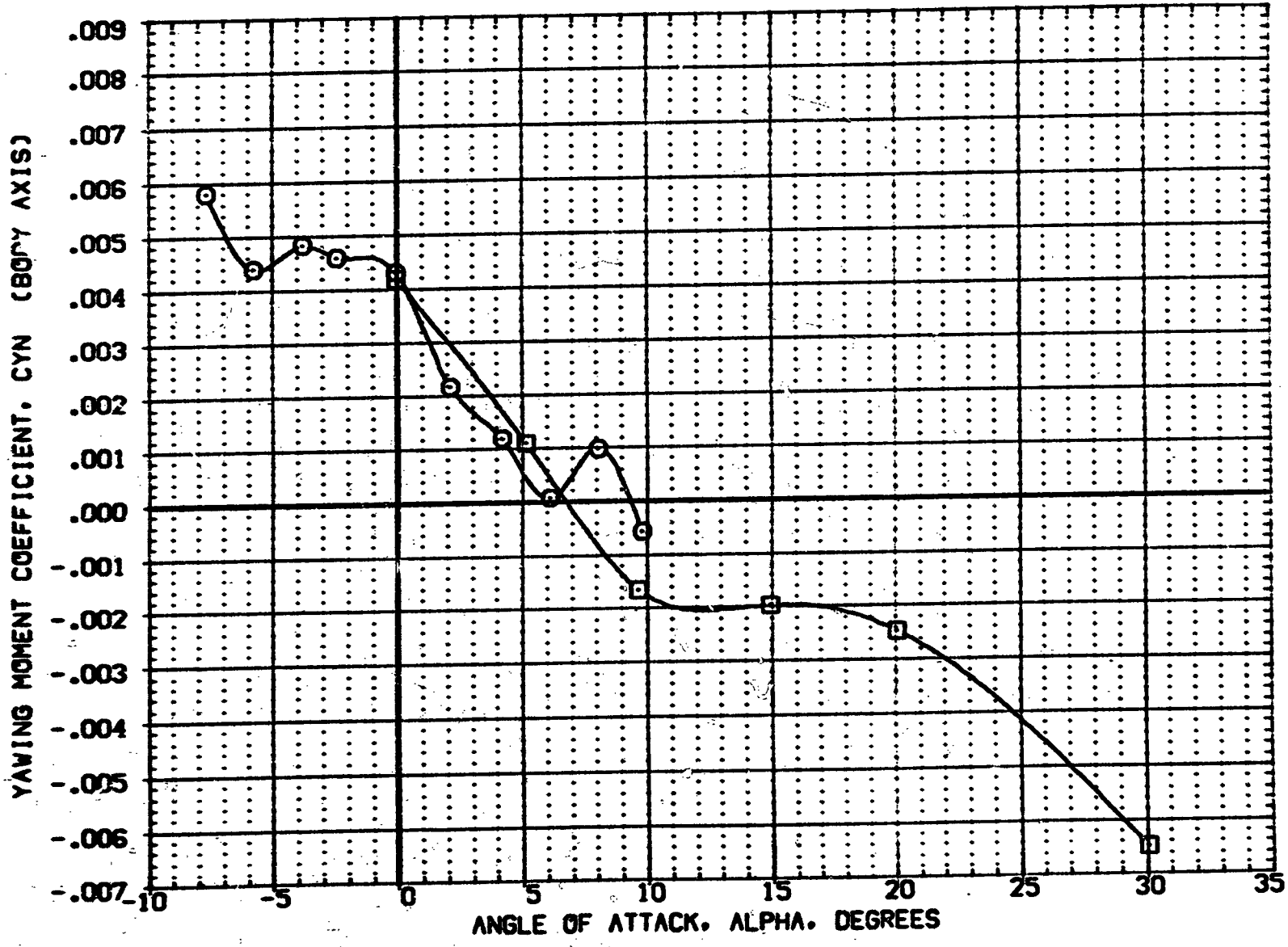


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(A)MACH = 5.26

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(D87011)	○	DATA NOT AVAILABLE	.000	.000	.000	.000
(S87005)	□	DATA NOT AVAILABLE	.000	10.000	.000	.000
(R87001)	◇	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(T87005)	△	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

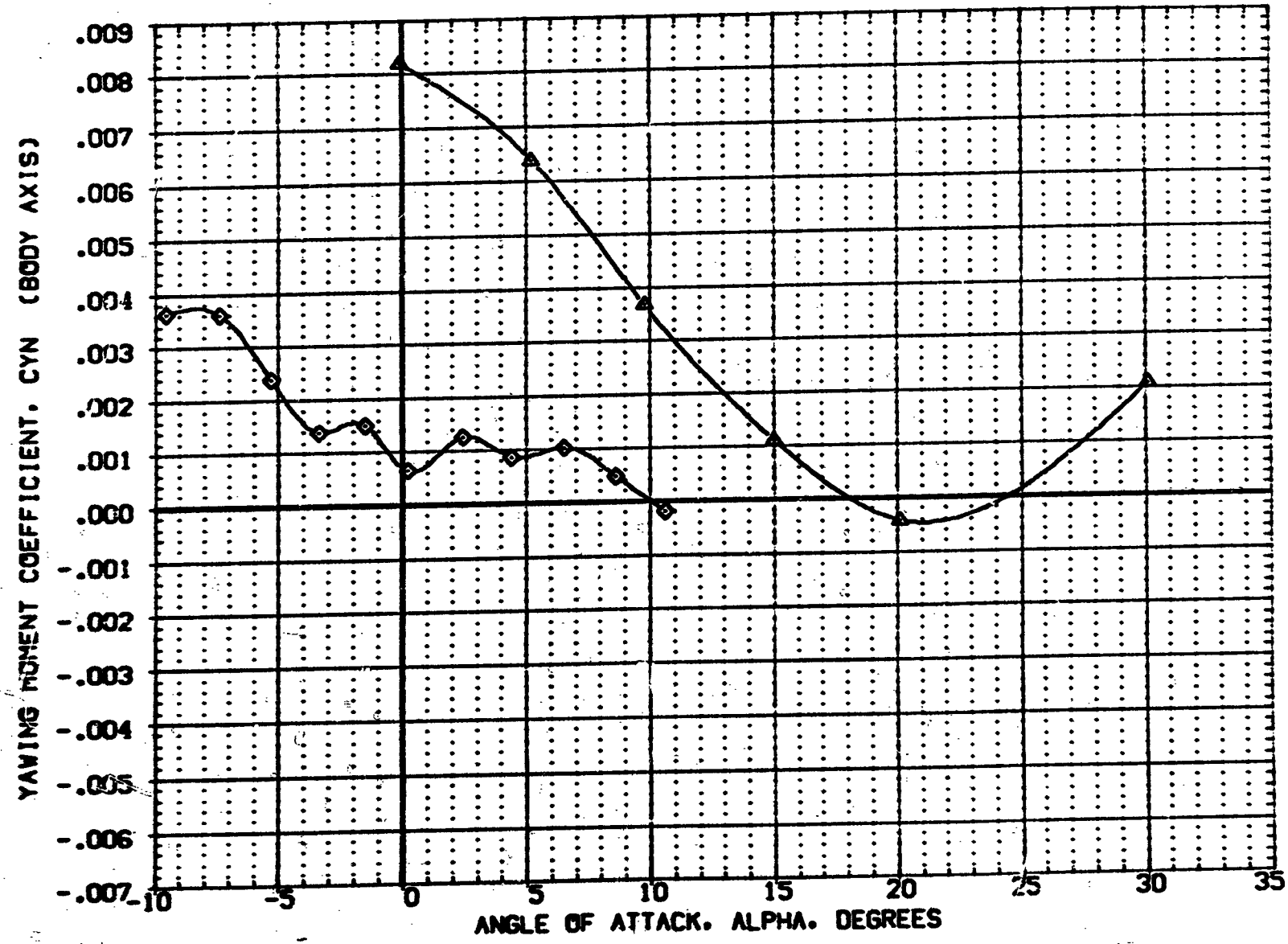


FIG. 7 EFFECT OF DIFFERENTIAL ELEVON DEFLECTION.

(B)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7006) ○	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(RB7007) □	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1790.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

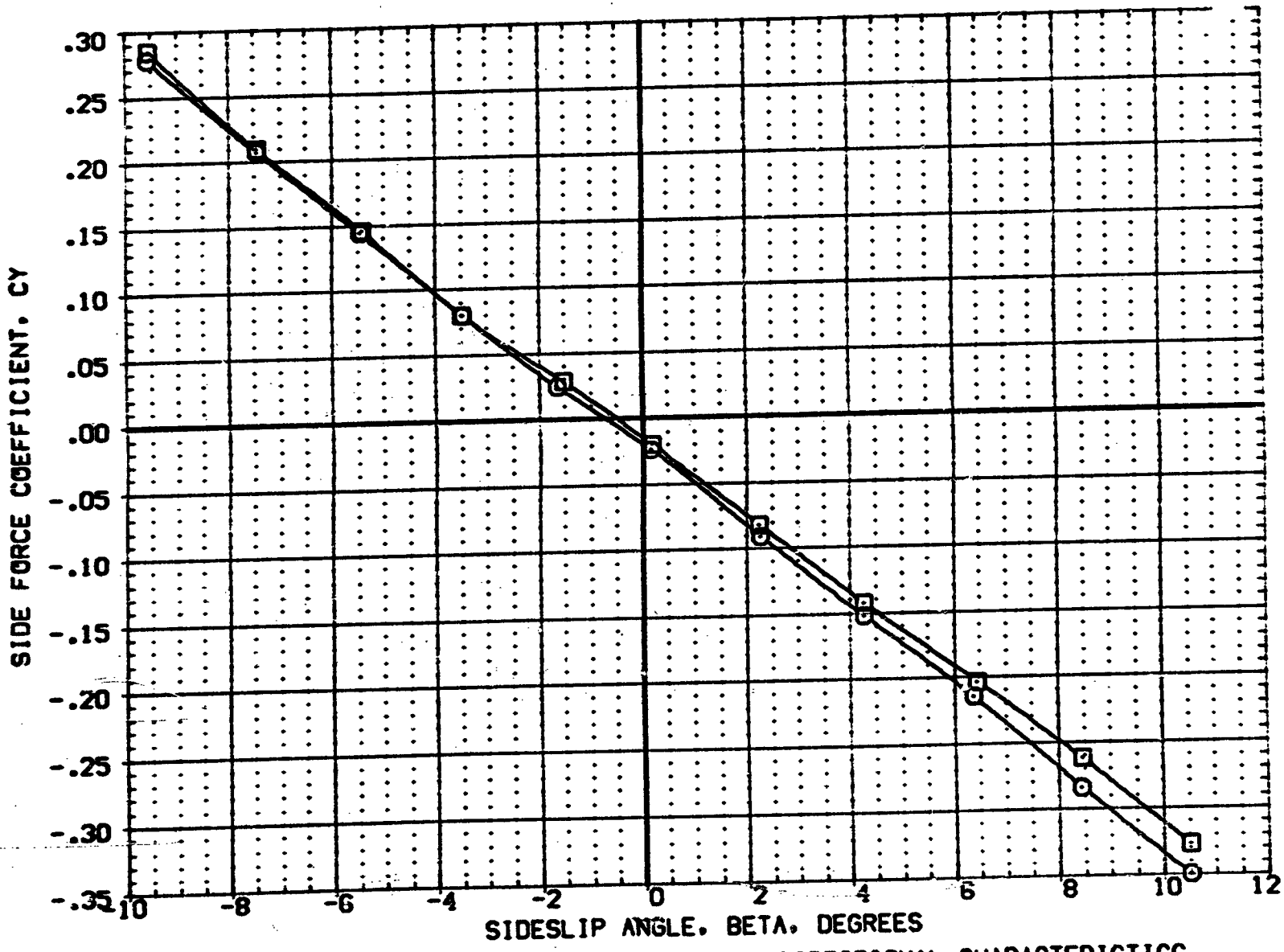


FIG. 8 EFFECT OF RUDDER DEFLECTION ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(R97006) ○	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(R97007) □	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

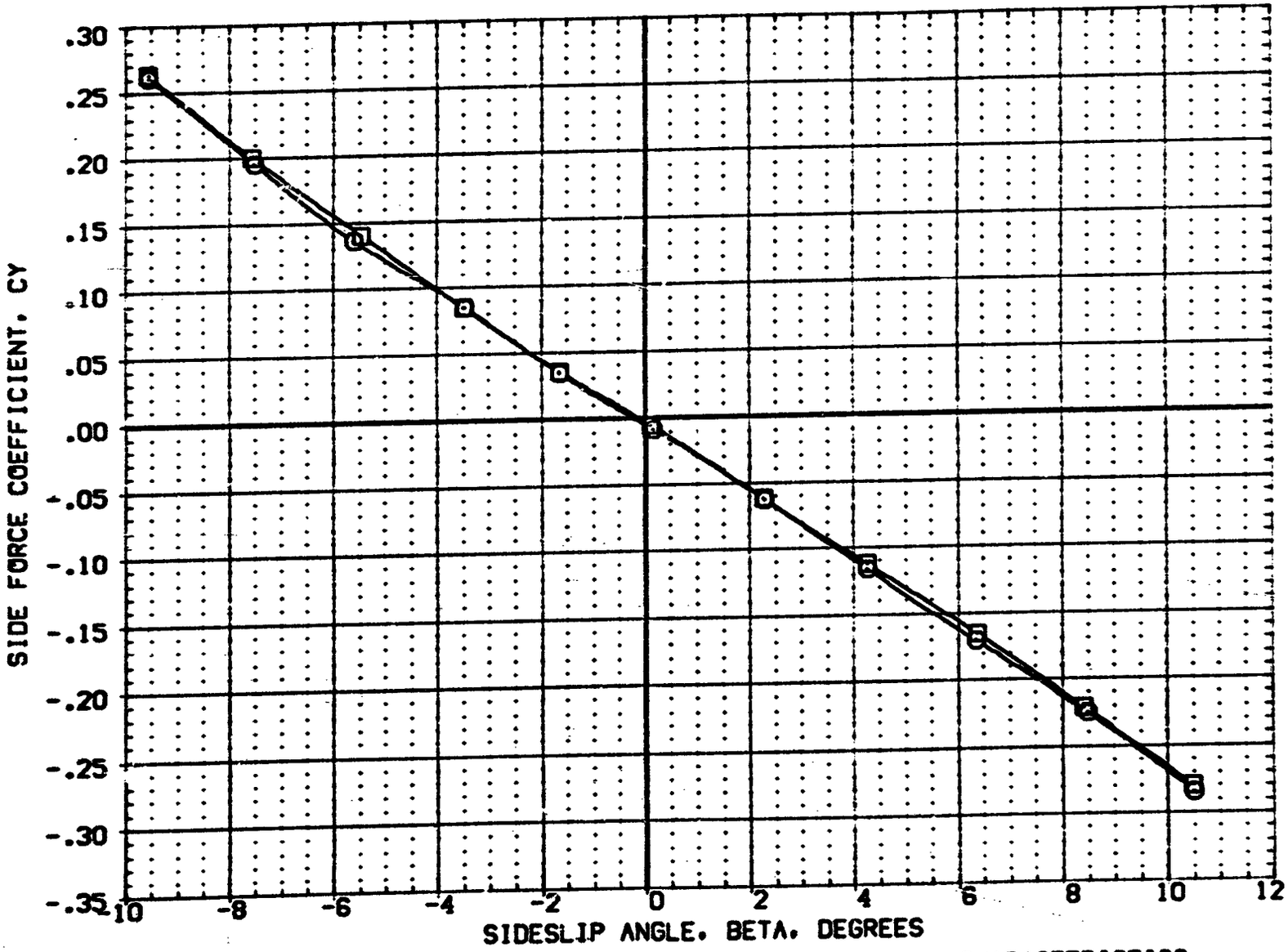


FIG. 8 EFFECT OF RUDDER DEFLECTION ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(R87006)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(R87007)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

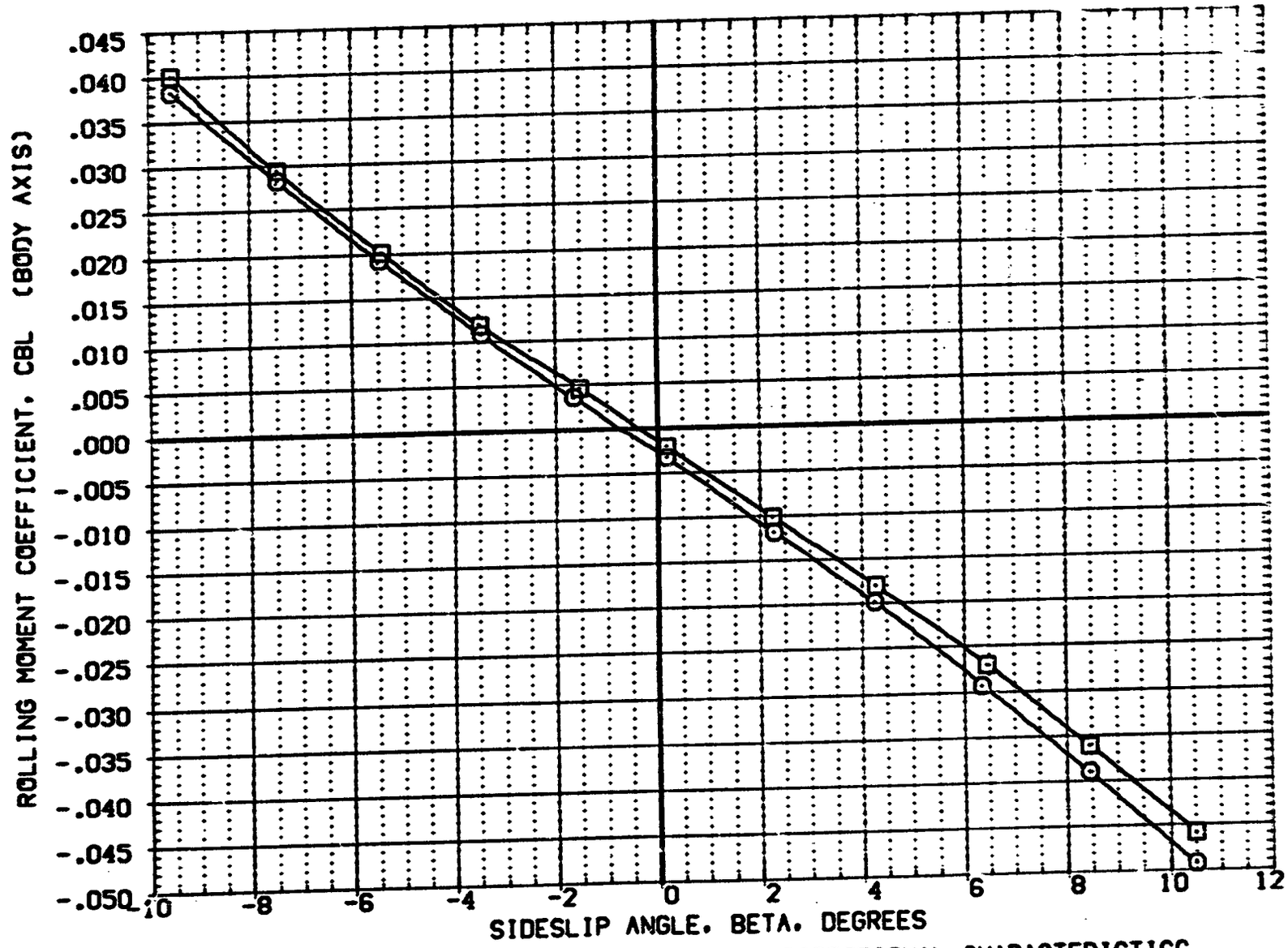


FIG. 8 EFFECT OF RUDDER DEFLECTION ON LATERAL-DIRECTIONAL CHARACTERISTICS.

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7006)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(RB7007)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

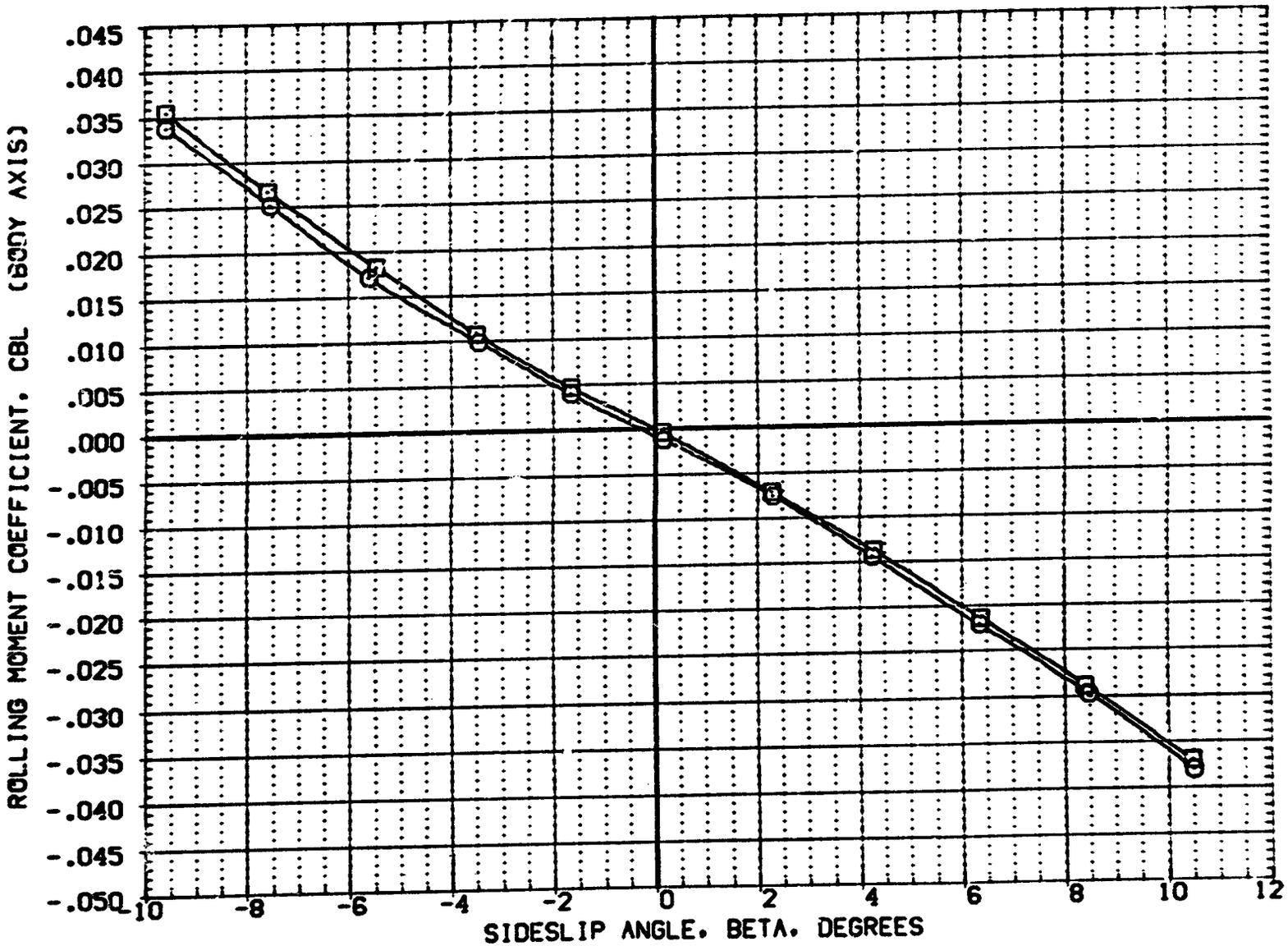


FIG. 8 EFFECT OF RUDDER DEFLECTION ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7006)		AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(RB7007)		AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

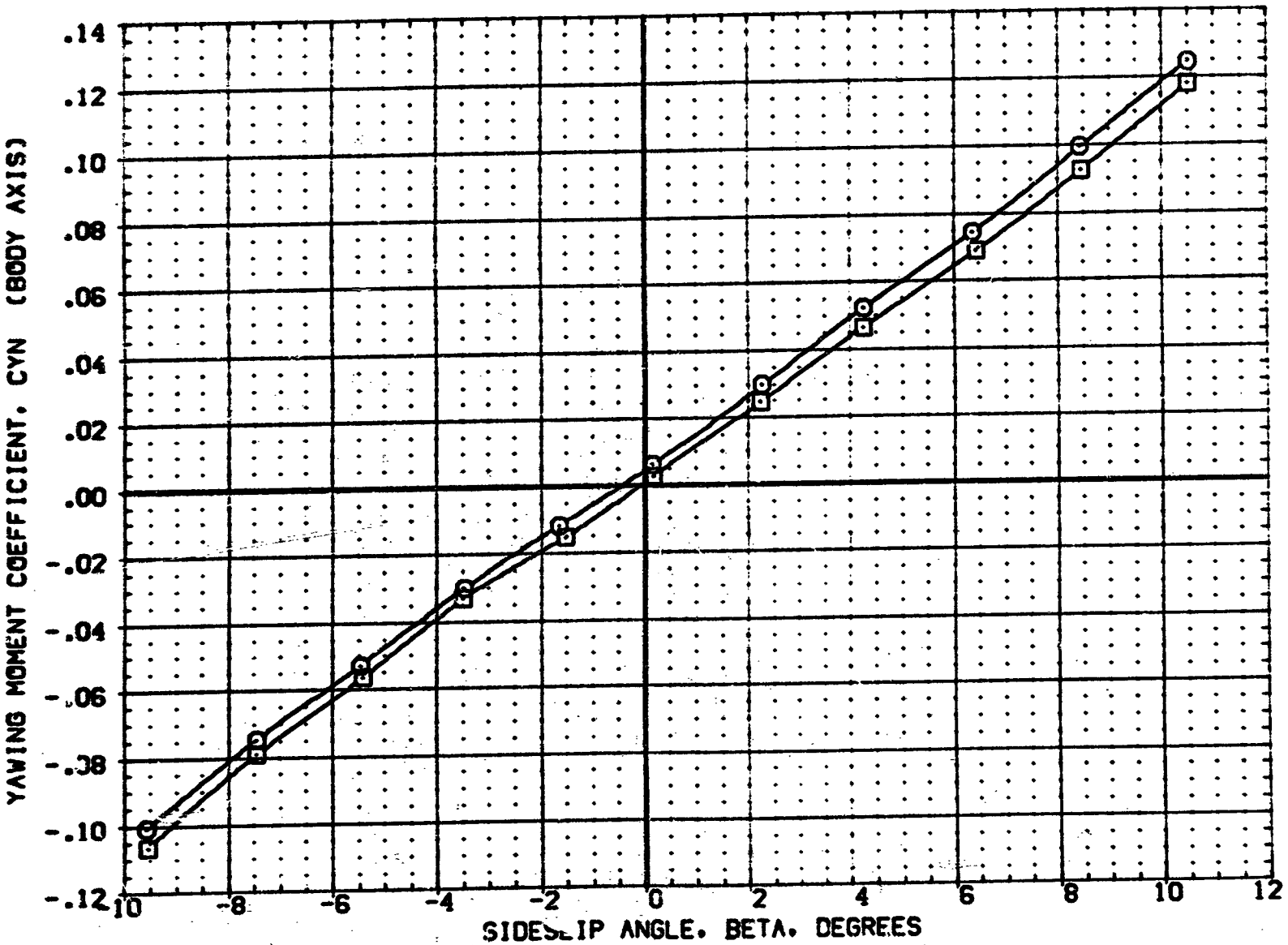


FIG. 8 EFFECT OF RUDDER DEFLECTION ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7006) ○	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(RB7007) □	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000

REFERENCE INFORMATION

SREF	2690.[illegible]	SQ. FT.
LREF	12[illegible]	IN.
BREF	936.6000	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

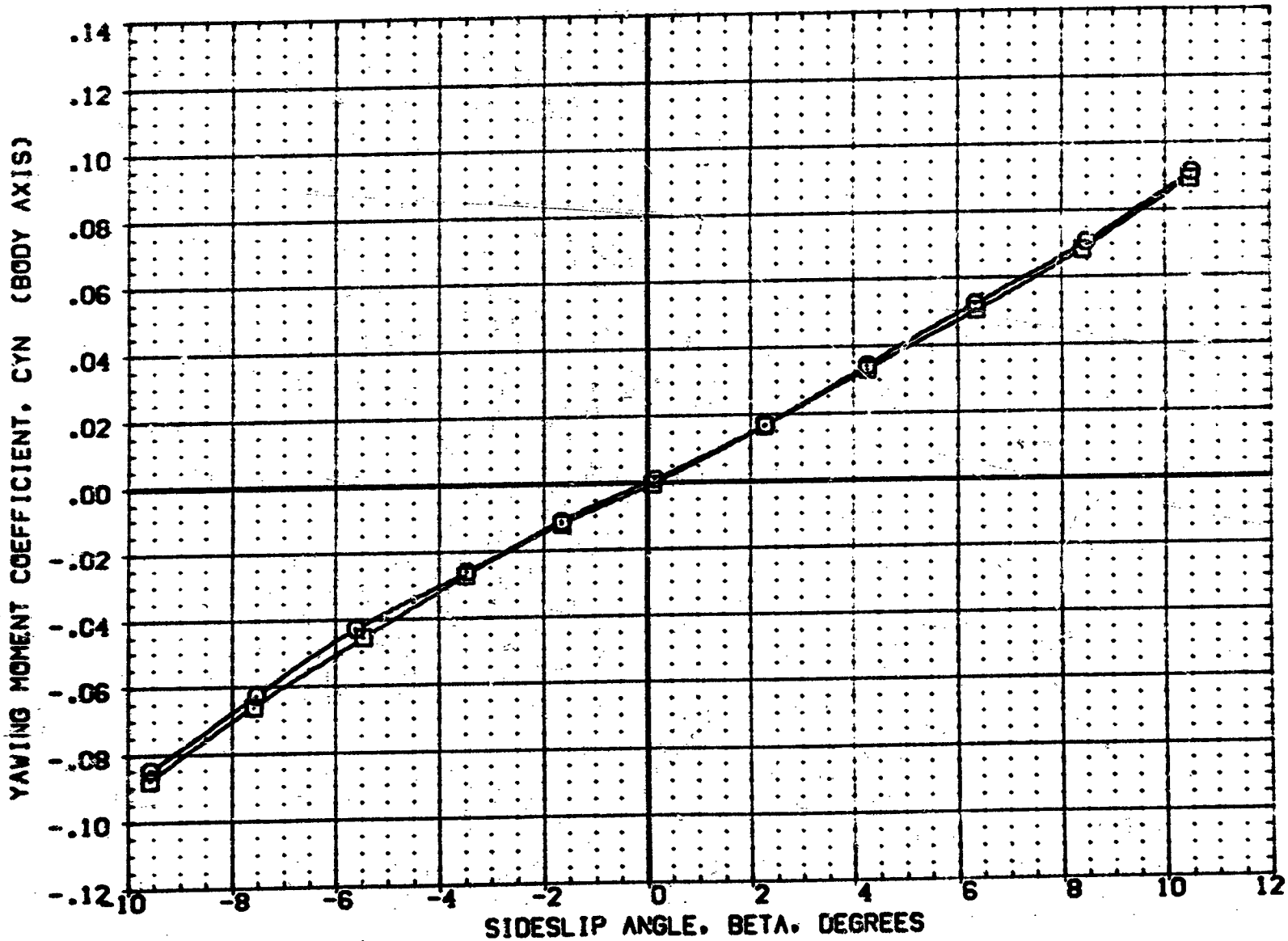


FIG. 8 EFFECT OF RUDDER DEFLECTION ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7006)	⊖	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(RB7007)	⊟	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

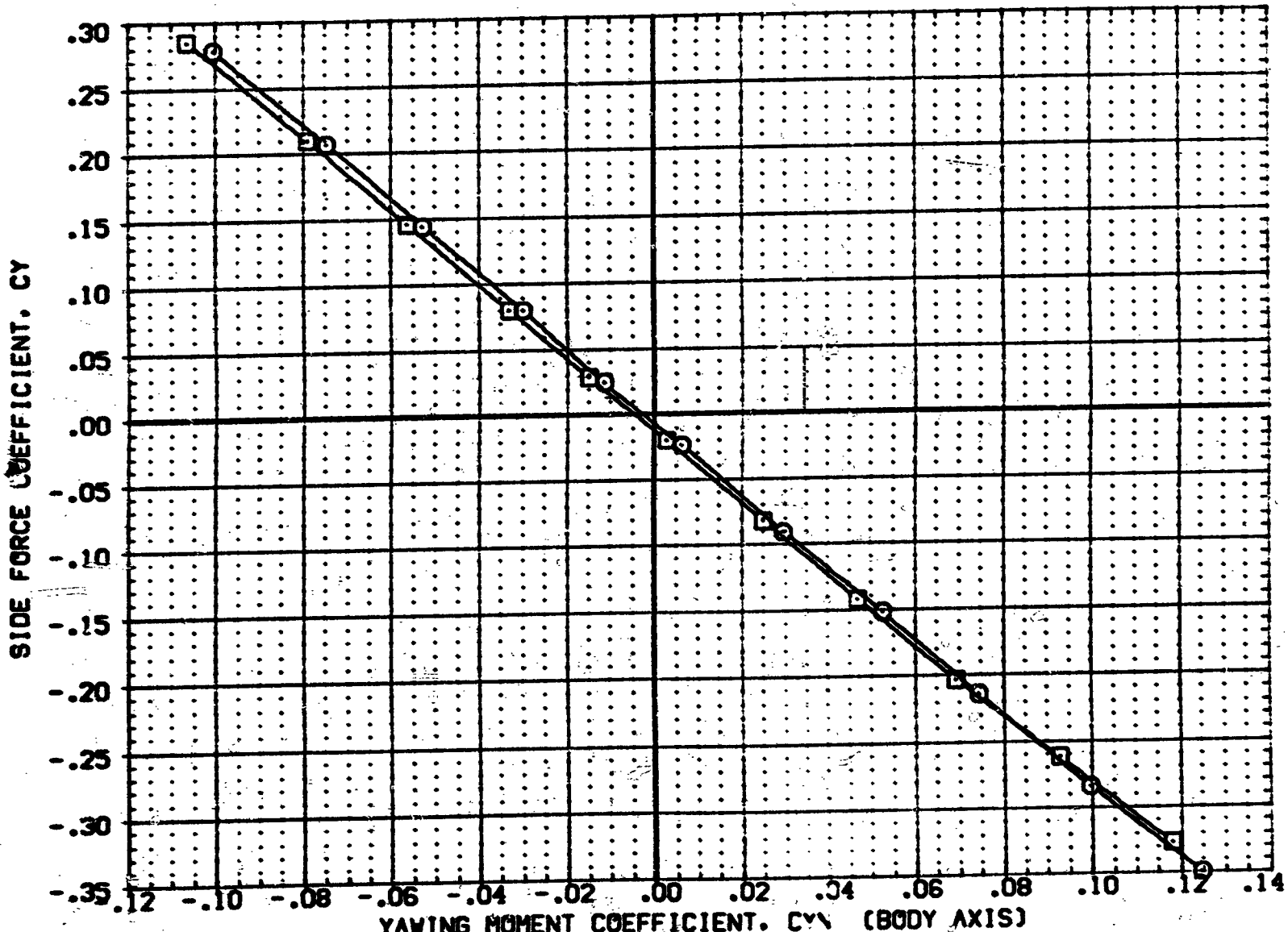


FIG. 8 EFFECT OF RUDDER DEFLECTION ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(R87006)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(R87007)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

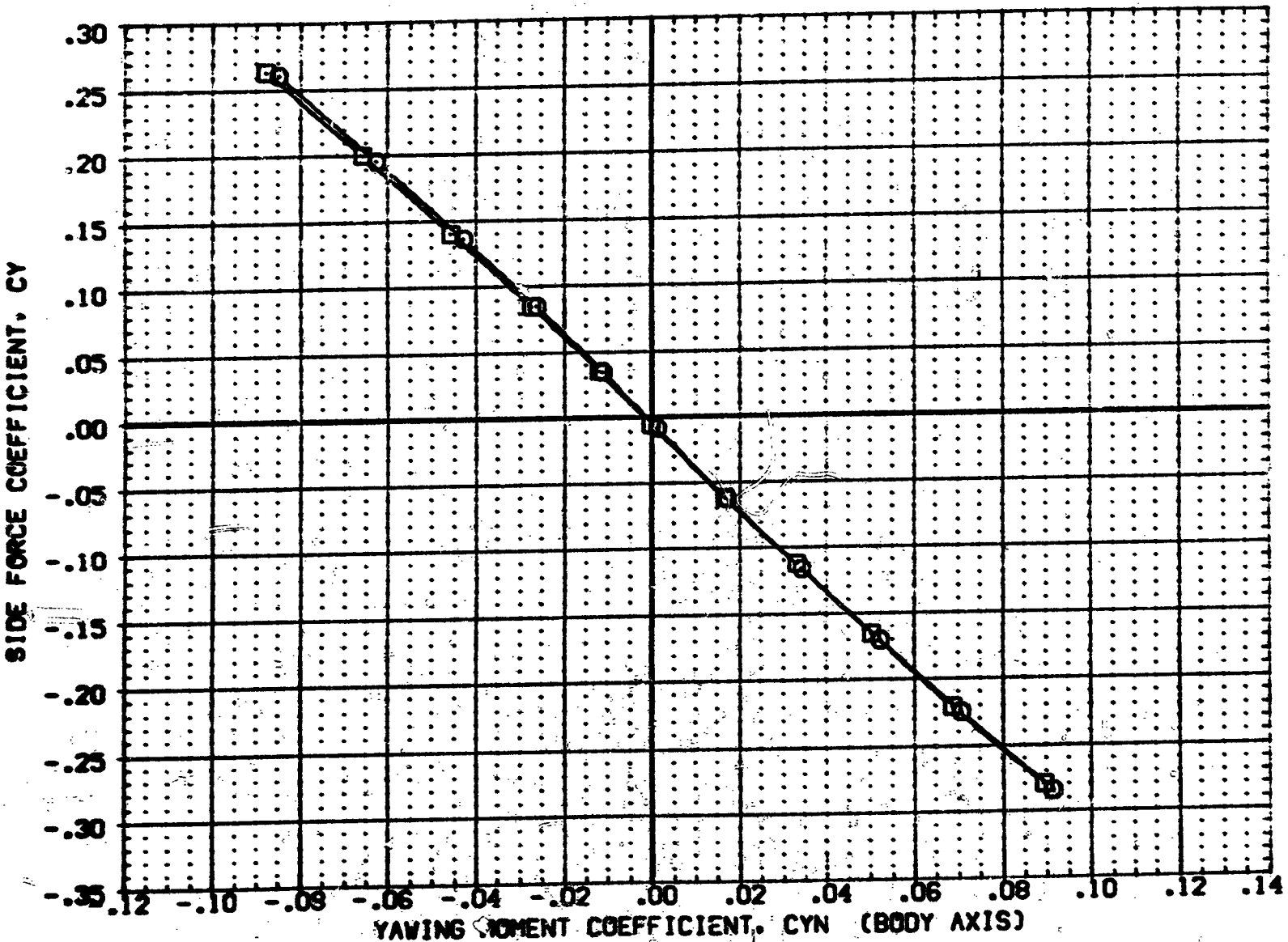


FIG. 8 EFFECT OF RUDDER DEFLECTION ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(RB7001)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF
(RB7002)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF
(RB7004)	⊠	DATA NOT AVAILABLE
(RB7003)	△	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
5.000	.000	.000	.000
.000	.000	.000	.000
5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

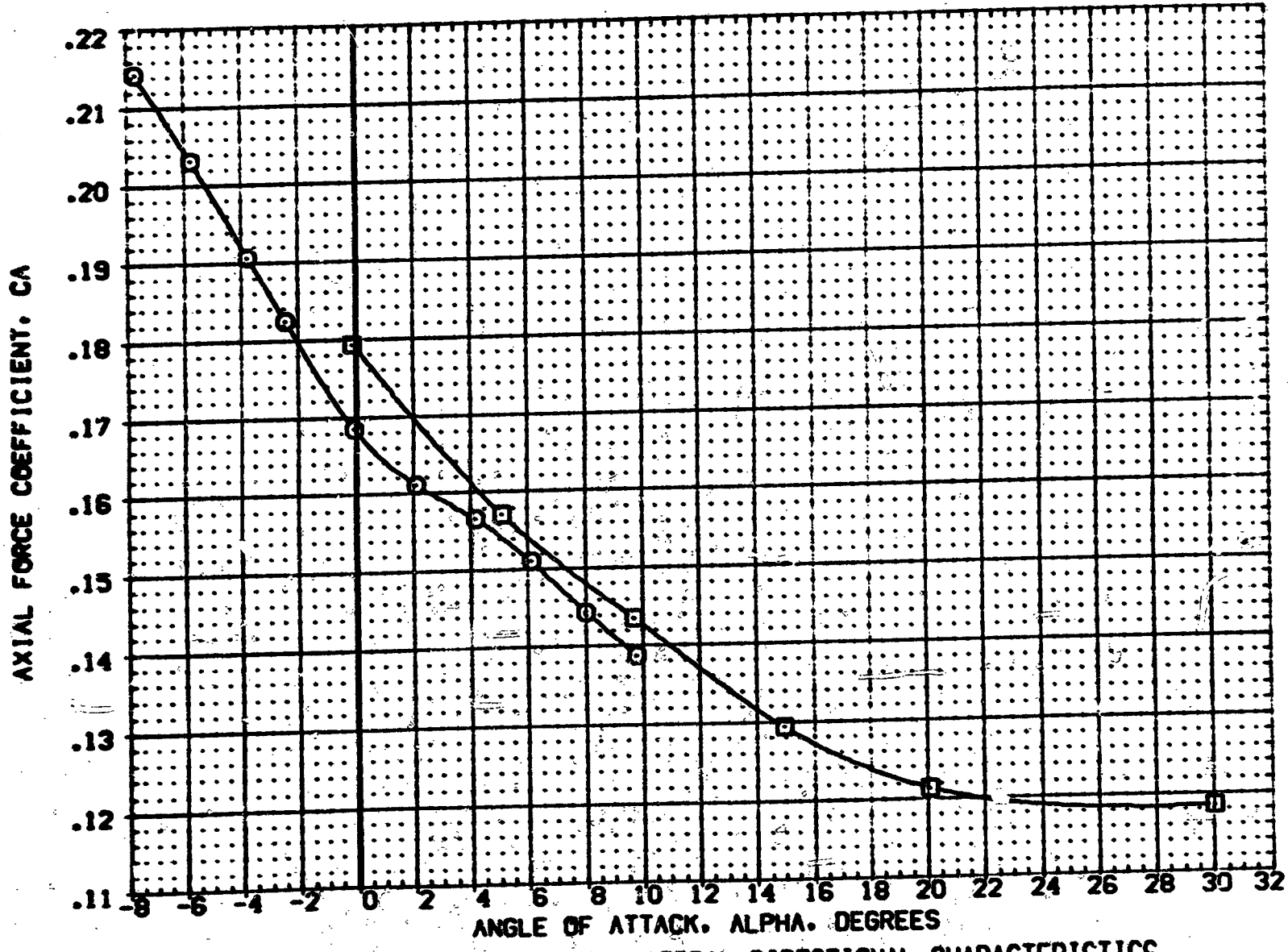


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B87011)	○	DATA NOT AVAILABLE
(B87002)	□	DATA NOT AVAILABLE
(B87004)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF
(B87003)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
5.000	.000	.000	.000
.000	.000	.000	.000
5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

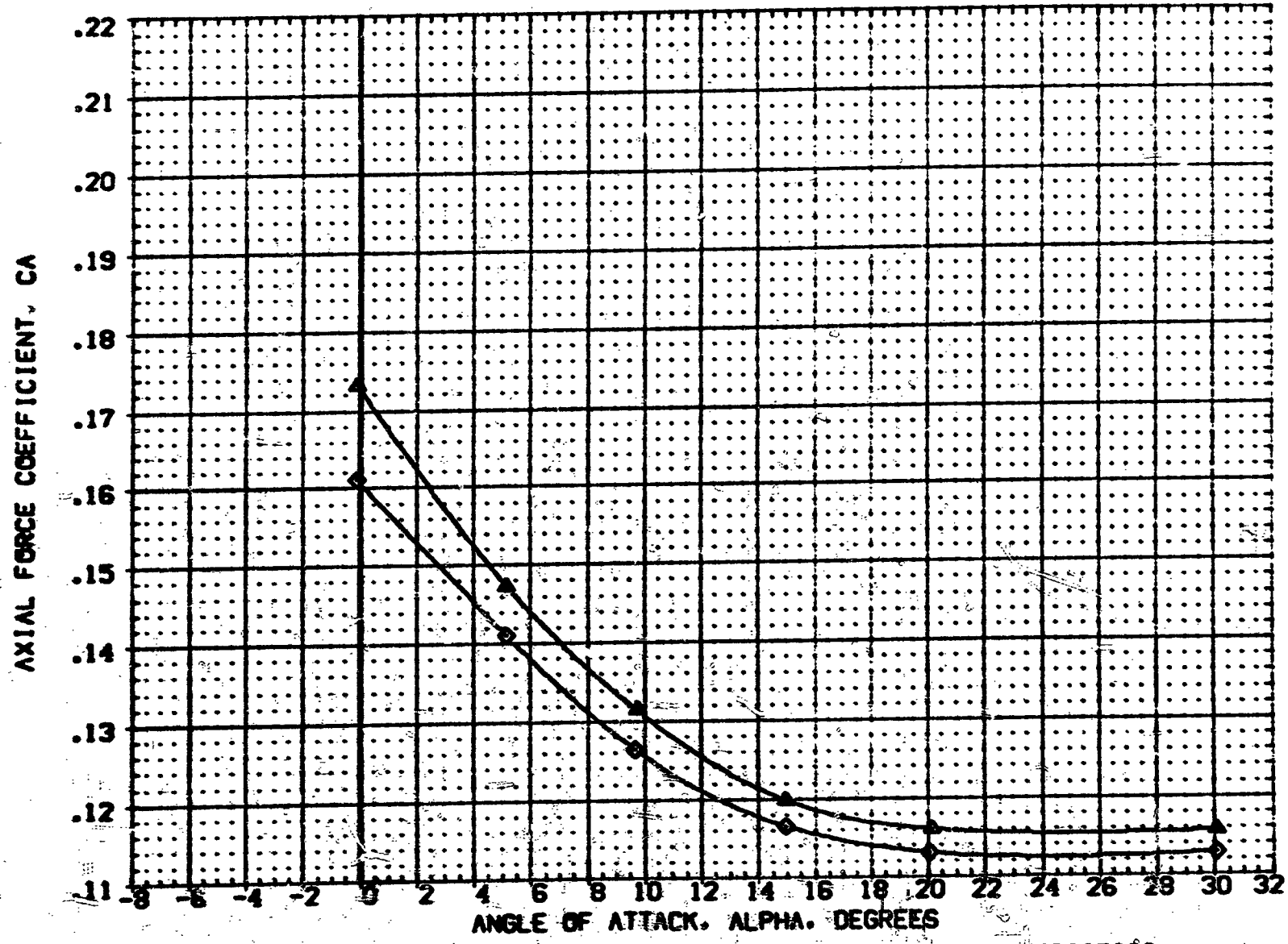


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION
(S87011) □	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(S87002) □	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(R87004) ⊗	DATA NOT AVAILABLE
(R87003) △	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
5.000	.000	.000	.000
.000	.000	.000	.000
5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

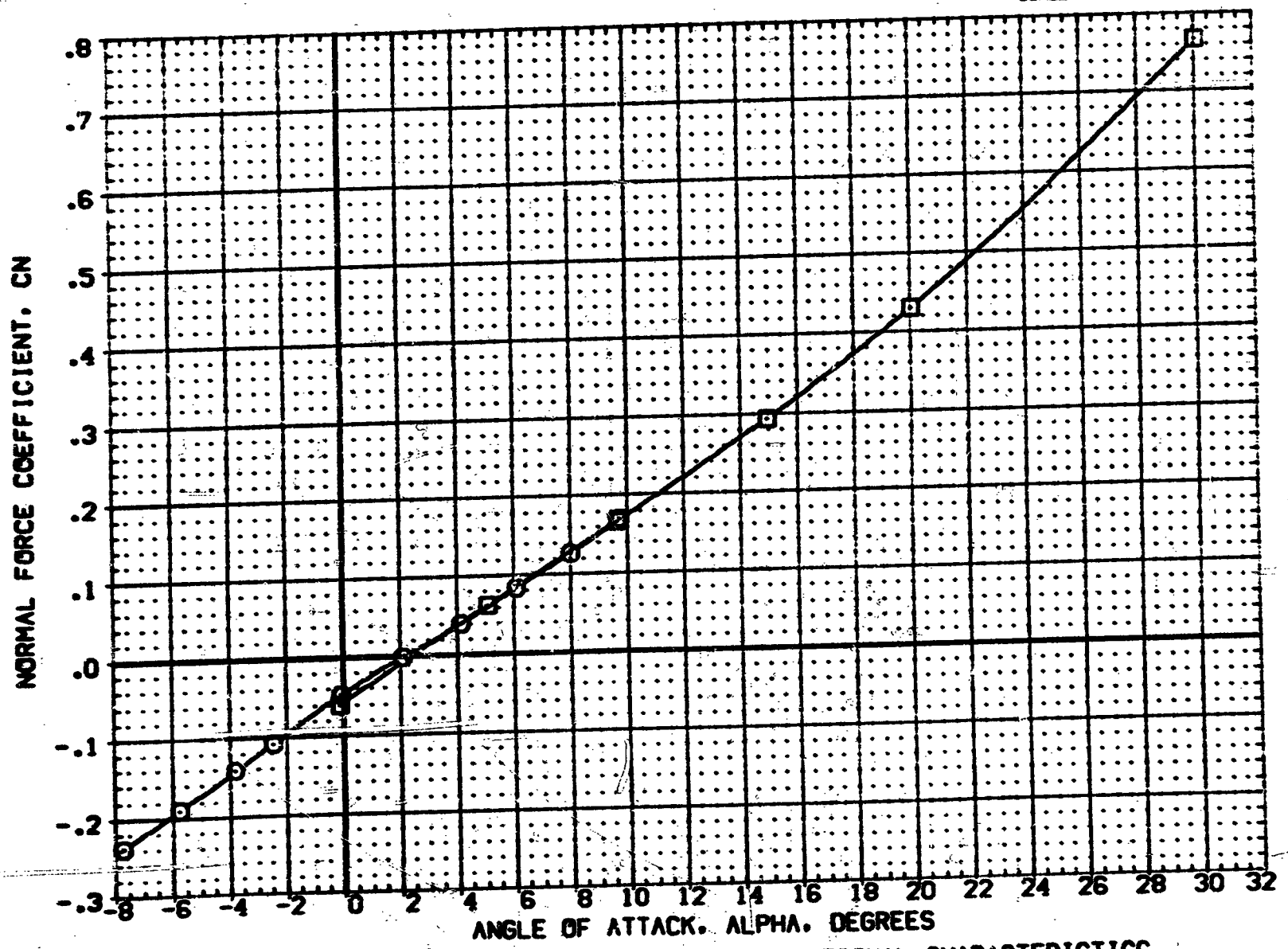


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = .26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B97011)	□	DATA NOT AVAILABLE
(B97002)	◇	DATA NOT AVAILABLE
(B97004)	⊠	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(B97003)	△	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
5.000	.000	.000	.000
.000	.000	.000	.000
5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

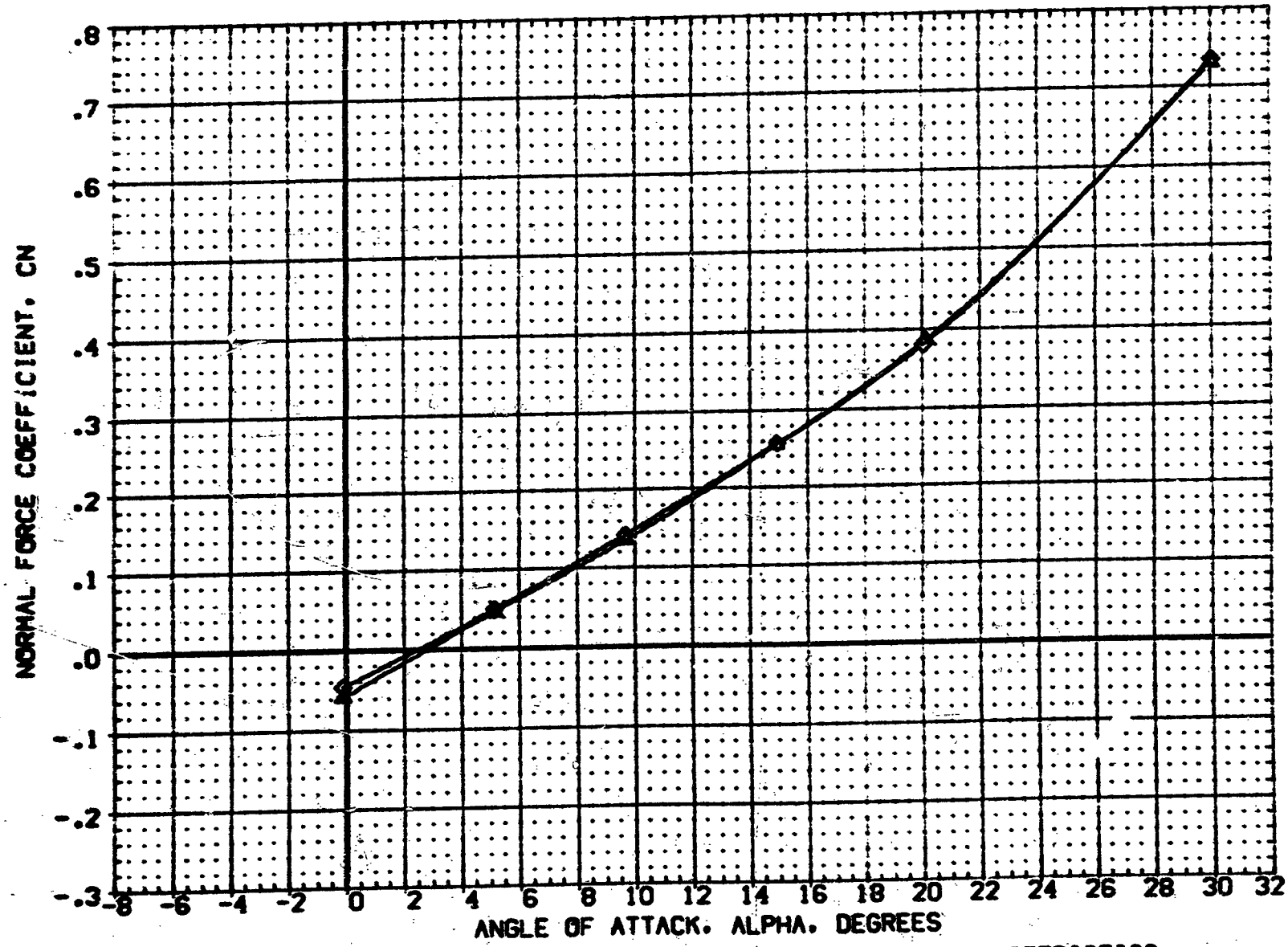


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B87011)	○	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(B87002)	□	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(B87004)	◇	DATA NOT AVAILABLE
(B87003)	△	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
5.000	.000	.000	.000
.000	.000	.000	.000
5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

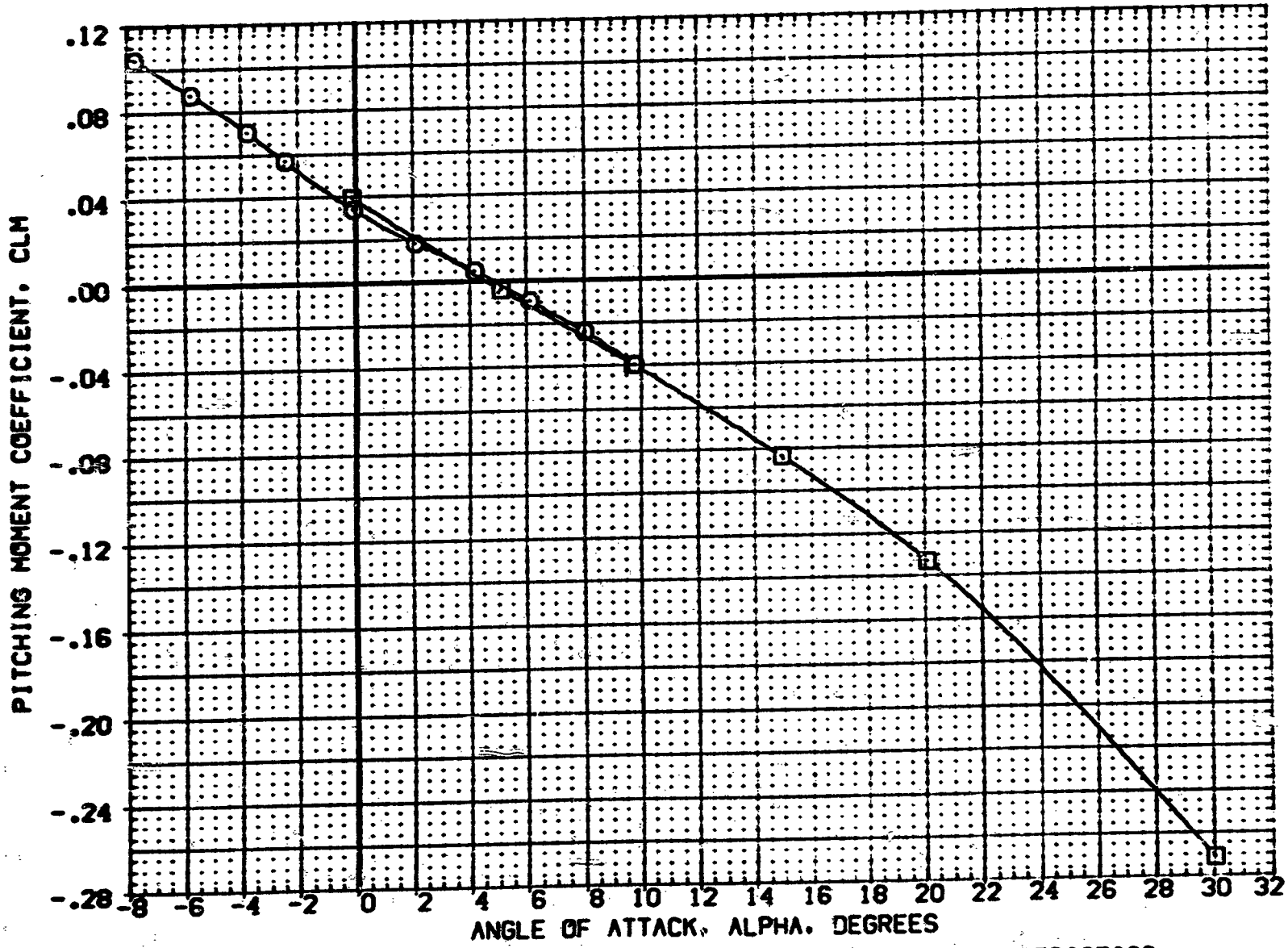


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(SB7011)	DATA NOT AVAILABLE	.000	.000	.000	.000
(SB7002)	DATA NOT AVAILABLE	5.000	.000	.000	.000
(RB700[illegible])	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(RB7003)	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

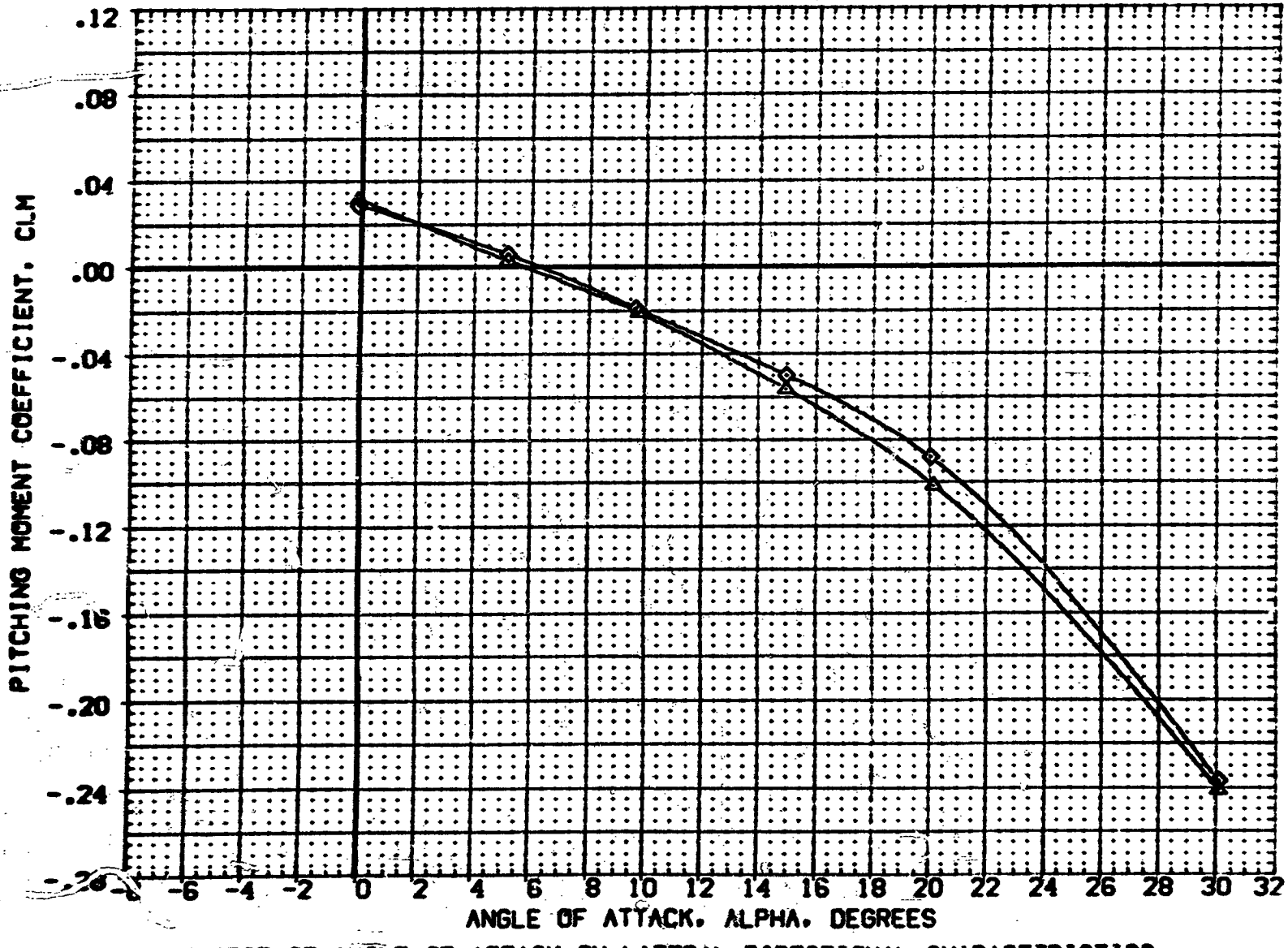


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B87011)	○	AMES 3.5-1169 1A10 09 T10 AT2 PLUME OFF
(B87002)	□	AMES 3.5-1169 1A10 09 T10 AT2 PLUME OFF
(B87004)	◇	DATA NOT AVAILABLE
(B87003)	△	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
5.000	.000	.000	.000
.000	.000	.000	.000
5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

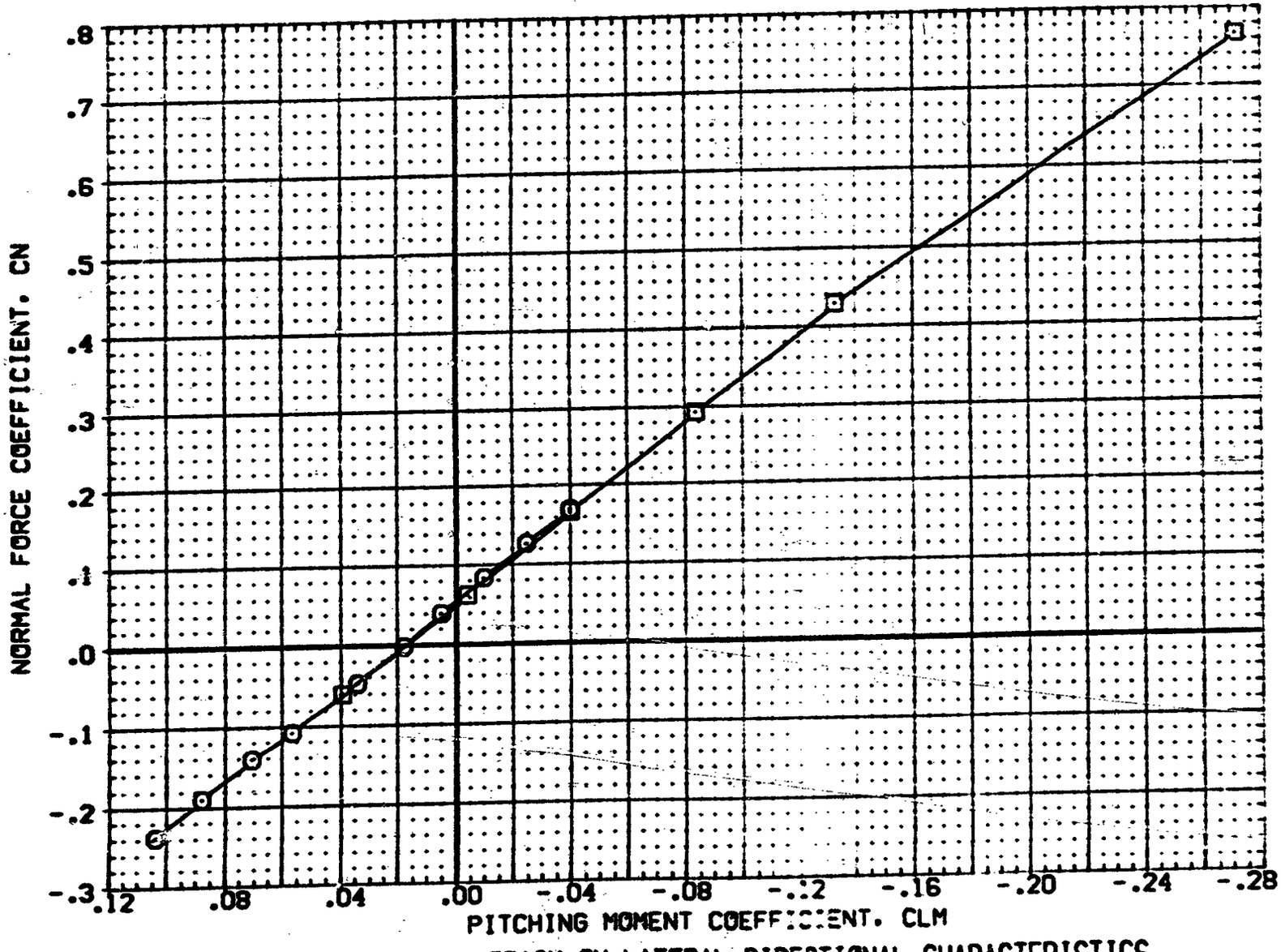


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(OB7011)	○	DATA NOT AVAILABLE	.000	.000	.000	.000
(SB7002)	□	DATA NOT AVAILABLE	5.000	.000	.000	.000
(RB7004)	⊠	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(RB7003)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

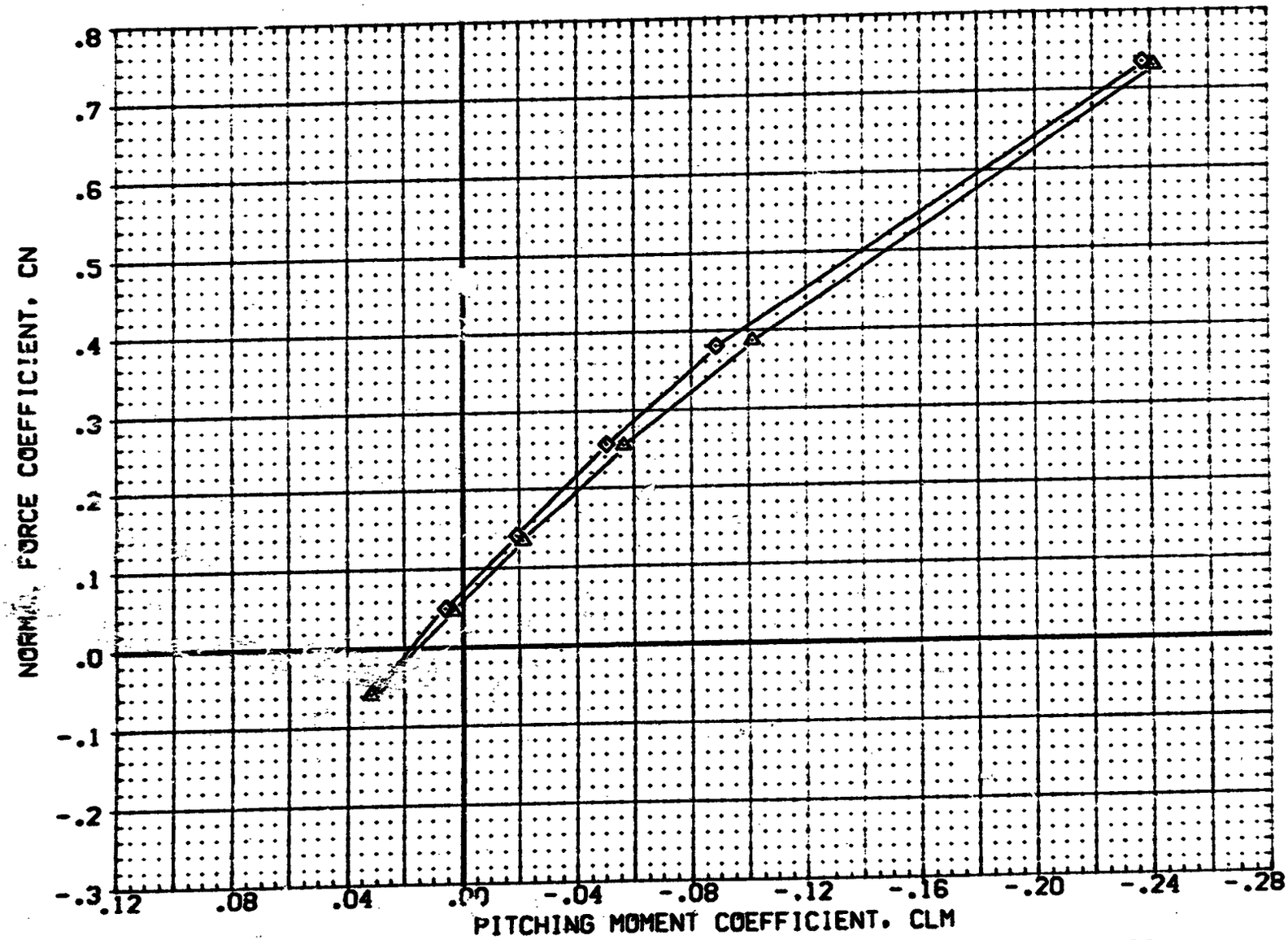


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(D87011)	○	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(S87002)	□	AMES 3.5-169 1A10 09 T10 AT2 PLUME OFF
(R97004)	⊠	DATA NOT AVAILABLE
(R97003)	⧖	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
5.000	.000	.000	.000
.000	.000	.000	.000
5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

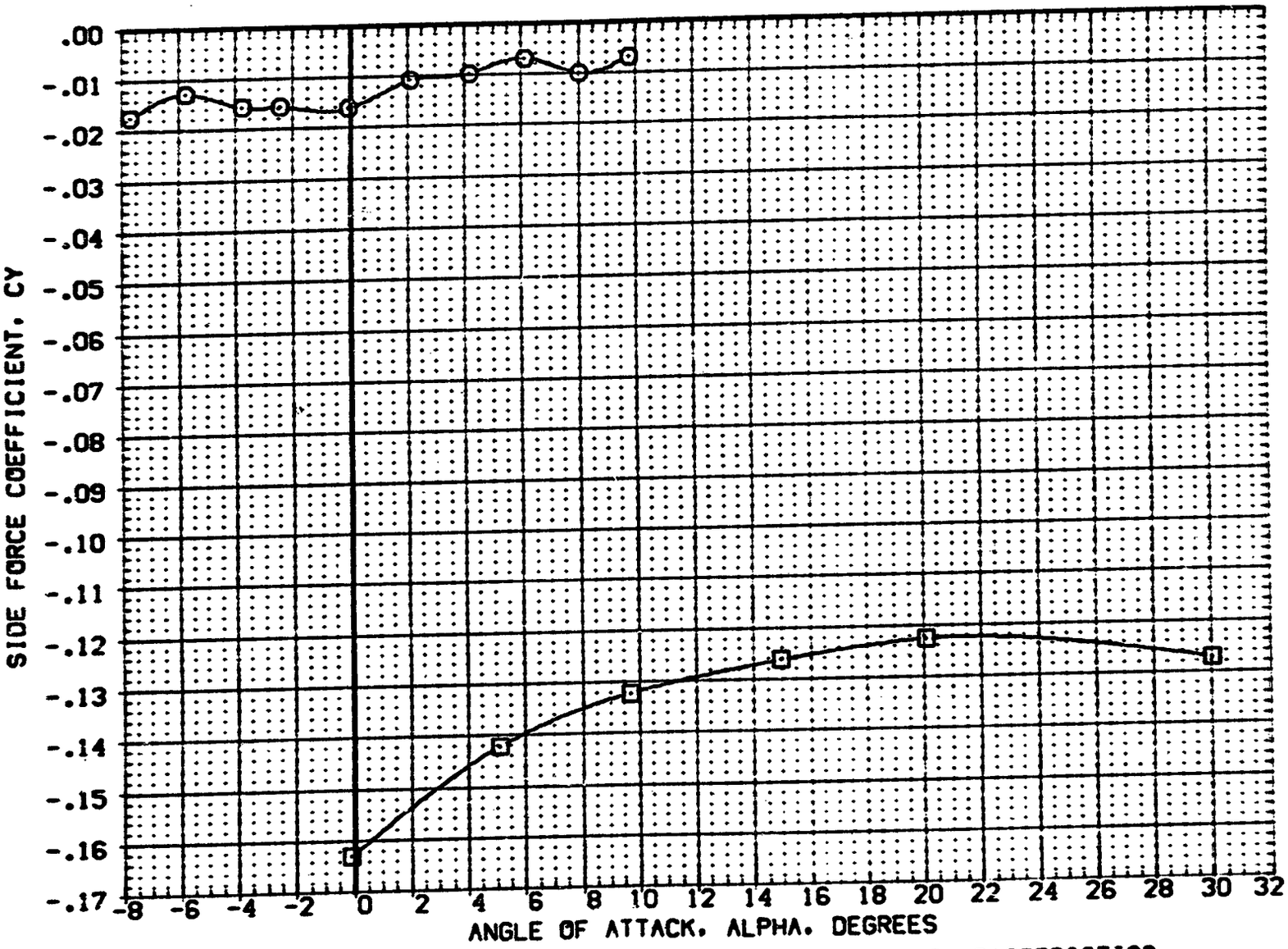


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(B87011)	○	DATA NOT AVAILABLE	.000	.000	.000	.000
(SB70?2)	□	DATA NOT AVAILABLE	5.000	.000	.000	.000
(RB?004)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(RB?003)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	5.000	.000	.000	.000

REFERENCE INFORMATION

SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

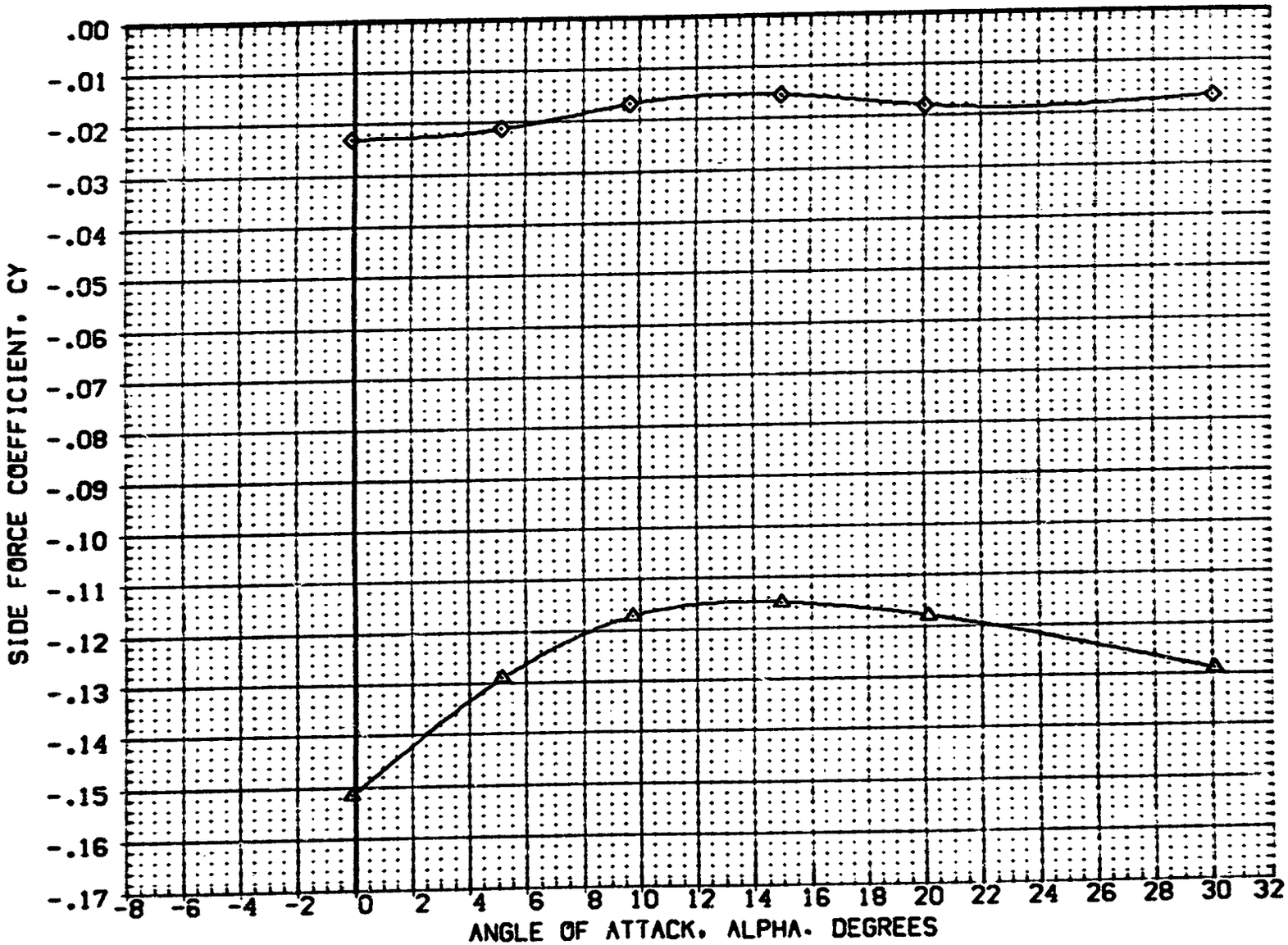


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(B8701:)	□	AMES 3.5-169 IA10 @ T10 AT2 PLUME OFF
(S87002)	◇	AMES 3.5-169 IA10 @ T10 AT2 PLUME OFF
(R87004)	⊠	DATA NOT AVAILABLE
(R87003)	⧖	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
5.000	.000	.000	.000
.000	.000	.000	.000
5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2590.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	[illegible]	IN.
ZMRP	[illegible]	IN.
SCALE	.D[illegible]	

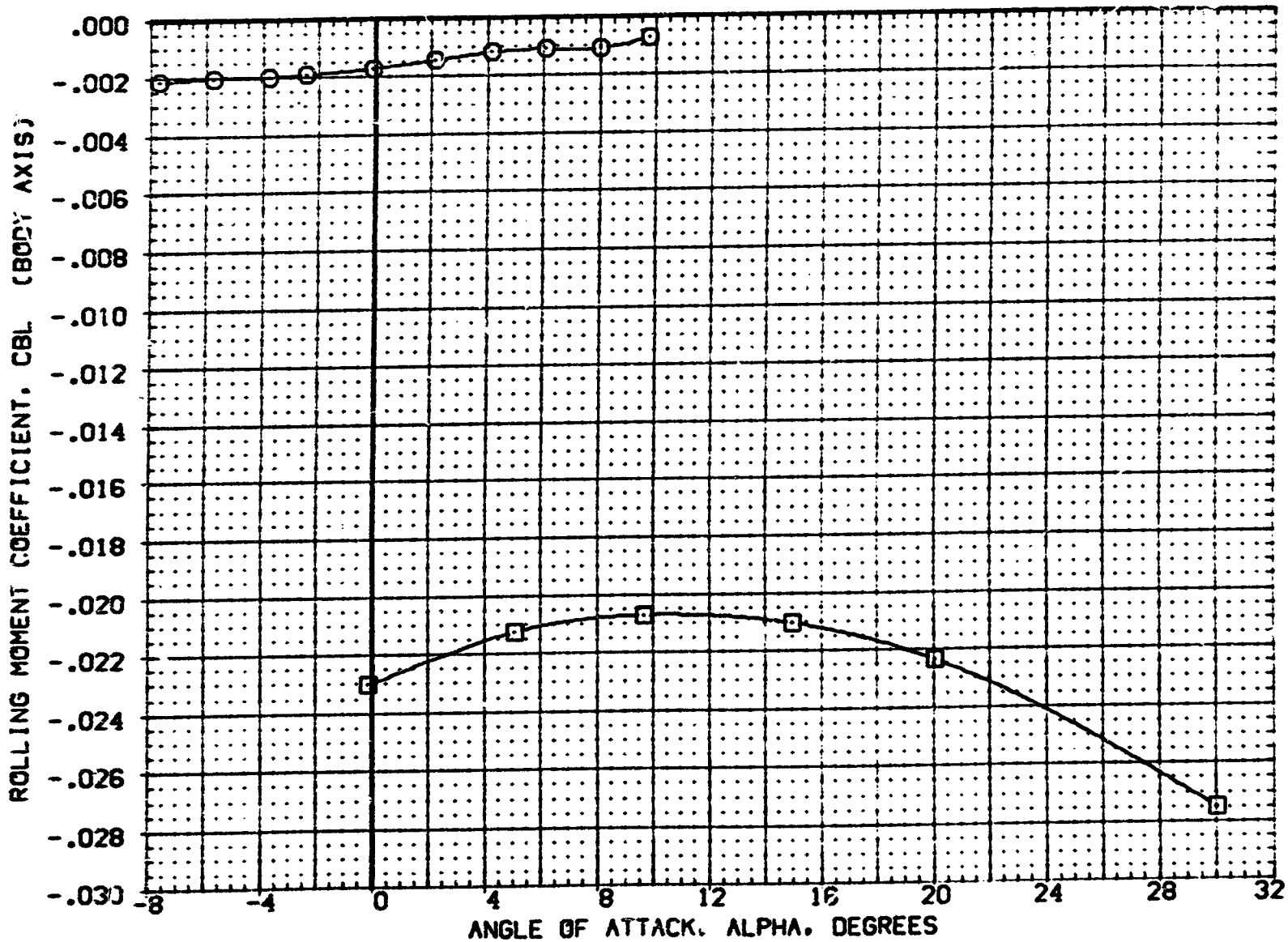


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(OB7011)	○	DATA NOT AVAILABLE	.000	.000	.000	.000
(SB7002)	□	DATA NOT AVAILABLE	5.000	.000	.000	.000
(RB7004)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(RB7003)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

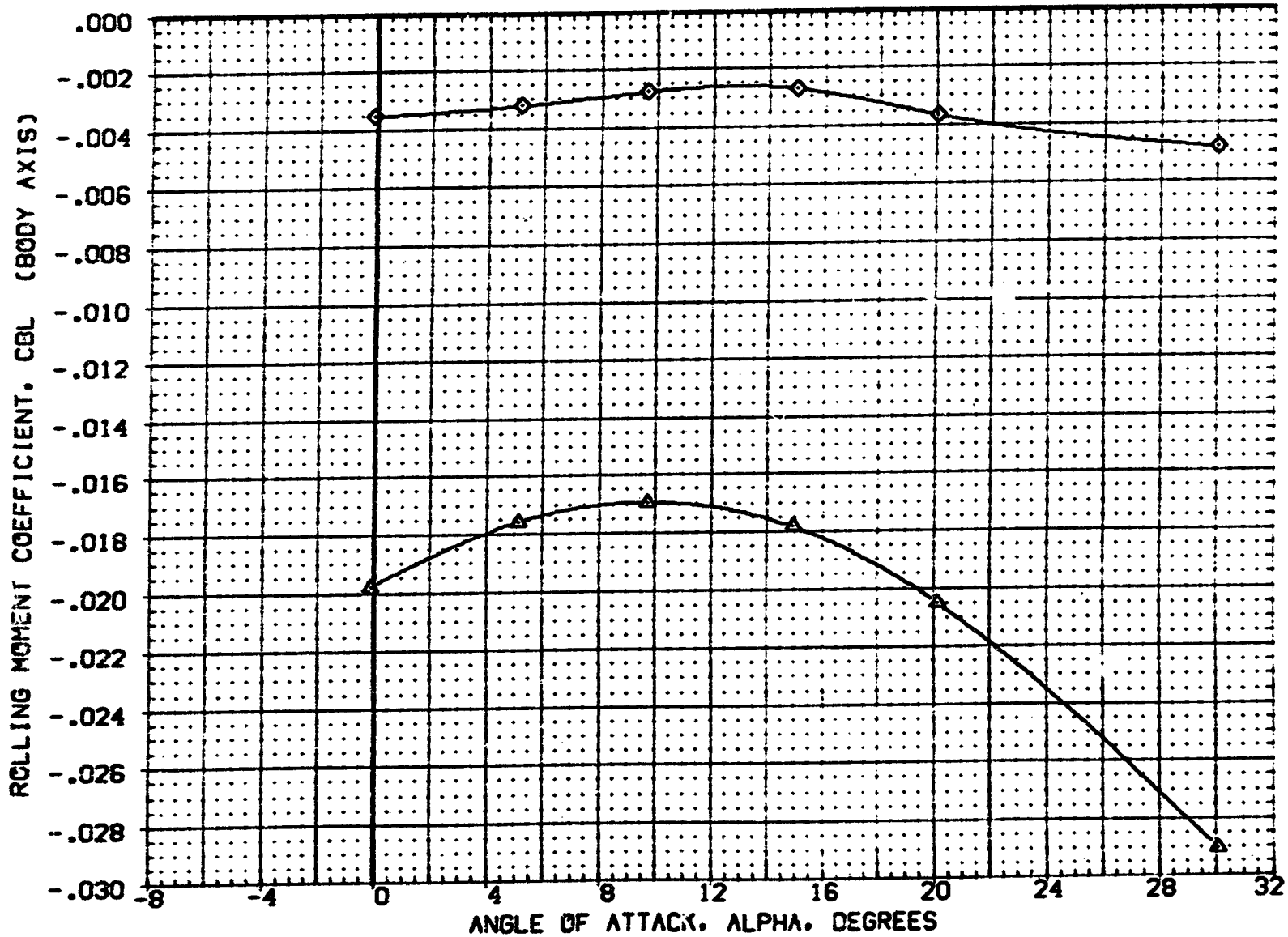


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(DB7011)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF
(SB7C02)	□	AMES 3.5-169 IA10 02 T10 AT2 PLUME OFF
(RB7C04)	⊠	DATA NOT AVAILABLE
(RB7C03)	△	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
5.000	.000	.000	.000
.000	.000	.000	.000
5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

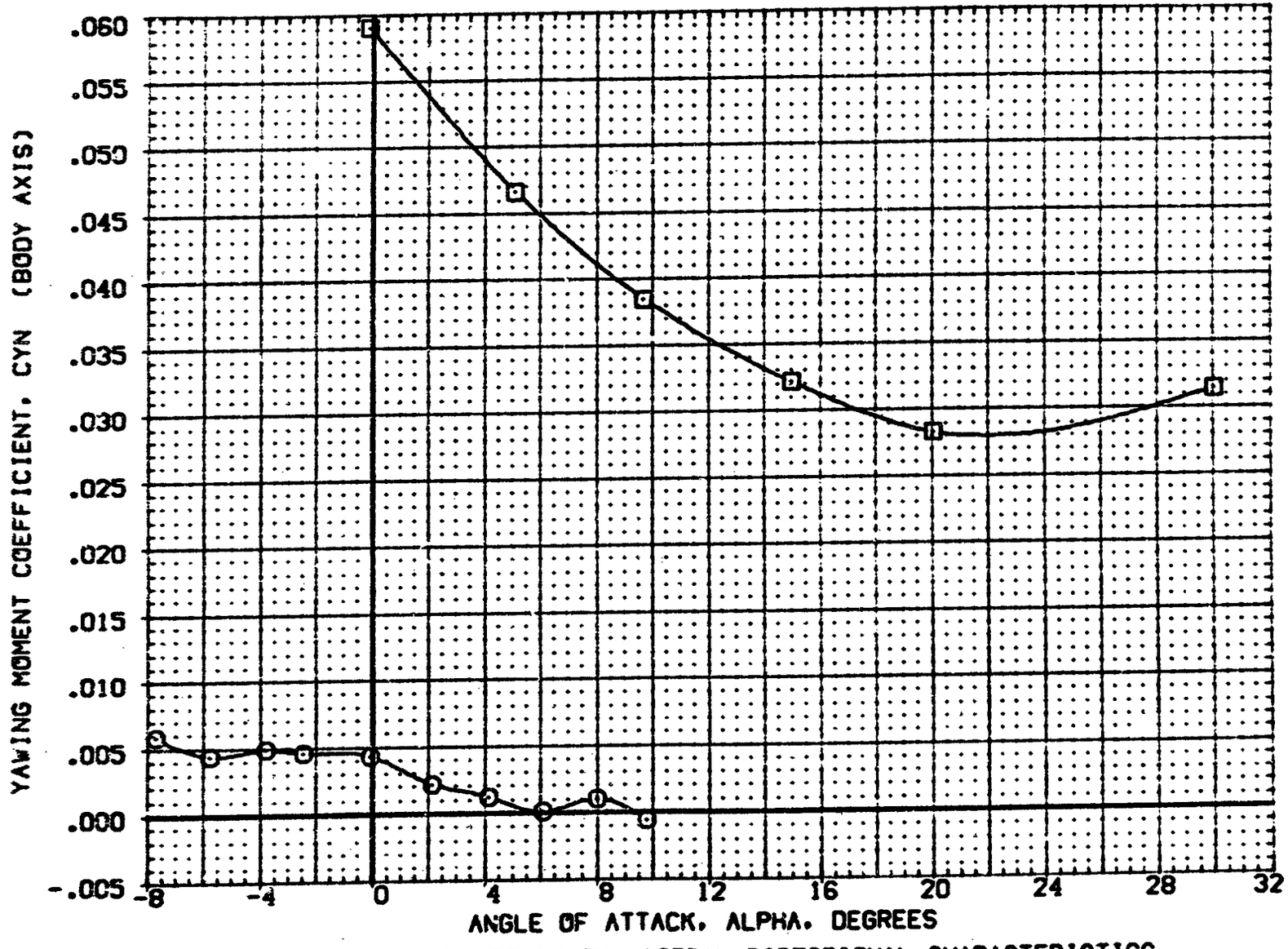


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(D97011)	○	DATA NOT AVAILABLE	.000	.000	.000	.000
(S87002)	□	DATA NOT AVAILABLE	5.000	.000	.000	.000
(R87014)	◇	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(R97003)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	5.000	.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4000	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

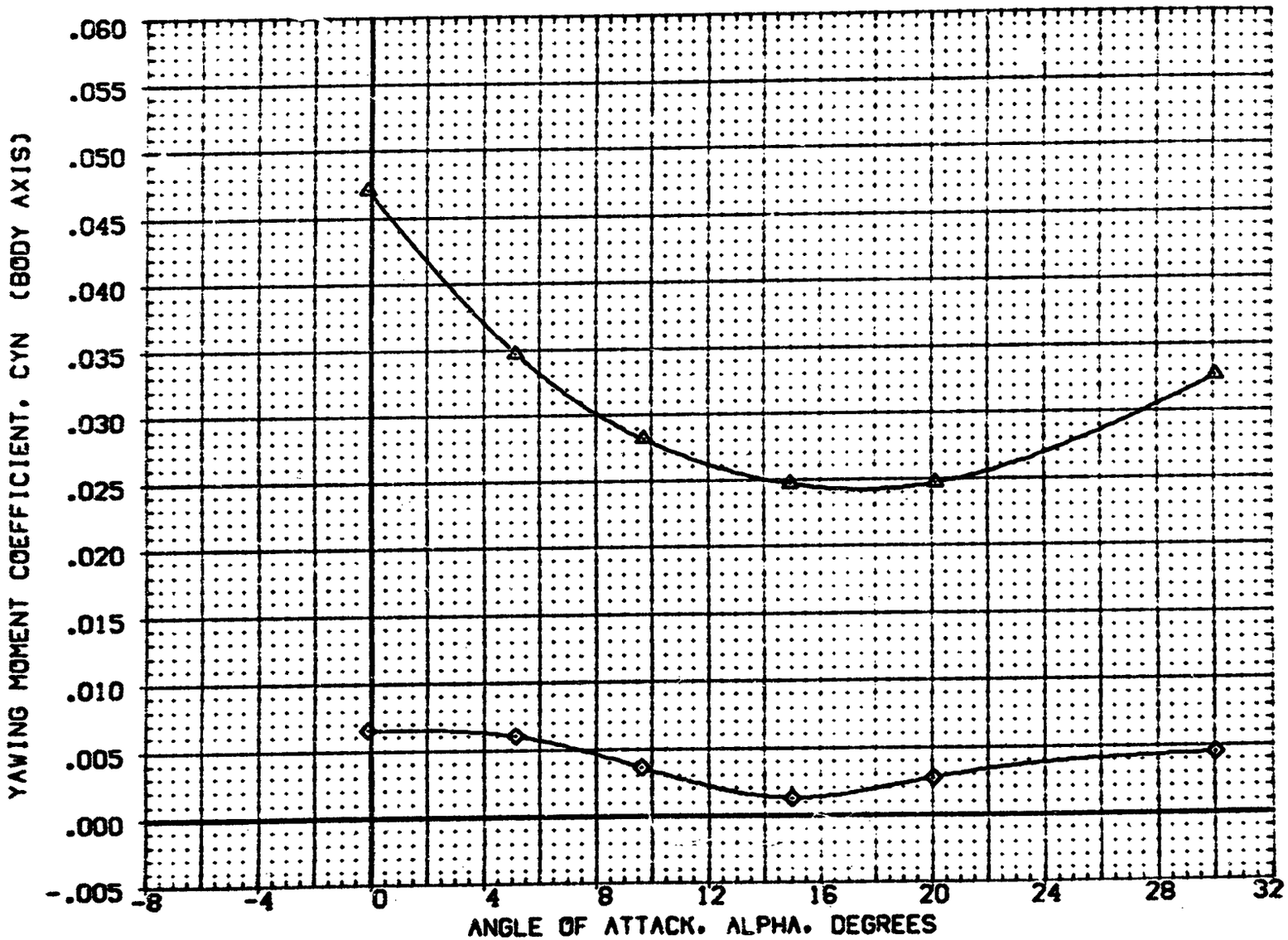


FIG. 9 EFFECT OF ANGLE OF ATTACK ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7009)	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7008)	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

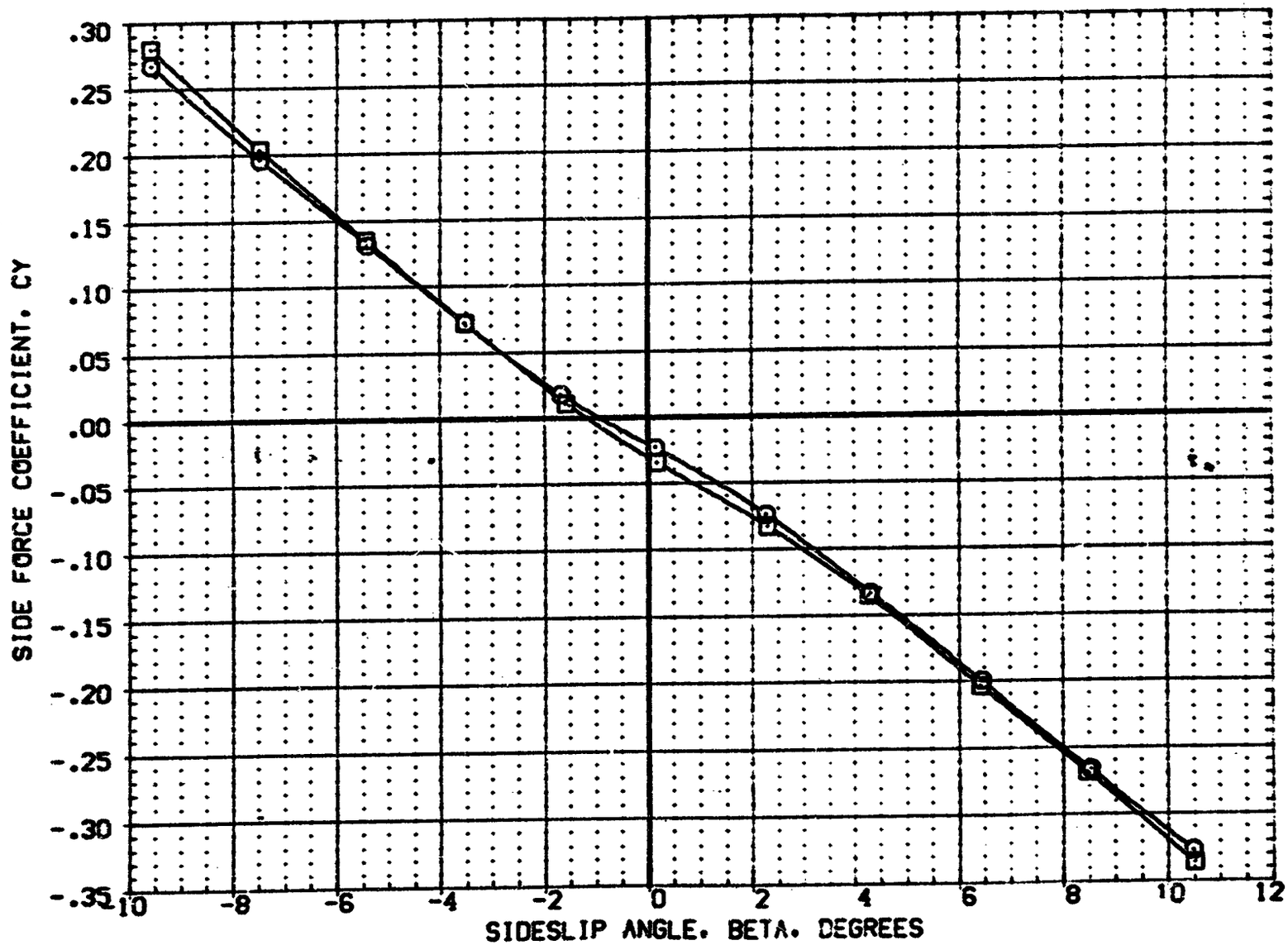


FIG. 10 EFFECT OF RUDDER ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(R87009)	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(R87008)	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

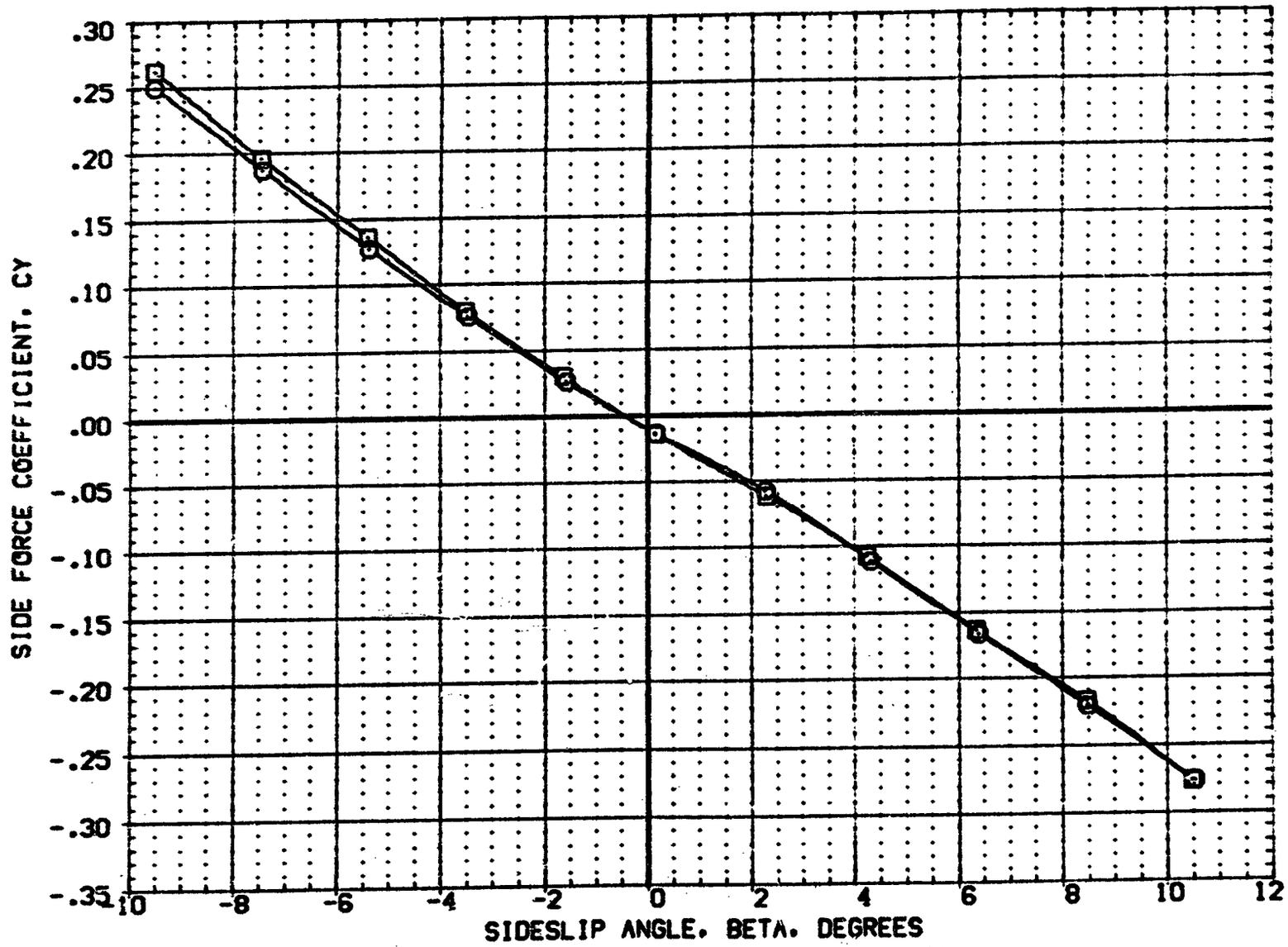


FIG. 10 EFFECT OF RUDDER ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7139) ○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7008) □	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4900	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

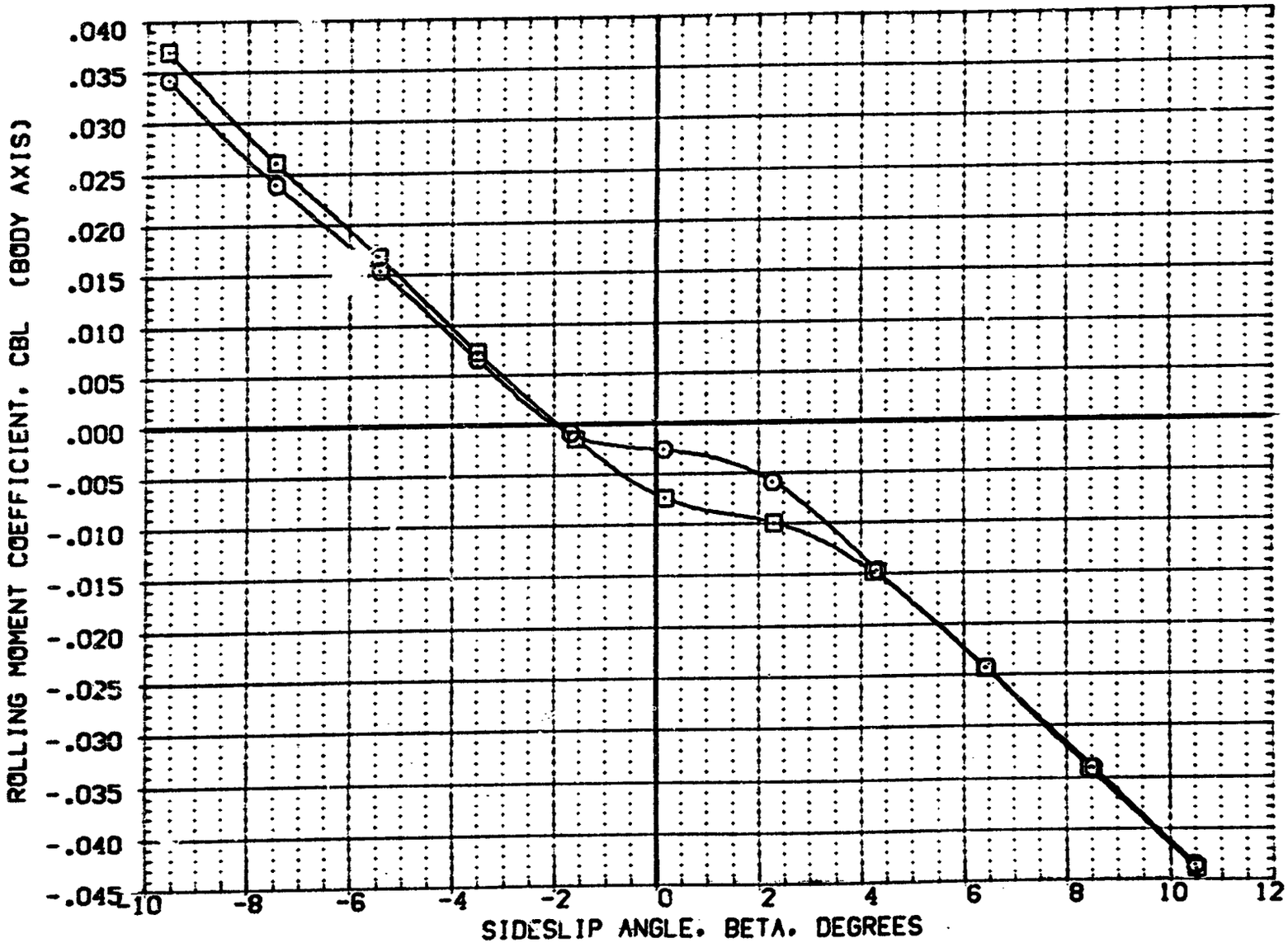


FIG. 10 EFFECT OF RUDDER ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
[R97C09]	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
[R97C09]	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2680.0000	SQ.FT.
BREF	1290.0000	IN.
CREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	480.0000	IN.
SCALE	.0100	

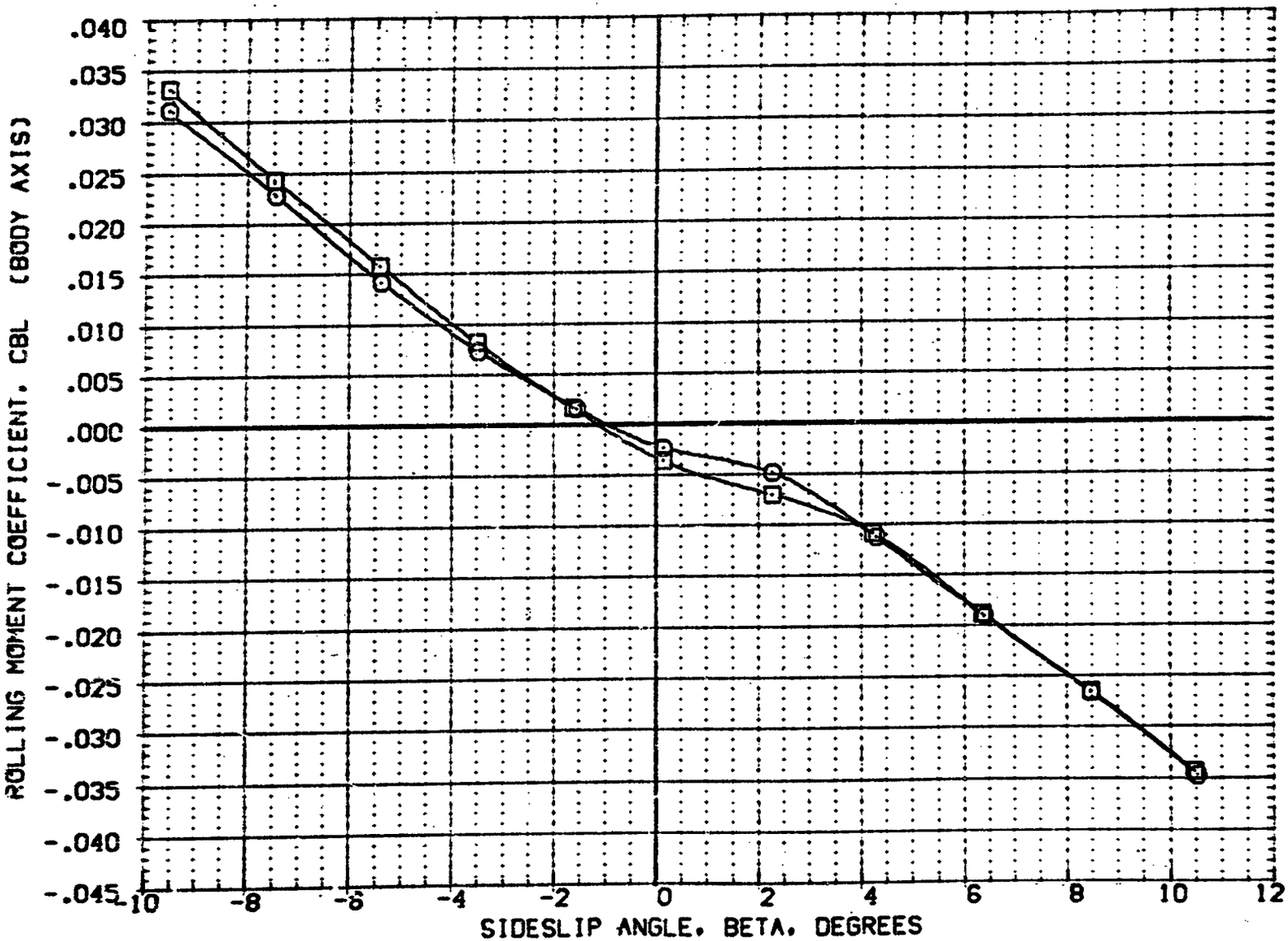


FIG. 10 EFFECT OF RUDDER ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(R87009) ○	AMES 3.5-169 1A10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(R87008) □	AMES 3.5-169 1A10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

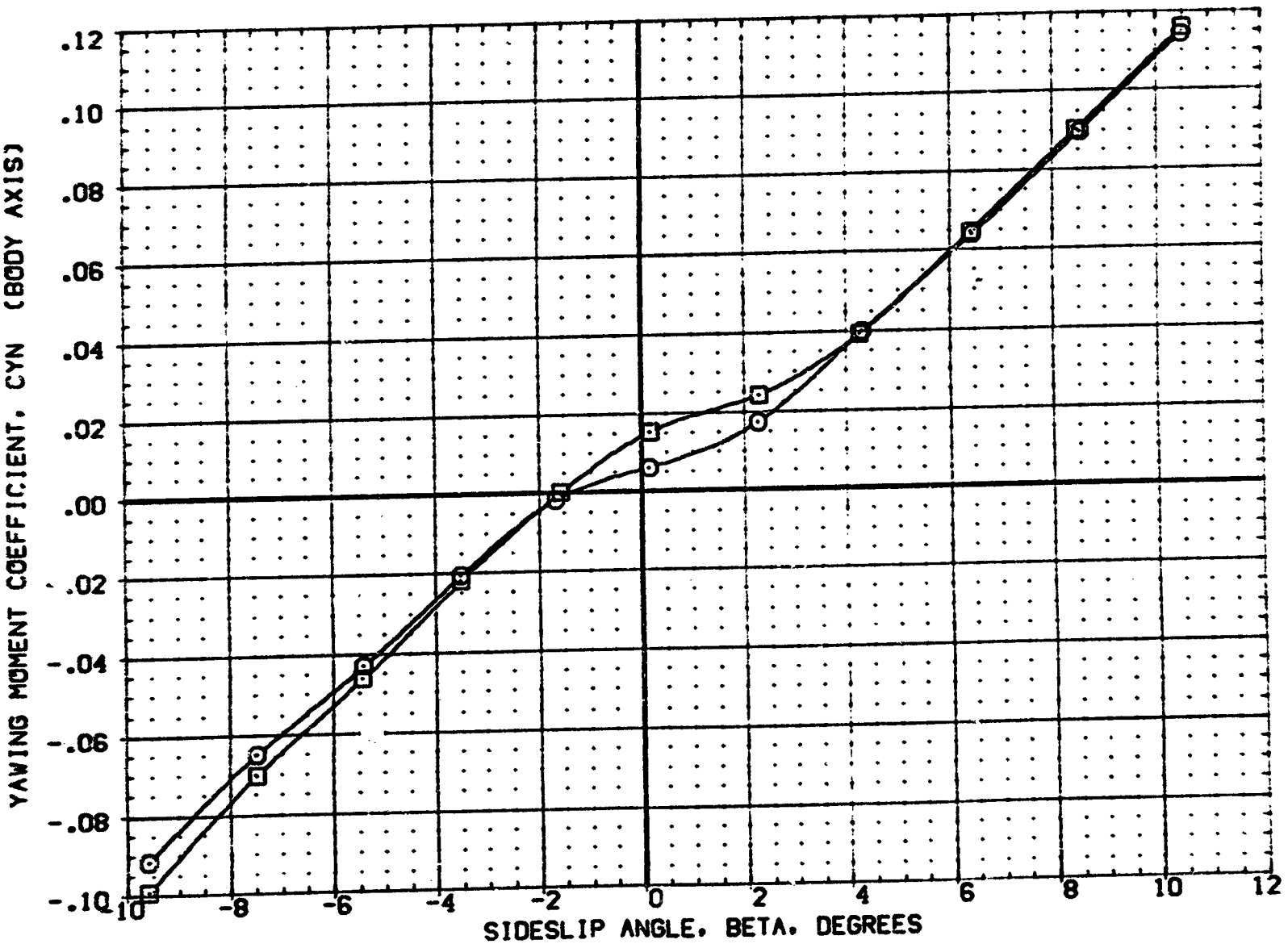


FIG. 10 EFFECT OF RUDDER ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(R97009)	○	AMES 3.5-169 1A10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(R97008)	□	AMES 3.5-169 1A10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6900	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.2500	

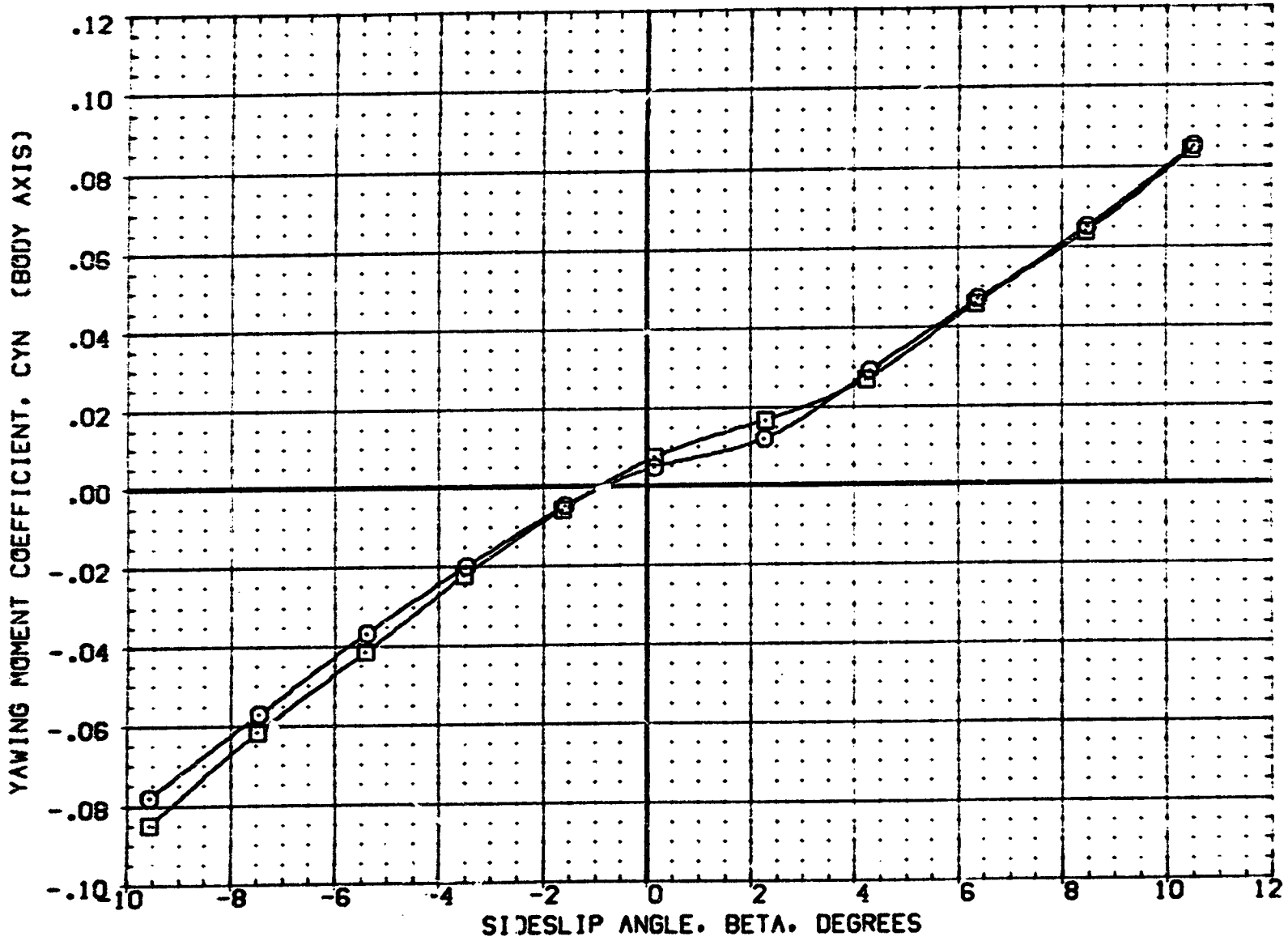


FIG. 10 EFFECT OF RUDDER ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(RB7009) ○	AMES 3.5-169 1A10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(RB7008) □	AMES 3.5-169 1A10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

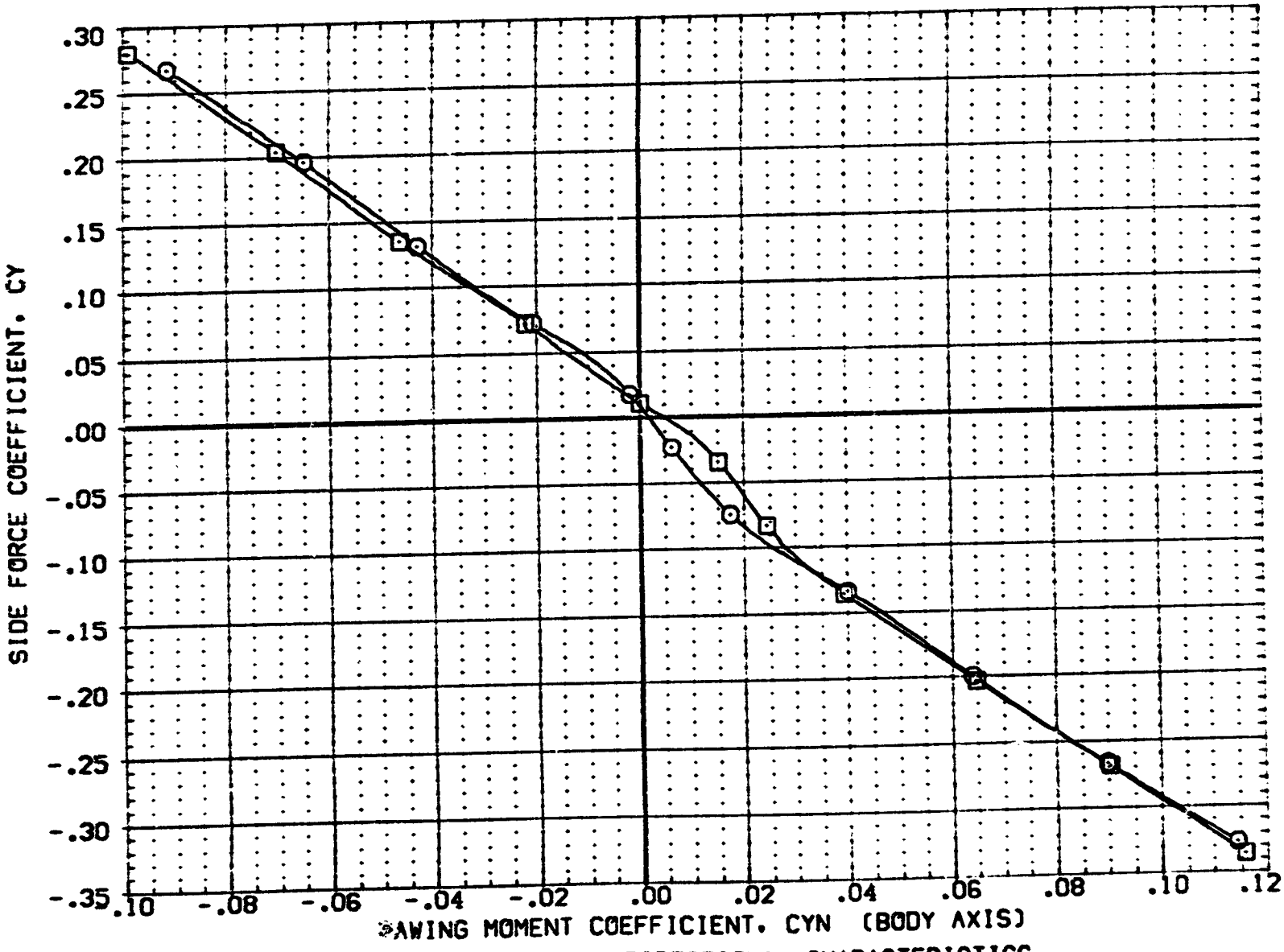


FIG. 10 EFFECT OF RUDDER ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(A)MACH = 5.25

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	ALPHA	AILRON	ELEVON	RUDDER
(R87009)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	.000
(R87008)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME ON	.000	.000	.000	10.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	536.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

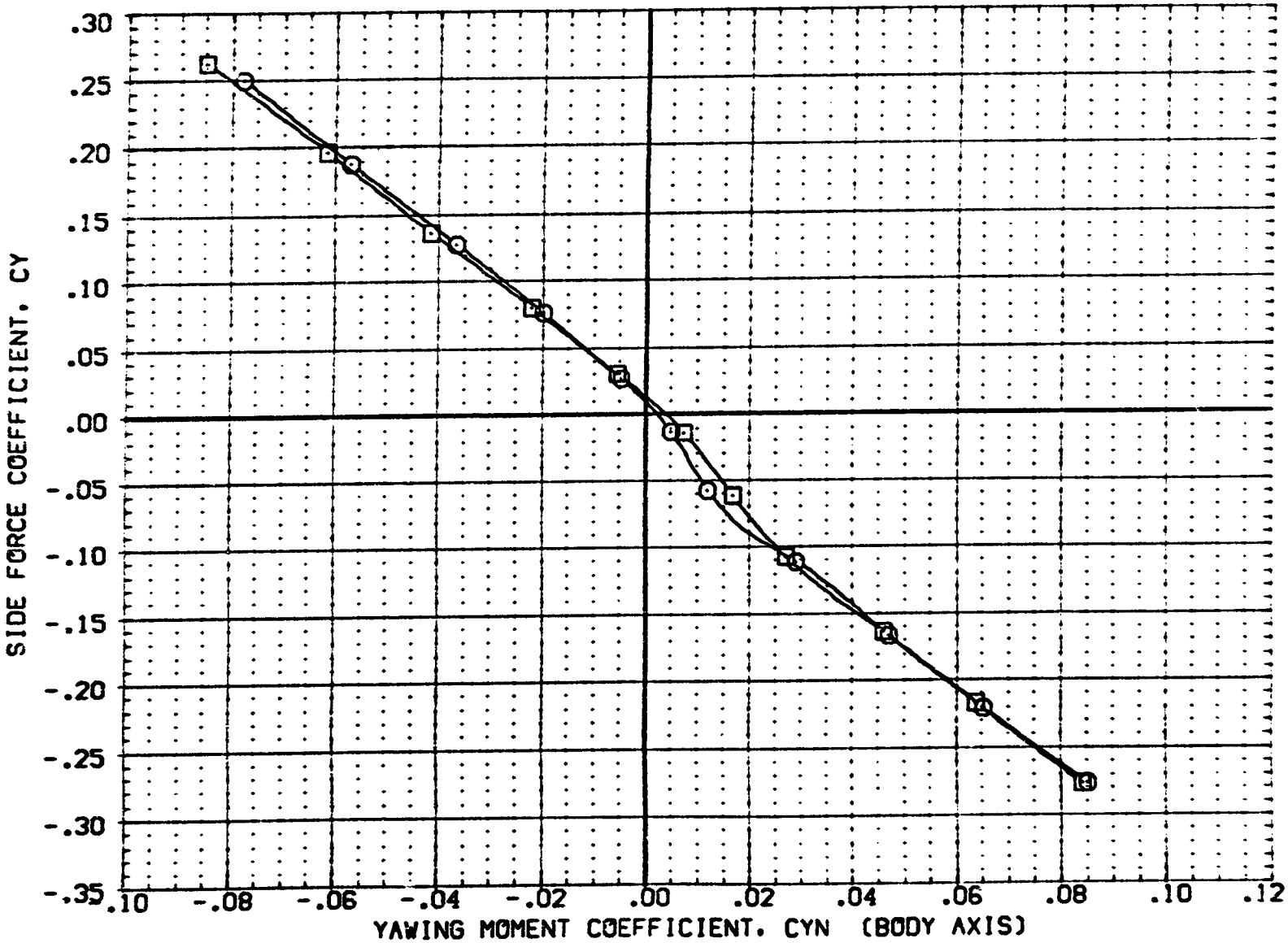


FIG. 10 EFFECT OF RUDDER ON LATERAL-DIRECTIONAL CHARACTERISTICS.

(B)MACH = 7.32

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(MB7011)	○	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(UB7005)	□	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000
(MB7004)	⊗	DATA NOT AVAILABLE	.000	.000	.000	.000
(VB7005)	△	DATA NOT AVAILABLE	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

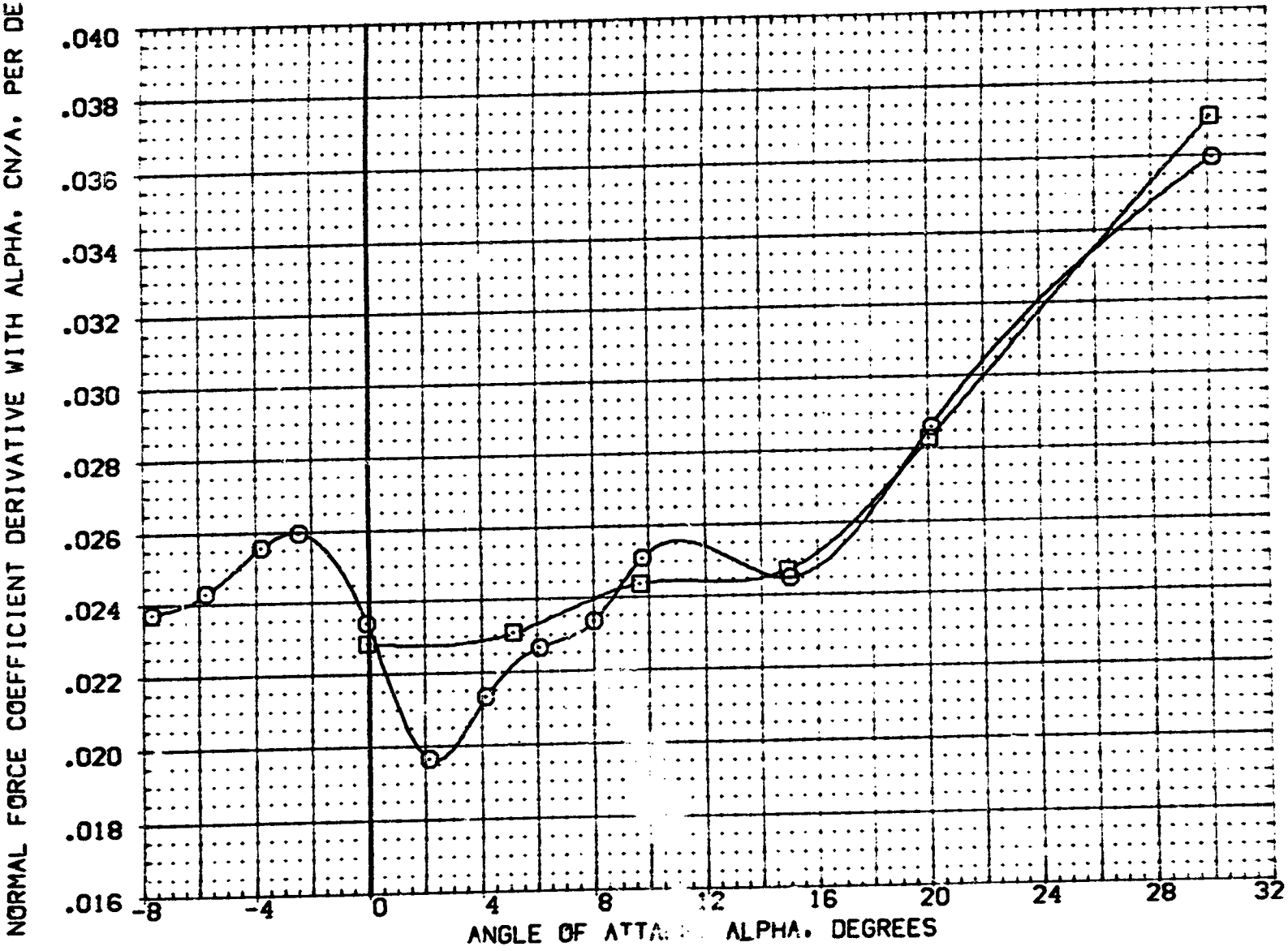


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(V97011)	○	DATA NOT AVAILABLE	.000	.000	.000	.000
(V97005)	□	DATA NOT AVAILABLE	.000	10.000	.000	.000
(V97004)	◇	AMES 3.5-169 IA10 C9 T10 AT2 PLUME OFF	.000	.000	.000	.000
(V97005)	△	AMES 3.5-169 IA10 C8 T10 AT2 PLUME OFF	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	935.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

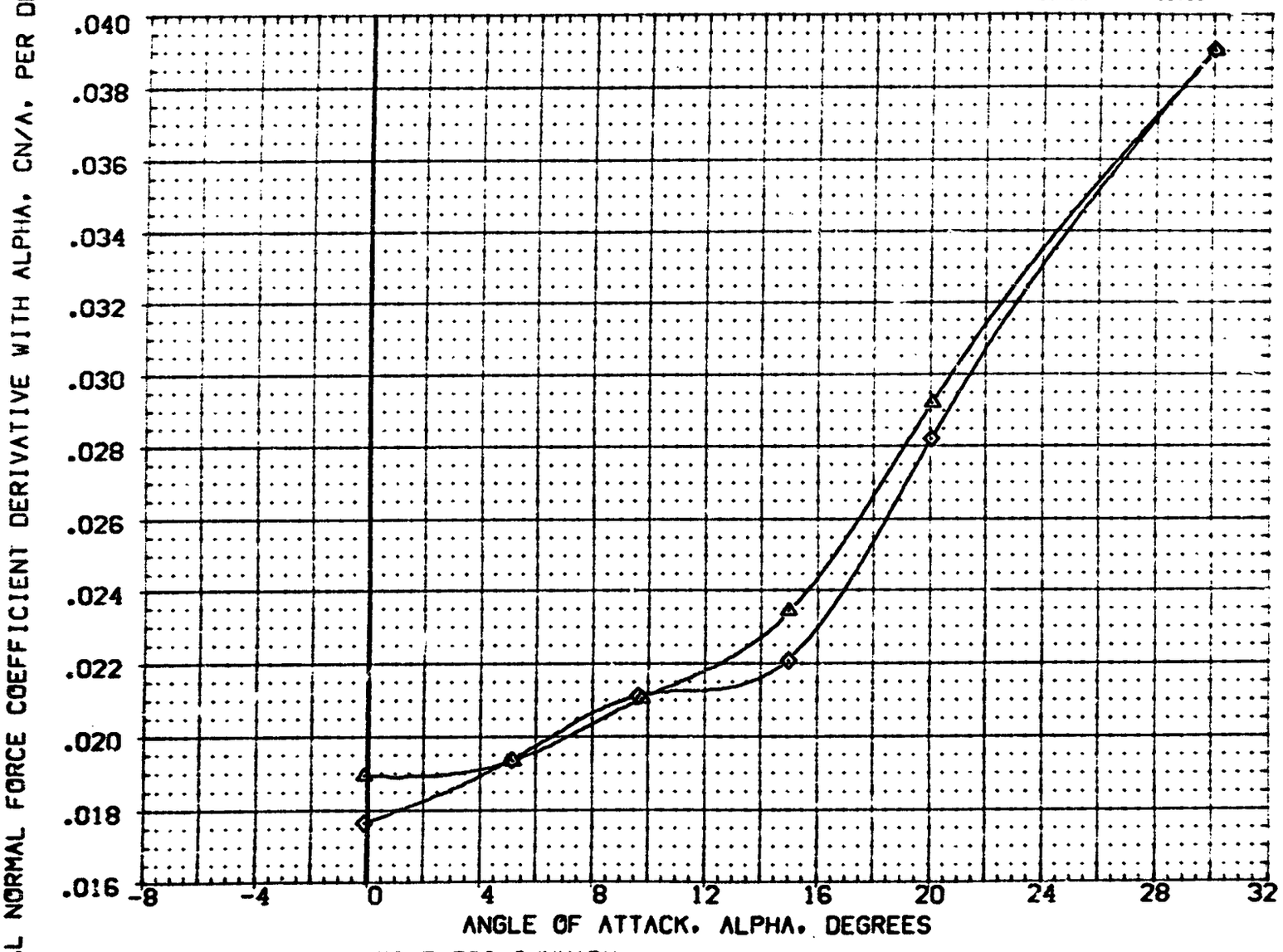


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

(B)MACH = 7.32

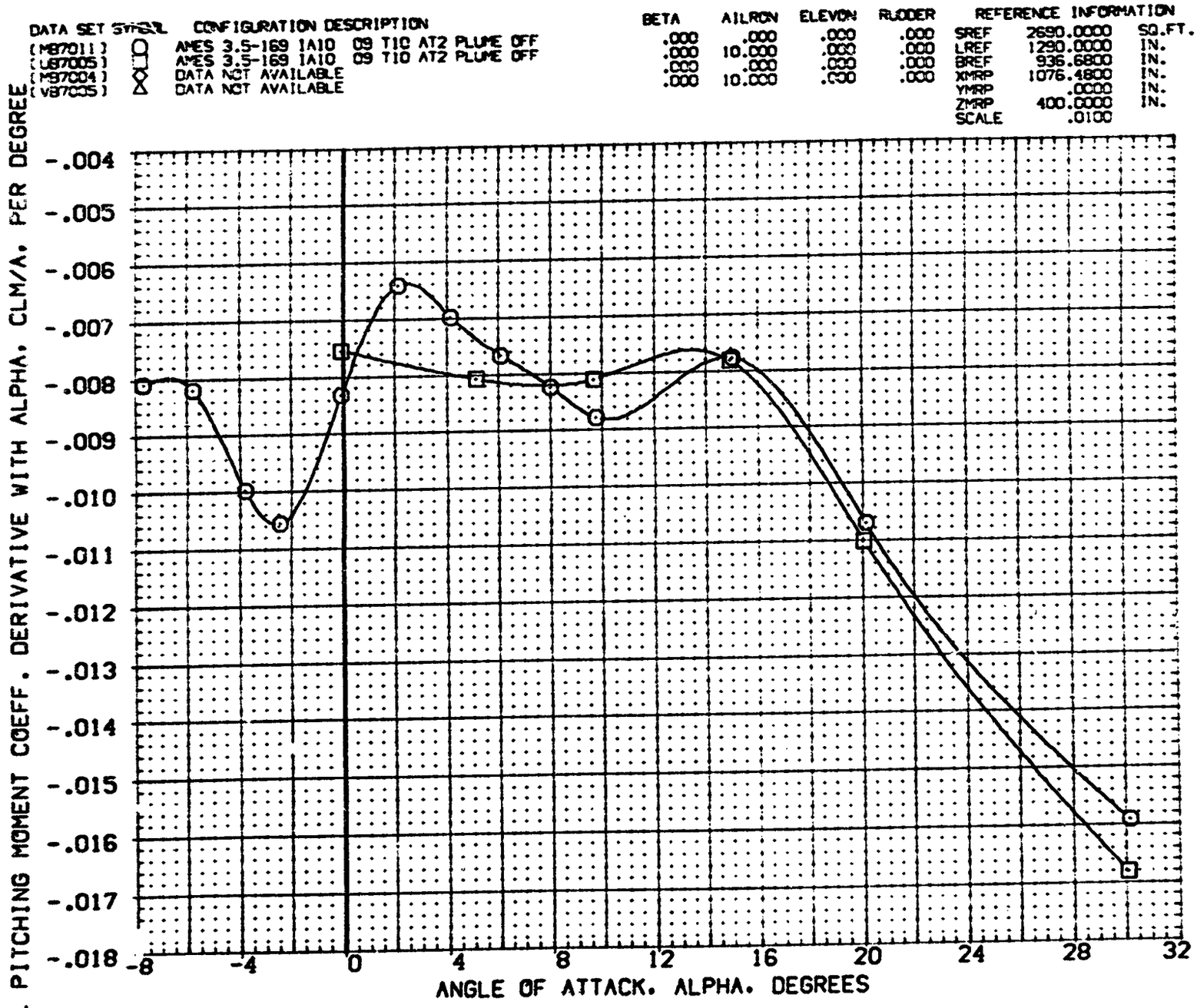


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(MB7011)	◇	DATA NOT AVAILABLE	.000	.000	.000	.000
(VB7005)	□	DATA NOT AVAILABLE	.000	10.000	.000	.000
(MB7004)	⊠	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(VB7005)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

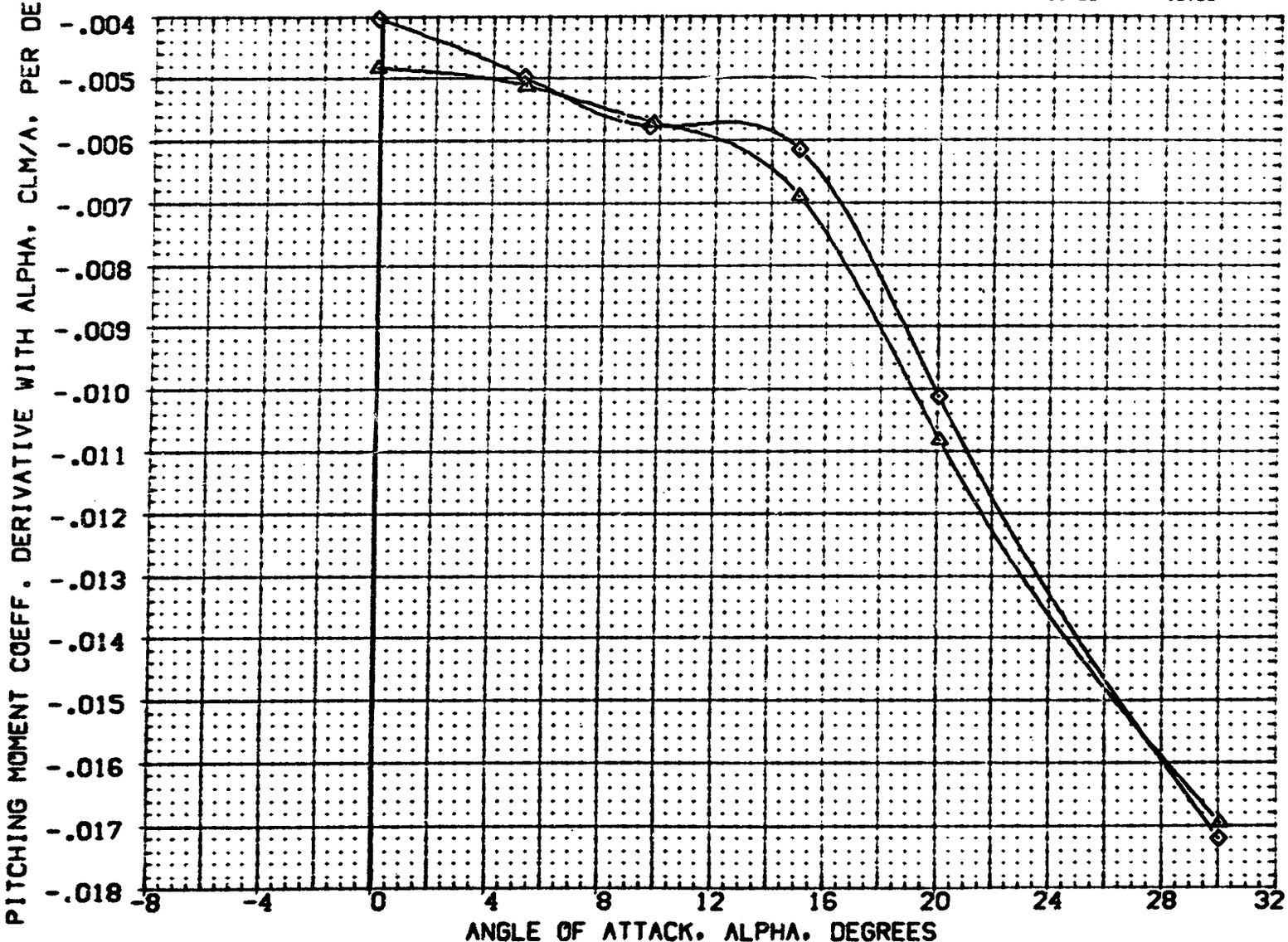


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

(B)MACH = 7.32

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION
(V87011)	○	AMES 3.5-169 IA10 03 T10 AT2 PLUME OFF
(V87005)	□	AMES 3.5-169 IA10 03 T10 AT2 PLUME OFF
(V87004)	⊠	DATA NOT AVAILABLE
(V87005)	△	DATA NOT AVAILABLE

BETA	AILRON	ELEVON	RUDDER
.000	.000	.000	.000
.000	10.000	.000	.000
.000	.000	.000	.000
.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

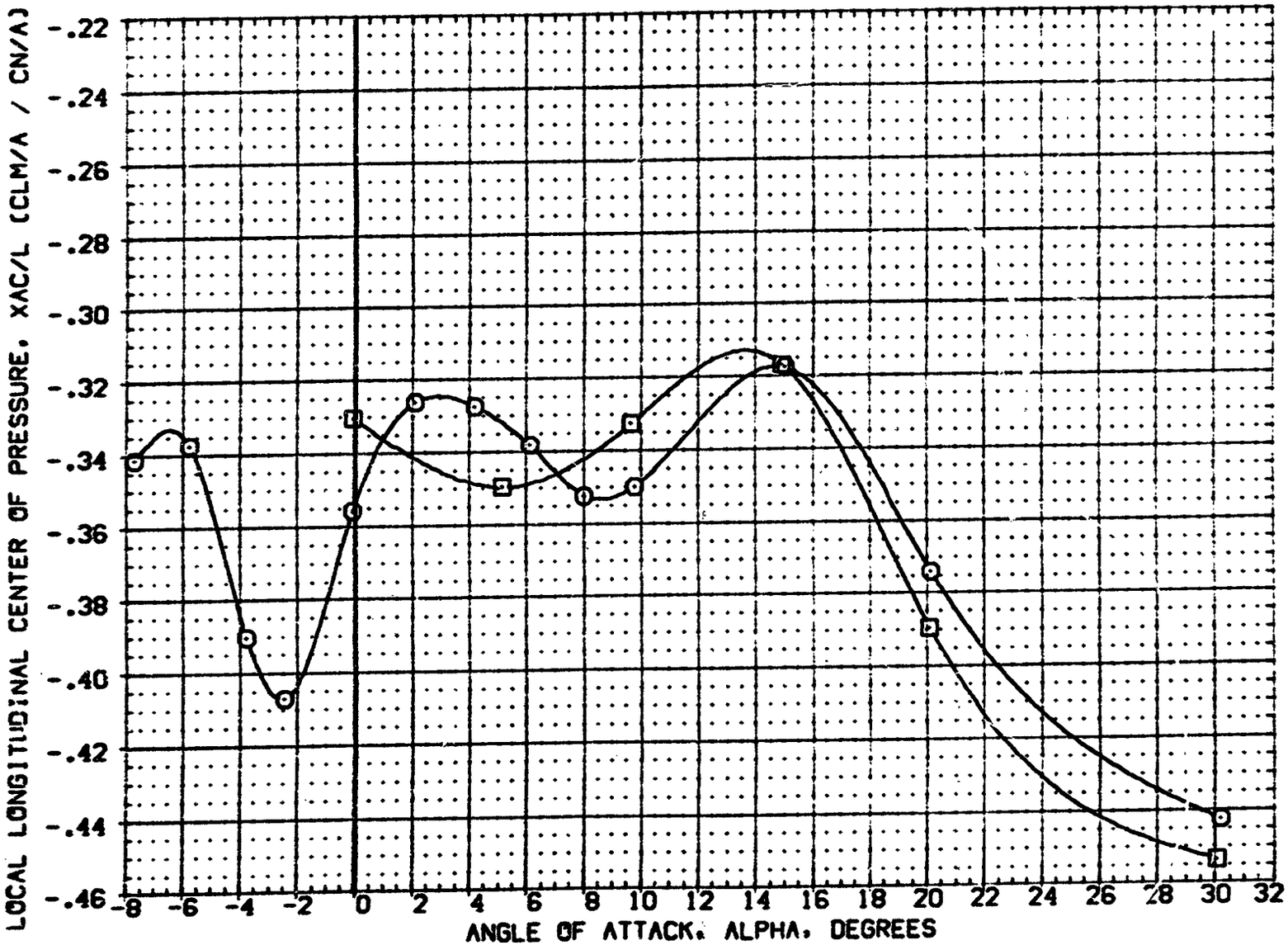


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

(A)MACH = 5.26

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	BETA	AILRON	ELEVON	RUDDER
(MB7011)	○	DATA NOT AVAILABLE	.000	.000	.000	.000
(LB7005)	□	DATA NOT AVAILABLE	.000	10.000	.000	.000
(MB7004)	⊗	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	.000	.000	.000
(VB7005)	△	AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF	.000	10.000	.000	.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

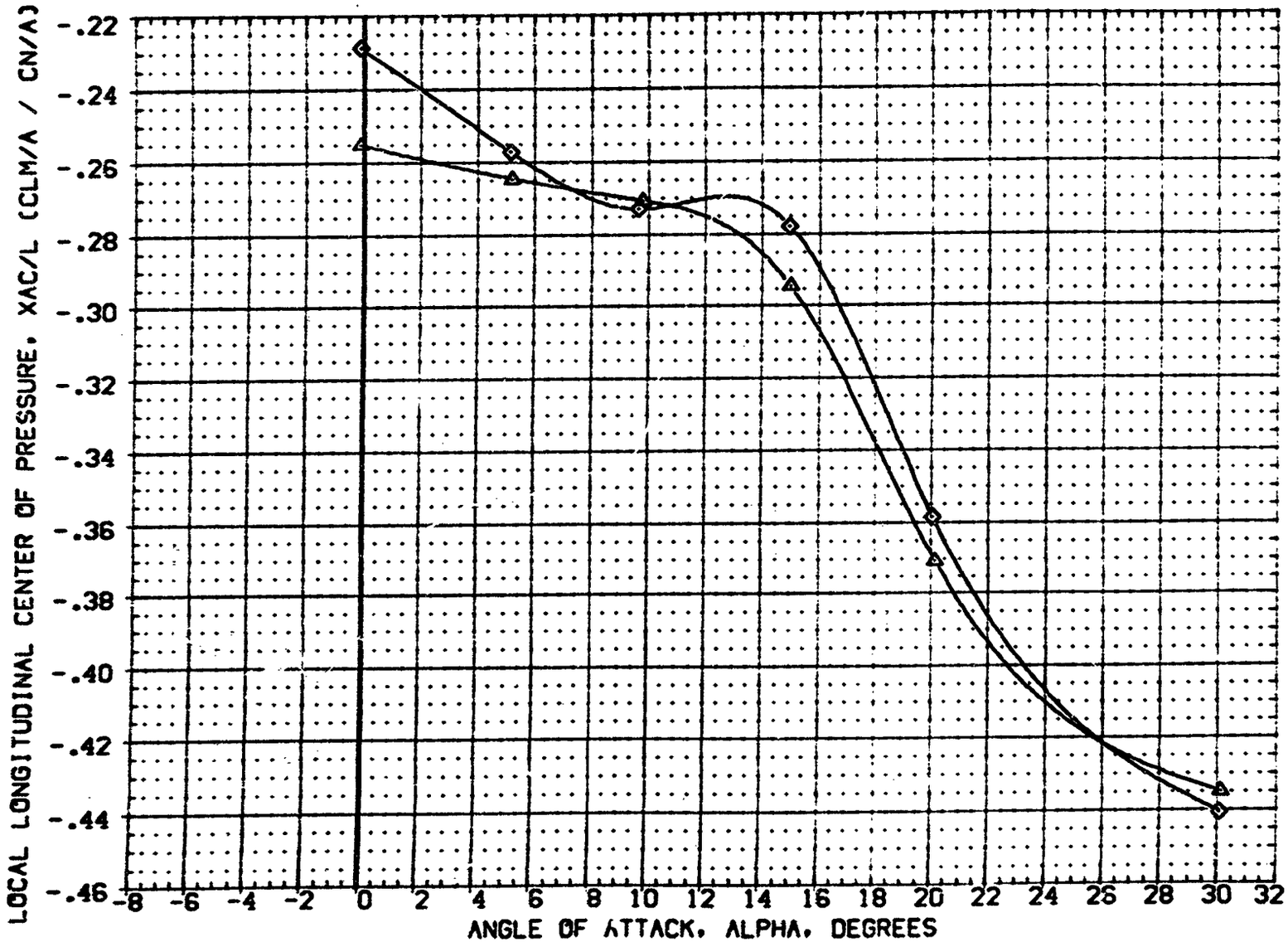


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

(B)MACH = 7.32

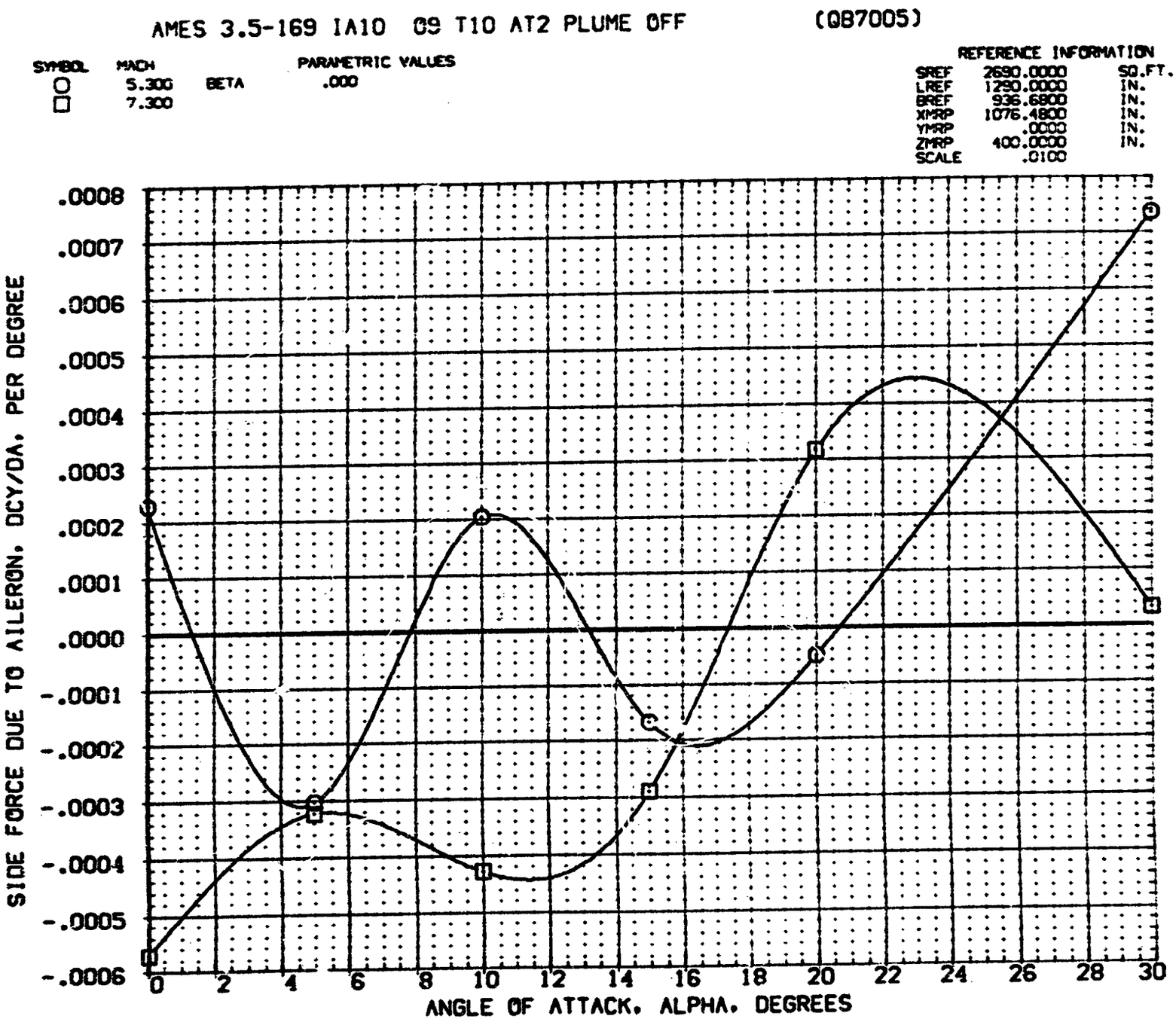


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF (QB7005)

SYMBOL	MACH	PARAMETRIC VALUES	
○	5.300	BETA	.000
□	7.300		

REFERENCE INFORMATION

SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

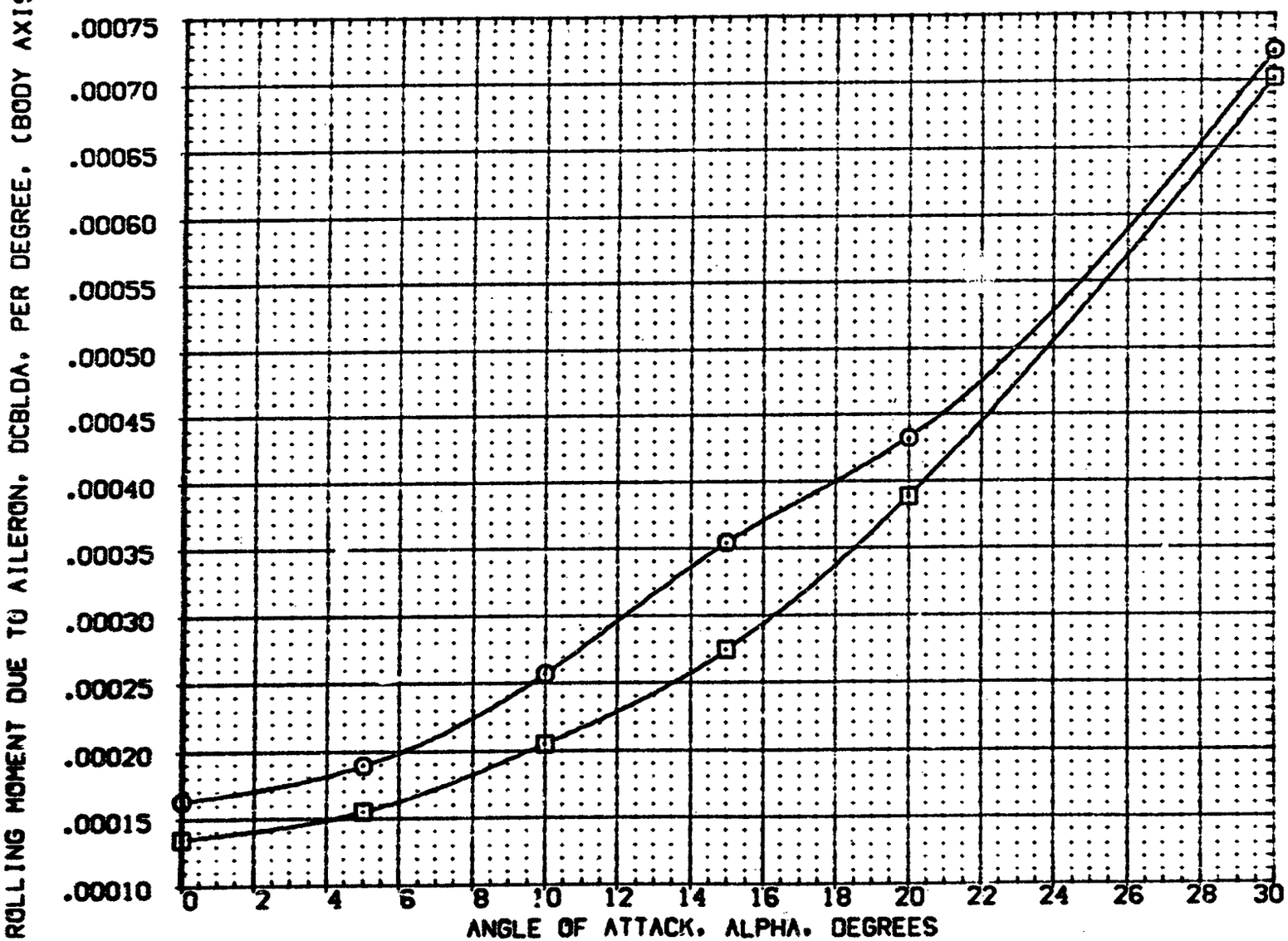


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

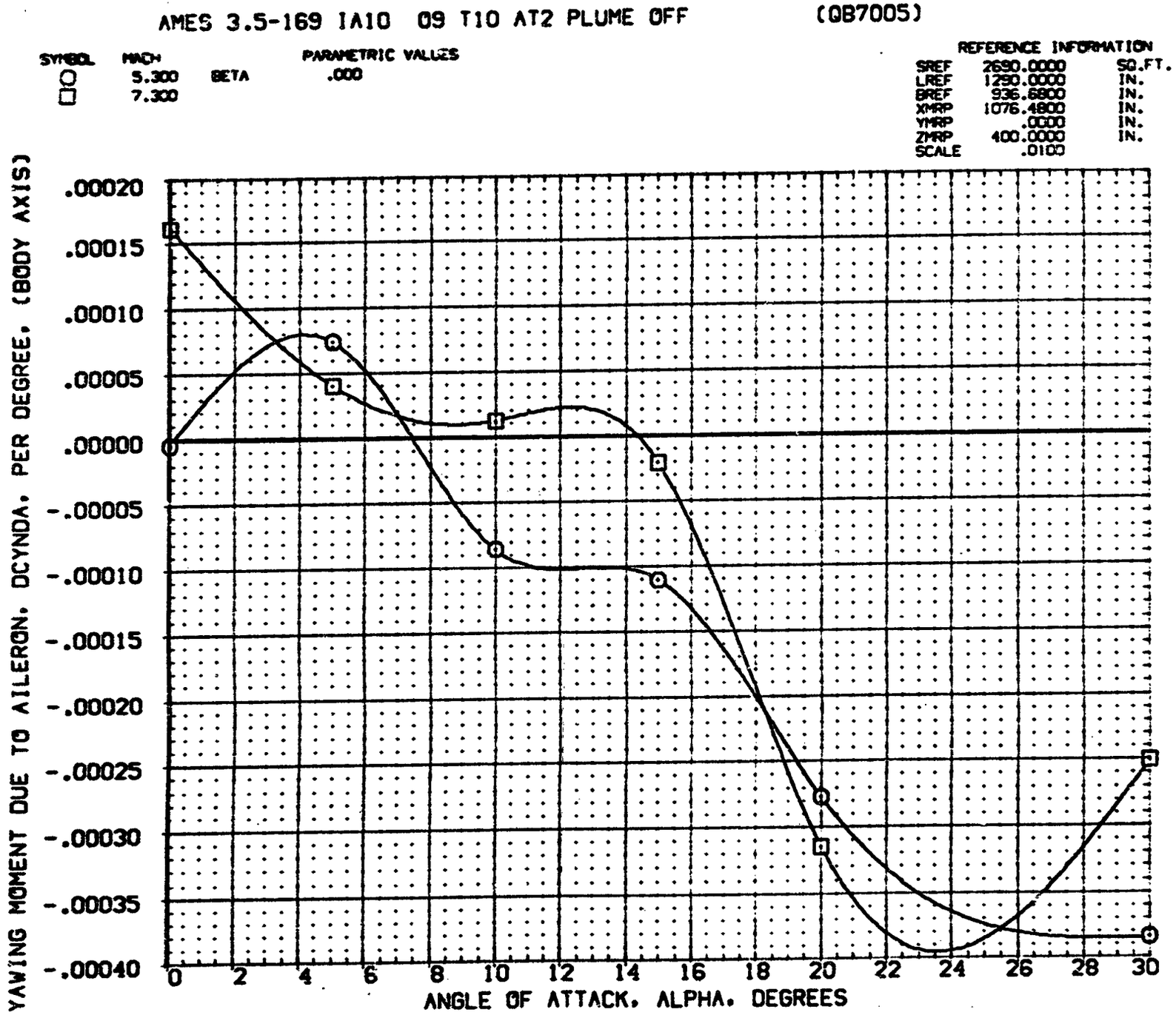


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF (QB7005)

SYMBOL	MACH		PARAMETRIC VALUES
○	5.300	BETA	.000
□	7.300		

REFERENCE INFORMATION

SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

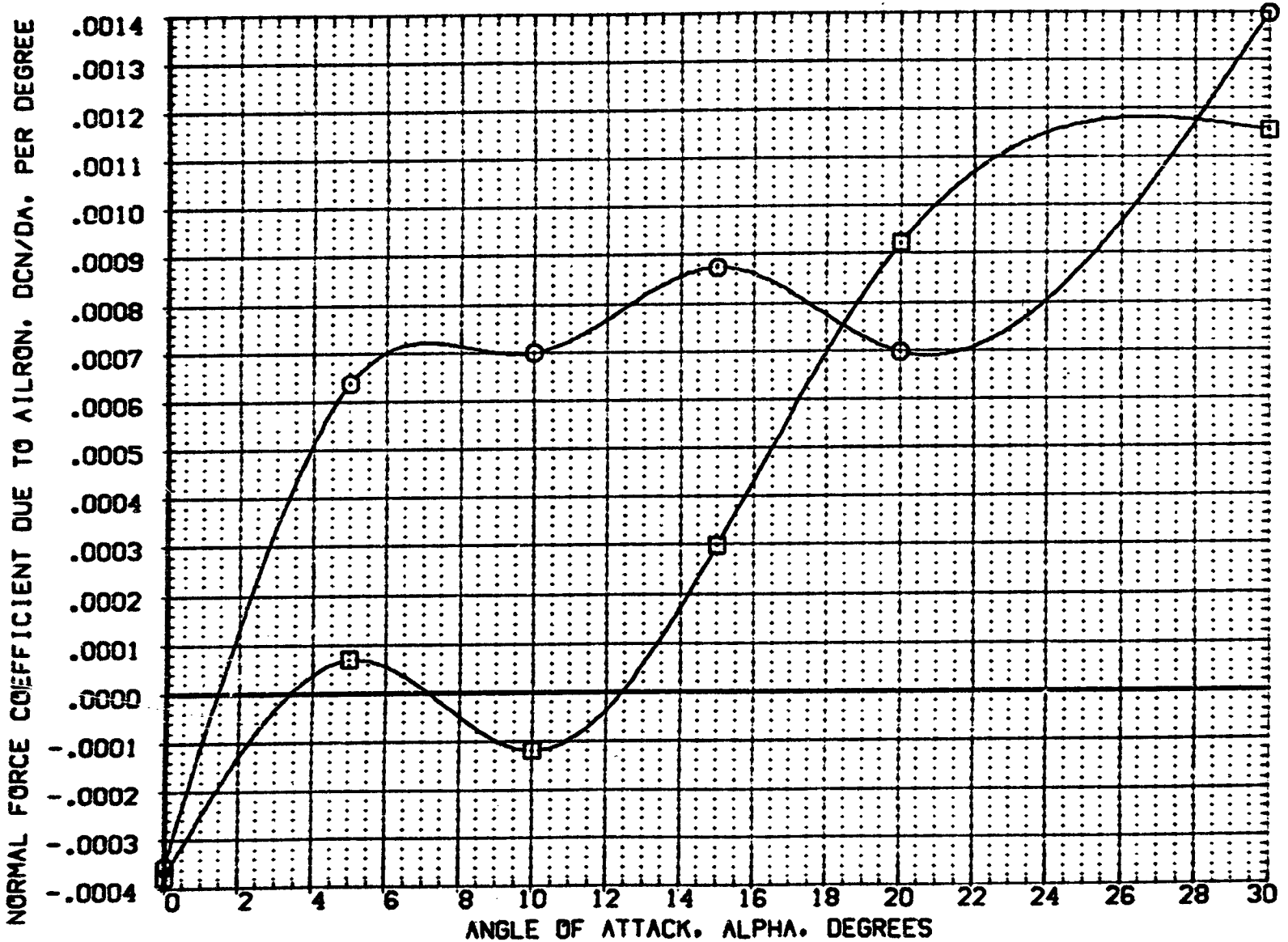


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF (QB7005)

SYMBOL	MACH	PARAMETRIC VALUES	
○	5.300	BETA	.000
□	7.300		

REFERENCE INFORMATION

SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

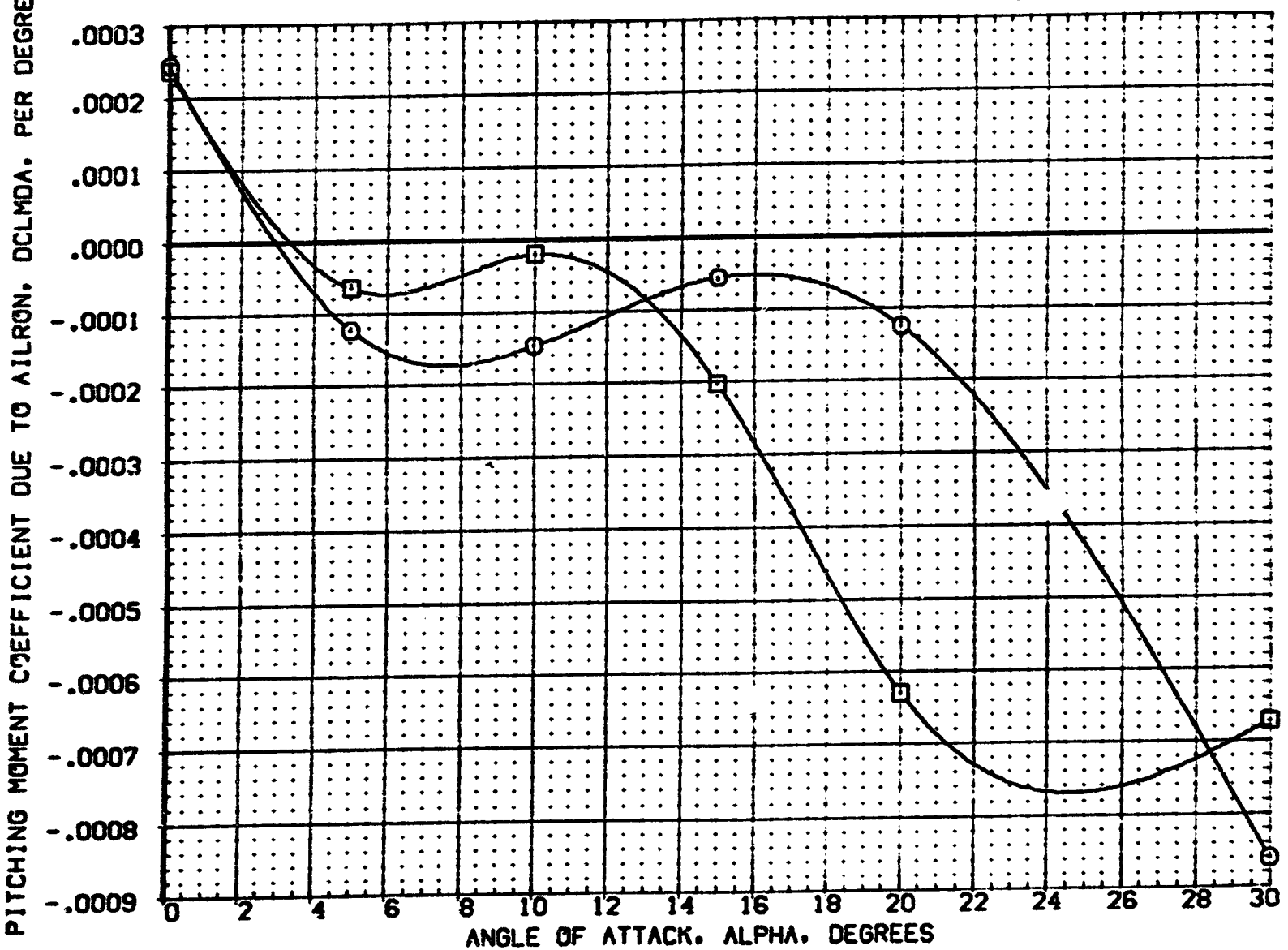


FIG 11 ELEVON EFFECTIVENESS SUMMARY.

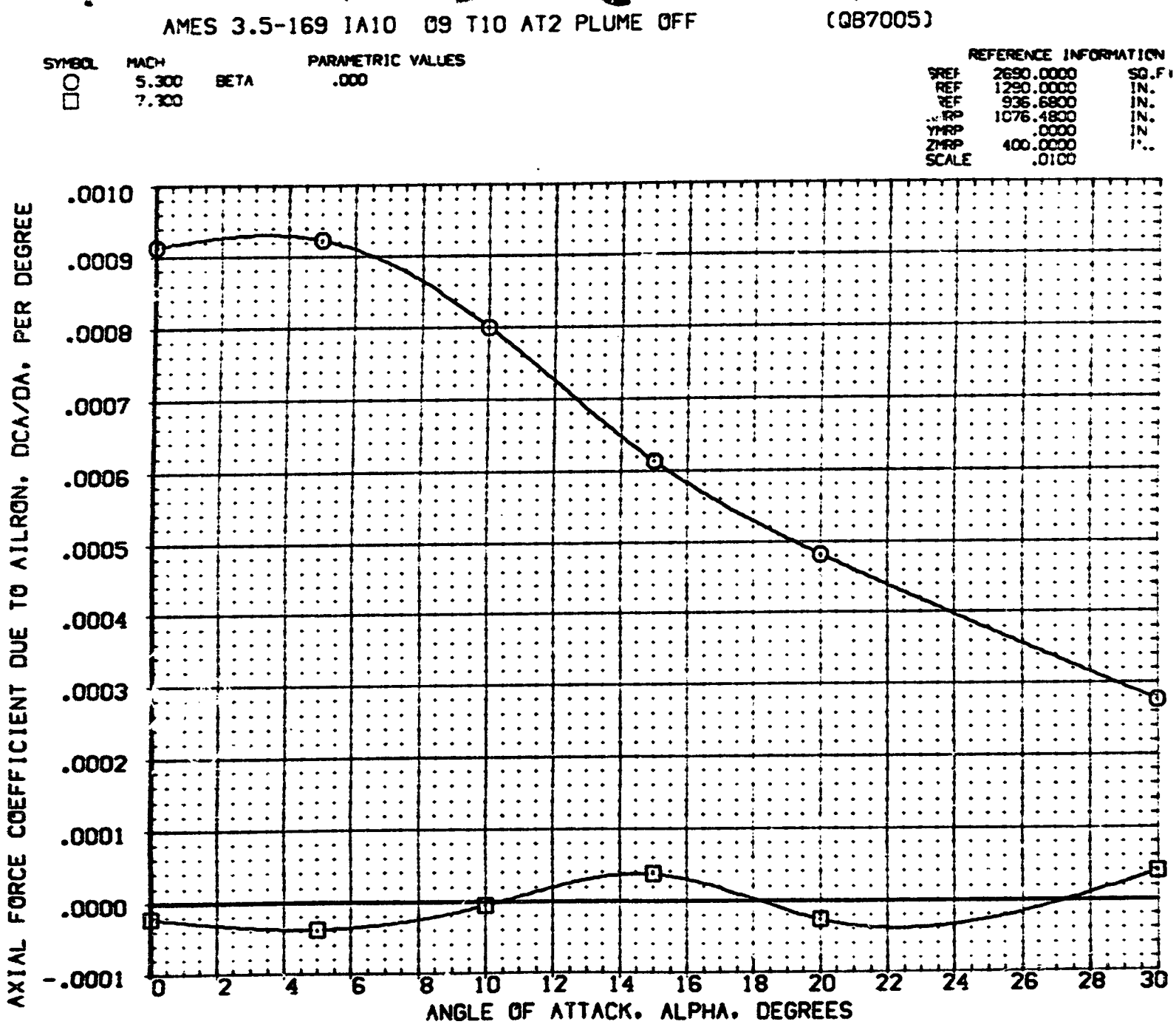


FIG. 11 ELEVON EFFECTIVENESS SUMMARY.

AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF (QB7002)

SYMBOL	MACH		PARAMETRIC VALUES
○	5.300	BETA	5.000
□	7.300		

REFERENCE INFORMATION

SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

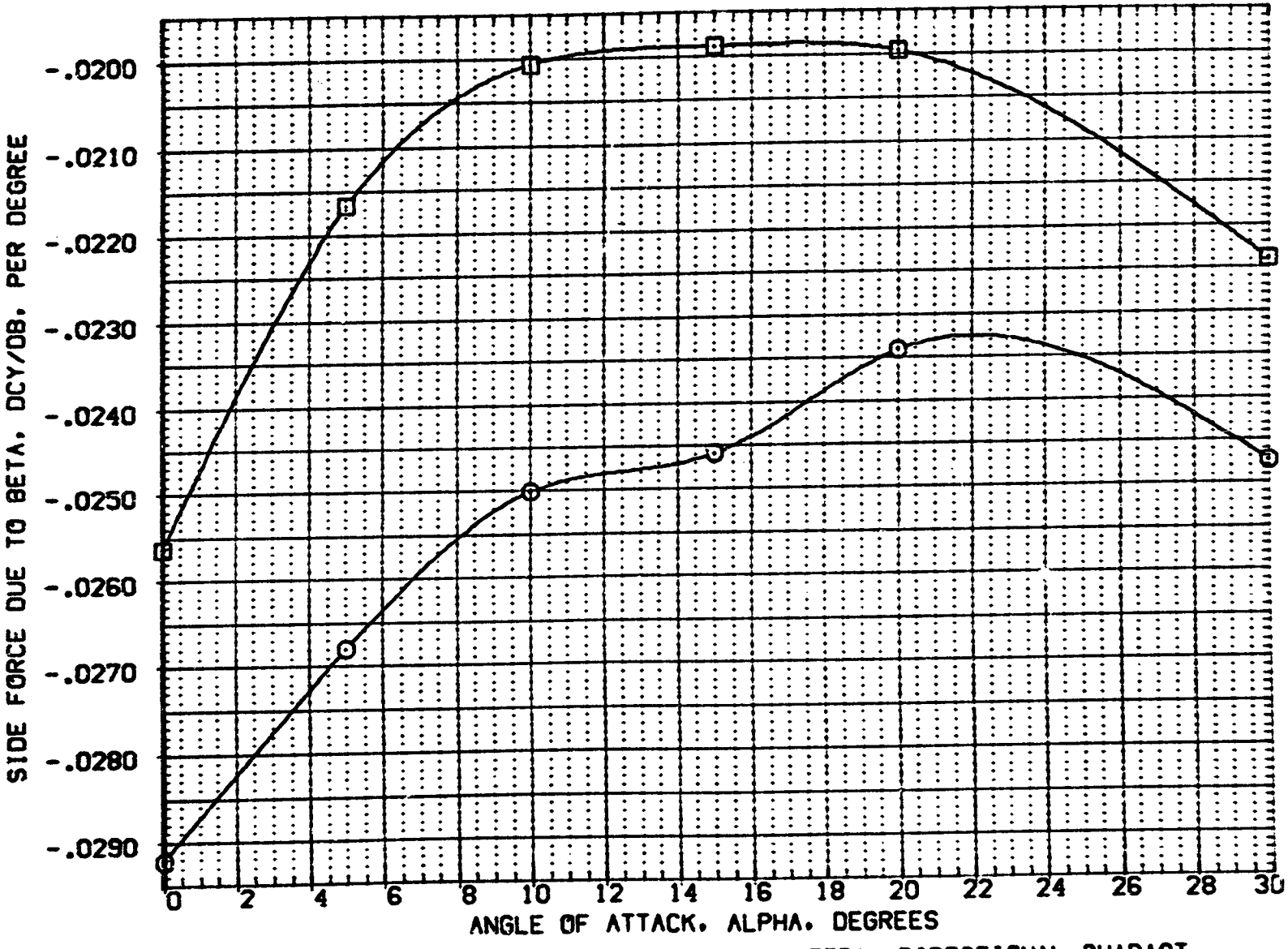


FIG. 12 SUMMARY OF ANGLE OF ATTACK EFFECTS ON LATERAL-DIRECTIONAL CHARACT.

AMES 3.5-169 IA10 09 T10 AT2 PLUME OFF (QB7002)

SYMBOL	MACH	PARAMETRIC VALUES	
○	5.300	BETA	5.000
□	7.300		

REFERENCE INFORMATION

SREF	2690.0000	SQ.FT.
LREF	1290.0000	IN.
BREF	936.6800	IN.
XMRP	1076.4800	IN.
YMRP	.0000	IN.
ZMRP	400.0000	IN.
SCALE	.0100	

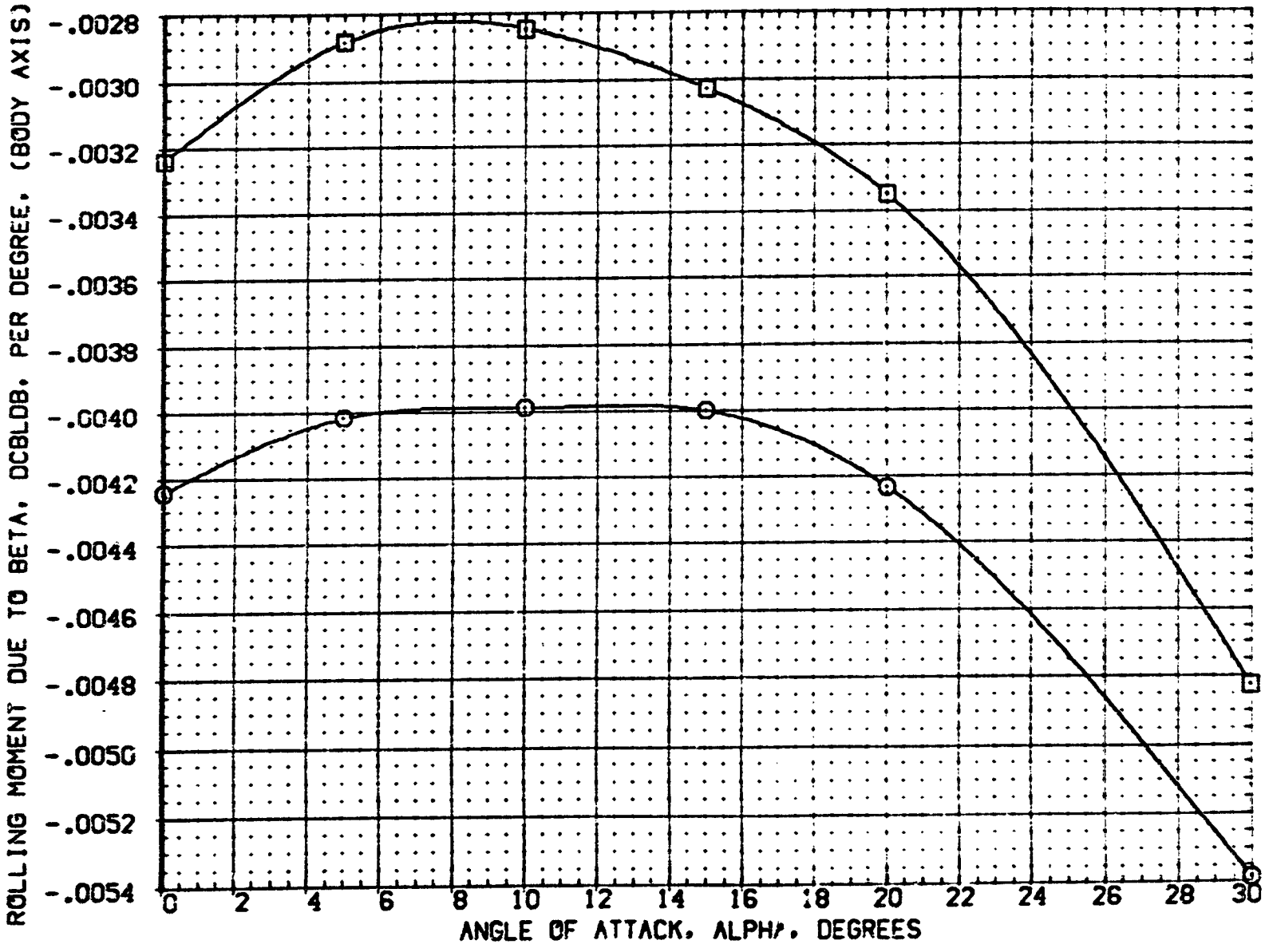


FIG. 12 SUMMARY OF ANGLE OF ATTACK EFFECTS ON LATERAL-DIRECTIONAL CHARACT.

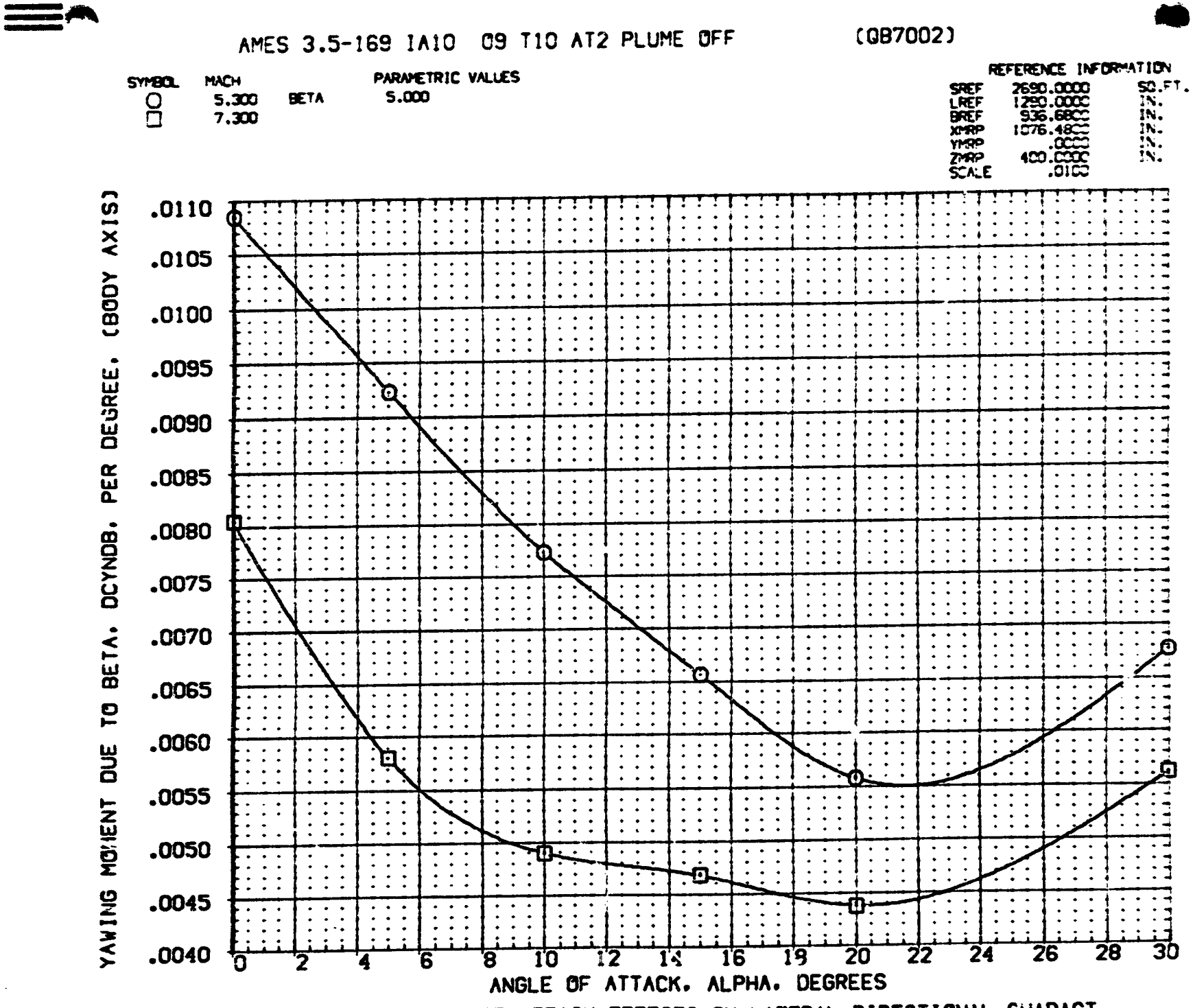


FIG. 12 SUMMARY OF ANGLE OF ATTACK EFFECTS ON LATERAL-DIRECTIONAL CHARACT.

APPENDIX

TABULATED SOURCE DATA

Tabulations of plotted data are available on request from Data Management Systems

DATE 05 DEC 75 TABULATED SOURCE ARC 3.5-169, IA10

AMES 3.5-169 IA10 C0 T10 AT2 PLUME OFF (MB7001) (28 NOV 75)

REFERENCE DATA

SREF = 2680.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

BETA = .000 AILRON = .000
ELEVON = .000 BDFLAP = .000
SPDBRK = .000 RUDDER = .000

RN/L = 4.13 GRADIENT INTERVAL = -5.00/ 5.00

MACH = 7.320

ALPHA	CN	CY	CA	CLM	CYN	CBL	CL	CD	L/D
-9.580	-.25482	-.01010	.21747	.09320	.00363	-.00193	-.21488	.25681	-.83671
-7.387	-.21872	-.00984	.20424	.08651	.00361	-.00201	-.19068	.23067	-.82661
-5.339	-.17338	-.00814	.19355	.07158	.00239	-.00162	-.15463	.20883	-.74048
-3.384	-.13376	-.00610	.18164	.05909	.00139	-.00149	-.12280	.18922	-.64899
-1.518	-.09334	-.00727	.17065	.04450	.00151	-.00138	-.08879	.17306	-.51303
.165	-.05684	-.00488	.16151	.03328	.00063	-.00108	-.05710	.16134	-.35393
2.413	-.01616	-.00714	.14979	.02163	.00127	-.00107	-.02245	.14898	-.15070
4.291	.01646	-.00550	.14169	.01446	.00086	-.00097	.00556	.14254	.03904
6.507	.05678	-.00594	.13785	.00404	.00105	-.00075	.04080	.14339	.28452
8.591	.09489	-.00510	.13027	-.00628	.00048	-.00057	.07417	.14295	.51880
10.606	.13597	-.00444	.12494	-.01785	-.00020	-.00043	.11065	.14783	.74851
GRADIENT	.01954	.00006	-.00516	-.00573	-.00006	.00007	.01654	-.00600	.08932

MACH	CAAFO	CNAFO	CLMAFO	XAC/L
7.320	.162389	-.060034	.034281	-.296205

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

DATE 05 DEC 73 TABULATED SURFACE ARC 3.5-169, IA10

AMES 3.5-169 IA10 C9 T10 AT2 PLUME OFF (KB7002) (28 NOV 73)

REFERENCE DATA

SREF = 2890.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 956.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

BETA = 5.000 AILRON = .000
ELEVON = .000 BDFLAP = .000
SPDBRK = .000 RUDDER = .000

RUN NO. 0/ 0 RN/L = 2.37 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CN	CY	CA	CLN	CYN	CBL	CL	CD	L/D
5.260	-.110	-.06013	-.16291	.17932	.03937	.05904	-.02304	-.05979	.17543	-.30986
5.260	5.108	.06267	-.14208	.15707	-.00397	.04669	-.02126	.04843	.16203	.27875
5.260	9.893	.16683	-.13218	.14344	-.03969	.03851	-.02072	.14030	.16948	.77852
5.260	14.980	.29331	-.12622	.12927	-.08380	.03216	-.02105	.24993	.20069	1.18612
5.260	20.084	.42996	-.12260	.12131	-.13296	.02829	-.02236	.36216	.26159	1.33781
5.260	30.044	.76590	-.12716	.11844	-.27161	.03140	-.02753	.60370	.48599	1.22156
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

RUN NO. 0/ 0 RN/L = 4.99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CN	CY	CA	CLN	CYN	CBL	CL	CD	L/D
7.320	-.068	-.05910	-.15144	.17141	.03106	.04654	-.01978	-.05890	.17148	-.32006
7.320	5.188	.04899	-.13109	.14567	.00198	.03472	-.01785	.03362	.14932	.20996
7.320	9.821	.13969	-.12085	.12977	-.02504	.02831	-.01734	.11551	.15170	.71515
7.320	15.024	.25675	-.11612	.11904	-.05804	.02442	-.01820	.21712	.18153	1.13876
7.320	20.180	.39229	-.11909	.11452	-.10433	.02444	-.02084	.32870	.24282	1.30565
7.320	30.025	.74373	-.13207	.11411	-.24850	.03333	-.02980	.58684	.47092	1.22372
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

MACH	CAAFD	CNAFD	CLNAFD
5.260	.178807	-.057511	.038434
7.320	.171065	-.057756	.030689

AMES 3.5-100 IA10 C0 T10 ATR PLUME OFF (PBT002) (28 NOV 73)

REFERENCE DATA

SREF = 2680.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1280.0000 IN. YMRP = .0000 IN.
BREF = 936.6600 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

BETA = 5.000 AILRON = .000
ELEVON = .000 BOFLAP = .000
SPDBRK = .000 RUDDER = .000

RUN NO. 0/ 0 RN/L = 2.37 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CLM/A	CN/A	XAC/L
5.260	-.110	-.00648	.02382	-.35606
5.260	5.108	-.00796	.02297	-.34651
5.260	9.693	-.00792	.02298	-.34490
5.260	14.980	-.00872	.02495	-.34939
5.260	20.084	-.01115	.02936	-.37985
5.260	30.044	-.01531	.03591	-.42617
	GRADIENT	.00000	.00000	.00000

RUN NO. 0/ 0 RN/L = 4.99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CLM/A	CN/A	XAC/L
7.320	-.086	-.00564	.02036	-.27689
7.320	5.168	-.00532	.01981	-.26838
7.320	9.821	-.00586	.02090	-.28015
7.320	15.024	-.00754	.02392	-.31540
7.320	20.180	-.01109	.02979	-.37233
7.320	30.023	-.01642	.03868	-.42483
	GRADIENT	.00000	.00000	.00000

AMES 3.5-169 IA10 C0 T10 AT2 PLUME OFF (RB7003) (21 SEP 75)

REFERENCE DATA

SREF = 2880.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

BETA = 5.000 AILRON = .000
ELEVON = .000 BDFLAP = .000
SPDBRK = .000 RUDDER = .000

RN/L = 3.79 GRADIENT INTERVAL = -5.00/ 5.00

MACH = 7.320

ALPHA	CN	CY	CA	CLN	CYN	CBL	CL	CD	L/D
-.123	-.05906	-.15166	.17326	.03197	.04709	-.01978	-.09949	.17339	-.31993
5.161	.04615	-.12908	.14752	.00311	.03473	-.01759	.03271	.15087	.20253
9.726	.13572	-.11750	.13138	-.02092	.02813	-.01696	.11157	.15241	.68902
14.955	.25489	-.11480	.11981	-.05645	.02486	-.01785	.21534	.18153	1.13005
20.136	.38628	-.11794	.11603	-.10127	.02464	-.02051	.32273	.24191	1.28701
30.074	.72961	-.12894	.11567	-.24118	.03260	-.02904	.57343	.46571	1.20947
GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

AMES 3.5-169 IA10 C0 T10 AT2 PLUME OFF (KB7004) (28 NOV 75)

REFERENCE DATA

SREF = 2880.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

BETA = .000 AILRON = .000
ELEVON = .000 BDFLAP = .000
SPDBRK = .000 RUDDER = .000

RN/L = 4.76 GRADIENT INTERVAL = -5.00/ 5.00

MACH = 7.320

ALPHA	CN	CY	CA	CLN	CYN	CBL	CL	CD	L/D
-.112	-.04825	-.02292	.16104	.02895	.00680	-.00354	-.04394	.16113	-.26510
5.165	.04986	-.02127	.14100	.00601	.00598	-.00325	.03896	.14491	.25905
9.681	.14177	-.01889	.12640	-.01678	.00558	-.00276	.11654	.14840	.79684
14.967	.25819	-.01552	.11652	-.05001	.00128	-.00272	.21741	.17873	1.21639
20.054	.37997	-.01807	.11308	-.08865	.00274	-.00367	.31816	.23652	1.34516
30.080	.73487	-.01684	.11291	-.23722	.00446	-.00484	.57990	.46572	1.24489
GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

MACH	CAAF0	CNAF0	CLMAF0
7.320	.160811	-.044284	.026496

AMES 3.5-100 IA10 C9 T10 AT2 PLUME OFF (PS7004) (28 NOV 73)

REFERENCE DATA

SREF =	2880.0000 SQ.FT.	XMRP =	1076.4800 IN.
LREF =	1290.0000 IN.	YMRP =	.0000 IN.
BREF =	936.6800 IN.	ZMRP =	400.0000 IN.
SCALE =	.0100		

PARAMETRIC DATA

BETA =	.000	AILRON =	.000
ELEVON =	.000	BDFLAP =	.000
SPOBRK =	.000	RUDDER =	.000

RN/L = 4.78 GRADIENT INTERVAL = -5.00/ 5.00

MACH = 7.320

ALPHA	CLM/A	CN/A	XAC/L
-.112	-.00405	.01784	-.22655
5.165	-.00498	.01937	-.25715
9.661	-.00577	.02113	-.27306
14.967	-.00614	.02209	-.27769
20.054	-.01012	.02821	-.35879
30.080	-.01721	.03807	-.44065
GRADIENT	.00000	.00000	.00000

DATE 05 DEC 73 TABULATED SOURCE ARC 3.5-169, IA10

AMES 3.5-169 IA10 C9 T10 ATI PLUME OFF (KS7005) (28 NOV 73)

REFERENCE DATA

SREF = 2880.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1280.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

BETA = .000 AILRON = 10.000
ELEVON = .000 BDFLAP = .000
SPOBRK = .000 RUDDER = .000

RUN NO. 0/ 0 RN/L = 1.92 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CN	CY	CA	CLN	CYN	CBL	CL	CD	L/D
5.260	-.075	-.05148	-.01354	.17774	.03667	.00417	-.00006	-.05125	.17781	-.28821
5.260	5.130	.06776	-.01084	.16366	-.00348	.00109	.00083	.05286	.16906	.31264
5.260	9.667	.17473	-.00439	.14756	-.04066	-.00168	.00184	.14747	.17481	.84360
5.260	14.934	.30588	-.00443	.13533	-.08218	-.00196	.00259	.26068	.20958	1.24380
5.260	20.081	.43758	-.00579	.12565	-.12627	-.00247	.00327	.36782	.26824	1.37124
5.260	30.068	.77857	.00434	.11607	-.27694	-.00650	.00672	.61564	.49054	1.25503
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

RUN NO. 0/ 0 RN/L = 5.78 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CN	CY	CA	CLN	CYN	CBL	CL	CD	L/D
7.320	-.093	-.04981	-.02885	.16059	.03127	.00619	-.00221	-.04955	.16067	-.30838
7.320	5.200	.05105	-.02459	.14027	.00523	.00639	-.00169	.03812	.14432	.26417
7.320	9.771	.14258	-.02120	.12582	-.01941	.00368	-.00078	.11916	.14819	.80410
7.320	15.011	.25970	-.01855	.11865	-.05202	.00110	-.00001	.22062	.17994	1.22611
7.320	20.115	.39058	-.01490	.11265	-.09531	-.00042	.00020	.32799	.24010	1.36608
7.320	30.100	.74748	-.01681	.11329	-.24431	.00207	.00217	.59987	.47289	1.24758
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

MACH	CAAFO	CNAFO	CLNAFO
5.260	.177958	-.049759	.036104
7.320	.160220	-.048045	.030620

AMES 3.5-100 IA10 C0 T10 AT2 PLUME OFF (PS7005) (28 NOV 73)

REFERENCE DATA

SREF = 2880.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

BETA = .000 AILRON = 10.000
ELEVON = .000 BDFLAP = .000
SPOBRK = .000 RUDDER = .000

RUN NO. D/ 0 RN/L = 1.92 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CLM/A	CN/A	XAC/L
5.260	-.075	-.00754	.02283	-.33018
5.260	5.130	-.00807	.02307	-.34980
5.260	9.667	-.00811	.02457	-.33280
5.260	14.934	-.00762	.02489	-.31673
5.260	20.081	-.01102	.02829	-.38942
5.260	30.068	-.01682	.03707	-.45372
	GRADIENT	.00000	.00000	.00000

RUN NO. D/ 0 RN/L = 5.78 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CLM/A	CN/A	XAC/L
7.320	-.095	-.00482	.01691	-.25491
7.320	5.200	-.00511	.01933	-.26449
7.320	9.771	-.00570	.02104	-.27086
7.320	15.011	-.00690	.02343	-.29454
7.320	20.115	-.01084	.02924	-.37069
7.320	30.101	-.01696	.03900	-.43498
	GRADIENT	.00000	.00000	.00000

AMES 3.5-100 IA10 CD T1D AT2 PLUME OFF (MB70G6) (28 NOV 73)

REFERENCE DATA

SREF = 2880.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

ALPHA = .000 AILRON = .000
ELEVON = .000 BOFLAP = .000
SPOBRK = .000 RUDDER = .000

RUN NO. 0/ 0 RN/L = 1.85 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CA	CLN	CYN	CBL	CL	CD	L/D
5.260	-9.568	-.05815	.27782	.19193	.03290	-.10061	.03823	-.05815	.19193	-.24886
5.260	-7.458	-.06176	.20729	.18796	.03651	-.07461	.02826	-.06176	.18796	-.28959
5.260	-5.475	-.06470	.14449	.18393	.03944	-.05278	.01923	-.06470	.18393	-.32085
5.260	-3.470	-.06557	.07971	.17943	.04115	-.02991	.01063	-.06557	.17943	-.35649
5.260	-1.680	-.06811	.02447	.17706	.04248	-.01167	.00354	-.06811	.17706	-.38331
5.260	.161	-.06722	-.03391	.17646	.04165	.00616	-.00334	-.06722	.17646	-.38080
5.260	2.272	-.06486	-.09089	.18366	.04134	.02963	-.01187	-.06486	.18366	-.34682
5.260	4.253	-.06145	-.15217	.18652	.03868	.05238	-.01984	-.06145	.18652	-.31146
5.260	6.363	-.05677	-.21444	.19515	.03570	.07440	-.02929	-.05677	.19515	-.26074
5.260	8.446	-.05587	-.28402	.20192	.03365	.09961	-.03906	-.05587	.20192	-.23138
5.260	10.502	-.05587	-.34947	.20910	.03123	.12486	-.04928	-.05587	.20910	-.20673
	GRADIENT	.00061	.02990	.00110	-.00030	.01064	-.00396	.00061	.00110	.00674

RUN NO. 0/ 0 RN/L = 3.98 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CA	CLN	CYN	CBL	CL	CD	L/D
7.320	-9.385	-.04941	.28088	.18025	.02584	-.08500	.03391	-.04941	.18025	-.22343
7.320	-7.592	-.05062	.19550	.17431	.02715	-.06260	.02521	-.05062	.17431	-.25510
7.320	-5.613	-.05227	.13624	.16876	.02894	-.04297	.01706	-.05227	.16876	-.28837
7.320	-3.482	-.05291	.08432	.16467	.02926	-.02615	.00992	-.05291	.16467	-.31222
7.320	-1.880	-.05777	.03428	.16108	.03203	-.01120	.00399	-.05777	.16108	-.35660
7.320	.152	-.05882	-.00863	.16103	.03226	.00106	-.00122	-.05882	.16103	-.36521
7.320	2.298	-.05409	-.06309	.16295	.03031	.01716	-.00763	-.05409	.16295	-.32715
7.320	4.248	-.05087	-.11638	.16830	.02854	.03412	-.01444	-.05087	.16830	-.29831
7.320	6.347	-.05266	-.17104	.17395	.02632	.05232	-.02213	-.05266	.17395	-.27457
7.320	8.485	-.04884	-.22553	.17923	.02611	.07055	-.02978	-.04884	.17923	-.23195
7.320	10.503	-.05039	-.28432	.18695	.02513	.09128	-.03800	-.05039	.18695	-.21365
	GRADIENT	.00043	-.02574	.00049	-.00018	.00769	-.00311	.00043	.00049	.00427

MACH	YAC/L
5.260	17.457196
7.320	17.821684

AMES 3.5-169 IA10 C9 T10 AT2 PLUME OFF (MBT007) (28 NOV 75)

REFERENCE DATA

SREF = 2880.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

ALPHA = .000 AILRON = .000
ELEVON = .000 BDFLAP = .000
SPOBRK = .000 RUDDER = 10.000

RUN NO. 0/ 0 RN/L = 2.61 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CA	CLN	CYN	CBL	CL	CD	L/D
5.260	-9.561	-.05859	.28529	.18831	.03376	-.10661	.04007	-.05859	.18831	-.25140
5.260	-7.472	-.05989	.20981	.18279	.03594	-.07904	.02938	-.05989	.18279	-.28722
5.260	-5.426	-.06377	.14580	.17957	.03916	-.05644	.02007	-.06377	.17957	-.33121
5.260	-3.487	-.06545	.08021	.17450	.04102	-.03318	.01183	-.06545	.17450	-.36554
5.260	-1.526	-.06581	.02840	.17086	.04177	-.01509	.00460	-.06581	.17086	-.38361
5.260	.166	-.06705	-.01997	.16923	.04190	.00270	-.00212	-.06705	.16923	-.39609
5.260	2.251	-.06342	-.06203	.17421	.03980	.02492	-.01018	-.06342	.17421	-.35771
5.260	4.266	-.06157	-.14240	.17688	.03851	.04670	-.01800	-.06157	.17688	-.32930
5.260	6.453	-.05694	-.20335	.18209	.03502	.06911	-.02731	-.05694	.18209	-.27940
5.260	8.454	-.05453	-.26253	.18645	.03242	.09275	-.03613	-.05453	.18645	-.24450
5.260	10.497	-.05381	-.32705	.19250	.03054	.11791	-.04575	-.05381	.19250	-.21623
	GRADIENT	.00054	-.02883	.00044	-.00037	.01036	-.00386	.00054	.00044	.00527

RUN NO. 0/ 0 RN/L = 4.24 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CA	CLN	CYN	CBL	CL	CD	L/D
7.320	-9.585	-.05069	.26356	.17937	.02710	-.08798	.03549	-.05069	.17937	-.22962
7.320	-7.586	-.05413	.20056	.17374	.02927	-.06598	.02675	-.05413	.17374	-.27242
7.320	-5.481	-.05496	.14051	.16809	.03089	-.04575	.01817	-.05496	.16809	-.30415
7.320	-3.504	-.05712	.08468	.16353	.03180	-.02737	.01074	-.05712	.16353	-.33920
7.320	-1.656	-.06059	.03555	.16020	.03357	-.01225	.00474	-.06059	.16020	-.37599
7.320	.110	-.05865	-.00533	.15951	.03311	-.00038	-.00037	-.05865	.15951	-.36768
7.320	2.288	-.05648	-.06231	.16233	.03145	.01666	-.00723	-.05648	.16233	-.34800
7.320	4.288	-.05394	-.11280	.16637	.03034	.03304	-.01374	-.05394	.16637	-.30947
7.320	6.367	-.05142	-.16579	.17194	.02830	.05032	-.02134	-.05142	.17194	-.27168
7.320	8.413	-.05150	-.22132	.17850	.02743	.06848	-.02886	-.05150	.17850	-.24645
7.320	10.485	-.05125	-.27969	.18392	.02638	.08941	-.03707	-.05125	.18392	-.21929
	GRADIENT	.00055	-.02532	.00043	-.00027	.00770	-.00313	.00055	.00043	.00495

MACH	YAC/L
5.260	19.216957
7.320	13.944569

AMES 3.5-169 IA10 C9 T10 AT2 PLUME ON (RB7008) (21 SEP 73)

REFERENCE DATA

SREF = 2880.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 956.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

ALPHA = .000 AILRON = .000
ELEVON = .000 BDFLAP = .000
SPDBRK = .000 RUDDER = 10.000

RUN NO. 0/ 0 RNVL = 2.05 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CA	CLM	CYN	CBL	CL	CD	L/D
5.260	-9.390	-.06274	.28042	.17423	.03384	-.09926	.03697	-.06274	.17423	-.28712
5.260	-7.477	-.06682	.20395	.17045	.03738	-.07012	.02604	-.06682	.17045	-.34174
5.260	-5.439	-.06763	.13520	.16673	.03836	-.04639	.01677	-.06763	.16673	-.37826
5.260	-3.512	-.06725	.07194	.16172	.03682	-.02206	.00725	-.06725	.16172	-.40557
5.260	-1.582	-.06643	.01131	.15801	.03811	.00009	-.00146	-.06643	.15801	-.41979
5.260	.167	-.06542	-.03457	.15702	.03689	.01520	-.00746	-.06542	.15702	-.41638
5.260	2.289	-.06504	-.08331	.16236	.03780	.02427	-.00996	-.06504	.16236	-.39287
5.260	4.251	-.06236	-.13564	.16877	.03753	.03927	-.01486	-.06236	.16877	-.34961
5.260	6.426	-.05630	-.20593	.17540	.03365	.06475	-.02436	-.05630	.17540	-.28592
5.260	8.484	-.05708	-.26890	.18110	.03301	.09014	-.03419	-.05708	.18110	-.26101
5.260	10.513	-.06010	-.33636	.18920	.03270	.11583	-.04396	-.06010	.18920	-.24295
	GRADIENT	.00058	-.02626	.00098	-.00014	.00755	-.00270	.00058	.00098	.00727

RUN NO. 0/ 0 RNVL = 5.24 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CA	CLM	CYN	CBL	CL	CD	L/D
7.320	-9.574	-.05725	.28285	.16420	.02943	-.08904	.03317	-.05725	.16420	-.27843
7.320	-7.485	-.06213	.19689	.16036	.03216	-.06175	.02434	-.06213	.16036	-.33655
7.320	-5.422	-.06244	.13630	.15494	.03230	-.04145	.01583	-.06244	.15494	-.37356
7.320	-3.510	-.06375	.08026	.15095	.03298	-.02219	.00813	-.06375	.15095	-.40974
7.320	-1.632	-.06543	.03018	.14876	.03371	-.00565	.00163	-.06543	.14876	-.43748
7.320	.151	-.06352	-.01397	.14749	.03254	.00737	-.00369	-.06352	.14749	-.43053
7.320	2.285	-.06105	-.06195	.14865	.03152	.01673	-.00709	-.06105	.14865	-.40426
7.320	4.229	-.05948	-.10757	.15456	.03064	.02692	-.01091	-.05948	.15456	-.36703
7.320	6.354	-.05912	-.16430	.15981	.02974	.04397	-.01685	-.05912	.15981	-.33400
7.320	8.471	-.05911	-.21746	.16512	.02920	.06382	-.02651	-.05911	.16512	-.30259
7.320	10.477	-.05831	-.27674	.17127	.02628	.08426	-.03443	-.05831	.17127	-.28658
	GRADIENT	.00067	-.02410	.00038	-.00036	.00620	-.00240	.00067	.00038	.00625

DATE 05 DEC 73 TABULATED SOURCE ARC 3.5-169, IA10

AMES 3.5-169 IA10 C9 T10 AT2 PLUME ON (MB7009) (28 NOV 73)

REFERENCE DATA

SREF = 2880.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

ALPHA = .000 AILRON = .000
ELEVON = .000 BDFLAP = .000
SPDBRK = .000 RUDDER = .000

RUN NO. 0/ 0 RN/L = 3.54 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CA	CLM	CYN	CBL	CL	CD	L/D
5.260	-9.595	-.06042	.26775	.16777	.03212	-.09160	.03417	-.06042	.16777	-.26784
5.260	-7.476	-.06636	.19641	.16341	.03605	-.06495	.02392	-.06636	.16341	-.35360
5.260	-5.407	-.06500	.13197	.15959	.03677	-.04303	.01538	-.06500	.15959	-.37944
5.260	-3.520	-.06323	.07171	.15652	.03675	-.02068	.00654	-.06323	.15652	-.39366
5.260	-1.675	-.06407	.01806	.15352	.03785	-.00185	-.00084	-.06407	.15352	-.41608
5.260	.148	-.06675	-.02335	.15155	.03930	.00617	-.00268	-.06675	.15155	-.44029
5.260	2.268	-.06502	-.07430	.15590	.03852	.01730	-.00590	-.06502	.15590	-.40969
5.260	4.314	-.06082	-.13384	.16071	.03536	.03979	-.01466	-.06082	.16071	-.35708
5.260	6.440	-.05763	-.20008	.16646	.03283	.06387	-.02437	-.05763	.16646	-.30677
5.260	8.325	-.05828	-.26727	.17029	.03298	.08973	-.03409	-.05828	.17029	-.28015
5.260	10.489	-.05571	-.32708	.17574	.03045	.11424	-.04353	-.05571	.17574	-.23976
	GRADIENT	.00722	-.02567	.00058	-.00012	.00715	-.00242	.00022	.00058	.00434

RUN NO. 0/ 0 RN/L = 4.74 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CA	CLM	CYN	CBL	CL	CD	L/D
7.320	-9.580	-.05597	.25031	.16358	.02894	-.07800	.03115	-.05597	.16358	-.27575
7.320	-7.456	-.05920	.18795	.15906	.03058	-.05711	.02278	-.05920	.15906	-.32509
7.320	-5.399	-.05922	.12786	.15407	.03104	-.03662	.01421	-.05922	.15407	-.35803
7.320	-3.476	-.06042	.07585	.14999	.03178	-.01984	.00731	-.06042	.14999	-.39153
7.320	-1.567	-.06055	.02618	.14729	.03183	-.00481	.00162	-.06055	.14729	-.40928
7.320	.159	-.06108	-.01339	.14607	.03163	.00488	-.00237	-.06108	.14607	-.41801
7.320	2.270	-.06034	-.05772	.14846	.03138	.01195	-.00491	-.06034	.14846	-.40057
7.320	4.307	-.05669	-.11107	.15285	.02943	.02900	-.01133	-.05669	.15285	-.35266
7.320	6.408	-.05662	-.16677	.15922	.02911	.04700	-.01913	-.05662	.15922	-.32020
7.320	8.489	-.05552	-.22103	.16443	.02741	.06512	-.02667	-.05552	.16443	-.28435
7.320	10.527	-.05530	-.27707	.17018	.02666	.08522	-.03472	-.05533	.17018	-.25375
	GRADIENT	.00041	-.02359	.00038	-.00027	.00589	-.00225	.00041	.00038	.00465

MACH	YAC/L
5.260	32.802392
7.320	14.502700

AMES 3.5-169 IA10 C9 T10 AT2 PLUME ON (957010) (28 NOV 73)

REFERENCE DATA

SREF = 2880.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1790.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

BETA = .000 AILRON = .000
ELEVON = .000 BDFLAP = .000
SPDBRK = .000 RUDDER = .000

RUN NO. 0/ 0 RN/L = 9.64 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CN	CY	CA	CLM	CYN	CBL	CL	CD	L/D
5.300	-9.539	-.28156	-.02686	.18946	.10695	.00736	-.00253	-.24827	.23350	-1.05469
5.300	-7.395	-.23531	-.03017	.18267	.09608	.01054	-.00337	-.20985	.21144	-.99247
5.300	-5.365	-.18837	-.03350	.17398	.08006	.01470	-.00526	-.16929	.19064	-.88798
5.300	-3.402	-.13802	-.02742	.16474	.06229	.01014	-.00382	-.12800	.17264	-.74143
5.300	-1.510	-.09254	-.02394	.15562	.04566	.00743	-.00282	-.08841	.15800	-.55955
5.300	.175	-.05368	-.02341	.14848	.03178	.00760	-.00305	-.05413	.14831	-.36497
5.300	2.256	-.00439	-.02206	.14194	.01498	.00700	-.00301	-.00997	.14165	-.07038
5.300	4.354	.03999	-.02333	.13660	-.00002	.00849	-.00342	.02951	.13924	.21192
5.300	6.517	.08616	-.02126	.13323	-.01434	.00743	-.00317	.07048	.14215	.49580
5.300	8.547	.12475	-.01786	.12726	-.02596	.00541	-.00255	.10445	.14439	.72340
5.300	10.531	.16801	-.01360	.12136	-.04044	.00224	-.00125	.14300	.15003	.95319
	GRADIENT	.02303	.00051	-.00361	-.00805	-.00018	.00003	.02040	-.00427	.12460

RUN NO. 0/ 0 RN/L = 5.55 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CN	CY	CA	CLM	CYN	CBL	CL	CD	L/D
7.320	-9.586	-.26159	-.02093	.19565	.09310	.01137	-.00440	-.22569	.23451	-.96239
7.320	-7.396	-.21882	-.02658	.18314	.08461	.00882	-.00346	-.19342	.20978	-.92201
7.320	-5.389	-.17778	-.02774	.17453	.07221	.01053	-.00425	-.16060	.19045	-.84326
7.320	-3.418	-.13841	-.02418	.16323	.05964	.00844	-.00364	-.12643	.17107	-.73906
7.320	-1.486	-.09476	-.02727	.15316	.04459	.01016	-.00447	-.09075	.15557	-.58338
7.320	.199	-.05938	-.02365	.14561	.03323	.00743	-.00334	-.05989	.14540	-.41187
7.320	2.285	-.02039	-.01549	.13776	.02332	.00181	-.00134	-.02607	.13683	-.19052
7.320	4.323	.01297	-.01814	.13309	.01473	.00385	-.00187	.00290	.13369	.02172
7.320	6.486	.04988	-.01649	.12885	.00648	.00281	-.00162	.03500	.13366	.26186
7.320	8.519	.08747	-.01587	.12231	-.00388	.00175	-.00113	.06838	.13391	.51066
7.320	10.541	.12661	-.01555	.11727	-.01540	.00385	-.00254	.10499	.13882	.75631
	GRADIENT	.01934	.00124	-.00392	-.00575	-.00091	.00035	.01677	-.00482	.09952

MACH	CAAFO	CNAFO	CLMAFO	XAC/L
5.300	.149138	-.057781	.033211	-.349371
7.320	.146459	-.063408	.034393	-.297273

AMES 3.5-169 IA10 C0 T10 AT2 PLUME OFF (NB7011) (28 NOV 73)

REFERENCE DATA

SREF = 2080.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

BETA = .000 AILRON = .000
ELEVON = .000 BOFLAP = .000
SPDBRK = .000 RUDDER = .000

RN/L = 2.50 GRADIENT INTERVAL = -5.00/ 5.00

MACH = 5.260

ALPHA	CN	CY	CA	CLM	CYN	CBL	CL	CD	L/D
-7.722	-.23808	-.01734	.21431	.10419	.00580	-.00214	-.20713	.24435	-.84767
-5.757	-.19111	-.01290	.20318	.08821	.00439	-.00202	-.16976	.22133	-.76700
-3.789	-.14207	-.01557	.19065	.07084	.00482	-.00197	-.12916	.19962	-.64702
-2.465	-.10784	-.01574	.18241	.05688	.00460	-.00191	-.09990	.18688	-.53456
-.066	-.04772	-.01622	.16839	.03409	.00430	-.00173	-.04752	.16845	-.28213
2.114	-.00098	-.01091	.16100	.01817	.00217	-.00147	-.00692	.16085	-.04301
4.171	.03956	-.00974	.15657	.00509	.00118	-.00120	.02807	.15903	.17650
6.112	.08372	-.00693	.15098	-.00968	.00007	-.00112	.06717	.15904	.42247
8.039	.12681	-.01001	.14430	-.02448	.00098	-.00110	.10538	.16062	.65610
9.774	.16953	-.00700	.13875	-.03965	-.00058	-.00075	.14351	.16552	.86704
15.033	.29665	-.00307	.12865	-.08180	-.00078	-.00100	.25506	.20171	1.26446
20.135	.43124	-.00552	.12052	-.12692	.00036	-.00112	.36339	.26160	1.38914
30.190	.76827	-.00344	.11322	-.26955	-.00254	-.00060	.60713	.48419	1.25390
GRADIENT	.02289	.00082	-.00434	-.00827	-.00048	.00010	.01984	-.00517	.10458

MACH	CAAFD	CNAFD	CLMAFD	XAC/L
5.260	.168085	-.046180	.033546	-.361308

AMES 3.5-169 IA10 C9 T10 AT2 PLUME OFF (JB7007) (25 OCT 73)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 936.6800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

PARAMETRIC DATA

RN/L = 2.64 GRADIENT INTERVAL = -5.00/ 5.00

MACH = 5.300

BETA	DCN/DR	DCY/DR	DCA/DR	DCLM/DR	DCYN/DR	DCBL/DR
-10.000	-.00011	.00093	-.00031	.00012	-.00065	.00021
-8.000	.00014	.00027	-.00030	-.00003	-.00045	.00012
-6.000	.00014	.00031	-.00044	-.00005	-.00043	.00011
-4.000	-.00002	-.00002	-.00046	.00000	-.00031	.00009
-2.000	.00021	.00063	-.00057	-.00007	-.00044	.00015
.000	.00003	.00043	-.00070	.00003	-.00036	.00013
2.000	.00013	.00072	-.00091	-.00014	-.00042	.00015
4.000	.00000	.00099	-.00093	-.00005	-.00056	.00018
6.000	-.00005	.00124	-.00124	-.00004	-.00061	.00025
8.000	.00010	.00200	-.00149	-.00011	-.00067	.00029
10.000	.00017	.00223	-.00160	-.00009	-.00067	.00033
GRADIENT	-.00000	.00010	-.00006	-.00001	-.00002	.00001

RN/L = 4.22 GRADIENT INTERVAL = -5.00/ 5.00

MACH = 7.300

BETA	DCN/DR	DCY/DR	DCA/DR	DCLM/DR	DCYN/DR	DCBL/DR
-10.000	-.00006	.00033	-.00009	.00012	-.00032	.00017
-8.000	-.00033	.00025	-.00009	.00021	-.00026	.00013
-6.000	-.00027	.00064	-.00003	.00018	-.00042	.00017
-4.000	-.00039	.00012	-.00011	.00025	-.00016	.00009
-2.000	-.00033	.00006	-.00009	.00018	-.00009	.00007
.000	.00001	.00024	-.00015	.00008	-.00012	.00008
2.000	-.00018	.00000	-.00007	.00010	-.00005	.00003
4.000	-.00034	.00035	-.00019	.00019	-.00011	.00007
6.000	.00010	.00061	-.00023	.00002	-.00022	.00009
8.000	-.00018	.00030	-.00009	.00009	-.00016	.00007
10.000	-.00018	.00035	-.00009	.00014	-.00016	.00008
GRADIENT	.00001	.00002	-.00001	-.00001	.00001	-.00000

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

AMES 3.5-169 IA10 09 T10 AT2 PLUME ON (JB7008) (25 OCT 73)

PARAMETRIC DATA

REFERENCE DATA

SREF = 2680.0000 SQ.FT. XMRP = 1076.4800 IN.
LREF = 1290.0000 IN. YMRP = .0000 IN.
BREF = 936.9800 IN. ZMRP = 400.0000 IN.
SCALE = .0100

RN/L = 2.11 GRADIENT INTERVAL = -5.00/ 5.00

MACH = 5.300

BETA	DCN/DR	DCY/DR	DCA/DR	DCLM/DR	DCYN/DR	DCBLD^2
-10.000	-.00028	.00137	.00062	.00018	-.00082	.00029
-8.000	-.00006	.00089	.00068	.00014	-.00057	.00023
-6.000	-.00019	.00055	.00072	.00014	-.00056	.00015
-4.000	-.00039	.00010	.00056	.00021	-.00018	.00008
-2.000	-.00030	-.00027	.00045	.00009	-.00000	.00002
.000	.00011	-.00102	.00053	-.00022	.00083	-.00044
2.000	.00003	-.00091	.00061	-.00011	.00077	-.00044
4.000	-.00015	-.00040	.00079	.00019	.00007	-.00008
6.000	.00007	-.00041	.00086	.00012	.00006	.00001
8.000	.00016	-.00033	.00102	-.00000	.00012	-.00003
10.000	-.00027	-.00067	.00125	.00015	.00012	-.00003
GRADIENT	.00004	-.00008	.00003	-.00001	.00006	-.00004

RN/L = 5.21 GRADIENT INTERVAL = -5.00/ 5.00

MACH = 7.300

BETA	DCN/DR	DCY/DR	DCA/DR	DCLM/DR	DCYN/DR	DCBLDR
-10.000	-.00009	.00140	.00005	.00002	-.00079	.00022
-8.000	-.00026	.00085	.00012	.00014	-.00047	.00015
-6.000	-.00033	.00062	.00010	.00014	-.00047	.00016
-4.000	-.00031	.00046	.00009	.00011	-.00028	.00010
-2.000	-.00048	.00025	.00013	.00018	-.00007	.00000
.000	-.00027	-.00005	.00015	.00010	.00023	-.00013
2.000	-.00006	-.00041	.00002	.00001	.00051	-.00023
4.000	-.00025	.00008	.00019	.00011	-.00008	-.00001
6.000	-.00025	.00011	.00011	.00007	-.00009	.00002
8.000	-.00033	.00028	.00007	.00015	-.00009	.00001
10.000	-.00033	.00005	.00012	.00018	-.00007	.00001
GRADIENT	.00003	-.00007	.00000	-.00001	.00005	-.00002

GOVERNMENT FIELD PRINTING PLANT
UNDER CONTRACT NAS9-2600
NASA-MICHOUD ASSEMBLY FACILITY 1973
NEW ORLEANS, LOUISIANA 70189