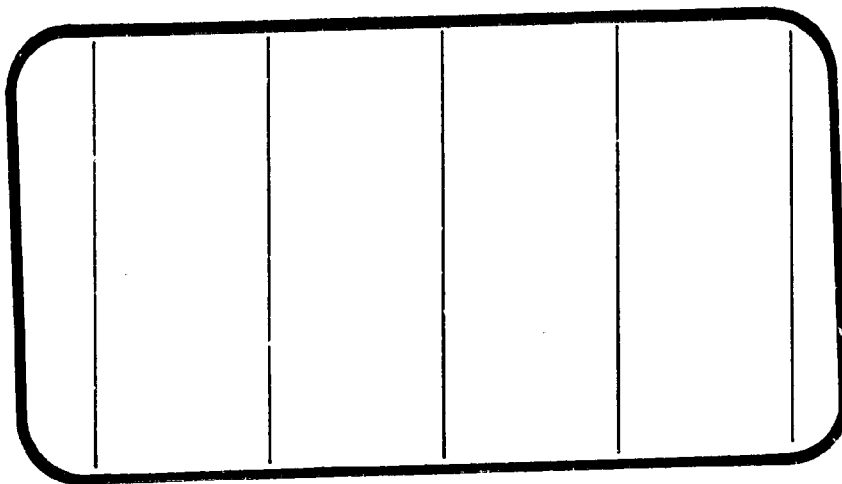




NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA CR-

134413



(NASA-CR-134413) WIND TUNNEL TESTS OF THE
0.010-SCALE SPACE SHUTTLE INTEGRATED VEHICLE
(MODEL 52-27) IN THE NASA/AMES 3.5-FOOT
HYPERSONIC WIND TUNNEL (IA13) (Chrysler
Corp.) 115 p HC \$5.25

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CSCL 22B 63/18

SPACE SHUTTLE

AEROTHERMODYNAMIC DATA REPORT

JOHNSON SPACE CENTER

HOUSTON, TEXAS

DATA Management services

SPACE DIVISION



CHRYSLER CORPORATION

March, 1975

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WIND TUNNEL TESTS OF THE 0.010-SCALE
SPACE SHUTTLE INTEGRATED VEHICLE (MODEL 52-0T) IN
THE NASA/AMES 3.5-FOOT HYPERSONIC WIND TUNNEL
(IA18)

By

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Prepared under NASA Contract Number NAS9-13247

by

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Johnson Space Center
National Aeronautics and Space Administration
Houston, Texas

WIND TUNNEL TEST SPECIFICS:

Test Number: ARC 3.5-191
NASA Series Number: IA18
Model Number: 52-0T
Test Dates: 9 through 12 April 1974 - Occupancy Hours: 62

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Chrysler Corporation Space Division assumes no responsibility for the data presented other than display characteristics.

WIND TUNNEL TESTS OF THE 0.010-SCALE
SPACE SHUTTLE INTEGRATED VEHICLE (MODEL 52-0T)
IN THE NASA/AMES 3.5-FOOT HYPERSONIC WIND TUNNEL (IA18)

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ABSTRACT

Experimental aerodynamic investigations were conducted in the NASA/Ames Research Center 3.5-foot Hypersonic Wind Tunnel from April 9, 1974 to April 12, 1974 on an 0.010-scale model of the Space Shuttle Integrated Vehicle consisting of an orbiter and external tank (Model 52-0T).

The purpose of the test was to evaluate the basic hypersonic stability characteristics of the orbiter attached rigidly to the external tank and to evaluate the basic hypersonic stability characteristics of external tank alone simulating RTLS abort conditions. Test IA18 was conducted at Mach numbers of 5.3, 7.3 and 10.3.

The integrated vehicle was tested at angles of attack from -8° through $+30^\circ$ and angles of sideslip of -8° through $+8^\circ$ at fixed angles of attack of -4° , 0° , and $+4^\circ$. A maximum angle-of-attack range of $+15^\circ$ through $+40^\circ$ was obtained for this configuration, at Mach number 7.3, for one run only.

External tank alone testing was conducted at angles of attack from $+8^\circ$ through -30° and angles of sideslip of -8° through $+8^\circ$ at fixed angles of attack of -4° , 0° and $+4^\circ$.

Six-component force data and static base pressures were recorded during the test.

TABLE OF CONTENTS

	Page
ABSTRACT	iii
INDEX OF MODEL FIGURES	2
INDEX OF DATA FIGURES	3
NOMENCLATURE	5
CONFIGURATIONS INVESTIGATED	9
TEST FACILITY DESCRIPTION	11
DATA REDUCTION	12
TABLES	
I. TEST CONDITIONS	14
II. DATASET/RUN NUMBER COLLATION SUMMARY	15
III. MODEL DIMENSIONAL DATA	16
FIGURES	
MODEL	42
DATA	51
APPENDIX	
TABULATED SOURCE DATA	

INDEX OF MODEL FIGURES

Figure		Page
1.	Axis Systems	42
2.	Model Sketches	
	a. Integrated Configuration - O _g T ₂₀	43
	b. Orbiter - O _g	44
	c. External Tank (T ₂₀) per R. I. Drawing VL78-000062B	45
	d. Base Pressure Orifice Locations	46
3.	Model Installation Photographs	
	a. Orbiter and Tank, Side View	47
	b. Orbiter and Tank, 3/4 Rear View	48
	c. Tank Only, Rolled 90° for Sideslip Run, 3/4 Rear View from Right Side	49
	d. Tank Only, Rolled 90° for Sideslip Run, Left Side View (Top of Model is toward Viewer)	50

INDEX OF DATA FIGURES

FIGURE NUMBER	TITLE	COEFFICIENT SCHEDULE	CONDITIONS VARYING	PLOT PAGES
4	Effect of Mach Number on Second Stage Longitudinal Aerodynamic Characteristics	A	MACH	1-12
5	Effect of Mach Number on Isolated ET Longitudinal Aerodynamic Characteristics	A	MACH	13-16
6	Effect of Angle of Attack on Second Stage Lateral-Directional Aerodynamic Characteristics	B	ALPHA	17-28
7	Effect of Angle of Attack on Isolated ET Lateral-Directional Aerodynamic Characteristics	H	ALPHA	29-37
8	Summary of Second Stage Longitudinal Aerodynamic Characteristics	C	MACH	38-38
9	Summary of Isolated ET Longitudinal Aerodynamic Characteristics	D	MACH	39-39
10	Summary of Second Stage Lateral-Directional Aerodynamic Characteristics	E	MACH, ALPHA	40-40
11	Summary of Isolated ET Lateral-Directional Aerodynamic Characteristics	F	MACH, ALPHA	41-41
12	Summary of Second Stage Longitudinal Characteristics With Beta Varying	G	MACH, BETA	42-44
13	Summary of Isolated ET Longitudinal Characteristics With Beta Varying	G	MACH, BETA	45-47

INDEX OF DATA FIGURES (Concluded)

COEFFICIENT SCHEDULE:

- (A): CAF, CN, CLM vs ALPHA,
CN vs CLM
- (B): CY, CYN, CBL vs BETA,
CY vs CYN
- (C): CAFAFO, CNAFO, CLMAFO, XAC/L vs MACH
- (D): CAFAFO, CLMAFO, XAC/L vs MACH
- (E): CYBETA, CBLBET, CYNBET, YAC/L vs MACH
- (F): CYBETA, CYNBET, YAC/L vs MACH
- (G): CAF, CN, CLM, XAC/L vs MACH
- (H): CY, CYN vs BETA
CY vs CYN

NOMENCLATURE
General

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
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) Q(PSF)	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

A_b		base area; m^2 , ft^2
b	BREF	wing span or reference span; ft
c.g.		center of gravity
$\frac{l}{c}$	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

NOMENCLATURE (Continued)

Body-Axis System

<u>SYMBOL</u>	<u>SADSAC SYMBOL</u>	<u>DEFINITION</u>
C_N	CN	normal-force coefficient; $\frac{\text{normal force}}{qS}$
C_A	CA	axial-force coefficient; $\frac{\text{axial force}}{qS}$
C_Y	CY	side-force coefficient; $\frac{\text{side force}}{qS}$
C_{A_b}	CAB	base-force coefficient; $\frac{\text{base force}}{qS}$ $-A_b(p_b - p_\infty)/qS$
C_{A_f}	CAF	forebody axial force coefficient, $C_A - C_{A_b}$
C_m	CLM	pitching-moment coefficient; $\frac{\text{pitching moment}}{qS L_{REF}}$
C_n	CYN	yawing-moment coefficient; $\frac{\text{yawing moment}}{qS b}$
C_l	CBL	rolling-moment coefficient; $\frac{\text{rolling moment}}{qS b}$

Stability-Axis System

C_L	CL	lift coefficient; $\frac{\text{lift}}{qS}$
C_D	CD	drag coefficient; $\frac{\text{drag}}{qS}$
C_{D_b}	CDB	base-drag coefficient; $\frac{\text{base drag}}{qS}$
C_{D_f}	CDF	forebody drag coefficient; $C_D - C_{D_b}$
C_Y	CY	side-force coefficient; $\frac{\text{side force}}{qS}$
C_m	CLM	pitching-moment coefficient; $\frac{\text{pitching moment}}{qS L_{REF}}$
C_n	CIN	yawing-moment coefficient; $\frac{\text{yawing moment}}{qS b}$
C_l	CIL	rolling-moment coefficient; $\frac{\text{rolling moment}}{qS b}$
L/D	L/D	lift-to-drag ratio; C_L/C_D
L/D_f	L/D _f	lift to forebody drag ratio; C_L/C_{D_f}

NOMENCLATURE (Continued)
Additions to Standard List

<u>Symbol</u>	<u>Plot Symbol</u>	<u>Definition</u>
A_i		model base area at station i , $i=1, \dots, 10$, in ²
C_{P1}		Orbiter OMS pod base pressure coefficient
C_{P3}		Orbiter base pressure coefficient
C_{P5}		external tank base pressure coefficient in the integrated configuration
C_{P6}		external tank base pressure coefficient
C_{P7}		external tank base pressure coefficient
C_{P10}		Orbiter balance cavity pressure coefficient
C_{P5}		external tank balance cavity pressure coefficient (tank alone)
$C_{A_{b0}}$	CAB-O	Orbiter base axial force coefficient
$C_{A_{bOET}}$	CAB-T	external tank base axial-force coefficient in the integrated configuration
$C_{A_{bET}}$	CAB-T	external tank base axial-force coefficient for tank alone
$(C_N)_{\alpha=0}$	CNAFO	normal-force coefficient at $\alpha=0$
$(C_m)_{\alpha=0}$	CLMAFO	pitching-moment coefficient at $\alpha=0$
$(C_{N\alpha})$	CNALFA	normal-force coefficient slope ($-5^\circ \leq \alpha \leq 5^\circ$)
$C_{m\alpha}$	CLMALF	pitching-moment coefficient slope ($-5^\circ \leq \alpha \leq 5^\circ$)
$X_{mAC} / \frac{1}{2}R$	XAC/L	aerodynamic center, pitch ($-5^\circ \leq \alpha \leq 5^\circ$)

NOMENCLATURE (Concluded)
Additions to Standard List

<u>Symbol</u>	<u>Plot Symbol</u>	<u>Definition</u>
$C_{Y\beta}$	CYBETA	side-force coefficient slope ($-5^\circ \leq \beta \leq 5^\circ$)
$C_{l\beta}$	CBLBET	rolling-moment coefficient slope ($-5^\circ \leq \beta \leq 5^\circ$)
$C_{n\beta}$	CYNBET	yawing-moment coefficient slope ($-5^\circ \leq \beta \leq 5^\circ$)
x_{nAC}/ℓ_R	YAC/L	aerodynamic center, yaw ($-5^\circ \leq \beta \leq 5^\circ$)
$(C_{A_f})_{\alpha=0}$	CAFAFO	forebody axial force coefficient at $\alpha=0$

CONFIGURATIONS INVESTIGATED

The model for this test was an 0.010-scale representation of the Space Shuttle Integrated Configuration (model 52-0T). The model consisted of the orbiter and external tank. The model was constructed of stainless steel.

There were two configurations tested. The first configuration tested was the orbiter rigidly attached to the external tank. The second configuration tested was external tank alone. Model components tested were:

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

Orbiter

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

$C_7 =$ VL70-000139B (lines) canopy

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

$F_5 =$ VL70-000139B (lines) Bodyflap

$M_4 =$ VL70-000139B (lines) OMS pod

$N_8 =$ VL70-000140A (lines) OMS nozzle

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

$R_5 =$ VL70-000139B and VL70-000095 rudder

$V_7 =$ VL70-000139B (lines) vertical tail

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

External Tank

$T_{20} =$ VL78-000062B (lines) external tank

CONFIGURATIONS INVESTIGATED (Concluded)

AT₁₆ = VL78-000062B, SK-H-4011; forward Orbiter/ ET attach structure (when attached to Orbiter)

AT₁₇ = VL78-000062B, SK-H-4013; left rear Orbiter/ET attach structure

AT₁₈ = VL78-000062B, SK-H-4013; right rear Orbiter/ET attach structure

AT₁₉ = VL78-000062B, VL72-000140, VL72-000115; forward SRB/ET attach structure

AT₂₀ = VL78-000062B, VL72-000140, VL72-000115; Aft SRB/ET attach structure

AT₂₄ = VL78-000062B, forward Orbiter/ET attach structure (tank alone)

FL₅ = VL78-000062B, LOX feed line simulated between ET and Orbiter

FL₆ = VL78-000062B pressure line; max cross-sectional area simulating LH₂ pressure line and electrical conduit box on the ET.

FL₉ = VL78-000062B umbilical feedline

FR₆ = VL78-000062B VL78-000050 cross-members between ET/Orbiter attach structure

PT₁₂ = VL78-000062B lightning rod attached to ET

PT₁₃ = VL78-000062B ET protuberance simulation of LOX recirculation line and electrical conduit box

PT₁₄ = VL78-000062B ET protuberance simulation LOX pressure line

PT₁₉ = VL78-000062B SRB separation push off pad

PT₂₀ = VL78-000062B nose cone lines

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 ft³ 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 +20 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 1.0-inch MK XIV strain gage balance and the moment data were transferred to the external tank centerline at a point 6.501 inches (model scale) aft of the tank nose.

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

1. Orbiter base axial-force coefficient:

$$C_{A_b} = - [A_1 C_{P_1} + A_3 C_{P_3} + A_{10} C_{P_{10}}] / S$$

$$\text{where: } A_1 = A_1 + A_2 = 2.64 \text{ in}^2$$

$$A_3 = A_3 + A_4 = 3.28 \text{ in}^2$$

$$A_{10} = 0.843 \text{ in}^2$$

2. External tank (when in the integrated configuration)

$$C_{A_b} = - [A_5 C_{P_5} + A_6 C_{P_6} + A_7 C_{P_7}] / S$$

$$\text{where: } A_5 = 1.767 \text{ in}^2$$

$$A_6 = 1.699 \text{ in}^2$$

$$A_7 = 5.097 \text{ in}^2$$

3. External tank (alone)

$$C_{A_b} = - [A_5 C_{P_5} + A_6 C_{P_6} + A_7 C_{P_7}] / S$$

$$\text{where: } A_5 = \text{sting cavity} = 1.109 \text{ in}^2$$

$$A_6 = 1.699 \text{ in}^2$$

$$A_7 = 5.097 \text{ in}^2$$

DATA REDUCTION (Concluded)

The following reference dimensions were used for data reduction:

<u>Symbol</u>	<u>Definition</u>	<u>Value</u> (model scale)
S	reference area	38.736 in ²
XMRP	longitudinal moment reference point	9.79 in
YMRP	moment reference point on Y axis	0.00 in
ZMRP	moment reference point on Z axis	4.00 in
l_R	reference length	12.903 in

The location of the base pressure orifices and their respective areas are shown in figure 2d.

TABLE 1.

TEST : IA18		DATE : 4-9-74	
TEST CONDITIONS			
MACH NUMBER	REYNOLDS NUMBER (per unit length)	DYNAMIC PRESSURE (pounds/sq. inch)	STAGNATION TEMPERATURE (degrees Fahrenheit)
5.3	3.64×10^6	6.95	740
7.3	3.16×10^6	3.47	740
10.3	1.74×10^6	2.303	1540
BALANCE UTILIZED: <u>ARC 1.0-inch TASK No. XIV A</u>			
	CAPACITY:	ACCURACY:	COEFFICIENT TOLERANCE:
NF	<u>800 lb</u>	<u> </u>	<u> </u>
SF	<u>400 lb</u>	<u> </u>	<u> </u>
AF	<u>100 lb</u>	<u> </u>	<u> </u>
PM	<u>1600 in-lb</u>	<u> </u>	<u> </u>
RM	<u>250 in-lb</u>	<u> </u>	<u> </u>
YM	<u>660 in-lb</u>	<u> </u>	<u> </u>
COMMENTS			

TABLE II.

TEST: JAS (ARG 3-E 141)		DATE: APRIL 11, 1974										
DATA SET IDENTIFIER	CONFIGURATION	SCHD.		PARAMETERS/VALUES				NO. OF RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE)			TEST RUN NUMBERS
		A	B	CA	CB	CC	CD		CE	CF	CG	
RES001	CRBITER + TANK	A	C	C	C	R		19	18	1		
02		A	B					22	16	3		
03		C	B					21	14	2		
04		A	B					23	15	4		
05		C	C						17			
06	TANK	D	C					26	9	8		
07		A	B						11	6		
08		C	B					25	13	7		
09		A	B					27	12	5		
RES002	CRBITER + TANK	O	B	C	C	X		20				
01		A	O					19				
02	TANK	D	C					26				

NOTES: *R* D/S ARE CORRECTED FOR CAB EFFECTS AT MACH 5.3 ONLY; CAB CONSIDERED NEGLIGIBLE FOR REMAINDER OF MACH RANGE.
 X D/S CONTAIN DATA (CAB-0, CAB-T) USED TO CORRECT AXIAL FORCE AND PITCHING MOMENT (MATED CONFIG.) COEFFICIENTS AT MACH 5.3. XES010 USED TO CORRECT RES002-004, XES001 USED TO CORRECT RES001, AND XES006 USED TO CORRECT RES006 AND RES008-009. XES006 IS ALPHA SWEEP DATA BUT WAS USED TO CORRECT BOTH α AND β SWEEP DATA DUE TO TANK SYMMETRY.

COEFFICIENT SCHEDULES	CA	CB	CC	CD	CE	CF	CG	CH
TYPE OF DATA	RES001	RES002	RES003	RES004	RES005	RES006	RES007	RES008
α OR β	RES001	RES002	RES003	RES004	RES005	RES006	RES007	RES008
SWEEP SCHEDULES	RES001	RES002	RES003	RES004	RES005	RES006	RES007	RES008

COEFFICIENT SCHEDULES
 (A): 15, 20, 25, 30, 35, 40
 (B): 15, 20, 25, 30, 35, 40
 (C): 15, 20, 25, 30, 35, 40
 (D): 15, 20, 25, 30, 35, 40

TABLE III. - MODEL DIMENSIONAL DATA

MODEL COMPONENT : BODY - B19

GENERAL DESCRIPTION : FUSELAGE per Rockwell Lines VL70-000139B

SCALE: 0.010

DRAWING NUMBER VL70-000139B

DIMENSIONS	FULL SCALE	MODEL SCALE
Length - In.	<u>1290.3</u>	<u>12.903</u>
Max Width - In.	<u>267.6</u>	<u>2.676</u>
Max Depth - In.	<u>244.5</u>	<u>2.445</u>
Fineness Ratio	<u>4.82175</u>	<u>4.82175</u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u>386.67</u>	<u>0.0387</u>
Planform	<u> </u>	<u> </u>
Wetted	<u> </u>	<u> </u>
Base	<u> </u>	<u> </u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT : CANOPY - C7

GENERAL DESCRIPTION : Basic configuration 3A canopy

MODEL SCALE: 0.010

DRAWING NUMBER VL70-000139B

DIMENSIONS :	FULL SCALE	MODEL SCALE
Length ($X_0=433$ to $X_0=670$) in.FS	<u>237.</u>	<u>2.370</u>
Max Width	<u> </u>	<u> </u>
Max Depth	<u> </u>	<u> </u>
Fineness Ratio	<u> </u>	<u> </u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u> </u>	<u> </u>
Planform	<u> </u>	<u> </u>
Wetted	<u> </u>	<u> </u>
Base	<u> </u>	<u> </u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ELEVON - E₂₃

GENERAL DESCRIPTION: Configuration 3 per W107 Rockwell Lines
VL70-000139B, data for (1) of (2) sides.

MODEL SCALE: 0.010

DRAWING NUMBER: VL70-000139B

<u>DIMENSIONS:</u>	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area - FT ²	<u>205.52</u>	<u>0.0206</u>
Span (equivalent) - In.	<u>353.34</u>	<u>3.533</u>
Inb'd equivalent chord - In.	<u>114.78</u>	<u>1.148</u>
Outb'd equivalent chord - In.	<u>55.00</u>	<u>0.550</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>0.208</u>	<u>0.208</u>
At Outb'd equiv. chord	<u>0.400</u>	<u>0.400</u>
Sweep Back Angles, degrees		
Leading Edge	<u>0.00</u>	<u>0.00</u>
Trailing Edge	<u>- 10.24</u>	<u>-10.24</u>
Hingeline	<u>0.00</u>	<u>0.00</u>
Area Moment (Normal to hinge line)	<u>1548.07</u>	<u>0.00155</u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT : BODY FLAP - F₅

GENERAL DESCRIPTION : Configuration 3 - A lightweight orbiter body flap

MODEL SCALE: 0.010 MODEL DRAWING NO.: SS-A00062

DRAWING NUMBER VL70-000139B

DIMENSIONS :	FULL SCALE	MODEL SCALE
Length - In.	<u>84.70</u>	<u>0.8470</u>
Max Width - In.	<u>267.6</u>	<u>2.6760</u>
Max Depth	<u> </u>	<u> </u>
Fineness Ratio	<u> </u>	<u> </u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u>142.5195</u>	<u>0.01425</u>
Planform	<u> </u>	<u> </u>
Wetted	<u>38.0958</u>	<u>0.00381</u>
Base	<u> </u>	<u> </u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT : OMS - M₄
 GENERAL DESCRIPTION : Orbital maneuvering system pods located on
th orbiter aft fuselage

 MODEL SCALE: 0.010

 DRAWING NUMBER VL70-000139

DIMENSIONS :	FULL SCALE	MODEL SCALE
Length - In.	<u>346.0</u>	<u>3.460</u>
Max Width - In.	<u>108.0</u>	<u>1.080</u>
Max Depth - In.	<u>113.0</u>	<u>1.113</u>
Fineness Ratio	_____	_____
Area	_____	_____
Max. Cross-Sectional	_____	_____
Planform	_____	_____
Wetted	_____	_____
Base	_____	_____

Centerline of OMS Pods:

WP = 463.9 IN FS: WP = 400 + 63.9 = 463.9

BP = 80.0 IN F.S.

Length: 1214.0 to 1560.0 = 346.0 IN. F.S.

NOTE: M₄ identical to M of 2A configuration except intersection to body.

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: MP3 NOZZLES - N8

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 $X_0 = 1570.75$, $Y_0 = \pm 99.25$,
 $Z_0 = 507.25$

MODEL SCALE: 0.010

DRAWING NUMBER: VL70-008306, VL70-00089"B", SS-A00092

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
MACH NO.		
Length - In.		
Gimbal Point to Exit Plane	_____	_____
Throat to Exit Plane	_____	_____
Diameter - In.		
Exit	<u>50.00</u>	<u>0.50</u>
Throat	<u>N/A</u>	<u>N/A</u>
Inlet	<u>28.00</u>	<u>0.280</u>
Area - ft ²		
Exit	<u>13.635</u>	<u>0.1364</u>
Throat	_____	_____
Gimbal Point (Station) - In.		
Upper Nozzle		
X	<u>1518.0</u>	<u>15.18</u>
Y	<u>+ 88.0</u>	<u>+ 0.88</u>
Z	<u>492.0</u>	<u>4.92</u>
Lower Nozzles		
X	_____	_____
Y	_____	_____
Z	_____	_____
Null Position - Deg.		
Upper-Nozzle		
Pitch	<u>15049'</u>	<u>15049'</u>
Yaw (Outboard)	<u>+ 12017'</u>	<u>+ 12017'</u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: MPS NOZZLES - N 24

GENERAL DESCRIPTION: Configuration 140A/B Orbiter MPS Nozzles

MODEL SCALE: 0.010

DRAWING NUMBER: VL70-005030A, VL70-000140A

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
MACH NO.		
Length - In.		
Gimbal Point to Exit Plane	<u>157.0</u>	<u>1.570</u>
Throat to Exit Plane	<u>99.2</u>	<u>0.992</u>
Diameter - In.		
Exit	<u>91.000</u>	<u>0.910</u>
Throat	<u> </u>	<u> </u>
Inlet	<u> </u>	<u> </u>
Area - ft ²		
Exit	<u>45.16585</u>	<u>0.00452</u>
Throat	<u> </u>	<u> </u>
Gimbal Point (Station) - In.		
Upper Nozzle		
X	<u>1445.0</u>	<u>14.450</u>
Y	<u>0</u>	<u>0</u>
Z	<u>443.0</u>	<u>4.430</u>
Lower Nozzles		
X	<u>1468.16996</u>	<u>0.00147</u>
Y	<u>+ 53.0000</u>	<u>0.530</u>
Z	<u>- 342.63988</u>	<u>3.426</u>
Null Position - Deg.		
Upper Nozzle		
Pitch	<u>16°</u>	<u>16°</u>
Yaw	<u>0°</u>	<u>0°</u>
Lower Nozzle		
Pitch	<u>10°</u>	<u>10°</u>
Yaw	<u>3.5°</u>	<u>3.5°</u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: RUDDER - R₅

GENERAL DESCRIPTION: Rudder for vertical stabilizer V₇

MODEL SCALE: 0.010

DRAWING NUMBER: VL70-000095

<u>DIMENSIONS:</u>	<u>FULL-SCALE</u>	<u>MODEL SCALE</u>
Area - Ft ²	<u>100.15</u>	<u>0.0100</u>
Span (equivalent) - In.	<u>201.0</u>	<u>2.010</u>
Inb'd equivalent chord - In.	<u>91.585</u>	<u>0.916</u>
Outb'd equivalent chord - In.	<u>50.833</u>	<u>0.508</u>
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	<u>0.400</u>	<u>0.400</u>
At Outb'd equiv. chord	<u>0.400</u>	<u>0.400</u>
Sweep Back Angles, degrees		
Leading Edge	<u>34.83</u>	<u>34.83</u>
Tailing Edge	<u>26.25</u>	<u>26.25</u>
Hingeline	<u>34.83</u>	<u>34.83</u>
Area Moment (Normal to hinge line) FT ³	<u>526.125</u>	<u>0.0005261</u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: VERTICAL - V₇

GENERAL DESCRIPTION: Centerline vertical tail, double-wedge airfoil
with rounded leading edge.

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

MODEL SCALE: 0.010

DRAWING NUMBER: VL70-000139

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
TOTAL DATA		
Area (Theo) - Ft ²		
Planform	<u>425.92</u>	<u>0.0426</u>
Span (Theo) - In.	<u>315.72</u>	<u>3.157</u>
Aspect Ratio	<u>1.675</u>	<u>1.675</u>
Rate of Taper	<u>0.507</u>	<u>0.507</u>
Taper Ratio	<u>0.404</u>	<u>0.404</u>
Sweep-Back Angles, Degrees.		
Leading Edge	<u>45.000</u>	<u>45.000</u>
Trailing Edge	<u>26.249</u>	<u>26.249</u>
0.25 Element Line	<u>41.130</u>	<u>41.130</u>
Chords:		
Root (Theo) WP	<u>268.50</u>	<u>2.685</u>
Tip (Theo) WP	<u>108.47</u>	<u>1.085</u>
MAC	<u>199.81</u>	<u>1.998</u>
Fus. Sta. of .25 MAC	<u>1463.50</u>	<u>14.635</u>
W.P. of .25 MAC	<u>635.522</u>	<u>6.355</u>
B.L. of .25 MAC	<u>0.00</u>	<u>0.00</u>
Airfoil Section		
Leading Wedge Angle - Deg.	<u>10.000</u>	<u>10.000</u>
Trailing Wedge Angle - Deg.	<u>14.920</u>	<u>14.920</u>
Leading Edge Radius	<u>2.0</u>	<u>2.0</u>
Void Area	<u>13.17</u>	<u>0.1317</u>
Blanketed Area	<u>0.00</u>	<u>0.00</u>

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TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: <u>WING-W 107</u>			
GENERAL DESCRIPTION: <u>Configuration 3 per Rockwell Lines VL70-000130B</u>			
NOTE: <u>Same as W₁₀₃, except cuff, airfoil and incidence angle.</u>			
MODEL SCALE: <u>0.010</u>			
TEST NO.	DWG. NO. <u>VL70-000130B</u>		
DIMENSIONS:	FULL-SCALE	MODEL SCALE	
<u>TOTAL DATA</u>			
Area (Theo.) Ft ²			
Planform	2600.00	0.260	
Span (Theo) In.	936.68	9.367	
Aspect Ratio	2.877	2.875	
Rate of Taper	1.177	1.177	
Taper Ratio	0.200	0.200	
Dihedral Angle, degrees	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	- 12.500	- 10.000	
0.25 Element Line	35.000	35.000	
Chords:			
Root (Theo) B.P.O.O.	689.24	6.892	
Tip, (Theo) B.P.	137.85	1.378	
MAC	474.50	4.745	
Fus. Sta. of .25 MAC	1100.00	11.000	
W.P. of .25 MAC	200.00	2.000	
B.L. of .25 MAC	100.00	1.000	
<u>EXPOSED DATA</u>			
Area (Theo) Ft ²	1752.29	0.1752	
Span, (Theo) In. BP108	720.00	7.200	
Aspect Ratio	2.000	2.000	
Taper Ratio	0.250	0.250	
Chords:			
Root BP108	562.50	5.625	
Tip 1.00 $\frac{b}{2}$	137.50	1.375	
MAC	293.00	2.930	
Fus. Sta. of .25 MAC	1185.31	11.853	
W.P. of .25 MAC	200.00	2.000	
B.L. of .25 MAC	100.00	1.000	
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			
Leading Edge Intersect Fus M. L. @ Sta			
Leading Edge Intersect Wing 1 Sta			

TABLE III.- MODEL DIMENSIONAL DATA- Continued.

MODEL COMPONENT: EXTERNAL TANK - T₂₀

GENERAL DESCRIPTION: External Oxygen Hydrogen Tank

MODEL SCALE: 0.010

DRAWING NUMBER: VL78-000062, VL72-000131

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Length (In.) (Nose @ $X_0 = 328.92$)	<u>1846.905</u>	<u>18.469</u>
Max. Width - Dia - In. (@ $X_0 = 975.675$)	<u>333.2</u>	<u>3.332</u>
Major Dia - In.	<u>330.2</u>	<u>3.302</u>
Max. Depth:	<u> </u>	<u> </u>
Fineness Ratio	<u>5.65713</u>	<u>5.6571</u>
Area - Ft ²		
Max. Cross-sectional @ $X_0 = 975.675$	<u>605.534</u>	<u>0.0605</u>
Major cross-sectional	<u>594.679</u>	<u>0.0595</u>
Base (based on 330.2 dia)	<u>594.679</u>	<u>0.0595</u>
WP of Tank Centerline (Z) -In.	<u>400.0</u>	<u>4.00</u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ATTACH STRUCTURE - AT₁₆

GENERAL DESCRIPTION: Forward orbiter/ET Attach Structure (2 member Structure)

MODEL SCALE: 0.010

DRAWING NO.: VL73-000062B, SK-H-4011

MODEL DRAWING: SS-AG0117

DIMENSIONS:	<u>MEMBER</u>		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
	#1	X _O	394.38	3.944
		Y _O	0	0
		Z _O	LWR ML	LWR ML
		X _T	1131.0	11.310
		Y _T	46.8	0.468
		Z _T	561.298	5.613
	#2	X _O	394.38	3.944
		Y _O	0	0
		Z _O	LWR ML	LWR ML
		X _T	1131.0	11.310
		Y _T	- 46.8	- 0.468
		Z _T	561.298	5.613

Diameter of Members: 5.70 IN. DIA., F.S.

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ATTACH STRUCTURE - AT₁₇

GENERAL DESCRIPTION: Left rear orbiter/ET attach structure (2 member structure)

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, SK-H-4013.

MODEL DRAWING: SS-A00117

DIMENSIONS:	MEMBER		FULL SCALE	MODEL SCALE
#	#1	X _O	1317	13.17
		Y _O	- 96.5	- 0.965
		Z _O	267.5	2.675
		X _T	2058.0	20.58
		Y _T	- 125.827	1.258
		Z _T	515.5	5.155
	#2	X _O	1317.0	13.17
		Y _O	- 96.5	- 0.965
		Z _O	267.5	2.675
		X _T	2058.0	20.58
		Y _T	- 125.827	1.258
		Z _T	515.5	5.155

Diameter of Members: #1 11.5 In. Dia. F.S.

#2 15.5 In. Dia. F.S.

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ATTACH STRUCTURE - AT₁₈

GENERAL DESCRIPTION: Right rear orbiter/ET attach structure (3 member structure)

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, SK-II-4013

MODEL DRAWING: SS-A00117

DIMENSIONS:	MEMBER		FULL SCALE	MODEL SCALE
	#1	X _O	1317.00	13.170
		Y _O	+ 96.5	+ 0.965
		Z _O	267.5	2.675
		X _T	1872.0	18.720
		Y _T	+ 125.827	+ 1.258
		Z _T	515.5	5.155
	#2	X _O	1317.0	13.170
		Y _O	+ 96.5	+ 0.965
		Z _O	267.5	2.675
		X _T	2058.0	20.580
		Y _T	+ 125.827	+ 1.258
		Z _T	515.5	5.155
	#3	X _O	1317.0	13.170
		Y _O	54.40	0.544
		Z _O	19.30	0.193
		X _T	2058.0	20.580
		Y _T	2.5	0.025
		Z _T	567.6	5.676
Diameter of Members: (in.)	#1		15.5	0.155
	#2		11.5	0.115
	#3		4.5	0.045

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ATTACH STRUCTURE - AT₁₉

GENERAL DESCRIPTION: Forward SRB/ET attach structure (2 attach structures - Left and Right).

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, VL72-000140, VL72-000115 MODEL DRAWING: SS-A0G117

DIMENSIONS:	FRONTAL VIEW	<u>MEMBER - LEFT</u>	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
		X _B		
		Y _B		
		Z _B		
		X _T	975.675	9.757
		Y _T	166.67	+ 1.667
		Z _T	+566.5	+ 5.665
		<u>MEMBER - RIGHT</u>		
		X _B		
		Y _B		
		B _B		
		X _T	975.675	9.757
		Y _T	166.67	1.667
		Z _T	- 233.5	- 2.335

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ATTACH STRUCTURE- AT₂₀

GENERAL DESCRIPTION: Att SRB/ET attach structure (3 member structure)

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, VL72-000140, VL72-000115 MODEL DWG: SS-A00117

DIMENSIONS:	MEMBER		FULL SCALE	MODEL SCALE
	#1	X _B	1317.0	13.17
		Y _B	+ 57.0	0.570
		Z _B		
		Z _T	457.0	4.570
	#2	X _B	1317.0	13.17
		X _T	2058.0	20.580
	#3	X _B	1317.0	13.170
		Y _B	+ 57.0	+ 0.570
		X _T	2058.0	20.580
		Z _T	343.0	3.430
Diameter of Members: -(In.)			6.0	0.060

TABLE III. - MODEL DIMENSIONAL DATA - Concluded.

MODEL COMPONENT: ATTACH STRUCTURE - AT₂₄

GENERAL DESCRIPTION: Forward orbiter/ET attach structure (2 member structure) simulating the attach structure after ET separation.

MODEL SCALE: 0.010

DRAWING NUMBER: VL78-000062B

MODEL DRAWING: SS-A00117

DIMENSIONS:	<u>MEMBER</u>		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
	#1	X _O	346.00	3.460
		Y _O	0	0
		Z _O	280.07	2.800
		X _T	1131.00	11.310
		Y _T	46.0	0.460
		Z _T	565.07	5.650
	#2	X _O	346.00	3.460
		Y _O	0	0
		Z _O	280.07	2.800
		X _T	1131.00	11.310
		Y _T	- 46.00	- 0.460
		Z _T	280.07	2.800
Diameters of Members: (In.)			5.70	0.057

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: FEEDLINE - FL₅

GENERAL DESCRIPTION: LOX Feed line simulated between ET and Orbiter.

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B,

MODEL DRAWING: SS-A00117

DIMENSIONS:

		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Leading edge at:	X _T	1033.3	10.333
	Y _T	70.0	0.700
	X _T	1033.3	10.333
	Y _T	- 70.0	- 0.700
Trailing edge at:	X _T	2071.50	20.715
	Y _T	70.00	0.700
	Dia. - Inches.	18.80	0.188
	X _T	2071.50	20.715
	Y _T	+ 70.00	+ 0.700

Centerline of LOX Feedline located radially at $\phi = 23^{\circ}24'$

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: PRESSURE LINE - FL6

GENERAL DESCRIPTION: Max. cross-sectional area simulating LH₂ pressure line and electrical conduit box between ET and Orbiter.

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B

MODEL DRAWING NO.: SS-400117

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Leading edge at: X _T	1127.1	11.271
Y _T	110.3	1.103
Trailing edge at: X _T	2062.1	20.621
Y _T	110.3	1.103

Centerline of LH₂ pressure line located radially at $\phi = 33^{\circ}45'$

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT : LH₂ UMBILICAL FEEDLINE - FL₂

GENERAL DESCRIPTION : LH₂ Umbilical Feedline with an electrical quick disconnect box between the Orbiter and ET.

MODEL SCALE: 0.010

DRAWING NUMBER VI78-000062B

DIMENSIONS	FULL SCALE	MODEL SCALE
Centerline at X _T	<u>2071.5</u>	<u>20.715</u>
Max Width	<u>37.2</u>	<u>0.372</u>
Max Depth	<u>37.5</u>	<u>0.375</u>
Diameter	<u>17.0</u>	<u>0.170</u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u> </u>	<u> </u>
Planform	<u> </u>	<u> </u>
Wetted	<u> </u>	<u> </u>
Base	<u> </u>	<u> </u>

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: FAIRING - FR₆

DESCRIPTION: Cross member between aft ET/orbiter attach structures

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B, VL78-000050 MODEL DRAWING: SS-A00117

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Leading edge at X _T	2035.50	20.355
Length	15.00	0.150
Width	193.0	1.930

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ET PROTUBERANCE - PT₁₂

GENERAL DESCRIPTION: Lightning rod attached to ET nose.

MODEL SCALE. 0.010

DRAWING NO.: VL78-000068B

DIMENSIONS:	<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Length	30.90	0.309
Diameter - In.	3.20	0.032

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ET PROTUBERANCE - PT₁₃

GENERAL DESCRIPTION: Maximum cross-sectional area simulating LOX recirculation line and electrical conduit box on planform view of external tank, T₂₀.

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B

MODEL DRAWING: SS-A00117

DIMENSIONS:		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Leading edge at:	X _T	1208.3	12.083
	Y _T	+ 95.0	+ 0.950
	X _T	1208.3	12.083
	Y _T	- 95.0	- 0.950
Trailing edge at:	X _T	2060.5	20.605
	Y _T	+ 95.0	+ 0.950
	X _T	2060.5	20.605
	Y _T	- 95.0	- 0.950

Centerline of LOX recirculation line located radially at $\phi = 33^{\circ}45'$.

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: ET PROTUBERANCE - PT₁₄

GENERAL DESCRIPTION: LOX pressure line on Tank T₂₀

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B

MODEL DRAWING:

DIMENSIONS:		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
Leading edge at:	X _T	355.90	3.559
	Y _T	6.0	0.06
Trailing edge at:	X _T	2060.5	20.605
	Y _T	+ 87.0	+ 0.870

Centerline of LOX pressure line located radially at $\phi = 23^{\circ}24'$.

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT: SRB SEPARATION PUSH-OFF PAD - PT₁₉

GENERAL DESCRIPTION: Forward ET/SRB Separation pads (push-off pads)

MODEL SCALE: 0.010

DRAWING NO.: VL78-000062B

MODEL DRAWING: SS-A00117

DIMENSIONS:	MEMBER		<u>FULL SCALE</u>	<u>MODEL SCALE</u>
	#1	X _T	450.0	4.50
		Y _T	975.60	9.756
		Z _T	166.50	1.665
	#2	X _T	450.00	4.500
		Y _T	- 975.60	9.756
		Z _T	166.50	1.665

TABLE III. - MODEL DIMENSIONAL DATA - Continued.

MODEL COMPONENT NOSE CONE LINES - PT₂₀
 GENERAL DESCRIPTION Maximum cross-sectional area simulating the
LOX pressure line and electrical conduit on top of external tank
(T₂₀) nose cone area.
MODEL SCALE: 0.010
 DRAWING NUMBER VL78-000062B

DIMENSIONS	FULL SCALE	MODEL SCALE
Leading Edge at: X _T	<u>360.92</u>	<u>3.609</u>
Y _T	<u>34.0</u>	<u>0.340</u>
Trailing Edge at: X _T	<u>955.1</u>	<u>9.551</u>
Y _T	<u>336.5</u>	<u>3.365</u>
Area	<u> </u>	<u> </u>
Max. Cross-Sectional	<u> </u>	<u> </u>
Planform	<u> </u>	<u> </u>
Wetted	<u> </u>	<u> </u>
Base	<u> </u>	<u> </u>

Centerline of lines located radially at $\phi = 33^{\circ}45'$

Notes:

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

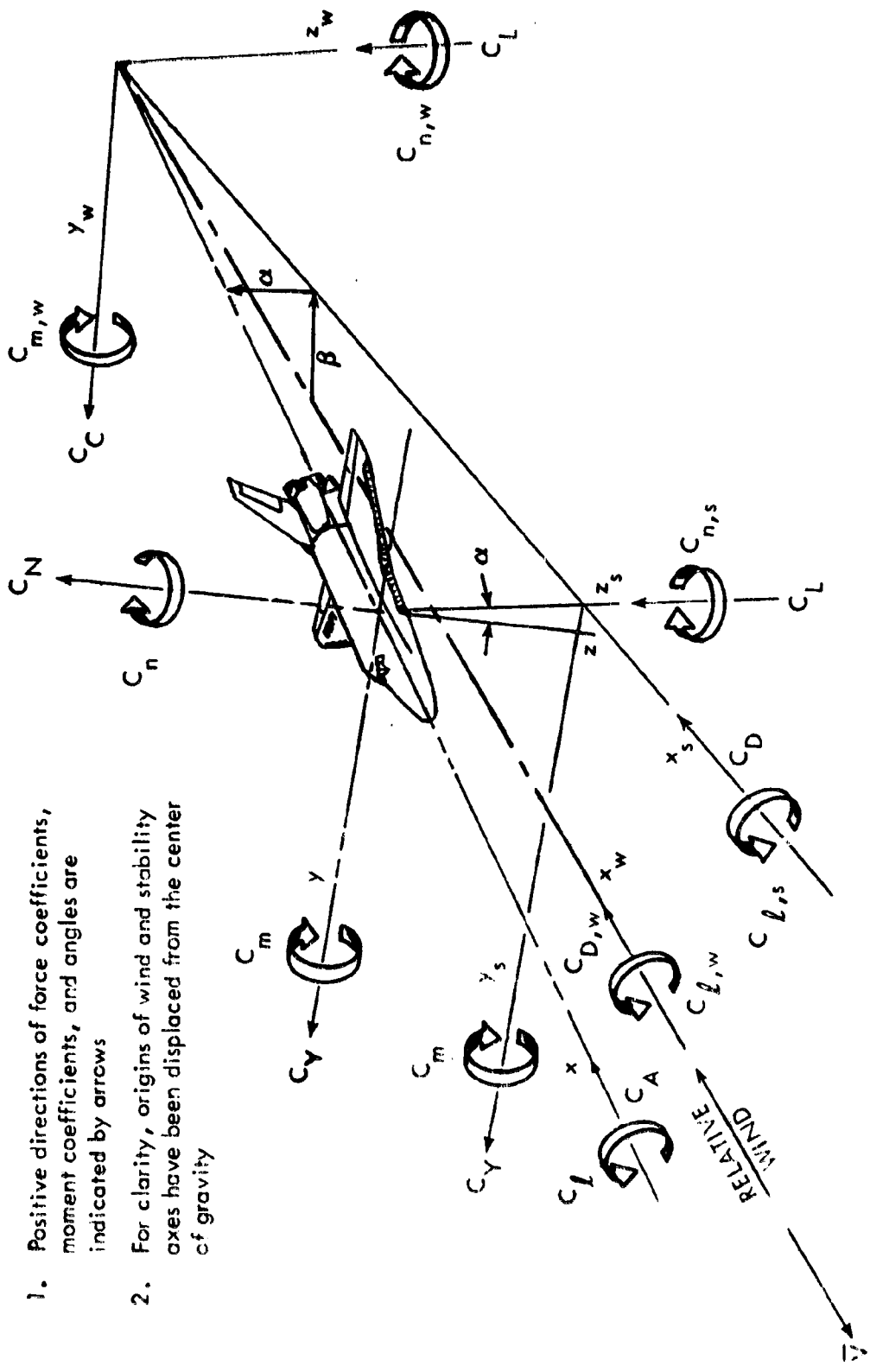
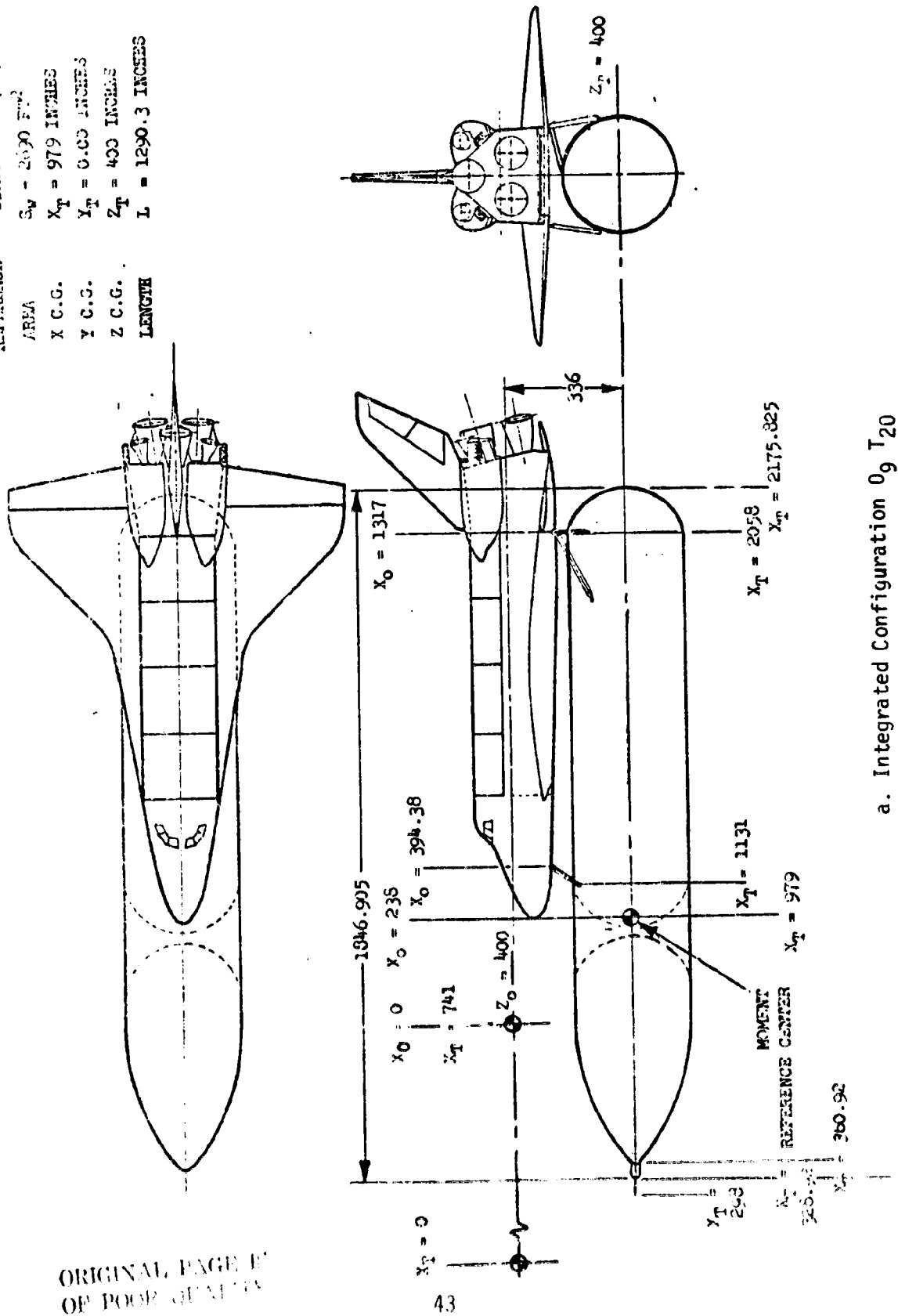


Figure 1. - Axis Systems.

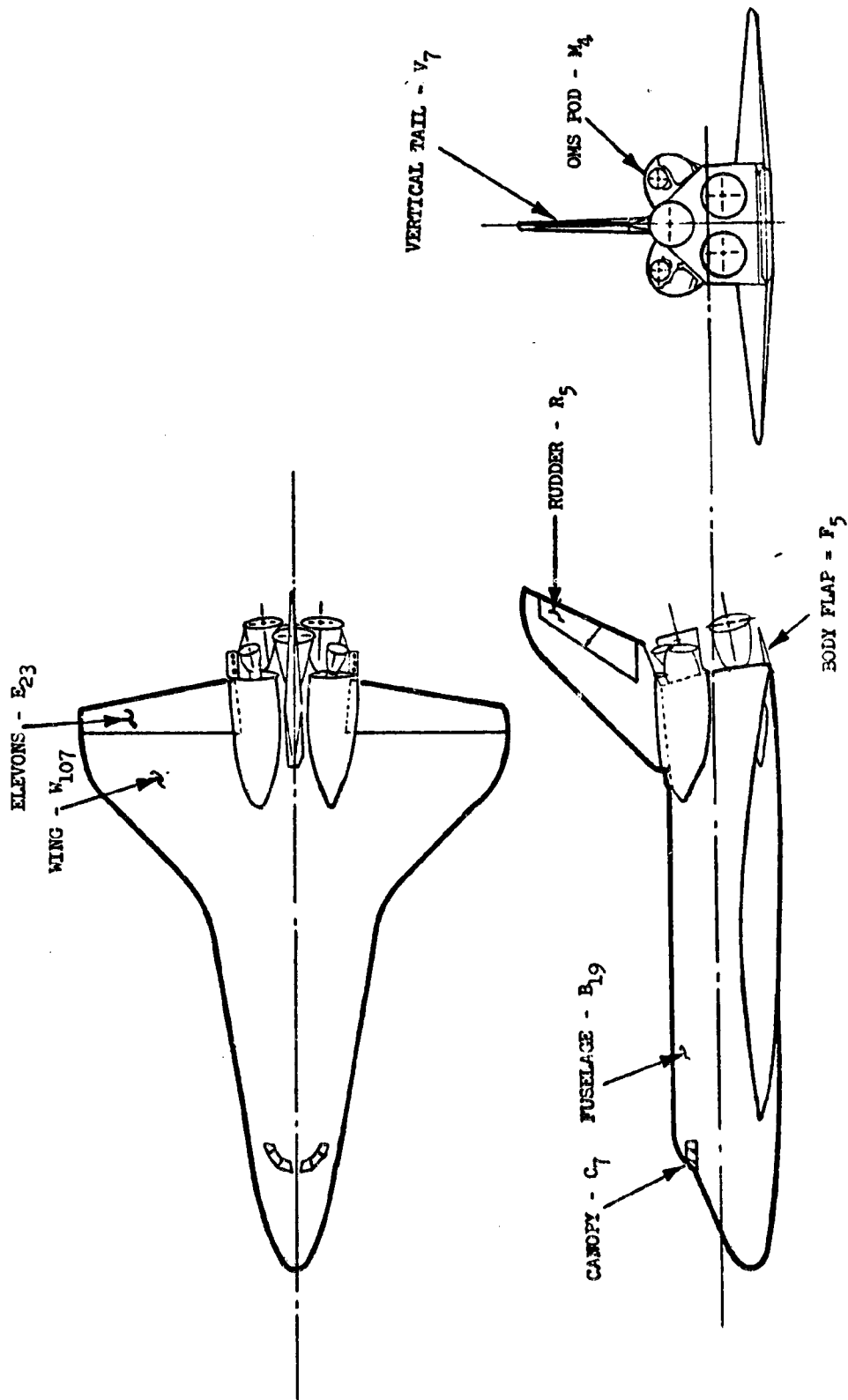
REFERENCE	DIMENSION (IN)
AREA	$S_V = 2090 \text{ FT}^2$
X C.G.	$X_T = 979 \text{ INCHES}$
Y C.G.	$Y_T = 0.00 \text{ INCHES}$
Z C.G.	$Z_T = 400 \text{ INCHES}$
LENGTH	$L = 1290.3 \text{ INCHES}$



ORIGINAL PAGE IS
OF POOR QUALITY

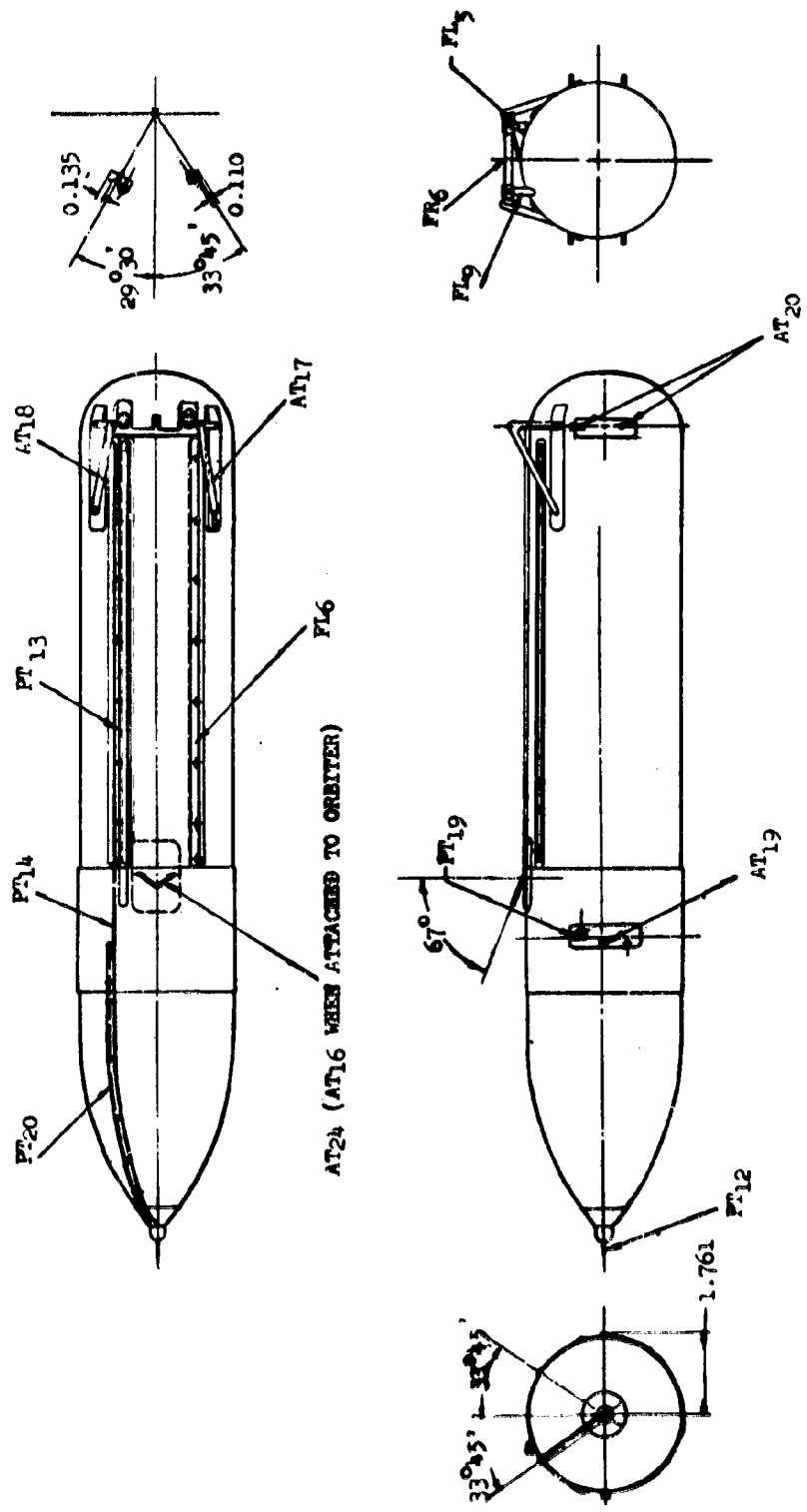
a. Integrated Configuration $O_g T_{20}$

Figure 2. - Model sketches.

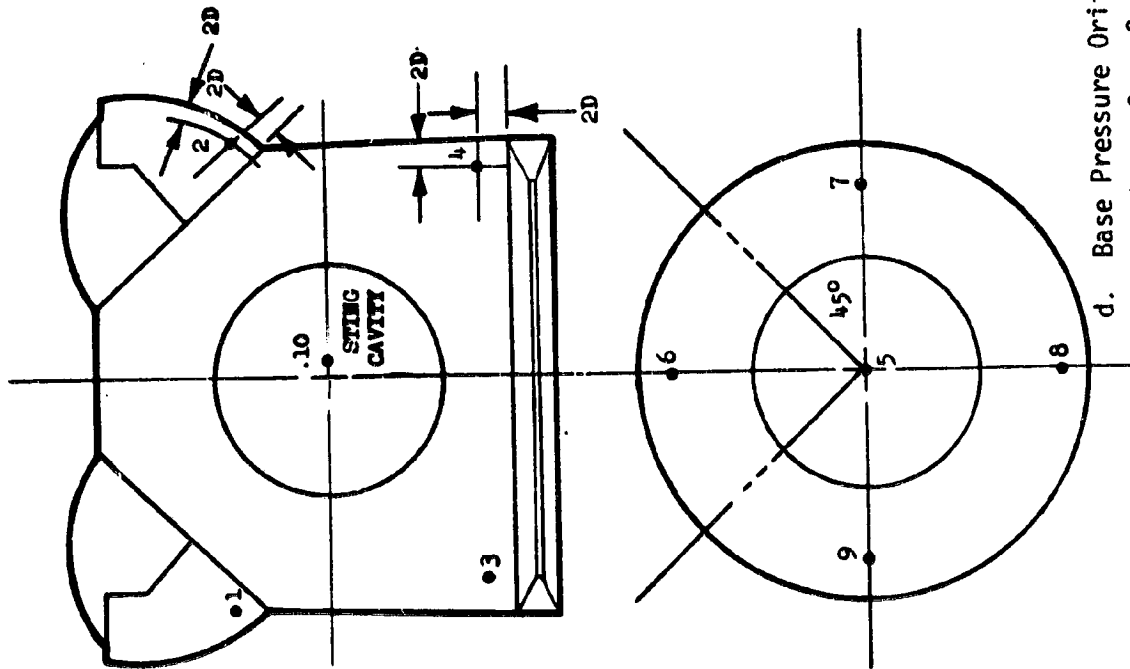


b. Orbiter - 09

Figure 2. - Continued.



c. External Tank (T20) per R. 1. Drawing VL78-000062B
Figure 2. - Continued.



- NOTE: 1) PRESSURE TUBES 1 & 2 ARE MANI-
 FOLDED TO EACH OTHER
 2) PRESSURE TUBES 3 & 4 ARE MANI-
 FOLDED TO EACH OTHER
 3) PRESSURE TUBES 7, 8 & 9 ARE
 MANIFOLDED TO EACH OTHER

d. Base Pressure Orifice Locations
 Figure 2. - Concluded.

ORIGINAL PAGE IS
 UNCLASSIFIED



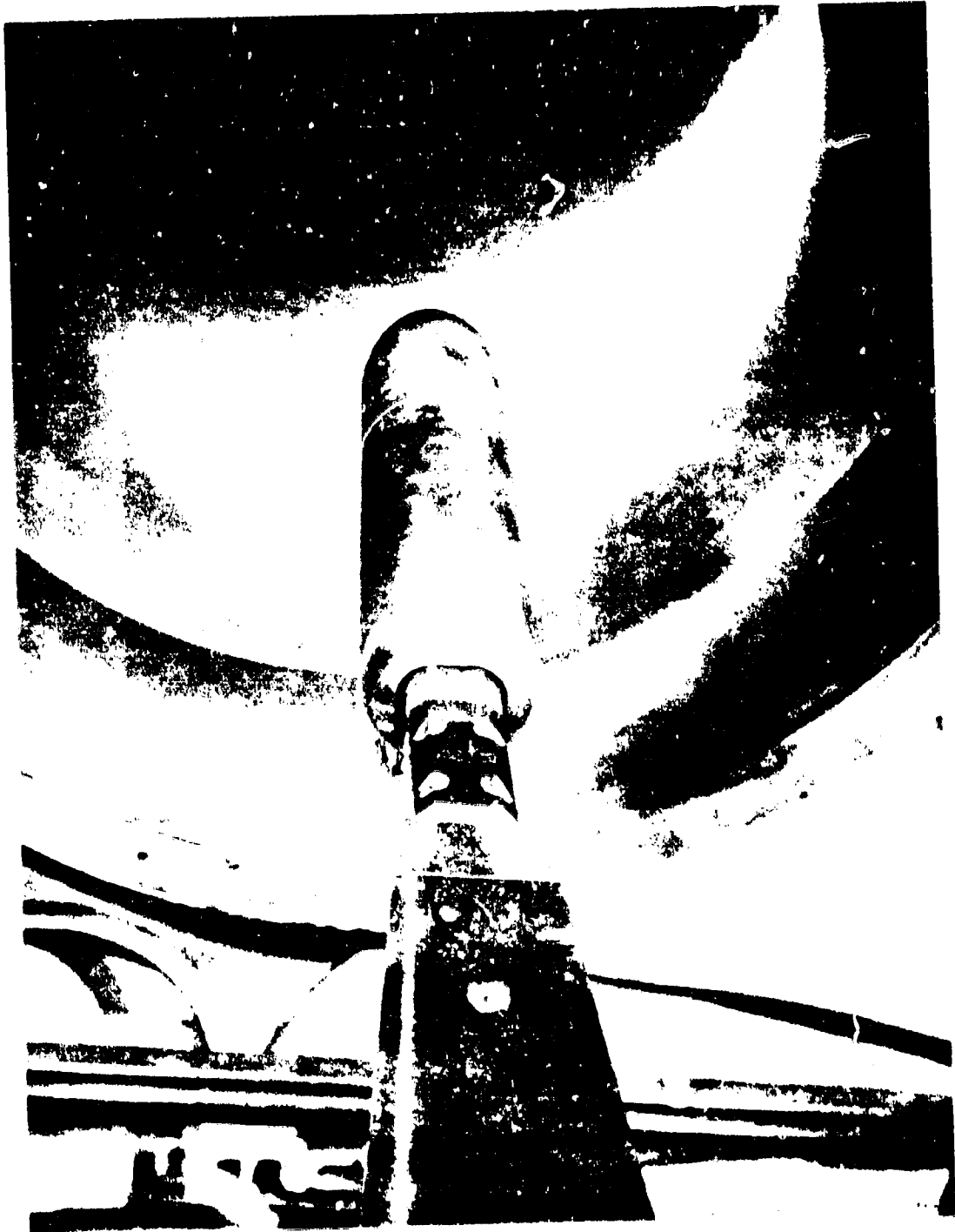
a. Orbiter and Tank, Side View

Figure 3. - Model installation photographs.

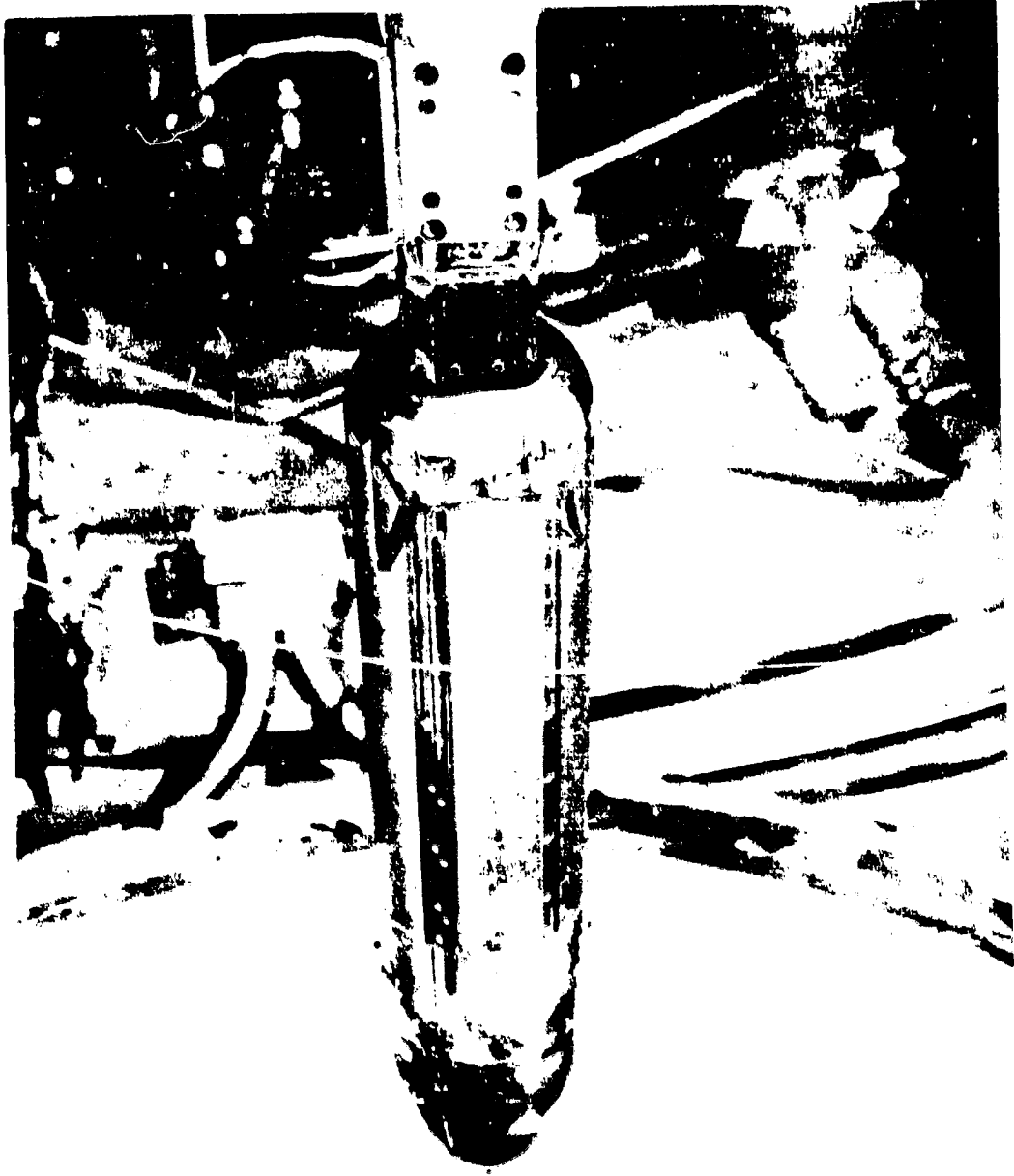


b. Orbiter and Tank, 3/4 Rear View

Figure 3. - Continued.



c. Tank Only, Rolled 90° for Sideslip Run, 3/4 Rear View from Right Side
Figure 3. - Continued.



3. Tank Only, Rolled 90° for Sideslip Run, Left Side View (Top of Model is Toward Viewer)
Figure 3. - Concluded.

DATA FIGURES

DATA SYSTEMS CONFIGURATION DESCRIPTION:
 (P. 5001) (M) (A)18 - ARC 3.5 (9) - ORBITER + TANK
 (P. 5003) (M) (A)18 - DATA NOT AVAILABLE

BETA .000
 RUDDER .000
 ELEVON .000

REFERENCE INFORMATION
 SREF 2690.0000 SQ.FT.
 LREF 1290.0000
 BREF 1290.0000
 YMRD 979.0000
 ZMRD 400.0000
 SCALE .0100

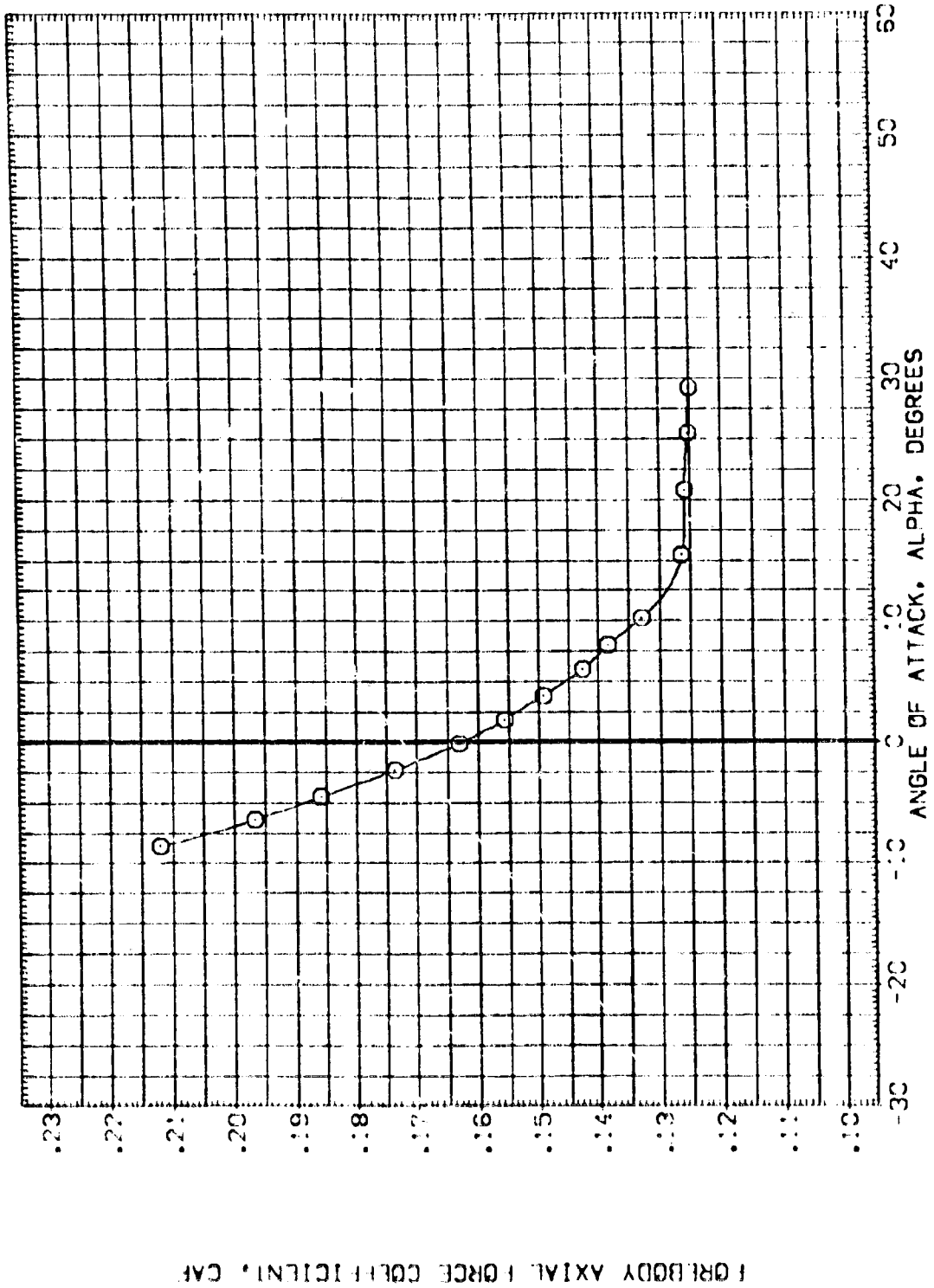


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.
 (A)MACH - 5.28 PAGE :

DATA SYMBOL
 (A) (B) (C) (D)
 (E) (F) (G) (H)

CONFIGURATION DESCRIPTION
 (A) B C D E F G H I J K L M N O P Q R S T U V W X Y Z

BETA PUDDER FILE NO.
 .000 .000 .000 .000
 .000 .000 .000 .000

REFERENCE INFORMATION
 SWP 1000 0000
 DT 1000 0000
 BT 1000 0000
 WDP 1000 0000
 TDP 1000 0000
 SCALE 1000 0000

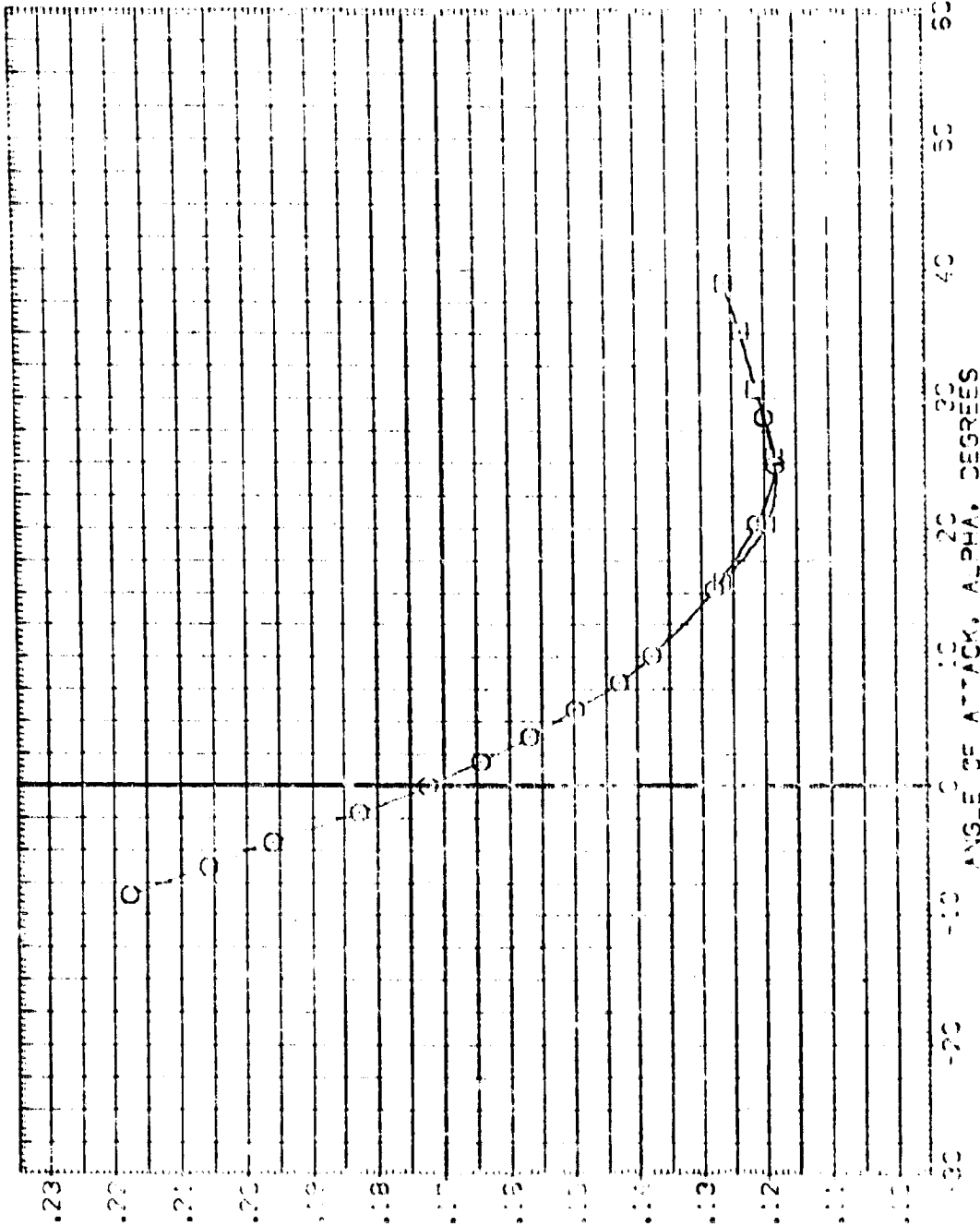


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

CONFIDENTIAL

DATA SET SYMBOL: CONFIGURATION DESCRIPTION
 (X SCALING) : 1A18 - ARC 3.5 (9) - CRIBBITER + TANK
 (X SCALING) : DATA NOT AVAILABLE

BETA: .000
 RUDDER: .000
 ELEVON: .000

REFERENCE INFORMATION:
 SREF: 7690.0000 SOLEF:
 XREF: 7690.0000
 YREF: 7690.0000
 ZREF: 7690.0000
 XMRB: 509.0000
 YMRB: 400.0000
 ZMRB: 400.0000
 SCALE: 0.1000

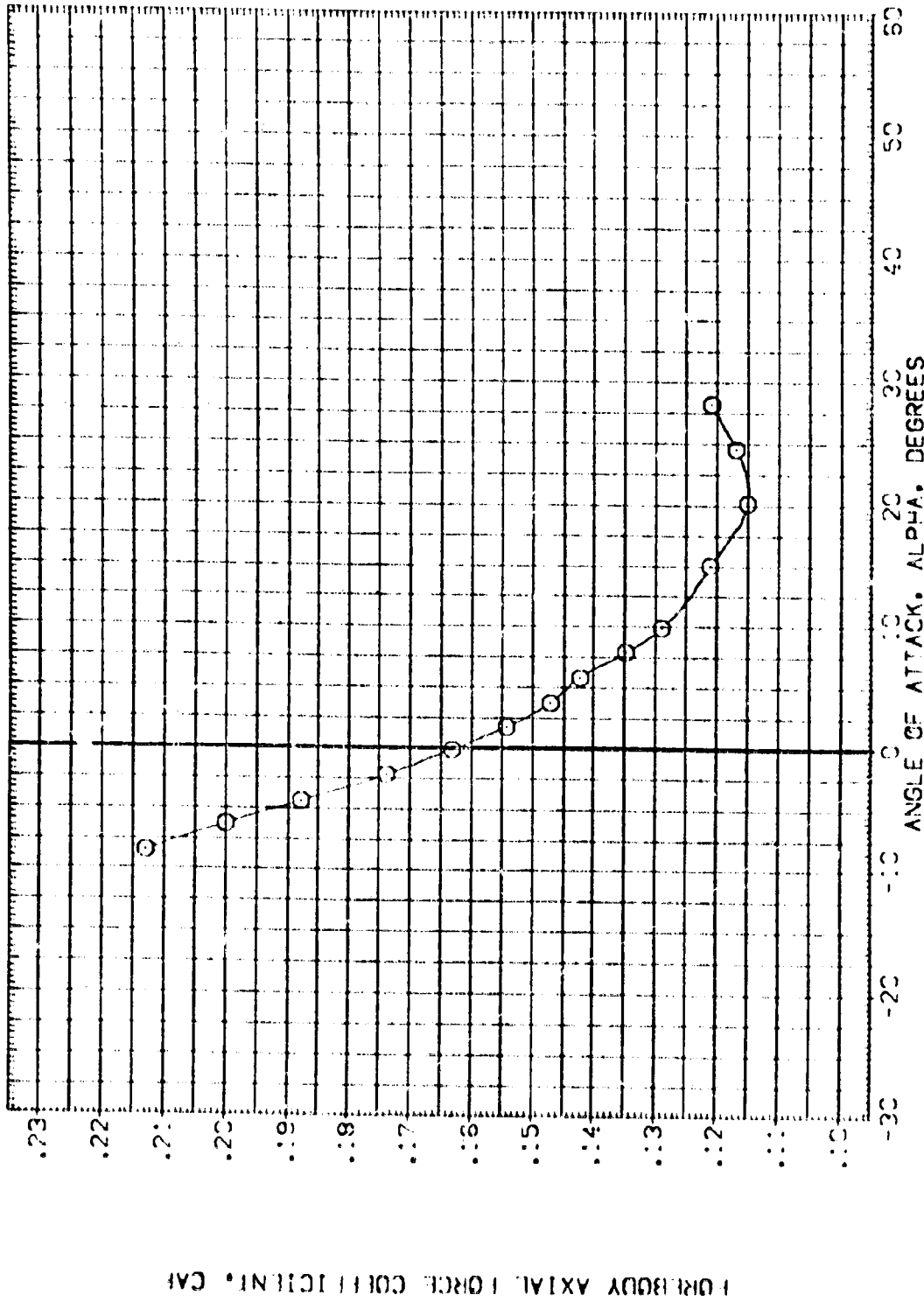


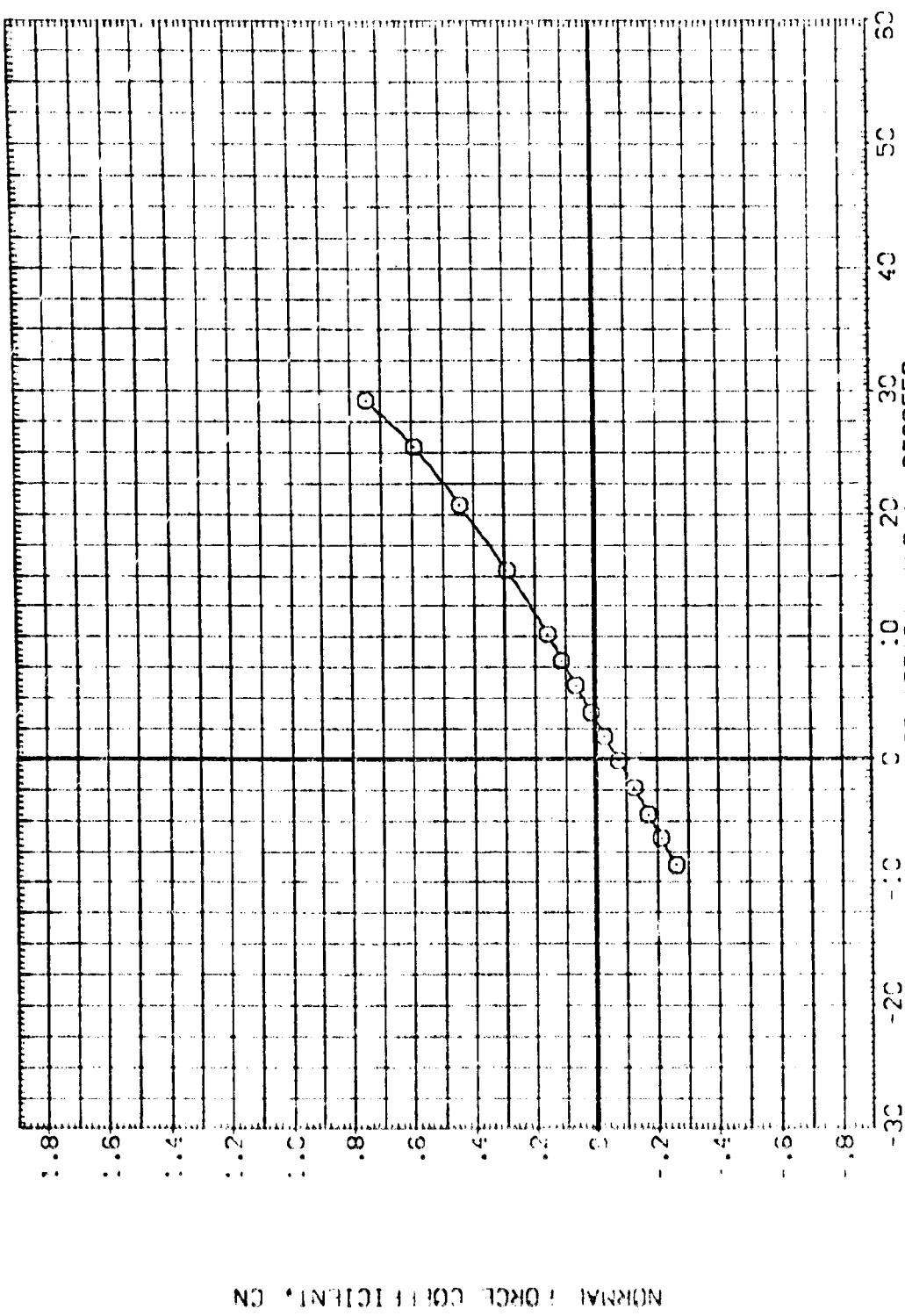
FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

COMACH = 10.29

DATA SET SYMBOL: CONFIGURATION DESCRIPTION
 (X: SCALING) (1) (1)18 - APC 3.15 (1)1 - CRIBBITER + TANK
 (P: SCALING) (1) DATA NOT AVAILABLE

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

REFERENCE INFORMATION
 SRPT 2690 0000 50.57
 REF 1290 0000 11.1
 BRP 1290 0000 11.1
 XMAP 509 0000 11.1
 VMAP 0000 0000 11.1
 7MAP 400 0000 11.1
 SCALE 100000



NORMAL FORCE COEFFICIENT, CN

FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

MACH = 5.29

DATA SKY SYMBOLS
 (X) SCALING
 (P) SCALING

CONFIGURATION DESCRIPTION
 TAIL - ARC 3.5 191 - CRIBITER + TANK
 TAIL - ARC 3.5 191 - CRIBITER + TANK

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

REFERENCE INFORMATION
 SREF 2680.0000 SQ.FT.
 LREF 1.00.3000
 BREF 1.00.3000
 XMRP 9.99.0000 XT
 YMRP .0000 YT
 ZMRP 400.0000 ZT
 SCALE 400.0000

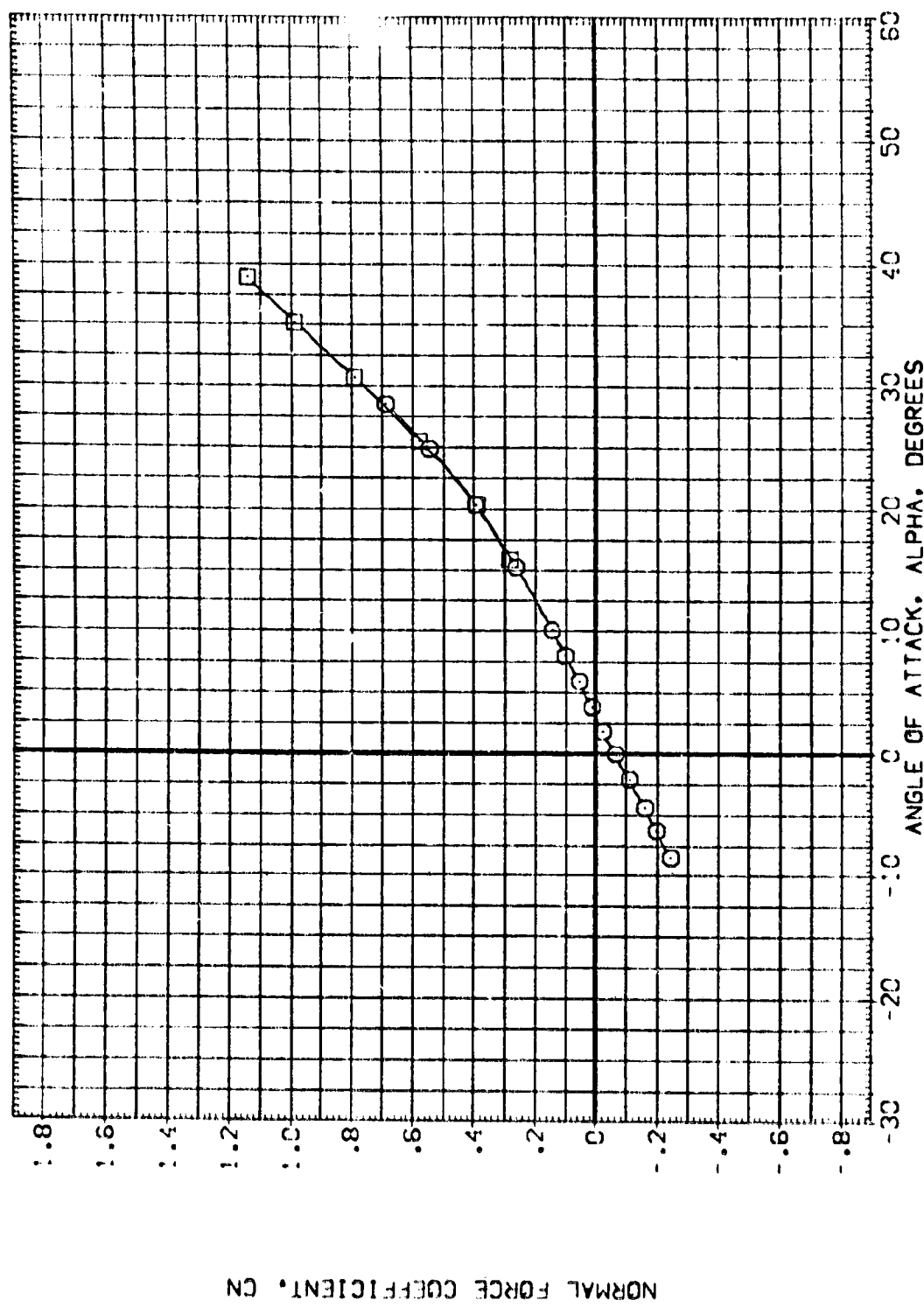


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

(B) MACH = 7.32

DATA SET SYMBOL: (C)
 (RECORDS):
 (PARAMS):

CONFIGURATION DESCRIPTION:
 1:18 - ARC 3.5 19: - OPSITER + TANK
 DATA NOT AVAILABLE

BETA: .000
 RUDDER: .000
 ELEVON: .000

REFERENCE INFORMATION:
 SREF: 2690.0000 SQ. FT.
 LREF: 1290.3000 IN.
 BREF: 260.3000 IN.
 WREF: 97.9 IN.
 XREF: 400.0000 IN.
 YREF: 400.0000 IN.
 ZREF: 400.0000 IN.
 SCALE: .0100

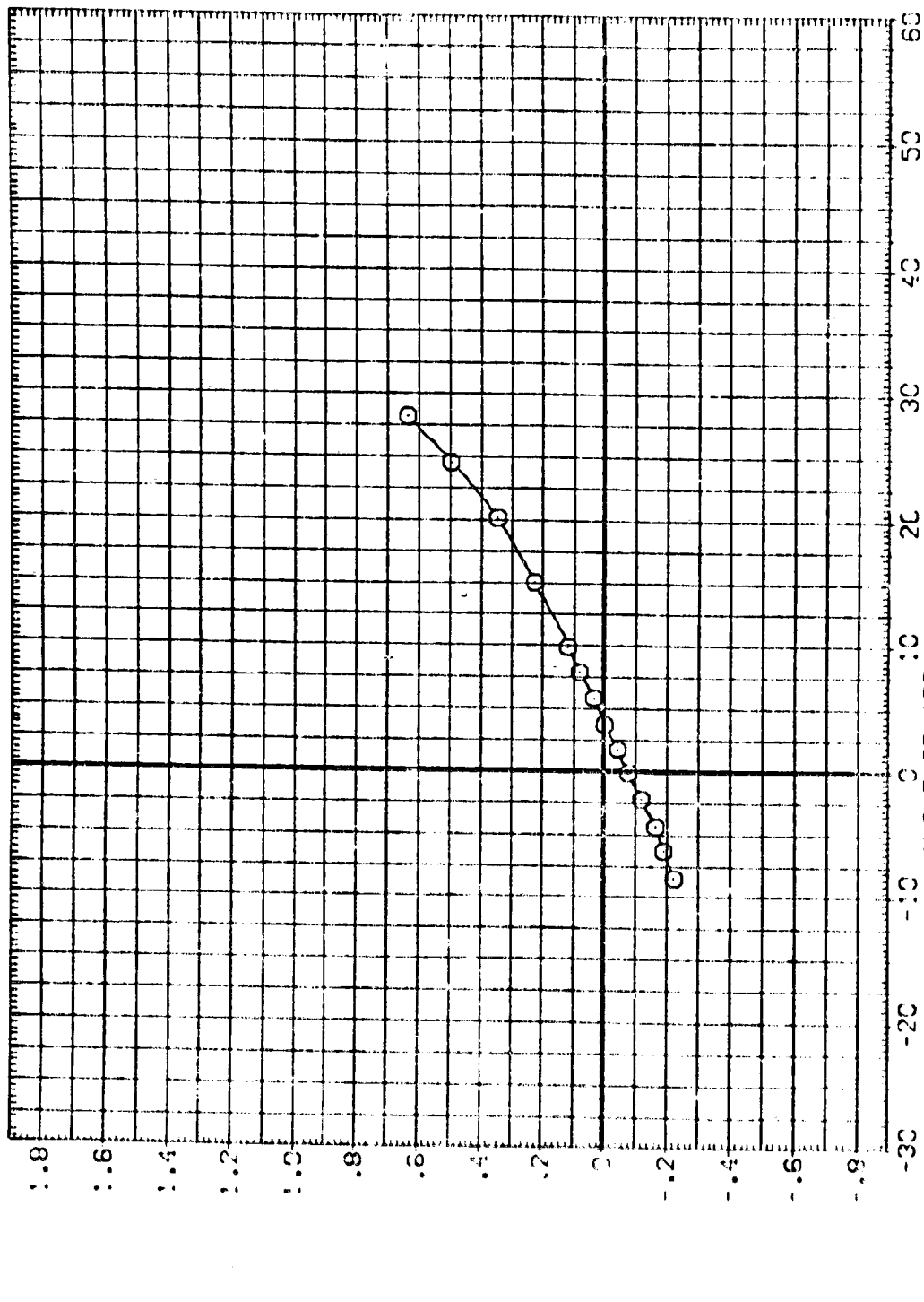


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.
 (C)MACH = 10.29

REFERENCE INFORMATION
 SREF 2690.0000 SQ.F.
 REF 1290.3000
 BREF 1290.3000
 XREF 579.0000
 YREF 400.0000
 ZREF 400.0000
 SCALE .0100

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

DATA SYMBOL CONFIGURATION DESCRIPTION
 (X) SCHEMATIC DATA NOT AVAILABLE
 (O) DATA NOT AVAILABLE

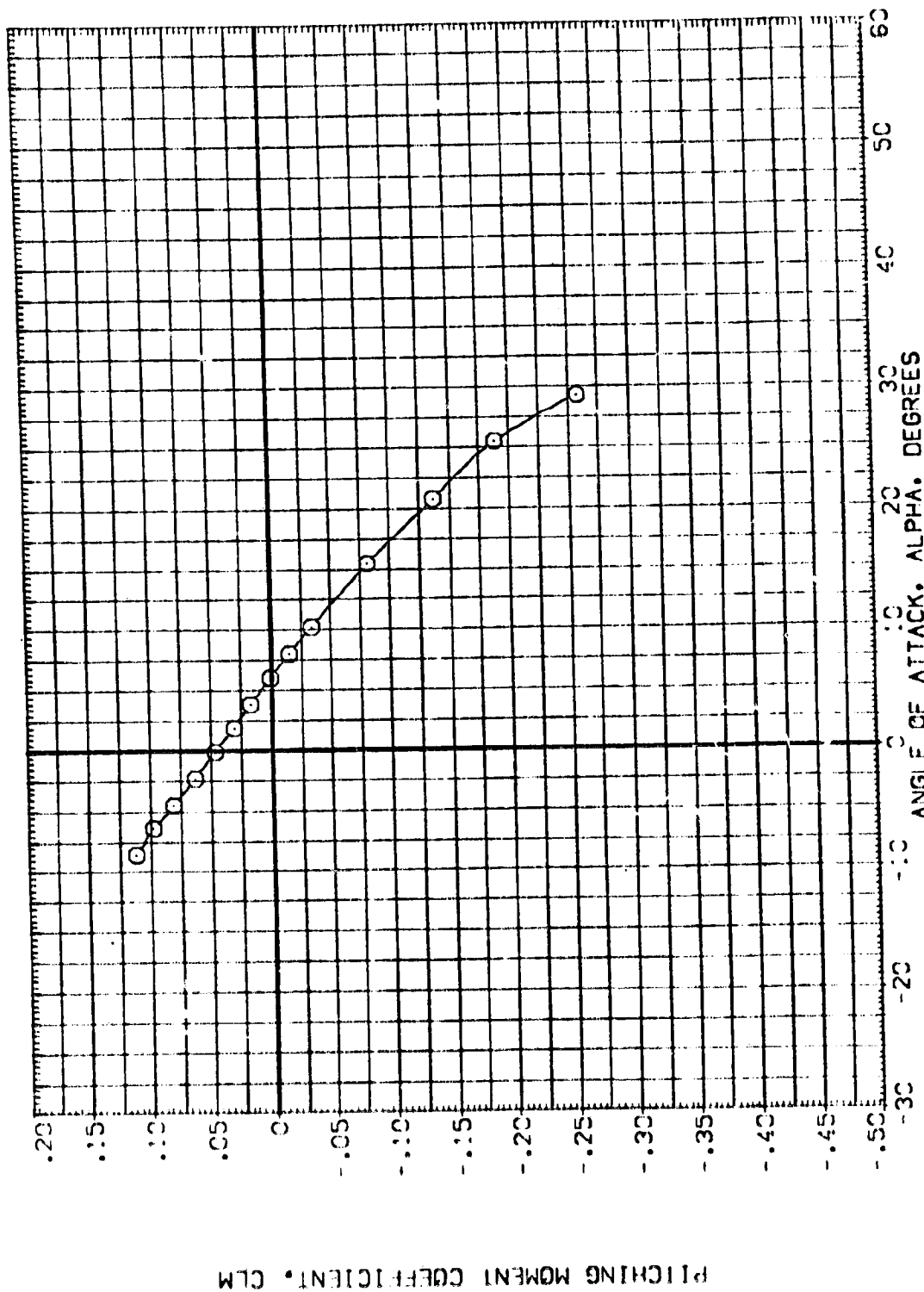


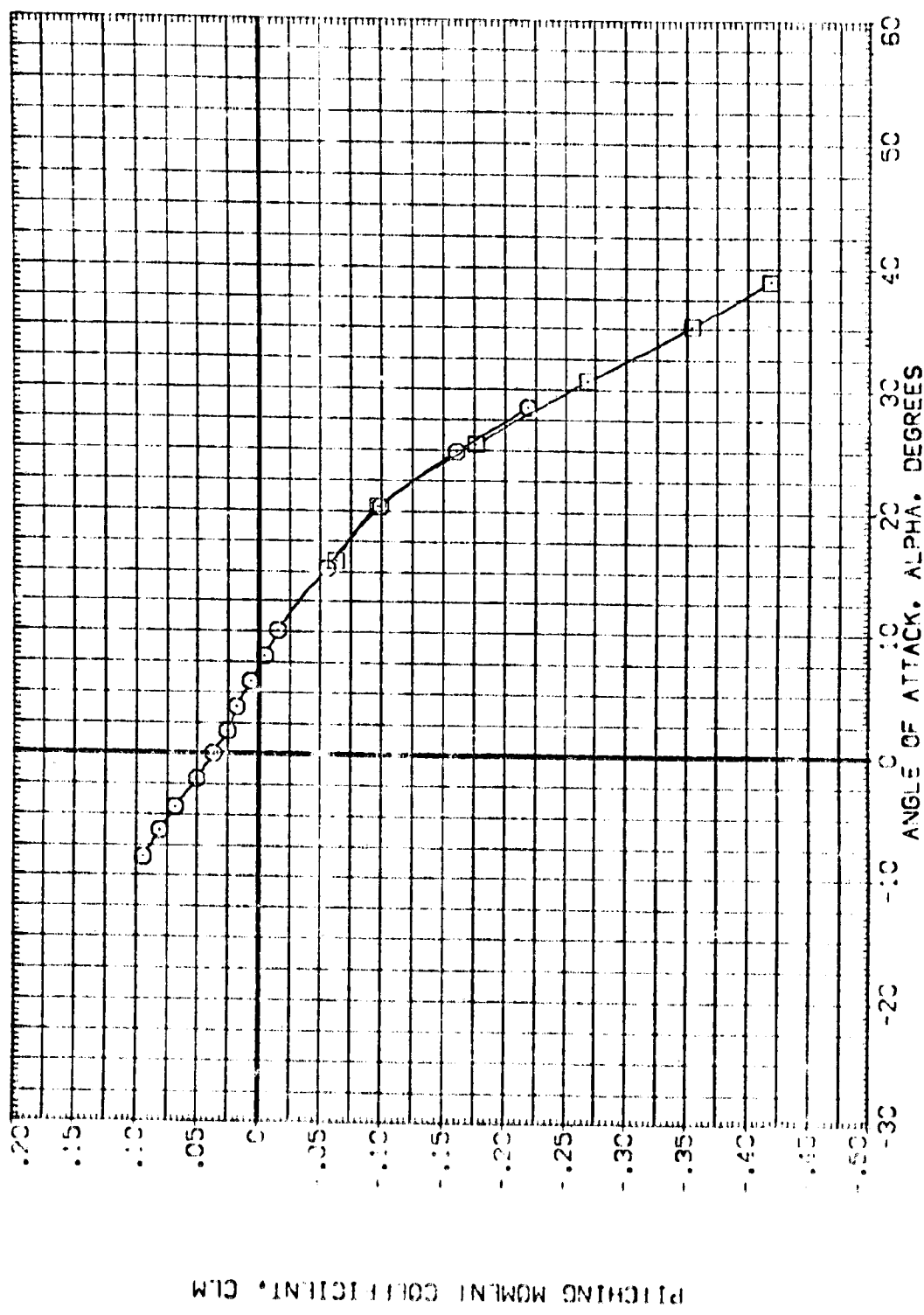
FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

(M)MACH = 5.28

DATA SYMBO. CONFIGURATION DESCRIPTION
 (R) SC(1) (C) 1A18 - ARC 3.5 (R) - 39811ER + TAN
 (A) SC(2) (C) 1A18 - ARC 3.5 (R) - 39811ER + TAN

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

REFERENCE INFORMATION
 SREF 7680.0000 SQ.FT.
 REF 100.0000
 BALE 100.0000
 YMRP 81.9
 YMRP 100.0000
 ZMRP 400.0000
 SCALE 10.000



PITCHING MOMENT COEFFICIENT, CM

FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.
 (C)MACH = 7.32

DATA SET SYMBOL: CONFIGURATION DESCRIPTION
 (P: SC01) (C) 7A16 - ARC 3.5 191 - ORBITER + TANK
 (P: SC05) (C) DATA NOT AVAILABLE

BETA: .000
 RUDDER: .000
 ELEVON: .000

REFERENCE INFORMATION
 SREF: 2680.0000 SQ. FT.
 LREF: 1.0000 IN.
 BR: 1.2000 IN.
 XREF: 9.9 IN.
 YREF: 0.0000 IN.
 ZREF: 400.0000 IN.
 SCALE: 0.0100

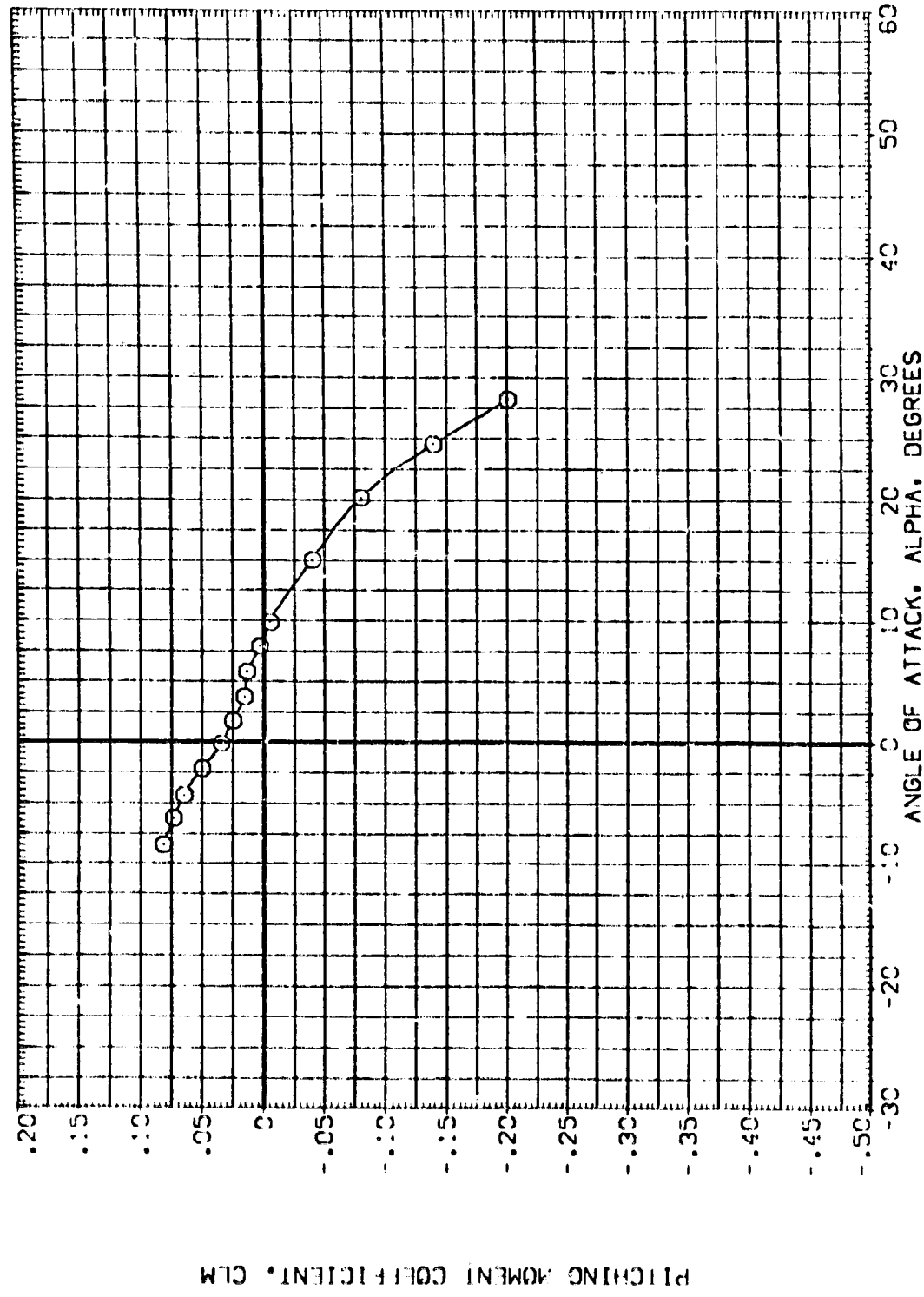


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

(C)MACH = 10.29

DATA SET SYMBOL: ○
 (2) (3) (4)
 (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100)

CONFIGURATION DESCRIPTION
 1A18 - ARC 3.5 191 - CRBITER + TANK
 DATA NOT AVAILABLE

BETA .000
 RUDDER .000
 ELEVON .000

REFERENCE INFORMATION
 SREF 2690.0000 SQ.FT.
 XREF 1.90 3000
 YREF 1.90 3000
 ZREF 9.9 3000
 XMRP 1.90 3000
 YMRP 1.90 3000
 ZMRP 400 3000
 SCALE 1.00

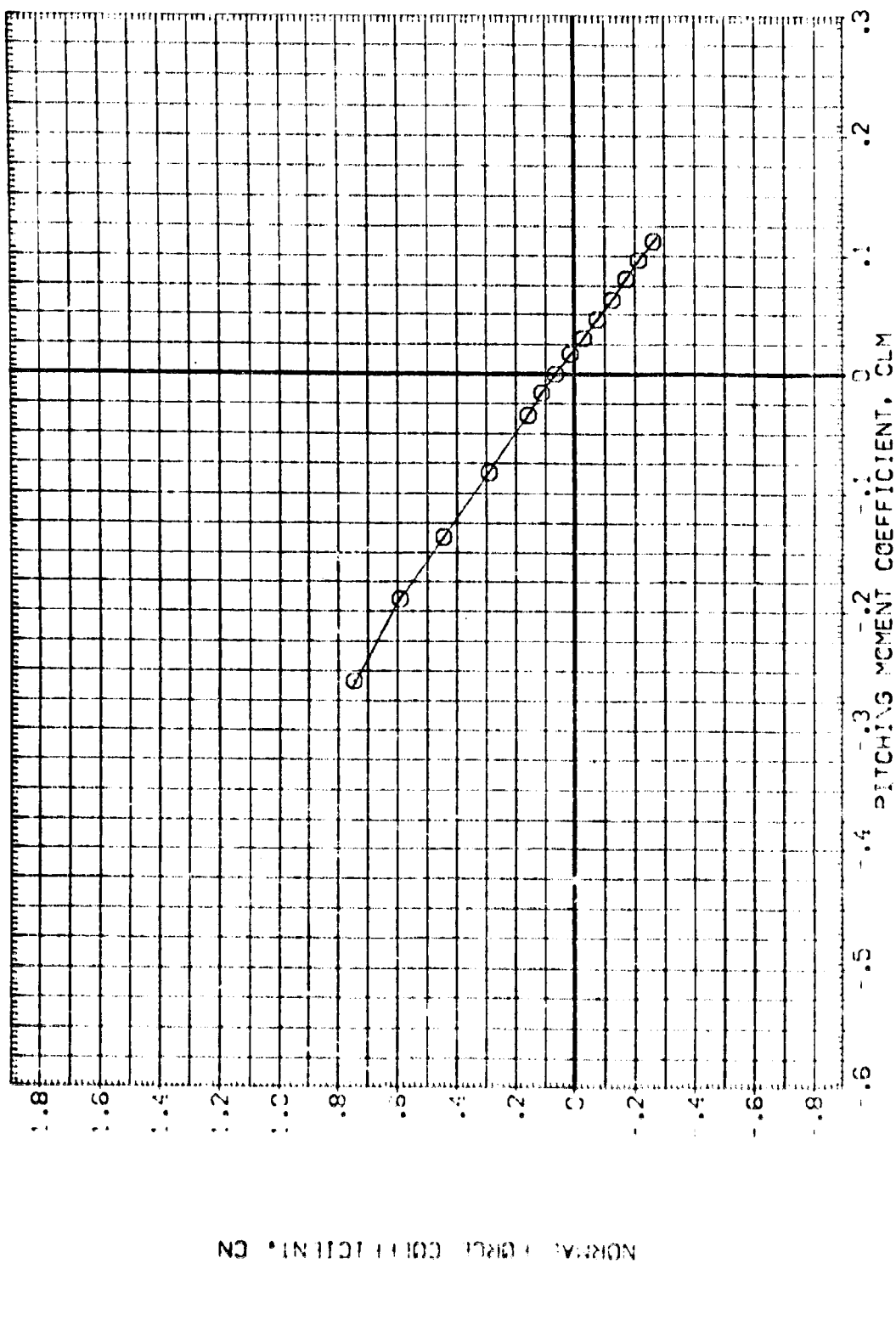


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

REFERENCE INFORMATION
 SREF 2690.0000 SQ.FT.
 SREF 1.0000 IN.
 BRLE 1.0000 IN.
 XMRP 5.19 IN.
 YMRP 1.0000 IN.
 ZMRP 4.00 IN.
 SCAL 2.100

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

CONFIGURATION DESCRIPTION
 1A18 - ARC 3.5 191 - ORBITER + 1AV
 1A18 - ARC 3.5 191 - ORBITER + 1AV

DATA SET SYMBOL
 (1A1800) (1)
 (1A1800) (1)

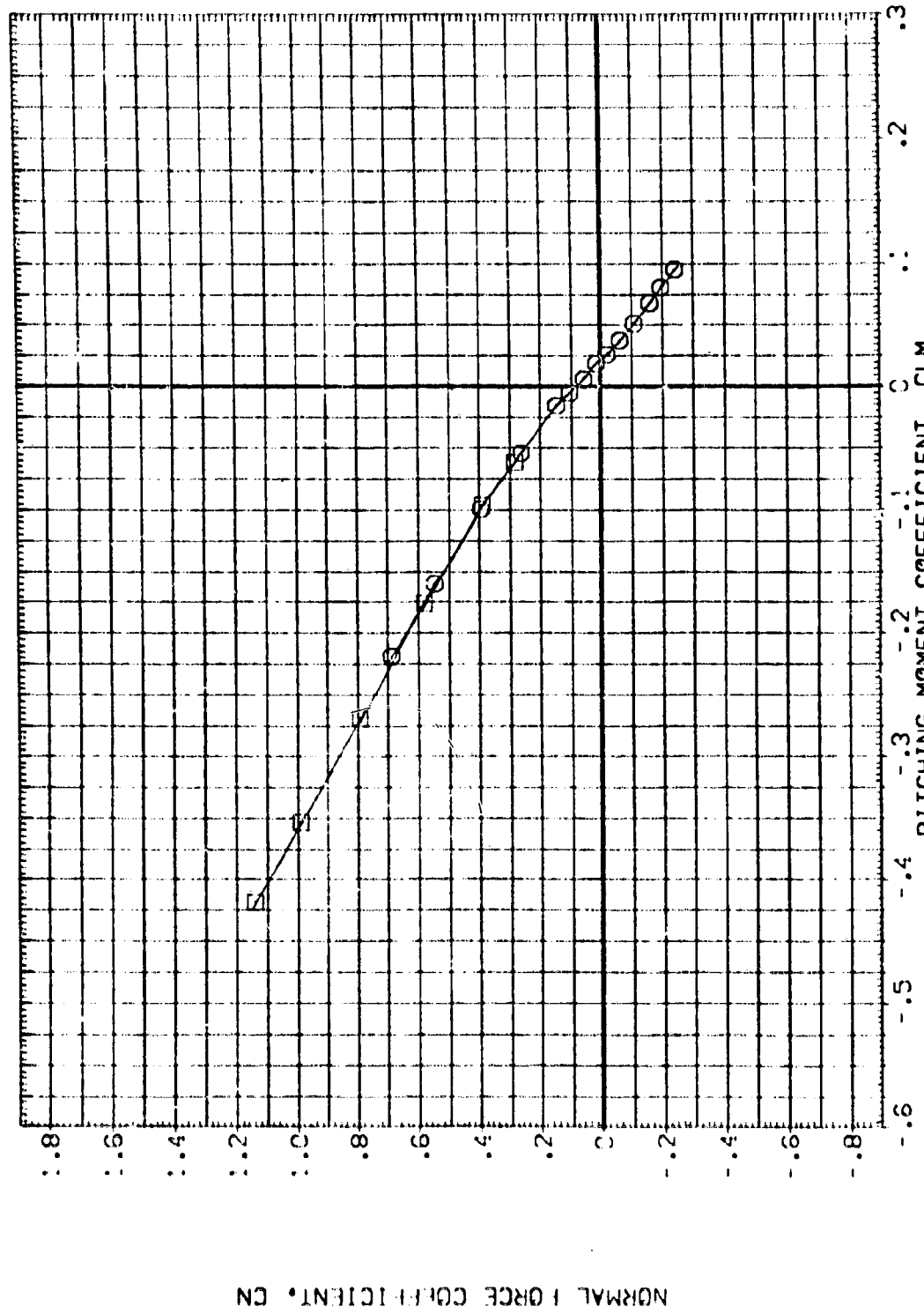
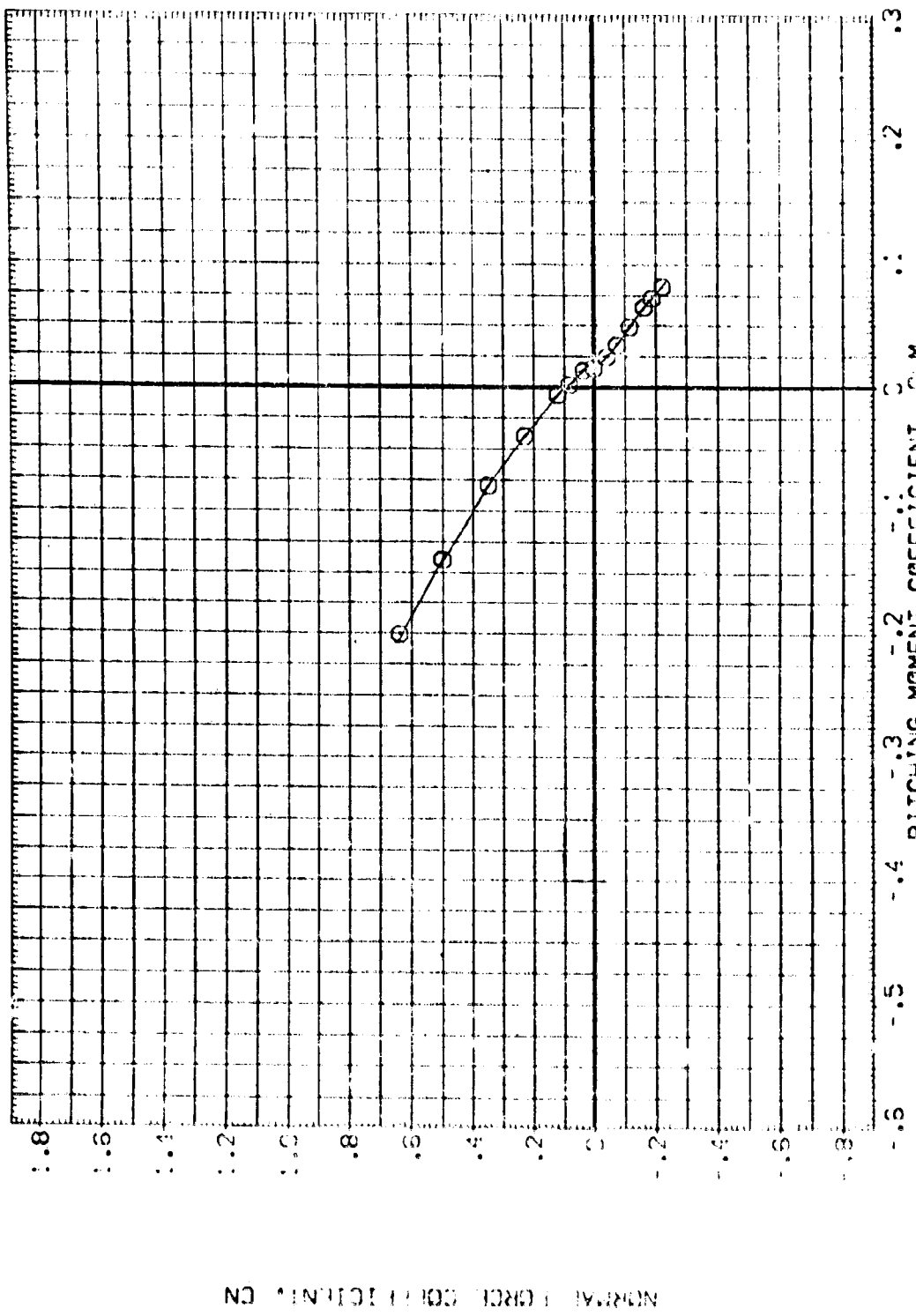


FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

DATA SET SYMBOL: \odot CONFIGURATION DESCRIPTION:
 (2) (302) (1) 1A18 - ARC 3.5 19: - ORBITER + TANK
 (2) (302) (1) DATA NOT AVAILABLE

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

REFERENCE INFORMATION
 SREF 2500.0000 SQ.FT.
 REF 2500.0000
 BREF 2500.0000
 1VXP 579.0000 XT
 1VYP 0.0000 YT
 1VZP 0.0000 ZT
 SCALE 400.0000



NORMAL FORCE COEFFICIENT, CN

FIG. 4 EFFECT OF MACH NUMBER ON SECOND STAGE LONGITUDINAL AERODYNAMIC CHAR.

(RES006)

W18 - ARC 3.5 : 9: - TAM

REFERENCE INFORMATION:
 SREF 2650.0000 SG.FT.
 PREF 1950.3000
 ZREF 190.2
 XREF 197.8
 YREF 400.0
 ZREF 400.0
 SCALE 1.0
 1.2
 1.4
 1.6
 1.8
 2.0

PARAMETRIC VALUES
 BETA .000
 ELEVON .000
 RUDDER .000

MACH 5.799
 BETA .320
 ELEVON 0.000

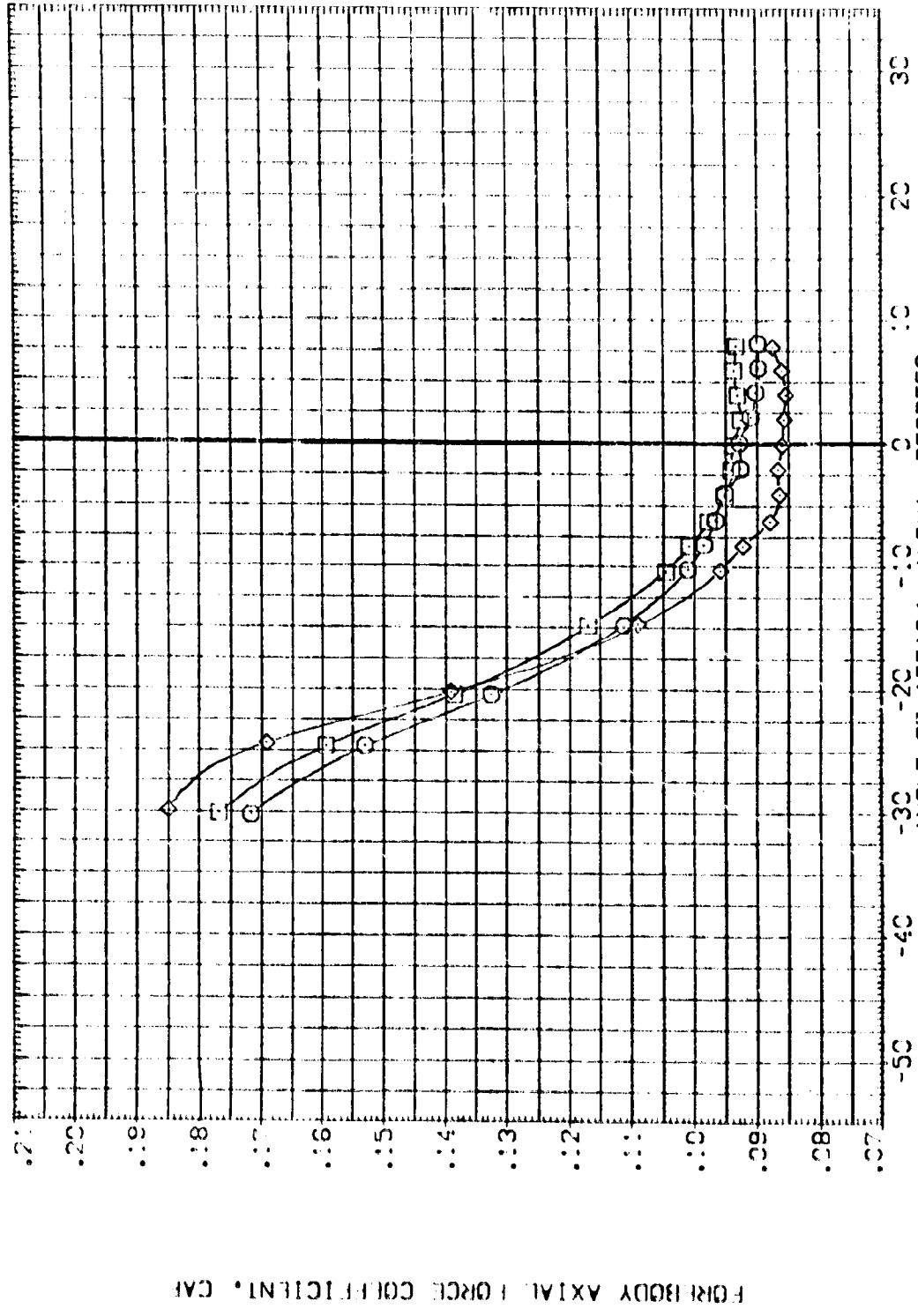


FIG. 5 EFFECT OF MACH NUMBER ON ISOLATED ET LONGITUDINAL AERODYNAMIC CHAR.

(REF 5006)

MA 18 - ARC 3.5 (9) - TAM

SI 90
MACH
5.289
7.300
10.289

BETA
ELEVON

PARAMETRIC VALUES
.000 RUDDER
.000

REFERENCE INFORMATION
SERIAL NO. 1000
DATE 10/28/50
BY 1000
UNIT 1000
SCALE 1000

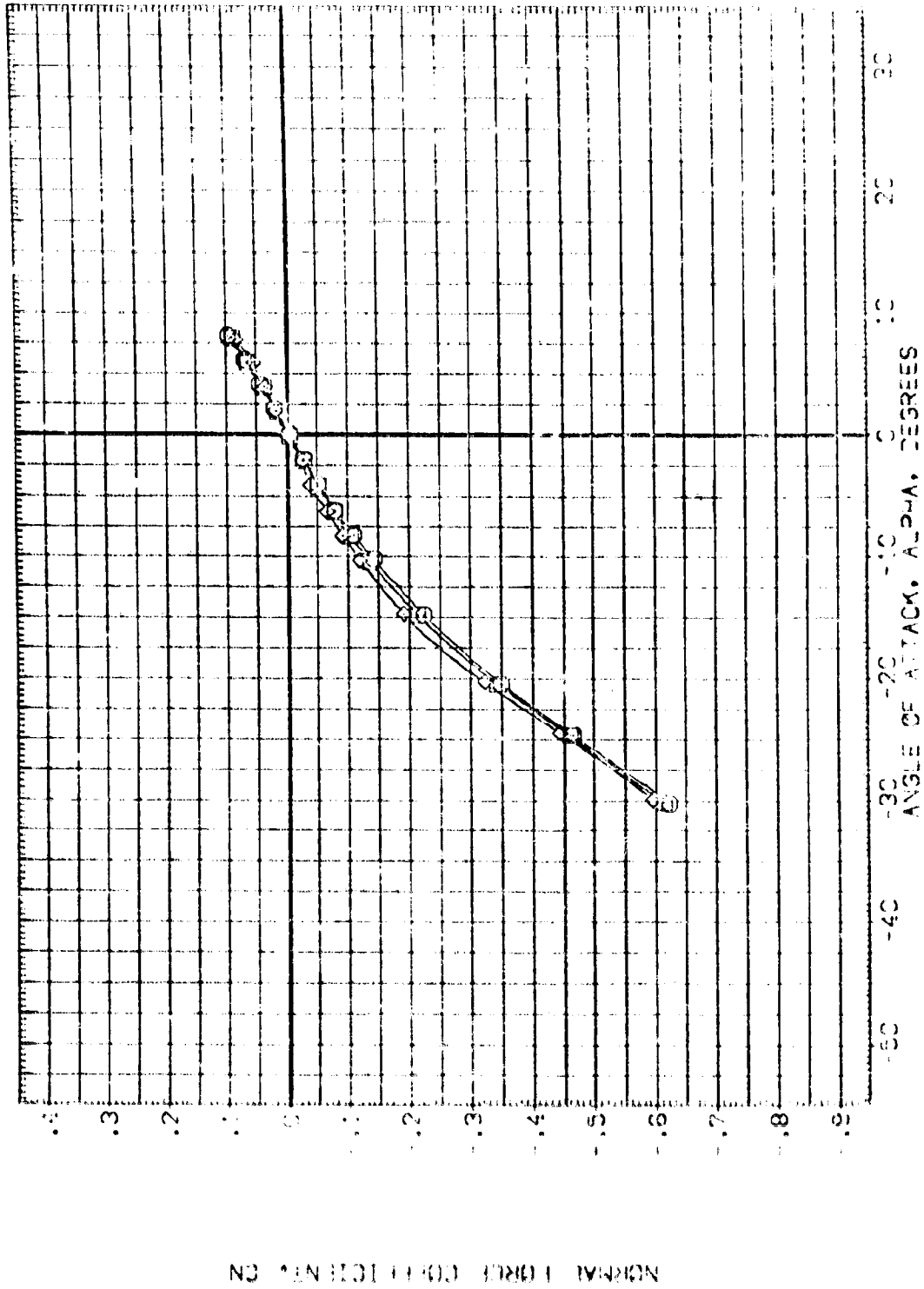


FIG. 5 EFFECT OF MACH NUMBER ON ISOLATED ET LONGITUDINAL AERODYNAMIC CHAR.



(RES006)

TAIS - ARC 3.5 19: TANK

SYMBOL: MACH: 5.789
 7.970
 12.789

BETA: .000
 ELEV: .000
 RUDER: .000

◇
 ○

REFERENCE INFORMATION:
 SR.F: 2680.0000
 DR.F: 1780.3000
 BR.F: 1780.3000
 VM03: 979.0000
 VM02: 1000.0000
 VM01: 400.0000
 SCALE: .0100

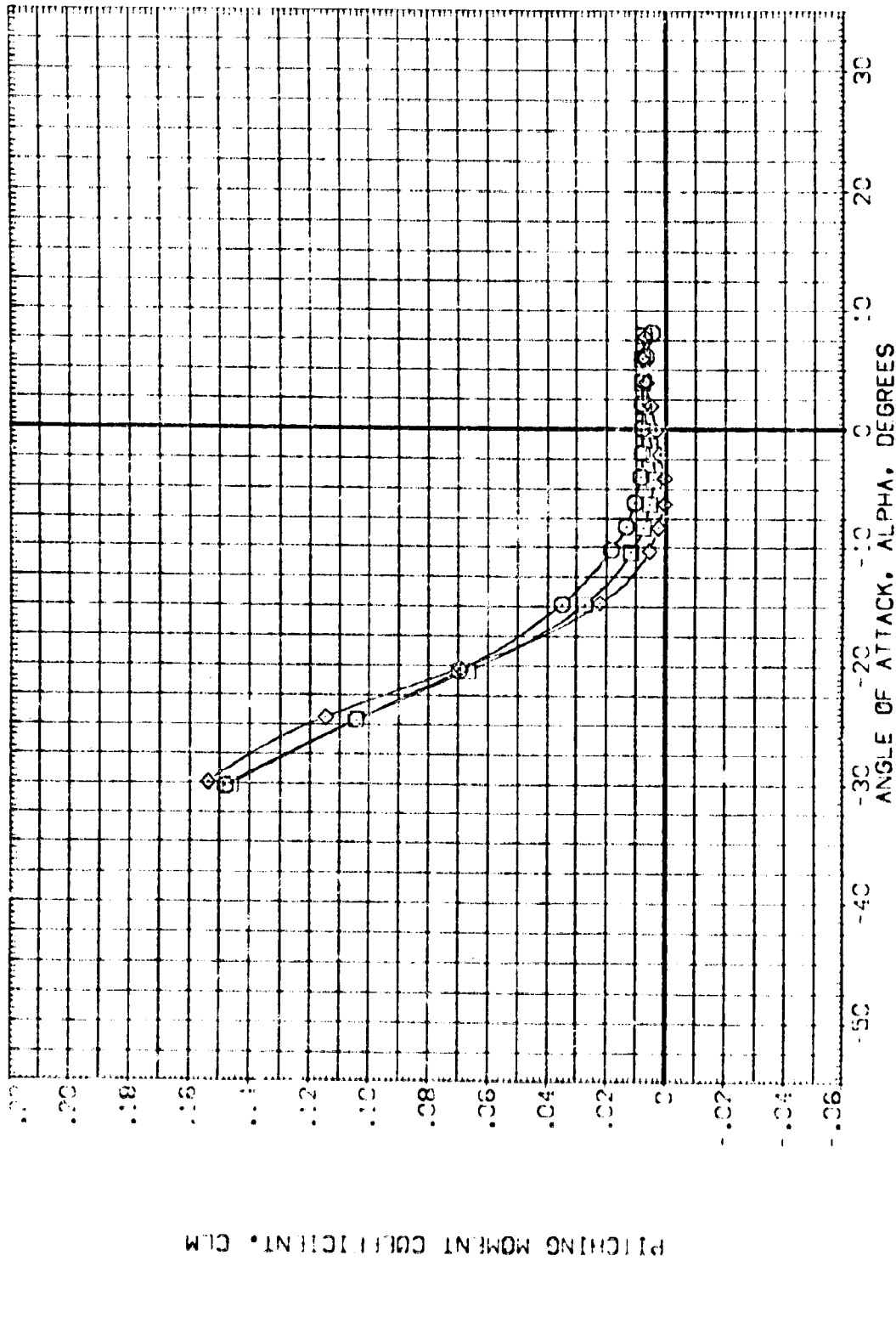


FIG. 5 EFFECT OF MACH NUMBER ON ISOLATED ET LONGITUDINAL AERODYNAMIC CHAR.

(RES006)

ARC 3.5 (9) TANK

SYMBOL MACH
 (1) 5.089
 (2) 5.330
 (3) 5.579

PARAMETRIC VALUES
 .000
 .000
 .000

RUDDER
 .000

REFERENCE INFORMATION
 SREF 2690.0000
 XREF 1000.0000
 YREF 1000.0000
 ZREF 1000.0000
 XMRP 5.0
 YMRP 5.0
 ZMRP 5.0
 SCALE 400.0000

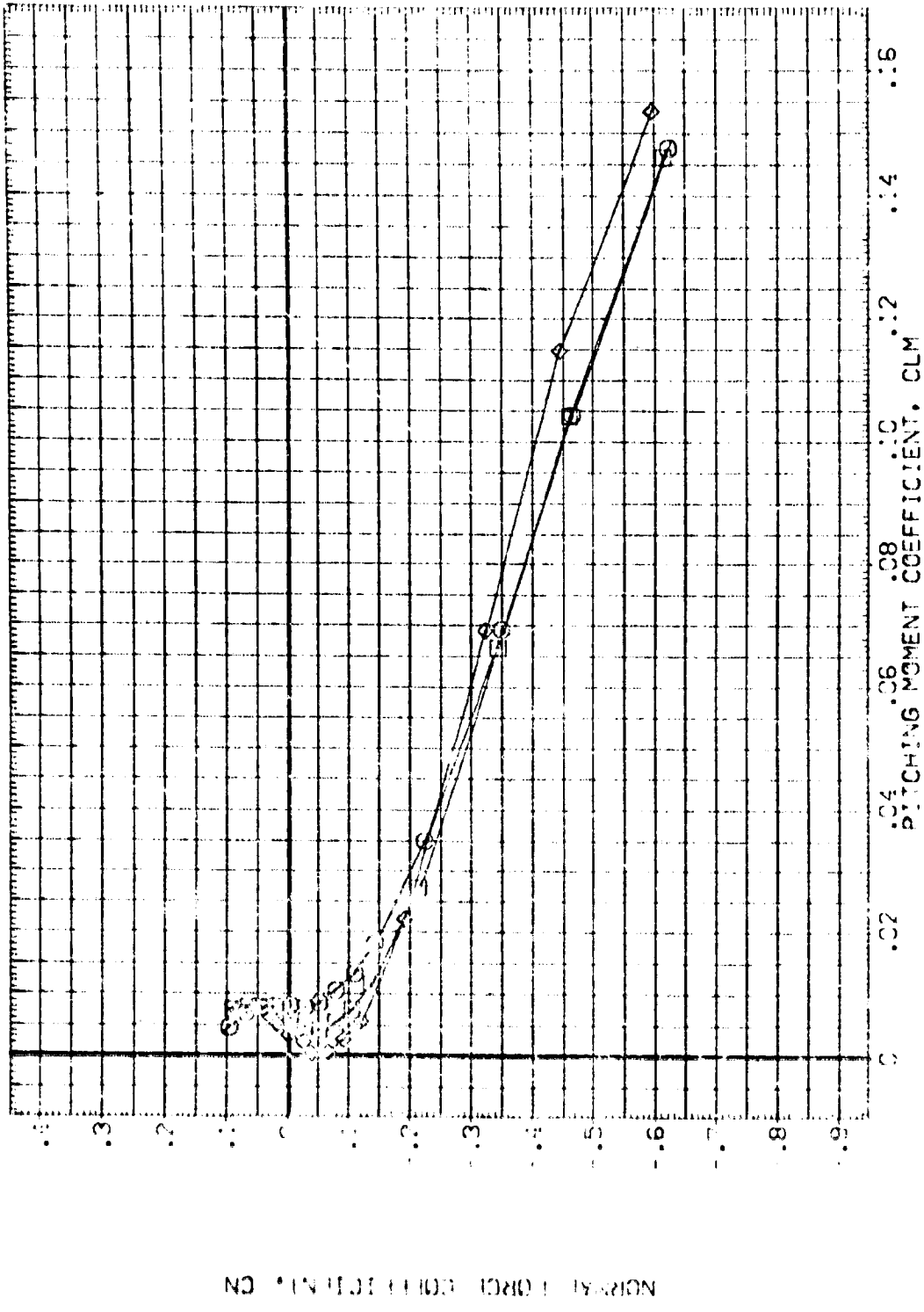


FIG. 5 EFFECT OF MACH NUMBER ON ISOLATED ET LONGITUDINAL AERODYNAMIC CHAR.

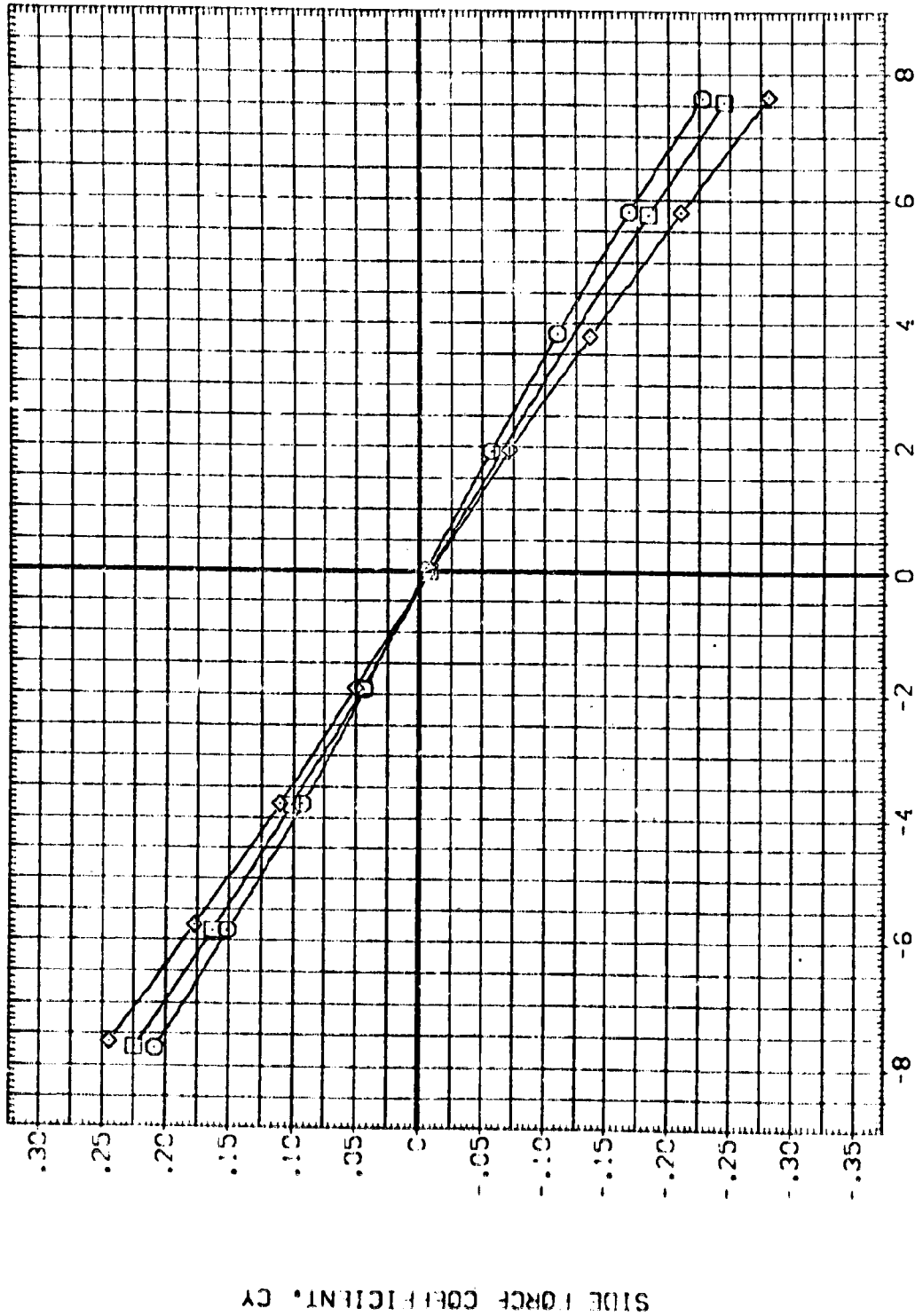


DATA SET SYMBOL: C
 * SC02
 * SC03
 * SC04

CONFIGURATION DESCRIPTION
 1A18 - ARC 3.5 (1) - 093:TER : TANK
 1A18 - ARC 3.5 (1) - 093:TER : TANK
 1A18 - ARC 3.5 (1) - 093:TER : TANK

ALPHA RUDDER ELEVON
 4.000 .000 .000
 .000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION
 SREF 2680.0000 SO.FT.
 REF 1200.0000
 SREF 1200.0000
 SREF 1200.0000
 XMRP 97.9 .0000
 YMRP .0000
 ZMRP .0000
 N.YI .0000
 N.ZI .0000
 SCALE 400.0100



SIDE FORCE COEFFICIENT, CY

FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

DATA SET SYMBO. CONFIGURATION DESCRIPTION

(X) 3000 () 1A18 - ARC 3.5 181 - ORBITER + TANK
 (X) 3003 () 1A18 - ARC 3.5 181 - ORBITER + TANK
 (X) 3004 () 1A18 - ARC 3.5 181 - ORBITER + TANK

REFERENCE INFORMATION

SREF 2690.0000 SO.FT.
 XREF 230.0000
 YREF 230.0000
 XMRP 979.0000
 YMRP 979.0000
 ZMRP 400.0000
 SCALE 100.0000

ALPHA RUDDER ELEVON

4.000 .000 .000
 .000 .000 .000
 -4.000 .000 .000

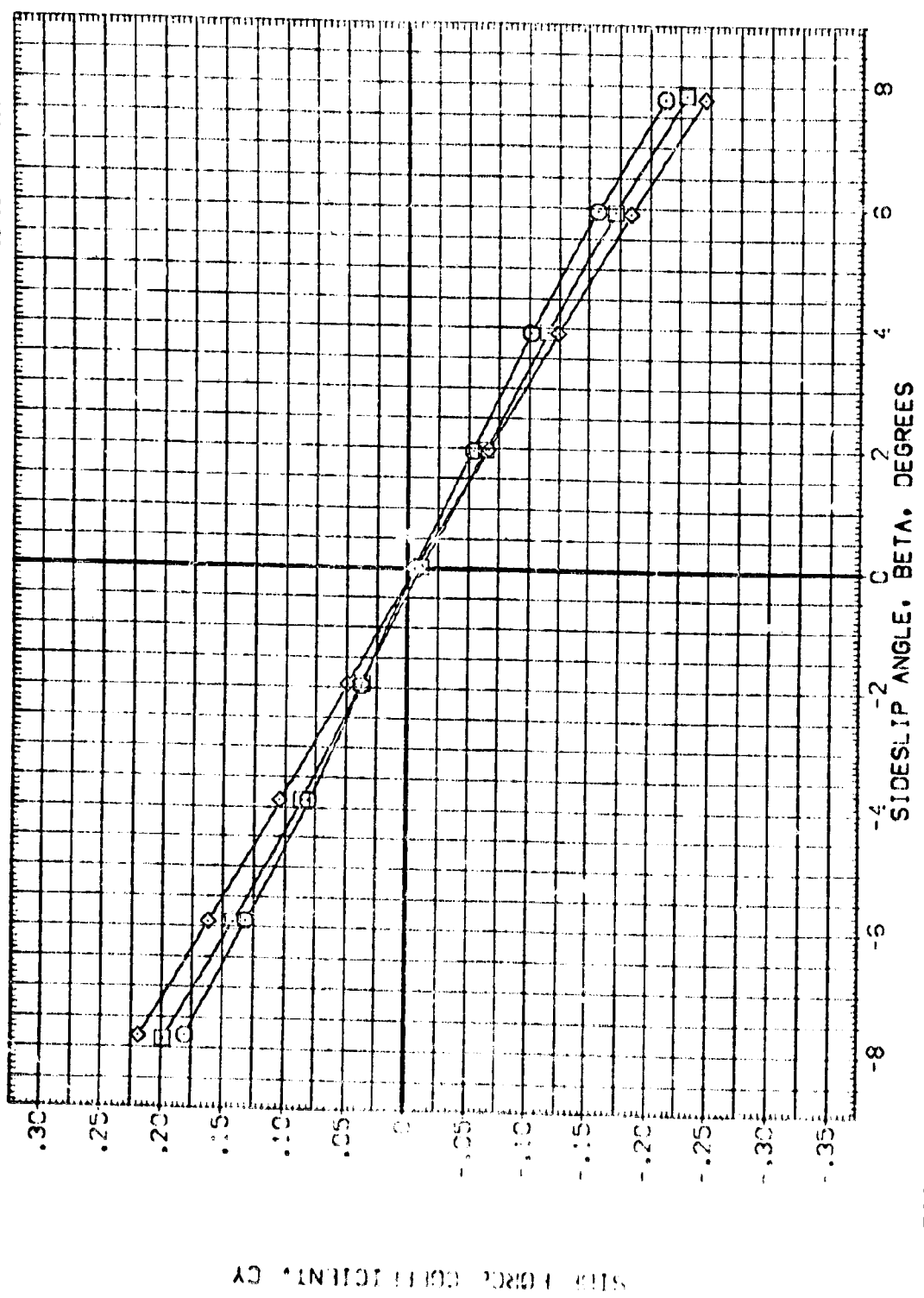


FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

CBMAC = 7.32

PAGE : 8



DATA SET SYMBO. CONFIGURATION DESCRIPTION
 (R) S002 () A1B - APC 3.5 (9) - CRGITER * TAMK
 (R) S003 () A1B - APC 3.5 (9) - CRGITER * TAMK
 (R) S004 () A1B - APC 3.5 (9) - CRGITER * TAMK

ALPHA RUDDER ELEVON
 4.000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION
 SREF 2690.0000 SQ.FT.
 LREF 1.290.3000 IN.
 BREF 1.290.3000 IN.
 XWOP 979 IN. XT
 YWOP 10000 IN. YT
 ZWOP 400 IN. ZT
 SCALE .0100

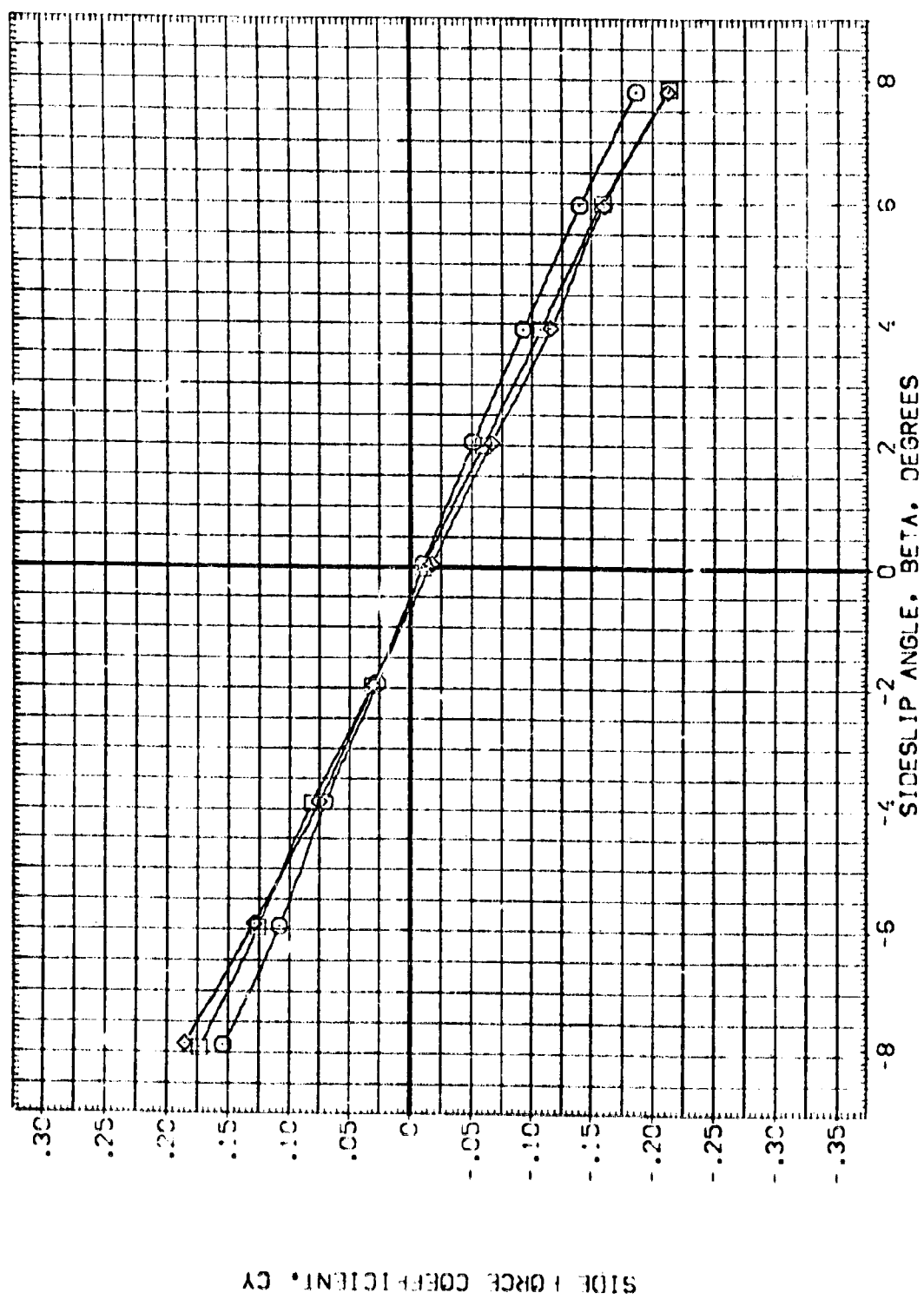


FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERC. CHAR.
 COMAC = 10.29 PAGE : 9

DATA SET SYMBOL CONFIGURATION DESCRIPTION

(P-5002) ○ 1A18 ARC 3.5 (9) - POSITIVE 1 TANK
 (P-5003) □ 1A18 ARC 3.5 (9) - POSITIVE 1 TANK
 (P-5004) ◇ 1A18 ARC 3.5 (9) - POSITIVE 1 TANK

REFERENCE INFORMATION

SREF 2680.0000 SQ.FT.
 REF 1260.0000
 BREF 1260.0000
 XREF 9.9
 YREF 400.0000
 ZREF 400.0000
 SCALE 400.0000

ALPHA RUDDER ELEVON

4.0000 .000 .000
 4.0000 .000 .000
 -4.0000 .000 .000

YAWING MOMENT COEFFICIENT, C_{YN} (BODY AXIS)

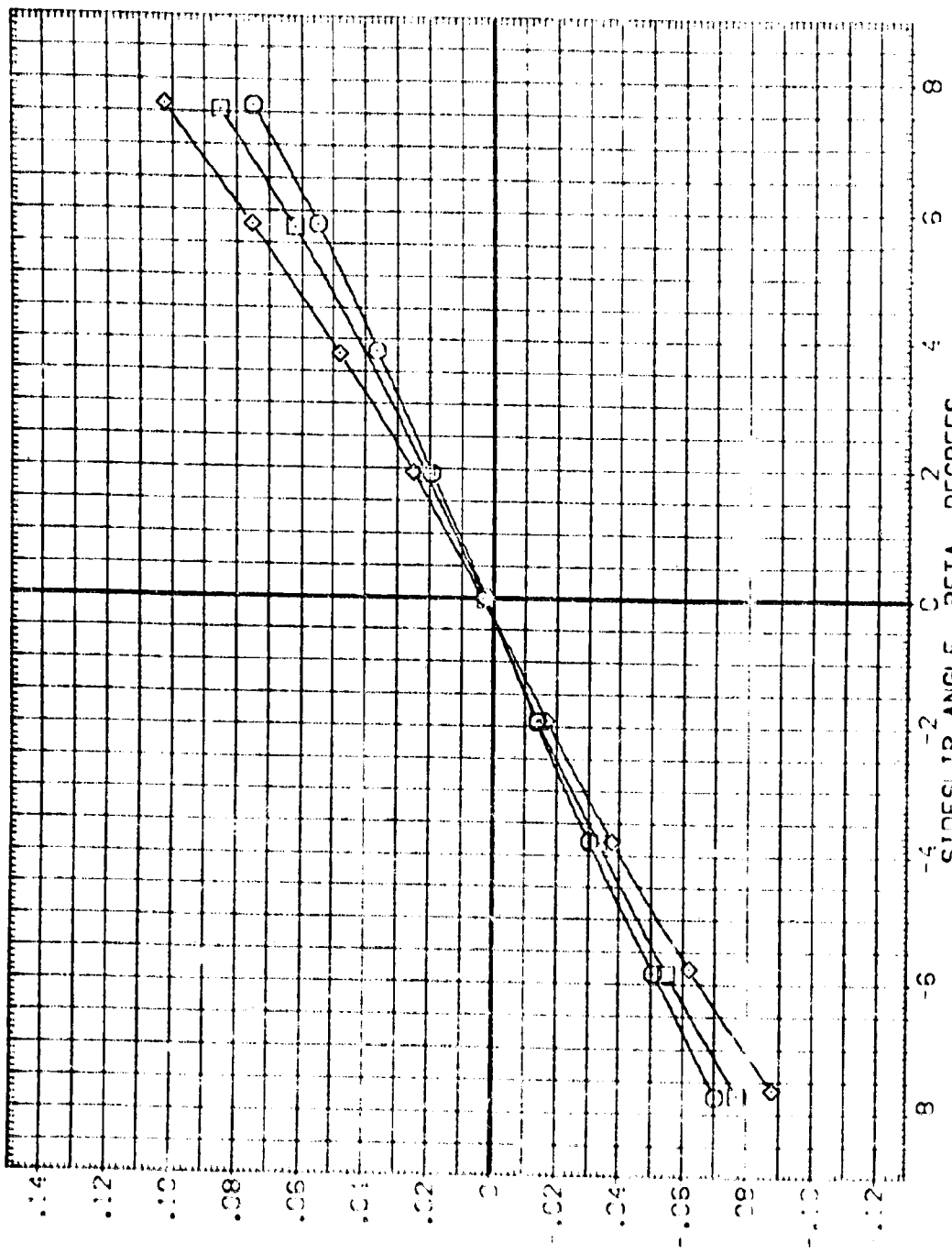


FIG. 8 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.
 CADMAC- 15.29 PAGE 20

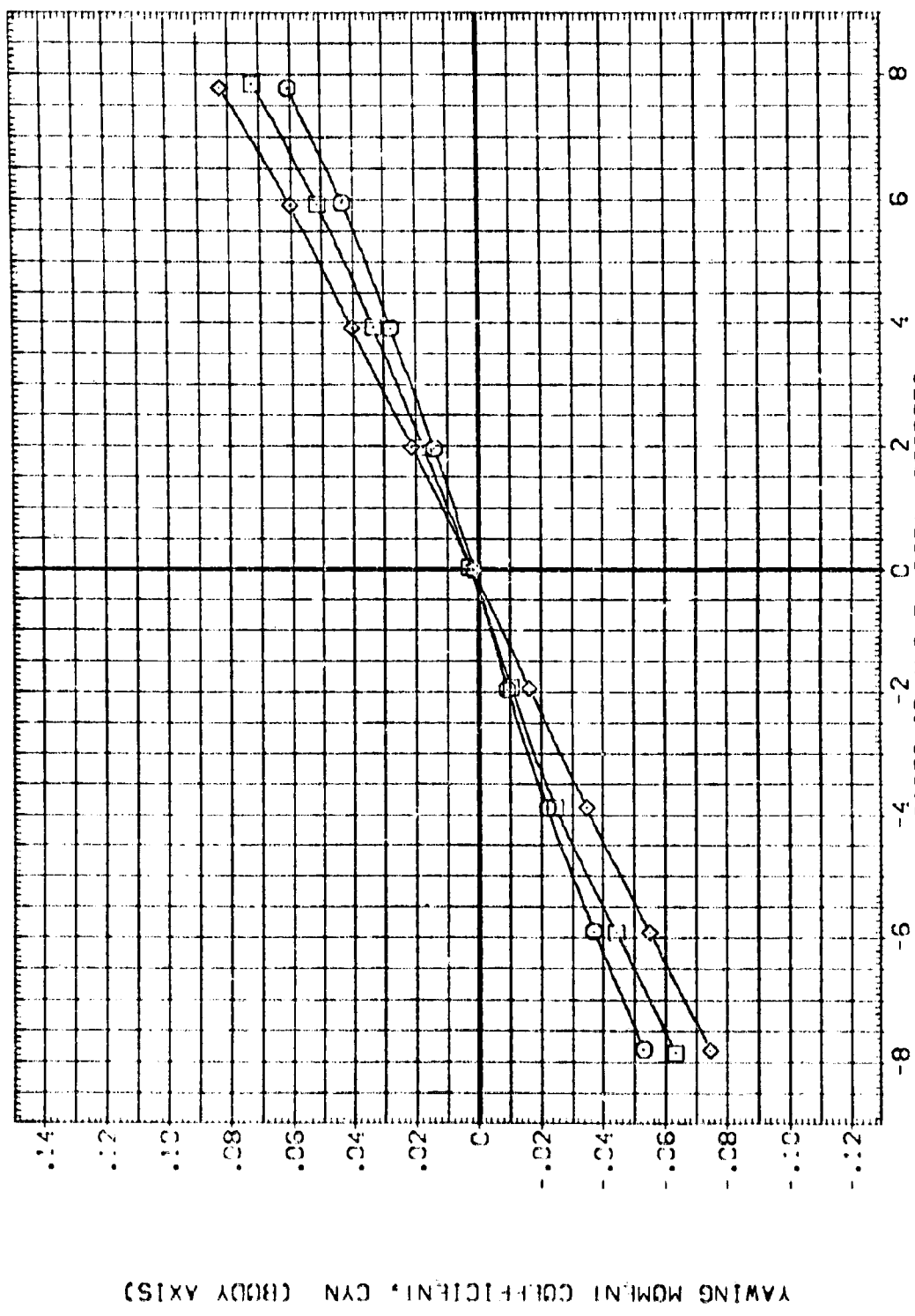


REFERENCE INFORMATION
 SREF 2500.0000 SQ.FT.
 RREF 1000.0000
 BRFE 2500.0000
 XREF 5.0000
 YREF 0.0000
 ZREF 0.0000
 XZT 0.0000
 YZT 0.0000
 ZT 0.0000
 SCALE 1.0000

ALPHA RUDDER ELEVON
 4.000 .000 .000
 4.000 .000 .000
 -4.000 .000 .000

CONFIGURATION DESCRIPTION
 1A18 - APC 3.5 191 - CRBITER * TANK
 1A18 - APC 3.5 191 - CRBITER * TANK
 1A18 - APC 3.5 191 - CRBITER * TANK

S.S. SYMBO
 (X) (O) (S) (D) (E) (F) (G) (H) (I) (J) (K) (L) (M) (N) (O) (P) (Q) (R) (S) (T) (U) (V) (W) (X) (Y) (Z)



YAWING MOMENT COEFFICIENT, CYN (BODY AXIS)

FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

DATA SET SYMBOL

CONFIGURATION DESCRIPTION
 1A18 - ARC 3.5 191 - ORBITER + TANK
 1A18 - ARC 3.5 191 - ORBITER + TANK
 1A18 - ARC 3.5 191 - ORBITER + TANK

ALPHA RUDDER ELEVON
 4.000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION
 SREF 2690.0000 50. FT.
 .REF 1290.3000
 .REF 1290.3000
 XREF 979.0000
 YREF 0.0000
 ZREF 400.0000
 SCALE 1.000

YAWING MOMENT COEFFICIENT, CYN (BODY AXIS)

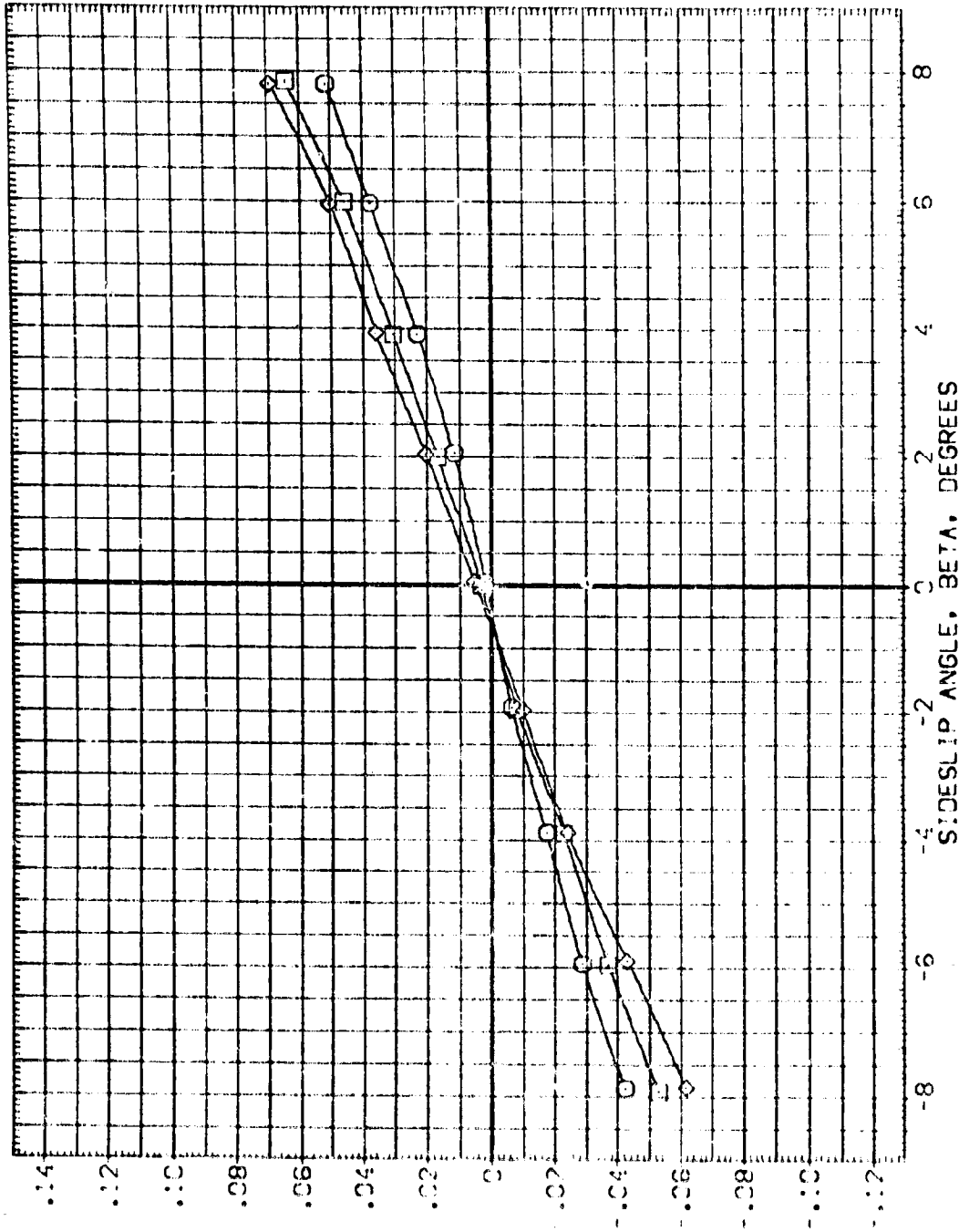


FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AEROS. CHAR.

COMAC = 10.29

DATA SET SYMBO: CONFIGURATION DESCRIPTION

(1) SC001 (1) A18 - ARC 3.5 (9) - C981TER + TANK

(2) SC002 (2) A18 - ARC 3.5 (9) - C981TER + TANK

(3) SC003 (3) A18 - ARC 3.5 (9) - C981TER + TANK

ALPHA RUDDER ELEVON

4.000 .000 .000

.000 .000 .000

-4.000 .000 .000

REFERENCE INFORMATION

SREF 2690.0000 SQ. FT.

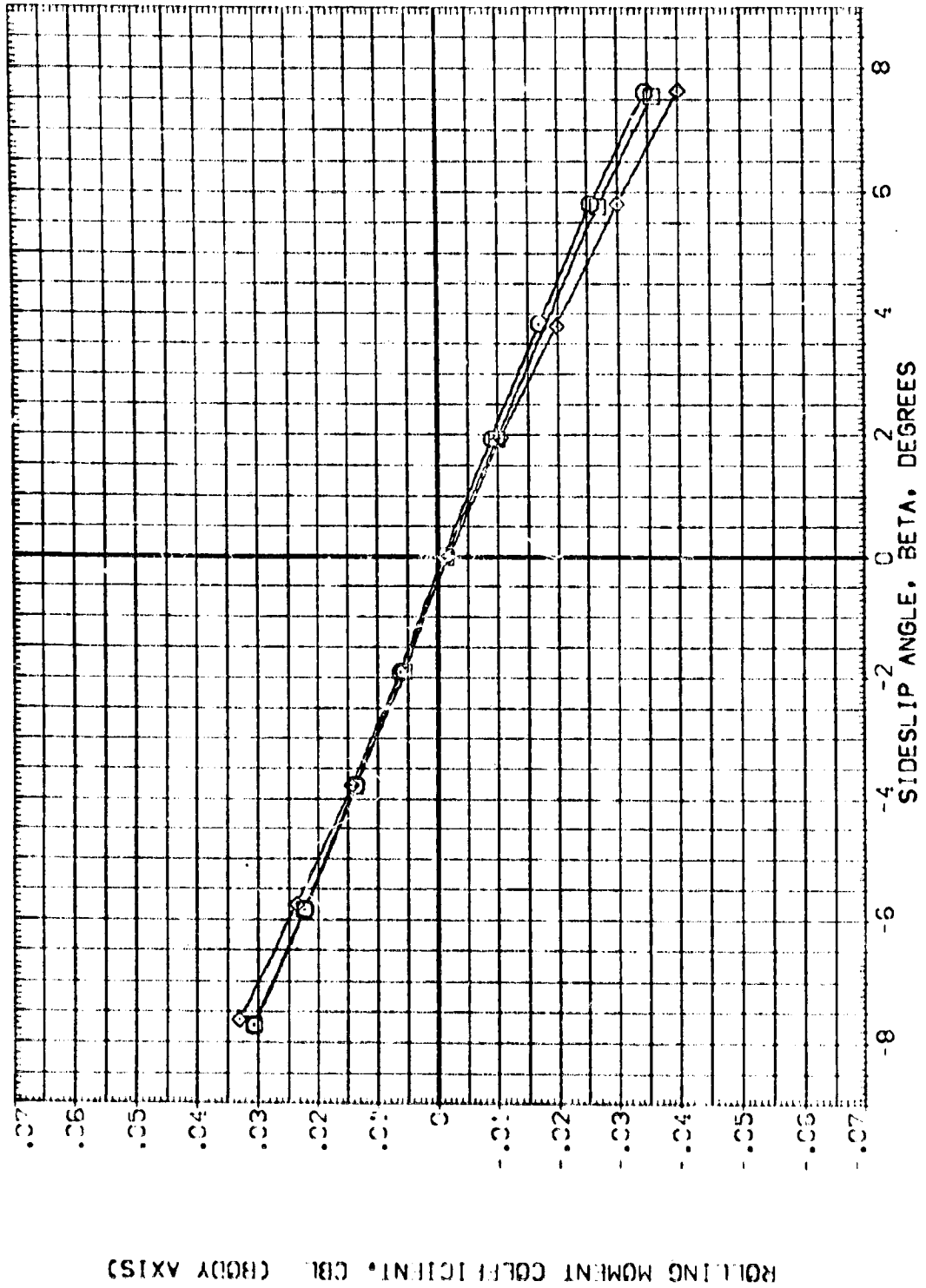
LREF 100.0000

BREF 1.0000

VMRD 9.0000

ZMRD 0.0000

SCALE 400.0000



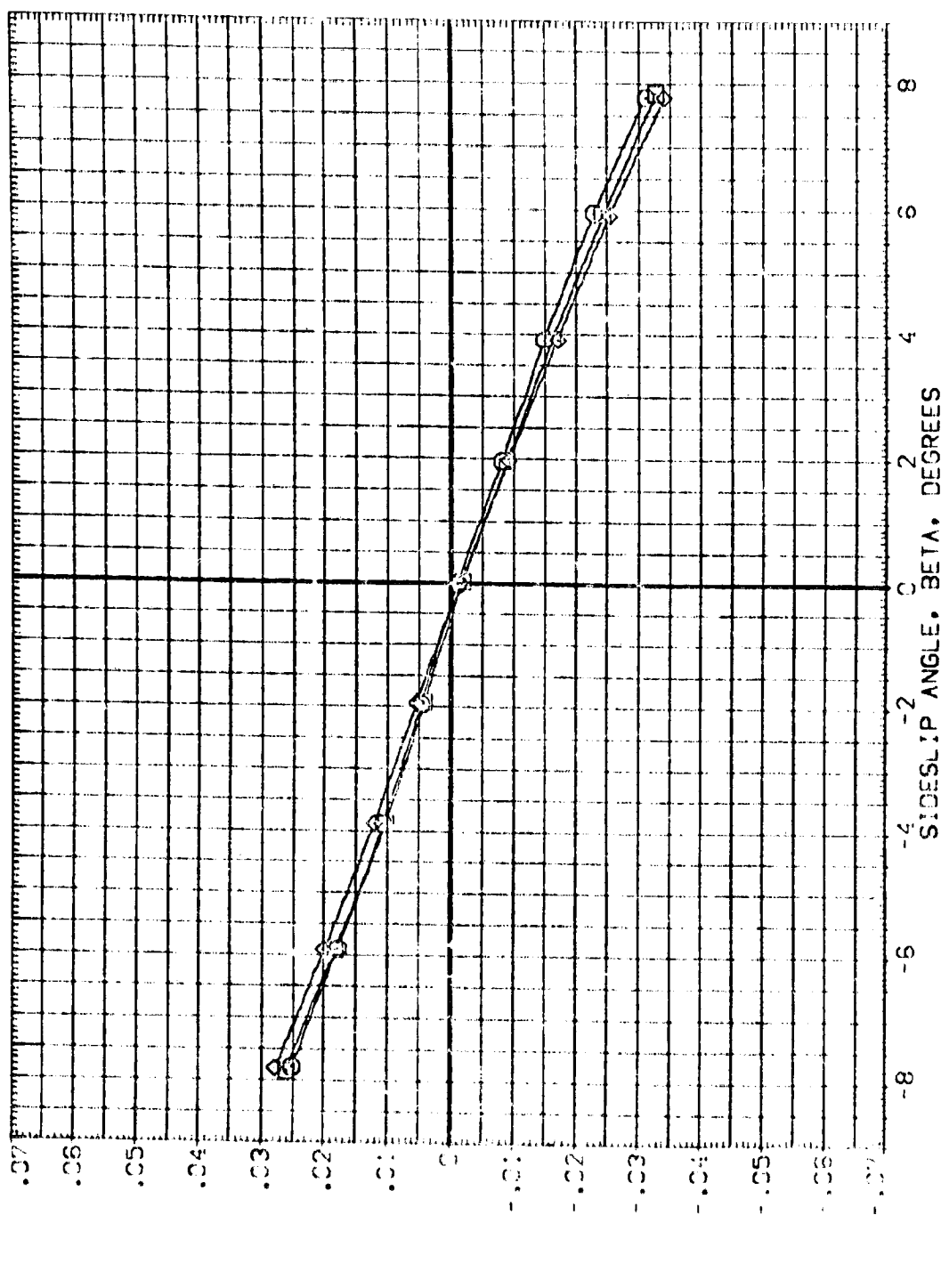
ROLLING MOMENT COEFFICIENT, CBL (BODY AXIS)

FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.

DATA SET SYMBOL CONFIGURATION DESCRIPTION
 (P-5002) ○ A18 : ARC 3.5 (9) : CRABLER + TAM
 (P-5003) ○ A18 : ARC 3.5 (9) : CRABLER + TAM
 (P-5004) ○ A18 : ARC 3.5 (9) : CRABLER + TAM

ALPHA RUDDER ELEVON
 4.000 .000 .000
 .000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION
 SREF : 2600.0000 SQ. FT.
 IREF : 290.3000
 BREF : 290.3000
 XMRP : 0.0000
 YMRP : 0.0000
 ZMRP : 400.0000
 SCALE : .0100



ROLLING MOMENT COEFFICIENT, CRL (BODY AXIS)

FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.
 (B)MAC = 0.32

DATA SET SYMB. CONFIGURATION DESCRIPTION

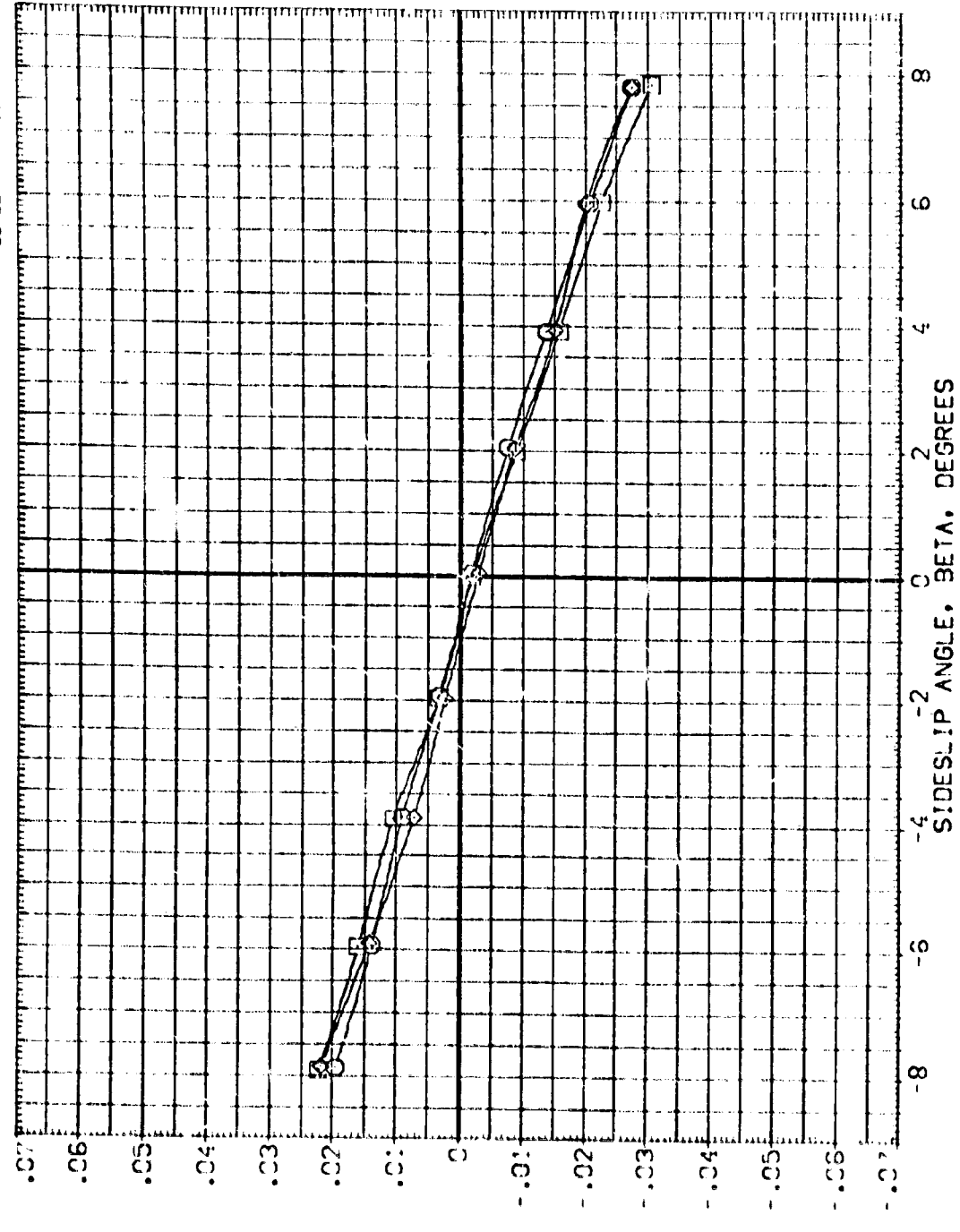
1	ARC 3.5 191	OPERATOR + TANK
2	ARC 3.5 191	OPERATOR + TANK
3	ARC 3.5 191	OPERATOR + TANK

REFERENCE INFORMATION

SREF	2890.0000	SO.FT.
LRP	1.0000	IN.
SRP	1.0000	IN.
VM00	97.9	KT
VM05	100.00	KT
VM08	100.00	KT
VM10	100.00	KT
VM15	100.00	KT
VM20	100.00	KT
SCALE	400	10000

ALPHA RUDDER ELEVON

4.000	.000	.000
1.000	.000	.000
-4.000	.000	.000



ROLLING MOMENT COEFFICIENT, CBL (BODY AXIS)

DATA SET SYMBOLS:
 (R) SC001
 (S) SC002
 (D) SC003

CONFIGURATION DESCRIPTION

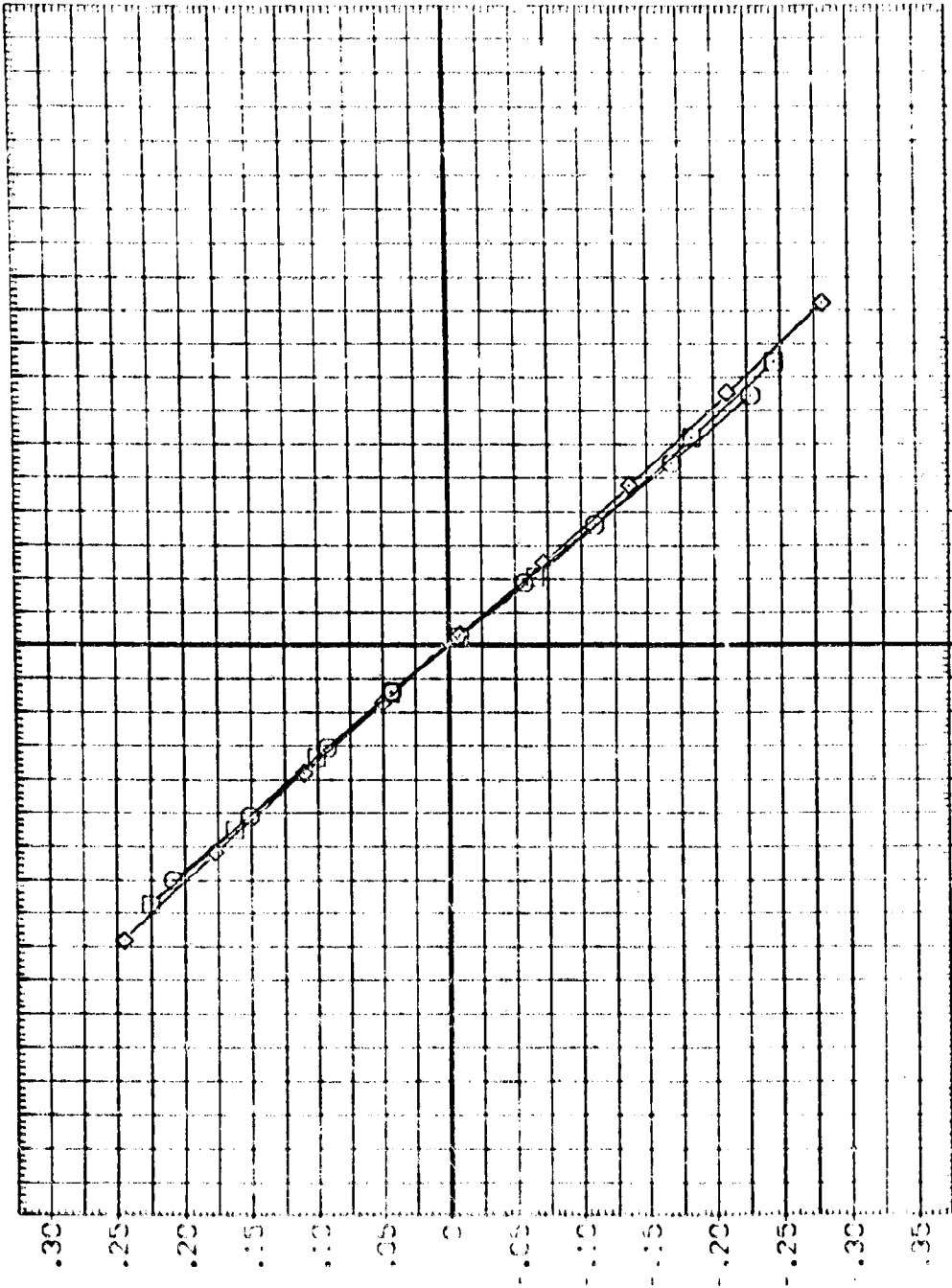
TAIL - ARC 3.5 (9) - ORBITER + TANK
 TAIL - ARC 3.5 (9) - ORBITER + TANK
 TAIL - ARC 3.5 (9) - ORBITER + TANK

ALPHA
 4.000
 .000
 .000
 -4.000

RUDDER
 .000
 .000
 .000

ELEVON
 .000
 .000
 .000

REFERENCE INFORMATION
 SURF 00000000 SC001
 ORF 00000000 SC002
 RUF 00000000 SC003
 WWD 00000000 SC004
 WWD 00000000 SC005
 WWD 00000000 SC006
 WWD 00000000 SC007
 WWD 00000000 SC008
 WWD 00000000 SC009
 WWD 00000000 SC010
 WWD 00000000 SC011
 WWD 00000000 SC012



0.15 0.12 0.08 0.04 0 0.04 0.08 0.12 0.15

FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.
 CASMAC 5.29 PAGE 26

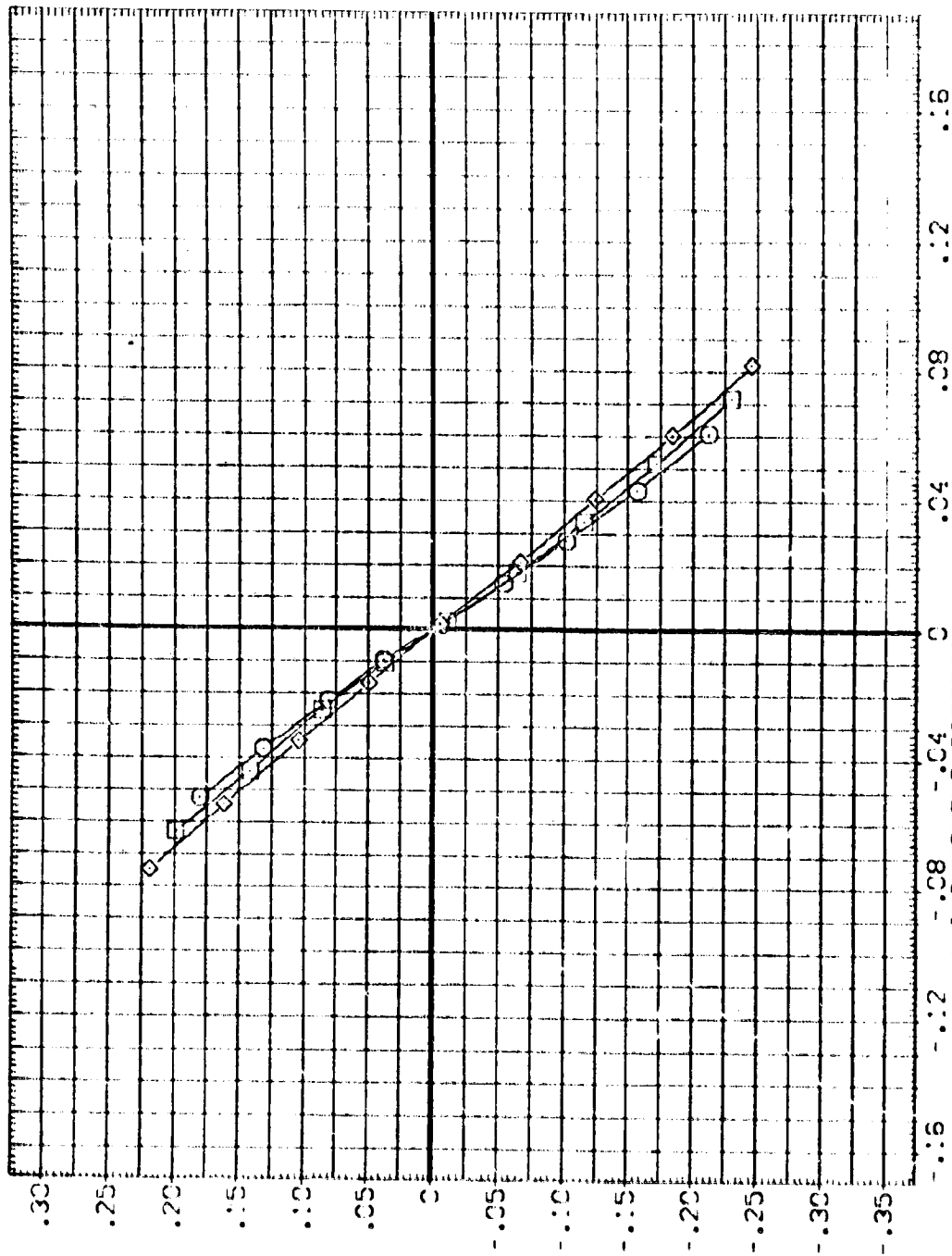
ANGLE OF ATTACK, ALPHA



DAT. SET SYMBO. CONFIGURATION DESCRIPTION
 (A) 1.8 - ARC 3.5 (S) - C931TER + TANK
 (B) 1.8 - ARC 3.5 (S) - C931TER + TANK
 (C) 1.8 - ARC 3.5 (S) - C931TER + TANK

ALPHA RUDDER ELEVON
 4.000 .000 .000
 .000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION
 SREF 2600.0000 SQ.FT.
 AREF 100.0000
 BRREF 100.0000
 XWOP 578.0000
 YWOP 0.0000
 ZWOP 400.0000
 SCALE 10.27



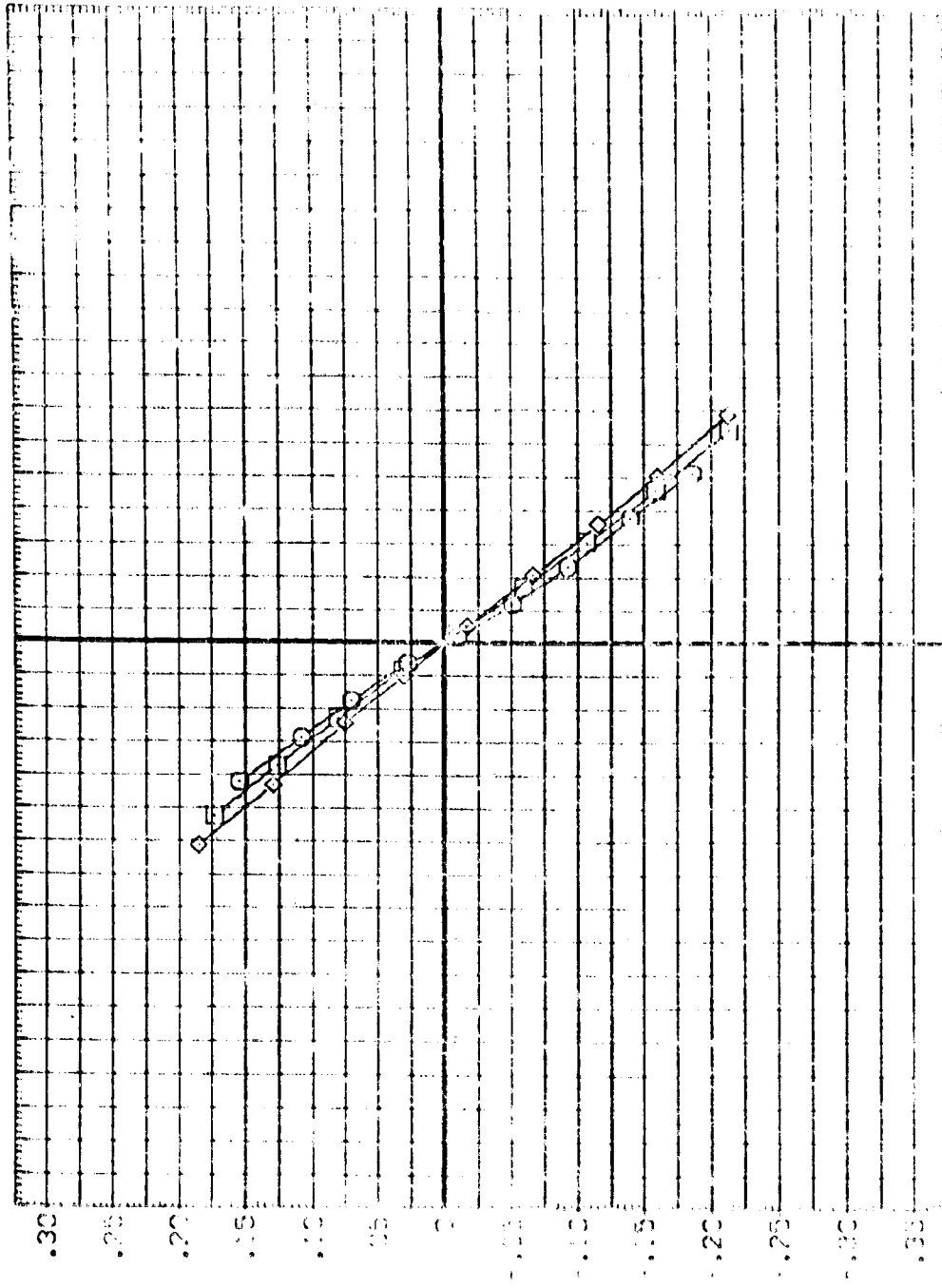
SIDE FORCE COEFFICIENT, CY

FIG. 6 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AEROC. CHAR.

DATA SET SYMBOL CONFIGURATION DESCRIPTION
 (X) S(00) (1) B (ARC 3.5 (9) - ORBITER + TAM
 (2) S(00) (1) B (ARC 3.5 (9) - ORBITER + TAM
 (3) S(00) (1) B (ARC 3.5 (9) - ORBITER + TAM

ALPHA RUDDER ELEVATOR
 4.000 0.000 0.000
 1.000 0.000 0.000
 -4.000 0.000 0.000

REFERENCE IN OPERATIONS
 S(00) 0.000 0.000
 R(00) 0.000 0.000
 E(00) 0.000 0.000
 Y(00) 0.000 0.000
 Z(00) 0.000 0.000
 STATE 0.000 0.000



1.16 1.12 1.08 1.04 1.00 0.96 0.92 0.88 0.84 0.80 0.76 0.72 0.68 0.64 0.60 0.56 0.52 0.48 0.44 0.40 0.36 0.32 0.28 0.24 0.20 0.16 0.12 0.08 0.04 0.00 0.04 0.08 0.12 0.16 0.20 0.24 0.28 0.32 0.36 0.40 0.44 0.48 0.52 0.56 0.60 0.64 0.68 0.72 0.76 0.80 0.84 0.88 0.92 0.96 1.00 1.04 1.08 1.12 1.16

FIG. 8 EFFECT OF ANGLE OF ATTACK ON SECOND STAGE LATERAL-DIRECTIONAL AERO. CHAR.
 103VAC 10.09 PAGE 28

DATA SET SYMBOLS: (X) 5007, (O) 5008, (S) 5009

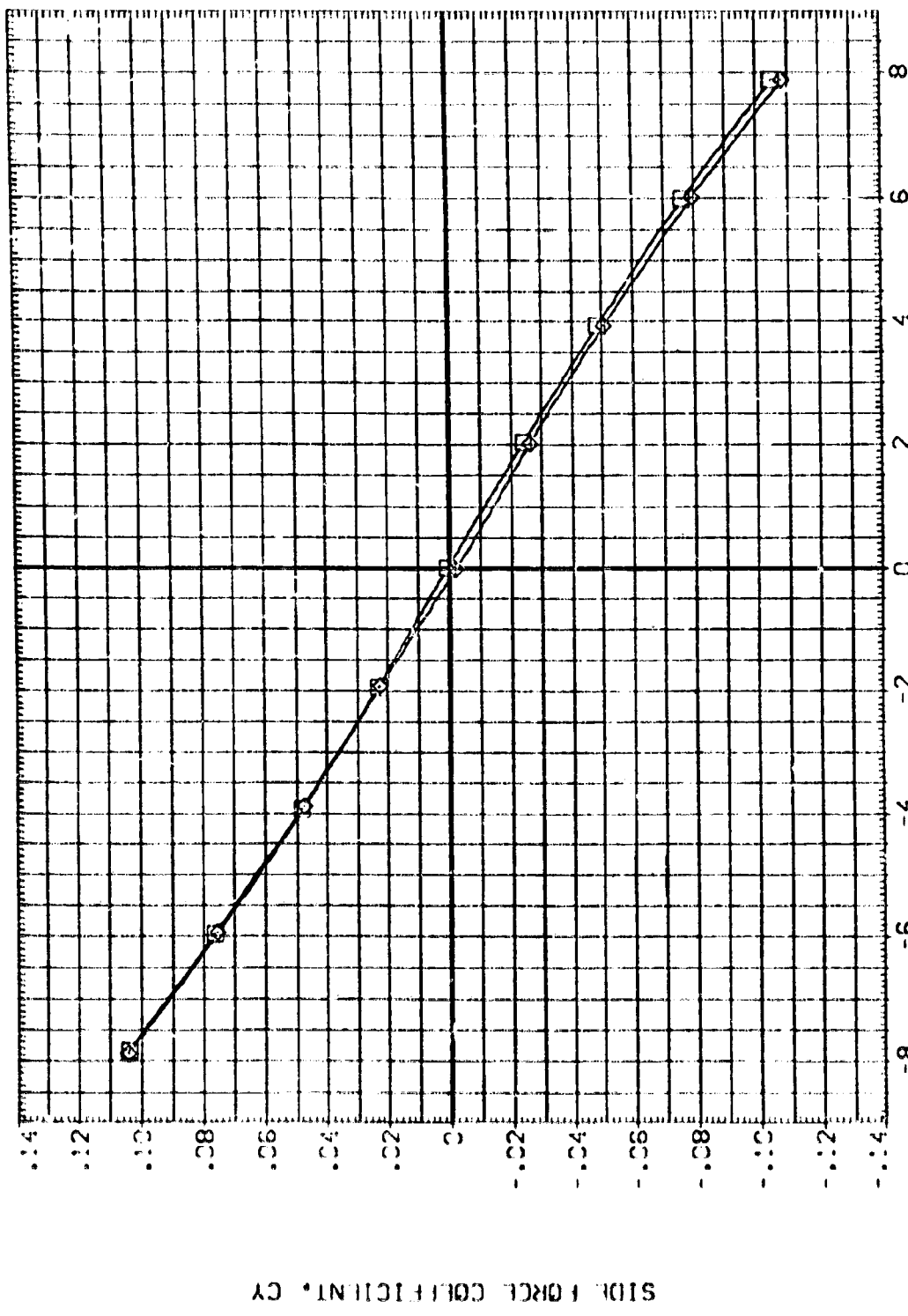
CONFIGURATION DESCRIPTION:
 DATA NOT AVAILABLE
 1:18 - ARC 3:5 191 - TANK
 1:18 - ARC 3:5 191 - TANK

ALPHA: 4.000, .000, .000, -4.000

RUDDER: .000, .000, .000

ELEVON: .000, .000, .000

REFERENCE INFORMATION:
 SREF: 2650.0000 SQ.FT.
 WREF: 1250.0000
 BREF: 1250.0000
 XMRD: 578.0000
 YMRD: 2500.0000
 ZMRD: 400.0000
 SCALE: 10.0000



SIDE FORCE COEFFICIENT, CY

SIDESLIP ANGLE, BETA, DEGREES

FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED ET LATERAL-DIRECTIONAL AEROC. CHAR.

CLMACH = 5.29

DATA SHEET SUMMARY

DATE	TIME	DESCRIPTION
11/18	1300	3.5
11/18	1300	3.5
11/18	1300	3.5

1. PWA	RUNNING	ELUTION
4.000	0.000	0.000
4.000	0.000	0.000
4.000	0.000	0.000

REFERENCE MATERIALS

SPEC	QUANTITY	DATE
2550	0.000	11/18
2550	0.000	11/18
2550	0.000	11/18
2550	0.000	11/18
2550	0.000	11/18
2550	0.000	11/18
2550	0.000	11/18
2550	0.000	11/18
2550	0.000	11/18
2550	0.000	11/18
2550	0.000	11/18
2550	0.000	11/18

REFERENCE MATERIALS

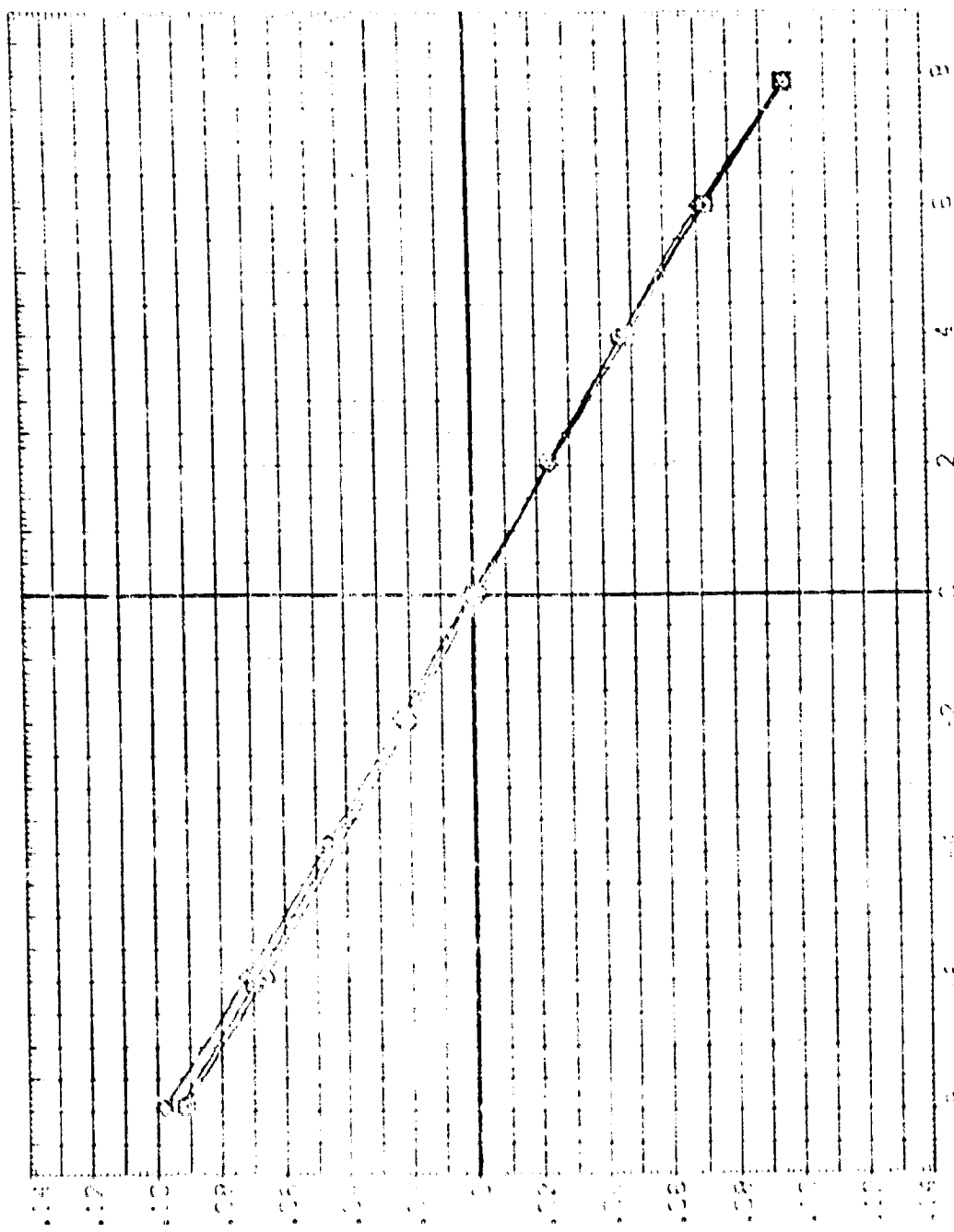


FIG. 3. EFFECT OF ANGLE OF ATTACK ON ISOLATED BY LATERAL DIP ANGLE, BETA, DEGREES. PAGE 30



DATA BY SYMBO. CONFIGURATION DESCRIPTION
 (1) 1A18 - ARC 3.5 91 - TAN
 (2) 1A18 - ARC 3.5 91 - TAN
 (3) 1A18 - ARC 3.5 91 - TAN
 (4) 1A18 - ARC 3.5 91 - TAN

ALPHA RUDDER ELEVON
 4.000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION
 SPEC 2800.0000 SOL.F.
 REF 2800.0000
 BRFL 2800.0000
 VM00 91.0000
 VM00 91.0000
 VM00 91.0000
 SCALE 400.0000

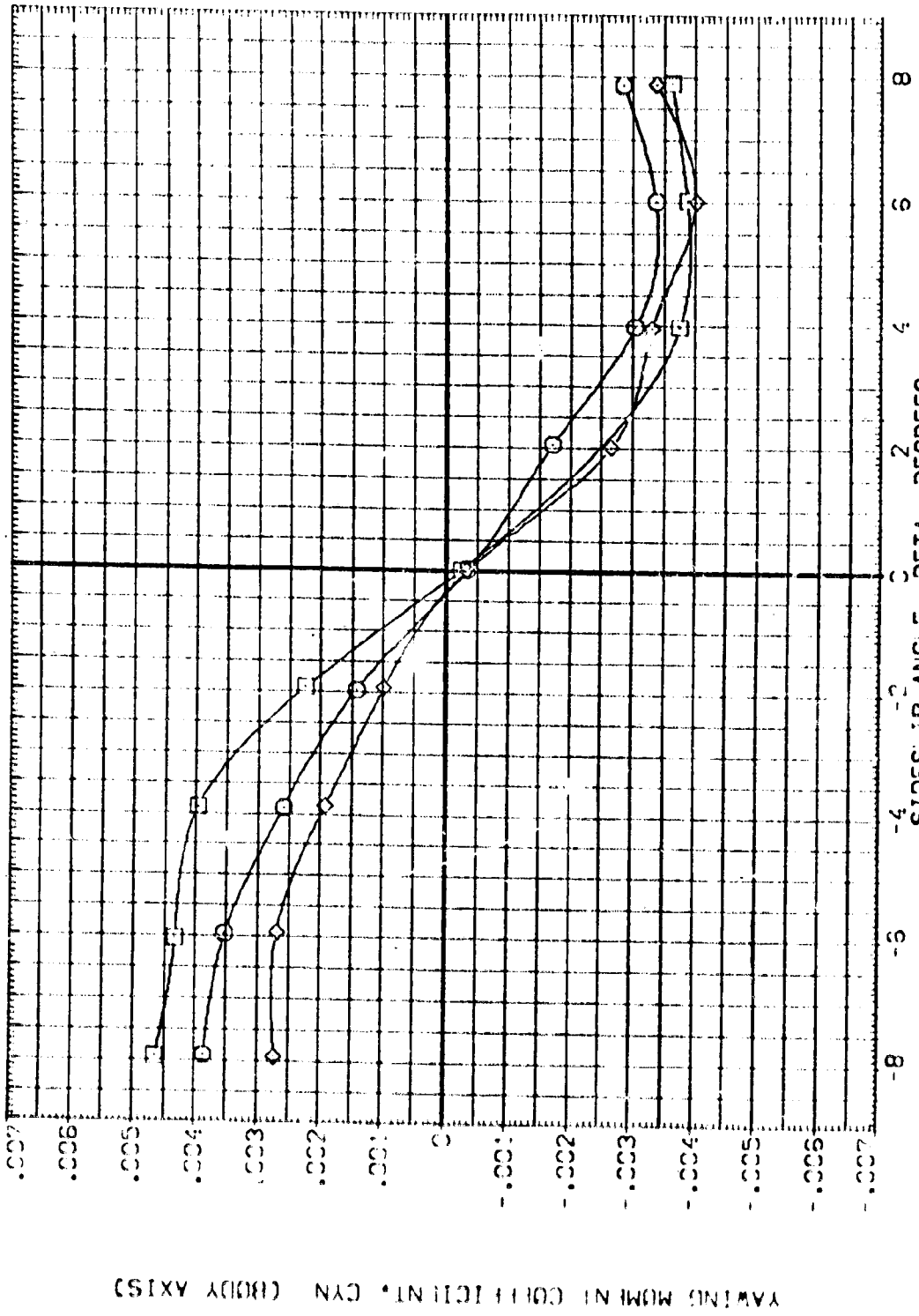


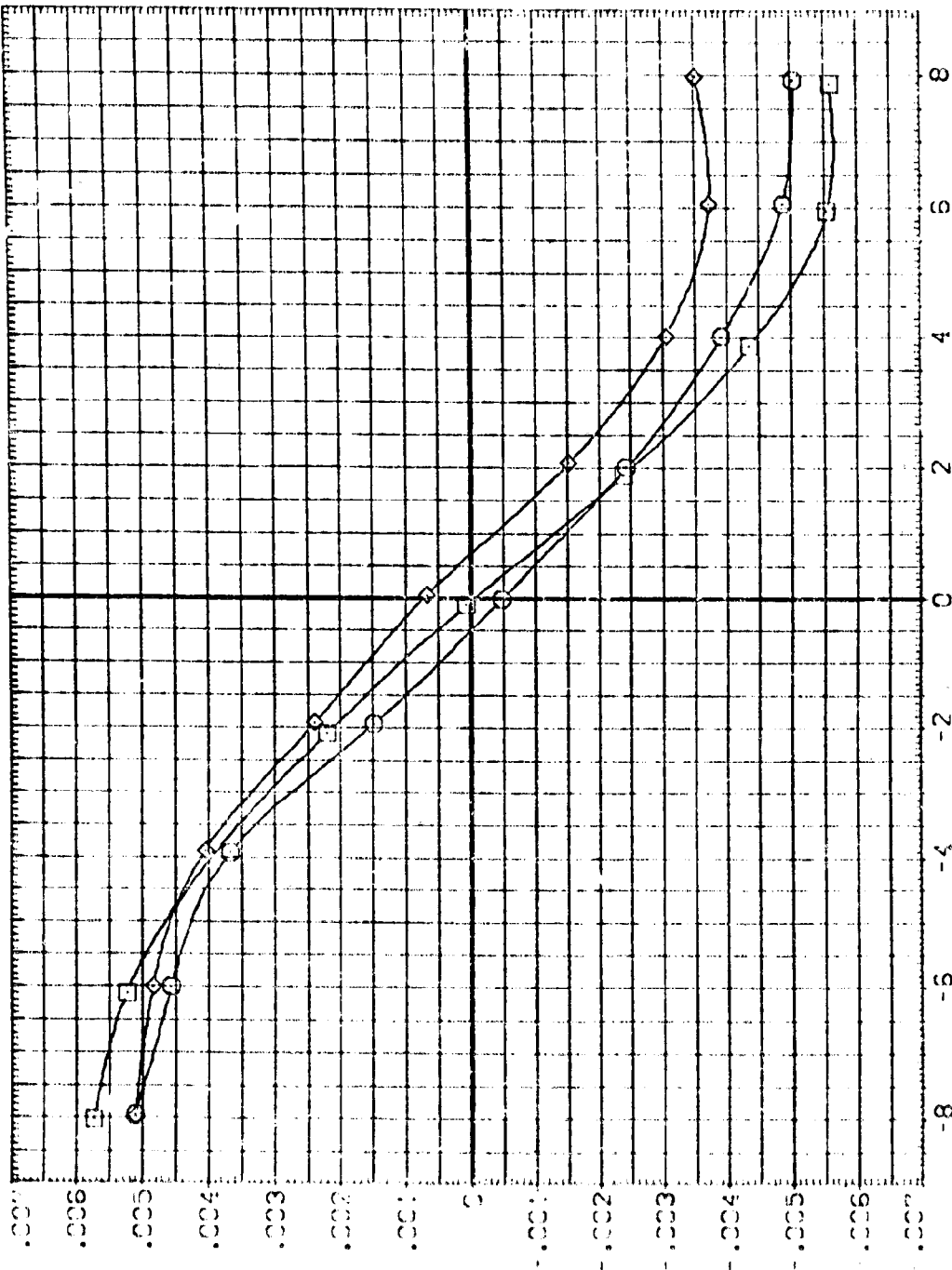
FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED ET LATERAL-DIRECTIONAL AERO. CHAR.

DATA S: 1 SYMBO
 (R) SC001: O
 (R) SC008: O
 (R) SC009: O

CONFIGURATION DESCRIPTION
 TAIL - ARC 3.5 (R) - TAV
 TAIL - ARC 3.5 (R) - TAV
 TAIL - ARC 3.5 (R) - TAV

ALPHA RUDDER E-LEVEN
 4.000 .000 .000
 .000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION
 SREF 2590.0000 SQ. FT.
 AREA 1200.0000
 BRKE 1200.0000
 XMRB 9.9
 YMRB .0000
 ZMRB .0000
 IN. Y1 .0000
 IN. Z1 .0000
 SCALE 400.0000



YAWING MOMENT COEFFICIENT, CYN (BODY AXIS)

SIDESLIP ANGLE, BETA, DEGREES

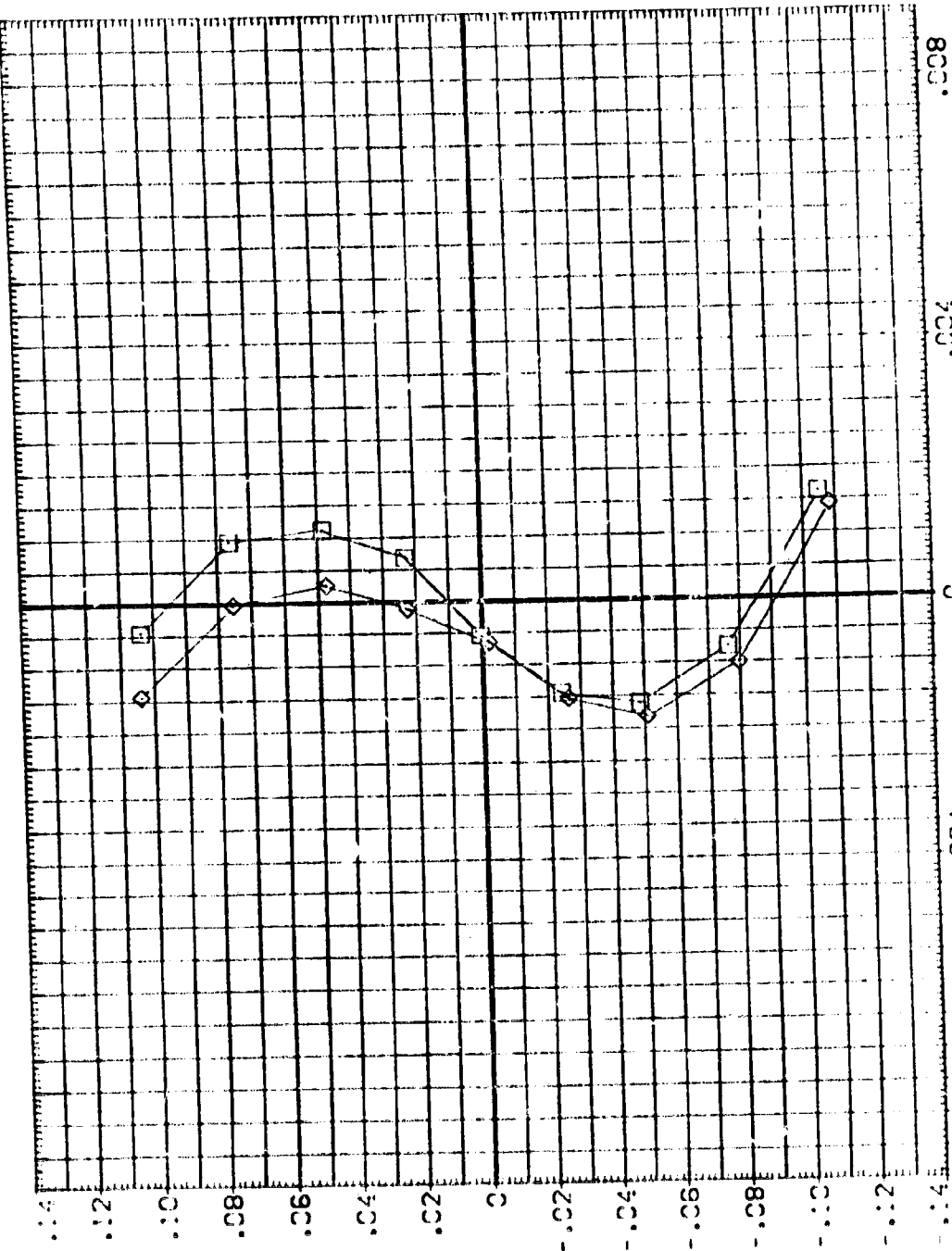
FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED ET LATERAL-DIRECTIONAL AERO. CHAR.



REFERENCE INFORMATION
 SREF 2690.0000 SQ.FT.
 LRE 2690.3000
 BRLE 2690.3000
 XMRB 579.0000
 YMRB 400.0000
 ZMRB 400.0000
 SCALE 0.100

ALPHA RUDDER ELEVON
 4.000 .000
 .000 .000
 -4.000 .000

DATA SET SYMBOL CONFIGURATION DESCRIPTION
 (R) SC01 (1) DATA NOT AVAILABLE
 (R) SC08 (1) 118 - APC 3.5 (9) - TANK
 (R) SC09 (1) 118 - APC 3.5 (9) - TANK



SIDE FORCE COEFFICIENT, CY

YAWING MOMENT COEFFICIENT, CYN (BODY AXIS)

FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED ET LATERAL-DIRECTIONAL AERO. CHAR.

REFERENCE INFORMATION
 SREF 2500.0000 SQ.FT.
 IREF 1000.0000
 BR.F 100.0000
 VMWP 9.75
 VMRP 10.0000
 ZMWP 400.0000
 ZMPP 400.0000
 SCALE 1.0000

ALPHA 4.0000
 RUDDER .0000
 ELEVON .0000
 .0000
 .0000
 -4.0000

CONFIGURATION DESCRIPTION
 1A1B - ARC 3.5 (9) - TANK
 1A1B - ARC 3.5 (9) - TANK
 1A1B - ARC 3.5 (9) - TANK

DATA SET SYMBOL
 (X) (O) (S) (D) (T) (Z)

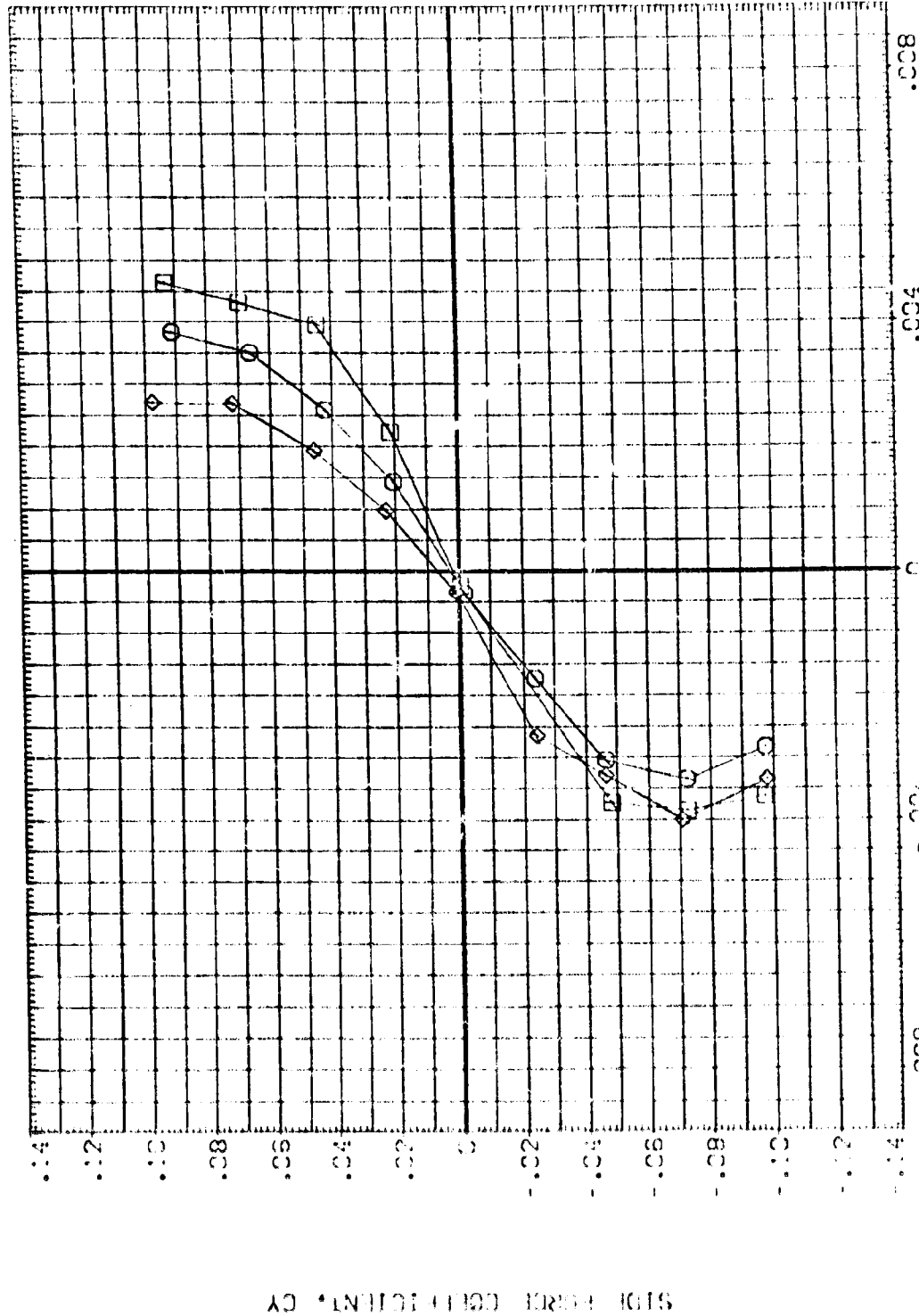


FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED ET LATERAL-DIRECTIONAL AERC. CHAR.
 (B) WAC = 7.32
 PAGE 36

REFERENCE INFORMATION
 SREF 2500.0000 SO.FT.
 XREF 1000.0000
 YREF 1000.0000
 ZREF 500.0000
 X1 1000.0000
 Y1 1000.0000
 Z1 500.0000
 X2 1000.0000
 Y2 1000.0000
 Z2 500.0000
 SCALE

ALPHA RUDDER ELEVON
 4.000 .000 .000
 -4.000 .000 .000

CONFIGURATION DESCRIPTION
 1A18 - ABC 3.5 9 - TANK
 1A18 - ABC 3.5 9 - TANK

SIDE FORCE COEFFICIENT, CY

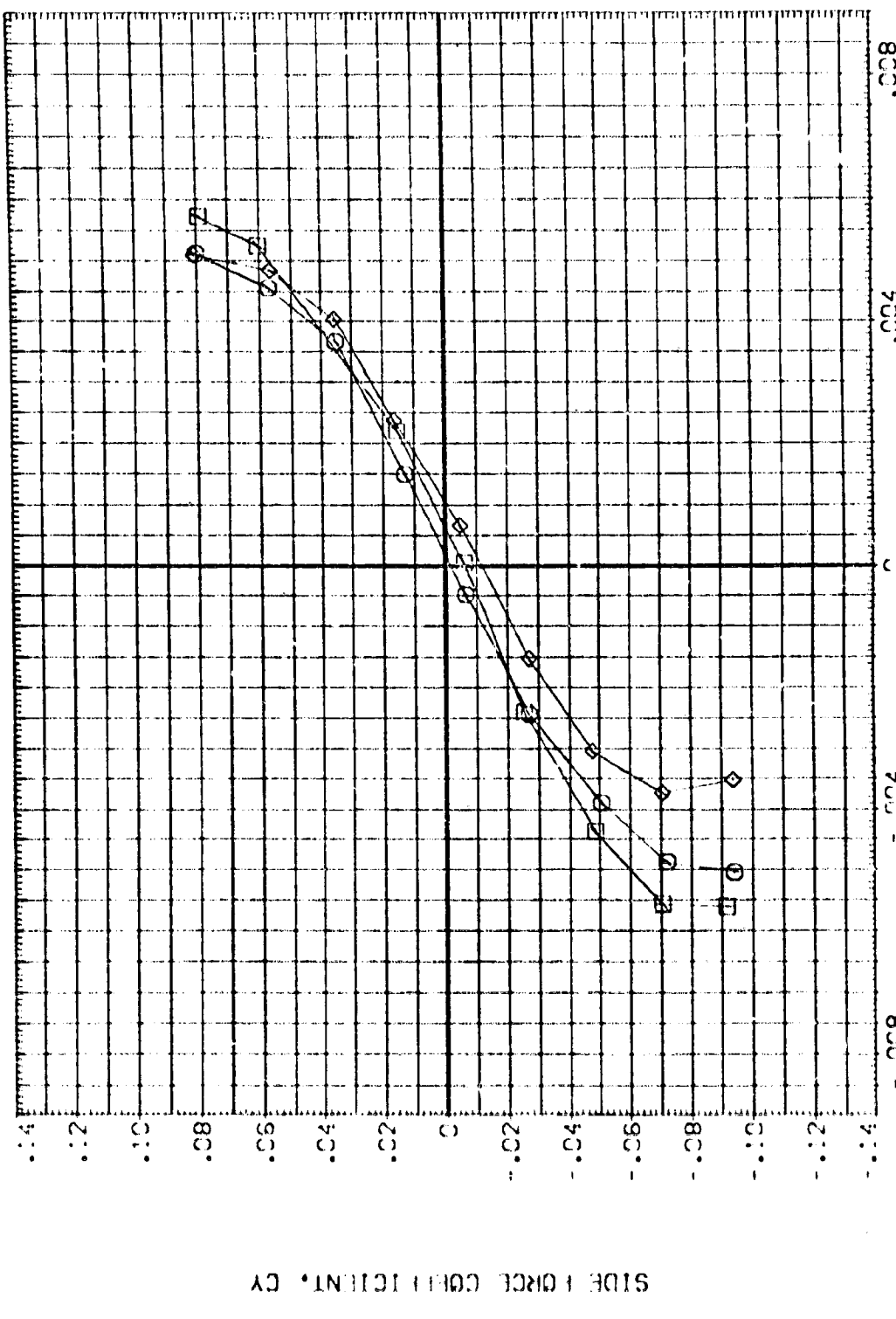


FIG. 7 EFFECT OF ANGLE OF ATTACK ON ISOLATED ET LATERAL-DIRECTIONAL AERO. CHAR.
 COMACH = 0.29

PARAMETRIC VALUES
 BETA .000 RUDDER .000
 ELEVATION .000

REFERENCE INFORMATION
 SREF 2850.0000 SQ FT.
 LREF 1120.0000
 BREF 1120.0000
 XMR0 5.00
 YMR0 0.00
 ZMR0 400.0000
 SCALE 10.0000

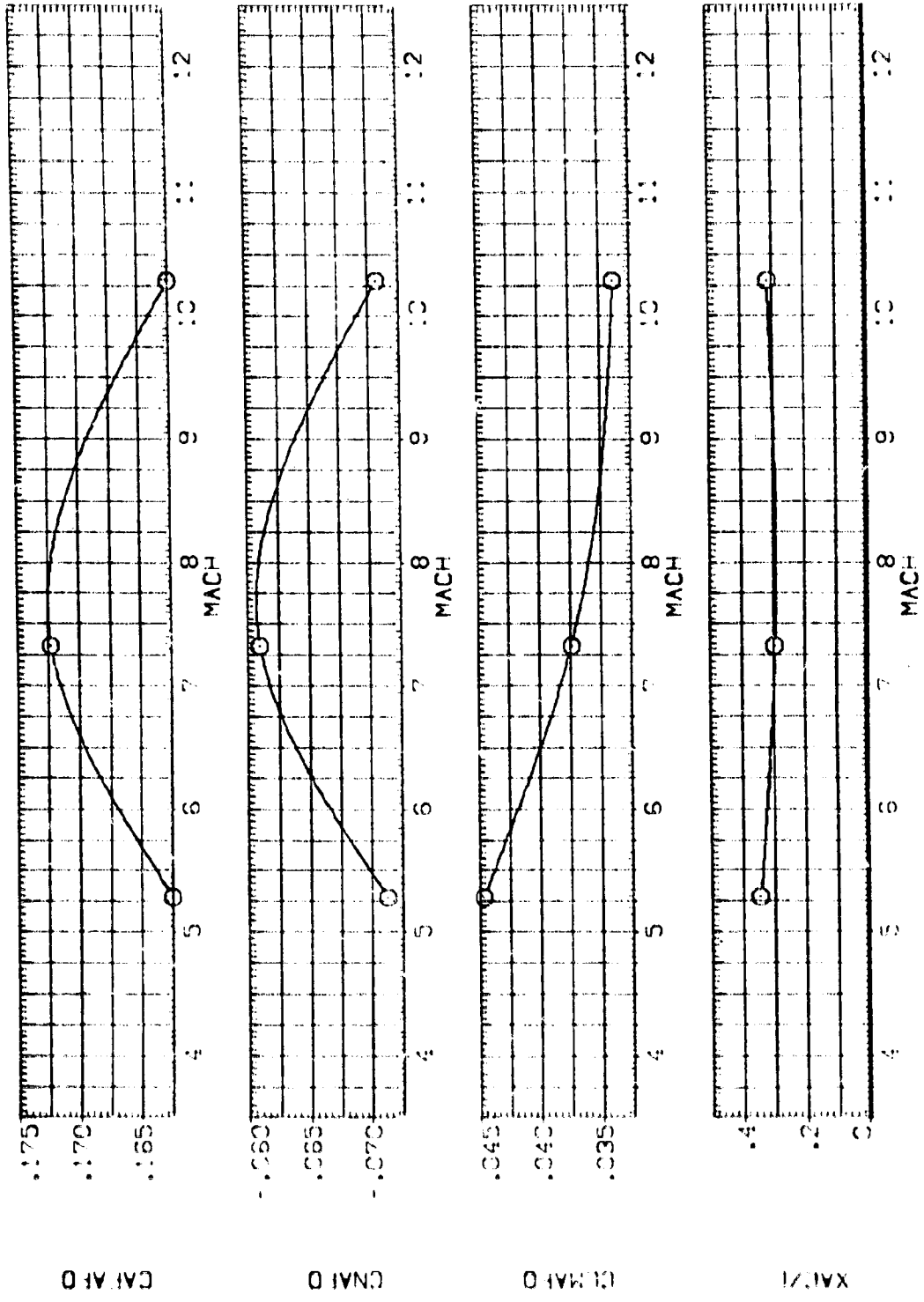


FIG. 8 SUMMARY OF SECOND STAGE LONGITUDINAL AERODYNAMIC CHARACTERISTICS.



(HES006)

ARC 3.5.19: MANY

PARAMETRIC VALUES
 BETA .000
 RUDDER .000
 FUSELAGE .000

REFERENCE INFORMATION
 SREF 2600.0000
 REF 2600.0000
 BRP 2600.0000
 YREF 0
 YAPP 0
 XREF 0
 XAPP 0
 ZREF 400.0000
 ZAPP 400.0000
 SCALE .0001

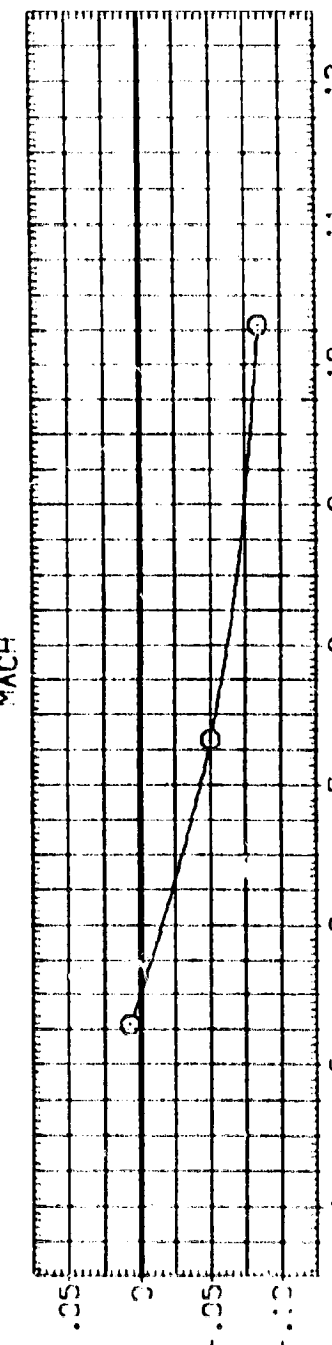
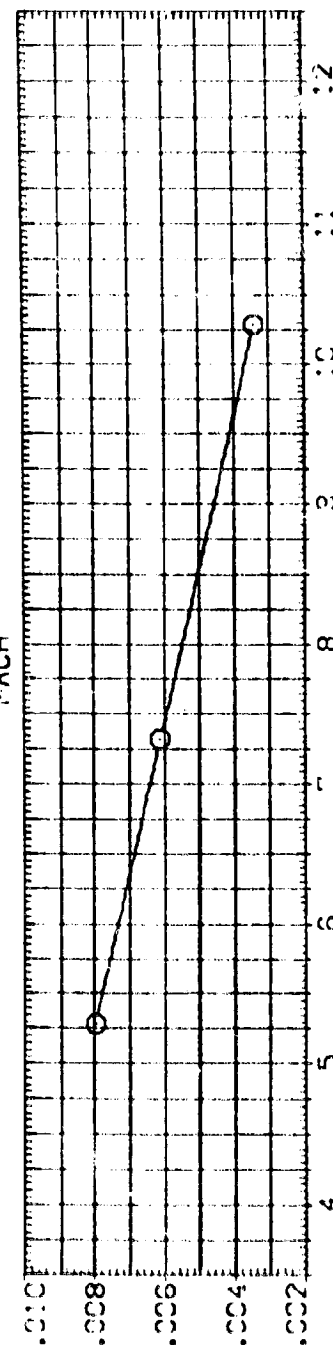
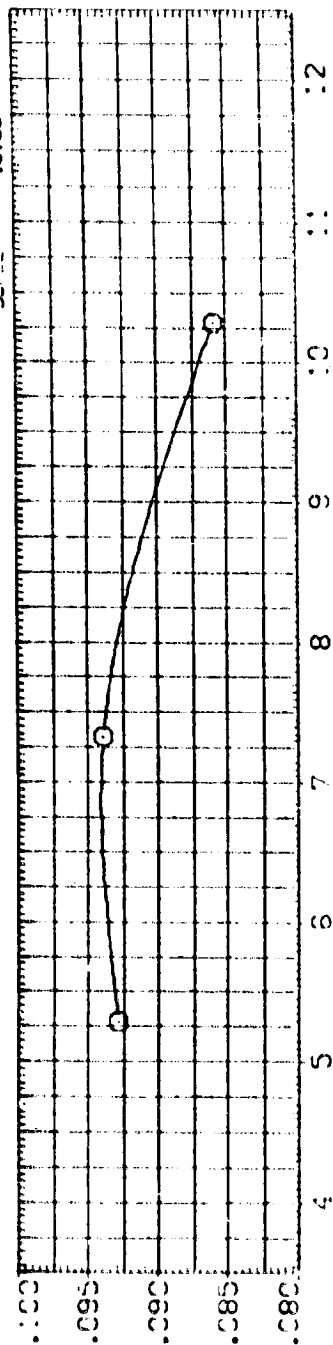


FIG. 9 SUMMARY OF ISOLATED ET LONGITUDINAL AERODYNAMIC CHARACTERISTICS.

DATA SET SYMBOL:
 (O)
 (X)
 (S)
 (□)
 (◇)

CONFIGURATION DESCRIPTION:
 :A18 - ARC 3.5 (O) - TANK
 :A18 - ARC 3.5 (X) - TANK
 :A18 - ARC 3.5 (S) - TANK
 :A18 - ARC 3.5 (□) - TANK
 :A18 - ARC 3.5 (◇) - TANK

ALPHA RUDDER ELEVON
 4.000 .000 .000
 -4.000 .000 .000

REFERENCE INFORMATION:
 SPEED 7500.0000 SCFT.
 ALT 2000.0000
 RATE 100.0000
 XWIND 0.0000
 YWIND 0.0000
 SCALE 400.0000

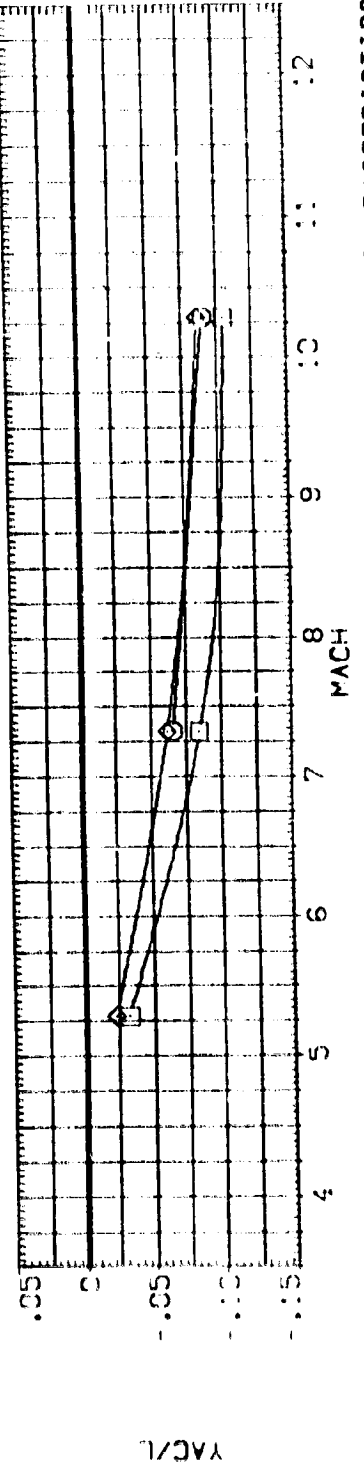
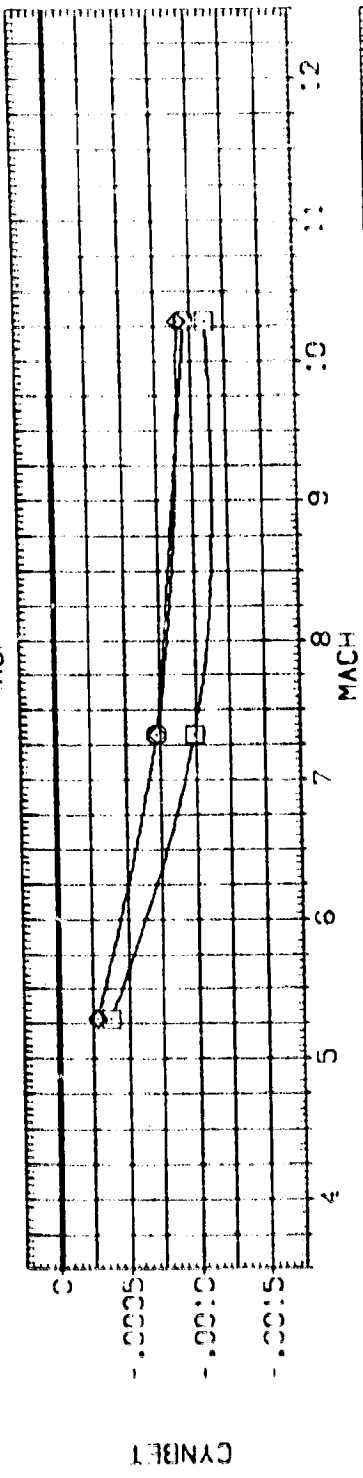
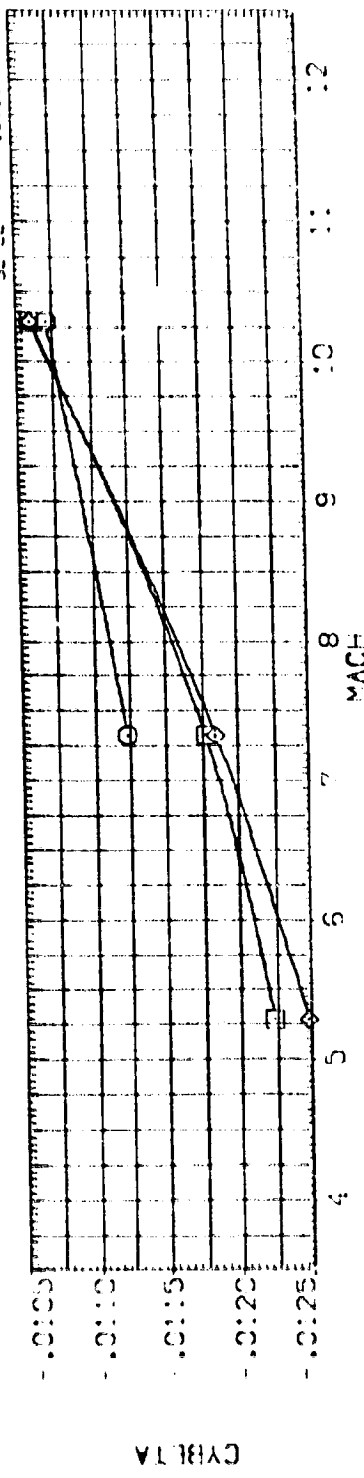


FIG. 11 SUMMARY OF ISOLATED ET LATERAL-DIRECTIONAL AERODYNAMIC CHARACTERISTICS.

ARC 3.5 191 - ORBITER + TANK (NESCI2)

REFERENCE INFORMATION
 SCF1
 SCF2
 SCF3
 SCF4
 SCF5
 SCF6
 SCF7
 SCF8
 SCF9
 SCF10
 SCF11
 SCF12
 SCF13
 SCF14
 SCF15
 SCF16
 SCF17
 SCF18
 SCF19
 SCF20
 SCF21
 SCF22
 SCF23
 SCF24
 SCF25
 SCF26
 SCF27
 SCF28
 SCF29
 SCF30
 SCF31
 SCF32
 SCF33
 SCF34
 SCF35
 SCF36
 SCF37
 SCF38
 SCF39
 SCF40
 SCF41
 SCF42
 SCF43
 SCF44
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 SCF49
 SCF50
 SCF51
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 SCF60
 SCF61
 SCF62
 SCF63
 SCF64
 SCF65
 SCF66
 SCF67
 SCF68
 SCF69
 SCF70
 SCF71
 SCF72
 SCF73
 SCF74
 SCF75
 SCF76
 SCF77
 SCF78
 SCF79
 SCF80
 SCF81
 SCF82
 SCF83
 SCF84
 SCF85
 SCF86
 SCF87
 SCF88
 SCF89
 SCF90
 SCF91
 SCF92
 SCF93
 SCF94
 SCF95
 SCF96
 SCF97
 SCF98
 SCF99
 SCF100

DATA SOURCE
 MACH 0.300
 NESCI3

PARAMETRIC VALUES
 .000
 NESCI2
 NESCI4

DATA SOURCE
 MACH 5.300
 NESCI3
 NESCI4

PARAMETRIC VALUES
 .000
 NESCI2
 NESCI4

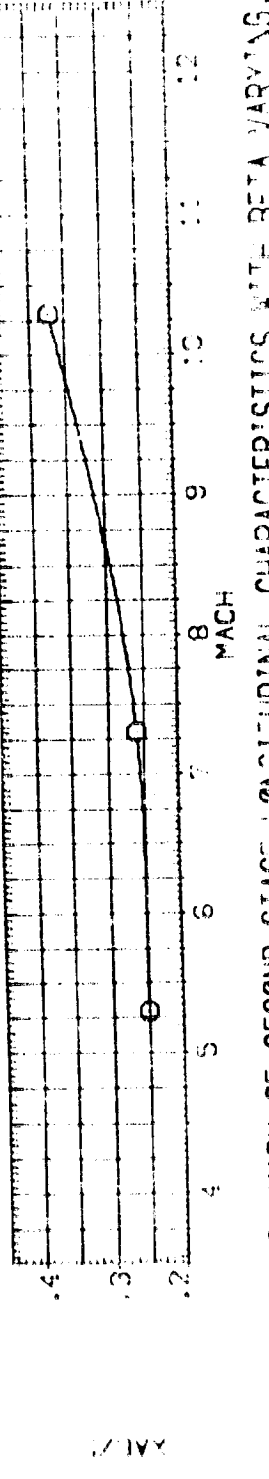
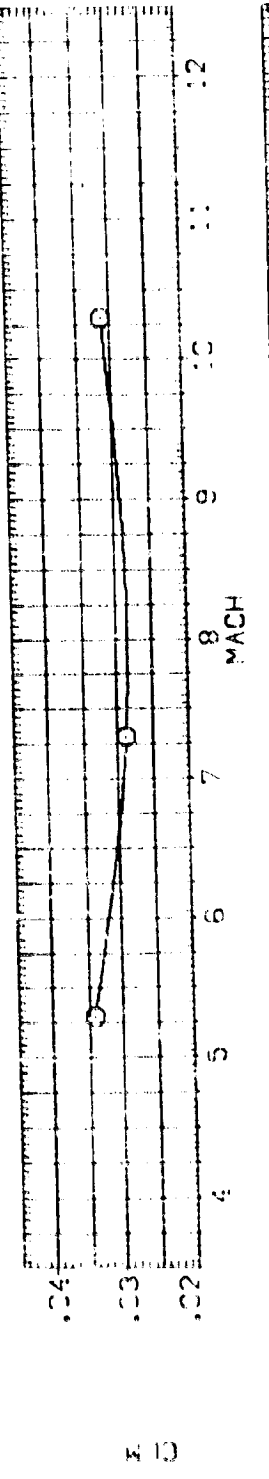
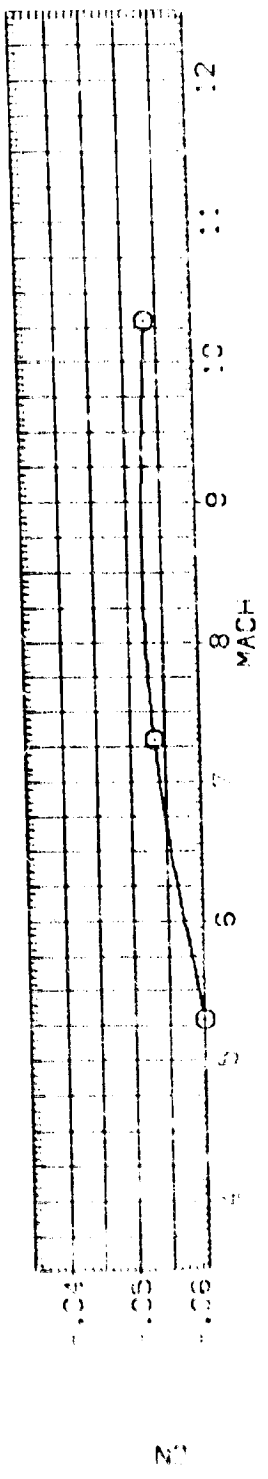
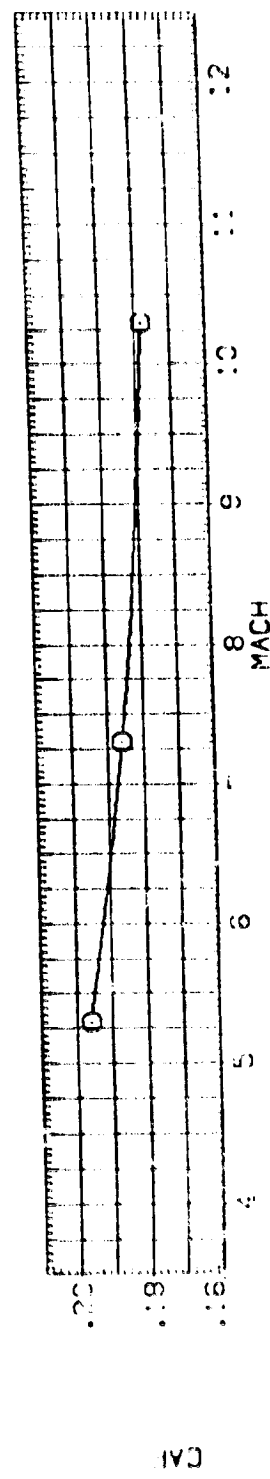


FIG. 12 SUMMARY OF SECOND STAGE LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.

1A18 - ARC 3.5 :91 - ORBITER + TANK (NES012)

SYMBOL	BETA	ALPHA	PARAMETRIC VALUES		DATA SOURCE		REFERENCE INFORMATION	
○	.000	.000	.000	ELEVON	MACH	DATASET	SREF	50. FT.
					5.300	NES012	L REF	
					10.300	NES014	B REF	
							X REF	
							Y REF	
							Z REF	
							SCALE	

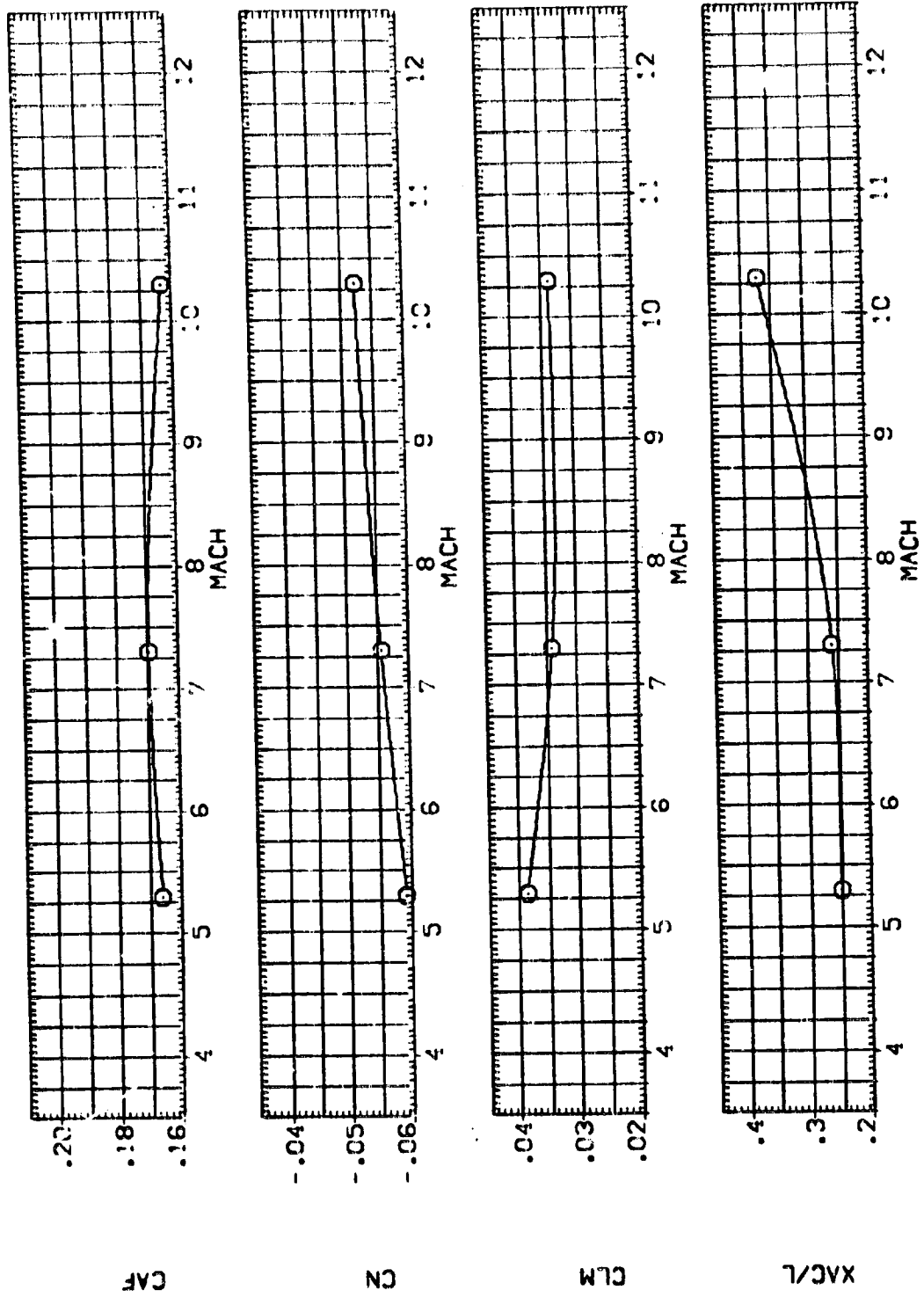


FIG. 12 SUMMARY OF SECOND STAGE LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.

TA18 - ARC 3.5 19: - ORBITER - TAN (NESO:2)

SYMBOL: ○

BETA: 8.000

ALPHA: .000

PARAMETRIC VALUES: .000 ELEVON

DATA SOURCE: MACH: 7.300

DATASET: NESO:13

REFERENCE INFORMATION: SQ.FT.

2600.0000

280.3000

280.3000

978.0000

XT

YT

ZT

400.0000

SCALE: .0100

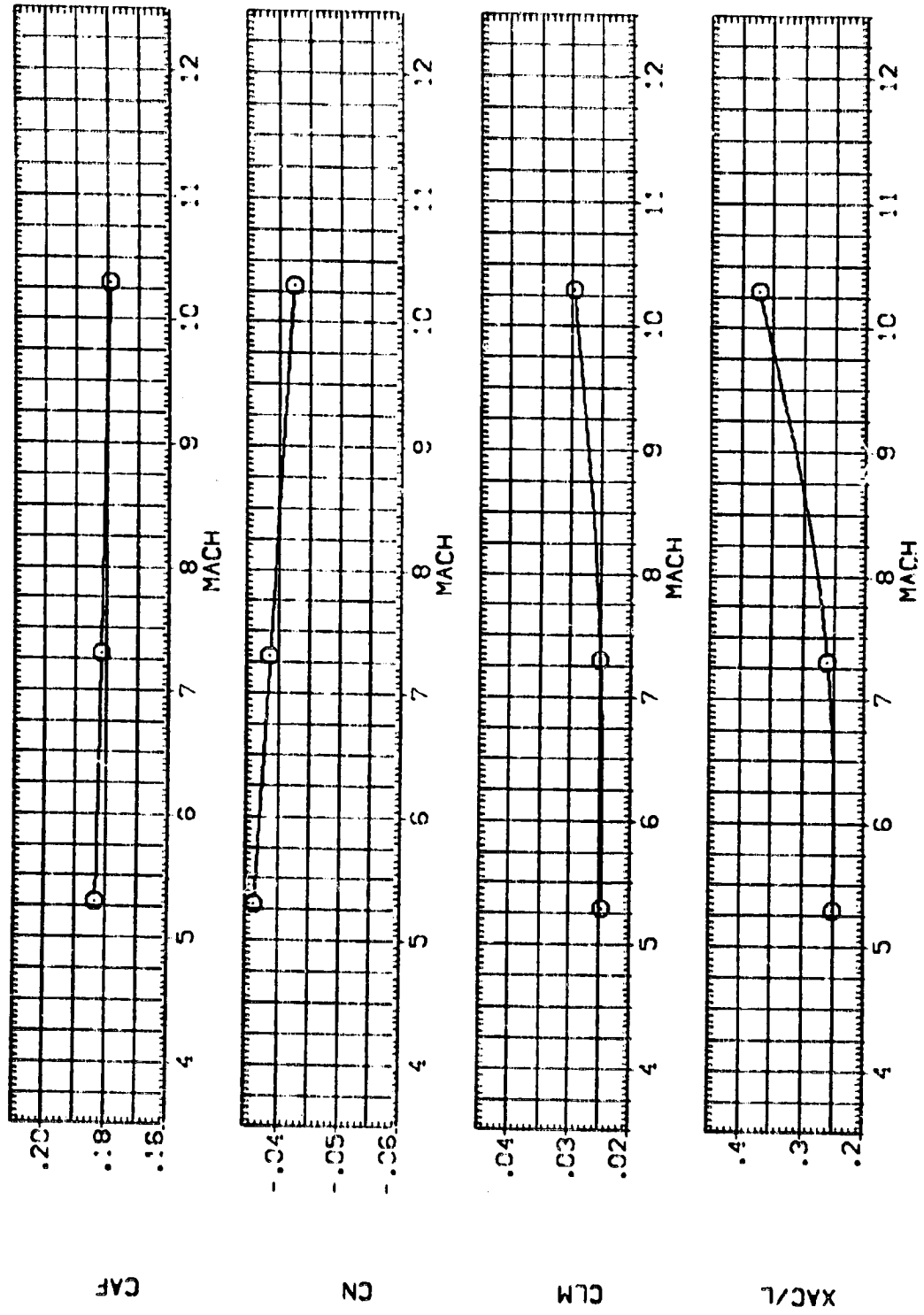


FIG. 12 SUMMARY OF SECOND STAGE LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.



(NES017)

1A18 - ARC 3.5 19: - TANK

SYMBOL	BETA	ALPHA	PARAMETRIC VALUES	.000	ELEVON	.000	DATASET	MACH	DATA SOURCE	DATASET	MACH	SREF	REFERENCE INFORMATION
○	-8.000						NES017	5.300	NES018	NES018	7.300	2680.0000	SOL.T.
							NES019	10.300				2680.0000	IN.
												250.0000	IN.
												250.0000	IN.
												979.0000	IN.
												0.0000	IN.
												0.0000	IN.
												400.0000	IN.
												0.0100	IN.

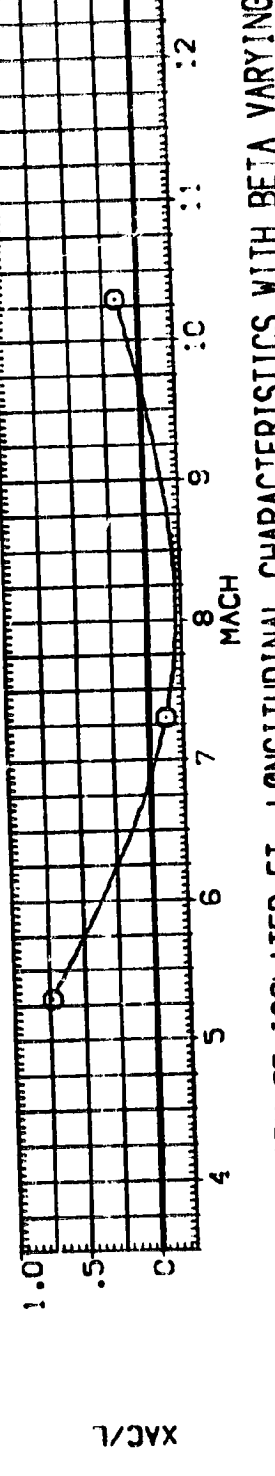
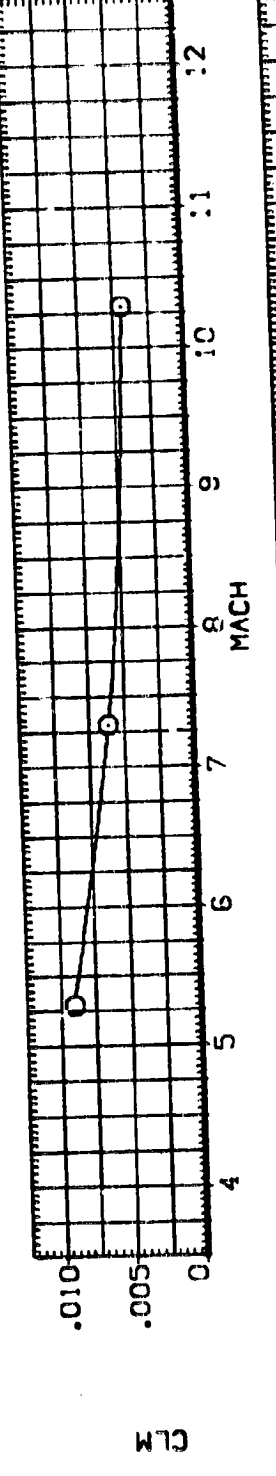
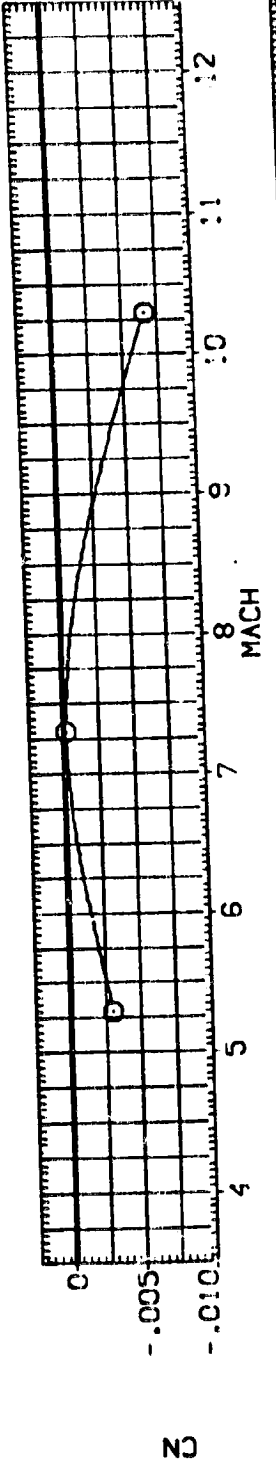
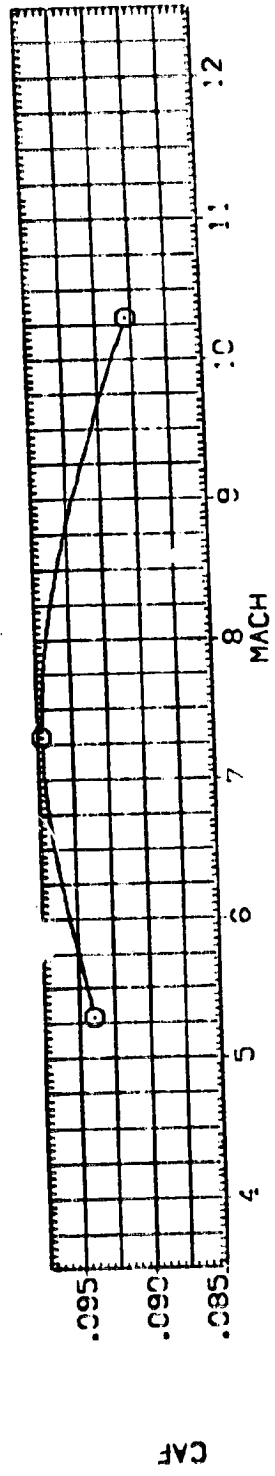


FIG. 13 SUMMARY OF ISOLATED ET LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.

IA:8 -- ARC 3.5 :9: - TANK

(NES017)

SYMBOL	BETA	ALPHA	PARAMETRIC VALUES		DATA SOURCE		REFERENCE INFORMATION	
C	.000	.000	.000	ELEVON	MACH	MACH	SREF	SO.F.T.
			NES017		5.300	7.300	2650.0000	???
			NES019		10.300	NES019	250.3000	???
							250.3000	XI
							979.0000	YI
							.0000	ZI
							400.0000	
							SCALE	10:00

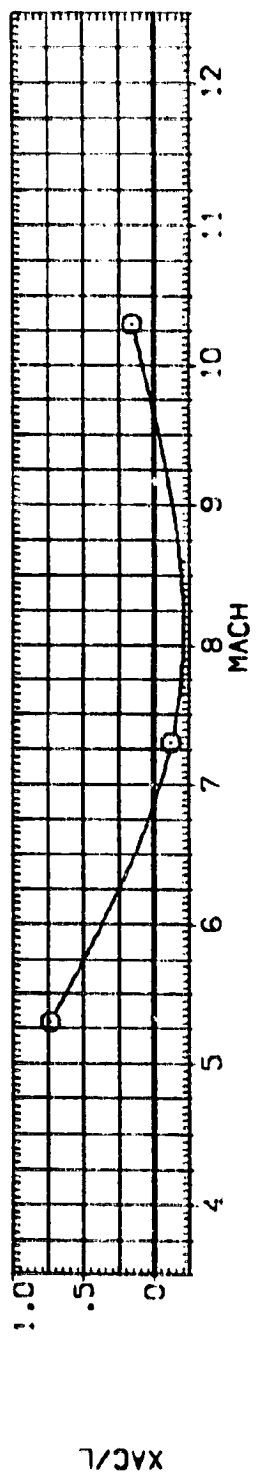
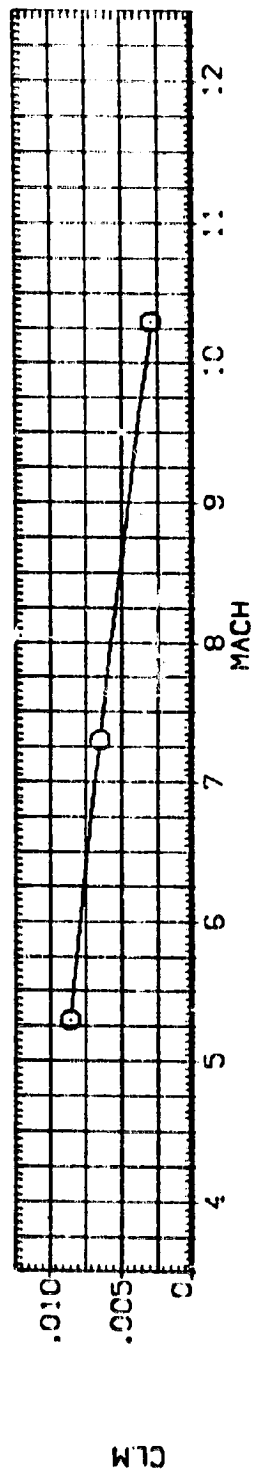
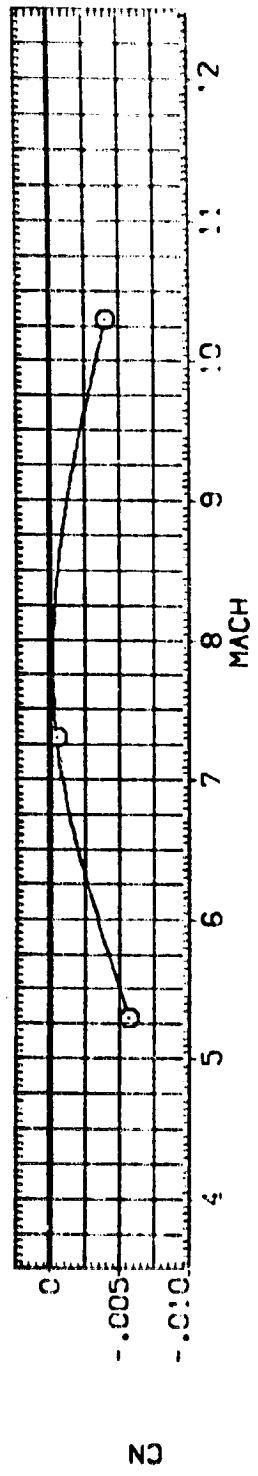
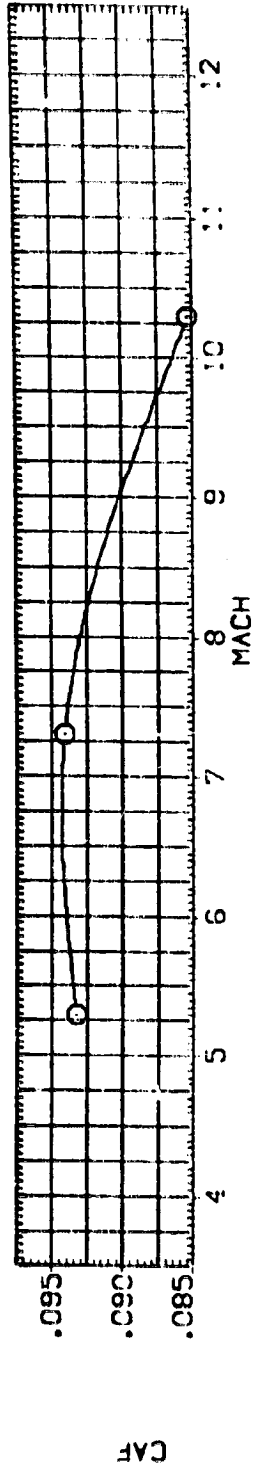


FIG. 13 SUMMARY OF ISOLATED ET LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.

IA18 - ARC 3.5 :91 - TANK

(NES017)

SYMBOL	BETA	ALPHA	PARAMETRIC VALUES	.000	ELEVON	.000	DATASET	MACH	DATA SOURCE	DATASET	MACH	SREF	REFERENCE INFORMATION
○	8.000						NES017	5.300		NES018	7.300	2690.0000	50. FT.
							NES019	10.300				290.3000	
												290.3000	
												979.0000	
												400.0000	
												400.0000	
												.0100	

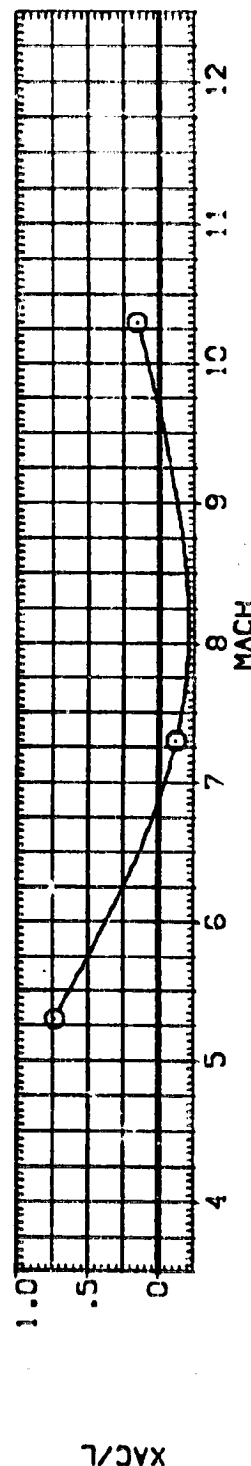
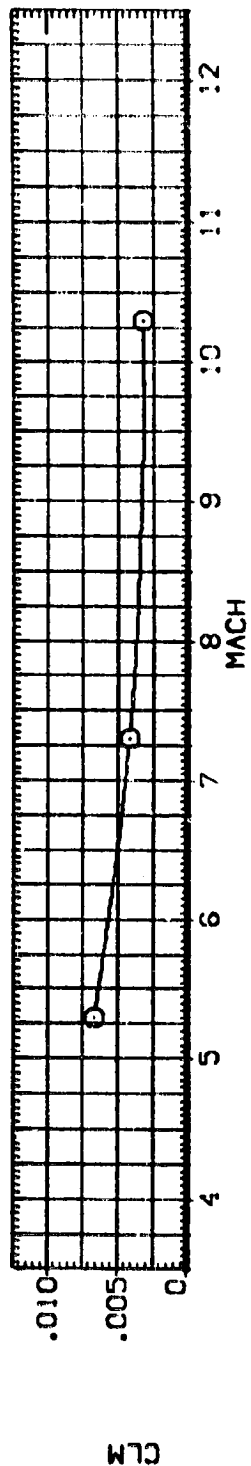
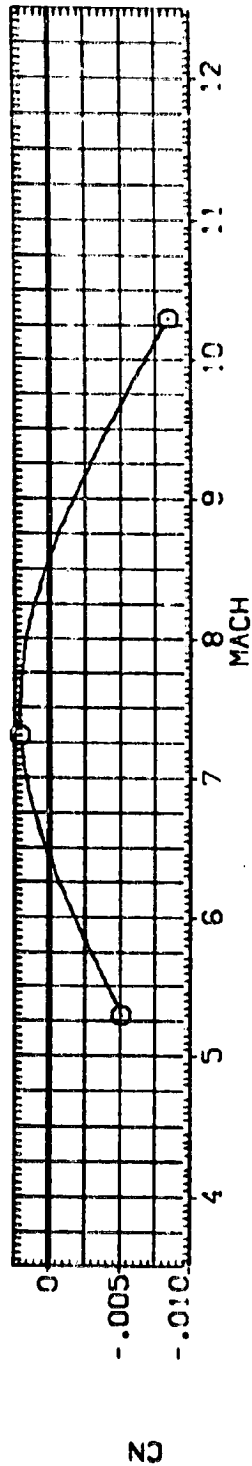
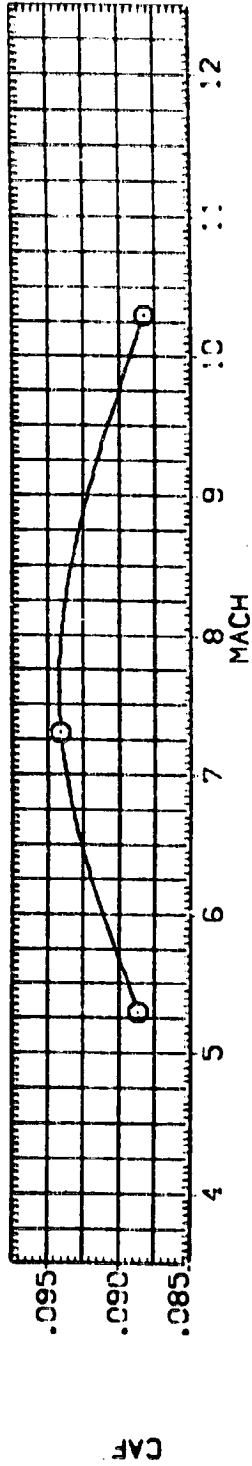


FIG. 13 SUMMARY OF ISOLATED ET LONGITUDINAL CHARACTERISTICS WITH BETA VARYING.

APPENDIX
TABULATED SOURCE DATA

Tabulations of plotted data are available on request
from Data Management Services.

REFERENCE DATA

SRP = 2890.0000 90. FT. XMRP = 979.0000 IN. XT
 LRP = 1290.0000 IN. YMRP = .0000 IN. YT
 BRP = 1290.0000 IN. ZMRP = 490.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

BETA = .000 RUDDER = .000
 ELEVON = .000

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

WACH	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CBL
5.289	-8.648	-.05982	-.26079	-.04032	-.21216	.11164	.01453	-.00556
5.289	-6.416	-.05640	-.21198	-.03894	-.19560	.09670	.01434	-.00517
5.289	-4.539	-.06034	-.17125	-.04033	.16001	.08047	.01393	-.00569
5.289	-2.284	-.06080	-.12273	-.03957	.17352	.06286	.01309	-.00584
5.289	-.165	-.05717	-.07496	-.03792	.16320	.04602	.01214	-.00568
5.289	1.900	-.05425	-.02826	-.03540	.15558	.03046	.01176	-.00578
5.289	3.901	-.04989	-.01560	-.03313	.14912	.01668	.01151	-.00574
5.289	6.050	-.04497	.06441	-.03005	.14259	.00014	.01043	-.00532
5.289	8.092	-.04219	.10916	-.02834	.13833	-.01563	.00993	-.00528
5.289	10.220	-.04038	.15695	-.02751	.13302	-.03438	.00987	-.00526
5.289	15.498	-.03829	.29141	-.03034	.12640	-.08211	.00787	-.00499
5.289	20.818	-.03403	.44703	-.02554	.12566	-.13718	.00231	-.00477
5.289	25.509	-.03464	.59194	-.03254	.12533	-.19918	.00881	-.00898
5.289	29.320	-.06891	.74804	-.04072	.12504	-.25908	.01082	-.00847
GRADIENT		.00134	.02222	.00088	-.00437	-.00760	-.00030	-.00000

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

GRADIENT INTERVAL = -5.00/ 5.00

WACH	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CBL
7.320	-6.464	-.03124	-.24011	-.04069	-.21768	.09497	.01458	-.00614
7.320	-6.250	-.02935	-.19309	-.03845	-.20589	.08090	.01391	-.00529
7.320	-4.384	-.03050	-.15614	-.03837	.19506	.06865	.01292	-.00528
7.320	-2.142	-.02937	-.10550	-.03625	.18281	.05136	.01176	-.00525
7.320	-.024	-.02675	-.06144	-.03159	.17241	.03764	.00933	-.00448
7.320	1.913	-.02621	-.01950	-.03000	.16444	.02597	.00822	-.00435
7.320	3.851	-.02502	.01535	-.02820	.15675	.01674	.00743	-.00425
7.320	5.970	-.02256	.05774	-.02537	.14969	.00693	.00664	-.00405
7.320	8.012	-.02155	.10041	-.02420	.14281	-.00461	.00630	-.00404
7.320	10.106	-.02060	.14274	-.02099	.13776	-.01528	.00395	-.00325
7.320	15.284	-.01985	.26324	-.01821	.12795	-.05436	.00187	-.00213
7.320	20.418	-.01602	.39640	-.01617	.12122	-.09883	.00293	-.00390
7.320	24.693	-.01789	.54722	-.01848	.11835	-.16045	.00368	-.00307
7.320	28.557	-.01759	.68736	-.01984	.12008	-.21896	.00522	-.00495
GRADIENT		.00069	.02092	.00130	-.00474	-.00612	-.00071	-.00014

IA18 - ARC 3.5 191 - ORBITER + TANK

(RES001) (21 FEB 75)

REFERENCE DATA

SREF = 2000.0000 SQ.FT. XWRP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YWRP = .0000 IN. YT
 BREF = 1290.3000 IN. ZWRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

BETA = .000 RUDDER = .000
 ELEVON = .000

RUN NO. 0/ 0 RIVL = 1.92 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CBL
10.290	-0.471	-0.03195	-21892	-0.4867	21299	.08131	.01136	-.00572
10.290	-6.269	-0.2981	-18656	-0.4676	19988	.07278	-.01094	-.00605
10.290	-4.401	-0.2965	-15977	-0.583	19772	.06501	.01022	-.00576
10.290	-2.202	-0.2651	-11463	-0.3391	17378	.04973	.00803	-.00512
10.290	-1.126	-0.2338	-07299	-0.3495	16315	.03460	.00692	-.00482
10.290	1.811	-0.1933	-03819	-0.2743	15405	.02515	.00431	-.00359
10.290	3.771	-0.1763	-00073	-0.2547	14697	.01562	.00435	-.00382
10.290	5.641	-0.1089	03441	-0.1615	14227	.01339	.00310	-.00254
10.290	7.908	-0.0825	08134	-0.1377	13488	.00257	.00383	-.00253
10.290	9.933	-0.0751	11719	-0.1231	12894	.00585	.00328	-.00228
10.290	15.048	-0.0426	22836	-0.0553	12102	.04010	.00045	-.00079
10.290	20.154	-0.0332	35007	-0.0492	11497	.07958	.00095	-.00075
10.290	24.611	-0.0295	49908	-0.0443	11593	.13973	.00101	-.00058
10.291	28.241	-0.0227	63906	-0.0337	12087	.20075	.00065	-.00045
GRADIENT		.00153	01953	.00261	-.00499	-.00607	-.00076	.00027

IA18 - ARC 3.5 191 - ORBITER + TANK

(RES002) (21 FEB 75)

REFERENCE DATA

SREF = 2000.0000 SQ.FT. XWRP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YWRP = .0000 IN. YT
 BREF = 1290.3000 IN. ZWRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

ALPHA = 4.000 RUDDER = .000
 ELEVON = .000

RUN NO. 0/ 0 RIVL = 3.18 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CBL	ALPHA	CAF	CLM
5.291	-7.741	-0.4274	-29844	-.07015	.03055	3.98527	.17571	.00195
5.291	-5.037	-0.3928	-15040	-.05087	.02224	3.99227	.16781	.00564
5.291	-3.789	-0.3571	-09174	-.03039	.01360	3.99734	.16072	.00638
5.291	-1.911	-0.3242	04287	-.01358	.00532	3.99925	.15344	.01087
5.291	.030	-0.3199	-00583	-.00249	-.00109	4.00045	.14905	.01141
5.291	1.945	-0.3045	-05751	01914	-.00893	4.00611	.14266	.00746
5.291	3.842	-0.4053	-11097	03824	-01700	4.00485	.13562	.00569
5.291	5.810	0.05120	-16876	05472	-02358	4.01234	.12998	-.00098
5.291	7.630	0.0969	-22772	07461	-03457	4.01648	.16339	-.00677
GRADIENT		.00082	-.02647	.00059	-.00400	.00115	-.00047	-.00046

IA10 - ARC 3.5 191 - ORBITER + TANK

(RES002) (21 FEB 75)

REFERENCE DATA

SREF = 2000.0000 90. FT. YMRP = 979.0000 IN. XT
 LREF = 1290.0000 IN. YMRP = .0000 IN. YT
 BREF = 1290.0000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

ALPHA = 4.000 RUPPER = .000
 ELEVON = .000

RUN NO. 0/ 0 RWL = 2.70 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CB	ALPHA	CAF	CLM
7.320	-7.799	.03278	.18032	-.02777	.02598	3.98618	.16158	.00398
7.320	-5.890	-.03024	-.13044	-.03705	.01789	3.98901	.15898	.00737
7.320	-3.881	.02217	.08025	-.02205	.01062	3.98735	.15659	.01297
7.320	-1.947	-.02346	-.03728	-.00939	.01471	3.99267	.15456	.01458
7.320	-.005	.02286	-.00577	.00149	-.00108	3.99294	.15602	.01568
7.320	1.966	-.02808	-.05396	-.01433	-.00811	3.99404	.15607	.01169
7.320	3.929	.03053	-.10270	.02792	-.01511	3.99447	.15912	.01055
7.320	5.946	-.03531	-.15662	-.04347	-.02284	3.99442	.16159	.00687
7.320	7.799	.04152	-.21245	.06084	-.03119	3.99564	.16343	.00305
GRADIENT		.00109	-.02341	.00633	-.00329	.00080	.00034	-.00040

RUN NO. 0/ 0 RWL = 1.49 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CB	ALPHA	CAF	CLM
10.290	-7.886	.02153	.15397	-.04211	.01933	3.99565	.16309	.00989
10.290	-5.943	-.01029	.10821	-.02885	.01388	3.98352	.15702	.01644
10.290	-3.892	.01793	.06975	-.01742	.00901	3.98955	.15327	.01445
10.290	-1.910	-.00585	-.02728	-.00632	.00317	3.98656	.14754	.02079
10.290	-.047	.01322	-.01074	.00192	-.00182	3.99043	.14754	.01773
10.290	2.054	.01925	-.05137	.01188	-.00759	3.99296	.14807	.01478
10.290	3.929	.02460	-.09337	.02298	-.01375	3.99489	.15083	.01263
10.291	5.967	.02873	-.14051	.03772	-.02078	3.99501	.15444	.00984
10.290	7.824	.03453	-.18607	.05123	-.02737	3.99573	.15813	.00622
GRADIENT		.00143	-.02065	.00505	-.00287	.00587	-.00002	-.00049

REFERENCE DATA

SREF = 2890.0000 SQ.FT. XMRP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YMRP = .0000 IN. YT
 BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

ALPHA = .000 RUDDER = .000
 ELEVON = .000

RUN NO.	Q/ O	R/V/L	GRADIENT INTERVAL	CLM	CAF	ALPHA	CLM
5.291	BETA	-7.714	3.08	-.03965	-.22754	-.19591	.03635
5.291	CN	-.06545		.03965	-.22754	-.19591	.03635
5.291	CY	.22478		-.03965	-.22754	-.19591	.03635
5.291	CN	-.06538		.02245	-.21617	-.18660	.03922
5.291	CY	.16273		-.02245	-.21617	-.18660	.03922
5.291	CN	-.06683		.03340	-.20897	-.17910	.04022
5.291	CY	.10089		-.03340	-.20897	-.17910	.04022
5.291	CN	-.06599		.04413	-.20158	-.17222	.04083
5.291	CY	.04413		-.04413	-.20158	-.17222	.04083
5.291	CN	-.06350		.00260	-.19560	-.17037	.04013
5.291	CY	.00260		-.00260	-.19560	-.17037	.04013
5.291	CN	-.05990		.02088	-.19037	-.17037	.03857
5.291	CY	.02088		-.02088	-.19037	-.17037	.03857
5.291	CN	-.05043		.06195	-.18713	-.17840	.03229
5.291	CY	.06195		-.06195	-.18713	-.17840	.03229
5.291	CN	-.04203		.06486	-.18421	-.18316	.02740
5.291	CY	.06486		-.06486	-.18421	-.18316	.02740
GRADIENT		.00122		.00942	-.00410	-.00160	-.00030

RUN NO.	Q/ O	R/V/L	GRADIENT INTERVAL	CLM	CAF	ALPHA	CLM
7.320	BETA	-7.850	2.84	-.02603	-.11102	-.18603	.02989
7.320	CN	-.05810		.02603	-.11102	-.18603	.02989
7.320	CY	.19897		-.02603	-.11102	-.18603	.02989
7.320	CN	-.05974		.01830	-.10830	-.18002	.03329
7.320	CY	.08616		-.01830	-.10830	-.18002	.03329
7.320	CN	-.05953		.02487	-.10385	-.17376	.03433
7.320	CY	.03723		-.02487	-.10385	-.17376	.03433
7.320	CN	-.05955		.00409	-.10155	-.17029	.03481
7.320	CY	.00409		-.00409	-.10155	-.17029	.03481
7.320	CN	-.05741		.00269	-.09890	-.17024	.03457
7.320	CY	.00269		-.00269	-.09890	-.17024	.03457
7.320	CN	-.05388		.01758	-.09577	-.16990	.03320
7.320	CY	.01758		-.01758	-.09577	-.16990	.03320
7.320	CN	-.05081		.03360	-.09451	-.17370	.03217
7.320	CY	.03360		-.03360	-.09451	-.17370	.03217
7.320	CN	-.04437		.05155	-.09374	-.17799	.02805
7.320	CY	.05155		-.05155	-.09374	-.17799	.02805
7.320	CN	-.04100		.07183	-.09414	-.18203	.02382
7.320	CY	.07183		-.07183	-.09414	-.18203	.02382
GRADIENT		.00119		.00742	-.00341	-.00125	-.00000

RUN NO.	Q/ O	R/V/L	GRADIENT INTERVAL	CLM	CAF	ALPHA	CLM
10.290	BETA	-7.919	1.73	.02212	-.07032	-.17843	.03172
10.290	CN	-.05440		-.02212	-.07032	-.17843	.03172
10.290	CY	.17258		.02212	-.07032	-.17843	.03172
10.290	CN	-.05291		.01602	-.06727	-.17274	.03159
10.290	CY	.12578		-.01602	-.06727	-.17274	.03159
10.290	CN	-.05631		.01042	-.06599	-.16724	.03435
10.290	CY	.08087		-.01042	-.06599	-.16724	.03435
10.290	CN	-.05026		.00326	-.06285	-.16452	.03102
10.290	CY	.03147		-.00326	-.06285	-.16452	.03102
10.290	CN	-.05324		.00193	-.06224	-.16378	.03406
10.290	CY	.01045		-.00193	-.06224	-.16378	.03406
10.290	CN	-.04536		.01684	-.05897	-.16460	.02956
10.290	CY	.05918		-.01684	-.05897	-.16460	.02956
10.290	CN	-.04142		.03062	-.05584	-.16801	.02876
10.290	CY	.10807		-.03062	-.05584	-.16801	.02876
10.290	CN	-.04142		.04601	-.05260	-.17515	.02944
10.290	CY	.15858		-.04601	-.05260	-.17515	.02944
10.290	CN	-.04324		.06413	-.05060	-.17936	.02994
10.290	CY	.21299		-.06413	-.05060	-.17936	.02994
GRADIENT		.00174		.00574	-.00330	-.00099	-.00000



IA10 - ARC 3.5 191 - ORBITER + TANK

ALPHA = -4.000 RUCDER = .000
 ELEVON = .000

PARAMETRIC DATA

REFERENCE DATA

SRP = 2000.0000 SQ. FT. TRRP = 979.0000 IN. XT
 LRFP = 1290.0000 IN. YMRP = .0000 IN. YT
 BRFP = 1290.0000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

RUN NO. 0/ 0 RVL = 3.13 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CBL	ALPHA	CAF	CLM
5.291	-7.632	-1.6032	.24506	-.08796	.03303	-4.40901	.21655	.07091
5.291	-5.751	-1.1988	.17691	-.06194	.02374	-4.39759	.20674	.07133
5.291	-3.787	-1.1947	.11009	-.03776	.01442	-4.38851	.19945	.07156
5.291	-1.893	-1.1689	.05062	-.01719	.00636	-4.38128	.19257	.07136
5.291	.006	-1.1494	-.00949	.00344	-.00101	-4.37785	.18817	.07038
5.291	1.956	-1.1225	-.07254	.02501	-.01048	-4.37297	.19170	.06959
5.291	3.803	-1.1239	-.13729	.04795	-.01978	-4.37483	.19468	.06942
5.291	5.798	-1.1478	-.21064	.07535	-.02993	-4.37489	.20034	.06571
5.291	7.653	-1.1419	-.28167	.10247	-.03993	-4.37489	.20512	.06210
GRADIENT		.00088	-.03247	.01122	-.00449	.00182	-.00055	-.00032

RUN NO. 0/ 0 RVL = 2.36 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CBL	ALPHA	CAF	CLM
7.320	-7.814	-1.1490	.21896	-.07470	.02776	-4.19556	.20236	.06091
7.320	-5.910	-1.1600	.16134	-.05473	.01999	-4.19239	.19645	.06256
7.320	-3.889	-1.1494	.10331	-.03469	.01222	-4.19317	.19709	.06482
7.320	-1.942	-1.1442	.04897	-.01655	.00545	-4.18690	.19421	.06348
7.320	-.012	-1.1406	-.00636	.00187	-.00149	-4.18771	.19139	.06374
7.320	1.982	-1.1278	-.06679	.02115	-.00325	-4.18405	.19470	.06423
7.320	3.923	-1.1442	-.12484	.04062	-.01711	-4.18583	.19676	.06465
7.320	5.913	-1.14271	-.18444	.06032	-.02529	-4.18736	.20098	.06339
7.320	7.796	-1.13921	-.24626	.08223	-.03415	-4.18855	.20539	.06267
GRADIENT		.00062	-.02926	.00963	-.00375	.00090	-.00000	.00001

RUN NO. 0/ 0 RVL = 1.45 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CYN	CBL	ALPHA	CAF	CLM
10.290	-7.869	-1.13493	.18506	-.06148	.02184	-4.12451	.20205	.05902
10.290	-5.882	-1.13782	.12847	-.04293	.01418	-4.12341	.19552	.06127
10.290	-3.899	-1.13741	.07527	-.02424	.00722	-4.12444	.19116	.06162
10.290	-1.956	-1.13015	.03066	-.00998	.00225	-4.11545	.18846	.05956
10.290	.045	-1.13395	-.01737	.00538	-.00288	-4.11599	.18705	.06202
10.290	2.046	-1.13259	-.06648	.02048	-.00889	-4.11441	.18747	.06238
10.290	3.946	-1.12971	-.11643	.03661	-.01524	-4.11370	.19146	.05775
10.290	5.963	-1.12094	-.15946	.05046	-.02014	-4.11090	.19198	.05610
10.290	7.818	-1.11129	-.21295	.06885	-.02742	-4.10978	.19906	.05025
GRADIENT		.00106	-.02443	.00767	-.00284	.00079	-.00002	-.00003

IA18 - ARC 3.5 191 - ORBITER + TANK

REFERENCE DATA
 XMRP = 2090.0000 SQ. FT.
 YMRP = 1290.3000 IN.
 ZMRP = 1290.3000 IN.
 SCALE = .0100

PARAMETRIC DATA
 BETA = .000
 RUDDER = .000
 ELEVON = .000

RUN NO. 17/ 0 RWL = 2.59 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CSL
7.320	19.844	-.00299	.28427	-.00221	.12668	-.06184	.00099	-.00029
7.320	20.361	-.00336	.39134	-.00368	.11969	-.09626	.00094	-.00038
7.320	21.551	-.00123	.57930	-.00091	.11853	-.17588	-.00011	.00024
7.320	30.711	-.00020	.79215	-.00192	.12118	-.26865	-.00131	.00101
7.320	35.218	-.00194	.98846	-.00362	.12363	-.35394	-.00196	.00164
7.320	38.901	-.00326	1.13934	-.00498	.12692	-.41800	-.00223	.00213
GRADIENT		.00000	.00000	.00000	.00000	.00000	.00000	.00000

(RES006) (21 FEB 75)

IA18 - ARC 3.5 191 - TANK

PARAMETRIC DATA
 BETA = .000
 RUDDER = .000
 ELEVON = .000

REFERENCE DATA
 XMRP = 2090.0000 SQ. FT.
 YMRP = 1290.3000 IN.
 ZMRP = 1290.3000 IN.
 SCALE = .0100

RUN NO. 0/ 0 RWL = 3.11 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CSL
5.289	-30.210	-.00338	-.62224	.00923	.17167	.14777	-.00419	.00135
5.289	-24.625	-.00772	-.46556	.00979	.15296	.10440	-.00351	.00079
5.289	-20.401	-.00892	-.39078	-.00170	.13241	.06937	-.00277	.00044
5.289	-14.732	-.01076	-.22533	-.00416	.11140	.03484	-.00221	.00025
5.289	-10.179	-.01068	-.14280	-.00516	.09115	.01840	-.00165	.00019
5.289	-8.192	-.01019	-.11020	-.00476	.08853	.01341	-.00166	.00014
5.289	-6.129	-.01063	-.07929	-.00345	.08671	.01054	-.00147	.00022
5.289	-4.022	-.00997	-.06218	-.00355	.08327	.00860	-.00115	.00001
5.289	-2.030	-.01177	-.02920	-.00725	.08268	.00781	-.00099	-.00003
5.289	.974	-.01248	-.00412	-.00801	.08285	.00891	-.00086	-.00002
5.289	2.105	-.01150	.00203	-.00791	.08103	.00812	-.00092	.00004
5.289	4.157	-.01200	.04319	-.00664	.08059	.00769	-.00023	-.00003
5.289	6.164	-.01231	.06737	-.00984	.08077	.00682	-.00016	-.00004
5.289	8.181	-.01306	.09459	-.01058	.08075	.00460	-.00027	-.00004
GRADIENT		-.00000	.01168	-.00035	-.00058	-.00007	.00011	-.00000

(RES006) (21 FEB 75)



REFERENCE DATA

SHEP = 2890.0000 SQ. FT. XMRP = 979.0000 IN. XT
 LMRP = 1290.3000 IN. YMRP = .0000 IN. YT
 BRP = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

BETA = .000 RUDDER = .000
 ELEVON = .000

IA18 - ARC 3.5 191 - TANK

RUN NO. 0/ 0 RWL = 3.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CY	CAF	CLM	CYN	CBL
7.320	-30.176	.00242	-.61317	.01698	.17687	.14628	-.00779	.00548
7.320	-24.640	.00229	-.46048	.01169	.15955	.10411	-.00594	.00063
7.320	-20.403	.00055	-.34508	.00888	.13954	.06646	-.00285	.00030
7.320	-14.795	-.00112	-.21520	.00339	.11992	-.02733	-.00240	.00018
7.320	-10.326	-.00022	-.13642	.00174	.10436	.01158	-.00105	.00011
7.320	-8.294	-.00120	-.10551	.00055	.10073	-.00758	-.00092	.00011
7.320	-6.290	-.00139	-.07865	-.00011	.09777	.00547	-.00067	.00010
7.320	-4.168	-.00016	-.05205	.00053	.09913	-.00408	-.00036	.00002
7.320	-2.132	-.00207	-.02782	-.00150	.09410	.00445	-.00029	-.00001
7.320	-.095	-.00338	-.00476	-.00207	.09393	.00804	-.00067	.00000
7.320	1.976	-.00278	.01637	-.00217	.09275	.00765	-.00033	-.00001
7.320	3.973	-.00300	.03718	-.00253	.09314	.00800	-.00023	-.00003
7.320	5.964	-.00164	.06417	-.00120	.09366	.00783	-.00022	-.00001
7.320	7.938	-.00286	.08828	-.00240	.09333	.00743	-.00022	-.00001
GRADIENT		-.00031	.01092	-.00033	-.00026	.00054	.00001	-.00003

RUN NO. 0/ 0 RWL = 1.61 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CY	C-F	CLM	CYN	CBL
10.290	-21.923	-.00166	-.59459	.01636	.15006	.15360	-.01069	.00180
10.290	-24.389	-.00016	-.44443	.01251	.15376	.11487	-.00687	.00095
10.290	-20.247	-.00254	-.32252	.00231	.13116	.06927	-.00429	.00045
10.290	-14.703	-.00204	-.19082	-.00195	.11000	.02213	-.00134	.00027
10.290	-10.216	-.00053	-.11950	.00060	.09721	.00561	-.00076	.00016
10.290	-6.231	-.00105	-.09041	-.00122	.09100	.00262	-.00037	.00015
10.290	-6.237	-.00175	-.06585	-.00378	.08735	.00048	-.00002	.00003
10.290	-4.139	-.00072	-.03926	-.00205	.08640	.00010	-.00026	.00013
10.290	-2.151	-.00054	-.02521	-.00112	.08663	.00231	-.00003	.00014
10.290	-.106	-.00095	-.00195	-.00103	.08593	.00337	.00010	.00014
10.290	1.985	-.00118	.01702	-.00280	.08569	.00317	.00011	.00009
10.290	3.920	-.00170	.03462	-.00366	.08531	.00680	-.00002	.00010
10.290	5.920	-.00166	.05414	-.00368	.08551	.00781	.00002	.00011
10.290	7.871	-.00122	.08296	-.00235	.08721	.00721	-.00018	.00013
GRADIENT		-.00013	.00929	.00025	-.00015	.00116	-.00002	-.00001

1A16 - ARC 3.5 191 - TANK

(RES0077) (21 FEB 75)

REFERENCE DATA

XREF = 2000.0000 SQ. FT. XMRP = 979.0000 IN. XT
 LREF = 1290.3000 IN. YMRP = .0000 IN. YT
 BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

ALPHA = 4.000 RUDDER = .000
 ELEVON = .000

RUN NO. 11/ 0 RV/L = 2.59 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	ALPHA	CN	CY	CAF	CJM	CYN	CBL
7.320	-7.919	4.04599	.04255	.09145	.09330	.00375	.00394	.00015
7.320	-5.949	4.04735	.04321	.06829	.09242	.00619	.00351	.00015
7.320	-3.899	4.04676	.04105	.04236	.09122	.00688	.00258	.00014
7.320	-1.955	4.05308	.04708	.02038	.08934	.00753	.00143	.00013
7.320	.038	4.05211	.04441	-.00177	.09006	.00826	-.00037	.00003
7.320	2.064	4.04963	.04375	-.02405	.09053	.00717	-.00173	.00003
7.320	3.978	4.04977	.04378	-.04644	.09112	.00716	-.00304	.00004
7.320	6.016	4.04824	.04402	-.07242	.09100	.00626	-.00336	.00012
7.320	7.886	4.04778	.04593	-.09754	.09129	.00509	-.00284	.00019
GRADIENT		.00013	.00010	-.01123	.00005	.00001	-.00073	-.00002

RUN NO. 6/ 0 RV/L = 1.52 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	ALPHA	CN	CY	CAF	CJM	CYN	CBL
10.290	-7.970	4.02704	.04215	.08012	.08937	.00520	.00511	.00020
10.290	-5.992	4.02646	.03941	.05005	.08731	.00598	.00450	.00020
10.290	-3.922	4.02751	.04010	.03327	.08501	.00660	.00366	.00012
10.290	-1.940	4.02671	.03822	.01302	.08437	.00675	.00149	.00004
10.290	-.003	4.02722	.03911	-.00680	.08493	.00680	-.00048	.00001
10.290	2.022	4.02717	.03890	-.02714	.08480	.00685	-.00244	.00000
10.290	4.020	4.02882	.04288	-.05084	.08363	.00651	-.00390	.00003
10.290	6.059	4.02676	.04098	-.07213	.08597	.00551	-.00487	.00003
10.290	7.935	4.02647	.04104	-.09403	.08727	.00522	-.00504	.00003
GRADIENT		.00016	.00032	-.01070	.00010	-.00000	-.00096	-.00002

IA18 - ARC 3.5 191 - TANK

(RES008) (21 FEB 75)

REFERENCE DATA

XPRP = 2999.0000 90. FT. XMRP = 979.0000 IN. XT
 LMRP = 1299.3000 IN. YMRP = .0000 IN. YT
 ZMRP = 1299.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

ALPHA = .000 RUDDER = .000
 ELEVON = .000

RUN NO. 0/ 0 R/VL = 3.02 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
5.289	-7.834	-.00276	.10394	.00904	-.00046	.00040	.02401	.09393
5.289	-5.932	-.00361	.07625	.00866	.00095	.00027	.02162	.09413
5.289	-3.915	-.00365	.04828	.00814	.00111	.00016	.01397	.09416
5.289	-1.929	-.00367	.02322	.00856	.00069	.00006	.01835	.09330
5.289	.001	-.00553	.00058	.00853	-.00054	.00002	.01846	.09331
5.289	2.033	-.00462	-.02410	.00834	-.00144	-.00008	.01917	.09215
5.289	3.939	-.00368	-.04641	.00788	-.00160	-.00023	.01910	.09095
5.289	5.999	-.00357	-.07636	.00708	-.00075	-.00028	.01676	.08993
5.289	7.897	-.00488	-.10521	.00665	-.00161	-.00048	.01352	.08869
GRADIENT		.00005	-.01224	-.00004	-.00038	-.00005	-.00005	-.00038

RUN NO. 0/ 0 R/VL = 2.18 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
7.320	-7.950	-.00005	.09348	.00605	.00464	.00016	.00969	.09720
7.320	-6.033	.00178	.06966	.00580	.00433	.00007	.01056	.09683
7.320	-3.898	-.00085	.04460	.00562	.00396	.00005	.00831	.09355
7.320	-1.917	-.00034	.02144	.00545	.00224	.00005	.00843	.09318
7.320	.009	-.00029	-.00023	.00644	-.00025	.00008	.01002	.09410
7.320	3.982	.00211	-.04823	.00584	-.00374	-.00014	.01084	.09286
7.320	6.047	.00213	-.07245	.00482	-.00386	-.00026	.00922	.09447
7.320	7.914	.00214	-.09720	.00415	-.00382	-.00032	.00815	.09414
GRADIENT		.00037	-.01177	.00005	-.00099	-.00002	.00035	-.00007

RUN NO. 0/ 0 R/VL = 1.51 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
10.290	-8.027	-.00489	.07920	.00434	.00573	.00021	.15226	.09035
10.290	-6.104	-.00156	.06029	.00341	.00524	.00020	.15292	.08890
10.290	-2.090	-.00072	.01531	.00321	.00021	.00004	.15313	.08653
10.290	-.103	-.00267	-.00636	.00297	.00206	.00003	.15187	.08535
10.290	1.908	.00213	-.02569	.00294	-.00239	.00001	.15427	.08497
10.290	3.893	-.00375	-.04866	.00373	-.00436	-.00003	.15113	.08525
10.290	5.950	-.00227	-.07049	.00280	-.00555	-.00003	.15188	.08790
10.290	7.871	-.00631	-.09174	.00314	-.00361	-.00002	.15019	.08816
GRADIENT		-.00051	-.01059	.00008	-.00111	-.00001	-.00018	-.00052

1A18 - ARC 3.5 191 - TANK

(RES009) (21 FEB 75)

REFERENCE DATA

SHEET = 2000.0000 50. FT. XMRP = 979.0000 IN. XT
 LNEY = 1230.3000 IN. YMRP = .0000 IN. YT
 SREP = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

ALPHA = -4.0000 RUDDER = .0000
 ELEVON = .0000

RUN NO. 0/ 0 RWL = 3.04 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
5.289	-7.870	-.06193	.10413	.01088	-.00143	.00059	-4.05562	-.09774
5.289	-5.936	-.05830	.07519	.02960	-.00004	.00041	-4.05440	.09730
5.289	-3.892	-.05462	.04732	.07064	.00026	.00028	-4.05207	-.09712
5.289	-1.915	-.05472	.02252	.02913	-.00011	.00018	-4.05074	.09611
5.289	-.091	-.05337	-.02226	.00852	-.00064	.00000	-4.05098	-.09504
5.289	2.027	-.05422	-.02630	.02889	-.00152	-.00005	-4.05081	.09449
5.289	3.949	-.05393	-.05071	.00914	-.00181	-.00017	-4.04961	-.09380
5.289	6.010	-.05493	-.07934	.02867	-.00090	-.00023	-4.05231	.09323
5.289	7.896	-.05623	-.10848	.00929	.00144	-.00044	-4.05249	-.09333
GRADIENT		-.00010	-.01248	.00004	-.00028	-.00005	.00025	-.00042

RUN NO. 0/ 0 RWL = 2.75 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
7.320	-7.943	-.05174	.09794	.00996	.00272	.00033	-4.05845	.10025
7.320	-5.934	-.04835	.07187	.00493	.00269	.00021	-4.05668	.09818
7.320	-3.871	-.04664	.04616	.00507	.00193	.00012	-4.05667	.09870
7.320	-1.911	-.04734	.02301	.00366	.00098	.00002	-4.05863	.09705
7.320	-.092	-.04993	.00075	.00383	-.00034	-.00003	-4.06125	.09579
7.320	2.017	-.04804	-.02424	.00368	-.00268	-.00003	-4.06026	.09562
7.320	3.977	-.04658	-.04640	.00391	-.00330	-.00004	-4.05663	.09682
7.320	6.027	-.04692	-.07088	.00374	-.00401	-.00018	-4.05704	.09697
7.320	7.911	-.05133	-.09774	.00463	-.00336	-.00024	-4.06221	.09693
GRADIENT		.00023	-.01184	-.00013	-.00072	-.00002	-.00008	-.00026

RUN NO. 0/ 0 RWL = 1.42 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CN	CY	CLM	CYN	CBL	ALPHA	CAF
10.290	-7.977	-.04794	.08059	.00430	.00511	.00030	-4.01962	.09445
10.290	-6.001	-.04182	.05662	.00223	.00484	.00021	-4.01879	.09288
10.290	-3.898	-.04338	.03574	.00192	.00404	.00020	-4.02093	.09036
10.290	-1.917	-.03987	.01628	.00080	.00238	.00021	-4.01935	.08930
10.290	.053	-.04158	-.03510	.00066	.00066	.00002	-4.02037	.08799
10.290	2.072	-.04237	-.02727	.00084	-.00153	-.00002	-4.02058	.08748
10.290	4.039	-.04098	-.04759	.00069	-.00304	-.00002	-4.02094	.08829
10.290	6.065	-.04389	-.07044	.00194	-.00373	-.00002	-4.02056	.09033
10.290	7.975	-.04097	-.09392	.00227	-.00352	-.00004	-4.01831	.09082
GRADIENT		.00032	-.01058	-.00012	-.00091	-.00003	.00003	-.00035



1A18 - ARC 3.5 191 - ORBITER + TANK

(YES010) (21 FEB 75)

REFERENCE DATA

SREF = 2000.0000 90. FT. XMRP = 979.0000 IN. XT
LREF = 1290.3000 IN. YMRP = .0000 IN. YT
BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
SCALE = .0100

ALPHA = .000 RUDDER = .000
ELEVON = .000

PARAMETRIC DATA

RUN NO. 20/ 0 RVAL = 2.95 GRADIENT INTERVAL = -5.00/ 5.00

MACH	BETA	CAB-O	CAB-T	ALPHA	CN	CY	CA	CLM	CYN	CBL
5.291	-7.745	-.00146	-.00631	-.17752	-.08777	.23219	.05313	.03659	-.09499	.03484
5.291	-5.058	.00040	-.00343	-.17105	-.08831	.16372	.05570	.03977	-.06857	-.02492
5.291	-3.834	.00280	-.00207	-.16937	-.08654	.10275	.06386	.04266	-.04626	.01618
5.291	-1.975	.00416	.00103	-.16597	-.08689	.04706	.07035	.04396	-.02651	.00803
5.291	-.059	.00474	.00470	-.16397	-.08354	-.00753	.07966	.04401	-.00826	.00225
5.291	1.938	.00493	.00134	-.16140	-.07789	-.06600	.08942	.04227	.01123	-.00832
5.291	3.794	.00308	-.00092	-.16349	-.07226	-.12039	.03940	.03037	-.03037	-.01610
5.291	5.760	.00498	-.00199	-.16602	-.08973	-.18375	.12648	.03413	.05583	-.02562
5.291	7.573	.00496	-.00298	-.17335	-.04604	-.24607	.16233	.02864	.08280	-.03542
	GRADIENT	.00028	.00018	.00085	.00217	-.02918	.00481	-.00043	.00996	-.00422

REFERENCE DATA

SREF = 2000.0000 90. FT. XMRP = 979.0000 IN. XT
LREF = 1290.3000 IN. YMRP = .0000 IN. YT
BREF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
SCALE = .0100

BETA = .000 RUDDER = .000
ELEVON = .000

PARAMETRIC DATA

RUN NO. 19/ 0 RVAL = 2.65 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CAB-O	CAB-T	BETA	CN	CY	CA	CLM	CYN	CBL
5.289	-8.648	-.00417	.00835	-.03962	-.26079	-.04052	-.21634	.11095	.01453	-.00556
5.289	-6.416	.00003	.00895	-.05640	-.21198	-.03894	.20558	.09671	.01434	-.00517
5.289	-4.339	.00238	.00955	-.06054	-.17125	-.04033	.19764	.08102	.01395	-.00569
5.289	-2.284	.00379	.00965	-.06080	-.12273	-.03957	.18687	.06363	.01309	-.00584
5.289	-.163	.00428	.00962	-.03717	-.07496	-.03792	.17710	.04713	.01214	-.00568
5.289	1.900	.00453	.00913	-.05426	-.02826	-.03540	.16824	.03164	.01176	-.00573
5.289	3.901	.00476	.00870	-.04960	.01560	-.03313	.16258	.01792	.01151	-.00574
5.289	6.050	.00536	.00822	-.04497	.06441	-.03095	.15617	.00154	.01043	-.00532
5.289	8.092	.00545	.00750	-.04219	.10916	-.02834	.15128	-.01421	.00993	-.00528
5.289	10.220	.00559	.00684	-.04038	.15695	-.02751	.14546	-.03292	.00987	-.00526
5.289	15.498	.00572	.00431	-.03229	.29141	-.03054	.13662	-.08061	.00787	-.00499
5.289	20.818	.00526	.00079	-.03403	.44703	-.02554	.13191	-.13581	.00231	-.00477
5.289	25.909	.00453	.00014	-.03464	.59194	-.02254	.12999	-.18799	.00881	-.00898
5.289	29.320	.00502	-.00167	-.06891	.74804	-.04072	.12839	-.25677	.01082	-.00847
	GRADIENT	.00000	.00010	.00134	.02222	.00088	-.00417	-.00752	-.00030	-.00000

1A18 - ARC 3.5 191 - ORBITER + TANK

(YES001) (21 FEB 75)

IA10 - ARC 3.5 191 - TANK

(RES006) (21 FEB 75)

REFERENCE DATA

SARP = 2090.0000 SQ.FT. ZMRP = 979.0000 IN. XT
 XREF = 1290.3000 IN. YMRP = .0000 IN. YT
 ORF = 1290.3000 IN. ZMRP = 400.0000 IN. ZT
 SCALE = .0100

PARAMETRIC DATA

BETA = .000 RUDDER = .000
 ELEVON = .000

RUN NO. 26/ 0 RWL = 3.11 GRADIENT INTERVAL = -.5.00/ 5.00

MACH	ALPHA	CAB-T	CN	CY	CA	CLM	CYN	CBL
5.289	-30.210	-.00196	-.62224	.00323	.16971	.14777	-.00419	.00135
5.289	-24.625	.00171	-.46556	.00079	.15468	.10440	-.00361	.00070
5.289	-20.401	.00097	-.35078	-.00170	.13748	.06937	-.00277	.00044
5.289	-14.732	.00710	-.22533	-.00416	.11830	.03484	-.00221	.00025
5.289	-10.179	.00679	-.14280	-.00516	.10794	.01840	-.00165	.00019
5.289	-8.192	.00644	-.11020	-.00476	.10497	.01341	-.00165	.00014
5.289	-6.129	.00578	-.07929	-.00545	.10249	.01054	-.00147	.00002
5.289	-4.022	.00536	-.05218	-.00555	.10563	.00860	-.00115	-.00001
5.289	-2.030	.00624	-.02920	-.00725	.09892	.00781	-.00098	-.00003
5.289	.074	.00560	-.00412	-.00801	.09846	.00801	-.00086	-.00002
5.289	2.185	.00628	.02028	-.00791	.09731	.00812	-.00052	-.00004
5.289	4.157	.00539	.04319	-.00884	.09648	.00769	-.00023	-.00003
5.289	6.164	.00667	.06737	-.00984	.09644	.00682	-.00018	-.00004
5.289	8.162	.00671	.09459	-.01058	.09646	.00460	.00027	-.00004
	GRADIENT	.00010	.01168	-.00035	-.00048	-.00007	.00011	-.00000

