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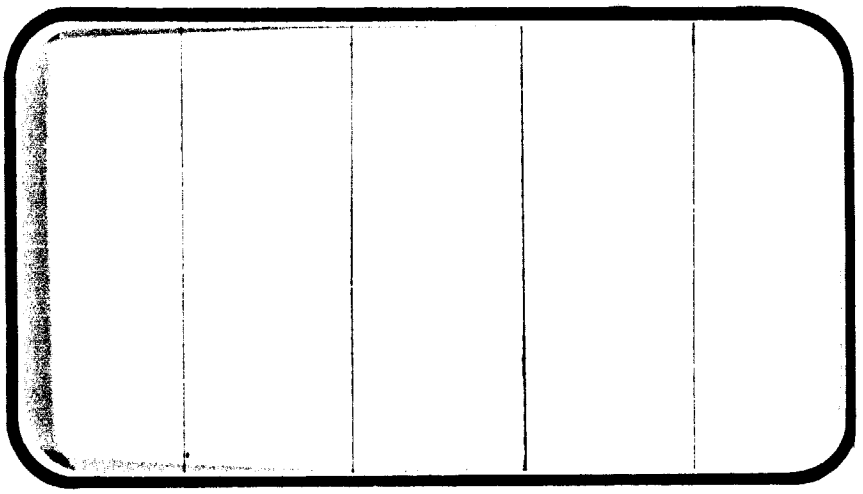

SPACE SHUTTLE

AEROTHERMODYNAMIC DATA REPORT

JOHNSON SPACE CENTER

HOUSTON, TEXAS

DATA MANagement services

SPACE DIVISION CHRYSLER CORPORATION

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REENTRY AERODYNAMIC CHARACTERISTICS OF A SPACE SHUTTLE SOLID ROCKET BOOSTER (MSFC MODEL 454) AT HIGH ANGLES OF ATTACK AND HIGH MACH NUMBER IN THE NASA/LANGLEY FOUR-FOOT UNITARY PLAN WIND TUNNEL (SA25F)

by

J. Johnson, NASA/MSFC
W. F. Braddock, NSI

Prepared Under NASA Contract Number NAS9-13247

by

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

for

Engineering Analysis Division

Johnson Space Center
National Aeronautics and Space Administration
Houston, Texas

WIND TUNNEL TEST SPECIFICS:

Test Number:	LaRC 4' UPWT 1087
NASA Series No.:	SA25F
Model Number:	MSFC 454
Test Dates:	March 4 - 11, 1974
Occupancy Hours:	30

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

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ABSTRACT

A force test of a 2.112 percent scale Space Shuttle Solid Rocket Booster (SRB), MSFC Model 454, was conducted in test section #2 of the Langley Research Center's Unitary Plan Wind Tunnel. This test, UPWT 1087, occupied the tunnel for 30 hours between March 4 and March 11,1974. Sixteen (16) runs (pitch polars) were performed over an angle of attack range from 144 through 179 degrees. Test Mach numbers were 2.30, 2.70, 2.96, 3.48, 4.00 and 4.63. The first three Mach numbers had a test Reynolds number of 1.5 million per foot. The remaining three were at 2.0 million per foot. The model was tested in the following configurations:

1. SRB without external protuberances
2. SRB with an electrical tunnel and a SRB/ET thrust attachment structure.

Schlieren photographs were taken during testing of the first configuration. The second configuration was tested at roll angles of 45, 90 and 135 degrees.

TABLE OF CONTENTS

	PAGE
ABSTRACT	iii
INDEX OF MODEL FIGURES	2
INDEX OF DATA FIGURES	3
NOMENCLATURE	4
INTRODUCTION	8
MODEL AND SUPPORT HARDWARE	9
CONFIGURATIONS INVESTIGATED	12
TEST FACILITY DESCRIPTION	13
DATA ACQUISITION AND REDUCTION	14
DATA PRESENTATION	17
REFERENCES	19
TABLES	
I TEST CONDITIONS	20
II DATA SET/RUN NUMBER COLLATIONS	21
III MODEL COMPONENT DIMENSIONS	22
IV PLOT SUMMARY	28
FIGURES	
MODEL	29
DATA	35
APPENDIX	
TABULATED SOURCE DATA	

INDEX OF MODEL FIGURES

FIGURE	DESCRIPTION	PAGE
1	Body and Missile Axis Systems	29
2	142 Inch Diameter SRB-0.02112 Scale Model (SRB Configuration 139 - MSFC Model #454)	30
3	SRB/ET Attachment Ring (MSFC Model #454)	31
4	Electrical Tunnel and SRB/ET Thrust Attachment Structure (MSFC Model #454)	32
5	Major Model Sections	33
6	Cavity Pressure Tap Locations	34

INDEX OF DATA FIGURES

TITLE	CONDITIONS VARYING	PLOTTED COEFFICIENT SCHEDULE	PAGE
Static Stability Characteristics of SRB With Attachment Ring	MACH	(A)	1-6
Effect of Roll Angle on Static Stability Characteristics of SRB	PHI MACH	(A)	7-24

PLOTTED COEFFICIENTS SCHEDULE

(A) CNM, CA, CLMM, CYM, CYNM, CBL Versus ALPHA

NOMENCLATURE

SYMBOL	PLOT SYMBOL	DEFINITION	UNITS
A_b		base area; cross-sectional area of the cylindrical section of the model	in^2
A_c		cavity area, area of the opening required for the balance and sting	in^2
BMC	BMC	Balance Moment Center	
b_{ref}	BREF	reference span (diameter of the cylindrical section of the model)	in.
ℓ_{body}		length of the body	in.
ℓ_{ref}	LREF	reference length (diameter of the cylindrical section of the model)	in.
M	MACH	Mach number	
MRP	MRP	Moment Reference Point (located by XMRP, YMRP, and ZMRP)	in.
P_{b_i}		base pressures	psi
P_t		free stream total pressure	psi
P_∞		free stream static pressure	psi
q_∞	Q(PSF)	free stream dynamic pressure	psf
R_N		Reynolds number based on ℓ_{ref}	
R_N/ft	RN/L	Reynolds number per unit length	per ft.
S_{ref}	SREF	reference area (cross sectional area of the cylindrical section of the model)	in^2
T_t		tunnel total temperature	^oF
C_{pc}	CPC	pressure coefficient of balance cavity	

NOMENCLATURE (Continued)

SYMBOL	PLOT SYMBOL	DEFINITION	UNITS
X, Y, Z		body axes system coordinates (for an airplane, the X, Z-plane is the plane of symmetry, the origin of the axes system is the center of gravity or any other convenient point, and the X axis is the airplane longitudinal axis)	in.
$X_{c.g.}$		distance of center of gravity from nose of body	in.
X_m, Y_m, Z_m		missile axes (see text)	in.
XMRP, YMRP, ZMRP	XMRP, YMRP, ZMRP	Abbreviations for the location of the Moment Reference Point in the missile axis system	in.
α_T	ALPHA	total angle-of-attack, angle between the X_m-axis and a vector in the direction of the relative wind	degrees
ϕ	PHI	roll angle; i.e., angle between the missile Y_m-axis and the body Y-axis (from a pilot's viewpoint in an airplane, a positive roll angle is a clockwise rotation).	degrees
C_A	CA	total axial force coefficient in the body axis system	
C_{A_b}	CAB	base axial force coefficient (same in both missile and body axis systems)	
$C_{A_{f_m}}$	CAF	forebody axial force coefficient, $C_A - C_{A_b}$	
C_{A_m}	CA	total axial force coefficient in the missile axis system, $F_{A_m}/q_\infty S_{ref}$	
C_l	CBL	rolling moment coefficient in the body axis system	
C_{l_m}	CBL	rolling moment coefficient in the missile axis system, $M_{Y_m}/q_\infty S_{ref} \ell_{ref}$	

NOMENCLATURE (Continued)

SYMBOL	PLOT SYMBOL	DEFINITION	UNITS
C_m	CLM	pitching moment coefficient in the body axis system	
C_{m_m}	CLMM	pitching moment coefficient in the missile axis system, $M_{Y_m}/q_\infty S_{ref} \ell_{ref}$	
C_N	CN	normal force coefficient in the body axis system	
C_{N_m}	CNM	normal force coefficient in the missile axis system, $F_{N_m}/q_\infty S_{ref}$	
C_n	CYN	yawing moment coefficient in the body axis system	
C_{n_m}	CYNM	yawing moment coefficient in the missile axis system, $M_{Z_m}/q_\infty S_{ref} \ell_{ref}$	
$C_{P_{bl}}$		base pressure coefficient: $\frac{P_{bl}-P_\infty}{q_\infty}$	
C_Y	CY	side force coefficient in the body axis system	
C_{Y_m}	CYM	side force coefficient in the missile axis system, $F_{Y_m}/q_\infty S_{ref}$	
X_{cp}/ℓ	ACP/L	center of pressure location in fraction of body length from nose; $\left[\frac{X_{c.g.}}{\ell_{body}} - \frac{C_{m_m}}{C_{N_m}} \cdot \frac{\ell_{ref}}{\ell_{body}}\right]$	
F_{Y_m}	SF	side force in the missile axis system, positive in the positive direction of Y_m	lb
F_{A_m}	AF	total axial force in the missile axis system, positive in the negative direction of X_m	lb
F_{N_m}	NF	normal force in the missile axis system, positive in the negative direction of Z_m	lb

NOMENCLATURE (Concluded)

SYMBOL	PLOT SYMBOL	DEFINITION	UNITS
My_{X_m}	RM	rolling moment in the missile axis system; i.e., moment about the X_m-axis (a positive rolling moment tends to rotate the positive Y_m-axis toward the positive Z_m-axis)	in.-lb
My_m	PM	pitching moment in the missile axis system; i.e., moment about the Y_m-axis (a positive pitching moment tends to rotate the positive Z_m-axis toward the positive X_m-axis)	in.-lb
Mz_m	YM	yawing moment in the missile axis system; i.e., moment about the Z_m-axis (a positive yawing moment tends to rotate the positive X_m-axis toward the positive Y_m-axis)	in.-lb
β	BETA	angle of sideslip	deg.
C_L	CL	lift coefficient (stability-axis system)	
C_D	CD	drag coefficient (stability-axis system)	

SUBSCRIPTS

b	base
c	cavity
c.g.	center of gravity
i	identifies the location of the base pressure measurements
m	missile axis system
ref	reference conditions
t	total conditions
∞	free stream conditions

INTRODUCTION

In a continuing effort to determine the aerodynamic characteristics of a space shuttle solid rocket booster (SRB) during reentry, a test was conducted at the Langley Research Center 4 foot Unitary Plan wind tunnel. Static stability coefficients were obtained at high Mach numbers and high angles of attack. This report describes the test that was performed and presents the data that were obtained.

Wind tunnel conditions during this test were as follows: Mach numbers were 2.3, 2.7, 3.0, 3.5, 4.0, and 4.63; angle of attack range was 144 through 179 degrees; and Reynolds numbers were 1.5 and 2.0 million per foot.

The two model configurations investigated during this test were:

- o SRB without external protuberances
- o SRB with an electrical tunnel and a SRB/ET thrust attachment structure

MODEL AND SUPPORT HARDWARE

MODEL

The model, MSFC wind tunnel model 454, was a 0.02112 scale model of the 142-inch diameter Space Shuttle solid rocket booster. Details of the model are presented in Figures 2, 3, and 4 and Table III. Figure 2 presents the major dimensions of the model. Figure 3 presents the dimensions and location of a scaled attachment ring. Figure 4 presents the dimensions and location of the electrical tunnel and external tank thrust attachment structure protuberances which were attached to the model during selected portions of this test.

The model was made in seven sections. These sections, as identified in Figure 5, are a nose, a strake ring, two fill rings, a balance body, a balance body end section, and a tail section. The model was made in these seven sections to facilitate testing at all angles of attack from 0 to 180 degrees. The features that were utilized for this test were:

- The two fill rings were assembled upstream of the balance to position the anticipated center of pressure as close as possible to the balance center.
- The tail section was mounted upstream and the nose and strake ring sections were mounted downstream to simulate high angles of attack approaching 180 degrees. A truncated cone nose section (Figure 2) allowed the passage of the sting.

The model is designed so that roll angles of 0, 45, 90, 135, 180, 225, 270, and 315 degrees can be simulated. These roll angles can be achieved by rolling the nose and tail sections relative to the balance body. The nose and tail sections can be rolled in 22 1/2 degree increments; however, screw holes in the balance body and sting outlet section for the electrical tunnel are only provided every 45 degrees. Therefore, roll angle changes are limited to changes in 45 degree increments. The roll angle sign convention for the SRB protuberances is shown in Figure 4.

For more information on the capabilities of this model, see Reference 2.

SUPPORT HARDWARE

The support hardware was provided by the test facility and included:

Knuckle #4 (angle of attack mechanism)

Knuckle offset (adjusted to 7 1/2 inches)

15° coupling

Sting UT 30

Balance #834

Knuckle #4 was the normal angle of attack mechanism for the facility and had a range from -14 to +21 degrees. The action of the knuckle produced a fore and aft translation as well as an angle of attack change.

The center of rotation produced by knuckle #4 was behind the model. With a model as long as the one used, and at angles at which it was tested, a knuckle offset was necessary. This offset placed the centerline of the sting 7 1/2 inches below the centerline of knuckle #4.

To adjust the -14 to +21 degrees range of knuckle #4 to angles more desirable for this test, a 15 degree coupling was used. This gave balance angles of 1 to 36 degrees which for a tail forward model gave angles of attack of 179 to 144 degrees.

CONFIGURATIONS INVESTIGATED

The run schedule, i.e., data set collation sheet, for this test, LaRC UPWT 1087, is shown in Table II. This table contains the data set identifiers for the test and gives the nominal conditions at which various configurations were tested. These conditions are angle of attack (α_T), roll angle (ϕ), and Mach number.

Configuration SRB w/attach ring was a 2.112 percent scale model of a 142 inch diameter SRB configuration, less electrical tunnel and external tank thrust attachment structure (Figures 2 and 3).

The configuration SRB w/attach ring, electrical tunnel, and thrust attachment, was formed by adding the two scaled protuberances to the previous configuration as shown in Figure 4. This configuration, tested at roll angles of 45, 90, and 135 degrees, was created by placing the scaled electrical tunnel and SRB/ET thrust attach structure on the model at the appropriate roll angle. Investigations were made over an alpha range from 144 to 179 degrees at Mach numbers of 2.3 through 4.63. A description of the individual model components is given in Table III.

TEST FACILITY DESCRIPTION

This wind tunnel test was conducted in the Unitary Plan Wind Tunnel (UPWT) at the Langley Research Center. The UPWT is a two leg, closed return, continuous run type wind tunnel. The test sections are four by four feet in cross section and seven feet long. The Mach number range is from 1.5 to 3.0 in the low Mach number test section and 2.3 to 4.63 in the test section used during this test. This high Mach number test section has a Reynolds number capability as high as 7.7×10^6 per foot. Additional details about this facility are presented in Reference 1.

DATA ACQUISITION AND REDUCTION

The parameters measured and recorded during this test were:

- o Wind tunnel conditions (P_∞, P_t, T_t)
- o Six-component force and moment data
- o Sting attitude
- o Cavity pressure

Tunnel conditions were used to calculate the Mach number, the dynamic pressure, and the Reynolds number (Table I); the six-component force and moment data were used to calculate static stability coefficients; the sting attitude, nominal model attitude, and deflection calibrations were used to calculate the model angle of attack; and the cavity pressures were used to calculate cavity pressure coefficients.

Figure 6 shows the location of the cavity pressure tubes. A tabulation of the cavity pressure coefficients (Cp_{ci}) are included in the appendix to this report.

As stated above, the six component force and moment data were used to calculate six-component static stability coefficients. These data were measured with Langley Research Center Balance #834. The rated capacities of this balance are listed in Table I. The six coefficients, C_{A_m}, C_{Y_m}, C_{n_m}, C_{N_m}, C_{n_m}, and CY_m, are coefficients in the missile axis system.

The missile axis system (X_M,Y_M,Z_M) is a non-rolling body axis system that is frequently used in wind tunnel tests and studies of missile flight dynamics. It is a system of axes that never rotates about the missile or model longitudinal axis. The orientations of the missile axes coefficients

are defined in Figure 1. The missile axis system is identical with the body axis system at zero roll angle.

Six-component static aerodynamic coefficients in the missile axis system may be coverted to coefficients in the body axis system with the following six equations:

$$C_A = C_{A_m}$$

$$C_N = C_{N_m} \cos \phi + C_{Y_m} \sin \phi$$

$$C_Y = -C_{N_m} \sin \phi + C_{Y_m} \cos \phi$$

$$C_\ell = C_{\ell_m}$$

$$C_m = C_{m_m} \cos \phi + C_{n_m} \sin \phi$$

$$C_n = -C_{m_m} \sin \phi + C_{n_m} \cos \phi$$

The following reference dimensions were used to calculate the static stability coefficients:

Parameter	Full Scale	Model Scale
Reference Area (S_{ref})		
based on body cross section	109.98 ft^2	7.069 $in.^2$
Reference Length (ℓ_{ref}) = (b_{ref}) =		
model diameter	142 in.	3.000 in.
Moment Reference Center (from body nose)		
*XMRP (1.134 inches upstream of balance center)	986.97 in.	20.834 in.
XMRP	0	0
ZMRP	0	0

*Note: XMRP (56.69% of total length without portion of nose removed, measured from nose tip)

The force and moment data were corrected for model weight tares but tunnel flow angularity was assumed to be zero.

Schlieren photographs were made during this test.

DATA PRESENTATION

Data are presented in two forms: (1) aerodynamic static stability coefficients are plotted as a function of angle-of-attack and (2) data tables are presented that include six static stability coefficients, two cavity pressure coefficients, wind tunnel flow conditions, and model attitude.

Data Plots

The plots of the six static stability coefficients are presented in the following groups:

- Static stability characteristics of SRB (with attachment ring).
- Static stability characteristics of SRB (with attach ring, electrical tunnel, and thrust attachment) for various roll angles.

Table IV presents, for each configuration or comparison of configurations, the roll angles and the Mach numbers for which data are available.

Data Tables

Data tables, identified as tabulated source data, are presented for each of the 16 runs that were made during this test, with the exception of run 12. Run 12 was found to have been made at tunnel conditions other than what was desired. Facility personnel elected to delete this run. The data are presented in the order of data set number. Each data set contains information that describes the model configuration, the model attitude, the tunnel flow conditions, and the model reference dimensions. Each data set contains a listing of the six static aerodynamic stability coefficients and two cavity pressure coefficients ($C_{p_{ci}}$). Zeros appeared in the

cavity pressure columns for runs 1 through 6. Equipment problems during these runs resulted in unreliable pressure data. Therefore, these pressure coefficients are not shown in the tabulated listing.

If a cavity pressure correction is desired, the cavity area to be used is:

$$A_c = 3.976 \text{ in.}^2$$

REFERENCES

1. "Unitary Plan Wind Tunnel Facilities," National Advisory Committee for Aeronautics; 1956.

2. DMS-DR-2161, "Aerodynamic Characteristics of a 142-Inch Diameter Solid Rocket Booster (Configuration 139)," Radford, W. D.,Johnson, J. D., Burstadt. P. L.,

Table I.

TEST: LARC UPWT 1087 DATE: March 1974

TEST CONDITIONS

MACH NUMBER	REYNOLDS NUMBER (per foot)	DYNAMIC PRESSURE (pounds/sq. inch)	STAGNATION TEMPERATURE (degrees Fahrenheit)	STAGNATION PRESSURE (pounds/sq inch)
2.30	1.5×10^6	2.36	155	7.97
2.70	↓	2.16	155	9.85
2.96	↓	2.01	155	11.34
3.48	2.0×10^6	2.26	150	19.76
4.00	↓	2.02	185	27.39
4.63	↓	1.62	185	36.69

BALANCE UTILIZED: LARC #834

	CAPACITY:	ACCURACY:	COEFFICIENT TOLERANCE:
NF	300 lbs		
SF	200 lbs		
AF	60 lbs		
PM	1000 in.-lbs		
RM	100 in.-lbs		
YM	400 in.-lbs		

COMMENTS:

TABLE II.

TEST: SA26F | DATA SET/RUN NUMBER COLLATION SUMMARY | DATE: MARCH 1974

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α_T	SCHD. β	PARAMETERS/VALUES	NO. OF RUNS	MACH NUMBERS (OR ALTERNATE INDEPENDENT VARIABLE) 2.3	2.7	3.0	3.5	4.0	4.63	TEST RUN NUMBERS
RH9001	SRB W/ATTACH RING	A	0°		6	1/0	2/0	3/0	4/0	5/0	6/0	
	SRB W/ATTACH RING & ELECT TUNNEL & THRUST ATTACHMENT	B	45°		3		7/0			9/0	8/0	
RH9002*		↓	90°		3		13/0			10/0	11/0	
RH9003*			135°		3		14/0			15/0	16/0	
RH9004*												

R DATA | CNM | CA | CLMM | CYM | CYNM | CBL | CL | CD | Q(PSF) | MACH | ALPHA | 9

P DATA | CPC1 | CPC2 | Q(PSF) | MACH | ALPHA | 3

TYPE OF DATA α_T SCHEDULES

COEFFICENT SCHEDULES

A = 144→179 @ $\Delta\alpha_T = 2°$

B = 144→155 @ $\Delta\alpha_T = 2°$; 155→179 @ $\Delta\alpha_T = 4°$

IDVAR (1) IDVAR (2) NDV

*DATASETS WITH "P" DATA

Table III.

MODEL COMPONENT DIMENSIONS

MODEL COMPONENT: Nose

GENERAL DESCRIPTION: 142-inch diameter SRB nose, cone angle is 18° with a spherical radius nose cap. (This nose was truncated to allow passage of the sting when the model was nose-mounted for testing at 144 degrees $\leq \alpha_t \leq$ 179 degrees)

MODEL DRAWING NUMBER: MSFC #80M42621
MSFC #80M42622

	THEORETICAL		ACTUAL MEASURED
DIMENSIONS:	FULL-SCALE	MODEL SCALE	MODEL SCALE
Length	188 in.	3.971 in.	3.892 in.
Max. Width	142 in.	3.000 in.	3.000 in.
Max. Depth	142 in.	3.000 in.	3.000 in.
Fineness Ratio	1.32	1.32	1.297
Area			
Max. Cross-Sectional	109.97 ft^2	7.069 $in.^2$	
Planform			
Wetted			
Base	109.97 ft^2	7.069 $in.^2$	
Length (when truncated for sting mounting)		1.130 in.	1.130 in.

Table III. (Continued)

MODEL COMPONENT: Body

GENERAL DESCRIPTION: 142-inch diameter SRB body for SRB configuration 139.

MODEL DRAWING NUMBER: 80M42621, 80M42623, 80M32580, 80M51331, 80M42646, 80M32581 80M42626

DIMENSIONS:	THEORETICAL FULL-SCALE	THEORETICAL MODEL SCALE	ACTUAL MEASURED MODEL SCALE
Length	1407.8 in.	29.734 in.	29.757 in.
Max. Width	142 in.	3.000 in.	3.001 in.
Max. Depth	142 in.	3.000 in.	3.001 in.
Fineness Ratio	9.91	9.91	9.915
Area			
Max. Cross-Sectional	109.98 ft^2	7.069 $in.^2$	
Planform			
Wetted			
Base	109.97 ft^2	7.069 $in.^2$	

Table III.(Continued)

MODEL COMPONENT: Engine/Shroud

GENERAL DESCRIPTION: 142-inch diameter SRB engine shroud/nozzle combination for SRB configuration 139.

MODEL DRAWING NUMBER: 80M42626, 80M32613

	THEORETICAL		ACTUAL MEASURED
DIMENSIONS:	FULL-SCALE	MODEL SCALE	MODEL SCALE
Engine Shroud			
Length	93 in.	1.964 in.	1.975 in.
Max. Width	192 in.	4.055 in.	4.062 in.
Max. Depth	192 in.	4.055 in.	4.062 in.
Max. Cross Sectional Area	201.1 ft^2	12.914 $in.^2$	12.959 $in.^2$
Engine Nozzle			
Length	52 in.	1.102 in.	1.095 in.
Max. Width	141.7 in.	2.993 in.	2.994 in.
Max. Depth	141.7 in.	2.993 in.	2.994 in.
Max. Cross Sectional Area	109.52 ft^2	7.040 $in.^2$	7.040 $in.^2$

Table III. (Continued)

MODEL COMPONENT: Attachment Ring

GENERAL DESCRIPTION: An attachment ring (used to attach the SRB to the ET) is located 27.773 inches model scale (1315 inches full scale) from the nose of the vehicle.

MODEL DRAWING NUMBER: 80M32547, 80M32582

	THEORETICAL		ACTUAL MEASURED
DIMENSIONS:	FULL-SCALE	MODEL SCALE	MODEL SCALE
Length			
Max. Width	10.98 in.	0.232 in.	
Max. Depth	9.99 in.	0.211 in.	
Fineness Ratio			
Area			
Max. Cross-Sectional			
Planform			
Wetted			
Base			

Table III.(Continued)

MODEL COMPONENT: Electrical Tunnel

GENERAL DESCRIPTION: The electrical tunnel runs along the outside the SRB tank to protect the various electrical cables from aerodynamic loading.

MODEL DRAWING NUMBER: 80M42642

	THEORETICAL		ACTUAL MEASURED
DIMENSIONS:	FULL-SCALE	MODEL SCALE	MODEL SCALE
Length	~1274 in.	~26.9 in.	
Max. Width	13 in.	0.275 in.	
Max. Depth	6 in.	0.127 in.	
Fineness Ratio			
Area			
Max. Cross-Sectional			
Planform			
Wetted			
Base			

Table III. (Concluded)

MODEL COMPONENT: SRB/ET Thrust Attachment Structure

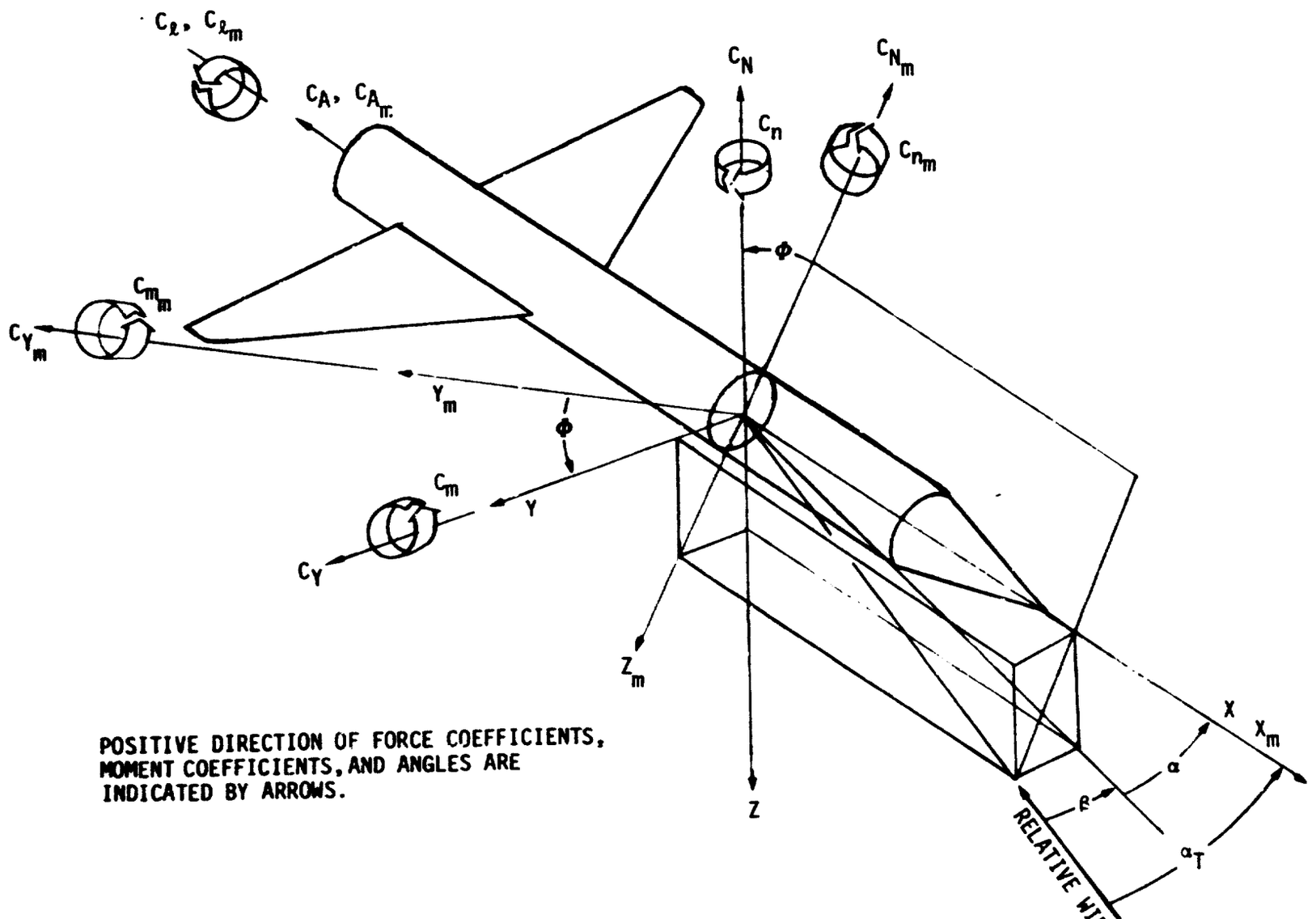
GENERAL DESCRIPTION: This structure is mounted aft the intersection of nose and body and is used to attach the SRB to the ET.

MODEL DRAWING NUMBER: 80M42641

	THEORETICAL		ACTUAL MEASURED
DIMENSIONS:	FULL-SCALE	MODEL SCALE	MODEL SCALE
Length	~ 47.3 in.	~1.000 in.	
Max. Width	~ 129.9 in.	~2.744 in.	
Max. Depth	~ 7.4 in.	~0.157 in.	
Fineness Ratio			
Area			
Max. Cross-Sectional			
Planform			
Wetted			
Base			

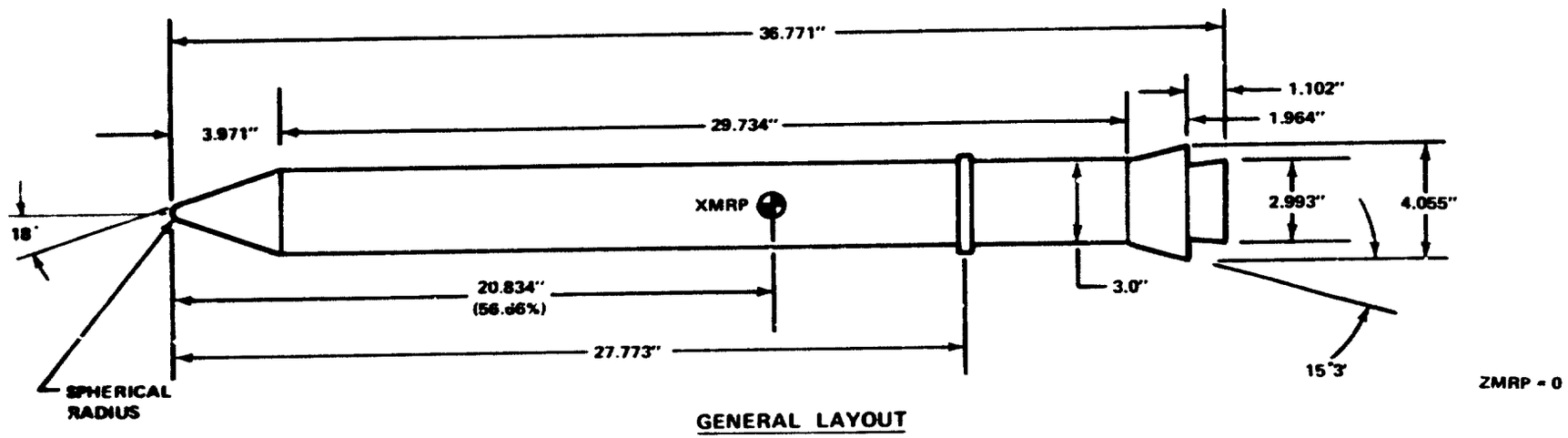
Table IV. PLOT SUMMARY

	ROLL ANGLE				MACH NUMBER					
INVESTIGATION	0	45	90	135	2.3	2.7	3.0	3.5	4.0	4.63
Static stability characteristics of SRB with attachment ring	X				X	X	X	X	X	X
Effect of roll on static stability characteristics of SRB (with protuberances)		X	X	X		X			X	X

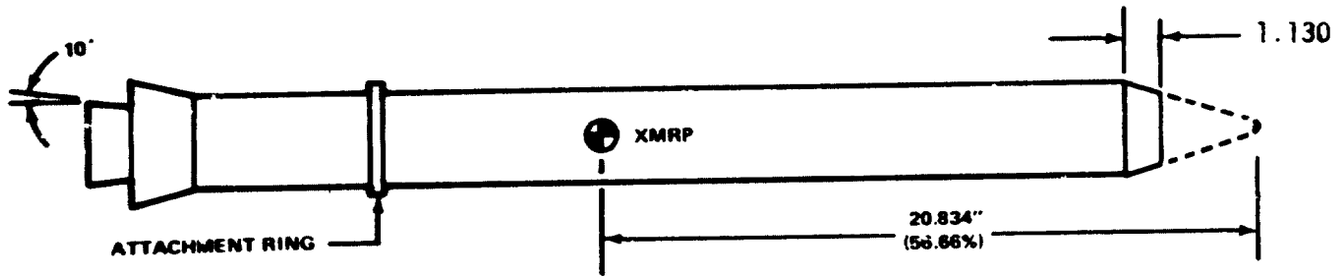


POSITIVE DIRECTION OF FORCE COEFFICIENTS, MOMENT COEFFICIENTS, AND ANGLES ARE INDICATED BY ARROWS.

Figure 1. - Body and Missile Axis Systems



GENERAL LAYOUT



NOSE MOUNT CASE

(ENGINE SHROUD/NOZZLE SYMMETRIC WITH BODY)

Figure 2. 142 INCH DIAMETER SRB - 0.02112 SCALE MODEL
(SRB CONFIGURATION 139 - MSFC MODEL #454)

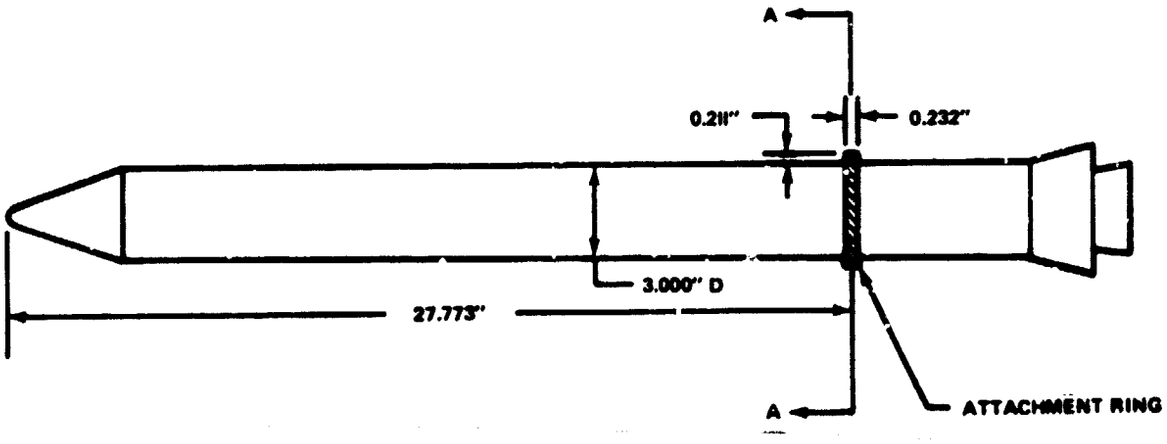
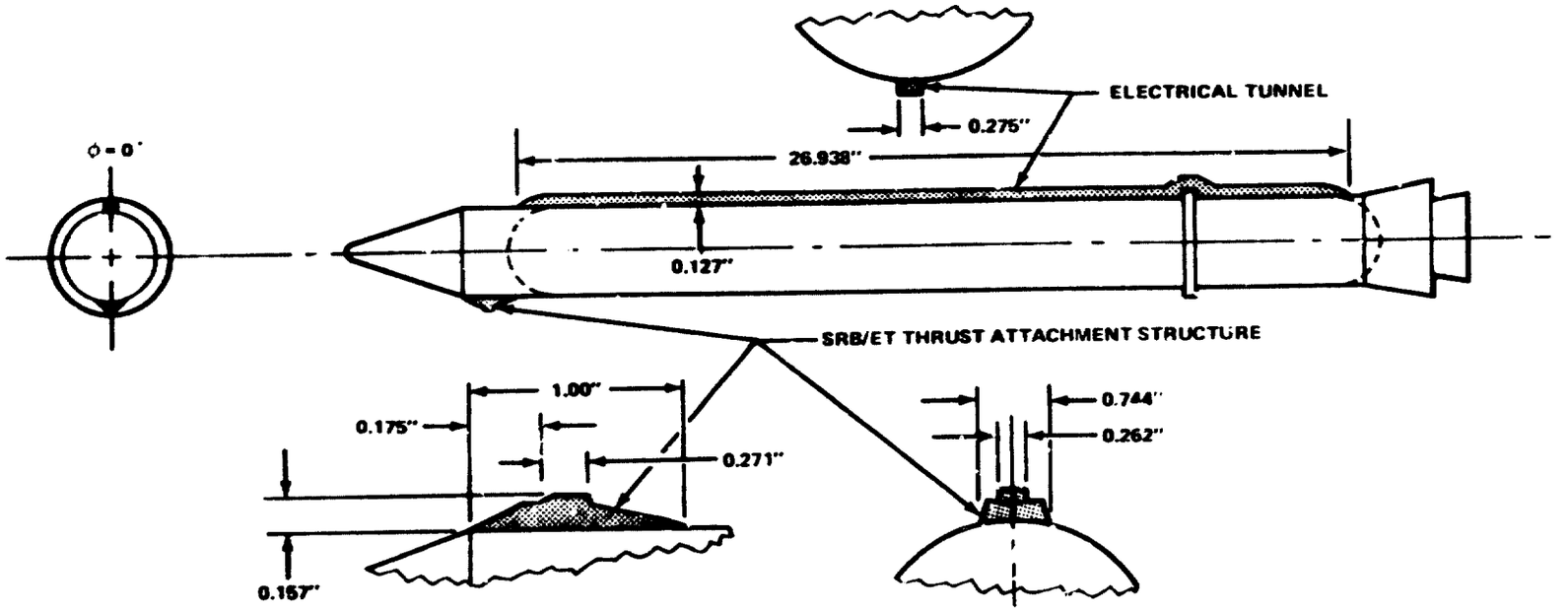
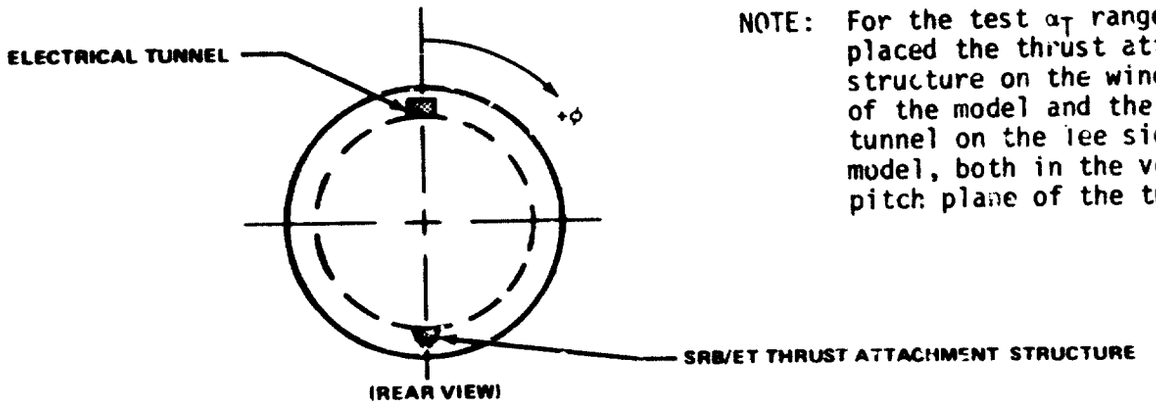


Figure 3. SRB/ET ATTACHMENT RING (MSFC MODEL #454)



ELECTRICAL TUNNEL AND SRB/ET THRUST ATTACHMENT STRUCTURE



ROLL (ϕ) SIGN CONVENTION

NOTE: For the test α_T range, $\phi=0^o$ placed the thrust attachment structure on the windward side of the model and the electrical tunnel on the lee side of the model, both in the vertical pitch plane of the tunnel.

Figure 4. ELECTRICAL TUNNEL AND SRB/ET THRUST ATTACHMENT STRUCTURE (MSFC MODEL #454)

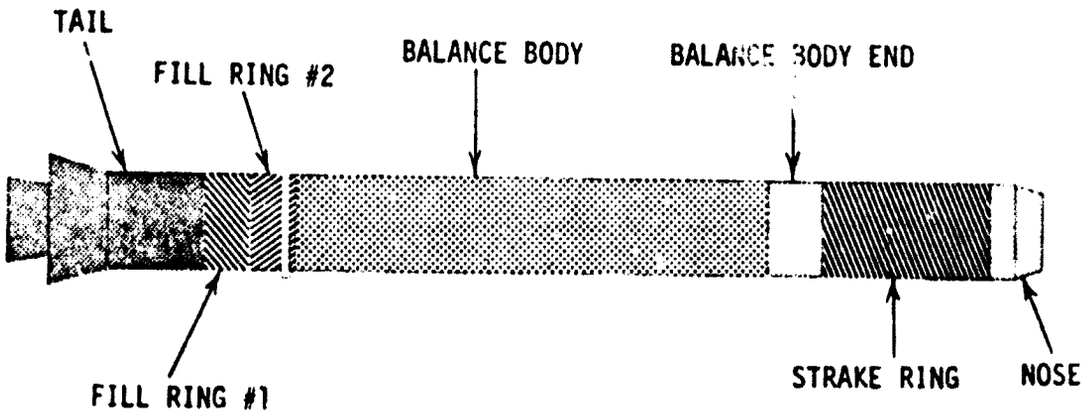


Figure 5. MAJOR MODEL SECTIONS

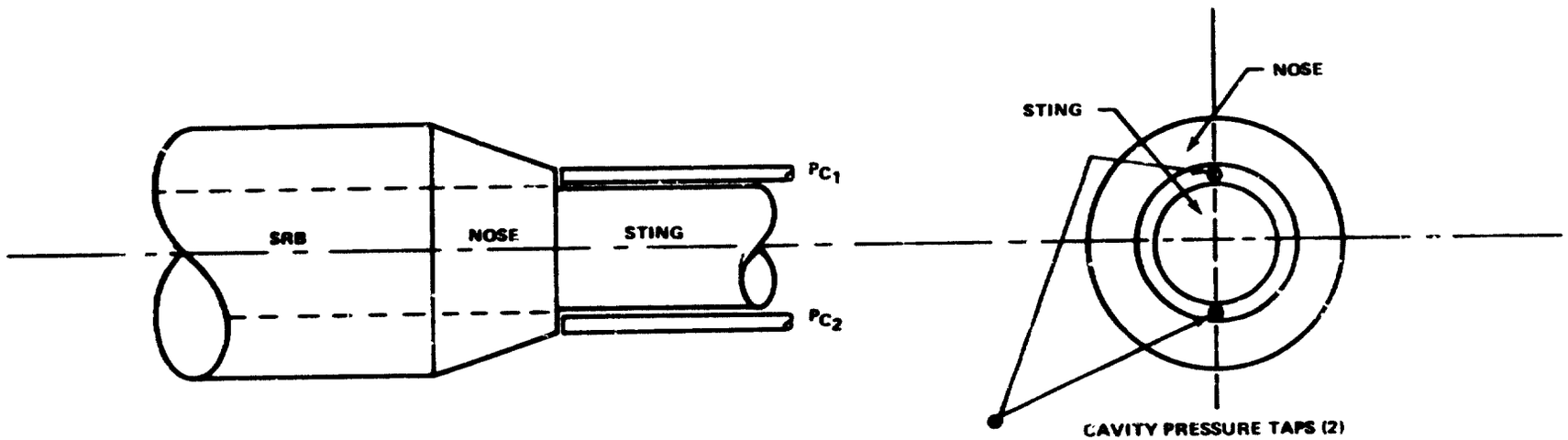
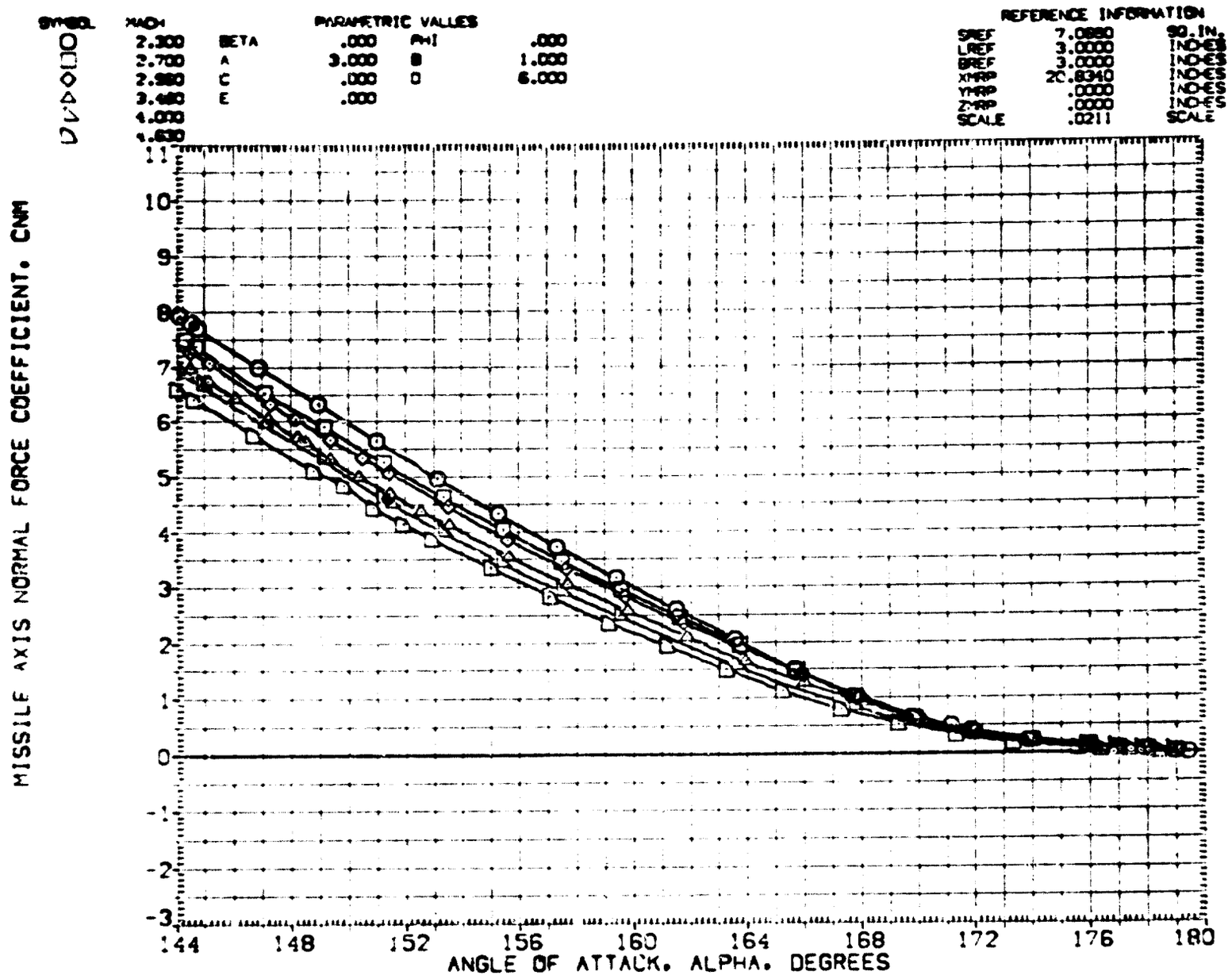


Figure 6. CAVITY PRESSURE TAP LOCATIONS

DATA FIGURES

SA-25F LARC UPWT 1087 MSFC 454 (RH9001)



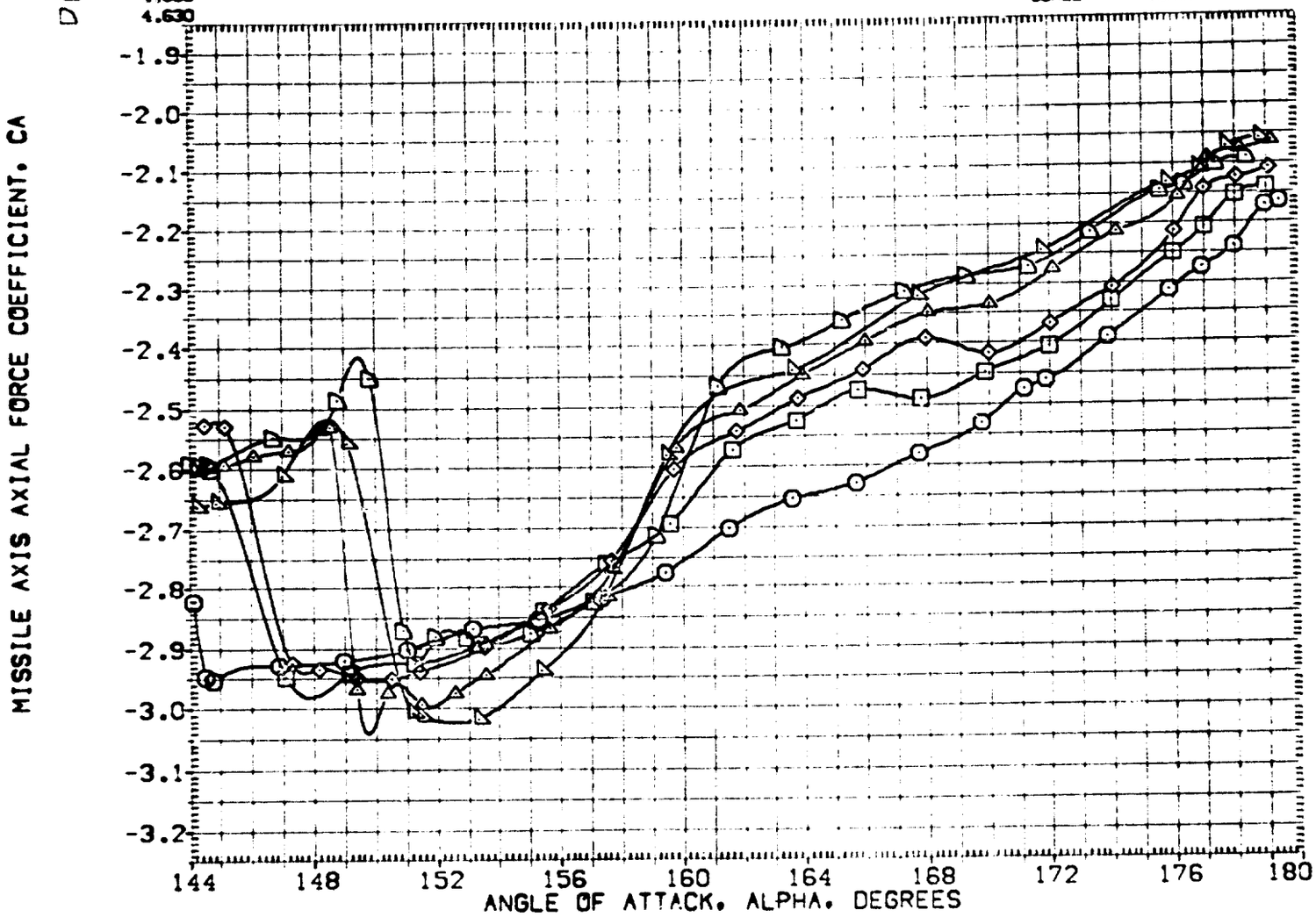
STATIC STABILITY CHARACTERISTICS OF SRB WITH ATTACHMENT RING

SA-2SF LARC UPWT 1087 MSFC 454 (RH9001)

SYMBOL	MACH		PARAMETRIC VALUES		
○	2.300	BETA	.000	PHI	.000
□	2.700	A	3.000	B	1.000
◇	2.960	C	.000	D	6.000
△	3.480	E	.000		
▱	4.000				
▱	4.630				

REFERENCE INFORMATION

SREF	7.0686	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



STATIC STABILITY CHARACTERISTICS OF SRB WITH ATTACHMENT RING

SA-25F LARC UPWT 1087 MSFC 454 (RH9001)

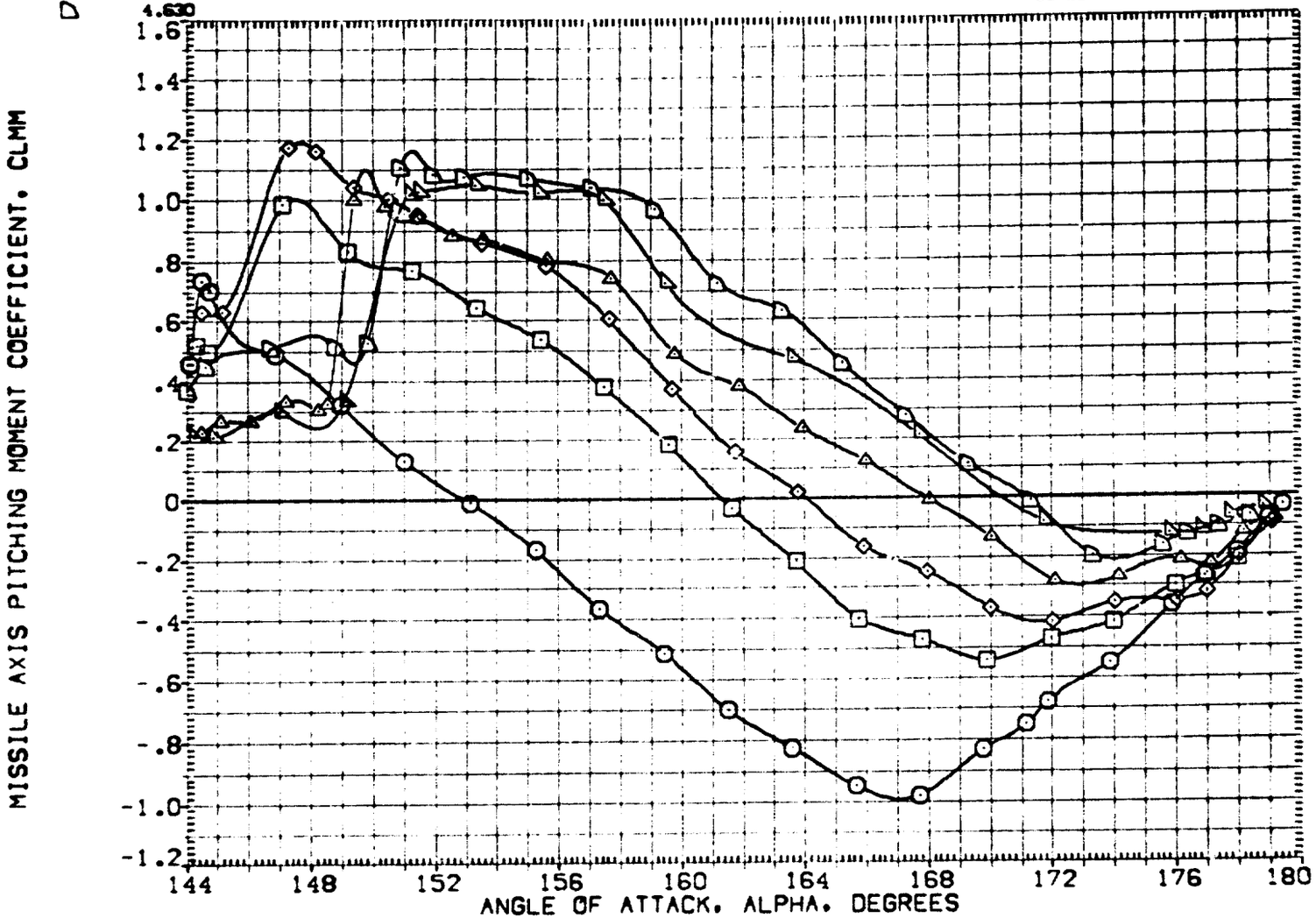
SYMBOL	MACH
○	2.300
□	2.700
◇	2.960
△	3.480
▱	4.000
▱	4.630

PARAMETRIC VALUES

BETA	.000	PHI	.000
A	3.000	B	1.000
C	.000	D	6.000
E	.000		

REFERENCE INFORMATION

SREF	7.0686	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



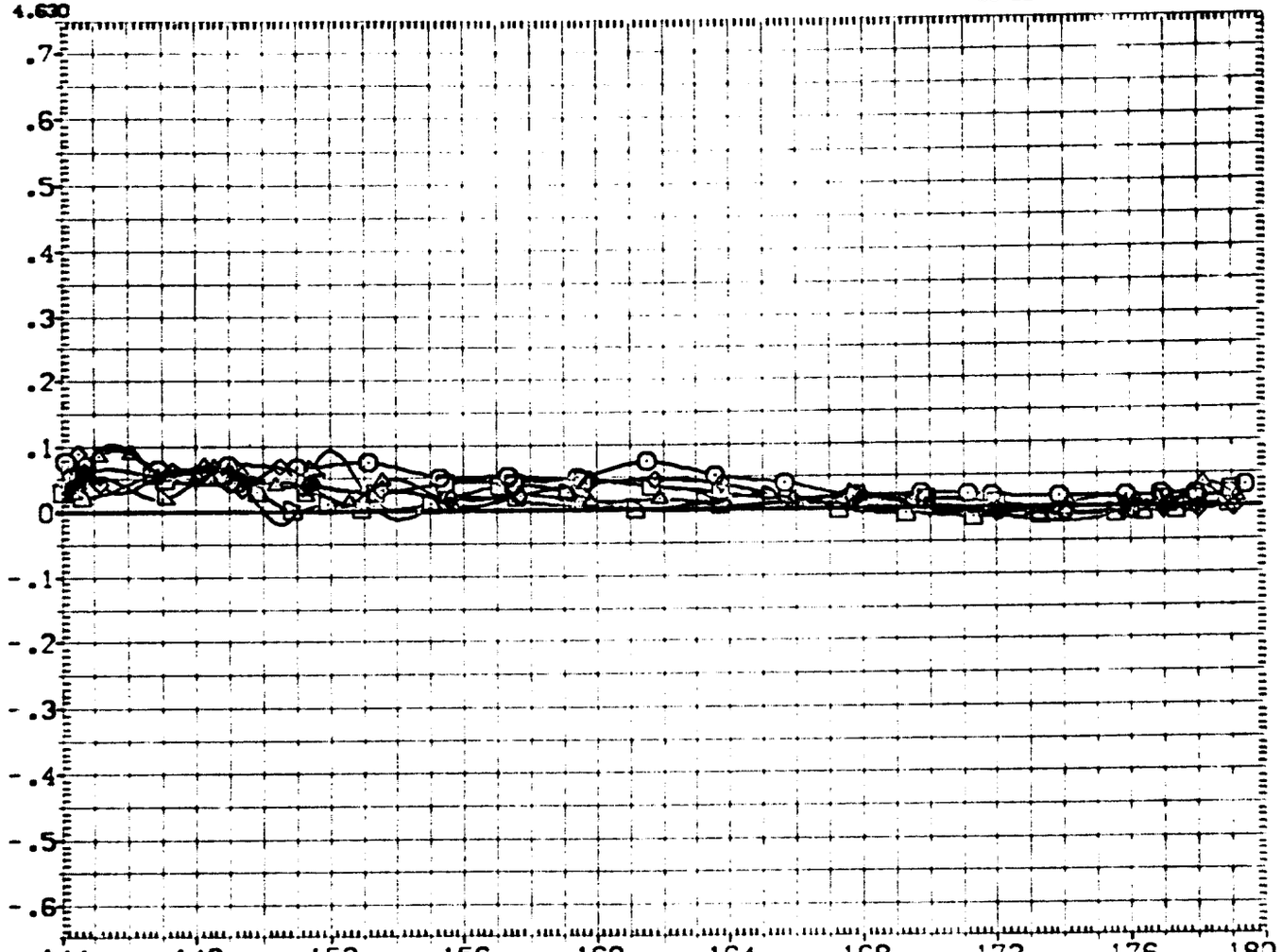
STATIC STABILITY CHARACTERISTICS OF SRB WITH ATTACHMENT RING

SA-25F LARC UPWT 1087 MSFC 454 (RH9001)

SYMBOL	MACH		PARAMETRIC VALUES		
○	2.300	BETA	.000	PHI	.000
△	2.700	A	3.000	B	1.000
◇	2.960	C	.000	D	6.000
□	3.480	E	.000		
⌐	4.000				
D	4.630				

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



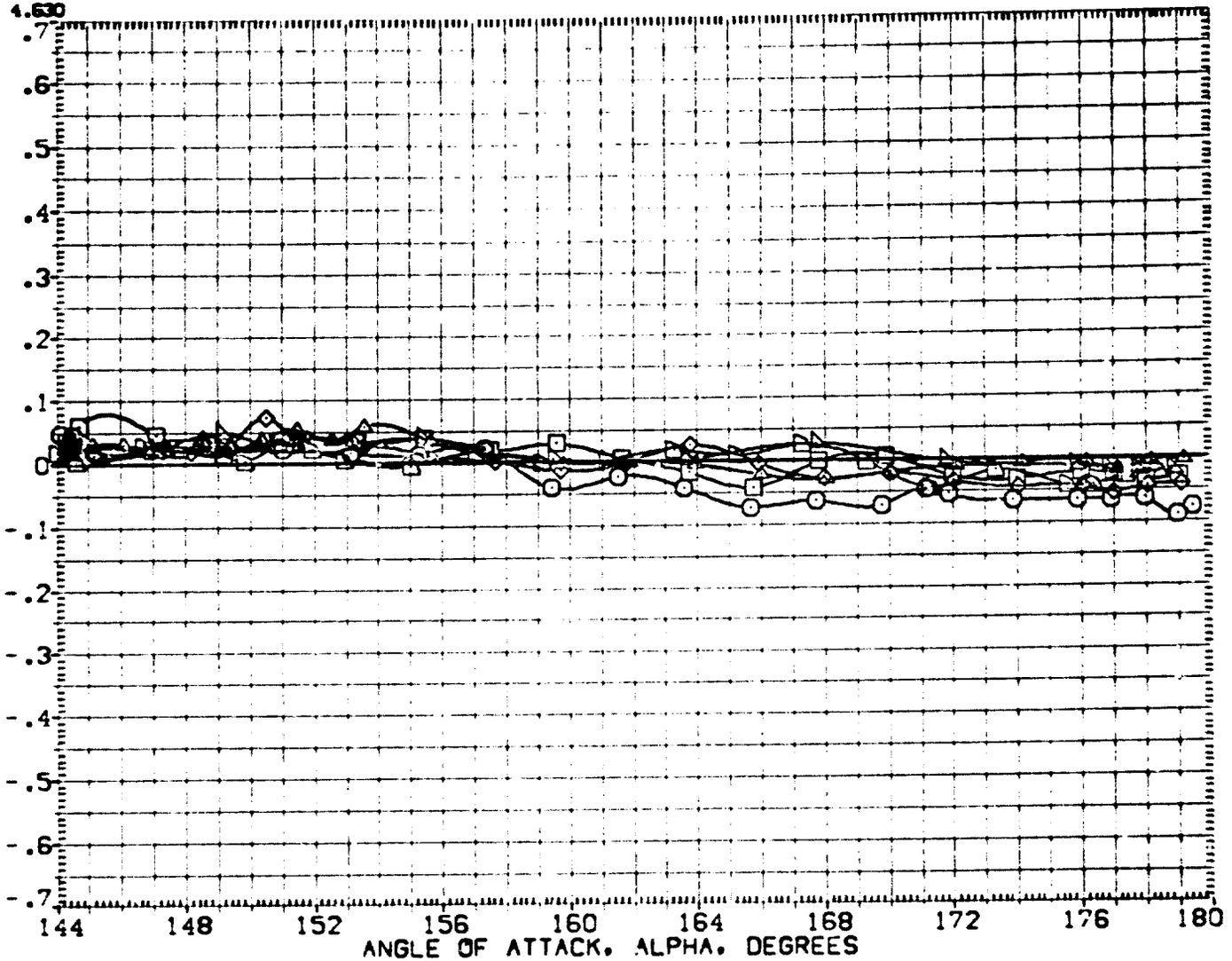
STATIC STABILITY CHARACTERISTICS OF SRB WITH ATTACHMENT RING

SA-25F LARC UPWT 1087 MSFC 454 (RH9001)

SYMBOL	MACH		PARAMETRIC VALUES		
○	2.300	BETA	.000	PHI	.000
□	2.700	A	3.000	B	1.000
◇	2.960	C	.000	D	6.000
△	3.480	E	.000		
▽	4.000				
	4.630				

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.9340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE

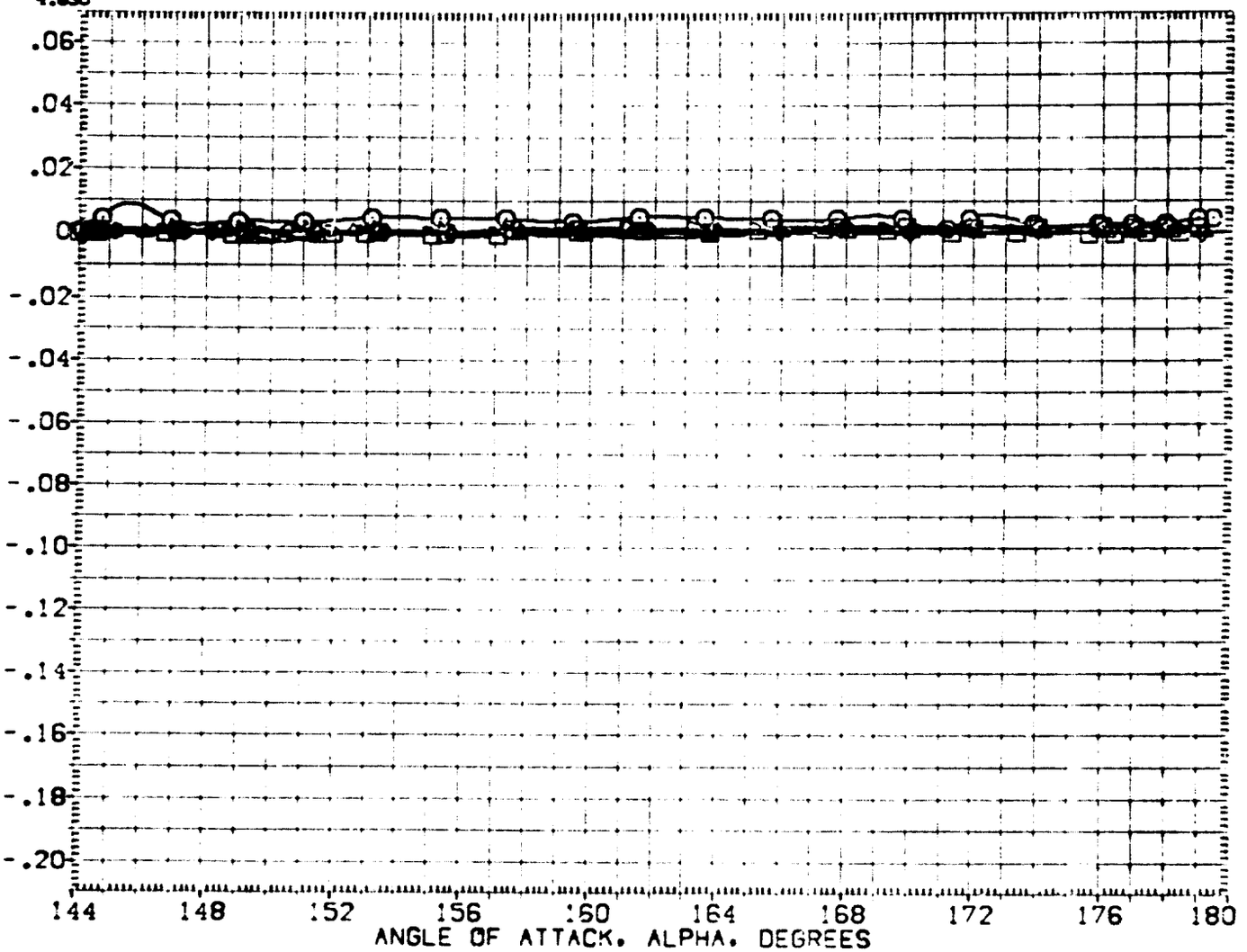


STATIC STABILITY CHARACTERISTICS OF SRB WITH ATTACHMENT RING

SA-25F LARC UPWT 1087 MSFC 454 (RH9001)

SYMBOL	MACH		PARAMETRIC VALUES		
□	2.300	BETA	.000	PHI	.000
◇	2.700	A	3.000	B	1.000
△	2.960	C	.000	D	6.000
○	3.480	E	.000		
	4.000				
	4.630				

REFERENCE INFORMATION		
SREF	7.0686	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE

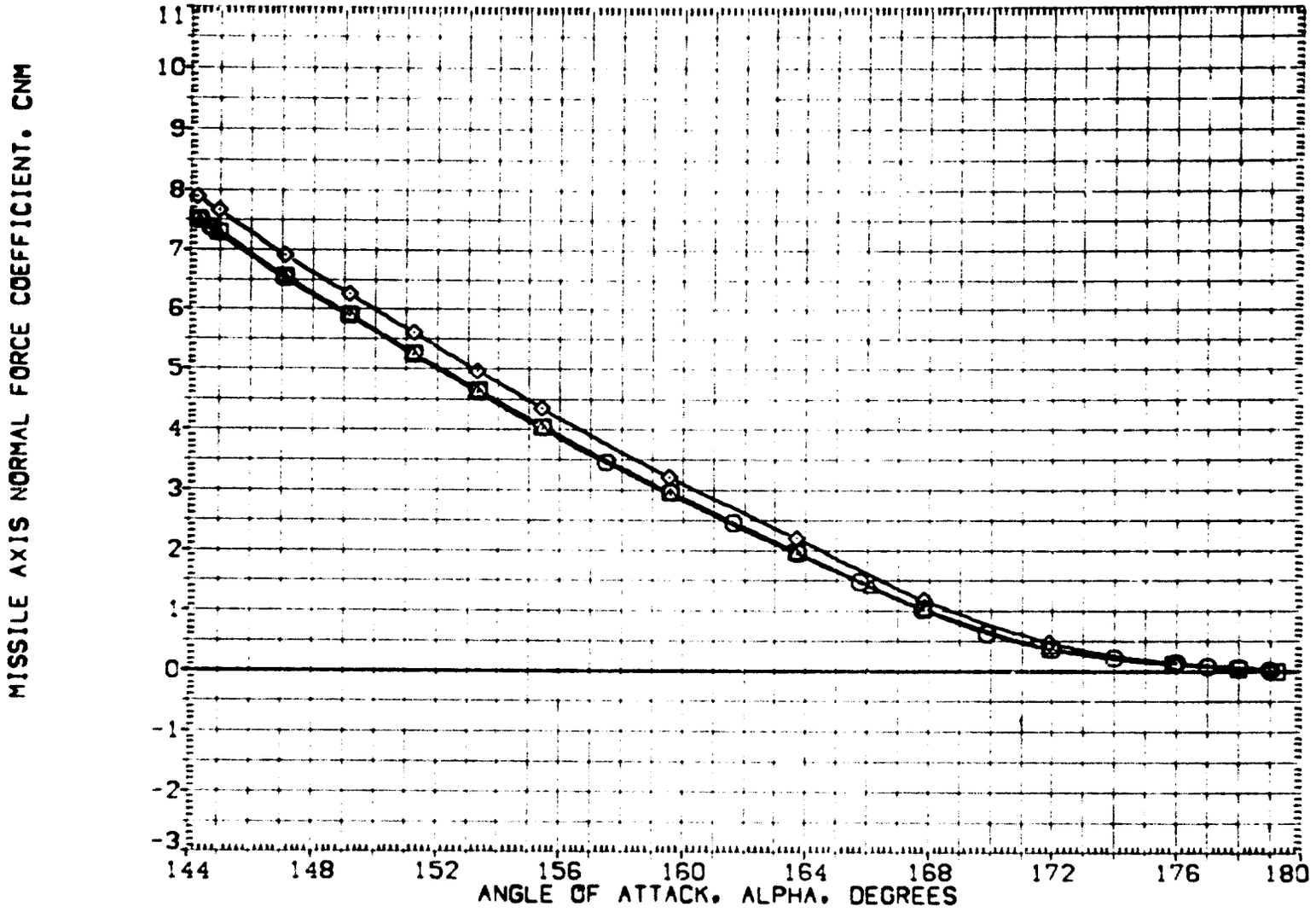


STATIC STABILITY CHARACTERISTICS OF SRB WITH ATTACHMENT RING

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
[A-9001]	□	SA-25F LARC UPVT 1087 MSFC 454			.000	.000
[A-9002]	◇	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	45.000	.000
[A-9003]	△	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	90.000	.000
[A-9004]	⊠	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8310	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



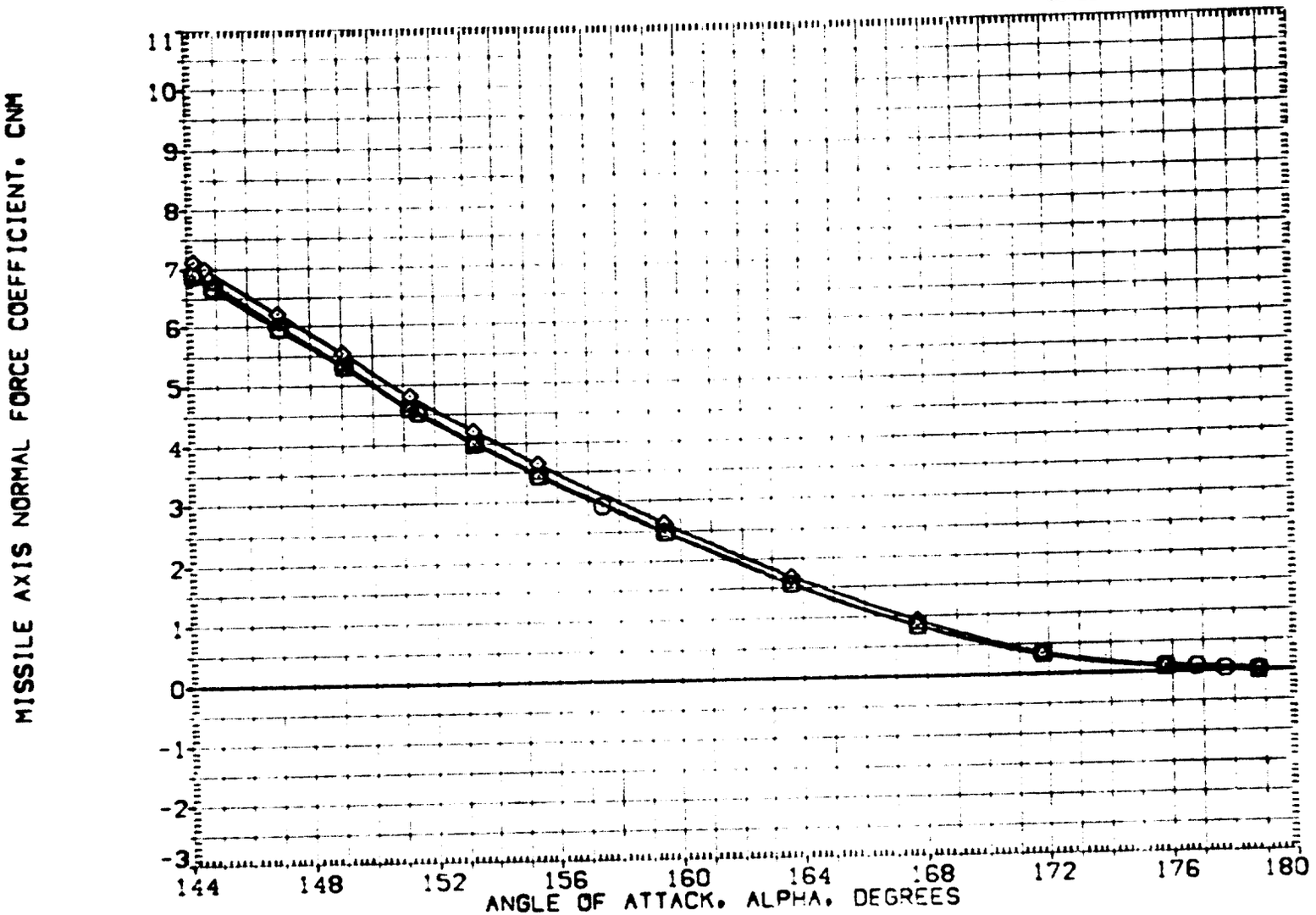
EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(A)MACH = 2.70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
[illegible]	□	SA-25F LARC USVT 1087 MSFC 454			.000	.000
[illegible]	◇	SA-25F LARC USVT 1087 MSFC 454	ELT	TH ATTACH	45.000	.000
[illegible]	⊠	SA-25F LARC USVT 1087 MSFC 454	ELT	TH ATTACH	90.000	.000
[illegible]	⊗	SA-25F LARC USVT 1087 MSFC 454	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



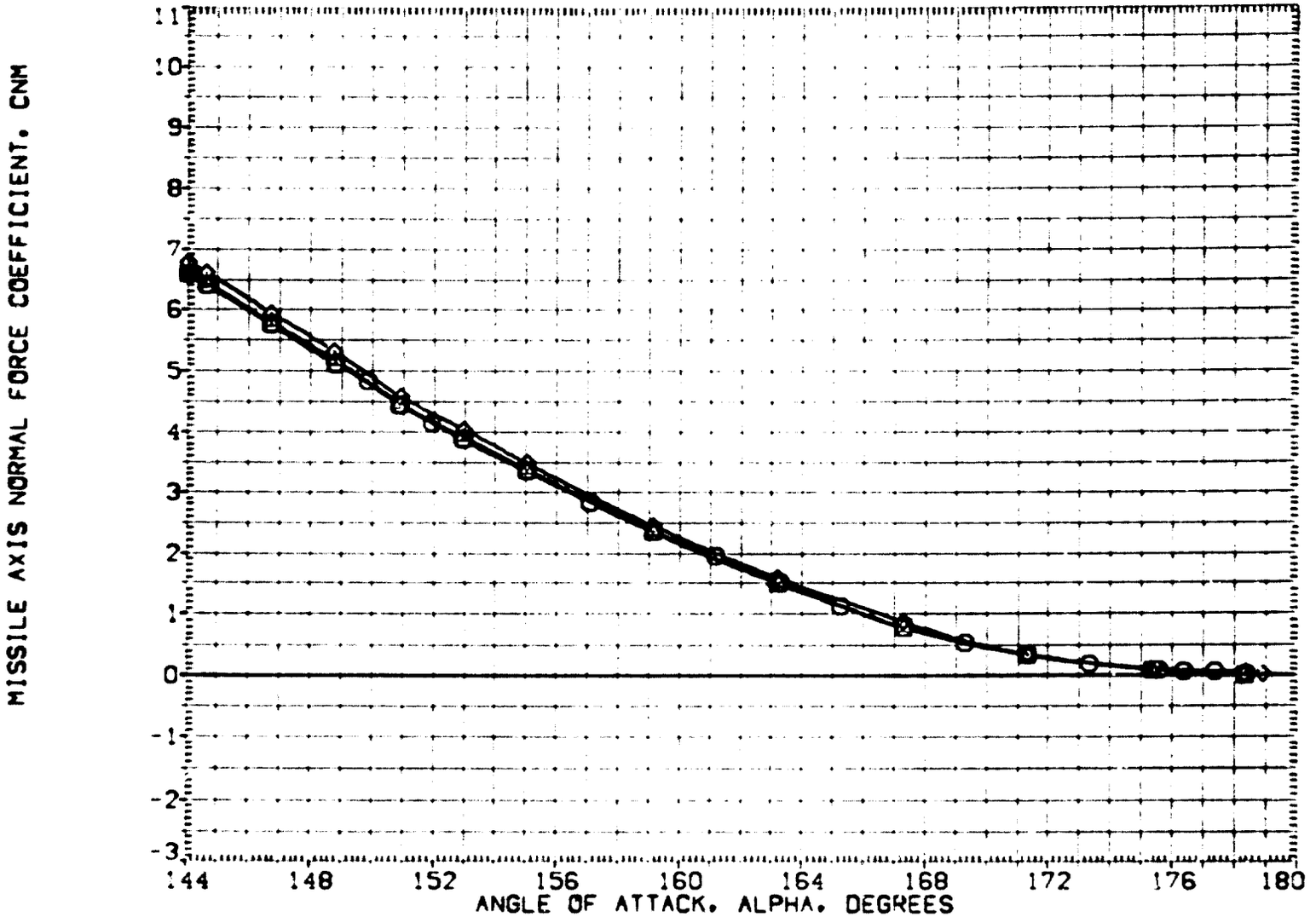
EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(B)MACH = 4.00

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	PHI	BETA
[A-9001]	□	SA-25F LARC UPWT 1087 MSFC 454	.000	.000
[A-9002]		SA-25F LARC UPWT 1087 MSFC 454 ELT TH ATTACH	45.000	.000
[A-9003]	⊠	SA-25F LARC UPWT 1087 MSFC 454 ELT TH ATTACH	90.000	.000
[A-9004]	△	SA-25F LARC UPWT 1087 MSFC 454 ELT TH ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



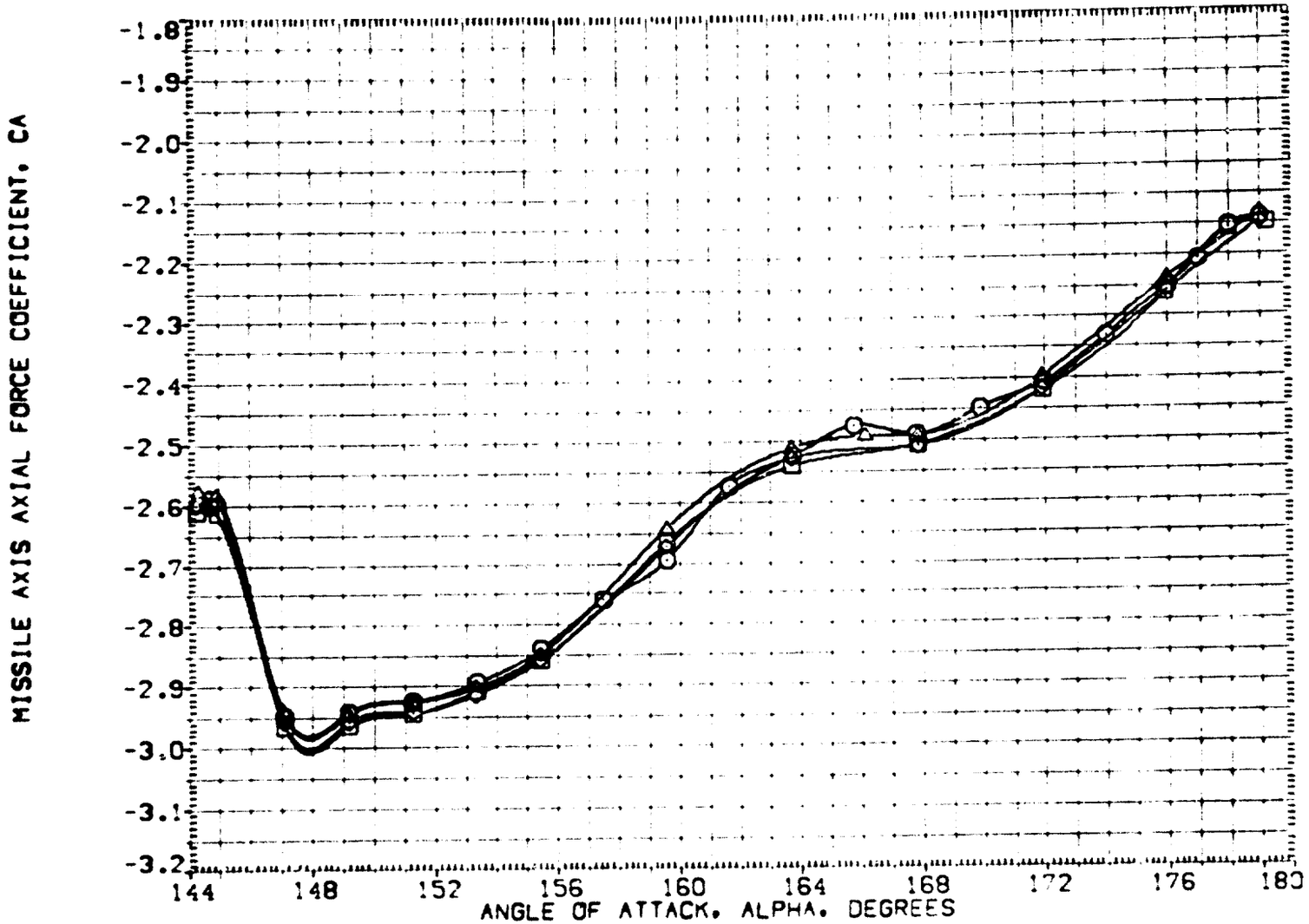
EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(C)MACH = 4.63

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
[illegible]	□	SA-25F LARC LSVT 1087 MSFC 454			.000	.000
[illegible]	◇	SA-25F LARC LSVT 1087 MSFC 454	ELT	TH ATTACH	45.000	.000
[illegible]	▽	SA-25F LARC LSVT 1087 MSFC 454	ELT	TH ATTACH	90.000	.000
[illegible]	△	SA-25F LARC LSVT 1087 MSFC 454	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(A)MACH = 2.70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION				PHI	BETA
(A-6001)	□	SA-25F LARC USVT 1087 MSFC 454				.000	.000
(B-6002)	◇	SA-25F LARC USVT 1087 MSFC 454	ELT	TH	ATTACH	45.000	.000
(B-6003)	⊠	SA-25F LARC USVT 1087 MSFC 454	ELT	TH	ATTACH	90.000	.000
(B-6004)	⊠	SA-25F LARC USVT 1087 MSFC 454	ELT	TH	ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0686	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
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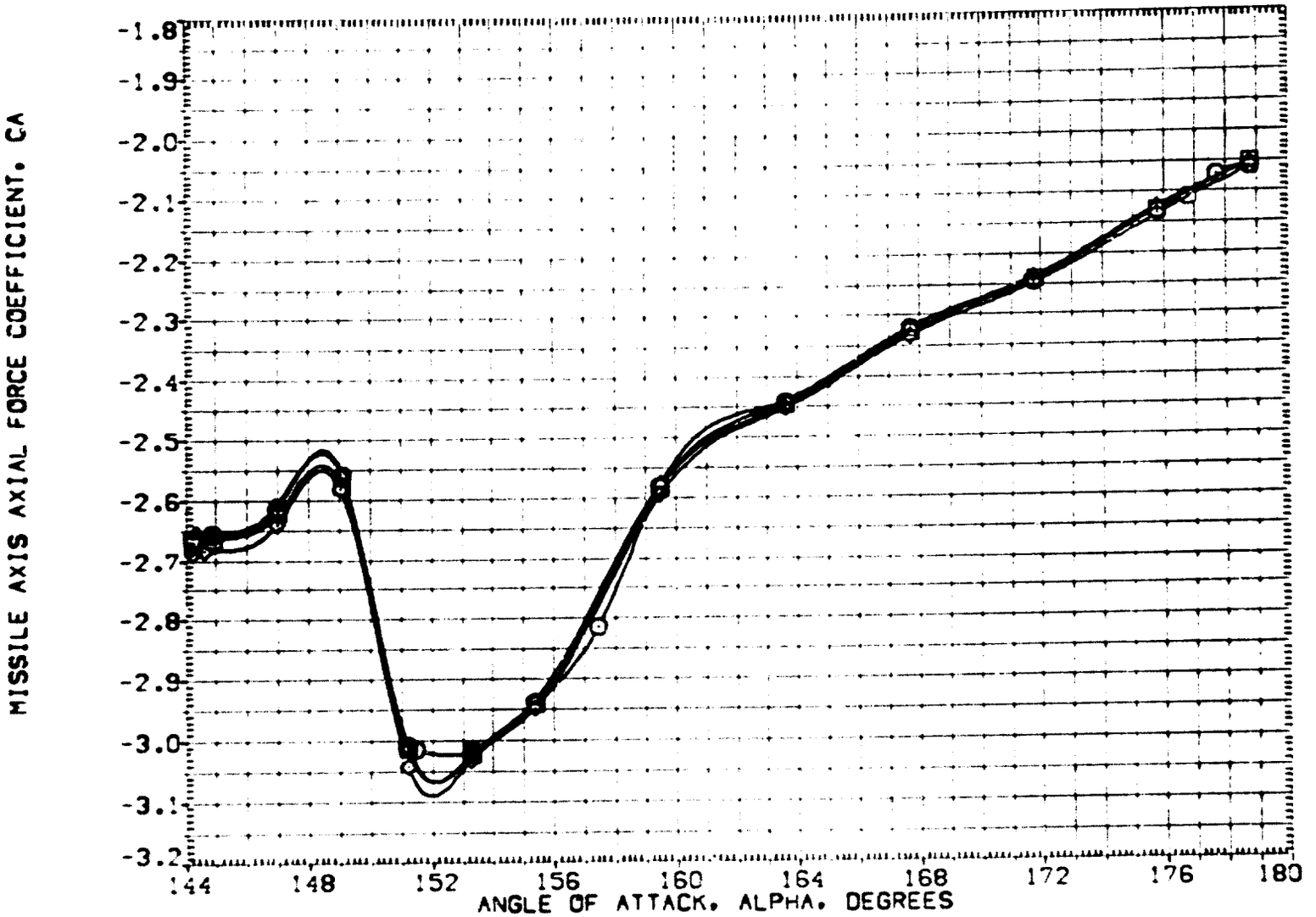
SCALE	.0211	SCALE



EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(B)MACH = 4.00

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
[illegible]	□	SA-23F LARC LPVT 1087 MSFC 454			.000	.000
[illegible]	◇	SA-23F LARC LPVT 1087 MSFC 454	ELT	TH ATTACH	45.000	.000
[illegible]	⊠	SA-23F LARC LPVT 1087 MSFC 454	ELT	TH ATTACH	90.000	.000
[illegible]	⊠	SA-23F LARC LPVT 1087 MSFC 454	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION		
SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
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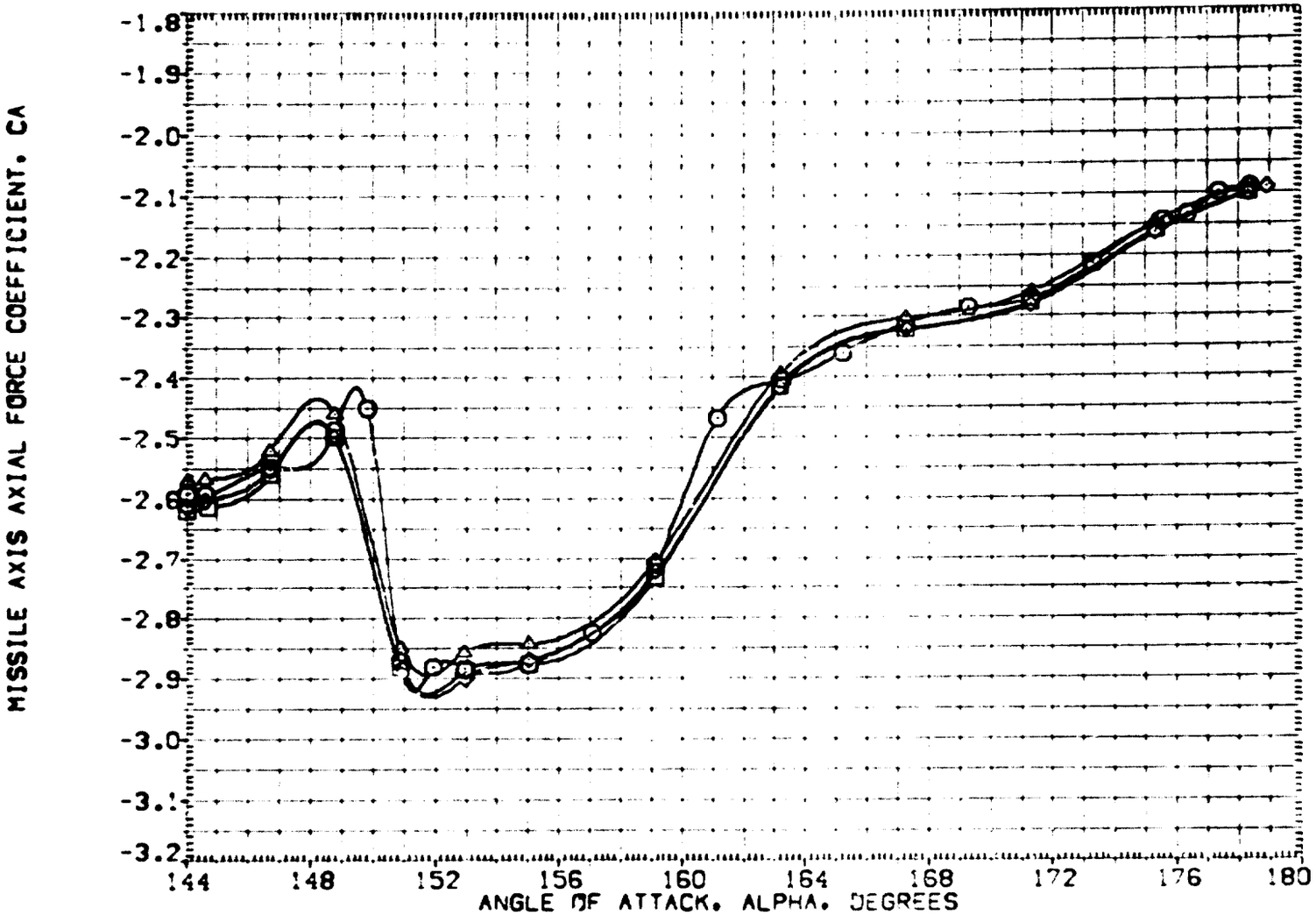
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE

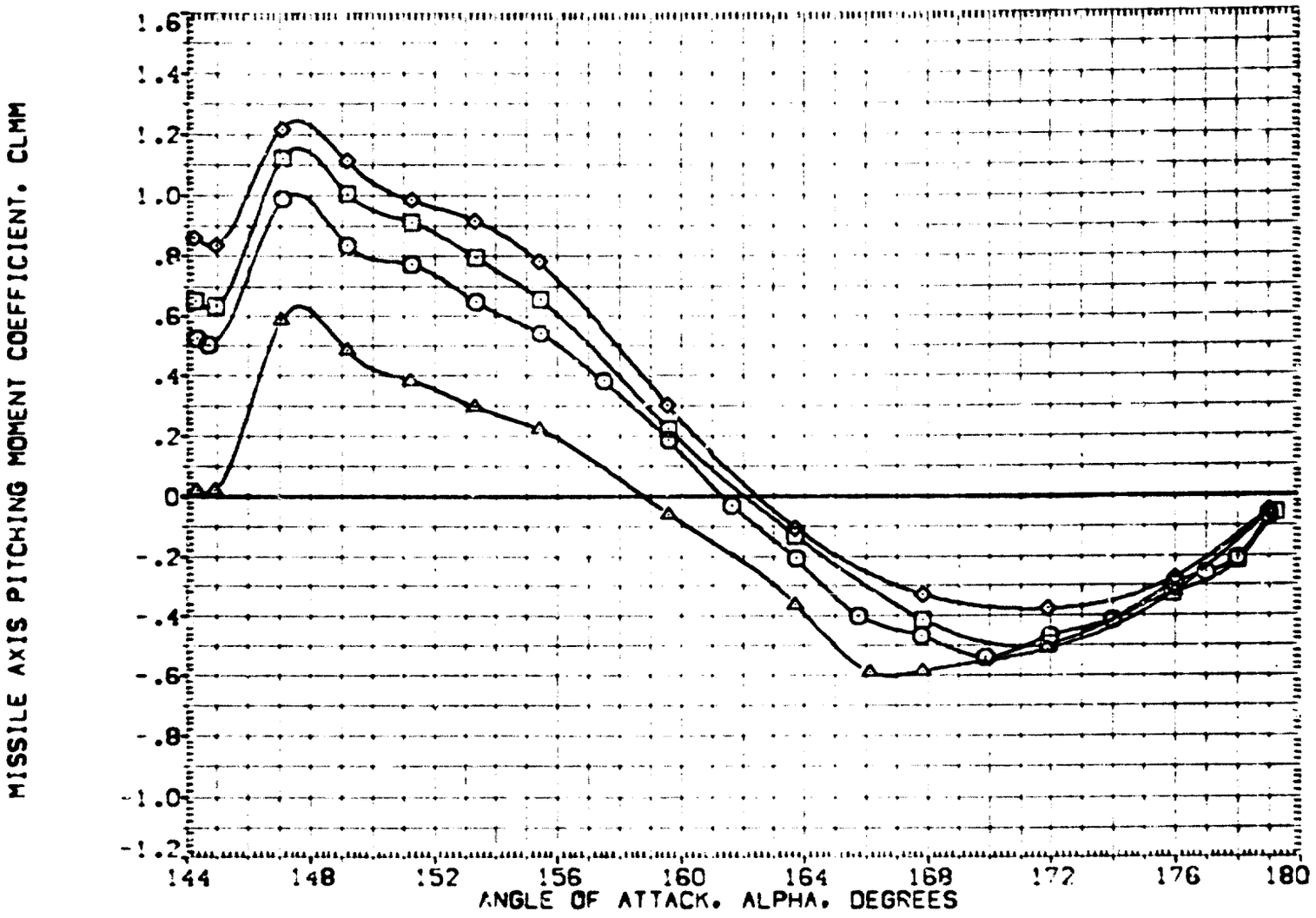


EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(C)MACH = 4.63

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
[illegible]	□	SA-2[illegible] LARC USVT 1087 MSFC 454			.000	.000
[illegible]	◇	SA-2[illegible] LARC USVT 1087 MSFC 454	ELT	TH ATTACH	45.000	.000
[illegible]	▽	SA-2[illegible] LARC USVT 1087 MSFC 454	ELT	TH ATTACH	90.000	.000
[illegible]	△	SA-2[illegible] LARC USVT 1087 MSFC 454	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION		
SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(A)MACH = 2.70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION				PHI	BETA
[illegible]	□	SA-2SF LARC USVT 1087 MSFC 454				.000	.000
[illegible]	◇	SA-2SF LARC USVT 1087 MSFC 454	ELT	TM	ATTACH	45.000	.000
[illegible]	△	SA-2SF LARC USVT 1087 MSFC 454	ELT	TM	ATTACH	90.000	.000
[illegible]		SA-2SF LARC USVT 1087 MSFC 454	ELT	TM	ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
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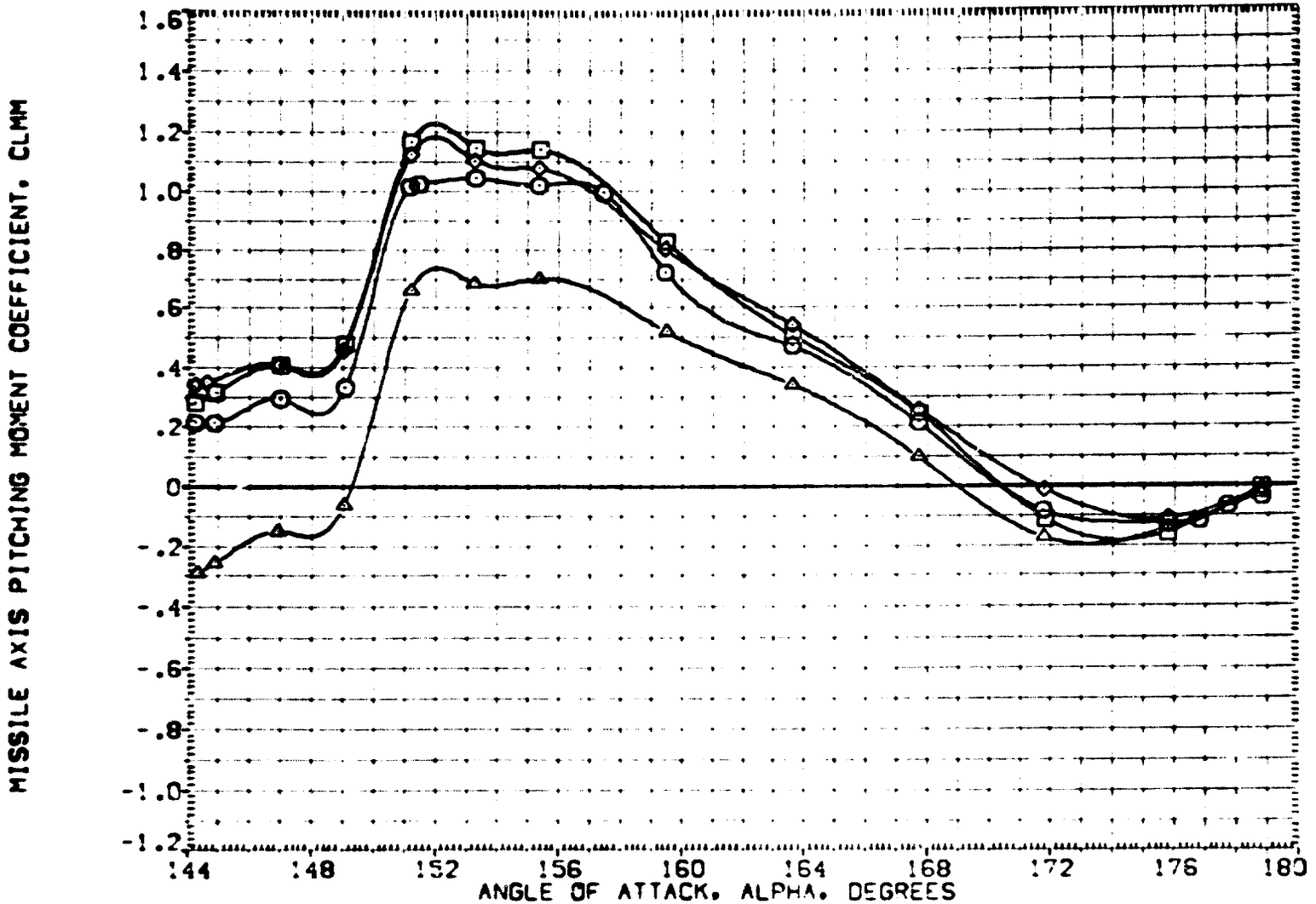
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(B)MACH = 4.00

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
[illegible]	○	SA-[illegible] LARC [illegible]			.000	.000
[illegible]	□	SA-[illegible] LARC [illegible]	ELT	TH ATTACH	45.000	.000
[illegible]	◇	SA-[illegible] LARC [illegible]	ELT	TH ATTACH	90.000	.000
[illegible]	△	SA-[illegible] LARC [illegible]	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION		
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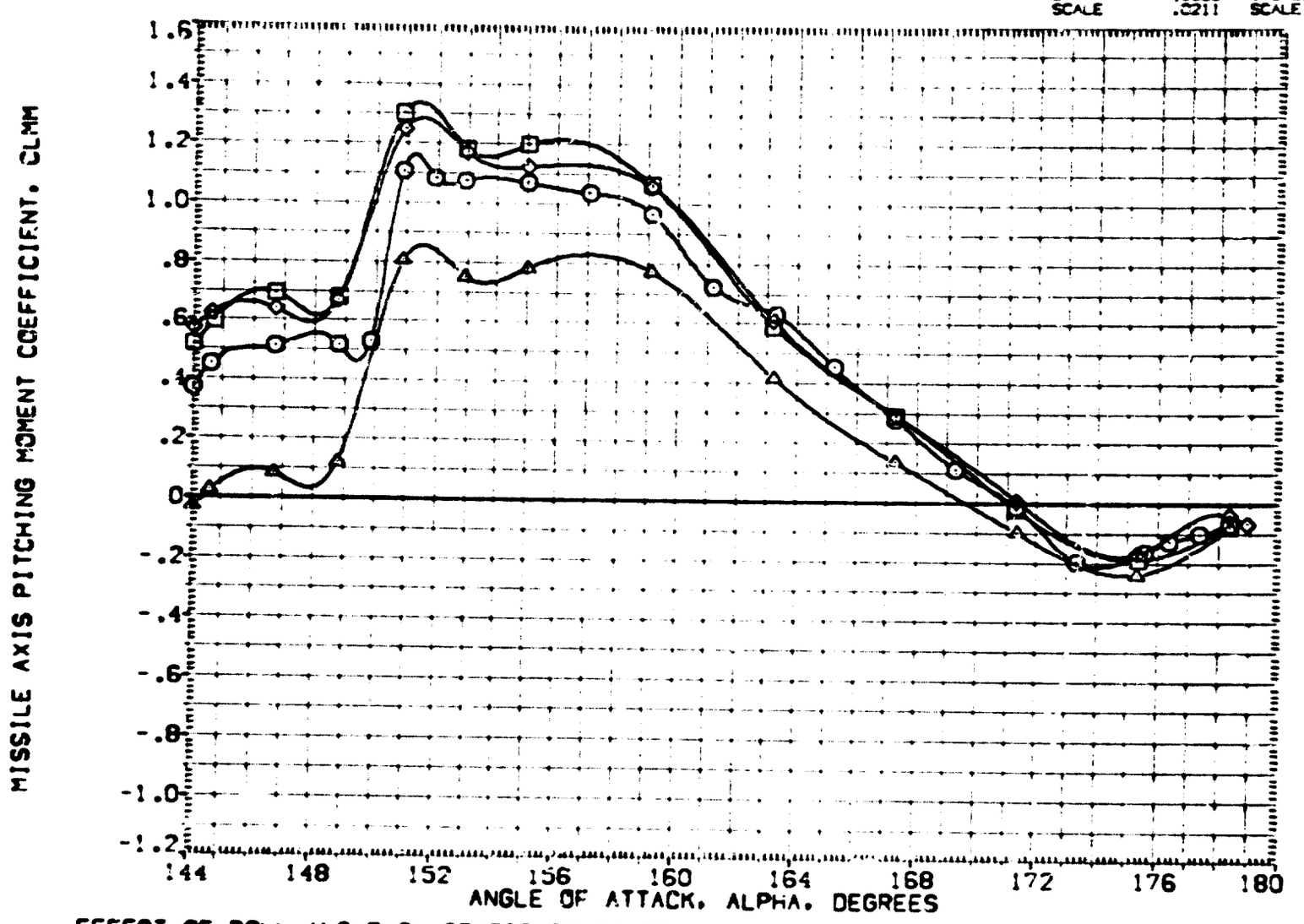
ZMRP	.0000	INCHES
SCALE	.0211	SCALE

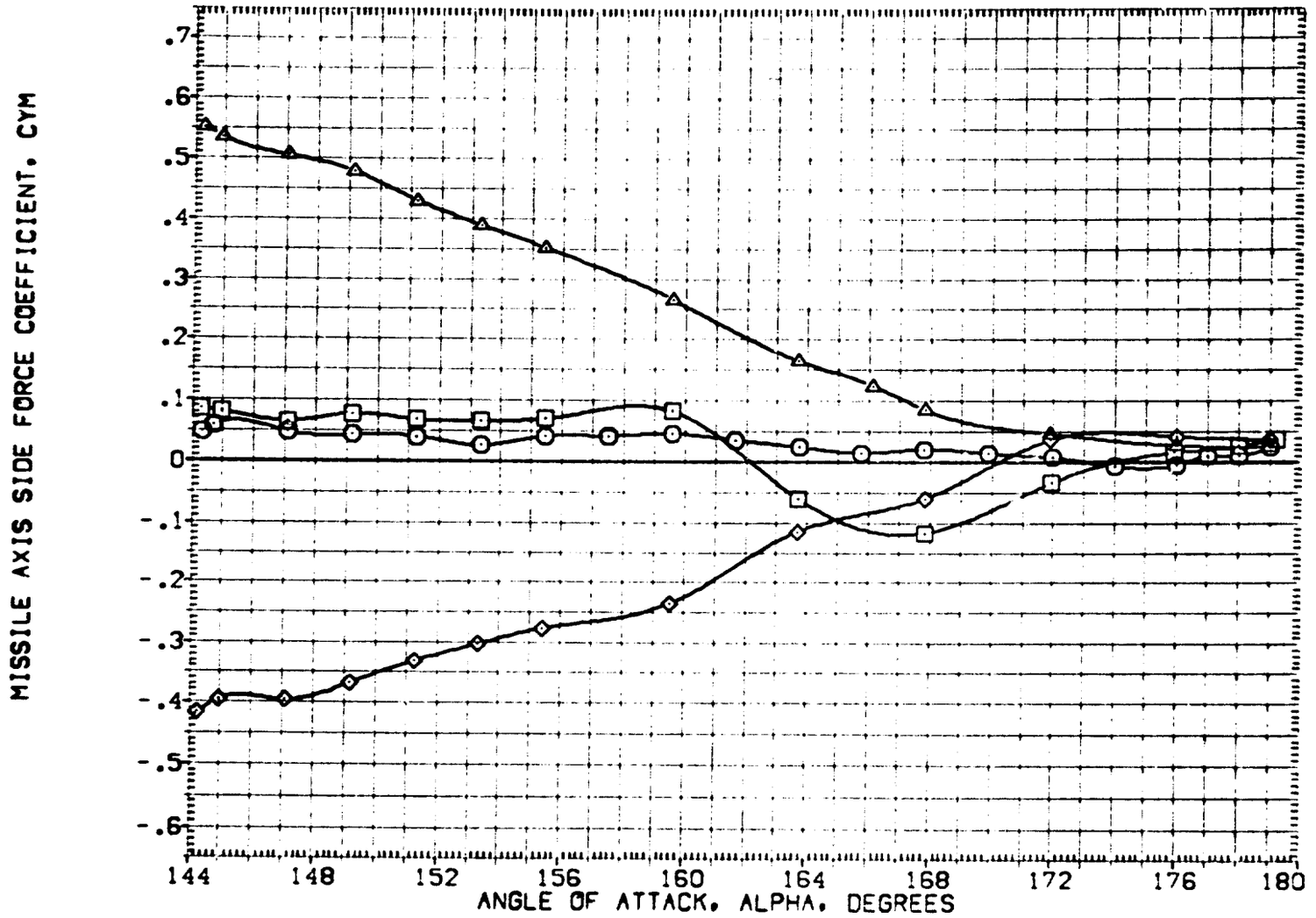


EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(C)MACH = 4.63

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
(A)9001	□	SA-25F LARC UPVT 1087 MSFC 454			.000	.000
(A)9002	○	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	45.000	.000
(A)9003	⊠	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	90.000	.000
(A)9004	△	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION		
SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



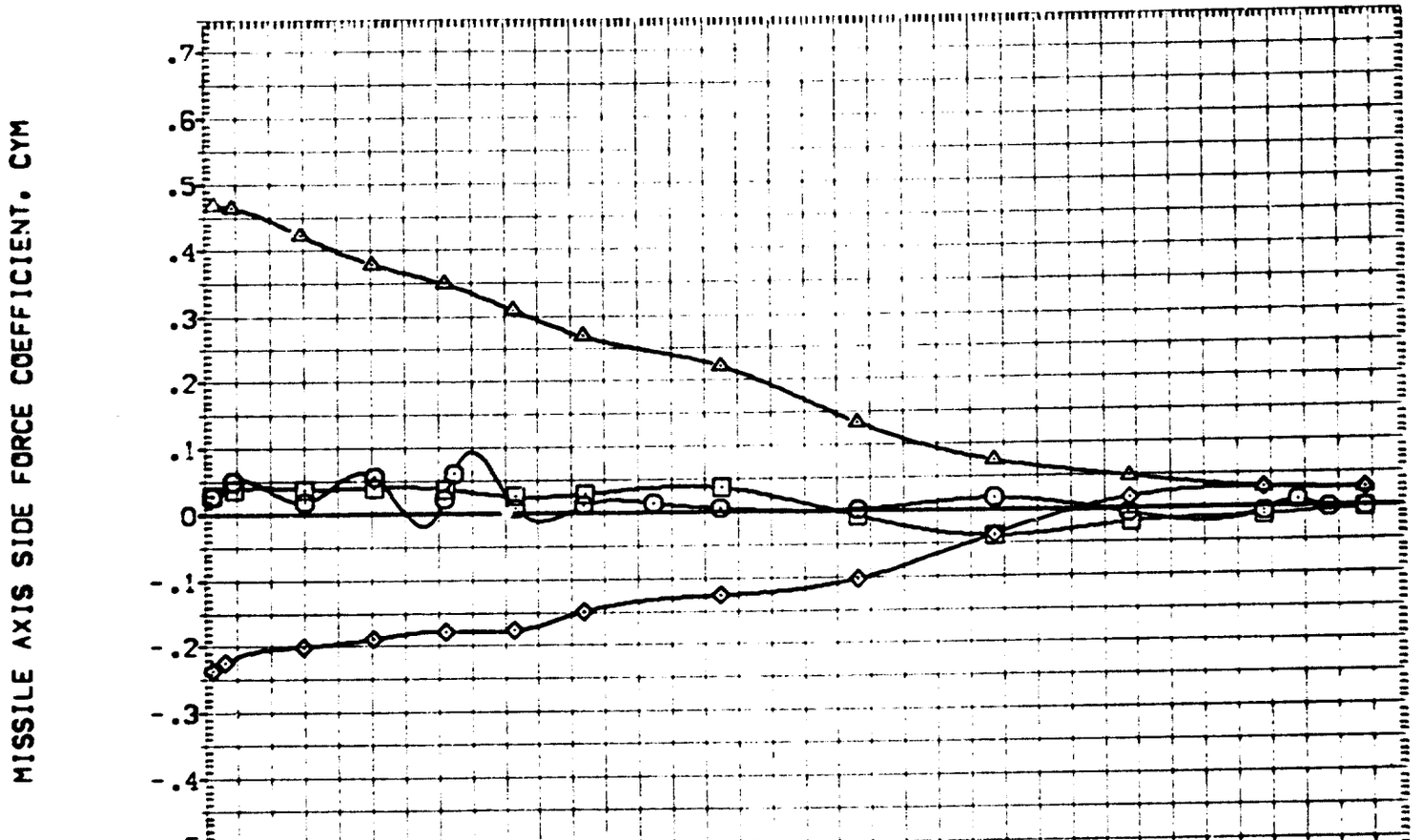
EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(A)MACH = 2.70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
[A-9001]	◇	SA-25F LARC UPVT 1087 MSFC 454			.000	.000
[A-9002]	△	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	45.000	.000
[A-9003]	⊠	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	90.000	.000
[A-9004]	⊡	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



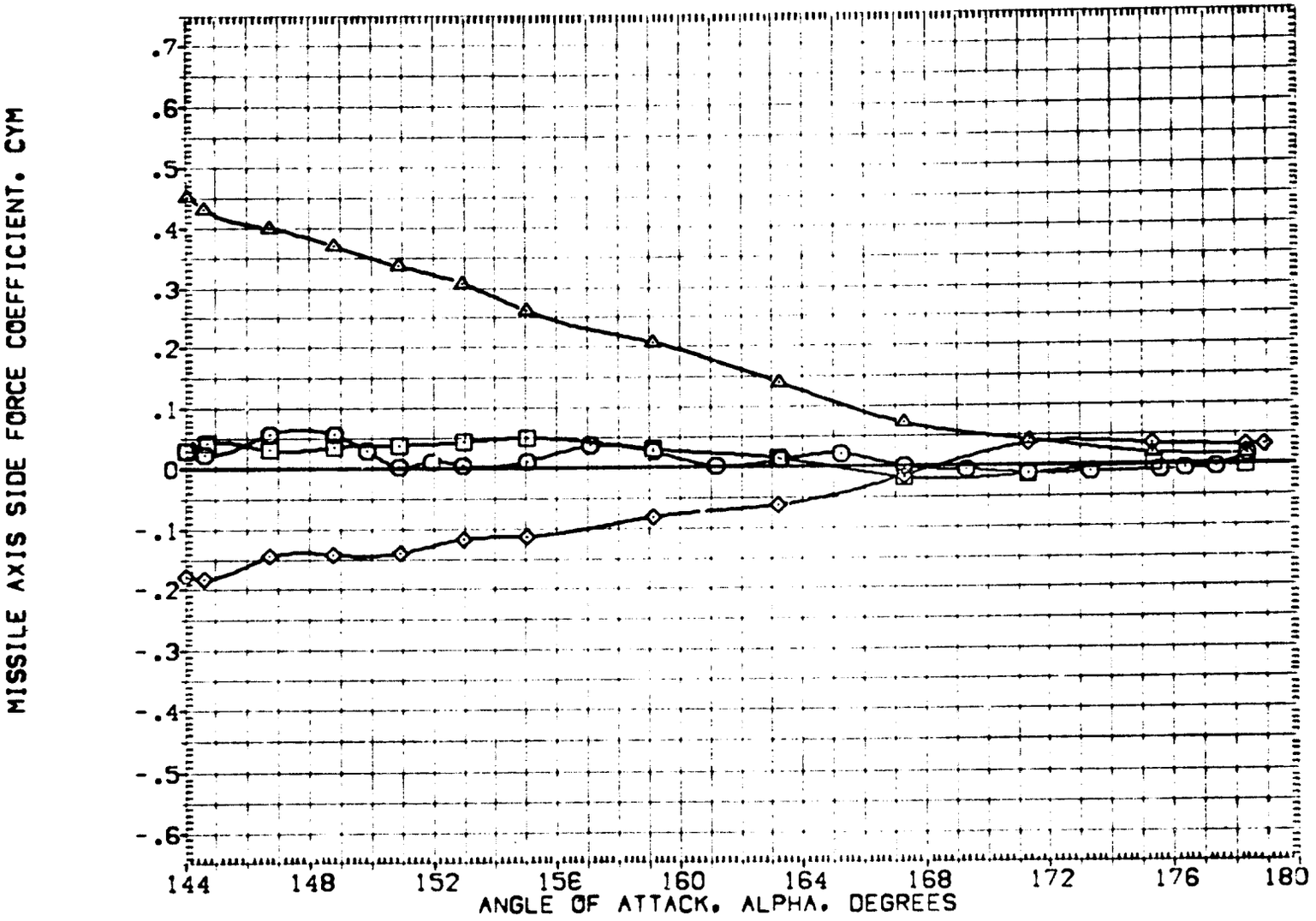
EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(B)MACH = 4.00

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	PHI	BETA
[A-9001]	□	SA-25F LARC UPVT 1087 MSFC 454	.000	.000
[A-9002]	◇	SA-25F LARC UPVT 1087 MSFC 454 ELT TH ATTACH	45.000	.000
[A-9003]	⊠	SA-25F LARC UPVT 1087 MSFC 454 ELT TH ATTACH	90.000	.000
[A-9004]	△	SA-25F LARC UPVT 1087 MSFC 454 ELT TH ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE

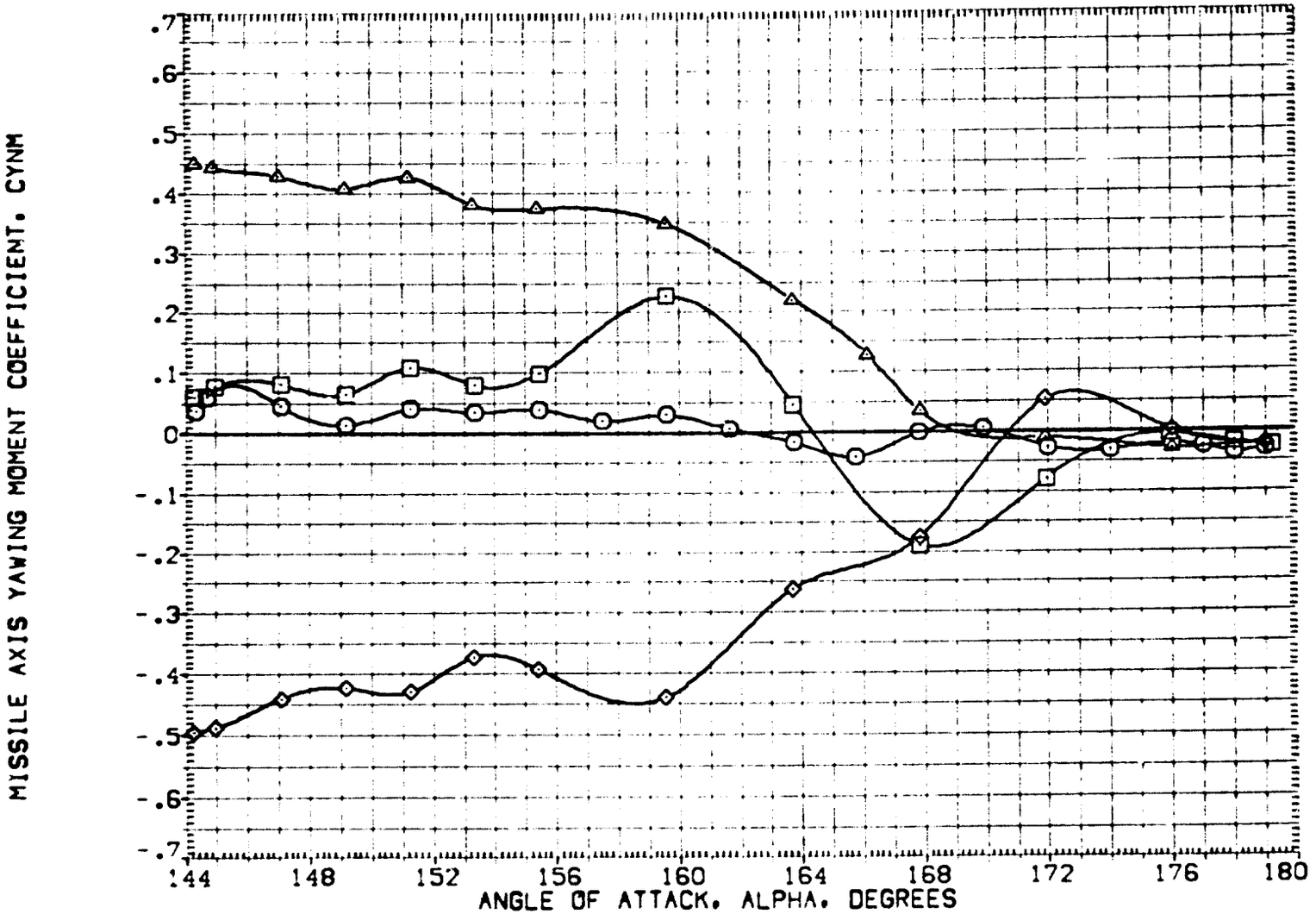


EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

[C]MACH = 4.63

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	PHI	BETA
[A-9001]	○	SA-25F LARC UPWT 1087 MSFC 454	.000	.000
[A-9002]	□	SA-25F LARC UPWT 1087 MSFC 454 ELT TH ATTACH	45.000	.000
[A-9003]	◇	SA-25F LARC UPWT 1087 MSFC 454 ELT TH ATTACH	90.000	.000
[A-9004]	△	SA-25F LARC UPWT 1087 MSFC 454 ELT TH ATTACH	135.000	.000

REFERENCE INFORMATION		
SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



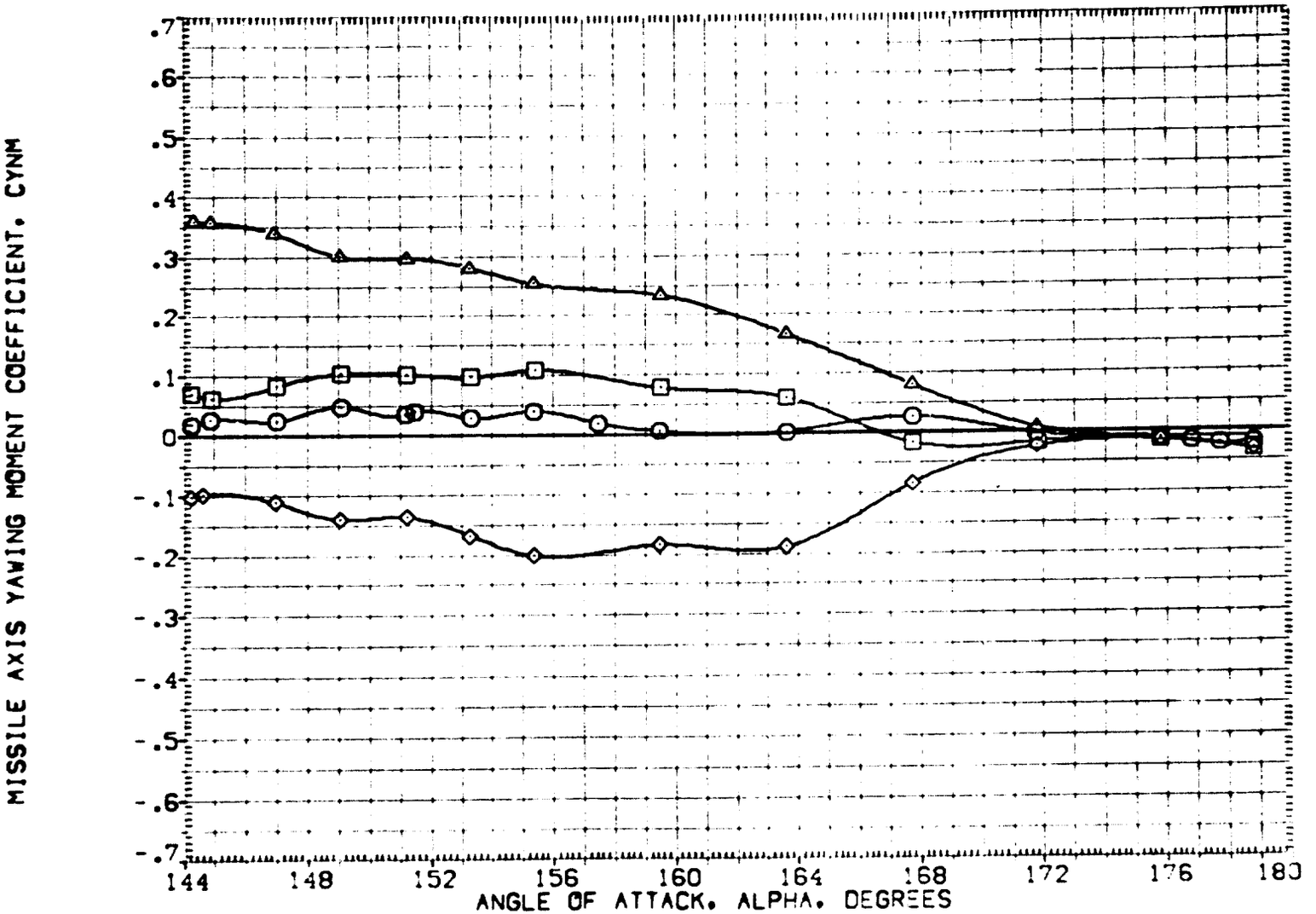
EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(A)MACH = 2.70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	PHI	BETA
[A-9001]	□	SA-25F LARC UPVT 1087 MSFC 454	.000	.000
[A-9002]	◇	SA-25F LARC UPVT 1087 MSFC 454 ELT TH ATTACH	45.000	.000
[A-9003]	⊠	SA-25F LARC UPVT 1087 MSFC 454 ELT TH ATTACH	90.000	.000
[A-9004]	⋈	SA-25F LARC UPVT 1087 MSFC 454 ELT TH ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE

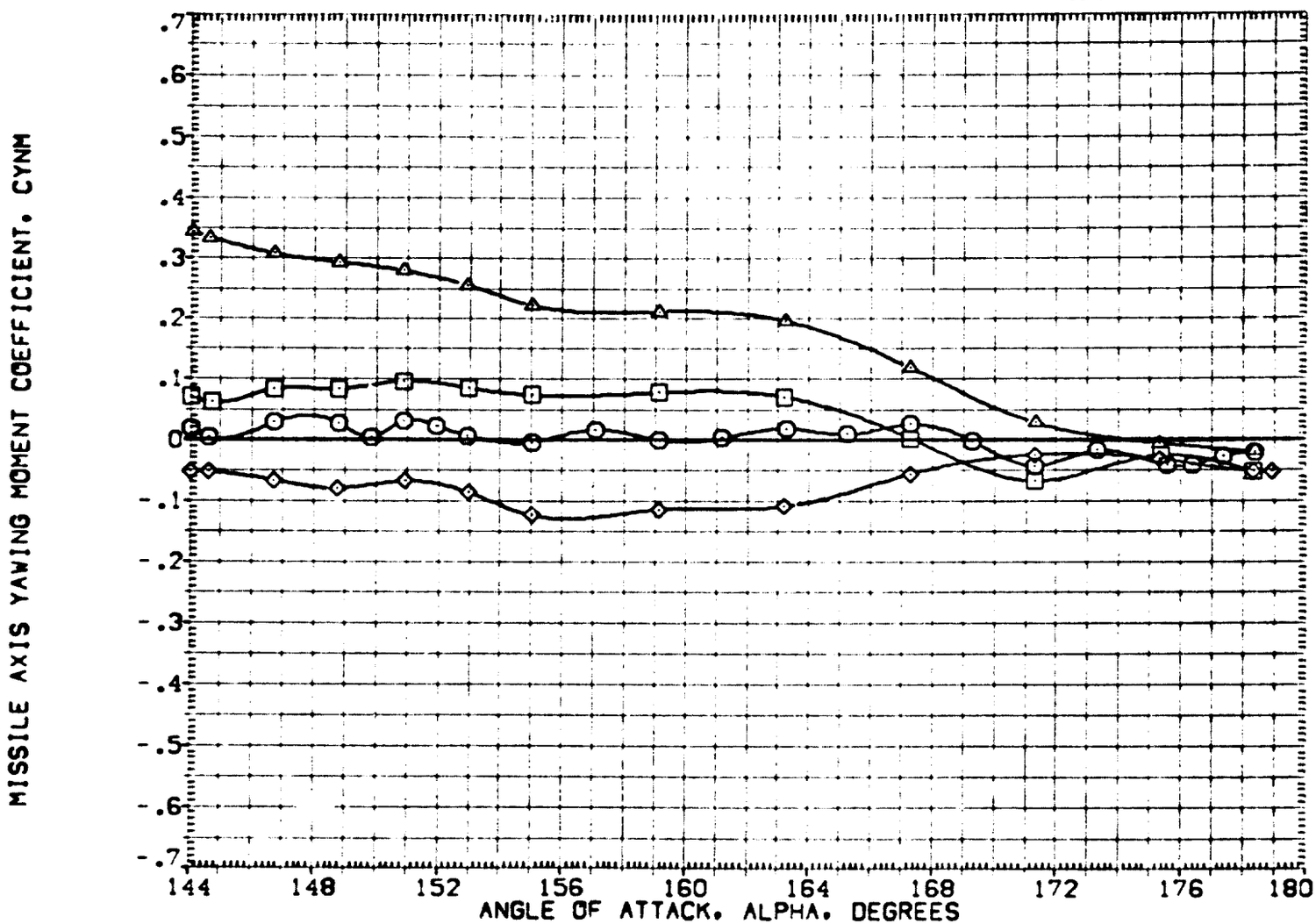


EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(B)MACH = 4.00

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	PHI	BETA
[A-9001]	○	SA-25F LARC USVT 1087 MSFC 454	.000	.000
[A-9002]	⊠	SA-25F LARC USVT 1087 MSFC 454 ELT TH ATTACH	45.000	.000
[A-9003]	⊠	SA-25F LARC USVT 1087 MSFC 454 ELT TH ATTACH	90.000	.000
[A-9004]	△	SA-25F LARC USVT 1087 MSFC 454 ELT TH ATTACH	135.000	.000

REFERENCE INFORMATION		
SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



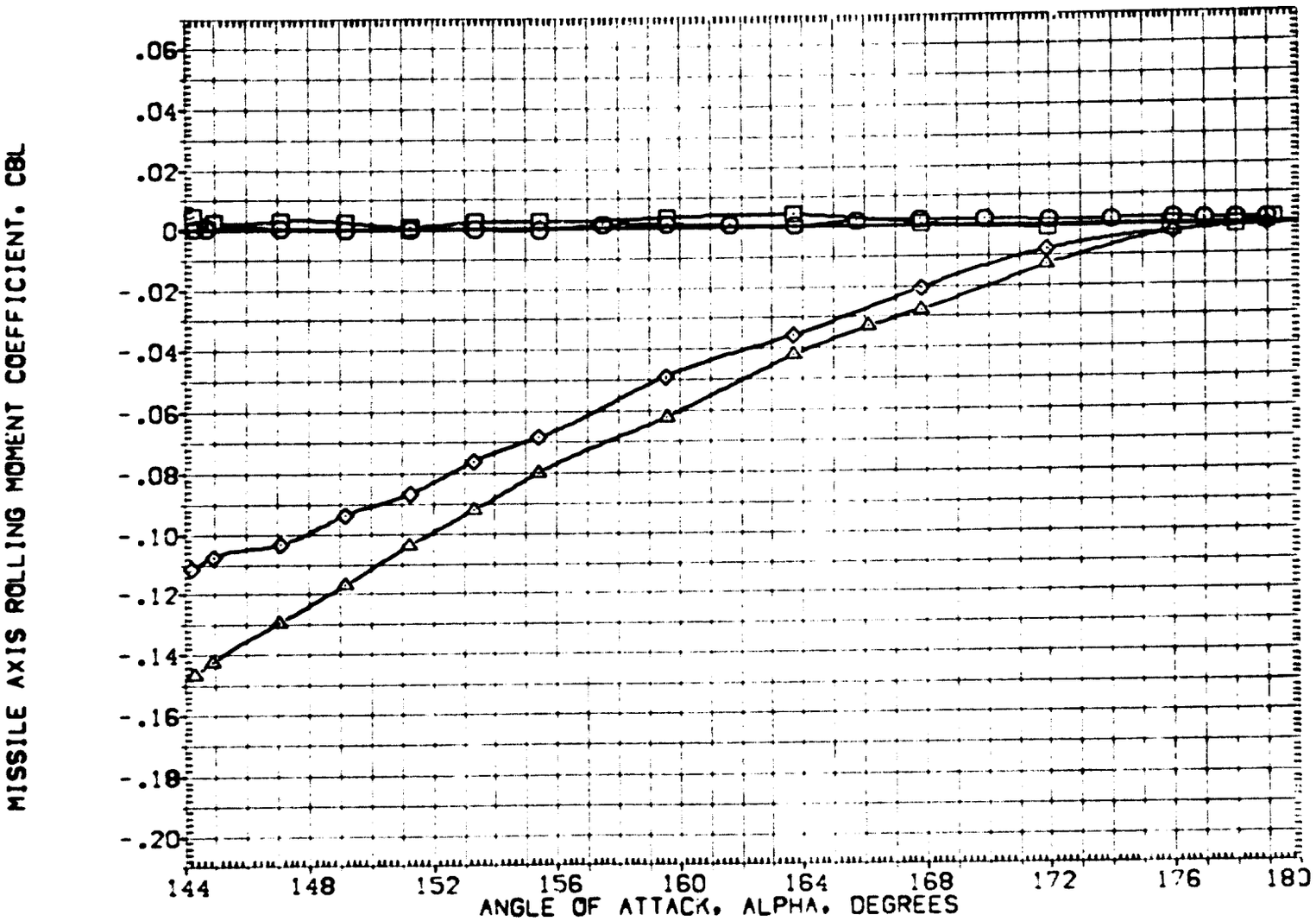
EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(C)MACH = 4.63

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
[A]0001]	□	SA-25F LARC UPVT 1087 MSFC 454			.000	.000
[B]0002]	□	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	45.000	.000
[C]0003]	⊠	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	90.000	.000
[D]0004]	△	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



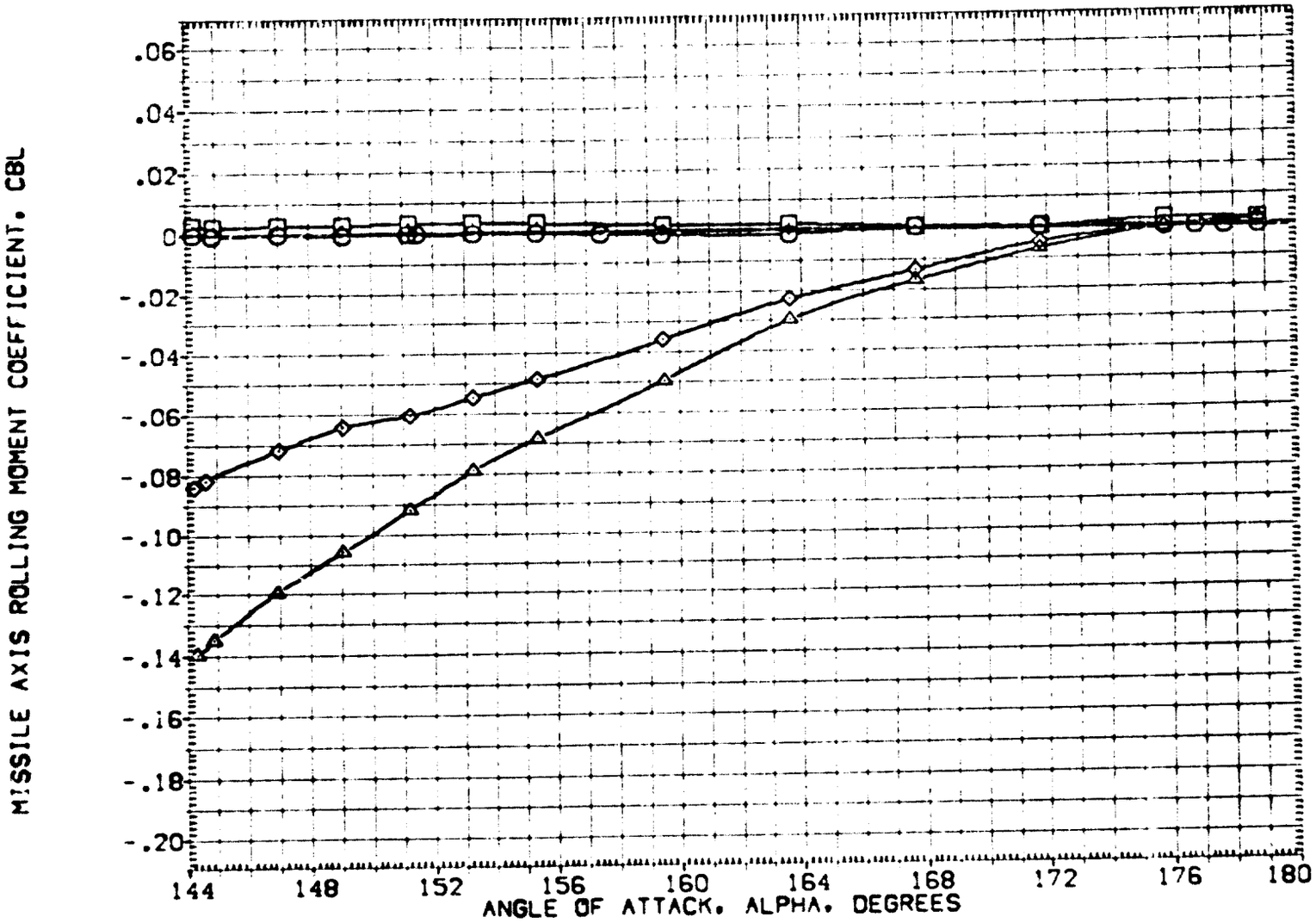
EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

[A]MACH = 2.70

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
[A-0001]	□	SA-25F LARC UPVT 1087 MSFC 454			.000	.000
[B-0002]	◇	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	45.000	.000
[B-0003]	△	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	90.000	.000
[B-0004]	⊠	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8340	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



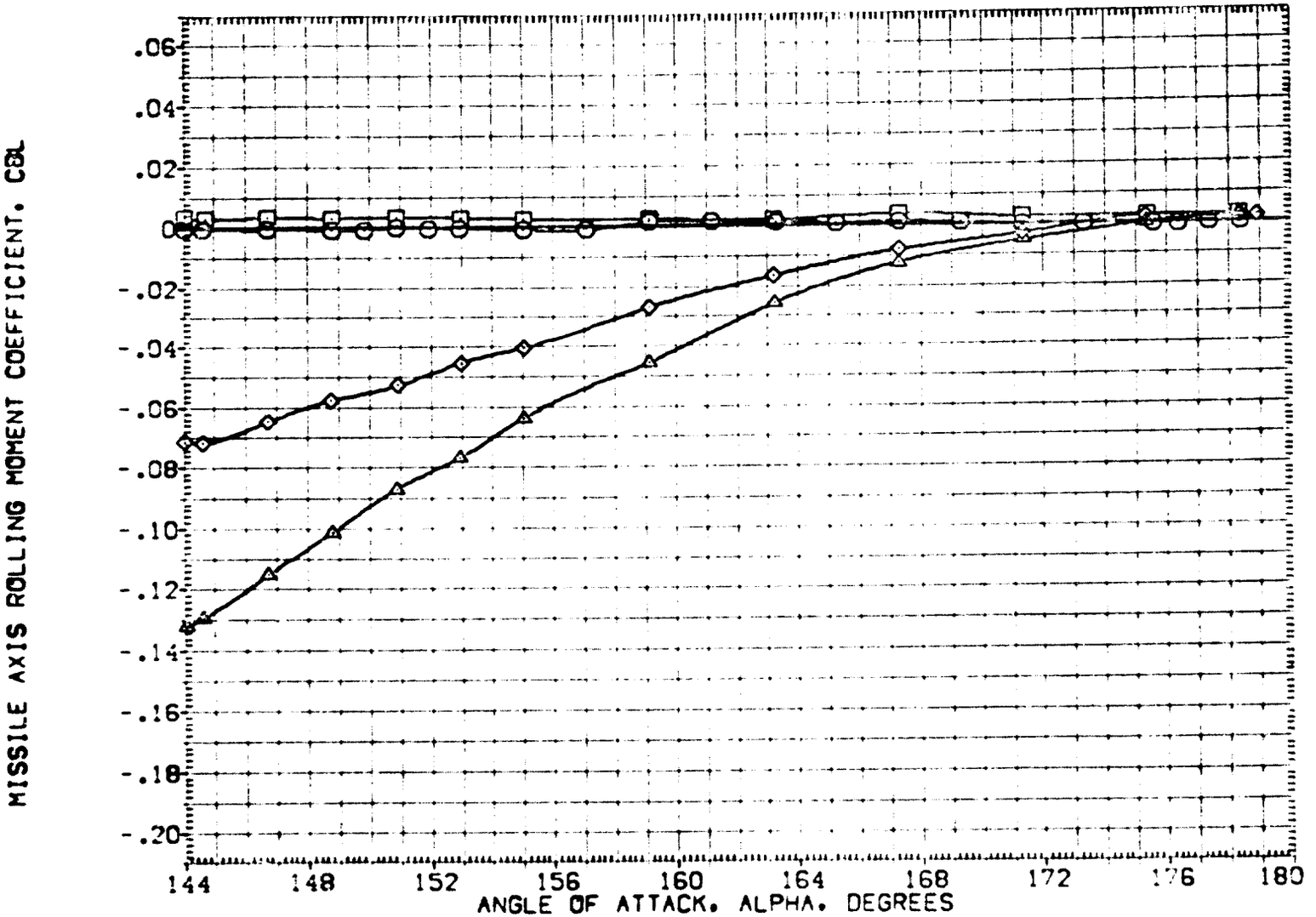
EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(B)MACH = 4.00

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION			PHI	BETA
[A-6001]	□	SA-25F LARC UPVT 1087 MSFC 454			.000	.000
[B-6002]	◇	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	45.000	.000
[B-6003]	⊠	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	90.000	.000
[B-6004]	△	SA-25F LARC UPVT 1087 MSFC 454	ELT	TH ATTACH	135.000	.000

REFERENCE INFORMATION

SREF	7.0690	SQ.IN.
LREF	3.0000	INCHES
BREF	3.0000	INCHES
XMRP	20.8300	INCHES
YMRP	.0000	INCHES
ZMRP	.0000	INCHES
SCALE	.0211	SCALE



EFFECT OF ROLL ANGLE ON STATIC STABILITY CHARACTERISTICS OF SRB

(C)MACH = 4.63

APPENDIX

TABULATED SOURCE DATA

Plotted data listings are available on request from Data Management Services.

DATE 18 FEB 75 TABULATED SOURCE DATA, LARC UPWT 1087 (SA2SF) PAGE 1

SA-2SF LARC UPWT 1087 MSFC 454 (RH9001) (14 FEB 75)

REFERENCE DATA

BREF = 7.0000 SQ.IN. XMRP = 20.8340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = .000

RUN NO. 1/ 0 MN/L = 1.90 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNM	CA	CLMM	CYM	CYMM	CBL	CL	CD	Q(PSF)
2.300	144.111	7.93871	-2.82203	.45949	.07743	.04779	.00011	-4.77565	6.93891	341.47734
2.300	144.489	7.89428	-2.84762	.73644	.05021	.04631	.00051	-4.64003	6.93232	341.71425
2.300	144.747	7.75180	-2.85333	.79236	.07014	.03570	.00395	-4.58457	6.85700	340.59008
2.300	145.855	6.99703	-2.92864	.48952	.06418	.02371	.00360	-4.25839	6.27705	340.59008
2.300	148.963	6.31677	-2.92144	.32233	.07097	.02529	.00333	-3.90619	5.76004	340.35201
2.300	151.029	5.65319	-2.90104	.12729	.06639	.02266	.00309	-3.54062	5.27623	340.59008
2.300	153.135	4.96755	-2.86913	-.01477	.07468	.01586	.00461	-3.13656	4.80318	340.61854
2.300	155.257	4.32795	-2.85329	-.16993	.05095	.01496	.00462	-2.73714	4.40232	340.64815
2.300	157.337	3.73619	-2.81758	-.36407	.05204	.02331	.00448	-2.36196	4.03959	340.26317
2.300	159.414	3.15884	-2.77625	-.51066	.04930	-.04009	.00344	-1.98097	3.70966	340.26317
2.300	161.518	2.59203	-2.75208	-.69992	.07479	-.02279	.00507	-1.60[illegible]6	3.38441	340.38163
2.300	163.583	2.05003	-2.65436	-.82381	.05183	-.04083	.00486	-1[illegible].1628	3.12552	340.35201
2.300	165.655	1.50757	-2.62898	-.94805	.03981	-.07243	.00433	-.80923	2.92052	340.32240
2.300	167.712	1.03204	-2.58972	-.98066	.01953	-.06299	.00453	-.45914	2.74124	340.29278
2.300	169.761	.64423	-2.53148	-.83116	.02276	-.07095	.00439	-.18398	2.60560	340.44085
2.300	171.149	.49761	-2.47478	-.74398	.02101	-.04506	.00095	-.11089	2.52187	340.38163
2.300	171.875	.41404	-2.46102	-.67733	.01878	-.05517	.00470	-.06205	2.49483	339.78935
2.300	173.859	.24291	-2.39182	-.55025	.01606	-.06497	.00271	.01437	2.40408	339.84758
2.300	175.892	.13160	-2.31429	-.35979	.01709	-.06463	.00279	.03451	2.31777	339.78935
2.300	176.927	.08771	-2.27557	-.26920	.01786	-.06431	.00283	.03510	2.27697	339.99665
2.300	177.951	.05473	-2.23977	-.18839	.01909	-.06382	.00286	.01540	2.24065	340.08549
2.300	178.991	.02018	-2.17177	-.07896	.01831	-.09039	.00445	.01807	2.17178	341.00352
2.300	179.443	-.00238	-2.16553	-.03419	.03098	-.07598	.00454	.02342	2.16543	340.73599
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-2SF LARC UPWT 1087 MSFC 454 (RM9001) (14 FEB 7))

REFERENCE DATA

SREF = 7.0690 SQ.IN. XMRP = 20.2340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = .000

RUN NO. 2/ 0 RN/L = 1.50 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNM	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q(FSF)
2.700	144.359	7.90906	-2.59661	.52116	.04756	.03689	.00024	-4.58053	5.48746	310.81062
2.700	144.678	7.36625	-2.59988	.50067	.05818	.05992	.00039	-4.50706	5.38023	310.72295
2.700	147.095	6.32717	-2.94762	.99634	.04770	.04560	.00041	-3.87874	5.02061	310.65720
2.700	149.170	5.90040	-2.94153	.83187	.04283	.01402	-.00018	-3.55912	5.54978	310.65720
2.700	151.258	5.24955	-2.92455	.76876	.04047	.04120	.00004	-3.19647	5.09855	310.65720
2.700	153.361	4.62208	-2.89404	.54303	.02678	.03525	-.00010	-2.83385	4.65923	310.65720
2.700	155.445	4.04190	-2.83977	.54083	.04151	.03336	-.00037	-2.49624	4.26263	310.61336
2.700	157.514	3.46077	-2.76029	.37790	.04232	.02000	.00122	-2.14197	3.87397	310.65720
2.700	159.575	2.95003	-2.69512	.18492	.04622	.03035	.00107	-1.82401	3.55518	310.59145
2.700	161.643	2.45322	-2.57229	-.03391	.03579	.00647	.00059	-1.51829	3.21393	310.54761
2.700	163.719	1.95565	-2.52395	-.21216	.02521	-.01744	.00012	-1.16961	2.97102	310.61336
2.700	165.758	1.48363	-2.47390	-.40122	.01523	-.04131	.00176	-.82940	2.76286	310.41611
2.700	167.809	1.03403	-2.40952	-.45949	.02170	-.00091	.00206	-.48502	2.65173	310.54761
2.700	169.895	.63438	-2.44707	-.53391	.01446	.00551	.00206	-.19499	2.52043	310.54761
2.700	171.972	.38052	-2.40543	-.47007	.00752	-.02624	.00167	-.04087	2.42499	310.85416
2.700	173.987	.24253	-2.33119	-.41320	-.00619	-.03162	.00173	.00299	2.34377	310.50378
2.700	175.982	.14504	-2.25065	-.29535	-.00415	-.02116	.00183	.01303	2.25528	310.50378
2.700	177.814	.09586	-2.20766	-.25869	.00933	-.02583	.00169	.01929	2.20966	310.48186
2.700	178.818	.07146	-2.15238	-.21074	.01019	-.03516	.00157	.00303	2.15357	310.50378
2.700	179.015	.02235	-2.14077	-.07155	.02390	-.03006	.00158	.01444	2.14084	310.39419
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-23F LARC UPWT 1987 MSFC 454 (RM9001) (14 FEB 75)

REFERENCE DATA

SREF = 7.0699 SQ.IN. XMRP = 20.0340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = .000

RUN NO. 3/ 9 RN/L = 1.30 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNN	CA	CLNN	CYN	CYNN	CBL	CL	CD	Q(PSF)
2.900	144.991	7.27014	-2.52759	.63184	.00931	.03210	-.00023	-4.45103	6.27949	288.59108
2.900	145.130	7.07160	-2.52871	.63230	.04190	.01431	-.00002	-4.35797	6.11710	288.60881
2.900	147.270	6.31790	-2.92905	1.17494	.05280	.02141	-.00001	-3.73412	5.87615	288.64427
2.900	148.175	6.04487	-2.93447	1.16252	.03544	.01033	-.00004	-3.58815	5.68126	288.60881
2.900	149.361	5.67213	-2.93080	1.04181	.03290	.03017	.00010	-3.37662	5.42935	288.57335
2.900	150.991	5.34717	-2.93183	1.00531	.06789	.03785	.00033	-3.20951	5.20214	288.64427
2.900	151.449	5.07431	-2.93919	.94959	.04476	.03377	-.00007	-3.05242	5.00702	288.56200
2.900	153.535	4.45300	-2.89763	.85815	.03119	.02791	-.00020	-2.69501	4.57848	288.53789
2.900	155.626	3.65900	-2.83520	.78097	.01886	.01217	-.00047	-2.34134	4.17348	288.53789
2.900	157.649	3.33375	-2.75604	.60394	.02241	.00219	.00138	-2.03523	3.81674	288.57335
2.900	159.724	2.93473	-2.60372	.37331	.03992	-.01278	.00073	-1.75678	3.42473	288.59108
2.900	161.758	2.35173	-2.54242	.15808	.04548	-.00105	.00055	-1.43769	3.15081	288.55562
2.900	163.798	1.89376	-2.48697	.01816	.03950	.02684	.00080	-1.12459	2.91661	288.76039
2.900	165.910	1.43955	-2.44073	-.16261	.01469	-.00340	.00037	-.80246	2.71763	288.55362
2.900	167.950	1.03533	-2.39049	-.24816	.00571	-.02821	.00220	-.51384	2.55388	288.55362
2.900	170.003	.65733	-2.41640	-.36857	-.00100	-.02068	-.00007	-.22795	2.49381	288.57335
2.900	172.013	.41031	-2.36735	-.41429	-.00634	-.03355	.00196	-.07737	2.40140	288.48469
2.900	174.047	.26096	-2.30666	-.35263	-.00805	-.04468	.00181	-.02933	2.32129	288.71520
2.900	176.034	.12990	-2.21282	-.34656	-.00635	-.04422	.00175	.02345	2.21651	288.62654
2.900	177.985	.10370	-2.14275	-.31698	-.00541	-.05428	.00161	.00765	2.14525	288.46696
2.900	178.056	.07748	-2.12389	-.19992	-.00339	-.04310	.00180	-.00538	2.12530	288.57335
2.900	179.099	.02507	-2.10938	-.09363	-.00254	-.04262	-.00040	.00811	2.10931	288.57335
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-2SF LARC UPWT 1987 WSFC 454 (RM9001) (14 FEB 75)

REFERENCE DATA

SREF	=	7.0685 SQ.IN.	XMRP	=	29.0340 INCHES
LREF	=	3.0000 INCHES	YMRP	=	.0000 INCHES
BREF	=	3.0000 INCHES	ZMRP	=	.0000 INCHES
SCALE	=	.0211 SCALE			

PARAMETRIC DATA

PHI = .000

RUN NO. 47 0 RN/L = 2.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNN	CA	CLNN	CYN	CYNN	CBL	CL		Q(PSF)
3.400	144.466	6.96380	-2.59655	.23025	.04108	.01491	-.00022	-4.15779	6. .18	326.28990
3.400	145.112	6.73946	-2.59333	.26735	.08487	.03092	-.00047	-4.04484	5.98206	326.28990
3.400	146.081	6.42675	-2.58213	.26554	.08919	.03214	-.00054	-3.89334	5.72732	326.36995
3.400	147.237	6.06645	-2.56995	.33457	.09448	.01880	-.00038	-3.69088	5.43520	326.34147
3.400	148.229	5.71633	-2.53500	.30475	.07078	.02442	-.00055	-3.52506	5.16494	326.33564
3.400	148.932	5.62005	-2.33044	.32360	.06938	.04214	-.00030	-3.48110	5.09503	326.34700
3.400	149.363	5.31120	-2.96901	.99867	.05914	.02926	-.00204	-3.05691	5.26118	326.58721
3.400	150.369	5.00477	-2.97455	.97968	.03976	.04000	-.00177	-2.87965	5.03397	326.39282
3.400	151.471	4.69565	-2.99319	.93967	.03263	.05528	-.00158	-2.69570	4.87228	326.43856
3.400	152.543	4.38441	-2.97498	.98325	.01240	.03799	.00029	-2.51882	4.65145	326.57578
3.400	153.564	4.12275	-2.94477	.86815	.04487	.03602	.00019	-2.38064	4.47228	326.25560
3.400	155.666	3.54644	-2.86829	.80110	.00826	.03537	.00009	-2.04944	4.07481	326.43856
3.400	157.730	3.03800	-2.77051	.74128	.02151	.01212	-.00050	-1.76236	3.71555	326.53004
3.400	159.797	2.57714	-2.66847	.69073	.01242	-.00113	-.00085	-1.53159	3.30044	326.34729
3.400	161.877	2.10443	-2.50553	.57988	.01572	-.00070	.00093	-1.22063	3.03591	326.24416
3.400	163.940	1.65252	-2.44004	.23753	.00710	-.00453	.00075	-.91049	2.81063	326.59865
3.400	165.993	1.27278	-2.39573	.12378	.01114	-.02190	.00029	-.65508	2.63256	326.38138
3.400	168.066	.91534	-2.34797	-.01048	.01822	-.02979	-.00006	-.41001	2.48651	326.33568
3.400	170.067	.58122	-2.33367	-.13558	-.00146	-.01849	.00010	-.16998	2.39894	326.35851
3.400	172.115	.33982	-2.27670	-.28210	-.00535	-.01105	.00007	-.02426	2.30179	326.30134
3.400	174.158	.20721	-2.21356	-.26674	.00624	-.00689	-.00003	.01919	2.22316	326.33717
3.400	176.155	.11454	-2.15451	-.21360	.00810	-.00628	-.00004	.03018	2.15734	326.27947
3.400	177.163	.09173	-2.08974	-.22555	-.00336	-.01976	-.00013	.01254	2.09171	326.17555
3.400	178.171	.06730	-2.07544	-.12319	.03508	-.00544	-.00026	-.00103	2.07613	326.32421
3.400	179.177	.04408	-2.06330	-.17683	.01217	-.03478	.00000	-.01526	2.06373	326.48439
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-25F LARC UFWT 1087 MSFC 454 (RM9001) (14 FEB 75)

REFERENCE DATA

SREF = 7.0690 SQ.IN. XMRP = 20.9340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = .000

RUN NO. 5/ 0 RN/L = 2.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNN	CA	CLMM	CYN	CYNM	CBL	CL	CD	Q(PSF)
4.000	144.245	6.85902	-2.66366	.21336	.02757	.01887	-.00025	-4.00983	6.16949	290.54234
4.000	144.879	6.65899	-2.65610	.21168	.03009	.02699	-.00041	-3.91853	6.00351	290.58660
4.000	146.977	5.96409	-2.61382	.29585	.01813	.02458	-.00018	-3.57612	5.44186	290.59398
4.000	149.077	5.32017	-2.55763	.33558	.03693	.04852	-.00035	-3.24964	4.92803	290.54234
4.000	151.195	4.59972	-3.00804	1.01713	.02219	.03503	.00007	-2.58121	4.85212	290.54234
4.000	151.455	4.52385	-3.01532	1.02611	.06129	.03917	-.00028	-2.53304	4.81051	290.57923
4.000	153.307	4.00763	-3.01778	1.04500	.00896	.02939	.00002	-2.22489	4.49644	290.49071
4.000	155.384	3.43784	-2.93943	1.02134	.01218	.04015	.00000	-1.90105	4.10427	290.59398
4.000	157.450	2.92115	-2.81474	.99715	.01467	.01982	-.00043	-1.61838	3.71977	290.61611
4.000	159.481	2.47792	-2.58123	.72492	.00596	.00561	-.00082	-1.41597	3.28601	290.61611
4.000	163.612	1.57115	-2.44140	.47067	.00245	.00306	-.00124	-.81851	2.78550	290.61611
4.000	167.698	.84573	-2.32012	.21205	.01777	.02816	.00081	-.33196	2.44704	290.63086
4.000	171.751	.32956	-2.24437	-.08410	-.00687	-.00239	.00028	-.00412	2.26844	290.63824
4.000	175.790	.10314	-2.13065	-.12637	-.00547	-.01247	.00002	.05357	2.13248	290.65299
4.000	176.805	.07653	-2.10869	-.11885	.00959	-.01721	-.00021	.04110	2.10968	290.86691
4.000	177.739	.05096	-2.07079	-.06704	-.00305	-.02188	-.00013	.03076	2.07119	290.86691
4.000	178.815	.02491	-2.05782	-.03781	-.00132	-.02125	-.00013	.01766	2.05789	290.86691
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-25F LARC UPWT 1087 MSFC 454 (RH9001) (14 FEB 75)

REFERENCE DATA

SREF = 7.0690 SQ.IN. XMRP = 20.8340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = .000

RUN NO. 6/ 0 RN/L = 2.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNN	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q (PSF)
4.630	144.025	6.58520	-2.59289	.37361	.02846	.01896	-.00048	-3.80605	5.96674	232.66627
4.630	144.627	6.40223	-2.59232	.45304	.02224	.00360	-.00061	-3.71967	5.82003	232.66627
4.630	146.719	5.75986	-2.54812	.51268	.05656	.02845	-.00073	-3.41687	5.29093	232.66627
4.630	148.796	5.11830	-2.48559	.51941	.05554	.02728	-.00088	-3.09011	4.77765	232.66627
4.630	149.830	4.84704	-2.44987	.52961	.02919	.00428	-.00098	-2.95920	4.55398	232.66627
4.630	150.895	4.44659	-2.87041	1.11009	.00156	.03240	-.00098	-2.48894	4.67083	232.66627
4.630	151.951	4.14117	-2.88075	1.08382	.01094	.02263	-.00040	-2.30015	4.48969	232.66627
4.630	152.954	3.86713	-2.88256	1.07495	.00474	.00711	-.00062	-2.13359	4.32574	232.66627
4.630	155.026	3.35227	-2.87740	1.06958	.01112	-.00403	-.00098	-1.82400	4.02370	232.66627
4.630	157.069	2.83633	-2.82436	1.03650	.03643	.01759	-.00110	-1.51174	3.70627	232.66627
4.630	159.146	2.34756	-2.71220	.96677	.02619	.00006	.00138	-1.22828	3.37922	232.66627
4.630	161.178	1.94440	-2.46710	.72466	.00214	.00339	.00139	-1.04446	2.96249	232.66627
4.630	163.278	1.50824	-2.40450	.63114	.01182	.01927	.00131	-.75260	2.73678	232.66627
4.630	165.246	1.13577	-2.35881	.45487	.02150	.00946	.00084	-.49759	2.57029	232.66627
4.630	167.312	.79785	-2.31103	.27789	-.00067	.02545	.00107	-.27078	2.42983	232.66627
4.630	169.312	.55620	-2.28545	.11174	-.00656	-.00186	.00055	-.12270	2.34895	232.66627
4.630	171.329	.34722	-2.27083	-.01434	-.01265	-.04305	-.00011	- 00092	2.29723	232.66627
4.630	173.341	.19427	-2.21317	-.19615	-.01111	-.01702	.00006	.06367	2.22077	232.66627
4.630	175.578	.09657	-2.14472	-.16346	-.00861	-.04192	-.00033	.06909	2.14578	232.66627
4.630	176.395	.06402	-2.13293	-.12581	-.00715	-.04140	-.00033	.07021	2.13274	232.66627
4.630	177.396	.06398	-2.09920	-.10307	-.00375	-.02725	-.00015	.03146	2.09994	232.66627
4.630	178.380	.03086	-2.09037	-.06669	.01556	-.02009	-.00024	.02823	2.09040	232.66627
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-2SF LARC UPWT 1087 MSFC 454 ELT TH ATTACH (RH9002) (14 FEB 75)

REFERENCE DATA

SREF = 7.0690 SQ.IN. XMRP = 20.8340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = 45.000

RUN NO. 7/ 0 RN/L = 1.50 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNM	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q(PSF)
2.700	144.254	7.52603	-2.61067	.64784	.08485	.06009	.00445	-4.58307	6.51554	310.89829
2.700	144.935	7.29289	-2.61366	.62921	.08134	.07793	.00257	-4.46765	6.32910	310.89829
2.700	147.079	6.54775	-2.96681	1.12163	.06565	.08106	.00289	-3.88392	6.04898	310.81254
2.700	149.177	5.89921	-2.96515	1.00431	.07796	.06552	.00236	-3.54659	5.56900	310.70103
2.700	151.271	5.25545	-2.94404	.90825	.06804	.10043	.00077	-3.19341	5.10776	310.30652
2.700	153.358	4.64328	-2.90863	.78931	.06761	.07925	.00228	-2.84603	4.68191	310.81052
2.700	155.448	4.04581	-2.85745	.65219	.07016	.09876	.00231	-2.49272	4.28018	310.28460
2.700	159.590	2.95115	-2.66479	.22090	.08276	.22719	.00340	-1.83658	3.52666	310.43802
2.700	163.714	1.95977	-2.53976	-.13531	-.06052	.04700	.00403	-1.16890	2.98744	310.45994
2.700	167.853	1.03936	-2.50570	-.41427	-.11672	-.18993	.00092	-.48886	2.66830	310.28460
2.700	171.953	.38235	-2.41740	-.49634	-.03371	-.07855	-.00075	-.04018	2.44712	310.30652
2.700	175.938	.11985	-2.25963	-.32580	.01599	-.00389	-.00020	.04053	2.26244	311.16130
2.700	178.014	.04656	-2.15779	-.21983	.02612	-.01940	-.00048	.02825	2.15811	311.16130
2.700	179.214	-.00239	-2.14823	-.06077	03722	-.02502	.00151	.03187	2.14799	311.24897
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

RUN NO. 9/ 0 RN/L = 2.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNM	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q(PSF)
4.000	144.237	6.88236	-2.67104	.28515	.02854	.07060	.00272	-4.02355	6.18970	290.68987
4.000	144.903	6.65848	-2.66473	.31888	.03732	.06330	.00252	-3.91569	6.00862	290.68250
4.000	146.978	5.96263	-2.62190	.41009	.03827	.08343	.00272	-3.57060	5.44777	290.67512
4.000	149.082	5.31929	-2.57651	.47860	.04034	.10402	.00290	-3.23964	4.94348	290.66774
4.000	151.210	4.59922	-3.01317	1.16615	.03800	.10261	.00316	-2.57957	4.85570	290.60136
4.000	153.310	4.00589	-3.02272	1.14785	.02622	.09747	.00308	-2.22135	4.49996	290.62348
4.000	155.407	3.43835	-2.94136	1.13990	.02943	.10826	.00307	-1.90231	4.10549	290.57923
4.000	159.494	2.47682	-2.58385	.82817	.03717	.07888	.00218	-1.41474	3.28777	290.68250
4.000	163.599	1.57185	-2.44602	.50657	-.00788	.05088	.00193	-.81725	2.79031	290.58660
4.000	167.722	.84781	-2.32643	.24727	-.03933	-.01643	.00080	-.33370	2.45351	290.61611
4.000	171.800	.33078	-2.23984	-.11203	-.02122	-.01652	.00021	-.00792	2.26412	290.32105
4.000	175.786	.07747	-2.12893	-.15788	-.01223	-.01520	.00226	.07919	2.12886	290.27679
4.000	178.825	-.00104	-2.04916	-.00393	-.00148	-.03183	.00198	.04305	2.04870	290.36531
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-25F LARC UPWT 1087 MSFC 454 ELT TH ATTACH (RM9002) (14 FEB 75)

REFERENCE DATA

SREF = 7.0690 SQ.IN. XMRP = 20.8340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = 45.000

RUN NO. 8/ 0 RN/L = 2.01 GRADIENT INTERVAL = -5.00/ 5.00

MACH	A PHA	CNM	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q(PSF)
4.630	144.030	6.99530	-2.61974	.51660	.02938	.07044	.00310	-3.79900	5.99405	233.50038
4.630	144.693	6.41356	-2.61402	.59739	.04214	.06218	.00287	-3.72310	5.83998	233.50038
4.630	146.707	5.77335	-2.55962	.69430	.03056	.08277	.00319	-3.42074	5.30865	233.50038
4.630	148.800	5.13413	-2.49773	.68243	.03517	.08369	.00300	-3.09768	4.79607	233.50038
4.630	150.886	4.46255	-2.88058	1.30503	.03813	.09708	.00337	-2.49719	4.68787	233.50038
4.630	152.966	3.88541	-2.88763	1.18472	.04353	.08550	.00293	-2.14838	4.33812	233.50038
4.630	155.040	3.37236	-2.87618	1.19839	.04984	.07439	.00259	-1.84370	4.03064	233.50038
4.630	159.149	2.33951	-2.73153	1.06502	.03032	.07862	.00248	-1.21405	3.38536	233.50038
4.630	163.199	1.50225	-2.41407	.59120	.01488	.07163	.00197	-.74036	2.74524	233.50038
4.630	167.313	.79562	-2.32079	.29273	-.01887	.00302	.00373	-.26550	2.43886	233.50038
4.630	171.321	.34593	-2.27696	-.02206	-.01385	-.05727	.00235	.00162	2.30309	233.50038
4.630	175.375	.09599	-2.15961	-.18848	.00108	-.02558	.00257	.07848	2.16032	233.50038
4.630	178.352	-.00110	-2.09905	-.07730	-.00267	-.05267	.00226	.06146	2.09815	233.50038
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-29F LARC UPWT 1087 MSFC 454 ELT TH ATTACH (RM9003) (14 FEB 75)

REFERENCE DATA

SREF = 7.0695 SQ.IN. XMRP = 20.8340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = 90.000

RUN NO. 13/ 0 RN/L = 1.19 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNM	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q(PSF)
2.700	144.224	7.88932	-2.60111	.85600	-.41709	-.49497	-.11133	-4.88008	6.72250	307.54493
2.700	144.926	7.65387	-2.59359	.83348	-.39550	-.48760	-.10749	-4.77362	6.52082	307.61068
2.700	147.056	6.90923	-2.95774	1.21893	-.39641	-.44065	-.10342	-4.18982	6.23948	307.47918
2.700	149.155	6.25762	-2.95813	1.11096	-.36944	-.42274	-.09376	-3.85585	5.74811	307.50109
2.700	151.230	5.60556	-2.94225	.98200	-.33086	-.42952	-.08668	-3.49936	5.27575	307.52301
2.700	153.326	4.96942	-2.91357	.91262	-.30141	-.37177	-.07609	-3.13258	4.83436	307.47918
2.700	155.414	4.35055	-2.85864	.77629	-.27571	-.39305	-.06841	-2.76673	4.40957	307.47918
2.700	159.533	3.21099	-2.67225	.60094	-.23465	-.43971	-.04887	-2.07515	3.62562	307.50109
2.700	163.694	2.19418	-2.52796	-.10786	-.11445	-.26147	-.03554	-1.39617	3.04232	307.28192
2.700	167.824	1.18810	-2.50768	-.33033	-.06043	-.17568	-.02052	-.63244	2.70186	307.47918
2.700	171.914	.48591	-2.41685	-.37867	.03711	.05359	-.00801	-.14111	2.46117	307.52301
2.700	175.991	.13137	-2.25793	-.27529	.04220	.00161	-.00248	.02682	2.26159	307.36959
2.700	179.019	.01963	-2.14569	-.05134	.03805	-.02400	-.00057	.01711	2.14571	307.47918
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

RUN NO. 10/ 0 RN/L = 2.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNM	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q(PSF)
4.000	144.218	7.12073	-2.68766	.34114	-.23631	-.10220	-.08373	-4.20523	6.34385	290.70462
4.000	144.589	6.99781	-2.68453	.35081	-.22496	-.09834	-.08171	-4.14782	6.24272	290.68987
4.000	146.956	6.21049	-2.64029	.40964	-.20064	-.11191	-.07186	-3.76626	5.59970	290.67512
4.000	149.029	5.54817	-2.58120	.45818	-.18819	-.13981	- 06422	-3.42883	5.06033	290.64561
4.000	151.200	4.80889	-3.04256	1.12408	-.17724	-.13677	-.05036	-2.74828	4.98292	290.66774
4.000	153.282	4.21367	-3.03172	1.10530	-.17704	-.16897	-.05445	-2.40275	4.60247	290.60873
4.000	155.360	3.63680	-2.94849	1.07875	-.14908	-.20111	-.04861	-2.07641	4.19623	290.61611
4.000	159.485	2.61457	-2.59442	.80102	-.12626	-.19488	-.03561	-1.53952	3.34617	290.61611
4.000	163.615	1.69616	-2.45059	.54289	-.10244	-.18868	-.02289	-.93597	2.82954	290.61611
4.000	167.706	.94462	-2.33184	.23745	-.03827	-.08421	-.01355	-.42643	2.47959	290.60136
4.000	171.769	.35898	-2.24741	-.01153	.01727	-.02392	-.00470	-.03352	2.27566	290.52759
4.000	175.812	.11370	-2.13615	-.11060	.02921	-.01447	-.00035	.04261	2.13875	290.44645
4.000	179.821	.02137	-2.05925	-.01305	.02633	-.03073	.00171	.02100	2.05926	290.43170
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-25F LARC UPWT 1087 MSFC 454 ELT TM ATTACH (RM9003) (14 FEB 75)

REFERENCE DATA

SREF = 7.0699 SQ.IN. XMRP = 20.0340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = 90.000

RUN NO. 11/ 0 RN/L = 2.01 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNM	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q(PSF)
4.630	144.005	8.79122	-2.61265	.57209	-.17885	-.05162	-.07125	-3.95912	6.10509	233.54011
4.630	144.613	5.61177	-2.60201	.62289	-.18265	-.05323	-.07149	-3.88347	5.95018	233.54011
4.630	146.792	5.94863	-2.55230	.63893	-.14555	-.06651	-.05471	-3.57086	5.39902	233.54011
4.630	148.769	5.31850	-2.49763	.66918	-.14171	-.07946	-.05757	-3.25279	4.89326	233.54011
4.630	150.930	4.59389	-2.88152	1.25253	-.13986	-.06703	-.05262	-2.61574	4.75025	233.54011
4.630	152.966	4.04313	-2.89987	1.17266	-.11736	-.08572	-.04514	-2.28336	4.42068	233.54011
4.630	155.011	3.48808	-2.86879	1.12418	-.11314	-.12379	-.04031	-1.94963	4.07376	233.54011
4.630	159.139	2.44285	-2.72237	1.05839	-.08156	-.11451	-.02690	-1.31326	3.41382	233.54011
4.630	163.210	1.59129	-2.41666	.61046	-.06237	-.10952	-.01643	-.82536	2.77331	233.5401
4.630	167.288	.80329	-2.31979	.29258	-.01638	-.05565	-.00823	-.35117	2.45729	233.54011
4.630	171.326	.34918	-2.27947	.00882	.03666	-.02434	-.00313	-.00140	2.30606	233.54011
4.630	175.335	.10312	-2.16402	-.16864	.03485	-.03150	.00216	.06725	2.16573	233.54011
4.630	178.347	.02677	-2.10069	-.03717	.03183	-.05137	.00197	.03384	2.10059	233.12100
4.630	178.926	.02950	-2.09087	-.06766	.03184	-.05238	.00193	.00967	2.09106	233.54011
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-2SF LARC UPWT 1967 MSFC 454 ELT TH ATTACH (RM9004) (14 FEB 75)

REFERENCE DATA

SREF = 7.0690 SQ.IN. XMRP = 20.8340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = 135.000

RUN NO. 14/ 0 RN/L = 1.50 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNM	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q(PSF)
2.700	144.327	7.45685	-2.57780	.01680	.55294	.44968	-.14643	-4.55438	6.44261	311.05171
2.700	144.914	7.27231	-2.58347	.01700	.53607	.44275	-.14220	-4.46588	6.29418	311.02979
2.700	147.041	6.53219	-2.93997	.58499	.50588	.42955	-.12933	-3.88148	6.02056	310.81062
2.700	149.100	5.88388	-2.94556	.48272	.47926	.40788	-.11695	-3.54188	5.54540	310.81062
2.700	151.233	5.23949	-2.92502	.38161	.42973	.42609	-.10388	-3.18522	5.08551	310.59145
2.700	153.329	4.61135	-2.90205	.29449	.38944	.38013	-.09205	-2.81806	4.66316	310.67912
2.700	155.412	4.00939	-2.84950	.21967	.35213	.37409	-.07998	-2.46017	4.25939	310.54761
2.700	159.577	2.92025	-2.64178	-.06219	.26615	.34818	-.05192	-1.81487	3.49472	311.16130
2.700	163.738	1.93547	-2.51002	-.36313	.16463	.22074	-.04213	-1.15363	2.95219	311.09555
2.700	166.142	1.39158	-2.49195	-.59108	.12419	.12709	-.03285	-.75422	2.75272	310.94212
2.700	167.836	1.01242	-2.49071	-.58689	.08522	.03496	-.02752	-.46485	2.64812	311.07363
2.700	171.920	.38026	-2.39775	-.51309	.04611	-.01074	-.01322	-.03946	2.42739	311.05171
2.700	175.985	.13047	-2.23775	-.32240	.02741	-.02835	-.00276	.02655	2.24137	310.96404
2.700	179.021	.04447	-2.13193	-.06215	.02566	-.01951	-.00039	-.00802	2.13238	310.67912
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

RUN NO. 15/ 0 RN/L = 2.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNM	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q(PSF)
4.000	144.318	6.89388	-2.65384	-.29044	.46962	.36001	-.13954	-4.05169	6.17675	290.62348
4.000	144.857	6.72060	-2.65517	-.25826	.46490	.35797	-.13505	-3.96715	6.03971	290.62348
4.000	146.927	6.02648	-2.60901	-.14989	.42230	.33969	-.11919	-3 62625	5.47501	290.64561
4.000	149.045	5.33392	-2.55576	-.06377	.37882	.30975	-.10587	-3.25959	4.93535	290.63086
4.000	151.206	4.61771	-3.01135	.66151	.34869	.29797	-.09185	-2.59633	4.86318	290.49809
4.000	153.282	4.02553	-3.02369	.68702	.30888	.28126	-.07881	-2.23621	4.51071	290.46858
4.000	155.362	3.45822	-2.93585	.70309	.26906	.25450	-.06831	-1.91944	4.11026	290.44645
4.000	159.492	2.48064	-2.57637	.52131	.22240	.23420	-.04936	-1.42085	3.28214	290.48333
4.000	163.614	1.57868	-2.43869	.34236	.13383	.16743	-.02953	-.82660	2.78499	290.68987
4.000	167.701	.85355	-2.31880	.09748	.07501	.08169	-.01705	-.33710	2.44675	290.66774
4.000	171.767	.32945	-2.23736	-.17368	.04821	.00828	-.00693	-.00565	2.26148	290.63824
4.000	175.801	.11383	-2.12318	-.14406	.02954	-.00972	-.00033	.04194	2.12581	290.66774
4.000	179.818	.04764	-2.05240	-.02846	.02801	-.01048	.00197	-.00522	2.05295	290.58660
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-2SF LARC UPWT 1987 MSFC 454 ELT TH ATTACH (RM99D4) (14 FEB 75)

REFERENCE DATA

SREF = 7.0690 SQ.IN. XMRP = 20.0340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = 135.000

RUN NO. 16/ 0 RN/L = 2.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CNM	CA	CLMM	CYM	CYNM	CBL	CL	CD	Q(PSF)
4.630	144.075	6.62579	-2.56852	-.03100	.45283	.34217	-.13215	-3.85840	5.96750	232.97561
4.630	144.624	6.44292	-2.56634	.02229	.43155	.33377	-.12924	-3.76763	5.82257	232.97561
4.630	146.690	5.80433	-2.52111	.08485	.40027	.30719	-.11539	-3.46622	5.29449	232.97561
4.630	148.785	5.16636	-2.45887	.12004	.36992	.28382	-.10139	-3.14407	4.78039	232.97561
4.630	150.889	4.46398	-2.84679	.80518	.33635	.27946	-.08697	-2.51515	4.65891	232.97561
4.630	152.955	3.91885	-2.85662	.75206	.30754	.25427	-.07667	-2.19141	4.32613	232.97561
4.630	155.019	3.37337	-2.84155	.70278	.26123	.22241	-.06358	-1.85773	4.00036	232.97561
4.630	159.140	2.35034	-2.70326	.77378	.20714	.21236	-.04520	-1.23368	3.36300	232.97561
4.630	163.219	1.51643	-2.39317	.41747	.14058	.19775	-.02565	-.76092	2.72907	232.97561
4.630	167.289	.80255	-2.30200	.13537	.07254	.11892	-.01248	-.27636	2.42210	232.97561
4.630	171.343	.34713	-2.25869	-.03845	.04251	.02932	-.00533	-.00320	2.28521	232.97561
4.630	175.352	.11031	-2.14554	-.23802	.01948	-.00573	-.00017	.06391	2.14742	232.97561
4.630	179.380	.06025	-2.08562	-.08074	.01742	-.01953	.00253	-.00126	2.08649	232.97561
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

SA-2SF LARC UPWT 1087 MSFC 454 ELT TH ATTACH (PM9002) (14 FEB 75)

REFERENCE DATA

SREF = 7.0000 SQ.IN. XMRP = 29.8340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = 45.000

RUN NO. 7/ 0 RN/L = 1.50 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CPC1	CPC2	Q(PSF)
2.700	144.254	-.13213	-.13276	310.89829
2.700	144.935	-.13213	-.13584	310.89829
2.700	147.079	-.13519	-.13891	310.83254
2.700	149.177	-.13516	-.13580	310.70103
2.700	151.271	-.13201	-.13572	310.30652
2.700	153.350	-.13211	-.13274	310.81062
2.700	155.448	-.12893	-.13264	310.28460
2.700	159.390	-.12588	-.12650	310.43802
2.700	163.714	-.12281	-.12343	310.45994
2.700	167.853	-.11662	-.12030	310.28460
2.700	171.953	-.09817	-.10180	310.30652
2.700	175.938	-.07389	-.07746	311.16130
2.700	178.014	-.06775	-.07131	311.16130
2.700	179.214	-.06472	-.06827	311.24897
	GRADIENT	.00000	.00000	.00000

RUN NO. 9/ 0 RN/L = 2.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CPC1	CPC2	Q(PSF)
4.000	144.237	-.03743	-.03815	290.68987
4.000	144.903	-.03743	-.04144	290.68250
4.000	146.978	-.04072	-.04144	290.67512
4.000	149.082	-.04400	-.04473	290.66774
4.000	151.210	-.04727	-.04801	290.60136
4.000	153.310	-.05385	-.05789	290.62348
4.000	155.407	-.05384	-.05789	290.57923
4.000	159.494	-.05714	-.06119	290.68250
4.000	163.599	-.05713	-.05789	290.58660
4.000	167.722	-.05385	-.05460	290.61611
4.000	171.800	-.04723	-.04797	290.32105
4.000	175.786	-.04065	-.04467	290.27679
4.000	178.825	-.03738	-.04139	290.36531
	GRADIENT	.00000	.00000	.00000

SA-2SF LARC UPWT 1007 MSFC 454 ELT TM ATTACH (PM9502) (14 FEB 75)

REFERENCE DATA

SREF =	7.0000 SQ.IN.	XMRP =	20.0340 INCHES
LREF =	3.0000 INCHES	YMRP =	.0000 INCHES
BREF =	3.0000 INCHES	ZMRP =	.0000 INCHES
SCALE =	.9211 SCALE		

PARAMETRIC DATA

PHI = 45.000

RUN NO. 8/ 8 RN/L = 2.01 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CPC1	CPC2	Q(PSF)
4.630	144.930	-.01844	-.02347	233.50038
4.630	144.693	-.01844	-.02347	233.50038
4.630	146.757	-.02253	-.02347	233.50038
4.630	148.820	-.02253	-.02757	233.50038
4.630	150.884	-.02662	-.02757	233.50038
4.630	152.966	-.03071	-.03576	233.50038
4.630	155.049	-.03480	-.03986	233.50038
4.630	159.149	-.03480	-.04396	233.50038
4.630	163.199	-.03480	-.04396	233.50038
4.630	167.313	-.03480	-.03576	233.50038
4.630	171.321	-.03071	-.03576	233.50038
4.630	175.375	-.02662	-.03167	233.50038
4.630	179.352	-.02253	-.02757	233.50038
	GRADIENT	.00000	.00000	.00000

SA-2SF LARC UPWT 1007 MSFC 454 ELT TH ATTACH (PM9003) (14 FEB 75)

REFERENCE DATA

SREF = 7.0000 SQ.IN. XMRP = 20.8340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = 90.000

RUN NO. 13/ 0 RN/L = 1.49 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CPC1	CPC2	Q(PSF)
2.700	144.224	-.13348	-.13113	307.54493
2.700	144.928	-.13659	-.13114	307.61060
2.700	147.036	-.13657	-.13112	307.47918
2.700	149.155	-.13347	-.13112	307.50109
2.700	151.290	-.13347	-.13113	307.52301
2.700	153.326	-.13346	-.13112	307.47918
2.700	155.414	-.13346	-.13112	307.47918
2.700	159.553	-.13036	-.12801	307.50109
2.700	163.694	-.12100	-.12173	307.28192
2.700	167.824	-.11484	-.11556	307.47918
2.700	171.914	-.09933	-.10001	307.52301
2.700	175.991	-.07443	-.07194	307.36959
2.700	179.019	-.06026	-.06576	307.47918
	GRADIENT	.00000	.00000	.00000

RUN NO. 10/ 0 RN/L = 2.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CPC1	CPC2	Q(PSF)
4.000	144.210	-.04091	-.04493	290.79462
4.000	144.589	-.04091	-.04164	290.68987
4.000	146.936	-.04419	-.04493	290.67512
4.000	149.029	-.05404	-.05480	290.64561
4.000	151.200	-.05732	-.06139	290.66774
4.000	153.282	-.05732	-.06138	290.60873
4.000	155.380	-.06080	-.06138	290.61611
4.000	159.485	-.06080	-.06467	290.61611
4.000	163.615	-.05732	-.06138	290.61611
4.000	167.706	-.05403	-.05809	290.60136
4.000	171.769	-.05074	-.05479	290.52759
4.000	175.812	-.04415	-.04489	290.44645
4.000	179.821	-.04086	-.04159	290.43170
	GRADIENT	.00000	.00000	.00000

SA-23F LARC UPWT 1987 MSFC 454 ELT TH ATTACH (PW9003) (14 FEB 75)

REFERENCE DATA

SREF = 7.0000 SQ.IN. XMRP = 20.8340 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .9211 SCALE

PARAMETRIC DATA

PHI = 90.000

RUN NO. 117 0 RN/L = 2.81 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CPC1	CPC2	Q(PSF)
4.630	144.995	-.02277	-.02372	233.54011
4.630	144.613	-.02277	-.02372	233.54011
4.630	146.792	-.02686	-.02372	233.54011
4.630	148.769	-.02686	-.02782	233.54011
4.630	150.939	-.03504	-.03601	233.54011
4.630	152.966	-.04321	-.04421	233.54011
4.630	155.011	-.03912	-.04011	233.54011
4.630	159.139	-.03912	-.04011	233.54011
4.630	163.219	-.03912	-.04011	233.54011
4.630	167.289	-.03912	-.04011	233.54011
4.630	171.326	-.03504	-.04011	233.54011
4.630	175.335	-.03095	-.03601	233.54011
4.630	178.347	-.02687	-.03188	233.12100
4.630	178.926	-.03095	-.03192	233.54011
	GRADIENT	.00000	.00000	.00000

SA-2SF LARC UPWT 1987 WSFC 454 ELT TW ATTACH (PW9804) (14 FEB 79)

REFERENCE DATA

XREF = 7.0000 50.IN. XMRP = 50.0308 INCHES
LREF = 5.0000 INCHES YMRP = .0000 INCHES
BREF = 5.0000 INCHES ZMRP = .0000 INCHES
SCALE = .0211 SCALE

PARAMETRIC DATA

PHI = 135.000

RUN NO. 14/ 0 RN/L = 1.50 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CPC1	CPC2	Q(PSF)
2.700	144.327	-.13696	-.13765	311.05171
2.700	144.914	-.13695	-.13765	311.02979
2.700	147.041	-.13691	-.13761	310.81062
2.700	149.180	-.13384	-.13451	310.81062
2.700	151.233	-.13380	-.13449	310.59145
2.700	153.329	-.13381	-.13450	310.67912
2.700	155.412	-.13379	-.13140	310.54761
2.700	159.377	-.13384	-.13460	311.16130
2.700	163.798	-.12489	-.12336	311.09555
2.700	166.142	-.12150	-.12225	310.94212
2.700	167.836	-.11548	-.12228	311.07363
2.700	171.920	-.10015	-.10074	311.05171
2.700	175.985	-.07247	-.07609	310.96404
2.700	179.021	-.06621	-.06982	310.67912
	GRADIENT	.00000	.00000	.00000

RUN NO. 15/ 0 RN/L = 2.00 GRADIENT INTERVAL = 5.00/ 5.00

MACH	ALPHA	CPC1	CPC2	Q(PSF)
4.000	144.318	-.03927	-.04334	290.62348
4.000	144.857	-.03927	-.04334	290.62348
4.000	146.927	-.04256	-.04664	290.64561
4.000	149.045	-.04256	-.04663	290.63086
4.000	151.206	-.04911	-.04991	290.49809
4.000	153.282	-.05568	-.06308	290.46858
4.000	155.362	-.05567	-.05979	290.44645
4.000	159.492	-.05696	-.05979	290.48333
4.000	163.614	-.05899	-.06310	290.68987
4.000	167.751	-.05242	-.05981	290.66774
4.000	171.787	-.04913	-.05322	290.63824
4.000	175.851	-.03920	-.04664	290.66774
4.000	179.816	-.03598	-.04004	290.58660
	GRADIENT	.00000	.00000	.00000

SA-23F LARC UPWT 1087 MSFC 454 ELT TM ATTACH (FM9024) (14 FEB 75)

REFERENCE DATA

SREF = 7.9000 SQ.IN. XMRP = 22.8349 INCHES
LREF = 3.0000 INCHES YMRP = .0000 INCHES
BREF = 3.0000 INCHES ZMRP = .0000 INCHES
SCALE = .9211 SCALE

PARAMETRIC DATA

FM1 = 135.000

RUN NO. 19/ 0 BM/L = 2.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CPC1	CPC2	Q(PSF)
4.630	144.575	-.02984	-.02576	232.97561
4.630	144.624	-.02984	-.02576	232.97561
4.630	146.699	-.02984	-.02576	232.97561
4.630	148.785	-.02474	-.02986	232.97561
4.630	150.889	-.02884	-.02986	232.97561
4.630	152.955	-.03293	-.03808	232.97561
4.630	155.019	-.04113	-.04219	232.97561
4.630	159.140	-.04113	-.04629	232.97561
4.630	163.219	-.03703	-.04629	232.97561
4.630	167.289	-.03703	-.04219	232.97561
4.630	171.343	-.03293	-.03808	232.97561
4.630	175.352	-.02474	-.03397	232.97561
4.630	178.380	-.02474	-.02986	232.97561
	GRADIENT	.00000	.00000	.00000