

NASA TECHNICAL MEMORANDUM

NASA TM-78195

AERODYNAMIC ROLL CHARACTERISTICS OF A 0.00548 SCALE
146-INCH SOLID ROCKET BOOSTER REENTRY CONFIGURATION
(MSFC MODEL NUMBER 486) OVER A PORTION OF THE REENTRY
FLIGHT REGIME IN THE NASA MSFC 14-INCH TRISONIC
WIND TUNNEL

By Paul E. Ramsey

Systems Dynamics Laboratory

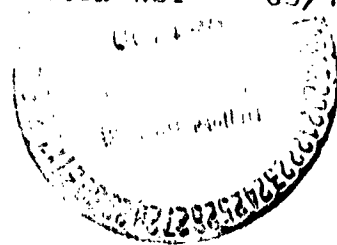
(NASA-TM-78195) AERODYNAMIC ROLL
CHARACTERISTICS OF A 0.00548 SCALE 146-INCH
SOLID ROCKET BOOSTER REENTRY CONFIGURATION
(MSFC MODEL NUMBER 486) OVER A PORTION OF
THE REENTRY FLIGHT REGIME IN THE NASA MSF

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NASA

*George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama*

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PLOTTED COEFFICIENTS SCHEDULE:

(A) C_l versus α

(B) C_l versus ϕ

NOMENCLATURE

<u>PLOT SYMBOL</u>	<u>MNEMONIC</u>	<u>DEFINITION</u>	<u>UNITS</u>
b_{ref}	BREF	reference span (diameter of the cylindrical section of the model)	in.
$C_{\ell m}, C_{\ell}$	CBL	rolling moment coefficient in the missile axis system, $M_{X_m} / q_{\infty} S_{ref} b_{ref}$	
M	MACH	Mach number	
M_{X_m}		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.
P_t		free stream total pressure	psi
P_{∞}		free stream static pressure	psi
q_{∞}	Q	free stream dynamic pressure	psi
RM		abbreviation for rolling moment	
RN	RN/L	Reynolds number per foot	
S_{ref}	SREF	reference area (cross sectional area of the cylindrical section of the model)	in. ²
T_t		tunnel total temperature	°F
α_T	ALPHA	angle of attack, angle between the X_m -axis and a vector in the direction of the air flow (For this test, $\beta = 0$ and $\alpha = \alpha_T$)	degrees
l_{ref}	LREF	reference length	

NOMENCLATURE (Continued)

<u>PLOT SYMBOL</u>	<u>MNEMONIC</u>	<u>DEFINITION</u>	<u>UNITS</u>
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 air— plane, a positive roll angle is a clockwise rotation)	degrees
SRB		abbreviation for solid rocket booster	
C_A		total axial force coefficient in the body axis system.	
C_{A_m}	CA	total axial force coefficient in the missile axis system, $F_{AN}/q_\infty S_{ref}$ (nozzle balance)	
C_m		pitching moment coefficient in the body axis system	
C_{m_m}	CLMM	pitching moment coefficient in the missile axis system (nozzle balance), $M_{Y_m}/q_\infty S_{ref} l_{ref}$	
C_N		normal force coefficient in the body axis system	
C_{N_m}	CNM	normal force coefficient in the missile axis system, $F_{NN}/q_\infty S_{ref}$ (nozzle balance)	
C_n		yawing moment coefficient in the body axis system	
C_{n_m}	CYNM	yawing moment coefficient in the missile axis system (nozzle balance), $M_{Z_m}/q_\infty S_{ref} l_{ref}$	
C_Y		side force coefficient in the body axis system	
C_{Y_m}	CYM	side force coefficient in the missile axis system, $F_{YN}/q_\infty S_{ref}$ (nozzle balance)	
<u>Subscripts</u>			
m		missile axis system	
ref		reference conditions	
t		total conditions	
∞		free stream conditions	

INTRODUCTION

This report describes a wind tunnel test program to obtain the aerodynamic roll characteristics of the 146-inch diameter solid rocket booster (SRB) reentry configuration over a portion of its reentry flight regime. The model is representative of the latest SRB configuration and has been tested in the NASA MSFC 14 x 14-inch Trisonic Wind Tunnel and the AEDC PWT 4T.

The SRB model tested was a 0.00548 scale model of the 146-inch diameter right hand solid rocket booster reentry configuration with all major protuberances. The SRB model was mounted nose aft onto a one-component roll balance to obtain rolling moment data. The model balance was supported by the MSFC double-knuckle sting to achieve the desired angle of attack range. The SRB reentry test configuration included a simulated heat shield around the engine nozzle.

The SRB was tested at Mach numbers of 1.46, 1.96, 2.75, and 3.48 at angles of attack from 150° to 190° . Roll angles varied from 0 to 337.5° at $22\frac{1}{2}^\circ$ increments.

MODEL DESCRIPTION AND SUPPORT HARDWARE

The model tested was a 0.00548 scale model of the 146-inch diameter Space Shuttle solid rocket booster with a truncated nozzle. The general model arrangement is shown in Figure 2. The SRB model was made of stainless steel and has been designated MSFC Model Number 486. The model was an assembly of three components: a nose section, a center body section, and a tail section. The nose section of the SRB model included the 18-degree conical nose and a portion of the cylindrical body of the SRB. The protuberances on the nose section were the data capsule and camera, the forward attach structure, and the forward section of the cable systems tunnel. The center body section of the SRB model was a long cylindrical tube and was pinned to the strain-gage balance. The only protuberance on the center body, a portion of the cable systems tunnel, was attached with machine screws. The model tail section was made up of the rear portion of the SRB cylindrical body, the nozzle skirt and the engine nozzle. The protuberances on the SRB tail section include: the aft attachment ring, the motor case ring stiffeners, aft separation motors, actuator supports, hold-down posts, and the rear portion of the cable systems tunnel. When the SRB model was nose mounted or side mounted, engine nozzle insert and heat shield were installed in the tail section. The SRB model components are shown in Figure 3.

The SRB model was mounted nose aft on a single component roll balance No. 247 which, in turn, was mounted to the MSFC double knuckle sting by using balance adapter 113A. This setup provided an angle of

MODEL DESCRIPTION AND SUPPORT HARDWARE (Concluded)

attack range of 150° to 190° . Changes in roll angle were achieved by rotating the entire SRB model about the balance after removing the four pins which attached the model body to the model/balance adapter. A series of holes around the model/balance adapter allowed roll angles of 0 to $337\frac{1}{2}^{\circ}$ in $22\frac{1}{2}^{\circ}$ increments to be achieved.

Table IV lists the combinations of support hardware and associated angle of attack ranges used during this test. The sting components are depicted in Figures 4 and 5. Model dimensional data are included as Table..III.

TEST FACILITY DESCRIPTION

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

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

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

Downstream of the test section is a hydraulically controlled pitch sector that provides a total angle of attack range of 20° ($\pm 10^\circ$). Sting offsets are available for obtaining various maximum angles of attack up to 90°.

TEST FACILITY DESCRIPTION (Continued)

The diffuser section has movable floor and ceiling panels which are the primary means of controlling the subsonic Mach numbers and permit more efficient running supersonically. The sector assembly at supersonic diffuser telescopes into the subsonic diffuser to allow easy access to the model and test section.

Tunnel flow is exhausted through an acoustically damped tower to atmosphere or into the vacuum field of 42,000 cubic feet. The vacuum tanks are evacuated by vacuum pumps driven by a total of 500 hp.

Data are recorded by a solid-state digital data acquisition system. The digital data are transferred to punched cards during the run to be reduced later by a computer to proper coefficient form.

TEST CONDITIONS

Mach numbers consisted of 1.46, 1.96, 2.74, and 3.48. The complete tunnel test conditions are presented in Table I. The angle of attack range consisted of 150° to 190° and roll angles varied from 0 to $337\frac{1}{2}^{\circ}$ in $22\frac{1}{2}^{\circ}$ increments. The test program is included as Table II.

Maximum model loads are presented in Table V. No base pressure measurements were made during this investigation.

DATA REDUCTION

The rolling moment was resolved in the missile axis system and presented in the form of a nondimensional coefficient as shown below:

$$CBL = \frac{M_{x_m}}{Q \text{ SREF BREF}}, \text{ rolling moment coefficient}$$

The usual tunnel parameters P_∞ , P_t , T_t , q_∞ , RN, α_T and ϕ were measured, computed and tabulated along with the data. Data were corrected for sting deflections and are tabulated in the Appendix. The only data coefficient required for input was the rolling moment coefficient, C_g .

Because the model was originally designed to be tested at angles of attack from 0 to 180°, it was reversed on the balance for alphas greater than 90 degrees; consequently, a sign change was required during data reduction for the rolling moment measured by the balance.

Model reference dimensions used for data reductions are presented below:

<u>Parameter</u>	<u>Symbol</u>	<u>Full Scale</u>	<u>0.00548 Scale</u>
Reference Area (based on body cross section)	SREF	116.26 ft. ²	0.503 in. ²
Reference Span (body diameter)	BREF	146 in.	0.800 in.

TABLE II.

TEST: MSFC TNT 645		DATA SET/RUN NUMBER COLLATION SUMMARY										DATE: 10/0/76	
DATA SET IDENTIFIER	CONFIGURATION	SCHD.		PARAMETERS/VALUES		NO. OF RUNS	WACH N. MEERS OF ALTERNATE INDEPENDENT TESTABLE					TEST RUN NUMBER	
		α	β	ϕ			1.46	1.96	2.74	3.48			
R1001	SBB WITH	I	0	0			112	81	1/4	2/1			
02	PROTUBERANCES	J		0			111	82	4/2	3/2			
03		J		22.5			114	79	36	35			
04		I		22.5			113	80/1	33	34			
05		I		45			109	84	8	7			
06		J		45			110	83	5	6/2			
07		J		67.5			115	78	39	38/2			
08		I		67.5			116/1	79	40	39			
09		I		90			108/2	85	9	10			
10		J		90			107/1	86	12	11			
11		J		112.5			118/0	75	44	43			
12		I		112.5			112/0	76	41	42			
13		I		135			105/1	88	16	15			
14		J		135			106	87	13	14			
15		J		157.5			119	94	45	46			
16		I		157.5			120	93/1	48	47			
17		I		180			104	89/1	17	18			
18		J		180			103	90	20	19			

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7	13	19	25	31	37	43	49	55	61	67	73	79
C.B.L.:												
COEFFICIENTS												
α SCHEDULES												
α : I : 150° → 170°												
α : J : 170° → 190°												
ϕ = 2°												

TABLE III. MODEL DIMENSIONAL DATA

MODEL COMPONENT: SOLID ROCKET BOOSTER NOSE

GENERAL DESCRIPTION: A CONICAL SECTION WITH A SPHERICAL RADIUS NOSE

MODEL SCALE: 0.00548 SCALE

REFERENCE DRAWING(S): MSFC #80M42805 & 80M42806

<u>DIMENSIONS:</u>	<u>THEORETICAL</u>	
	<u>FULL-SCALE</u>	<u>MODEL-SCALE</u>
Spherical Nose Radius	13.27 in.	0.073 in
Conical Nose Section Half Angle	18 Degrees	18 Degrees
SRB Nose Length	195 in.	1.069 in.
Forward Cylindrical Body Diameter	146 in.	0.8 in.

TABLE III. - Continued

MODEL COMPONENT: SOLID ROCKET BOOSTER CYLINDRICAL BODY

GENERAL DESCRIPTION: THE CYLINDRICAL SECTION OF THE SRB BODY

MODEL SCALE: 0.00548 SCALE

REFERENCE DRAWING(S): MSFC #80M42802 & 80M42804

<u>DIMENSIONS:</u>	<u>THEORETICAL</u>	
	<u>FULL-SCALE</u>	<u>MODEL-SCALE</u>
Center Body Diameter	146 in.	0.8 in.
Center Body Length	1443.6 in.	7.910 in.

TABLE III. - Concluded

MODEL COMPONENT: SOLID ROCKET BOOSTER ENGINE SKIRT

GENERAL DESCRIPTION: A CONICAL FRUSTRUM FLARING OUT FROM THE SRB
BODY TO ENCLOSE THE ENGINE NOZZLE WITHOUT THE ENGINE EXTENSION

MODEL SCALE: 0.00548 SCALE

REFERENCE DRAWING(S): MSFC #80M51473

<u>DIMENSIONS:</u>	<u>THEORETICAL</u>	
	<u>FULL-SCALE</u>	<u>MODEL-SCALE</u>
Cylindrical Body Diameter	146 in.	0.8 in.
Engine Skirt Flare Angle	18°40'	18°40'
Engine Skirt Exit Diameter	208.20 in.	1.141 in.

TABLE IV.

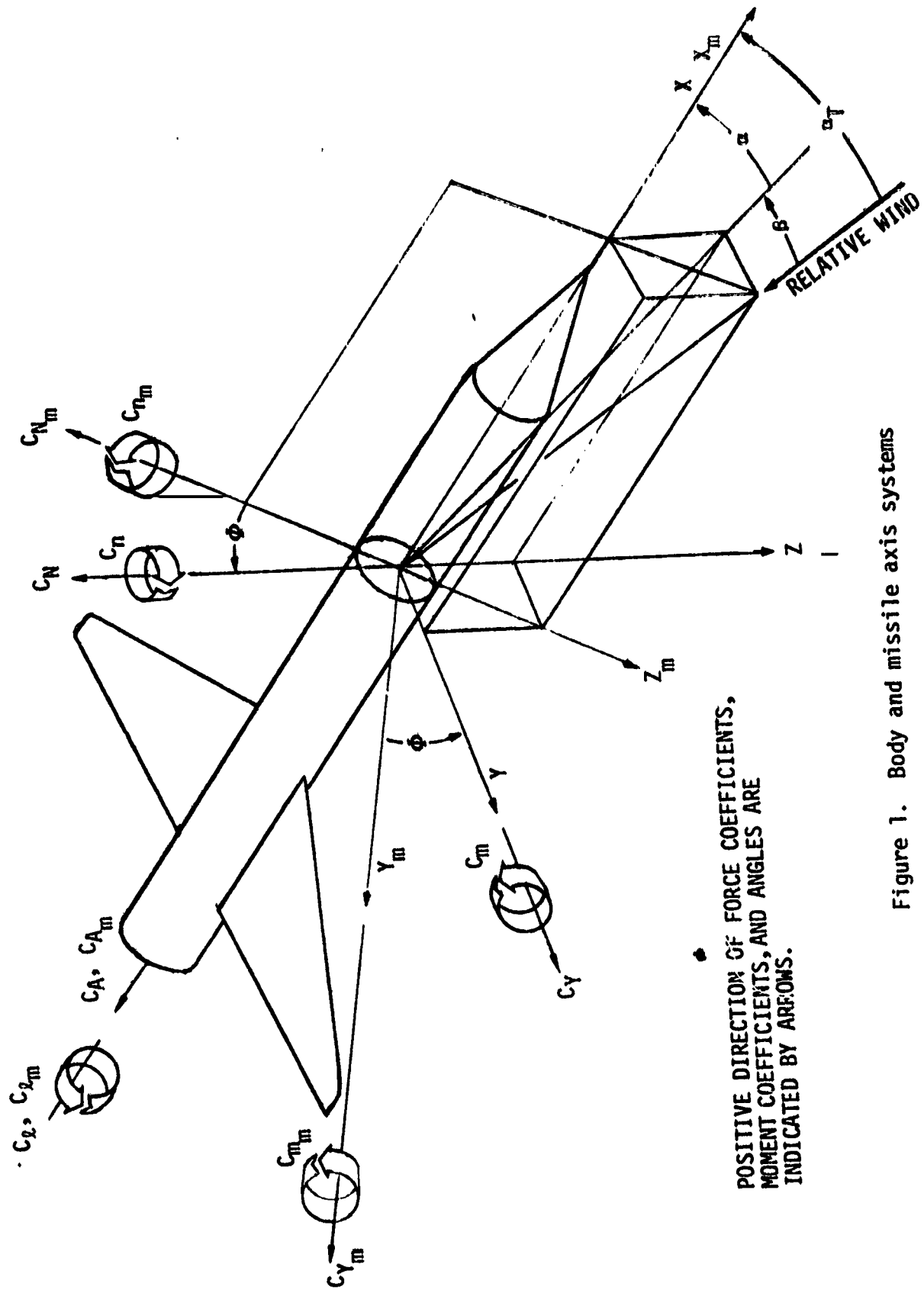
STING COMBINATION AND ANGLE OF ATTACK NOMENCLATURE

ANGLE OF ATTACK DESIGNATOR	α (DEG) RANGE	STING ADAPTER		STING ADAPTER POSITION	STING NUMBER	BALANCE ADAPTER	
		ADAPTER NO.	HOLE NO.			ADAPTER NO.	HOLE NO.
I	150 to 170	1	51	7.50 in.	1	113A	3
J	170 to 190	1	53	7.50 in.	1	113A	1

TABLE V.

MAXIMUM MODEL LOADS

NORMAL FORCE	40 LBS.
SIDE FORCE	3 LBS.
AXIAL FORCE	20 LBS.
PITCHING MOMENT	50 IN-LBS.
YAWING MOMENT	2 IN-LBS.
ROLLING MOMENT	1 IN-LBS.



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

Figure 1. Body and missile axis systems

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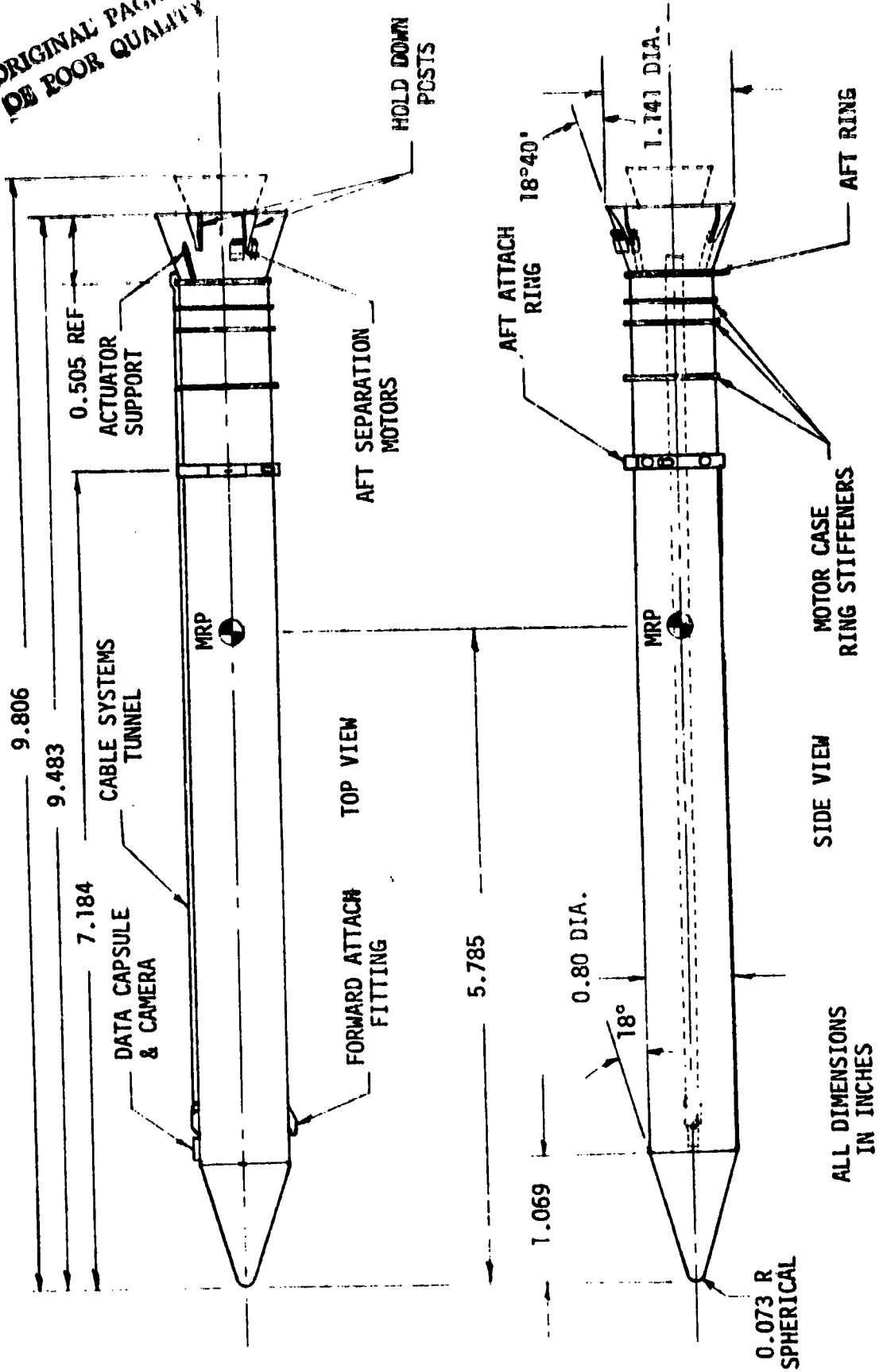
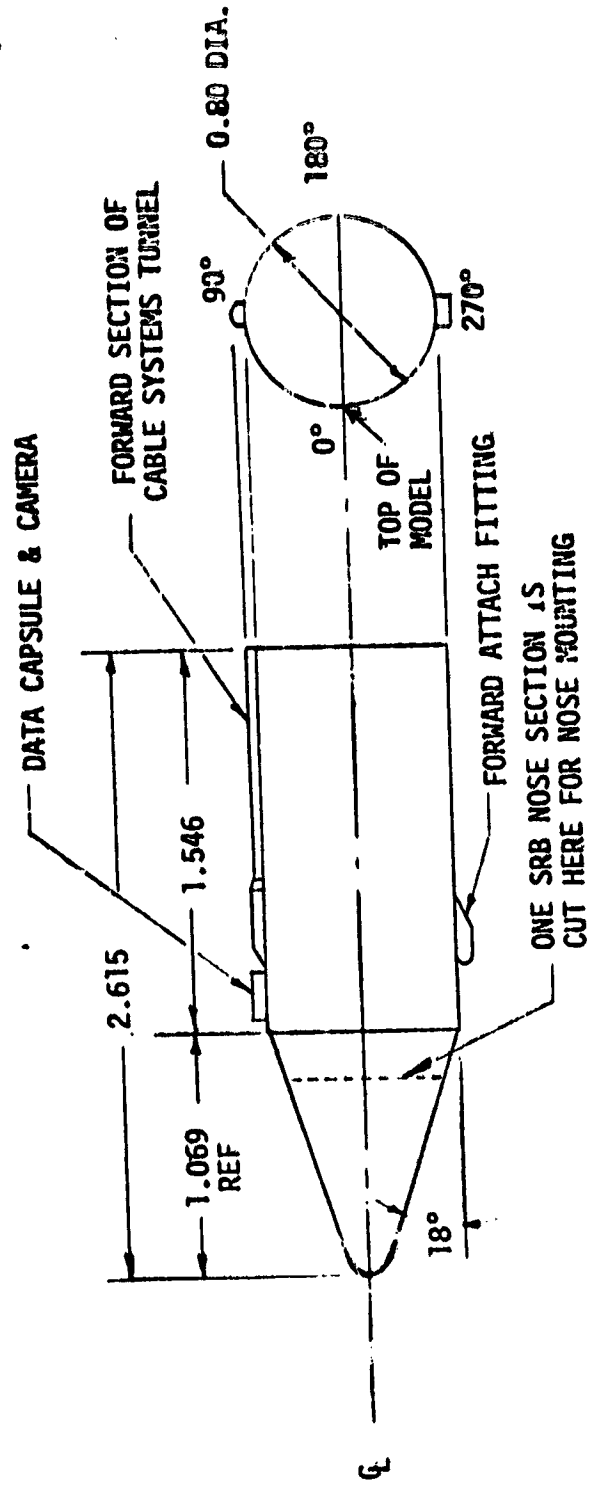


Figure 2. General model arrangement

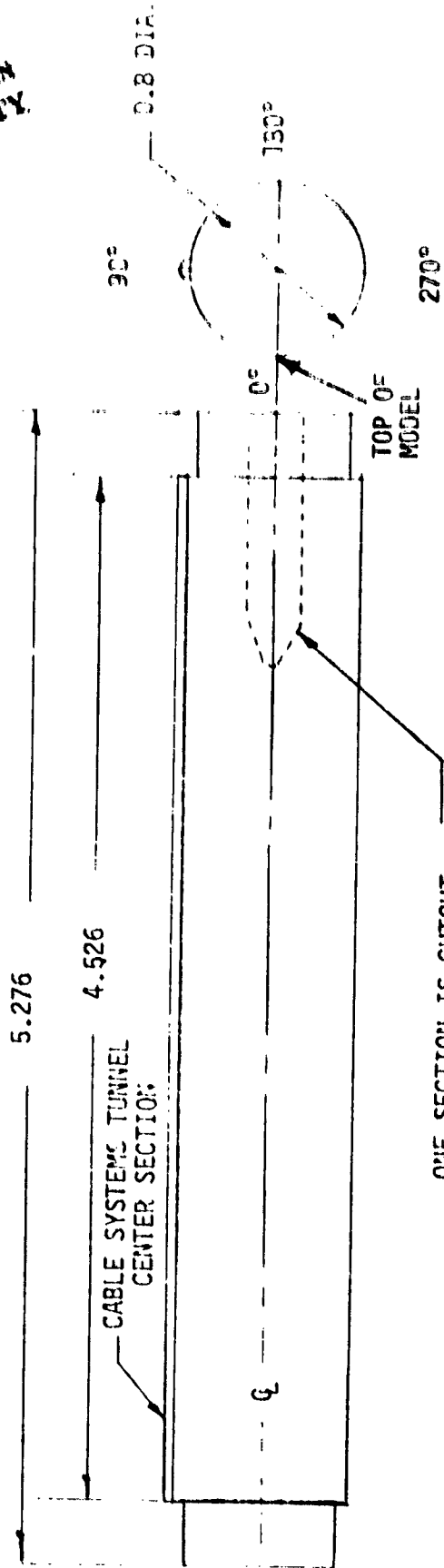


ALL DIMENSIONS IN INCHES

SRB MODEL NOSE SECTION

Figure 3. SRB model components

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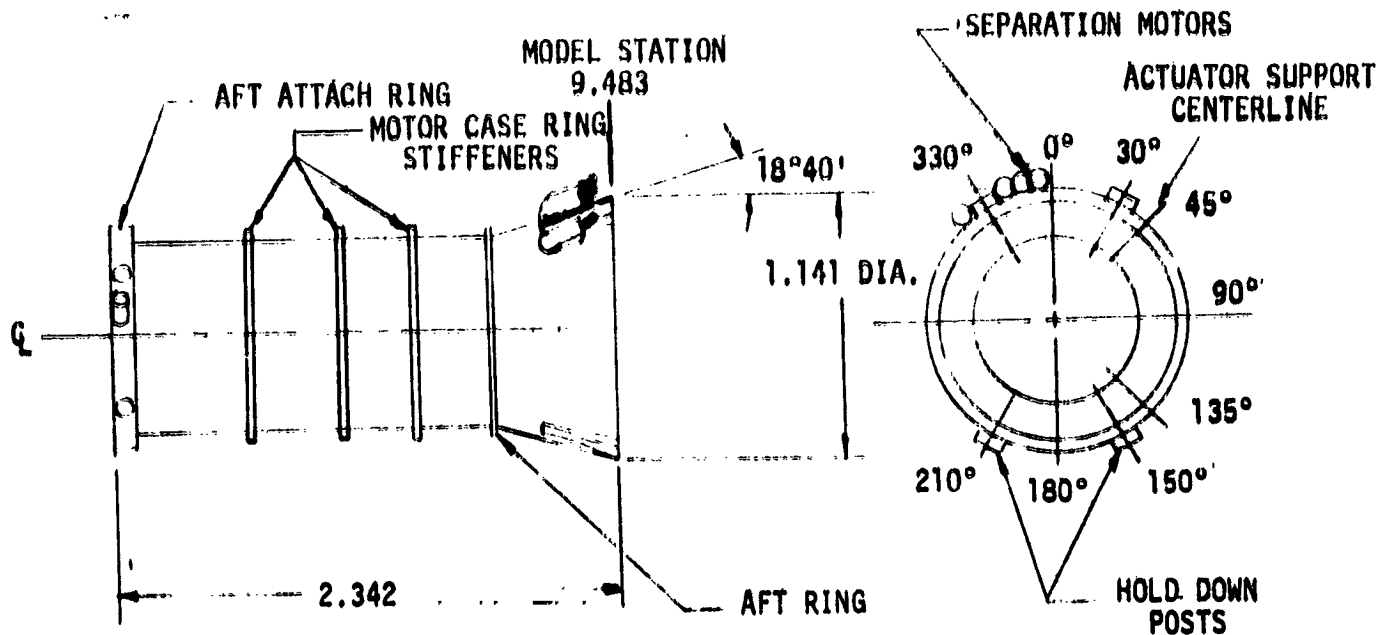


ONE SECTION IS CUTOUT
HERE FOR USE WITH THE
SIDE MOUNT BALANCE ADAPTER 118

ALL DIMENSIONS
IN INCHES

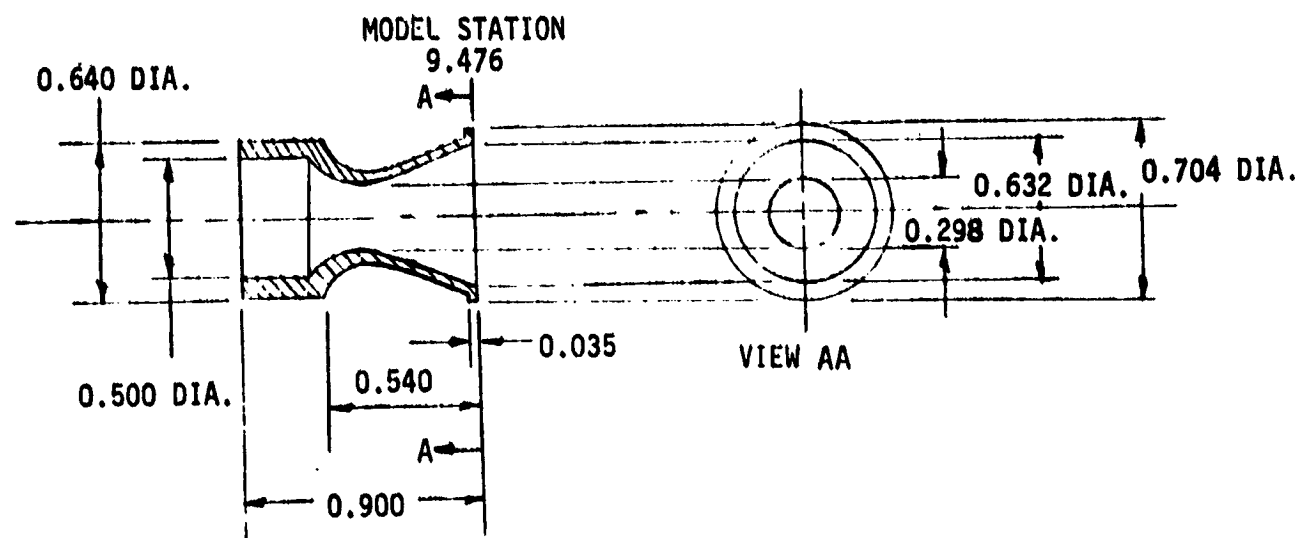
SRB MODEL CENTER BODY SECTIONS

Figure 3. (Continued)



SRB MODEL TAIL SECTION

ALL DIMENSIONS IN INCHES



SRB MODEL ENGINE NOZZLE INSERT

Figure 3. (Concluded)

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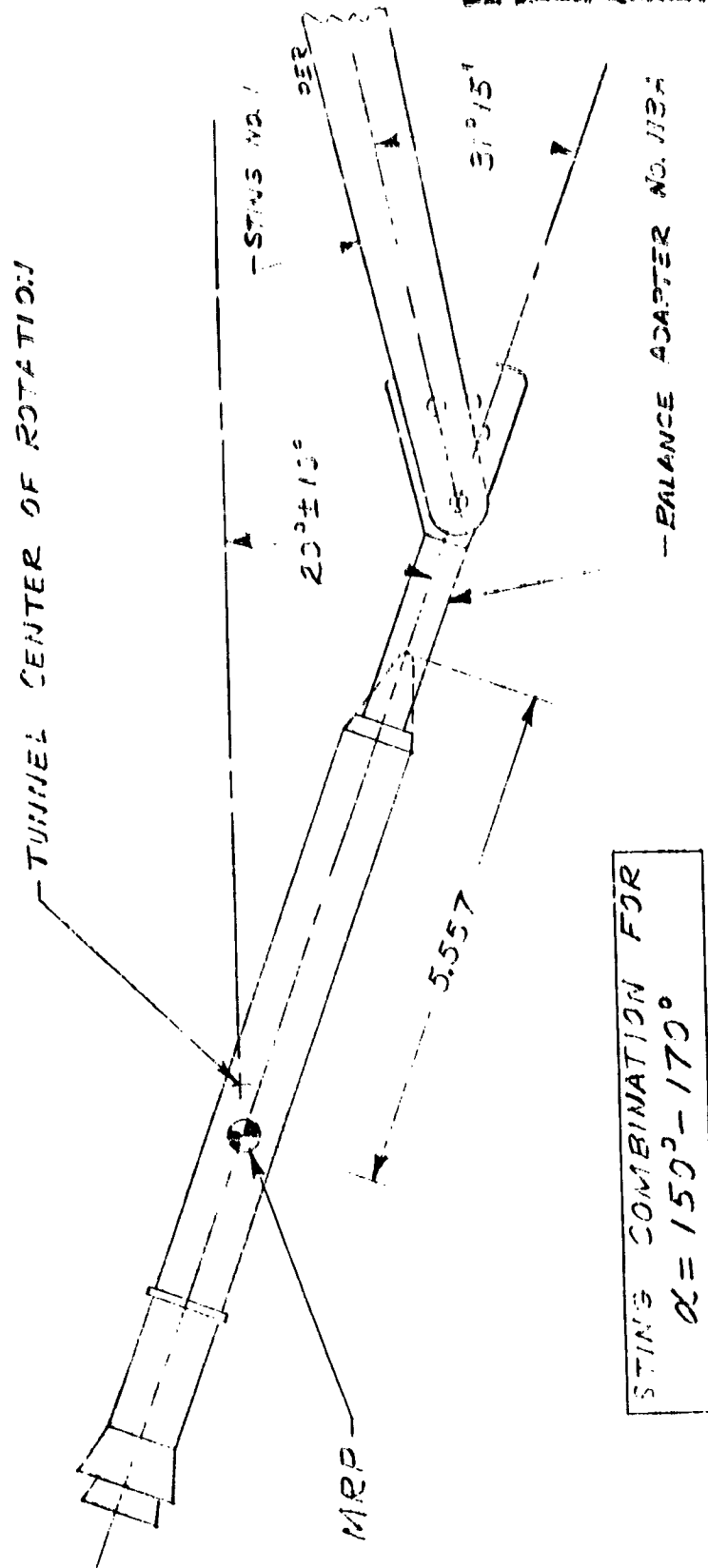
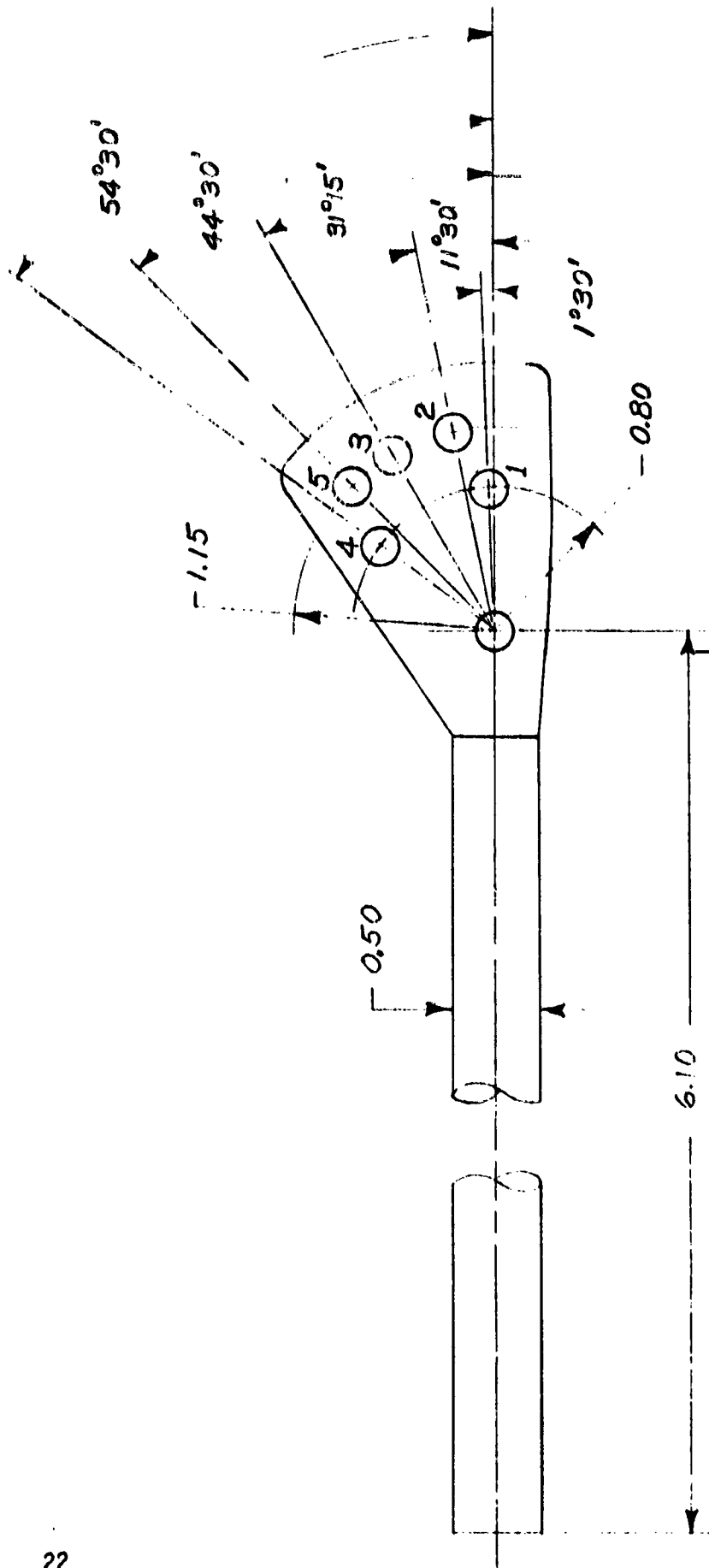


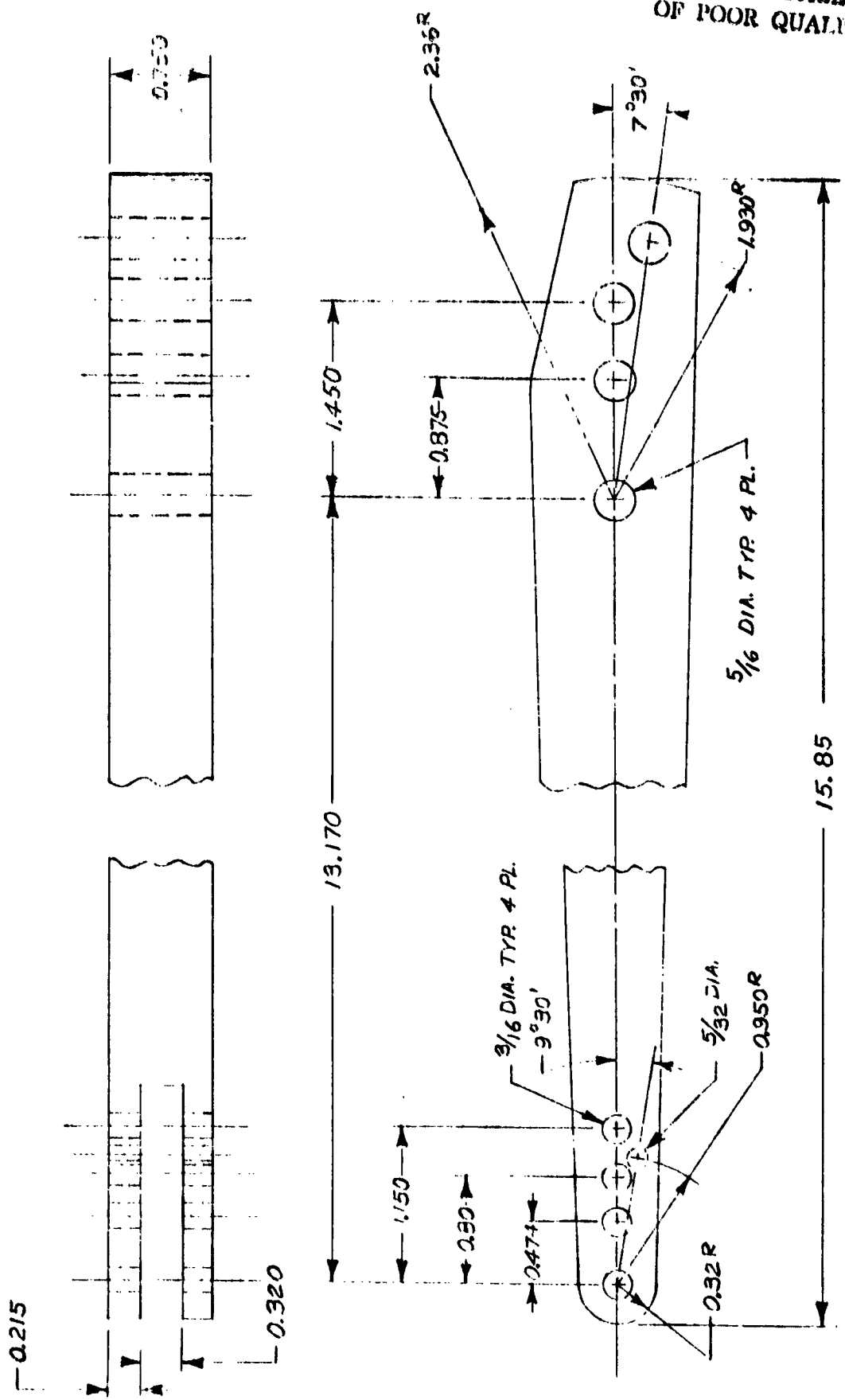
Figure 4. Layout of nose mounted sting



(a) Balance adapter No. 113A

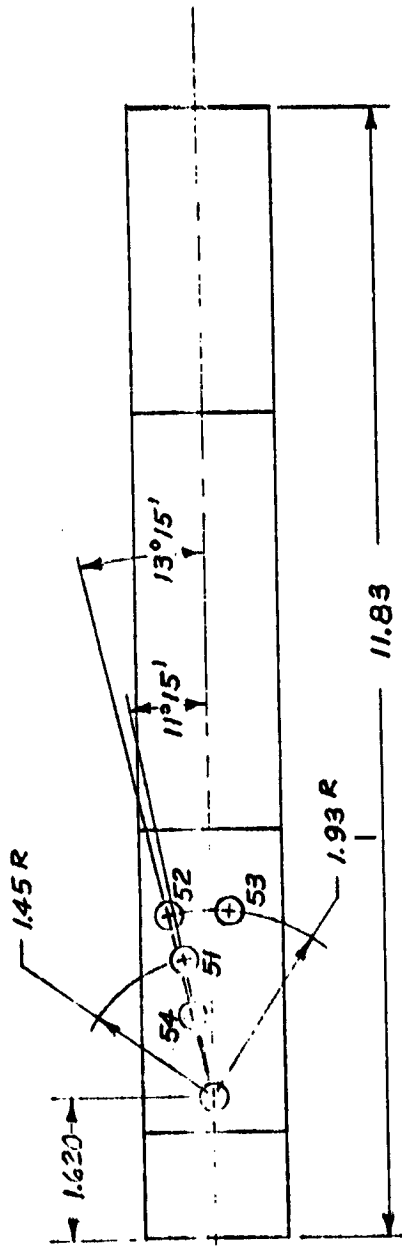
Figure 5. Double knuckle sting details

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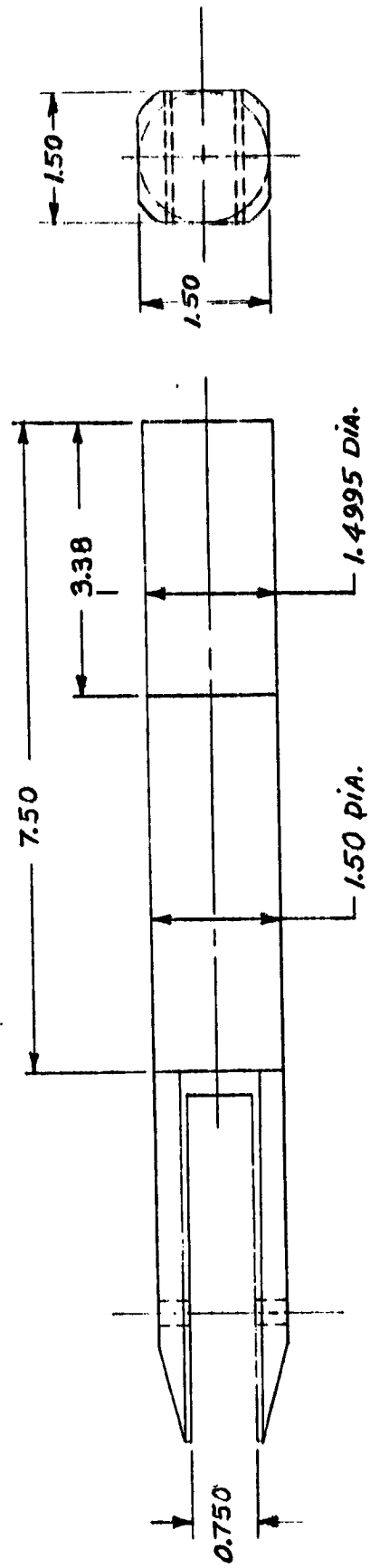


(b) Sting No. 1

Figure 5. Continued



NOTE: ALL HOLES ARE $\frac{5}{16}$ DIA.



(c) Sting adapter No. 1

Figure 5. Concluded

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DATA FIGURES

REFERENCE INFORMATION

SREF	116.2600	SQ.FT.
LREF	146.0000	IN.
BREF	146.0000	IN.
XMPP	.0000	IN.
YMPP	.0000	IN.
ZMPP	.0000	IN.
SCALE	.0055	

PHI

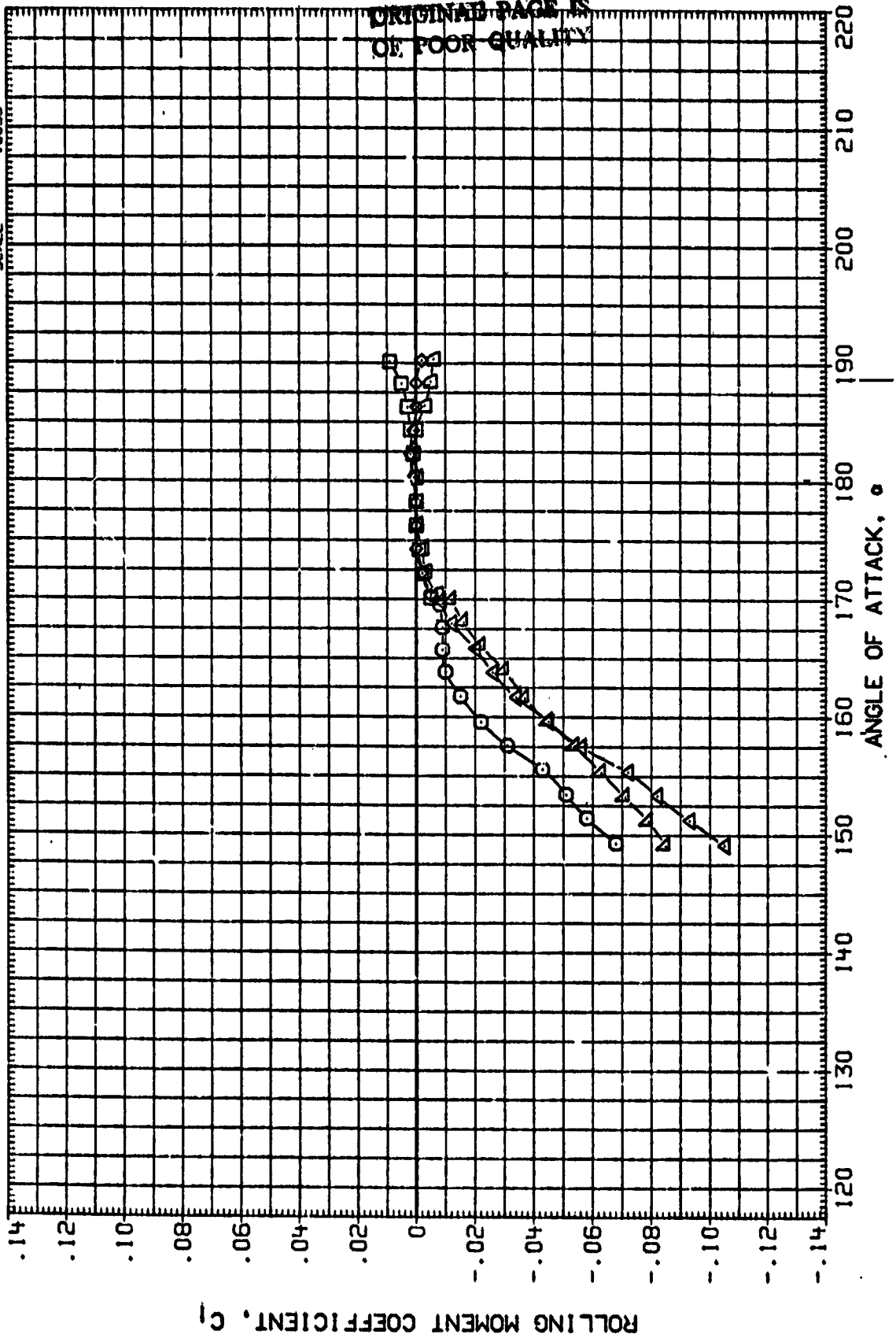
.000
.000
22.500
22.500
45.000

CONFIGURATION

MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES

DATA SET SYMBOL

A1R001	○
A1R002	◇
A1R003	△
A1R004	△
A1R005	△
A1R006	△



DATA SET SYMBOL

- AIR001
- AIR002
- AIR003
- AIR004
- AIR005
- AIR006

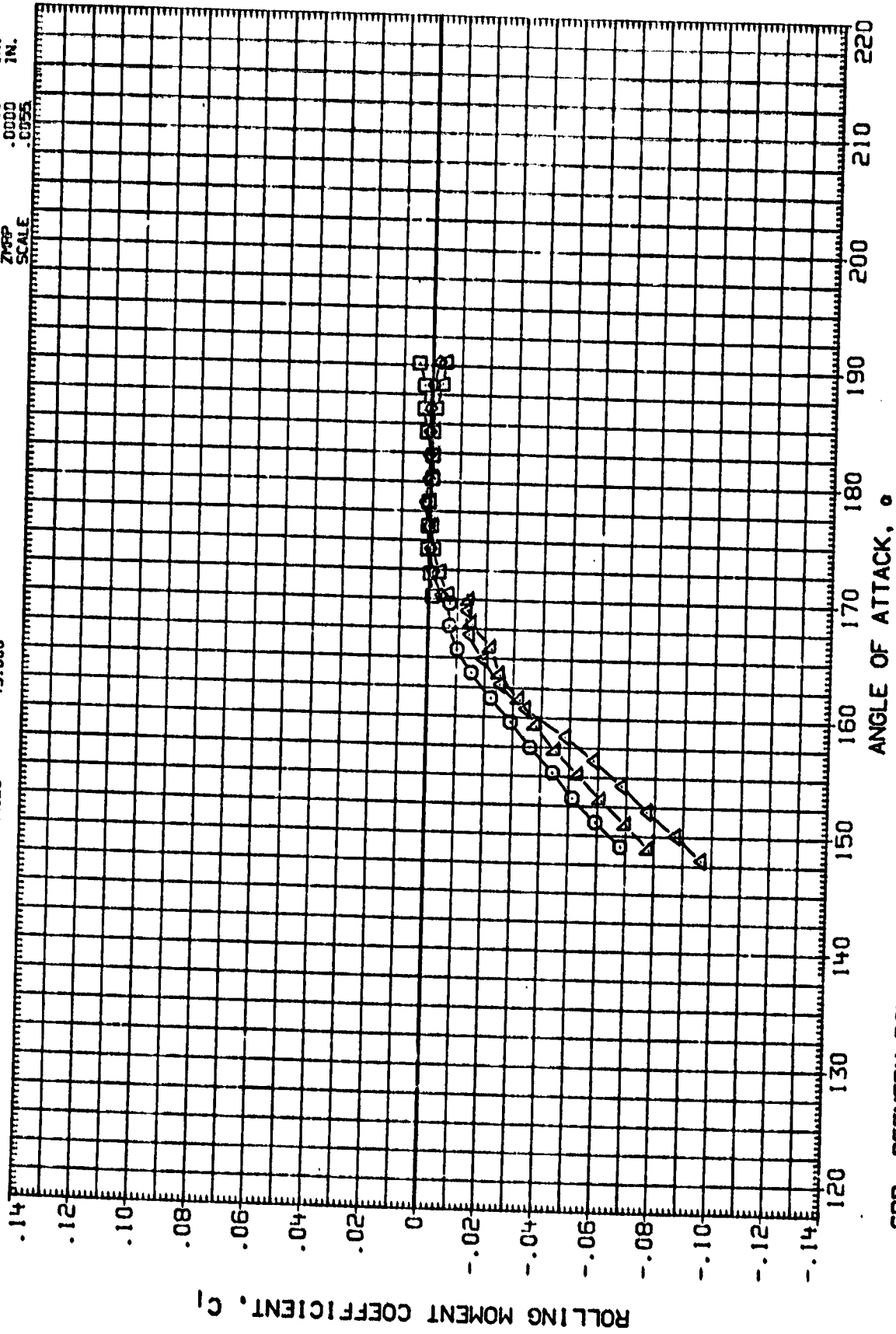
CONFIGURATION

- MSFC TMT 645 (SA2IF) SRB WITH PROTUBERANCES
- MSFC TMT 645 (SA2IF) SRB WITH PROTUBERANCES
- MSFC TMT 645 (SA2IF) SRB WITH PROTUBERANCES
- MSFC TMT 645 (SA2IF) SRB WITH PROTUBERANCES
- MSFC TMT 645 (SA2IF) SRB WITH PROTUBERANCES

- PHI
- .000
- .000
- 22.500
- 22.500
- 45.000

REFERENCE INFORMATION

SREF	116.2500	SO.FT.
LREF	146.0000	IN.
BREF	146.0000	IN.
XPRP	.0000	IN.
YPRP	.0000	IN.
ZPRP	.0000	IN.
SCALE	.0055	



SRB REENTRY ROLL CHARACTERISTICS

(B) MACH = 1.96

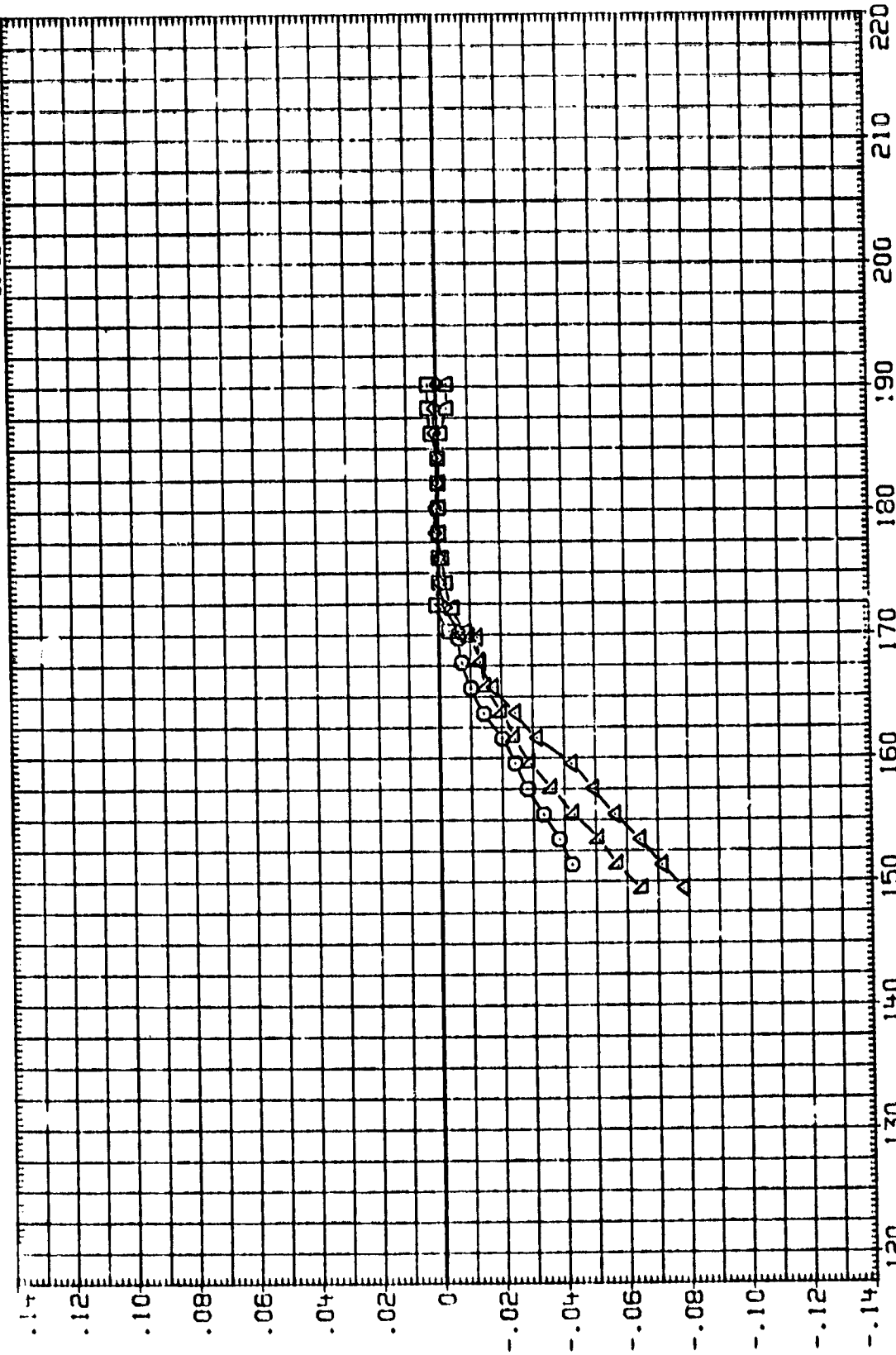
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BREF 146.0000 IN.
XMPR .0000 IN.
YMPR .0000 IN.
ZMPR .0000 IN.
SCALE .0055

PH: .000
.000
22.500
45.000
45.000

DESCRIPTION
SRB WITH PROTUBERANCES
SRB WITH PROTUBERANCES
SRB WITH PROTUBERANCES
SRB WITH PROTUBERANCES
SRB WITH PROTUBERANCES
SRB WITH PROTUBERANCES

ANGLE OF ATTACK, °



ROLLING MOMENT COEFFICIENT, C_l

SRB REENTRY ROLL CHARACTERISTICS

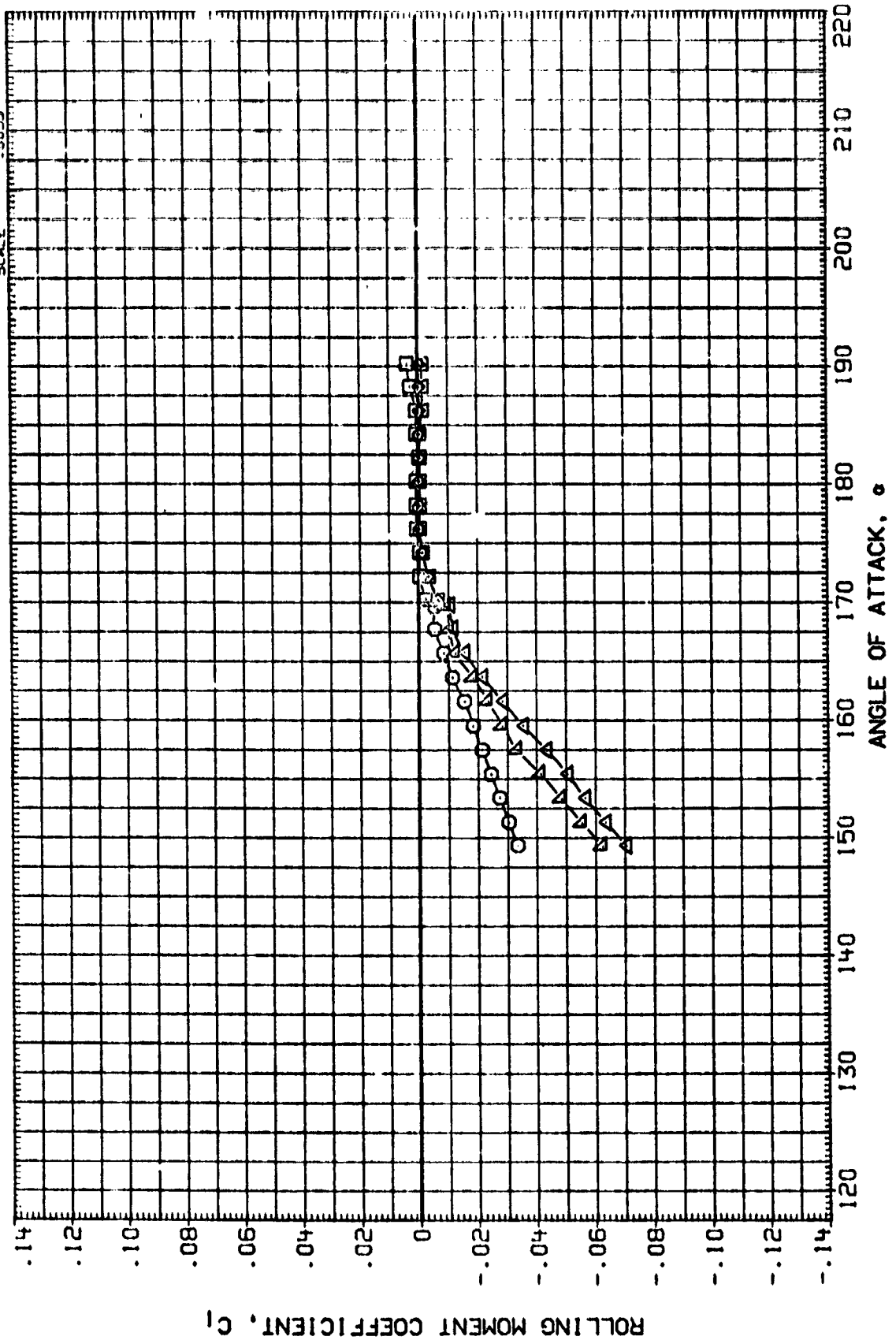
2 (C)MACH = 2.74

DATA SET SYMBOL
 AIR001 ○
 AIR002 □
 AIR003 ◇
 AIR004 △
 AIR005 ▽
 AIR006 ▾

CONFIGURATION
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

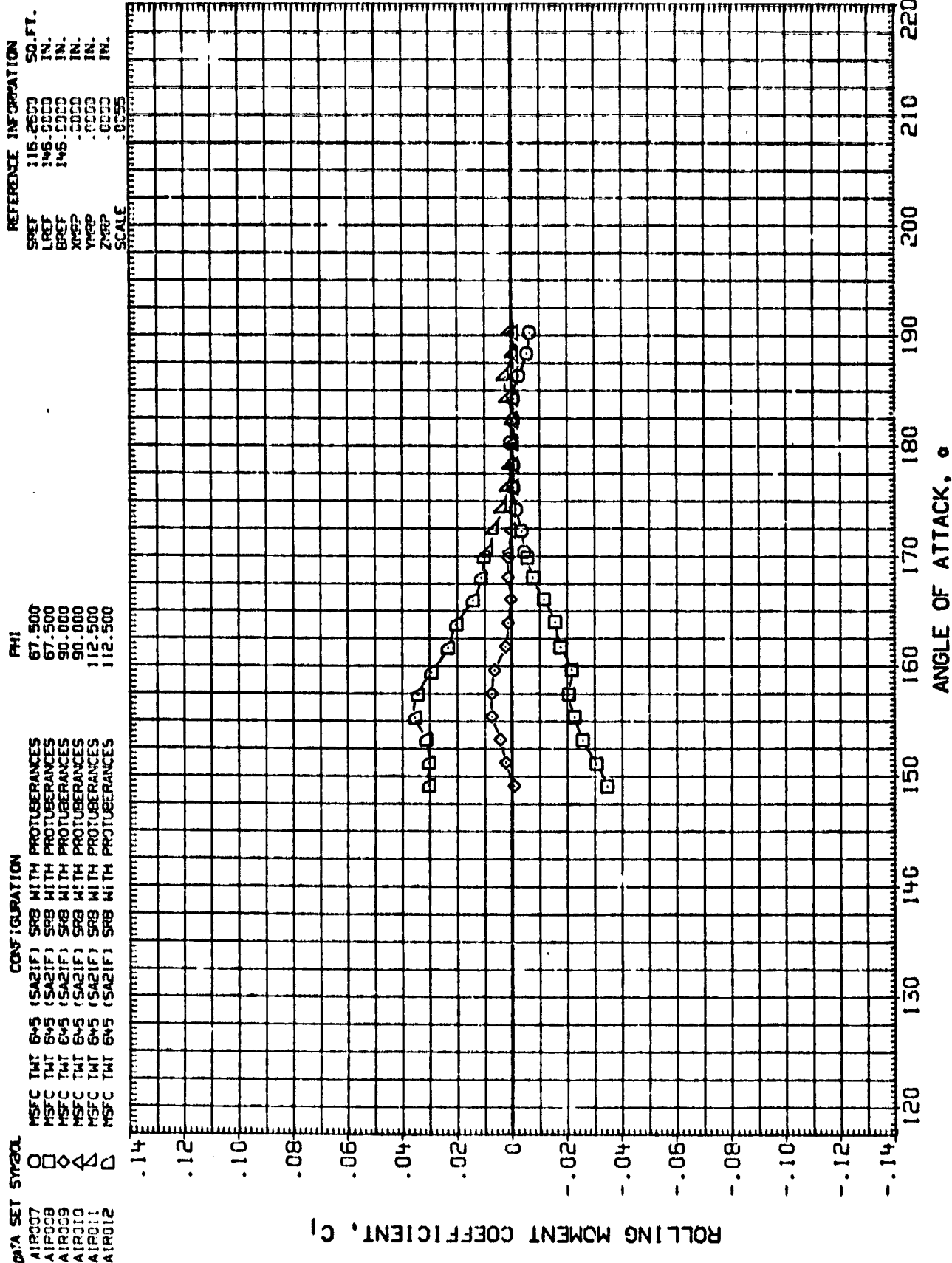
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 .000
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 22.500
 45.000
 45.000

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 BRREF 146.0000 IN.
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 YMRP .0000 IN.
 ZMRP .0000 IN.
 SCALE .0025



SRB REENTRY ROLL CHARACTERISTICS

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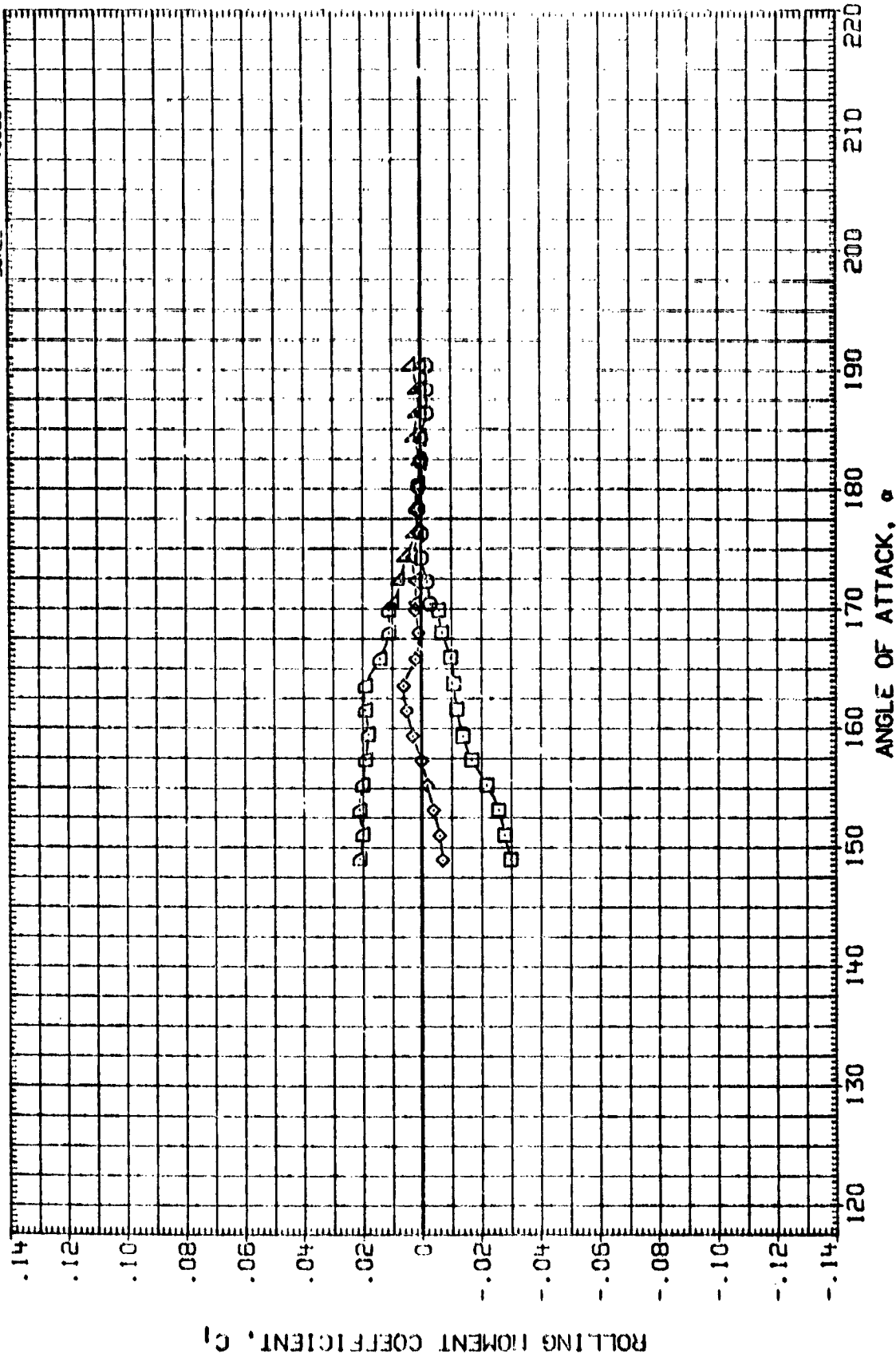
22

DATA SET SYMBOL
 AIR007 □
 AIR008 ◊
 AIR009 △
 AIR010 ▽
 AIR011 □
 AIR012 ◊

CONFIGURATION
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

PHI
 67.500
 67.500
 90.000
 90.000
 112.500
 112.500

REFERENCE INFORMATION
 SREF 115.2500 50.FT.
 UREF 145.0000 IN.
 BREF 145.0000 IN.
 XREF -0000 IN.
 YREF -0000 IN.
 ZREF -0000 IN.
 SCALE .0055



SRB REENTRY ROLL CHARACTERISTICS

(B) MACH = 1.96

REFERENCE INFORMATION

SREF	116.2500	SO.FT.
LREF	145.0000	IN.
BREF	145.0000	IN.
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YREF	.0000	IN.
ZREF	.0000	IN.
SCALE	.0055	

PHI

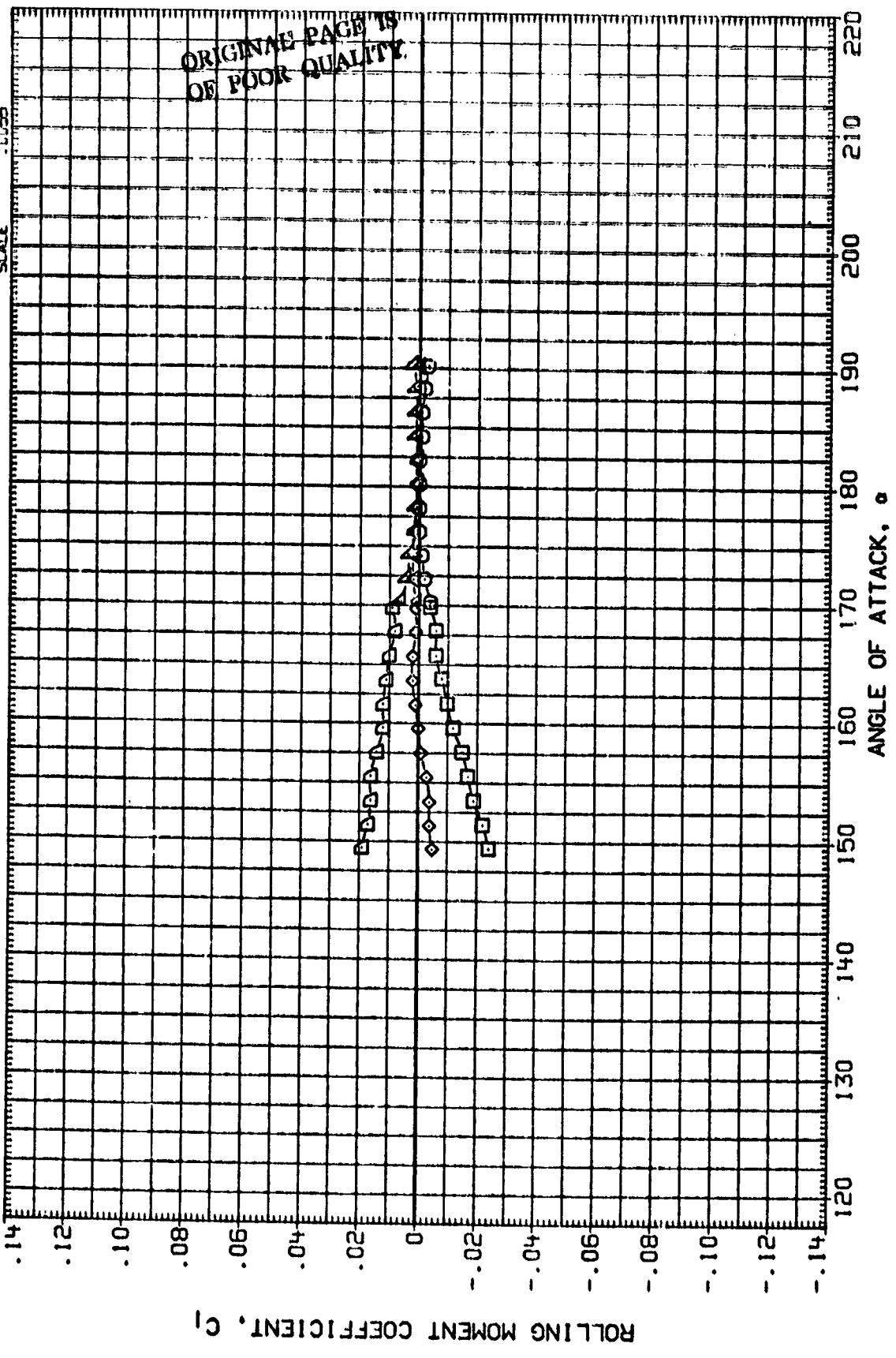
67.500
67.500
90.000
90.000
112.500
112.500

CONFIGURATION

MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES

DATA SET SYMBOL

AIR007	□
AIR008	◇
AIR009	△
AIR010	▽
AIR011	○
AIR012	□

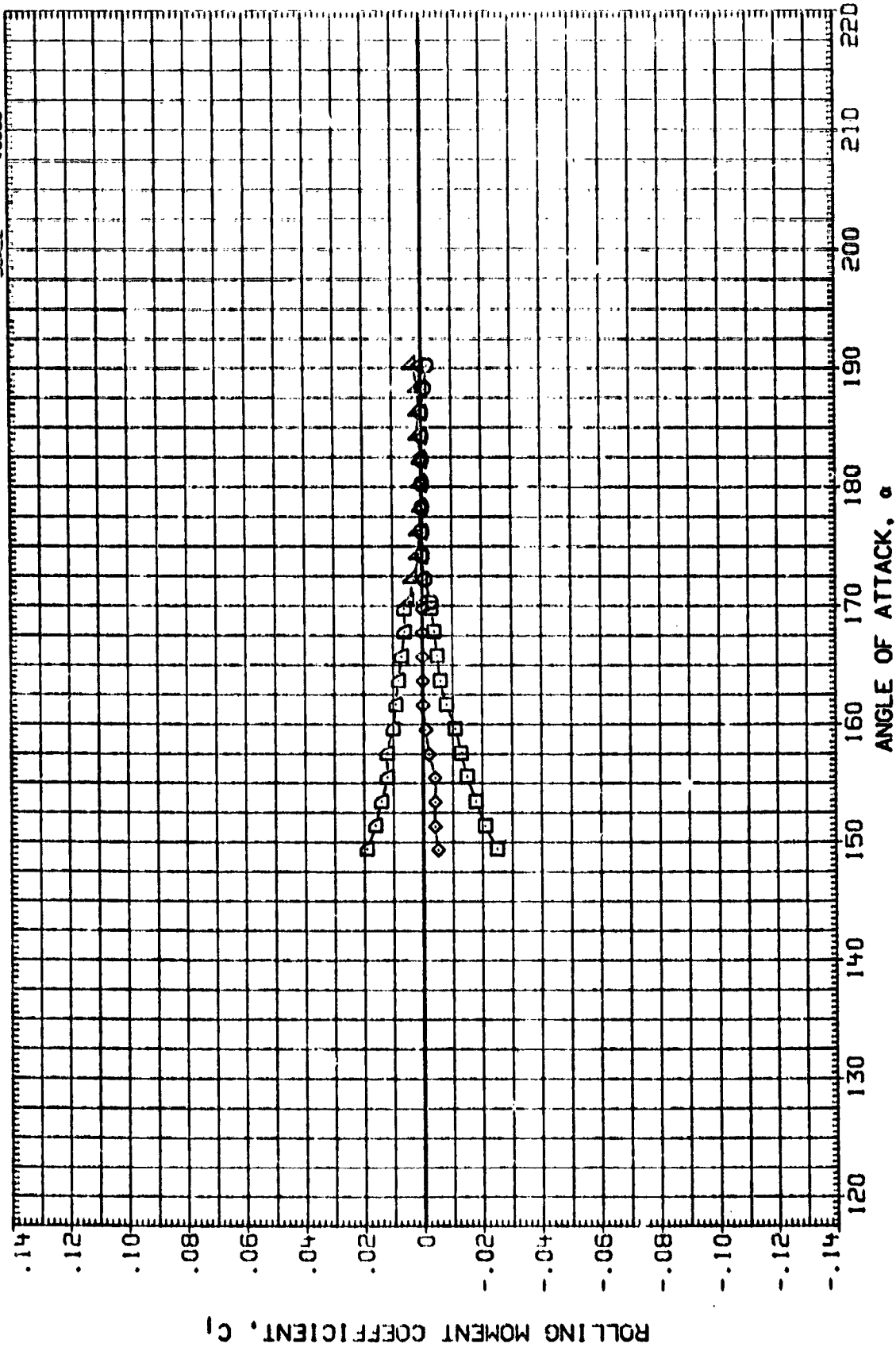


DATA SET SYMBOL
 AIR007 □
 AIR008 ◇
 AIR009 △
 AIR010 □
 AIR011 △
 AIR012 □

MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

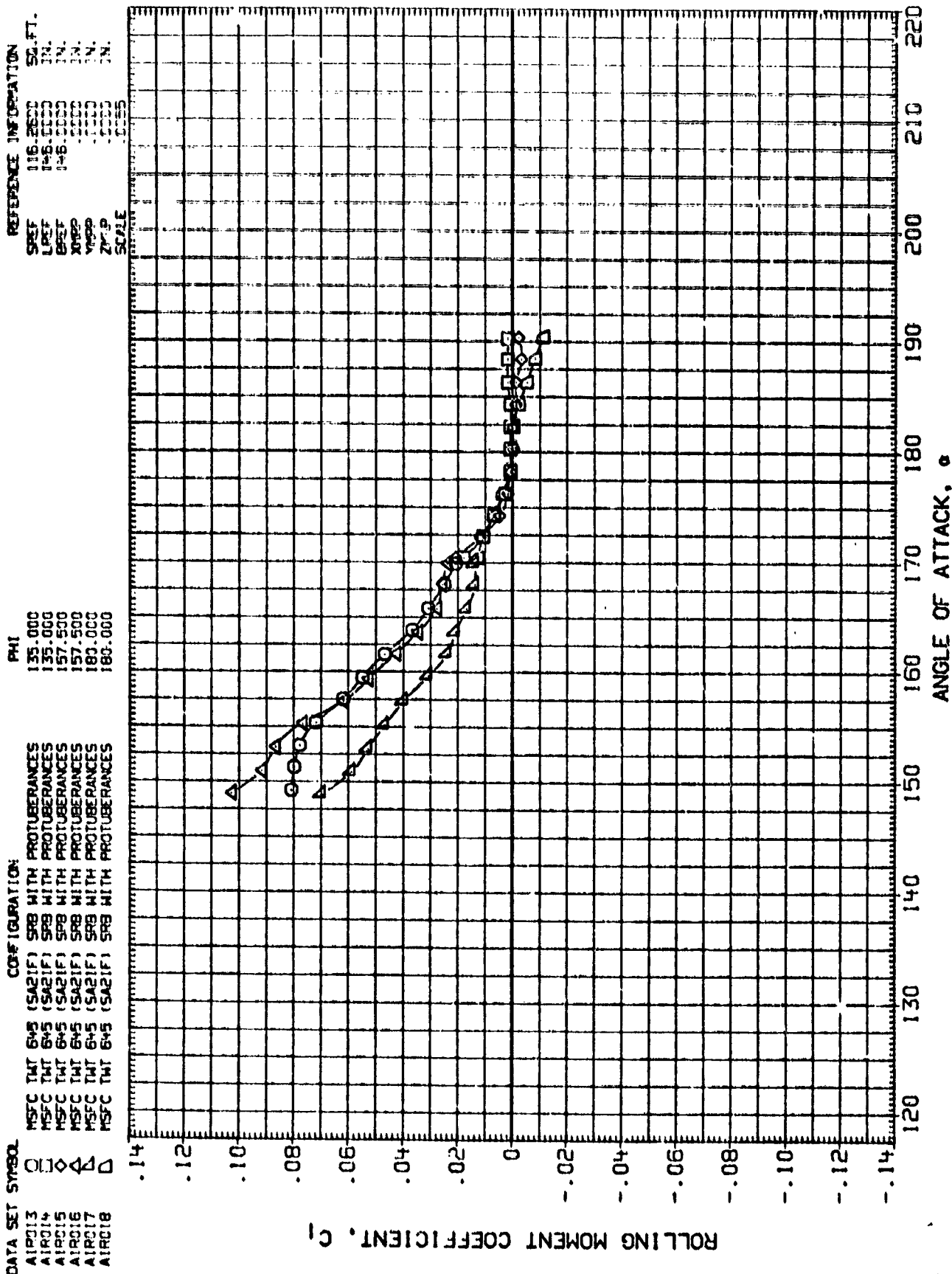
PHI
 67.500
 67.500
 90.000
 90.000
 112.500
 112.500

REFERENCE INFORMATION
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 LREF 146.0000 IN.
 BREF 146.0000 IN.
 XREF -0.0000 IN.
 YREF -0.0000 IN.
 ZREF -0.0000 IN.
 SCALE 0.0005



SRB REENTRY ROLL CHARACTERISTICS

ORIGINAL PAGE IS
OF POOR QUALITY



SRB REENTRY ROLL CHARACTERISTICS

(A) MACH = 1.46

REFERENCE INFORMATION

SRF	016.2600	SO. FT.
LEF	145.0000	IN.
BEF	145.0000	IN.
YMRP	-0.0000	IN.
ZMRP	-0.0000	IN.
SCALE	0.0050	

PHI:

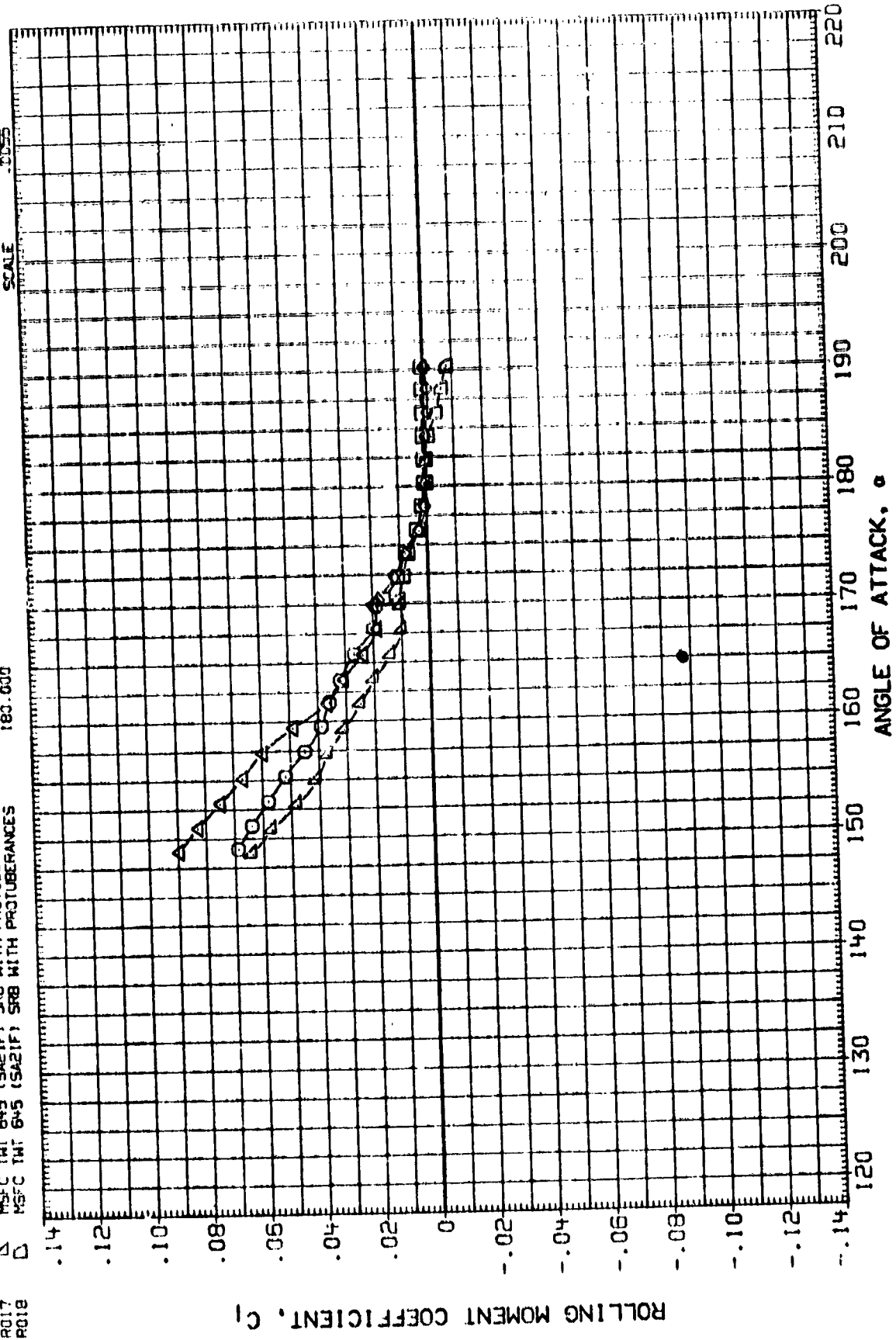
135.000
135.000
157.500
180.000
180.000

CONFIGURATION

MSFC TMT 6N5	(SA21F) SRB WITH PROTUBERANCES
MSFC TMT 6N5	(SA21F) SRB WITH PROTUBERANCES
MSFC TMT 6N5	(SA21F) SRB WITH PROTUBERANCES
MSFC TMT 6N5	(SA21F) SRB WITH PROTUBERANCES
MSFC TMT 6N5	(SA21F) SRB WITH PROTUBERANCES

DATA SET SYMBOL

AIR013	○
AIR014	□
AIR015	◇
AIR016	△
AIR017	▽
AIR018	◇



SRB REENTRY ROLL CHARACTERISTICS

(B) MACH = 1.96

REFERENCE INFORMATION

SREF	116.2500	SQ.FT.
LREF	146.0000	IN.
BREF	146.0000	IN.
XMPF	.0000	IN.
YMPF	.0000	IN.
ZMPF	.0000	IN.
SCALE	.0055	

PHI

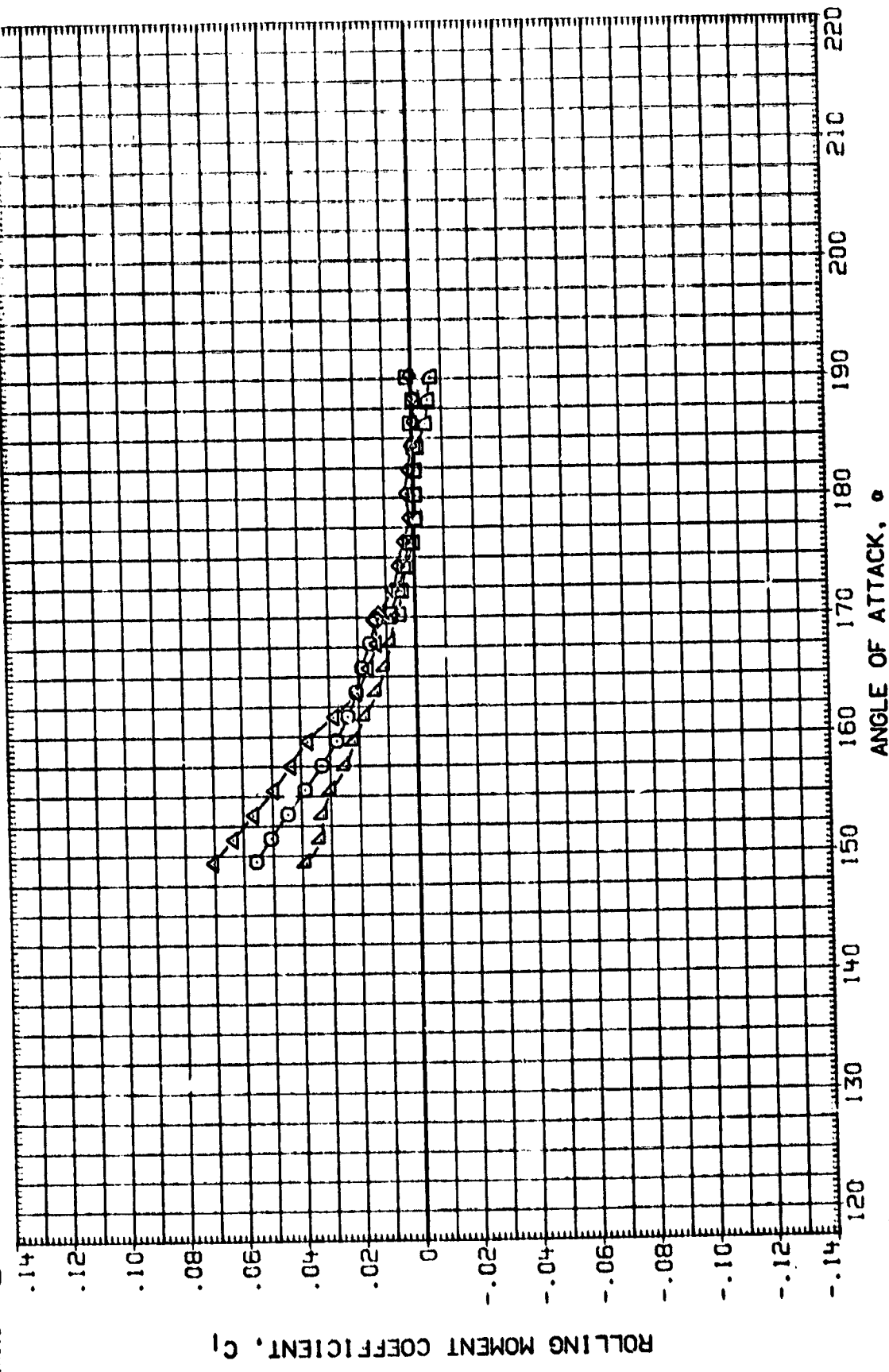
135.000
135.000
157.500
157.500
180.000
180.000

CONFIGURATION

MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F)	SRB WITH PROTUBERANCES

DATA SET SYMBOL

AIRC13	□
AIRC14	○
AIRC15	△
AIRC16	▽
AIRC17	◇
AIRC18	◇



SRB REENTRY ROLL CHARACTERISTICS

(C)MACH = 2.74

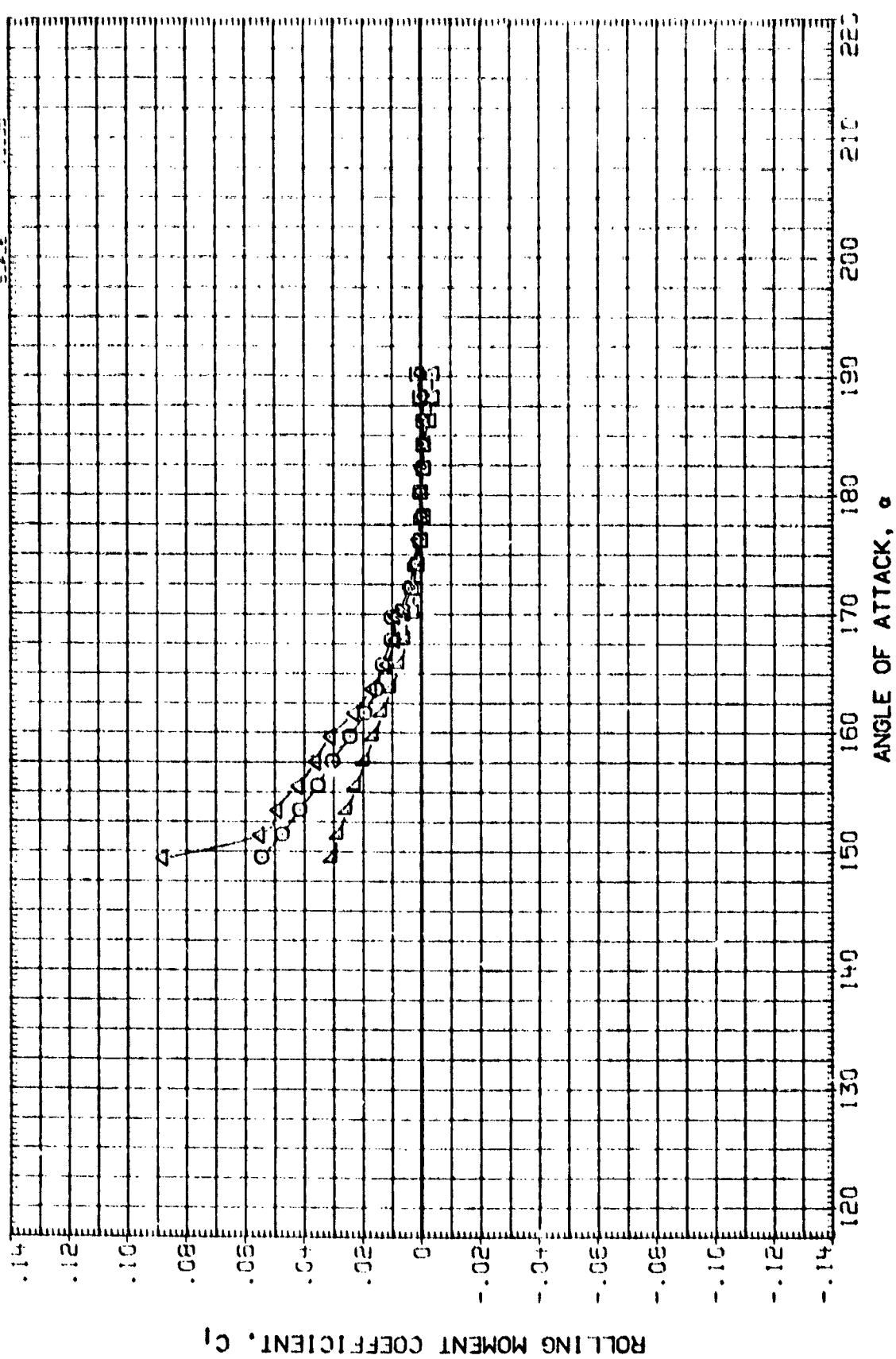
DATA SET SYMBOL
 AIRC13
 AIRC14
 AIRC15
 AIRC16
 AIRC17
 AIRC18

MSFC TWT 6-5 (SAB1F) SRB WITH PROTUBE RANGES
 MSFC TWT 6-5 (SAB1F) SRB WITH PROTUBE RANGES
 MSFC TWT 6-5 (SAB1F) SRB WITH PROTUBE RANGES
 MSFC TWT 6-5 (SAB1F) SRB WITH PROTUBE RANGES
 MSFC TWT 6-5 (SAB1F) SRB WITH PROTUBE RANGES

CONF (GURATION)
 SRB WITH PROTUBE RANGES
 SRB WITH PROTUBE RANGES
 SRB WITH PROTUBE RANGES
 SRB WITH PROTUBE RANGES
 SRB WITH PROTUBE RANGES

PHI
 135.000
 150.000
 157.500
 180.000
 180.000

REFERENCE INFORMATION
 SREF 115.2000 SQ. FT.
 LREF 145.0000 IN.
 SREF 145.0000 IN.
 YMPD 145.0000 IN.
 ZMPD 145.0000 IN.
 SCALE 145.0000 IN.



SRB REENTRY ROLL CHARACTERISTICS

(0) MACH = 3.78

ORIGINAL PAGE IS
OF POOR QUALITY

REFERENCE INFORMATION

SREF	116.2600	SO. FT.
LREF	146.0000	IN.
BREF	146.0000	IN.
XPRP	.0000	IN.
YPRP	.0000	IN.
ZPRP	.0000	IN.
SCALE	.0055	

PHI

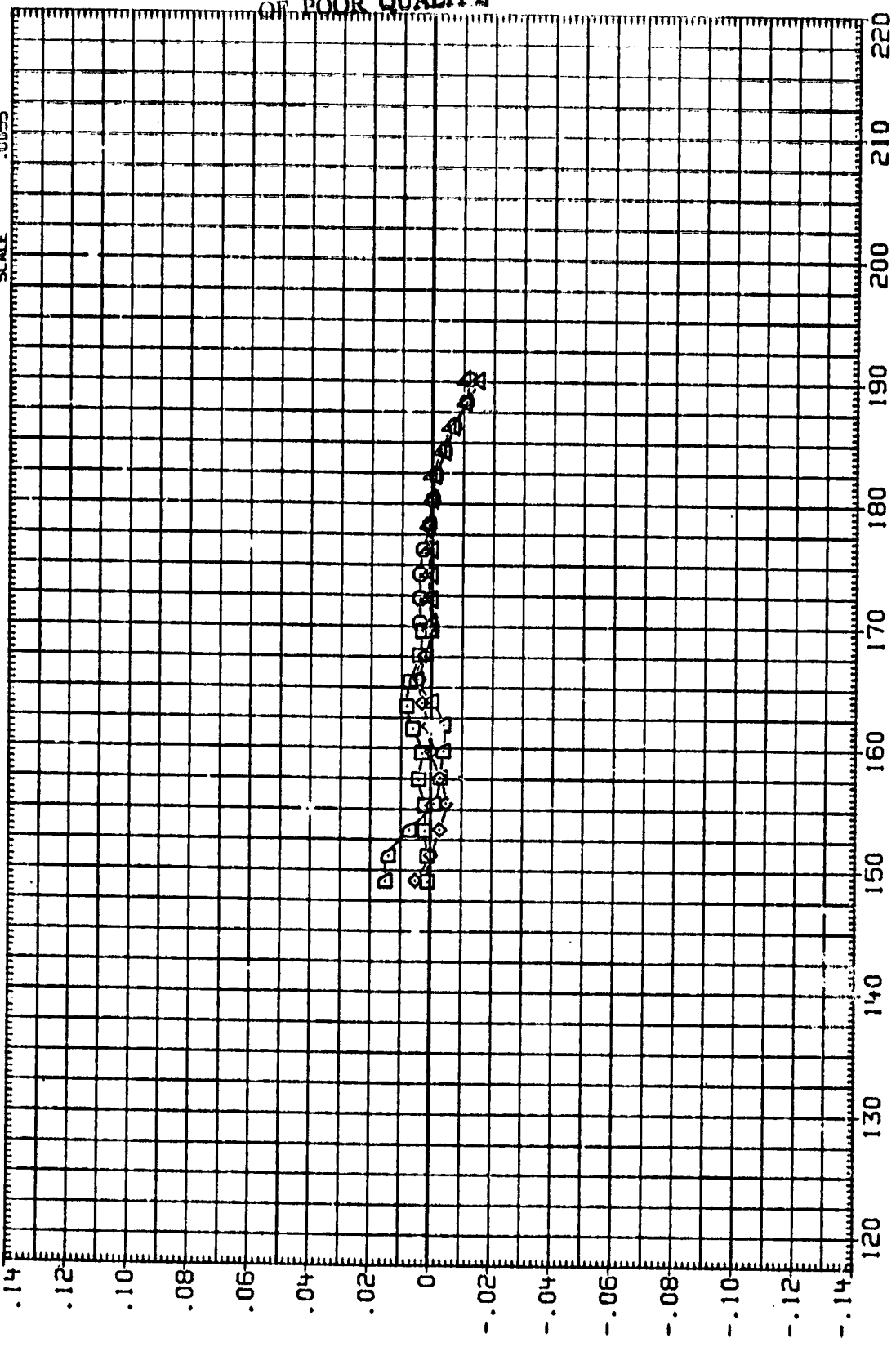
202.500
202.500
225.000
225.000
247.500
247.500

CONFIGURATION

MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

DATA SET SYMBOL

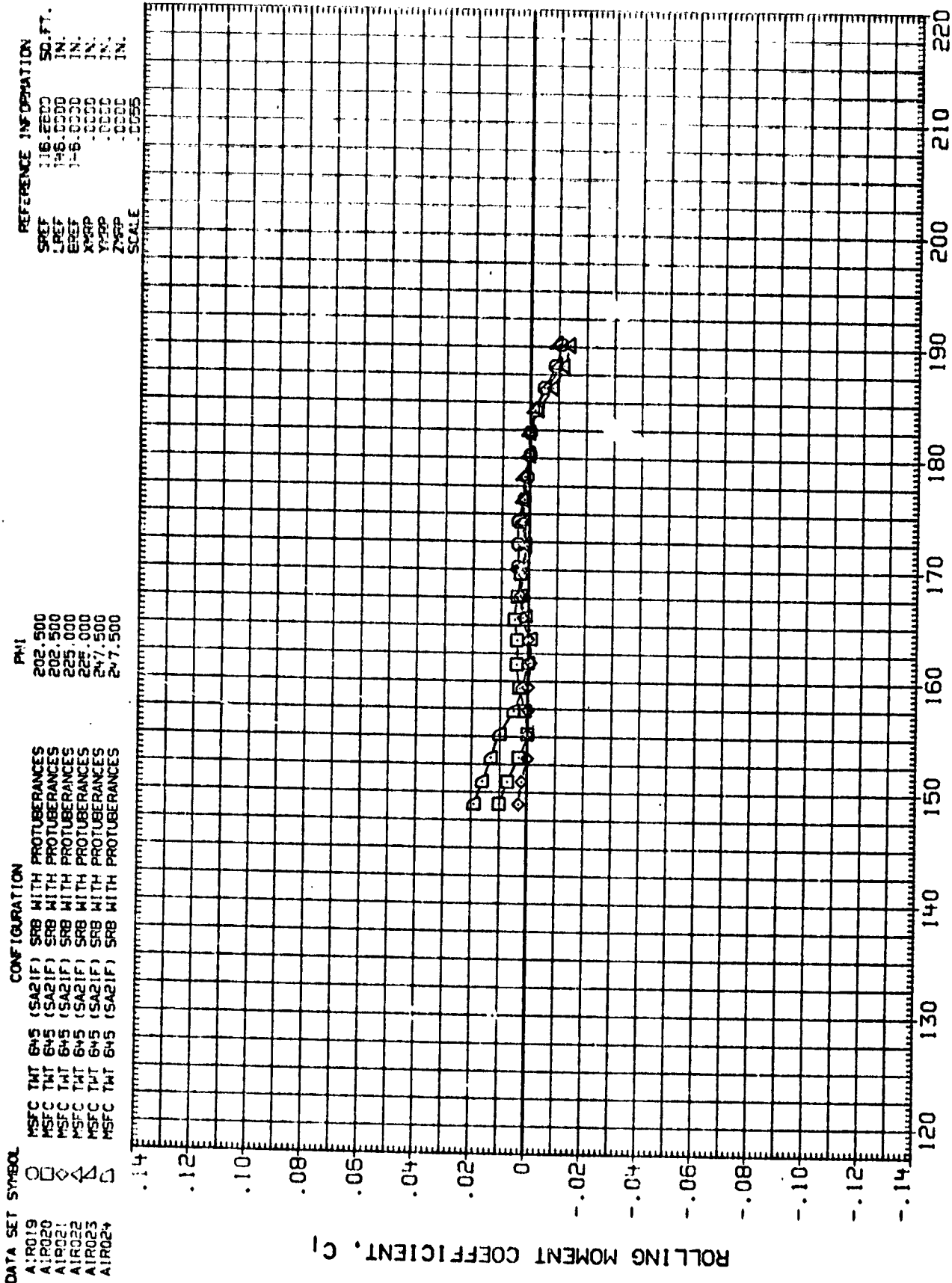
AIRO19	□
AIRO20	○
AIRO21	◇
AIRO22	△
AIRO23	▽
AIRO24	◇



ANGLE OF ATTACK, α

SRB REENTRY ROLL CHARACTERISTICS

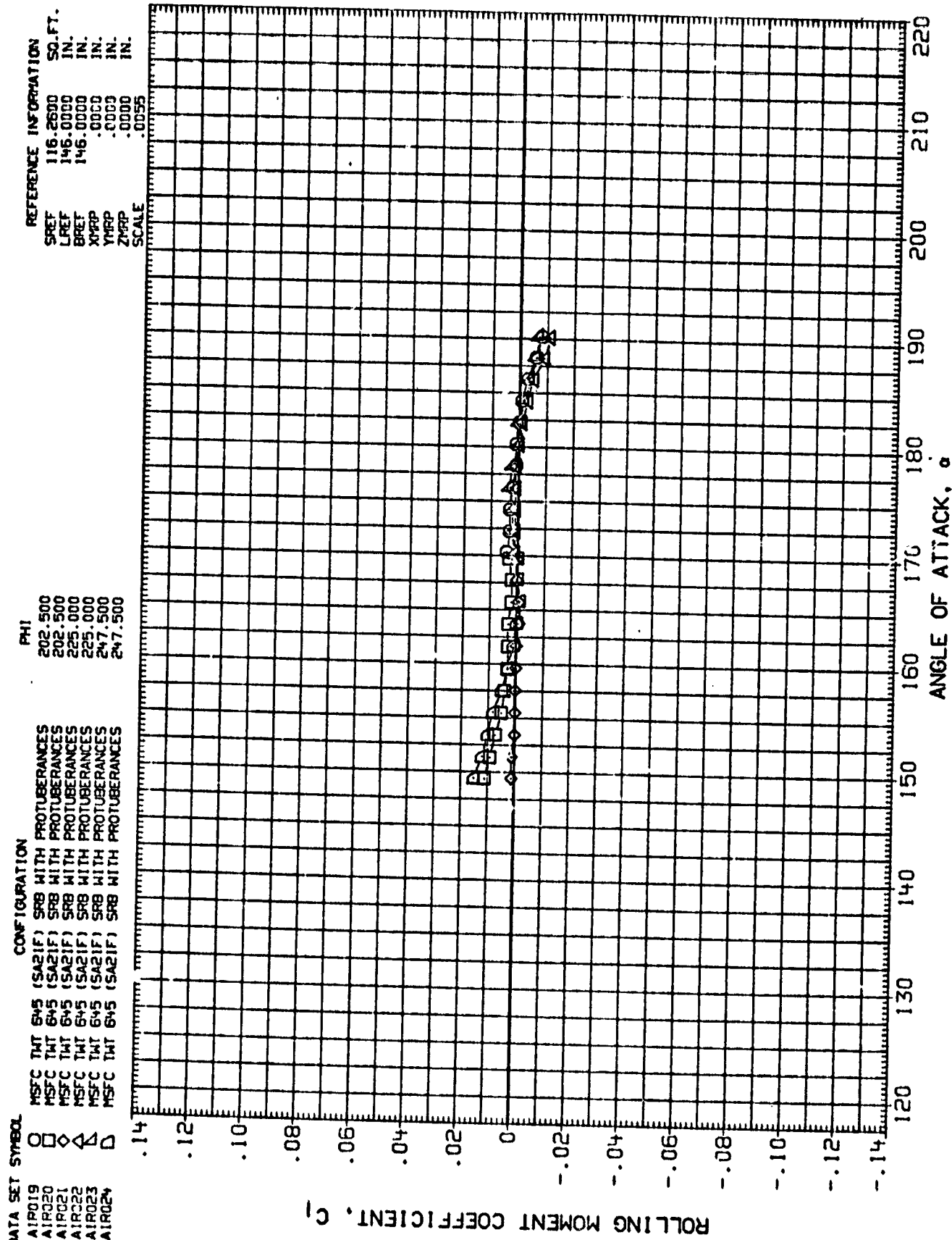
(A) MACH = 1.46



SRB REENTRY ROLL CHARACTERISTICS

(B)MACH = 1.96

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OF POOR QUALITY



SRB REENTRY ROLL CHARACTERISTICS

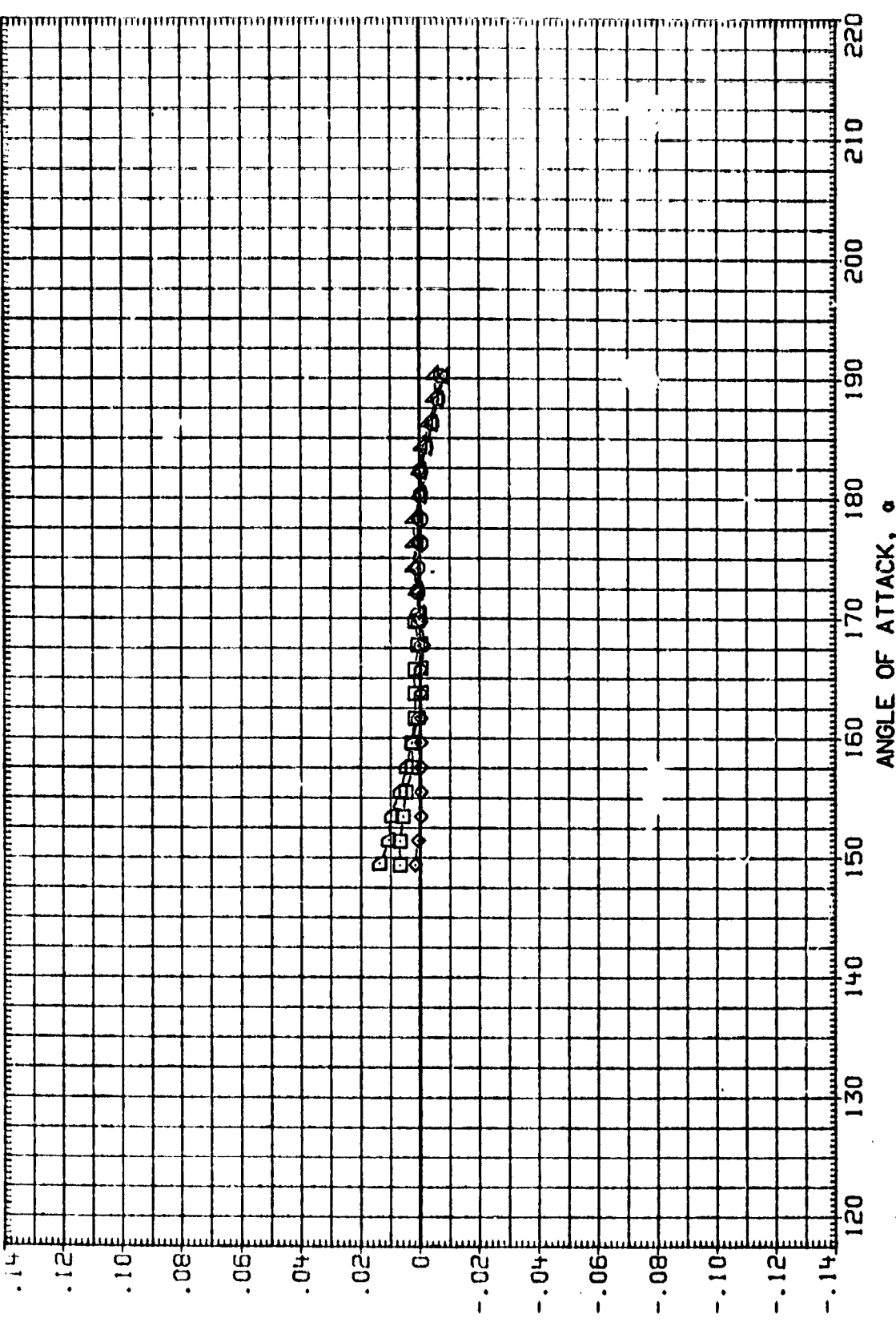
(C)MACH = 2.74

REFERENCE INFORMATION
 SREF 116.2600 SQ. FT.
 LREF 146.0000 IN.
 BREF 145.0000 IN.
 XREF .0000 IN.
 YREF .0000 IN.
 ZREF .0000 IN.
 SCALE .0055

PHI
 202.500
 202.500
 225.000
 225.000
 247.500

CONFIGURATION
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

DATA SET SYMBOL
 AIR019 □
 AIR020 ◊
 AIR021 △
 AIR022 ▽
 AIR023 □
 AIR024 ▽



SRB REENTRY ROLL CHARACTERISTICS

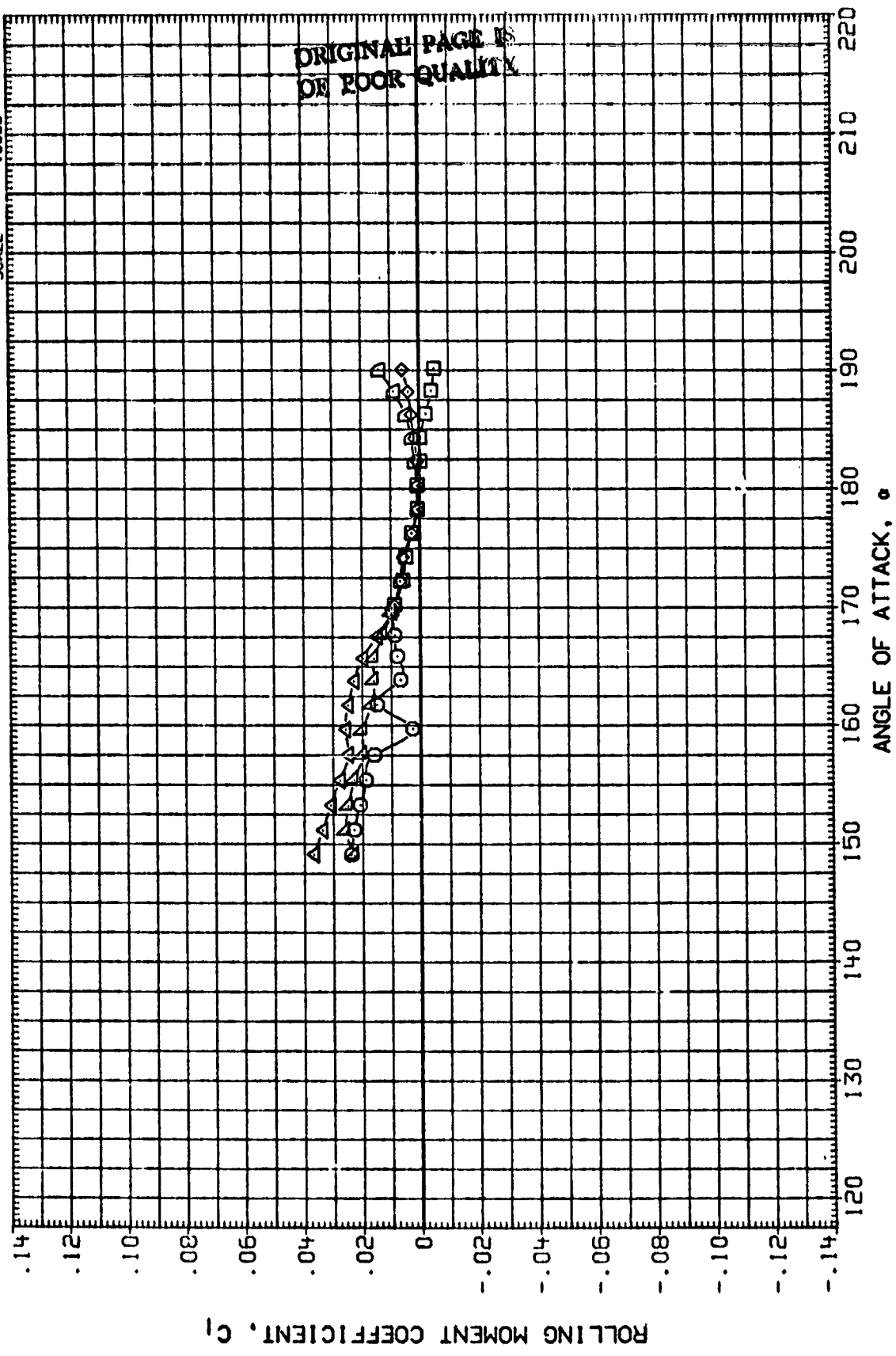
(D)MACH = 3.48

REFERENCE INFORMATION

SREF	116.2600	SO.FT.
LREF	146.0000	IN.
BREF	146.0000	IN.
XMRP	.0000	IN.
YMRP	.0000	IN.
ZMRP	.0000	IN.
SCALE	.0055	

DATA SET SYMBOL

AIR025	□	MSFC TMT 6N5 (SA21F)	SRB WITH PROTUBERANCES	PHI	270.000
AIR026	◇	MSFC TMT 6N5 (SA21F)	SRB WITH PROTUBERANCES		270.000
AIR027	◇	MSFC TMT 6N5 (SA21F)	SRB WITH PROTUBERANCES		292.500
AIR028	△	MSFC TMT 6N5 (SA21F)	SRB WITH PROTUBERANCES		292.500
AIR029	△	MSFC TMT 6N5 (SA21F)	SRB WITH PROTUBERANCES		315.000
AIR030	◇	MSFC TMT 6N5 (SA21F)	SRB WITH PROTUBERANCES		315.000



SRB REENTRY ROLL CHARACTERISTICS

(A) MACH = 1.46

DATA SET SYMBOL

AIR025
AIR026
AIR027
AIR028
AIR029
AIR030

CONFIGURATION

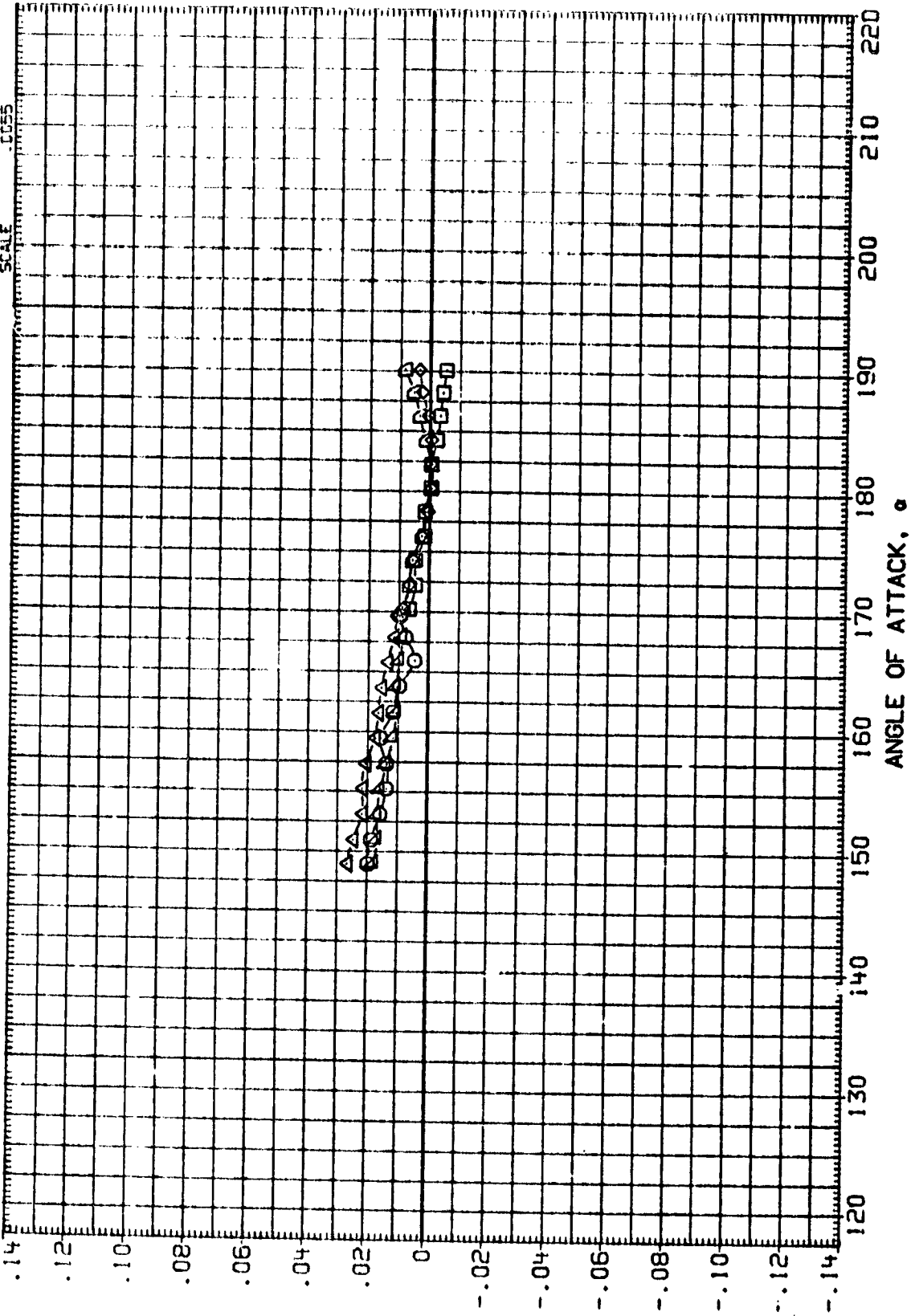
MSFC TWT 645 (S21F) SRB WITH PROTUBERANCES
MSFC TWT 645 (S21F) SRB WITH PROTUBERANCES
MSFC TWT 645 (S21F) SRB WITH PROTUBERANCES
MSFC TWT 645 (S21F) SRB WITH PROTUBERANCES
MSFC TWT 645 (S21F) SRB WITH PROTUBERANCES

P.I

270.000
270.000
292.500
292.500
315.000
315.000

REFERENCE INFORMATION

SREF 115.2600 SQ. FT.
LREF 148.0000 IN.
SREF 145.0000 IN.
XMRP 10000 IN.
YMRP 10000 IN.
ZMRP 10000 IN.
SCALE 0.0055



SRB REENTRY ROLL CHARACTERISTICS

(B) MACH = 1.96

REFERENCE INFORMATION

SREF	116.2600	SO. FT.
LREF	146.0000	IN.
BREF	146.0000	IN.
XPRP	.0000	IN.
YPRP	.0000	IN.
ZPRP	.0000	IN.
SCALE	.0035	

PHI

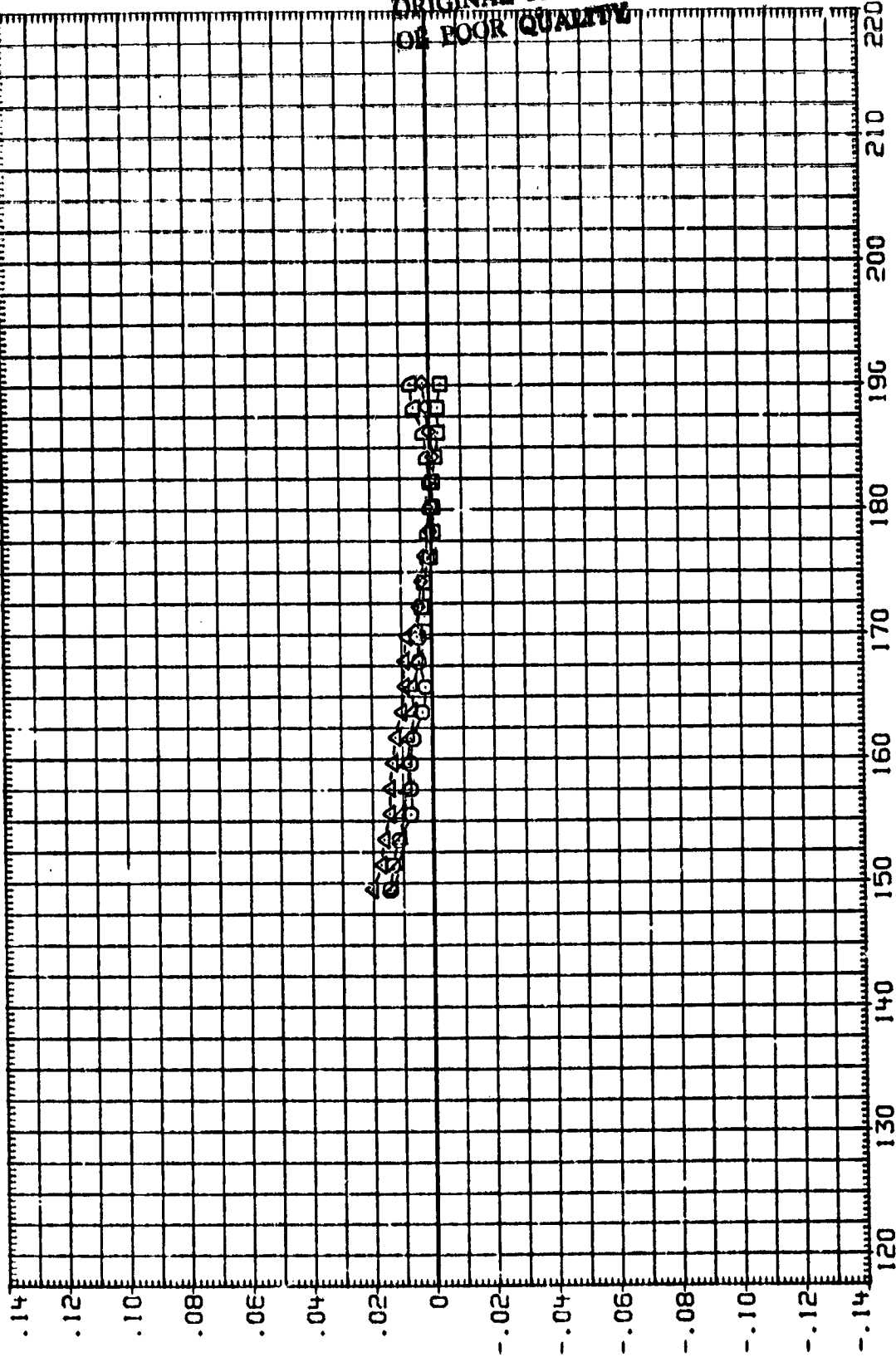
270.000
270.000
292.500
292.500
315.000
315.000

CONFIGURATION

MSFC TMT 6x5 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 6x5 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 6x5 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 6x5 (SA21F)	SPS WITH PROTUBERANCES
MSFC TMT 6x5 (SA21F)	SRB WITH PROTUBERANCES
MSFC TMT 6x5 (SA21F)	SRB WITH PROTUBERANCES

DATA SET SYMBOL

A1R025	□
A1R026	◇
A1R027	◇
A1R028	△
A1R029	△
A1R030	△



SRB REENTRY ROLL CHARACTERISTICS

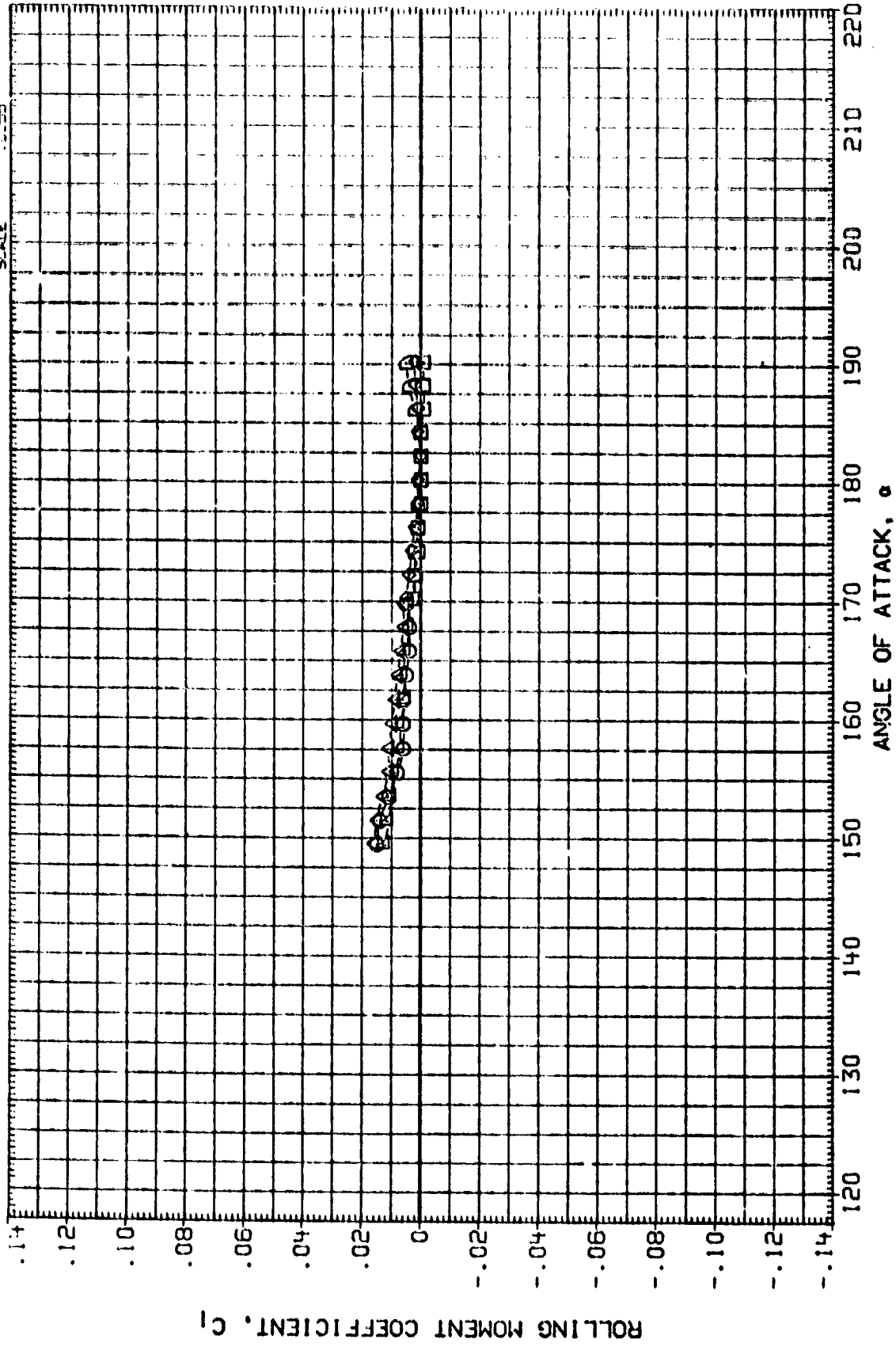
(C)MACH = 2.74

DATA SET SYMBOL
 AIR025
 AIR026
 AIR027
 AIR028
 AIR029
 AIR030

CONFIGURATION
 MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES
 MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES

PHI
 270.000
 270.000
 292.500
 292.500
 315.000
 315.000

REFERENCE INFORMATION
 SREF 116.2500 SQ.FT.
 LREF 146.0000 IN.
 EREF 145.0000 IN.
 XMPR 1.0000 IN.
 YMPR 1.0000 IN.
 ZMPR 1.0000 IN.
 SCALE 1.0000



SRB REENTRY ROLL CHARACTERISTICS

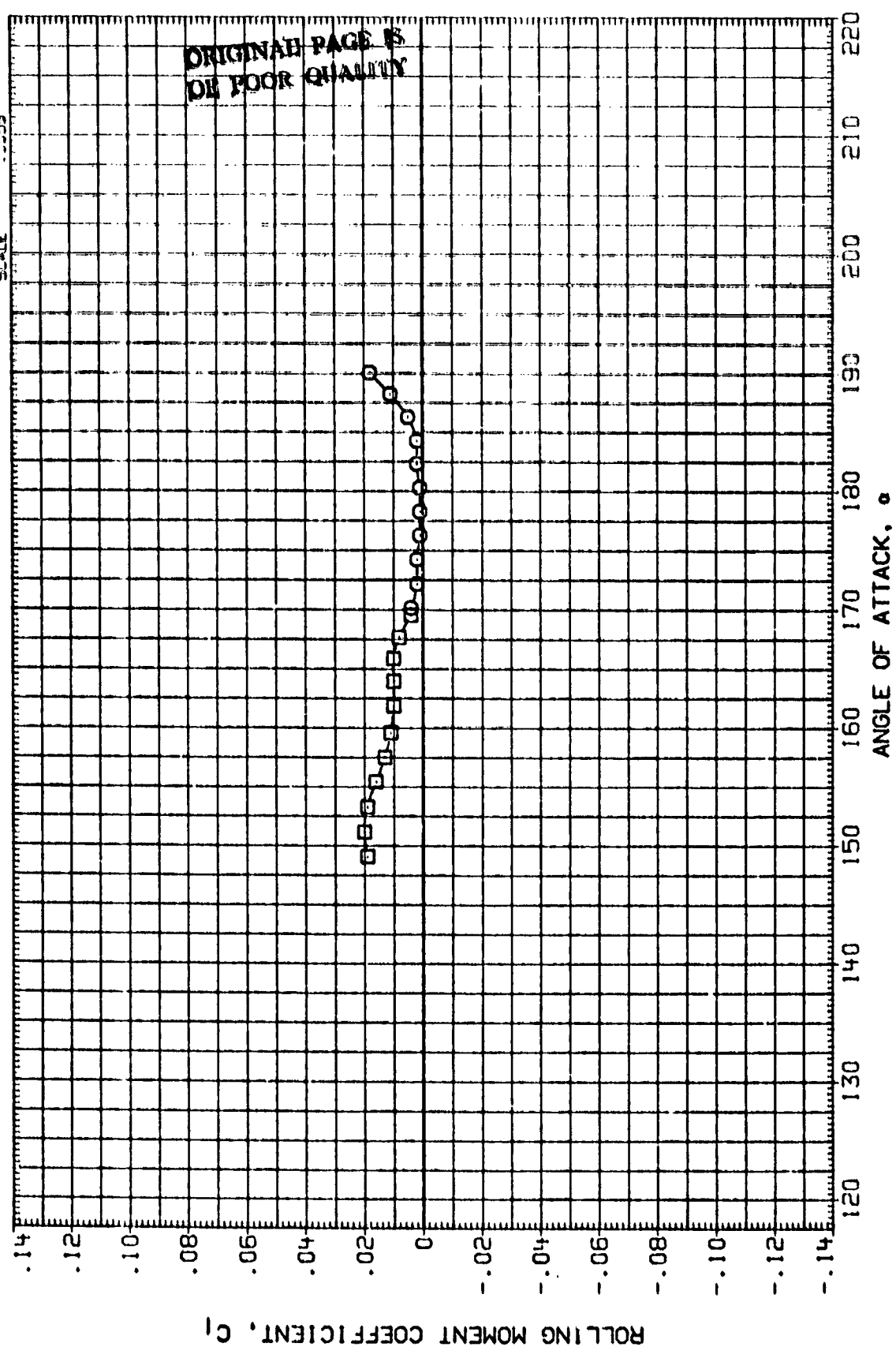
(D)MACH = 3.48

REFERENCE INFORMATION
 SREF 316.2600 SQ. FT.
 LREF 146.0000 IN.
 BREF 146.0000 IN.
 XREF -0000 IN.
 YREF -0000 IN.
 ZREF -0000 IN.
 SCALE .0055

PHI
 337.500
 337.500

CONFIGURATION
 MSFC TMT 6W5 (SA21F) SRB WITH PROTUBERANCES
 MSFC TMT 6W5 (SA21F) SRB WITH PROTUBERANCES

DATA SET SYMBOL
 A1R031 ○
 A1R032 □



SRB REENTRY ROLL CHARACTERISTICS

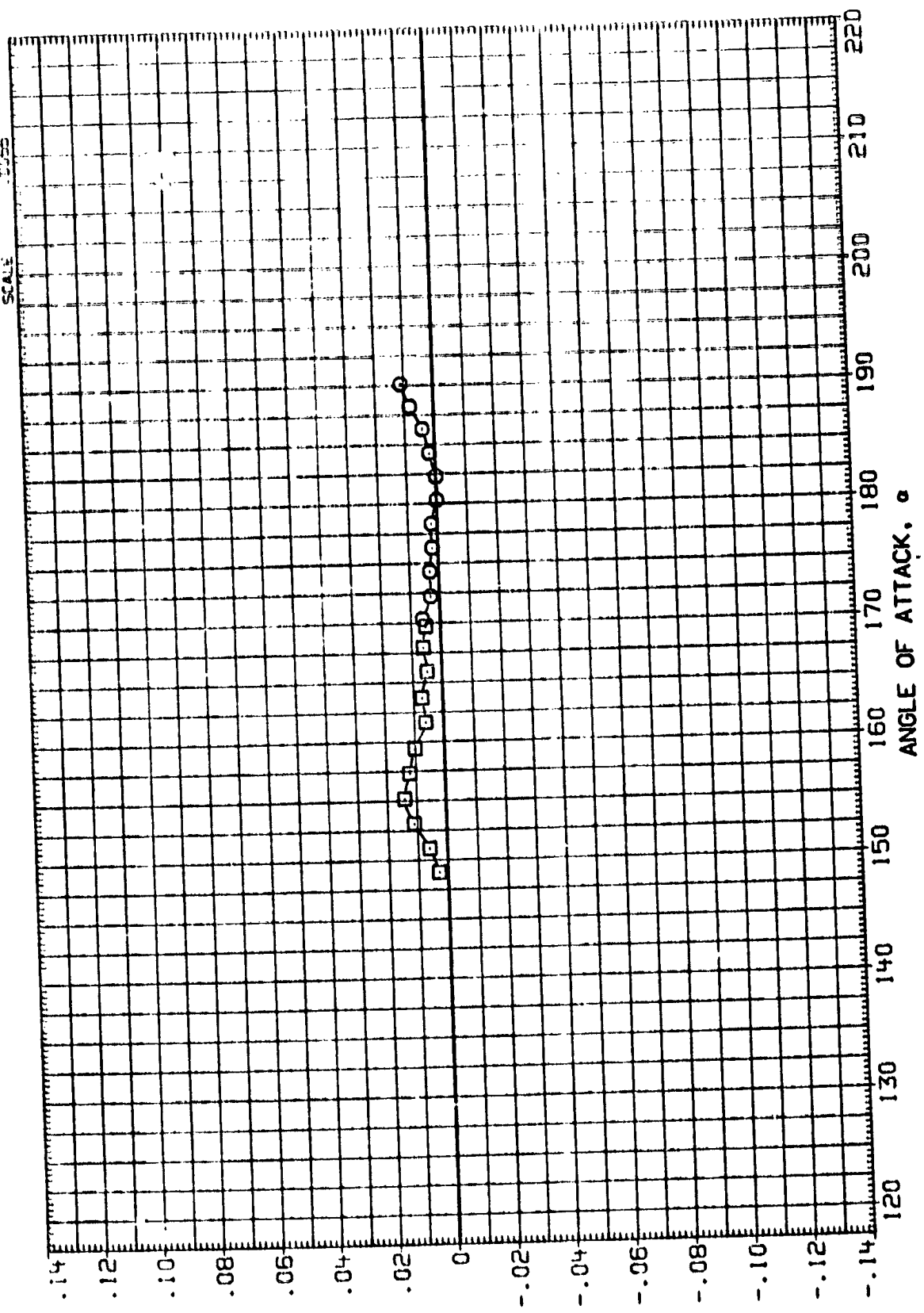
(A) MACH = 1.46

REFERENCE INFORMATION
 SPRT 116.2500 SQ.FT.
 LREF 146.0000 IN.
 BREF 146.0000 IN.
 XREF 146.0000 IN.
 YREF 146.0000 IN.
 ZREF 146.0000 IN.
 SCALE .0005

PHI
 337.500
 337.500

CONFIGURATION
 MSFC INT 6V5 (SA21F) SRB WITH PROTRUBERANCES
 MSFC INT 6V5 (SA21F) SRB WITH PROTRUBERANCES

DATA SET SYMBOL
 AIR031
 AIR032



SRB REENTRY ROLL CHARACTERISTICS

(B) MACH = 1.96

DATA SET SYMBOL

A1R031
A1R032

CONFIGURATION

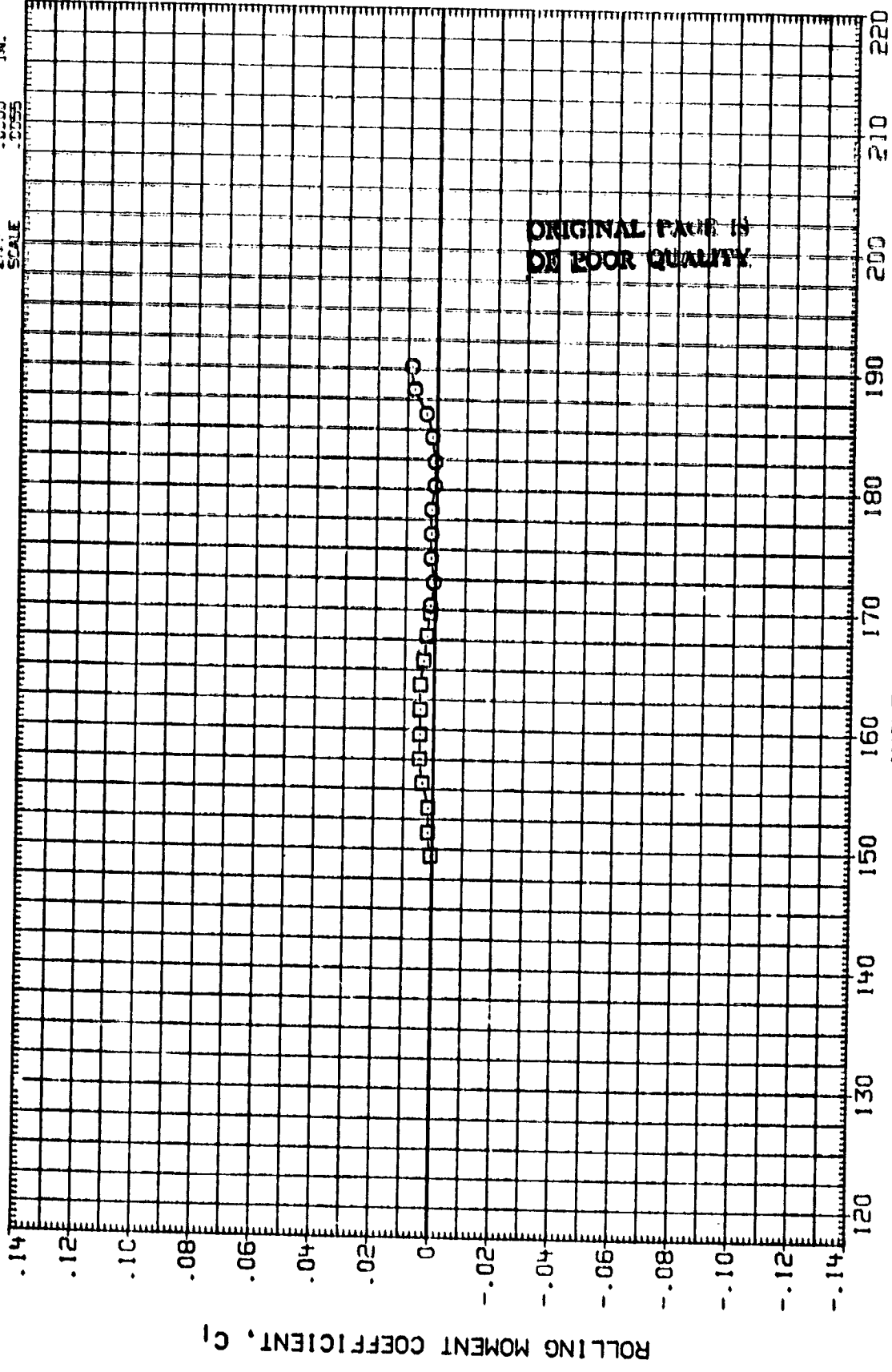
MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES
MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

PHI

337.500
337.500

REFERENCE INFORMATION

SREF 116.2600 50. FT.
LREF 146.0000 IN.
BREF 146.0000 IN.
XREF -5000 IN.
YREF -5000 IN.
ZREF -5000 IN.
SCALE .0055



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SRB REENTRY ROLL CHARACTERISTICS

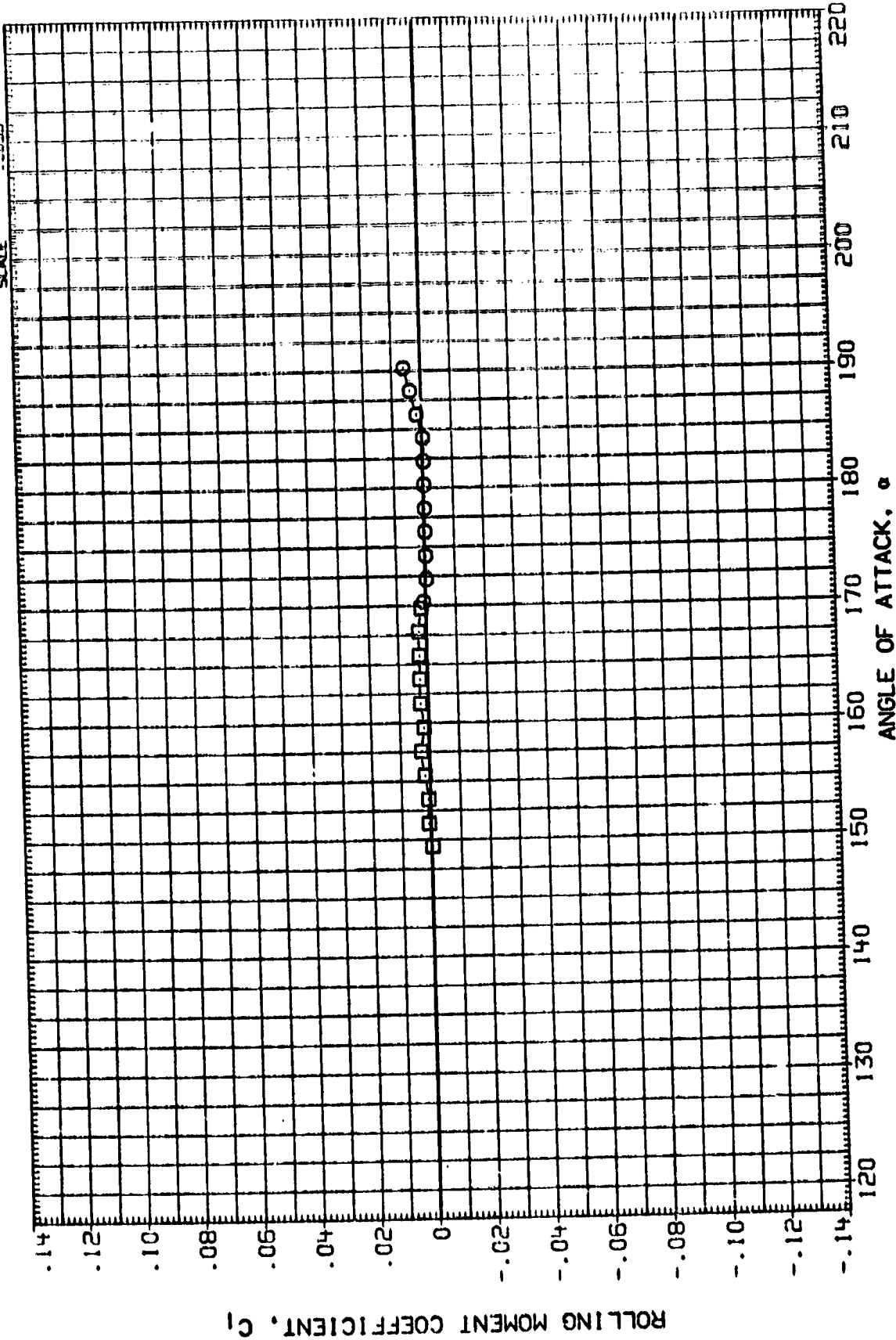
(C)MACH = 2.74

DATA SET SYMBOL
AIR031
AIR032

MSFC TMT 6M5 (SA21F) SRB WITH PROTUBERANCES
MSFC TMT 6M5 (SA21F) SRB WITH PROTUBERANCES

PHI
337.500
337.500

REFERENCE INFORMATION
SPEC 315.2500 SO.FT.
LEEF 145.0000 IN.
EPEF 145.0000 IN.
XMPF .0000 IN.
YMPF .0000 IN.
ZMPF .0000 IN.
SCALE .0050

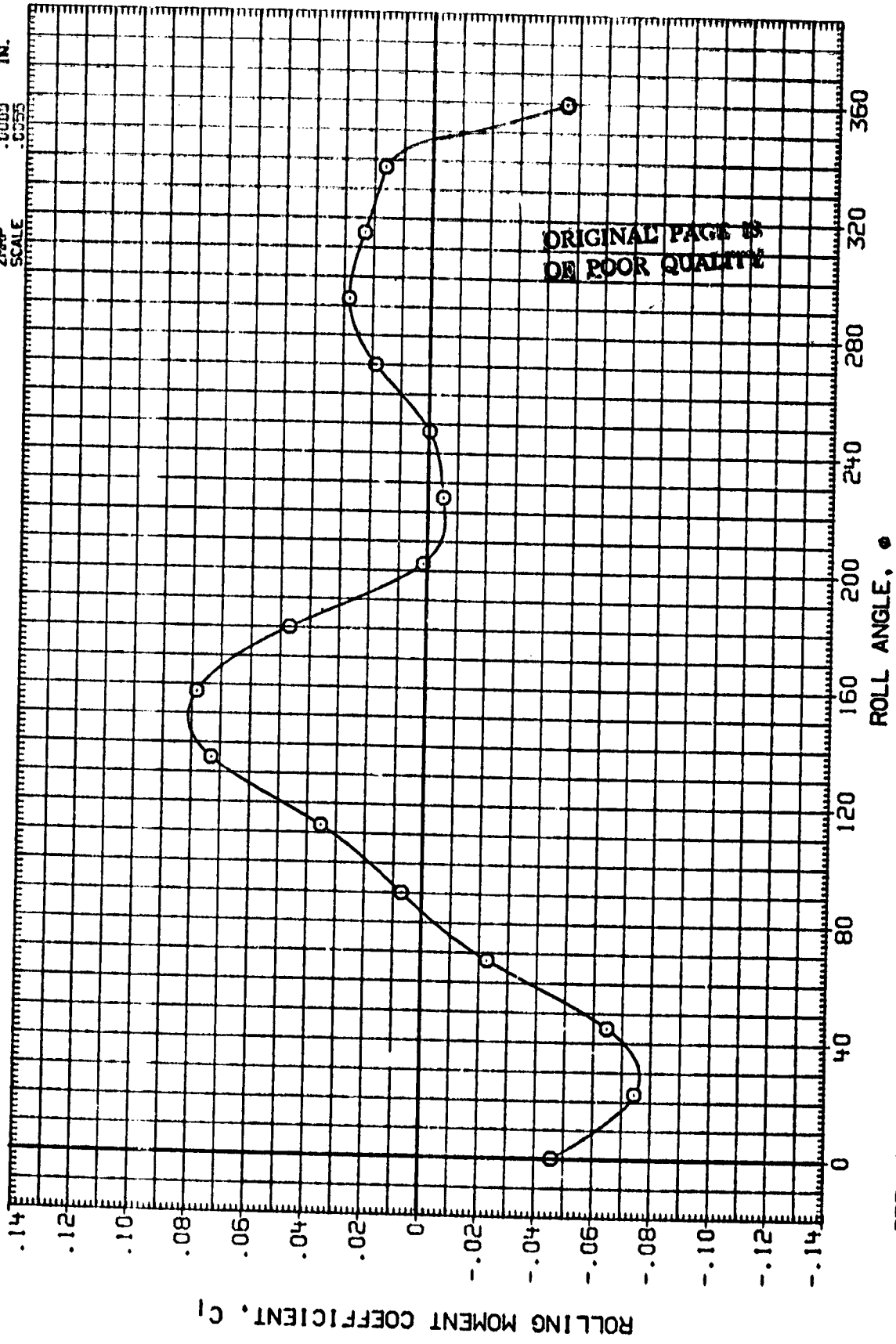


SRB REENTRY ROLL CHARACTERISTICS

(D)MACH = 3.48

DATA SET SYMBOL: EIR101
 CONFIGURATION: MSFC TMT 6+5 (SA21F) SRB WITH PROTUBERANCES
 ALPHA: 155.000

REFERENCE INFORMATION
 SREF 116.2600 SQ.FT.
 LREF 146.0000 IN.
 BREF 146.0000 IN.
 XMRP .0000 IN.
 YMRP .0000 IN.
 ZMRP .0000 IN.
 SCALE .0000



SRB REENTRY ROLL CHARACTERISTICS

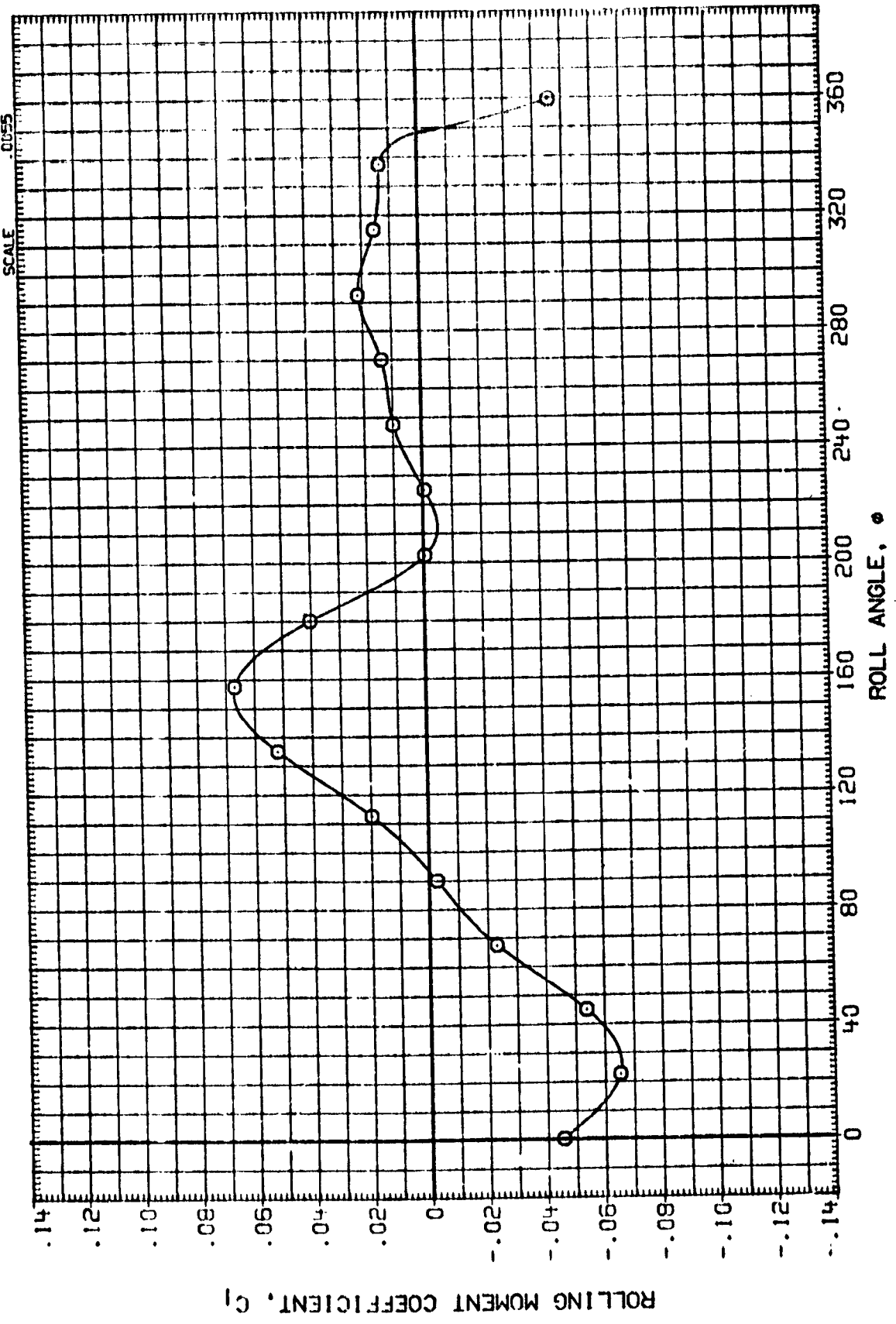
(A) MACH = 1.46

REFERENCE INFORMATION

SREF	116.2600	SO.FT.
LREF	146.0000	IN.
BREF	146.0000	IN.
XMRP	.0000	IN.
YMRP	.0000	IN.
ZMRP	.0000	IN.
SCALE	.0055	

ALP/A
155.000

DATA SET SYMBOL: O CONFIGURATION: MSFC THT 6x5 (SA21F) SRB WITH PROTUBERANCES



SRB REENTRY ROLL CHARACTERISTICS

(B) MACH = 1.96

REFERENCE INFORMATION

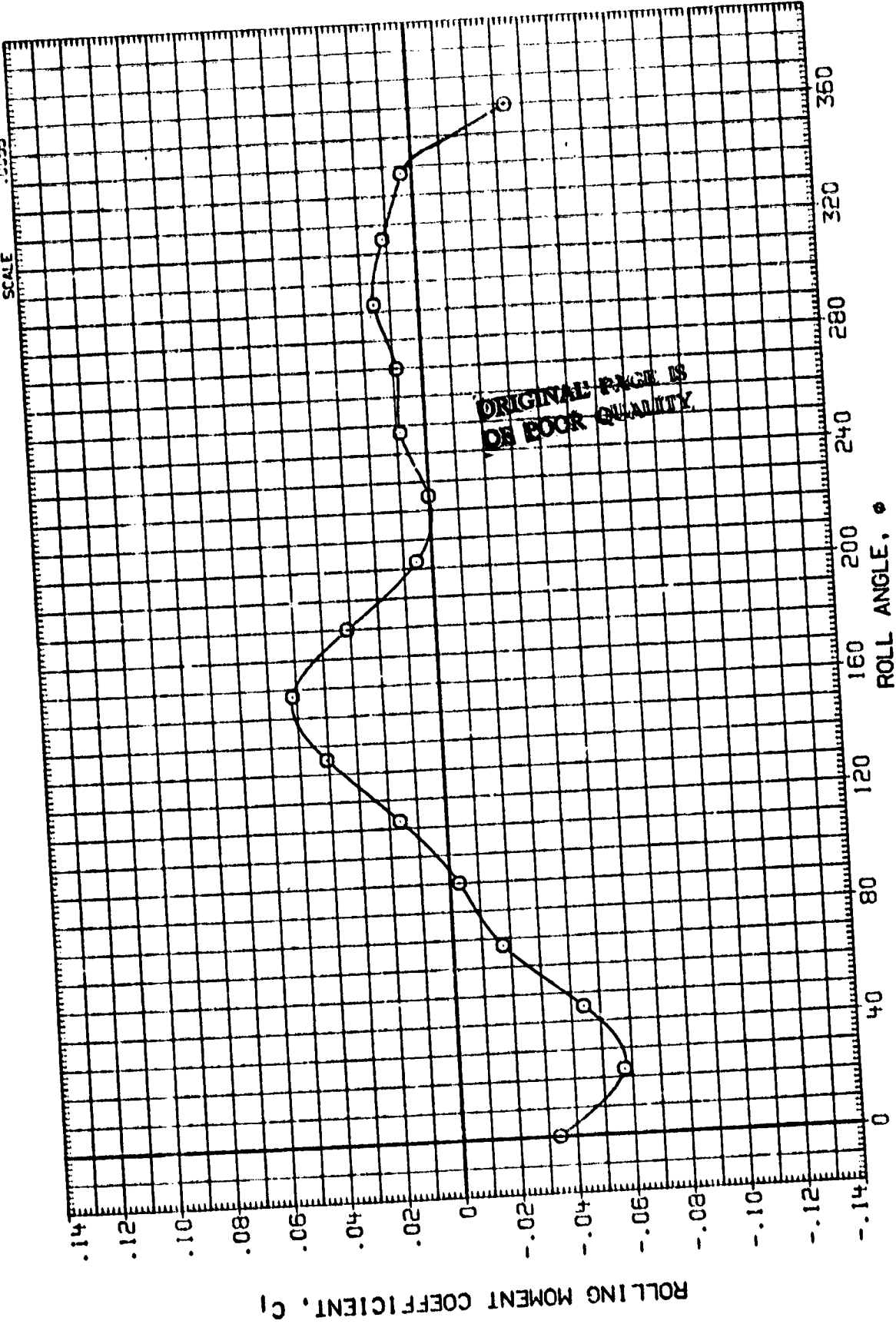
SREF	116.2600	SO. FT.
LREF	146.0000	IN.
BREF	146.0000	IN.
XMPF	.0000	IN.
YMPF	.0000	IN.
ZMPF	.0000	IN.
SCALE	.0055	

ALPHA
155.000

CONFIGURATION
SRB WITH PROTUBERANCES

DATA SET SYMBOL
EIR:01 O

MSC TMT 645 (SA2IF) SRB WITH PROTUBERANCES



SRB REENTRY ROLL CHARACTERISTICS

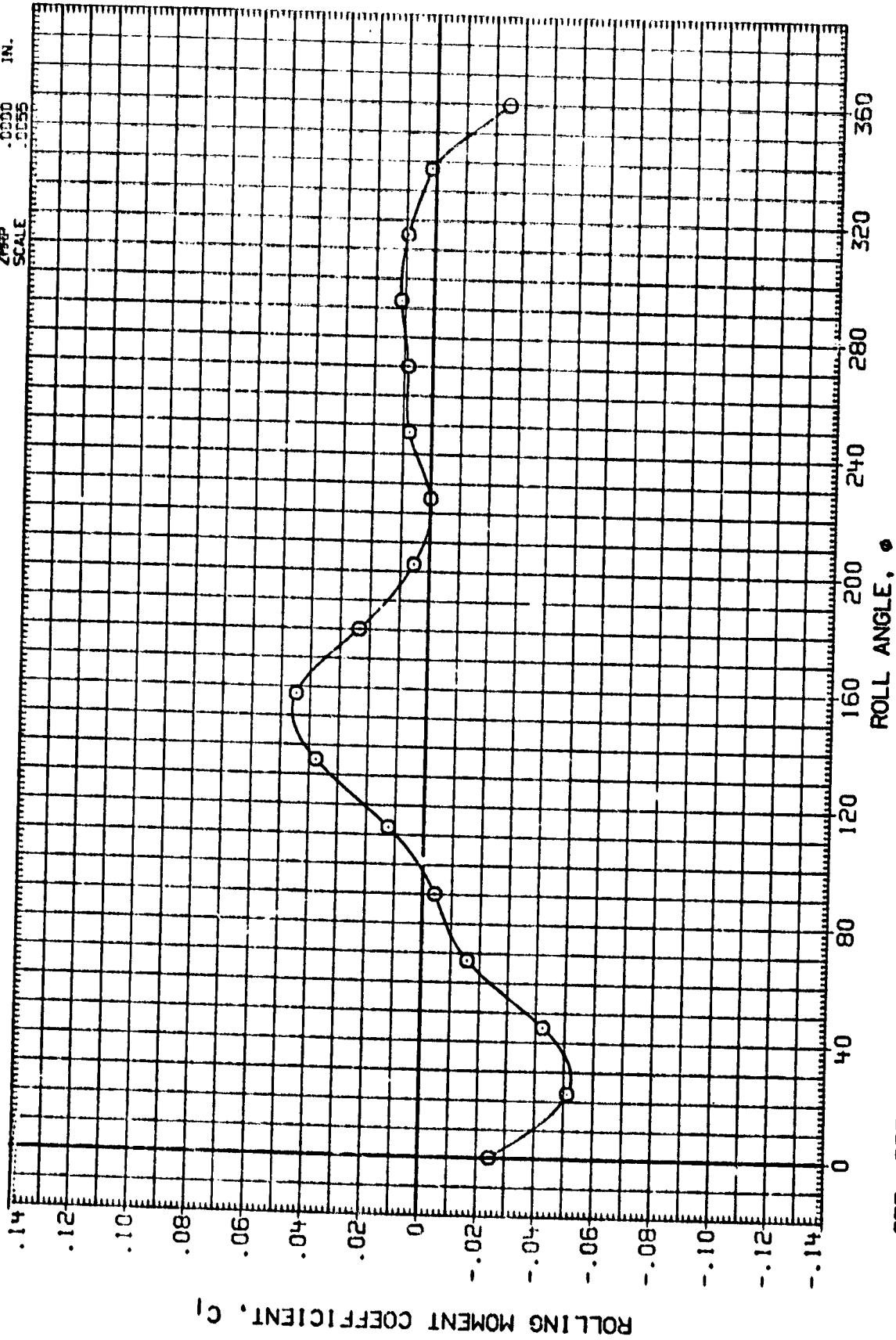
(C) MACH = 2.74

DATA SET SYMBOL
EIR:01 O

MSFC TMT 645 (S421F) SRB WITH PROTUBERANCES

ALPHA
155.000

REFERENCE INFORMATION
SREF 116.2600 SQ.FT.
I.REF 146.0000 IN.
BREF 146.0000 IN.
YMRP .0000 IN.
ZMRP .0000 IN.
SCALE .0055



SRB REENTRY ROLL CHARACTERISTICS

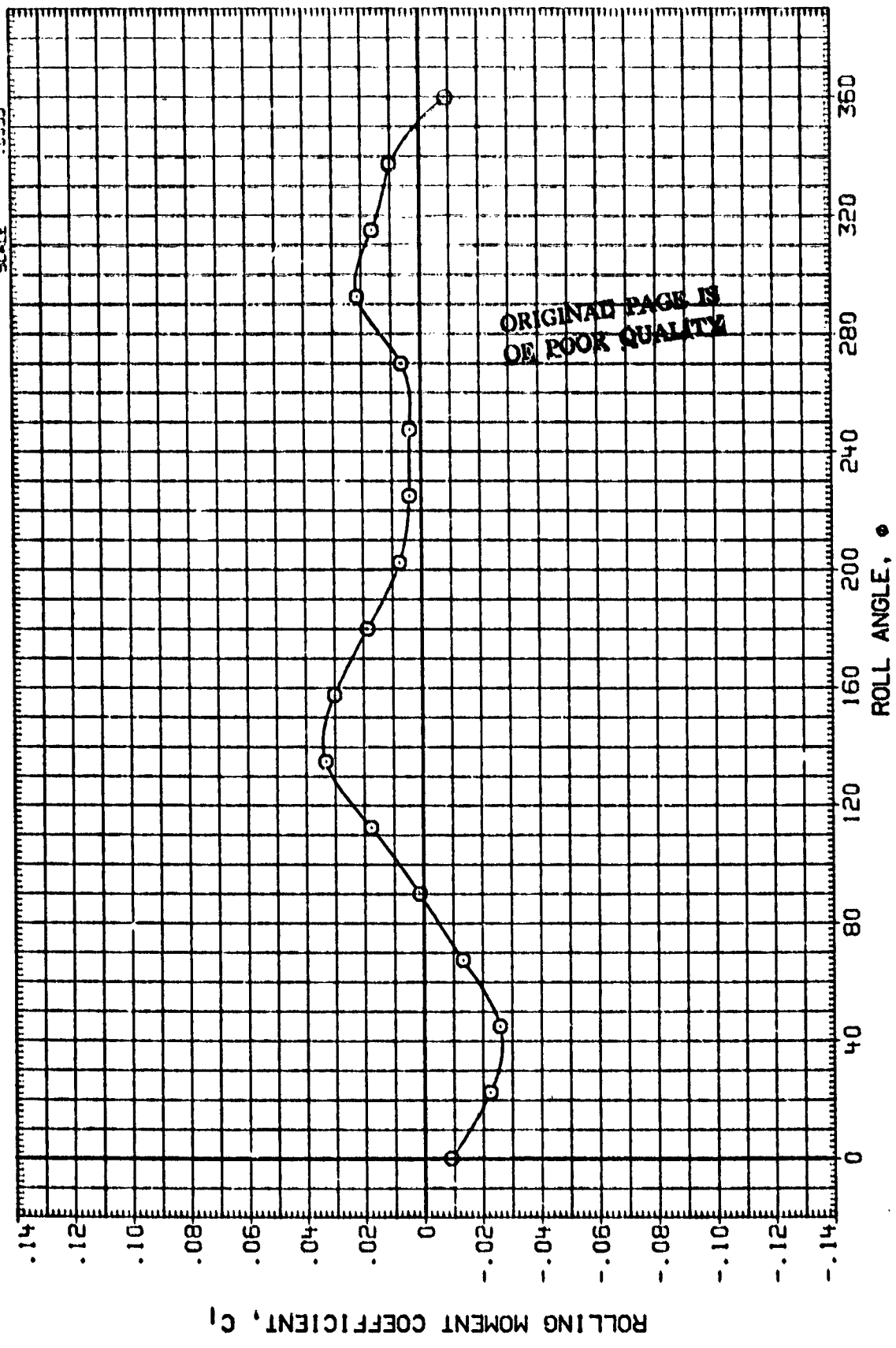
(D)MACH = 3.48

DATA 'ET SYMBOL
E1P201 O

MSFC TMT 645 (S21F) SRB WITH PROTUBERANCES

CONFIGURATION ALPHA
165.000

REFERENCE INFORMATION
SREF 115.2600 SQ.FT.
LREF 146.0000 IN.
BREF 146.0000 IN.
XREF .0000 IN.
YREF .0000 IN.
ZREF .0000 IN.
SCALE .0005



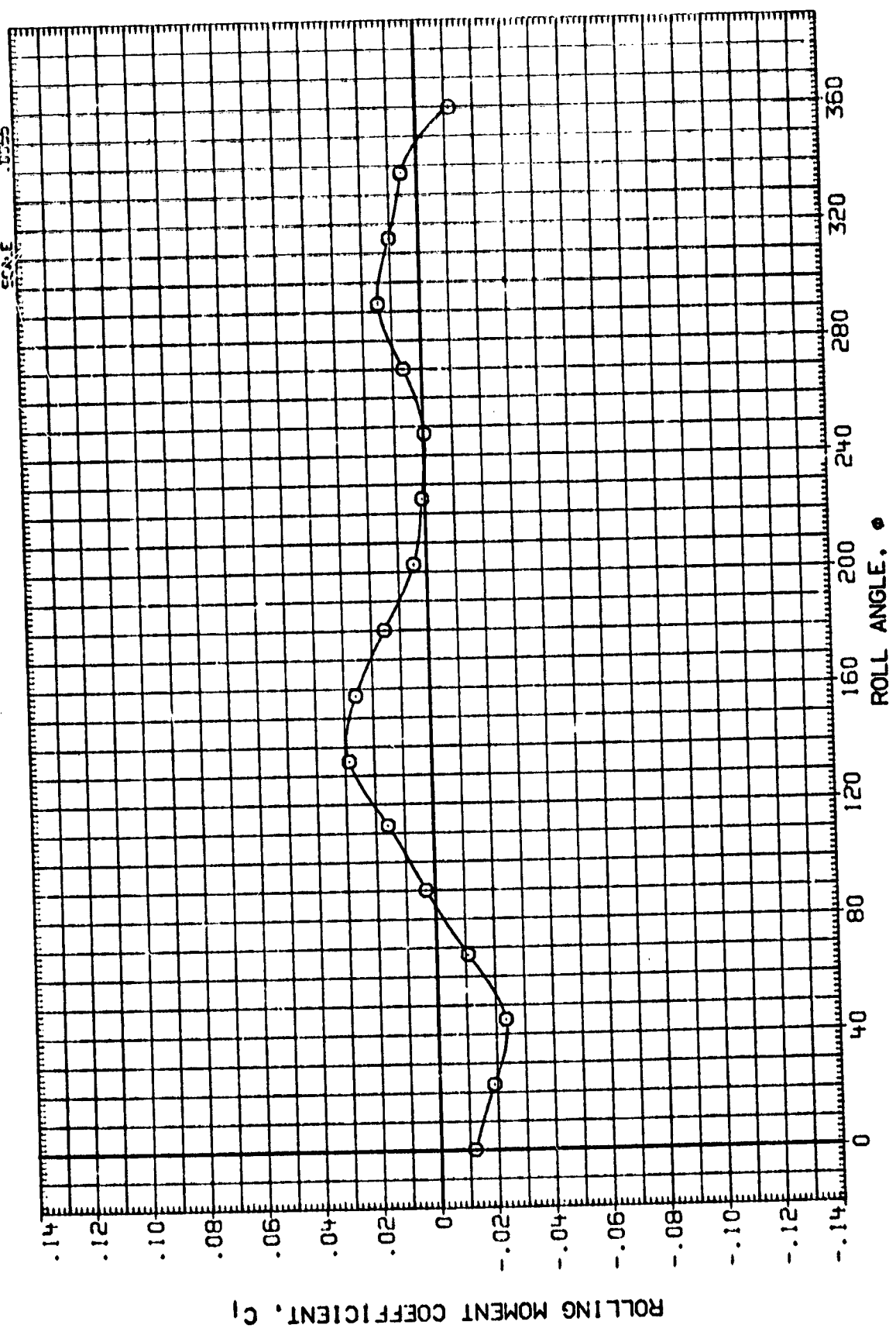
SRB REENTRY ROLL CHARACTERISTICS

(A) MACH = 1.46

REFERENCE INFORMATION
 SREF 116.2500 SO.FT.
 LREF 146.0000 IN.
 BREF 146.0000 IN.
 XREFP .0000 IN.
 YREFP .0000 IN.
 ZREFP .0000 IN.
 SCALE .005

ALPHA
 165.000

DATA SET SYMBOL ○ MSFC TMT 6x3 (SA21F) SRB WITH PROTUBERANCES



SRB REENTRY ROLL CHARACTERISTICS

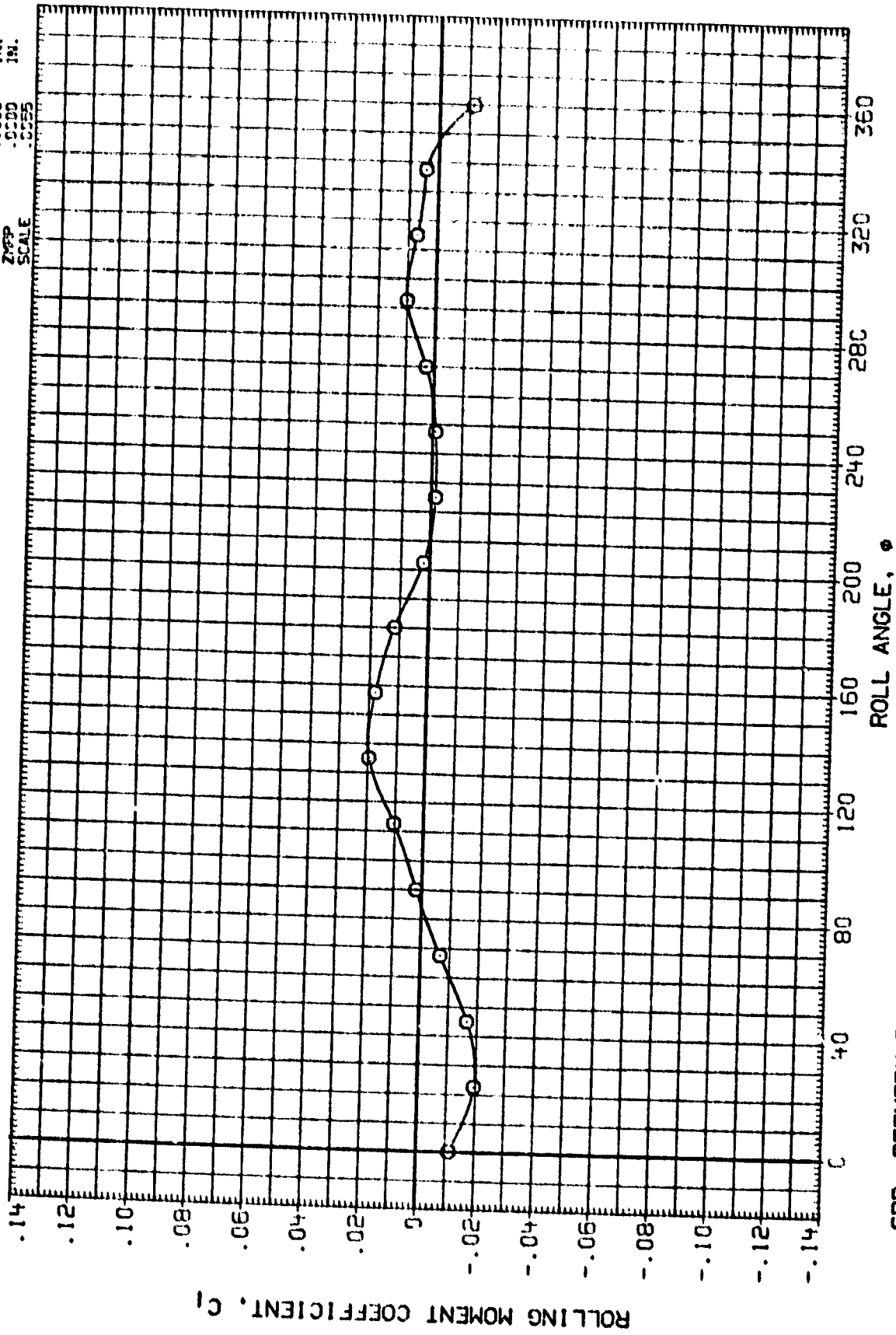
(B) MACH = 1.96

DATA SET SYMBOL
E1R201

CONFIGURATION
MSFC THT 6N5 (SA21F) SRB WITH PROTUBERANCES

ALPHA
165.000

REFERENCE INFORMATION
SREF 116.2500 SQ.FT.
LREF 146.0000 IN.
BREF 145.0000 IN.
XREF .0000 IN.
YREF .0000 IN.
ZREF .0000 IN.
SCALE .0005



SRB REENTRY ROLL CHARACTERISTICS

(C)MACH = 2.74

53

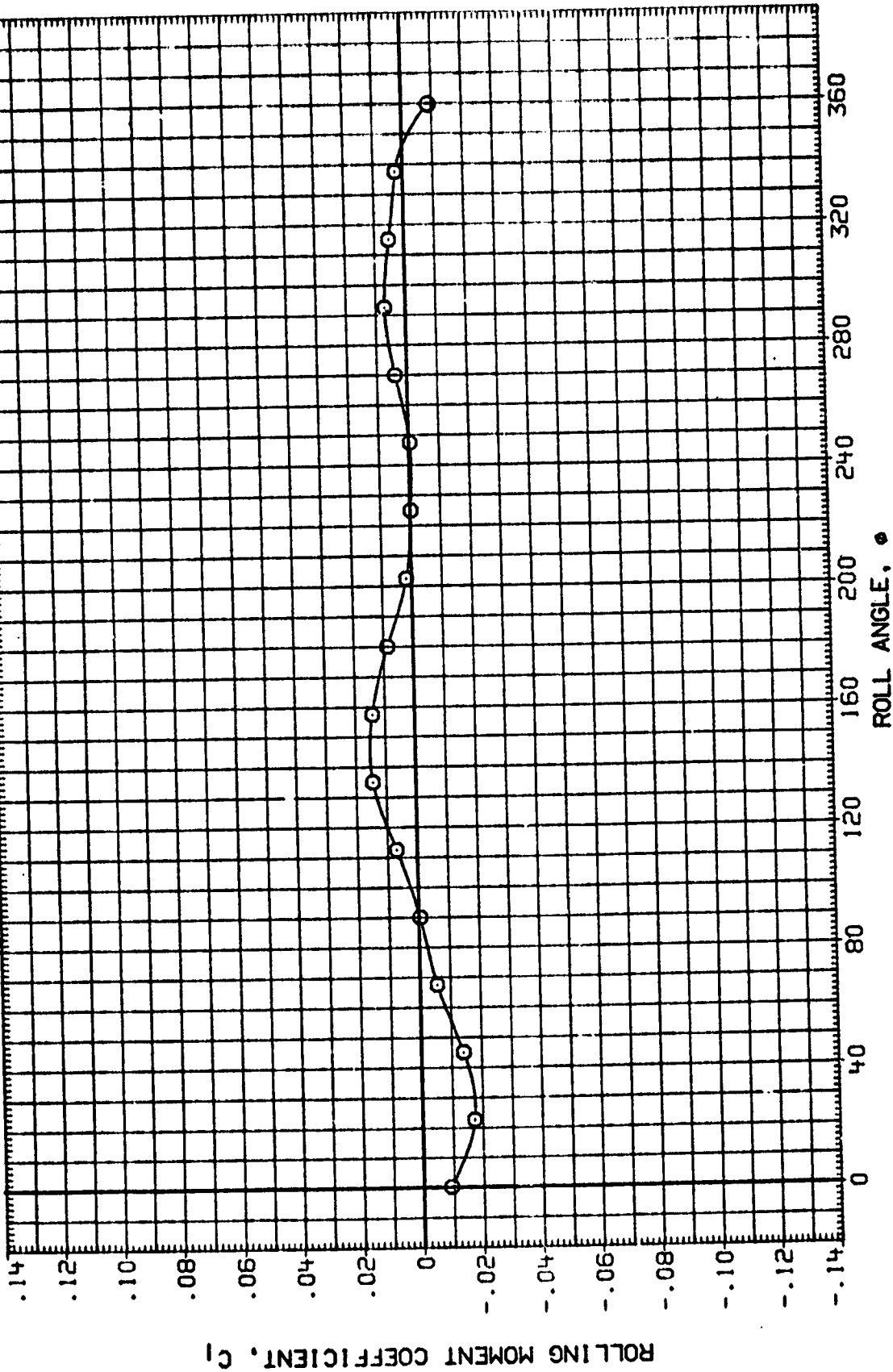
DATA SET SYMBOL
E1R201 ○

CONFIGURATION
MSFC TMT 6V5 (SA21F) SRB WITH PROTUBERANCES

ALPHA
165.000

REFERENCE INFORMATION

SREF	116.2600	SO. FT.
LREF	146.0000	IN.
BREF	146.0000	IN.
XMRP	.0000	IN.
YMRP	.0000	IN.
ZMRP	.0000	IN.
SCALE	.0055	

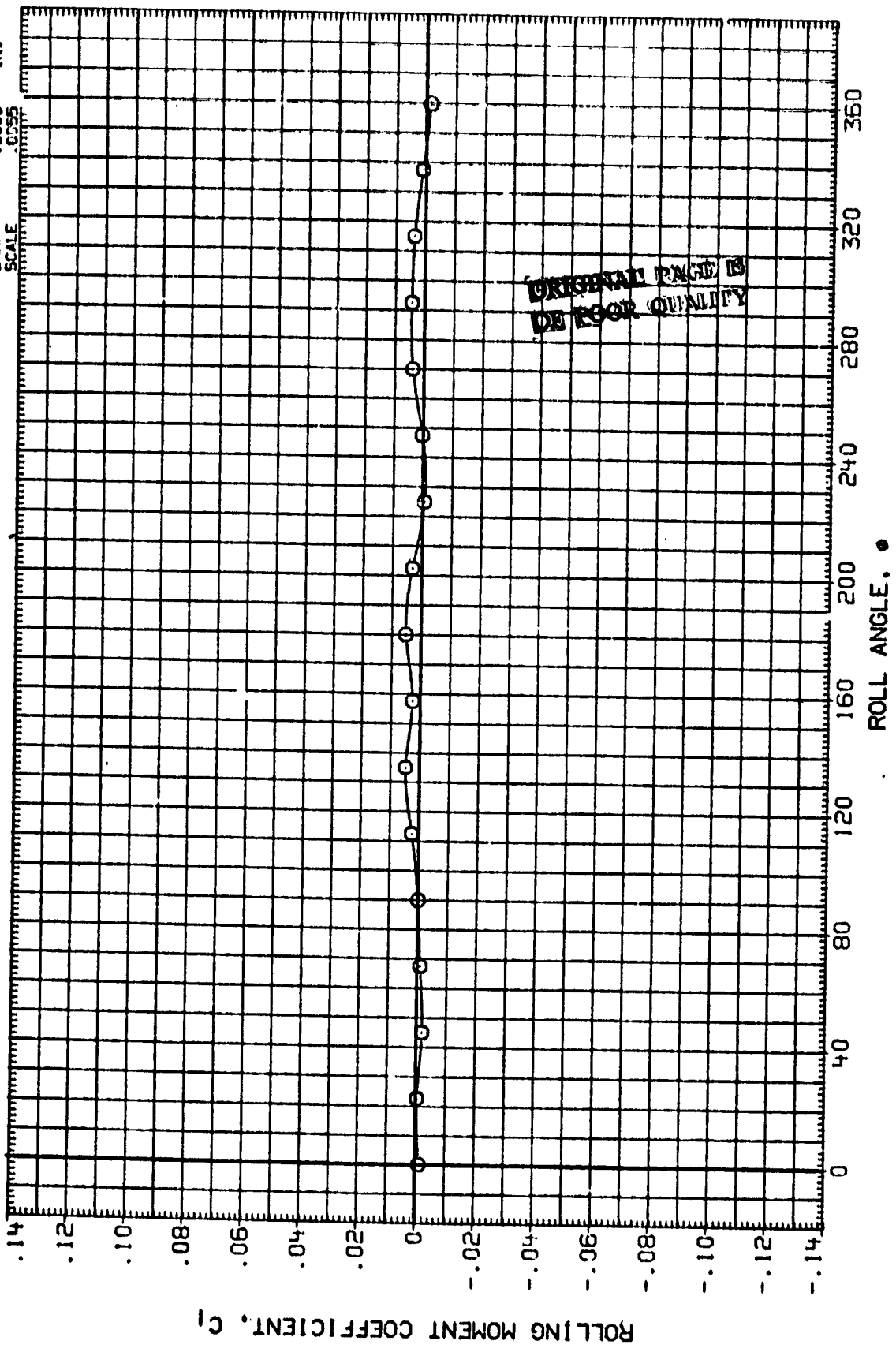


SRB REENTRY ROLL CHARACTERISTICS

(D)MACH = 3.48

DATA SET SYMBOL CONFIGURATION ALPHA
 E1R301 O MSFC INT 645 (SA21F) SRB WITH PROTUBERANCES 175.000

REFERENCE INFORMATION
 SREF 116.2600 SQ.FT.
 LREF 146.0000 IN.
 BREF 146.0000 IN.
 XMRP .0000 IN.
 YMRP .0000 IN.
 ZMRP .0000 IN.
 SCALE .0055



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 OF POOR QUALITY

SRB REENTRY ROLL CHARACTERISTICS

65 (A)MACH = 1.46

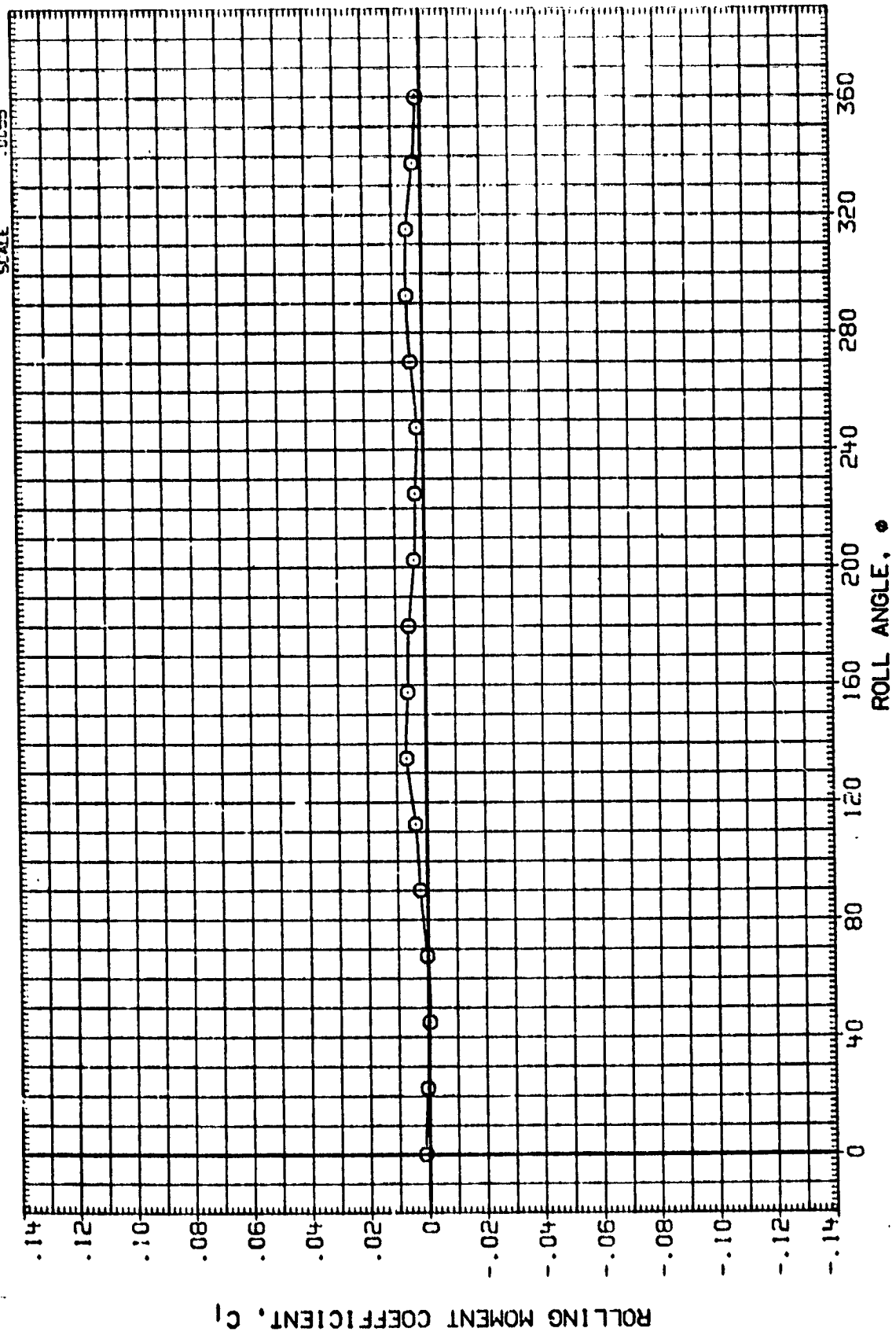
REFERENCE INFORMATION
 SREF 116.2500 SQ. FT.
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 BPREF 146.0000 IN.
 XPPP .0000 IN.
 YPPP .0000 IN.
 ZPPP .0000 IN.
 SCALE .0025

ALPHA
 175.000

CONFIGURATION
 SRB WITH PROTUBERANCES

DATA SET SYMBOL
 E1R301 O

09



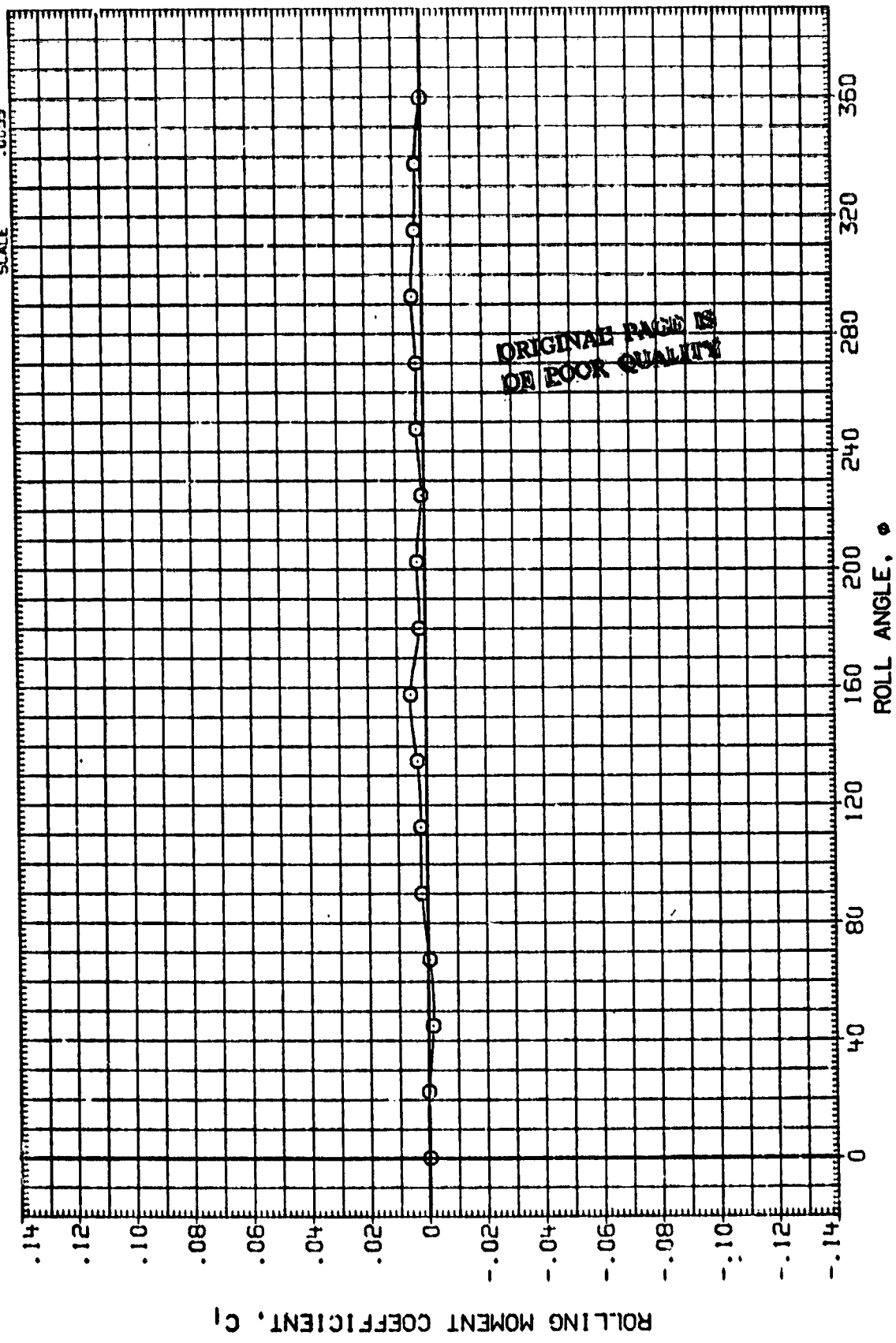
SRB REENTRY ROLL CHARACTERISTICS

(B) MACH = 1.96

DATA SET SYMBOL O MSFC TMT 6M5 (SA21F) SRB WITH PROTUBERANCES CONFIGURATION ALPHA SO. FT.
 E1R301 116.2500 175.000
 L1REF 146.0000
 B1REF 146.0000
 X1PRP -0.0000
 Y1PRP -0.0000
 Z1PRP -0.0000
 SCALE -0.0035

ALPHA
175.000

CONFIGURATION
SRB WITH PROTUBERANCES



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 OF POOR QUALITY

SRB REENTRY ROLL CHARACTERISTICS

(C)MACH = 2.74

22

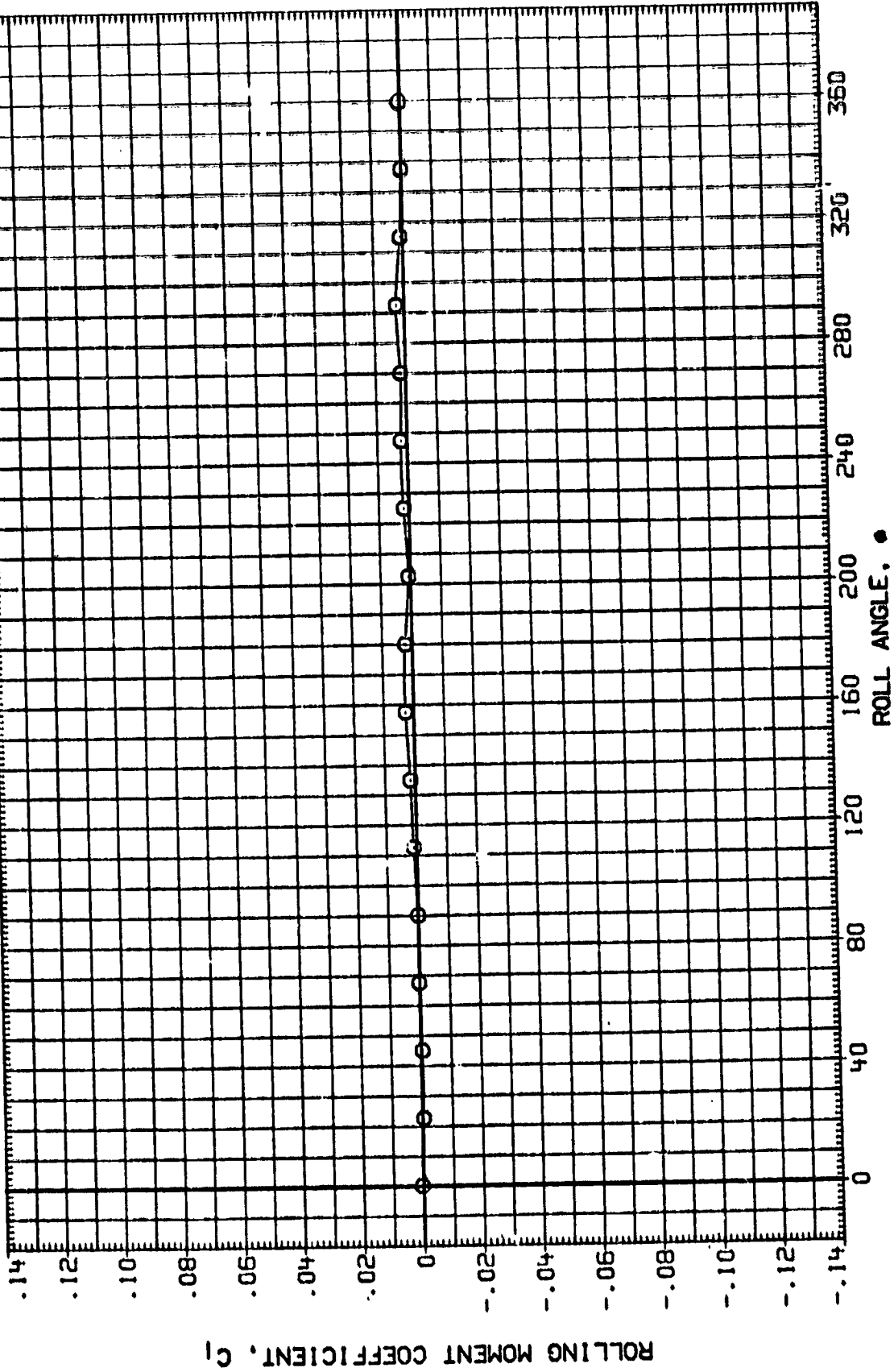
DATA SET SYMBOL
E1R301 O

CONFIGURATION
MSC TH1 645 (SA21F) SRB WITH PROTUBERANCES

ALPHA
175.000

REFERENCE INFORMATION

SREF	116.2600	IN.	SD. FT.
LREF	145.0000	IN.	
BREF	145.0000	IN.	
XREF	-0.0000	IN.	
YREF	-0.0000	IN.	
ZREF	-0.0000	IN.	
SCALE	-0.055		



SRB REENTRY ROLL CHARACTERISTICS

(D) MACH = 3.48

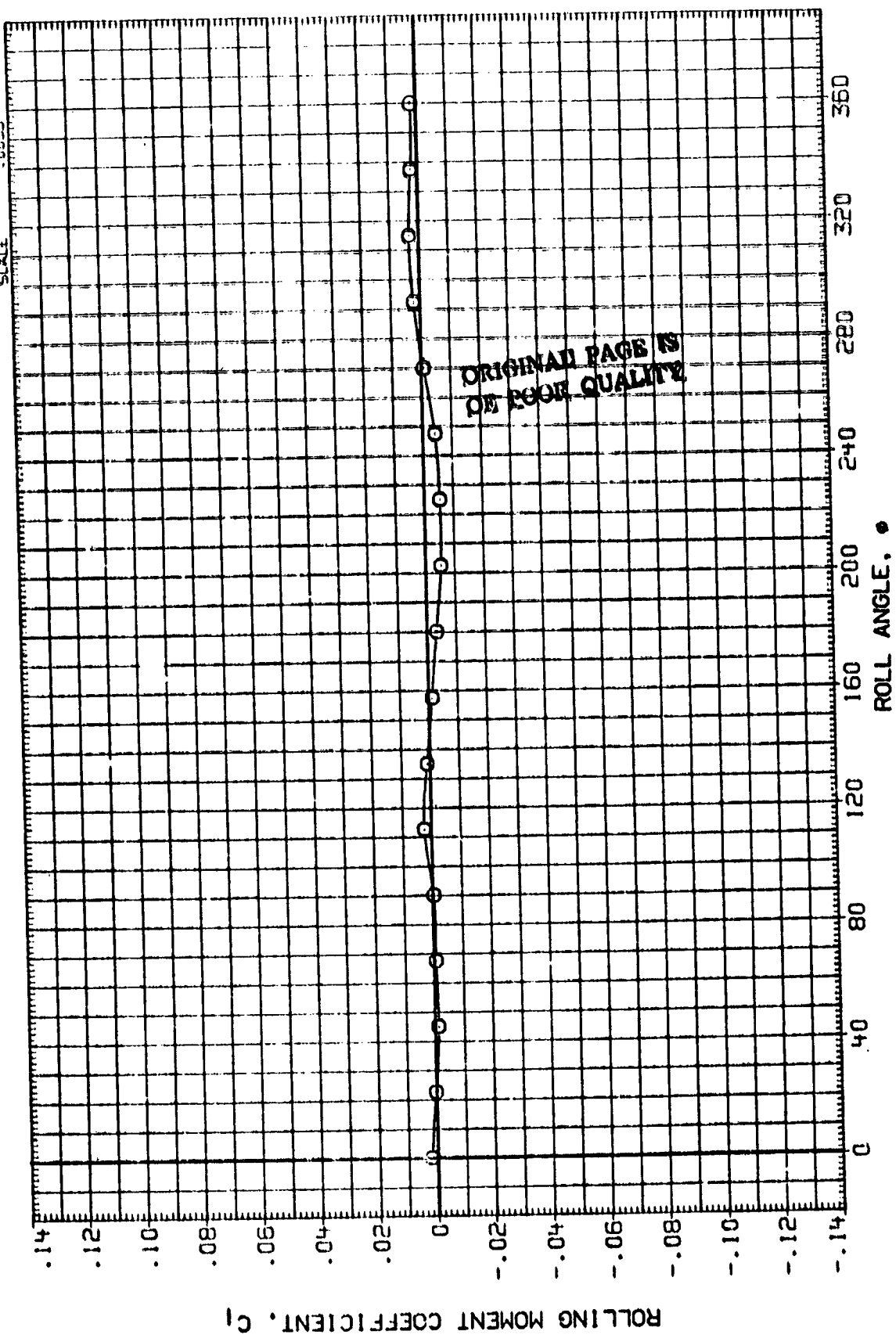
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SPAT	0115.2630	SQ. FT.
LREF	146.0000	IN.
BREF	146.0000	IN.
XREF	0.0000	IN.
YREF	0.0000	IN.
ZREF	0.0000	IN.
SCALE	0.0525	

ALPHA
185.000

CONFIGURATION
MSFC TMT 6M5 (SA21F) SRB WITH PROTUBERANCES

DATA SET SYMBOL
E1R401 O



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ROLL ANGLE, °

SRB REENTRY ROLL CHARACTERISTICS

(A) MACH = 1.46

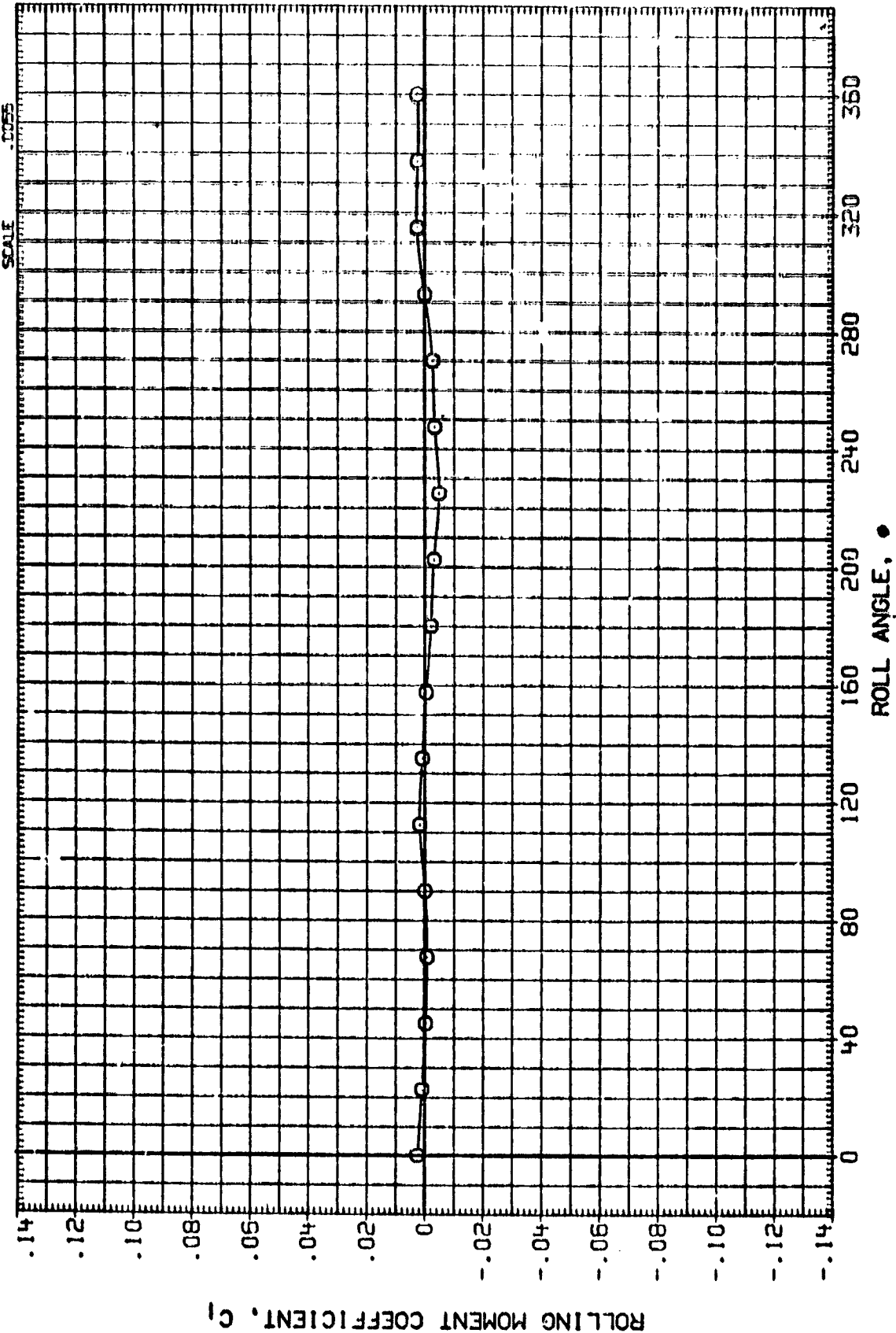
49

DATA SET SYMBOL
EIR401 O

CONFIGURATION
MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

ALPHA
185.000

REFERENCE INFORMATION
SREF 116.2500 SO.FT.
LREF 146.0000 IN.
BREF 146.0000 IN.
XREF -0000 IN.
YREF -0000 IN.
ZREF -0000 IN.
SCALE -0055



SRB REENTRY ROLL CHARACTERISTICS

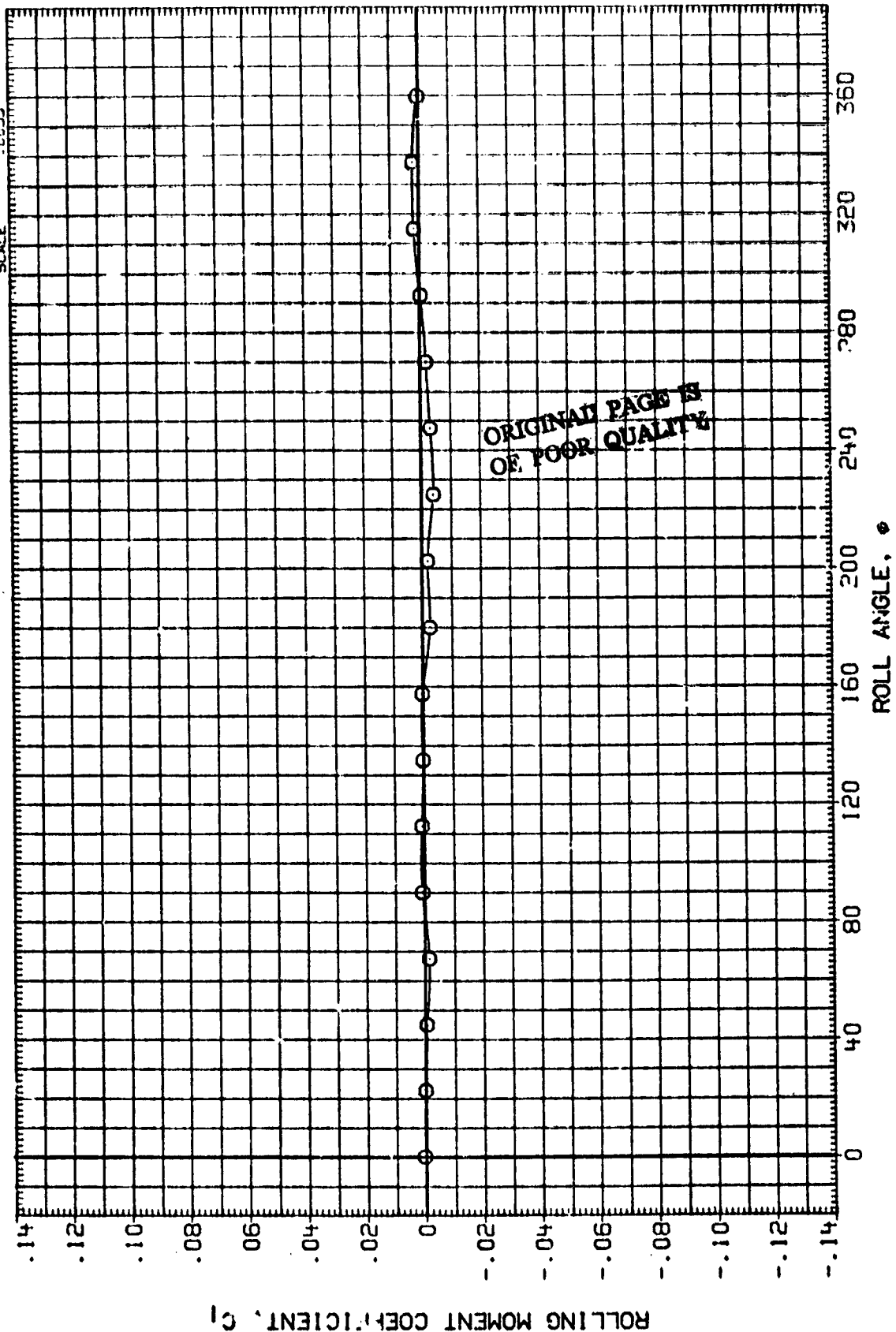
(B)MACH = 1.96

DATA SET SYMBOL
EIR-01

CONFIGURATION
MSFC TWT 6W5 (SA2IF) SRB WITH PROTUBERANCES

ALPHA
185.000

REFERENCE INFORMATION
SREF 116.2600 SQ.FT.
LREF 146.0000 IN.
BREF 146.0000 IN.
XREF .0000 IN.
YREF .0000 IN.
ZREF .0000 IN.
SCALE .025



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SRB REENTRY ROLL CHARACTERISTICS

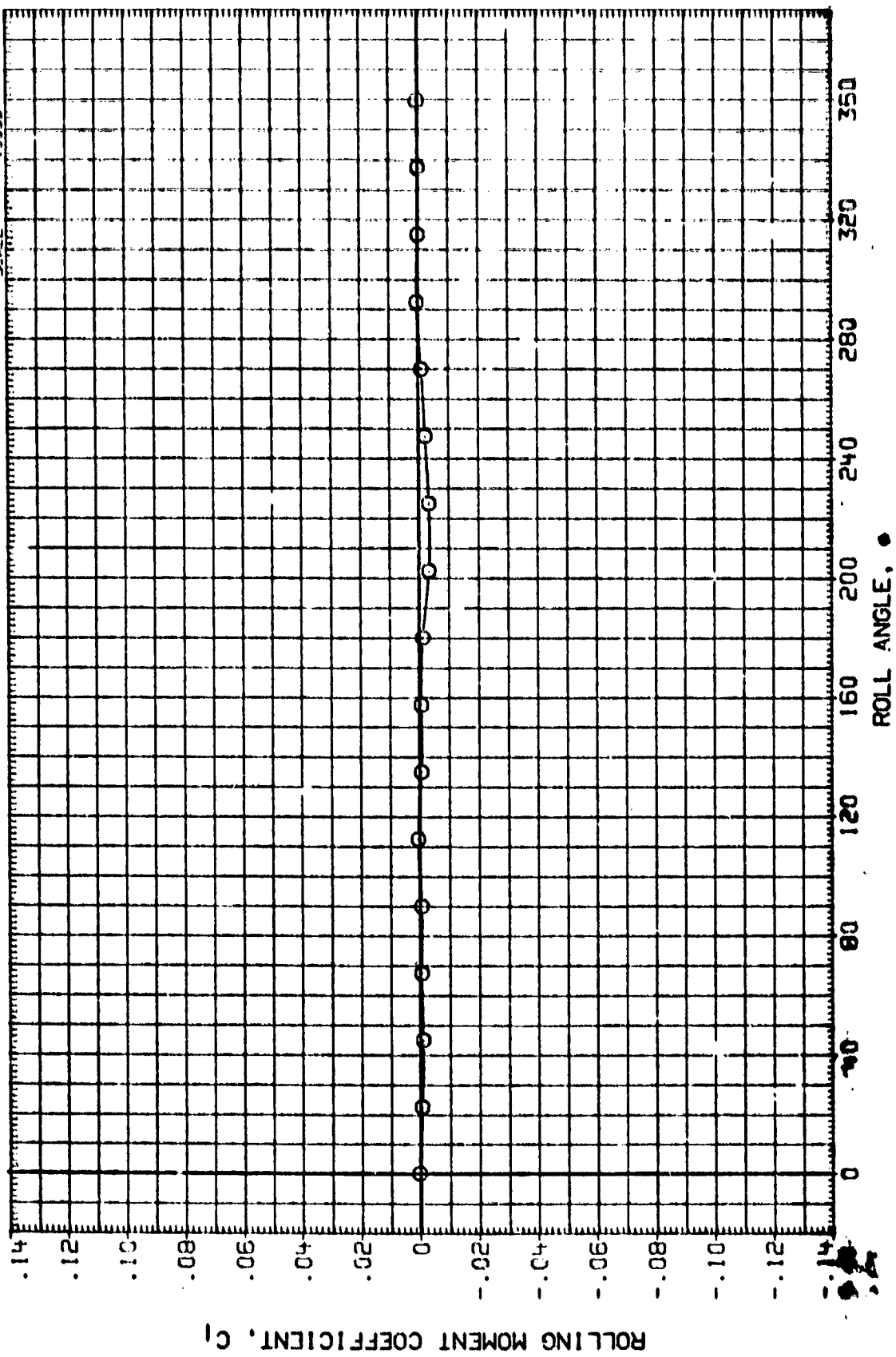
(C)MACH = 2.74

REFERENCE INFORMATION
 SREF 116.2600 SQ. FT.
 LREF 146.0000 IN.
 BREF 146.0000 IN.
 YPRP .0000 IN.
 YMRP .0000 IN.
 ZPRP .0000 IN.
 SCALE 0.005

ALPHA
 185.000

CONFIGURATION
 MSFC TMT 6N5 (SA21F) SRB WITH PROTUBERANCES

DATA SET SYMBOL
 E1R401 O



SRB REENTRY ROLL CHARACTERISTICS

(0)MACH = 3.48

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APPENDIX

TABULATED SOURCE DATA

TABLULATED SOURCE DATA. MSFC THT 645 (SA2IF)
 MSFC THT 645 (SA2IF) SRB WITH PROTUBERANCES

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = .000

RUN NO. 112/ 0 RN/L = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.459	149.280	-.06800
1.459	151.430	-.05800
1.459	153.450	-.05100
1.459	155.550	-.04300
1.459	157.570	-.03100
1.459	159.570	-.02200
1.459	161.750	-.01500
1.459	163.860	-.01000
1.459	165.710	-.00900
1.459	167.610	-.00900
1.459	169.550	-.00800
	GRADIENT	.00000

RUN NO. 81/ 0 RN/L = 7.56 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.959	149.060	-.06800
1.959	151.140	-.05900
1.959	153.150	-.05100
1.959	155.290	-.04400
1.959	157.450	-.03600
1.959	159.560	-.02900
1.959	161.600	-.02200
1.959	163.730	-.01500
1.959	165.720	-.01000
1.959	167.720	-.00700
1.959	169.660	-.00700
	GRADIENT	.00000

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TABLATED SOURCE DATA. MSFC THT 645 (SA21F)
MSFC THT 645 (SA21F) SPB WITH PROTURERANCES

PAGE 2

(RIPROD) 1 23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SO.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = .000

RUN NO. 1/ 4 RV/L = 5.24 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	151.320	-.04200
2.740	153.390	-.03200
2.740	155.420	-.03300
2.740	157.500	-.02800
2.740	159.560	-.02400
2.740	161.570	-.02000
2.740	163.610	-.01400
2.740	165.660	-.01000
2.740	167.700	-.00700
2.740	169.670	-.00500
	GRADIENT	.00000

RUN NO. 2/ 1 RV/L = 7.13 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	149.320	-.03300
3.480	151.300	-.03000
3.480	153.380	-.02700
3.480	155.390	-.02400
3.480	157.460	-.02100
3.480	159.530	-.01800
3.480	161.580	-.01500
3.480	163.600	-.01100
3.480	165.670	-.00800
3.480	167.700	-.00500
3.480	169.660	-.00500
	GRADIENT	.00000

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PAGE 3

TABLULATED SOURCE DATA. MSFC TMT 645 (SA21F)
MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

(R1R002) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = .000

RUN NO. 111/ 0 RN/L = 6.52 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.459	170.090	-.00500
1.459	172.150	-.00200
1.459	174.230	-.00150
1.459	175.260	.00000
1.459	178.260	.00000
1.459	180.290	.00000
1.459	182.310	.00100
1.459	184.330	.00200
1.459	185.280	.00300
1.459	188.240	.00500
1.459	190.100	.00900
	GRADIENT	.00000

RUN NO. 82/ 0 RN/L = 7.59 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBI
1.959	170.200	-.00100
1.959	172.150	.00000
1.959	174.230	.00100
1.959	176.220	.00100
1.959	178.270	.00100
1.959	180.260	.00000
1.959	182.270	.00000
1.959	184.250	.00200
1.959	186.260	.00300
1.959	188.240	.00300
1.959	190.170	.00500
	GRADIENT	.00000

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TABLULATED SOURCE DATA. MSFC THT 645 (SA21F)
MSFC THT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 4
(R1R002) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SO.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = .000

RUN NO. 4/ 2 RN/L = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	170.260	-.00300
2.740	172.370	.00100
2.740	174.200	.00300
2.740	176.220	.00000
2.740	178.210	.00000
2.740	180.240	.00000
2.740	182.230	.00000
2.740	184.210	.00000
2.740	186.190	.00200
2.740	188.230	.00300
2.740	190.180	.00300
	GRADIENT	.00000

RUN NO. 3/ 2 RN/L = 7.17 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	170.240	-.00200
3.480	172.190	.00000
3.480	174.220	.00000
3.480	176.210	.00100
3.480	178.220	.00100
3.480	180.220	.00100
3.480	182.250	.00000
3.480	184.240	.00100
3.480	186.220	.00100
3.480	188.260	.00300
3.480	190.220	.00400
	GRADIENT	.00000

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ABULATED SOURCE DATA. MSFC THT 645 (SA21F)
MSFC THT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 5
(R1R003) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SO.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PACINETRIC DATA

BETA = .000 PHI = 22.500

RUN NO. 114/ 0 RN/L = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.458	170.340	-.00500
1.458	172.270	-.00200
1.458	174.260	.00000
1.458	176.240	.00000
1.458	178.220	.00000
1.458	180.260	.00100
1.458	182.290	.00200
1.458	184.280	.00100
1.458	186.280	.00000
1.458	188.280	.00000
1.458	190.220	-.00200
	GRADIENT	.00000

RUN NO. 79/ 0 RN/L = 7.60 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.960	170.310	-.00400
1.960	172.260	-.00100
1.960	174.260	.00000
1.960	176.210	.00100
1.960	178.270	.00200
1.960	180.240	.00100
1.960	182.280	.00100
1.960	184.280	.00100
1.960	186.290	.00100
1.960	188.280	.00000
1.960	190.290	-.00200
	GRADIENT	.00000

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TABLULATED SOURCE DATA. MSFC :MT 645 (SA21F)
 MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 6
 (IR1P003) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 50.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 22.500

RUN NO. 35/ 0 RN/L = 5.24 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	170.260	-.00600
2.740	172.210	-.00200
2.740	174.170	-.00900
2.740	176.190	.00000
2.740	178.180	.00100
2.740	180.230	.00100
2.740	182.230	.00000
2.740	184.230	.00000
2.740	186.230	.00100
2.740	188.250	.00100
2.740	190.190	.00900
	GRADIENT	.00000

RUN NO. 35/ 0 RN/L = 7.13 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	170.180	-.00600
3.480	172.160	-.00300
3.480	174.170	-.00100
3.480	176.190	.00000
3.480	178.180	.00000
3.480	180.210	.00000
3.480	182.210	.00000
3.480	184.200	.00000
3.480	186.210	.00000
3.480	188.240	.00000
3.480	190.180	.00000
	GRADIENT	.00000

TABULATED SOURCE DATA. MSFC TH 645 (S2ZIF)
 MSFC TH 645 (S2ZIF) SP9 WITH PROTUBERANCES

PARAMETRIC DATA

BETA = .000 PHI = 22.500

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

RUN NO. 113/ 0 RN/L = 6.52 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.459	149.120	-.10500
1.459	151.250	-.09300
1.453	153.350	-.08200
1.459	155.340	-.07200
1.459	157.470	-.06500
1.459	159.620	-.04500
1.459	161.570	-.03400
1.459	163.790	-.02600
1.459	165.820	-.02000
1.459	167.970	-.01200
1.459	169.850	-.00800
	GRADIENT	-.00000

RUN NO. 80/ 1 RN/L = 7.61 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.960	147.990	-.09600
1.960	150.060	-.09700
1.960	152.130	-.07700
1.960	154.280	-.06900
1.960	156.390	-.05900
1.960	158.410	-.04800
1.960	160.720	-.03400
1.960	162.760	-.02500
1.960	164.890	-.01900
1.960	166.990	-.01400
1.960	169.020	-.01300
	GRADIENT	-.00000

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TABLULATED SOURCE DATA. MSFC THT 645 (S21F)
 MSFC THT 645 (S21F) SRB WITH PROTUBERANCES

PARAMETRIC DATA

BETA = .000 PHI = 72.500

REFERENCE DATA

SREF = 116.2500 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

RUN NO. 33/ 0 RV/L = 5.24 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
2.740	149.380	-.07800
2.740	151.340	-.07100
2.740	153.370	-.06400
2.740	155.420	-.05600
2.740	157.480	-.04900
2.740	159.510	-.04200
2.740	161.640	-.03100
2.740	163.670	-.02400
2.740	165.730	-.01700
2.740	167.770	-.01300
2.740	169.760	-.01200
	GRADIENT	.00000

RUN NO. 34/ 0 RV/L = 7.14 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
3.480	149.340	-.07000
3.480	151.330	-.06300
3.480	153.380	-.05600
3.480	155.410	-.05000
3.480	157.470	-.04300
3.480	159.530	-.03500
3.480	161.590	-.02800
3.480	163.670	-.02100
3.480	165.730	-.01500
3.480	167.780	-.01100
3.480	169.750	-.01000
	GRADIENT	.00000

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TABULATED SOURCE DATA, MSFC TWT 645 (SAR:F)
MSFC TWT 645 (SAR:F) SPB WITH PHOTOGRAPHS

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REFERENCE DATA

SPEF = 116.2600 SQ.FT. XMRB = .0000 IN.
LREF = 146.0000 IN. YMRB = .0000 IN.
SPEF = 146.0000 IN. ZMRB = .0000 IN.
SCALE = .0055

PAPYMETRIC DATA

BETA = .000 PHJ = 45.000

RUN NO. 109/0 PIVL = 6.52 GRADIENT INTERVAL = -5.000/ 5.00

MACH	ALPHA	CEL
1.461	149.030	-0.9200
1.461	151.167	-0.9200
1.461	153.270	-0.9200
1.461	155.340	-0.9200
1.461	157.380	-0.9200
1.461	159.500	-0.9200
1.461	161.590	-0.9200
1.461	163.930	-0.9200
1.461	165.220	-0.9200
1.461	169.040	-0.9200
1.461	169.870	-0.9200
	GRADIENT	-0.0000

RUN NO. 84/0 PIVL = 7.53 GRADIENT INTERVAL = -5.000/ 5.00

MACH	ALPHA	CEL
1.933	149.800	-0.7800
1.933	150.850	-0.7800
1.933	153.000	-0.6600
1.933	155.070	-0.5500
1.933	157.180	-0.4500
1.933	159.270	-0.3800
1.933	161.470	-0.3200
1.933	163.500	-0.2800
1.933	165.750	-0.2500
1.933	167.830	-0.2300
1.933	169.810	-0.2100
	GRADIENT	-0.0000

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TABULATED SOURCE DATA. MSFC THT 645 (SA2IF)
MSFC THT 645 (SA2IF) SRP WITH PROTURBANCES

PAGE 10
(R1P005) 1 23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PAPAMETRIC DATA

BETA = .000 PHI = +5.000

RUN NO. 8 / 0 RV/L = 5.30 GRADIENT INTERVAL = -5.00 / 5.00

MACH	ALPHA	CEB
2.740	149.280	-.05500
2.740	151.260	-.05700
2.740	153.340	-.05100
2.740	155.390	-.04300
2.740	157.450	-.03600
2.740	159.530	-.02900
2.740	161.580	-.02400
2.740	163.610	-.02000
2.740	165.670	-.01500
2.740	167.750	-.01300
2.740	169.710	-.01000
	GRADIENT	.00000

RUN NO. 7 / 0 RV/L = 7.19 GRADIENT INTE. VAL = -5.00 / 5.00

MACH	ALPHA	CEB
3.480	149.250	-.06200
3.480	151.220	-.05500
3.480	153.300	-.04800
3.480	155.370	-.04100
3.480	157.430	-.03300
3.480	159.500	-.02800
3.480	161.560	-.02300
3.480	163.580	-.01800
3.480	165.650	-.01200
3.480	167.690	-.01000
3.480	169.660	-.00900
	GRADIENT	.00000

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LABULATED SOURCE DATA. MSFC INT 645 (S21F)
MSFC INT 645 (S21F) SRB WITH PROTRUSANCES

(R1R0036) 1 23 FEB 77)

REFERENCE DATA

SREF = 115.2600 SQ.FT. XMRP = .0000 IN.
LREF = 145.0000 IN. XMRB = .0000 IN.
BREF = 145.0000 IN. XMRG = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 45.000

RUN NO. 110/ 0 RM/L = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEI
1.459	170.430	-.00700
1.459	172.350	-.00300
1.459	174.290	-.00200
1.459	176.260	-.00000
1.459	178.260	-.00000
1.459	180.300	-.00100
1.459	182.310	-.00100
1.459	184.330	-.00000
1.459	185.350	-.00300
1.459	189.450	-.00500
1.459	193.370	-.00600
	GRADIENT	.00000

RUN NO. 83/ 0 RM/L = 7.95 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEI
1.960	170.420	-.05600
1.960	172.390	-.00300
1.960	174.260	-.00100
1.960	176.230	.00000
1.960	178.270	-.00100
1.960	180.260	-.00000
1.960	182.260	-.00000
1.960	184.290	-.00200
1.960	186.310	-.00100
1.960	188.400	-.00300
1.960	190.320	-.00400
	GRADIENT	.00000

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TABLATED SOURCE DATA, MSFC THT 645 (SA21F)
 MSFC THT 645 (SA21F; SRB WITH PROTUBERANCES

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REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .5000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 45.000

RUN NO. 5/ 0 RN/L = 5.24 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	170.240	-.00800
2.740	172.160	-.07400
2.740	174.180	-.00200
2.740	176.170	-.00100
2.740	178.180	.00000
2.740	180.220	.00000
2.740	182.230	.00000
2.740	184.230	.00000
2.740	186.240	-.00100
2.740	188.260	-.00300
2.740	190.200	-.00300
	GRADIENT	.00000

RUN NO. 6/ 2 RN/L = 7.15 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	170.220	-.00600
3.480	172.170	-.00300
3.480	174.190	-.00100
3.480	176.200	.00000
3.480	178.190	.00000
3.480	180.220	.00000
3.480	182.220	.00000
3.480	184.240	.00000
3.480	186.230	-.02100
3.480	188.250	-.00100
3.480	190.190	-.00100
	GRADIENT	.00000

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 CALCULATED SOURCE DATA, MSFC TWT 645 (S421F)
 MSFC TWT 645 (S421F) SRB WITH PROTOBERANCES

PAGE 3
 (17:007) 1 23 FEB 77

REFERENCE DATA

SREF = 115.2600 SQ.FT. YMRP = .0000 IN.
 LREF = 145.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA
 BETA = .000 PHI = 87.500

RUN NO. 115/ 0 PIVL = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.450	170.350	-.00400
1.450	172.260	-.00300
1.450	174.250	-.00100
1.450	176.220	.00000
1.450	178.230	.00000
1.450	180.270	.00100
1.450	182.280	.00200
1.450	184.290	.00300
1.450	185.310	.00200
1.450	188.320	-.00500
1.450	190.250	-.00500
	GRADIENT	.00000

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RUN NO. 78/ 0 PIVL = 7.60 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.951	170.350	-.00300
1.951	172.240	-.00200
1.951	174.220	.00000
1.951	176.220	.00000
1.951	178.280	.00100
1.951	180.240	.00100
1.951	182.280	.00200
1.951	184.290	.00200
1.951	185.310	-.00200
1.951	188.340	-.00200
1.951	190.310	-.00200
	GRADIENT	.00000

DATE 29 MAR 77

TABLULATED SOURCE DATA. MSFC THT 645 (5A21F)
 MSFC THT 645 (5A21F) SRB WITH PROTOBERANCES

PAGE 14
 (RIP707) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 67.500

RUN NO. 37/ 0 RV/L = 5.23 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	170.220	-.00400
2.740	172.170	-.07200
2.740	174.180	-.00100
2.740	176.170	.00000
2.740	178.160	.00000
2.740	180.200	.00000
2.740	182.210	.00000
2.740	184.200	-.00100
2.740	186.240	-.00100
2.740	188.250	-.00200
2.740	190.280	-.00300
2.740	GRADIENT	.00000

RUN NO. 38/ 2 RV/L = 7.15 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	170.260	-.00300
3.480	172.210	-.00100
3.480	174.210	.00000
3.480	176.210	.00000
3.480	178.230	.00000
3.480	180.240	.00000
3.480	182.250	.00000
3.480	184.290	.00000
3.480	186.250	.00000
3.480	188.280	-.00100
3.480	190.230	-.00200
3.480	GRADIENT	.00000

DATE 29 MAR 77

TABLULATED SOURCE DATA, MSFC TMT 645 (SA21F)
MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 15
(R1P028) (23 FEB 77)

REFERENCE DATA

SPEF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 67.500

RUN NO. 116/ 1 RVAL = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
1.461	149.080	-.03400
1.461	151.140	-.03000
1.461	153.260	-.02500
1.461	155.390	-.02200
1.461	157.440	-.02000
1.461	159.670	-.01700
1.461	161.720	-.01500
1.461	163.980	-.01100
1.461	166.050	-.00700
1.461	168.050	-.00500
1.461	169.860	-.00000

GRADIENT

RUN NO. 77/ 0 RVAL = 7.59 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
1.959	148.960	-.03000
1.959	151.010	-.02800
1.959	153.120	-.02600
1.959	155.240	-.02200
1.959	157.340	-.01700
1.959	159.320	-.01400
1.959	161.570	-.01200
1.959	163.740	-.01100
1.959	165.920	-.01000
1.959	168.000	-.00700
1.959	169.860	-.00600

GRADIENT

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TABLULATED SOURCE DATA. MSFC TWT 645 (SA21F)
MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES

(IRIK008) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0300 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

SETA = .000 PHI = 67.500

RUN NO. 40/ 0 RN/L = 5.24 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	149.420	-.02400
2.740	151.410	-.02200
2.740	153.460	-.01900
2.740	155.520	-.01700
2.740	157.550	-.01500
2.740	159.610	-.01200
2.740	161.680	-.01000
2.740	163.790	-.00800
2.740	165.750	-.00600
2.740	167.850	-.00500
2.740	169.820	-.00400
2.740	GRADIENT	.00000

RUN NO. 39/ 0 RN/L = 7.14 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	149.420	-.02500
3.480	151.390	-.02100
3.480	153.450	-.01800
3.480	155.540	-.01500
3.480	157.550	-.01300
3.480	159.620	-.01100
3.480	161.670	-.00900
3.480	163.670	-.00600
3.480	165.780	-.00500
3.480	167.830	-.00400
3.480	169.800	-.00300
3.480	GRADIENT	.00000

DATE 29 MAR 77

TABULATED SOURCE DATA. MSFC TNT 645 (SA21F)
MSFC TNT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 17
(RIF003) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 90.000

RUN NO. 108/ 2 RN/L = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.458	149.140	.00000
1.458	151.250	.00730
1.458	153.340	.00500
1.458	155.400	.00800
1.458	157.500	.00800
1.458	159.600	.00700
1.458	161.780	.00300
1.458	163.900	.00200
1.458	166.040	.00100
1.458	168.080	.00200
1.458	169.870	.00200
	GRADIENT	.00000

RUN NO. 85/ 0 RN/L = 7.59 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.950	148.950	-.00700
1.950	150.990	-.00500
1.950	153.090	-.00400
1.960	155.180	-.00200
1.960	157.250	.00000
1.960	159.330	.00300
1.960	161.430	.00500
1.960	163.520	.00600
1.960	165.770	.00400
1.960	167.970	.00100
1.960	169.850	.00200
	GRADIENT	.00000

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DATE 29 MAR 77

TABLULATED SOURCE DATA, MSFC TWT 645 (S21F)
MSFC TWT 645 (S21F) SRB WITH PROTRUSANCES

PAGE 18
(R1R003) 1 23 FEB 77

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 F-11 = 90.000

RUN NO. 9/ 0 RV/L = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
2.740	149.330	-.00500
2.740	151.300	-.00400
2.740	153.330	-.00400
2.740	155.400	-.00300
2.740	157.440	-.00100
2.740	159.510	.00000
2.740	161.590	.00100
2.740	163.590	.00200
2.740	165.640	.00200
2.740	167.720	.00100
2.740	169.700	.00100
	GRADIENT	.00000

RUN NO. 10/ 0 RV/L = 7.17 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
3.480	149.340	-.00500
3.480	151.310	-.00400
3.480	153.370	-.00400
3.480	155.410	-.00400
3.480	157.450	-.00200
3.480	159.520	-.00100
3.480	161.560	.00000
3.480	163.620	.00000
3.480	165.660	.00000
3.480	167.720	.00000
3.480	169.720	.00000
	GRADIENT	.00000

DATE 29 MAR 77

TABULATED SOURCE DATA. MSFC TWT 645 (SA21F)
MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 19
(RIF210) 23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 90.000

RUN NO. 107/ 1 RN/L = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.459	170.340	.00200
1.459	172.290	.00100
1.459	174.240	.00100
1.459	176.230	.00000
1.459	178.230	.00000
1.459	180.250	.00000
1.459	182.240	.00000
1.459	184.250	.00000
1.459	186.250	.00000
1.459	188.270	.00000
1.459	190.230	.00000
	GRADIENT	.00000

RUN NO. 95/ 0 RN/L = 7.60 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.960	170.410	.00200
1.960	172.290	.00200
1.960	174.280	.00300
1.960	176.250	.00100
1.960	178.270	.00200
1.960	180.270	.00100
1.960	182.250	.00000
1.960	184.250	.00000
1.960	186.270	.00000
1.960	188.320	.00000
1.960	190.310	.00000
	GRADIENT	.00000

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DATE 29 MAR 77

TABULATED SOURCE DATA. MSFC TWT 645 (SA21F)

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MSFC TWT 645 (SA21F) SPB WITH PROTUBERANCES

(R12010) (23 FEB 77)

REFERENCE DATA

SPEF = 116.2500 SQ.FT. XMRP = .0000 IN.
LPEF = 145.0000 IN. YMRP = .0000 IN.
BPEF = 145.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 90.000

RUN NO. 12/ 0 RN/L = 5.26 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	170.300	.00100
2.740	172.210	.00200
2.740	174.230	.00200
2.740	176.240	.00200
2.740	178.220	.00100
2.740	180.250	.00100
2.740	182.240	.00100
2.740	184.220	.00100
2.740	186.240	.00100
2.740	188.250	.00000
2.740	190.160	.00000
	GRADIENT	.00000

RUN NO. 11/ 0 RN/L = 7.16 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	170.230	.00000
3.480	172.160	.00000
3.480	174.190	.00000
3.480	176.180	.00000
3.480	178.190	.00000
3.480	180.210	.00000
3.480	182.210	.00000
3.480	184.220	.00000
3.480	186.220	.00000
3.480	188.220	.00000
3.480	190.160	.00000
	GRADIENT	.00000

DATE 23 MAR 77

UNCALIBRATED SOURCE DATA. MSFC TWT 645 (SARIF)
MSFC TWT 645 (SARIF) SPB WITH PROTRUBANCES

PAGE 2:
11230111 1 23 FEB 77

REFERENCE DATA

SEFF = 116.2500 CG.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

PETA = .000 PHI = 112.500

RUN NO. 118/ 0 R/V/L = 6.50 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
1.458	170.390	.00900
1.458	172.310	.00700
1.458	174.240	.00400
1.458	176.200	.00200
1.458	178.260	.00100
1.458	180.240	.00000
1.458	182.230	.00000
1.458	184.240	.00200
1.458	186.230	.00300
1.458	188.320	.00000
1.458	190.320	.00100
	GRADIENT	.00000

RUN NO. 75/ 0 R/V/L = 7.59 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
1.959	170.390	.00900
1.959	172.270	.00700
1.959	174.240	.00500
1.959	176.200	.00200
1.959	178.270	.00100
1.959	180.220	.00000
1.959	182.250	.00000
1.959	184.260	.00200
1.959	186.270	.00100
1.959	188.290	.00100
1.959	190.260	.00200
	GRADIENT	.00000

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DATE 29 MAR 77

TABULATED SOURCE DATA, MSFC TWT 645 (S2IF)

PAGE 22

(R1R011) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LPEF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0005

PARAMETRIC DATA

BETA = .000 PHI = 112.500

RUN NO. 44/ 0 RV/L = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CR1
2.740	170.320	.00000
2.740	172.240	.00150
2.740	174.270	.00300
2.740	176.270	.00450
2.740	178.250	.00600
2.740	180.270	.00750
2.740	182.270	.00900
2.740	184.260	.01050
2.740	186.290	.01200
2.740	188.280	.01350
2.740	190.240	.01500
	GRADIENT	.00000

RUN NO. 43/ 0 RV/L = 7.15 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CR1
3.480	170.270	.00400
3.480	172.220	.00300
3.480	174.230	.00100
3.480	175.250	.00100
3.480	176.230	.00000
3.480	180.250	.00000
3.480	182.270	.00000
3.480	184.260	.00100
3.480	185.270	.00100
3.480	186.260	.00100
3.480	190.220	.00300
	GRADIENT	.00000

DATE 29 MAR 77

TABULATED SOURCE DATA. MSFC TWT 645 (SA2IF)
MSFC TWT 645 (SA2IF) SPB WITH PROTRUDANCES

PAGE 23
(IR1012) 1 23 FEB 77)

REFERENCE DATA

SREF = 116.2500 SQ.FT. XMRP = .0070 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHJ = 112.500

RUN NO. 117/ 0 RM/L = 6.52 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
1.459	145.130	.03100
1.459	151.230	.03100
1.459	153.320	.03200
1.459	155.230	.03600
1.459	157.330	.03500
1.459	159.440	.03000
1.459	161.660	.02400
1.459	163.810	.02100
1.459	165.950	.01500
1.459	168.050	.01200
1.459	169.940	.01100
	GRADIENT	.07000

RUN NO. 76/ 0 RM/L = 7.60 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
1.950	149.010	.02100
1.950	151.070	.02000
1.950	153.130	.02100
1.950	155.260	.02000
1.950	157.390	.01900
1.950	159.450	.01800
1.950	161.510	.01900
1.950	163.530	.01900
1.950	165.920	.01400
1.950	167.980	.01100
1.950	169.880	.01100
	GRADIENT	.00000

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DATE 29 MAR 77

TABULATED SOURCE DATA. MSFC TWT 645 (SAZIF)
MSFC TWT 645 (SAZIF) SRB WITH PROTUBERANCES

PAGE 24
(RIR012) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0035

PARAMETRIC DATA

BETA | .000 PHI = 112.500

RUN NO. 41/ 0 RV/L = 5.22 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
2.740	149.430	.01900
2.740	151.400	.01780
2.740	153.480	.01600
2.740	155.530	.01600
2.740	157.550	.01400
2.740	159.610	.01200
2.740	161.640	.01200
2.740	163.690	.01100
2.740	165.740	.01000
2.740	167.800	.00800
2.740	169.800	.00900
	GRADIENT	.00000

RUN NO. 42/ 0 RV/L = 7.14 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
3.480	149.420	.01900
3.480	151.410	.01600
3.480	153.450	.01400
3.480	155.500	.01200
3.480	157.560	.01200
3.480	159.620	.01000
3.480	161.670	.00900
3.480	163.690	.00800
3.480	165.750	.00700
3.480	167.780	.00600
3.480	169.770	.00500
	GRADIENT	.00000

DATE 29 MAR 77

TABULATED SOURCE DATA. MSFC THT 645 (SA21F)
MSFC THT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 25
(R1R013) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 145.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 135.000

RUN NO. 105/ 1 RNV/L = 6.52 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.460	149.170	.08100
1.460	151.270	.08000
1.460	153.230	.07800
1.460	155.360	.07200
1.460	157.490	.06200
1.460	159.440	.05500
1.460	161.560	.04700
1.460	163.800	.03700
1.460	165.800	.03100
1.460	167.990	.02500
1.460	169.870	.02100
	GRADIENT	.00000

RUN NO. 88/ 0 RNV/L = 7.57 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.959	149.060	.06900
1.959	151.050	.06400
1.959	153.120	.05800
1.959	155.240	.05200
1.959	157.370	.04500
1.959	159.510	.03900
1.959	161.550	.03600
1.959	163.440	.03200
1.959	165.700	.02700
1.959	167.870	.02000
1.959	169.780	.01900
	GRADIENT	.00000

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DATE 29 MAR 77

(R130:3) (23 FEB 77)

PARAMETRIC DATA

BETA = .000 PHI = 135.000

TABULATED SOURCE DATA. MSFC TWT 645 (SA21F).

MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LPEF = 146.0000 IN. YMRP = .0000 IN.
SREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

RUN NO. 16/ 0 RV/L = 5.24 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEI
2.740	149.460	.05600
2.740	151.420	.05100
2.740	153.470	.04500
2.740	155.500	.03900
2.740	157.540	.03300
2.740	159.640	.02800
2.740	161.650	.02400
2.740	163.660	.02100
2.740	165.700	.01900
2.740	167.770	.01600
2.740	169.770	.01400
	GRADIENT	.00000

RUN NO. 15/ 0 RV/L = 7.14 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEI
3.480	149.470	.05500
3.480	151.440	.04800
3.480	153.500	.04200
3.480	155.540	.03600
3.480	157.590	.03100
3.480	159.650	.02500
3.480	161.680	.02000
3.480	163.680	.01600
3.480	165.750	.01400
3.480	167.810	.01100
3.480	169.760	.01100
	GRADIENT	.00000

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TABLATED SOURCE DATA. MSFC TWT 645 (SA21F)
MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES

(R1R014) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 135.000

RUN NO. 106/ 0 RN/L = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.459	170.410	.01800
1.459	172.320	.01100
1.459	174.270	.00700
1.459	176.220	.00300
1.459	178.220	.00100
1.459	180.250	.00100
1.459	182.270	.00100
1.459	184.280	.00100
1.459	186.250	.00200
1.459	188.330	.00200
1.459	190.250	.00200
	GRADIENT	.00000

RUN NO. 87/ 0 RN/L = 7.58 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.959	170.400	.01600
1.959	172.250	.01100
1.959	174.280	.00800
1.959	176.250	.00400
1.959	178.260	.00200
1.959	180.270	.00100
1.959	182.260	.00100
1.959	184.260	.00100
1.959	186.260	.00100
1.959	188.290	.00100
1.959	190.260	.00100
	GRADIENT	.00000

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DATE 29 MAR 77

TABLULATED SOURCE DATA. MSFC TWT 645 (SA21F)
MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 28
(R1R014) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 135.000

RUN NO. 13/ 0 RN/L = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	170.240	.00900
2.740	172.170	.00600
2.740	174.200	.00450
2.740	176.200	.00200
2.740	178.190	.00000
2.740	180.210	.00500
2.740	182.210	.00300
2.740	184.190	.00000
2.740	186.210	.03100
2.740	188.210	.00000
2.740	190.120	.00200
	GRADIENT	.00000

RUN NO. 14/ 0 RN/L = 7.22 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.459	170.230	.00700
3.459	172.170	.00400
3.459	174.190	.00200
3.459	176.190	.00100
3.459	178.200	.00000
3.459	180.220	.05100
3.459	182.220	.00000
3.459	184.200	.00000
3.459	186.210	.00000
3.459	188.210	.00100
3.459	190.150	.00200
	GRADIENT	.00000

DATE 29 MAR 77

TABULATED SOURCE DATA. MSFC TWT 645 (SA21F)
MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES

(RIPJ15) 23 FEB 77

PARAMEPIC DATA

REFERENCE DATA

BETA = .000 PAI = 157.520

SCALE = .0055
SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.

RUN NO. 119/ 0 RN/L = 6.50 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.459	170.370	.02100
1.452	172.260	-.01200
1.459	174.200	-.00500
1.459	176.200	-.00200
1.459	178.190	-.00100
1.459	180.240	-.00000
1.459	182.240	-.00100
1.459	184.250	-.00100
1.459	186.290	-.00300
1.459	188.350	-.00200
1.459	190.330	-.00000
GRADIENT		

RUN NO. 74/ 0 RN/L = 7.58 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.961	170.340	-.01800
1.961	172.270	-.01200
1.961	174.230	-.00800
1.961	176.190	-.00300
1.961	178.240	-.00100
1.961	180.210	-.00100
1.961	182.230	-.00000
1.961	184.220	-.00000
1.961	186.290	-.00100
1.961	188.330	-.00100
1.961	190.190	-.00000
GRADIENT		

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TABLULATED SOURCE DATA. MSFC TMT 645 (SA21F)
 MSFC T:T 645 (SA21F) SRB WITH PROTUBERANCES

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 (R1R015) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 157.500

RUN NO. 45/ 0 RN/L = 5.23 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	170.330	.01300
2.740	172.260	.00800
2.740	174.270	.00600
2.740	176.280	.00400
2.740	178.270	.00200
2.740	180.310	.00300
2.740	182.290	.00200
2.740	184.320	.00100
2.740	186.330	.00000
2.740	188.330	.00000
2.740	190.250	.00100
	GRADIENT	.00000

RUN NO. 46/ 0 RN/L = 7.14 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	170.300	.00800
3.480	172.240	.00500
3.480	174.280	.00300
3.480	176.270	.00200
3.480	178.250	.00100
3.480	180.300	.00100
3.480	182.280	.00100
3.480	184.310	.00300
3.480	186.320	.00000
3.480	188.320	.00000
3.480	190.260	.00100
	GRADIENT	.00000

DATE 29 MAR 77

TABULATED SOURCE DATA, MSFC THT 645 (SARIF)
MSFC THT 645 (SARIF) SPB WITH PROTUBERANCES

PAGE 3
R:PCIS: 1 23 FEB 77

REFERENCE DATA

SPEF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
SREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0025

PARAMETRIC DATA

BETA = .000 PHI = 157.500

RUN NO. 120/ 0 PIVL = 6.51 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CE
1.459	149.280	.10300
1.459	150.940	.09300
1.459	153.090	.08700
1.459	155.250	.07700
1.459	157.300	.06200
1.459	159.290	.05300
1.459	161.630	.04300
1.459	163.590	.03500
1.459	165.730	.02800
1.459	167.980	.02200
1.459	169.280	.02400
	GRADIENT	.00000

RUN NO. 73/ 1 PIVL = 7.62 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CE
1.959	148.350	.09300
1.959	150.890	.08300
1.959	153.000	.07500
1.959	155.130	.06700
1.959	157.270	.05900
1.959	159.400	.04900
1.959	161.460	.03700
1.959	163.510	.03100
1.959	165.810	.02400
1.959	167.810	.01900
1.959	169.850	.02000
	GRADIENT	.00000

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TABULATED SOURCE DATA, MSFC TWT 645 (SA21F)

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MSFC TWT 645 (SA21F) SRB WITH PROTRUBERANCES

(RIR016) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LPEF = 146.0000 IN. YMRP = .0000 IN.
 BRPF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHA = 157.500

RUN NO. 48/ 0 RNV/L = 5.24 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	149.350	.07100
2.740	151.320	.06400
2.740	153.370	.05700
2.740	155.430	.05000
2.740	157.500	.04400
2.740	159.570	.03800
2.740	161.610	.02900
2.740	163.600	.02100
2.740	165.650	.01700
2.740	167.750	.01400
2.740	169.760	.01500
	GRADIENT	.00000

RUN NO. 47/ 0 RNV/L = 7.14 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	149.350	.08900
3.480	151.340	.05600
3.480	153.400	.05000
3.480	155.450	.04300
3.480	157.510	.03700
3.480	159.600	.03200
3.480	161.640	.02400
3.480	163.650	.01800
3.480	165.710	.01300
3.480	167.790	.01000
3.480	169.780	.01000
	GRADIENT	.00000

(R1R017) 1 23 FEB 77

ABULATED SOURCE DATA. MFSC TMT 645 (SA21F)

PARAMETRIC DATA

120.000

BETA = .000 PHI =

GRADIENT INTERVAL = -5.00/ 5.00

3: 22 MAR 77

REFERENCE DATA

SPEF = 116.2600 SQ.FT. XMRP = .0600 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 145.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

RUN NO. 104 C RN/L = 6.52
MACH 1.459
1.459
1.459
1.459
1.459
1.459
1.459
1.459
1.459
1.459
1.459
GRADIENT

ALPHA 142.810
150.850
152.970
155.080
157.300
159.590
161.630
163.730
165.730
167.510
169.860
GRADIENT

GRADIENT INTERVAL = -5.00/ 5.00

FUN NO. 83/ 1 RN/L = 7.58
MACH 1.959
1.959
1.959
1.959
1.959
1.959
1.959
1.959
1.959
1.959
1.959
GRADIENT

ALPHA 148.620
150.730
152.830
154.830
157.070
159.250
161.400
163.510
165.560
167.690
169.800
GRADIENT

CBL .07200
.05920
.05300
.04700
.04000
.03100
.02400
.02100
.01700
.01400
.01400
.00000
GRADIENT

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 TABULATED SOURCE DATA. MSFC TWT 645 (SA21F) (IR1017: 1 23 FEB 77)

MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES PARAMETRIC DATA

REFERENCE DATA BETA = .000 FHI = 160.000
 SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

RUN NO. 17/ 0 RN/L = 5.24 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	149.310	.03900
2.740	151.330	.03400
2.740	153.350	.03300
2.740	155.400	.03000
2.740	157.430	.02500
2.740	159.550	.02200
2.740	161.610	.01800
2.740	163.650	.01400
2.740	165.730	.01100
2.740	167.780	.00900
2.740	169.730	.00800
	GRADIENT	.00000

RUN NO. 18/ 0 RN/L = 7.14 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	149.350	.03100
3.480	151.330	.02900
3.480	153.400	.02600
3.480	155.440	.02300
3.480	157.510	.02000
3.480	159.590	.01700
3.480	161.650	.01400
3.480	163.680	.01100
3.480	165.720	.00900
3.480	167.770	.00600
3.480	169.730	.00600
	GRADIENT	.00000

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TABULATED SOURCE DATA. MSFC THT 645 (SA21F)
MSFC THT 645 (SA21F) SRB WITH PROTUBERANCES

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IRIP0181 (23 FEB 77)

REFERENCE DATA

SPEF = 116.2500 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
RREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARKETRIC DATA

BETA = .000 PHI = 160.000

RUN NO. 103/ 0 RN/L = 6.52 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEI
1.450	170.330	.01100
1.460	172.330	.01100
1.460	174.290	-.00700
1.460	176.250	-.00400
1.450	178.250	-.00100
1.460	180.250	-.00100
1.450	182.280	-.00000
1.460	184.300	-.00200
1.460	186.310	-.00500
1.460	188.450	-.00800
1.460	190.420	-.01100
	GRADIENT	-.00000

RUN NO. 90/ 0 RN/L = 7.58 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEI
1.959	170.330	.01100
1.959	172.290	-.00300
1.959	174.280	-.00700
1.959	176.250	-.00500
1.959	178.280	-.00200
1.959	180.260	-.00200
1.959	182.260	-.00000
1.959	184.300	-.00100
1.959	186.310	-.00400
1.959	188.360	-.00600
1.959	190.310	-.00800
	GRADIENT	-.00000

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TABLULATED SOURCE DATA. MSFC TWT 645 (SA21F)
 MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES

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 (RIFD18) 1 23 FEB 77)

REFERENCE DATA

SPEF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 145.0000 IN. YMRP = .0000 IN.
 BREF = 145.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 180.000

RUN NO. 20/ 0 RVL = 5.23 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEI
2.740	173.210	.05500
2.740	172.160	.06500
2.740	174.180	.03300
2.740	176.170	.00100
2.740	178.170	.05000
2.740	180.220	.00000
2.740	182.220	.00000
2.740	184.200	-.00100
2.740	185.200	-.00400
2.740	189.210	-.00500
2.740	190.150	-.00600
	GRADIENT	.00000

RUN NO. 19/ 0 RVL = 7.13 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEI
3.480	170.200	.00400
3.480	172.160	.05300
3.480	174.180	.03300
3.480	176.190	.00100
3.480	178.190	.00100
3.480	180.230	.00100
3.480	182.230	.00000
3.480	184.220	.00000
3.480	186.220	-.00200
3.480	188.230	-.00300
3.480	190.190	-.00300
	GRADIENT	.00000

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TABLULATED SOURCE DATA. MSFC TNT 645 (SA2IF)
MSFC TNT 645 (SA2IF) SPB WITH PROTRUDANCES

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(RIR019) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 202.500

RUN NO. 122/ 0 RNL = 6.52 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
1.460	170.240	.00400
1.460	172.270	.00400
1.460	174.240	.00400
1.460	176.250	.00300
1.460	178.240	.00100
1.460	180.230	.00000
1.460	182.230	-.00100
1.460	184.230	-.00400
1.460	186.280	-.00700
1.460	188.280	-.01100
1.460	190.160	-.01200
	GRADIENT	.00000

RUN NO. 71/ 0 RNL = 7.60 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
1.959	170.220	.00400
1.959	172.260	.00300
1.959	174.230	.00100
1.959	176.280	.00200
1.959	178.300	.00100
1.959	180.270	.00000
1.959	182.280	.00000
1.959	184.280	-.00200
1.959	186.230	-.00500
1.959	188.240	-.00900
1.959	190.200	-.01100
	GRADIENT	.00000

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TABULATED SOURCE DATA, MSFC TWT 645 (SAZIF)
 MSFC TWT 645 (SAZIF) SRG WITH PROTEGERANCES

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(R:EDIS) (23 FEB 77)

REFERENCE DATA

SPEF = 115.2600 SO.FT. XMRP = .0000 IN.
 LPEF = 145.0000 IN. YMRP = .0000 IN.
 BREP = 145.0000 IN. ZMRP = .0000 IN.
 SCALE = .0033

PARAMETRIC DATA

BETA = .000 PHI = 202.500

RUN NO. 52/ 0 PIVL = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	170.290	.03400
2.740	172.230	.03300
2.740	174.250	.03300
2.740	176.260	.03200
2.740	178.250	.03100
2.740	180.260	.03100
2.740	182.260	.03000
2.740	184.260	-.00100
2.740	185.250	-.03300
2.740	189.260	-.00600
2.740	190.200	-.00600
	GRADIENT	.00000

RUN NO. 51/ 0 PIVL = 7.13 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	170.230	.00100
3.480	172.180	.00100
3.480	174.190	.00100
3.480	176.210	.00000
3.480	178.220	.00000
3.480	180.250	.00000
3.480	182.230	.00000
3.480	184.260	.00200
3.480	185.220	.00400
3.480	188.250	.00600
3.480	190.200	.00700
	GRADIENT	.00000

TABLULATED SOURCE DATA. MSFC TMT 645 (SA21F)
MSFC TMT 645 (SA21F) SRB WITH PROTUBERANCES

(RIJCEJ) (23 FEB 77)

PARAMETRIC DATA

BETA = .000 PHI = 202.500

DATE 29 MAR 77

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

RUN NO. 121/ 0 RN/L = 6.52 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
1.460	149.050	.00100
1.460	151.150	.00100
1.460	153.230	.00200
1.460	155.320	.00200
1.460	157.430	.00400
1.460	159.600	.00300
1.460	161.600	.00500
1.460	163.470	.00800
1.460	165.430	.00700
1.460	167.590	.00400
1.460	169.600	.00300
	GRADIENT	.00000

RUN NO. 72/ 0 RN/L = 7.60 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
1.959	148.910	.01000
1.959	150.940	.00700
1.959	153.100	.00300
1.959	155.200	.00000
1.959	157.300	.00100
1.959	159.370	.00300
1.959	161.490	.00400
1.959	163.650	.00400
1.959	165.820	.00500
1.959	167.970	.00400
1.959	169.660	.00300
	GRADIENT	.00000

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TABLED SOURCE DATA. MSFC TWT 645 (S21F)
 MSFC TWT 645 (S21F) SFB WITH PROTUBERANCES

PARAMETRIC DATA

BETA = .000 PHI = 202.500

REFERENCE DATA

SPEF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LPEF = 146.0000 IN. YMRP = .0000 IN.
 BPEF = 145.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

RUN NO. 49/ 0 RN/L = 5.23 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
2.740	149.350	.01100
2.740	151.340	.00900
2.740	153.400	.00700
2.740	155.430	.00500
2.740	157.490	.00400
2.740	159.530	.00300
2.740	161.600	.00300
2.740	163.670	.00300
2.740	165.680	.00200
2.740	167.730	.00200
2.740	169.720	.00300
	GRADIENT	.00000

RUN NO. 50/ 0 RN/L = 7.14 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
3.480	149.360	.00700
3.480	151.370	.00700
3.480	153.410	.00600
3.480	155.460	.00500
3.480	157.520	.00300
3.480	159.560	.00300
3.480	161.620	.00200
3.480	163.710	.00200
3.480	165.710	.00100
3.480	167.760	.00200
3.480	169.730	.00200
	GRADIENT	.00000

DATE 29 MAR 77

TABULATED SOURCE DATA, MSFC TWT 645 (SA21F)
MSFC TWT 645 (SA21F) SP3 WITH PROTUBERANCES

REFERENCE DATA
SREF = 17.2500 SQ.FT. XMPR =
LREF = 145.0000 IN. YMPR =
BREF = 145.0000 IN. ZMPR =
SCALE = .0055

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(R/R21) 1 23 FEB 77)
PARAMETRIC DATA

BETA = .000 PHI = 225.000

RUN NO. 101/ C R/V/L = 6.52

MACH	ALPHA	GRADIENT	INTERVAL
1.450	143.130	CBL	-5.00/ 5.00
1.460	151.220	.02500	
1.460	153.340	.00000	
1.460	153.460	-.00300	
1.460	157.540	-.00500	
1.460	159.740	-.00300	
1.460	161.750	.00200	
1.460	163.710	.00100	
1.460	163.640	.00300	
1.460	167.580	.00400	
1.460	169.530	.00200	
	GRADIENT	.00300	
		.00000	

RUN NO. 92/ G R/V/L = 7.58

MACH	ALPHA	GRADIENT	INTERVAL
1.950	148.920	CBL	-5.00/ 5.00
1.960	150.940	.00300	
1.960	153.030	.00200	
1.960	155.160	.00000	
1.960	157.310	.00300	
1.960	159.440	.00000	
1.960	161.520	.00000	
1.960	163.720	-.00100	
1.960	165.670	.00000	
1.960	167.620	.00200	
1.960	169.600	.00300	
	GRADIENT	.00700	
		.00000	

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TABLULATED SOURCE DATA. MSFC INT 645 (SA21F)
MSFC INT 645 (SA21F) SPB WITH PROTUBERANCES

(RIR321) (23 FEB 77)

PARAMETRIC DATA

BETA = .000 PHI = 2.33.000

REFERENCE DATA

SREF = 116.2500 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 145.0000 IN. ZMRP = .0000 IN.
SCALE = .0005

RUN NO. 22/ 0 RVAL = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	149.410	.00100
2.740	151.390	.00100
2.740	153.410	.00000
2.740	155.450	.00000
2.740	157.520	.00000
2.740	159.600	.00000
2.740	161.660	.00000
2.740	163.720	-.00100
2.740	165.720	-.00100
2.740	167.720	.00000
2.740	169.690	.00000
	GRADIENT	.00000

RUN NO. 23/ 0 RVAL = 7.19 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	149.400	.00200
3.480	151.430	.00100
3.480	153.410	.00000
3.480	155.470	.00000
3.480	157.530	.00000
3.480	159.600	.00000
3.480	161.650	.00000
3.480	163.700	.00000
3.480	165.730	-.00100
3.480	167.730	-.00100
3.480	169.720	.00000
	GRADIENT	.00000

(RIR)22. 1 23 FEB 77

TABULATED SOURCE DATA. MSFC THT 645 (SA21F) SRB WITH POTUBERANCES

PARAMETRIC DATA

BETA = .900 PHI = 225.000

DATE 23 MAR 77

REFERENCE DATA

SEEF = 115.2600 SQ.F. XMSB = .0000 IN.
LREF = 146.0000 IN. YMSB = .0000 IN.
SEEF = 146.0000 IN. ZMSB = .0000 IN.
SCALE = .0055

RUN NO. 102/ 1 RNYL = 6.53

GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CP
1.459	170.150	.0000
1.459	172.150	.0000
1.459	174.170	.0000
1.459	176.230	.0000
1.459	178.220	.0000
1.459	180.280	.0000
1.459	182.260	.0000
1.459	184.270	.0000
1.459	185.250	.0000
1.459	189.220	.0000
1.459	193.050	.0000
1.459	GRADIENT	.0000

RUN NO. 91/ 0 RNYL = 7.58

GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CB
1.950	173.180	.0000
1.950	175.150	.0000
1.950	177.230	.0000
1.950	179.250	.0000
1.950	181.270	.0000
1.950	183.260	.0000
1.950	185.300	.0000
1.950	186.290	.0000
1.950	188.250	.0000
1.950	190.140	.0000
1.950	GRADIENT	.0000

DATE 29 MAR 77 PAGE 44
 TABULATED SOURCE DATA. MSFC TWT 645 (S2IF1) (R1R022) (23 FEB 77)

MSFC TWT 645 (S2IF1) SRB WITH PROTUBERANCES PARAMETRIC DATA
 REFERENCE DATA BETA = .000 PHI = 225.000
 SREF = 116.266 SQ.FT. XMRP = 0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

RUN NO. 21/ 1 RN/L = 5.27 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
2.740	.70.200	.00100
2.740	.72.180	.00100
2.740	.74.170	.00100
2.740	.76.190	.00100
2.740	.78.210	.01000
2.740	.80.200	.00000
2.740	.82.230	.00100
2.740	.84.230	-.00300
2.740	.86.220	-.00500
2.740	.88.200	-.00900
2.740	.90.140	-.01100
	GRADIENT	.00000

RUN NO. 22/ 0 RN/L = 7.18 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
3.480	170.230	.00000
3.480	172.170	.00100
3.480	174.180	.00200
3.480	176.210	.00100
3.480	178.200	.00100
3.480	180.210	.00000
3.480	182.240	.00000
3.480	184.250	-.00200
3.480	186.220	-.00400
3.480	188.220	-.00600
3.480	190.190	-.00800
	GRADIENT	.00000

DATE 29 MAR 77

TABULATED SOURCE DATA, MSFC TMT 645 (S21F)
MSFC TMT 645 (S21F) SFB WITH PROTUBERANCES

PAGE 45
(R1R023) 23 FEB 77

REFERENCE DATA

SPEF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 247.500

RUN NO. 123/ 0 RN/L = 6.51 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.460	170.220	.00000
1.460	172.230	.00100
1.460	174.230	.00100
1.460	176.220	.00100
1.460	178.230	.00100
1.460	180.280	.00000
1.460	182.270	.00000
1.460	184.270	-.00300
1.460	186.260	-.00500
1.460	188.290	-.01100
1.460	190.070	-.01100
	GRADIENT	.00000

RUN NO. 70/ 0 RN/L = 7.61 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.959	172.100	.00300
1.959	174.190	.00100
1.959	176.260	.00200
1.959	178.290	.00200
1.959	180.270	.00000
1.959	182.260	.00000
1.959	184.300	-.00200
1.959	186.280	-.00500
1.959	188.240	-.01000
1.959	190.130	-.01000
	GRADIENT	.00000

DATE 29 MAR 77

TABLATED SOURCE DATA. MSFC TNT 645 (SA21F)
 MSFC TNT E:5 (SA21F) SRB WITH PRC TUBERANCES

PAGE 45
 (R1R023) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0095

PARAMETRIC DATA

BETA = .000 PHI = .247.500

RUN NO. 53/ 0 RV/L = 5.26 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	170.240	.00100
2.740	172.200	.00200
2.740	174.200	.00300
2.740	176.220	.00300
2.740	178.220	.00200
2.740	180.240	.00000
2.740	182.240	.00000
2.740	184.270	-.00200
2.740	186.220	-.00400
2.740	188.240	-.00600
2.740	190.180	-.00700
	GRADIENT	.00000

RUN NO. 54/ 0 RV/L = 7.15 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	170.250	.00000
3.480	172.200	.00100
3.480	174.190	.00200
3.480	176.220	.00200
3.480	178.220	.00200
3.480	180.240	.00000
3.480	182.260	.00000
3.480	184.280	-.00100
3.480	186.240	-.00300
3.480	188.300	-.00500
3.480	190.220	-.00500
	GRADIENT	.00000

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 247.500

RUN NO. 124/ 0 RV/L = 6.52 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.460	149.100	.01500
1.460	151.190	.01400
1.460	153.310	.00700
1.460	155.480	-.00100
1.460	157.610	-.00300
1.460	159.780	-.00400
1.460	161.910	-.00400
1.460	163.890	-.00000
1.460	165.660	-.00500
1.460	167.670	-.00200
1.460	169.670	-.00000
	GRADIENT	.00000

RUN NO. 69/ 0 RV/L = 7.64 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.958	148.920	.01900
1.958	150.950	.01600
1.958	153.100	.01300
1.958	155.200	.01000
1.958	157.300	.00500
1.958	159.450	.00200
1.958	161.620	.00000
1.958	163.790	-.00100
1.958	165.820	-.00100
1.958	167.680	-.00300
1.958	169.650	-.00300
	GRADIENT	.00000

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TABULATED SOURCE DATA. MSFC TMT 645 (SA2IF)

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MSFC TMT 645 (SA2IF) SRB WITH PROTUBERANCES (R1R024) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 247.500

RUN NO. 56/ 0 RN/L = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
2.740	149.420	.01500
2.740	151.400	.01200
2.740	153.460	.01000
2.740	155.520	.00800
2.740	157.550	.00500
2.740	159.620	.00300
2.740	161.740	.00100
2.740	163.790	.00000
2.740	165.790	-.00100
2.740	167.830	-.00000
2.740	169.760	-.00000
	GRADIENT	.00000

RUN NO. 55/ 2 RN/L = 7.17 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
3.480	149.500	.01400
3.480	151.460	.01100
3.480	153.500	.01000
3.480	155.560	.00700
3.480	157.570	.00500
3.480	159.630	.00300
3.480	161.700	.00100
3.480	163.770	.00000
3.480	165.810	.00000
3.480	167.810	.00000
3.480	169.800	.00000
	GRADIENT	.00000

DATE 23 MAR 77

TABLULATED SOURCE DATA. MSFC THT 645 (SA2IF)
MSFC THT 645 (SA2IF) SRB WITH PROTFERANCLLS

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(RIP025) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0355

PARAMETRIC DATA

BETA = .000 P41 = 270.000

RUN NO. 100/ 1 RV/L = 6.51 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.459	149.090	.02400
1.459	151.200	.02300
1.459	153.300	.02100
1.459	155.410	.01900
1.459	157.520	.01600
1.459	159.710	.00300
1.459	161.780	.01500
1.459	163.890	.00700
1.459	165.870	.02800
1.459	167.660	.00900
1.459	169.590	.01900
	GRADIENT	.00000

RUN NO. 93/ 0 RV/L = 7.58 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.960	149.910	.02300
1.960	150.940	.01900
1.960	153.020	.01600
1.960	155.210	.01400
1.960	157.320	.01400
1.960	159.450	.01500
1.960	161.500	.01200
1.960	163.770	.01000
1.960	165.930	.00500
1.960	167.850	.00800
1.960	169.620	.01000
	GRADIENT	.00000

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TABLATED SOURCE DATA. MSFC THT 645 (SA21F)
 MSFC THT 645 (SA21F) SRB WITH PROTUBERANCES

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(RIPO25) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 270.000

RUN NO. 25/ 1 RN/L = 5.26 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	149.420	.01500
2.740	151.420	.01400
2.740	153.420	.01200
2.740	155.420	.00800
2.740	157.550	.00900
2.740	159.640	.00900
2.740	161.600	.00700
2.740	163.750	.00400
2.740	165.770	.00300
2.740	167.790	.00500
2.740	169.740	.00500
	GRADIENT	.00000

RUN NO. 26/ 0 RN/L = 7.17 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
3.480	149.410	.01500
3.480	151.400	.01400
3.480	153.400	.01100
3.480	155.470	.00900
3.480	157.530	.00500
3.480	159.610	.00500
3.480	161.670	.00500
3.480	163.730	.00500
3.480	165.760	.00400
3.480	167.780	.00400
3.480	169.740	.00500
	GRADIENT	.00000

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TABLULATED SOURCE DATA, MSFC THT 645 (SA2IF)
MSFC THT 645 (SA2IF) SRB WITH PROTEGEANCES

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(RIPDS) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PAPAMETRIC DATA

BETA = .000 PHI = 270.000

RUN NO. 99/ 0 RM/L = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
1.459	170.240	.00900
1.459	172.230	.00600
1.459	174.290	.00500
1.459	176.230	.00300
1.459	178.310	.00100
1.459	180.310	.00100
1.459	182.320	.00000
1.459	184.310	.00000
1.459	186.300	-.00200
1.459	188.290	-.00470
1.459	190.160	-.00500
	GRADIENT	.00000

RUN NO. 94/ 0 RM/L = 7.60 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
1.959	170.190	.00700
1.959	172.190	.00500
1.959	174.270	.00500
1.959	176.230	.00200
1.959	178.270	.00000
1.959	180.250	.00000
1.959	182.240	.00200
1.959	184.260	.00300
1.959	186.260	.00400
1.959	188.210	.00500
1.959	190.090	.00000
	GRADIENT	.00000

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TABLULATED SOURCE DATA. MSFC TWT 645 (SA21F)

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MSFC TWT 645 (SA21F) SRB WITH PROTRUBANCES

(IRIP02S) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0035

PARAMETRIC DATA

BETA = .000 PMJ = 270.0000

RUN NO. 28/ 0 RV/L = 5.26 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CE.
2.740	170.240	.00300
2.740	172.190	.00300
2.740	174.170	.00300
2.740	176.190	.00100
2.740	178.200	.00000
2.740	180.190	.00000
2.740	182.210	.00000
2.740	184.220	-.00100
2.740	186.170	-.00200
2.740	188.170	-.00200
2.740	190.110	-.00300
	GRADIENT	.00000

RUN NO. 27/ 0 RV/L = 7.18 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
3.480	170.210	.00200
3.480	172.180	.00200
3.480	174.150	.00200
3.480	176.170	.00100
3.480	178.170	.00000
3.480	180.170	.00000
3.480	182.200	.00000
3.480	184.200	.00000
3.480	186.170	-.00100
3.480	188.170	-.00100
3.480	190.130	-.00100
	GRADIENT	.00000

DATE 29 MAR 77

TABLULATED SOURCE DATA, MSFC INT 645 (SA21F)

PAGE 53

MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES (R1R027) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 292.500

RUN NO. 126/ 0 RN/L = 6.54 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.460	170.120	.00900
1.460	172.230	.00700
1.460	174.250	.00600
1.460	176.240	.00300
1.460	178.230	.00100
1.460	180.260	.00100
1.460	182.280	.00100
1.460	184.260	.00200
1.460	186.230	.00300
1.460	188.170	.00400
1.460	190.050	.00600
	GRADIENT	.00000

RUN NO. 57/ 0 RN/L = 7.59 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.959	170.230	.00900
1.959	172.240	.00700
1.959	174.320	.00600
1.959	176.280	.00300
1.959	178.300	.00100
1.959	180.260	.00000
1.959	182.270	.00000
1.959	184.260	.00000
1.959	186.280	.00100
1.959	188.230	.00300
1.959	190.100	.00400
	GRADIENT	.00000

PARAMETRIC DATA

BETA = .000 PHI = 292.500

REFERENCE DATA

SPEF = 116.2600 SQ.FT. XMRP = .0000 IN.
 YMRP = 145.0000 IN. ZMRP = .0000 IN.
 SPEF = 145.0000 IN. SCALE = .0000

RUN NO. 60/ 0 RVL = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
2.740	173.270	.00500
2.740	173.210	.00500
2.740	174.250	.00400
2.740	175.250	.00300
2.740	176.250	.00200
2.740	177.250	.00100
2.740	178.250	.00000
2.740	179.250	.00000
2.740	180.250	.00000
2.740	181.250	.00000
2.740	182.250	.00000
2.740	183.250	.00000
2.740	184.250	.00000
2.740	185.250	.00000
2.740	186.250	.00000
2.740	187.250	.00000
2.740	188.250	.00000
2.740	189.250	.00000
2.740	190.250	.00000
2.740	GRADIENT	.00000

RUN NO. 59/ 0 RVL = 7.15 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
3.480	170.250	.00500
3.480	172.210	.00400
3.480	174.230	.00300
3.480	176.250	.00200
3.480	178.250	.00100
3.480	180.250	.00000
3.480	182.250	.00000
3.480	184.250	.00000
3.480	186.250	.00000
3.480	188.270	.00000
3.480	190.220	.00000
3.480	GRADIENT	.00000

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TABULATED SOURCE DATA. MSFC TWT 645 (SA2IF)
MSFC TWT 645 (SA2IF) SPB WITH PROTUBERANCES

PAGE 55
(R1P028) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 282.500

RUN NO. 125/ 1 RIV/L = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CB
1.460	146.100	.03700
1.460	151.170	.03400
1.460	152.260	.03100
1.460	155.370	.02800
1.460	157.550	.02500
1.460	159.650	.02200
1.460	161.700	.02000
1.460	163.760	.02000
1.460	165.690	.01500
1.460	167.550	.01000
1.460	169.600	.00000
	GRADIENT	

RUN NO. 68/ 0 RIV/L = 7.61 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CB
1.959	148.900	.02700
1.959	150.930	.02500
1.959	153.090	.02200
1.959	155.200	.02200
1.959	157.320	.02100
1.959	159.460	.01800
1.959	161.510	.01700
1.959	163.620	.01600
1.959	165.780	.01400
1.959	167.830	.01200
1.959	169.620	.01100
	GRADIENT	.00000

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TABLULATED SOURCE DATA, MSFC TH1 6W5 (SA21F)
MSFC TH1 6W5 (SA21F) SRB WITH PROTRUSANCES

PAGE 56
(R1R028' (23 FEB 77)

REFERENCE DATA

SPEF = 116.2600 SQ.FT. XPRP = .0000 IN.
LREF = 146.0000 IN. YPRP = .0000 IN.
BREF = 146.0000 IN. ZPRP = .0000 IN.
SCALE = .0055

FAPAMETRIC DATA

BETA = .000 PHI = 292.500

RUN NO. 57/ 0 RN/L = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
2.740	149.470	.02100
2.740	151.460	.01800
2.740	153.490	.01700
2.740	155.560	.01500
2.740	157.600	.01500
2.740	159.660	.01400
2.740	161.700	.01300
2.740	163.750	.01100
2.740	165.790	.01000
2.740	167.840	.01000
2.740	169.720	.00900
	GRADIENT	.00000

RUN NO. 59/ 0 RN/L = 7.16 GRADIENT INTERVAL = 5.00/ 5.00

MACH	ALPHA	CBL
3.480	149.510	.01600
3.480	151.460	.01500
3.480	153.510	.01300
3.480	155.570	.01100
3.480	157.570	.01100
3.480	159.650	.00900
3.480	161.690	.00800
3.480	163.740	.00800
3.480	165.760	.00700
3.480	167.820	.00600
3.480	169.790	.00600
	GRADIENT	.00000

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TABLULATED SOURCE DATA. MSFC TWT 645 (SA21F)
MSFC TWT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 57
(R1R029) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .006 PHI = 315.000

RUN NO. 97/ 0 RIVL = 6.54 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.459	149.030	.02300
1.459	151.080	.02600
1.459	153.200	.02500
1.459	155.400	.02300
1.459	157.500	.02000
1.459	159.510	.02000
1.459	161.690	.01700
1.459	163.790	.01600
1.459	165.680	.01600
1.459	167.600	.01300
1.459	169.572	.01000
	GRADIENT	.00900

RUN NO. 96/ 0 RIVL = 7.57 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.959	148.900	.01800
1.959	150.900	.01700
1.959	152.960	.01700
1.959	155.120	.01600
1.959	157.280	.01400
1.959	159.460	.01200
1.959	161.530	.01100
1.959	163.720	.01100
1.959	165.850	.01000
1.959	167.820	.00900
1.959	169.580	.00900
	GRADIENT	.00900

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 TABULATED SOURCE DATA. MSFC TMT 645 (SA2IF) (IRIR029) (23 FEB 77)
 MSFC TMT 645 (SA2IF) SRB WITH PROT. SERANCES

PARAMETRIC DATA
 BETA = .000 PHI = 315.000

REFERENCE DATA

SREF = 116.2600 SO.FT. XMRP = .0000 IN.
 LREF = 146.0000 IN. YMRP = .0000 IN.
 BREF = 146.0000 IN. ZMRP = .0000 IN.
 SCALE = .0055

RUN NO. 32/ 0 RN/L = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEBL
2.740	149.400	.01400
2.740	151.390	.01200
2.740	153.400	.01100
2.740	155.470	.01100
2.740	157.520	.00900
2.740	159.600	.00900
2.740	161.660	.00900
2.740	163.720	.00700
2.740	165.740	.00700
2.740	167.810	.00500
2.740	169.770	.00500
	GRADIENT	.00000

RUN NO. 31/ 0 RN/L = 7.16 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEBL
3.480	149.400	.01200
3.480	151.380	.01100
3.480	153.400	.01000
3.480	155.470	.00300
3.480	157.530	.00700
3.480	159.590	.00700
3.480	161.630	.00500
3.480	163.690	.00500
3.480	165.740	.00500
3.480	167.780	.00400
3.480	169.770	.00400
	GRADIENT	.00000

DATE 29 MAR 77

TABLATED SOURCE DATA, MSFC TWT 645 (SA2IF)
MSFC TWT 645 (SA2IF) SRB WITH PROTUBERANCES

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(R1R030) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA ↑ .000 PHI = 315.000

RUN NO. 98/ 0 RN/L = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
1.459	170.230	.00900
1.459	172.230	.00700
1.459	174.260	.00500
1.459	176.260	.00300
1.459	178.230	.00100
1.459	180.260	.00100
1.459	182.280	.00200
1.459	184.310	.00300
1.459	186.250	.00500
1.459	188.230	.00900
1.459	190.050	.01400
	GRADIENT	.00000

RUN NO. 95/ 0 RN/L = 7.59 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
1.958	170.220	.00900
1.958	172.190	.00700
1.958	174.240	.00500
1.958	176.230	.00300
1.958	178.270	.00200
1.958	180.250	.00000
1.958	182.250	.00000
1.958	184.250	.00200
1.958	186.250	.00400
1.958	188.230	.00600
1.958	190.150	.00900
	GRADIENT	.00000

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TABLULATED SOURCE DATA, MSFC TN. 645 (SA21F)
MSFC THT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 69
(RIR030) (23 FEB 77)

REFERENCE DATA

SREF = 115.2600 SQ.FT. XMRP = .0000 IN.
LREF = 145.0000 IN. YMRP = .0000 IN.
BREF = 145.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PH = 315.000

RUN NO. 29/ 0 RN/L = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
2.740	170.290	.00600
2.740	172.220	.00400
2.740	174.130	.00300
2.740	175.220	.00200
2.740	178.210	.00200
2.740	180.240	.00100
2.740	182.240	.00100
2.740	184.230	.00200
2.740	186.200	.00300
2.740	188.200	.00500
2.740	190.130	.00700
	GRADIENT	.00000

RUN NO. 30/ 0 RN/L = 7.15 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
3.480	170.240	.00300
3.480	172.220	.00200
3.480	174.160	.00100
3.480	176.180	.00100
3.480	178.190	.00100
3.480	180.200	.00000
3.480	182.210	.00000
3.480	184.220	.00000
3.480	186.190	.00200
3.480	188.180	.00400
3.480	190.140	.00500
	GRADIENT	.00000

DATE 29 MAR 77

TABLULATED SOURCE DATA. MSFC THT 645 (SA21F)
MSFC THT 645 (SA21F) SRB WITH PROTUBERANCES

PAGE 61

(R1P031) (23 FEB 77)

REFERENCE DATA

SREF = 115.2600 SQ.FT. XMRP = .0000 IN.
LREF = 145.0000 IN. YMRP = .0000 IN.
BREF = 145.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PHI = 337.500

RUN NO. 127/ 0 FN/L = 6.53 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.460	170.050	.00400
1.460	172.120	.00200
1.460	174.200	.00200
1.460	176.230	.00100
1.460	178.230	.00100
1.460	180.250	.00100
1.460	182.280	.00200
1.460	184.260	.00200
1.460	186.260	.00500
1.460	188.210	.01100
1.460	190.050	.01800
	GRADIENT	.00000

RUN NO. 66/ 0 FN/L = 7.61 GRADIENT INTE:VAL = -5.00/ 5.00

MACH	ALPHA	CBL
1.957	170.270	.00600
1.957	172.180	.00300
1.957	174.270	.00300
1.957	176.270	.00200
1.957	178.290	.00200
1.957	180.270	.00000
1.957	182.270	.00000
1.957	184.270	.00200
1.957	186.270	.00400
1.957	188.200	.00800
1.957	190.100	.01100
	GRADIENT	.00000

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 TABULATED SOURCE DATA. MSFC TWT 6W5 (SA21F) (R1R031) (23 FEB 77)
 MSFC TWT 6W5 (SA21F) SRB WITH PROTUBERANCES

REFERENCE DATA PARAMETRIC DATA
 SREF = 116.260) SQ.FT. XMRP = .0000 IN.
 LREF = 146.0070 IN. YMRP = .0000 IN.
 BREF = 146.0070 IN. ZMRP = .0000 IN.
 SCALE = .0055 BETA = .000 PHI = 337.500

RUN NO. 61/ 0 RN/L = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
2.740	170.290	.00200
2.740	172.210	.00100
2.740	174.440	.00200
2.740	176.270	.00200
2.740	178.270	.00200
2.740	180.270	.00100
2.740	182.270	.00100
2.740	184.300	.00200
2.740	186.260	.00400
2.740	188.270	.00800
2.740	190.230	.00900
	GRADIENT	.00030

RUN NO. 62/ 0 RN/L = 7.15 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEL
3.480	170.270	.00100
3.480	172.180	.00000
3.480	174.200	.00000
3.480	176.230	.00000
3.480	178.220	.00000
3.480	180.230	.00000
3.480	182.230	.00000
3.480	184.270	.00000
3.480	186.230	.00200
3.480	188.250	.00400
3.480	190.220	.00600
	GRADIENT	.00000

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TABULATED SOURCE DATA, MSFC THT 645 (5A21F)
MSFC THT 645 (5A21F) SPB WITH PR.TUBERANCES

PAGE 63

(R1R032) (23 FEB 77)

REFERENCE DATA

SREF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PARAMETRIC DATA

BETA = .000 PH: • 337.500

RUN NO. 128 / 0 RNL = 6.54 GRADIENT INTERVAL = -5.00 / 5.00

MACH	ALPHA	CEB
1.460	149.060	.01900
1.450	151.120	.02500
1.460	153.250	.01960
1.450	155.400	.01500
1.450	157.490	.01300
1.460	159.580	.01100
1.460	161.830	.01000
1.460	163.940	.01000
1.460	165.840	.01000
1.460	167.650	.00800
1.460	169.540	.00400
	GRADIENT	.00000

RUN NO. 65 / 1 RNL = 7.58 GRADIENT INTERVAL = -5.00 / 5.00

MACH	ALPHA	CEB
1.957	148.910	.00300
1.957	150.940	.00500
1.957	152.640	.01100
1.957	154.160	.01400
1.957	157.300	.01200
1.957	159.400	.01000
1.957	161.590	.00500
1.957	163.650	.00700
1.957	165.880	.00500
1.957	167.900	.00600
1.957	169.670	.00500
	GRADIENT	.00000

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TABULATED SOURCE DATA. MTC TMT 645 (SA21F)
MSFC TMT 645 (SA21F) SR8 WITH PROTURBANCES

PAGE 64
(RIPO32: (23 FEB 77)

REFERENCE DATA

SPEF = 116.2600 SQ.FT. XMRP = .0000 IN.
LREF = 146.0000 IN. YMRP = .0000 IN.
BREF = 146.0000 IN. ZMRP = .0000 IN.
SCALE = .0055

PAPAMETRIC DATA

BETA = .000 PHI = 337.500

RUN NO. 64/ 0 RV/L = 5.25 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	CEB
2.740	149.280	.00100
2.740	151.370	.00200
2.740	153.420	.00200
2.740	155.460	.00400
2.740	157.520	.00500
2.740	159.580	.00500
2.740	161.650	.00500
2.740	163.720	.00500
2.740	165.750	.00400
2.740	167.800	.00300
2.740	169.710	.00200
	GRADIENT	.00000

RUN NO. 63/ 0 RV/L = 7.15 GRADIENT INTERVAL = -5.00/ 5.00

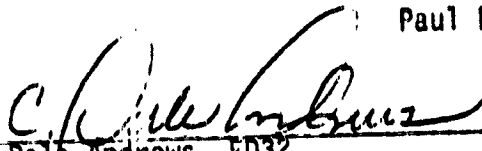
MACH	ALPHA	CEB
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3.480	151.370	.00100
3.480	153.400	.00100
3.480	155.460	.00200
3.480	157.530	.00300
3.480	159.570	.00200
3.480	161.620	.00300
3.480	163.700	.00300
3.480	165.720	.00300
3.480	167.770	.00300
3.480	169.740	.00200
	GRADIENT	.00000


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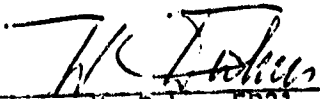
Aerodynamic Roll Characteristics of A 0.00548 Scale 146-Inch Solid Rocket Booster Reentry Configuration (MSFC Model Number 486) Over A Portion of the Reentry Flight Regime in the NASA/MSFC 14-Inch Transonic Wind Tunnel (SA21F).


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