NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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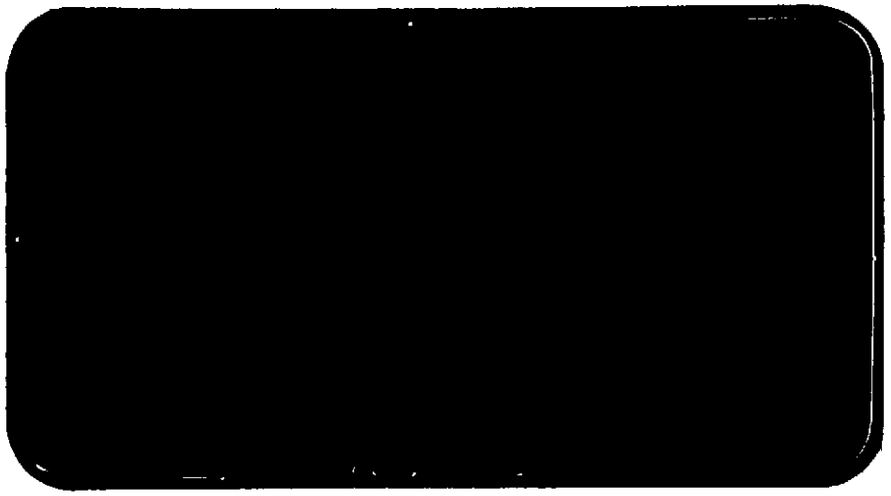

(NASA-CR-134111) EFFECTS OF REACTION CONTROL SYSTEM JET FLOW FIELD INTERACTIONS ON THE AERODYNAMIC CHARACTERISTICS OF A 0.010-SCALE (Chrysler Corp.) 202 p HC $7.25 CSCL 22B G3/18

SPACE SHUTTLE

AEROTHERMODYNAMIC DATA REPORT

JOHNSON SPACE CENTER

HOUSTON, TEXAS

DATA MANagement service

SPACE DIVISION CHRYSLER CORPORATION

September, 1974

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NASA CR-134,111

EFFECTS OF REACTION CONTROL SYSTEM JET FLOW FIELD INTERACTIONS ON THE AERODYNAMIC CHARACTERISTICS OF A 0.010-SCALE SPACE SHUTTLE ORBITER MODEL IN THE LANGLEY RESEARCH CENTER 31-INCH CFHT

(OA85)

By

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Prepared under NASA Contract Number NAS9-13247

by

Data Management Services
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New Orleans, La. 70189

for

Engineering Analysis Division

Johnson Space Center
National Aeronautics and Space Administration
Houston, Texas

WIND TUNNEL TEST SPECIFICS:

Test Number:	LaRC CFHT 101
NASA Series No.:	0A85
Date:	Oct. 31, Nov. 8, 1973
Model No.:	32-0

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

EFFECTS OF REACTION CONTROL SYSTEM JET FLOW FIELD INTERACTIONS ON THE AERODYNAMIC CHARACTERISTICS OF A 0.010-SCALE SPACE SHUTTLE ORBITER MODEL IN THE LANGLEY RESEARCH CENTER 31-INCH CFHT

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Rockwell International Space Division

ABSTRACT

An experimental investigation was conducted in the NASA/LaRC 31" CFHT to obtain detailed effects on SSV hypersonic aerodynamic and stability and control characteristics of RCS jet flow field interactions with the local vehicle flow field. A 0.010-scale model (Model 32-Ø) was used.

Six-component force data and wing, elevon, and body flap surface pressure data were obtained through an angle-of-attack range of -10 to +3! degrees with 0° angle of sideslip. The test was conducted with yaw, pitcl and roll jet simulation at a free-stream Mach number of 10.3 and RCS plum simulation of flight dynamic pressures of 5, 10 and 20 PSF.

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NOMENCLATURE
General

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

SUBSCRIPTS

b	base
l	local
o	static conditions
t	total conditions
∞	free stream

NOMENCLATURE (Continued)

Body-Axis System

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

Stability-Axis System

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

NOMENCLATURE (Continued)

additions to standard list

SYMBOL	Plot Symbol	DEFINITION
A_{b_M}		OMS pod base area, ft^2
P_t		freestream total pressure, psia
P_c	PC-RCS	model RCS plenum chamber pressure, psia
P_x		pressure at station X, psia
T_t		freestream total temperature, °R
R/ft	RN/L	freestream unit Reynolds number, per foot
X_{CP}/ℓ_B	XCP/L	longitudinal center of pressure location, fraction of body length
δ_{bf}	BDFLAP	body-flap surface deflection angle, positive trailing edge down, degrees
δ_e	ELEVON	elevon deflection angle, ELEVON = (LEFT ELEVON + RIGHT ELEVON)/2, degrees
δ_{rf}	RUDFLR	rudder flare deflection angle, included angle between split rudder used to decrease speed, RUDFLR = (LEFT RUDDER - RIGHT RUDDER), degrees
ε		model OMS nozzle expansion ratio

INTRODUCTION

Investigations were conducted to determine interaction effects of reaction control system (RCS) flow on the aerodynamic characteristics of the Space Shuttle Configuration 3, designated model 32-Ø. Tests were conducted in the NASA/LaRC 31-inch CFHT at a Mach number of 10.3. The 0.010-scale model orbiter was used.

RCS operation at four free flight conditions were simulated and are summarized below:

Mach	Q(PSF)	*R_N x 10^6	Altitude (ft)
29.5	5	0.16	280,000
29.4	10	0.32	267,300
28.0	20	0.63	253,000
7.0	20	1.23	200,000

*Reynolds number based on orbiter length, L_{ref} = 107.5 feet.

Differences in angle of attack and Mach number required that different simulation techniques be used for reentry and return-to-launch-site (RTLS) abort separation conditions.

RCS rocket plumes were simulated by blowing air from non-metric nozzles. These nozzles were attached to the model support sting near the fuselage base. In addition to obtaining data at the nominal position, data were taken with the RCS nozzles located 60 percent body flap chord and 100 percent body flap chord aft of the nominal position by using spacers between the RCS plenum and the OMS pods. Nozzle combinations which represented yaw, pitch and roll controls were tested with various elevon and body flap control surface settings.

Prior to the tests, all nozzles were calibrated at the Rockwell International Rocketdyne Division Rocket Nozzle Test Facility. Nozzle thrust was measured using a Revere No. 244267 10-lb. load cell. Plots of the thrust calibration versus chamber pressure are presented in figures 2h through 2t.

Six-component force data were measured using 0.750-inch diameter LaRC Balance No. 2019A, supported by LaRC sting No. 15. The orbiter wing and body flap were instrumented with pressure taps. Pressure tap locations are shown in figure 2v and pressure measurements are in table VI.

CONFIGURATION INVESTIGATED

Tested was a Rockwell 0.010-scale model (Model 32-Ø) of the VL70-000139 SSV Orbiter Configuration 3. A three-view sketch of the model is in figure 2a; RCS hardware and model installation in the tunnel are shown in figures 3a and 3b.

The model is of aluminum construction (with steel RCS components) and consists of the following parts: fuselage, canopy, wing, vertical tail, OMS pods, RCS and body flap. Elevon brackets for 0°, +15° and -20°, body flap deflections of 0°, +13.75° and -14.25°, and a rudder flare deflection of 55° were tested.

RCS operation at four free flight conditions were simulated. Results of individual simulations are summarized in table V. Lip angles in table V were adjusted during the nozzle calibration to match model plume shape with theoretical plume shape.

The following nomenclature were used to designate model components in the run schedule and for data reduction:

$O_1 = B_{19}\ C_7\ E_{23}\ F_5\ M_6\ N_{39}\ R_5\ V_7\ W_{107}$

$O_2 = B_{19}\ C_7\ E_{23}\ F_5\ M_8\ N_{39}\ R_5\ V_7\ W_{107}$

$O_3 = B_{19}\ C_7\ E_{23}\ F_5\ M_9\ N_{39}\ R_5\ V_7\ W_{107}$

Orbiter Components

Component	Definition
B_{19}	near vehicle configuration 3 (139B) fuselage of the SSV orbiter configuration (VL70-000139B)
C_7	basic vehicle configuration 3 (139) canopy (VL70-000139)
E_{23}	elevon on near vehicle configuration 3 (139B) wing (VL70-000139)
F_5	basic vehicle configuration 3 (139) body flap (VL70-000139)
M_6	modified OMS-RCS pod for the SSV configuration 3 (VL70-000139)
M_8	modified OMS-RCS pod for SSV configuration 3A with RCS pods located 51.6 inches (full-scale) aft of nominal position
M_9	modified OMS-RCS pod for SSV configuration 3A with RCS pods located 85.6 inches (full-scale) aft of nominal position
N_{39}	simulated lower main engine nozzles (VL70-000140A)
R_5	basic vehicle configuration 3 (139) rudder for vertical tail (VL70-000139)

Component	Definition
V_7	basic vehicle configuration 3 vertical tail (VL70-000139)
W_{107}	near vehicle configuration 3A (139B) wing (VL70-000139B)

RCS Nozzles

Component	Definition
N_{42}	twin right side pitch down RCS nozzles sized to simulate the forward two prototype 3A configuration (VL70-000140A) aft RCS pitch engines at q_∞ = 5 psf and M_∞ = 29.0 with a wind tunnel Mach number of 10.3; nozzles canted 30° aft and 20° outboard
N_{43}	twin left side pitch down RCS nozzles sized the same as N_{42}; nozzles canted 12° aft and 20° outboard
N_{44}	twin right side pitch up RCS nozzles sized the same as N_{42}; nozzles uncanted
N_{45}	same as N_{42} except for left side of model
N_{46}	twin right side pitch down RCS nozzles sized the same as N_{42} except aft RCS pitch engines at q_∞ = 20 psf and M_∞ = 28.0; wind tunnel Mach number is 10.3; nozzles canted 12° aft and 20° outboard
N_{47}	same as N_{46} except for left side of model
N_{48}	twin right side pitch up RCS nozzles sized the same as N_{42}; nozzles uncanted

Component	Definition
N_{49}	twin left side pitch down RCS nozzles sized to simulate the forward two prototype 3A configuration (VL70-000140A) aft pitch engines at q_∞ = 20 psf and M_∞ = 7.0 with a wind tunnel Mach number of 10.3. Nozzles are canted 12° aft and 20° outboard
N_{50}	same as N_{49} except for right side of model
N_{51}	four left side yaw RCS nozzles sized to simulate the center four prototype 3A configuration (VL70-000140A) RCS yaw engines at q_∞ = 20 psf and M_∞ = 7.0 with a wind tunnel Mach number of 10.3; nozzles uncanted
N_{52}	twin right hand pitch up RCS nozzles sized the same as N_{49}; nozzles uncanted
N_{60}	same as N_{42} except nozzles are canted 12° aft and 20° outboard
N_{61}	twin left side yaw RCS nozzles sized to simulate the forward two prototype 3A configuration (VL70-000140A); aft RCS yaw engines at q_∞ = 5 psf and M_∞ = 29.0 with a wind tunnel Mach number of 10.3; nozzles uncanted

TEST FACILITY DESCRIPTION

The Mach 10 nozzle of the CFHT is designed to operate at stagnation pressures of 15 to 150 atmospheres at temperatures up to 1960°R. Air is preheated electrically by passing it through a multi-tube heater. The nozzle has a 31-inch square test section which incorporates a movable second minimum. Continuous operation is achieved by passing the air through a series of compressors. Additional information on this facility is given in NASA TM X-1130, "Characteristics of Major Active Wind Tunnels at the Langley Research Center," by William T. Schaefer, Jr.

DATA REDUCTION

Wing, elevon and body flap surface pressures are in table VI.

Total aerodynamic force and moment data were calculated by LaRC using standard data reduction methods and were corrected for static tares and balance deflections.

Center of pressure location was computed in percent of body length by:

$$X_{CP}/\ell_B = (X_{cg} - C_m\bar{c}/C_N)/\ell_B$$

where:

X_{cg} = location of reference moment point, inches aft of model nose

ℓ_B = body length, inches

$\bar{c}$ = wing mean aerodynamic chord, inches

Reference dimensions and constants are as follows:

Symbol	Definition	Value
b_{REF}	span, wing	9.3668 in.
X_{cg}	reference C.G. (X)	8.3870 in.
Z_{cg}	reference C.G. (Z)	4.000 in.
$\bar{c} = \ell_{REF}$	MAC wing	4.748 in.
ℓ_B	reference body length	12.903 in.
S_{REF}	area, wing (ref.)	0.2690 ft^2

REFERENCES

Model Drawings

SS-A-00062 Model Assembly - 0.010-Scale SSV Orbiter, #3 Configuration, 9/20/73

SS-A00109 Wing Assembly - VL70-000139B 0.010-Scale SSV Orbiter 5/17/73

SS-A01160 Assembly and Details - RCS Powered Orbiter - 0.010-Scale SSV (Test #32-) 10/15/73

SS-A01161 Details - R.N.T.F. Calibration - 0.010-Scale SSV RCS Nozzles 10/11/73

WT-73-108150 (Convair Wind Tunnel Drawing) Assembly and Details - R.C.S. Powered Orbiter Model 0.010-Scale 8/24/73

TABLE I

TEST : 31" CFHT 101

DATE : 11-2-73

TEST CONDITIONS

MACH NUMBER	REYNOLDS NUMBER (per foot) *	DYNAMIC PRESSURE (psi)	STAGNATION TEMPERATURE (degrees Fahrenheit)
10.3	0.8×10^6	0.693	1350
10.3	1.0×10^6	1.04	1350

BALANCE UTILIZED: LRC 0.750 DIA. BALANCE #2019A & B

	CAPACITY:	ACCURACY:	COEFFICIENT TOLERANCE:
NF	70 lb.		
SF	25 lb.		
AF	15 lb.		
PM	70 in. lb.		
RM	15 in. lb.		
YM	25 in. lb.		

COMMENTS:

* Based on orbiter length of 107.5 ft.

TABLE IIa. RCS Air Off Force Data

TEST: ΦA-85 CFHT 101 | DATA SET/RUN NUMBER COLLATION SUMMARY | DATE: 11-2-73

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α	SCHD. β	PARAMETERS/VALUES q_∞	p_c	δ_e	δ_{bf}	δ_{rf}	NO. OF RUNS	MACH NUMBERS	TEST RUN NUMBERS
RQI01F	Φ1 N49 N50	B	0	150	0	15	0	55		10.3	
02F	Φ1 N51	B	0	150	0	-20	0	55		66	
03F	Φ1 N52	B	0	150	0	0	0	55		25	
04F	Φ1 N61	C	0	100	0	15	13.75	55		71	
05F	Φ1 N43 N44	C	0	100	0	0	0	55		55	
06F	Φ1 N43 N60	C	0	100	0	-20	-14.25	55		37	
07F	Φ1 N46 N47	C	0	150	0	-20	-14.25	55		14	
08F	Φ1 N46 N47	C	0	150	0	0	0	55		19	
09F	Φ1 N46 N47	C	0	150	0	15	13.75	55		42	
10F	Φ2 N43 N60	C	0	100	0	15	13.75	55		59	
11F	Φ1 N43 N60	C	0	100	0	15	-14.25	55		50	
13F	Φ1 N46 N47	C	0	150	0	15	-14.25	55		75	
										77	

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

BETA, CN, CA, CLM, CBL, CYN, CY, CL, CD, L/D, MACH, ALPHA

COEFFICENTS

α OR β SCHEDULES: α(B) = -10° → (Δα = 5°) → 35°; α(C) = 15° → (Δα = 5°) → 35°

IDVAR (1) IDVAR (2) NDV

TABLE IIb. RCS On Force Data

TEST: ΦA-85 CFHT 101 | DATA SET/RUN NUMBER COLLATION SUMMARY | DATE: 11-2-73

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α	SCHD. β	PARAMETERS/VALUES q∞	ϕ_c	δ_e	δ_{bf}	δ_{rf}	NO. OF RUNS	MACH NUMBERS 10.3	TEST RUN NUMBERS
RQI 01N	ϕ_1 N49 N50	B	0	150	167	15	0	55		67	
02N	ϕ_1 N49 N52	B	0	"	158	15	0	"		68	
03N	ϕ_1 N51	B	0		179	15	0			65	
04N	ϕ_1 N51	B	0		179	-20	0			26	
05N	ϕ_1 N49 N52	B	0		158	-20	0			27	
06N	ϕ_1 N52	B	0		158	-20	0			29	
07N	ϕ_1 N52	B	0		158	0	0			72	
08N	ϕ_1 N49 N52	B	0		158	0	0			70	
09N	ϕ_1 N49 N50	B	0	▼	167	0	0			73	
10N	ϕ_1 N61	C	0	100	860	15	13.75			56	
11N	ϕ_1 N43 N60	C	0	"	770	15	13.75			57	
12N	ϕ_1 N43 N44	C	0		764	15	13.75			58	
13N	ϕ_1 N43 N44	C	0		767	0	0			38	
14N	ϕ_1 N44	C	0		775	0	0			40	
15N	ϕ_1 N43 N60	C	0		771	0	0			41	
16N	ϕ_1 N43 N60	C	0		773	-20	-14.25			15	
17N	ϕ_1 N43 N44	C	0		768	-20	-14.25			16	
▼ 18N	ϕ_1 N61	C	0	▼	860	-20	-14.25	▼		17	

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

BETA, CN, CA, CLM, CBL, CYN, CY, CL, CD, L/D, MACH, ALPHA, 1.0

COEFFICENTS

IDVAR (1) IDVAR (2) NDV

α OR β SCHEDULES

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

TABLE IIb. (Continued)

TEST : ΦA-85 CFHT 101 — DATA SET/RUN NUMBER COLLATION SUMMARY — DATE : 11-2-73

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α	SCHD. β	PARAMETERS/VALUES q_∞	p_c	δ_e	δ_{bt}	δ_{rf}	NO. OF RUNS	MACH NUMBERS	TEST RUN NUMBERS
RQI 19N	Φ2 N43 N60	C	O	100	772	-20	-14.25	55		10.3	
20N	Φ3 N43 N60				772	-20	-14.25			32	
21N	Φ1 N42 N45				795	-20	-14.25			34	
22N	Φ3 N42 N45				784	-20	-14.25			18	
23N	Φ1 N46 N47			150	311	-20	-14.25			35	
24N	Φ1 N47 N46				302	-20	-14.25			21	
25N	Φ1 N48				302	-20	-14.25			22	
26N	Φ2 N46 N47				311	-20	-14.25			24	
27N	Φ3 N46 N47				311	-20	-14.25			31	
28N	Φ1 N46 N47				311	0	0			33	
29N	Φ1 N47 N48				302	0	0			43	
30N	Φ1 N48				302	0	0			45	
31N	Φ2 N46 N47				311	0	0			47	
32N	Φ3 N46 N47				311	0	0			48	
33N	Φ1 N46 N47				311	15	13.75			36	
34N	Φ1 N47 N48				302	15	13.75			60	
35N	Φ2 N46 N47				311	15	13.75			64	
36N	Φ3 N46 N47				311	15	13.75			52	
										53	

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

BETA, IGN, ICA, ICLM, ICBL, ICYN, ICY, ICL, ICD, L/D, IMACH, IALPHA, 1.0

COEFFICENTS — IDVAR (1) — IDVAR (2) — NDV

α OR β SCHEDULES

TABLE IIb. (Concluded)

TEST: ΦA-85 CFHT 101 — DATA SET/RUN NUMBER COLLATION SUMMARY — DATE: 11-2-73

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α	SCHD. β	PARAMETERS/VALUES q∞	pc	δe	δLf	δrf	NO. OF RUNS	MACH NUMBERS	TEST RUN NUMBERS
RQI-37N	Φ1 N46 N47	C	C	150	621	15	13.75	55		10.3	
38N	Φ1 N47 N48	C	O		602	15	13.75			61	
39N	Φ1 N47 N48	C	O		602	0	0			62	
40N	Φ1 N46 N47	C	O		621	0	0			46	
41N	Φ1 N46 N47	C	O		621	-20	-14.25			44	
42N	Φ1 N47 N48	C	O		602	-20	-14.25			20	
43N	Φ2 N43 N60	C	O	100	769	15	13.75			23	
44N	Φ3 N43 N60	C	O		769	15	13.75			51	
45N	Φ1 N43 N60	C	O		767	15	14.25			54	
46N	Φ2 N43 N60	C	O		771	0	0			76	
47N	Φ3 N43 N60	C	O		767	0	0			49	
48N	Φ1 N42 N45	C	O		777	0	0			79	
49N	Φ2 N42 N45	C	O		777	0	0			74	
50N	Φ1 N52	B	O	150	158	15	0			80	
51N	Φ1 N49 N50	B	O	150	167	-20	0			69	
52N	Φ1 N46 N47	C	O	150	311	15	-14.25			28	
										78	

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

BETIA | IGN | ICA | ICLM | ICBL | ICYN | ICY | ICL | ICD | IL/D | MACH | IALPHA | 1.0

COEFFICENTS — IDVAR (1) — IDVAR (2) — NDV

α OR β SCHEDULES

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

TABLE IIc. Pressure Data

TEST: ΦA-85 CFHT 101 — DATA SET/RUN NUMBER COLLATION SUMMARY — DATE: 11-2-73

DATA SET IDENTIFIER	CONFIGURATION	SCHD. α	SCHD. β	PARAMETERS/VALUES q_∞	ϕ_c	δ_a	δ_{bf}	δ_{rf}	NO. OF RUNS	MACH NUMBERS 10.3	TEST RUN NUMBERS
RQI 1PF	ϕ_1 N43 N60	A	0	100	0	15	13.75	55		1	
2PF	"	A	0	100	0	0	0	55		3	
3PF	↓	A	0	100	0	-20	-14.25	55		10	
4PF	ϕ_1 N46 N47	A	0	150	0	0	0	55		8	
RQI 1PN	ϕ_1 N43 N60	A	0	100	766	15	13.75	55		2	
2PN	ϕ_1 N43 N60	A	0	100	764	0	0	55		4	
3PN	ϕ_2 N43 N60	A	0	100	766	0	0	55		6	
4PN	ϕ_1 N42 N45	A	0	100	773	0	0	55		5	
5PN	ϕ_1 N43 N60	A	0	100	766	-20	-14.25	55		11	
6PN	ϕ_1 N46 N47	A	0	150	311	0	0	55		9	
7PN	ϕ_2 N46 N47	A	0	150	311	0	0	55		7	
	ϕ_1 = B19 C7 E23 F5 M39 R5 V7 W107 M6										
	ϕ_2 =							M8			
	ϕ_3 =							M9			

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

α OR β SCHEDULES: A) 20°, 30° — COEFFICENTS — IDVAR (1) — IDVAR (2) — NDV

* Measured pressures in table IIc. Pressure DATA NOT COLLATED BY DMS.

TABLE III.

MODEL DIMENSIONAL DATA

MODEL COMPONENT : BODY - B_{19}

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

NOTE: Identical to B_{17} except forebody.

MODEL SCALE: 0.010

DRAWING NUMBER : VL70-000139B

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

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT : CANOPY - C_7

GENERAL DESCRIPTION : 3 Configuration per Lines VL70-000139.

MODEL SCALE: 0.010

DRAWING NUMBER : VL70-000139.

DIMENSIONS :	FULL SCALE	MODEL SCALE
Length (X_o= 433 to X_o=670) In.	237.0	2.370
Max Width		
Max Depth		
Fineness Ratio		
Area		
Max. Cross-Sectional		
Planform		
Wetted		
Base		

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: ELEVON - E_{23}

GENERAL DESCRIPTION: Configuration 3 per W_{107} Rockwell Lines VL70-000139B, data for (1) of(2) sides.

MODEL SCALE: .010

DRAWING NUMBER: VL70-000139B

DIMENSIONS:

	FULL-SCALE	MODEL SCALE
Area - Ft^2	205.52	0.02055
Span (equivalent) - In.	353.34	3.533
Inb'd equivalent chord	114.78	1.148
Outb'd equivalent chord	55.00	0.550
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	0.208	0.208
At Outb'd equiv. chord	0.400	0.400
Sweep Back Angles, degrees		
Leading Edge	0.00	0.00
Tailing Edge	- 10.24	- 10.24
Hingeline	0.0	0.0
Area Moment (Normal to hinge line) - Ft^3 (Product of Area Moment)	1548.07	0.001548

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT : BODY FLAP - F_5

GENERAL DESCRIPTION : 3 Configuration per Rockwell Lines VL70-000139

MODEL SCALE: 0.010

DRAWING NUMBER : VL70-000139

DIMENSIONS :	FULL SCALE	MODEL SCALE
Length	84.70	0.8470
Max Width	267.6	2.676
Max Depth		
Fineness Ratio		
Area		
Max. Cross-Sectional		
Planform	142.5	0.01425
Wetted		
Base	38.0958	0.00380958

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT : OMS POD - M_6

GENERAL DESCRIPTION : Configuration 3

Aft end of OMS pod cut off for RCS installation.

See Convair Model Drawing No. WT-73-108150.

MODEL SCALE: 0.010

DRAWING NUMBER : VL70-000139

DIMENSIONS :	FULL SCALE	MODEL SCALE
Length - In. (OMS Fwd Sta X X_o = 1233.0)	327.00	3.27
Max Width - In. (@ X_o = 1450.0)	108.0	1.080
Max Depth - In. (@ X_o = 1493.0)	113.0	1.13
Fineness Ratio		
Area		
Max. Cross-Sectional		
Planform		
Wetted		
Base		
Station of aft end of RCS nozzle block	1560	15.60

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT : OMS POD - M_8

GENERAL DESCRIPTION : Configuration 3A. Same as M_6 but with 51.7 inch (full-scale) extension added between end of pod and RCS block. See Model Drawing SS-A01160.

MODEL SCALE: 0.010

DRAWING NUMBER : VL70-000140A, VL70-000145

DIMENSIONS :	FULL SCALE	MODEL SCALE
Length (OMS Fwd Sta X_o = 1233.0) In.	378.70	3.787
Max Width (@ X_o = 1450.0) - In.	108.0	1.080
Max Depth (@ X_o = 1493.0) - In.	113.0	1.13
Fineness Ratio		
Area		
Max. Cross-Sectional		
Planform		
Wetted		
Base		
Station of aft end of RCS nozzle block	1611.7	16.117

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: OMS Pod - M_9

GENERAL DESCRIPTION: Configuration 3A. Same as M_6 but with 85.6 inch (full-scale) extension added between end of pod and RCS block. See Model Drawing SS-A01160.

Model Scale = 0.010

DRAWING NUMBER VL70-000139

DIMENSION:	FULL SCALE	MODEL SCALE
Length (OMS Fwd Sta X_o = 1233.0) - IN.	327.000	3.27
Max Width (@ X_o = 1450.0) - IN.	94.5	0.945
Max Depth (@ X_o = 1493.0) - IN.	109.000	1.090
Fineness Ratio		
Area - FT^2		
Max Cross-Sectional		
Planform		
Wetted		
Base		
Station of Aft End of RCS Nozzle Block	1645.6	16.456

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: MPS NOZZLES - N_{39}

GENERAL DESCRIPTION: Configuration 3A MPS Nozzles.

MODEL SCALE = 0.010

DRAWING NO. VL70-000140A (See figures 2d, 2e, 2f)

DIMENSIONS	FULL SCALE	MODEL SCALE
Mach No.		
Length ~ in.		
Gimbal Point to Exit Plane	157.00	1.570
Throat to Exit Plane	39.20	0.392
Diameter ~ in.		
Exit	94.000	0.940
Throat	43.00	0.430
Inlet		
Area ~ ft^2.		
Exit	48.193	0.00482
Throat		
Gimbal Point (station) ~ in.		
Upper Nozzle NOT USED		
X		
Y		
Z		
Lower Nozzles		
X	1462.0	14.62
Y	± 53.000	± 0.530
Z	342.7	3.427
Null Position ~ deg.		
Upper Nozzle NOT USED		
Pitch		
Yaw		
Lower Nozzles		
Pitch	10°	10°
Yaw	3° 30'	3° 30'

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: RUDDER - R_5

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

MODEL SCALE: 0.010

DRAWING NUMBER: VL70-000139

DIMENSIONS:	FULL-SCALE	MODEL SCALE
Area	106.38	0.0106
Span (equivalent)	201.0	2.010
Inb'd equivalent chord	91.585	0.916
Outb'd equivalent chord	50.833	0.508
Ratio movable surface chord/ total surface chord		
At Inb'd equiv. chord	0.400	0.400
At Outb'd equiv. chord	0.400	0.400
Sweep Back Angles, degrees		
Leading Edge	34.83	34.83
Trailing Edge	26.25	26.25
Hingeline	34.83	34.83
Area Moment (Normal to hinge line)	526.13	0.000526

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: VERTICAL - V_7

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

NOTE: Same as V_5, but with manipulator housing removed.

MODEL SCALE: .010

DRAWING NUMBER: VL70-000139

DIMENSIONS:	FULL-SCALE	MODEL SCALE
TOTAL DATA		
Area (Theo) Ft^2		
Planform	425.92	0.0426
Span (Theo) In	315.72	3.16
Aspect Ratio	1.675	1.675
Rate of Taper	0.507	0.507
Taper Ratio	0.404	0.404
Sweep Back Angles, degrees		
Leading Edge	45.000	45.000
Trailing Edge	26.249	26.249
0.25 Element Line	41.130	41.130
Chords:		
Root (Theo) WP	268.50	2.69
Tip (Theo) WP	108.47	1.09
MAC	199.81	1.998
Fus. Sta. of .25 MAC	1463.50	14.64
W. P. of .25 MAC	635.522	6.36
B. L. of .25 MAC		
Airfoil Section		
Leading Wedge Angle Deg	10.000	10.000
Trailing Wedge Angle Deg	14.920	14.920
Leading Edge Radius	2.0	2.0
Void Area	13.17	0.0013
Blanketed Area	0.00	0.00

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: WING-W107

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

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

MODEL SCALE: 0.010

TEST NO. DWG. NO. VL70-000139B

DIMENSIONS:	FULL-SCALE	MODEL SCALE
TOTAL DATA		
Area (Theo.) Ft^2 Planform	2690.00	0.2690
Span (Theo In.	936.68	9.3668
Aspect Ratio	2.265	2.265
Rate of Taper	1.177	1.177
Taper Ratio	0.200	0.200
Dihedral Angle, degrees	3.500	3.500
Incidence Angle, degrees	0.500	0.500
Aerodynamic Twist, degrees	± 3.000	± 3.000
Sweep Back Angles, degrees		
Leading Edge	45.000	45.000
Trailing Edge	- 10.24	- 10.24
0.25 Element Line	35.209	35.209
Chords:		
Root (Theo) B.P.O.O.	689.24	6.892
Tip, (Theo) B.P.	137.85	1.378
MAC	474.81	4.748
Fus. Sta. of .25 MAC	1136.89	11.3689
W.P. of .25 MAC	299.20	2.992
B.L. of .25 MAC	182.13	1.8213
EXPOSED DATA		
Area (Theo) - Ft^2	1752.29	0.1752
Span, (Theo) In. BP108	720.68	7.2068
Aspect Ratio	2.058	2.058
Taper Ratio	0.2451	0.2451
Chords		
Root BP108	562.40	5.6240
Tip 1.00 $\frac{b}{2}$	137.85	I.3785
MAC	393.03	3.9303
Fus. Sta. of .25 MAC	1185.31	11.8531
W.P. of .25 MAC	300.20	3.002
B.L. of .25 MAC	251.76	2.518
Airfoil Section (Rockwell Mod NASA) XXXX-64		
Root $\frac{b}{2}$ =	0.10	0.10
Tip $\frac{b}{2}$ =	0.12	0.12
Data for (1) of (2) Sides		
Leading Edge Cuff Planform Area Ft^2	118.333	0.0118
Leading Edge Intersects Fus M. L. @ Sta	500	5.00
Leading Edge Intersects Wing @ Sta	1083.4	10.834

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TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLES - N_{42}

GENERAL DESCRIPTION: RCS nozzle providing right hand pitch down control to simulate re-entry.

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-13

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	5
Cant angle - deg.	
Aft	30
Outboard	20
Diameter - In.	
Exit	0.129
Throat	0.0465
Area - $In.^2$	
Exit	0.013069
Throat	0.001698
Area ratio	7.697
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLES - N_{43}

GENERAL DESCRIPTION: RCS nozzle providing left hand pitch down control to simulate re-entry.

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-15

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	5
Cant angle - deg.	
Aft	12
Outboard	20
Diameter - In.	
Exit	0.129
Throat	0.0465
Area - $In.^2$	
Exit	0.013069
Throat	0.001698
Area ratio	7.697
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLE - N_{44}

GENERAL DESCRIPTION: RCS nozzle providing right hand pitch up control to simulate re-entry.

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-9

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	5
Cant angle - deg.	
Aft	0
Outboard	0
Diameter - In.	
Exit	0.129
Throat	0.0465
Area - $In.^2$	
Exit	0.013069
Throat	0.001698
Area ratio	7.697
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLES - N_{45}

GENERAL DESCRIPTION: RCS nozzle providing left hand pitch down control to simulate re-entry.

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-14

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	5
Cant angle - deg.	
Aft	30
Outboard	20
Diameter - In.	
Exit	0.129
Throat	0.0465
Area - $In.^2$	
Exit	0.013069
Throat	0.001698
Area ratio	7.697
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLE - N46

GENERAL DESCRIPTION: RCS Nozzle providing right hand pitch down control to simulate re-entry.

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-18

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	20
Cant angle - deg.	
Aft	12
Outboard	20
Diameter - In.	
Exit	0.117
Throat	0.0465
Area - $In.^2$	
Exit	0.010751
Throat	0.001698
Area ratio	6.332
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLE - N_{47}

GENERAL DESCRIPTION: RCS nozzle providing left hand pitch down control to simulate re-entry.

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-17

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	20
Cant angle - deg.	
Aft	12
Outboard	20
Diameter - In.	
Exit	0.117
Throat	0.0465
Area - $In.^2$	
Exit	0.010751
Throat	0.001698
Area ratio	6.332
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLE - N48

GENERAL DESCRIPTION: RCS nozzle providing right hand pitch up control to simulate re-entry.

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-10

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	20
Cant angle - Deg.	
Aft	0
Outboard	0
Diameter - In.	
Exit	0.117
Throat	0.0465
Area - $In.^2$	
Exit	0.010751
Throat	0.001698
Area ratio	6.332
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLE - N_{49}

GENERAL DESCRIPTION: RCS Nozzle providing left hand pitch down control to simulate return to launch site (RTLS)

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-19

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	20
Cant Angle - deg.	
Aft	12
Outboard	20
Diameter - In.	
Exit	0.141
Throat	0.0670
Area - $In.^2$	
Exit	0.015614
Throat	0.003525
Area ratio	4.430
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLE - N_{50}

GENERAL DESCRIPTION: RCS nozzle providing right hand pitch down control to simulate return to launch site (RTLS).

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-20

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	20
Cant angle - deg.	
Aft	12
Outboard	20
Diameter - In.	
Exit	0.141
Throat	0.0670
Area - $In.^2$	
Exit	0.015614
Throat	0.003525
Area ratio	4.430
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLE - N_{51}

GENERAL DESCRIPTION: RCS Nozzle providing left hand yaw control to simulate return to launch site (RTLS).

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-11

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	20
Cant angle - Deg.	
Aft	0
Outboard	0
Diameter - In.	
Exit	0.141
Throat	0.0670
Area - $In.^2$	
Exit	0.015614
Throat	0.003525
Area ratio	4.430
No. of nozzles	4

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLE - N_{52}

GENERAL DESCRIPTION: RCS nozzle providing right hand pitch up control to simulate return to launch site (RTLS).

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-12

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	20
Cant angle - deg.	
Aft	0
Outboard	0
Diameter - In.	
Exit	0.141
Throat	0.0670
Area - $In.^2$	
Exit	0.015614
Throat	0.003525
Area ratio	4.430
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Continued)

MODEL COMPONENT: NOZZLES - N_{60}

GENERAL DESCRIPTION: RCS nozzle providing right hand pitch down control to simulate re-entry.

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-16

DIMENSIONS:	MODEL SCALE
Flight dynamic pressure simulation - PSF	5
Cant angle - deg.	
Aft	12°
Outboard	20°
Diameter - In.	
Exit	0.129
Throat	0.0465
Area - $In.^2$	
Exit	0.013069
Throat	0.001698
Area ratio	7.697
No. of Nozzles	2

TABLE III. MODEL DIMENSIONAL DATA (Concluded)

MODEL COMPONENT: NOZZLES - N_{61}

GENERAL DESCRIPTION: RCS nozzle providing left hand yaw control to simulate re-entry.

MODEL SCALE: 0.010

DRAWING NO.: SS-A01160-8

DIMENSIONS:	MODEL SCALE
Flight dymamic pressure simulation - PSF	5
Cant angle - deg.	
Aft	0
Outboard	0
Diameter - In.	
Exit	0.129
Throat	0.0465
Area - $In.^2$	
Exit	0.013069
Throat	0.001698
Area Ratio	7.697
No. of Nozzles	2

TABLE IV. NOZZLE GEOMETRY

NOZZLE NO.	DASH NO.	NO. OF NOZZLES	THROAT DIA. (IN.)	THROAT AREA ($IN.^2$)	EXIT DIA. (IN.)	EXIT AREA (IN^2)	AREA RATIO	NOTES
N60	-16	2	.0465	.001698	.129	.013069	7.697	R/H PITCH DOWN. SIM. RE-ENTRY q_∞ = 5 PSF CANTED 12° AFT & 20° OUTBOARD
N61	- 8	2						L/H YAW NOZZLE. SIM. RE-ENTRY q_∞ = 5 PSF
N42	-13	2						R/H PITCH DOWN. SIM. RE-ENTRY q_∞ = 5 PSF CANTED 30° AFT & 20° OUTBOARD
N43	-15	2						L/H PITCH DOWN. SIM. RE-ENTRY q_∞ = 5 PSF CANTED 12° AFT & 20° OUTBOARD
N44	- 9	2						R/H PITCH UP. SIM. RE-ENTRY q_∞ = 5 PSF
N45	-14	2						L/H PITCH DOWN. SIM. RE-ENTRY q_∞ = 5 PSF CANTED 30° AFT & 20° OUTBOARD
N46	-18	2	.0465	.001698	.117	.010751	6.332	R/H PITCH DOWN. SIM. RE-ENTRY q_∞ = 20 PSF CANTED 12° AFT & 20° OUTBOARD
N47	-17	2						L/H PITCH DOWN. SIM. RE-ENTRY q_∞ = 20 PSF CANTED 12° AFT & 20° OUTBOARD
N48	-10	2						R/H PITCH UP. SIM. RE-ENTRY q_∞ = 20 PSF
N49	-19	2	.0670	.003525	.141	.015614	4.430	L/H PITCH DOWN. SIM. RTLS q_∞ = 20 PSF CANTED 12° AFT & 20° OUTBOARD
N50	-20	2						R/H PITCH DOWN. SAME AS N49
N52	-12	2						R/H PITCH UP. SIM. RTLS q_∞ = 20 PSF
N51	-11	4						L/H YAW NOZZLE. SIM. RTLS q_∞ = 20 PSF

NOTE: See figure 2g for nozzle configurations and figures 2h through 2t for nozzle calibration results.

TABLE V. RCS SIMULATION TABLES

a. q_∞ = 5 PSF Entry Trajectory Point Simulation

A. Free Stream Conditions		Free Flight	Wind Tunnel
Dynamic pressure	q_∞	5 PSF	100 PSF
Mach number	M_∞	29.5	10.3
*Reynolds number	Re_∞	0.16×10^6	0.8×10^6
Altitude	h	280,000 ft	---
B. RCS Jet Characteristics		**Prototype**	**Model**
Chamber pressure	P_c	150 psia	732.7 psia
Chamber temp.	Tc	5450°R	520 °R
Average specific heat	$\bar{\gamma}$	1.232	1.4
Expansion ratio	ϵ	20	8.169
Nozzle lip angle	θ_p	9°	40°
Exit Area	A_e	72.382 in^2	0.013 in^2
Exit Mach no.	Mj	3.93	3.7
Exit pressure	P_j	0.643 psia	7.256 psia
Mass flow rate	$\dot{m}_j$	3.287 lbm/sec	0.0272 lbm/sec
Momentum	$\dot{m}_j U_j$	903.46 lbs.	1.8 lbs.
Thrust	TH	950 lbs.	1.9 lbs.
C. Jet to Free Stream Parameters (S_{ref} = 1 ft^2)		**Full Scale Free Flight**	**Simulation**
Thrust ratio	$\frac{TH}{q_\infty S_{ref}}$	190	190 (Matched)
Mass flow ratio	$\frac{\dot{m}_j}{q_\infty V_\infty S_{ref}}$	270	193.5
Momentum ratio	$\frac{\dot{m}_j U_j}{q_\infty S_{ref}}$	180	180 (Matched)
Pressure ratio	$\frac{P_j}{P_\infty}$	11480	750
Plume shape		Boundary & impact station	(Matched)

* Reynolds number based on orbiter length $L_{orb.}$ = 107.5 ft.

TABLE V. (Continued)

b. q_∞ = 10 PSF Entry Trajectory Point Simulation

A. Free Stream Conditions		Free Flight	Wind Tunnel
Dynamic pressure	q_∞	10 PSF	150 PSF
Mach number	M_∞	29.4	10.3
*Reynolds no.	Re_∞	0.32×10^6	1×10^6
Altitude	h	267,300 ft.	- - -

B. RCS Jet Characteristics		Prototype	Model
Chamber pressure	P_c	150 psia.	555 psia.
Chamber Temp.	T_c	5450°R	520 °R
Average specific heat	$\tilde{\gamma}$	1.232	1.4
Expansion ratio	ϵ	20	6.79
Nozzle lip angle	θ_p	9°	42°
Exit area	A_e	72.382	0.0108 $in.^2$
Exit Mach no.	M_j	3.93	3.5
Exit pressure	P_j	0.643 psia	7.276 psia
Mass flow rate	$\dot{m}_j$	3.287 lbm/sec.	0.0206 lbm/sec.
Momentum	$\dot{m}_j U_j$	903.46 lbF	1.348 lbF
Thrust	TH	950 lbF	1.426 lbF

C. Jet to Free Stream Parameters (S_{ref} = 1 ft^2)		Full Scale Free Flight	Simulation
Thrust ratio	$\frac{TH}{q_\infty S_{ref}}$	95	95 (Matched)
Mass flow ratio	$\frac{\dot{m}_j}{P_\infty V_\infty S_{ref}}$	134.5	97.7
Momentum ratio	$\frac{\dot{m}_j U_j}{q_\infty S_{ref}}$	90	90 (Matched)
Pressure ratio	$\frac{P_j}{P_\infty}$	5675	519.7
Plume shape			

* Reynolds number based on orbiter length $L_{orb.}$ = 107.5 ft.

TABLE V. (Continued)

c. q_∞ = 20 PSF Entry Trajectory Point Simulation

A. Free Stream Conditions		Free Flight	Wind Tunnel
Dynamic pressure	q_∞	20 PSF	150 PSF
Mach number	M_∞	28	10.3
*Reynolds number	Re_∞	0.63×10^6	1×10^6
Altitude	h	253,000 ft	---

B. RCS Jet Characteristics		Prototype	Model
Chamber pressure	P_c	150 psia	277.4 psia
Chamber temp.	T_c	5450 °R	520 °R
Average specific heat	$\bar{\gamma}$	1.232	1.4
Expansion ratio	ε	20	6.79
Nozzle lip angle	θ_p	9°	42°
Exit area	A_e	72.382 in^2	0.0108 in^2
Exit Mach no.	M_j	3.93	3.5
Exit pressure	P_j	0.643 psia	3.636 psia
Mass flow rate	$\dot{m}_j$	3.287 lbm/sec.	0.0103 lbm/sec.
Momentum	$\dot{m}_j U_j$	903.46 lbs.	0.673 lbs.
Thrust	TH	950 lbs.	0.712 lbs.

C. Jet to Free Stream Parameters (S_{ref} = 1 ft^2)		Full Scale Free Flight	Simulation
Thrust ratio	$\frac{TH}{q_\infty S_{ref}}$	47.5	47.5 (Matched)
Mass flow ratio	$\frac{\dot{m}_j}{q_\infty V_\infty S_{ref}}$	64.96	48.8
Momentum ratio	$\frac{\dot{m}_j U_j}{q_\infty S_{ref}}$	45	45 (Matched)
Pressure ratio	$\frac{P_j}{P_\infty}$	2550	260
Plume shape		Boundary & impact station	(Matched)

* Reynolds number based on orbiter length $L_{orb.}$ = 107.5 ft.

TABLE V. (Concluded)

d. q_∞ = 20 PSF RTLS Abort Separation Point Simulation

A. Free Stream Conditions		Free Flight	Wind Tunnel
Dynamic pressure	q_∞	20 PSF	150 PSF
Mach number	M_∞	7	10.3
*Reynolds no.	Re_∞	1.23×10^6	1×10^6
Altitude	h	200,000 ft	---
B. RCS Jet Characteristics		**Prototype**	**Model**
Chamber pressure	P_c	150 psia	140 psia
Chamber temp.	T_c	5450 °R	520 °R
Average specific heat	$\bar{\gamma}$	1.232	1.4
Expansion ratio	ϵ	20	4.792
Nozzle lip angle	θ_p	9°	40°
Exit area	Ae	72.382 in^2	0.01567 in^2
Exit Mach no.	Mj	3.93	3.13
Exit pressure	P_j	0.643 psia	3.136 psia
Mass flow rate	$\dot{m}_j$	3.287 lbm/sec.	0.01067 lbm/sec.
Momentum	$\dot{m}_j U_j$	903.46 lbF	0.675 lbs.
Thrust	TH	950 lbF	0.7239 lbs.
C. Jet to Free Stream Parameters (S_{ref} = 1 ft^2)		**Full Scale Free Flight**	**Simulation**
Thrust ratio	$\frac{TH}{q_\infty S_{ref}}$	47.5	47.5 (Matched)
Mass flow ratio	$\frac{\dot{m}_j}{P_\infty V_\infty S_{ref}}$	26.4	50.6
Momentum ratio	$\frac{\dot{m}_j U_j}{q_\infty S_{ref}}$	45.7	45 (Matched)
Pressure ratio	$\frac{P_j}{P_\infty}$	224	224 (Matched)
Plume shape			(Roughly matched)

*Reynolds number based on orbiter length $L_{orb.}$ = 107.5 ft.

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TABLE VI. OA85 Pressure Measurements

RUN	CONFIG	α	MACH	P_o	T_o	P_c	T_c	P_{101}	P_{102}	P_{103}	P_{104}	P_{105}	P_{106}	P_{107}	P_{108}	P_{109}	P_{110}	P_{111}	P_{112}
1	OFF $O_1M_{43}M_{60}$	20	10.30	502	1362	--	--	.1008	.0506	.0713	--	.0685	.0788	.4703	.4772	.0651	.1382	.0705	.2385
1		30	↑	501	1355			.1005	.0455	.0858	--	.0731	.0898	.6020	.7357	.0626	.1323	.0612	.1774
2	$O_1M_{43}M_{60}$	20		507	1321	767	73	.0915	.0489	.1455	--	.3255	.1052	.4262	.5060	.4381	.4857	2.473	.3032
2		30		508	1318	765	73	.0885	.0469	.1757	--	.4556	.1073	.6331	.7551	.4496	.5248	2.530	.5657
3	OFF $O_1M_{43}M_{60}$	20		503	1353	--	--	.0838	.0312	.0447	.0404	.0380	.0410	--	.1381	.0372	.0849	.0417	.1100
3		30		502	1353	--	--	.0819	.0297	.0461	.0359	.0390	.0422	--	.2854	.0375	.0893	.0416	.2548
4	$O_1M_{43}M_{60}$	20		506	1356	764	76	.0922	.0501	.1076	.1131	.4003	.1057	1.082	.2473	.3591	.4191	3.581	.1869
4		30		508	1352	762	76	.0938	.0475	.1315	.0943	.5025	.0857	1.013	.3979	.4748	.3172	3.847	.3065
5	$O_1M_{42}M_{45}$	20		506	1365	774	77	.0959	.0402	.0459	.0485	.1705	.0613	3.835	.2326	.2019	.3352	.5454	.2282
5		30		508	1362	773	77	.0984	.0401	.0569	.0617	.1360	.0589	3.506	.3702	.2374	.3751	.4812	.3847
6	$O_2M_{43}M_{60}$	20	↓	506	1316	767	80	.1650	.0492	.1247	.0957	.2321	.0806	.2849	.2884	.2290	.3802	.6314	.2687
6		30	10.30	507	1312	766	80	.1986	.0504	.1467	.1090	.1911	.0836	.4203	.4180	.2522	.4426	.4834	.4288
7	$O_2M_{46}M_{47}$	20	10.33	750	1340	310	67	.1174	.0562	.0737	.0964	.0840	.0900	.2502	.2288	.1247	.2183	.5303	.2434
7		30	↑	750	1340	310	67	.1558	.0521	.1126	.0901	.1086	.0880	.4491	.4077	.2078	.2130	1.068	.4809
8	OFF $O_1M_{46}M_{47}$	20		750	1346	--	--	.0794	.0420	.0570	.0428	.0431	.0641	.2354	.1927	.0510	.0962	.0577	.1645
8		30		749	1346	--	--	.0730	.0391	.0575	.0417	.0420	.0668	.4457	.4027	.0495	.0938	.0505	.3732
9	$O_1M_{46}M_{47}$	20	↓	750	1349	311	68	.1239	.0473	.0655	.0722	.0900	.0784	.2379	.2401	.1760	.1573	1.315	.2230
9		30	10.33	750	1347	311	68	.1528	.0456	.0751	.0758	.1223	.0789	.4498	.4310	.2057	.2290	1.608	.4677
10	OFF $O_1M_{43}M_{60}$	20	10.30	497	1366	--	--	.0738	.0304	.0404	.0298	.0344	.0492	.1008	.0554	.0419	.0764	.0367	.0511
10		30	↑	496	1367	--	--	.0712	.0300	.0392	.0308	.0321	.0521	.1318	.0791	.0546	.0764	.0366	.0857
11	$O_1M_{43}M_{60}$	20	↓	499	1379	764	83	.1432	.0512	.0538	.0914	.0879	.0724	.2829	.1873	.4325	.3796	4.432	.0985
11		30	10.30	501	1375	764	83	.1514	.0512	.0599	.0795	.0925	.0718	.3869	.2854	.4579	.3860	4.437	.1881

NOTE: ● ALL PRESSURES IN PSIA
● ALL TEMPERATURES IN °F

Notes:

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

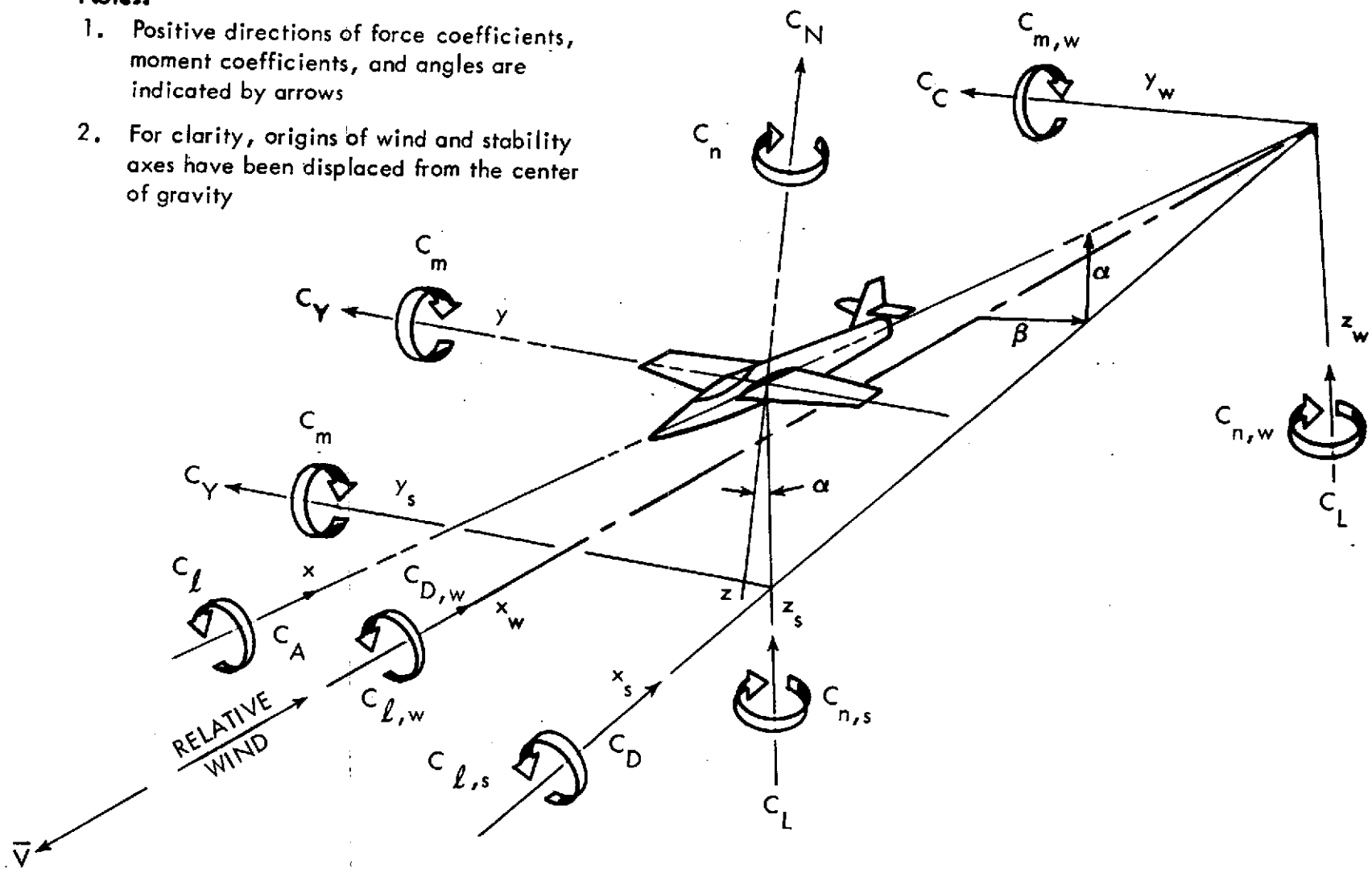
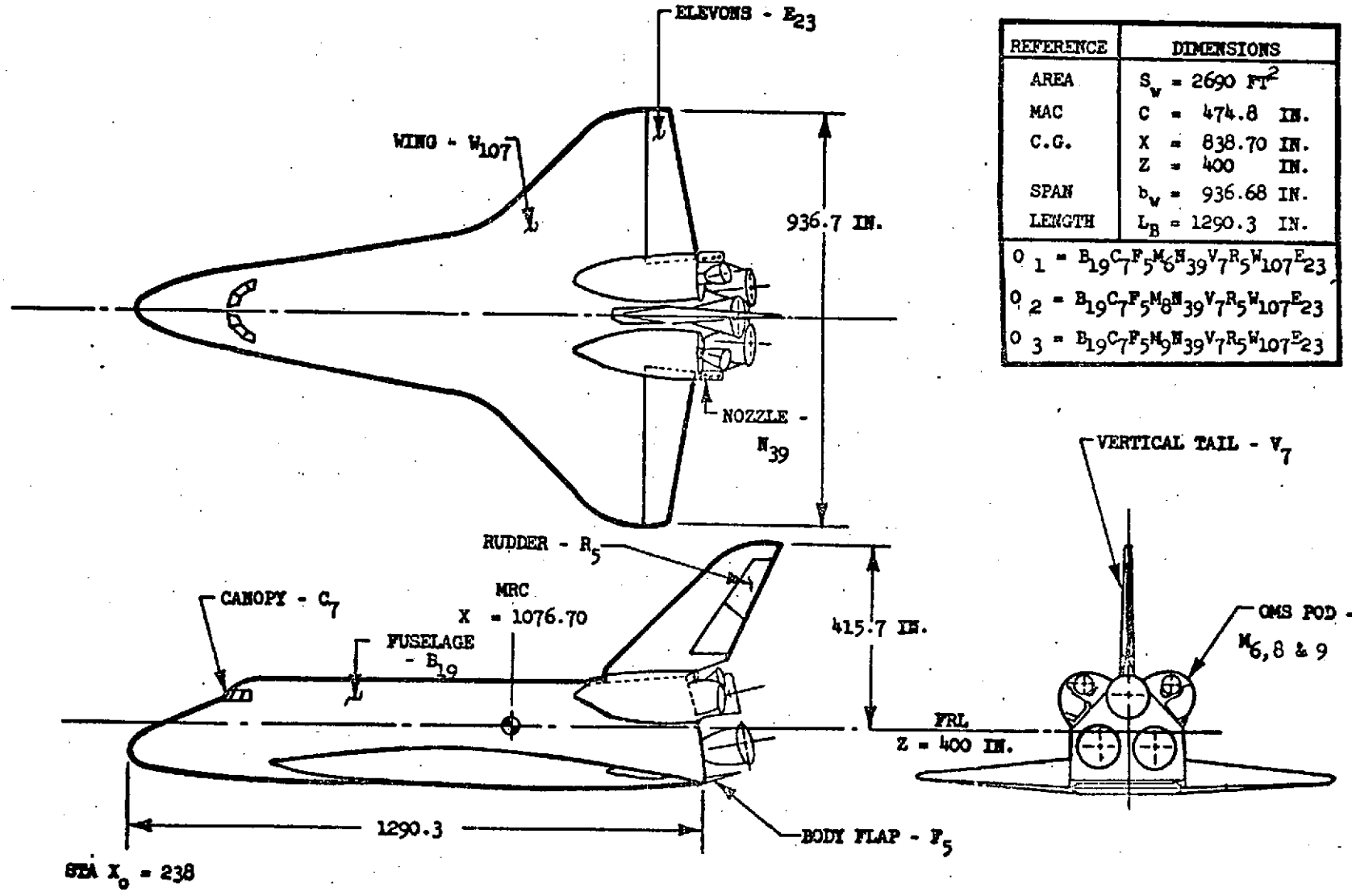


Figure 1. Axis Systems

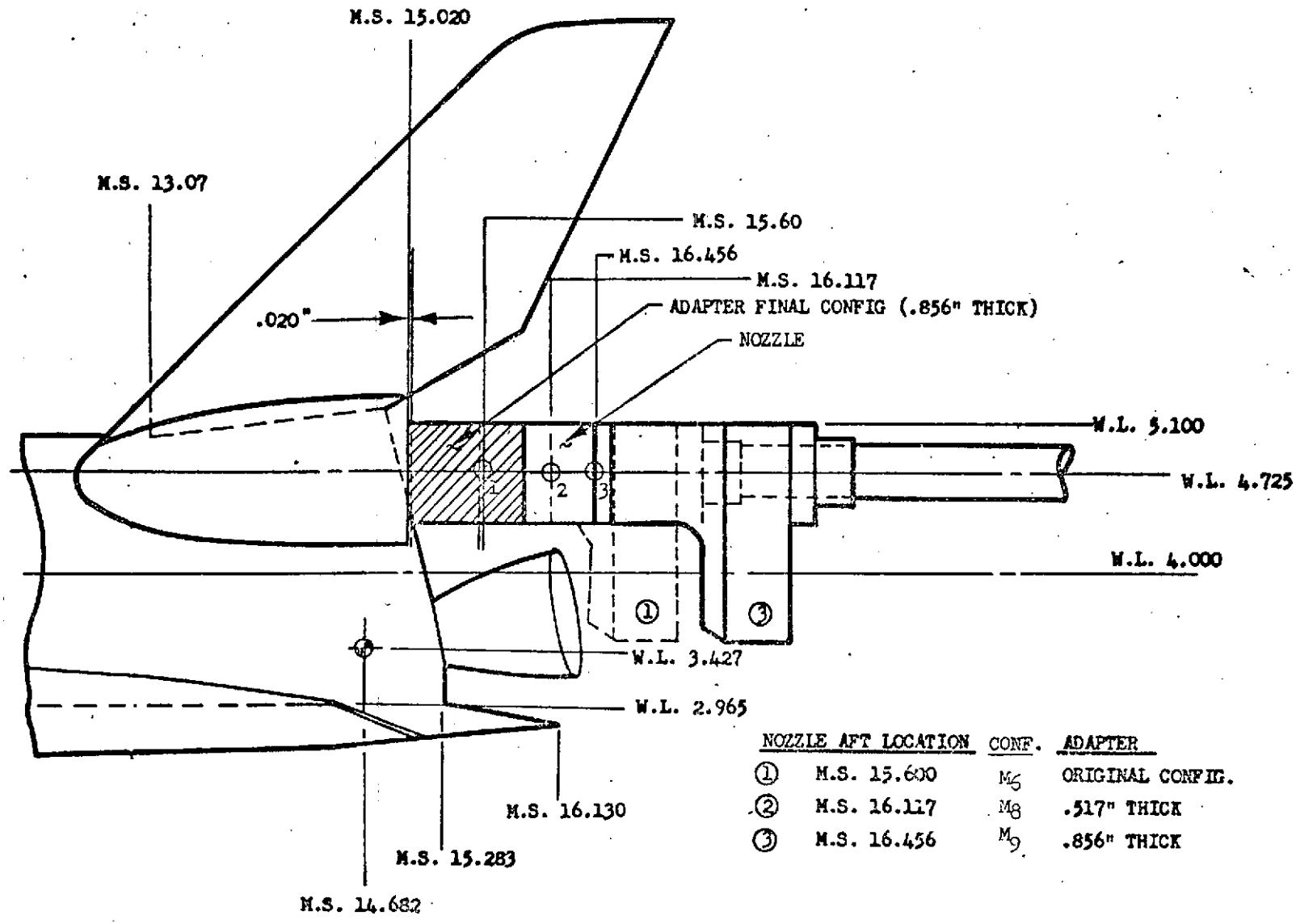


REFERENCE	DIMENSIONS
AREA	S_w = 2690 FT^2
MAC	C = 474.8 IN.
C.G.	X = 838.70 IN. Z = 400 IN.
SPAN	b_w = 936.68 IN.
LENGTH	L_B = 1290.3 IN.

O 1	$B_{19}C_7F_5M_6N_{39}V_7R_5W_{107}E_{23}$
O 2	$B_{19}C_7F_5M_8N_{39}V_7R_5W_{107}E_{23}$
O 3	$B_{19}C_7F_5M_9N_{39}V_7R_5W_{107}E_{23}$

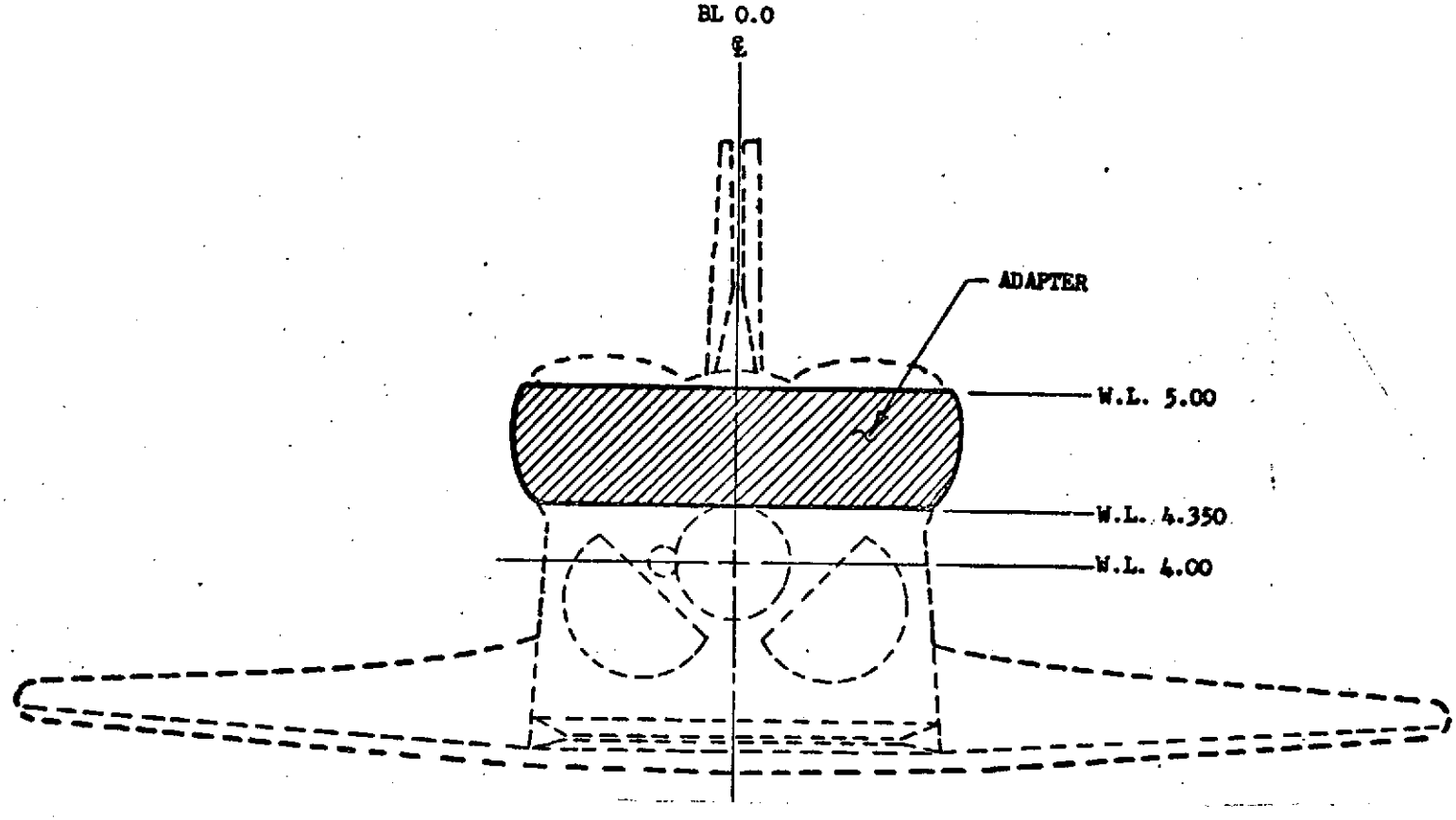
a. Configuration Diagram

Figure 2. Model Sketches



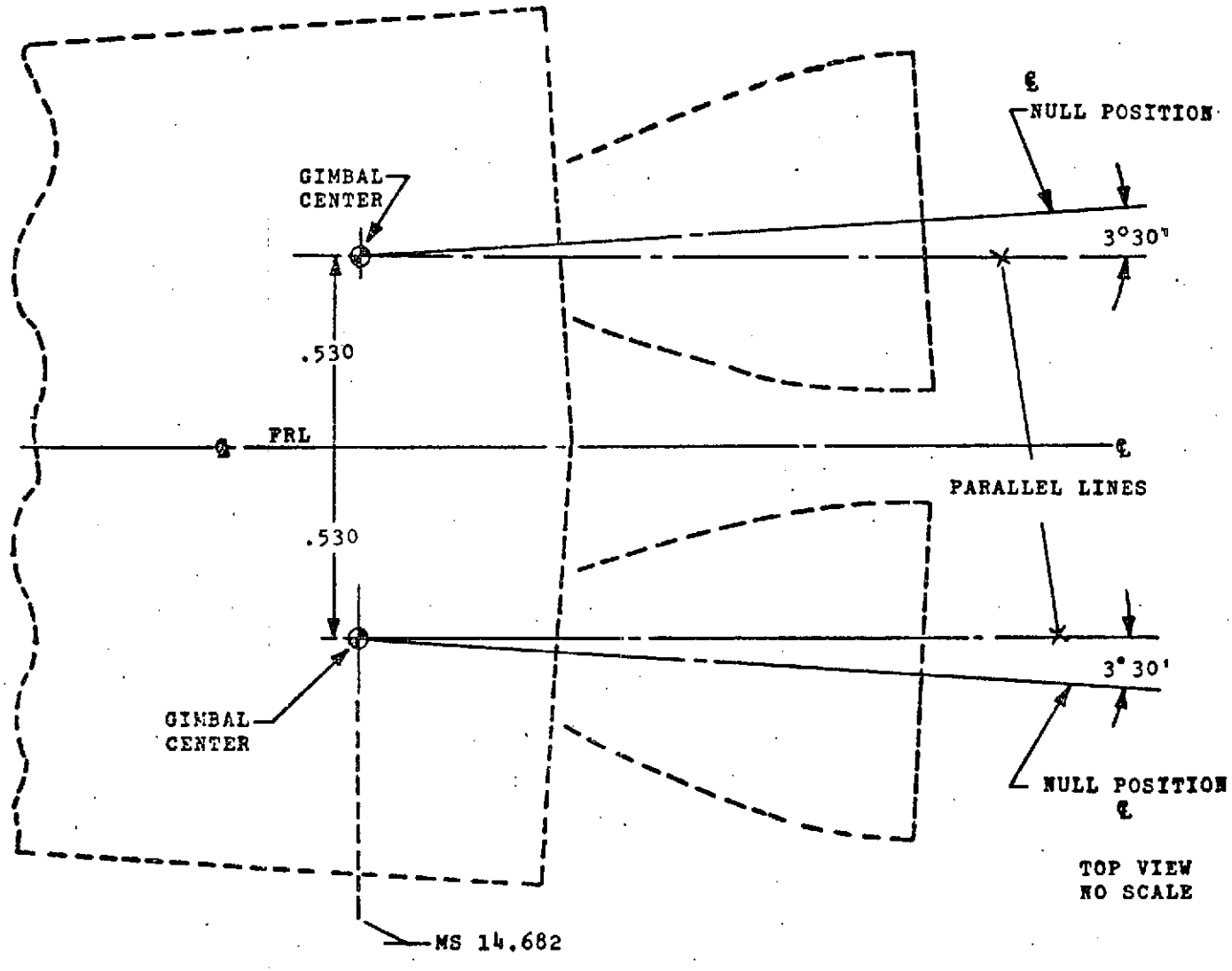
b. RCS Plenum Nozzle Block and Spacer Installation

Figure 2. Continued



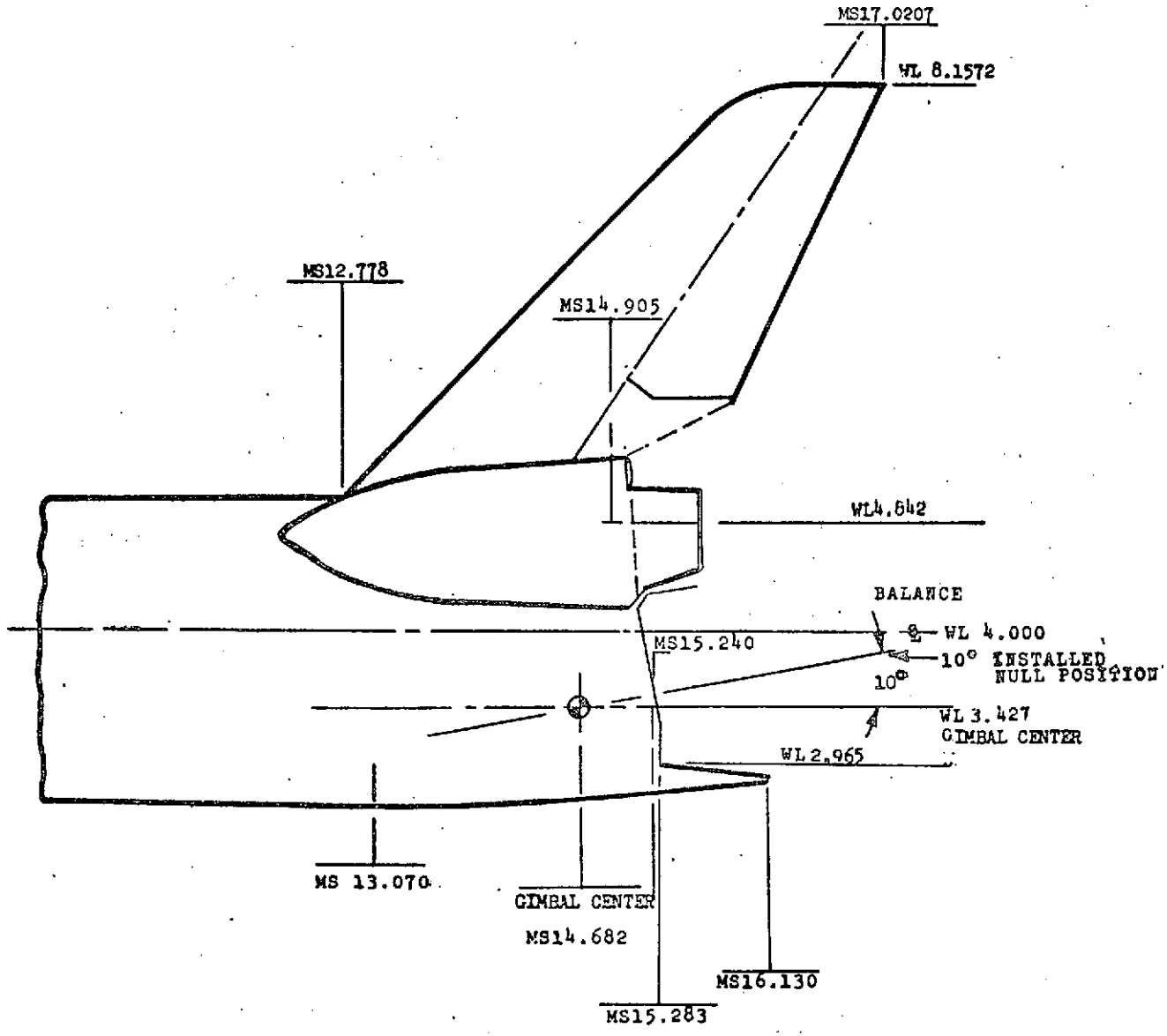
c. Adapter Plate-OMS Pods M_8 and M_9

Figure 2. Continued



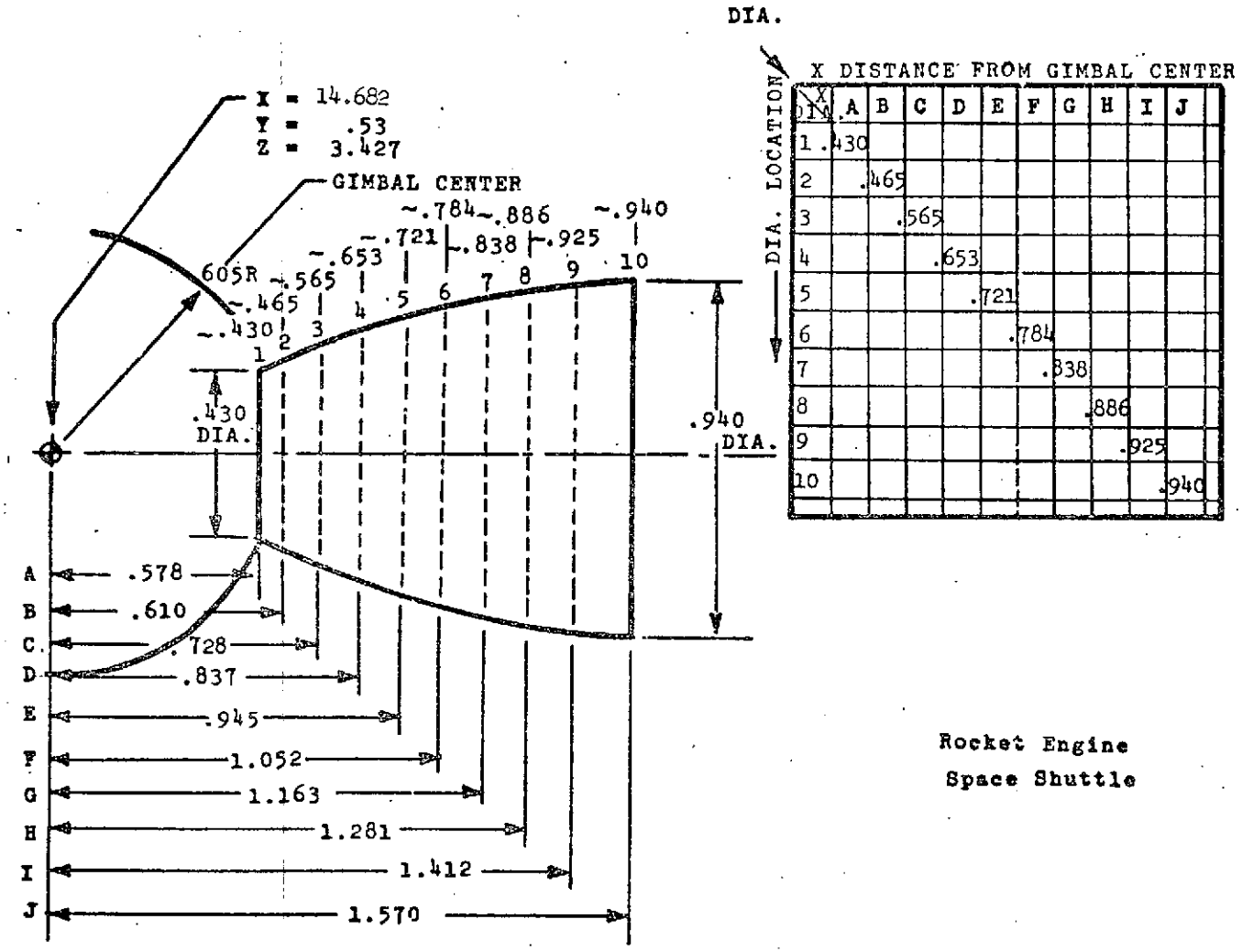
d. Orbiter Main Engine Installation--Top View

Figure 2. Continued



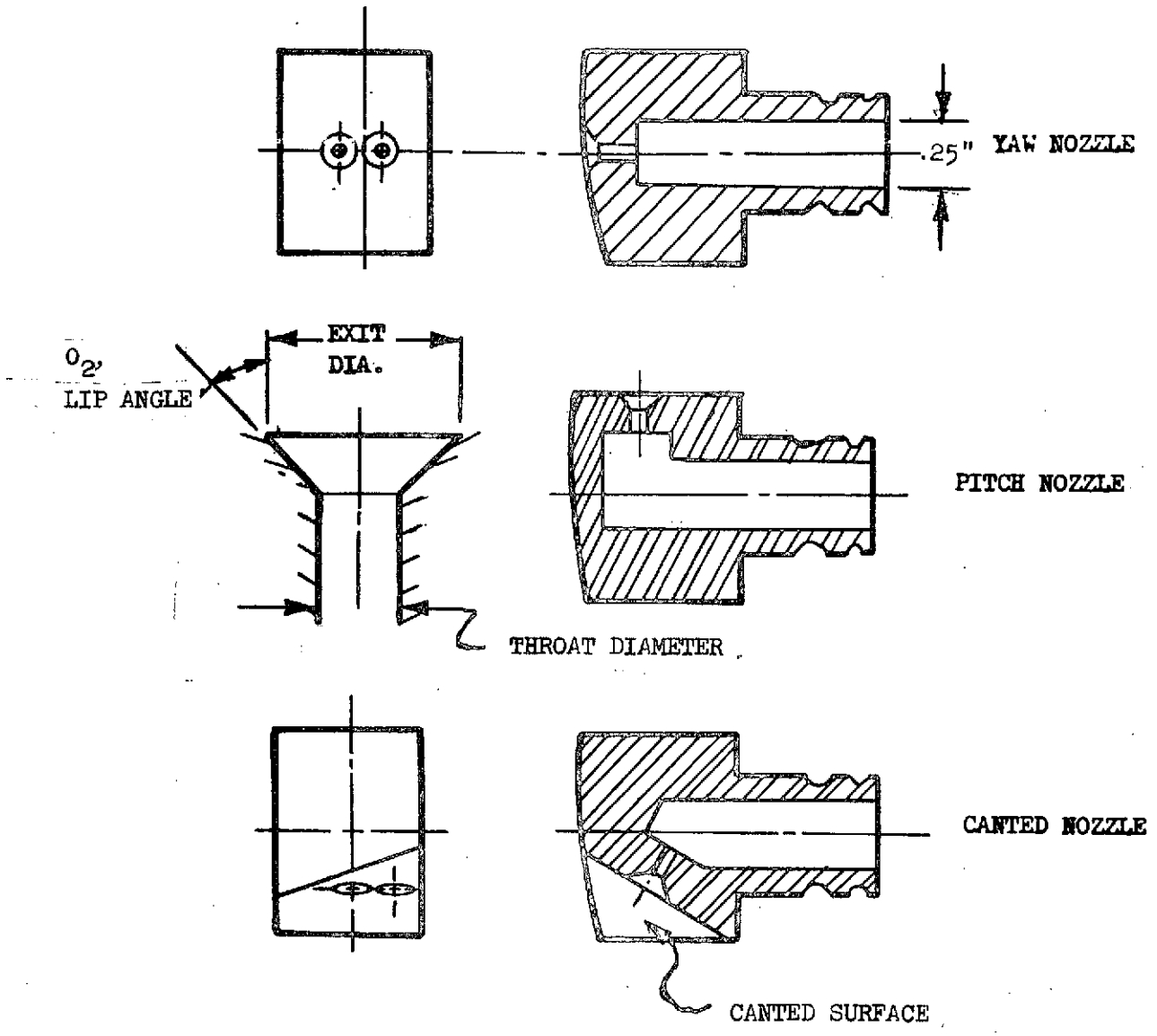
e. Orbiter Main Engine Installation--Side View

Figure 2. Continued



f. Orbiter Main Engine Lines

Figure 2. Continued



g. Nozzle Configurations

Figure 2. Continued

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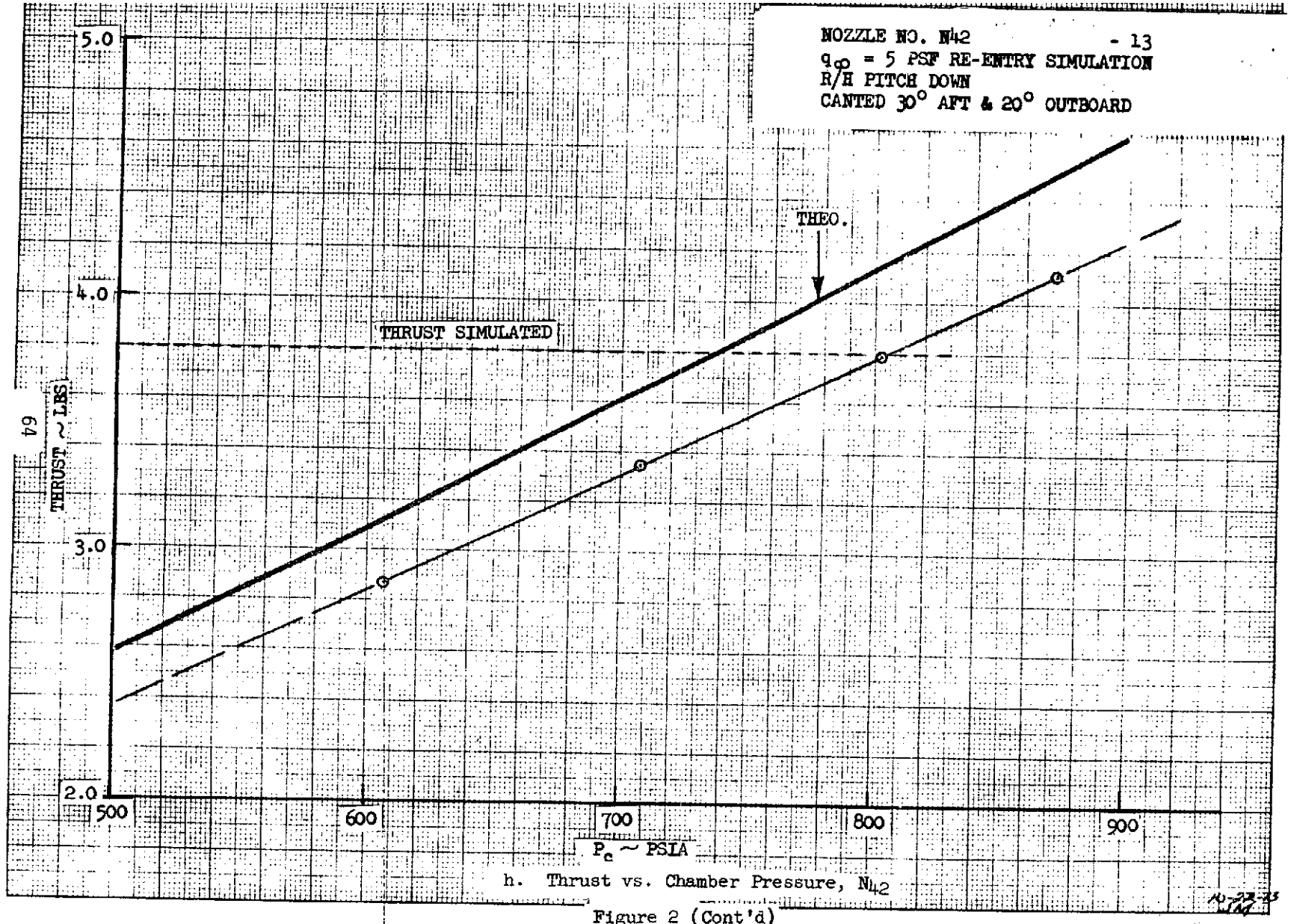

h. Thrust vs. Chamber Pressure, N_{42}

Figure 2 (Cont'd)

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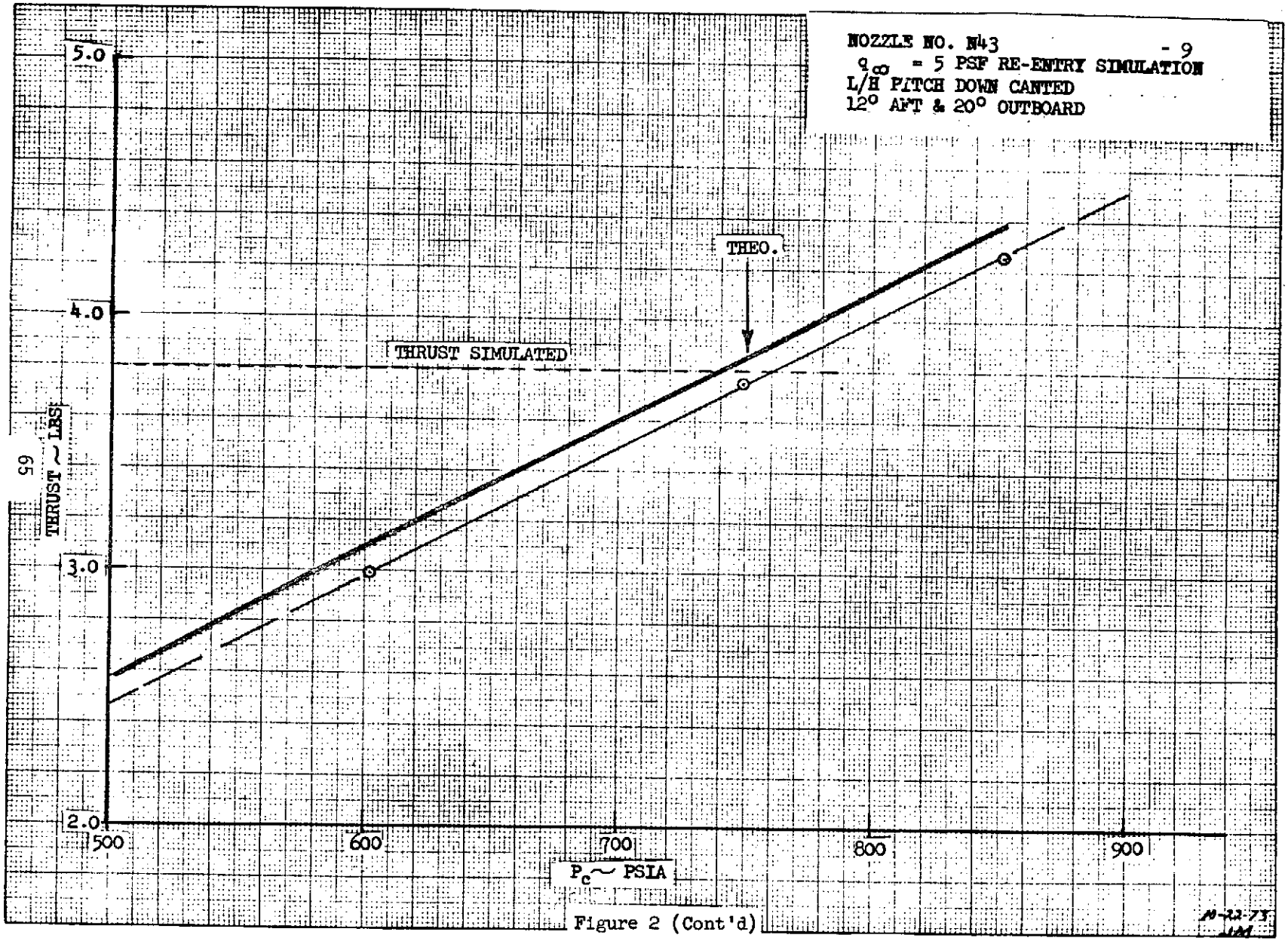

Figure 2 (Cont'd)

i. Thrust Vs. Chamber Pressure, N43

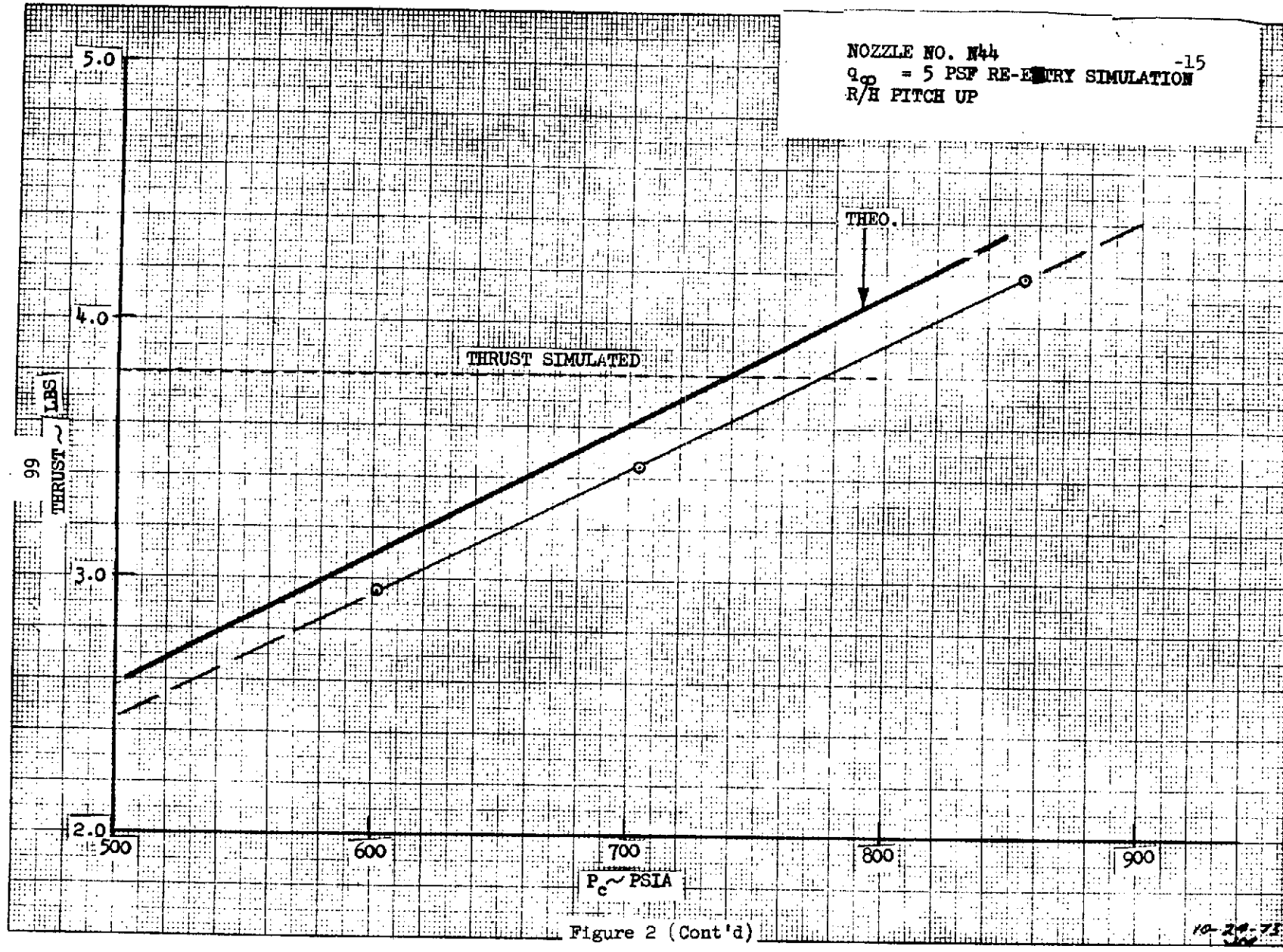

Figure 2 (Cont'd)

j. Thrust Vs.Chamber Pressure, N44

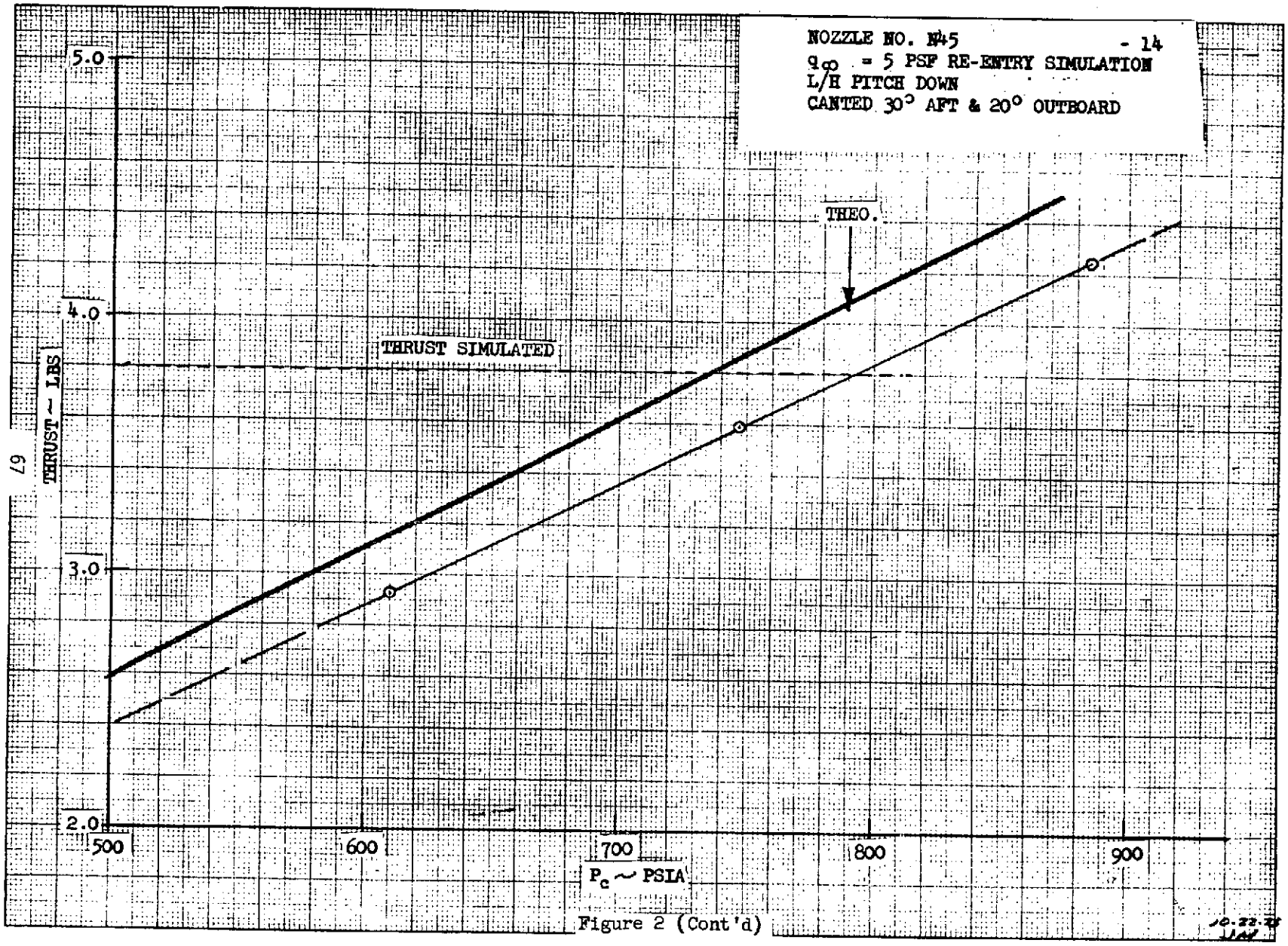

Figure 2 (Cont'd)

k. Thrust Vs. Chamber Pressure, N45

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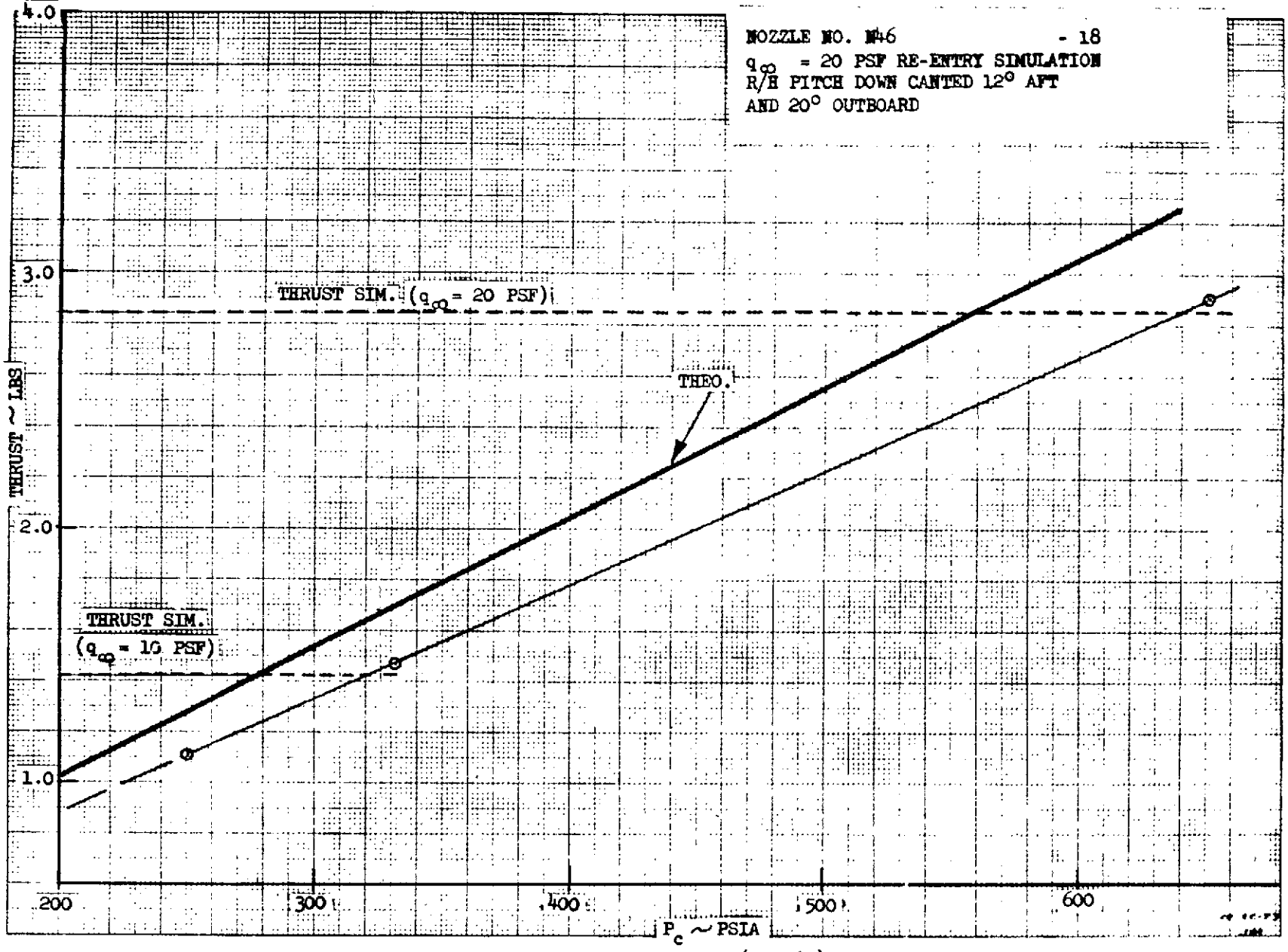

Figure 2 (Cont'd)
1. Thrust Vs. Chamber Pressure, N_{46}

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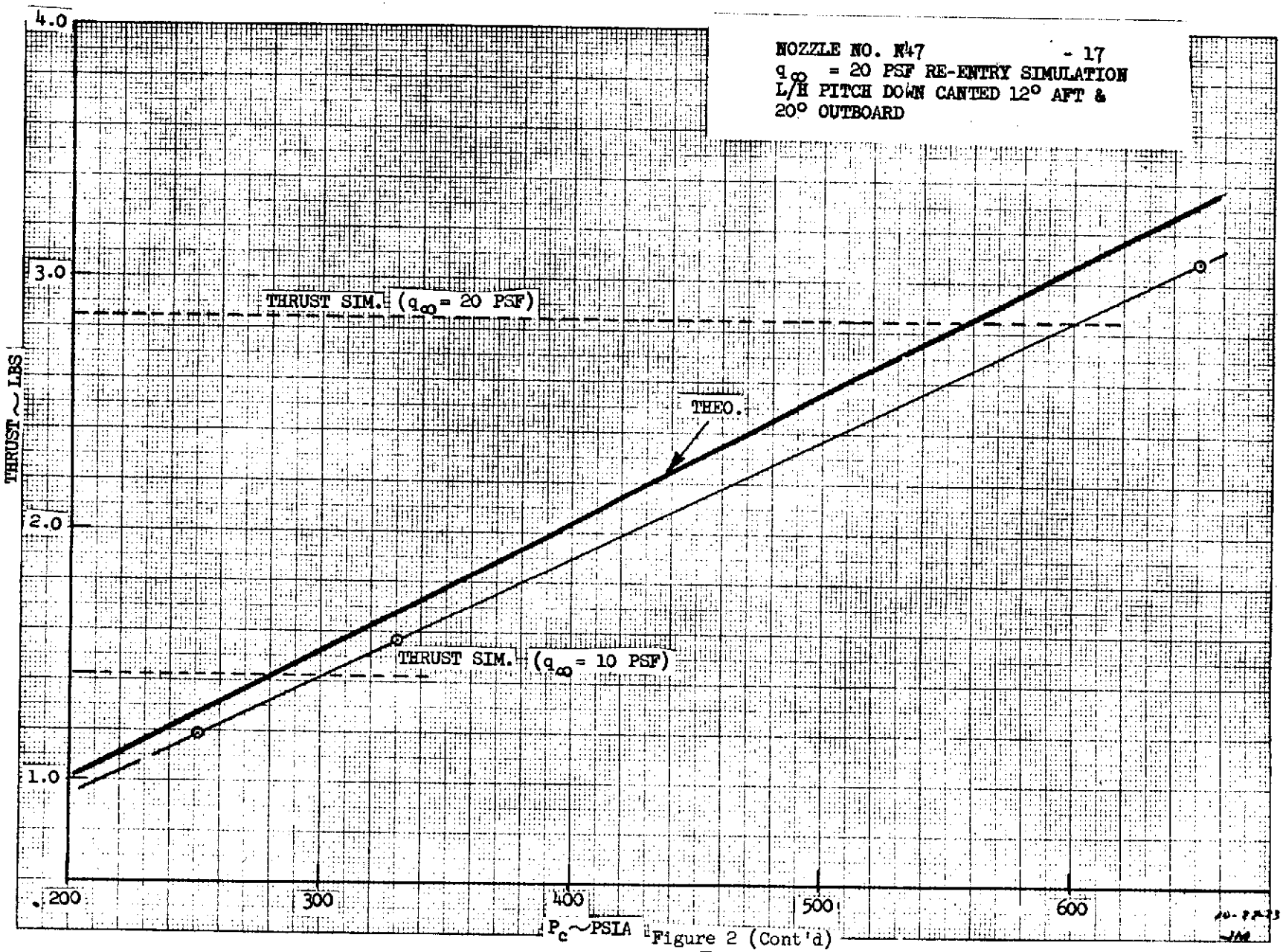

Figure 2 (Cont'd)

m. Thrust Vs. Chamber Pressure, N_{47}

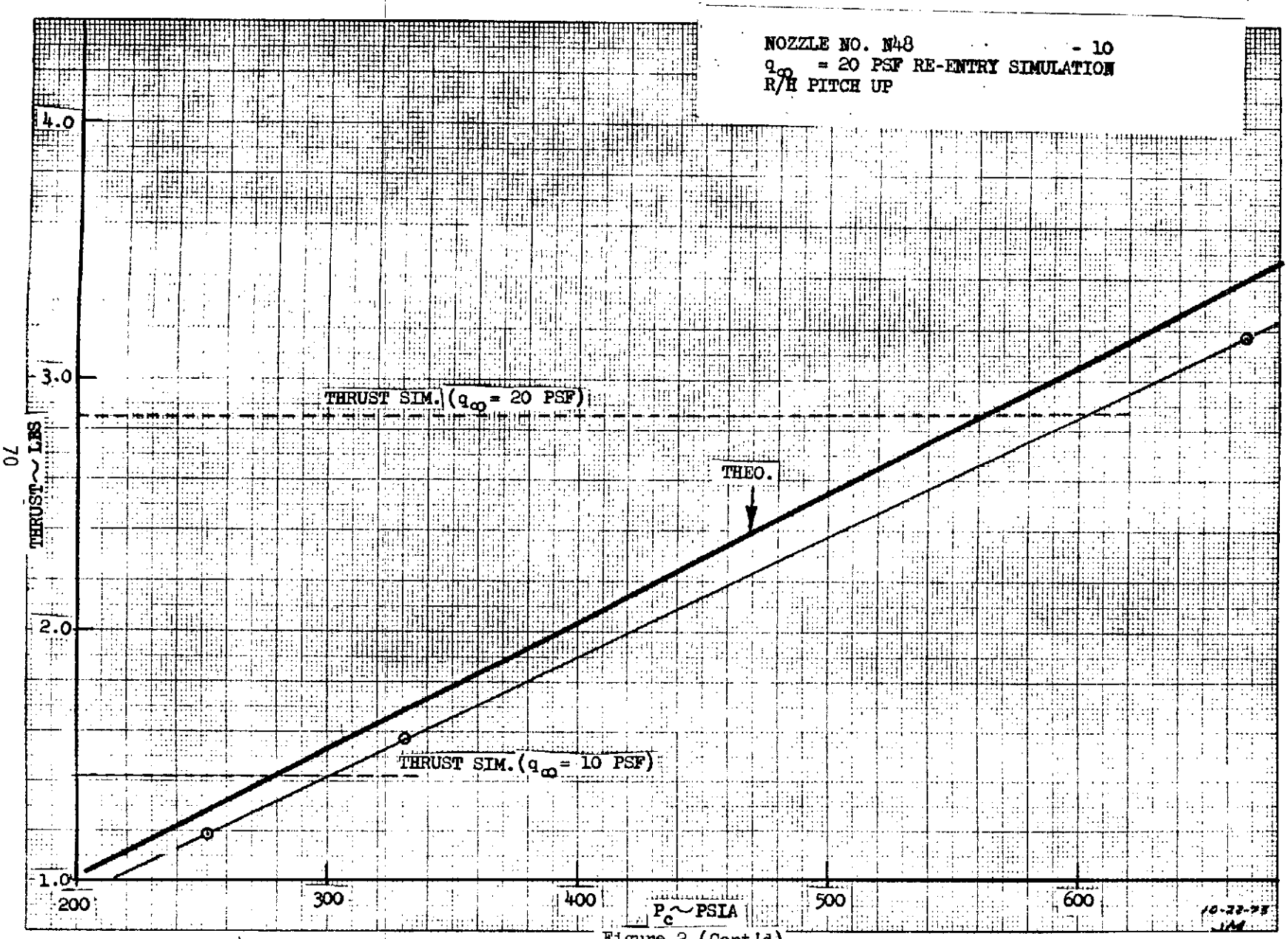

Figure 2 (Cont'd)

n. Thrust Vs. Chamber Pressure, N48

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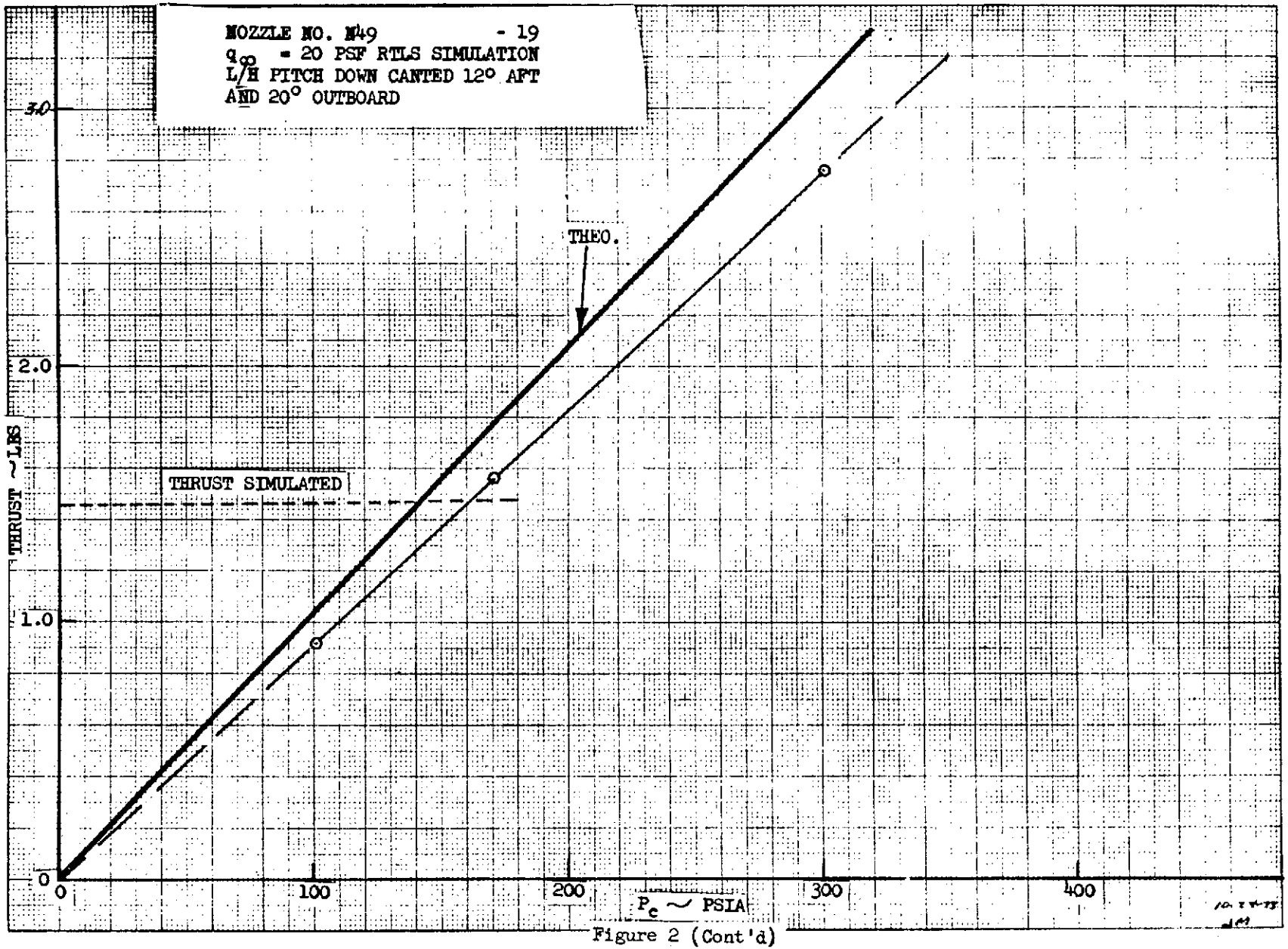

Figure 2 (Cont'd)

o. Thrust Vs. Chamber Pressure, N_{i_4O}

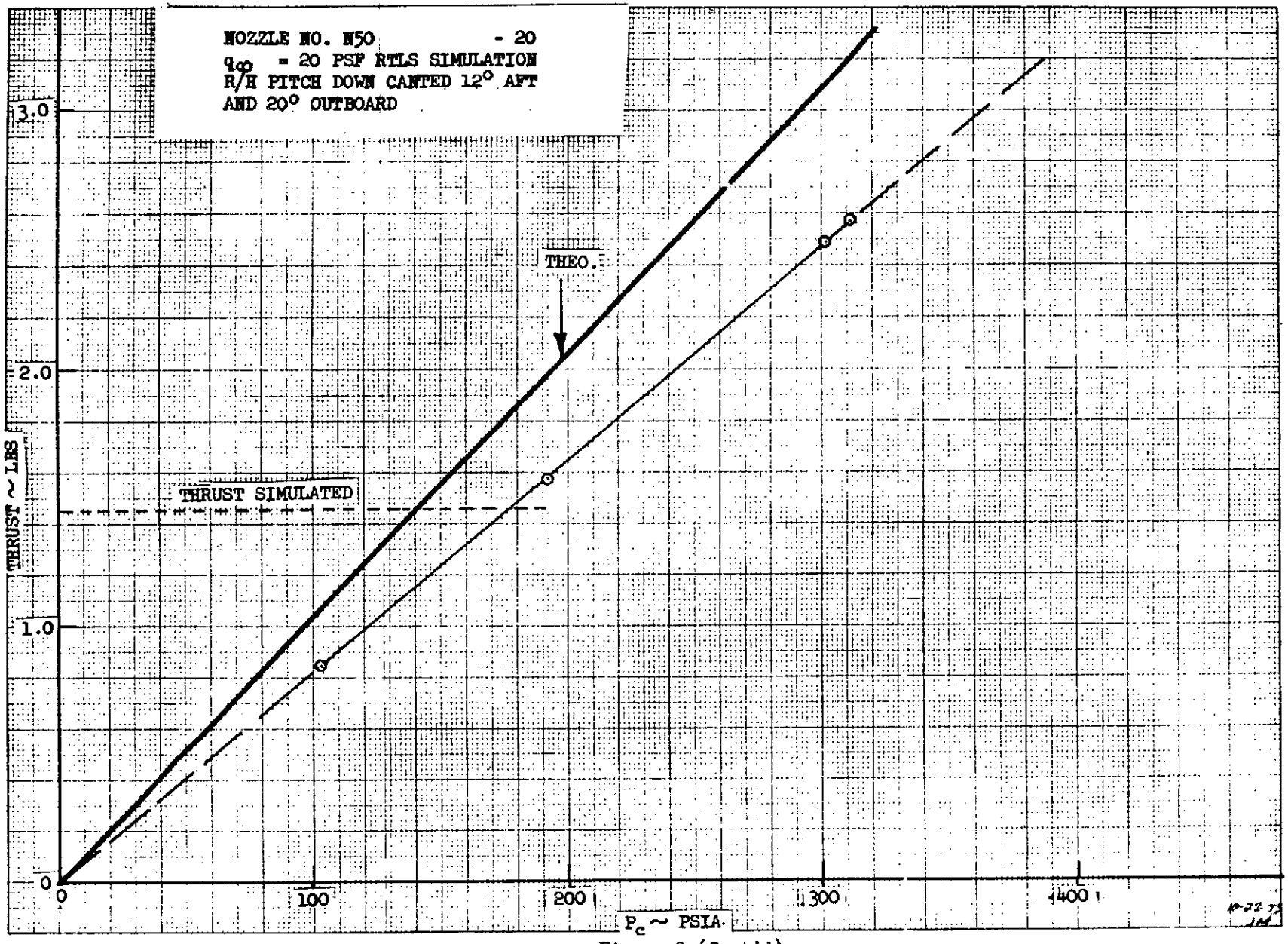

Figure 2 (Cont'd)

p. Thrust Vs. Chamber Pressure, N_{50}

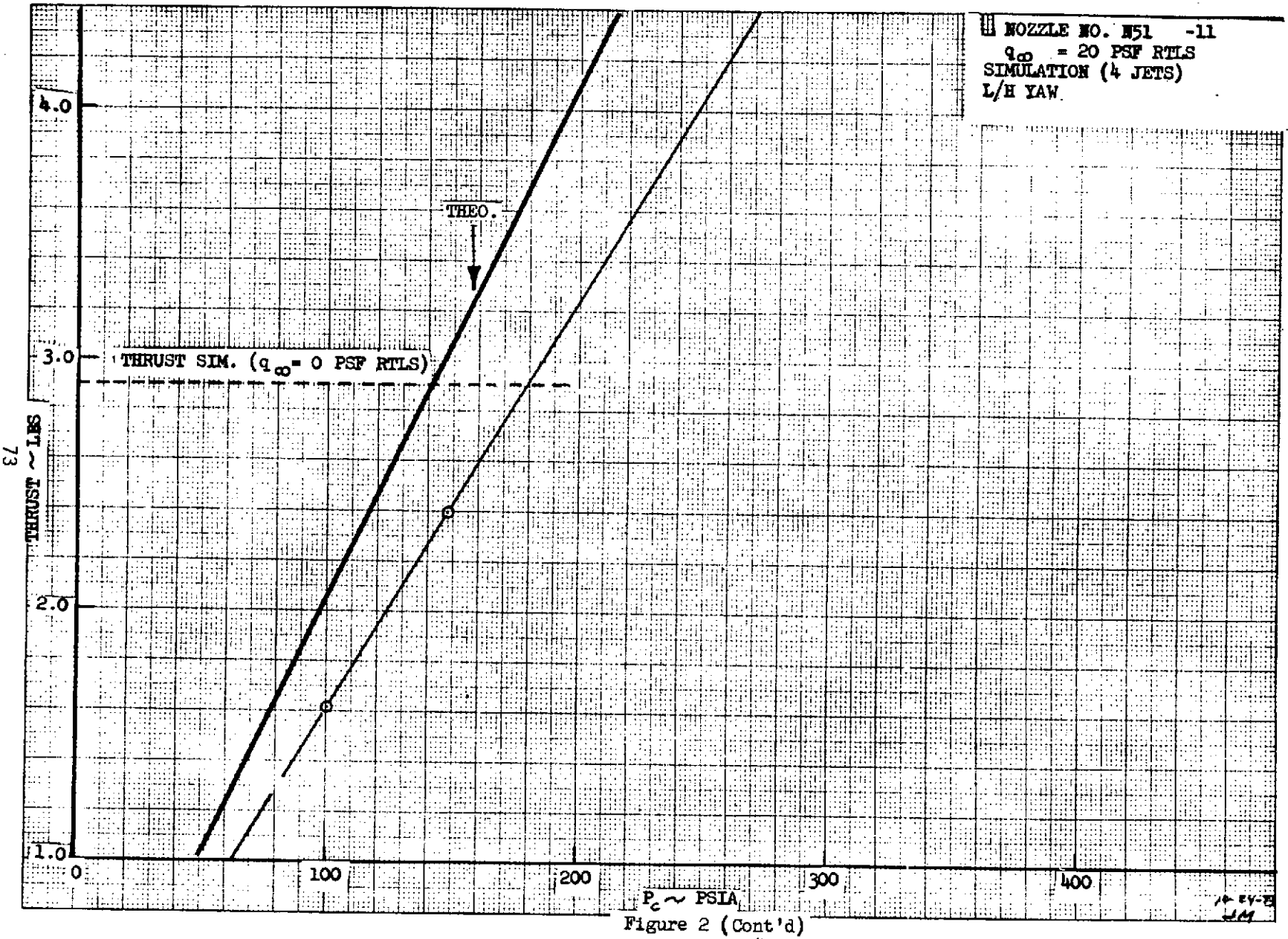

Figure 2 (Cont'd)

q. Thrust Vs. Chamber Pressure, N_{51}

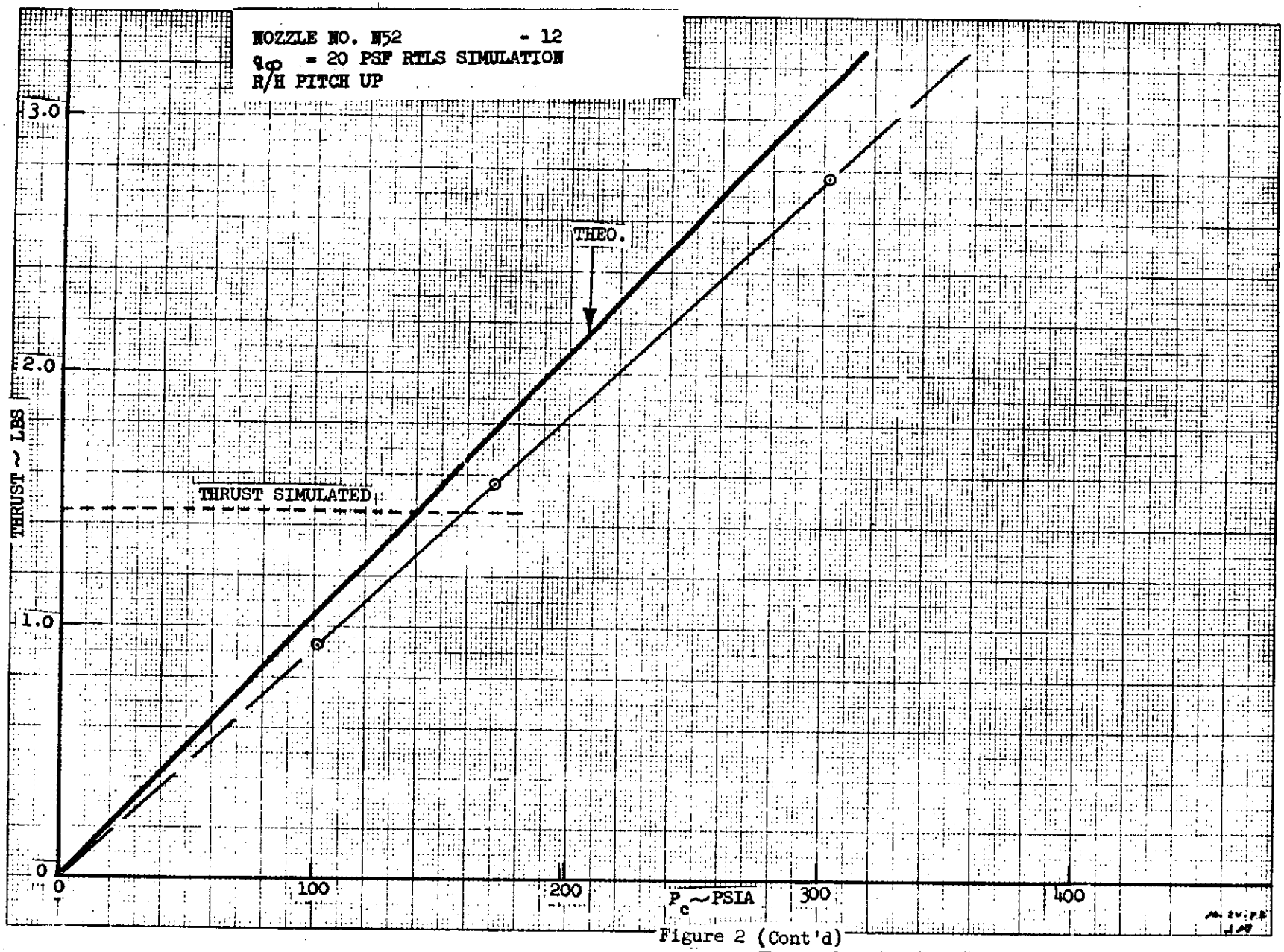

Figure 2 (Cont'd)
r. Thrust Vs. Chamber Pressure, N_{52}

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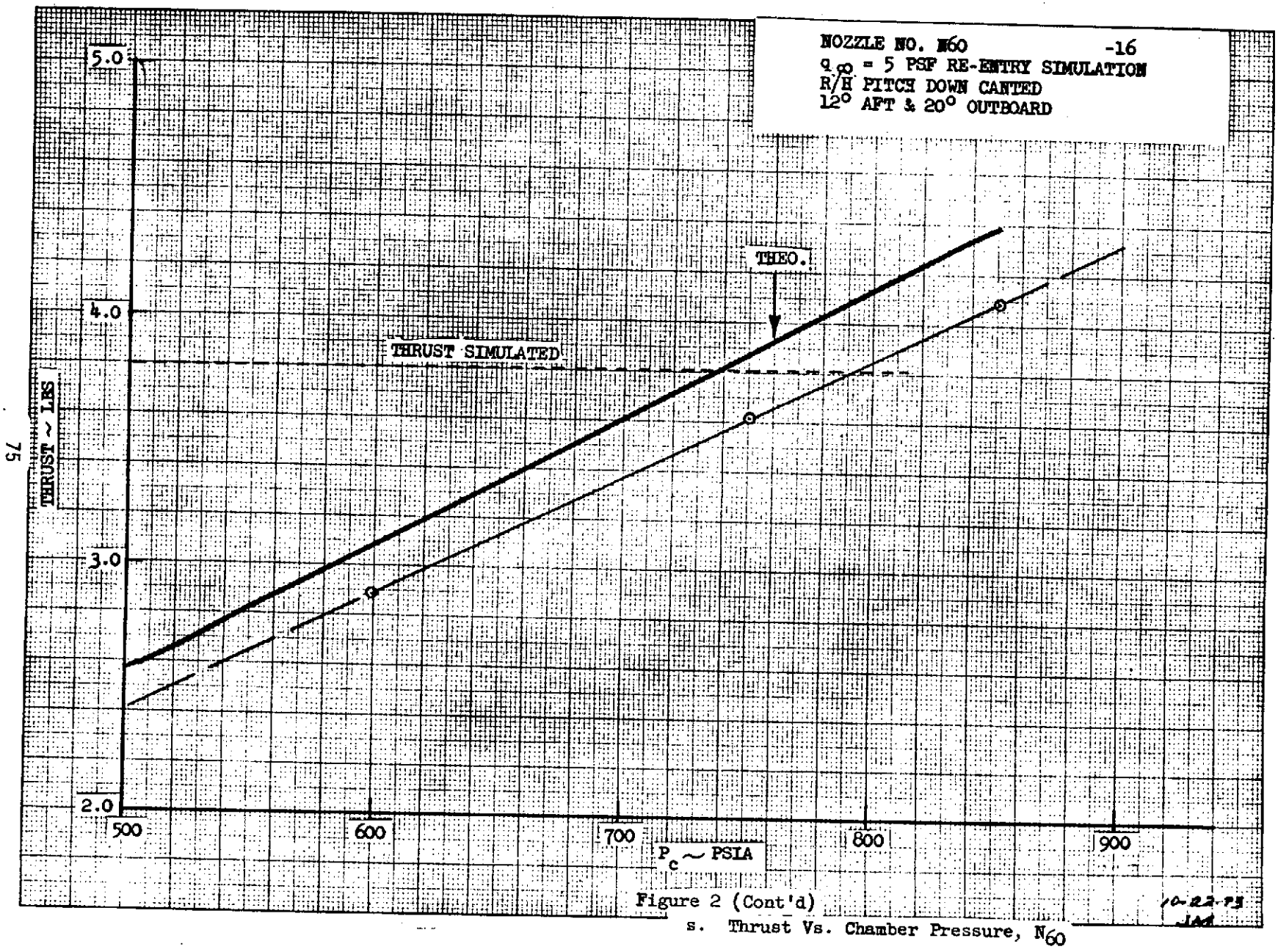


Figure 2 (Cont'd)

s. Thrust Vs. Chamber Pressure, N_{60}

10-22-73
JAA

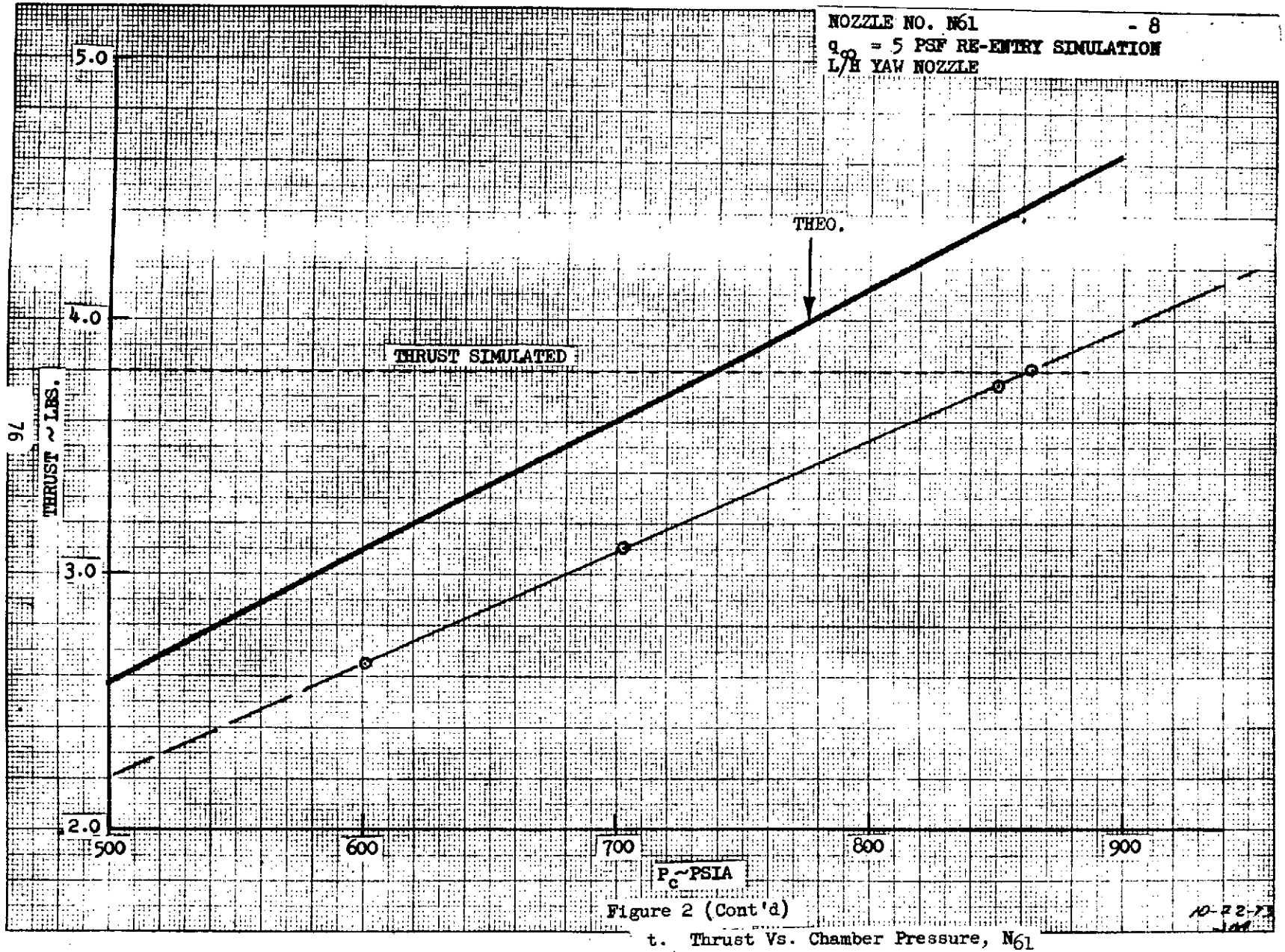
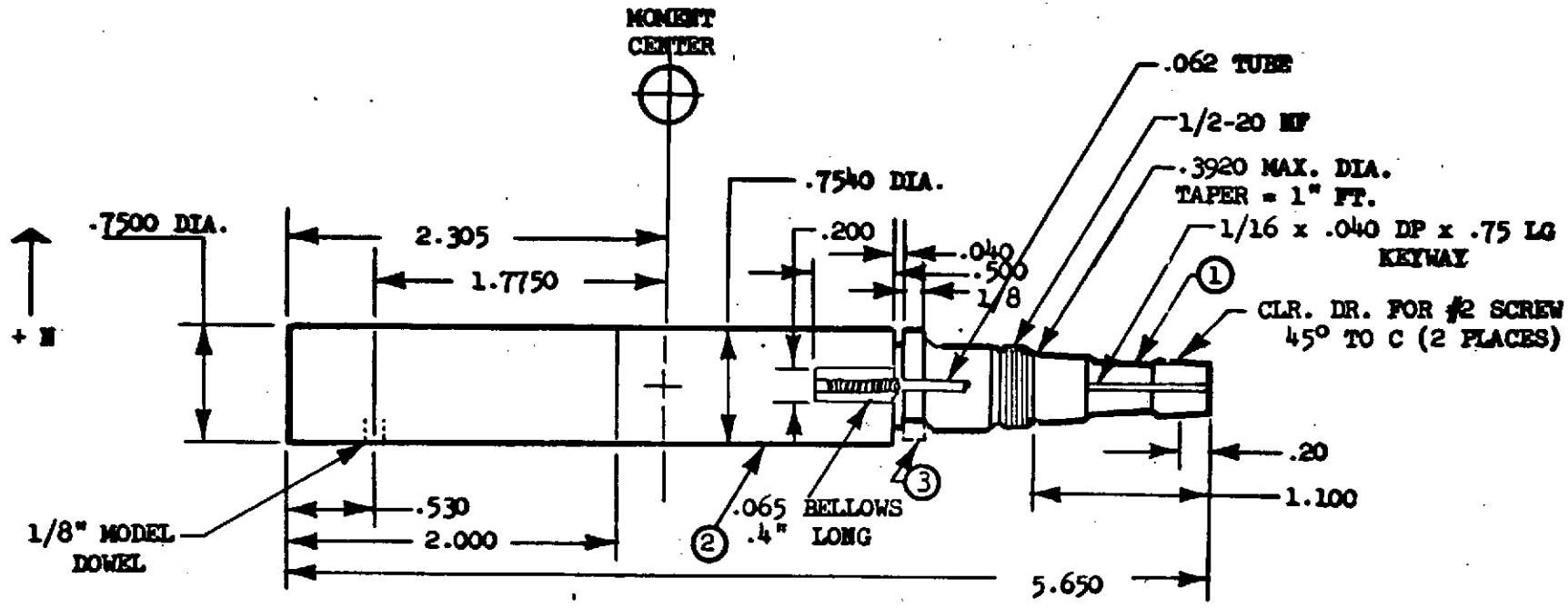


Figure 2 (Cont'd)

t. Thrust Vs. Chamber Pressure, N_{61}

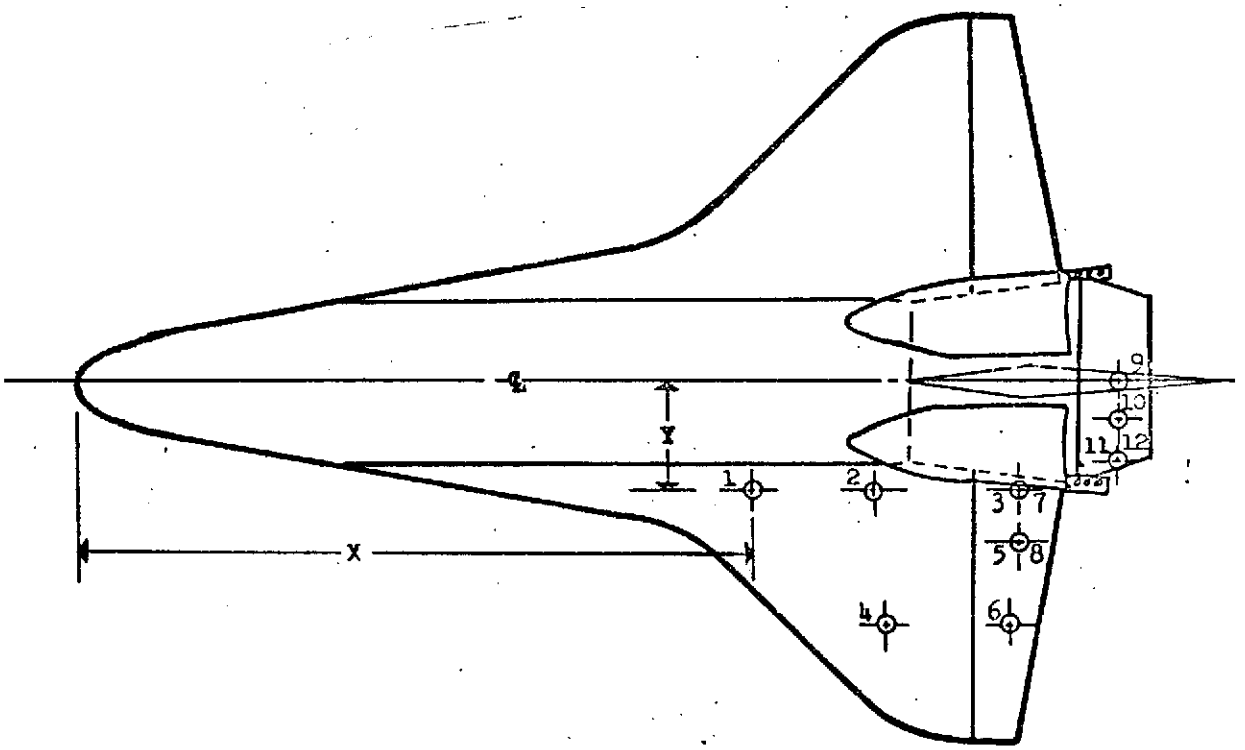
10-22-73



BALANCE 2018, 2019, 2020, & 2021
OUTLINE & ASSEMBLY

u. LRC 0.750-inch Balance No. 2019

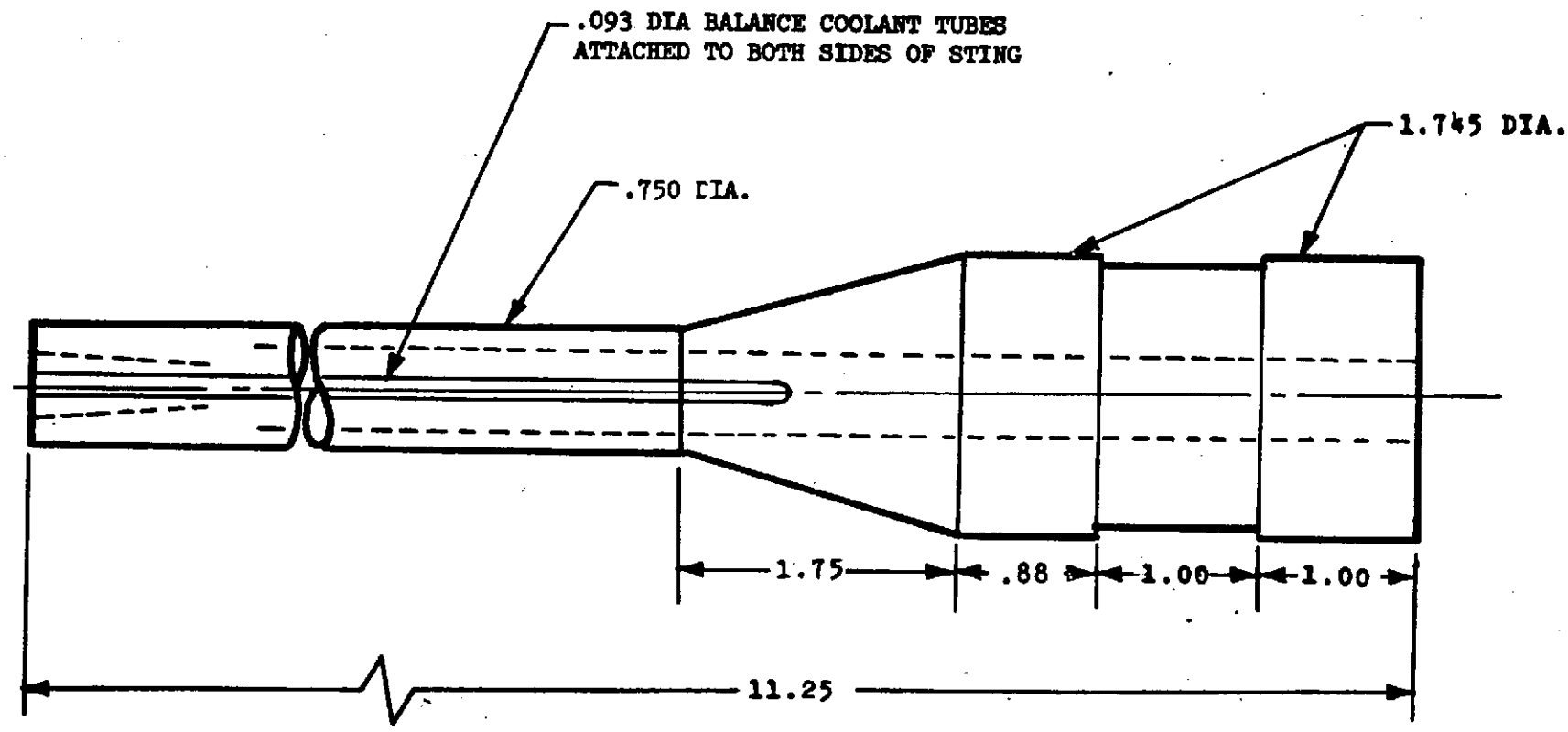
Figure 2. Continued



TAP NO.	X (IN M.S.)	Y (IN M.S.)	COMMENTS
1	8.70	1.40	TOP SIDE OF WING
2	10.24	1.40	
3	12.26	1.40	
4	10.41	3.15	
5	12.29	2.00	
6	12.02	3.15	TOP SIDE OF WING
7	12.26	1.40	UNDER SIDE OF WING
8	12.29	2.00	UNDER SIDE OF WING
9	13.33	0	TOP SIDE OF BODY FLAP
10	13.33	0.55	
11	13.33	1.10	
12	13.33	1.10	UNDER SIDE OF BODY FLAP

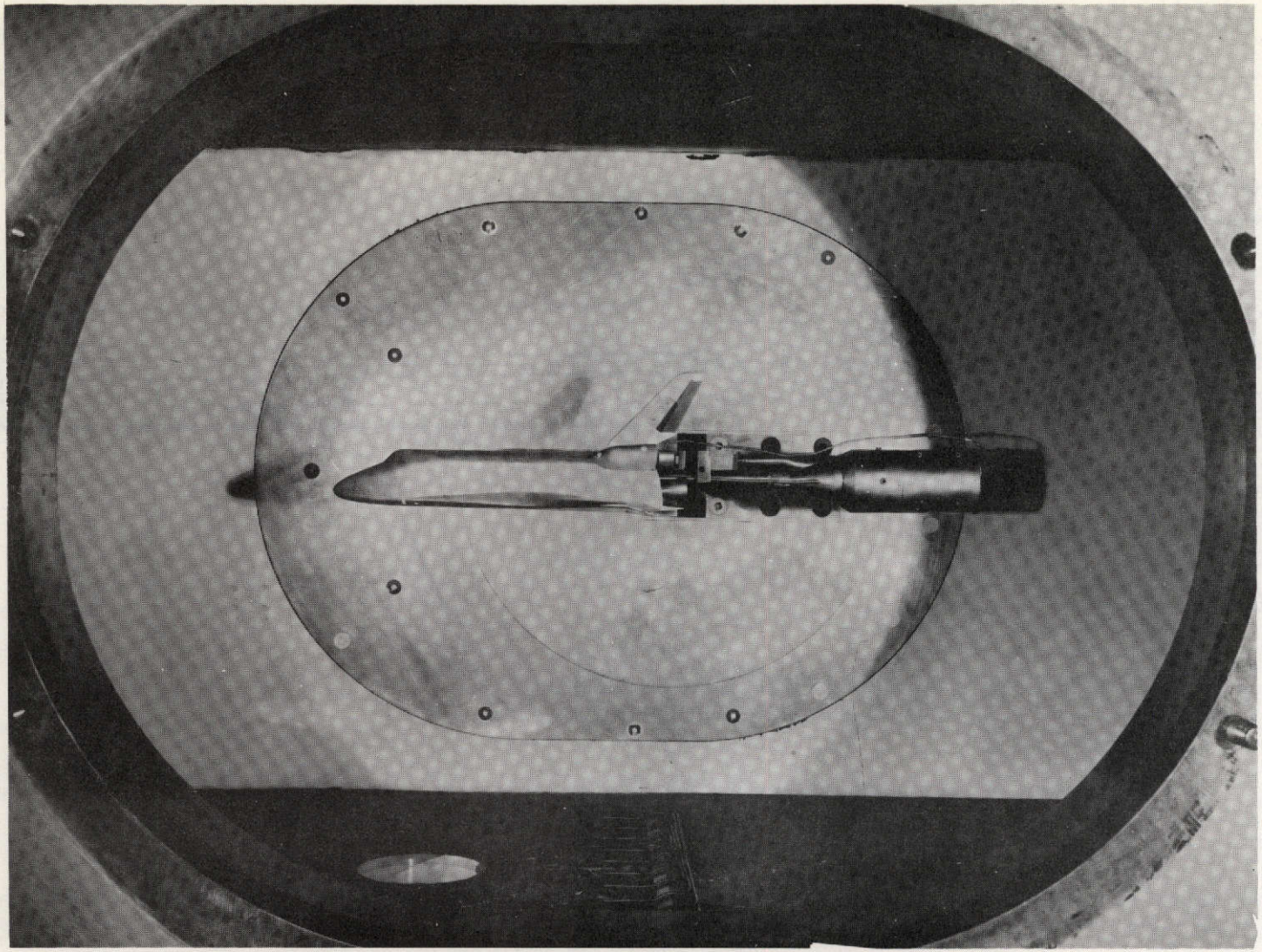
v. Wing/Body Flap Pressure Tap Locations

Figure 2. Continued

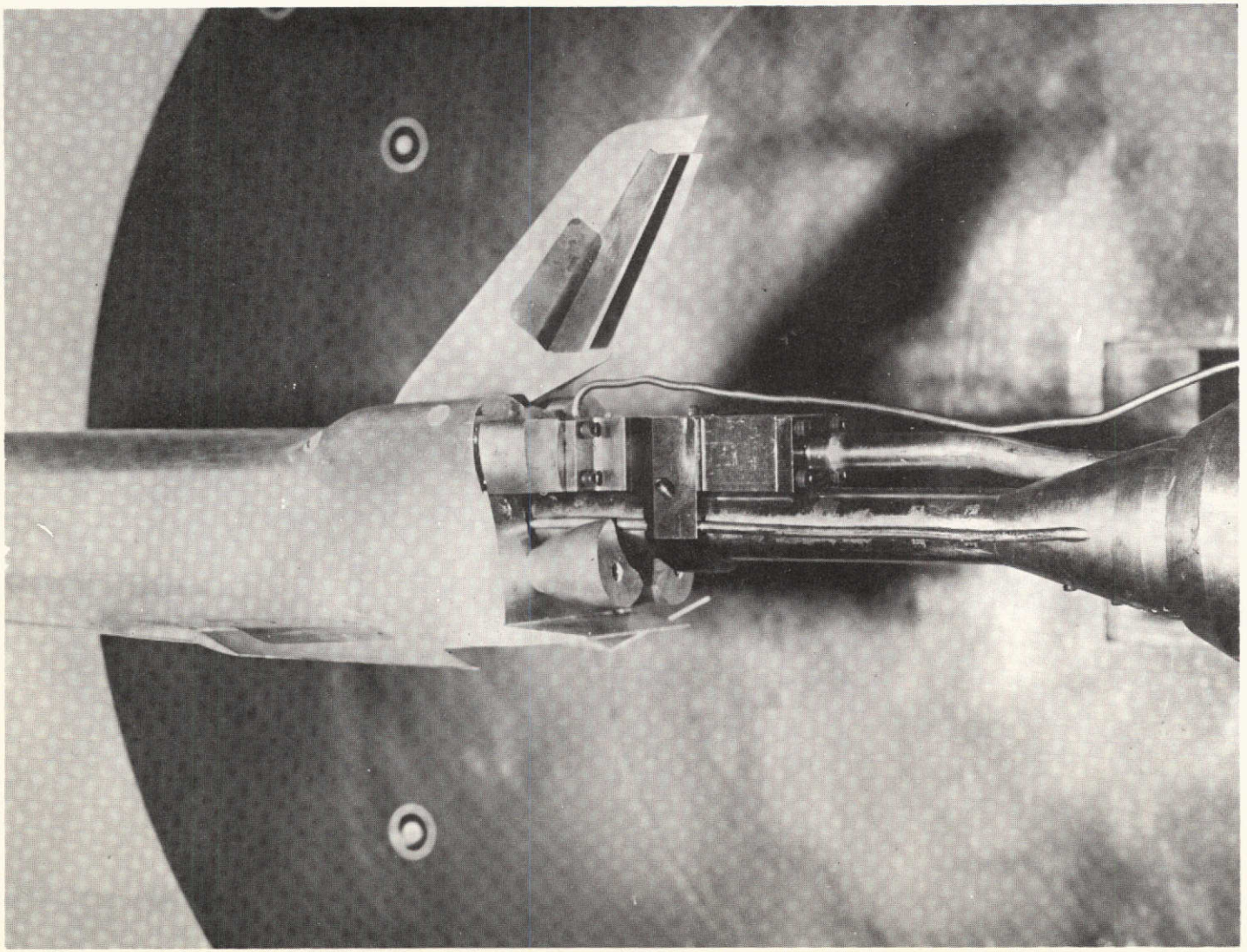


w. Stings No. 15 and 16 (CFHT)--Side View

Figure 2. Continued



a. General Installation
Figure 3. Model Photographs



b. OMS Nozzle Assembly Installation

Figure 3. Concluded

DATA FIGURES

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DATA SET SYMBOL	CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BOFLAP	W.T.Q
(AQ104F) ○	0A-85 CFHT101 MODEL 32-0 01 N61	RCS OFF	.000	15.000	13.750	100.000
(AQ110N) □	0A-85 CFHT101 MODEL 32-0 01N61	YAW	860.000	15.000	13.750	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

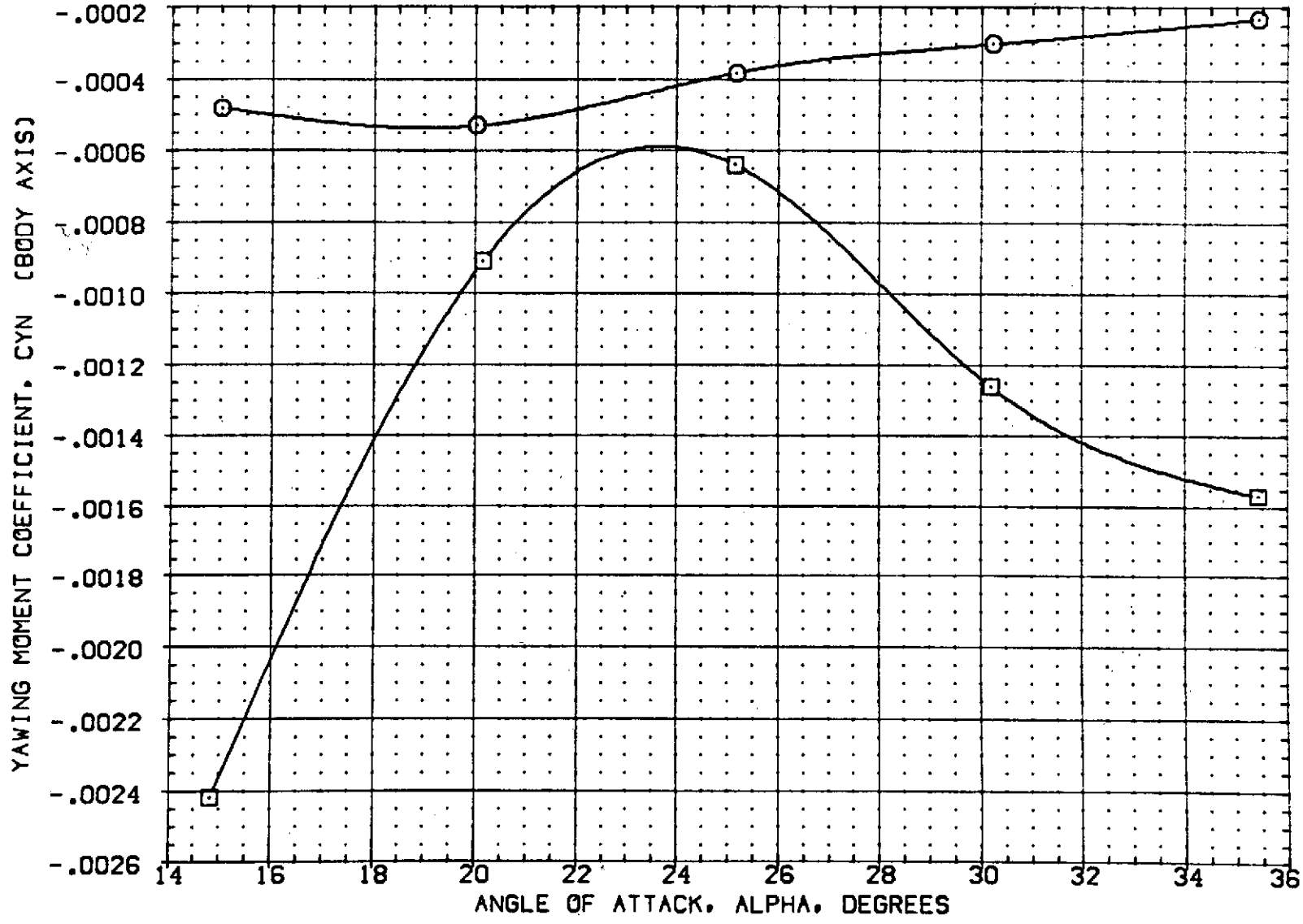


FIG 4 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (YAW) 01N61

ELEVON = 15

(A)MACH = 10.30

DATA SET SYMBOL		CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BOFLAP	V.T.Q
(AQI04F)	○	0A-85 CFHTI01 MODEL 32-0 01 N61	RCS OFF	.000	15.000	13.750	100.000
(AQIIIN)	□	0A-85 CFHTI01 MODEL 32-0 01N43N60 PITCH DOWN		770.000	15.000	13.750	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

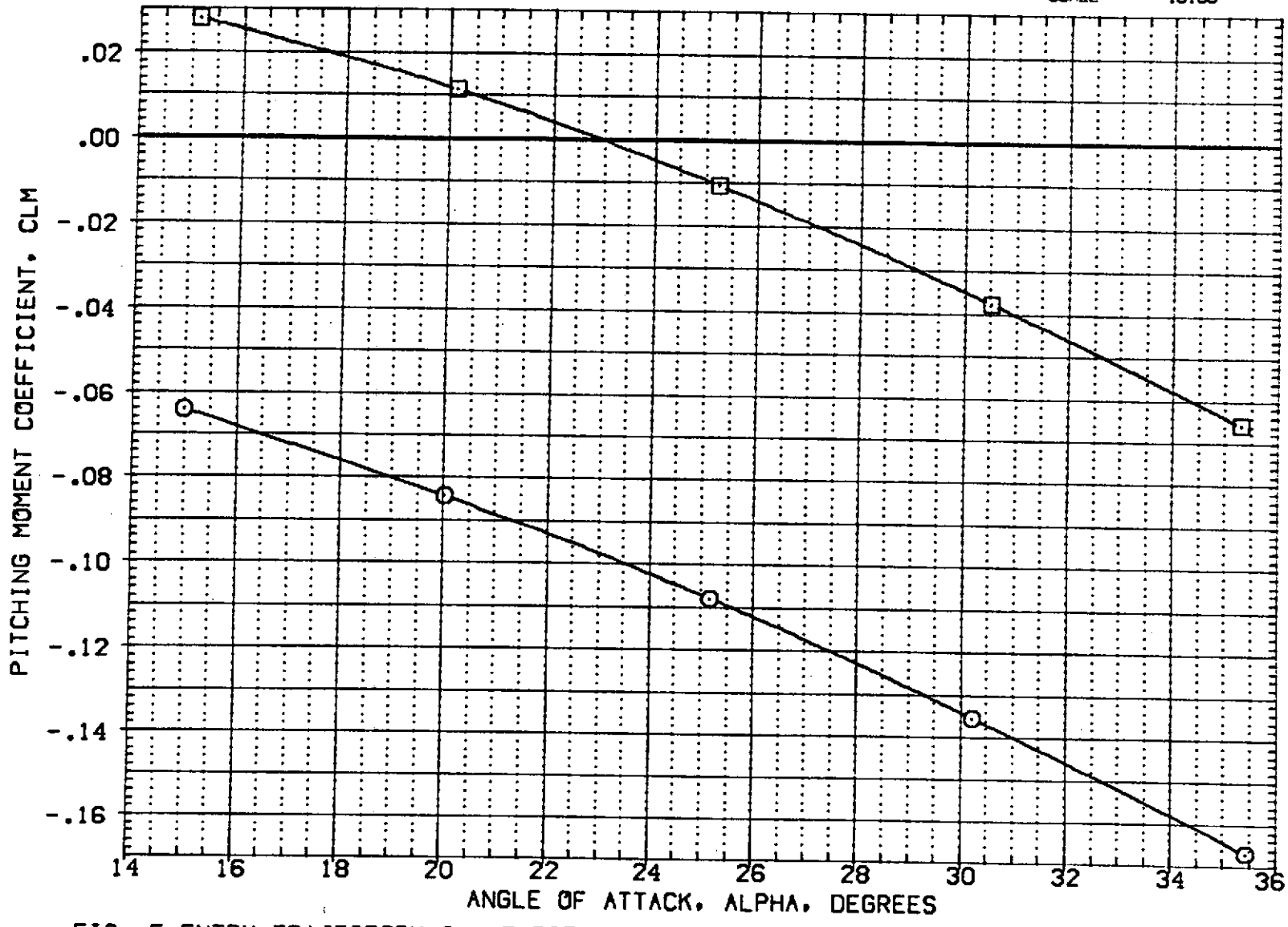


FIG 5 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 01N43N60 ELEVON = 15

(A)MACH = 10.30

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BDFLAP	W.T.Q
(AQ104F)	○	0A-85 CFHT101 MODEL 32-0 01 N61	RCS OFF	.000	15.000	13.750	100.000
(AQ112N)	□	0A-85 CFHT101 MODEL 32-0 01N43N44	ROLL	764.000	15.000	13.750	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

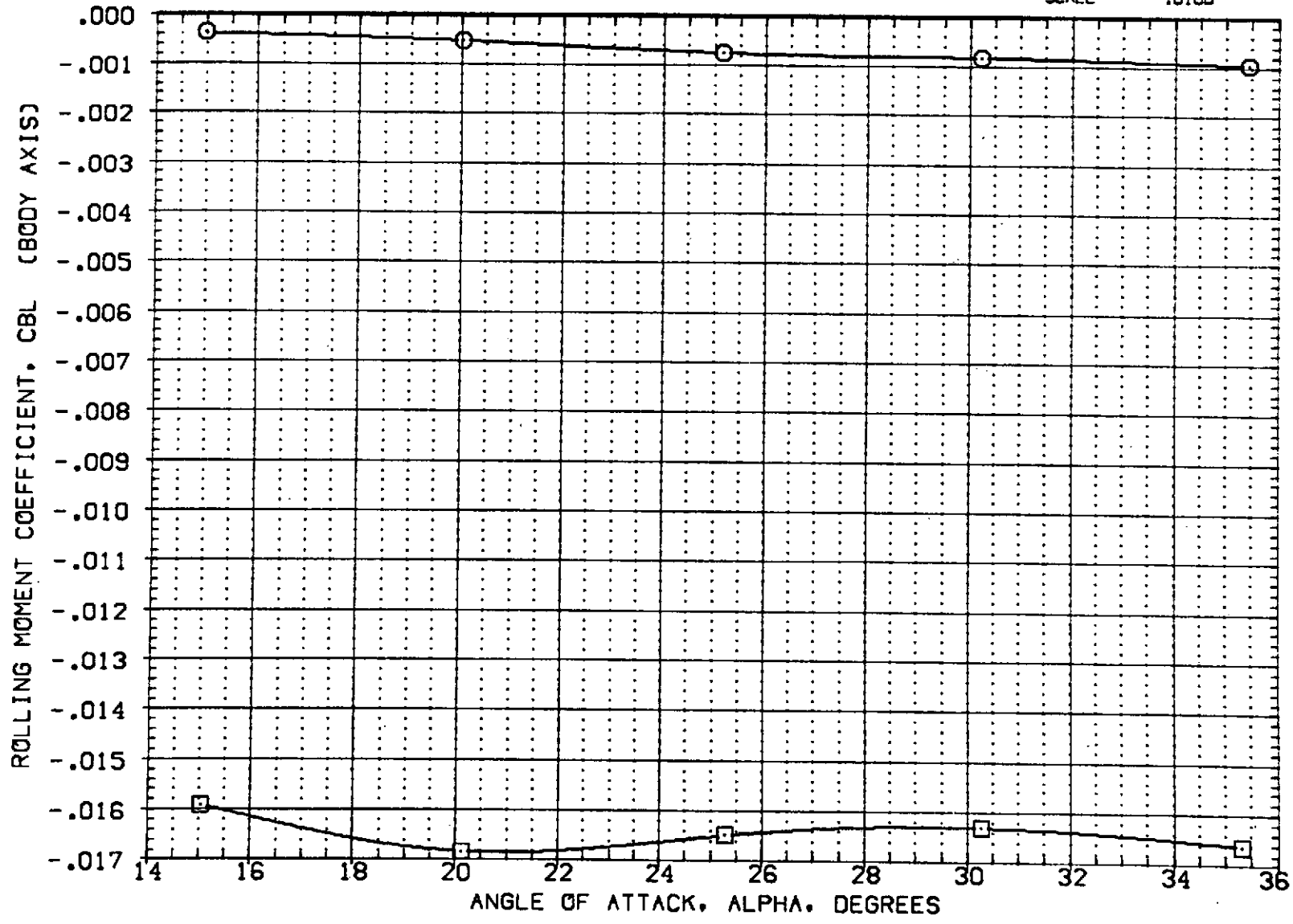


FIG 6 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (ROLL) 01N43N44 ELEVON = 15

(A)MACH = 10.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	W.T.Q
[AQ105F]	0A-85 CFHT101 MODEL 32-0 01 N43 N44 RCS OFF	.000	.000	.000	100.000
[AQ113N]	0A-85 CFHT101 MODEL 32-0 01N43N44 ROLL	767.000	.000	.000	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

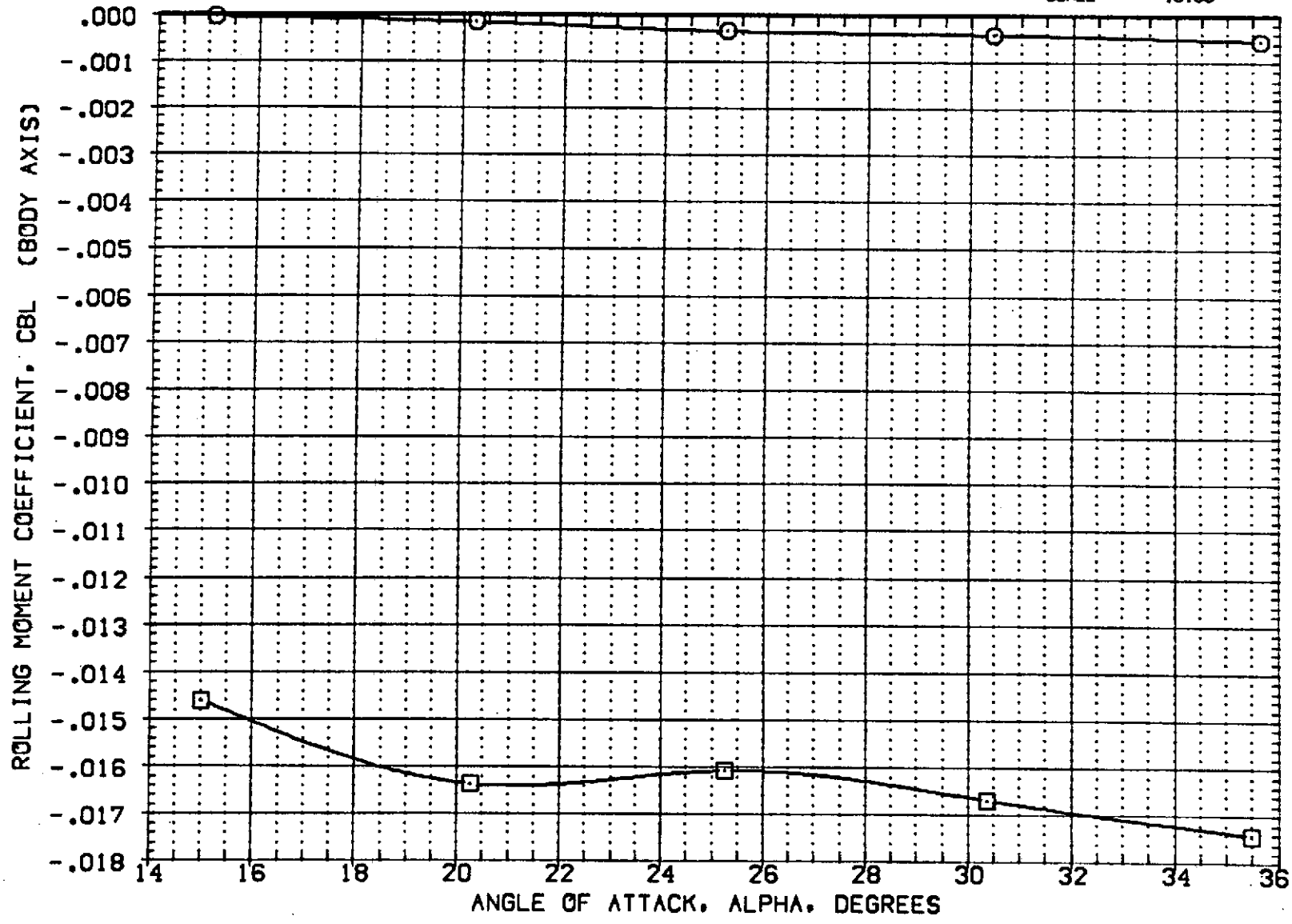


FIG 7 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (ROLL) 01N43N44 ELEVON = 0

(A)MACH = 10.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	W.T.Q
[AQ105F] ○	0A-85 CFHT101 MODEL 32-0 01 N43 N44 RCS OFF	.000	.000	.000	100.000
[AQ114N] □	0A-85 CFHT101 MODEL 32-0 01N44 PITCH UP	775.000	.000	.000	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

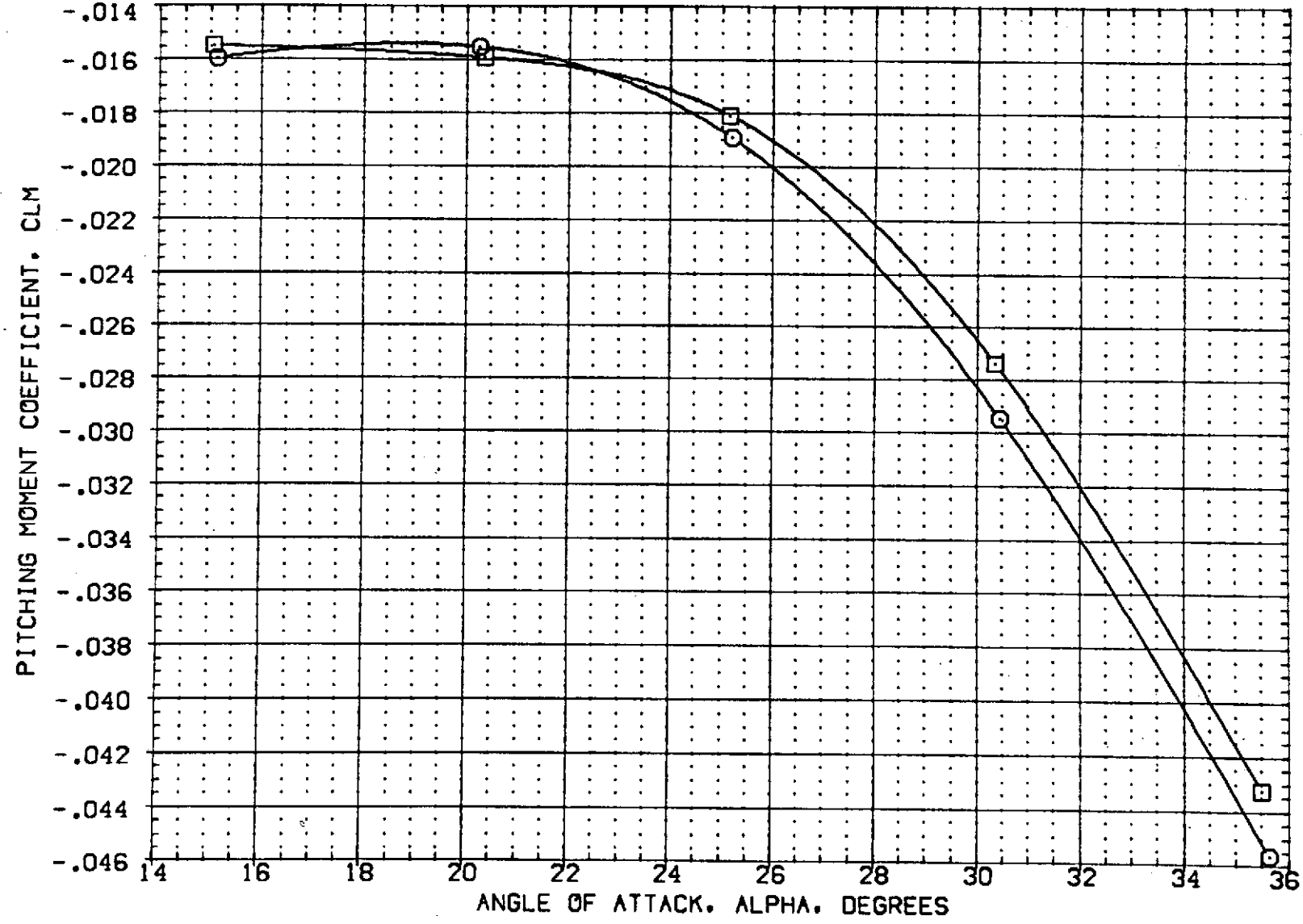


FIG 8 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-UP) 01N44 ELEVON = 0

(A)MACH = 10.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	W.T.Q
(AQIOSF) ○	0A-85 CFHT101 MODEL 32-0 01 N43 N44 RCS OFF	.000	.000	.000	100.000
(AQI1SN) □	0A-85 CFHT101 MODEL 32-0 01N43N60 PITCH DOWN	771.000	.000	.000	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

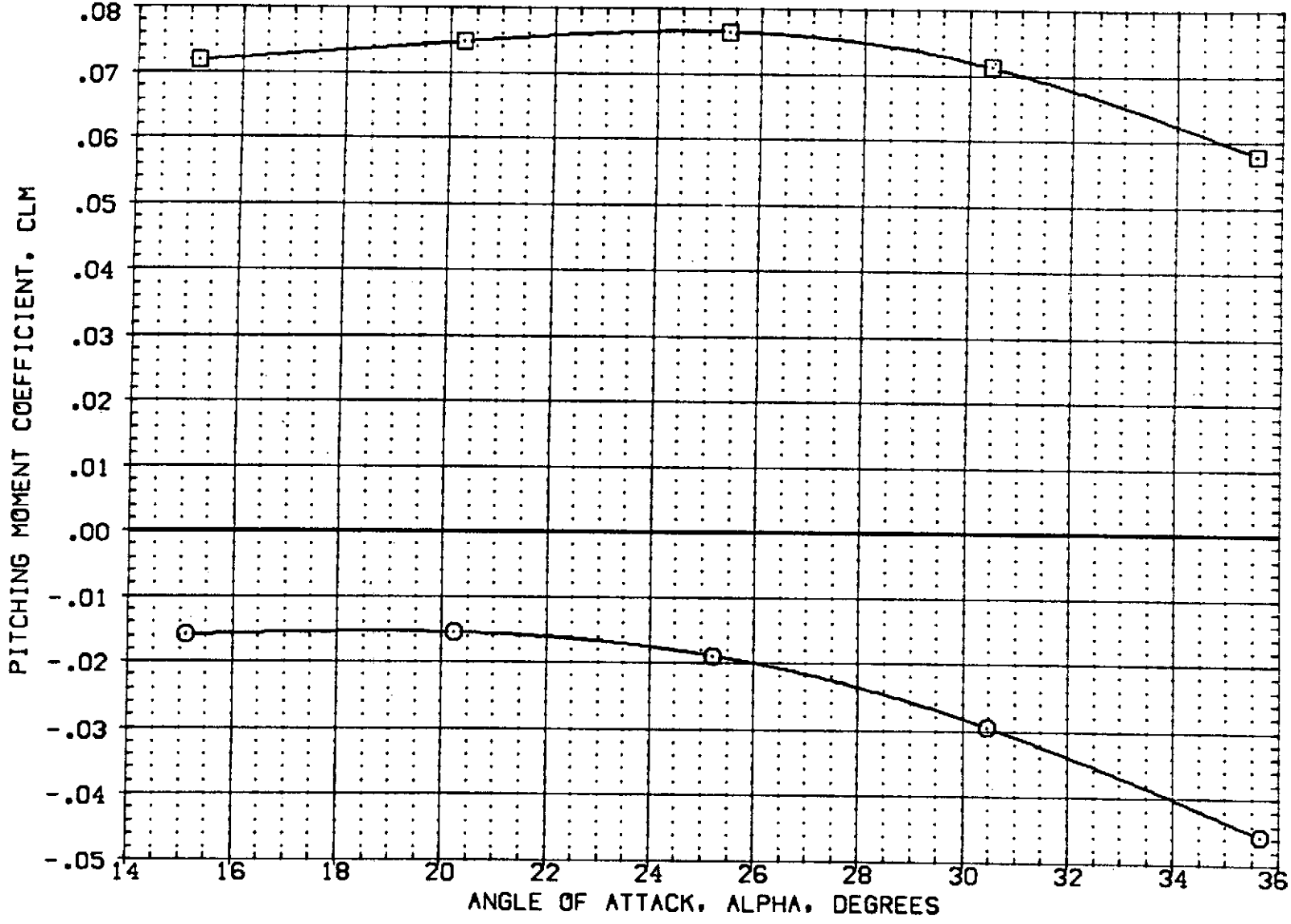


FIG 9 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 01N43N60 ELEVON = 0

(A)MACH = 10.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	W.T.Q
(AQ106F) ○	0A-85 CFHT101 MODEL 32-0 01 N43 N60 RCS OFF	.000	-20.000	-14.250	100.000
(AQ116N) □	0A-85 CFHT101 MODEL 32-0 01N43N60 PITCH DOWN	773.000	-20.000	-14.250	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XQ
YMRP	.0000	IN. YQ
ZMRP	400.0000	IN. ZQ
SCALE	.0100	

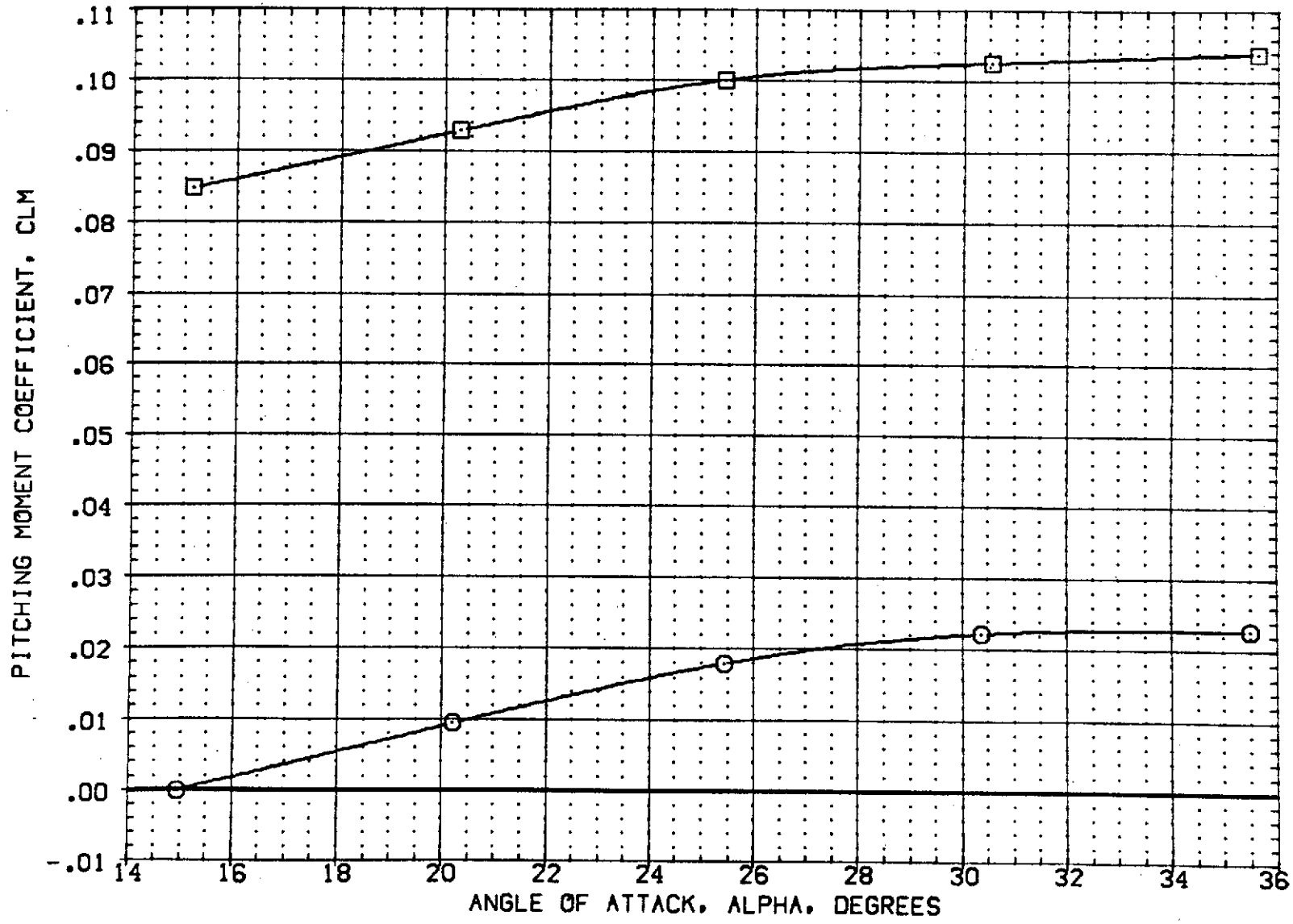


FIG 10 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 01N43N60 ELEVON =-20

(A)MACH = 10.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	W.T.Q
[AQ106F] ○	0A-85 CFHT101 MODEL 32-0 01 N43 N60 RCS OFF	.000	-20.000	-14.250	100.000
[AQ117N] □	0A-85 CFHT101 MODEL 32-0 01N43N44 ROLL	768.000	-20.000	-14.250	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

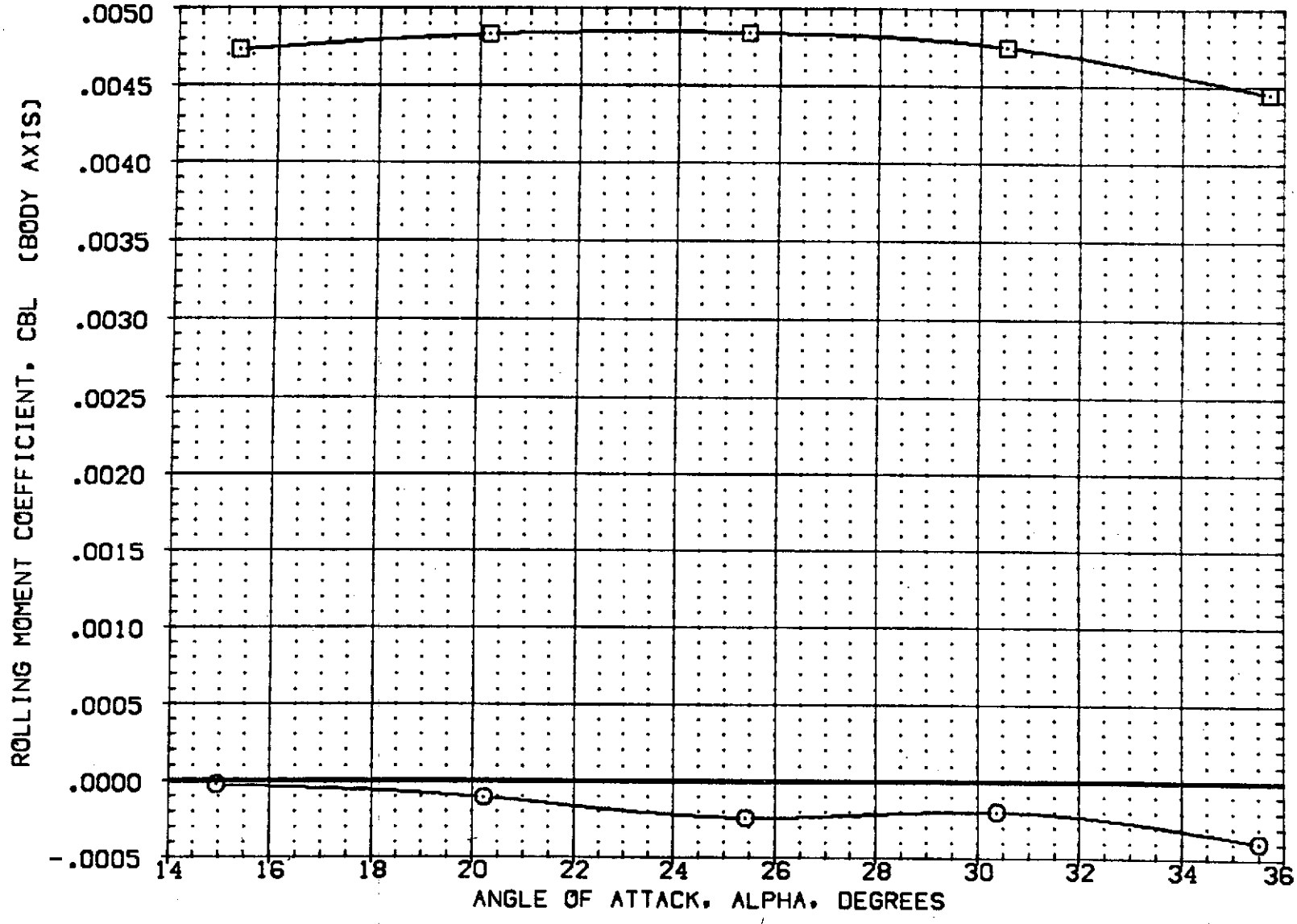


FIG 11 ENTRY TRAJECTORY Q = 5 PSF SIMULATION/(ROLL) 01N43N44 ELEVON =-20

(A)MACH = 10.30

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	W.T.Q
(AQ106F)	○	OA-85 CFHT101 MODEL 32-0 01 N43 N60 — RCS OFF	.000	-20.000	-14.250	100.000
(AQ118N)	□	OA-85 CFHT101 MODEL 32-0 01N61 YAW	860.000	20.000	-14.250	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XB
YMRP	.0000	IN. YB
ZMRP	400.0000	IN. ZB
SCALE	.0100	

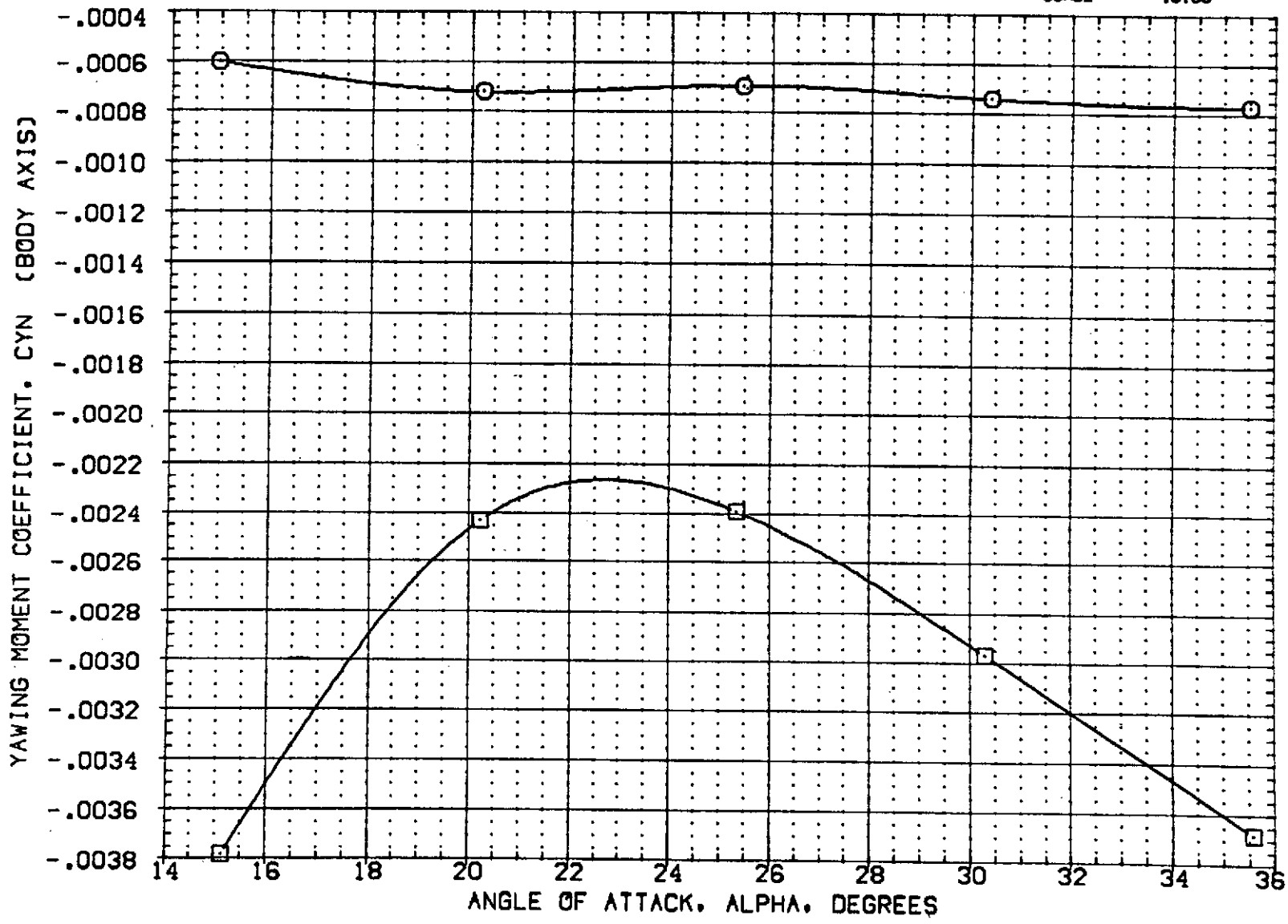


FIG 12 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (YAW) 01N61 ELEVON =-20

(A)MACH = 10.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.Q
[AQ106F] ○	OA-85 CFHT101 MODEL 32-0 01 N43 N60 RCS OFF	.000	-20.000	-14.250	100.000
[AQ121N] □	OA-85 CFHT101 MODEL 32-0 01N42N45 PITCH DOWN	795.000	-20.000	-14.250	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

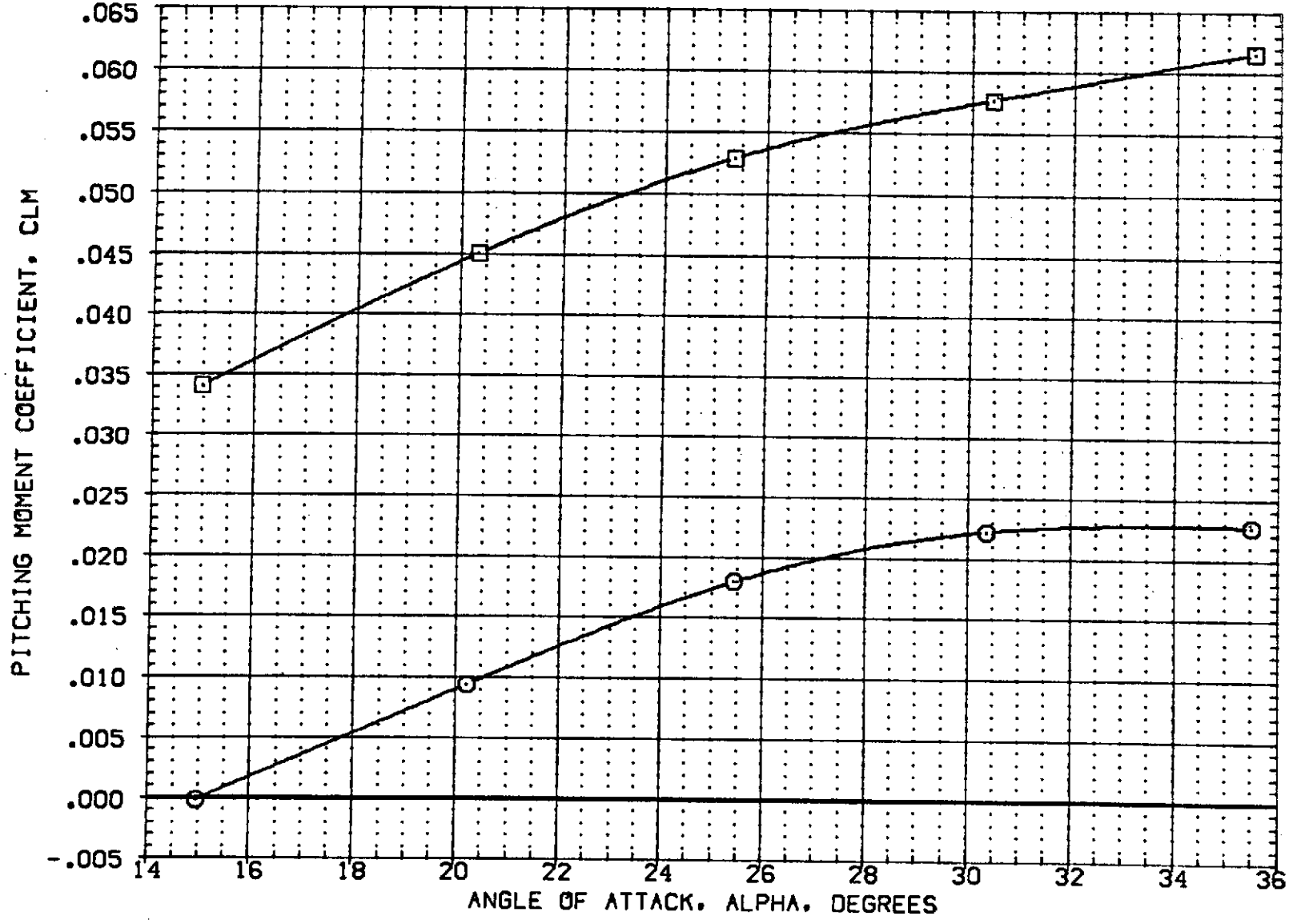


FIG 13 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 01N42N45 ELEVON =-20

(A)MACH = 10.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.O
[AQ106F]	0A-85 CFHT101 MODEL 32-0 01 N43 N60 RCS OFF	.000	-20.000	-14.250	100.000
[AQ119N]	0A-85 CFHT101 MODEL 32-0 02N43N60 PITCH DOWN	772.000	-20.000	-14.250	100.000

REFERENCE INFORMATION

SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

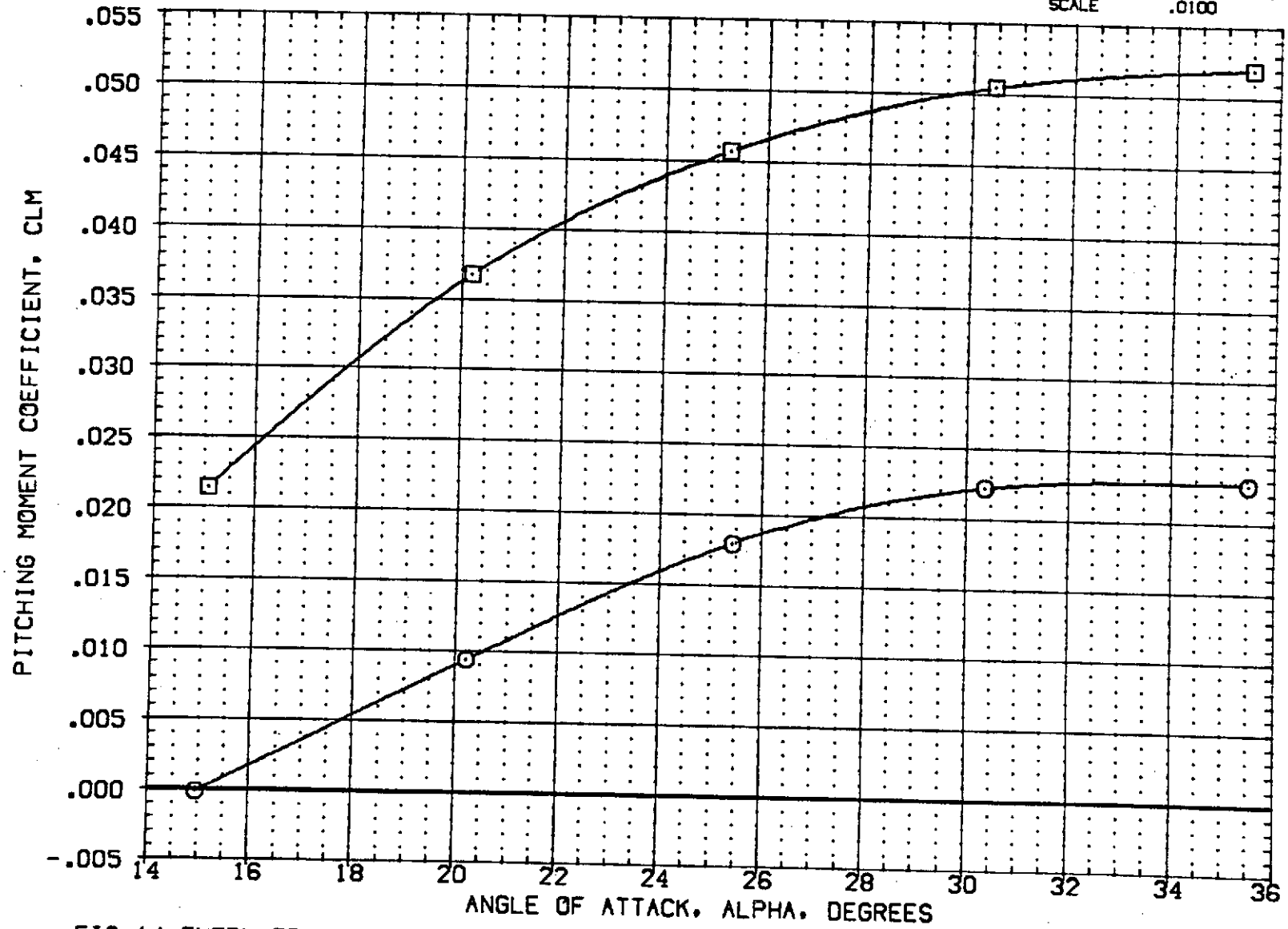


FIG 14 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 02N43N60 ELEVON =-20

(A)MACH = 10.30

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	W.T.Q
(AQ106F)	○	0A-85 CFHT101 MODEL 32-0 01 N43 N60 RCS OFF	.000	-20.000	-14.250	100.000
(AQ120N)	□	0A-85 CFHT101 MODEL 32-0 03N43N60 PITCH DOWN	772.000	-20.000	-14.250	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XB
YMRP	.0000	IN. YB
ZMRP	400.0000	IN. ZB
SCALE	.0100	

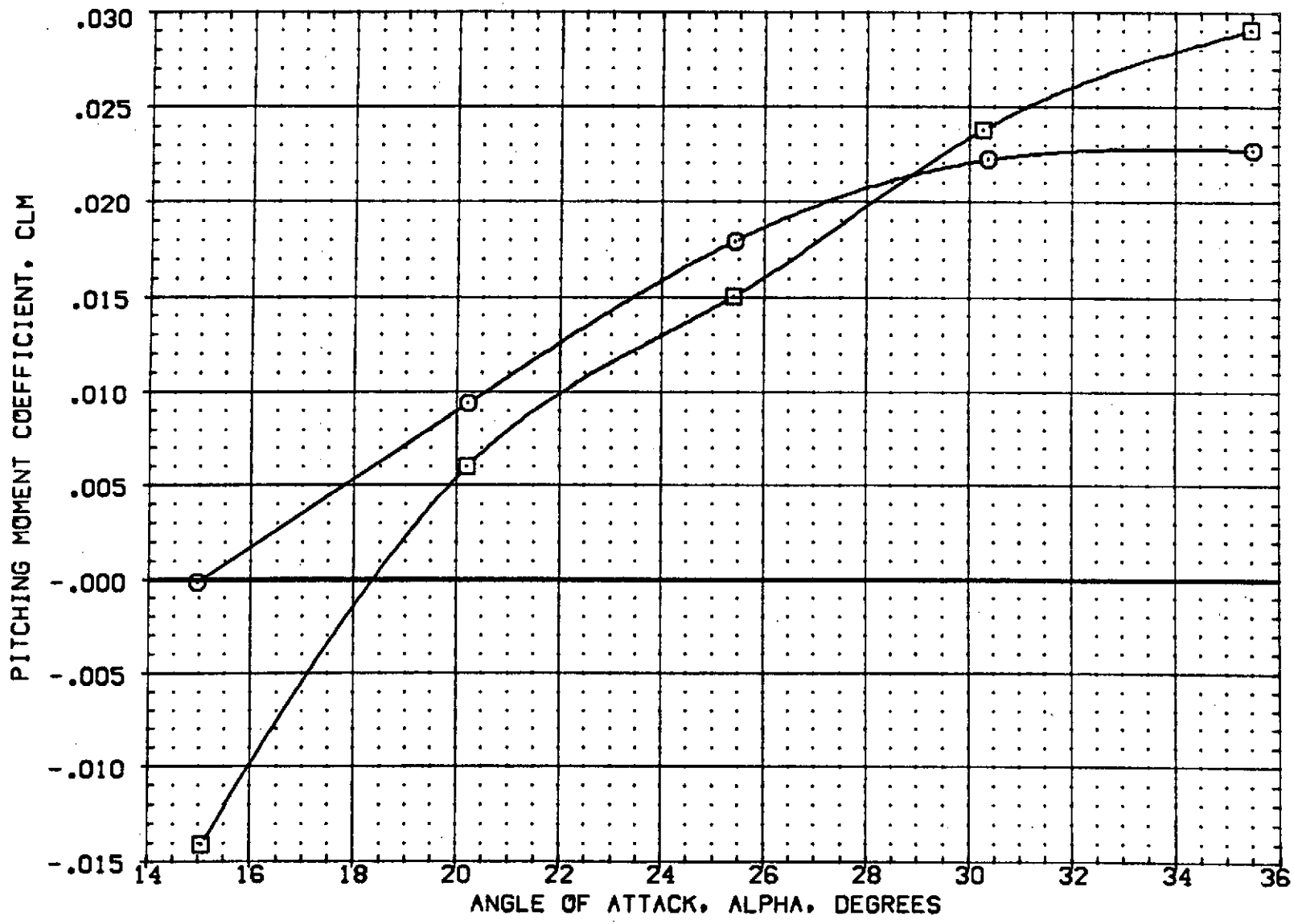


FIG 15 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 03N43N60 ELEVON =-20

(A)MACH = 10.30

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	W.T.Q
(AQ106F)	○	OA-85 CFHT101 MODEL 32-0 01 N43 N60 RCS OFF	.000	-20.000	-14.250	100.000
(AQ122N)	□	OA-85 CFHT101 MODEL 32-0 03N42N45 PITCH DOWN	784.000	-20.000	-14.250	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

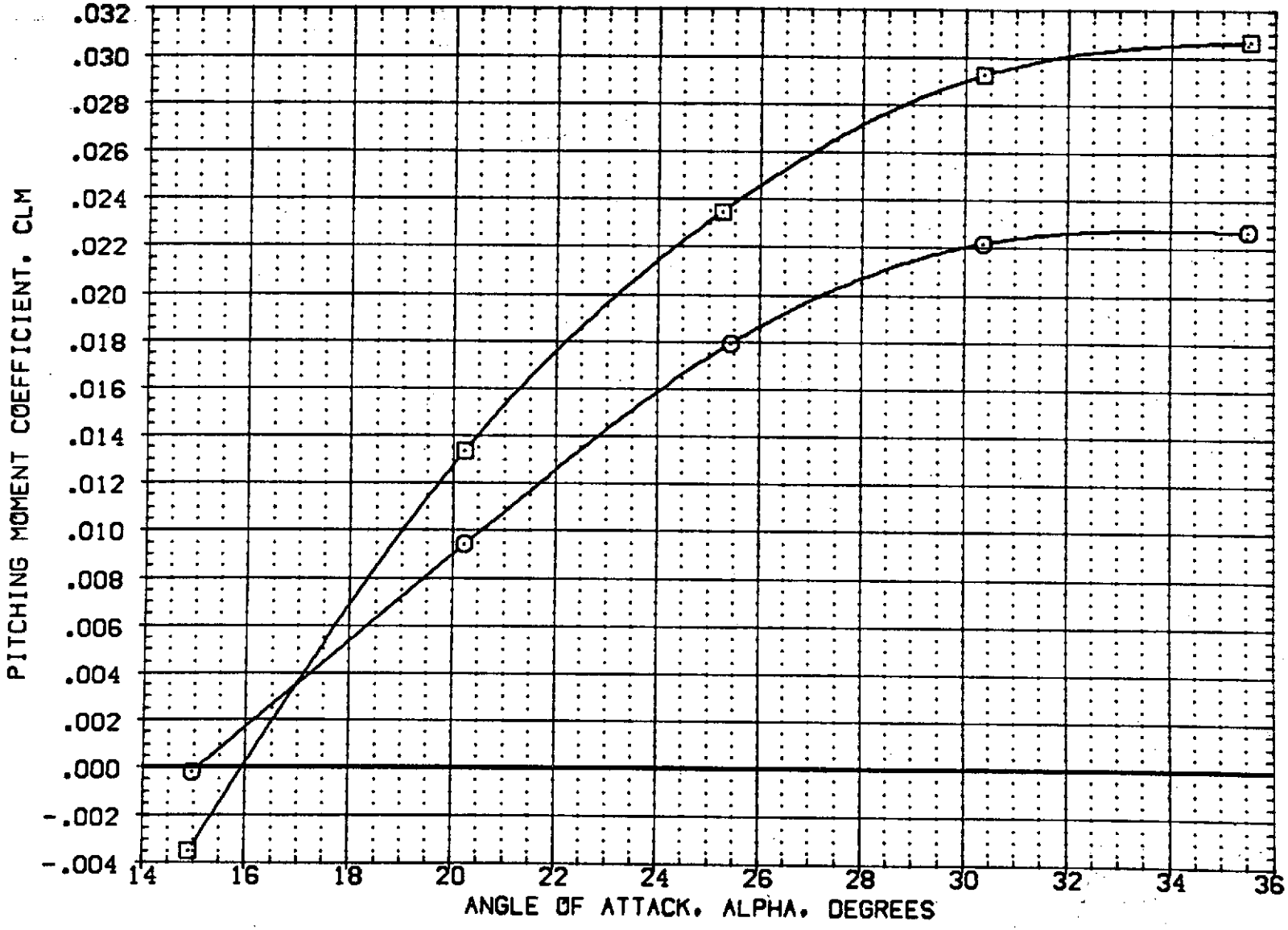


FIG 16 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 03N43N45 ELEVON =-20

(A)MACH = 10.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.Q
[AQ110F]	0A-85 CFHT101 MODEL 32-0 02 N43 N60 RCS OFF	.000	15.000	13.750	100.000
[AQ143N]	0A-85 CFHT101 MODEL 32-0 02N43N60 PITCH DOWN	769.000	15.000	13.750	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XB
YMRP	.0000	IN. YB
ZMRP	400.0000	IN. ZB
SCALE	.0100	

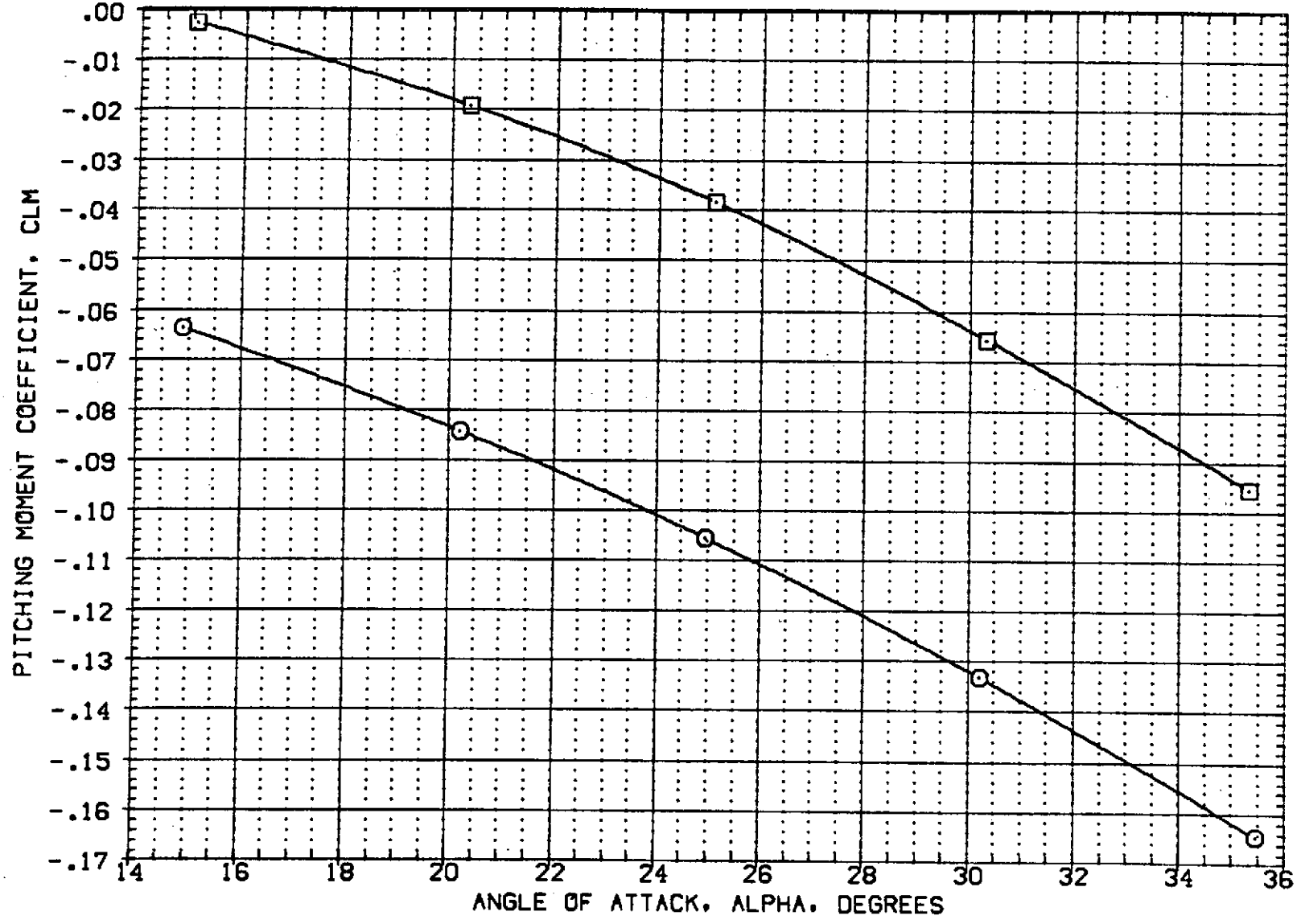


FIG 17 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 02N43N60 ELEVON = 15

(A)MACH = 10.30

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	V.T.O
(AQ110F)	○	0A-85 CFHT101 MODEL 32-0 02 N43 N60 RCS OFF	.000	15.000	13.750	100.000
(AQ144N)	□	0A-85 CFHT101 MODEL 32-0 03N43N60 PITCH DOWN	769.000	15.000	13.750	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

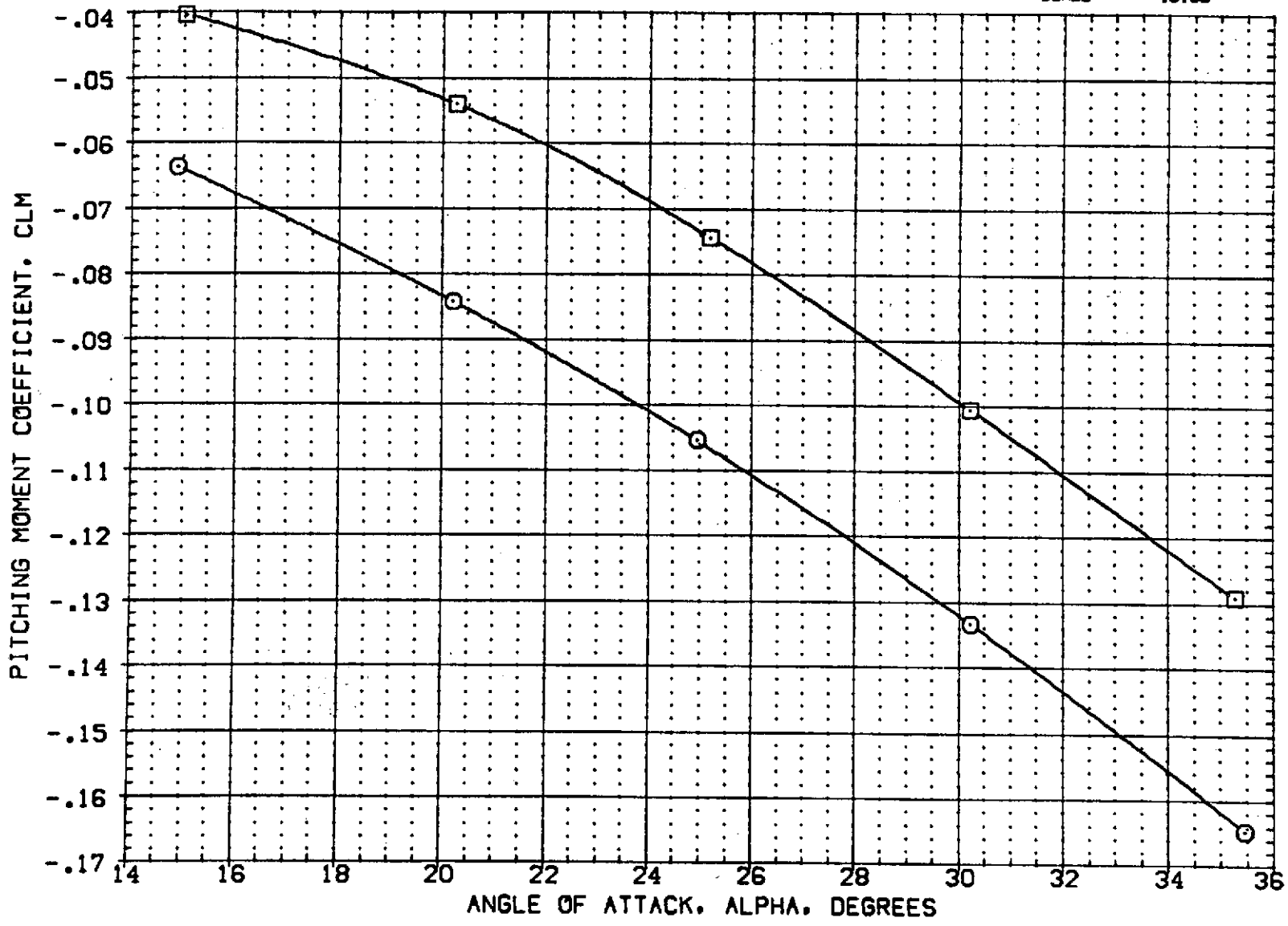


FIG 18 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 03N43N60 ELEVON = 15

(A)MACH = 10.30

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.Q
(AQ111F)	○	0A-85 CFHT101 MODEL 32-0 01 N43 N60 RCS OFF	.000	15.000	-14.250	100.000
(AQ145N)	□	0A-85 CFHT101 MODEL 32-0 01N43N60 PITCH DOWN	767.000	15.000	-14.250	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XQ
YMRP	.0000	IN. YQ
ZMRP	400.0000	IN. ZQ
SCALE	.0100	

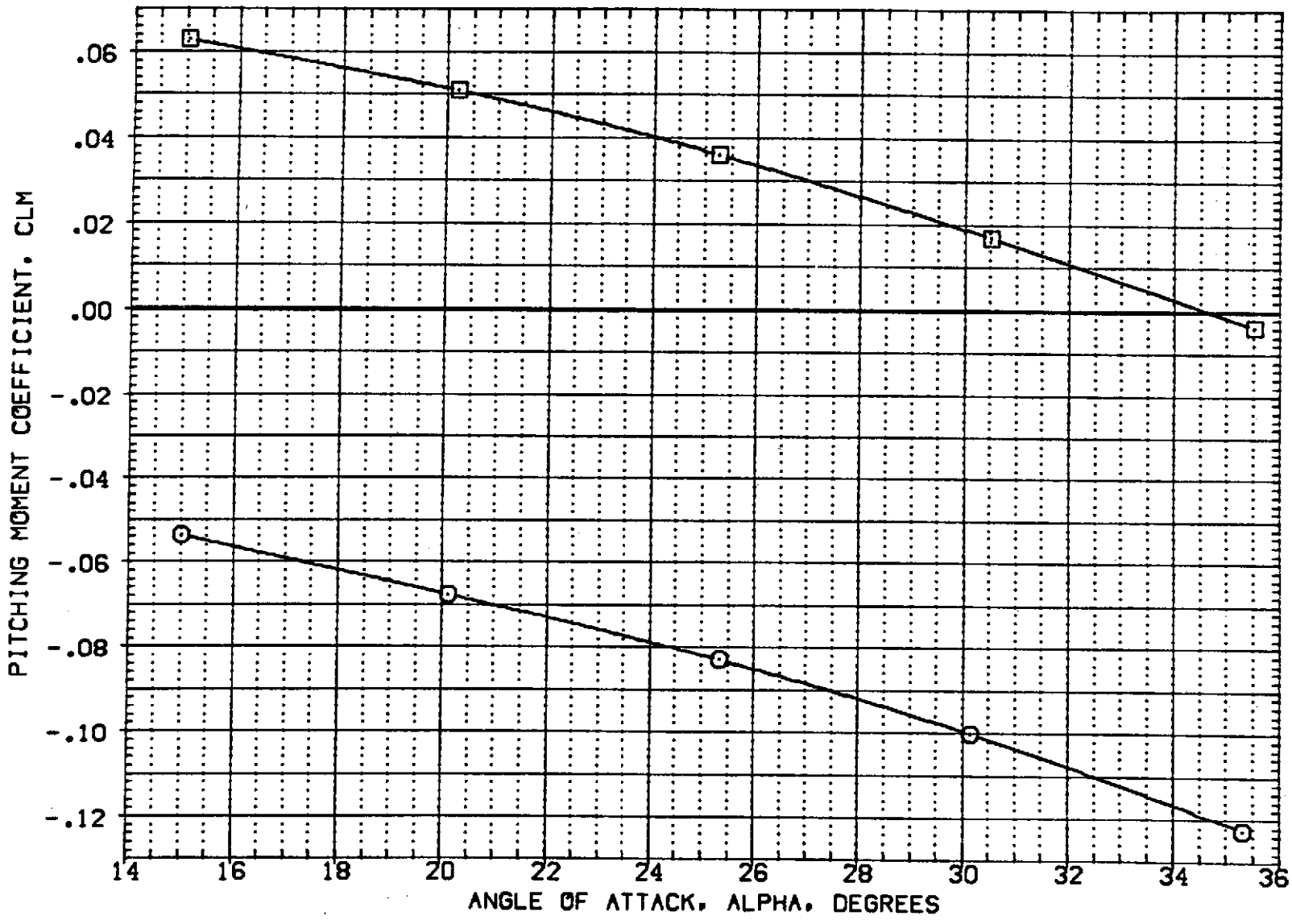


FIG 19 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 01N43N60 ELEVON = 15

(A)MACH = 10.30

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.Q
(AQ105F)	○	0A-85 CFHT101 MODEL 32-0 01 N43 N44 RCS OFF	.000	.000	.000	100.000
(AQ148N)	□	0A-85 CFHT101 MODEL 32-0 01N42N45 PITCH DOWN	777.000	.000	.000	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

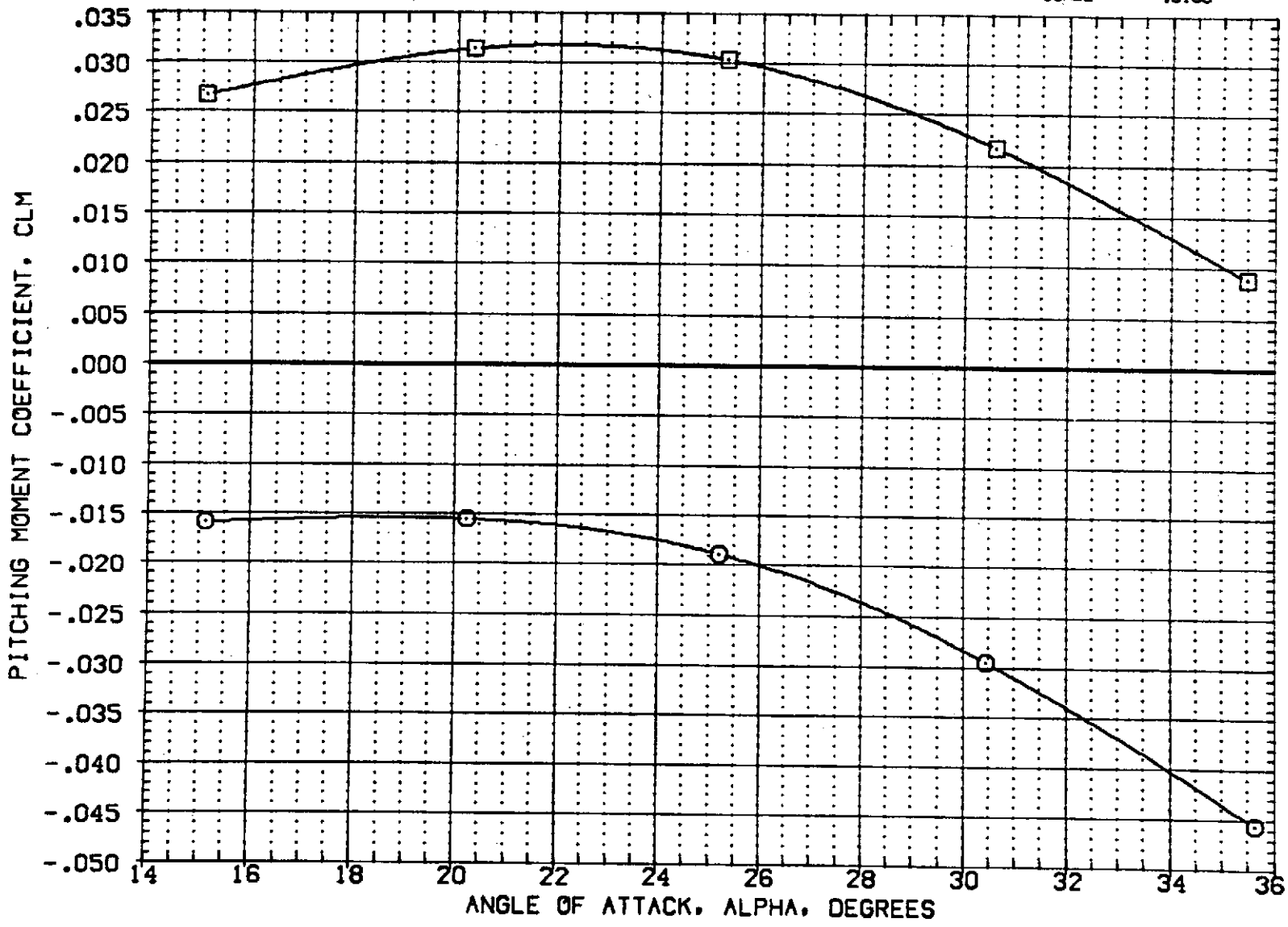


FIG 20 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 01N42N45 ELEVON = 0

(A)MACH = 10.30

DATA SET SYMBOL		CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BOFLAP	W.T.Q
(AQ105F)	○	0A-85 CFHT101 MODEL 32-0 01 N43 N44	RCS OFF	.000	.000	.000	100.000
(AQ149N)	□	0A-85 CFHT101 MODEL 32-0 02N42N45 PITCH DOWN		777.000	.000	.000	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

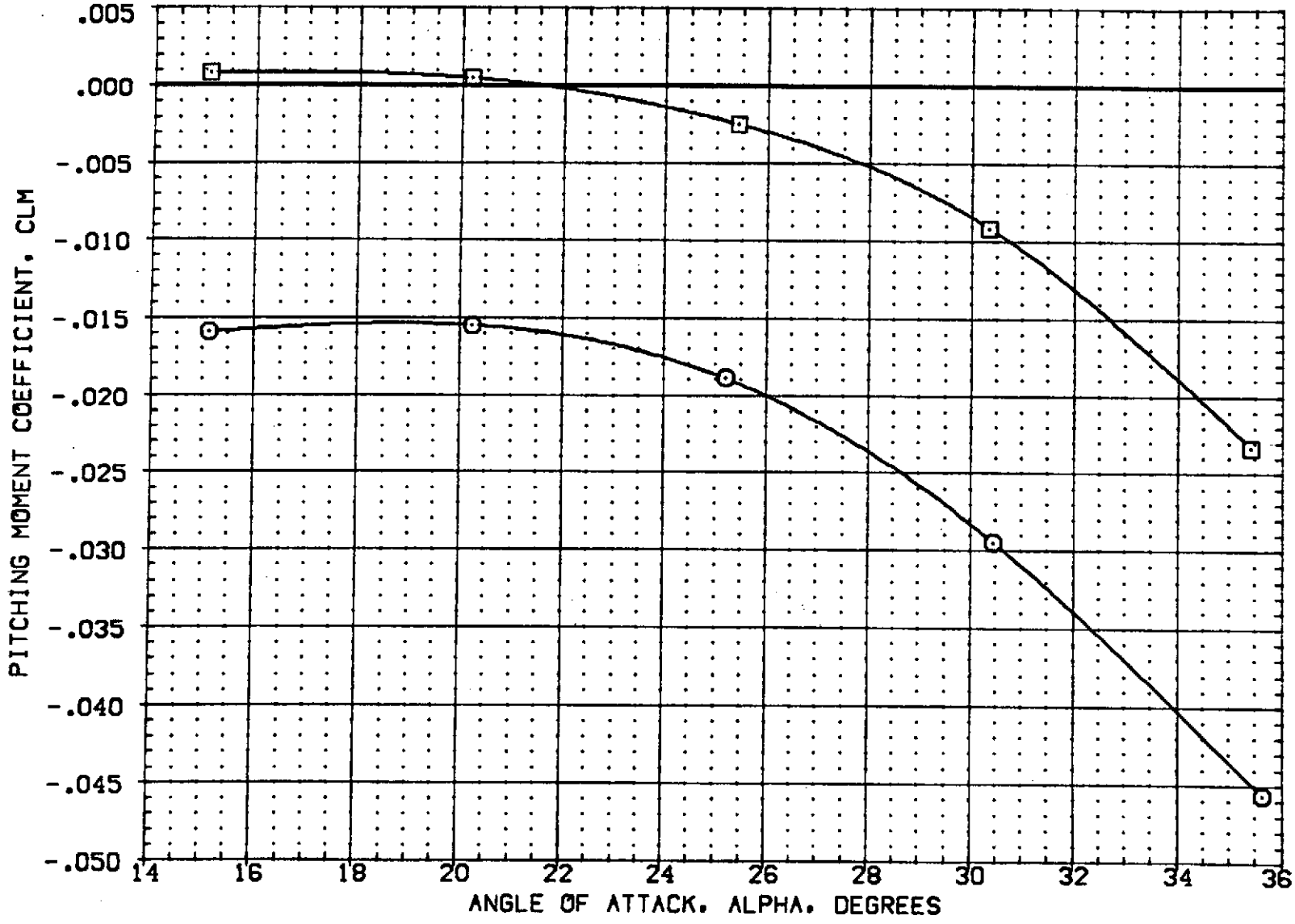


FIG 21 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 02N42N45 ELEVON = 0

(A)MACH = 10.30

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	V.T.O
[AQ105F]	○	0A-85 CFHT101 MODEL 32-0 01 N43 N44 RCS OFF	.000	.000	.000	100.000
[AQ146N]	□	0A-85 CFHT101 MODEL 32-0 02N43N60 PITCH DOWN	771.000	.000	.000	100.000

REFERENCE INFORMATION

SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

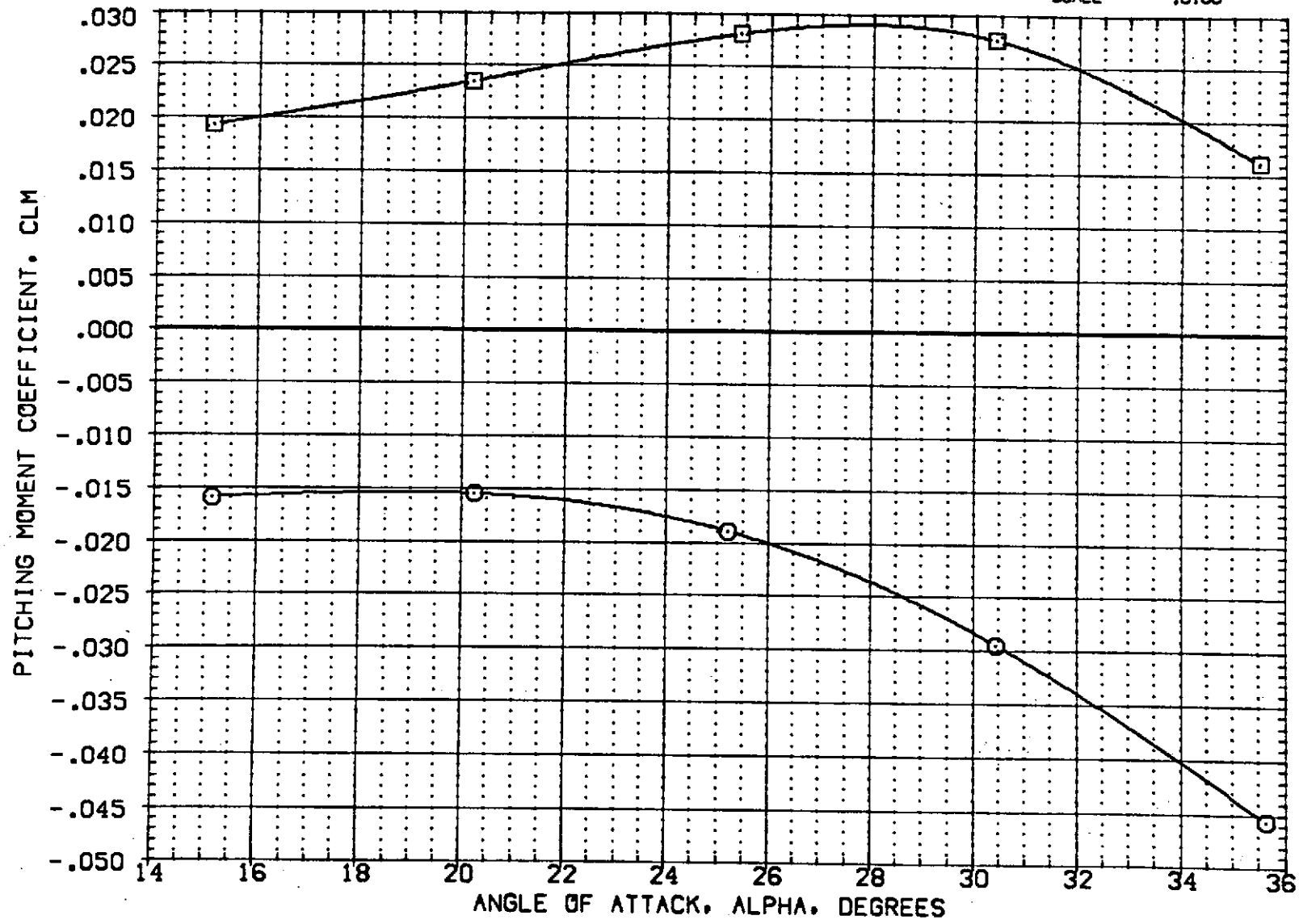


FIG 22 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 02N43N60 ELEVON = 0

(A)MACH = 10.30

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	W.T.Q
[AQ105F]	○	0A-65 CFHT101 MODEL 32-0 01 N43 N44 RCS OFF	.000	.000	.000	100.000
[AQ147N]	□	0A-65 CFHT101 MODEL 32-0 03N43N60 PITCH DOWN	767.000	.000	.000	100.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

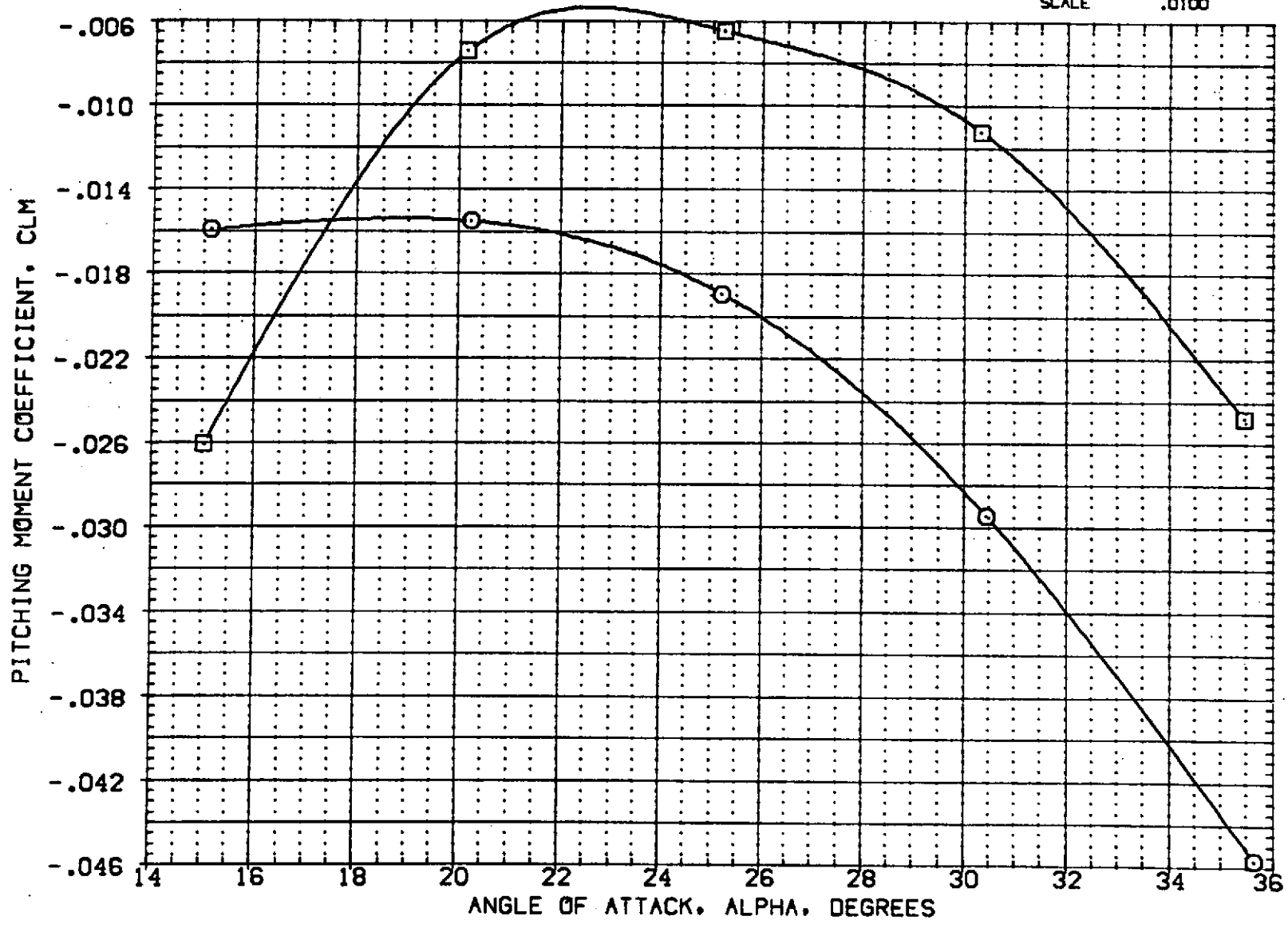


FIG 23 ENTRY TRAJECTORY Q = 5 PSF SIMULATION (PITCH-DOWN) 03N43N60 ELEVON = 0

(A)MACH = 10.30

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.O
(AQ109F) ○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	15.000	13.750	150.000
(AQ137N) □	0A-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN	621.000	15.000	13.750	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

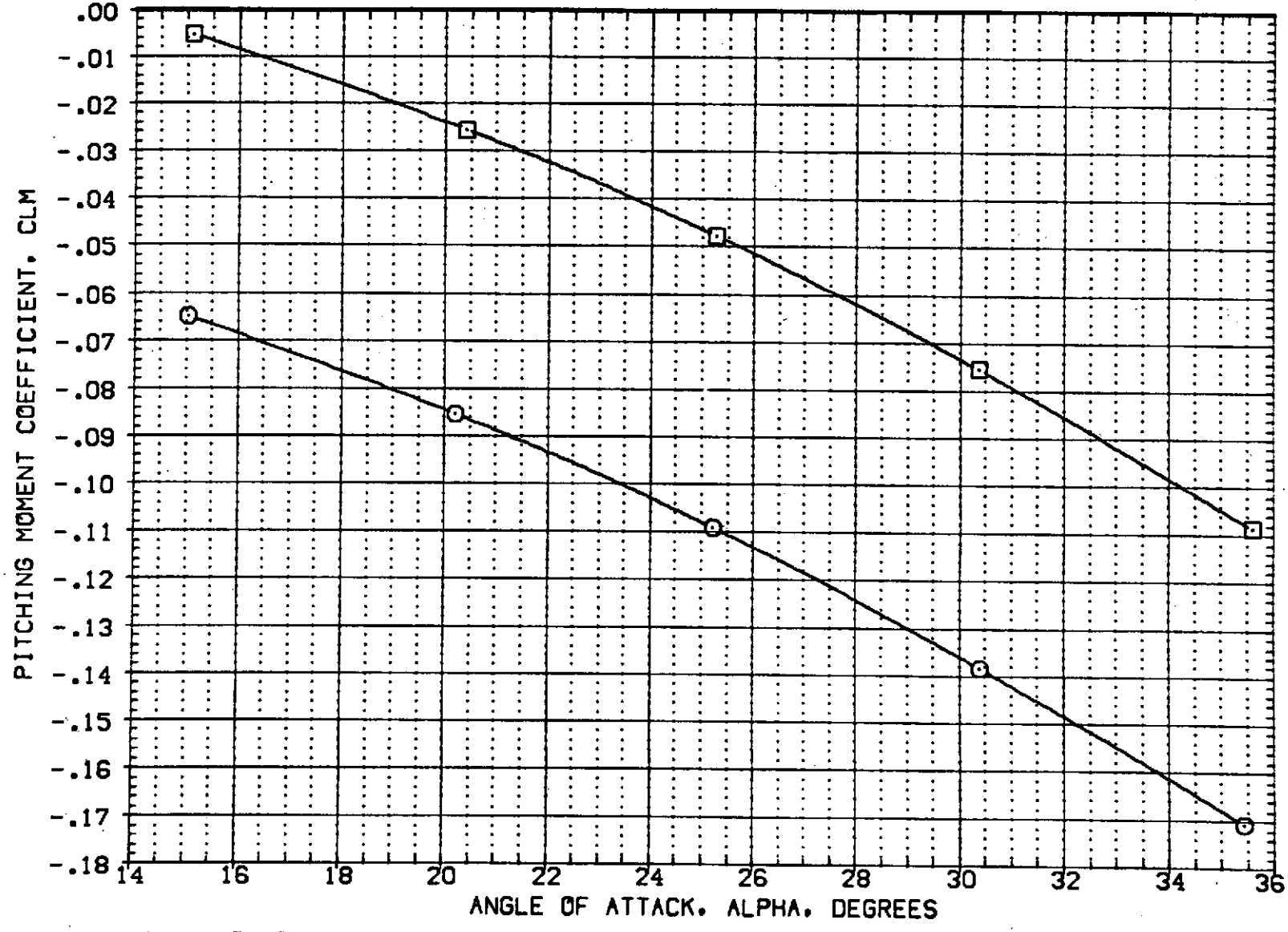


FIG 24 ENTRY TRAJECTORY Q =10 PSF SIMULATION (PITCH-DOWN) 01N46N47 ELEVON = 15

(A)MACH = 10.33

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	W.T.Q
[AQ108F] ○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	.000	.000	150.000
[AQ140N] □	0A-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN	621.000	.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

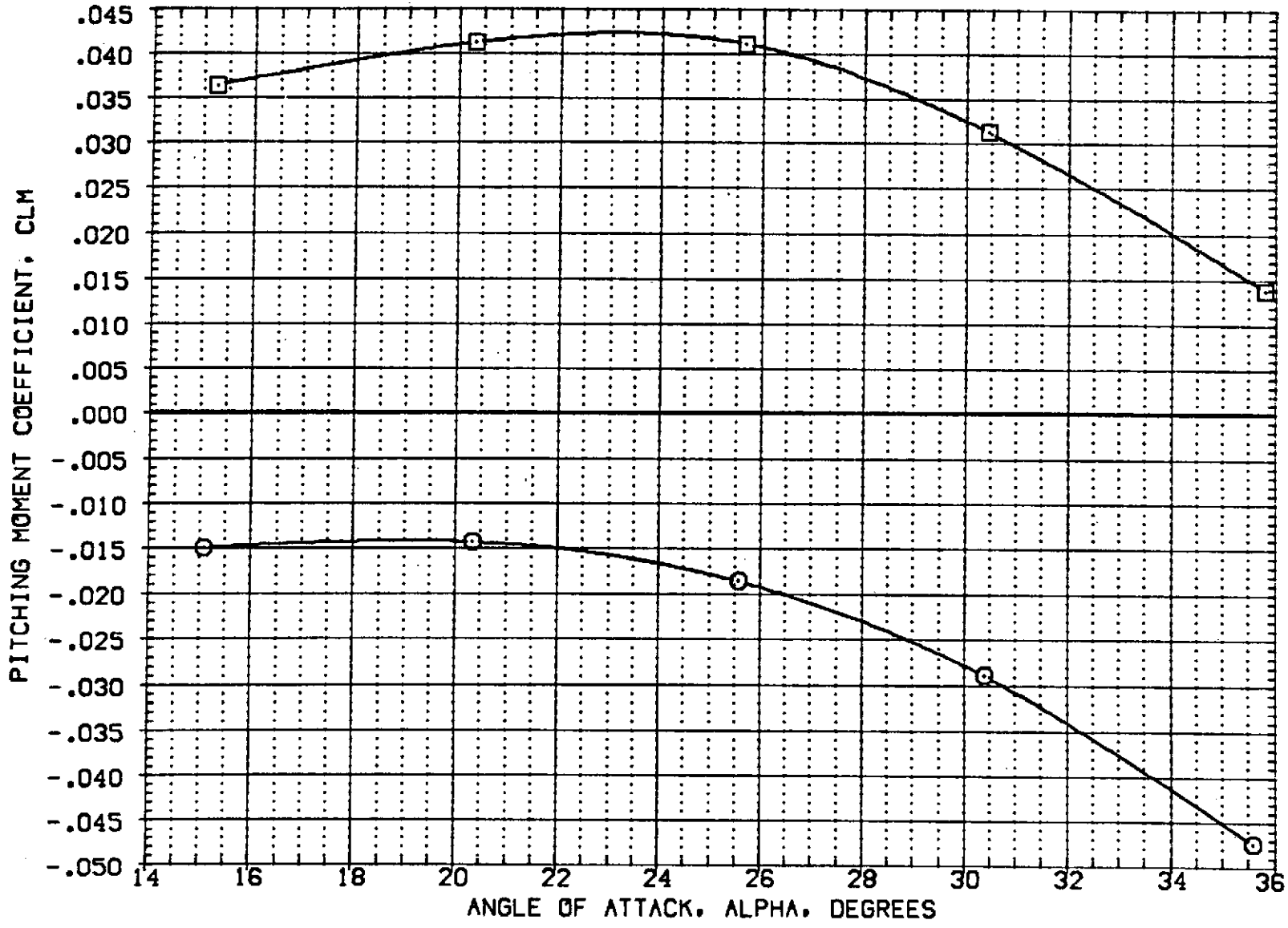


FIG 25 ENTRY TRAJECTORY Q =10 PSF SIMULATION (PITCH-DOWN) 01N46N47 ELEVON = 0

(A)MACH = 10.33

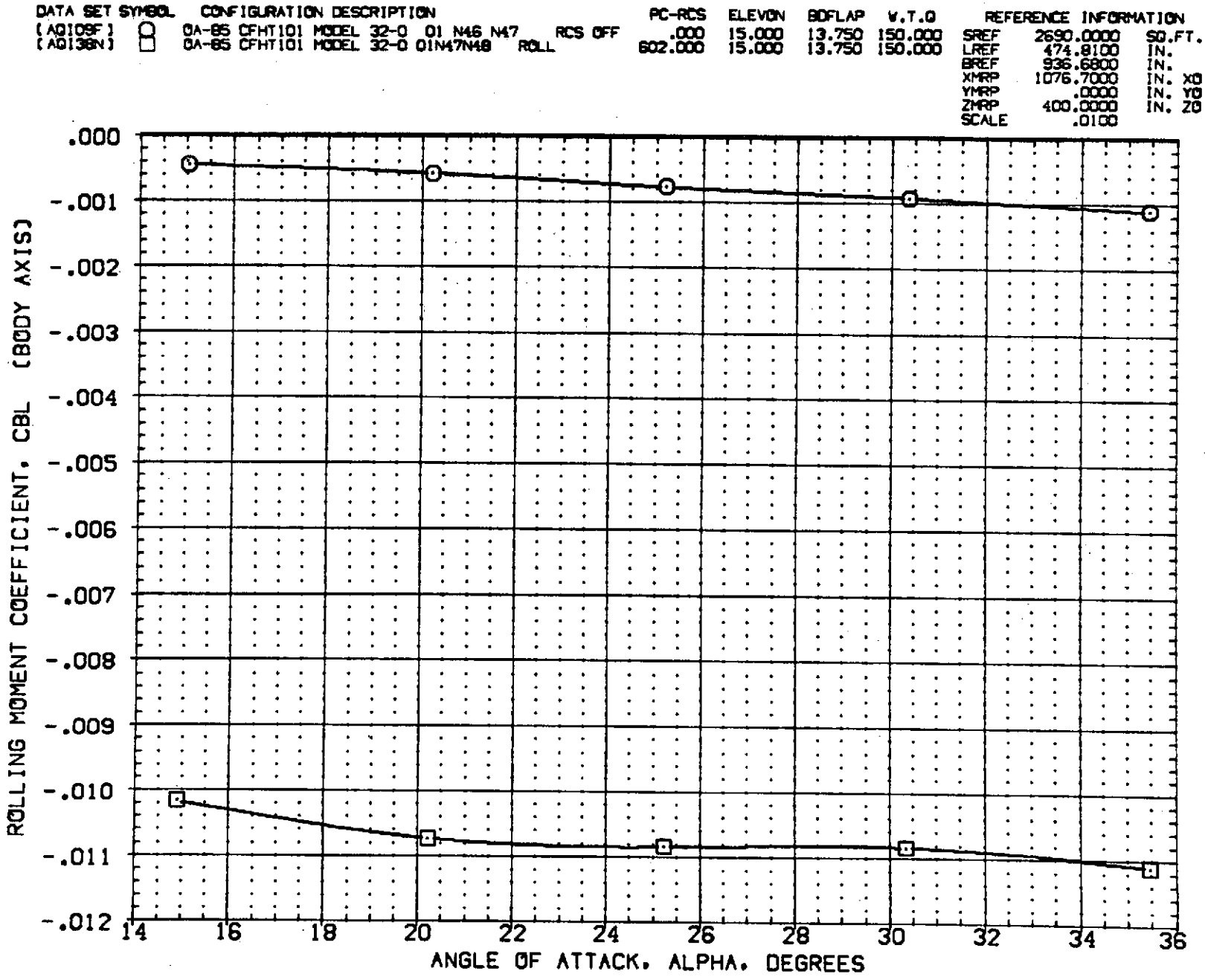


FIG 26 ENTRY TRAJECTORY Q =10 PSF SIMULATION (ROLL) 01N47N48 ELEVON = 15

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	V.T.Q
(A0108F)	○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	.000	.000	150.000
(A0139N)	□	0A-85 CFHT101 MODEL 32-0 01N47N48 ROLL	602.000	.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XB
YMRP	.0000	IN. YB
ZMRP	400.0000	IN. ZB
SCALE	.0100	

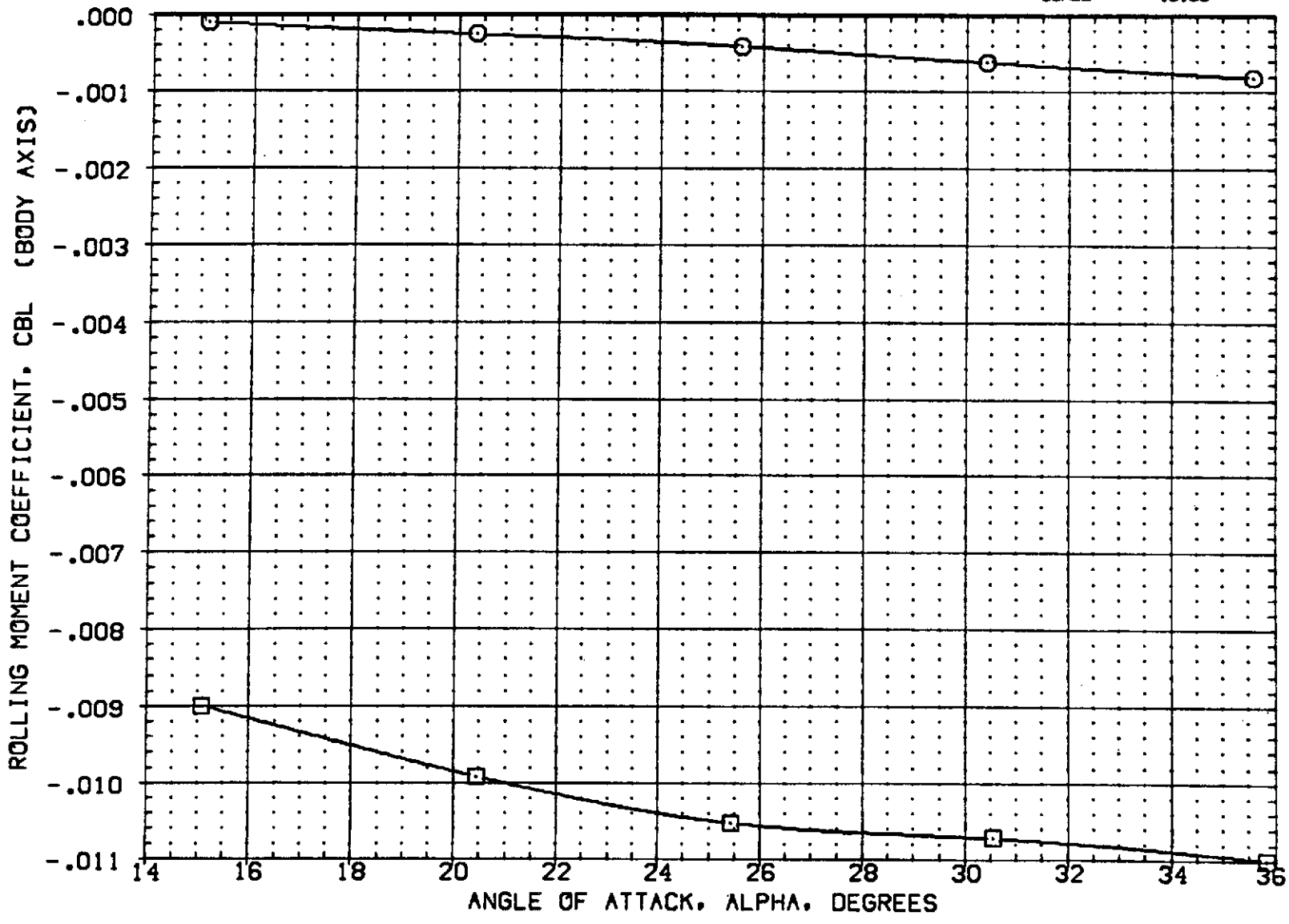


FIG 27 ENTRY TRAJECTORY Q =10 PSF SIMULATION (ROLL) 01N47N48 ELEVON = 0

(A)MACH = 10.33

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.Q
(AQ107F)	○	OA-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	-20.000	-14.250	150.000
(AQ141N)	□	OA-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN	621.000	-20.000	-14.250	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

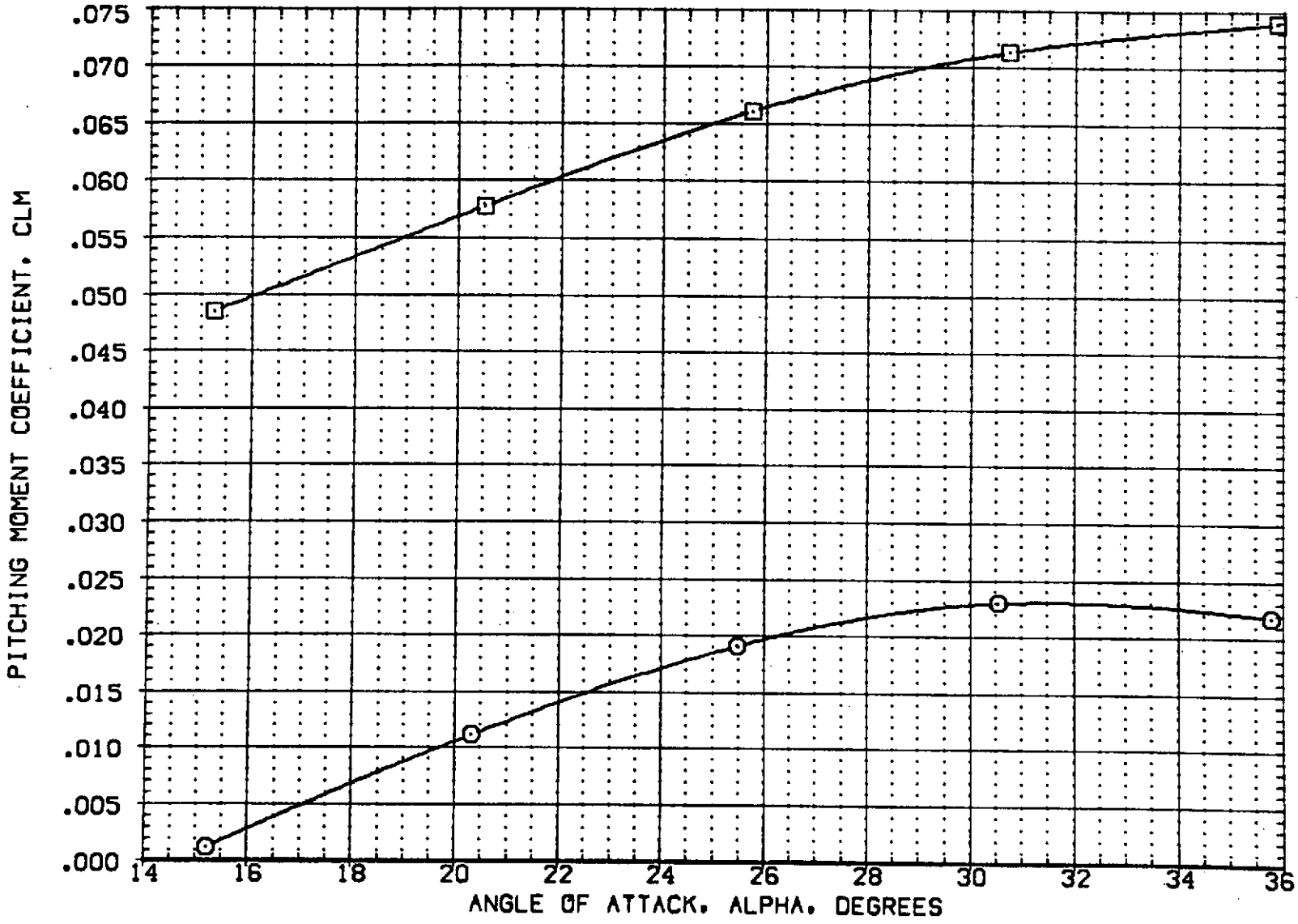


FIG 28 ENTRY TRAJECTORY Q =10 PSF SIMULATION (PITCH-DOWN) 01N46N47 ELEVON =-20

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.O
[AQ107F]	⊗	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	-20.000	-14.250	150.000
[AQ142N]	⊟	0A-85 CFHT101 MODEL 32-0 01N47N48 ROLL	602.000	-20.000	-14.250	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

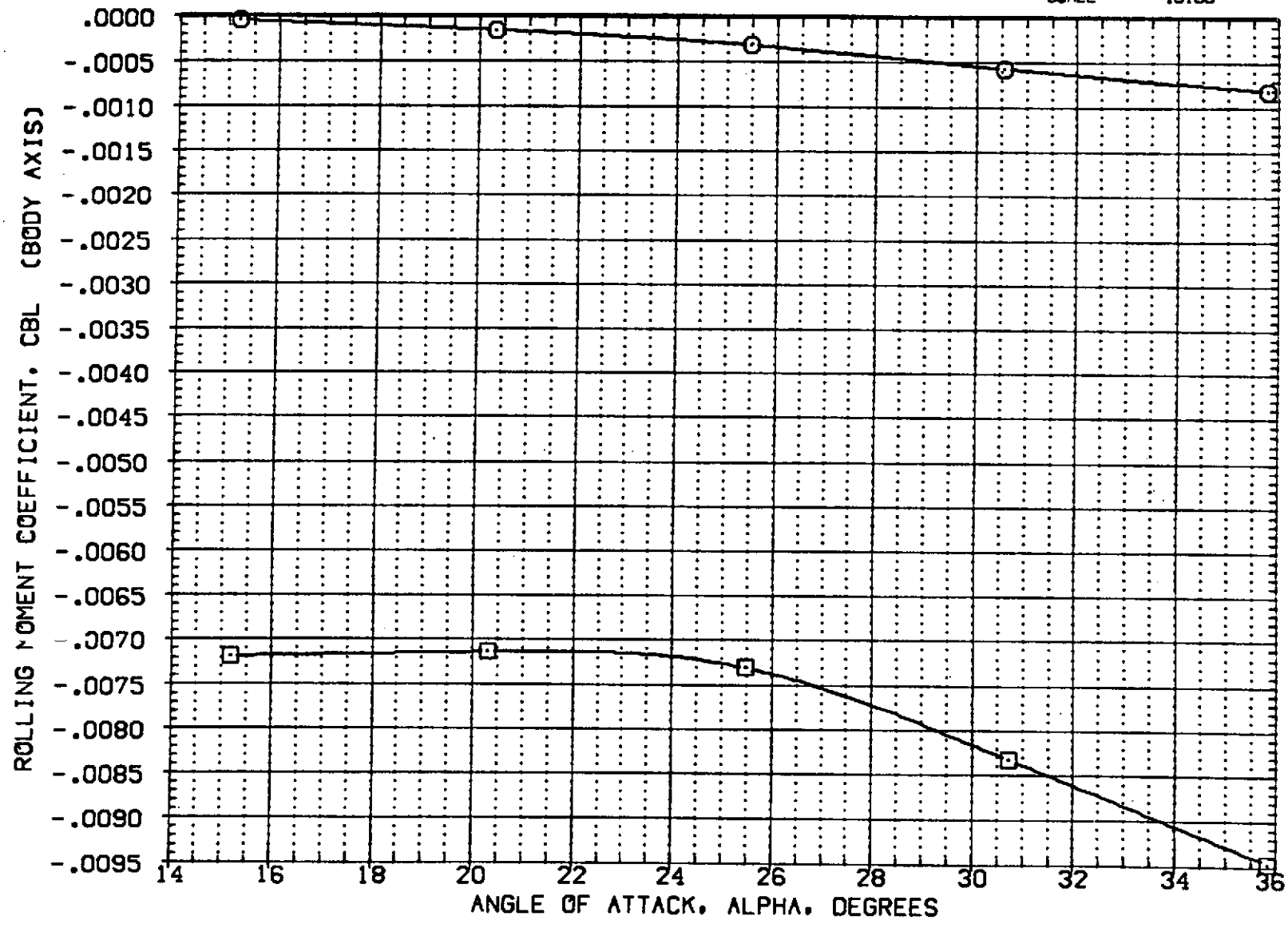


FIG 29 ENTRY TRAJECTORY Q =10 PSF SIMULATION (ROLL) 01N47N48 ELEVON =-20

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.O
(AQ107F)	○	OA-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	-20.000	-14.250	150.000
(AQ123N)	□	OA-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN	311.000	-20.000	-14.250	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

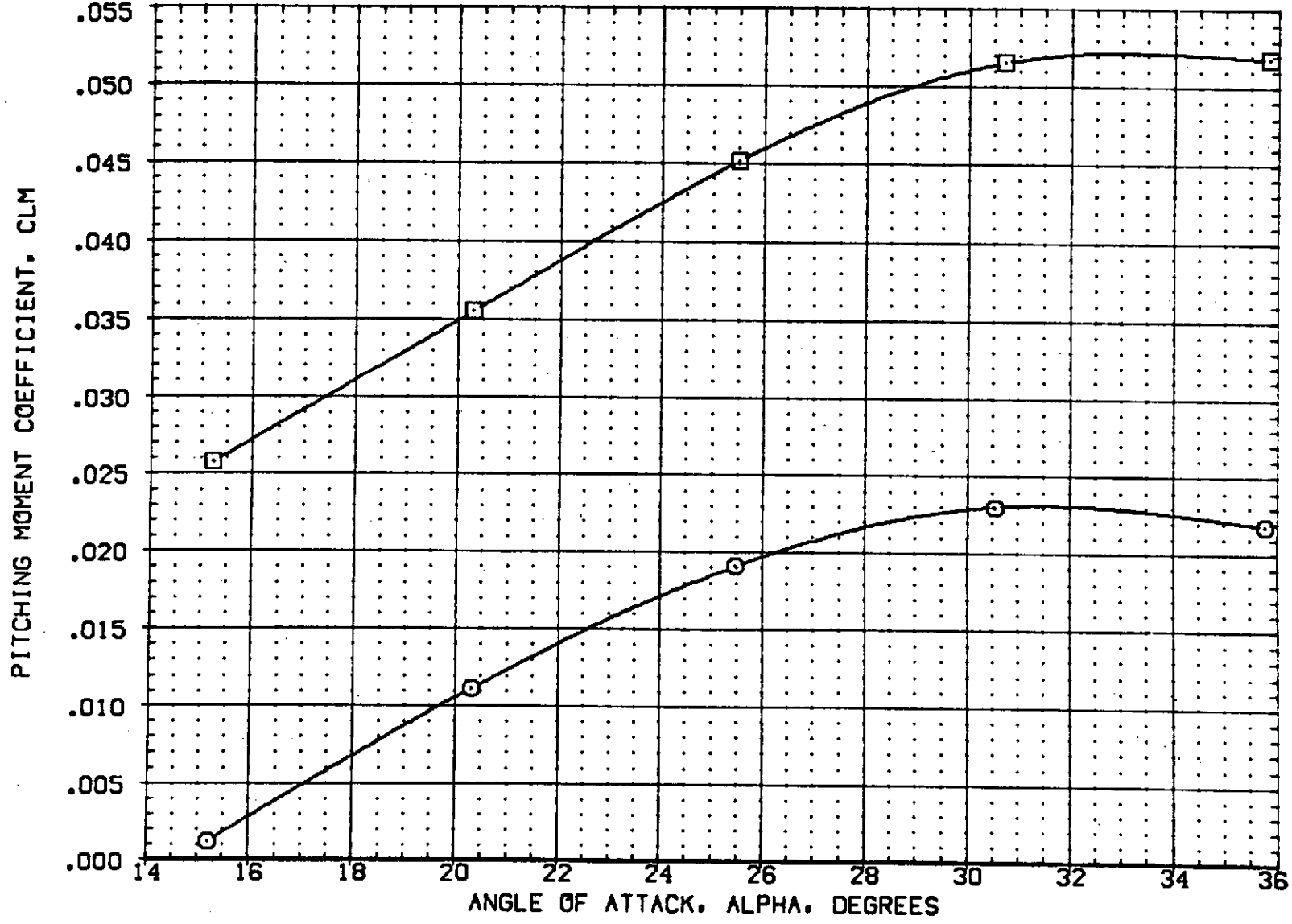


FIG 30 ENTRY TRAJECTORY Q =20 PSF SIMULATION (PITCH-DOWN) 01N46N47 ELEVON =-20

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.Q
[AQ107F]	○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	-20.000	-14.250	150.000
[AQ126N]	□	0A-85 CFHT101 MODEL 32-0 02N46N47 PITCH DOWN	311.000	-20.000	-14.250	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

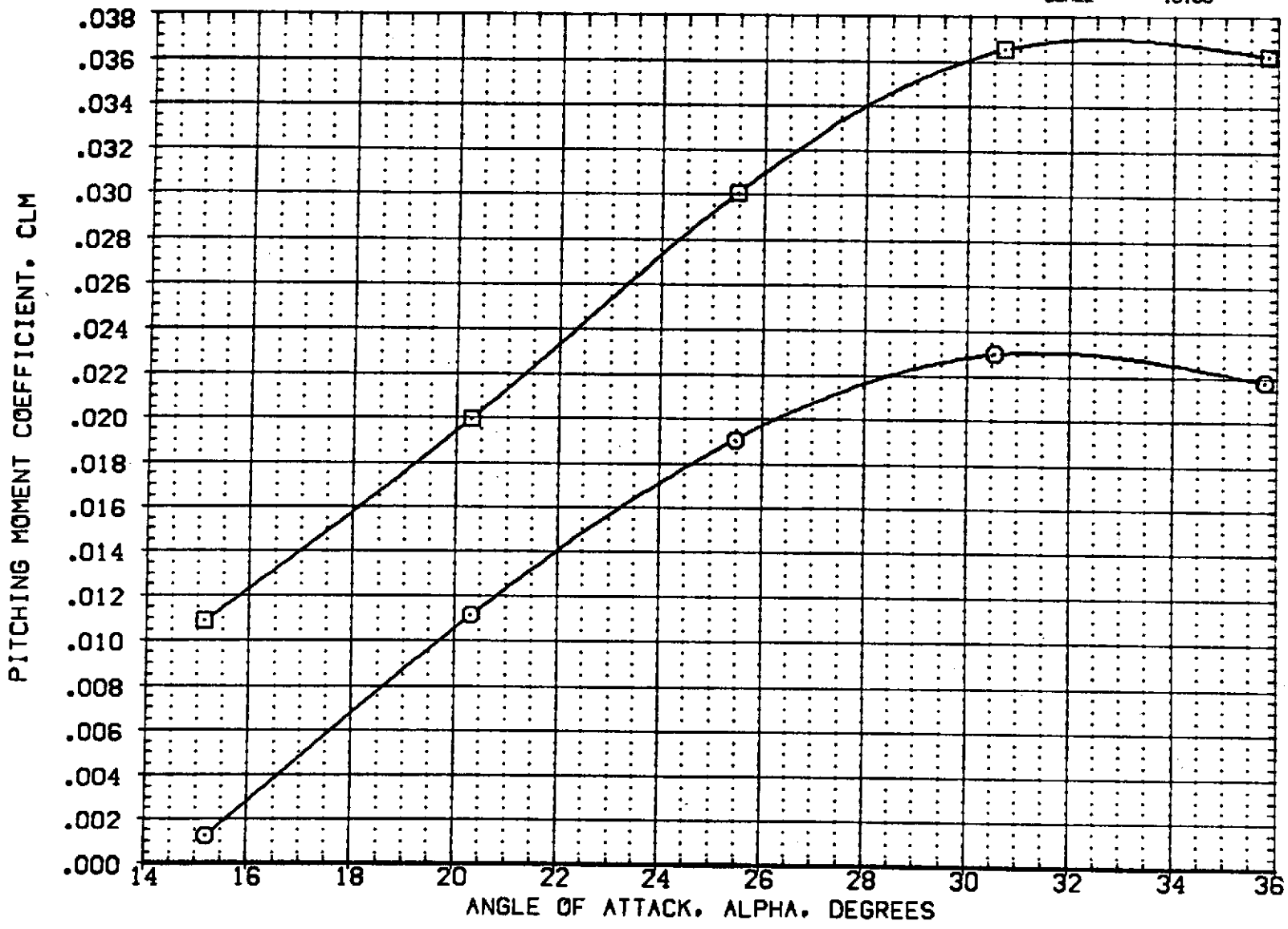


FIG 31 ENTRY TRAJECTORY Q =20 PSF SIMULATION (PITCH-DOWN) 02N46N47 ELEVON =-20

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	V.T.G
[AQ107F]	○	OA-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	-20.000	-14.250	150.000
[AQ127N]	□	OA-85 CFHT101 MODEL 32-0 03N46N47 PITCH DOWN	311.000	-20.000	-14.250	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

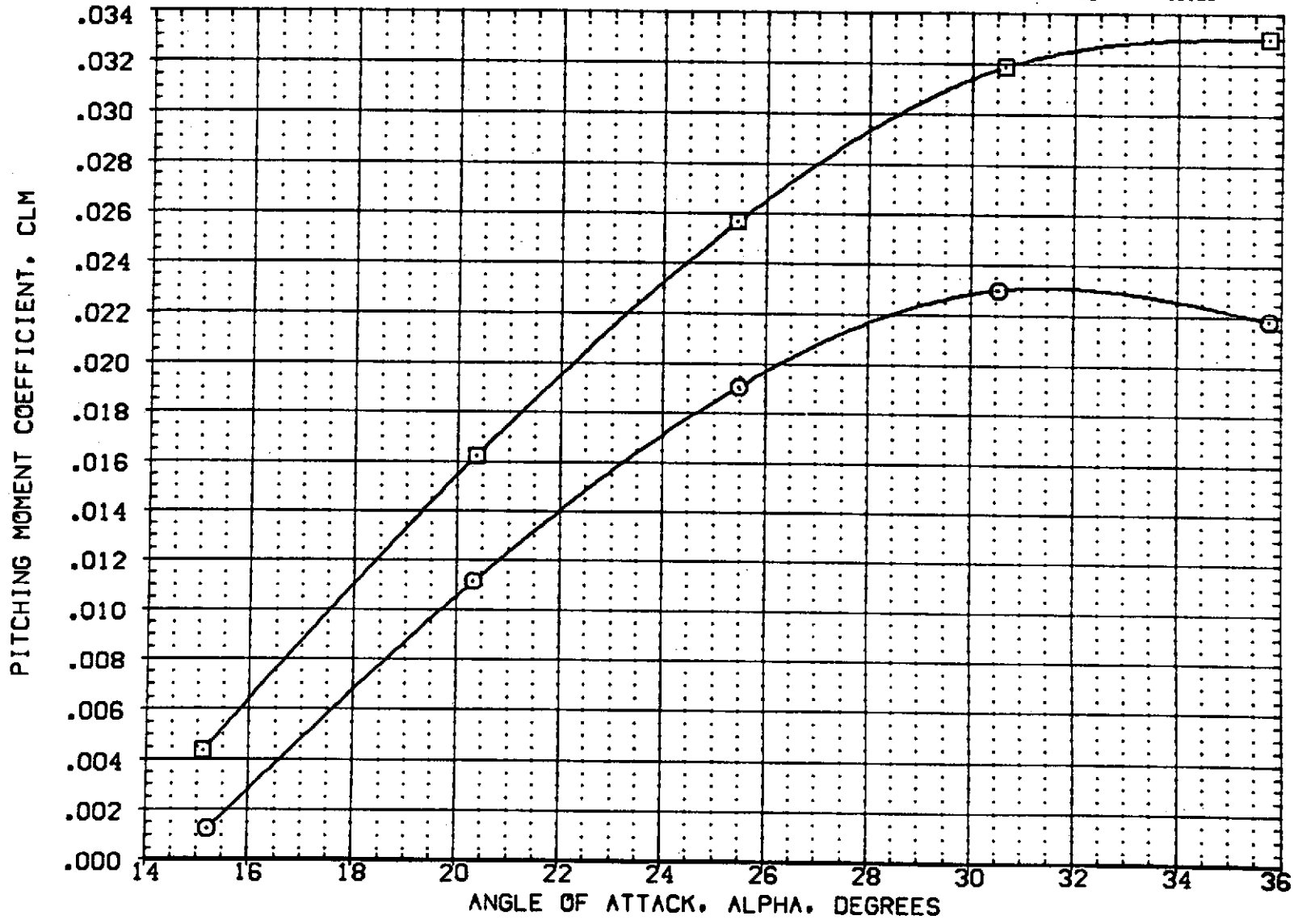


FIG 32 ENTRY TRAJECTORY Q =20 PSF SIMULATION (PITCH-DOWN) 03N46N47 ELEVON =-20

(A)MACH = 10.33

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.Q
(AQ107F) ○	OA-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	-20.000	-14.250	150.000
(AQ125N) □	OA-85 CFHT101 MODEL 32-0 01N48 PITCH UP	302.000	-20.000	-14.250	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XB
YMRP	.0000	IN. YB
ZMRP	400.0000	IN. ZB
SCALE	.0100	

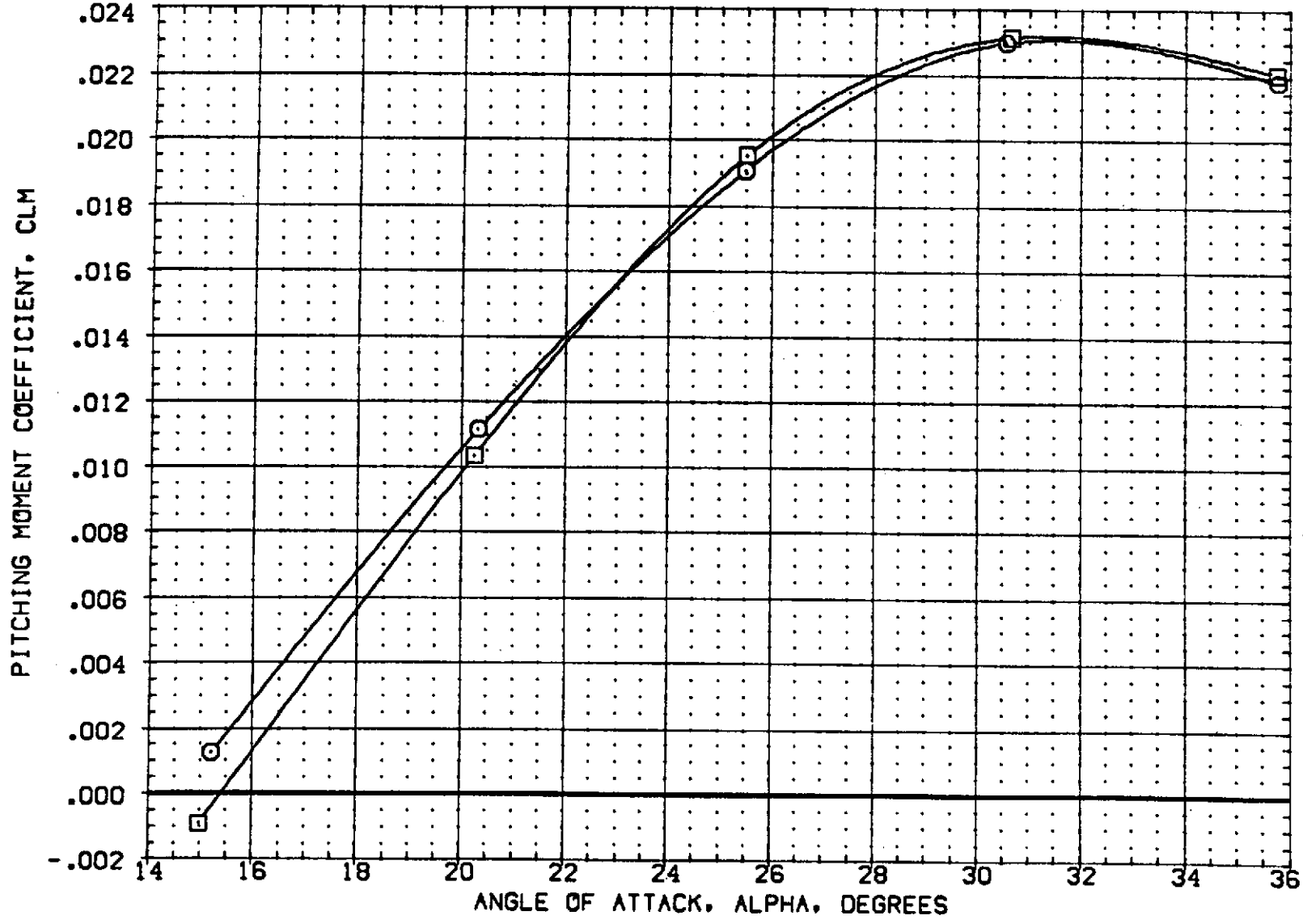


FIG 33 ENTRY TRAJECTORY Q =20 PSF SIMULATION (PITCH-UP) 01N48 ELEVON =-20

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	W.T.Q
(AQ107F)	○	OA-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	-20.000	-14.250	150.000
(AQ124N)	□	OA-85 CFHT101 MODEL 32-0 01N47N48 ROLL	302.000	-20.000	-14.250	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

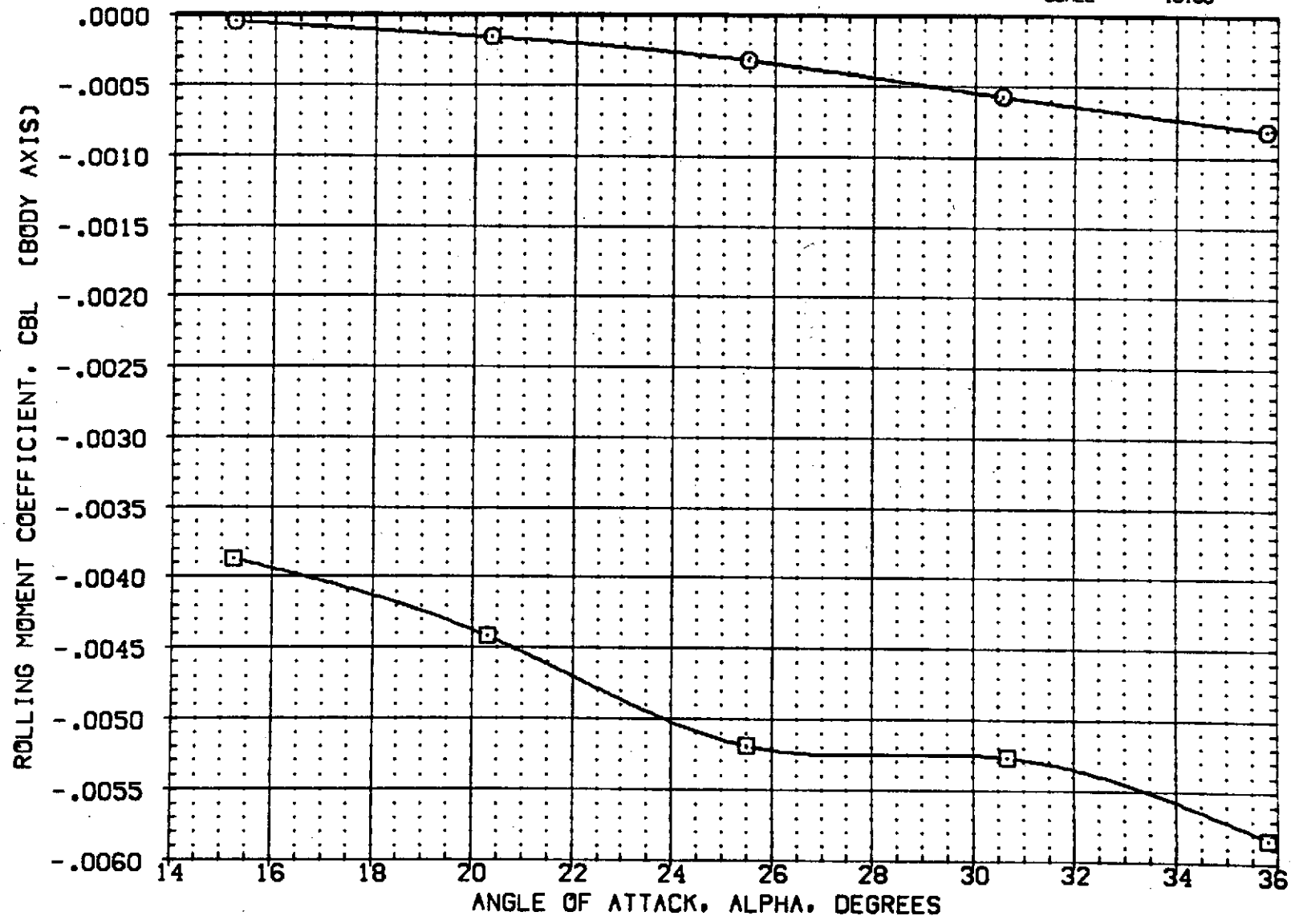


FIG 34 ENTRY TRAJECTORY Q =20 PSF SIMULATION (ROLL) 01N47N48 ELEVON =-20

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.O
[AQ108F]	○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	.000	.000	150.000
[AQ128N]	□	0A-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN	311.000	.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. X0
YMRP	.0000	IN. Y0
ZMRP	400.0000	IN. Z0
SCALE	.0100	

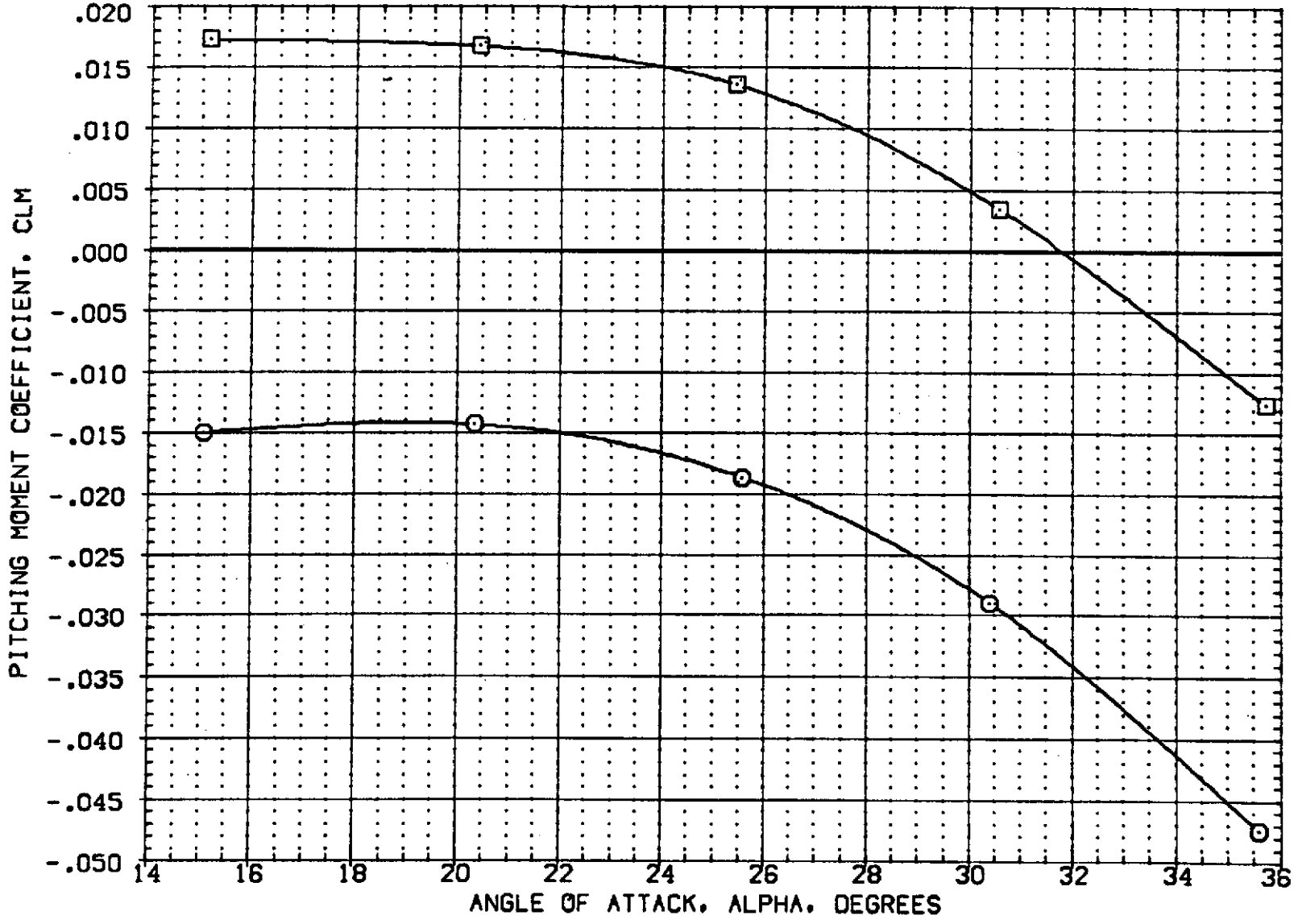


FIG 35 ENTRY TRAJECTORY Q =20 PSF SIMULATION (PITCH-DOWN) 01N46N47 ELEVON = 0

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	V.T.Q
(AQ108F)	○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	.000	.000	150.000
(AQ131N)	□	0A-85 CFHT101 MODEL 32-0 02N46N47 PITCH DOWN	311.000	.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XB
YMRP	.0000	IN. YB
ZMRP	400.0000	IN. ZB
SCALE	.0100	

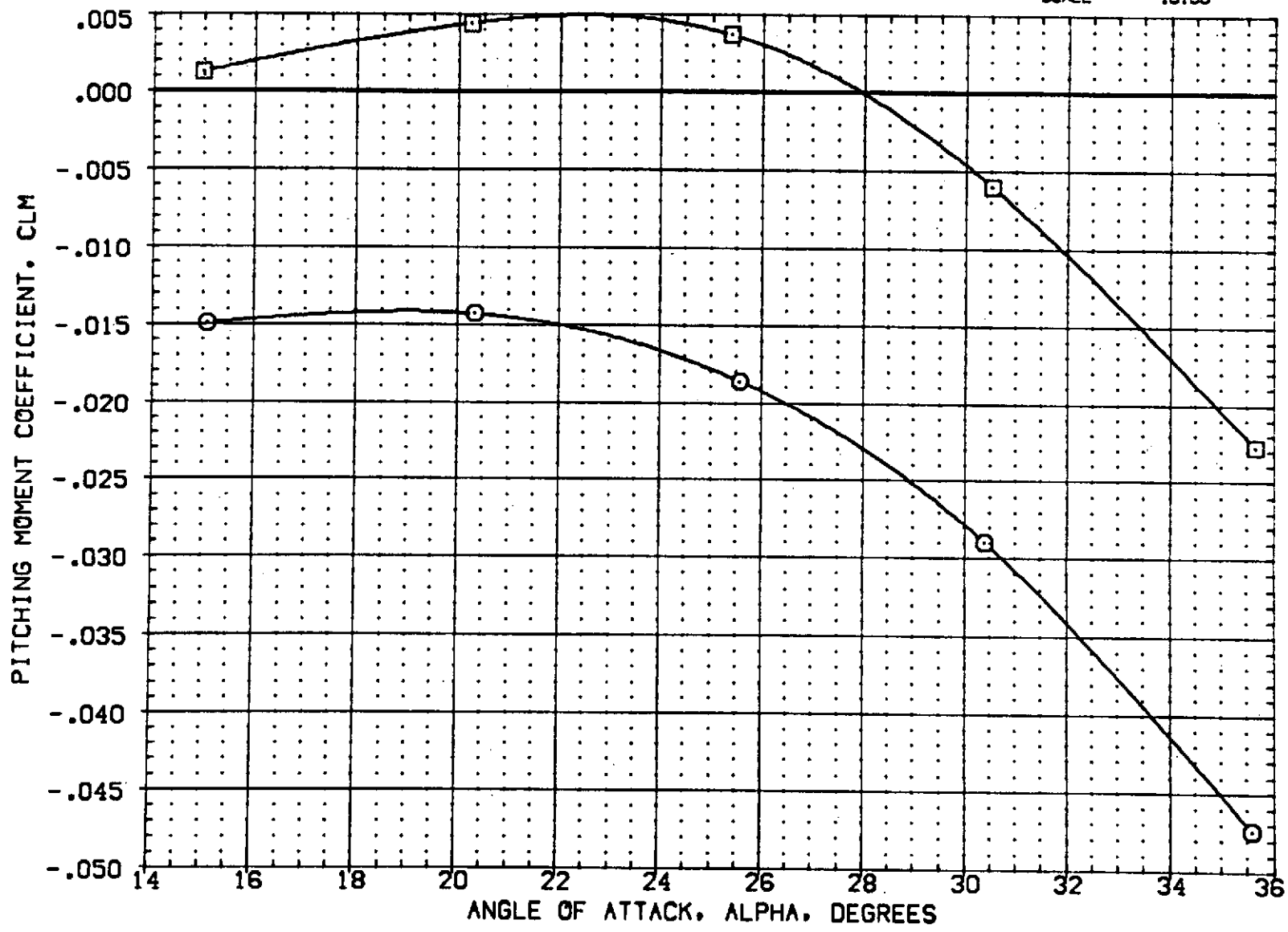


FIG 36 ENTRY TRAJECTORY Q =20 PSF SIMULATION (PITCH-DOWN) 02N46N47 ELEVON = 0

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	V.T.O
(AQ108F)	○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	.000	.000	150.000
(AQ132N)	□	0A-85 CFHT101 MODEL 32-0 03N46N47 PITCH DOWN	311.000	.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

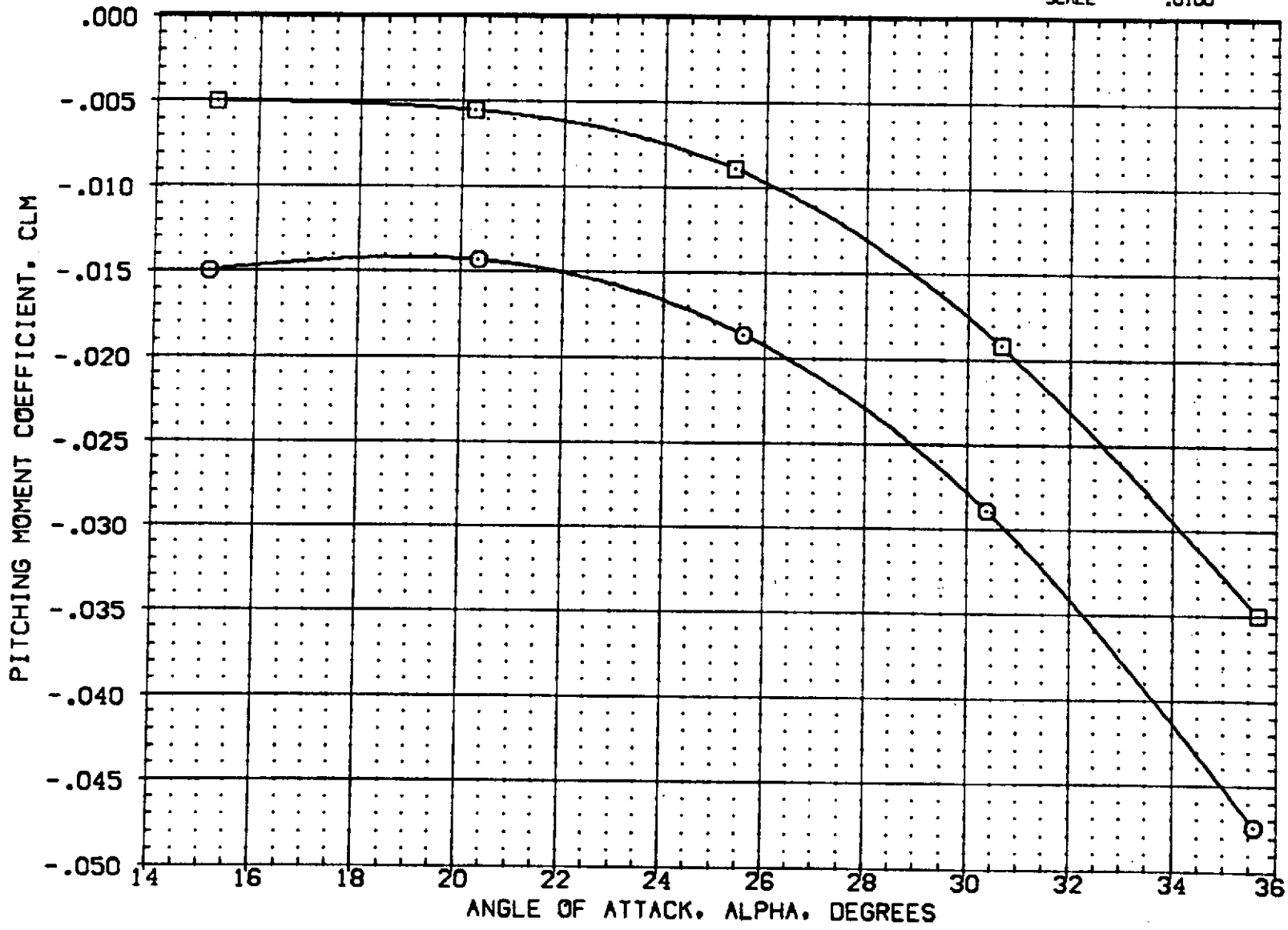


FIG 37 ENTRY TRAJECTORY Q =20 PSF SIMULATION (PITCH-DOWN) 03N46N47 ELEVON = 0

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	V.T.O
(AQ108F)	○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	.000	.000	150.000
(AQ130N)	□	0A-85 CFHT101 MODEL 32-0 01N48 PITCH UP	302.000	.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

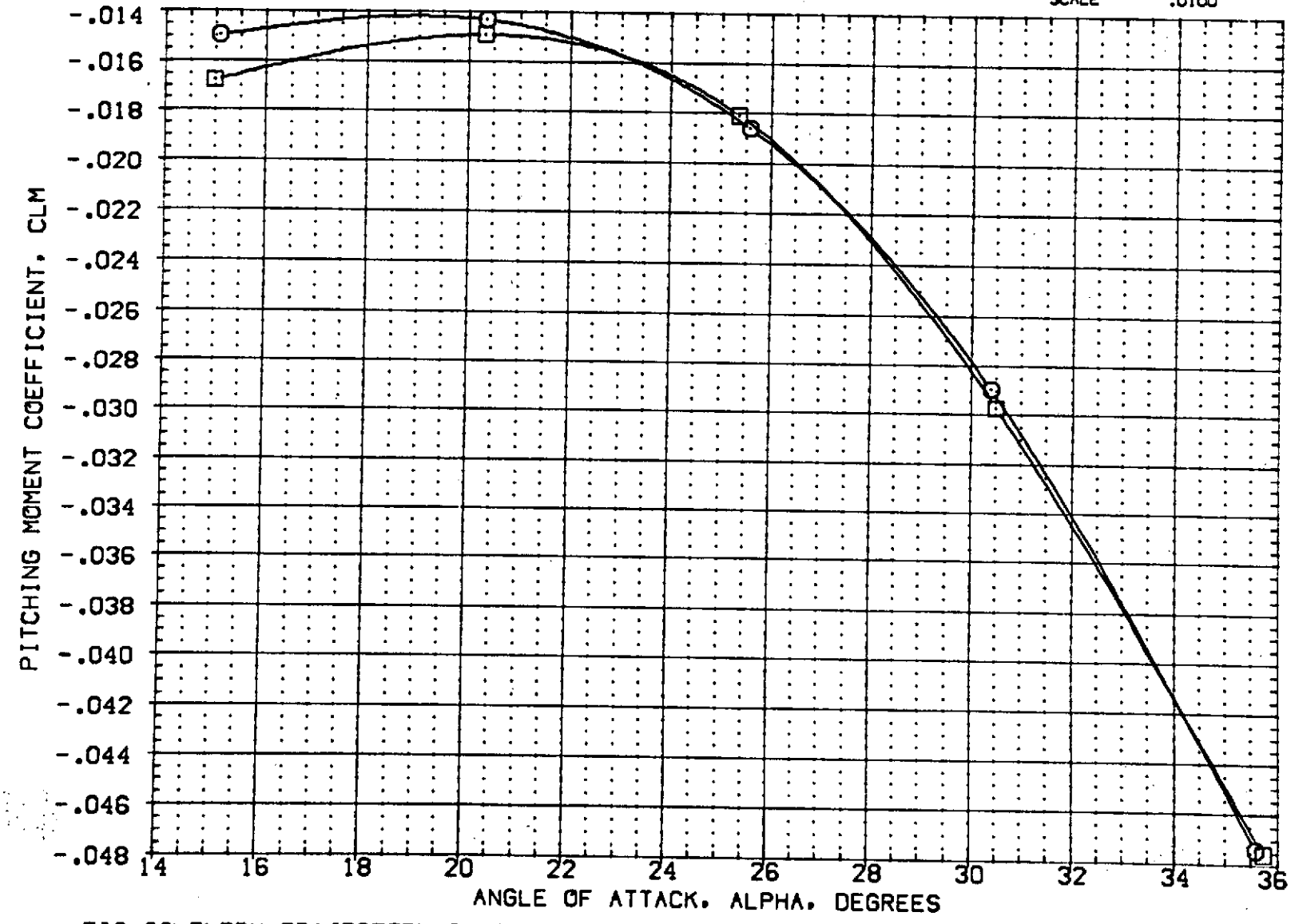


FIG 38 ENTRY TRAJECTORY Q =20 PSF SIMULATION (PITCH-UP) 01N48 ELEVON = 0

(A)MACH = 10.33

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.O
[AQ108F] ○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	.000	.000	150.000
[AQ129N] □	0A-85 CFHT101 MODEL 32-0 01N47N48 ROLL	302.000	.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

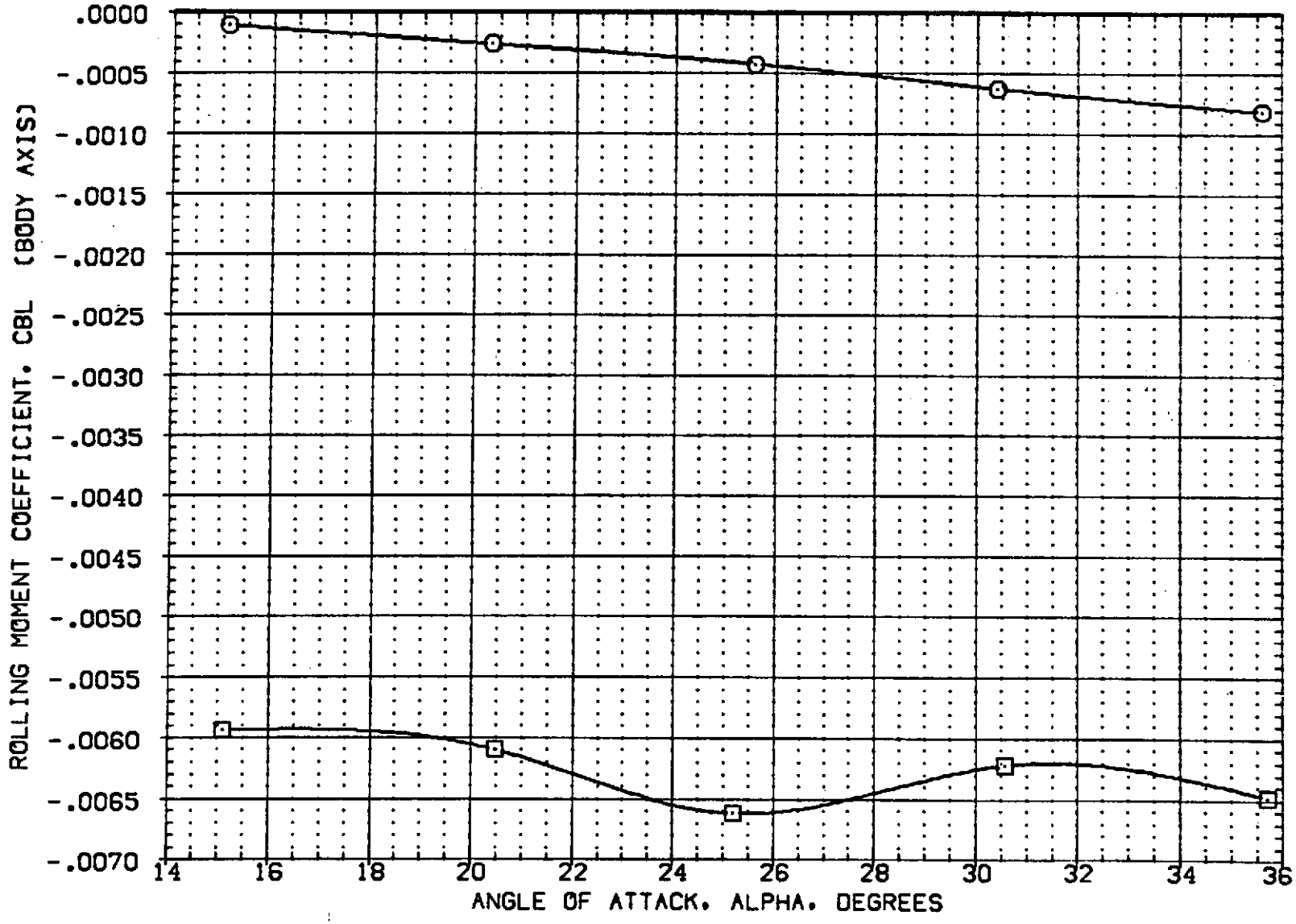


FIG 39 ENTRY TRAJECTORY Q =20 PSF SIMULATION (ROLL) 01N47N48 ELEVON = 0

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	W.T.Q
[AQ113F]	○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	15.000	-14.250	150.000
[AQ152N]	□	0A-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN	311.000	15.000	-14.250	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

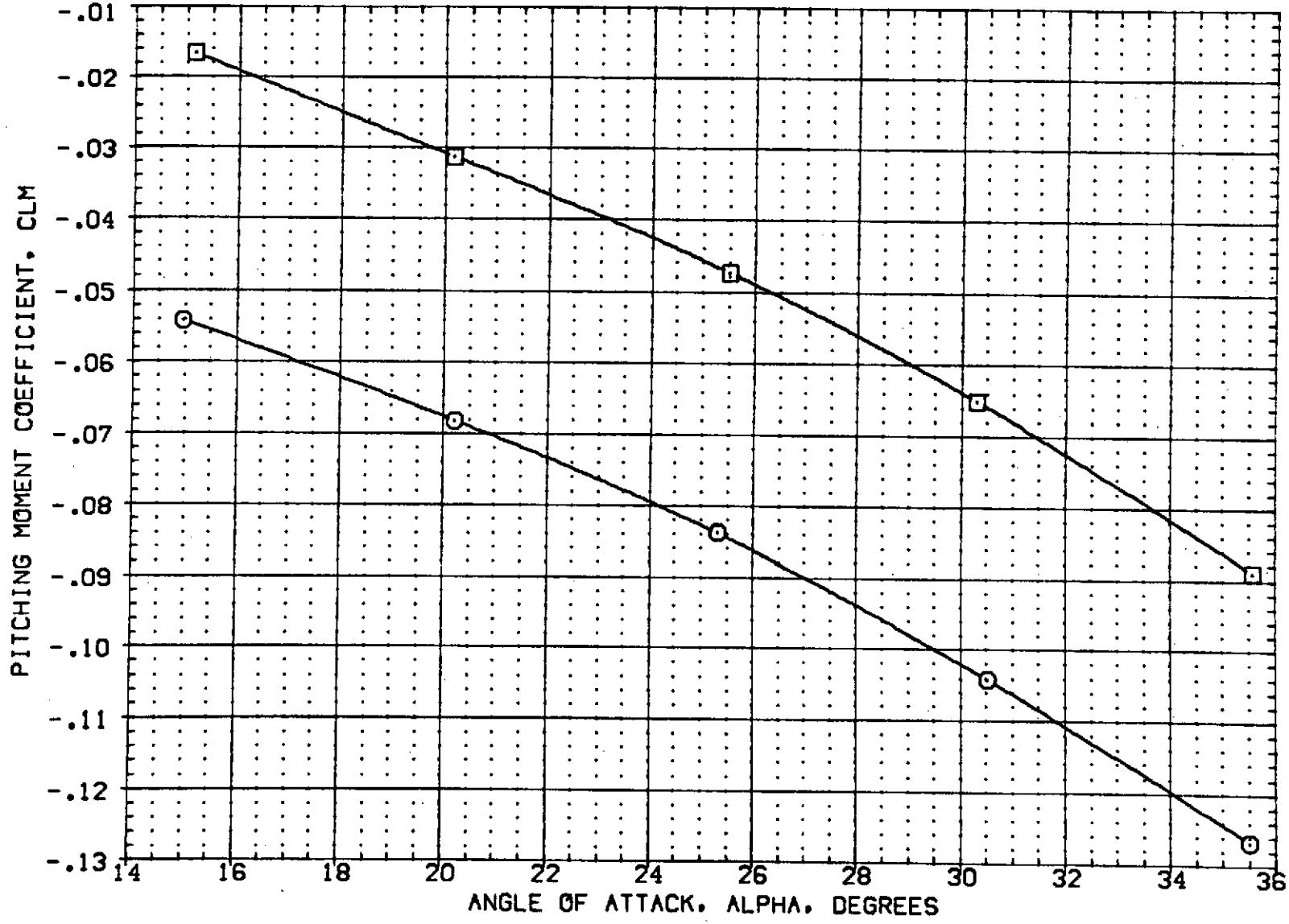


FIG 40 ENTRY TRAJ Q=20 PSF SIML BDFLAP=-14 (PITCH-DOWN) 01N46N47 ELEVON = 15

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.O
(AQ109F)	○	0A-65 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	15.000	13.750	150.000
(AQ133N)	□	0A-65 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN	311.000	15.000	13.750	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

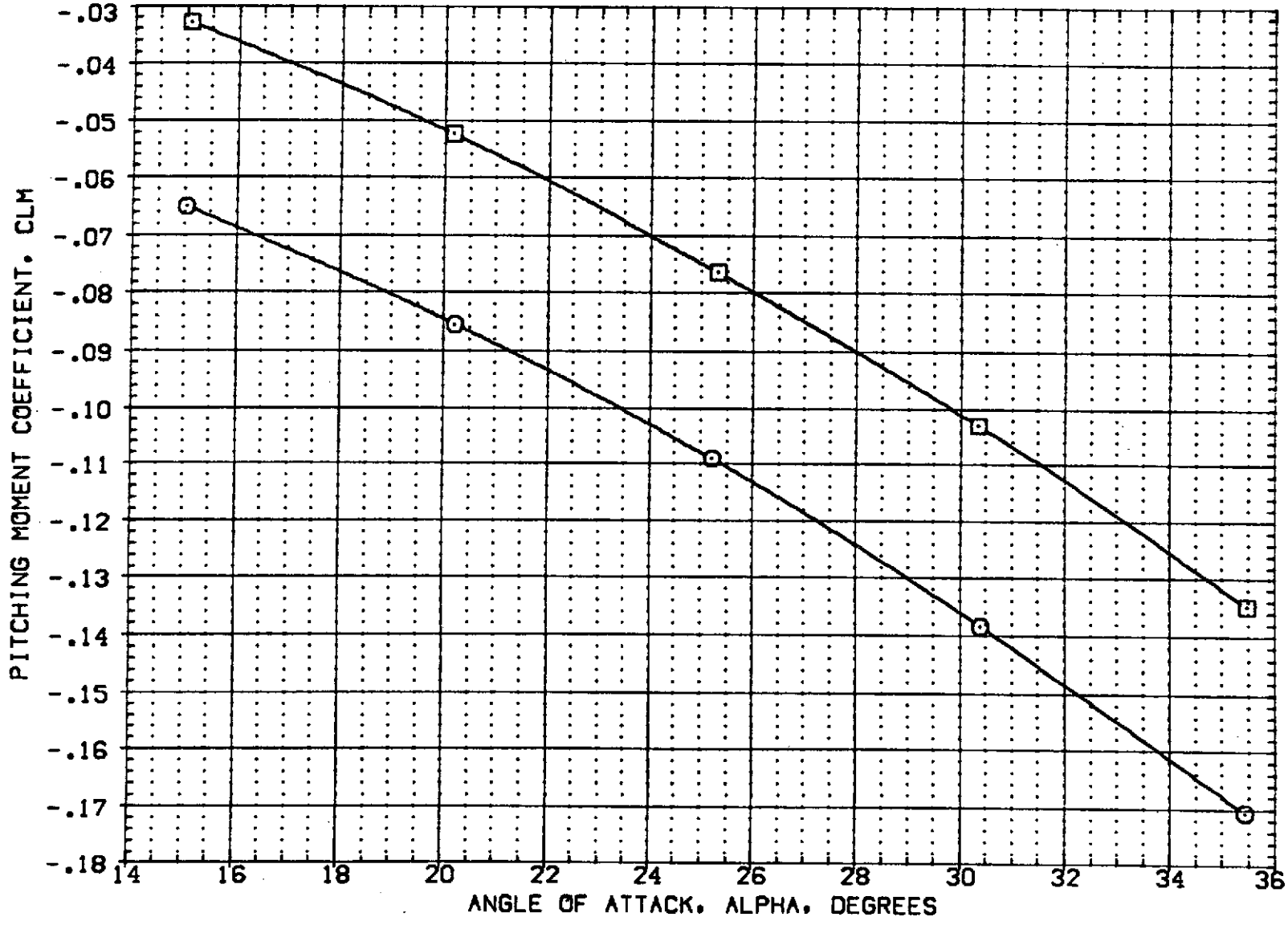


FIG 41 ENTRY TRAJ Q=20 PSF SIML BDFLAP=+14 (PITCH-DOWN) 01N46N47 ELEVON = 15

(A)MACH = 10.33

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	W.T.Q
(AQ109F)	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	15.000	13.750	150.000
(AQ135N)	0A-85 CFHT101 MODEL 32-0 02N46N47 PITCH DOWN	311.000	15.000	13.750	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

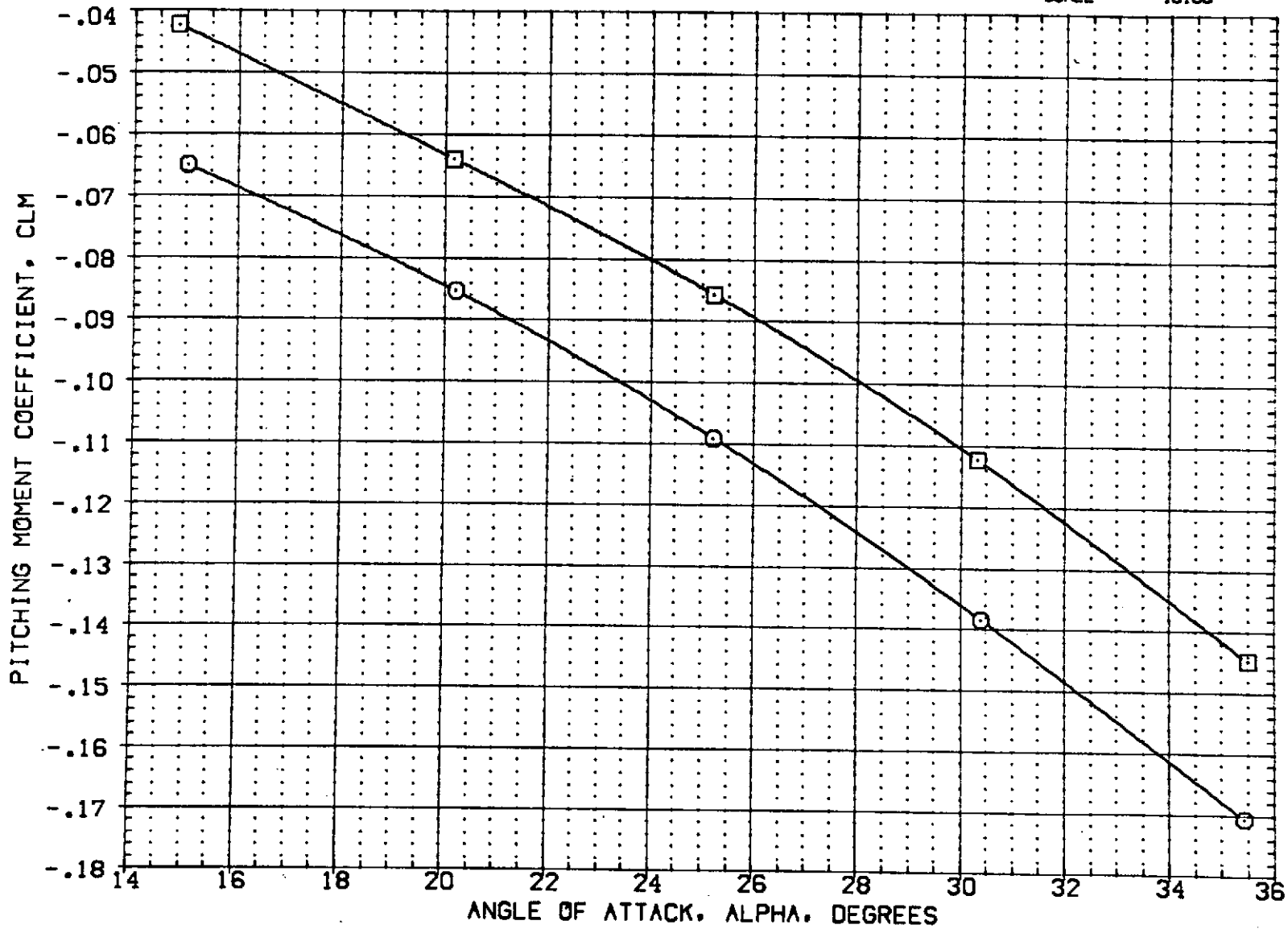


FIG 42 ENTRY TRAJECTORY Q =20 PSF SIMULATION (PITCH-DOWN) 02N46N47 ELEVON = 15

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	W.T.O
[AQ109F]	○	OA-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	15.000	13.750	150.000
[AQ136N]	□	OA-85 CFHT101 MODEL 32-0 03N46N47 PITCH DOWN	311.000	15.000	13.750	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

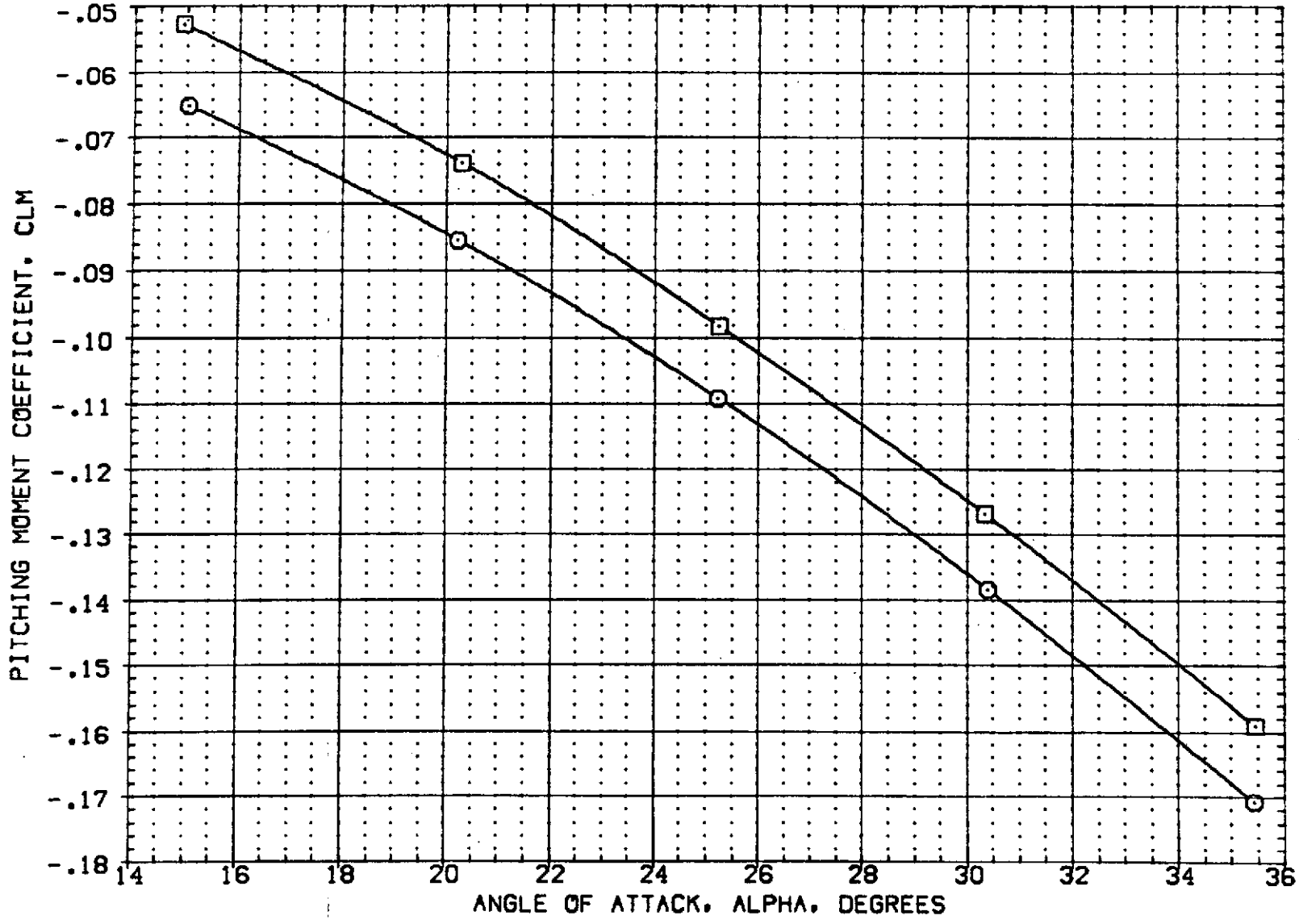


FIG 43 ENTRY TRAJECTORY Q =20 PSF SIMULATION (PITCH-DOWN) 03N46N47 ELEVON = 15

(A)MACH = 10.33

DATA SET SYMBOL		CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BOFLAP	V.T.O
[AQ109F]	○	0A-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF	.000	15.000	13.750	150.000
[AQ134N]	□	0A-85 CFHT101 MODEL 32-0 01N47N48 ROLL	302.000	15.000	13.750	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

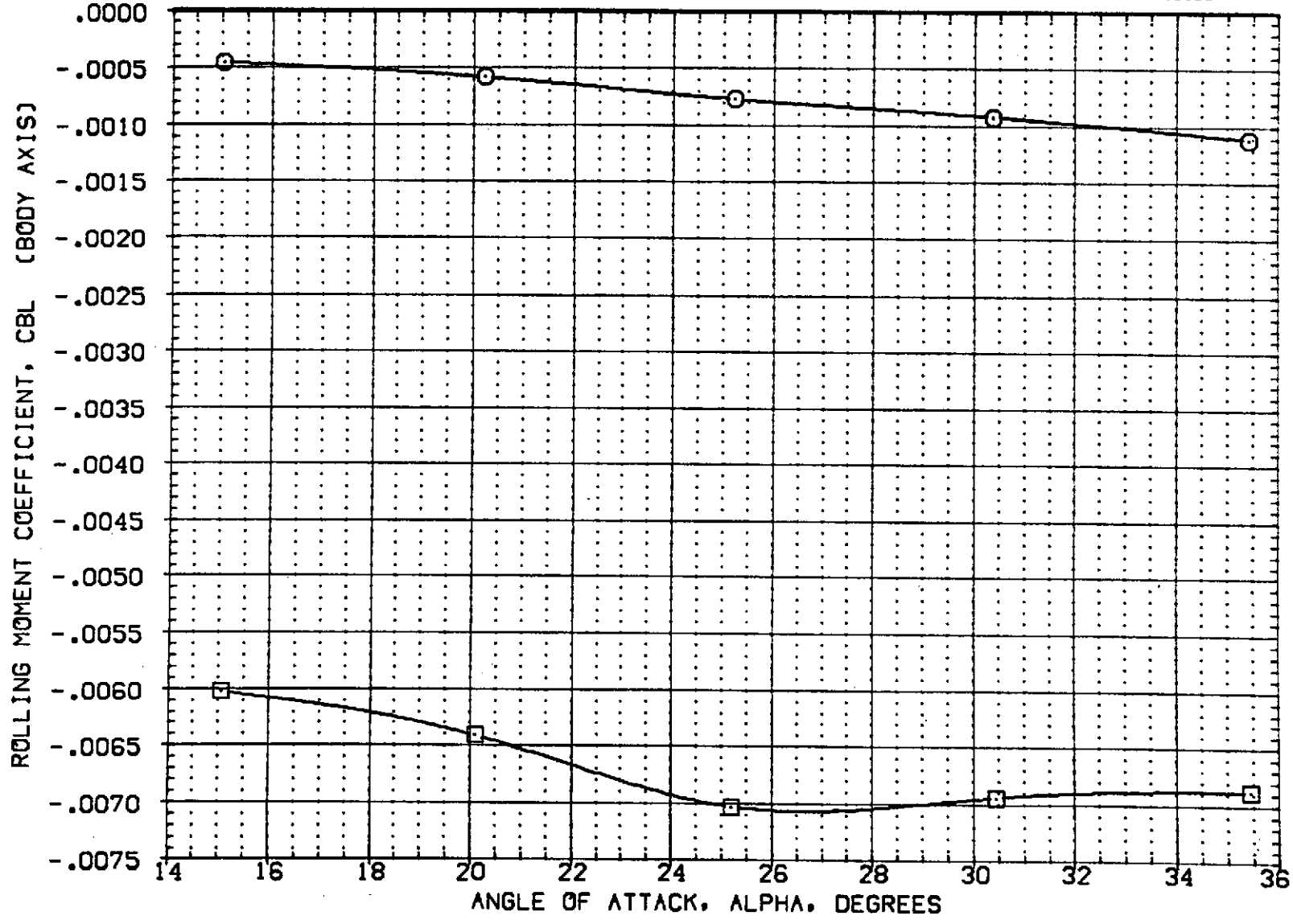


FIG 44 ENTRY TRAJECTORY Q =20 PSF SIMULATION (ROLL) 01N47N48 ELEVON = 15

(A)MACH = 10.33

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	W.T.Q
(AQIOIF)	0A-85 CFHT101 MODEL 32-0 01 N49 N50 RCS OFF	.000	15.000	.000	150.000
(AQIOIN)	0A-85 CFHT101 MODEL 32-0 01N49N50 PITCH DOWN	167.000	15.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

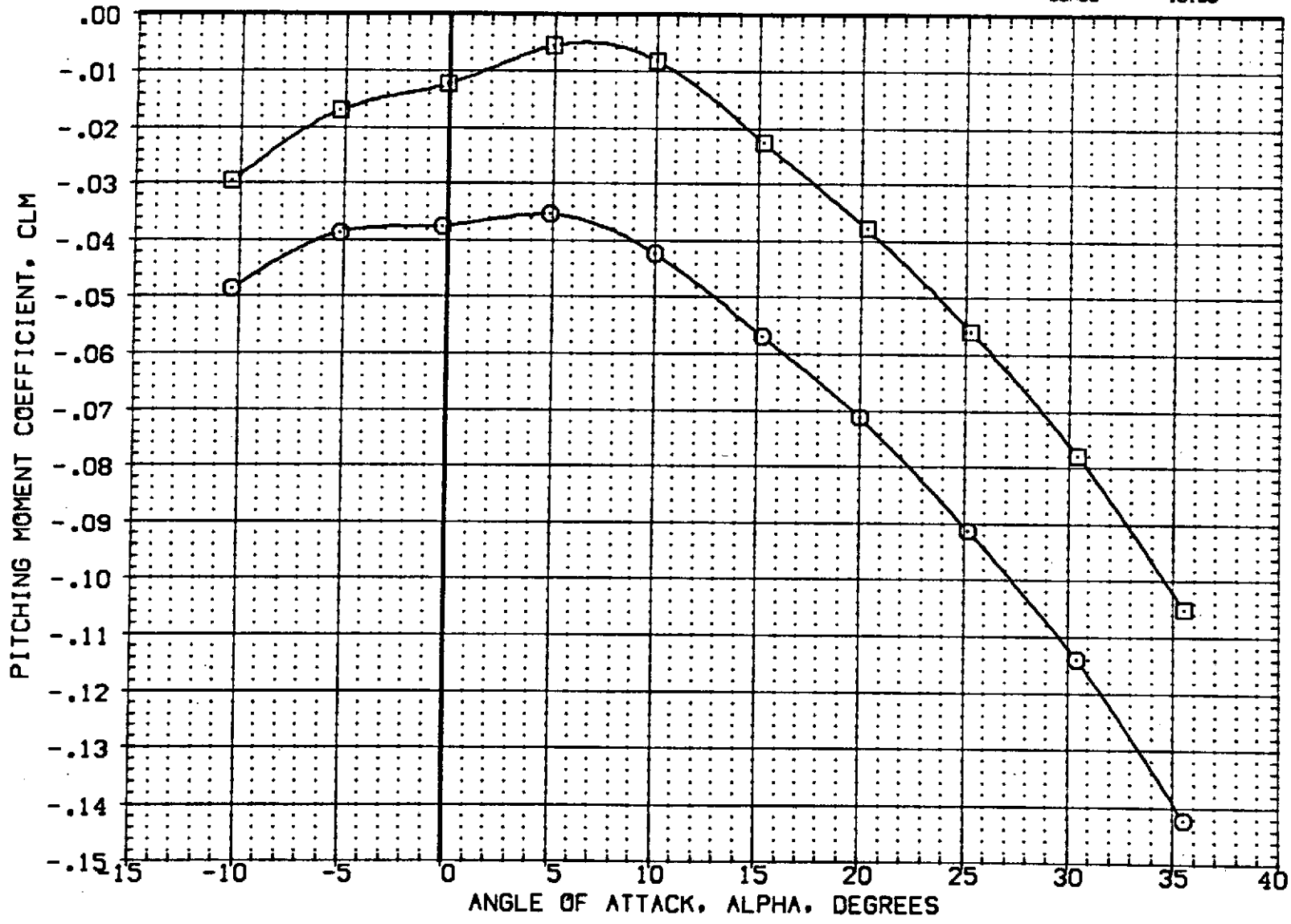


FIG 45 RTLS ABORT SEPARATION Q =20PSF SIML. (PITCH-DOWN) 01N49N50 ELEVON = 15

(A)MACH = 10.33

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.Q
[AQ101F] ○	0A-85 CFHT101 MODEL 32-0 01 N49 N50 RCS OFF	.000	15.000	.000	150.000
[AQ102N] □	0A-85 CFHT101 MODEL 32-0 01N49N52 ROLL	158.000	15.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XC
YMRP	.0000	IN. YC
ZMRP	400.0000	IN. ZC
SCALE	.0100	

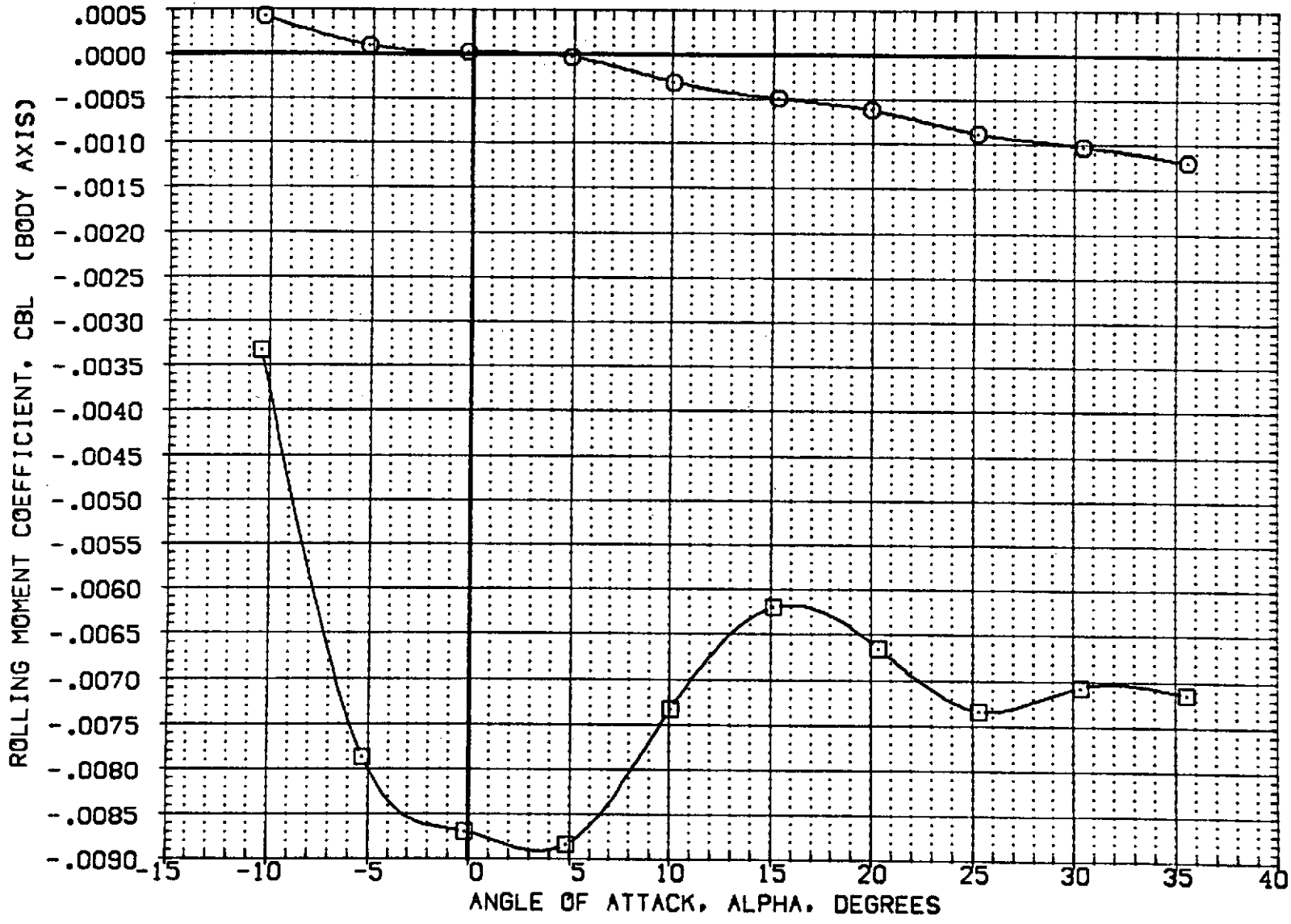


FIG 46 RTLS ABORT SEPARATION Q =20PSF SIML. (ROLL) 01N49N52 ELEVON = 15

(A)MACH = 10.33

DATA SET SYMBOL	CONFIGURATION DESCRIPTION	PC-RCS	ELEVON	BDFLAP	V.T.O
(AQ101F) ○	OA-85 CFHT101 MODEL 32-0 01 N49 N50 RCS OFF	.000	15.000	.000	150.000
(AQ103N) □	OA-85 CFHT101 MODEL 32-0 01N51 YAW	179.000	15.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

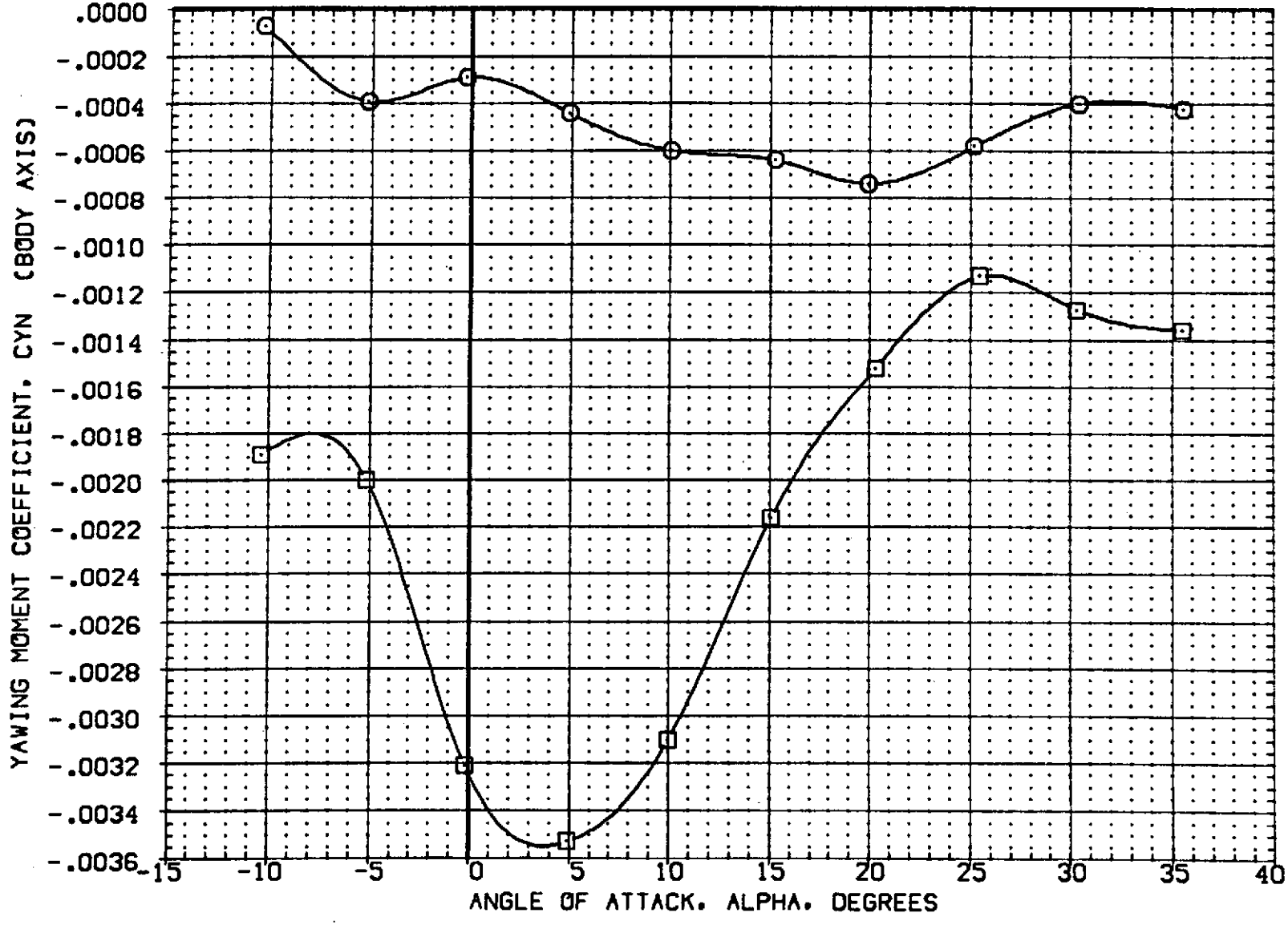


FIG 47 RTLS ABORT SEPARATION Q =20PSF SIML. (YAW) 01N51 ELEVON = 15

(A)MACH = 10.33

DATA SET SYMBOL	CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BDFLAP	V.T.G
(AQ102F) ○	0A-85 CFHT101 MODEL 32-0 01 NS1	RCS OFF	.000	-20.000	.000	150.000
(AQ104N) □	0A-85 CFHT101 MODEL 32-0 01N51	YAW	179.000	-20.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

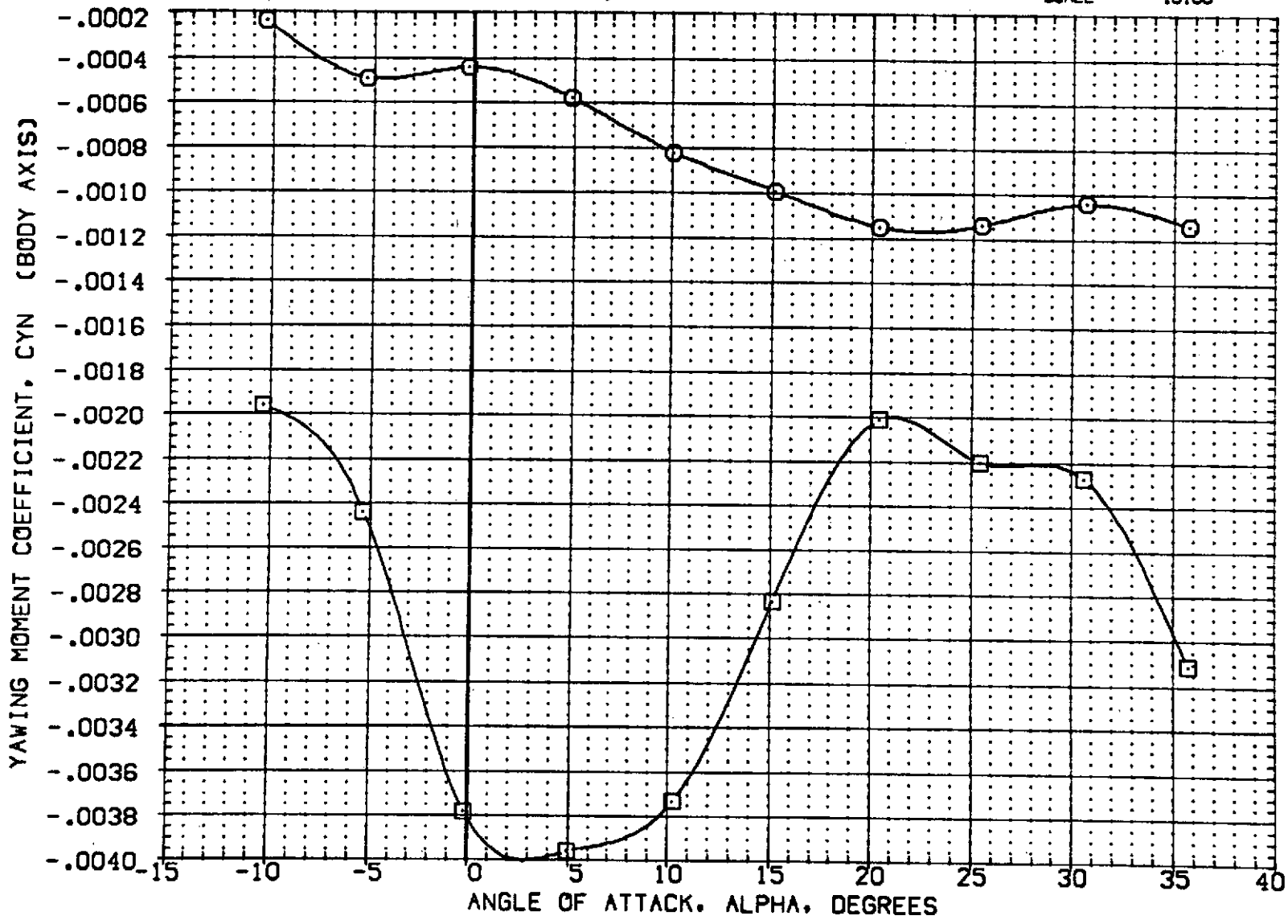


FIG 48 RTLS ABORT SEPARATION Q =20PSF SIML. (YAW) 01N51 ELEVON =-20

(A)MACH = 10.33

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BOFLAP	V.T.Q
[AQ102F]	○	0A-85 CFHT101 MODEL 32-0 01 NS1	RCS OFF	.000	-20.000	.000	150.000
[AQ105N]	□	0A-85 CFHT101 MODEL 32-0 01N49N52	ROLL	158.000	-20.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XQ
YMRP	.0000	IN. YQ
ZMRP	400.0000	IN. ZQ
SCALE	.0100	

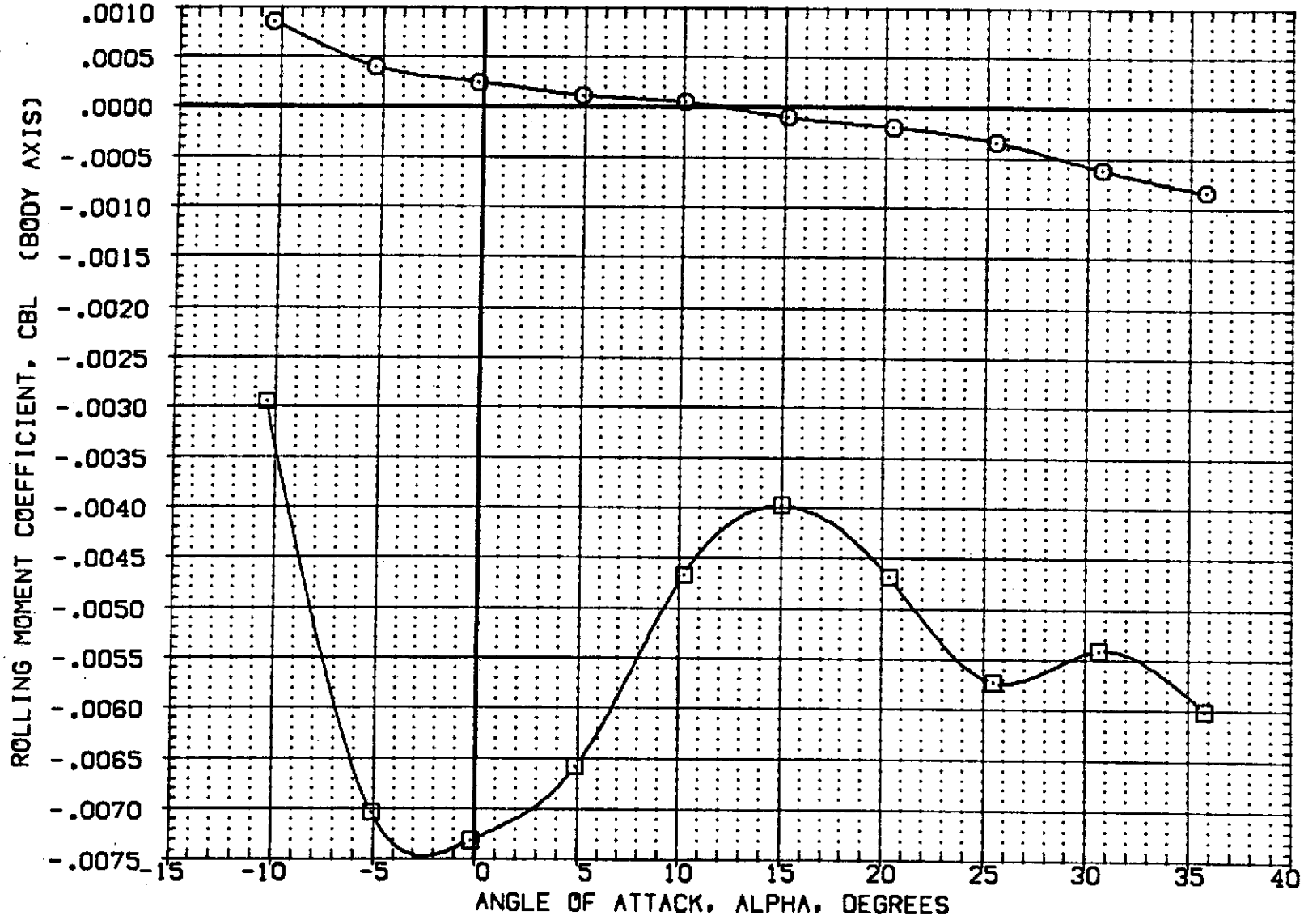


FIG 49 RTLS ABORT SEPARATION Q =20PSF SIML. (ROLL) 01N49N52 ELEVON =-20

(A)MACH = 10.33

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BDFLAP	V.T.Q
[AQ102F]	○	0A-85 CFHT101 MODEL 32-0 01 N51	RCS OFF	.000	-20.000	.000	150.000
[AQ106N]	□	0A-85 CFHT101 MODEL 32-0 01N52	PITCH UP	158.000	-20.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.9100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

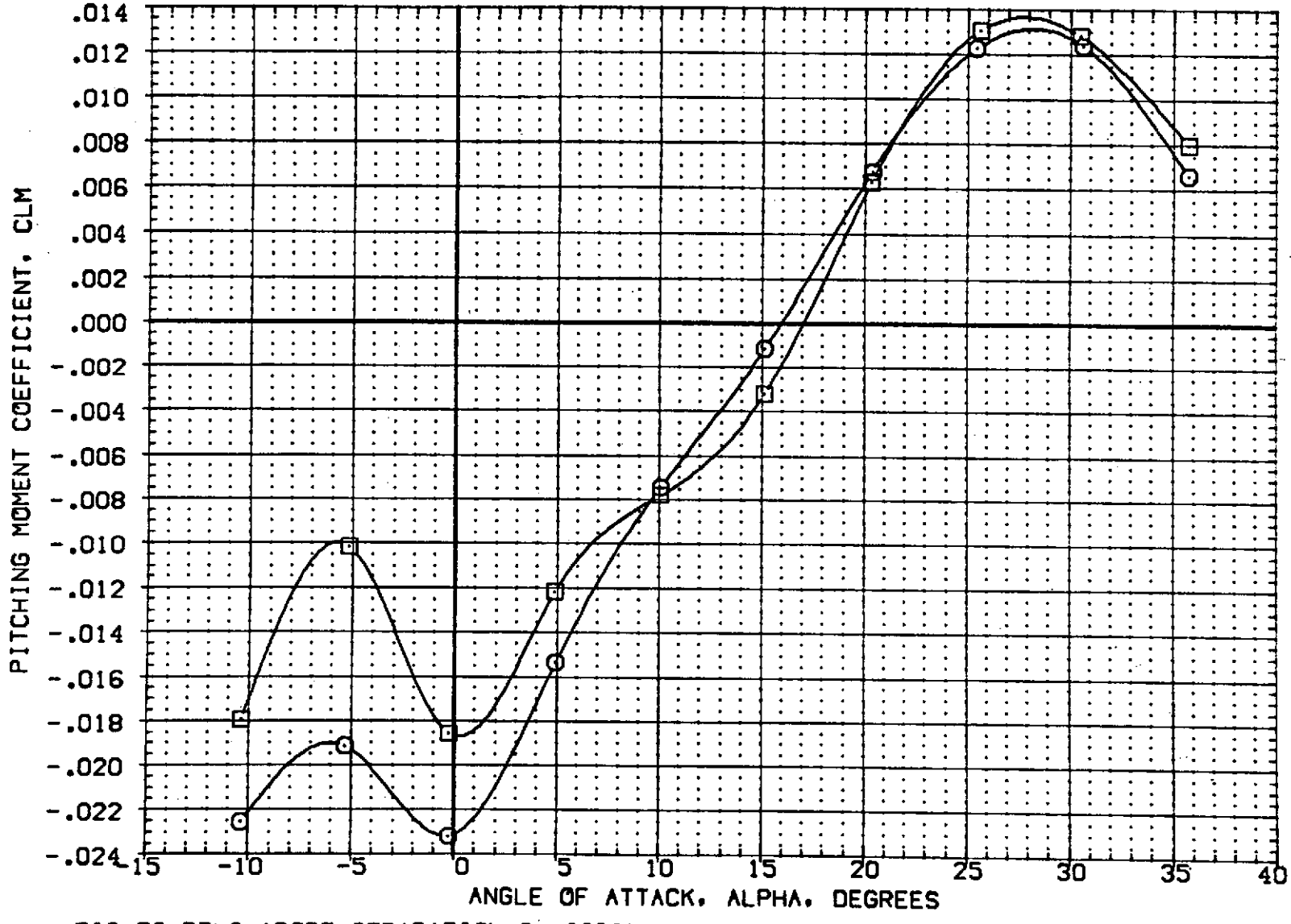


FIG 50 RTLS ABORT SEPARATION Q =20PSF SIML. (PITCH-UP) 01N52 ELEVON =-20

(A)MACH = 10.33

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BDFLAP	V.T.G
[AQ103F]	○	0A-85 CFHT101 MODEL 32-0 01 N52	RCS OFF	.000	.000	.000	150.000
[AQ107N]	□	0A-85 CFHT101 MODEL 32-0 01N52	PITCH UP	150.000	.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

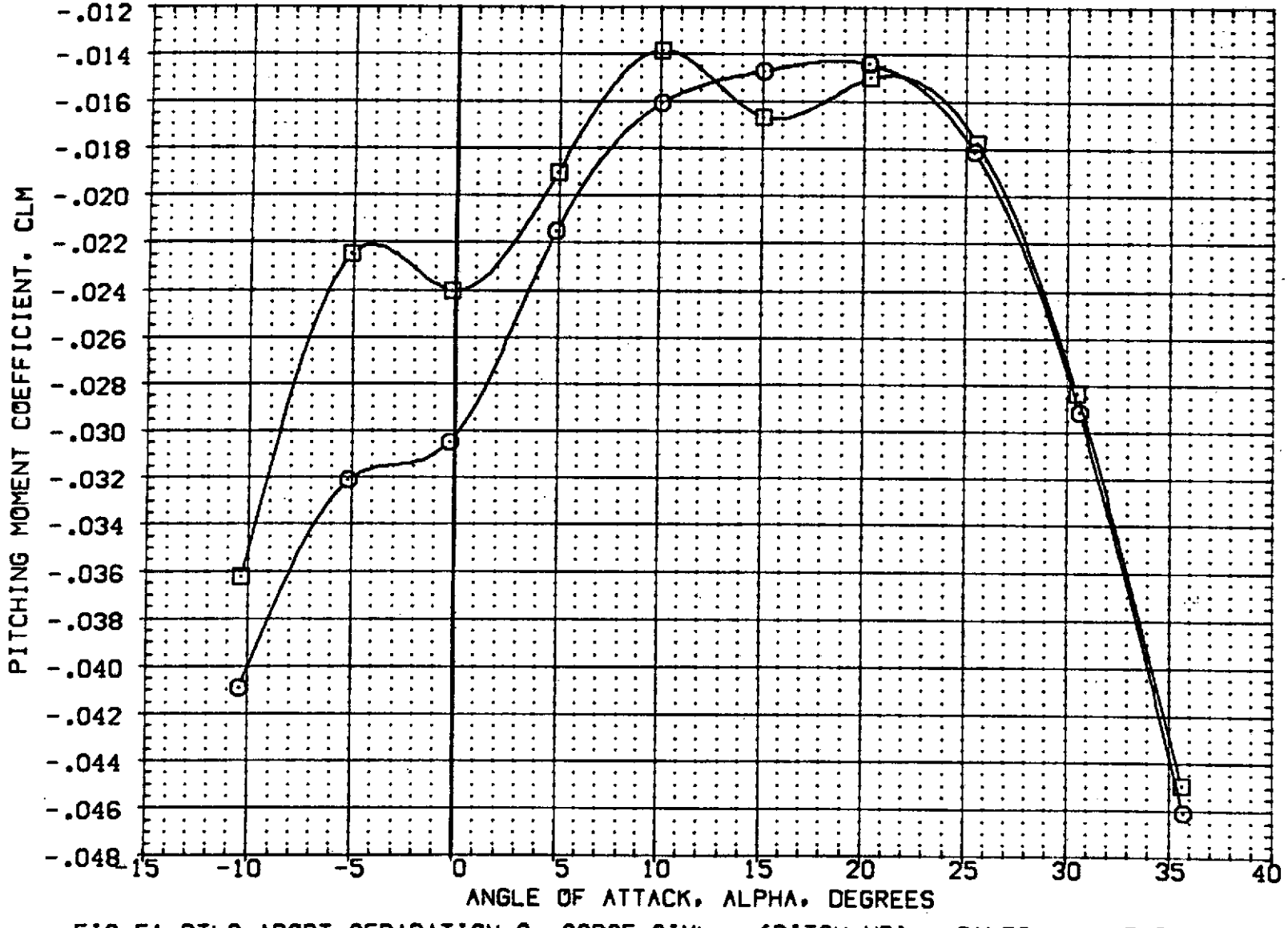


FIG 51 RTLS ABORT SEPARATION Q =20PSF SIML. (PITCH-UP) 01N52 ELEVON = 0

[A]MACH = 10.33

DATA SET SYMBOL	CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BDFLAP	V.T.O
(AQ103F) ○	0A-85 CFHT101 MODEL 32-0 01 N52	RCS OFF	.000	.000	.000	150.000
(AQ108N) □	0A-85 CFHT101 MODEL 32-0 01N49N52	ROLL	198.000	.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XO
YMRP	.0000	IN. YO
ZMRP	400.0000	IN. ZO
SCALE	.0100	

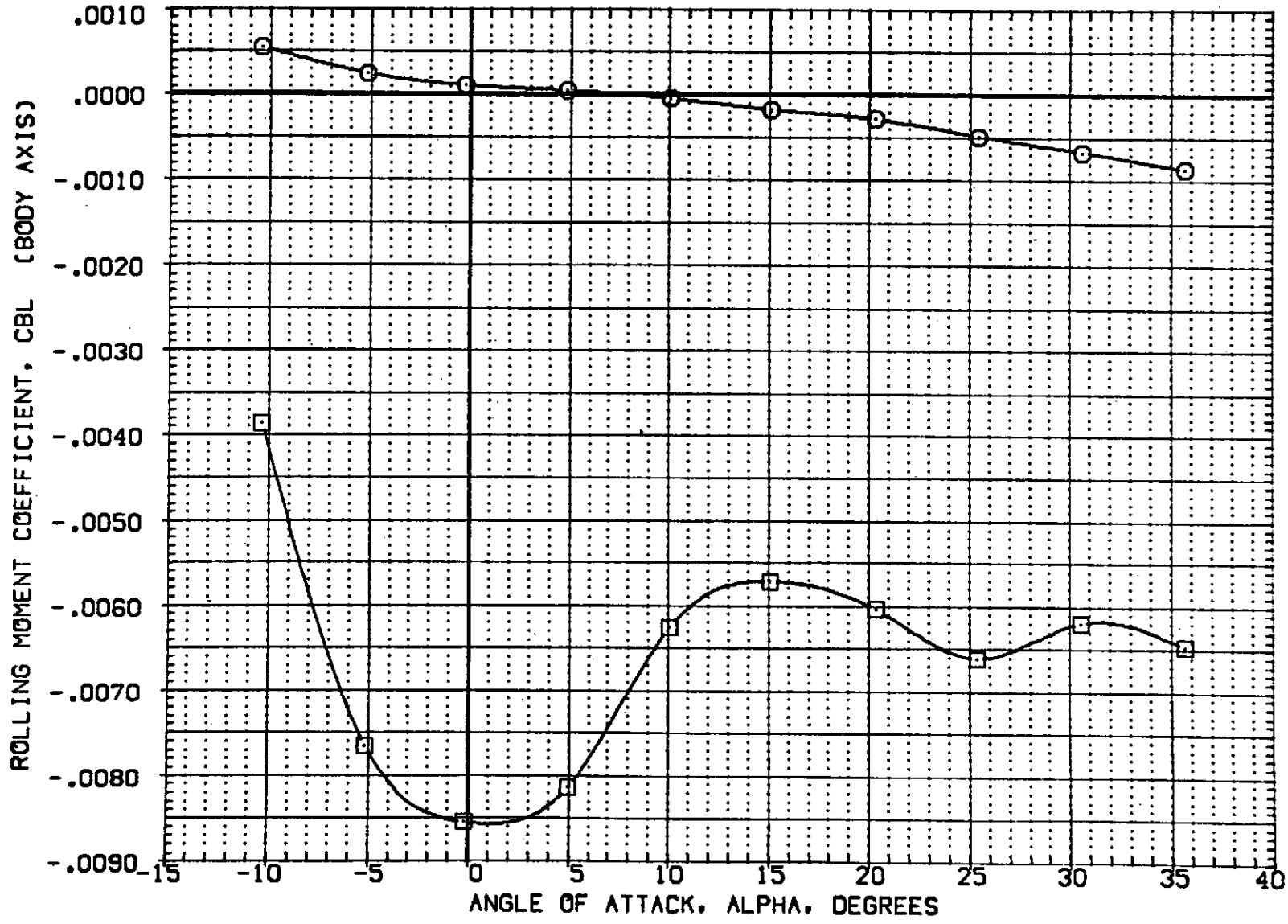


FIG 52 RTLS ABORT SEPARATION Q =20PSF SIML. (ROLL) 01N49N52 ELEVON = 0

(A)MACH = 10.33

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BOFLAP	V.T.G
[AQ103F]	○	0A-85 CFHT101 MODEL 32-0 01 N52	RCS OFF	.000	.000	.000	150.000
[AQ109N]	□	0A-85 CFHT101 MODEL 32-0 01N49N50 PITCH	DOWN	167.000	.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

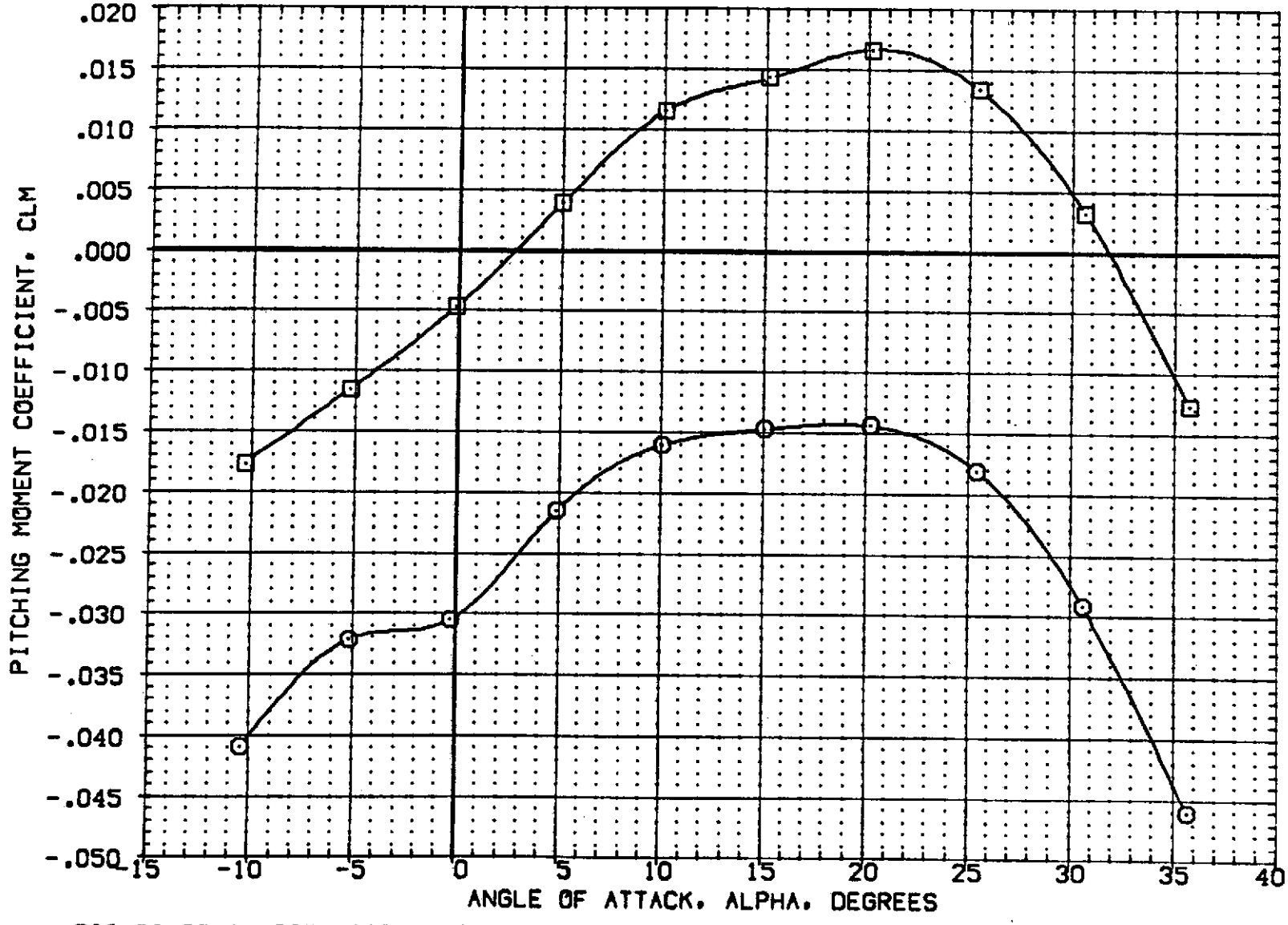


FIG 53 RTLS ABORT SEPARATION Q =20PSF SIML. (PITCH-DOWN) 01N49N50 ELEVON = 0

(A)MACH = 10.33

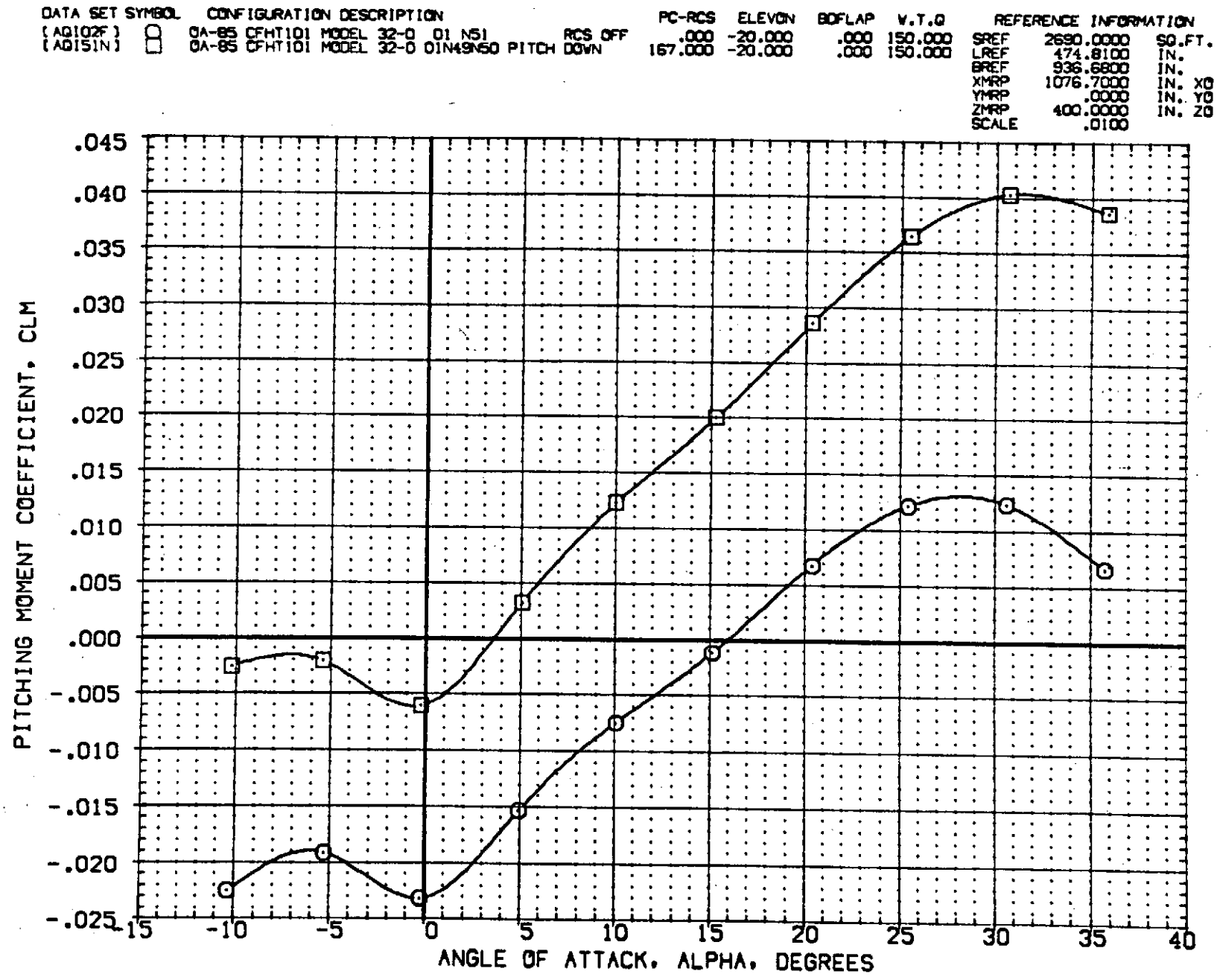


FIG 54 RTLS ABORT SEPARATION Q =20PSF SIML. (PITCH-DOWN) 01N49N50 ELEVON =-20

(A)MACH = 10.33

DATA SET	SYMBOL	CONFIGURATION DESCRIPTION		PC-RCS	ELEVON	BDFLAP	V.T.G
[AQ101F]	○	OA-85 CFHT101 MODEL 32-0 01 N49 N50	RCS OFF	.000	15.000	.000	150.000
[AQ15ON]	□	OA-85 CFHT101 MODEL 32-0 01N52	PITCH UP	150.000	15.000	.000	150.000

REFERENCE INFORMATION		
SREF	2690.0000	SQ.FT.
LREF	474.8100	IN.
BREF	936.6800	IN.
XMRP	1076.7000	IN. XG
YMRP	.0000	IN. YG
ZMRP	400.0000	IN. ZG
SCALE	.0100	

FIG 55 RTLS ABORT SEPARATION Q =20PSF SIML. (PITCH-UP) 01N52 ELEVON = 15

(A)MACH = 10.33

APPENDIX A

CALIBRATION OF THE 0.010-SCALE SPACE SHUTTLE RCS NOZZLES FOR TEST 0A85 IN THE ROCKETDYNE ROCKET TEST FACILITY.

ABSTRACT

This appendix contains information on the calibration of 0.010-scale model RCS nozzles for the Space Shuttle Configuration 3 in the Rocketdyne Rocket Nozzle Test Facility. The calibration was run from Oct. 10 to Oct. 24, 1973.

Primary objective was to design and fabricate 13 RCS nozzles that simulate selected yaw, pitch, and roll RCS jet plume characteristics at points on the entry and RTLS abort separation trajectories for a wind tunnel Mach number of 10.3.

These calibrations were performed in preparation for RCS test 0A85 in the LaRC 31-inch CFHT.

TABLE OF CONTENTS

INDEX OF FIGURES

INTRODUCTION

Thirteen reaction control system (RCS) nozzle blocks were designed and fabricated by Rockwell International and calibrated in the Rocketdyne Rocket Nozzle Test Facility (RNTF).

These nozzles were designed for the .010-scale Space Shuttle Configuration 3 (Model 32-0) to support the RCS engine simulation test in the NASA/LaRC 31-inch CFHT (OA85).

Primary test objective was to develop nozzle configurations to simulate selected yaw, pitch, and roll RCS jet plume characteristics at points on the entry and RTLS abort separation trajectories for a wind tunnel Mach number of 10.3.

MODEL DESCRIPTION

Nozzle configurations developed during this calibration are for use with a 0.010-scale model of the Rockwell International Space Shuttle Configuration 3 (Model 32-0). A complete description of this model is in the main body of this report.

The aft end of the OMS pods have been modified for installation of simulated RCS nozzles. A plenum for supplying air to these nozzles is mounted at the rear of the orbiter fuselage between the RCS nozzles.

The RCS air system and nozzles are non-metric, with a 0.020 inch gap between metric and non-metric model components.

Nozzle configurations were developed to simulate four RCS free-stream flight conditions. The first three simulations are at the early reentry trajectory points for free-stream dynamic pressures of 5, 10, and 20 psf. The fourth simulation represents the RTLS abort separation point for a free-stream dynamic pressure of 20 psf.

Three sample nozzle blocks, each with a single nozzle, were used to adjust lip angle to match actual plume shape with theoretical plume shape at the desired pressure ratio.

Nozzles in the test-nozzle blocks N_{42} through N_{51}, N_{60} and N_{61} were built to the dimensions of the final sample nozzle configurations.

The following nomenclature were used to designate nozzle configurations for data reduction.

Component	Definition
N42	twin right side pitch down RCS nozzles sized to simulate the forward two prototype 3A configuration (VL70-000140A) aft RCS pitch engines at q_∞ = 5 psf and M_∞ = 29.0 with a wind tunnel Mach number of 10.3; nozzles canted 30° aft and 20° outboard
N43	twin left side pitch down RCS nozzles sized the same as N_{42}; nozzles canted 12° aft and 20° outboard
N44	twin right side pitch up RCS nozzles sized the same as N_{42}; nozzles uncanted
N45	same as N_{42} except for left side of model
N46	twin right side pitch down RCS nozzles sized same as N_{42} except aft RCS pitch engines at q_∞ = 20 psf and M_∞ = 28.0 with a wind tunnel Mach number of 10.3; nozzles canted 12° aft and 20° outboard
N47	same as N_{46} except for left side of model
N_{48}	twin right side pitch up RCS nozzles sized the same as N_{42}; nozzles uncanted
N49	twin left side pitch down RCS nozzles sized to simulate the forward two prototype 3A configuration (VL70-000140A) aft pitch engines at q_∞ = 20 psf and M_∞ = 7.0 with a wind tunnel Mach number of 10.3; nozzles canted 12° aft and 20° outboard
N50	same as N49 except for right side of model

Component	Definition
N_{51}	four left side yaw RCS nozzles sized to simulate the center four prototype 3A configuration (VL70-000140A) RCS yaw engines at q_∞ = 20 psf and M_∞ = 7.0 with a wind tunnel Mach number of 10.3; nozzles uncanted
N_{52}	twin right hand pitch up RCS nozzles sized the same as N_{49}; nozzles uncanted
N_{60}	same as N_{42} except nozzles are canted 12° aft and 20° outboard
N_{61}	twin left side yaw RCS nozzles sized to simulate the forward two prototype 3A configuration (VL70-000140A) aft RCS yaw engines at q_∞ = 5 psf and M_∞ = 29.0 with a wind tunnel Mach number of 10.3; nozzles uncanted

Geometry for all nozzles tested is given in table IV and figure 2g in the main body of this report.

INSTRUMENTATION

Force Measurement

A single-component force balance (10-lb load cell Revere No. 244267) was used for the test. See figure A1 for the calibration curve for the balance.

Flow to the nozzle block mounted on the load cell was introduced through two flexible lines. The flow entered the metric portion of the calibration hardware along a line perpendicular to the thrust line of the load cell, thereby not affecting the load cell output.

Nozzle blocks were installed on the calibration rig with the nozzle centerline parallel to the load cell force axis. The load cell was calibrated in the test chamber before and after the test.

Integrating digital voltmeters were used to record force measurements. The voltmeters have an accuracy of better than $\pm$0.07 percent of full scale on any range; they are equipped with internal calibrators accurate to better than $\pm$0.01 percent.

Pressure Measurement

RCS nozzle plenum pressure, test chamber static pressure, and venturi flowmeter pressures were measured during the test.

Precision dial gages were used for directly reading test pressures. Wallace and Tiernan gages reading in terms of absolute pressure measure the relatively low pressures. Full scale ranges from 0.4 psia to 15.5 psia. Heise gages were used for pressure levels to 3000 psia. They are

rated for ±0.1 percent full scale with a calibration traceable to the NBS. To obtain accurate pressure readings, the expected pressure value was applied to one side of the transducer as a reference, and the opposite side was exposed to the test pressure. The reference pressure was measured with a mercury micromanometer or dial gage. Differences between the reference and test pressures were recorded by the Bristol-Datex system. The range of the transducers measuring these small differences was represented by 1000 units, called counts, on the Bristol recorder. The Datex encoder recorded these digital values on IBM cards.

Mass Flow Measurement

Sonic venturi flowmeters were the primary flow measurement instruments used. A theoretically determined discharge coefficient was applied to the measured venturi throat area for flowrate calaulations. Venturi total supply pressure was measured by dial gages and pressure transducers using the "small difference" pressure measurement technique.

Temperature Measurement

Flowmeter temperatures were measured using an iron-constantan thermocouple modified to measure total temperature.

Temperature data were recorded in terms of counts on the data cards. A calibration of temperature measuring recording circuits provided curves of degrees Rankine vs. gross counts.

Plume Shape Measurement

The RNTF Schlieren system obtained plume shape photographs on the "sample" nozzles at pressure ratios corresponding to those planned for the OA85 test. Eight- by 10-inch photographs of the plume shapes were used to calculate actual plume boundaries for the nozzles. These calculations were made by scaling the plume dimensions that are shown on figures A8 through A11.

OPERATIONS

Test Facility Description

This test program was conducted in the free jet test cell of the Rocketdyne Rocket Nozzle Test Facility. The facility is at the B-1 Division of Rockwell International, adjacent to the Los Angeles International Airport.

The test cell is intermittent blowdown-to-vacuum with a test chamber 5 feet wide, 7 feet high and 16 feet long. Access is provided at both ends through 5-foot diameter doors equipped with hydraulically actuated cam locks. Several six-inch access ports accommodate instrumentation, controls, tubing, gas flow supply lines, and other equipment. The cell is evacuated to a 36,000 cubic foot vacuum sphere through a removable diffuser tube attached to the downstream door. The variable area diffuser tube uses a hydraulic-servo actuated plug to control ambient pressure in the test section.

The primary air supply is regulated through an elaborate system of valves and regulators to permit accurate selection of the desired pressure level. The test chamber is evacuated through the vacuum sphere by four two-stage rotary vacuum pumps of 100 horsepower each.

Flow regulators are operated single-stage for precision flow control at low model pressures.

Nozzles were mounted on a specially-built flow calibration fixture which could be rotated so that the nozzle centerline was always aligned with the load cell force axis. Angled adapters aligned the nozzle axes

of the canted nozzles with the load cell force axis. The nozzle calibration fixture was mounted in the RNTF test cell at a level where Schlieren photos could be obtained. This necessitated mounting the load cell and associated hardware on a pedestal (figure A-2).

An exit-plane windshield was used to isolate the model and balance from recirculation impingement forces. The installation with the windshield in place is shown in figure A-3.

Prior to testing, the expected parameter values were calculated, and the appropriate load cell, gages, transducers, and flowmeters were selected and installed.

Following set-up of the test section and model installation, the entire model supply air test system was pressurized to operating conditions and thoroughly checked for leaks.

The load cell was calibrated before and after the test. These calibrations were conducted in the test chamber using precision cable and pully set-up that applied weights along the load cell force axis.

The temperature sensors are calibrated with precision thermometers in an oil bath; the pressure transducers were calibrated with a precision mercury servo-monometer. These data, together with the force calibration data, were checked and then corrected to a form that was usable for on-the-spot calculations during the test.

Test conditions during the calibration varied, depending upon the nozzle and simulation being checked. Test conditions for each nozzle are

given in table A-I.

Sample nozzles were used to obtain specific plume shapes for the simulation conditions. Therefore, thrust measurements were not obtained for these nozzles.

To obtain plume shapes, Schlieren photos were obtained at an RCS plenum pressure (P_c) to test chamber pressure (P_s) ratio, approximating the ratio of P_c/P_s expected to be used for the OA85 test. Because of the higher P_s in the test chamber, the value of P_c was as much as three times the P_c required for the test.

Plume shape was obtained by scaling the actual balance size to photo size. A series of X distances were measured on the photo in line with the center line of the nozzle, and corresponding plume radii (R) were obtained. Both the X and R distances were converted to actual model size and divided by the model $\sqrt{A_{ref}}$.

Figures A4 through A7 compare measured and theoretical plume shapes. Figures A8 through A11 were used to measure the plume shapes.

Nozzle plume shapes were adjusted by changing the nozzle expansion ratio. Adjustments to plume shape were made for each simulation condition until a reasonable agreement between theoretical and actual shapes was obtained.

Test nozzles were calibrated to obtain a curve of thrust as a function of RCS plenum pressure over the expected operating range.

Nozzle blocks were mounted on the calibration fixture with the nozzle

centerlines aligned with the load cell force axis.

Load cell and venturi flowmeter data were obtained at several plenum pressure levels for each nozzle block. Thrust data were corrected to the CFHT static pressure at the test Mach number of 10.3.

DATA ACQUISITION AND REDUCTION

Data Acquisition

Three recording systems were used: 1) a set of direct-reading high precision dial gages; 2) a Bristol-Datex analog system; and 3) a group of precision (Vidar) digital voltmeters. Use of these systems is explained in the instrumentation section.

Initial observations were made to ensure proper operating conditions before beginning data acquisition. On-the-spot calculations were made throughout the test to aid in maintaining quality output.

Schlieren photographs recorded plume shapes for the nozzles, and 8- by 10-inch prints were used for plume shape calculations.

DATA REDUCTION

Bulk of the pressure data was automatically recorded via the Bristol-Datex system. At the time the transducers were calibrated, the output was also recorded on this system; the computed calibration factors were in terms of psid/count. The pressure value of a given parameter was then obtained by simply multiplying the test net counts by the appropriate calibration factor and algebraically adding the product to the reference pressure. Generally, the reference pressures are recorded on the data cards through encoders installed in the servodrive trains of the micro-manometers, which convert the mercury levels to digital form.

Temperatures for hand performance calculations were determined by reading the appropriate curve of gross counts recorded by the circuit. Temperature calibration curves were input to the computer in table form. The average of two or more temperature measurements made by each sensor during a test was calculated during IBM data processing for absolute values. The absolute values for each pair of temperature sensors at the same station were then averaged to obtain a value to be used in calculating the performance parameters.

Force was measured in terms of millivolts by Vidar voltmeters and was automatically punched into the data cards. The load cell output signals without gas flow were measured immediately following the test. These zero returns were used to calculate the net millivolts and model thrust. Force calibration data were plotted in terms of pound-volts/millivolt vs pounds for use in hand calculation during testing and were also made into

a table for computer processing.

Space Shuttle control nozzle thrust and plume study was performed at RNTF. Thrust per nozzle configuration was computed for each chamber pressure required. These data were presented in a tabulated form.

TEST RESULTS

Three sample nozzles were used to adjust lip angle so that the plume shape would match the theoretical plume shape at the desired pressure ratio. This procedure was repeated until actual and theoretical plume shapes matched. Test nozzles were built to the dimensions of the final sample nozzle configurations (see figure 2g in the main body of this report).

Thirteen nozzle blocks were calibrated by obtaining thrust versus chamber pressure. Calibration results were plotted and shown in figures A4 through A7. This was done for both plume shape and thrust matching for a specific pressure ratio.

Curves of thrust as a function of chamber pressure are given in figures 2h through 2t in the main body of this report.

REFERENCE

SS-A01161 Details - RNTF Calibration 0.010-scale SSV RCS Nozzle 10-11-73.

Table AI. Operating Conditions

Nozzle No.	Nozzle Design Condition	Nozzle Chamber Pressure (psia)	Test Cell Static Pressure (in. Hg_o)
N_{60}	q_∞ = 5 PSF Reentry Sim.	600 - 890	.172
N_{61}	q_∞ = 5 PSF Reentry Sim.	600 - 890	.172
N_{42}	q_∞ = 5 PSF Reentry Sim.	600 - 890	.172
N_{43}	q_∞ = 5 PSF Reentry Sim.	600 - 890	.172
N_{44}	q_∞ = 5 PSF Reentry Sim.	600 - 890	.172
N_{45}	q_∞ = 5 PSF Reentry Sim.	600 - 890	.172
N_{46}	q_∞ = 20 PSF Reentry Sim.	200 - 680	.172
N_{47}	q_∞ = 20 PSF Reentry Sim.	200 - 680	.172
N_{48}	q_∞ = 20 PSF Reentry Sim.	200 - 680	.172
N_{49}	q_∞ = 20 PSF RTL Sim.	100 - 310	.172
N_{50}	q_∞ = 20 PSF RTL Sim.	100 - 310	.172
N_{51}	q_∞ = 20 PSF RTL Sim.	100 - 310	.172
N_{52}	q_∞ = 20 PSF RTL Sim.	100 - 310	.172

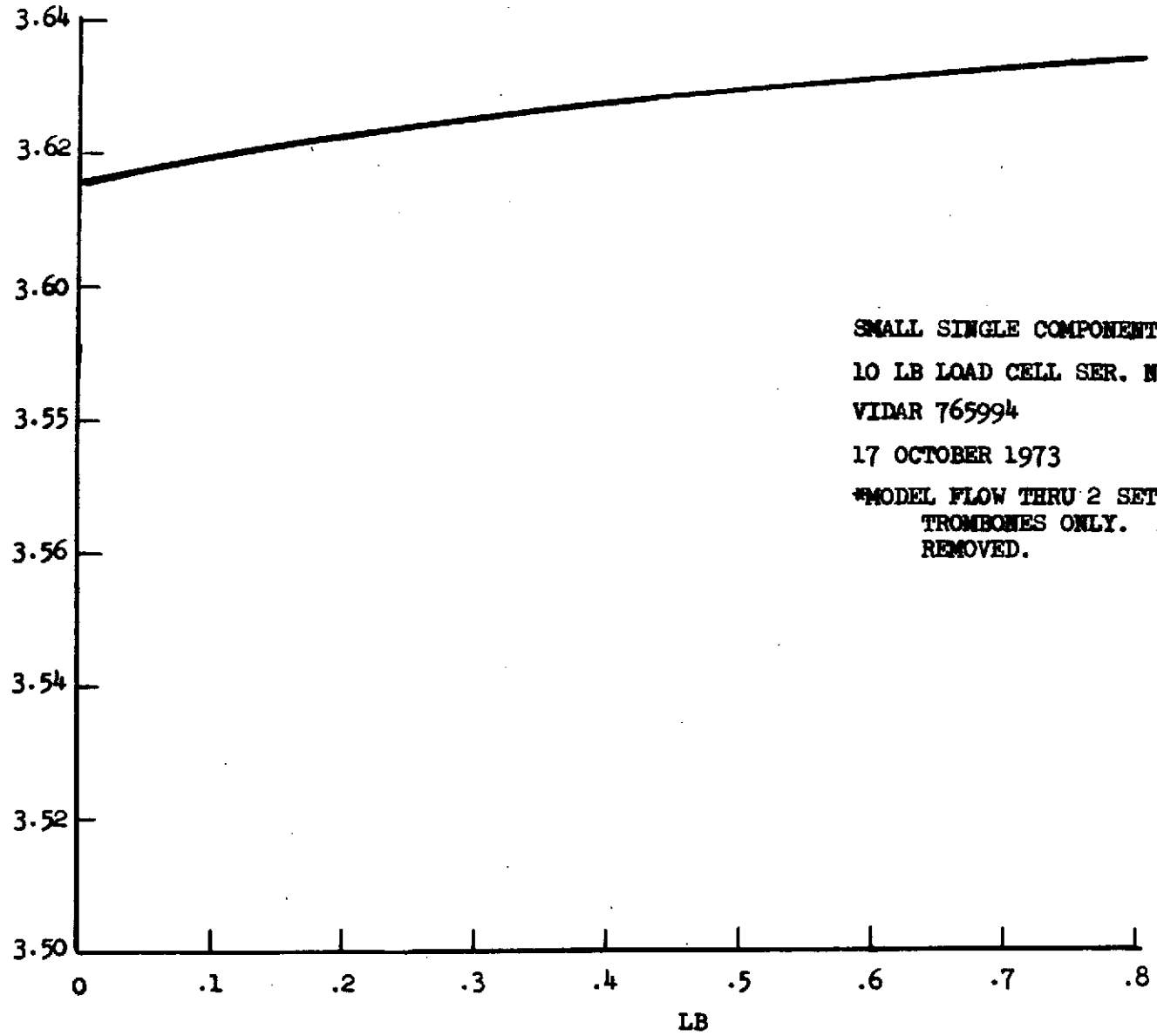


Figure A1 Load Cell Calibration
Voltage = 14.998

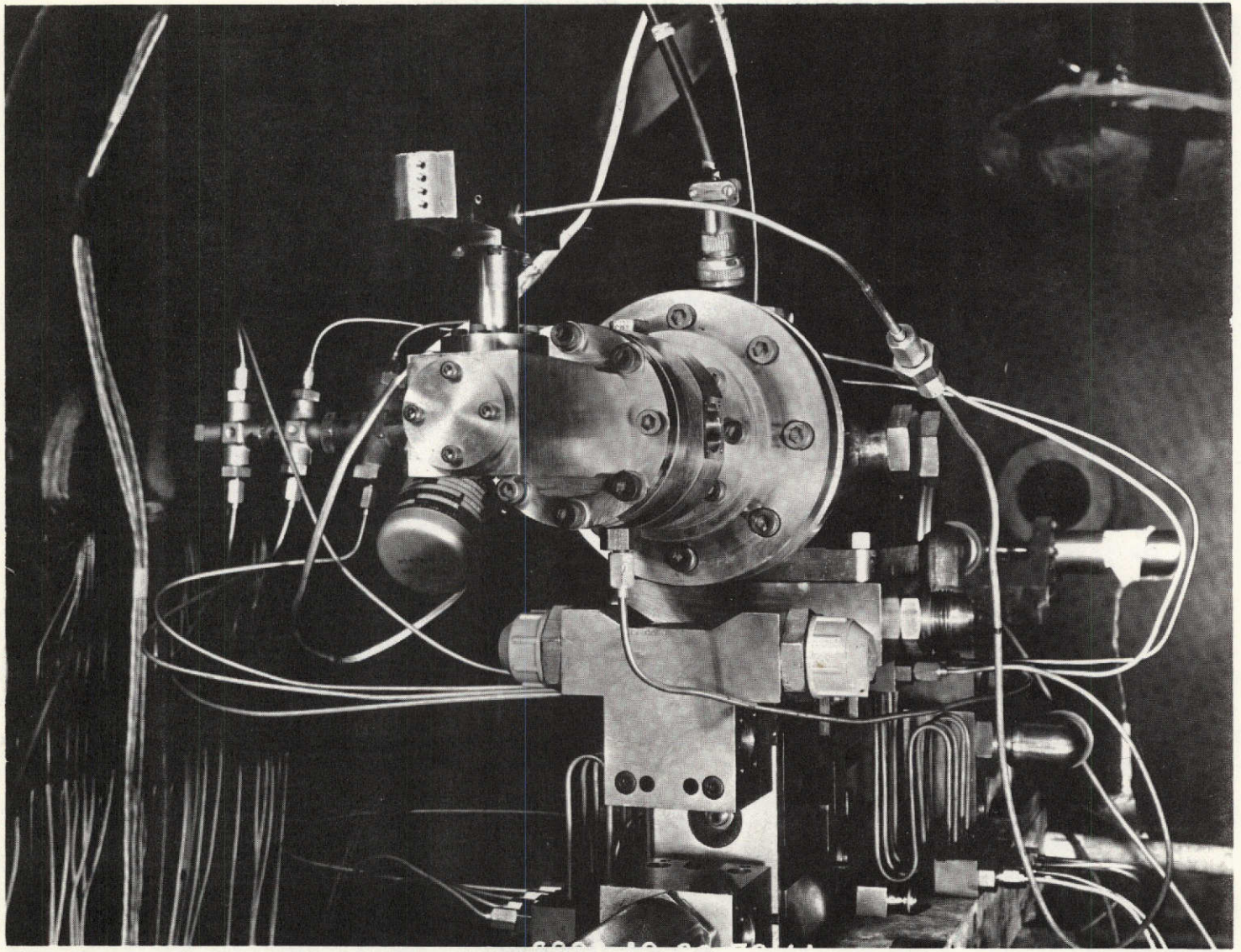
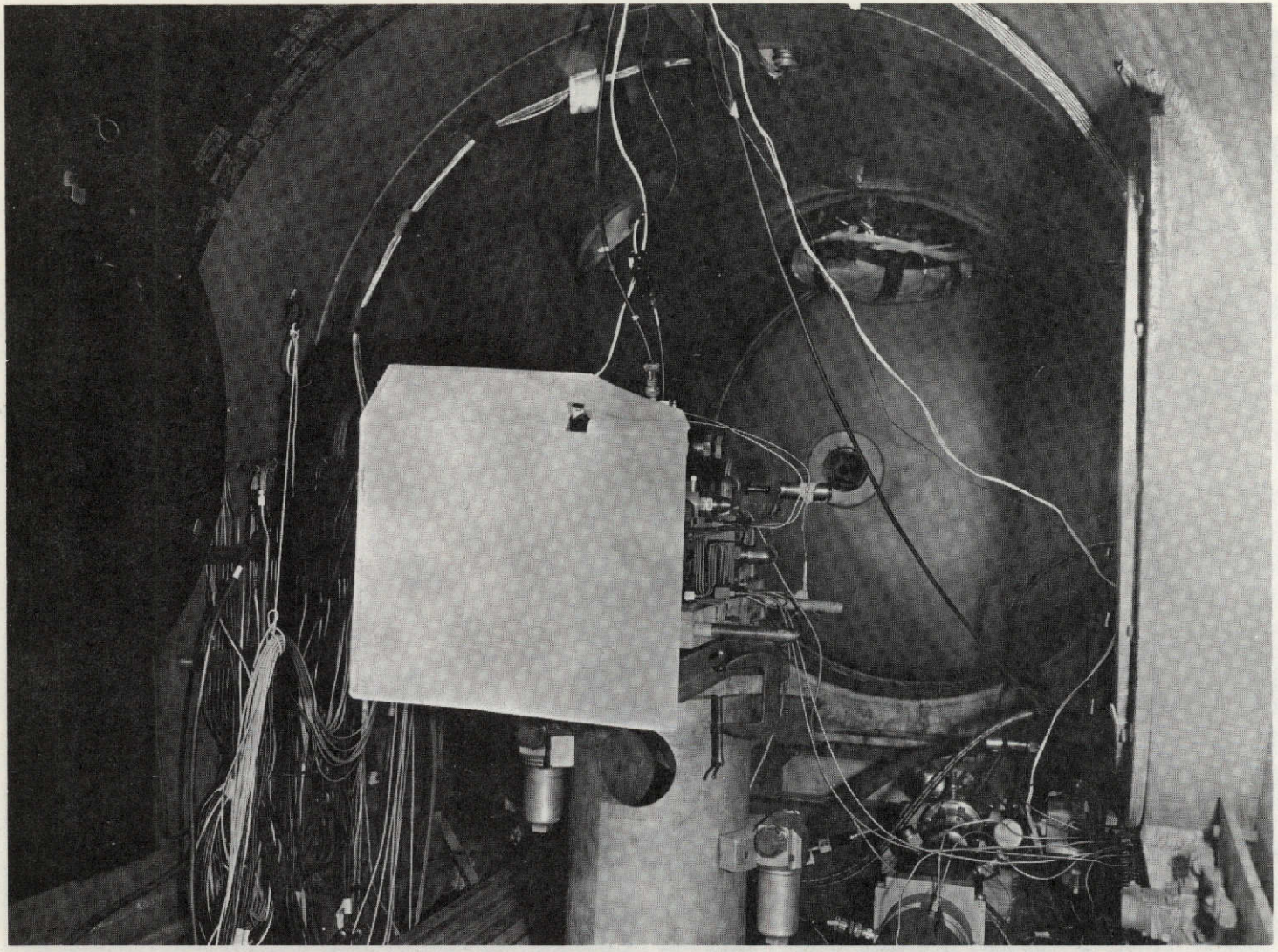
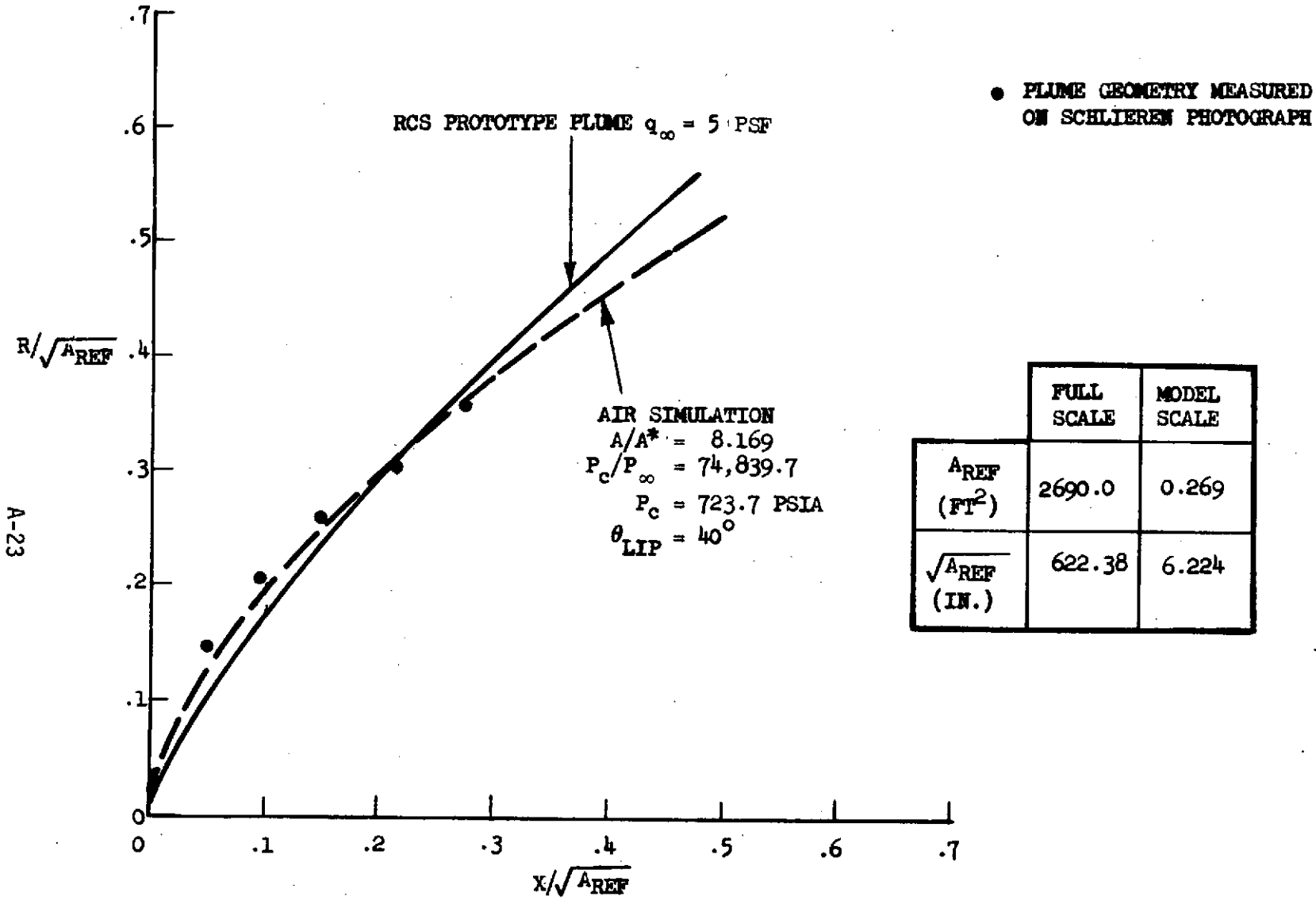


Figure A2. RCS Nozzle Installation in RNTF

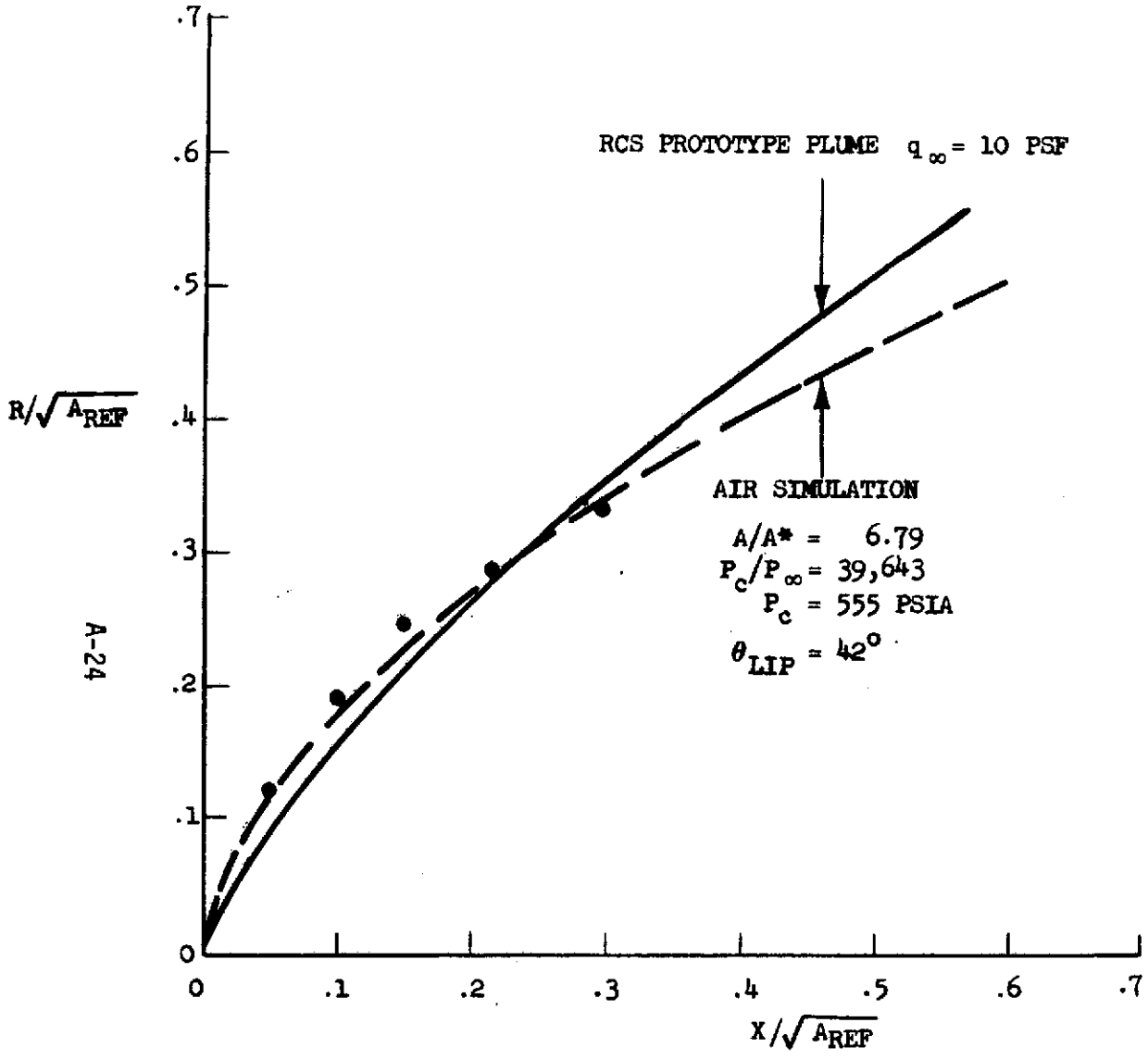


A3. RCS Nozzle with Windshield Installed



	FULL SCALE	MODEL SCALE
A_{REF} (FT^2)	2690.0	0.269
$\sqrt{A_{REF}}$ (IN.)	622.38	6.224

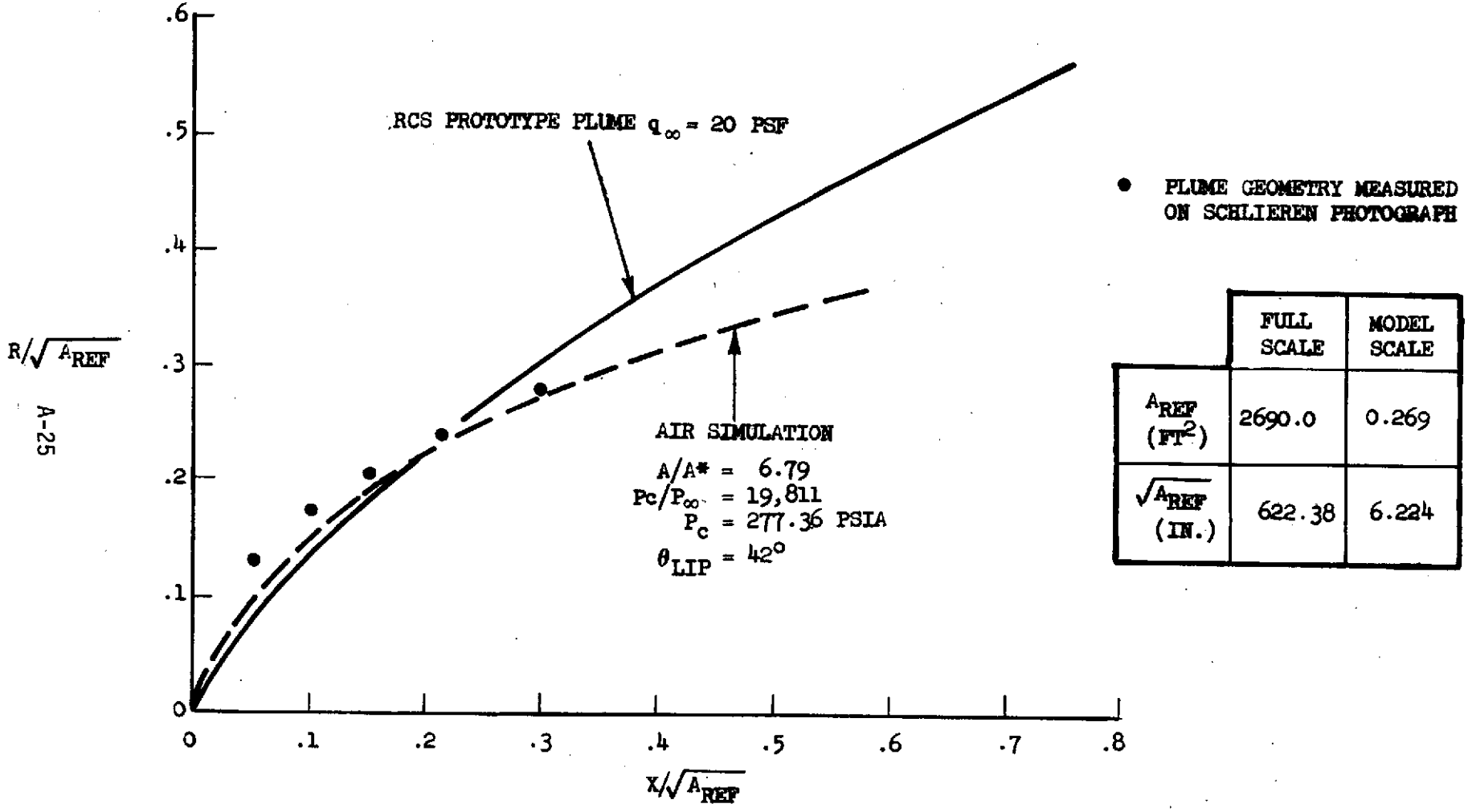
Figure A4. RCS Plume Air Simulation of q_∞ = 5PSF Reentry Case, N_{62}



● PLUME GEOMETRY MEASURED ON SCHLIEREN PHOTOGRAPH

	FULL SCALE	MODEL SCALE
A_{REF} (FT^2)	2690	0.269
$\sqrt{A_{REF}}$ (IN.)	622.38	6.224

Figure A5 RCS Plume Air Simulation q_∞ = 10PSF Reentry Case with a q_∞ = 20 PSF Model Nozzle, N_{58}



	FULL SCALE	MODEL SCALE
A_{REF} (FT^2)	2690.0	0.269
$\sqrt{A_{REF}}$ (IN.)	622.38	6.224

Figure A6 RCS Plume Air Simulation of q_∞ = 20 PSF Reentry Case, N_{58}

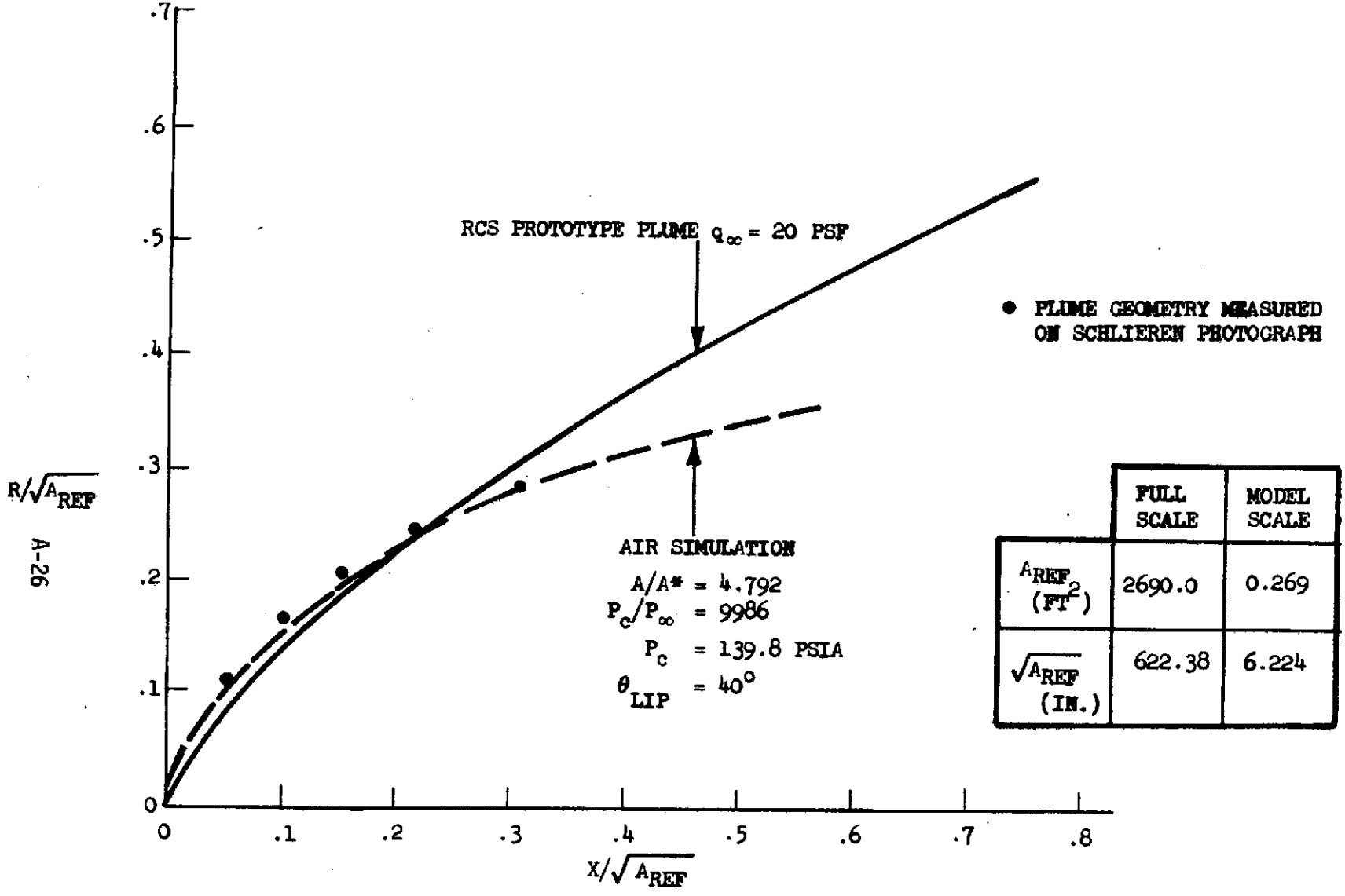
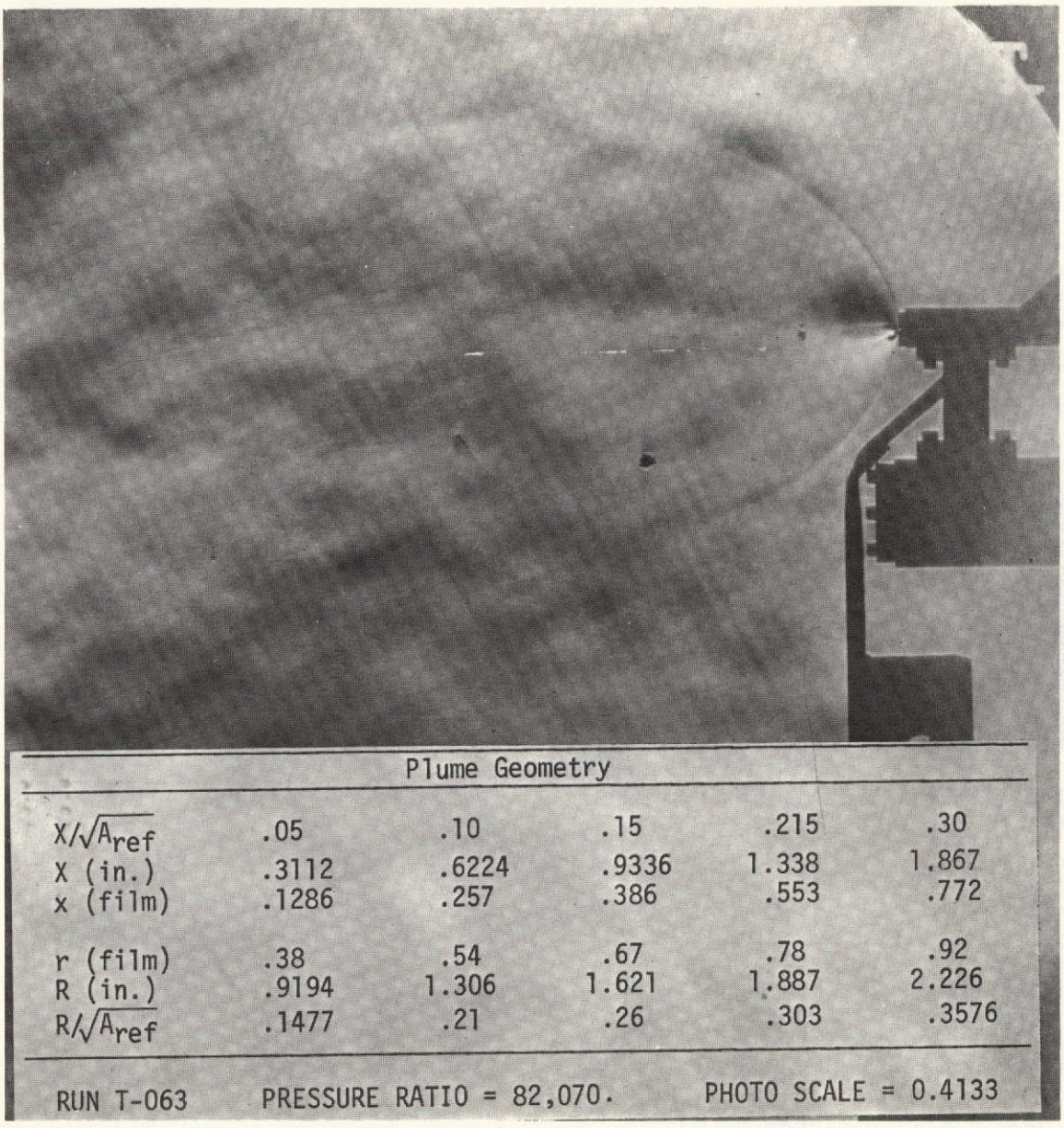


Figure A7 RCS Plume Air Simulation of q_∞ = 20 PSF, RTLS Case, N_{59}

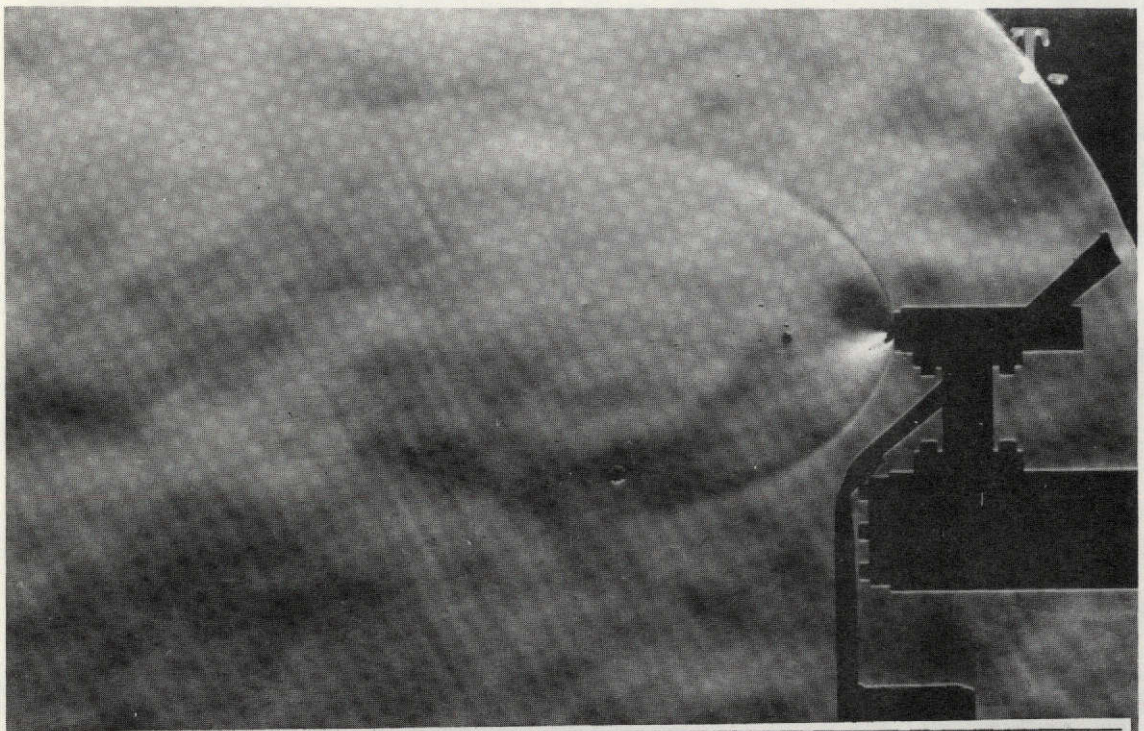


Plume Geometry					
$X/\sqrt{A_{ref}}$	.05	.10	.15	.215	.30
X (in.)	.3112	.6224	.9336	1.338	1.867
x (film)	.1286	.257	.386	.553	.772
r (film)	.38	.54	.67	.78	.92
R (in.)	.9194	1.306	1.621	1.887	2.226
$R/\sqrt{A_{ref}}$	.1477	.21	.26	.303	.3576

RUN T-063 PRESSURE RATIO = 82,070. PHOTO SCALE = 0.4133

Figure A8. Schlieren of N_{62} Plume Simulating q_∞ = 5 psf Reentry Condition

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR

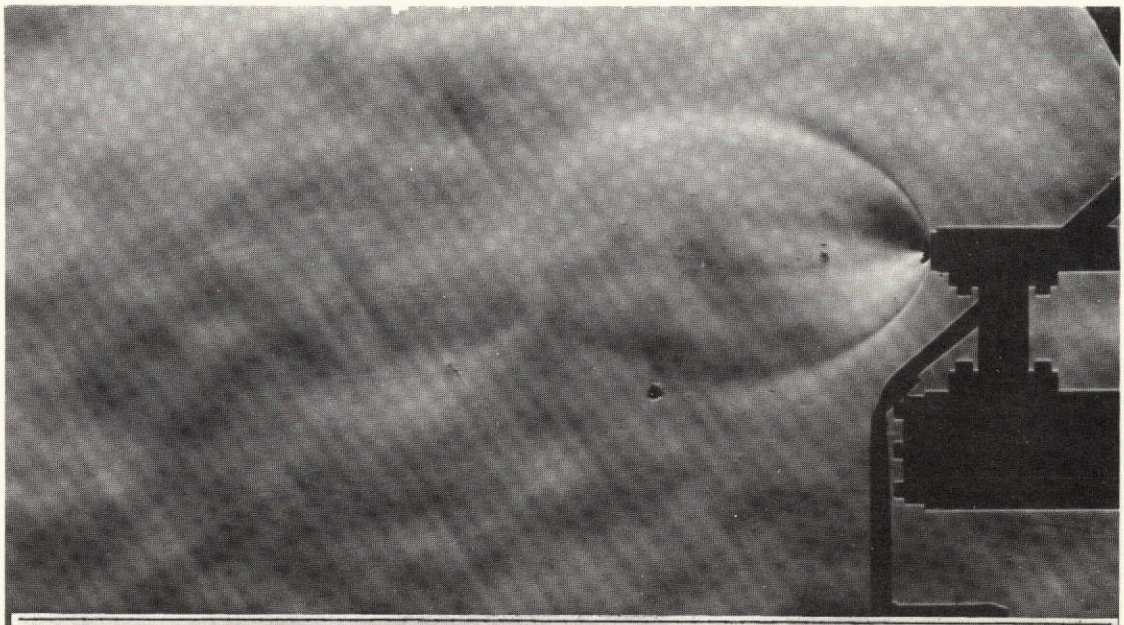


Plume Geometry

$(X/\sqrt{A_{ref}})$	.05	.1	.15	.215	.3
X (in.)	.3112	.6224	.9336	1.338	1.867
x (film)	.1286	.257	.386	.553	.772
r (film)	.335	.49	.64	.74	.86
R (in.)	.8105	1.185	1.548	1.79	2.081
$(R/\sqrt{A_{ref}})$	.13	.19	.248	.287	.334

RUN T-052 PRESSURE RATIO = 46,190. PHOTO SCALE = 0.4133

Figure A9. Schlieren of N_{58} Plume Simulating q_∞ = 10 psf Reentry Condition

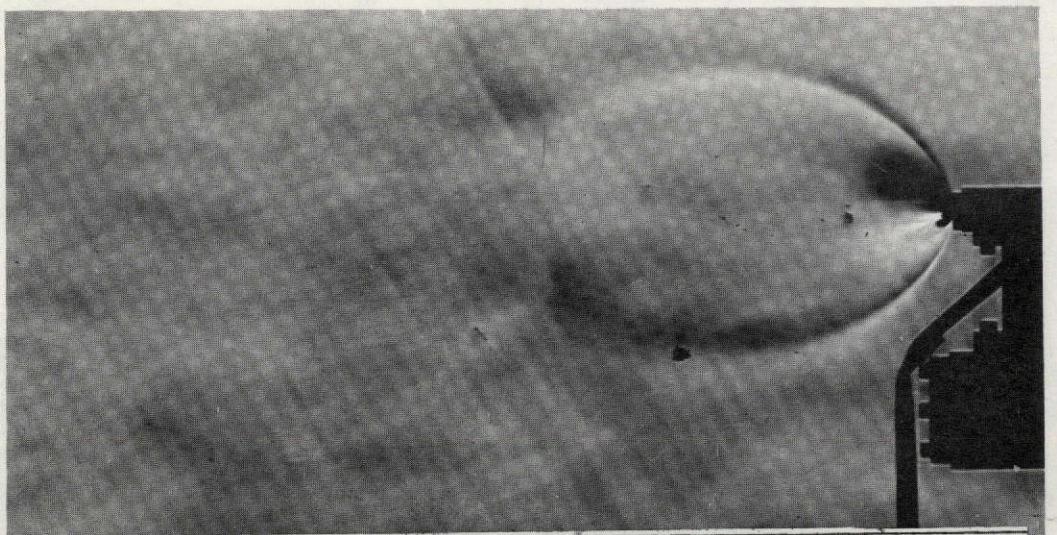


Plume Geometry					
$X/\sqrt{A_{ref}}$	.05	.10	.15	.215	.30
X (in.)	.3112	.6224	.9336	1.338	1.867
x (film)	.1286	.257	.386	0.553	.772
r (film)	.34	.45	.53	.615	.72
R (in.)	.8226	1.0888	1.282	1.488	1.742
$R/\sqrt{A_{ref}}$	.132	.175	.206	.239	.280

RUN T-053 PRESSURE RATIO = 22,940. PHOTO SCALE = 0.4133

Figure A10. Schlieren of N_{58} Plume Simulating q_∞ = 20 psf Reentry Condition

REPRODUCIBILITY OF THE
ORIGINAL PAGE IS POOR



Plume Geometry

$X/\sqrt{A_{ref}}$	.05	.10	.15	.215	.30
X (in.)	.3112	.6224	.9336	1.338	1.867
x (film)	.1286	.257	.386	0.553	.772
r (film)	.30	.440	.54	.620	.715
R (in.)	.726	1.0646	1.306	1.500	1.730
$R/\sqrt{A_{ref}}$	.117	.171	.210	.2410	.278

RUN T-057 PRESSURE RATIO = 11,880. PHOTO SCALE = 0.4133

Figure A11. Schlieren of N_{59} Plume Simulating q_∞ = 20 psf RTLS Condition

APPENDIX B

TABULATED SOURCE DATA

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

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

OA-85 CFHT101 MODEL 32-0 01 N49 N50 RCS OFF (RQI01F) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = .000 ELEVON = 15.000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 66/ 0 RN/L = .99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.358	.00011	-.19259	.11623	-.04850	.00042	-.00007	-.00615	-.16855	.14896	-1.13151
10.330	-5.182	.00148	-.12160	.09908	-.03860	.00010	-.00039	-.00452	-.11215	.10966	-1.02276
10.330	-.258	.00118	-.04868	.08033	-.03745	.00002	-.00029	-.00397	-.04832	.08055	-.59991
10.330	4.885	.00204	.03733	.07471	-.03542	-.00003	-.00044	-.00322	.03083	.07762	.39721
10.330	10.037	.00074	.15848	.07250	-.04227	-.00031	-.00060	-.00342	.14342	.09901	1.44856
10.330	15.235	-.00133	.31635	.07464	-.05688	-.00049	-.00064	-.00386	.28561	.15515	1.84087
10.330	19.945	-.00269	.49215	.08046	-.07113	-.00062	-.00074	-.00494	.43518	.24351	1.78710
10.330	25.203	-.00584	.72603	.08896	-.09129	-.00088	-.00058	-.00658	.61903	.38966	1.58867
10.330	30.410	-.00765	.95981	.09518	-.11408	-.00102	-.00040	-.00752	.77958	.56793	1.37268
10.330	35.559	-.00838	1.21688	.10227	-.14234	-.00119	-.00042	-.00911	.93048	.79086	1.17654
	GRADIENT	.00017	.01672	-.00109	.00039	-.00001	-.00003	.00015	.01539	-.00057	.19388

OA-85 CFHT101 MODEL 32-0 01 N51 RCS OFF (RQI02F) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = .000 ELEVON = -20.000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 25/ 0 RN/L = 1.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.368	-.00341	-.23493	.12691	-.02253	.00086	-.00023	-.00540	-.20825	.16712	-1.24613
10.330	-5.340	-.00050	-.15610	.10661	-.01915	.00040	-.00049	-.00395	-.14551	.12067	-1.20577
10.330	-.235	-.00022	-.06939	.08386	-.02317	.00025	-.00044	-.00340	-.06905	.08414	-.82087
10.330	4.911	-.00126	.01420	.07447	-.01535	.00012	-.00058	-.00239	.00778	.07542	.10312
10.330	10.055	-.00039	.11483	.06782	-.00743	.00005	-.00082	-.00248	.10122	.08683	1.16574
10.330	15.145	-.00093	.24681	.06425	-.00115	-.00010	-.00099	-.00257	.22145	.12650	1.75059
10.330	20.351	-.00020	.41422	.06476	.00678	-.00020	-.00115	-.00302	.36585	.20477	1.78664
10.330	25.448	-.00136	.60285	.06551	.01224	-.00034	-.00114	-.00343	.51621	.31819	1.62232
10.330	30.664	-.00298	.82143	.06529	.01238	-.00062	-.00104	-.00392	.67328	.47509	1.41715
10.330	35.742	-.00408	1.05891	.06430	.00664	-.00084	-.00114	-.00462	.82191	.67074	1.22539
	GRADIENT	-.00020	.01624	-.00182	.00152	-.00003	-.00003	.00020	.01493	-.00169	.17952

OA-85 CFHT101 MODEL 32-0 01 N52 RCS OFF (RQ103F) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	.000	ELEVON =	.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 71/ 0 RN/L = .97 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLN	CBL	CYN	CY	CL	CD	L/D
10.330	-10.428	.00531	-.20085	.11538	-.04091	.00055	-.00045	-.01203	-.17665	.14983	-1.17901
10.330	-5.175	.00746	-.12881	.09779	-.03211	.00025	-.00075	-.01048	-.11947	.10901	-1.09589
10.330	-.245	.00833	-.05617	.07815	-.03048	.00011	-.00070	-.01009	-.05583	.07839	-.71223
10.330	4.855	.00910	.02196	.07000	-.02152	.00005	-.00082	-.00933	.01596	.07161	.22288
10.330	10.033	.00688	.12287	.06477	-.01607	-.00004	-.00105	-.00971	.10971	.08518	1.28797
10.330	15.086	.00866	.25636	.06234	-.01470	-.00017	-.00116	-.01011	.23130	.12691	1.82250
10.330	20.285	.00795	.43143	.06252	-.01441	-.00028	-.00133	-.01088	.38299	.20821	1.83947
10.330	25.446	.00497	.62755	.06321	-.01810	-.00048	-.00127	-.01243	.53951	.32671	1.65133
10.330	30.616	.00255	.85611	.06357	-.02915	-.00066	-.00113	-.01339	.70440	.49070	1.43550
10.330	35.710	.00306	1.09233	.06314	-.04610	-.00086	-.00121	-.01481	.85010	.68885	1.23409
	GRADIENT	.00015	.01532	-.00160	.00175	-.00001	-.00002	.00015	.01408	-.00133	.18335

OA-85 CFHT101 MODEL 32-0 01 N61 RCS OFF (RQ104F) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	100.000
PC-RCS =	.000	ELEVON =	15.000
BDFLAP =	13.750	RUDFLR =	55.000

RUN NO. 55/ 0 RN/L = .67 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLN	CBL	CYN	CY	CL	CD	L/D
10.300	14.983	-.00579	.31205	.07858	-.06421	-.00038	-.00048	-.00374	.28113	.15658	1.79537
10.300	20.028	-.00683	.50272	.08606	-.08443	-.00052	-.00053	-.00447	.44284	.25303	1.75014
10.300	25.173	-.00764	.72233	.09518	-.10792	-.00075	-.00038	-.00579	.61325	.39338	1.55890
10.300	30.232	-.00801	.95829	.10444	-.13543	-.00082	-.00030	-.00668	.77537	.57274	1.35379
10.300	35.436	-.00860	1.22026	.11412	-.16694	-.00096	-.00023	-.00774	.92807	.80046	1.15943
	GRADIENT	-.00013	.04446	.00175	-.00302	-.00003	.00001	-.00020	.03182	.03147	-.03266

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OA-85 CFHT101 MODEL 32-0 01 N43 N44 RCS OFF (RQ105F) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = .000 ELEVON = .000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 37/ 0 RN/L = .66 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.118	.00068	.26395	.06446	-.01592	-.00005	-.00105	-.01006	.23800	.13107	1.81584
10.300	20.239	.00134	.43410	.06532	-.01549	-.00016	-.00117	-.01124	.38471	.21145	1.81934
10.300	25.209	.00040	.62652	.06597	-.01892	-.00034	-.00113	-.01226	.53875	.32654	1.64988
10.300	30.461	.00069	.85706	.06741	-.02947	-.00041	-.00108	-.01326	.70459	.49259	1.43039
10.300	35.638	.00131	1.10047	.06704	-.04565	-.00055	-.00110	-.01453	.85531	.69569	1.22944
	GRADIENT	.00001	.04091	.00014	-.00144	-.00002	-.00000	-.00021	.03033	.02754	-.03050

OA-85 CFHT101 MODEL 32-0 01 N43 N60 RCS OFF (RQ106F) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = .000 ELEVON = -20.000
BDFLAP = -14.250 RUDFLR = 55.000

RUN NO. 14/ 0 RN/L = .63 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	14.942	-.00057	.23835	.06606	-.00019	-.00003	-.00060	-.00264	.21325	.12529	1.70214
10.300	20.222	-.00114	.39416	.06550	.00941	-.00011	-.00072	-.00327	.34722	.19771	1.75619
10.300	25.433	-.00011	.57910	.06688	.01795	-.00024	-.00069	-.00431	.49426	.30910	1.59904
10.300	30.375	.00020	.77118	.06705	.02220	-.00020	-.00074	-.00467	.63142	.44779	1.41007
10.300	35.506	-.00091	.99310	.06638	.02271	-.00039	-.00077	-.00538	.76988	.63083	1.22043
	GRADIENT	.00001	.03676	.00004	.00115	-.00002	-.00001	-.00013	.02725	.02455	-.02544

OA-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF (RQI07F) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	.000	ELEVON =	-20.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 19/ 0 RN/L = .96 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.204	-.00318	.24385	.06167	.00123	-.00005	-.00078	-.00173	.21914	.12347	1.77489
10.330	20.315	-.00166	.40883	.06236	.01114	-.00016	-.00102	-.00258	.36174	.20042	1.80493
10.330	25.471	-.00119	.59038	.06258	.01908	-.00032	-.00104	-.00282	.50608	.31039	1.63045
10.330	30.559	-.00387	.80301	.06304	.02301	-.00057	-.00096	-.00351	.65942	.46256	1.42560
10.330	35.795	-.00324	1.03191	.06170	.02183	-.00081	-.00112	-.00422	.80090	.65360	1.22536
	GRADIENT	-.00005	.03832	.00001	.00103	-.00004	-.00001	-.00011	.02841	.02573	-.02877

OA-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF (RQI08F) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	.000	ELEVON =	.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 42/ 0 RN/L = .99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.085	-.00027	.26104	.06214	-.01495	-.00011	-.00081	-.00254	.23588	.12794	1.84365
10.330	20.335	-.00041	.43830	.06247	-.01430	-.00026	-.00103	-.00328	.38927	.21089	1.84587
10.330	25.569	-.00197	.64094	.06323	-.01861	-.00042	-.00098	-.00441	.55088	.33366	1.65103
10.330	30.394	-.00246	.85088	.06328	-.02898	-.00062	-.00089	-.00508	.70193	.48509	1.44702
10.330	35.600	-.00473	1.10735	.06391	-.04742	-.00081	-.00094	-.00628	.86317	.69659	1.23915
	GRADIENT	-.00021	.04118	.00009	-.00155	-.00003	-.00000	-.00018	.03067	.02759	-.03139

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

OA-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF (RQI09F) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = .000 ELEVON = 15.000
BDFLAP = 13.750 RUDFLR = 55.000

RUN NO. 59/ 0 RN/L = .97 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.026	-.00513	.31808	.07522	-.06500	-.00045	-.00057	-.00312	.28770	.15511	1.85478
10.330	20.211	-.00545	.51099	.08279	-.08541	-.00058	-.00064	-.00402	.45093	.25422	1.77376
10.330	25.217	-.00827	.72610	.09142	-.10908	-.00077	-.00050	-.00532	.61795	.39208	1.57618
10.330	30.385	-.00861	.97190	.10088	-.13843	-.00092	-.00035	-.00638	.78738	.57863	1.36077
10.330	35.433	-.01017	1.22466	.11002	-.17075	-.00111	-.00035	-.00756	.93406	.79964	1.16810
	GRADIENT	-.00026	.04460	.00172	-.00519	-.00003	.00001	-.00022	.03195	.03164	-.03502

OA-85 CFHT101 MODEL 32-0 02 N43 N60 RCS OFF (RQI10F) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = .000 ELEVON = 15.000
BDFLAP = 13.750 RUDFLR = 55.000

RUN NO. 50/ 0 RN/L = .63 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	14.884	-.00413	.30779	.06328	-.06353	-.00040	-.00045	-.00477	.28121	.14022	2.00547
10.300	20.217	-.00641	.50552	.07092	-.08421	-.00052	-.00048	-.00584	.44987	.24125	1.86475
10.300	24.941	-.00662	.70749	.07899	-.10548	-.00064	-.00042	-.00697	.60820	.36996	1.64396
10.300	30.221	-.00699	.95119	.08865	-.13334	-.00071	-.00029	-.00810	.77729	.55537	1.39958
10.300	35.464	-.00600	1.21212	.09805	-.16456	-.00077	-.00021	-.00963	.93037	.78311	1.18804
	GRADIENT	-.00008	.04407	.00171	-.00491	-.00002	.00001	-.00023	.03177	.03130	-.04102

OA-85 CFHT101 MODEL 32-0 01 N43 N60 RCS OFF (RQ111F) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	100.000
PC-RCS =	.000	ELEVON =	15.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 75/ 0 RN/L = .63 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.012	-.00735	.30252	.07663	-.05373	-.00027	-.00048	-.00254	.27235	.15237	1.78739
10.300	20.114	-.00751	.49413	.08351	-.06771	-.00040	-.00057	-.00334	.43528	.24834	1.75274
10.300	25.346	-.00765	.70460	.09051	-.08303	-.00054	-.00054	-.00430	.59803	.38342	1.55974
10.300	30.162	-.00846	.92124	.09702	-.10028	-.00063	-.00049	-.00492	.74776	.54676	1.36762
10.300	35.314	-.00865	1.18011	.10476	-.12256	-.00077	-.00045	-.00629	.90242	.76765	1.17556
	GRADIENT	-.00007	.04307	.00138	-.00336	-.00002	.00000	-.00018	.03105	.03016	-.03173

ERROR THERE IS NO AERO DATASET NAMED RQ112F

OA-85 CFHT101 MODEL 32-0 01 N46 N47 RCS OFF (RQ113F) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	.000	ELEVON =	15.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 77/ 0 RN/L = .97 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	14.959	-.00576	.30371	.07445	-.05415	-.00037	-.00070	-.00333	.27420	.15032	1.82409
10.330	20.219	-.00491	.49641	.08090	-.06818	-.00043	-.00084	-.00407	.43786	.24748	1.76929
10.330	25.316	-.00634	.70879	.08772	-.08389	-.00066	-.00074	-.00550	.60322	.38238	1.57754
10.330	30.512	-.00871	.95054	.09510	-.10425	-.00081	-.00061	-.00642	.77062	.56454	1.36505
10.330	35.503	-.00931	1.19041	.10110	-.12662	-.00095	-.00068	-.00734	.91038	.77364	1.17675
	GRADIENT	-.00021	.04334	.00131	-.00352	-.00003	.00001	-.00022	.03124	.03040	-.03303

OA-85 CFHT101 MODEL 32-0 01N49N50 PITCH DOWN (RQ101N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	167.000	ELEVON =	15.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 67/ 0 RN/L = .99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.399	-.00629	-.20194	.10096	-.02957	-.00004	-.00011	-.00487	-.18040	.13575	-1.32888
10.330	-5.243	-.00526	-.14104	.07942	-.01691	-.00034	-.00057	-.00168	-.13319	.09197	-1.44820
10.330	-.052	-.00734	-.07099	.06404	-.01224	-.00081	-.00001	-.00215	-.07093	.06410	-1.10658
10.330	4.984	-.00418	.00254	.05549	-.00555	-.00061	-.00047	-.00116	-.00229	.05550	-.04122
10.330	9.994	-.00700	.11353	.05304	-.00810	-.00070	-.00058	-.00148	.10260	.07193	1.42632
10.330	15.260	-.01165	.26608	.05344	-.02263	-.00116	-.00021	-.00304	.24264	.12159	1.99554
10.330	20.253	-.01071	.45268	.05987	-.03789	-.00129	-.00048	-.00341	.40396	.21287	1.89767
10.330	25.259	-.01082	.67260	.06781	-.05586	-.00141	-.00063	-.00430	.57935	.34834	1.66321
10.330	30.412	-.01303	.90403	.07440	-.07789	-.00147	-.00054	-.00534	.74199	.52180	1.42198
10.330	35.545	-.01343	1.15966	.08081	-.10508	-.00160	-.00057	-.00656	.89659	.73990	1.21177
	GRADIENT	.00063	.01460	-.00170	.00133	.00004	-.00009	.00020	.01363	-.00171	.21155

OA-85 CFHT101 MODEL 32-0 01N49N52 ROLL (RQ102N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	150.000	ELEVON =	15.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 68/ 0 RN/L = 1.03 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.458	-.00775	-.20556	.10785	-.03664	-.00332	.00338	-.01209	-.18257	.14337	-1.27344
10.330	-5.284	-.03694	-.14198	.09256	-.02053	-.00787	.00961	-.01941	-.13285	.10524	-1.26234
10.330	-.197	-.04331	-.07420	.07497	-.02257	-.00869	.00962	-.02084	-.07394	.07522	-.98295
10.330	4.855	-.04312	.00390	.06415	-.02027	-.00883	.00757	-.01665	-.00155	.06425	-.02409
10.330	10.029	-.02907	.12661	.06000	-.02806	-.00733	.00266	-.00418	.11423	.08113	1.40793
10.330	15.153	-.02694	.28227	.06316	-.04189	-.00620	.00019	.00068	.25595	.13474	1.89949
10.330	20.373	-.03656	.48055	.07056	-.05707	-.00665	.00044	-.00075	.42592	.23345	1.82450
10.330	25.297	-.04851	.69324	.07795	-.07357	-.00734	.00128	-.00360	.59345	.36670	1.61834
10.330	30.351	-.04993	.93927	.08555	-.09738	-.00707	.00055	-.00318	.76731	.54844	1.39909
10.330	35.562	-.05394	1.19249	.09254	-.12563	-.00715	.00008	-.00368	.91626	.76881	1.19178
	GRADIENT	.00004	.01546	-.00214	.00046	-.00003	-.00041	.00083	.01433	-.00217	.18980

OA-85 CFHT101 MODEL 32-0 01N51 YAW (RQI03N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.@ =	150.000
PC-RCS =	179.000	ELEVON =	15.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 65/ 0 RN/L = .98 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.409	.00248	-.19297	.11442	-.04745	.00043	-.00189	-.00182	-.16912	.14740	-1.14738
10.330	-5.138	-.00195	-.12606	.09411	-.03761	-.00109	-.00200	.00814	-.11713	.10502	-1.11534
10.330	-.219	.00643	-.05278	.07948	-.03702	-.00041	-.00321	.00505	-.05248	.07968	-.65861
10.330	4.925	.00847	.03071	.07058	-.03200	-.00104	-.00353	.00590	.02454	.07296	.33634
10.330	10.009	-.00109	.13754	.06696	-.03761	-.00264	-.00310	.00722	.12380	.08985	1.37795
10.330	15.064	-.01229	.29165	.06988	-.04995	-.00347	-.00216	.00521	.26347	.14328	1.83882
10.330	20.281	-.02325	.48886	.07660	-.06402	-.00470	-.00152	.00348	.43201	.24130	1.79033
10.330	25.439	-.03535	.70474	.08403	-.08261	-.00569	-.00113	.00267	.60032	.37861	1.58558
10.330	30.286	-.03888	.93077	.09170	-.10498	-.00573	-.00127	.00207	.75750	.54859	1.38081
10.330	35.495	-.04450	1.19202	.09887	-.13304	-.00617	-.00136	.00070	.91308	.77263	1.18179
	GRADIENT	.00040	.01623	-.00173	.00098	-.00012	-.00006	.00017	.01497	-.00131	.19342

OA-85 CFHT101 MODEL 32-0 01N51 YAW (RQI04N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.@ =	150.000
PC-RCS =	179.000	ELEVON =	-20.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 26/ 0 RN/L = 1.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.357	.00346	-.23358	.12211	-.02196	.00097	-.00196	-.00073	-.20782	.16212	-1.28190
10.330	-5.326	-.00064	-.16116	.09952	-.01948	-.00033	-.00244	.01121	-.15122	.11405	-1.32596
10.330	-.197	.01122	-.07329	.07997	-.02265	.00088	-.00378	.00727	-.07301	.08023	-.91008
10.330	4.984	.01336	.00801	.06822	-.01402	.00059	-.00396	.00742	.00205	.06865	.02984
10.330	10.225	.00619	.10459	.05947	-.00669	-.00070	-.00373	.00908	.09238	.07709	1.19821
10.330	15.110	-.00153	.23085	.05798	.00158	-.00169	-.00283	.00752	.20776	.11616	1.78860
10.330	20.417	-.01349	.40025	.05906	.01164	-.00320	-.00201	.00633	.35450	.19498	1.81812
10.330	25.439	-.02086	.58627	.06083	.01803	-.00443	-.00220	.00645	.50330	.30677	1.64063
10.330	30.597	-.02630	.80749	.06130	.01816	-.00462	-.00227	.00673	.66386	.46378	1.43142
10.330	35.728	-.04074	1.03685	.06144	.01499	-.00680	-.00311	.00622	.80584	.65533	1.22966
	GRADIENT	.00041	.01569	-.00227	.00167	-.00006	-.00003	.00003	.01449	-.00224	.18142

OA-85 CFHT101 MODEL 32-0 01N49N52 ROLL (RQI05N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = 158.000 ELEVON = -20.000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 27/ 0 RN/L = 1.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.473	-.01654	-.24712	.11449	-.00970	-.00295	.00420	-.01327	-.22219	.15750	-1.41067
10.330	-5.085	-.04482	-.16591	.09499	-.00345	-.00704	.00983	-.01939	-.15684	.10932	-1.43470
10.330	-.186	-.05164	-.09567	.07513	-.01240	-.00731	.01047	-.02293	-.09543	.07544	-1.26490
10.330	4.925	-.04393	-.01902	.06200	-.00459	-.00658	.00720	-.01632	-.02427	.06014	-.40356
10.330	10.206	-.02779	.09127	.05301	.00093	-.00467	.00220	-.00431	.08043	.06834	1.17688
10.330	15.015	-.01956	.21806	.05100	.00723	-.00398	-.00031	.00198	.19741	.10575	1.86671
10.330	20.329	-.02650	.38714	.05253	.01717	-.00469	-.00064	.00194	.34478	.18376	1.87629
10.330	25.483	-.03808	.58593	.05421	.02505	-.00573	.00038	-.00075	.50560	.30103	1.67959
10.330	30.689	-.03565	.79313	.05373	.02723	-.00541	-.00089	.00095	.65463	.45100	1.45150
10.330	35.839	-.04148	1.02393	.05251	.02377	-.00601	-.00138	.00074	.79932	.64208	1.24489
	GRADIENT	.00151	.01500	-.00257	.00153	.00014	-.00064	.00129	.01392	-.00299	.16853

OA-85 CFHT101 MODEL 32-0 01N52 PITCH UP (RQI06N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = 158.000 ELEVON = -20.000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 29/ 0 RN/L = .99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.374	-.03037	-.23909	.12346	-.01794	-.00211	.00741	-.01954	-.21296	.16449	-1.29461
10.330	-5.206	-.05328	-.16182	.10606	-.01017	-.00590	.01276	-.02882	-.15153	.12031	-1.25953
10.330	-.287	-.06260	-.08182	.08322	-.01855	-.00683	.01350	-.02852	-.08143	.08260	-.97407
10.330	4.885	-.05912	-.00484	.07159	-.01218	-.00621	.01122	-.02282	-.01092	.07092	-.15397
10.330	10.060	-.03472	.10242	.06248	-.00780	-.00353	.00525	-.01220	.08993	.07941	1.13250
10.330	15.141	-.01591	.24053	.06120	-.00319	-.00113	.00138	-.00541	.21619	.12190	1.77356
10.330	20.313	-.01948	.41174	.06302	.00630	-.00153	.00169	-.00686	.36425	.20204	1.80290
10.330	25.651	-.02698	.60720	.06349	.01307	-.00224	.00260	-.00931	.51988	.32009	1.62418
10.330	30.510	-.02080	.81101	.06331	.01282	-.00162	.00136	-.00714	.66657	.46629	1.42952
10.330	35.762	-.01982	1.04926	.06233	.00803	-.00175	.00120	-.00769	.81499	.66380	1.22778
	GRADIENT	.00068	.01494	-.00226	.00124	.00012	-.00044	.00111	.01369	-.00246	.15918

OA-85 CFHT101 MODEL 32-0 01N52 PITCH UP (RQI07N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN.	XO	
LREF =	474.8100 IN.	YMRP =	.0000 IN.	YO	
BREF =	936.6800 IN.	ZMRP =	400.0000 IN.	ZO	
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	158.000	ELEVON =	.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 72/ 0 RN/L = .96 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.389	-.03220	-.20623	.11192	-.03626	-.00230	.00737	-.02010	-.18267	.14728	-1.24026
10.330	-5.120	-.05602	-.13709	.09868	-.02247	-.00588	.01275	-.02922	-.12774	.11052	-1.15578
10.330	-.195	-.06359	-.06701	.07829	-.02400	-.00661	.01308	-.02953	-.06674	.07852	-.84999
10.330	4.901	-.06173	.00733	.06811	-.01901	-.00625	.01126	-.02435	.00149	.06849	.02170
10.330	10.063	-.03671	.10590	.05748	-.01385	-.00287	.00549	-.01430	.09423	.07510	1.25474
10.330	15.074	-.01666	.24892	.05895	-.01665	-.00121	.00152	-.00731	.22502	.12165	1.84968
10.330	20.306	-.01942	.42527	.06088	-.01501	-.00164	.00173	-.00928	.37772	.20468	1.84544
10.330	25.588	-.02673	.62660	.06147	-.01774	-.00240	.00271	-.01237	.53860	.32608	1.65176
10.330	30.497	-.02165	.84225	.06193	-.02835	-.00190	.00160	-.01090	.69430	.48081	1.44402
10.330	35.642	-.01974	1.08494	.06200	-.04495	-.00191	.00134	-.01208	.84558	.68260	1.23877
	GRADIENT	.00036	.01459	-.00200	.00098	.00007	-.00036	.00102	.01339	-.00197	.17105

OA-85 CFHT101 MODEL 32-0 01N49N52 ROLL (RQI08N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN.	XO	
LREF =	474.8100 IN.	YMRP =	.0000 IN.	YO	
BREF =	936.6800 IN.	ZMRP =	400.0000 IN.	ZO	
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	158.000	ELEVON =	.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 70/ 0 RN/L = .99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.403	-.00500	-.21198	.10369	-.02489	-.00386	.00348	-.01504	-.18977	.14026	-1.35298
10.330	-5.154	-.03253	-.14385	.08962	-.01288	-.00766	.00904	-.02217	-.13522	.10218	-1.32336
10.330	-.190	-.04274	-.08406	.07151	-.01509	-.00855	.00980	-.02536	-.08382	.07179	-1.16756
10.330	4.955	-.03767	-.01081	.06000	-.00660	-.00814	.00696	-.01924	-.01595	.05884	-.27114
10.330	10.032	-.02501	.08965	.05193	-.00354	-.00626	.00213	-.00748	.07923	.06675	1.18698
10.330	15.074	-.01918	.22642	.05125	-.00099	-.00572	-.00043	-.00210	.20530	.10837	1.89437
10.330	20.350	-.02725	.39892	.05237	.00053	-.00604	-.00038	-.00322	.35581	.18783	1.89437
10.330	25.389	-.03737	.58882	.05297	-.00158	-.00661	.00018	-.00553	.50924	.30032	1.69565
10.330	30.540	-.03832	.80815	.05348	-.01114	-.00619	-.00054	-.00514	.66886	.45672	1.46451
10.330	35.670	-.04175	1.04652	.05361	-.02808	-.00647	-.00107	-.00576	.81892	.65379	1.25257
	GRADIENT	.00099	.01424	-.00224	.00165	.00008	-.00055	.00119	.01319	-.00252	.17423

OA-85 CFHT101 MODEL 32-0 01N49N50 PITCH DOWN (RQ109N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = 167.000 ELEVON = .000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 73/ 0 RN/L = 1.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.362	.00062	-.22169	.09808	-.01768	.00069	.00009	-.00716	-.20043	.13636	-1.46986
10.330	-5.287	.00446	-.15143	.07909	-.01153	.00024	-.00092	-.00572	-.14350	.09271	-1.54785
10.330	-.149	.00337	-.08719	.06367	-.00465	-.00008	-.00070	-.00211	-.08702	.06389	-1.36198
10.330	4.993	.00511	-.01326	.05296	.00393	-.00019	-.00059	-.00235	-.01781	.05160	-.34523
10.330	10.075	.00120	.08441	.04608	.01159	-.00078	-.00090	-.00217	.07505	.06014	1.24790
10.330	15.156	-.00410	.21379	.04207	.01435	-.00126	-.00074	-.00317	.19535	.09650	2.02447
10.330	20.207	-.00341	.38380	.04334	.01665	-.00063	-.00094	-.00397	.34521	.17324	1.99265
10.330	25.456	-.00345	.58878	.04413	.01341	-.00079	-.00107	-.00485	.51265	.29291	1.75017
10.330	30.640	-.00462	.80794	.04397	.00325	-.00092	-.00110	-.00584	.67273	.44959	1.49633
10.330	35.736	-.00697	1.05004	.04279	-.01269	-.00122	-.00124	-.00712	.82734	.64801	1.27673
	GRADIENT	.00034	.01438	-.00208	.00167	-.00002	.00002	-.00005	.01346	-.00239	.19773

OA-85 CFHT101 MODEL 32-0 01N61 YAW (RQ110N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = 860.000 ELEVON = 15.000
BDFLAP = 13.750 RUDFLR = 55.000

RUN NO. 56/ 0 RN/L = .68 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	14.818	-.01927	.27098	.06912	-.04863	-.00746	-.00242	.01035	.24429	.13612	1.79467
10.300	20.137	-.03523	.47105	.07720	-.06855	-.00969	-.00091	.00934	.41568	.23465	1.77152
10.300	25.153	-.04555	.68437	.08644	-.09035	-.01070	-.00064	.00906	.58274	.36912	1.57871
10.300	30.196	-.05080	.92317	.09701	-.11762	-.01117	-.00126	.00950	.74910	.54817	1.36655
10.300	35.445	-.05658	1.18735	.10701	-.14990	-.01158	-.00157	.00891	.90524	.77576	1.16691
	GRADIENT	-.00176	.04452	.00186	-.00490	-.00019	.00003	-.00005	.03226	.03103	-.03231

OA-85 CFHT101 MODEL 32-0 01N43N60 PITCH DOWN (RQI11N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN.	XO	
LREF =	474.8100 IN.	YMRP =	.0000 IN.	YO	
BREF =	936.6800 IN.	ZMRP =	400.0000 IN.	ZO	
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	100.000
PC-RCS =	770.000	ELEVON =	15.000
BDFLAP =	13.750	RUDFLR =	55.000

RUN NO. 57/ 0 RN/L = .69 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.159	-.00297	.19619	.01663	.02778	-.00009	-.00172	-.00098	.18501	.06736	2.74671
10.300	20.150	-.00123	.38051	.02437	.01152	.00022	-.00198	-.00197	.34882	.15396	2.26574
10.300	25.238	-.00084	.60599	.03449	-.01054	.00005	-.00189	-.00316	.53344	.28958	1.84210
10.300	30.512	-.00158	.84584	.04365	-.03764	.00008	-.00173	-.00461	.70655	.46705	1.51279
10.300	35.319	-.00104	1.08440	.05209	-.06595	-.00001	-.00167	-.00566	.85470	.66942	1.27677
	GRADIENT	.00007	.04423	.00178	-.00467	-.00000	.00001	-.00024	.03349	.02992	-.07289

OA-85 CFHT101 MODEL 32-0 01N43N44 ROLL (RQI12N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN.	XO	
LREF =	474.8100 IN.	YMRP =	.0000 IN.	YO	
BREF =	936.6800 IN.	ZMRP =	400.0000 IN.	ZO	
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	100.000
PC-RCS =	764.000	ELEVON =	15.000
BDFLAP =	13.750	RUDFLR =	55.000

RUN NO. 58/ 0 RN/L = .65 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.036	-.05328	.22883	.04769	-.01813	-.01591	.00461	-.00352	.20862	.10542	1.97890
10.300	20.129	-.06763	.43000	.05818	-.03812	-.01683	.00467	-.00071	.38371	.20261	1.89388
10.300	25.293	-.08126	.64339	.06566	-.05761	-.01649	.00607	-.00581	.55366	.33425	1.65639
10.300	30.281	-.08553	.88106	.07535	-.08422	-.01631	.00544	-.00563	.72285	.50935	1.41918
10.300	35.324	-.09490	1.14423	.08553	-.11535	-.01663	.00512	-.00568	.88412	.73137	1.20886
	GRADIENT	-.00200	.04497	.00183	-.00474	-.00002	.00004	-.00018	.03332	.03070	-.03970

OA-85 CFHT101 MODEL 32-0 01N43N44 ROLL (RQI13N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = 767.000 ELEVON = .000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 38/ 0 RN/L = .65 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	14.994	-.04938	.17493	.03808	.02861	-.01461	.00316	-.00119	.15912	.08204	1.93950
10.300	20.254	-.06441	.34862	.03996	.02988	-.01637	.00296	.00204	.31324	.15817	1.98036
10.300	25.271	-.07564	.53963	.04183	.03087	-.01608	.00407	-.00165	.47013	.26819	1.75294
10.300	30.376	-.08339	.76238	.04384	.02191	-.01669	.00304	-.00086	.63556	.42333	1.50132
10.300	35.484	-.09392	1.00605	.04450	.00671	-.01742	.00265	-.00078	.79337	.62022	1.27917
	GRADIENT	-.00212	.04061	.00033	-.00101	-.00012	-.00002	-.00004	.03113	.02623	-.03515

OA-85 CFHT101 MODEL 32-0 01N44 PITCH UP (RQI14N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = 775.000 ELEVON = .000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 40/ 0 RN/L = .68 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.043	-.04345	.23525	.06125	-.01545	-.00544	.00844	-.01875	.21129	.12021	1.75774
10.300	20.350	-.04472	.41452	.06398	-.01590	-.00488	.00865	-.02147	.36640	.20414	1.79485
10.300	25.166	-.04727	.60476	.06501	-.01807	-.00506	.00930	-.02472	.51971	.31602	1.64456
10.300	30.344	-.04738	.83013	.06651	-.02735	-.00513	.00929	-.02523	.68281	.47677	1.43214
10.300	35.498	-.04829	1.07503	.06664	-.04323	-.00522	.00893	-.02563	.83653	.67849	1.23293
	GRADIENT	-.00024	.04116	.00026	-.00132	.00000	.00003	-.00034	.03078	.02729	-.02771

OA-85 CFHT101 MODEL 32-0 01N43N60 PITCH DOWN (RQI15N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	100.000
PC-RCS =	771.000	ELEVON =	.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 41/ 0 RN/L = .68 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.188	-.00499	.14671	.00479	.07187	-.00092	-.00106	-.00084	.14033	.04306	3.25887
10.300	20.252	-.00606	.31276	.00715	.07485	-.00114	-.00124	-.00175	.29095	.11497	2.53072
10.300	25.386	-.00562	.50163	.00923	.07649	-.00083	-.00133	-.00233	.44923	.22340	2.01090
10.300	30.452	-.00474	.71469	.01097	.07129	-.00075	-.00116	-.00334	.61054	.37167	1.64268
10.300	35.533	-.00572	.95210	.01161	.05803	-.00090	-.00116	-.00457	.76805	.56278	1.36475
	GRADIENT	-.00000	.03955	.00034	-.00061	.00001	-.00000	-.00018	.03095	.02547	-.09190

OA-85 CFHT101 MODEL 32-0 01N43N60 PITCH DOWN (RQI16N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	100.000
PC-RCS =	773.000	ELEVON =	-20.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 15/ 0 RN/L = .68 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.144	.00524	.12175	.00513	.08472	.00081	-.00156	.00005	.11618	.03676	3.16070
10.300	20.285	.00541	.28552	.00493	.09282	.00050	-.00172	-.00107	.26610	.10361	2.56836
10.300	25.416	.00494	.47494	.00515	.10010	.00013	-.00187	-.00227	.42676	.20849	2.04690
10.300	30.542	.00468	.68112	.00395	.10256	-.00003	-.00184	-.00249	.58461	.34953	1.67255
10.300	35.623	.00403	.90086	.00301	.10388	.00010	-.00200	-.00361	.73053	.52715	1.38580
	GRADIENT	-.00006	.03814	-.00010	.00094	-.00004	-.00002	-.00017	.03021	.02394	-.08683

REPRODUCIBILITY OF THE ORIGINAL PAGE IS POOR

OA-85 CFHT101 MODEL 32-0 01N43N44 ROLL (RQI17N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = 768.000 ELEVON = -20.000
BDFLAP = -14.250 RUDFLR = 55.000

RUN NO. 16/ 0 RN/L = .67 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.226	-.00610	.09969	-.03435	.11607	.00473	.00595	-.02137	.10522	-.00696	-15.10639
10.300	20.208	-.00322	.25656	-.03423	.12537	.00483	.00590	-.02168	.25259	.05650	4.47087
10.300	25.395	.00061	.44502	-.03418	.13389	.00484	.00602	-.02297	.41667	.15997	2.60463
10.300	30.537	.00436	.66578	-.03417	.13636	.00475	.00604	-.02300	.59080	.30885	1.91291
10.300	35.723	.00678	.88684	-.03544	.13551	.00445	.00618	-.02446	.74067	.48902	1.51460
	GRADIENT	.00065	.03866	-.00004	.00097	-.00001	.00001	-.00015	.03135	.02427	.59225

OA-85 CFHT101 MODEL 32-0 01N61 YAW (RQI18N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = 860.000 ELEVON = 20.000
BDFLAP = -14.250 RUDFLR = 55.000

RUN NO. 17/ 0 RN/L = .68 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.121	-.00805	.21006	.05919	.01032	-.00615	-.00378	.01243	.18735	.11194	1.67369
10.300	20.223	-.02002	.36944	.06042	.02003	-.00760	-.00243	.01174	.32578	.18440	1.76670
10.300	25.342	-.02654	.55872	.06197	.03020	-.00850	-.00239	.01098	.47843	.29515	1.62096
10.300	30.315	-.03429	.76864	.06332	.03465	-.00888	-.00297	.01159	.63157	.44264	1.42682
10.300	35.592	-.03828	.99289	.06264	.03453	-.00939	-.00368	.01111	.77095	.62880	1.22607
	GRADIENT	-.00146	.03851	.00019	.00123	-.00015	-.00001	-.00005	.02886	.02533	-.02422

OA-85 CFHT101 MODEL 32-0 02N43N60 PITCH DOWN (RQI19N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	100.000
PC-RCS =	772.000	ELEVON =	-20.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 32/ 0 RN/L = .65 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.066	-.00172	.21937	.00699	.02144	-.00045	-.00106	.00031	.21002	.06377	3.29318
10.300	20.198	-.00101	.35633	.00639	.03675	.00047	-.00115	.00037	.33221	.12902	2.57488
10.300	25.268	-.00063	.53188	.00662	.04570	.00037	-.00118	-.00120	.47816	.23301	2.05207
10.300	30.441	.00040	.73993	.00736	.05053	.00045	-.00125	-.00158	.63421	.38123	1.66360
10.300	35.502	.00187	.94887	.00532	.05200	.00069	-.00137	-.00199	.76938	.55537	1.38535
	GRADIENT	.00017	.03605	-.00005	.00147	.00004	-.00001	-.00013	.02780	.02417	-.09249

OA-85 CFHT101 MODEL 32-0 03N43N60 PITCH DOWN (RQI20N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	100.000
PC-RCS =	772.000	ELEVON =	-20.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 34/ 0 RN/L = .64 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.041	-.00347	.24722	.02586	-.01412	.00009	-.00070	-.00036	.23204	.08913	2.60338
10.300	20.204	-.00451	.39744	.02660	.00602	-.00001	-.00083	-.00097	.36380	.16223	2.24256
10.300	25.408	-.00334	.57625	.02610	.01504	.00021	-.00090	-.00220	.50931	.27083	1.88058
10.300	30.274	.00172	.75680	.02755	.02377	.00171	-.00063	-.00217	.63970	.40532	1.57824
10.300	35.469	.00136	.97525	.02798	.02906	.00066	-.00116	-.00288	.77804	.58868	1.32167
	GRADIENT	.00031	.03564	.00010	.00205	.00006	-.00001	-.00012	.02686	.02437	-.06339

OA-85 CFHT101 MODEL 32-0 01N42N45 PITCH DOWN (RQI21N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = 795.000 ELEVON = -20.000
BDFLAP = -14.250 RUDFLR = 55.000

RUN NO. 18/ 0 RN/L = .65 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	14.982	.00443	.19475	.03321	.03410	.00063	-.00124	-.00279	.17954	.08243	2.17816
10.300	20.349	.00374	.36033	.03414	.04509	.00078	-.00116	-.00397	.32597	.15731	2.07214
10.300	25.365	.00455	.53697	.03508	.05296	.00058	-.00132	-.00493	.47018	.26173	1.79643
10.300	30.433	.00357	.74461	.03549	.05777	.00019	-.00144	-.00461	.62404	.40778	1.53035
10.300	35.515	.00260	.96141	.03343	.06160	-.00002	-.00147	-.00561	.76313	.58570	1.30293
	GRADIENT	-.00007	.03747	.00004	.00133	-.00004	-.00001	-.00012	.02864	.02454	-.04474

OA-85 CFHT101 MODEL 32-0 03N42N45 PITCH DOWN (RQI22N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = 784.000 ELEVON = -20.000
BDFLAP = -14.250 RUDFLR = 55.000

RUN NO. 35/ 0 RN/L = .63 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	14.914	-.00170	.22598	.04221	-.00349	.00001	-.00052	-.00207	.20750	.09895	2.09712
10.300	20.205	-.00331	.38014	.04306	.01336	-.00011	-.00050	-.00293	.34188	.17170	1.99111
10.300	25.268	-.00452	.55912	.04306	.02349	-.00038	-.00071	-.00285	.48724	.27761	1.75516
10.300	30.378	-.00482	.76263	.04187	.02928	-.00048	-.00084	-.00337	.63675	.42179	1.50964
10.300	35.544	-.00502	.98981	.03840	.03067	-.00064	-.00083	-.00480	.78306	.60665	1.29078
	GRADIENT	-.00016	.03713	-.00017	.00164	-.00003	-.00002	-.00011	.02811	.02459	-.04068

OA-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN (RQI23N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	311.000	ELEVON =	-20.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 21/ 0 RN/L = 1.01 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.217	.00451	.20581	.04033	.02574	.00070	-.00142	-.00104	.18801	.09294	2.02291
10.330	20.299	.00487	.36866	.04125	.03553	.00042	-.00159	-.00249	.33146	.16658	1.98981
10.330	25.515	.00331	.55073	.04285	.04518	.00010	-.00162	-.00267	.47856	.27590	1.73453
10.330	30.707	.00214	.75931	.04328	.05155	.00005	-.00136	-.00330	.63075	.42495	1.48431
10.330	35.848	.00057	.98273	.04193	.05180	-.00034	-.00144	-.00442	.77202	.60951	1.26662
	GRADIENT	-.00021	.03764	.00010	.00132	-.00005	.00000	-.00015	.02840	.02500	-.03908

OA-85 CFHT101 MODEL 32-0 01N47N48 ROLL (RQI24N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	302.000	ELEVON =	-20.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 22/ 0 RN/L = 1.01 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.212	-.01712	.22079	.05081	.01057	-.00387	-.00083	.00447	.19972	.10697	1.86715
10.330	20.304	-.02227	.38647	.05267	.02183	-.00442	-.00116	.00396	.34418	.18350	1.87564
10.330	25.505	-.03201	.57114	.05364	.03183	-.00519	-.00069	.00168	.49239	.29434	1.67287
10.330	30.670	-.03356	.77924	.05382	.03690	-.00527	-.00150	.00288	.64278	.44377	1.44845
10.330	35.821	-.03916	1.00924	.05303	.03615	-.00583	-.00218	.00282	.78731	.63366	1.24248
	GRADIENT	-.00107	.03819	.00011	.00128	-.00009	-.00006	-.00008	.02857	.02547	-.03252

OA-85 CFHT101 MODEL 32-0 01N48 PITCH UP (RQI25N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.G = 150.000
PC-RCS = 302.000 ELEVON = -20.000
BDFLAP = -14.250 RUDFLR = 55.000

RUN NO. 24/ 0 RN/L = 1.01 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	14.975	-.01410	.23195	.06004	-.00092	-.00118	.00141	-.00741	.20856	.11794	1.76834
10.330	20.251	-.01614	.39896	.06171	.01034	-.00138	.00137	-.00811	.35294	.19599	1.80080
10.330	25.509	-.01962	.59313	.06264	.01954	-.00185	.00188	-.01002	.50833	.31196	1.62946
10.330	30.643	-.01750	.81033	.06299	.02316	-.00162	.00117	-.00912	.66507	.46720	1.42352
10.330	35.768	-.01808	1.02884	.06147	.02208	-.00179	.00105	-.00972	.79886	.65124	1.22667
	GRADIENT	-.00018	.03856	.00008	.00114	-.00003	-.00002	-.00011	.02872	.02571	-.02804

OA-85 CFHT101 MODEL 32-0 02N46N47 PITCH DOWN (RQI26N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.G = 150.000
PC-RCS = 311.000 ELEVON = -20.000
BDFLAP = -14.250 RUDFLR = 55.000

RUN NO. 31/ 0 RN/L = .99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.121	.00145	.22400	.04307	.01086	.00047	-.00137	-.00062	.20501	.10001	2.04998
10.330	20.297	.00302	.37409	.04403	.01999	.00049	-.00140	-.00180	.33559	.17106	1.96181
10.330	25.492	-.00093	.55347	.04528	.03010	-.00007	-.00120	-.00250	.48010	.27907	1.72034
10.330	30.692	.00086	.75461	.04549	.03654	-.00016	-.00147	-.00312	.62569	.42429	1.47468
10.330	35.832	-.00051	.97705	.04463	.03627	-.00039	-.00139	-.00435	.76601	.60815	1.25956
	GRADIENT	-.00012	.03641	.00009	.00130	-.00006	-.00000	-.00017	.02725	.02450	-.03991

OA-85 CFHT101 MODEL 32-0 03N46N47 PITCH DOWN (RQI27N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	311.000	ELEVON =	-20.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 33/ 0 RN/L = 1.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.099	-.00311	.22797	.04670	.00433	-.00037	-.00078	-.00315	.20793	.10447	1.99033
10.330	20.374	.00005	.38405	.04721	.01626	.00023	-.00112	-.00367	.34359	.17797	1.93060
10.330	25.441	.00051	.56572	.04756	.02567	.00025	-.00092	-.00543	.49044	.28596	1.71502
10.330	30.651	.00048	.77841	.04673	.03188	.00016	-.00106	-.00551	.64584	.43704	1.47775
10.330	35.776	.00009	1.00653	.04313	.03301	-.00029	-.00130	-.00669	.79140	.62342	1.26944
	GRADIENT	.00013	.03779	-.00015	.00141	.00000	-.00002	-.00017	.02845	.02511	-.03667

OA-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN (RQI28N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	311.000	ELEVON =	.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 43/ 0 RN/L = .98 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.125	-.00126	.20894	.04275	.01728	.00009	-.00100	-.00216	.19055	.09579	1.98928
10.330	20.393	-.00165	.38504	.04421	.01676	-.00017	-.00116	-.00320	.34550	.17561	1.96749
10.330	25.429	.00017	.58303	.04483	.01362	-.00018	-.00120	-.00409	.50729	.29083	1.74430
10.330	30.563	.00012	.80363	.04478	.00344	-.00020	-.00115	-.00491	.66921	.44720	1.49645
10.330	35.748	-.00196	1.04891	.04400	-.01262	-.00049	-.00120	-.00624	.82558	.64851	1.27305
	GRADIENT	.00001	.04081	.00006	-.00142	-.00002	-.00001	-.00019	.03099	.02678	-.03699

OA-85 CFHT101 MODEL 32-0 01N47N48 ROLL (RQI29N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.@ = 150.000
PC-RCS = 302.000 ELEVON = .000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 45/ 0 RN/L = .98 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.103	-.02549	.22739	.05136	-.00067	-.00594	-.00028	.00211	.20615	.10884	1.89415
10.330	20.476	-.03218	.40846	.05336	.00014	-.00610	-.00028	.00096	.36399	.19288	1.88714
10.330	25.206	-.04019	.59887	.05477	-.00250	-.00662	.00021	-.00106	.51852	.30460	1.70231
10.330	30.582	-.04103	.83176	.05492	-.01333	-.00622	-.00056	-.00067	.68812	.47046	1.46265
10.330	35.713	-.04476	1.07701	.05469	-.03110	-.00648	-.00113	-.00102	.84255	.67309	1.25178
	GRADIENT	-.00092	.04136	.00016	-.00145	-.00002	-.00004	-.00015	.03111	.02741	-.03328

OA-85 CFHT101 MODEL 32-0 01N48 PITCH UP (RQI30N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.@ = 150.000
PC-RCS = 302.000 ELEVON = .000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 47/ 0 RN/L = .99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	14.977	-.01415	.25078	.05965	-.01679	-.00116	.00136	-.00691	.22684	.12244	1.85271
10.330	20.328	-.01768	.43057	.06178	-.01490	-.00165	.00166	-.00889	.38229	.20751	1.84228
10.330	25.350	-.02342	.63191	.06278	-.01808	-.00212	.00231	-.01121	.54419	.32728	1.66274
10.330	30.512	-.01868	.85814	.06321	-.02975	-.00170	.00137	-.01024	.70722	.49015	1.44286
10.330	35.730	-.01813	1.11075	.06391	-.04759	-.00176	.00108	-.01103	.86436	.70052	1.23388
	GRADIENT	-.00017	.04154	.00019	-.00148	-.00002	-.00002	-.00019	.03095	.02783	-.03163

OA-85 CFHT101 MODEL 32-0 02N46N47 PITCH DOWN (RQI31N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.@ =	150.000
PC-RCS =	311.000	ELEVON =	.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 48/ 0 RN/L = .95 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	14.976	.00410	.21900	.00591	.00128	.00049	-.00129	-.00079	.21004	.06231	3.37108
10.330	20.238	.00326	.38391	.00688	.00442	.00030	-.00118	-.00174	.35783	.13926	2.56955
10.330	25.388	-.00011	.57795	.00768	.00371	-.00026	-.00110	-.00266	.51884	.25473	2.03682
10.330	30.515	.00068	.80331	.00761	-.00595	.00026	-.00077	-.00392	.68819	.41445	1.66047
10.330	35.660	.00274	1.03379	.00615	-.02273	.00017	-.00097	-.00529	.83636	.60766	1.37635
	GRADIENT	-.00010	.03966	.00002	-.00113	-.00001	.00002	-.00022	.03065	.02643	-.09494

OA-85 CFHT101 MODEL 32-0 03N46N47 PITCH DOWN (RQI32N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.@ =	150.000
PC-RCS =	311.000	ELEVON =	.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 36/ 0 RN/L = .98 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.180	-.00078	.23568	.04651	-.00496	.00030	-.00102	-.00418	.21528	.10660	2.01948
10.330	20.233	-.00091	.40617	.04667	-.00548	.00009	-.00101	-.00551	.36496	.18426	1.98070
10.330	25.375	.00105	.60702	.04714	-.00884	.00006	-.00122	-.00680	.52625	.30272	1.74502
10.330	30.662	.00176	.84081	.04623	-.01920	.00007	-.00132	-.00689	.69968	.46856	1.49324
10.330	35.660	.00073	1.07817	.04433	-.03502	-.00024	-.00148	-.00807	.85016	.66457	1.27926
	GRADIENT	.00011	.04125	-.00009	-.00144	-.00002	-.00002	-.00018	.03123	.02725	-.03833

OA-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN (RQ133N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = 311.000 ELEVON = 15.000
BDFLAP = 13.750 RUDFLR = 55.000

RUN NO. 60/ 0 RN/L = .98 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.093	-.00626	.26924	.05371	-.03285	-.00034	-.00074	-.00304	.24597	.12196	2.01682
10.330	20.165	-.00532	.45915	.06070	-.05241	-.00053	-.00090	-.00358	.41008	.21527	1.90498
10.330	25.316	-.00547	.68709	.07006	-.07641	-.00069	-.00099	-.00433	.59115	.35713	1.65528
10.330	30.359	-.00623	.91526	.07822	-.10299	-.00070	-.00089	-.00552	.75022	.53008	1.41529
10.330	35.474	-.00721	1.17125	.08722	-.13483	-.00080	-.00082	-.00698	.90323	.75075	1.20310
	GRADIENT	-.00006	.04435	.00166	-.00500	-.00002	-.00000	-.00019	.03247	.03086	-.04155

OA-85 CFHT101 MODEL 32-0 01N47N48 ROLL (RQ134N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = 302.000 ELEVON = 15.000
BDFLAP = 13.750 RUDFLR = 55.000

RUN NO. 64/ 0 RN/L = .99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.052	-.03222	.28544	.06451	-.05115	-.00603	.00034	.00143	.25889	.13643	1.89766
10.330	20.096	-.03895	.47723	.07203	-.06990	-.00641	.00047	.00037	.42343	.23161	1.82817
10.330	25.198	-.04899	.69715	.08035	-.09221	-.00703	.00111	-.00206	.59660	.36951	1.61458
10.330	30.463	-.05311	.95128	.09016	-.12206	-.00694	.00072	-.00217	.77425	.56000	1.38259
10.330	35.460	-.05455	1.20206	.09931	-.15427	-.00688	.00039	-.00312	.92149	.77825	1.18405
	GRADIENT	-.00115	.04508	.00171	-.00505	-.00004	.00001	-.00023	.03275	.03150	-.03661

OA-85 CFHT101 MODEL 32-0 02N46N47 PITCH DOWN (RQI35N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.@ =	150.000
PC-RCS =	311.000	ELEVON =	15.000
BDFLAP =	13.750	RUDFLR =	55.000

RUN NO. 52/ 0 RN/L = 1.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	14.843	-.00406	.26865	.05857	-.04216	-.00048	-.00088	-.00219	.24468	.12543	1.95065
10.330	20.165	-.00547	.46809	.06584	-.06392	-.00063	-.00085	-.00343	.41670	.22317	1.86724
10.330	25.228	-.00366	.68282	.07438	-.08573	-.00049	-.00074	-.00498	.58599	.35832	1.63540
10.330	30.312	-.00556	.92011	.08308	-.11229	-.00053	-.00060	-.00644	.75238	.53611	1.40341
10.330	35.496	-.00617	1.18020	.09224	-.14484	-.00079	-.00071	-.00781	.90731	.76037	1.19325
	GRADIENT	-.00008	.04421	.00164	-.00493	-.00001	.00001	-.00028	.03228	.03074	-.03841

OA-85 CFHT101 MODEL 32-0 03N46N47 PITCH DOWN (RQI36N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.@ =	150.000
PC-RCS =	311.000	ELEVON =	15.000
BDFLAP =	13.750	RUDFLR =	55.000

RUN NO. 53/ 0 RN/L = .99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	14.928	.00166	.28237	.06464	-.05266	-.00035	-.00085	-.00796	.25619	.13520	1.89484
10.330	20.273	.00091	.48430	.07198	-.07380	-.00045	-.00084	-.00893	.42935	.23533	1.82445
10.330	25.243	-.00150	.70170	.08012	-.09827	-.00069	-.00072	-.01037	.60053	.37172	1.61555
10.330	30.343	-.00327	.94317	.08855	-.12685	-.00071	-.00041	-.01126	.76923	.55289	1.39129
10.330	35.444	-.00500	1.19920	.09701	-.15917	-.00103	-.00052	-.01273	.92071	.77445	1.18885
	GRADIENT	-.00034	.04484	.00159	-.00520	-.00003	.00002	-.00023	.03266	.03120	-.03605

OA-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN (RQI37N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = 621.000 ELEVON = 15.000
BDFLAP = 13.750 RUDFLR = 55.000

RUN NO. 61/ 0 RN/L = .98 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.117	-.00205	.23669	.03601	-.00517	-.00030	-.00150	-.00118	.21911	.09649	2.27074
10.330	20.409	-.00191	.43391	.04370	-.02557	-.00054	-.00149	-.00229	.39144	.19227	2.03592
10.330	25.270	-.00372	.64351	.05205	-.04774	-.00075	-.00149	-.00334	.55971	.32178	1.73944
10.330	30.378	-.00388	.88235	.06133	-.07560	-.00084	-.00134	-.00447	.73019	.49912	1.46297
10.330	35.590	-.00395	1.14672	.07112	-.10867	-.00097	-.00137	-.00588	.89112	.72520	1.22879
	GRADIENT	-.00011	.04456	.00173	-.00505	-.00003	.00001	-.00023	.03304	.03073	-.05215

OA-85 CFHT101 MODEL 32-0 01N47N48 ROLL (RQI38N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = 602.000 ELEVON = 15.000
BDFLAP = 13.750 RUDFLR = 55.000

RUN NO. 62/ 0 RN/L = .99 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	14.890	-.04671	.25482	.05511	-.03640	-.01017	.00173	.00001	.23210	.11874	1.95459
10.330	20.209	-.06260	.45826	.06422	-.05700	-.01073	.00190	.00048	.40787	.21857	1.86607
10.330	25.224	-.07394	.67789	.07242	-.07958	-.01085	.00241	-.00164	.58239	.35440	1.64333
10.330	30.355	-.08007	.93320	.08336	-.10956	-.01084	.00196	-.00193	.76313	.54354	1.40401
10.330	35.465	-.08866	1.18392	.09232	-.14124	-.01111	.00169	-.00280	.91070	.76211	1.19498
	GRADIENT	-.00198	.04547	.00182	-.00511	-.00004	-.00000	-.00016	.03338	.03139	-.03858

OA-85 CFHT101 MODEL 32-0 01N47N48 ROLL (RQI39N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = 602.000 ELEVON = .000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 46/ 0 RN/L = .98 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.082	-.04029	.20650	.04396	.00945	-.00900	.00072	.00160	.18795	.09618	1.95407
10.330	20.431	-.05131	.38606	.04654	.01222	-.00992	.00068	.00202	.34553	.17837	1.93709
10.330	25.444	-.06475	.58165	.04738	.01133	-.01053	.00110	.00001	.50488	.29268	1.72505
10.330	30.548	-.07073	.80598	.04831	.00098	-.01072	.00029	.00062	.66956	.45125	1.48378
10.330	35.837	-.07847	1.05928	.04840	-.01746	-.01099	-.00008	-.00027	.83041	.65943	1.25929
	GRADIENT	-.00185	.04117	.00021	-.00126	-.00009	-.00004	-.00010	.03116	.02710	-.03564

OA-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN (RQI40N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = 621.000 ELEVON = .000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 44/ 0 RN/L = .98 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.251	-.00238	.18677	.02624	.03647	-.00043	-.00114	-.00170	.17522	.07497	2.33701
10.330	20.319	-.00119	.35062	.02839	.04125	-.00040	-.00126	-.00272	.31894	.14838	2.14951
10.330	25.659	-.00107	.55385	.02980	.04109	-.00050	-.00131	-.00383	.48633	.26668	1.82363
10.330	30.439	-.00237	.76142	.03079	.03127	-.00068	-.00133	-.00469	.64087	.41230	1.55439
10.330	35.813	-.00121	1.01794	.03027	.01389	-.00066	-.00139	-.00614	.80777	.62019	1.30245
	GRADIENT	.00002	.04038	.00020	-.00108	-.00001	-.00001	-.00021	.03097	.02643	-.05199

OA-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN (RQI41N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	621.000	ELEVON =	-20.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 20/ 0 RN/L = 1.01 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.241	.00771	.17332	.02357	.04849	.00048	-.00198	.00039	.16102	.06831	2.35743
10.330	20.513	.00705	.34279	.02384	.05780	.00031	-.00208	-.00077	.31271	.14244	2.19528
10.330	25.741	.00665	.53441	.02434	.06614	.00009	-.00221	-.00135	.47081	.25402	1.85346
10.330	30.711	.00541	.73416	.02549	.07132	-.00030	-.00225	-.00206	.61818	.39685	1.55769
10.330	35.888	.00406	.95614	.02549	.07389	-.00052	-.00222	-.00281	.75969	.58114	1.30724
	GRADIENT	-.00017	.03799	.00011	.00125	-.00006	-.00001	-.00015	.02919	.02483	-.05314

OA-85 CFHT101 MODEL 32-0 01N47N48 ROLL (RQI42N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	150.000
PC-RCS =	602.000	ELEVON =	-20.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 23/ 0 RN/L = 1.01 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.179	-.02799	.19630	.04309	.02175	-.00719	-.00096	.00616	.17817	.09299	1.91607
10.330	20.302	-.03556	.36490	.04516	.03201	-.00714	-.00085	.00673	.32656	.16896	1.93276
10.330	25.481	-.04227	.55077	.04535	.04134	-.00731	-.00069	.00472	.47769	.27788	1.71901
10.330	30.737	-.05005	.77180	.04643	.04596	-.00833	-.00176	.00608	.63965	.43437	1.47258
10.330	35.834	-.06205	.98873	.04582	.04605	-.00946	-.00243	.00653	.77475	.61599	1.25773
	GRADIENT	-.00160	.03849	.00013	.00121	-.00011	-.00007	.00000	.02911	.02535	-.03436

OA-85 CFHT101 MODEL 32-0 02N43N60 PITCH DOWN (RQI43N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.@ = 100.000
PC-RCS = 769.000 ELEVON = 15.000
BDFLAP = 13.750 RUDFLR = 55.000

RUN NO. 51/ 0 RN/L = .63 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.064	-.00201	.22051	.03361	-.00255	-.00005	-.00101	-.00139	.20419	.08977	2.27472
10.300	20.342	-.00292	.41406	.04099	-.01924	-.00007	-.00112	-.00217	.37398	.18237	2.05070
10.300	25.108	-.00376	.61611	.04829	-.03860	-.00021	-.00097	-.00355	.53740	.30516	1.76104
10.300	30.329	-.00340	.85971	.05782	-.06557	-.00030	-.00081	-.00511	.71285	.48403	1.47275
10.300	35.342	-.00413	1.10748	.06645	-.09534	-.00057	-.00073	-.00689	.86494	.69484	1.24481
	GRADIENT	-.00009	.04391	.00163	-.00459	-.00003	.00002	-.00028	.03285	.02990	-.05216

OA-85 CFHT101 MODEL 32-0 03N43N60 PITCH DOWN (RQI44N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.@ = 100.000
PC-RCS = 769.000 ELEVON = 15.000
BDFLAP = 13.750 RUDFLR = 55.000

RUN NO. 54/ 0 RN/L = .65 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.032	-.00611	.25903	.04440	-.04022	-.00021	-.00074	-.00048	.23865	.11007	2.16821
10.300	20.266	-.00554	.44300	.05144	-.05397	-.00044	-.00079	-.00132	.39776	.20171	1.97194
10.300	25.197	-.00764	.65273	.05861	-.07428	-.00059	-.00045	-.00297	.56567	.33092	1.70936
10.300	30.237	-.00849	.88753	.06681	-.10054	-.00074	-.00029	-.00388	.73314	.50467	1.45272
10.300	35.272	-.00997	1.13576	.07379	-.12915	-.00105	-.00027	-.00510	.88465	.71609	1.23540
	GRADIENT	-.00021	.04355	.00147	-.00444	-.00004	.00003	-.00023	.03225	.03000	-.04725

OA-85 CFHT101 MODEL 32-0 01N43N60 PITCH DOWN (RQI45N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = 767.000 ELEVON = 15.000
BDFLAP = -14.250 RUDFLR = 55.000

RUN NO. 76/ 0 RN/L = .64 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.024	-.00721	.14751	.01385	.06286	.00004	-.00080	-.00150	.13887	.05161	2.69066
10.300	20.216	-.00777	.33308	.02166	.05091	-.00013	-.00091	-.00234	.30507	.13543	2.25263
10.300	25.277	-.00811	.54261	.03001	.03610	-.00029	-.00091	-.00341	.47784	.25883	1.84614
10.300	30.513	-.00776	.78193	.03819	.01686	-.00032	-.00087	-.00435	.65425	.42991	1.52185
10.300	35.530	-.00777	1.02711	.04460	-.00377	-.00039	-.00090	-.00562	.80985	.63334	1.27869
	GRADIENT	-.00002	.04303	.00153	-.00326	-.00002	-.00000	-.00020	.03296	.02840	-.06930

OA-85 CFHT101 MODEL 32-0 02N43N60 PITCH DOWN (RQI46N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = 771.000 ELEVON = .000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 49/ 0 RN/L = .65 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.105	-.00137	.20219	.02332	.01926	-.00031	-.00155	.00051	.18913	.07520	2.51491
10.300	20.165	.00007	.36119	.02492	.02352	-.00003	-.00171	-.00012	.33046	.14790	2.23435
10.300	25.420	.00093	.55043	.02718	.02815	.00050	-.00159	-.00152	.48547	.26082	1.86135
10.300	30.392	.00215	.74987	.02901	.02767	.00051	-.00163	-.00201	.63216	.40439	1.56323
10.300	35.517	.00140	.98582	.02947	.01616	.00020	-.00173	-.00316	.78528	.59668	1.31608
	GRADIENT	.00015	.03831	.00032	-.00004	.00003	-.00001	-.00018	.02926	.02544	-.06013

OA-85 CFHT101 MODEL 32-0 03N43N60 PITCH DOWN (RQI47N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	100.000
PC-RCS =	767.000	ELEVON =	.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 79/ 0 RN/L = .66 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.030	-.00558	.25116	.03124	-.02607	.00020	-.00047	-.00208	.23447	.09531	2.46018
10.300	20.139	-.00808	.39609	.03401	-.00743	-.00061	-.00067	-.00263	.36016	.16830	2.13999
10.300	25.235	-.00705	.57848	.03551	-.00645	-.00010	-.00050	-.00407	.50813	.27875	1.82289
10.300	30.335	-.00493	.78807	.03600	-.01121	.00019	-.00039	-.00542	.66199	.42909	1.54278
10.300	35.459	-.00409	1.03117	.03423	-.02479	.00029	-.00060	-.00619	.82006	.62608	1.30983
	GRADIENT	.00012	.03824	.00016	-.00002	.00002	.00000	-.00122	.02885	.02590	-.05676

OA-85 CFHT101 MODEL 32-0 01N42N45 PITCH DOWN (RQI48N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.Q =	100.000
PC-RCS =	777.000	ELEVON =	.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 74/ 0 RN/L = .65 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.066	-.00256	.19477	.03662	.02868	.00033	-.00064	-.00270	.17855	.08599	2.07640
10.300	20.320	-.00269	.36119	.03764	.03134	.00029	-.00074	-.00355	.32564	.16073	2.02601
10.300	25.307	-.00313	.54970	.03897	.03034	.00017	-.00083	-.00441	.48029	.27021	1.77744
10.300	30.587	-.00257	.77612	.04008	.02172	.00001	-.00093	-.00560	.64774	.42942	1.50840
10.300	35.487	-.00197	1.00516	.03965	.00883	-.00012	-.00088	-.00726	.79543	.61579	1.29173
	GRADIENT	.00003	.03981	.00017	-.00088	-.00002	-.00001	-.00122	.03044	.02596	-.04179

OA-85 CFHT101 MODEL 32-0 02N42N45 PITCH DOWN (RQI49N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 100.000
PC-RCS = 777.000 ELEVON = .000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 80/ 0 RN/L = .66 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.300	15.081	-.00481	.22002	.04306	.00062	-.00047	-.00079	-.00145	.20124	.09883	2.03628
10.300	20.189	-.00960	.39456	.04379	.00052	-.00091	-.00037	-.00221	.35521	.17727	2.00379
10.300	25.435	-.00738	.59254	.04368	-.00245	-.00081	-.00059	-.00285	.51634	.29394	1.75665
10.300	30.362	-.00779	.80223	.04301	-.00915	-.00065	-.00074	-.00349	.67046	.44260	1.51483
10.300	35.431	-.00590	1.05007	.04015	-.02331	-.00060	-.00076	-.00515	.83234	.64146	1.29756
	GRADIENT	-.00001	.04063	-.00013	-.00114	-.00000	-.00001	-.00017	.03101	.02652	-.03862

OA-85 CFHT101 MODEL 32-0 01N52 PITCH UP (RQI50N) (19 SEP 74)

REFERENCE DATA

SREF = 2690.0000 SQ.FT. XMRP = 1076.7000 IN. XO
LREF = 474.8100 IN. YMRP = .0000 IN. YO
BREF = 936.6800 IN. ZMRP = 400.0000 IN. ZO
SCALE = .0100

PARAMETRIC DATA

BETA = .000 W.T.Q = 150.000
PC-RCS = 158.000 ELEVON = 15.000
BDFLAP = .000 RUDFLR = 55.000

RUN NO. 69/ 0 RN/L = 1.03 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.393	-.02440	-.19929	.11523	-.04510	-.00232	.00696	-.02100	-.17523	.14929	-1.17379
10.330	-5.222	-.04936	-.13240	.10202	-.03005	-.00599	.01247	-.03002	-.12256	.11364	-1.07849
10.330	-.160	-.05633	-.05692	.08234	-.03222	-.00666	.01272	-.03011	-.05668	.08250	-.68706
10.330	4.896	-.05602	.02660	.07376	-.03351	-.00641	.01111	-.02544	.02021	.07576	.26674
10.330	9.950	-.05420	.14357	.06906	-.04222	-.00403	.00567	-.01563	.12948	.09283	1.39484
10.330	15.034	-.01497	.30349	.07260	-.05819	-.00159	.00152	-.00870	.27427	.14884	1.84274
10.330	20.235	-.02041	.50123	.08031	-.07522	-.00205	.00200	-.01063	.44252	.24872	1.77923
10.330	25.254	-.02951	.71875	.08810	-.09079	-.00282	.00295	-.01375	.61247	.38633	1.58537
10.330	30.370	-.02346	.96711	.09559	-.11559	-.00226	.00187	-.01246	.78607	.57142	1.37564
10.330	35.477	-.02508	1.22972	.10280	-.14441	-.00238	.00170	-.01345	.94175	.79742	1.18100
	GRADIENT	.00008	.01652	-.00170	-.00026	.00005	-.00032	.00092	.01521	-.00133	.18865

OA-85 CFHT101 MODEL 32-0 01N49N50 PITCH DOWN (RQ151N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.@ =	150.000
PC-RCS =	167.000	ELEVON =	-20.000
BDFLAP =	.000	RUDFLR =	55.000

RUN NO. 28/ 0 RN/L = 1.00 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	-10.284	.00643	-.24746	.10331	-.00263	.00108	-.00021	-.01651	-.22504	.14583	-1.54314
10.330	-5.432	.00993	-.17218	.08215	-.00217	.00023	-.00102	-.01232	-.16363	.09809	-1.66828
10.330	-.245	.01167	-.09035	.06323	-.00600	.00025	-.00116	-.01160	-.09008	.06362	-1.41596
10.330	5.042	.01209	-.01184	.05067	.00322	-.00009	-.00121	-.01115	-.01624	.04943	-.32860
10.330	10.023	.00986	.08517	.04292	.01227	-.00022	-.00145	-.01091	.07640	.05708	1.33834
10.330	15.239	.00821	.21960	.03791	.02000	-.00033	-.00156	-.01123	.20191	.09430	2.14114
10.330	20.347	.00819	.37851	.03818	.02860	-.00083	-.00183	-.01145	.34161	.16741	2.04059
10.330	25.492	.00585	.57360	.03958	.03645	-.00075	-.00193	-.01202	.50072	.28259	1.77190
10.330	30.675	.00325	.77577	.03843	.04039	-.00080	-.00180	-.01279	.64762	.42883	1.51020
10.330	35.685	.00233	1.00760	.03592	.03872	-.00107	-.00189	-.01376	.79530	.61971	1.28333
	GRADIENT	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

OA-85 CFHT101 MODEL 32-0 01N46N47 PITCH DOWN (RQ152N) (19 SEP 74)

REFERENCE DATA

SREF =	2690.0000 SQ.FT.	XMRP =	1076.7000 IN. XO		
LREF =	474.8100 IN.	YMRP =	.0000 IN. YO		
BREF =	936.6800 IN.	ZMRP =	400.0000 IN. ZO		
SCALE =	.0100				

PARAMETRIC DATA

BETA =	.000	W.T.@ =	150.000
PC-RCS =	311.000	ELEVON =	15.000
BDFLAP =	-14.250	RUDFLR =	55.000

RUN NO. 78/ 0 RN/L = .98 GRADIENT INTERVAL = -5.00/ 5.00

MACH	ALPHA	BETA	CN	CA	CLM	CBL	CYN	CY	CL	CD	L/D
10.330	15.145	-.00641	.25349	.05292	-.01659	-.00026	-.00085	-.00246	.23086	.11731	1.96798
10.330	20.167	-.00651	.43896	.05955	-.03125	-.00040	-.00093	-.00334	.39152	.20723	1.88929
10.330	25.513	-.00672	.66398	.06775	-.04736	-.00059	-.00093	-.00466	.57005	.34712	1.64222
10.330	30.296	-.00730	.88117	.07442	-.06508	-.00069	-.00089	-.00540	.72329	.50877	1.42164
10.330	35.568	-.00729	1.13964	.08120	-.08895	-.00080	-.00093	-.00686	.87979	.72894	1.20694
	GRADIENT	-.00005	.04344	.00140	-.00350	-.00003	-.00000	-.00021	.03197	.02991	-.03903