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RESULTS OF TRANSONIC WIND TUNNEL INVESTIGATIONS TO DETERMINE THE EFFECTS OF NOZZLE GEOMETRY AND JET PLUME ON THE AERODYNAMICS OF A BODY OF REVOLUTION

James H. Henderson, et al

Chrysler Corporation

Prepared for:

Army Missile Command

November 1972

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TECHNICAL REPORT

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November, 1972

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By

James H. Henderson, AMSMI

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Results of Transonic Wind Tunnel Investigations to Determine the Effects of Nozzle Geometry and Jet Plume on the Aerodynamics of a Body of Revolution.

By: James H. Henderson

A B S T R A C T

A transonic wind tunnel test was conducted by the Army Missile Command, Redstone Arsenal, on a base drag research missile model in the Cornell Aeronautical Laboratory (CAL) 8-Foot Transonic Wind Tunnel during June 1972.

The test was conducted to investigate the effects of nozzle geometry on jet plume characteristics at high thrust levels and to study the effects of nozzle geometry on base pressure at low thrust levels. Model external and nozzle internal static pressure measurements were made on several nozzles, while base pressure measurements were obtained on all nozzles.

The investigations were conducted at Mach numbers from .70 to 1.20 over an angle of attack range from -6 to +6 degrees.

This report presents details of the test program, an outline of the test procedures and the results of the investigations in plotted form.

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NOMENCLATURE

SYMBOL	SAISAC SYMBOL	DEFINITION
C_T	CT	Nozzle thrust coefficient
D^*		Nozzle throat diameter - inches
D_A		Shroud internal diameter = 2 inches
D_B	DB or D	Model body diameter = 2.50 inches
D_j	DIA-J	Nozzle exit diameter - inches
L		Nozzle length - inches
M_∞	MACH	Nominal free stream Mach number
M_j	MACH-J	Nozzle exit Mach number
P_ℓ	PL	Local static pressure - psf
P_∞	PF	Freestream static pressure - psf
P_b	PB	Base static pressure - psf
P_c	PC	Nozzle chamber total pressure - psi
P_f		Face static pressure - psf
PJC		Static to total pressure ratio at the nozzle exit $(1 + .2M_j^2)^{-3.5}$
P_T	PT	Tunnel total pressure - psf
R		Sonic throat radius of curvature in the axial direction - inches
T^*		Axial dimension, measured from nozzle throat - inches
U		Radial dimension, measured from nozzle centerline - inches
X	X	Distance of pressure orifice forward of model base - inches
α	ALPHA	Model angle of attack - degrees, positive nose up
θ_j	THETAJ	Nozzle exit angle - degrees

INTRODUCTION

During the past few years, the Army Missile Command has been interested in the various effects of the propulsive jet on missile aerodynamics. These effects include the detrimental effects due to jet plumes at high levels of thrust, high levels of drag on the missile afterbody due to low and moderate thrust level jets, and the effects of various jet parameters on prediction of optimum afterbody shape for improved drag and stability characteristics. Past transonic tests (reference 1 and 2) at Cornell Aeronautical Laboratory (CAL) and supersonic test (reference 3) have indicated that adverse plume effects could be alleviated by changes in nozzle geometry. For example lengthening the divergent portion of the nozzle delays the onset of adverse effects to higher levels of thrust (reference 4). Since increasing nozzle length results in increased missile weight and length, tradeoffs are necessary to arrive at the proper design. The primary purpose of the present test is to investigate effects of nozzle geometry on jet plume characteristics. A secondary purpose is to investigate nozzle geometry effects on base pressure at low levels of thrust where base drag is important.

CONFIGURATIONS INVESTIGATED

The basic strut-mounted model utilized for these tests consists of a body of revolution, 2.5 inches in diameter and 32.5 inches in length having a 4-caliber tangent ogive nose and a cylindrical afterbody. Cold dry air, is supplied to the nozzle through a hollow swept strut which also houses the instrumentation lines and supports the model to the standard sting support system of the CAL facility. A drawing of the model installed in the tunnel is given in Figure 1. Figure 2 shows close up photographs of several configurations tested.

Nozzle configurations investigated included five conical shapes, four contoured shapes and three shrouded nozzles.

Each conical nozzle had an exit Mach number of 2.7. The jet exit to base diameter ratio (D_J/D_B) varied between 0.60 and 0.95. Nozzle geometry and static base pressure orifice locations are summarized in Figure 3. No nozzle internal static pressures were measured for the conical shapes.

Geometry and pressure instrumentation details for the contoured nozzles are presented in Figure 4. The (-1) nozzle, which is 4.803 inches long, is designed to have uniform exit flow with an exit Mach number of 3.0. Nozzles (-2) and (-3) have the same geometry as nozzle (-1) but have been cut off to lengths of 3.8 inches and 2.6 inches, respectively. Their exit Mach numbers are 2.9 and 2.7, respectively. Nozzle (-4) is designed as a uniform exit flow nozzle with an exit Mach number of 2.7 having the same throat geometry as the first three nozzles. Internal static pressures are measured on nozzles (-1), (-2), and (-3) only.

The shroud configuration consists of a cylindrical chamber into which interchangeable nozzles exhaust. The chamber is 1.5 inches deep and has a diameter of 2.0 inches. The exit planes of the inserted nozzles are 1.5 inches from the model base (flush with the forward wall of the chamber). The shroud may be vented to free stream by four 0.14 diameter holes through the shroud wall. Investigations were conducted with the shroud in both vented and unvented configurations. Two sonic nozzles and one supersonic nozzle were tested with the shroud. Shroud geometry, nozzle insert geometry, and base and internal orifice locations are shown in Figure 5.

TEST CONDITIONS

The test consisted of 71 runs during which the model plenum pressure or the angle of attack was varied while the free-stream test conditions were held constant at various Mach numbers. The tunnel was operated with a constant mass of air in the circuit corresponding to a wind-off total pressure of .25 atmospheres. One series of runs was conducted at conditions corresponding to a wind-off total pressure of .70 atmospheres. Due to the reduced efficiency of the tunnel evacuation pumps at the low density at which the tunnel was operated, the large amounts of air which were at times injected into the tunnel circuit through the nozzle could not always be pumped out fast enough, resulting in slight variations of the test conditions throughout a run. A detailed run schedule is presented in Table I.

The tunnel facility 4 and 15 pounds per second air supply systems, which deliver cold dry air, were used consecutively in order to obtain the required range of model plenum pressures during a run. A leak was found in the 4 pounds per second system after Run 6, resulting in the use of the 1 and 15 pounds per second systems for the remainder of the test.

The model was supported by a hollow swept strut, through which the nozzle air was supplied, and which also housed the instrumentation lines. The strut in turn was mounted in the standard sting support system. A model installation drawing is shown in Figure 1.

Each nozzle also contained 10 external surface static pressure orifices in addition to the internal surface static and base pressure orifices. One total and two static pressure orifices were installed in the model plenum chamber.

The external nozzle surface and base static pressures were measured by two 12.5 psi pressure transducers in two Scanivalves mounted on the model support strut. The nozzle internal surface static pressure orifices were measured by four 500 and six 1000 psi pressure transducers. The pressures in the model plenum chamber were measured using two 1500 psi and one 2000 psi pressure transducers.

The weight flow through the high pressure air supply systems was measured using ASME standard orifice plates (Reference 5). The static pressures upstream of the orifice plates were measured with 2500 psi pressure transducers and the differential pressures across the orifices with 200 or 250 psi pressure transducers.

The temperatures upstream of the orifice plates and in the model plenum were measured with five iron-constantan thermocouples.

The model angles of attack were set using electrolytic potentiometers. Angles of attack were monitored at all times using the angle of attack digital voltmeter (Reference 6).

The various pressure transducers used during this program were calibrated prior to testing by applying static loads as discussed in Reference 7. The electrolytic bubbles and the angle of attack digital voltmeter were calibrated with a precision inclinometer during the installation of the model in the test section.

A complete description of the Cornell Aeronautical Laboratory 8-Foot Transonic Wind Tunnel is contained in Reference 8.

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DATA REDUCTION AND ACCURACY

No corrections of any type have been applied to the data contained in this report to account for wind tunnel wall effects. It has been found that within the accuracy required, theoretically determined wall interference corrections do not have to be applied in the perforated test section of the CAL 8-Foot Transonic Wind Tunnel, if the blockage produced by the model does not exceed a maximum of 1 percent.

Above a Mach number of 1, the perforated walls are effective in attenuating shock and expansion waves emanating from the model, thus reducing the effect of reflections from the walls. Although complete attenuation is not obtained, experience has indicated that in general the effect of residual reflections is negligible on a model of this size. Some experimental substantiation for this belief is presented in Reference 9.

It is estimated that the model angle of attack was measured with an accuracy of $\pm.05$ degrees.

The pressure transducers in the Scanivalves were calibrated to an accuracy of ± 2 pounds per square foot. The pressure transducers measuring differential pressures from the metering orifices and the pressures from orifices 24 through 27 were calibrated to an accuracy of .08 pounds per square inch. The transducers measuring the pressures from orifices 28 through 33 were calibrated to an accuracy of .4 pounds per square inch, while the transducers measuring the plenum chamber pressures and the high pressure air supply system line pressures were calibrated to accuracies of 1.25 and 2 pounds per square inch, respectively.

Repeat points were not obtained during the test making an estimate of the data repeatability impossible.

The nozzle jet thrust coefficient was calculated by the following equations:

(Contoured and conical nozzles)

$$C_T = [(D_j/D_B)^2] \quad [(PJC)\ (p_c/p_\infty)(144)(1.4\ M_j^2 + 1) - (1)]/[(.7)(M_\infty)^2]$$

(Shrouded nozzles)

$$C_T' = C_T + \left[\frac{(D_A)^2 - (D_j)^2}{(D_B)^2}\right] \quad \left[\frac{(p_f/p_\infty) - (1)}{(.7)(M_\infty)^2}\right]$$

where p_f = average nozzle face pressure = $\dfrac{(p_{24} + p_{25} + p_{26} + p_{27})}{(4)}$

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TEST 17 - 043 PRESSURE DATASET COLLATION SHEET

☐ PRETEST
☒ POSTTEST

DATASET IDENTIFIER	CONFIGURATION	MODEL SECTION	GEO. CONFIG.	SCHD. α	SCHD. P_c	PARAMETER/VALUES M_j	D_j	θ_j	P_T	NO. OF RUNS	MACH NUMBERS	.7	.9	1.0	1.2		
RUC001	SHROUDED NOZZLE (-3)			0	A	1.0	.5	-	atm. .25			9	8	7	6		
02	(-4)	PORTS CLOSED		0	A	1.0	1.0	-	.25			13	12	11	10		
03	(-2)			0	A	2.7	.75	-	.25				2	4	5		
04	(-3)	PORTS OPEN		0	A	1.0	.5	-	.25			21	20	19	18		
05	(-4)			0	A	1.0	1.0	-	.25			17	16	15	14		
							D_j/D_e										
RUC006	CONTOURED NOZZLE (-1)			0	A	3.0	.9	0	.25			28	27	26	25		
07	(-2)			0	A	2.9	.89	1.7	.25			36	35	34	33		
08	(-3)			0	A	2.7	.83	5.7	.25			32	31	30	29		
09	(-4)			0	A	2.7	.78	0	.25			40	39	38	37		
RUC010	CONICAL NOZZLE (-1)			0	A	2.7	.95	20	.25			67	66	65	64		
11	(-1)			0	A	2.7	.95	20	.70			68	69	70	71		
12	(-2)			0	A	2.7	.90	20	.25			51	48	45	44		
13	(-3)			0	A	2.7	.70	20	.25			63	62	61	60		
14	(-4)			0	A	2.7	.60	20	.25			56	59	58	57		
15	(-5)			0	A	2.7	.83	11	.25			55	54	53	52		
16	(-2)			B	0	2.7	.90	20	.25				49	46	41		
17	(-2)			B	105	2.7	.90	20	.25				50	47	42		
18	(-2)			B	320	2.7	.90	20	.25						43		

GEOMETRY CONFIGURATION

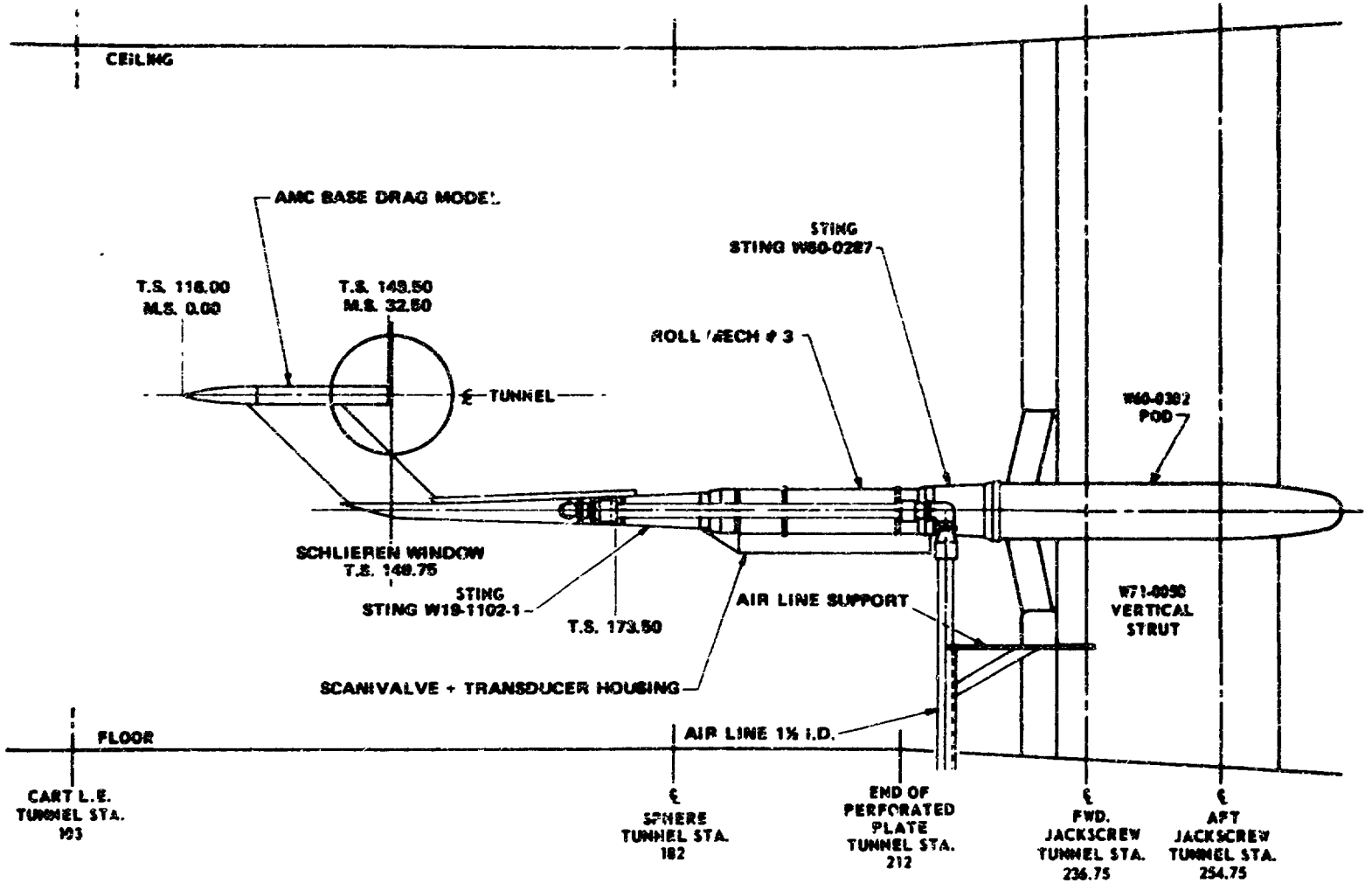
α OR β SCHEDULES

P_c (A) = 0, 4, 7, 11, 16, 22, 33, 50, 75, 105, 160, 220, 320, 440, max; (PSI)

α (B) = 0, $\pm 3^\circ$, $\pm 6^\circ$

TABLE II. DATA PLOT PRESENTATION SUMMARY

PLOT TITLE	DATA PRESENTATION	CONDITION VARYING	PAGES
Base Pressures as a Function of Jet Thrust Coefficient	PB/PF vs CT		
Shrouded Nozzle			1-19
Contoured Nozzle			20-35
Conical Nozzle			36-59
Base Pressures as a Function of Angle of Attack	PB/PF vs Alpha		
Conical Nozzle			60-66
Missile Exterior Pressures	PL/PF vs X/D	CT	
Shrouded Nozzle			67-102
Contoured Nozzle			103-128
Conical Nozzle			129-175
Missile Exterior Pressures	PL/PF vs X/D	Alpha	
Conical Nozzle			176-182
Nozzle Wall Pressures	PL/PF vs X/D	CT	
Shrouded Nozzle			183-218
Contoured Nozzle			219-235



INSTALLATION DRAWING

BASE DRAG RESEARCH MISSILE MODEL

Figure 1.

A-14

MODEL PHOTOGRAPH

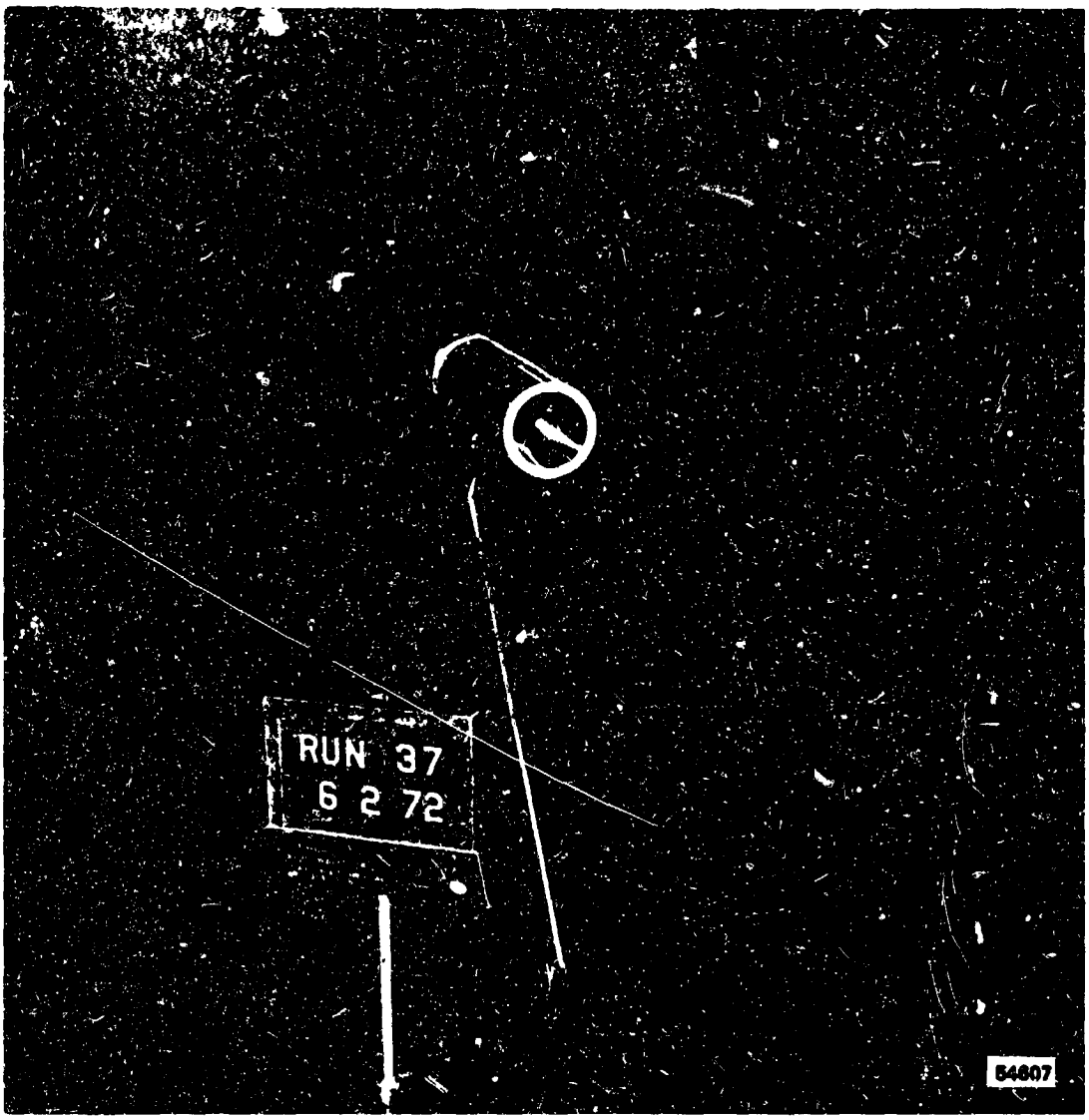
BASE DRAG RESEARCH MISSILE MODEL

Figure 2a

MODEL PHOTOGRAPH

BASE DRAG RESEARCH MISSILE MODEL

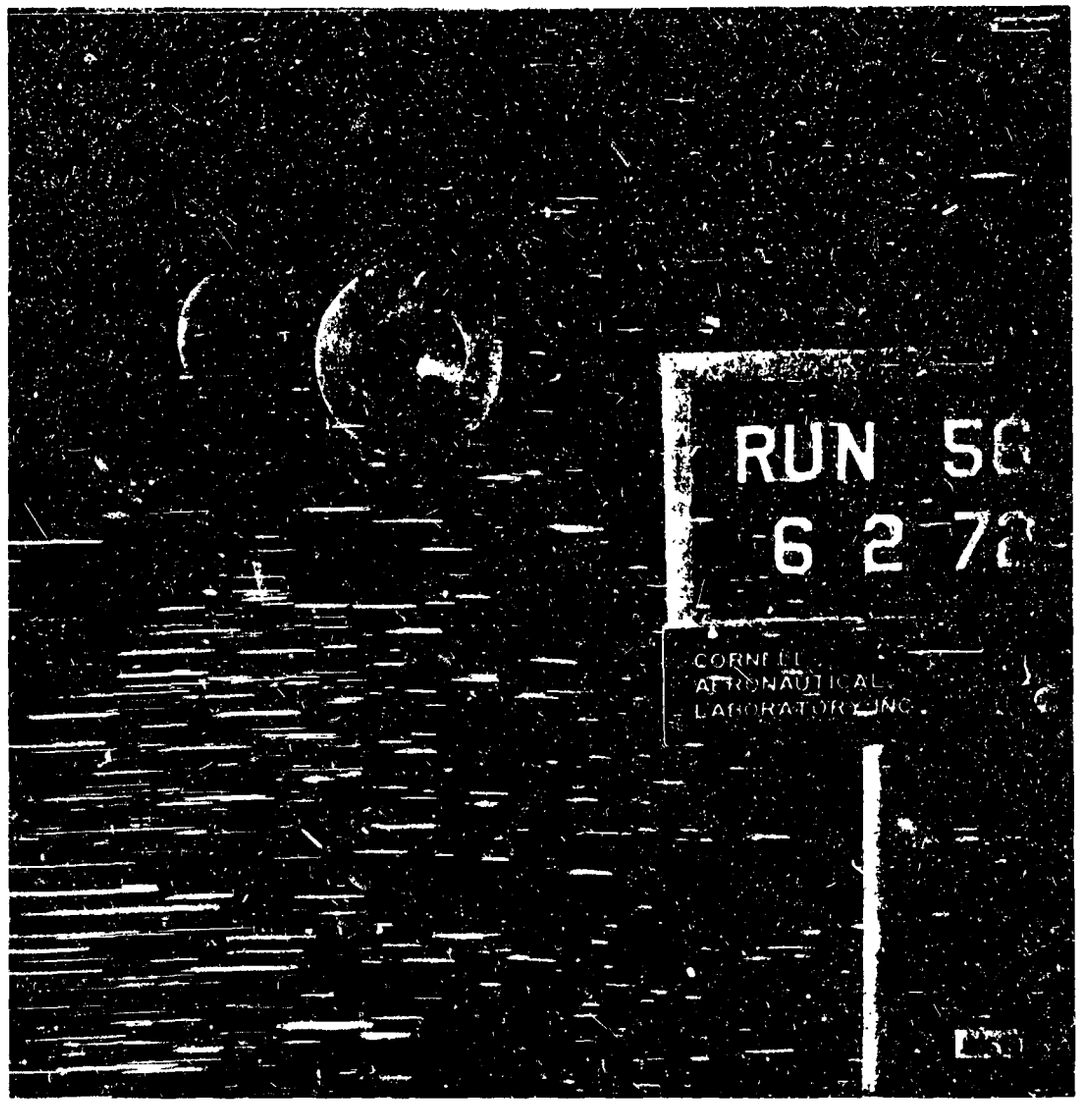
Figure 2b



MODEL PHOTOGRAPH

BASE DRAG RESEARCH MISSILE MODEL

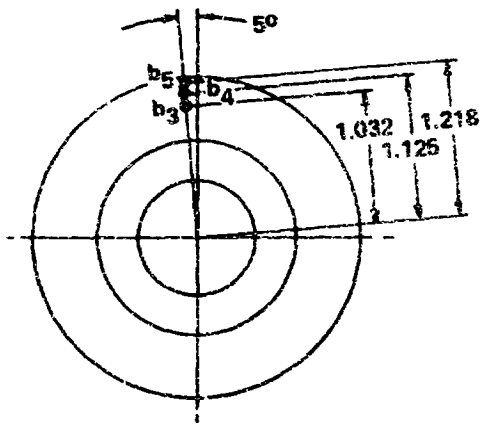
Figure 2c



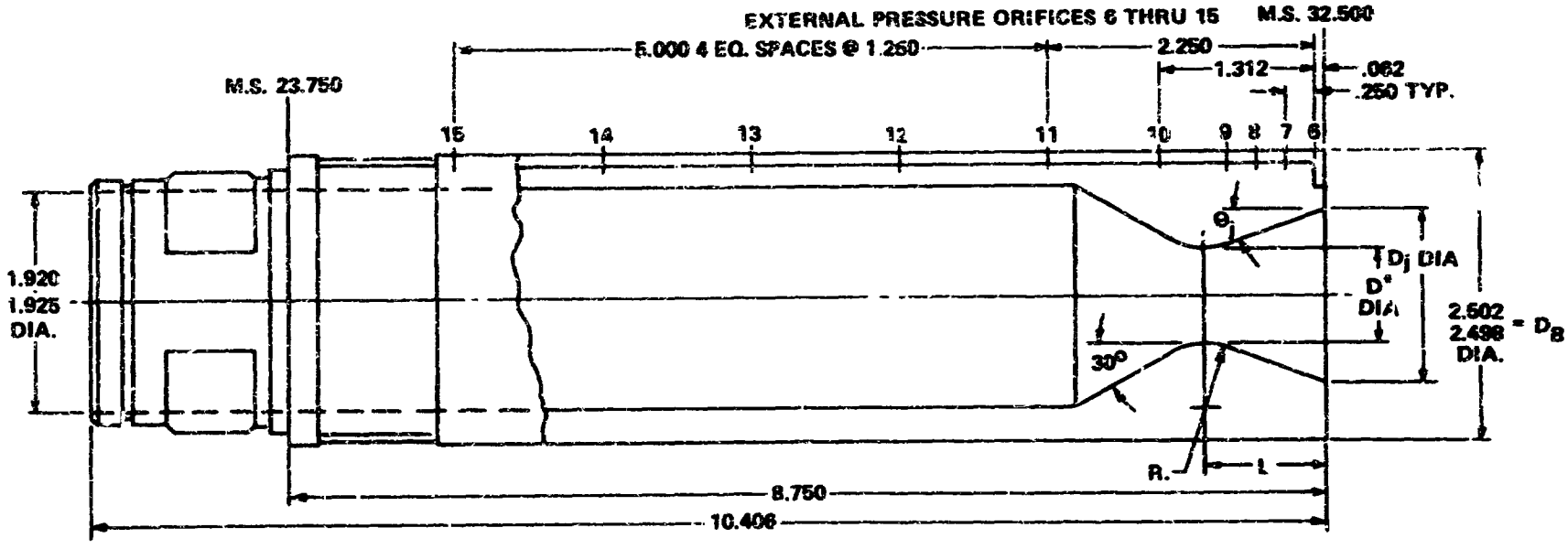
MODEL PHOTOGRAPH

BASE DRAG RESEARCH MISSLE MODEL

Figure 2d



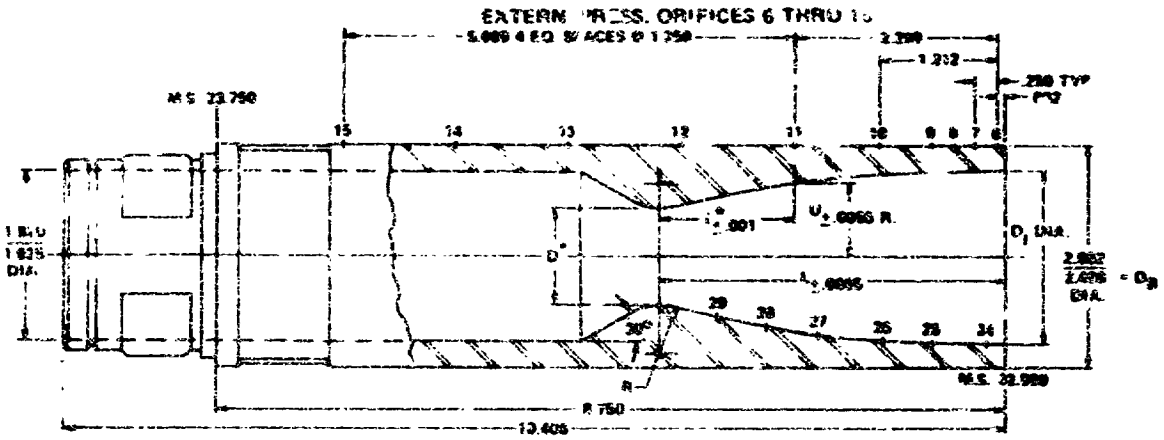
NOZZLE	D^* -.000 +.001	D_j -.000 +.001	L ±.003	R	θ_j	D_j/D_B	INSTALLED BASE PRESSURE ORIFICES b_3	b_4	b_5
-1	1.331	2.375	1.533	.562	20	.950	NO	NO	YES
-2	1.261	2.250	1.458	↓	↓	.900	NO	NO	↓
-3	.981	1.750	1.156	↓	↓	.700	YES	YES	↓
-4	.841	1.500	1.004	↓	↓	.600	YES	↓	↓
-5	1.094	2.084	2.600	↓	11	.834	NO	↓	↓

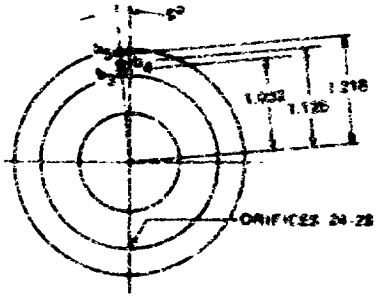


DETAILS CONICAL NOZZLES

BASE DRAG RESEARCH MISSILE MODEL

Figure 3





NOZZLE	D* .000 +.001	D1 .000 +.001	L ±.003	R	θ1	D1/D*	INSTALLED BASE PRESSURE ORIFICES		
							#3	#4	#6
−1	1.094	2.260	4.803	.562	6.6	.500	NO	NO	YES
−2	↓	2.226	3.820	↓	1.7	.890	↓	NO	↓
−3	↓	2.084	2.940	↓	5.7	.834	↓	YES	↓
−4	↓	1.952	3.808	↓	6.0	.781	YES	YES	↓

NOZZLE INTERNAL ORIFICE LOCATIONS

ORIFICE NO.	−1 T*	−2 T*	−3 T*	−4 T*
24	4.75	3.75	2.85	NONE
25	4.25	3.25	2.00	↓
26	3.75	2.50	1.50	↓
27	3.25	2.00	1.00	↓
28	2.50	1.50	.50	↓
29	2.00	–	0	↓

NOZZLE DIMENSIONS

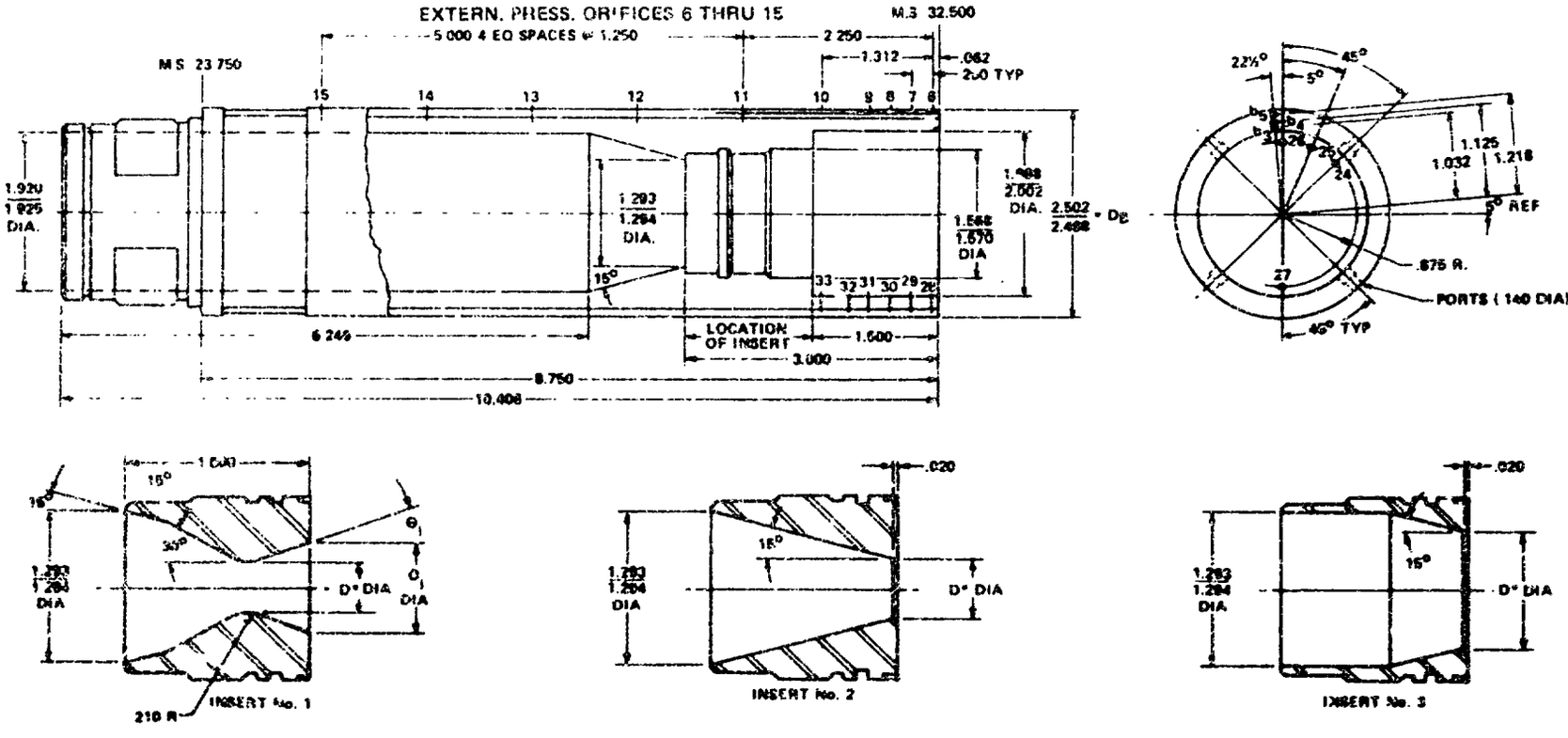
T*	−1, −2, −3 U	−4 U
0	.547	.547
.1	.556	.556
.2	.579	.577
.4	.631	.629
.6	.681	.666
.8	.730	.713
1.0	.781	.752
1.2	.829	.792
1.4	.870	.825
1.6	.900	.856
1.8	.942	.881
2.0	.972	.903
2.2	.996	.921
2.4	1.022	.936
2.6	1.042	.948
2.8	1.060	.958
3.0	1.075	.965
3.2	1.087	.970
3.4	1.098	.973
3.6	1.107	.975
3.8	1.113	.976
4.0	1.116	
4.3	1.123	
4.6	1.125	
4.8	1.125	

DETAILS CONTOURED NOZZLES

BASE DRAG RESEARCH MISSILE MODEL

Figure 4

A-20



NOZZLE NO	INSERT	D* -.000 +.001	D_I -.000 +.001	θ_I	D_I/D_B
-2	# 1	.420	.750	20	.30
-3	# 2	.500	.500	0	.20
-4	# 3	1.000	1.000	0	.40

DETAILS SHROUDED NOZZLES WITH INSERTS

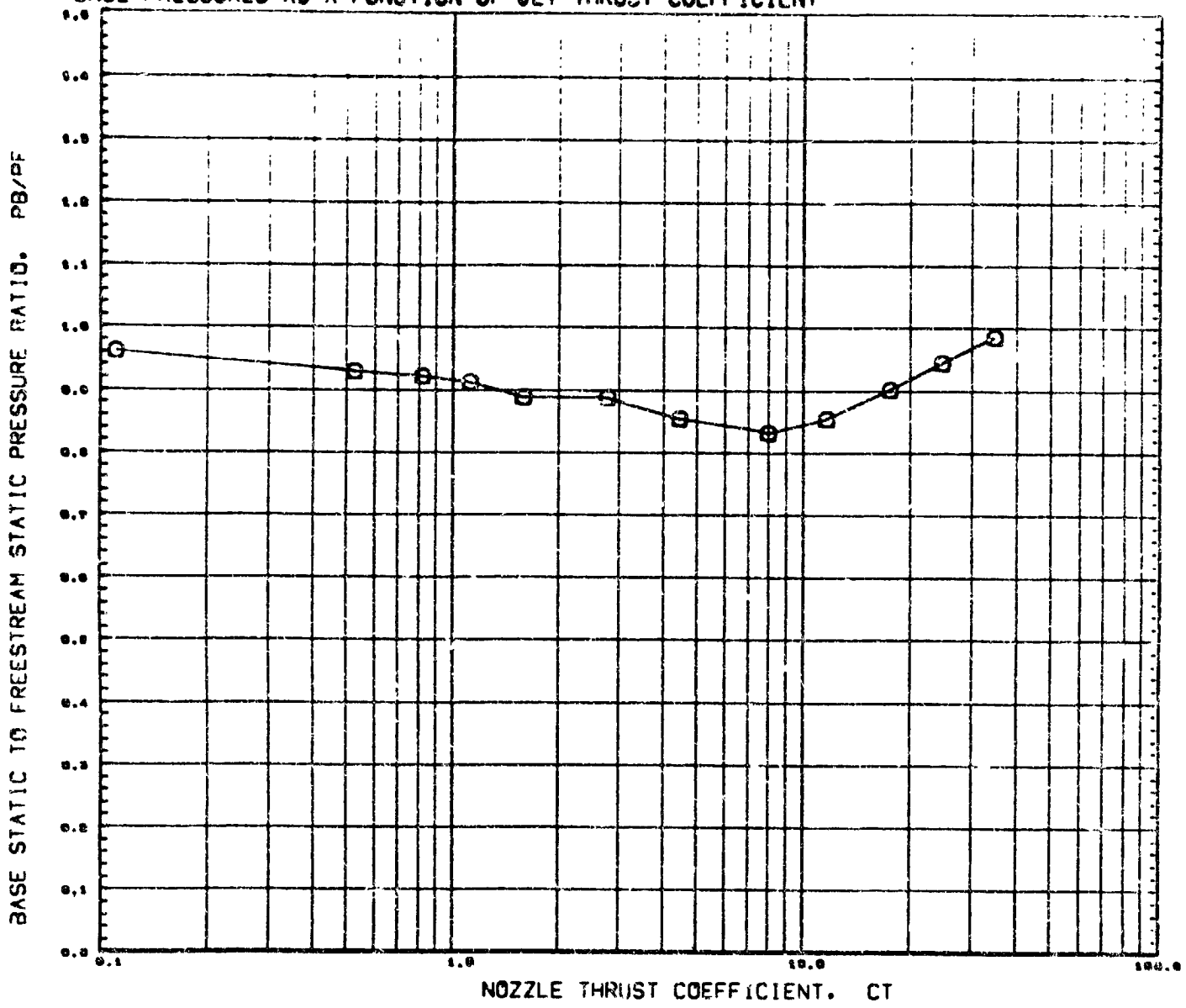
BASE DRAG RESEARCH MISSILE MODEL

Figure 5

A-21

P L O T T E D D A T A

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.701

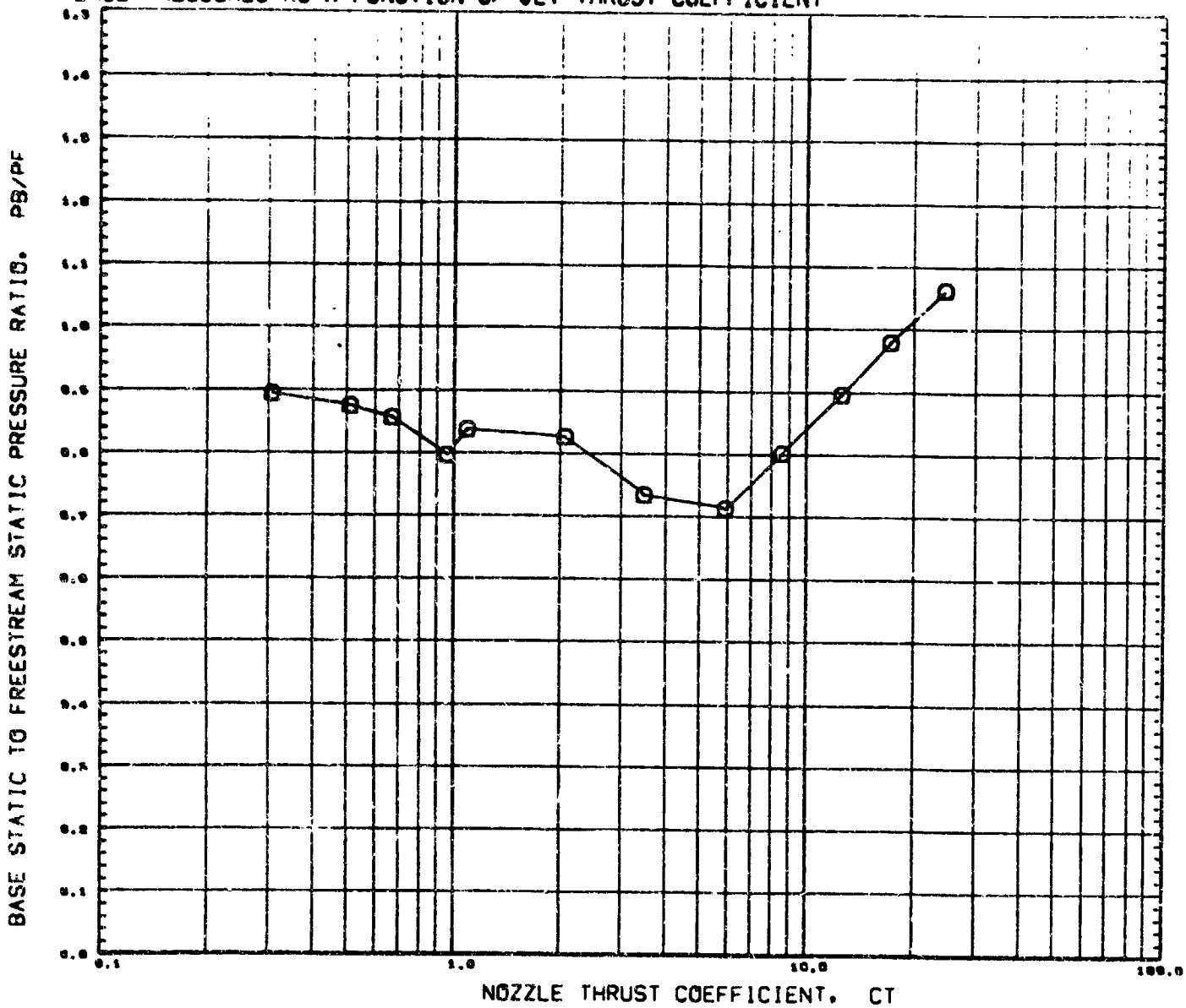
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.500		

REFERENCE FILE

AMC PLUME STUDY. SHROUDED NOZZLE(-3).PORTS CLSD (RUCB01)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



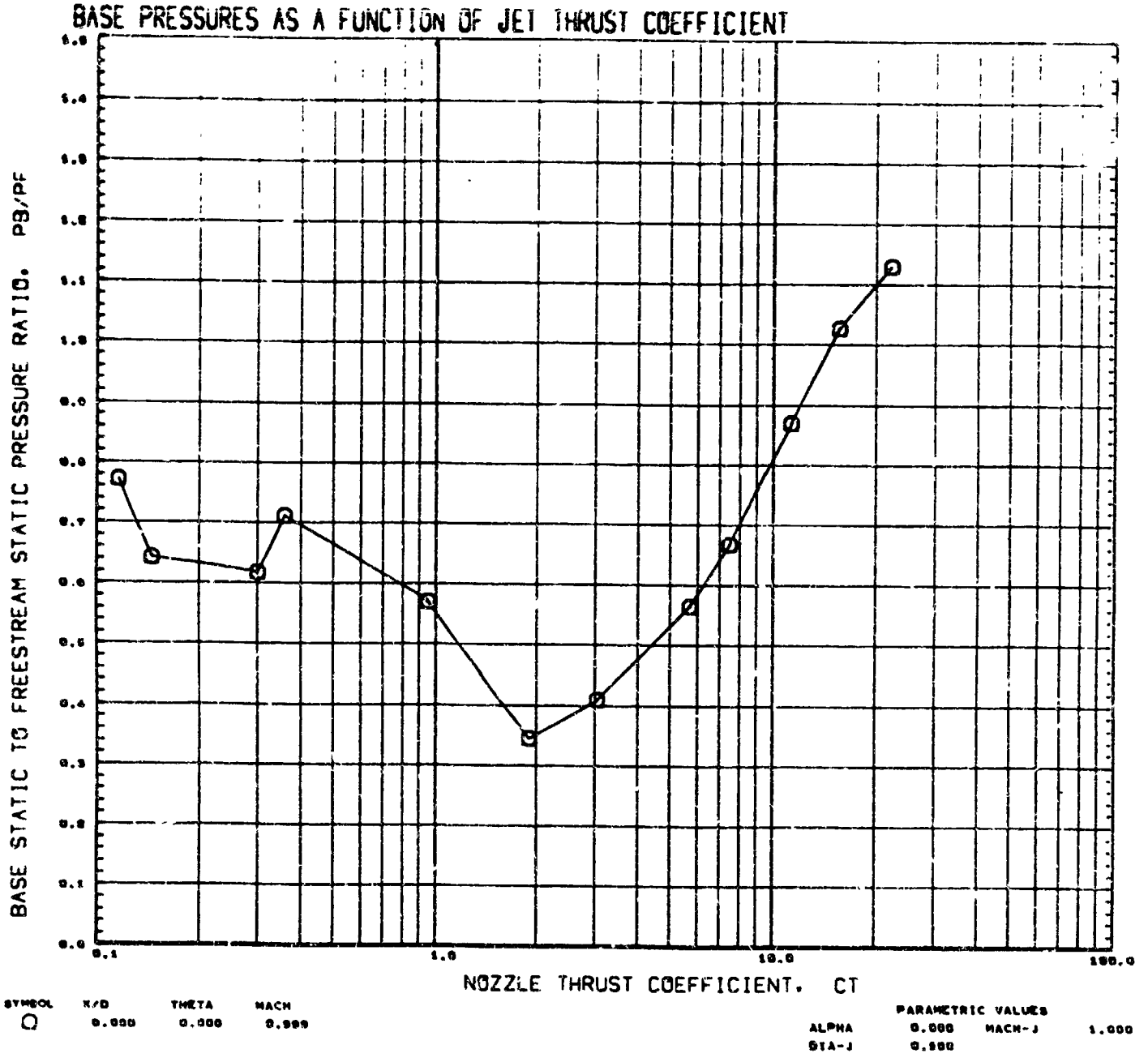
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.000

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
BETA-J	0.000		

REFERENCE FILE

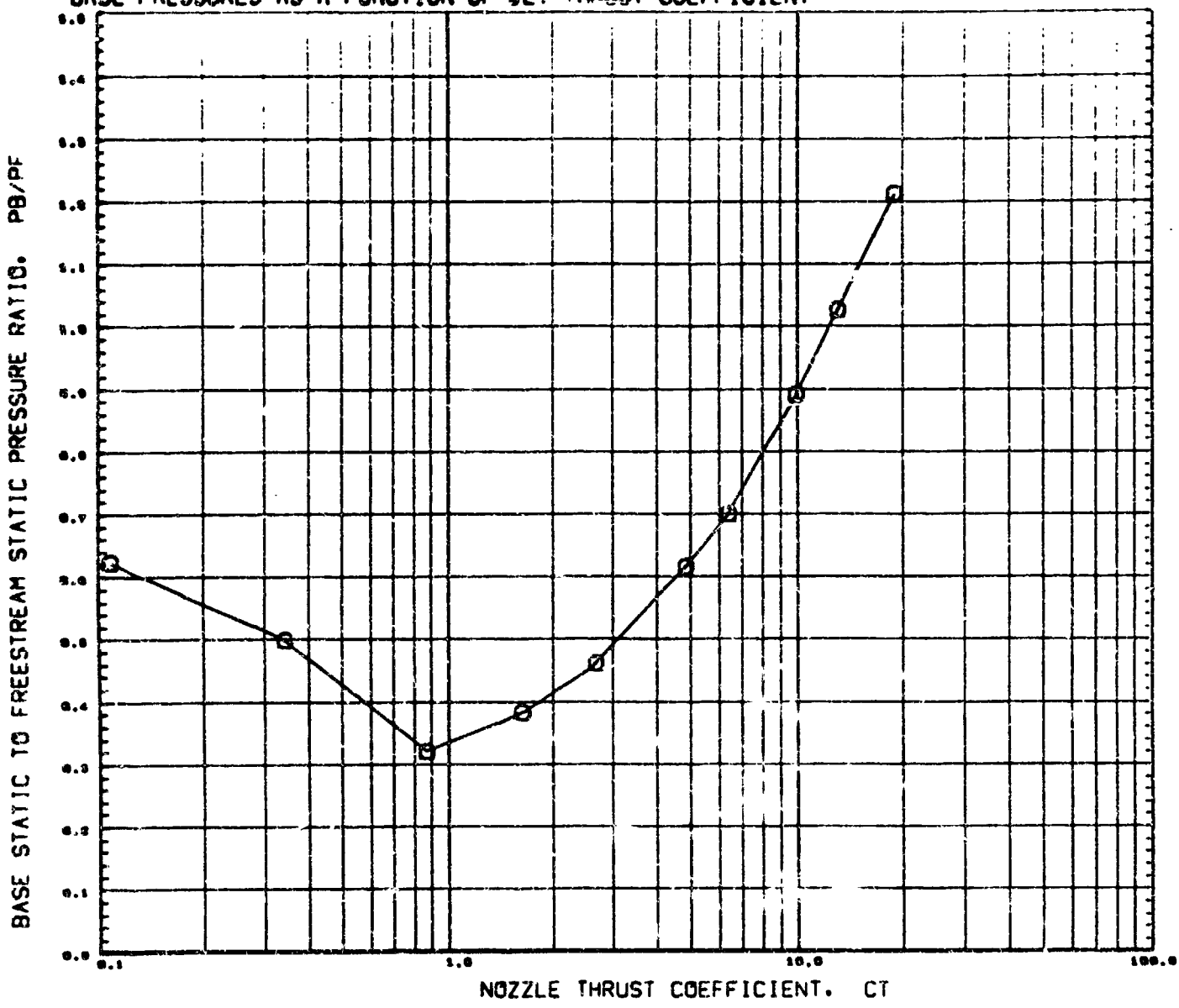
AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (FUCB01)



REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUC801)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
○	0.000	0.000	1.199

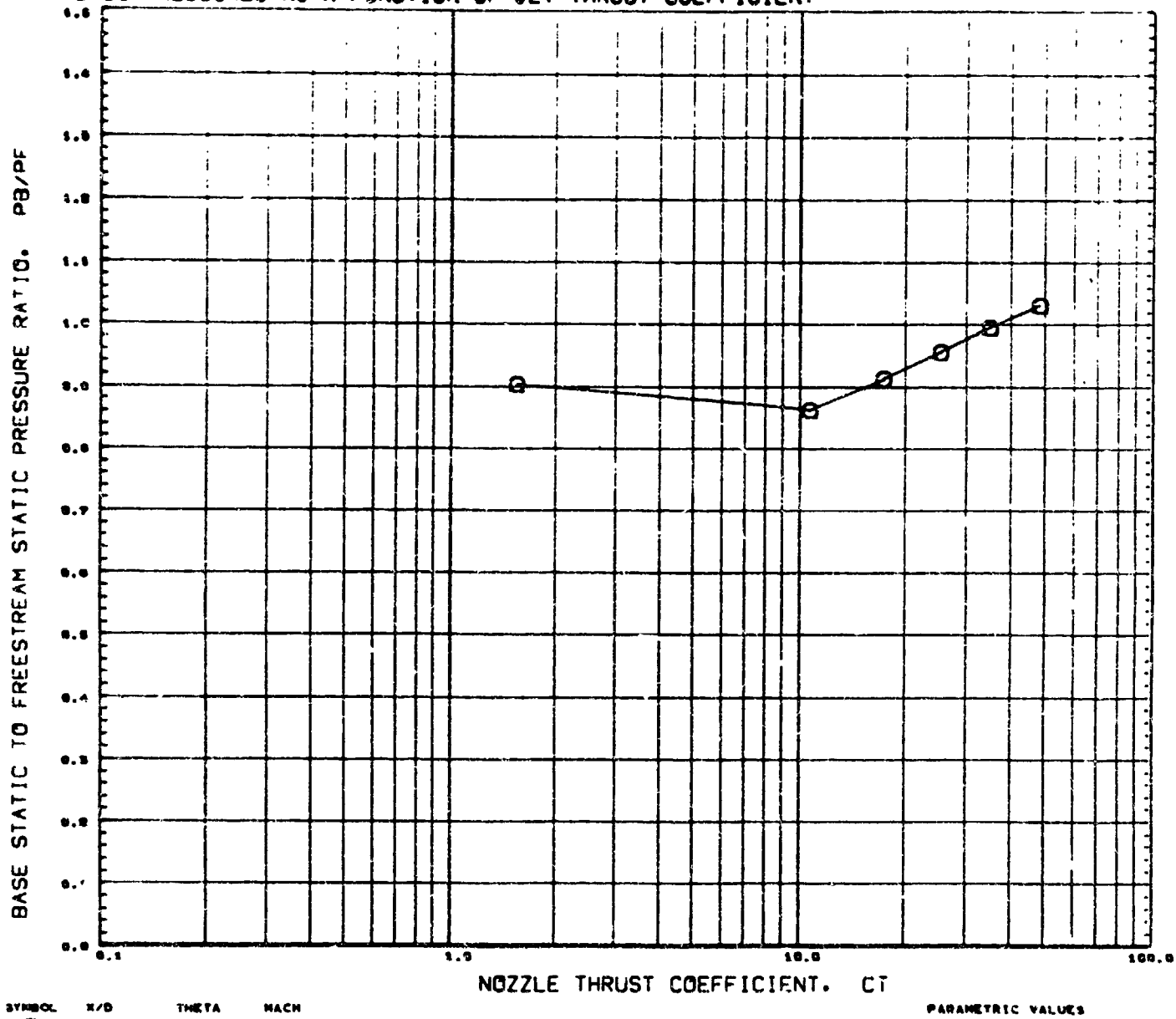
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.000		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUCB01)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



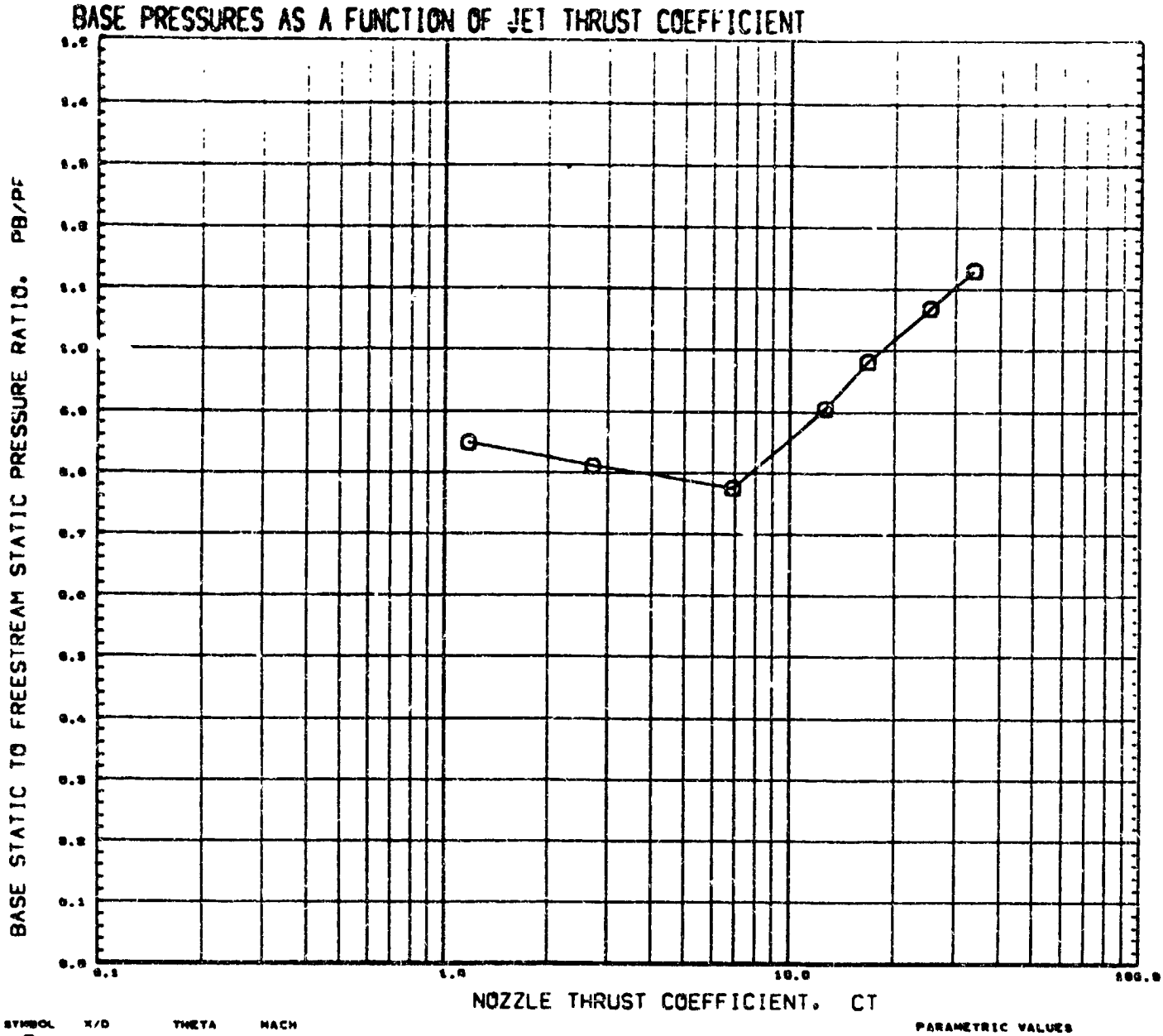
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.098

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

REFERENCE FILE

AMC PLUME STUDY. SHROUDED NOZZLE(-4).PORTS CLSD (RUCB02)



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.000

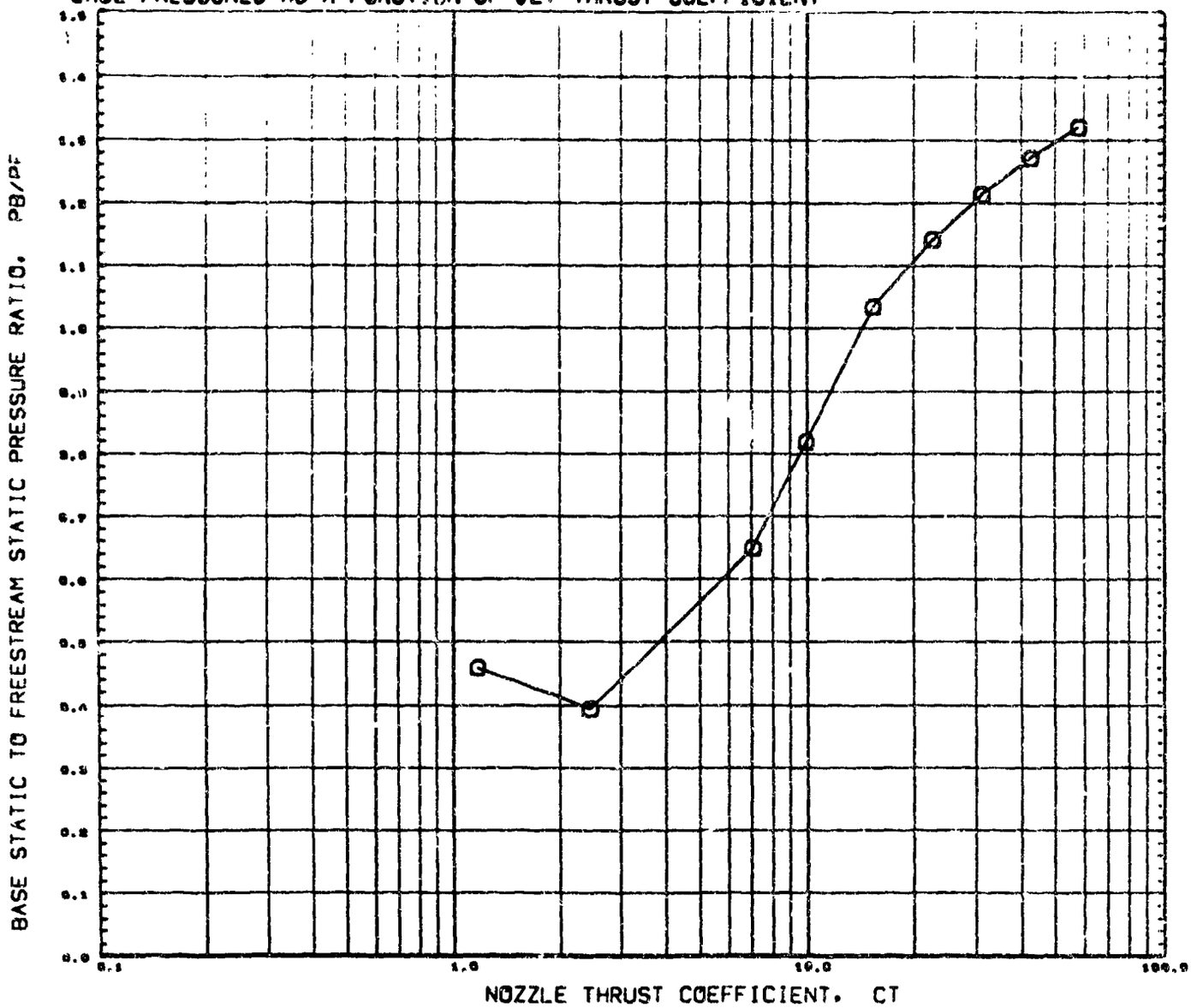
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS CLSD (RUCB02)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.002

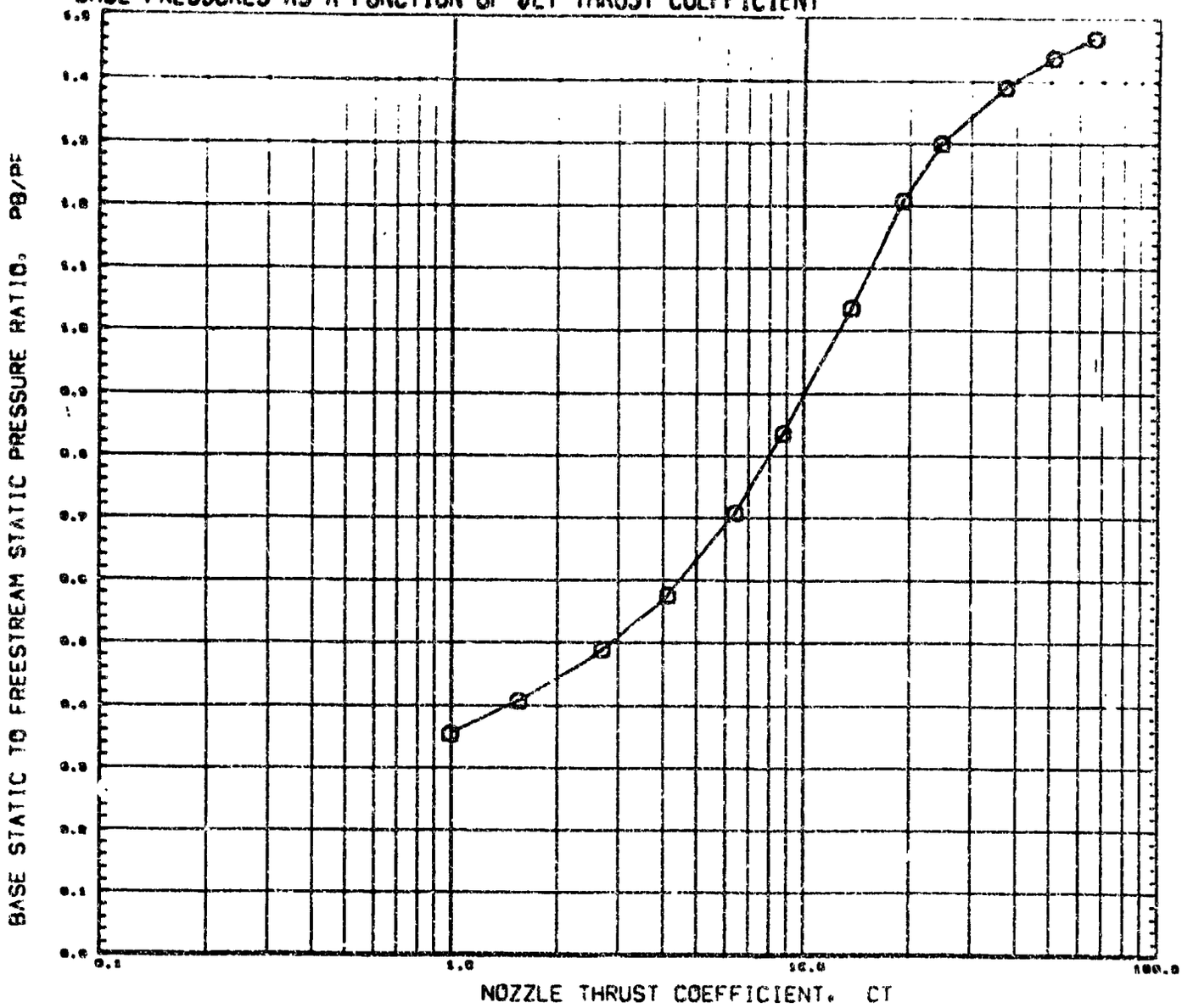
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS CLSD (RUCB02)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.200

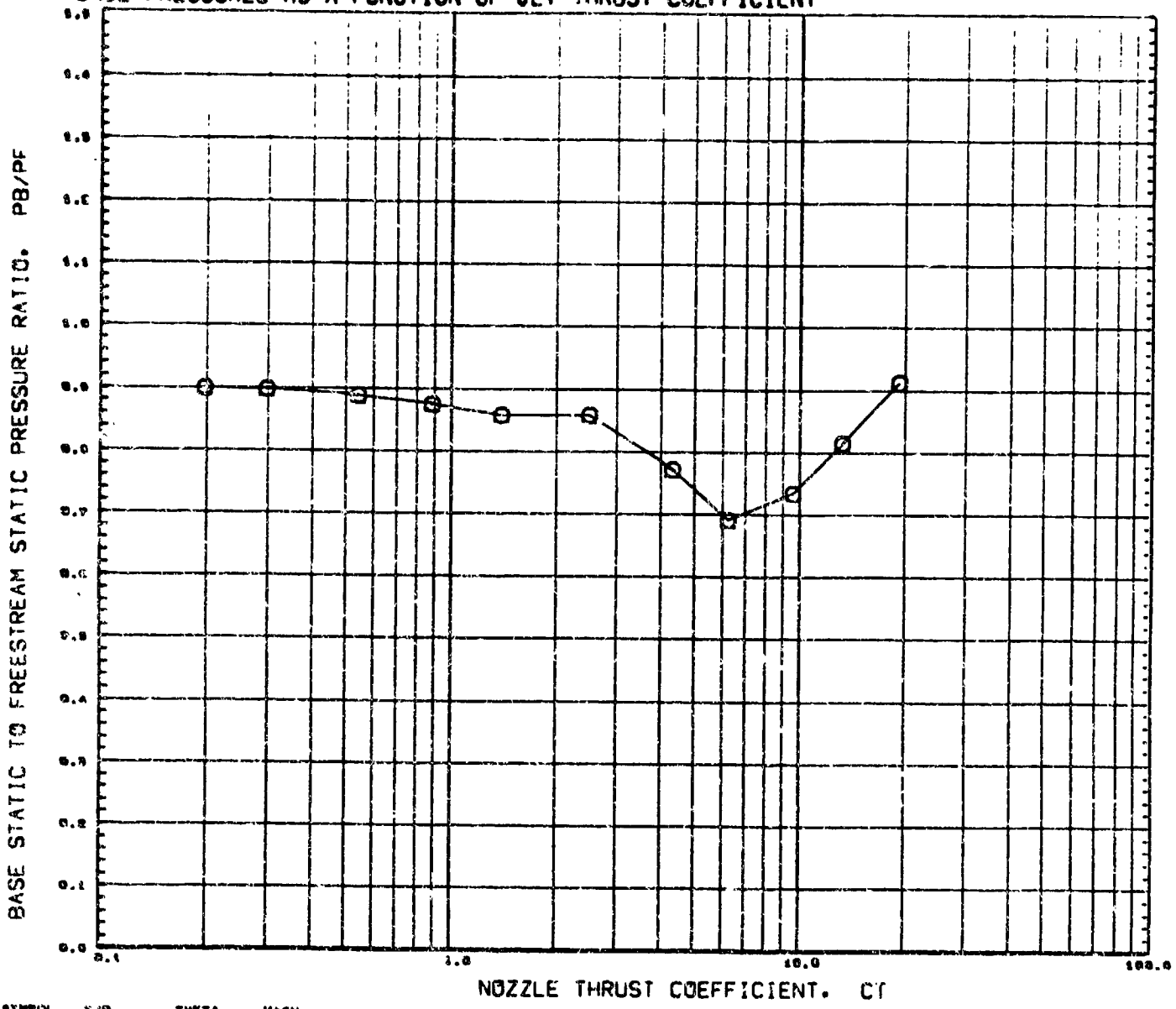
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS CLSD (RUCB02)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.901

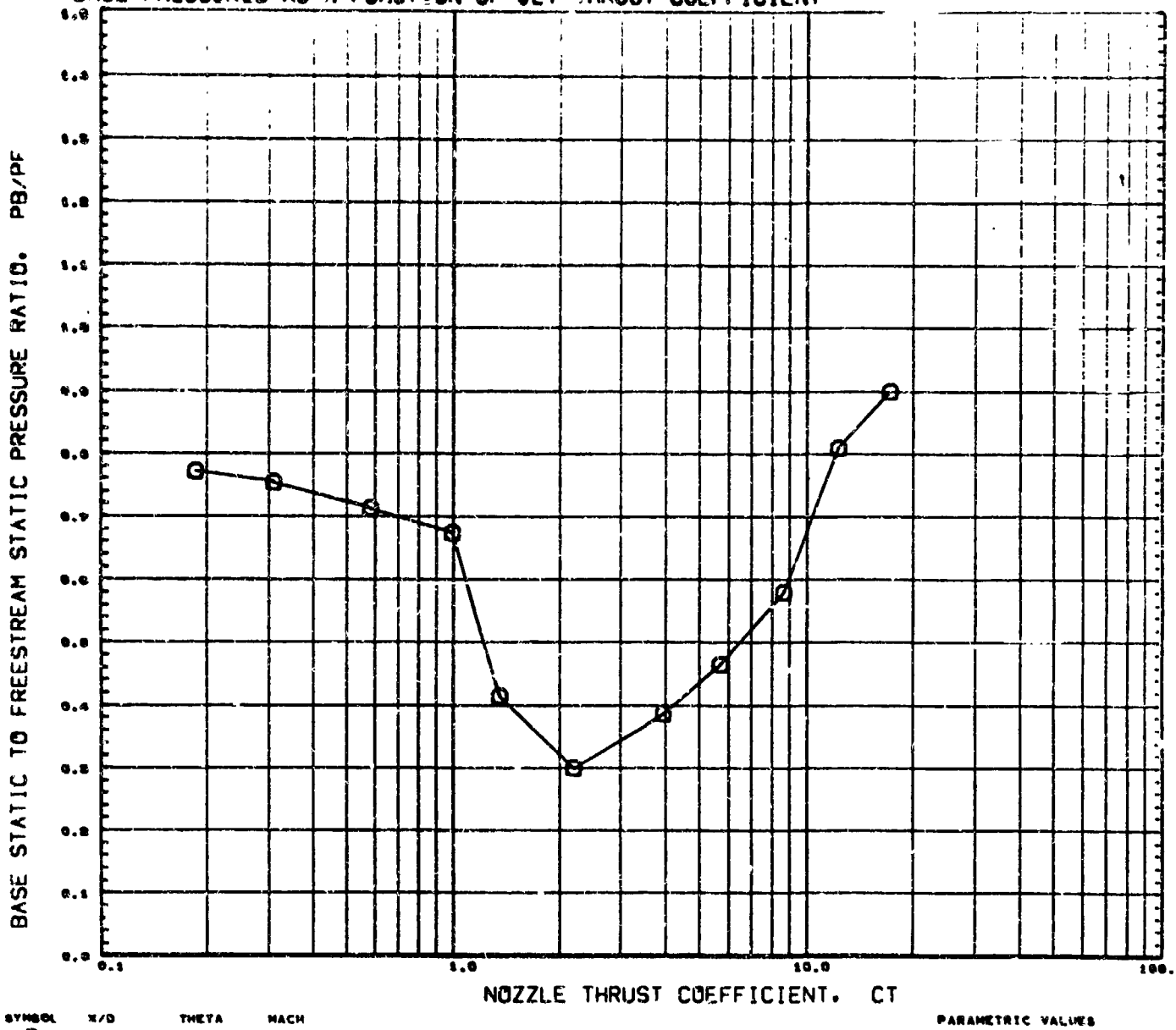
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
D/A-J	0.750		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-2),PORTS CLSD (RUCB03)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.000

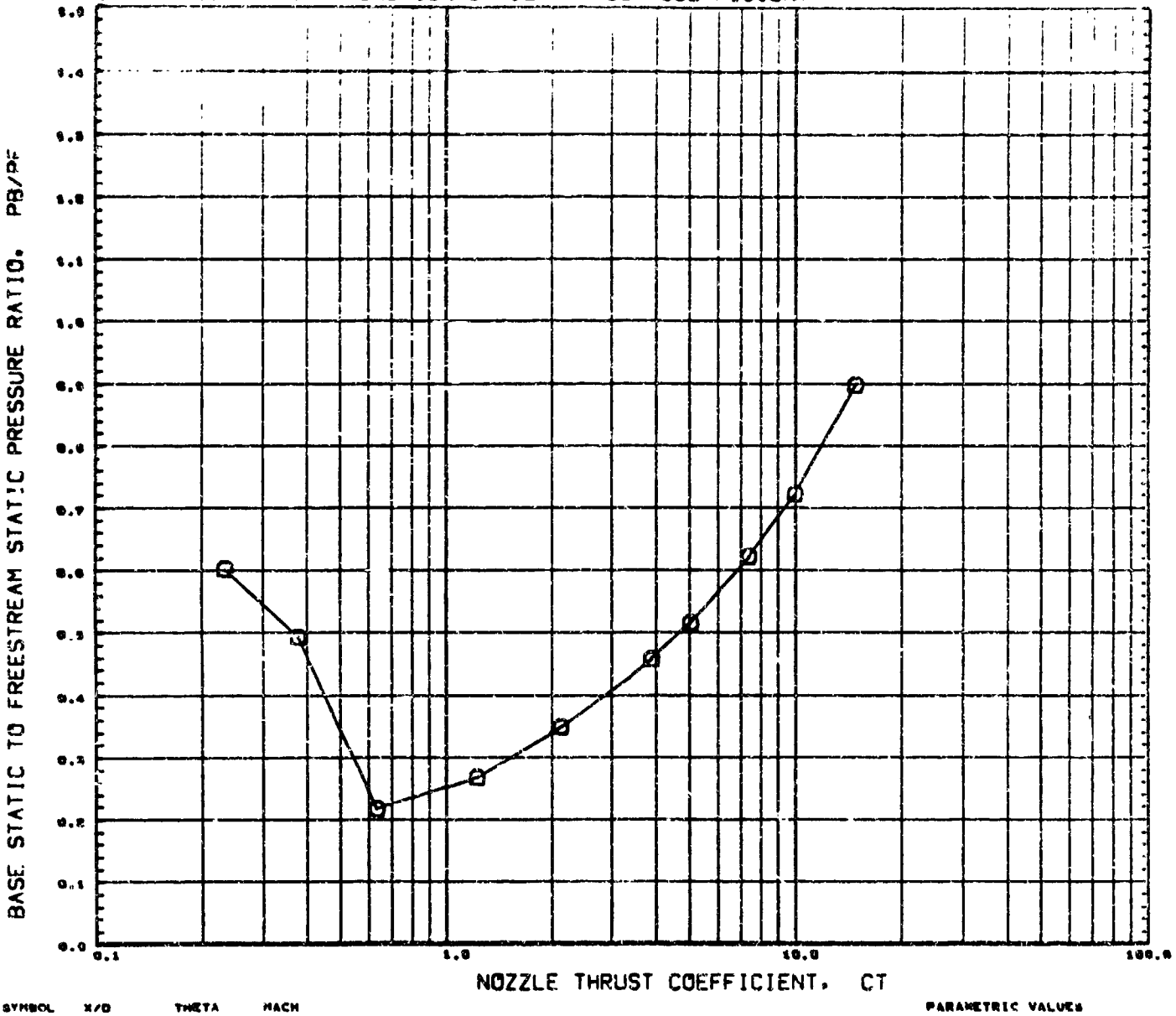
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DIA-J	0.75		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-2),PORTS CLSD (RUCB03)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.200

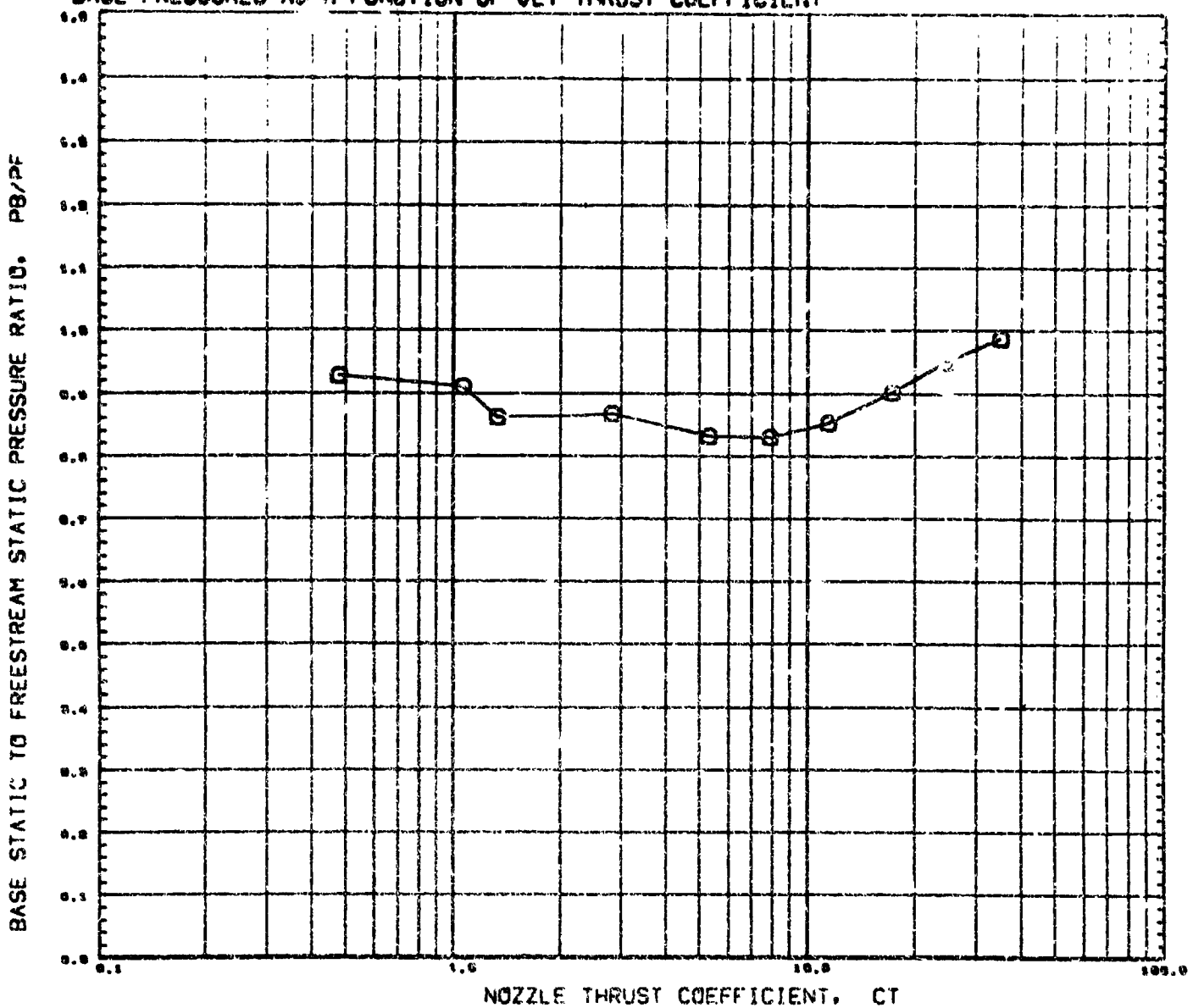
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DIA-J	0.750		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-2),PORTS CLSD (RUCB03)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.701

PARAMETRIC VAL

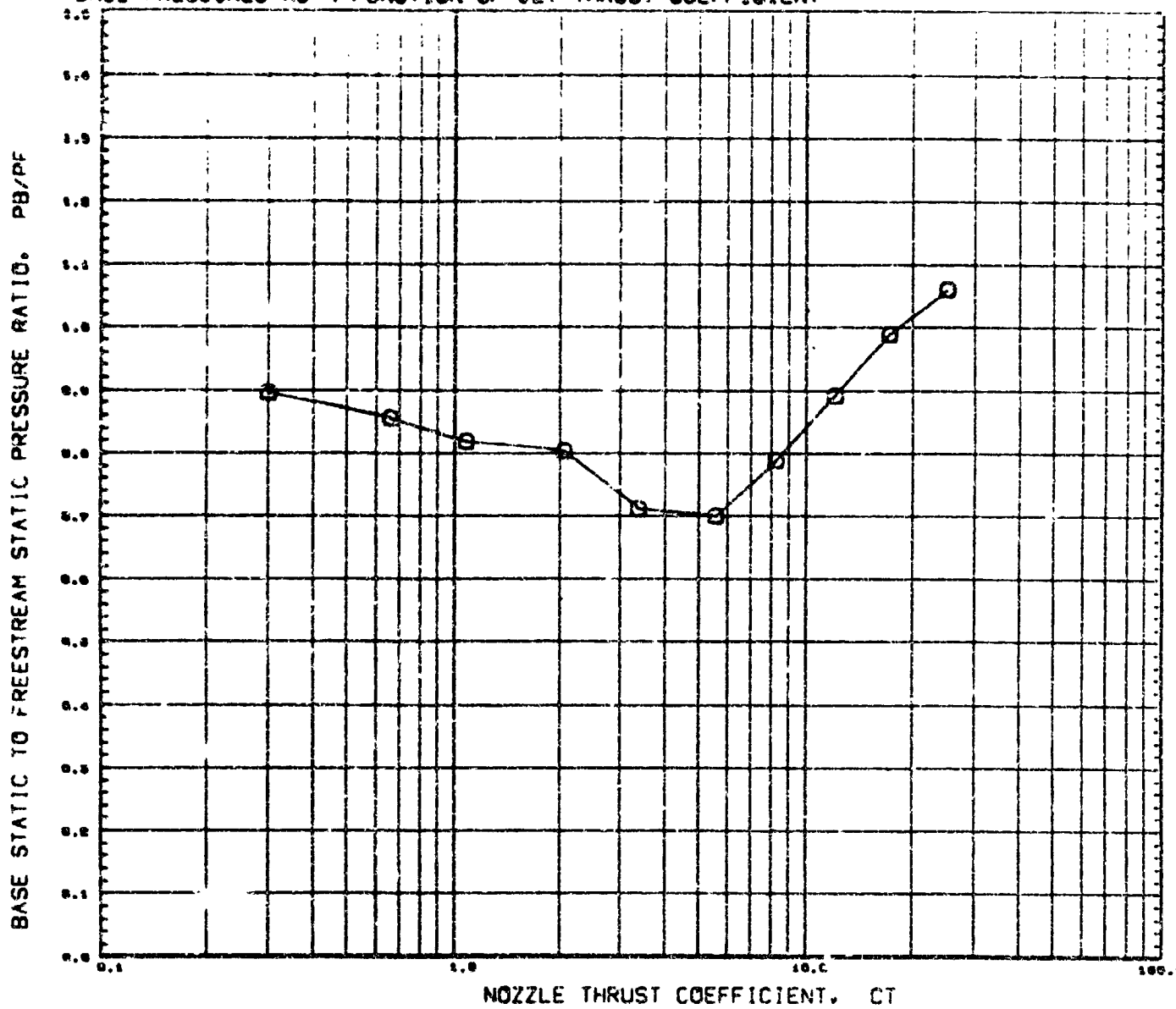
ALPHA 0.000 MACH-J 1.000

DIA-J 0.992

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCB04)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.000

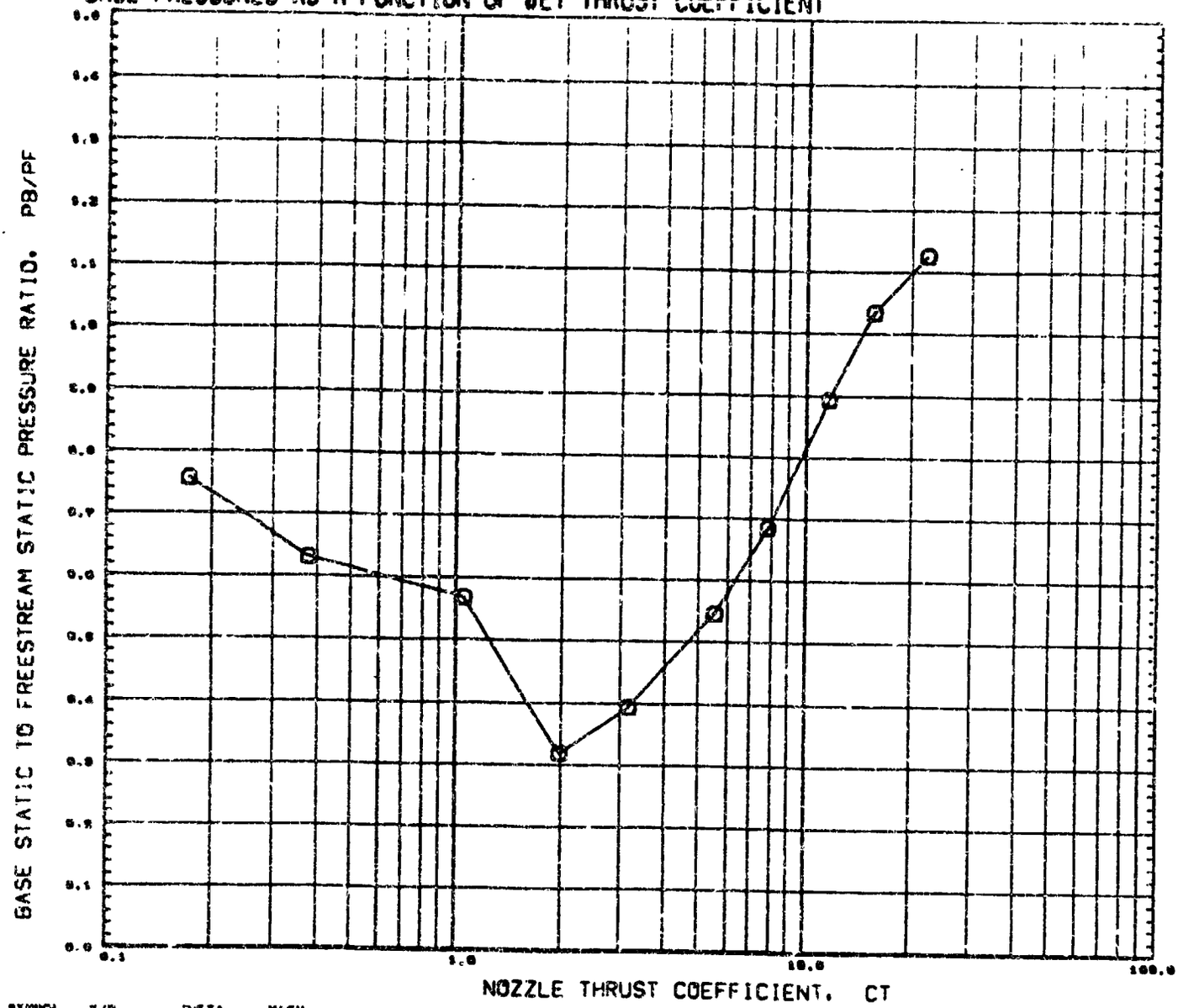
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.000		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCB04)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.000

PARAMETRIC VALUES

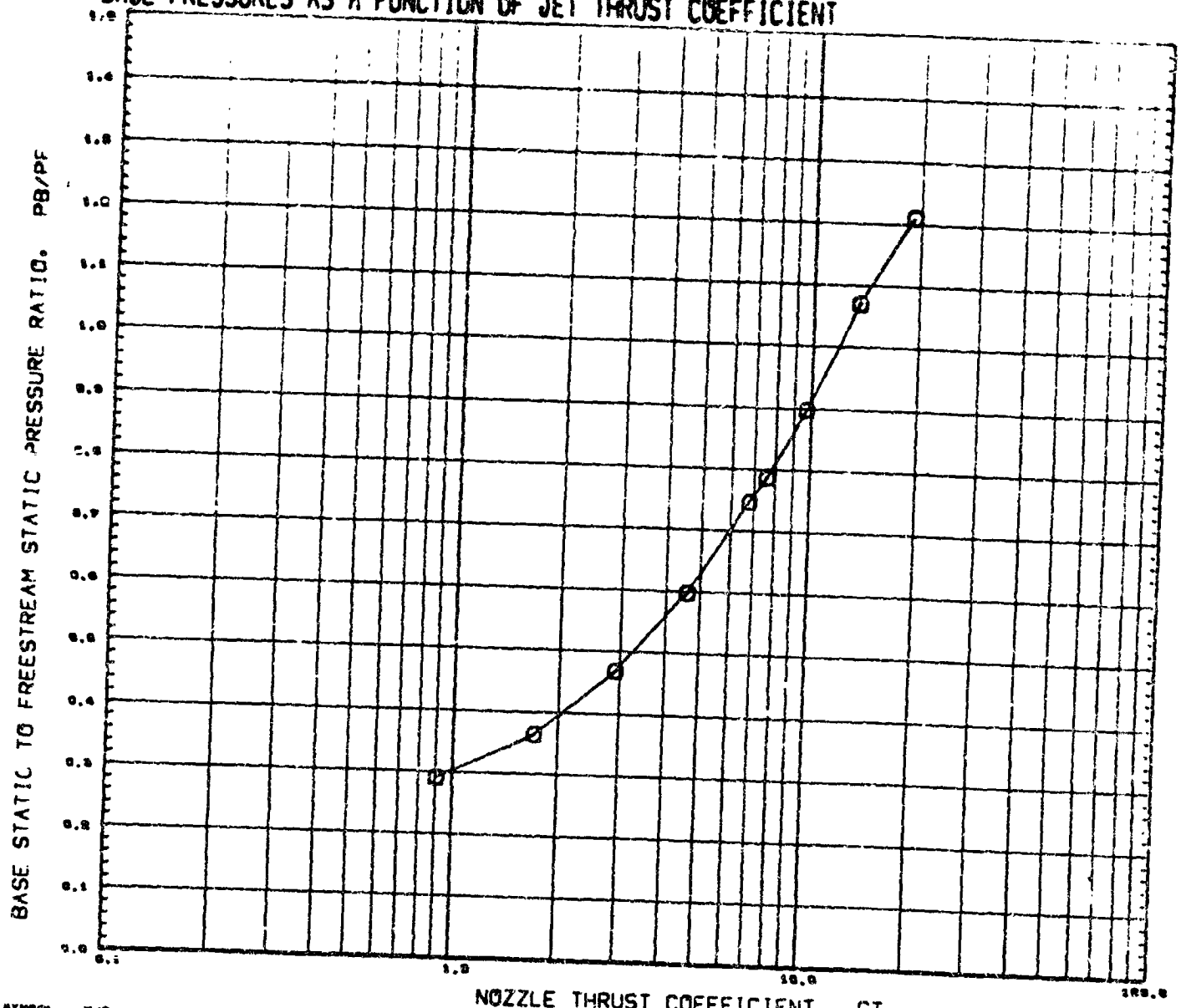
ALPHA 0.000 MACH-J 1.000

DIA-J 0.500

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCB04)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.300	0.000	1.200

PARAMETRIC VALUES

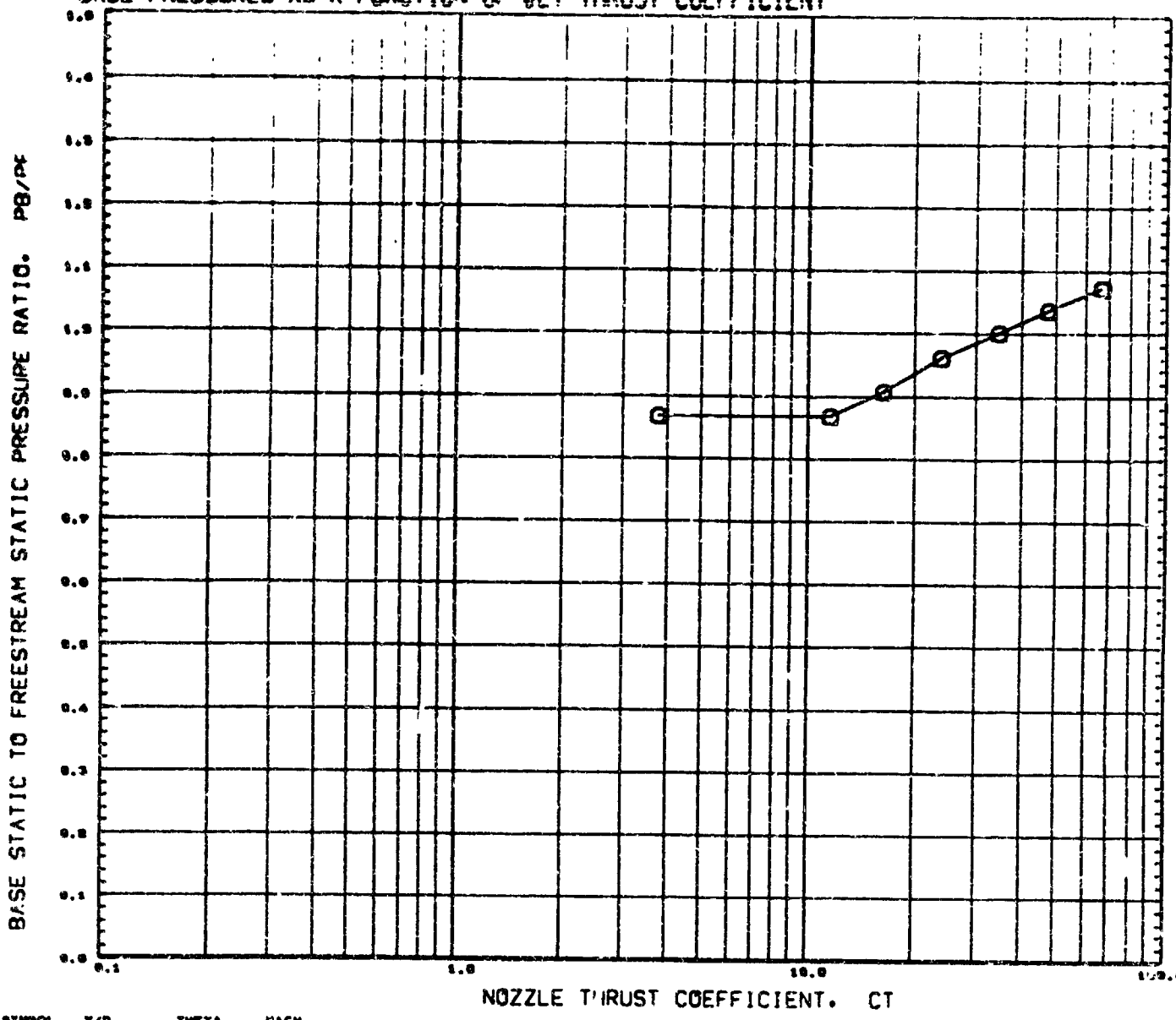
ALPHA 0.000 MACH-J 1.000

DIA-J 0.030

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCB04)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.700

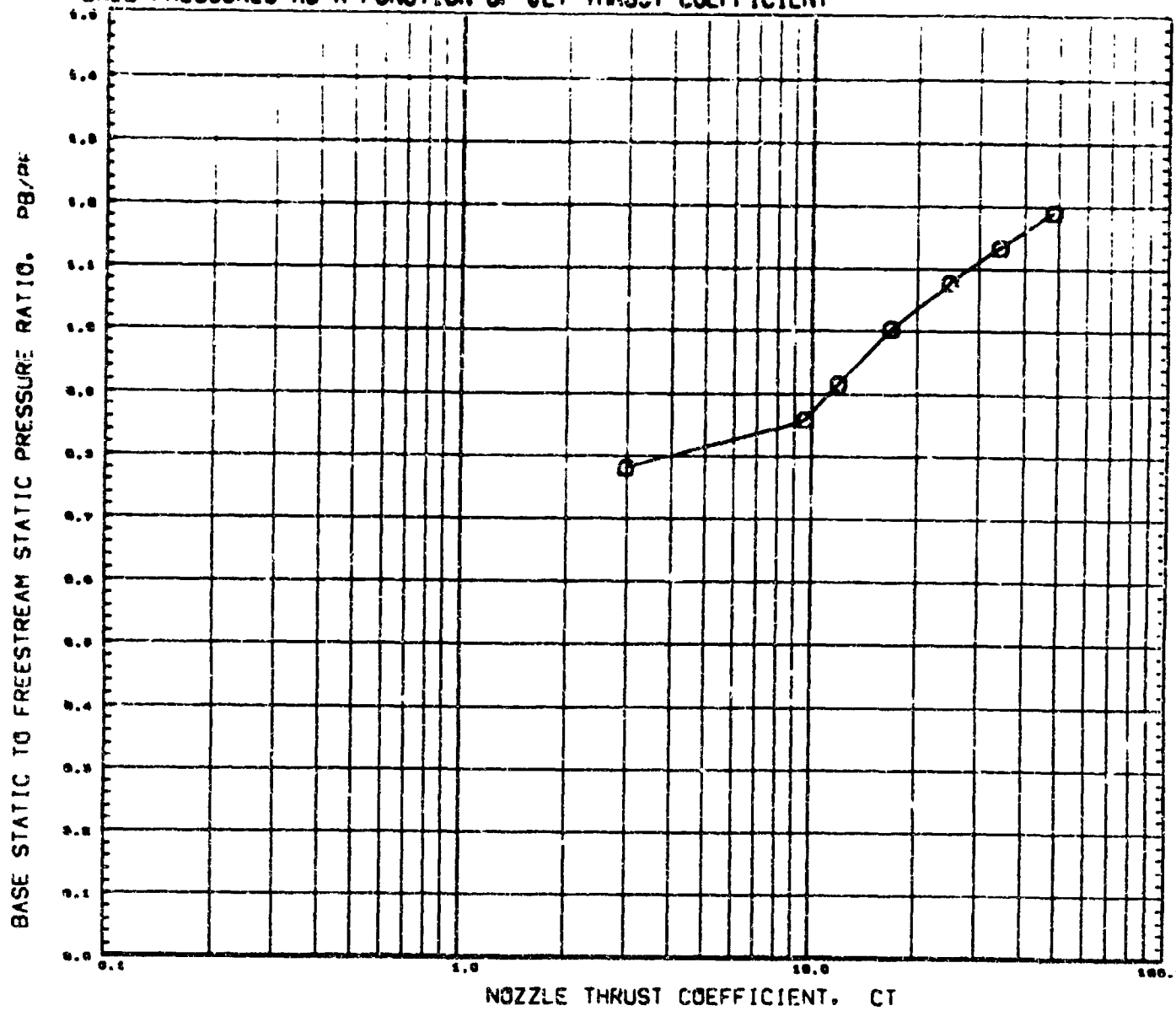
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

REFERENCE FILE

AMC PLUME STUDY. SHROUDED NOZZLE(-4).PORTS OPEN (RUCB05)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.900

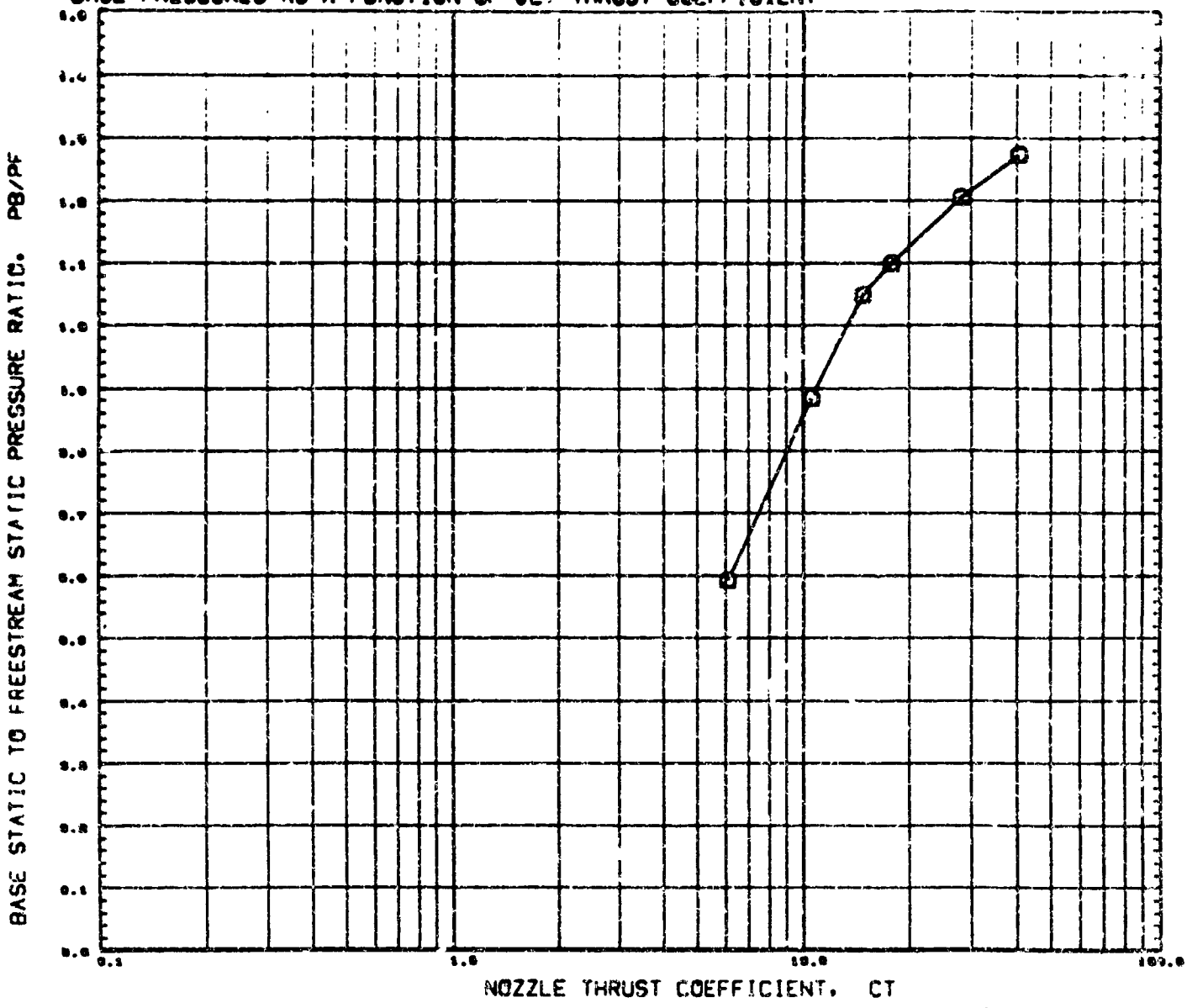
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCB05)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.007

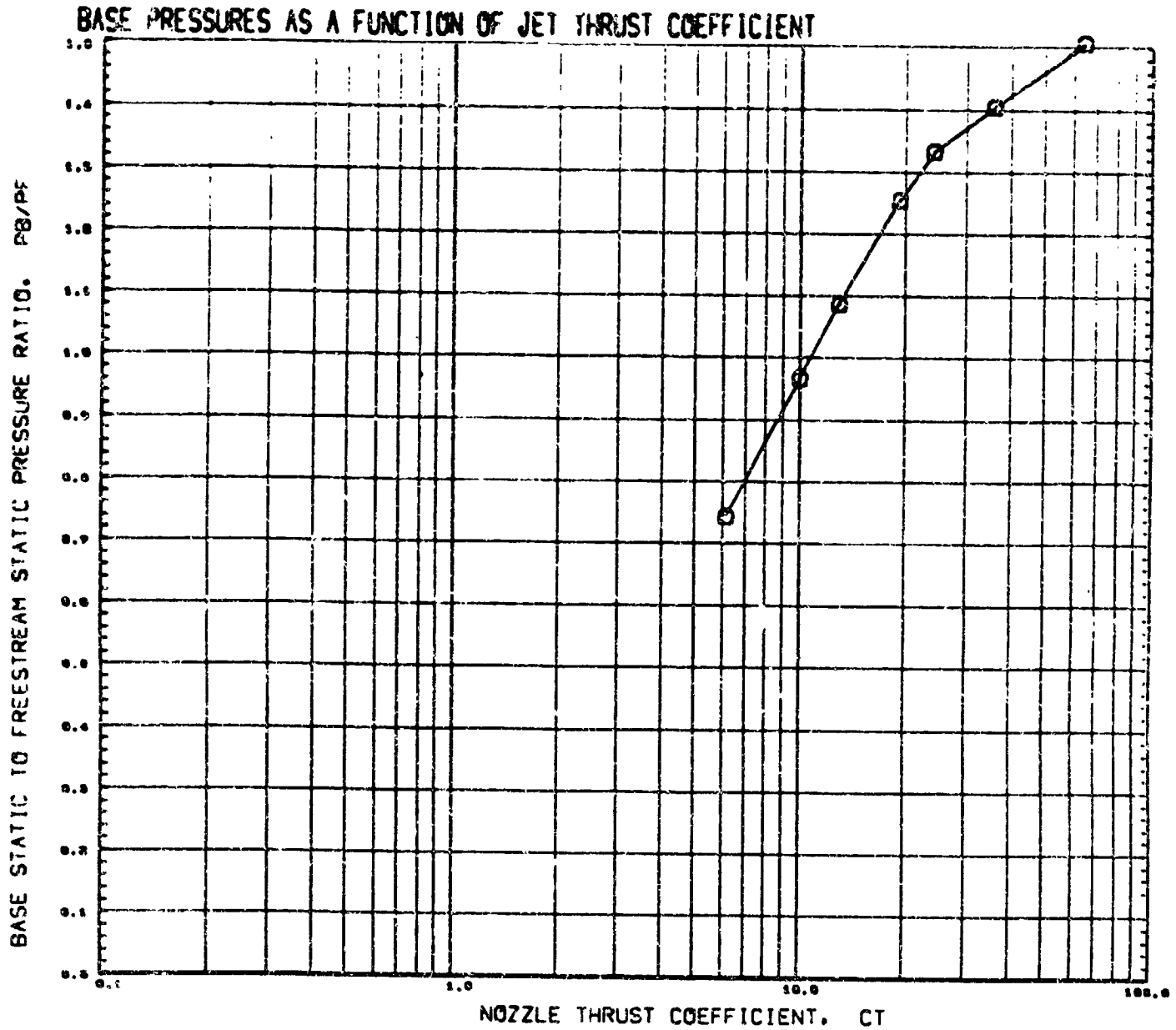
PARAMETRIC VALUES

ALPHA 0.000 MACH-J 1.030

DIA-J 1.000

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCBOS)



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.200

PARAMETRIC VALUES

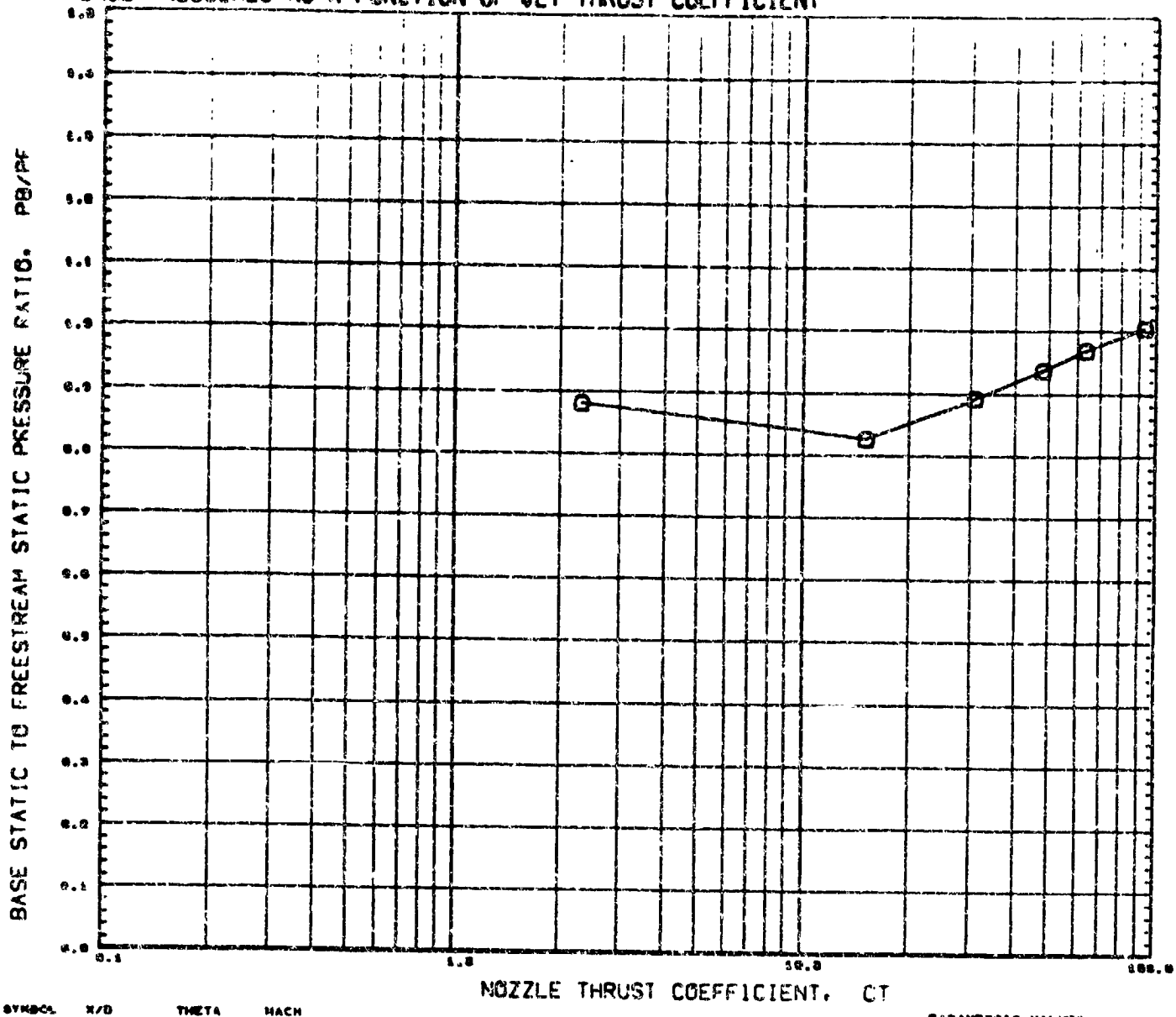
ALPHA 0.000 MACH-J 1.000

DIA-J 1.000

REFERENCE FILE

AMC PLUME STUDY. SHROUDED NOZZLE(-4).PORTS OPEN (RUCB05)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



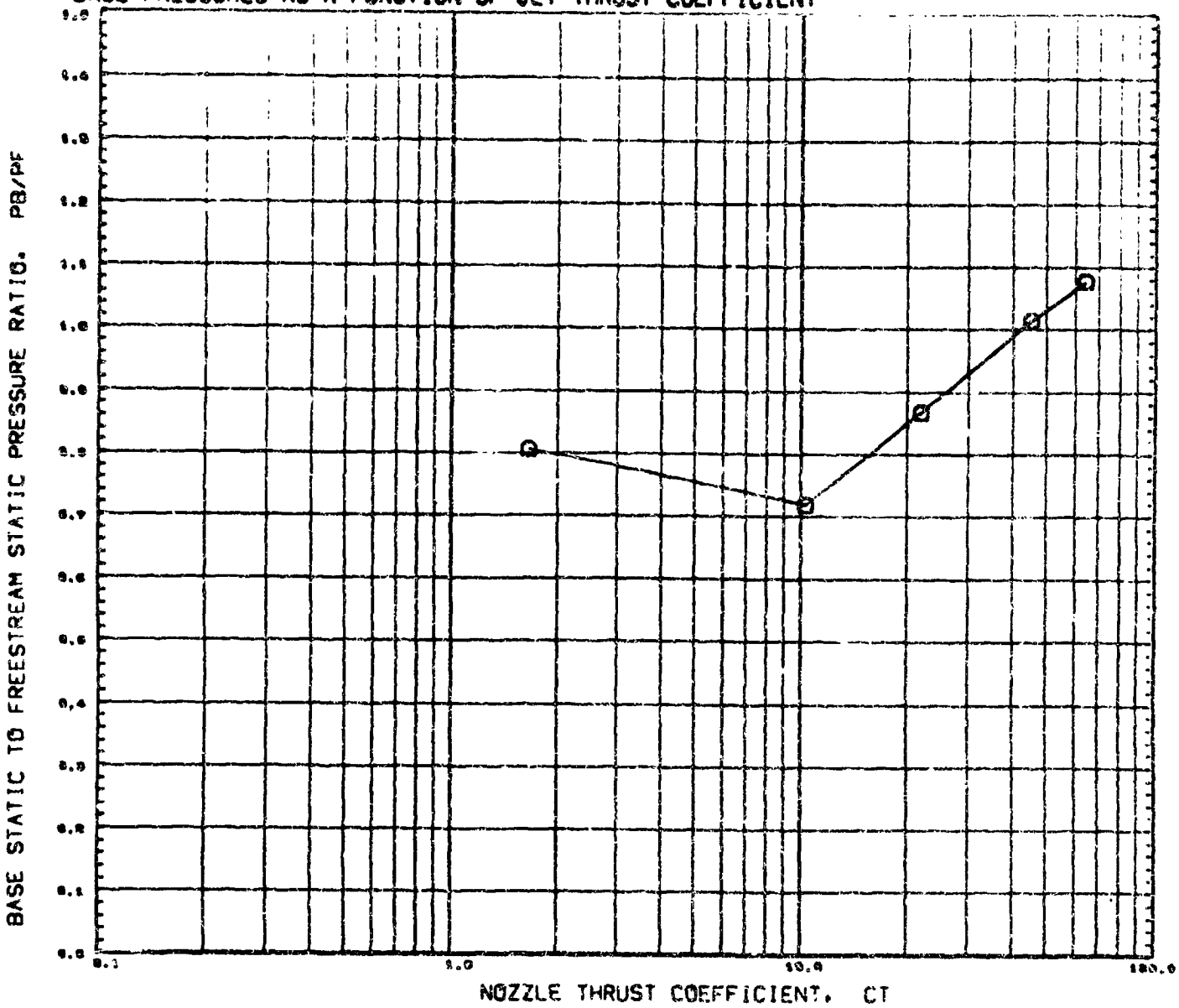
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.702

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	3.000
DJ/DB	0.000	THETAJ	0.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.005

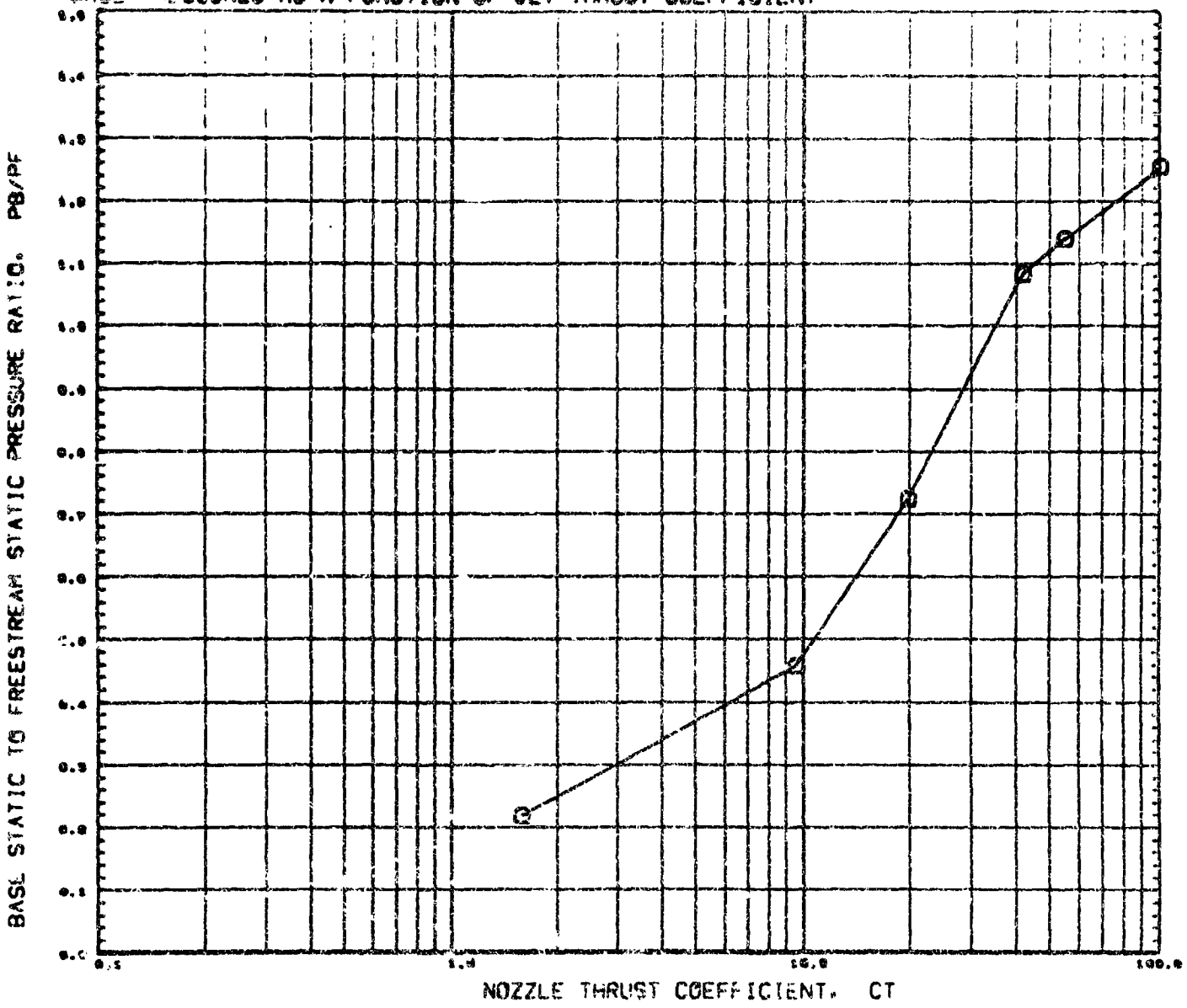
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	3.000
DJ/DB	0.060	THETAJ	0.000

REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-1) (RUCB06) PAGE 21

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT

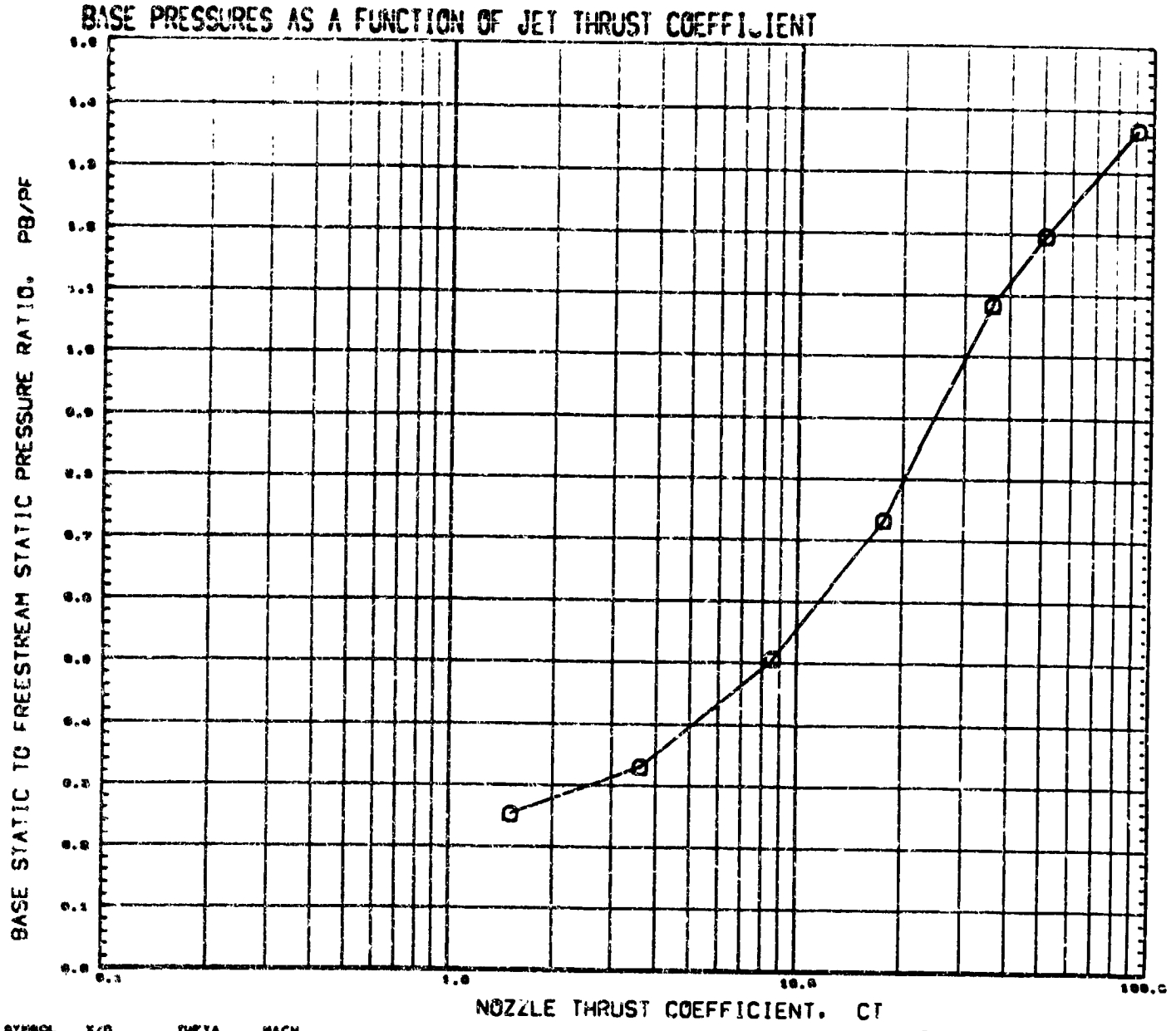


SYMBOL	X/D	THE	MACH
O	0.000	0.000	1.004

PARAMETRIC VALUES

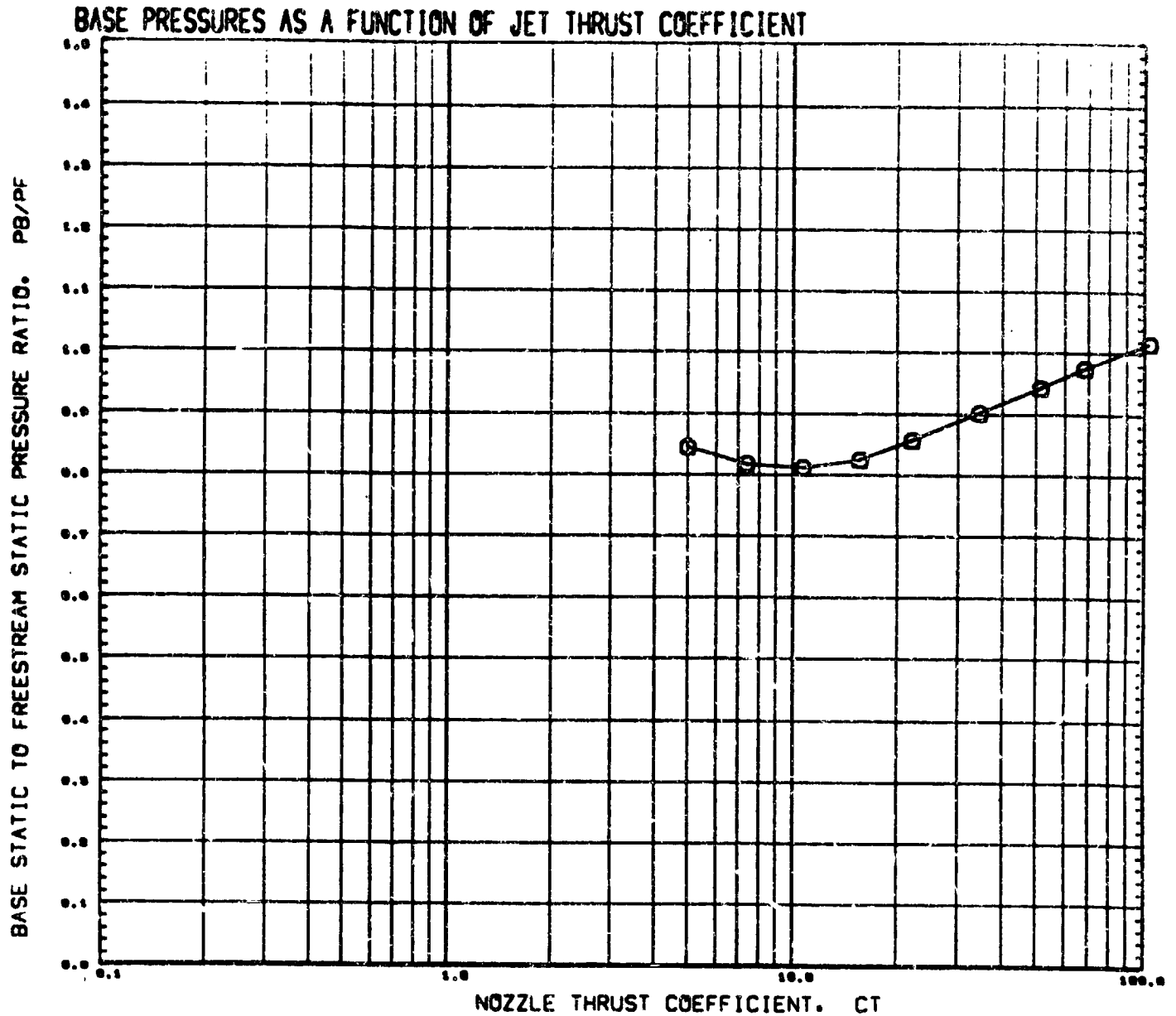
ALPHA	0.000	MACH-J	3.000
GJ/GB	0.900	THETAJ	0.000

REFERENCE FILE



REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-1) (RUCB06)



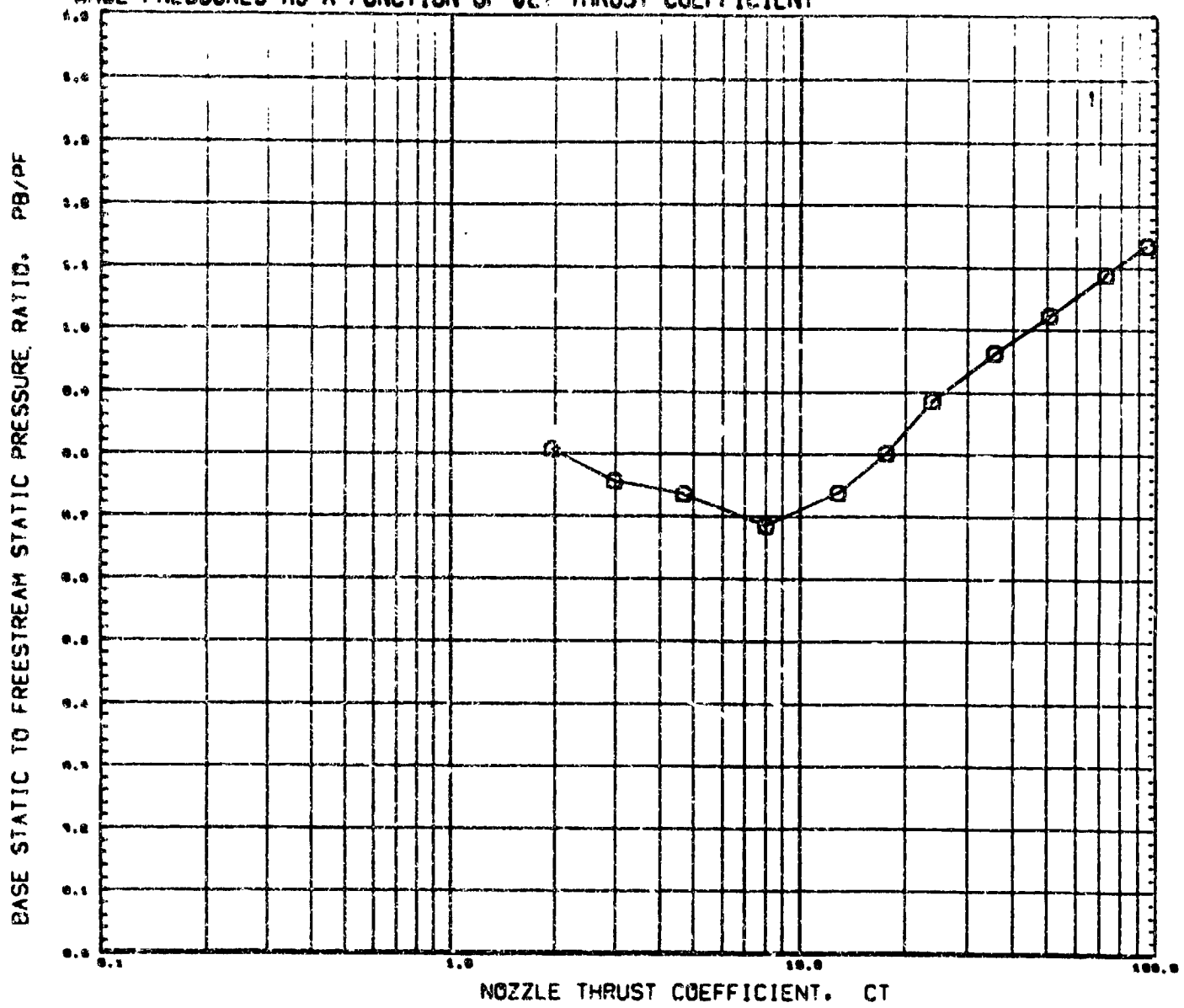
SYMBOL	H/D	THETA	MACH
O	0.000	0.000	0.703

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.000
DJ/DB	0.000	THETAJ	1.786

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



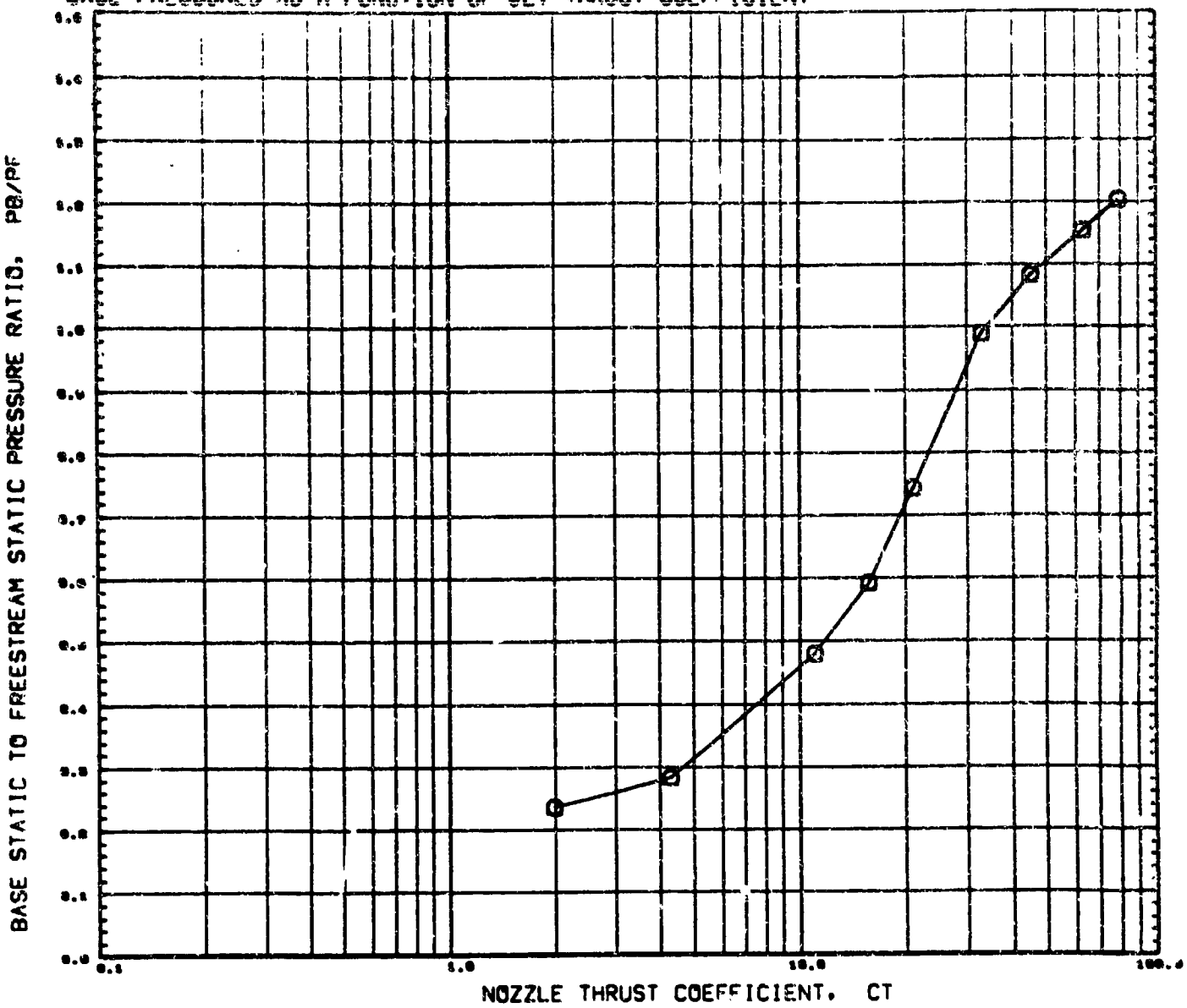
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.903

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.900
DJ/DB	0.000	THETAJ	1.700

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
○	0.000	0.000	1.004

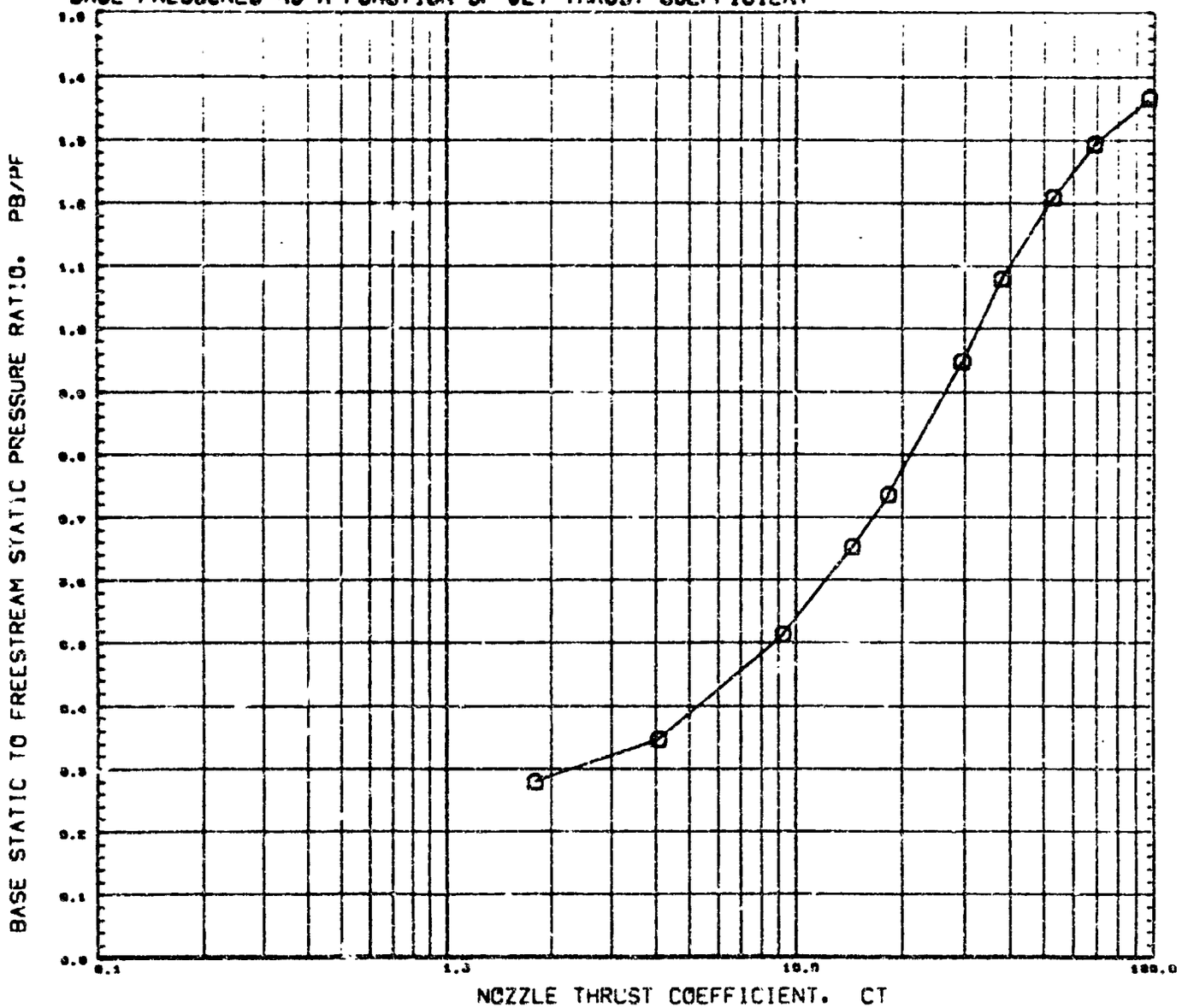
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.000
BJ/DB	0.000	THETA-J	1.700

REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-2) (RUCB07) PAGE 26

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.206

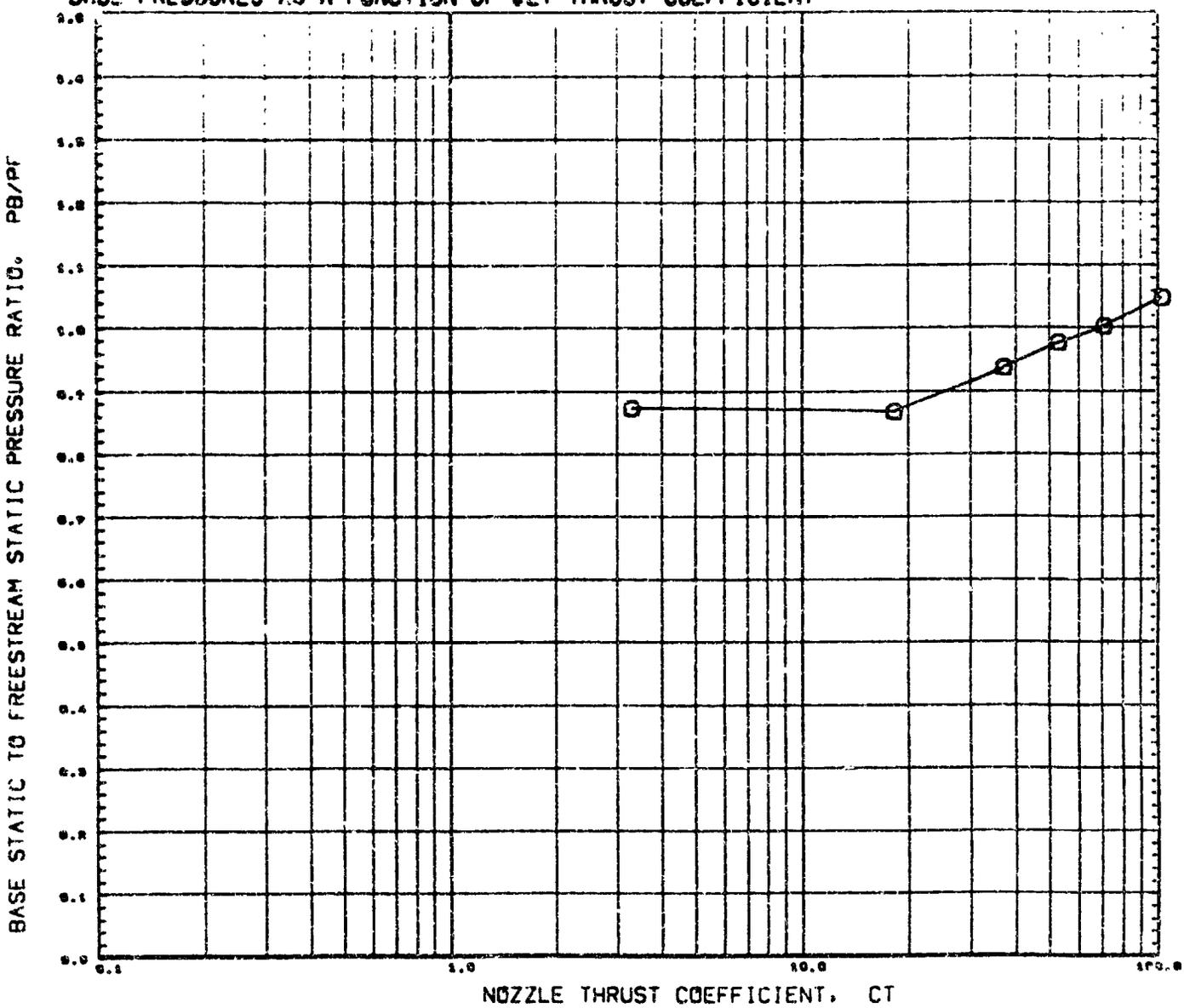
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.900
DJ/DB	0.890	THETAJ	1.730

REFERENCE FILE

AMC PLUME STUDY. CONTOURED NOZZLE(-2) (RUCB07) PAGE 27

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.700

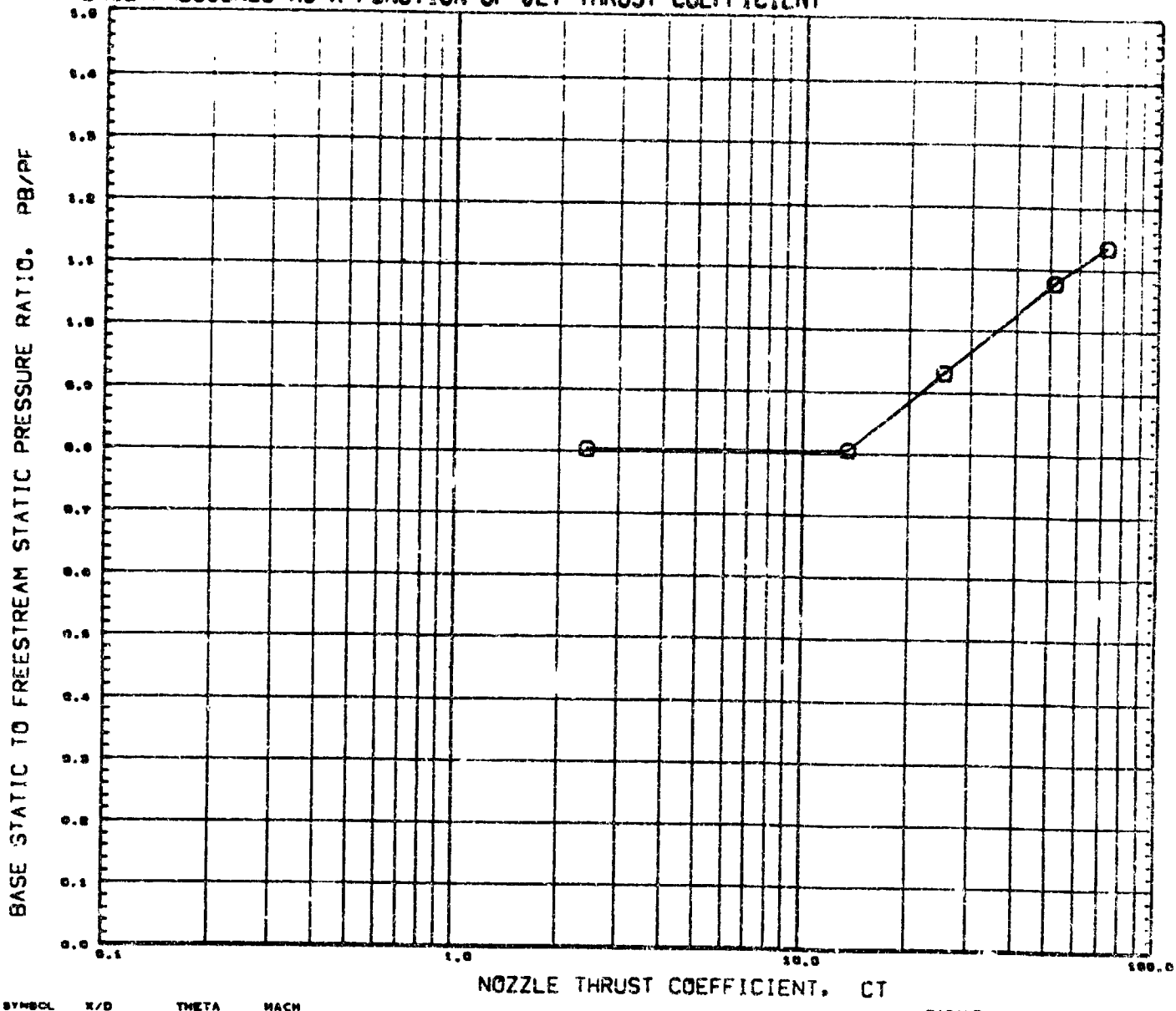
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.035	THETAJ	9.703

REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-3) (RUCB08)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.000

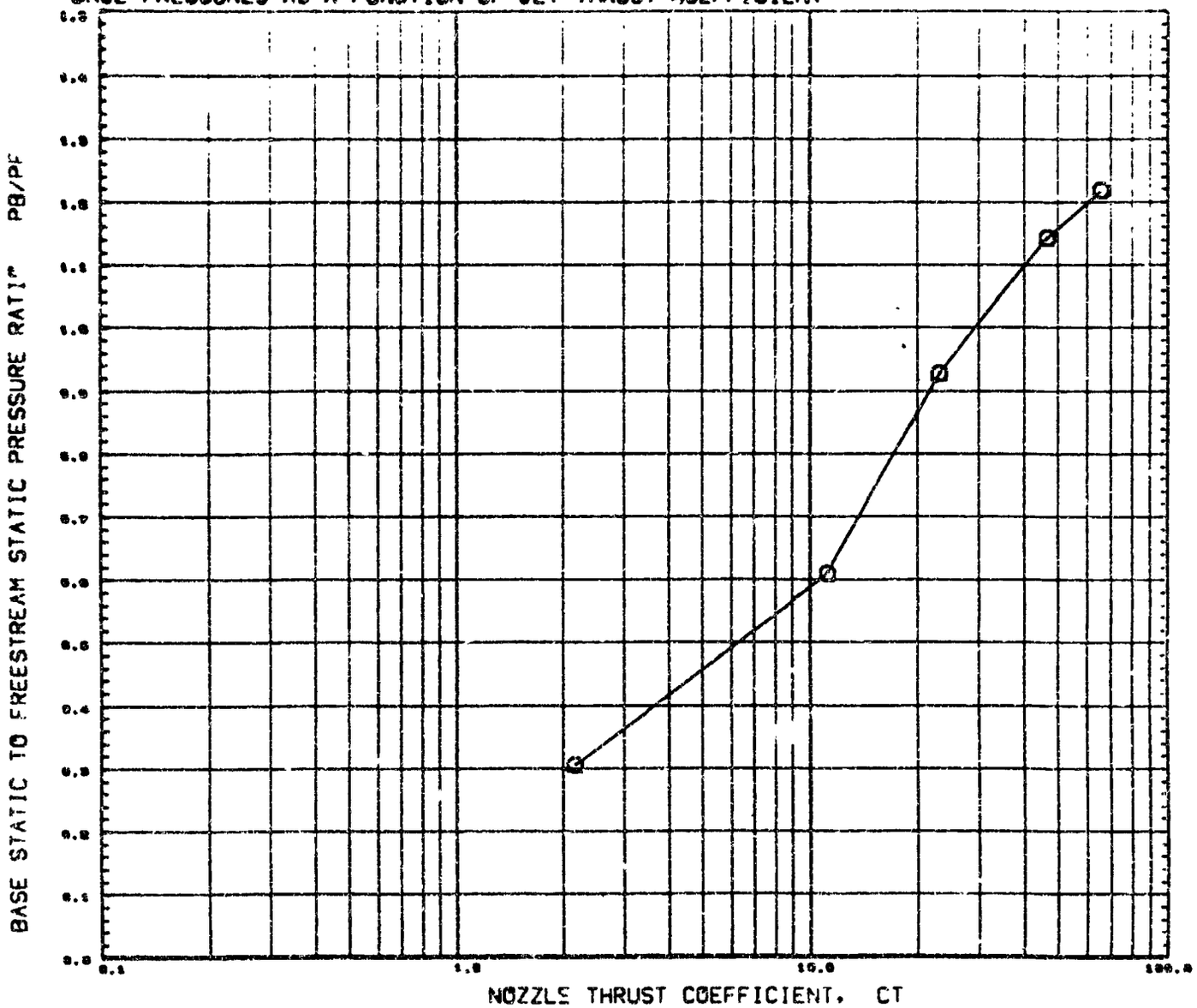
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.030	THETAJ	5.700

REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-3) (RUCB08)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.000

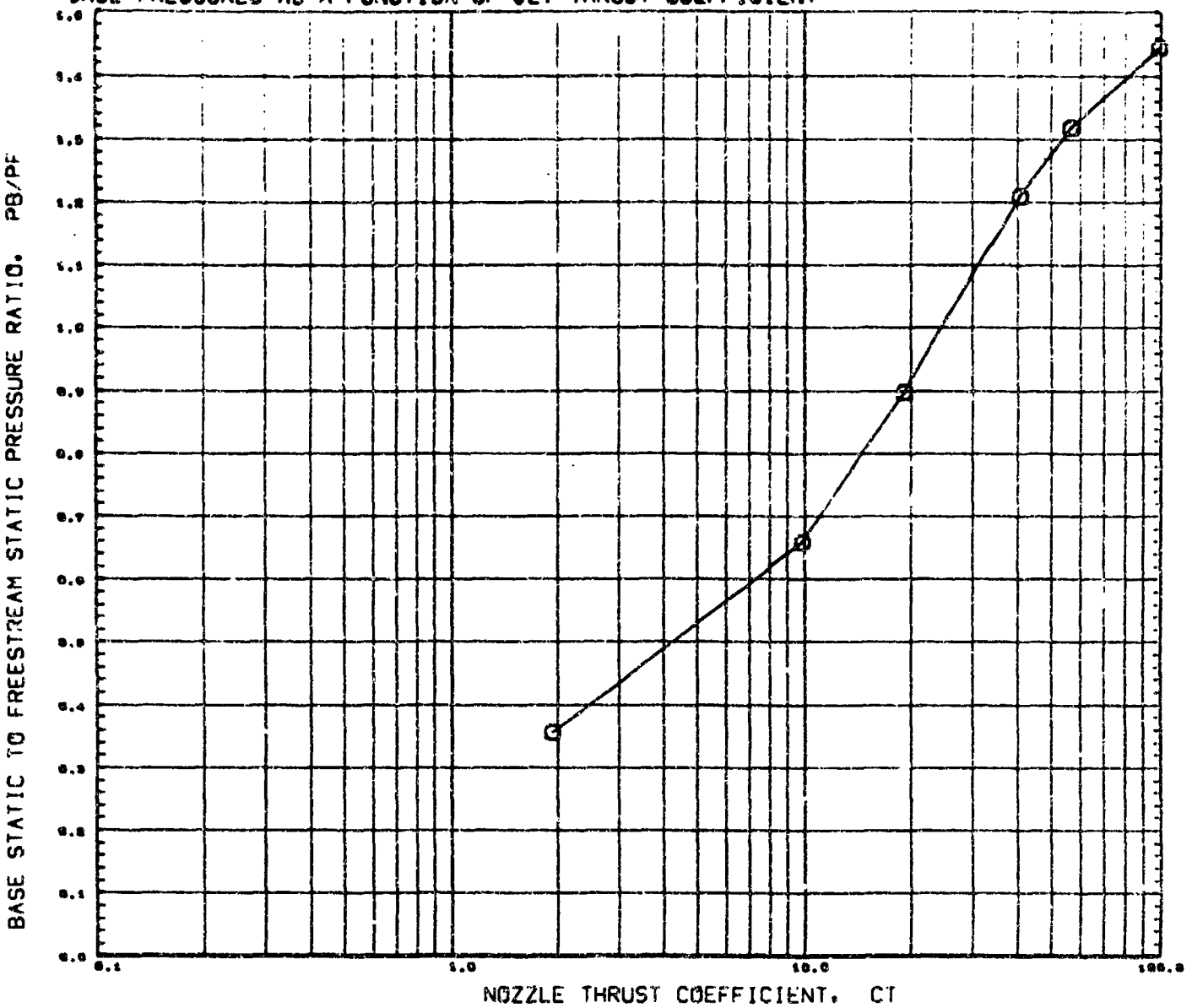
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.750
DJ/DB	0.050	THETAJ	0.700

REFERENCE FILE

AMC PLUME STUDY. CONTOURED NOZZLE(-3) (RUCB08) PAGE 30

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.200

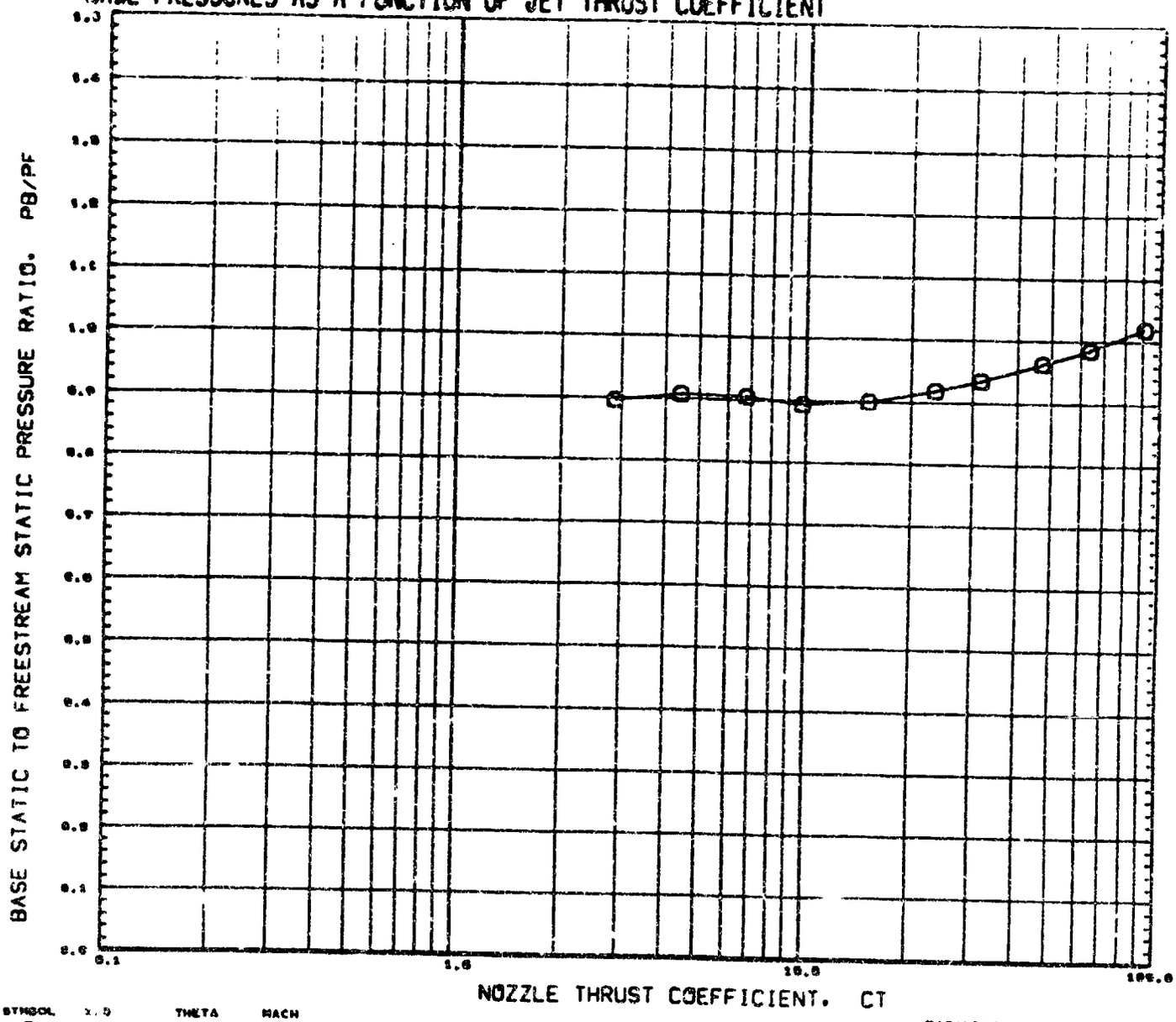
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DS	0.530	THETAJ	0.100

REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-3) (RUCB08)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
○	0.000	0.000	0.703

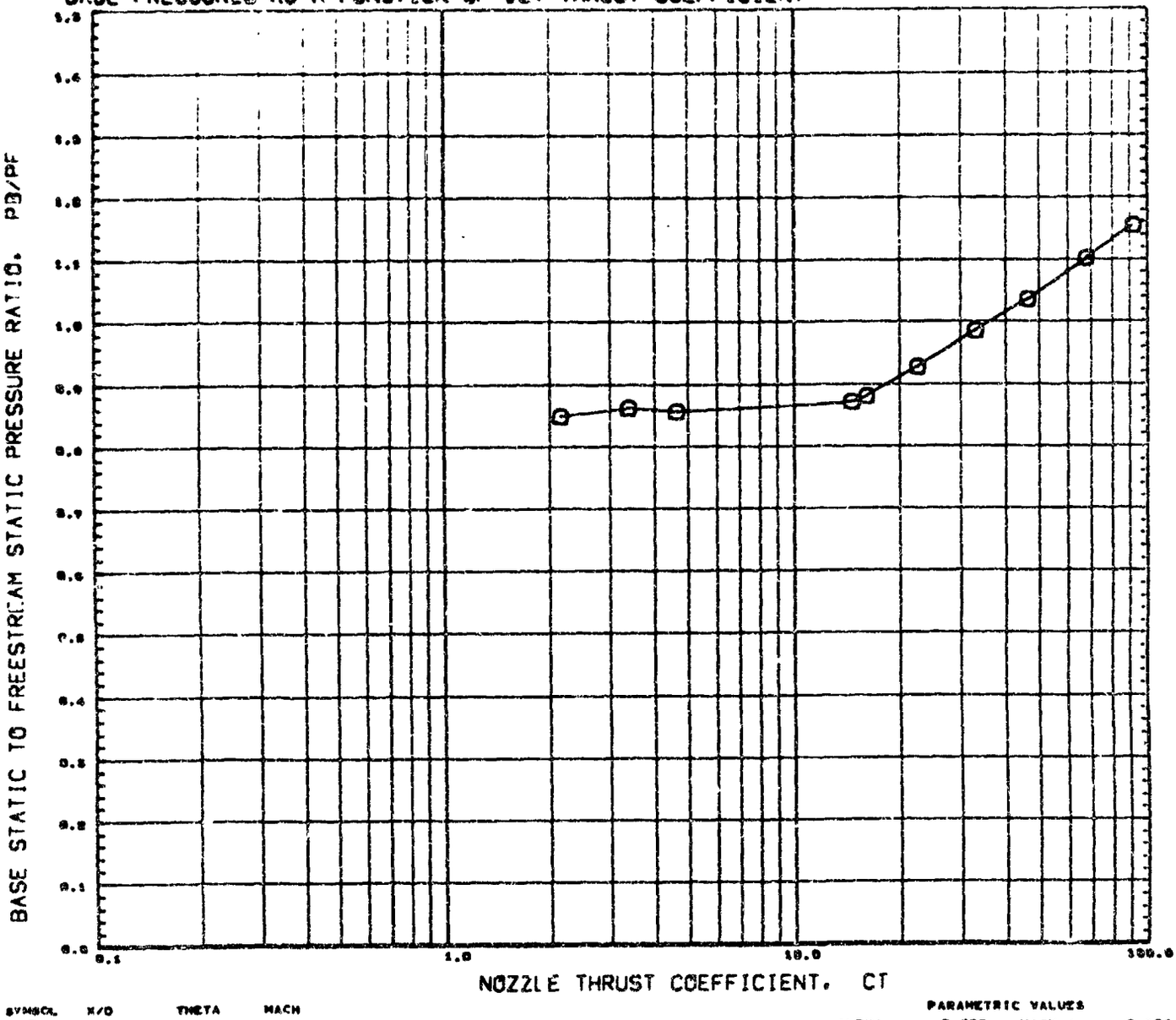
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
[illegible]	0.700	THETA-J	0.000

REFERENCE FILE

AMC PLUME STUDY. CONTOURED NOZZLE(-4) (RUCB09)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



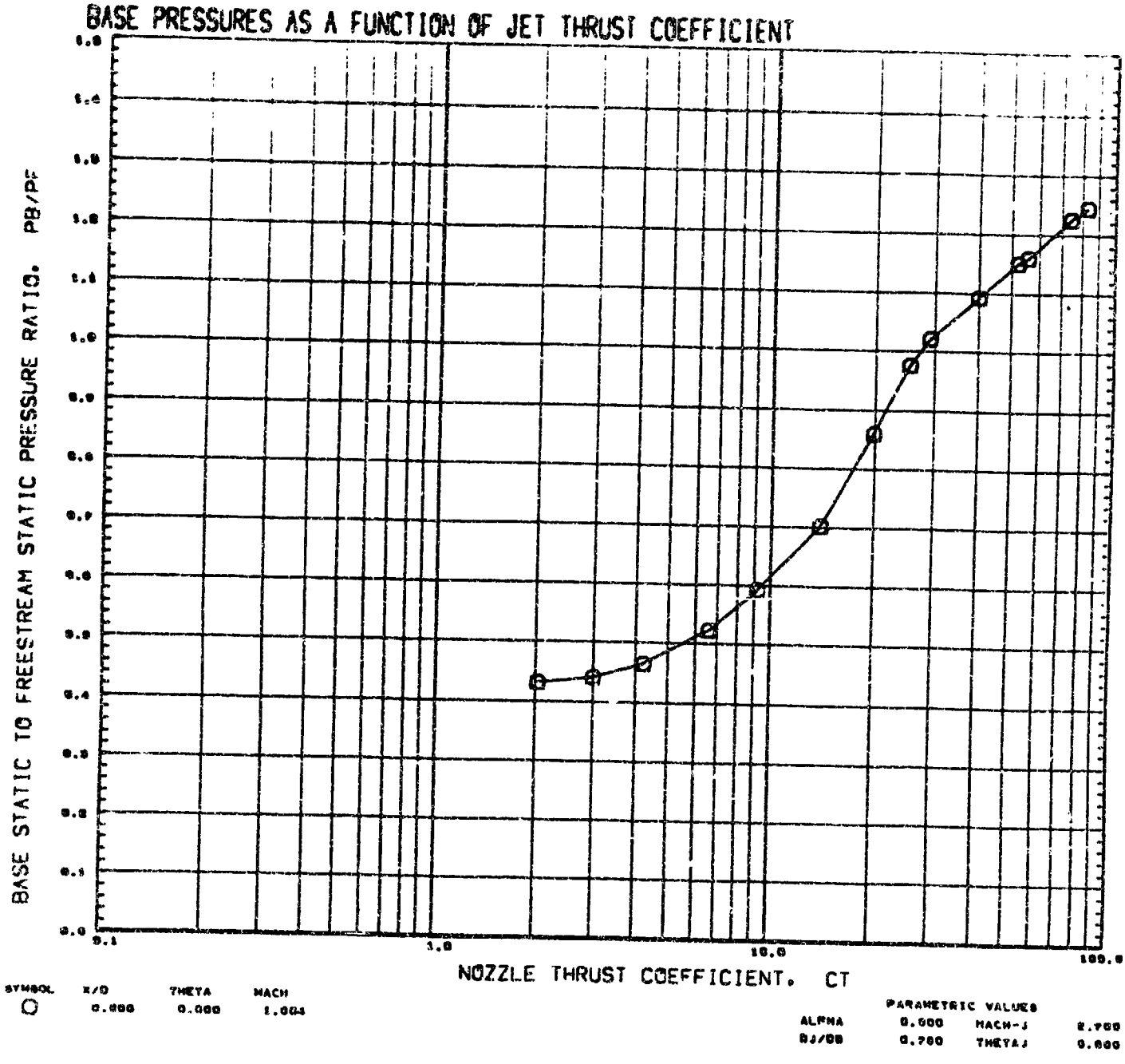
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.001

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.750	THETAJ	0.000

REFERENCE FILE

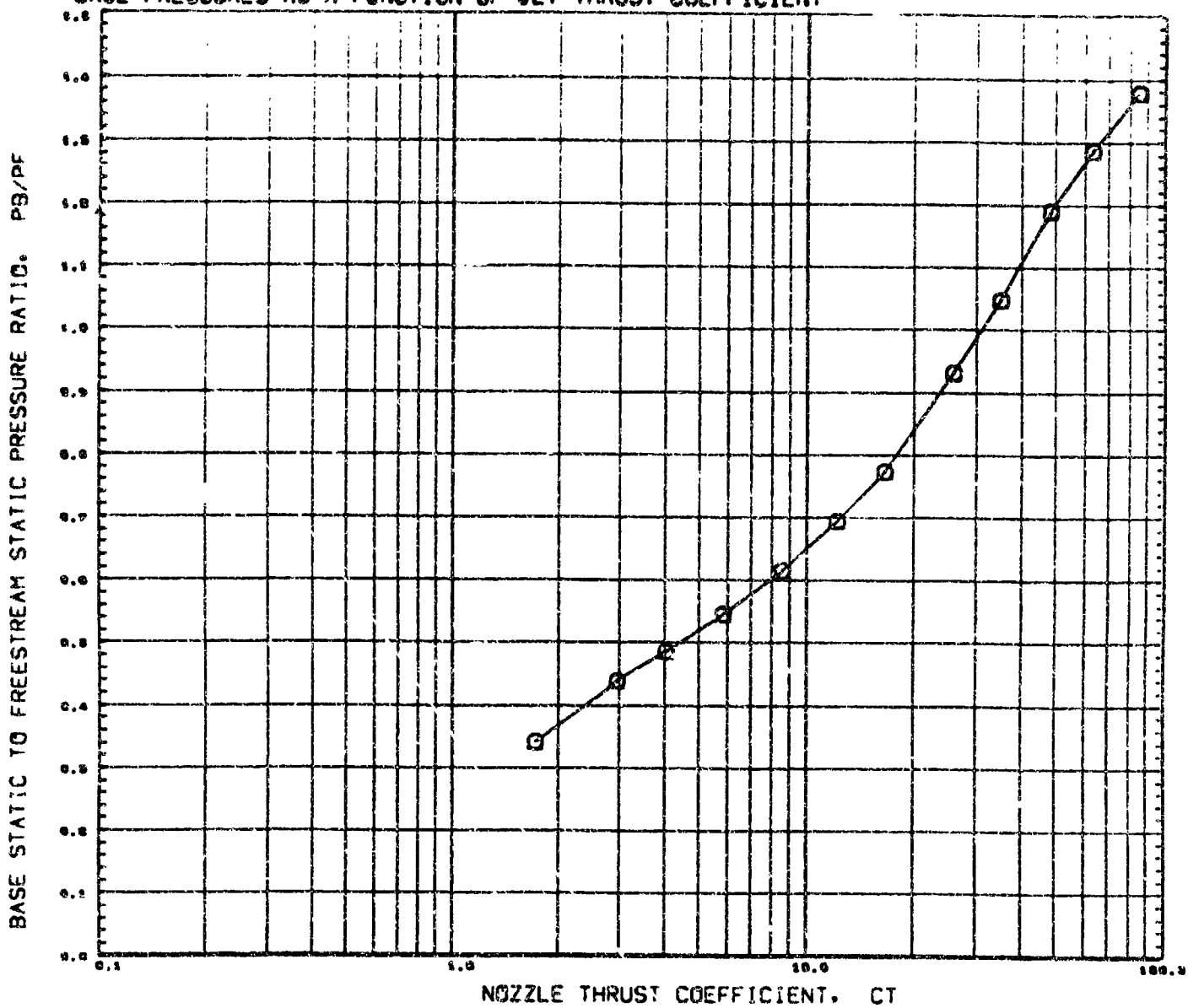
AMC PLUME STUDY- CONTOURED NOZZLE(-4) (RUCB09)



REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-4) (RUCB09)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.200

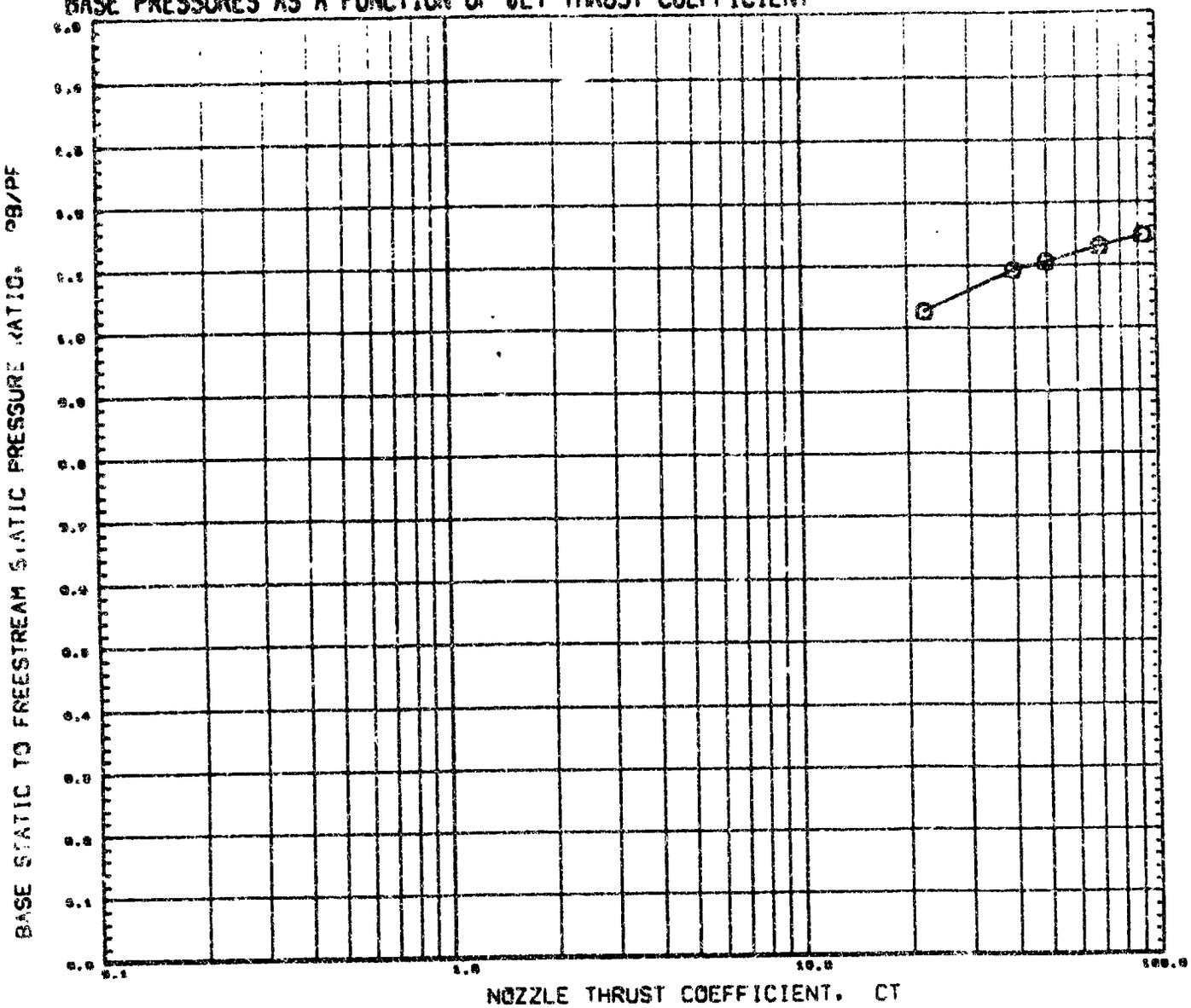
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	[illegible]	THETAJ	0.000

REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-4) (RUCB09)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.703

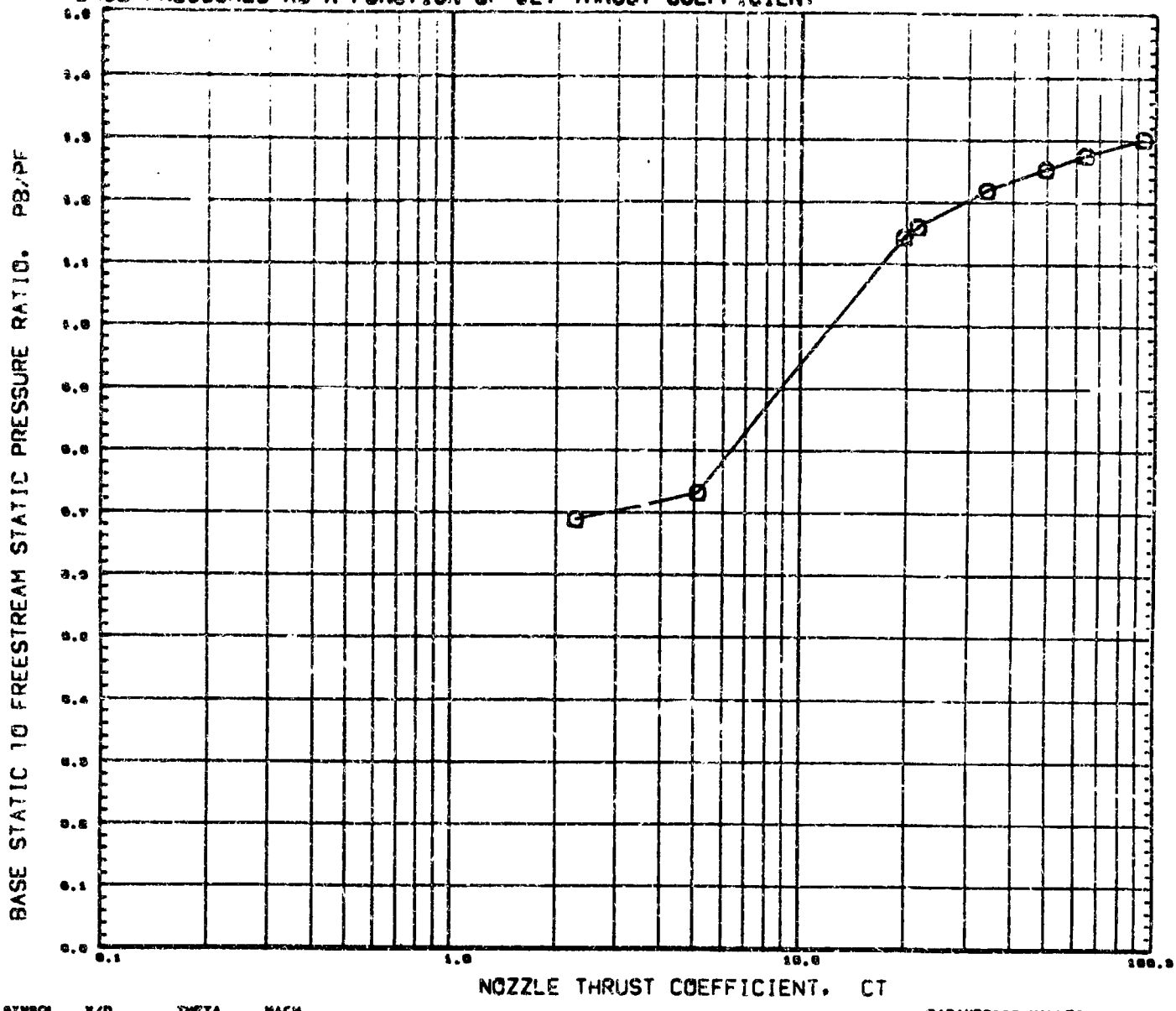
PARAMETRIC VALUES

ALPHA	0.000	MACH-1	2.700
CJ/DB	0.050	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-1) (RUCB10)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



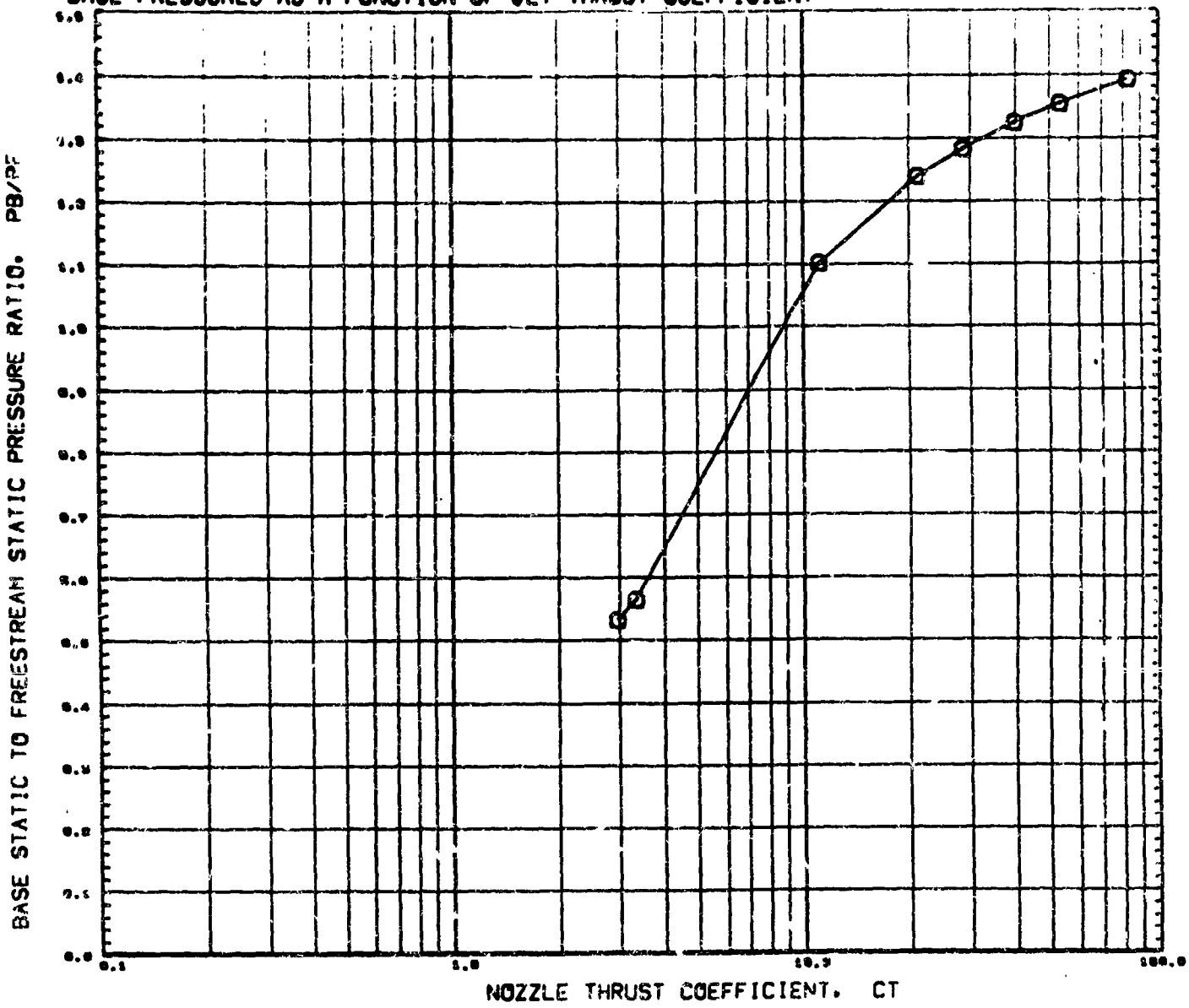
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.908

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.980	THETAJ	20.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT

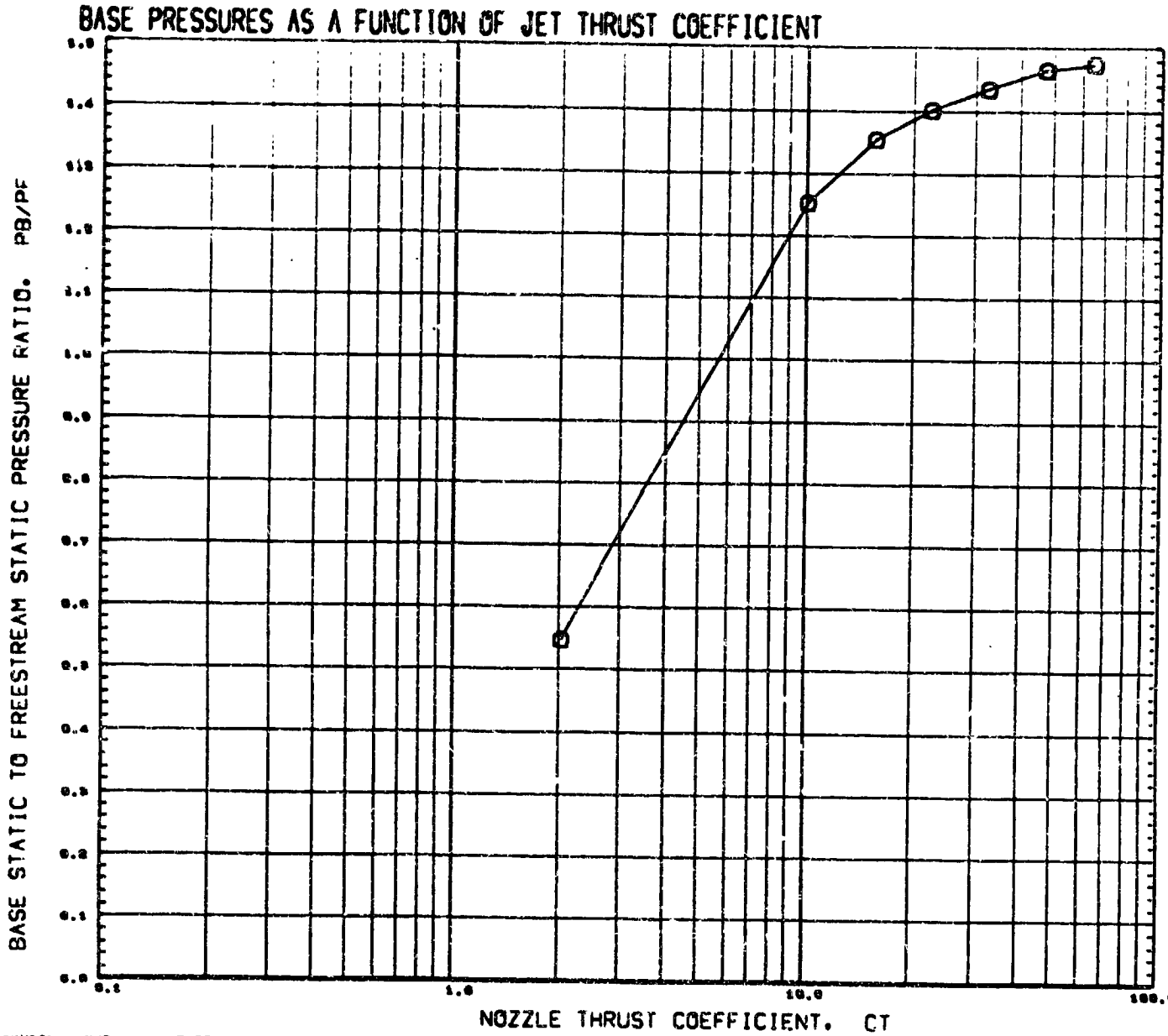


SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.602

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DD	0.000	THETAJ	00.000

REFERENCE FILE



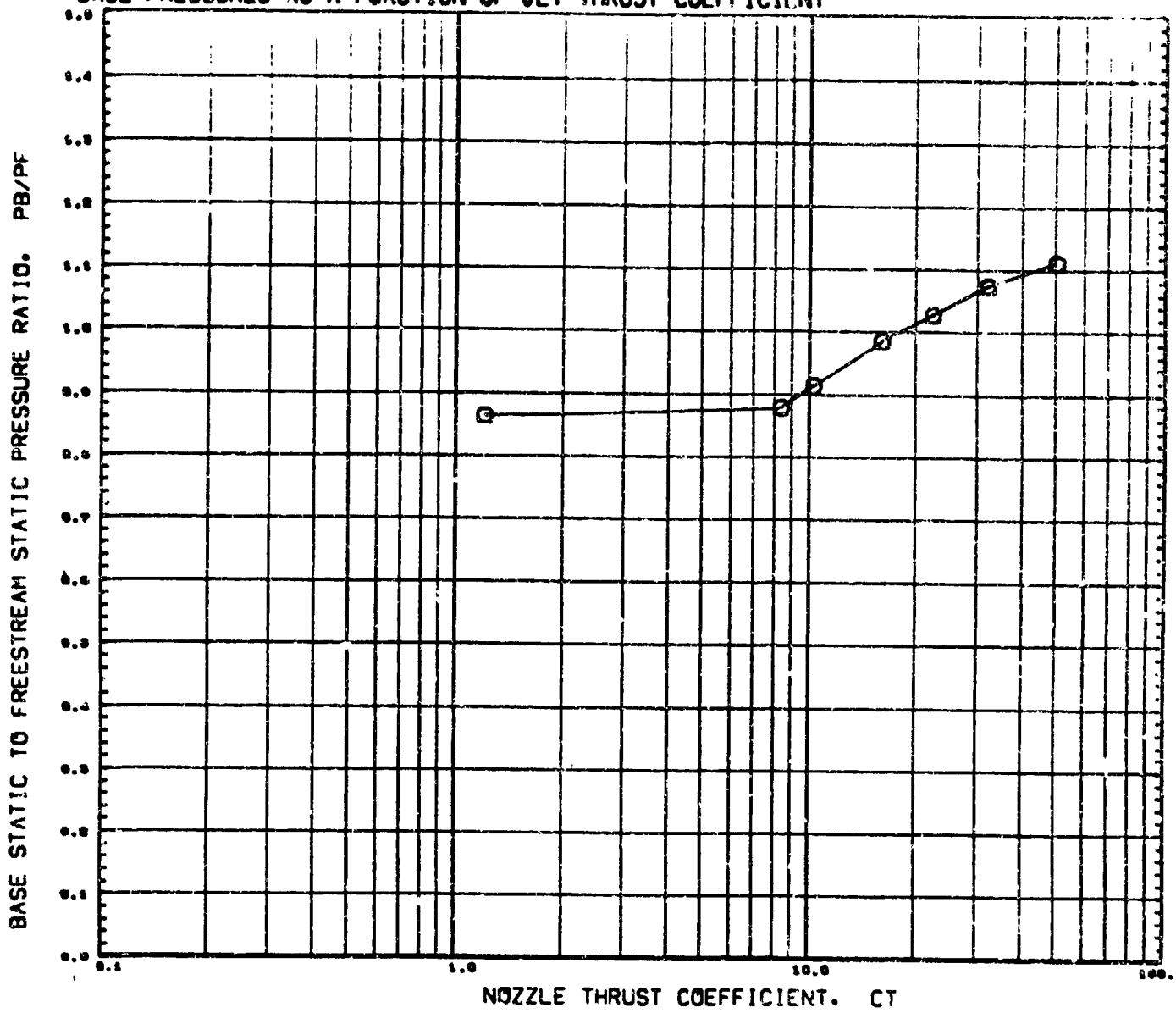
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.205

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DS	0.050	THETAJ	20.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



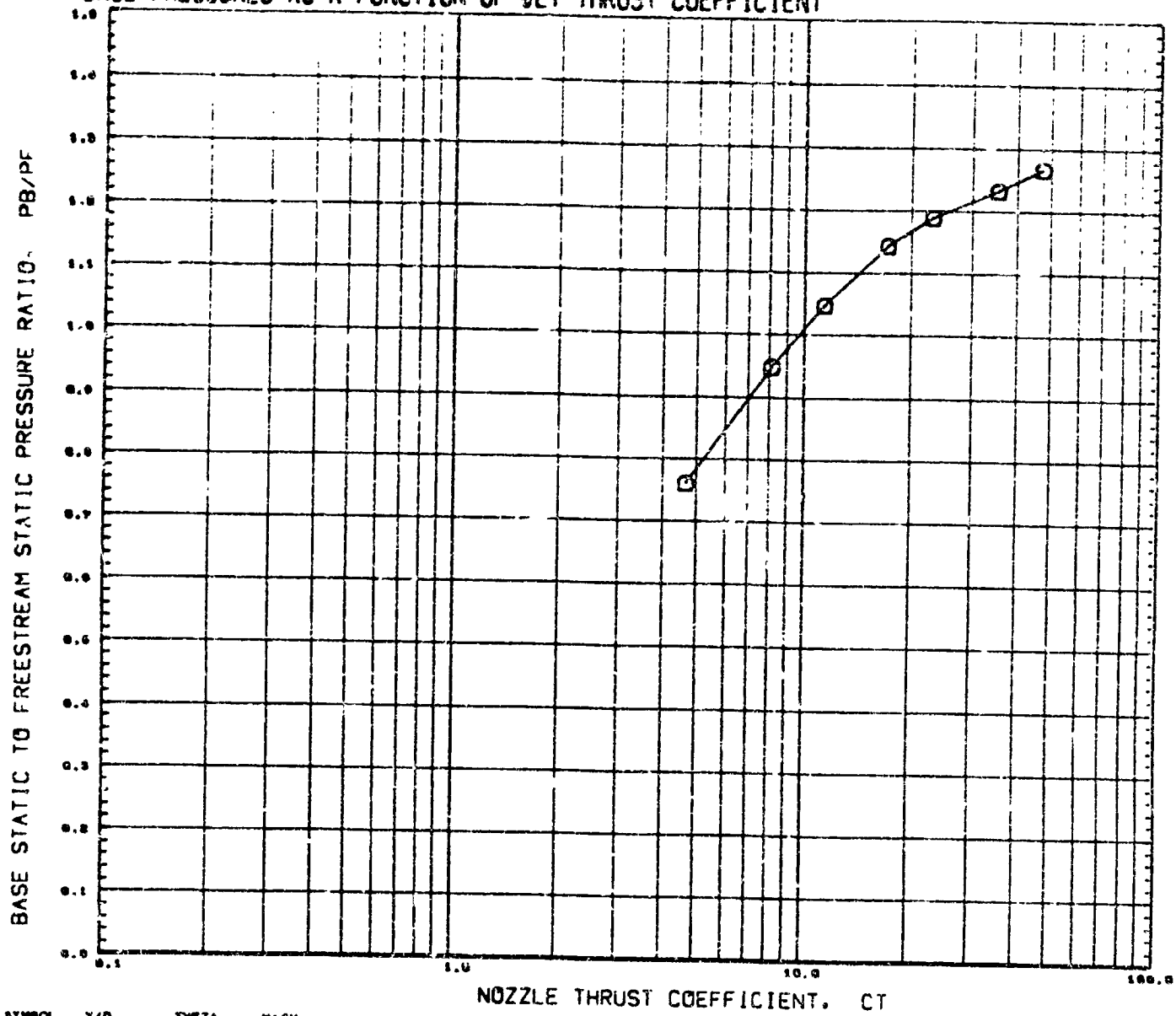
SYMBOL	X/D	THETA	MACH
O	0.009	0.000	0.702

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	0.703
DJ/DB	0.000	THETAJ	20.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



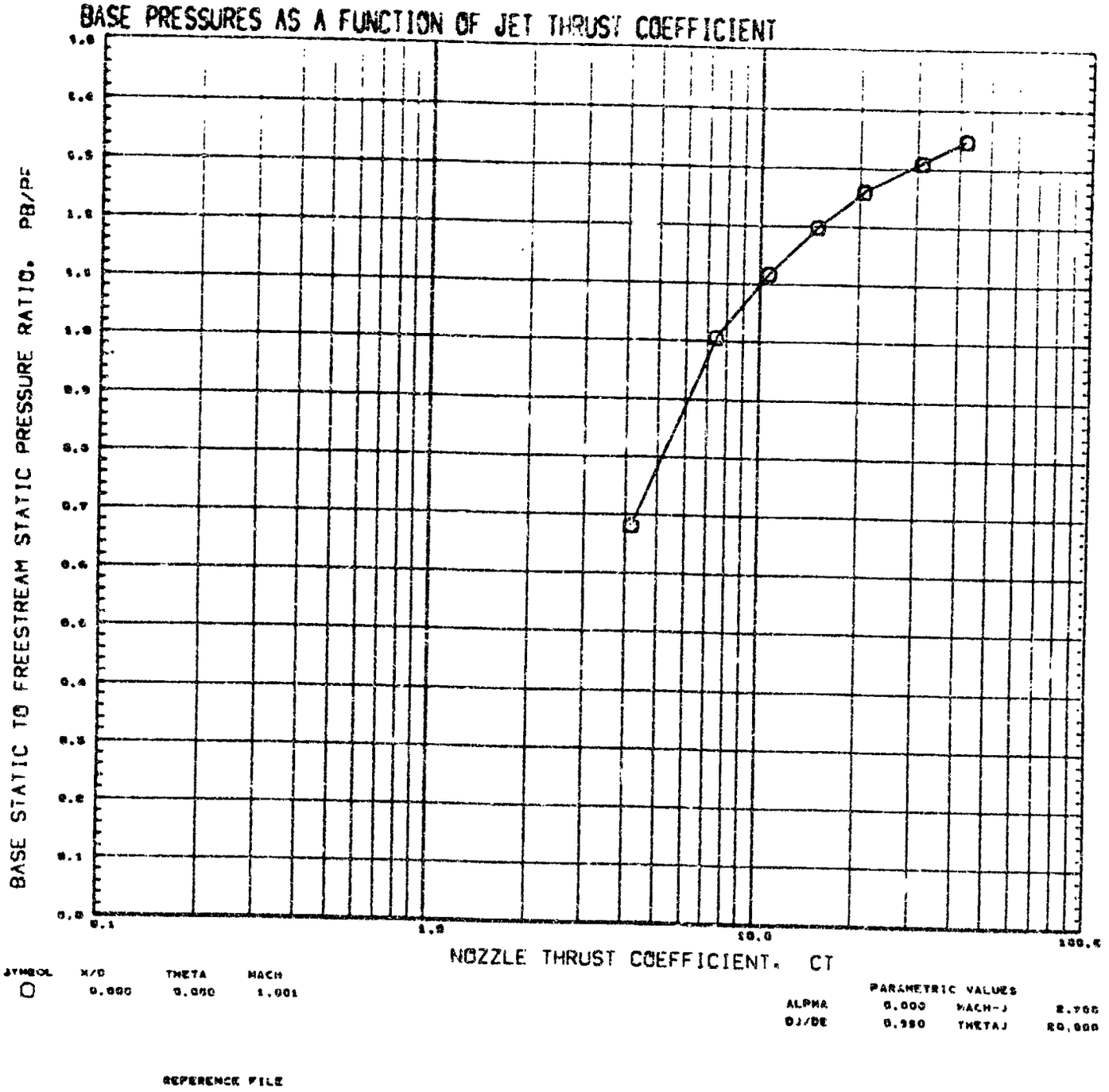
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.903

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
PJ/DS	0.950	THETAJ	20.000

REFERENCE FILE

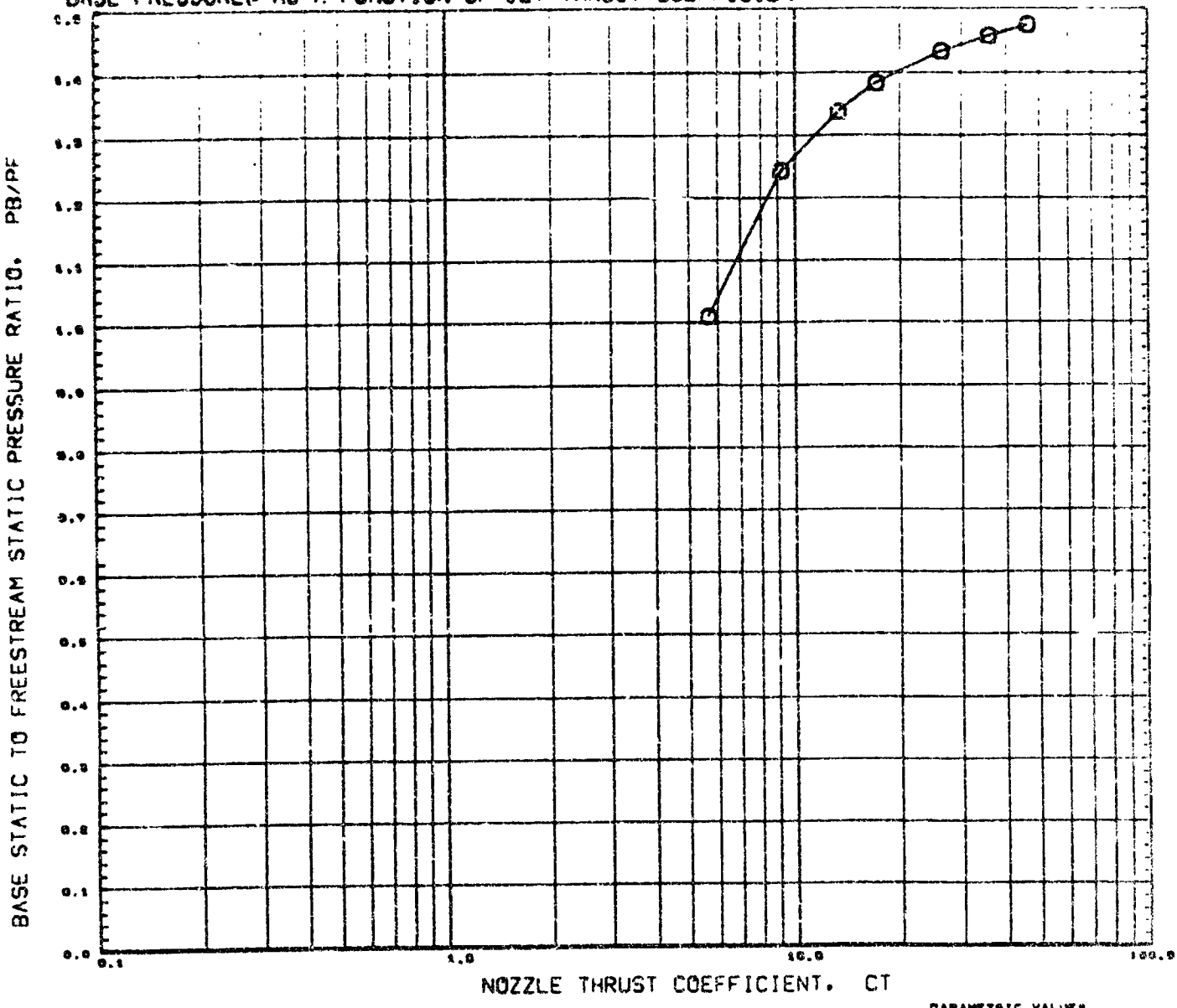
AMC PLUME STUDY, CONICAL NOZZLE (-1) (RUCB11)



REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-1) (RUCB11)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.201

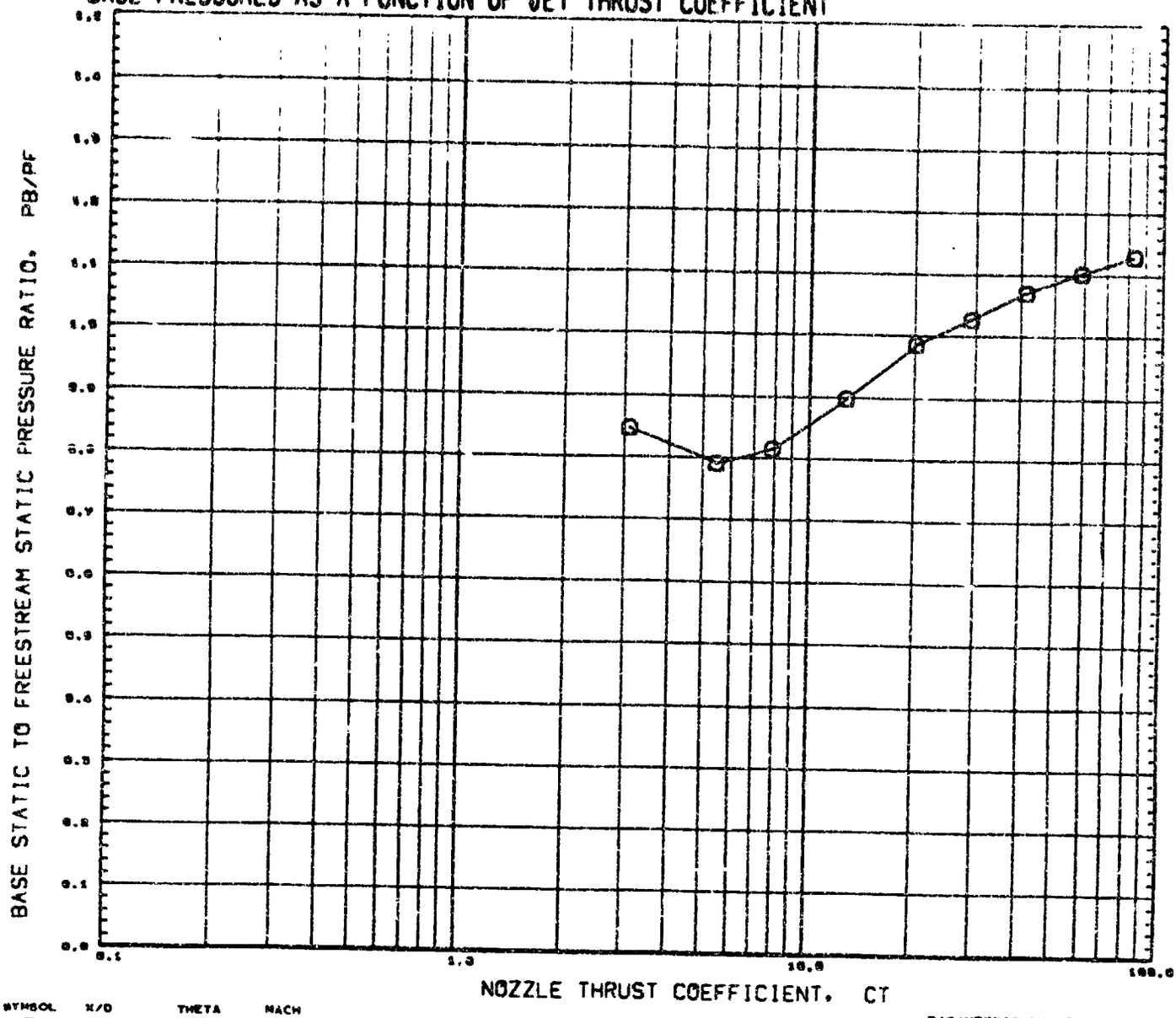
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	3.993	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-1) (RUCB11)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.703

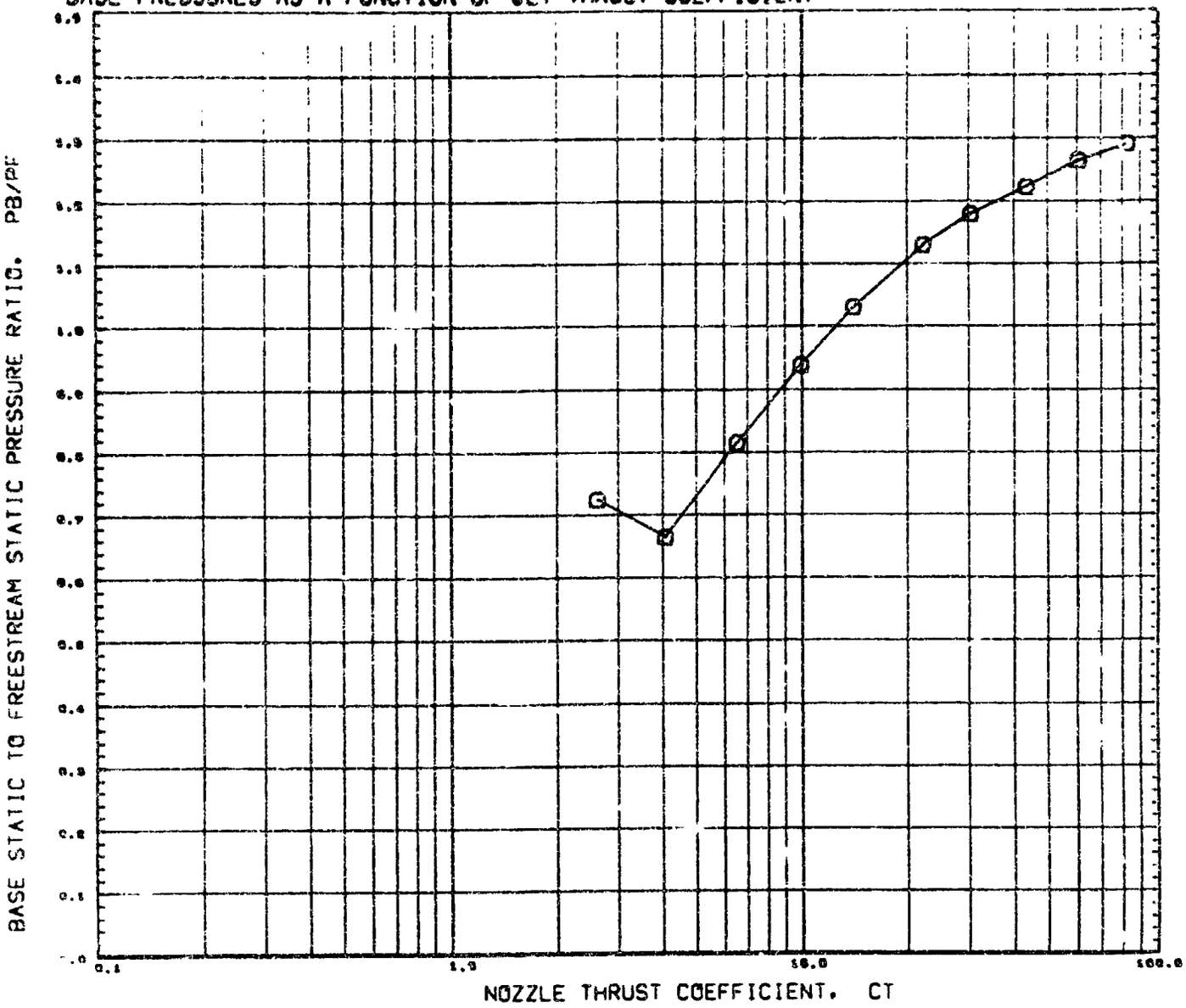
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.750
DJ/DB	0.900	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-2) (RUCB12)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



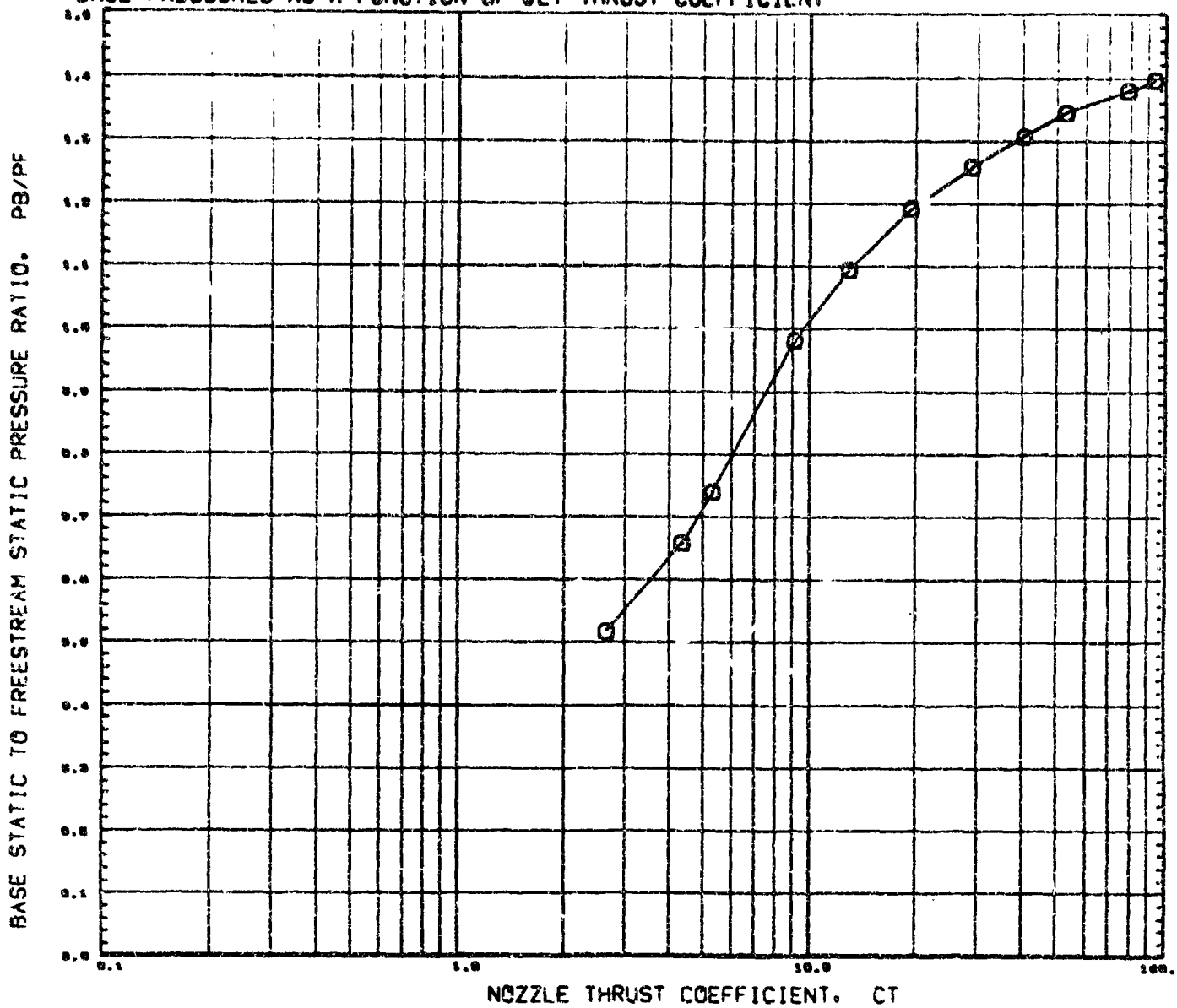
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.903

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.900	THETAJ	20.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



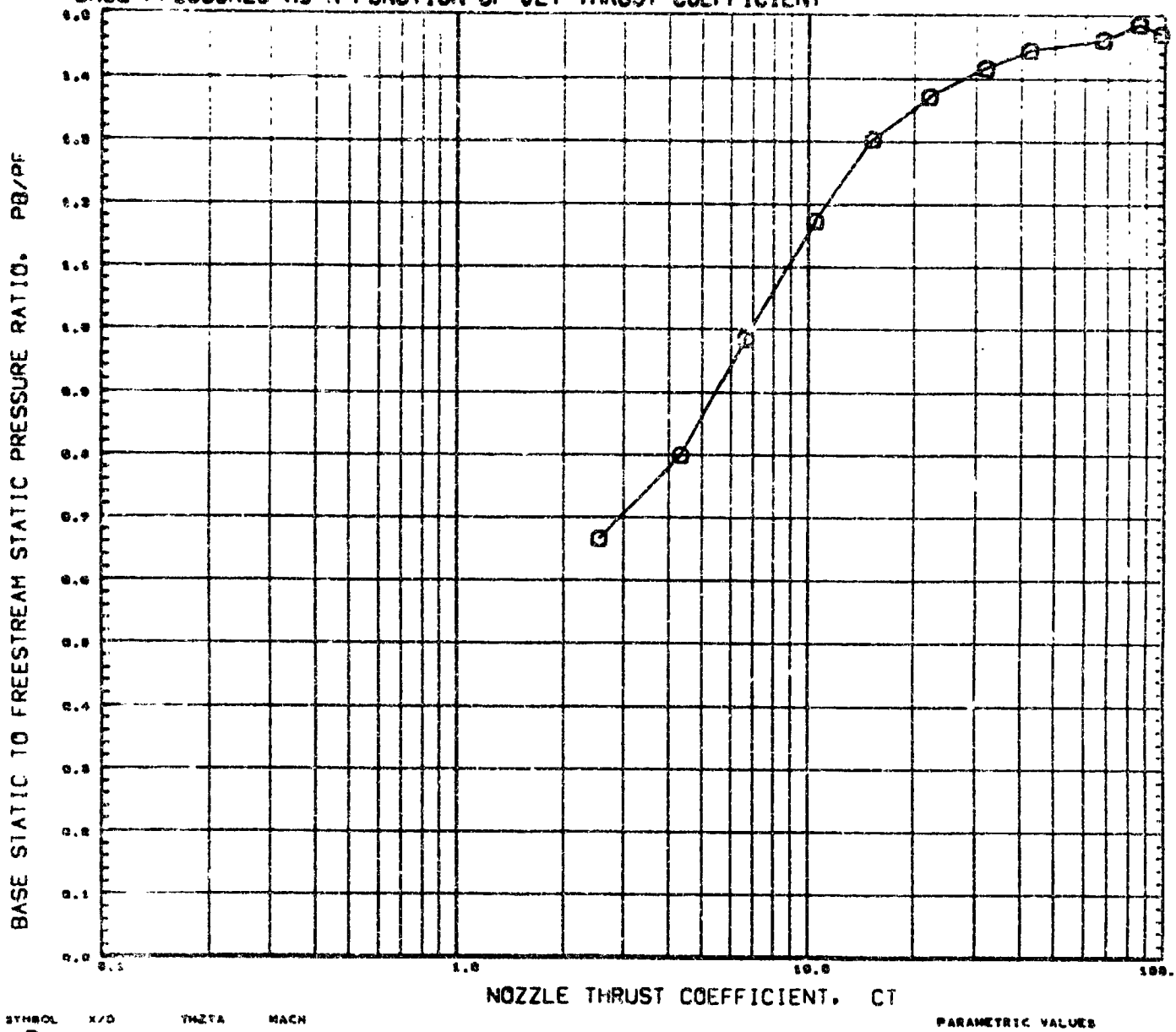
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.000

PARAMETRIC VALUES

ALPHA	0.00	MACH-J	2.700
DJ/DB	0.000	THETAJ	30.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



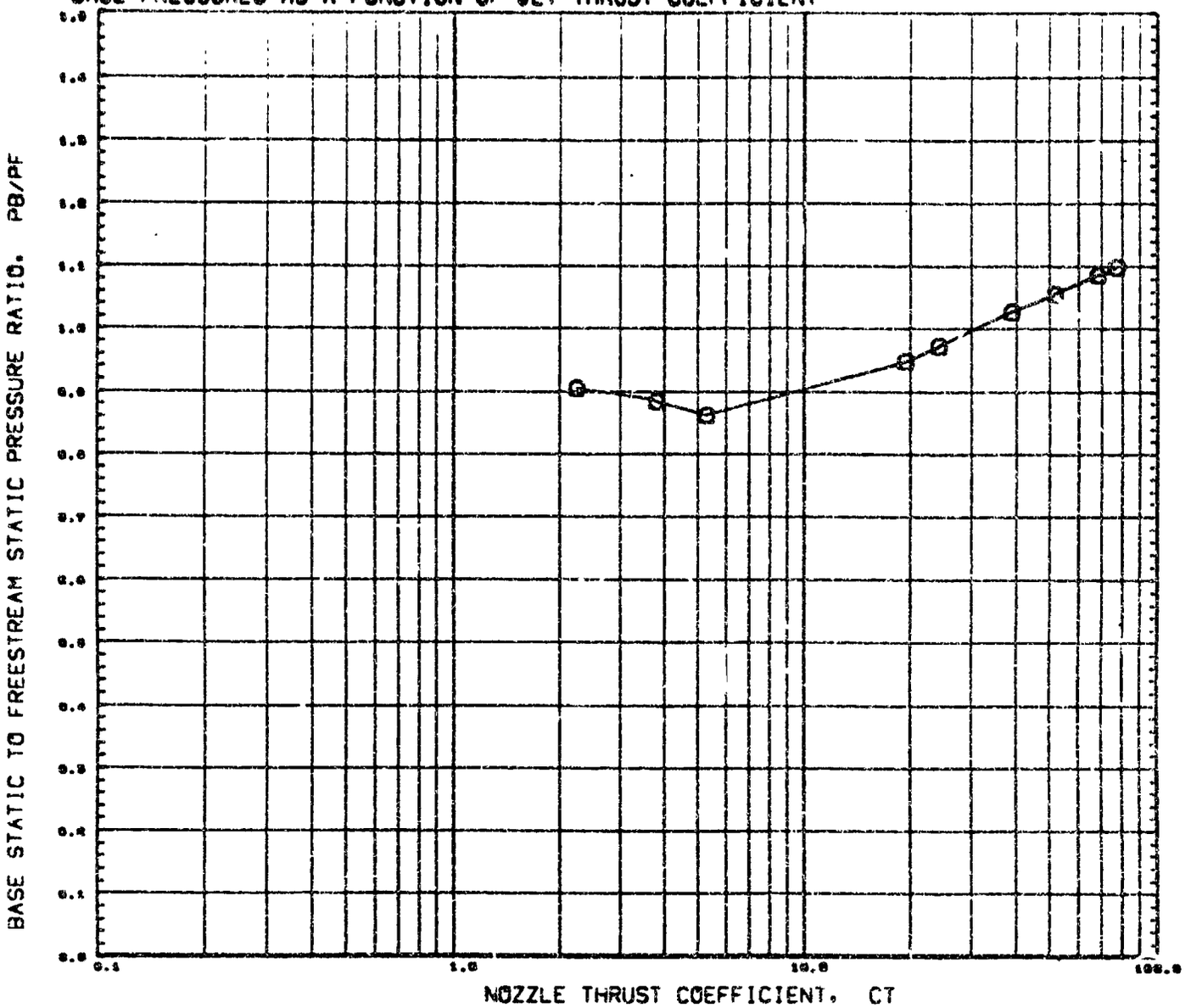
SYMBOL	X/D	THETA	MACH
○	[illegible]	0.000	1.803

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.900	THETAJ	30.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



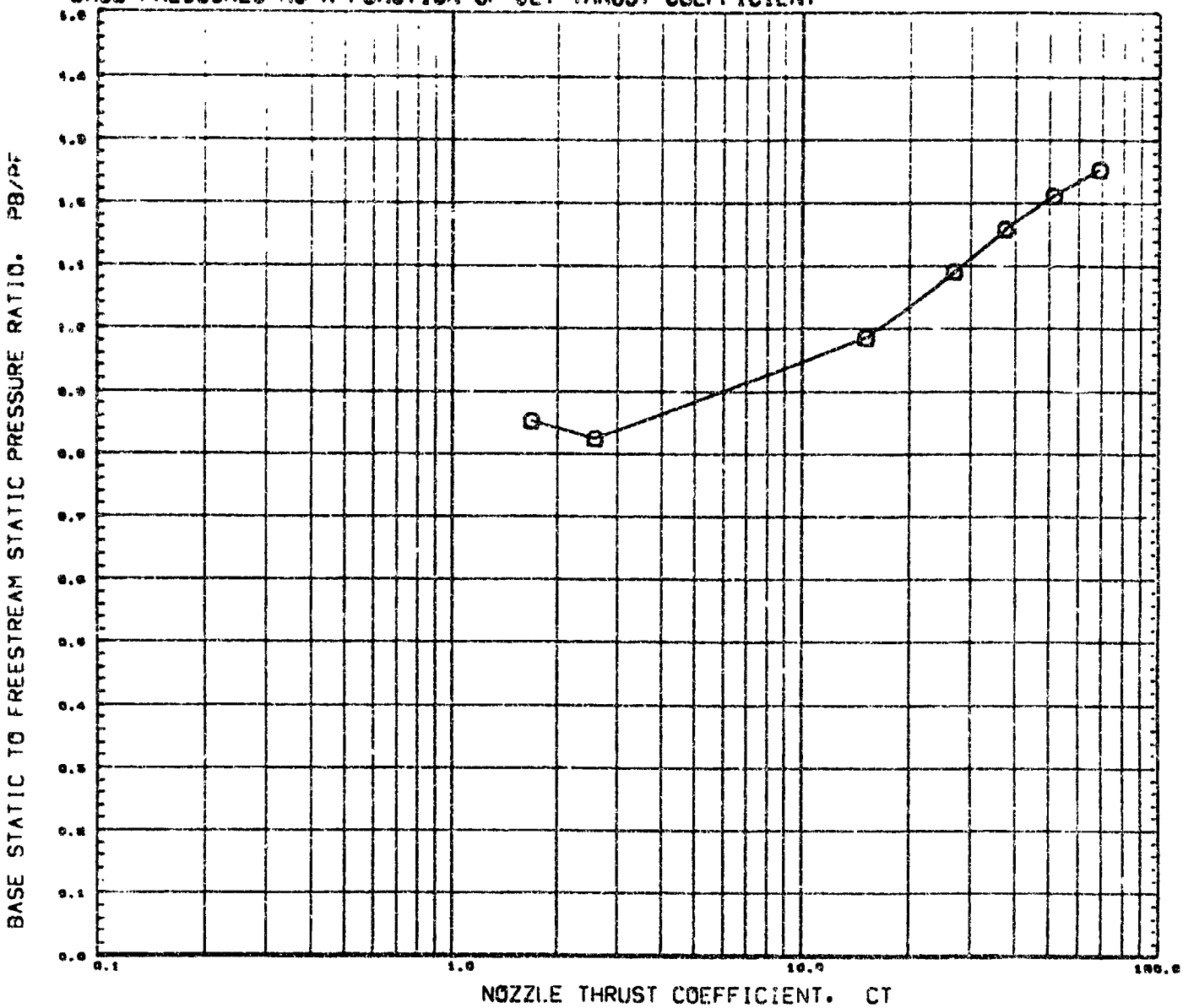
SYMBOL	X/D	THETA	MACH
O	0.050	0.000	0.703

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.700	THETAJ	20.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.903

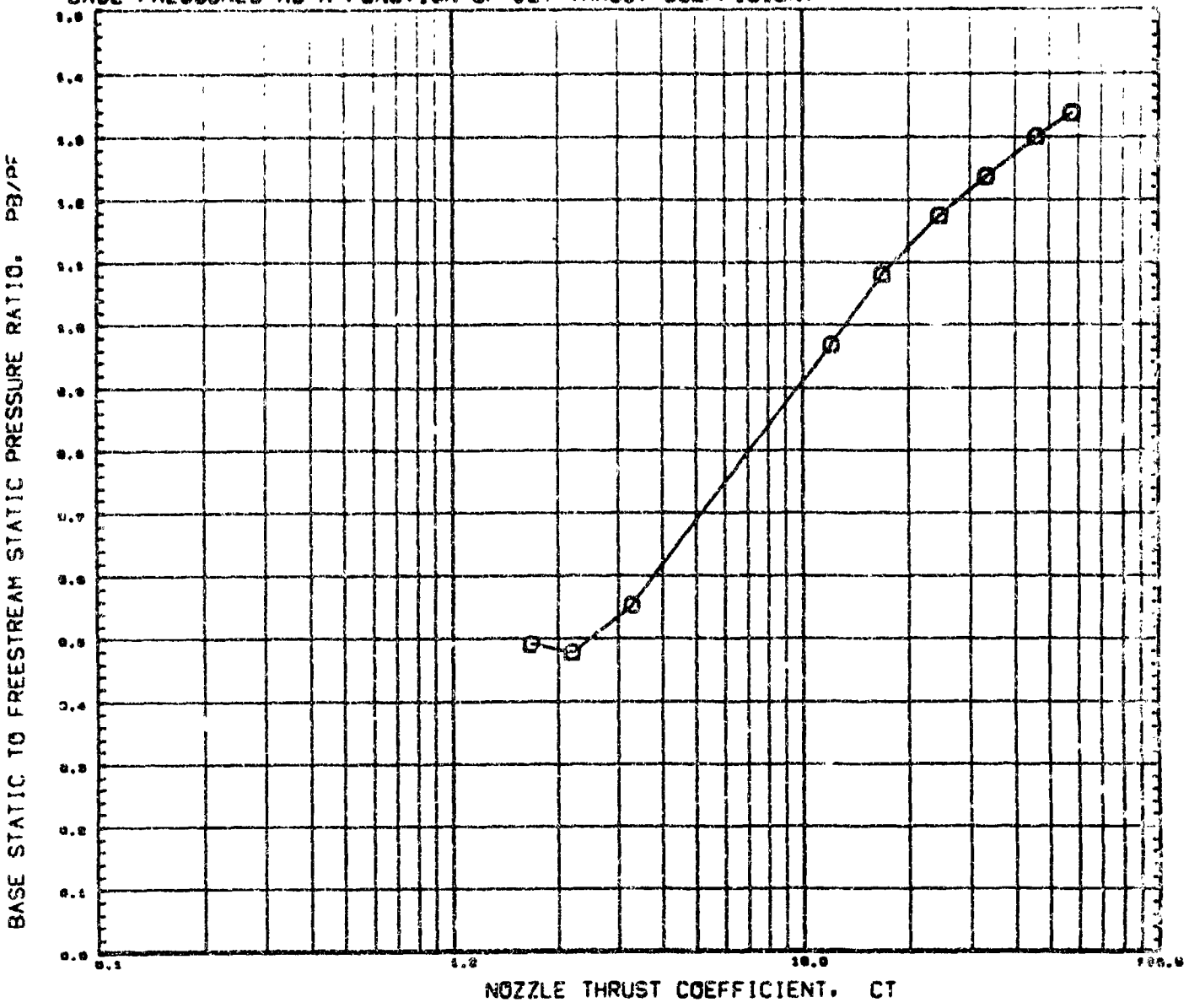
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.700	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-3) (RUCB13)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



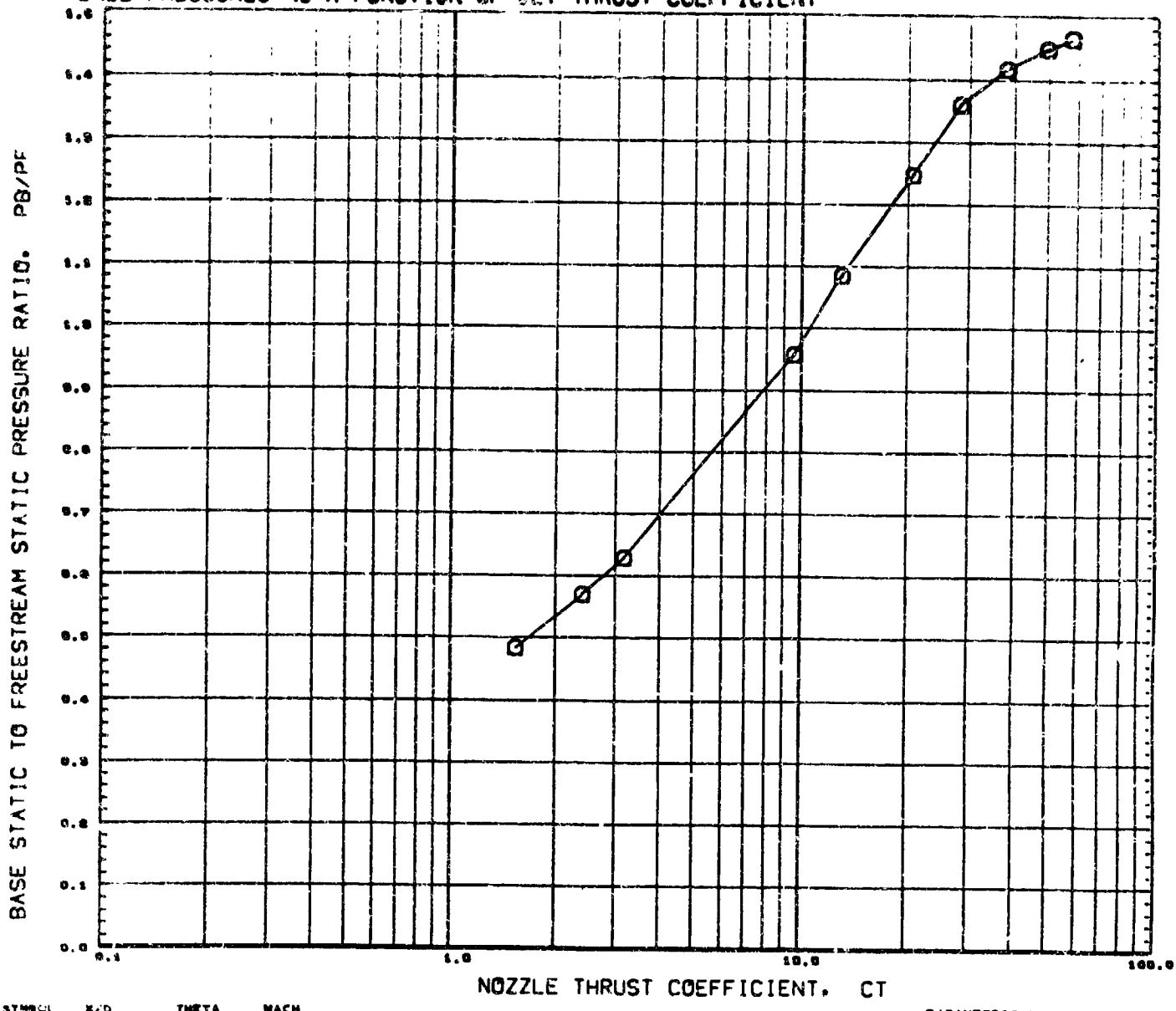
SYMBOL	X/D	THETA	MACH
O	3.000	0.000	1.003

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	7.700
DJ/DB	0.966	THETAJ	25.200

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.205

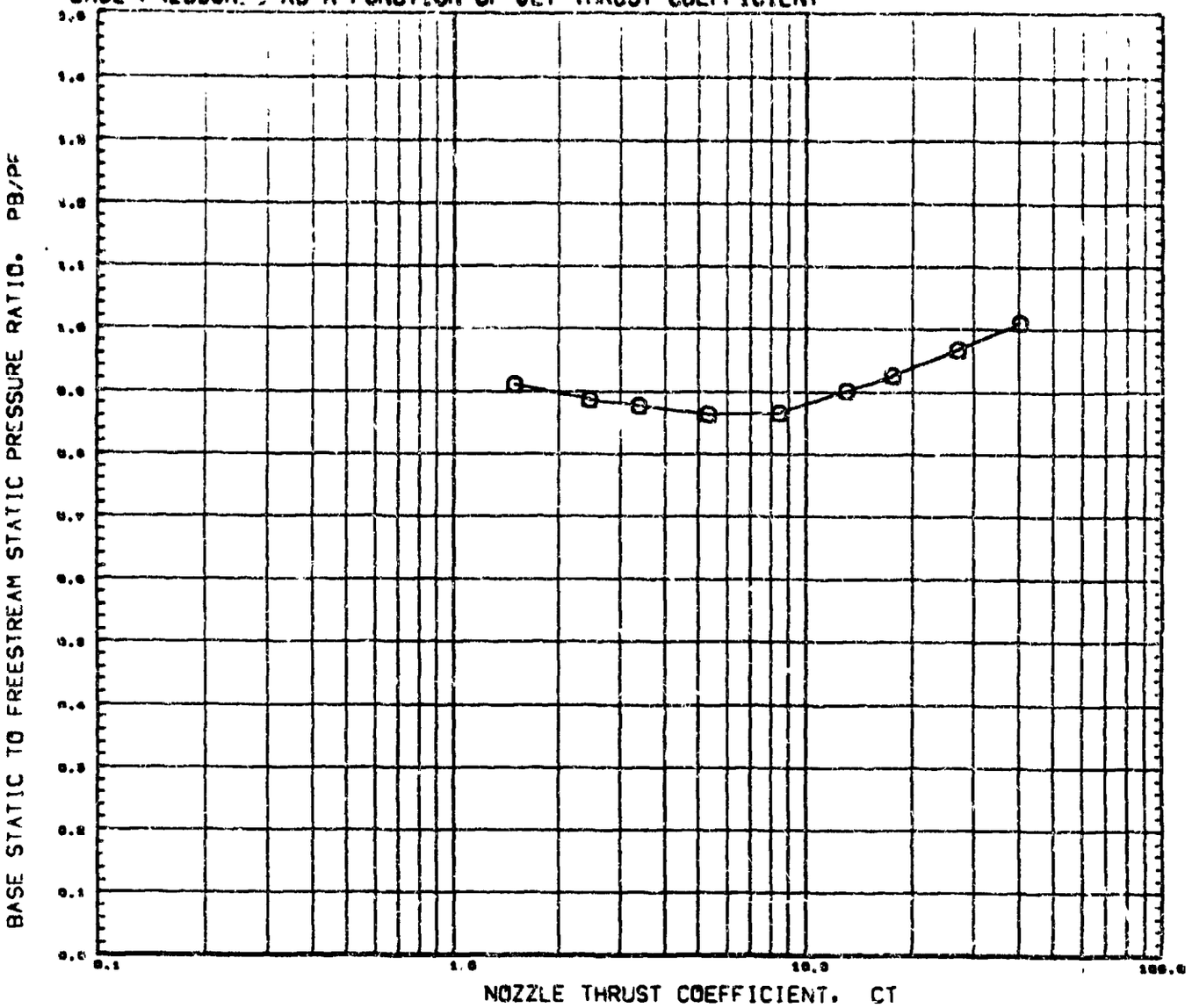
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DE	0.700	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-3) (RUCB13)

BASE PRESSURE AS A FUNCTION OF JET THRUST COEFFICIENT



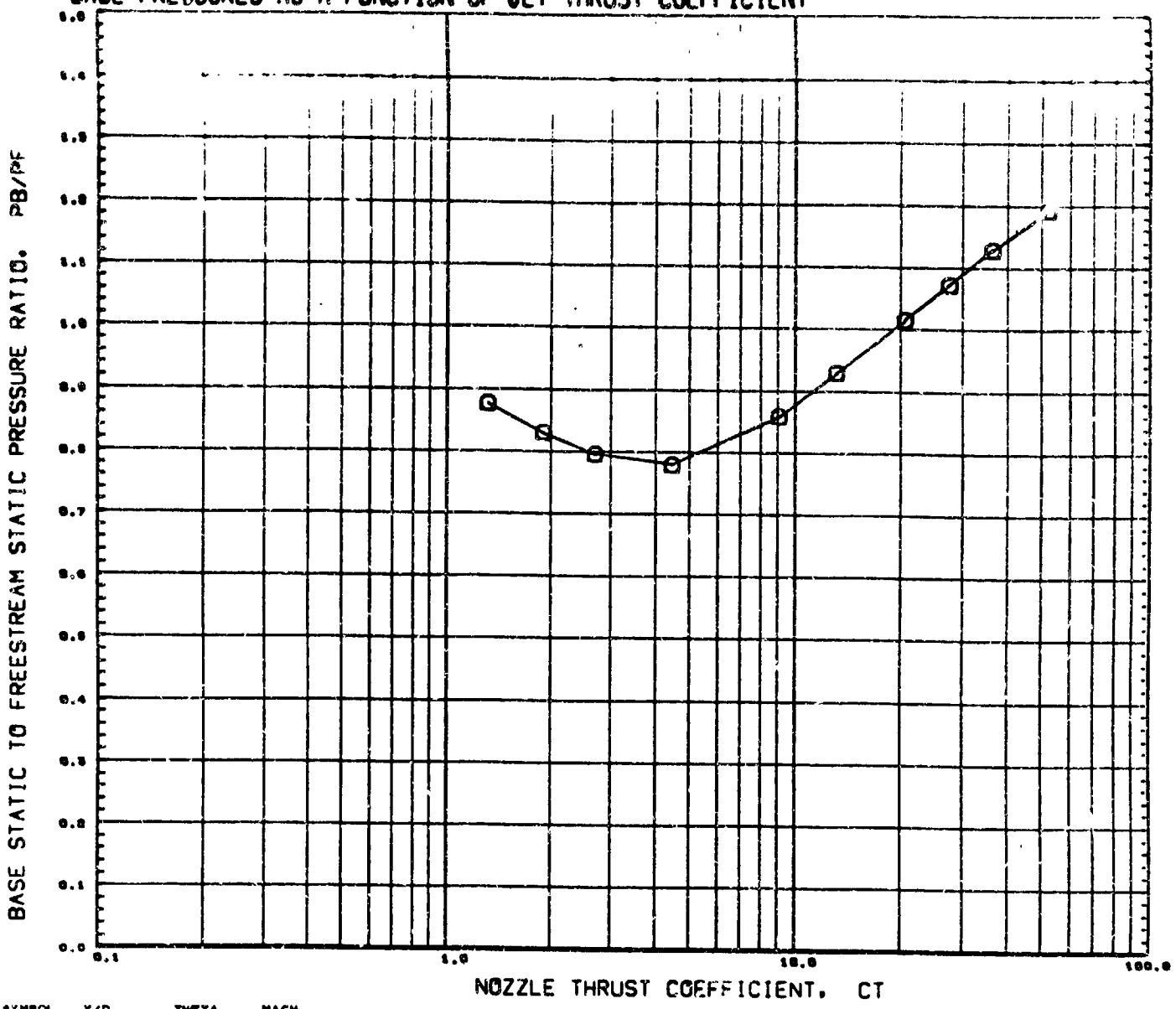
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.703

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DE	0.000	THETAJ	20.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.903

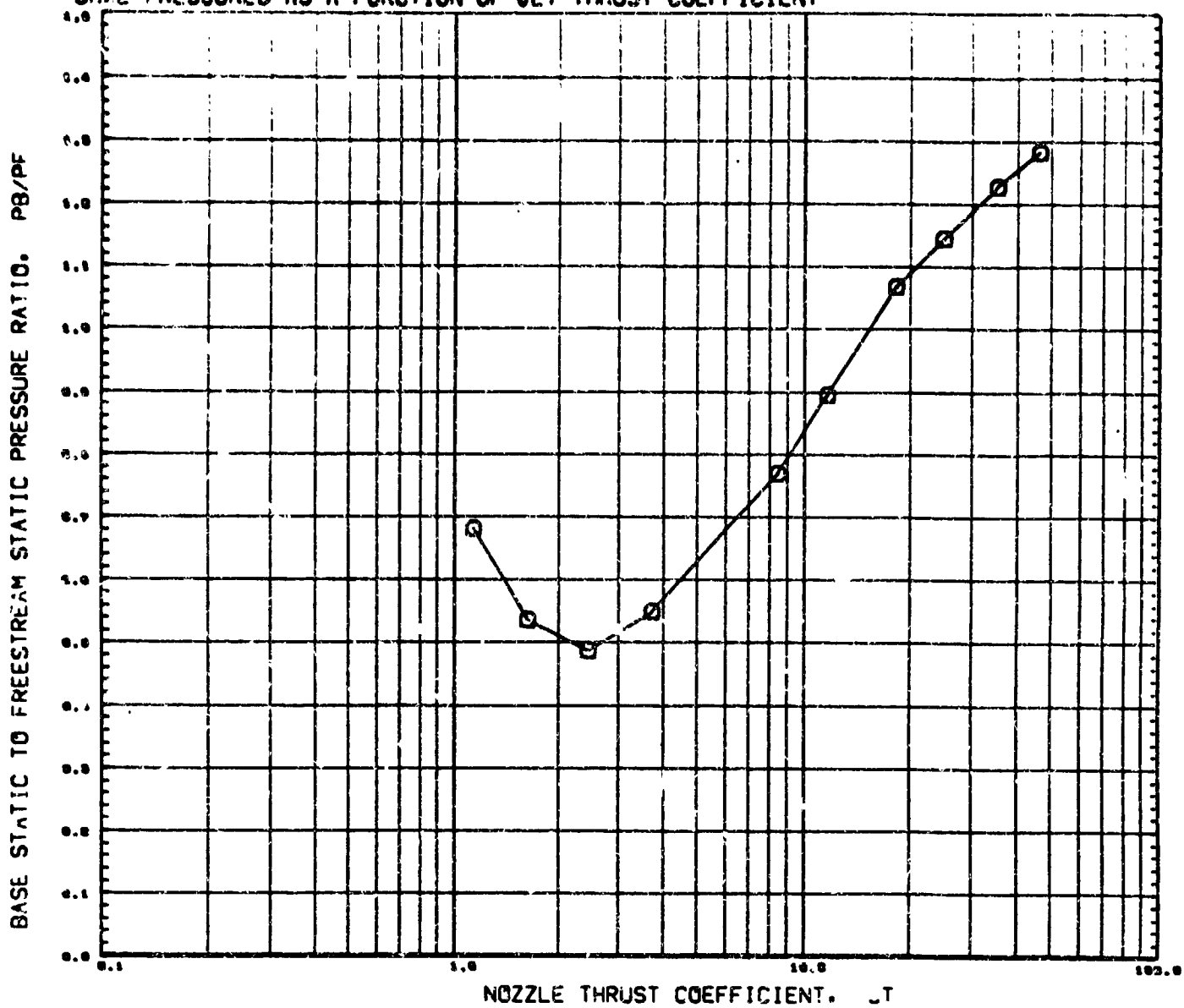
PARAMETRIC VALUES

ALPHA	0.000	MACH	2.700
DJ/DB	0.600	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-4) (RUCB14)

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	2.000	0.000	1.003

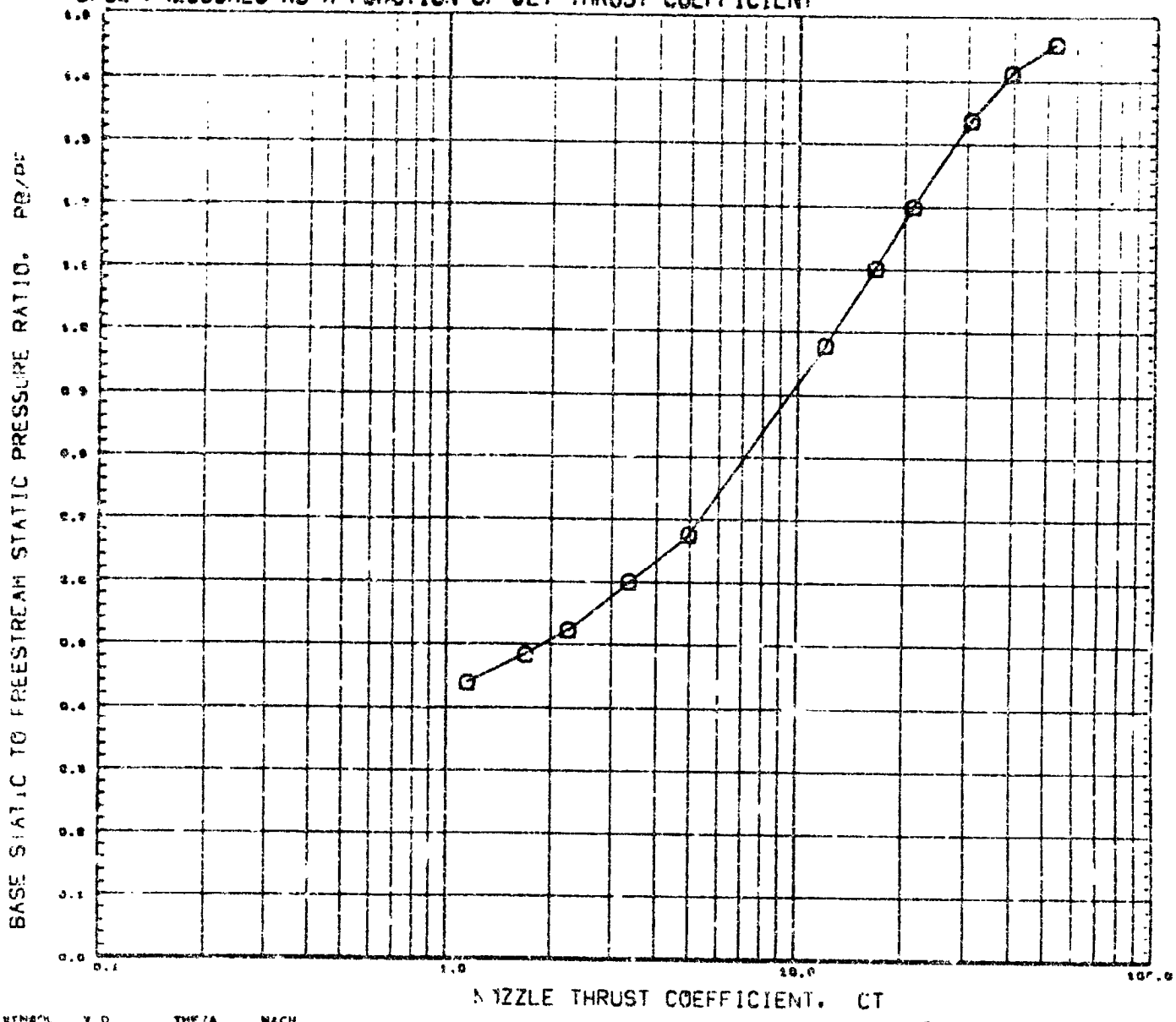
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.797
DJ/DB	0.000	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-4) (RUCB14) PAGE 54

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	V D	THETA	MACH
○	0.000	0.000	1.201

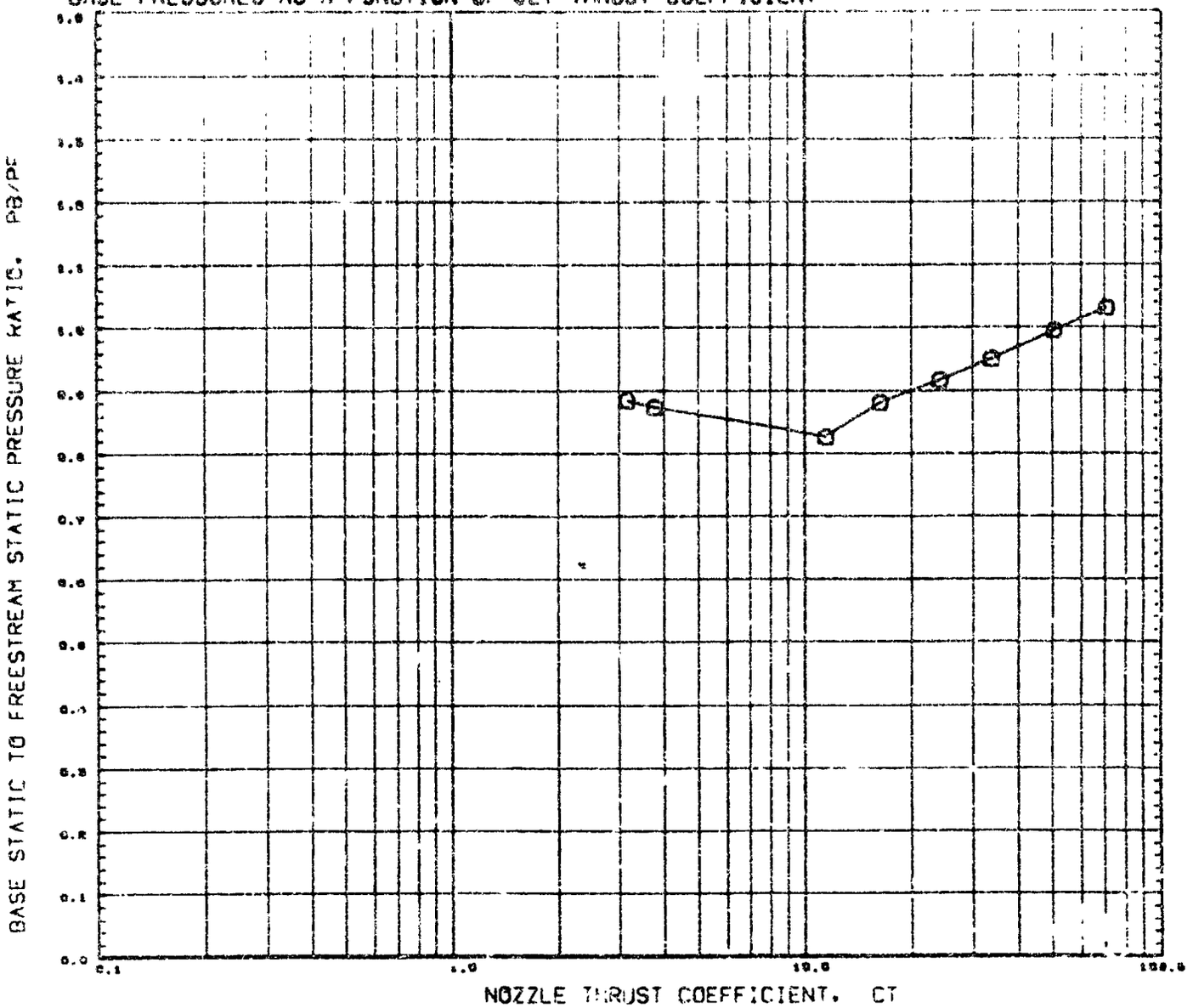
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	3.700
DJ/DB	0.600	THETAJ	20.000

REF. CENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-4) (RUCB14) PAGE 55

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	3.000	5.000	6.704

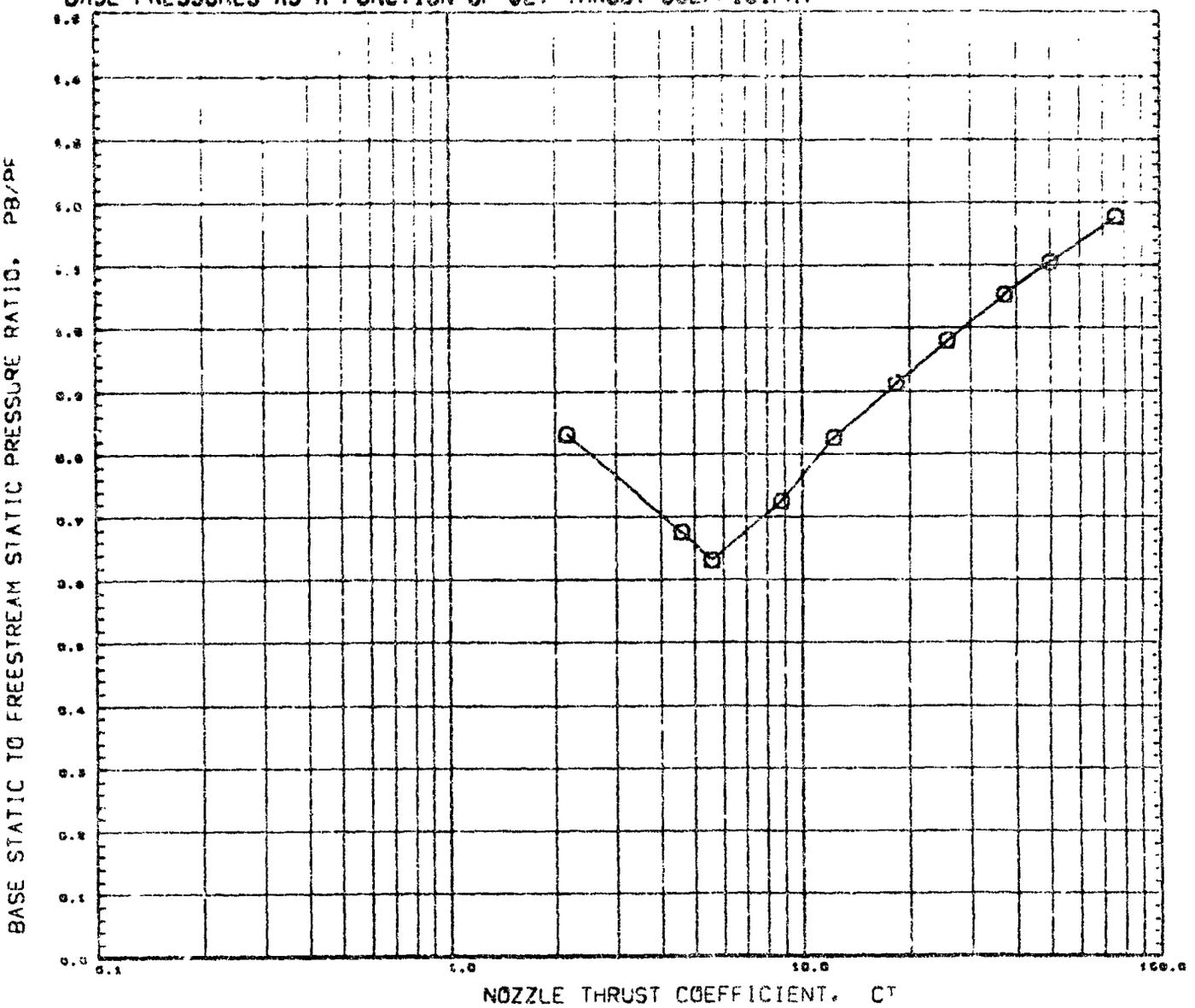
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.760
DJ/DB	0.430	THETAJ	11.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-5) (RUCB15) PAGE 56

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



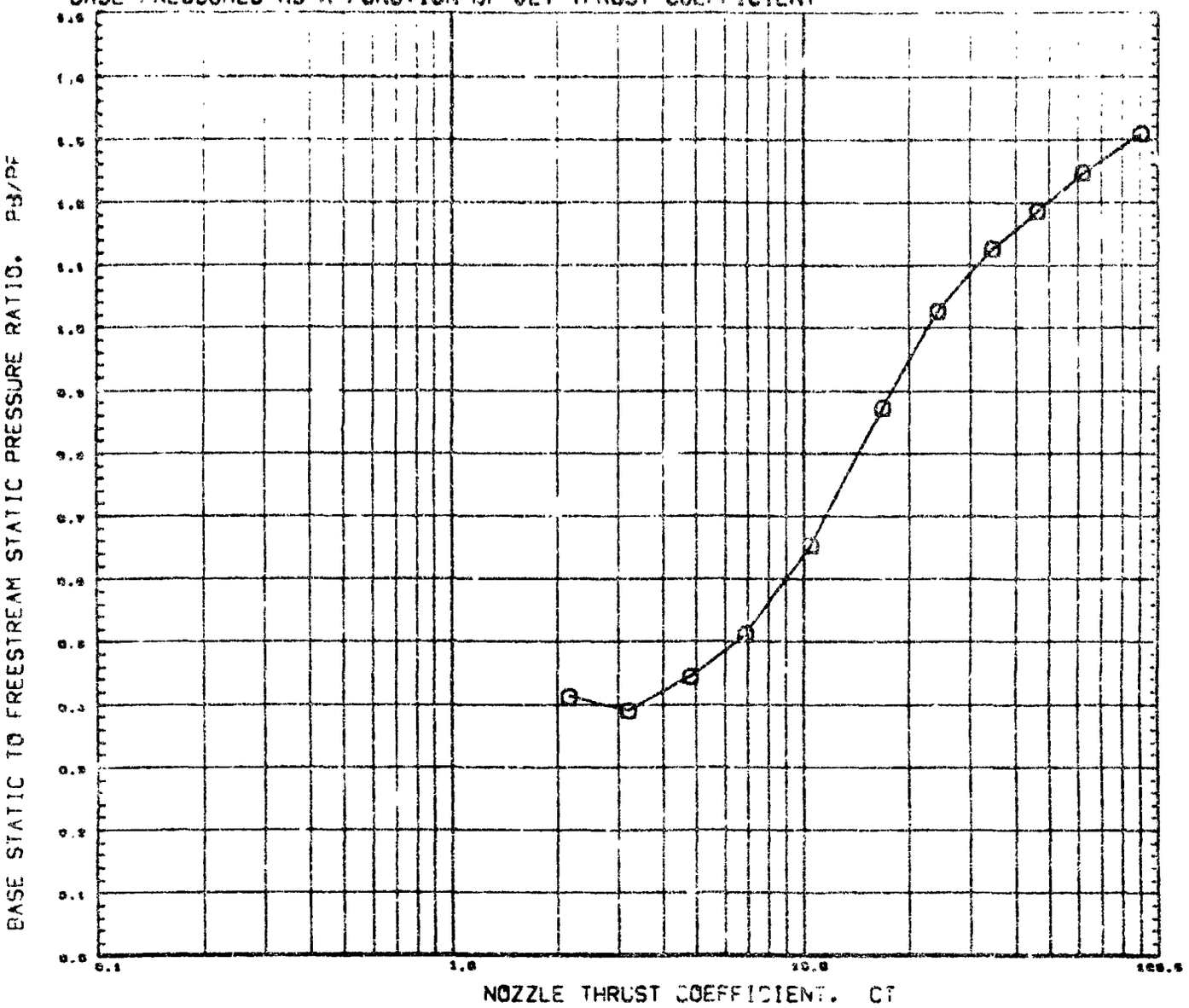
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.903

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	8.700
DJ/DB	0.030	THETAJ	11.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



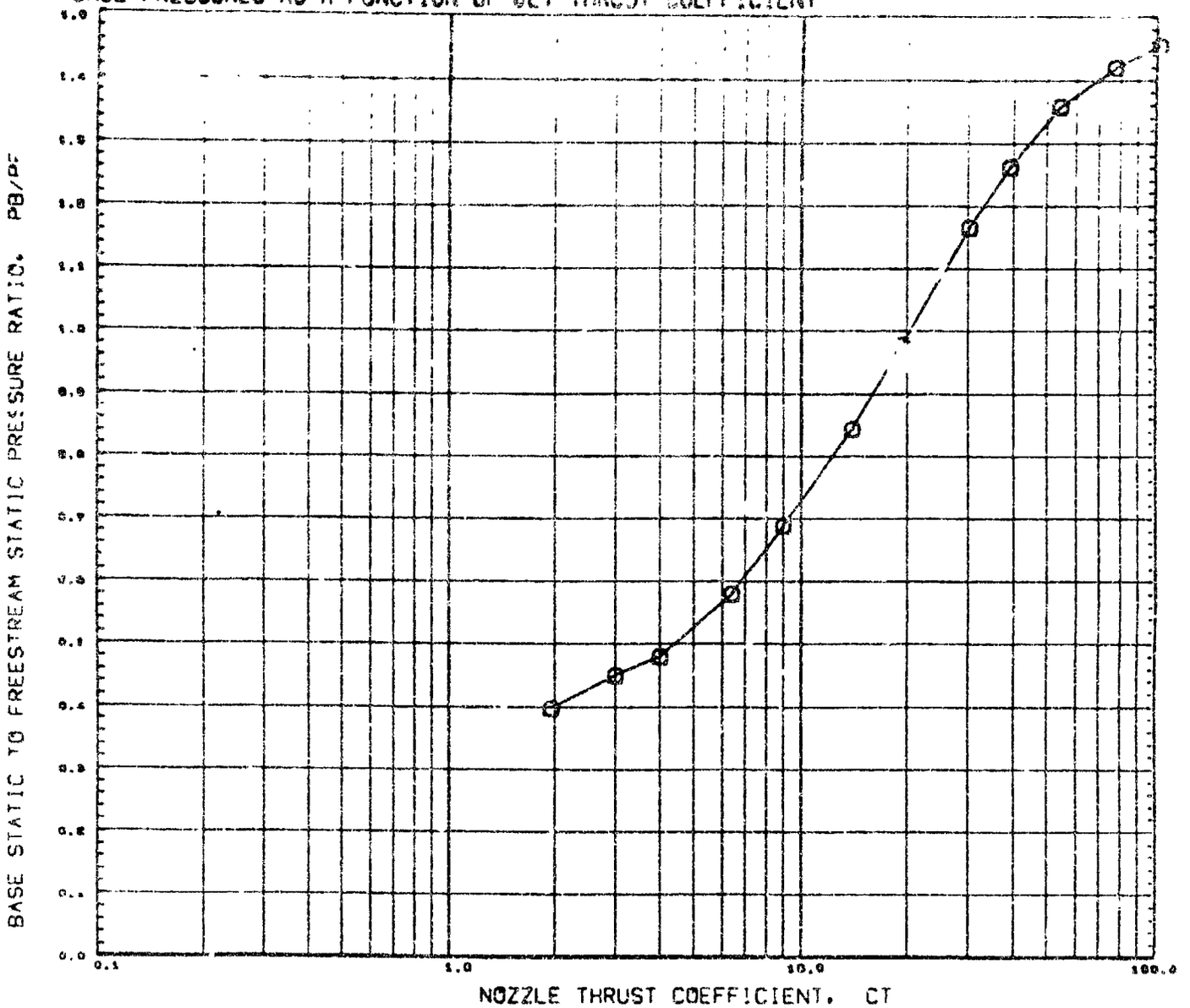
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.004

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	0.760
DJ/DO	0.030	THETAJ	11.060

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF JET THRUST COEFFICIENT



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.205

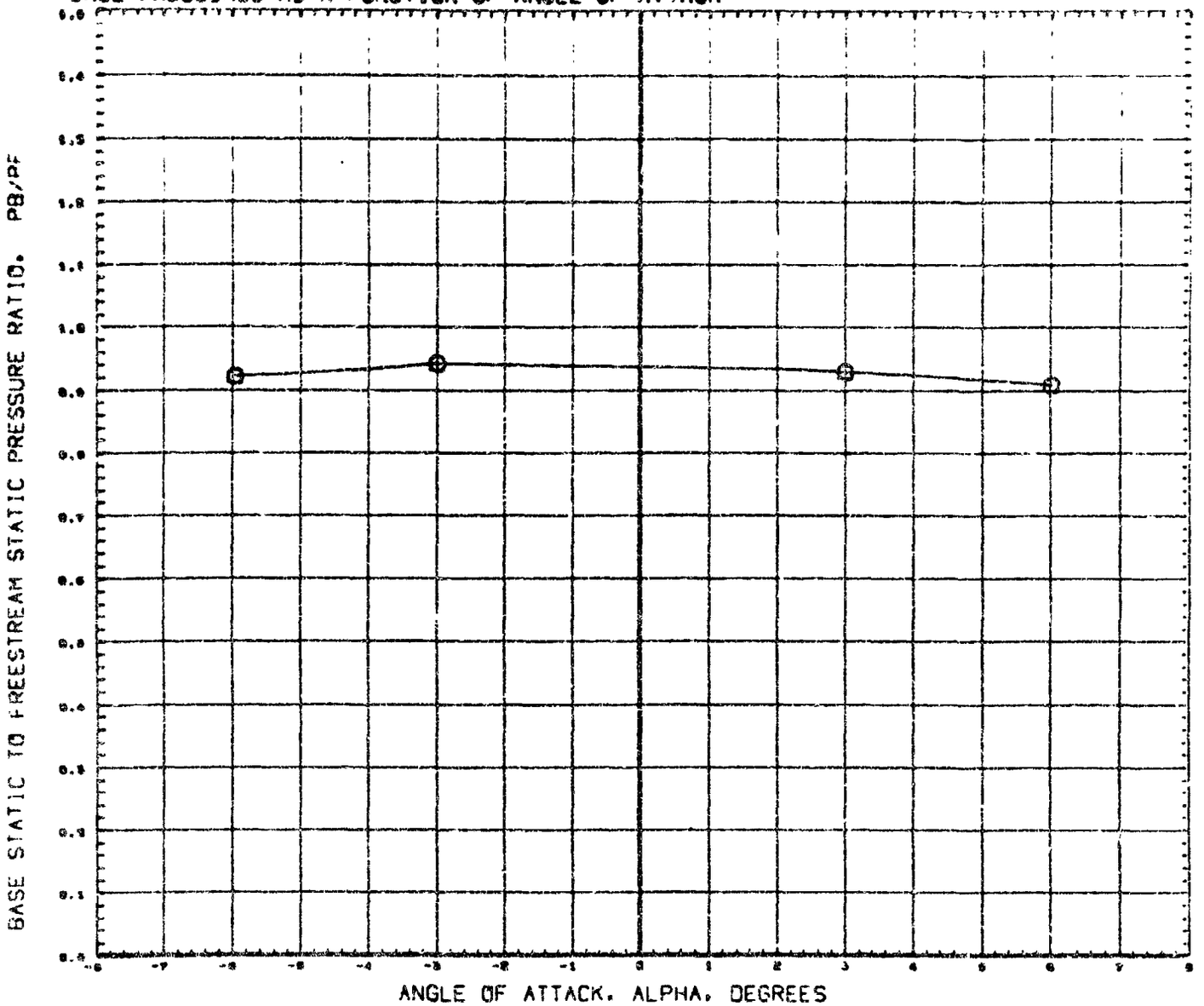
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.630	THETAJ	11.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-5) (RUCB15) PAGE 59

BASE PRESSURES AS A FUNCTION OF ANGLE OF ATTACK



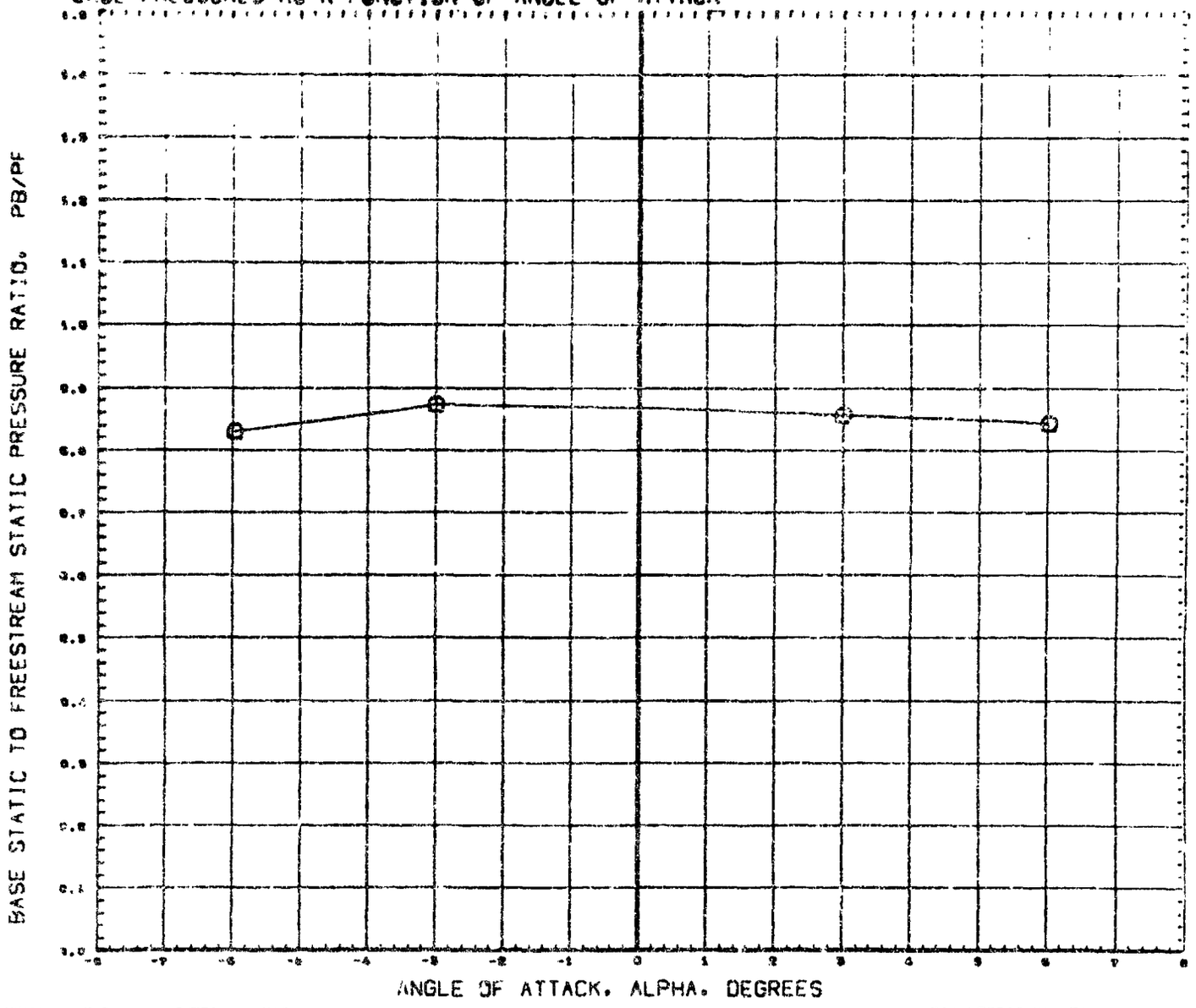
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	0.902

PARAMETRIC VALUES

PC	0.000	MACH-J	2.100
DJ/DB	0.900	THETAJ	20.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF ANGLE OF ATTACK



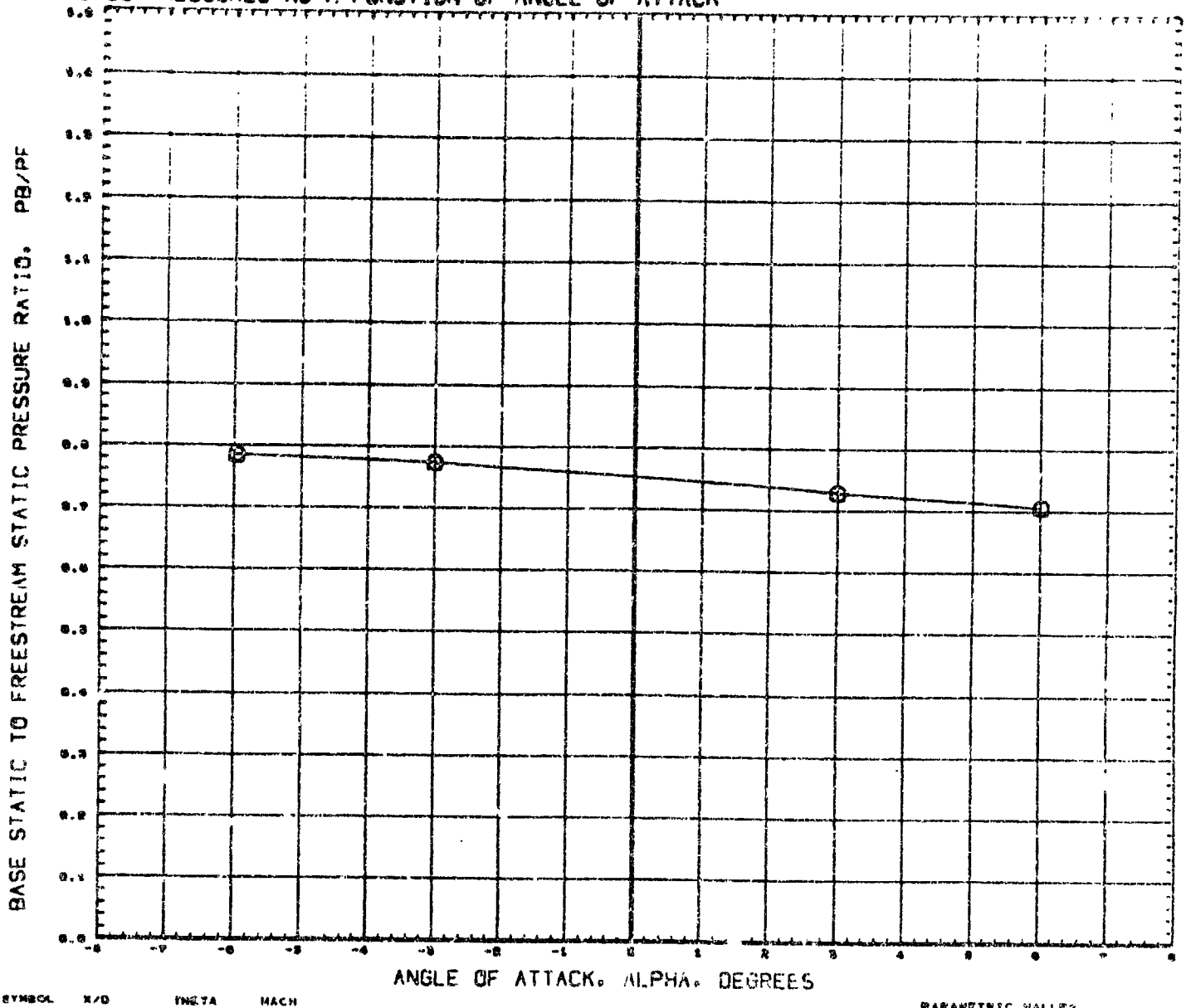
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.000

PARAMETRIC VALUES

PC	0.000	MACH-J	2.700
DJ/DB	0.900	THETAJ	60.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF ANGLE OF ATTACK



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.206

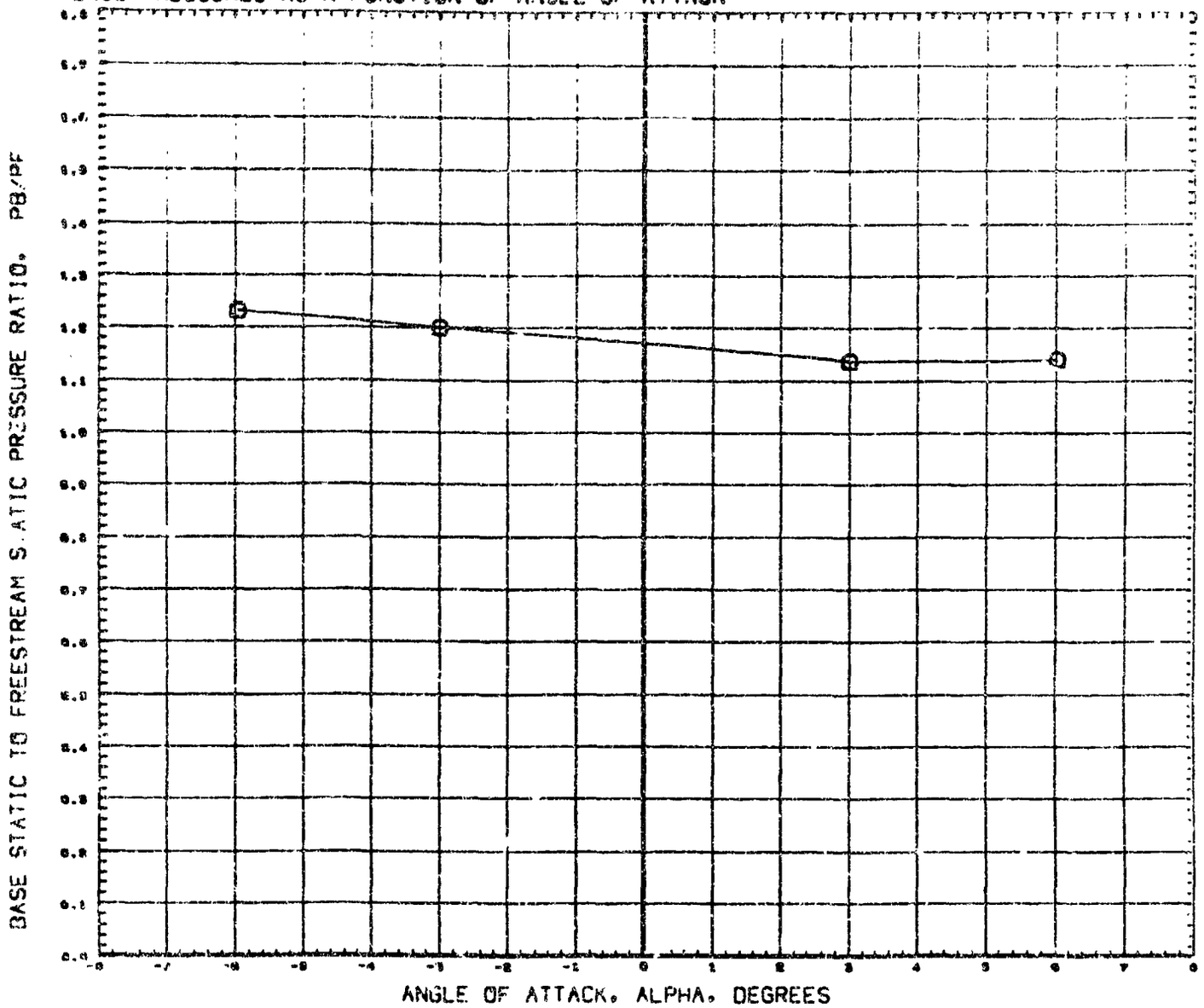
PARAMETRIC VALUES

PC	0.000	MACH-J	2.700
DJ/DB	0.900	THETAJ	20.00

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-2) (RUCB16)

BASE PRESSURES AS A FUNCTION OF ANGLE OF ATTACK



SYMBOL	Y/C	THETA	MACH
O	0.000	3.000	0.902

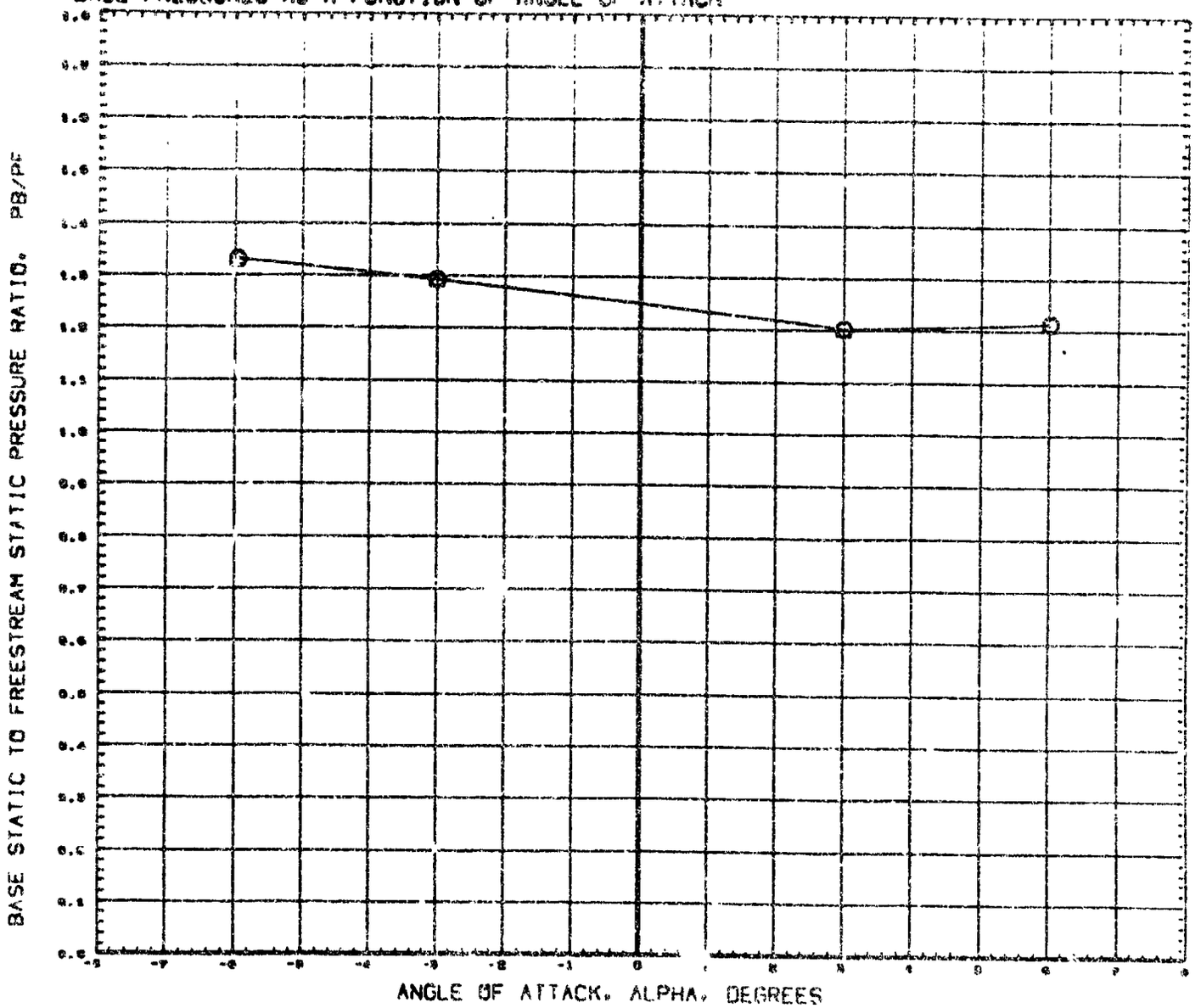
PARAMETRIC VALUES

PC	105.000	MACH-J	0.700
DJ/DE	0.930	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-2) (RUCB17)

BASE PRESSURES AS A FUNCTION OF ANGLE OF ATTACK



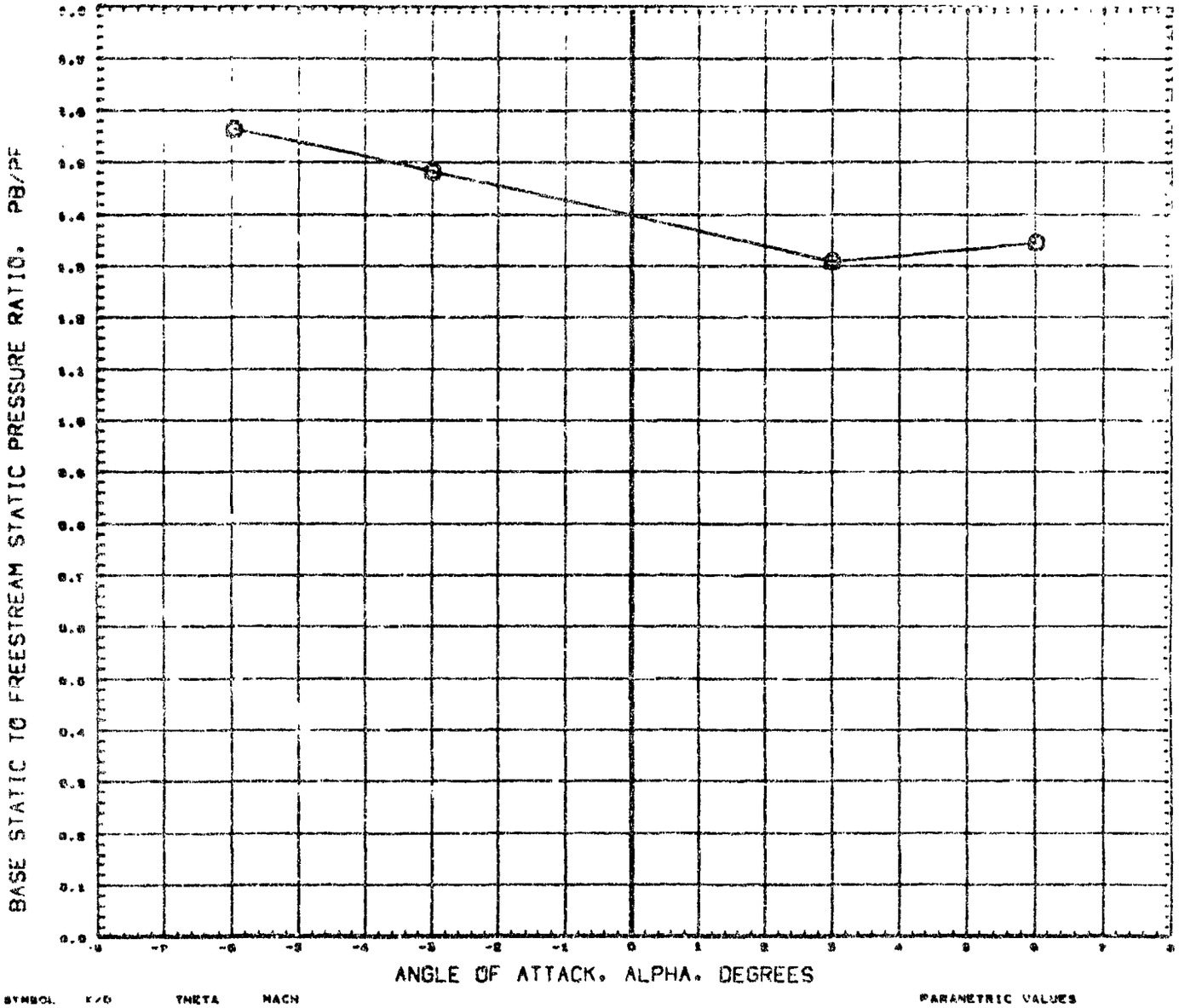
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.002

PARAMETRIC VALUES

PC	105.000	MACH-J	2.700
DJ/DO	0.900	THETA J	20.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF ANGLE OF ATTACK



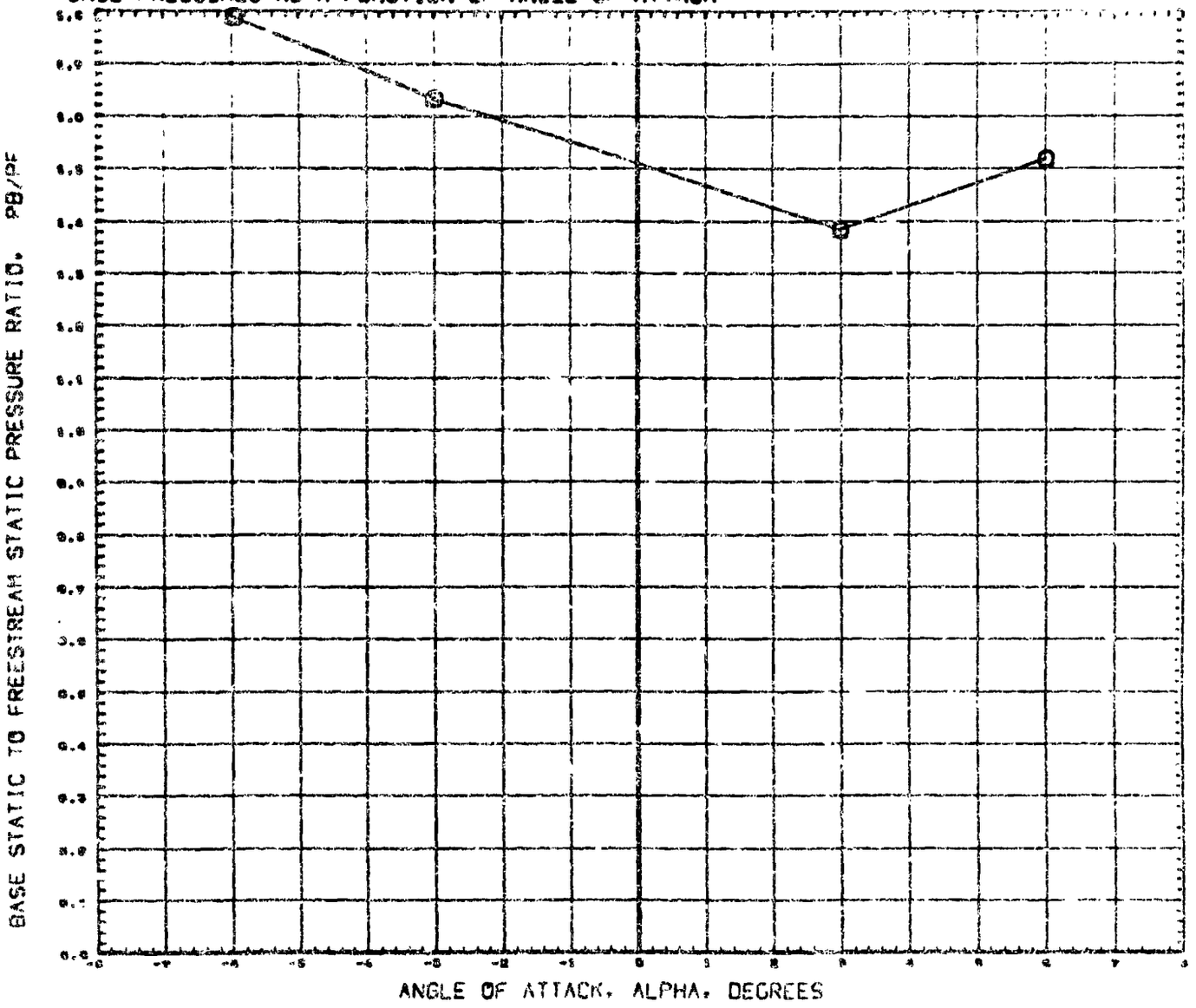
SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.209

PARAMETRIC VALUES

PC	108.000	MACH-J	2.700
DJ/DB	0.900	THETAJ	20.000

REFERENCE FILE

BASE PRESSURES AS A FUNCTION OF ANGLE OF ATTACK



SYMBOL	X/D	THETA	MACH
O	0.000	0.000	1.200

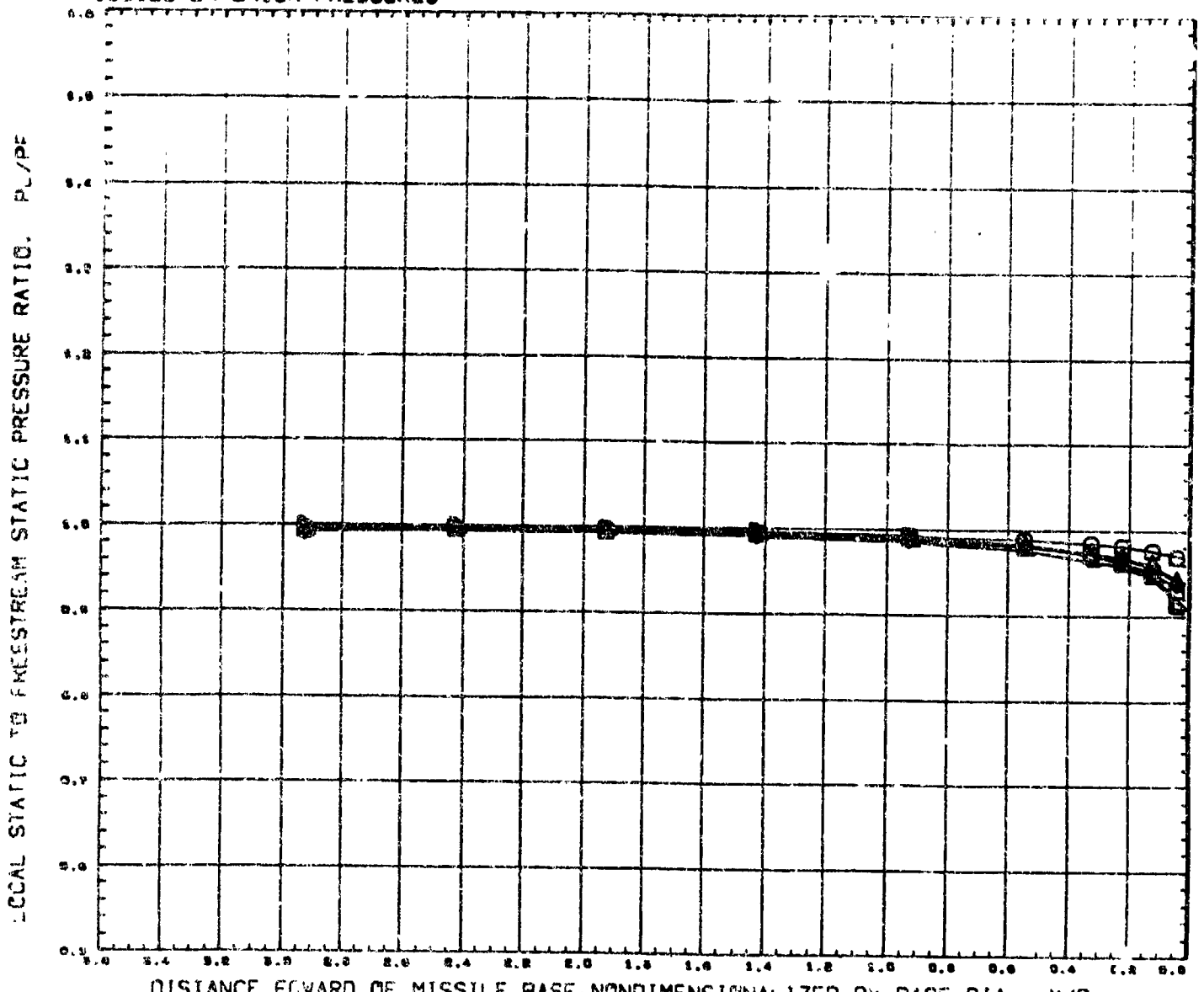
PARAMETRIC VALUES

PC	820.000	MACH-1	0.700
D/DB	0.900	THETA,	40.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-2) (RUCB18) PAGE 66

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
◇	0.111	0.000	0.701
◇	0.526		
◇	0.827		
◇	1.123		
◇	1.868		
◇	2.774	REFERENCE FILE	

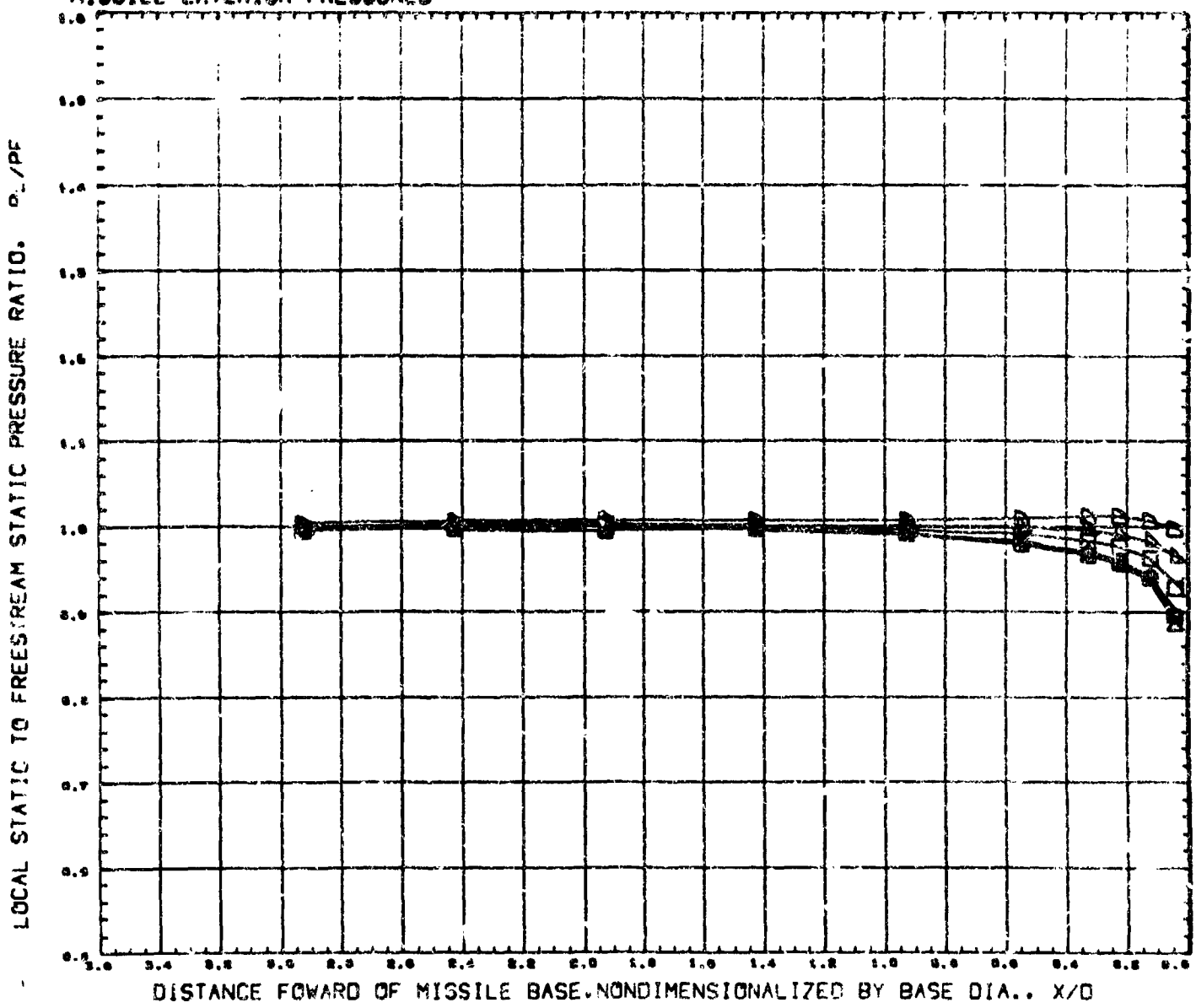
PARAMETRIC VALUES

ALPHA 0.000 MACH-J 1.000

DIA-J 0.500

AMC PLUME STUDY. SHROUDED NOZZLE(-3).PORTS CLSD (RUCE01)

MISSILE EXTERIOR PRESSURES



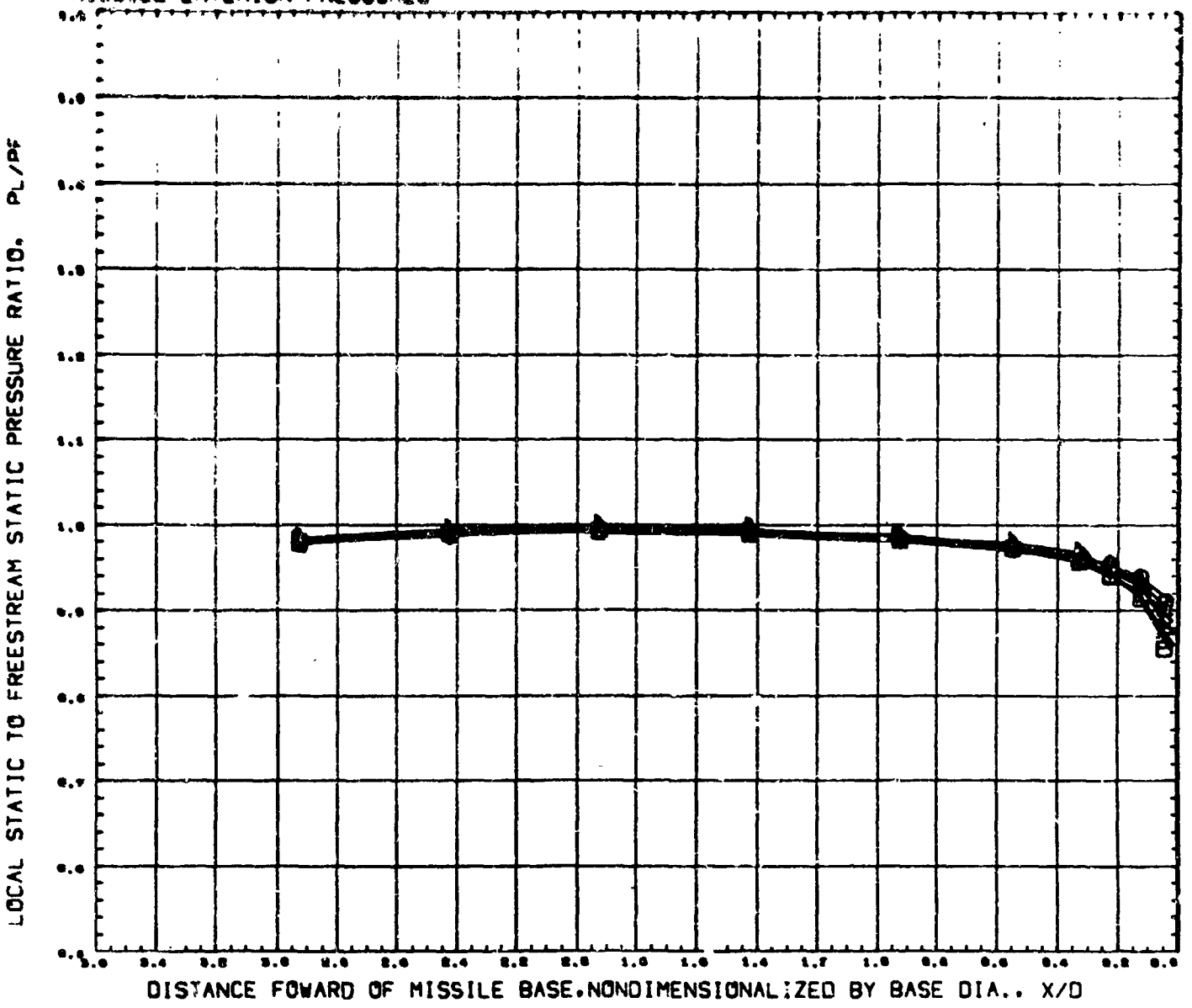
SYMBOL	CT	THETA	MACH
▷	4.440	0.000	0.701
▷	8.000		
◇	11.000		
□	17.641		
▷	24.700		
▷	34.018	REFERENCE TILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.900
DIA-J	0.900		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUCE01)

MISSILE EXTERIOR PRESSURES



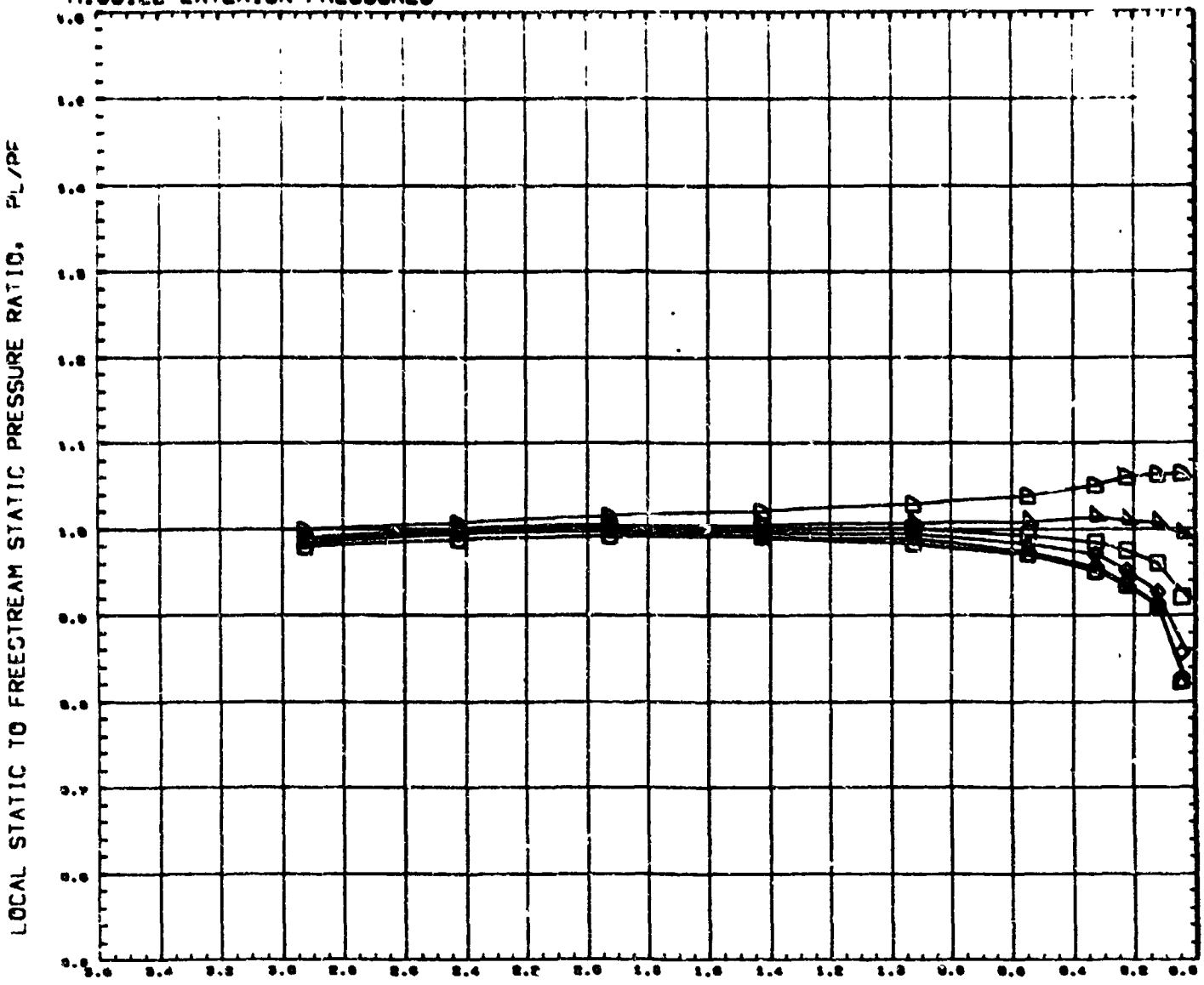
SYMBOL	CT	THETA	MACH
○	0.308	0.000	0.000
△	0.000		
◇	0.071		
□	0.003		
◺	1.003		
◸	0.074	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSC (RUCE01)

MISSILE EXTERIOR PRESSURES

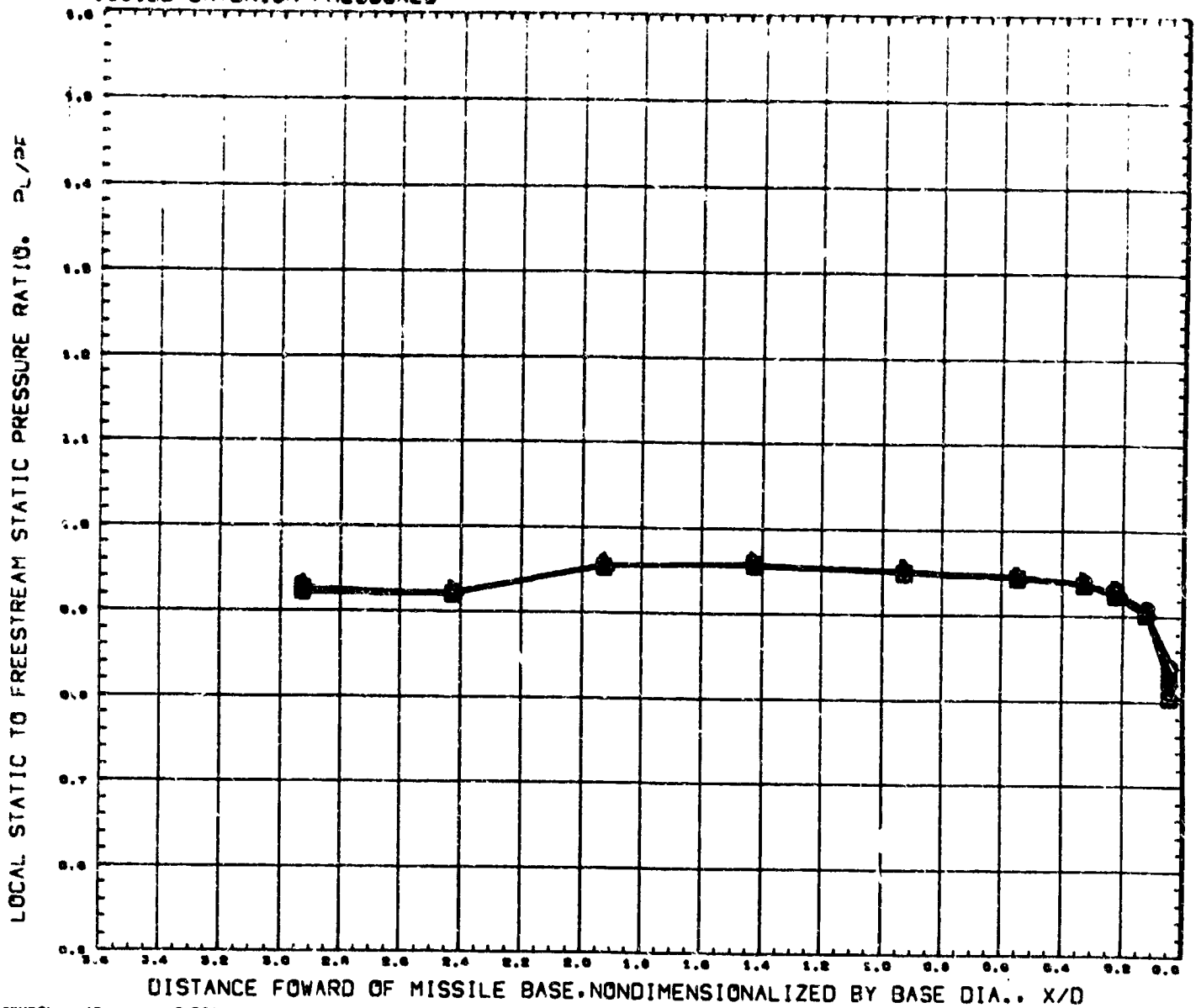


SYMBOL	CT	THETA	MACH
○	3.408	0.000	0.900
△	8.931		
◇	8.692		
□	12.945		
◸	17.222		
D	24.079	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.500		

MISSILE EXTERIOR PRESSURES



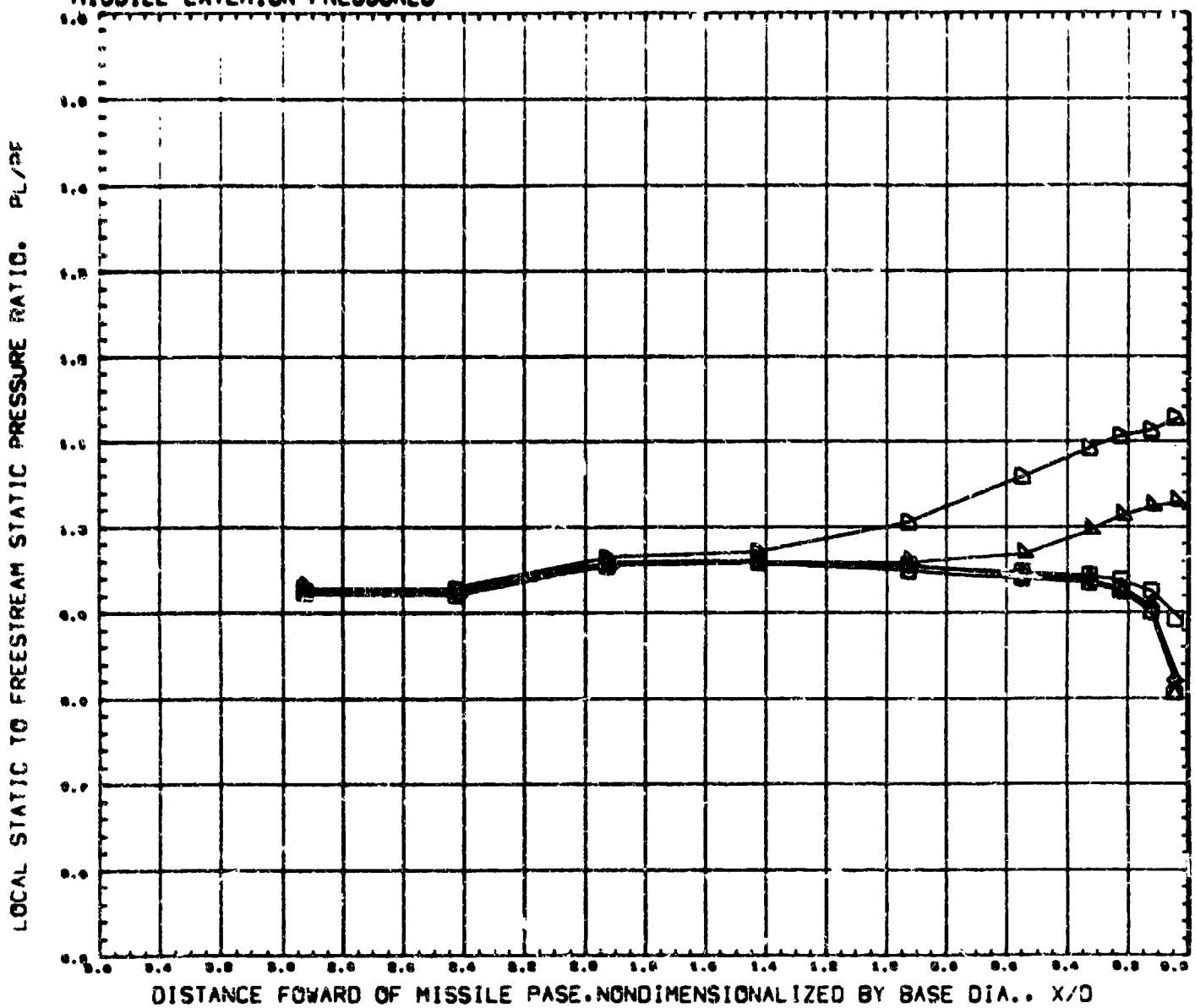
SYMBOL	CT	THETA	MACH
	0.110	0.000	0.997
	0.148		
	0.500		
	0.587		
	0.933		
	1.910	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUCE01)

MISSILE EXTERIOR PRESSURES



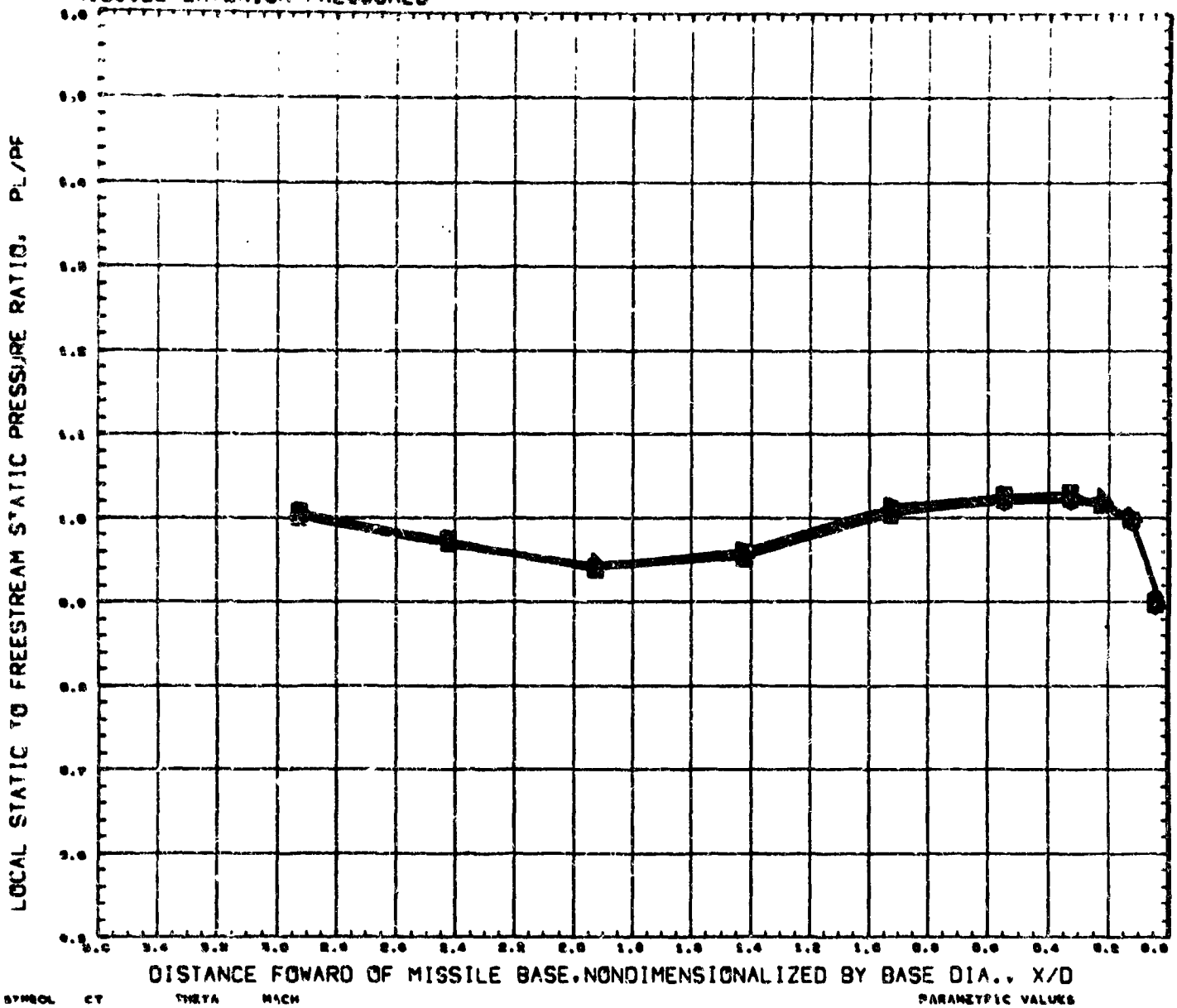
SYMBOL	CT	THETA	MACH
○	3.045	0.000	0.000
△	3.000		
◇	7.015		
□	11.30V		
◁	19.016		
D	22.201	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUCE01)

MISSILE EXTERIOR PRESSURES

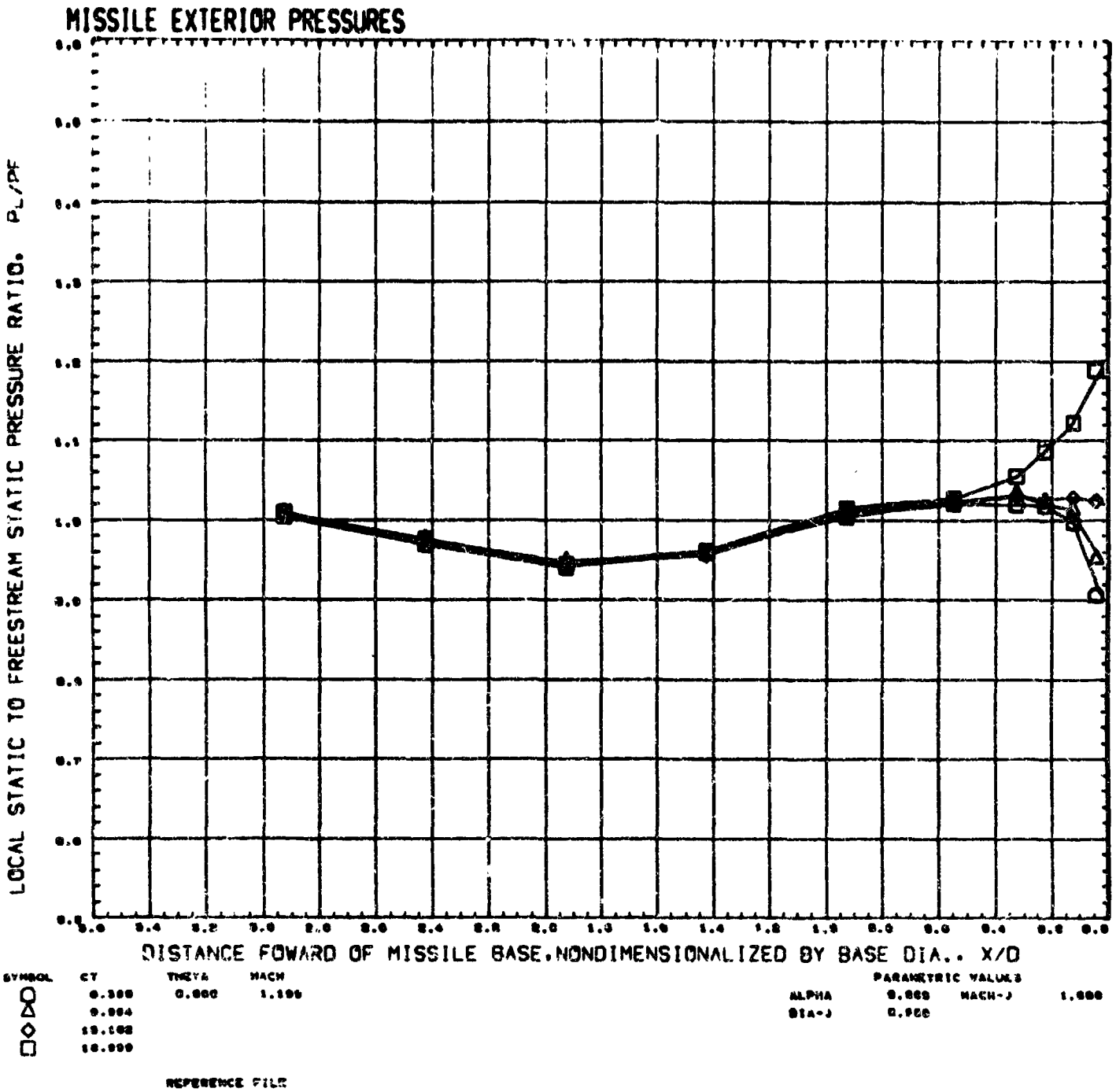


SYMBOL	CT	THETA	MACH
	0.106	0.000	1.100
	0.042		
	0.075		
	1.032		
	0.000		
	4.057	REFERENCE FILE	

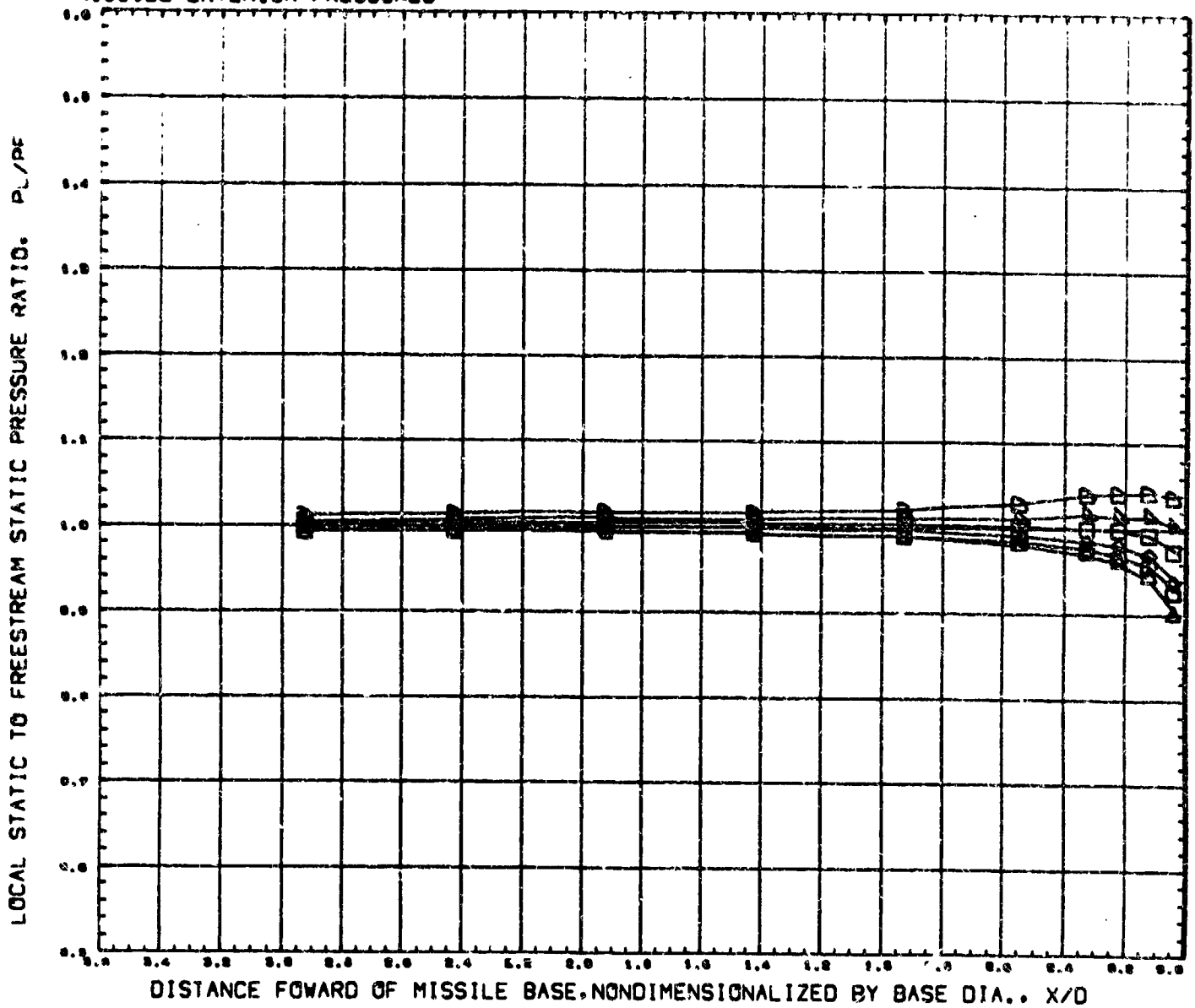
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	9.500		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUCE01)


MISSILE EXTERIOR PRESSURES
LOCAL STATIC TO FREESTREAM STATIC PRESSURE RATIO, PL/PF
DISTANCE FOWARD OF MISSILE BASE,NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL
CT
THETA
MACH
PARAMETRIC VALUES
ALPHA
MACH-J
DIA-J
REFERENCE FILE

MISSILE EXTERIOR PRESSURES



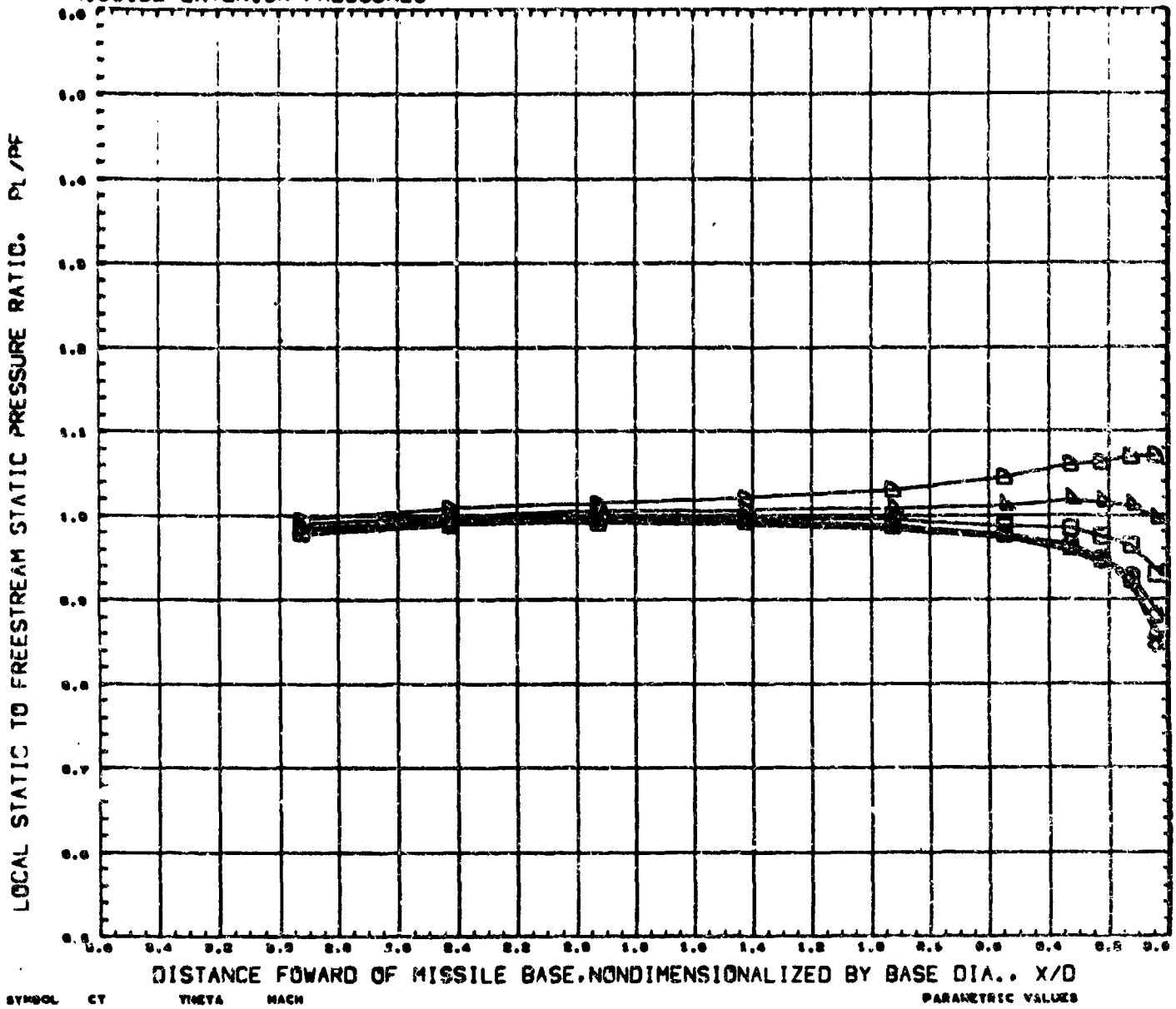
SYMBOL	CT	THETA	MACH
○	1.049	0.000	0.696
△	10.739		
◇	17.397		
□	25.365		
◺	36.070		
D	40.340	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS CLSD (RUCE02)

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
	1.174	0.000	0.000
	5.714		
	0.000		
	12.001		
	10.700		
	20.000	REFERENCE FILE	

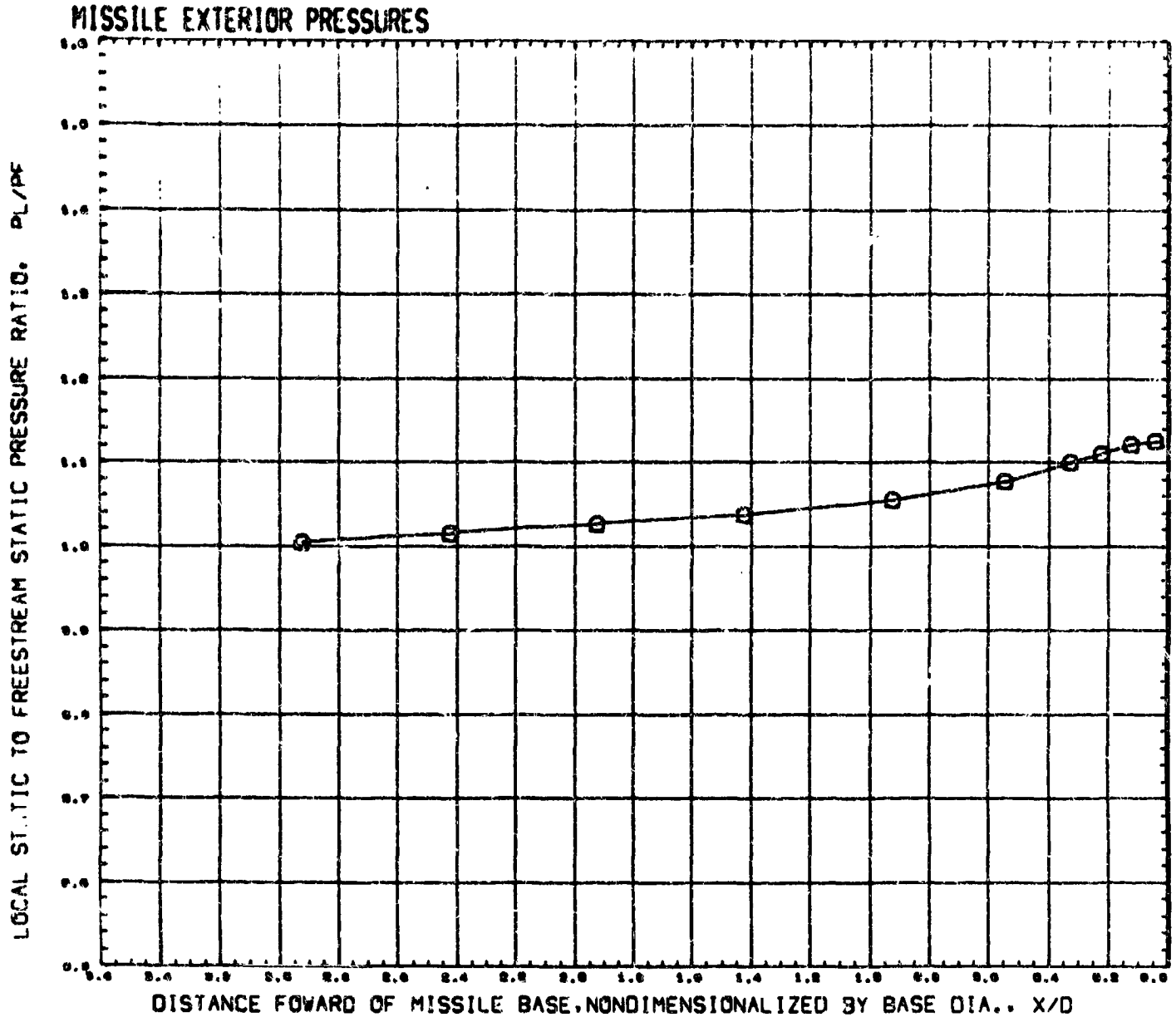
PARAMETRIC VALUES

ALPHA 5.000 MACH-J 1.000

DIA-J 1.000

AMC PLUME STUDY. SHROUDED NOZZLE(-4).PORTS CLSD (RUCE02)

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
O	33.005	0.000	0.293

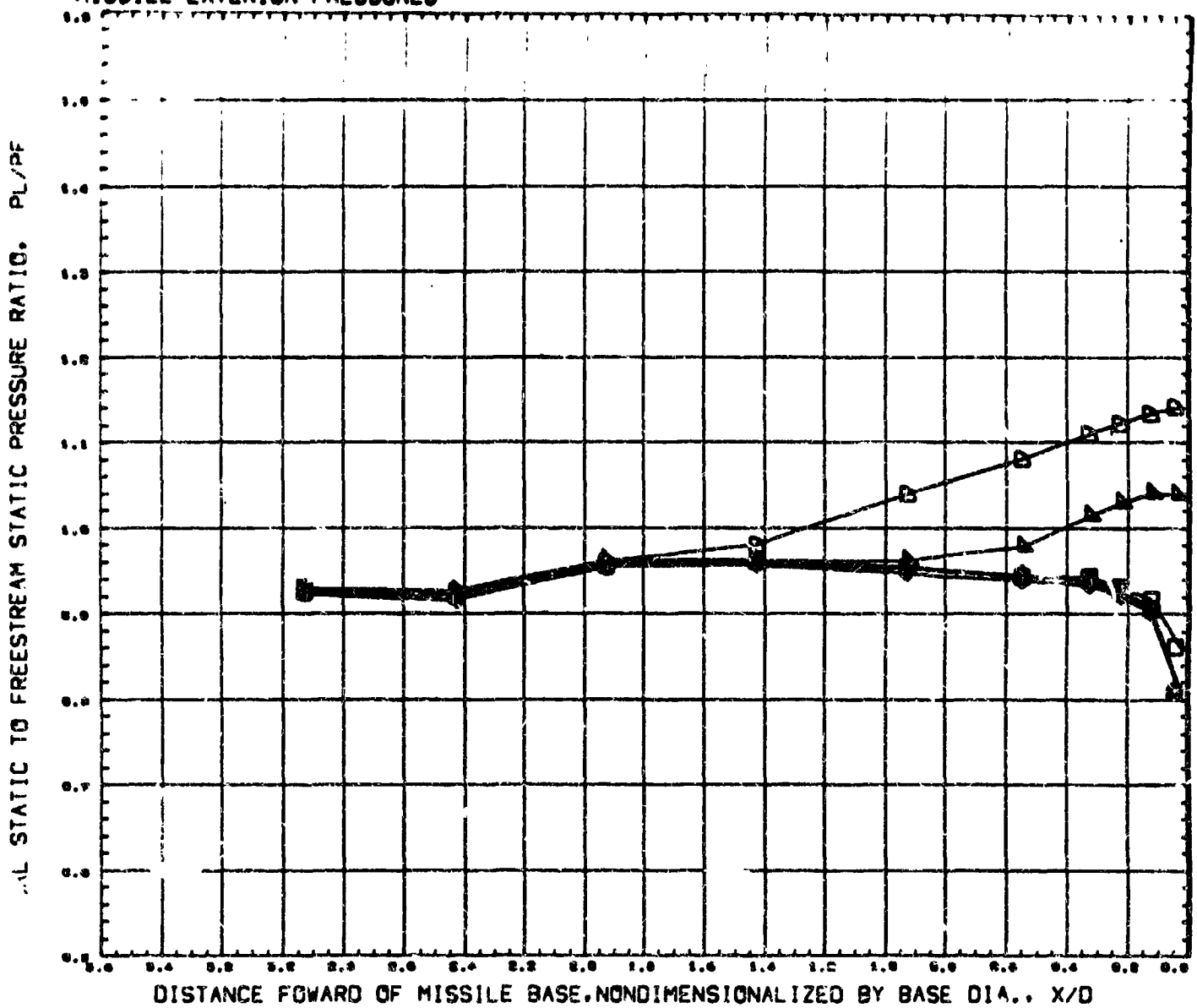
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS CLSD (RUCE02)

MISSILE EXTERIOR PRESSURES



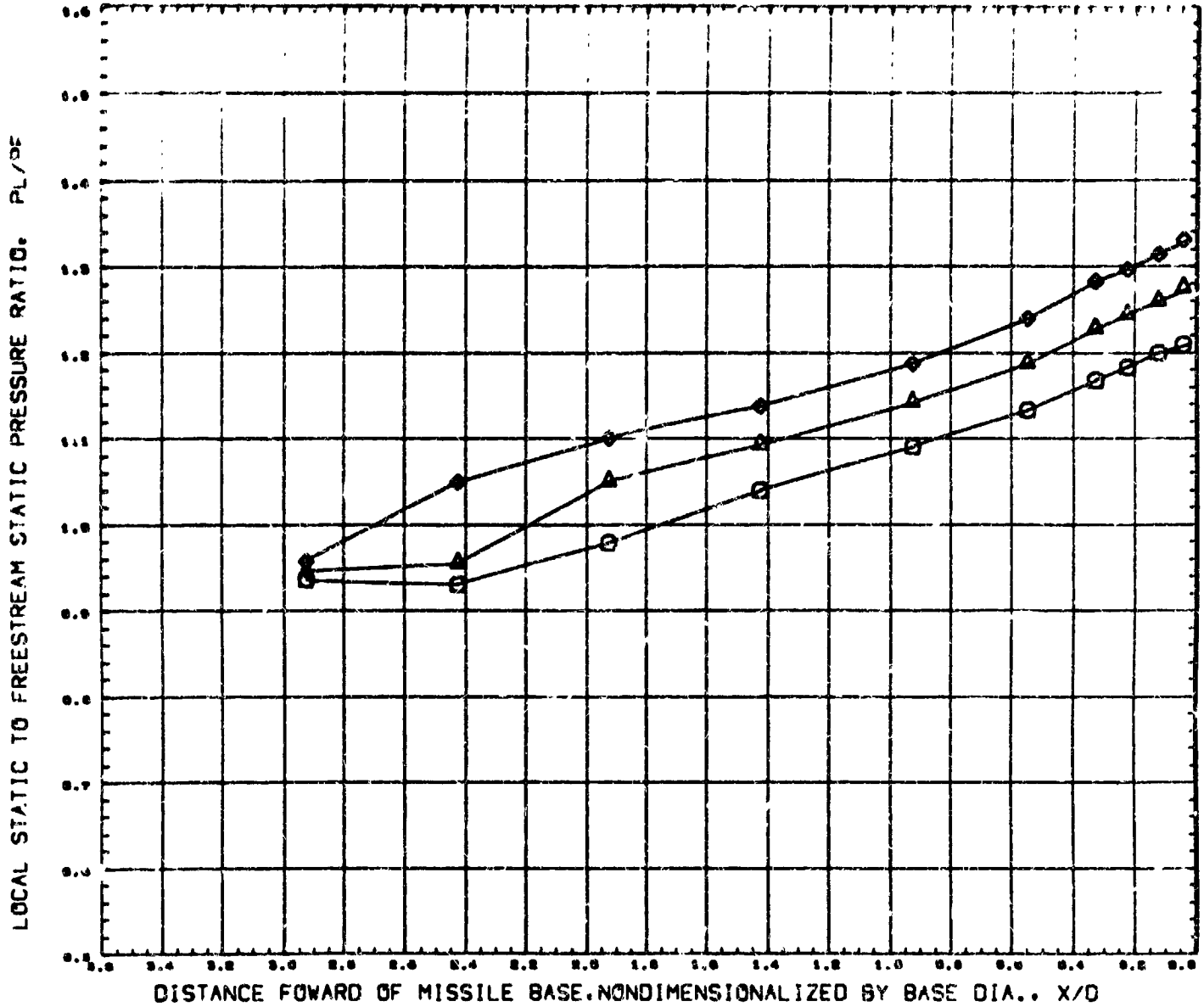
SYMBOL	CT	THETA	MACH
○	1.177	0.000	1.000
△	2.436		
◇	7.365		
□	9.902		
◺	18.489		
D	32.091	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS CLSD (RUCE02)

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
○	31.017	0.000	1.002
△	-8.990		
◇	86.071		

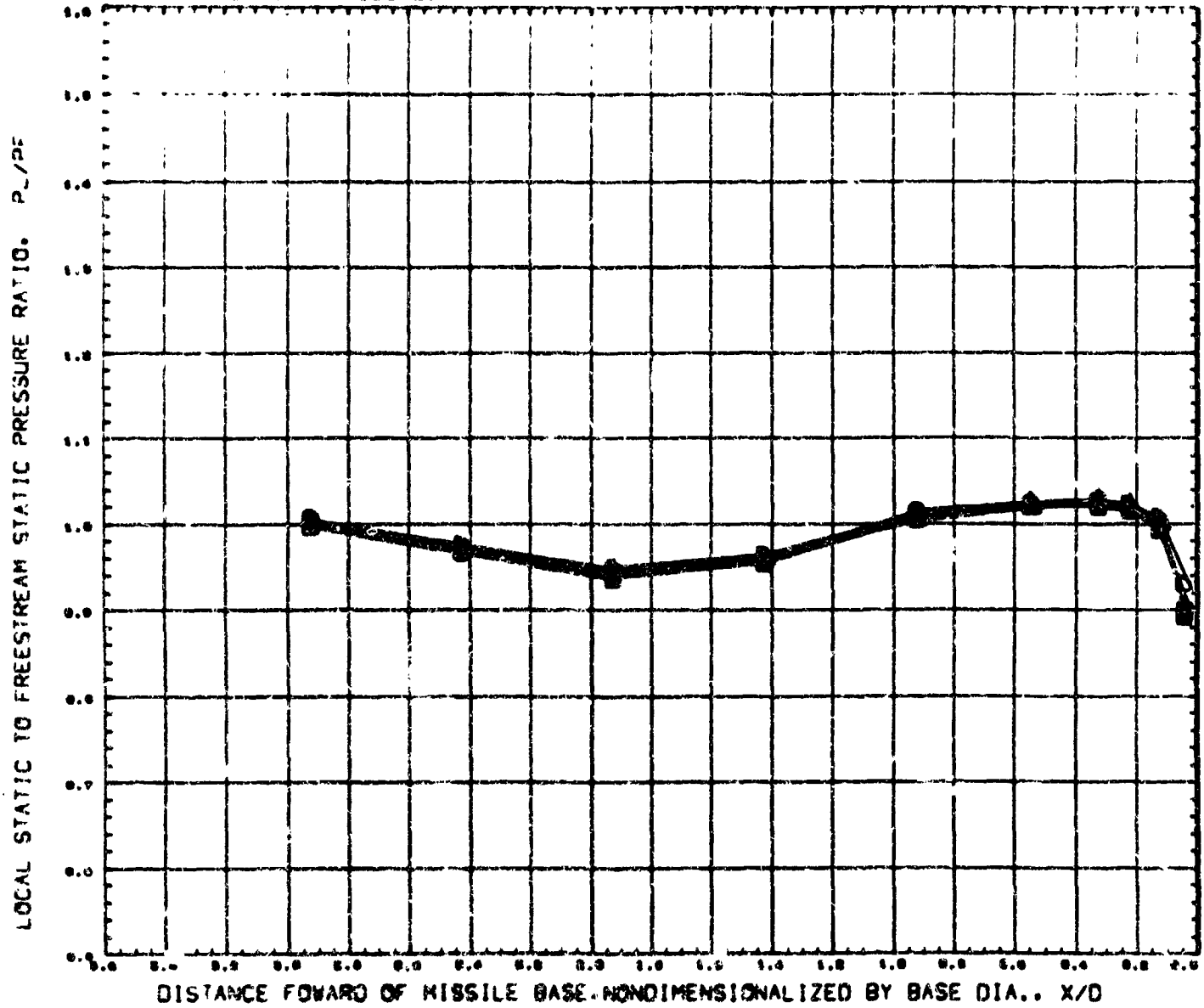
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS CLSD (RUCE02)

MISSILE EXTERIOR PRESSURES

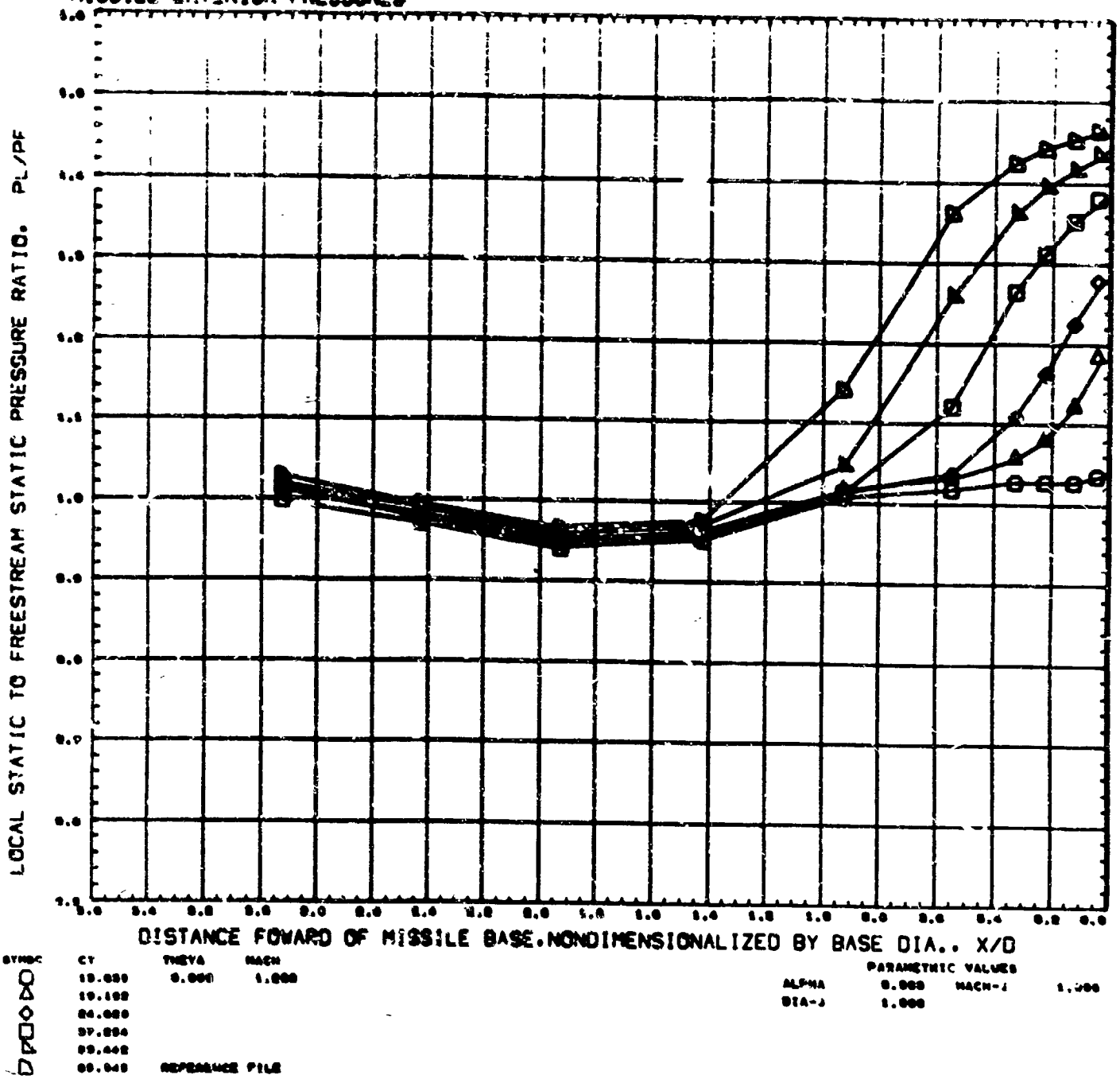


SYMBOL	CT	THETA	MACH
○	0.004	0.000	1.000
△	1.007		
□	0.000		
◇	4.196		
▽	0.007		
◁	0.794	REFERENCE FILE	

PARAMETRIC VALUES

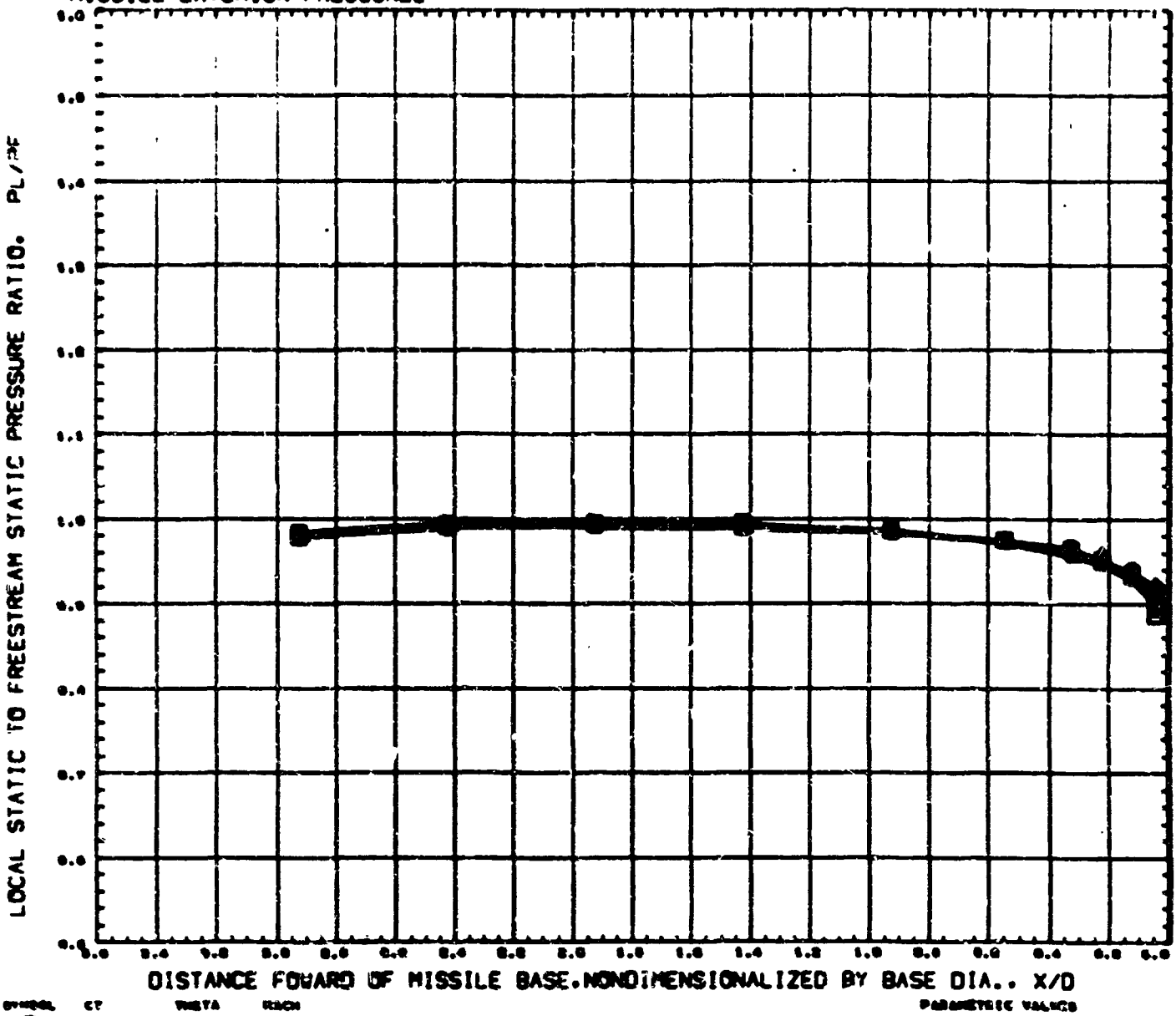
ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

MISSILE EXTERIOR PRESSURES



AMC PLUME STUDY. SHROUDED NOZZLE(-4).PORTS CLSD (RUCEO^.

MISSILE EXTERIOR PRESSURES



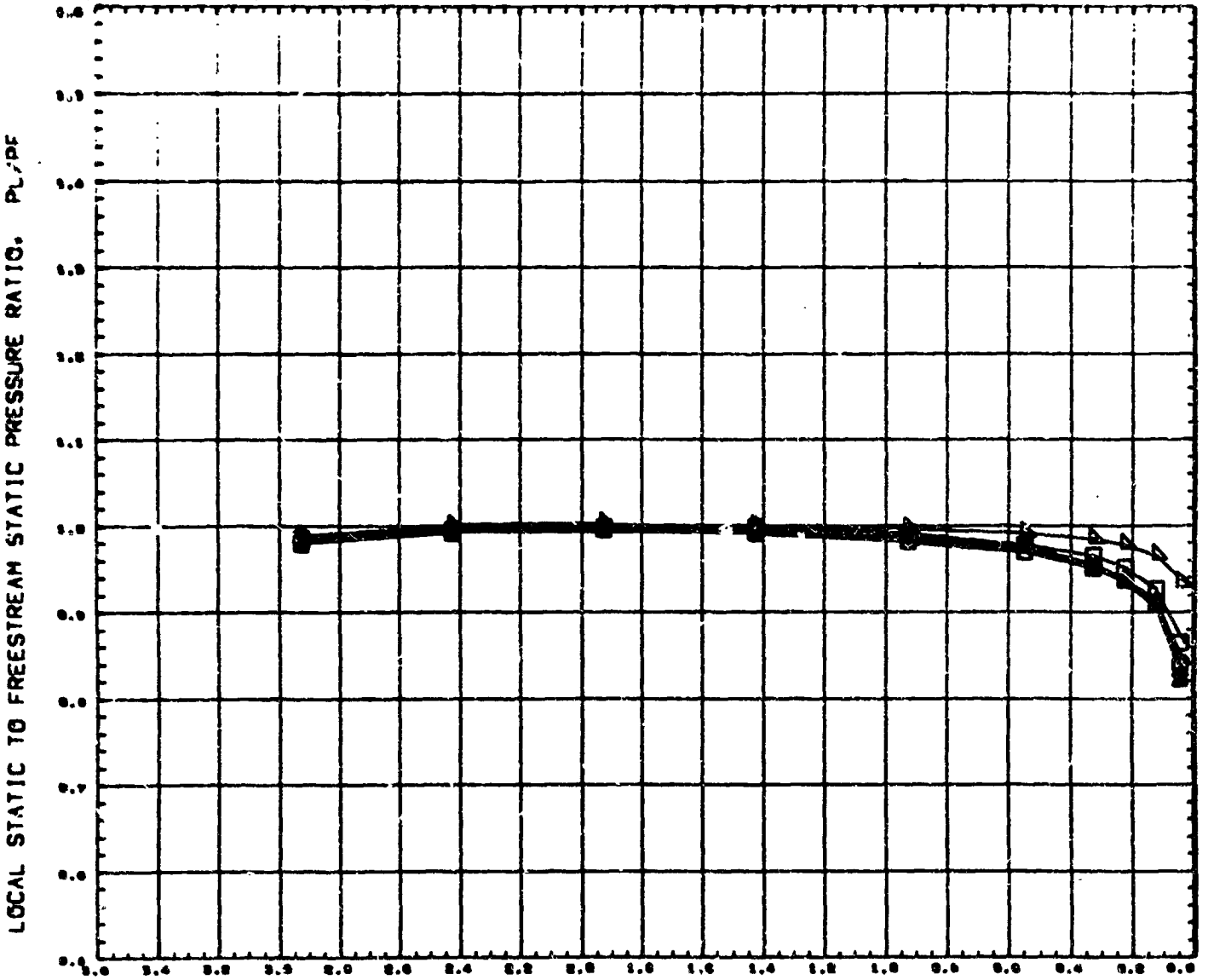
SYMBOL	CT	THETA	MACH
○	0.107	0.000	0.501
▷	0.207		
◇	0.045		
□	0.004		
▷	1.000		
◁	2.400	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	0.700
DIA-J	0.700		

AMC PLUME STUDY. SHROUDED NOZZLE(-2).PORTS CLSD (RUCE03)

MISSILE EXTERIOR PRESSURES



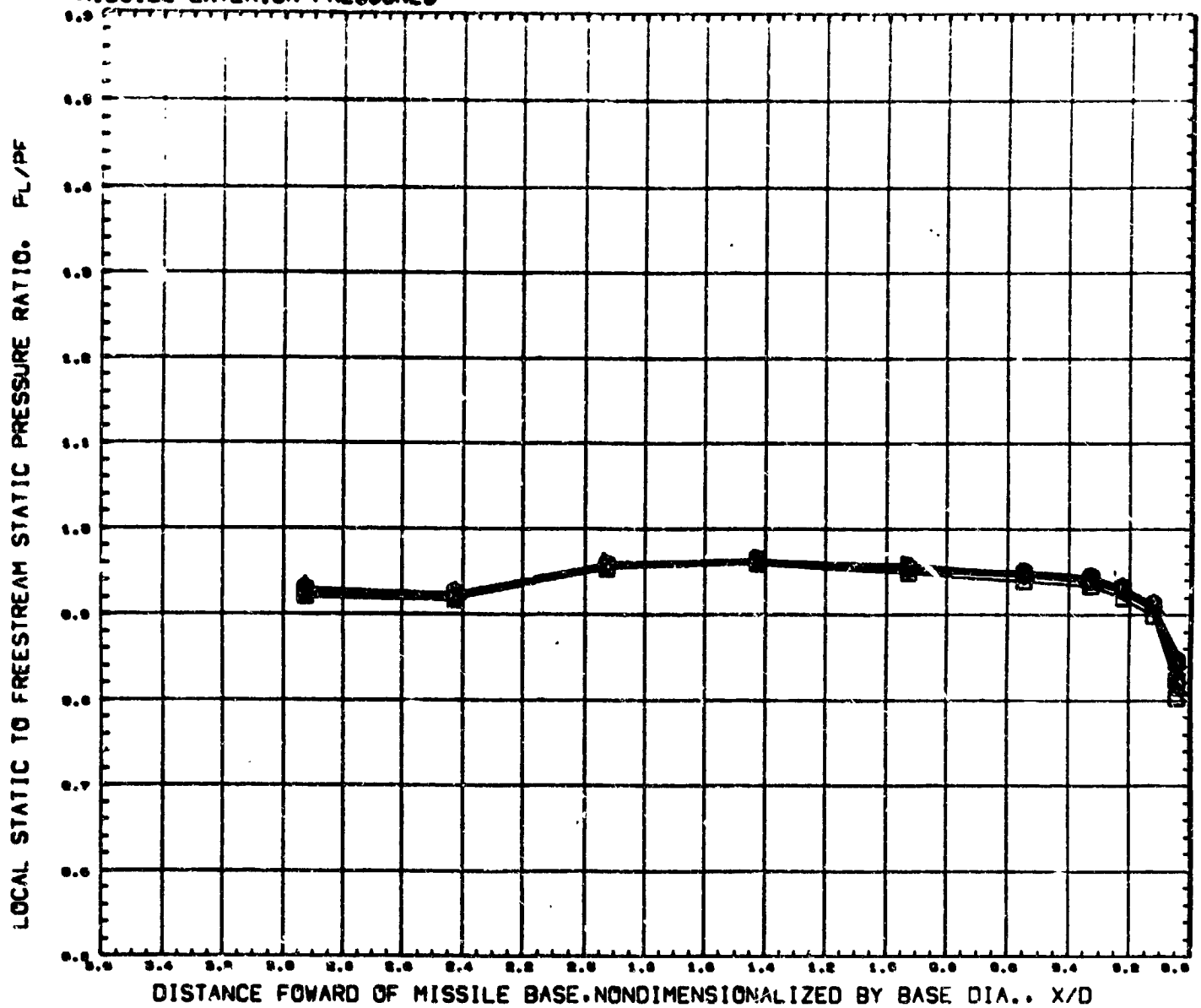
SYMBOL	CT	THETA	MACH
▽	4.319	0.000	0.001
□	6.251		
◇	9.503		
△	13.275		
○	19.001		

REFERENCE FILE

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DIA-J	0.700		

MISSILE EXTERIOR PRESSURES

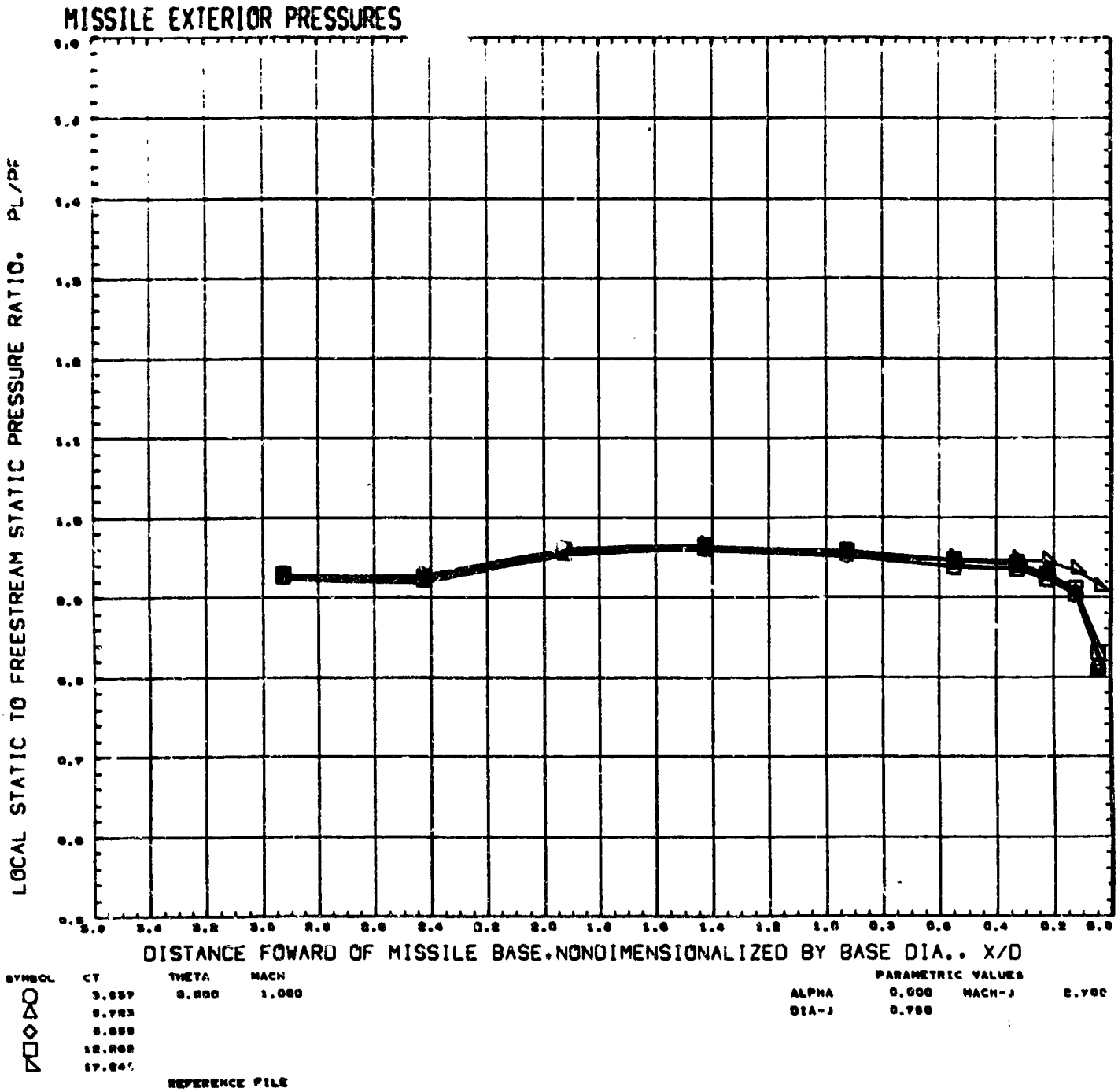


SYMBOL	CT	THETA	MACH
○	0.100	0.000	1.500
△	0.307		
◇	0.504		
□	0.999		
◺	1.302		
D	2.104	REFERENCE FILE	

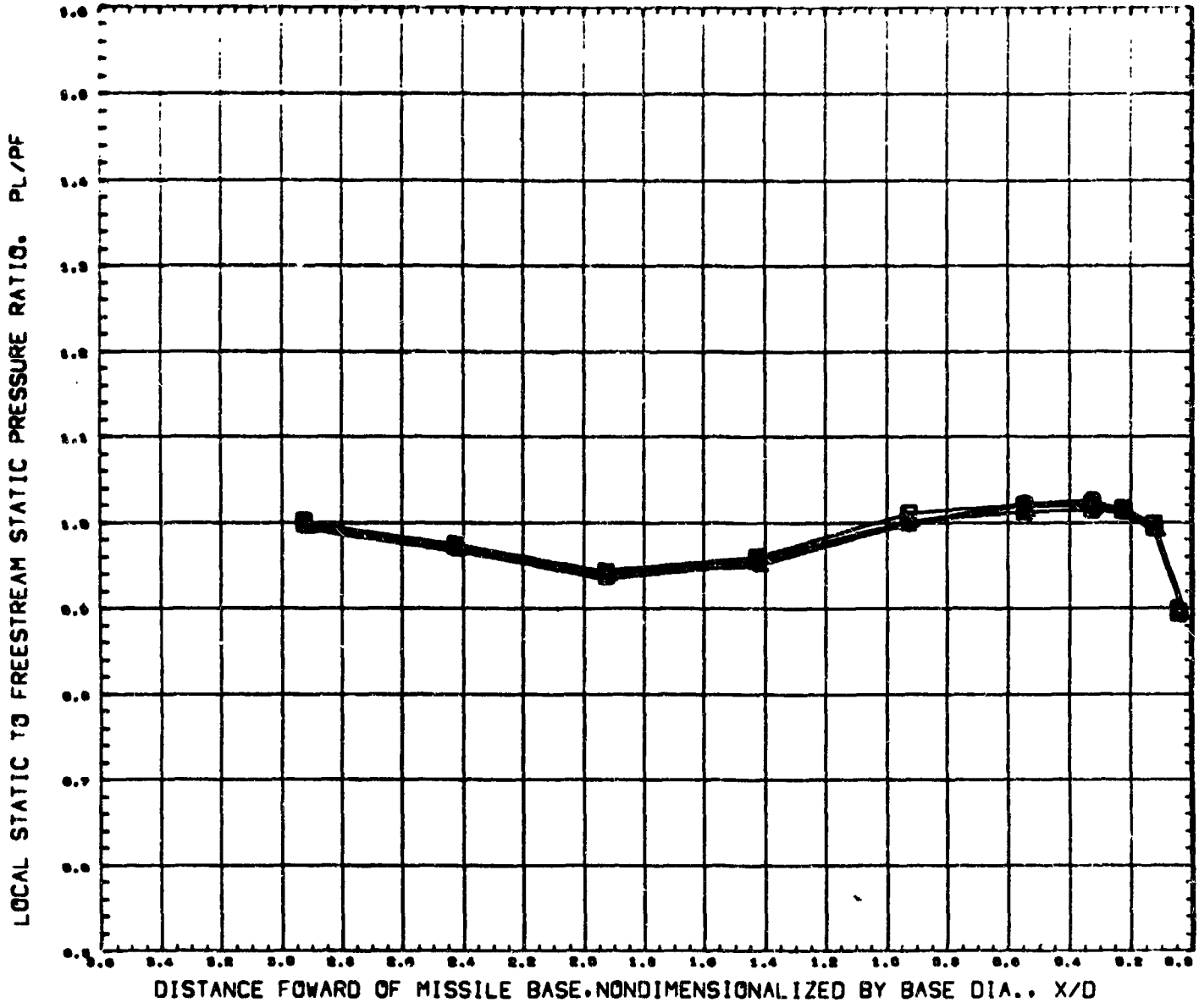
PARAMETRIC VALUES

ALPHA	6.000	MACH-J	2.700
DIA-J	3.700		

AMC PLUME STUDY, SHROUDED NOZZLE(-2),PORTS CLSD (RUCE03)


MISSILE EXTERIOR PRESSURES
LOCAL STATIC TO FREESTREAM STATIC PRESSURE RATIO, PL/PF
DISTANCE FOWARD OF MISSILE BASE,NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL CT THETA MACH
3.957 0.000 1.000
PARAMETRIC VALUES
ALPHA 0.000 MACH-J
DIA-J 0.750
REFERENCE FILE

MISSILE EXTERIOR PRESSURES



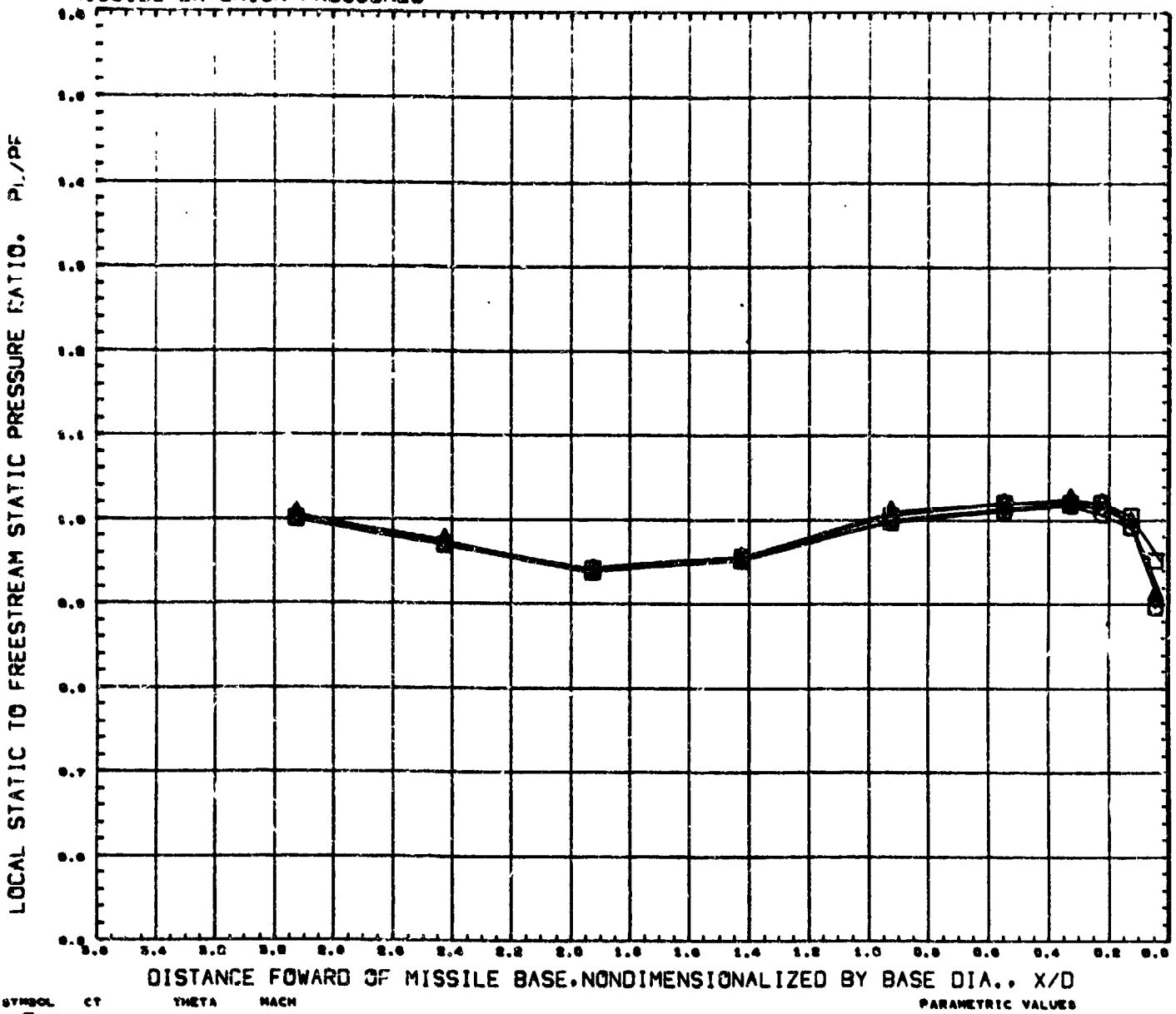
SYMBOL	CT	THETA	MACH
○	0.234	0.000	1.200
△	0.376		
◇	0.634		
□	1.232		
◺	2.134		
D	3.884	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DIA-J	0.750		

AMC PLUME STUDY. SHROUDED NOZZLE(-2).PORTS CLSD (RUCE03)

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
○	5.022	0.000	1.200
△	7.376		
◇	10.046		
□	14.001		

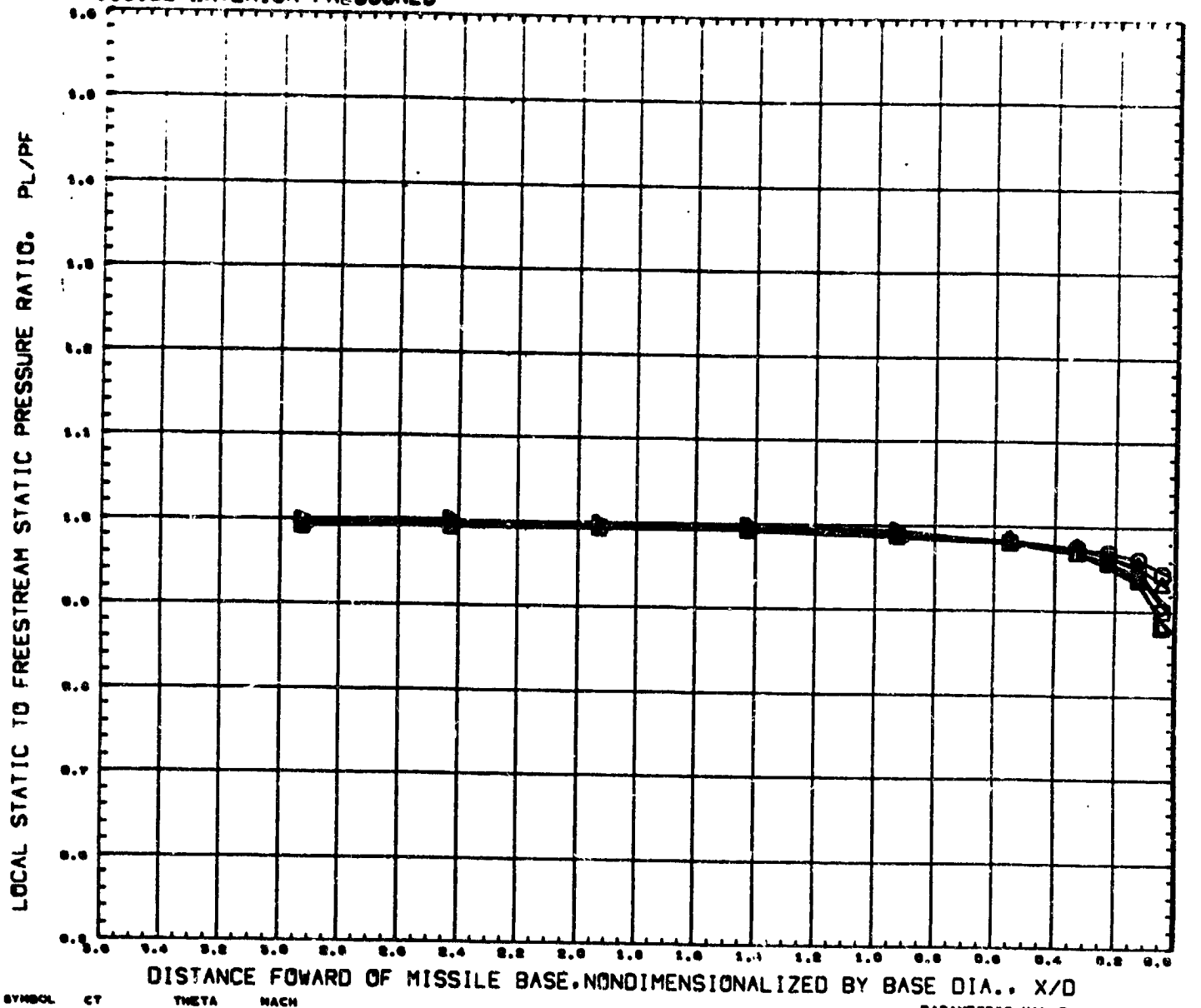
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DIA-J	0.750		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-2),PORTS CLSD (RUCE03)

MISSILE EXTERIOR PRESSURES



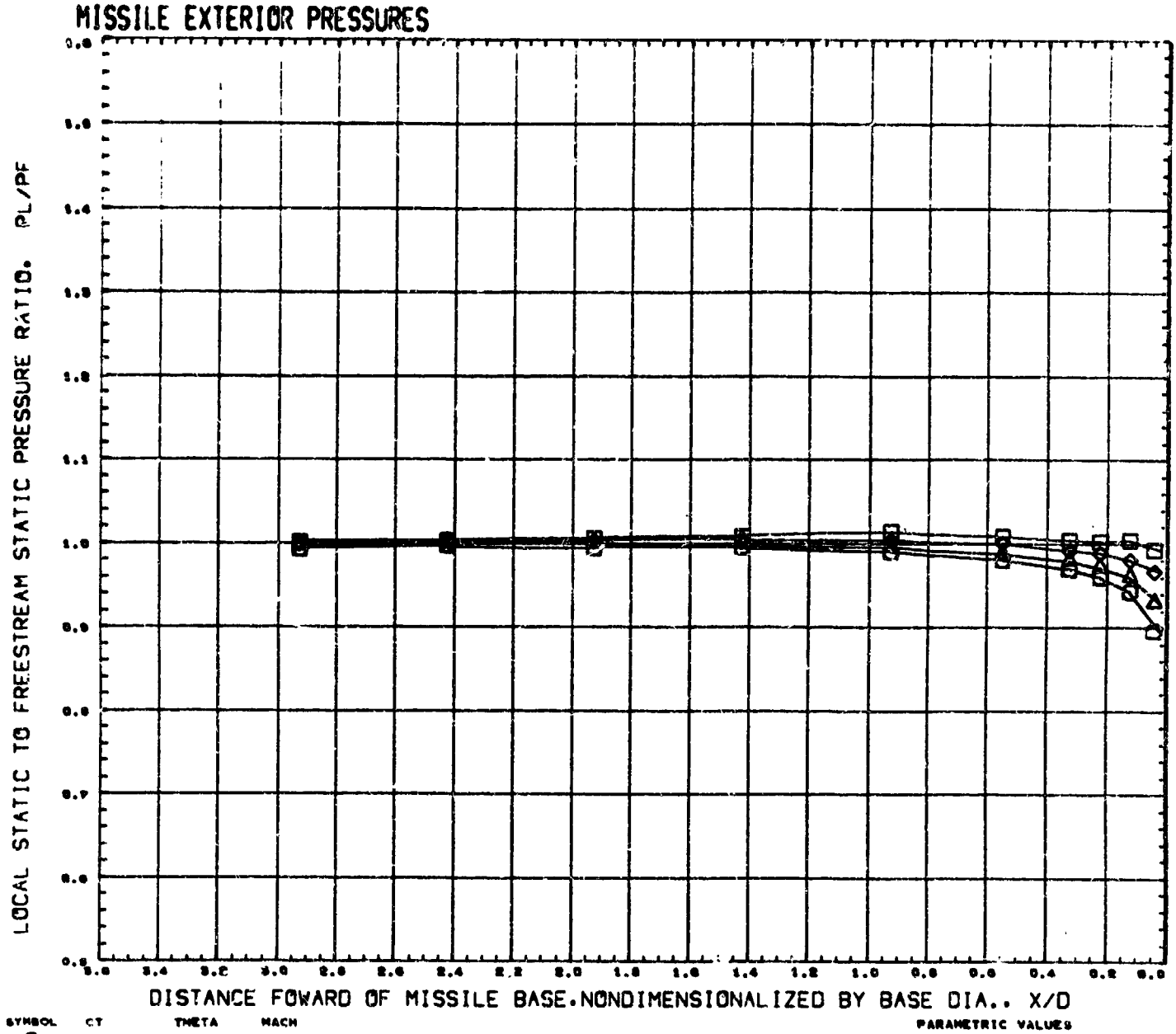
SYMBOL	CT	THETA	MACH
	0.478	0.004	0.701
	1.004		
	1.997		
	2.007		
	3.078		
	7.001	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA 0.000 MACH-J 1.000

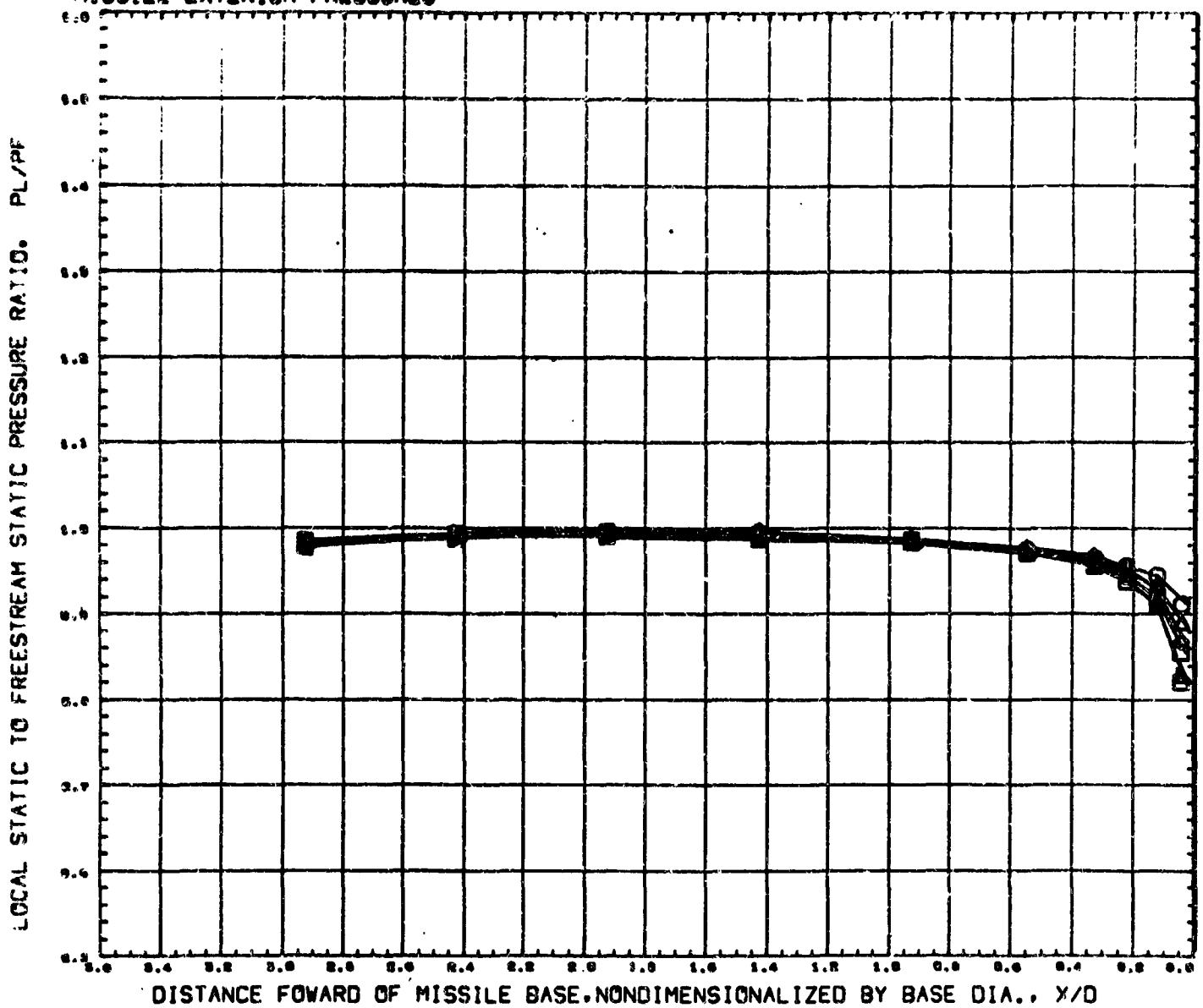
DIA-J 0.500

AMC PLUME STUDY, SHROUDED NOZZLE(-3)-PORTS OPEN (RUCE04)



AMC PLUME STUDY. SHROUDED NOZZLE(-3).PORTS OPEN (RUCE04)

MISSILE EXTERIOR PRESSURES



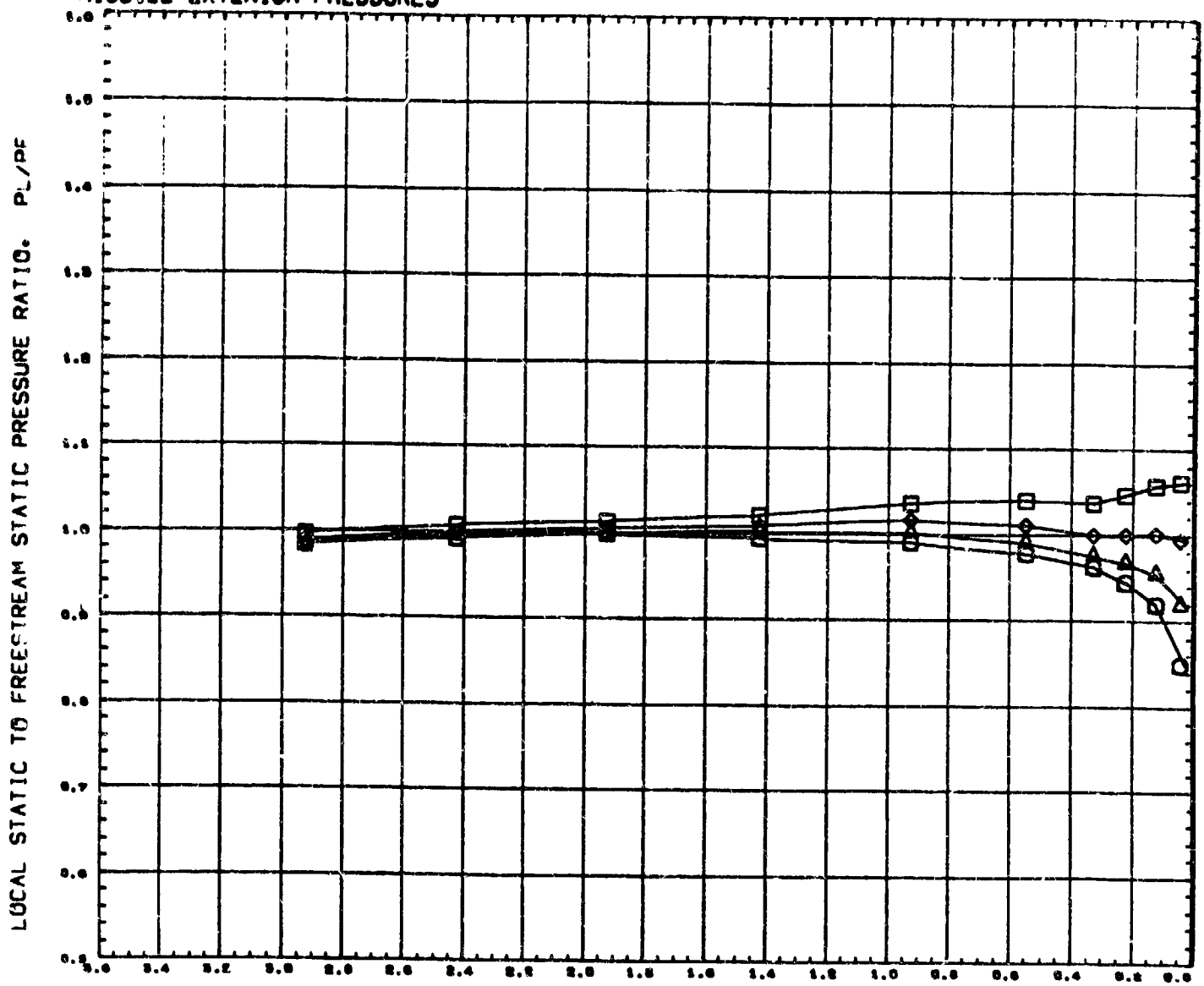
SYMBOL	CT	THETA	MACH
○	0.200	0.000	0.000
△	0.050		
◇	1.002		
□	2.065		
◺	3.370		
D	0.073	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.500		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCE04)

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
○	0.000	0.000	0.000
◇	12.079		
△	17.194		
□	29.030		

PARAMETRIC VALUES

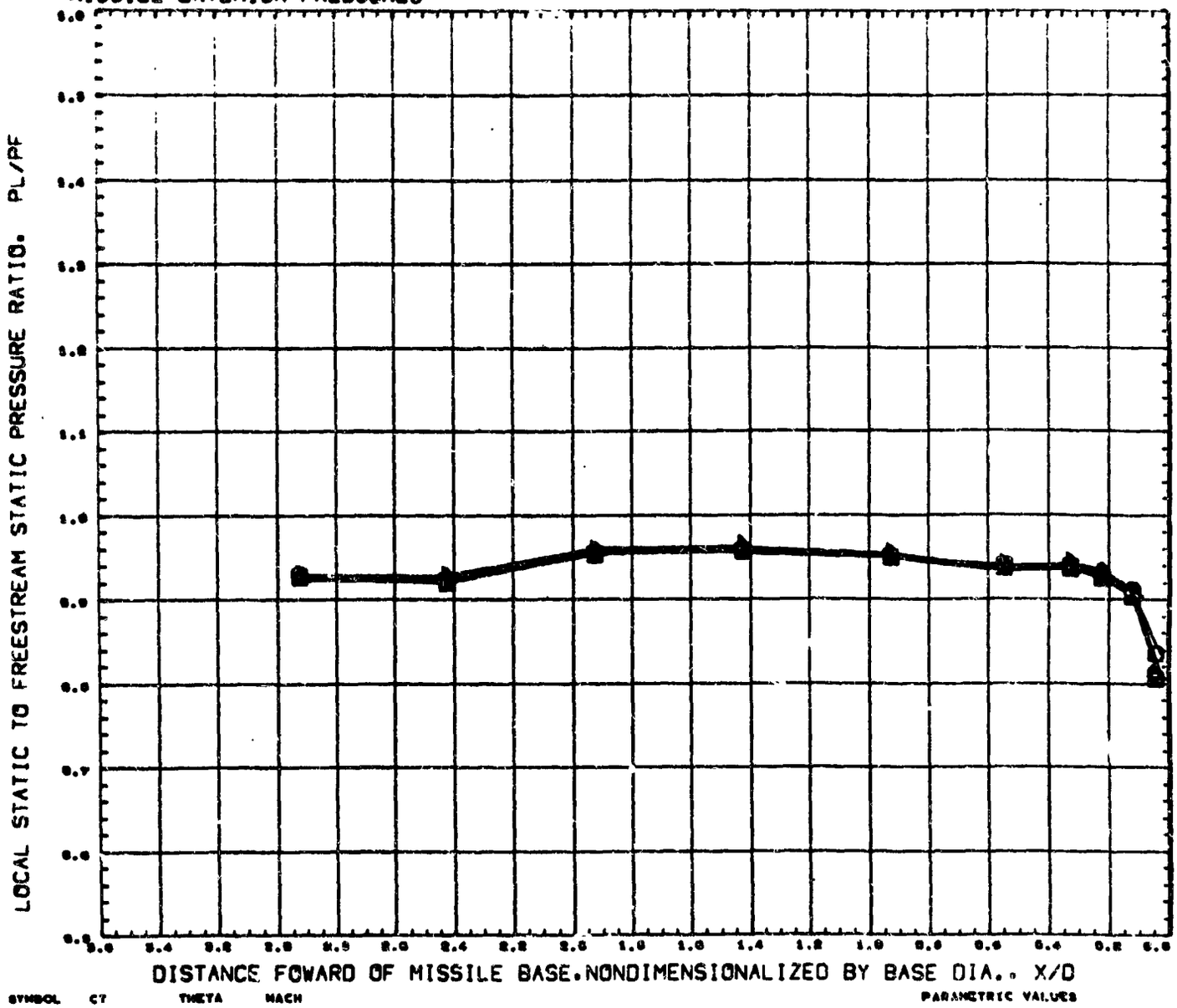
ALPHA 0.000 MACH-J 1.000

BETA-J 0.000

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCE04)

MISSILE EXTERIOR PRESSURES



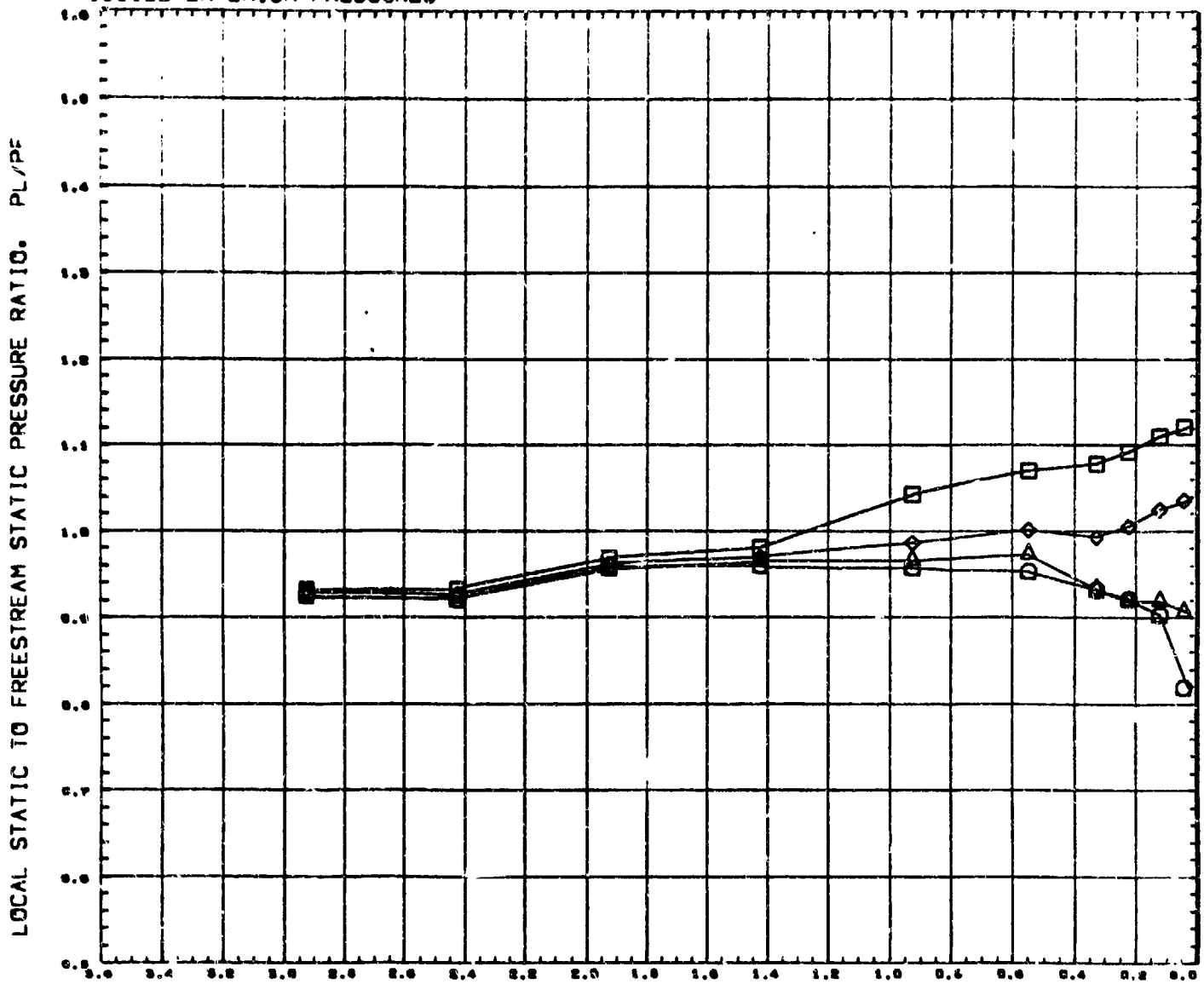
SYMBOL	CT	THETA	MACH
○	0.172	0.000	1.000
△	0.377		
◇	1.001		
□	1.000		
◺	3.102		
D	0.033	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.000		

AMC PLUME STUDY. SHROUDED NOZZLE(-3).PORTS OPEN (RUCE04)

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
○	7.012	0.000	1.000
△	11.991		
◇	19.005		
□	22.000		

PARAMETRIC VALUES

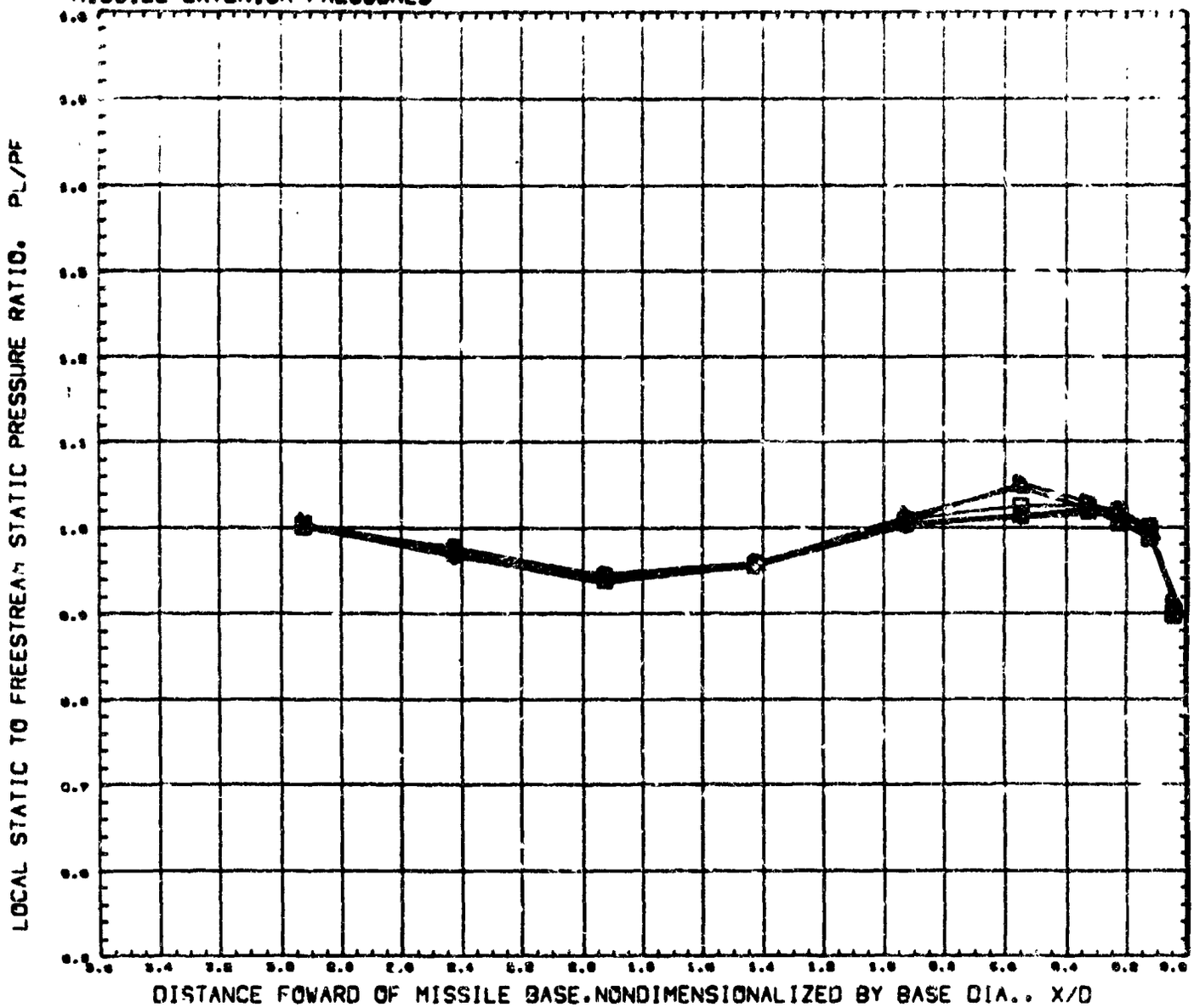
ALPHA 0.000 MACH-J 1.000

DIA-J 0.900

REFERENCE FILE

AMC PLUME STUDY. SHROUDED NOZZLE(-3).PORTS OPEN (RUCE04)

MISSILE EXTERIOR PRESSURES

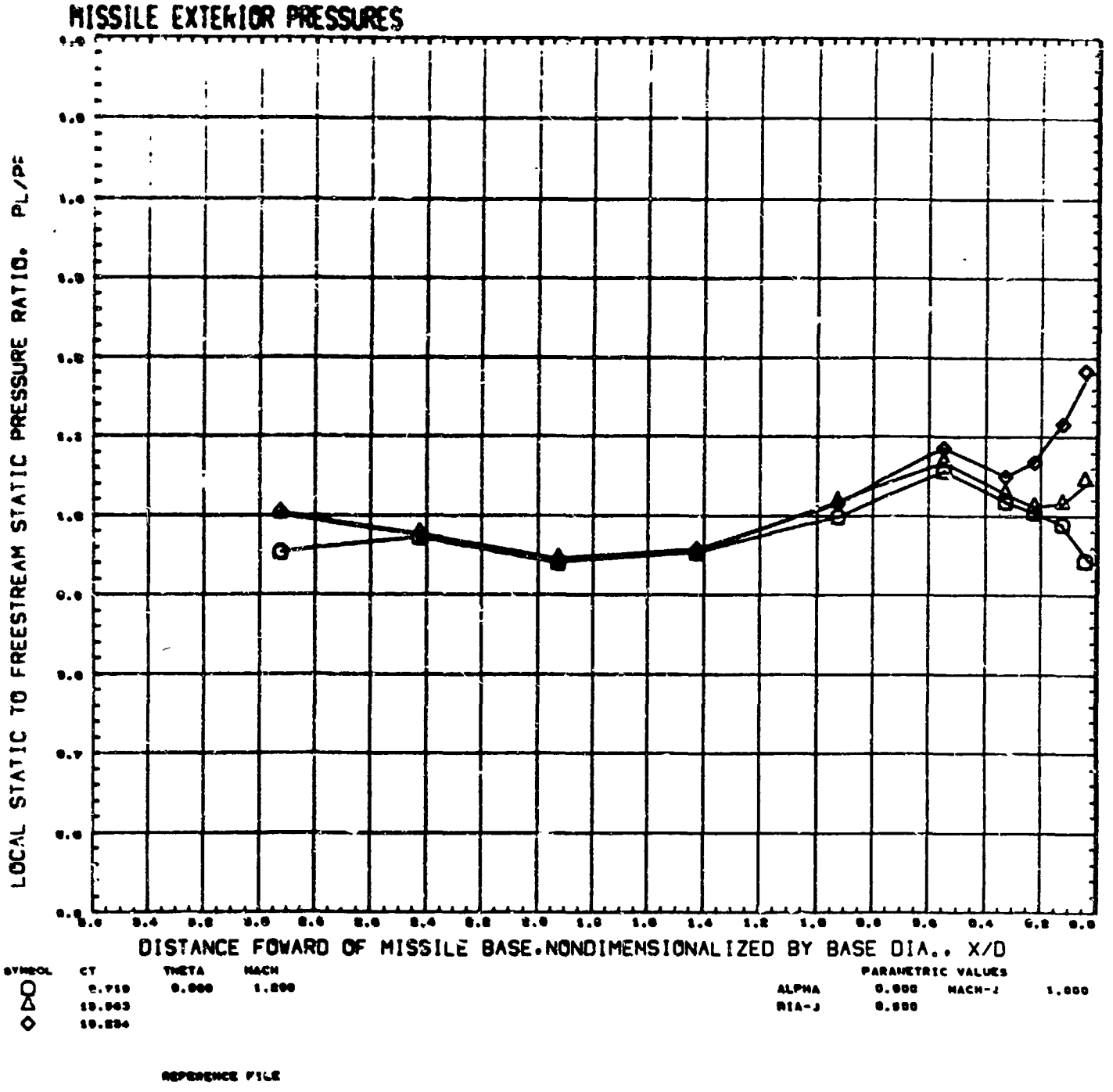


SYMBOL	CT	THETA	MACH
	0.005	0.000	1.700
	1.716		
	2.007		
	4.002		
	6.739		
	7.004	REFERENCE FILE	

PARAMETRIC VALUES

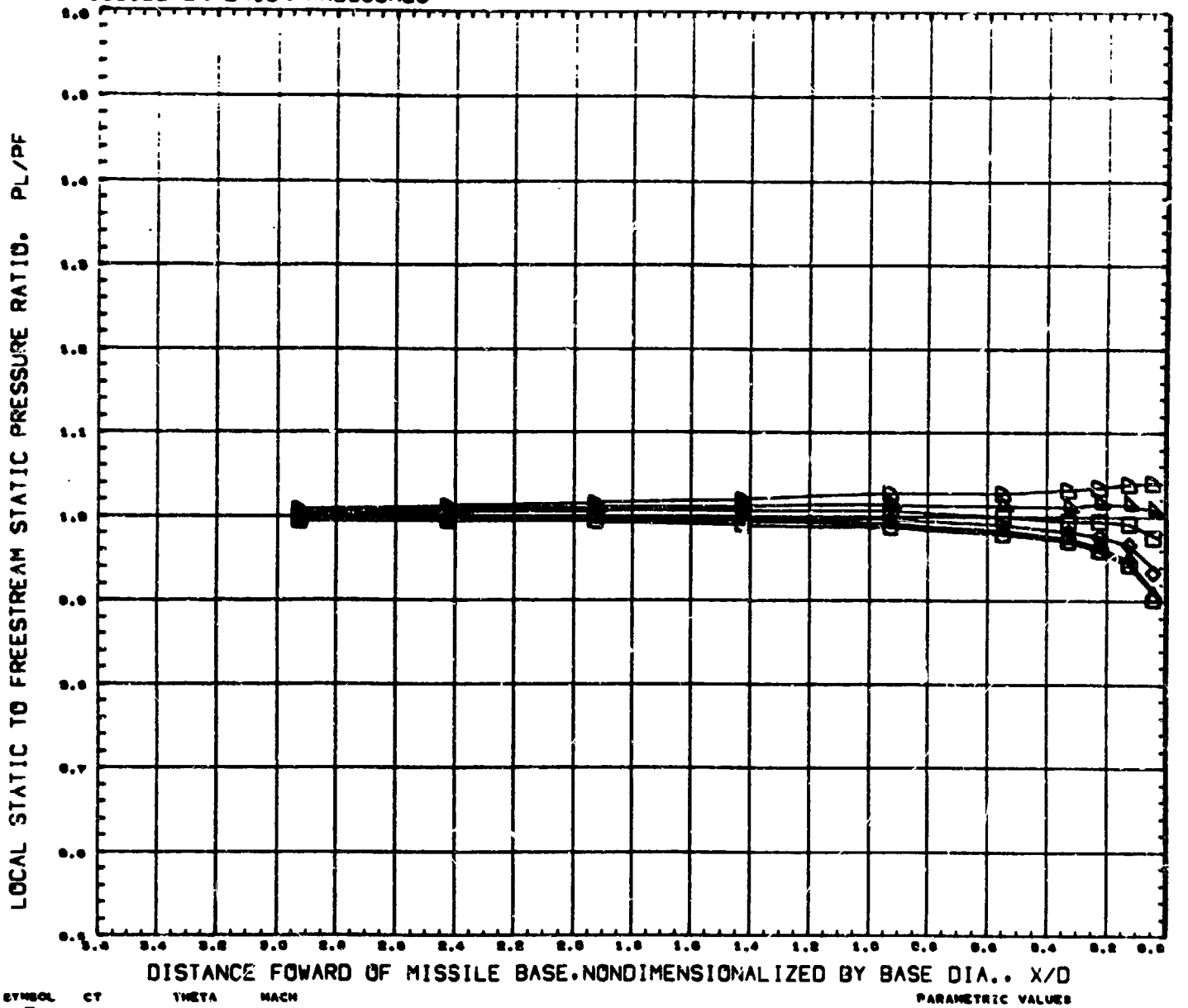
ALPHA	0.000	MACH-J	1.000
DIA-J	0.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCE04)



AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCE04)

MISSILE EXTERIOR PRESSURES



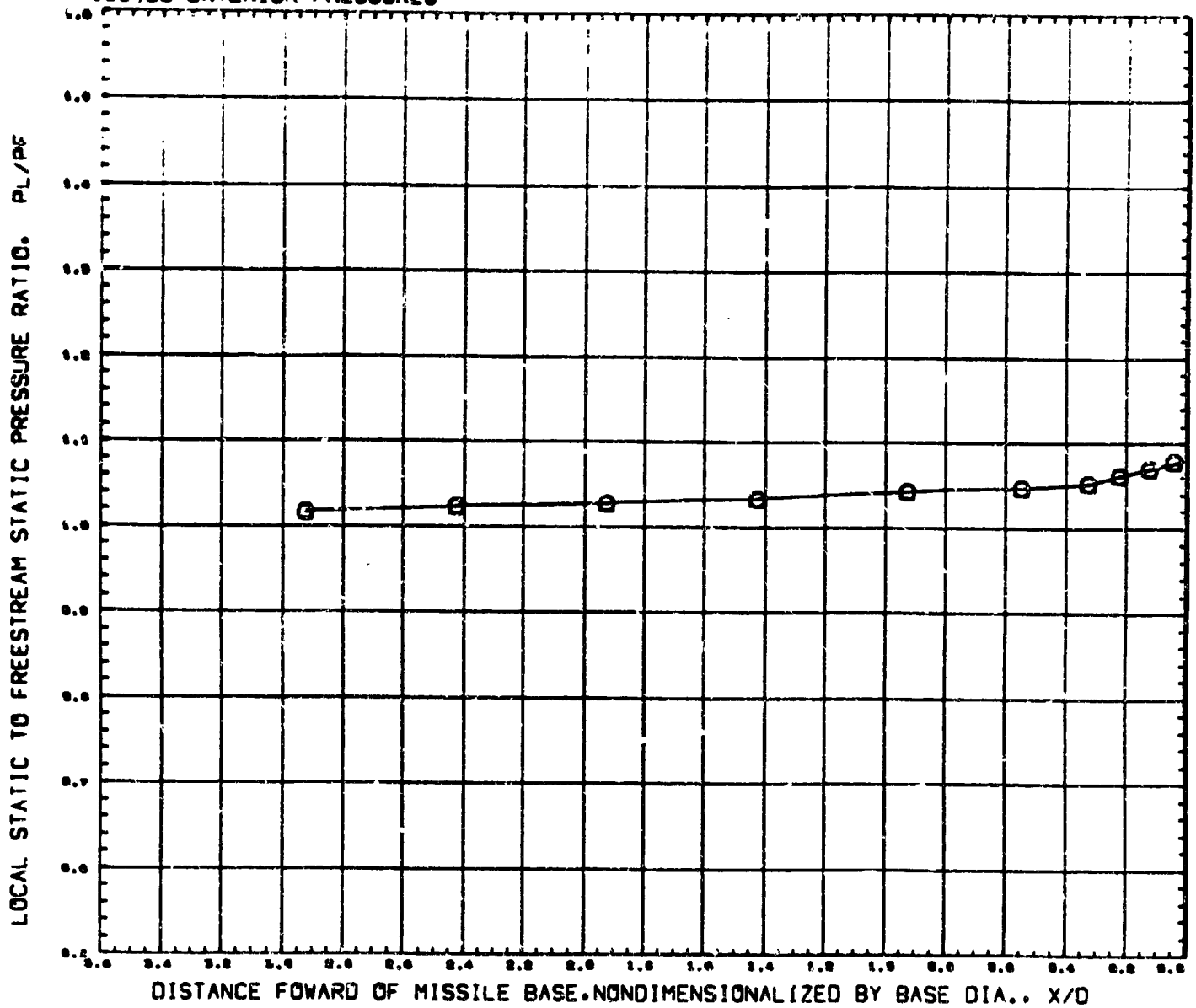
SYMBOL	CT	THETA	MACH
	3.772	0.000	0.700
	11.044		
	18.420		
	23.681		
	34.303		
	47.120	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCE05)

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
O	67.020	0.000	0.700

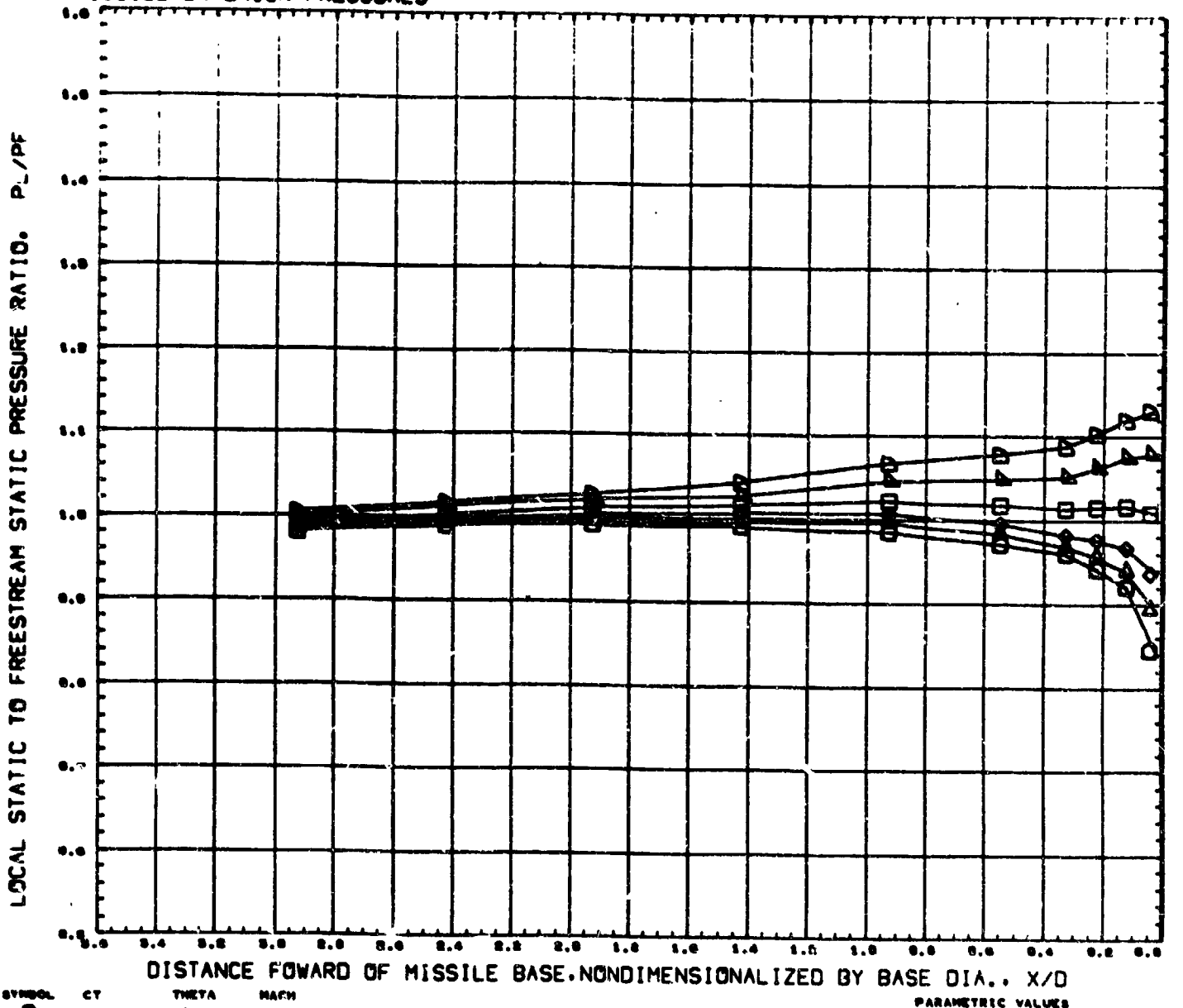
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

REFERENCE FILE

AMC PLUME STUDY. SHROUDED NOZZLE(-4).PORTS OPEN (RUCE05)

MISSILE EXTERIOR PRESSURES



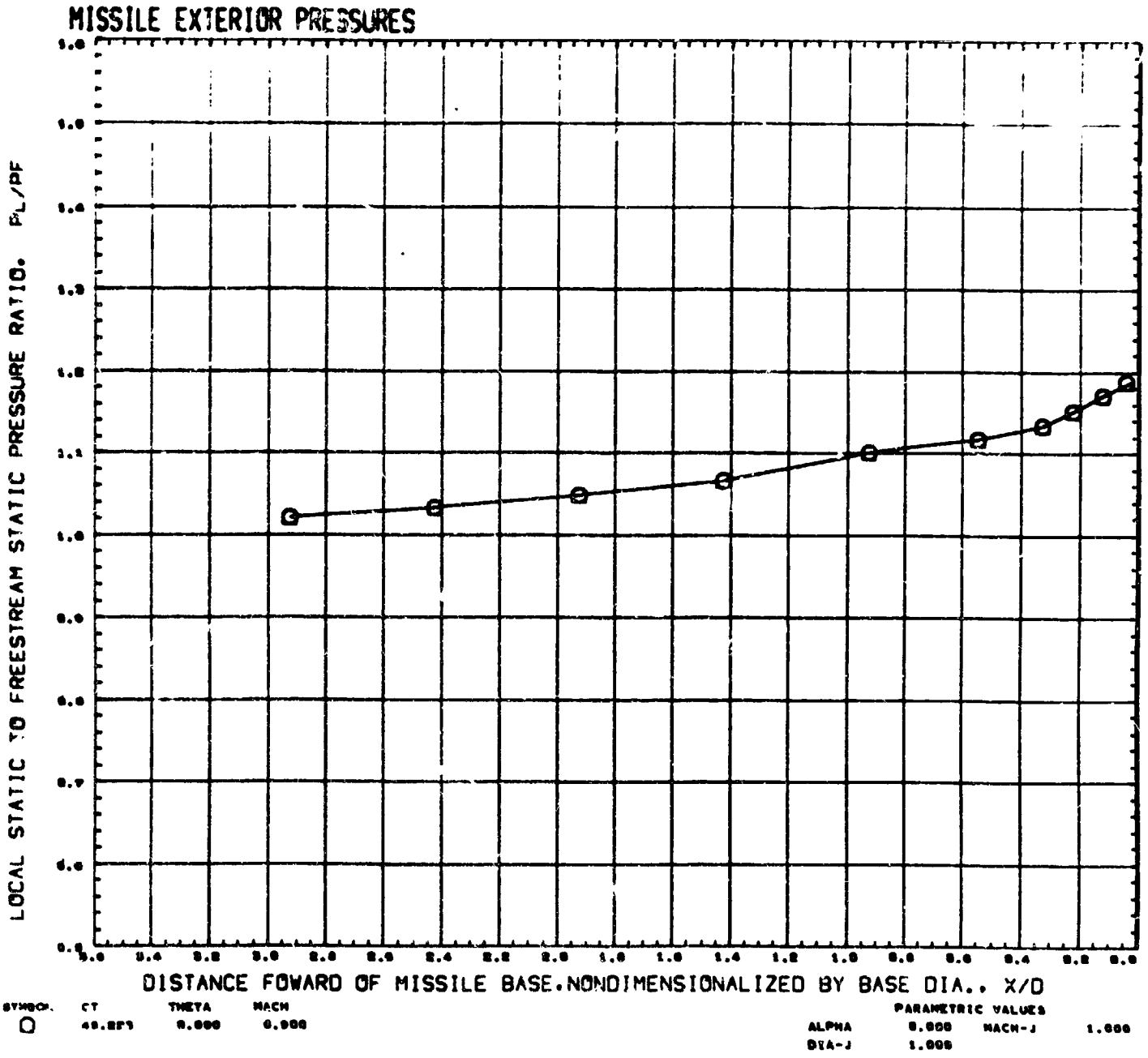
SYMBOL	CT	THETA	MACH
	7.272	0.000	0.000
	0.000		
	11.047		
	18.001		
	24.049		
	34.100	REFERENCE FILE	

PARAMETRIC VALUES

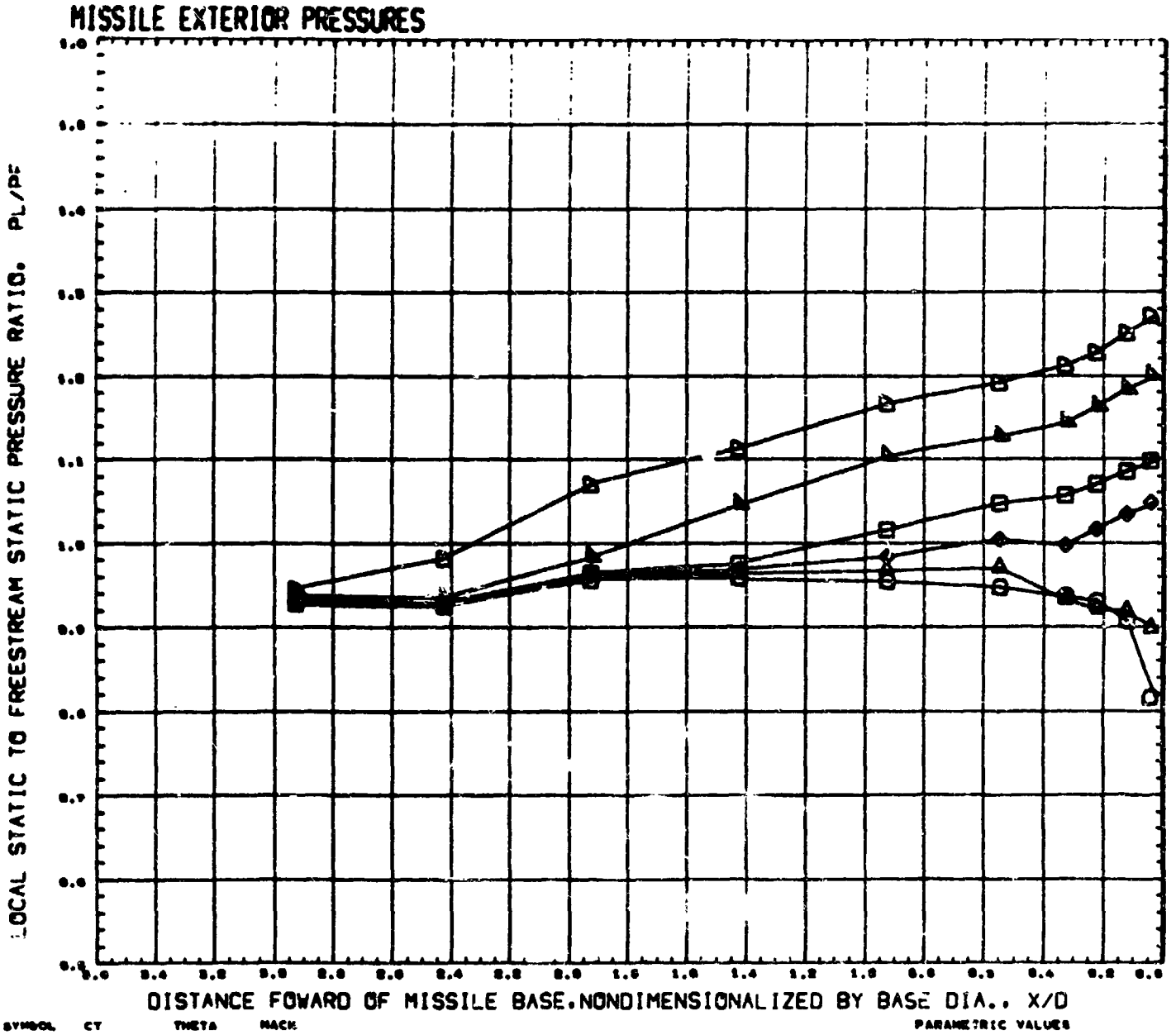
ALPHA 0.000 MACH-J 1.000

DIA-J 1.000

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCE05)


MISSILE EXTERIOR PRESSURES
LOCAL STATIC TO FREESTREAM STATIC PRESSURE RATIO, PL/PF
DISTANCE FOWARD OF MISSILE BASE.NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL CT THETA MACH
PARAMETRIC VALUES
ALPHA 0.000 MACH-J 1.000
DIA-J 1.000
REFERENCE FILE

MISSILE EXTERIOR PRESSURES



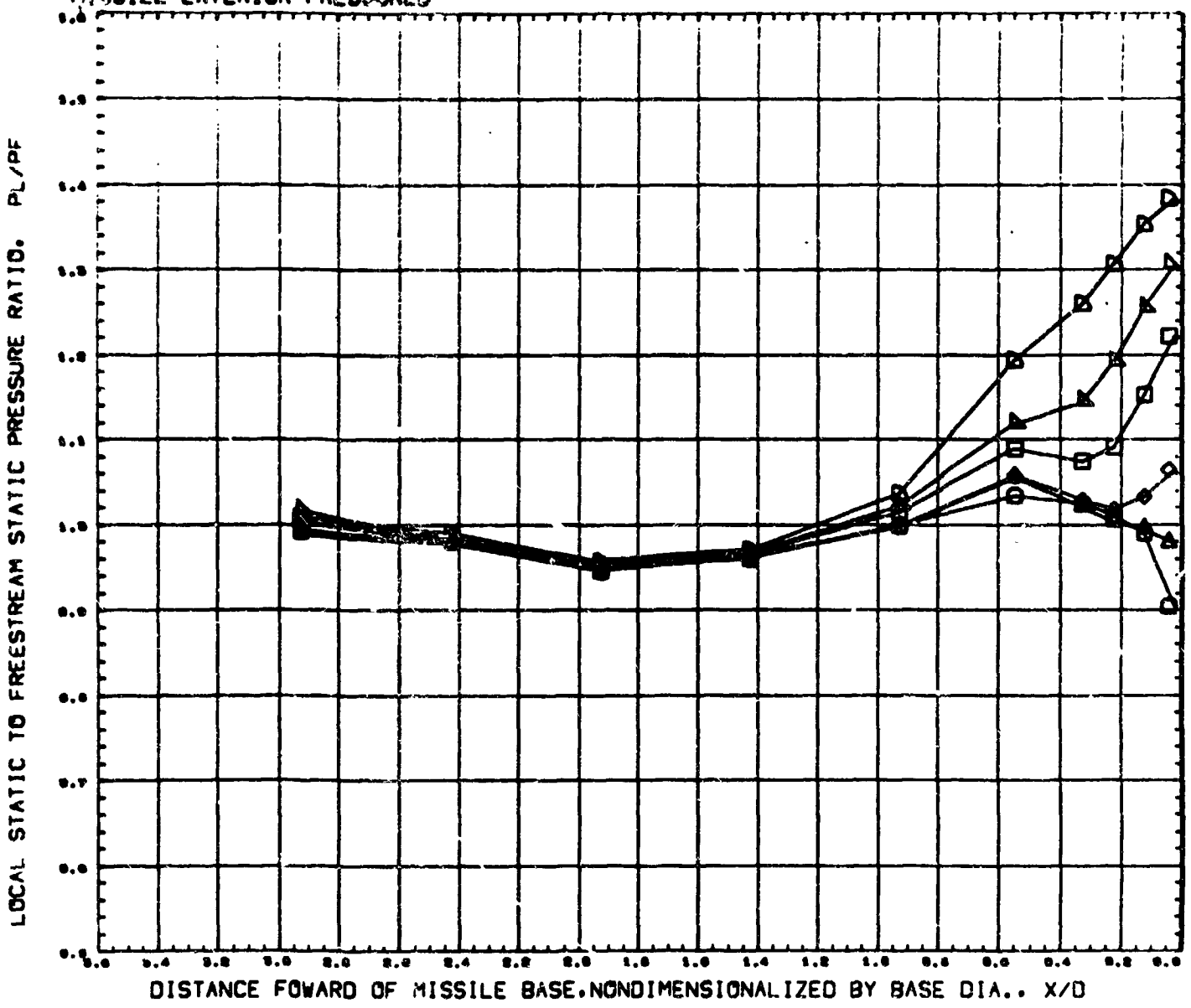
SYMBOL	CT	THETA	MACH
○	0.101	0.000	1.002
△	10.000		
◇	14.875		
□	17.001		
◺	20.100		
D	40.700	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

AMC PLUME STUDY. SHROUDED NOZZLE(-4).PORTS OPEN (RUCE05)

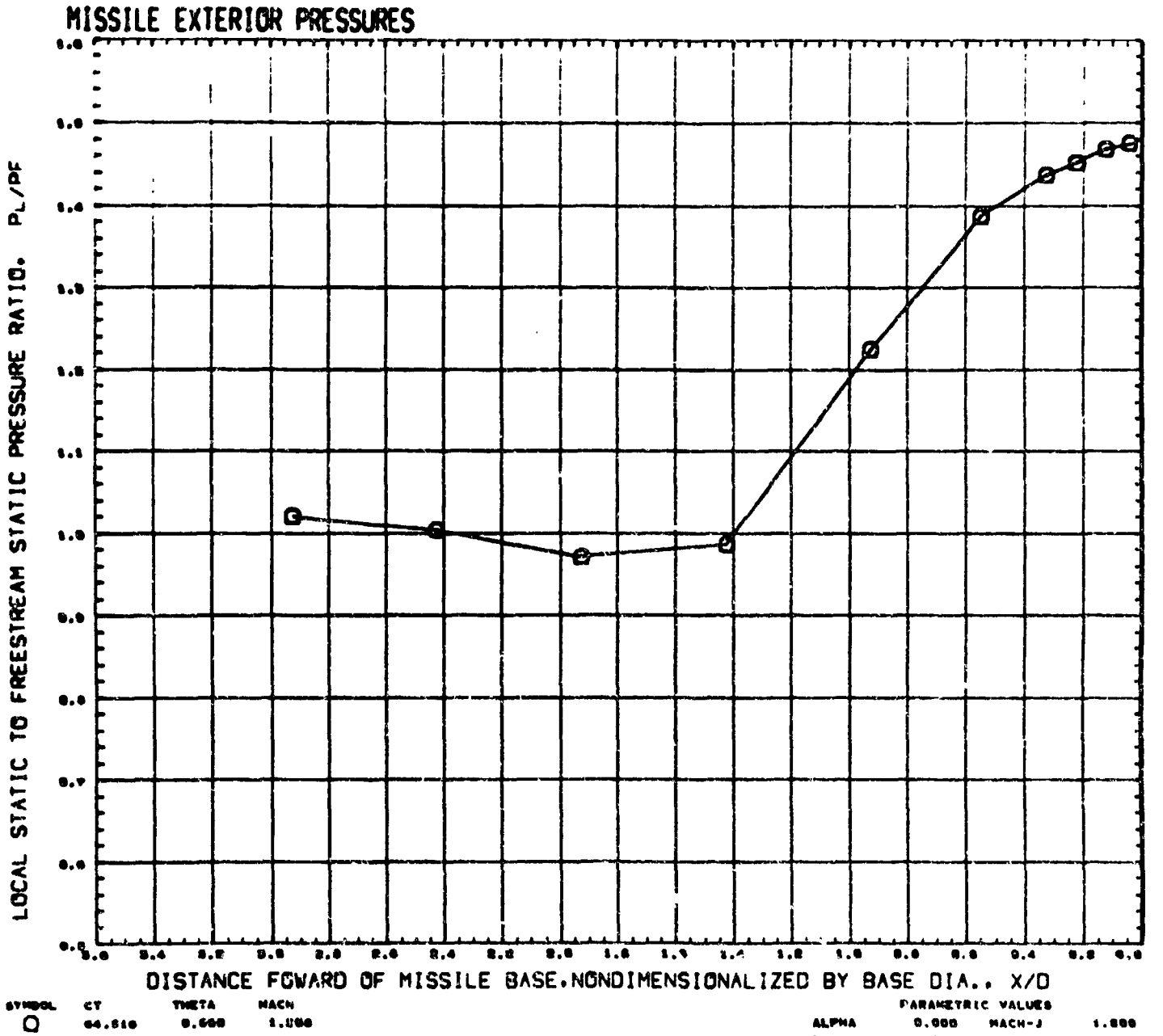
MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
	0.141	0.000	1.200
	10.030		
	12.097		
	19.300		
	24.141		
	55.073	REFERENCE FILE	

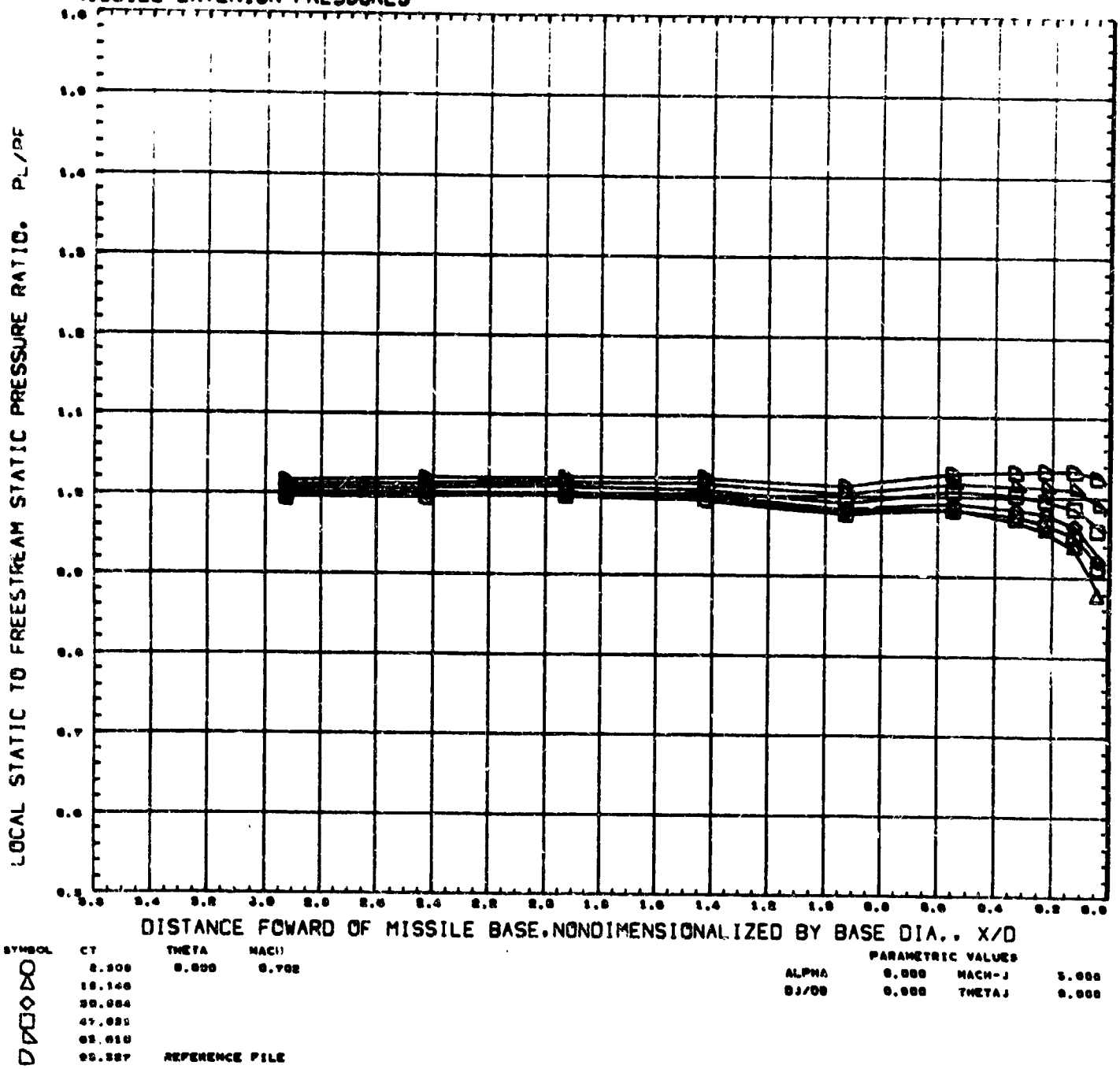
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.650
DIA-J	1.000		



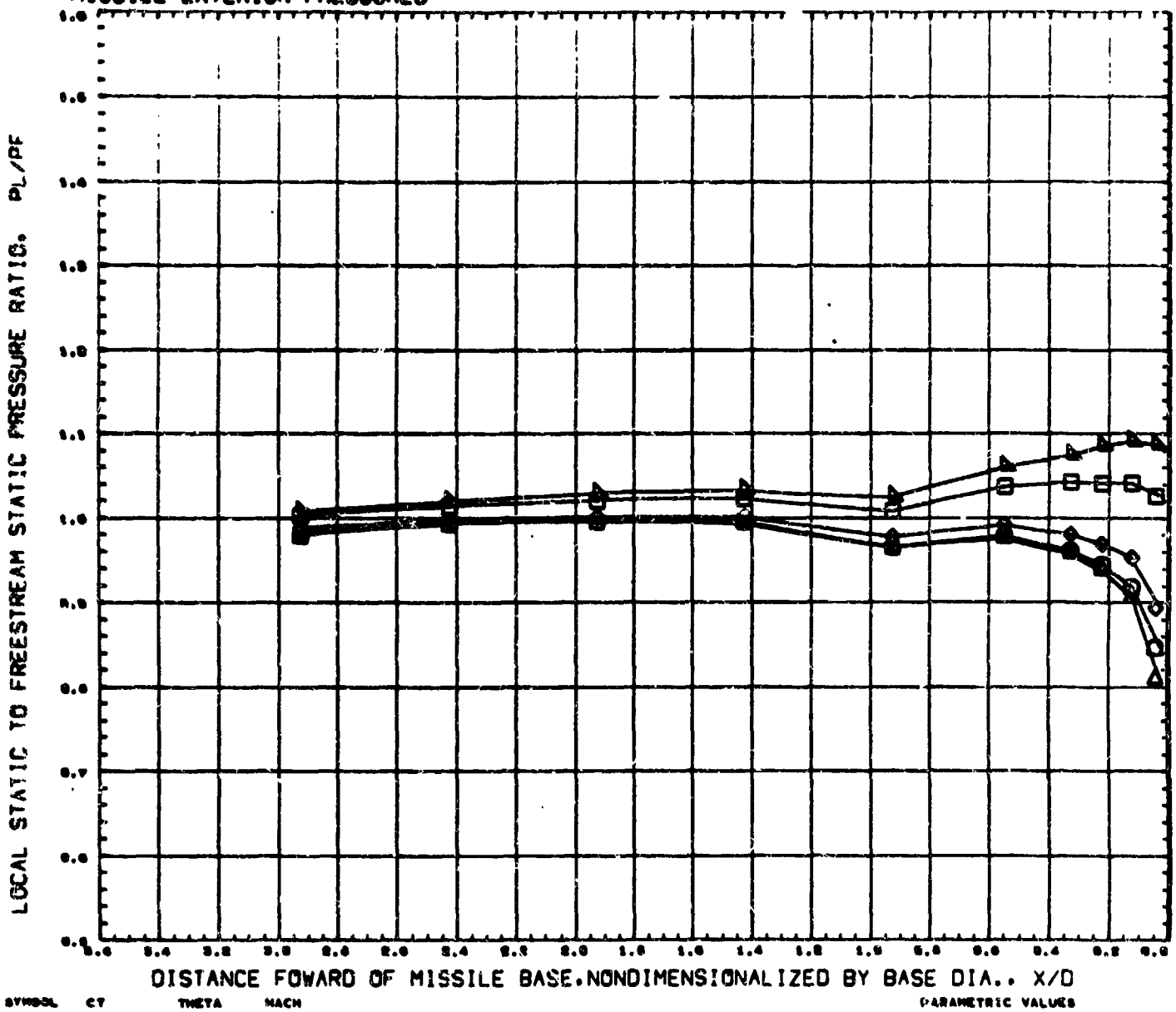
AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCE05)

MISSILE EXTERIOR PRESSURES



AMC PLUME STUDY, CONTOURED NOZZLE(-1) (RUCE06) PAGE 103

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
○	1.004	0.000	0.903
△	10.369		
◇	21.915		
□	45.304		
◺	64.300		

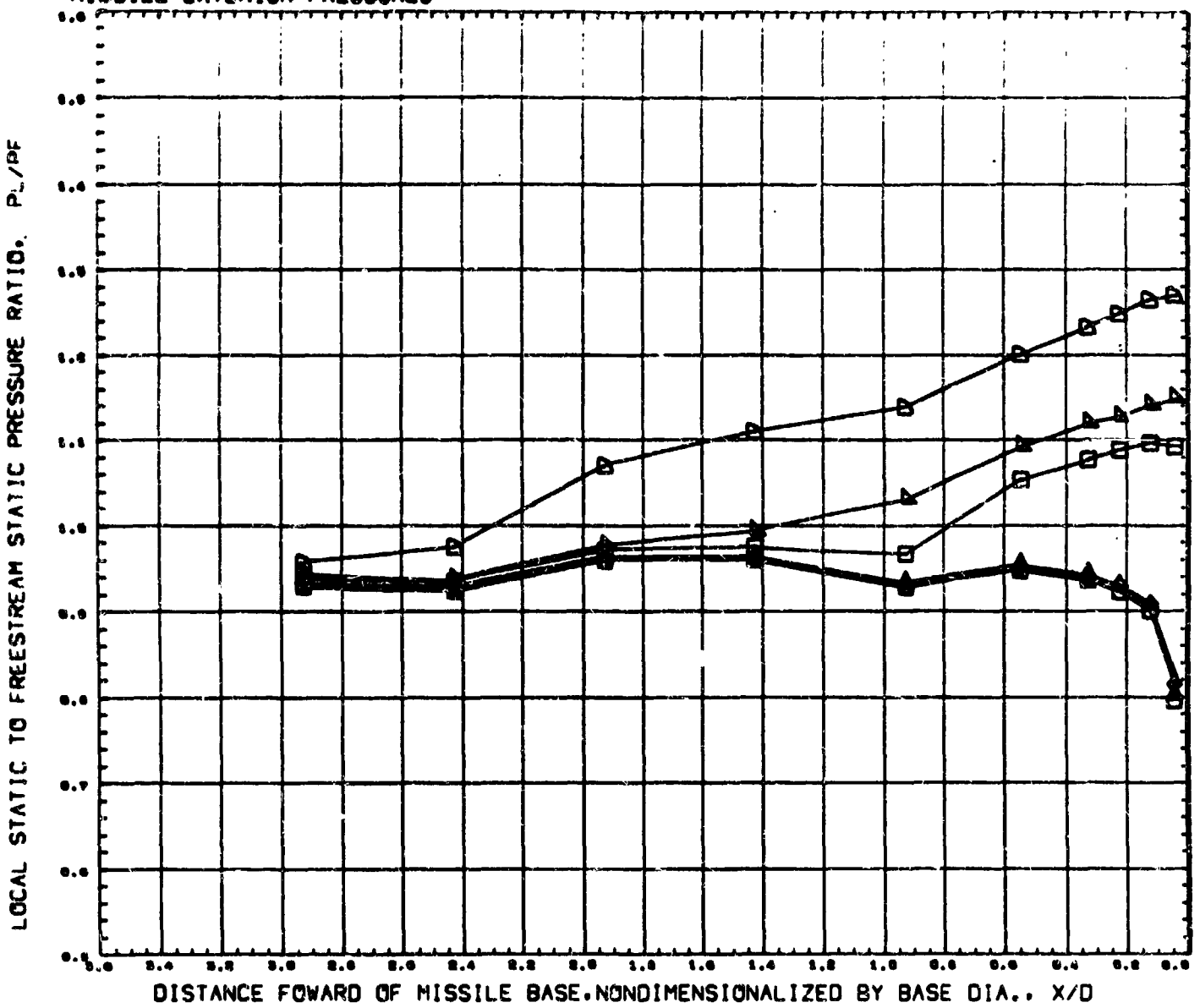
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	3.000
BJ/DB	0.900	THETAJ	0.000

REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-1) (RUCE06) PAGE 104

MISSILE EXTERIOR PRESSURES

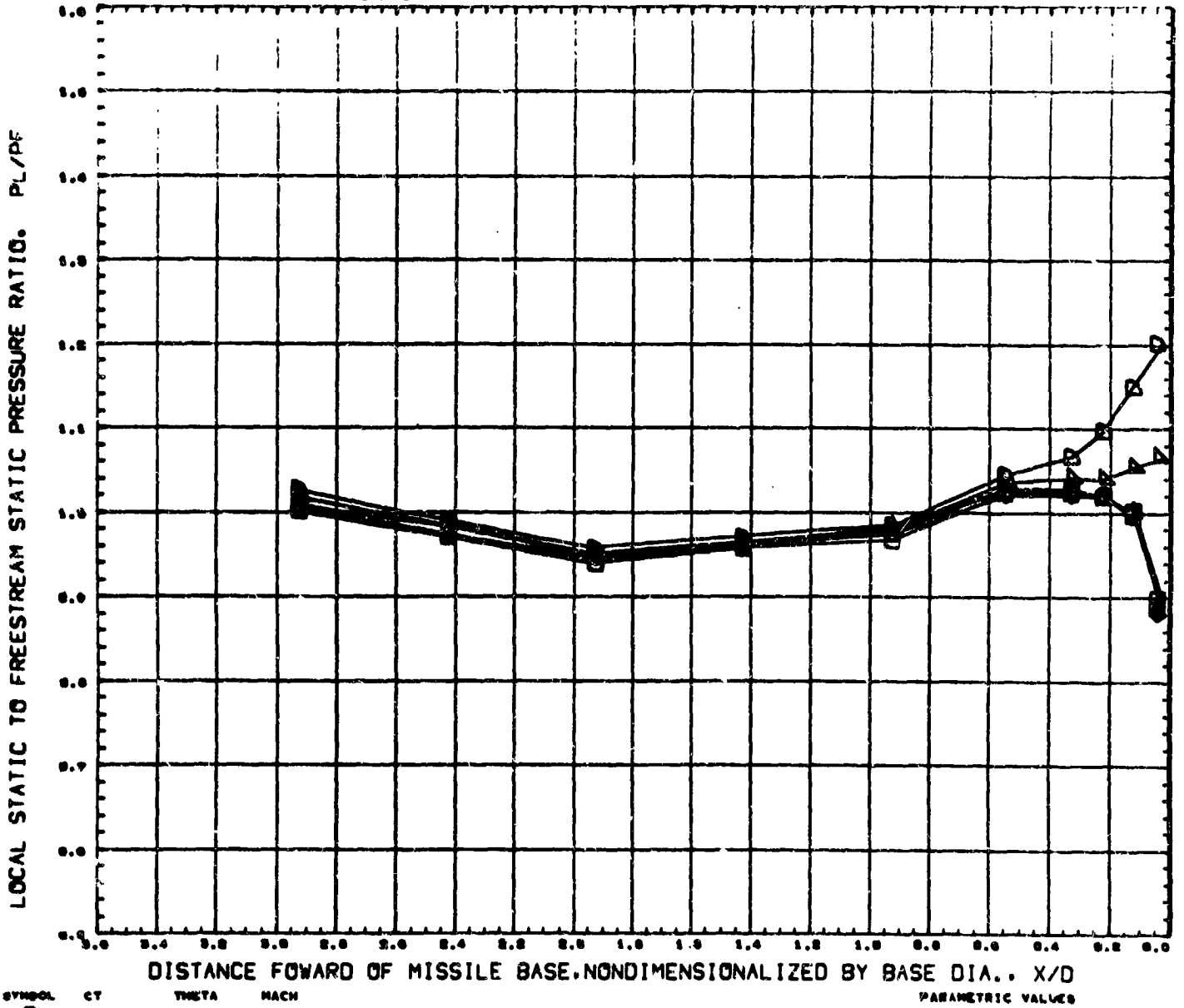


SYMBOL	CT	THETA	MACH
	1.004	0.000	1.004
	0.007		
	10.000		
	41.000		
	84.000		
	101.240	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	3.000
DJ/DB	0.000	THETAJ	0.000

MISSILE EXTERIOR PRESSURES

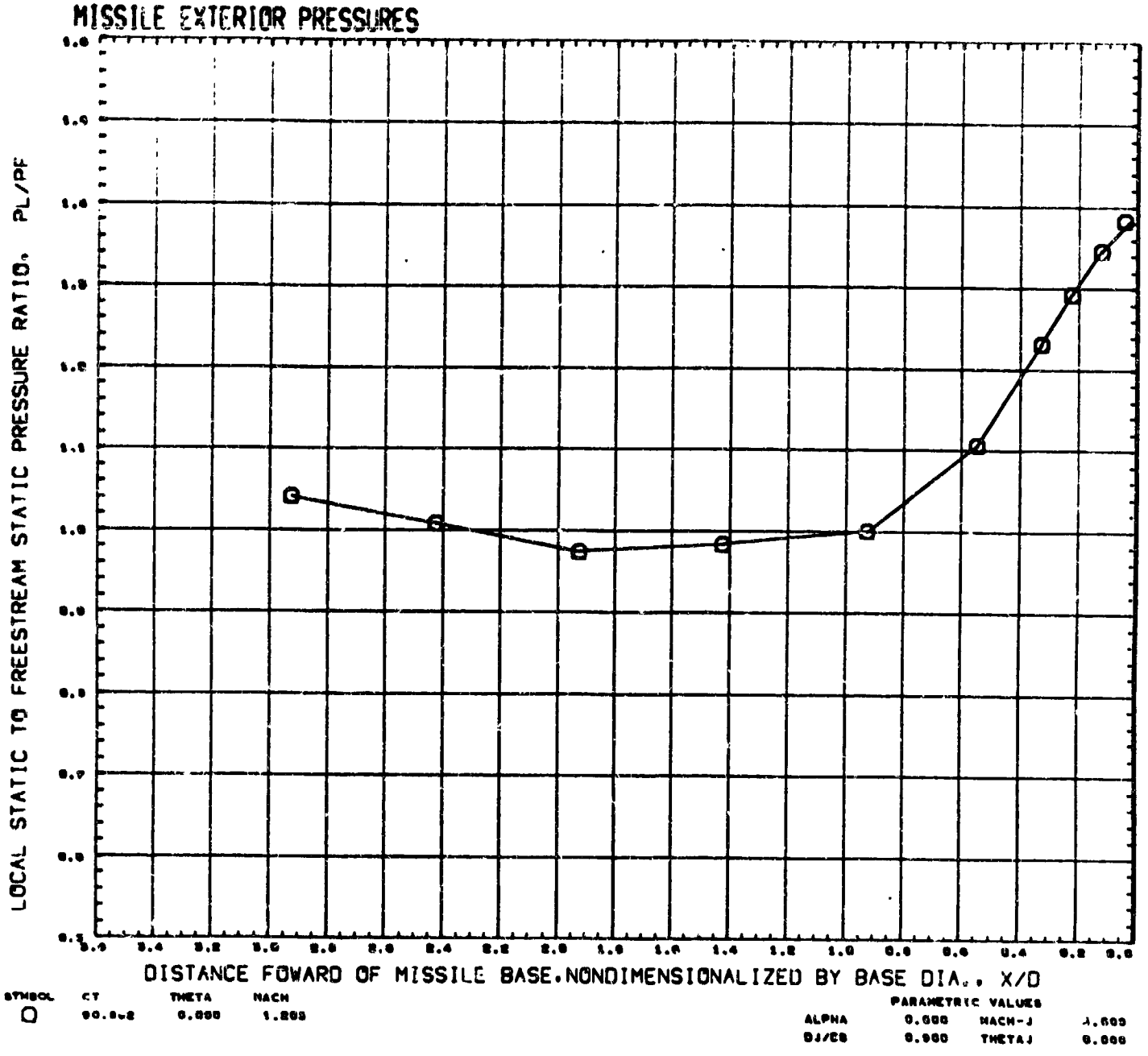


SYMBOL	CT	THETA	MACH
○	1.910	0.000	1.203
△	3.500		
◇	8.502		
□	17.003		
◺	30.100		
D	50.000	REFERENCE FILE	

PARAMETRIC VALUES

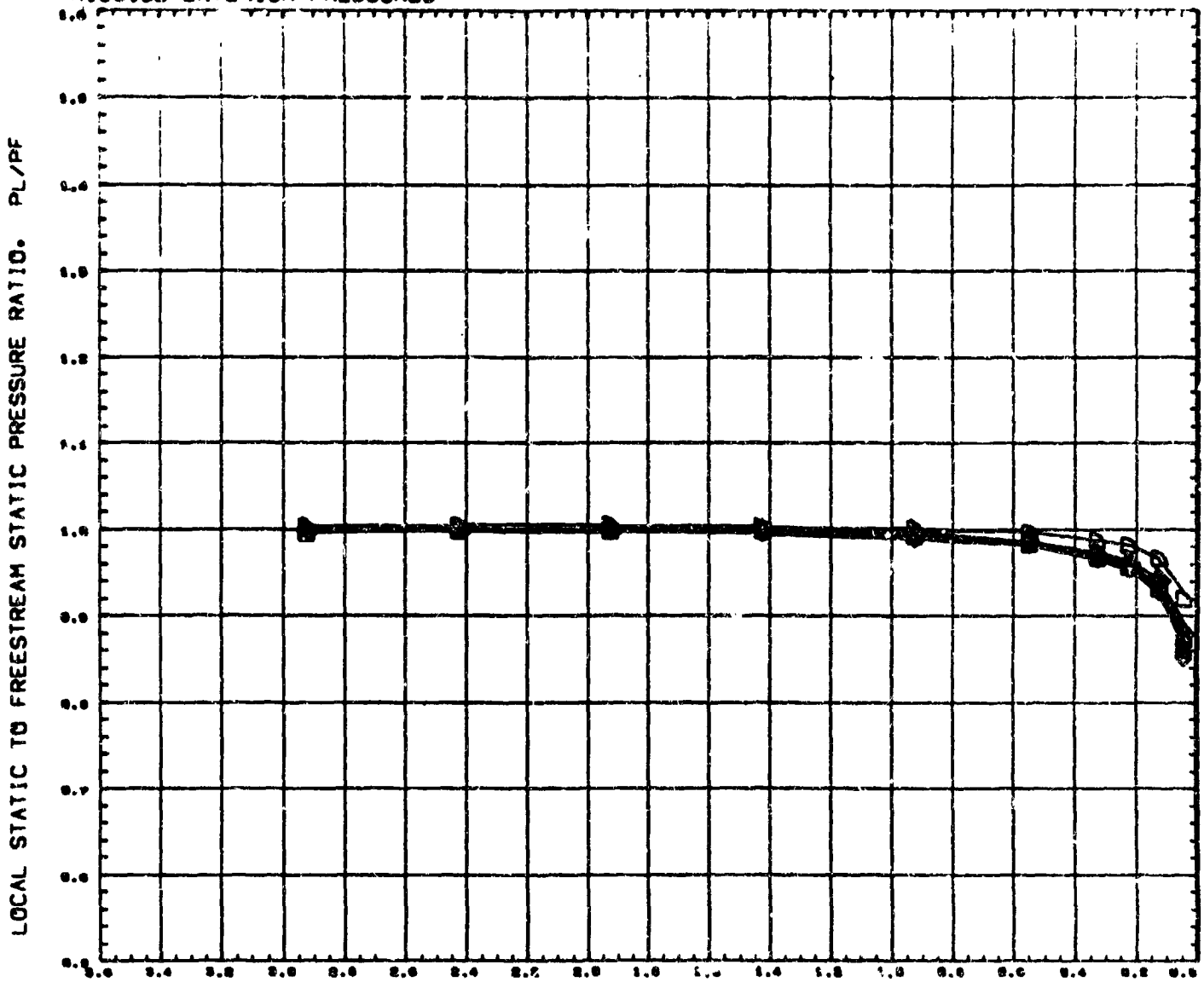
ALPHA	0.000	MACH-J	3.000
DJ/DB	0.900	THETAJ	0.900

AMC PLUME STUDY, CONTOURED NOZZLE(-1) (RUCE06) PAGE 106



REFERENCE FILE

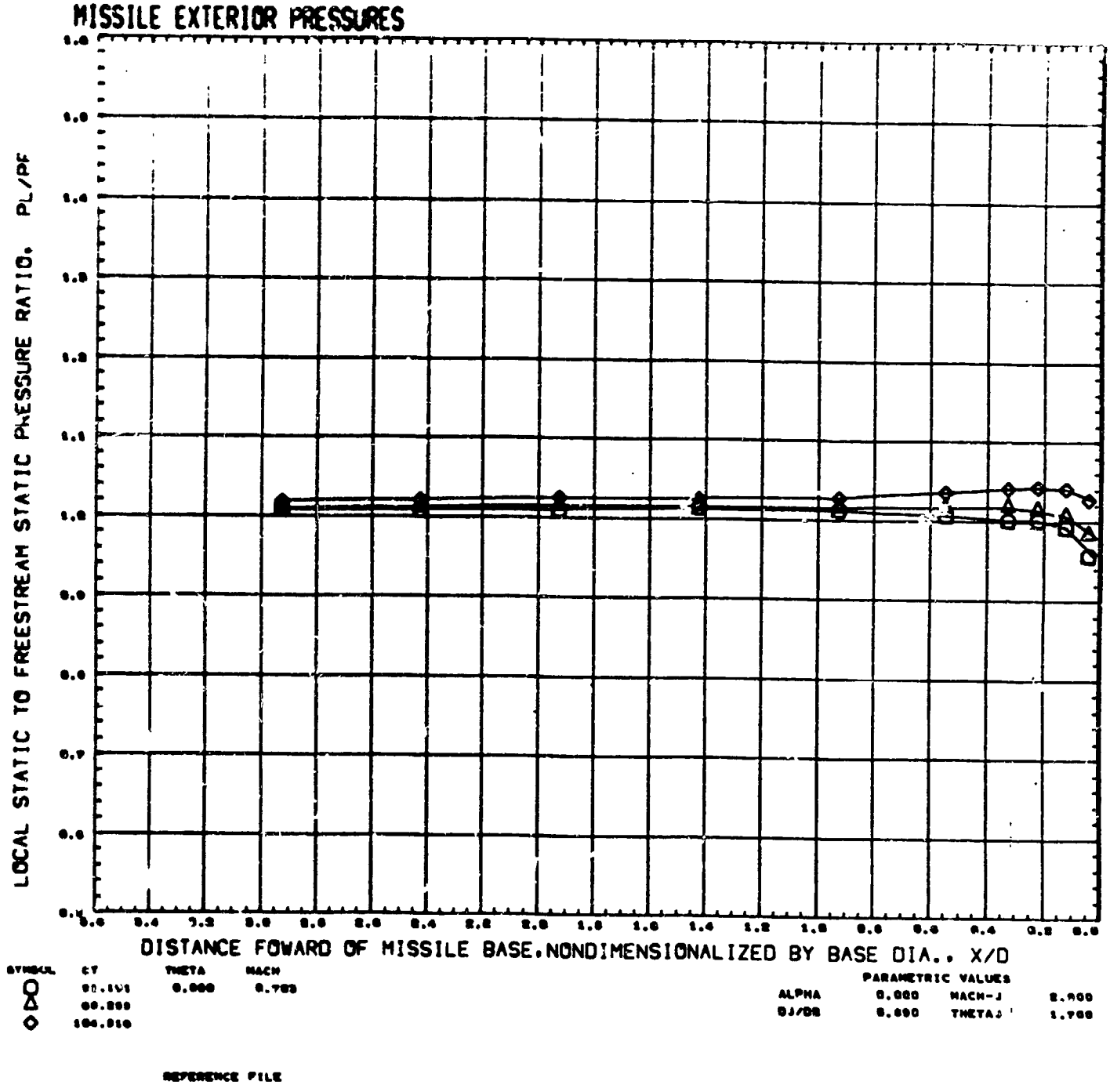
MISSILE EXTERIOR PRESSURES



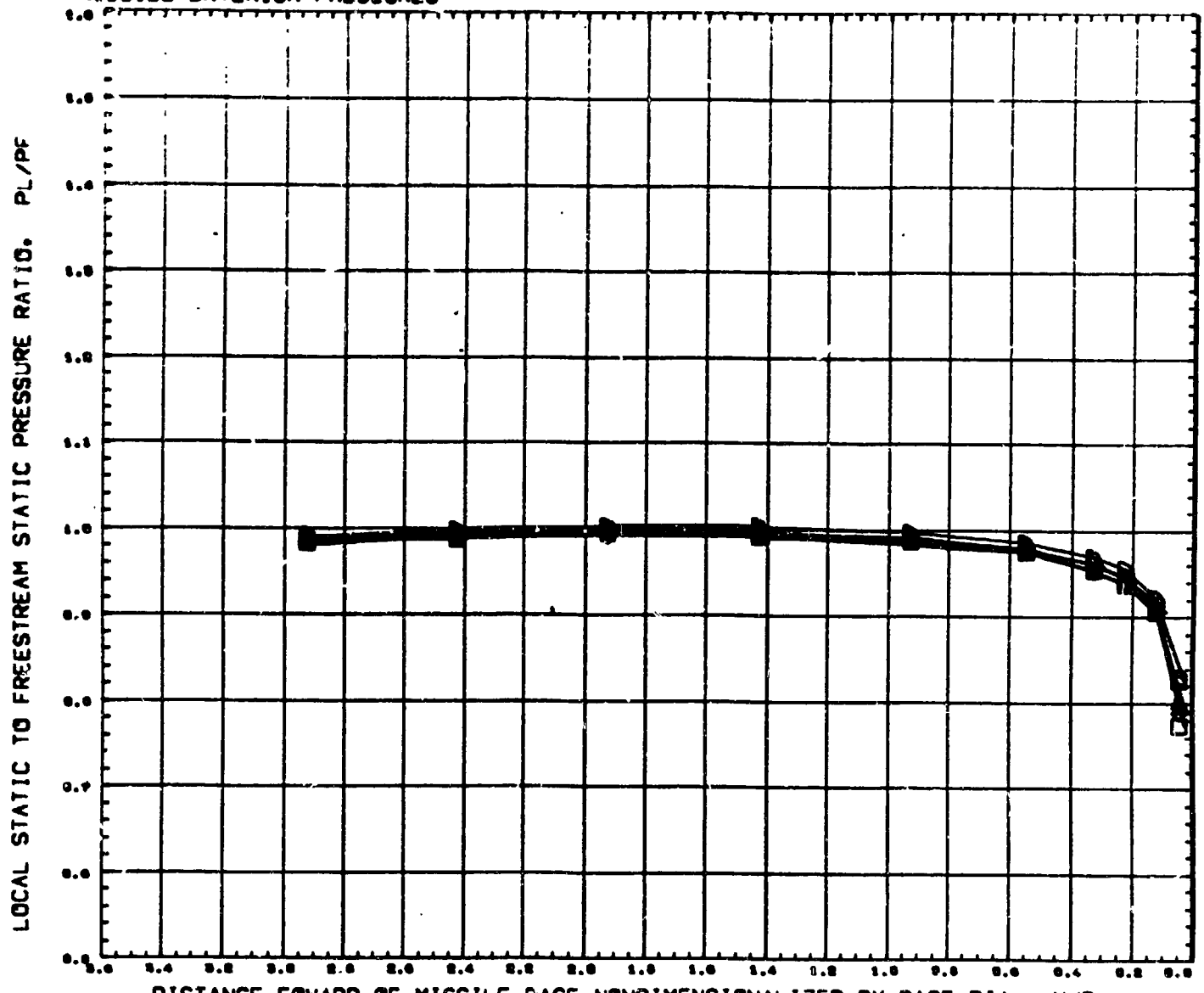
SYMBOL	CT	THETA	MACH
○	4.994	0.050	0.703
△	7.340		
◇	10.714		
□	13.646		
◺	22.070		
D	34.383	REFERENCE FILE	

PARAME.	VALUES		
ALPHA	0.000	MACH-J	2.000
BJ/DB	4.000	THETAJ	1.700

AMC PLUME STUDY, CONTOURED NOZZLE(-2) (RUCE07) PAGE 108


MISSILE EXTERIOR PRESSURES
LOCAL STATIC TO FREESTREAM STATIC PRESSURE RATIO, PL/PF
DISTANCE FOWARD OF MISSILE BASE,NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL
CT
THETA
MACH
PARAMETRIC VALUES
ALPHA
MACH-J
DJ/DB
THETAJ
REFERENCE FILE

MISSILE EXTERIOR PRESSURES



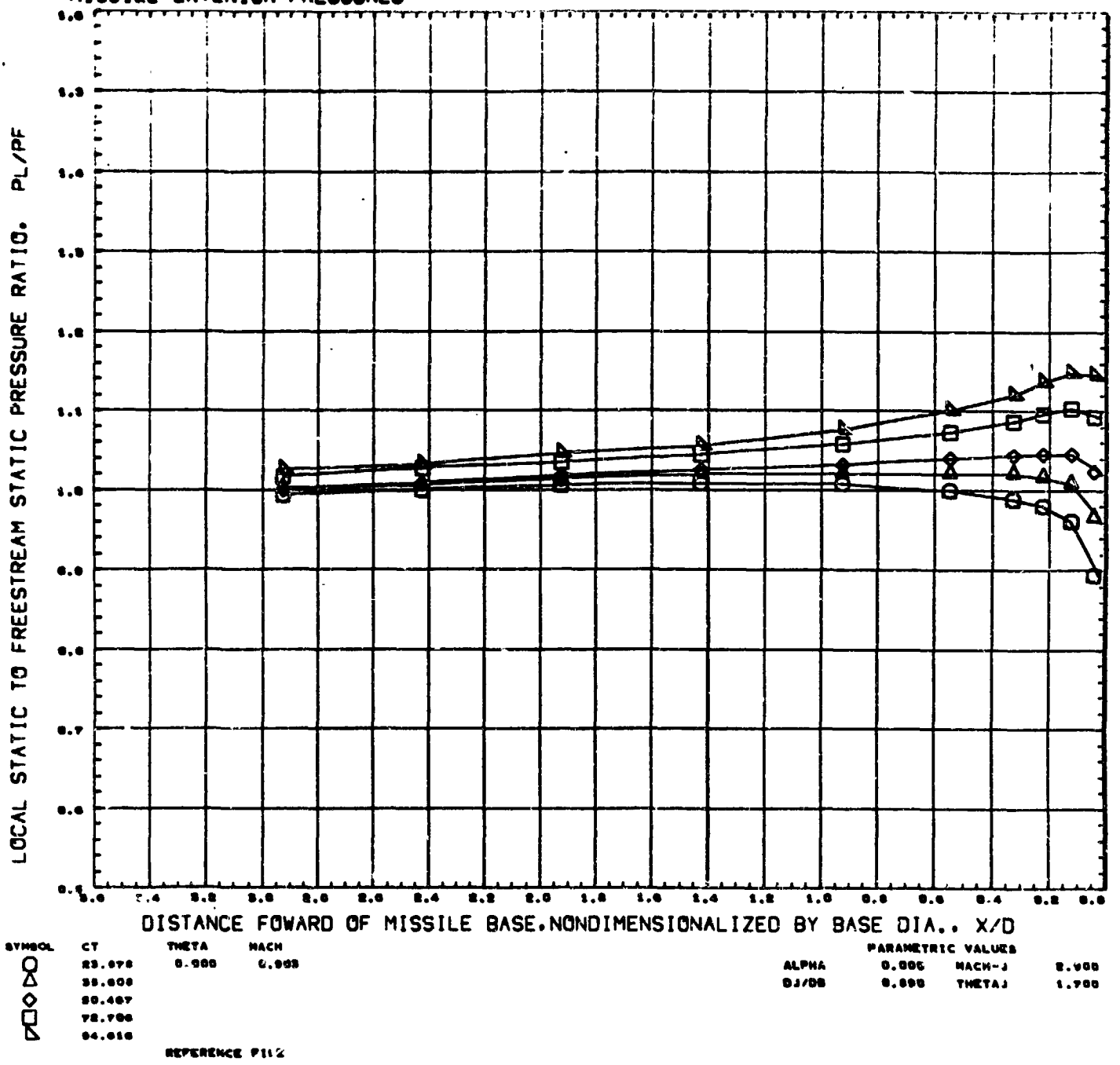
SYMBOL	CT	THETA	MACH
○	1.000	0.000	0.000
▷	2.000		
◇	4.000		
□	8.000		
↗	12.000		
D	17.001	REFERENCE FILE	

PARAMETRIC VALUES

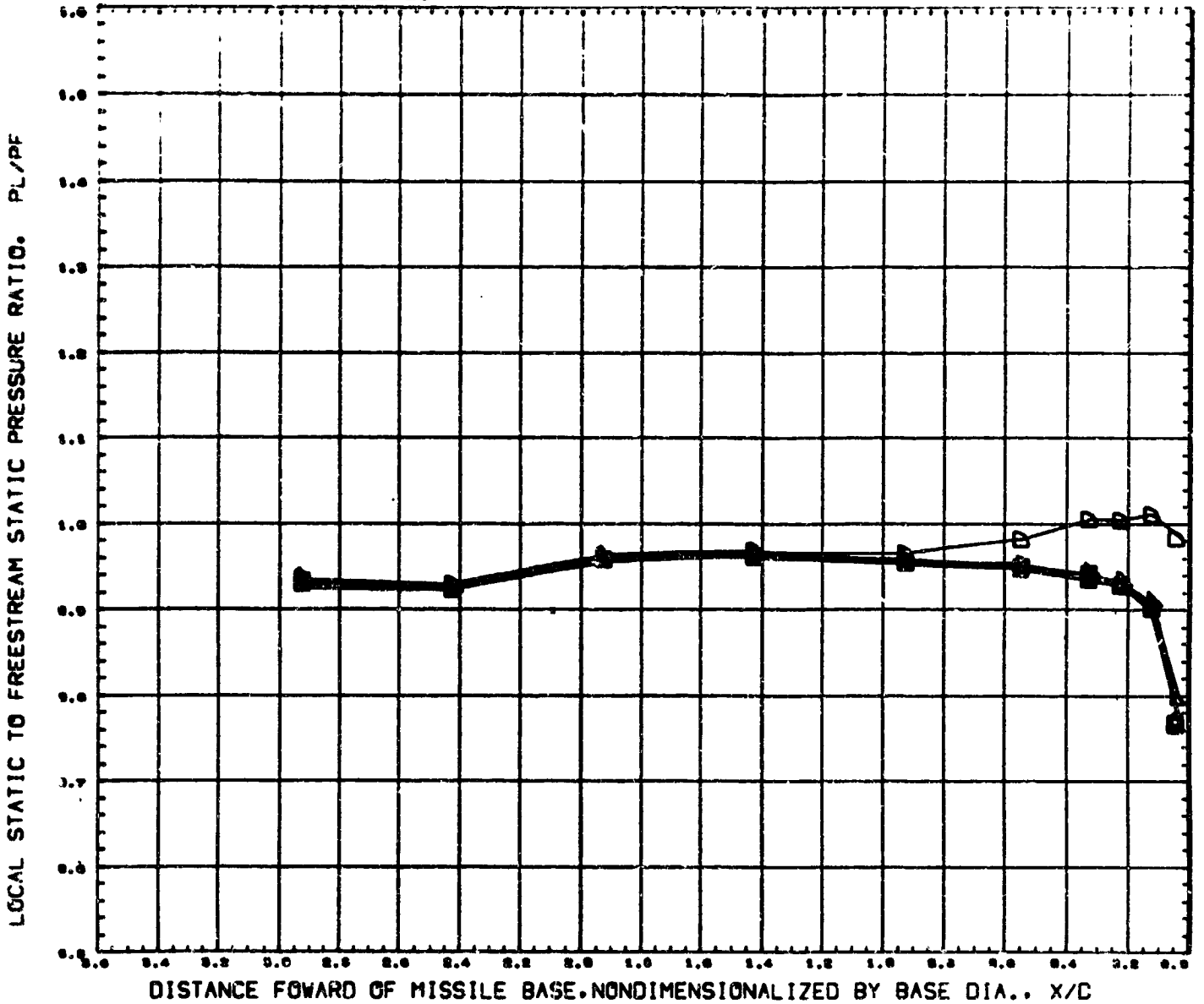
ALPHA	0.000	MACH-J	2.000
DJ/DS	0.000	THETAJ	1.700

AMC PLUME STUDY, CONTOURED NOZZLE(-2) (RUCE07) PAGE 110

MISSILE EXTERIOR PRESSURES



MISSILE EXTERIOR PRESSURES



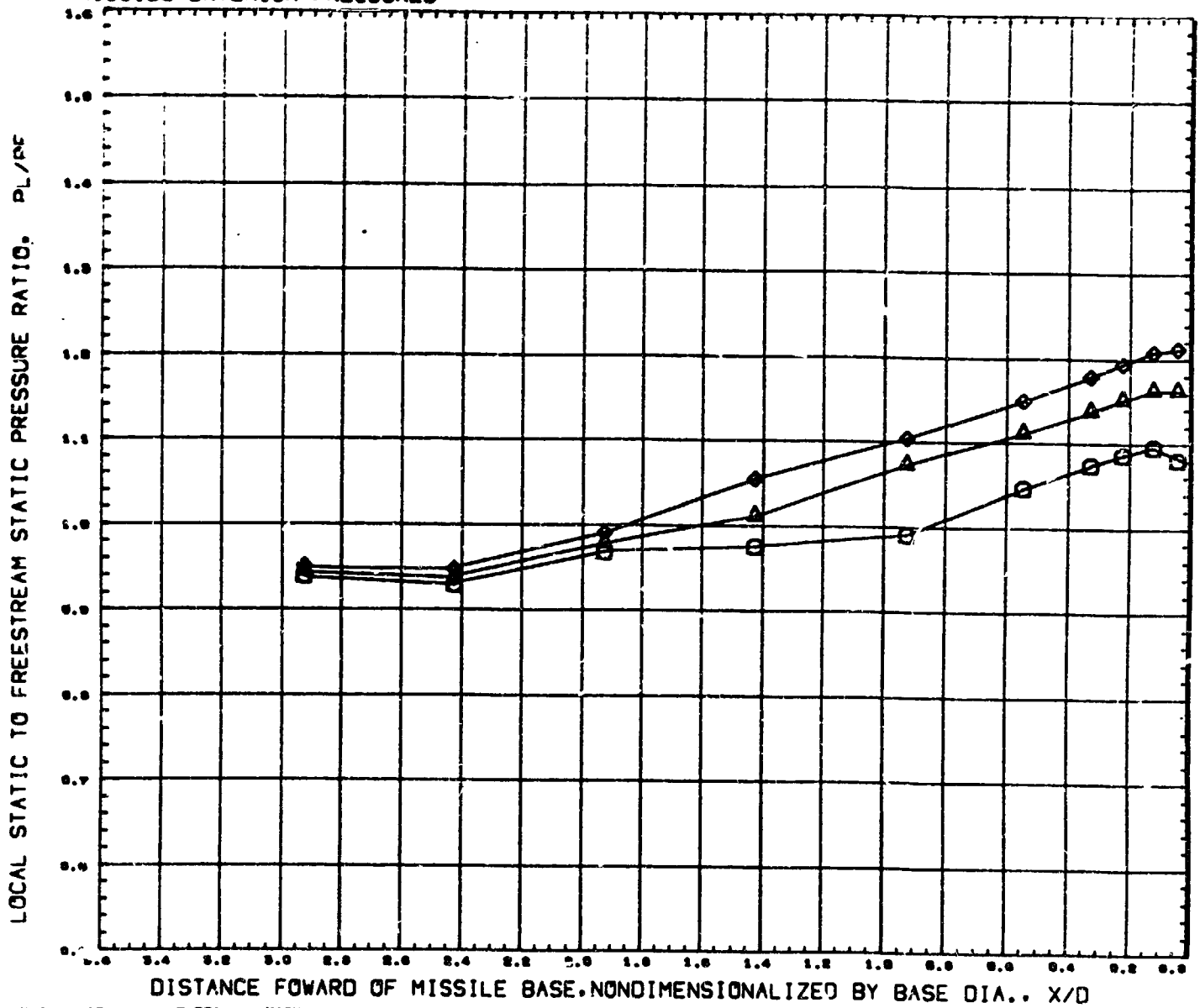
SYMBOL	CT	THETA	MACH
○	1.003	0.000	1.004
△	3.200		
◇	11.000		
□	15.700		
◺	21.134		
D	32.937	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.000
DJ/DB	0.090	THETAJ	1.700

AMC PLUME STUDY. CONTOURED NOZZLE(-2) (RUCE07) PAGE 112

MISSILE EXTERIOR PRESSURES

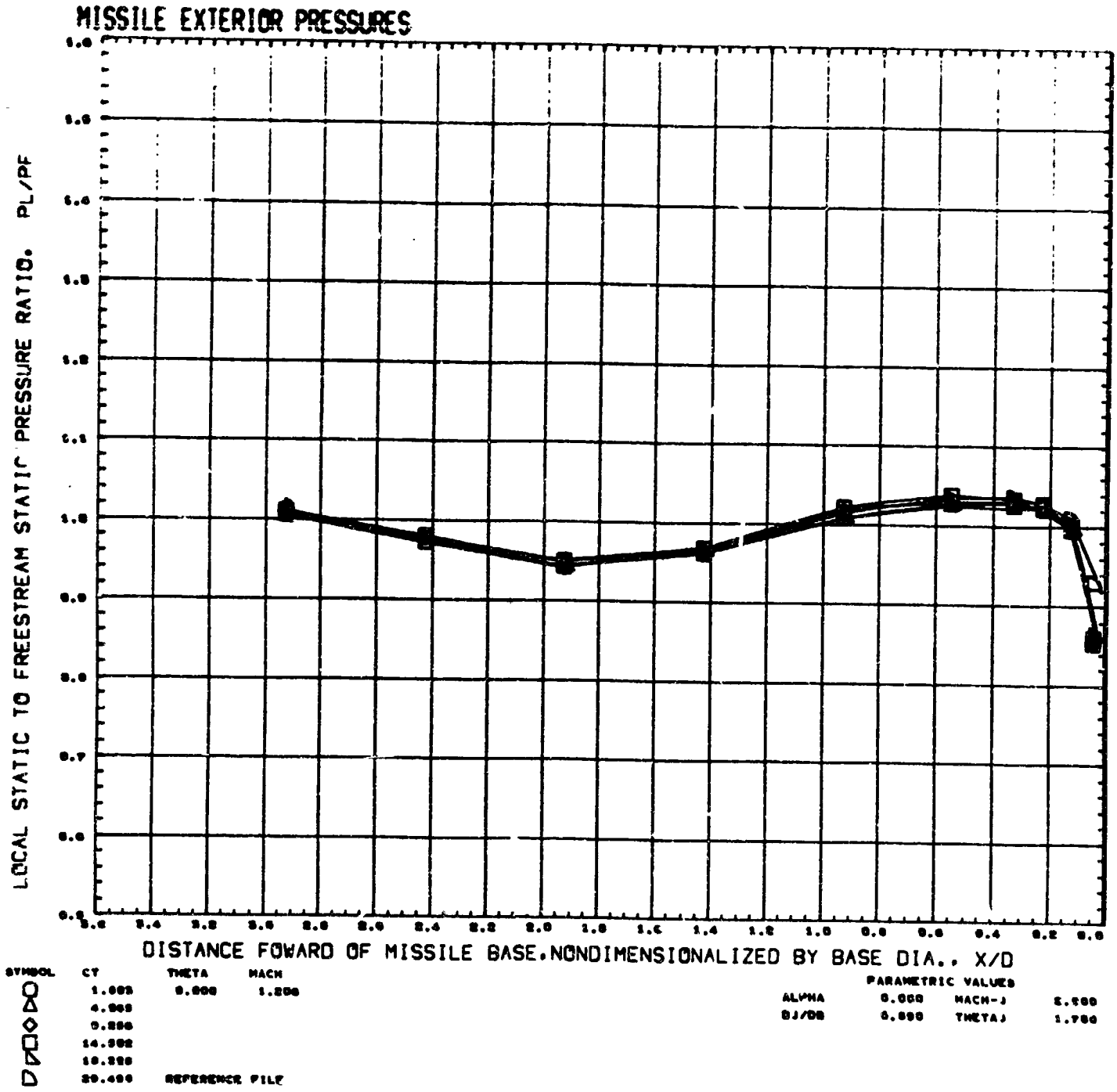


SYMBOL	CT	THETA	MACH
○	48.378	0.000	1.004
△	62.062		
◇	79.038		

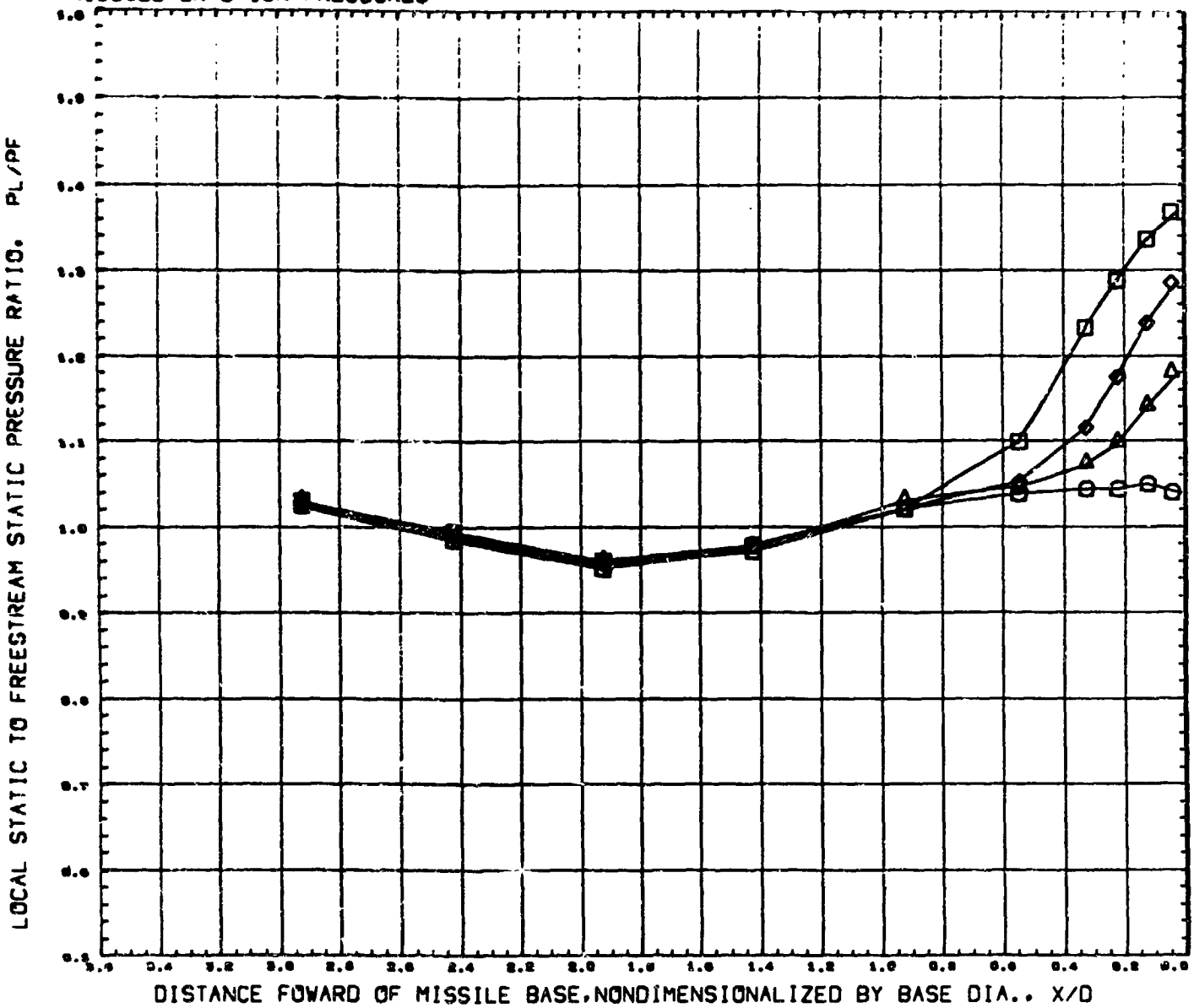
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.000
DJ/DB	0.000	THETAJ	1.700

REFERENCE FILE


MISSILE EXTERIOR PRESSURES
LOCAL STATIC TO FREESTREAM STATIC PRESSURE RATIO, PL/PF
DISTANCE FOWARD OF MISSILE BASE,NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL CT THETA MACH
REFERENCE FILE
PARAMETRIC VALUES
ALPHA
DJ/DB
MACH-J
THETAJ

MISSILE EXTERIOR PRESSURES



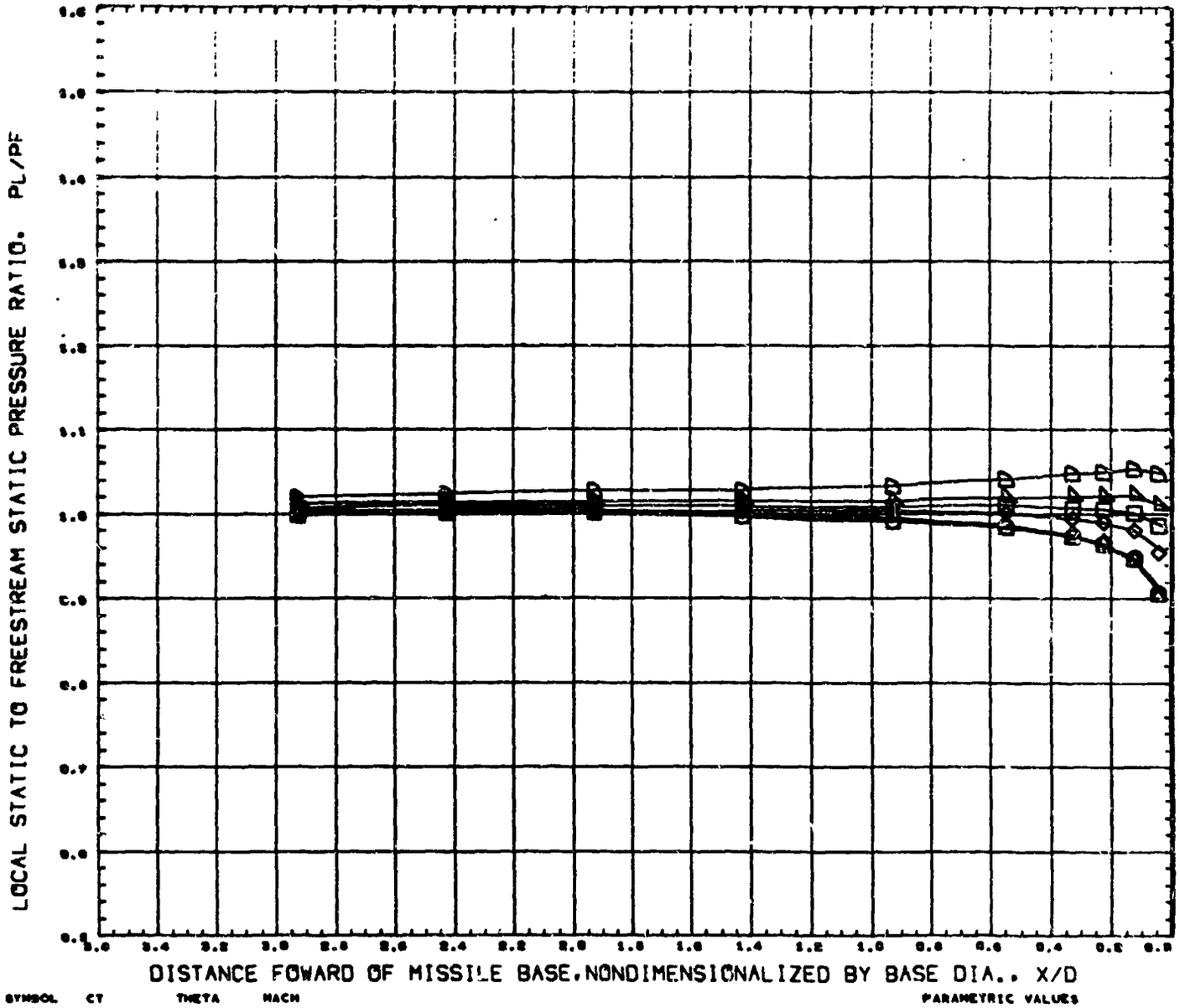
SYMBOL	CT	THETA	MACH
○	38.112	0.000	1.206
△	33.000		
◇	68.720		
□	97.493		

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.900
DJ/DB	0.606	THETAJ	1.700

REFERENCE FILE

MISSILE EXTERIOR PRESSURES



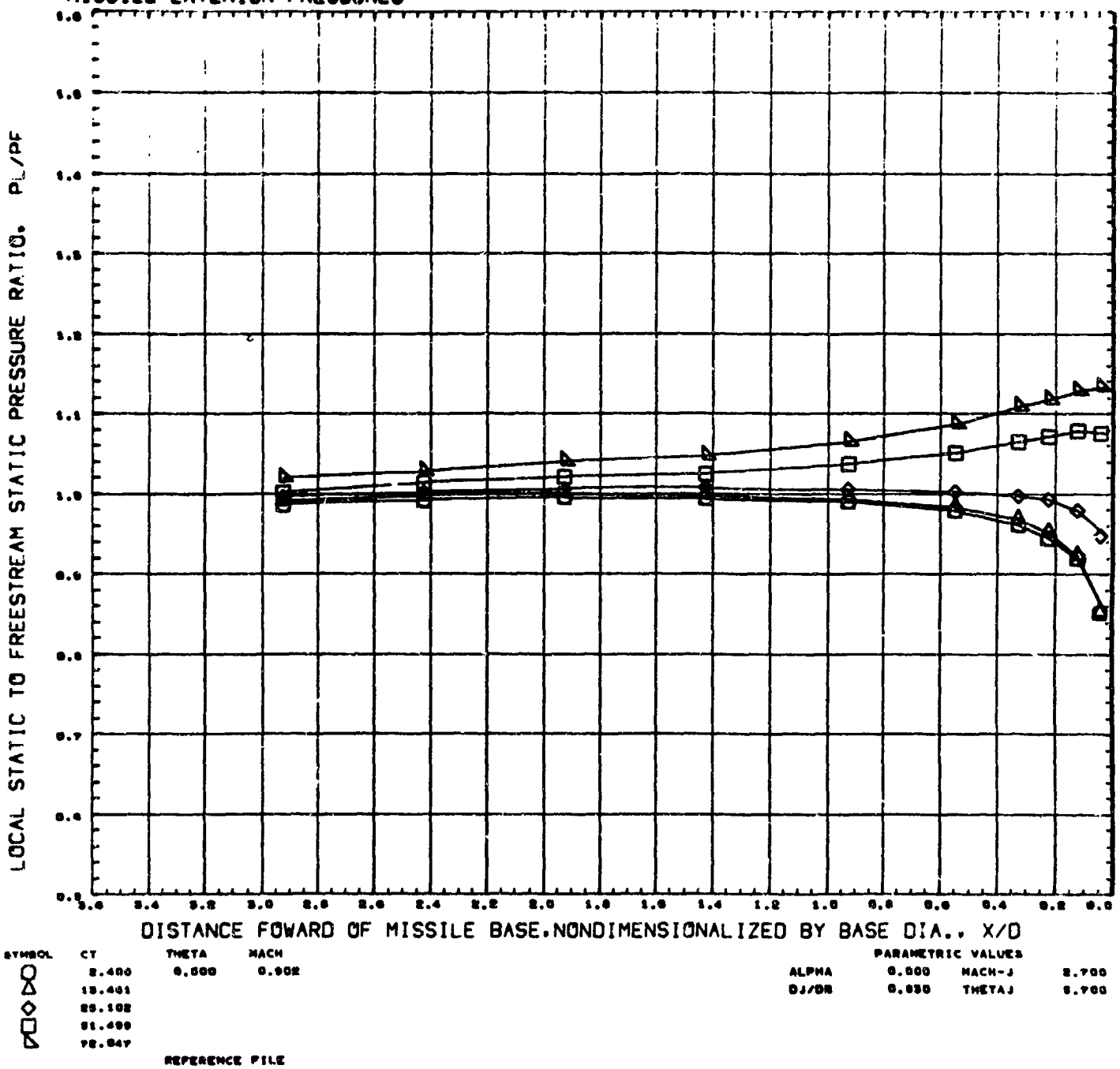
SYMBOL	CT	THETA	MACH
○	3.284	0.000	0.700
△	16.268		
◇	37.289		
□	63.115		
◺	71.838		
D	103.175	REFERENCE FILE	

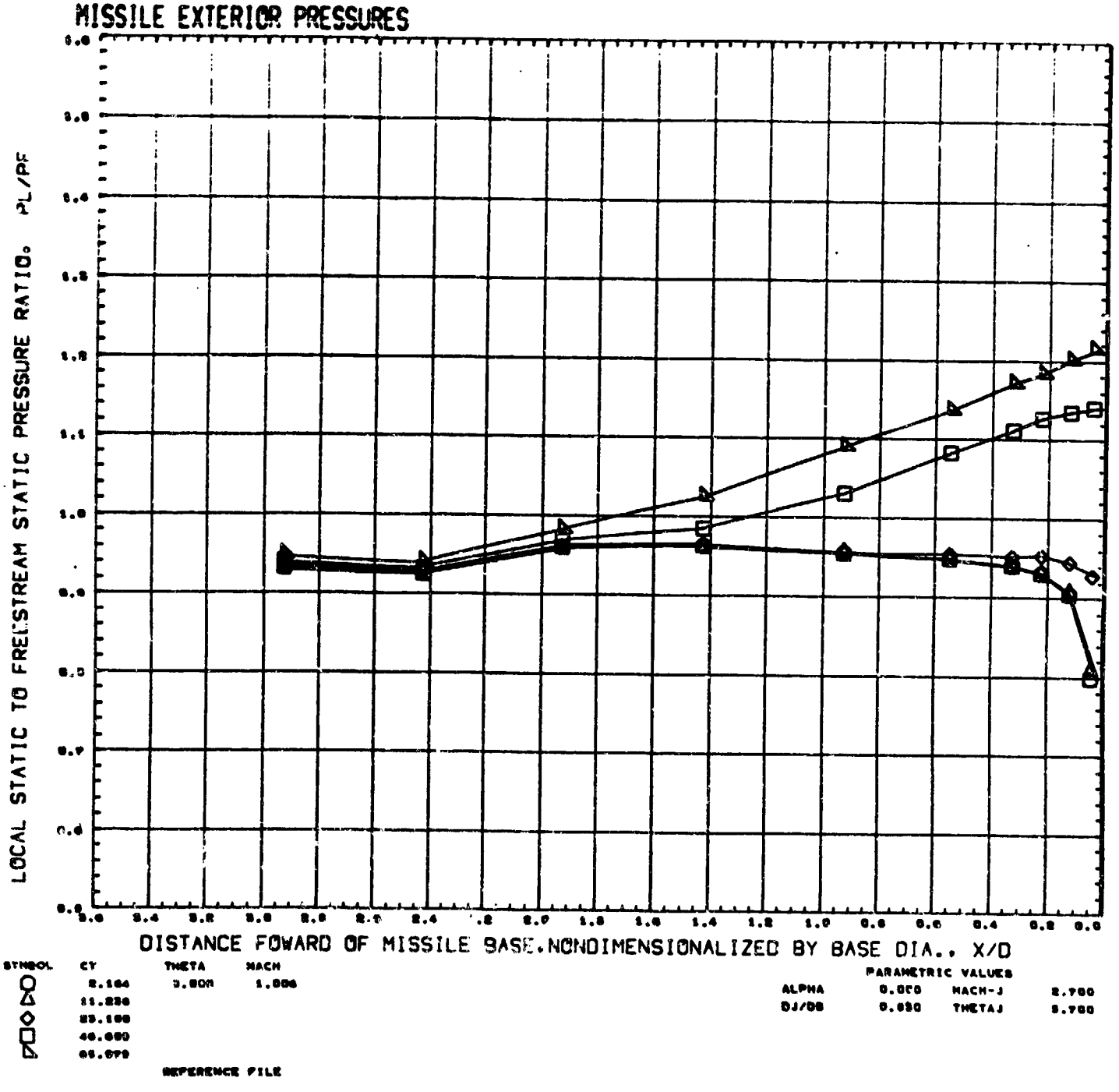
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.830	THETAJ	9.700

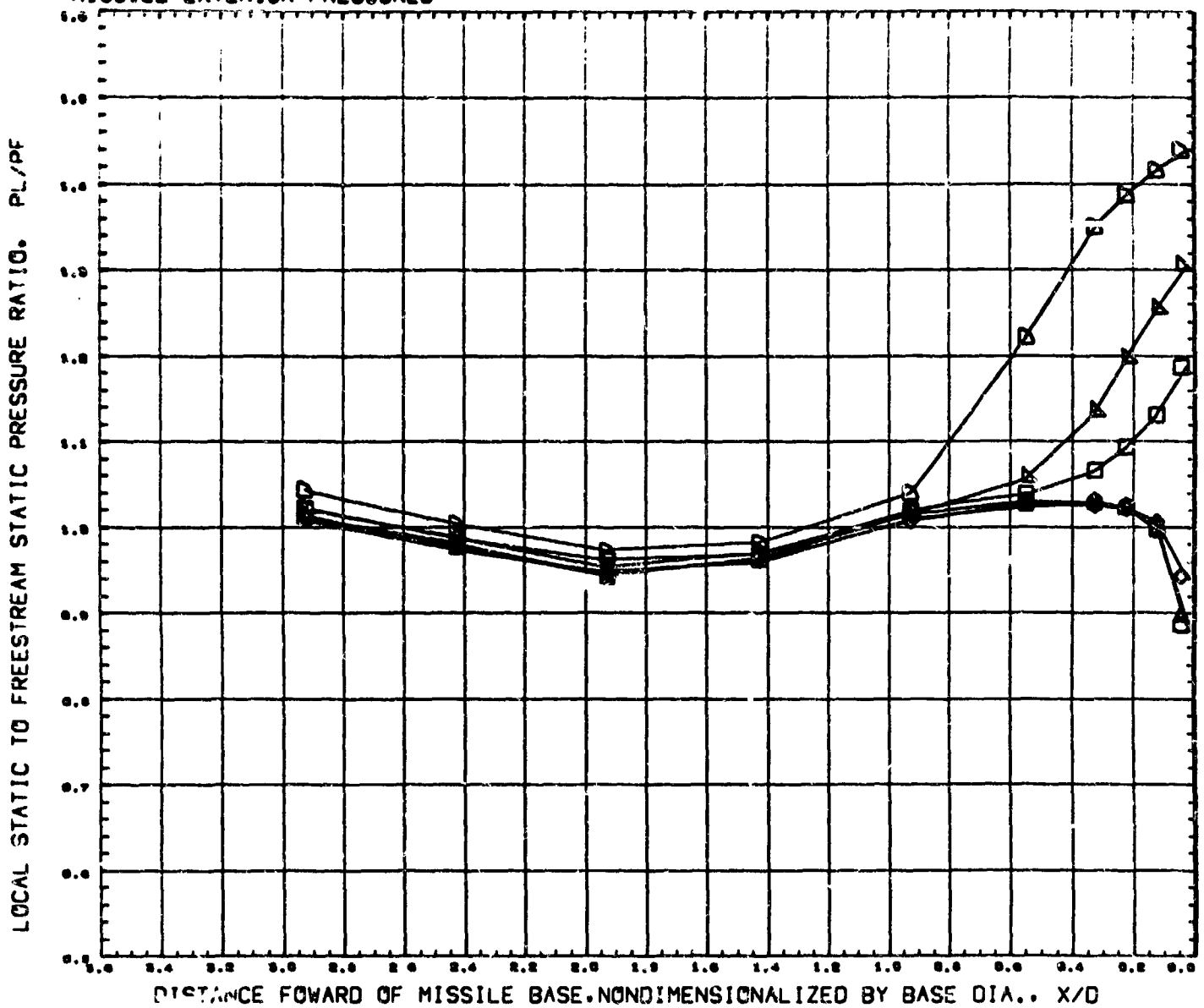
AMC PLUME STUDY, CONTOURED NOZZLE(-3) (RUCE08) PAGE 116

MISSILE EXTERIOR PRESSURES

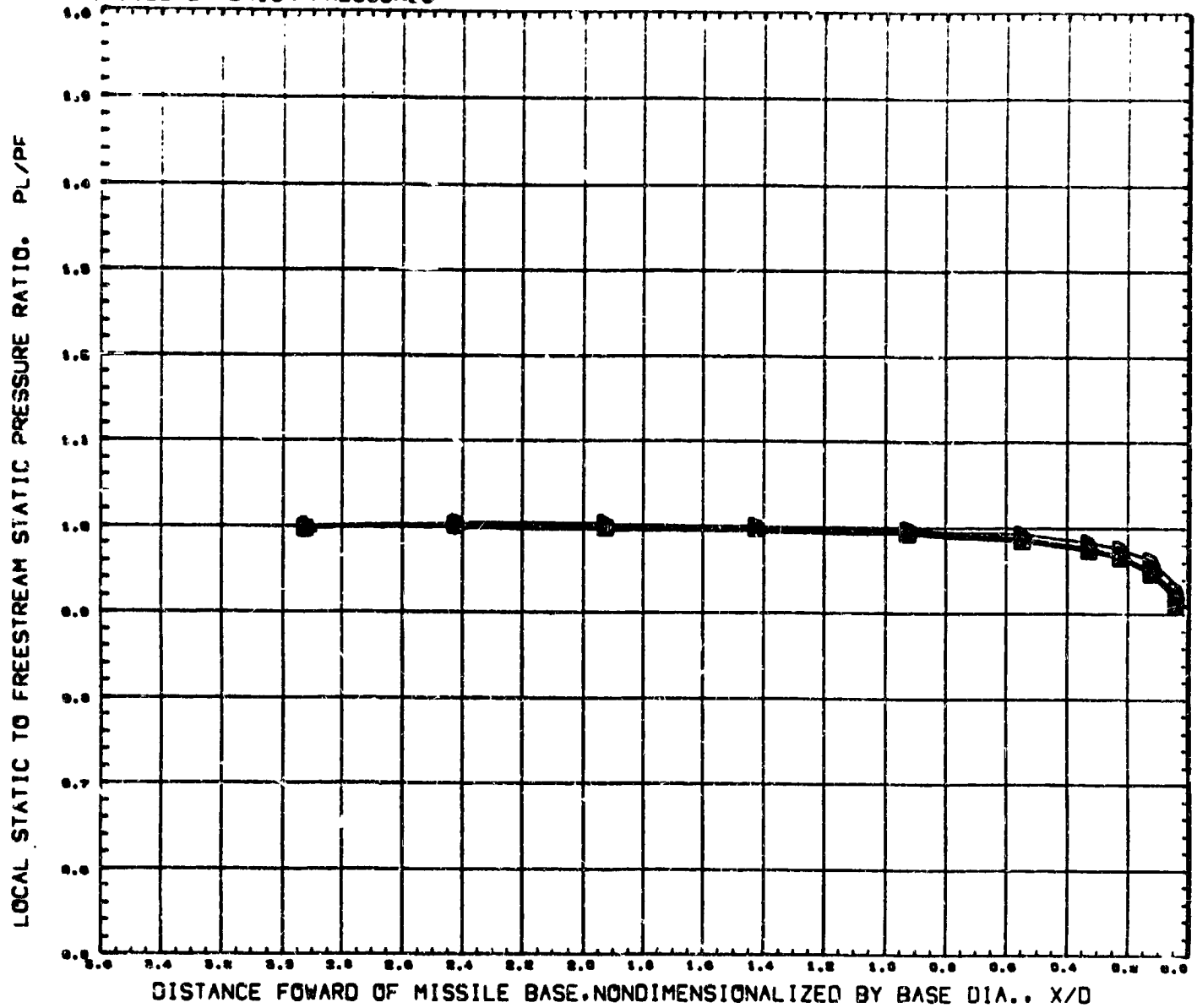



MISSILE EXTERIOR PRESSURES
LOCAL STATIC TO FREESTREAM STATIC PRESSURE RATIO, PL/PF
DISTANCE FOWARD OF MISSILE BASE,NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL CY THETA MACH
REFERENCE FILE
PARAMETRIC VALUES
ALPHA MACH-J
DJ/DB THETAJ

MISSILE EXTERIOR PRESSURES



MISSILE EXTERIOR PRESSURES



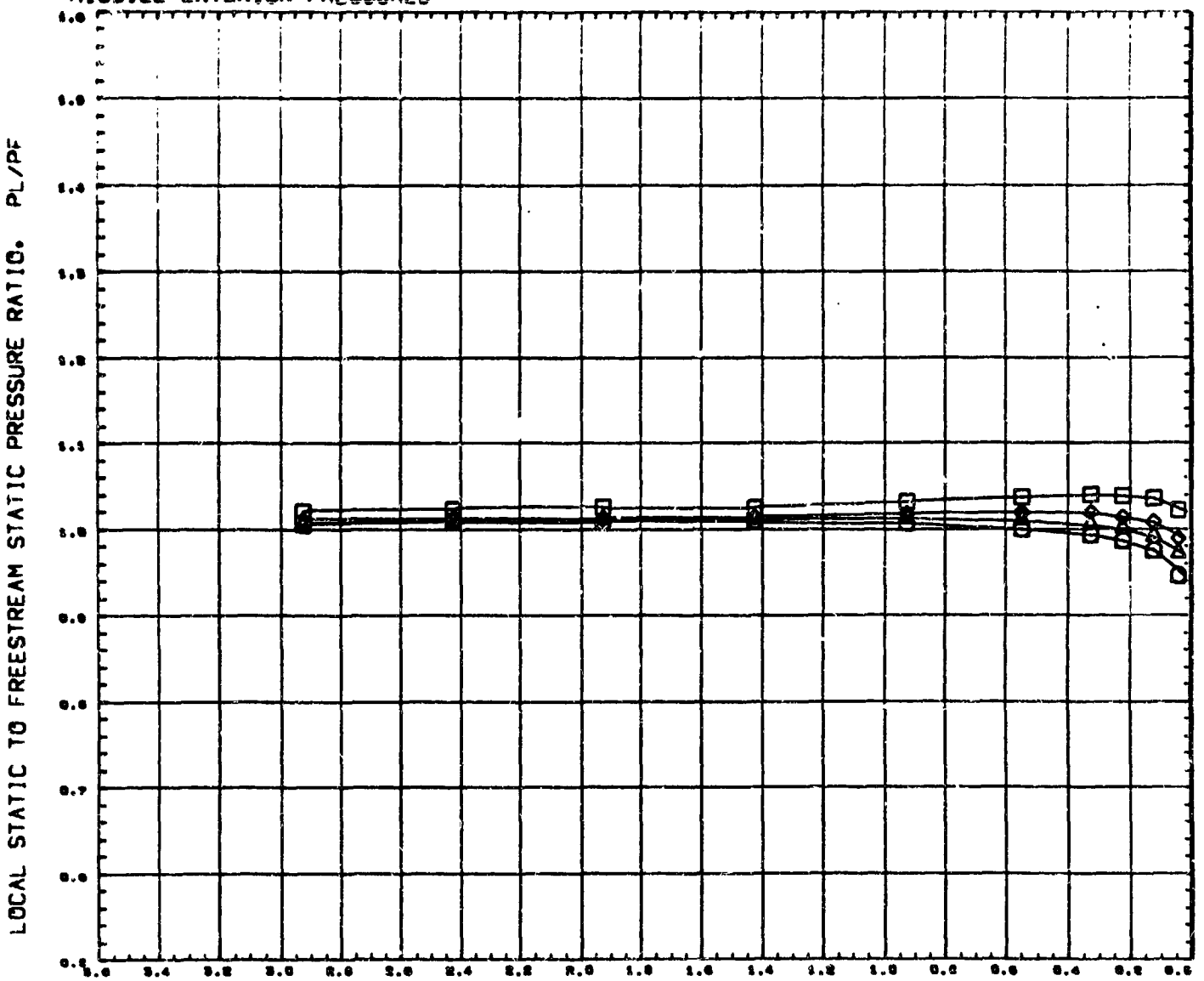
SYMBOL	CT	THETA	MACH
○	2.967	0.000	0.703
△	4.465		
◇	6.707		
□	9.541		
◺	19.177		
D	23.000	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.700	THETAJ	0.000

AMC PLUME STUDY. CONTOURED NOZZLE(-4) (RUCE09) PAGE 120

MISSILE EXTERIOR PRESSURES



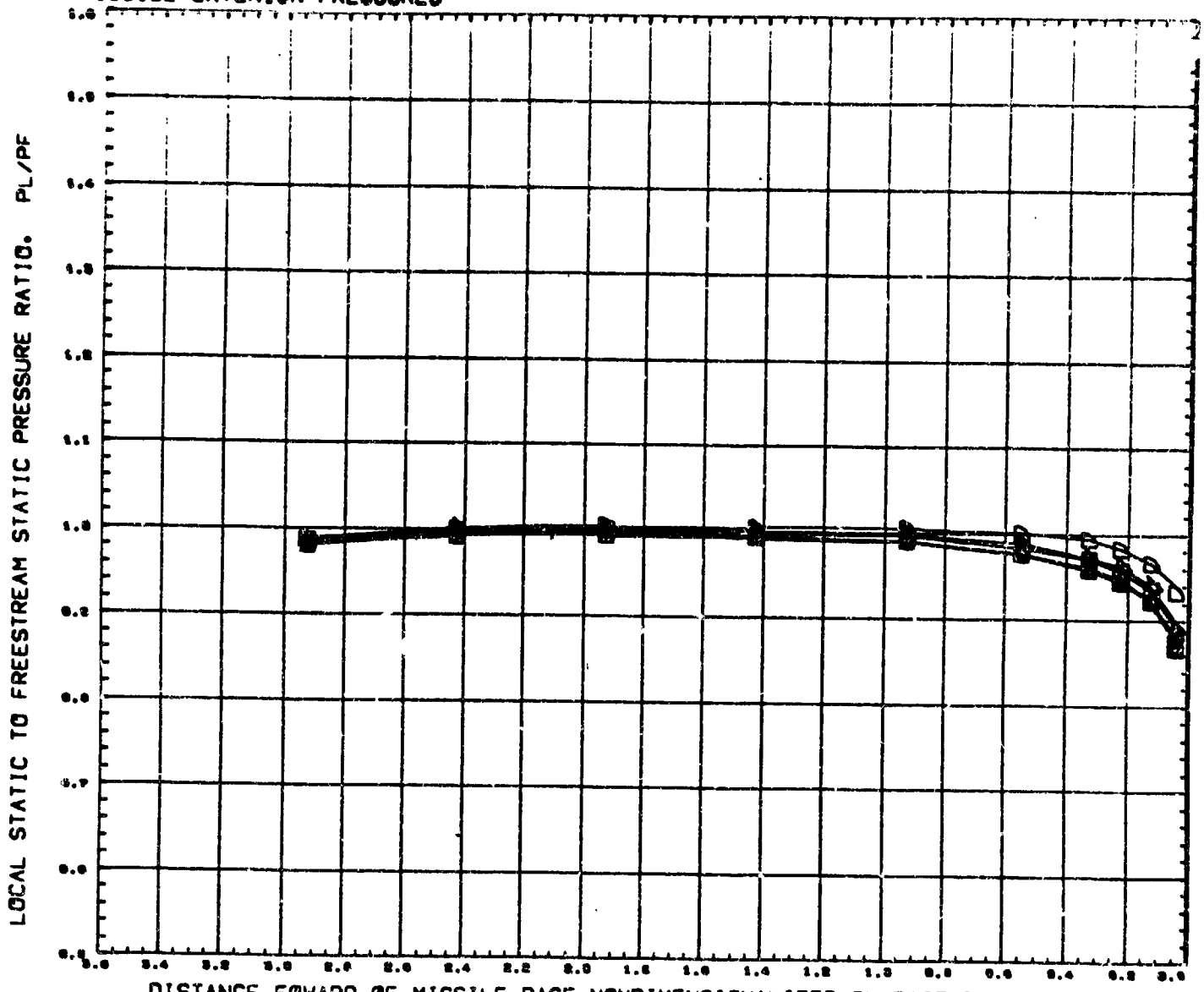
SYMBOL	CT	THETA	MACH
○	31.446	0.000	0.703
△	46.917		
◇	64.009		
□	98.74[illegible]		

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.700	THETAJ	0.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES

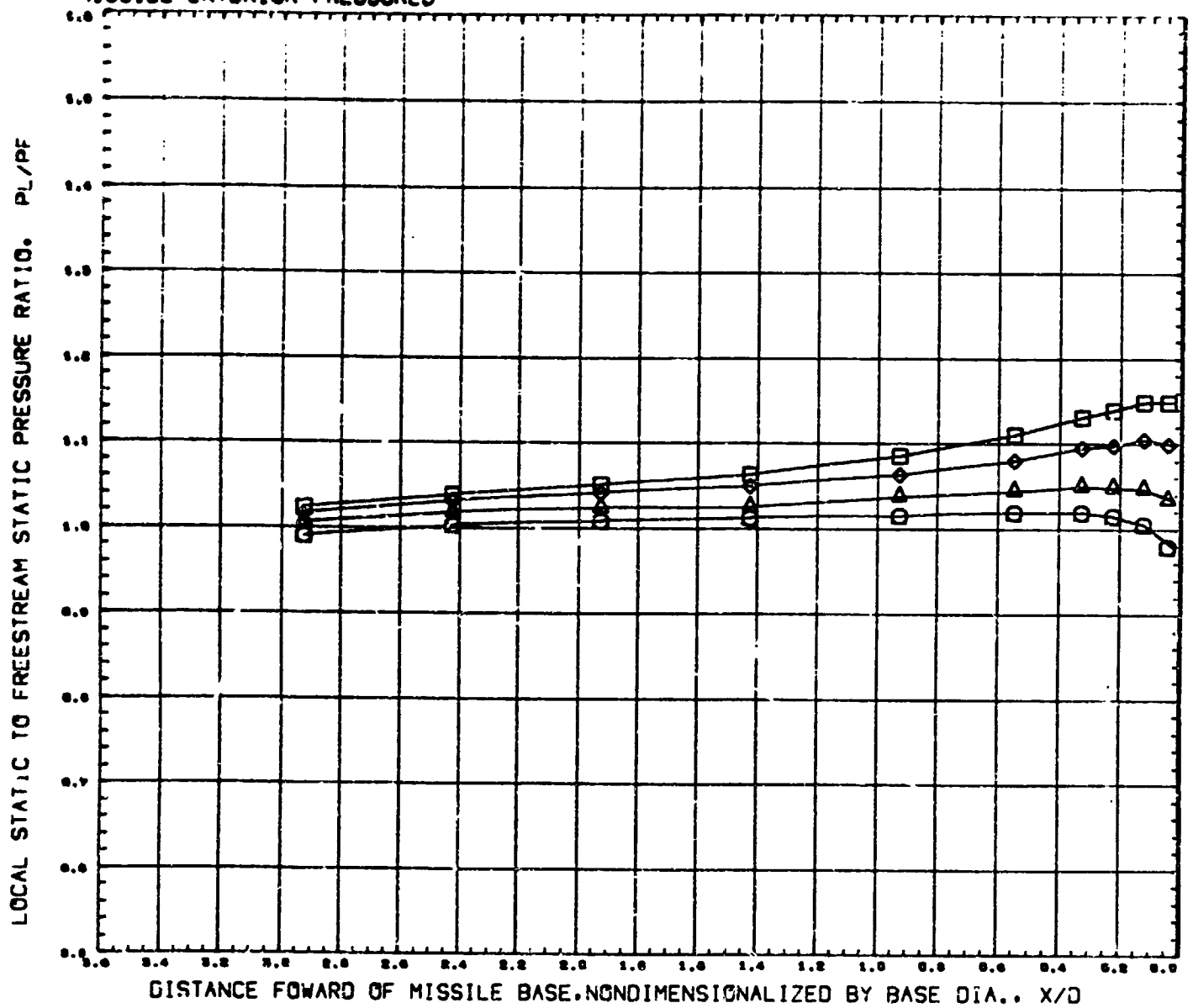


SYMBOL	CT	THETA	MACH
	2.148	0.000	0.001
	5.379		
	4.629		
	14.047		
	18.174		
	22.629	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.730	THETAJ	0.000

MISSILE EXTERIOR PRESSURES



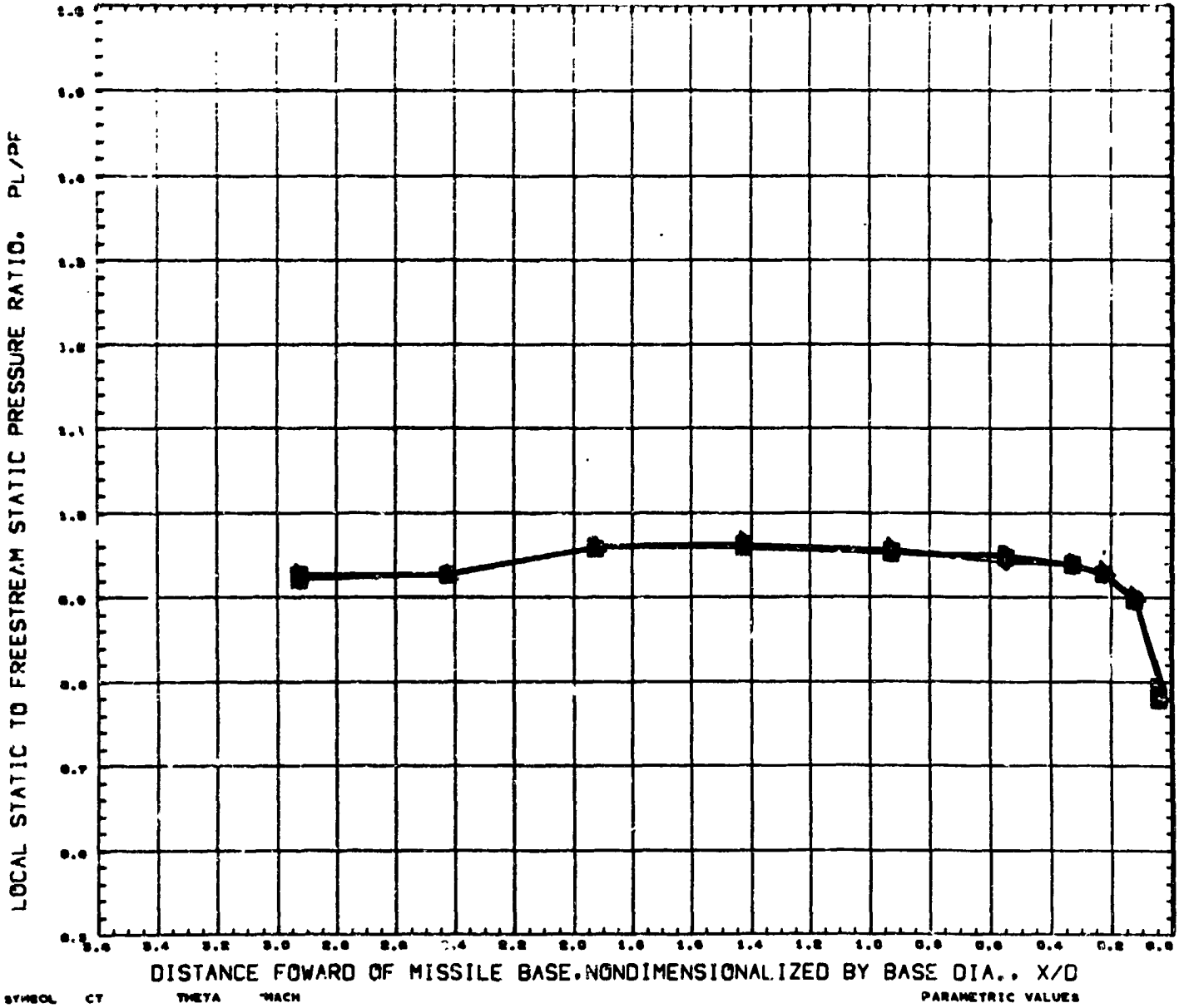
SYMBOL	CT	THETA	MACH
○	32.974	0.000	0.901
⊠	46.270		
◇	67.742		
□	91.630		

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.750	THETAJ	0.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES

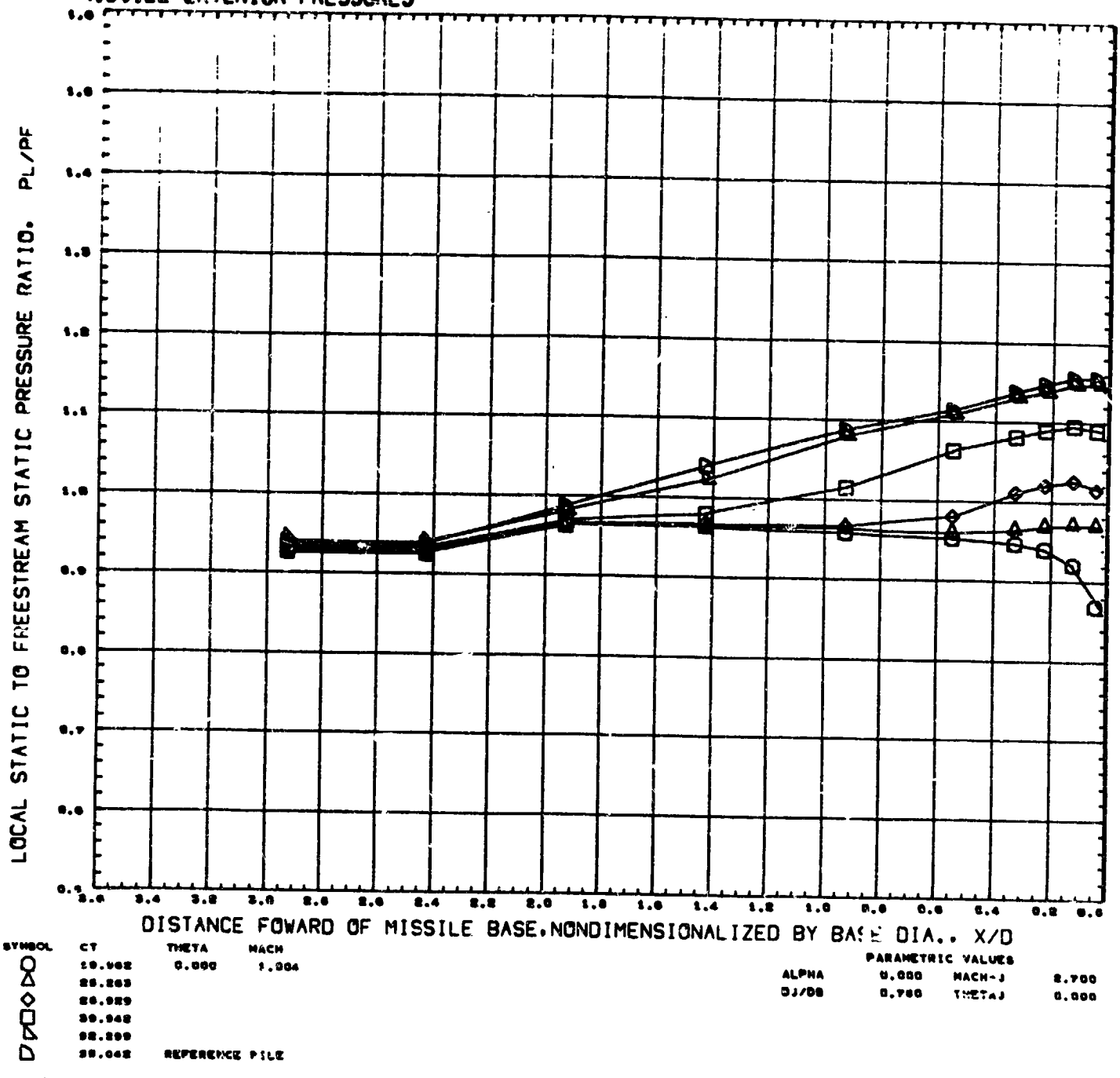


SYMBOL	CT	THETA	MACH
○	2.034	0.000	1.004
△	3.004		
◇	4.012		
□	7.003		
▽	9.100		
D	15.000	REFERENCE FILE	

PARAMETRIC VALUES

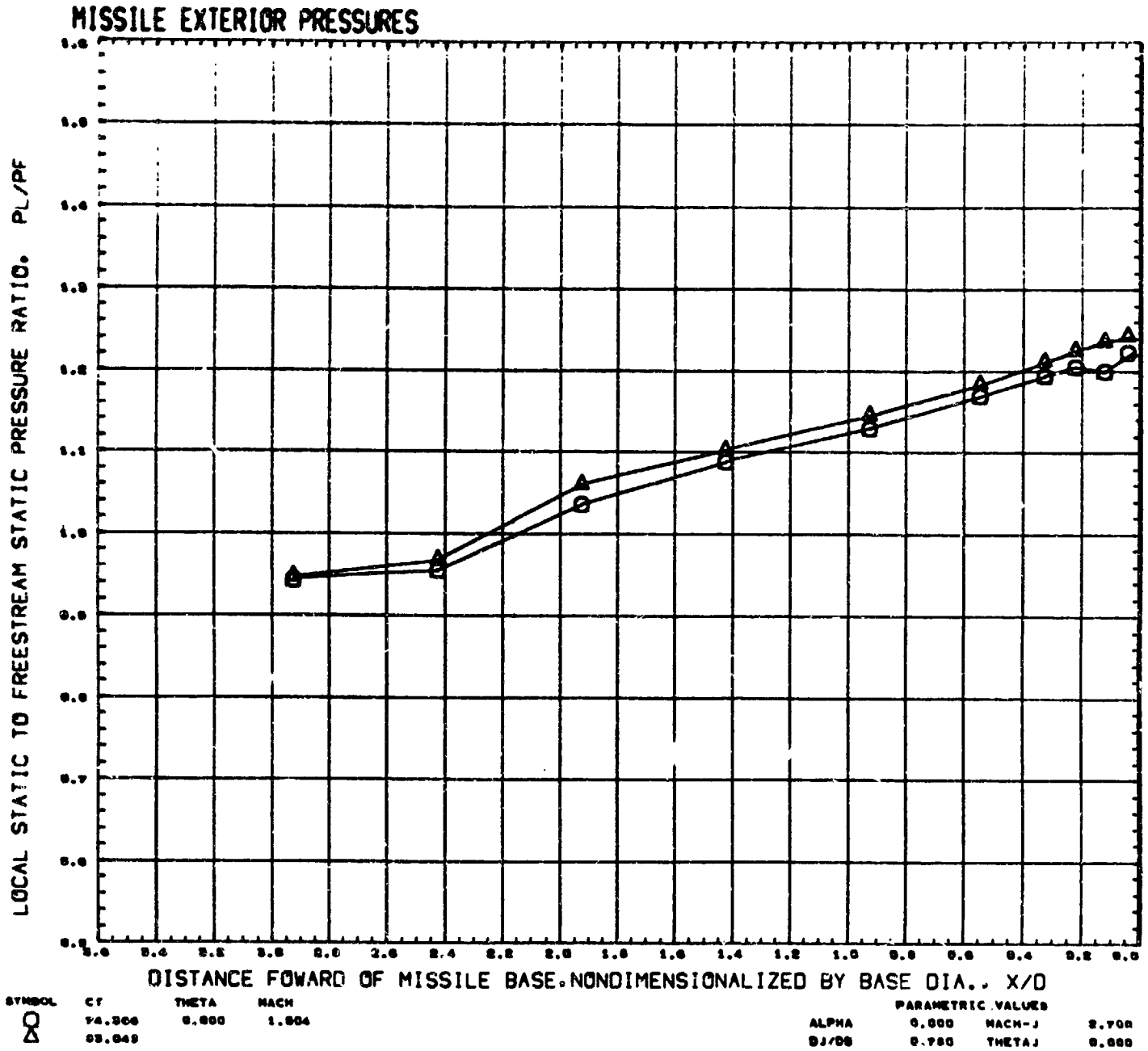
ALPHA	0.000	MACH-J	7.700
DJ/DB	0.700	THETAJ	0.000

MISSILE EXTERIOR PRESSURES



AMC PLUME STUDY, CONTOURED NOZZLE(-4) (RUCE09) PAGE 125

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
○	74.306	0.000	1.504
△	83.049		

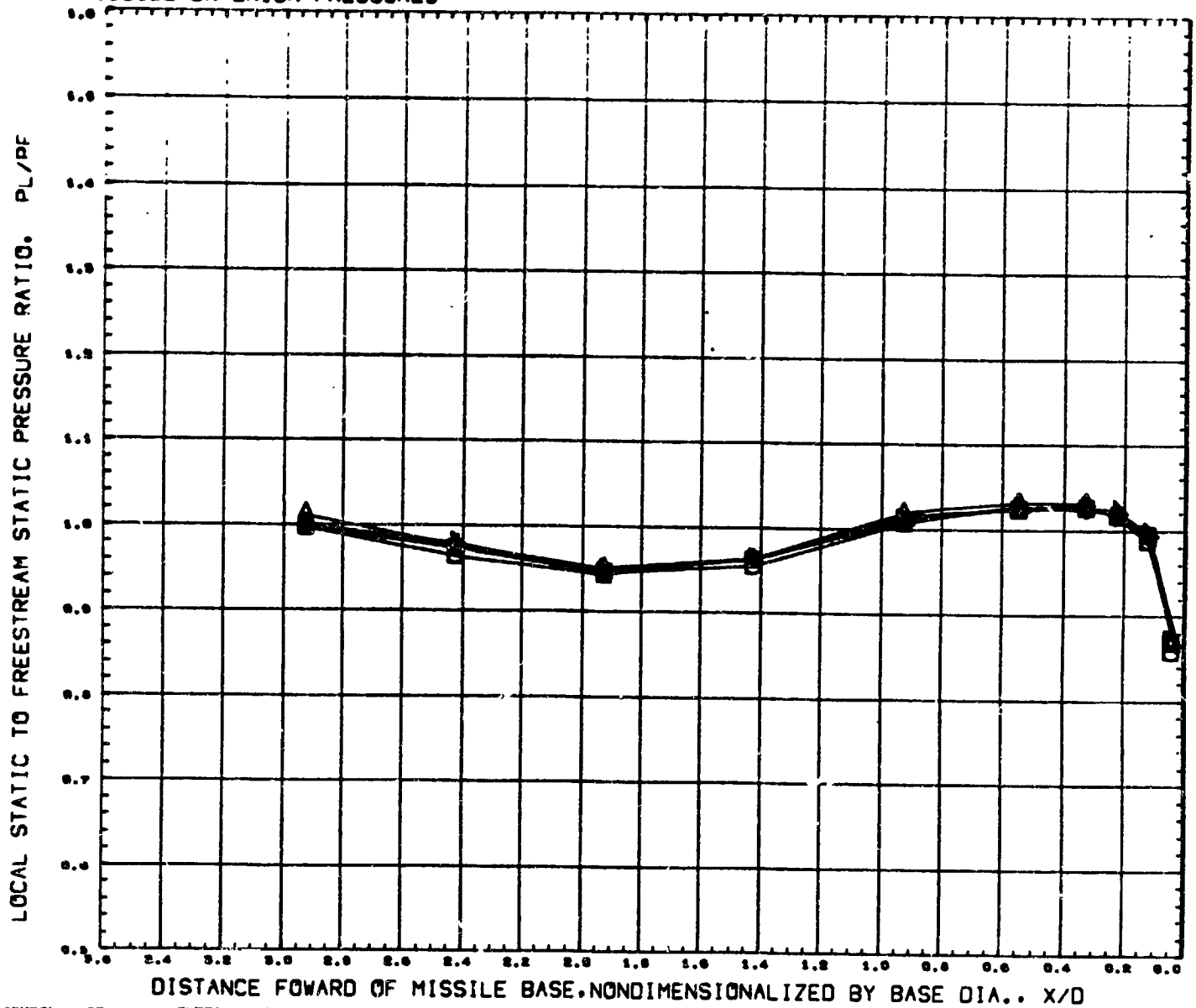
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.780	THETAJ	0.000

REFERENCE FILE

AMC PLUME STUDY. CONTOURED NOZZLE(-4) (RUCE09) PAGE 126

MISSILE EXTERIOR PRESSURES



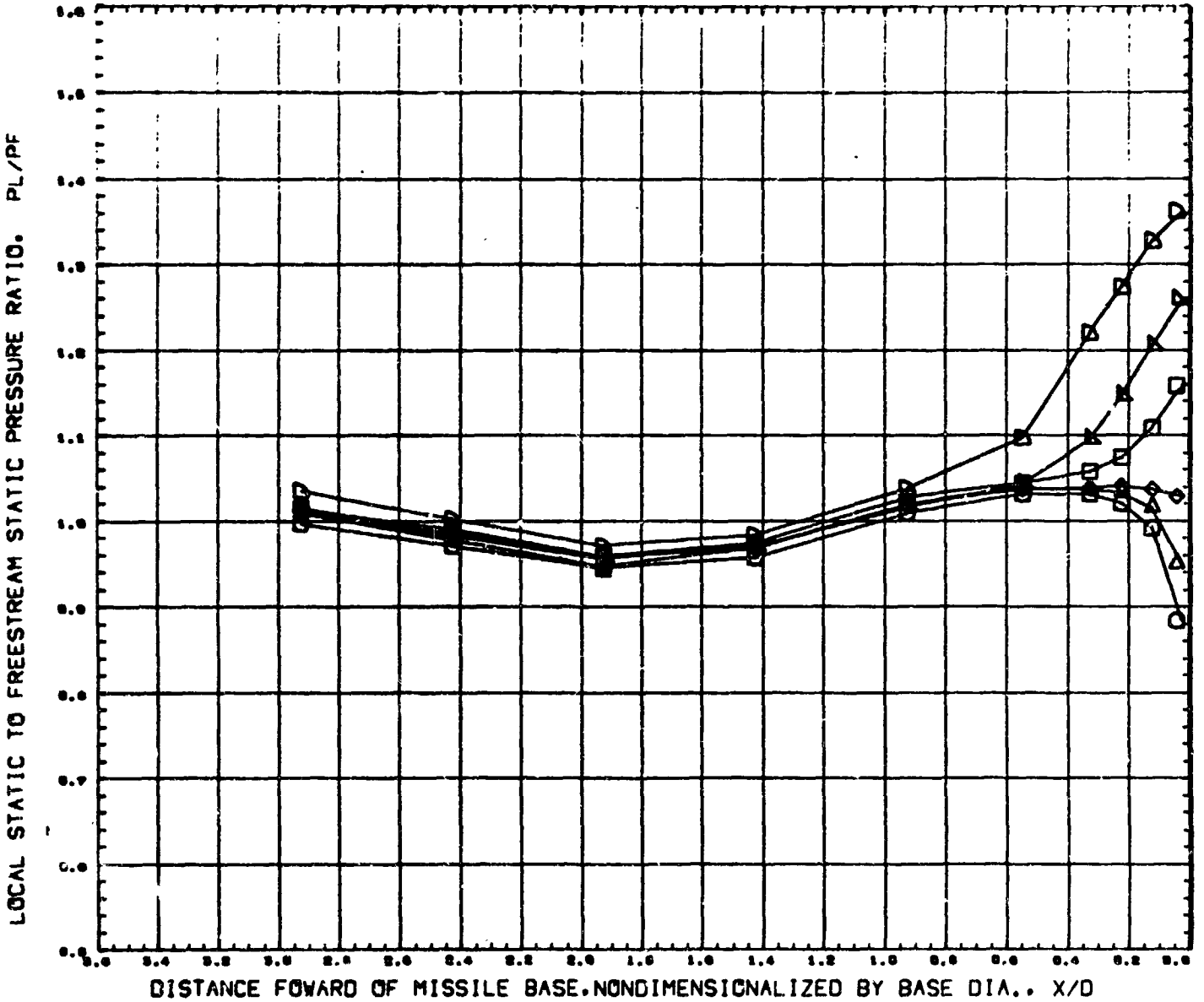
SYMBOL	CT	THETA	MACH
○	1.728	0.000	1.202
△	2.939		
◇	4.039		
□	5.824		
◺	8.893		
D	12.240	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.780	THETAJ	0.000

AMC PLUME STUDY. CONTOURED NOZZLE(-4) (RUCE09) PAGE 127

MISSILE EXTERIOR PRESSURES

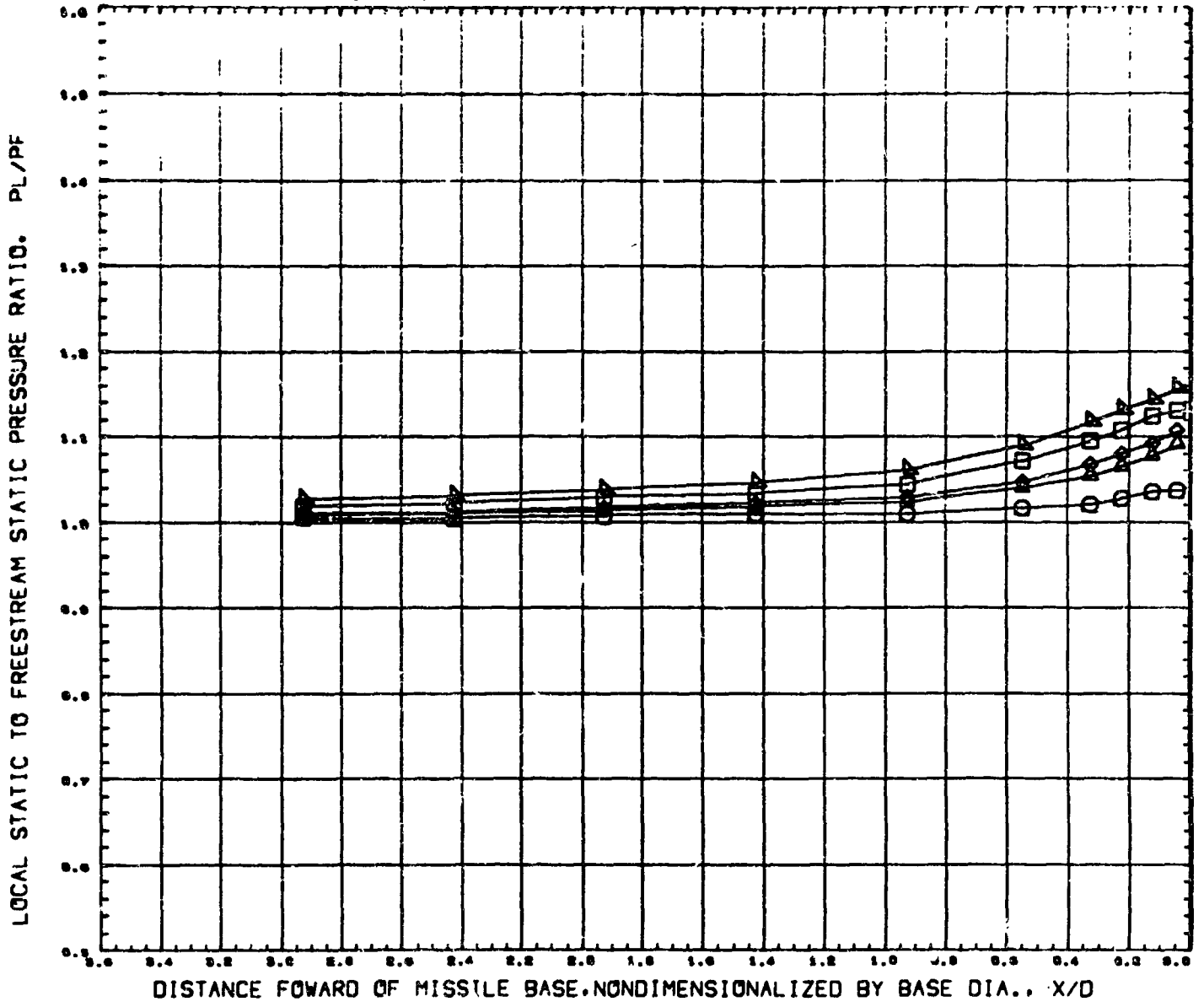


SYMBOL	CT	THETA	MACH
	10.070	0.000	1.202
	20.000		
	30.100		
	40.270		
	60.270		
	84.000	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.700	THET.	0.000

MISSILE EXTERIOR PRESSURES



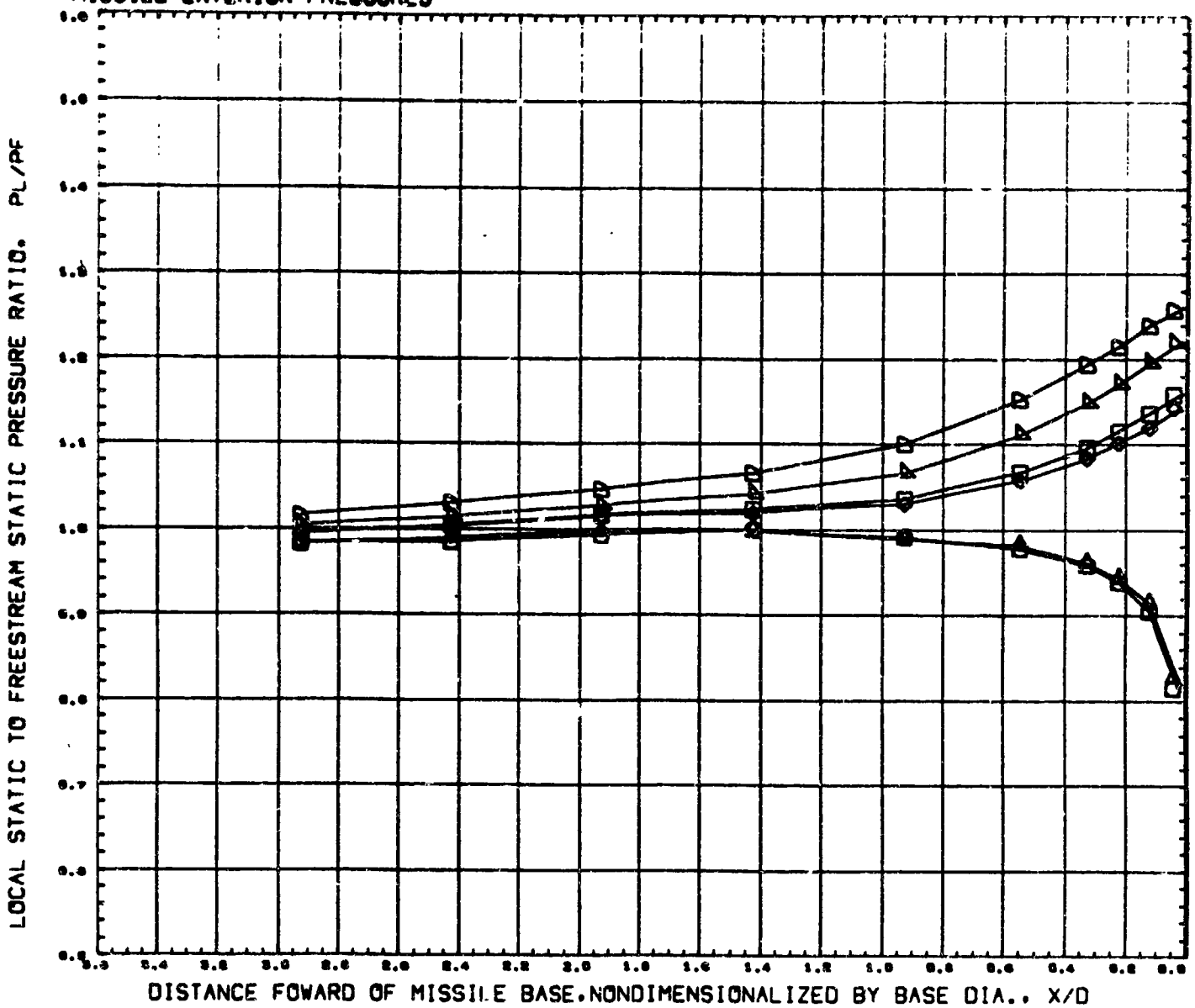
SYMBOL	CT	THETA	MACH
○	28.479	0.000	0.703
△	39.015		
◇	49.535		
□	69.770		
◸	98.077		

REFERENCE FILE

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.950	THETAJ	20.000

MISSILE EXTERIOR PRESSURES



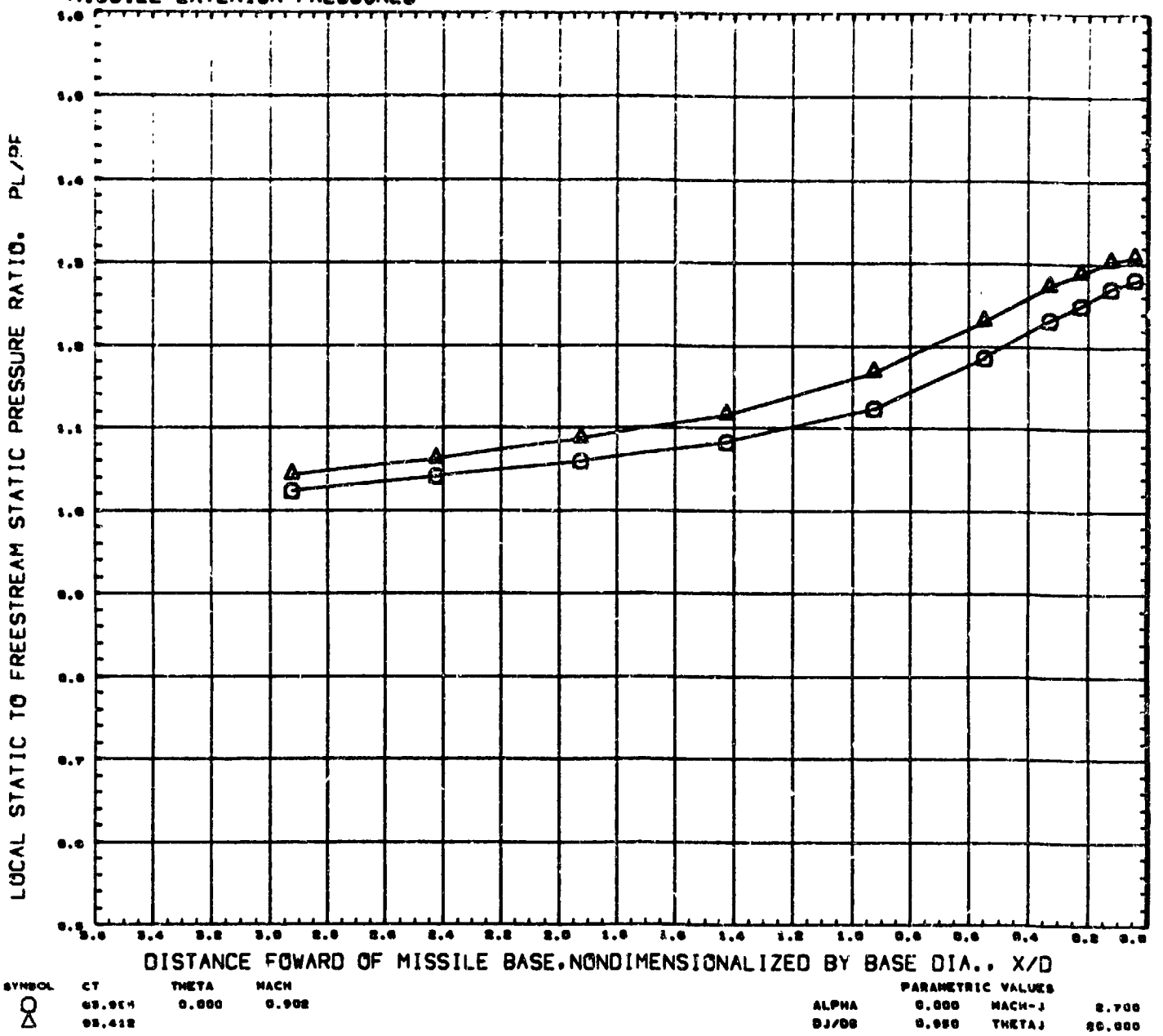
SYMBOL	CT	THETA	MACH
○	2.200	0.000	0.902
△	8.093		
◇	19.740		
□	21.030		
◺	35.042		
D	40.010	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.950	THETAJ	20.000

AMC PLUME STUDY, CONICAL NOZZLE (-1) (RUCE10) PAGE 130

MISSILE EXTERIOR PRESSURES



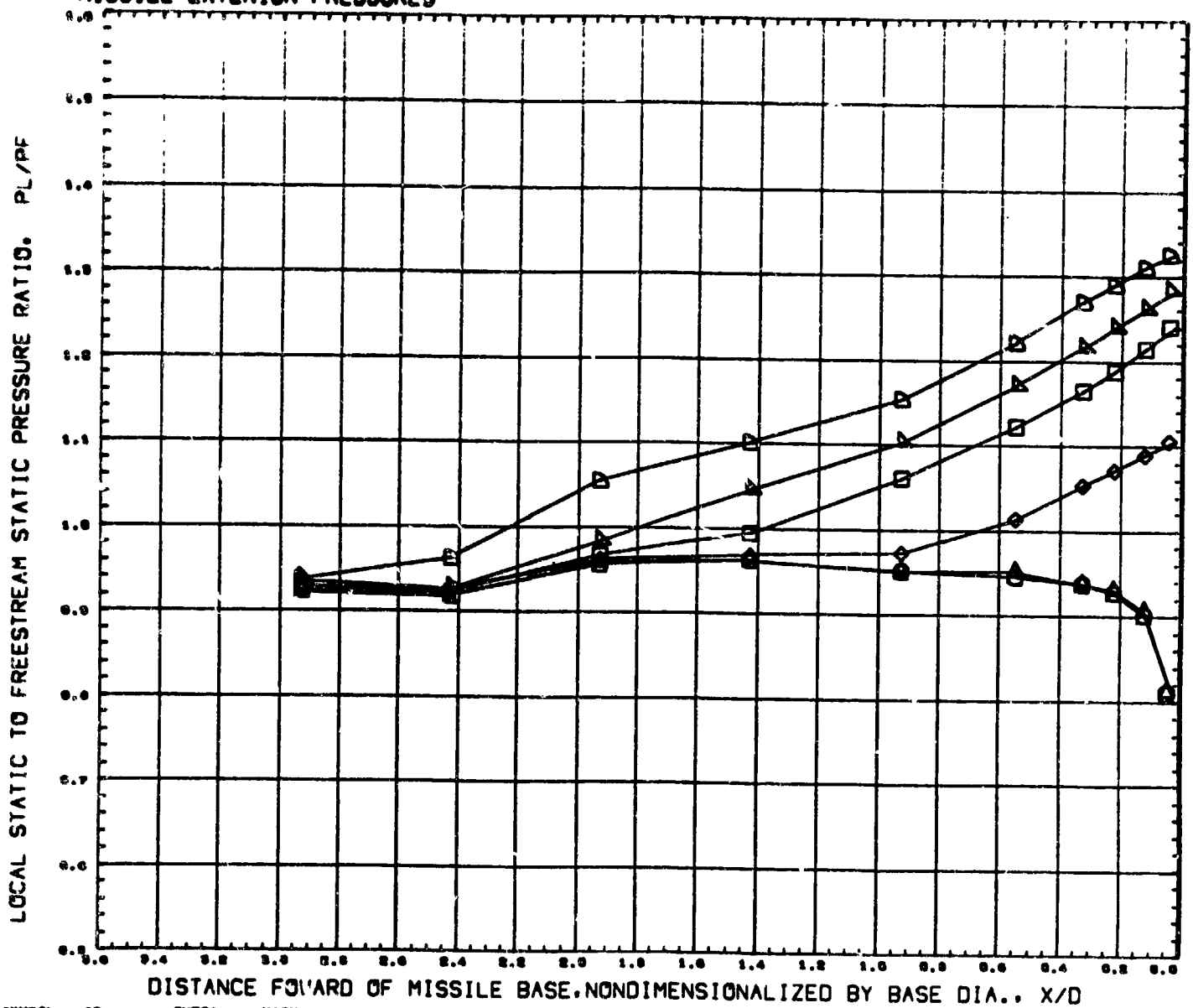
SYMBOL	CT	THETA	MACH
○	63.964	0.000	0.902
△	95.412		

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.950	THETAJ	20.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES

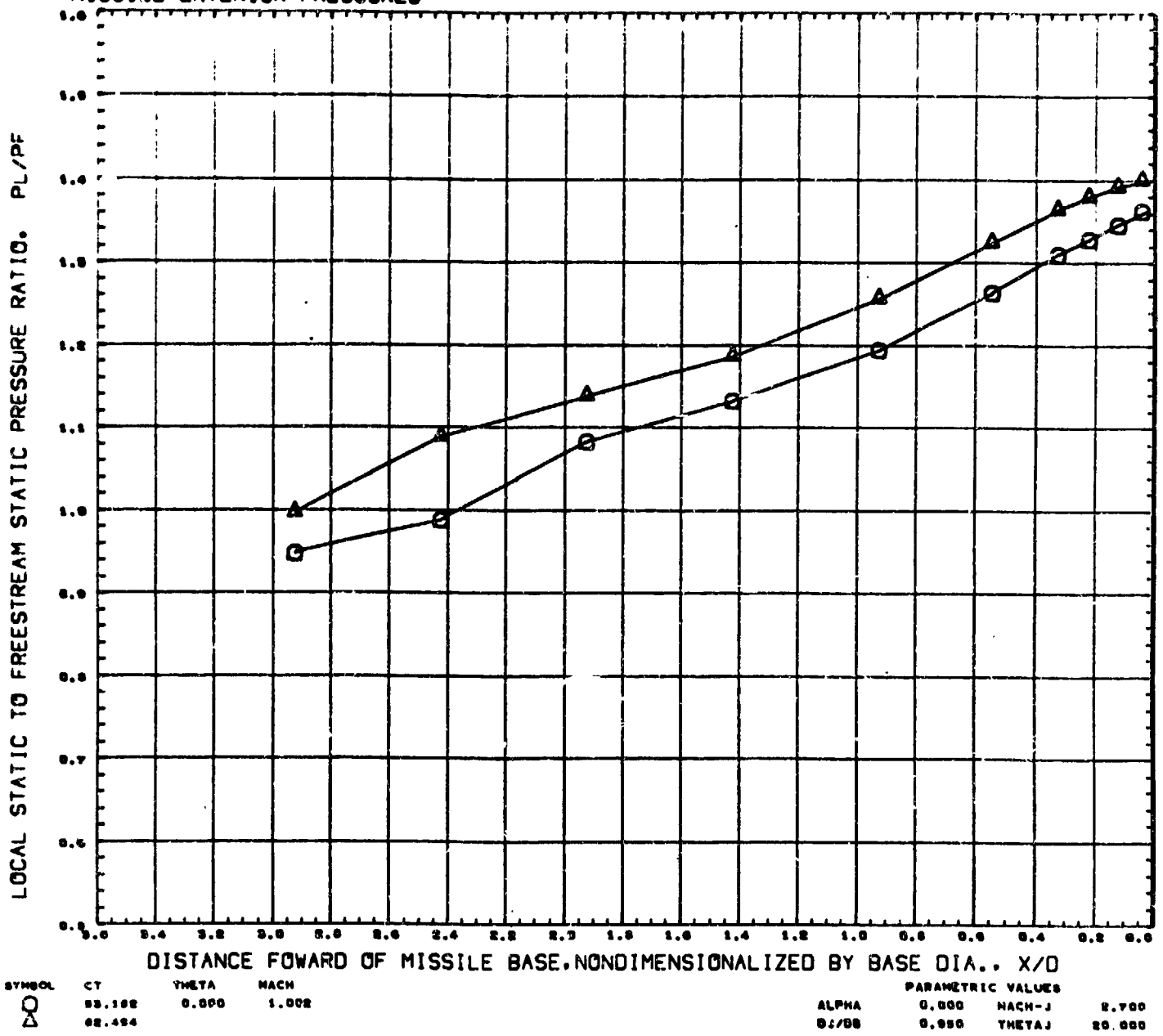


SYMBOL	CT	THETA	MACH
○	2.954	0.000	1.002
△	5.319		
◇	11.125		
□	21.194		
▷	30.948		
◁	39.714	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.790
DJ/DB	0.050	THETAJ	20.000

MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
△	53.192	0.000	1.002
○	62.494		

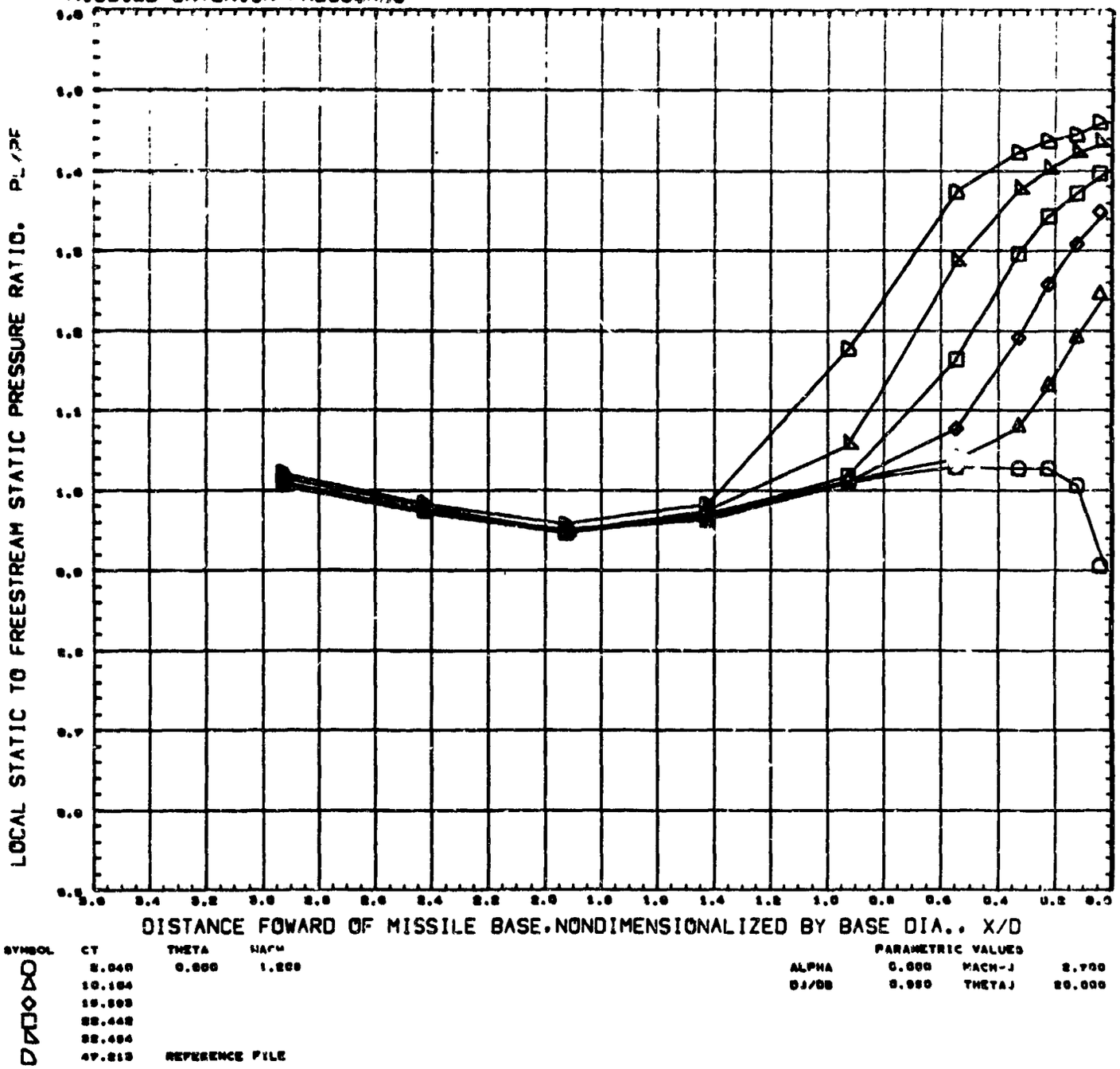
PARAMETRIC VALUES

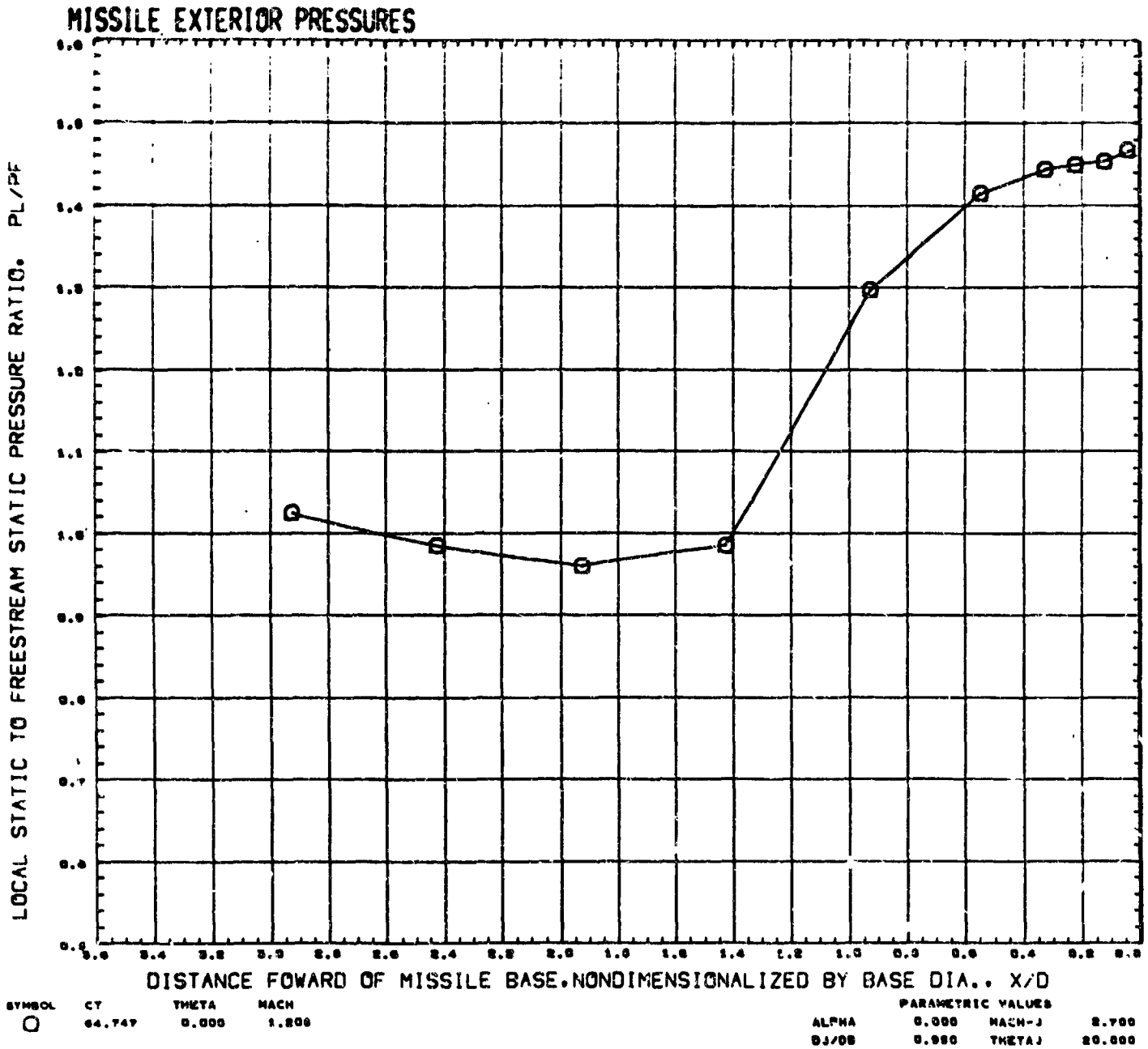
ALPHA	0.000	MACH-J	2.700
DJ/DB	0.950	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-1) (RUCE10) PAGE 133

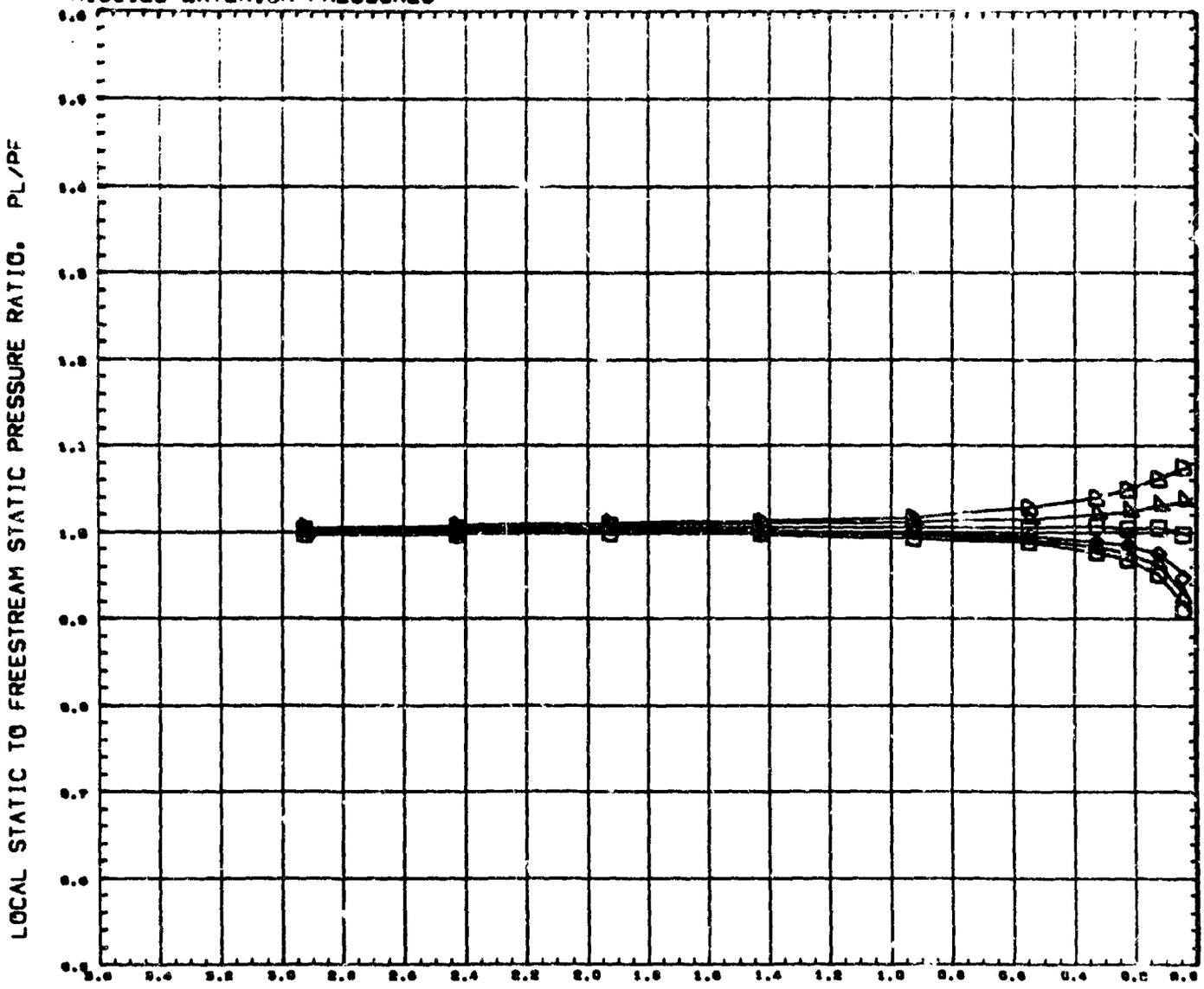
MISSILE EXTERIOR PRESSURES





REFERENCE FILE

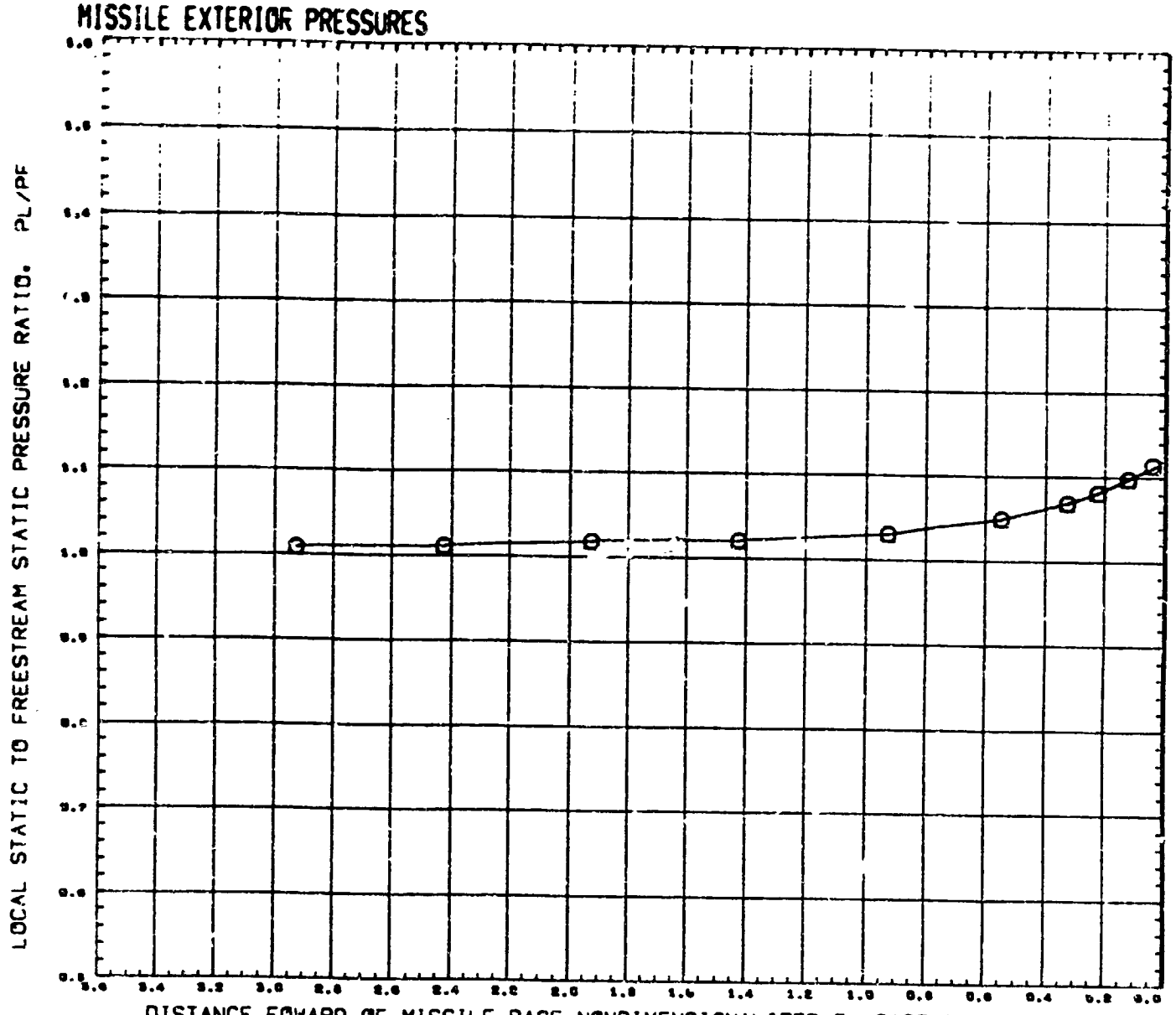
MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
○	1.210	0.000	0.702
△	9.348		
◇	10.341		
□	10.169		
◺	22.594		
D	31.920	REFERENCE FILE	

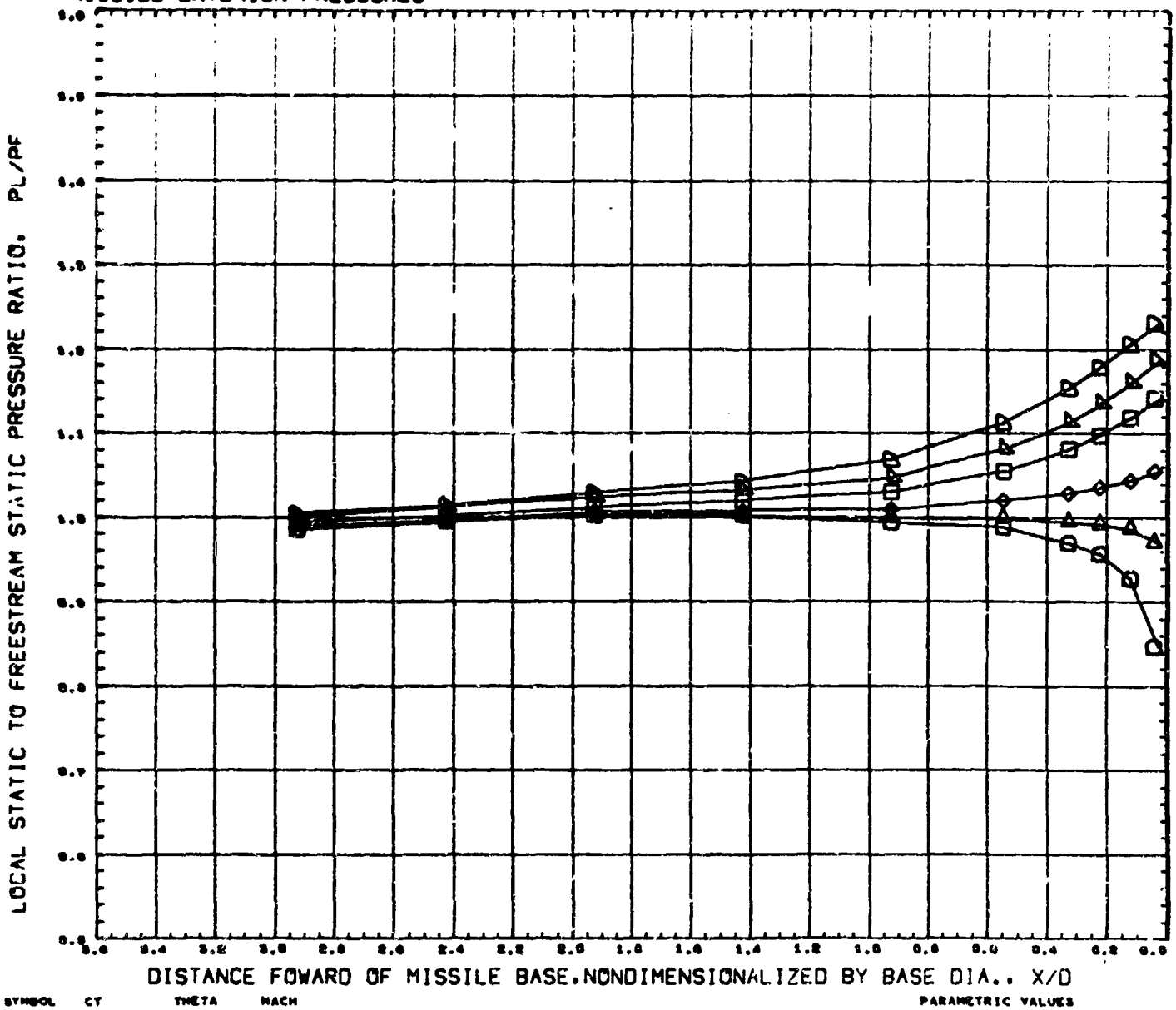
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.990	THETA-J	20.000



REFERENCE FILE

MISSILE EXTERIOR PRESSURES



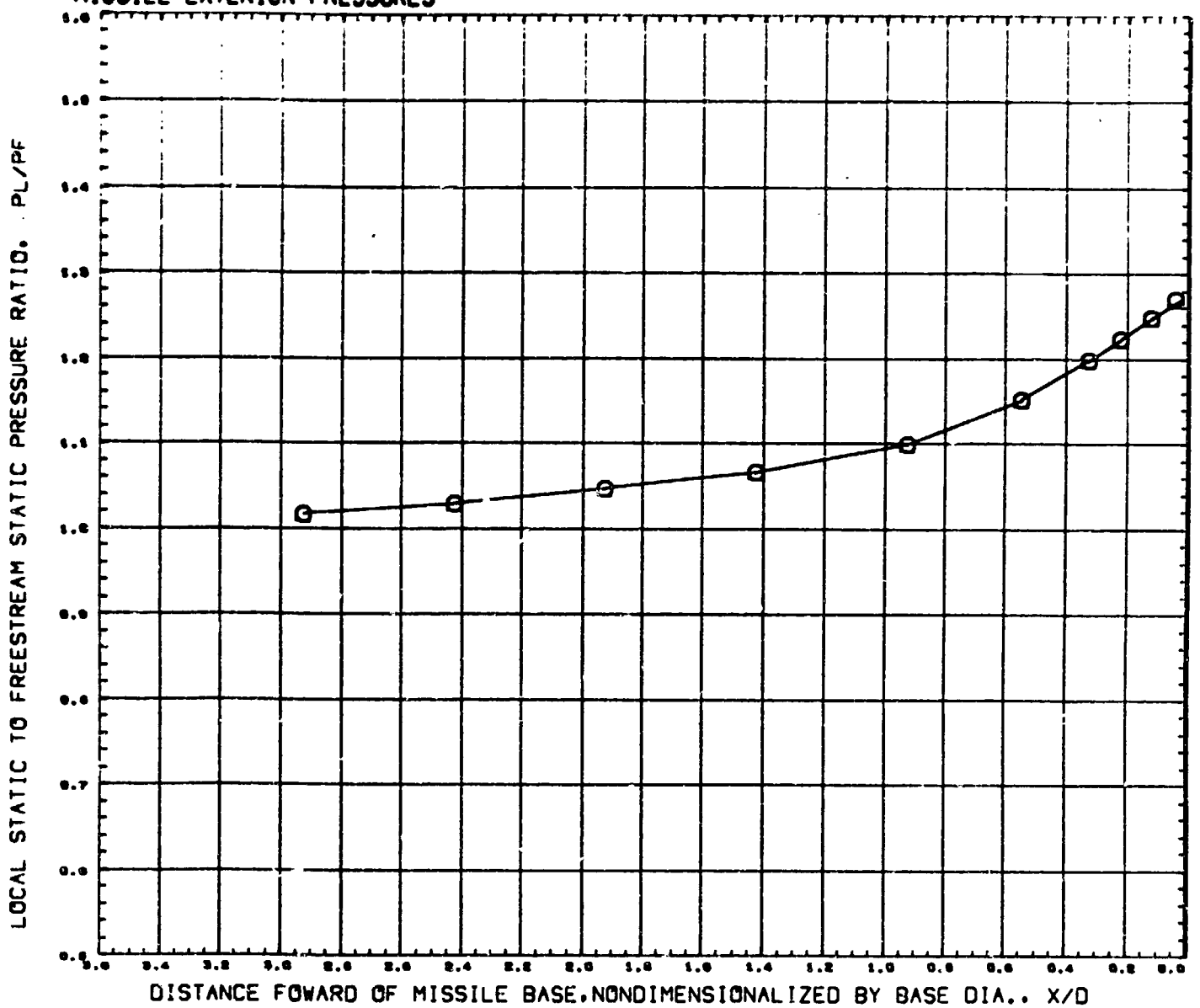
SYMBOL	CT	THETA	MACH
○	4.073	0.000	0.903
△	8.121		
◇	11.381		
□	17.307		
◺	23.225		
D	33.159	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
BJ/DB	0.990	THETAJ	20.000

AMC PLUME STUDY, CONICAL NOZZLE (-1) (RUCE11) PAGE 138

MISSILE EXTERIOR PRESSURES



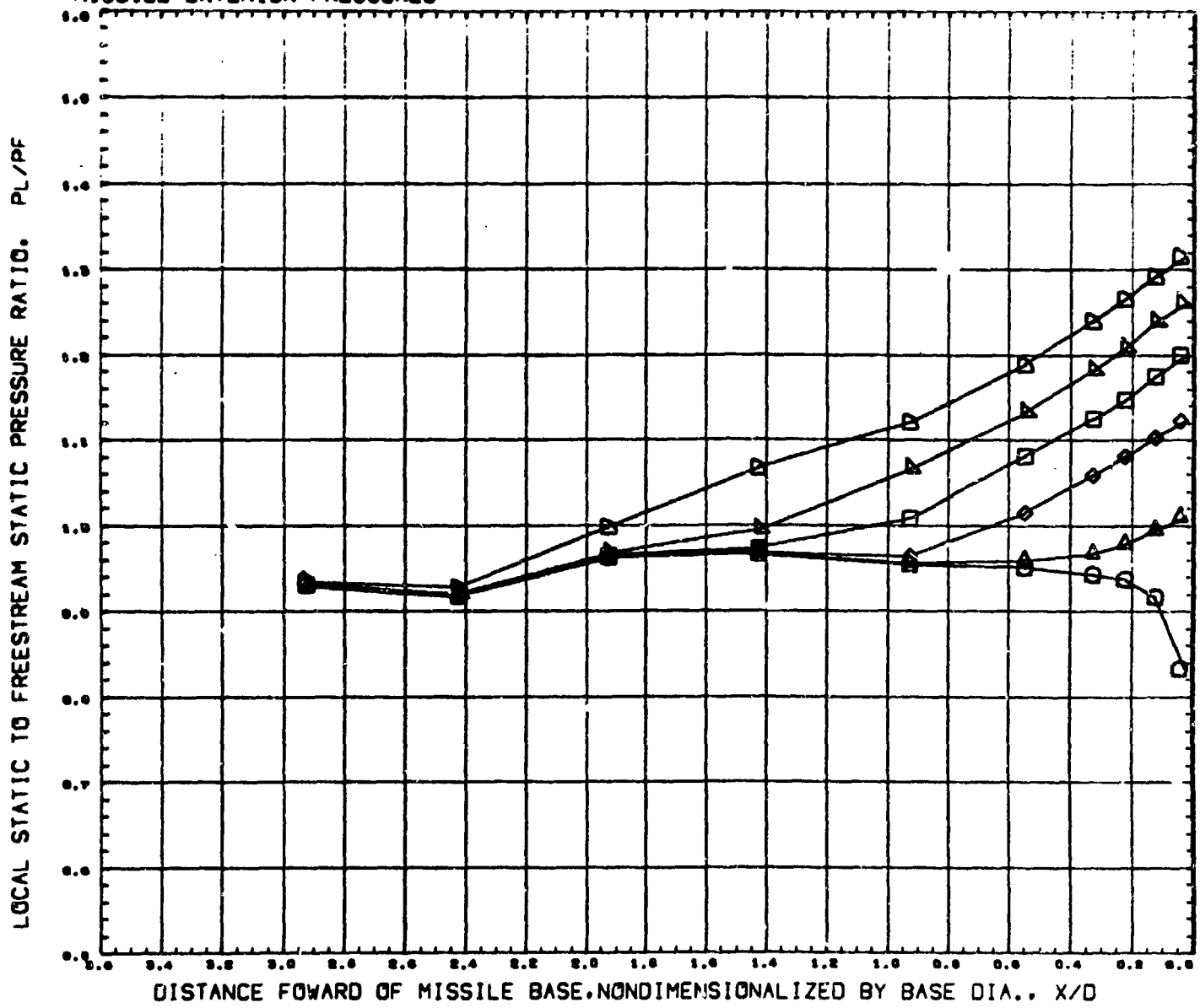
SYMBOL	CT	THETA	MACH
O	47.362	0.000	0.905

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.950	THETAJ	20.000

REFERENCE FILE

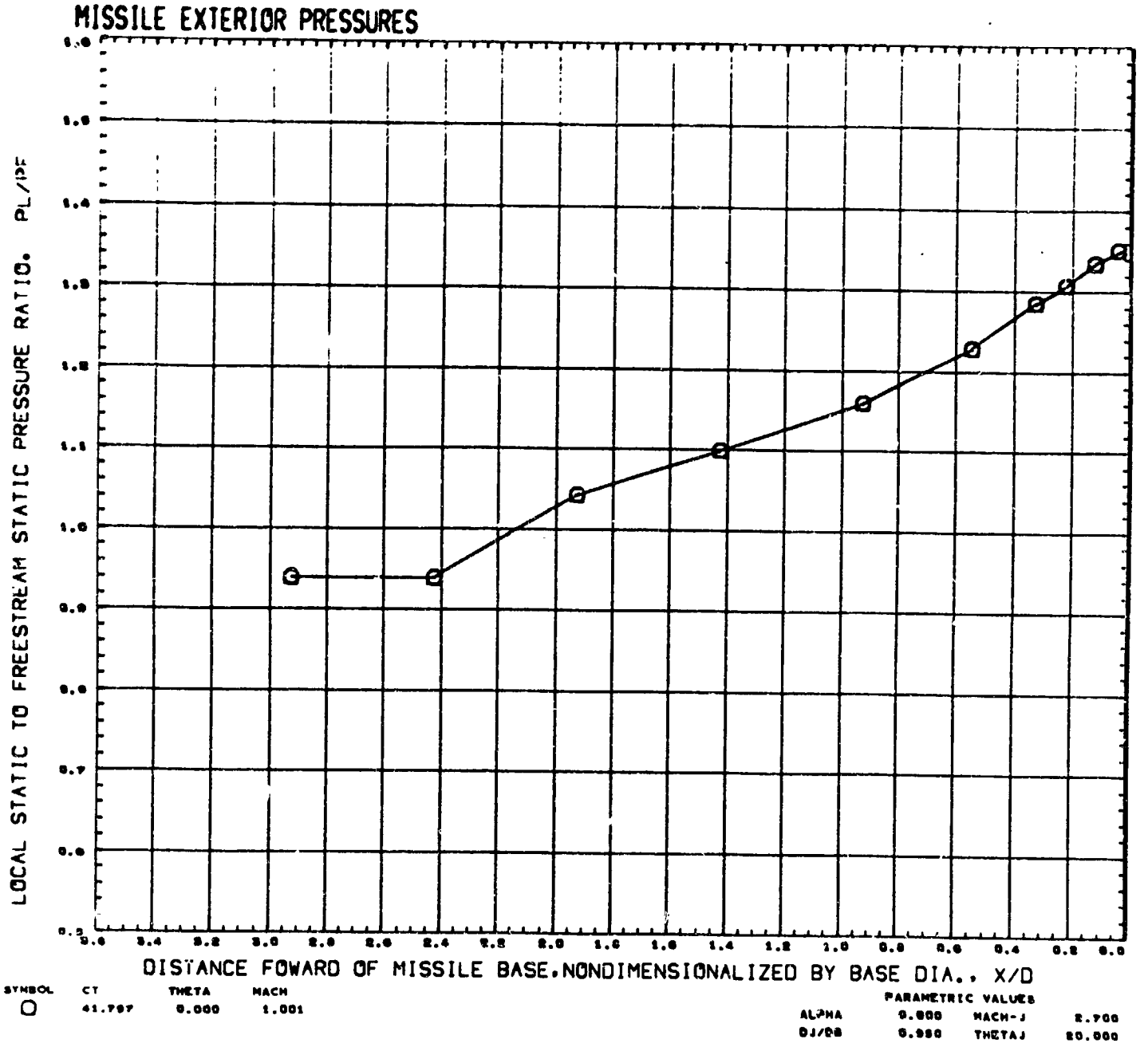
MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
	4.166	0.000	1.001
	7.488		
	10.036		
	14.978		
	20.748		
	30.691	REFERENCE FILE	

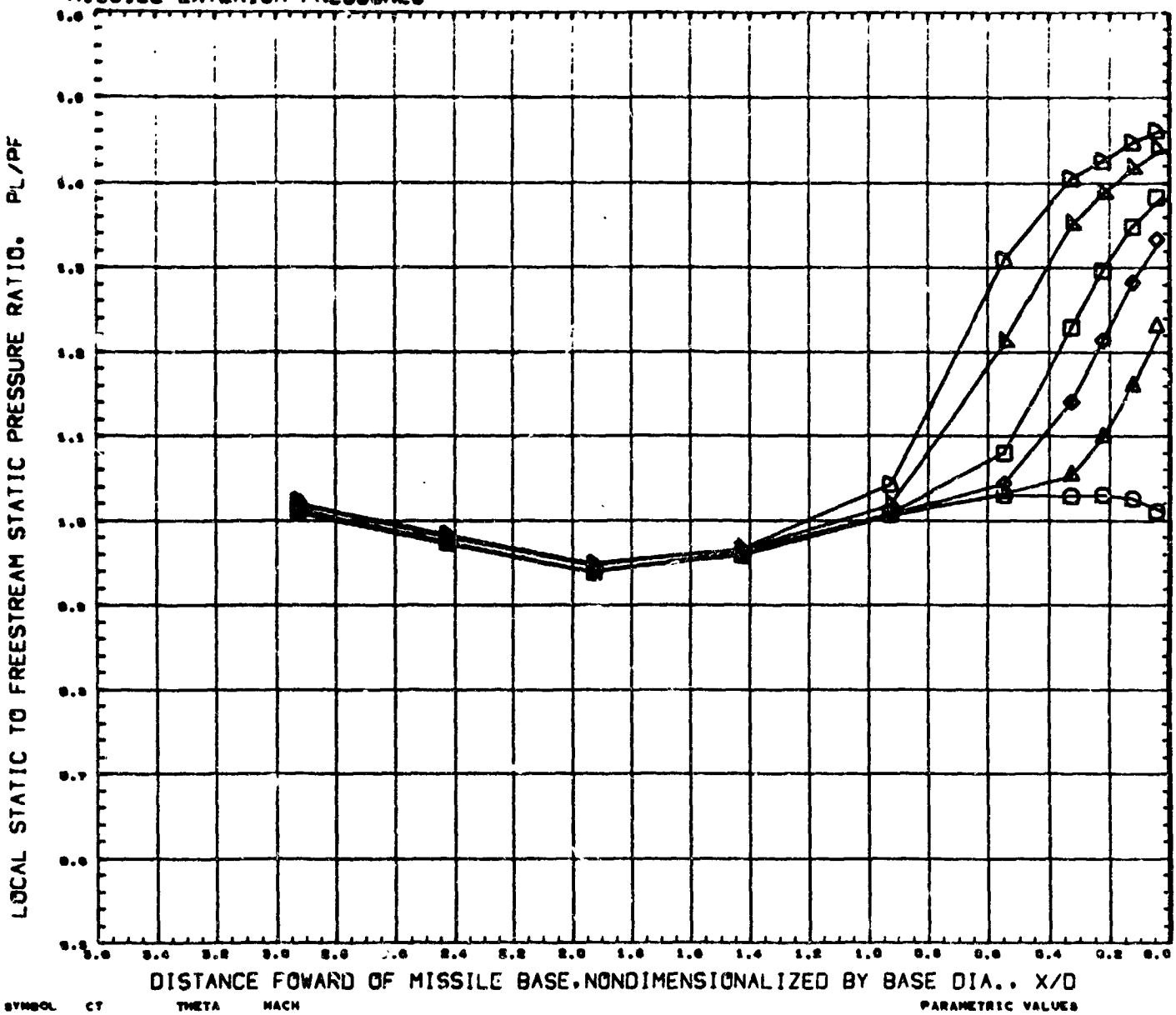
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.250	THETAJ	20.000



REFERENCE FILE

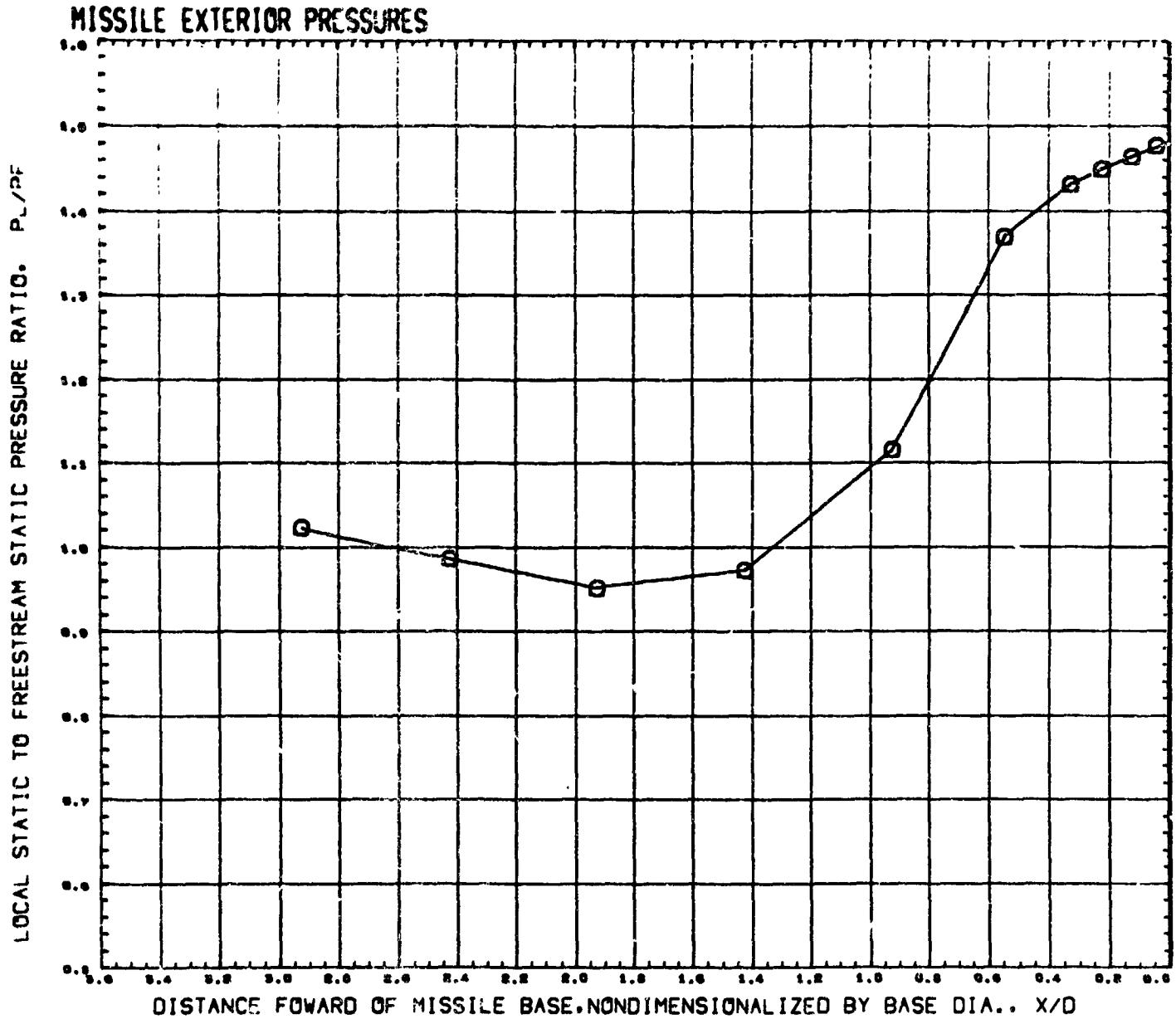
MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
	5.063	0.000	1.201
	9.180		
	13.391		
	17.167		
	20.843		
	39.052	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.020	THETAJ	20.000



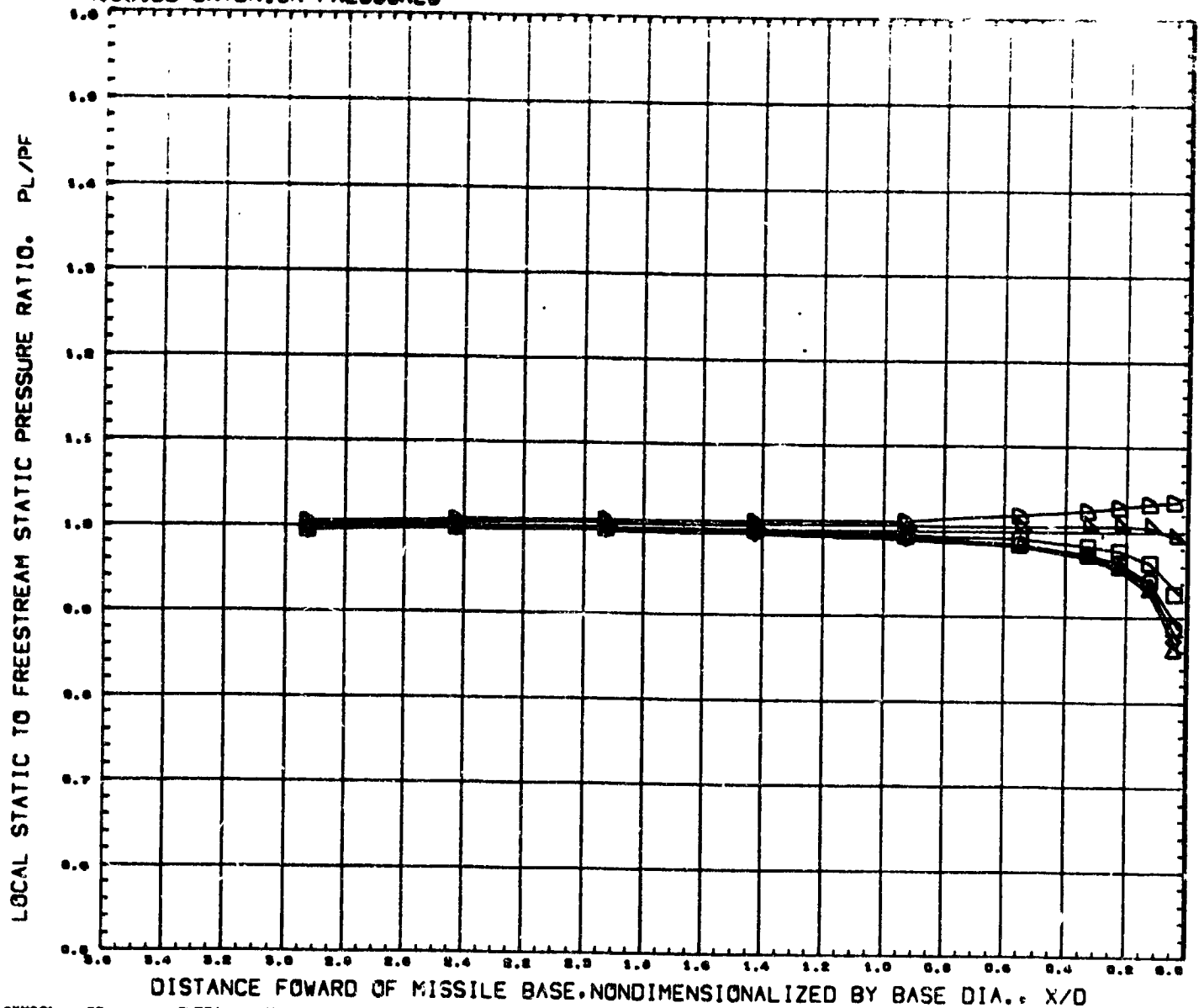
SYMBOL	CT	THETA	MACH
O	40.142	0.300	1.201

PARAMETRIC VALUES

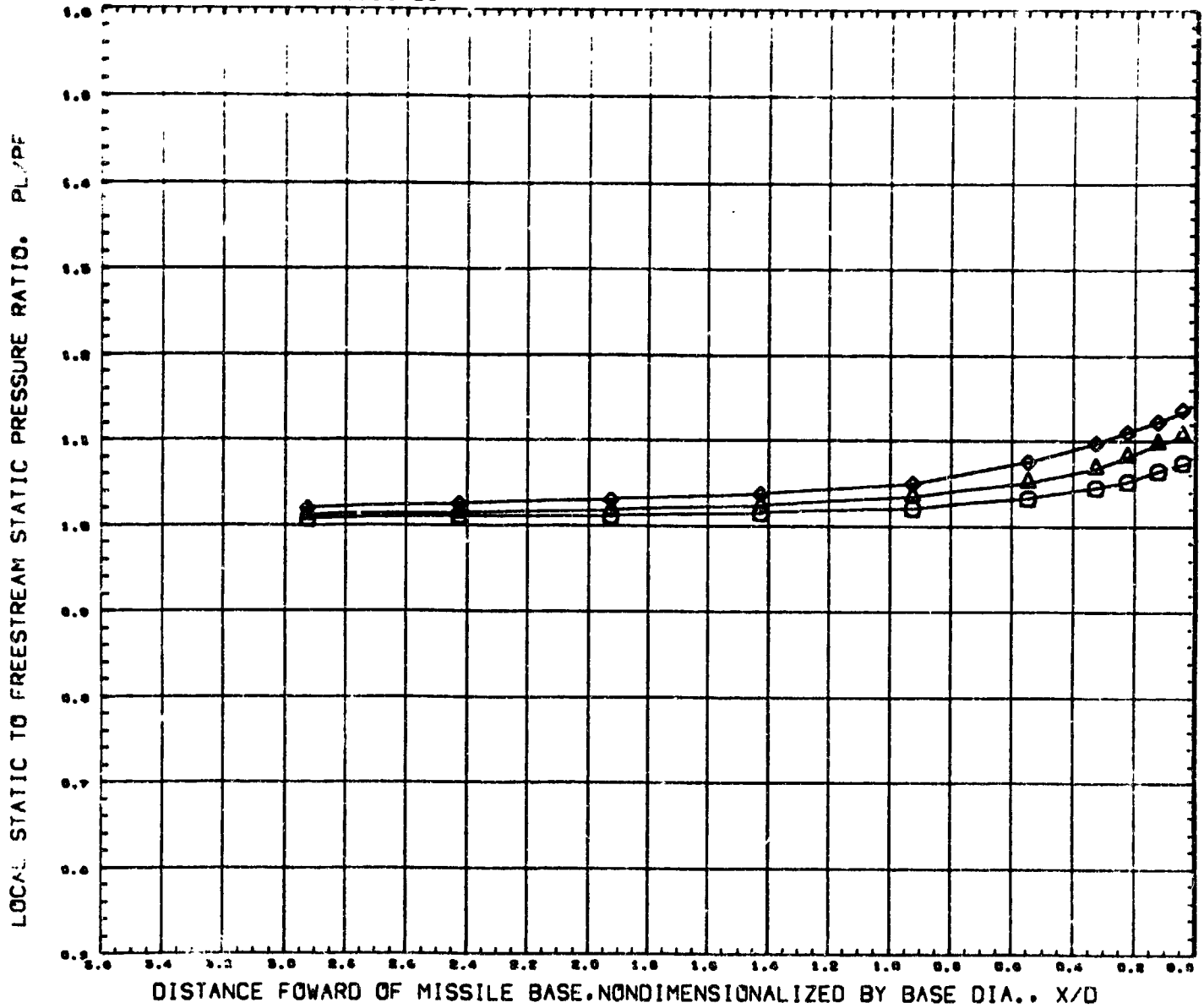
ALPHA	0.000	MACH-J	2.700
DJ/DB	0.050	THETAJ	20.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES



MISSILE EXTERIOR PRESSURES



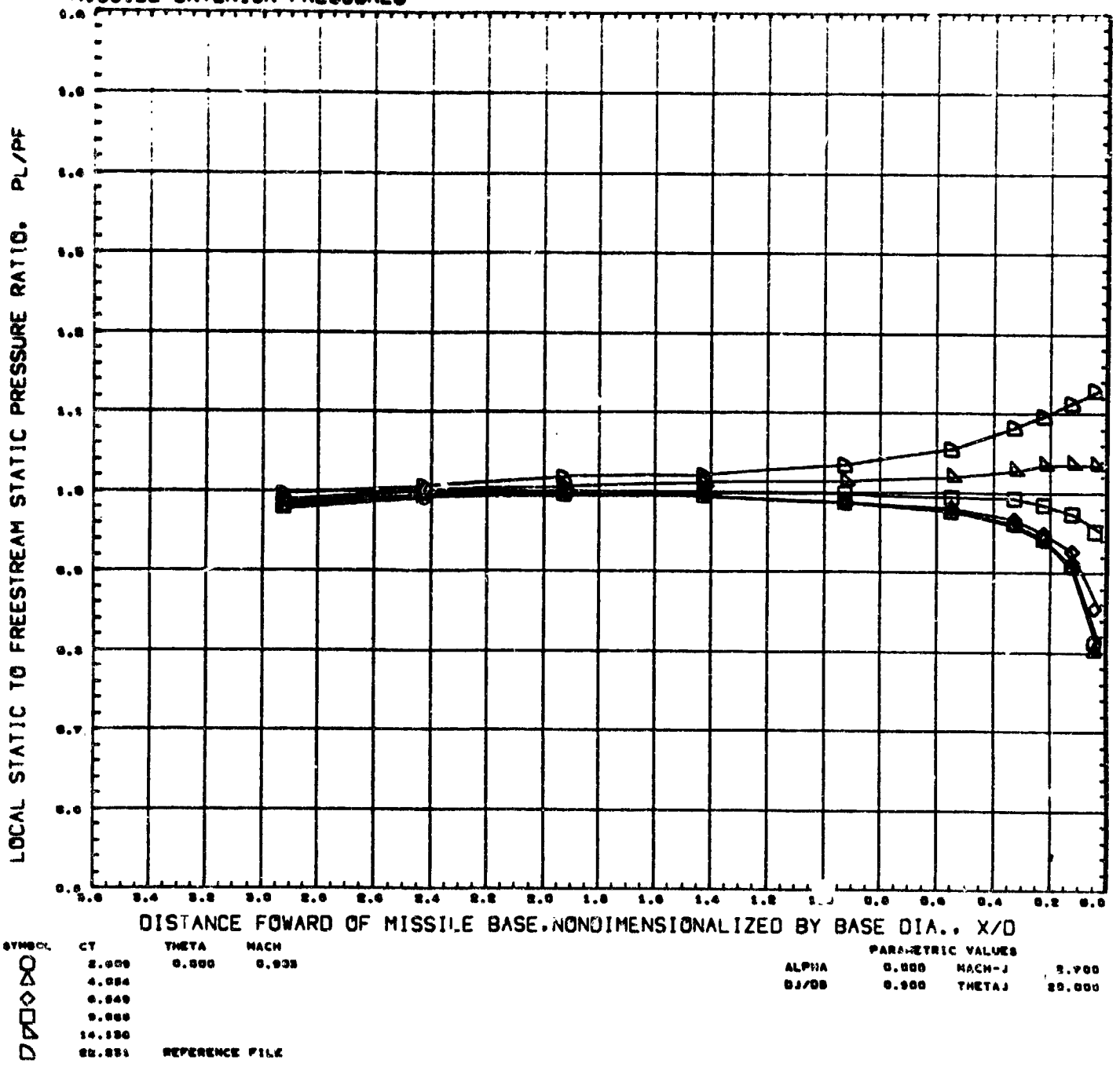
SYMBOL	CT	THETA	MACH
○	41.174	0.000	0.703
△	59.103		
◇	83.400		

PARAMETRIC VALUES

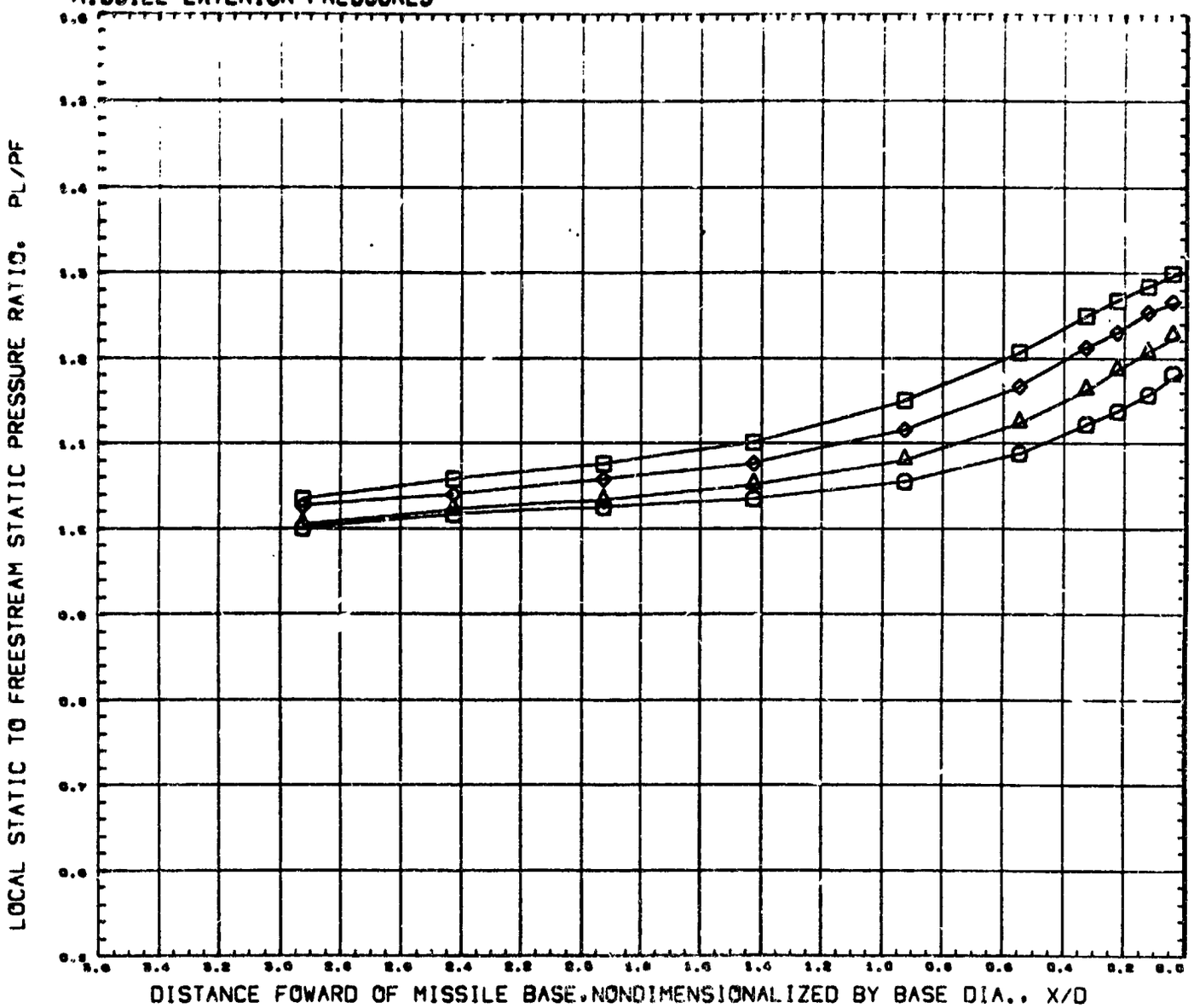
ALPHA	0.000	MACH-J	2.700
DJ/DB	0.900	THETAJ	20.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES



MISSILE EXTERIOR PRESSURES



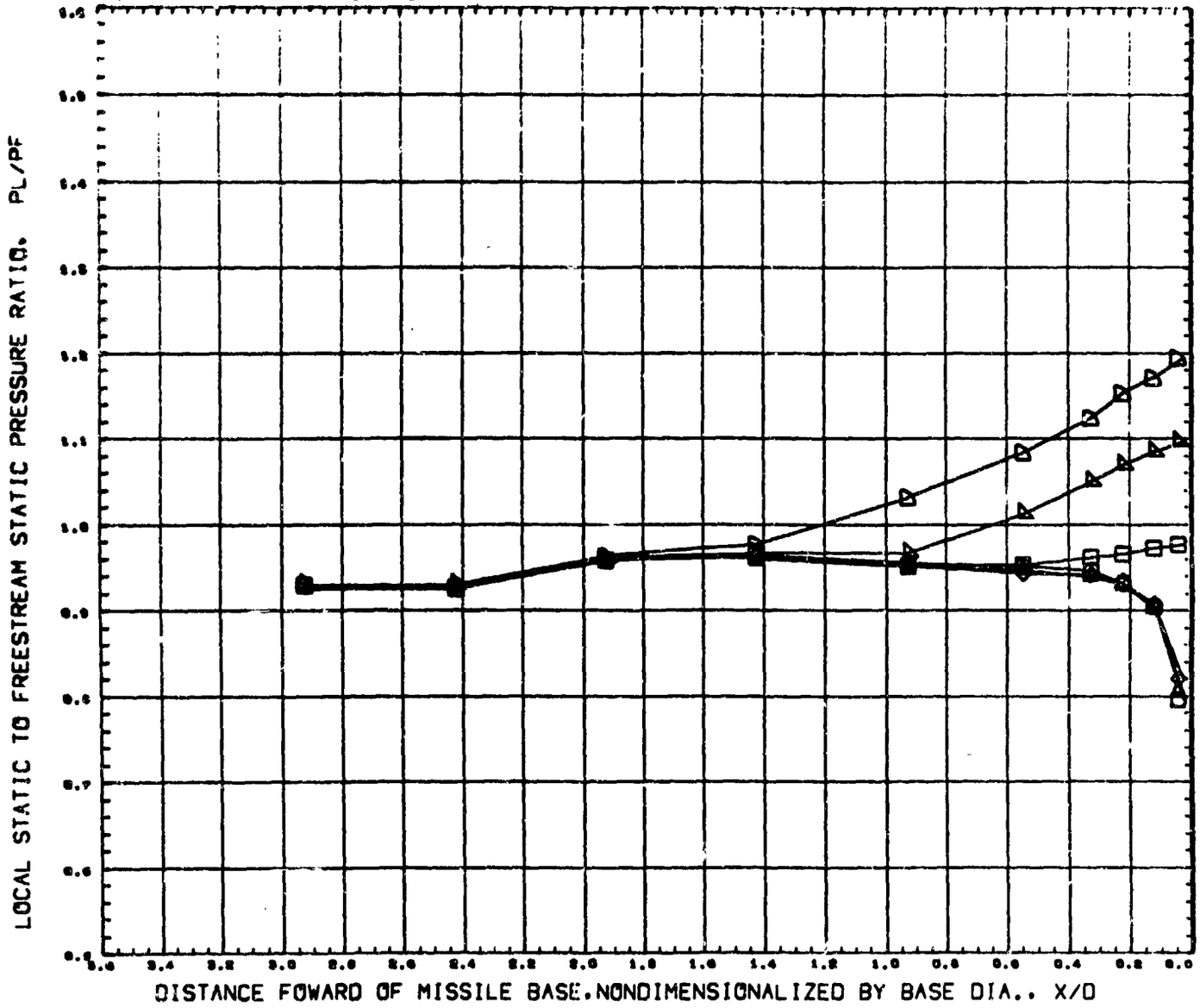
SYMBOL	CT	THETA	MACH
○	30.313	0.000	0.903
△	43.382		
◇	60.815		
□	82.704		

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.900	THETAJ	20.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES



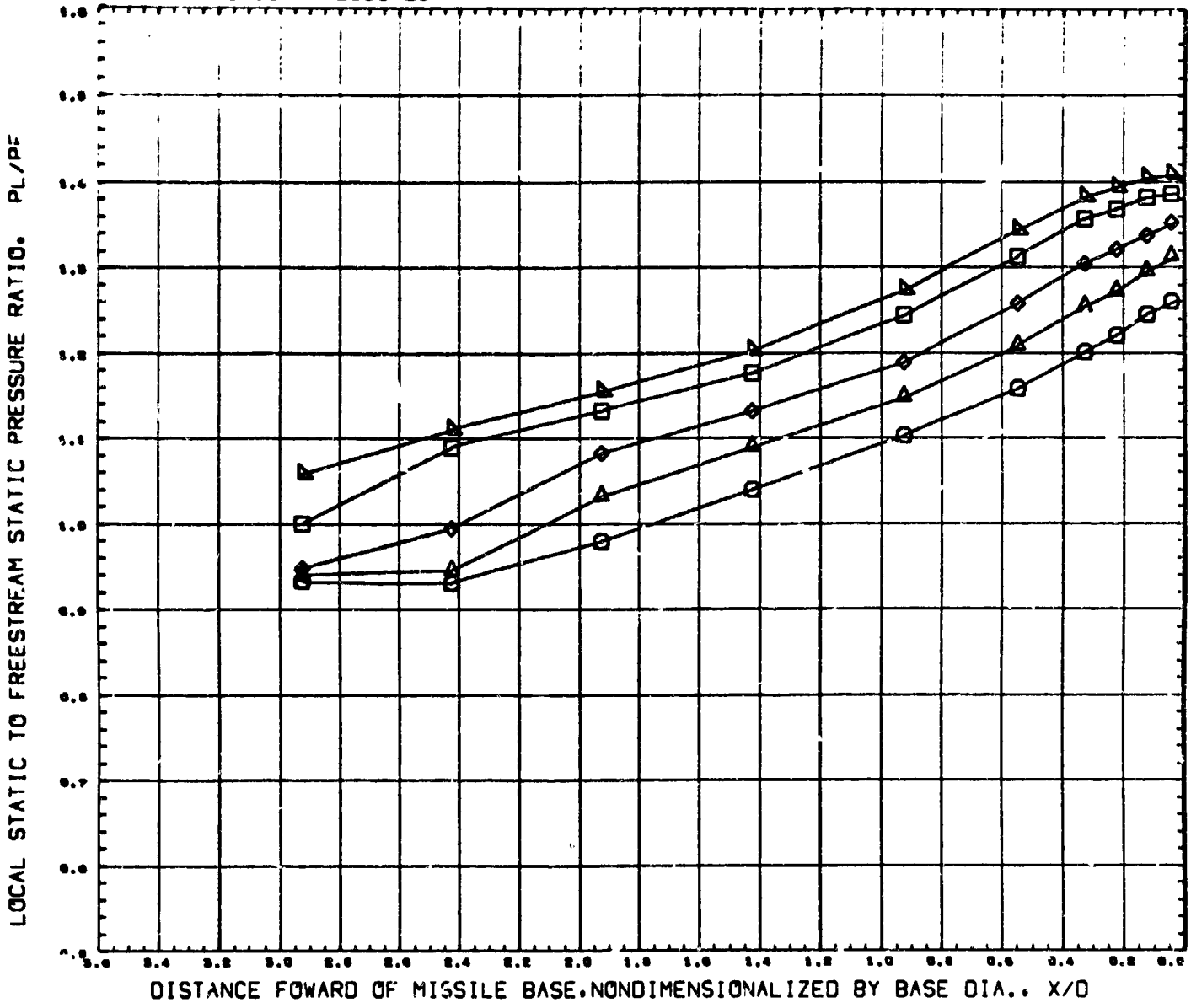
SYMBOL	CT	THETA	MACH
○	2.640	0.000	1.005
△	4.343		
◇	9.278		
□	8.887		
◺	13.800		
D	19.404	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
BJ/DB	0.900	THETAJ	20.000

AMC PLUME STUDY, CONICAL NOZZLE (-2) (RUCE12) PAGE 148

MISSILE EXTERIOR PRESSURES



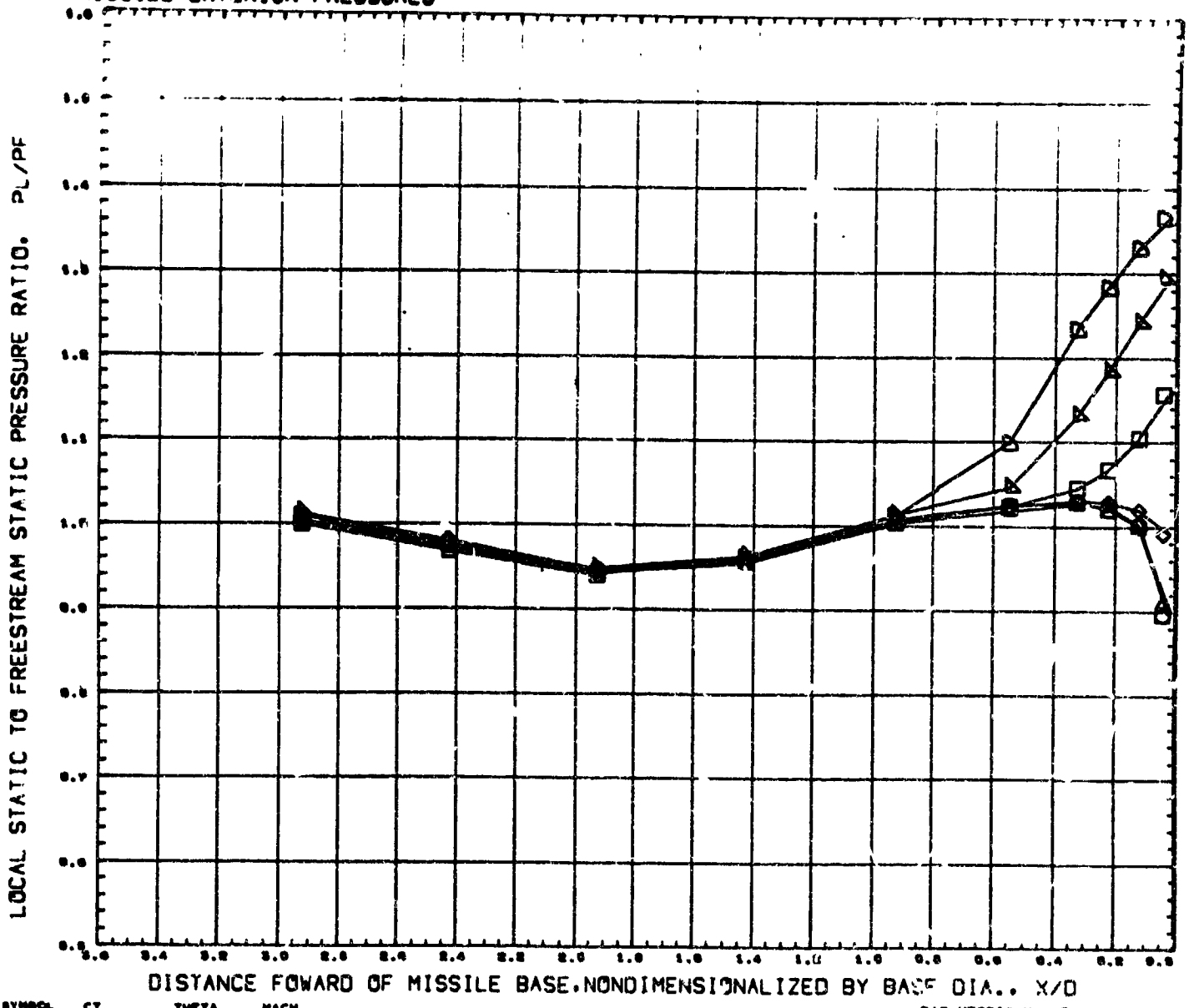
SYMBOL	CT	THETA	MACH
○	28.789	0.000	1.009
△	40.286		
◇	52.826		
□	78.756		
◺	93.909		

REFERENCE FILE

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	.700
DJ/DB	0.900	THETAJ	20.000

MISSILE EXTERIOR PRESSURES



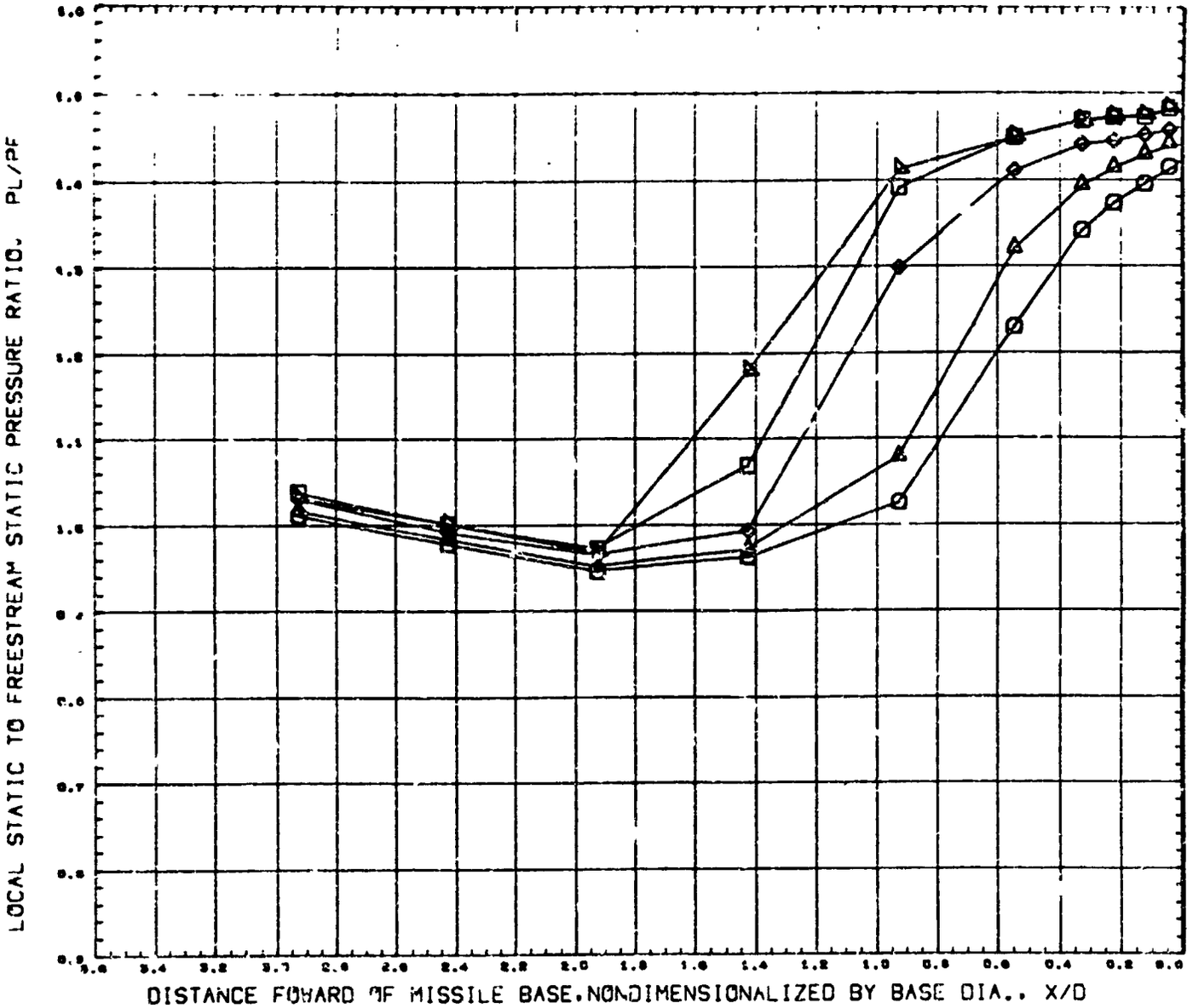
SYMBOL	CT	THETA	MACH
○	2.836	0.000	1.203
△	4.324		
◇	6.698		
□	10.468		
◺	15.352		
◻	22.077	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.900	THETAJ	20.000

AMC PLUME STUDY, CONICAL NOZZLE (-2) (RUCE12) PAGE 150

MISSILE EXTERIOR PRESSURES



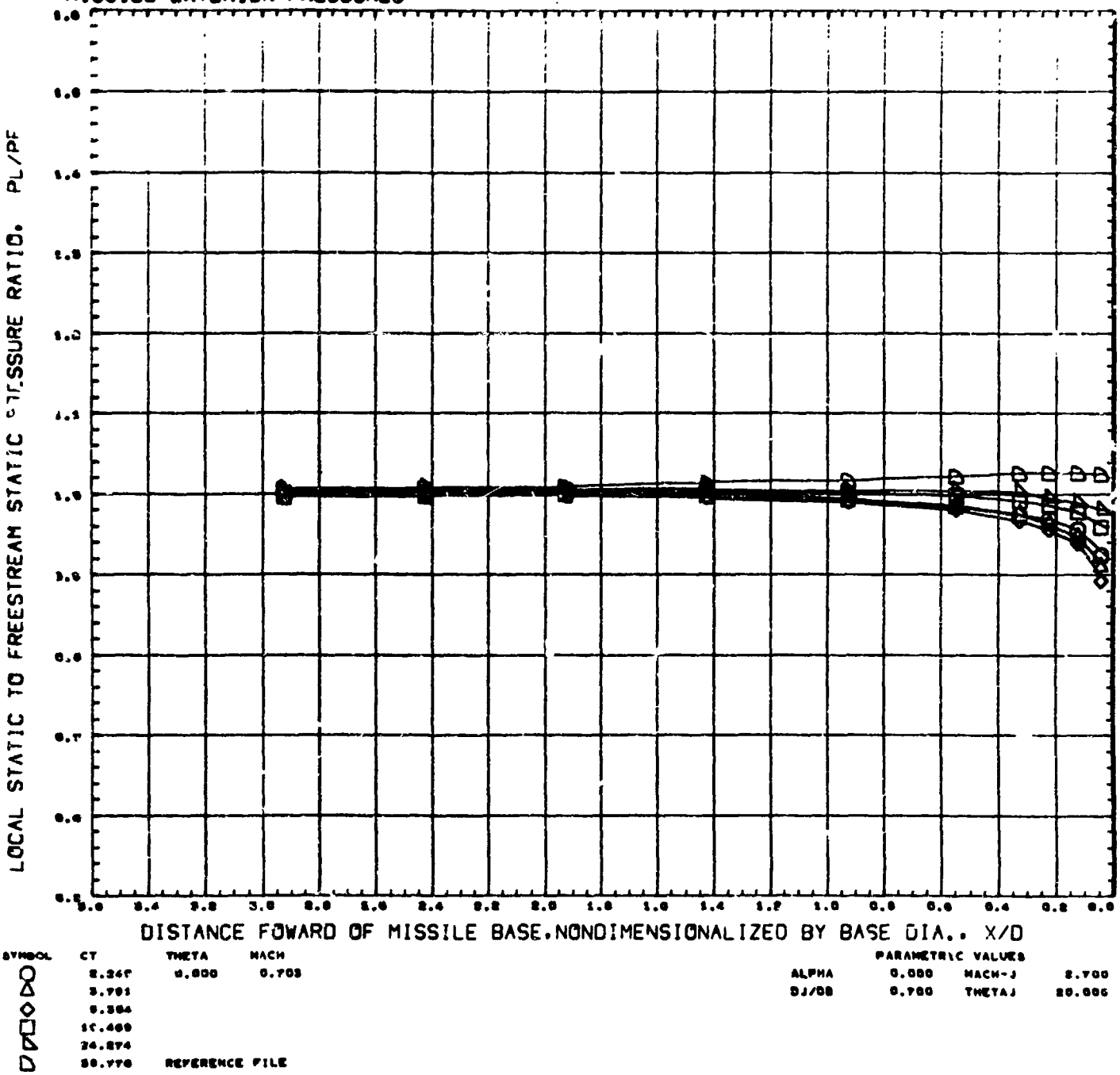
SYMBOL	CT	THETA	MACH
○	31.799	0.000	1.303
△	42.207		
◇	57.822		
□	65.047		
◺	96.378		

REFERENCE FILE

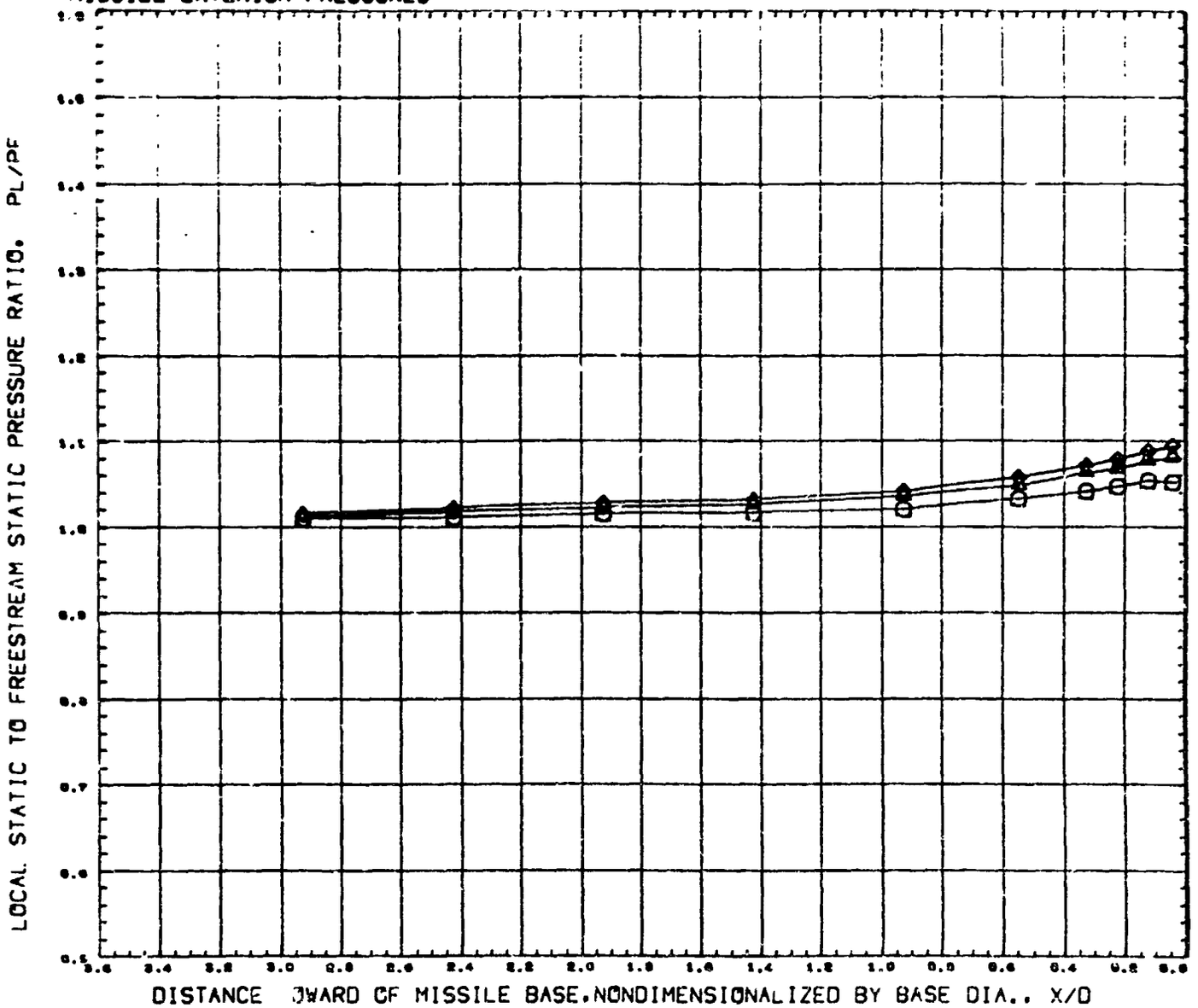
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	[illegible].700
DJ/DB	0.900	THETA-J	20.000

MISSILE EXTERIOR PRESSURES



MISSILE EXTERIOR PRESSURES



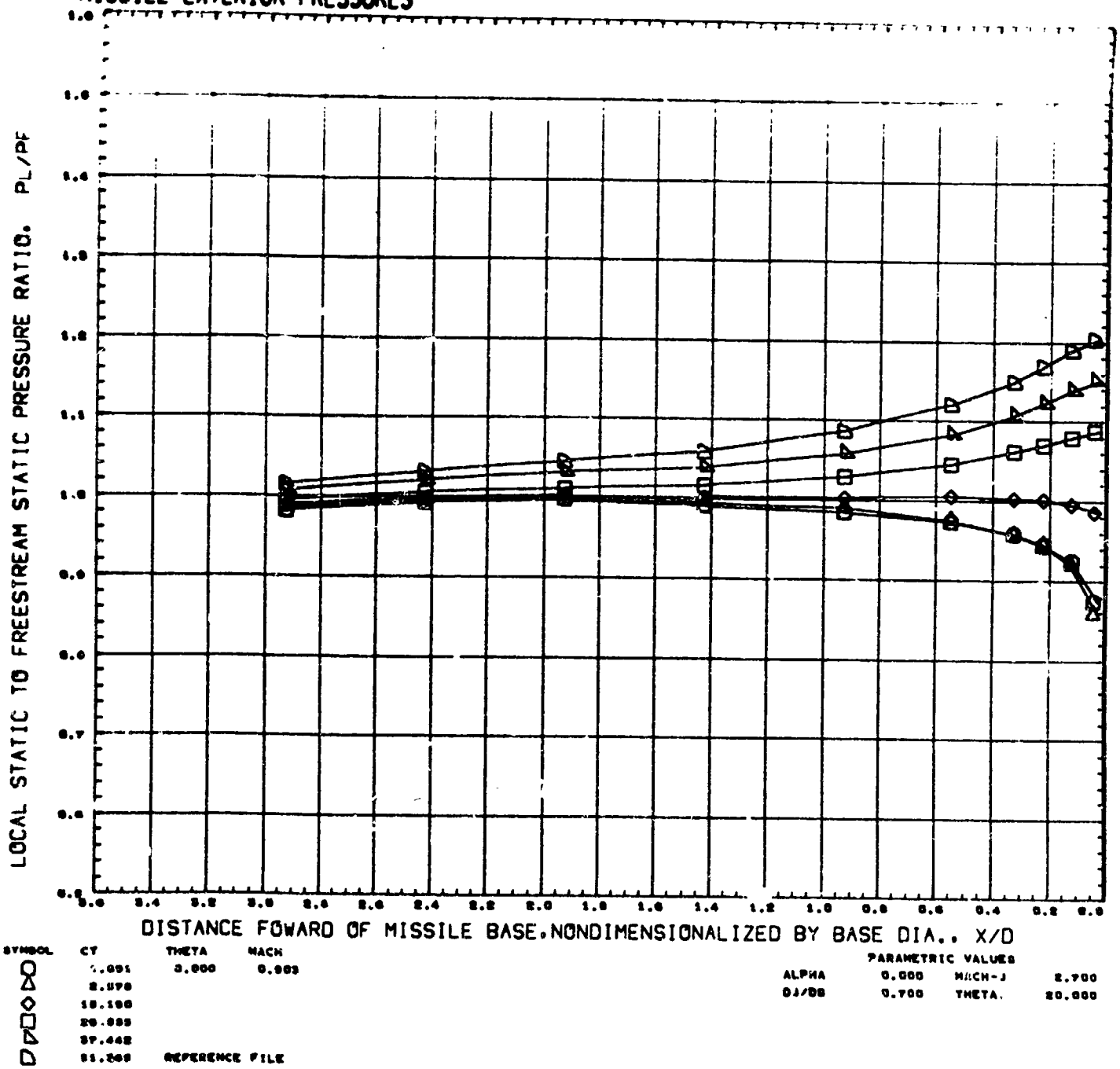
SYMBOL	CT	THETA	MACH
○	91.702	0.000	0.703
△	68.603		
◇	76.893		

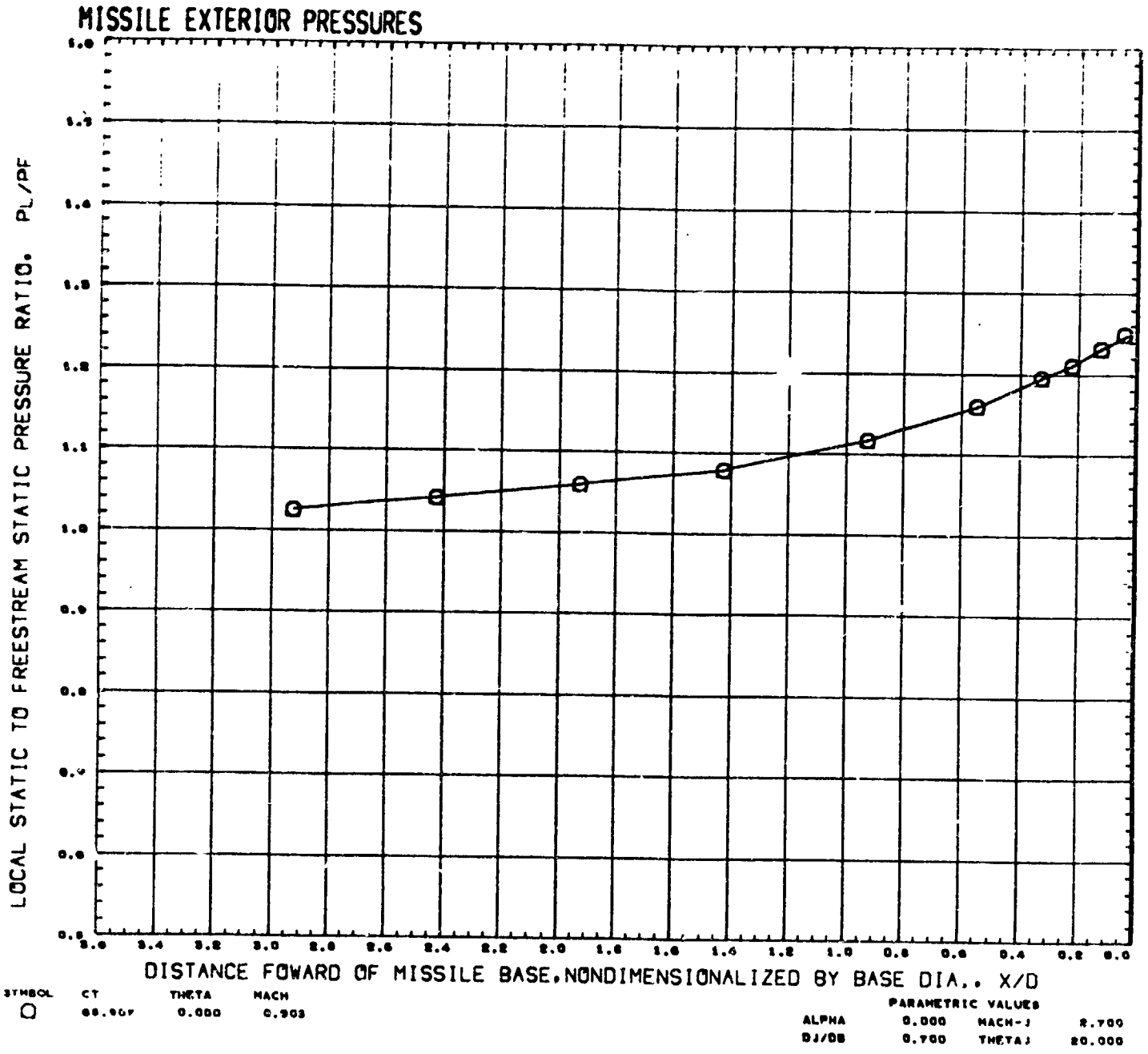
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.700	THETAJ	20.000

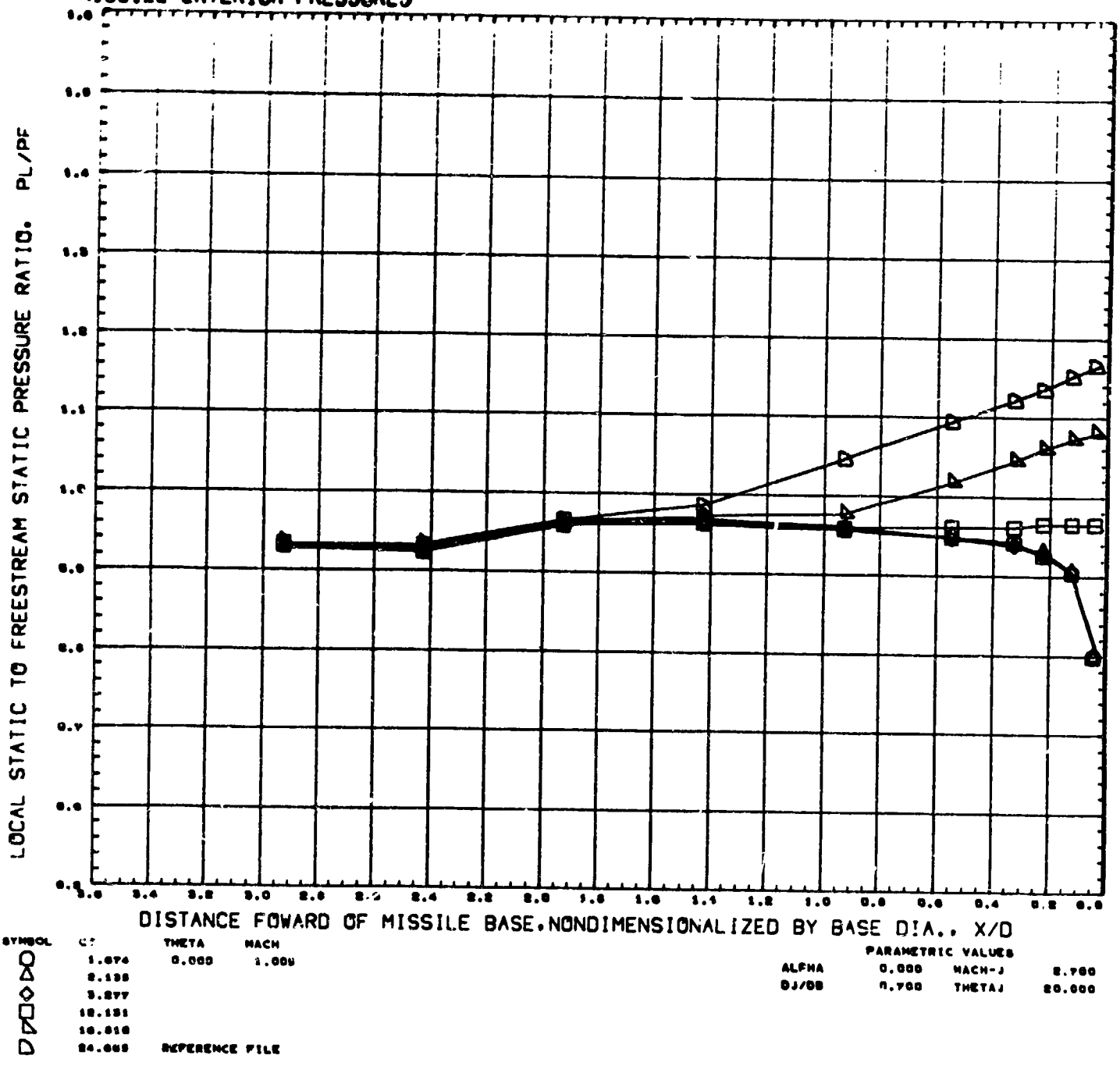
REFERENCE FILE

MISSILE EXTERIOR PRESSURES

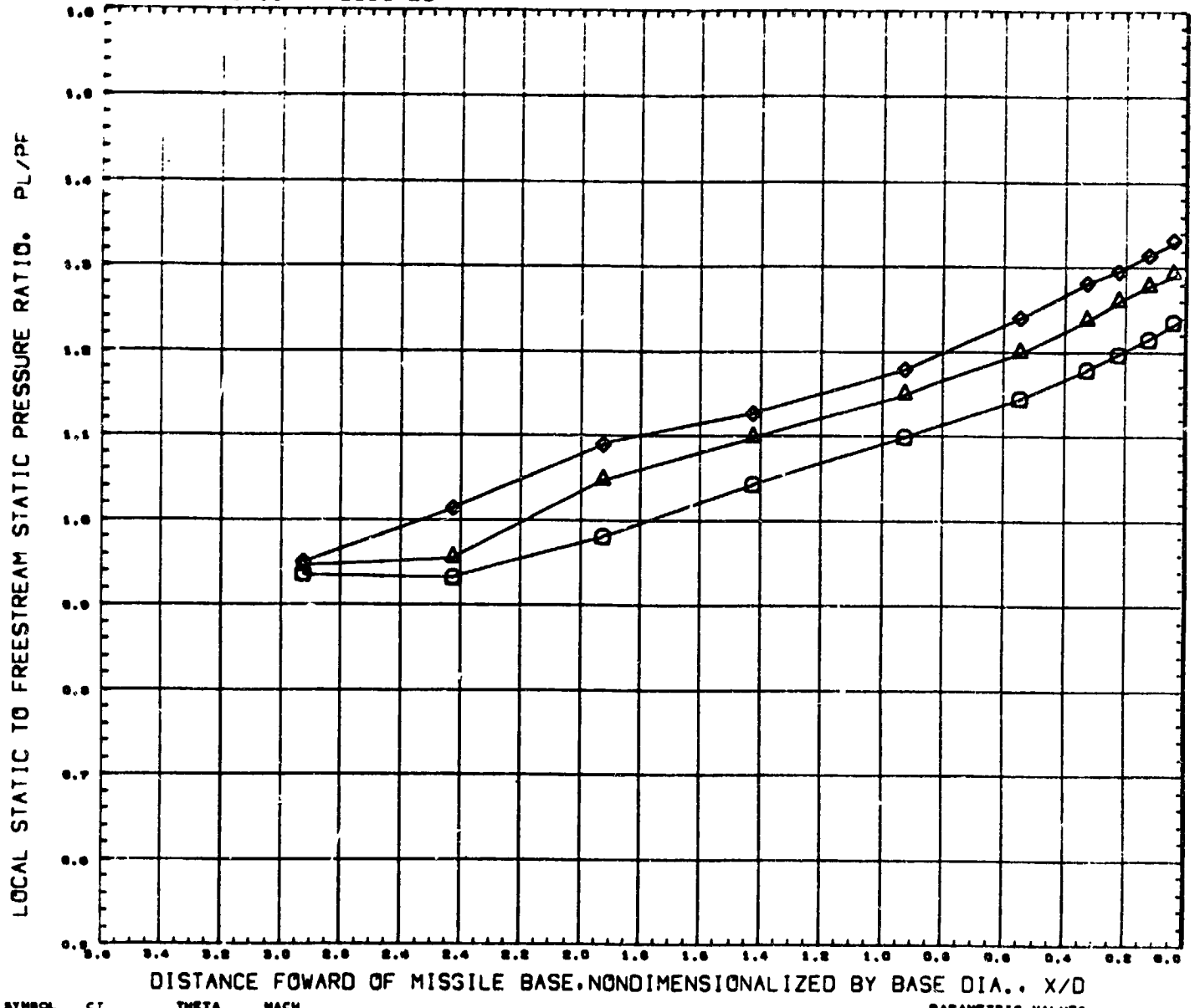



MISSILE EXTERIOR PRESSURES
LOCAL STATIC TO FREESTREAM STATIC PRESSURE RATIO, PL/PF
DISTANCE FOWARD OF MISSILE BASE,NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL CT THETA MACH
0.000 0.903
PARAMETRIC VALUES
ALPHA 0.000 MACH-J 2.700
DJ/DB 0.700 THETAJ 20.000
REFERENCE FILE

MISSILE EXTERIOR PRESSURES



MISSILE EXTERIOR PRESSURES



SYMBOL	CT	THETA	MACH
○	33.000	0.000	1.000
△	46.010		
◇	57.000		

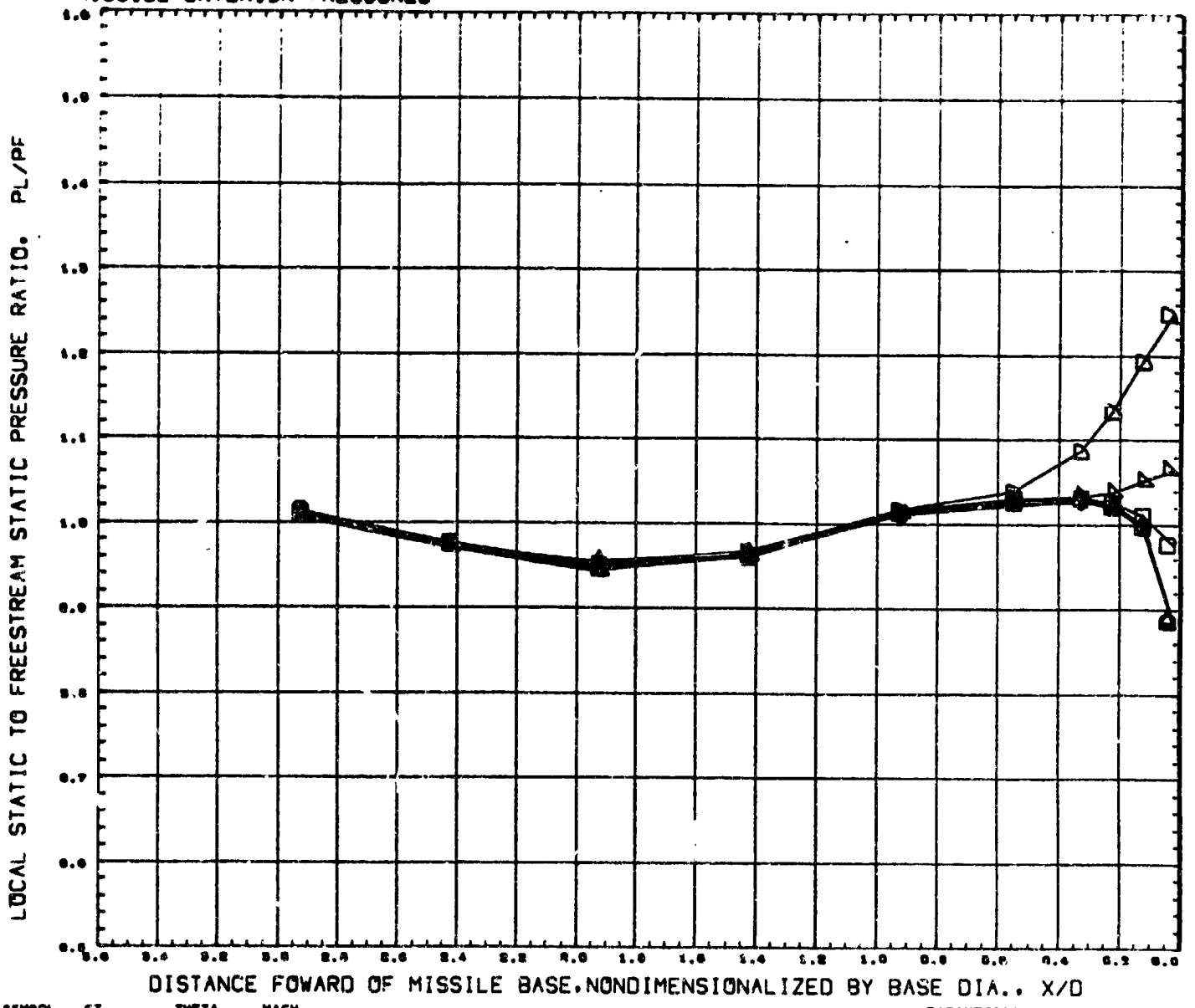
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.700	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-3) (RUCE13) PAGE 157

MISSILE EXTERIOR PRESSURES

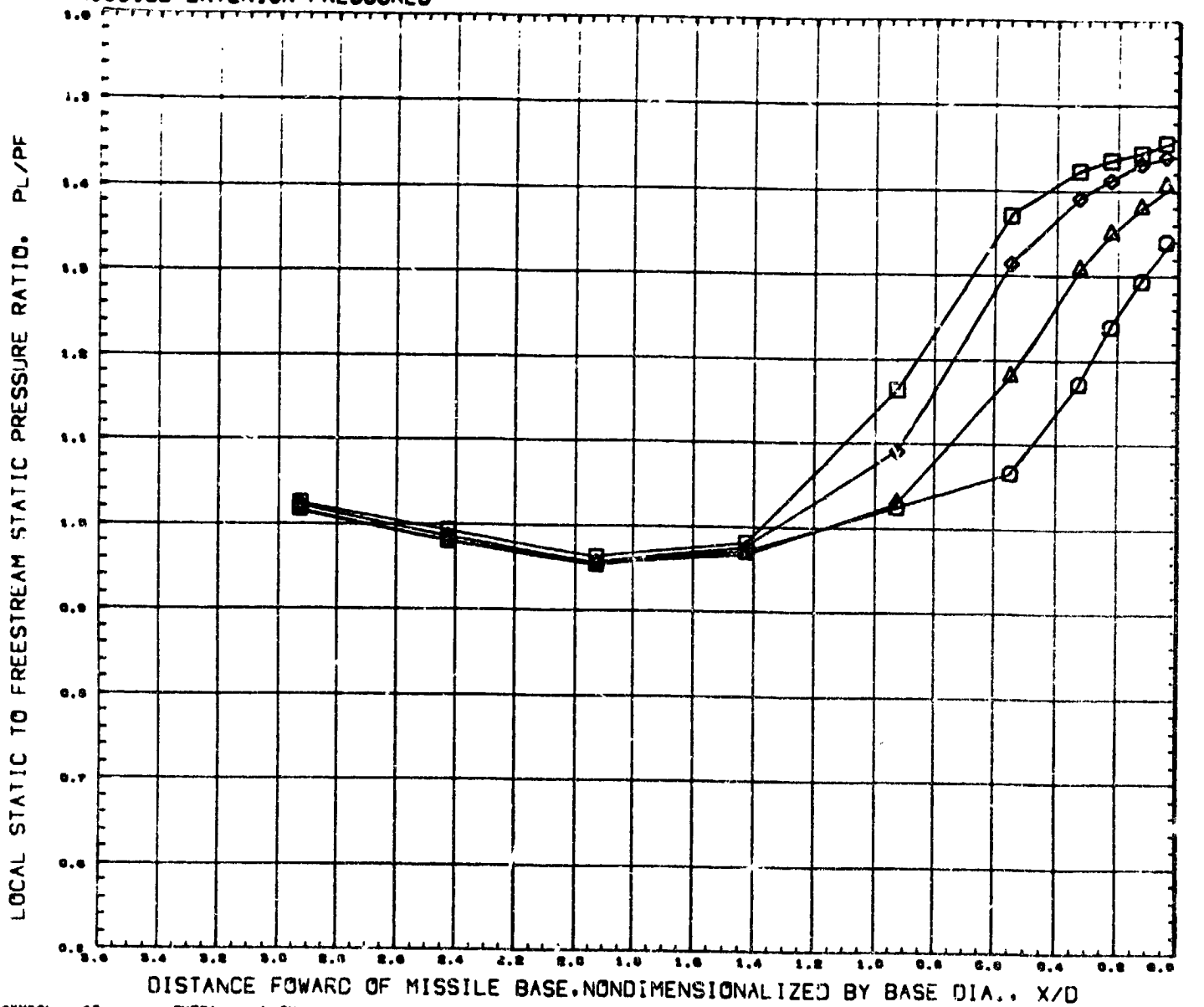


SYMBOL	CT	THETA	MACH
○	1.342	0.000	1.205
△	2.408		
◇	5.167		
□	9.592		
◺	13.106		
D	20.735	REFERENCE FILE	

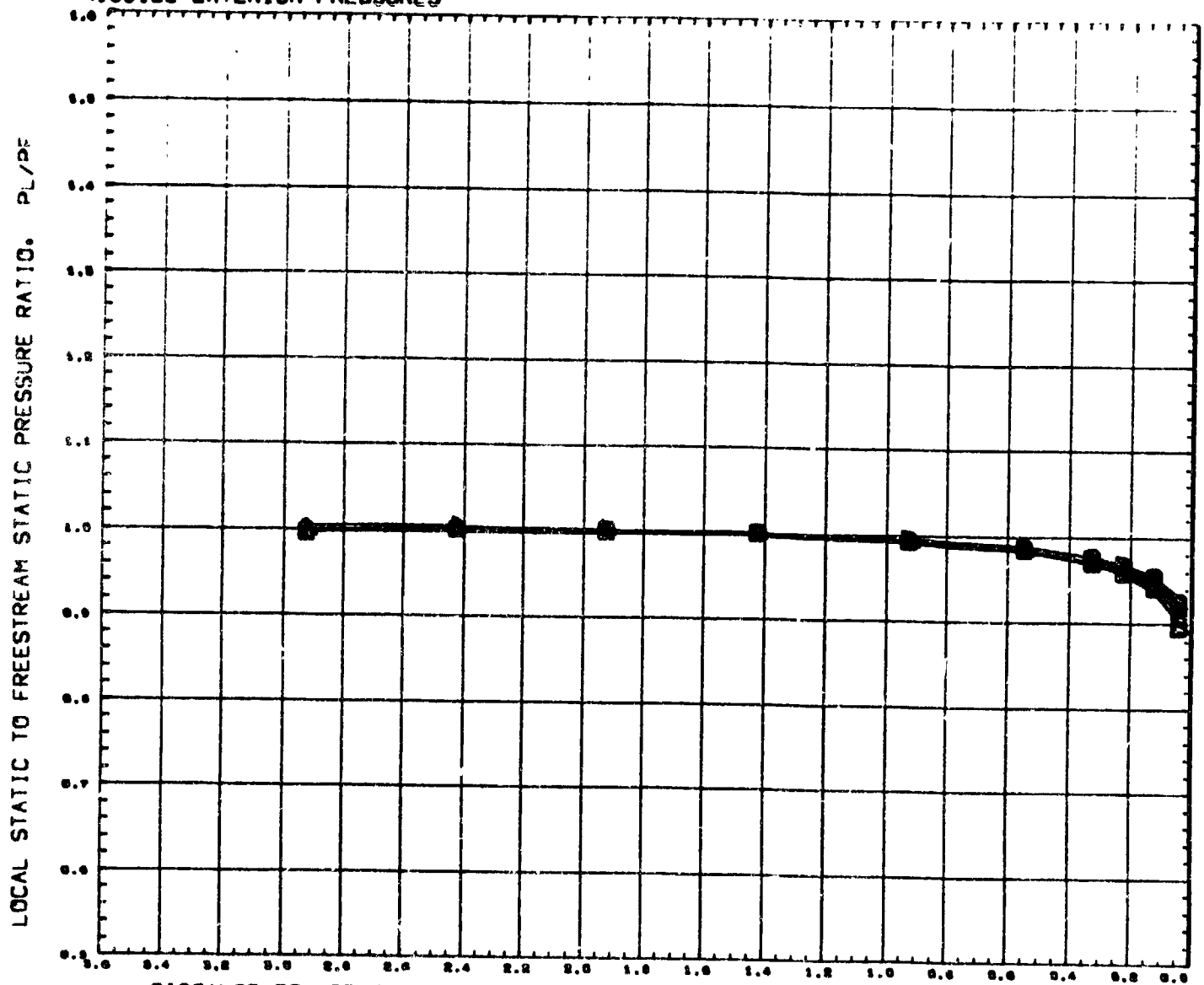
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.700	THETAJ	20.000

MISSILE EXTERIOR PRESSURES



MISSILE EXTERIOR PRESSURES



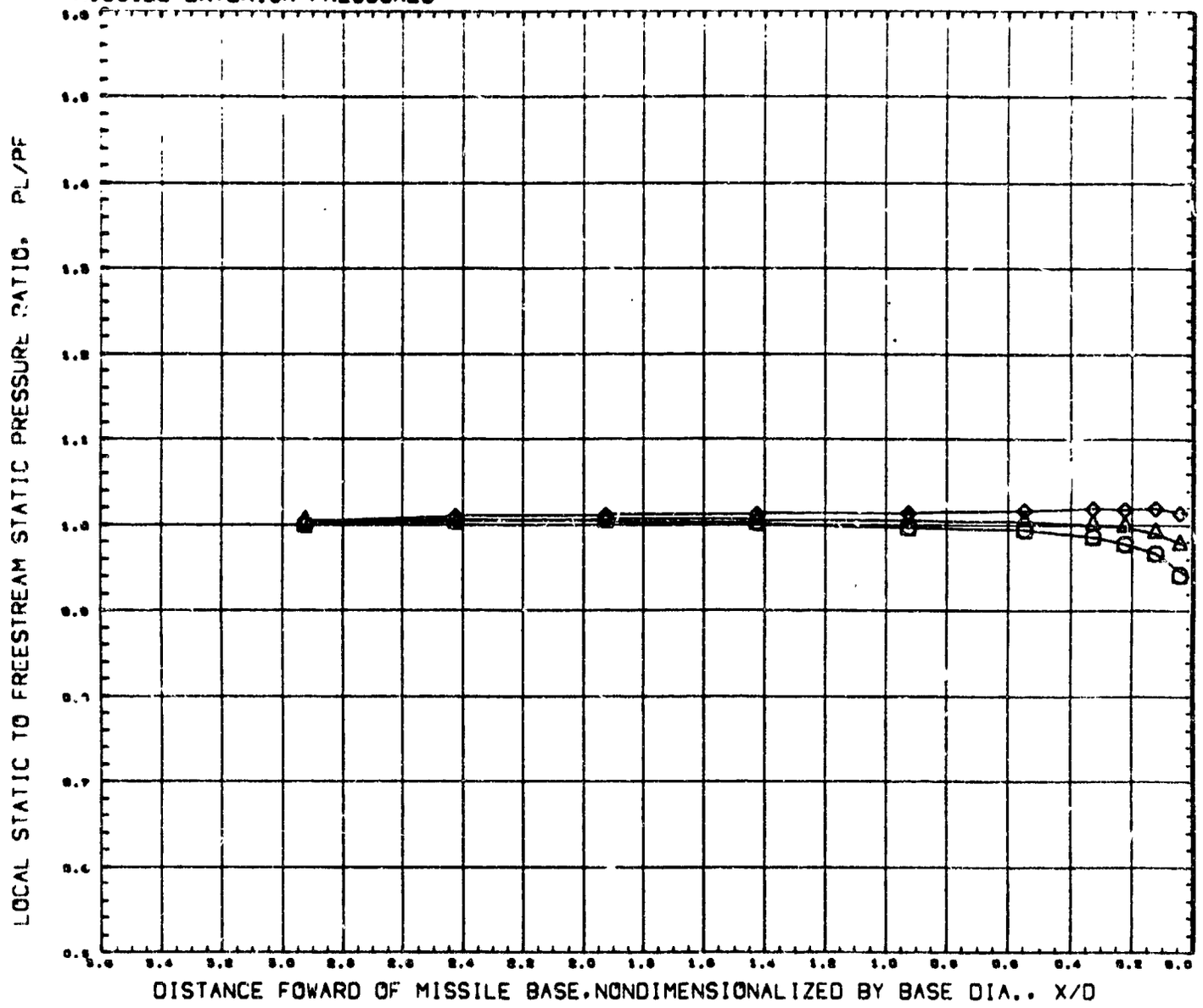
SYMBOL	CT	THETA	MACH
○	1.492	0.000	0.700
△	2.433		
◇	[illegible]		
□	[illegible]		
▷	0.461		
D	13.000	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.000	THETAJ	20.000

AMC PLUME STUDY, CONICAL NOZZLE (-4) (RUCE14) PAGE 160

MISSILE EXTERIOR PRESSURES



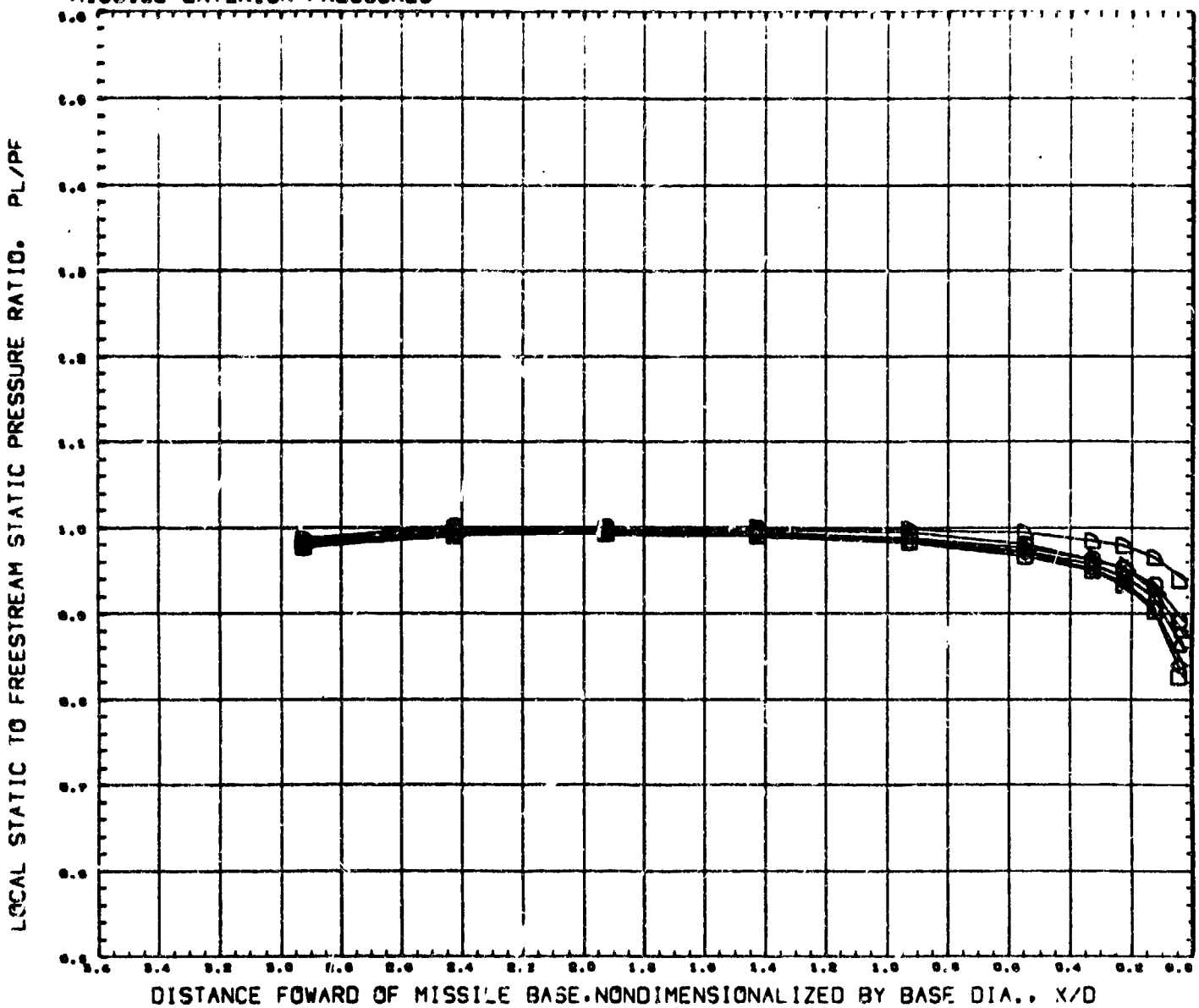
SYMBOL	CT	THETA	MACH
○	17.992	0.000	0.705
△	27.131		
◇	40.444		

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.000	THETAJ	20.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES



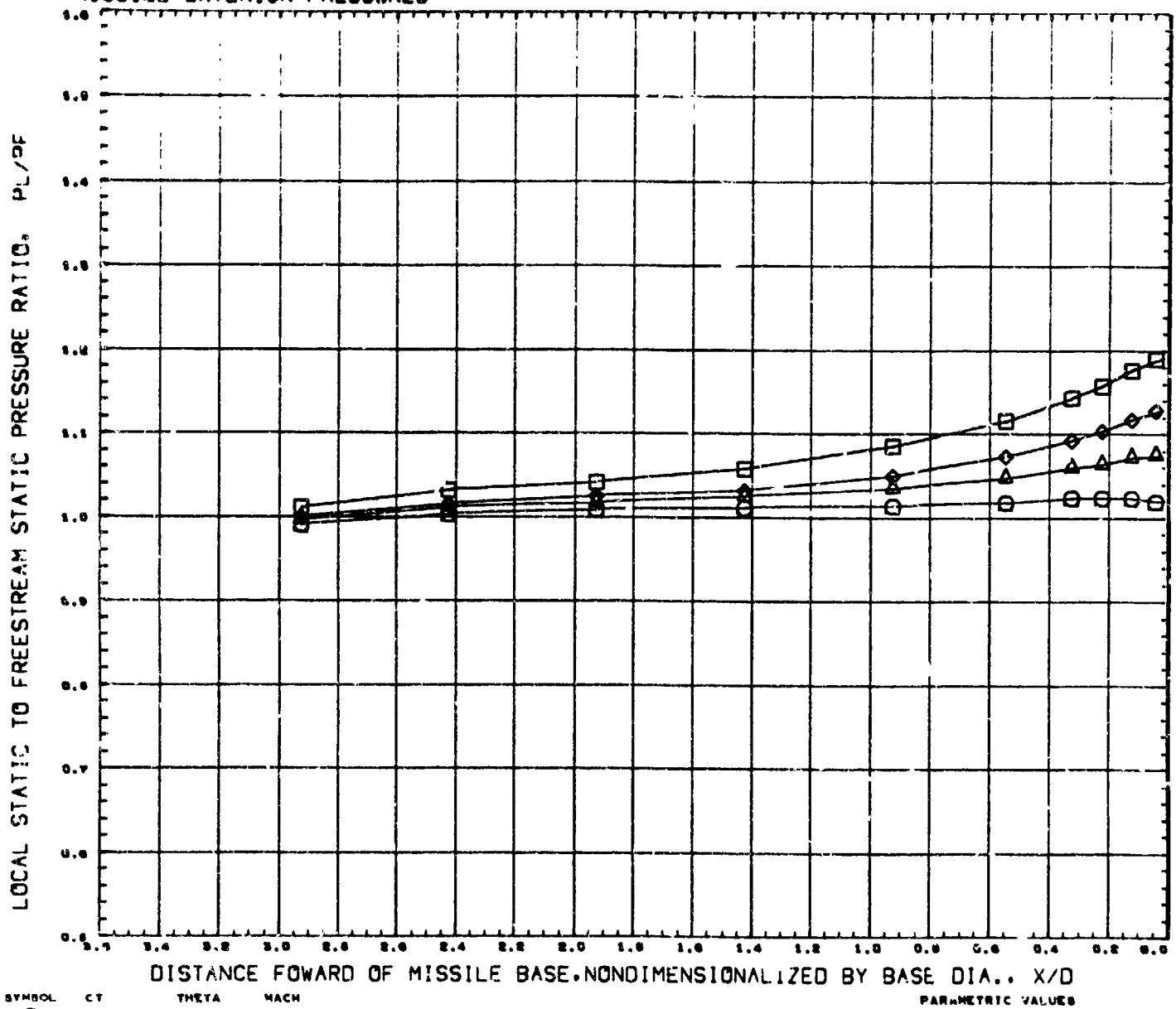
SYMBOL	CT	THETA	MACH
○	1.321	0.000	0.905
△	1.909		
◇	2.369		
□	4.464		
◺	9.036		
D	13.205	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.600	THETAJ	20.000

AMC PLUME STUDY, CONICAL NOZZLE (-4) (RUCE14) PAGE 162

MISSILE EXTERIOR PRESSURES



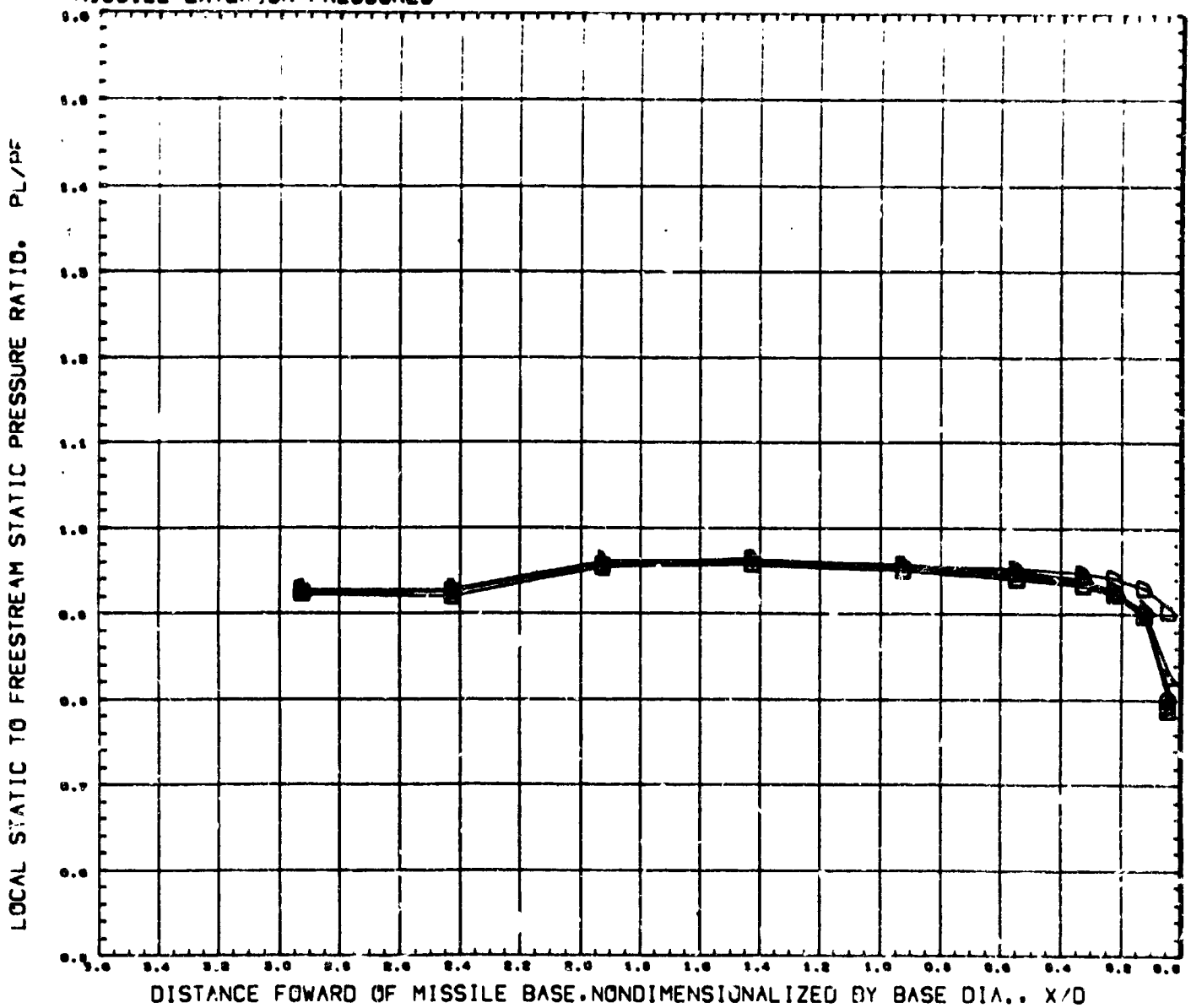
SYMBOL	CT	THETA	MACH
○	20.736	0.000	0.905
△	27.424		
◇	36.480		
□	52.004		

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.600	THETAJ	20.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES



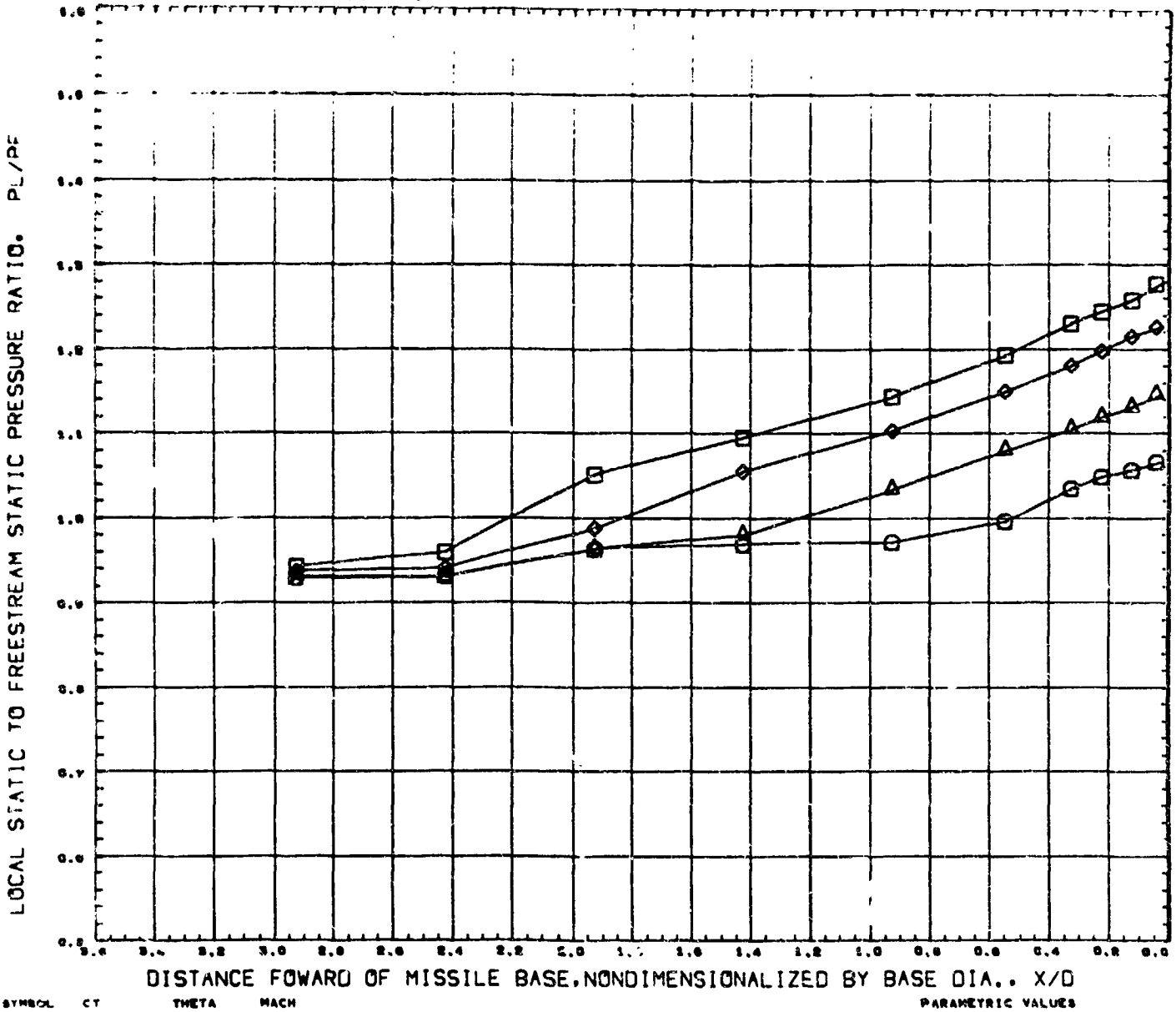
SYMBOL	CT	THETA	MACH
○	1.142	0.000	1.003
△	1.635		
◇	2.444		
□	3.730		
◺	6.423		
D	11.042	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MAC -J	2.730
DJ/DB	0.600	THETAJ	20.000

AMC PLUME STUDY, CONICAL NOZZLE (-4) (RUCE14) PAGE 164

MISSILE EXTERIOR PRESSURES



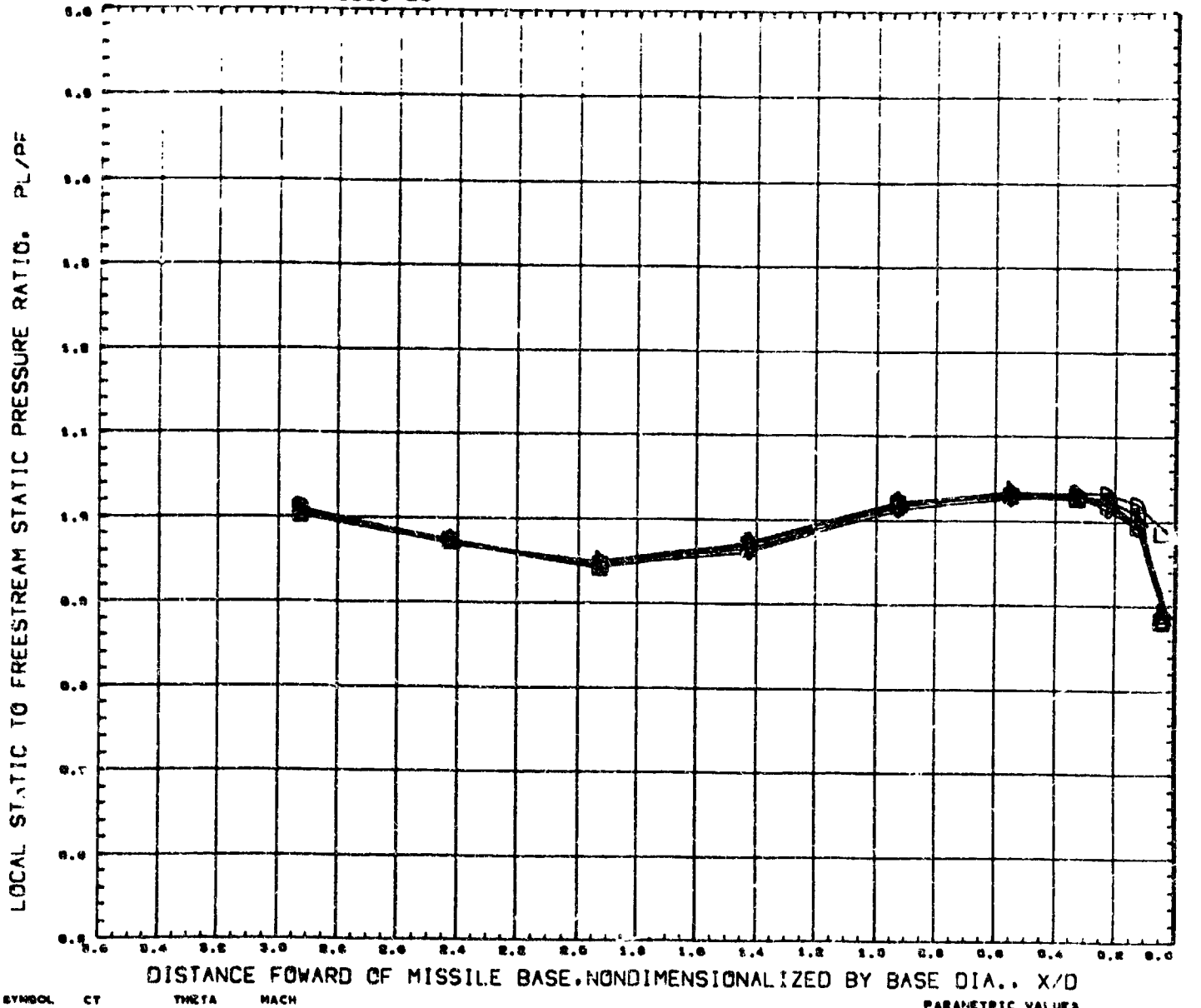
SYMBOL	CT	THETA	MACH
○	18.390	0.000	1.003
△	25.036		
◇	35.360		
□	46.257		

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	3.700
DJ/DB	0.600	THETAJ	20.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES



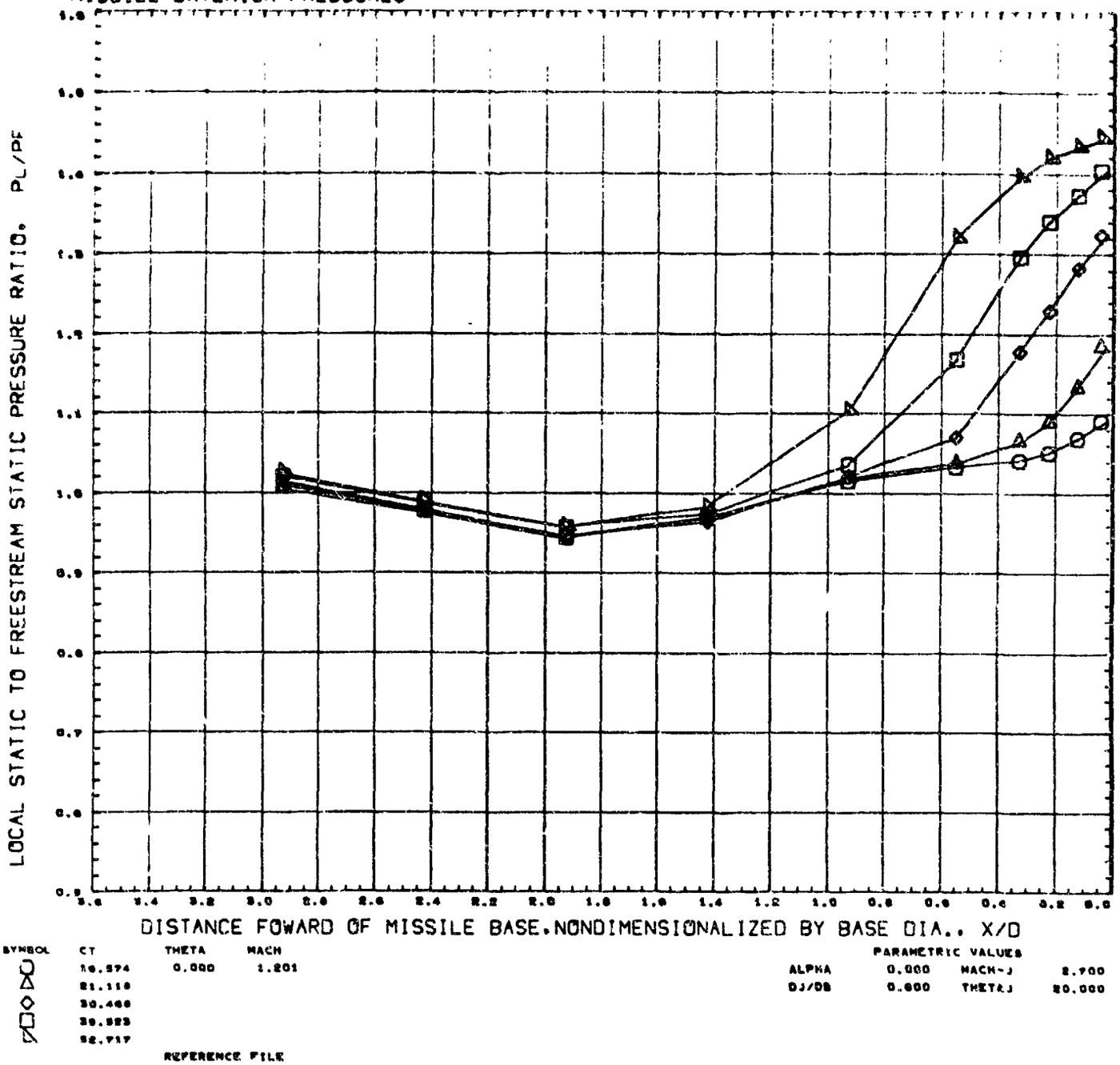
SYMBOL	CT	THETA	MACH
○	1.194	0.000	1.201
△	1.705		
◇	2.247		
□	3.338		
◺	4.932		
D	12.023	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.600	THETAJ	20.000

AMC PLUME STUDY, CONICAL NOZZLE (-4) (RUCE14) PAGE 166

MISSILE EXTERIOR PRESSURES



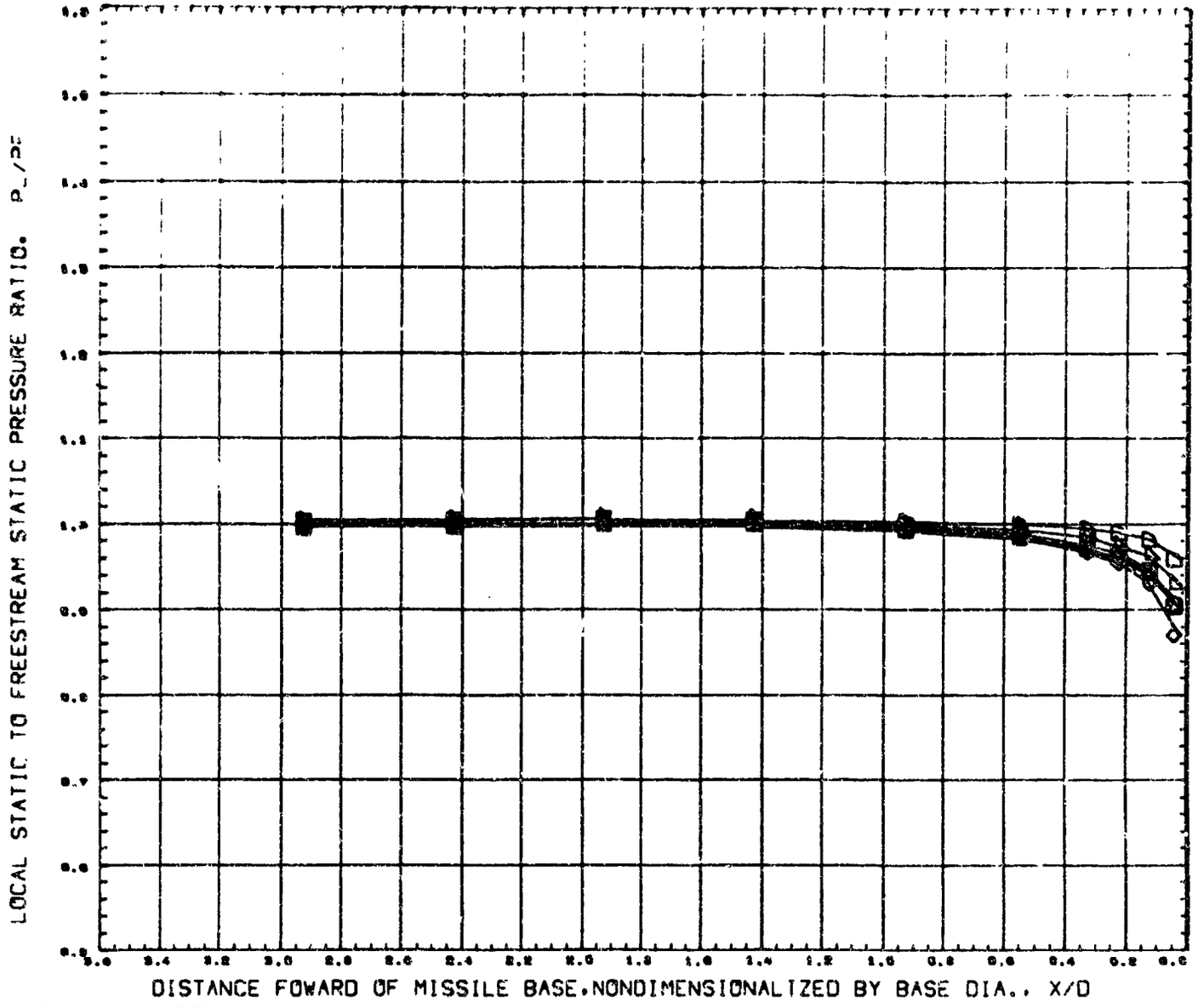
SYMBOL	CT	THETA	MACH
	10.574	0.000	1.201
	21.118		
	30.466		
	39.523		
	52.717		

REFERENCE FILE

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.600	THETAJ	20.000

MISSILE EXTERIOR PRESSURES

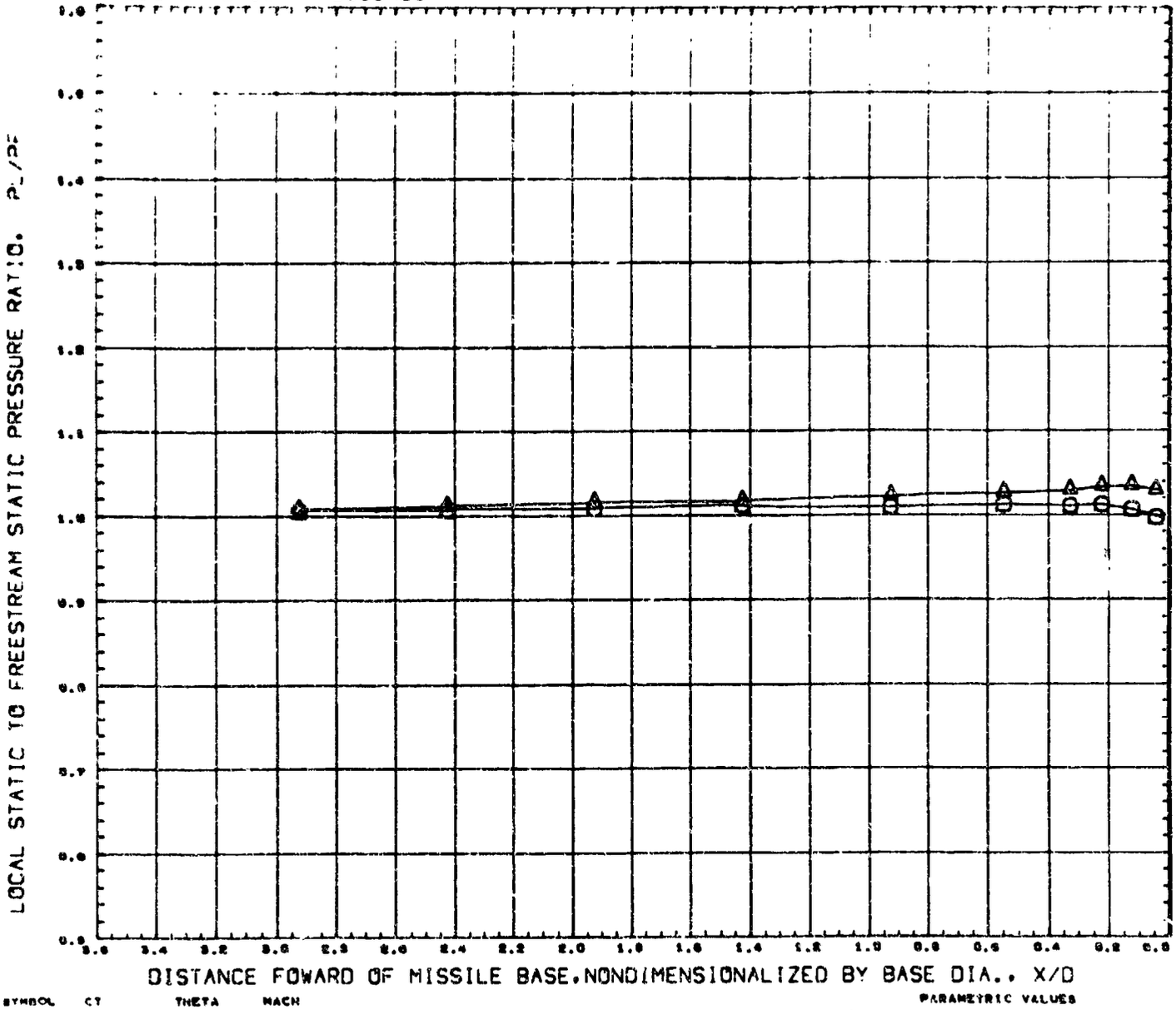


SYMBOL	CT	THETA	MACH
	3.149	0.000	0.704
	3.760		
	11.806		
	16.384		
	24.287		
	33.799	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.760
DJ/DB	0.630	THETAJ	11.806

MISSILE EXTERIOR PRESSURES



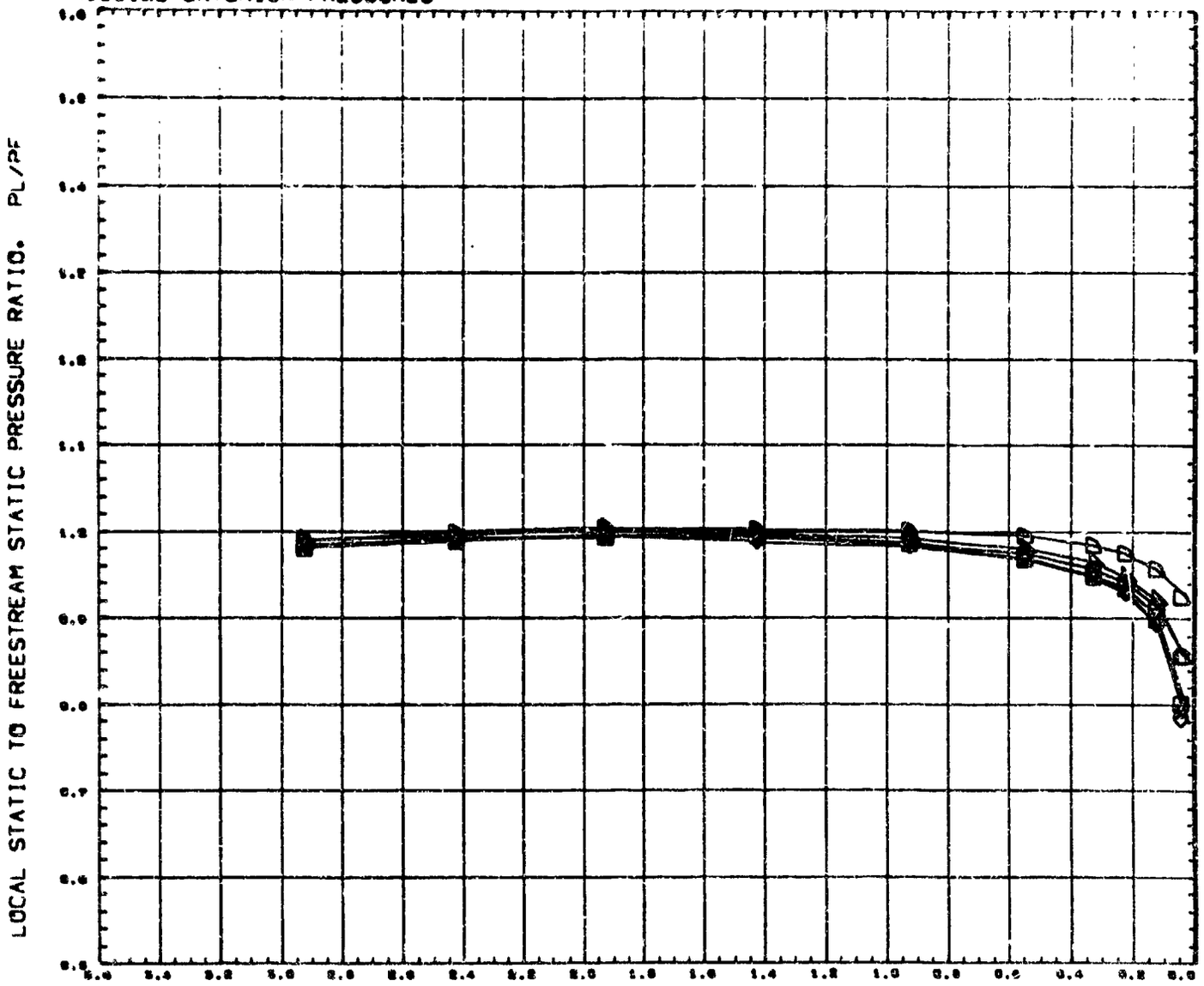
SYMBOL	CT	THETA	MACH
○	50.799	0.000	0.704
△	70.972		

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.030	THETAJ	11.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES

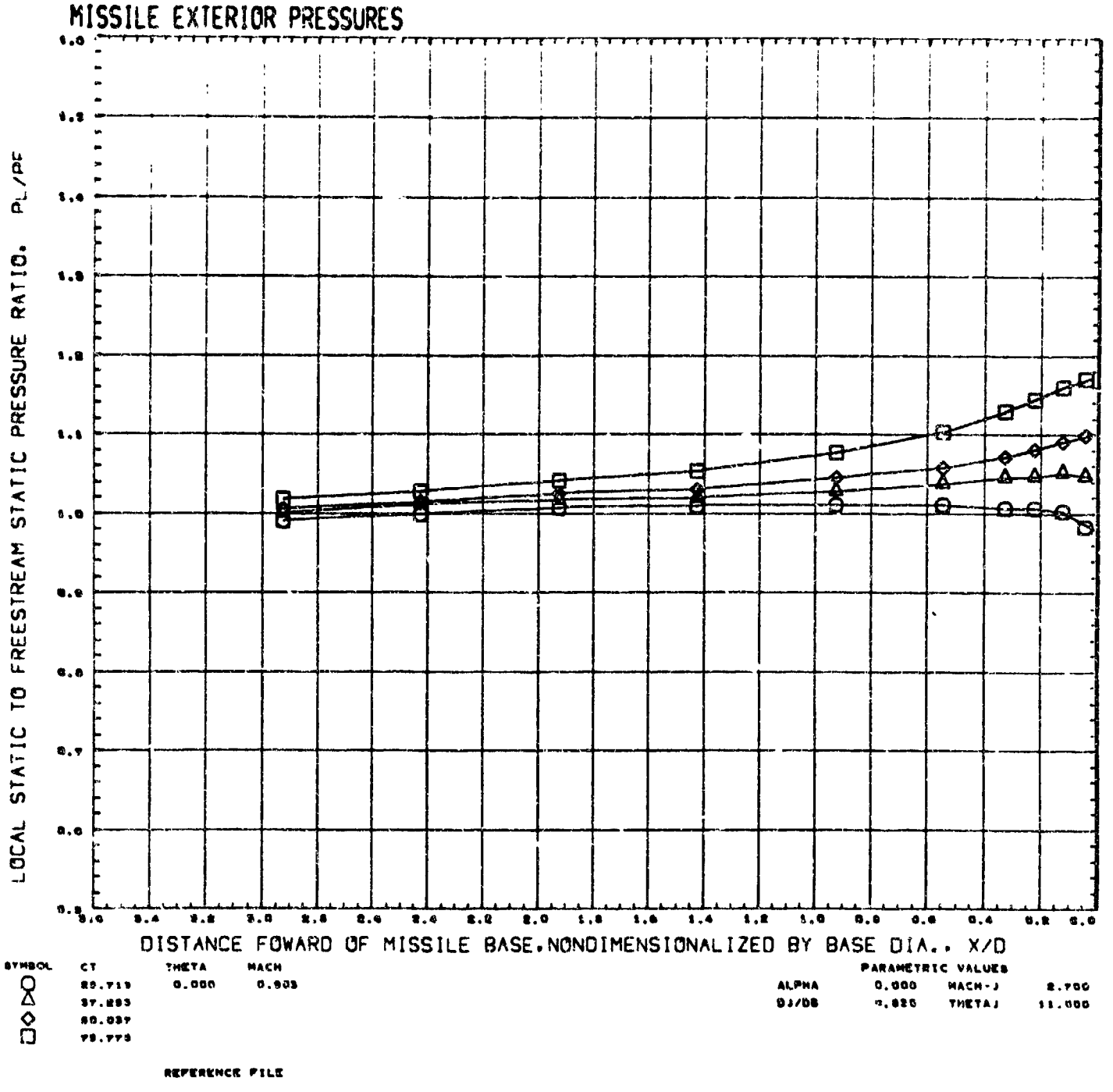


SYMBOL	CT	THETA	MACH
○	2.100	0.000	0.905
△	4.900		
◇	8.272		
□	8.763		
◺	12.250		
D	19.910	REFERENCE FILE	

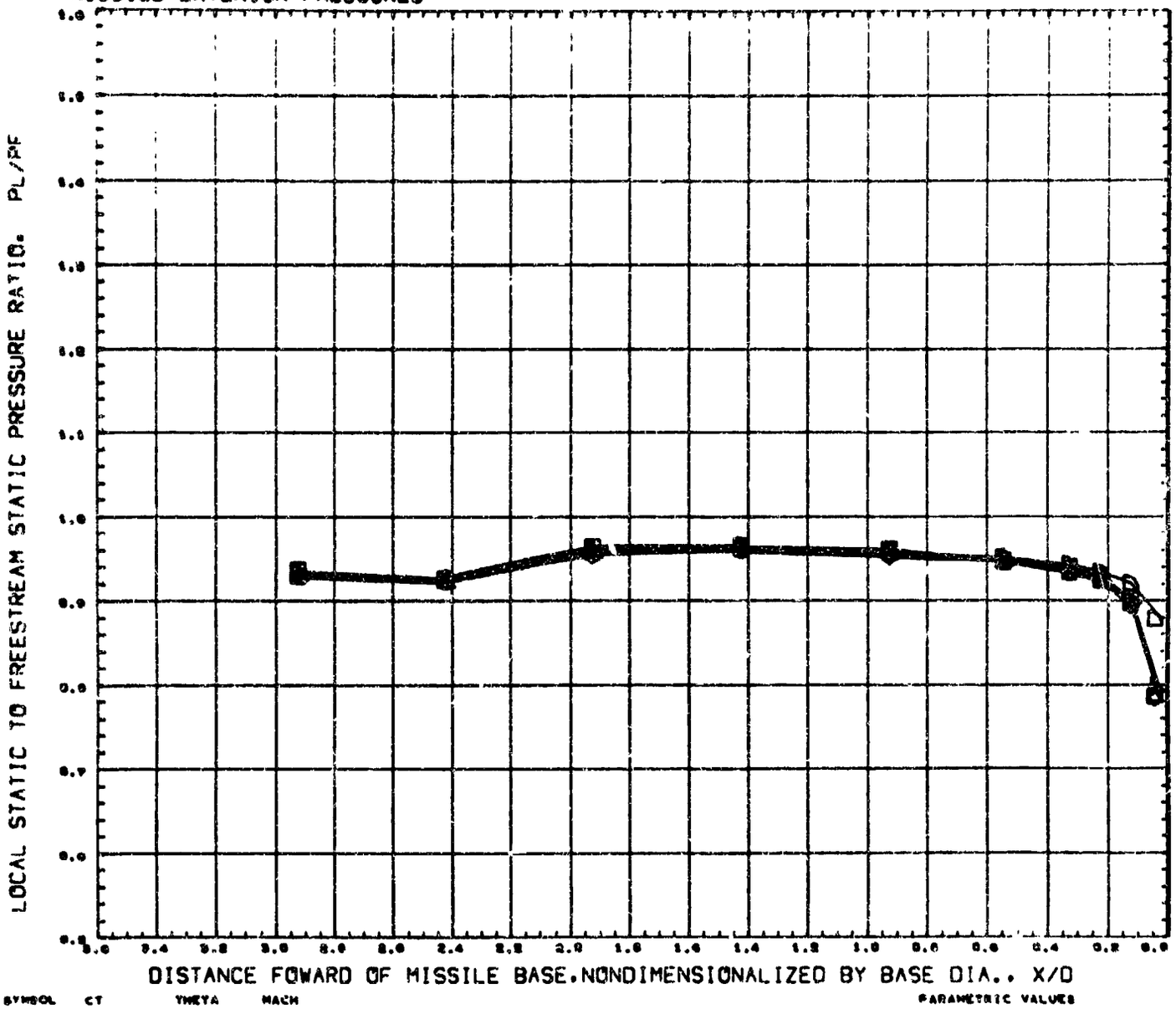
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.930	THETAJ	11.000

AMC PLUME STUDY, CONICAL NOZZLE (-5) (RUCE15) PAGE 170


MISSILE EXTERIOR PRESSURES
LOCAL STATIC TO FREESTREAM STATIC PRESSURE RATIO, PL/PF
DISTANCE FOWARD OF MISSILE BASE, NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL CT THETA MACH
25.719 0.000 0.903
37.293
50.037
79.773
PARAMETRIC VALUES
ALPHA 0.000 MACH-J 2.700
DJ/DB 0.820 THETAJ 11.000
REFERENCE FILE

MISSILE EXTERIOR PRESSURES

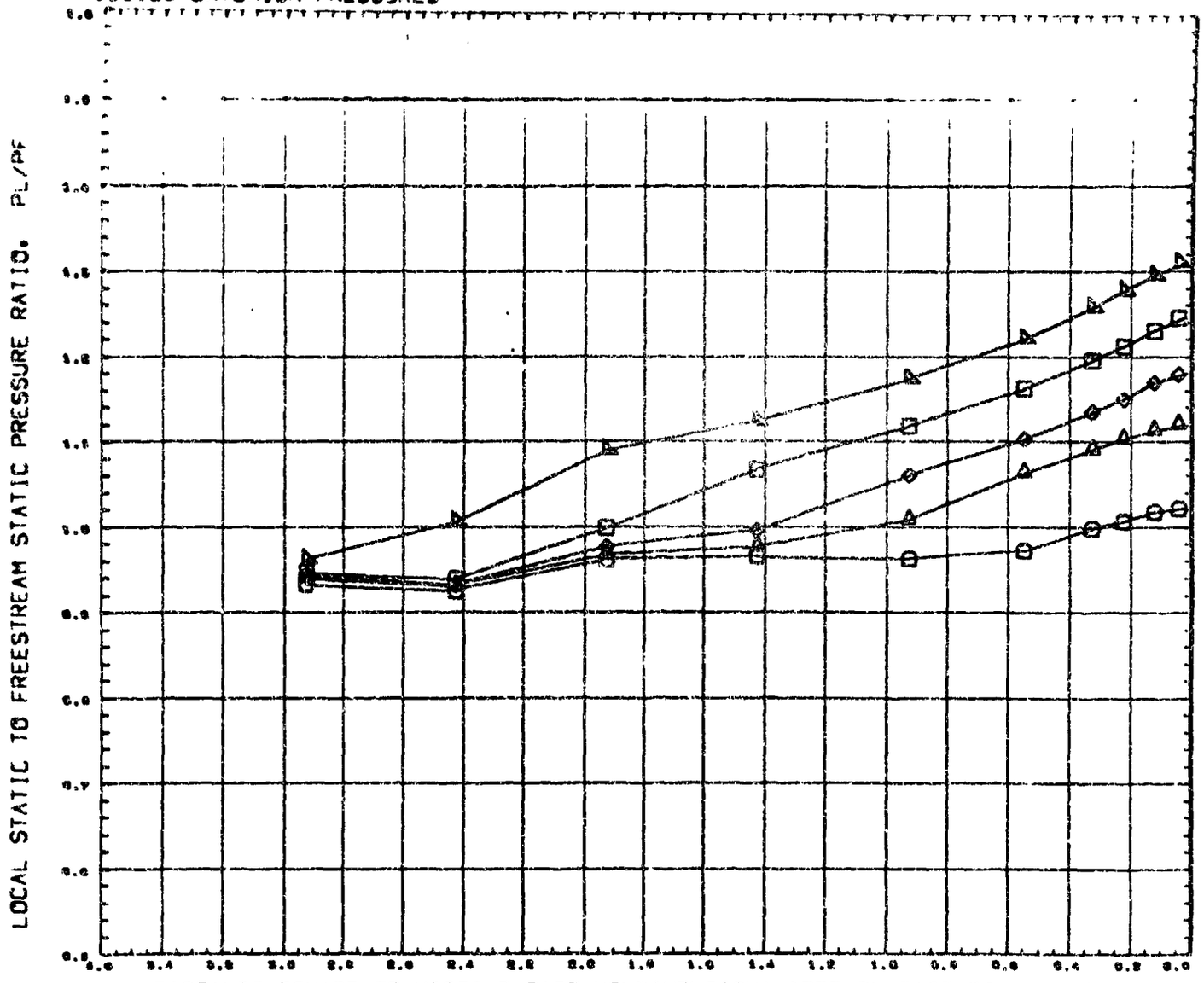


SYMBOL	CT	THETA	MACH
	2.102	0.000	1.004
	3.000		
	4.012		
	6.000		
	10.010		
	10.750	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.050	THETAJ	11.000

MISSILE EXTERIOR PRESSURES



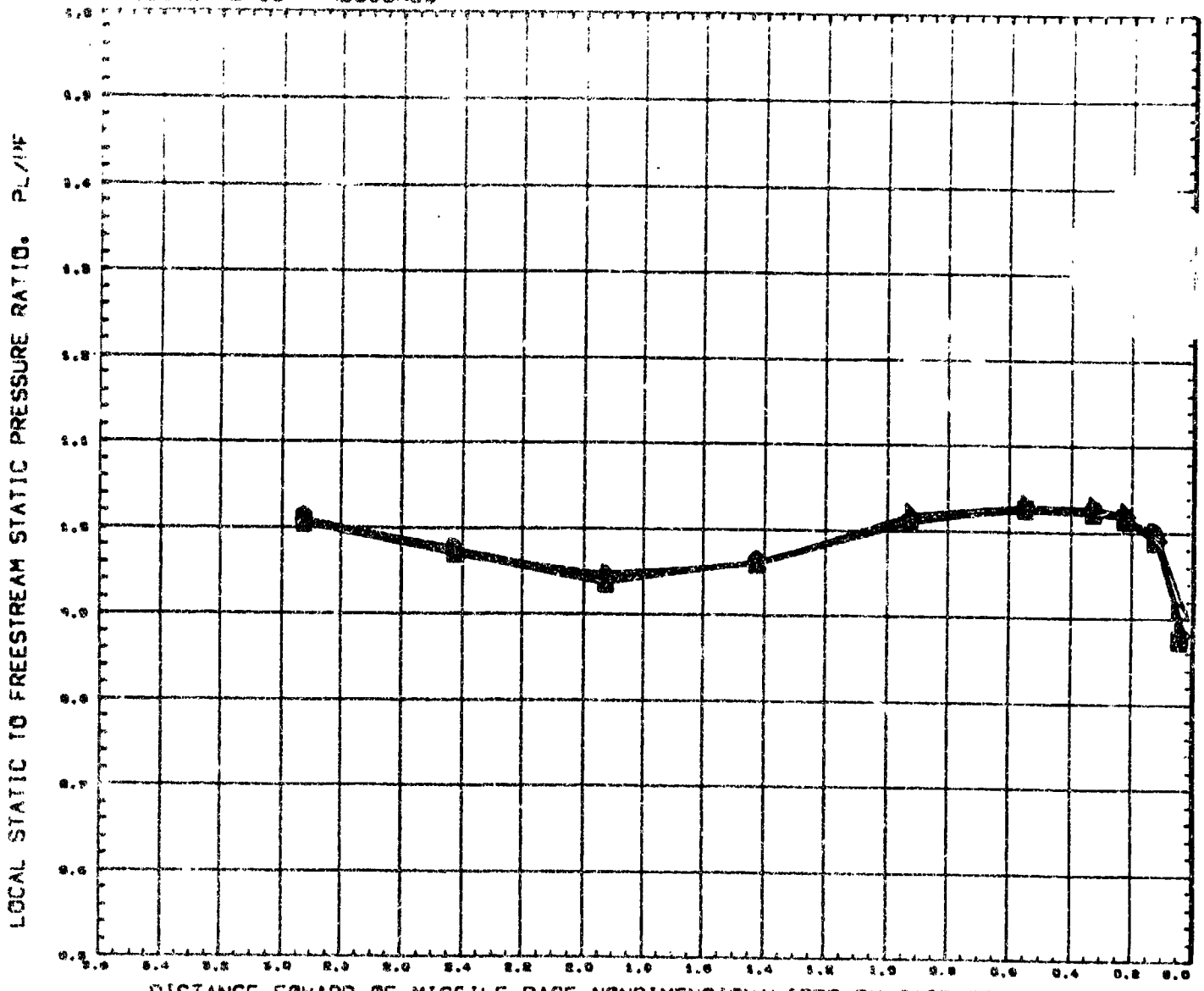
SYMBOL	CT	THETA	MACH
○	24.209	0.000	1.004
△	34.944		
◇	46.124		
□	58.192		
▽	68.458		

REFERENCE FILE

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
BJ/DB	0.030	THETAJ	11.000

MISSILE EXTERIOR PRESSURES

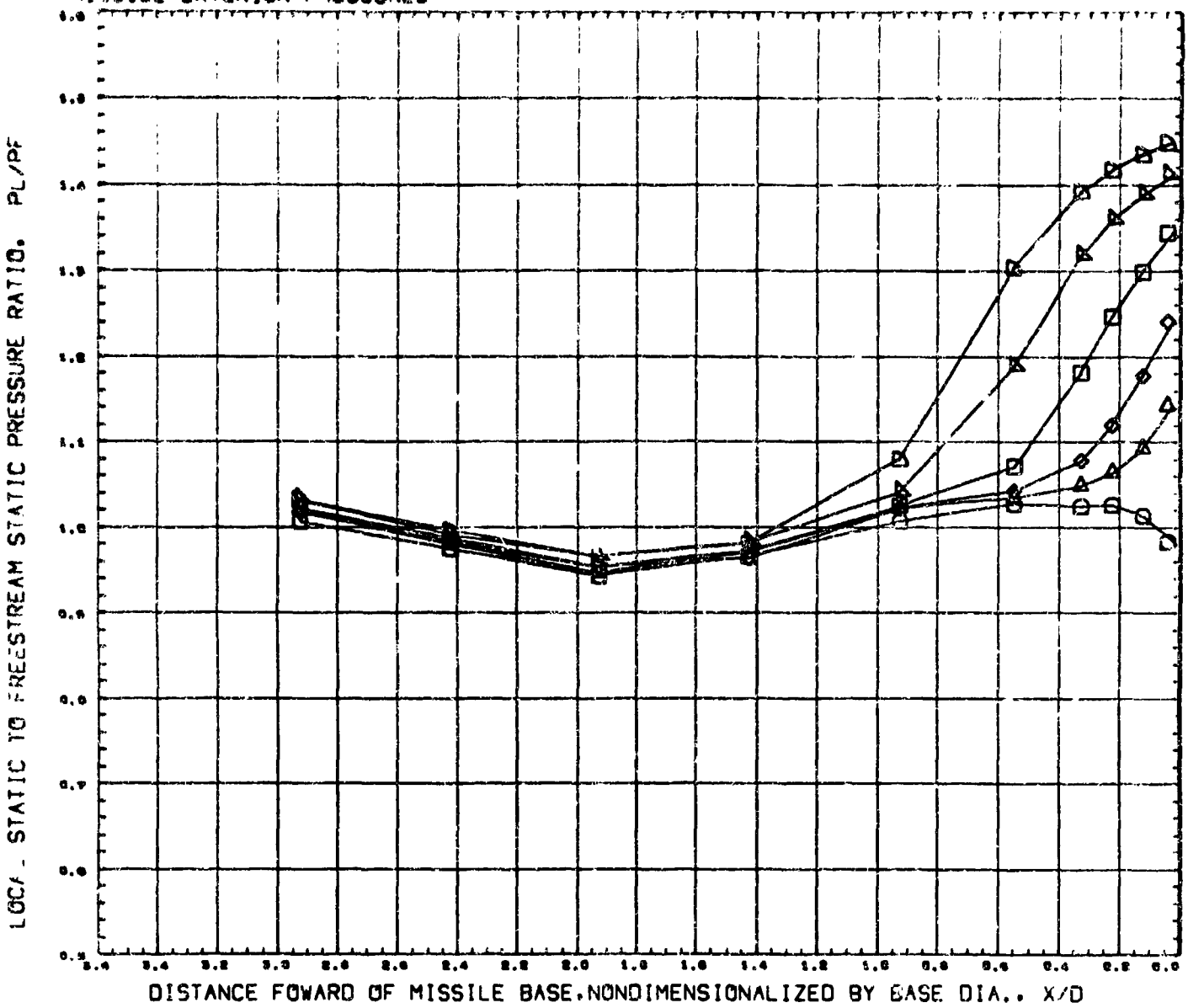


SYMBOL	CT	THETA	MACH
	1.054	0.000	1.809
	2.000		
	4.003		
	6.574		
	8.006		
	15.034	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.030	THETAJ	11.000

MISSILE EXTERIOR PRESSURES

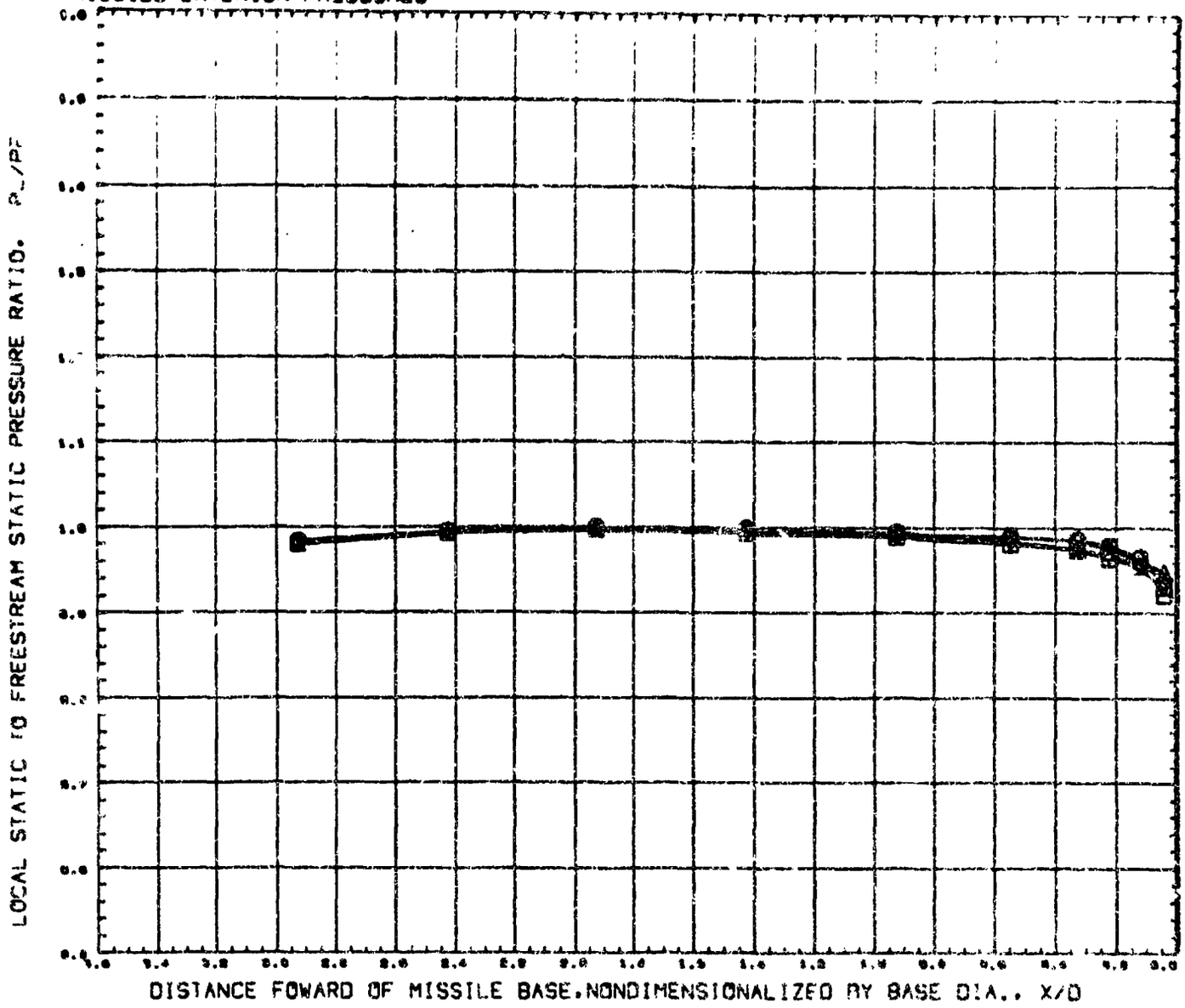


SYMBOL	CT	THETA	MACH
	19.499	0.000	1.205
	50.214		
	39.233		
	84.582		
	77.010		
	102.492	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.720
DJ/DB	0.030	THETAJ	11.000

MISSILE EXTERIOR PRESSURES



SYMBOL	ALPHA	THETA	MACH
○	- 5.000	.000	0.902
▷	- 3.010		
◇	3.010		
□	6.030		

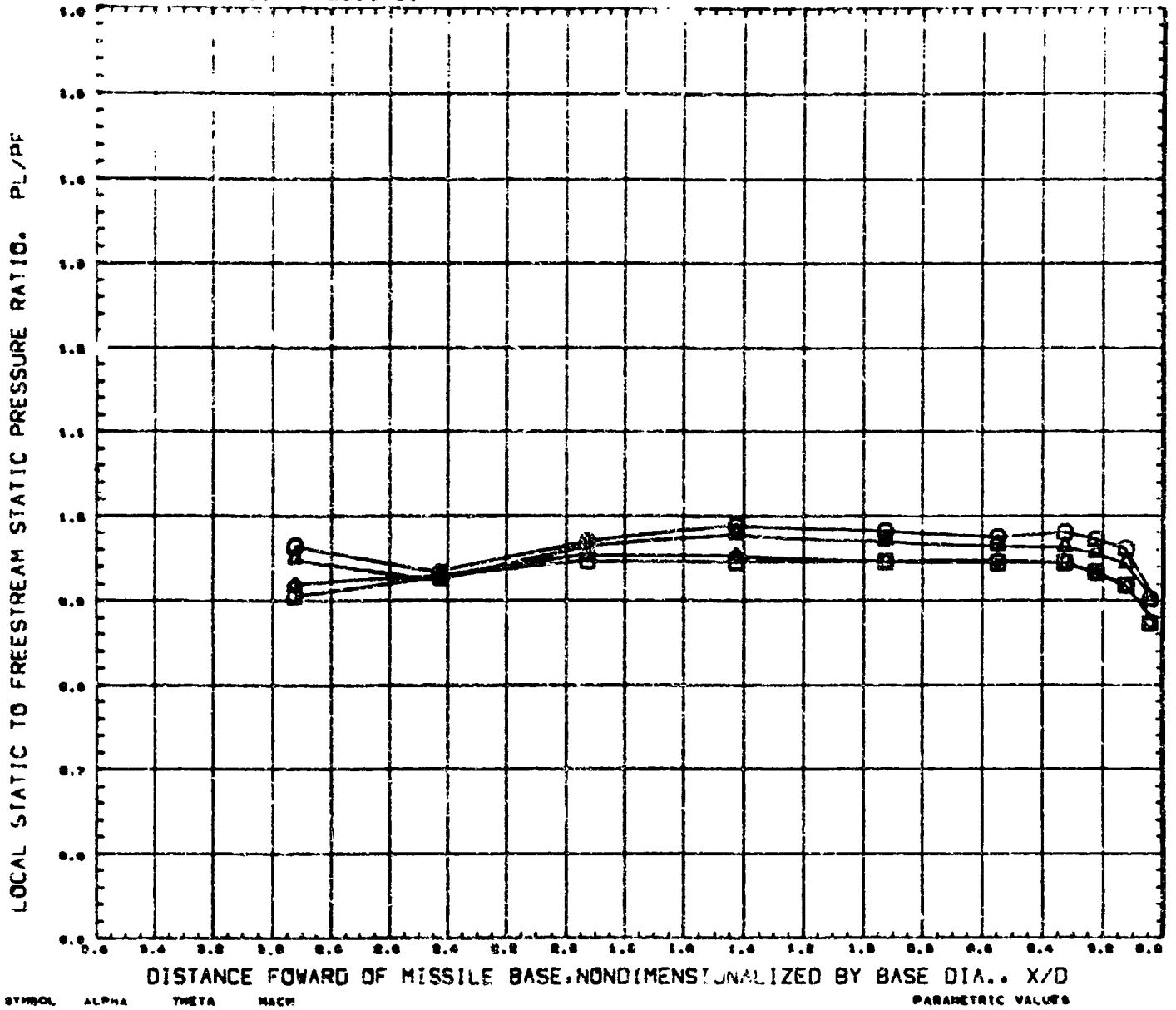
PARAMETRIC VALUES

PC	0.300	MACH-J	4.700
DJ/DB	0.000	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-2) (RUCE16)

MISSILE EXTERIOR PRESSURES



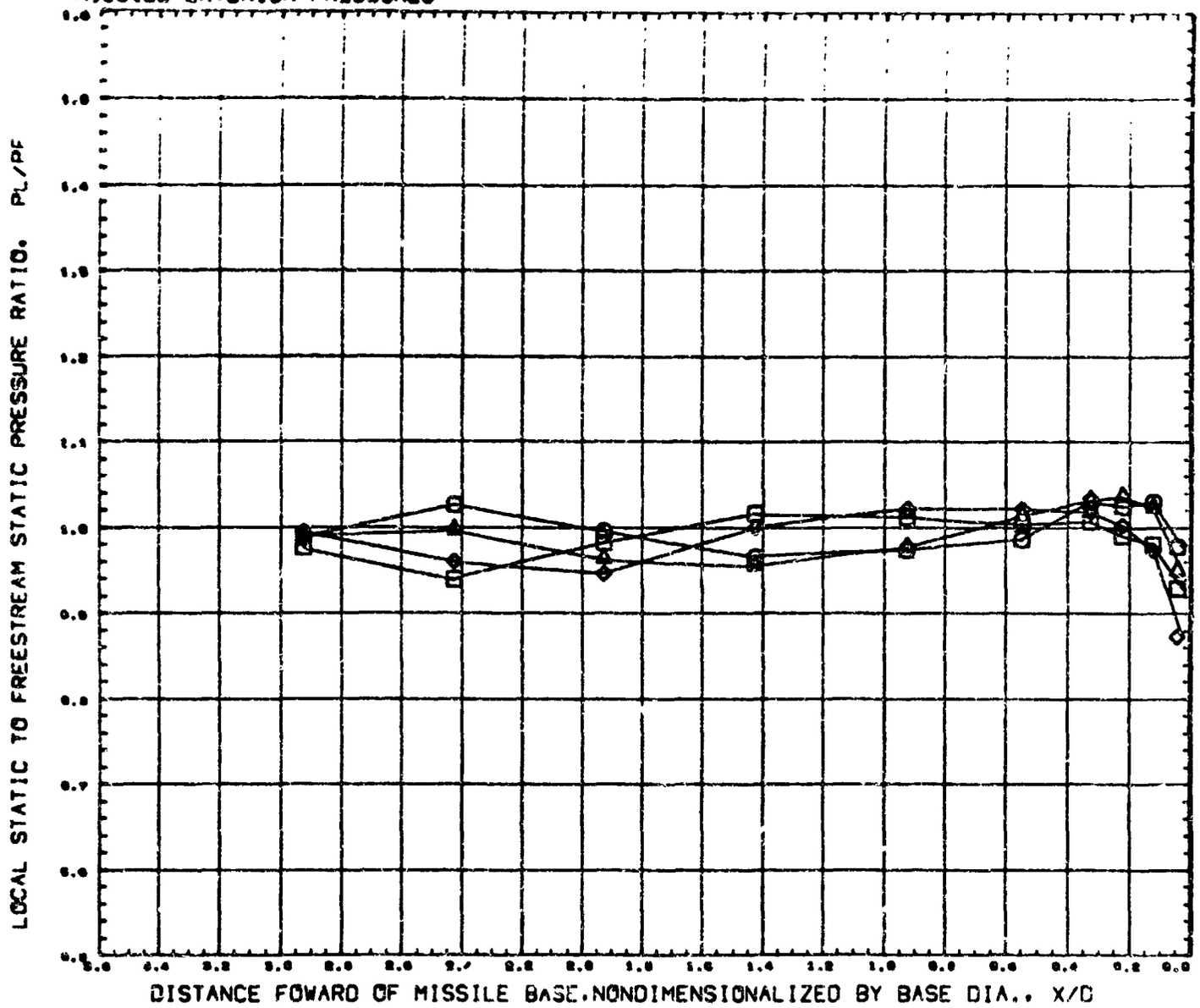
SYMBOL	ALPHA	THETA	MACH
○	0.000	0.000	1.000
⊠	3.010		
◇	3.010		
□	6.050		

PARAMETRIC VALUES

PC	6.000	MACH-J	2.700
DJ/DB	0.500	THETAJ	20.000

REFERENCE FILE

MISSILE EXTERIOR PRESSURES

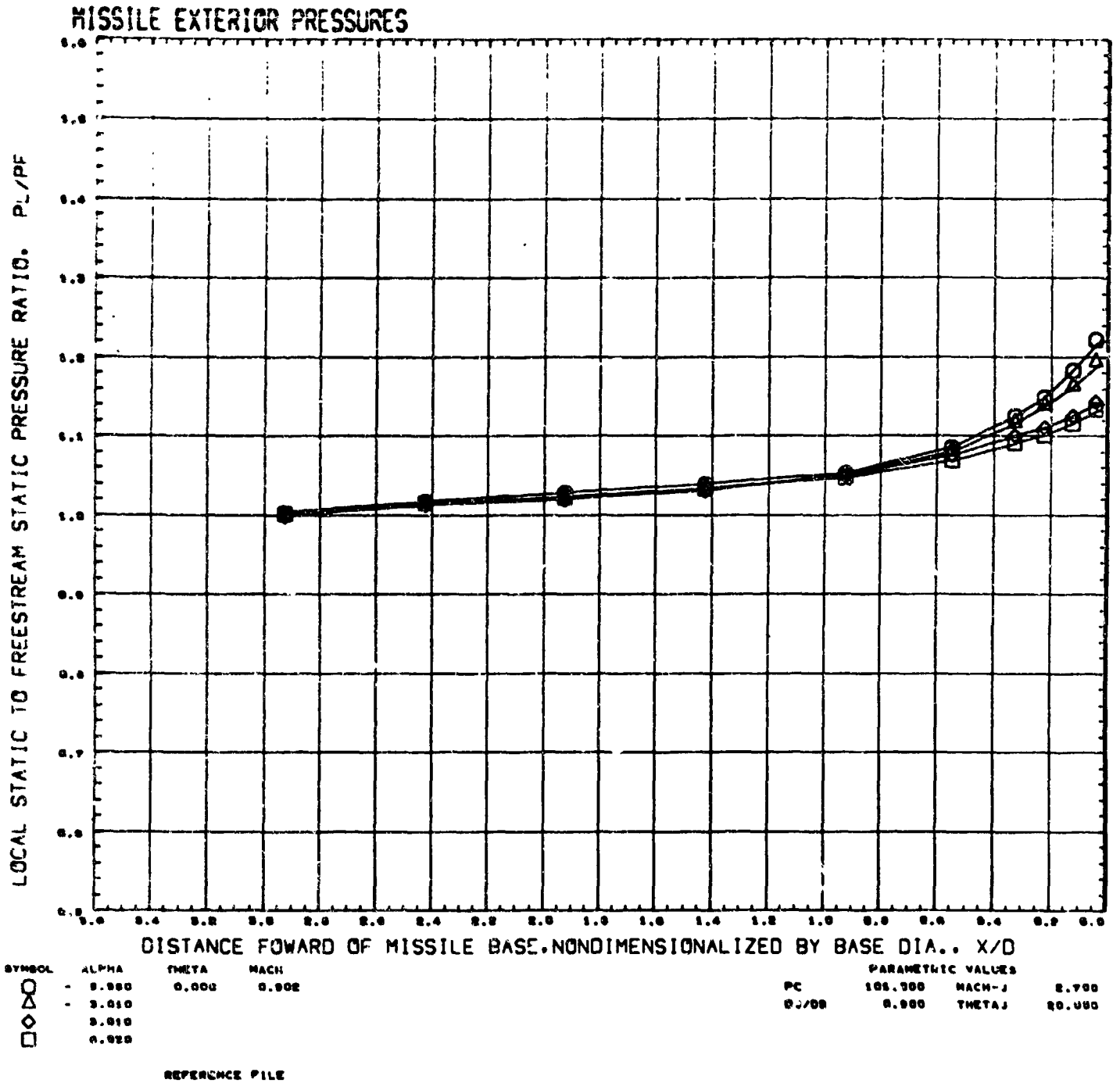


SYMBOL	ALPHA	THETA	MACH
○	0.000	0.000	1.200
△	3.010		
◇	3.010		
□	0.000		

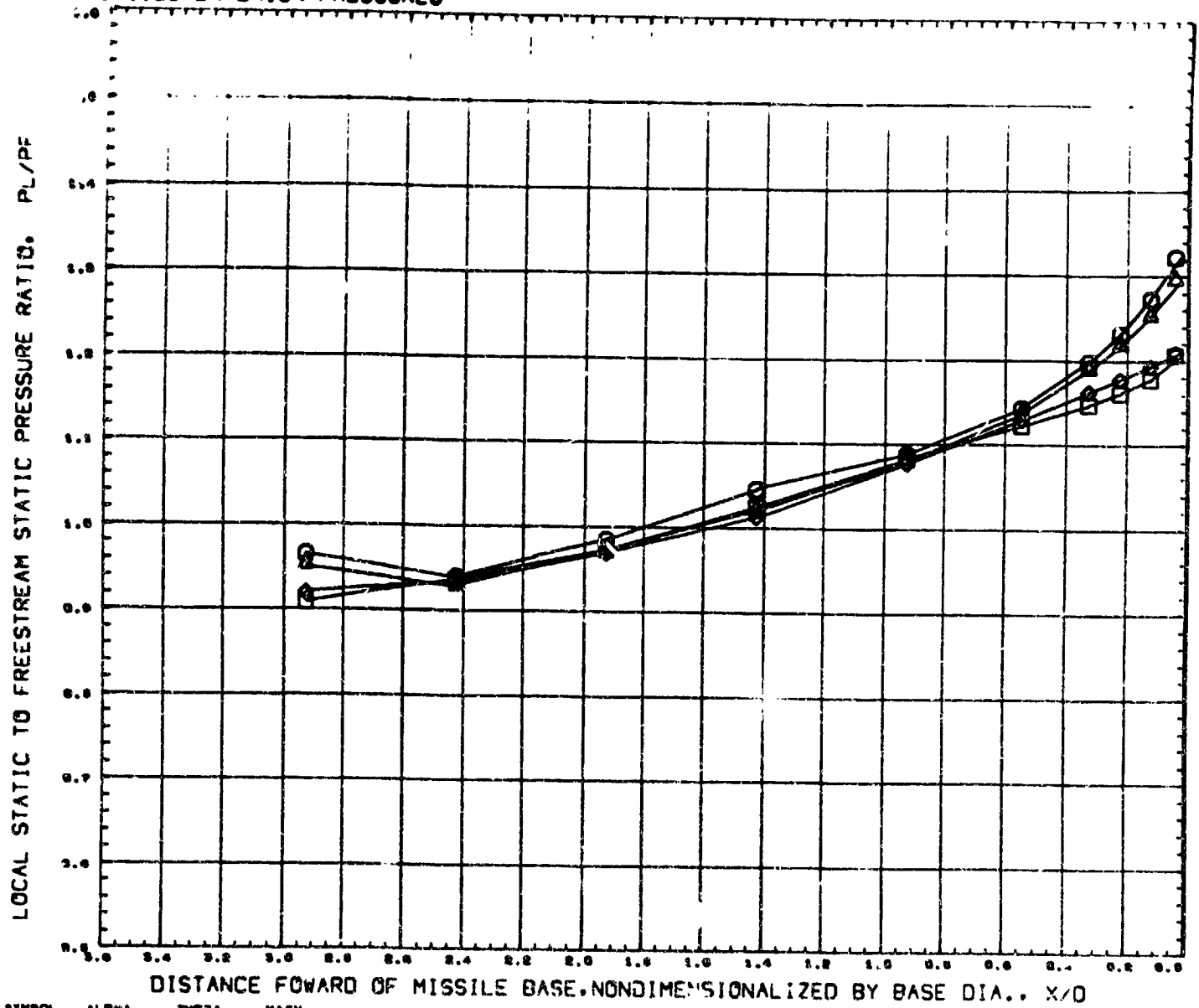
PARAMETRIC VALUES

PC	0.000	MACH-J	2.700
DJ/CB	0.000	THETAJ	80.000

REFERENCE FILE


MISSILE EXTERIOR PRESSURES
LOCAL STATIC TO FREESTREAM STATIC PRESSURE RATIO, PL/PF
DISTANCE FOWARD OF MISSILE BASE,NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL ALPHA THETA MACH
PARAMETRIC VALUES
PC 105.000 MACH-J 2.700
DJ/DB 0.000 THETAJ 20.000
REFERENCE FILE

MISSILE EXTERIOR PRESSURES



SYMBOL	ALPHA	THETA	MACH
○	- 0.000	0.000	1.002
△	- 3.010		
◇	3.010		
□	6.030		

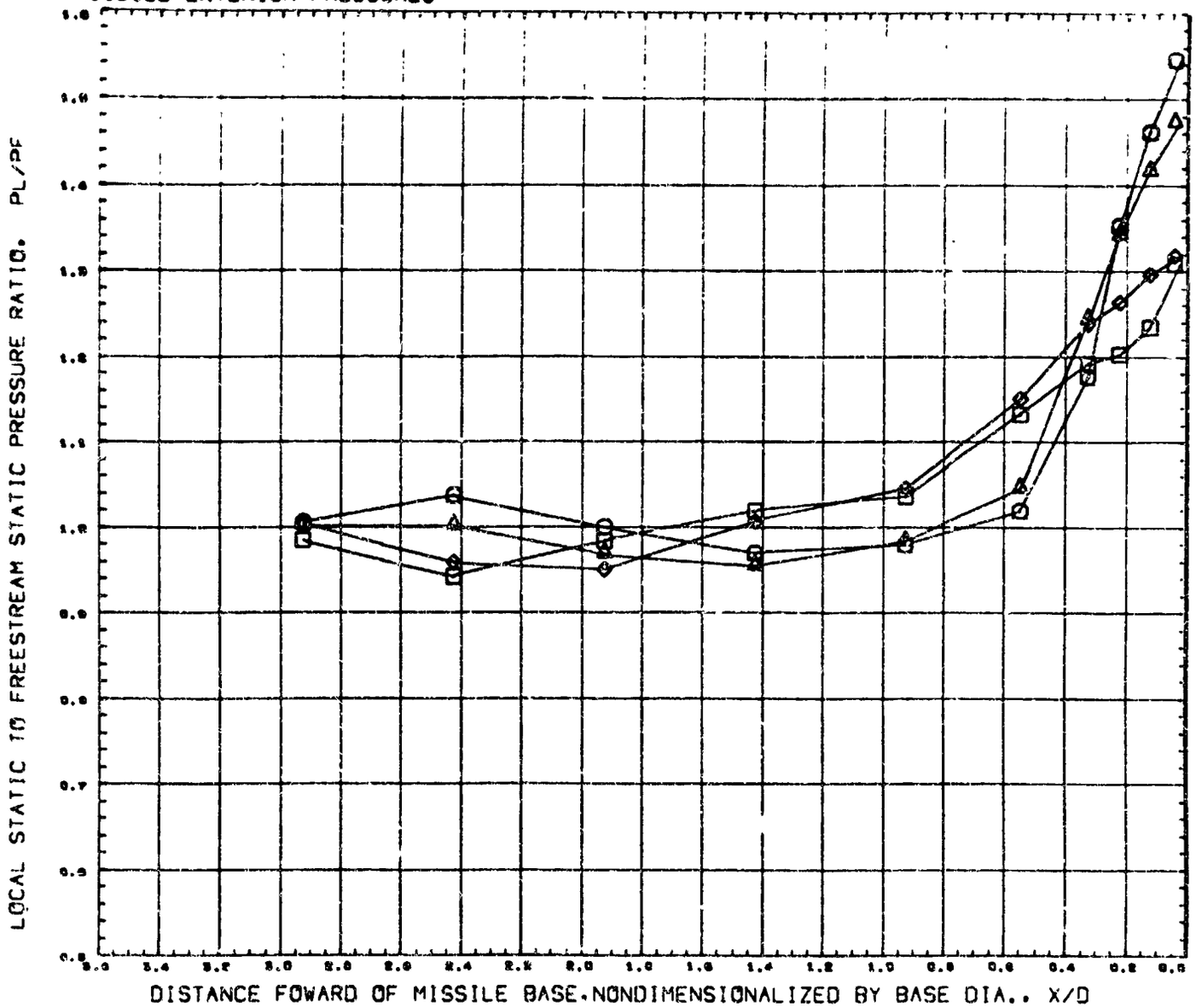
PARAMETRIC VALUES

PC	100.000	MACH-J	2.700
DJ/DB	0.000	THETAJ	20.000

REFERENCE FILE

AMC PLUME STUDY, CONICAL NOZZLE (-2) (RUCE17) PAGE 180

MISSILE EXTERIOR PRESSURES

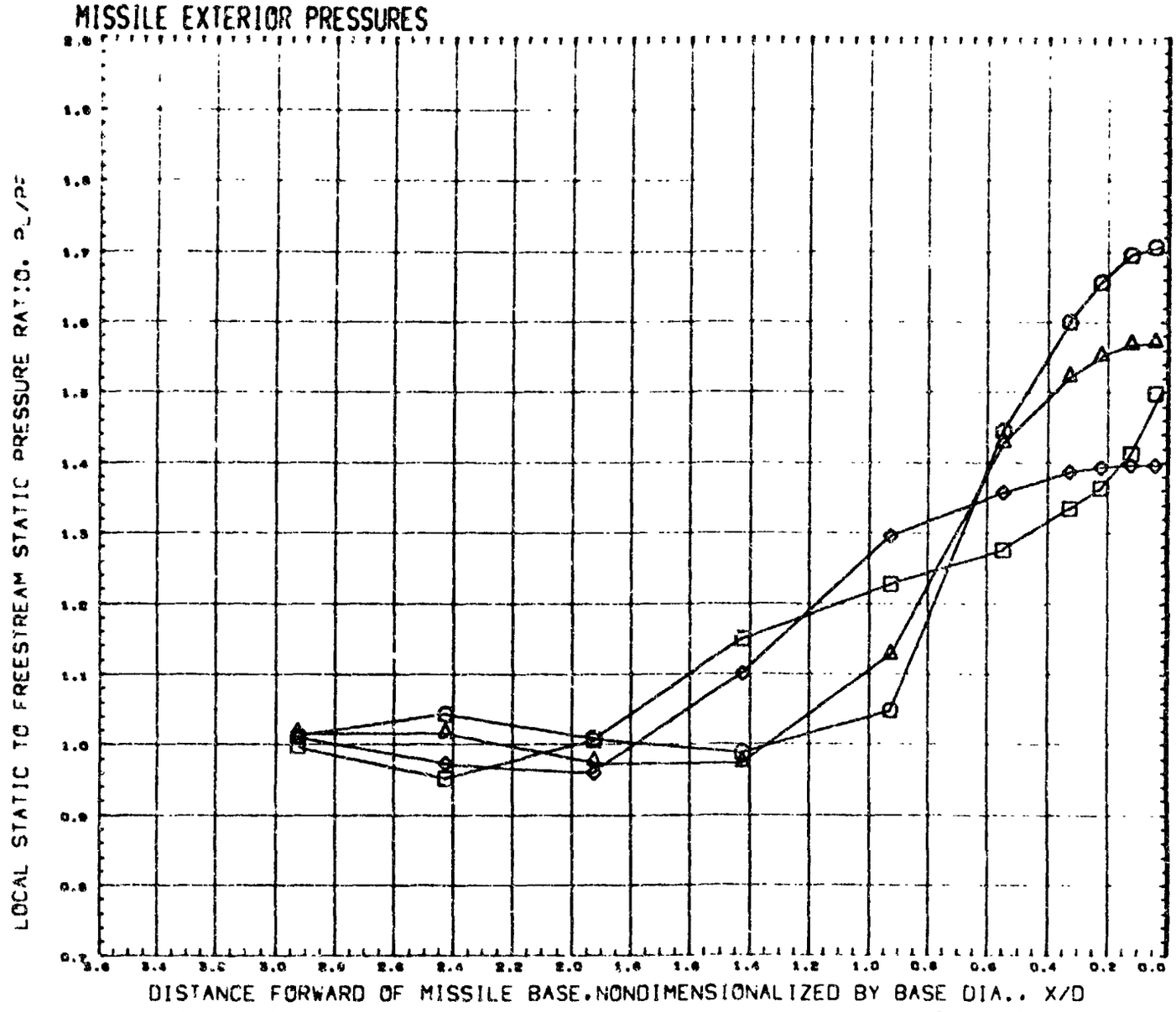


SYMBOL	ALPHA	THETA	MACH
○	0.000	0.000	1.203
△	3.010		
◇	3.010		
□	0.030		

PARAMETRIC VALUES

PC	100.000	MACH-J	2.700
DJ/DB	0.900	THETAJ	20.000

REFERENCE FILE



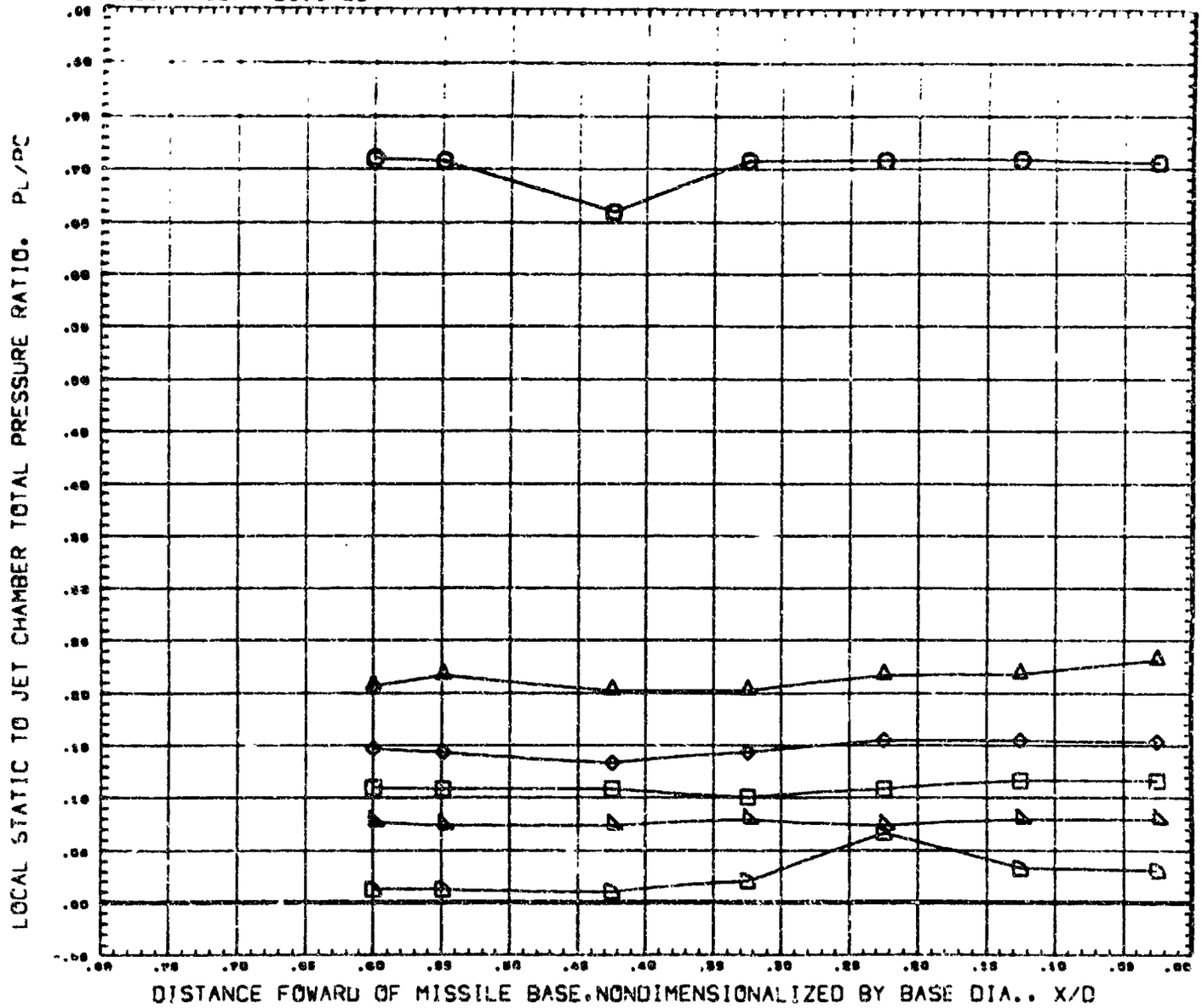
SYMBOL	ALPHA	THETA	MACH
○	- 9.980	0.000	1.200
⊠	- 3.010		
◇	3.010		
□	6.070		

PARAMETRIC VALUES

PC	320.000	MACH-J	2.700
DJ/DB	0.900	THETAJ	20.000

REFERENCE FILE

NOZZLE WALL PRESSURES



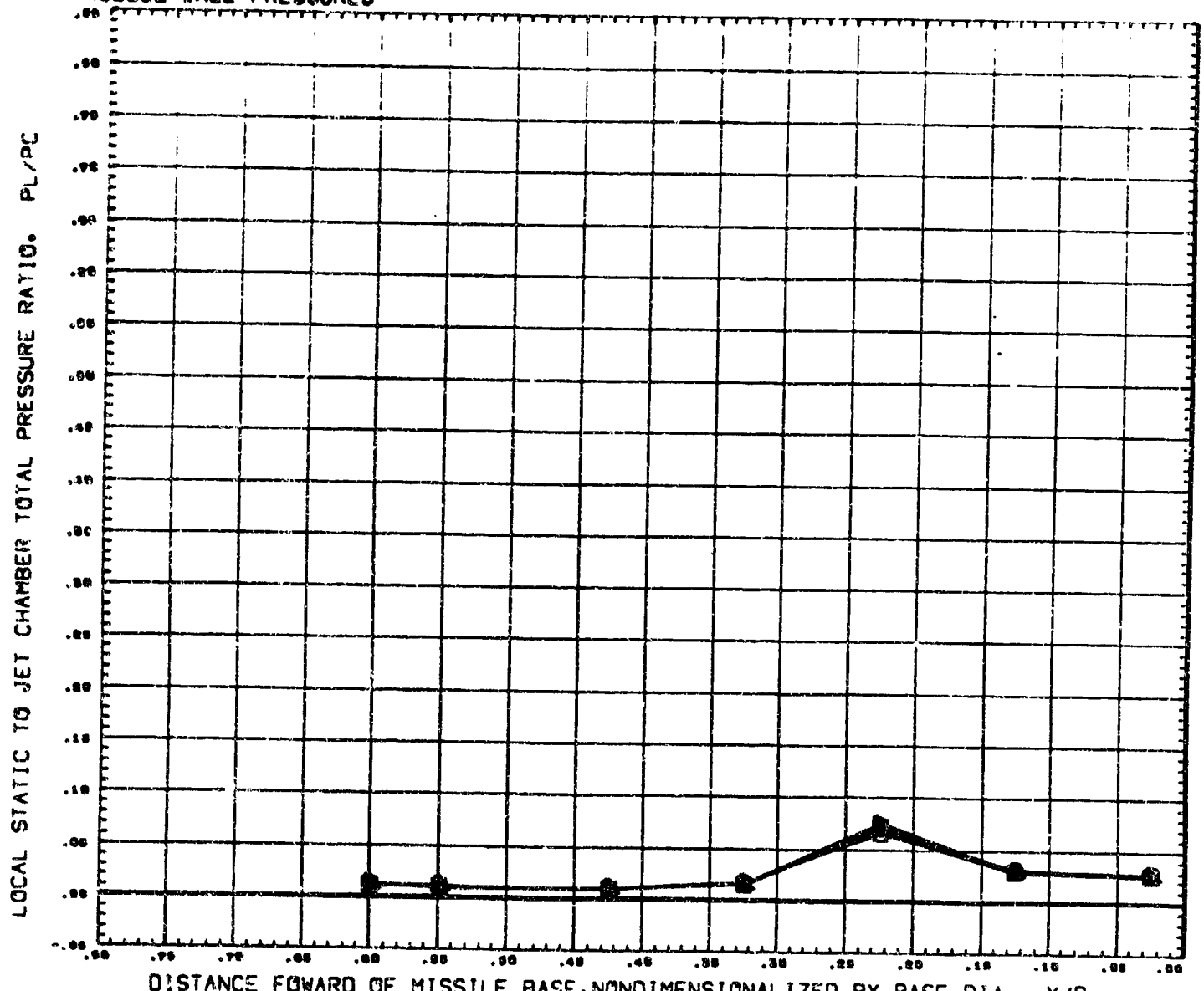
SYMBOL	CT	THETA	MACH
○	0.111	180.000	0.701
△	0.926		
◇	0.821		
□	1.125		
◁	1.268		
▷	0.774	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.000		

AMC PLUME STUDY. SHROUDED NOZZLE(-3).PORTS CLSD (RUCI01)

NOZZLE WALL PRESSURES



SYMBOL	CT	THETA	MACH
	4.440	180.000	0.701
	8.000		
	11.000		
	17.041		
	24.700		
	34.015	REFERENCE FILE	

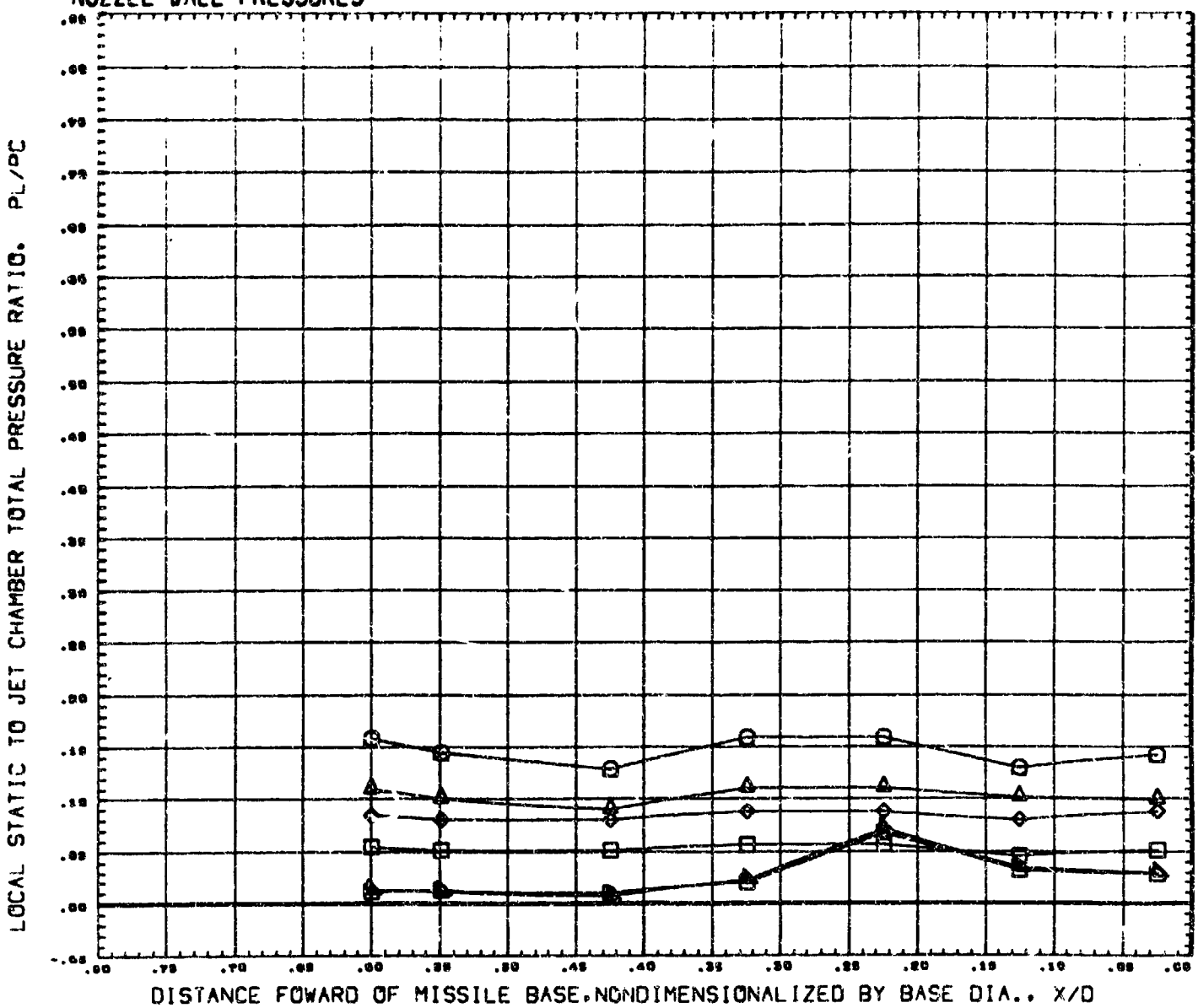
PARAMETRIC VALUES

ALPHA 0.000 MACH-J 1.000

DIA-J 0.000

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUCI01)

NOZZLE WALL PRESSURES



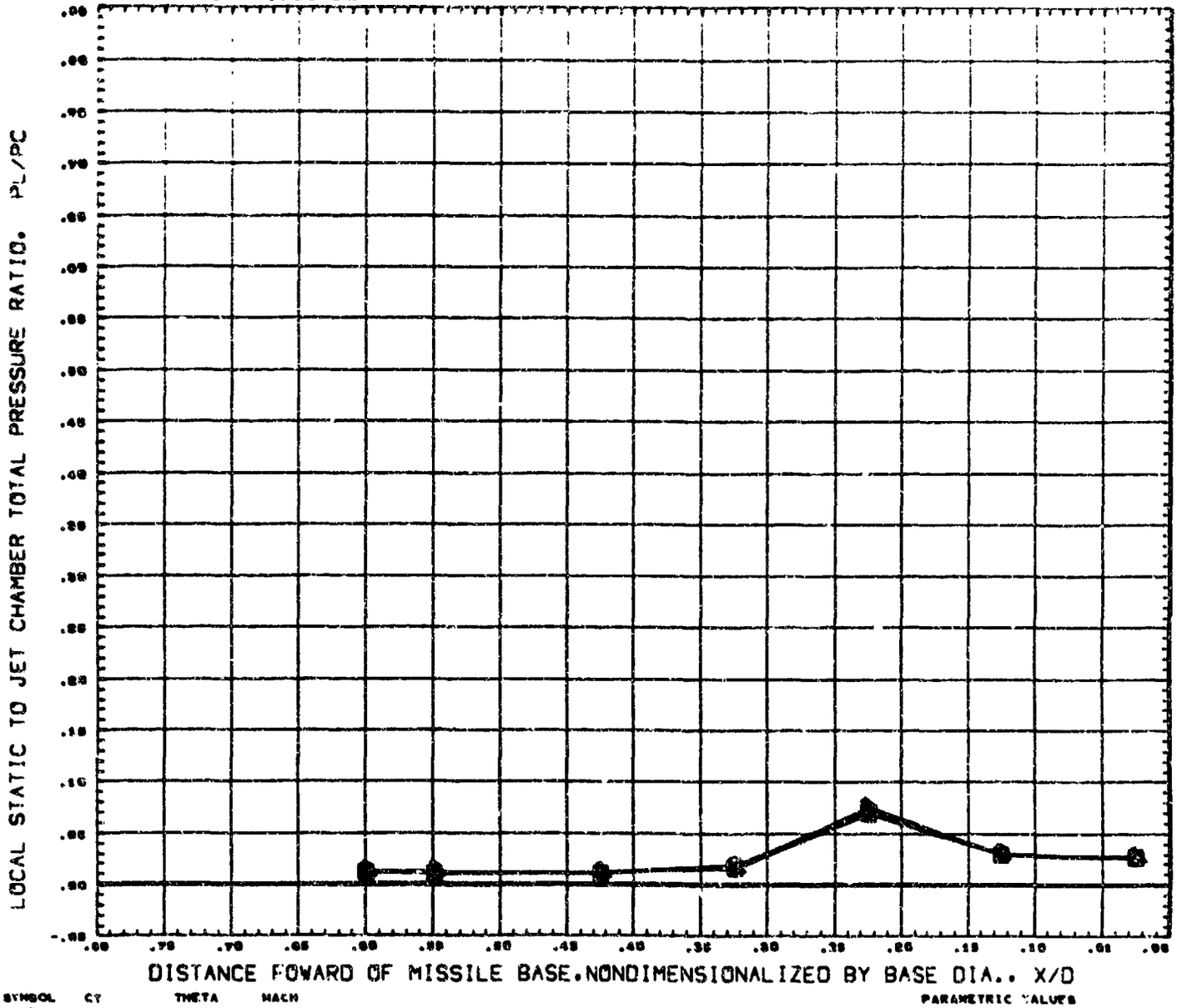
SYMBOL	CT	THETA	MACH
○	0.308	180.000	0.900
△	0.509		
◇	0.671		
□	0.983		
◺	1.090		
D	2.074	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.800		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUCI01)

NOZZLE WALL PRESSURES



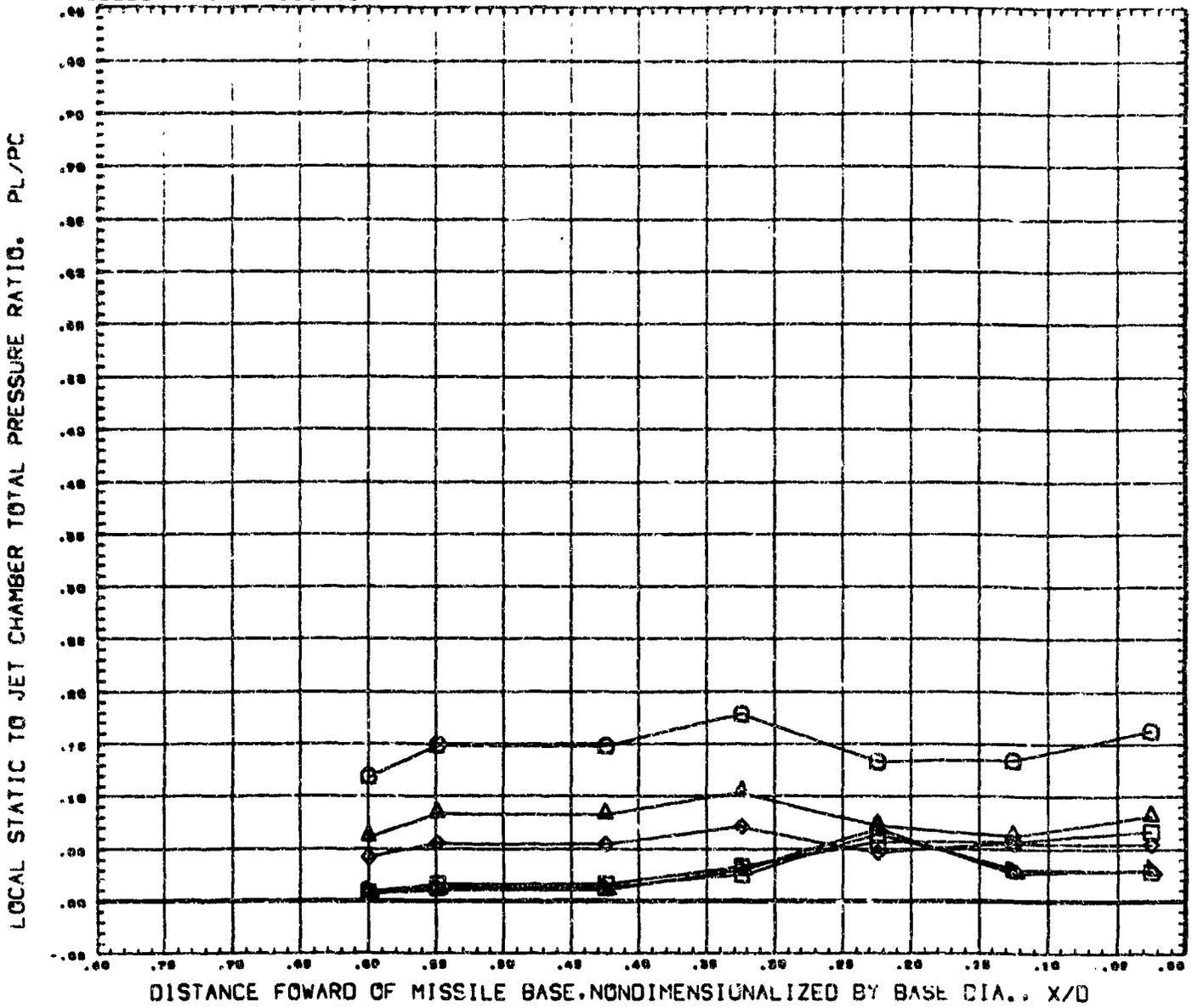
SYMBOL	CY	THETA	MACH
○	3.485	180.000	0.900
△	5.951		
◇	9.992		
□	12.949		
◺	17.228		
D	24.979	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.900		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUCI01)

NOZZLE WALL PRESSURES



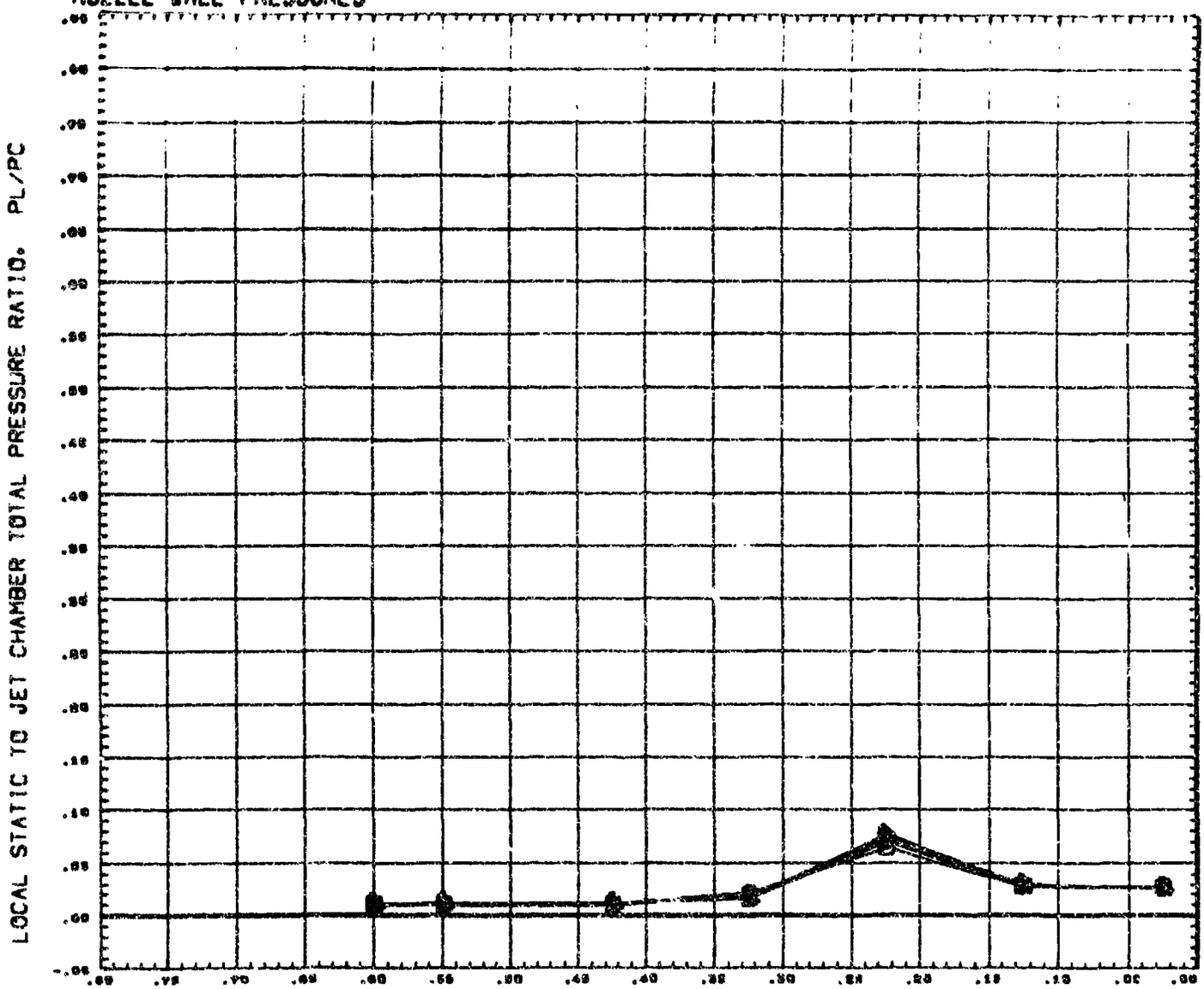
SYMBOL	CT	THETA	MACH
○	0.116	180.000	0.999
△	0.149		
◇	0.306		
□	0.397		
◺	0.933		
D	1.010	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.900		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUC101)

NOZZLE WALL PRESSURES



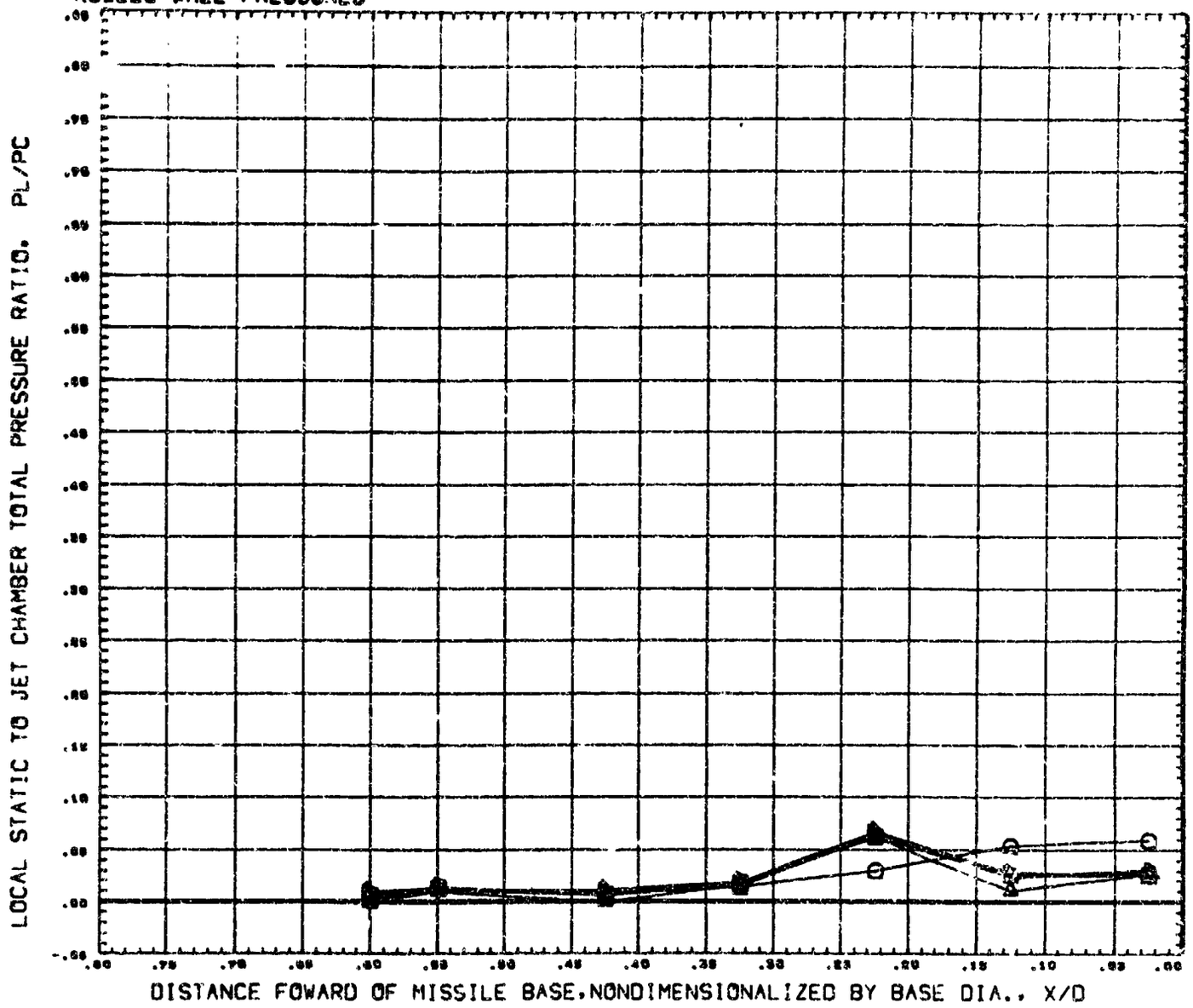
SYMBOL	CT	THETA	MACH
○	5.045	100.000	0.000
△	6.000		
◇	7.013		
□	11.007		
◺	15.012		
D	22.001	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.500		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUCI01)

NOZZLE WALL PRESSURES

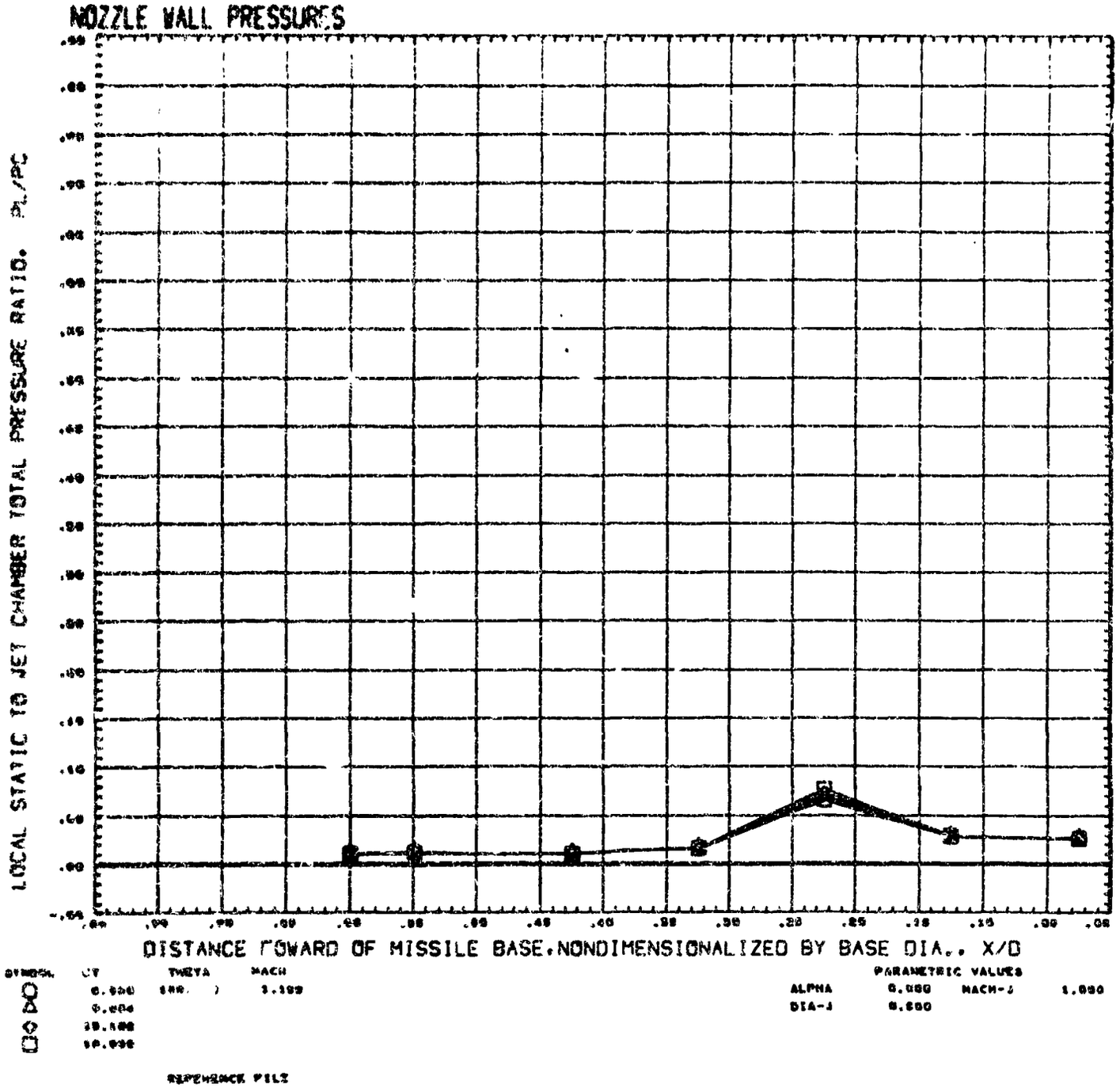


SYMBOL	CT	THETA	MACH
○	0.108	180.000	1.199
△	0.342		
◇	0.873		
□	1.633		
◺	2.866		
D	4.837	REFERENCE FILE	

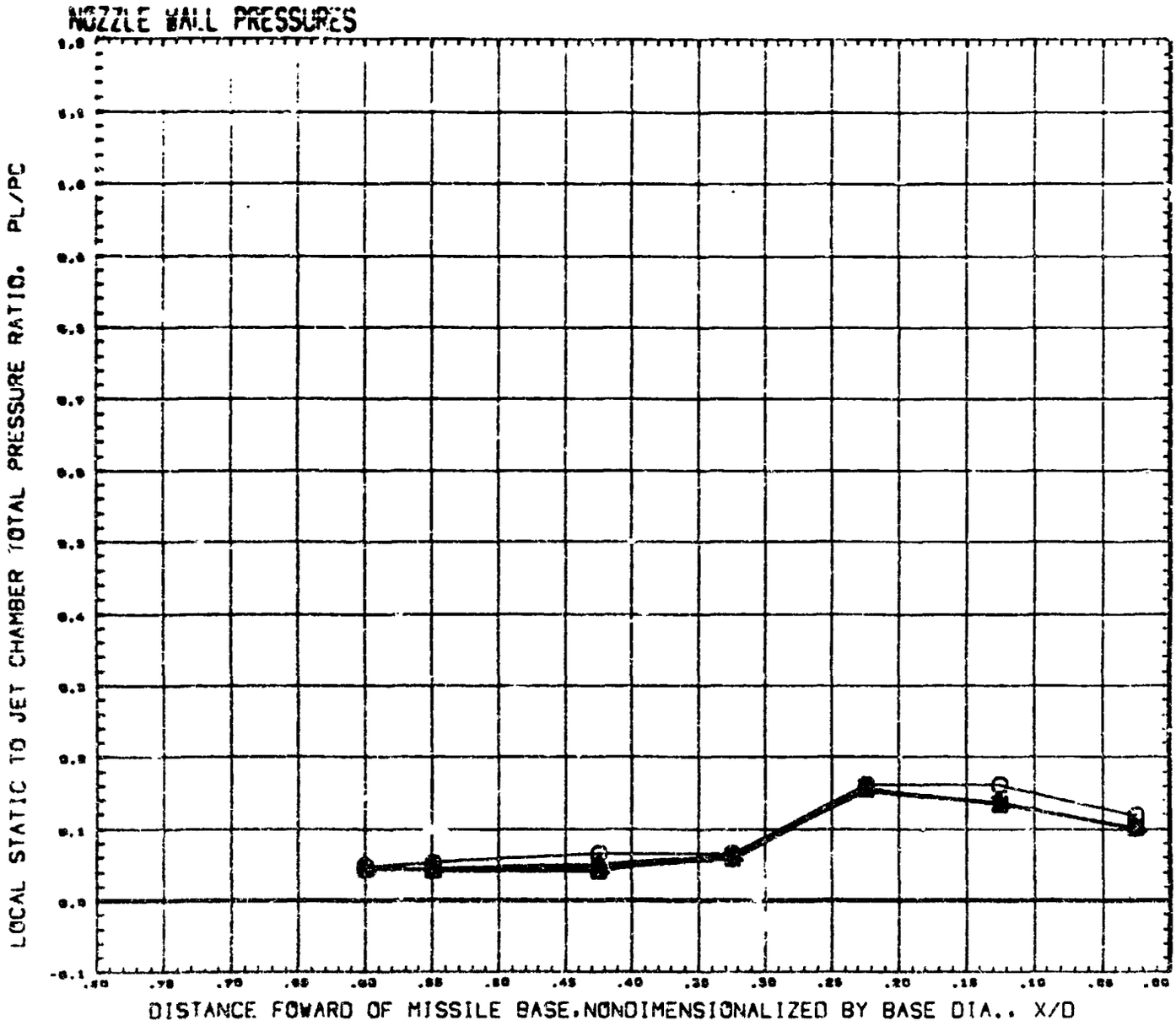
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.800		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS CLSD (RUCI01)


NOZZLE WALL PRESSURES
LOCAL STATIC TO JET CHAMBER TOTAL PRESSURE RATIO, PL/PC
DISTANCE FORWARD OF MISSILE BASE,NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL
CT
THETA
MACH
PARAMETRIC VALUES
ALPHA
MACH-J
DIA-J
REFERENCE FILE

NOZZLE WALL PRESSURES



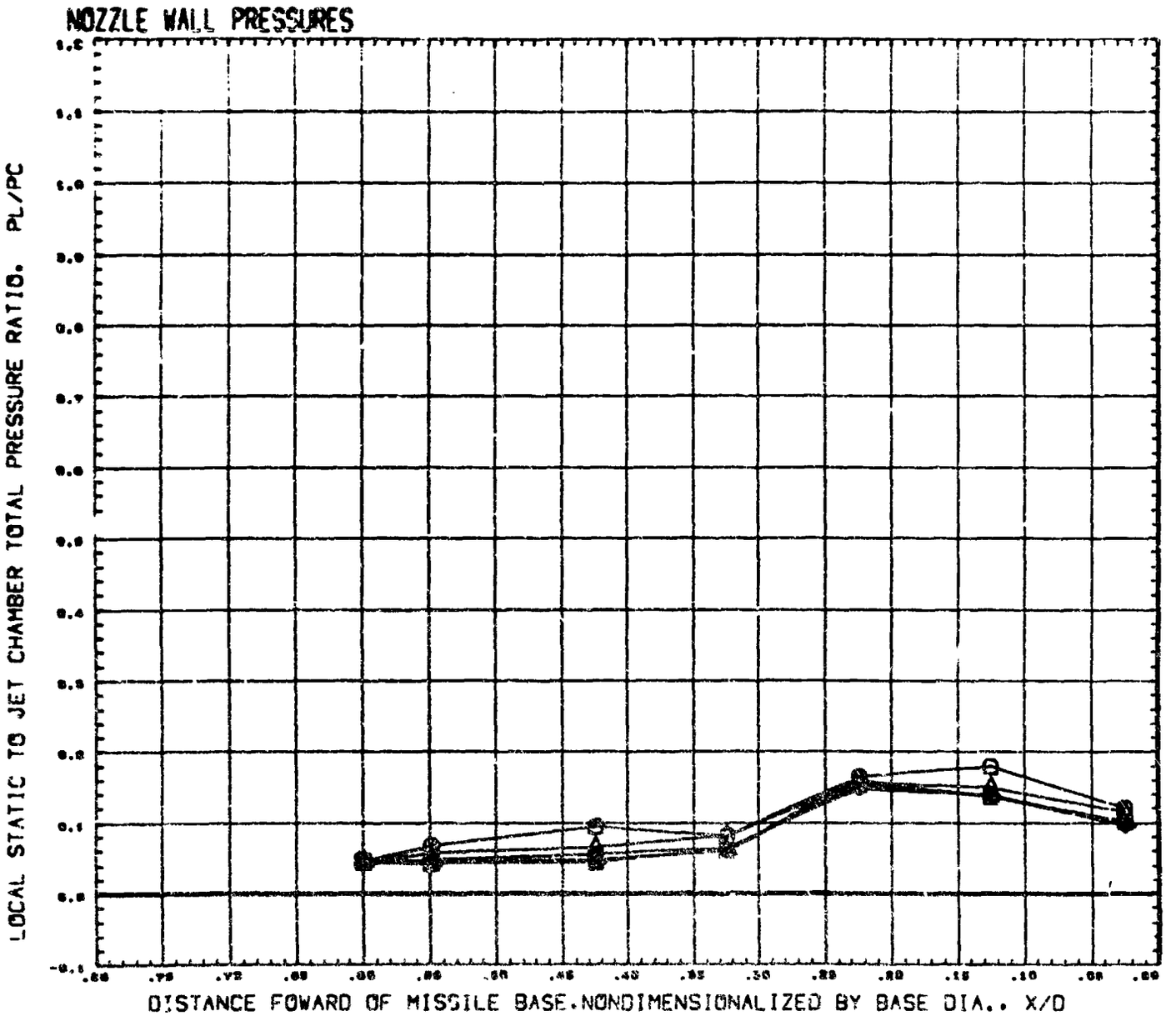
SYMBOL	CT	THETA	MACH
○	1.949	100.000	0.699
△	10.739		
◇	17.397		
□	25.300		
◺	30.070		
D	40.284	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS CLSD (RUCI02)

NOZZLE WALL PRESSURES

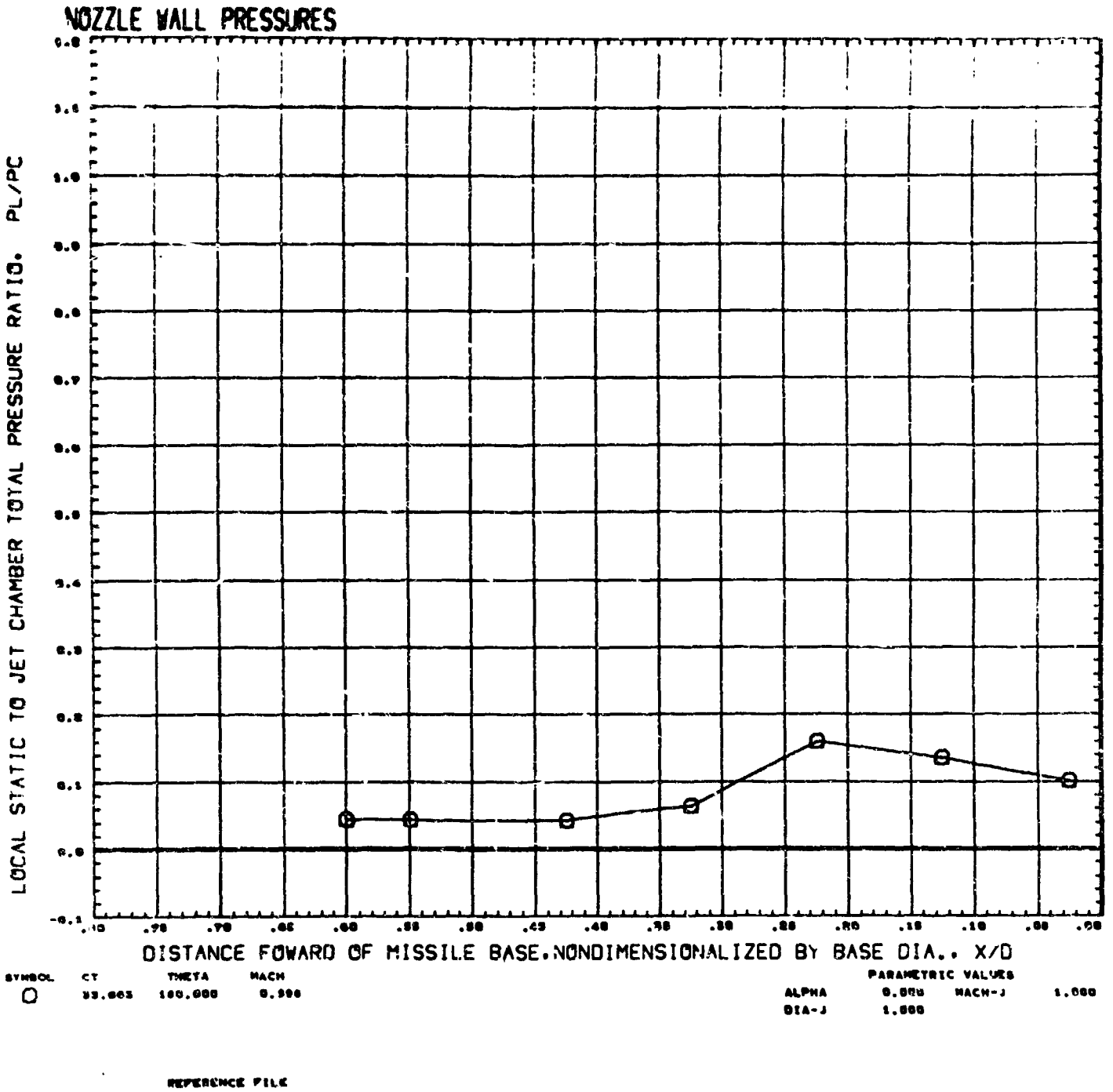


SYMBOL	CT	THETA	MACH
○	1.174	160.000	0.098
△	2.714		
◇	6.094		
□	12.681		
◁	16.700		
D	25.834	REFERENCE FILE	

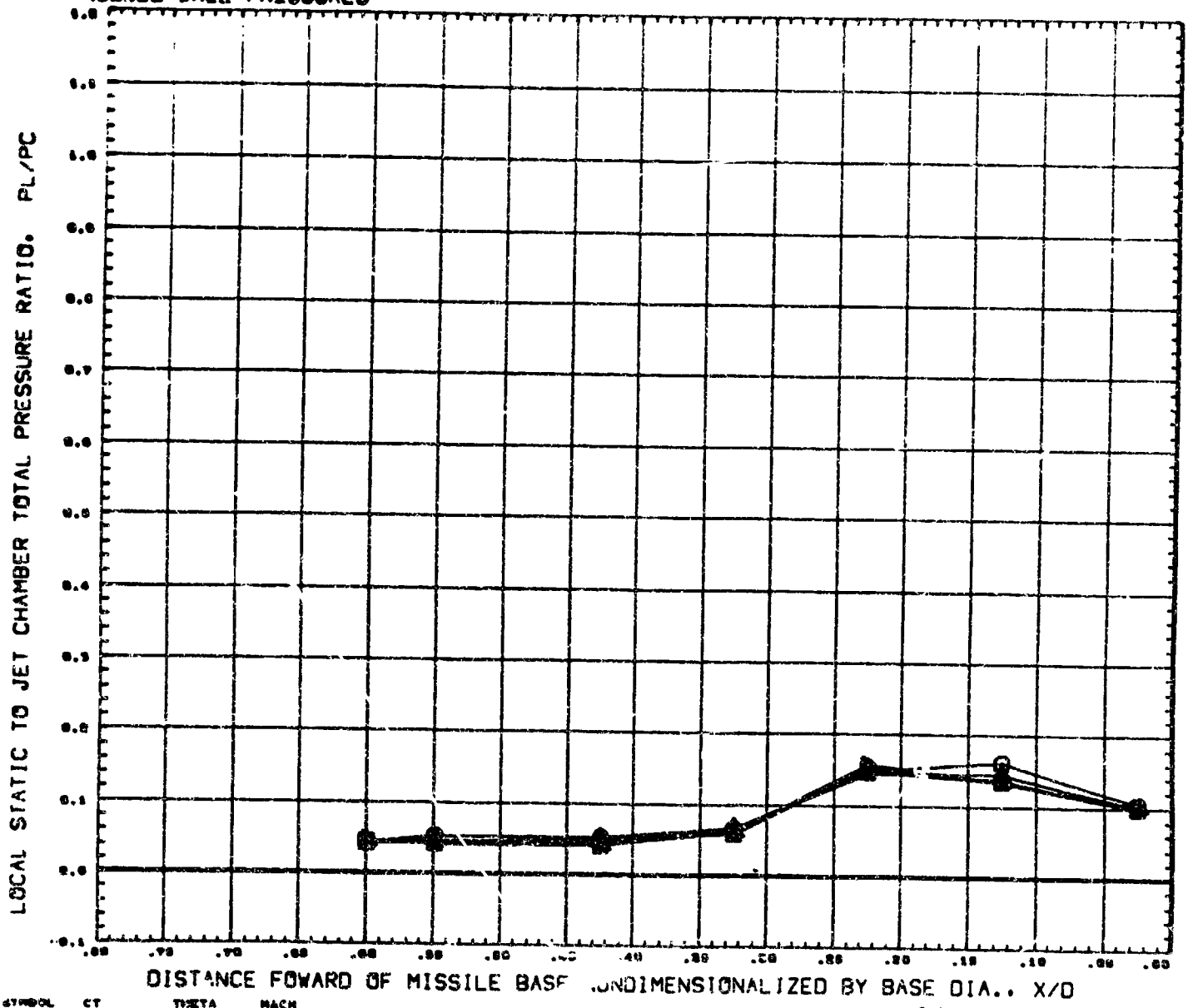
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

AMC PLUME STUDY. SHROUDED NOZZLE(-4).PORTS CLSD (RUCI02)


NOZZLE WALL PRESSURES
LOCAL STATIC TO JET CHAMBER TOTAL PRESSURE RATIO. PL/PC
DISTANCE FOWARD OF MISSILE BASE.NONDIMENSIONALIZED BY BASE DIA.. X/D
SYMBOL CT THETA MACH
PARAMETRIC VALUES
ALPHA 0.000 MACH-J 1.000
DIA-J 1.000
REFERENCE FILE

NOZZLE WALL PRESSURES

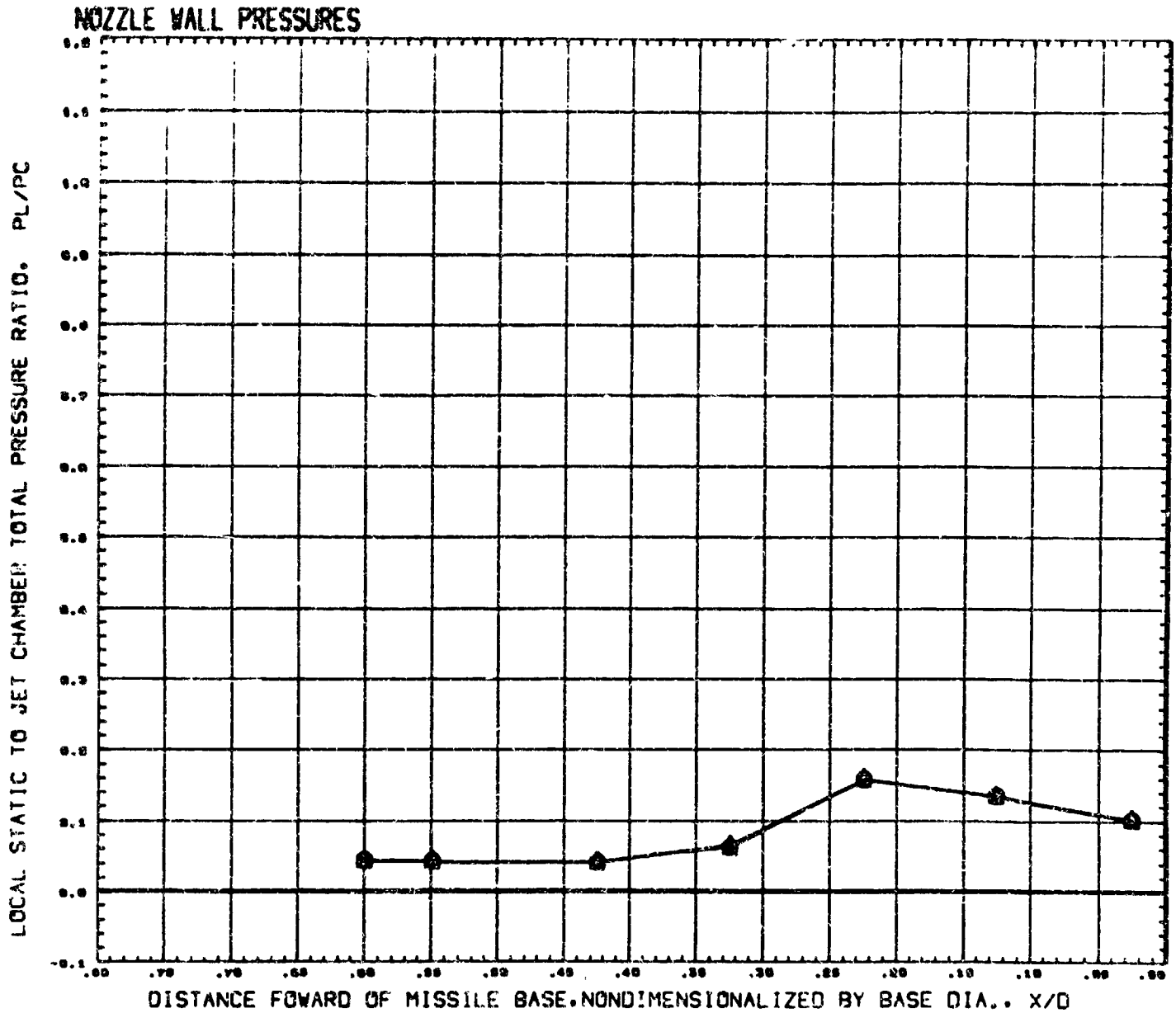


SYMBOL	CT	THETA	MACH
○	1.177	180.000	1.002
△	0.486		
◇	7.065		
□	9.902		
◁	19.400		
D	22.051	REFERENCE FILE	

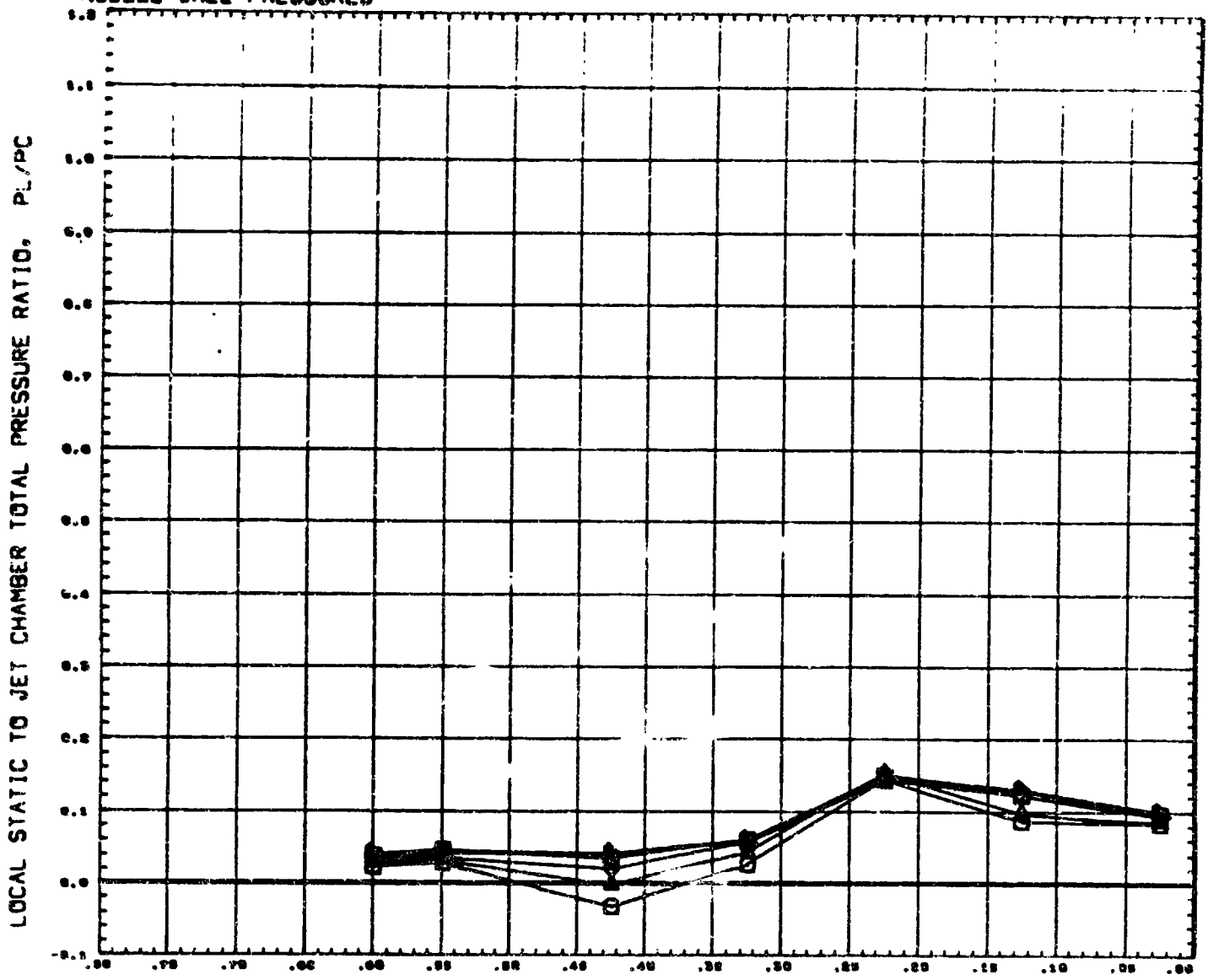
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS CLSD (RUCI02)


NOZZLE WALL PRESSURES
LOCAL STATIC TO JET CHAMBER TOTAL PRESSURE RATIO, PL/PC
DISTANCE FOWARD OF MISSILE BASE,NONDIMENSIONALIZED BY BASE DIA., X/D
SYMBOL CT THETA MACH
PARAMETRIC VALUES
ALPHA 0.000 MACH-J 1.000
DIA-J 1.000
REFERENCE FILE

NOZZLE WALL PRESSURES



SYMBOL	CT	THETA	MACH
	0.000	180.000	1.200
	1.007		
	2.006		
	4.130		
	6.307		
	8.730	REFERENCE FILE	

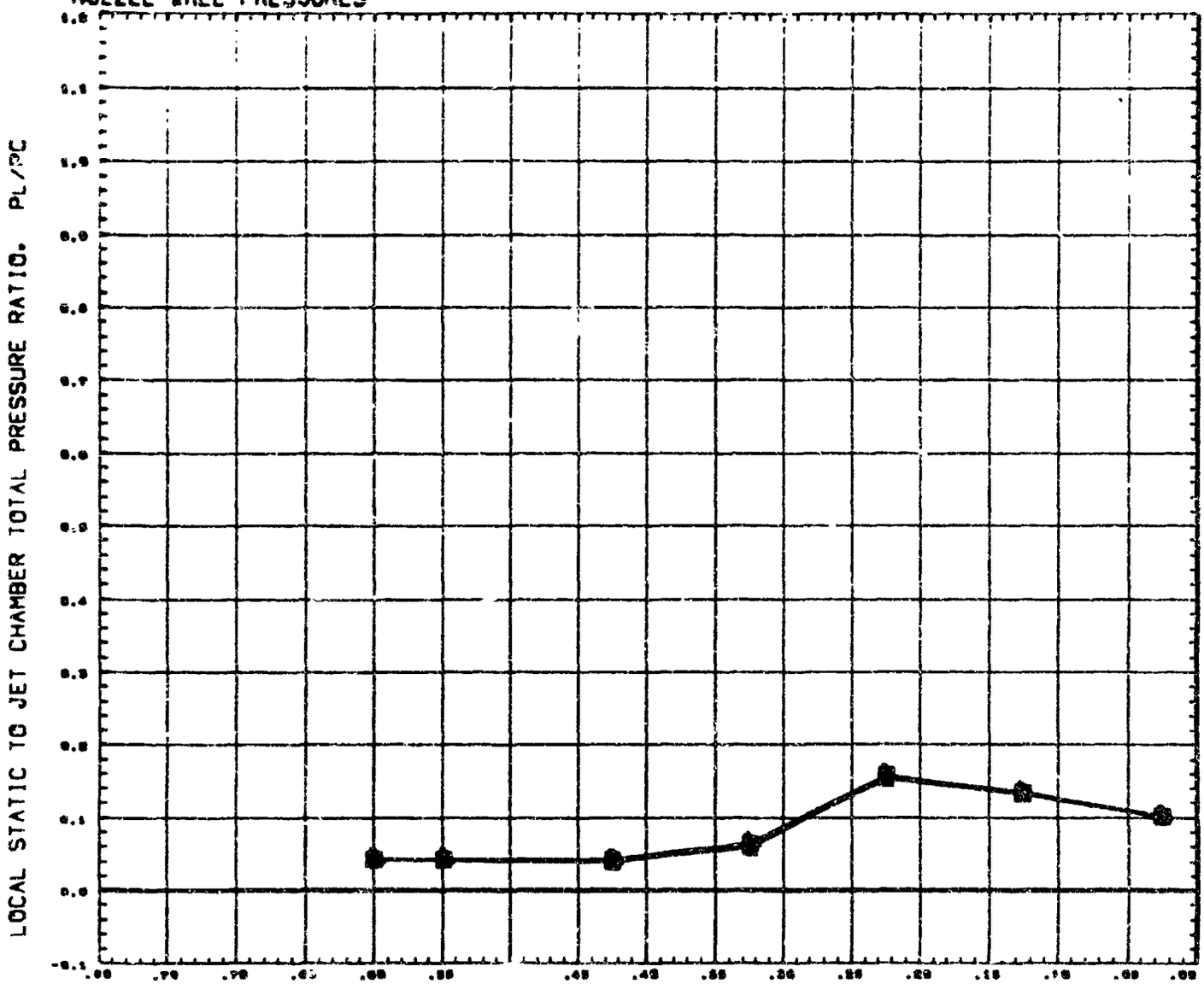
PARAMETRIC VALUES

ALPHA 0.000 MACH-1 1.000

DIA-J 1.000

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS CLSD (RUCI02)

NOZZLE WALL PRESSURES



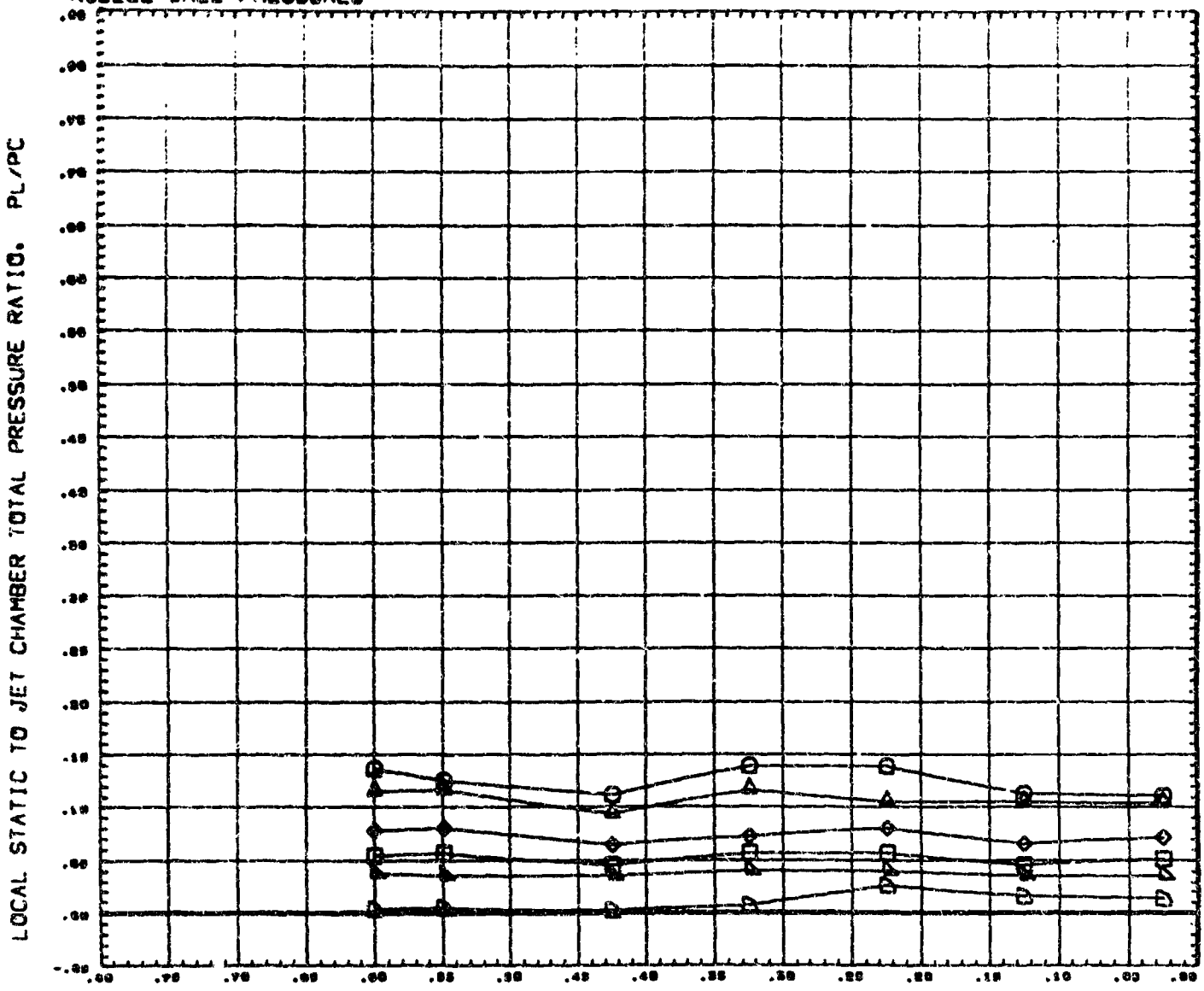
SYMBOL	CT	THETA	MACH
○	13.635	160.000	1.200
△	10.192		
◇	24.626		
□	37.284		
◺	58.442		
D	69.948	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

AMC PLUME STUDY. SHROUDED NOZZLE(-4).PORTS CLSD (RUCI02)

NOZZLE WALL PRESSURES

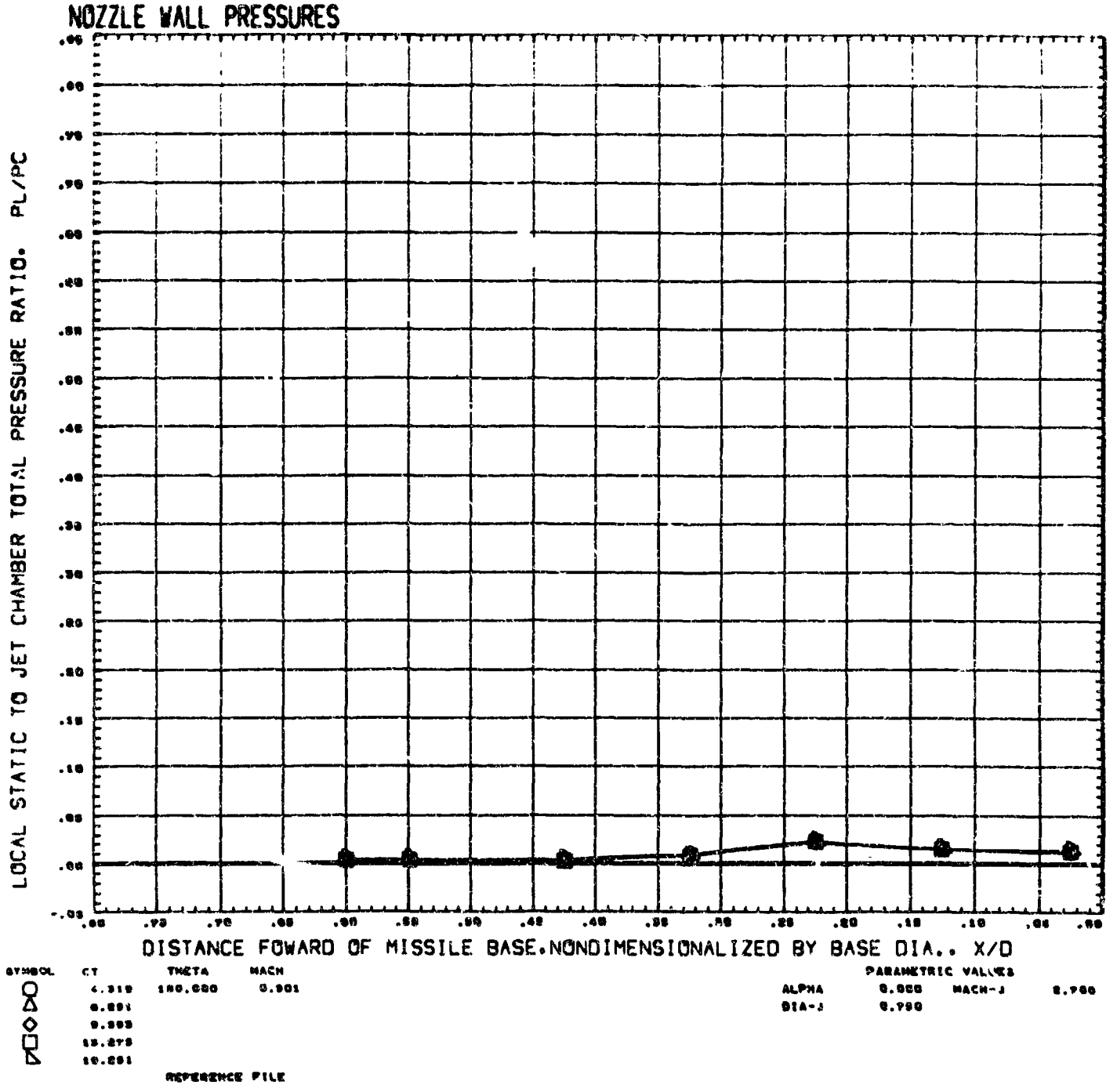


SYMBOL	CT	THETA	MACH
○	0.107	100.000	0.001
△	0.207		
◇	0.043		
□	0.084		
◺	1.403		
D	2.400	REFERENCE FILE	

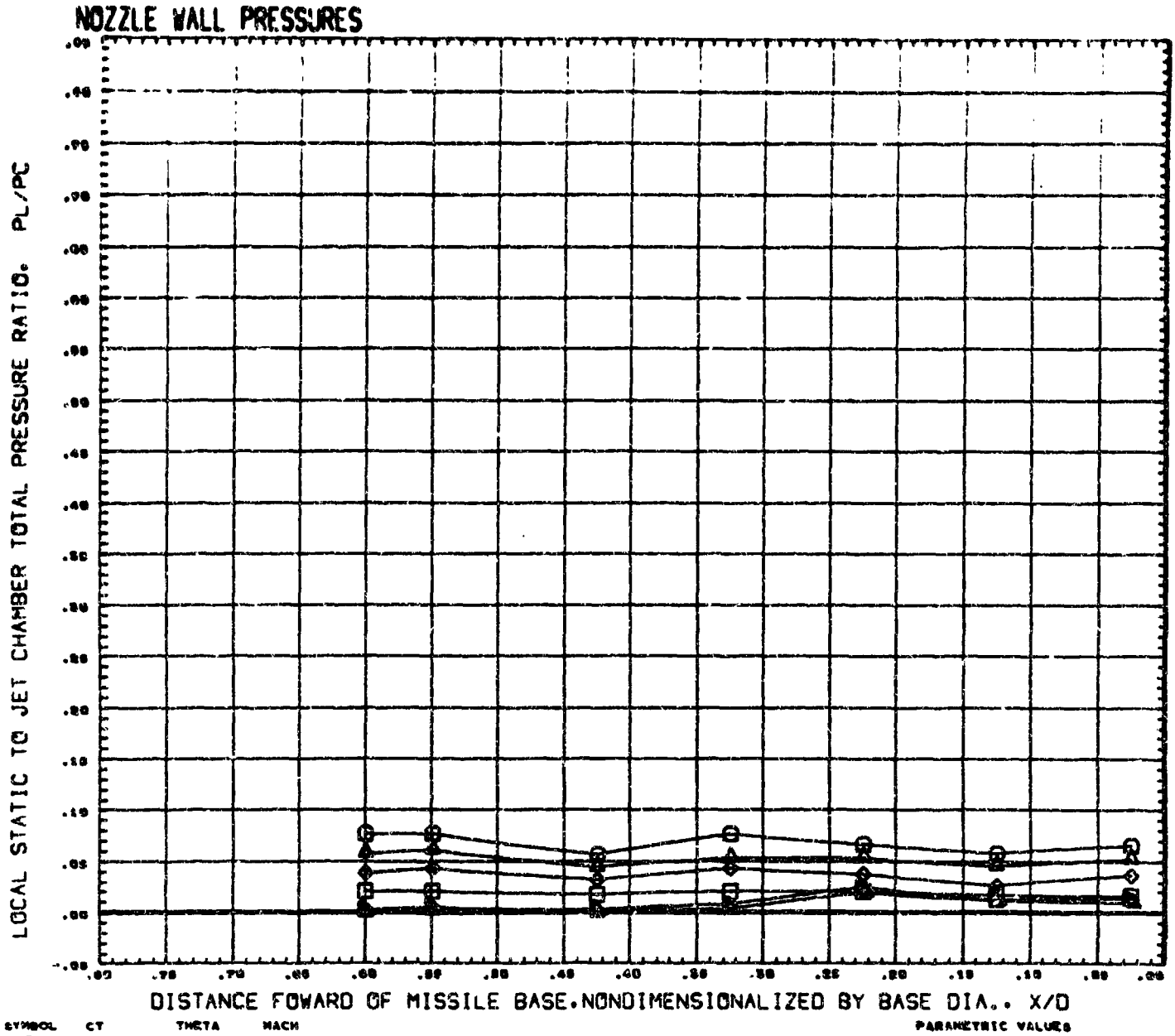
PARAMETRIC VALUES

/'PNA	0.000	MACH-J	2.700
DIA-J	0.750		

AMC PLUME STUDY, SHROUDED NOZZLE(-2).PORTS CLSD (RUCI03)



AMC PLUME STUDY. SHROUDED NOZZLE(-2).PORTS CLSD (RUCI03)

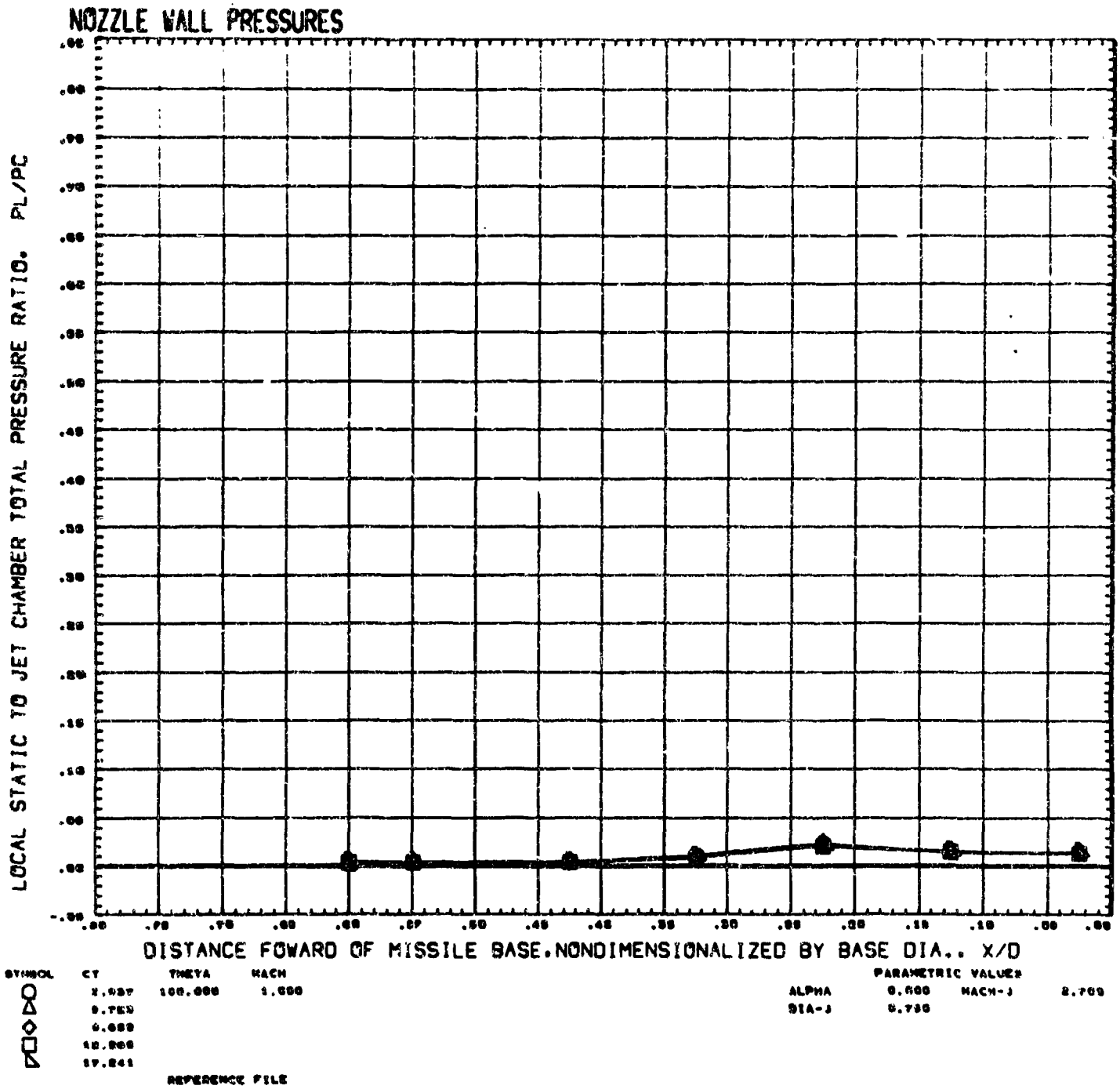


SYMBOL	CT	THETA	MACH
	0.168	180.000	1.060
	0.307		
	0.594		
	0.999		
	1.393		
	2.194	REFERENCE FILE	

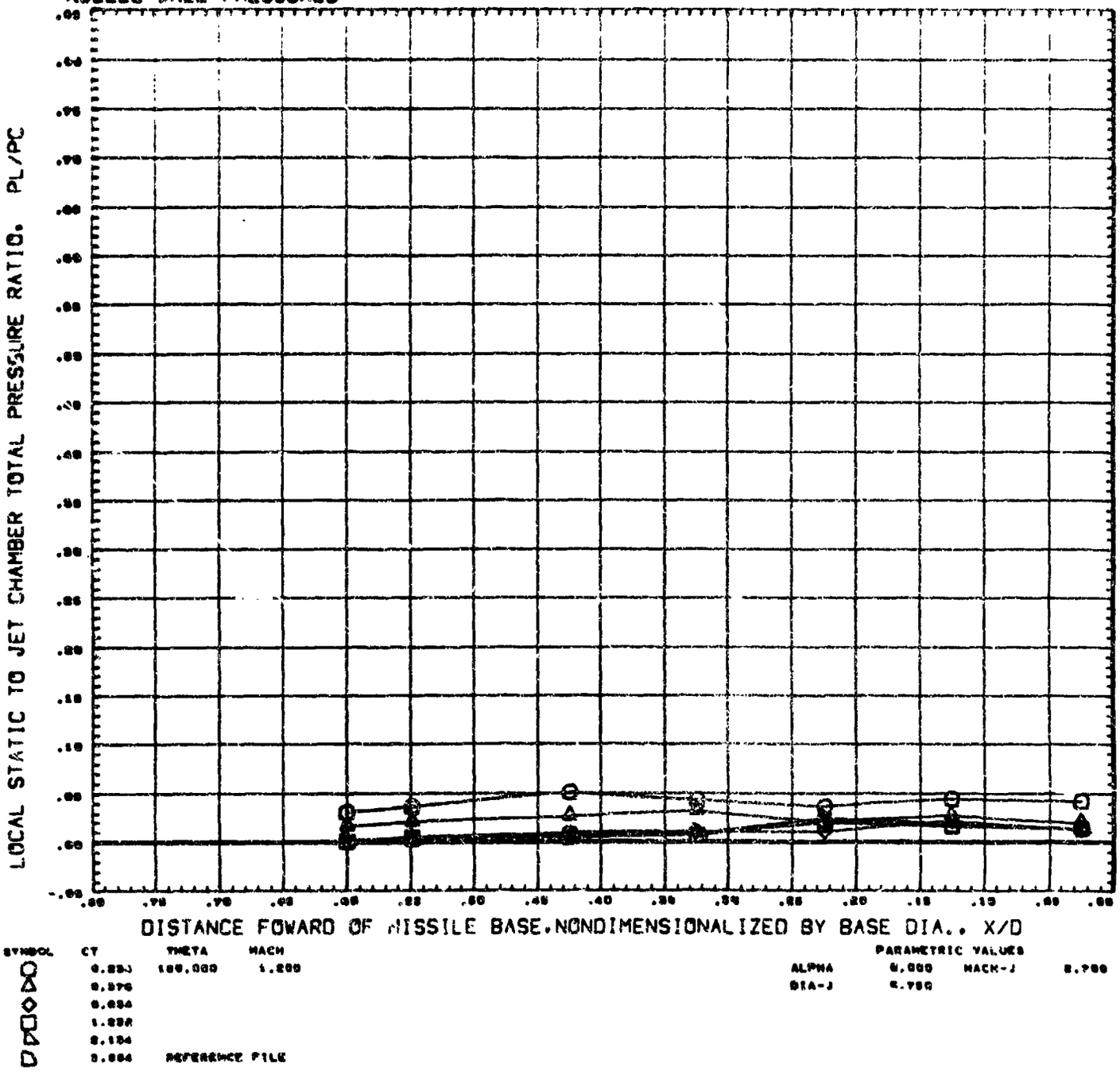
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	0.738
DIA-J	0.750		

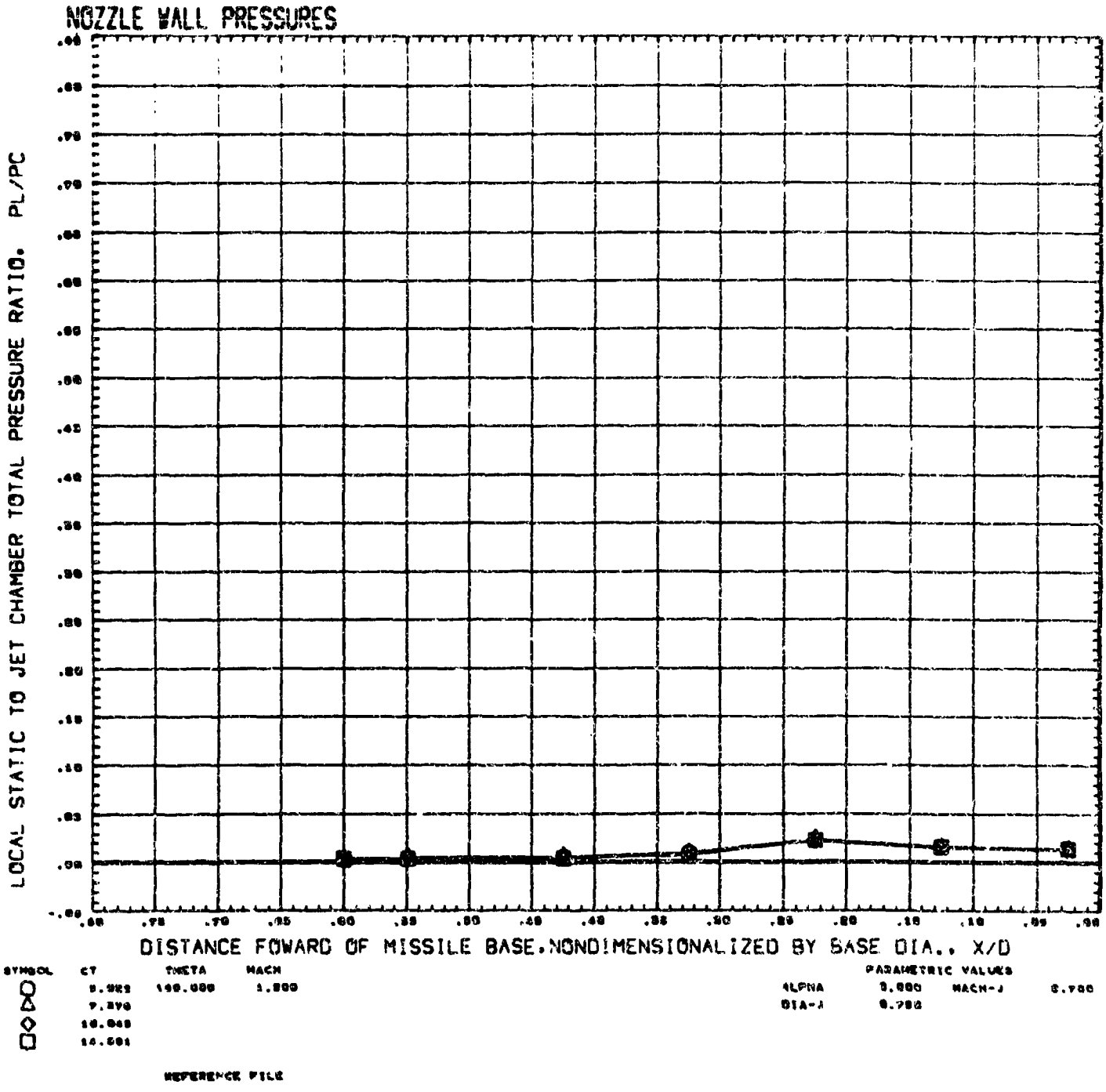
AMC PLUME STUDY. SHROUDED NOZZLE(-2).PORTS CLSO (RUCI03)


NOZZLE WALL PRESSURES
LOCAL STATIC TO JET CHAMBER TOTAL PRESSURE RATIO. PL/PC
DISTANCE FOWARD OF MISSILE BASE.NONDIMENSIONALIZED BY BASE DIA.. X/D
SYMBOL CT THETA MACH
PARAMETRIC VALUES
ALPHA
MACH-J
DIA-J
REFERENCE FILE

NOZZLE WALL PRESSURES

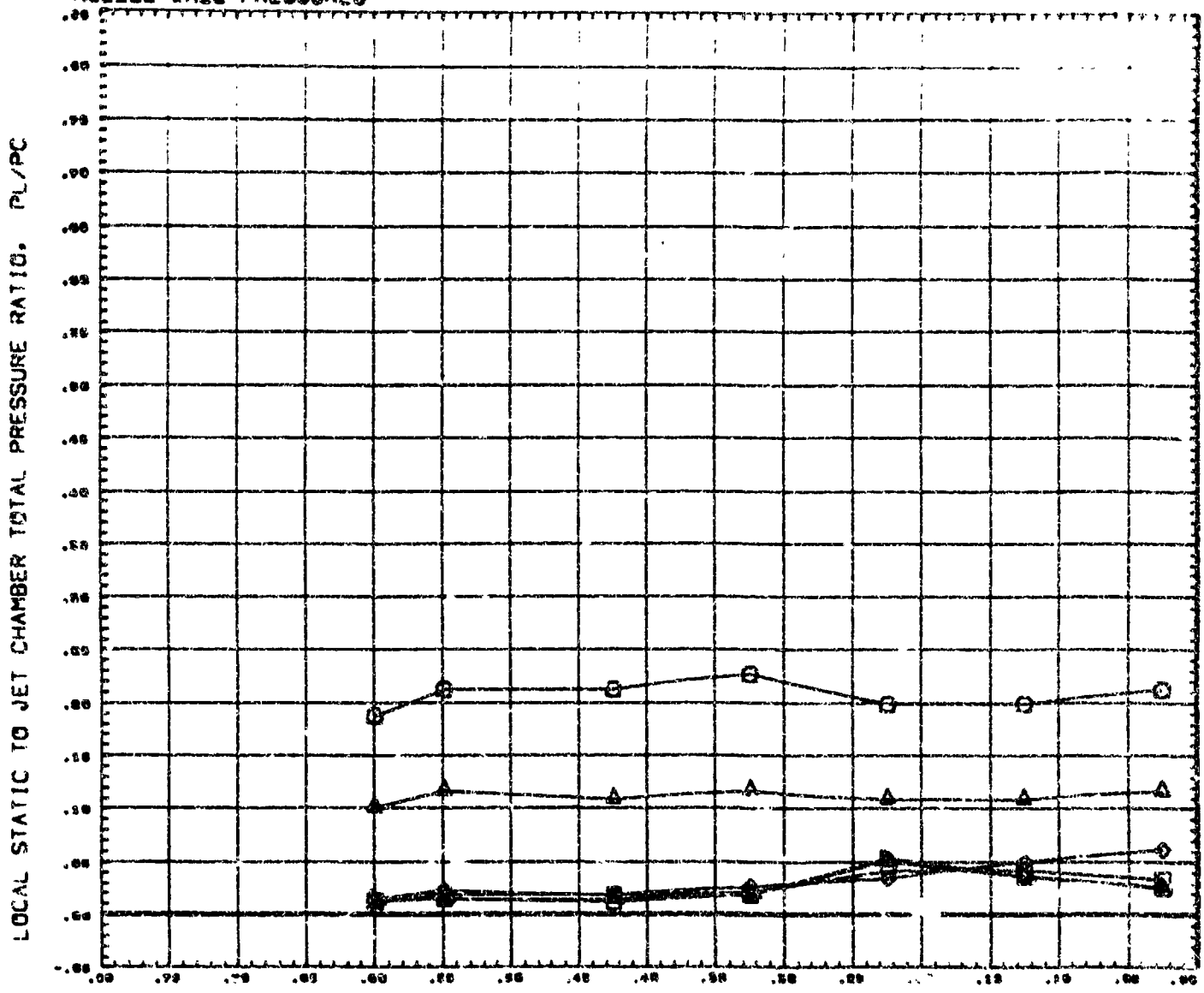


AMC PLUME STUDY, SHROUDED NOZZLE(-2),PORTS CLSD (RUCI03)



AMC PLUME STUDY, SHROUDED NOZZLE(-2),PORTS CLSD (RUC103)

NOZZLE WALL PRESSURES

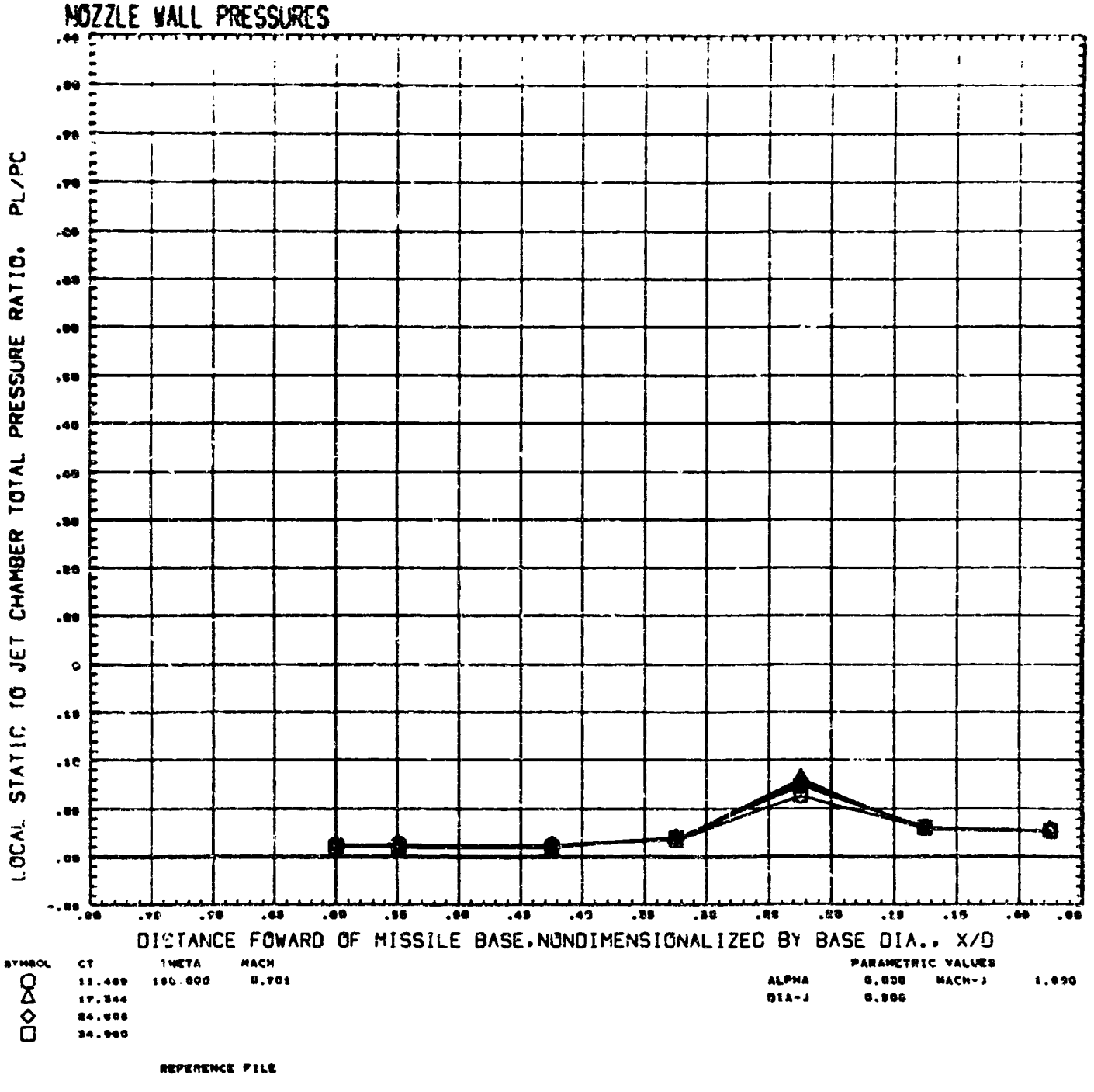


SYMBOL	CT	THETA	MACH
○	0.478	100.000	0.701
△	1.004		
◇	1.237		
□	2.007		
◺	6.278		
D	7.901	REFERENCE FILE	

PARAMETRIC VALUES

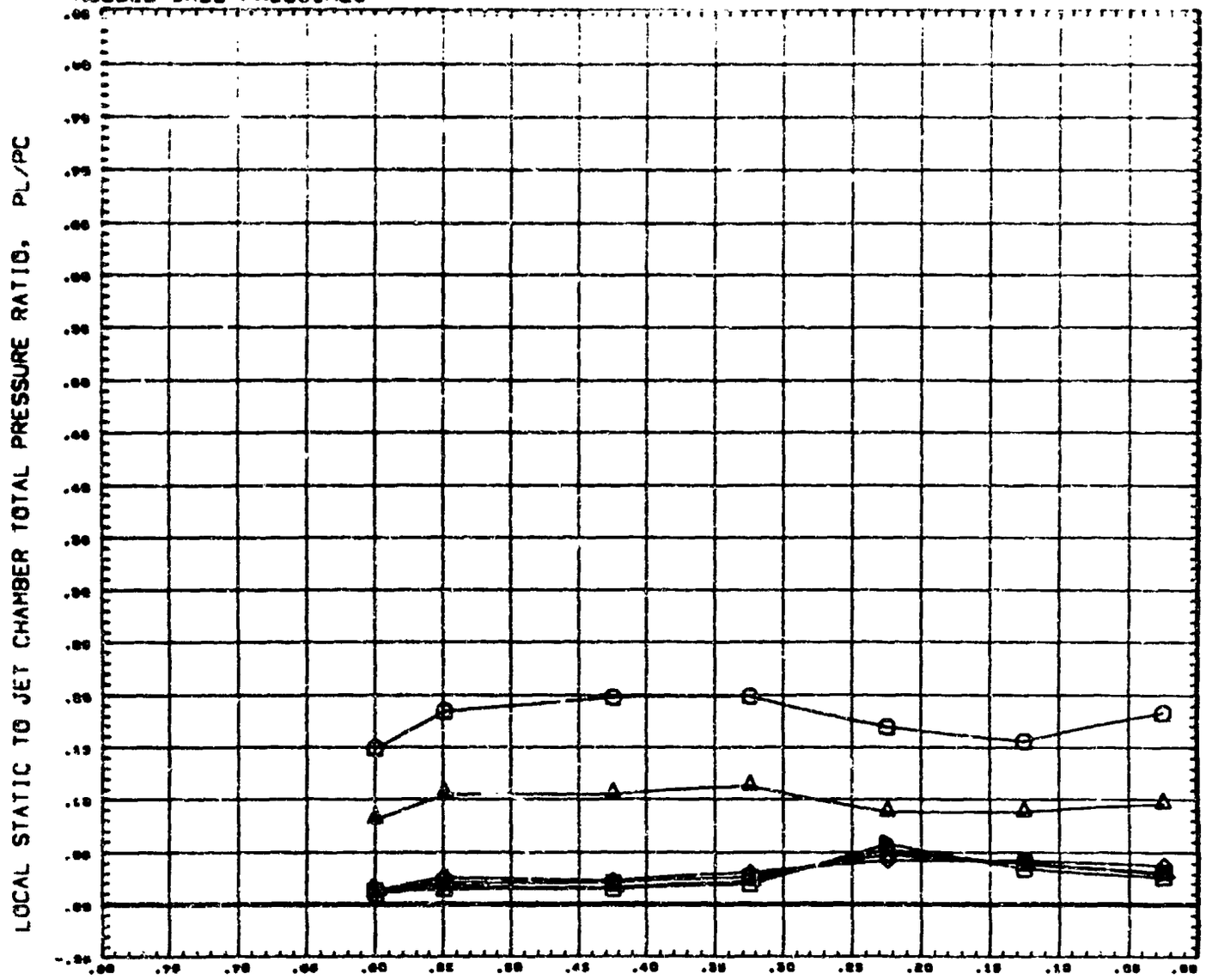
ALPHA	0.000	MACH-J	1.000
DIA-J	0.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-3)-PORTS OPEN (RUCI04)



AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCI04)

NOZZLE WALL PRESSURES

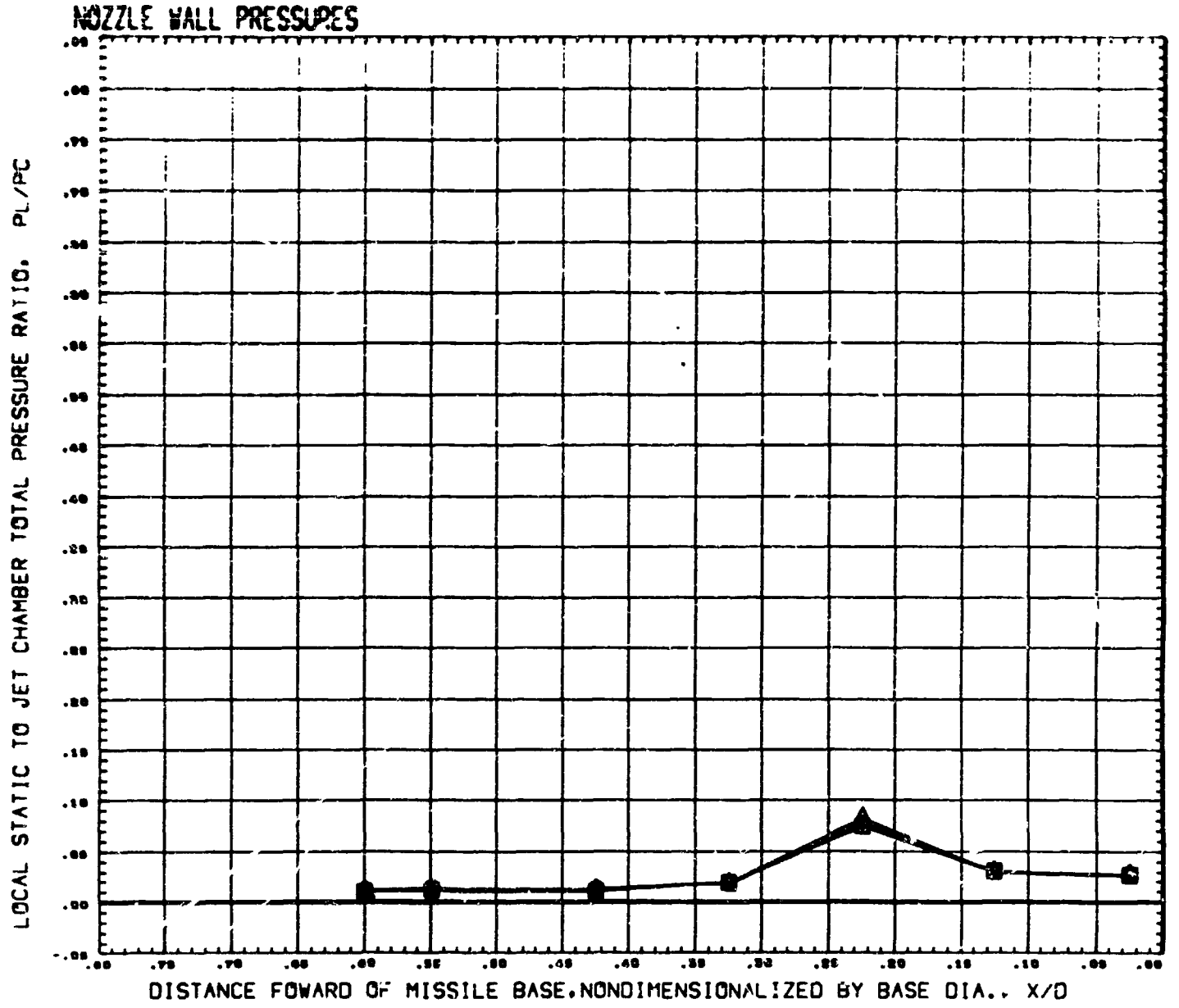


SYMBOL	CT	THETA	MACH
○	0.296	160.000	0.899
△	0.688		
◇	1.082		
□	2.063		
◁	3.379		
▷	5.575	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.500		

AMC PLUME STUDY, SHROUDED NOZZLE(-3).PORTS OPEN (RUCI04)

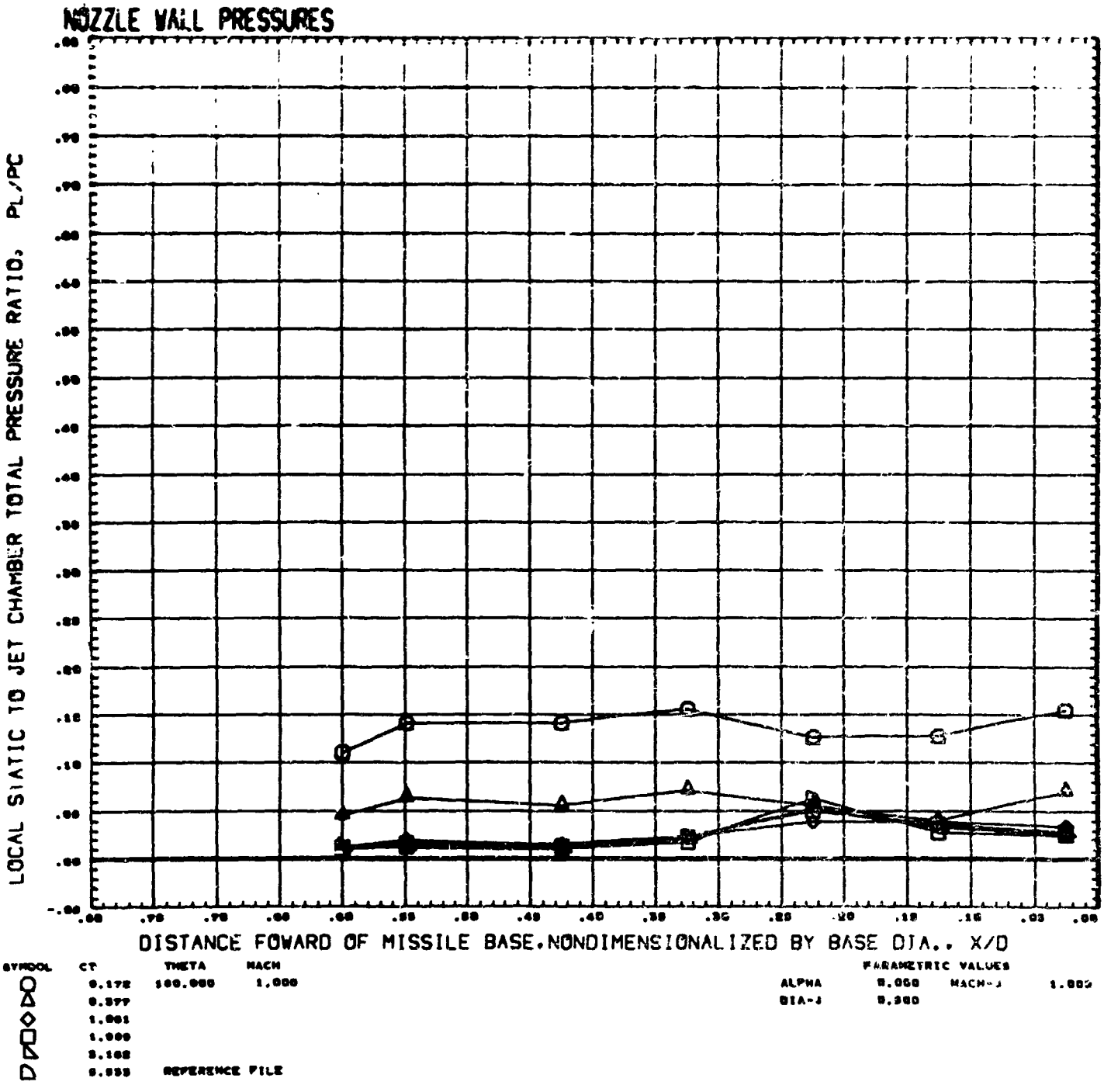


SYMBOL	CT	THETA	MACH
○	0.292	180.000	0.999
△	12.073		
◇	17.194		
□	29.000		

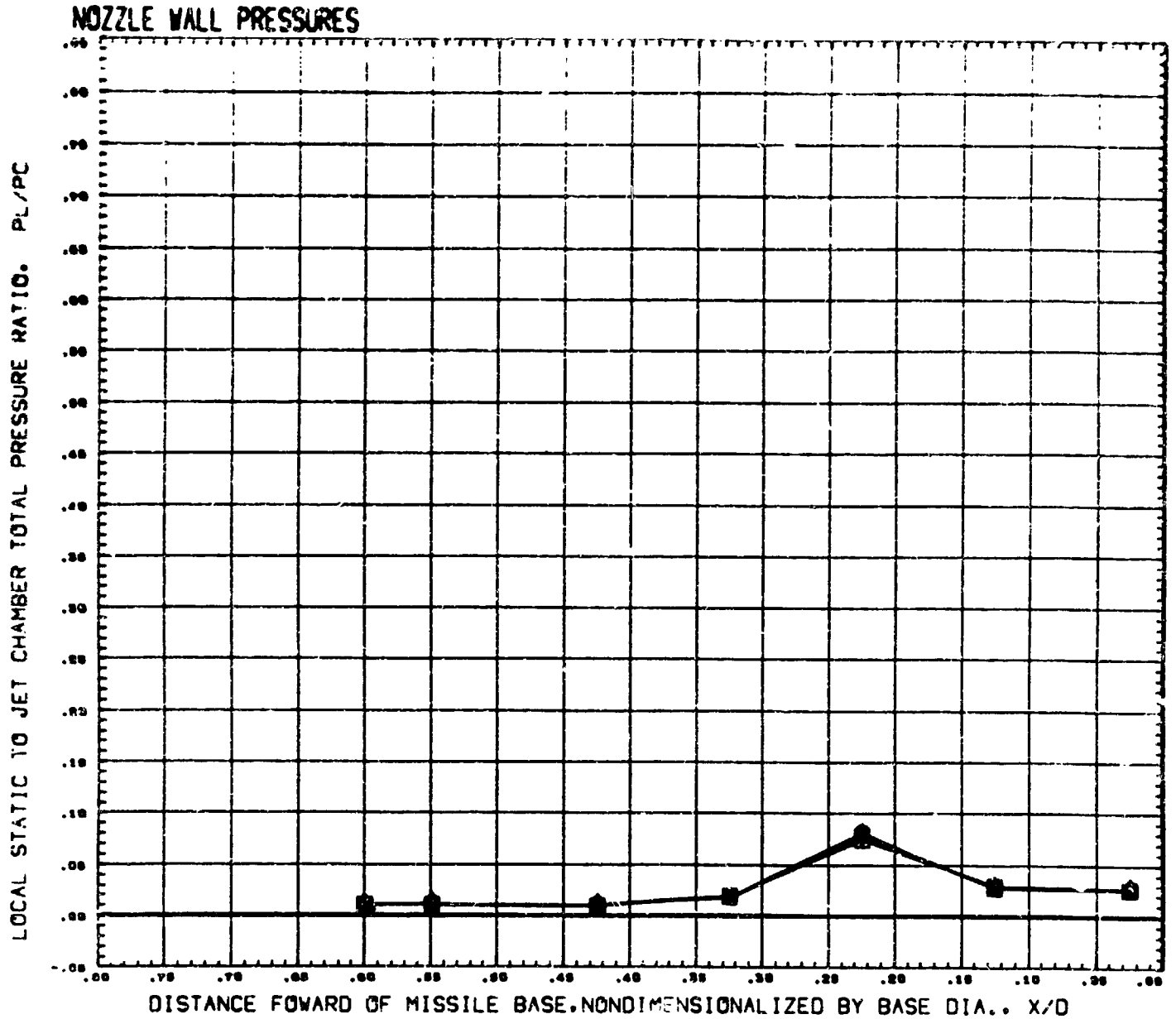
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	0.000		

REFERENCE FILE



AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCI04)



SYMBOL	CT	THETA	MACH
○	7.012	180.000	1.000
⊠	11.381		
◇	15.000		
□	22.200		

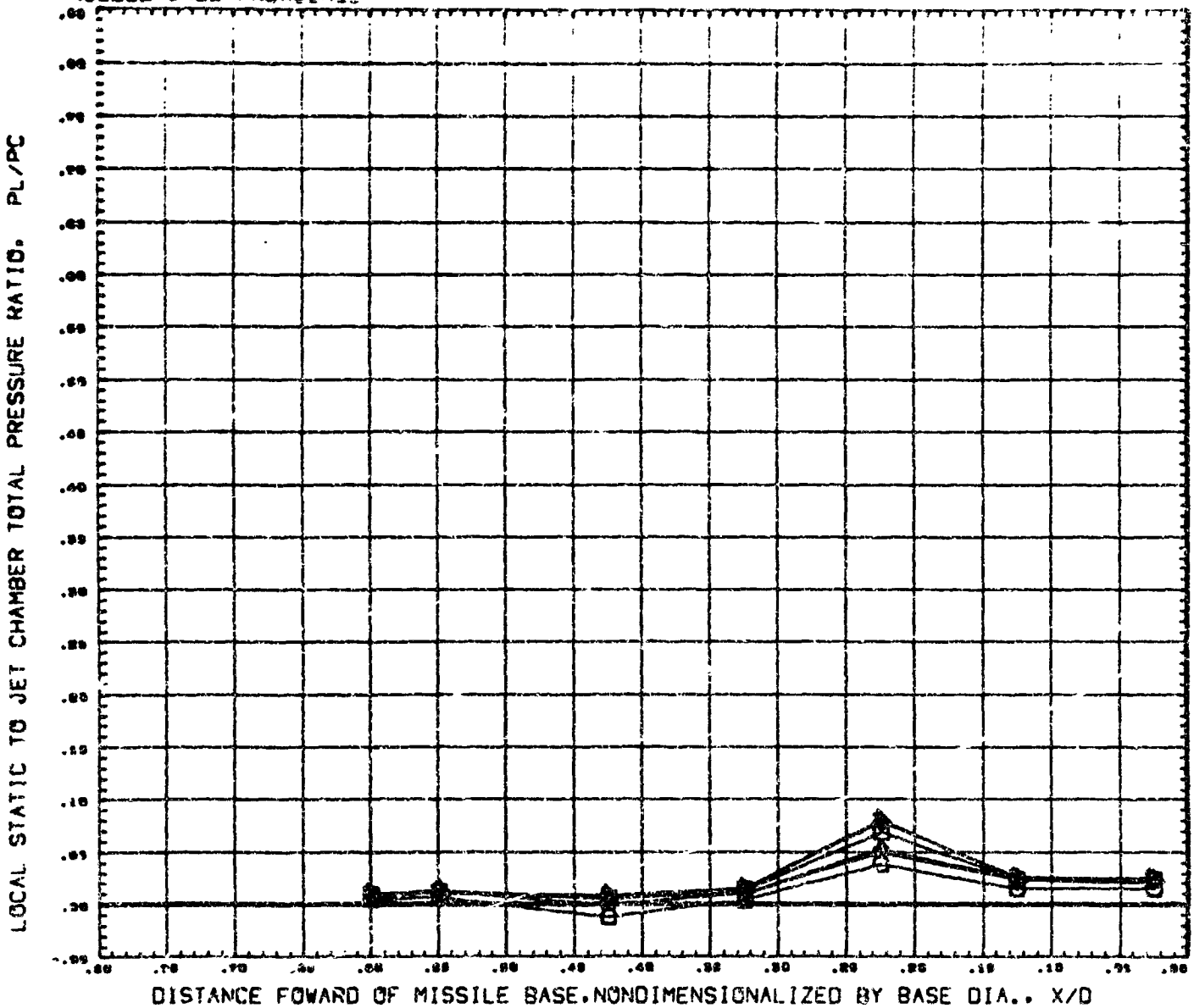
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.000
DIA-J	0.500		

REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCI04)

NOZZLE WALL PRESSURES

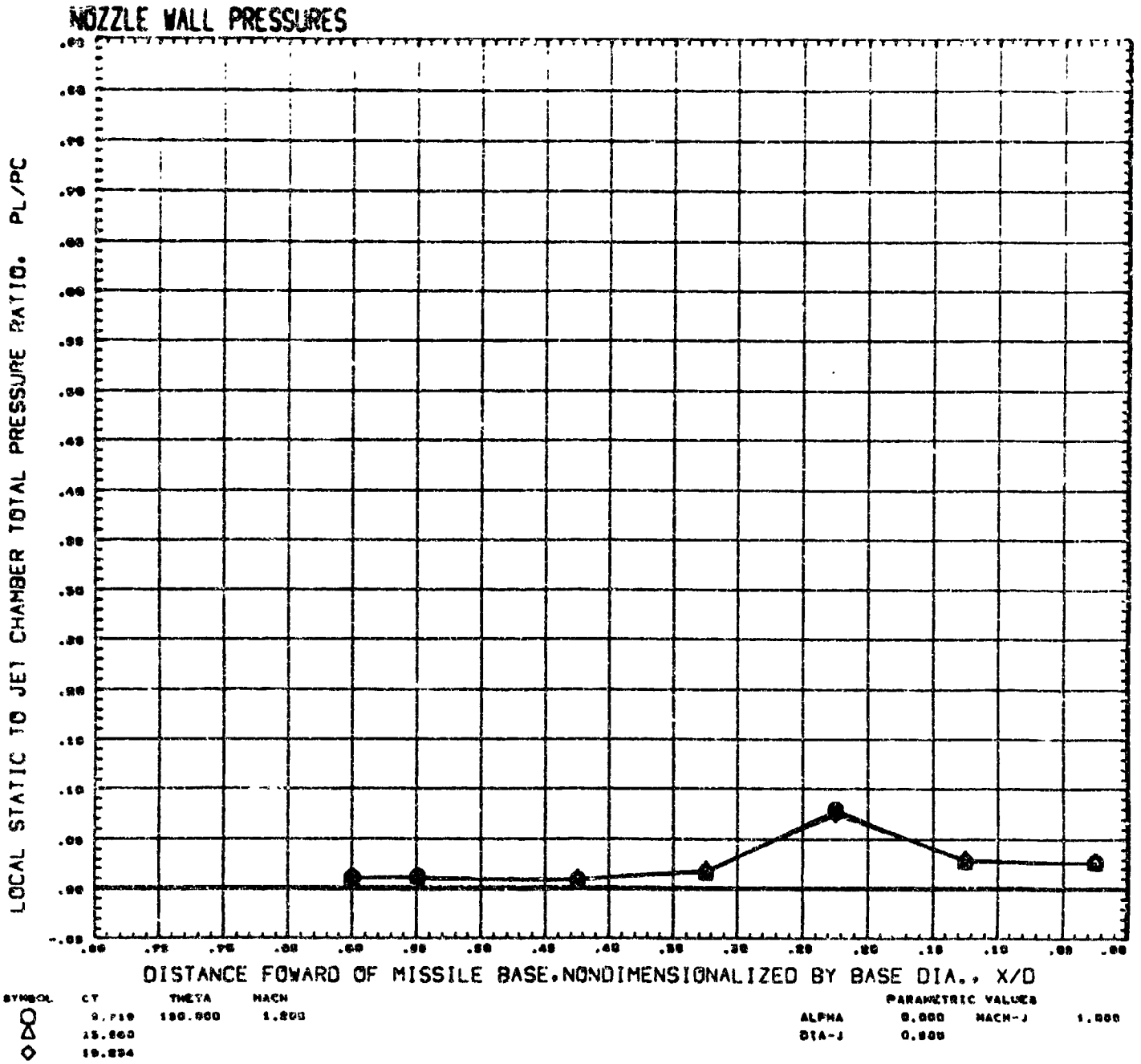


SYMBOL	CT	THETA	MACH
○	0.909	140.000	1.200
△	1.710		
◇	2.937		
□	4.892		
◺	6.790		
D	7.204	REFERENCE FILE	

PARAMETRIC VALUES

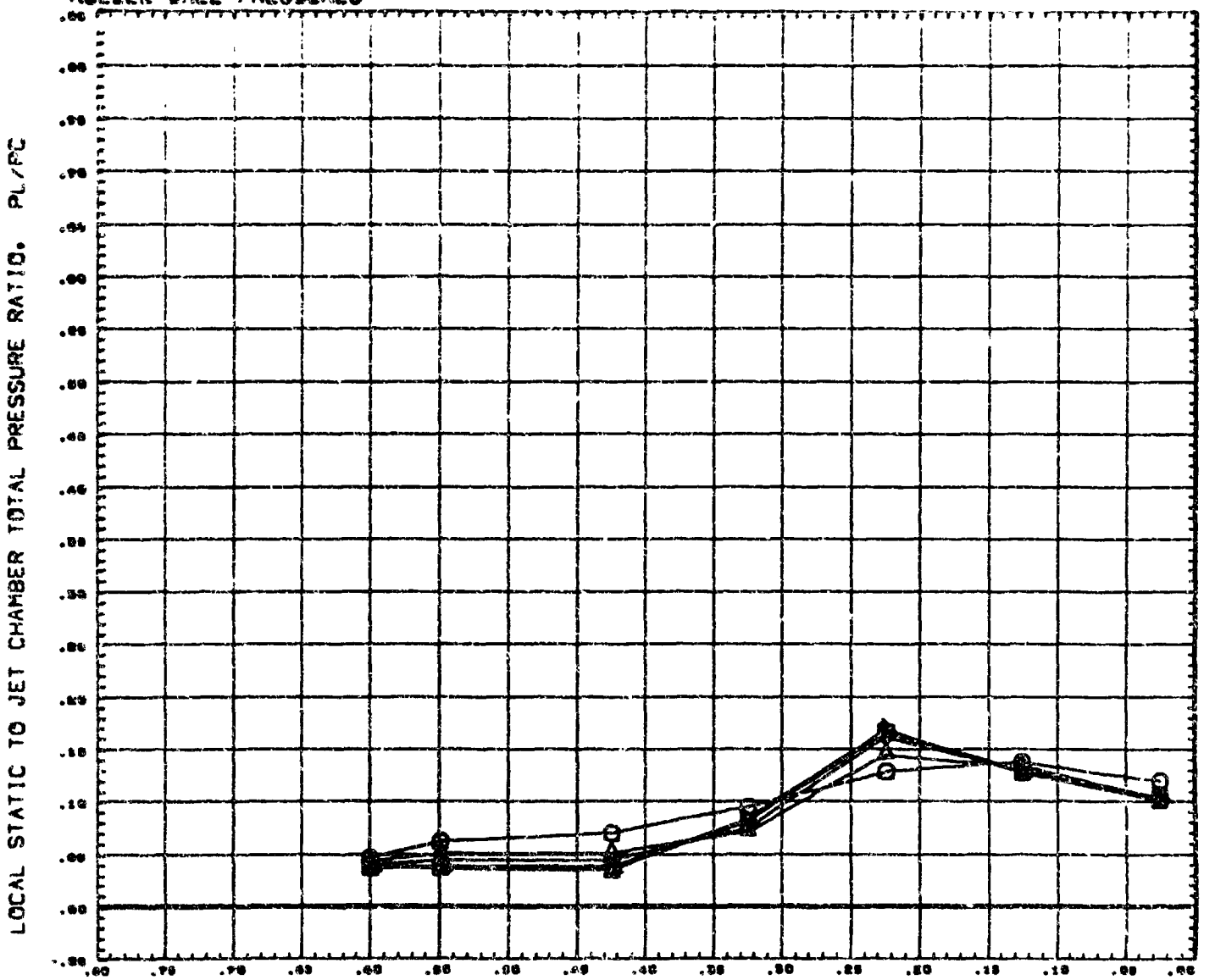
ALPHA	0.000	MACH-J	1.000
DIA-J	0.900		

AMC PLUME STUDY, SHROUDED NOZZLE(-3),PORTS OPEN (RUCI04)



AMC PLUME STUDY. SHROUDED NOZZLE(-3).PORTS OPEN (RUCI04)

NOZZLE WALL PRESSURES

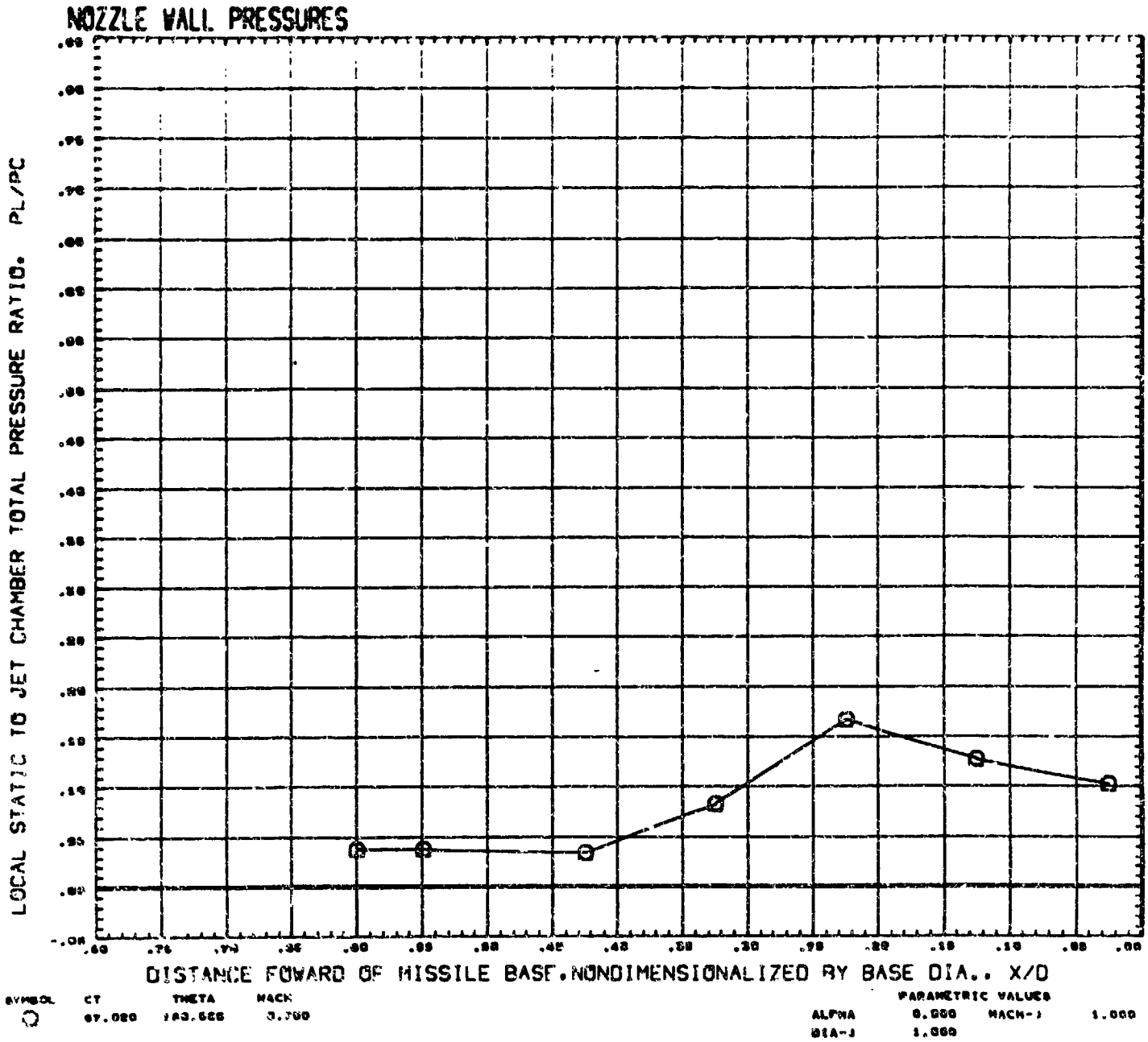


SYMBOL	CT	THETA	MACH
○	3.772	180.000	0.700
△	11.844		
◇	18.488		
□	33.921		
◺	34.365		
D	47.128	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.600	MACH-J	1.300
DIA-J	1.000		

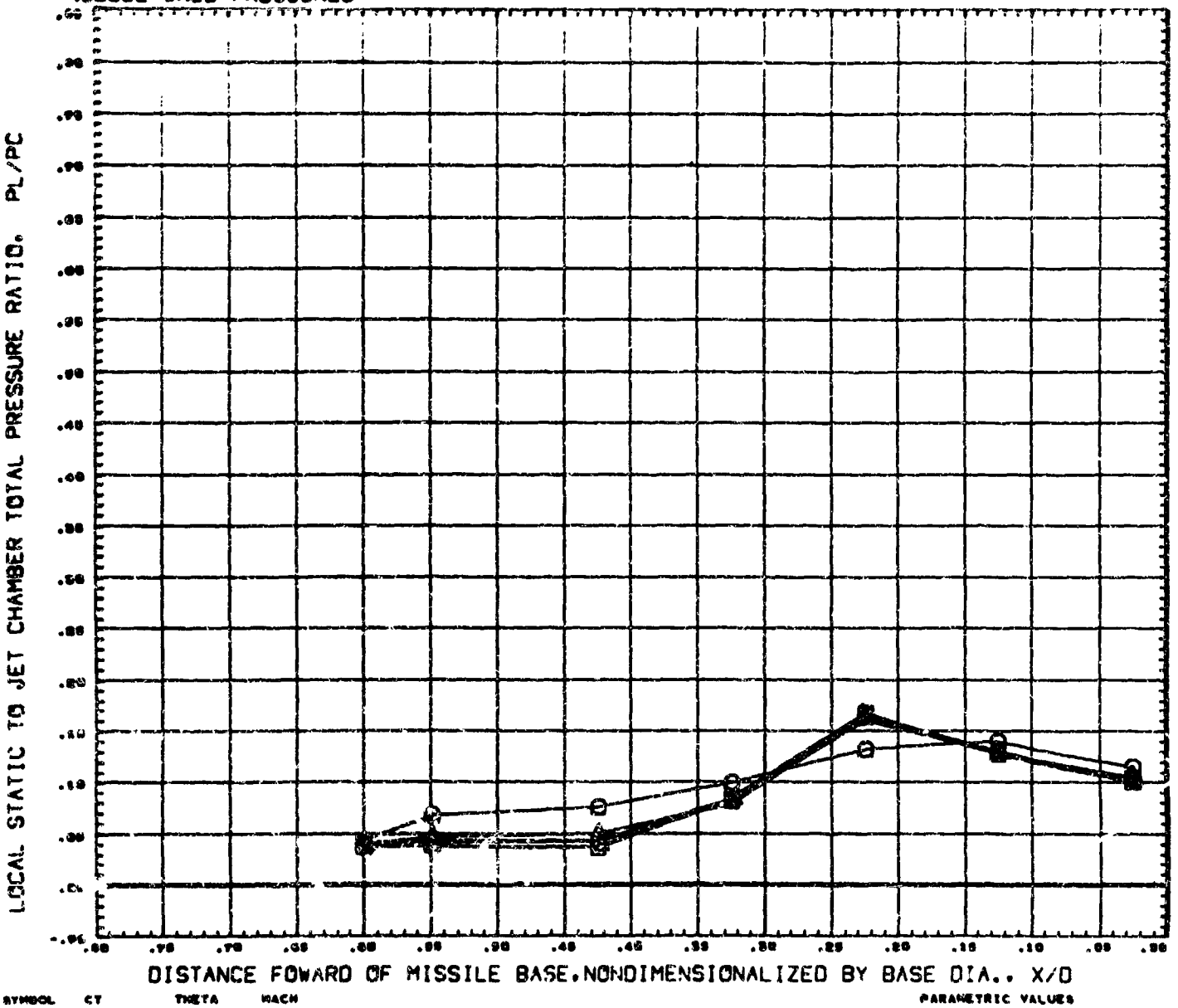
AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCI05)



REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCI05)

NOZZLE WALL PRESSURES

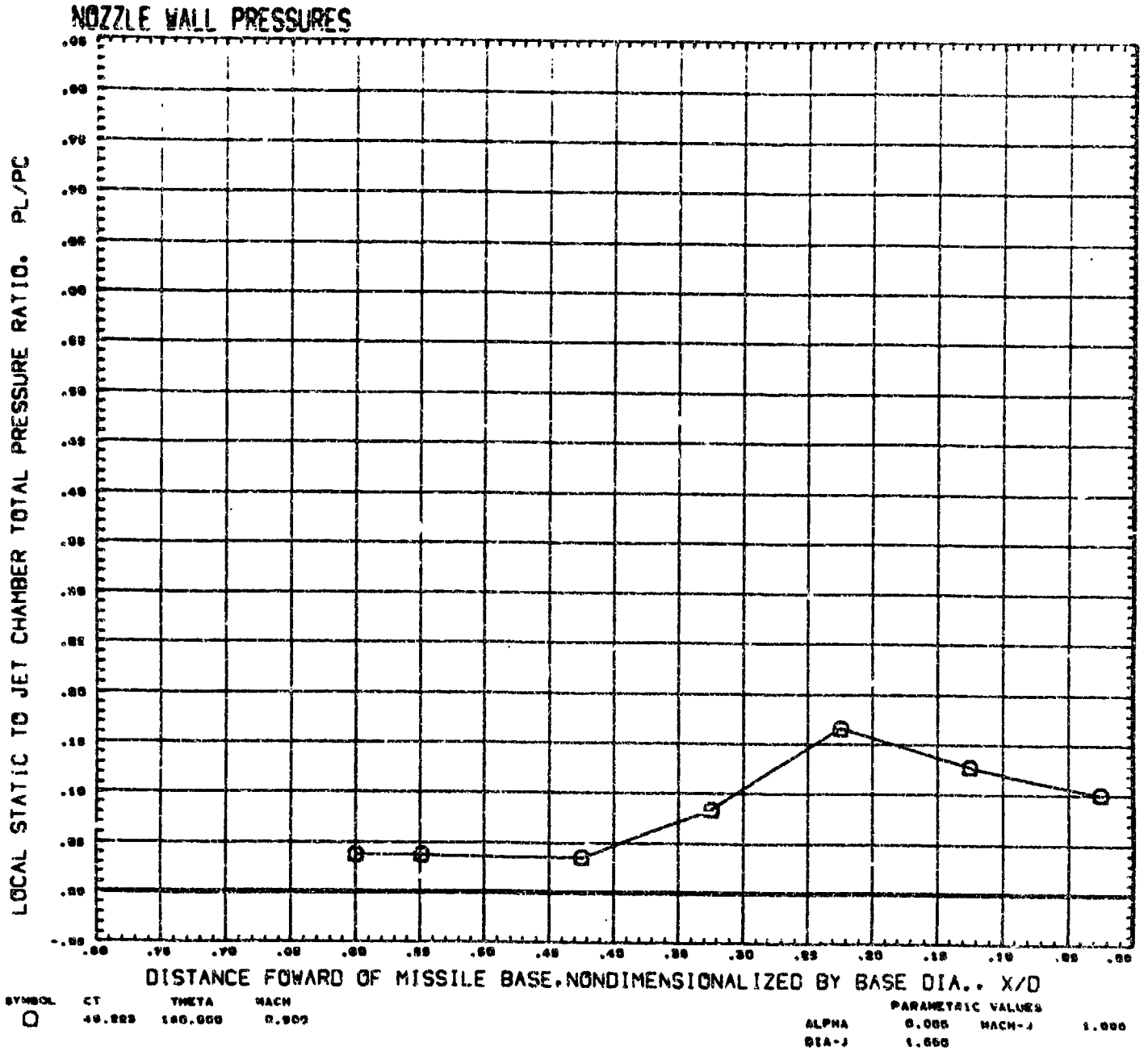


SYMBOL	CT	THETA	MACH
○	2.972	160.000	0.000
△	9.998		
◇	11.947		
□	16.691		
◁	24.843		
▷	34.109	REFERENCE FILE	

PARAMETRIC VALUES

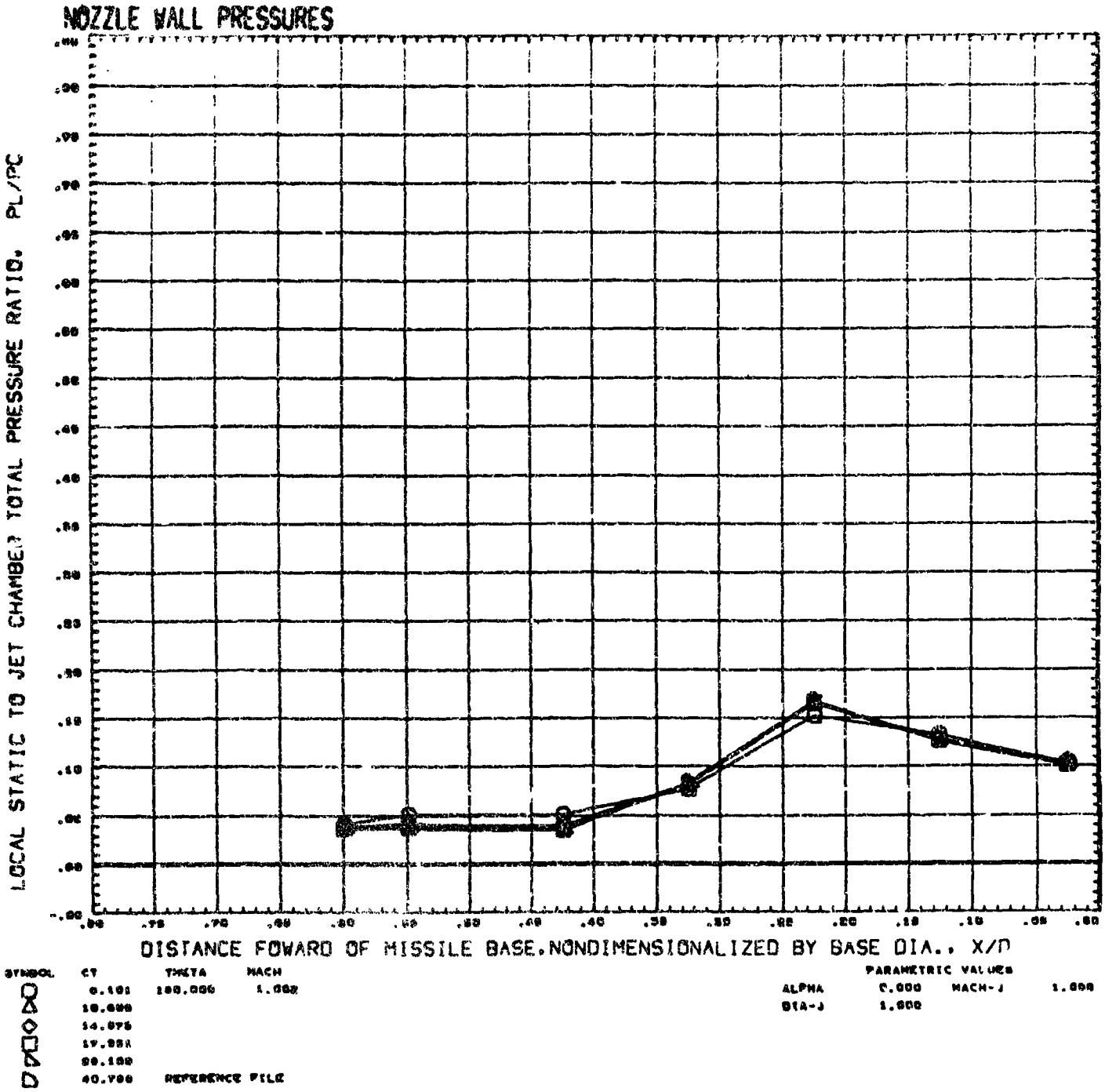
ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCI05)



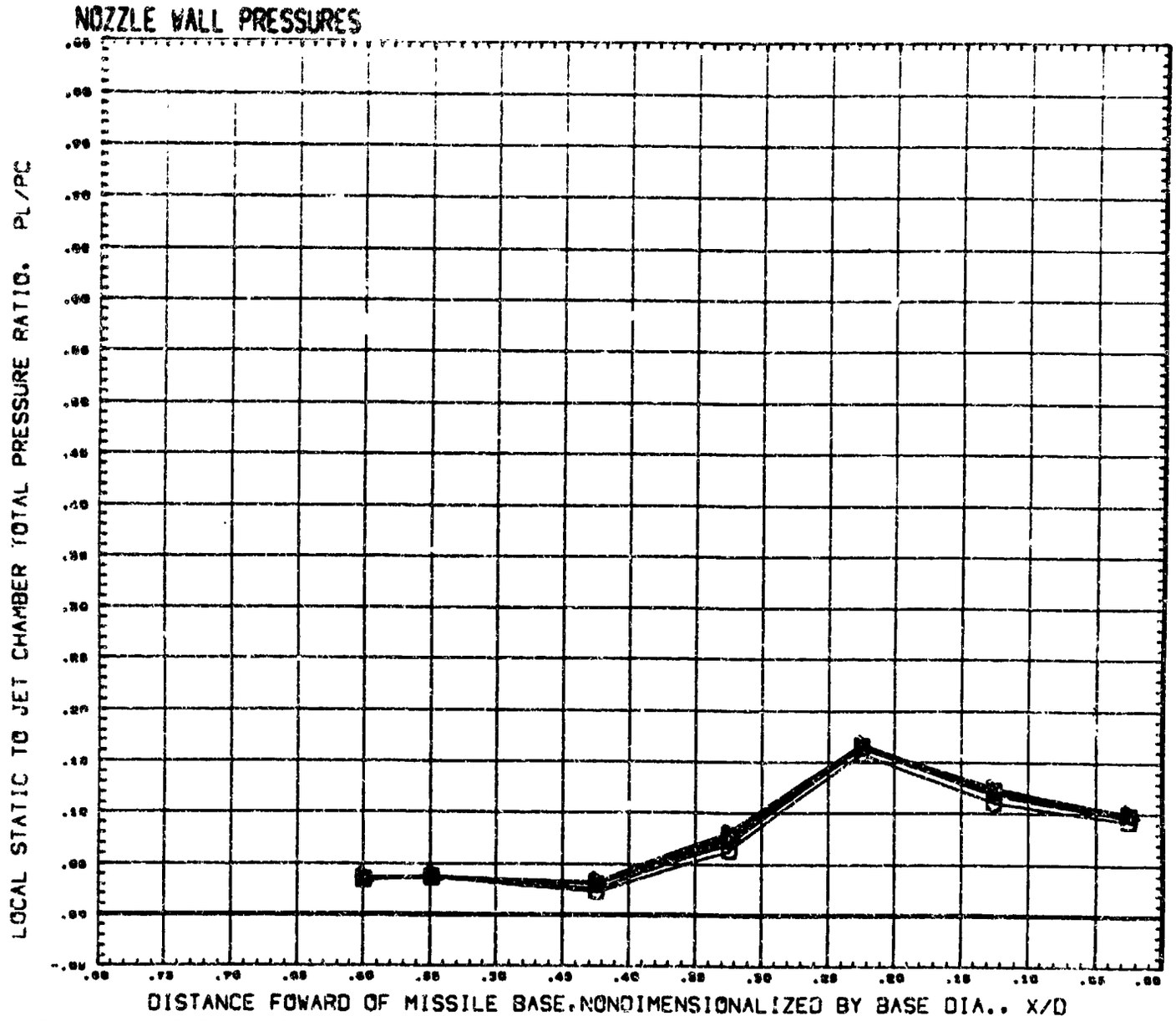
REFERENCE FILE

AMC PLUME STUDY. SHROUDED NOZZLE(-4).PORTS OPEN (RUC105)



AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCI05)

NOZZLE WALL PRESSURES

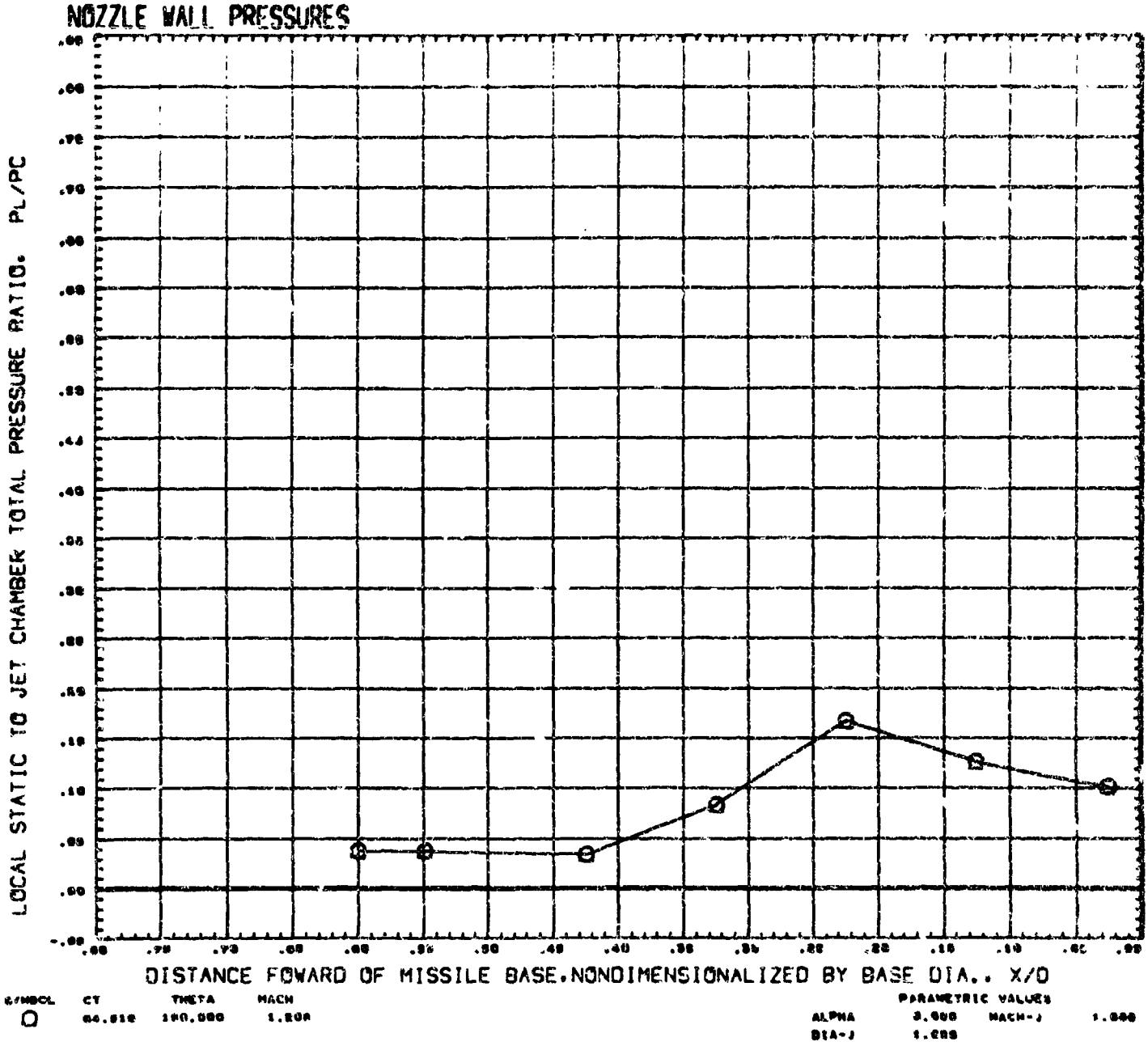


SYMBOL	CT	THETA	MACH
○	0.141	100.000	1.200
△	10.039		
◇	12.997		
□	19.360		
◺	24.141		
D	39.673	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	1.000
DIA-J	1.000		

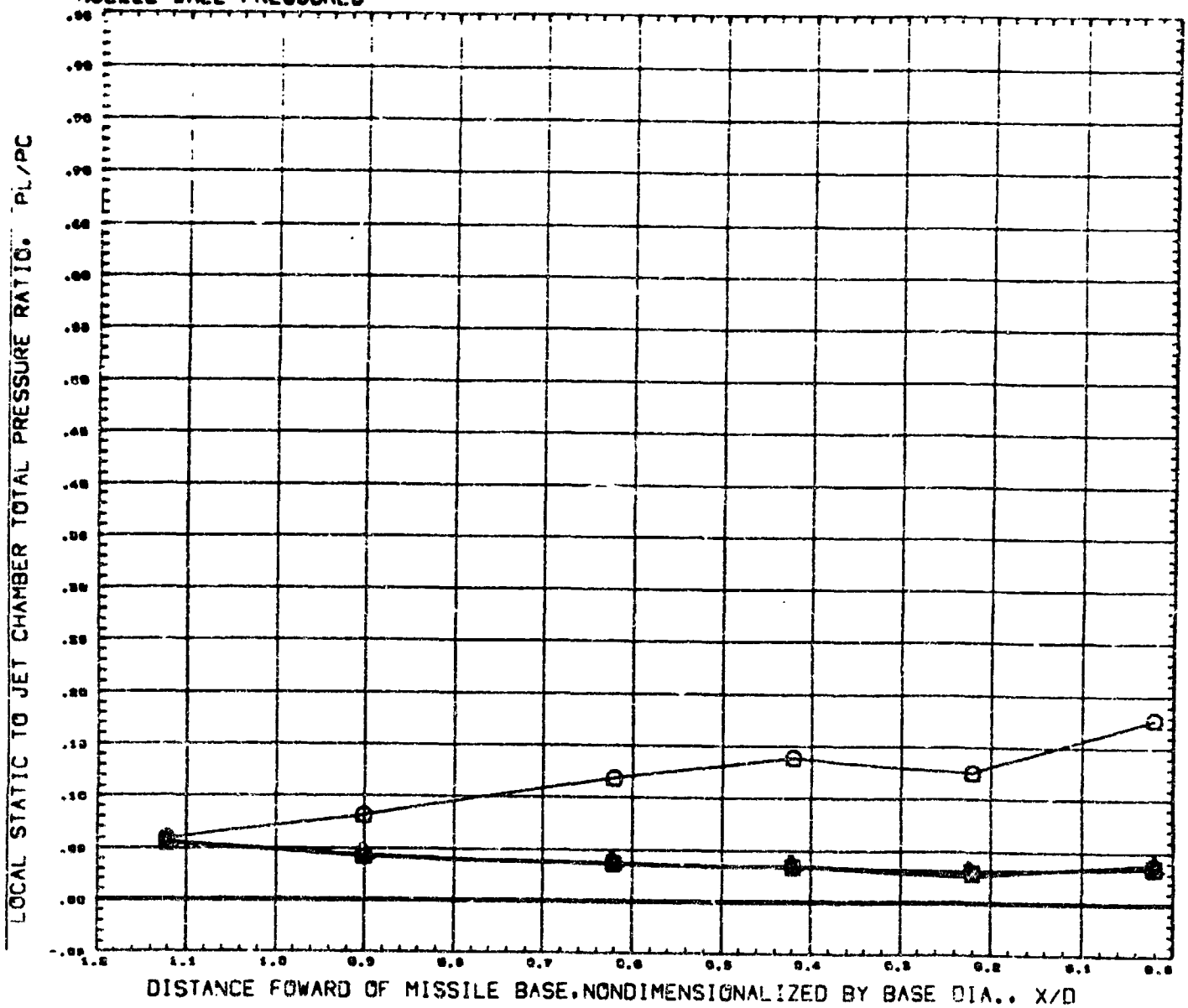
AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCI05)



REFERENCE FILE

AMC PLUME STUDY, SHROUDED NOZZLE(-4),PORTS OPEN (RUCI05)

NOZZLE WALL PRESSURES

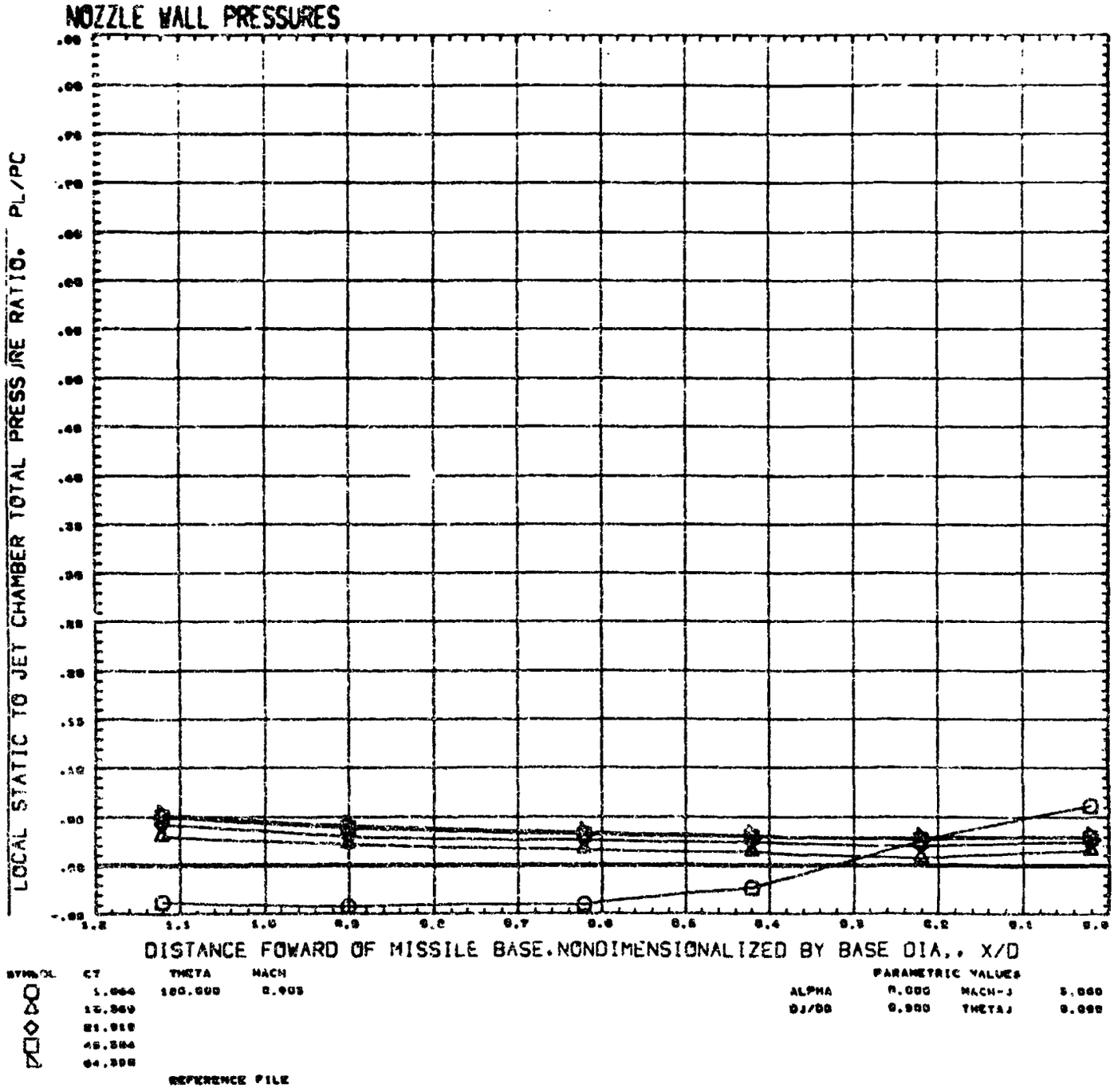


SYMBOL	CT	THETA	MACH
	8.306	180.000	0.702
	18.146		
	30.064		
	47.081		
	65.010		
	95.327	REFERENCE FILE	

PARAMETRIC VALUES

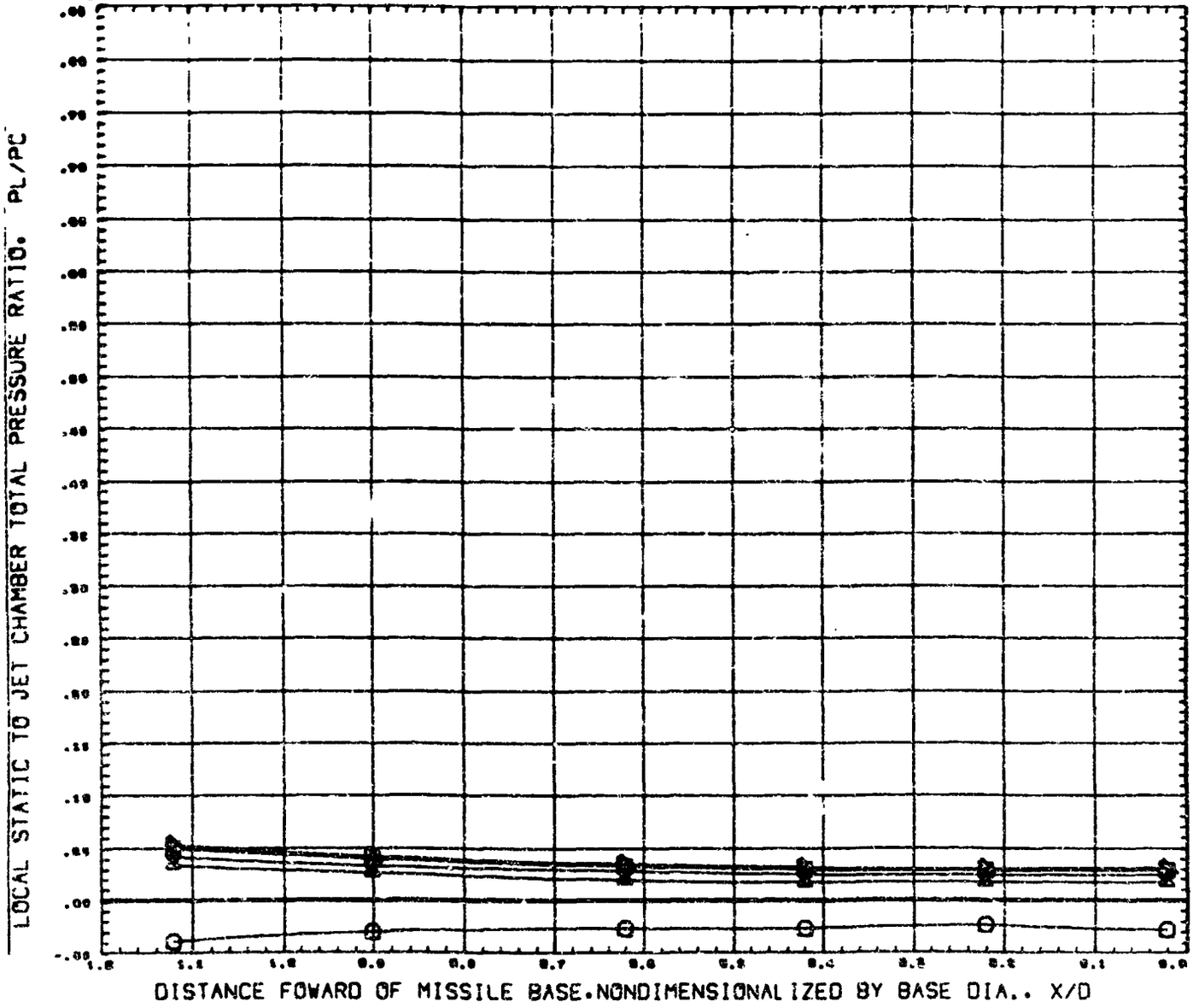
ALPHA	0.000	MACH-J	3.000
DJ/DB	0.900	THETAJ	0.030

AMC PLUME STUDY, CONTOURED NOZZLE(-)) (RUCI06)



AMC PLUME STUDY, CONTOURED NOZZLE(-1) (RUCI06) PAGE 220

NOZZLE WALL PRESSURES



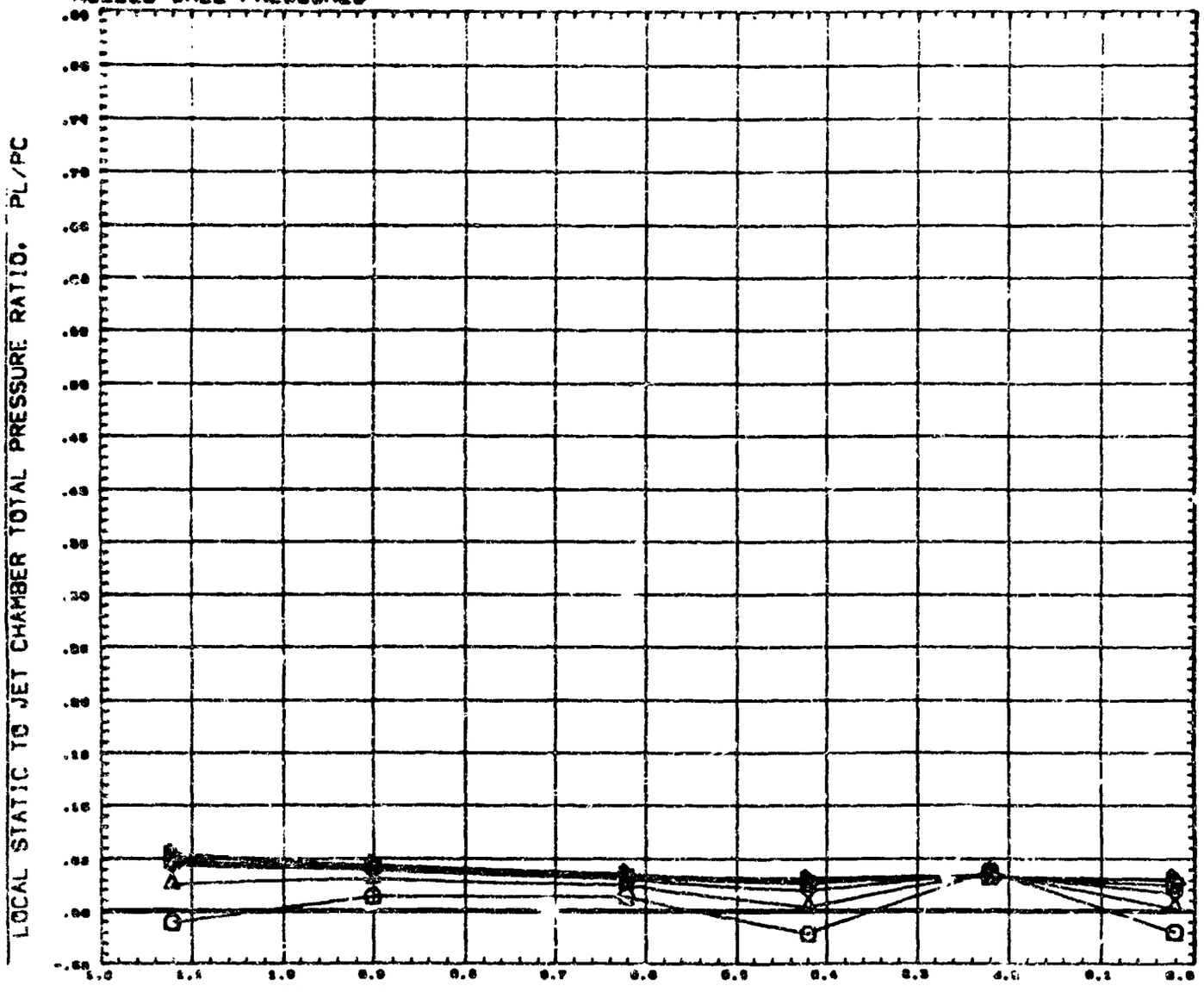
SYMBOL	CT	THETA	MACH
○	1.504	180.000	1.004
△	9.567		
◇	19.950		
□	41.030		
◺	94.850		
D	101.240	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	3.000
DJ/DB	0.000	THETAJ	0.050

AMC PLUME STUDY. CONTOURED NOZZLE(-1) (RUCI06) PAGE 221

NOZZLE WALL PRESSURES

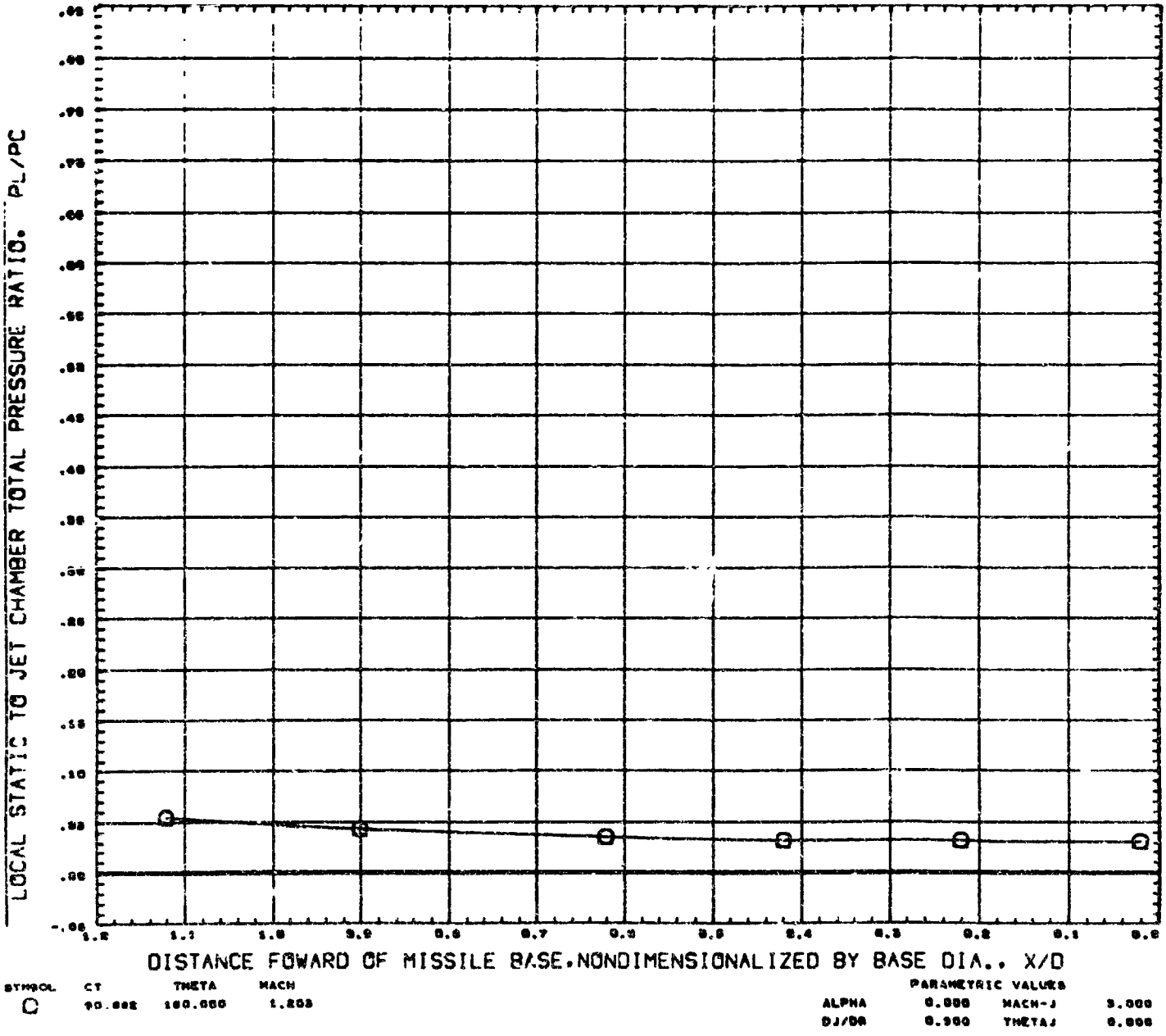


SYMBOL	CT	THETA	MACH
○	1.310	100.000	1.203
△	3.500		
◇	9.802		
□	17.603		
◺	35.755		
D	50.000	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	3.000
DJ/DB	0.000	THETAJ	0.000

NOZZLE WALL PRESSURES



SYMBOL	CT	THETA	MACH
O	90.000	180.000	1.203

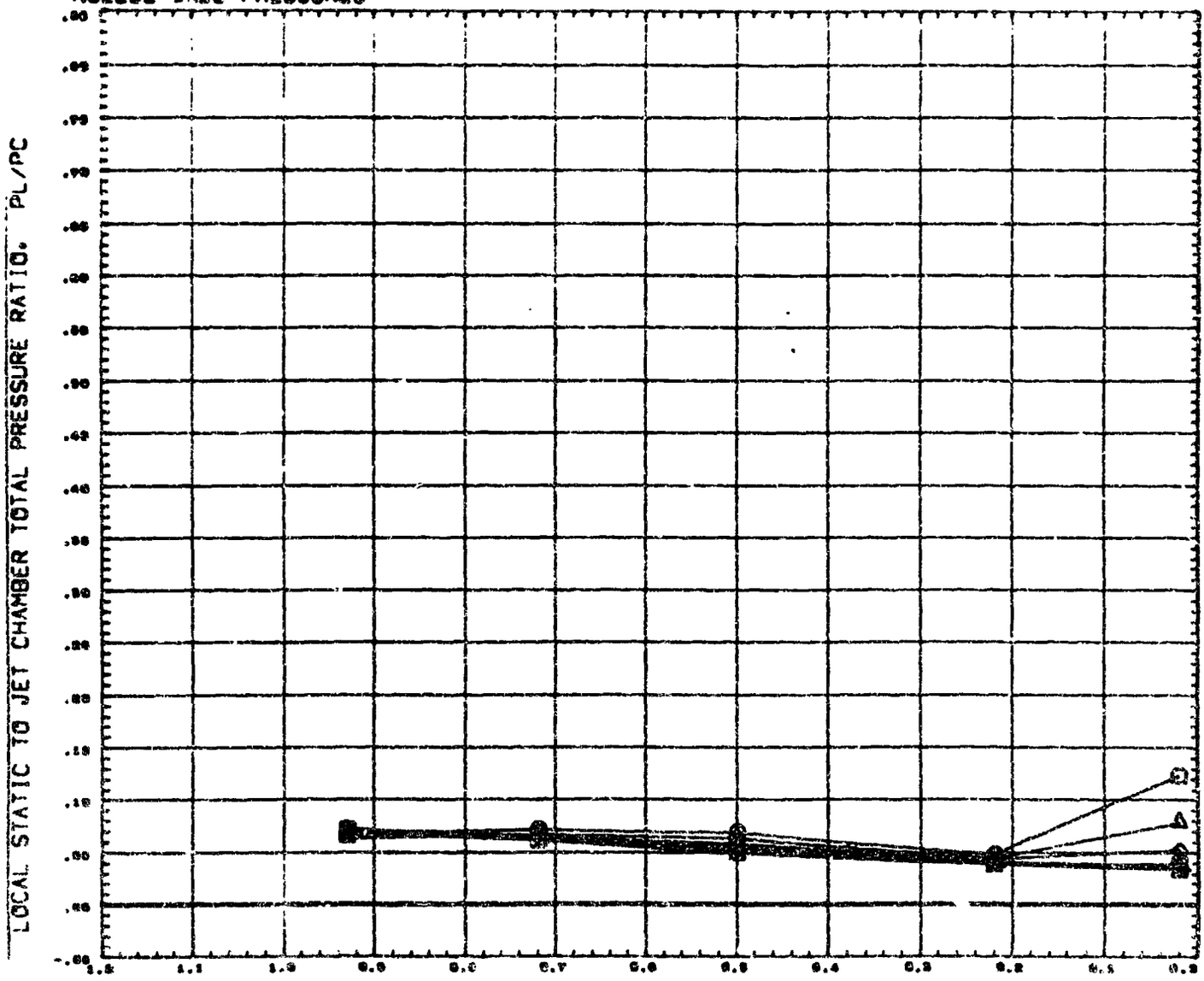
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	3.000
DJ/DB	0.900	THETAJ	0.000

REFERENCE FILE

AMC PLUME STUDY. CONTOURED NOZZLE(-1) (RUC106)

NOZZLE WALL PRESSURES



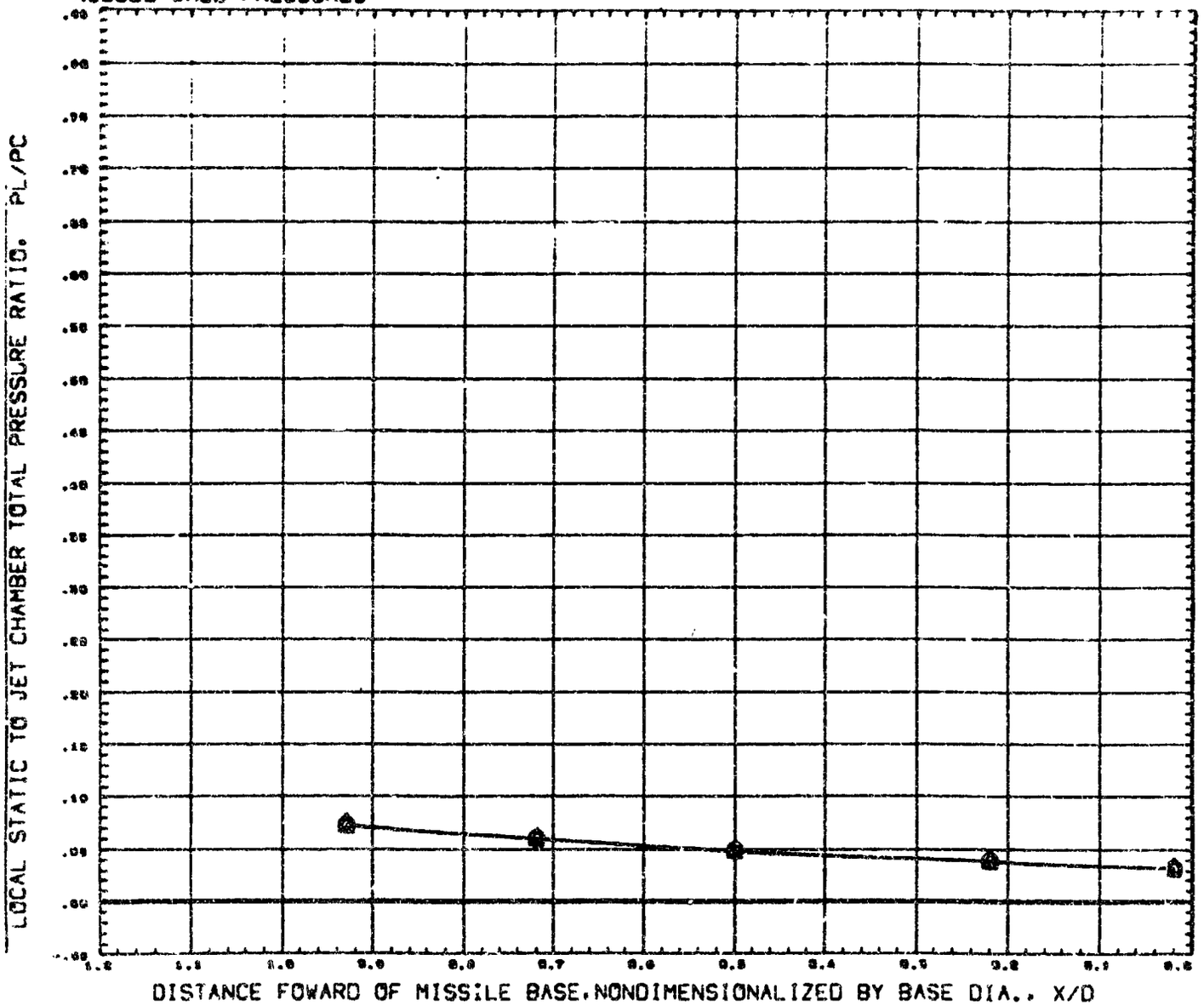
SYMBOL	CT	THETA	MACH
○	4.994	180.000	0.703
△	7.546		
◇	10.714		
□	18.048		
◺	22.070		
D	34.969	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.000
DJ/DB	0.600	THETAJ	1.700

AMC PLUME STUDY, CONTOURED NOZZLE(-2) (RUCI07) PAGE 224

NOZZLE WALL PRESSURES



SYMBOL	CT	THETA	MACH
○	91.191	100.000	0.705
△	60.255		
◇	104.510		

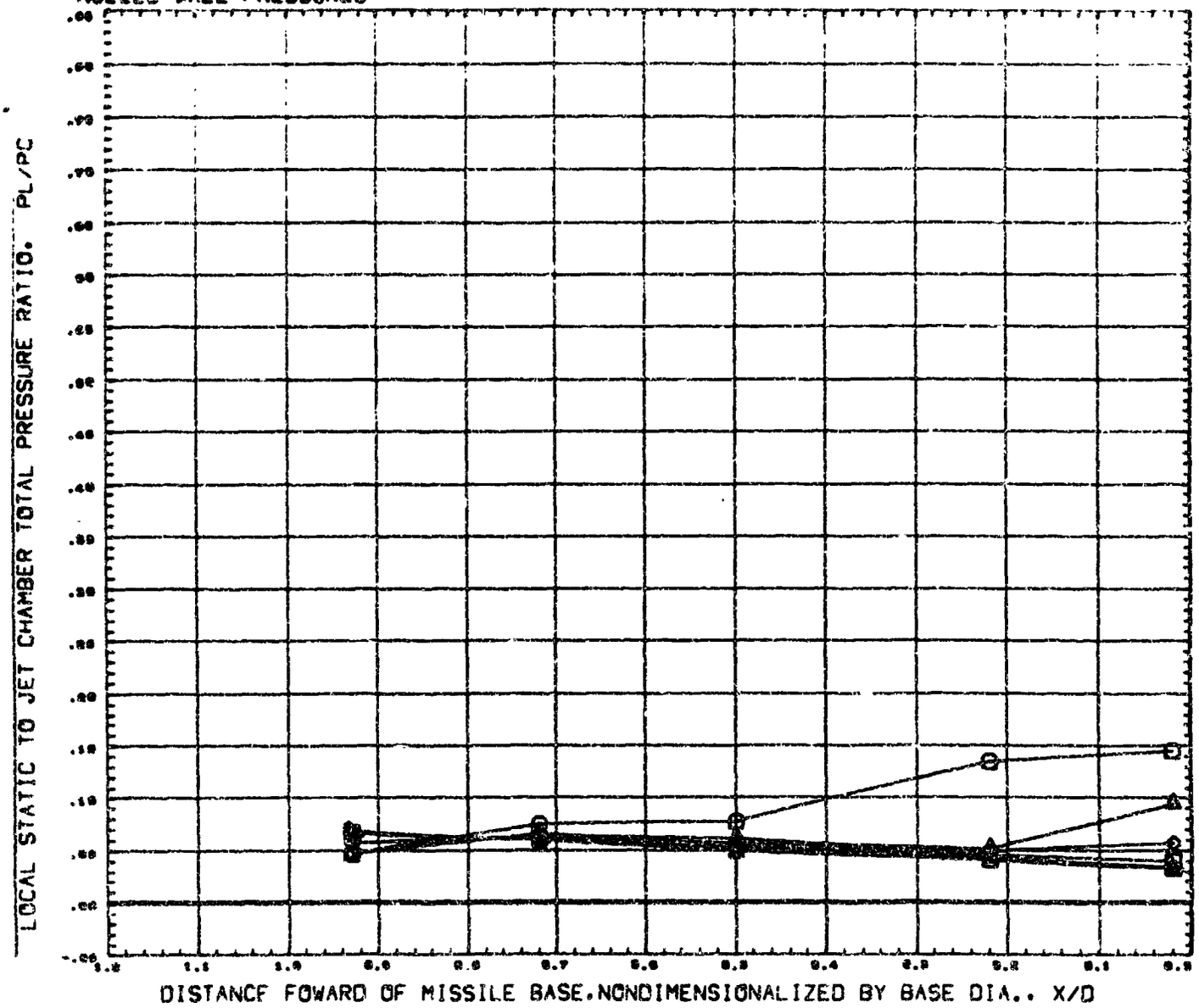
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.000
DJ/DD	0.800	THETAJ	1.700

REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-2) (RUCI07) PAGE 225

NOZZLE WALL PRESSURES



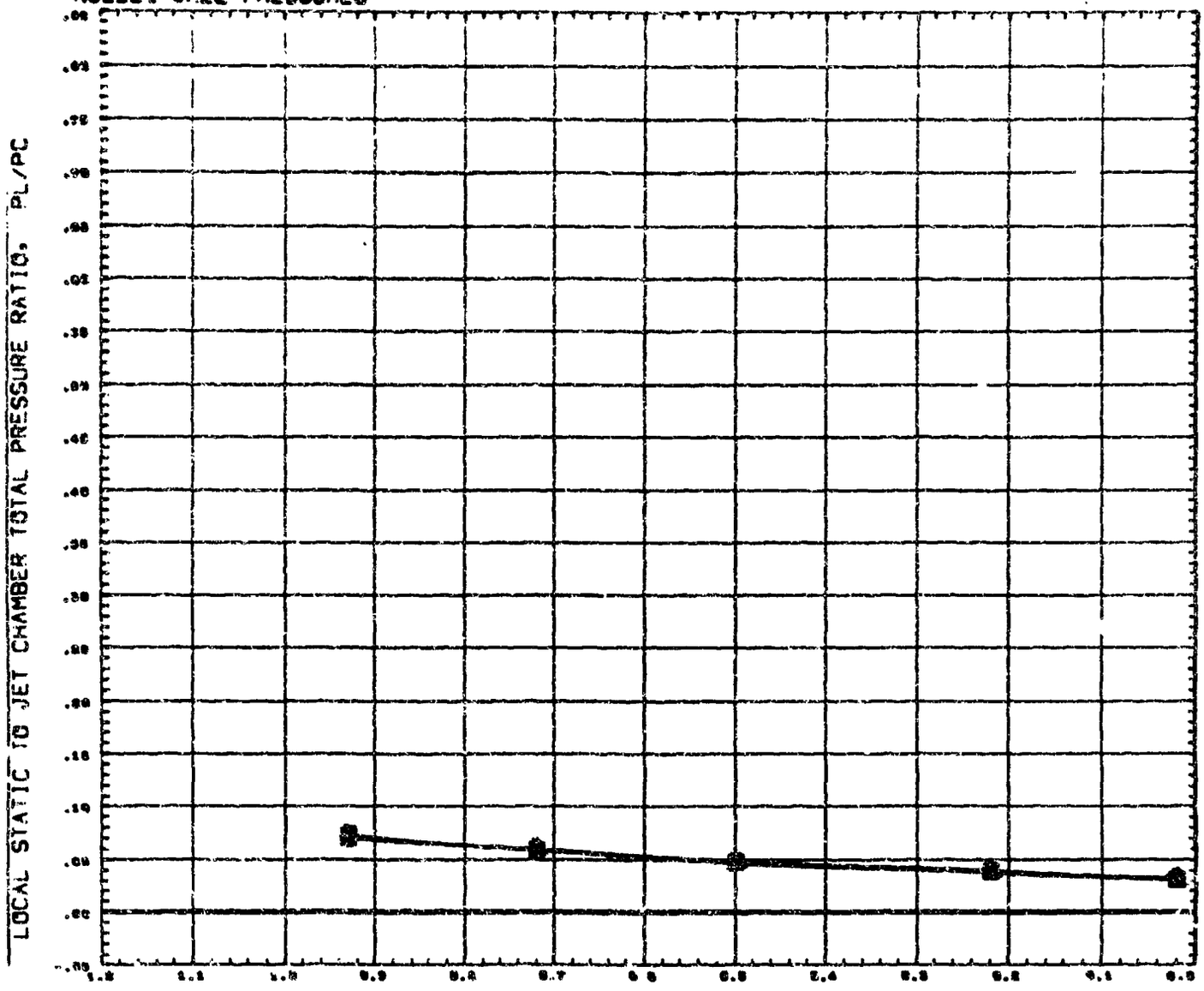
SYMBOL	CT	THETA	MACH
○	1.000	100.000	0.003
△	2.000		
◇	4.003		
□	8.007		
◺	12.000		
D	17.001	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.000
DJ/DB	0.000	THETA J	1.700

AMC PLUME STUDY. CONTOURED NOZZLE(-2) (RUCI07) PAGE 226

NOZZLE WALL PRESSURES



SYMBOL	CT	THETA	MACH
○	[illegible]	100.000	0.003
△	[illegible]		
◇	[illegible]		
□	[illegible]		
◺	[illegible]		

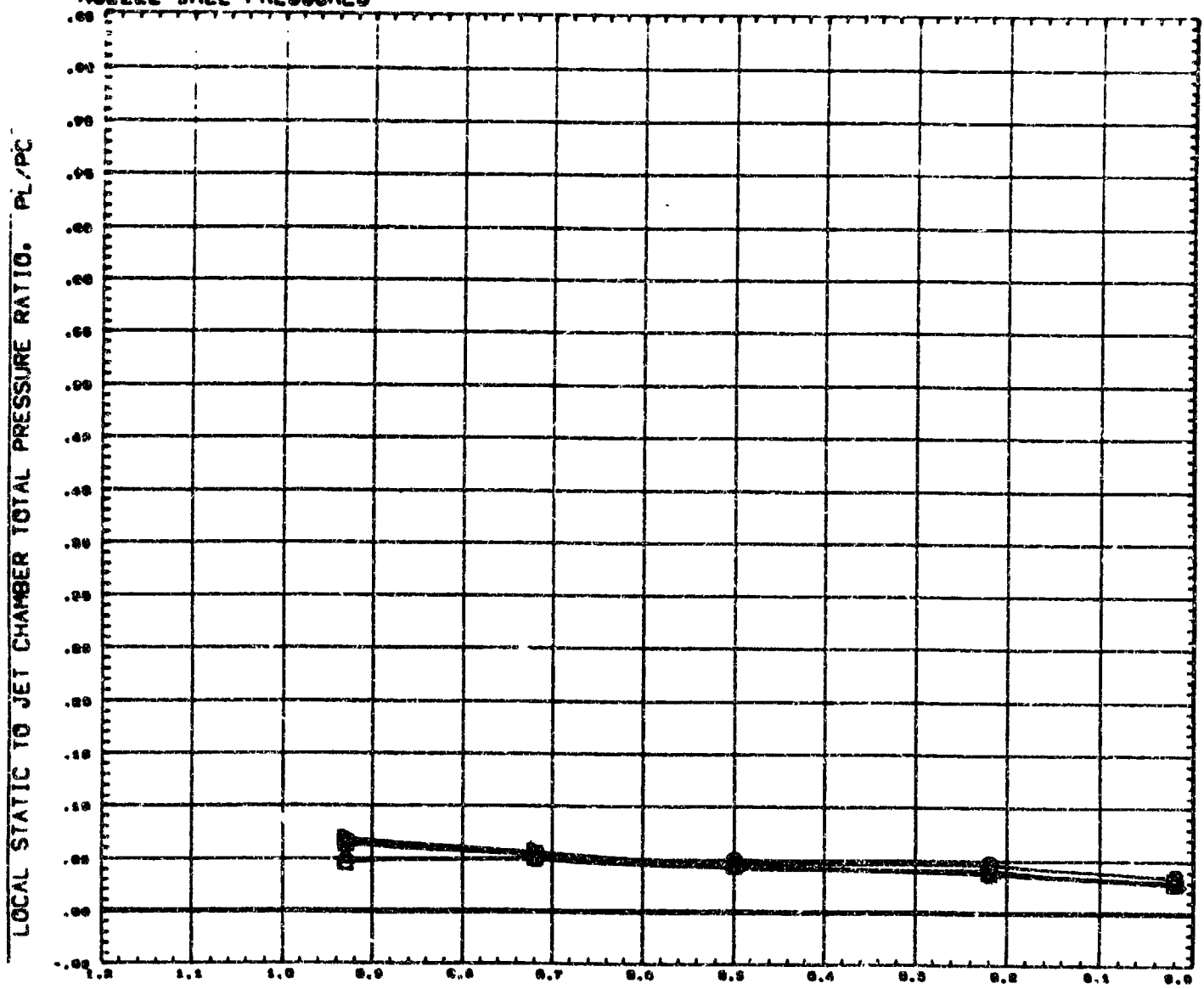
REFERENCE FILE

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	[illegible]
BJ/DB	0.000	THETAJ	1.750

AMC PLUME STUDY, CONTOURED NOZZLE(-2) (RUCI07) PAGE 227

NOZZLE WALL PRESSURES



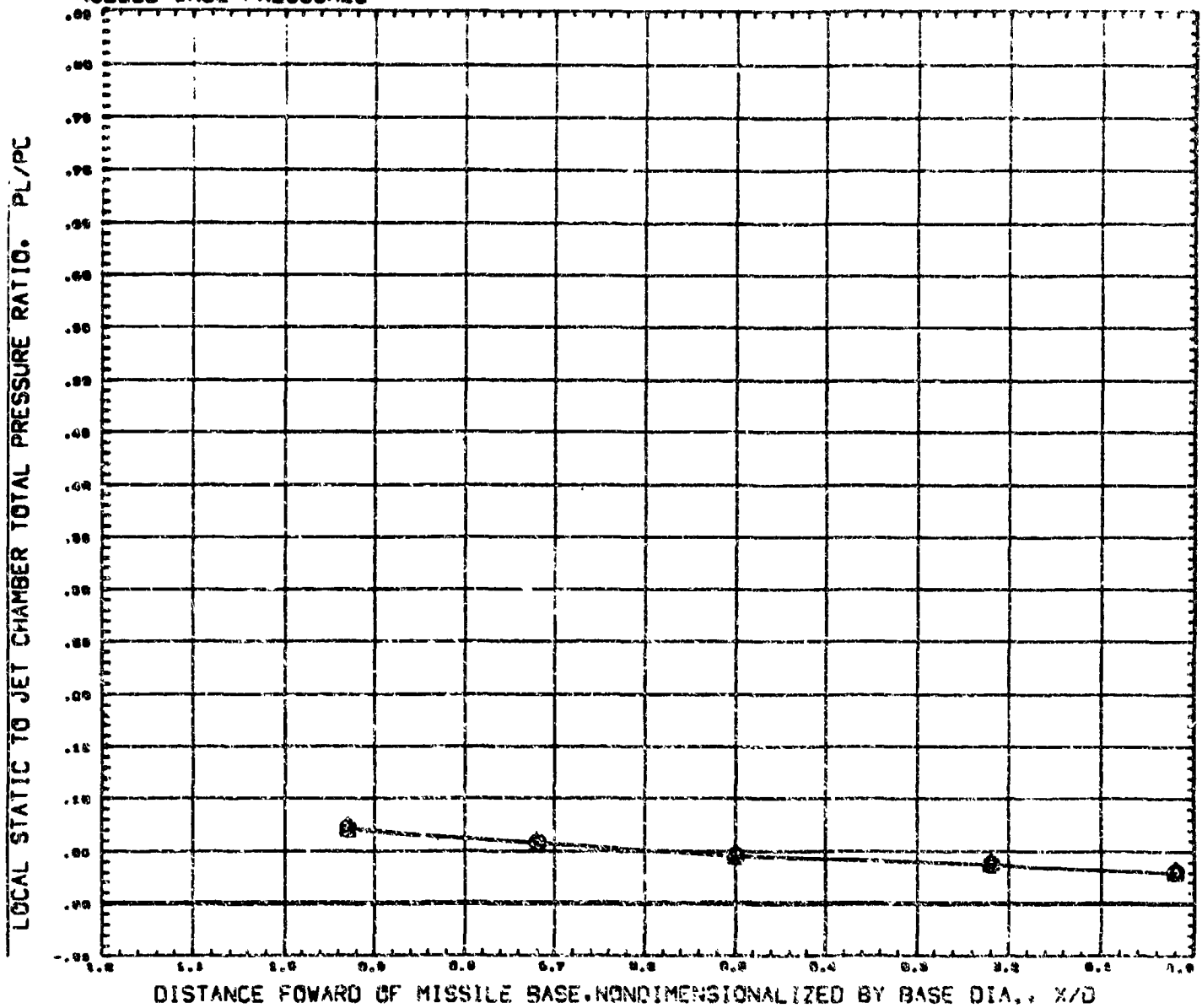
SYMBOL	CT	THETA	MACH
○	1.993	180.000	1.004
△	4.208		
◇	11.020		
□	18.700		
◺	21.134		
D	32.037	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.000
DJ/DB	0.890	THETAJ	1.700

AMC PLUME STUDY, CONTOURED NOZZLE(-2) (RUCI07) PAGE 228

NOZZLE WALL PRESSURES



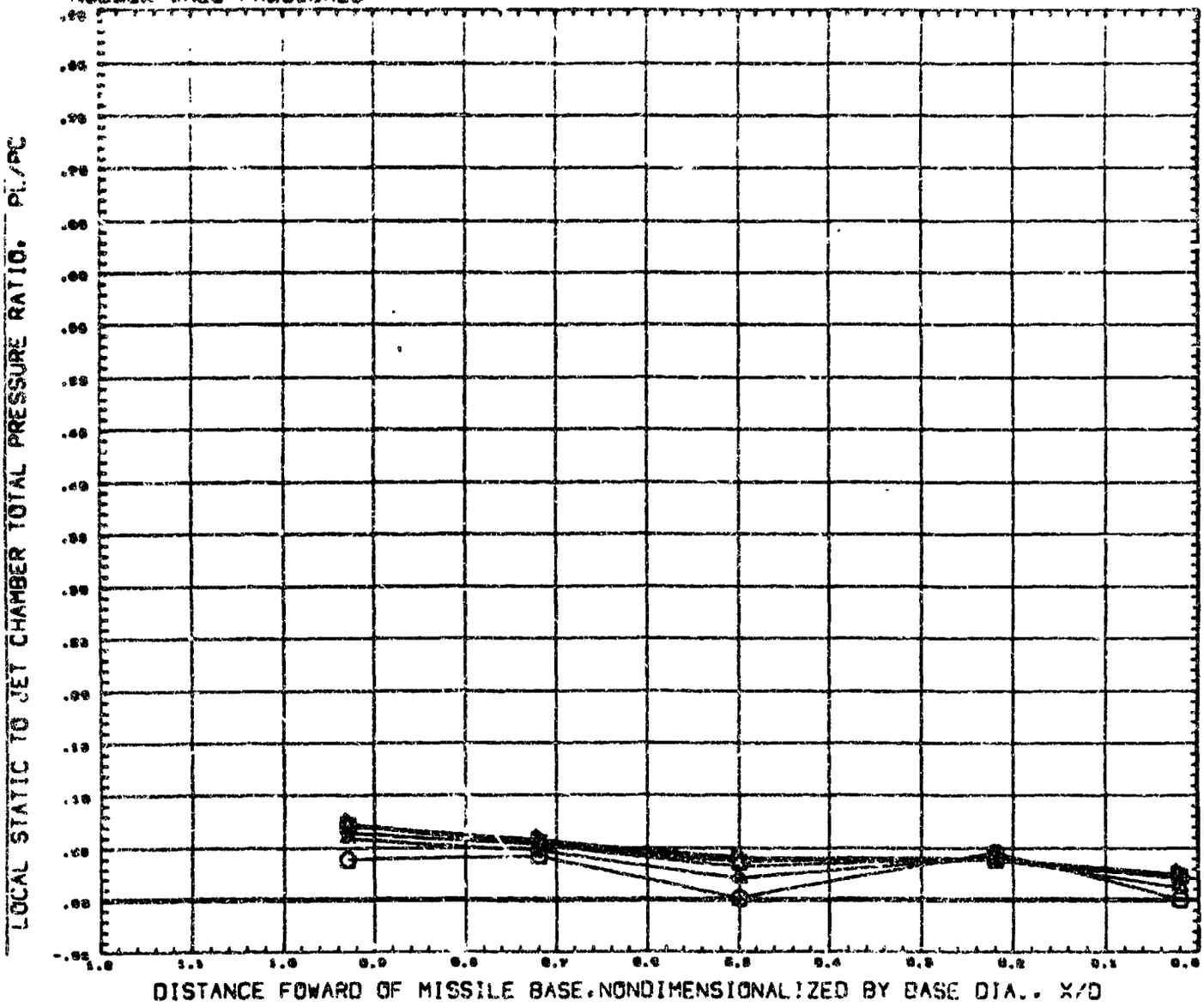
SYMBOL	CT	THETA	MACH
○	[illegible]	180.000	1.604
△	[illegible]		
◇	[illegible]		

PARAMETRIC VALUES

ALPHA	0.000	MACH-1	[illegible]
DJ/DB	0.090	THETAJ	[illegible]

REFERENCE FILE

NOZZLE WALL PRESSURES



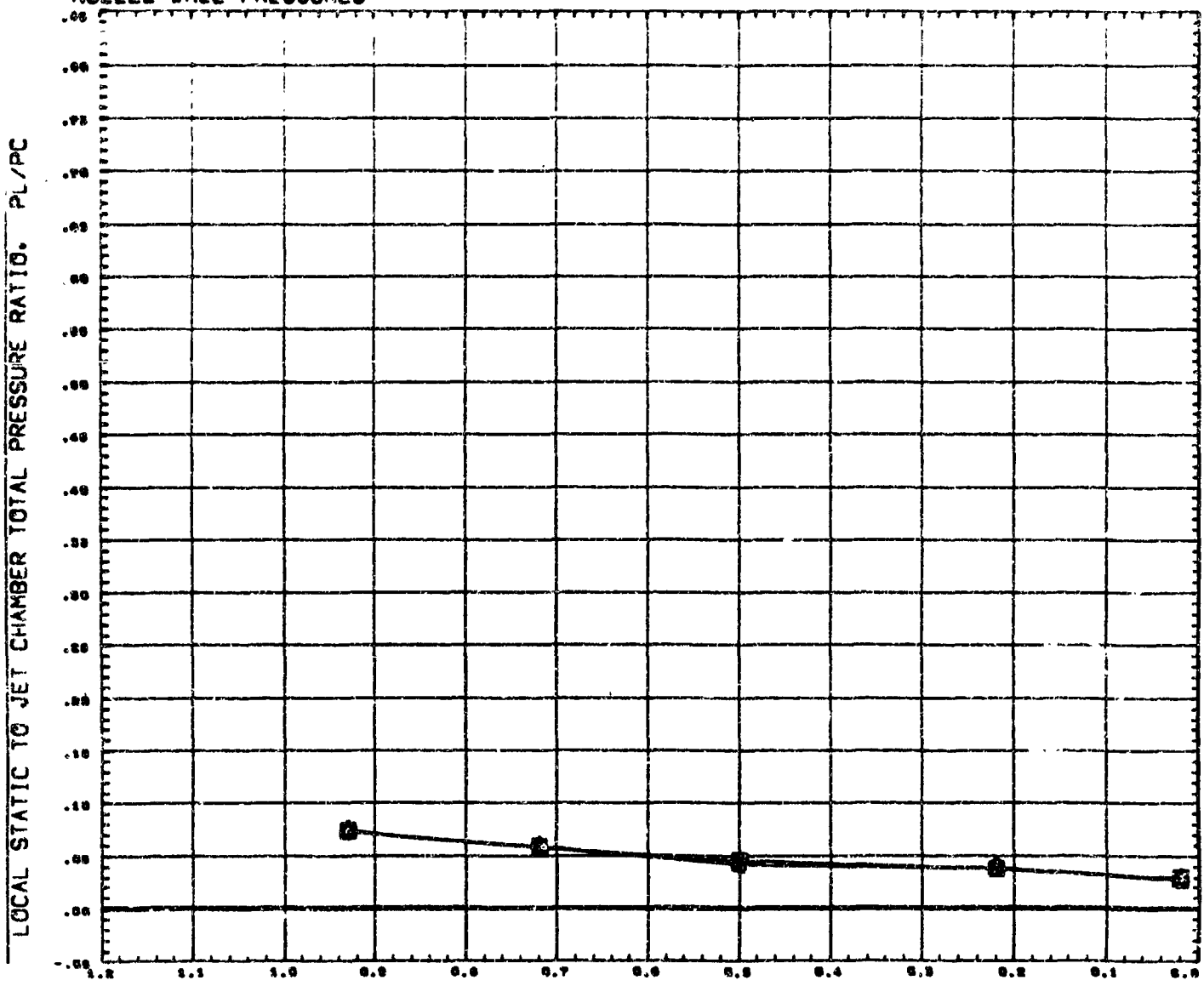
SYMBOL	CT	THETA	MACH
○	1.805	180.000	1.206
△	4.069		
◇	9.200		
□	14.902		
◺	18.328		
D	20.468	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.900
BJ/DB	0.890	THETAJ	1.700

AMC PLUME STUDY, CONTOURED NOZZLE(-2) (RUCI07) PAGE 230

NOZZLE WALL PRESSURES



SYMBOL	ST	THETA	MACH
○	38.112	180.000	1.206
△	53.049		
◇	60.736		
□	97.493		

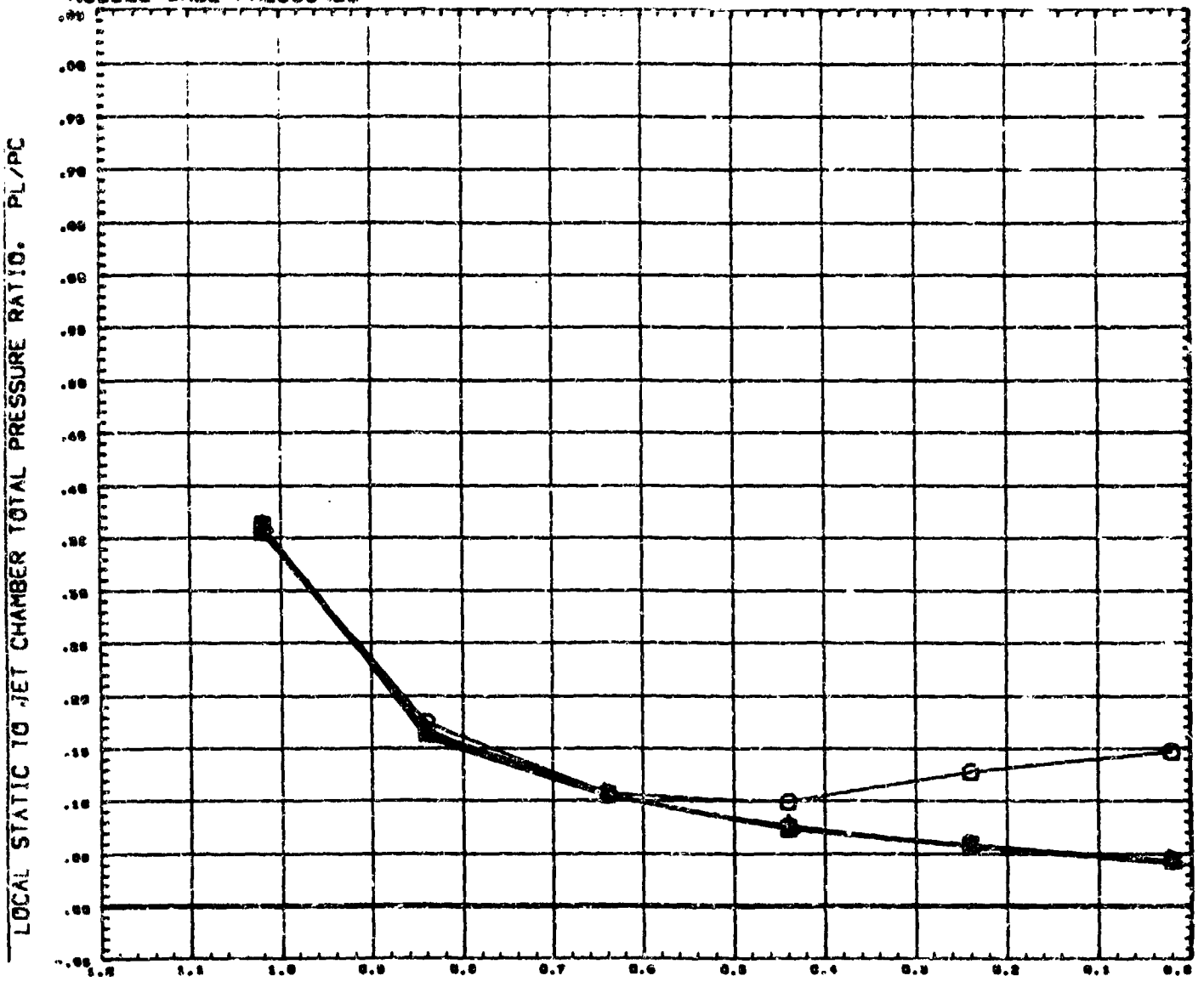
PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.000
DJ/DB	0.000	THETAJ	1.700

REFERENCE FILE

AMC PLUME STUDY, CONTOURED NOZZLE(-2) (RUCI07) PAGE 231

NOZZLE WALL PRESSURES



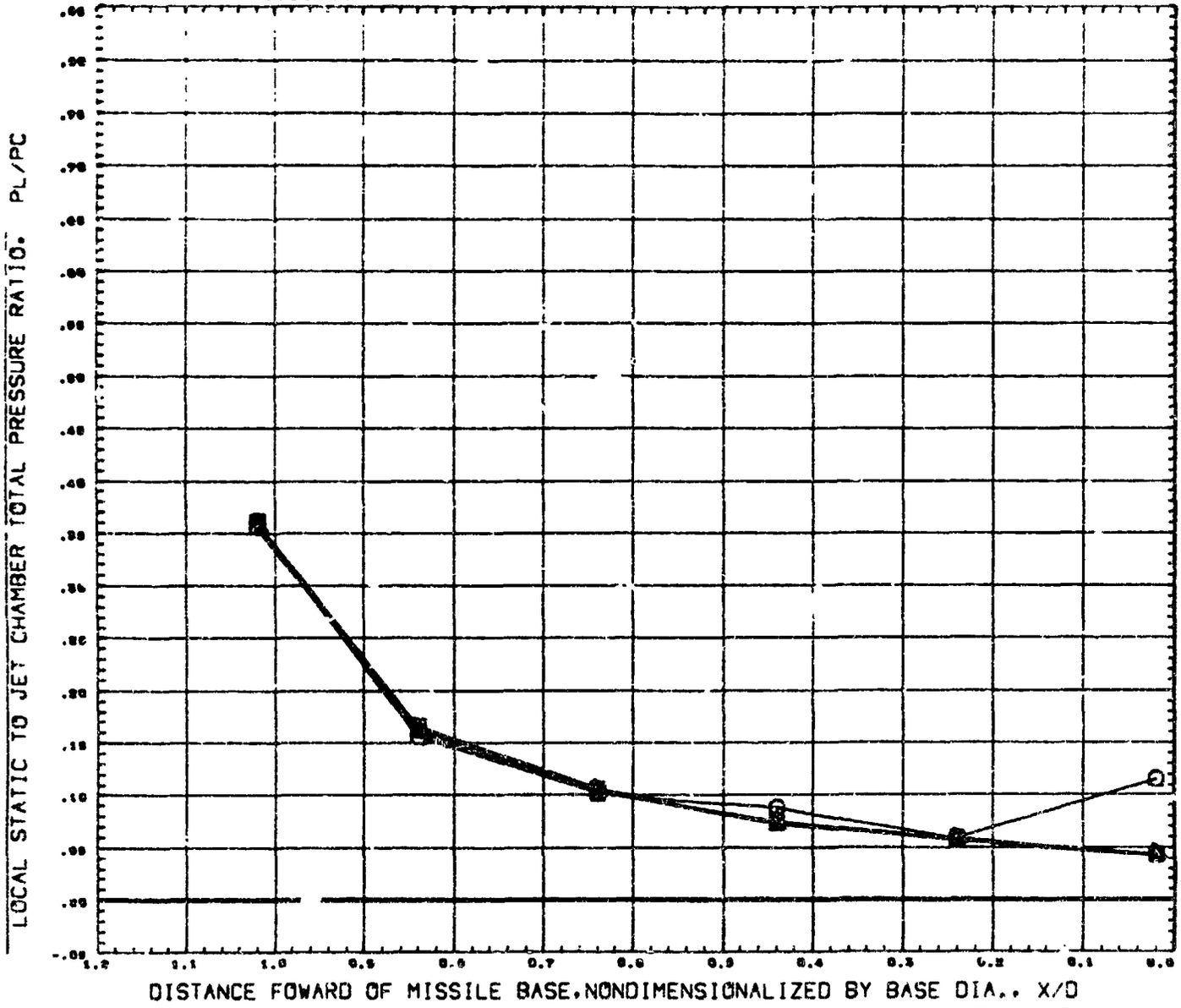
SYMBOL	CT	THETA	MACH
○	3.284	180.000	0.700
△	16.292		
◇	37.289		
□	63.119		
◺	71.036		
D	103.170	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.030	THETAJ	0.700

AMC PLUME STUDY, CONTOURED NOZZLE(-3) (RUCI08) PAGE 232

NOZZLE WALL PRESSURES



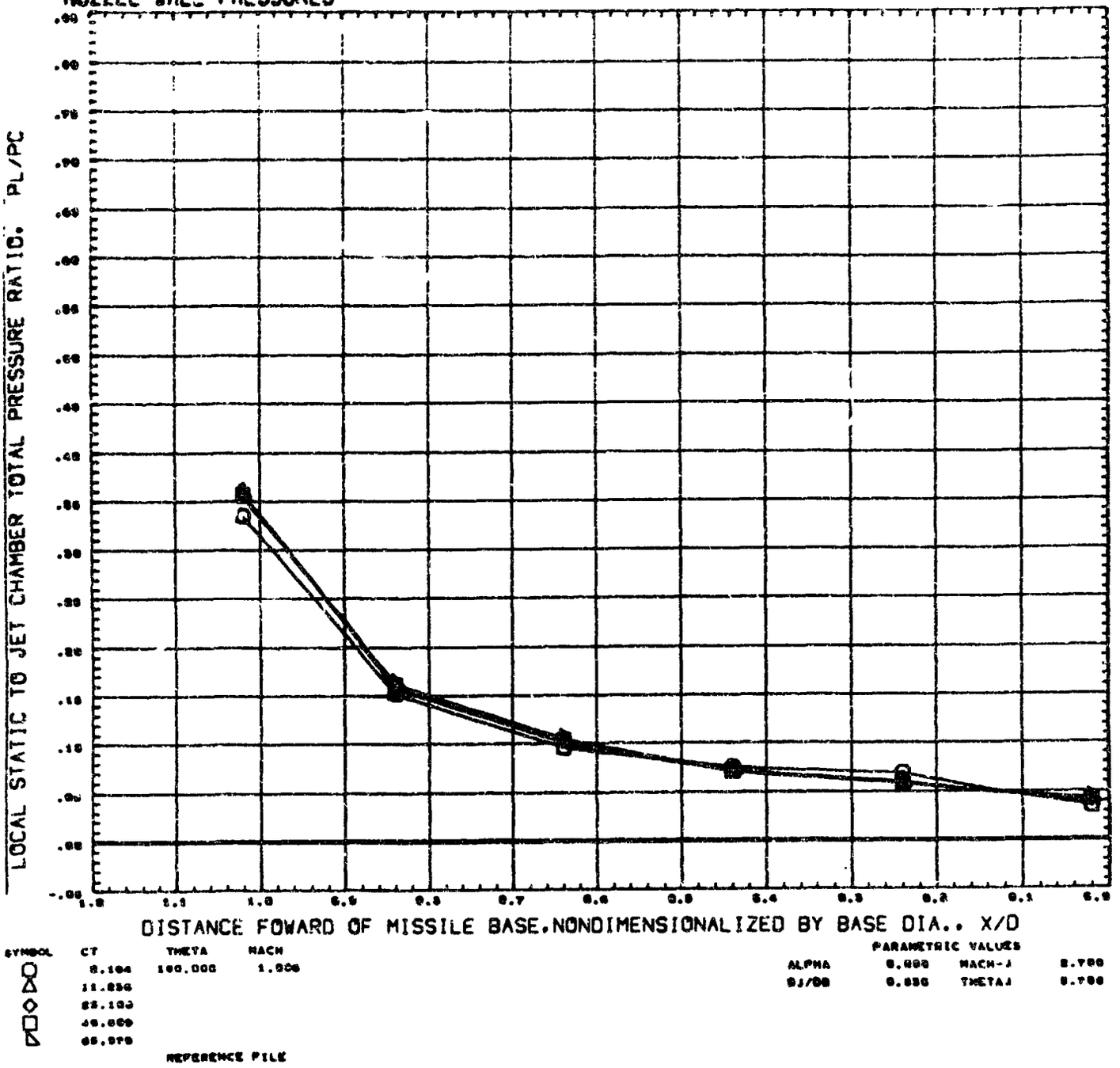
SYMBOL	CT	THETA	MACH
	2.400	160.000	0.902
	13.431		
	29.102		
	51.499		
	72.947		

REFERENCE FILE

PARAMETRIC VALUES

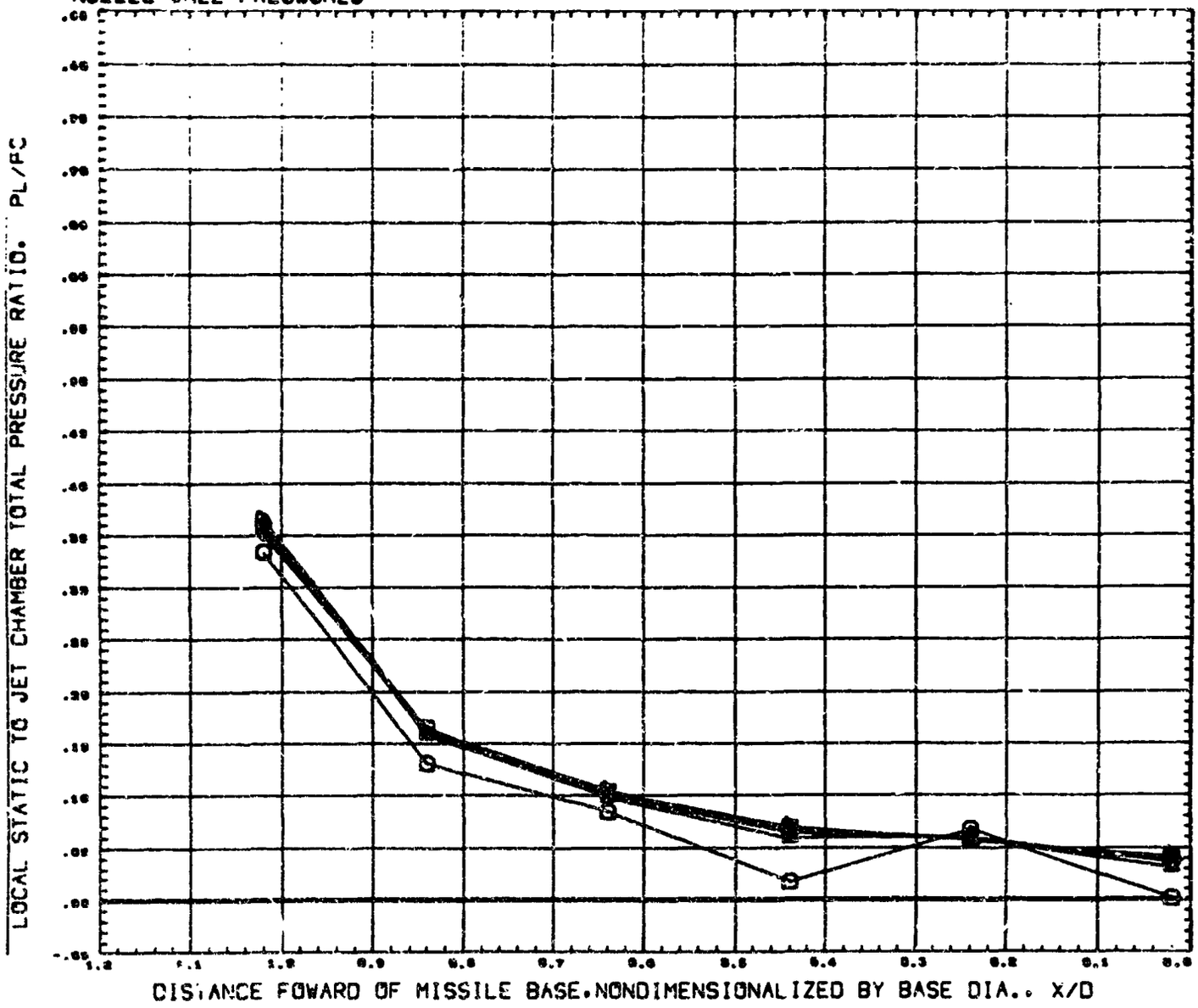
ALPHA	0.000	MACH-J	2.700
DJ/DB	0.030	THETAJ	0.700

NOZZLE WALL PRESSURES



AMC PLUME STUDY, CONTOURED NOZZLE(-3) (RUCI08) PAGE 234

NOZZLE WALL PRESSURES



SYMBOL	CT	THETA	MACH
○	1.938	180.000	1.205
△	5.850		
◇	19.211		
□	48.078		
◺	90.722		
D	99.540	REFERENCE FILE	

PARAMETRIC VALUES

ALPHA	0.000	MACH-J	2.700
DJ/DB	0.030	THETAJ	5.700

AMC PLUME STUDY, CONTOURED NOZZLE(-3) (RUCI08) PAGE 235