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SID 63-145

DATA REPORT FOR APOLLO MODEL FS-2 TESTS IN THE AMES UNITARY PLAN WIND TUNNELS TO MEASURE LAUNCH ESCAPE VEHICLE COMPONENT LOADS (u)

(FOURTH SERIES)

NAS9-150

April 1963

SID

Apollo

(NASA-CR-116675) DATA REPORT FOR APOLLO MODEL FS-2 TESTS IN THE AMES UNITARY PLAN WIND TUNNELS TO MEASURE LAUNCH ESCAPE VEHICLE COMPONENT LOADS (North American Aviation, Inc.) 303 p

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CLASSIFICATION CHANGE

To UNCLASSIFIED

By authority of EO 11652

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FOREWORD

The FS-2 launch escape vehicle component loads investigation was conducted under NASA Apollo Contract NAS9-150 in the Ames Research Center Unitary Plan Wind Tunnels from 27 August to 13 September 1962.

This report was prepared by R. G. Hendry of the Wind Tunnel Projects Group, Los Angeles Division of North American Aviation, Inc.

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I. INTRODUCTION

Wind tunnel tests of the 0.105-scale Apollo force model (FS-2) were conducted in the Ames 11- by 11-foot, 9- by 7-foot, and 8- by 7-foot Unitary Plan Wind Tunnels to measure launch escape vehicle (LEV) component loads.[1] The tests were conducted over an angle-of-attack range of -3 to +55 degrees. Data were obtained in the Mach number range of 0.7 to 3.4.

The tabulated and plotted data presented in the appendixes to this report consist of longitudinal stability characteristics for the escape motor and command module components of the LEV while in the presence of each other and the longitudinal stability characteristics of the total LEV.

[1] Pretest Report of the 0.105-Scale Apollo Force Model FS-2 in the Ames Unitary Plan Wind Tunnels. NAA S&ID SID 62-1007 (19 July 1962).

II. DISCUSSION

This investigation was conducted using a 0.105-scale model (FS-2) of the Apollo to obtain aerodynamic force data and stability characteristics on the individual components of the launch escape vehicle. To accomplish this, two six-component balances were installed in the model. The Ames T-1.5 balance was supported between the launch escape rocket motor and the tower. The Ames T-2.5 balance was mounted in the command module. The model was constructed so that the escape tower could be supported either directly by the sting or by the main balance in the command module. With the escape tower supported by both methods, the loads on the escape motor, the loads on the command module in the presence of the tower and escape motor, and the loads on the total LEV were measured.

The plotted data are presented in Appendix A. In most cases, these plots contain three curves representing the measured data for the total LEV, the escape motor, and the command module in the presence of the launch escape system. The curves are identified by the configuration nomenclature. The portion of the configuration nomenclature that is not enclosed by parenthesis is metric (forces and moments measured) and indicates the component load being measured. The components in parenthesis are present but are nonmetric. This is shown on the sample plot (page A-3) preceding the plotted data.

During these tests, the $E_{20}T_9C_2$ configuration was used to obtain total LEV data to correlate with previous tests on this configuration to determine whether the sting-knuckle model support affected the total loads on the LEV. During this portion of the test in the 9- by 7-foot tunnel (Mach numbers 1.55 to 2.4), the escape rocket balance failed. Therefore, no escape rocket data were obtained at these Mach numbers for the $E_{20}T_9C_2$ configuration.

The data obtained during the Mach number 3.4 run of the $E_{20}T_9C_2$ configuration contain certain discrepancies and were invalid. The raw data were checked and recomputed by Ames personnel with the same results. The source of the errors was not determined, and the plots of these data have been omitted.

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III. MODEL DESCRIPTION

The 0.105-scale Apollo FS-2 force model has been modified to permit installation of the Ames 1.5-inch Task balance in the escape motor body. The balance is supported on the forward end of the tower. The Ames 2.5-inch Task balance is installed on the model centerline in the balance block within the command module.

Two methods of supporting the tower are provided. One is nonmetric, in which the tower is supported from the sting and does not make contact with the command module. This arrangement permits testing of the LEV to obtain individual component loads on both the escape motor and the command module while in the presence of each other and the tower.

The second method is to make the tower metric by attaching it to the 2.5-inch balance block. With this arrangement, the T-2.5 balance measures the total LEV loads.

The 7121-01081 Ames sting, which was constructed for the AEDC T-2.5 balance, was shortened and modified to incorporate a pivot point aft of the command module. Two sets of adapter support arms for sting offset angles of 12 and 40 degrees were provided with a new adapter to fit the Ames T-2.5 balance (Figure 1).

Additional model information can be found in the structural analysis report.[1]

INSTRUMENTATION

Force data were measured on the launch escape motor by the Ames T-1.5 internal balance. Force data were measured on the command module alone and on the total LEV by the Ames T-2.5 internal balance.

The base pressure reading was obtained but was not used in the data reduction.

[1] Structural Analysis of the 0105-Scale Apollo Wind Tunnel Model (FS-2). NAA S&ID SID 62-104 (12 March 1962).

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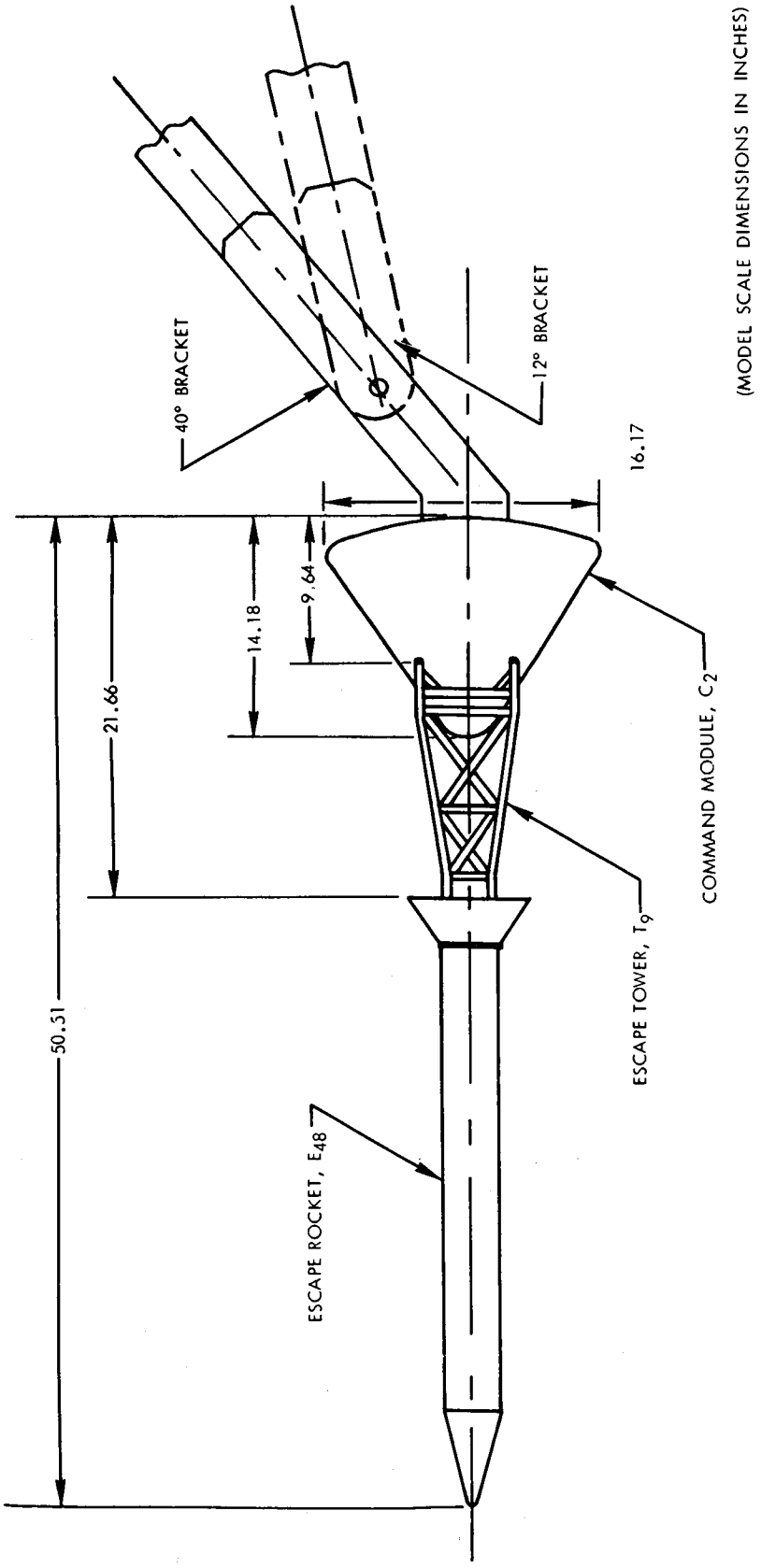

Figure 1. Launch Escape Vehicle

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MODEL NOMENCLATURE

The model nomenclature used during these tests is presented in the following tabulation.

Symbol	Description	Drawing No.	Sketch
E_{20}	Escape motor, 65-inch diameter disc mounted foward of the 30-degree flared skirt	7121-01080 -2, -9, -10 -11, -18, and -21	Figure 2
E_{48}	Escape motor, 34-degree flared skirt	7121-01089 -3, -4, -5, -6; 7121-01080 -15 and -18	Figure 2
E_{49}	Escape motor, 65-inch diameter disc with fairing mounted forward of 34-degree flared skirt	7121-01089 -3, -4, -5, -6, and -7; 7121-01080 -15 and -18	Figure 2
C_2	Command module	7121-01077 -3, -4, -5, -19, -20, and -21	Figure 3
T_9	Tower structure	7121-01079 -11	Figure 4

FULL-SCALE DIMENSIONS

Full-scale dimensions of the components represented in the tests are given in the following listing.

Escape Rocket Motor, E_{20}

Total length, including jettison motor	252.39 in.
Diameter of escape rocket	26.00 in.
Nose included angle	30.00 deg
Skirt-disc diameter	65.00 in.
Skirt-disc thickness	2.50 in.
Skirt-disc position forward of flared skirt base	18.70 in.
Diameter of escape rocket base	52.00 in.
Skirt flare angle	30.00 deg

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Escape Rocket Motor, E_{48}	
Total length, including jettison motor and kicker motor	274.81 in.
Diameter of escape motor, jettison motor, and kicker motor	26.00 in.
Nose included angle	30.00 deg
Diameter of escape rocket base	51.85 in.
Skirt flare angle	34.00 deg
Escape Rocket Motor, E_{49}	
Total length, including jettison motor and kicker motor	274.81 in.
Diameter of escape motor, jettison motor and kicker motor	26.00 in.
Nose included angle	30.00 deg
Skirt-disc diameter	65.00 in.
Skirt-disc thickness	1.25 in.
Skirt-disc position forward of flared skirt base	18.00 in.
Diameter of escape rocket base	51.848 in.
Skirt flare angle	34.00 deg
Skirt-disc fairing diameter	51.00 in.
Command Module, C_2	
Maximum diameter	154.00 in.
Radius of spherical blunt end	184.80 in.
Corner radius	7.70 in.
Nose cone semiangle	33.00 deg
Nose cone vertex radius	9.152 in.
Total height	135.021 in.
Frontal area	129.351 sq ft
Tower Structure, T_9	
Total length	114.514 in.
Number of longitudinal members	4.00
Diameter of longitudinal members	3.571 in.
Diameter of cross braces	2.381 in.
Distance between attachment points at command module	46.752 in.
Distance between attachment points at escape motor	21.905 in.

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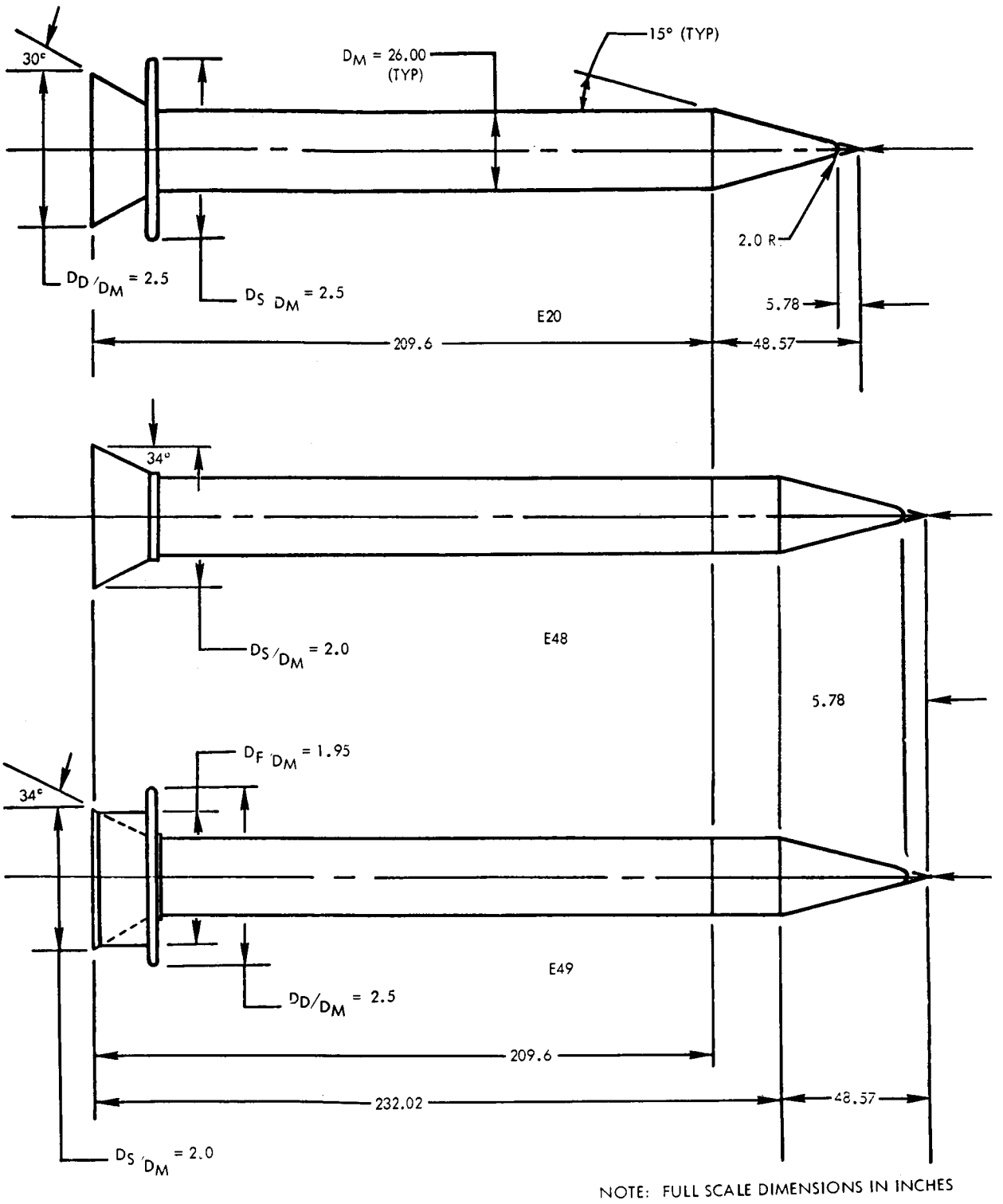

Figure 2. Escape Rocket Configurations

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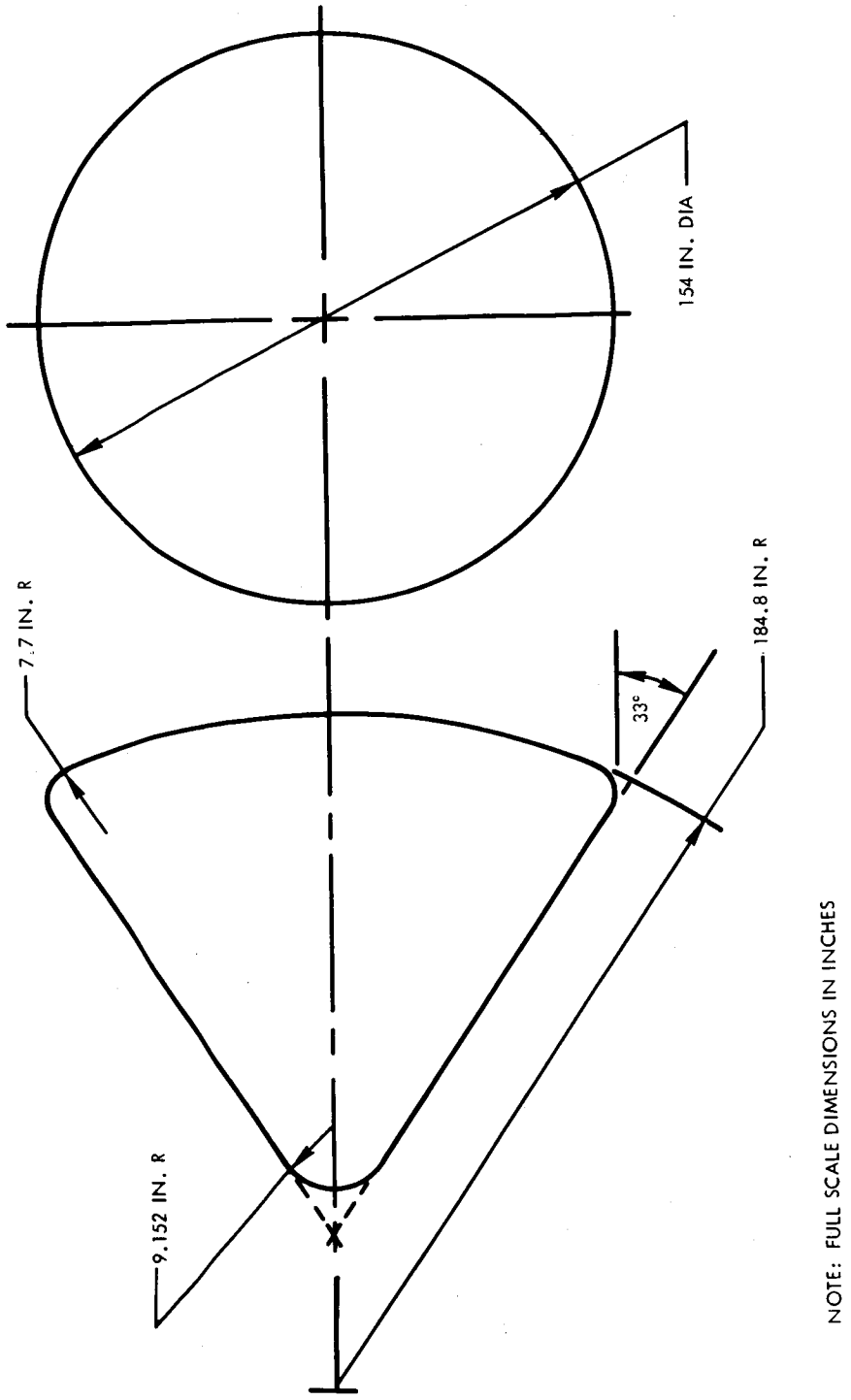

Figure 3. Command Module - C_2

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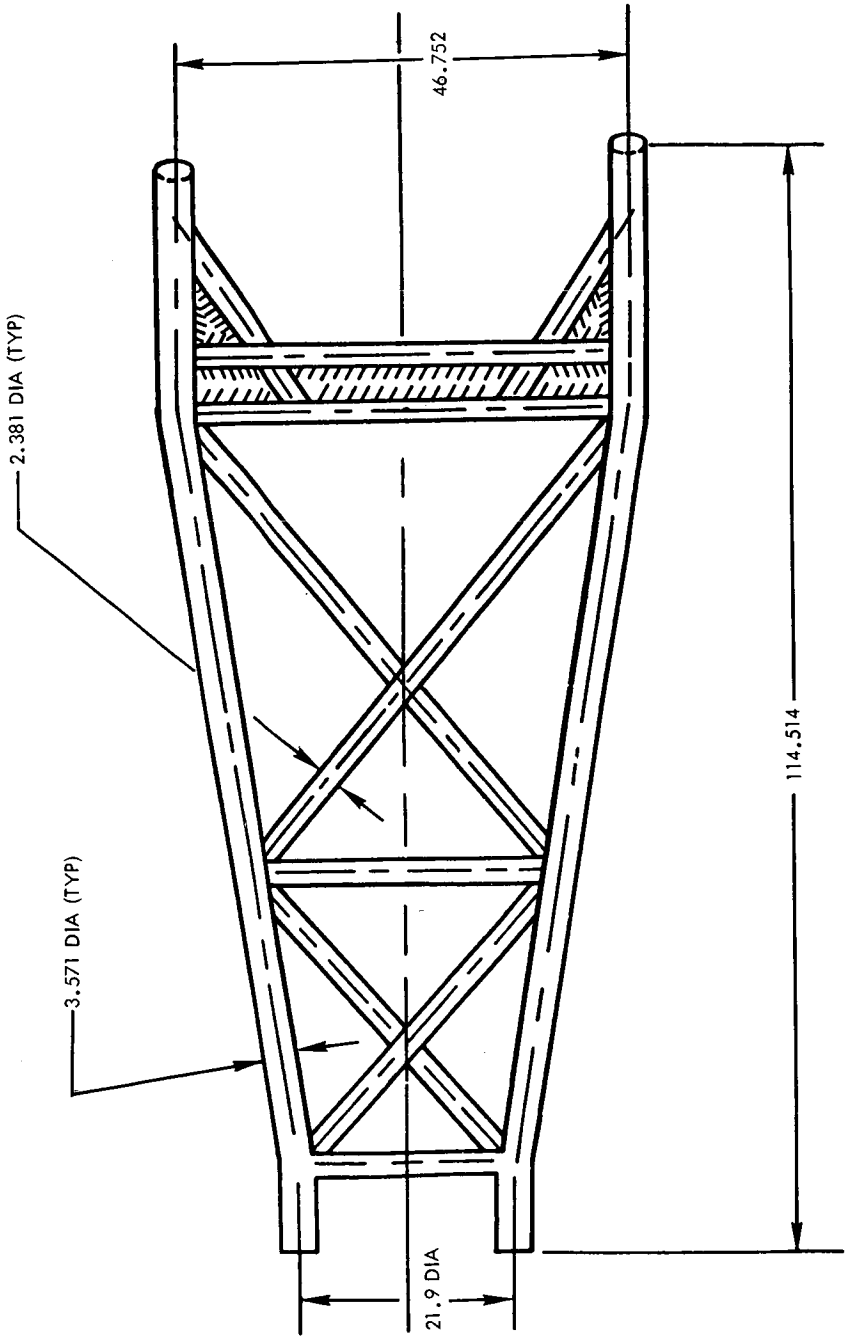

Figure 4. Escape Tower Structure - T_9

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IV. TEST PROCEDURE

TEST NOMENCLATURE

The symbols used in these tests are defined as follows:

A	Reference area = 1.4261 ft^2
M_∞	Free-stream Mach number
α	Angle of attack of the command module (applies for both LEV or command module alone), deg (0 degrees is command module apex forward)
β	Angle of sideslip of the command module (applies for both LEV or command module only), deg (0 degrees is command module apex forward)
α_E	Angle of attack of the escape motor, deg
β_E	Angle of sideslip of the escape motor, deg
q_∞	Free-stream dynamic pressure, lb/ft^2
K_c	Configuration number code
d	Model reference diameter (maximum diameter of command module), 1.3475 ft
R	Free-stream Reynolds number, per ft
C_{pb}	Command module base pressure coefficient, $\frac{Pb - P_\infty}{q}$
P_b	Base pressure, lb/ft^2
P_∞	Free-stream static pressure, lb/ft^2
θ_s	Sting bend angle, deg (measured between model axis of symmetry and sting centerline)

Coefficients with subscript E denote aerodynamic loads acting on the escape motor while in the presence of the tower and command module. These subscripts are used only in the tabulated data section of Appendix B.

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Stability System of Axes With Origin at Center of Gravity

C_D	Drag coefficient (not corrected for base effects) drag/qA
C_L	Lift coefficient, lift/qA
C_{m_1} or $C_{m_{cg}}$	Pitching moment coefficient about the reference center of gravity, pitching-moment/qAd.
L/D	Lift-to-drag ratio, C_L/C_D
C_{D_E}	Drag coefficient (not corrected for base effects) drag/qA (applies to drag on the escape motor only)
C_{L_E}	Lift coefficient, lift/qA (applies to lift on the escape motor only)
$C_{m_{1_E}}$ or $C_{m_{E_{cg}}}$	Pitching moment coefficient about the reference center of gravity, pitching moment/qAd (applies to pitching moment on the escape motor only)

Body System of Axes With Origin at Center of Gravity

C_N	Normal-force coefficient, normal force/qA
C_A	Axial-force coefficient (not corrected for base effects), axial force/qA
C_{N_E}	Normal-force coefficient, normal force/qA (applies to normal force on the escape motor only)
C_{A_E}	Axial-force coefficient (not corrected for base effects), axial force/qA (applies to axial force on the escape motor only)

Body System of Axes With Origin at Command Module Projected Cone Apex

C_{m_2} or C_{m_A}	Pitching moment coefficient, pitching moment/qAd
$(X_{cp})_N$ or X_{cp}/D	Location of the normal force center of pressure divided by the command module diameter and measured from the command module apex, positive forward
$C_{m_{2_E}}$	Pitching moment coefficient, pitching moment/qAd (applies to pitching moment on the escape motor only)

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$(X_{cp})_{NE}$ Location of the normal force center of pressure divided by the command module diameter, and measured from the command module apex, positive forward (applies to center of pressure on the escape motor only)

MODEL INSTALLATION

The FS-2 Apollo model was supported by an Ames adapter combined with a NAA modified sting and two sets of indexed brackets, with offset angles of 12 and 40 degrees, to provide an angle range of -3 to +55 degrees (Figure 5).

The command module was installed on the Ames T-2.5 balance, and the escape motor was installed on the Ames T-1.5 balance.

For measurement of the combined LEV loads, the tower that supports the escape motor was attached directly to the T-2.5 balance support block located in the command module.

For measurement of individual LEV component loads, the tower was attached by means of tie plates directly to the indexed brackets on the sting. In this way, the loads on the escape motor and tower were not measured (nonmetric) by the T-2.5 balance.

The basic angle range for the support system extended from α = -15 to +15 degrees. This range, combined with the offset angles of the two index brackets (12 and 40 degrees), allowed complete coverage of the angle-of-attack range.

INSTRUMENTATION

The outputs from both the Ames T-1.5 balance in the escape motor and the T-2.5 balance in the command module were recorded on the Ames Beckman data system.

The data were reduced at a remote computer location then transmitted to a flexowriter located in the tunnel control room.

Schlieren flow visualization photographs and motion pictures were taken during the tests.

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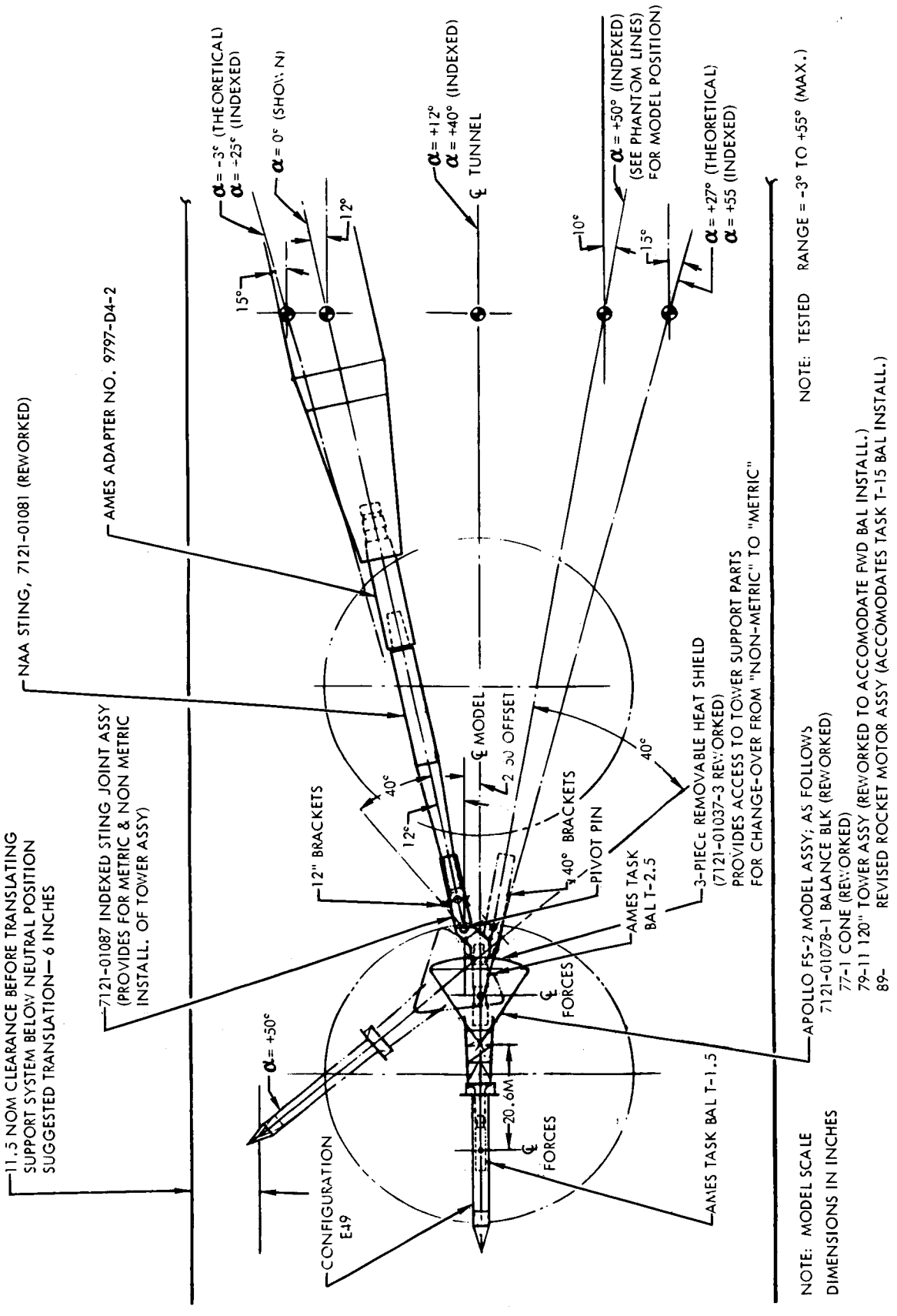

Figure 5. Typical Model Installation

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DATA REDUCTION

Equations and Methods

The data reduction program was set up to provide aerodynamic force and moment coefficient data about the body and stability axis for the escape motor and the command module of the launch escape vehicle.

The center of pressure location was reduced to dimensional form X_{cp}/D.

The aerodynamic force and moment coefficient data about the balance axes were obtained by the standard data reduction equations for tests conducted in the Unitary Plan Wind Tunnel.

Equations and moment transfer distances from the command module apex to the center of gravity and to the balance center have been tabulated and are included in this section. A moment transfer sketch is shown in Figure 6.

The following equations are used to transfer force coefficients from the balance axis to the body axis.

Escape motor coefficients (balance No. 1)

$$C_{A_1} = C_A \text{ balance No. } 1$$

$$C_{N_1} = C_N \text{ balance No. } 1$$

$$C_{m_{A_1}} = C_{N_1}\overline{X}_{x_1} + C_m \text{ balance No. } 1$$

$$C_{m_{cg_1}} = C_{N_1}\overline{X}_{cg} + C_{A_1}\overline{Z}_{cg} + C_{m_A}$$

$$(X_{cp})_1/D = C_{m_{A_1}}/C_{N_1}$$

Command module or LEV coefficients (balance No. 2)

$$C_{A_2} = C_A \text{ balance No. } 2$$

$$C_{N_2} = C_N \text{ balance No. } 2$$

$$C_{m_{A_2}} = C_{N_2}\overline{X}_{x2} + C_m \text{ balance No. } 2$$

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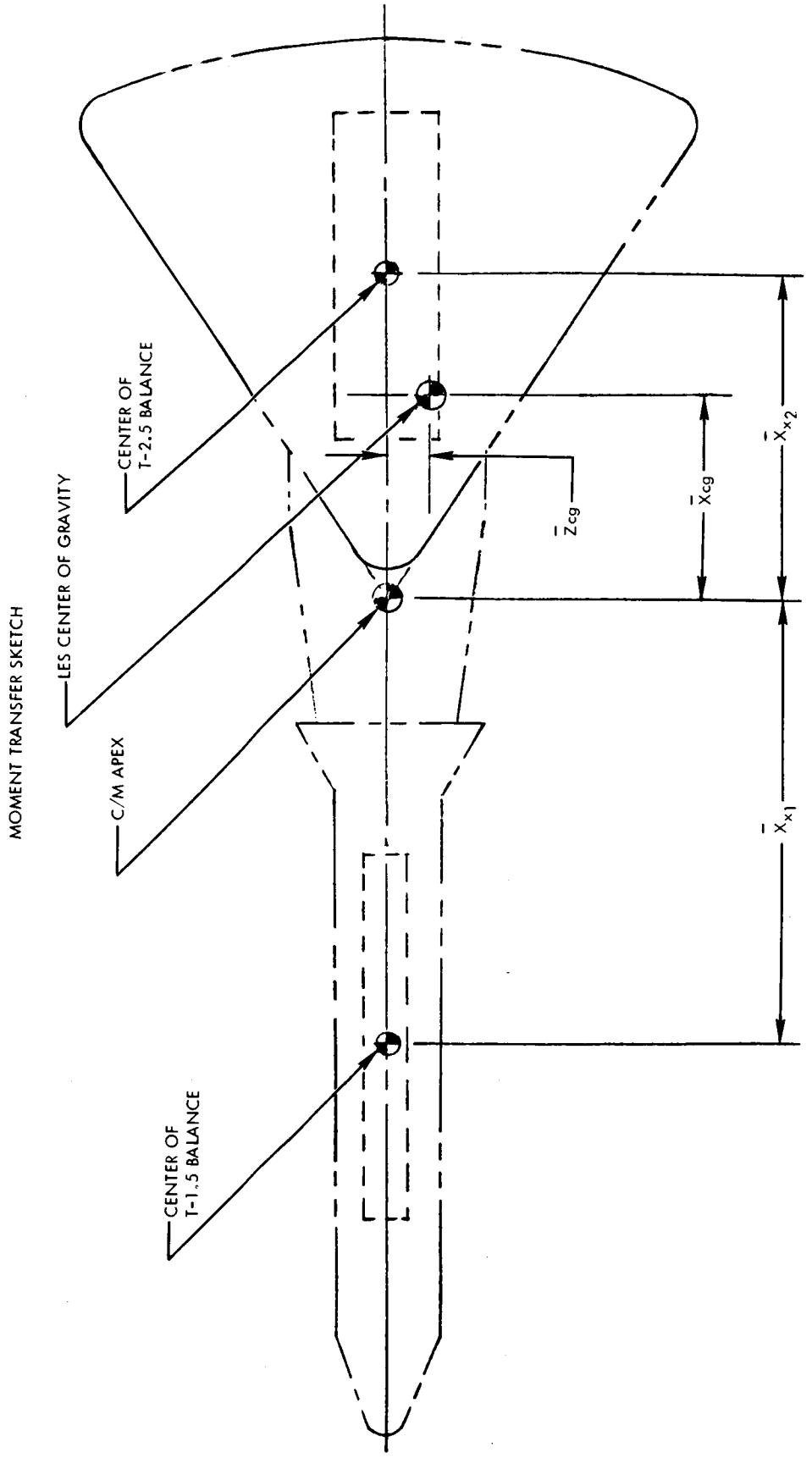

Figure 6. Moment Transfer

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$$C_{m_{cg_2}} = C_{N_2}\,\overline{X}_{cg} + C_{A_2}\overline{Z}_{cg} + C_{m_{A_2}}$$

$$(X_{cp})_2/D = C_{m_{A_Z}}/C_{N_2}$$

Data Reduction Factors

Symbol	Description	Value
S	Reference area (maximum cross section command module)	1.4261 ft^2
D	Reference length (maximum diameter of command module)	1.3475 ft
$\overline{X}_{x_1}$	Longitudinal distance from apex to center of T-1.5 balance in escape motor, positive forward of apex	1.5495 ft
$\overline{X}_{x_2}$	Longitudinal distance from apex to center of T-2.5 balance in command module, positive forward of apex	-0.7303 ft
$\overline{X}_{Z_1}$	Vertical distance from model axis of symmetry to center of T-1.5 balance in escape motor, positive above model axis	0
$\overline{X}_{Z_2}$	Vertical distance from model axis of symmetry to center of T-2.5 balance in command module, positive above model axis	0

Launch Escape System

Symbol	Description	Value
$\overline{X}_{cg}$	Longitudinal distance from command module apex to the center of gravity, positive forward of apex	-0.4252 ft
$\overline{Z}_{cg}$	Vertical distance from model axis to the center of gravity, positive below model axis	+0.05929 ft

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DATA ACCURACY

The balance and recording instrumentation were set to provide maximum sensitivity possible within the capabilities of the amplifying instrumentation and the limits established by keeping maximum loads less than full scale on the recorders. The Beckman data recorder at Ames has a readout capability of 10,000 counts full scale with a rated sensitivity of ±2 counts.

The dynamic pressure (q) remained constant at 540 psf for runs made at Mach number 0.7 to 3.0 and at 425 psf for runs made at Mach number 3.4 and can be recorded within ±0.02 inches Hg (2.829 psf).

The Mach number can be recorded within ±0.01, and the angle of attack (α) can be recorded within ±0.01 degree for angles up to 99 degrees and within ±0.1 degree for angles of 100 degrees and greater.

The model-to-balance offset angle (θ) remained constant at 0 degrees for the entire test.

The maximum coefficient deviations that could be expected in the presentation of the results of this test are presented below. Coefficient deviations for the escape motor are based on repeat runs obtained while measuring both total and component LEV loads. Other coefficient deviations were estimated assuming a 0.5 percent balance error, which is normal tolerance for the balances used.

Escape Motor (T-1.5 Balance)

Mach No.	C_N	C_A	$C_{m_{cg}}$	C_{m_A}	C_L	C_D
0.7 to 0.9	0.0058	0.0063	0.0123	0.0102	0.0063	0.0064
1.1 to 3.0	0.0059	0.0063	0.0123	0.0102	0.0063	0.0064
3.4	0.0075	0.0080	0.0157	0.0130	0.0081	0.0082

Command Module (T-2.5 Balance)

Mach No.	C_N	C_A	$C_{m_{cg}}$	C_{m_A}	C_L	C_D
0.7 to 0.9	0.0112	0.0139	0.0083	0.0105	0.0128	0.0139
1.1 to 3.0	0.0113	0.0139	0.0083	0.0105	0.0128	0.0139
3.4	0.0143	0.0176	0.0107	0.0133	0.0164	0.0178

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LEV (T-2.5 Balance)

Mach No.	C_N	C_A	$C_{m_{cg}}$	C_{m_A}	C_L	C_D
0.7 to 0.9	0.0113	0.0139	0.0083	0.0105	0.0133	0.0139
1.1 to 3.0	0.0114	0.0139	0.0083	0.0105	0.0133	0.0139
3.4	0.0144	0.0176	0.0107	0.0133	0.0169	0.0178

Model installation photographs are presented in Figures 7 through 16. Typical Schlieren photographs taken during the test are presented in Figures 17 and 18.

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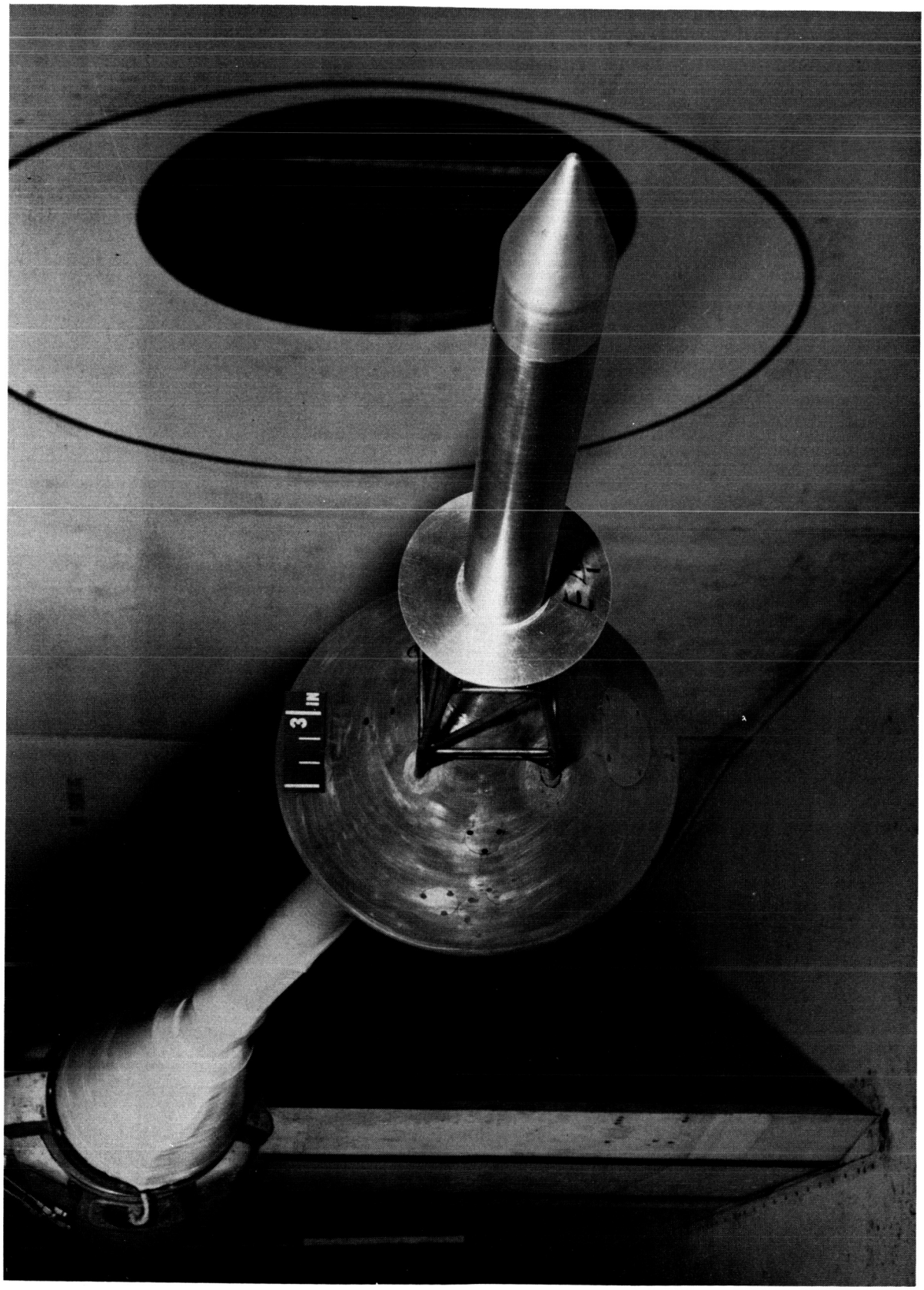

Figure 7. Model Installed - Sting Bend = 12 Degrees

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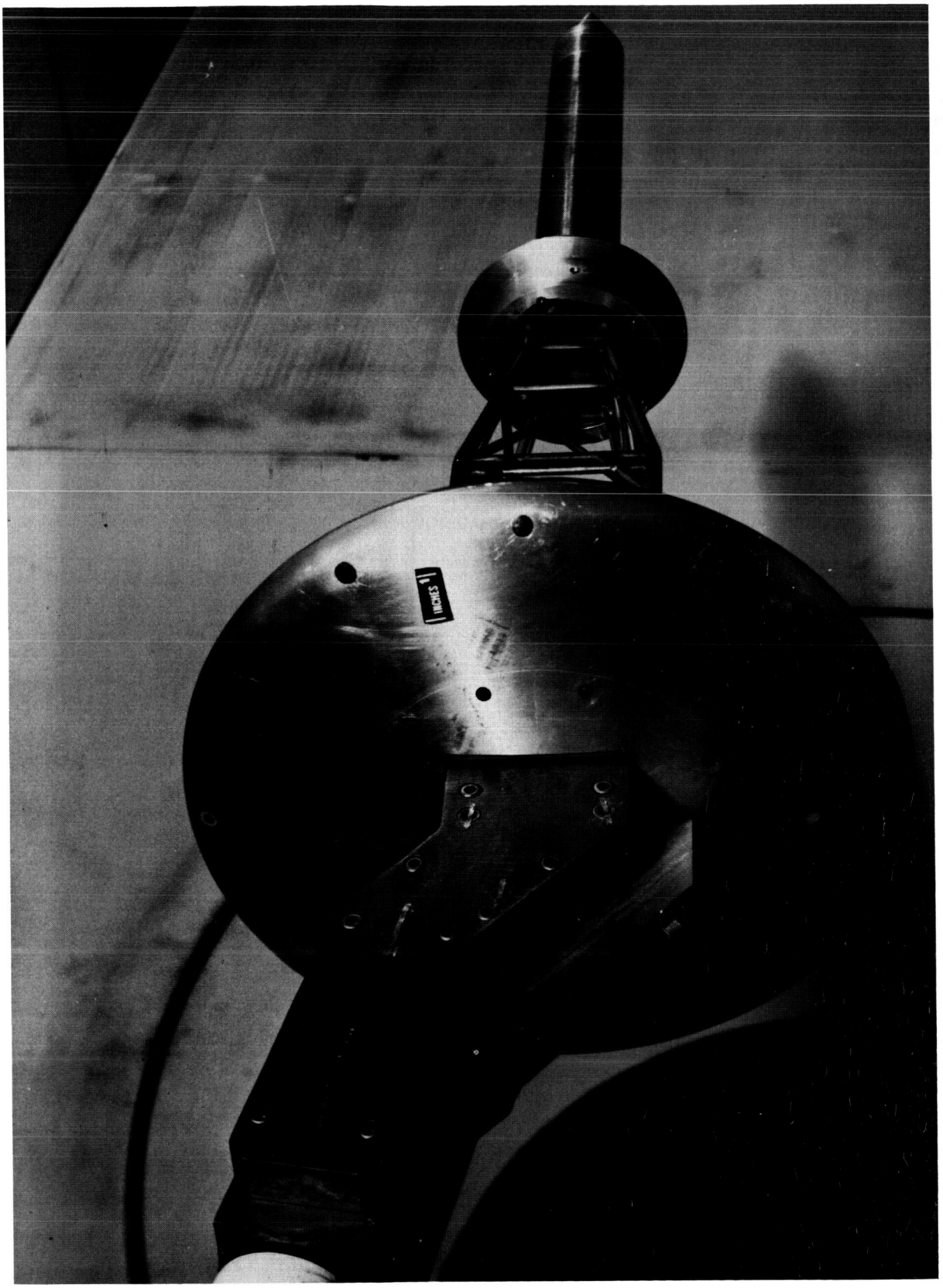

Figure 8. Rear View of Model Installed - Sting Bend = 12 Degrees

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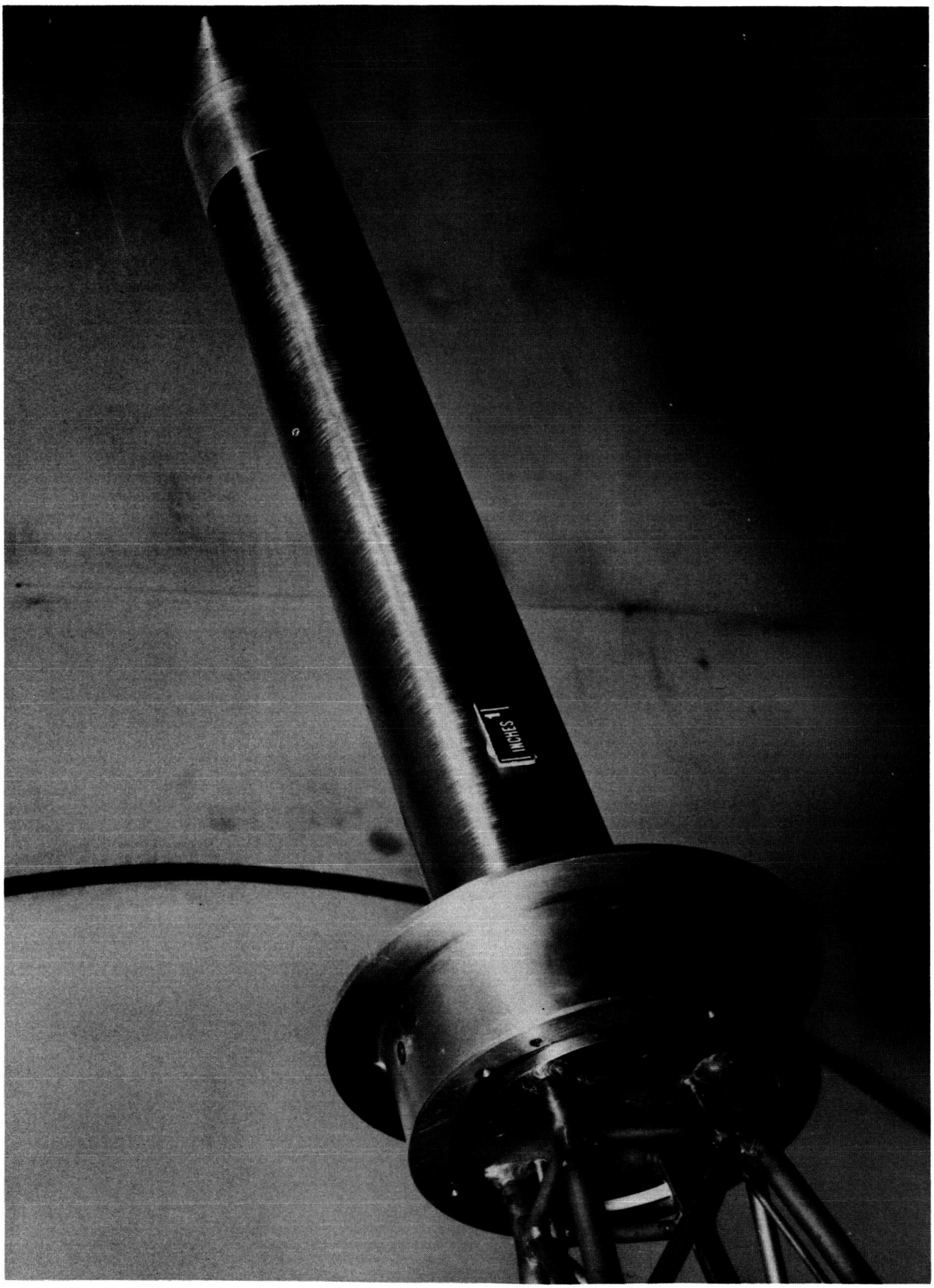

Figure 9. Kicker Motor and Escape Motor with 34-Degree Skirt Covered by Disc (D_d/D_m = 2.5) and Aft Cylinder

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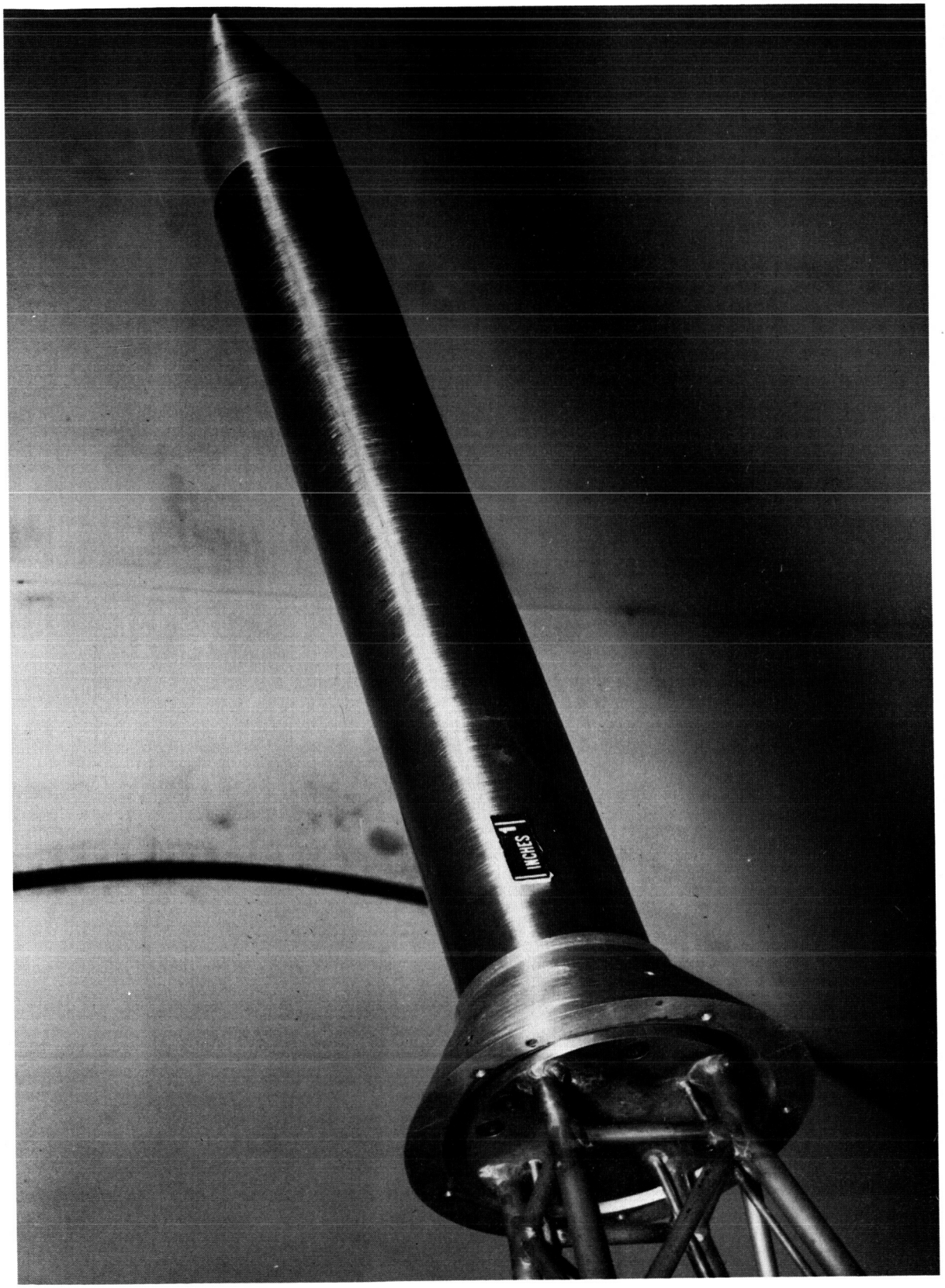

Figure 10. Kicker Motor and Escape Motor with 34-Degree Skirt

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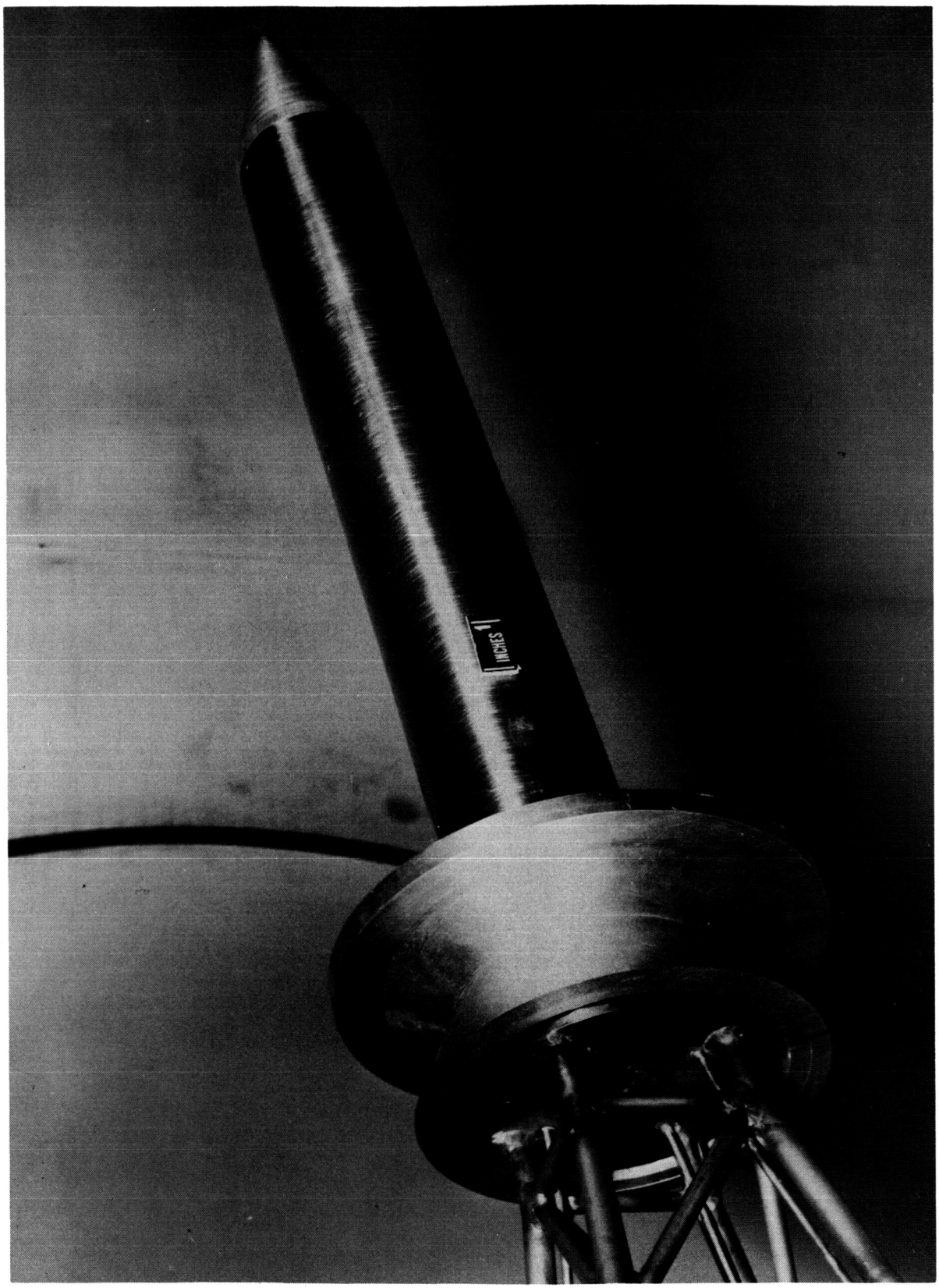

Figure 11. Escape Motor with Disc (D_d/D_m = 2.5) and 34-Degree Skirt

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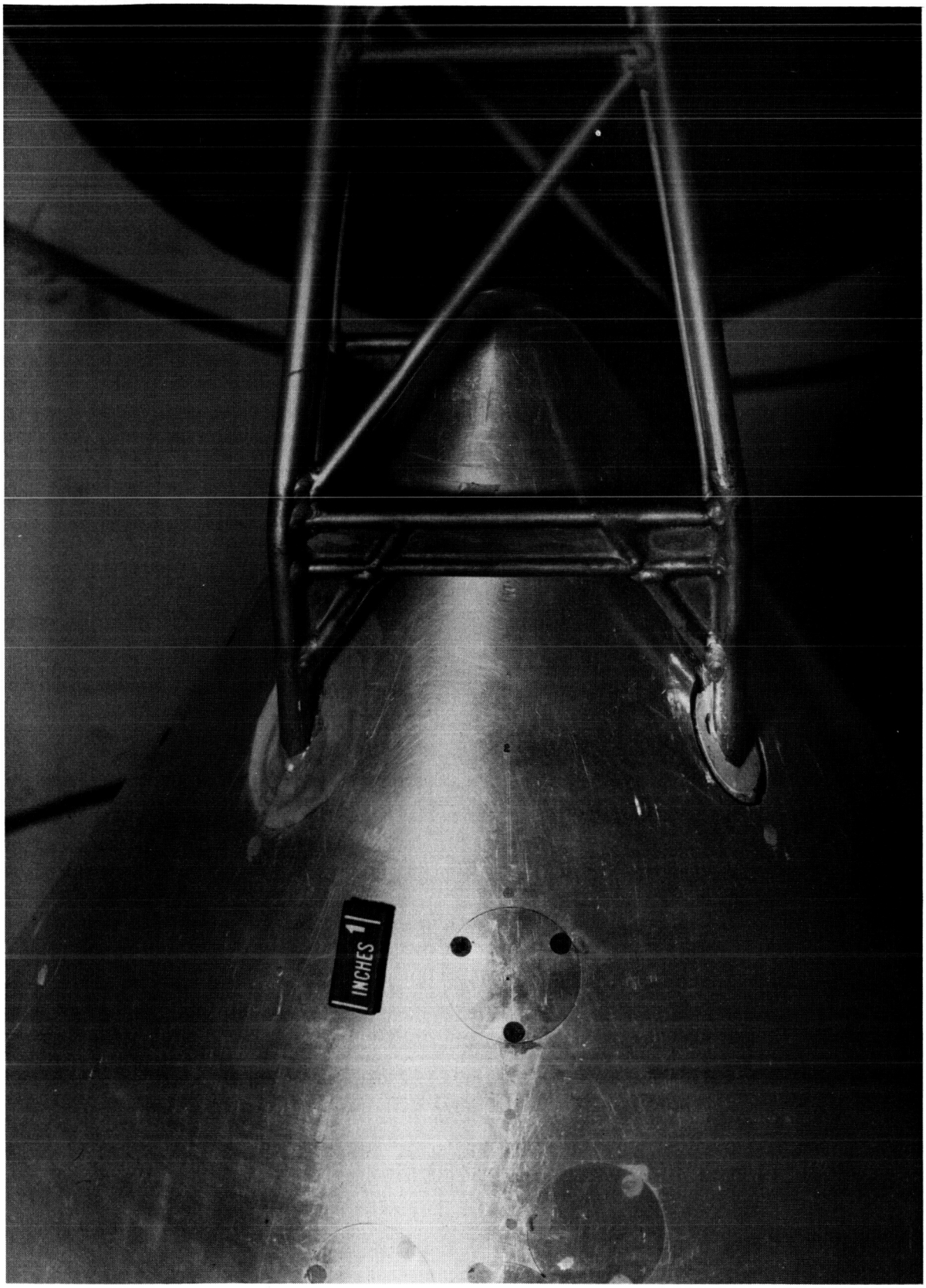

Figure 12. Component Loads Configuration Construction Details

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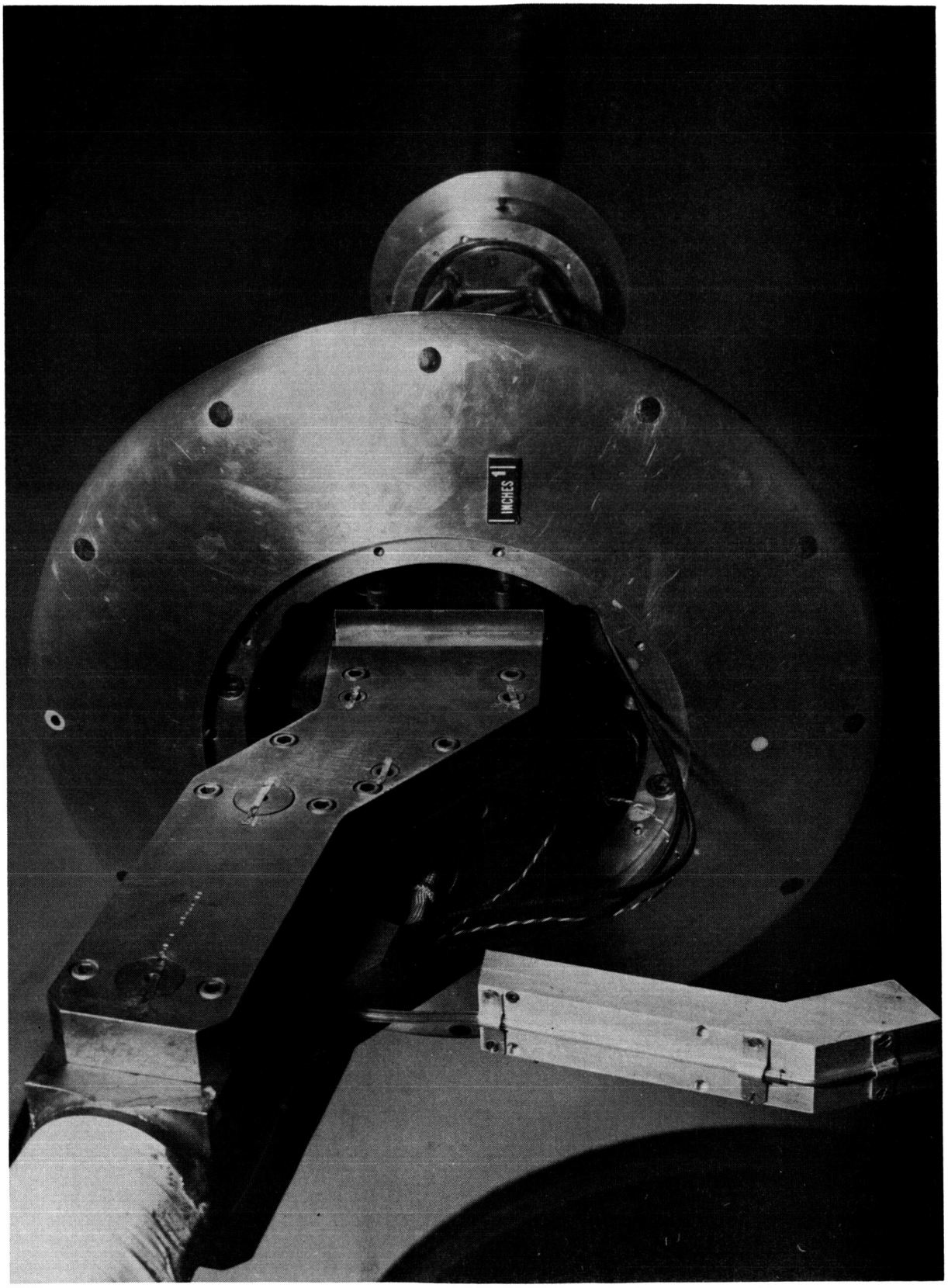

Figure 13. Model with Cover Plate Removed

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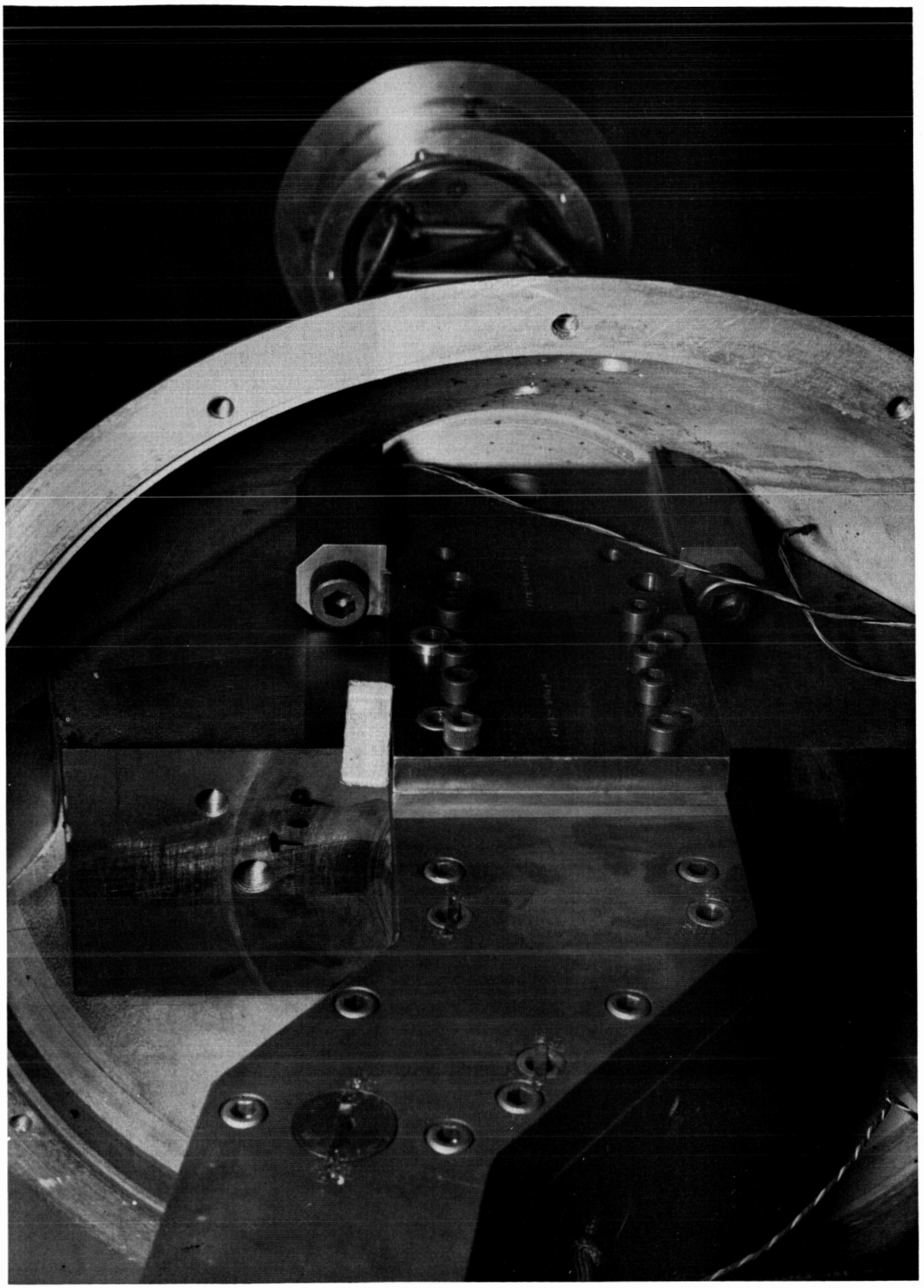

Figure 14. Model Interior

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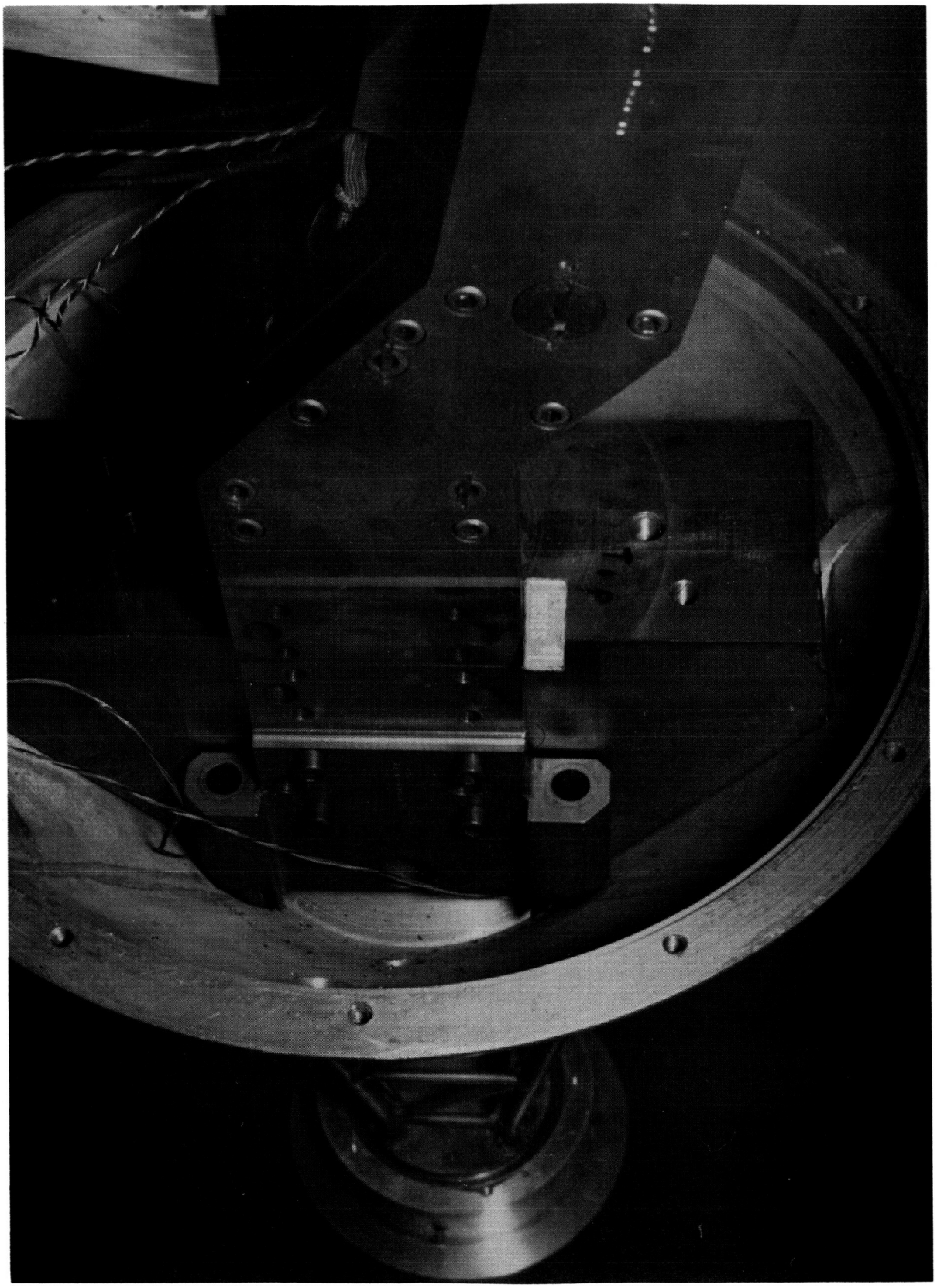

Figure 15. Model Interior with Splice Plate Removed

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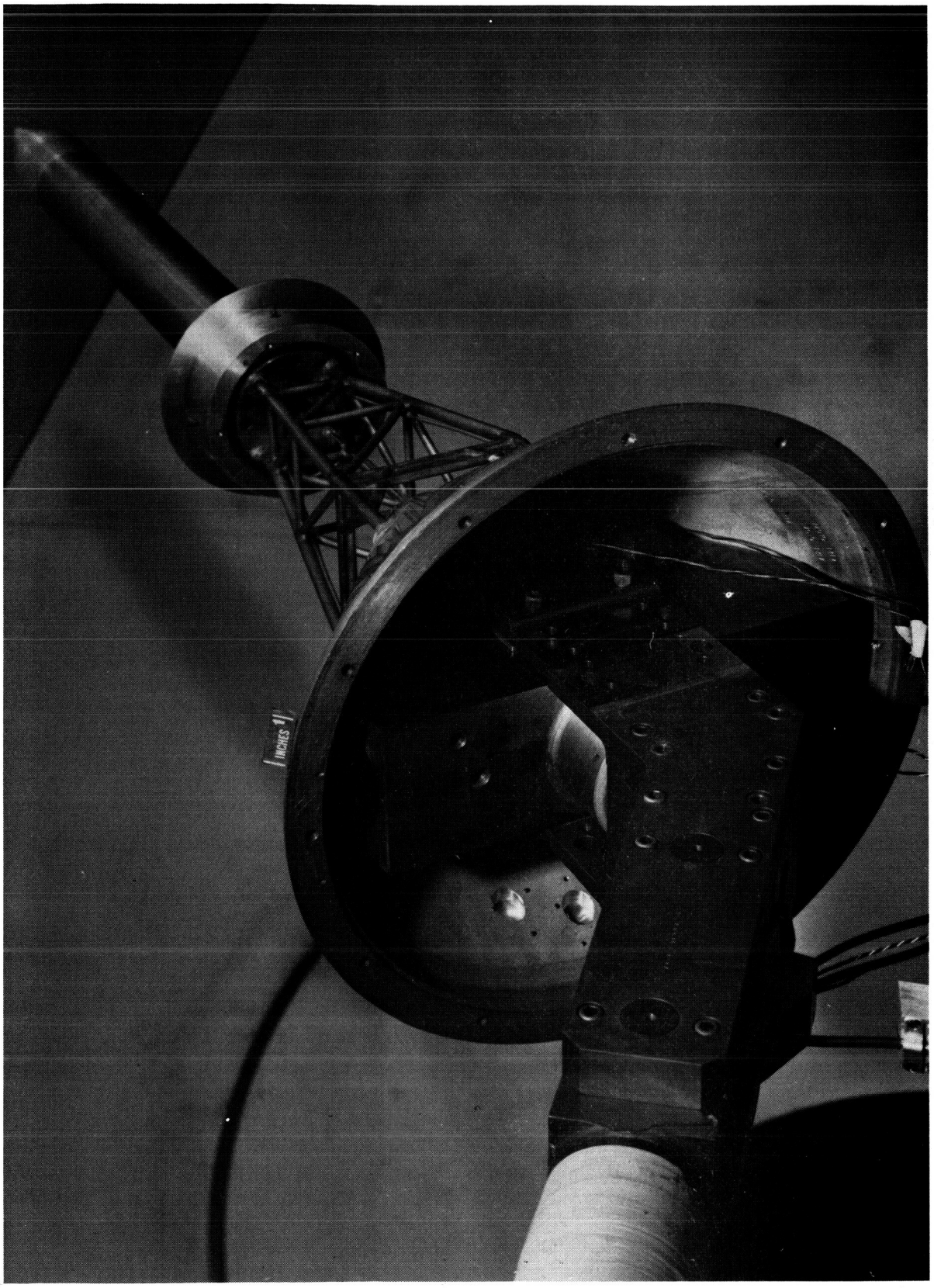

Figure 16. Index Arms of 40-Degree Sting

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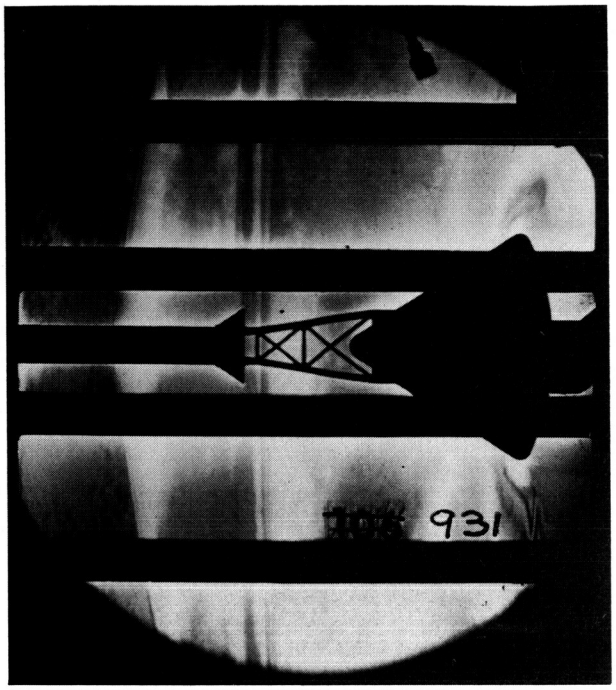
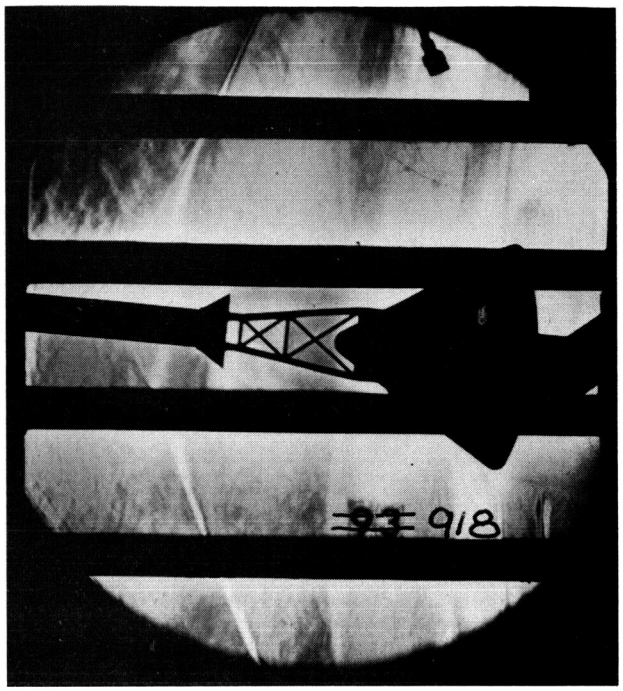
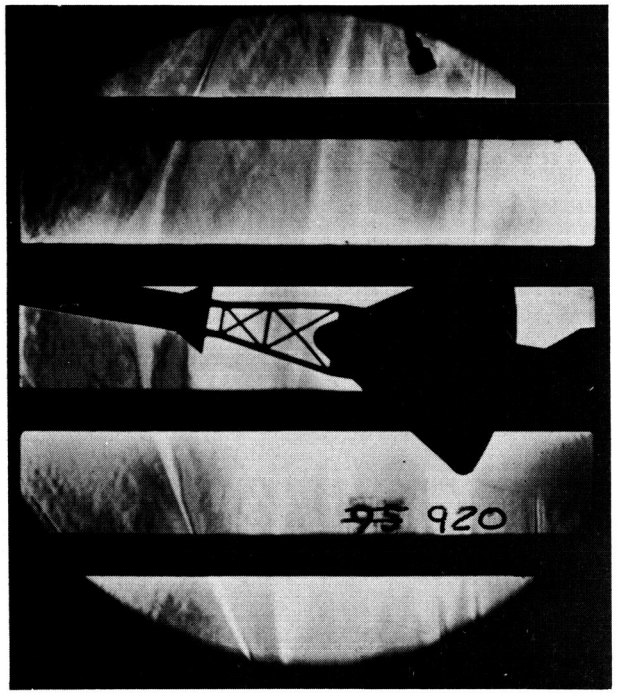


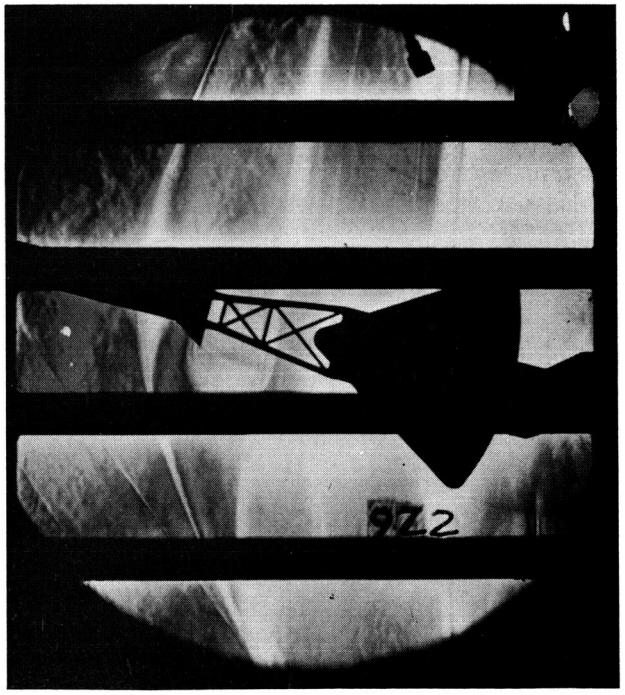
M = 1.1, α = 0 Degrees



M = 1.2, α = 5 Degrees



M = 1.2, α = 10 Degrees



M = 1.2, α = 15 Degrees

Figure 17. Schlieren Flow Visualization Studies of the $E_{48}T_9C_2$ Configuration. (Sheet 1 of 4)

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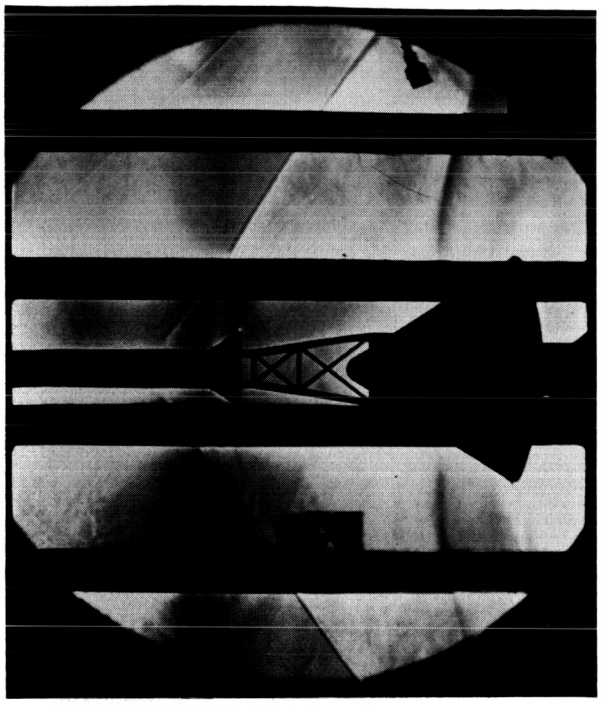
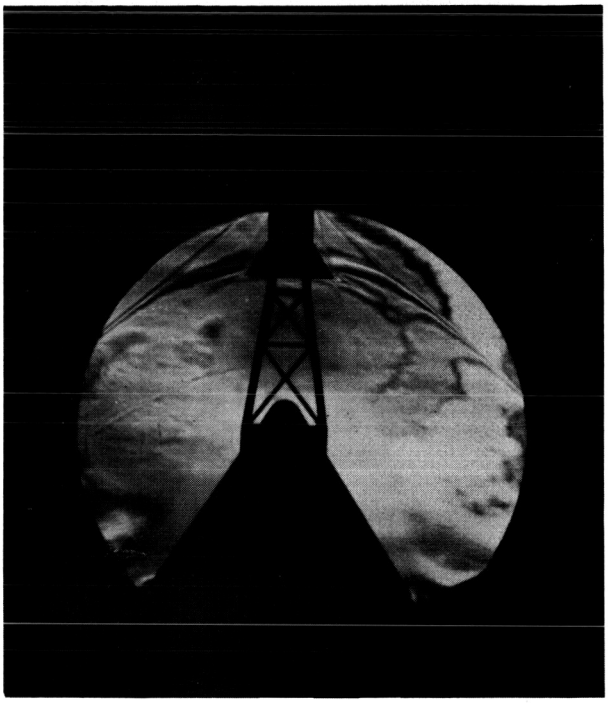
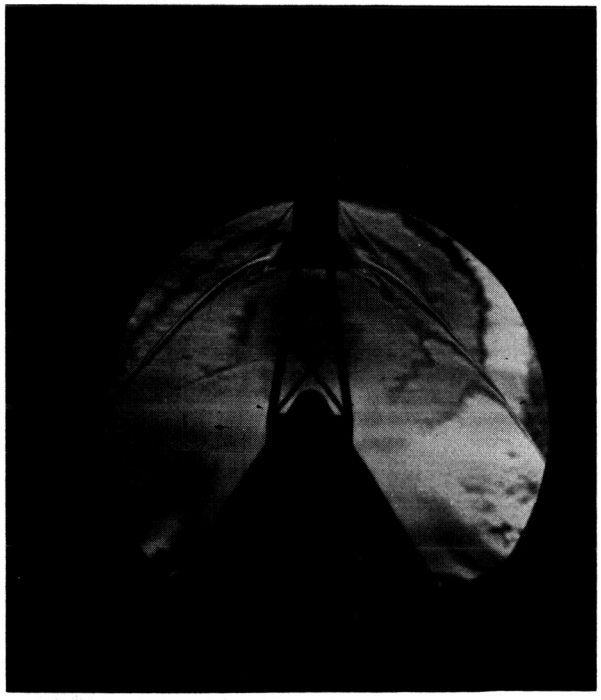


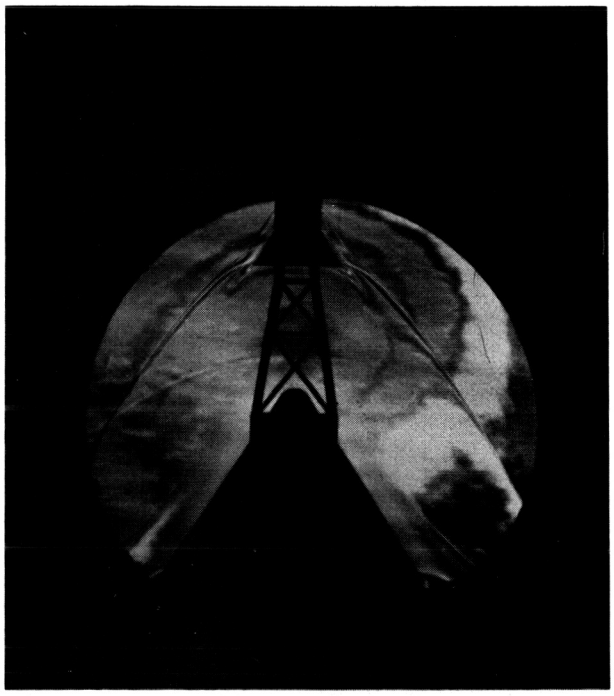
M = 1.35, α = 0 Degrees



M = 1.55, α = 0 Degrees



M = 2.0, α = 0 Degrees



M = 2.4, α = 0 Degrees

Figure 17. Schlieren Flow Visualization Studies of the $E_{48}T_9C_2$ Configuration.

(Sheet 2 of 4)

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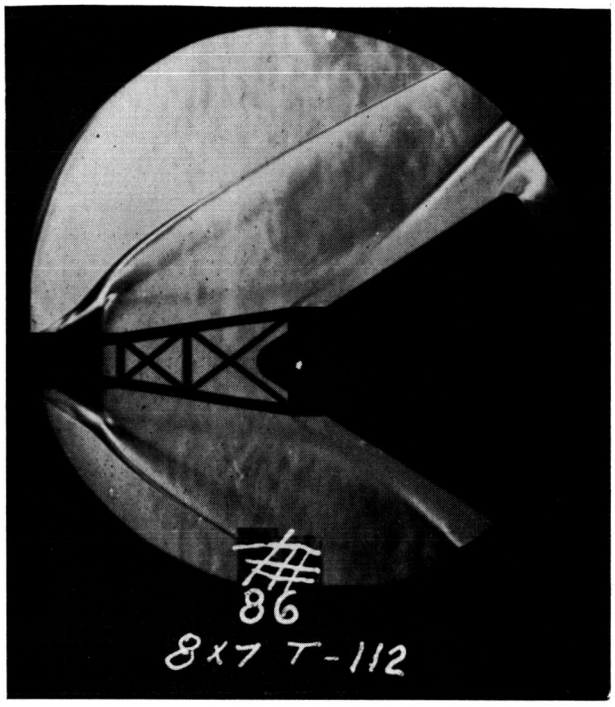
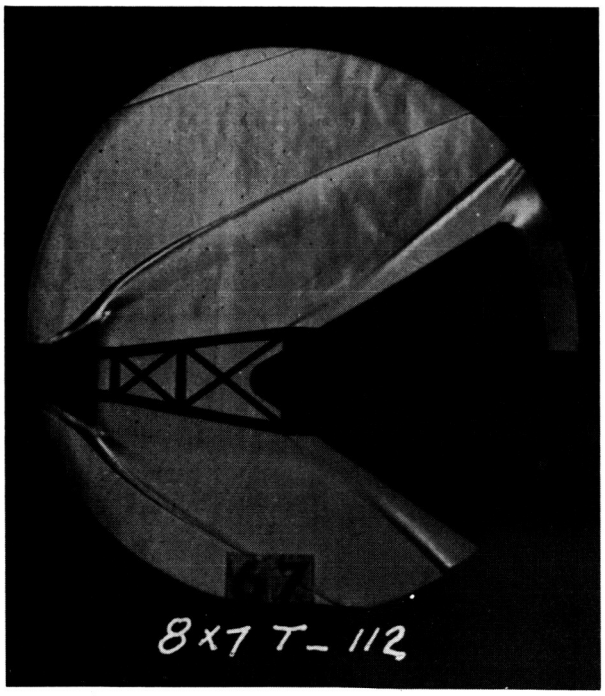
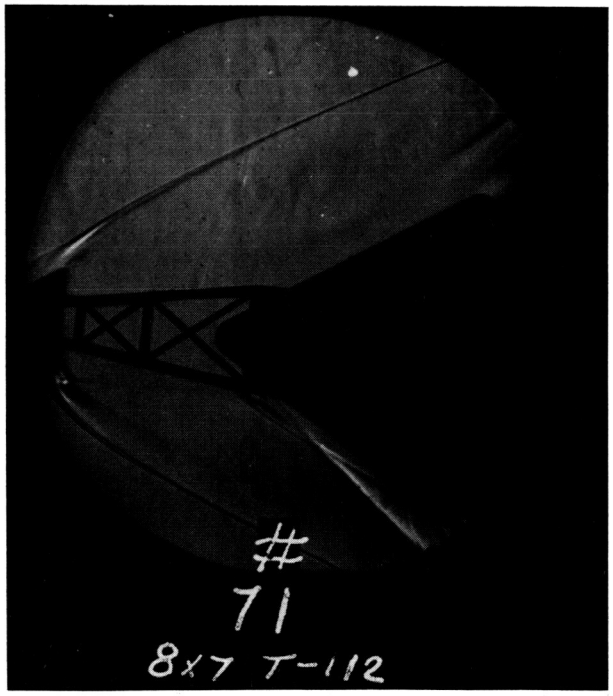
M = 2.4, α = 41 Degrees



M = 2.6, α = 0 Degrees



M = 3.0, α = 0 Degrees



M = 3.0, α = 5 Degrees

Figure 17. Schlieren Flow Visualization Studies of the $E_{48}T_9C_2$ Configuration. (Sheet 3 of 4)

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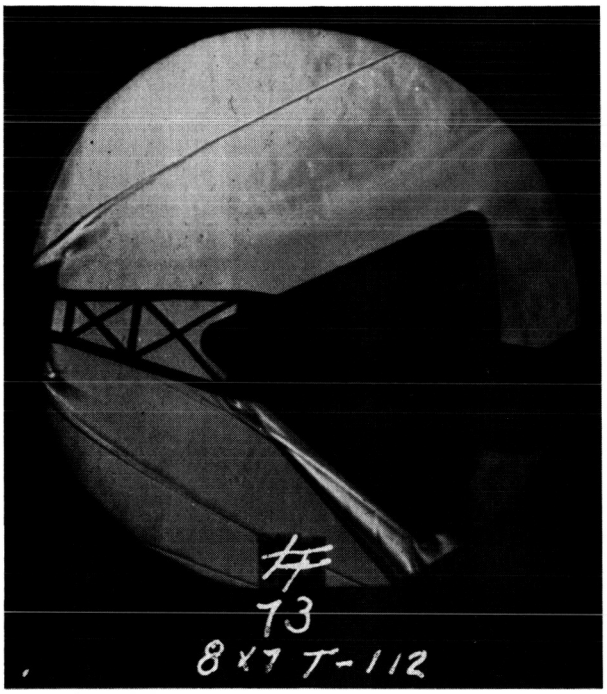
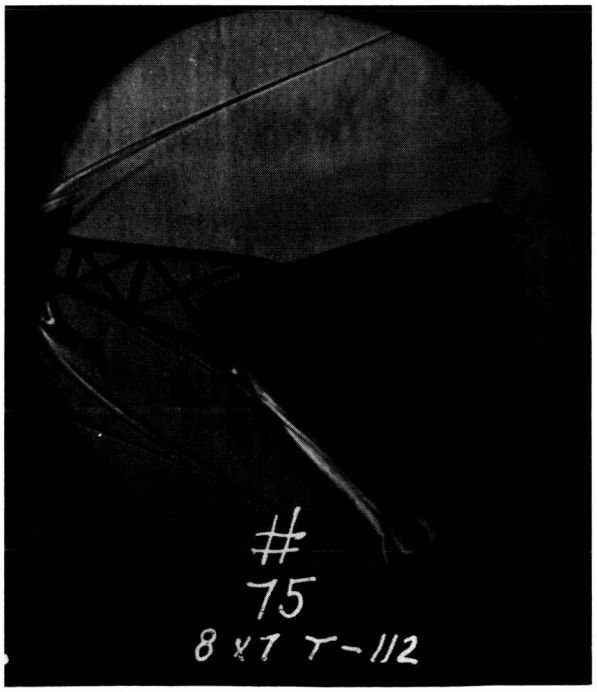
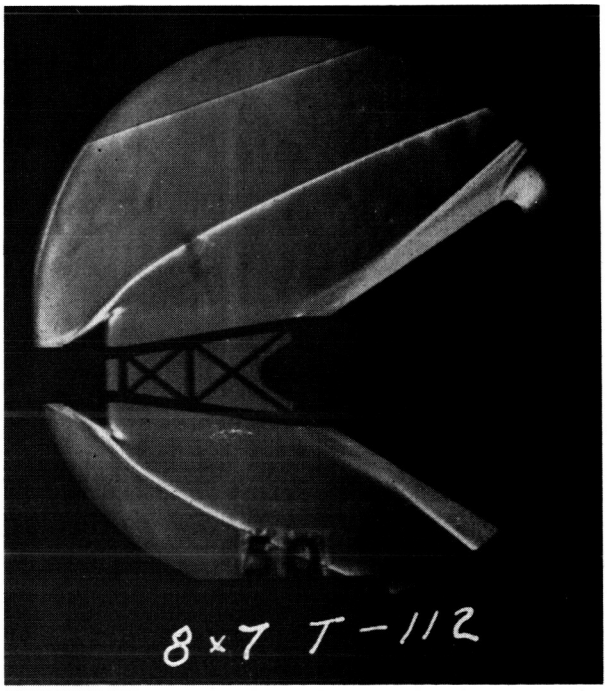


M = 3.0, α = 10 Degrees



M = 3.0, α = 15 Degrees



M = 3.4, α = 0 Degrees

Figure 17. Schlieren Flow Visualization Studies of the $E_{48}T_9C_2$ Configuration. (Sheet 4 of 4)

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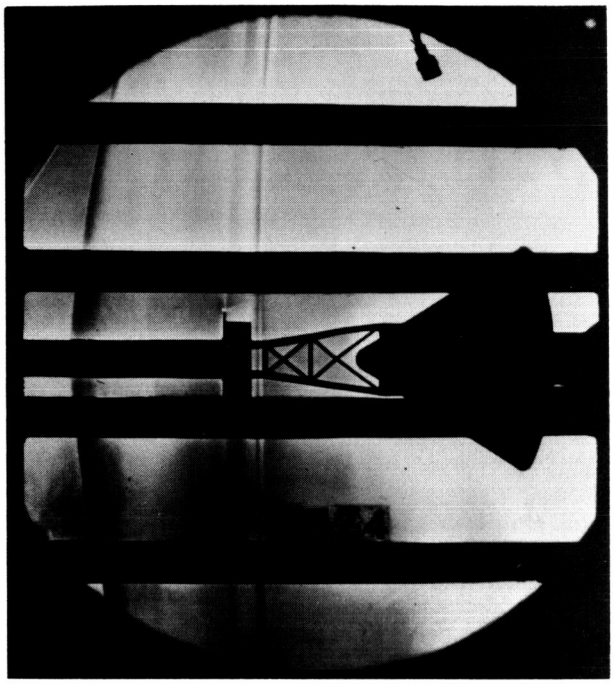
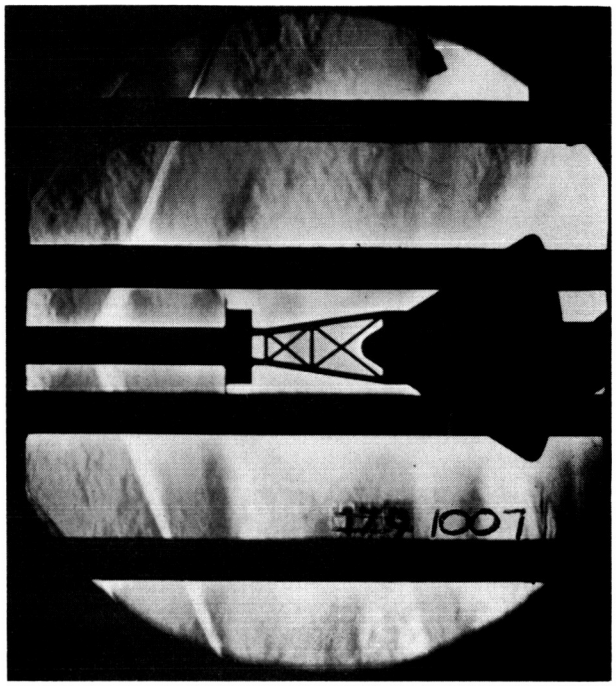
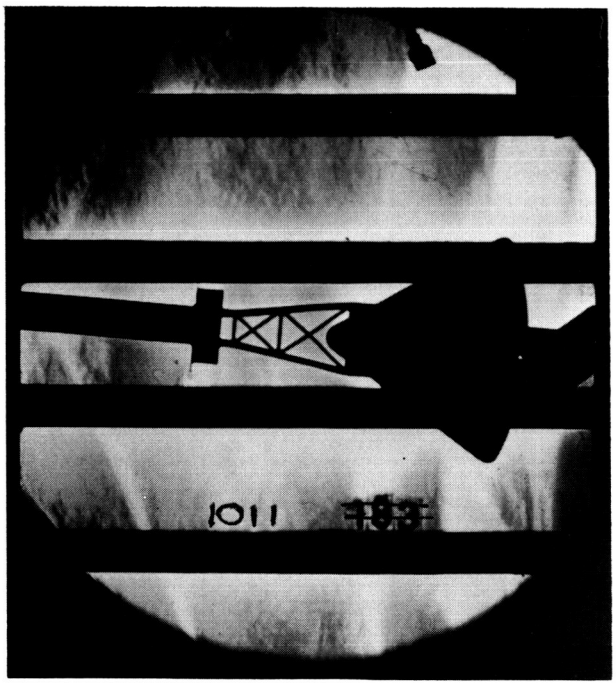


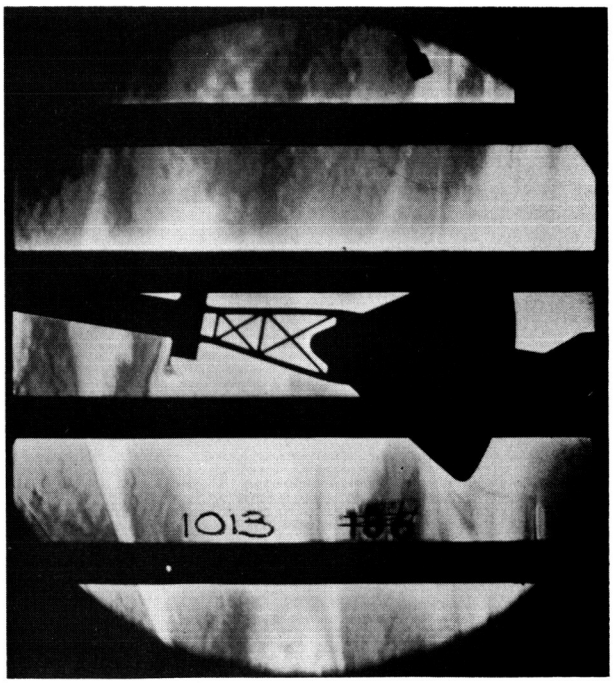
M = 1.1, α = 0 Degrees



M = 1.2, α = 0 Degrees



M = 1.2, α = 5 Degrees



M = 1.2, α = 10 Degrees

Figure 18. Schlieren Flow Visualization Studies of the $E_{49}T_9C_2$ Configuration. (Sheet 1 of 2)

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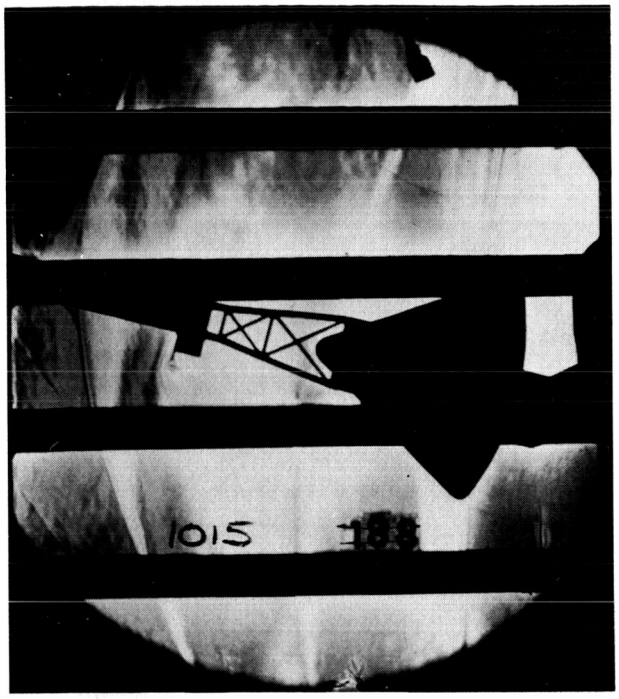
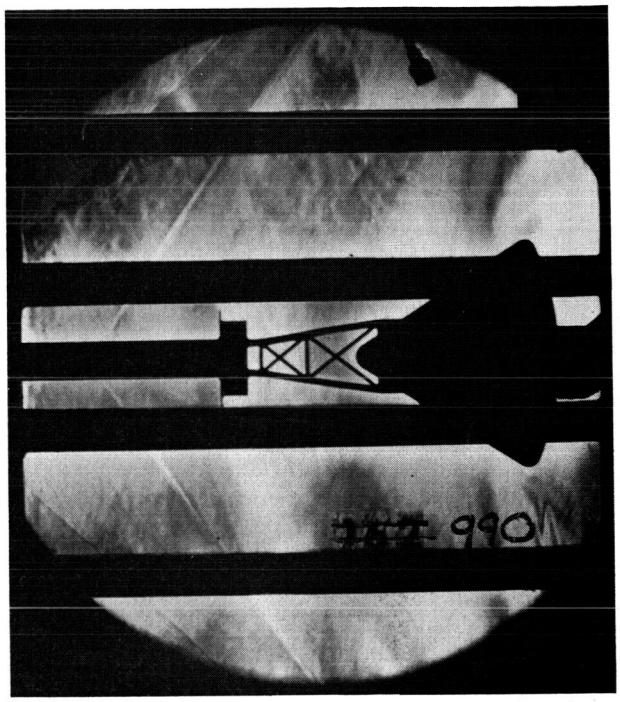
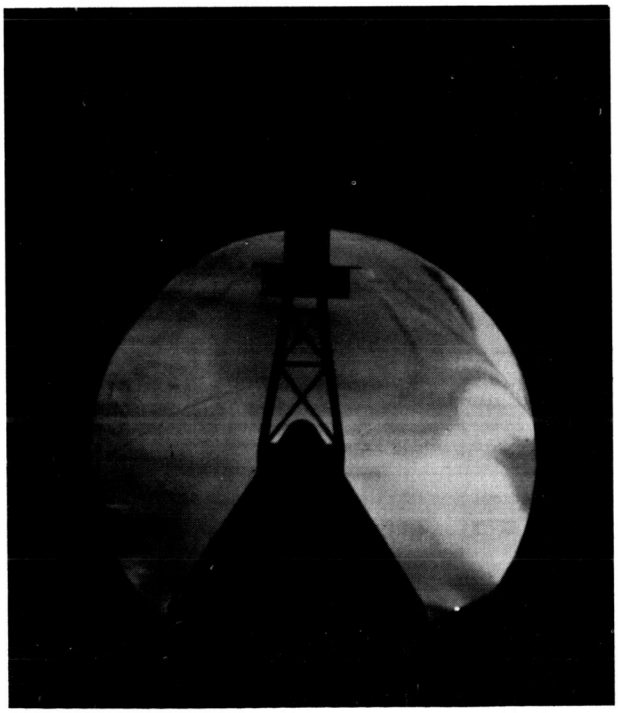


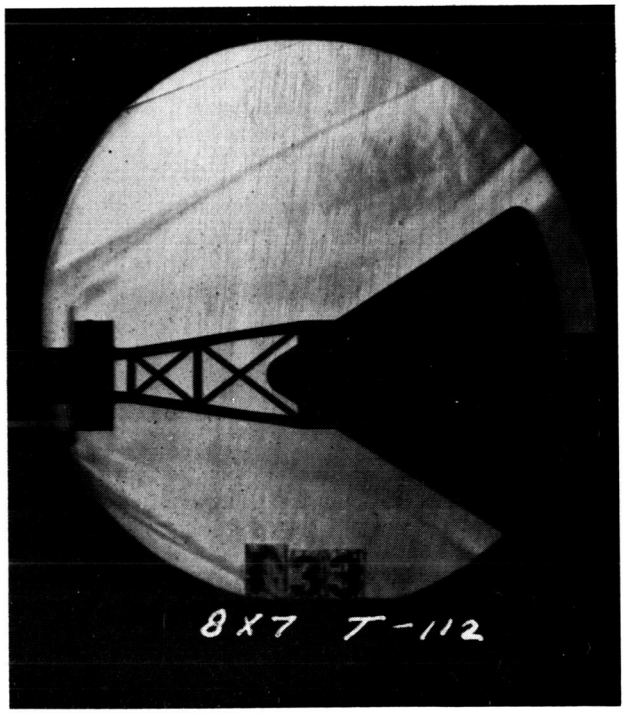
M = 1.2, α = 15 Degrees



M = 1.35, α = 0 Degrees



M = 2.0, α = 0 Degrees



M = 3.0, α = 0 Degrees

Figure 18. Schlieren Flow Visualization Studies of the $E_{49}T_9C_2$ Configuration. (Sheet 2 of 2)

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APPENDIX A

PLOTTED DATA

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PLOTTED DATA INDEX

Launch Escape Vehicle Characteristics $C_{m_{cg}}$, C_A, C_N, C_{m_A}, X_{cp}/D

Configuration: E_{20} T_9 C_2

M = 0.7	A-4
M = 1.1	A-12
M = 1.35	A-20
M = 1.55	A-28
M = 2.0	A-36

Configuration: E_{48} T_9 C_2

M = 0.7	A-44
M = 0.9	A-52
M = 1.1	A-60
M = 1.2	A-68
M = 1.35	A-76
M = 1.55	A-84
M = 2.0	A-92
M = 2.4	A-100
M = 2.6	A-108
M = 3.0	A-116
M = 3.4	A-124

Configuration: E_{49} T_9 C_2

M = 0.7	A-132
M = 0.9	A-140
M = 1.1	A-148
M = 1.2	A-156
M = 1.35	A-164
M = 1.55	A-172
M = 2.0	A-180
M = 2.4	A-188
M = 2.6	A-196
M = 3.0	A-204
M = 3.4	A-212

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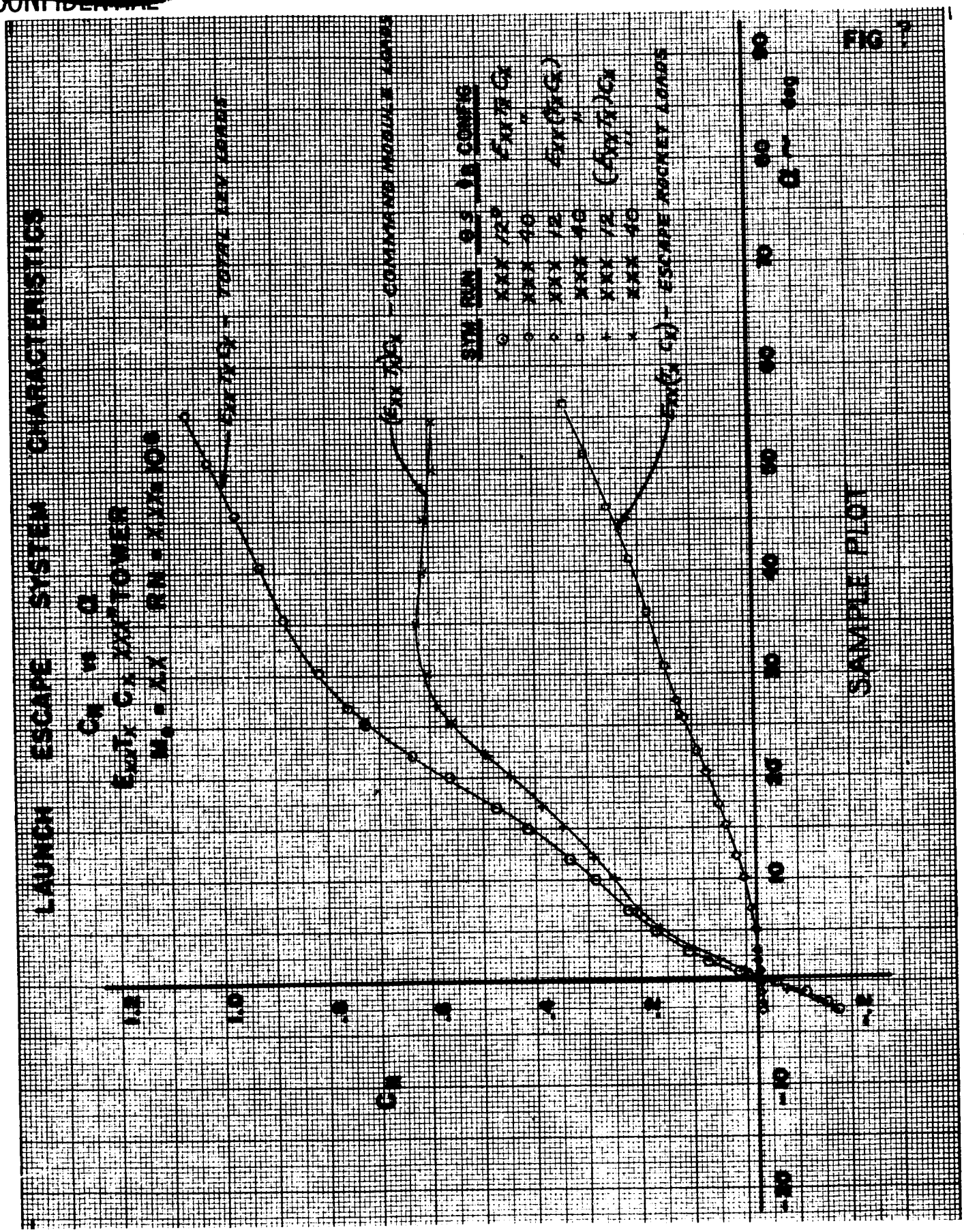

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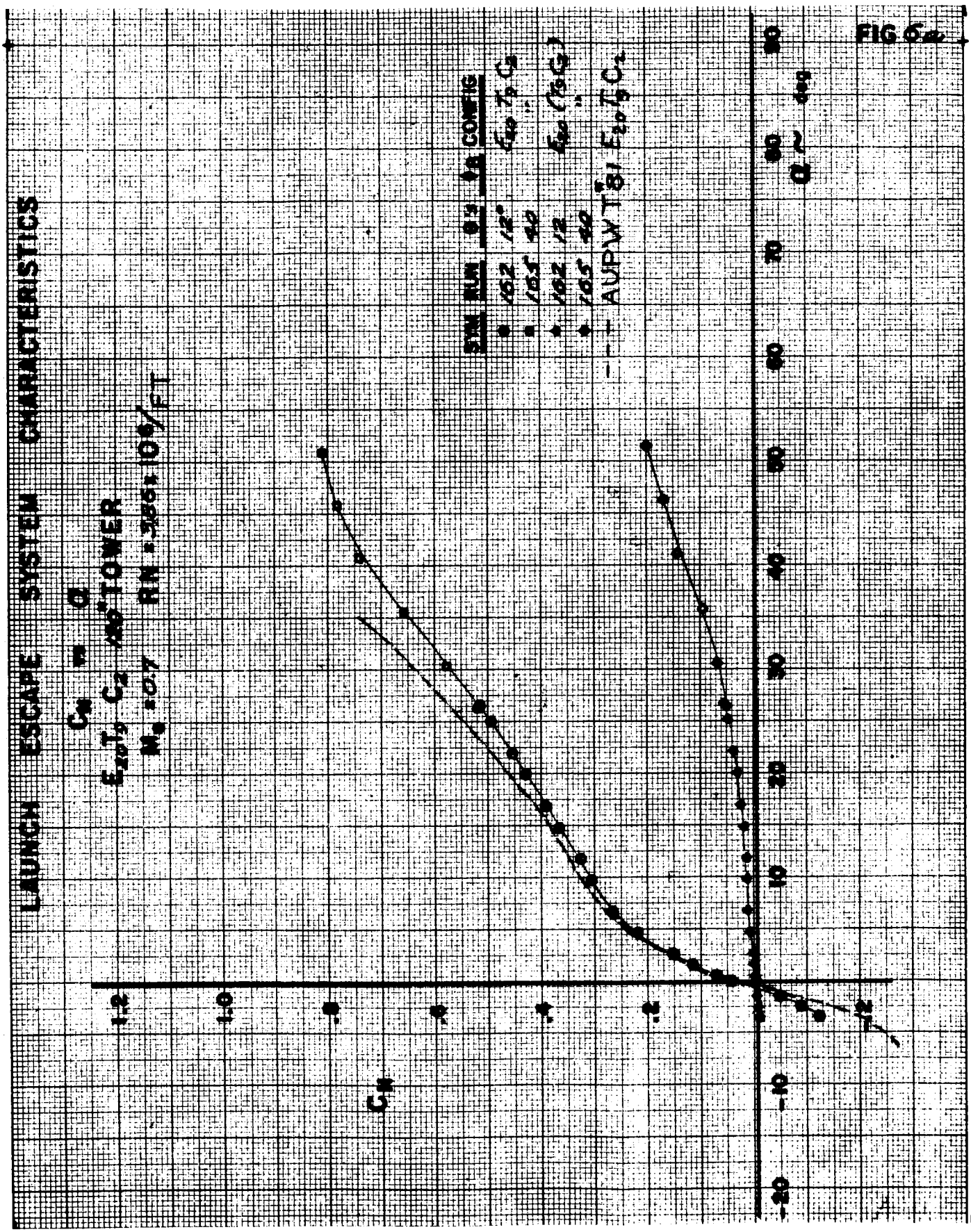

FIG 6a

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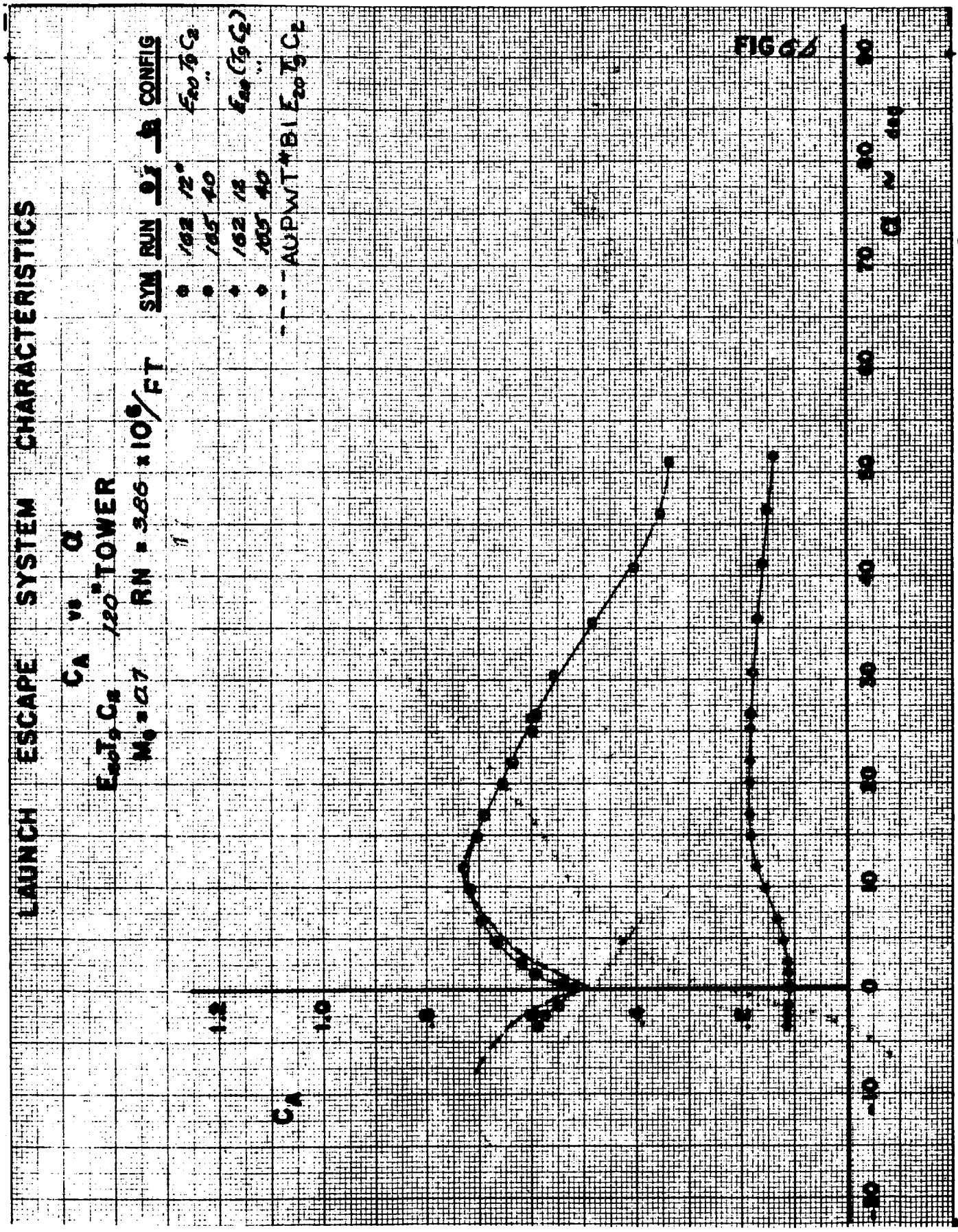

FIG 9b

[redacted]

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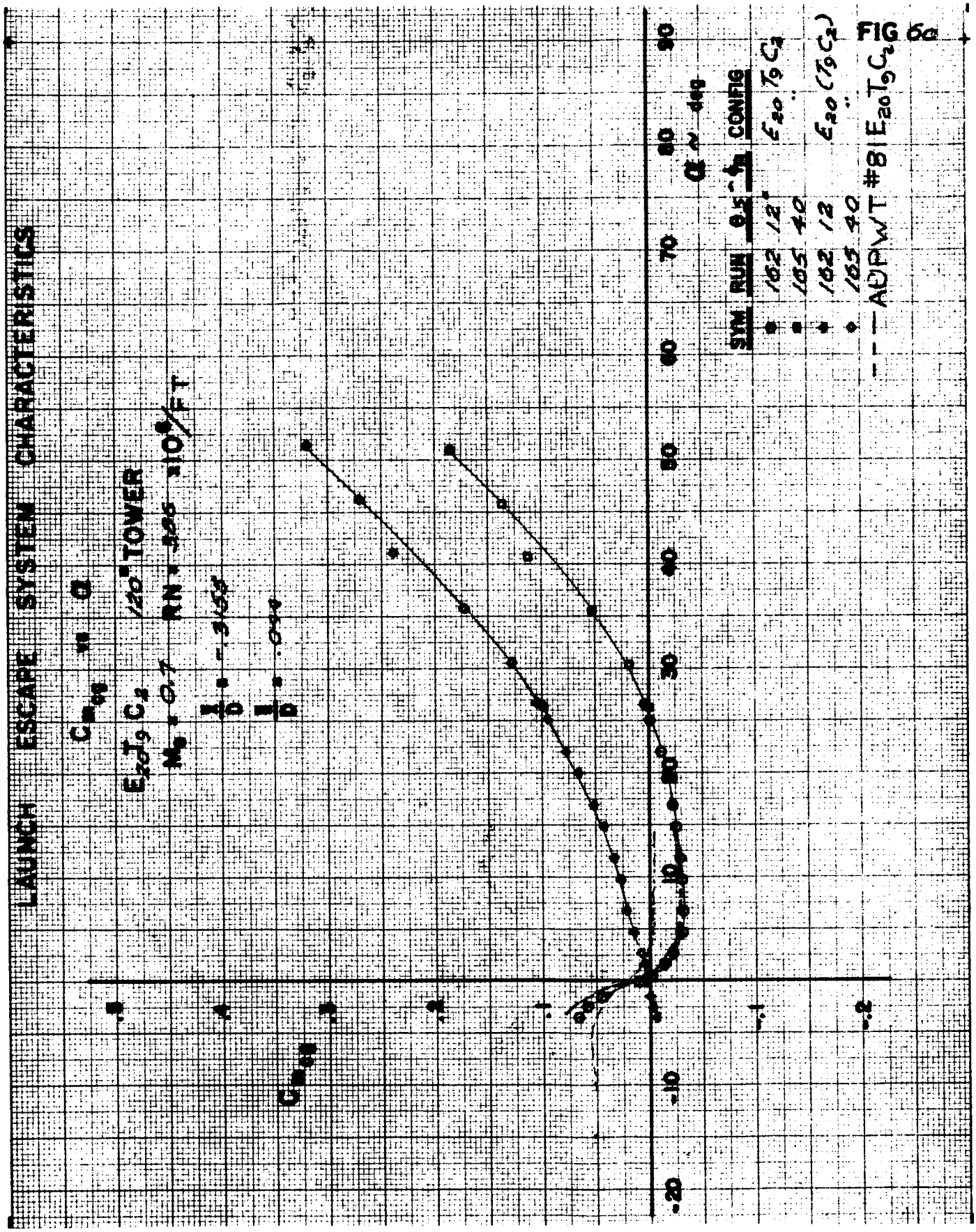

FIG 6a

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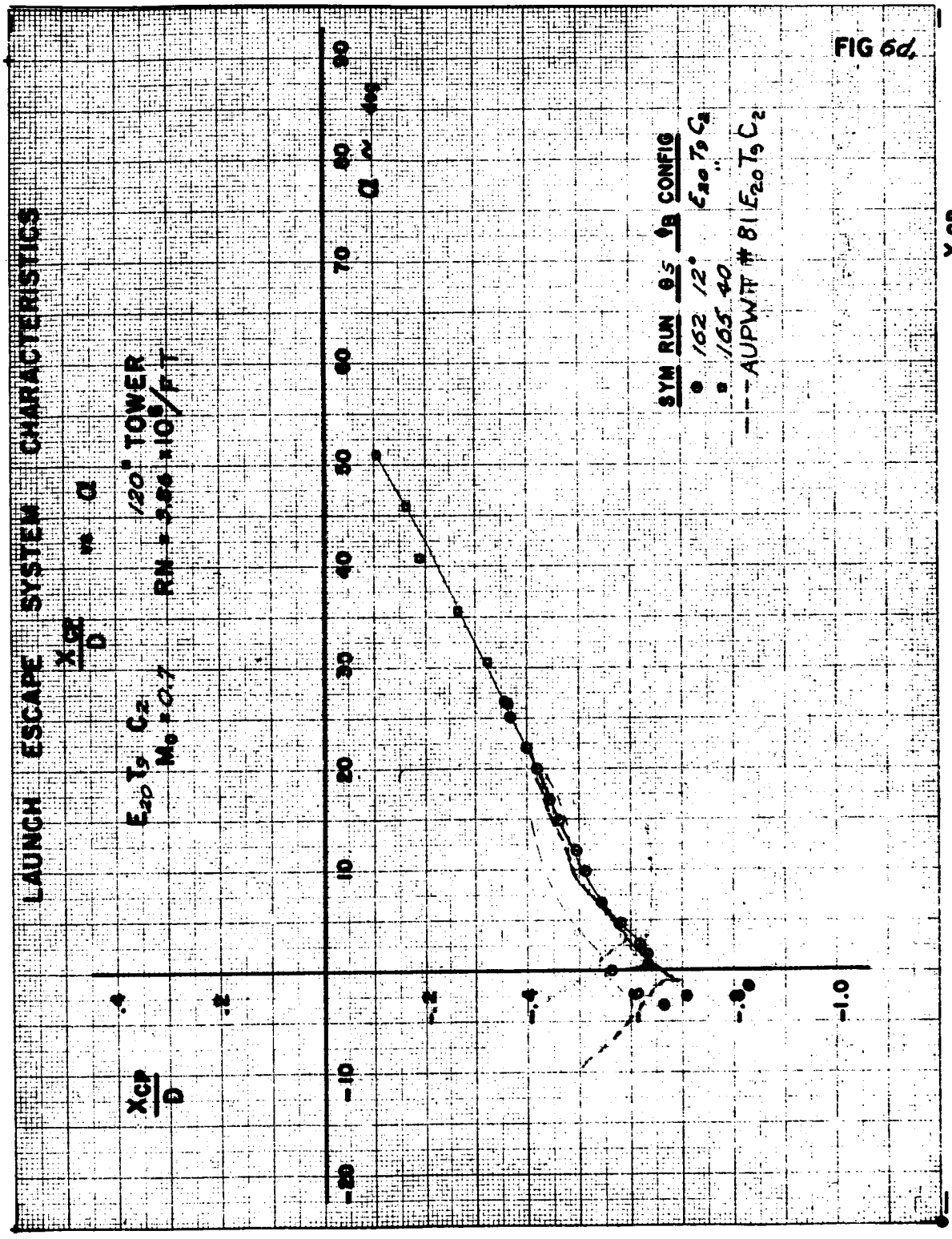

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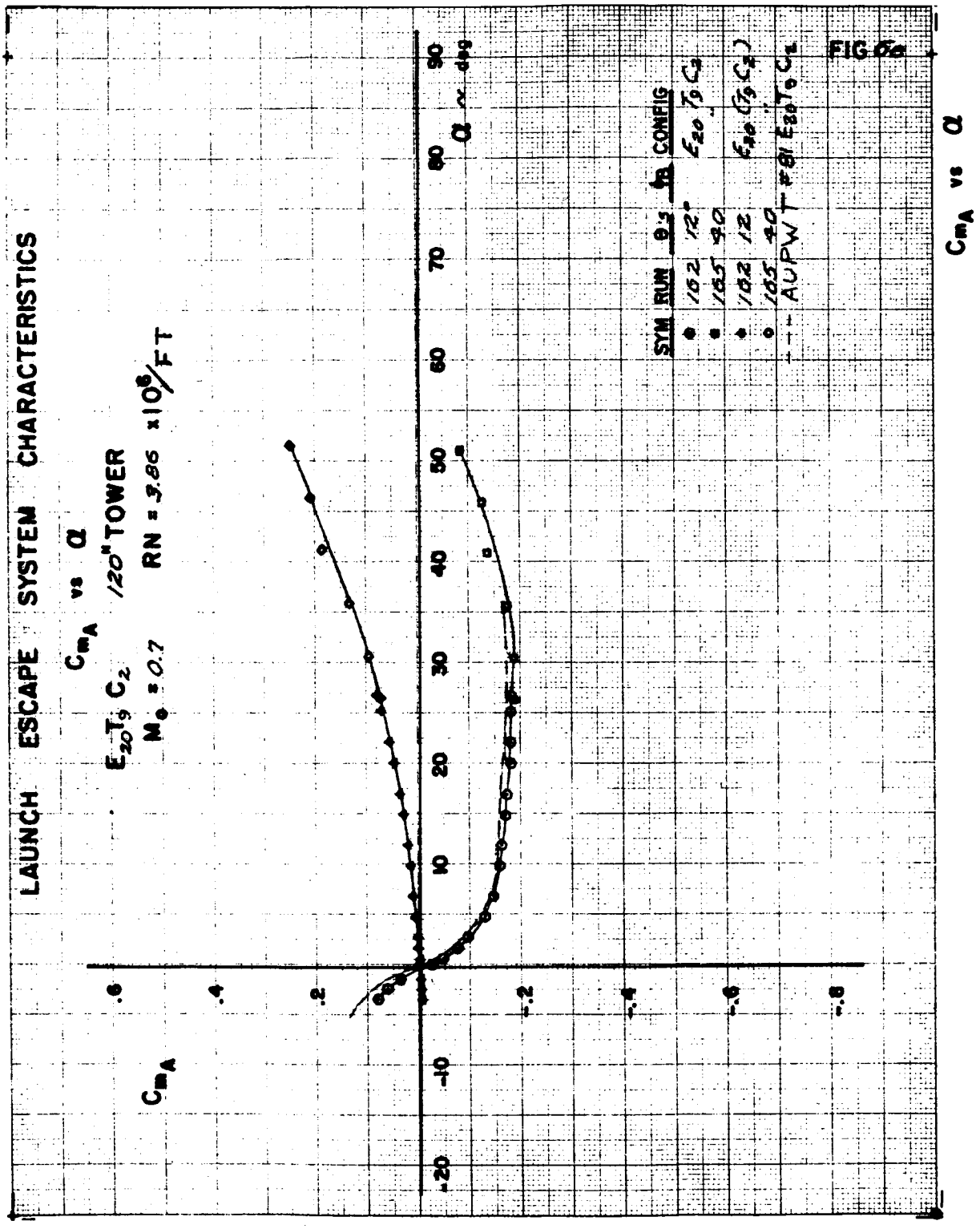

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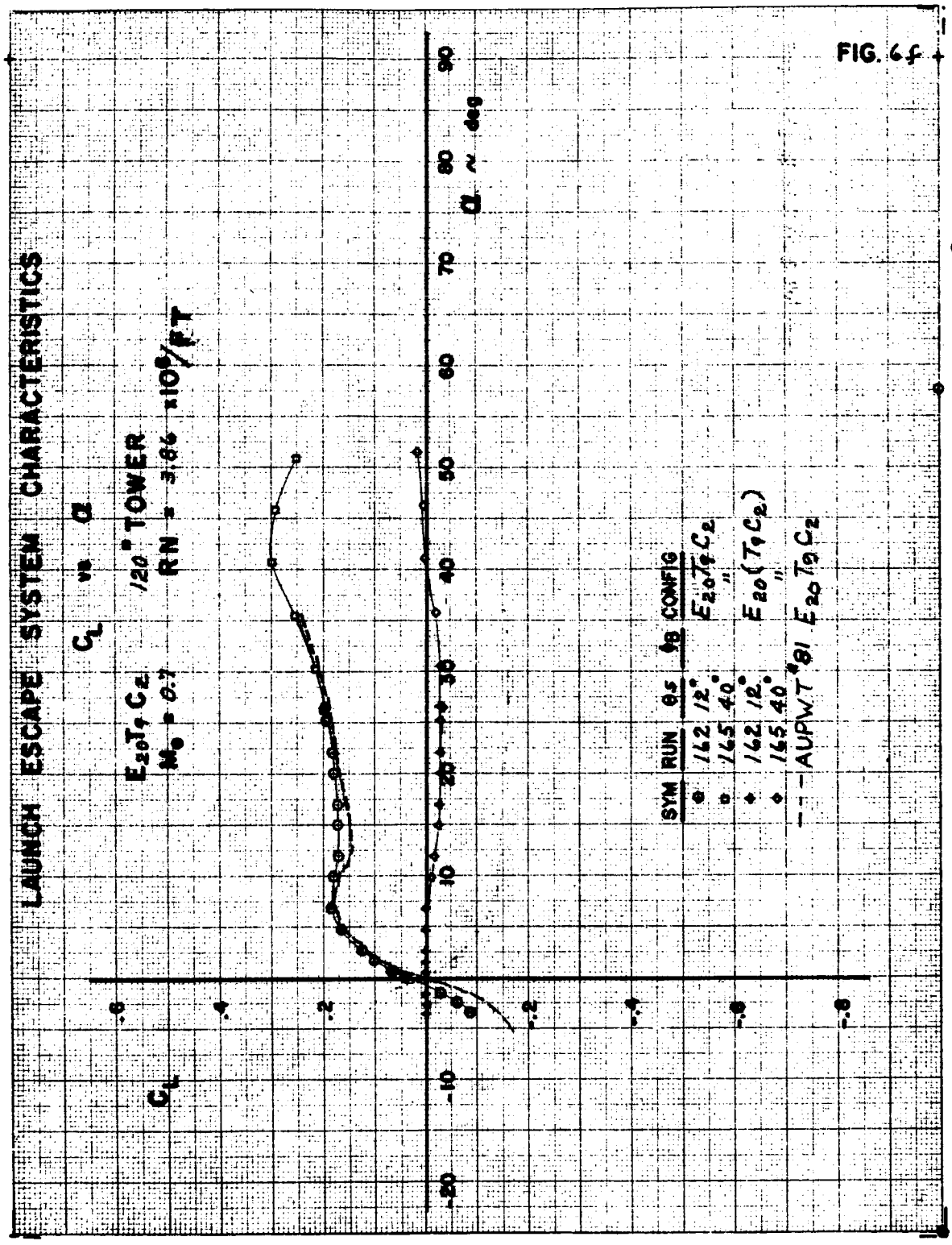

FIG. 6f

C_L vs α

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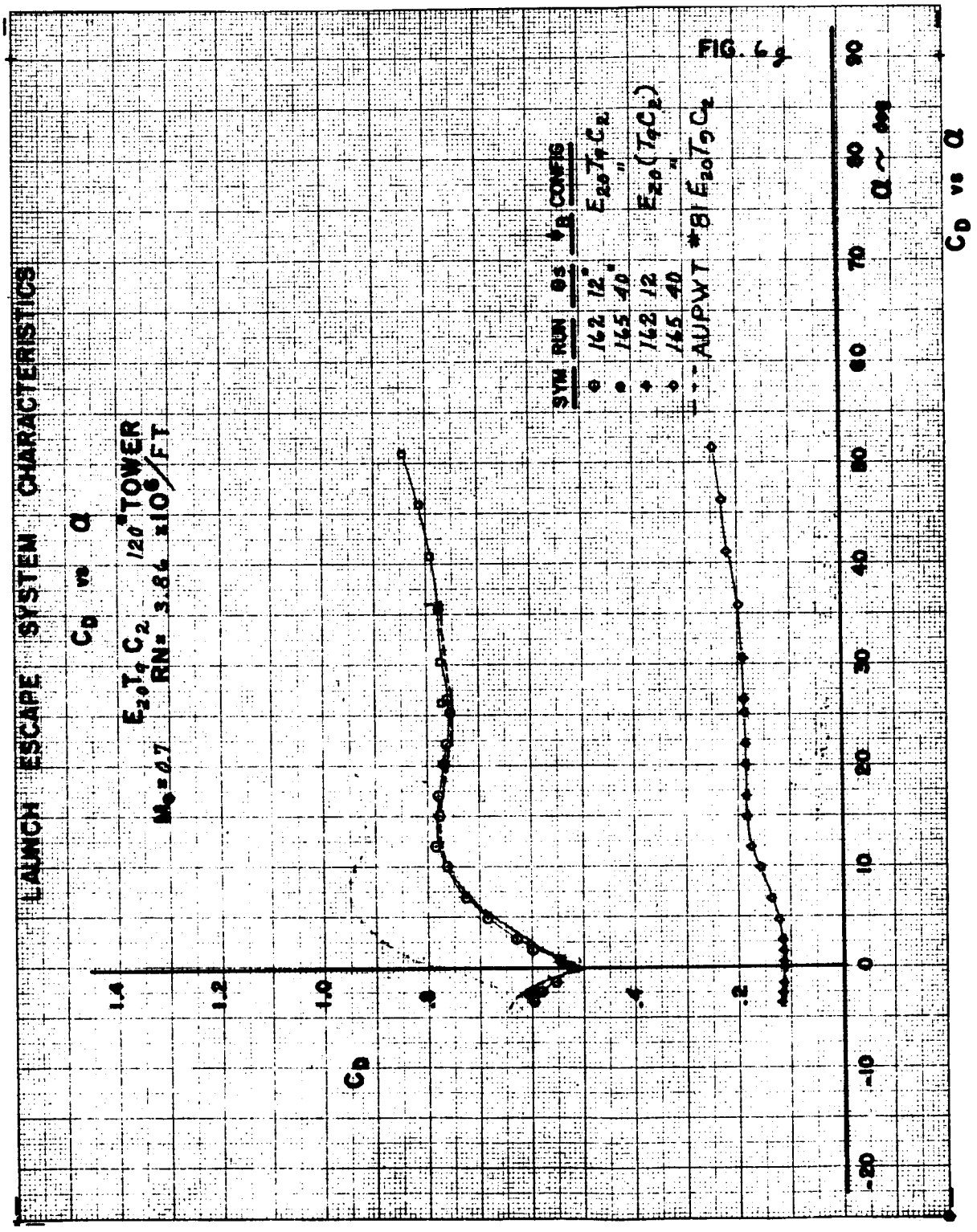

FIG. 6

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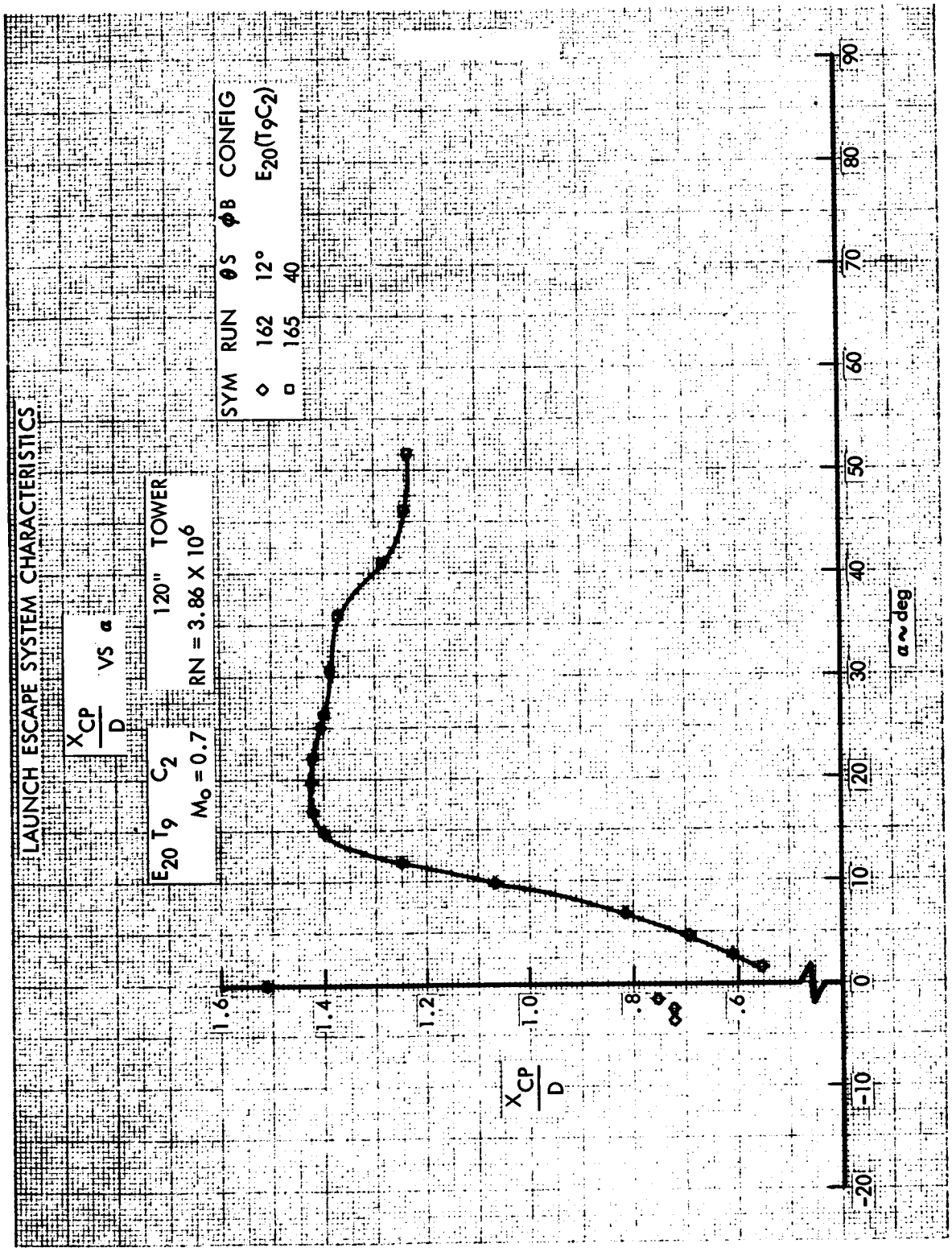

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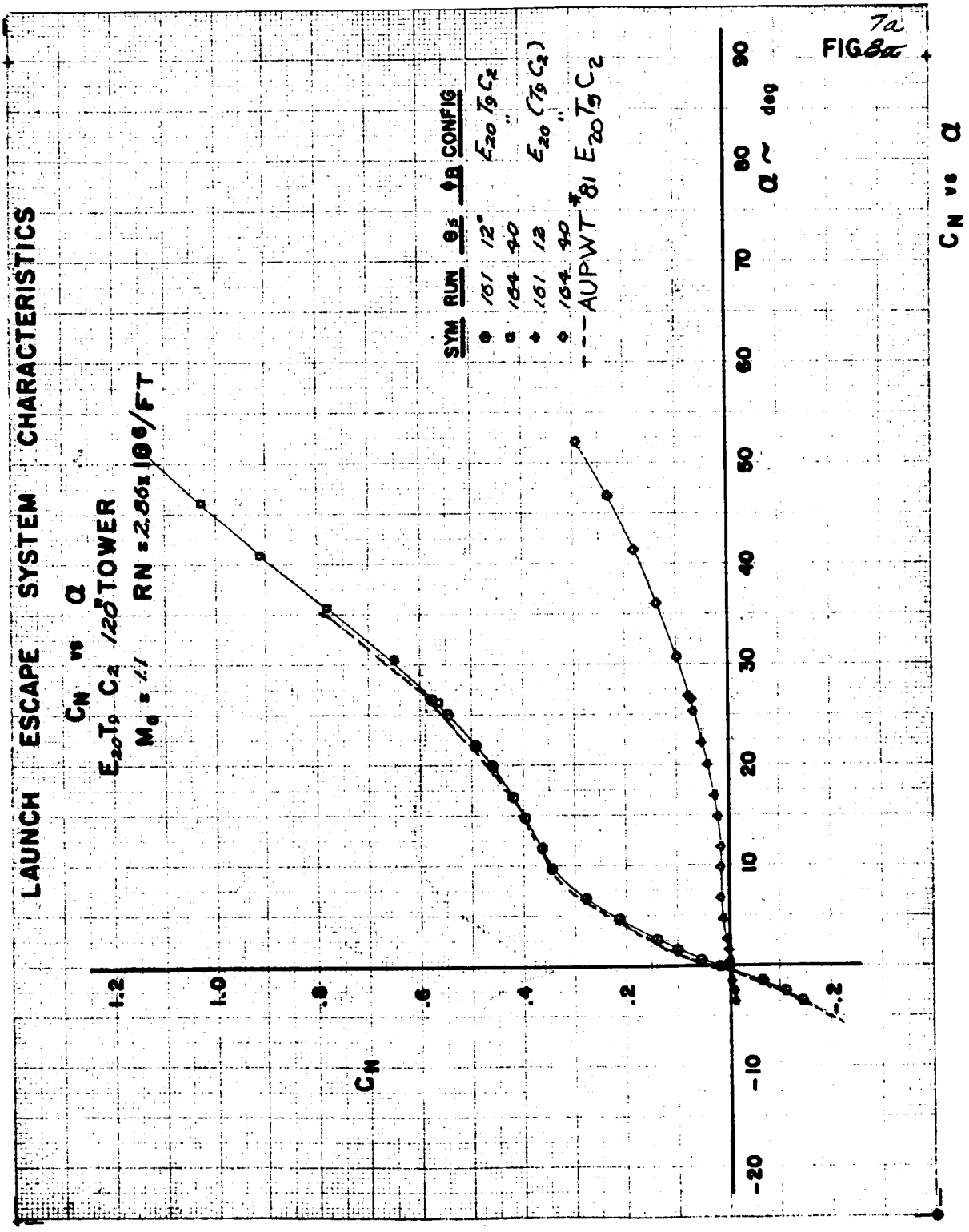

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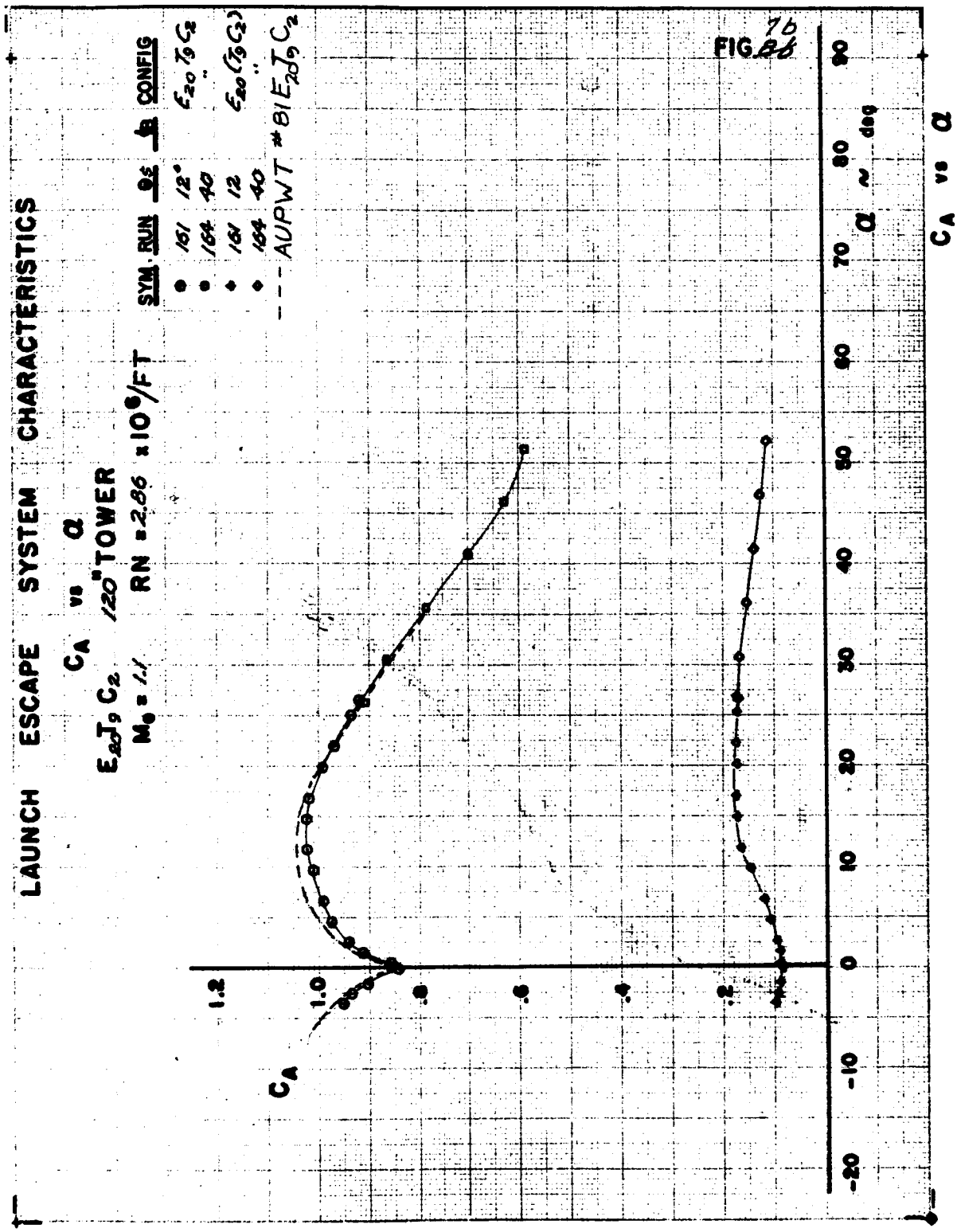

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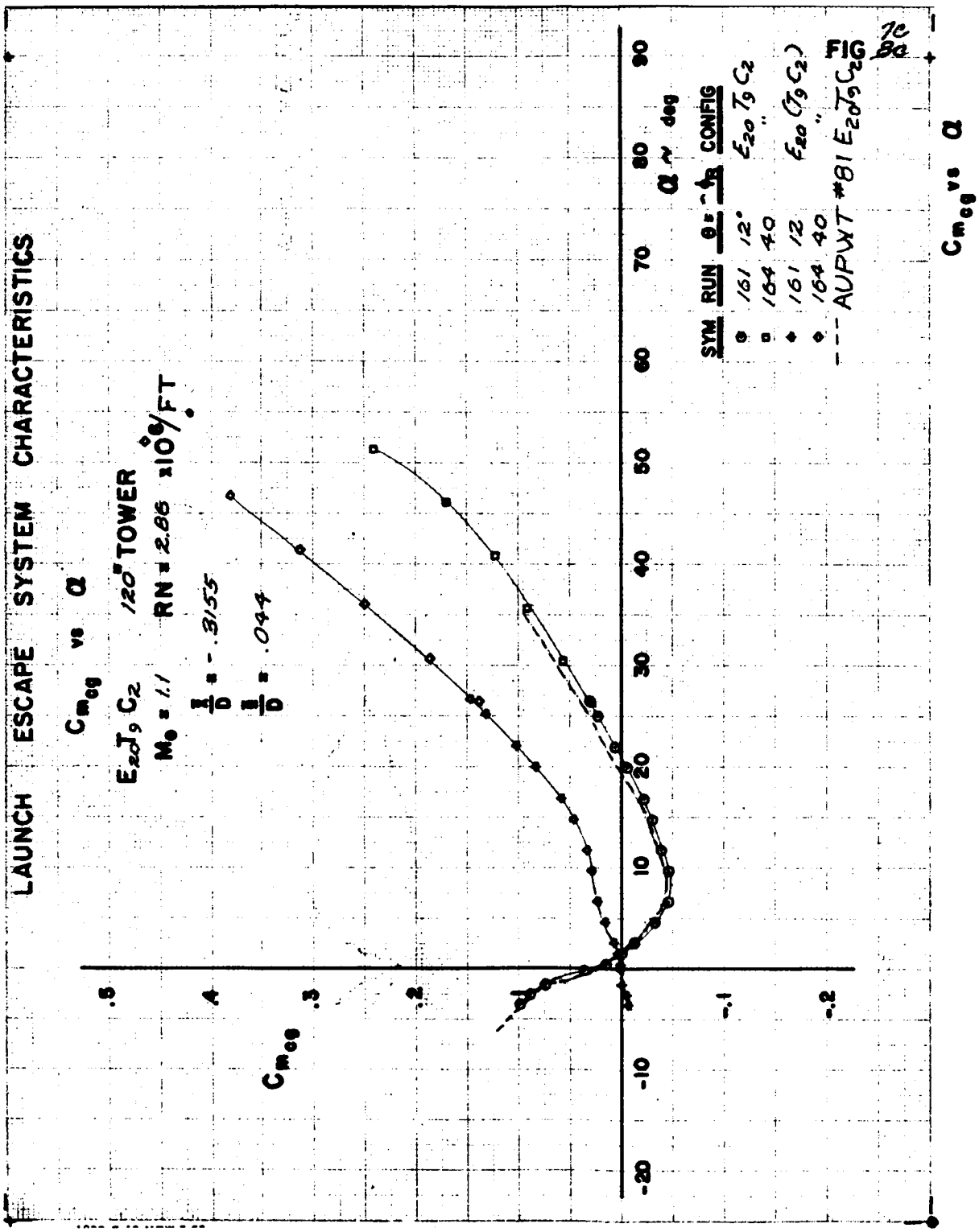

FIG 7c 8a

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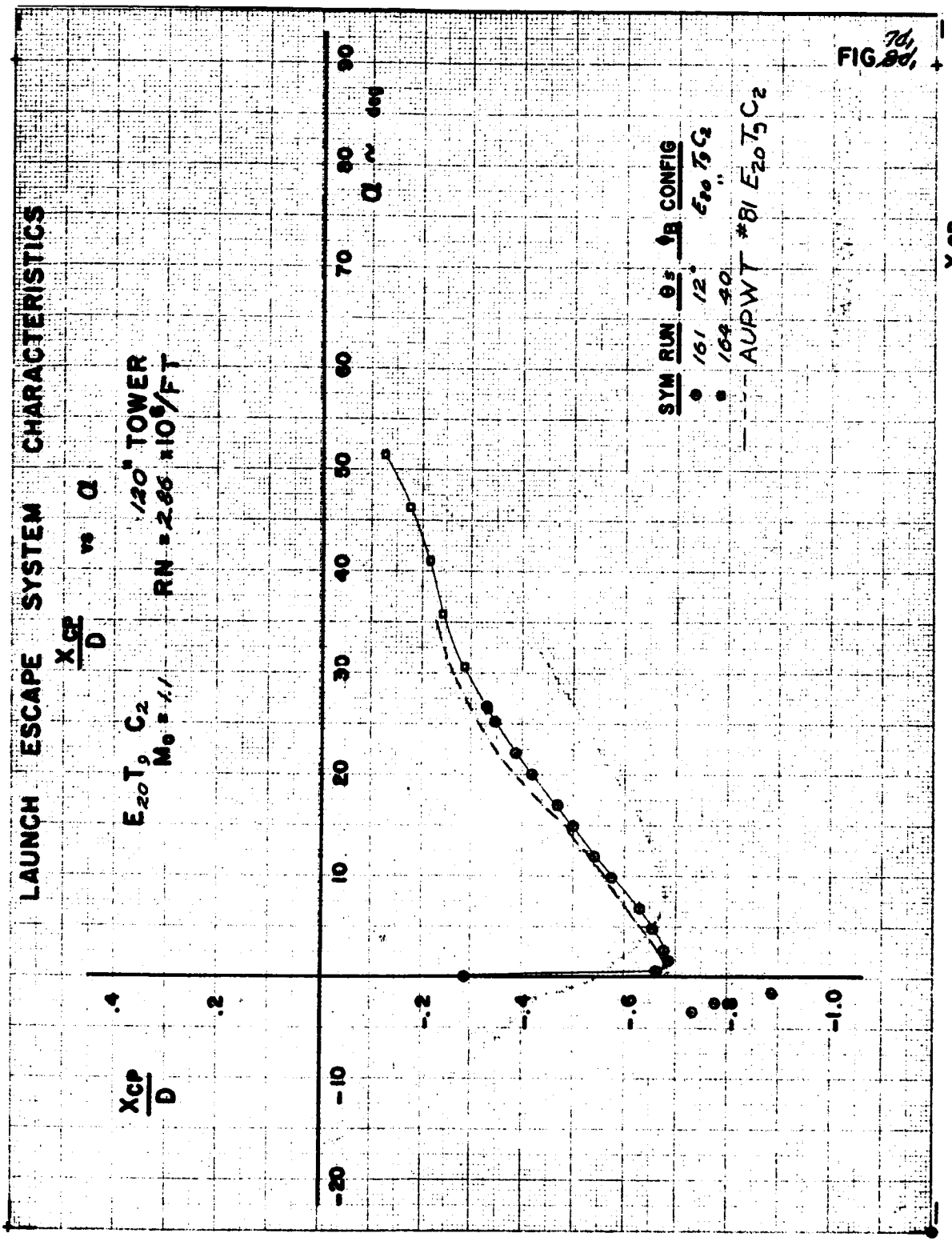

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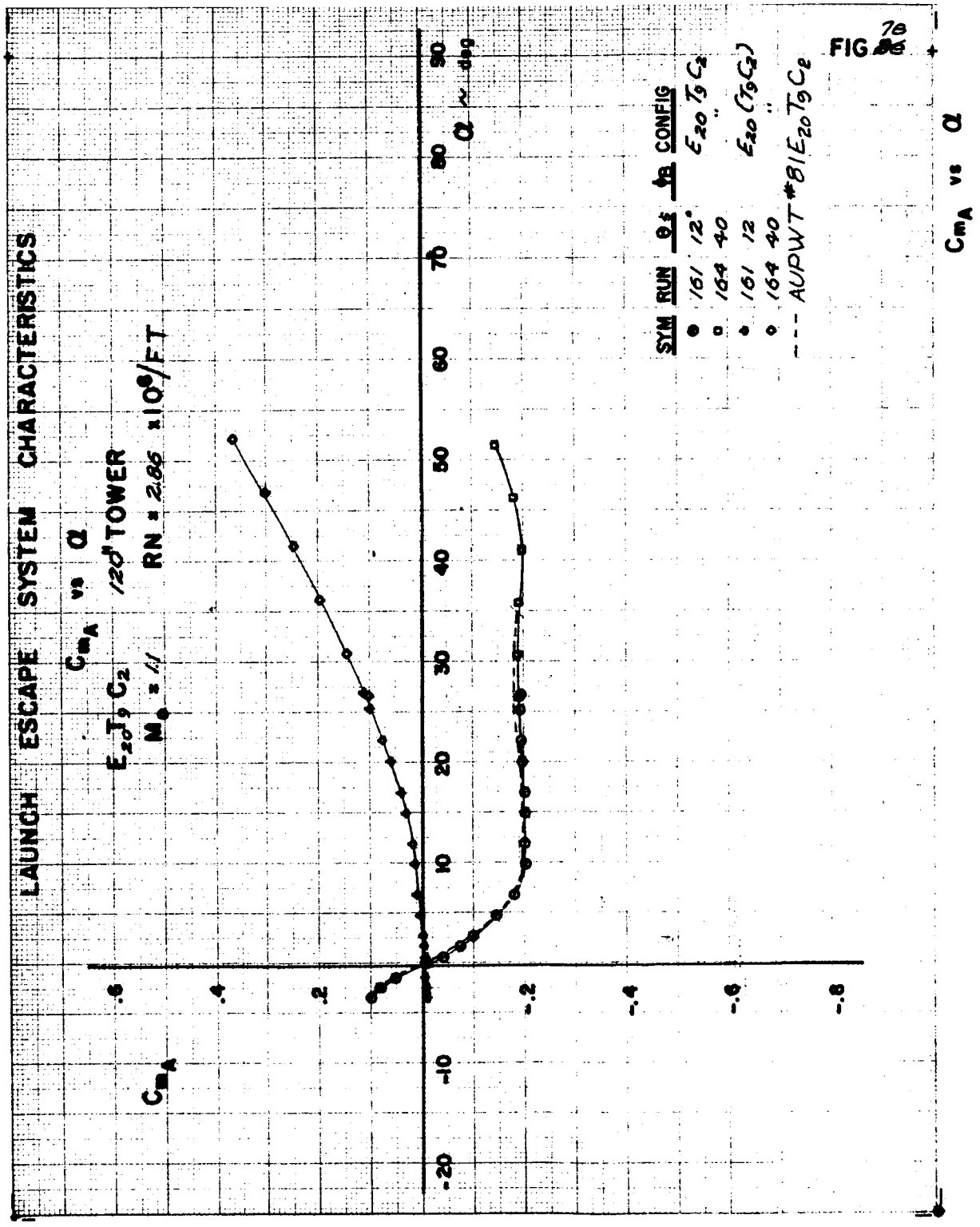

FIG 7B

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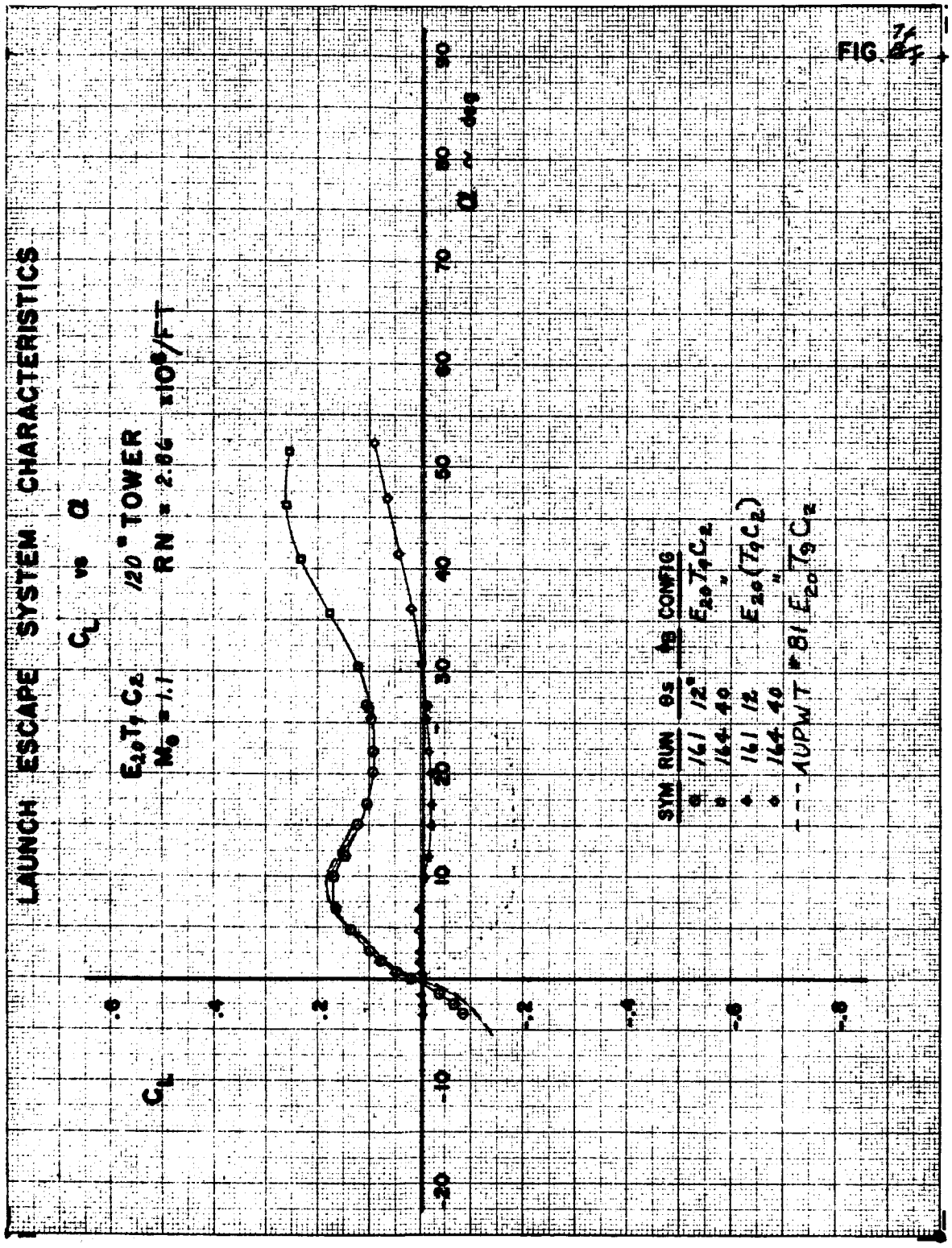

FIG. 7

C_L vs α

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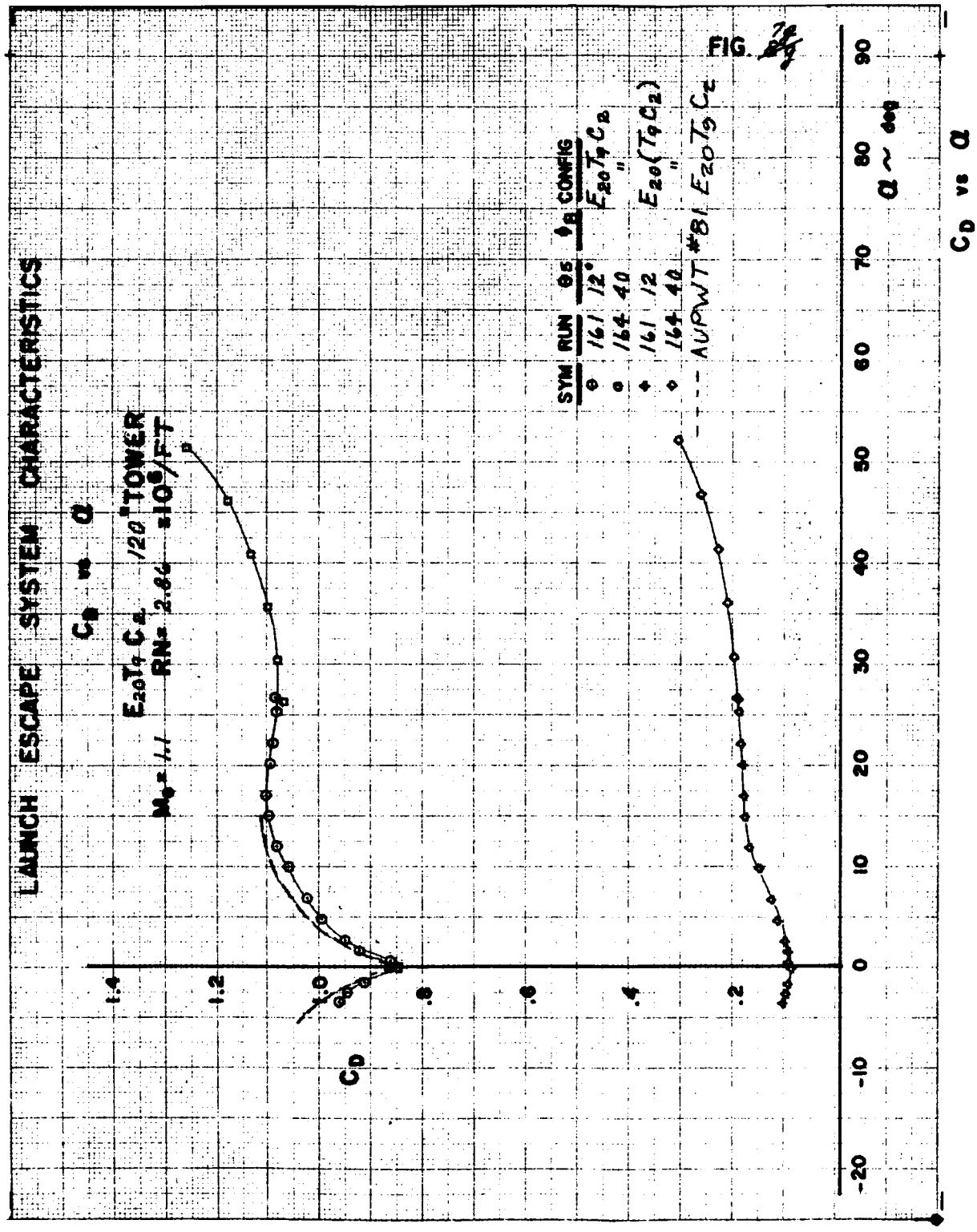

FIG. 24

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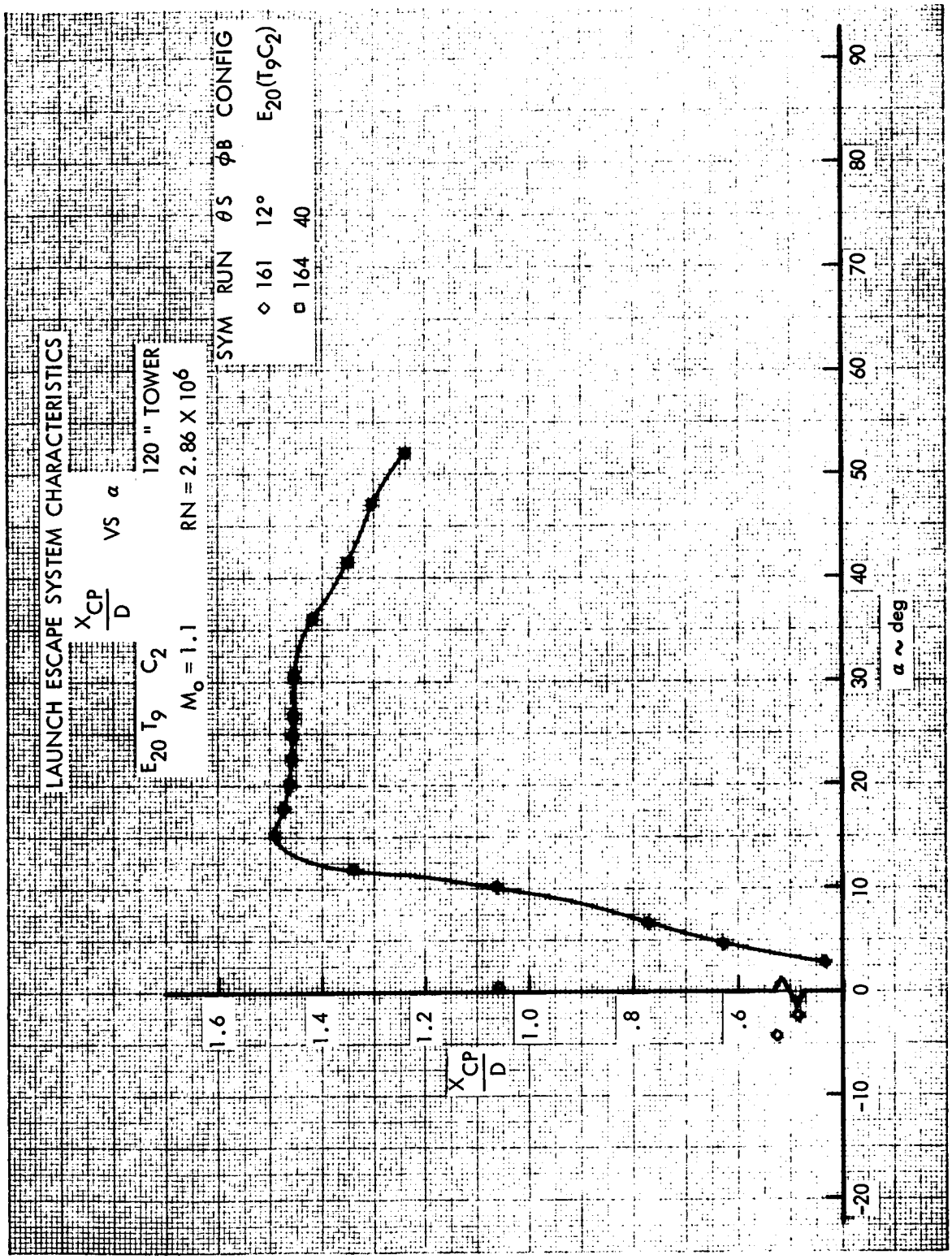

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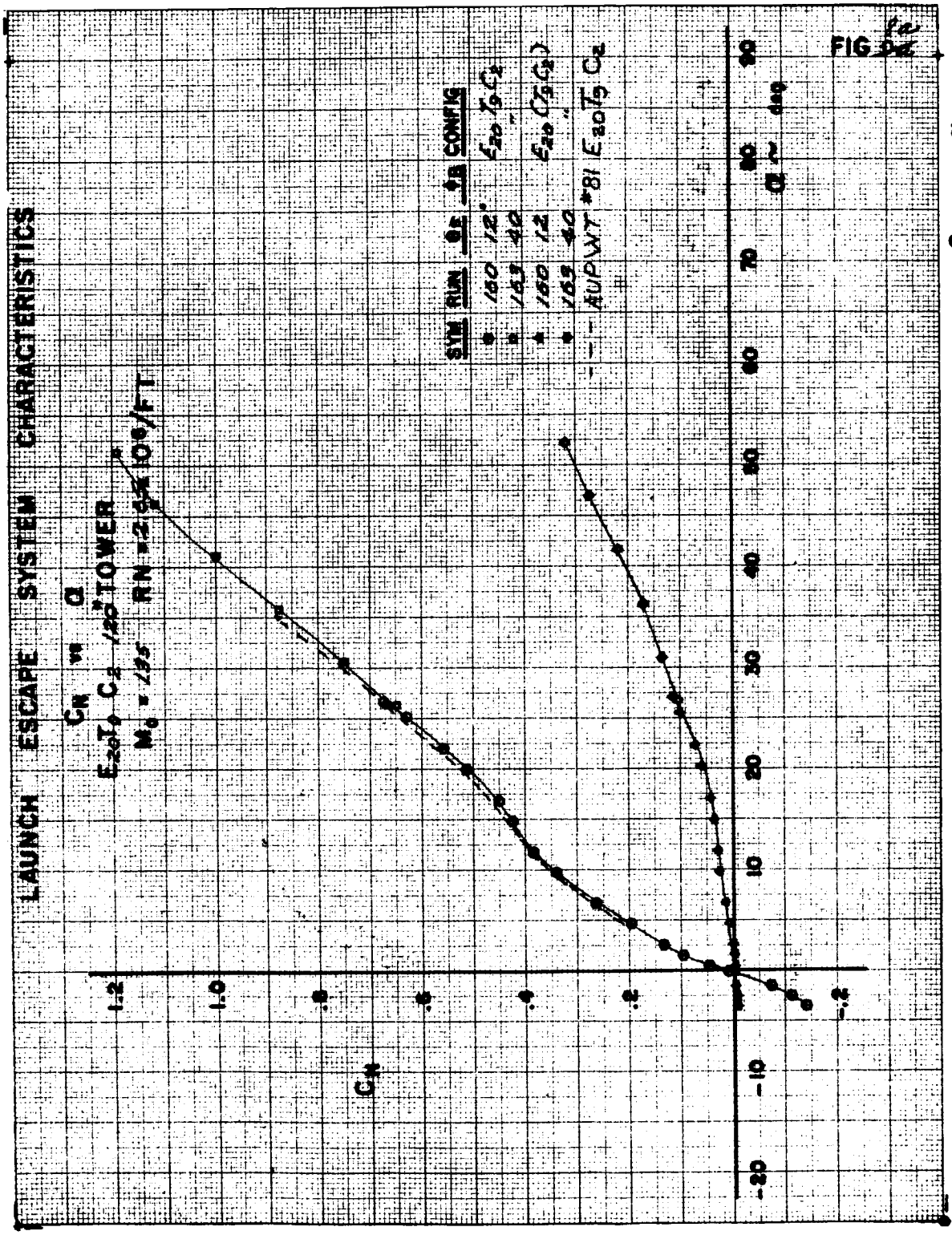

FIG 5a

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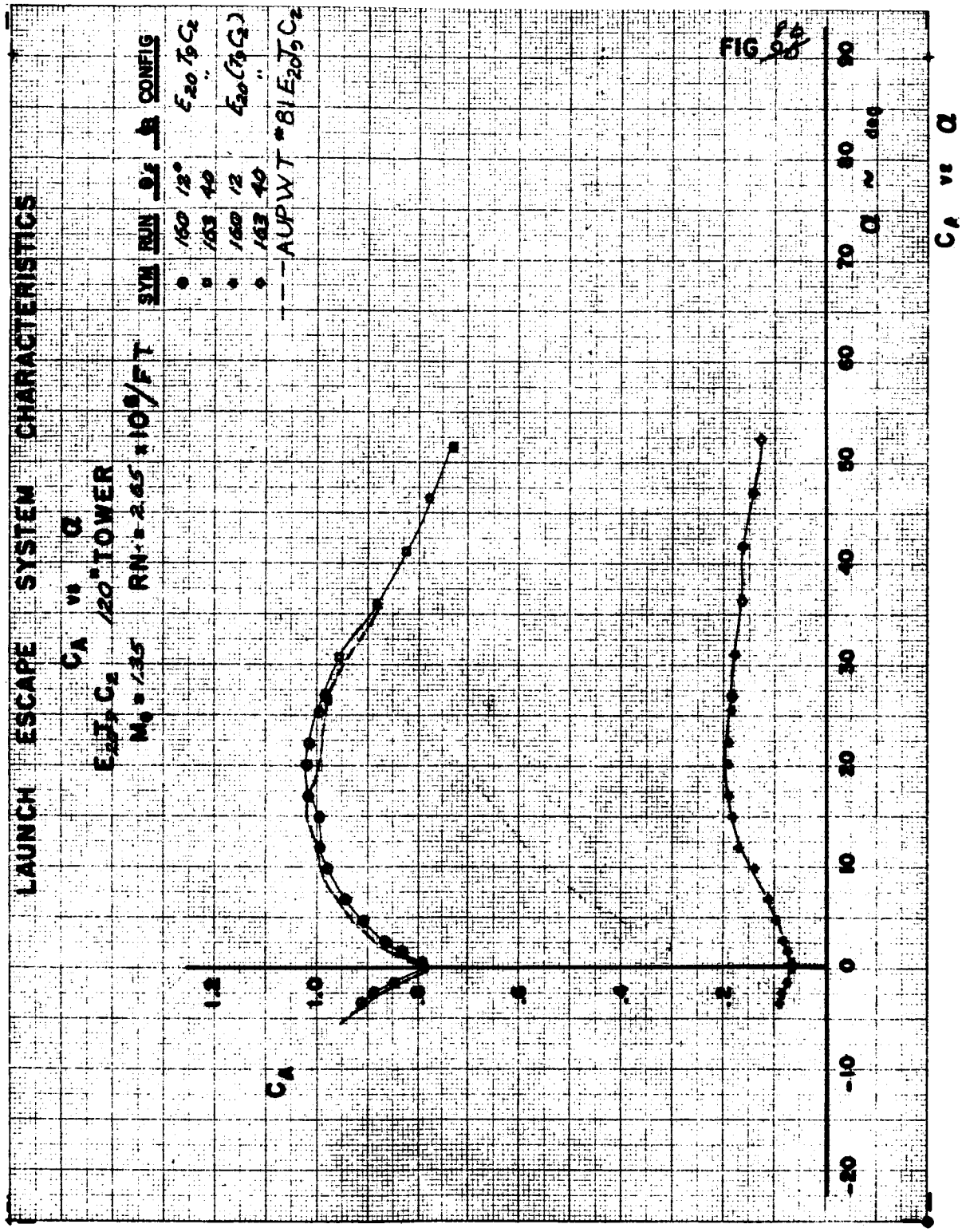

FIG 5b

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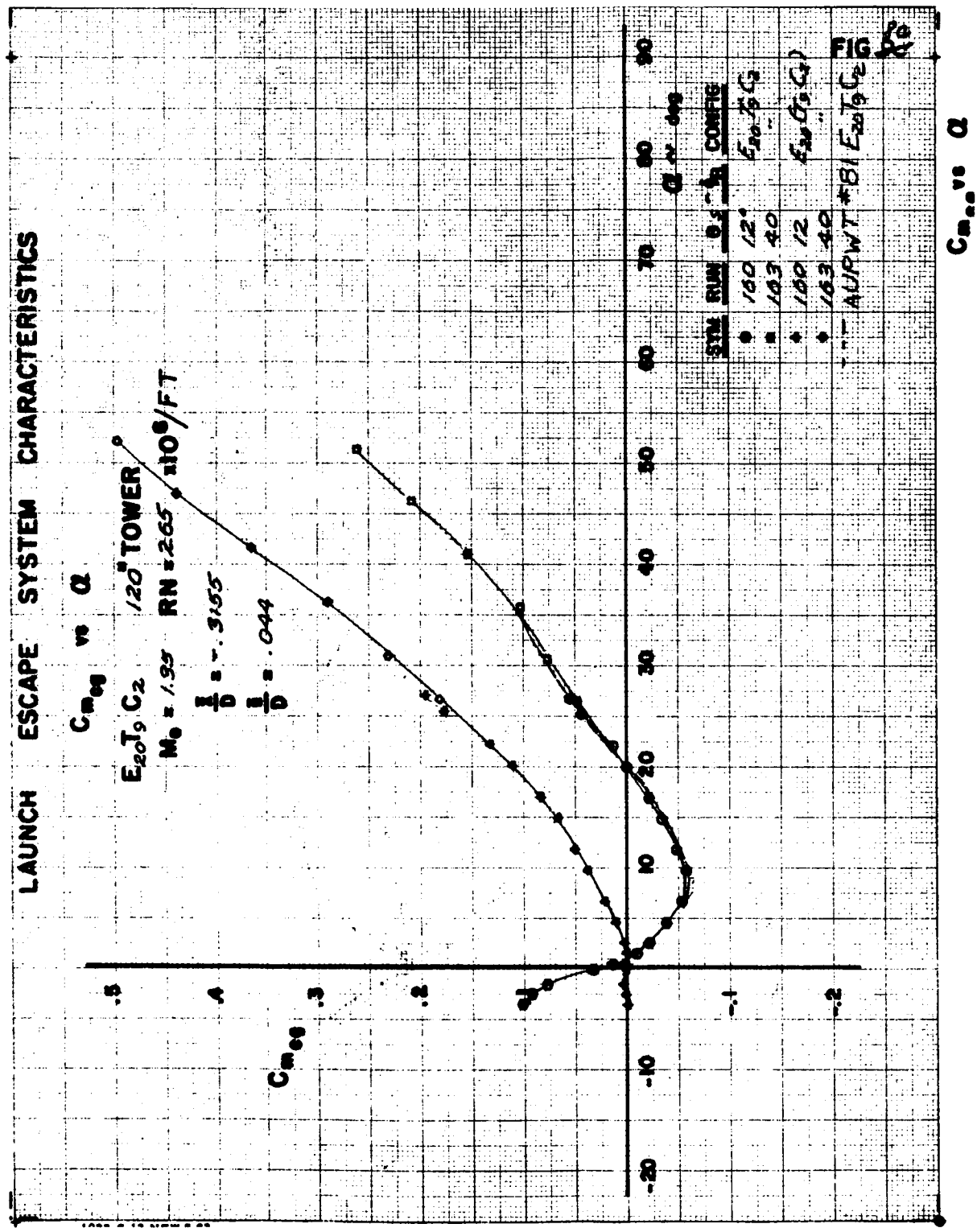

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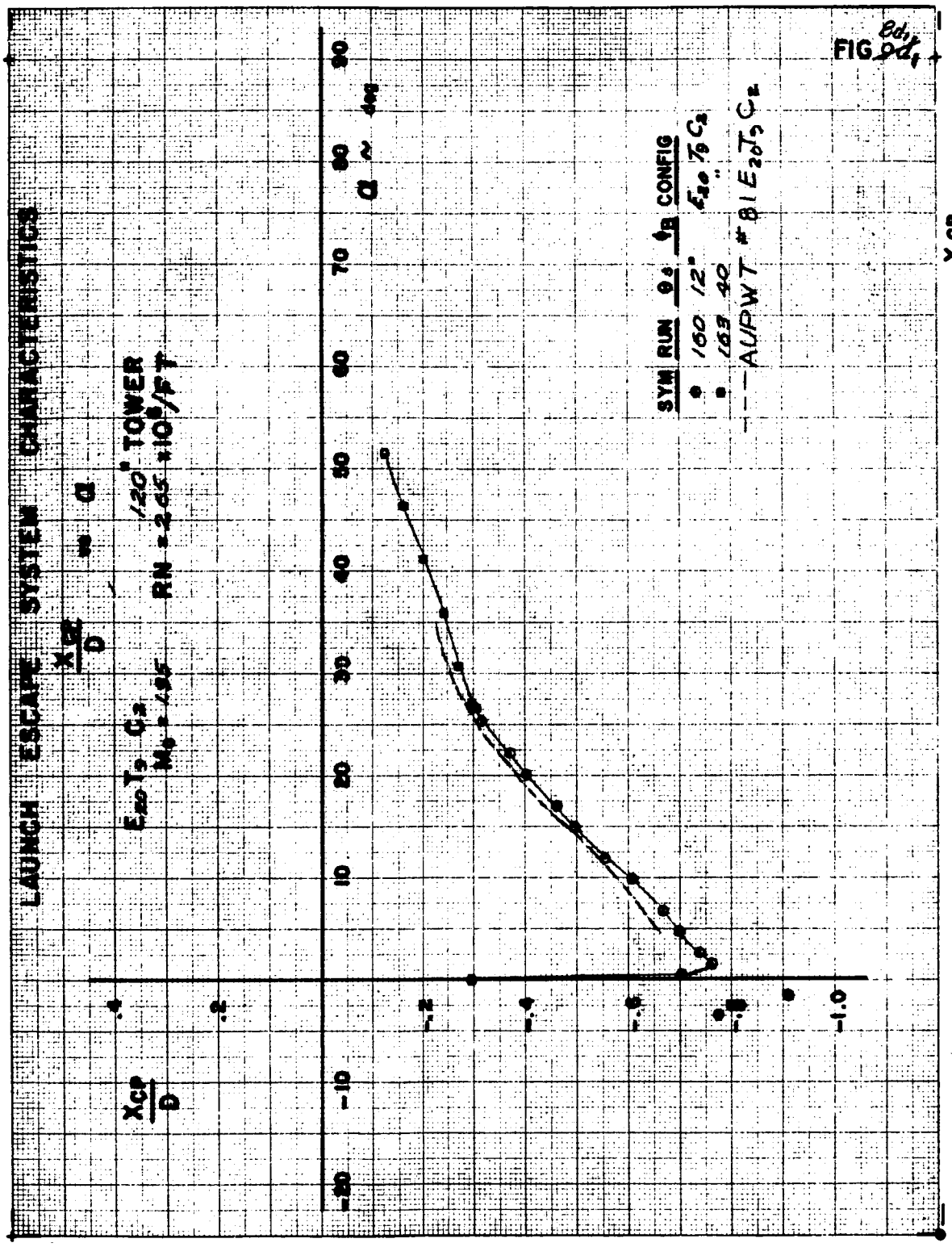

FIG 8d

[redacted]

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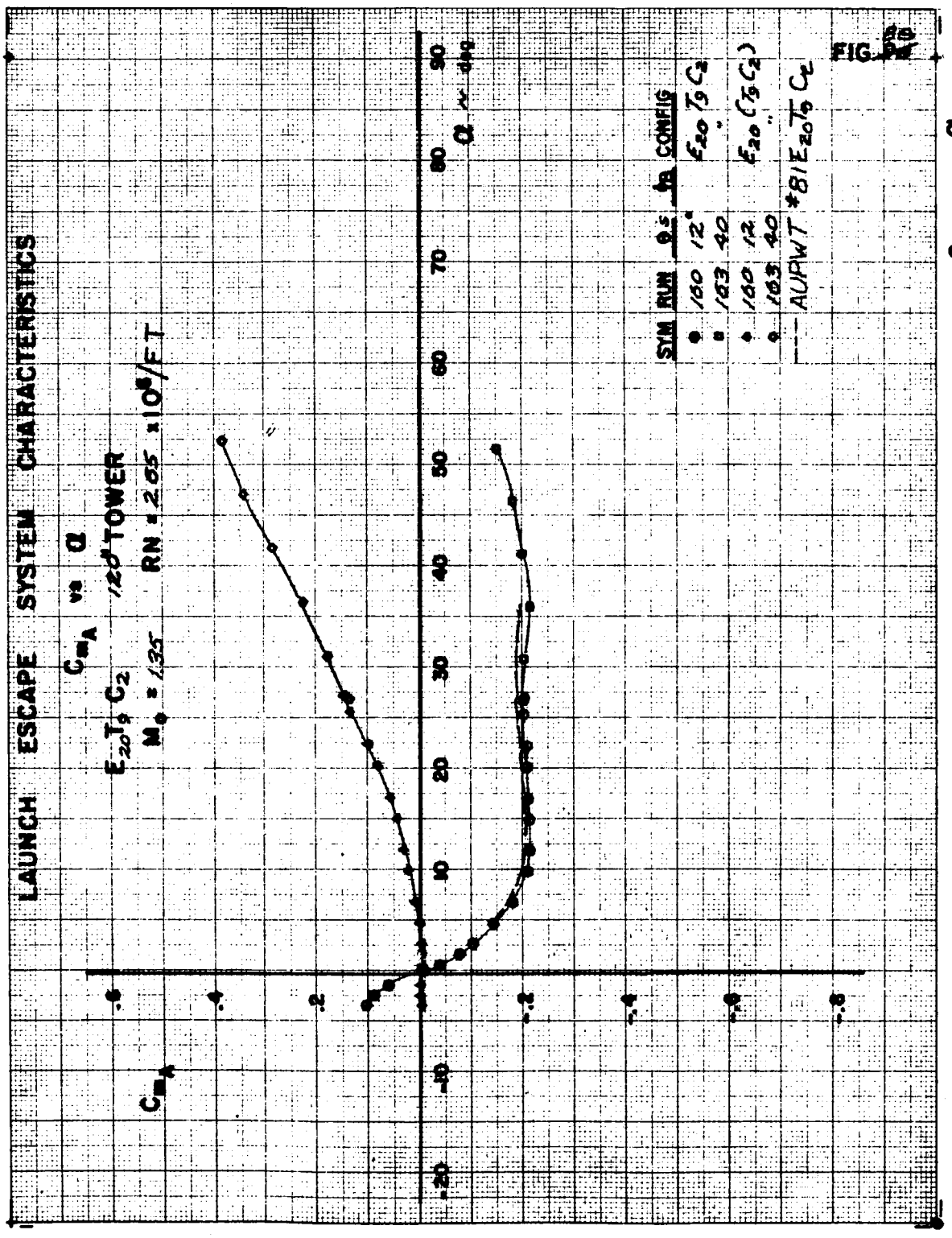

FIG. [illegible]

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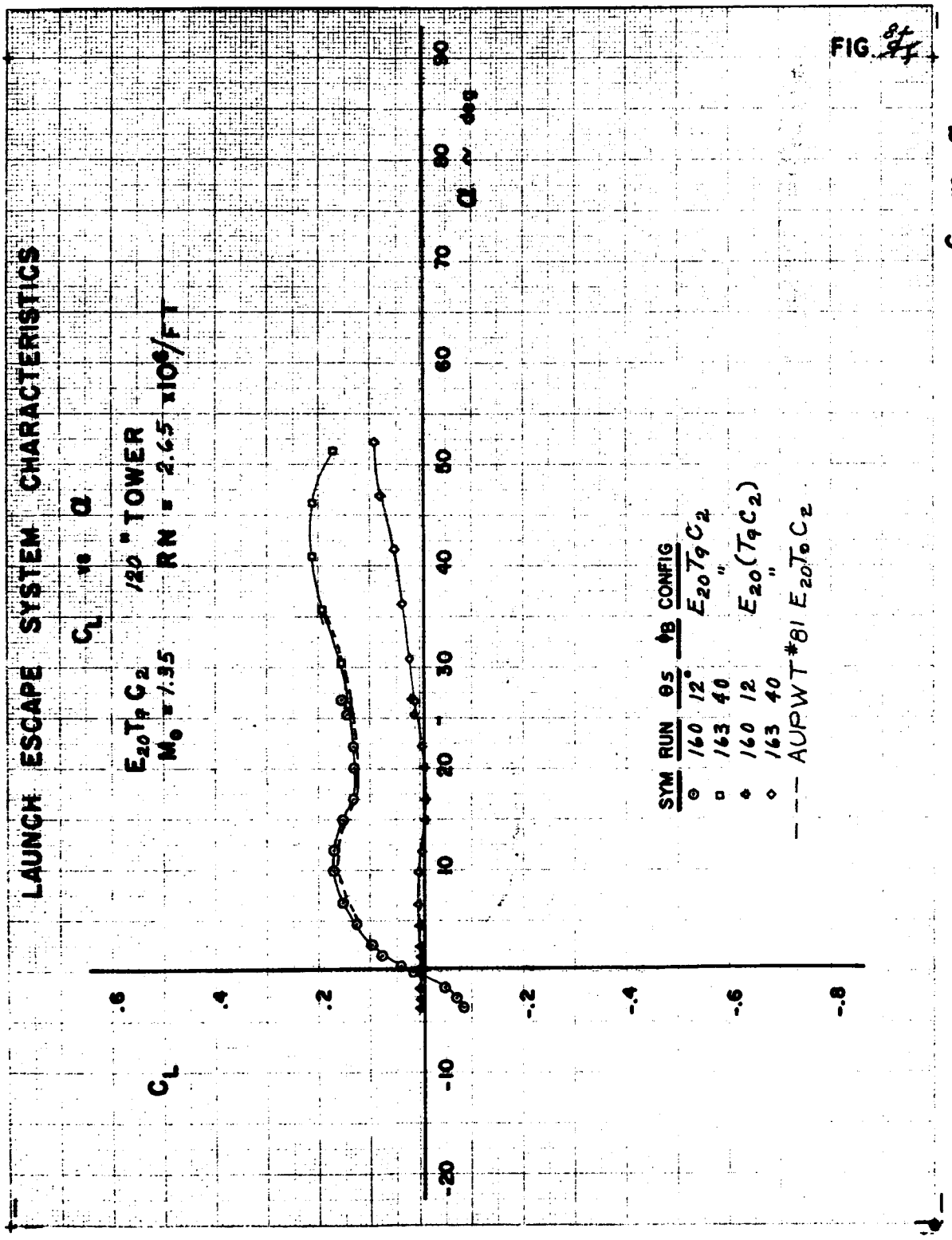

FIG. 84

C_L vs α

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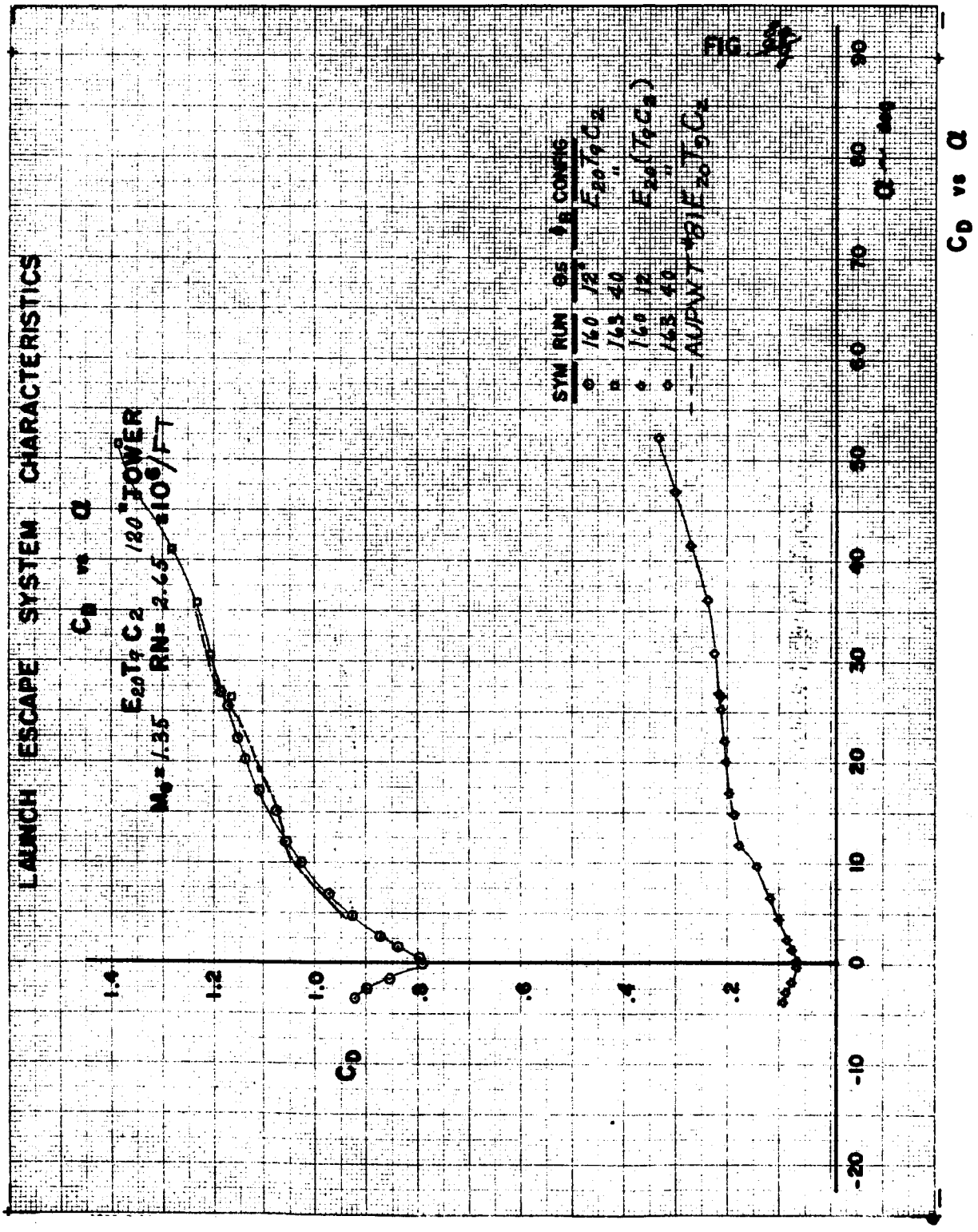

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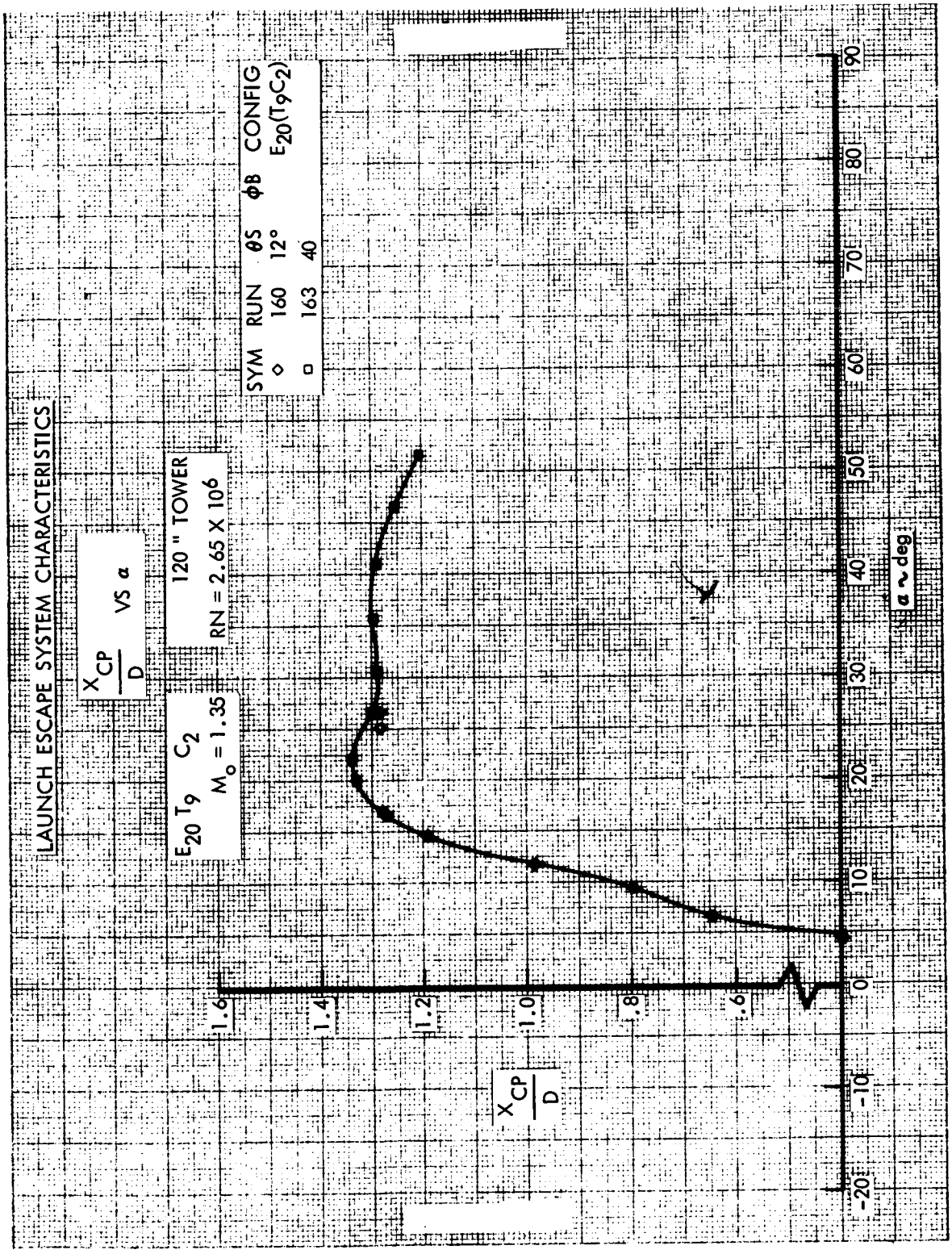

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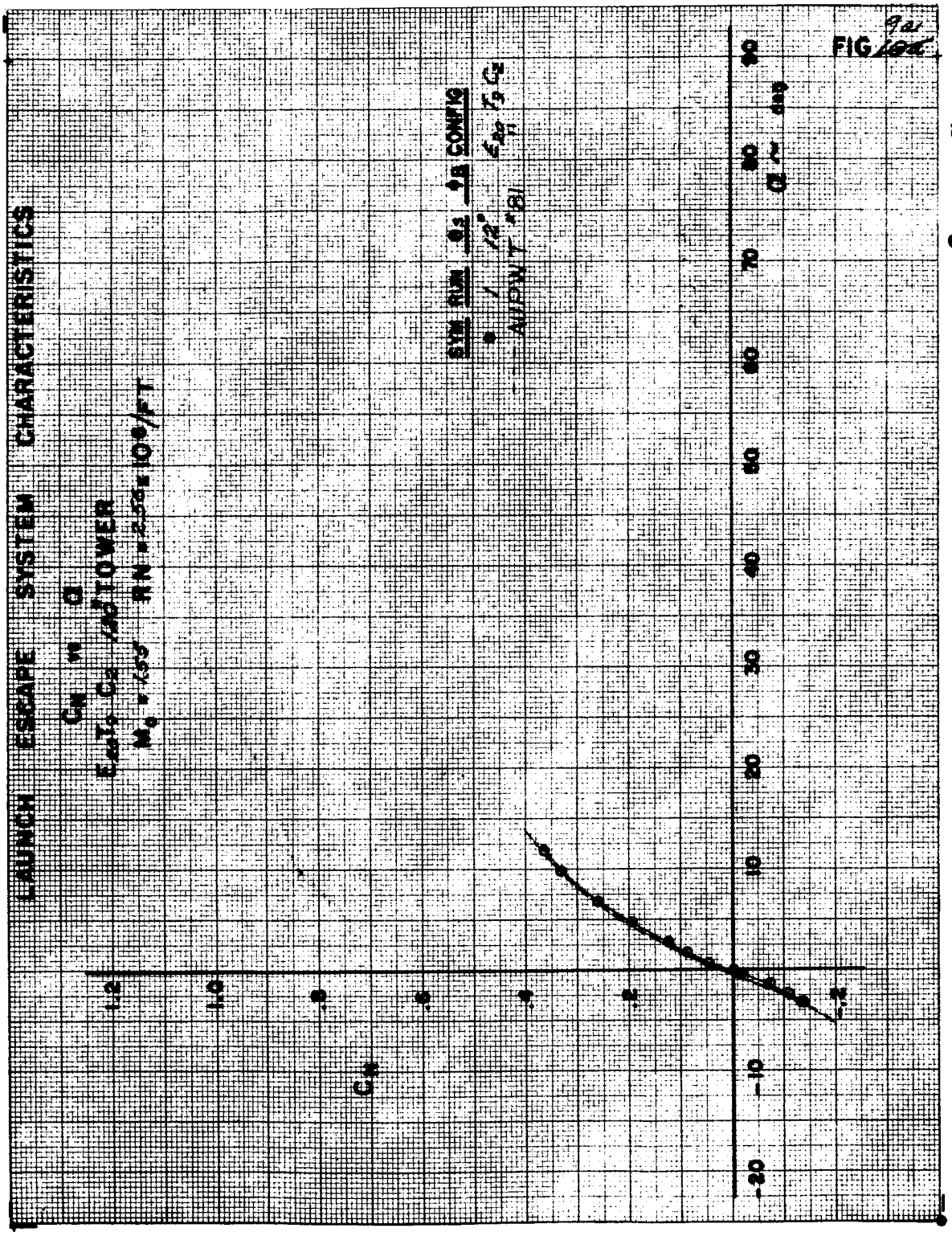

FIG 9a

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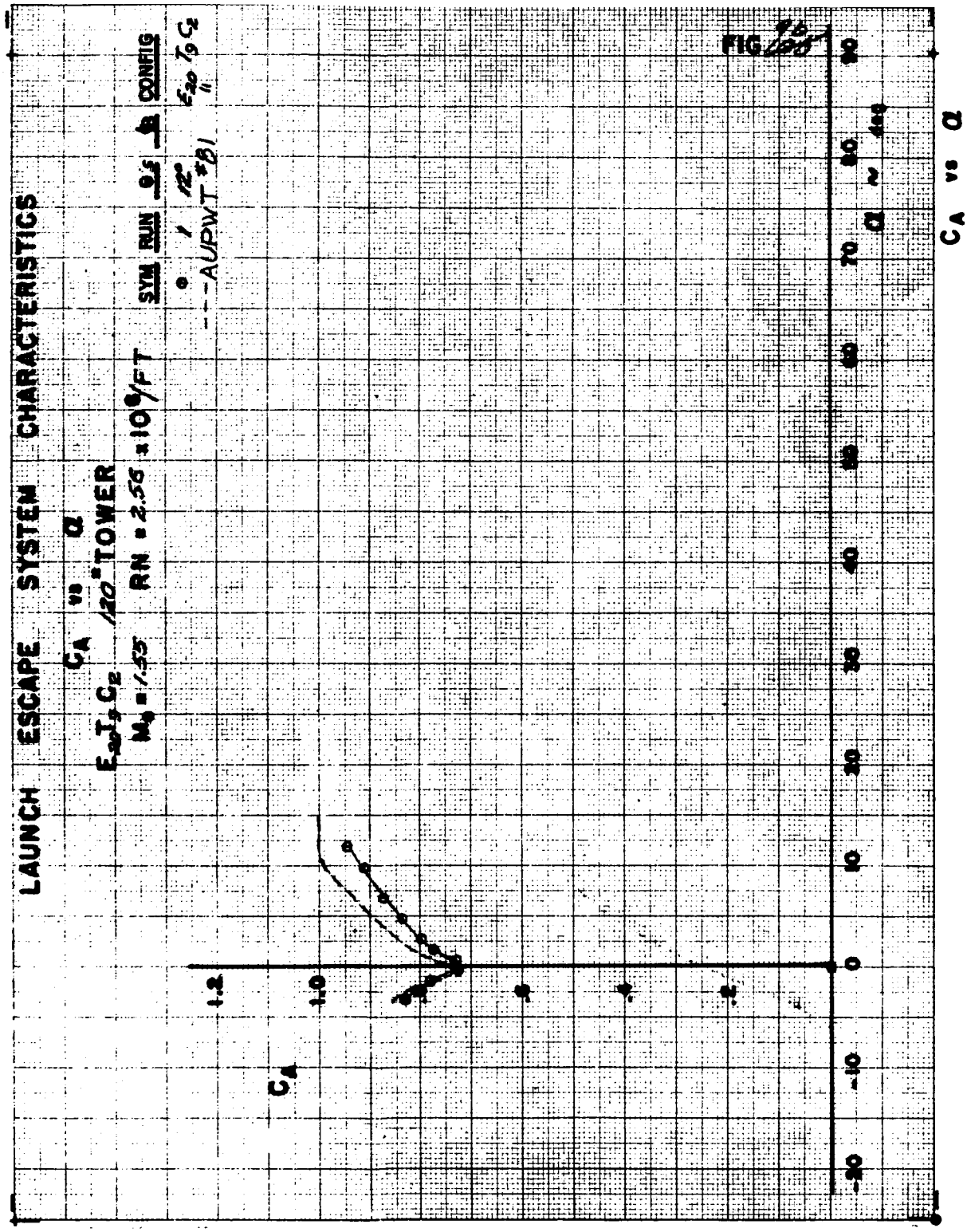

FIG

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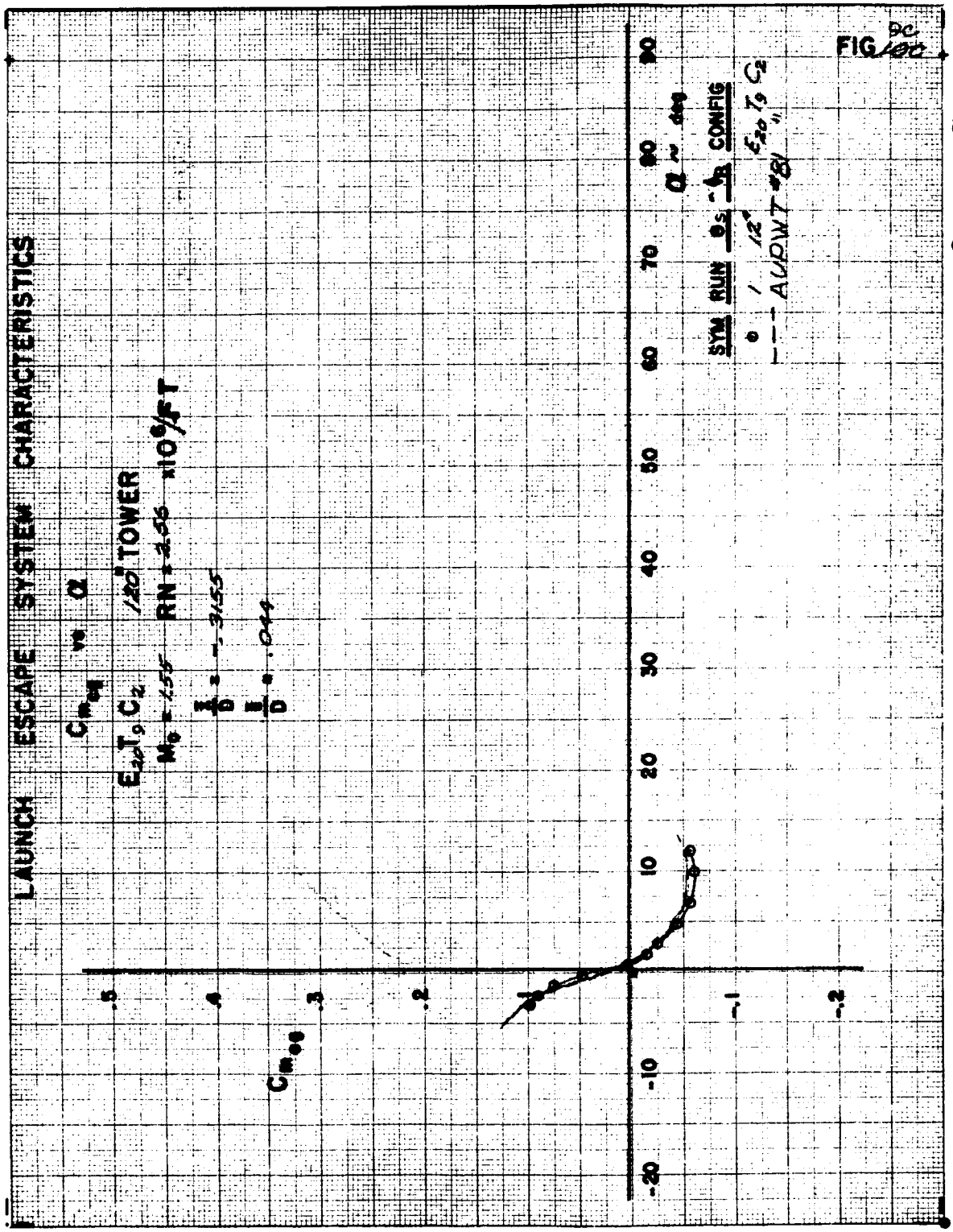

FIG 9c

$C_{m_{\alpha}}$ vs α

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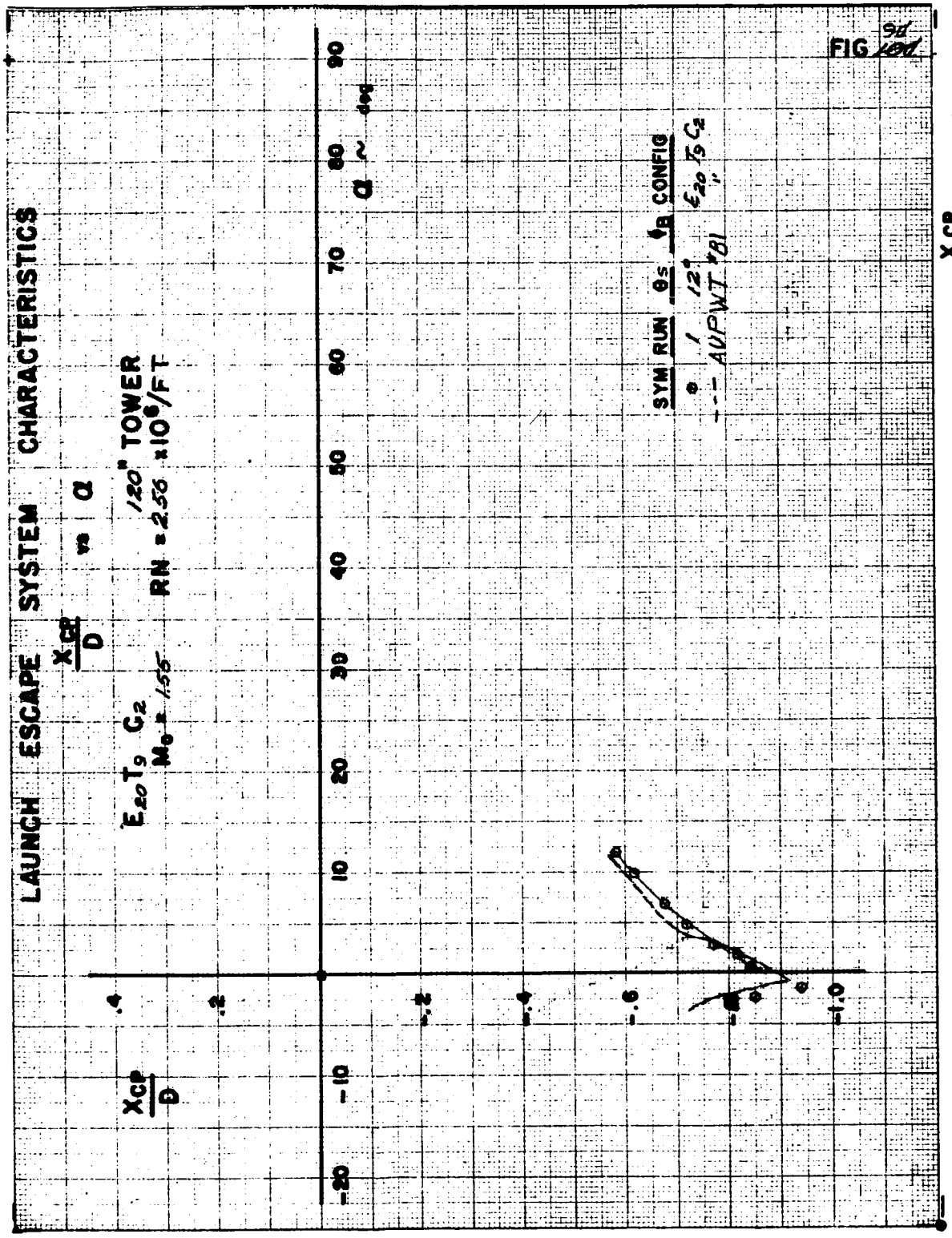

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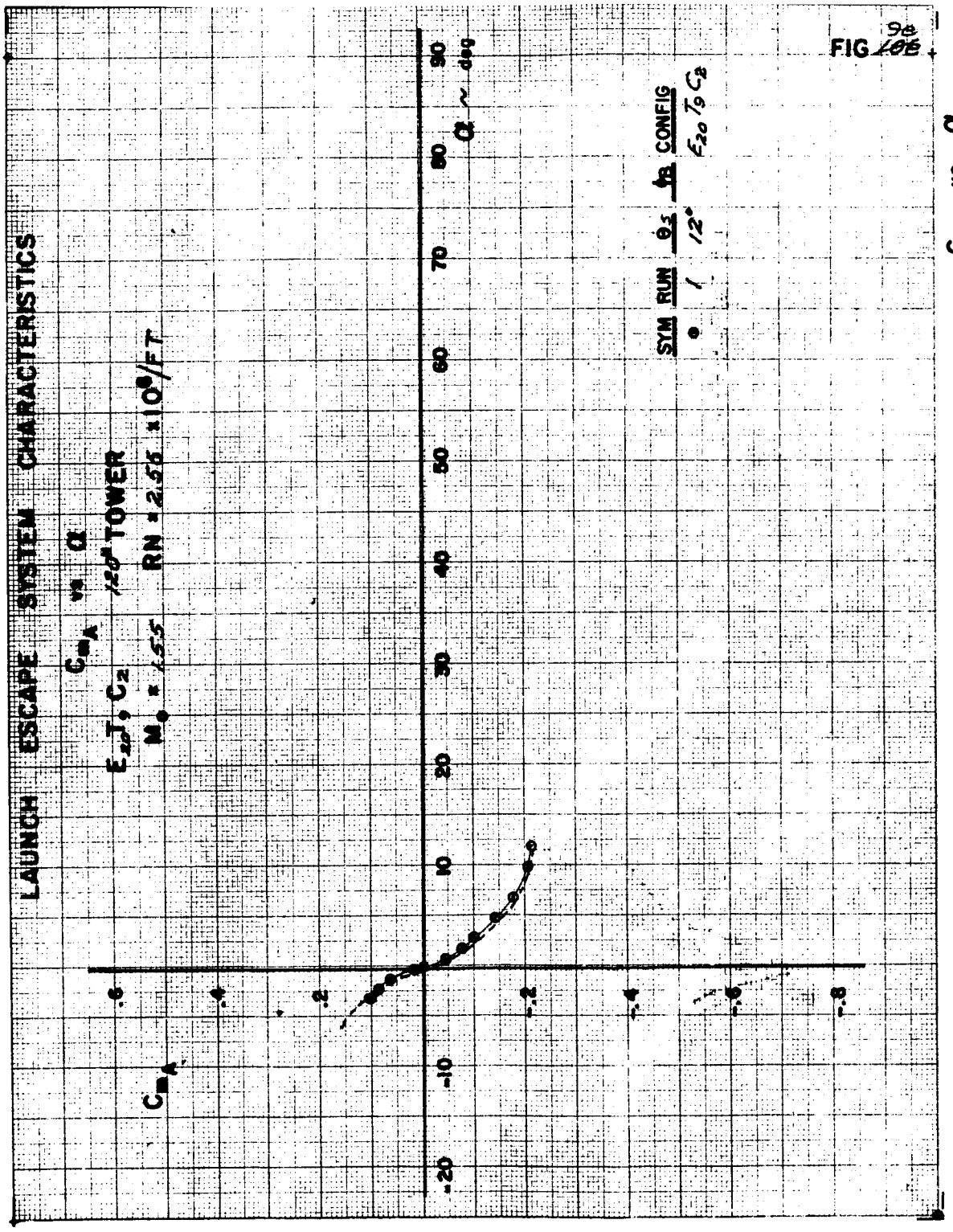

FIG 9a

C_{m_A} vs α

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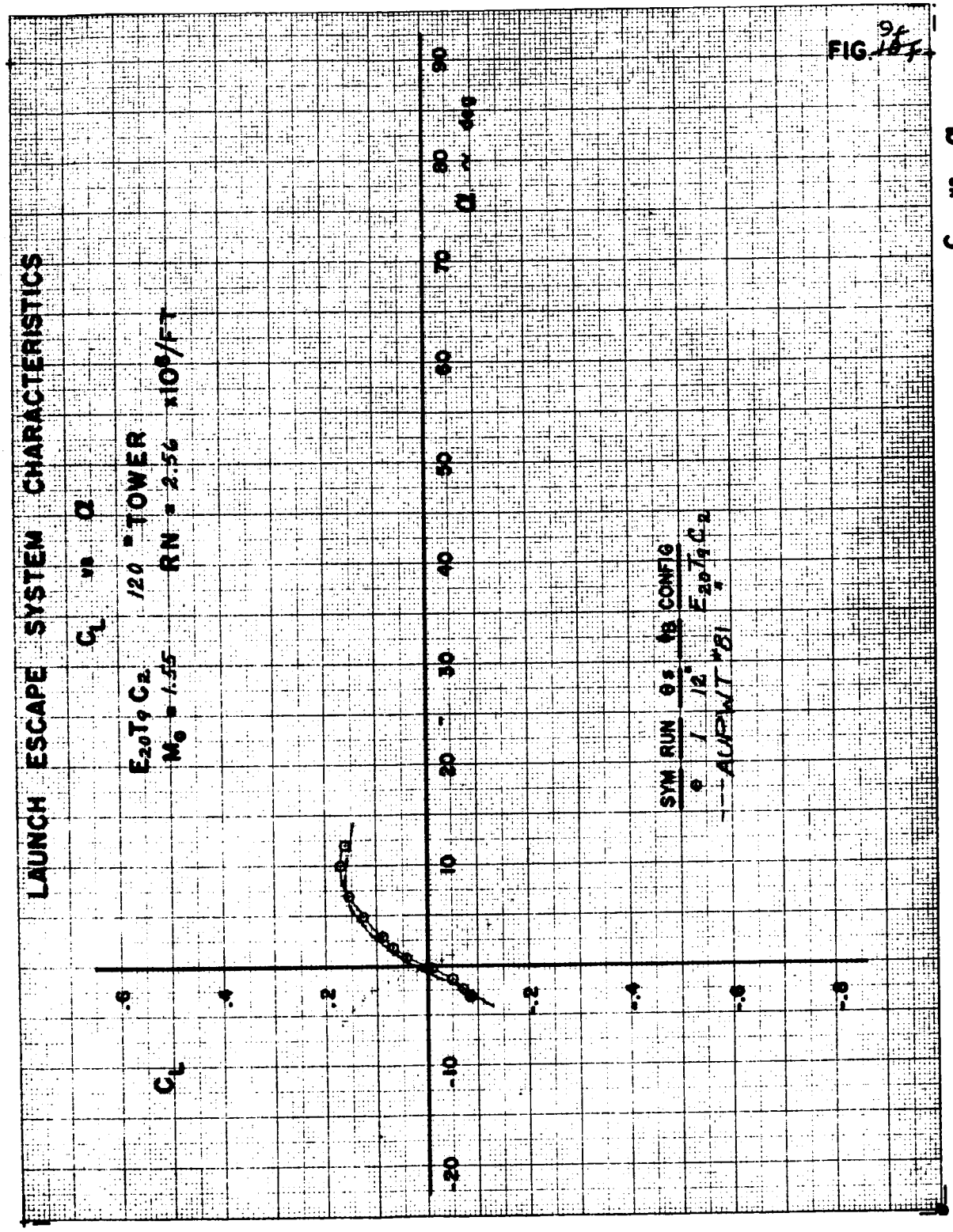

FIG. 9

C_L vs α

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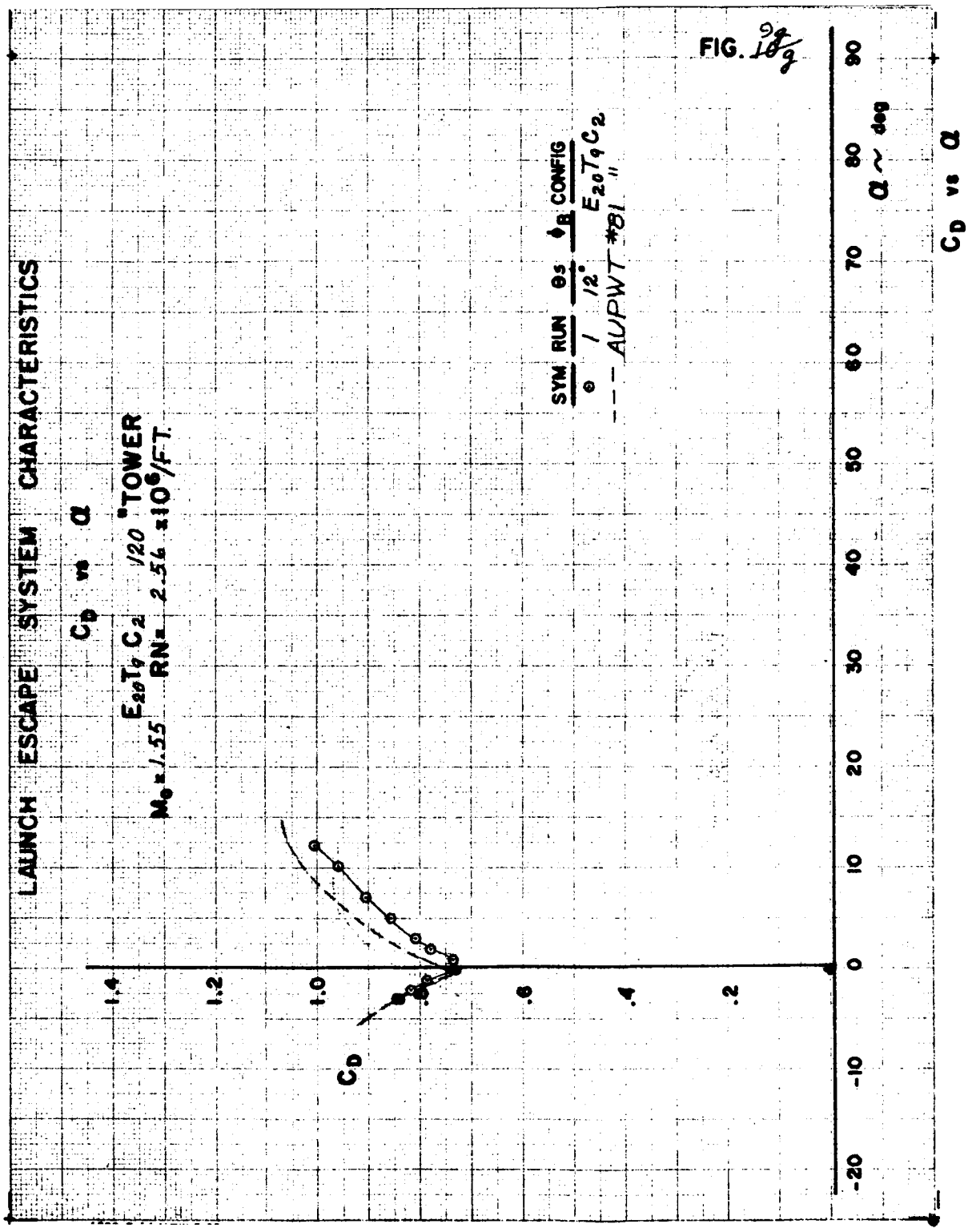

FIG. 19g

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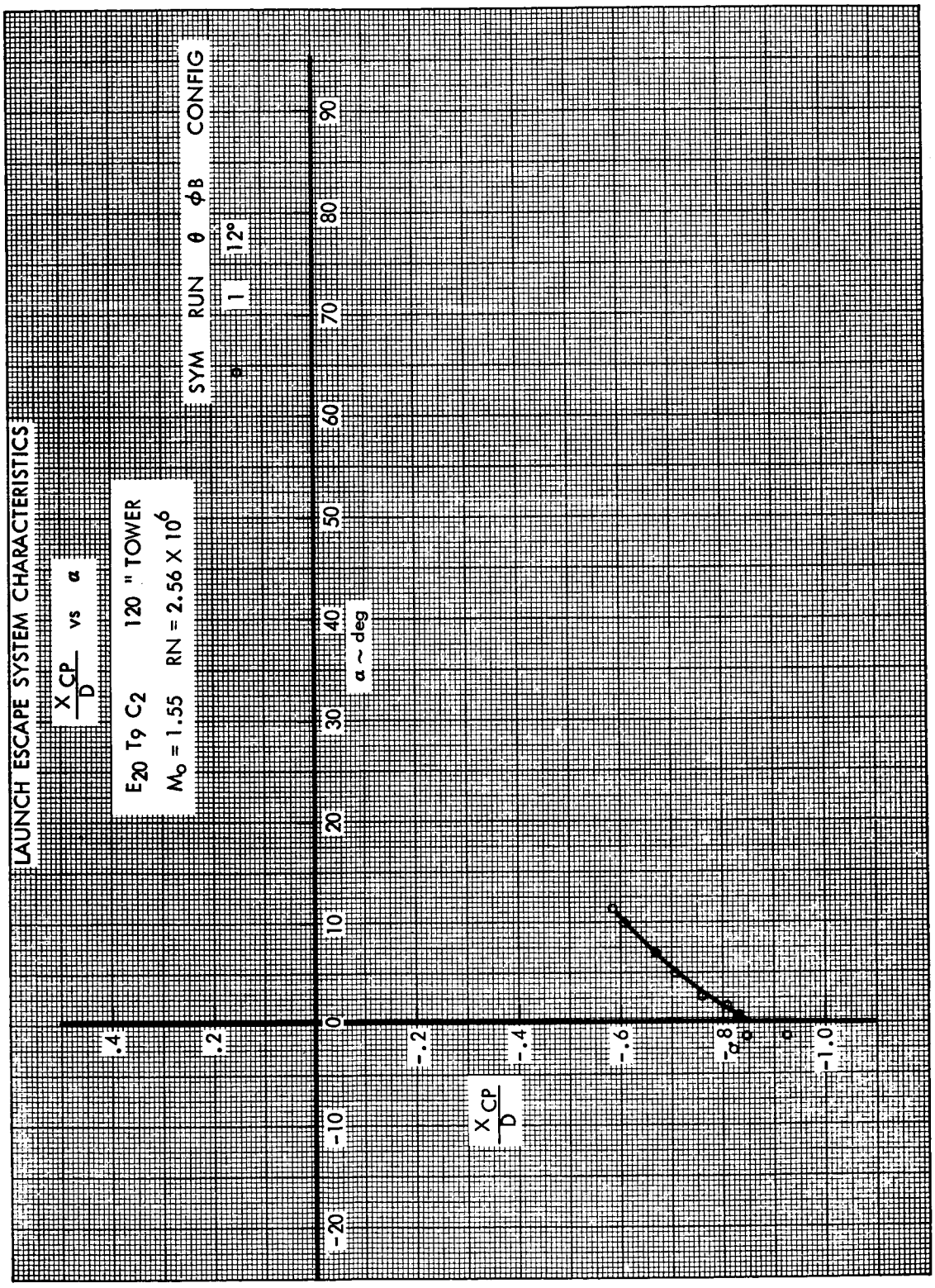

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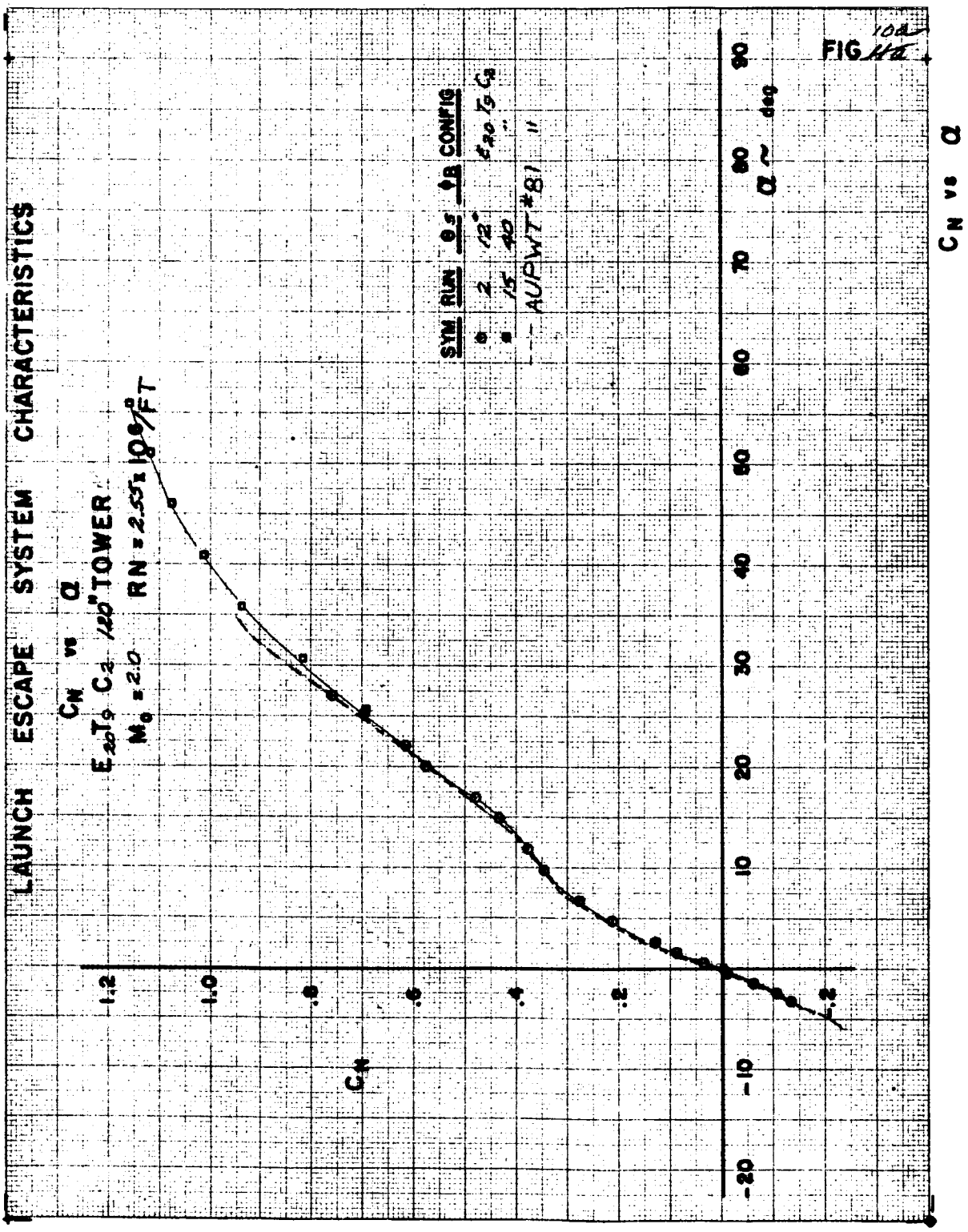

FIG 10d

C_N vs α

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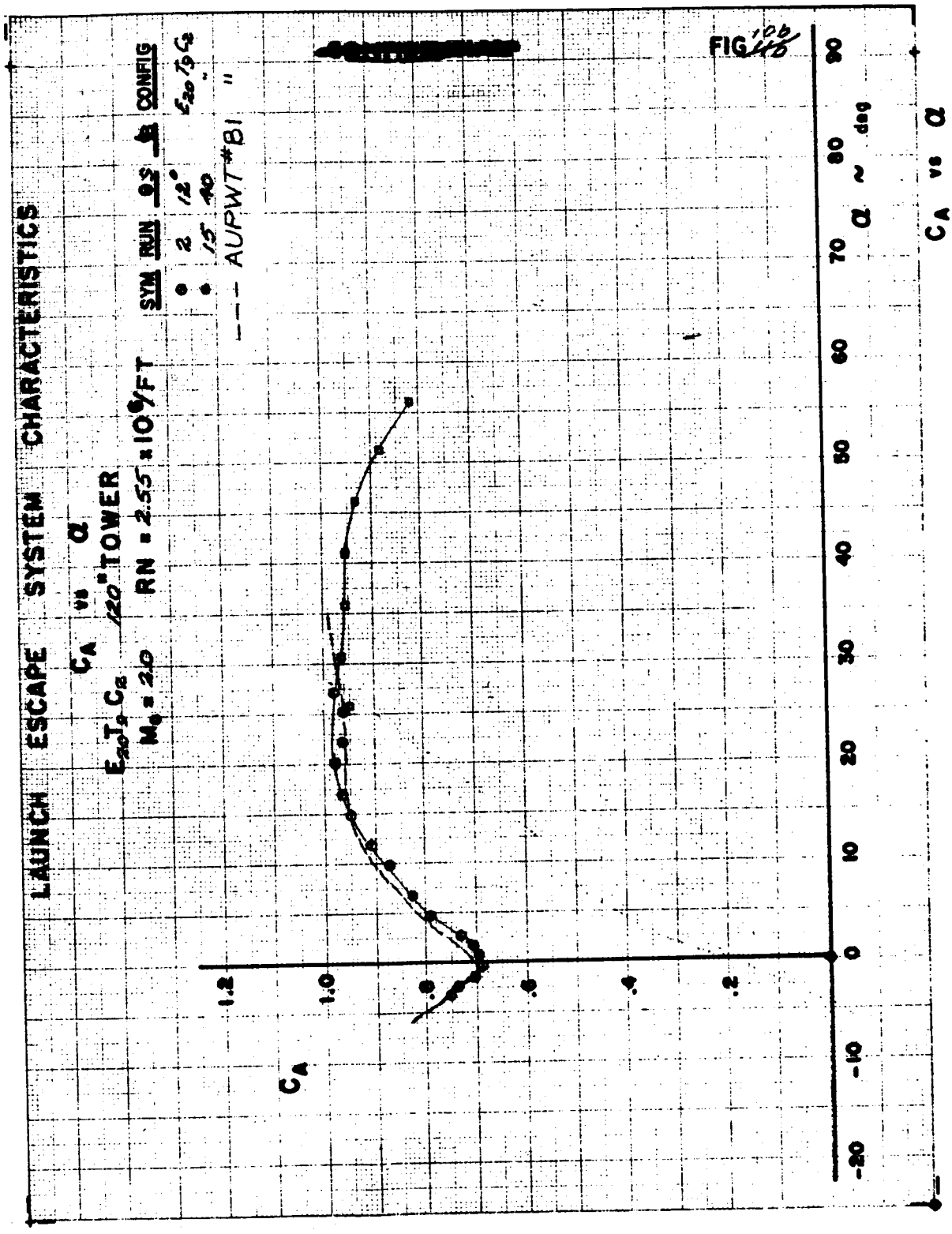

FIG 106

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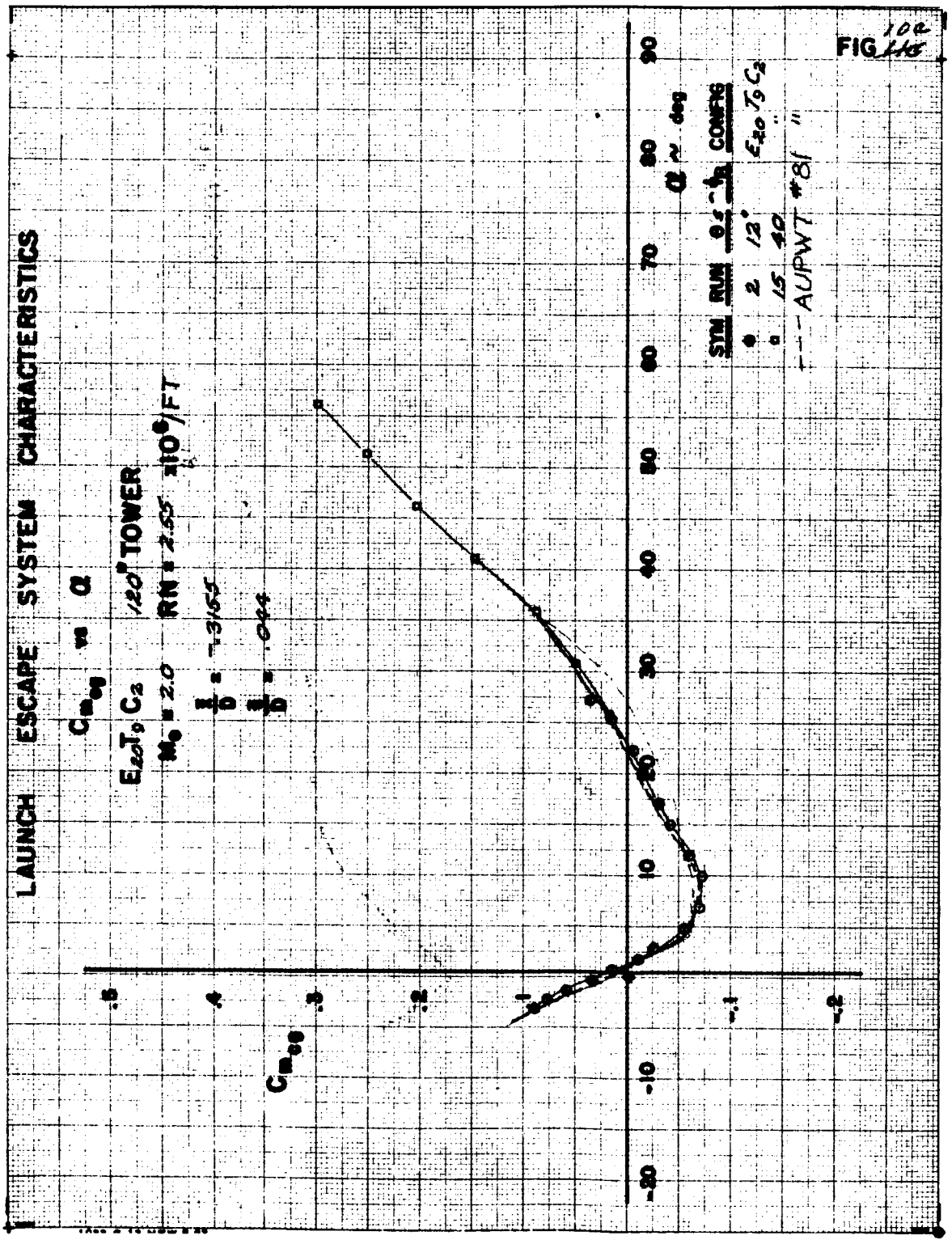

$C_{m_{\alpha_0}}$ vs α

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[redacted]

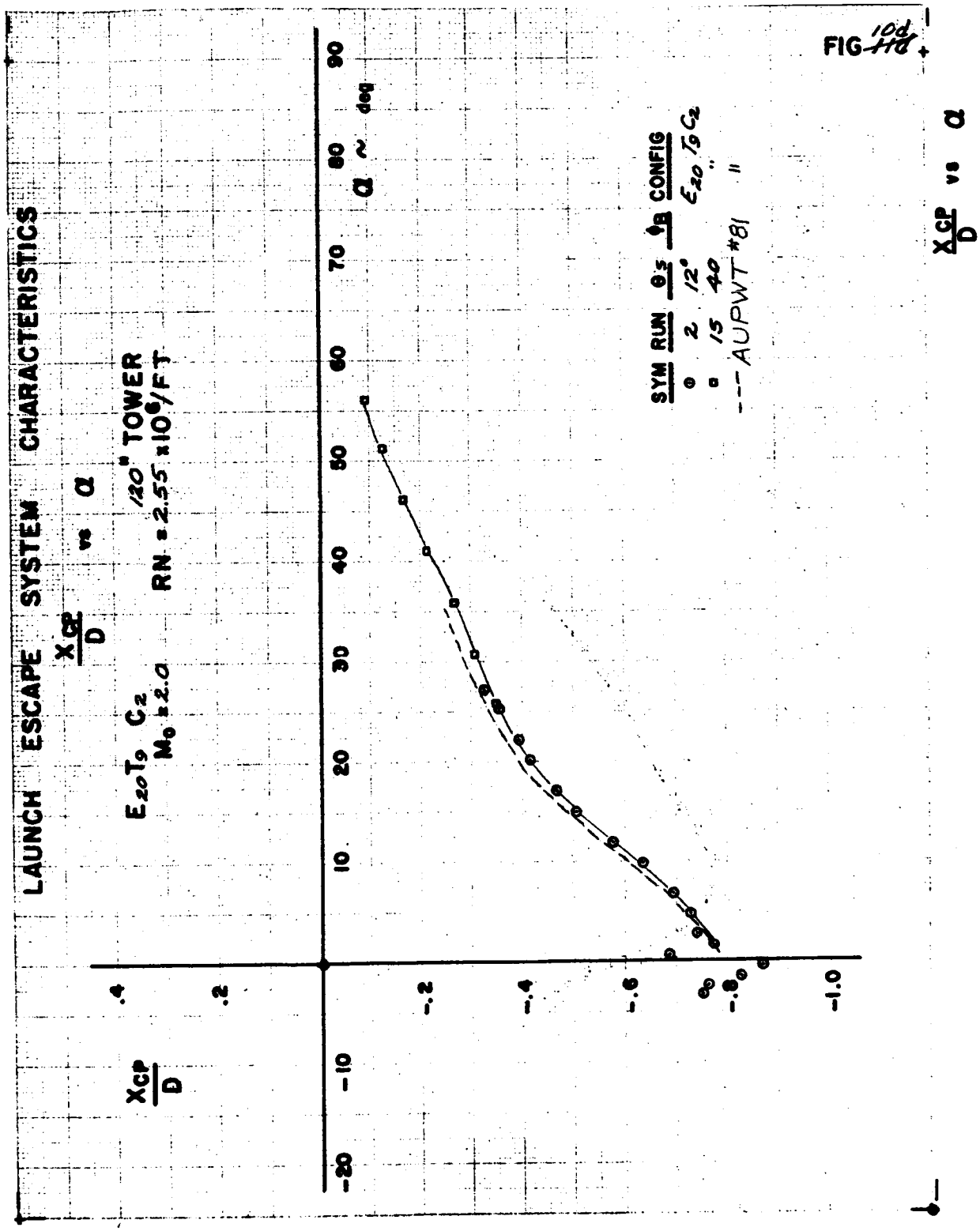

FIG 10d

[redacted]

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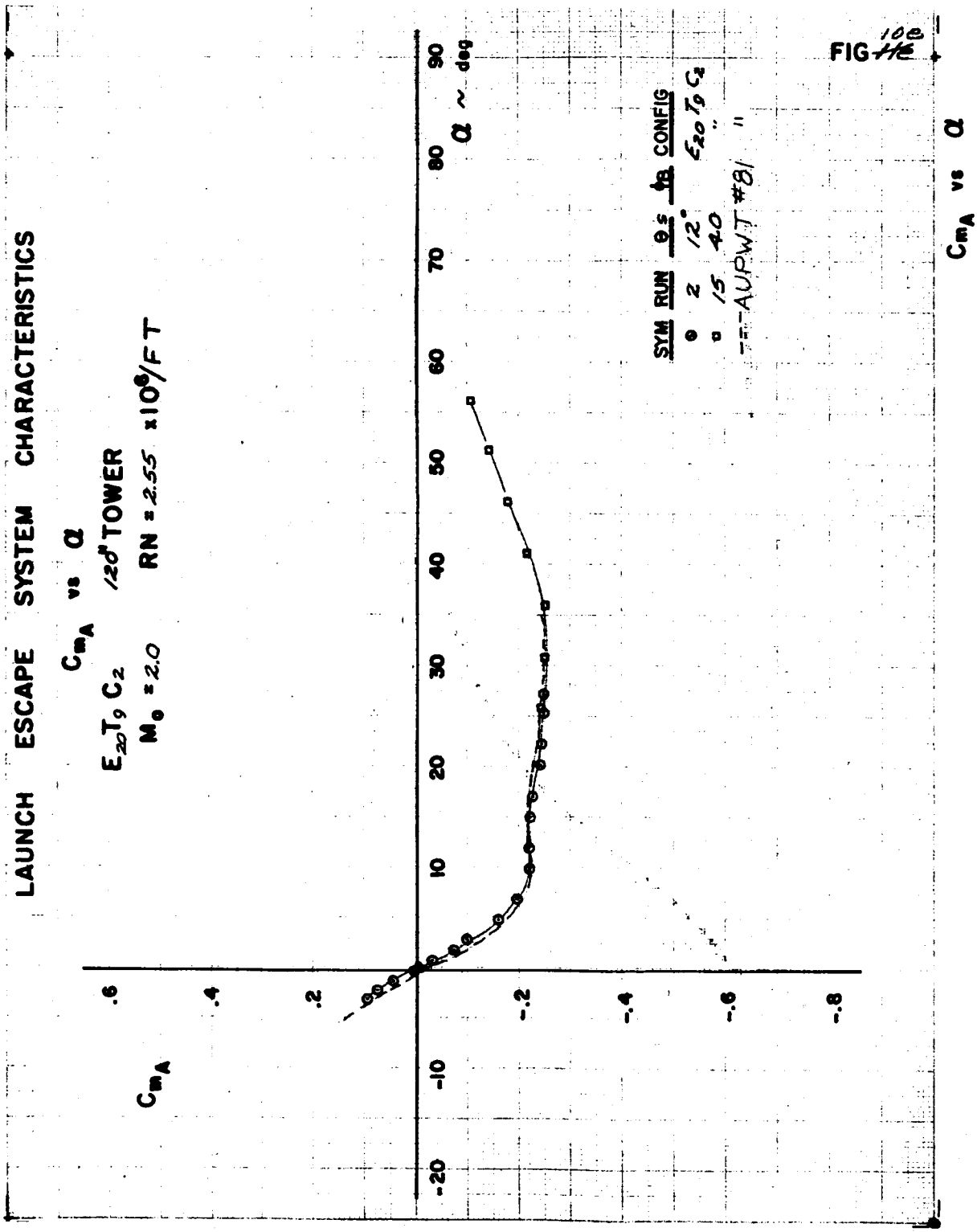

FIG 10e

C_{m_A} vs α

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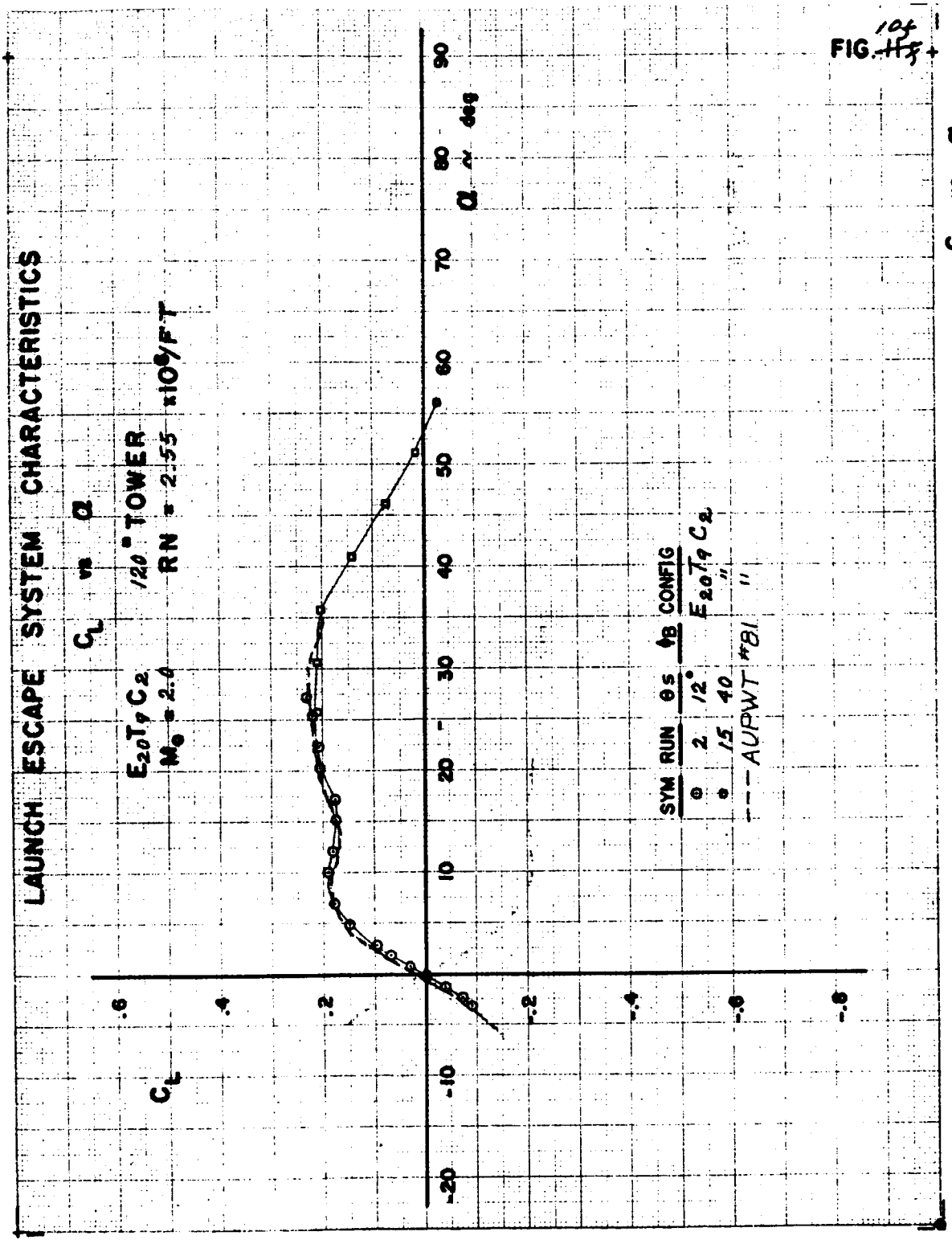

FIG. 104

C_L vs α

~~CONFIDENTIAL~~

[redacted]

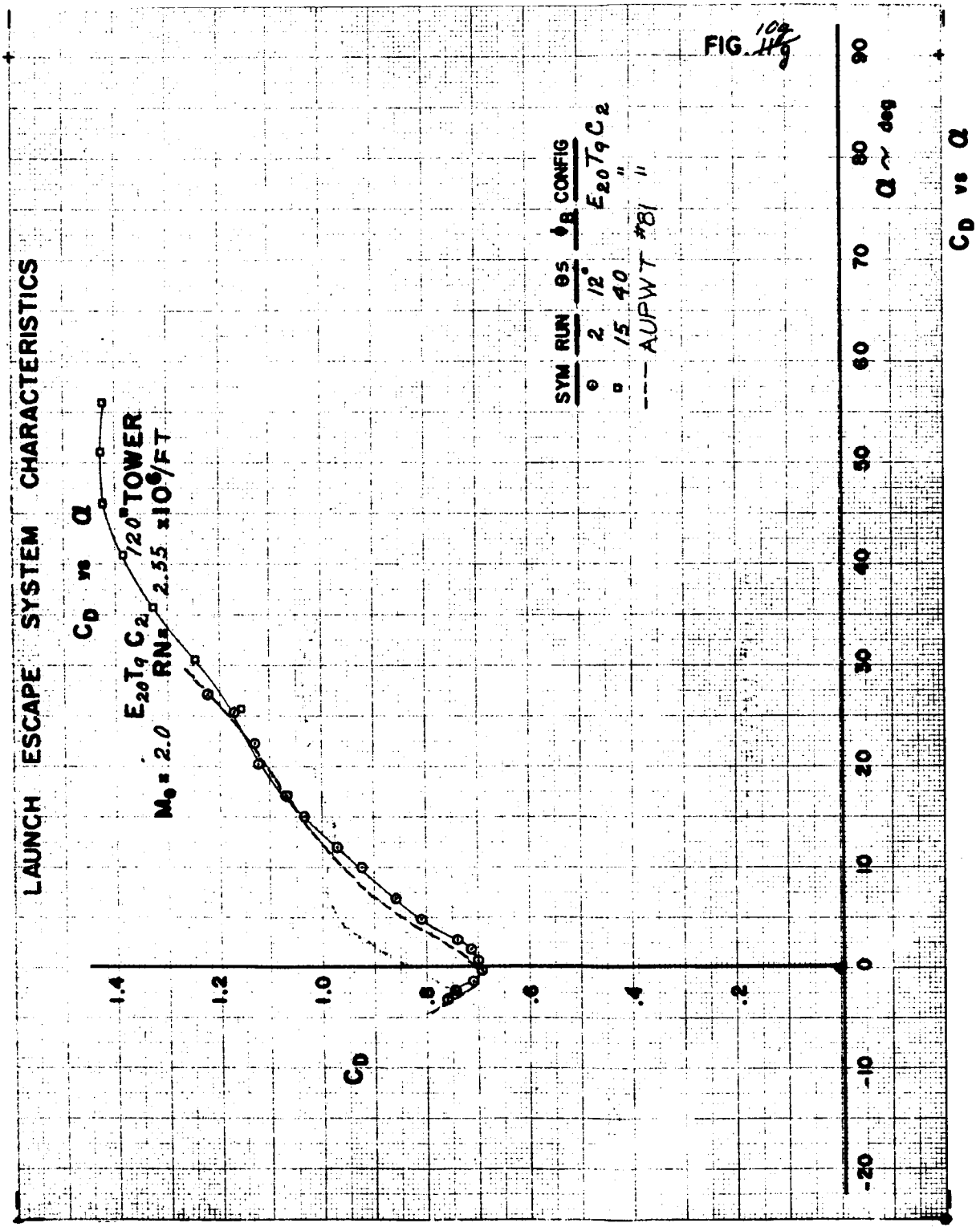

FIG. 104

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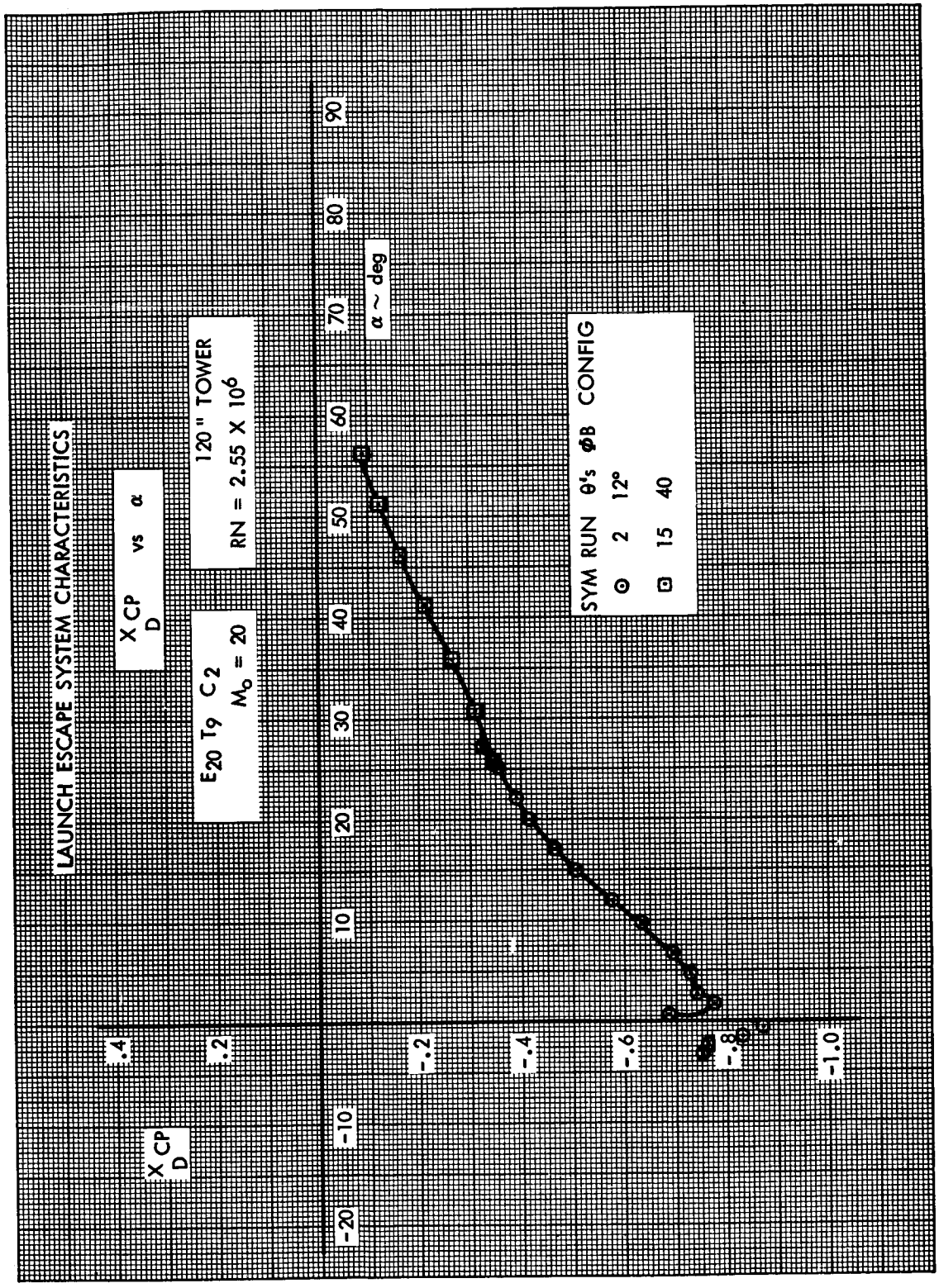
CO[redacted]



[redacted]

[redacted]

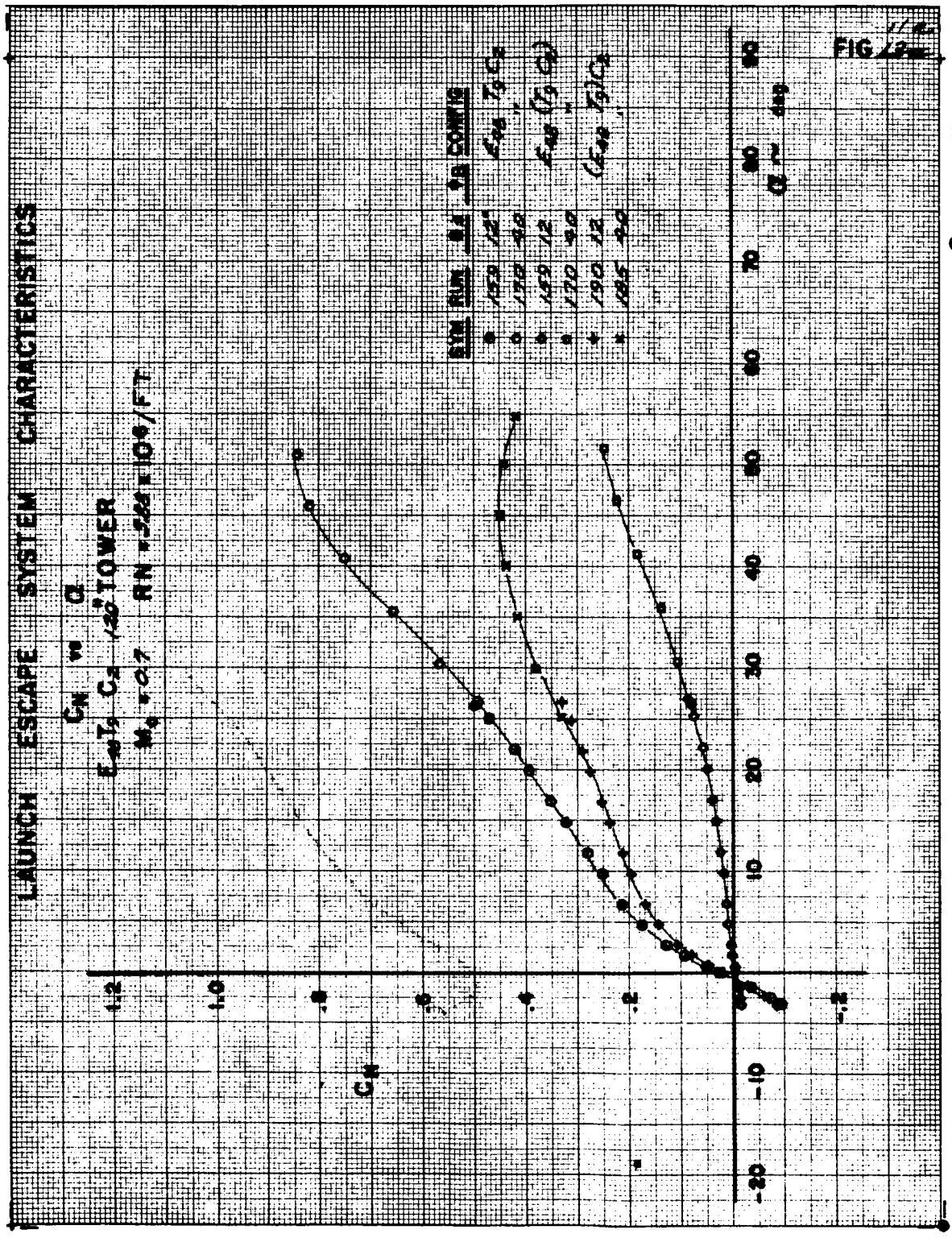


FIG 12

C_N vs α

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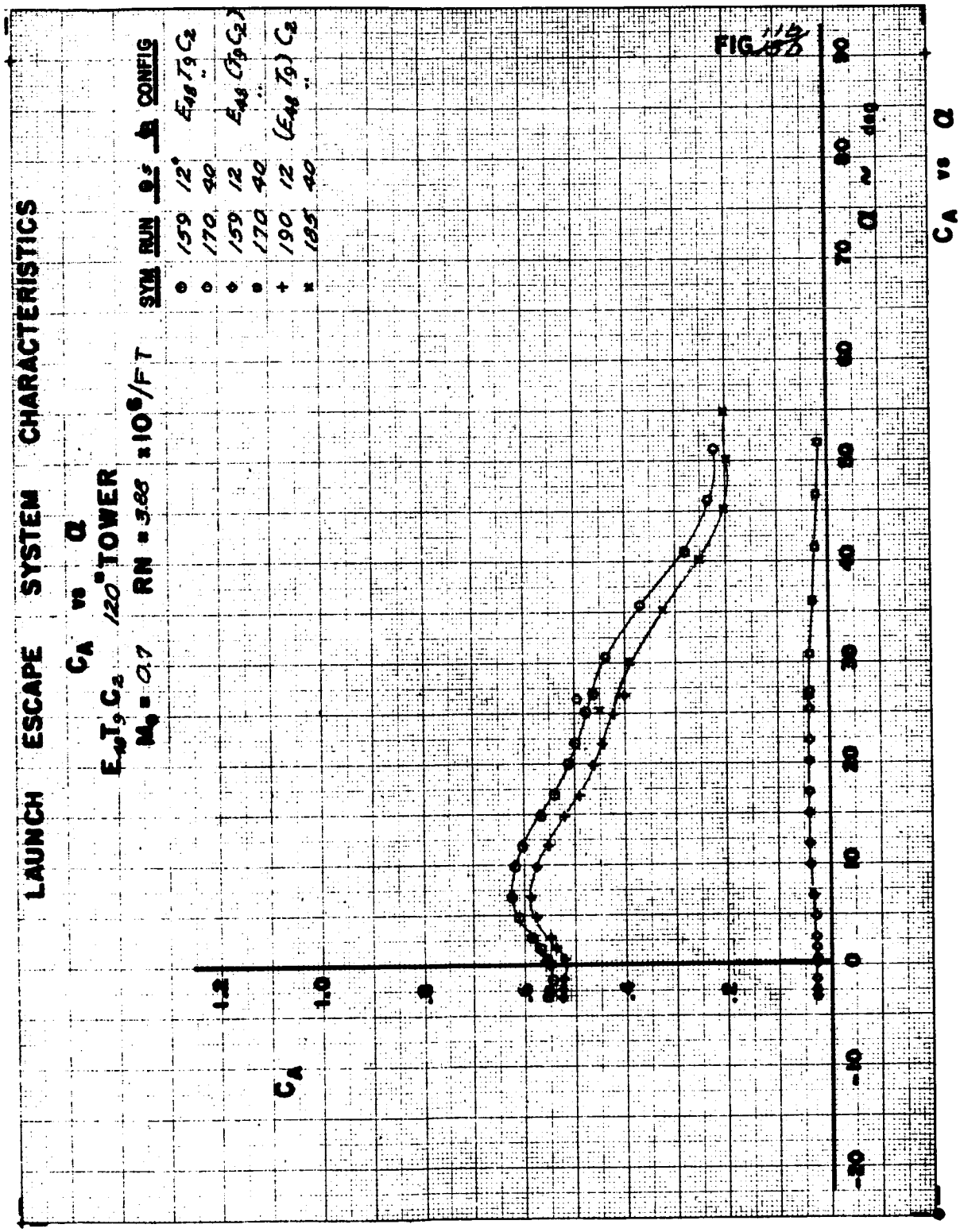

FIG. 11b

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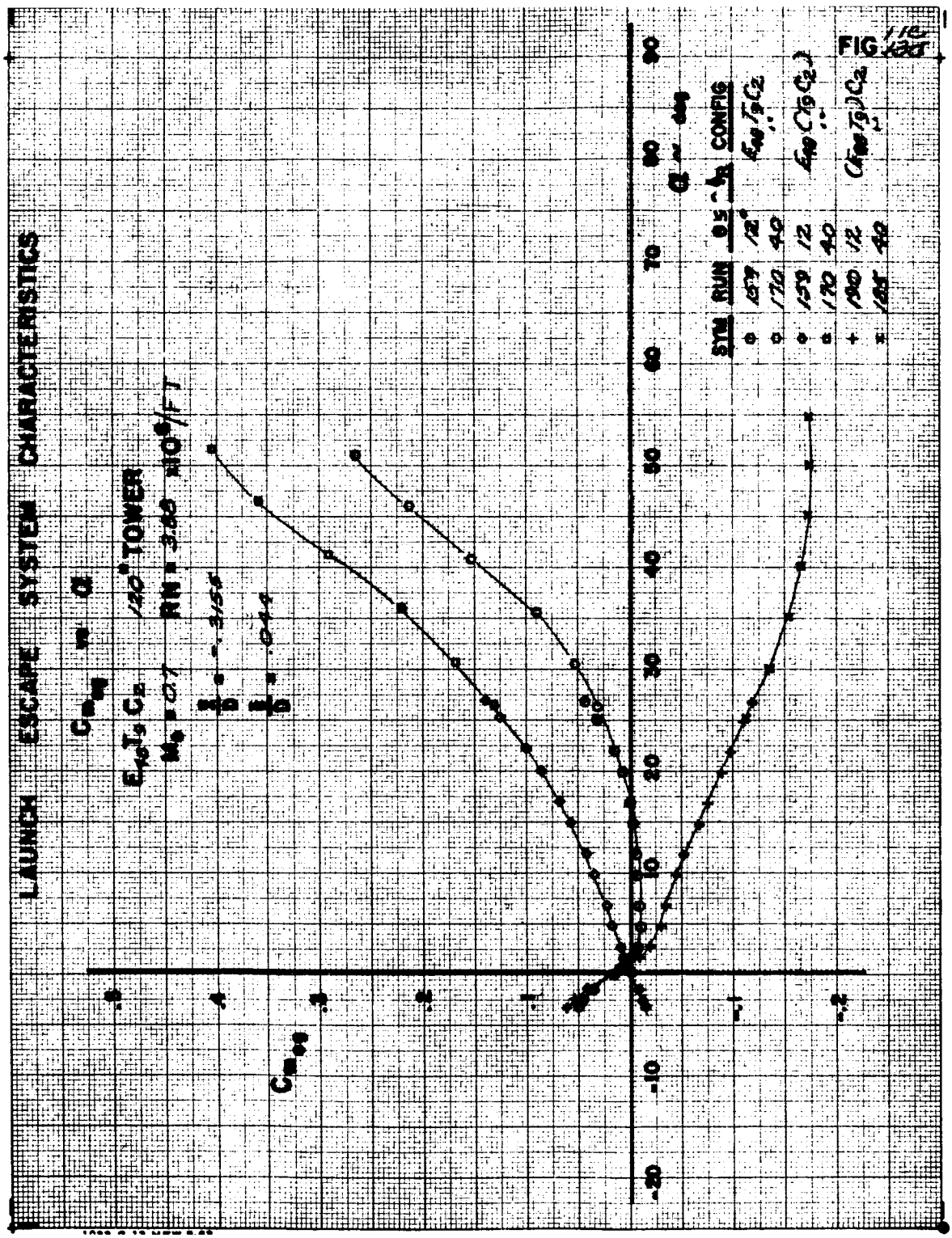

C_m vs α

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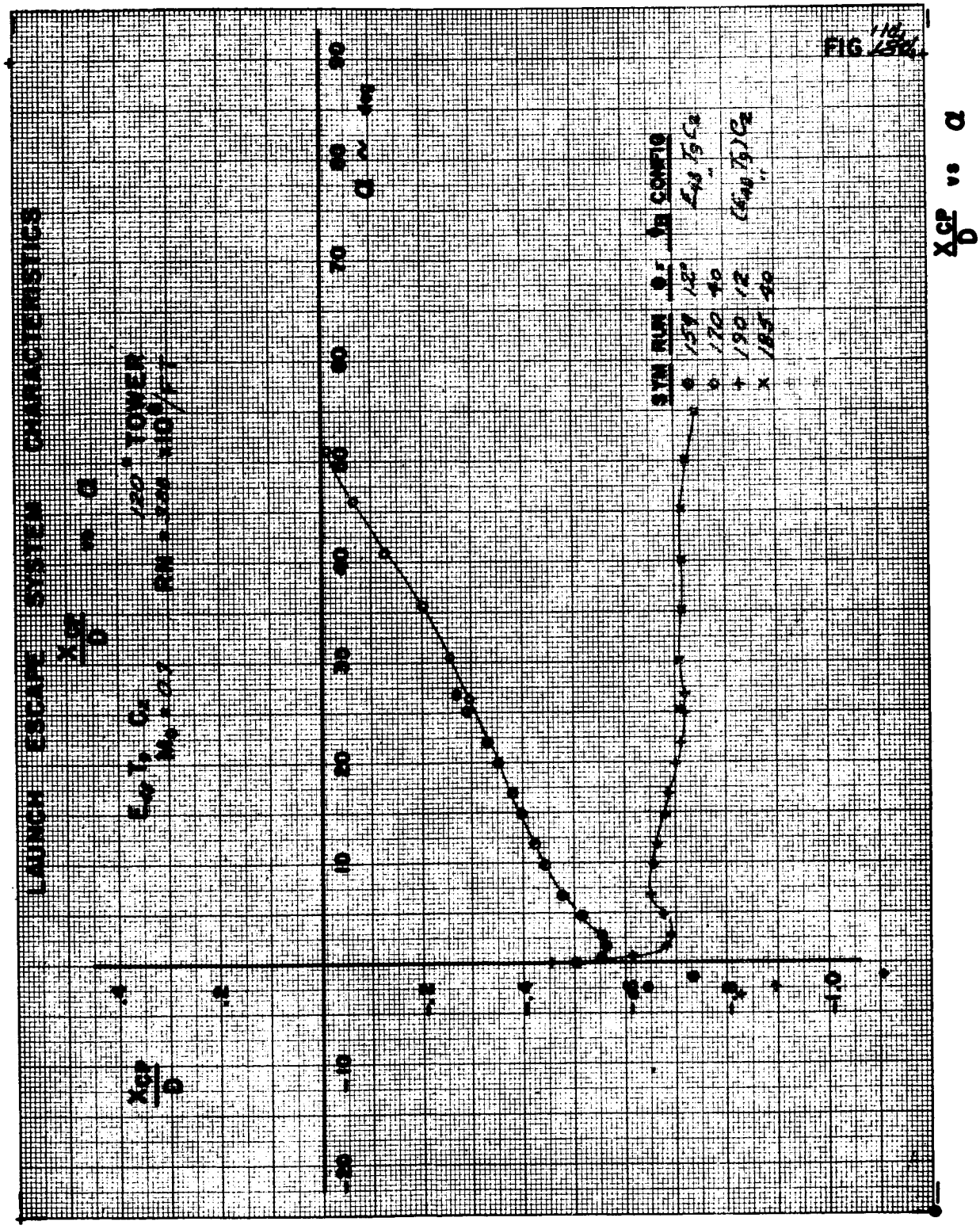

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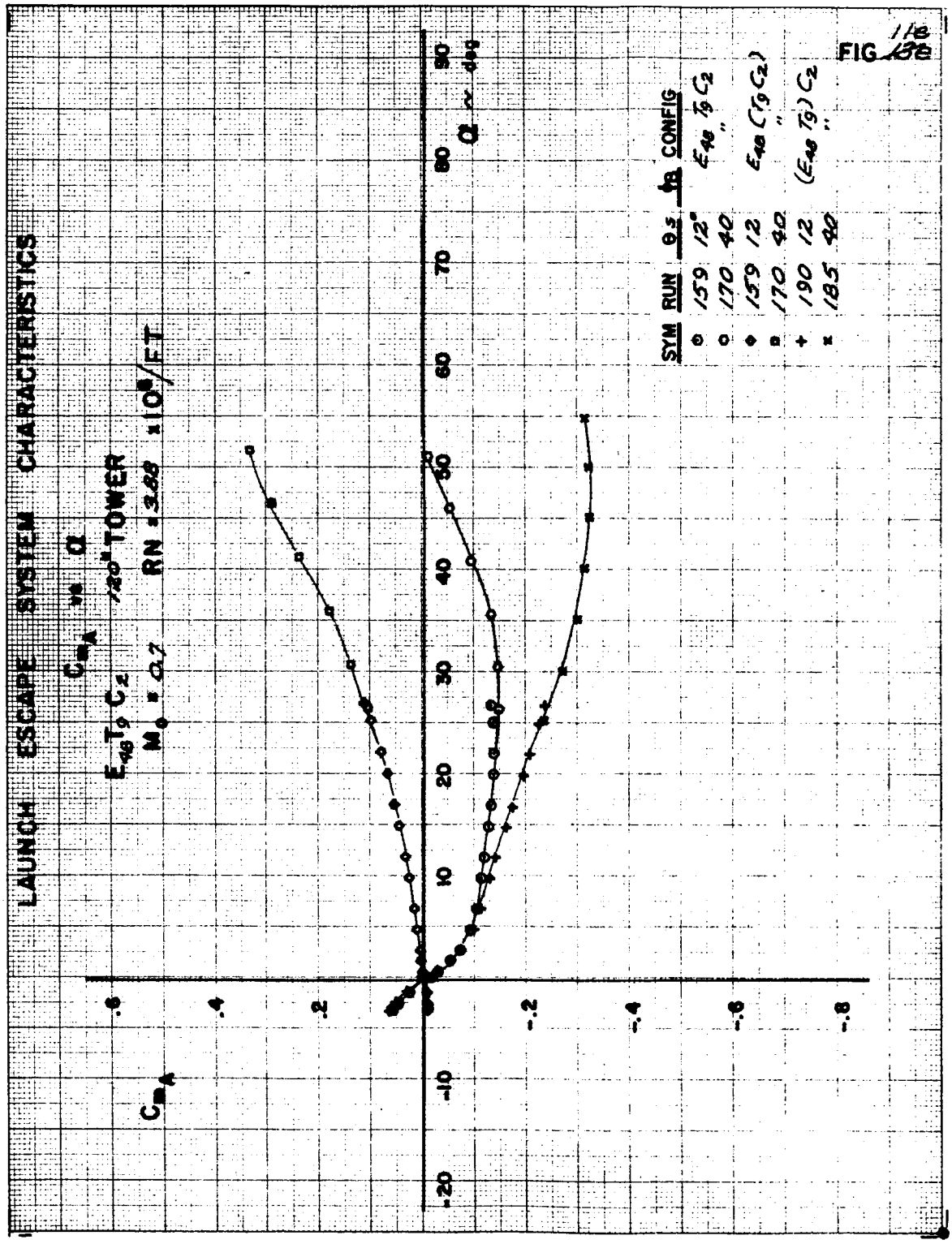

FIG 13e

C_{m_A} vs α

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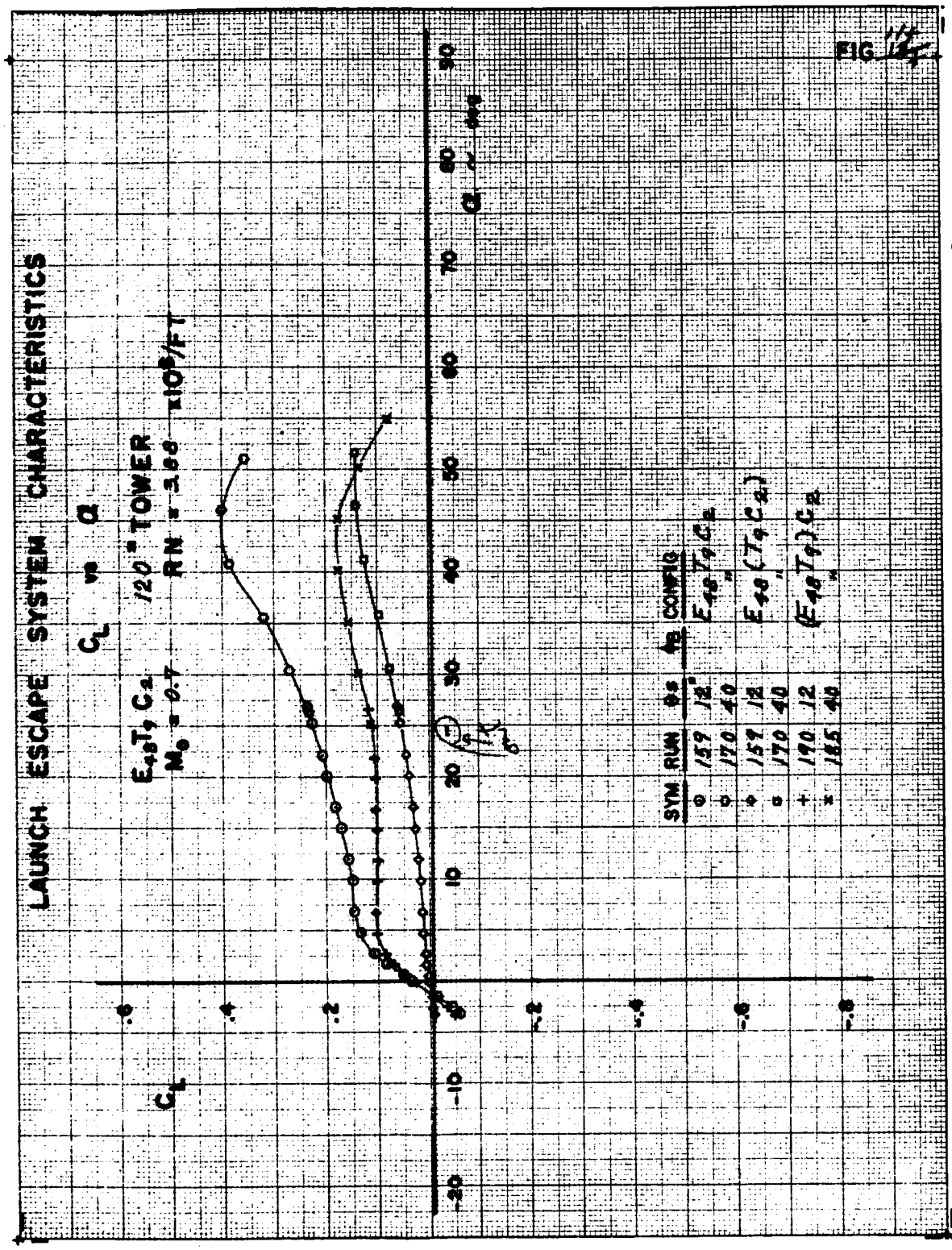

FIG 12

C_L vs α

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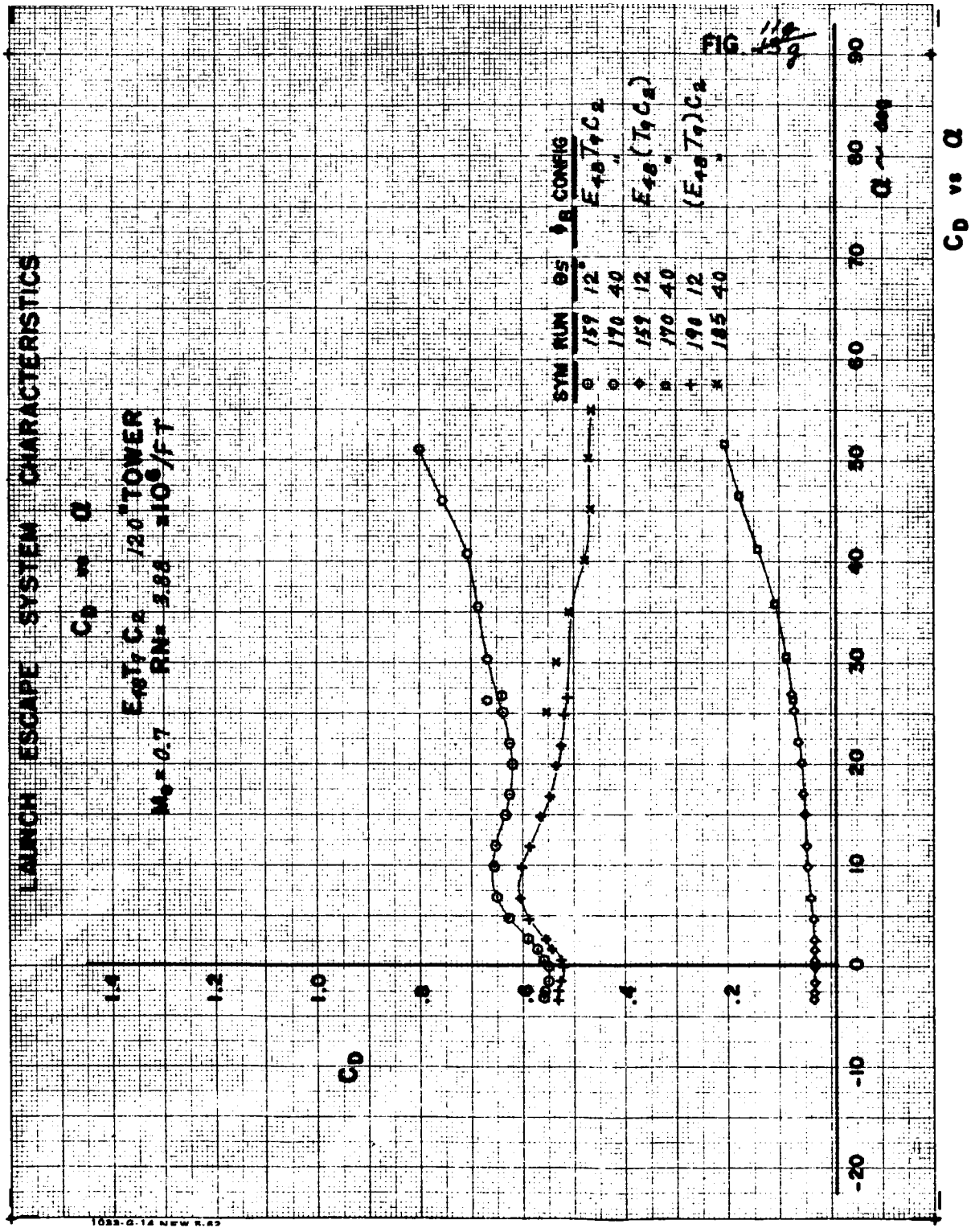

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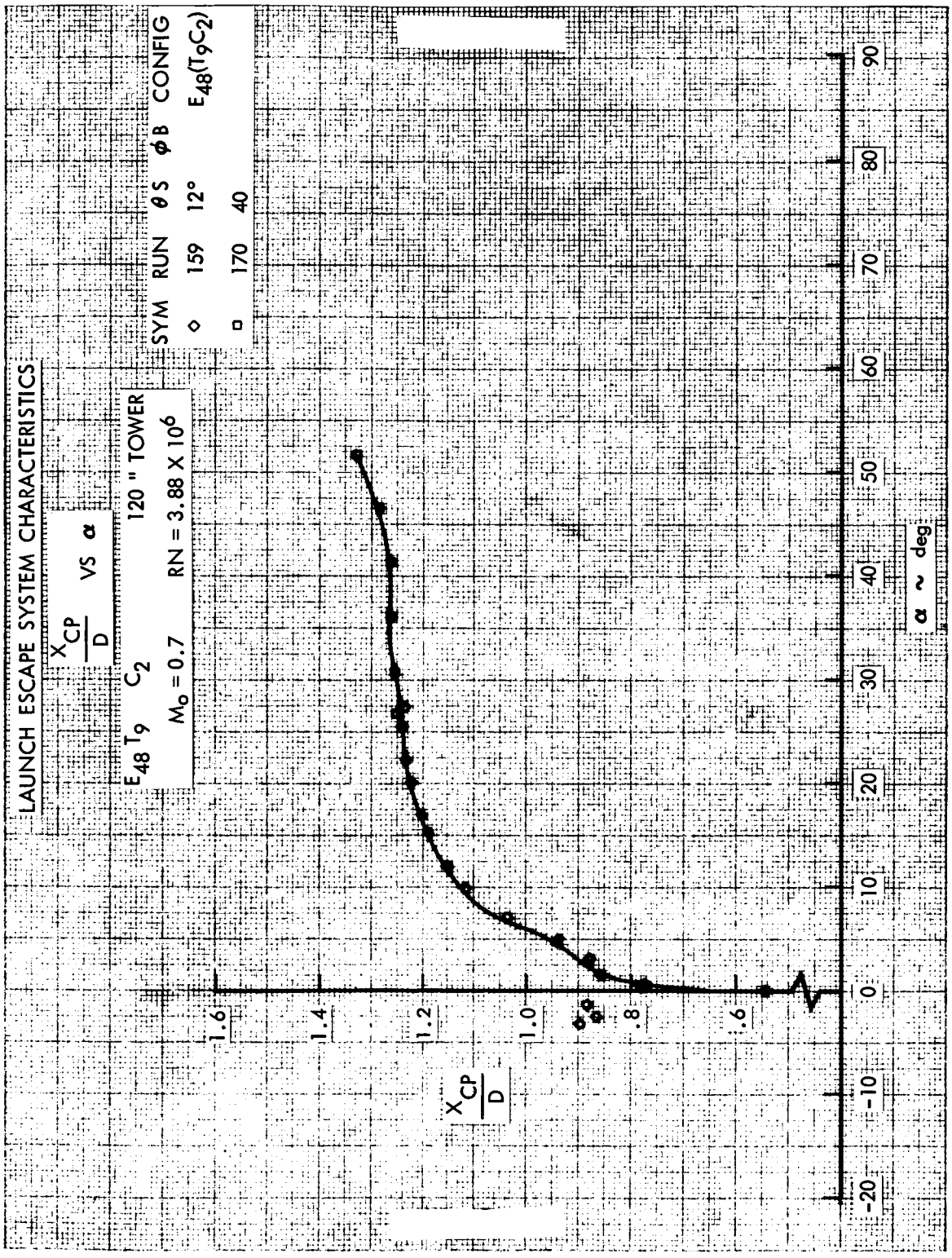

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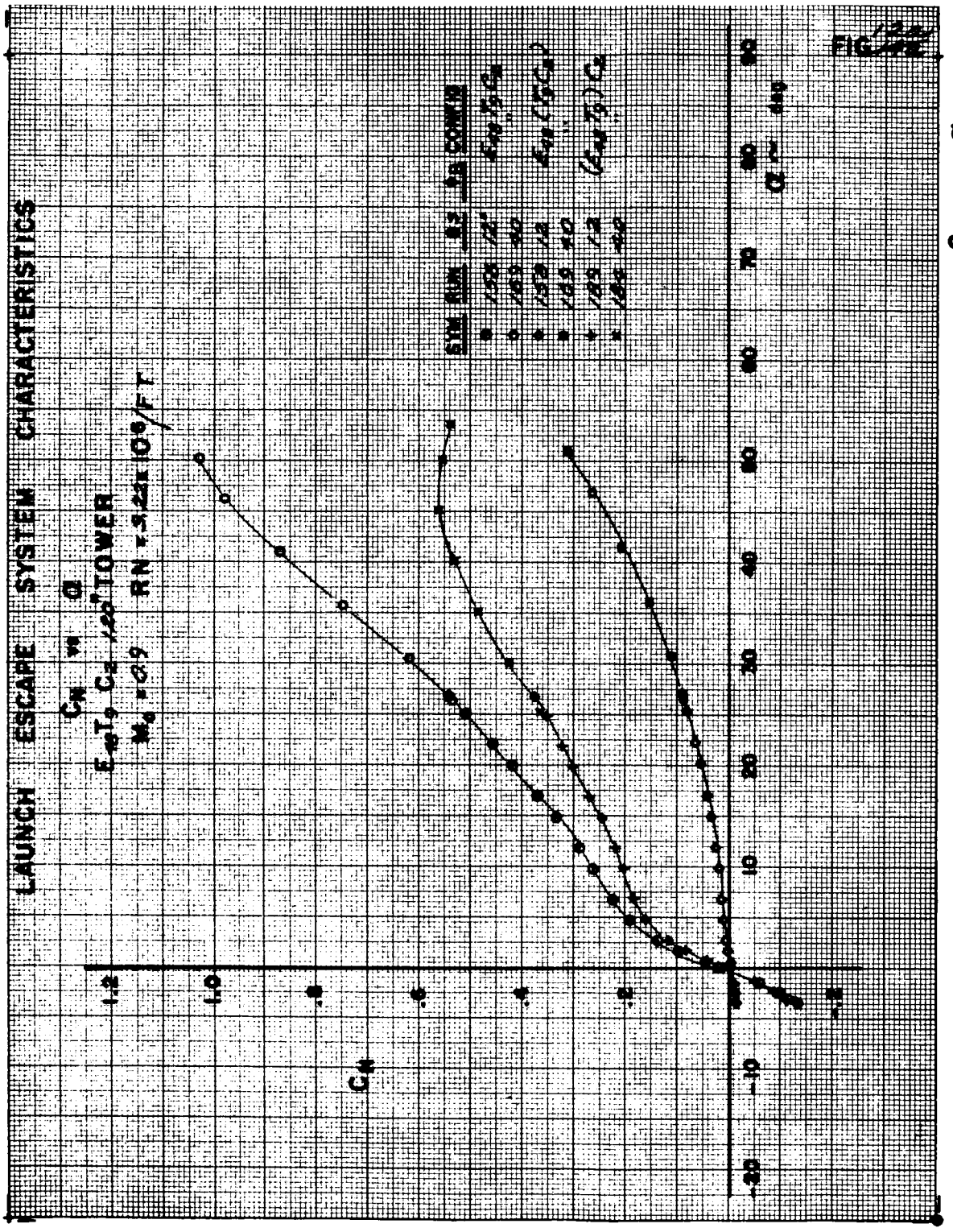

FIG. 12

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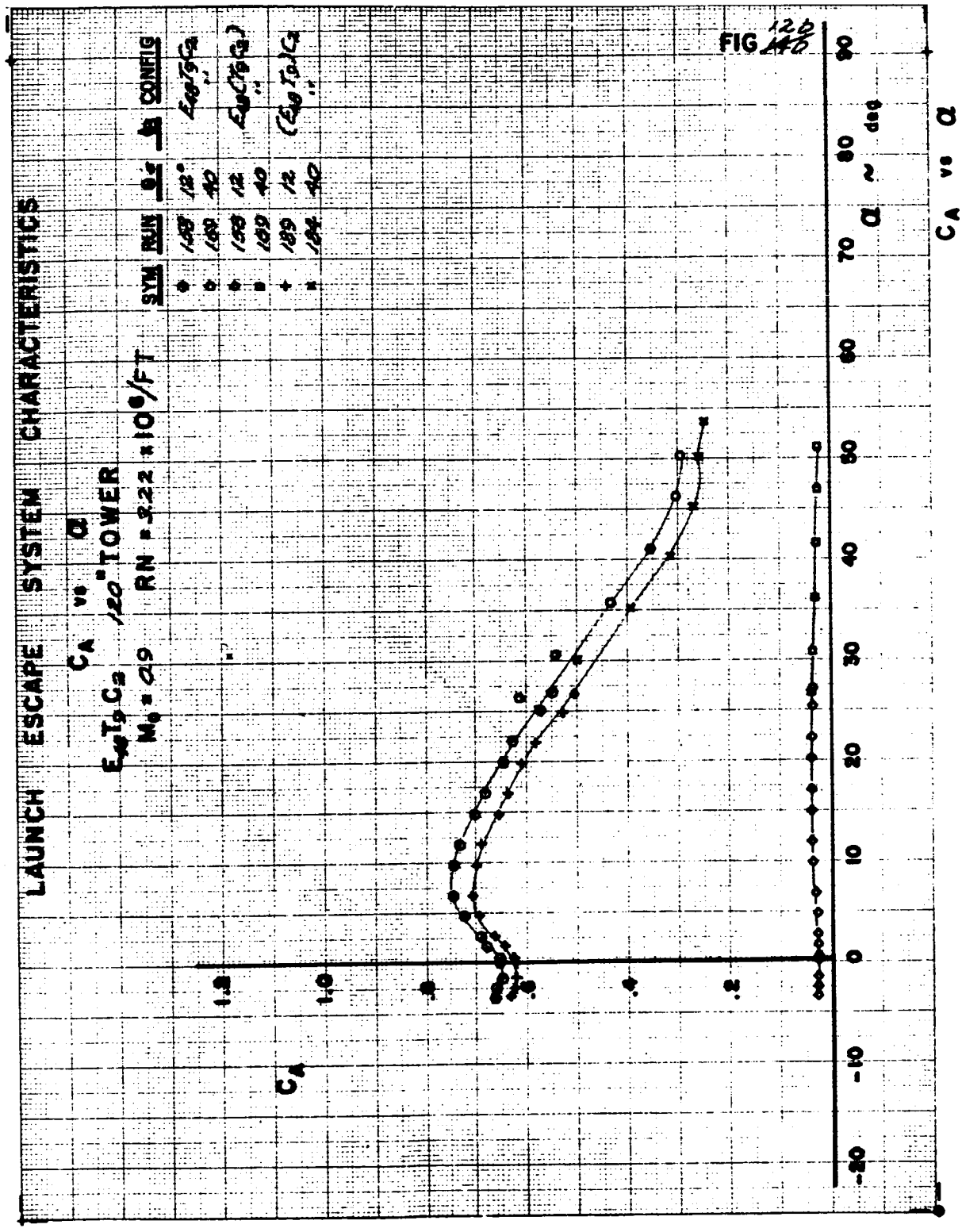

FIG 126

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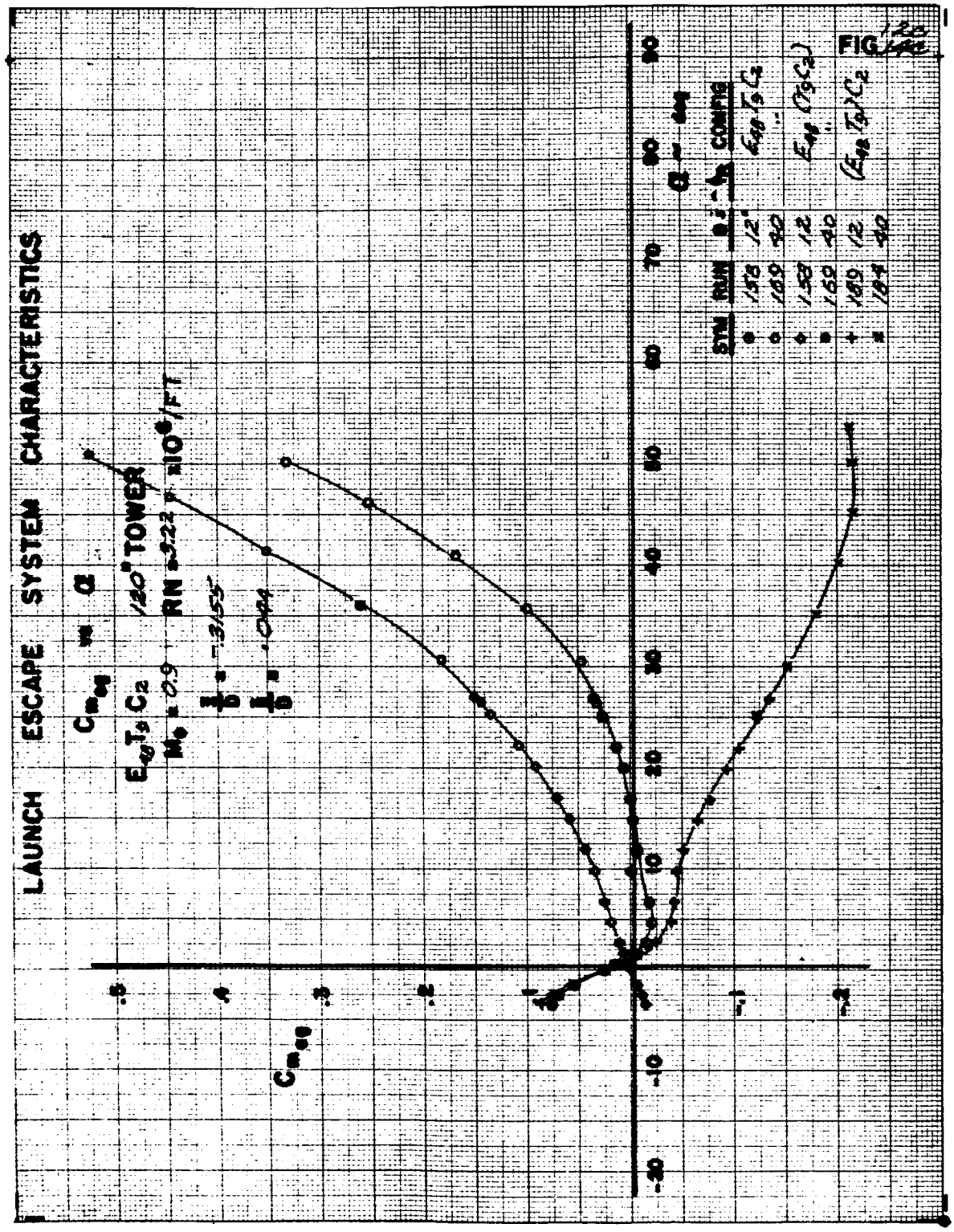

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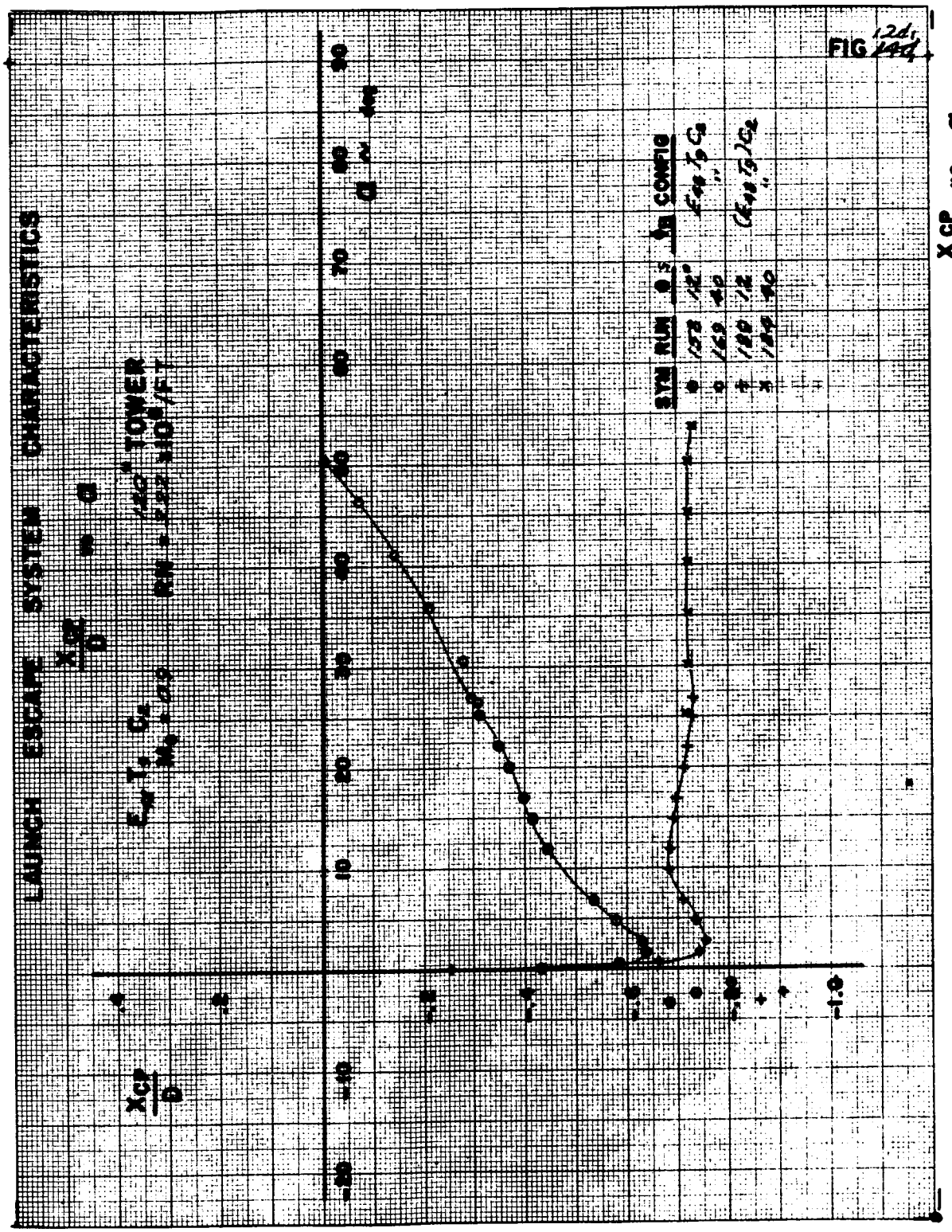
CO[redacted]



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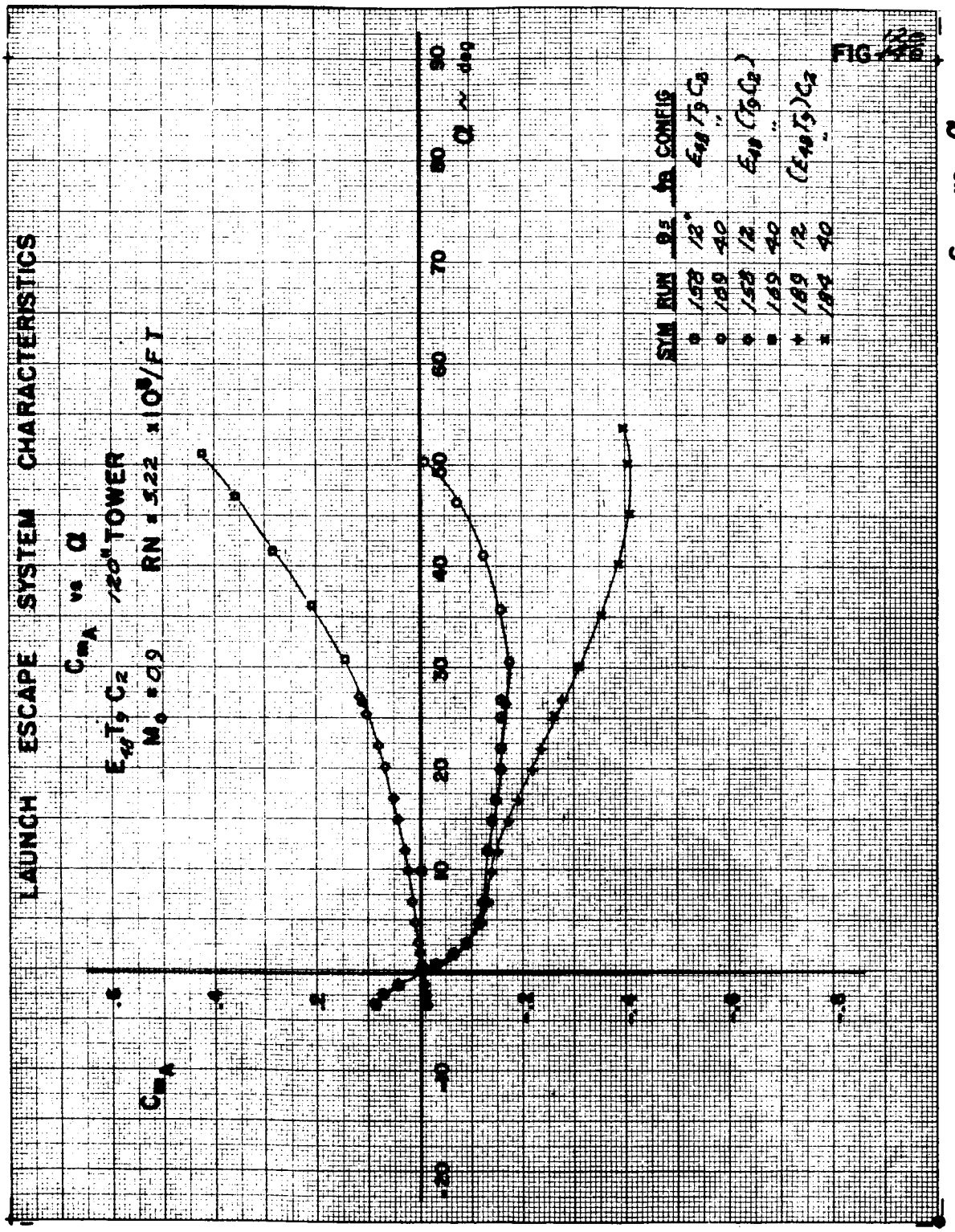

FIG. 22

C_{m_A} vs α

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CO[redacted]

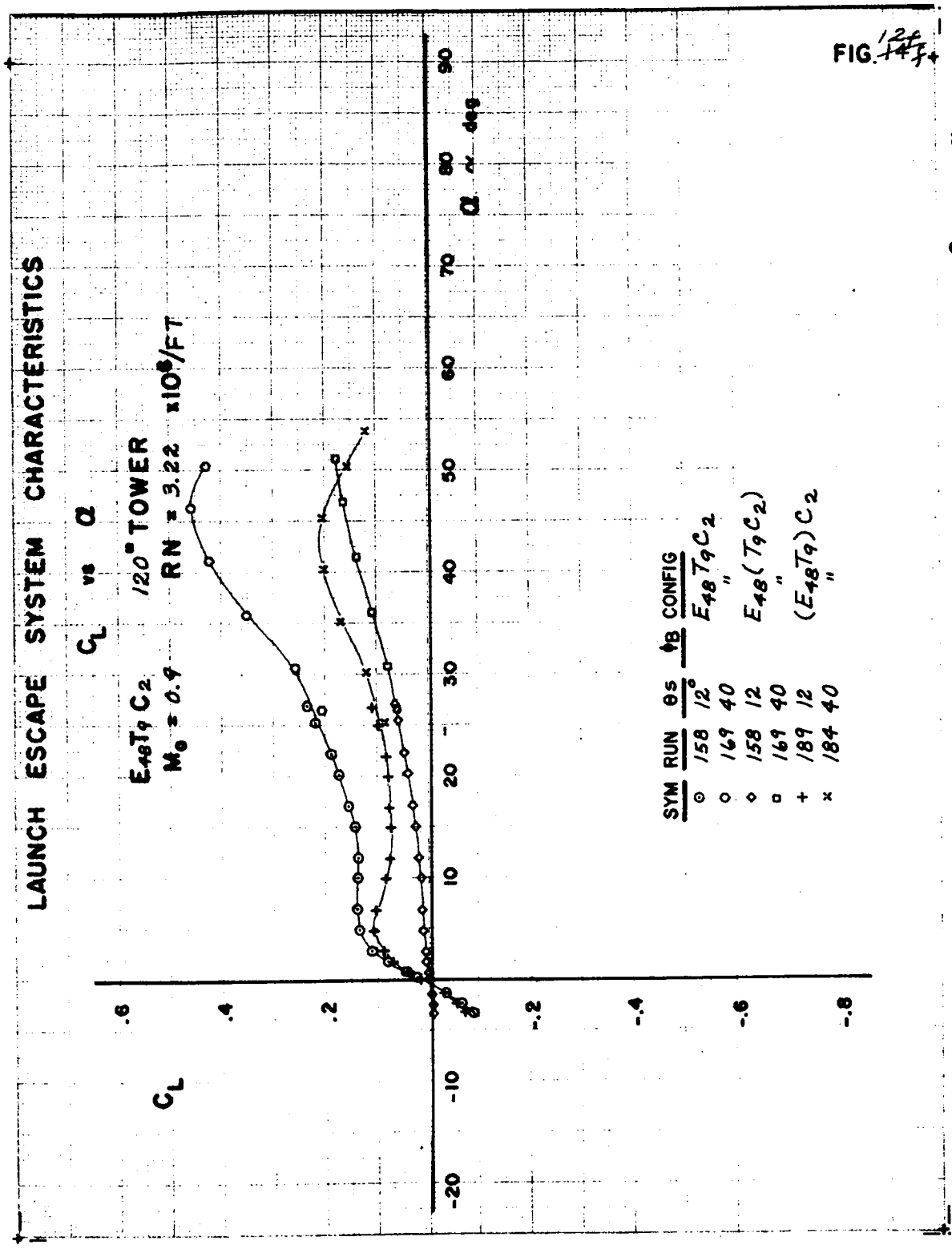

FIG. 12f

C_L vs α

[redacted]

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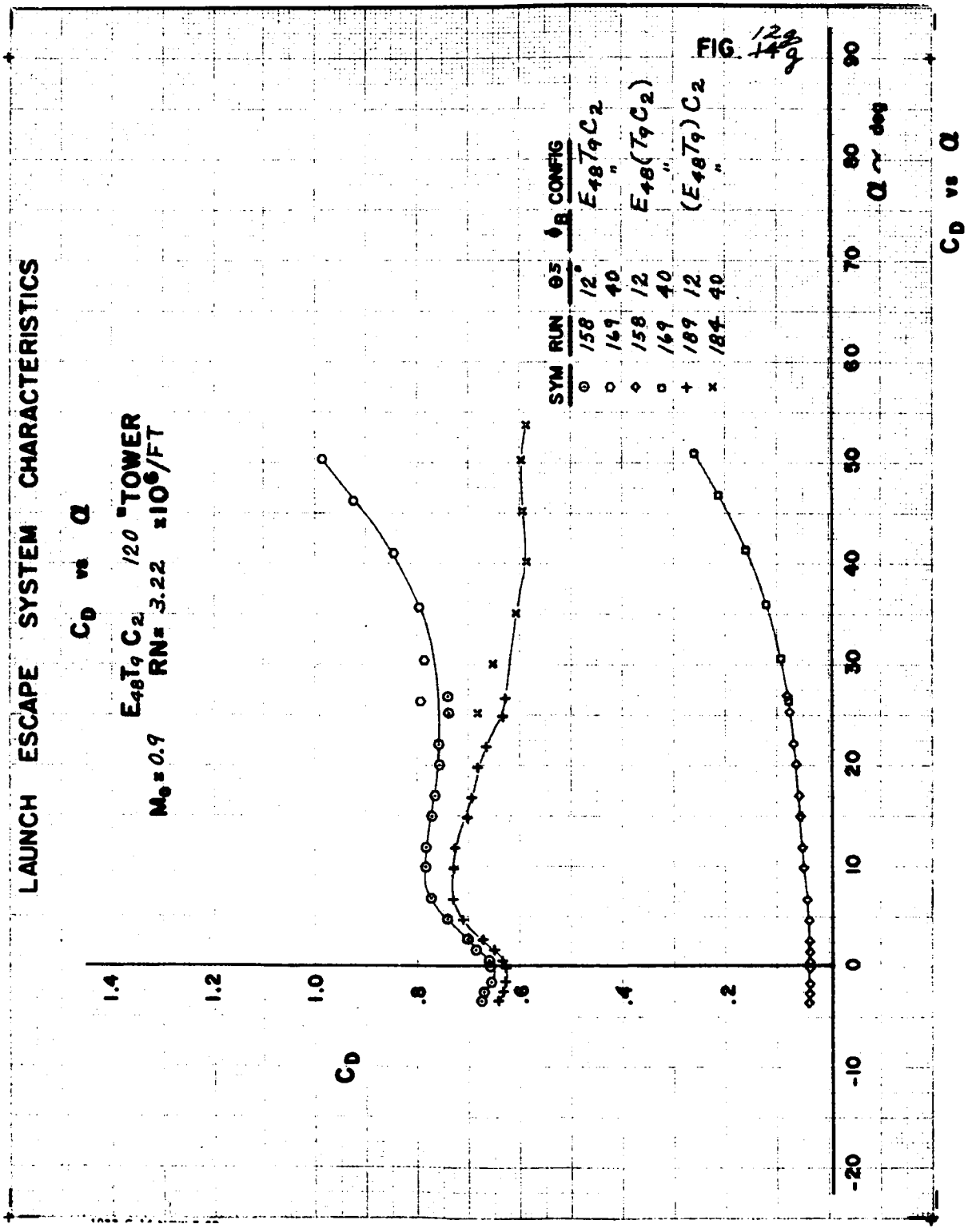

FIG. 12 & 14g

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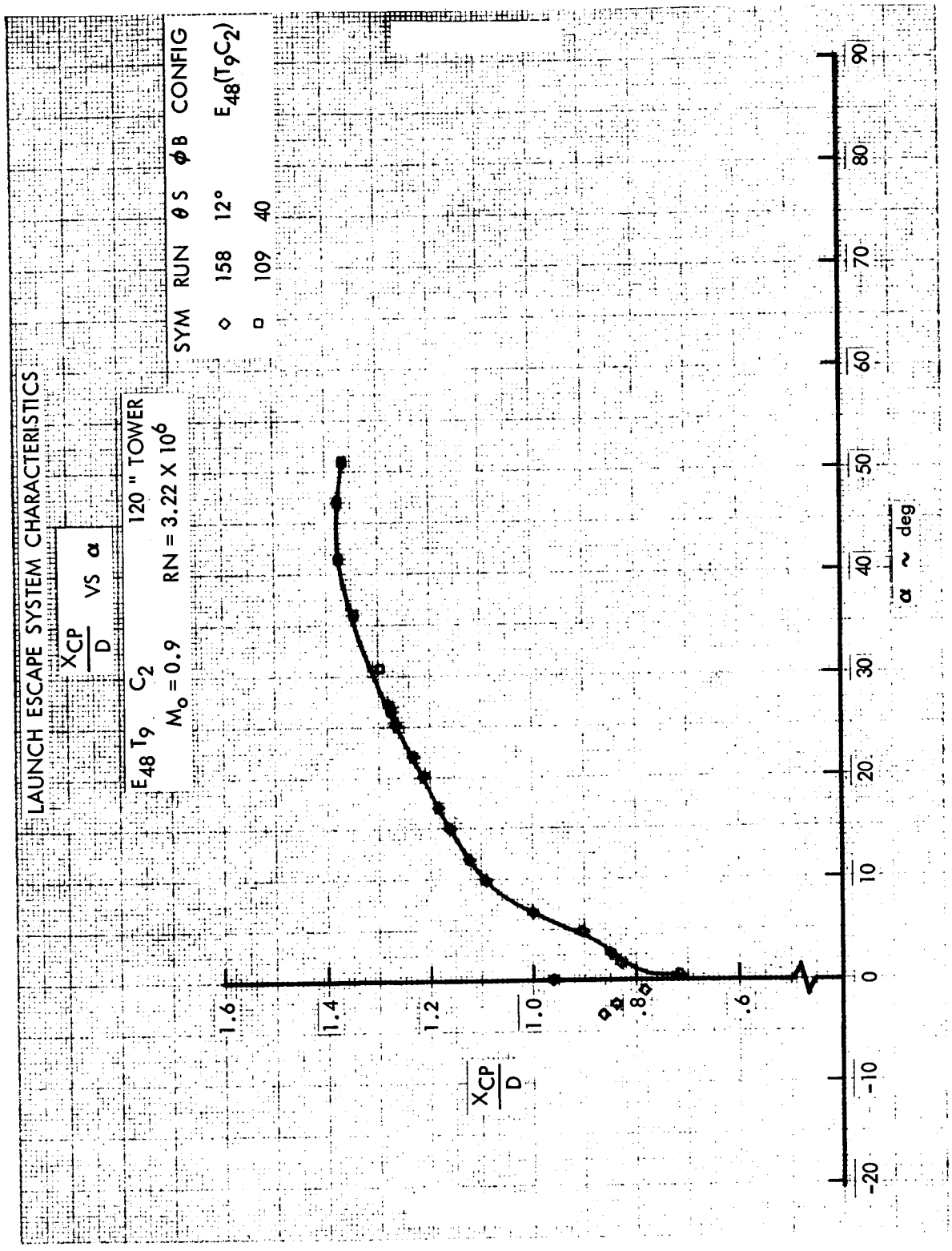
CO[redacted]



[redacted]

~~CONFIDENTIAL~~

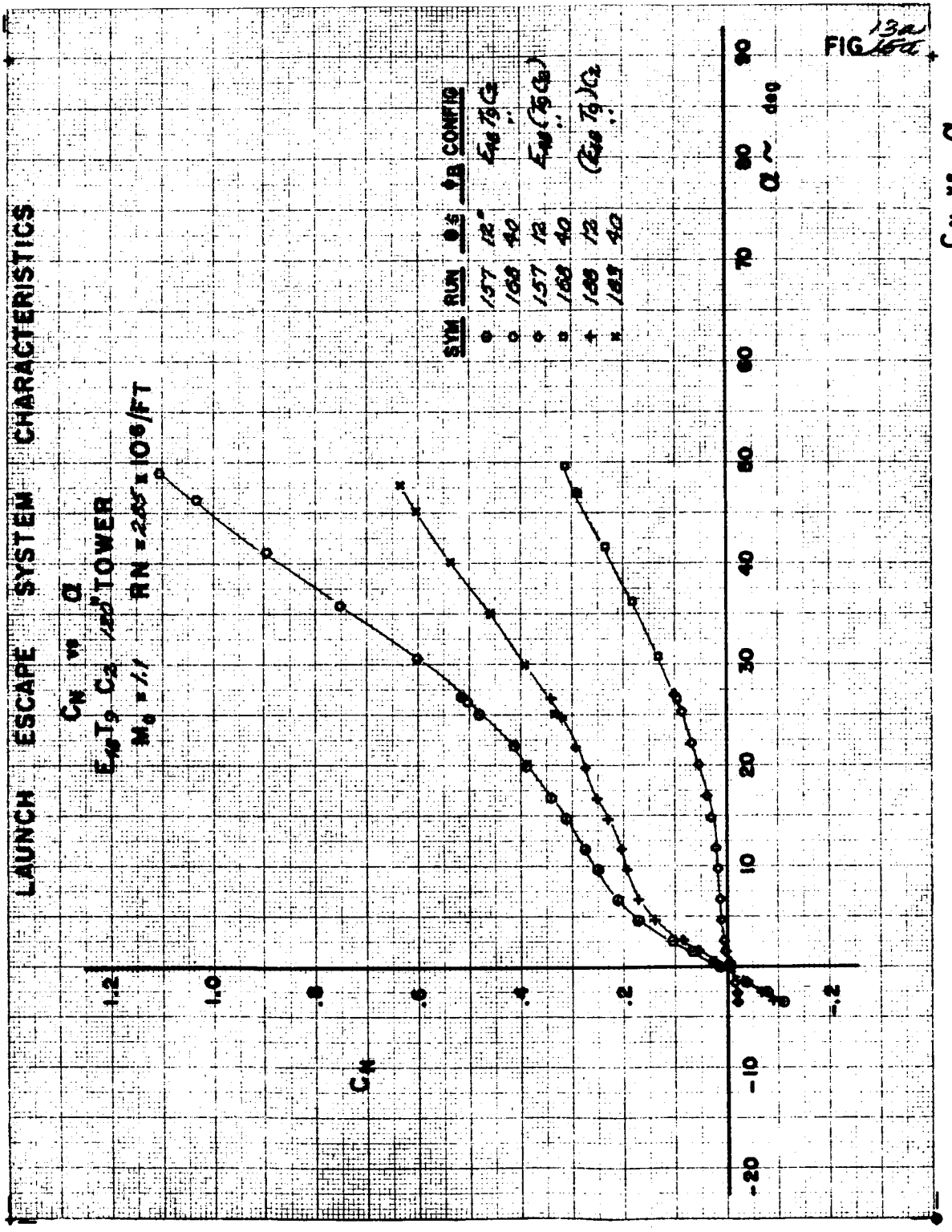


FIG 13a

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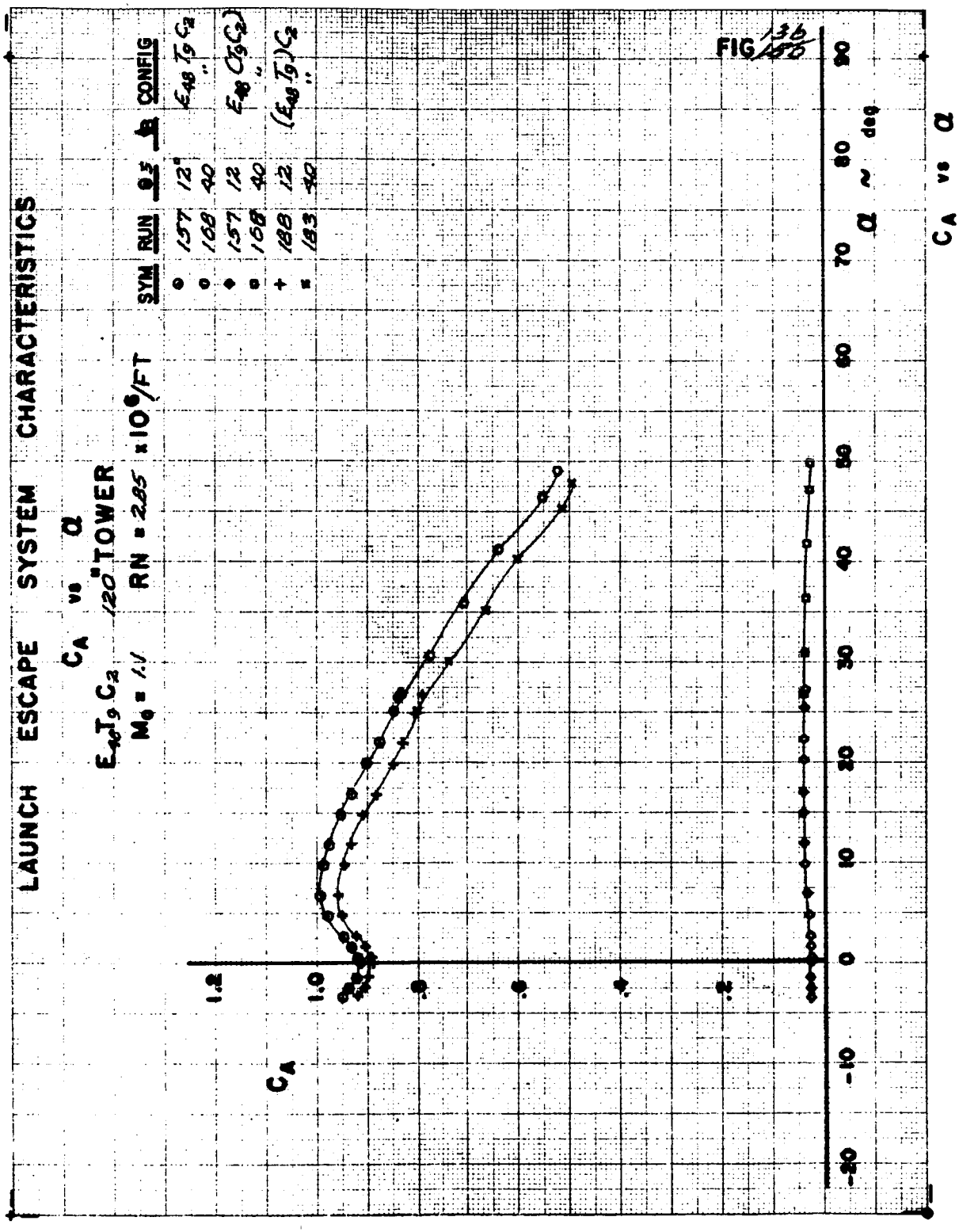

FIG 13b

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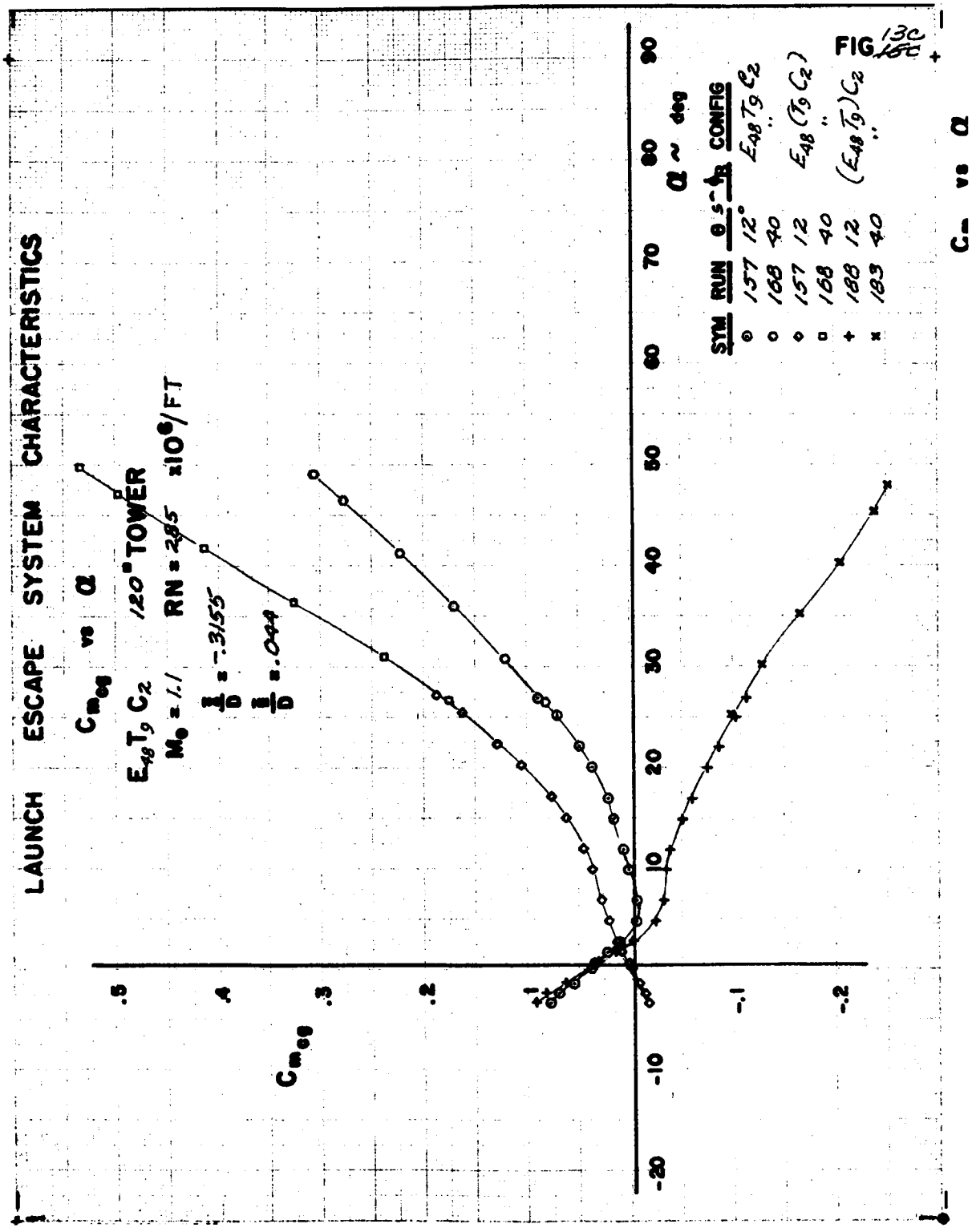

FIG 13c

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CO[redacted]

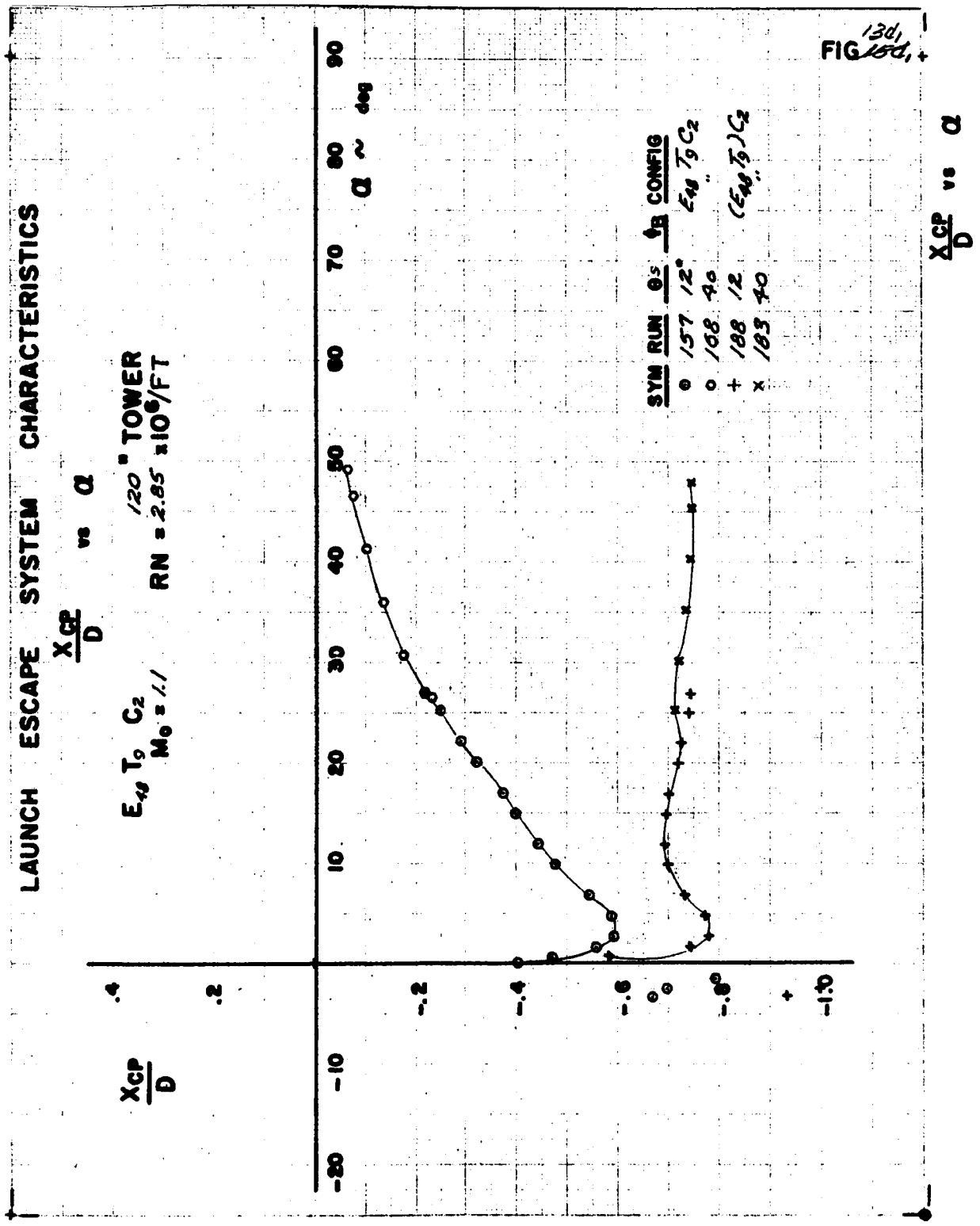

FIG 13d, 15d,

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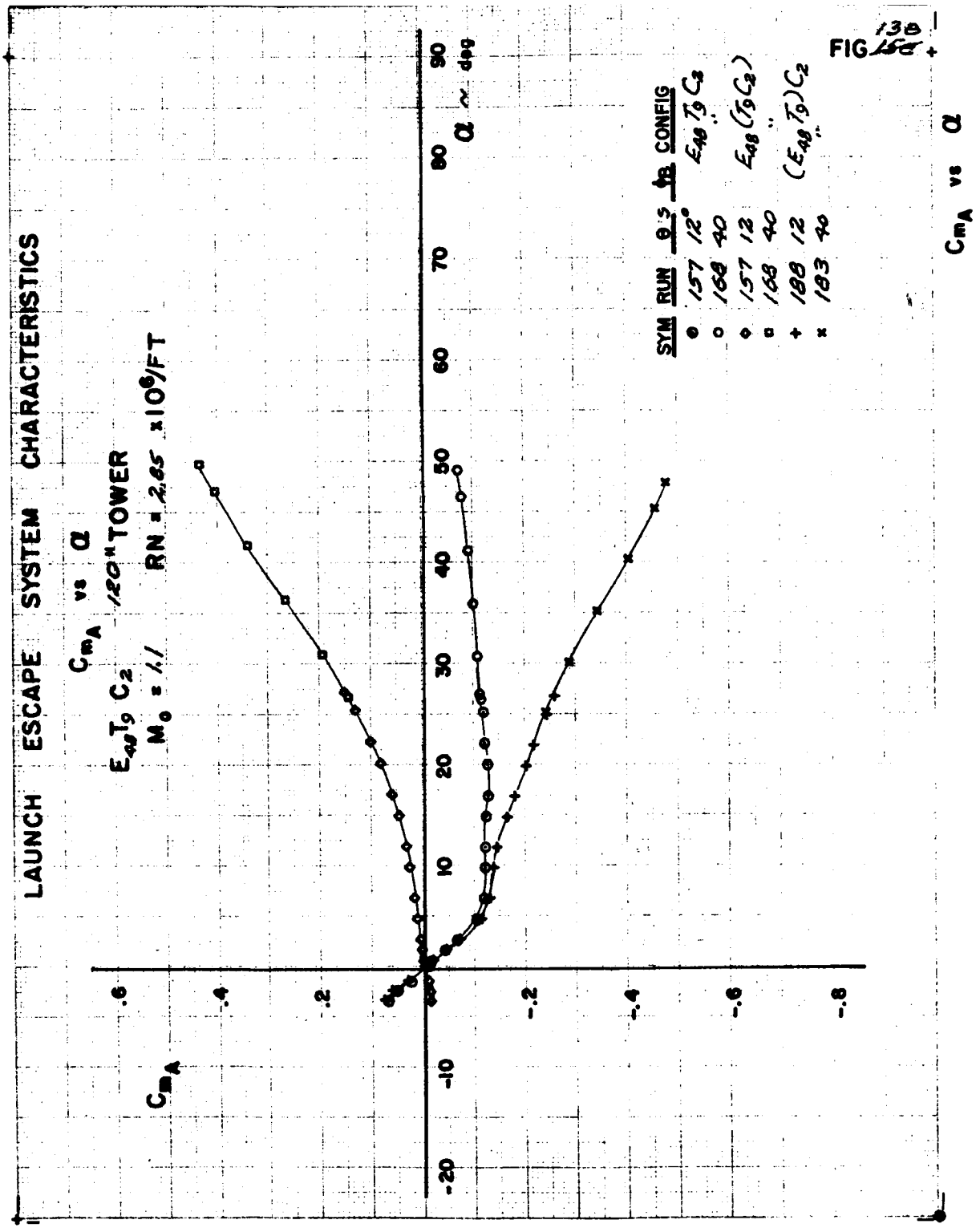

FIG 13B

C_{m_A} vs α

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CON[redacted]

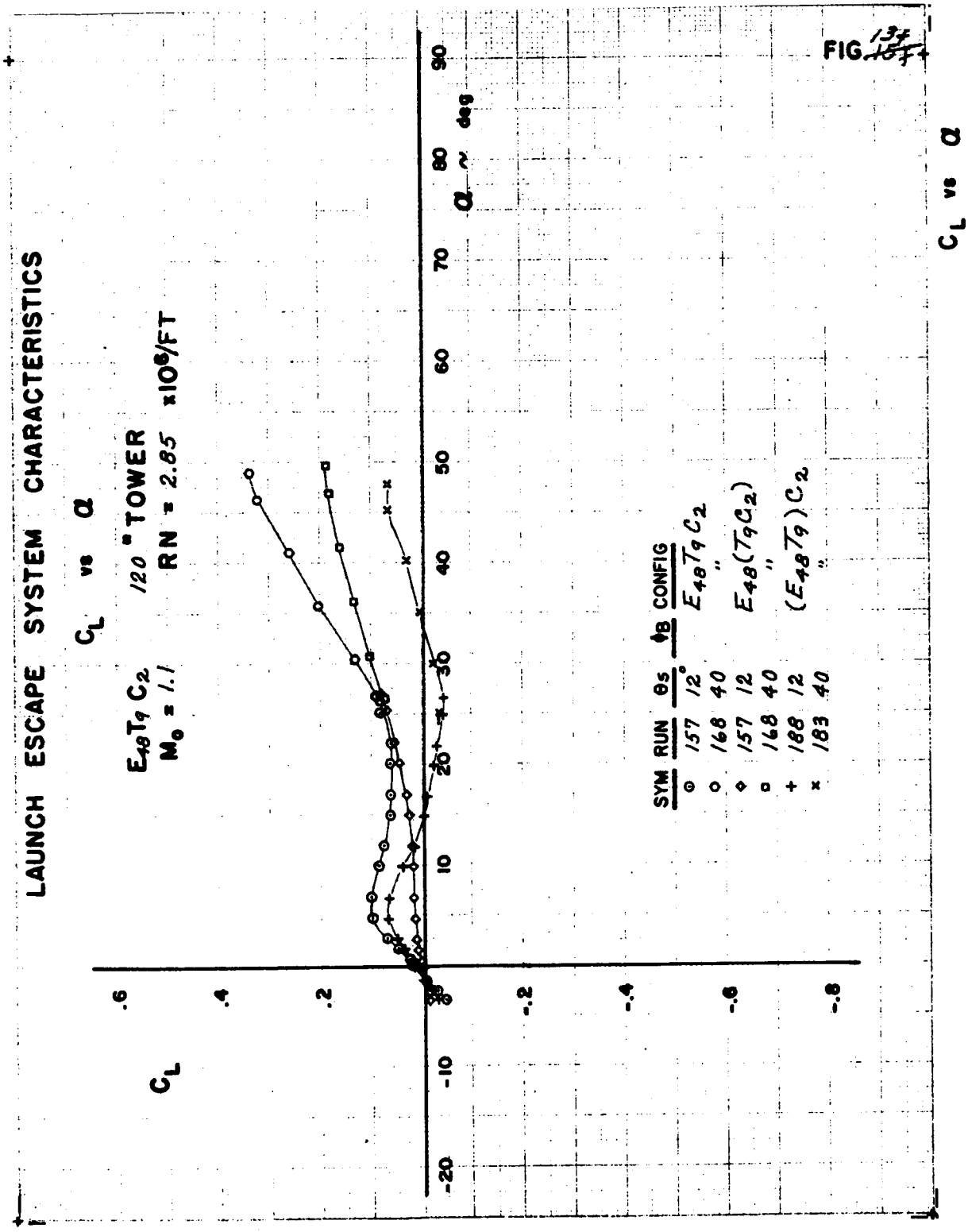


FIG. 137

C_L vs α

[redacted]

~~CONFIDENTIAL~~

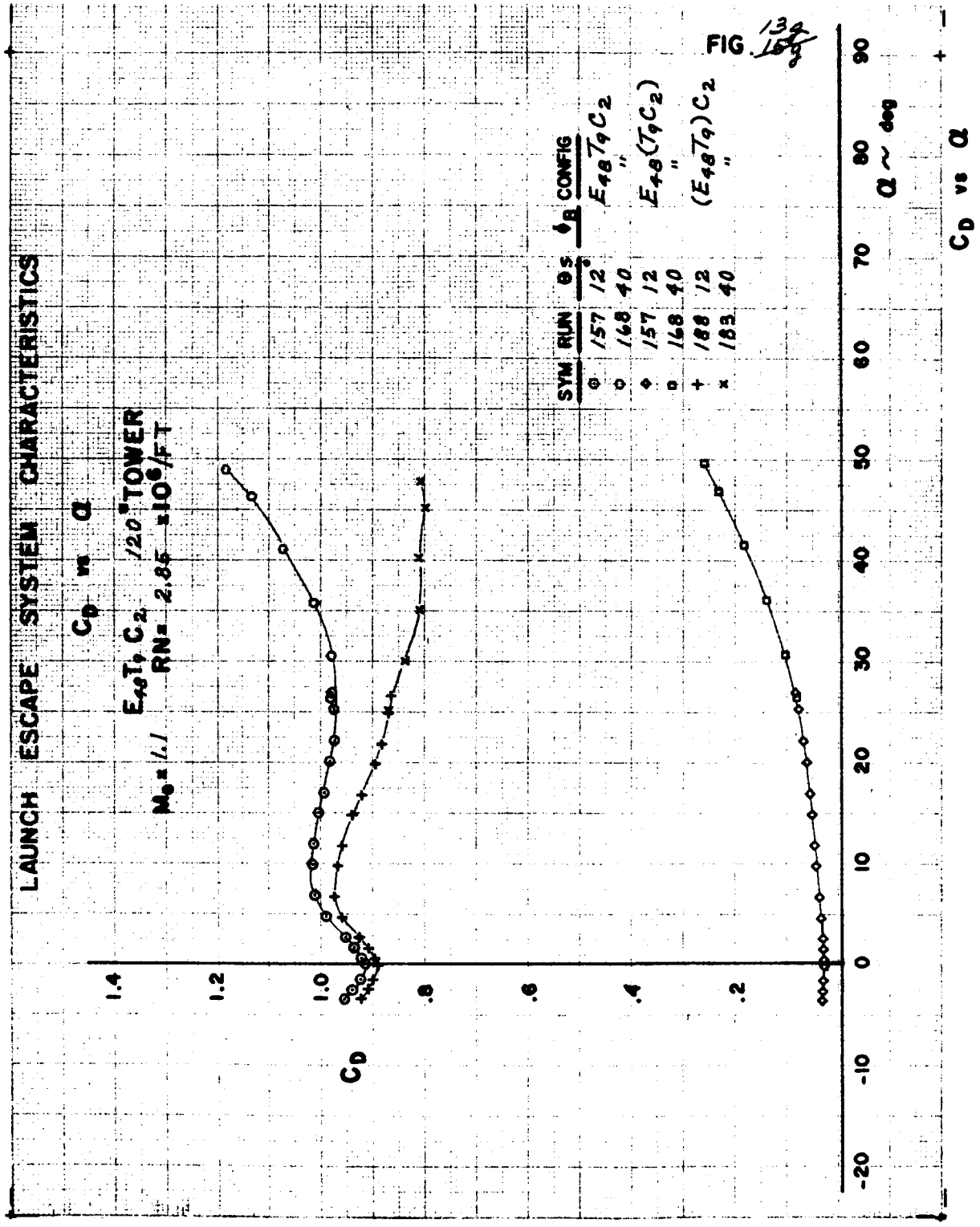
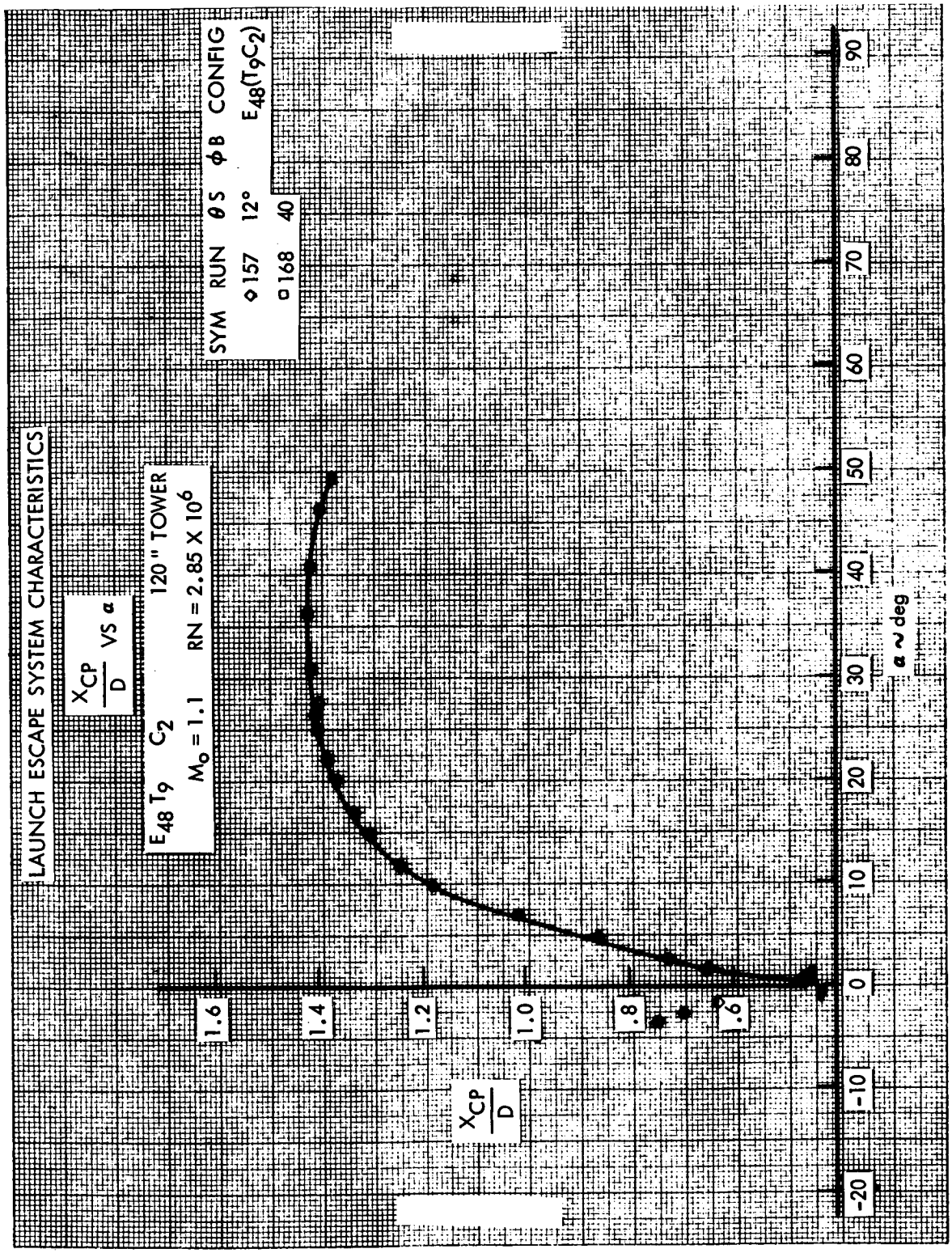


FIG. 13a

~~CONFIDENTIAL~~

C[redacted]



[redacted]

~~CONFIDENTIAL~~

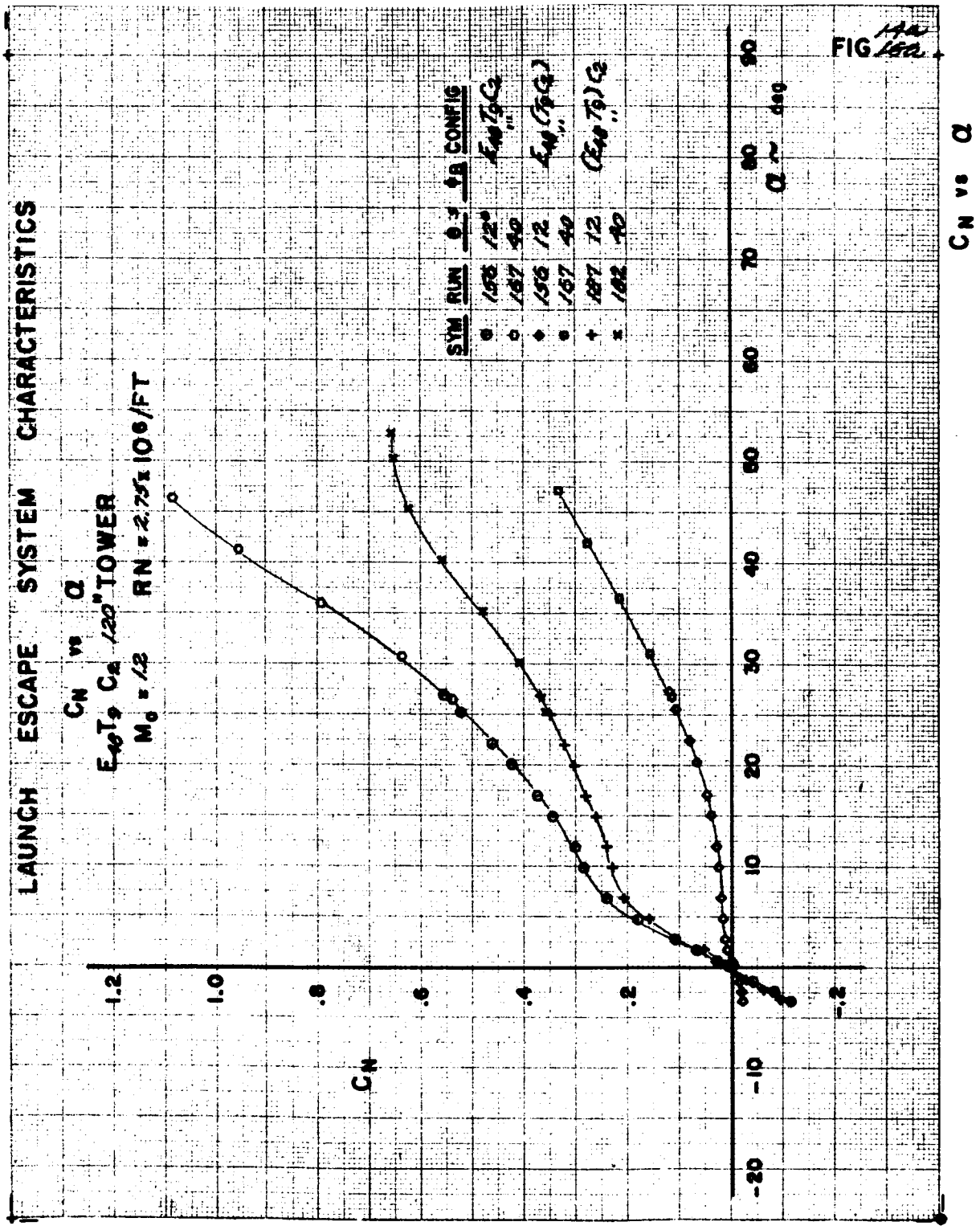


FIG 14a 16a

C_N vs α

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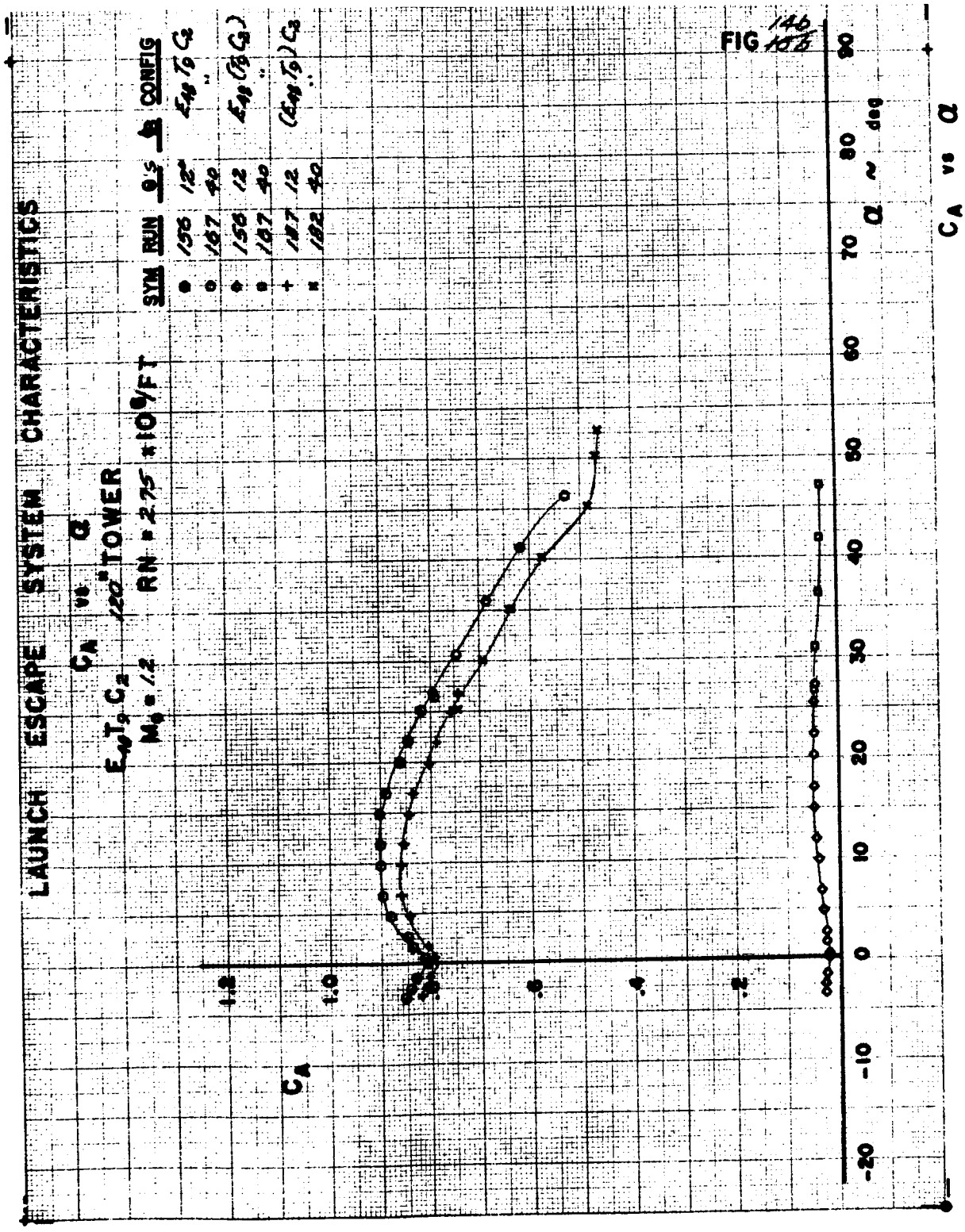

FIG 146

~~CONFIDENTIAL~~

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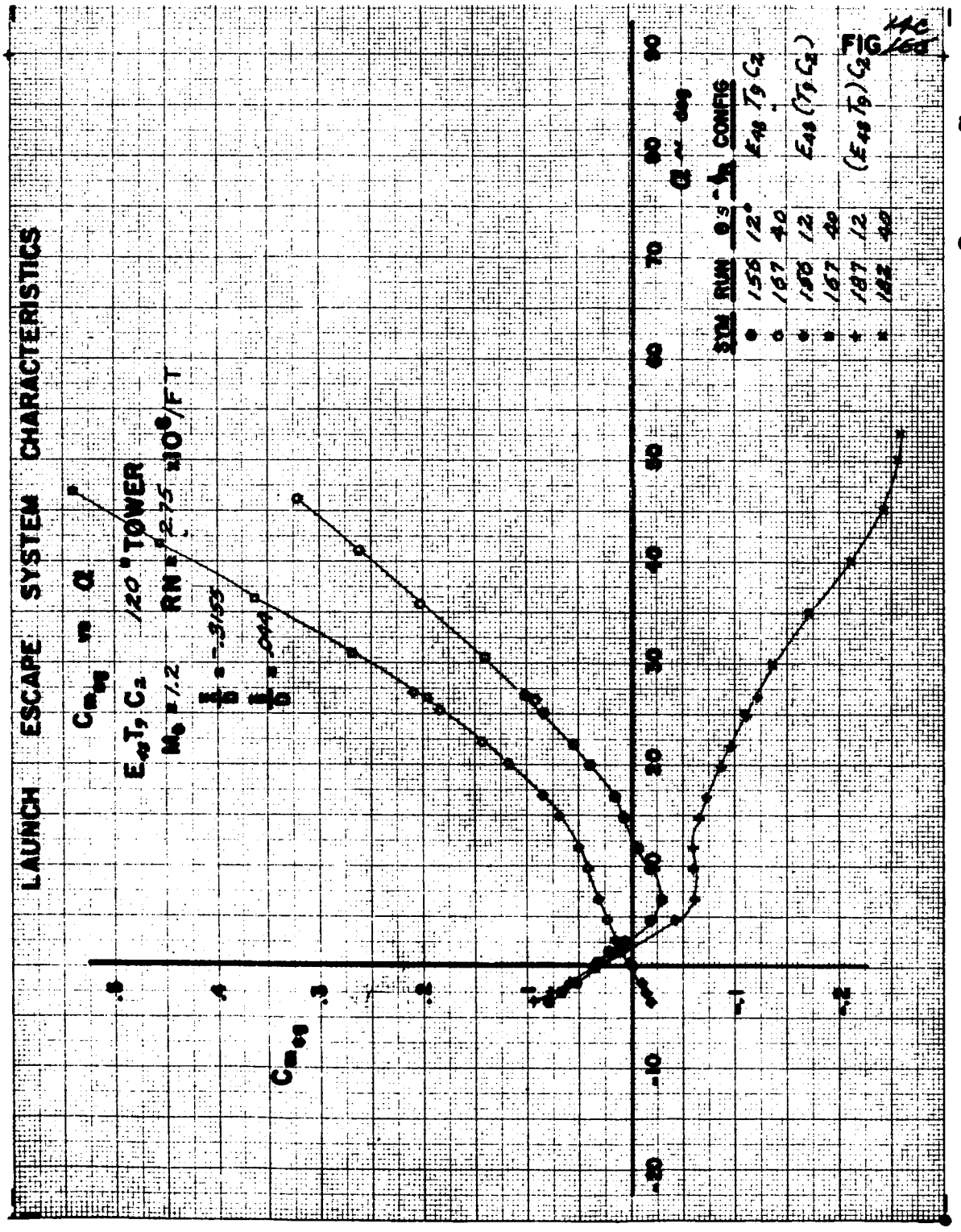

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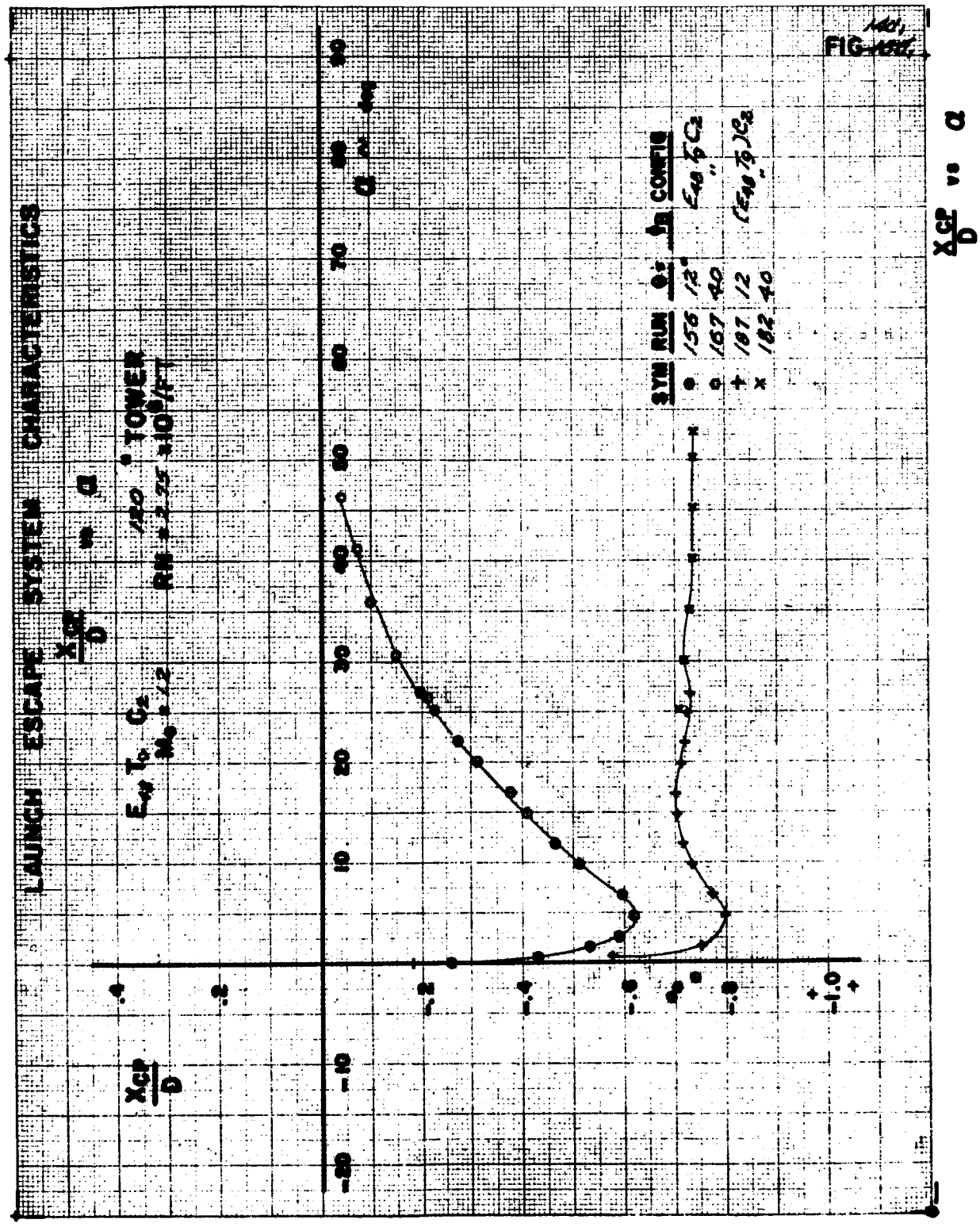
CON[redacted]



[redacted]

~~CONFIDENTIAL~~

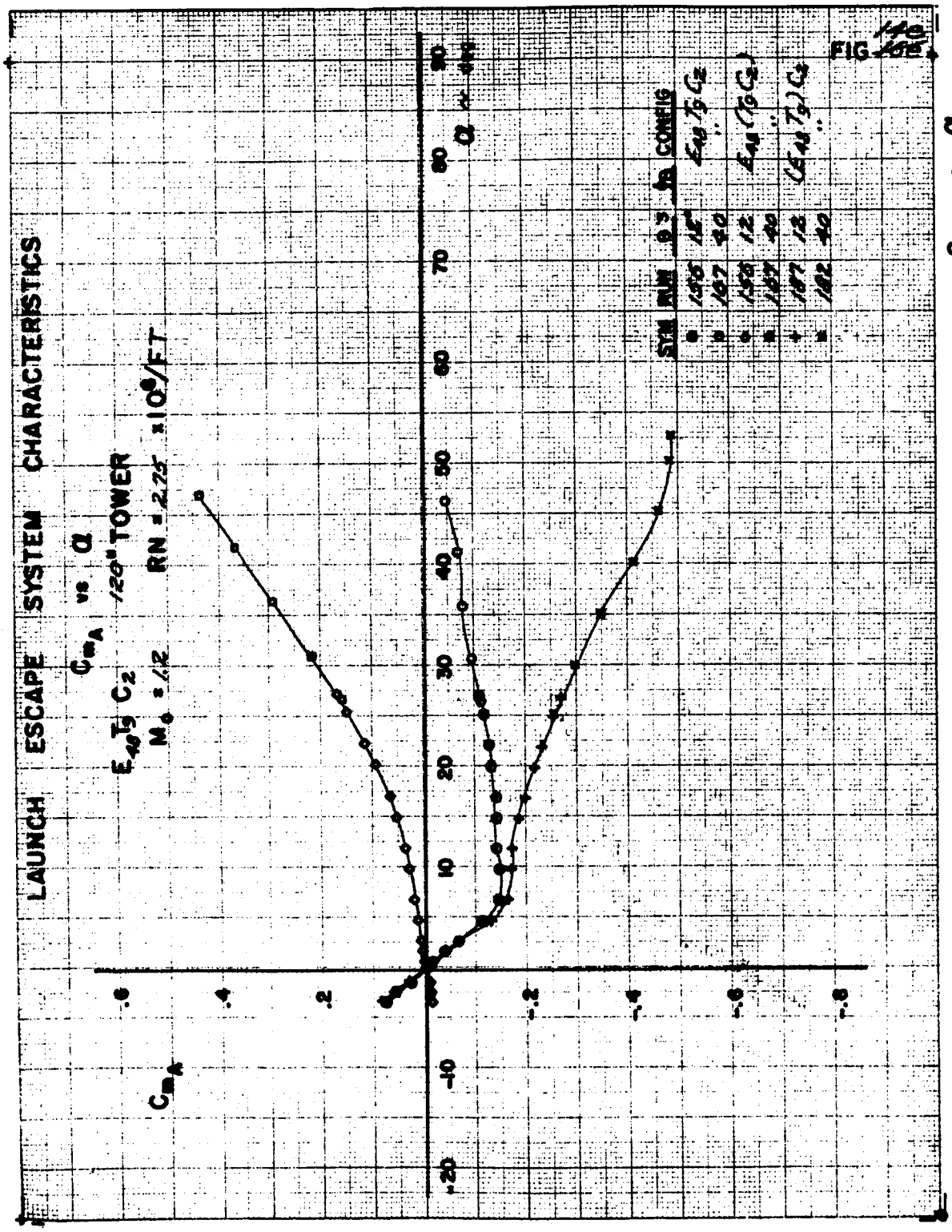


FIG 146

C_{m_A} vs α

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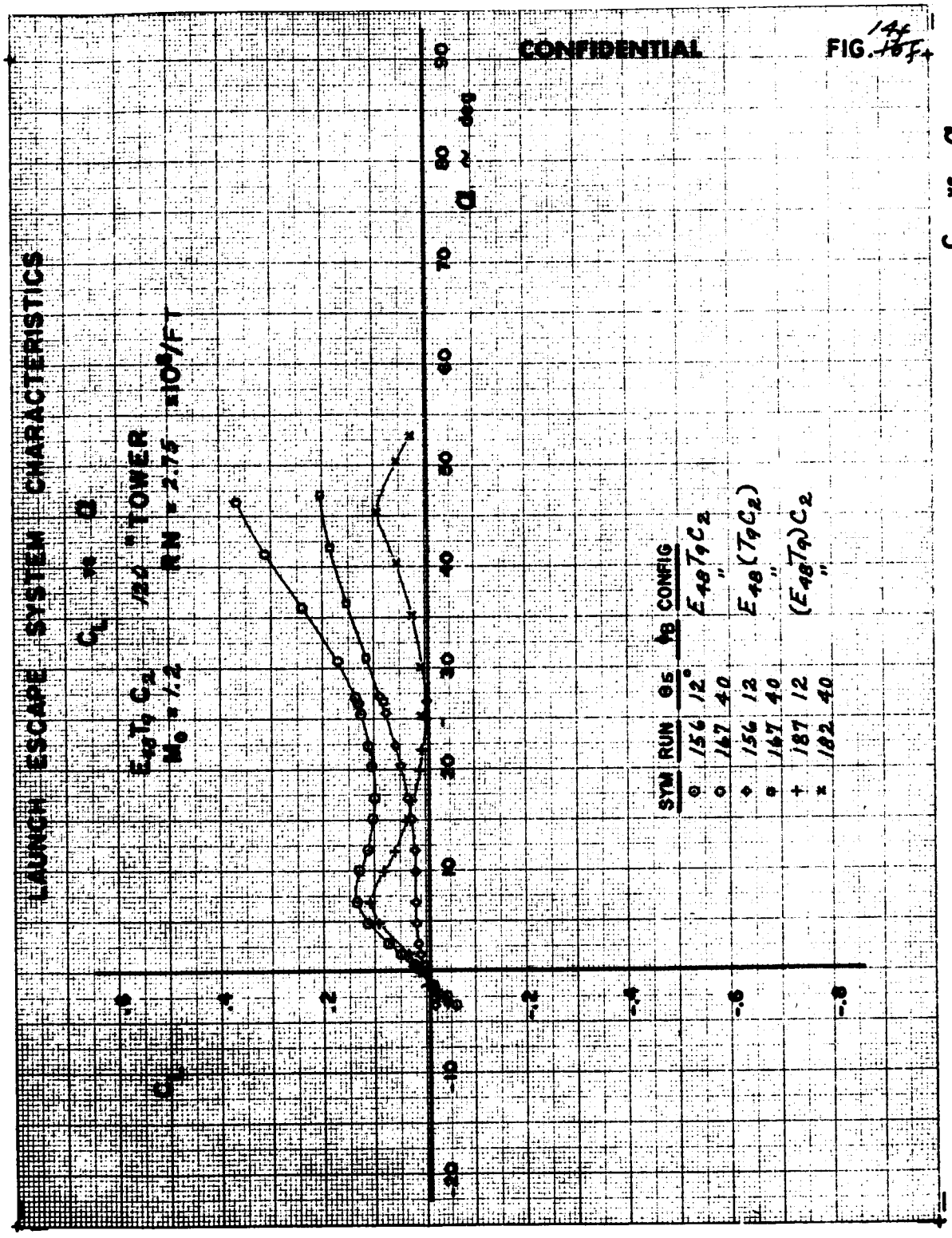

CONFIDENTIAL FIG. 14

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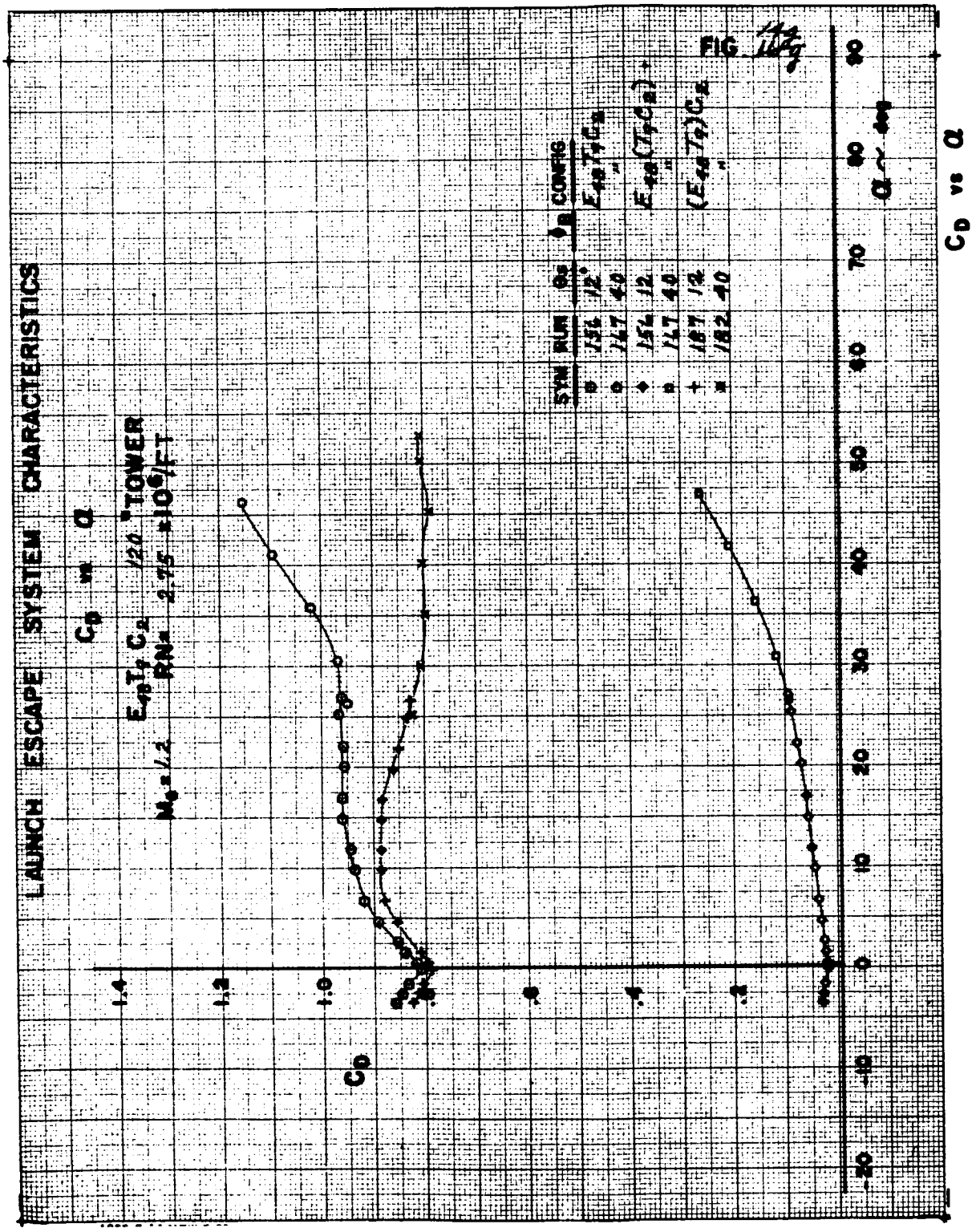
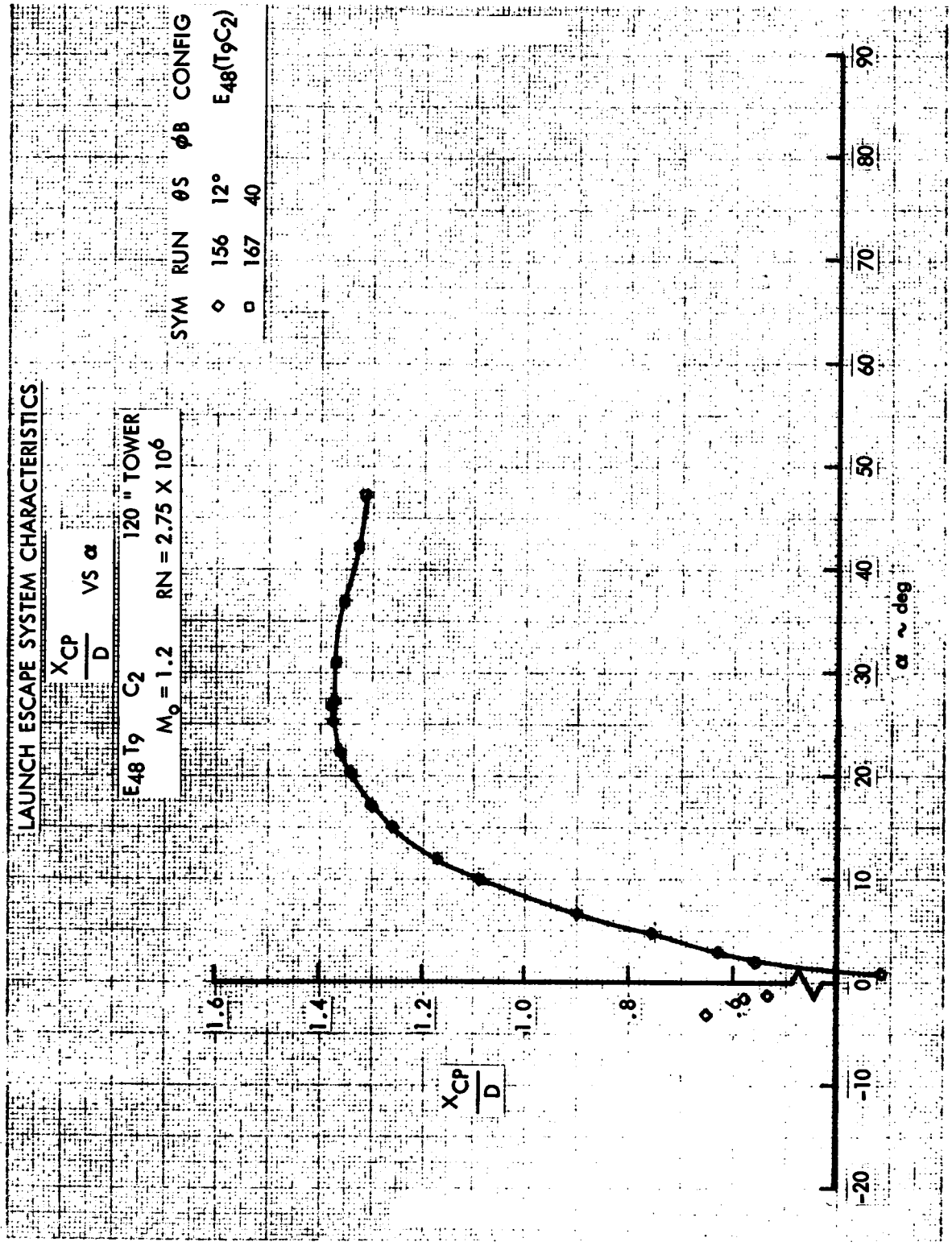
[redacted]



[redacted]

CO[redacted]



[redacted]

~~CONFIDENTIAL~~

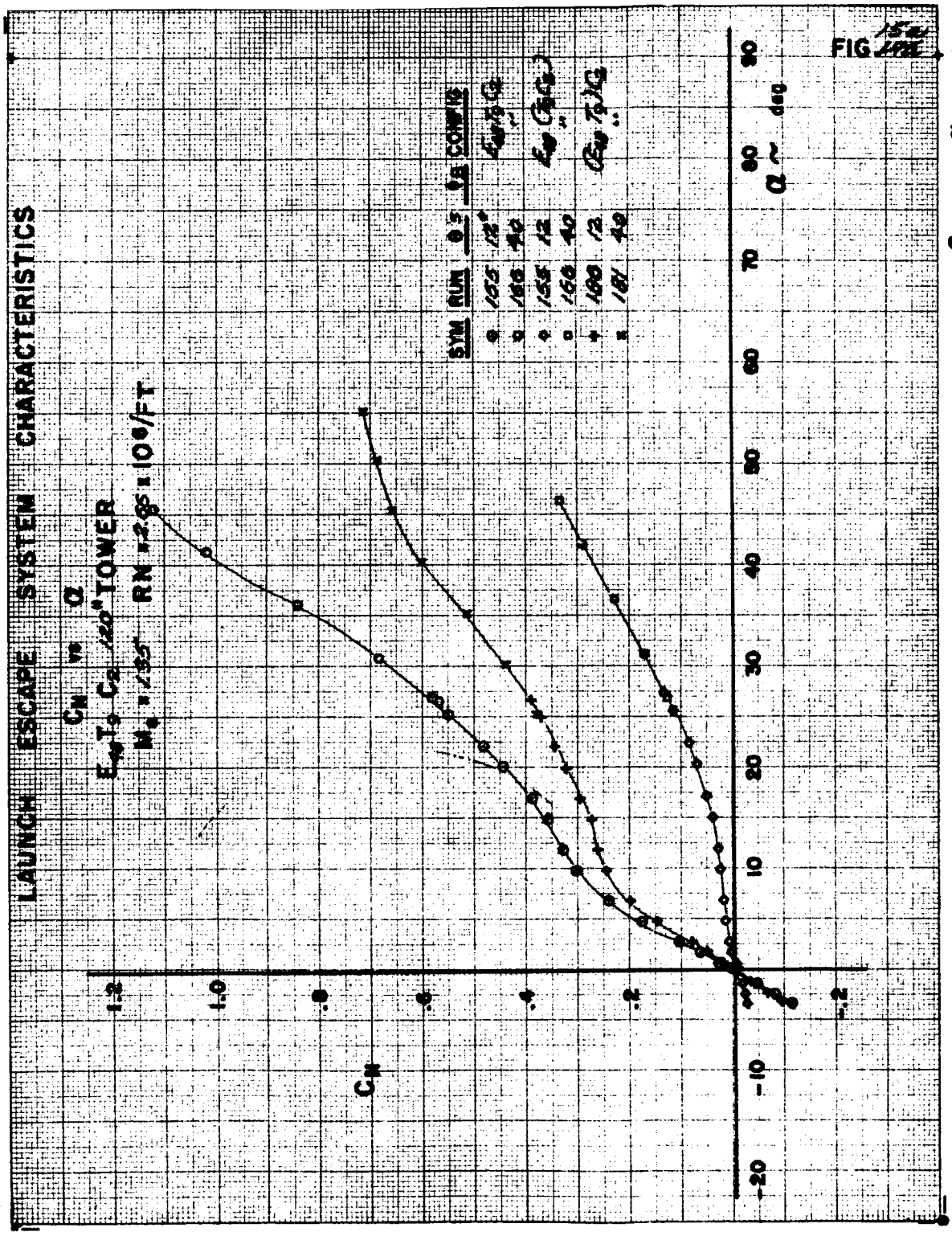


FIG 15a

C_N vs α

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CO[redacted]

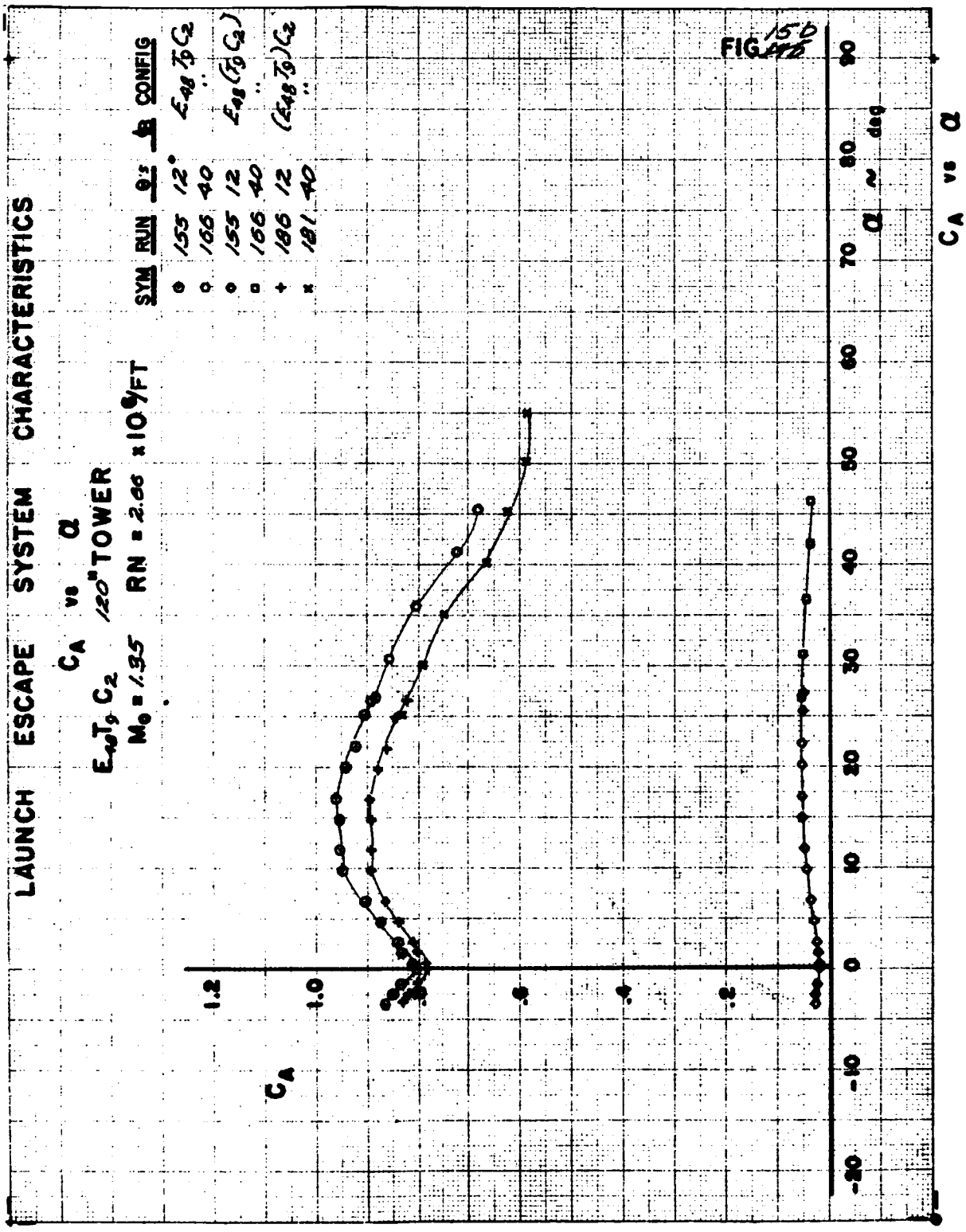

FIG 15b

[redacted]

~~CONFIDENTIAL~~

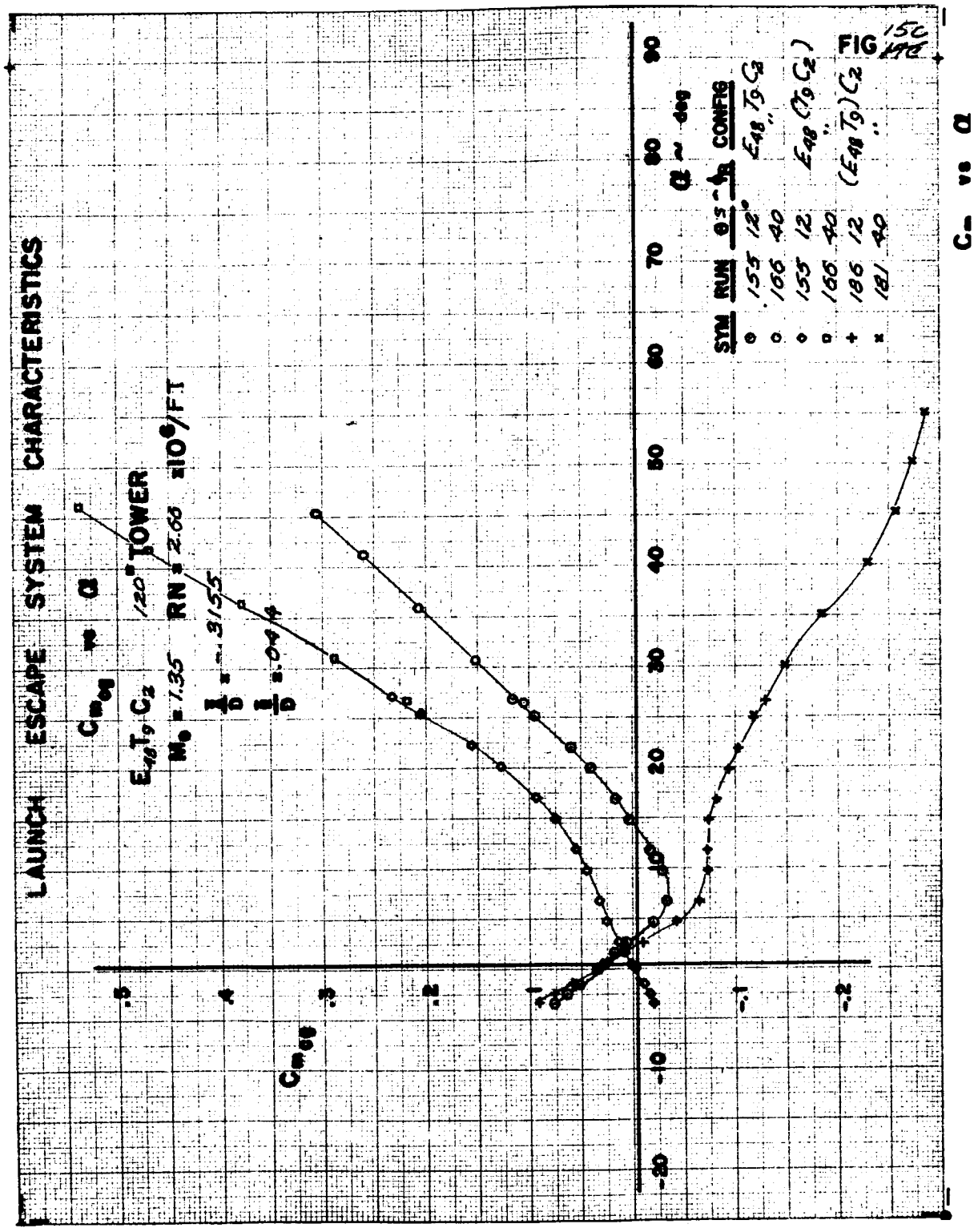

FIG 15c 15d

C_m vs α

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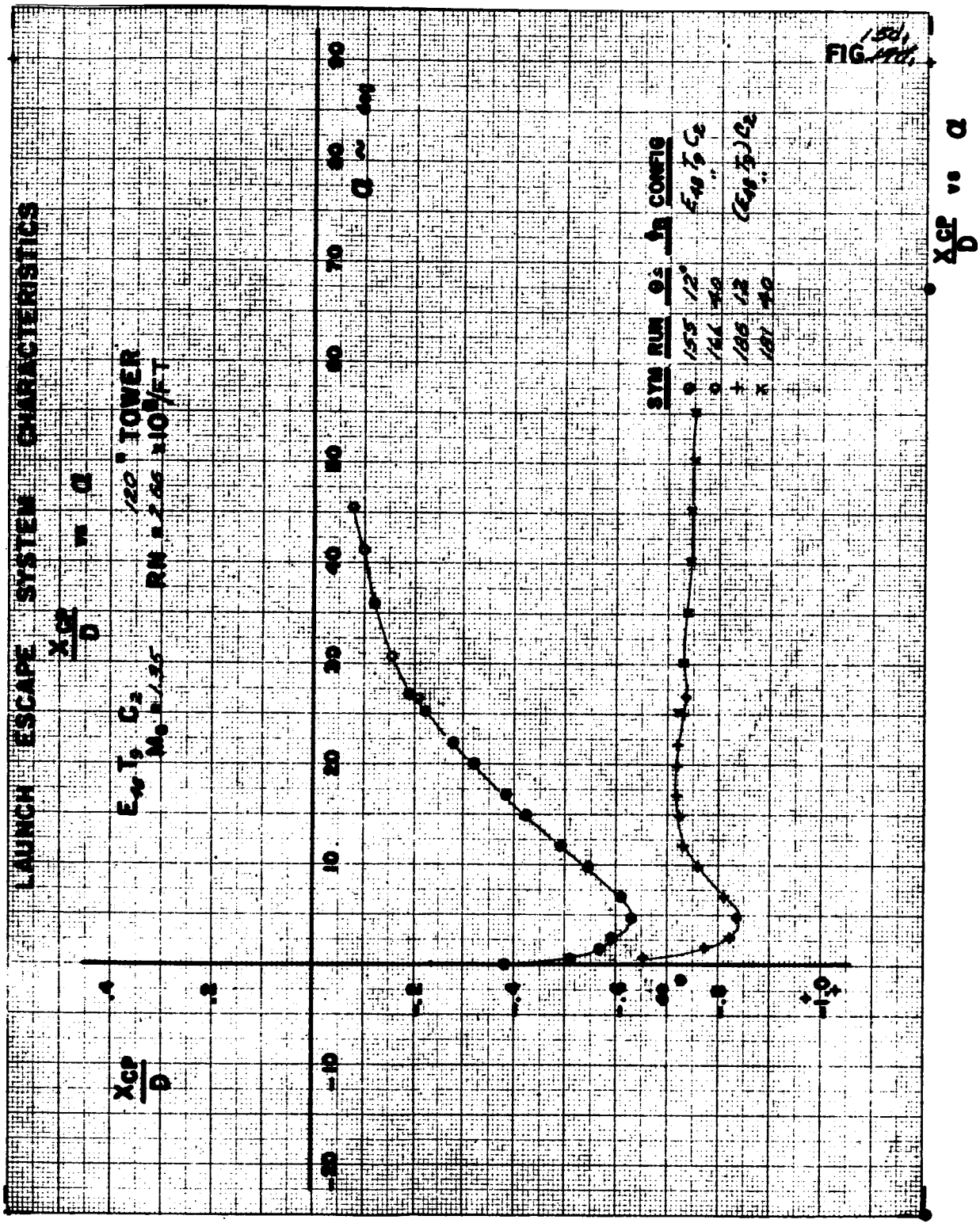

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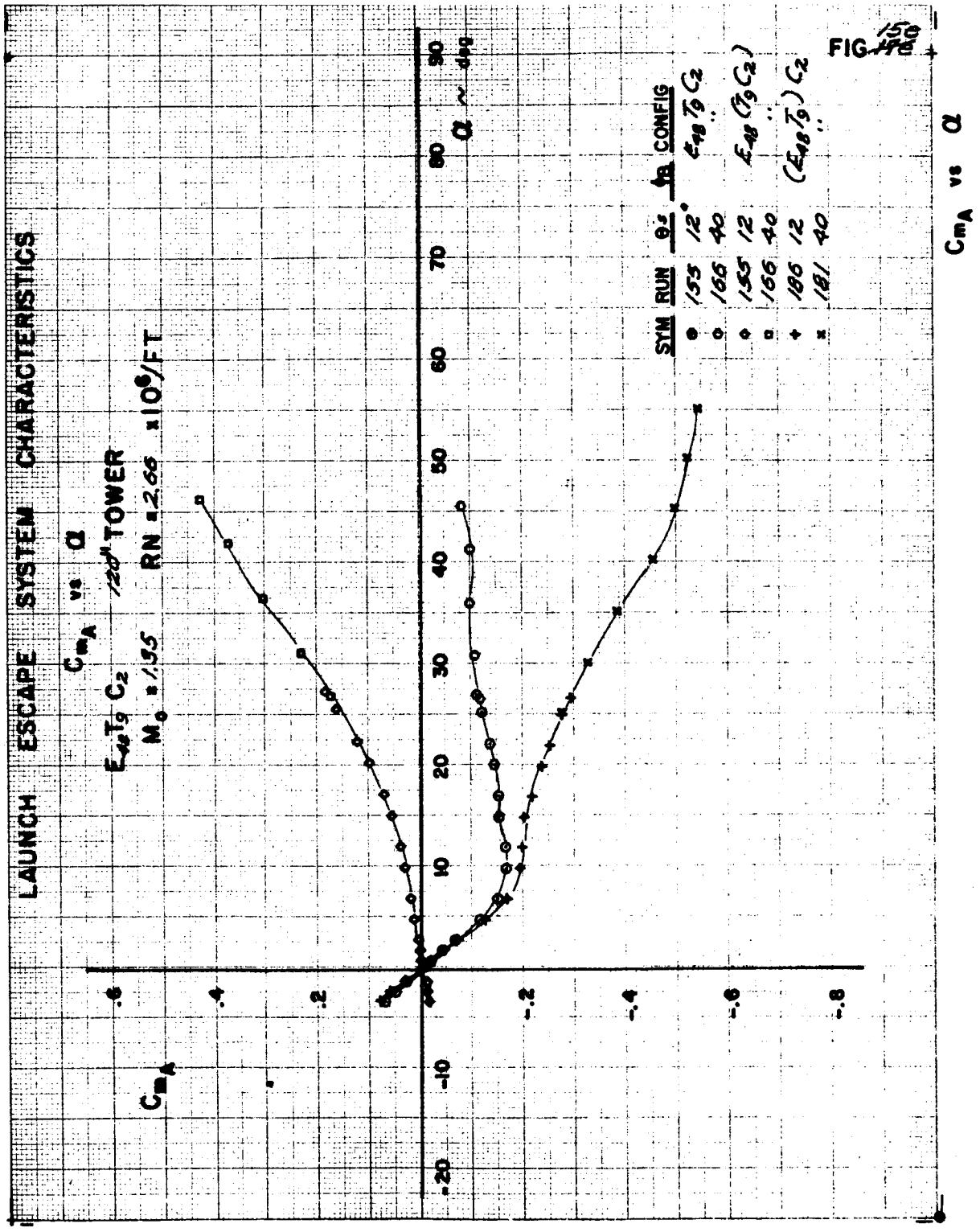

FIG 15a

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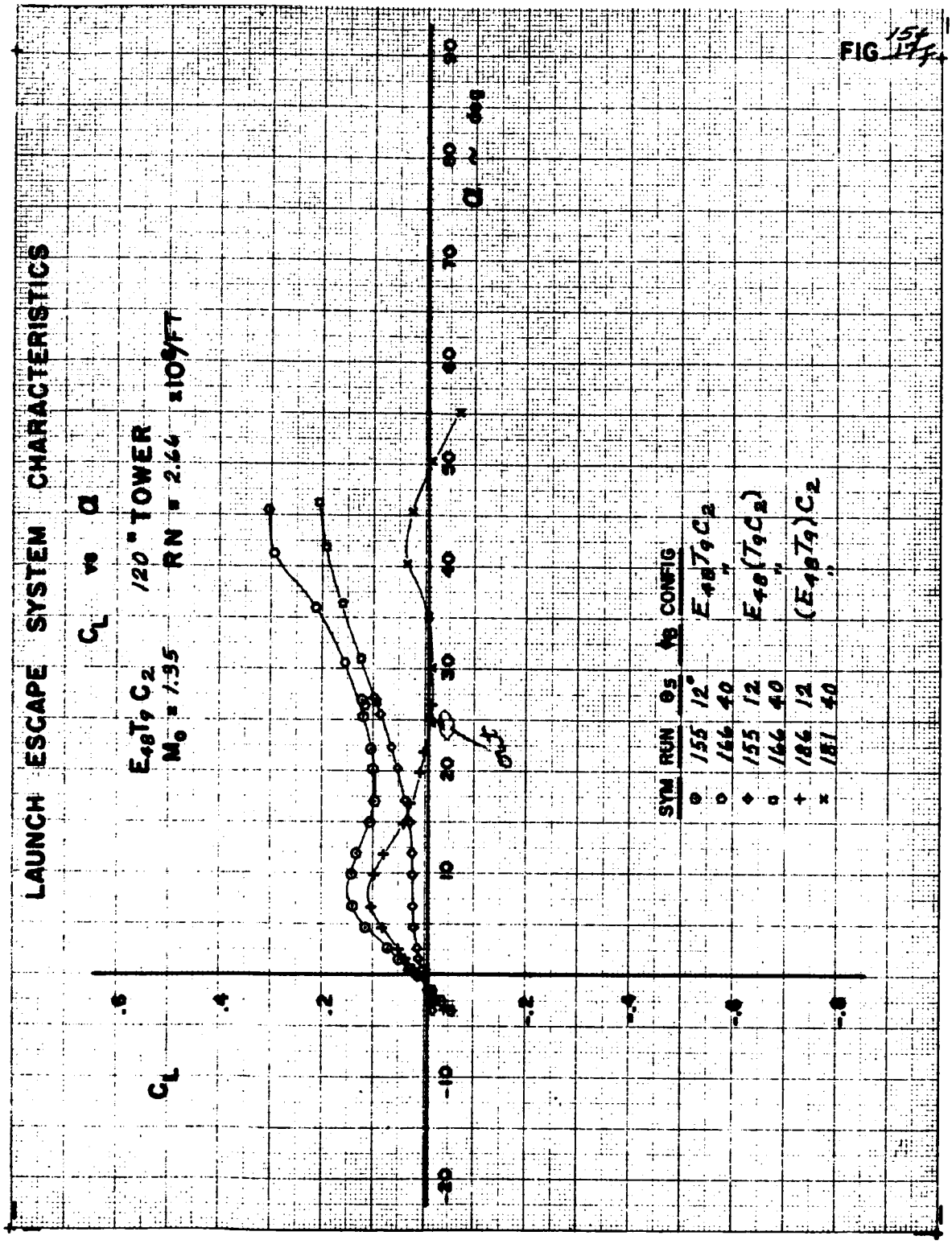

FIG 15f 17f

C_L vs α

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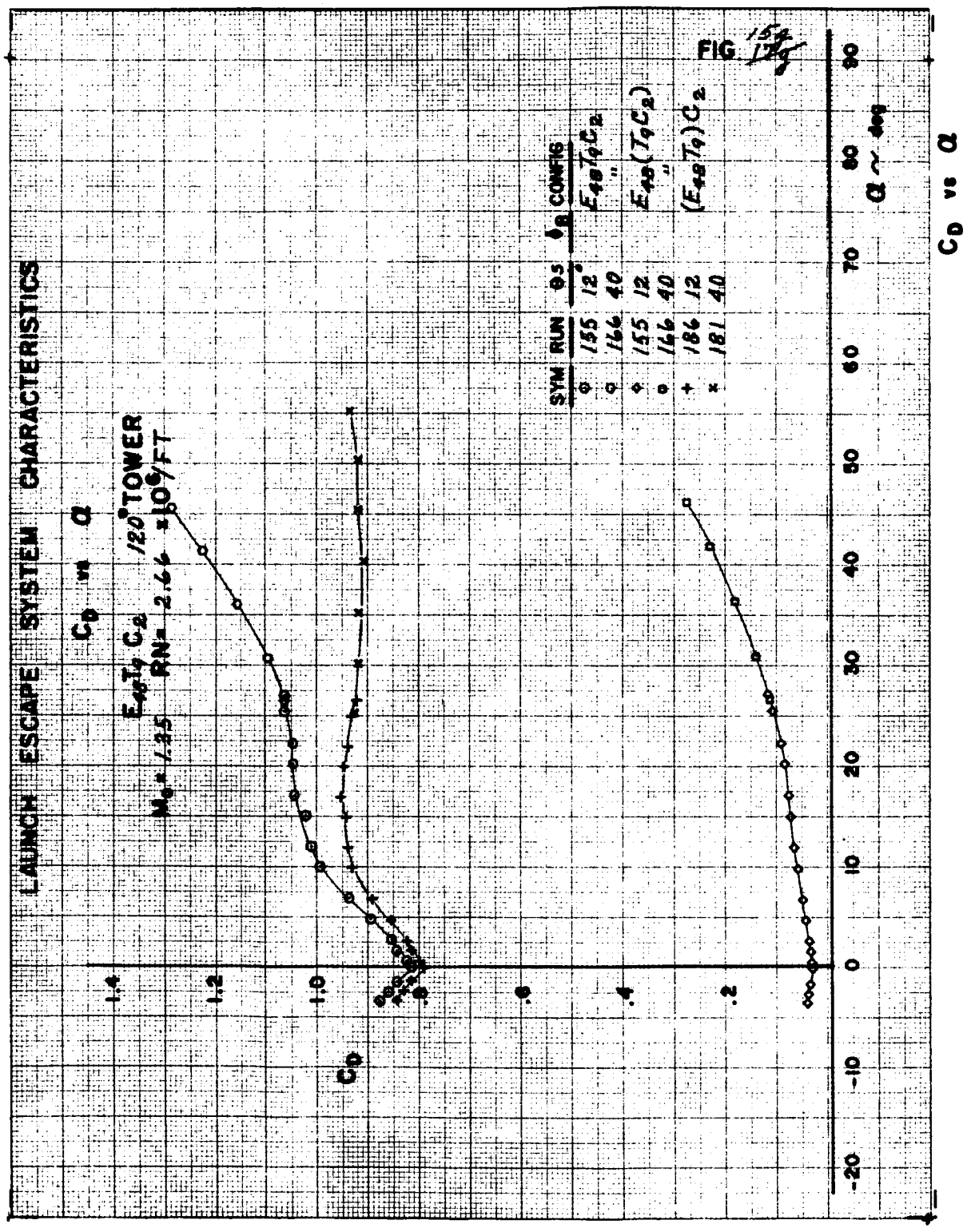

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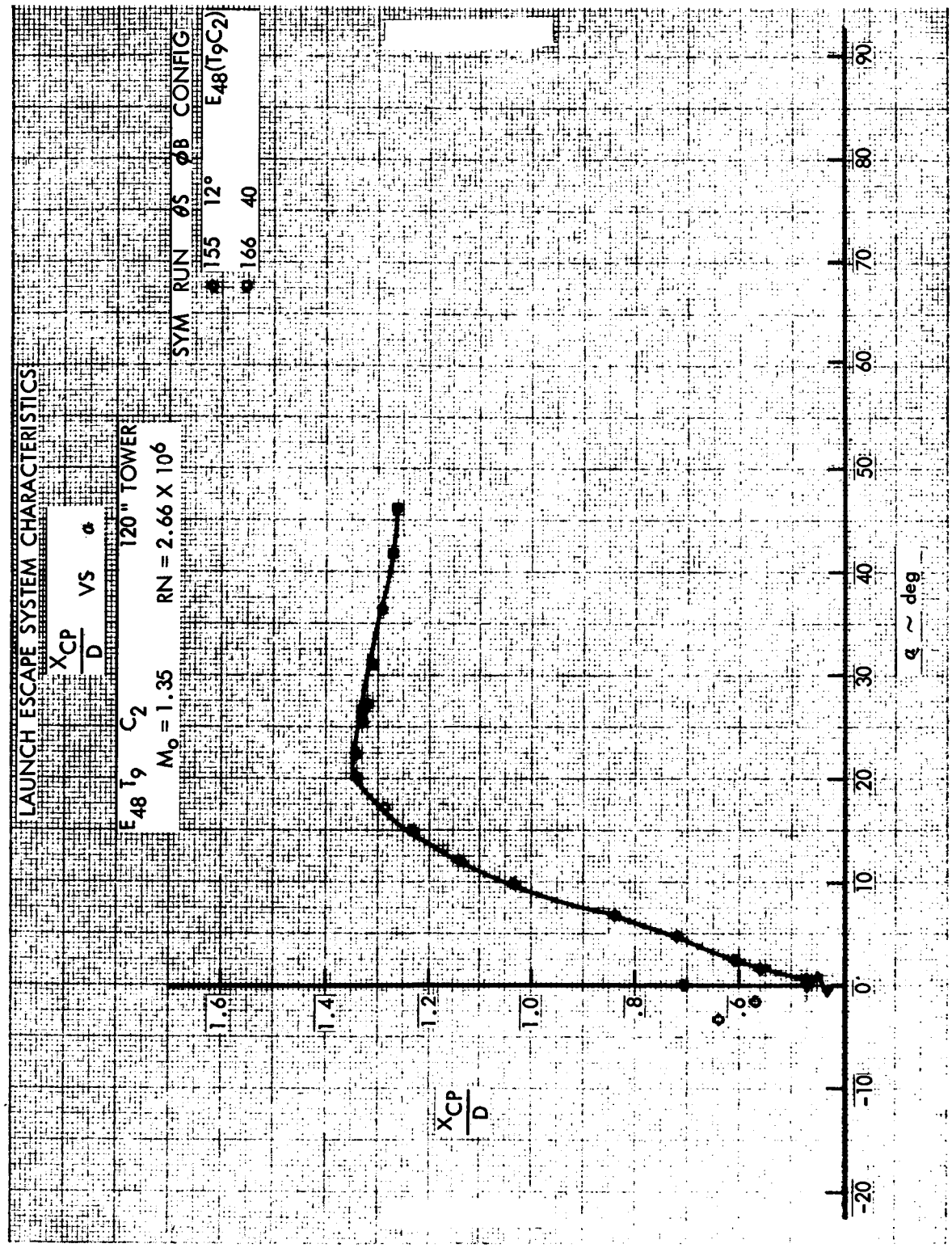
[redacted]



[redacted]

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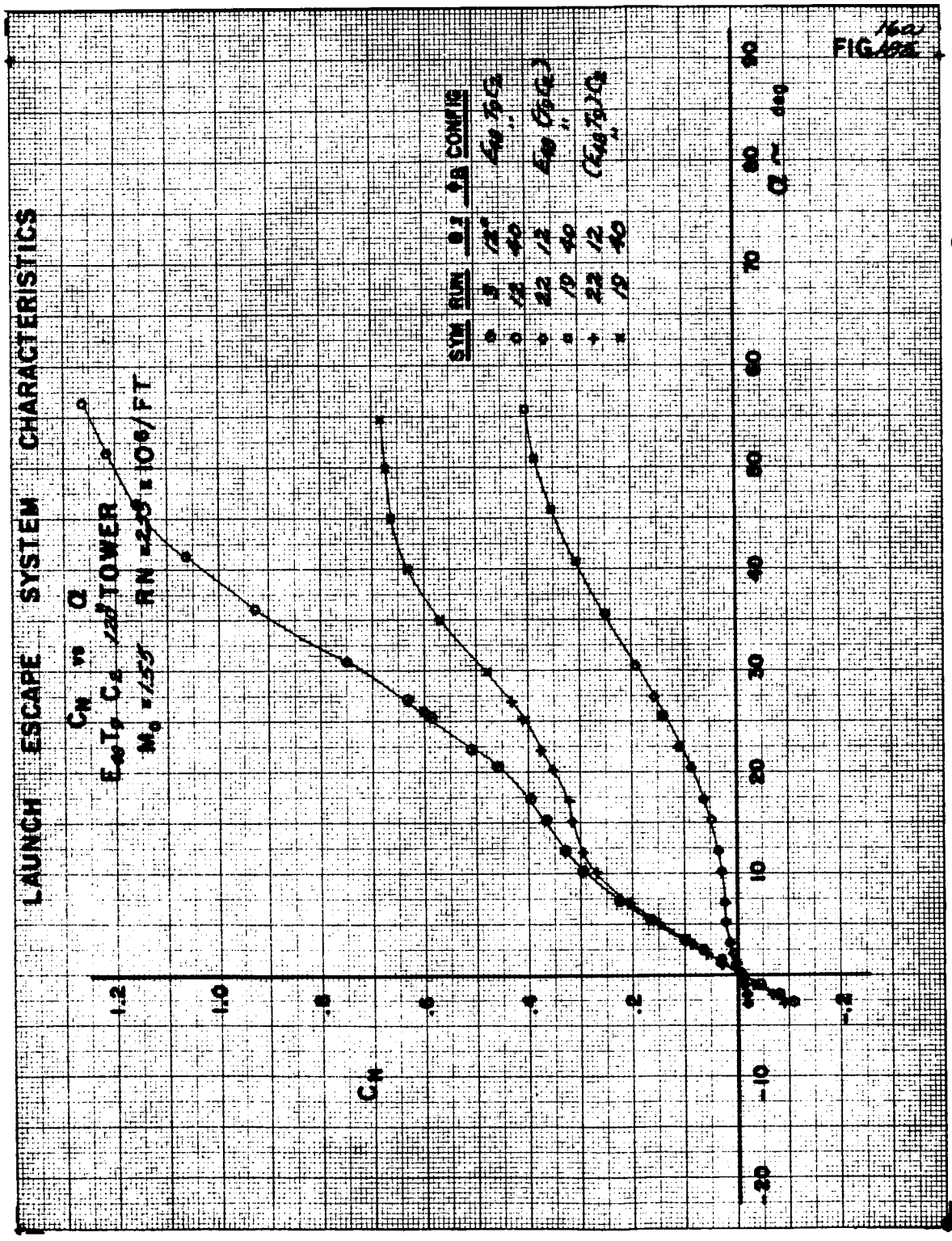

FIG. 162

C_N vs α

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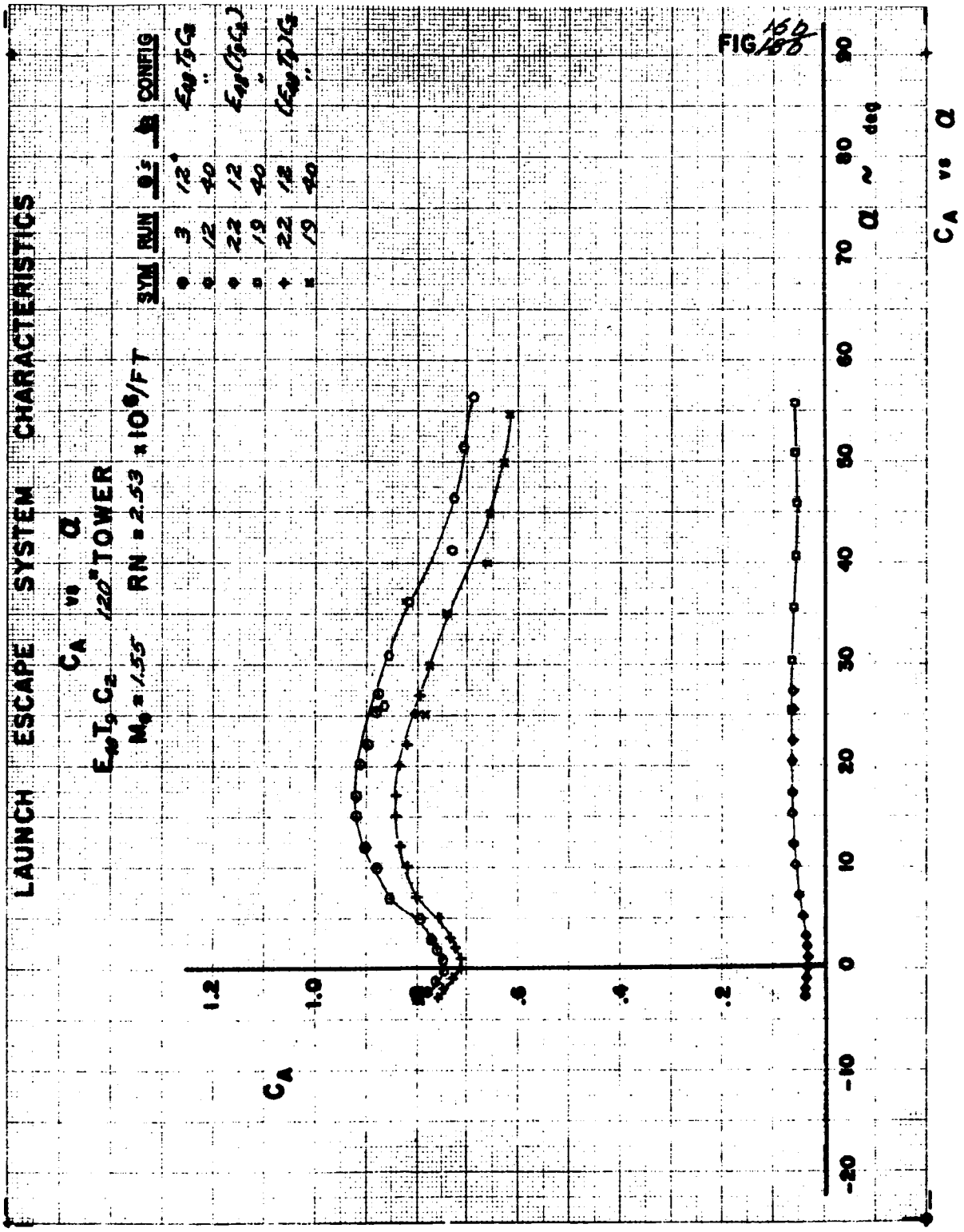

FIG 15D

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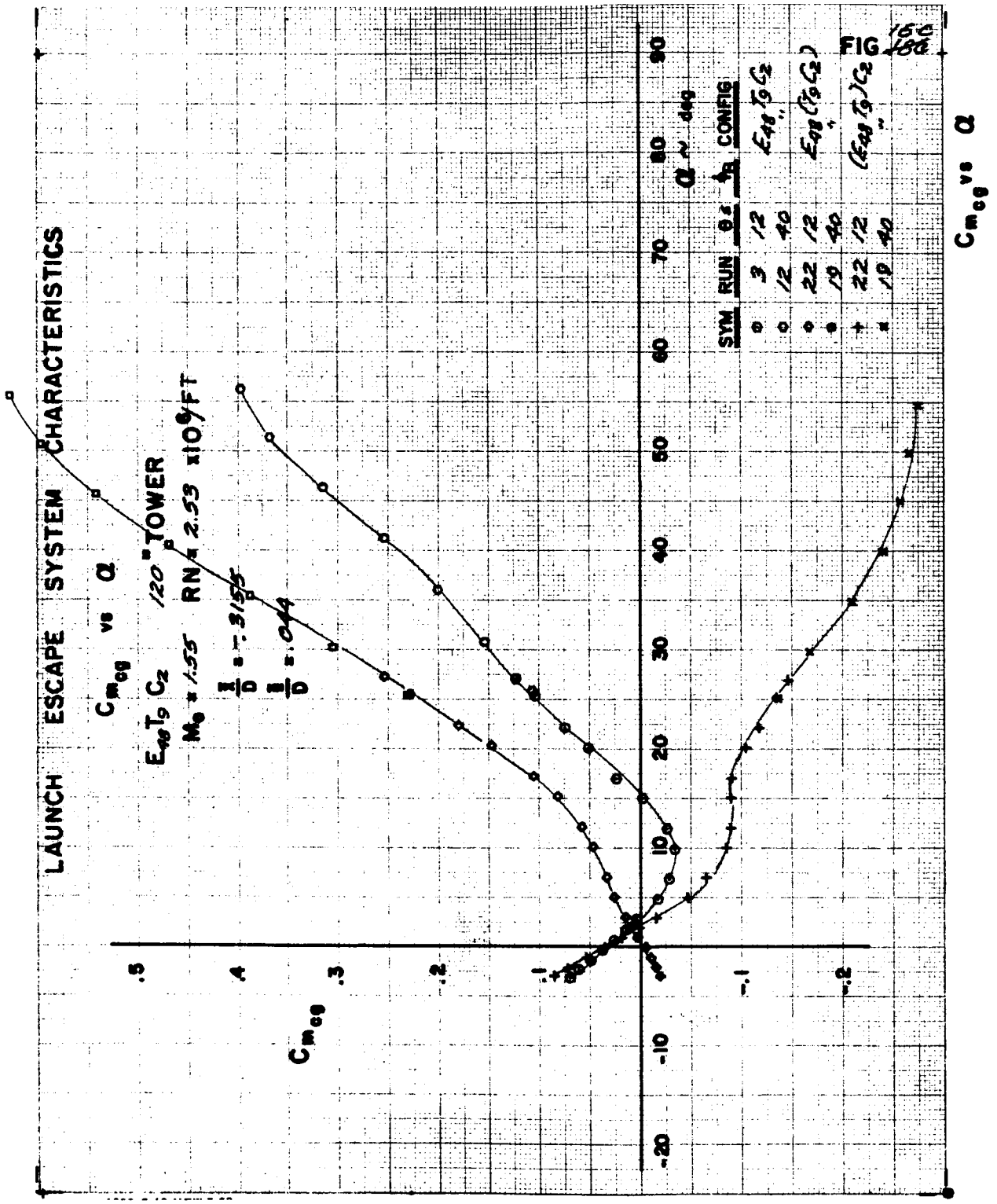

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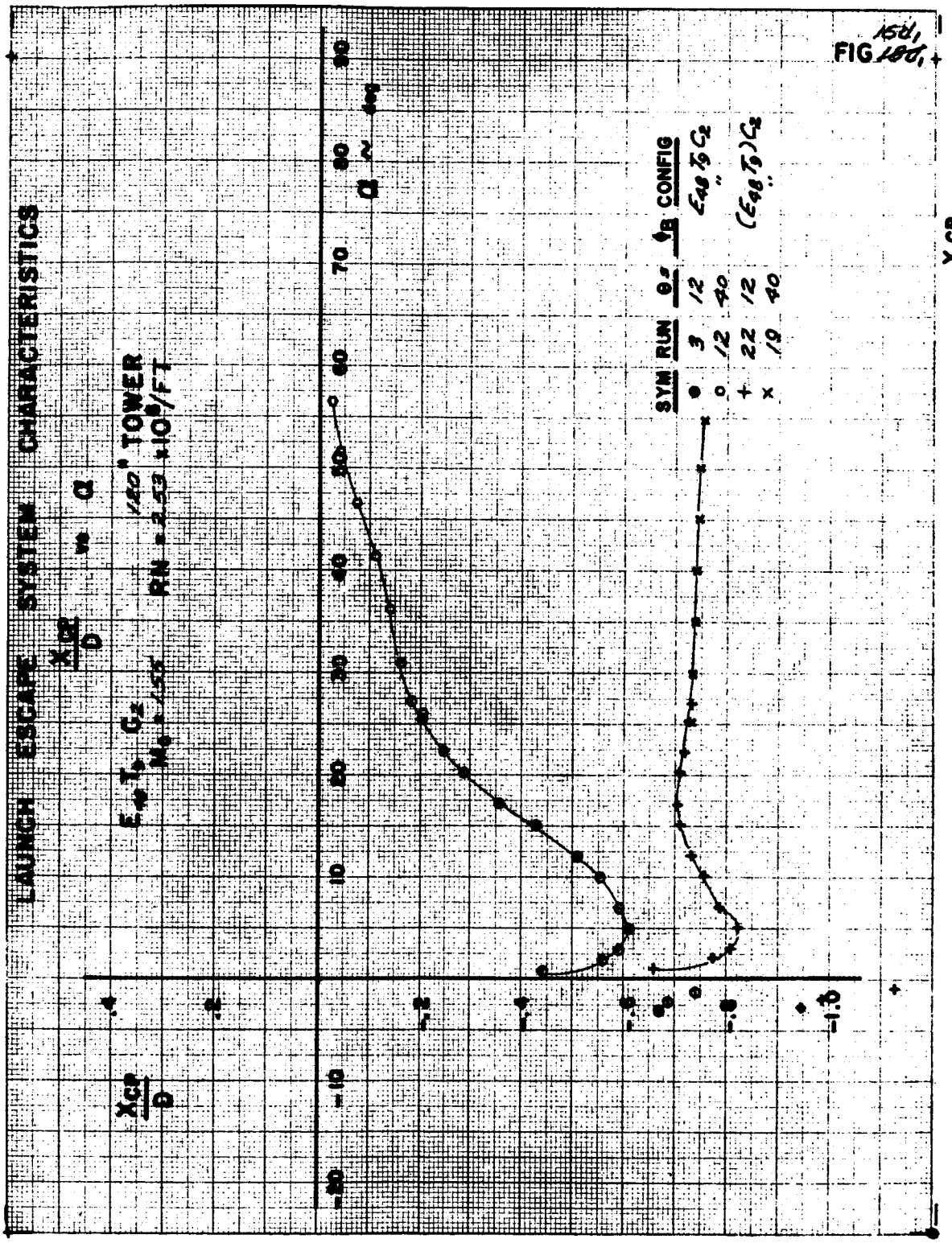

FIG 150, 180,

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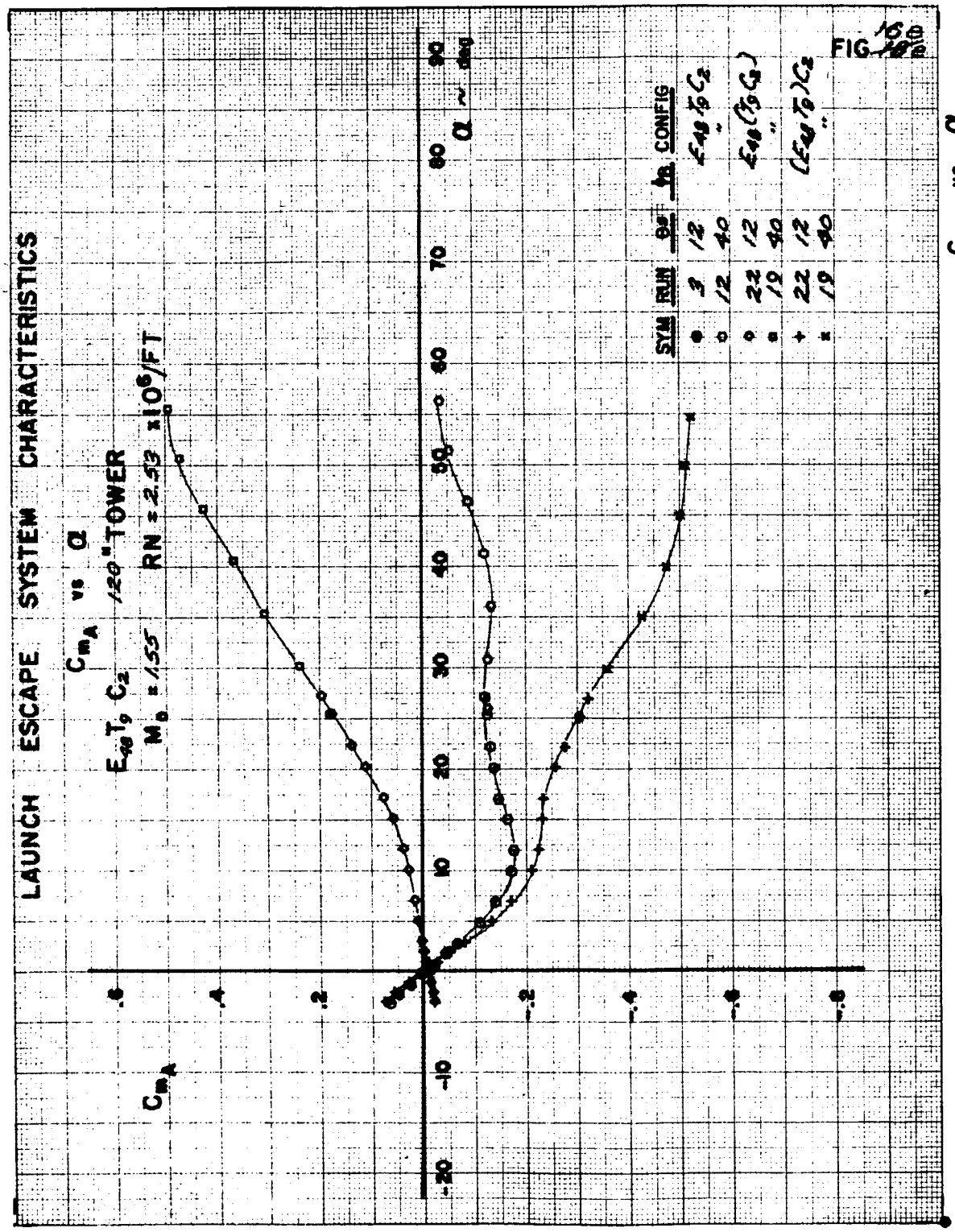

FIG. 16

C_{m_A} vs α

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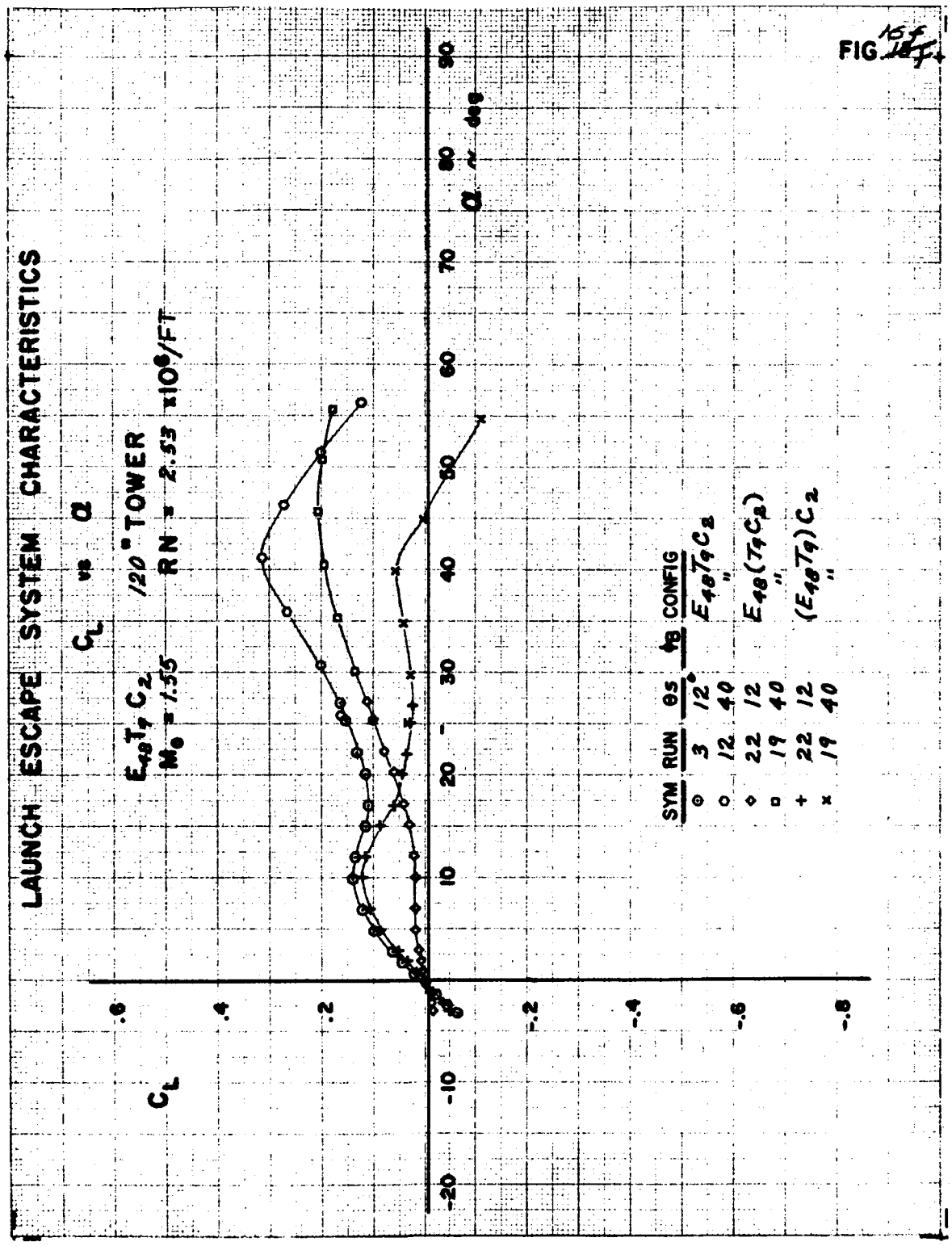

FIG 15f

C_L vs α

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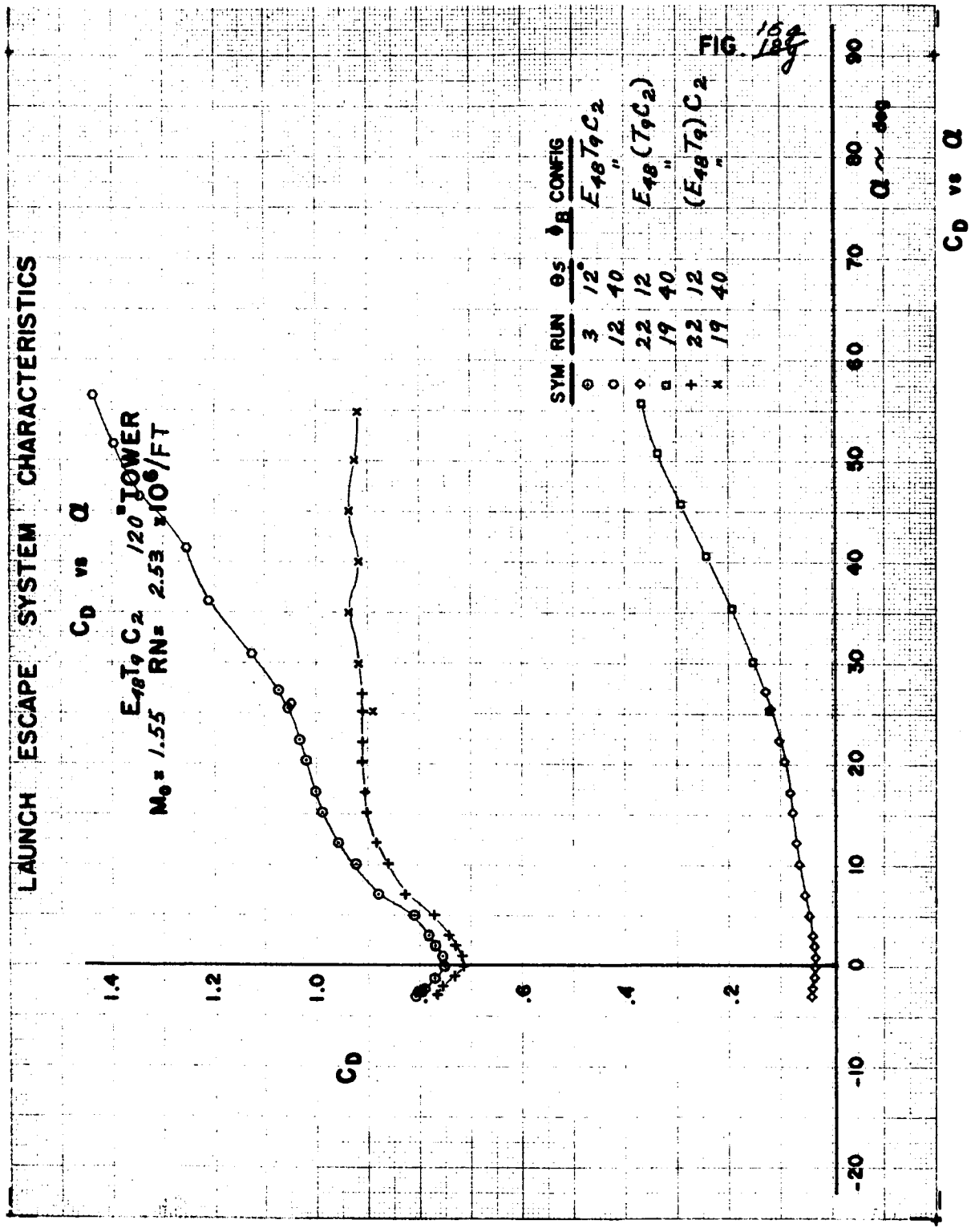

FIG. 18g

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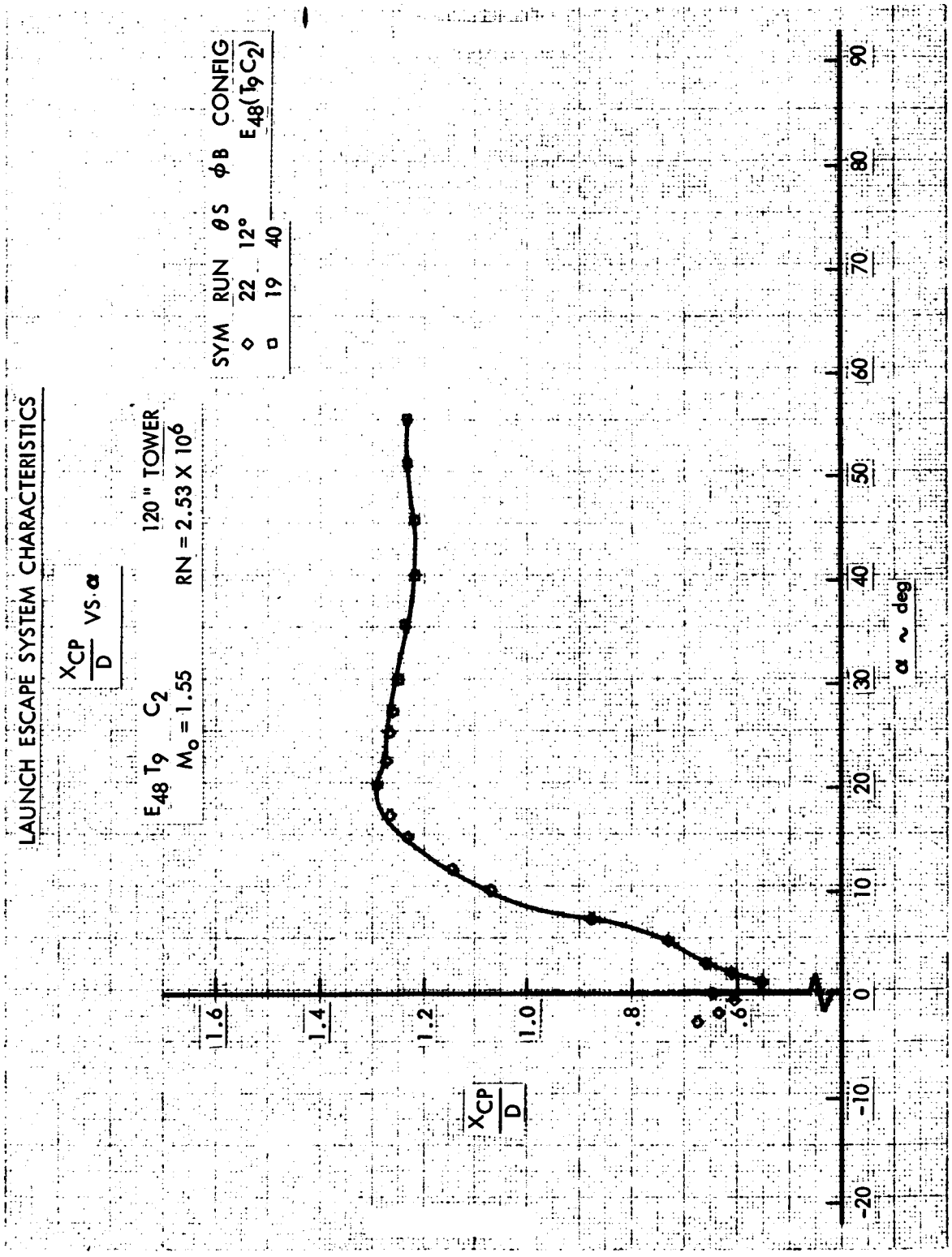

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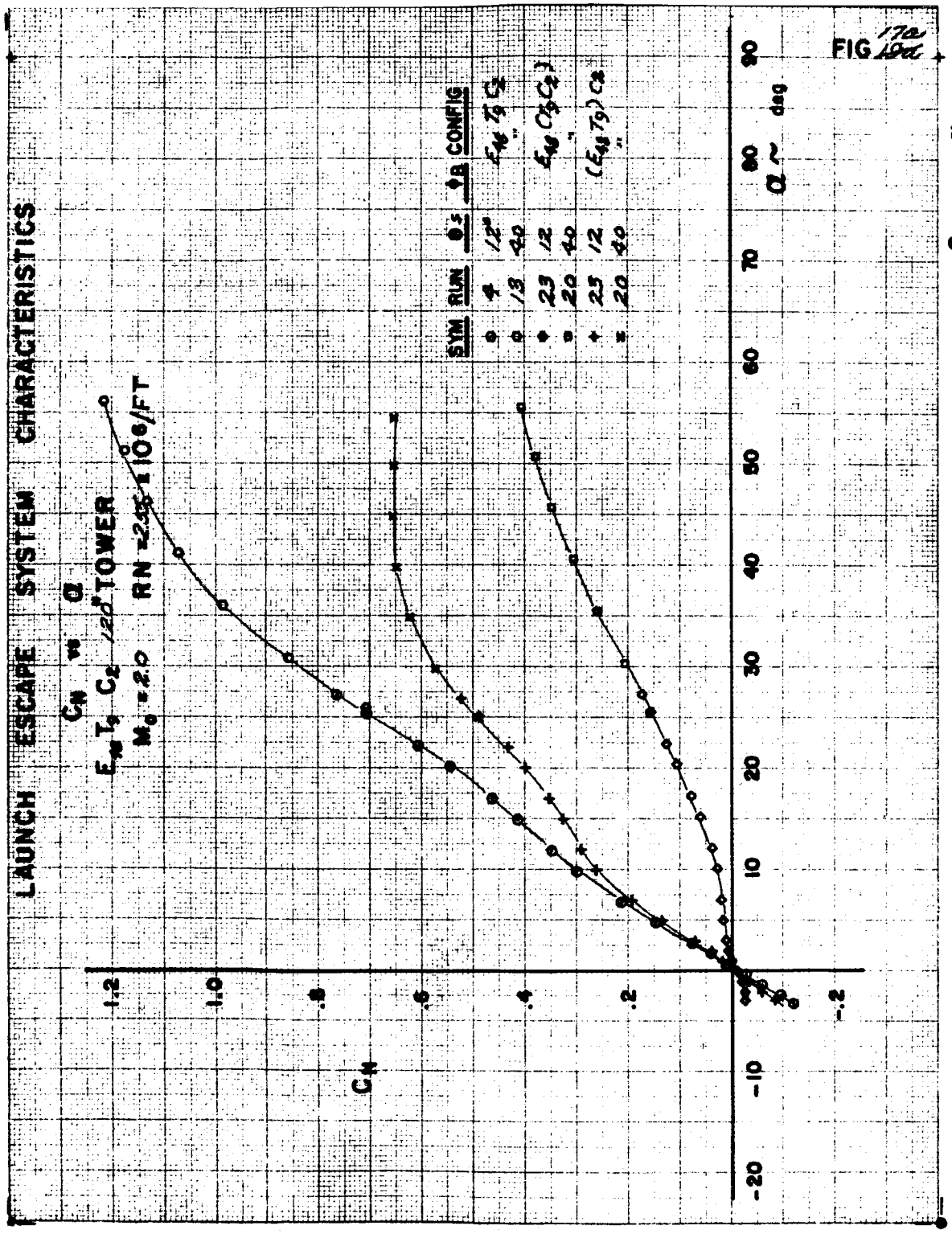

FIG 17a

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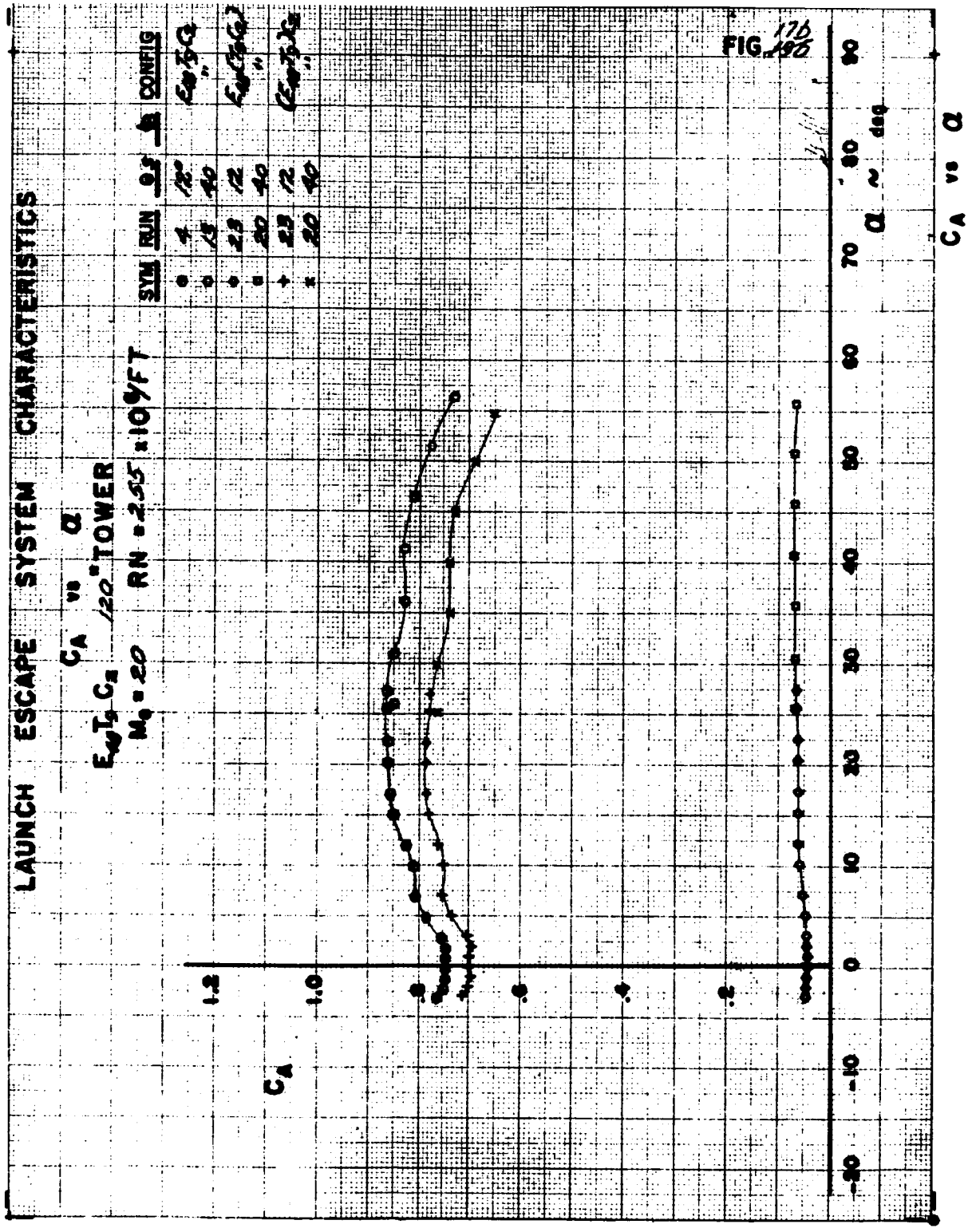

FIG. 17b

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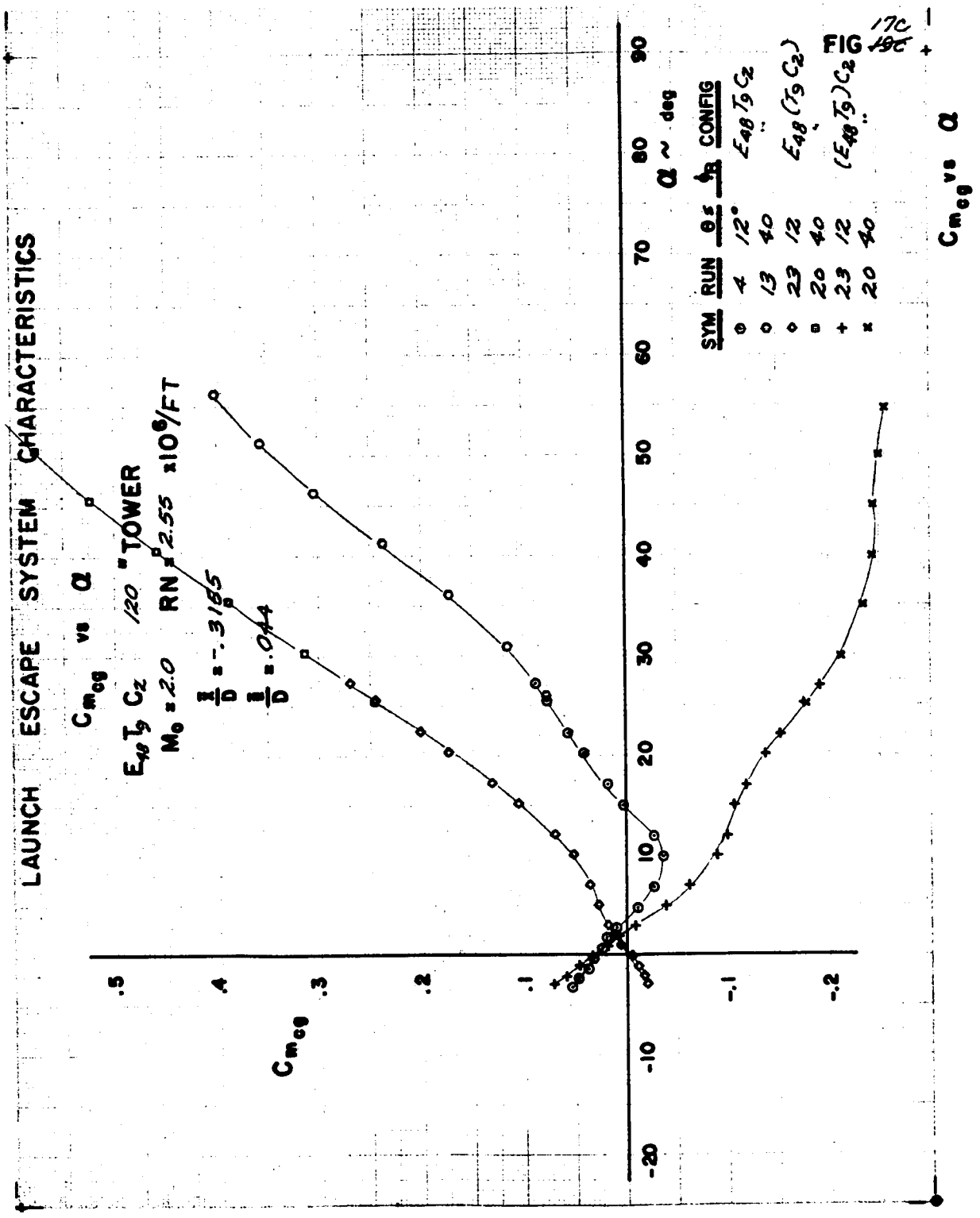

FIG ~~19C~~ 17C

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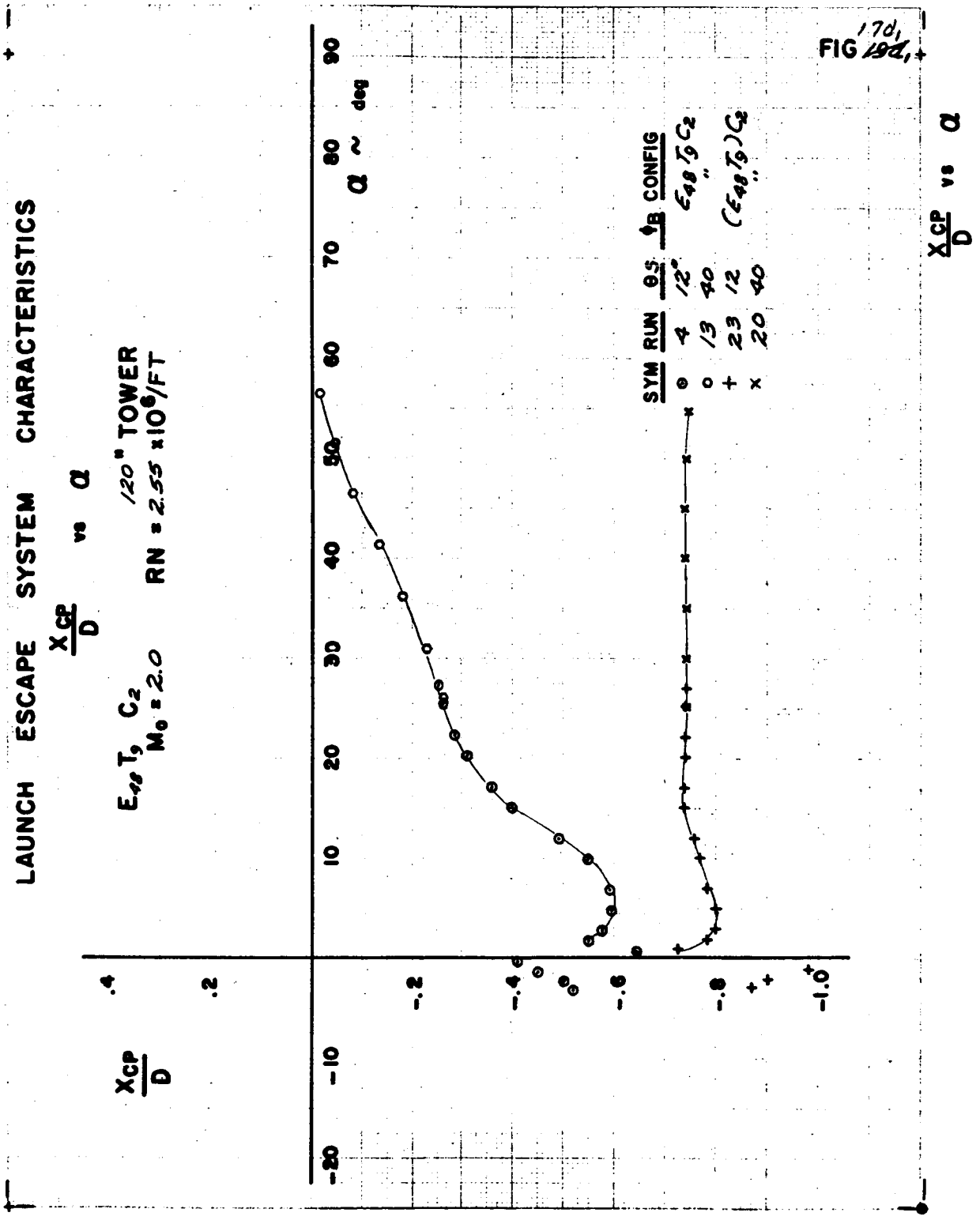

FIG 17d, 19d,

$\frac{X_{CP}}{D}$ vs α

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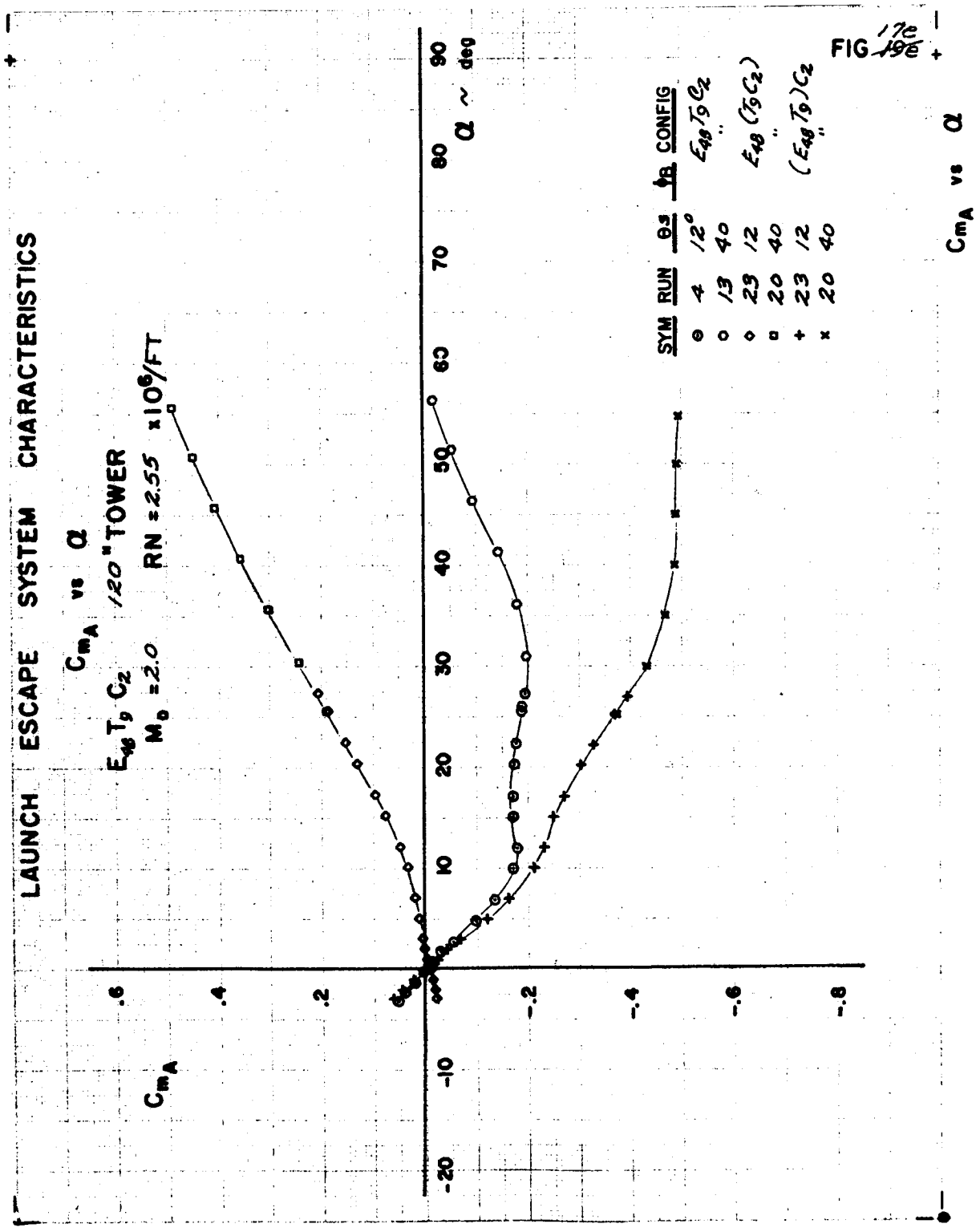

FIG 17e

C_{m_A} vs α

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CO[redacted]

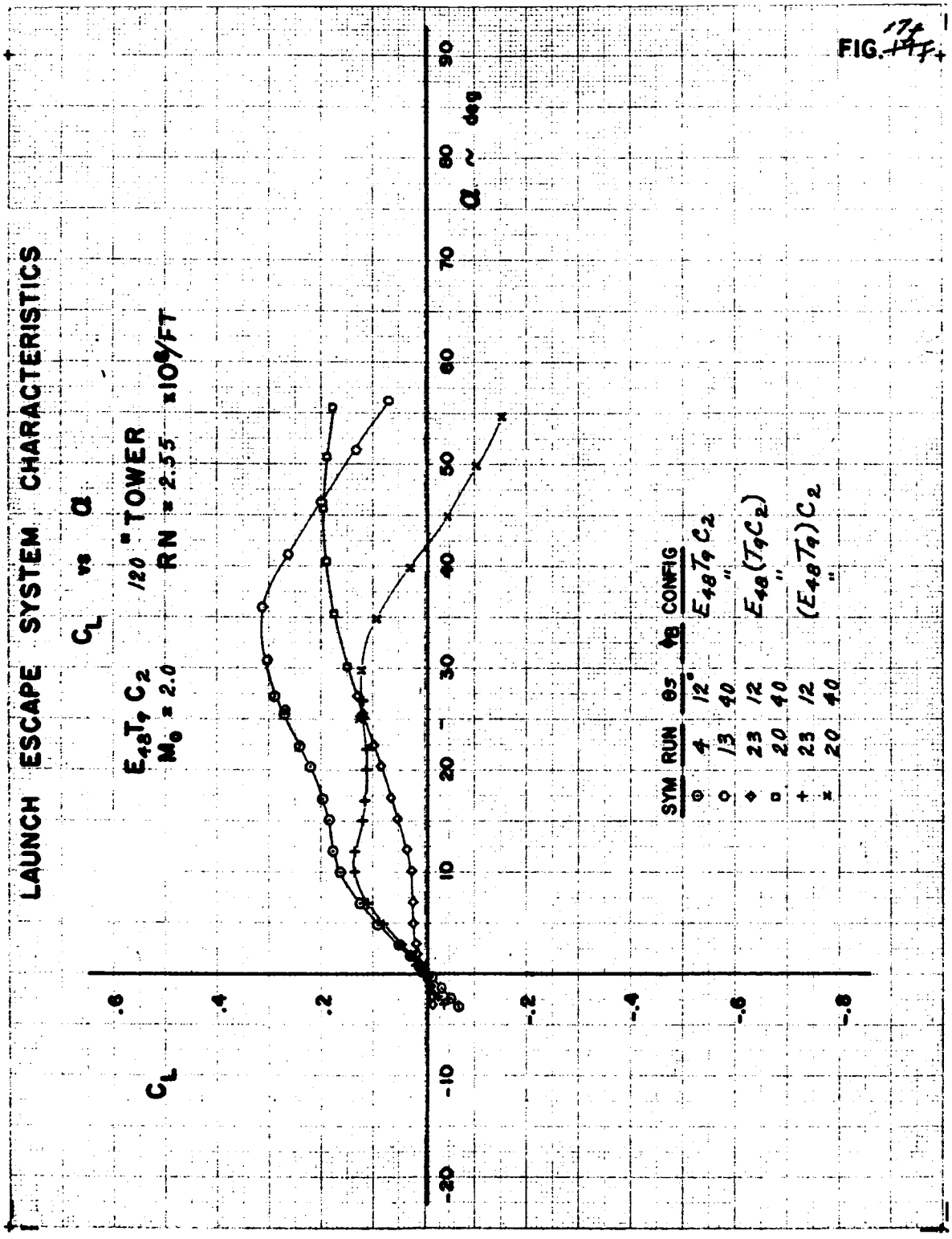

FIG. 17

C_L vs α

[redacted]

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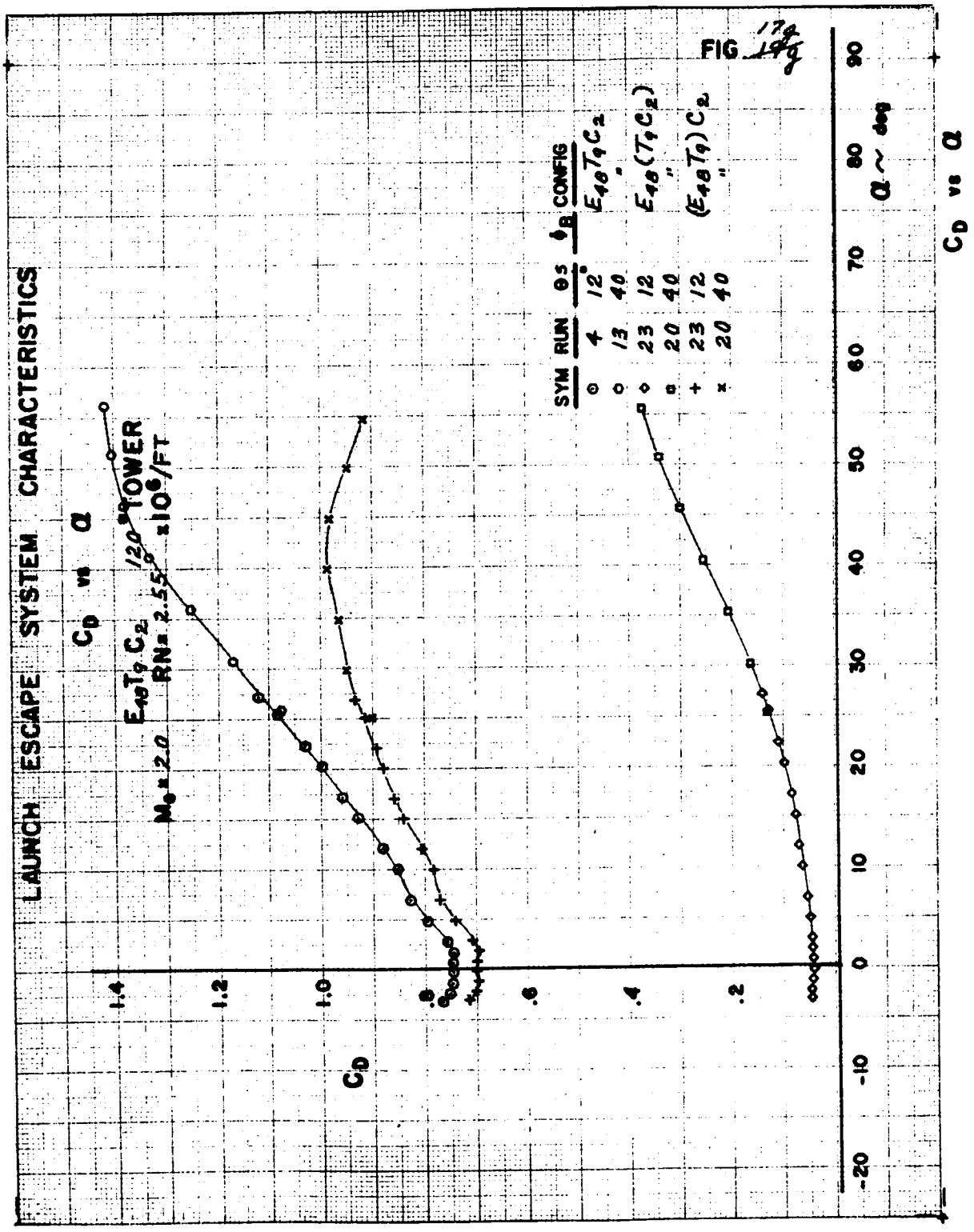

FIG 17g

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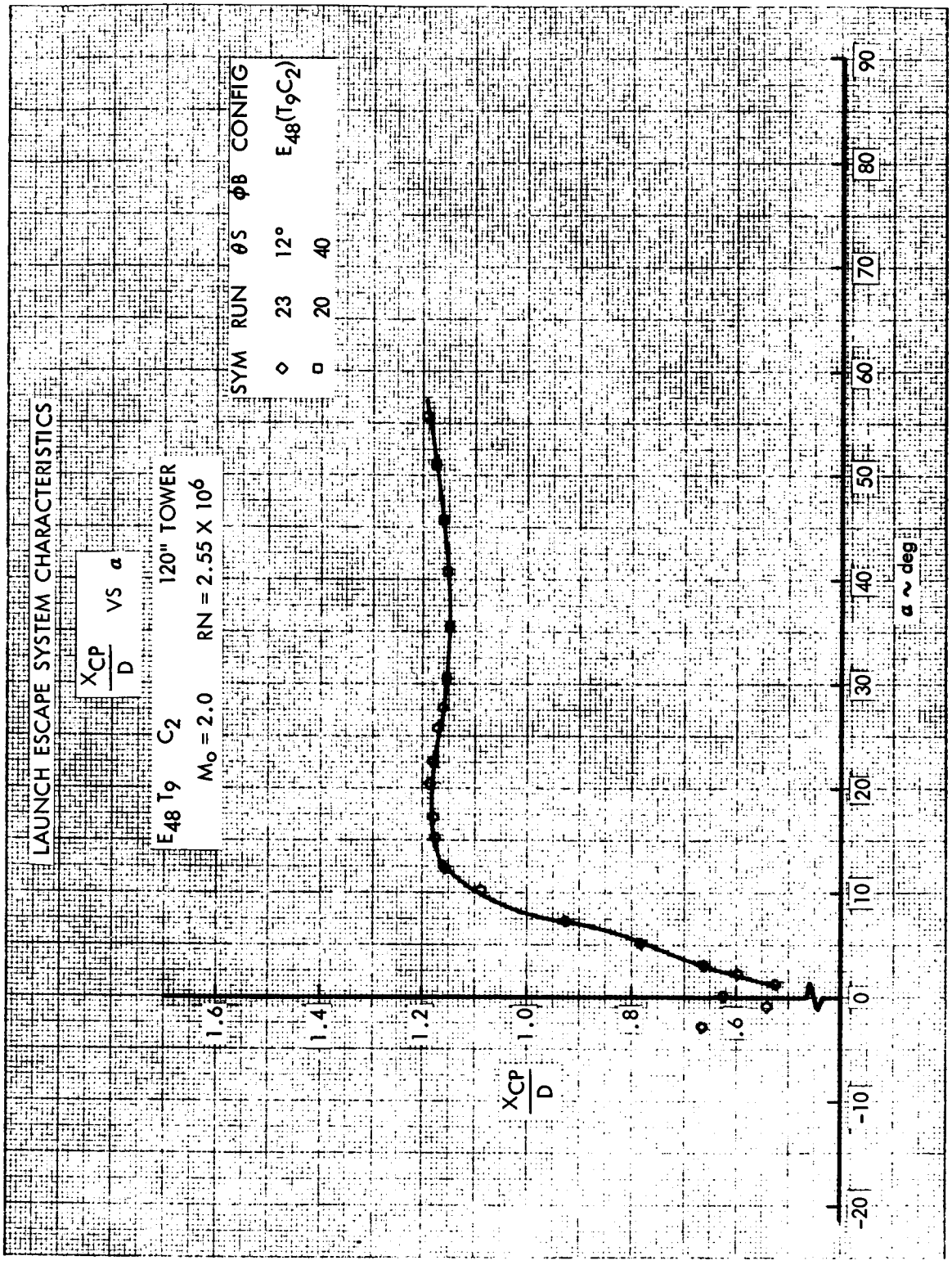

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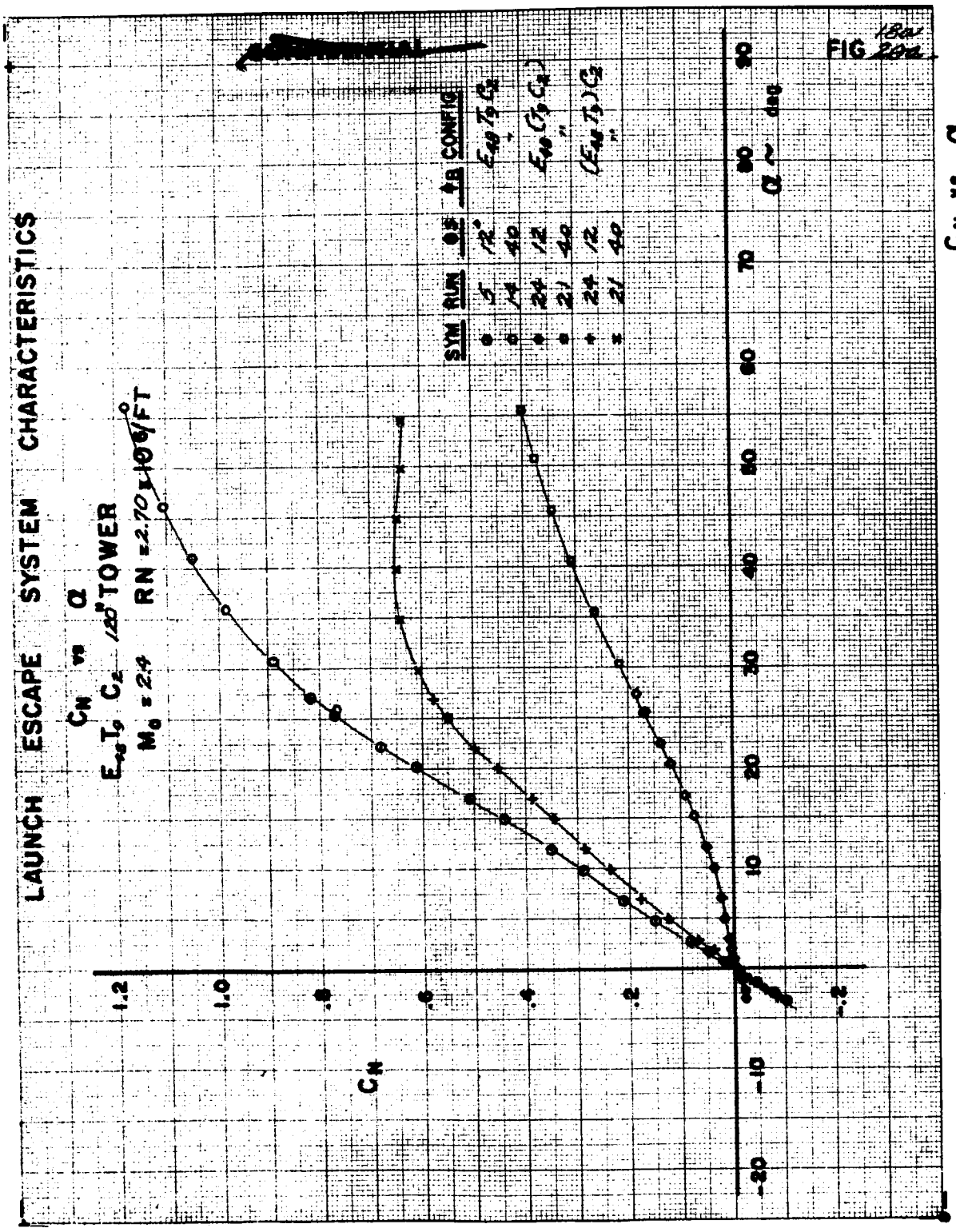

FIG 18a 20a

C_N vs α

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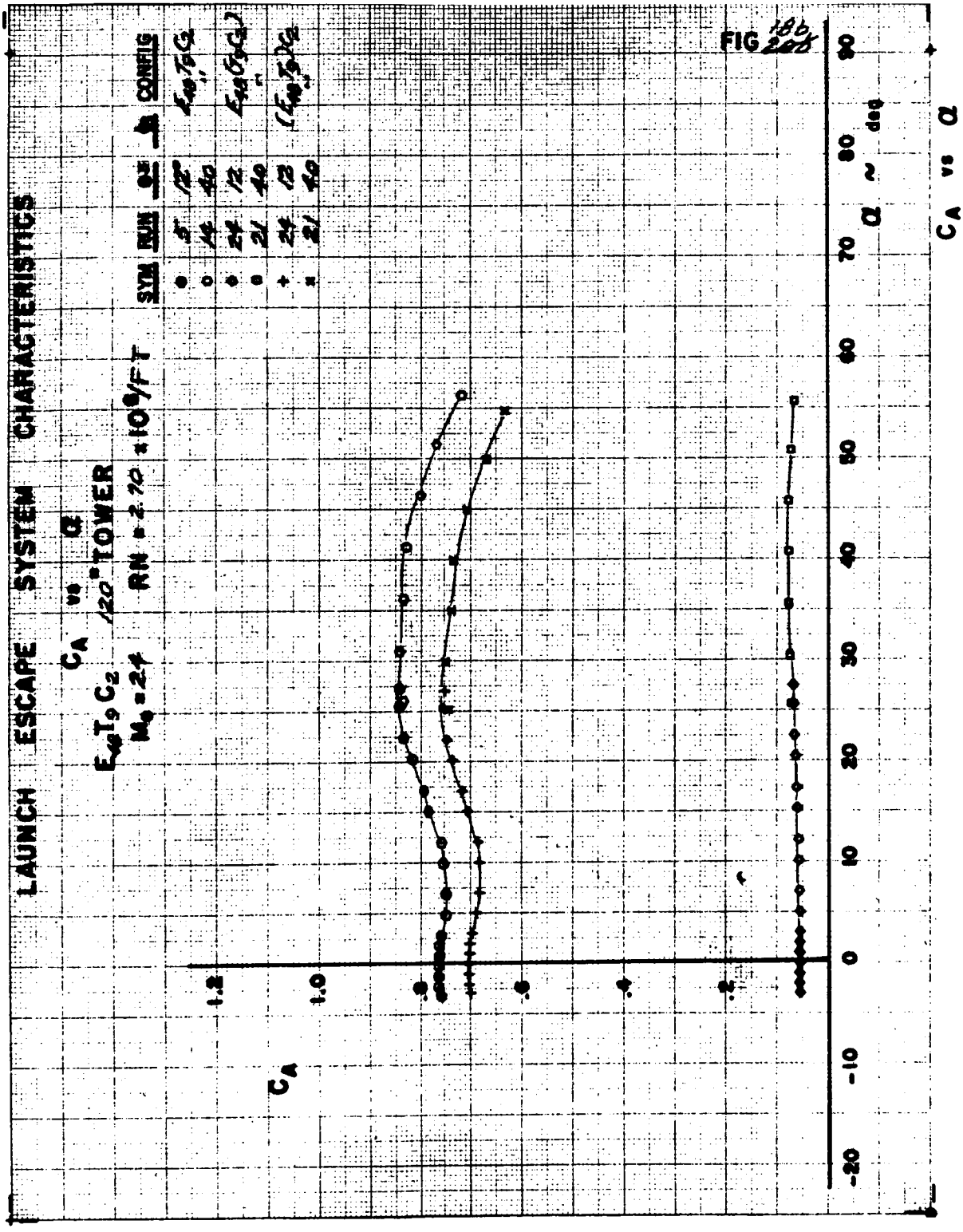

FIG 18b

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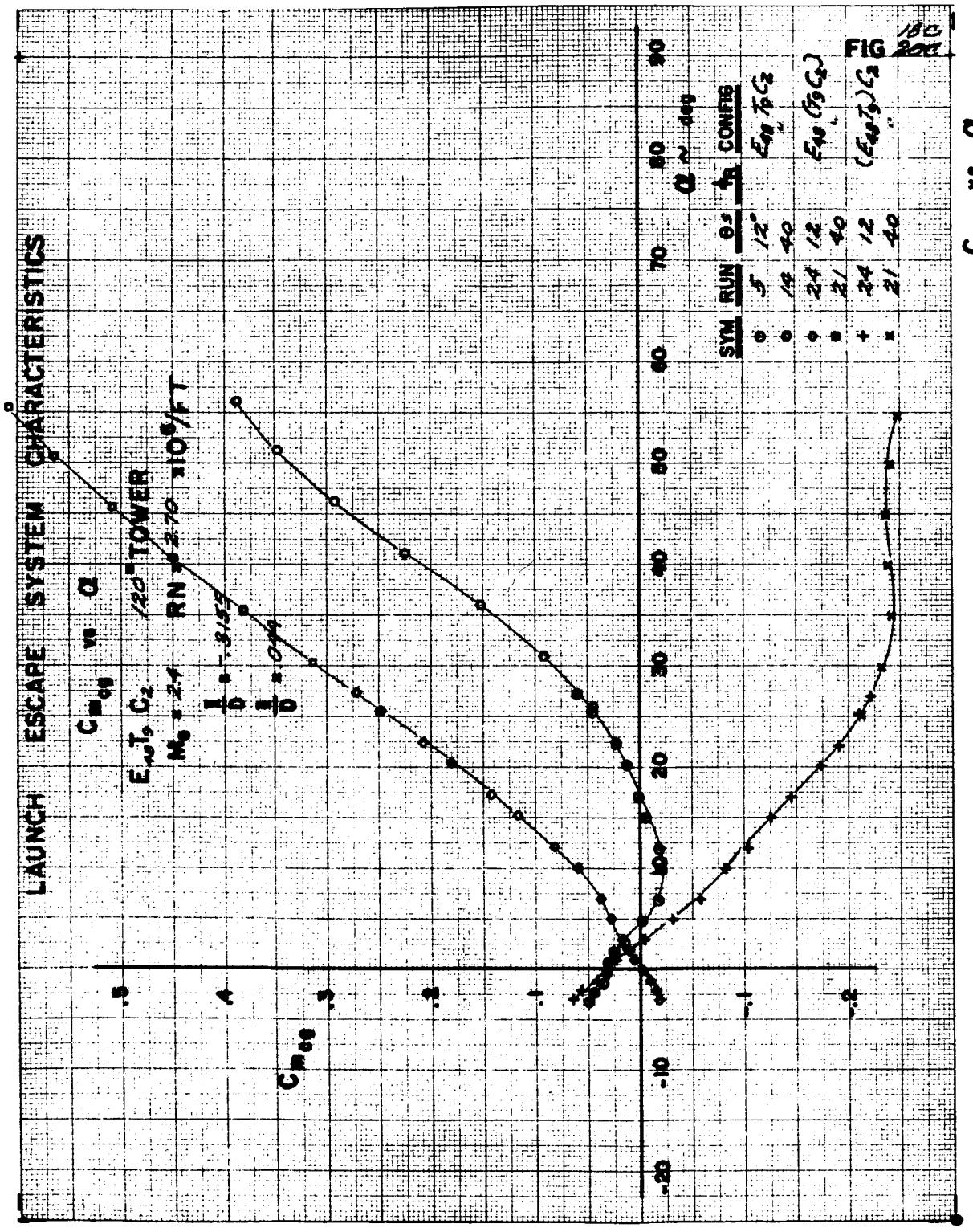

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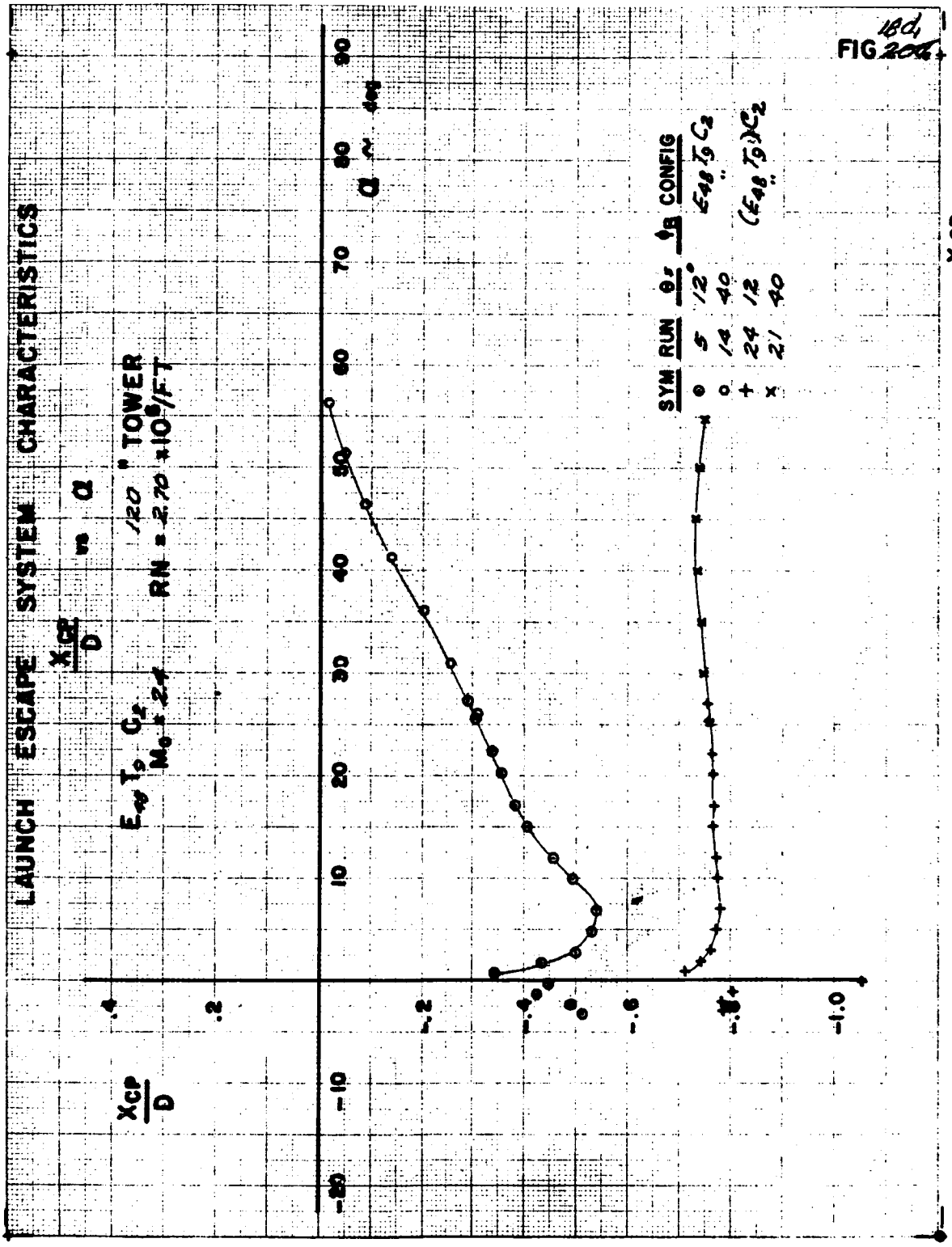

FIG 18d

Xcp/D vs α

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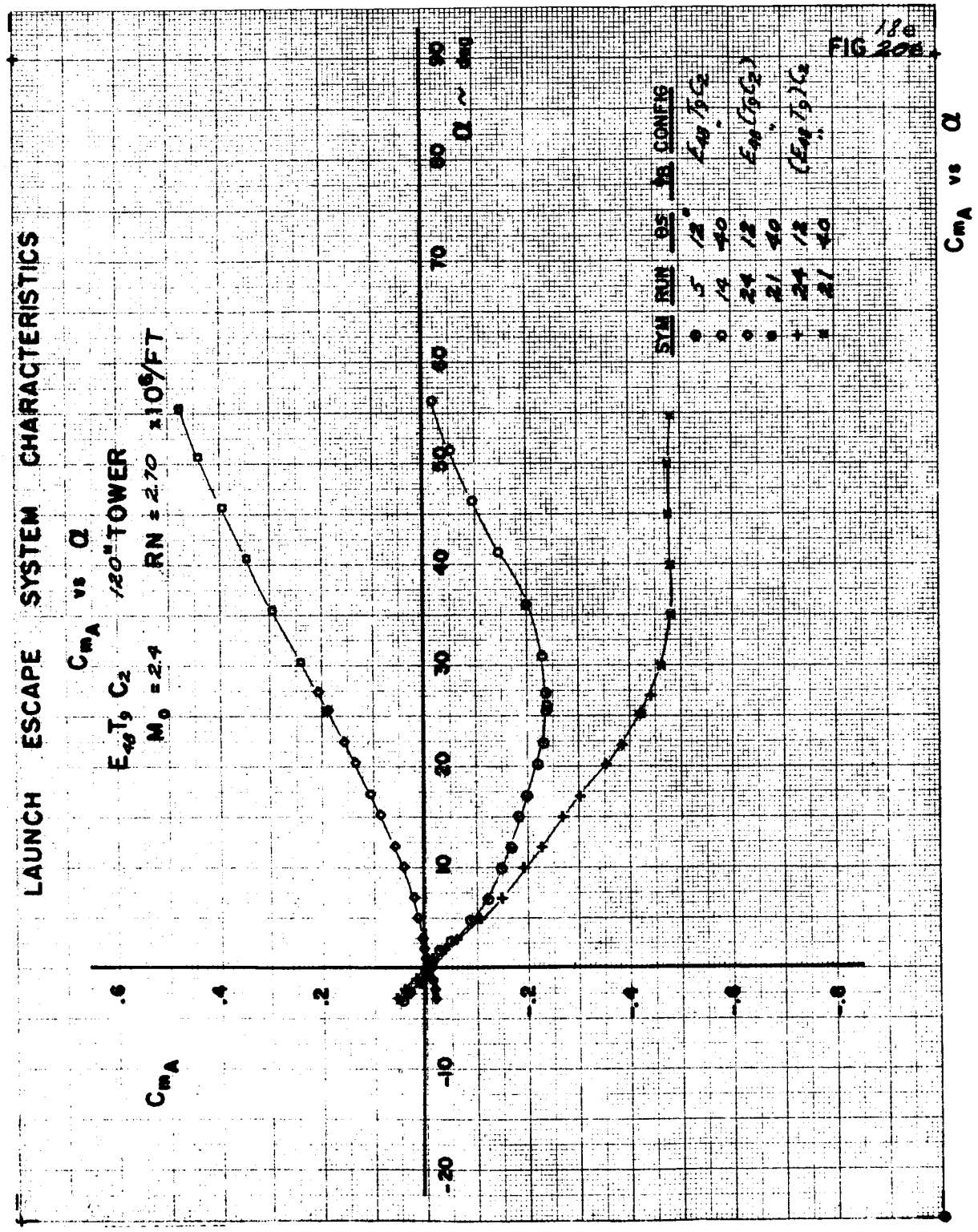

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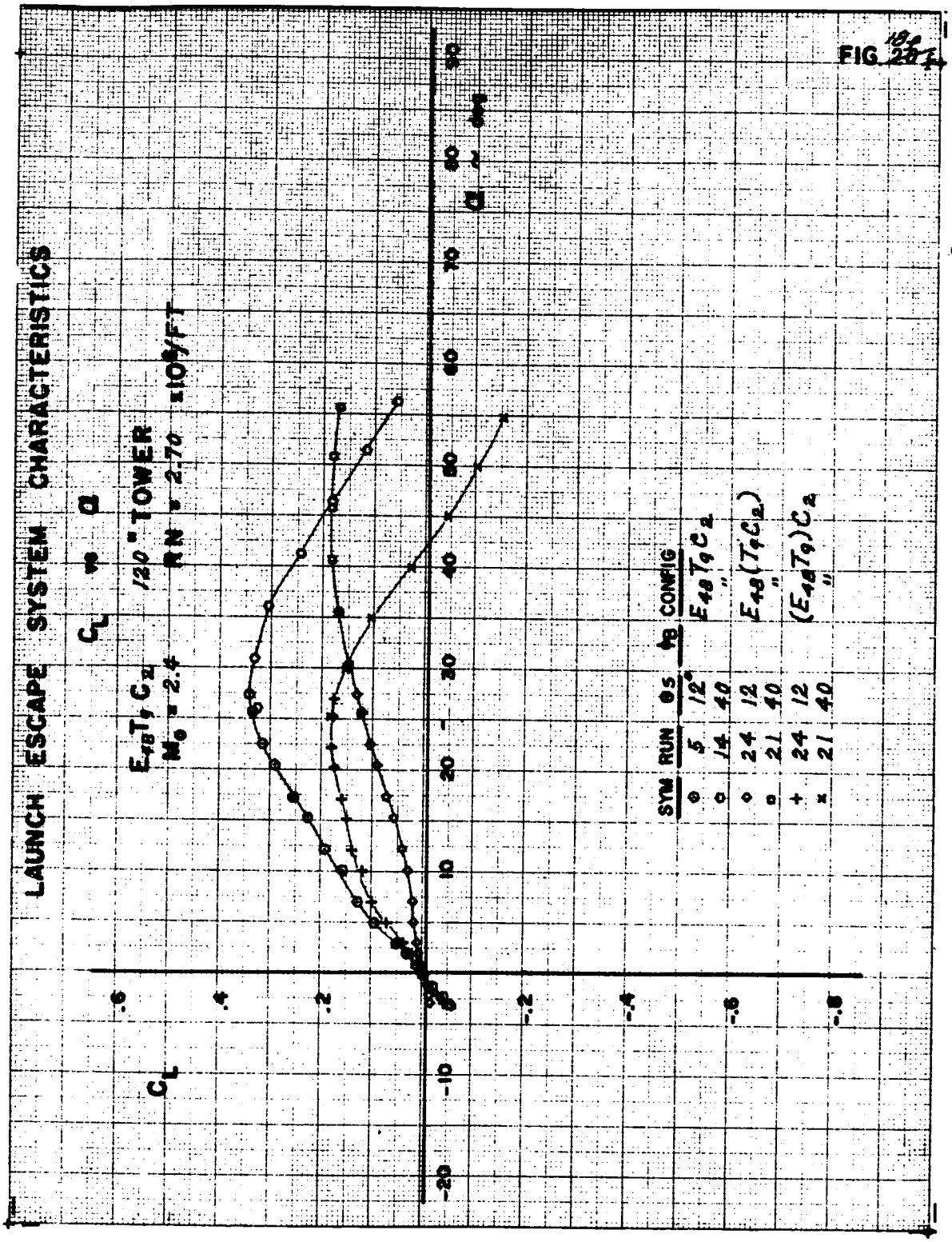

FIG. 20f

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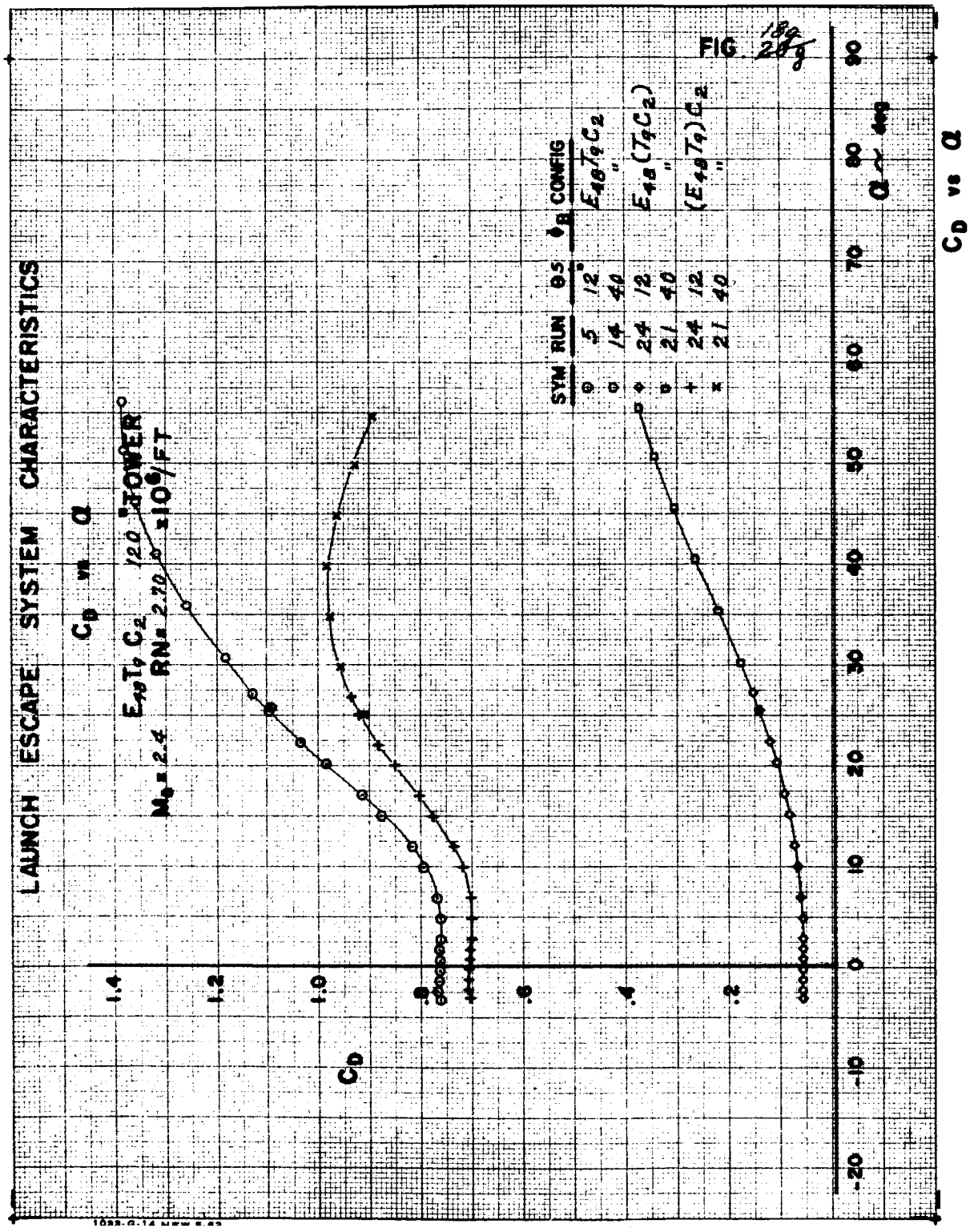

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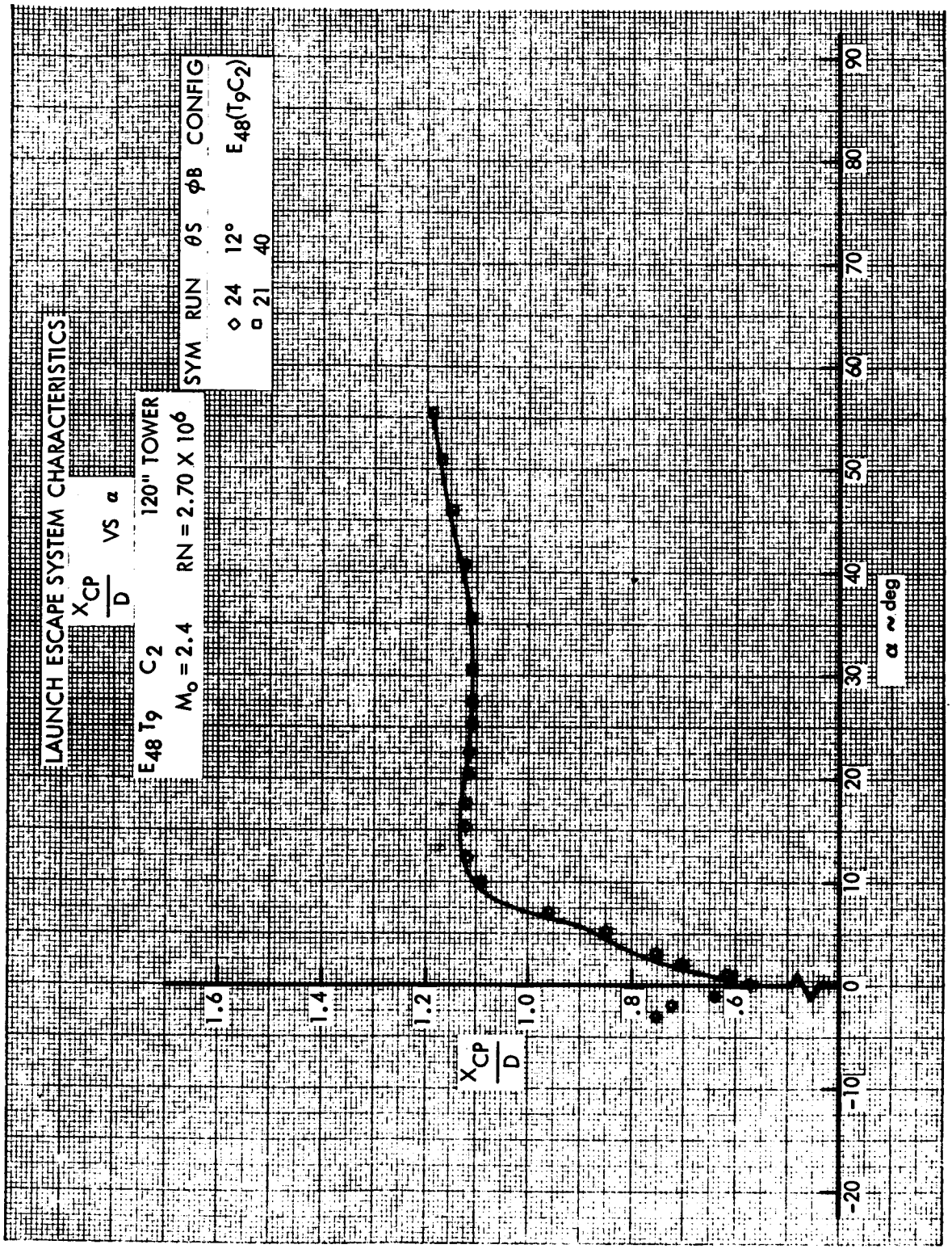

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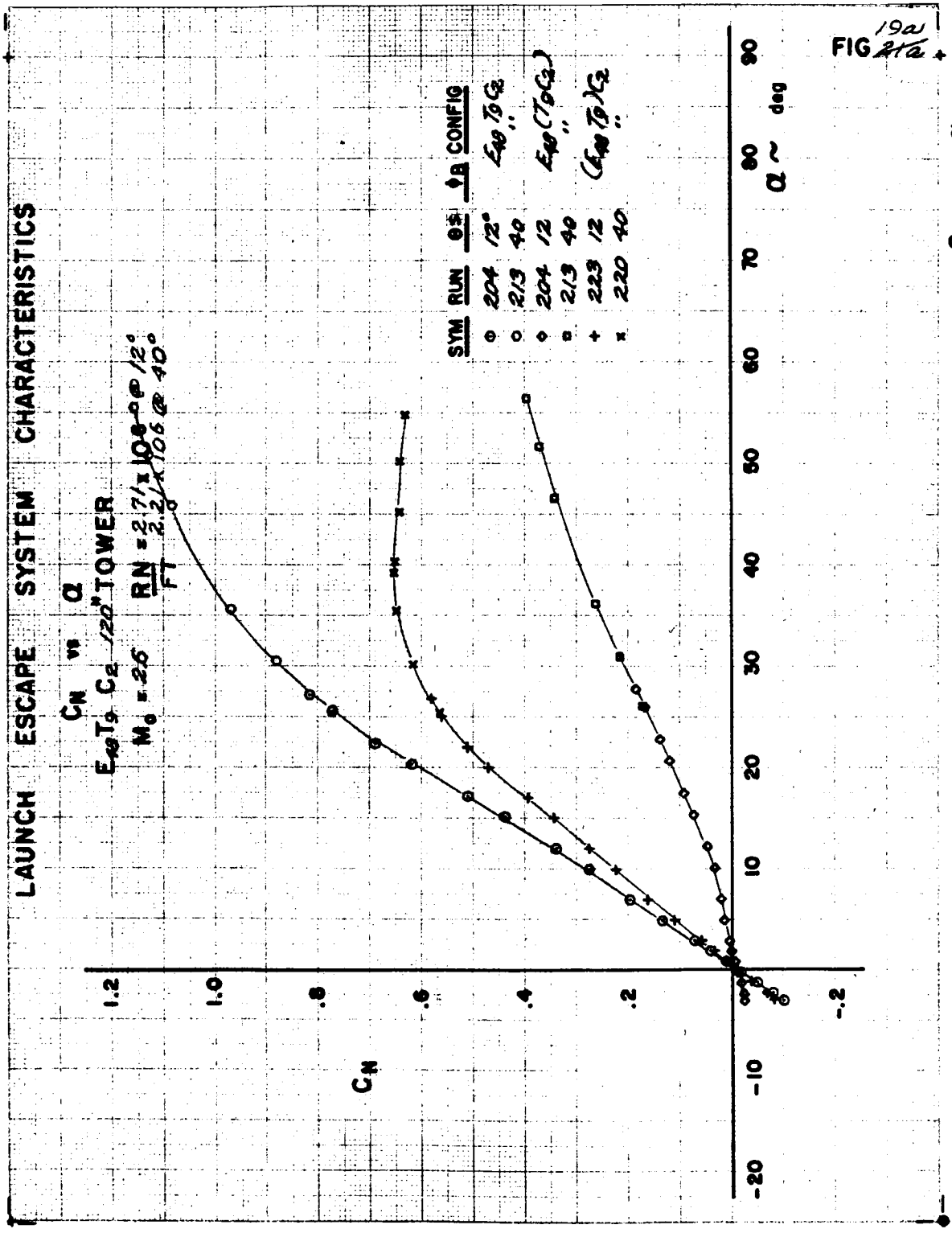

FIG 21a 19a

C_N vs α

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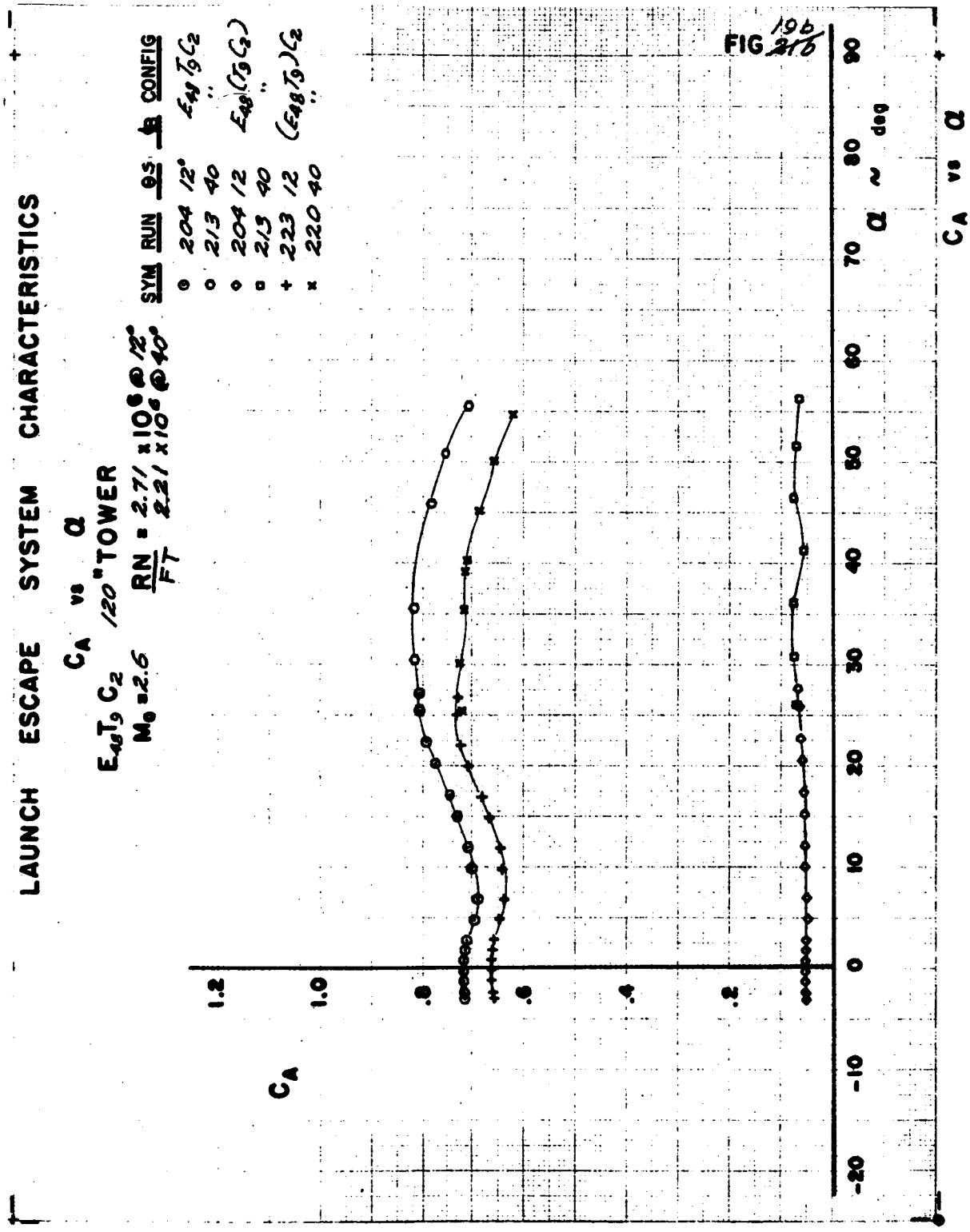

FIG 19b

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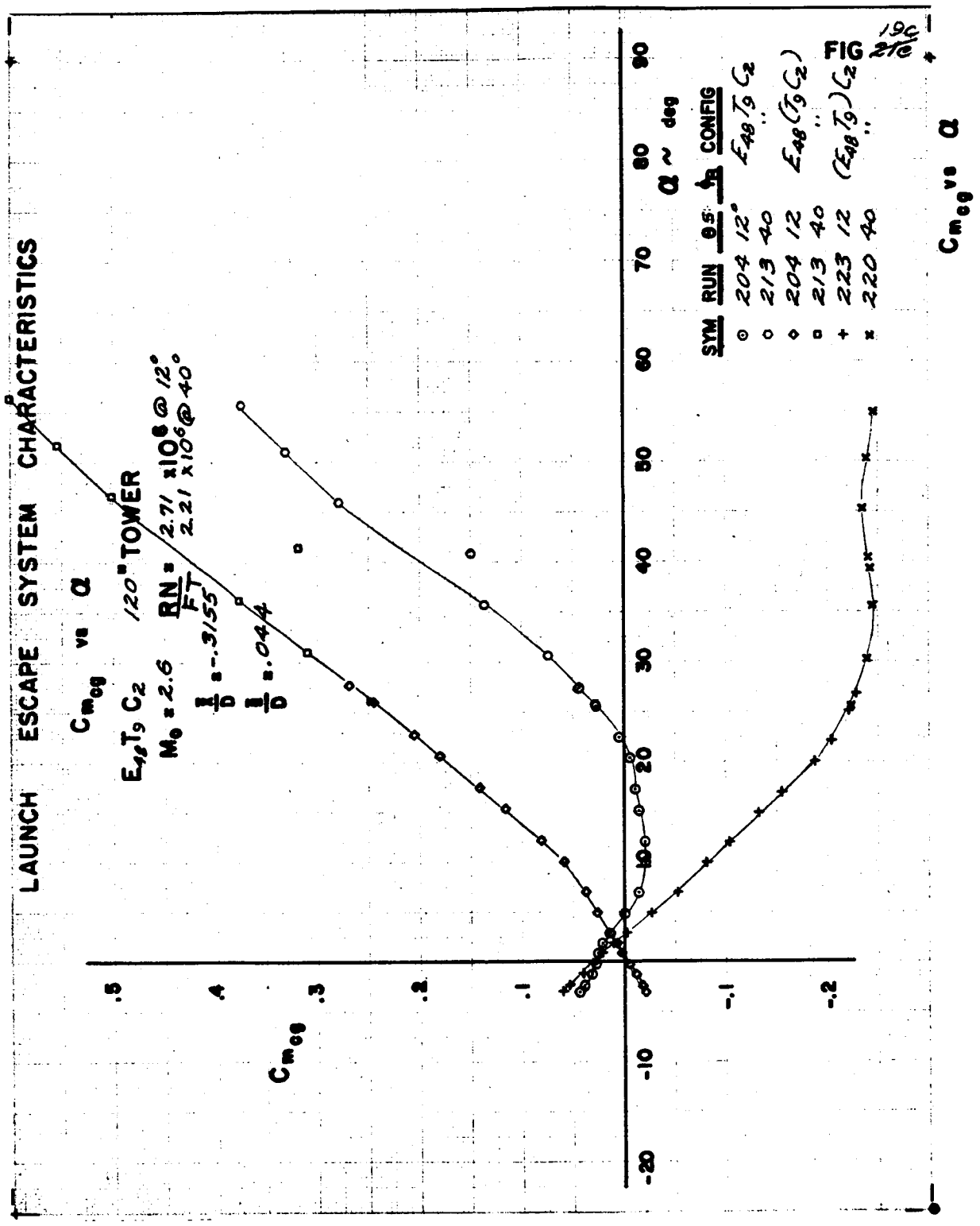

FIG 19c

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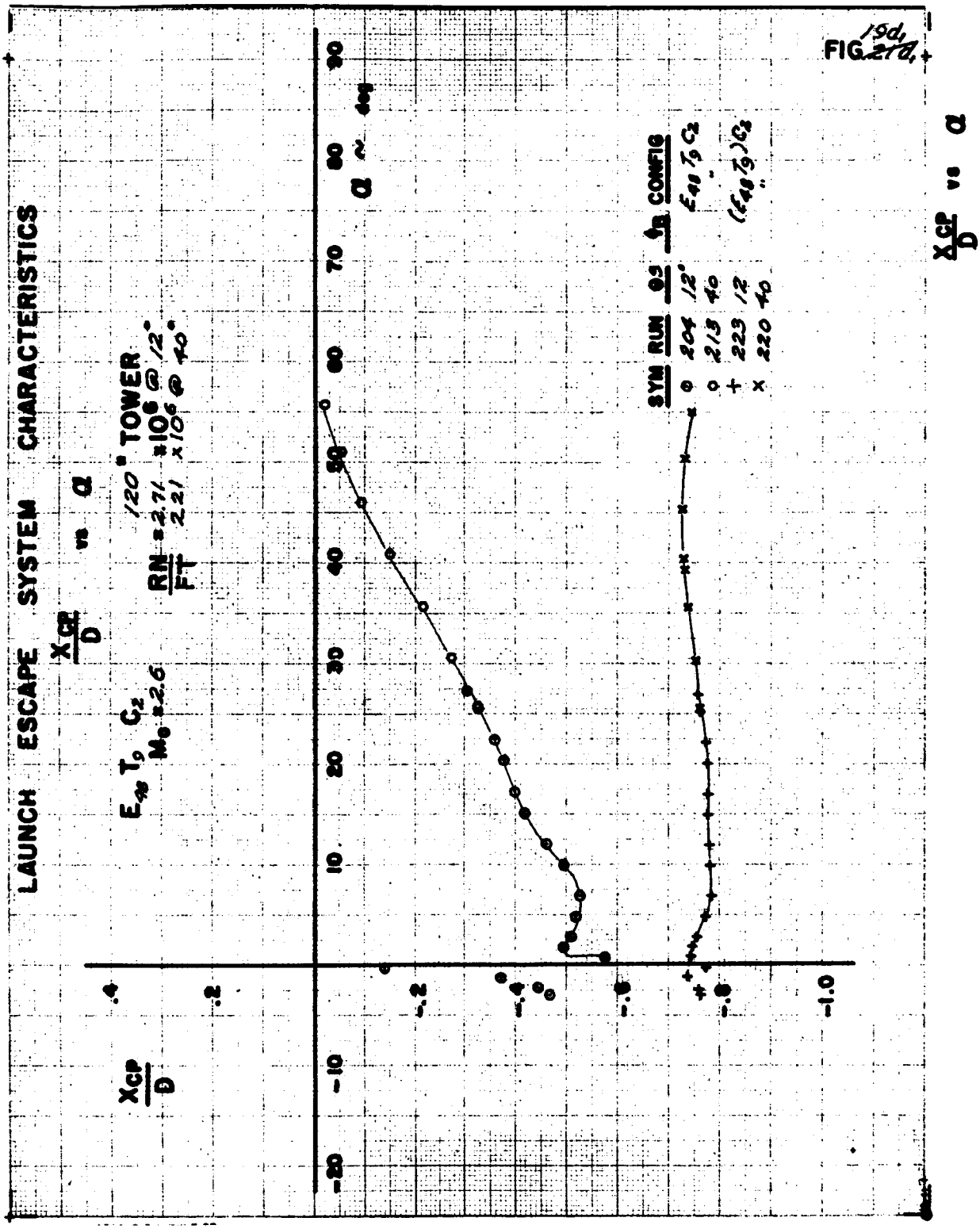

FIG. 19d, ~~21d~~

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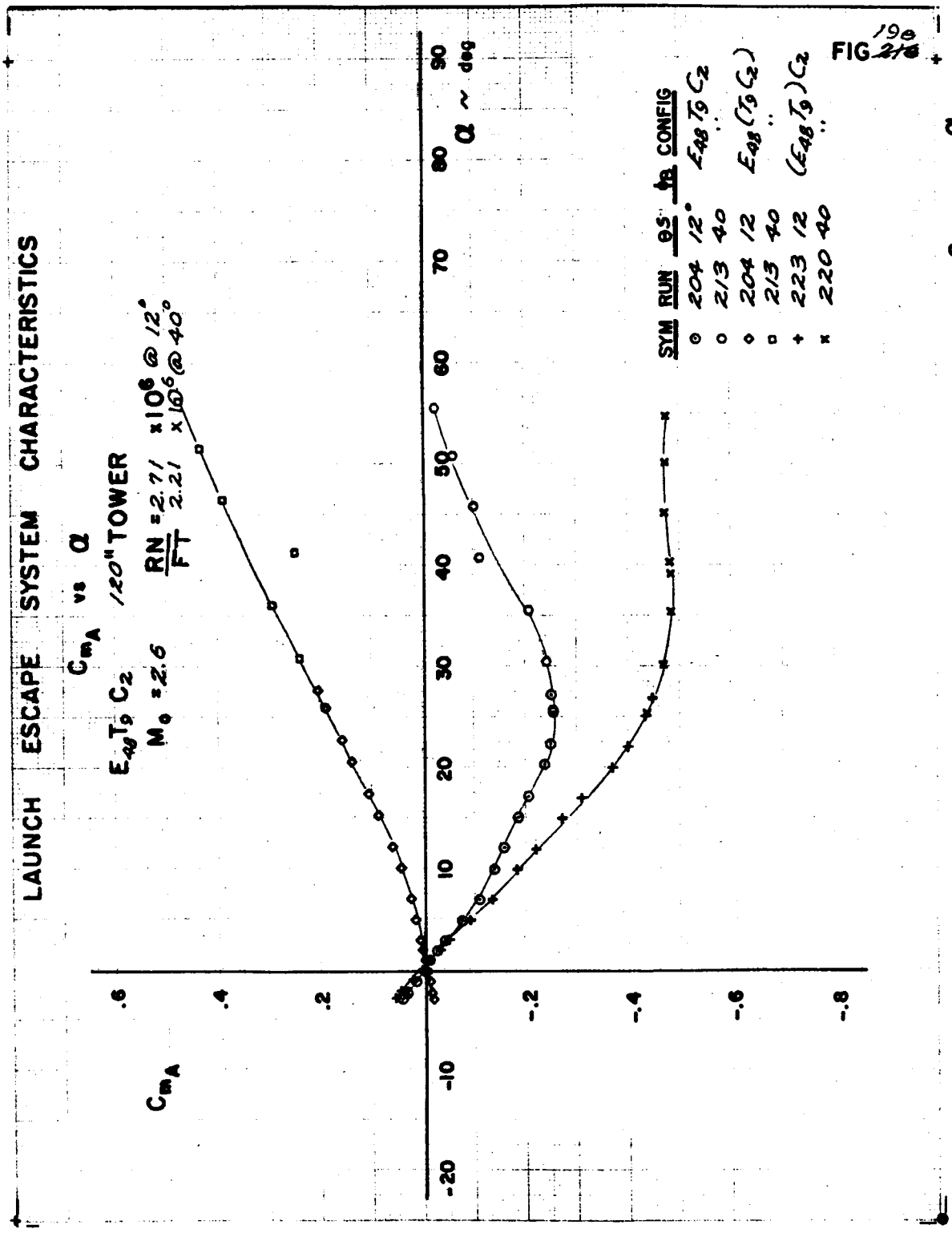

FIG 19a

C_{m_A} vs α

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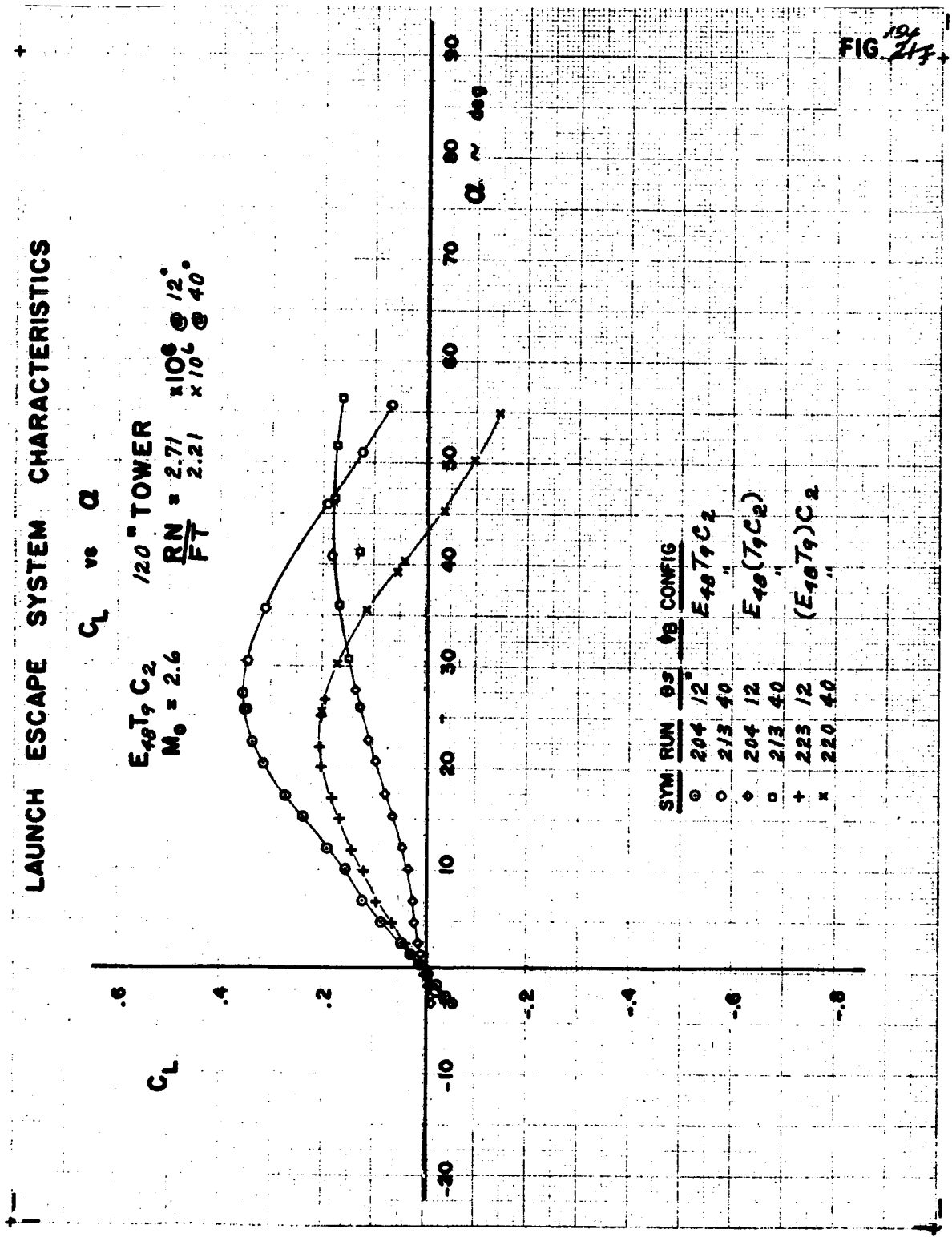

FIG. 124

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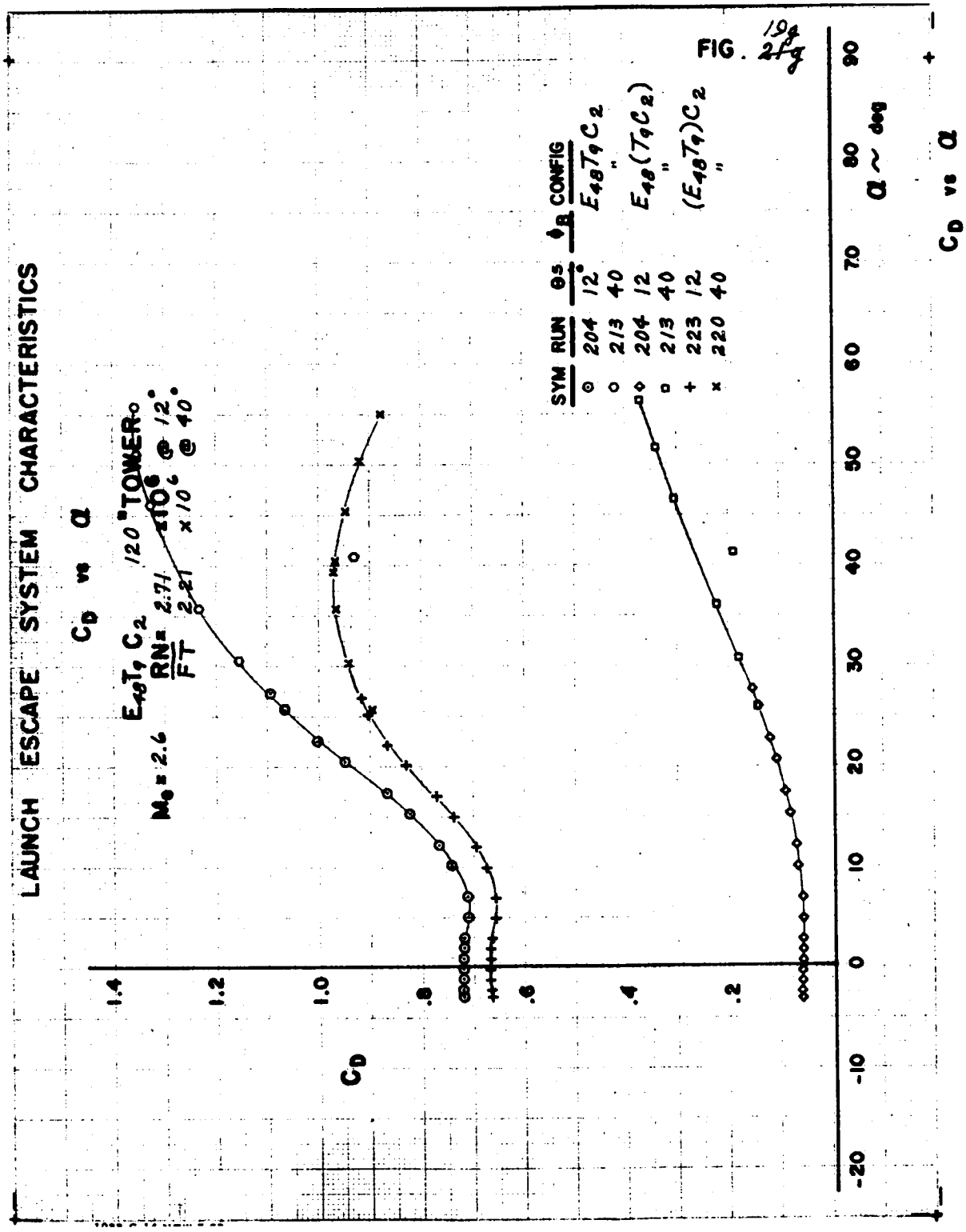

FIG. 19g

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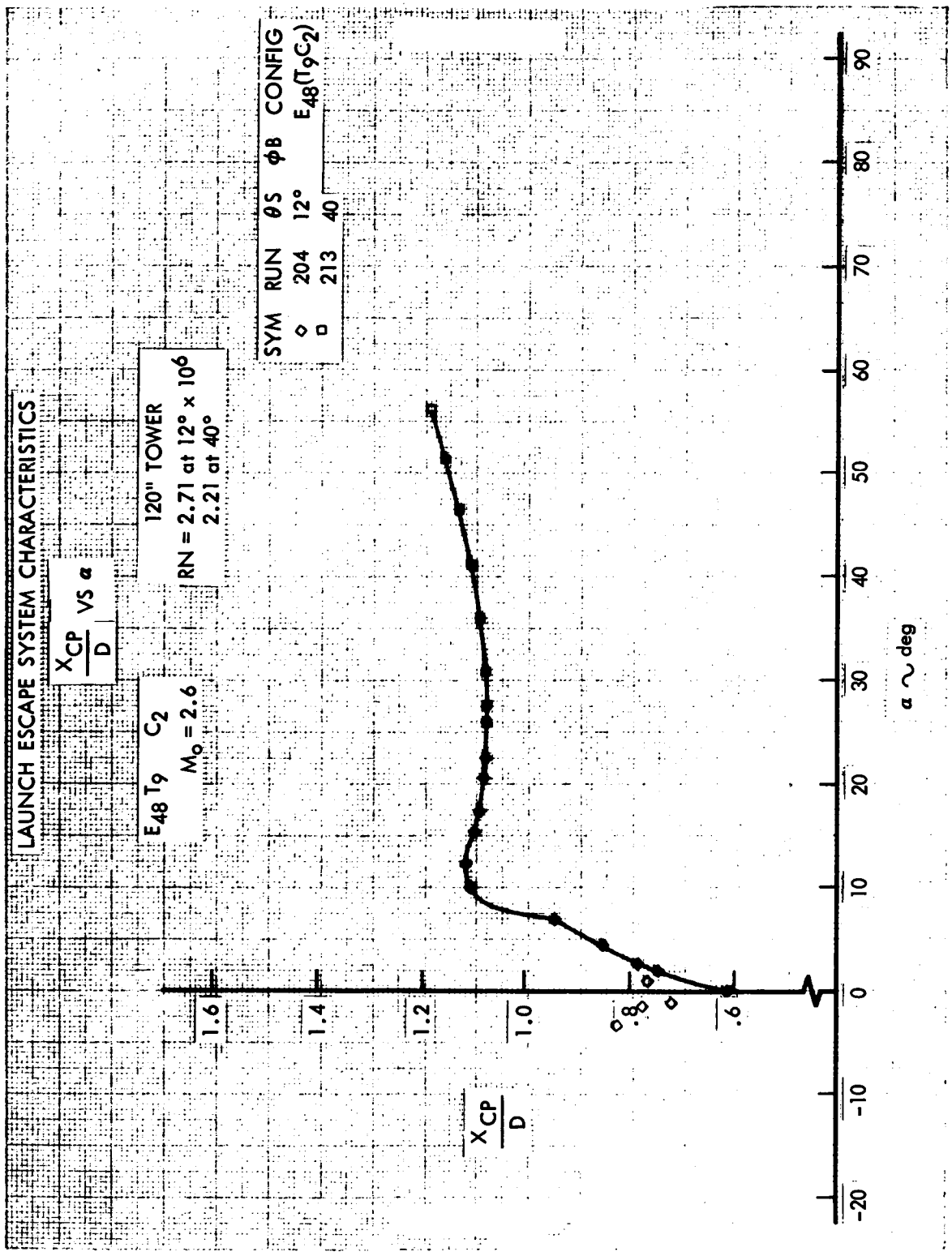

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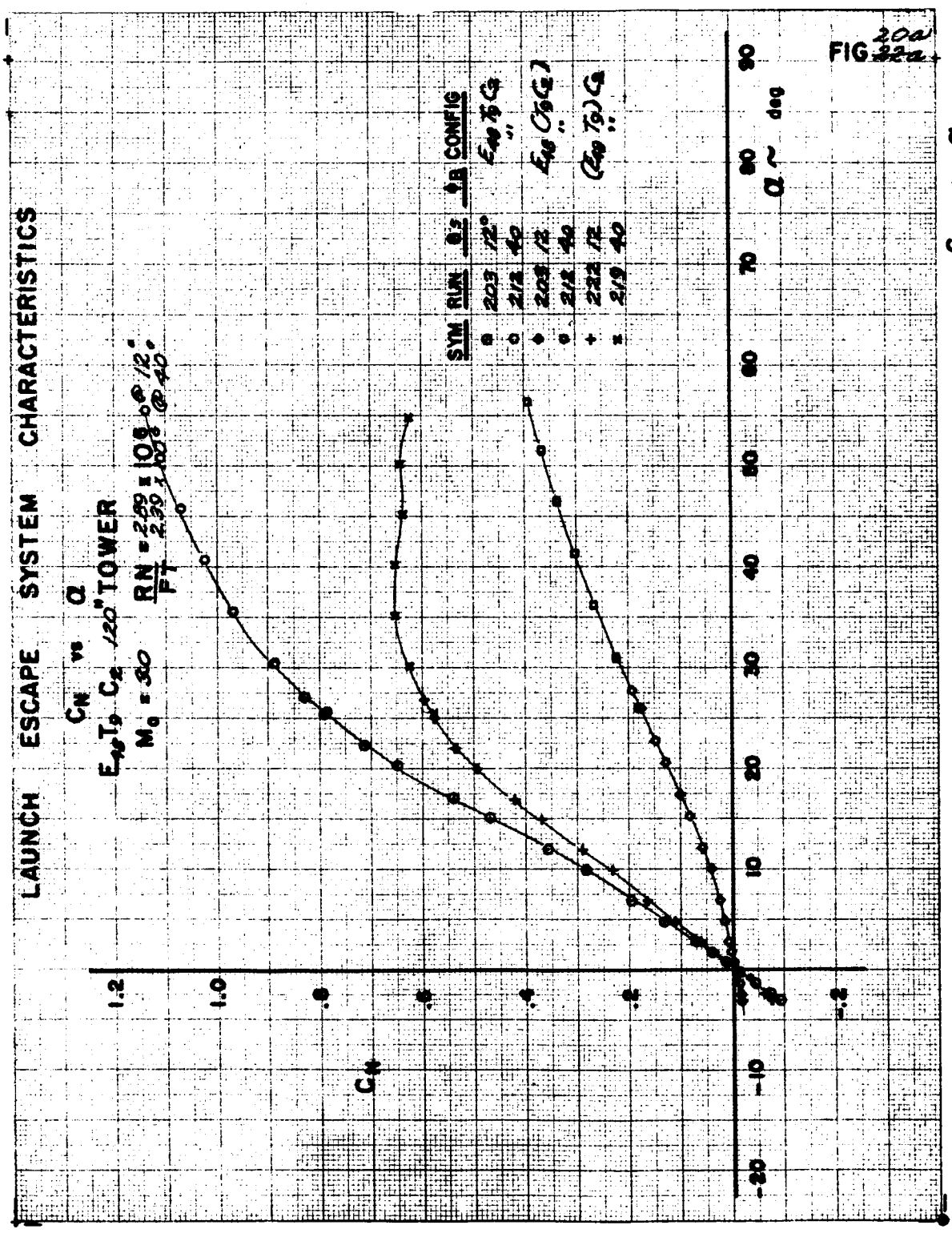

FIG 20a 22a

C_N vs α

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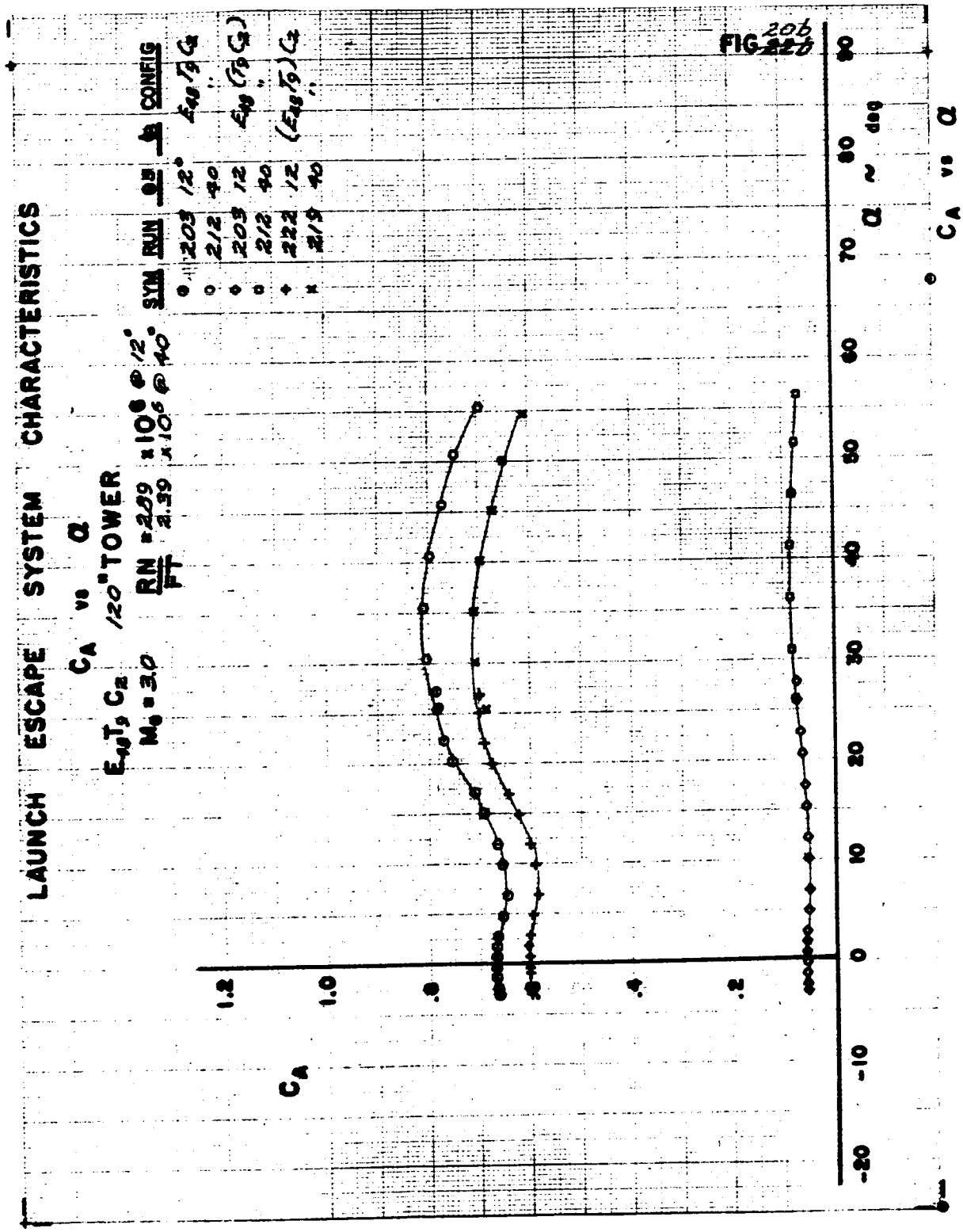

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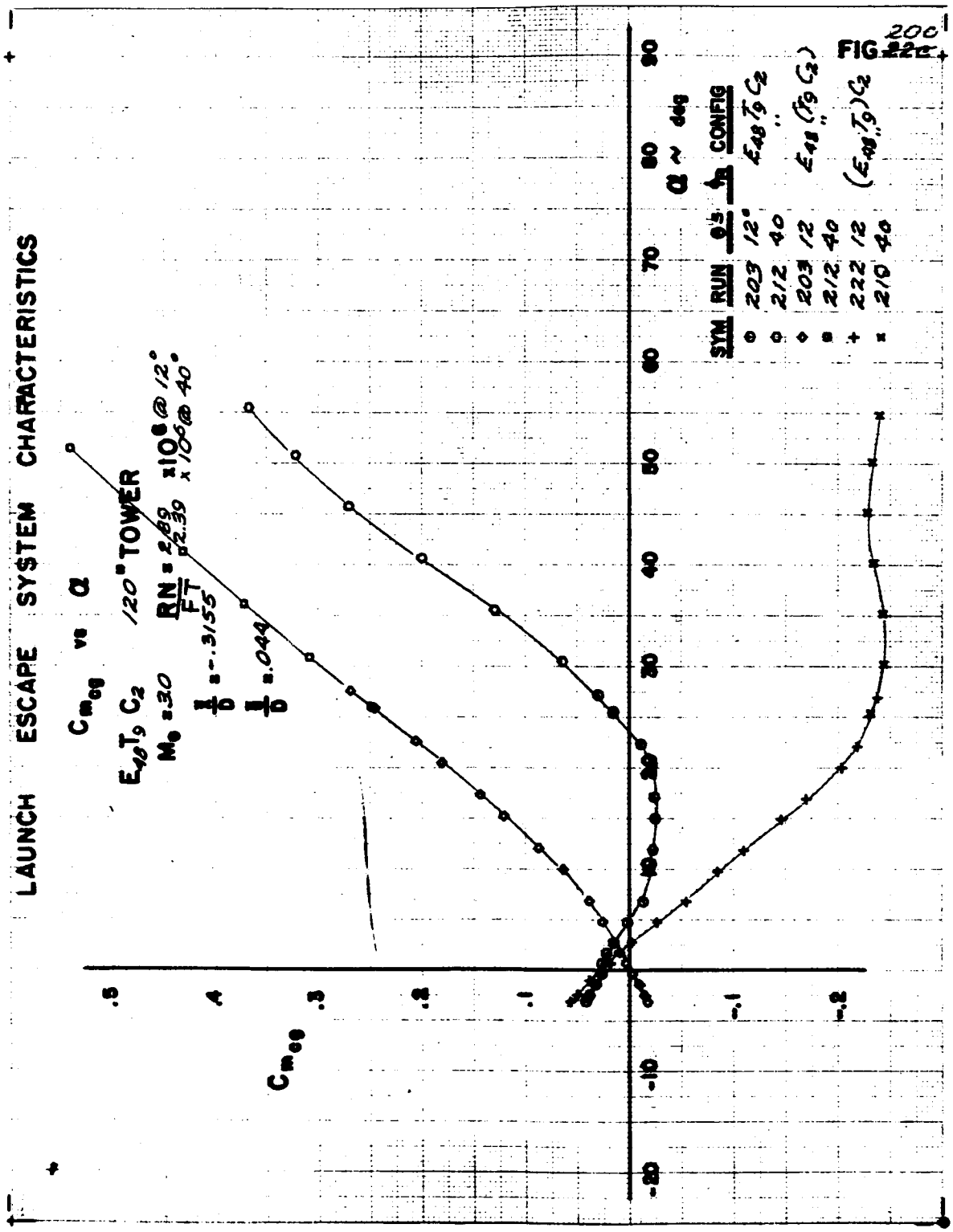

FIG 22c 20c

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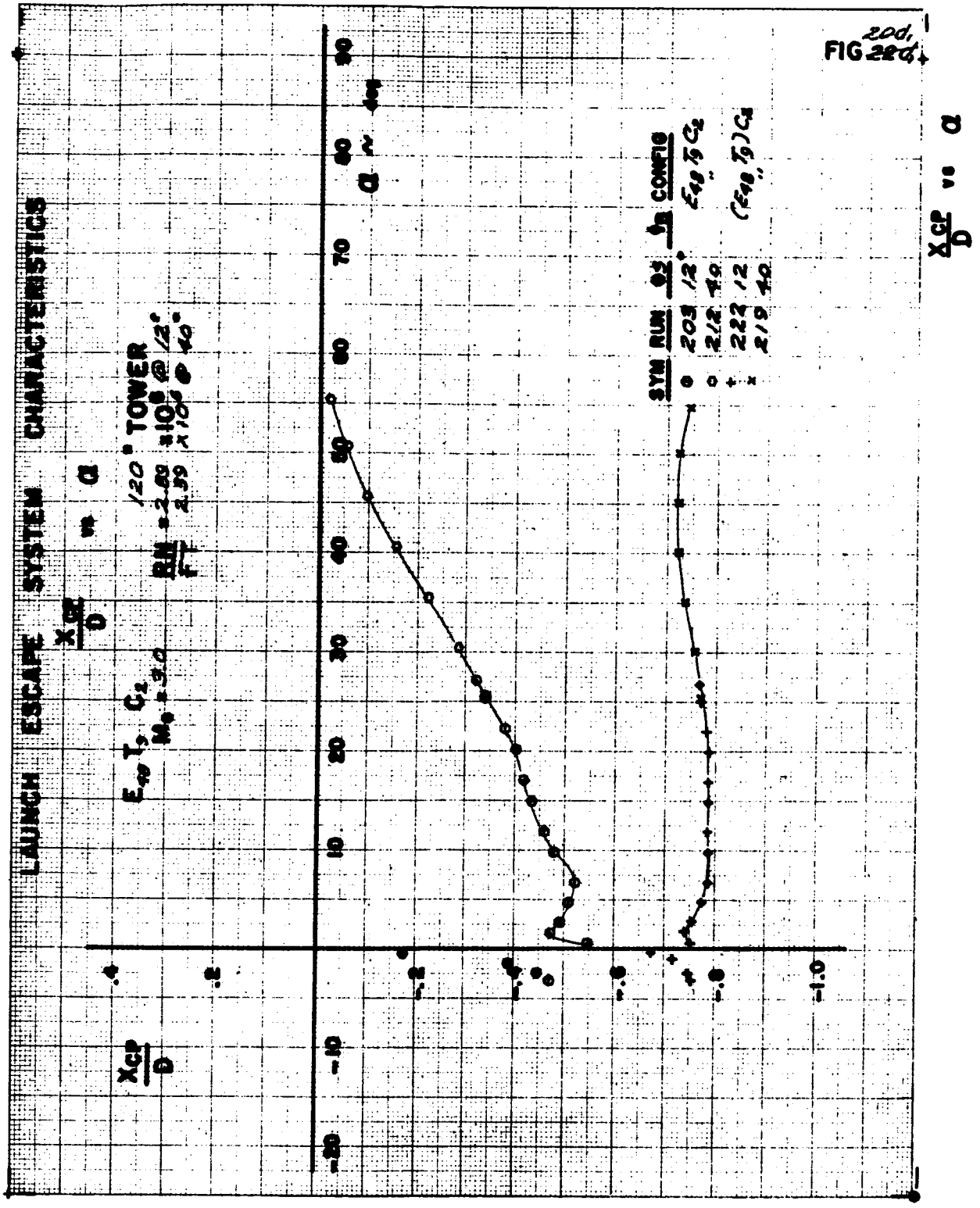

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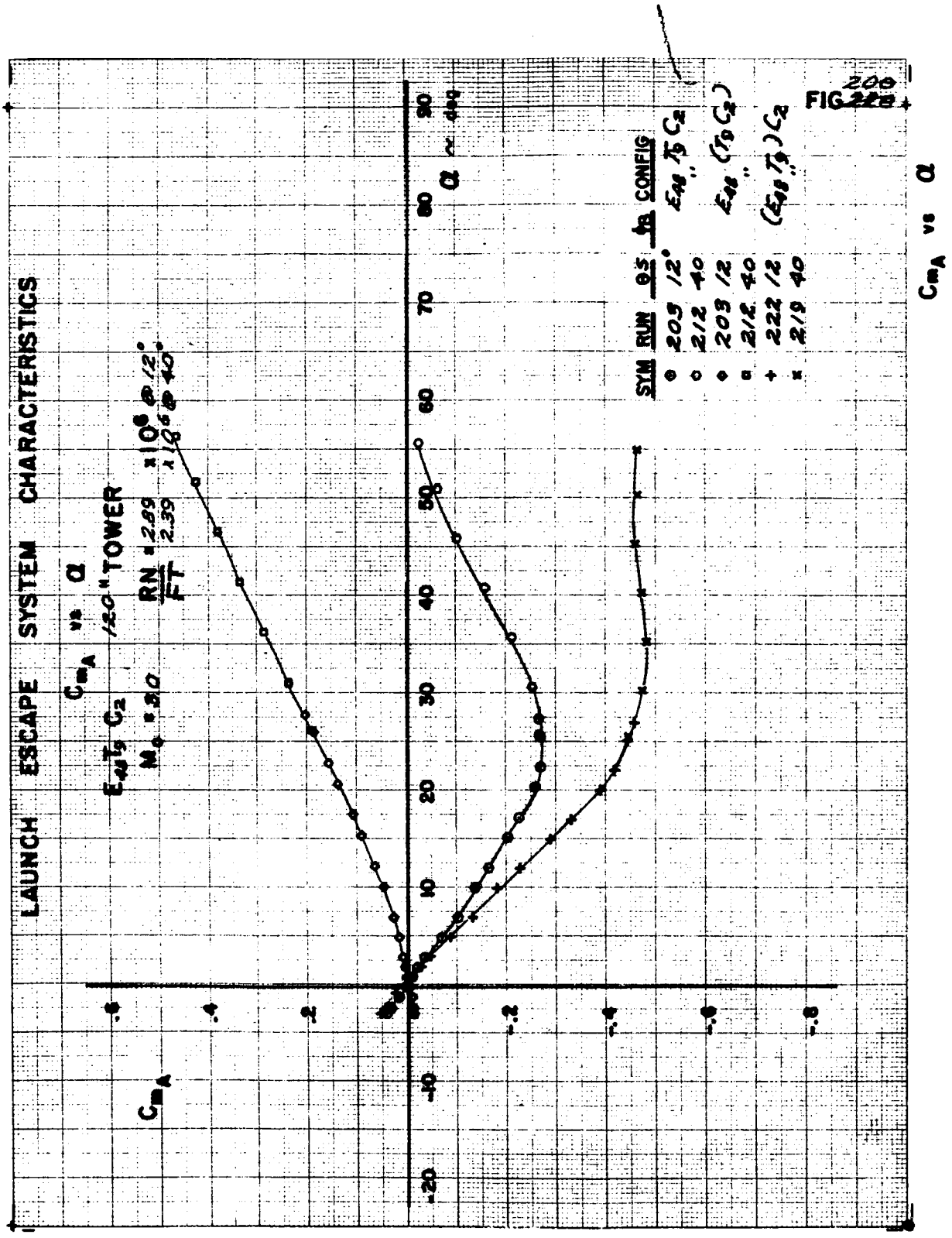

FIG 220

C_{m_A} vs α

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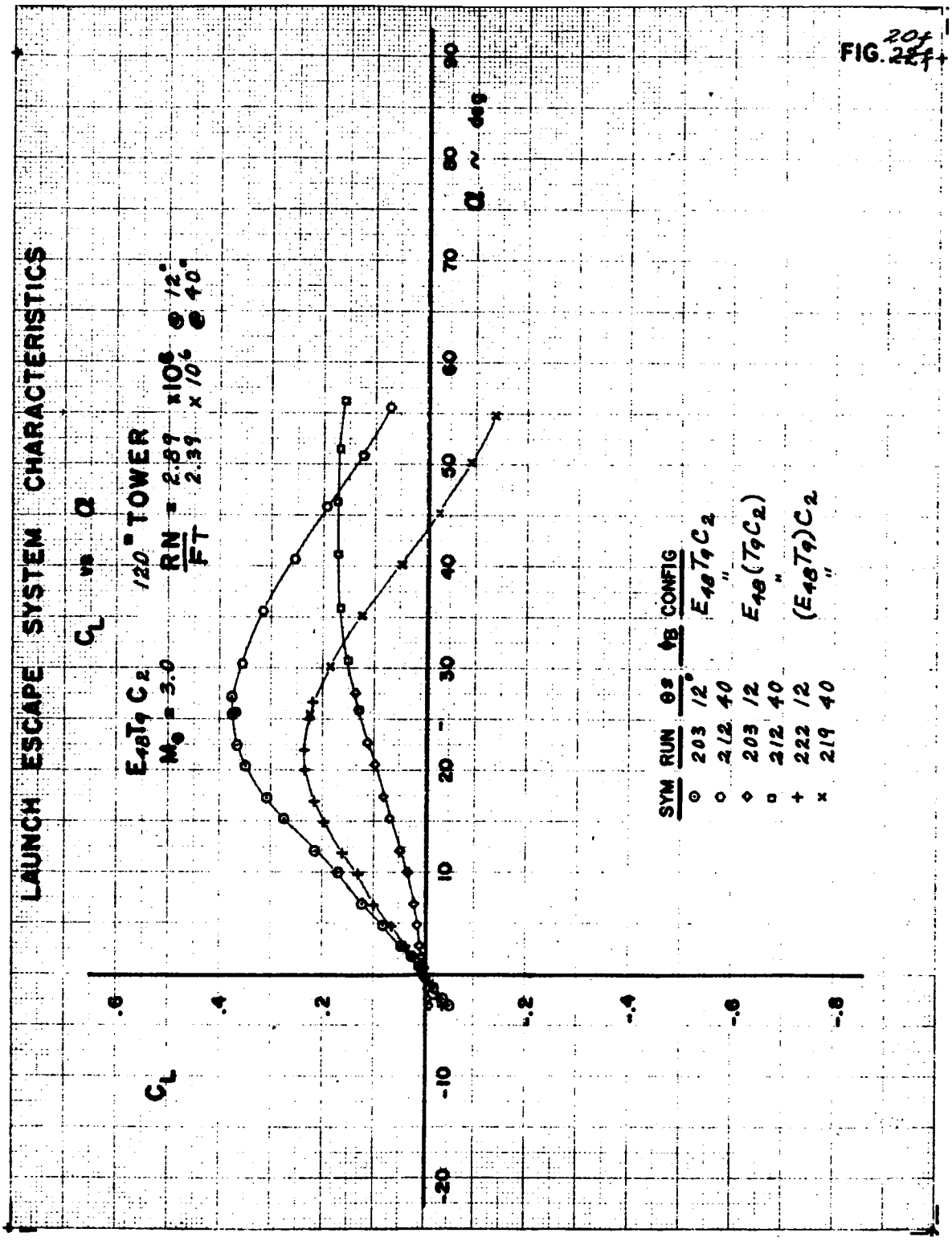

FIG. 204

C_L vs α

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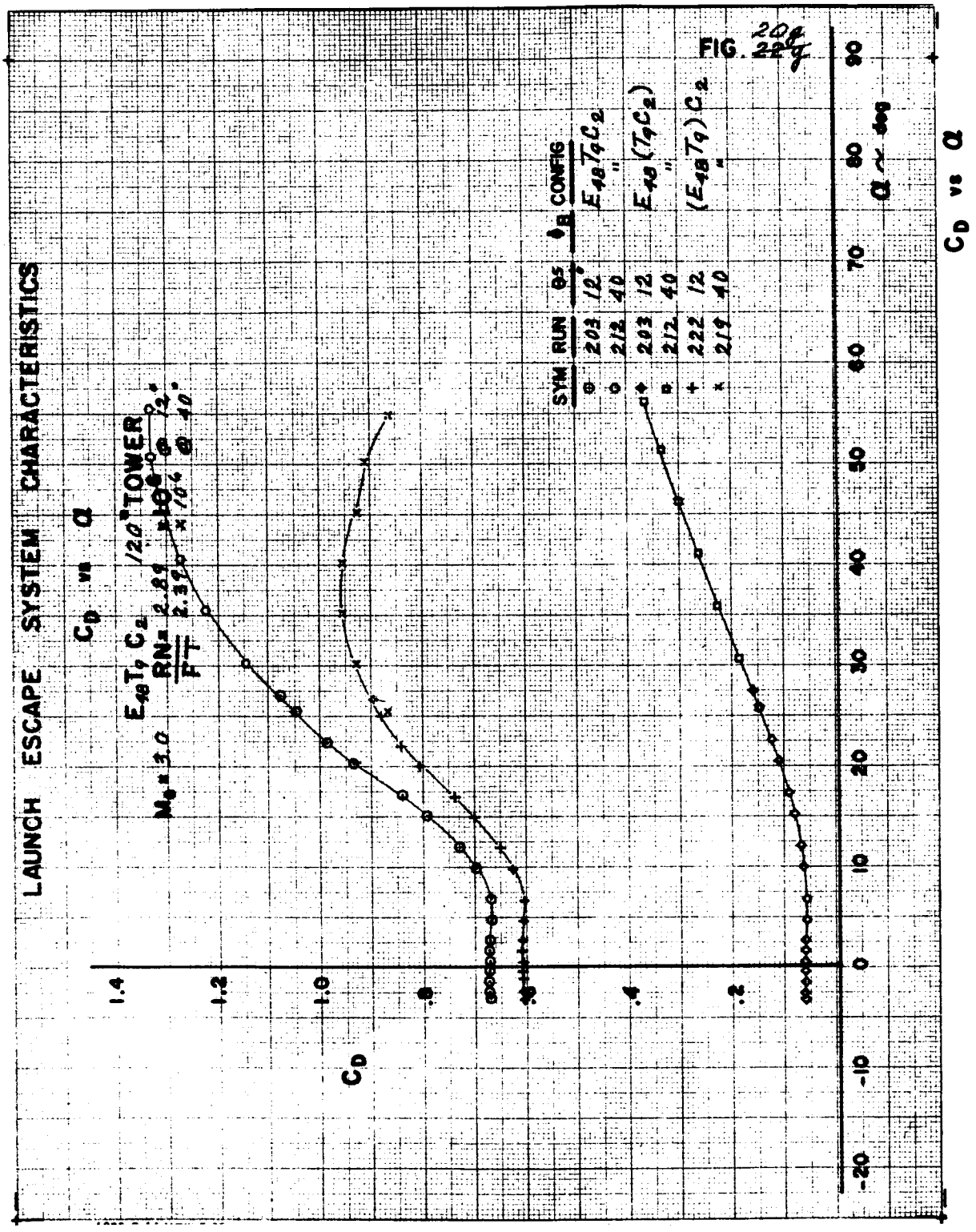

FIG. 22g

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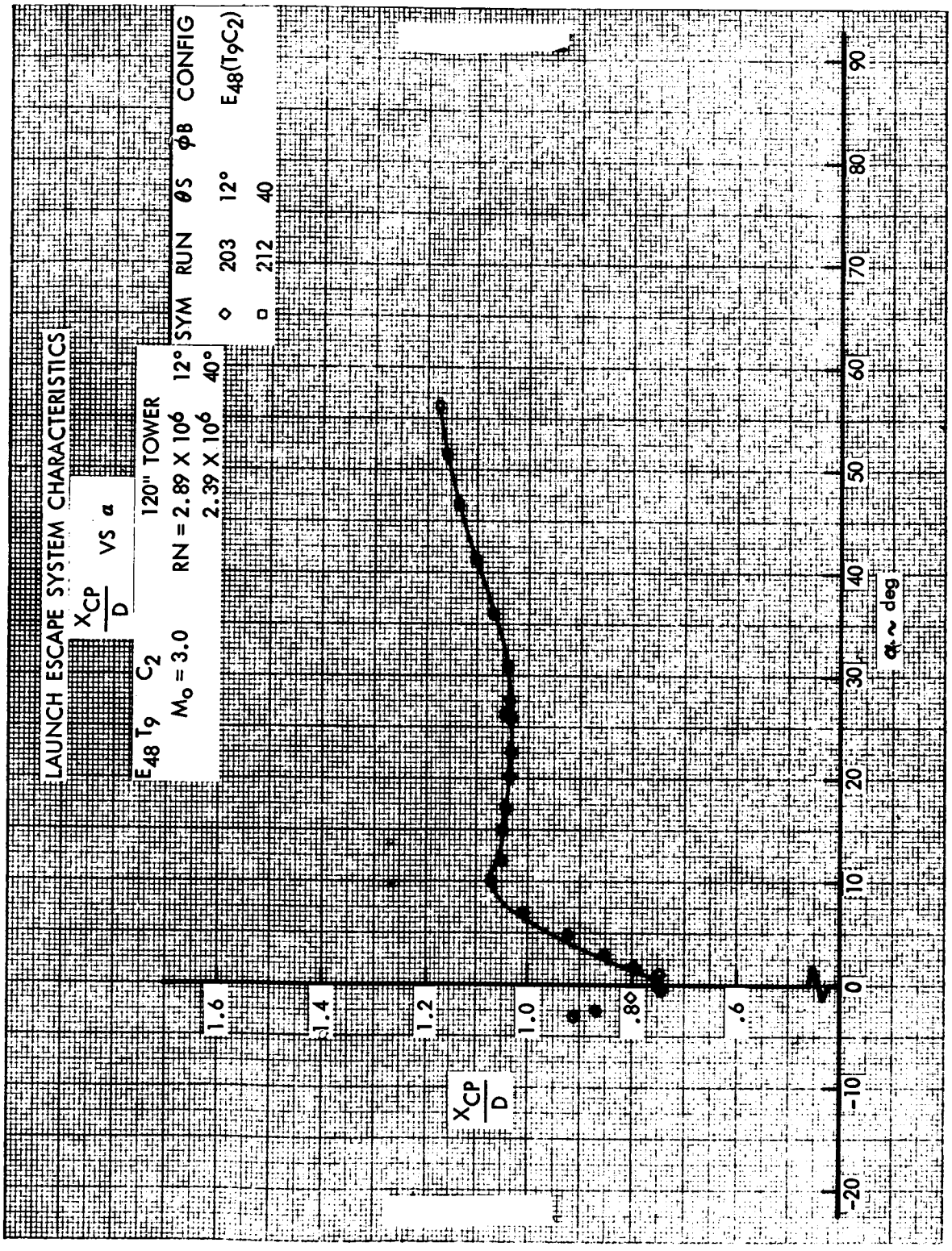

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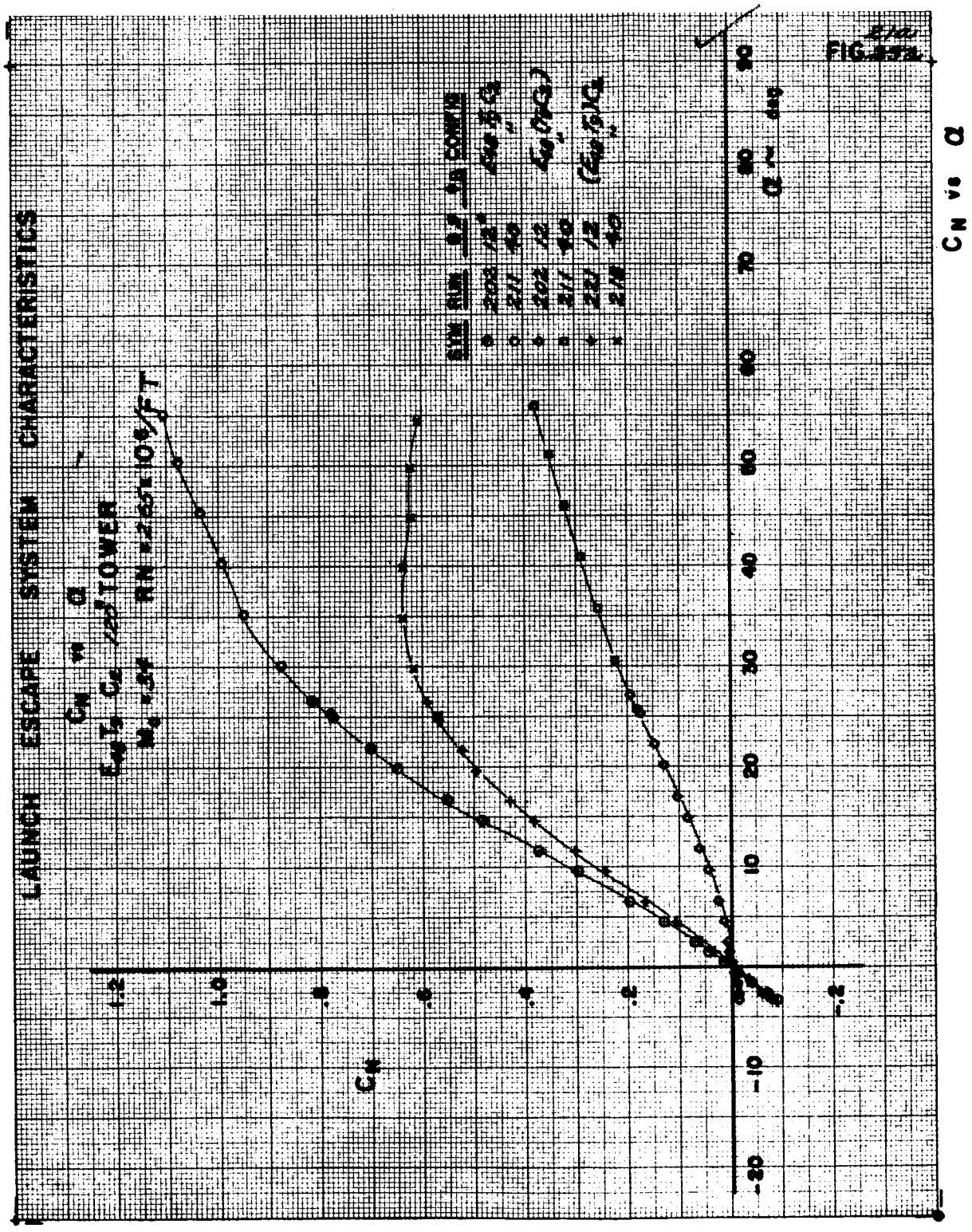

FIG. 21a

C_N vs α

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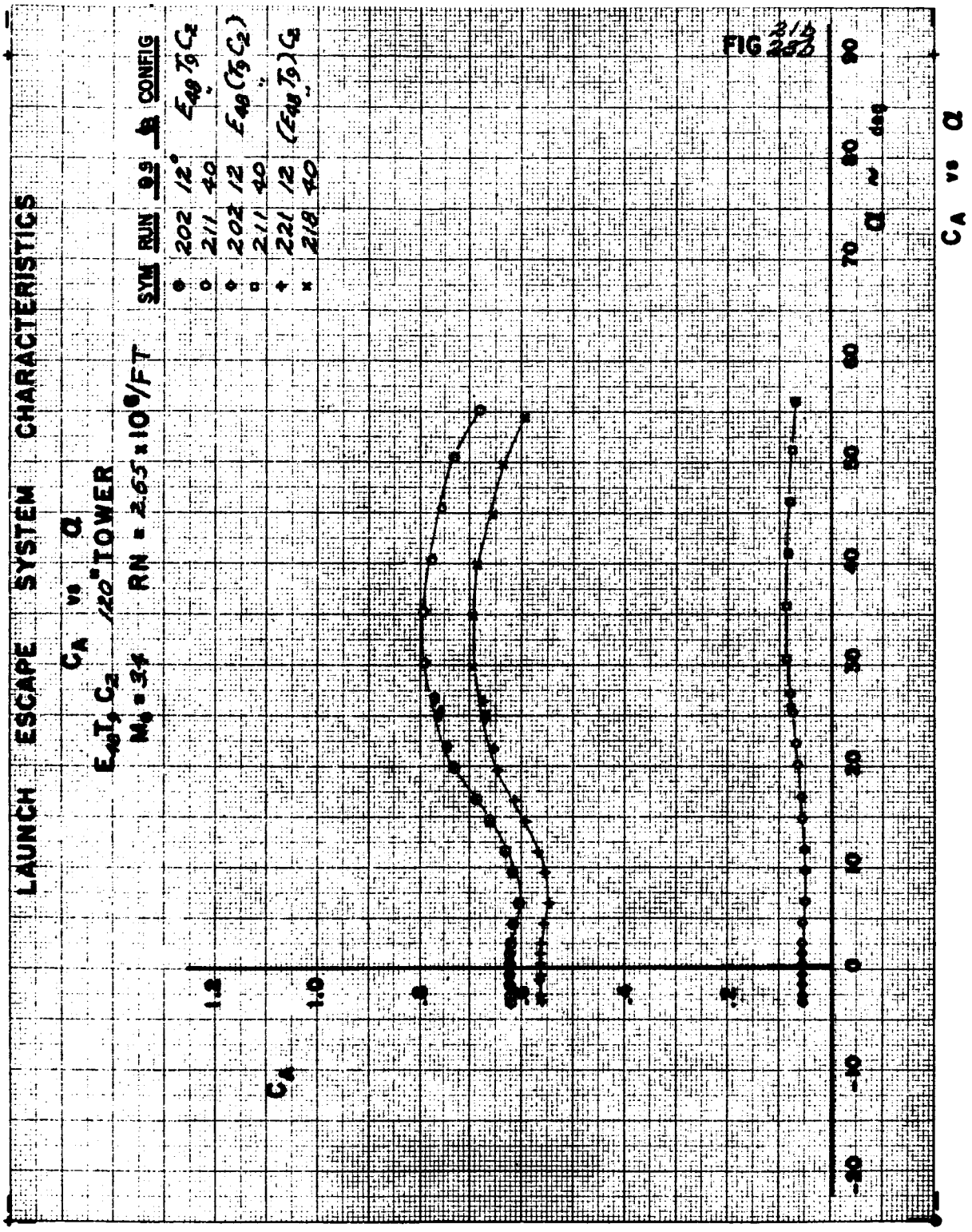

FIG 215

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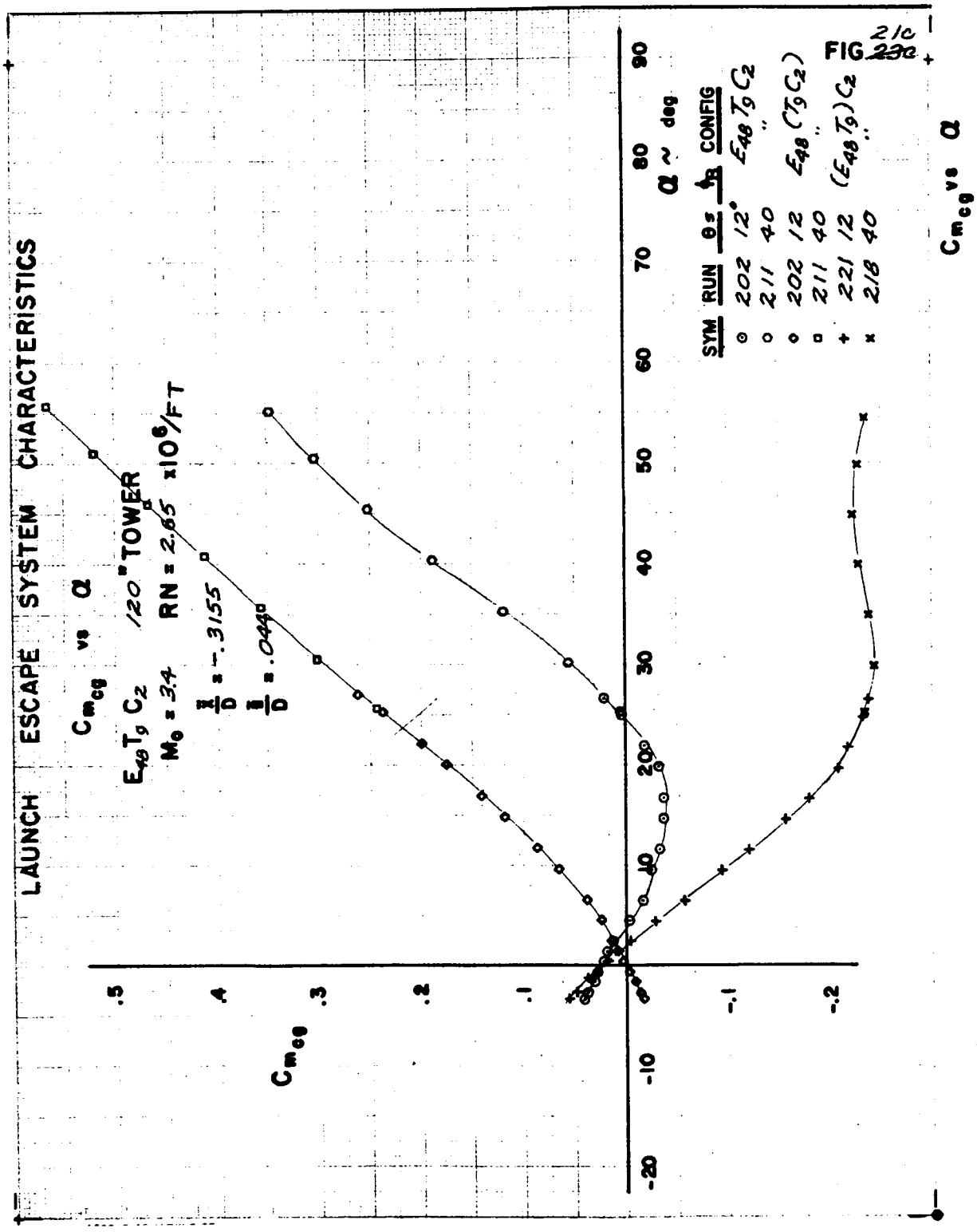

FIG ~~23a~~ 21c

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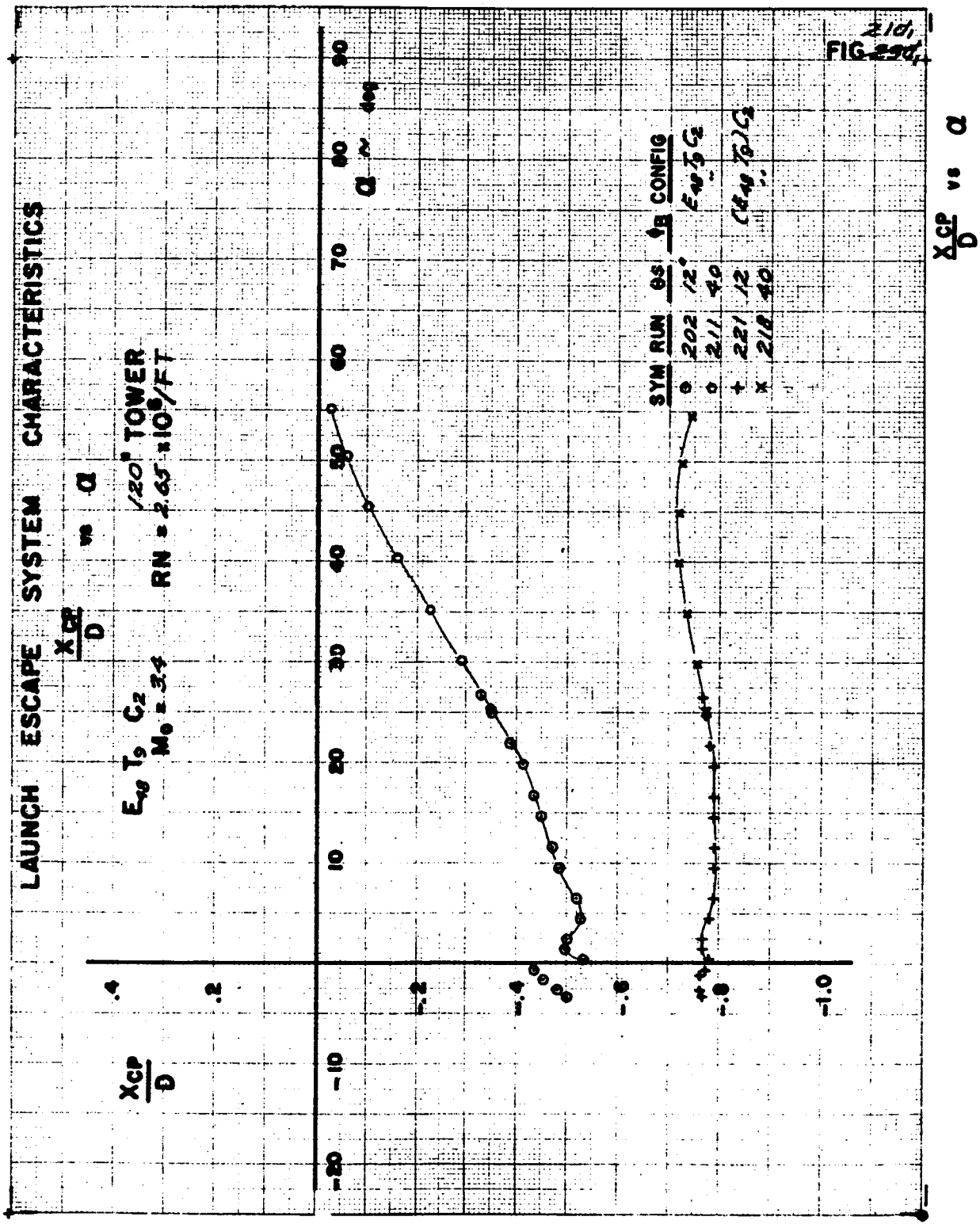

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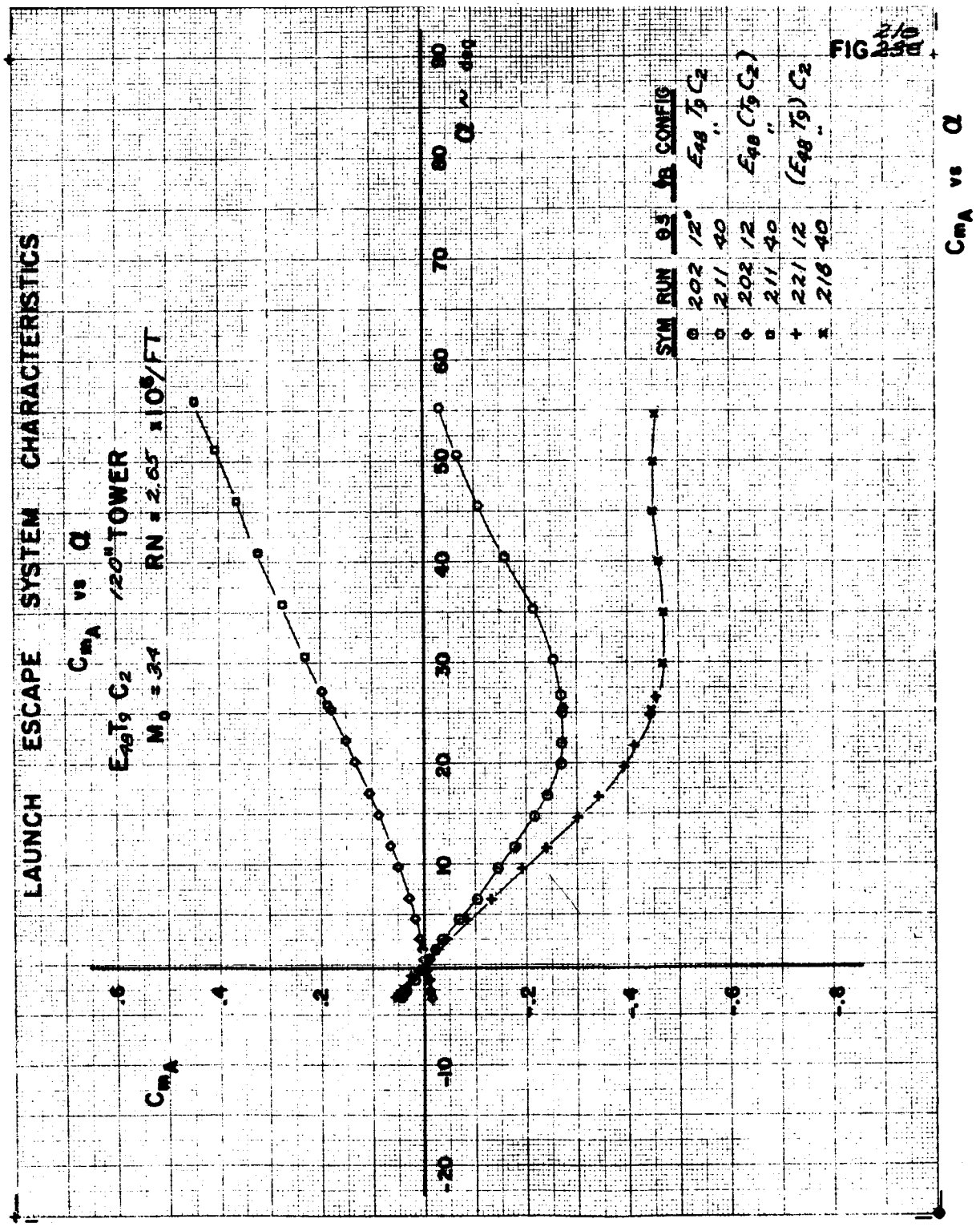

FIG 210

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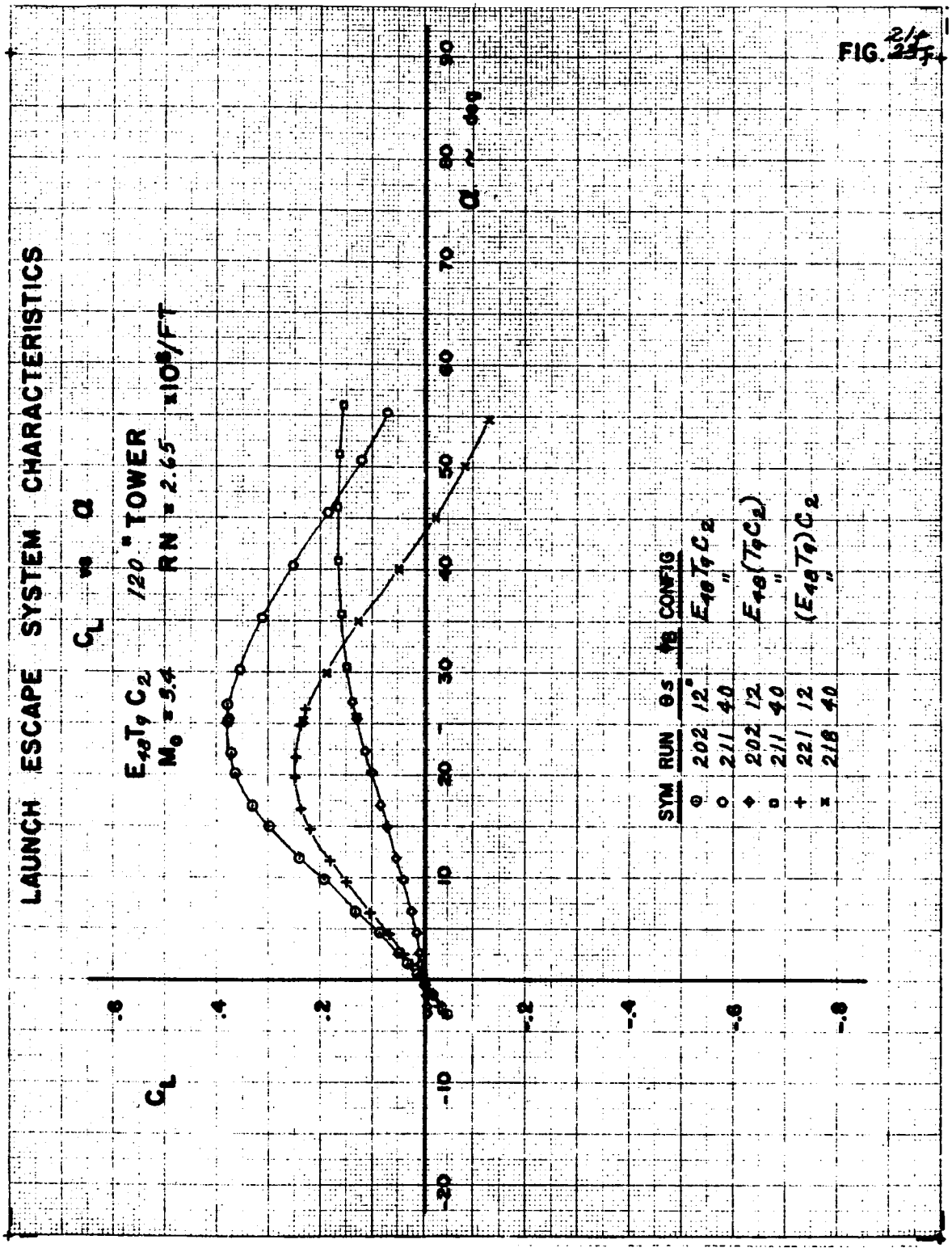

C_L vs α

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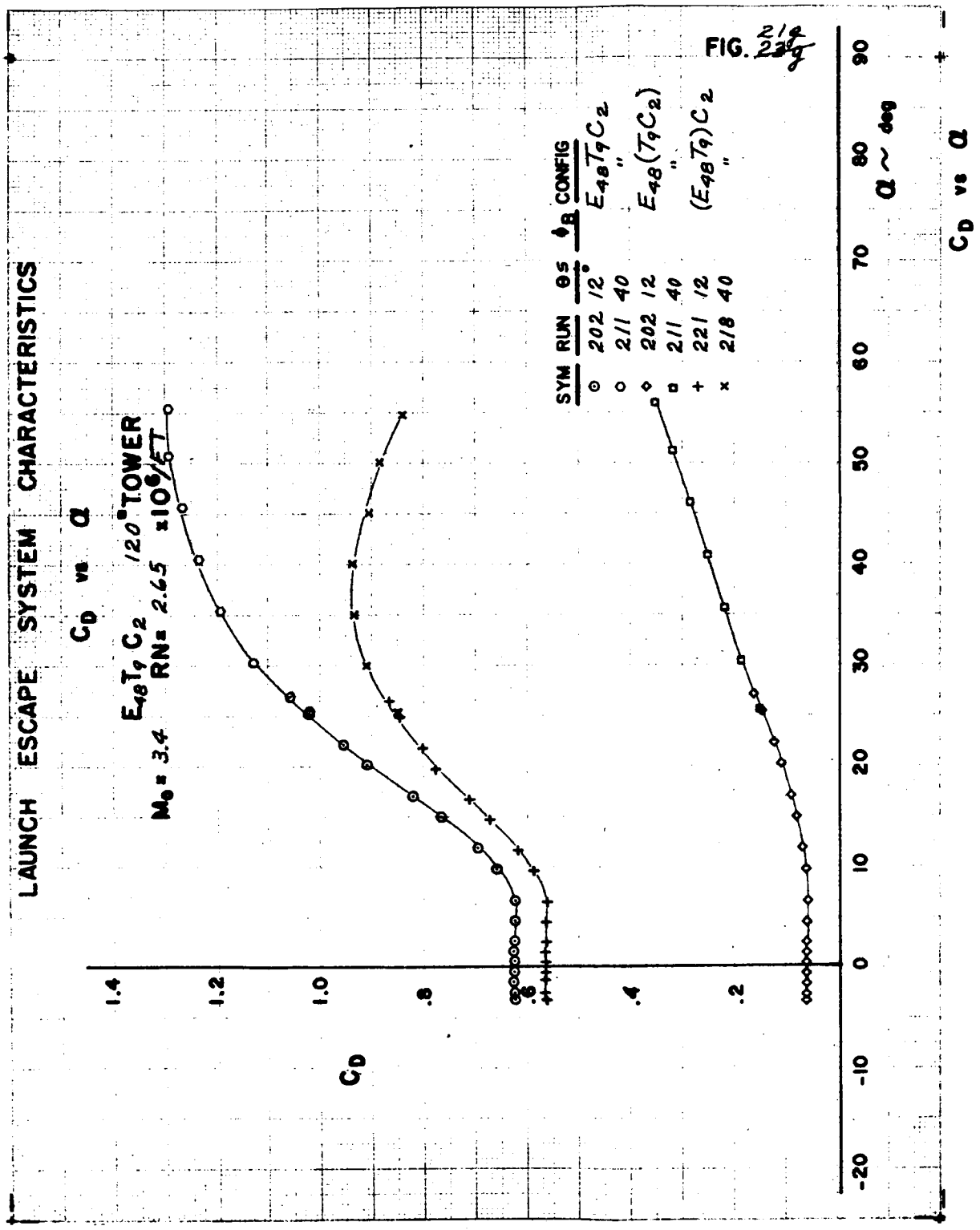

FIG. 21g

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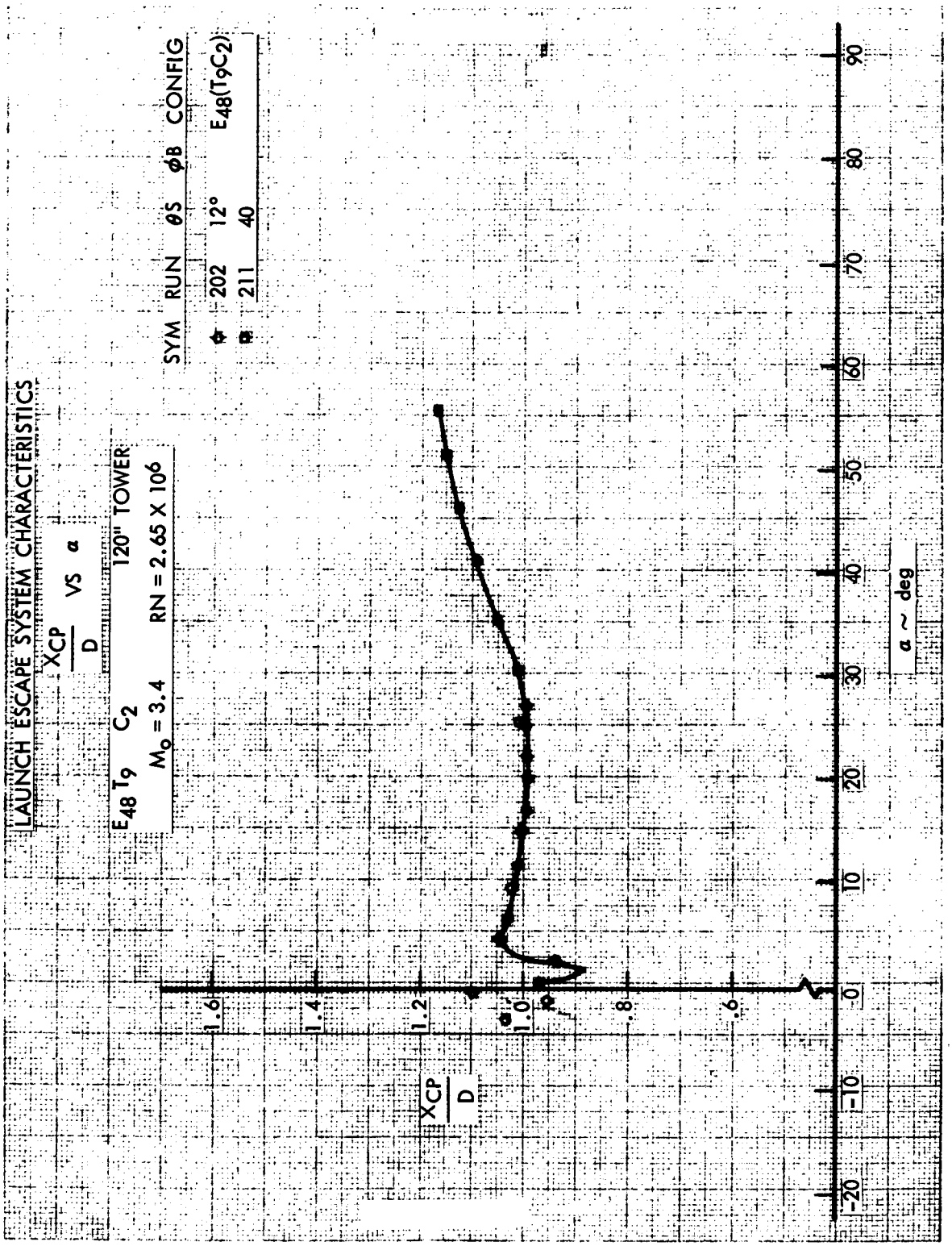
CO[redacted]



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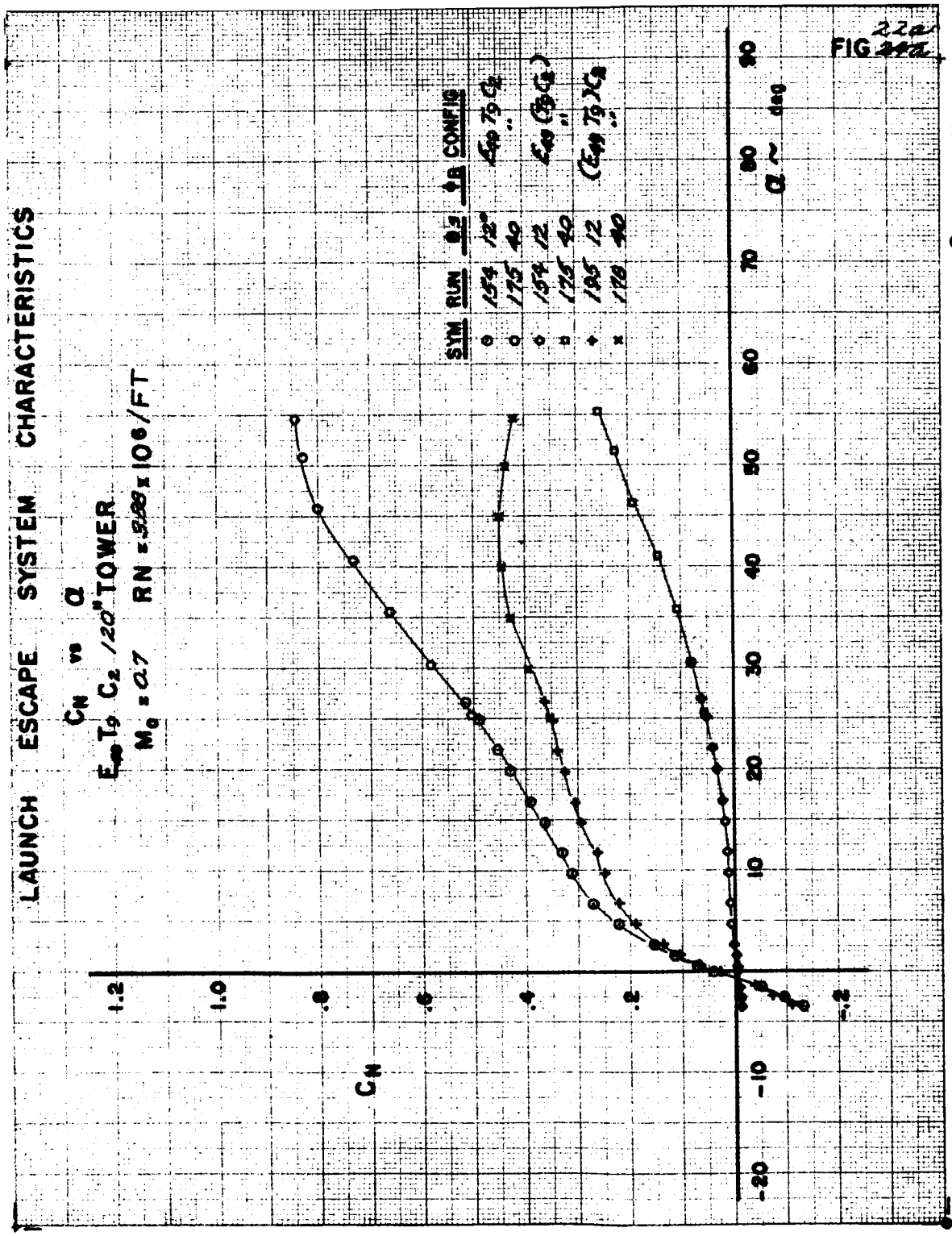

FIG 22a

C_N vs α

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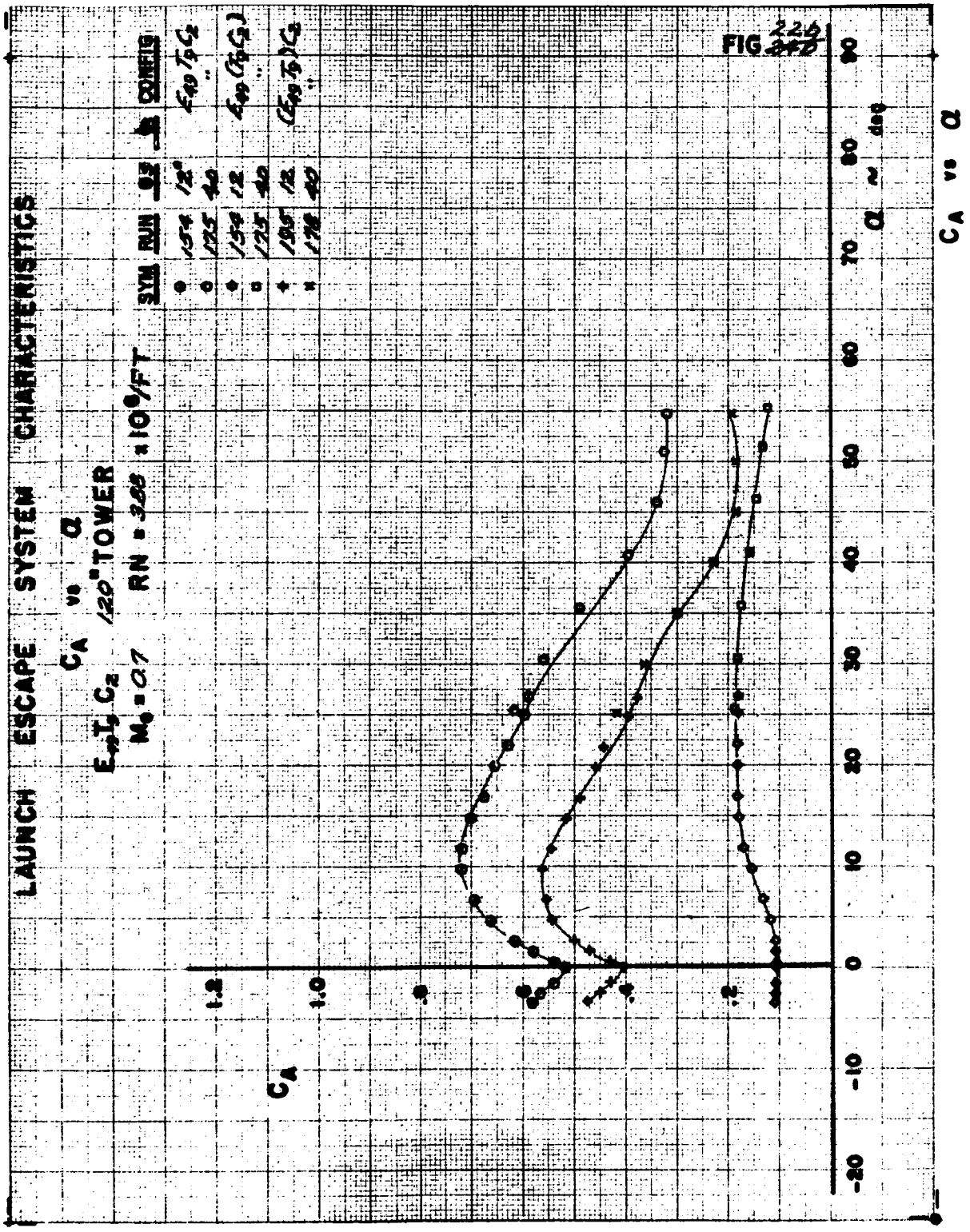

FIG 226

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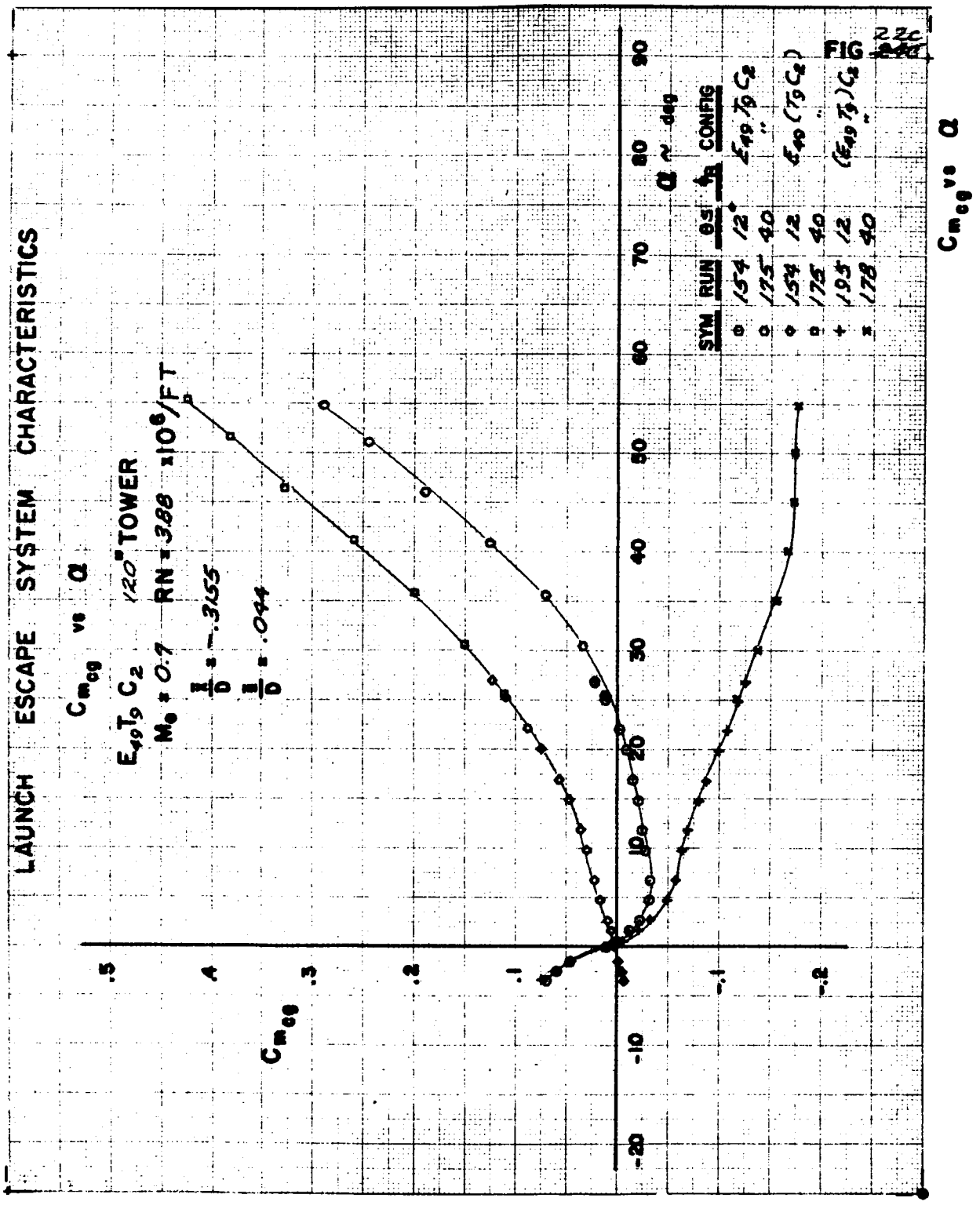
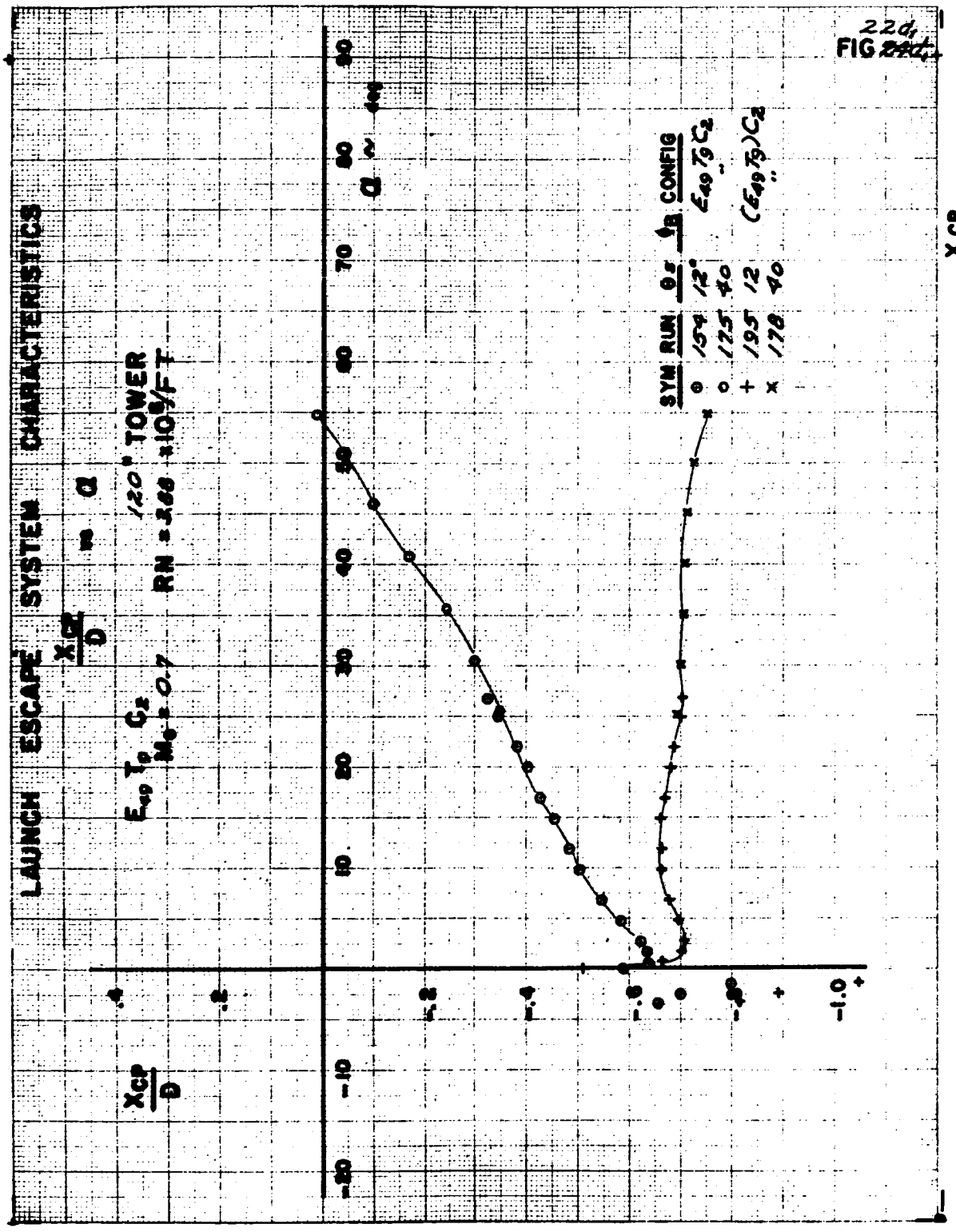


FIG 22c

~~CONFIDENTIAL~~

CO[redacted]



[redacted]

~~CONFIDENTIAL~~

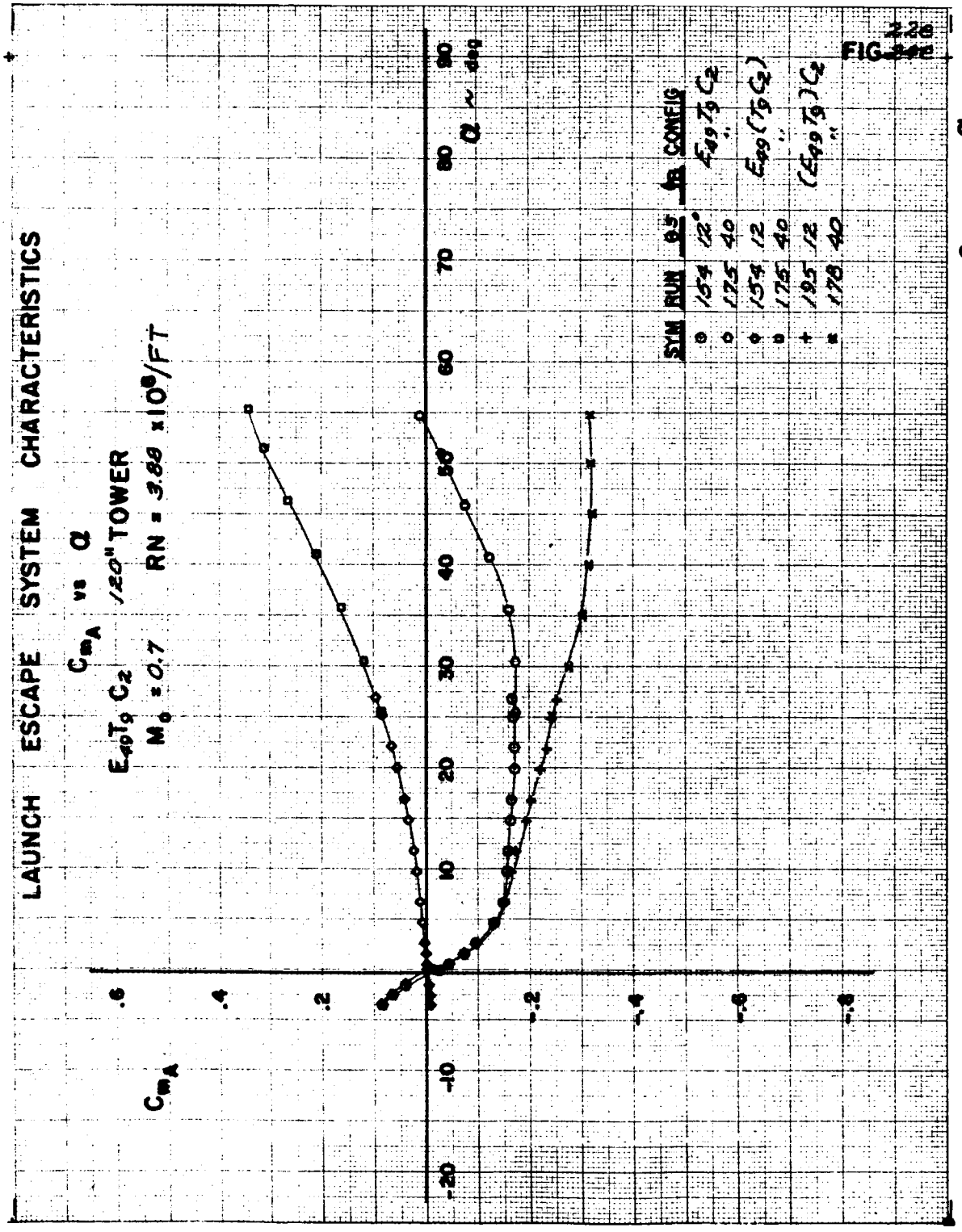


FIG. 3-26

C_{m_A} vs α

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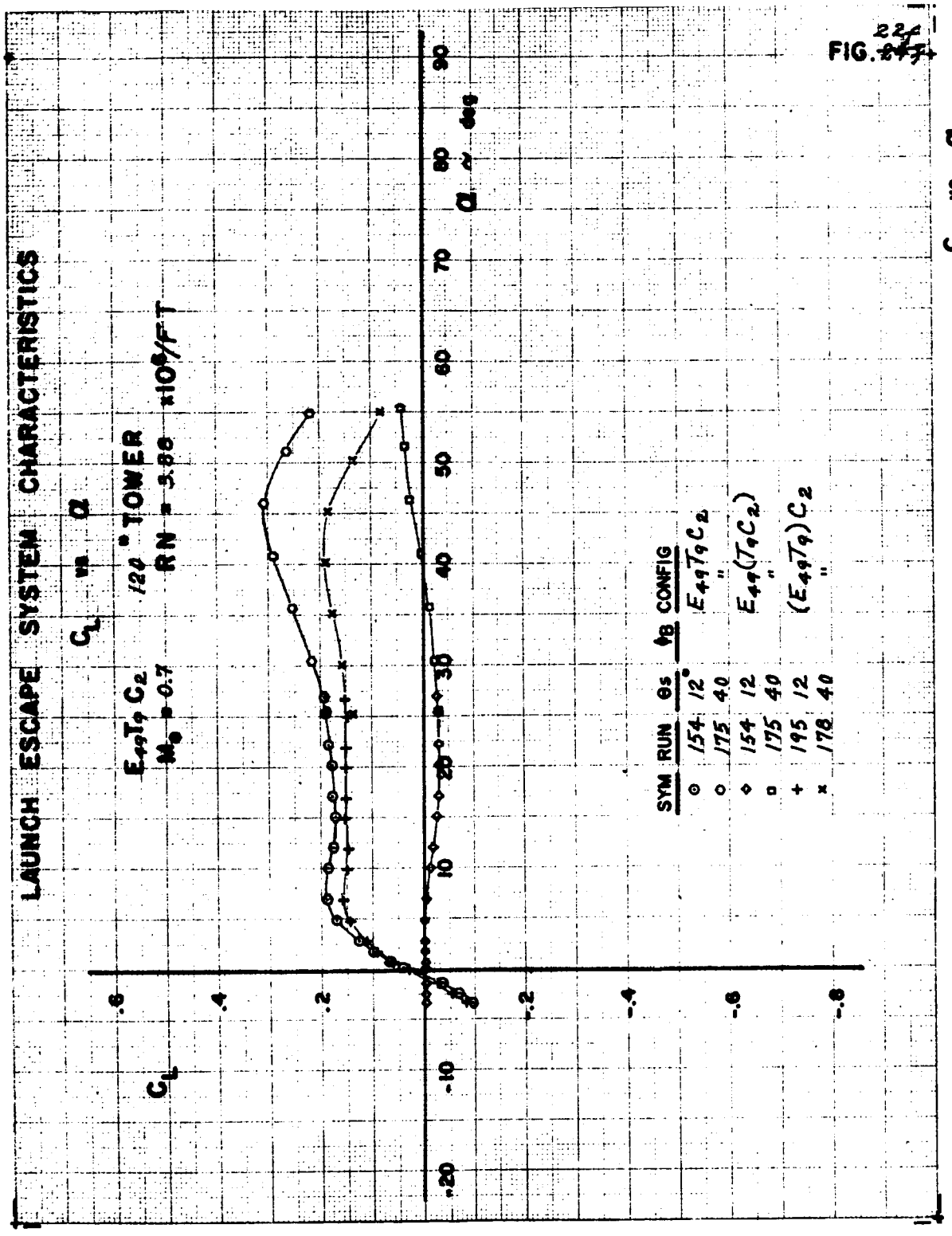

FIG. 224

C_L vs α

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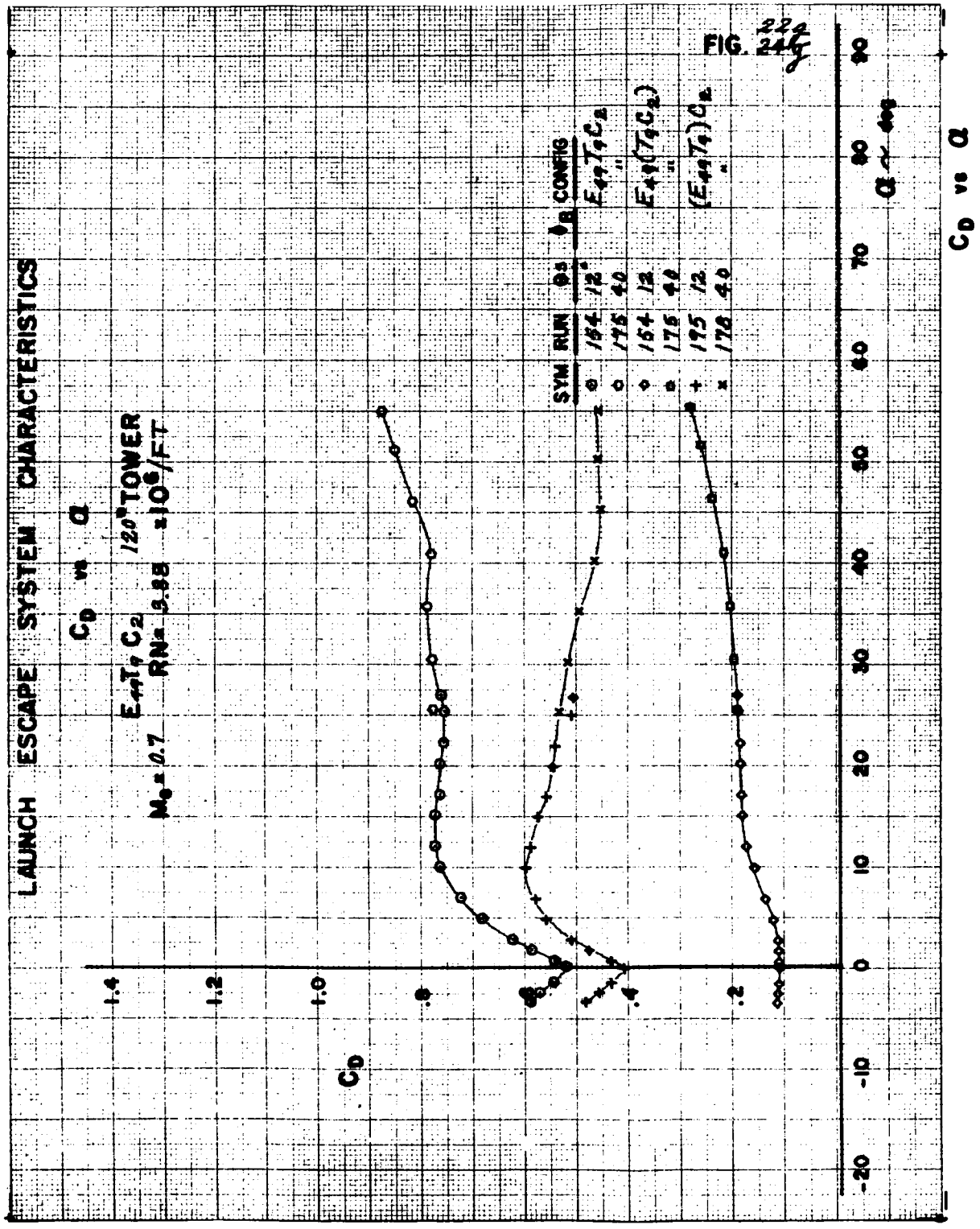
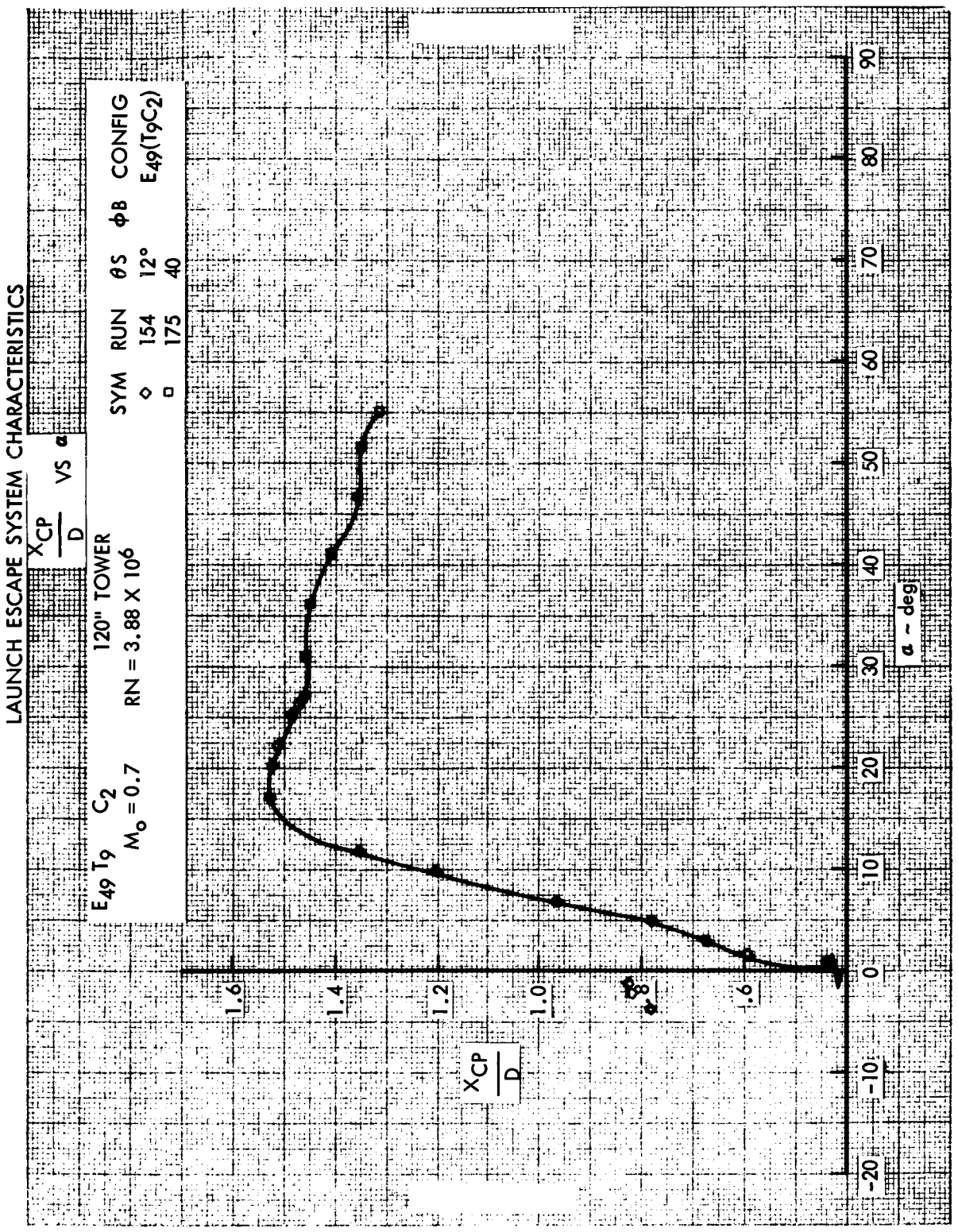


FIG. 22g

~~CONFIDENTIAL~~

CON[redacted]



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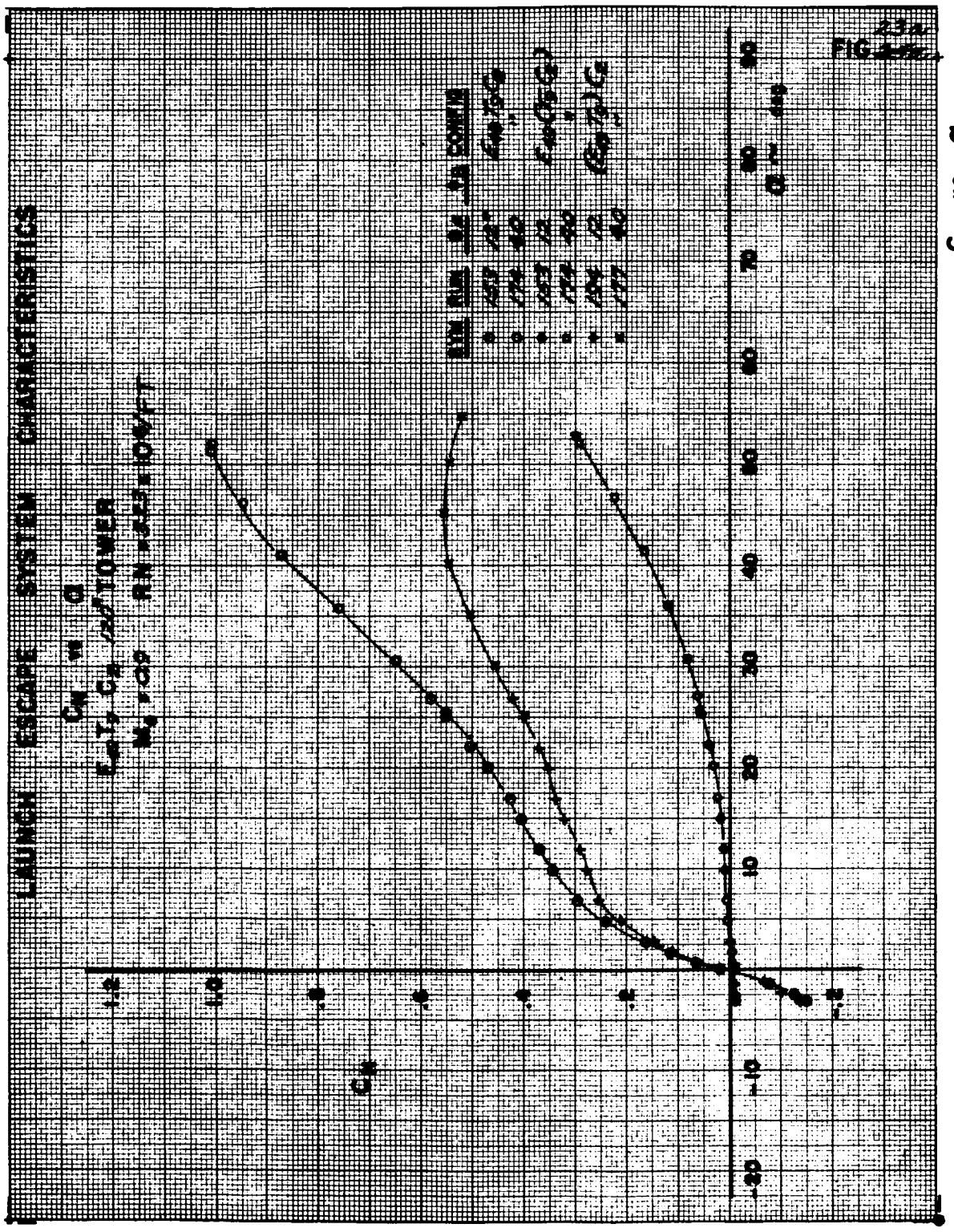

FIG. 23a

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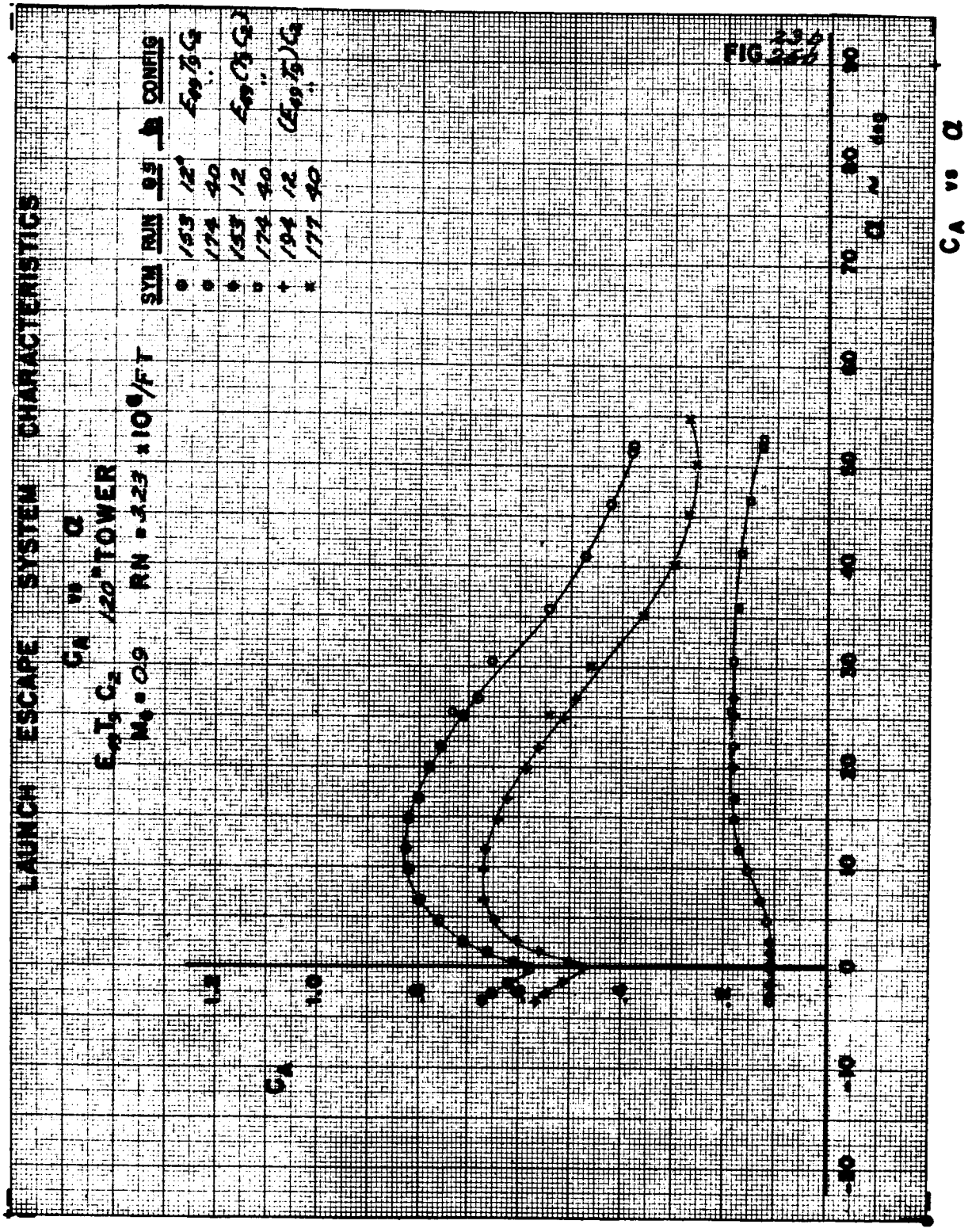

FIG 23

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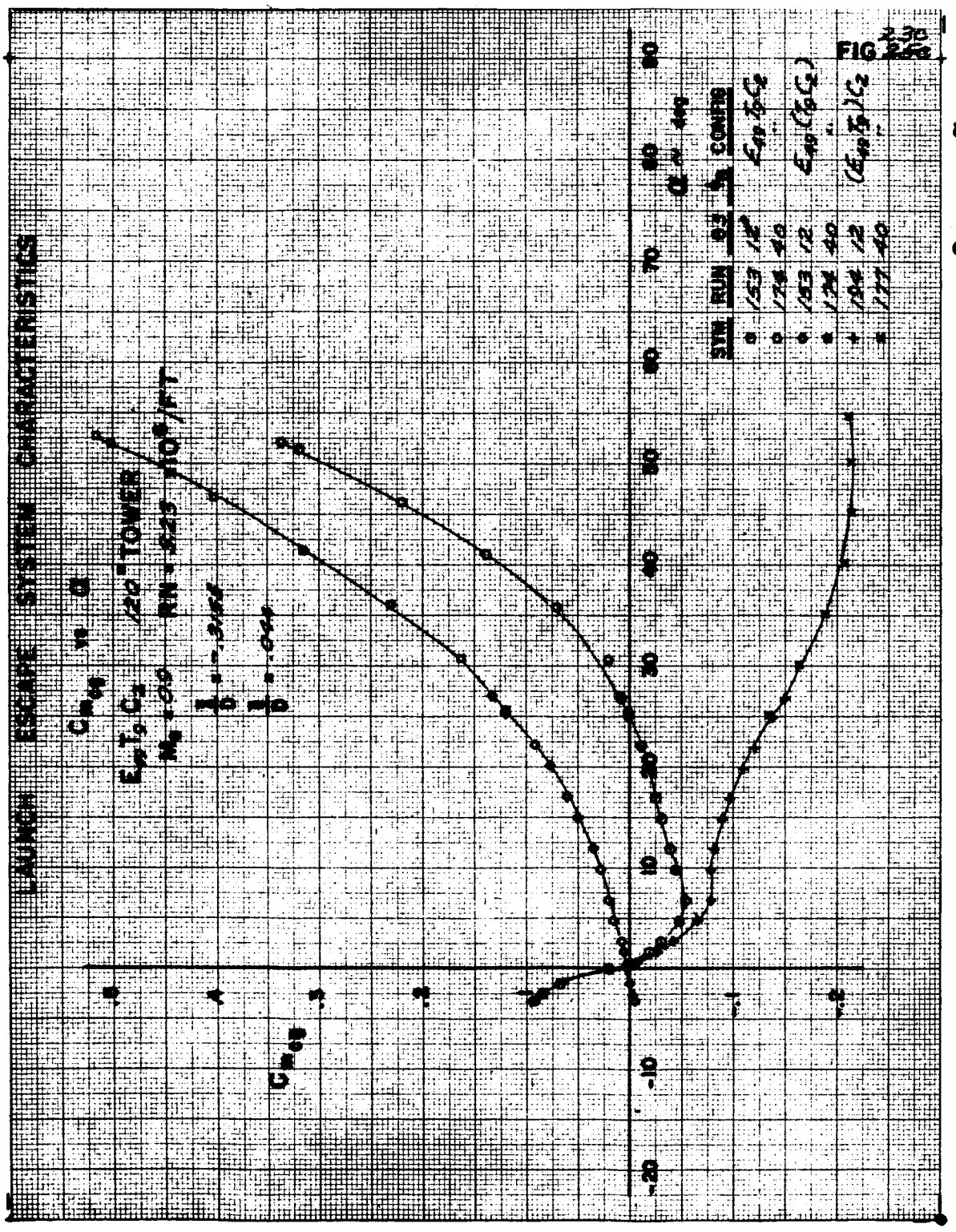

FIG 238

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CON[redacted]

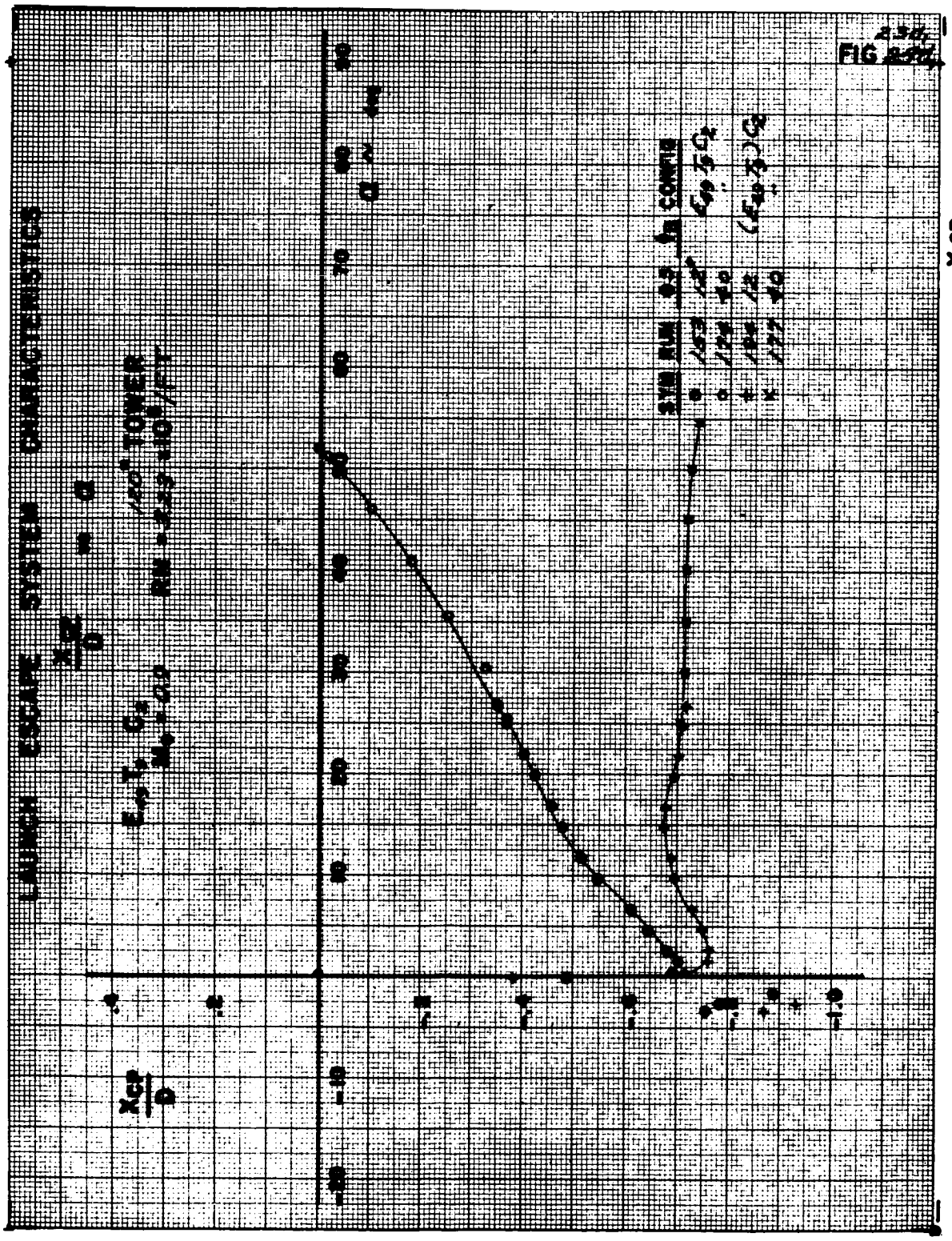

FIG 2.3d

X_{CP}/D vs α

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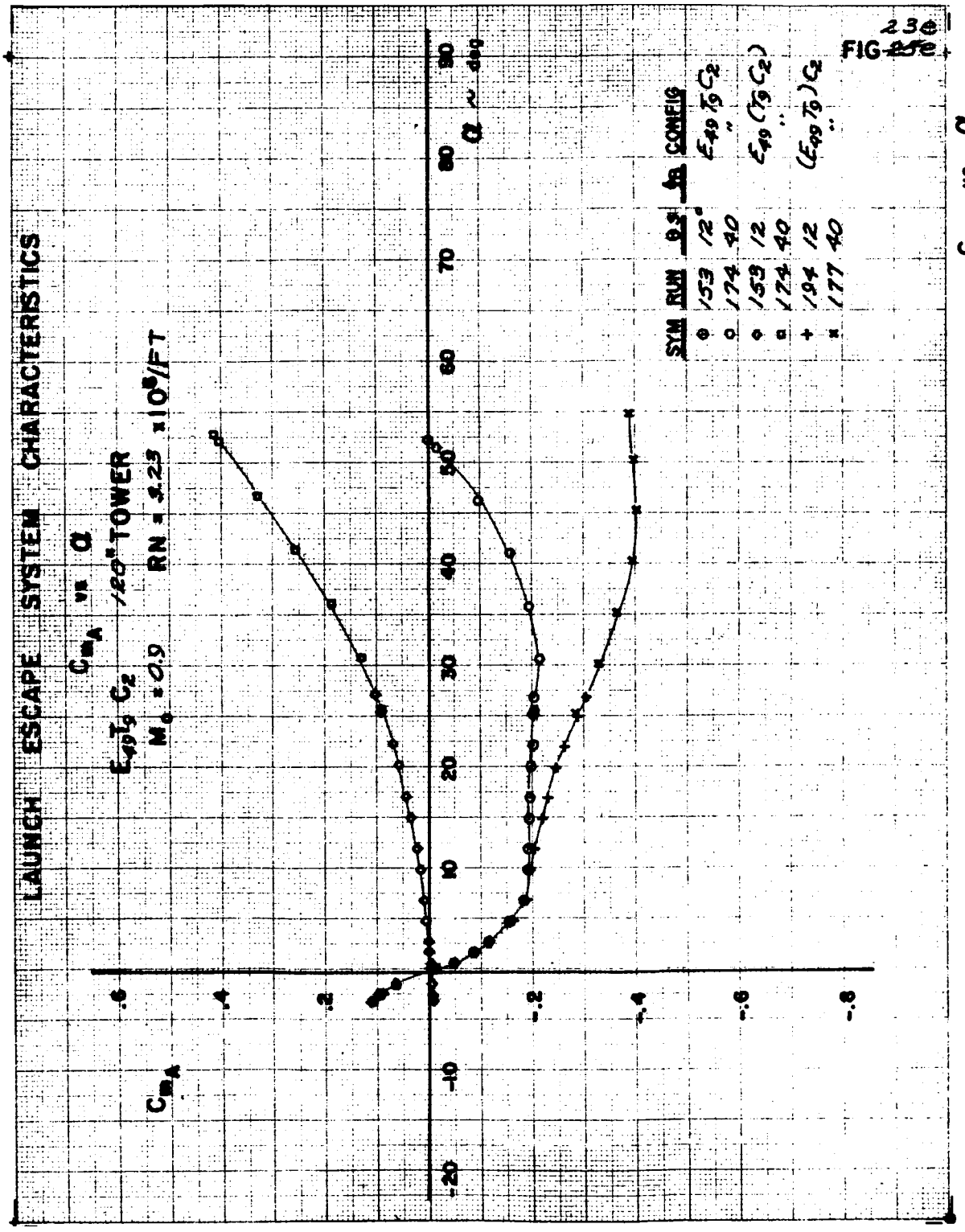

23e
FIG ~~25e~~

C_{m_A} vs α

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CO[redacted]

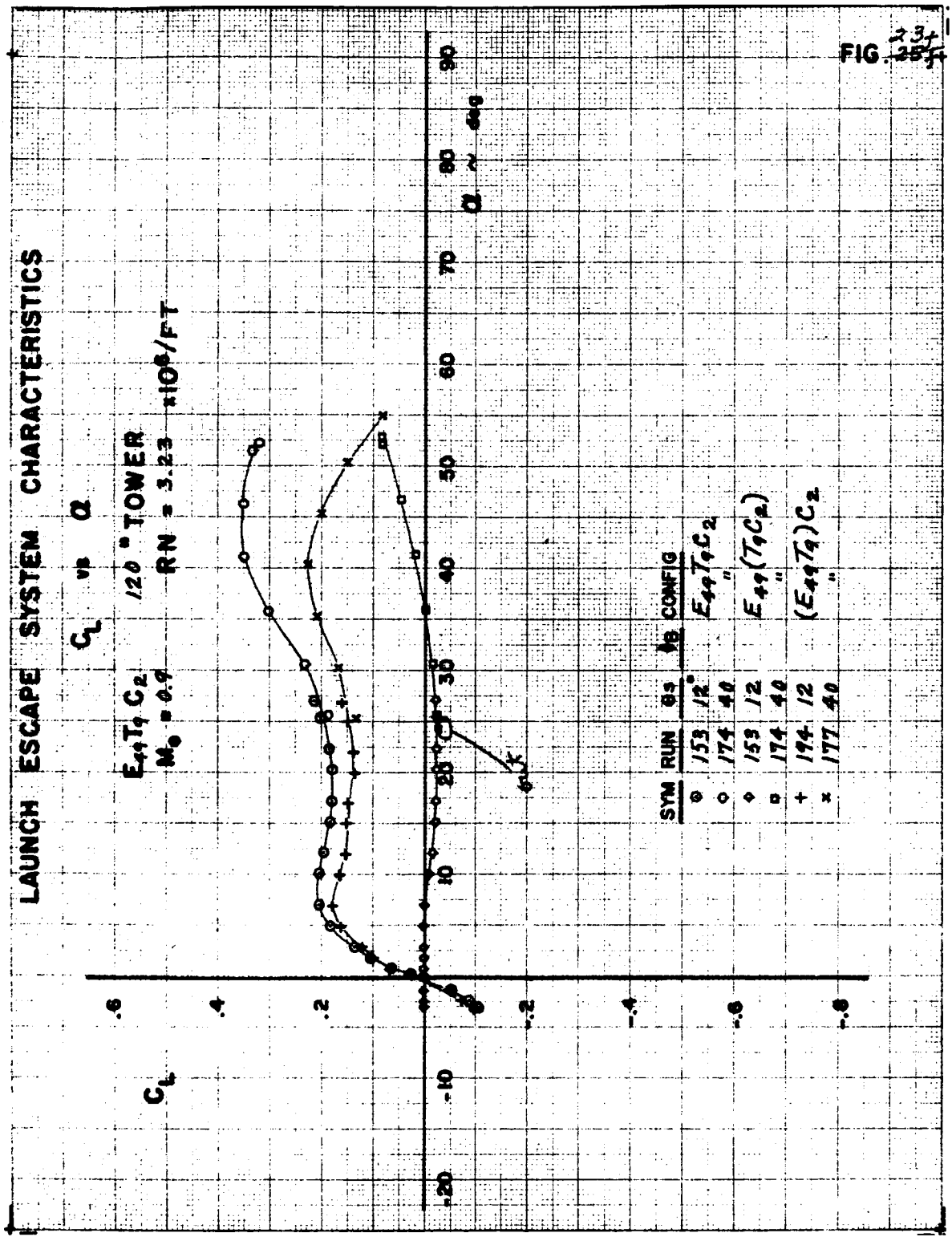

FIG. 23

C_L vs α

[redacted]

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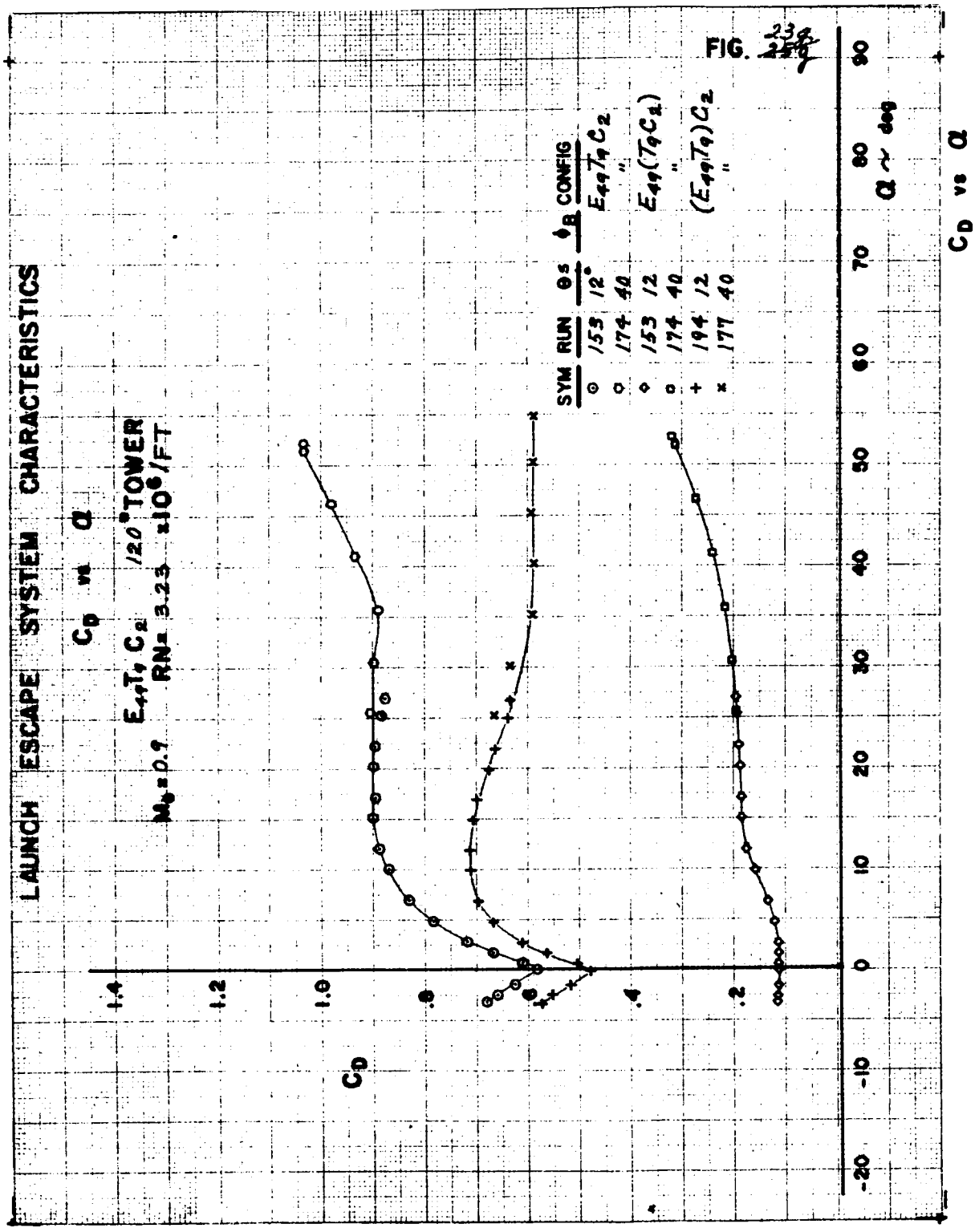

FIG. 239

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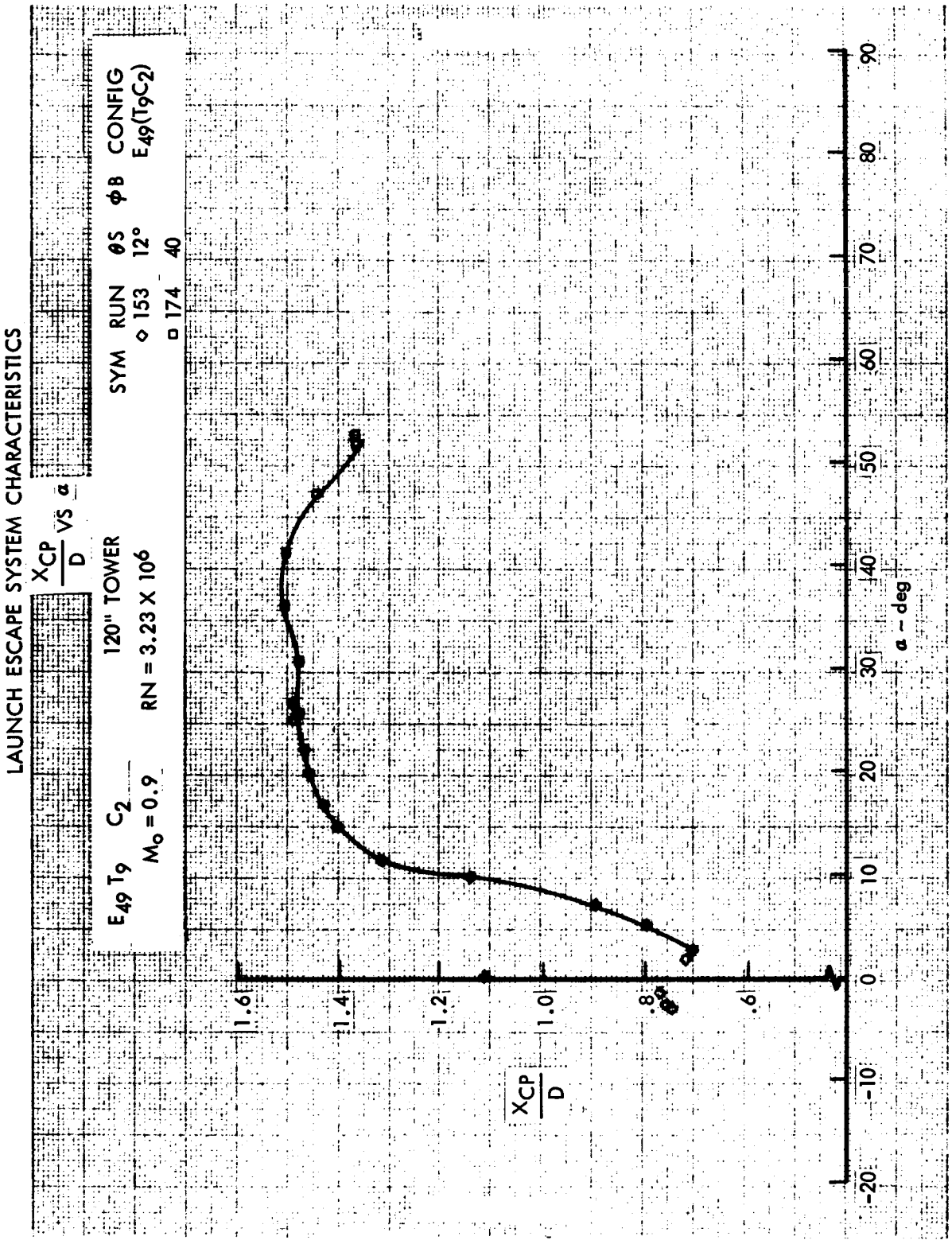

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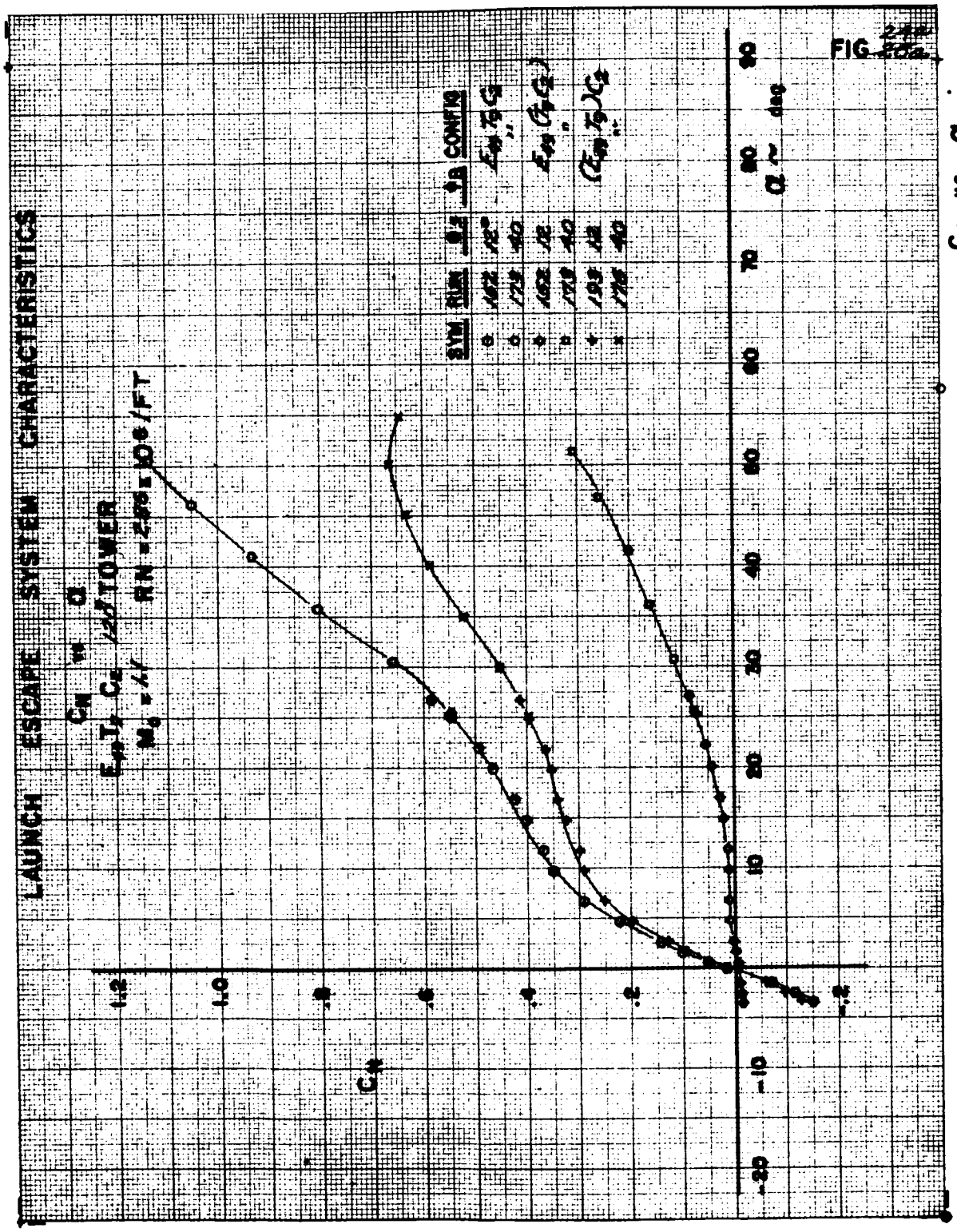

FIG. 24

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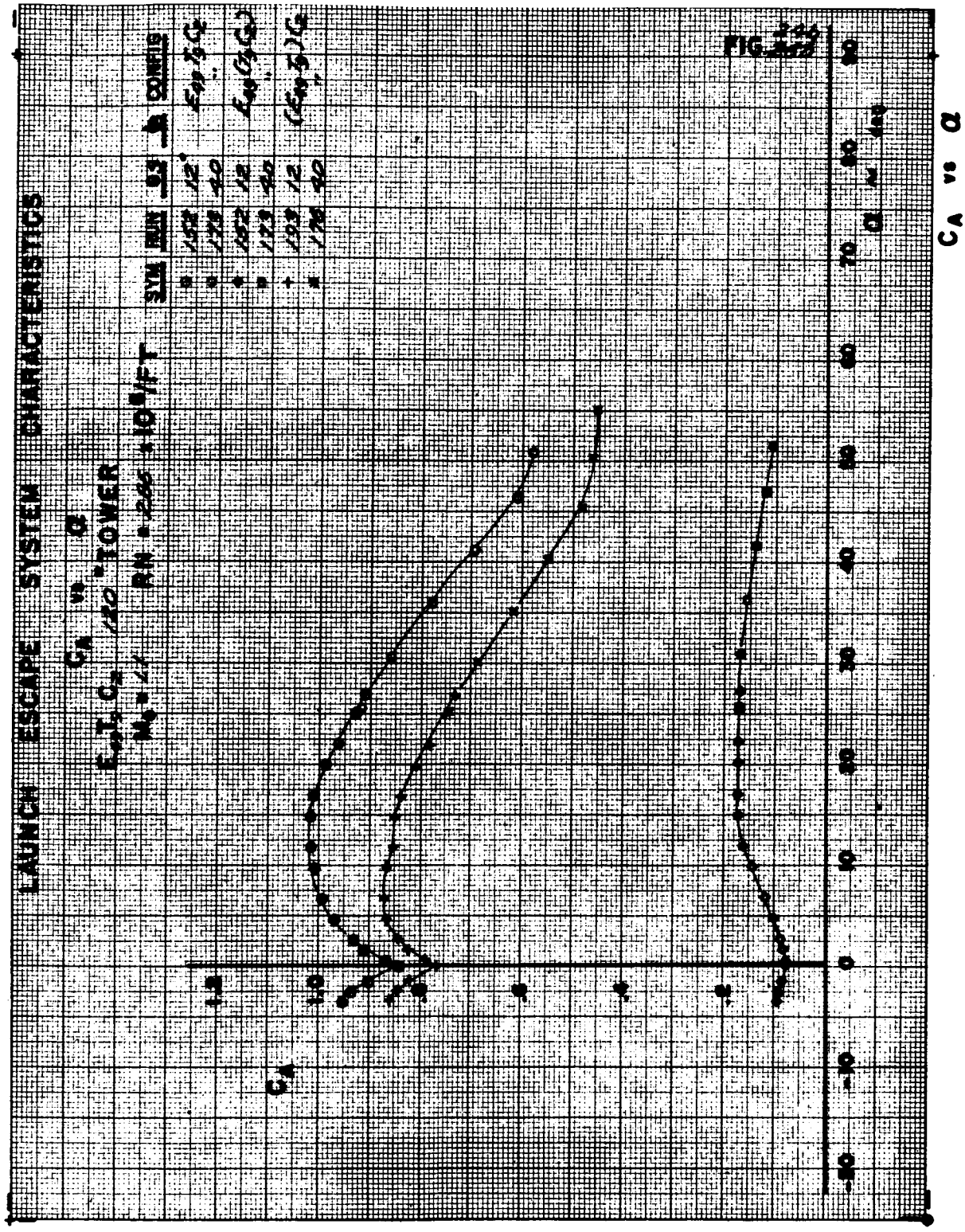

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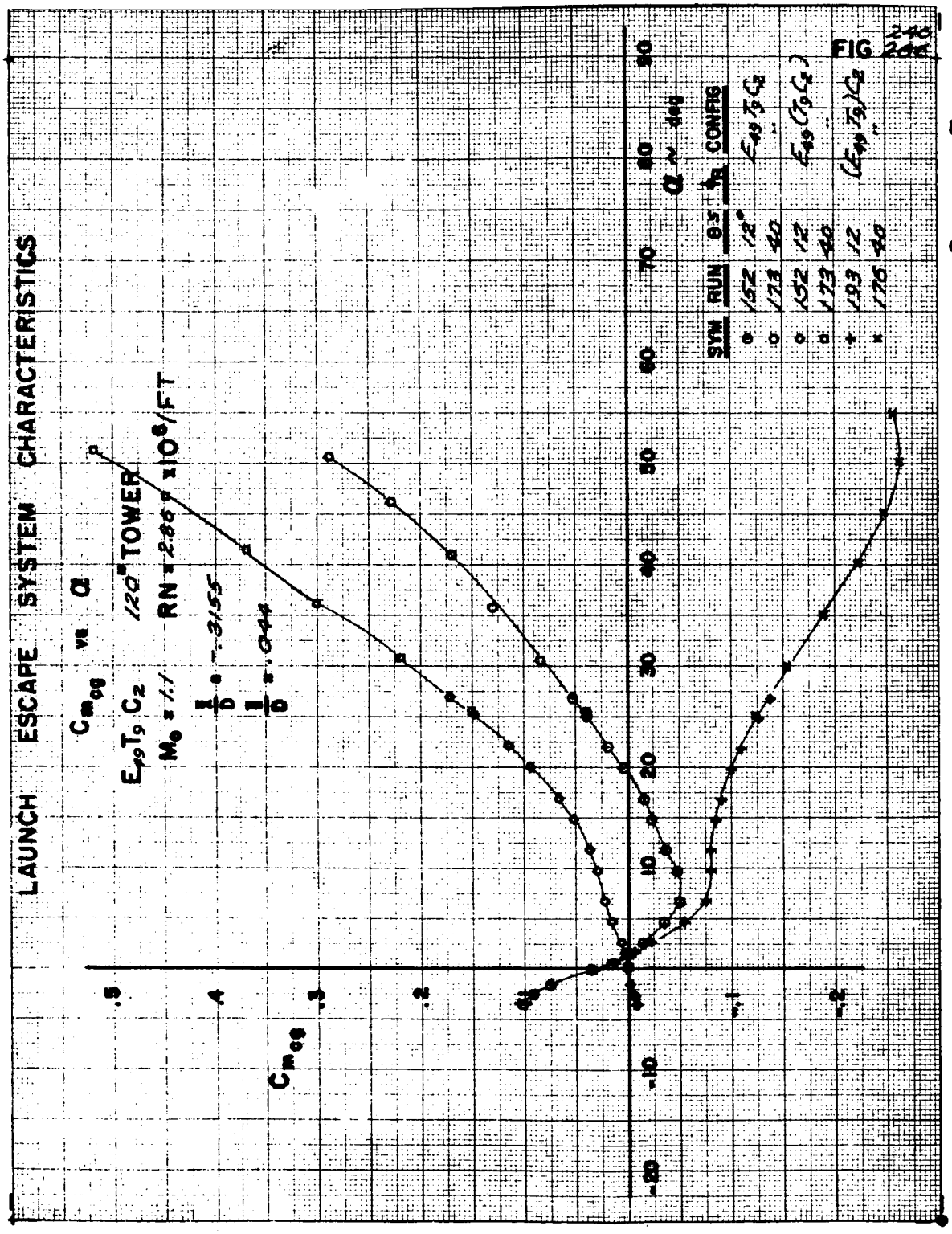

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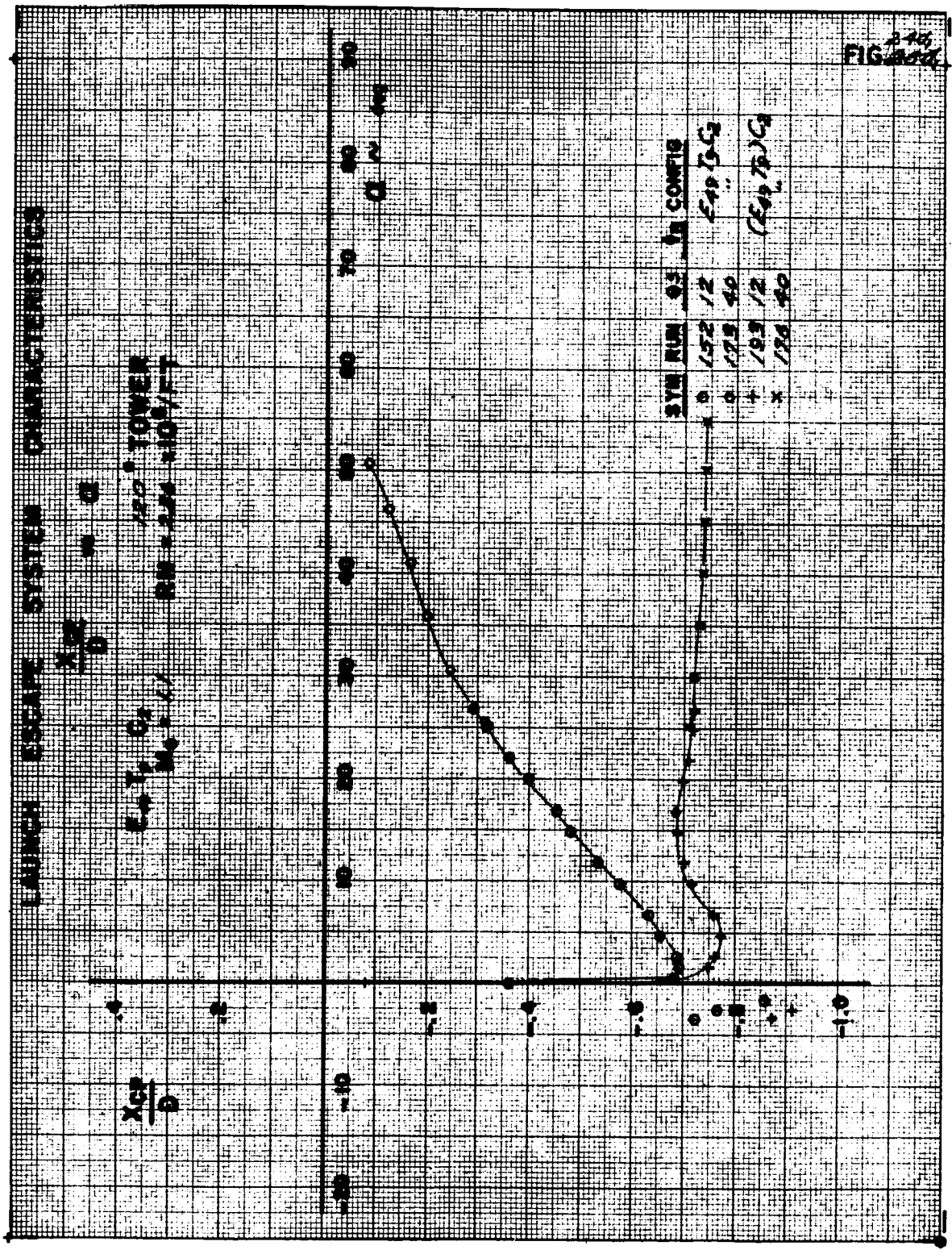

FIG. 2-44

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A-152

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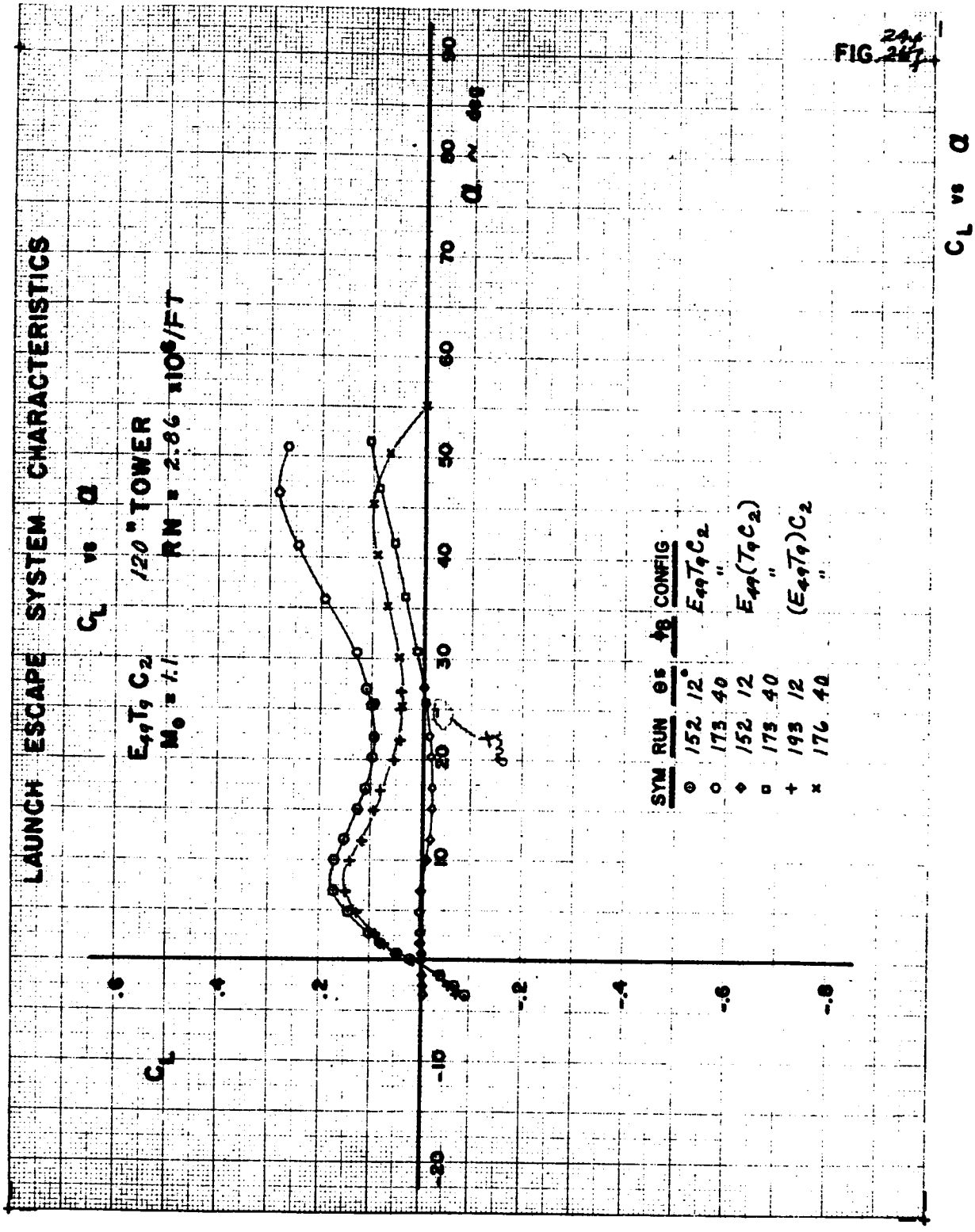

FIG. 24

C_L vs α

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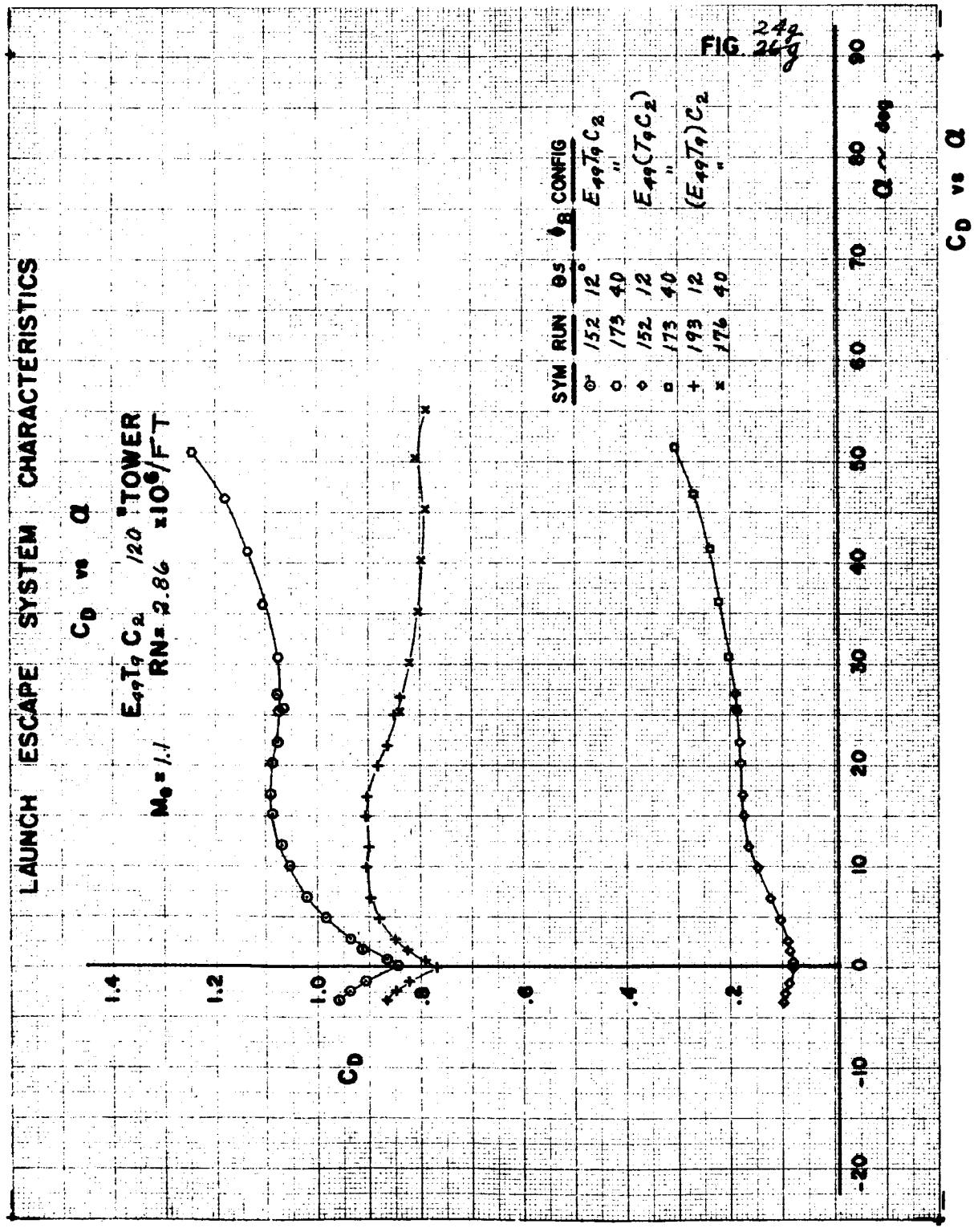

FIG. 24g 26g

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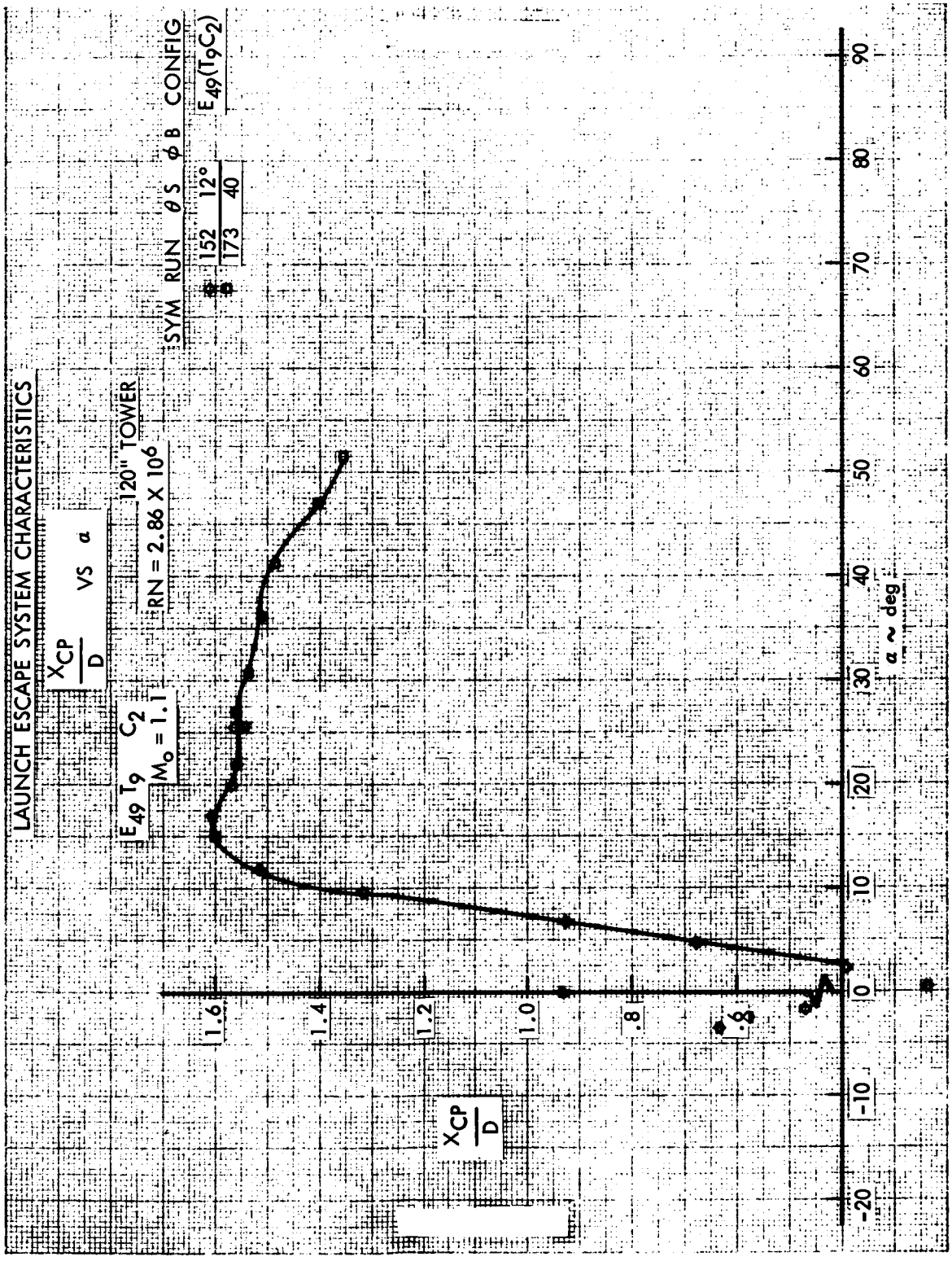

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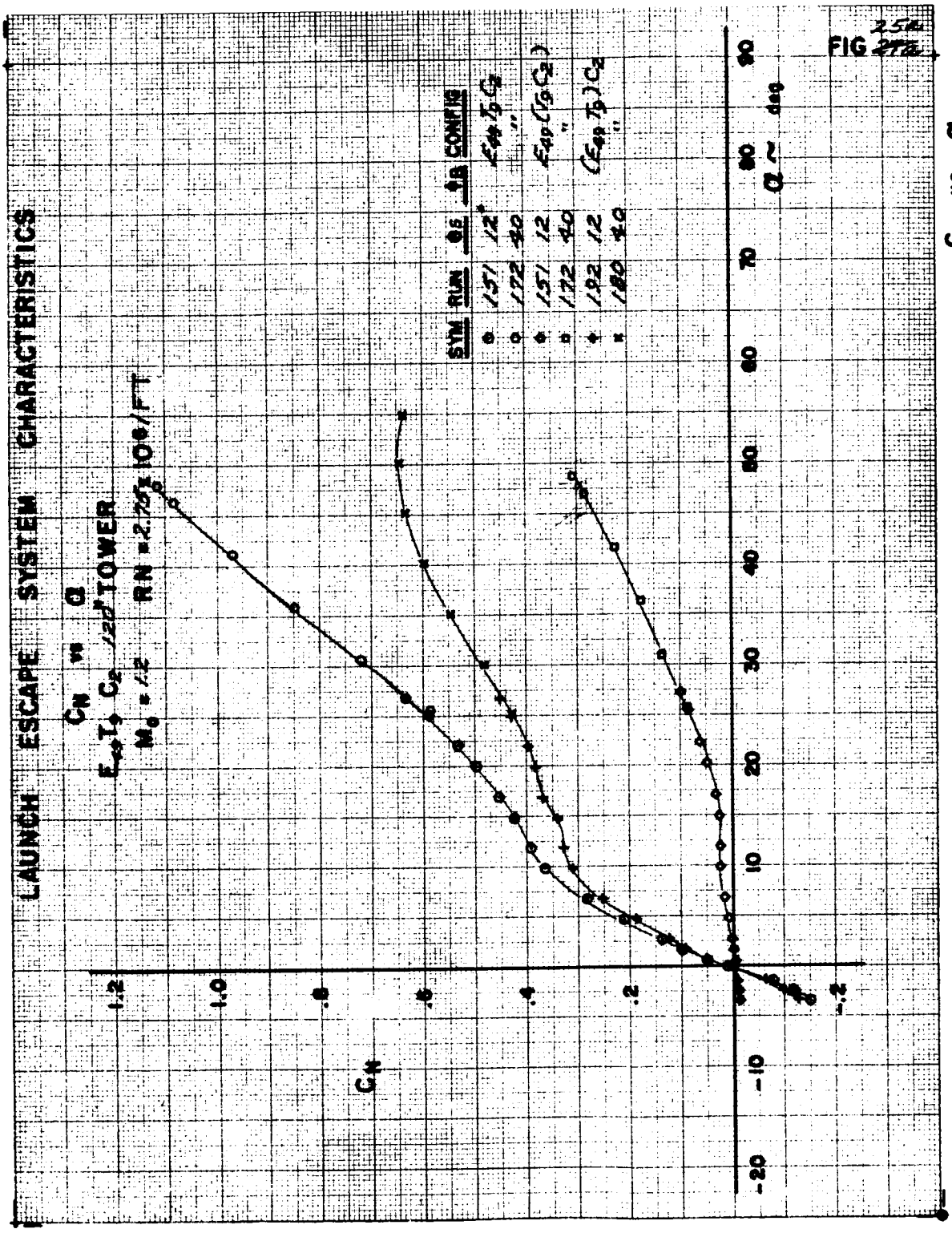

FIG 25a

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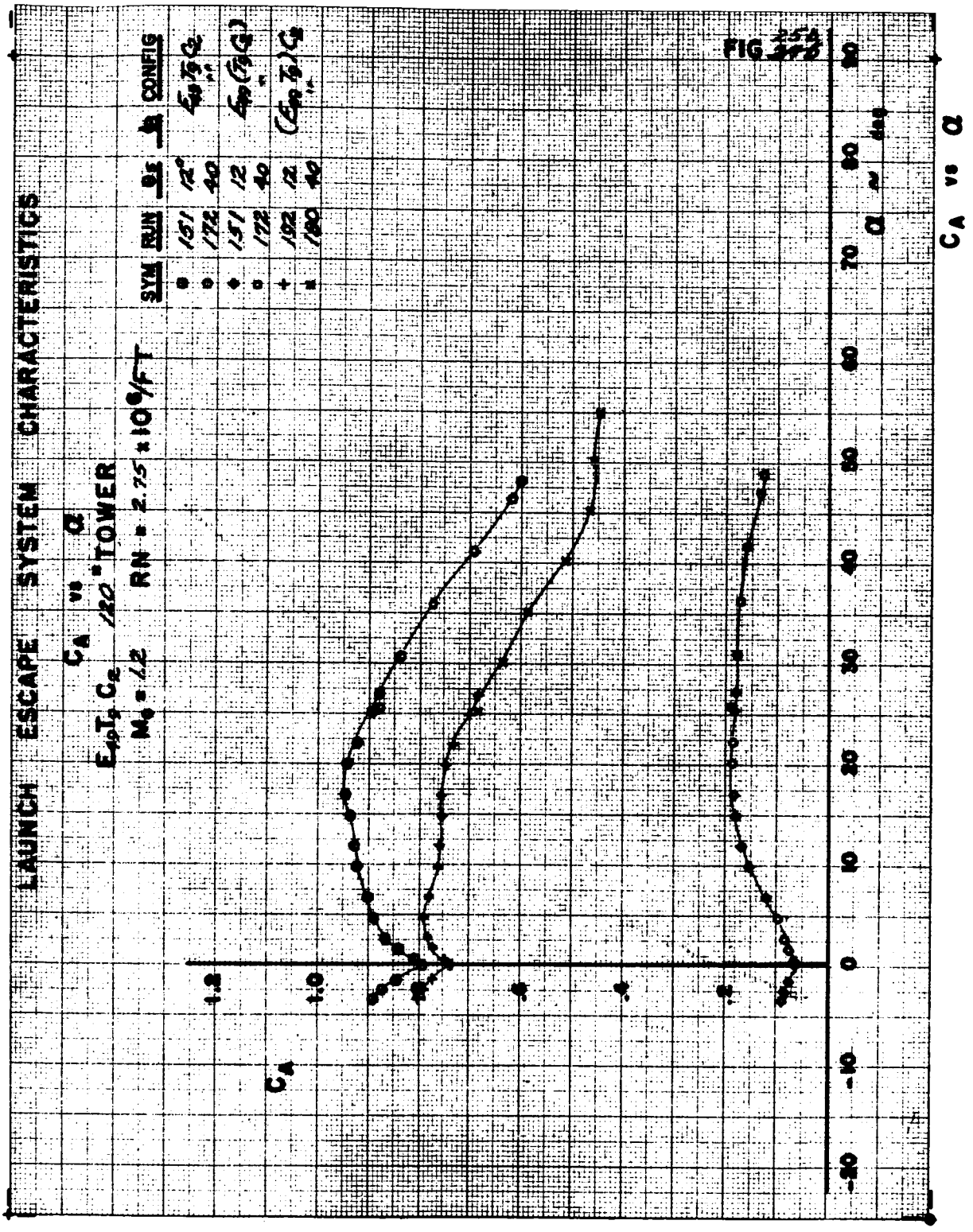

FIG. 25a

[redacted]

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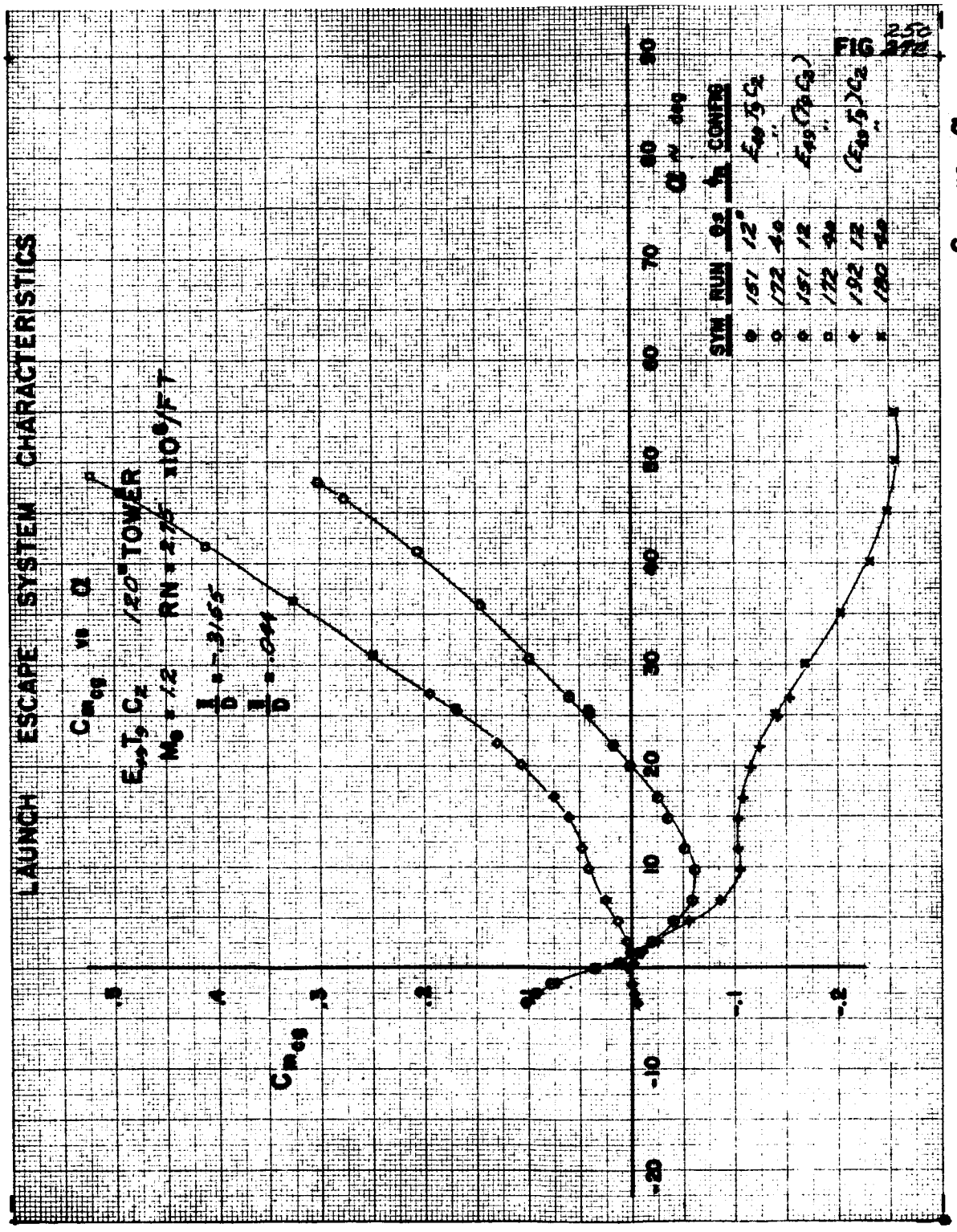

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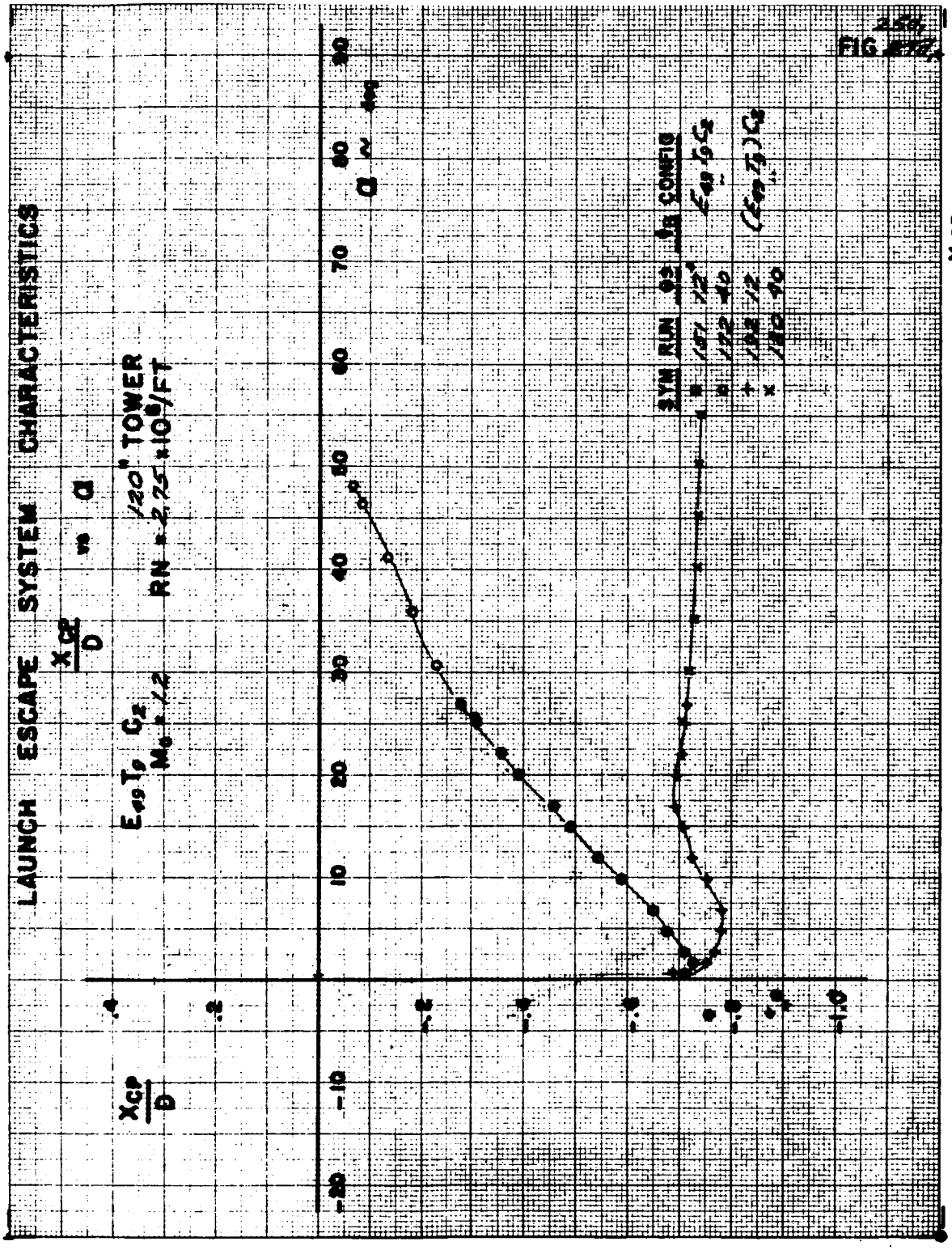

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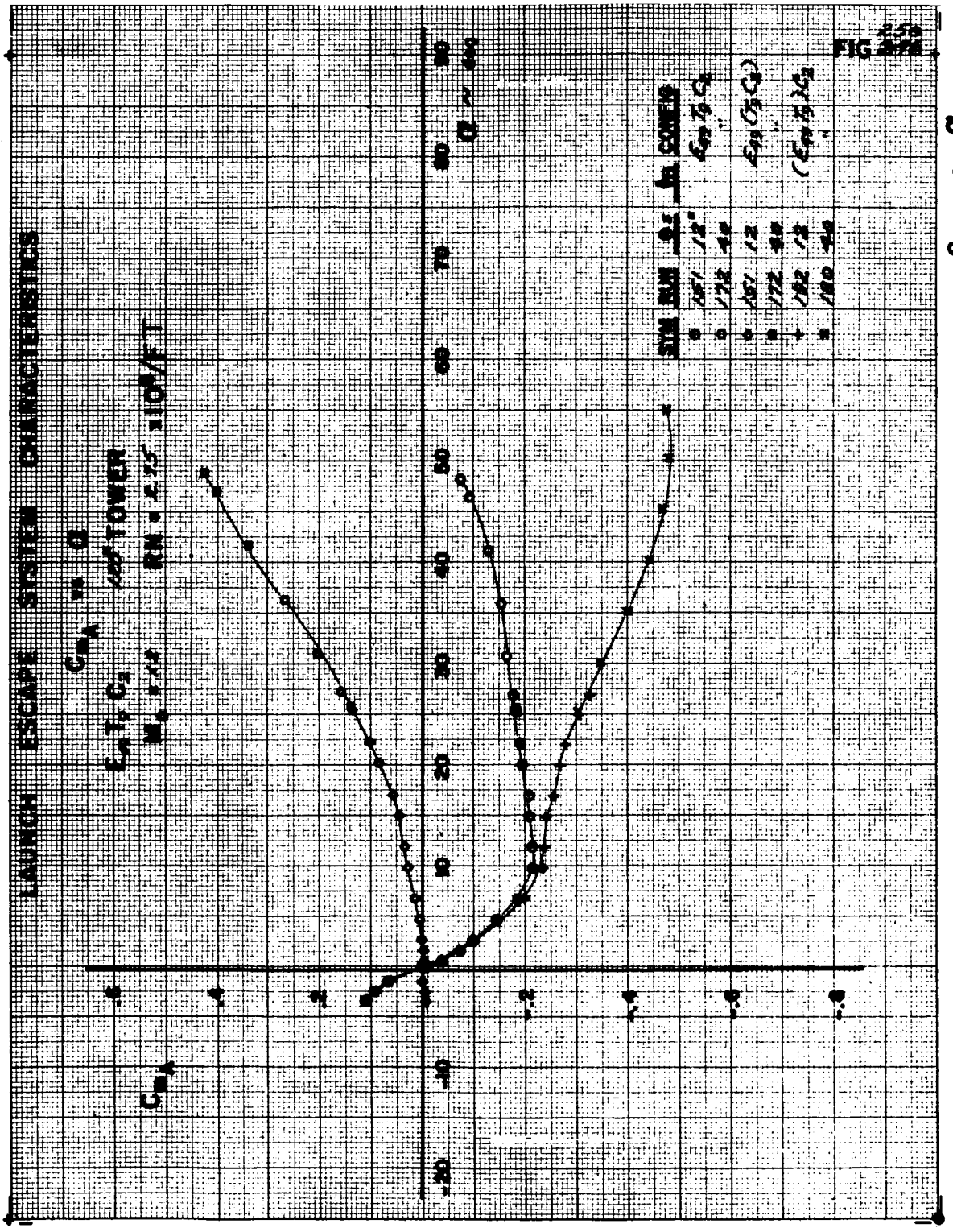

FIG 258

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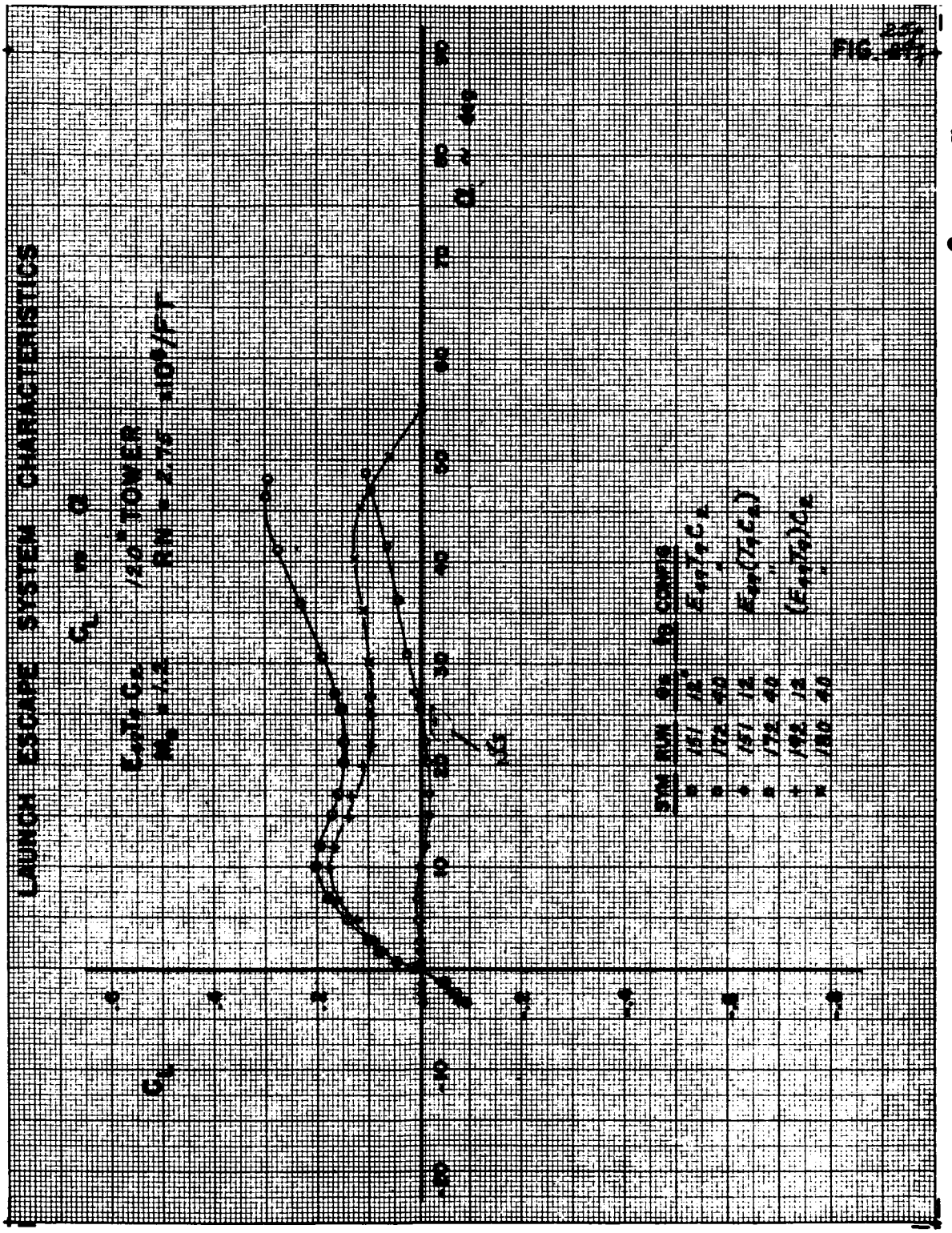

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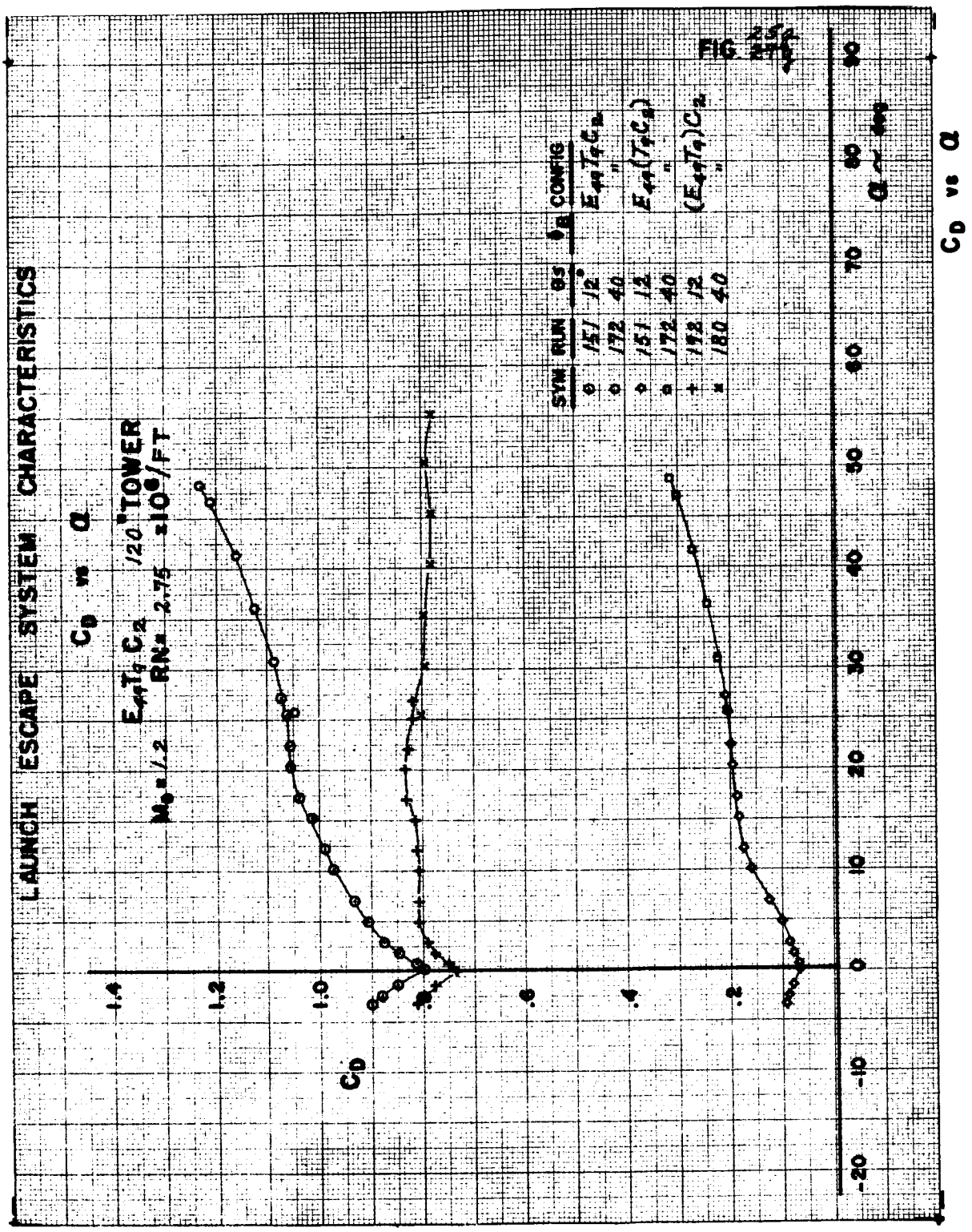

C_D vs α

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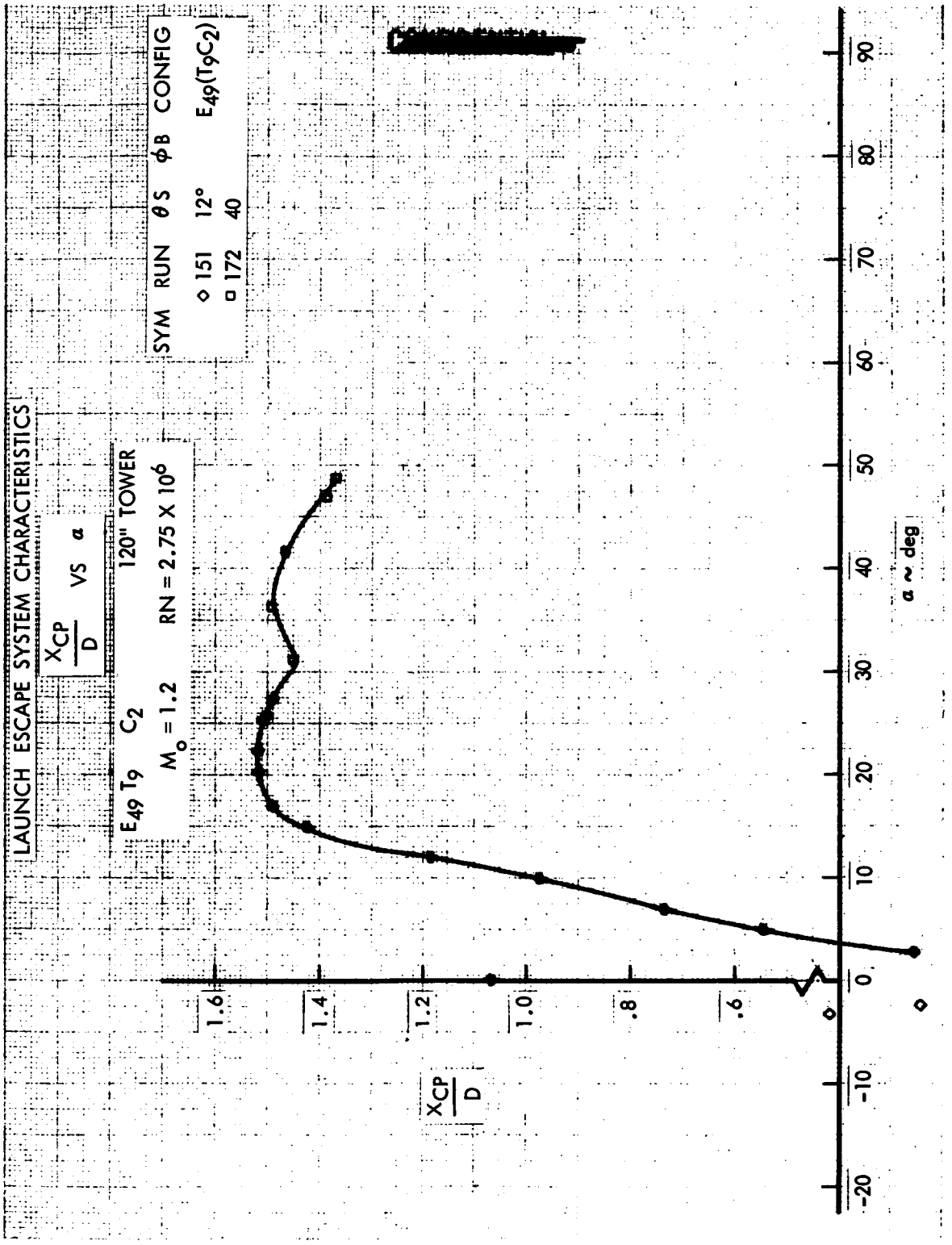

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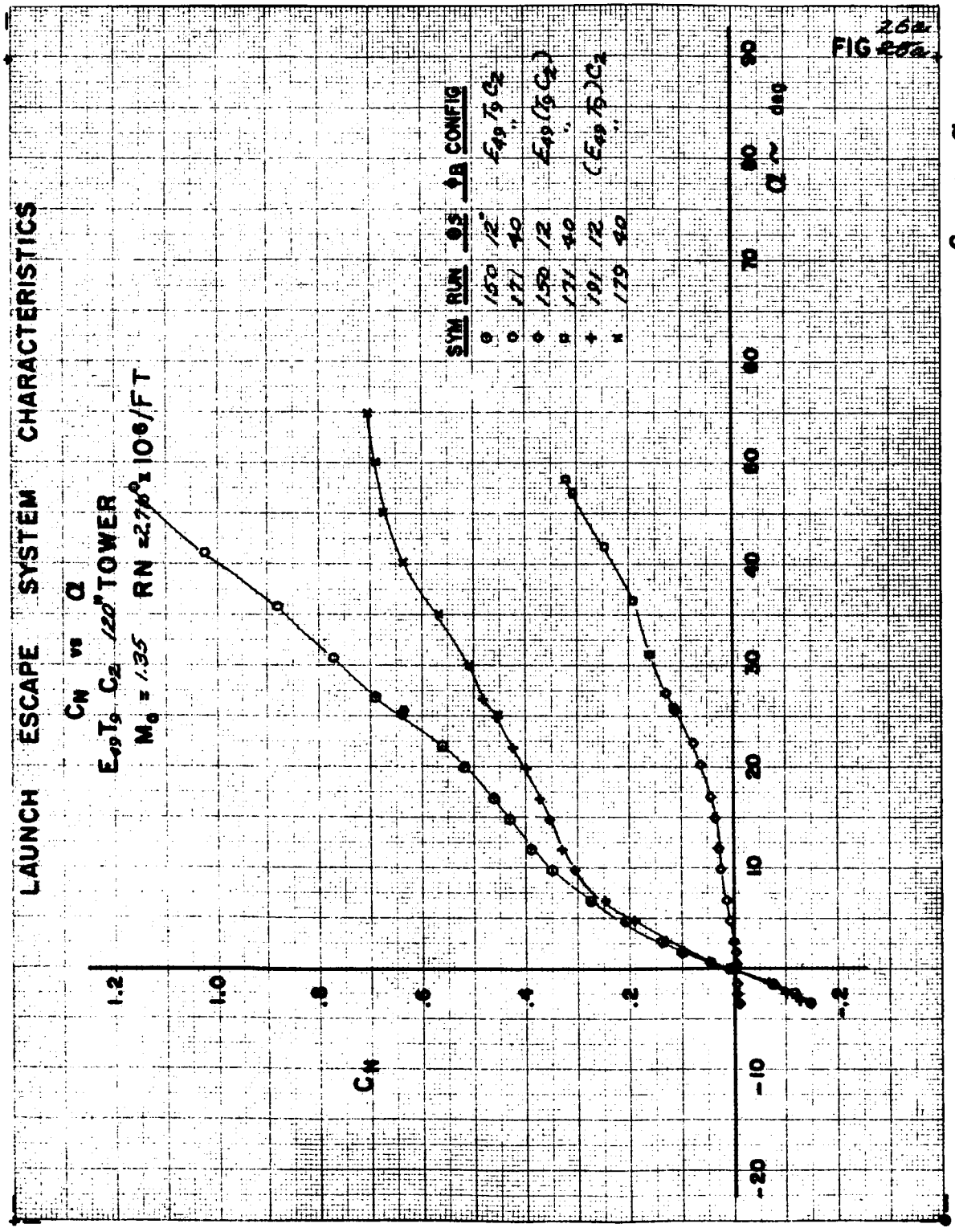

FIG 26a

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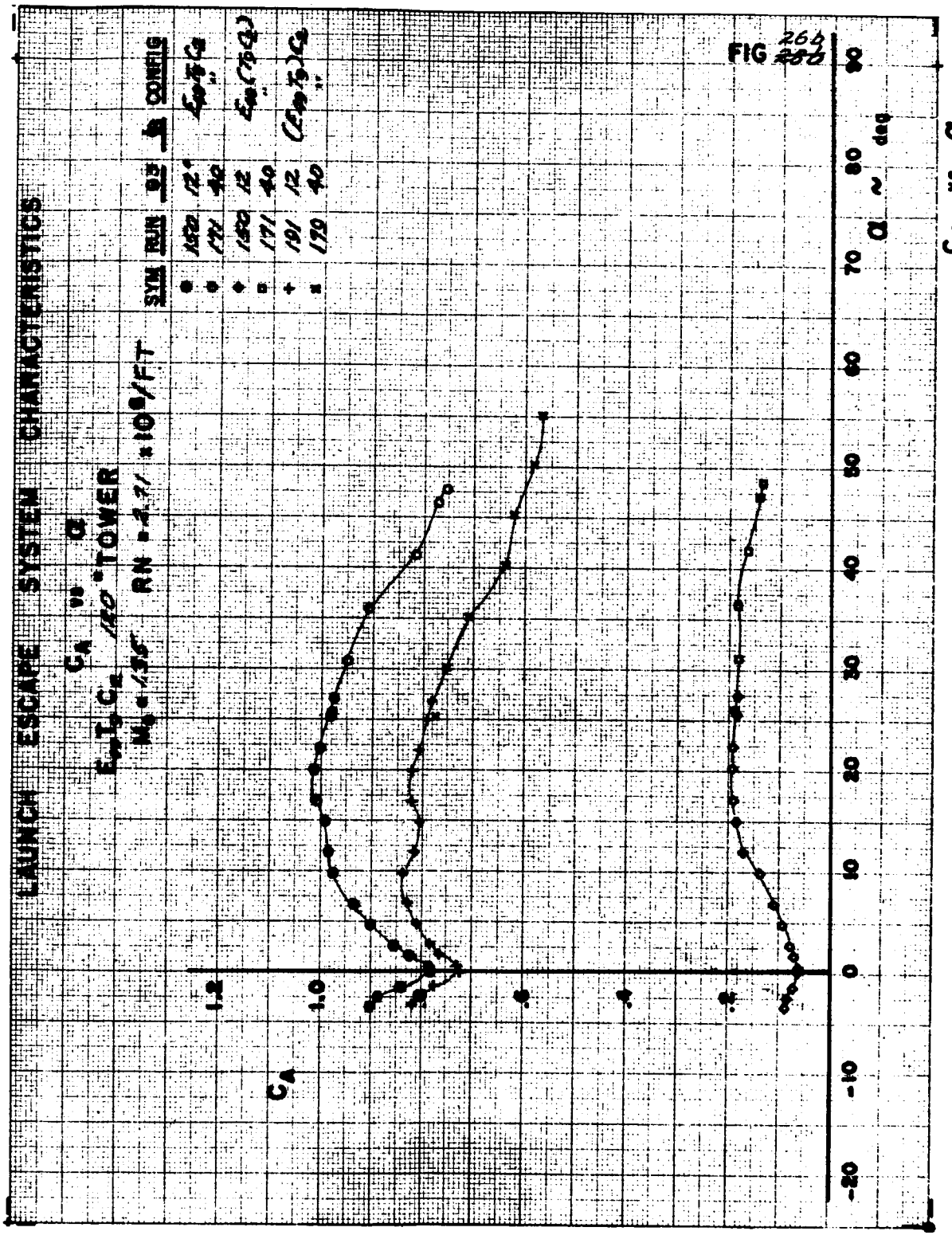

FIG 264

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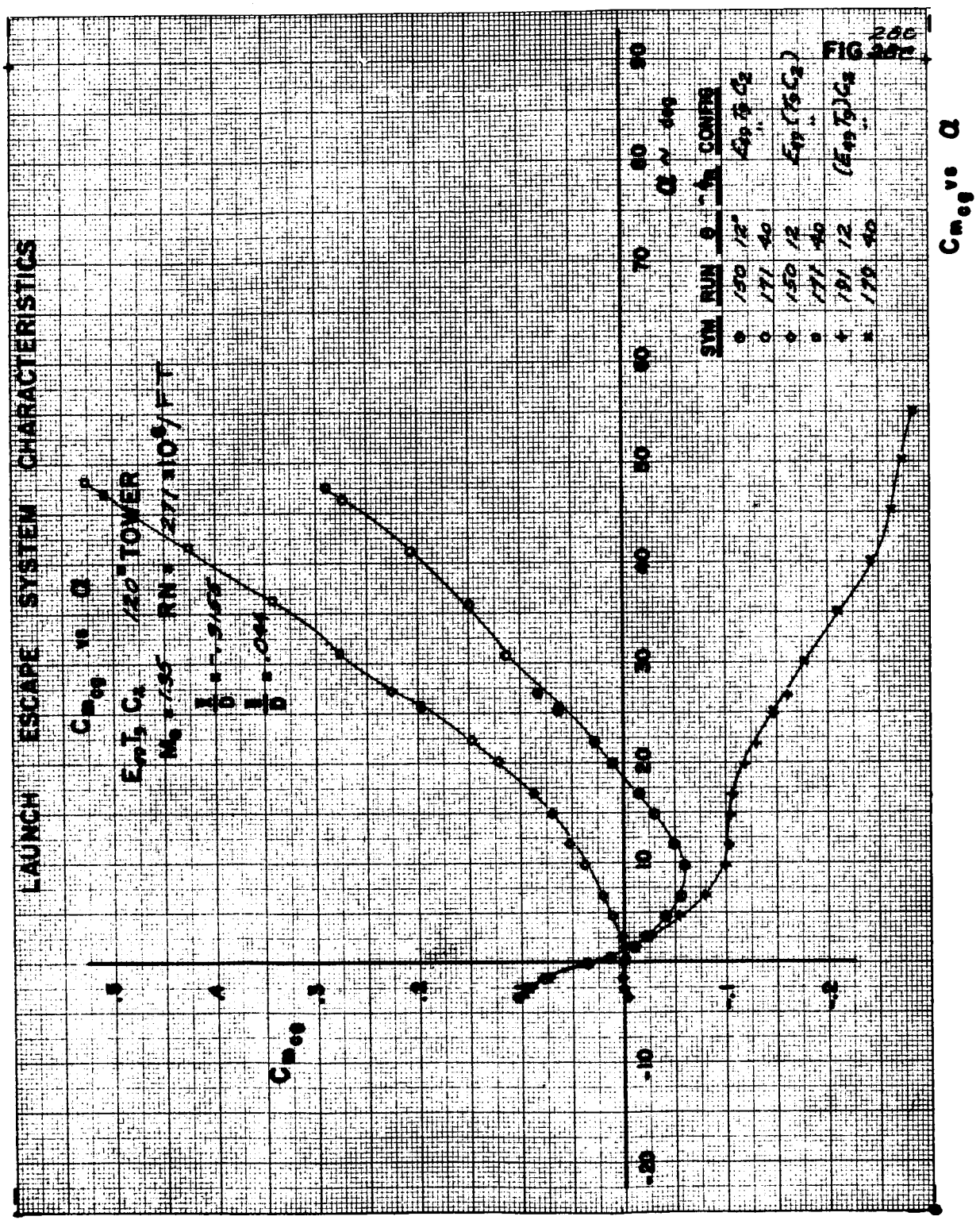

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CON[redacted]

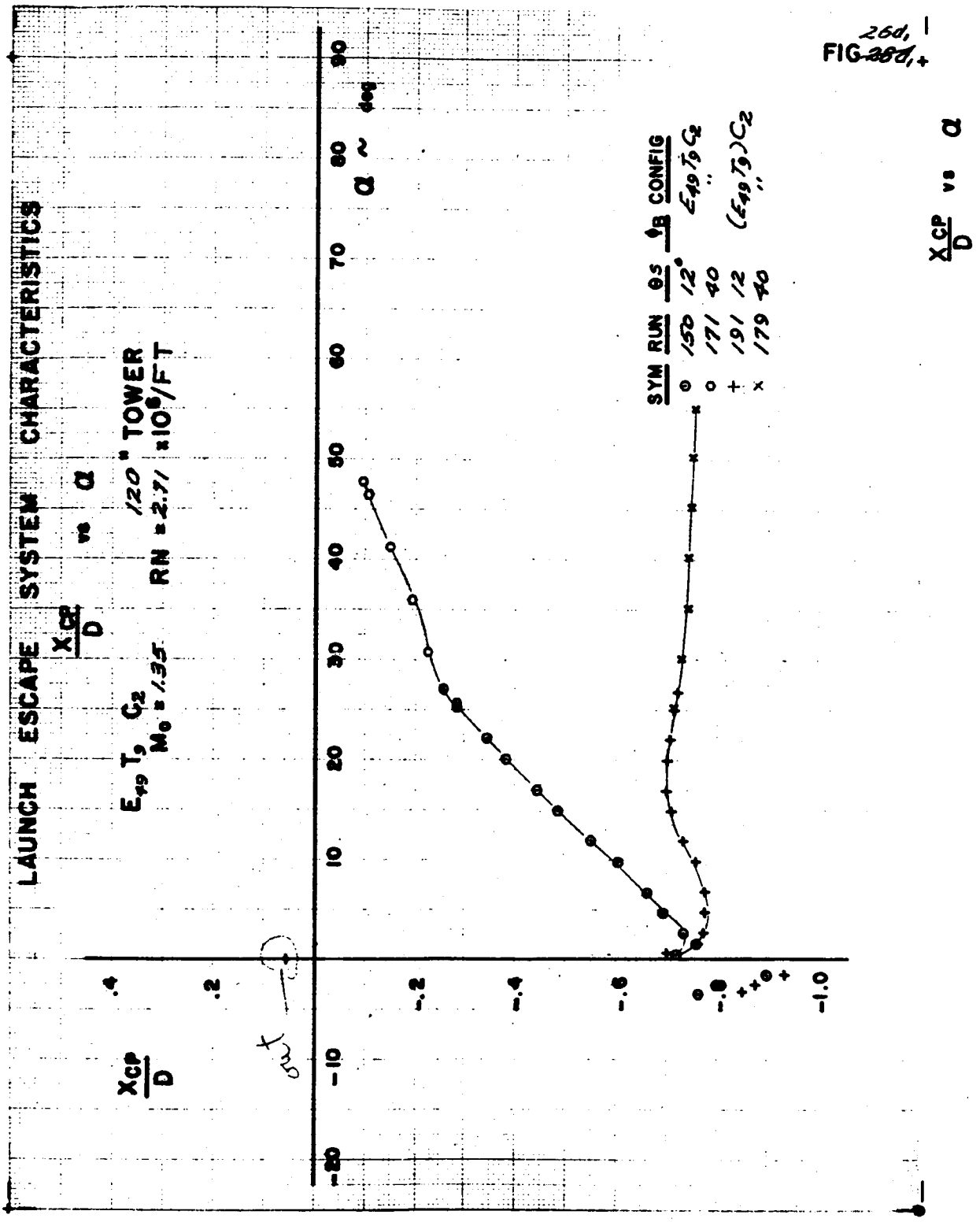

FIG 26d, 1

$\frac{X_{CP}}{D}$ vs α

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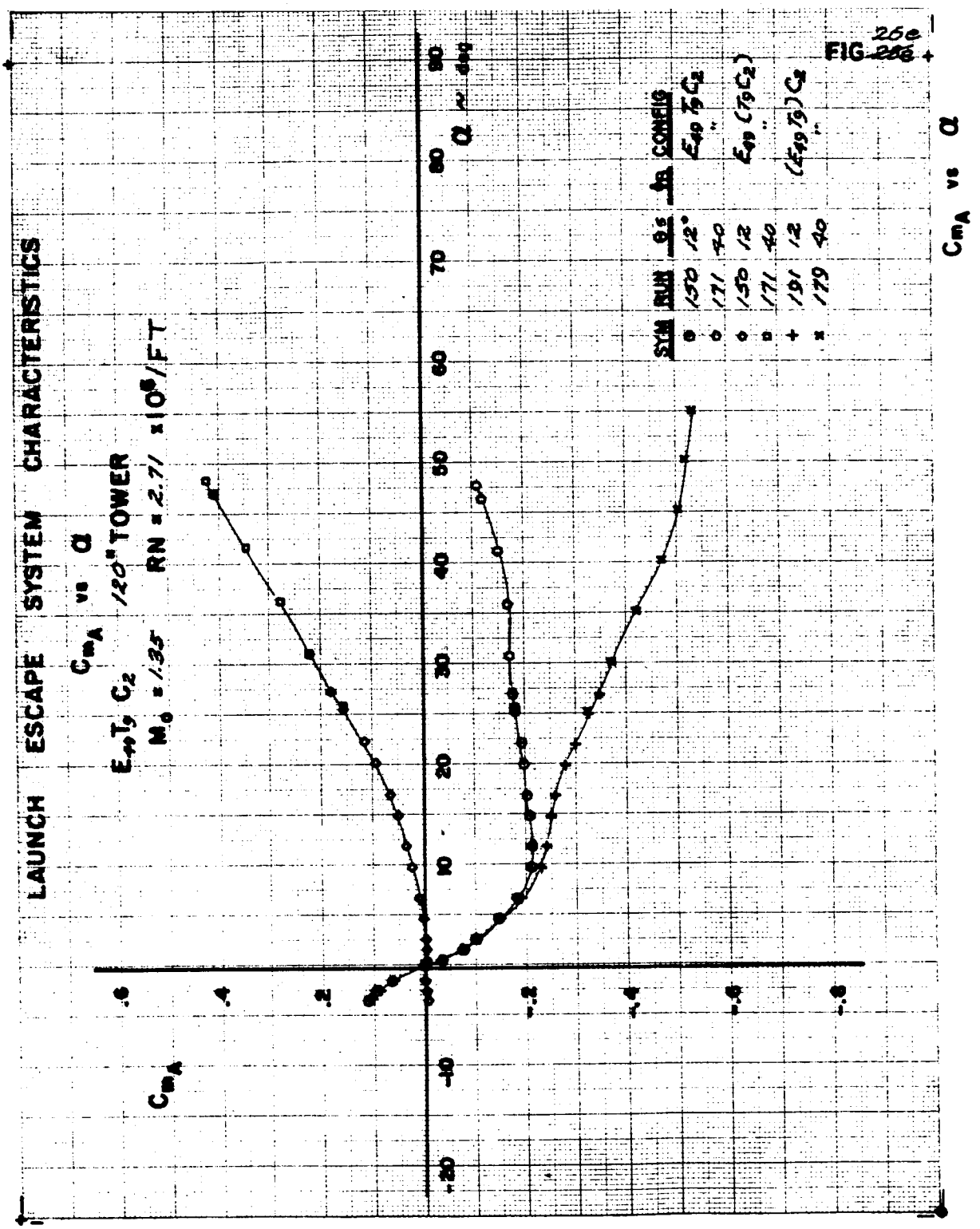

FIG ~~25b~~ 25e

C_{m_A} vs α

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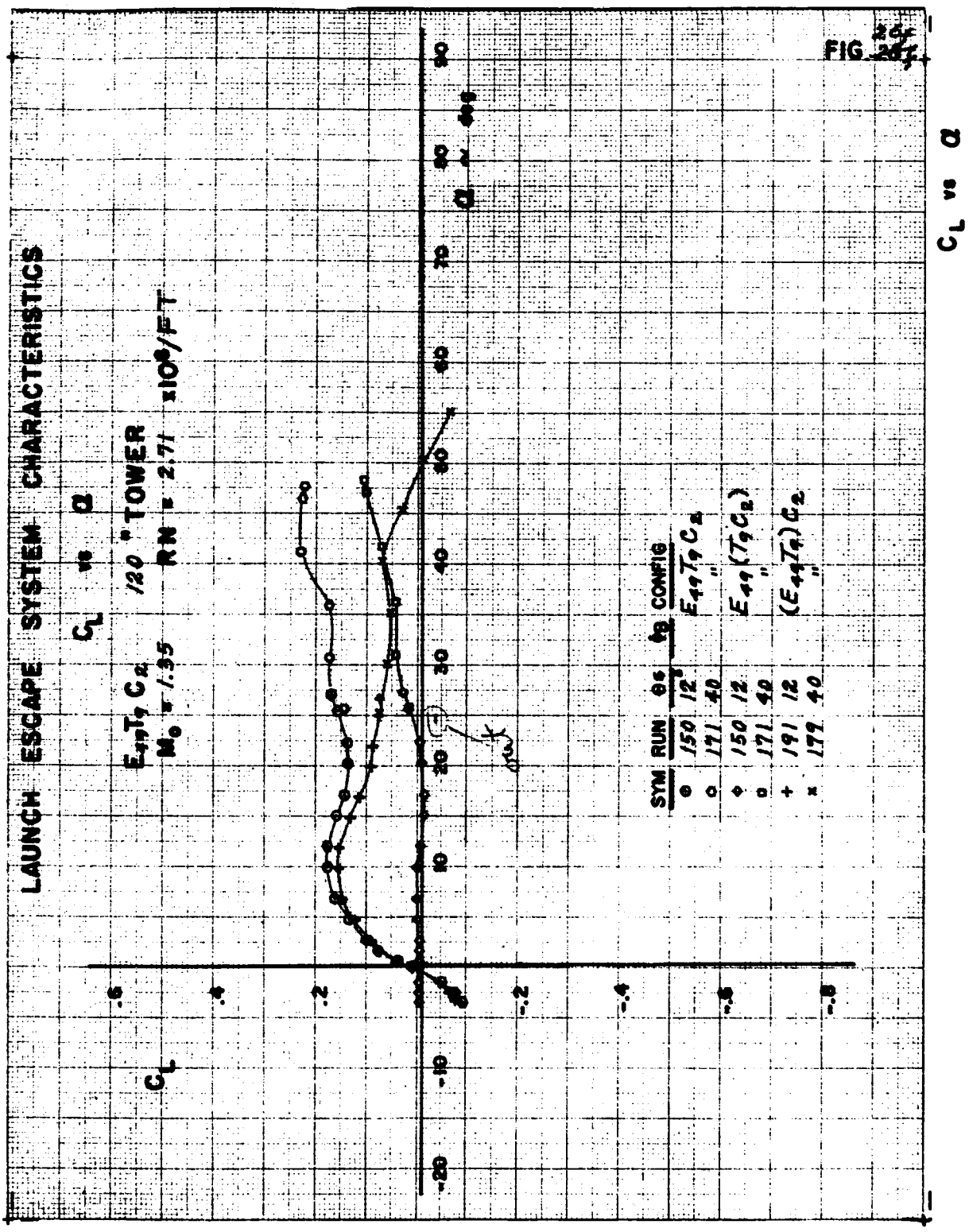

FIG 26f

C_L vs α

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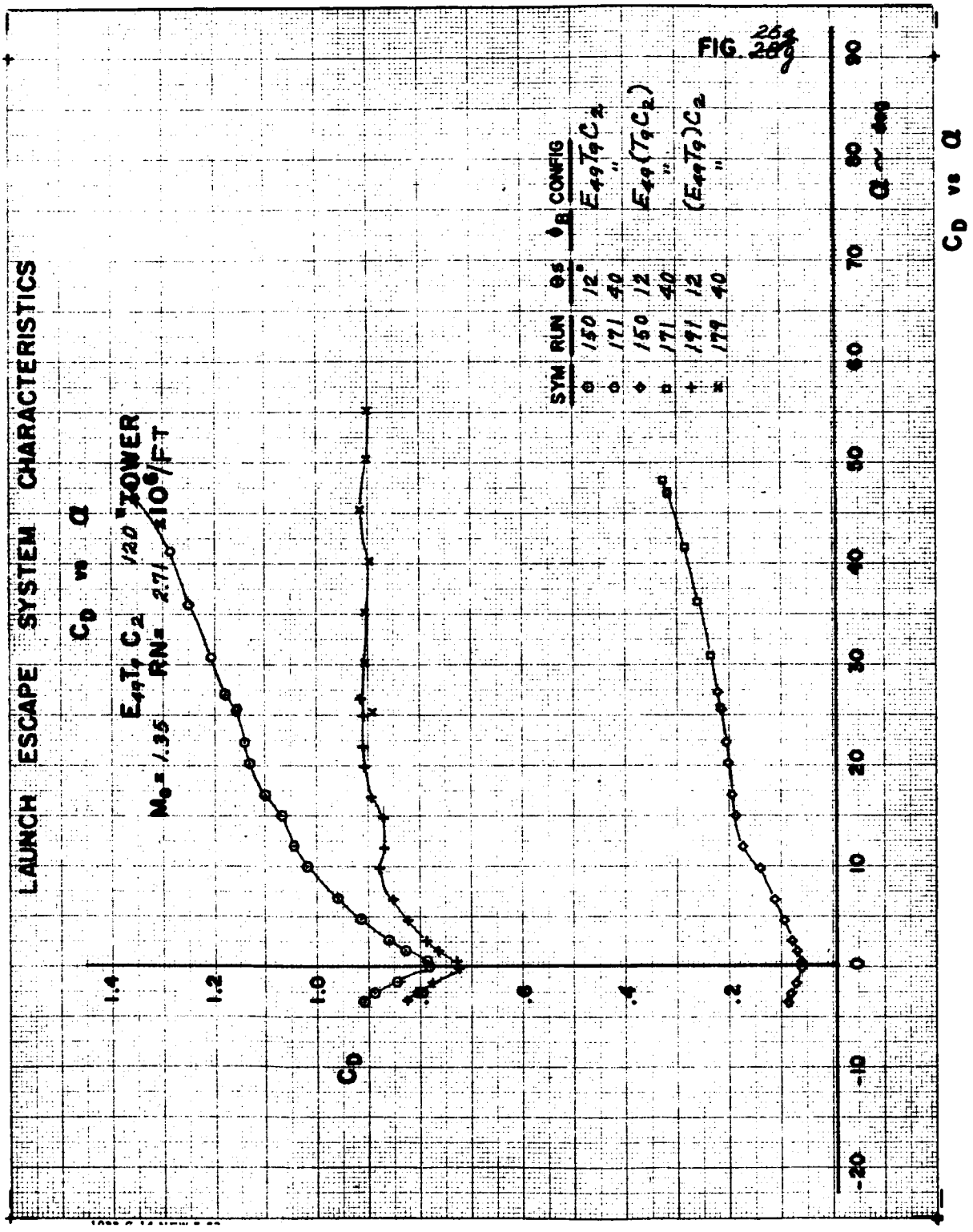

FIG. 28g

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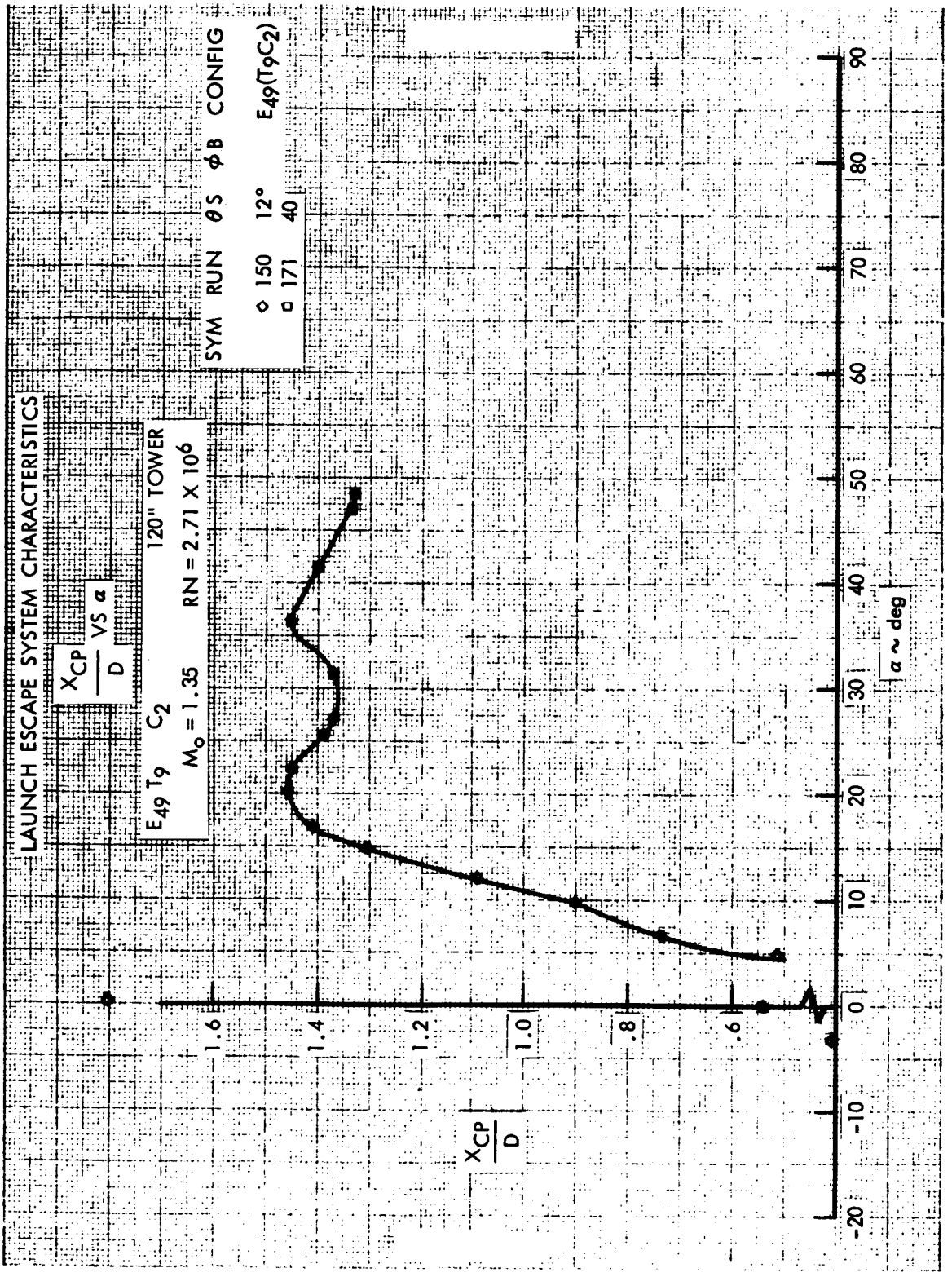

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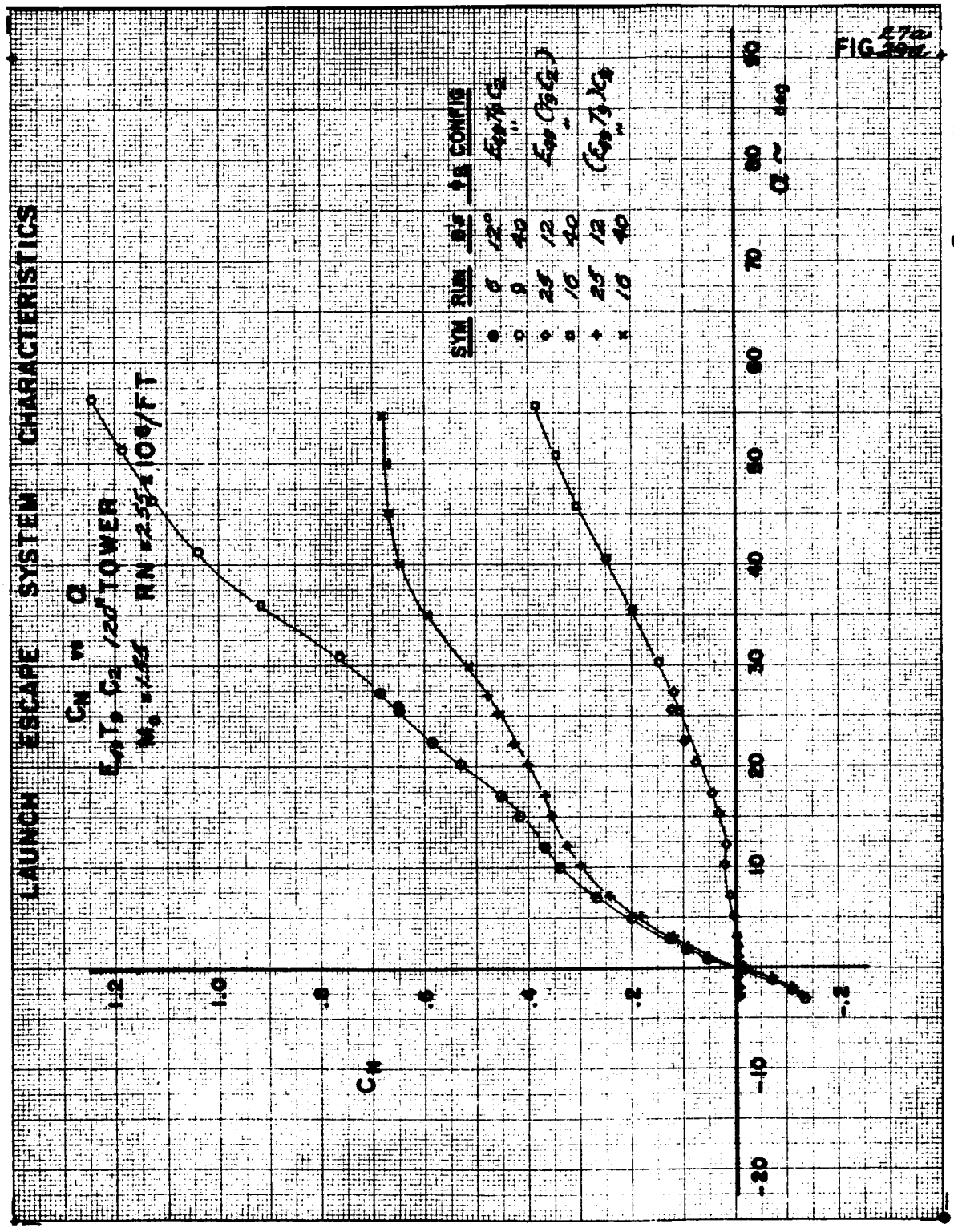

CN vs α

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CONFIDENTIAL

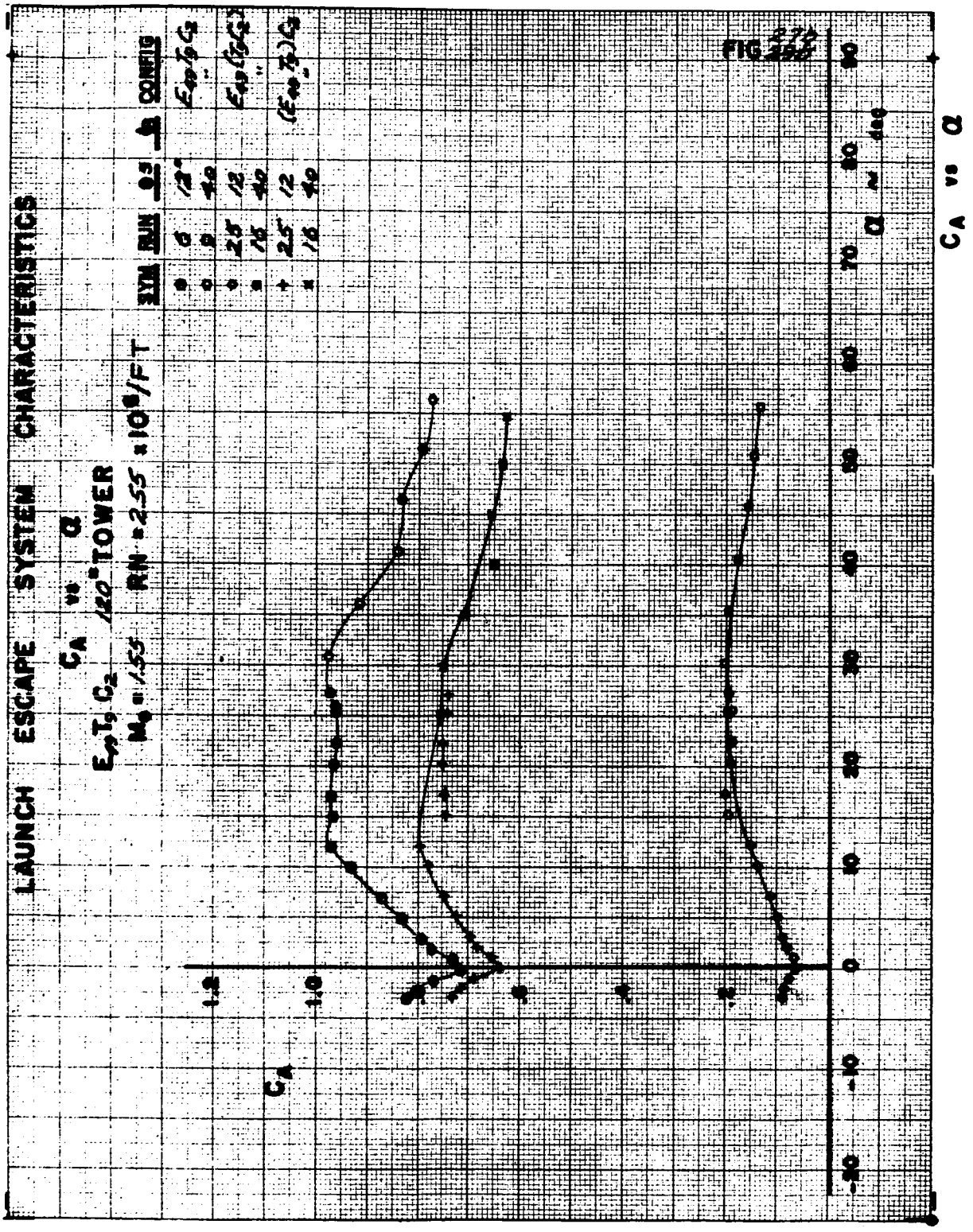

FIG 2.2.2

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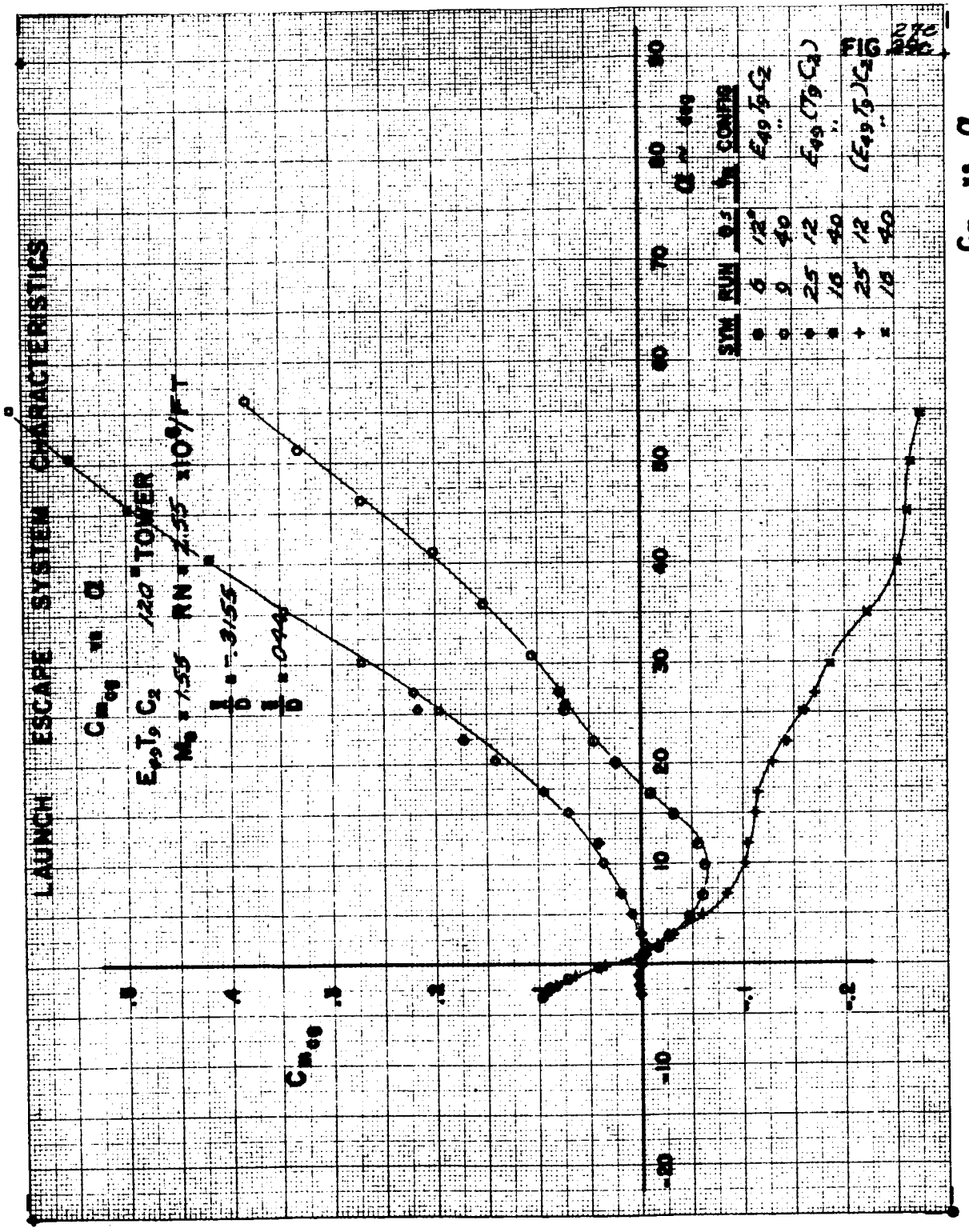

FIG 27c

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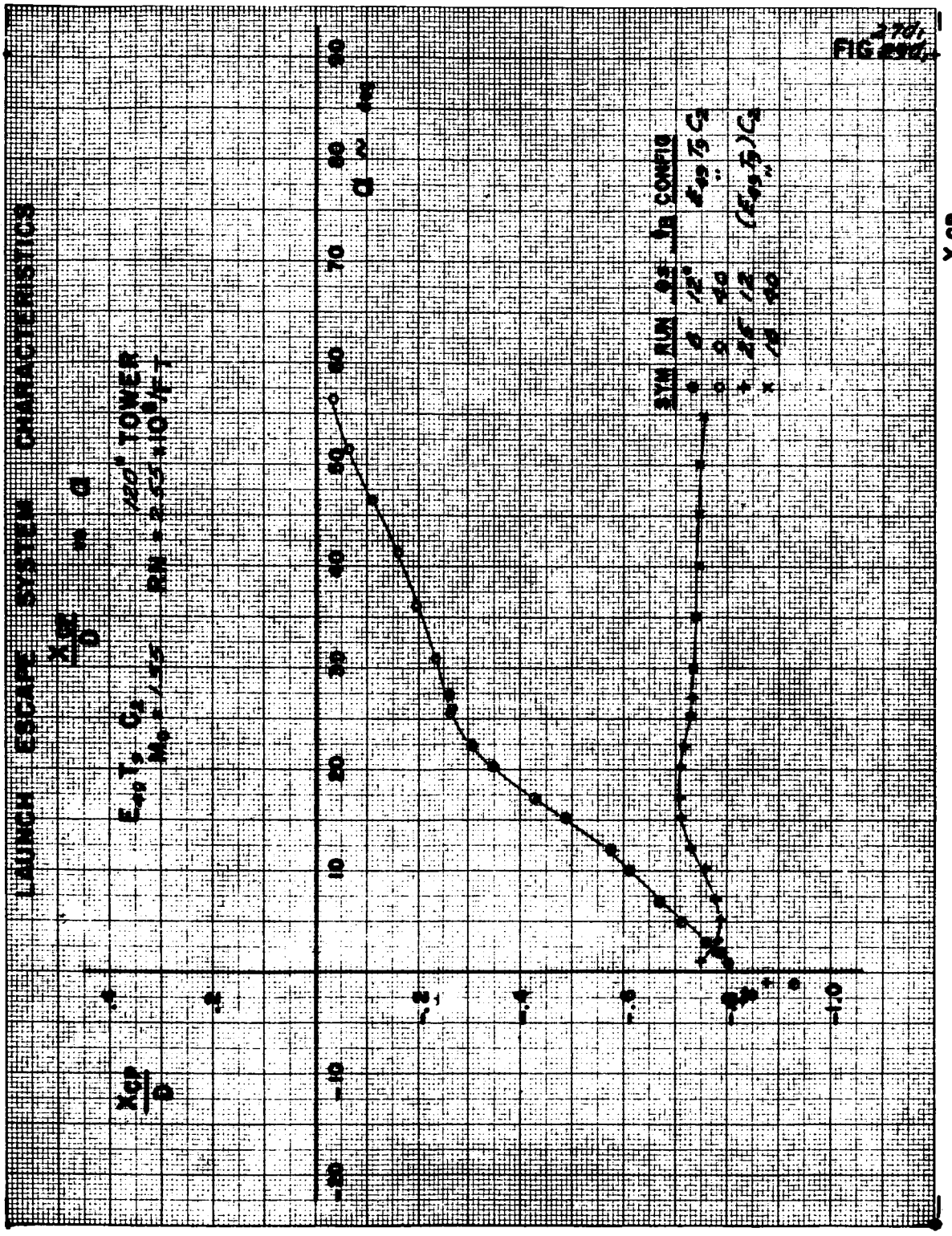

FIG [illegible]

$\frac{X_{CP}}{D}$ vs α

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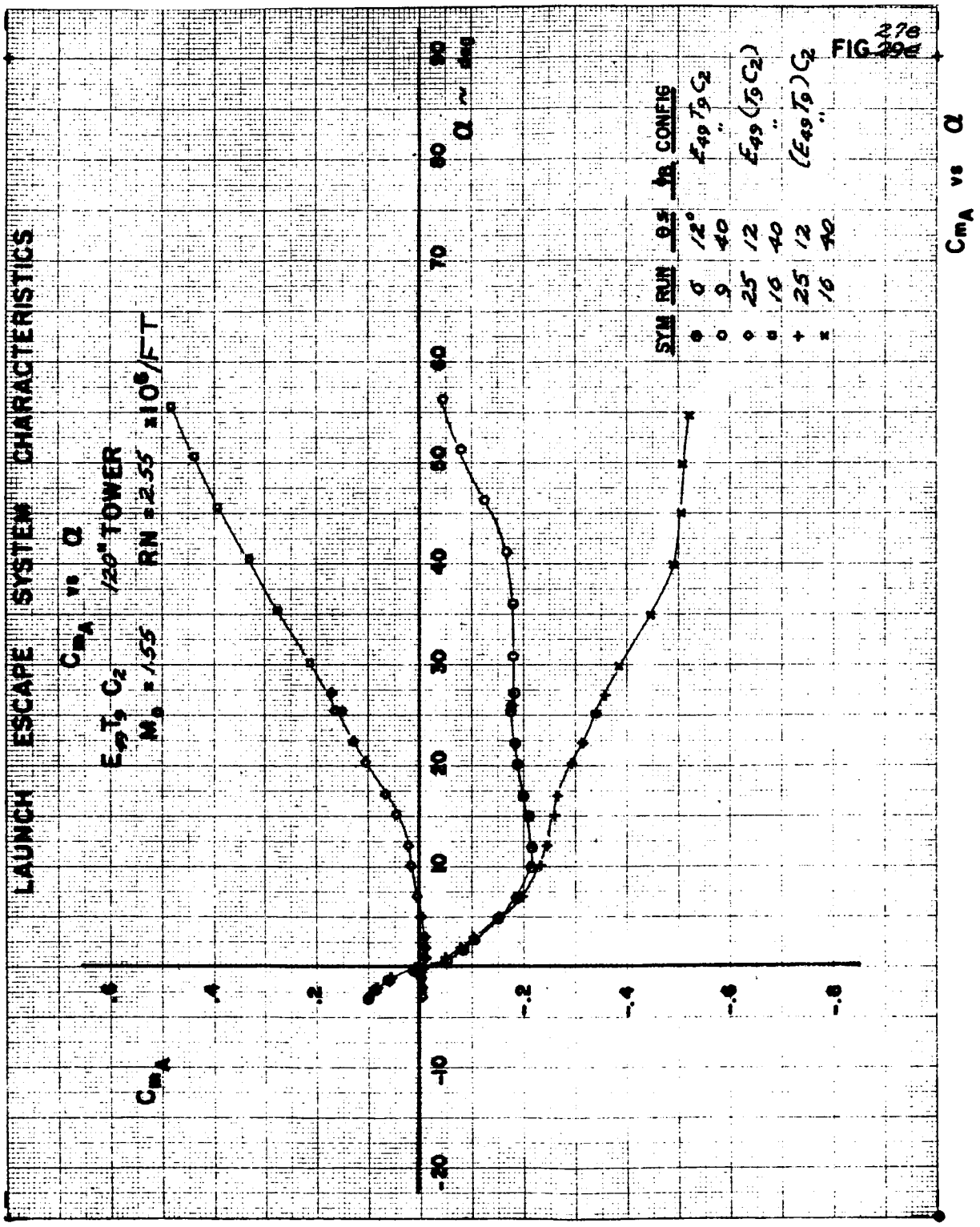

FIG. 29e

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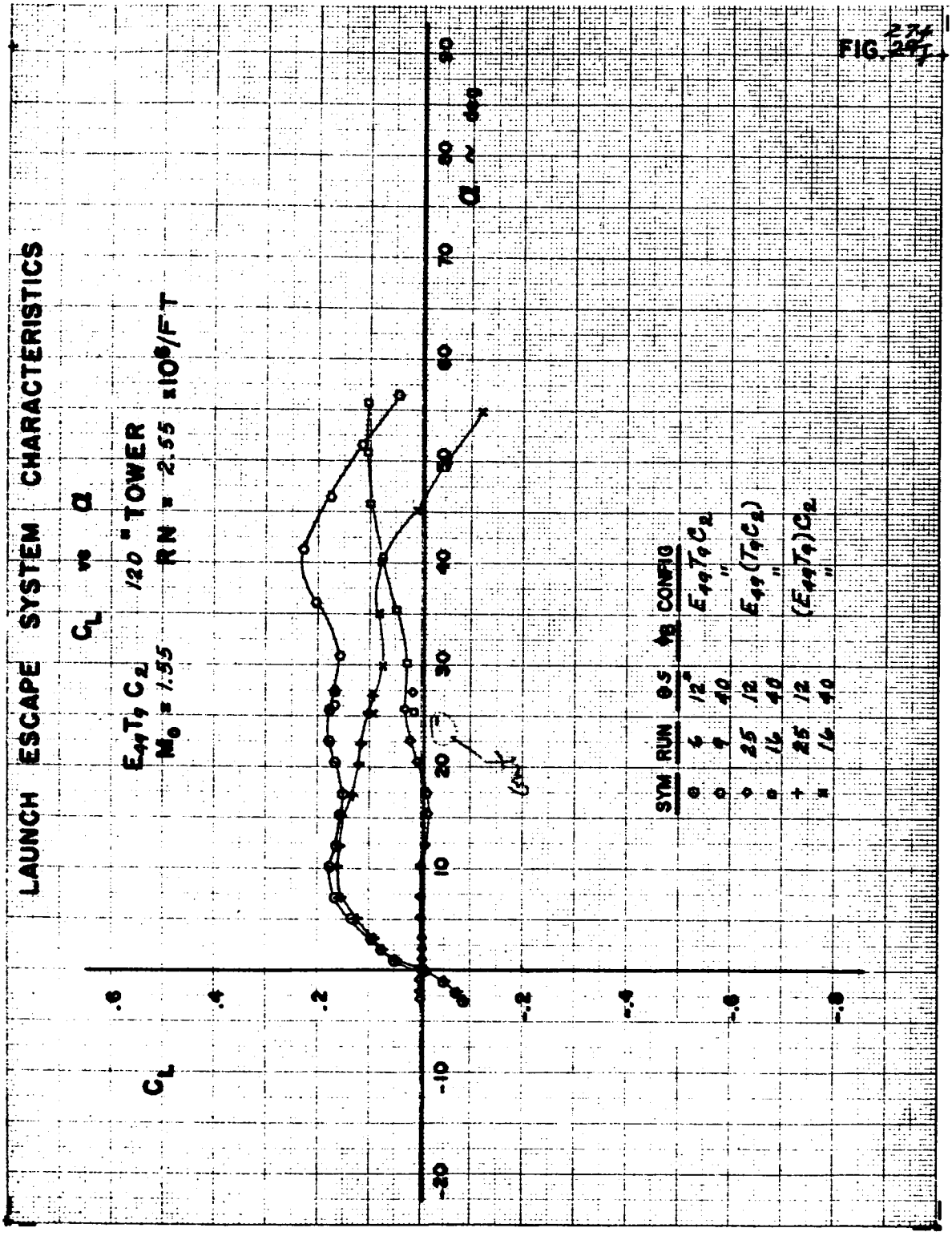

FIG. 29

C_L vs α

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[redacted]

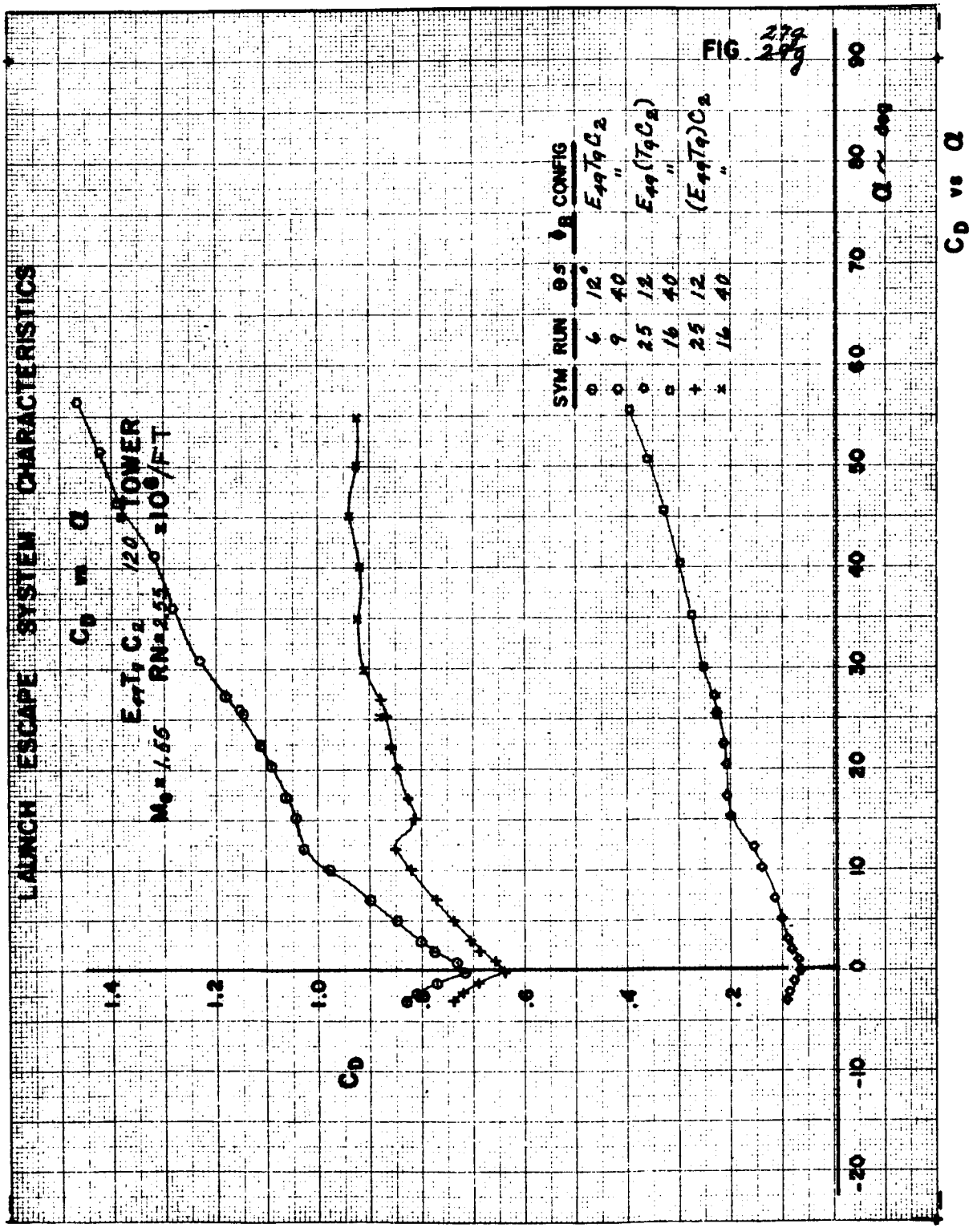

FIG. 27g 29g

[redacted]

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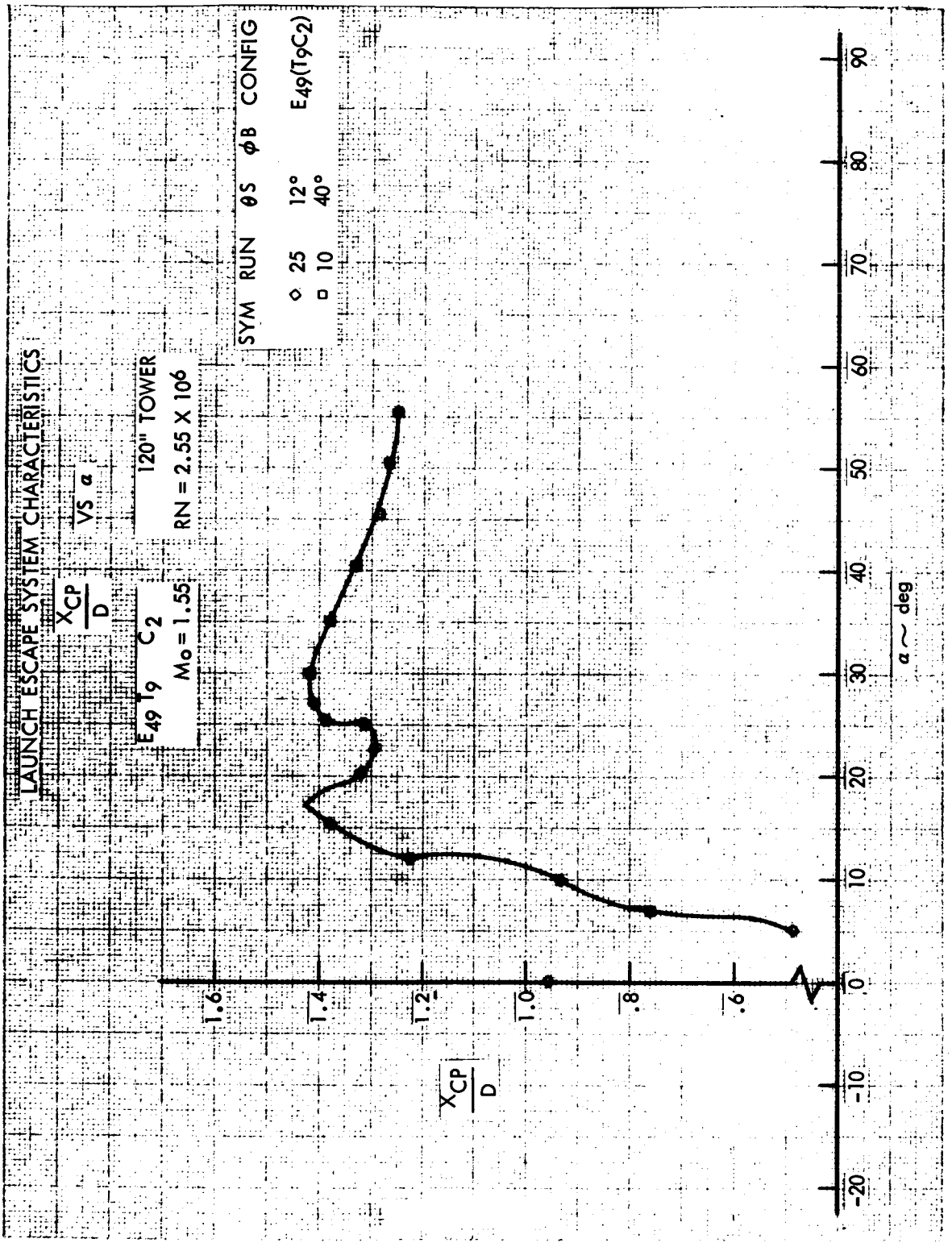

[redacted]

~~CONFIDENTIAL~~

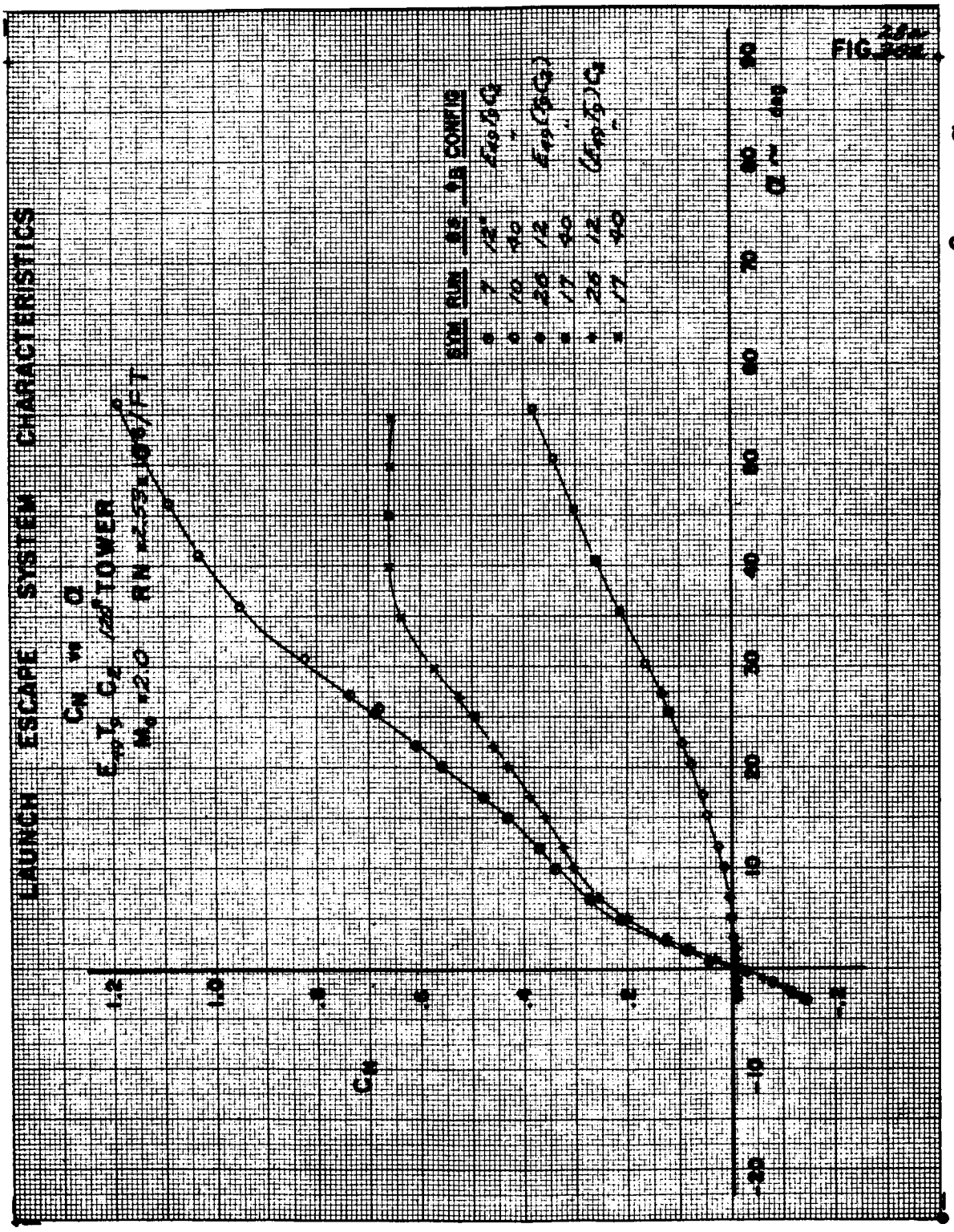

FIG. 25

C_N vs α

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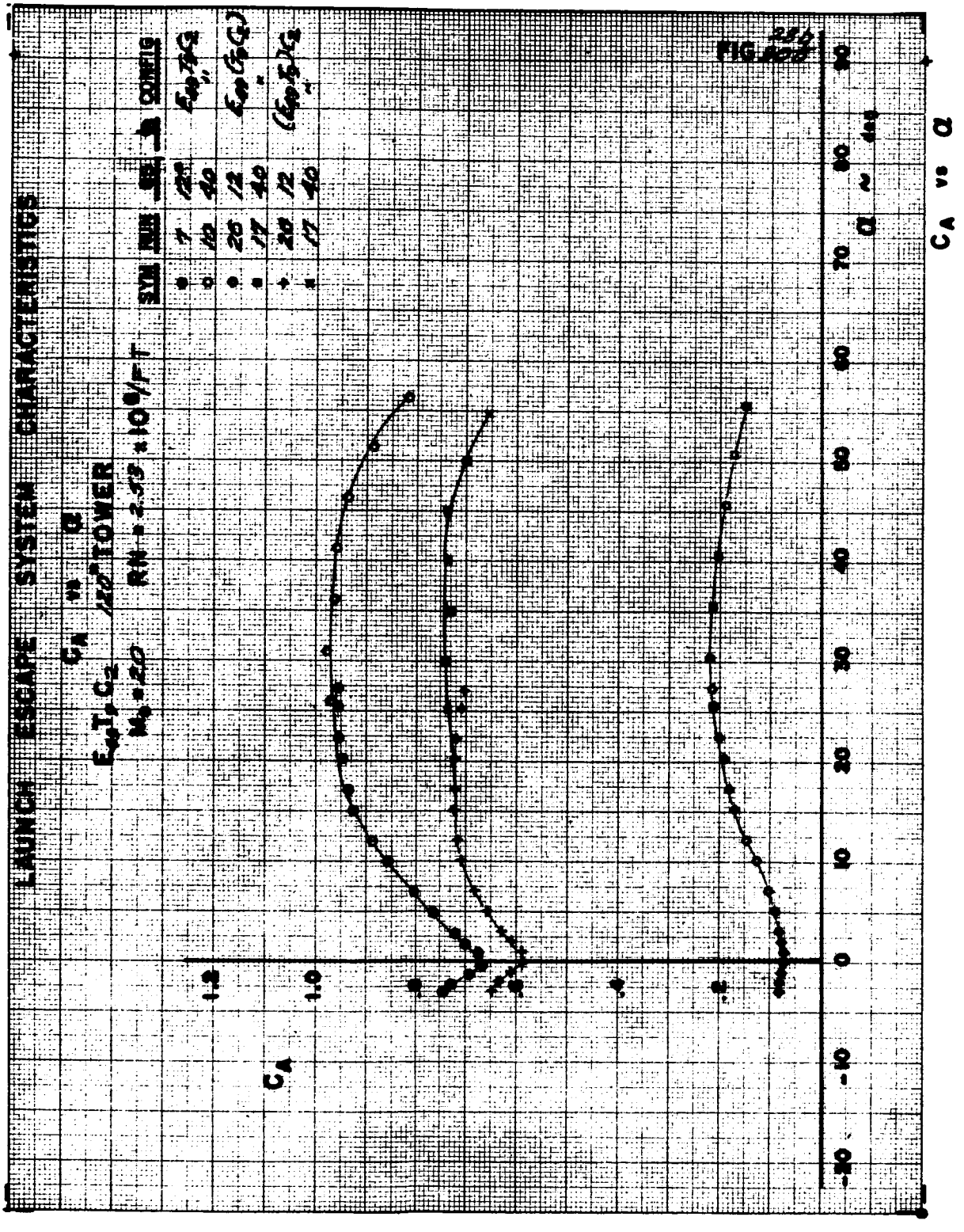

FIG. 25

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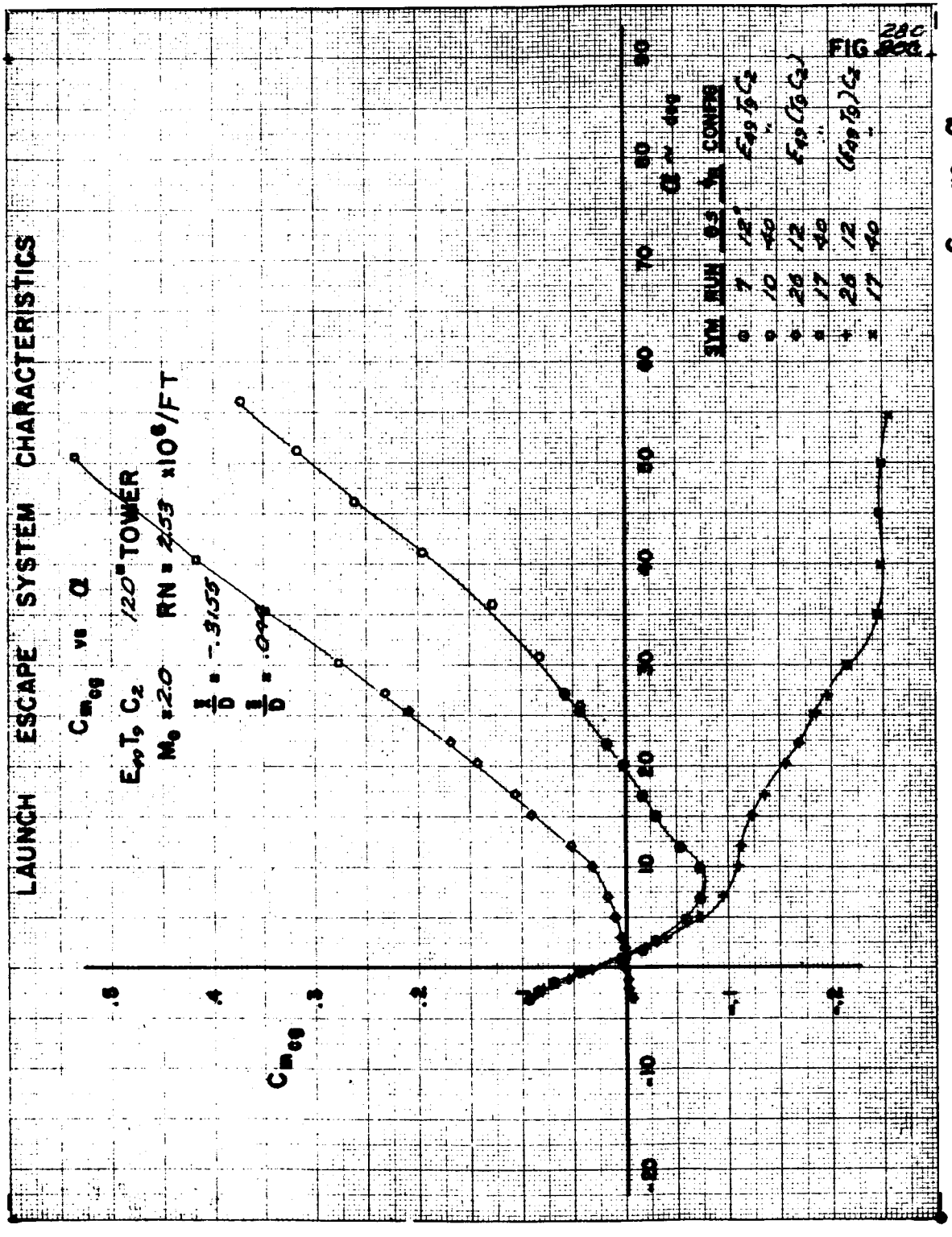

$C_{m_{cg}}$ vs α

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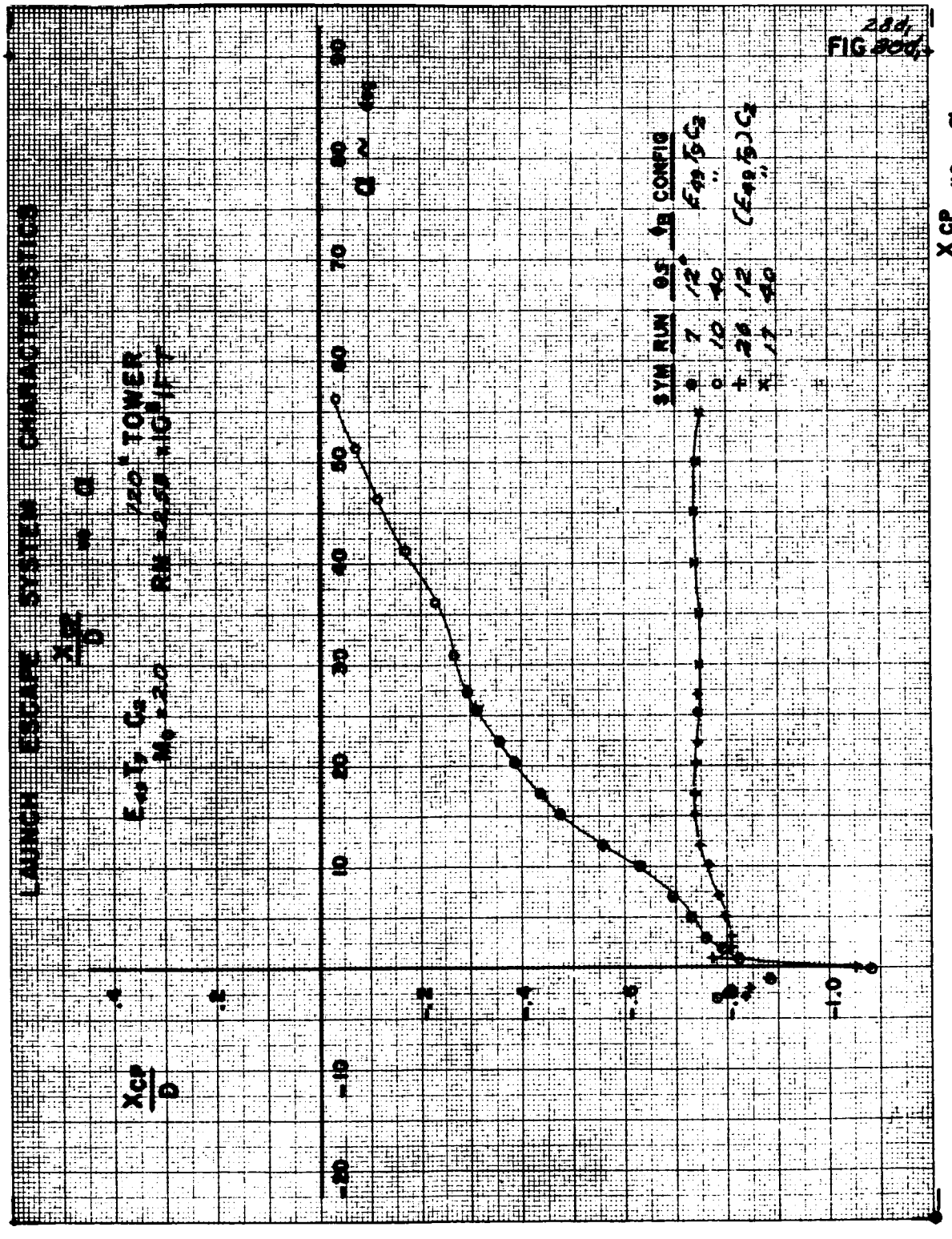

FIG 28d

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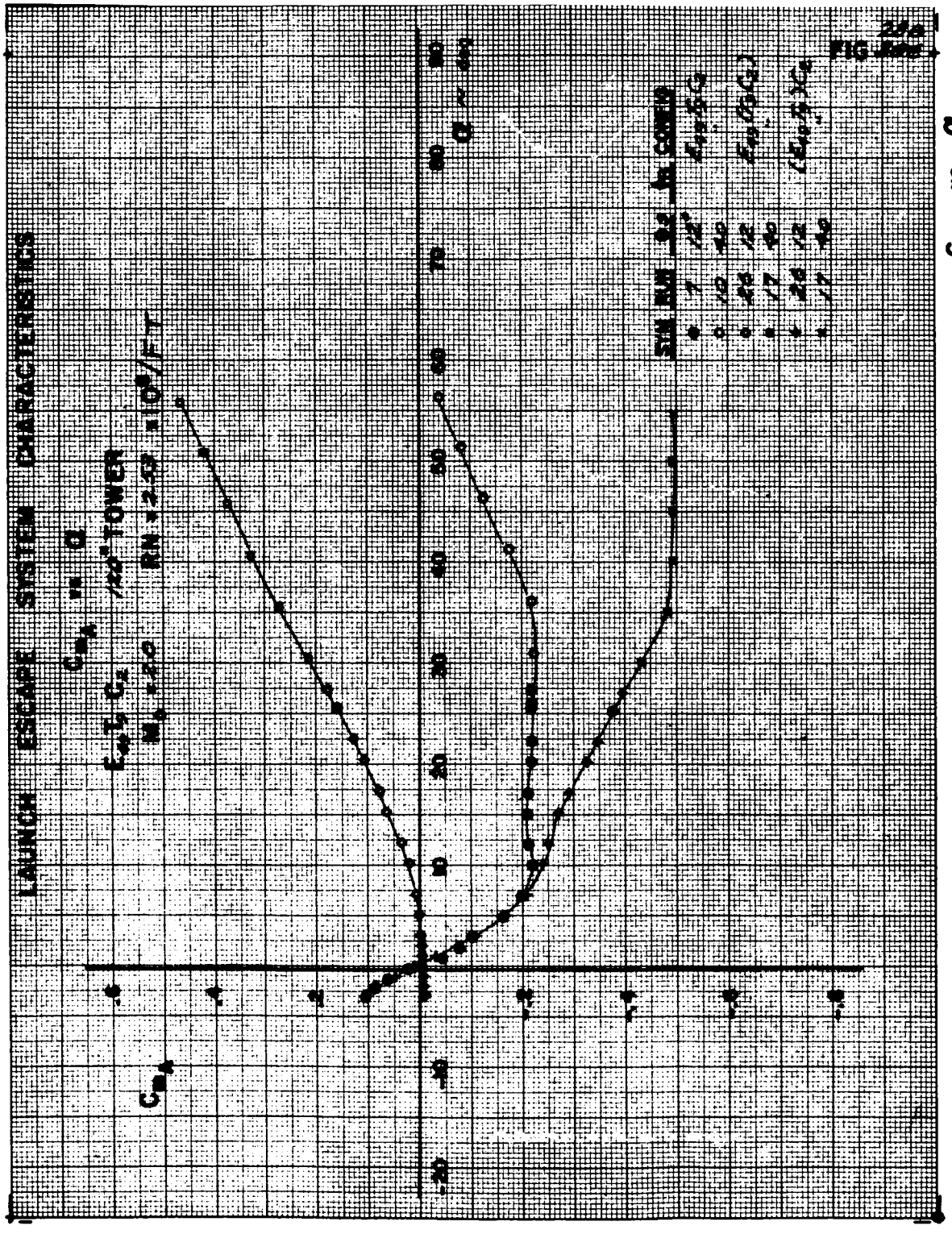

FIG 28a

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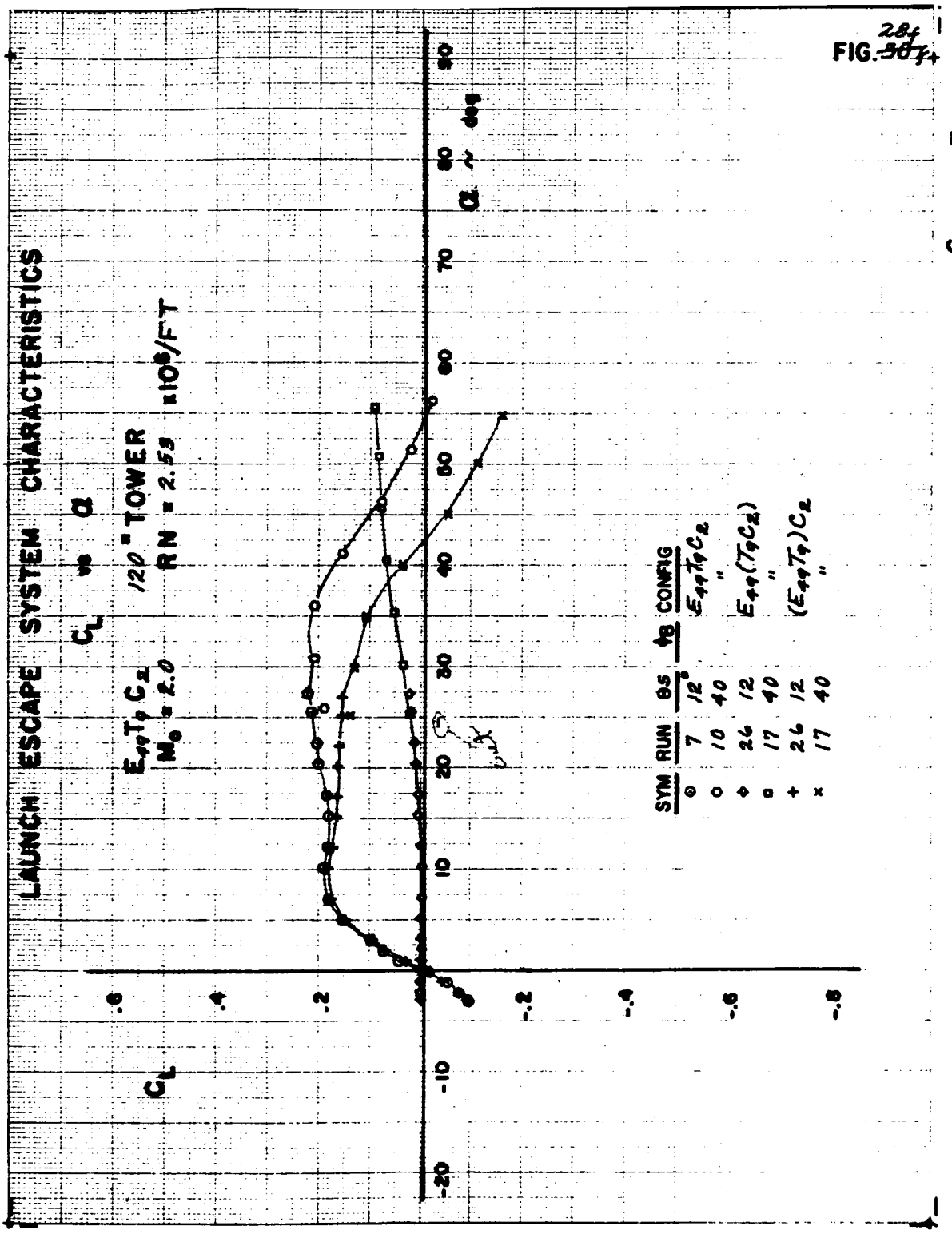

FIG. ~~30~~ 28

C_L vs α

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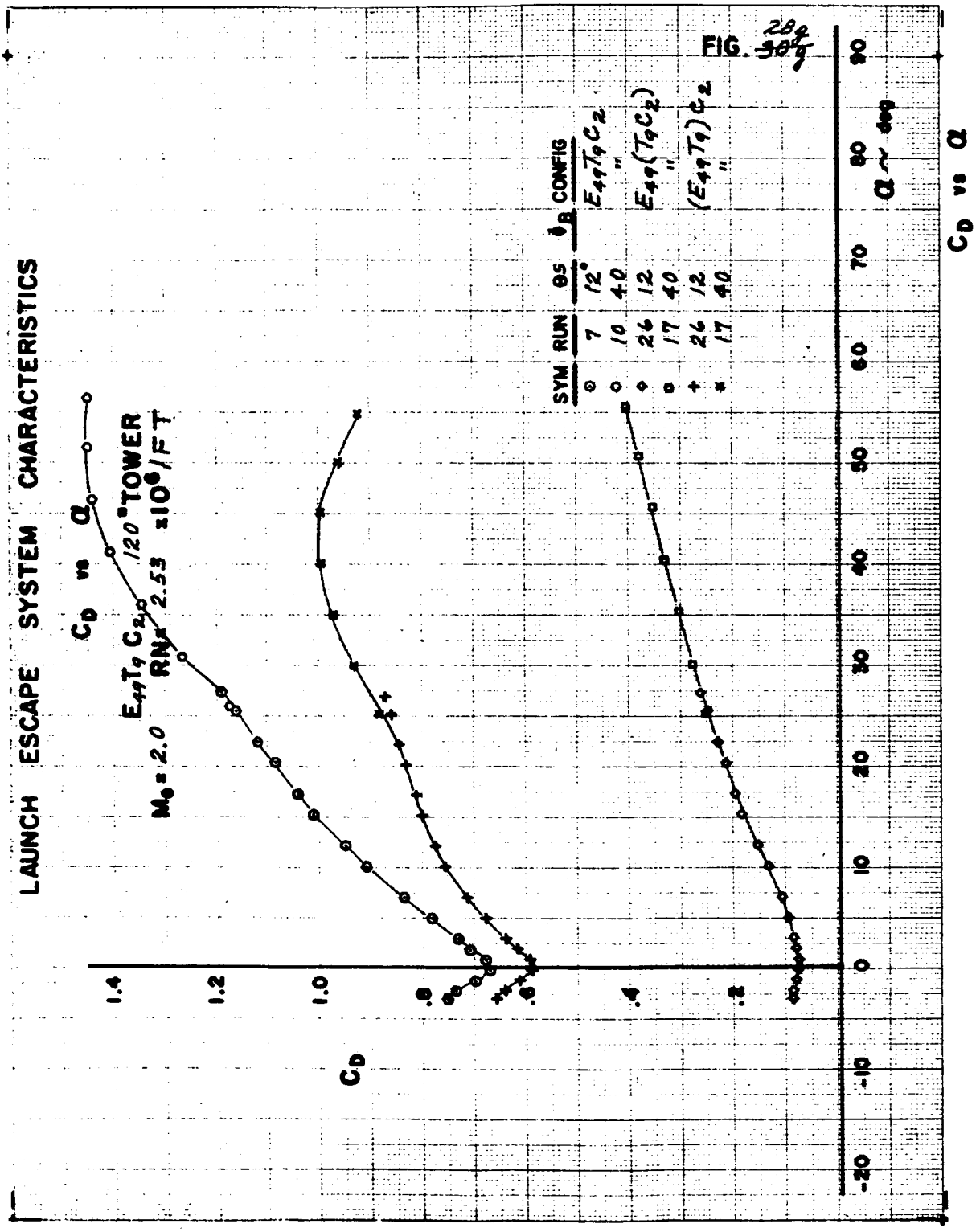

FIG. 28g

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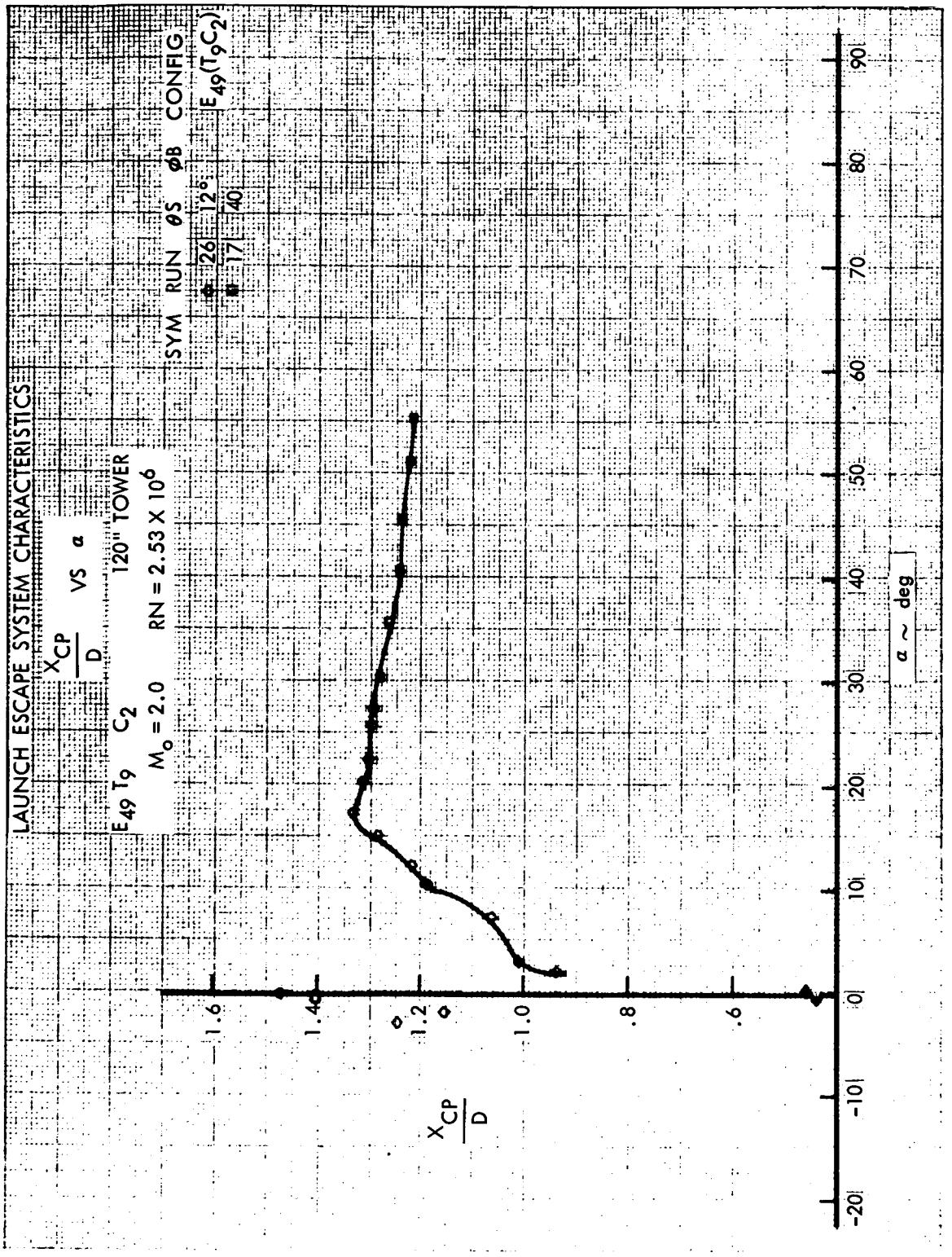

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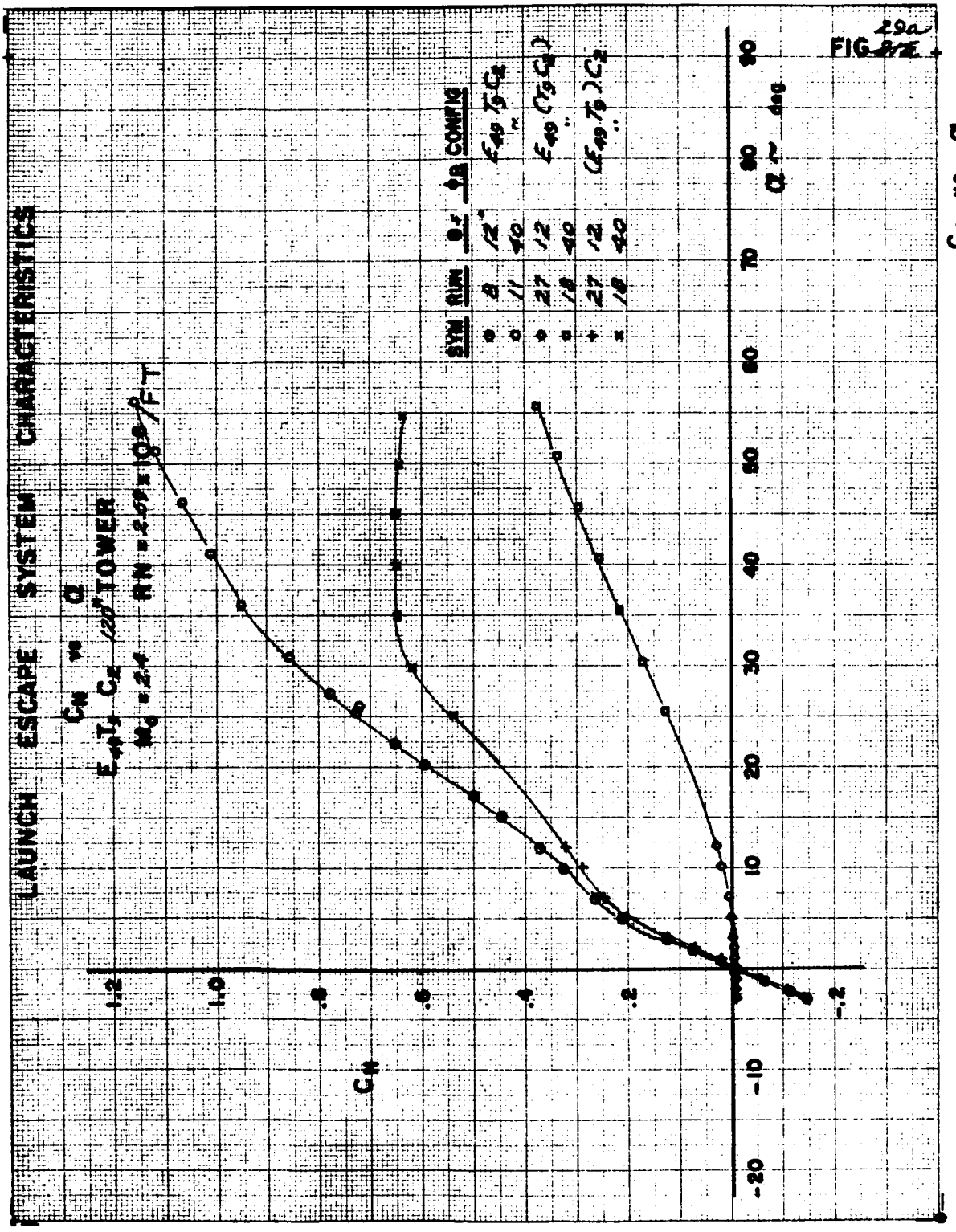

FIG 29a

C_N vs α

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CON[redacted]

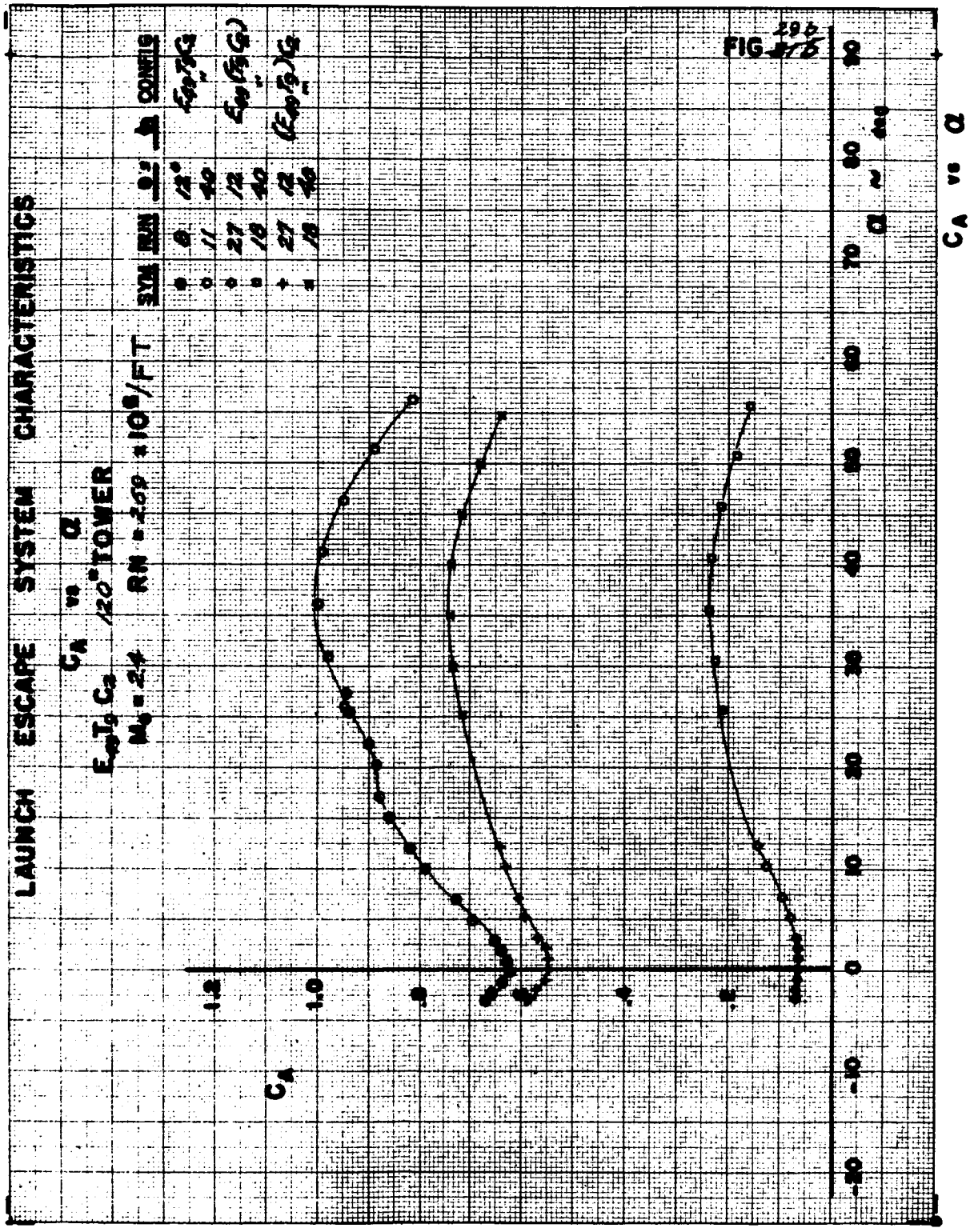

FIG 29b

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[redacted]

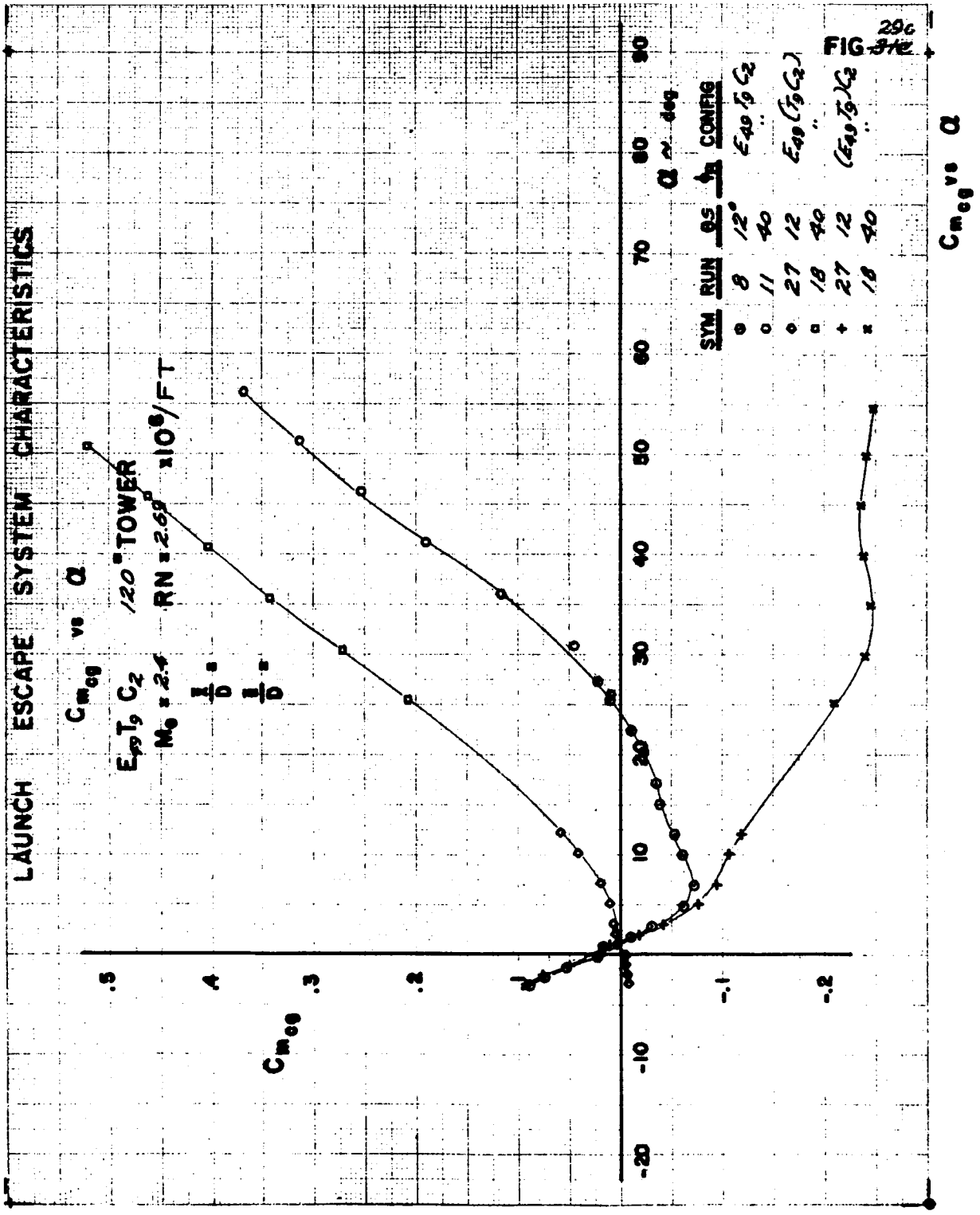

FIG 29c

[redacted]

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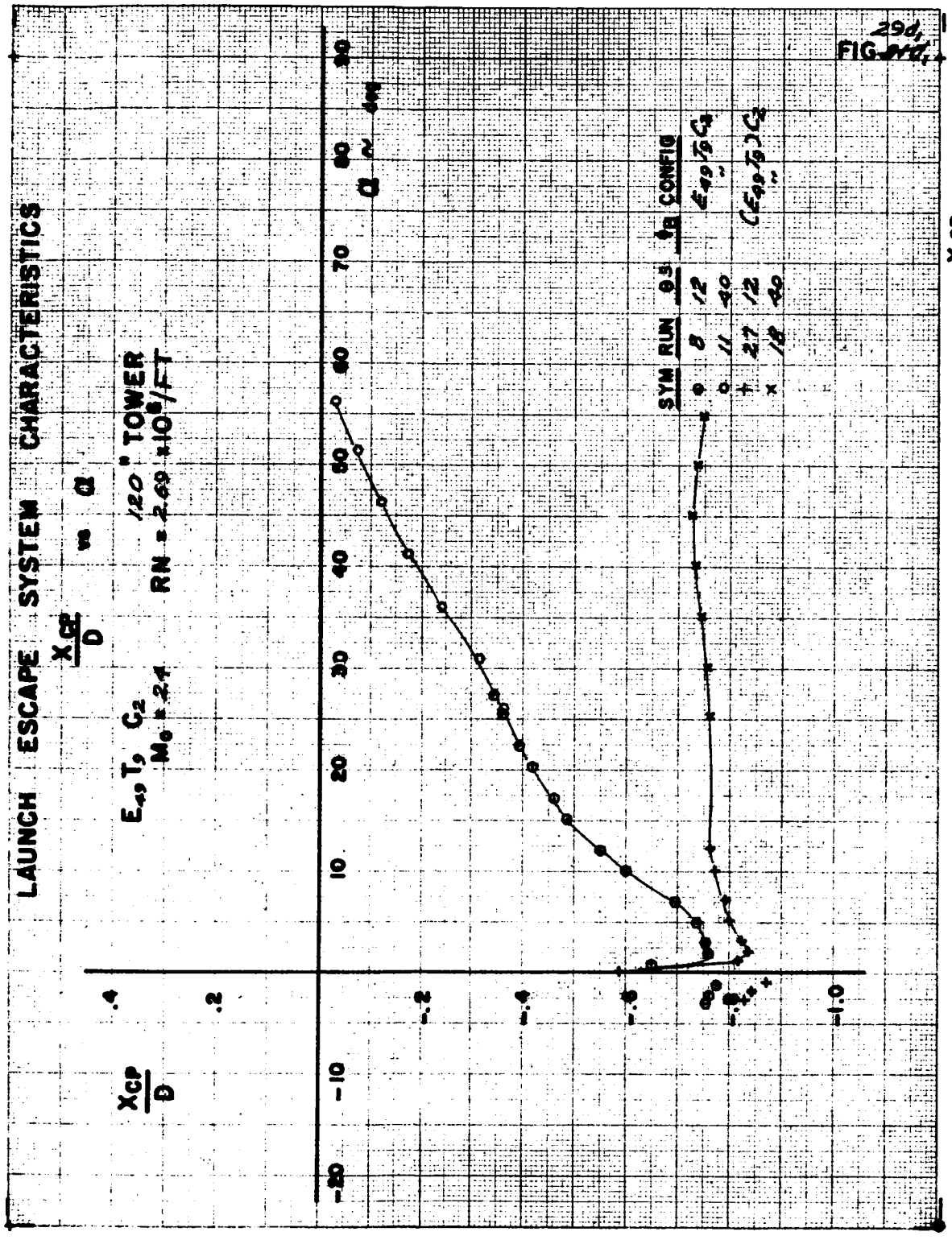

[redacted]

~~CONFIDENTIAL~~

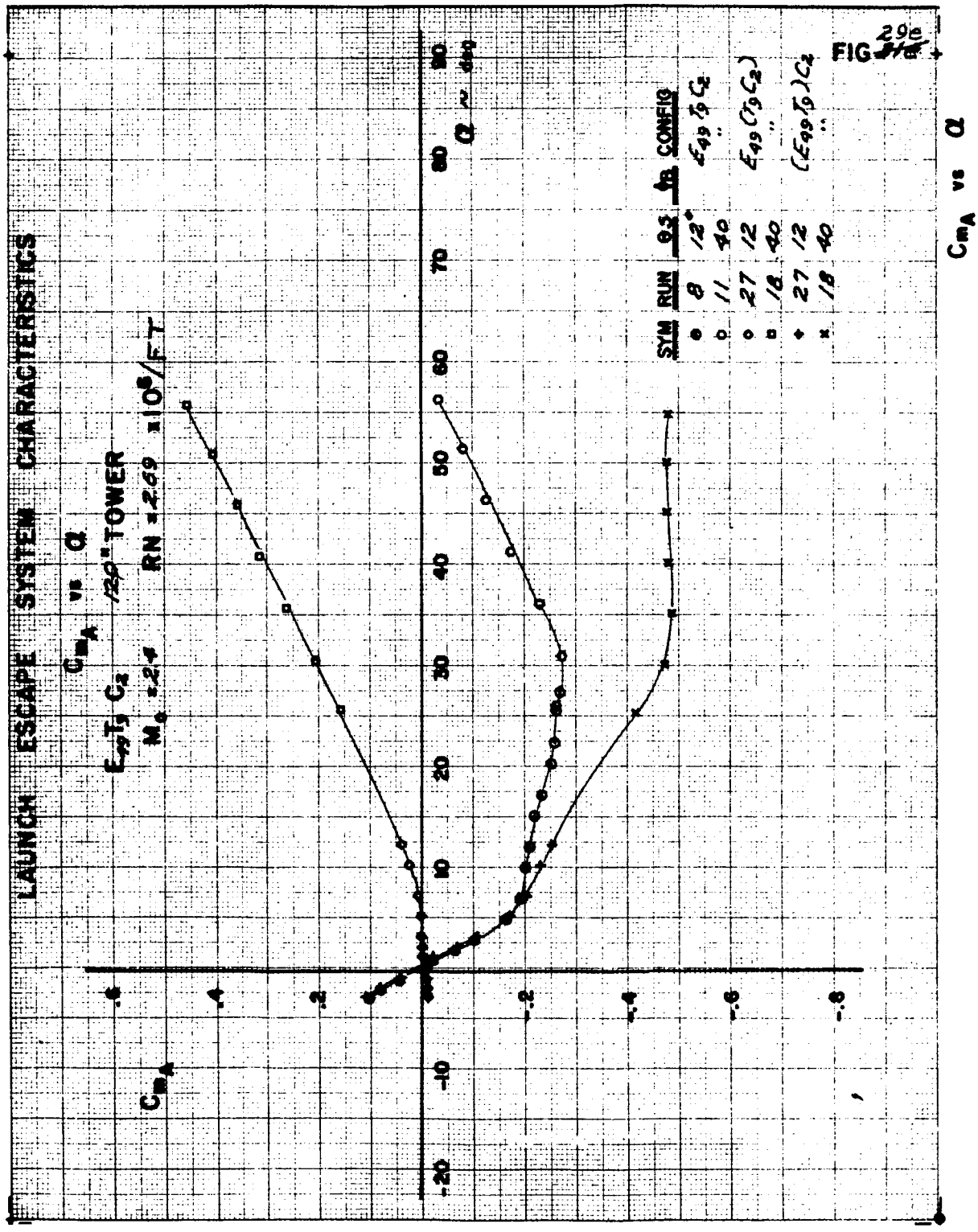

FIG 29e

C_{m_A} vs α

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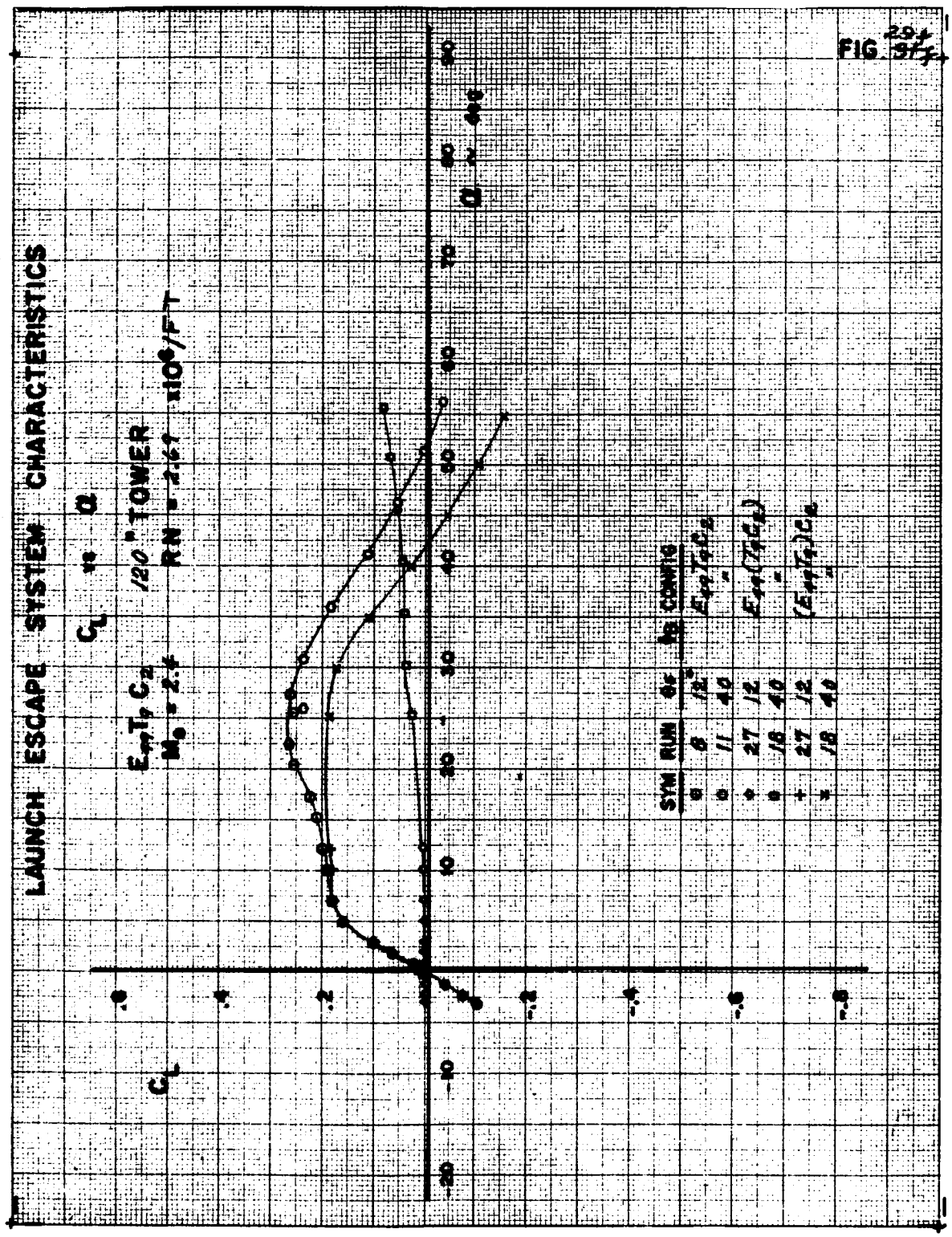

FIG 29

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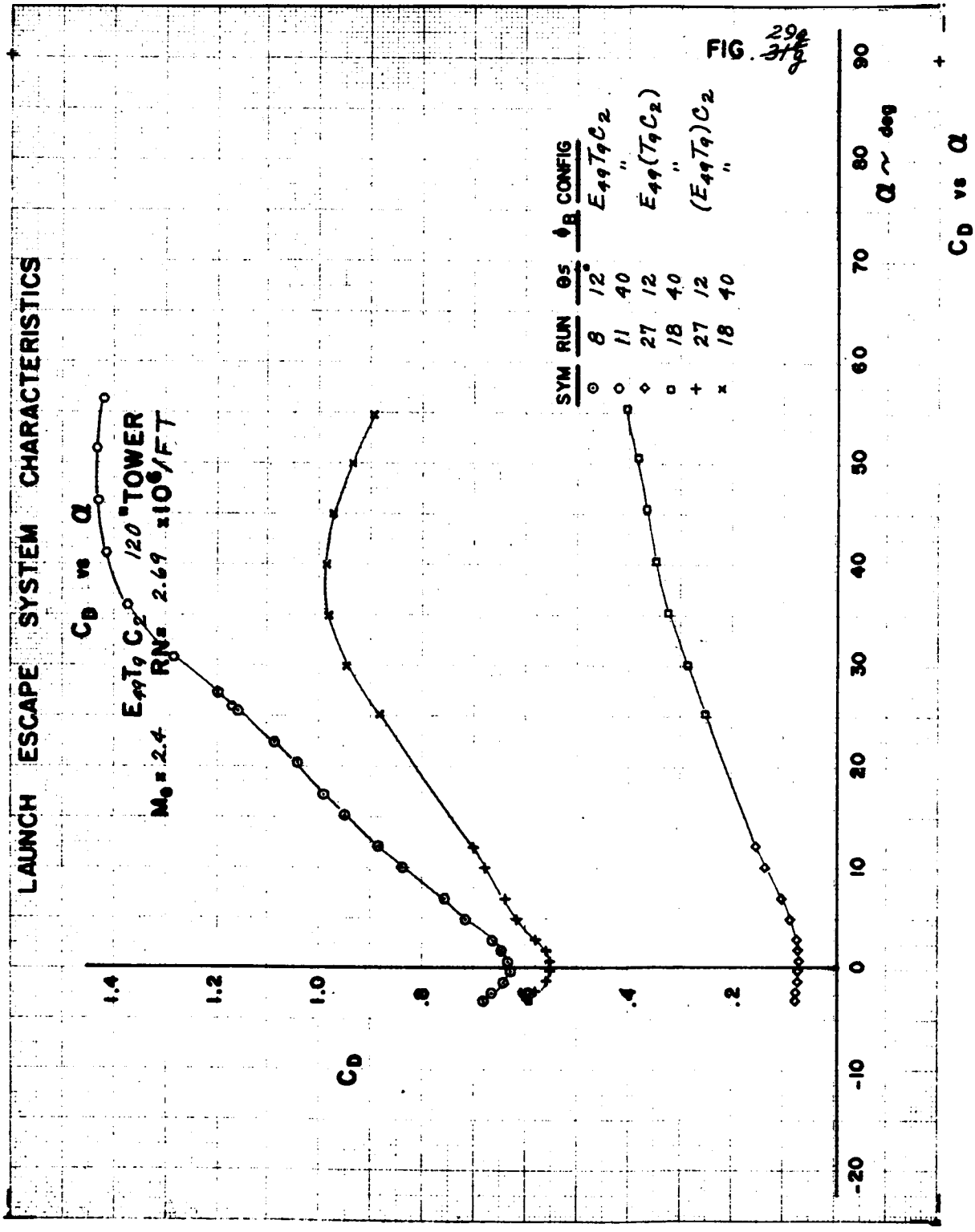

FIG. 29 ~~31~~

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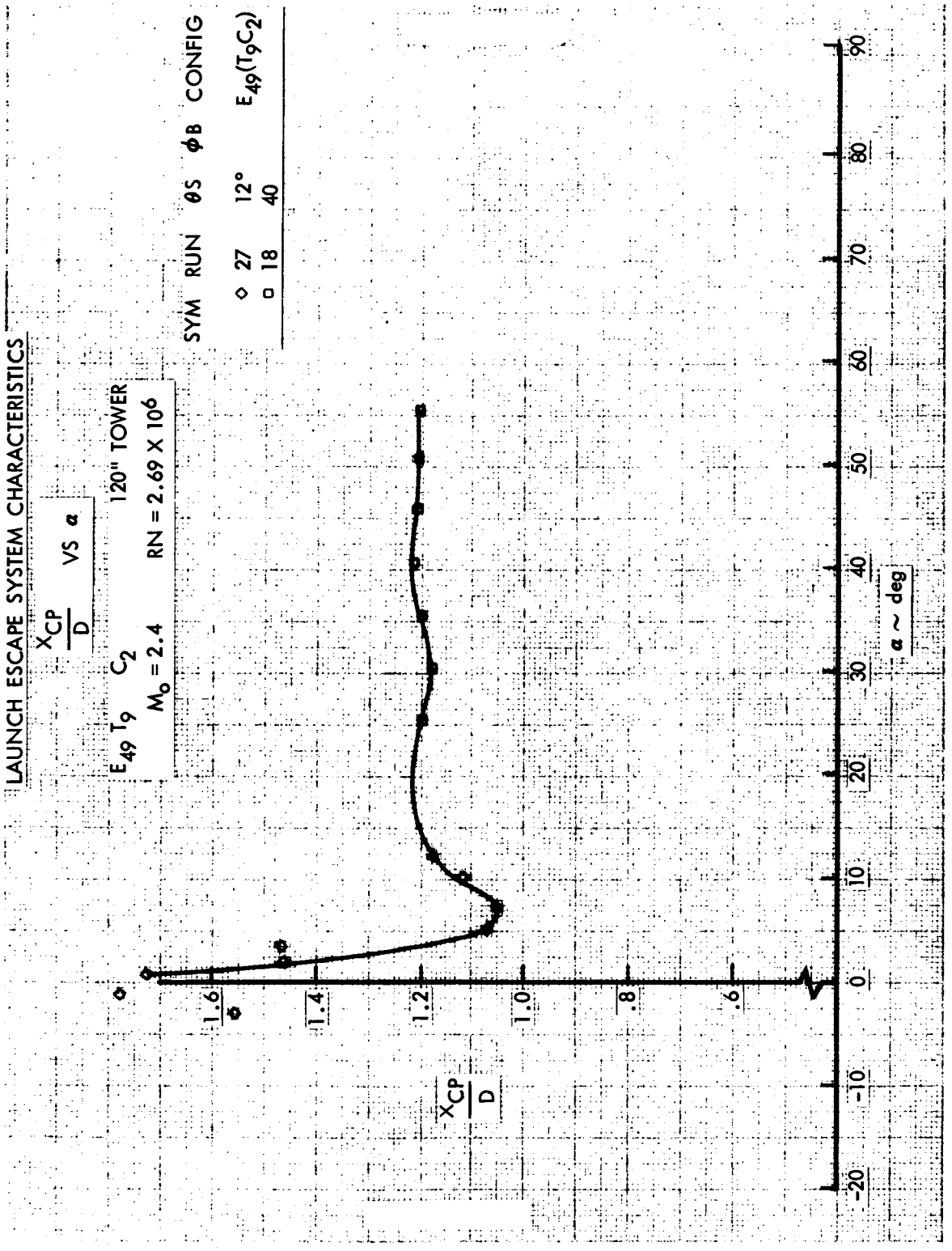

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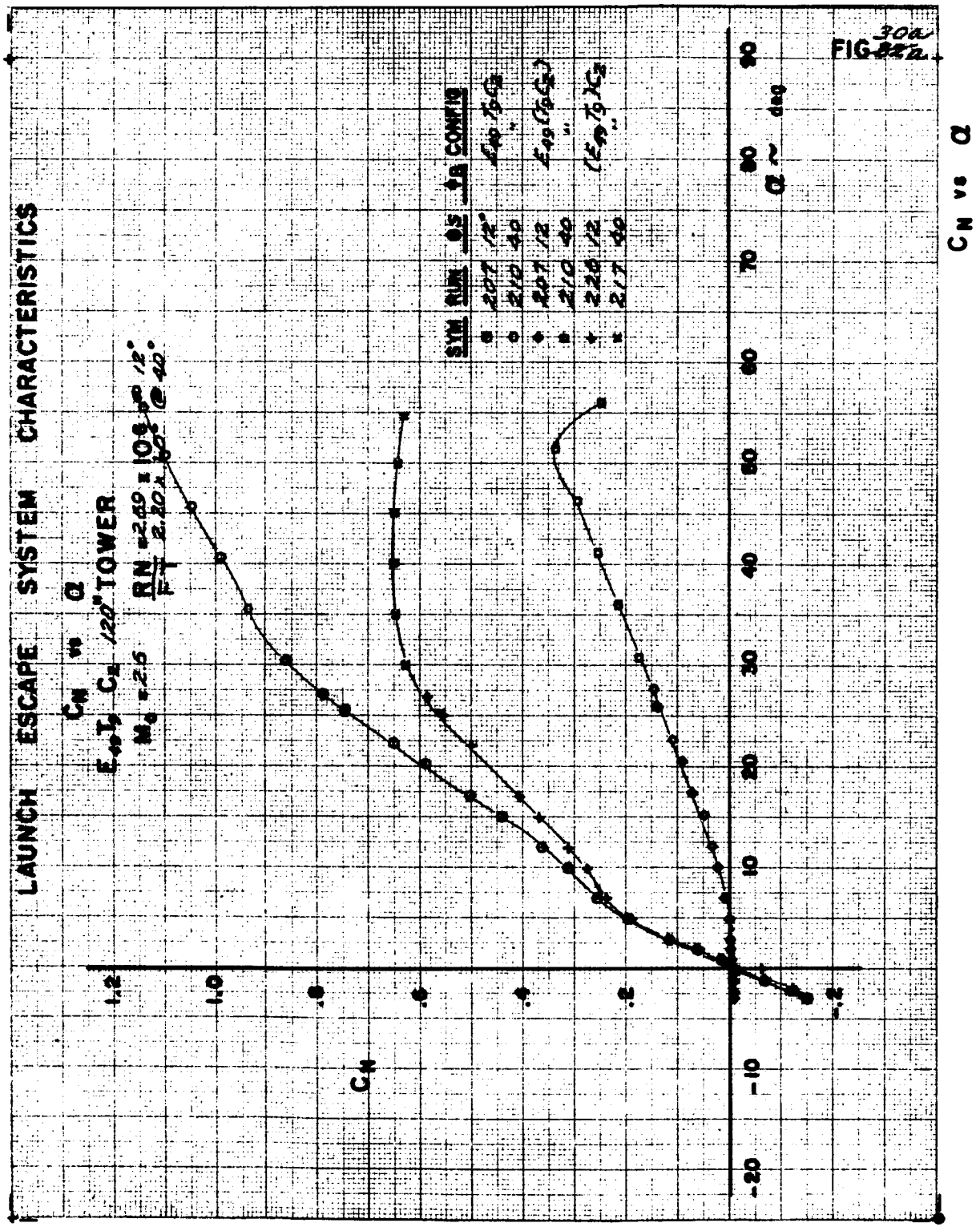

FIG 30a

C_N vs α

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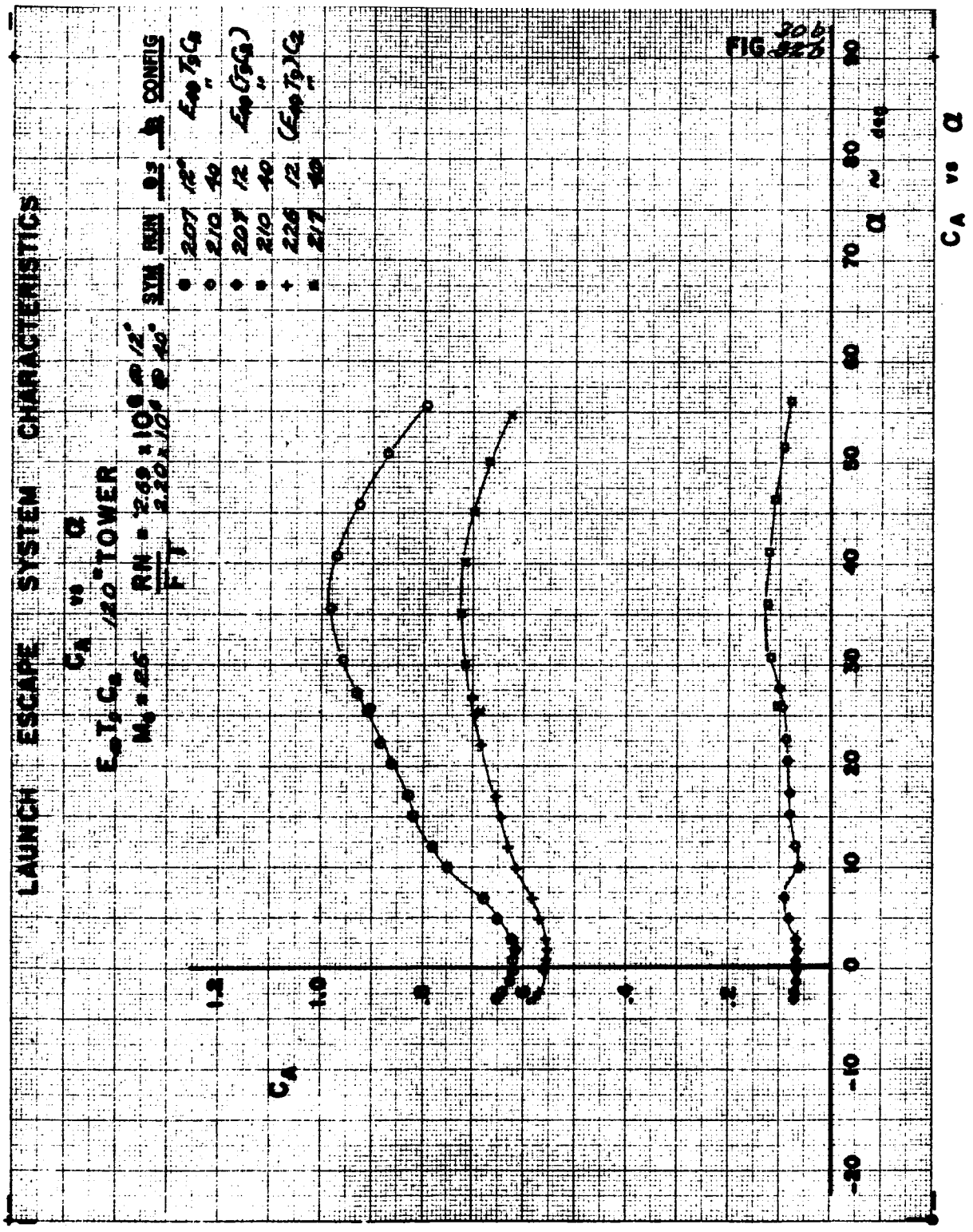

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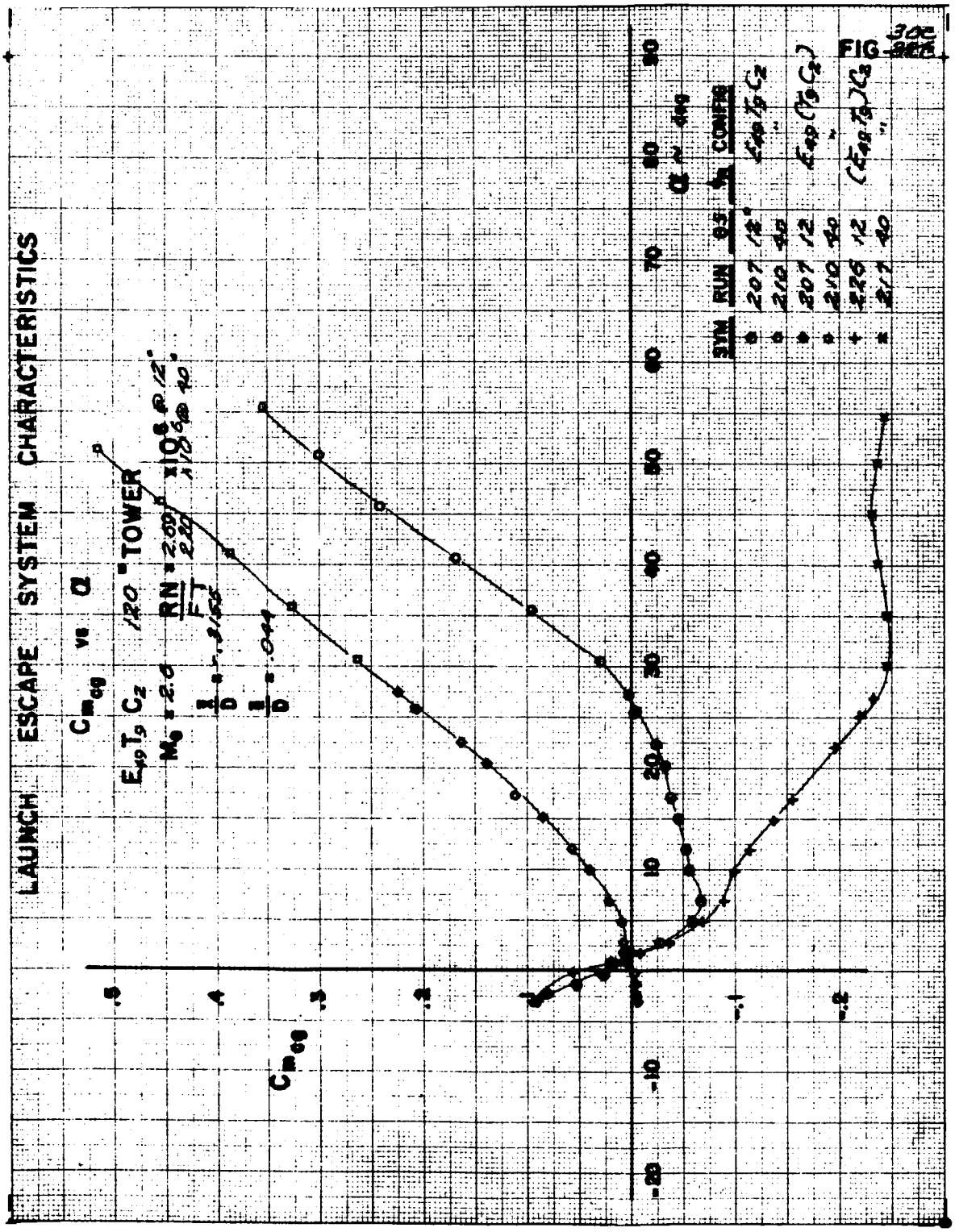

FIG 302

$C_{m_{cg}}$ vs α

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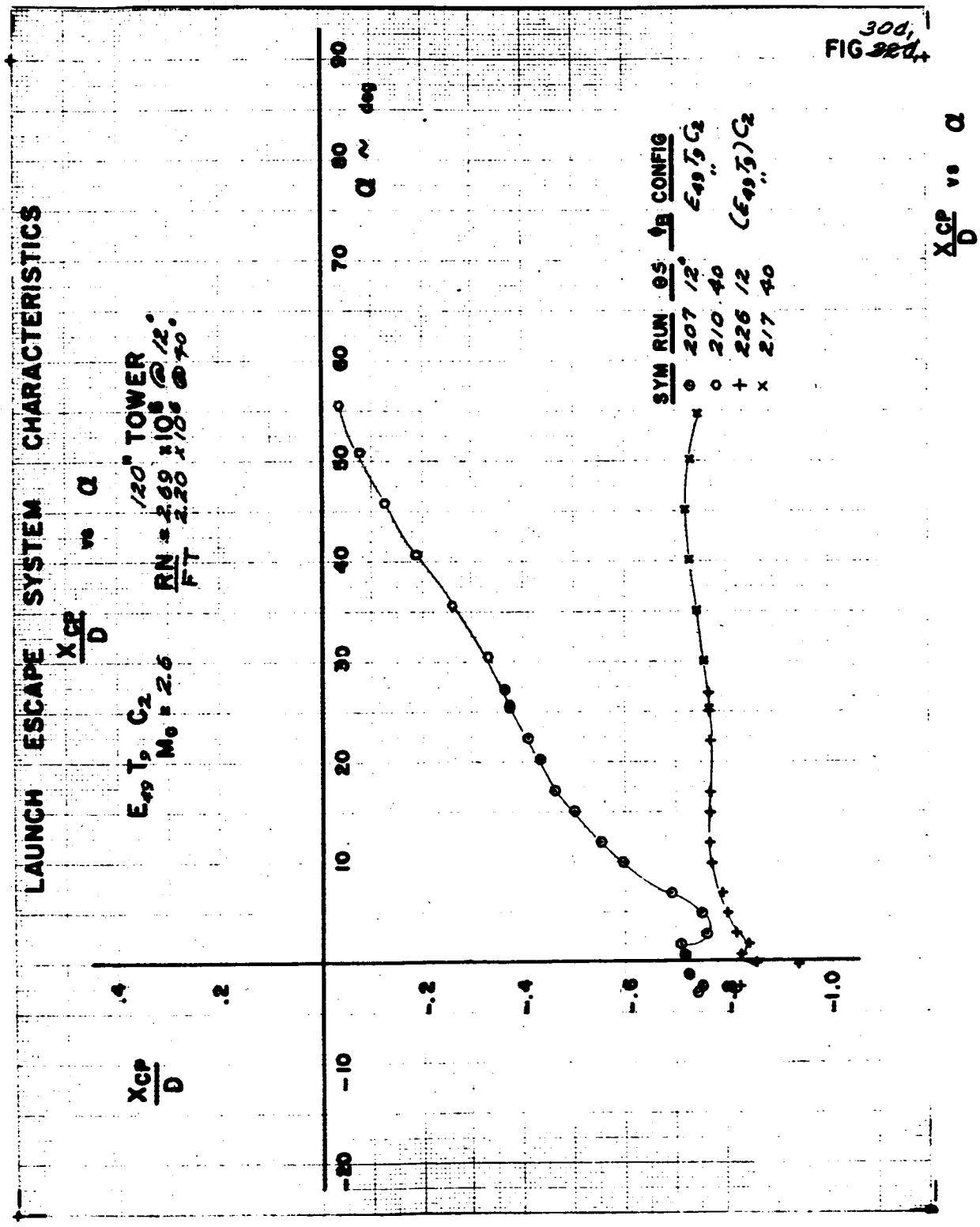


FIG 30d, ~~32d~~

$\frac{X_{CP}}{D}$ vs α

CONFIDENTIAL

~~CONFIDENTIAL~~

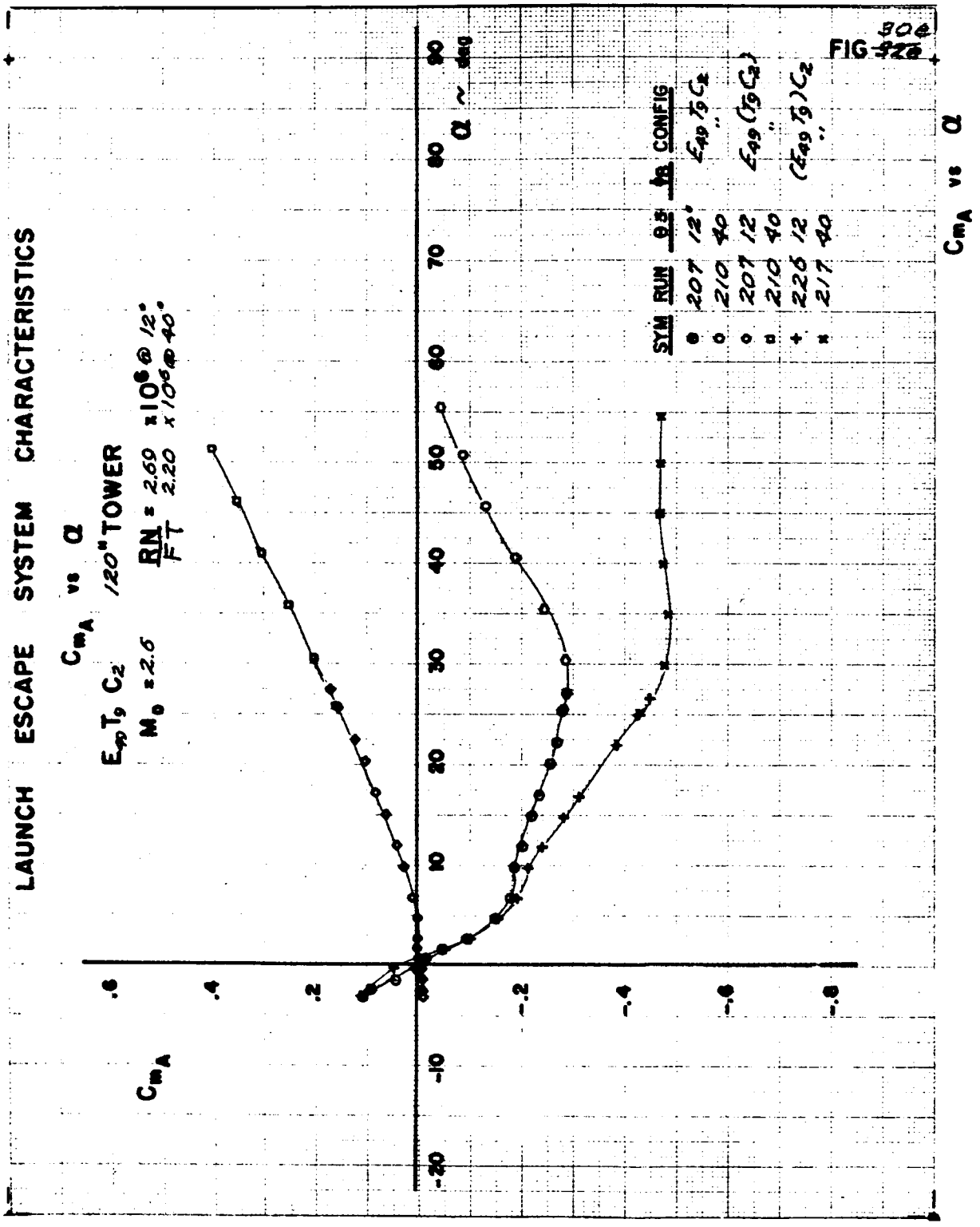


FIG ~~326~~ 304

C_{m_A} vs α

~~CONFIDENTIAL~~

CO[redacted]

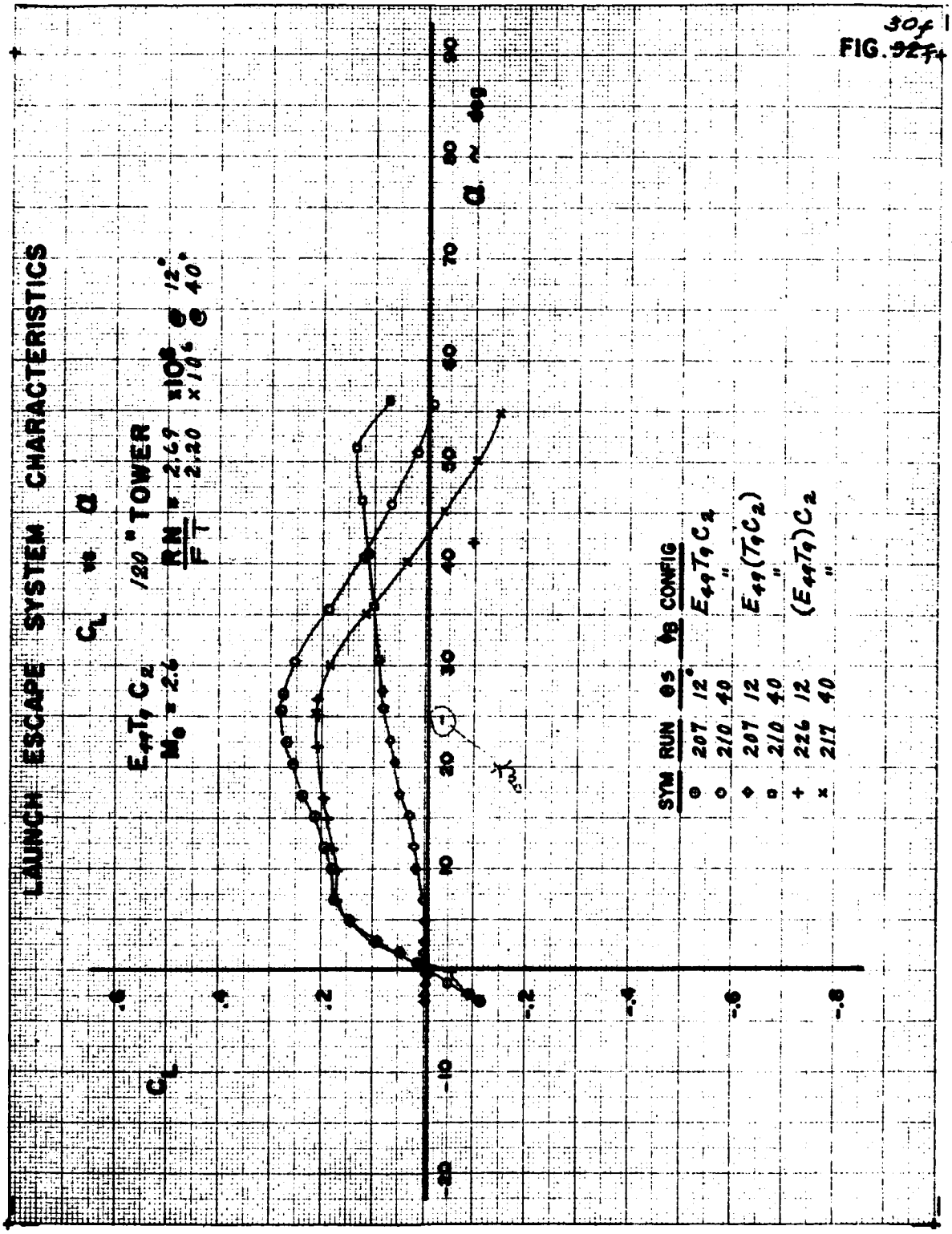
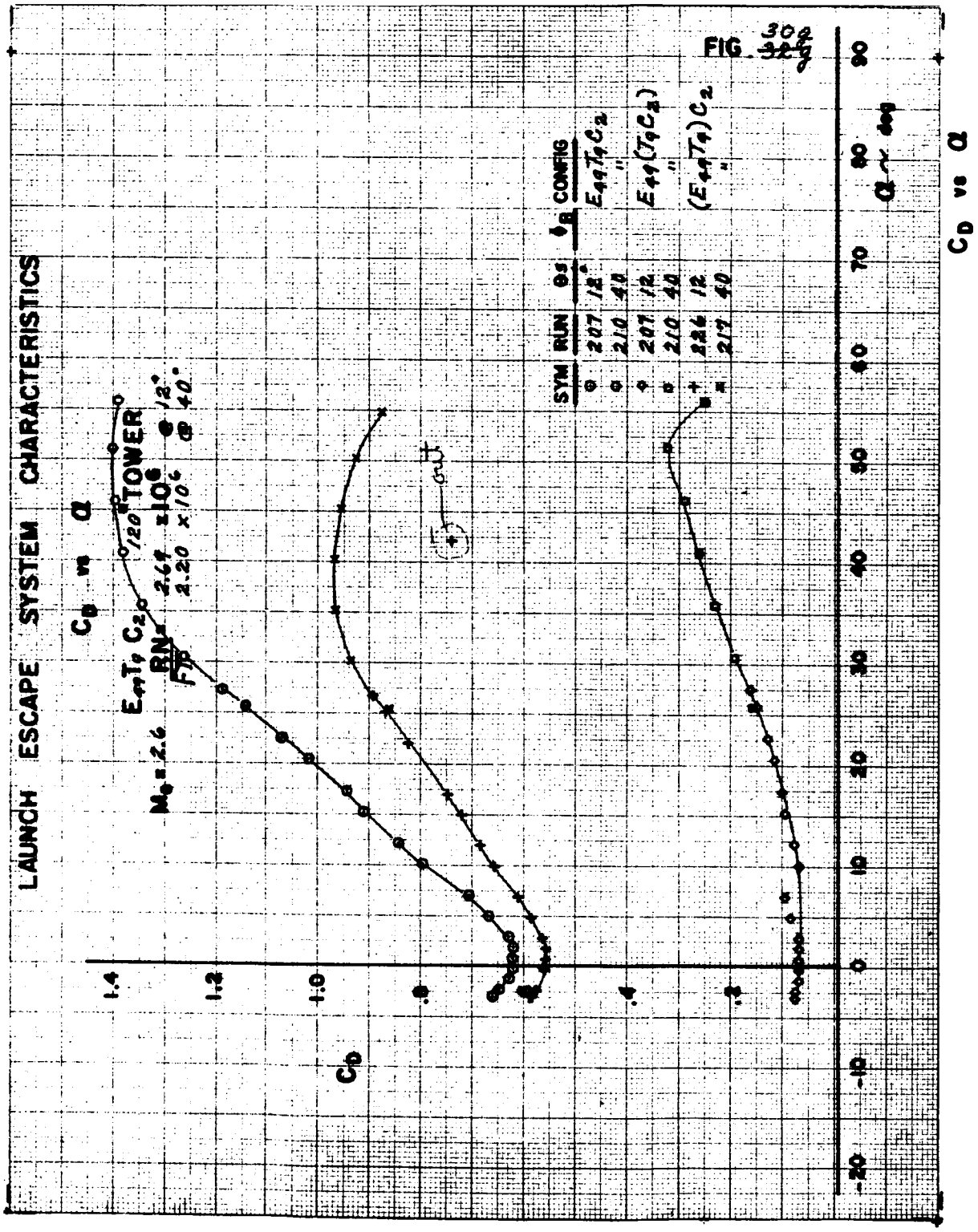


FIG. 30f

C_L vs α

[redacted]

~~CONFIDENTIAL~~



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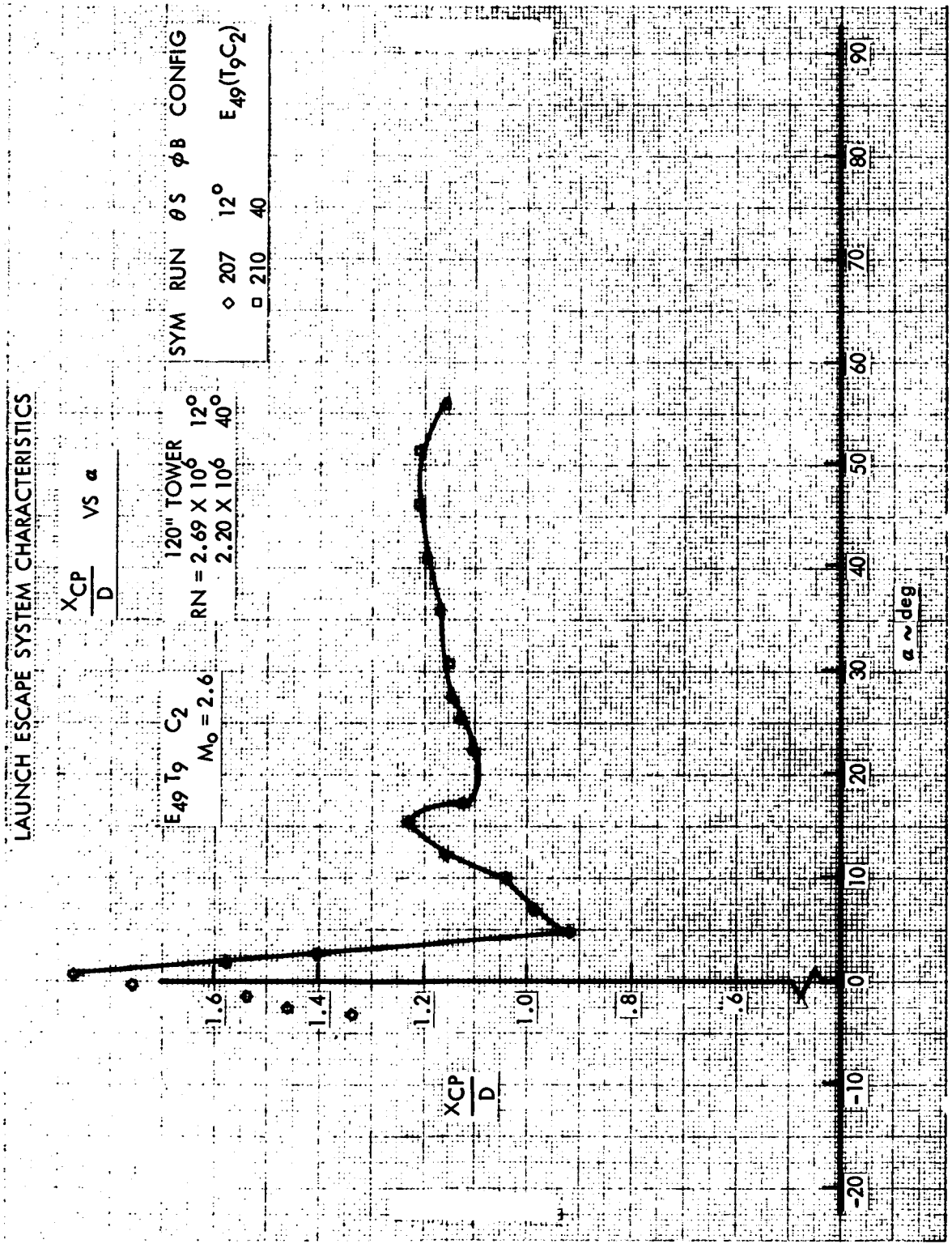
CO[redacted]



[redacted]

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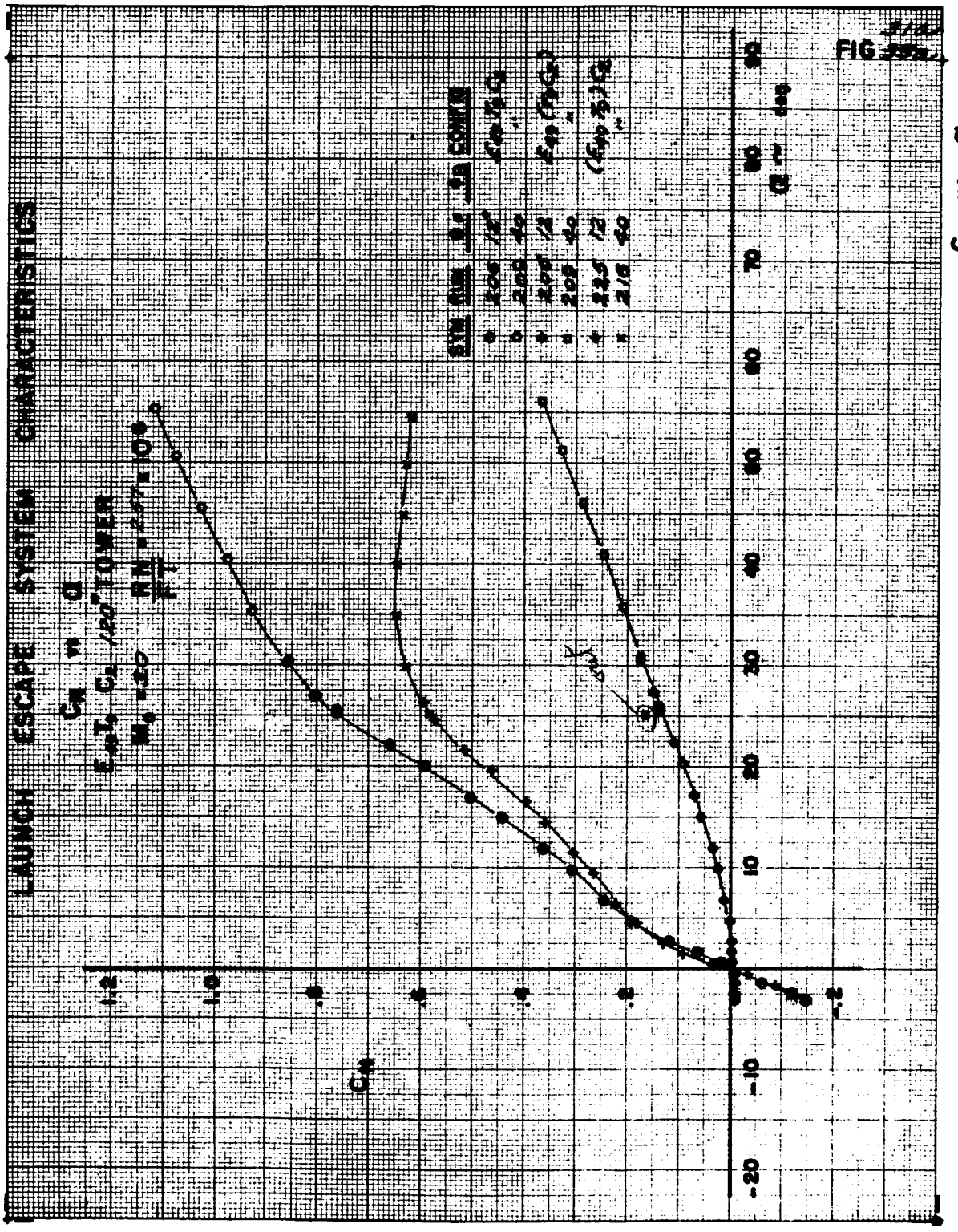

FIG

C_N vs α

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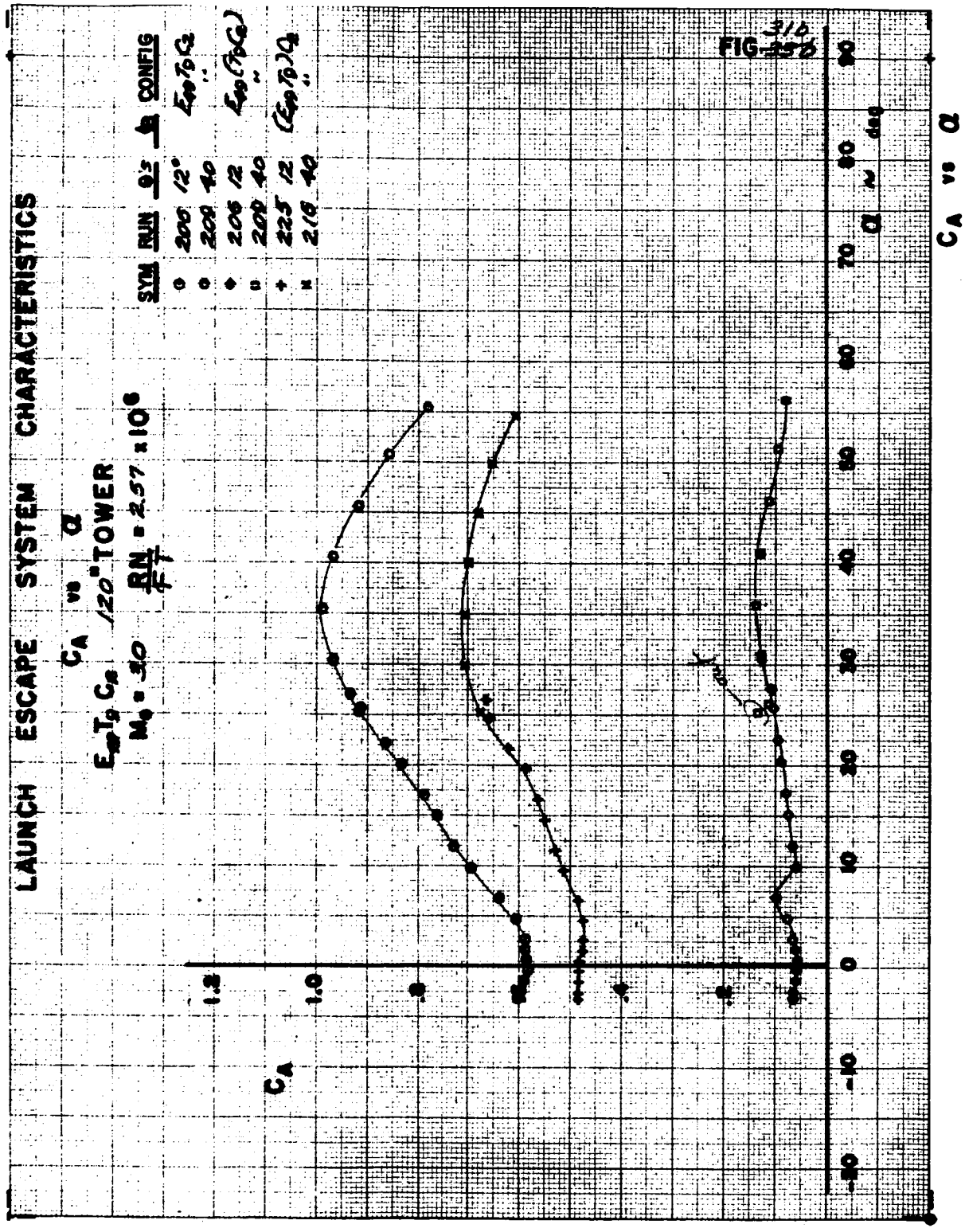

FIG. 310

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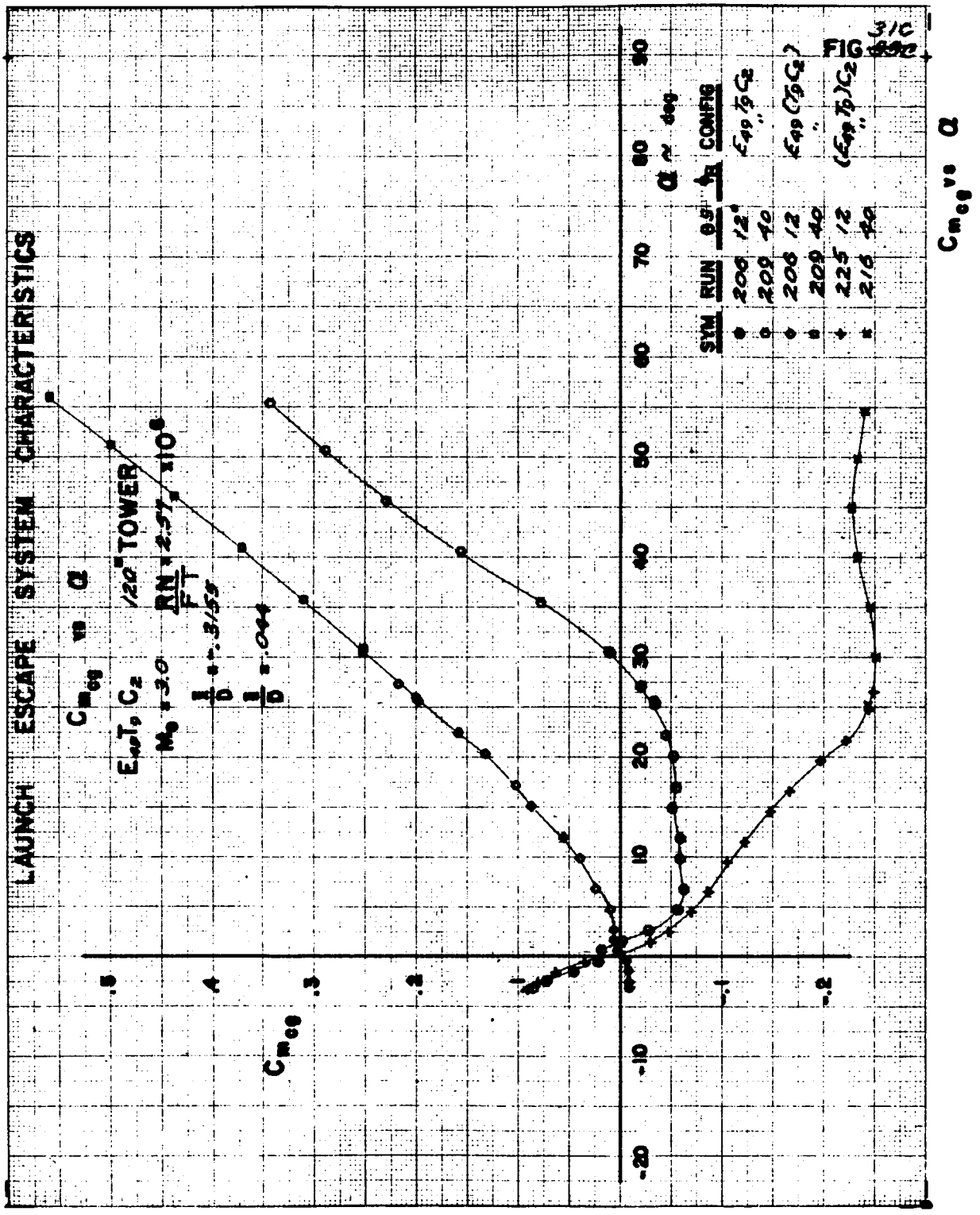

FIG 31C

$C_{m_{cg}}$ vs α

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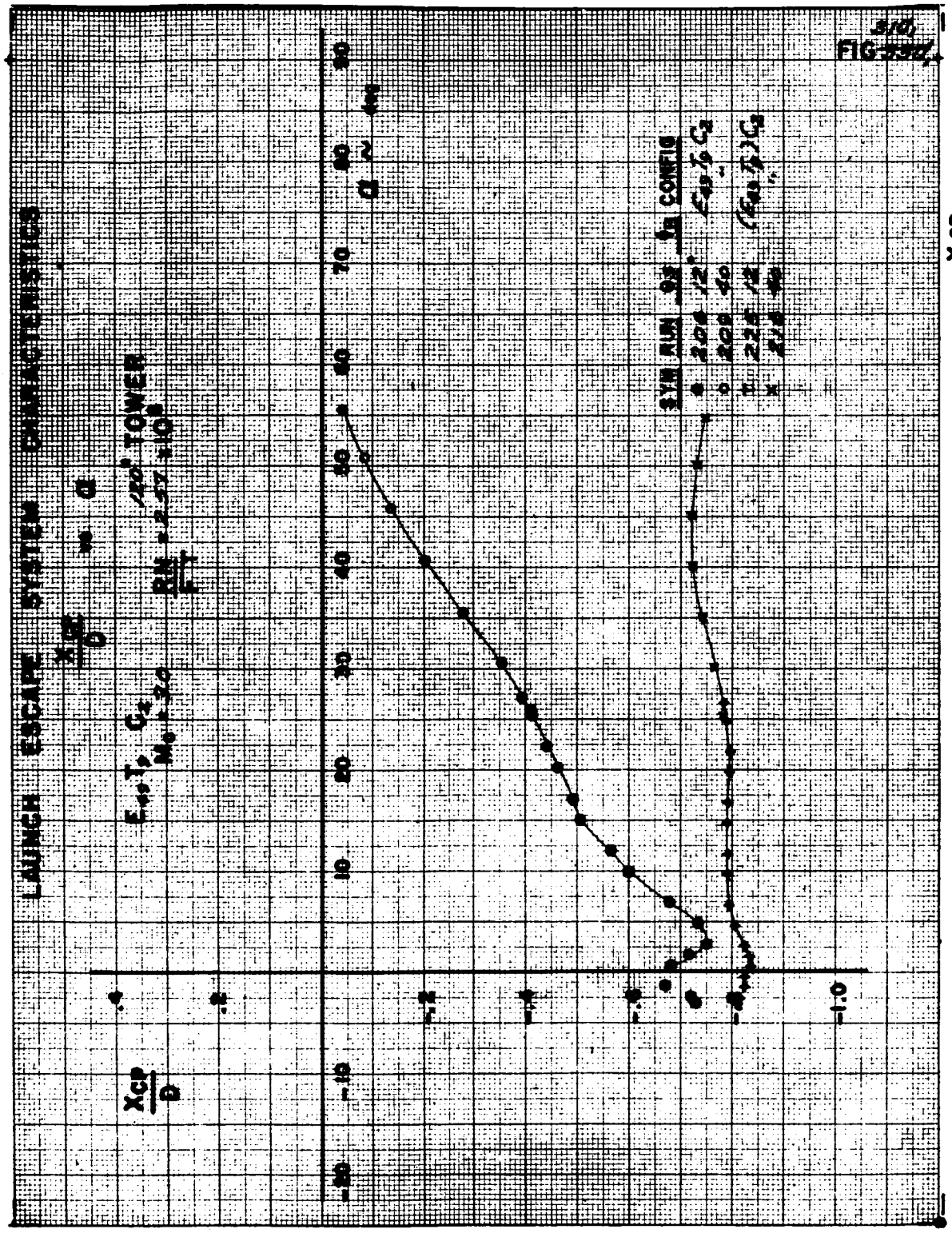

CONFIDENTIAL

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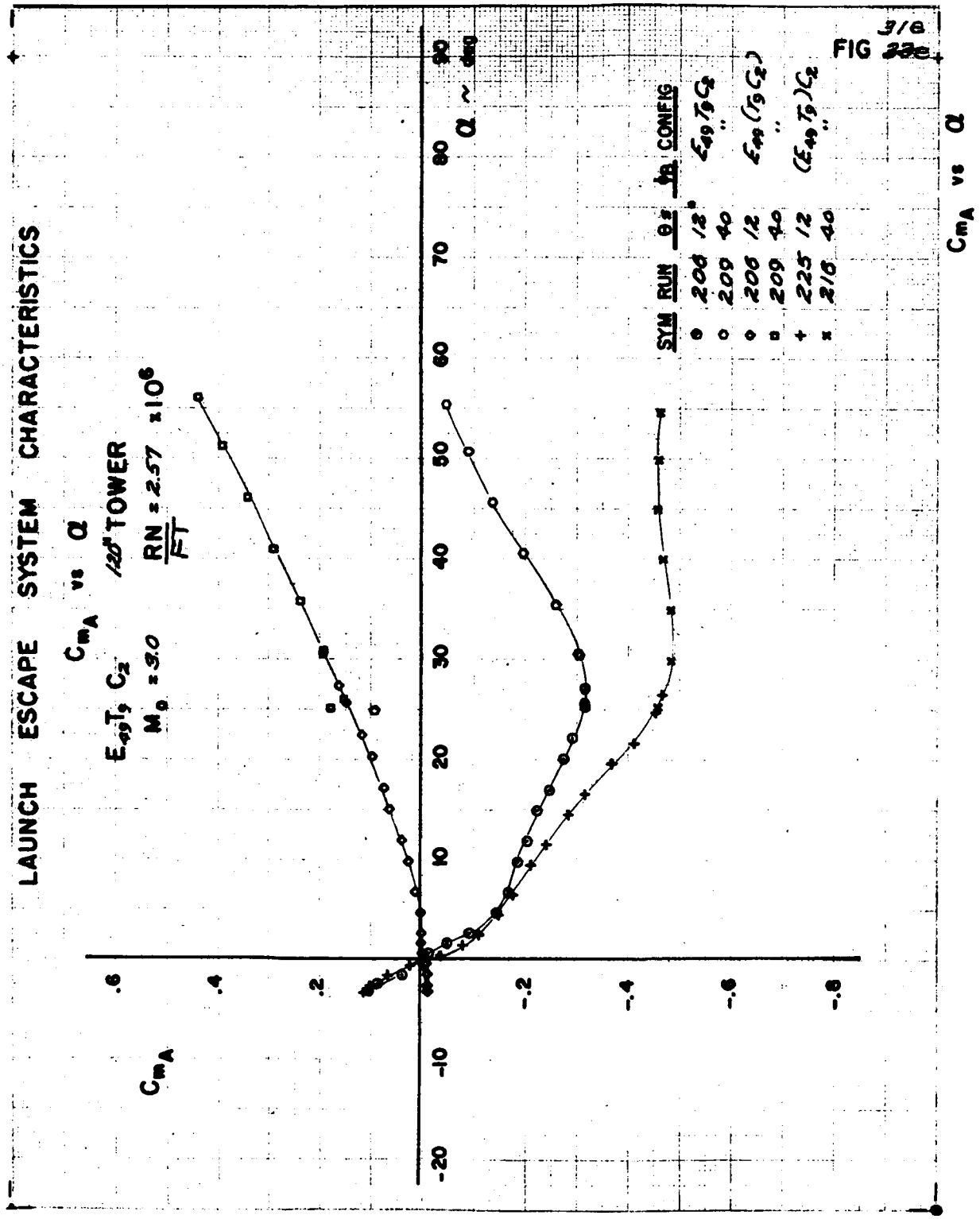

FIG 22e 3/8

C_{m_A} vs α

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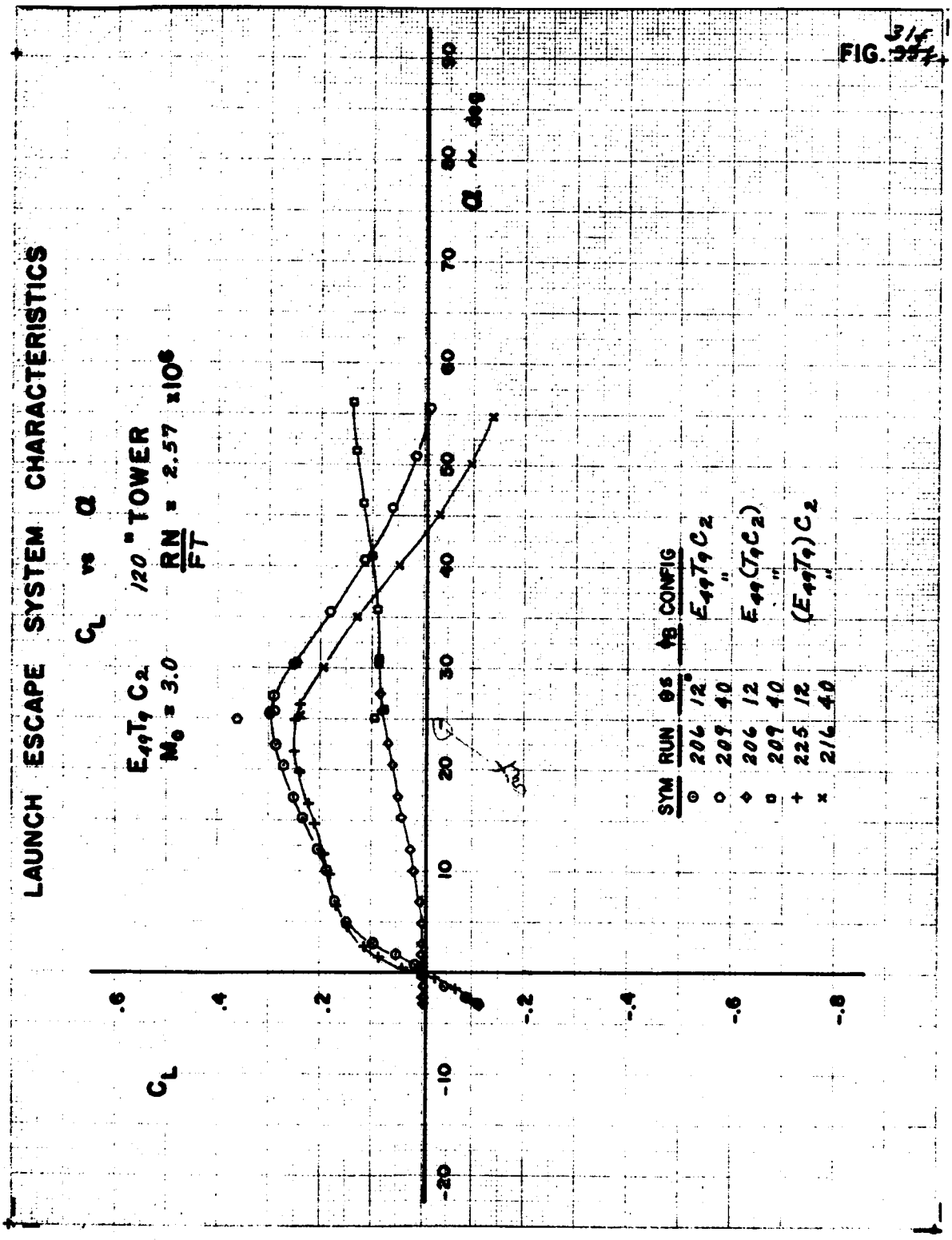

FIG. 316

C_L vs α

CONFIDENTIAL

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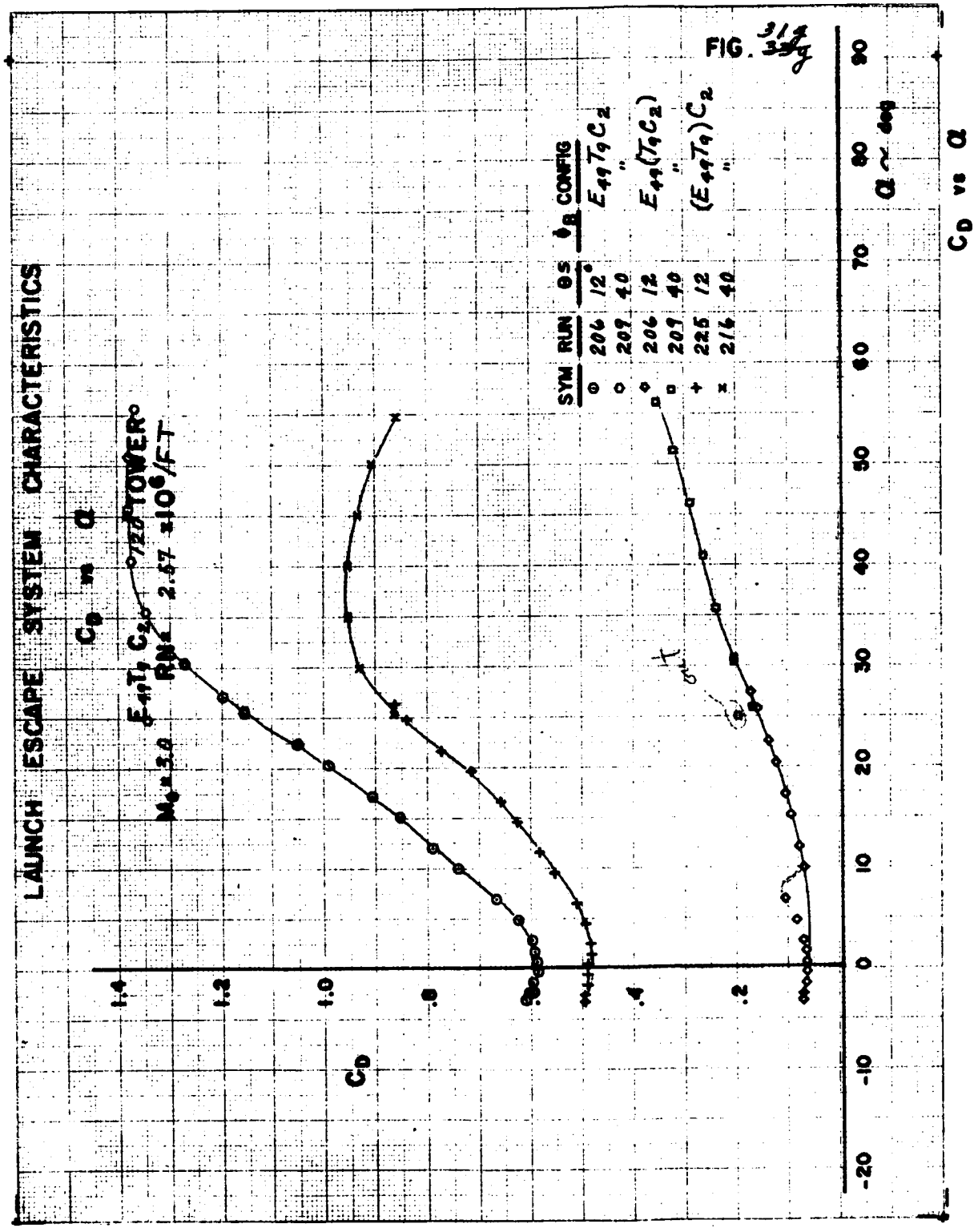

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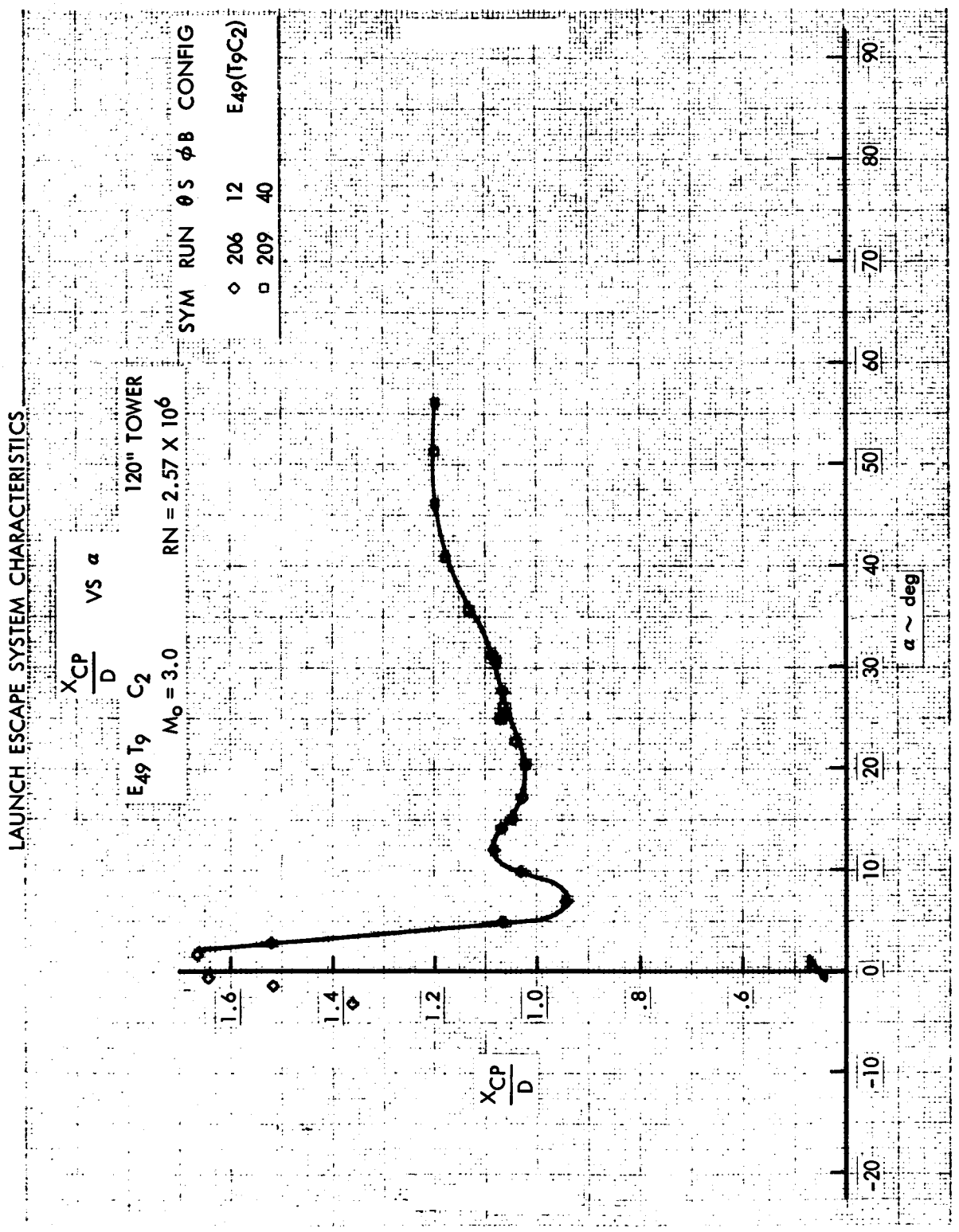

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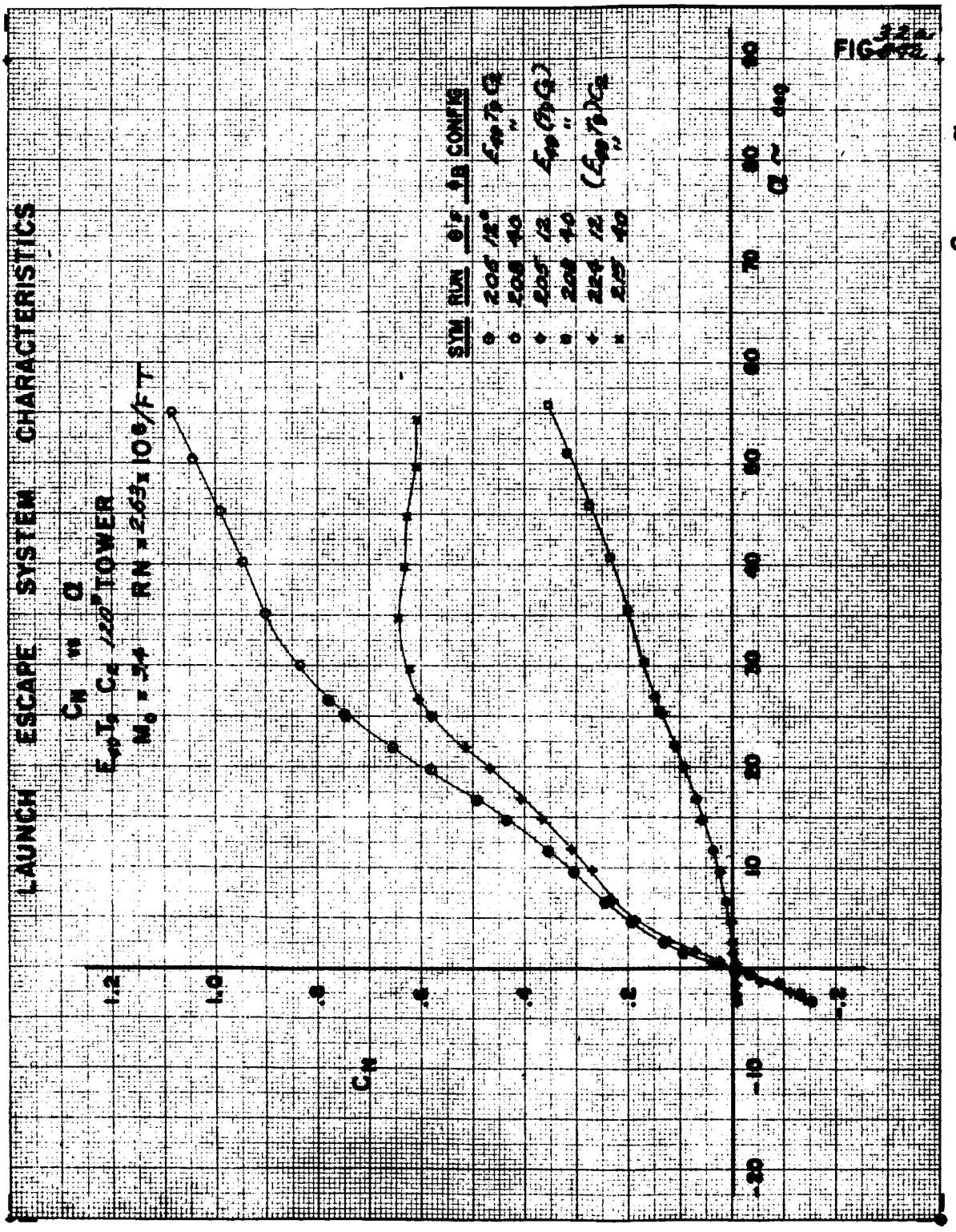

FIG 3.2a

C_N vs α

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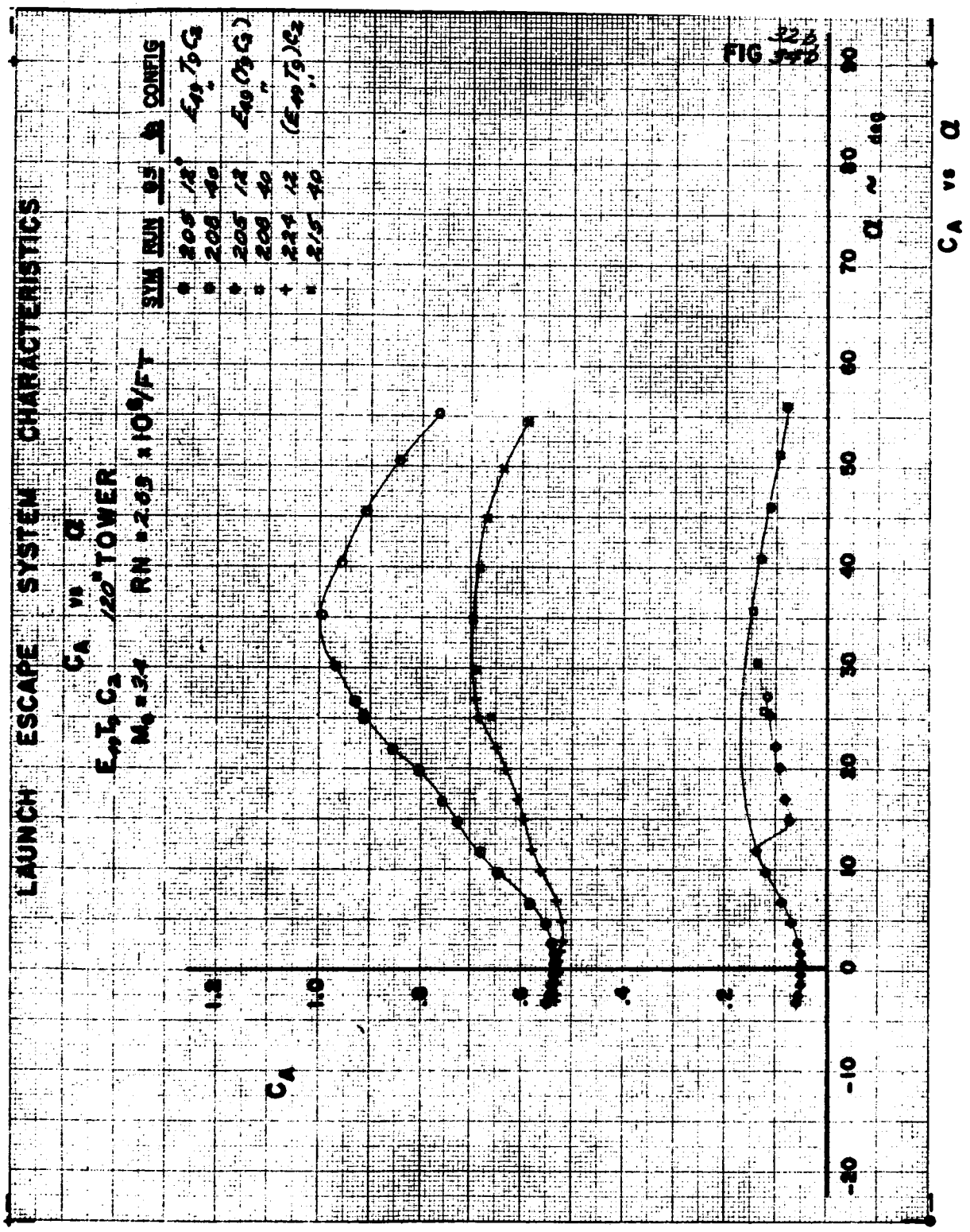

FIG 32b

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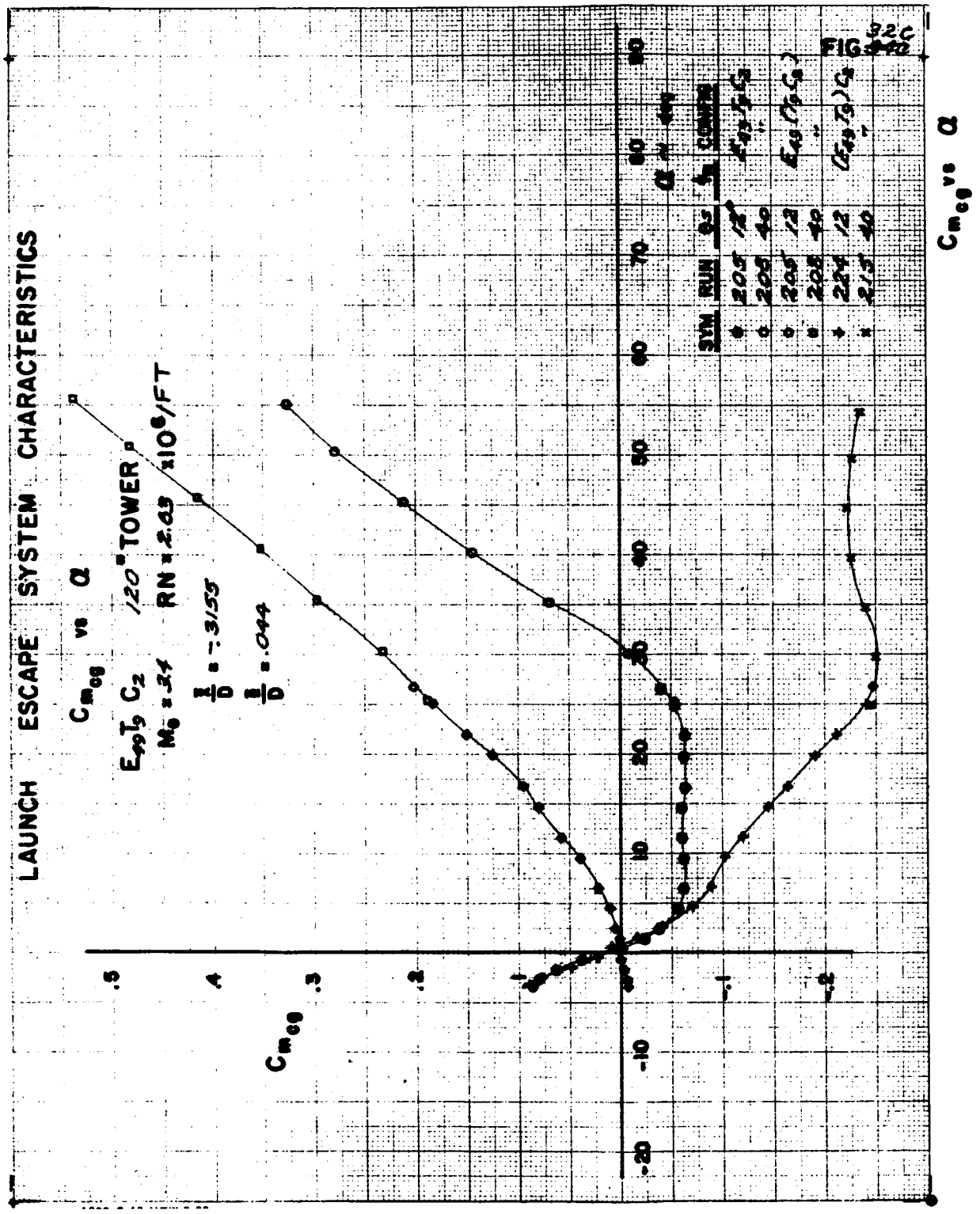

FIG 32C

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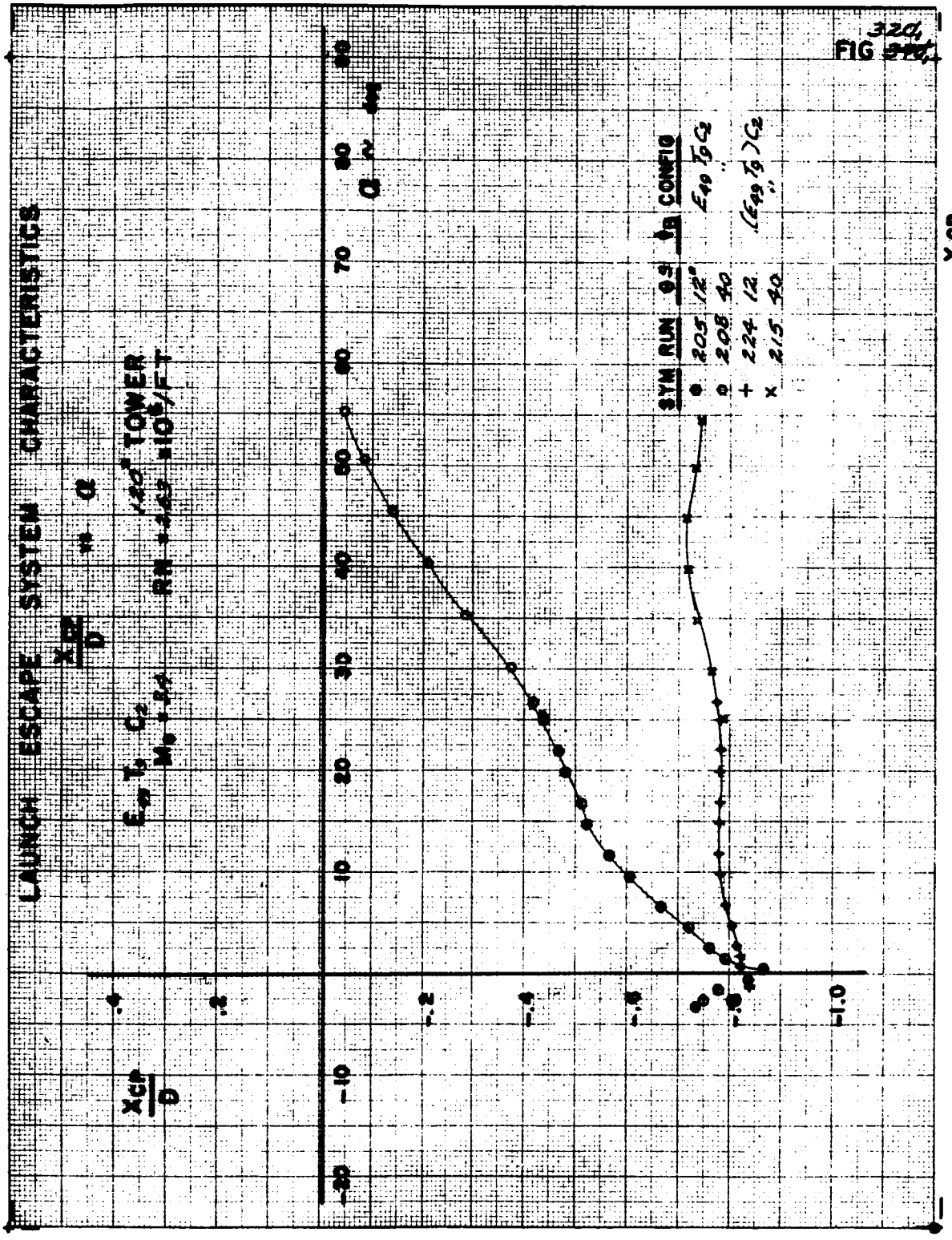

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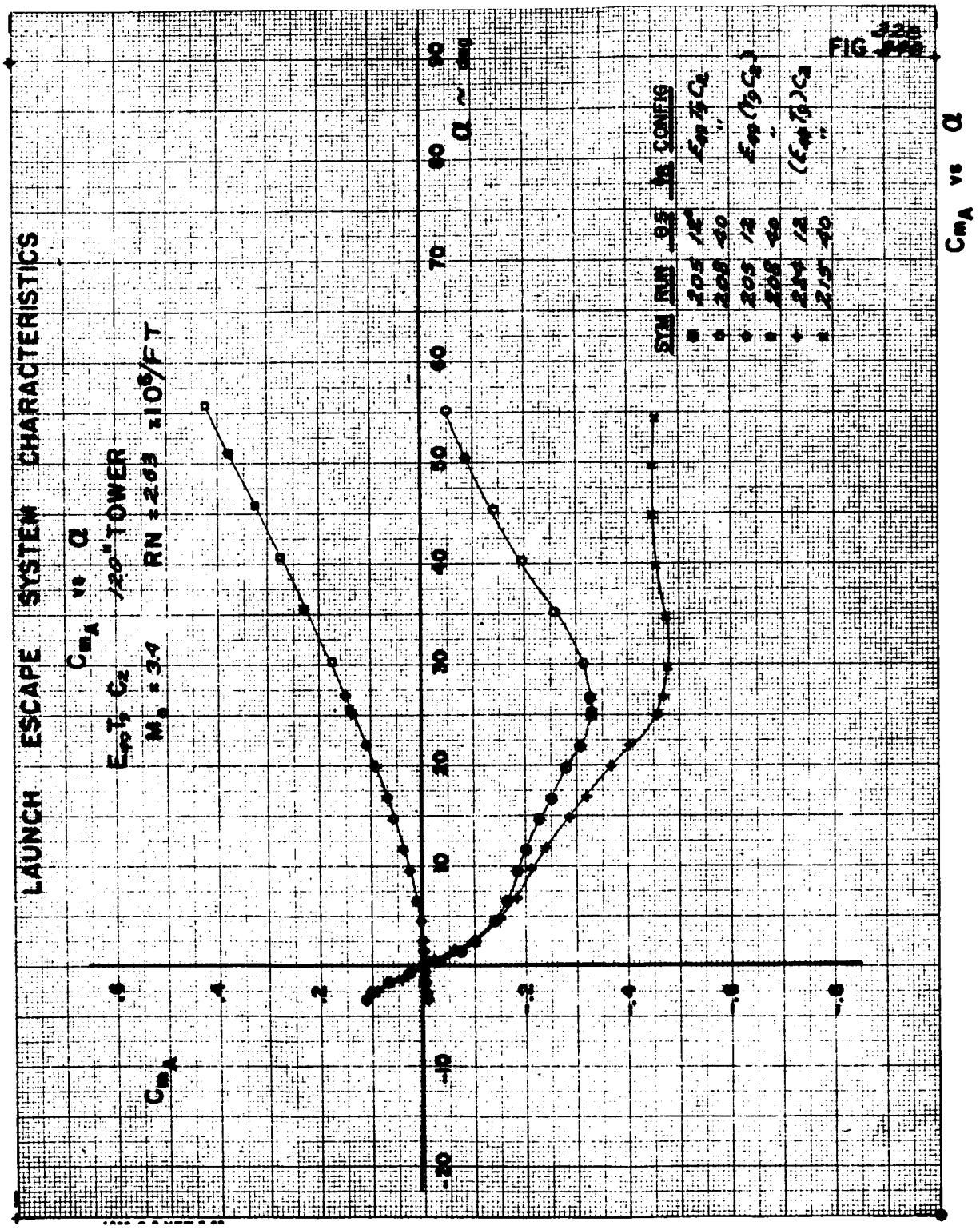

FIG [illegible]

C_{m_A} vs α

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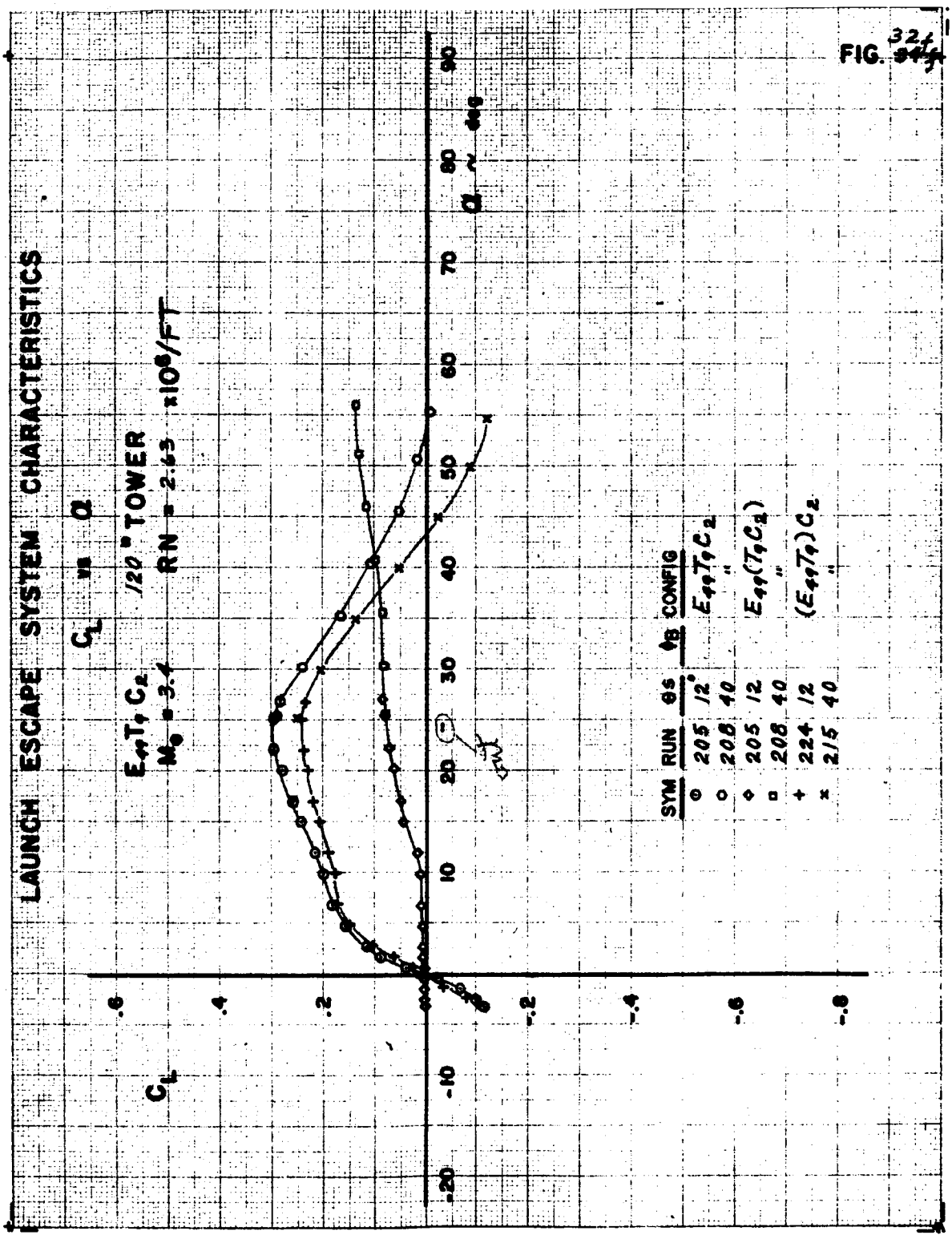

FIG. 324

C_L vs α

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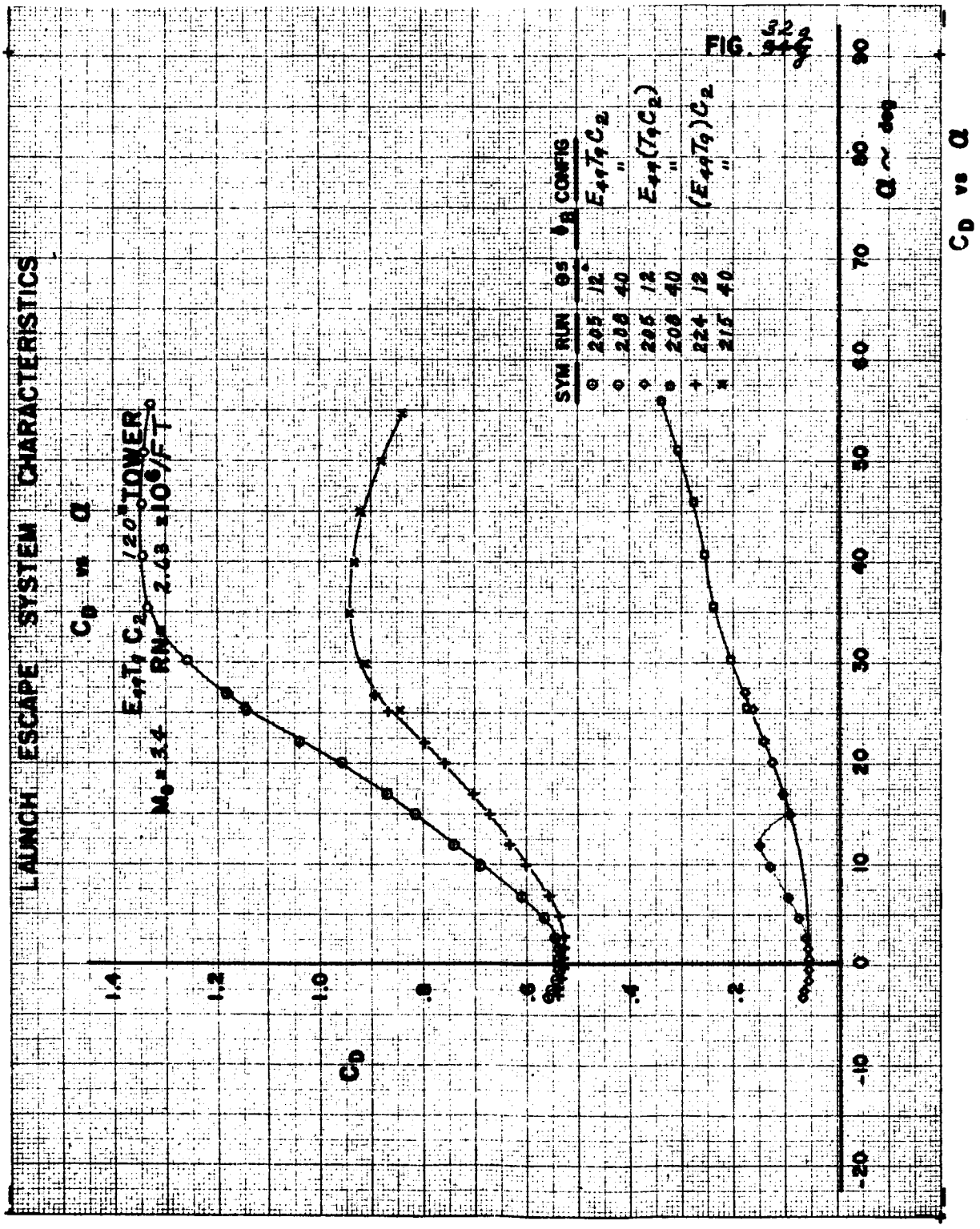

FIG. 32a

~~CONFIDENTIAL~~

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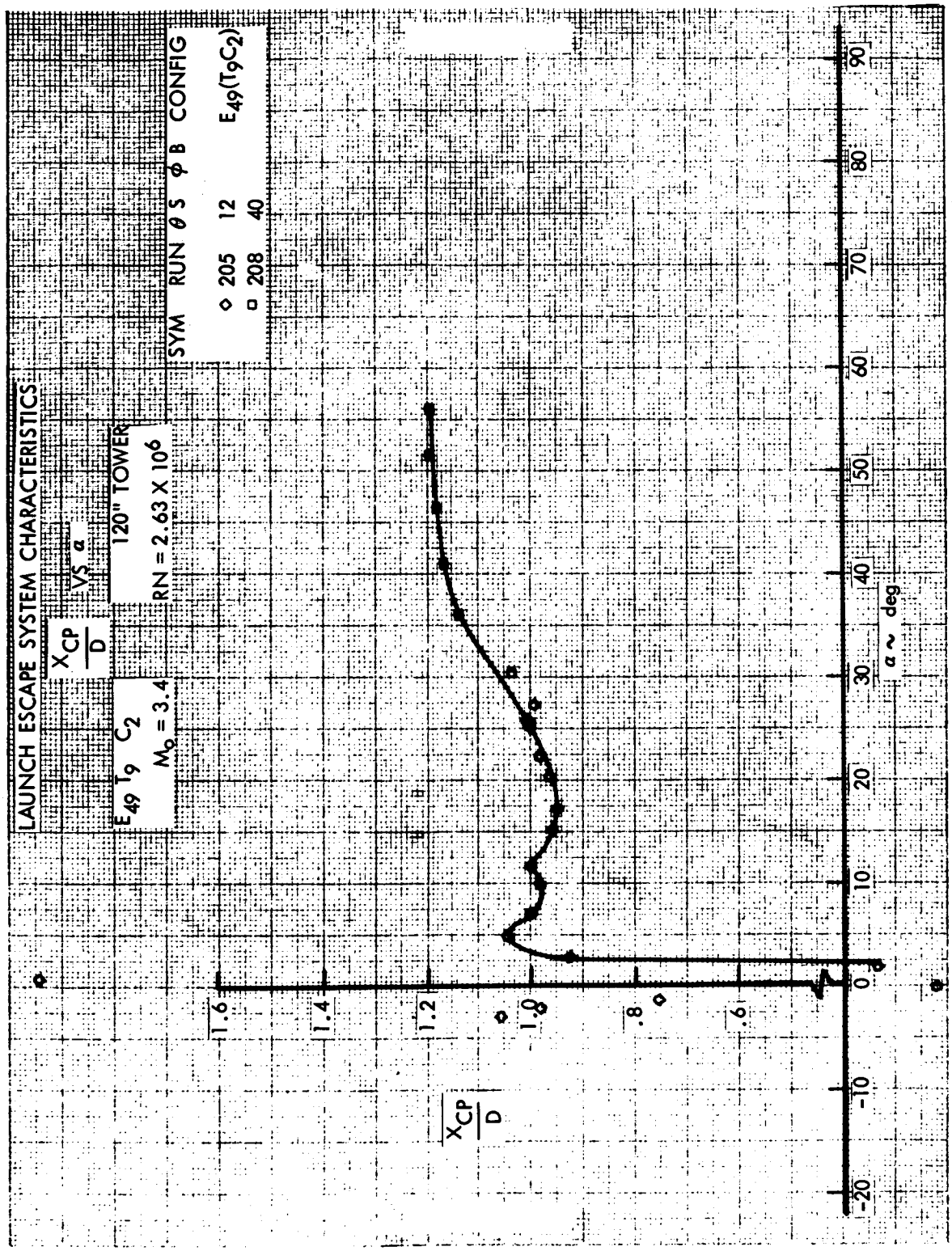

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APPENDIX B

TABULATED DATA

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[redacted]

Summary of Completed Runs

Facility-Ames 11-by 11-Foot Tunnel
Model - 0.105-Scale Apollo FS-2
Test No. 85

Configuration	Sting Angle (deg)	Angle Range (deg)	Mach Number				
			0.7	0.9	1.1	1.2	1.35
			Run Number				
E_{20} T_9 C_2 Total LEV	12	-3 to +27	162		161		160
	40	25 to 55	165		164		163
E_{48} T_9 C_2 Total LEV	12	-3 to +27	159	158	157	156	155
	40	25 to 55	170	169	168	167	166
E_{49} T_9 C_2 Total LEV	12	-3 to +27	154	153	152	151	150
	40	25 to 55	175	174	173	172	171
E_{48} T_9 C_2 LEV Components	12	-3 to +27	190	189	188	187	186
	40	25 to 55	185	184	183	182	181
E_{49} T_9 C_2 LEV Components	12	-3 to +27	195	194	193	192	191
	40	25 to 55	178	177	176	180	179

Angle schedule for 12-degree sting = -3, -2, -1, 0, +1, 2, 3, 5, 7, 10, 12, 15, 17, 20, 22, 25, 27 degrees
Angle schedule for 40-degree sting = +25, 30, 35, 40, 45, 50, 55 degrees
Dynamic pressure (q) = 540 psf
Reynolds No. = 3.6×10^6 to 5.2×10^6

[redacted]

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Summary of Completed Runs

Facility - Ames 9-by 7-Foot Tunnel
Model - 0.105-Scale Apollo FS-2
Test No. 108

Configuration	Sting Angle (deg)	Angle Range (deg)	Mach Number 1.55	Mach Number 2.0	Mach Number 2.4
			Run Number		
E_{20} T_9 C_2 Total LEV	12	-3 to +27	1	2	
	40	25 to 55		15	
E_{48} T_9 C_2 Total LEV	12	-3 to +27	3	4	5
	40	25 to +55	12	13	14
E_{49} T_9 C_2 Total LEV	12	-3 to +27	6	7	8
	40	25 to +55	9	10	11
E_{48} T_9 C_2 LEV components	12	-3 to +27	22	23	24
	40	25 to +55	19	20	21
E_{49} T_9 C_2 LEV components	12	-3 to +27	25	26	27
	40	25 to +55	16	17	18

Angle schedule for 12-degree sting = -3, -2, -1, 0, +1, 2, 3, 5, 7, 10, 12, 15, 17, 20, 22, 25, 27 degrees
Angle schedule for 40-degree sting = +25, 30, 35, 40, 45, 50, 55 degrees
Dynamic pressure (q) = 540 psf
Reynolds No. = 3.4×10^6 to 3.7×10^6

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Summary of Completed Runs

Facility - Ames 8-by 7-Foot Tunnel
Model - 0.105-Scale Apollo FS-2
Test No. 112

Configuration	Sting Angle (deg)	Angle Range (deg)	Mach Number 2.6	Mach Number 3.0	Mach Number 3.4
			Run Number		
E_{20} T_9 C_2 Total LEV	12	-3 to +27			*201
	40	25 to 55			*214
E_{48} T_9 C_2 Total LEV	12	-3 to +27	204	203	*202
	40	25 to 55	*213	*212	*211
E_{49} T_9 C_2 Total LEV	12	-3 to +27	207	206	*205
	40	25 to 55	*210	*209	*208
E_{48} T_9 C_2 LEV components	12	-3 to +27	223	222	*221
	40	25 to 55	*220	*219	*218
E_{49} T_9 C_2 LEV components	12	-3 to +27	226	225	*224
	40	25 to 55	*217	*216	*215

Angle schedule for 12-degree sting = -3, -2, -1, 0, +1, 2, 3, 5, 7, 10, 12, 15, 17, 20, 22, 25, 27 degrees
Angle schedule for 40-degree sting = +25, 30, 35, 40, 45, 50, 55 degrees
Dynamic pressure (q) = 540 psf
Reynolds No. = 3.0×10^6 to 3.9×10^6

* = 425 psf

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[redacted]

Run No./150	Tunnel/11x11	Test/85	Phase/1	Ames Config/22		Sting Bend Approx/11.53°	Rx10⁻⁶/FT
150	1 11	085	1	0022	0000	1153	0267

11- by 11-Foot Transonic Test Section

Model: Apollo, FS-2 Test: 85

Key to Tabulated Answer Listings

Corr	M_∞	α	β	C_L	C_D	C_{m_1}	L/D	$(X_{CP})_N$	C_N	C_A	C_{m_2}	C_{p_b}	α_E	β_E	C_{L_E}	C_{D_E}	$C_{m_{1_E}}$	$(X_{CP})_{N_E}$	C_{N_E}	C_{A_E}	$C_{m_{2_E}}$
xxxx	x.xxx	xx.xx	xx.xx	x.xxx	x.xxx	.xxxx	x.xxx	x.xxx	x.xxx	x.xxx	.xxxx	.xxxx	xx.xx	xx.xx	.xxxx	.xxxx	.xxxx	x.xxx	.xxxx	.xxxx	.xxxx
0408	1347	-0342	0000	-0092	0908	1048	-0101	-0762	-0146	0901	1113	-4166	-0344	0000	-0023	0894	-0017	0415	-0076	0891	-0032
0409	1350	-0256	0000	-0073	0888	0954	-0087	-0797	-0117	0884	0935	-4048	-0257	0000	-0006	0835	0019	0089	-0044	0834	-0004
0410	1352	-0152	0000	-0051	0843	0794	-0060	-0896	-0073	0842	0654	-3860	-0152	0000	-0001	0745	0036	-0457	-0021	0745	0003
0411	1351	0001	0000	0010	0781	0374	0013	-0025	0010	0781	-0003	-3477	0001	0000	-0007	0636	0022	0545	-0007	0636	-0004
0412	1348	0057	0000	0039	0784	0158	0049	-0719	0046	0784	-0332	-3480	0056	0000	-0016	0635	0007	1805	-0010	0636	-0018
0413	1348	0161	0000	0077	0827	-0080	0093	-0757	0100	0824	-0758	-3565	0161	0000	-0021	0717	0006		-0001	0717	-0026
0414	1349	0264	0000	0100	0860	-0204	0116	-0732	0139	0854	-1019	-3610	0265	0000	-0010	0811	0036	-0293	0028	0810	-0005
0416	1346	0471	0000	0134	0913	-0390	0147	-0692	0209	0899	-1445	-3661	0473	0000	0018	0967	0123	0516	0097	0962	0050
0417	1343	0677	0000	0163	0959	-0542	0170	-0662	0275	0933	-1820	-3645	0681	0000	0028	1147	0223	0742	0164	1135	0121
0418	1347	0986	0000	0178	1019	-0577	0175	-0603	0350	0974	-2110	-3612	0993	0000	0026	1434	0396	0912	0272	1408	0248
0419	1347	1193	0000	0180	1043	-0478	0172	-0548	0391	0984	-2145	-3523	1201	0000	-0044	1780	0541	1100	0328	1750	0360
0420	1347	1500	0000	0161	1069	-0291	0151	-0484	0432	0991	-2081	-3549	1509	0000	-0110	1907	0714	1304	0390	1870	0509
0421	1344	1705	0000	0145	1100	-0144	0132	-0443	0461	1009	-2042	-3757	1717	0000	-0126	1984	0887	1410	0465	1933	0655
0422	1341	2015	0000	0138	1130	0112	0122	-0380	0519	1014	-1971	-3899	2031	0000	-0068	2060	1238	1454	0651	1955	0947
0423	1341	2223	0000	0140	1140	0281	0123	-0344	0561	1002	-1930	-3923	2243	0000	-0006	2099	1488	1449	0795	1942	1152
0424	1341	2537	0000	0159	1160	0639	0137	-0283	0640	0980	-1813	-3962	2564	0000	0201	2173	1995	1390	1122	1872	1559
0425	1335	2705	0000	0172	1181	0829	0145	-0257	0690	0974	-1776	-4079	2737	0000	0310	2241	2284	1372	1306	1848	1791

Emc (cl)

National Aeronautics and Space Administration
Ames Research Center
MOFFETT FIELD, CALIF.

UNITARY PLAN WIND TUNNEL
PRELIMINARY DATA

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150 1 11 085 1 0022 0000 1153 0267

0408	1347	-0342	0000	-0092	0908	1048	-0101	-0762	-0146	0901	1113	-4166	-0344	0000	-0023	0894	-0017	0415	-0076	0891	-0032
0409	1350	-0256	0000	-0078	0888	0954	-0087	-0797	-0117	0884	0935	-4048	-0257	0000	-0006	0835	0019	0089	-0044	0834	-0004
0410	1352	-0152	0000	-0051	0843	0794	-0060	-0896	-0073	0842	0654	-3860	-0152	0000	-0001	0745	0036	-0457	-0021	0745	0009
0411	1351	0001	0000	0010	0781	0374	0013	-0025	0010	0781	-0003	-3477	0001	0000	-0007	0636	0022	0545	-0007	0636	-0004
0412	1348	0057	0000	0039	0784	0158	0049	-0719	0046	0784	-0333	-3480	0056	0000	-0016	0635	0007	1805	-0010	0636	-0018
0413	1348	0161	0000	0077	0827	-0080	0093	-0757	0100	0824	-0758	-3565	0161	0000	-0021	0717	0006	[illegible]	-0001	0717	-0026
0414	1349	0264	0000	0100	0860	-0204	0116	-0732	0139	0854	-1019	-3619	0265	0000	-0010	0811	0036	-0293	0028	0810	-0008
0416	1346	0471	0000	0134	0913	-0390	0147	-0692	0209	0899	-1445	-3661	0473	0000	0018	0967	0123	0516	0097	0962	0050
0417	1343	0677	0000	0163	0959	-0542	0170	-0662	0275	0933	-1820	-3645	0681	0000	0028	1147	0223	0742	0164	1135	0121
0418	1347	0986	0000	0178	1019	-0577	0175	-0603	0350	0974	-2110	-3612	0993	0000	0026	1434	0396	0912	0272	1408	0248
0419	1347	1193	0000	0180	1043	-0478	0172	-0548	0391	0984	-2145	-3523	1201	0000	-0044	1780	0541	1100	0328	1750	0360
0420	1347	1500	0000	0161	1069	-0291	0151	-0484	0432	0991	-2091	-3549	1509	0000	-0110	1907	0714	1304	0390	1870	0509
0421	1344	1705	0000	0145	1100	-0144	0132	-0443	0461	1009	-2042	-3757	1717	0000	-0126	1984	0887	1410	0465	[illegible]	0685
0422	1341	2015	0000	0138	1130	0112	0122	-0380	0519	1014	-1971	-3899	2031	0000	-0068	2060	1238	1454	0651	[illegible]	0947
0423	1341	2223	0000	0140	1140	0281	0123	-0344	0561	1002	-1930	-3923	2243	0000	-0006	2099	1488	1449	0795	1942	1152
0424	1341	2537	0000	0159	1160	0639	0137	-0283	0640	0980	-1813	-3962	2564	0000	0201	2173	1995	1390	1122	1672	[illegible]
0425	1335	2705	0000	0172	1181	[illegible]	0145	-0257	0690	0974	-1776	-4079	2737	0000	0310	2241	[illegible]	1272	1306	1848	1791

151 1 11 085 1 0022 0000 1153 0275

0427	1199	-0342	0000	-0093	0899	1038	-0104	-0755	-0147	0892	1100	-4146	-0344	0000	-0038	0936	-0029	0425	-0094	0932	-0040
0428	1201	-0256	0000	-0076	0878	0938	[illegible]	-0797	-0115	0874	0916	-4075	-0257	0000	-0027	0885	0001	0249	-0067	0883	-0017
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0942	1099 2189	0000-0032	0881	-0853-0036-0723	0299	0829-2162-4065
0943	1100 2492	0000-0044	0868	-1018-0051-0737	0326	0806-2401-4294
0944	1100 2670	0000-0047	0863	-1125-0054-0741	0346	0792-2566-4489

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0946	0901	-0242	0000	-0058	0629	0768	-0092	-0902	-0084	0626	0758-3302
0947	0901	-0139	0000	-0031	0624	0593	-0050	-1006	-0046	0623	0465-3147
0948	0901	0002	0000	0015	0623	0283	0024	-0253	0015	0623	-0038-3007
0949	0898	0067	0000	0038	0630	0120	0060	-0661	0045	0630	-0300-3137
0950	0898	0171	0000	0067	0647	-0079	0103	-0739	0086	0645	-0634-3267
0951	0895	0273	0000	0088	0670	-0228	0131	-0751	0119	0665	-0897-3405
0952	0898	0477	0000	0105	0707	-0373	0149	-0731	0164	0696	-1195-3485
0953	0900	0680	0000	0101	0727	-0414	0139	-0706	0186	0710	-1314-3516
0954	0898	0982	0000	0083	0725	-0439	0114	-0679	0205	0701	-1395-3524
0955	0898	1183	0000	0074	0722	-0505	0103	-0683	0221	0692	-1506-3495
0956	0898	1486	0000	0071	0699	-0639	0102	-0690	0248	0657	-1710-3469
0957	0900	1688	0000	0076	0690	-0758	0110	-0696	0273	0638	-1901-3421
0958	0898	1990	0000	0078	0679	-0929	0115	-0709	0304	0612	-2159-3520
0959	0899	2192	0000	0083	0663	-1045	0125	-0717	0324	0584	-2326-3563
0960	0900	2494	0000	0096	0631	-1215	0152	-0726	0353	0531	-2562-3583
0961	0896	2673	0000	0107	0624	-1331	0171	-0729	0376	0509	-2741-3704

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0962	0700	-0326	0000	-0049	0534	0636	-0092	-0823	-0079	0530	0653-3260
0963	0698	-0240	0000	-0035	0530	0559	-0065	-0891	-0057	0528	0505-3215
0964	0700	-0138	0000	-0012	0525	0428	-0024	-1105	-0025	0525	0276-3104
0965	0701	0003	0000	0023	0521	0197	0045	-0452	0023	0521	-0106-2984
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0967	0698	0171	0000	0067	0542	-0065	0124	-0678	0083	0540	-0565-3194
0968	0700	0274	0000	0083	0556	-0167	0150	-0689	0110	0551	-0756-3250
0969	0699	0477	0000	0099	0588	-0273	0169	-0673	0148	0578	-0994-3357
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0971	0698	0982	0000	0099	0602	-0423	0165	-0653	0201	0577	-1310-3373
0972	0701	1183	0000	0096	0587	-0497	0163	-0662	0214	0555	-1417-3357
0973	0702	1485	0000	0099	0567	-0643	0175	-0677	0241	0523	-1634-3338
0974	0700	1687	0000	0102	0548	-0729	0186	-0685	0256	0495	-1755-3316
0976	0698	1988	0000	0103	0535	-0864	0192	-0699	0279	0468	-1949-3338
0977	0700	2190	0000	0105	0525	-0953	0199	-0708	0293	0448	-2075-3432
0978	0698	2491	0000	0107	0519	-1083	0205	-0718	0315	0426	-2265-3694
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191 1 11 085 1 0032 0000 1164 0263

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0989	1349-0140	0000-0046	0776	0741-0059-0931-0065	0774	0606-3989
0990	1352 0002	0000 0009	0723	0353 0013 0055	0009	0723 0005-3652
0991	1349 0068	0000 0039	0728	0139 0053-0700	0047	0728-0330-3535
0992	1348 0172	0000 0075	0765	-0098 0098-0760	0098	0762-0741-3551
0993	1350 0275	0000 0093	0787	-0253 0118-0772	0131	0782-1009-3589
0994	1345 0479	0000 0123	0824	-0522 0150-0774	0192	0810-1483-3682
0995	1346 0683	0000 0147	0852	-0774 0173-0775	0248	0828-1920-3667
0996	1344 0989	0000 0156	0878	-0977 0178-0757	0305	0838-2308-3666
0997	1344 1192	0000 0155	0869	-1015 0178-0731	0331	0818-2419-3559
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1000	1337 2000	0000 0094	0907	-1173 0104-0700	0399	0821-2793-3940
1001	1334 2201	0000 0090	0910	-1295 0099-0704	0425	0809-2991-3995
1002	1332 2503	0000 0078	0910	-1460 0085-0713	0455	0791-3245-4062
1003	1325 2682	0000 0077	0915	-1600 0084-0719	0482	0782-3464-4175

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1004	1198-0328	0000-0077	0811	1041-0095-0872-0123	0806	1075-4104
1005	1201-0243	0000-0063	0797	0919-0080-0902-0097	0793	0877-4110
1006	1202-0140	0000-0041	0775	0745-0053-0991-0060	0774	0594-4005
1007	1201 0001	0000 0009	0735	0378 0012 0318	0009	0735 0028-3720
1008	1204 0068	0000 0045	0748	0128 0060-0689	0054	0747-0370-3574
1009	1202 0172	0000 0072	0774	-0077 0094-0751	0096	0771-0718-3628
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1011	1200 0478	0000 0123	0807	-0529 0152-0779	0190	0794-1477-3620
1012	1197 0684	0000 0161	0805	-0842 0199-0780	0255	0781-1991-3534
1013	1196 0989	0000 0177	0805	-1029 0220-0751	0313	0762-2351-3271
1014	1196 1192	0000 0167	0810	-1015 0206-0723	0331	0758-2391-3258
1015	1198 1494	0000 0139	0815	-1014 0170-0706	0344	0752-2431-3364
1016	1198 1697	0000 0134	0830	-1061 0161-0692	0370	0755-2562-3507
1017	1201 1998	0000 0109	0832	-1139 0131-0695	0386	0745-2686-3519
1018	1198 2199	0000 0096	0826	-1223 0117-0703	0399	0730-2803-3520
1019	1196 2501	0000 0095	0817	-1400 0116-0711	0432	0700-3070-3600
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1023	1102	-0139	0000	-0037	0822	0752	-0045	-0999	-0057	0821	0571-4506
1024	1102	0002	0000	0014	0768	0371	0018	-0081	0014	0768	-0011-3969
1025	1099	0069	0000	0047	0792	0145	0059	-0678	0056	0791	-0380-3992
1026	1090	0172	0000	0070	0825	-0047	0085	-0746	0095	0823	-0710-4249
1027	1092	0274	0000	0089	0849	-0205	0105	-0760	0130	0844	-0985-4282
1028	1088	0479	0000	0125	0880	-0519	0142	-0771	0198	0866	-1524-4360
1029	1100	0684	0000	0148	0896	-0733	0165	-0757	0253	0872	-1915-4184
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1031	1092	1190	0000	0118	0899	-0781	0132	-0700	0301	0855	-2108-4135
1032	1097	1493	0000	0096	0906	-0837	0106	-0687	0326	0850	-2240-4180
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1034	1097	1995	0000	0056	0884	-0991	0064	-0696	0354	0812	-2466-4240
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1037	1096	2677	0000	0042	0840	-1356	0050	-0719	0415	0731	-2989-4493

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1040	0902	-0140	0000	-0050	0515	0657	-0097	-1007	-0062	0514	0628-3262
1041	0906	0003	0000	0023	0475	0194	0048	-0381	0023	0475	-0088-2901
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1044	0900	0276	0000	0121	0608	-0403	0199	-0760	0150	0602	-1143-3507
1045	0898	0482	0000	0160	0663	-0643	0241	-0747	0215	0647	-1606-3673
1046	0899	0685	0000	0176	0693	-0768	0255	-0727	0258	0667	-1875-3783
1047	0898	0988	0000	0163	0707	-0769	0230	-0693	0282	0669	-1952-3799
1048	0901	1190	0000	0151	0710	-0803	0213	-0687	0295	0664	-2024-3801
1049	0899	1493	0000	0149	0703	-0880	0212	-0673	0326	0641	-2190-3845
1050	0896	1694	0000	0145	0696	-0956	0208	-0676	0342	0624	-2309-3898
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1053	0897	2499	0000	0148	0635	-1363	0234	-0710	0403	0513	-2859-3866
1054	0899	2678	0000	0158	0630	-1477	0251	-0714	0425	0491	-3034-3909

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195 1 11 1 0032 0000 1164 0386

1055	06928	0000-0079	0483	0738-0164-0811-0107	0477	0865-3393
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1059	07070	0000 0064	0433-0049	0147-0662	0069	0432-0457-2963
1060	06993	0000 0092	0475-0198	0193-0698	0106	0472-0740-3149
1061	06966	0000 0114	0509-0317	0225-0704	0139	0502-0976-3325
1062	06980	0000 0145	0558-0481	0259-0693	0191	0544-1323-3519
1063	06984	0000 0158	0578-0563	0273-0674	0225	0555-1518-3538
1064	07086	0000 0151	0598-0623	0253-0661	0252	0563-1664-3663
1065	07038	0000 0148	0589-0678	0252-0660	0266	0545-1758-3626
1066	07091	0000 0154	0575-0787	0267-0657	0296	0516-1949-3659
1067	07091	0000 0151	0559-0858	0269-0666	0307	0491-2043-3565
1068	07094	0000 0151	0544-0983	0277-0678	0327	0460-2217-3634
1069	07094	0000 0151	0539-1070	0279-0686	0341	0444-2342-3650
1070	07095	0000 0149	0510-1167	0292-0699	0350	0399-2448-3663
1071	07013	0000 0154	0505-1236	0305-0701	0364	0381-2554-3723

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9- by 7-Foot Supersonic Test Section

Model: Apollo, FS-2 Test: 108

Run No/001	Tunnel/9x7	Test/108	Phase/1	Ames Config/20	Sting Bend Approx/11.77°	Rx10⁻⁶/FT.
1	1 97	108	1	0020 0000	1177	0256

Key to Tabulated Answer Listings

Corr	M_∞	α	β	C_L	C_D	C_{m_1}	L/D	$(X_{CP})_N$	C_N	C_A	C_{m_2}	C_{p_b}	α_E	β_E	C_{L_E}	C_{D_E}	$C_{m_{1_E}}$	$(X_{CP})_{N_E}$	C_{N_E}	C_{A_E}	$C_{m_{2_E}}$
xxxx	x.xxx	xx.xx	xx.xx	x.xxx	x.xxx	.xxxx	x.xxx	x.xxx	x.xxx	x.xxx	.xxxx	.xxxx	xx.xx	xx.xx	.xxxx	.xxxx	.xxxx	x.xxx	.xxxx	.xxxx	.xxxx
1012	1554	-0317	0009	-0083	0839	0997	-0099	-0803	-0130	0833	1040	-3495	-0316	0009	-0047	0003	-0013	-0042	-0047	0000	0002
1013	1554	-0239	0009	-0070	0814	0906	-0086	-0844	-0104	0811	0877	-3468	-0237	0009	-0023	0001	0013	-0900	-0023	0000	0021
1014	1554	-0136	0010	-0050	0784	0769	-0064	-0934	-0069	0783	0641	-3310	-0135	0010	0006	0000	0042	6781	0006	0000	0041
1015	1554	-0032	0010	-0011	0729	0481	-0015	-1394	-0015	0729	0206	-3040	-0032	0010	-0001	0000	0009	-6765	-0001	0000	0010
1016	1554	-0318	0009	-0086	0844	1009	-0102	-0799	-0132	0838	1058	-3434	-0316	0009	-0048	0003	-0015	-0006	-0048	0000	0000
1017	1554	0071	0011	0043	0733	0049	0059	-0838	0052	0732	-0438	-3042	0070	0011	-0034	0000	-0065	1605	-0034	0000	-0054
1018	1554	0173	0011	0069	0777	-0120	0089	-0813	0093	0775	-0753	-3118	0171	0011	-0023	-0001	-0072	2734	-0023	0000	-0064
1019	1554	0276	0011	0090	0806	-0229	0111	-0768	0128	0800	-0986	-3131	0274	0011	0006	0000	-0041	-7442	0006	0000	-0043
1020	1554	0481	0012	0126	0854	-0418	0148	-0714	0198	0840	-1411	-3121	0480	0012	0075	0006	0045	0282	0075	0000	0021
1021	1554	0687	0013	0156	0903	-0550	0173	-0672	0263	0878	-1765	-3084	0685	0013	0150	0018	0141	0617	0151	0000	0093
1022	1554	0993	0014	0173	0959	-0592	0181	-0612	0336	0915	-2055	-3081	0993	0014	0252	0044	0296	0843	0256	0000	0216
1023	1554	1197	0014	0163	1005	-0547	0162	-0578	0368	0949	-2125	-3120	1198	0014	0261	0055	0359	1031	0267	0000	0275

National Aeronautics and Space Administration
Ames Research Center
MOFFETT FIELD, CALIF.

UNITARY PLAN WIND TUNNEL
PRELIMINARY DATA

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1 1 97 108 1 0020 0000 1177 0256

1012	1554-0317	0009-0083	0839	0907-0099-0803-0130	0833	1040-3495
1013	1554-0239	0009-0070	0814	0906-0086-0844-0104	0811	0877-3468
1014	1554-0136	0010-0050	0784	0769-0064-0934-0069	0783	0641-3310
1015	1554-0032	0010-0011	0729	0481-0015-1394-0015	0729	0206-3040
1016	1554-0318	0009-0086	0844	1009-0102-0799-0132	0838	1058-3434
1017	1554 0071	0011 0043	0733	0049 0059-0838 0052	0732-0438-3042
1018	1554 0173	0011 0069	0777-0120	0089-0813 0093	0775-0753-3112
1019	1554 0276	0011 0090	0806-0229	0111-0768 0128	0800-0986-3131
1020	1554 0481	0012 0126	0854-0410	0148-0714 0198	0840-1411-3121
1021	1554 0687	0013 0156	0903-0550	0173-0672 0263	0878-1765-3084
1022	1554 0993	0014 0173	0959-0592	0181-0612 0336	0915-2055-3081
1023	1554 1197	0014 0163	1005-0547	0162-0579 0368	0949-2125-3120

2 1 97 108 1 0020 0000 1177 0256

1031	1999-0320-0019-0090	0759	0901-0118-0748-0132	0753	0985-2522
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1033	1999-0138-0018-0040	0707	0602-0057-0823-0057	0706	0472-2471
1034	1999-0035-0012-0004	0691	0348-0006-0866-0008	0691	0070-2406
1035	1999 0068-0017 0032	0699	0160 0046-0682 0040	0698-0275-2367
1036	1999 0171-0017 0070	0711-0103	0098-0770 0091	0708-0702-2341
1037	1999 0274-0016 0096	0737-0235	0131-0739 0132	0732-0972-2341
1038	1999 0480-0016 0151	0806-0545	0187-0726 0218	0791-1579-2315
1039	1999 0685-0015 0179	0855-0600	0210-0692 0280	0827-1937-2261
1040	1999 0991-0014 0192	0922-0710	0208-0631 0340	0876-2192-2183
1041	1999 1195-0013 0183	0969-0583	0189-0575 0330	0910-2182-2171
1042	1999 1503-0013 0176	1032-0401	0171-0503 0437	0951-2199-2275
1043	1999 1708-0012 0178	1067-0299	0167-0465 0484	0968-2359-2354
1044	1999 2018-0011 0207	1120-0137	0185-0413 0531	0980-2400-2437
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1046	1999 2534-0010 0222	1170 0169	0190-0352 0701	0962-2467-2497
1047	1999 2714-0010 0233	1221 0365	0191-0324 0764	0980-2478-2463

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3 1 97 100 1 0021 0000 1177 0256

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1060	1554	-0032	0010	-0001	0751	[illegible]	-0001	-1647	-0005	0751	0087	-2977
1061	1554	0070	0011	[illegible]	0754	0221	0031	-0440	0033	0754	-0143	-2962
1062	1554	[illegible]	0011	0045	0767	0173	0059	-0585	0069	0765	-0378	-2972
1063	1554	0276	0011	0064	0781	0064	0082	-0588	0102	0777	-0599	-2970
1064	1554	0481	0012	0100	0810	-0136	0123	-0607	0167	[illegible]	-1016	-2946
1065	1554	0686	0013	0122	0878	-0243	0139	-0580	[illegible]	0857	-1334	-2998
1066	1554	0992	0014	0140	0923	[illegible]	[illegible]	-0551	0297	0865	-1635	-3016
1067	1554	1196	0014	0136	[illegible]	-0237	0142	-0587	0331	0907	-1681	-3014
1068	1554	1501	0015	0117	0908	0000	0118	-0426	0369	0924	-1570	-3091
1069	1554	1706	0016	0111	1000	0253	0111	-0354	0399	0924	-1413	-3169
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1071	1554	2222	0017	0132	1031	0766	0128	-0244	[illegible]	0904	-1247	-3209
1072	1554	2533	0017	0154	1056	1066	[illegible]	-0201	0531	0888	-1189	-3328
1073	1554	2712	0019	0164	[illegible]	[illegible]	0183	-0179	0635	0881	-1140	-3393

4 1 97 108 1 0021 0000 1177 0257

1074	[illegible]	[illegible]	-0019	-0071	0770	0563	-0092	-0515	-0114	0765	0585	-2398
1075	1998	-0248	-0018	-0056	0754	0491	-0075	-0497	-0085	0751	0430	[illegible]
1076	1998	-0140	-0018	-0036	0749	0401	-0048	-0448	-0054	0748	0243	-2360
1077	1998	-0037	-0017	-0016	0747	0348	-0021	[illegible]	-0021	0747	0084	-2344
1078	1998	0067	-0017	0005	0748	[illegible]	0011	-0629	0017	0748	-0107	-2327
1079	1998	0169	-0017	[illegible]	0747	0210	0033	-0547	0047	0746	-0257	-2307
1080	1998	[illegible]	-0016	0047	0759	0119	0062	-0574	0083	0756	-0478	-2279
1081	1998	0477	-0016	0089	0798	-0080	0111	-0591	0155	0788	-0914	-2266
1082	1998	0682	-0015	0121	0831	-0238	0145	-0587	0219	0811	-1284	-2253
1083	1998	0980	-0014	0161	0856	-0441	0188	[illegible]	0305	0815	-1662	-2123
1084	1998	1196	-0013	0176	0884	[illegible]	[illegible]	-0488	0355	0829	-1733	-2098
1085	1998	1405	-0012	[illegible]	[illegible]	0040	0197	-0395	0420	0853	-1660	-2199
1086	1998	1717	[illegible]	0196	0961	0193	0204	-0355	0470	0860	-1668	-2253
1087	1998	2021	-0011	0219	1002	0428	0218	-0307	0551	0864	-1691	-2342
1088	1998	2229	-0011	0239	1032	0583	0232	-0282	0612	0864	-1720	-2382
1089	1998	2541	-0010	0270	1066	0707	0248	-0259	[illegible]	0867	-1838	-2434
1090	1998	2721	-0010	0288	1123	0890	[illegible]	-0248	0770	0867	-1912	-2512

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5 1 97 103 1 0021 0000 1177 0272

1091	2399-0323	0003-0056	0761	0521-0073-0506-0098	0757	0498-1857
1092	2399-0243	0005-0041	0765	0450-0053-0485-0073	0762	0355-1856
1093	2399-0141	0005-0020	0762	0376-0026-0422-0039	0761	[illegible]
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1096	2399 0168	0007 0031	[illegible]	[illegible] 0040-0425	0053	0761-0227-1804
1097	2399 0270	0007 0053	0759	0174 [illegible]-0494	0089	0756-0439-1791
1098	2399 0476	0008 0094	0759	[illegible] 0124-0526	0157	0749-0825-1766
1099	2399 0681	0008 0127	0767-0140	0165-0506	0217	0747-[illegible]
1100	2399 0989	0009 0160	0733-0178	0202-0489	[illegible]	[illegible]-1437-1687
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1102	2399 1506	0011 0228	[illegible]	0261-0401	0448	0785-1794-1753
1103	2399 1712	0011 [illegible]	0012	0030 0280-0378	0513	0796-1938-1792
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6 1 97 108 1 0022 0000 1177 0254

1114	1555-0313	0009-[illegible]	0831	1010-0105-0804-0132	0825	1064-3520
1115	1555-[illegible]	0009-0073	0808	0917-0090-0844-0107	0804	0899-3463
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1118	1555 0071	0011 0049	0732	0040 0067-[illegible]	0058	0731-0466-3045
1119	1555 0174	0011 0076	0776-[illegible]	0088-0785	0100	0774-0782-3136
1120	1555 0277	0011 [illegible]	0802-0235	0110-0755	0133	0796-1006-3149
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1122	1555 0687	0013 0166	0899-0572	0185-0667	0272	0873-1816-[illegible]
1123	1555 0994	0014 0177	0979-0598	0181-0609	0343	[illegible]-0092-3095
1124	1555 1197	0014 0164	1029-0533	0155-[illegible]	0374	0972-2140-3146
1125	1555 1505	0015 0157	1044-[illegible]	0130-0485	0422	0968-2046-3109
1126	1555 1710	0016 [illegible]	1064-0066	0142-0424	0458	0973-1940-3171
1127	1555 [illegible]	0016 0168	1092	0270 0154-0345	0535	0967-1843-3287
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7 1 97 108 1 [illegible]

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[illegible]	[illegible]	0159	0016	0057	0697	0723	0082	0860	0074	0695	0651	[illegible]
1134	1999	0036	0018	0019	0669	0475	0026	1060	0028	[illegible]	0053	2456
1135	1999	0068	0017	0041	0676	[illegible]	[illegible]	[illegible]	[illegible]	0096	0676	0402-2392
1136	1999	0171	0017	0072	0705	[illegible]	0101	0706	0093	0703	0728	2367
1137	1999	0274	0016	[illegible]	0738	0259	0134	0753	0132	0723	0904	2354
1138	1999	[illegible]	0016	0152	0750	0548	0196	0724	0217	0764	1567	2328
[illegible]	1999	0685	0015	0180	0833	0692	0217	0681	0278	0805	1025	[illegible]
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1141	1999	1176	0013	0183	0948	0506	[illegible]	[illegible]	0375	0339	2084	2198
1142	1999	1503	0013	0181	1003	[illegible]	0179	0471	0437	0428	2056	2276
1143	1999	1709	0013	[illegible]	1040	0149	0178	0432	0482	0239	2084	2367
1144	1999	[illegible]	0011	0200	1084	0036	0184	0383	0862	0240	2154	2445
[illegible]	1999	2185	0012	0204	1113	0191	0183	0353	0812	0957	2162	2497
1146	1999	2335	0010	0214	1162	0453	0104	0310	0375	[illegible]	2145	2497
1147	1999	2525	0010	0222	1191	0626	[illegible]	[illegible]	0742	0958	2156	2497

8 1 97 [illegible] 1 [illegible] 289

1148	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0051	0915	0155	0748	0143	0674	1069	1948
1149	[illegible]	[illegible]	0006	0080	0669	0768	0121	0755	0109	0659	0820	1948
[illegible]	[illegible]	0141	0005	0044	0641	0554	0068	0779	0060	0640	[illegible]	[illegible]
1151	[illegible]	[illegible]	0006	0021	0625	0243	0002	0668	[illegible]	[illegible]	0018	1909
1152	[illegible]	[illegible]	0006	0021	0632	[illegible]	[illegible]	[illegible]	[illegible]	0026	0632	0180	1883
1153	[illegible]	[illegible]	0007	0062	[illegible]	[illegible]	[illegible]	0006	0753	0081	0642	0607	1857
1154	2379	0271	[illegible]	[illegible]	[illegible]	0652	0276	0150	0749	0130	0656	0976	1831
1155	[illegible]	[illegible]	0005	0157	0713	0501	0221	0731	0216	0637	1579	1779
[illegible]	2399	0662	0008	0181	0755	0601	0240	0691	0250	0720	[illegible]	1727
1157	2399	0989	0009	0190	0837	[illegible]	0227	0596	[illegible]	[illegible]	[illegible]	1973	1675
1158	2399	1194	0010	0199	0882	[illegible]	[illegible]	[illegible]	[illegible]	0377	0822	2057	1688
1159	2399	1503	0011	0210	[illegible]	[illegible]	[illegible]	0222	0481	0449	0862	2160	1714
1160	2399	1706	[illegible]	[illegible]	[illegible]	0990	0331	0229	0466	0504	0881	2299	1779
1161	[illegible]	[illegible]	0012	0253	1042	0202	0244	0415	0598	0890	2481	1844
[illegible]	2399	2225	0012	0265	1085	0033	0245	0330	0657	0904	[illegible]	1870
1163	2399	2534	0013	0257	1161	0121	0222	0356	[illegible]	0940	2595	1895
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9 1 97 108 1 0022 [illegible] 4000 0251

1176	1554	2592	[illegible]	0169	1157	0766	0146-0264	0658	0967-1734-3159
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1181	1554	5139	0010	[illegible]	[illegible]	3358	0084-0063	1191	0798-0752-3509
1182	1554	5628	[illegible]	0050	1472	3886	0034-0032	1252	0776-0407-2767

10 1 97 108 1 0022 0000 4000 0251

1183	1998	2589-0018	0192	1177	0467	0163-0310	0687	0975-2128-2406
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1185	1998	3596-0017	0210	1346	1308	0156-0224	0960	0966-2148-2460
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11 1 97 108 1 0022 0000 4000 0268

1190	2399	2589	0005	0238	1174	0124	0203-0356	0727	0953-2589-1805
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1193	2399	4105	0006	0113	1417	1939	0080-0168	1016	0995-1704-1896
1194	2399	4615	0006	0055	1432	2566	0038-0115	1071	0953-1231-1712
1195	2399	5125	0006	0004	1435	3158	0003-0069	1122	0895-0775-1297
1196	2399	5612	0005	-0033	1431	3725	-0023-0026	1162	0819-0300-0385

12 1 97 108 1 0021 0000 4000 0252

1208	1554	2589	0010	0164	1049	1097	0156-0198	0606	0872-1198-3048
1209	1554	3080	0010	0205	1127	1569	0182-0158	0754	0863-1188-3310
1210	1554	3603	0011	0269	1213	2031	0222-0136	0931	0823-1269-3534
1211	1554	4121	0011	0317	1258	2561	0252-0106	1067	0737-1131-3185
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1213	1554	5146	0010	0203	1399	3695	0145-0039	1221	0713-0470-3568
1214	1554	5631	0010	0126	1440	4016	0008-0023	1268	0693-0289-2730

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13 1 97 108 1 0021 0000 4000 0252

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1217	1998	3603	-0017	0312	1258	1749	0248	-0176	0993	0834	-1750-2472
1218	1998	4118	-0017	0263	1339	2391	0196	-0128	1079	0835	-1382-2616
1219	1998	4629	-0017	0199	1388	3063	0143	-0078	1140	0815	-0893-2551
1220	1998	5138	-0017	0130	1410	3574	0092	-0042	1183	0779	-0499-1939
1221	1998	5624	-0018	0070	1425	4041	0049	-0012	1223	0733	-0141-1068

14 1 97 108 1 0021 0000 40[illegible]

1222	2399	2597	0005	0320	1093	0466	0301	[illegible]	0774	0839	-2347-1831
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1224	2399	3600	0006	0311	1260	1552	0247	-0196	0992	0837	[illegible]
1225	[illegible]	4112	0006	0249	1321	2200	0186	-0134	1086	0832	-1418-1908
1226	2399	4623	[illegible]	0187	1360	2941	0139	-0068	1112	0806	-0921-1740
1227	2399	5132	0006	[illegible]	1388	3494	0058	-0043	1156	0770	-0492-1232
1228	2399	5617	0005	0062	[illegible]	[illegible]	0045	-0012	1183	0721	-0146-0452

15 1 97 108 1 0020 0000 4000 [illegible]

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[illegible]	1998	3592	-0017	0204	1327	0880	0154	-0267	0943	0955	-2518-[illegible]
1239	[illegible]	[illegible]	-0017	0142	1386	1484	0102	-0211	1017	0953	-2143-2526
1240	1998	4614	-0017	0075	1424	2049	0053	-0164	1079	0933	-1764-2522
1241	1998	5122	-0017	[illegible]	[illegible]	2526	0011	-0125	1123	0803	-1405-1916
1242	1998	5608	-0017	-0030	1423	[illegible]	[illegible]	-0021	-0089	1163	0819	-1034-1058

16 1 97 108 1 0032 0000 3960 0259

	M_∞	α	β	C_L	C_D	C_{m_1}	L/D	$(X_{cp})_N$	C_N	C_A	C_{m_2}	C_{A_b}	[illegible]	[illegible]	L/D	C_{N_B}	$C_{m_{1E}}$	$X_{cp/N}$	C_{NE}	C_{AE}	$C_{m_{2E}}$
1262	1554	2510	0002	0096	0884	-1556	0108	-0725	0462	0760	-3346	-3172	2538	0002	0165	2278	2003	1386	1125	1988	1560
1263	1554	2985	0003	0077	0912	-1833	0084	-0731	0520	0753	-3806	-3387	3022	0003	0292	2537	2736	1415	1529	2045	2164
1264	1554	3490	0004	0084	0925	-2201	0091	-0736	0598	0711	-4399	-3458	3539	0003	0506	2773	3494	1373	2018	1967	2771
1265	1554	3992	0004	0080	0921	-2498	0087	-0743	0652	0655	-4844	-3160	4053	0004	0762	2995	4231	1329	2525	1781	3355
1266	1554	4493	0005	0011	0943	-2597	0012	-0744	0674	0660	-5013	-3495	4568	0005	1029	3324	5018	1282	3097	1586	3971
1267	1554	4992	0005	-0052	0928	-2630	-0056	-0746	0677	0638	-5045	-3520	5077	0005	1078	3638	5584	1262	3500	1466	4416
1268	1554	5470	0005	-0117	0925	-2718	-0127	-0751	0687	0630	-5164	-2778	5564	0005	1074	3980	6139	1246	3892	1360	4851

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17 1 97 108 1 0032 0000 3960 0255

1269	1998	2510-0026	0140	0883-1796	0158-0739	0501	0740-3702-2416	2540-0026	0221	2491	2135	1293	1268	2156	1640
1270	1998	2986-0025	0131	0931-2132	0140-0742	0577	0743-4279-2524	3026-0025	0343	2759	2795	1284	1687	2210	2165
1271	1998	3489-0024	0107	0970-2425	0111-0743	0643	0734-4777-2485	3542-0024	0519	3012	3505	1257	2169	2154	2726
1272	1998	3489-0024	0108	0970-2424	0111-0743	0643	0734-4776-2472	3542-0024	0528	3017	3520	1257	2178	2152	2738
1273	1998	3991-0023	0036	0994-2462	0036-0734	0666	0740-4887-2537	4055-0024	0677	3278	4196	1237	2645	2051	3271
1274	1998	4491-0023	-0052	0995-2445	-0053-0732	0666	0742-4871-2602	4564-0023	0783	3511	4817	1232	3058	1895	3769
1275	1998	4989-0022	-0112	0960-2475	-0117-0736	0662	0704-4873-3422	5073-0023	0836	3783	5377	1217	3458	1747	4209
1276	1998	5467-0022	-0158	0921-2545	-0172-0745	0660	0662-4919-1054	5559-0022	0916	4034	5942	1212	3846	1524	4662

18 1 97 108 1 0032 0000 3960 0271

1277	2400	2510-0003	0189	0882-2072	0215-0754	0545	0718-4109-1842	2541-0003	0278	2497	2106	1206	1322	2136	1595
1278	2400	2986-0002	0174	0949-2305	0183-0750	0623	0736-4675-1857	3029-0002	0369	2857	2705	1182	1759	2281	2080
1279	2400	3488-0001	0111	0982-2433	0113-0739	0652	0742-4817-1907	3541-0001	0404	3228	3446	1203	2200	2397	2646
1280	2400	3988 0000	0029	0986-2367	0030-0727	0655	0738-4750-1907	4051 0000	0441	3464	4056	1213	2585	2347	3137
1281	2400	4488 0000	-0044	0973-2336	-0045-0720	0656	0720-4721-1764	4560 0000	0546	3649	4644	1207	2989	2163	3606
1282	2400	4986 0001	-0107	0936-2387	-0114-0731	0647	0685-4730-1230	5068 0001	0705	3811	5243	1205	3395	1870	4090
1283	2400	5463 0001	-0155	0893-2456	-0173-0744	0639	0543-4755-0423	5554 0001	0825	4040	5843	1204	3798	1606	4574

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1293	1554	2983	0003	0030	0918-1650	0022-0729	0482	0782-3516-3315	3030	0003	1357	1533	3074	1251	1945	0639	2433
1294	1554	3488	0004	0043	0938-2069	0046-0735	0572	0745-4200-3525	3548	0003	1698	1941	3912	1233	2510	0595	3094
1295	1554	3991	0004	0059	0917-2380	0064-0737	0634	0666-4672-3199	4065	0004	1963	2416	4717	1217	3063	0555	3727
1296	1554	4492	0005	0005	0938-2553	0006-0742	0667	0661-4947-3560	4578	0004	2092	2911	5445	1214	3546	0531	4303
1297	1554	4992	0005	-0050	0925-2639	-0054-0747	0676	0634-5050-3576	5085	0005	1994	3365	5997	1228	3869	0578	4751
1298	1554	5470	0005	-0111	0919-2725	-0120-0752	0686	0622-5164-2793	5568	0005	1792	3680	6301	1232	4056	0599	4995

20 1 97 108 1 0031 0000 3960 0255

1299	1999	2510-0026	0126	0906-1764	0139-0737	0498	0767-3674-2381	2549-0026	1193	1341	2487	1170	1654	0697	1934
1300	1999	2986-0025	0120	0954-2102	0126-0737	0579	0768-4266-2537	3037-0025	1470	1678	3151	1158	2117	0705	2452
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1302	1999	3990-0024	0027	0991-2421	0027-0734	0656	0743-4819-2639	4064-0024	1886	2576	4598	1153	3109	0726	3585
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1346	1998	0299	-0021 0042	0710	-0064	0059	-0795	0076	0707	-0622	-2252	0297	-0021	0167	0515	0213	0670	0194	0505	0130
1347	1998	0496	-0021 0078	0745	-0360	0105	-0796	0142	0736	-1133	-2252	0502	-0021	0206	0547	0303	0791	0253	0527	0200
1348	1998	0700	-0020 0106	0774	-0595	0138	-0779	0200	0755	-1558	-2226	0707	-0020	0223	0605	0392	0927	0295	0573	0274
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1420	2399	1003	0005	0179	0677	-1045	0265	-0765	0294	0635	-2253	-1674	1010	0005	0036	1356	0450	1117	0273	1329	0305
1421	2399	1206	0005	0185	0699	-1158	0265	-0757	0327	0645	-2473	-1687	1214	0005	0045	1539	0618	1185	0368	1495	0436

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Run No.	Tunnel (8x7)	Test No.	K_P		String Bend (Approx.)	RN10⁶/FT.
201	1 87	112 1	0020	0000	1154	0268
xxx	xx	xxx	xx		xx.xx	xx.xx

KEY TO TABULATED ANSWER LISTINGS

Corr	M_∞	α	β	C_L	C_D	C_{m_1}	(L/D)	$(X_{cp})_N$	C_N	C_A	C_{m_2}	C_{P_b}	α_E	β_E	C_{L_E}	C_{D_E}	$C_{m_{1_E}}$	$(X_{cp})_{N_E}$	C_{N_E}	C_{A_E}	$C_{m_{2_E}}$
xxx	x.xxx	xx.xx	xx.xx	x.xxx	x.xxx	.xxxx	x.xxx	x.xxx	x.xxx	x.xxx	.xxxx	.xxxx	xx.xx	xx.xx	.xxxx	.xxxx	.xxxx	x.xxx	.xxxx	.xxxx	.xxxx
0 20	3397	-0337	0008	-0294	0577	1693	-0510	-0757	-0328	0559	2481	-0941	-0335	0008	0152	1398	0241	2238	0070	1404	0157
0 21	3397	-0270	0008	-0275	0561	1582	-0490	-0760	-0301	0548	2292	-0941	-0269	0008	0100	1243	0176	2583	0042	1247	0108
0 22	3397	-0165	0008	-0193	0547	1182	-0353	-0767	-0209	0541	1602	-0941	-0164	0008	0055	1082	0120	2628	0024	1083	0064
0 23	3397	-0058	0008	-0094	0537	0704	-0176	-0784	-0100	0536	0783	-0941	-0055	0008	0178	0987	0294	1174	0168	0989	0197
0 24	3397	0050	0008	0080	0532	-0197	0150	-0827	0084	0531	-0697	-0941	0049	0008	-0093	0964	-0110	1490	-0084	0965	-0126
0 25	3397	0156	0008	0171	0541	-0640	0317	-0786	0186	0536	-1463	-0941	0155	0008	-0092	1080	-0079	1699	-0063	1082	-0107
0 26	3397	0261	0008	0254	0553	-1043	0459	-0775	0279	0540	-2160	-0924	0260	0008	-0138	1226	-0123	1841	-0082	1231	-0151
0 27	3397	0467	0008	0325	0586	-1354	0554	-0746	0372	0558	-2772	-0891	0467	0008	-0174	1512	-0084	2644	-0051	1521	-0134
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National Aeronautics and Space Administration
Ames Research Center
MOFFETT FIELD, CALIF.

UNITARY PLAN WIND TUNNEL
PRELIMINARY DATA

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0328	3399 0963	0008 0148	0588-0913	0[illegible]-0790	0244	0555-1927-0989	0972	0008 0379	0614 0669	1035 0478	0541 0494
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