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AERODYNAMIC CHARACTERISTICS OF AN A-4B AIRCRAFT WITH SIMULATED AND ACTUAL GUNFIRE DAMAGE TO ONE WING

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16. Abstract

The aerodynamic characteristics of a damaged McDonnell Douglas A-4B aircraft were studied in the Ames Research Center's 40- by 80-Foot Wind Tunnel. A standard fuselage and three different wings were used. The first wing tested was an undamaged one in which holes had been cut and detachable cover plates installed. Removal of one or more cover plates gave one of fourteen different simulated damage cases. The other two wings tested were damaged by actual gunfire at an Air Force range.

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NOTATION

A	Aspect ratio
ALPHA	Plotter Notation for α
b	Wing span, meters (feet)
$\bar{c}$	Mean aerodynamic chord, meters (feet)
C_D	Drag coefficient, $\frac{D}{qS}$
C_{D_u}	Uncorrected C_D
CD	Plotter notation for C_D
C_L	Lift Coefficient, $\frac{L}{qS}$
C_{L_u}	Uncorrected C_L
CL	Plotter notation for C_L
C_m	Pitching moment coefficient, $\frac{M}{qS\bar{c}}$
C_{m_u}	Uncorrected C_m
CM	Plotter notation for C_m
CN	Plotter notation for yawing moment coefficient, $\frac{N}{qSb}$
CRL	Plotter notation for rolling moment coefficient, $\frac{l}{qSb}$
D	Drag force, N(lb)
i_H	Horizontal tail incidence angle, degrees
l	Rolling moment, m-N (ft-lb)
L	Total lift on aircraft, N(lb)

M	Pitching moment, m-N (ft-lb)
N	Yawing moment, m-N (ft-lb)
q	Free-stream dynamic pressure, N/m^2 (lb/ft^2)
q_u	Uncorrected q
S	Wing area, m^2(ft^2)
α	Angle of attack of wing chord plane, degrees
α_u	Uncorrected α, degrees
Γ	Geometric dihedral angle, degrees
δ_a	Aileron deflection, degrees (positive for right roll)
δ_f	Flap deflection, degrees
$\Lambda_{c/4}$	Sweep angle of quarter chord line, degrees
λ	Taper ratio

Aerodynamic Characteristics of an A-4B Aircraft with Simulated and Actual Gunfire Damage to One Wing

David H. Brown and Mark D. Betzina

U.S. Army Air Mobility R&D Laboratory

The aerodynamic characteristics of a damaged McDonnell Douglas A-4B aircraft were studied in the Ames Research Center's 40- by 80-Foot Wind Tunnel. A standard fuselage and three different wings were used. The first wing tested was an undamaged one in which holes had been cut and detachable cover plates installed. Removal of one or more cover plates gave one of fourteen different simulated damage cases. The other two wings tested were damaged by actual gunfire at an Air Force range.

Introduction

The Air Force Armament Laboratory is currently studying the effectiveness of its air to air gun fired projectiles. The objective of this test was to obtain the necessary data that would allow an aerodynamic analysis, by McDonnell Douglas Corporation, of an A-4 aircraft that has been hit by 25mm and 30mm projectiles.

Model Description

The model used in this test was a McDonnell Douglas A-4B aircraft. Basic aircraft data is tabulated below.

	Wing	Hor. Stab.	Vert. Stab.
$S, m^2(ft^2)$	24.15(260)	4.260(45.85)	4.641(49.95)
A	2.91	2.80	1.24
c, m(ft)	3.292(10.8)	1.420(4.66)	2.249(7.38)
b, m(ft)	8.382(27.5)	3.453(11.33)	2.396(7.86)
$\Lambda_{c/4}$, deg	33.21	34.37	42.0
λ	0.226	0.225	0.205
Γ, deg	2.68	0	-----

The aircraft is shown mounted in the Ames 40- by 80-Foot Wind Tunnel in Figures 1 and 2.

A single fuselage and three different wings were used during the test. The first wing used was an undamaged one on which several panels had been removed on the upper and lower surfaces of the right wing and easily detachable cover plates of aluminum installed. By removing one or more of the cover plates, various simulated damage configurations could be obtained. These panels and hole configurations are shown in Figures 3 through 17 with the removed panels being shaded. Note that in configurations 1 and 5 an optional plate could be installed to simulate petaled metal.

Also tested were two wings that were damaged by actual gunfire at an Eglin Air Force Base gunfire range. These are shown in Figures 18 through 21. One was damaged by a 25mm projectile and the other by a 30mm

projectile. Both were hit between the front and intermediate spars and above the right landing gear fairing from an angle of 15° ~~degrees~~ above and behind the wing. The 25mm projectile created a large hole on the upper surface between the front and intermediate spars and from the fuselage to wing station 90. On the lower surface, the explosion made a small hole and blew off part of the landing gear fairing. The wing hit by the 30mm projectile was damaged mainly on the lower surface where the landing gear fairing was torn off and a hole was produced between the front and intermediate spars.

Electric drive actuators were installed in the undamaged wing and fuselage tail so that the ailerons and horizontal stabilizer could be operated remotely during running. The elevator was locked at zero deflection. During part of the test, the flaps were locked in the landing configuration by a bar attached to the flap control linkage of the aircraft. The leading edge slats were fastened either in the closed or open position and were not allowed to float free aerodynamically due to worn and binding tracks.

Testing and Procedures

Aerodynamic force and moment data were taken for each undamaged and simulated damage configuration by performing angle of attack sweeps (polars) from -4 to $+26^{\circ}$ with all other variables held constant. Tail incidence, aileron, flap and slat settings were varied between polars. Some data were taken with the horizontal tail removed from the aircraft.

For the actual damage cases, polars were conducted in the tail off configuration only, with ailerons and flaps at zero and slats closed.

Several baseline runs were repeated for checks on data repeatability and others were repeated with only a variation in dynamic pressure for an indication of Reynolds number effects.

Corrections

Force and moment data obtained in the test were corrected for the effects of the wind tunnel walls. The data were corrected as follows:

$$\alpha = \alpha_u + .6025\ C_{L_u}$$

$$C_D = C_{D_u} + .01051\ C_{L_u}^2$$

$$C_m = C_{m_u} + .00571\ C_{L_u} \qquad \text{(applies to tail on only)}$$

The data were also corrected for strut effects.

Results

The aerodynamic data obtained in this test are presented without analysis in Figures 22 through 88. All moments were computed about the quarter chord point of the mean aerodynamic chord. An index of all plots is given in Table 1.

Table 1
Index of Plots

Fig.	Hole Config.	Runs	i_H deg.	δ_a deg.	δ_f deg.	Slats	q_u N/m^2 (lb/ft^2)
			Reynolds Number Effects				
22	undamaged	1	0	0	0	closed	1197(25)
		3	0	0	0	closed	2394(50)
23	undamaged	7	-8	0	0	closed	1197(25)
		5	-8	0	0	closed	2394(50)
24	undamaged	58	-4	0	50	open	1197(25)
		59	-4	0	50	open	2394(50)
25	#1	10	0	0	0	closed	1197(25)
		11	0	0	0	closed	2394(50)
26	#15	128	Off	0	0	closed	1197(25)
		129	Off	0	0	closed	2394(50)
27	#16	131	Off	0	0	closed	1197(25)
		132	Off	0	0	closed	2394(50)
			Repeatability				
28	undamaged	1,8,70	0	0	0	closed	1197(25)
29	undamaged	51,69	0	0	0	assymetric	1197(25)
30	#3	77,79	Off	0	50	open	1197(25)

Index of Plots, Continued

Fig.	Hole Config.	Runs	i_H deg.	δ_a deg.	δ_f deg.	Slats	q_u N/m^2 (lb/ft^2)
			Undamaged Wing				
31	undamaged	3	0	0	0	closed	2394(50)
		4	-4	0	0	closed	2394(50)
		5	-8	0	0	closed	2394(50)
		71	Off	0	0	closed	1197(25)
32	undamaged	3	0	0	0	closed	2394(50)
		6	0	+10	0	closed	2394(50)
		9	0	-10	0	closed	1197(25)
33	undamaged	51	0	0	0	assymetric	1197(25)
		52	-4	0	0	assymetric	1197(25)
		53	-8	0	0	assymetric	1197(25)
		72	Off	0	0	assymetric	1197(25)
34	undamaged	51	0	0	0	assymetric	1197(25)
		54	0	+10	0	assymetric	1197(25)
		55	0	-10	0	assymetric	1197(25)
35	undamaged	56	0	0	50	open	1197(25)
		58	-4	0	50	open	1197(25)
		60	-8	0	50	open	1197(25)
		61	-11	0	50	open	1197(25)
		83	Off	0	50	open	1197(25)
36	undamaged	58	-4	0	50	open	1197(25)
		62	-4	+10	50	open	1197(25)
		63	-4	-10	50	open	1197(25)
			Simulated Damage				
37	undamaged	70	0	0	0	closed	1197(25)
	#1	10	0	0	0	closed	1197(25)
38	undamaged	70	0	0	0	closed	1197(25)
	#1 + Petaling	16	0	0	0	closed	1197(25)

Index of Plots, Continued

Fig.	Hole Config.	Runs	i_H deg.	δ_a deg.	δ_f deg.	Slats	q_u N/m^2 (lb/ft^2)
39	#1	10	0	0	0	closed	1197(25)
		12	-4	0	0	closed	1197(25)
		13	-8	0	0	closed	1197(25)
		73	Off	0	0	closed	1197(25)
40	#1	10	0	0	0	closed	1197(25)
		14	0	+10	0	closed	1197(25)
		15	0	-10	0	closed	1197(25)
41	#1 + Petaling	16	0	0	0	closed	1197(25)
		17	-4	0	0	closed	1197(25)
		18	-8	0	0	closed	1197(25)
		74	Off	0	0	closed	1197(25)
42	#1 + Petaling	16	0	0	0	closed	1197(25)
		19	0	+10	0	closed	1197(25)
		20	0	-10	0	closed	1197(25)
43	undamaged	70	0	0	0	closed	1197(25)
	#2	21	0	0	0	closed	1197(25)
44	#2	21	0	0	0	closed	1197(25)
		22	-4	0	0	closed	1197(25)
		23	-8	0	0	closed	1197(25)
		75	Off	0	0	closed	1197(25)
45	#2	21	0	0	0	closed	1197(25)
		24	0	+10	0	closed	1197(25)
		25	0	-10	0	closed	1197(25)
46	undamaged	70	0	0	0	closed	1197(25)
	#3	26	0	0	0	closed	1197(25)

Index of Plots, Continued

Fig.	Hole Config.	Runs	i_H deg.	δ_a deg.	δ_f deg.	Slats	q_∞ N/m^2 (lb/ft^2)
47	undamaged	58	-4	0	50	open	1197(25)
	#3	64	-4	0	50	open	1197(25)
48	#3	26	0	0	0	closed	1197(25)
		27	-4	0	0	closed	1197(25)
		28	-8	0	0	closed	1197(25)
		76	Off	0	0	closed	1197(25)
49	#3	26	0	0	0	closed	1197(25)
		29	0	+10	0	closed	1197(25)
		30	0	-10	0	closed	1197(25)
50	#3	64	-4	0	50	open	1197(25)
		65	-8	0	50	open	1197(25)
		66	-11	0	50	open	1197(25)
		77	Off	0	50	open	1197(25)
51	#3	64	-4	0	50	open	1197(25)
		67	-4	+10	50	open	1197(25)
		68	-4	-10	50	open	1197(25)
52	undamaged	70	0	0	0	closed	1197(25)
	#4	31	0	0	0	closed	1197(25)
53	#4	31	0	0	0	closed	1197(25)
		32	-4	0	0	closed	1197(25)
		33	-8	0	0	closed	1197(25)
		78	Off	0	0	closed	1197(25)
54	#4	31	0	0	0	closed	1197(25)
		34	0	+10	0	closed	1197(25)
		35	0	-10	0	closed	1197(25)

Index of Plots, Continued

Fig.	Hole Config.	Runs	i_H deg.	δ_a deg.	δ_f deg.	Slats	q_u N/m^2 (lb/ft^2)
55	undamaged	70	0	0	0	closed	1197(25)
	#5	36	0	0	0	closed	1197(25)
56	undamaged	70	0	0	0	closed	1197(25)
	#5 + Petaling	41	0	0	0	closed	1197(25)
57	#5	36	0	0	0	closed	1197(25)
		37	-4	0	0	closed	1197(25)
		38	-8	0	0	closed	1197(25)
58	#5	36	0	0	0	closed	1197(25)
		39	0	+10	0	closed	1197(25)
		40	0	-10	0	closed	1197(25)
59	#5 + Petaling	41	0	0	0	closed	1197(25)
		42	-4	0	0	closed	1197(25)
		43	-8	0	0	closed	1197(25)
		80	Off	0	0	closed	1197(25)
60	#5 + Petaling	41	0	0	0	closed	1197(25)
		44	0	+10	0	closed	1197(25)
		45	0	-10	0	closed	1197(25)
61	undamaged	70	0	0	0	closed	1197(25)
	#6	46	0	0	0	closed	1197(25)
62	#6	46	0	0	0	closed	1197(25)
		47	-4	0	0	closed	1197(25)
		48	-8	0	0	closed	1197(25)
		81	Off	0	0	closed	1197(25)
63	#6	46	0	0	0	closed	1197(25)
		49	0	+10	0	closed	1197(25)
		50	0	-10	0	closed	1197(25)

Index of Plots, Continued

Fig.	Hole Config.	Runs	i_H deg.	δ_a deg.	δ_f deg.	Slats	q_u N/m^2 (lb/ft^2)
64	undamaged	70	0	0	0	closed	1197(25)
	#7	123	0	0	0	closed	1197(25)
65	#7	123	0	0	0	closed	1197(25)
		124	-4	0	0	closed	1197(25)
		125	-8	0	0	closed	1197(25)
		84	Off	0	0	closed	1197(25)
66	#7	123	0	0	0	closed	1197(25)
		126	0	+10	0	closed	1197(25)
		127	0	-10	0	closed	1197(25)
67	undamaged	70	0	0	0	closed	1197(25)
	#8	115	0	0	0	closed	1197(25)
68	undamaged	82	Off	0	0	open	1197(25)
	#8	86	Off	0	0	open	1197(25)
69	#8	115	0	0	0	closed	1197(25)
		116	-4	0	0	closed	1197(25)
		117	-8	0	0	closed	1197(25)
		85	Off	0	0	closed	1197(25)
70	#8	115	0	0	0	closed	1197(25)
		118	0	+10	0	closed	1197(25)
		119	0	-10	0	closed	1197(25)
71	#8	120	0	0	0	open	1197(25)
		121	0	+10	0	open	1197(25)
		122	0	-10	0	open	1197(25)
72	undamaged	70	0	0	0	closed	1197(25)
	#9	110	0	0	0	closed	1197(25)

Index of Plots, Continued

Fig.	Hole Config.	Runs	i_H deg.	δ_a deg.	δ_f deg.	Slats	q_u N/m^2 (lb/ft^2)
73	#9	110	0	0	0	closed	1197(25)
		111	-4	0	0	closed	1197(25)
		112	-8	0	0	closed	1197(25)
		87	Off	0	0	closed	1197(25)
74	#9	110	0	0	0	closed	1197(25)
		113	0	+10	0	closed	1197(25)
		114	0	-10	0	closed	1197(25)
75	undamaged #10	70	0	0	0	closed	1197(25)
		107	0	0	0	closed	1197(25)
76	#10	107	0	0	0	closed	1197(25)
		108	-4	0	0	closed	1197(25)
		109	-8	0	0	closed	1197(25)
		88	Off	0	0	closed	1197(25)
77	undamaged #11	70	0	0	0	closed	1197(25)
		104	0	0	0	closed	1197(25)
78	#11	104	0	0	0	closed	1197(25)
		105	-4	0	0	closed	1197(25)
		106	-8	0	0	closed	1197(25)
		89	Off	0	0	closed	1197(25)
79	undamaged #12	70	0	0	0	closed	1197(25)
		101	0	0	0	closed	1197(25)
80	#12	101	0	0	0	closed	1197(25)
		102	-4	0	0	closed	1197(25)
		103	-8	0	0	closed	1197(25)
		90	Off	0	0	closed	1197(25)

Index of Plots, Continued

Fig.	Hole Config.	Runs	i_H deg.	δ_a deg.	δ_f deg.	Slats	q_u N/m^2 (lb/ft^2)
81	undamaged	70	0	0	0	closed	1197(25)
	#13	98	0	0	0	closed	1197(25)
82	#13	98	0	0	0	closed	1197(25)
		99	-4	0	0	closed	1197(25)
		100	-8	0	0	closed	1197(25)
		91	Off	0	0	closed	1197(25)
83	undamaged	70	0	0	0	closed	1197(25)
	#14	93	0	0	0	closed	1197(25)
84	#14	93	0	0	0	closed	1197(25)
		94	-4	0	0	closed	1197(25)
		95	-8	0	0	closed	1197(25)
		92	Off	0	0	closed	1197(25)
85	#14	93	0	0	0	closed	1197(25)
		96	0	+10	0	closed	1197(25)
		97	0	-10	0	closed	1197(25)
	25mm Wing Damage Case						
86	undamaged	71	Off	0	0	closed	1197(25)
	#15	128	Off	0	0	closed	1197(25)
	#15	130	Off	0	0	closed	1197(25)
	30mm Wing Damage Case						
87	undamaged	71	Off	0	0	closed	1197(25)
	#16	131	Off	0	0	closed	1197(25)
	#16	133	Off	0	0	closed	1197(25)
	25mm/30mm Comparison						
88	#15	128	Off	0	0	closed	1197(25)
	#16	131	Off	0	0	closed	1197(25)

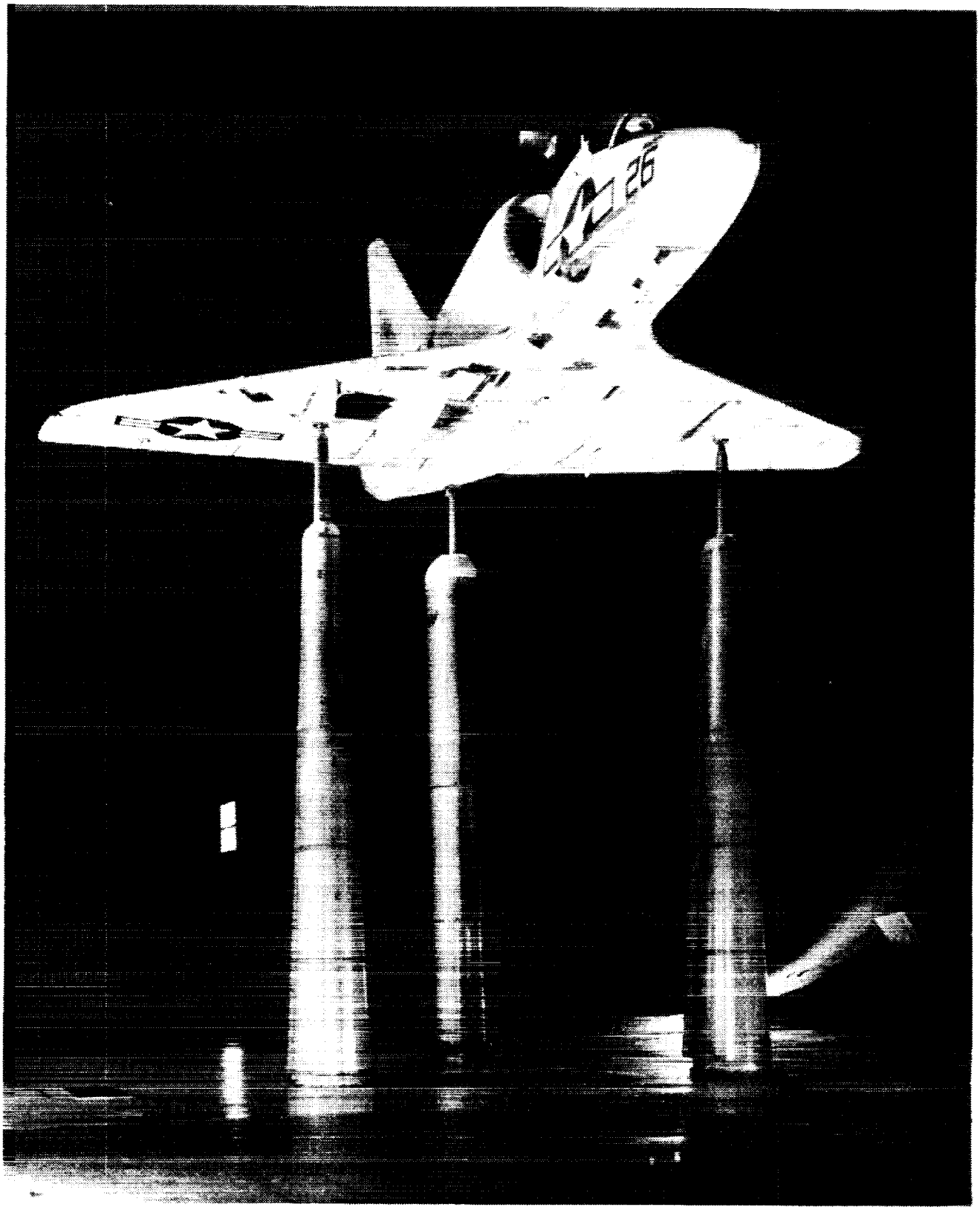


Fig. 1.- A-4B IN THE AMES 40 X 80 FOOT WIND TUNNEL
WITH HOLE CONFIGURATION #5

Fig. 2.- OVERHEAD VIEW OF A-4B WITH HOLE CONFIGURATION #5

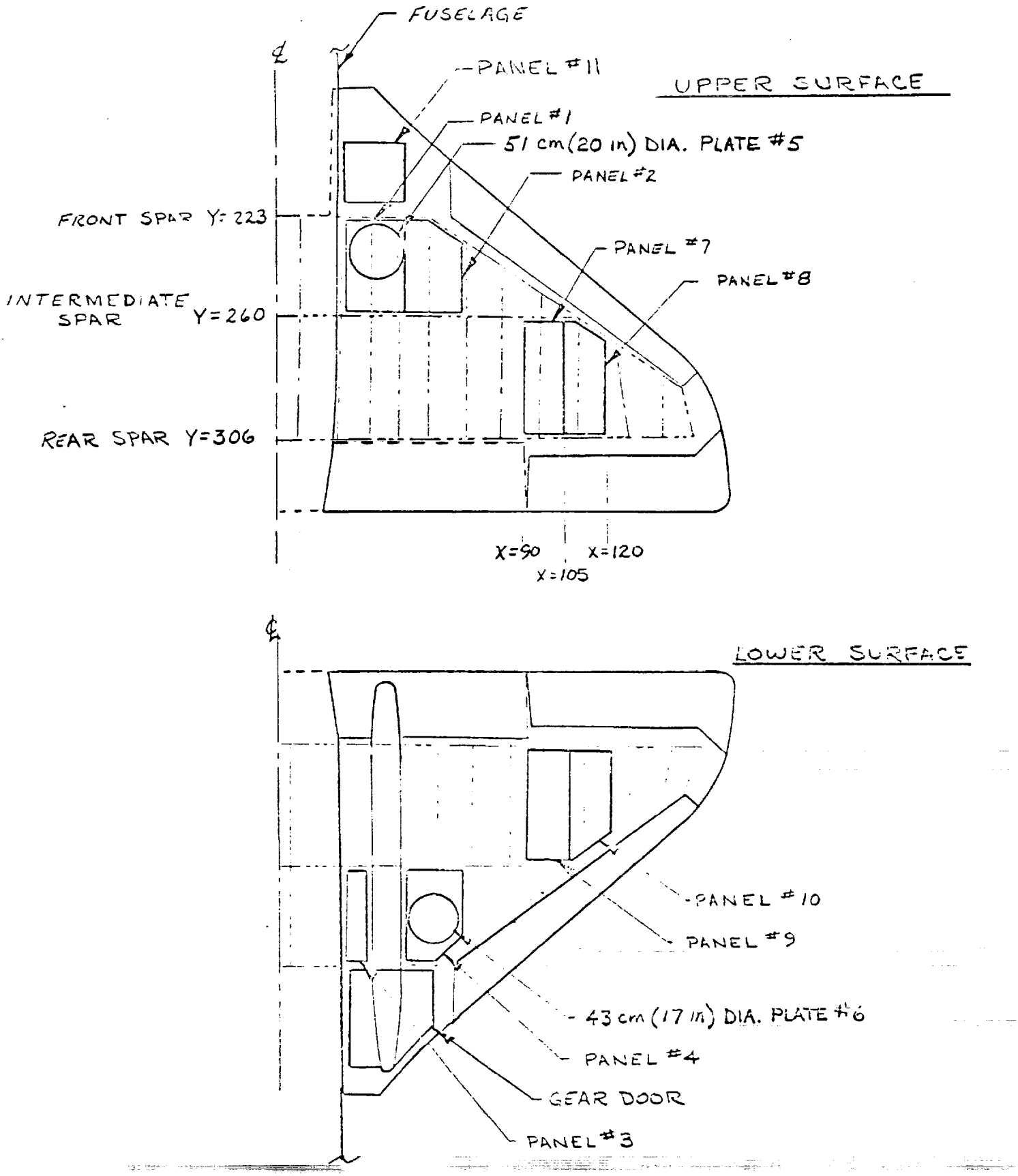


Fig. 3.- UNDAMAGED WING - ALL PANELS IN PLACE

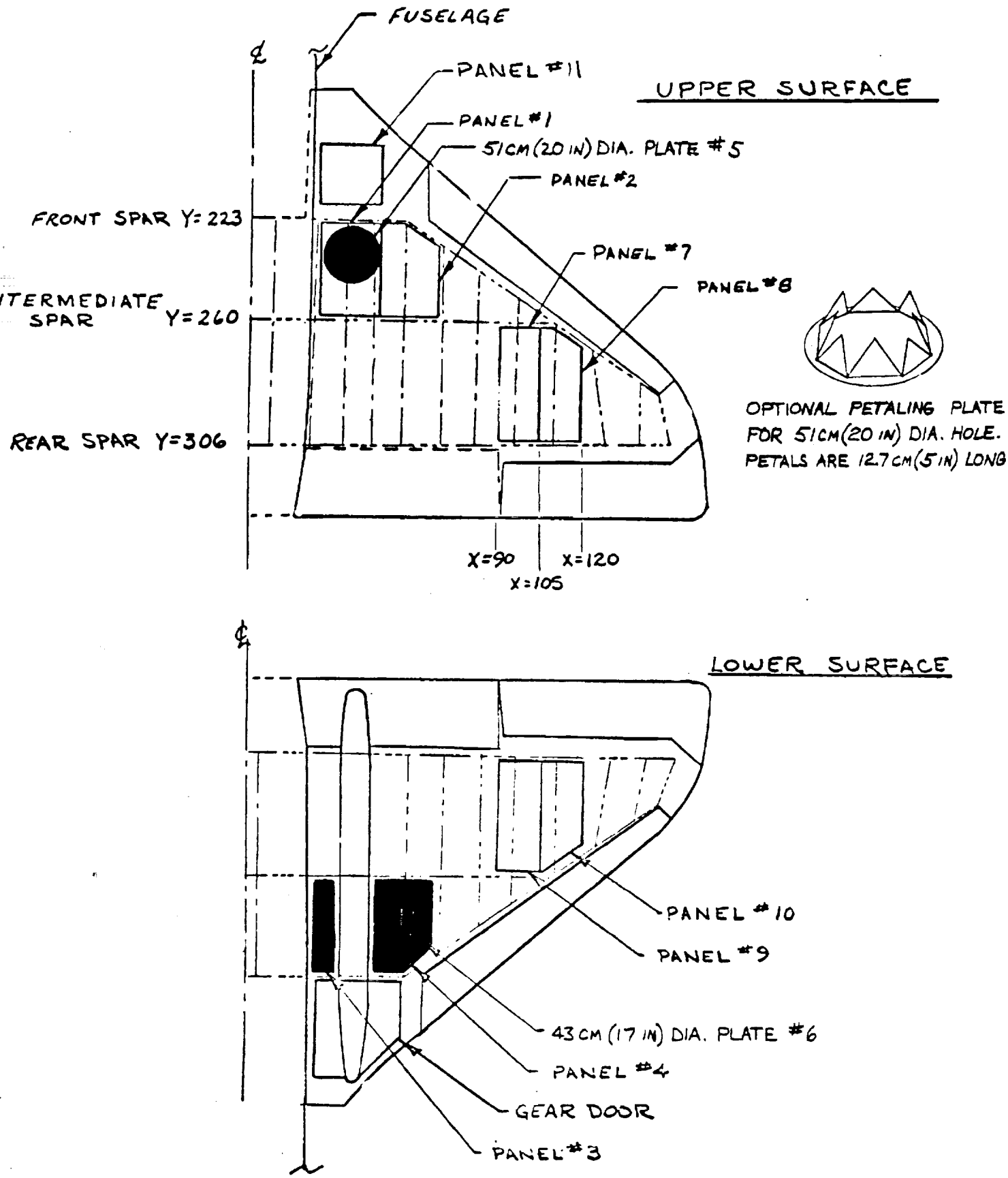


Fig. 4.- HOLE CONFIGURATION #1. PANELS 3&4 AND PLATES 5&6 REMOVED

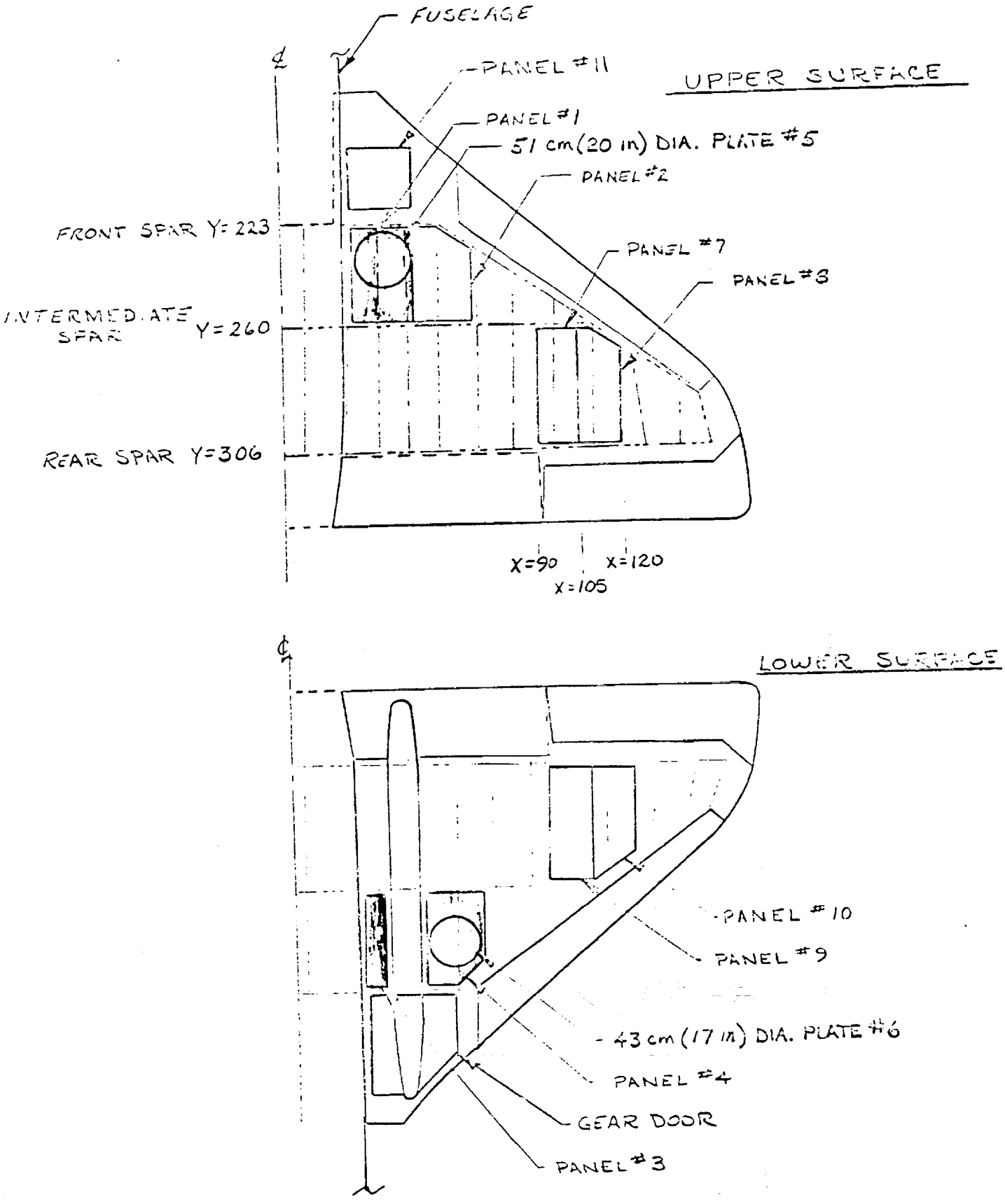


Fig. 5.- HOLE CONFIGURATION #2. PANELS 1,3,4 AND PLATES 5&6 REMOVED

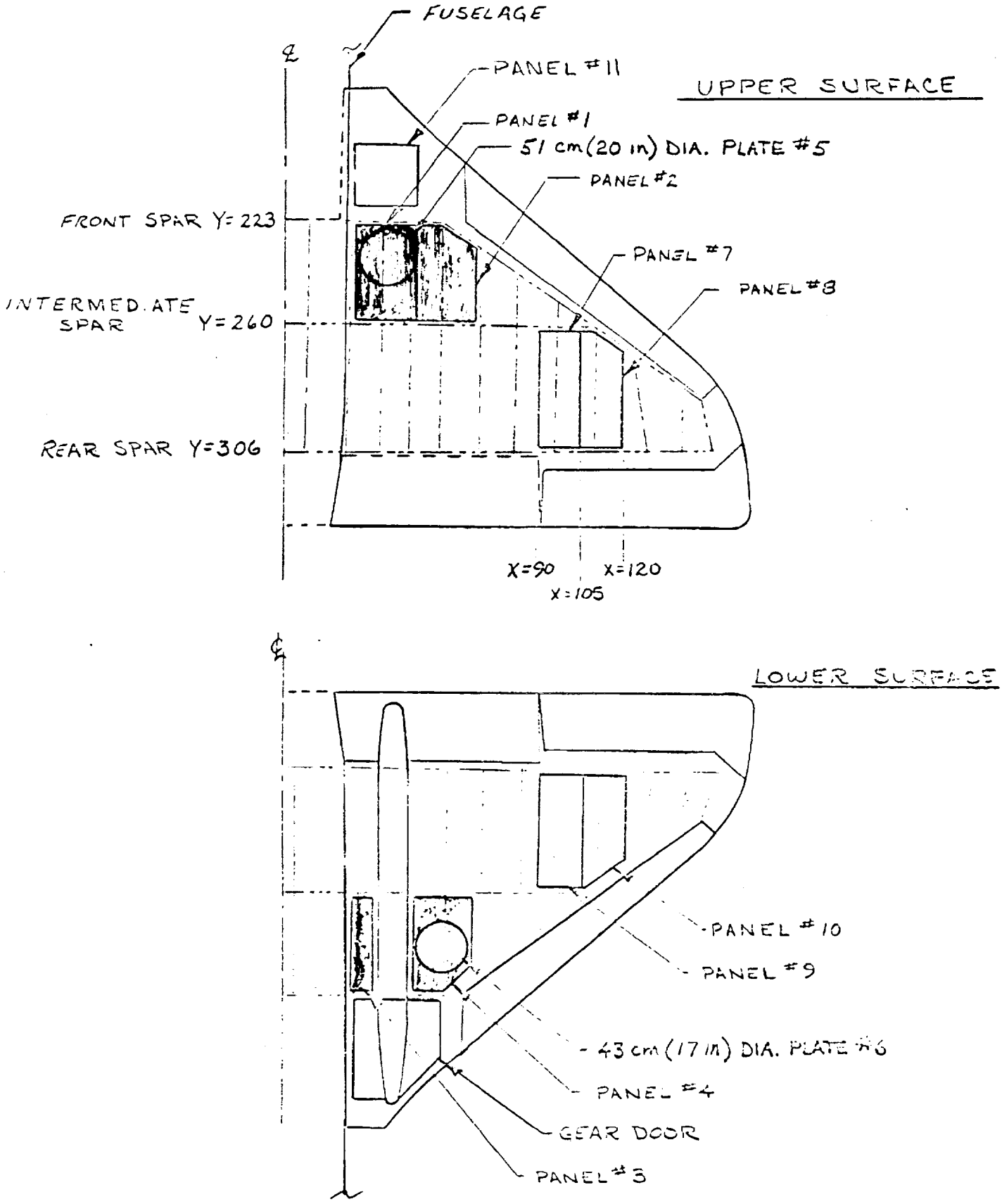


Fig. 6.- HOLE CONFIGURATION #3. PANELS 1,2,3,&4 AND PLATES 5&6 REMOVED

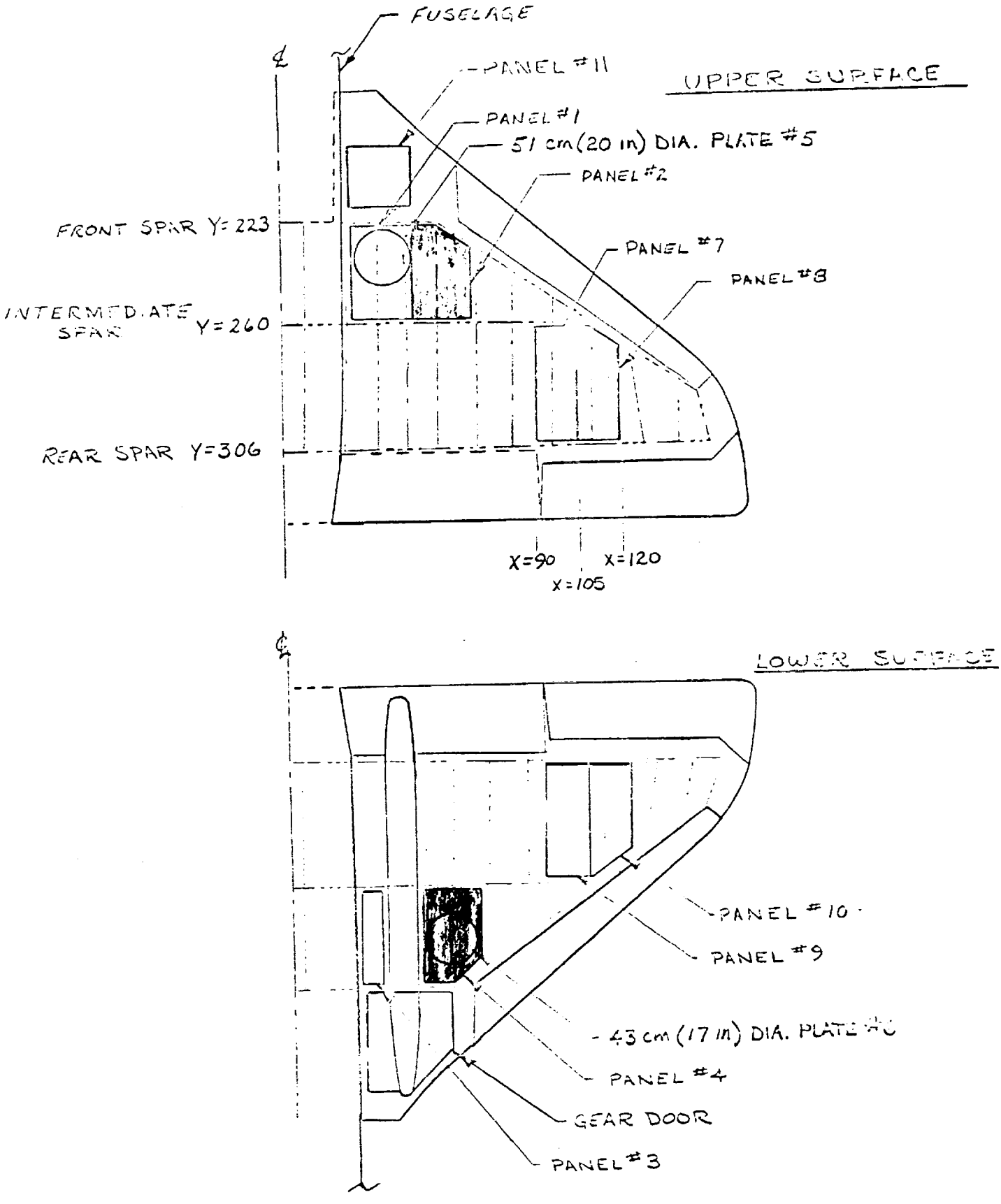


Fig. 7.- HOLE CONFIGURATION #4. PANELS 2&4 AND PLATE 6 REMOVED

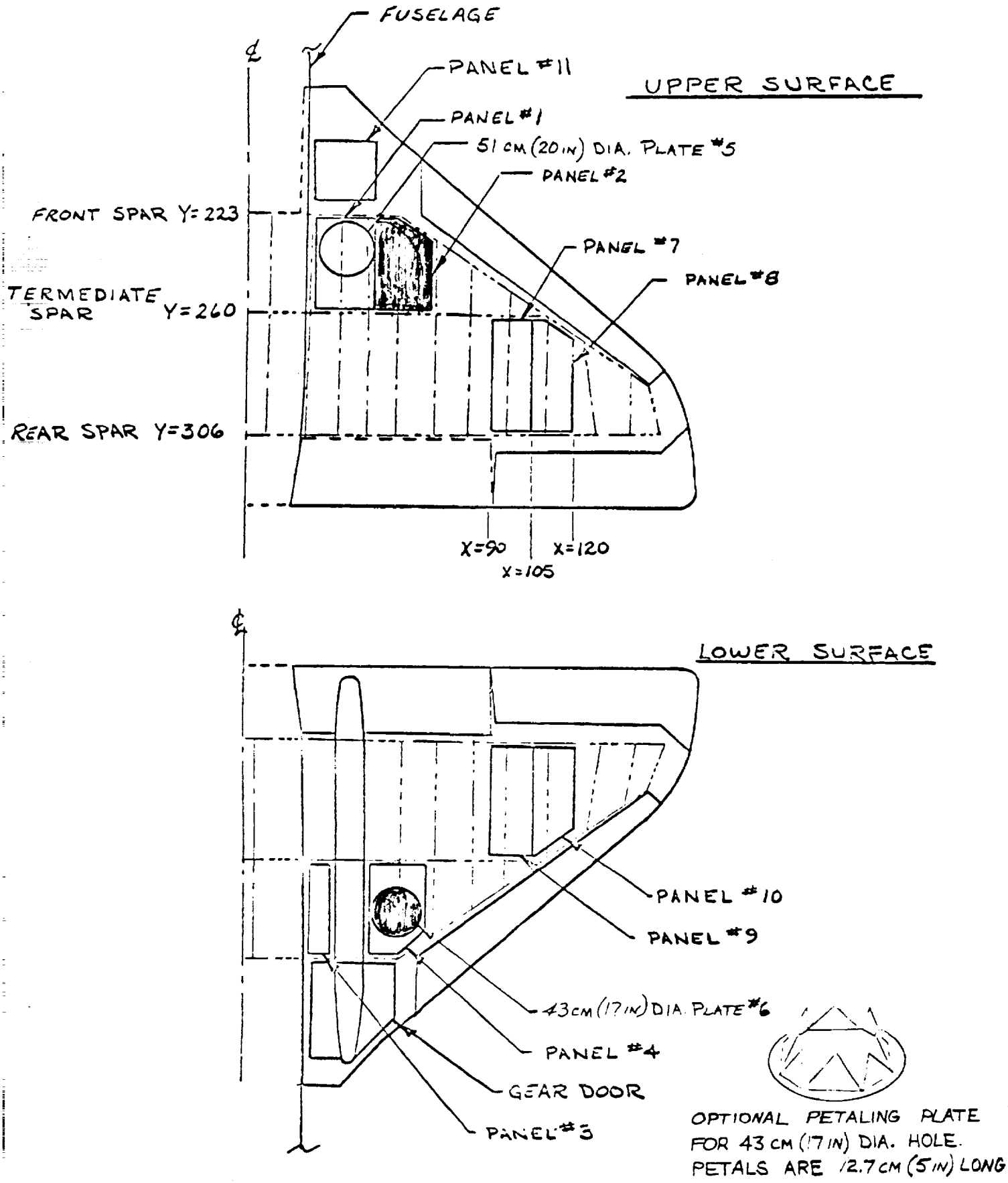


Fig. 8.- HOLE CONFIGURATION #5. PANEL 2 AND PLATE 6 REMOVED

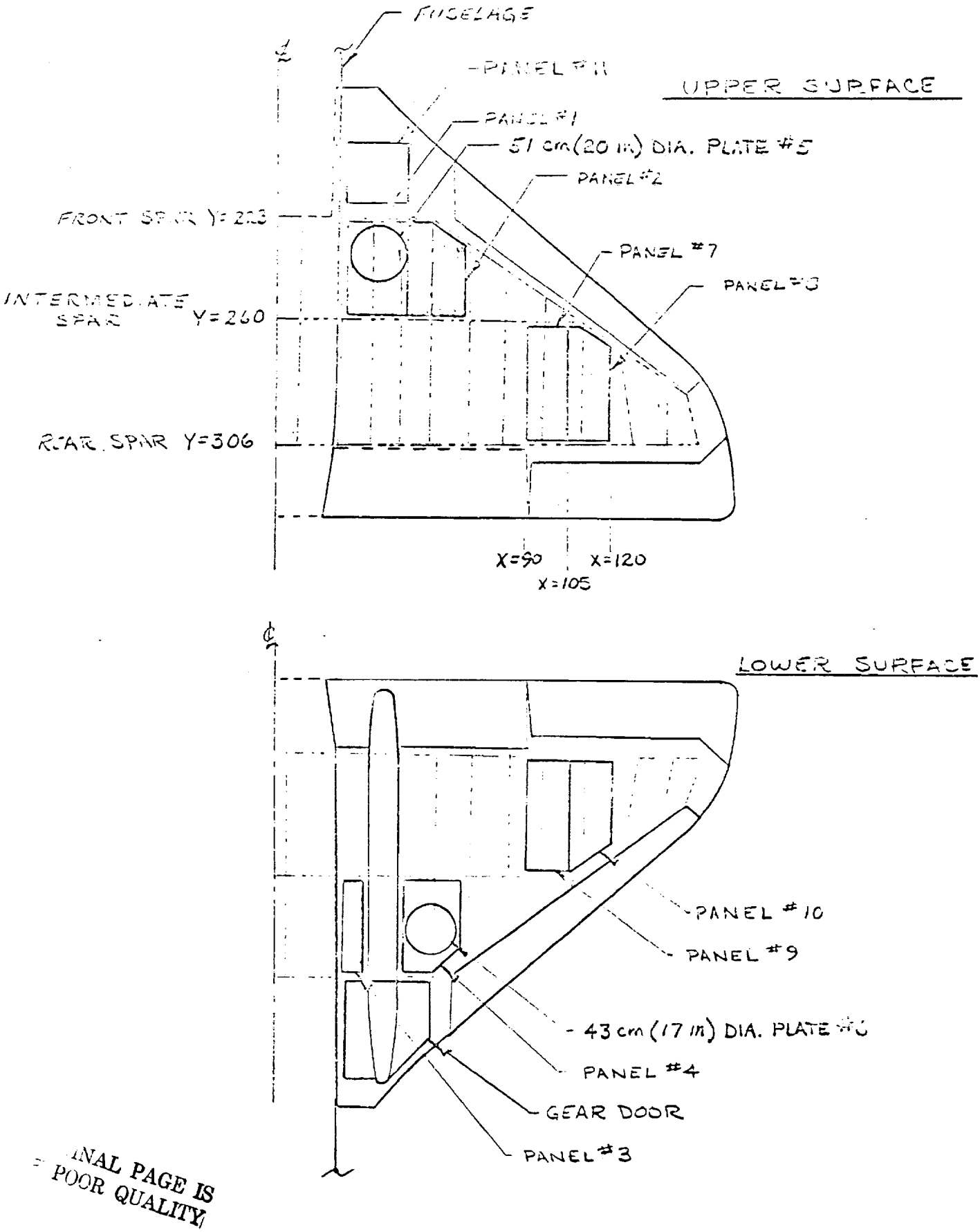


Fig. 9.- HOLE CONFIGURATION #6. PANELS 1&2 AND PLATE 5 REMOVED

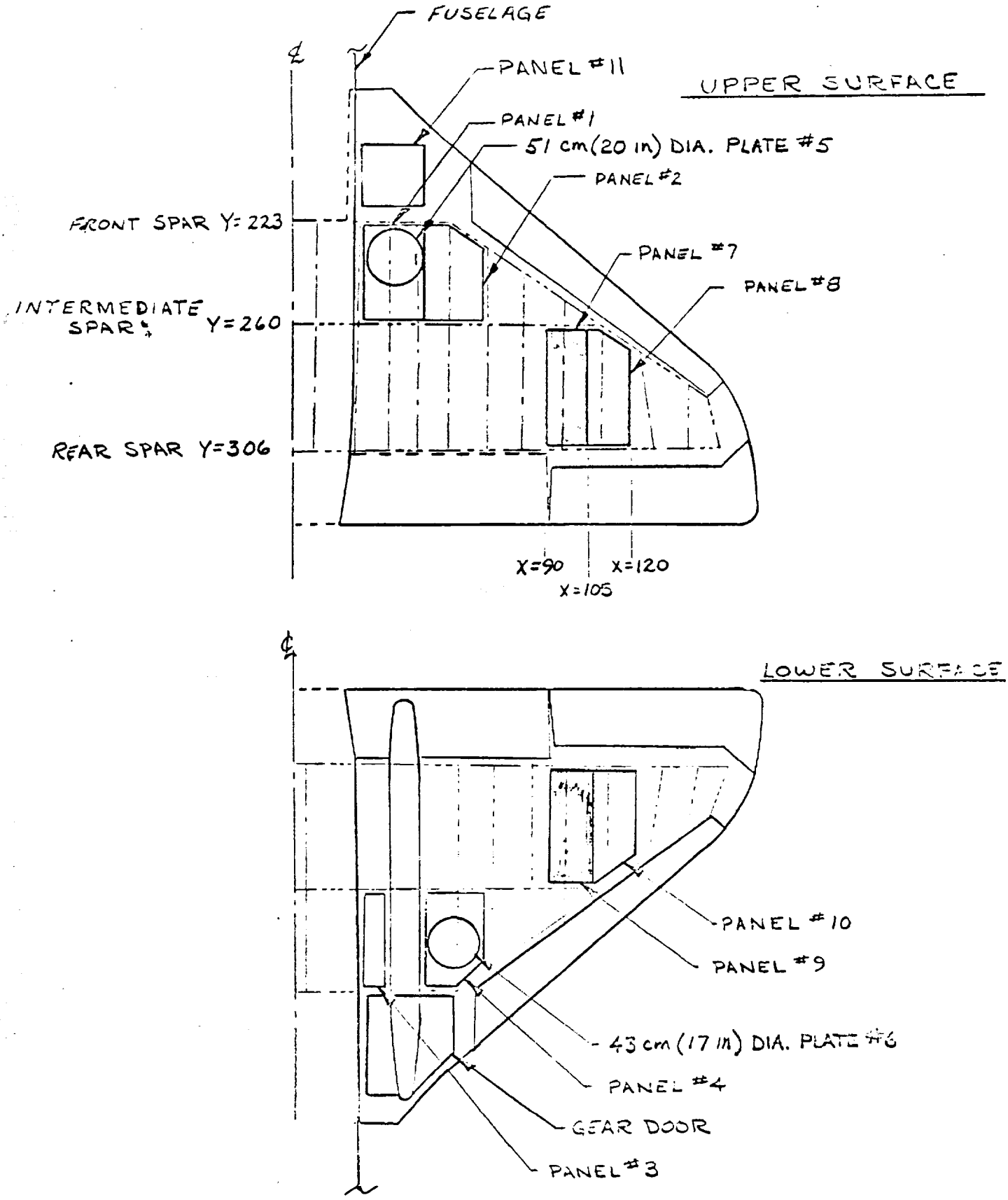


Fig. 10.- HOLE CONFIGURATION #7. PANELS 7&9 REMOVED

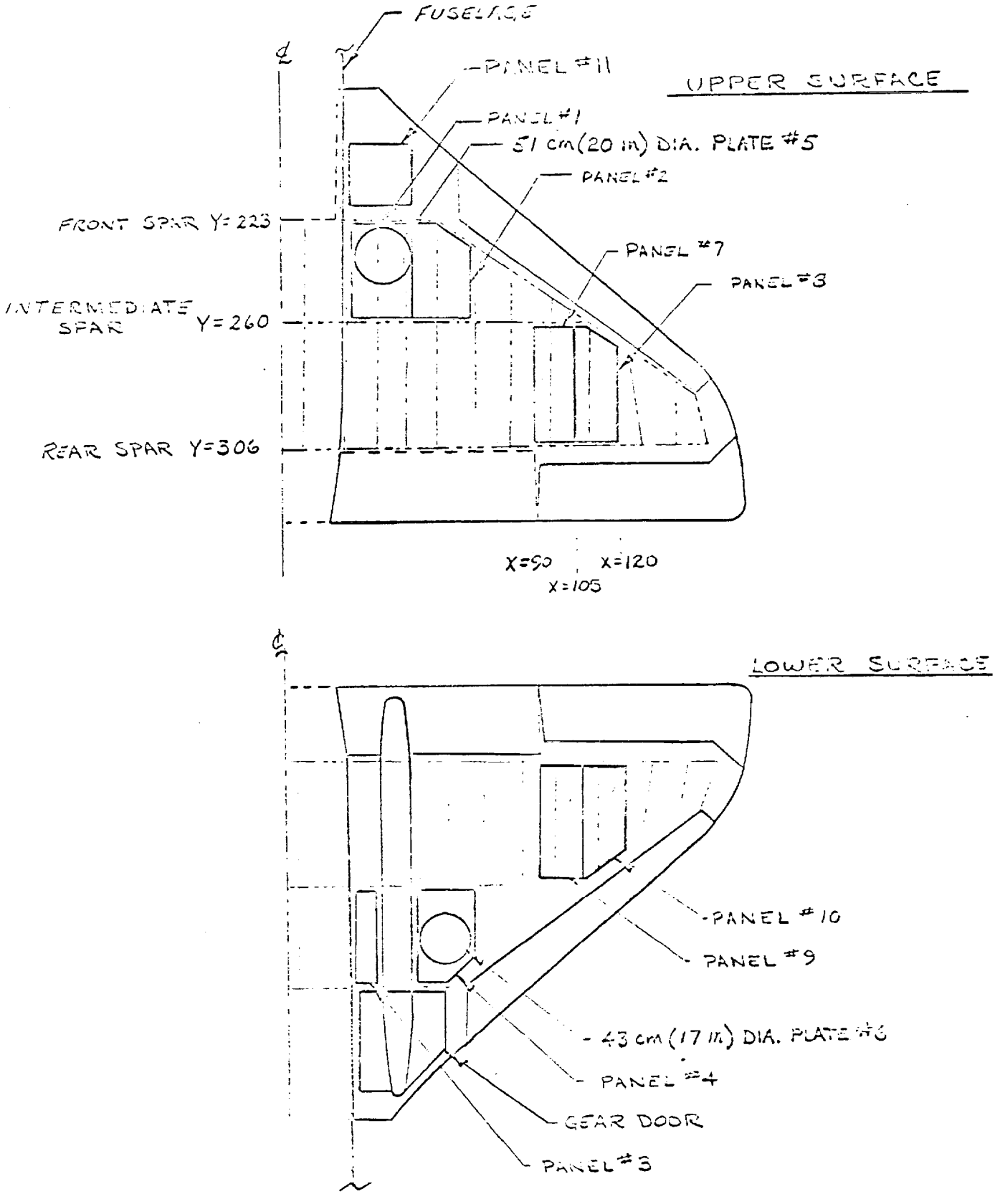


Fig. 11.- HOLE CONFIGURATION #8. PANELS 7,8,9,&10 REMOVED

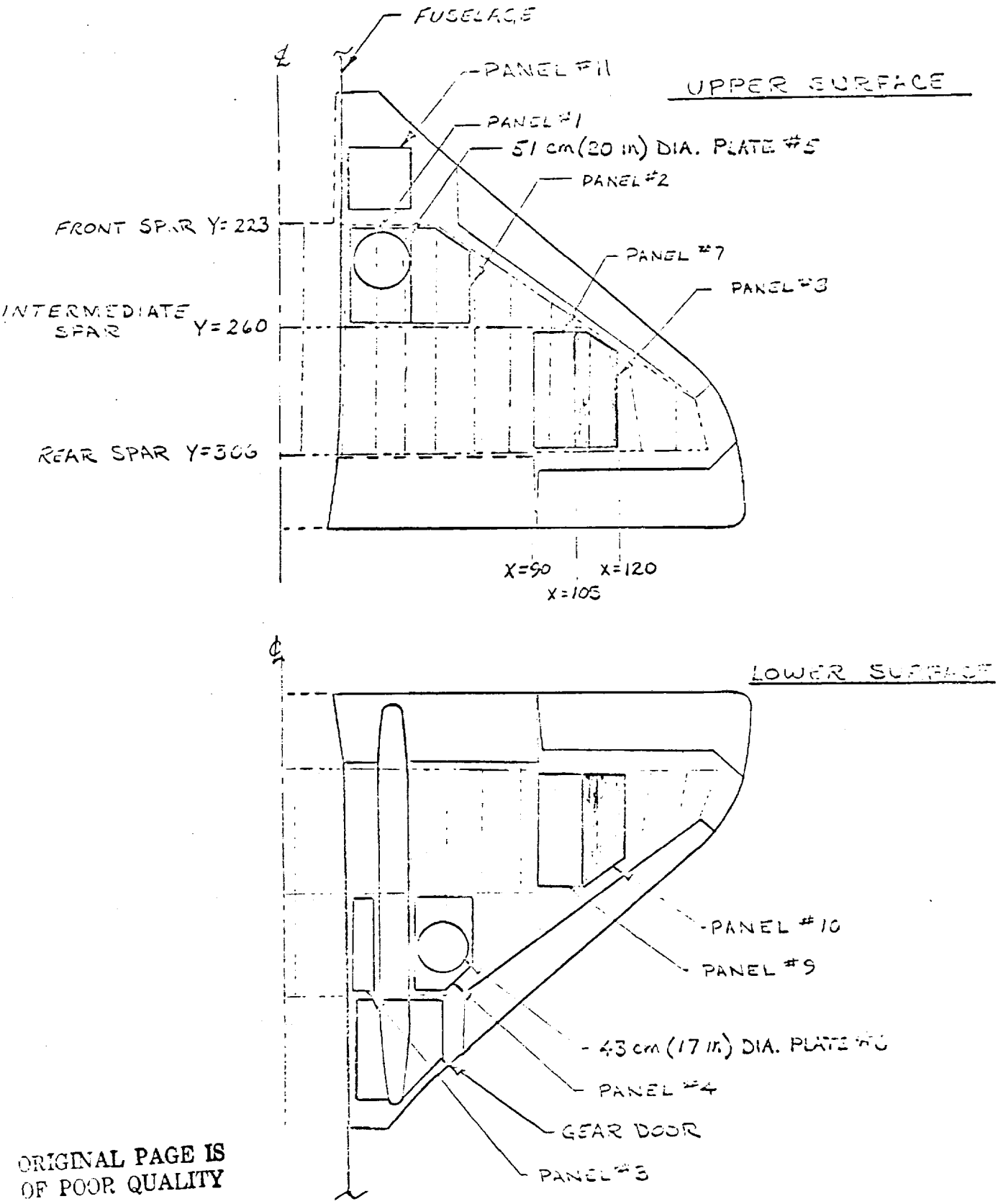


Fig. 12.- HOLE CONFIGURATION #9. PANELS 8&10 REMOVED.

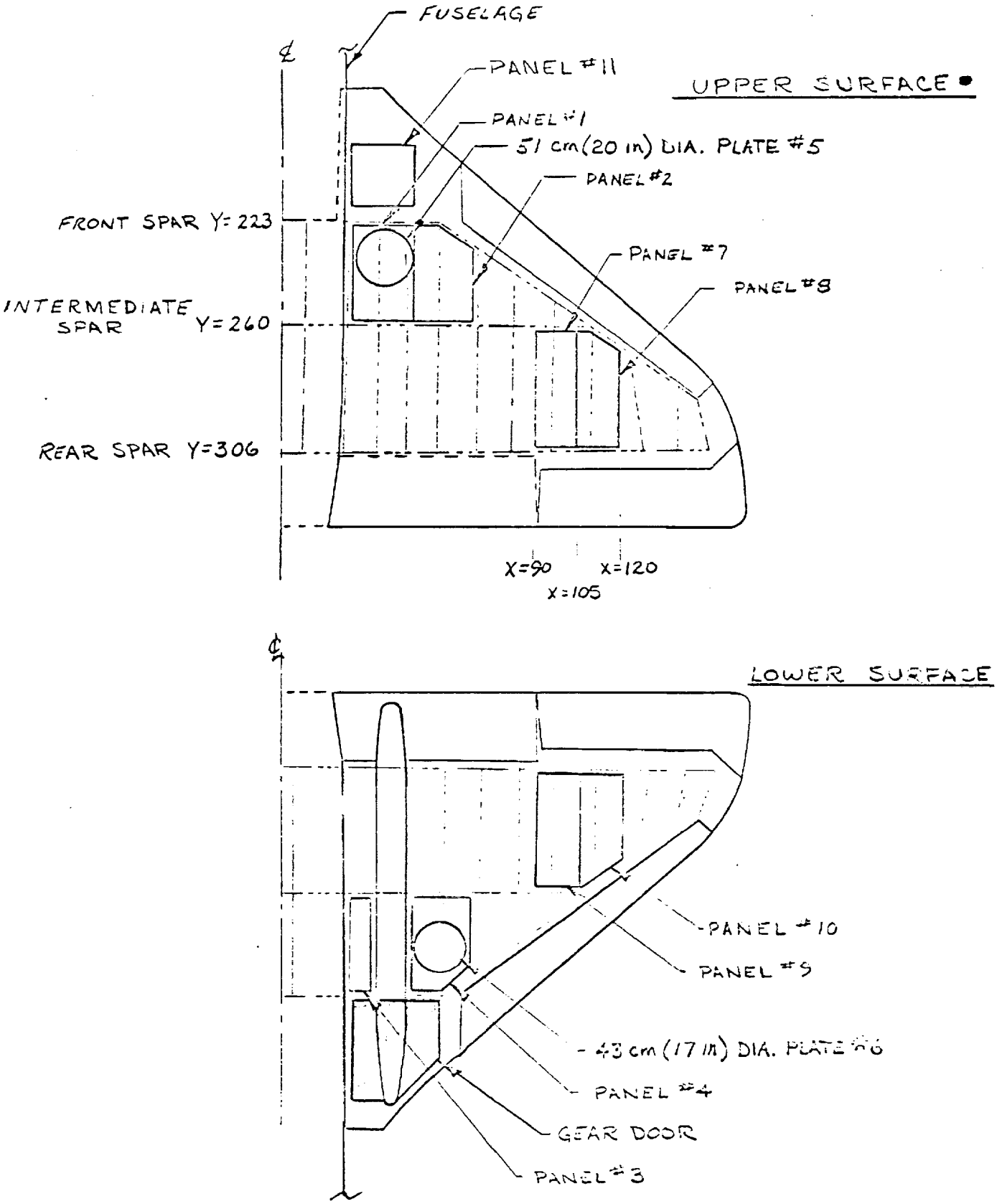


Fig. 13.- HOLE CONFIGURATION #10. GEAR DOOR LOCKED OPEN

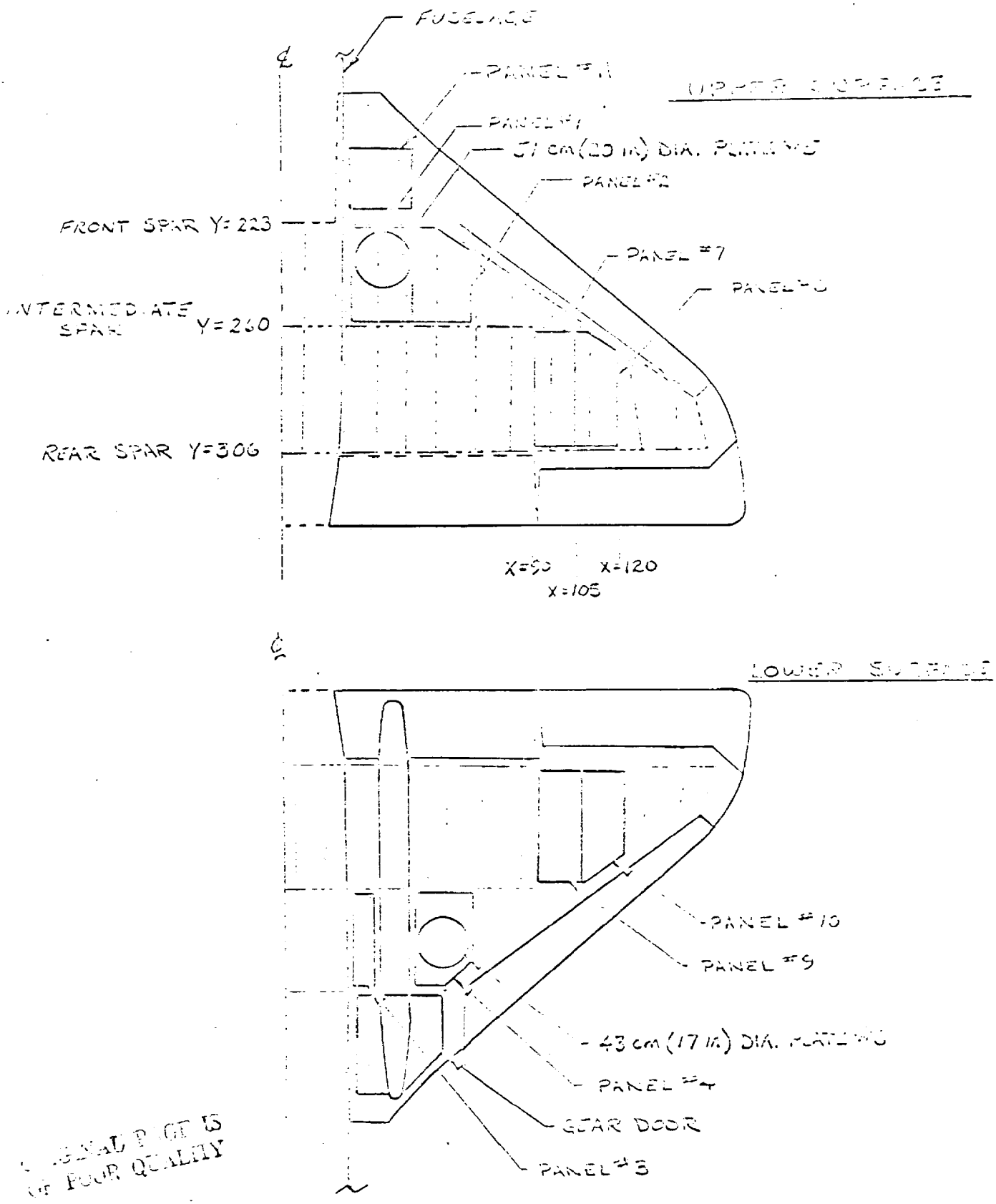


Fig. 14.- HOLE CONFIGURATION #11. PANEL 11 REMOVED AND GEAR DOOR OPEN

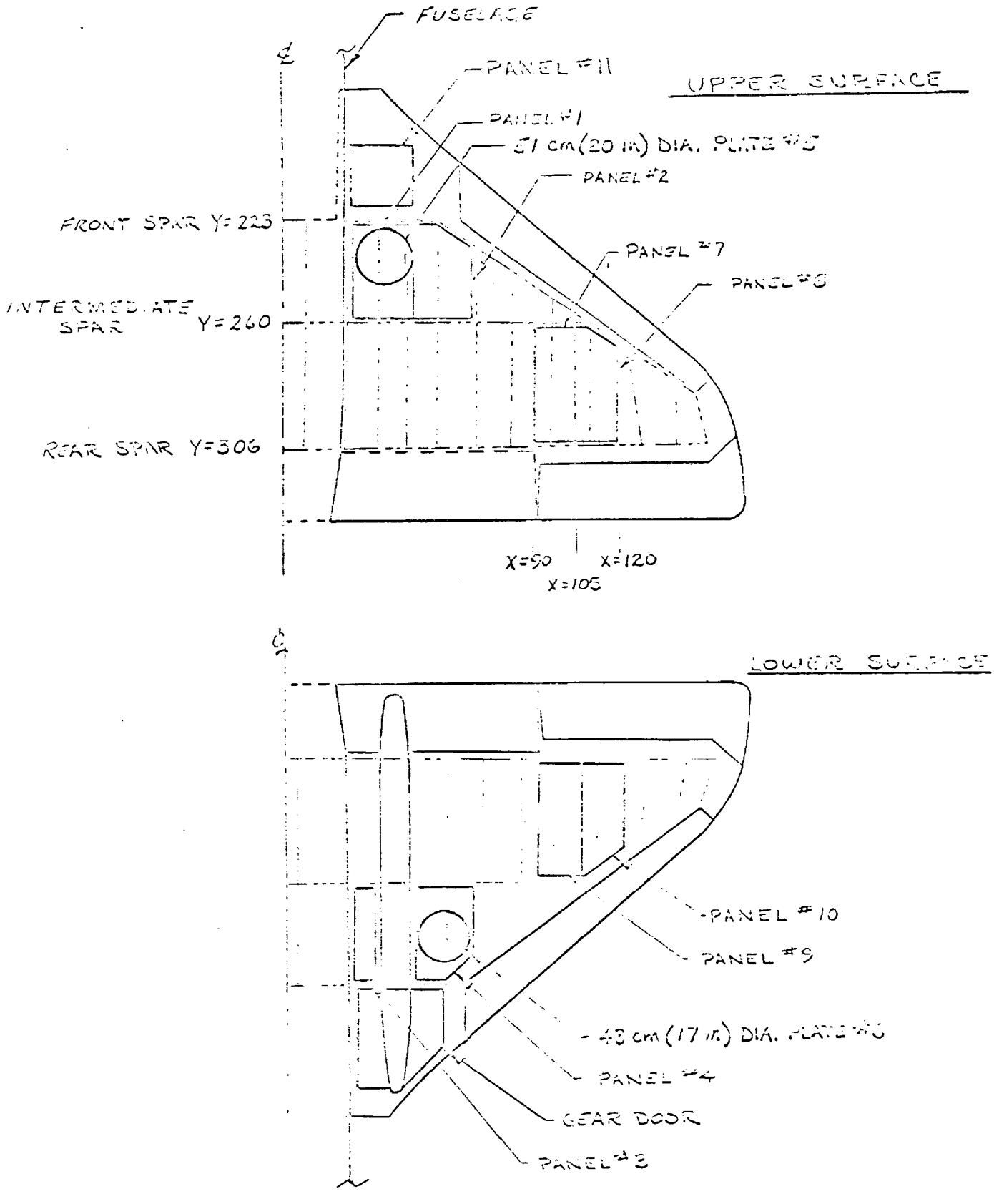


Fig. 15.- HOLE CONFIGURATION #12. PANELS 1,3,4,& 11 AND PLATES 5&6 REMOVED; GEAR DOOR LOCKED OPEN

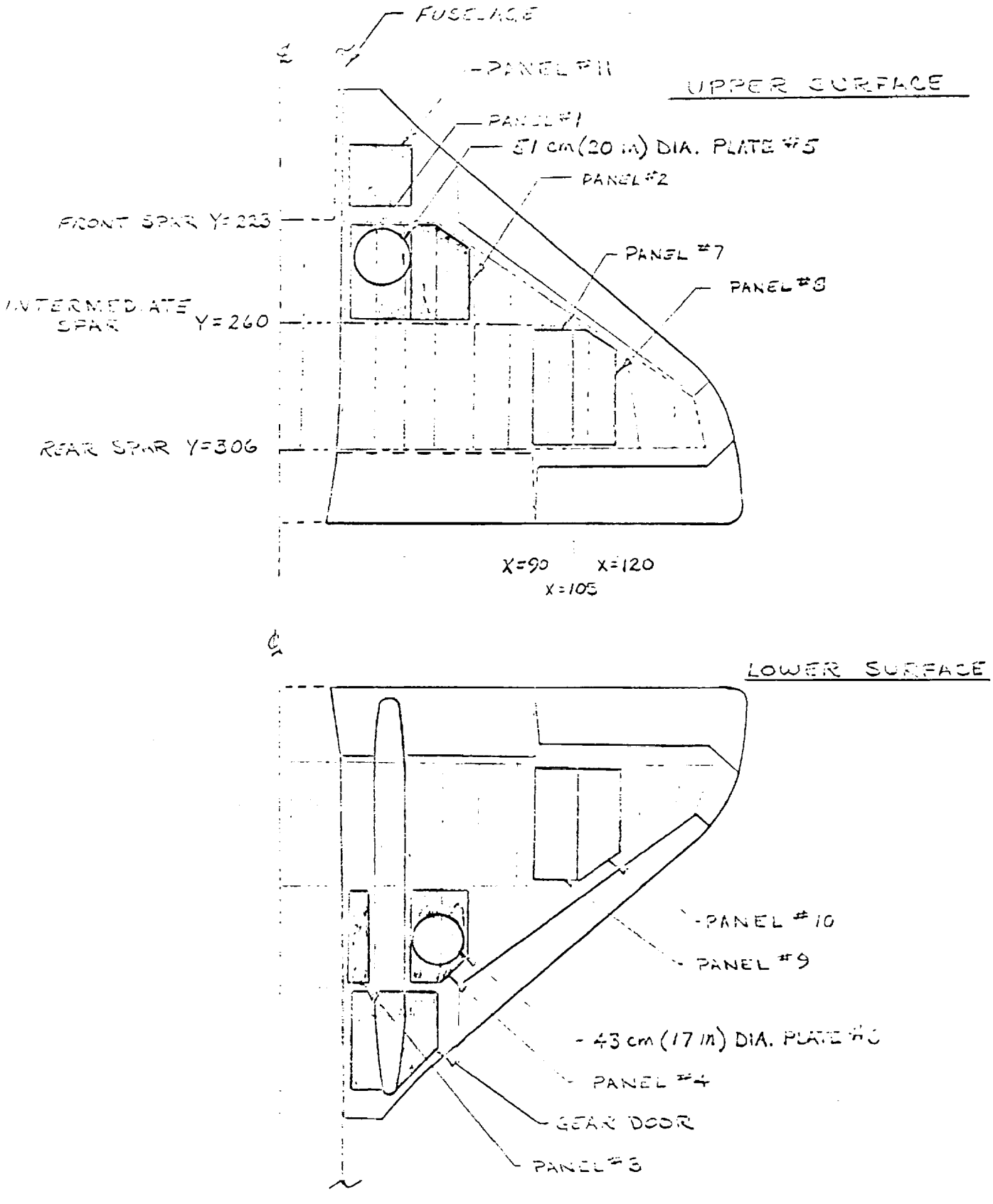


Fig. 16.- HOLE CONFIGURATION #13. ALL INBOARD PANELS & PLATES REMOVED; GEAR DOOR OPEN

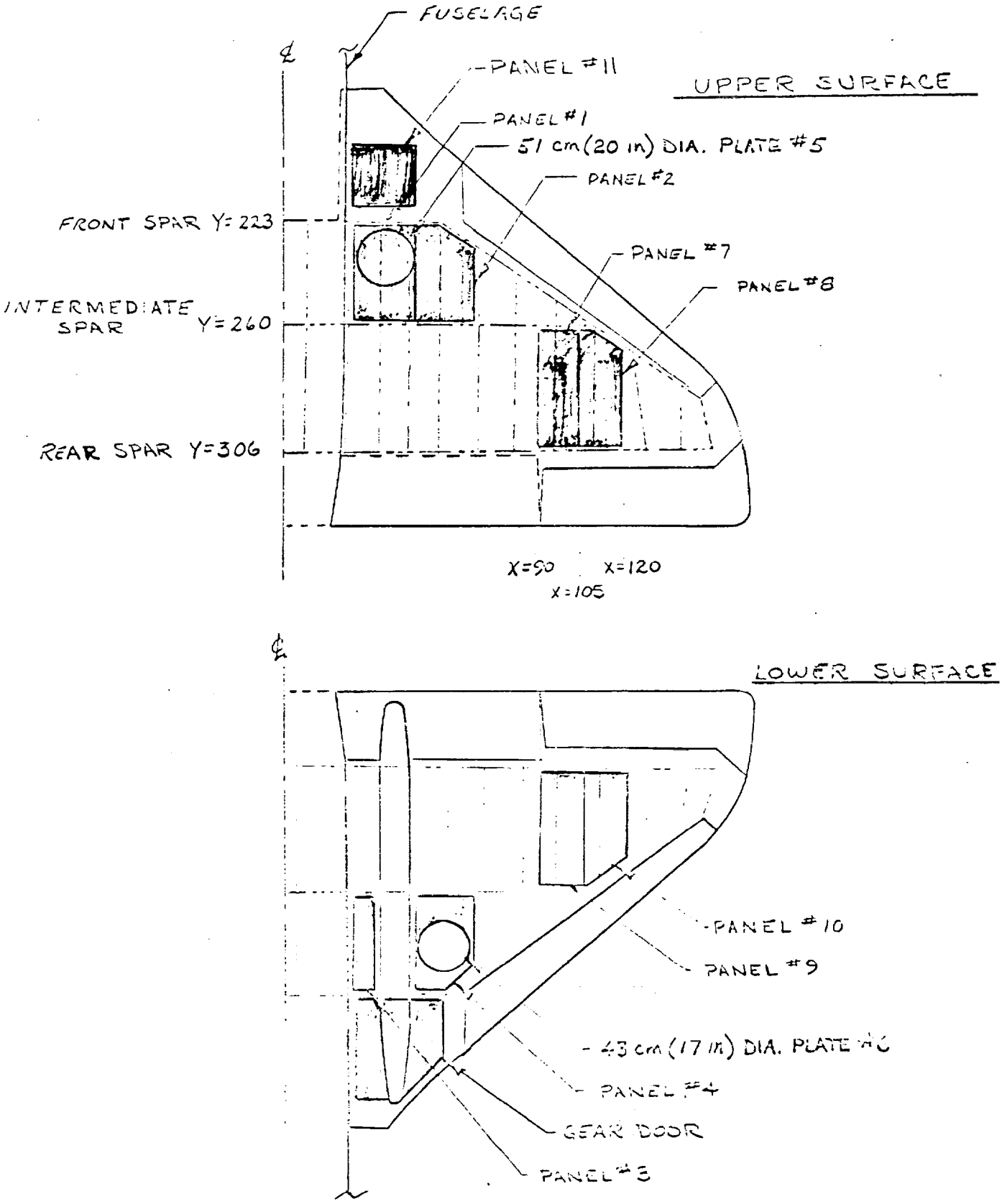


Fig. 17.- HOLE CONFIGURATION #14. ALL PLATES & PANELS REMOVED; GEAR DOOR LOCKED OPEN

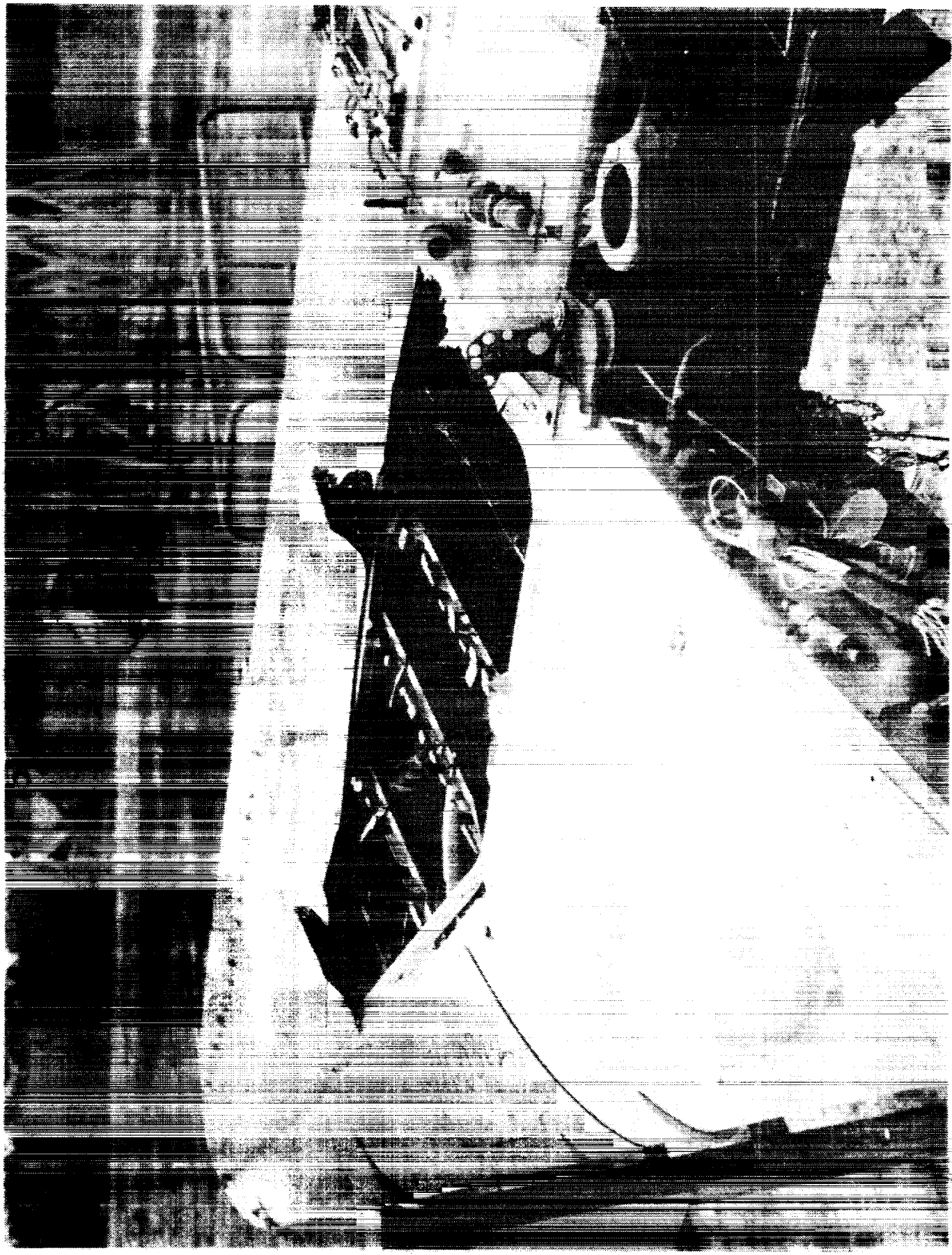


Fig. 18.- TOP SURFACE OF 25mm DAMAGED WING.
LEADING EDGE IS IN LEFT FOREGROUND

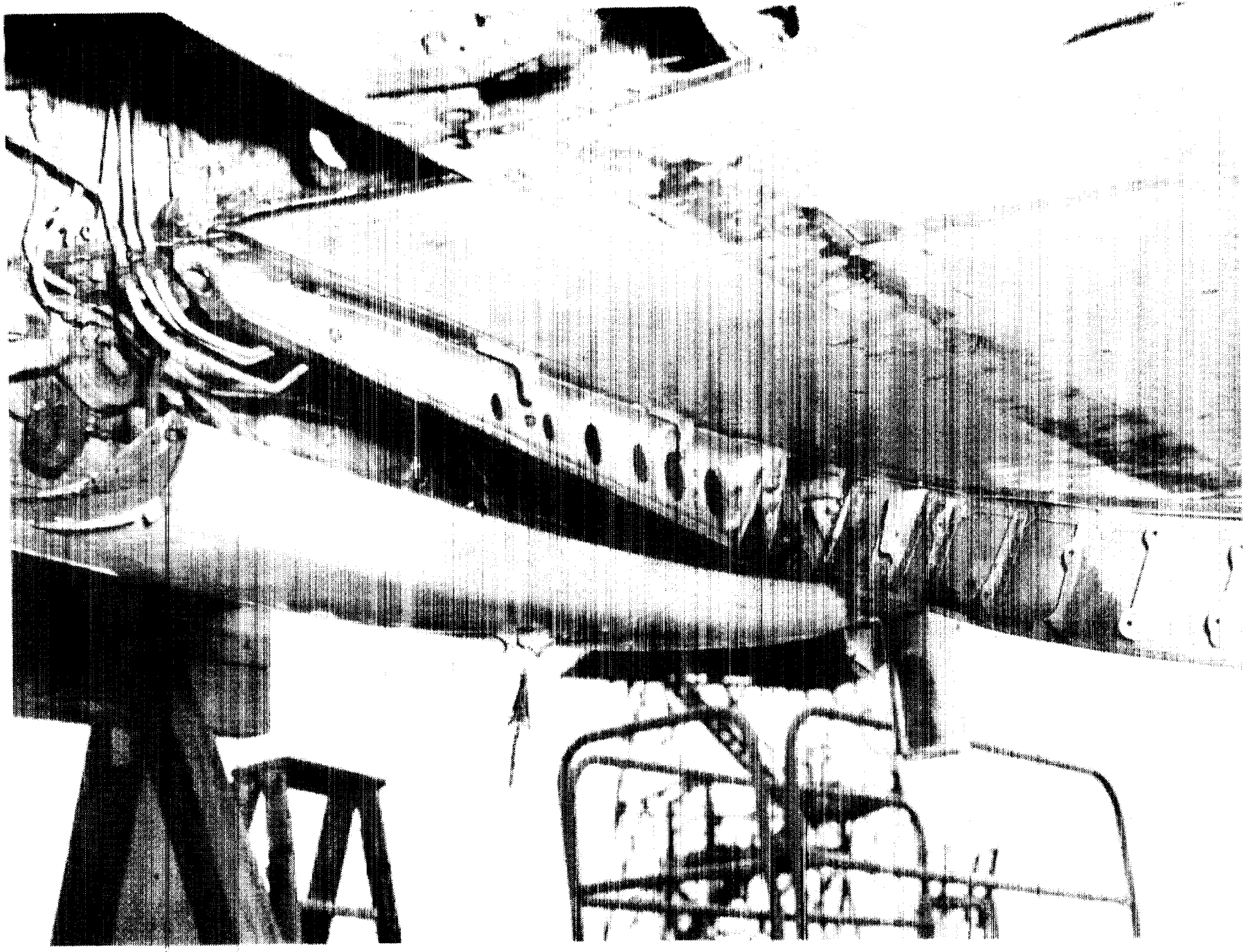


Fig. 19.- BOTTOM SURFACE OF 25mm DAMAGED WING. ARROW POINTS TO SMALL HOLE IN LOOSENED GEAR FAIRING.

Fig. 20.- TOP SURFACE OF 30mm DAMAGED WING.

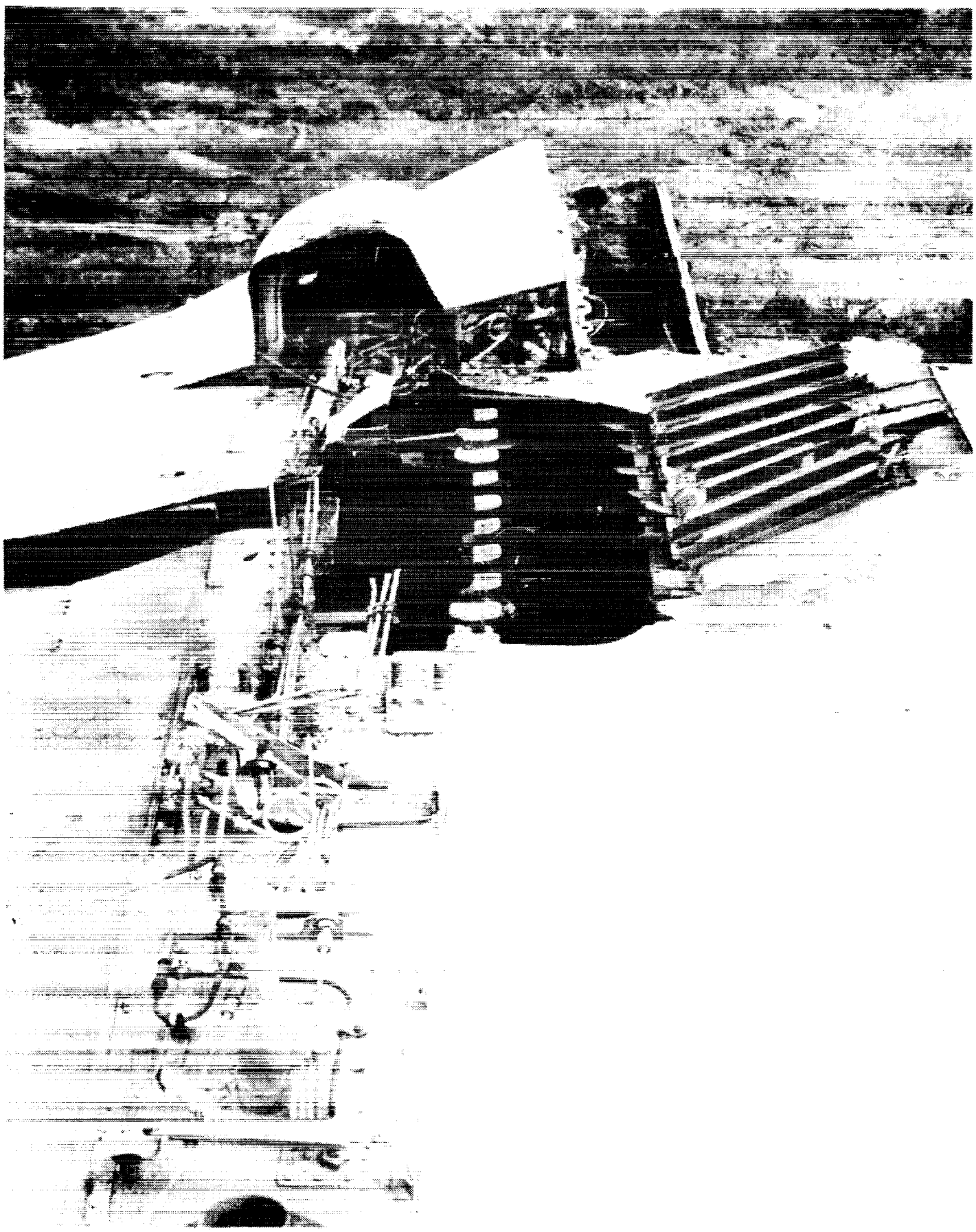


Fig. 21.- BOTTOM SURFACE OF 30mm DAMAGED WING.
LEADING EDGE IS IN LEFT BACKGROUND

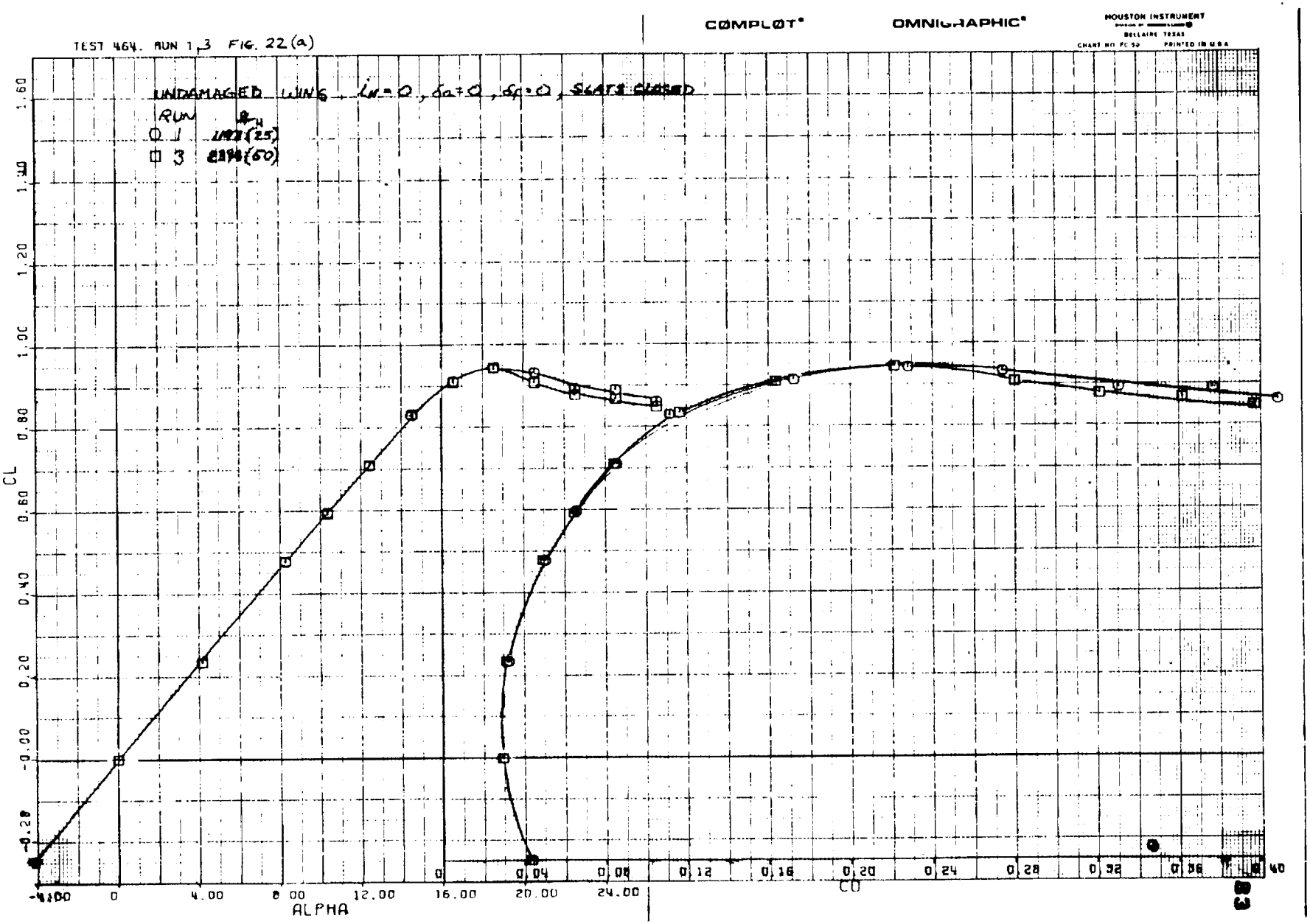

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 1,3 FIG. 22(a)
UNDAMAGED WING, $i_w = 0$, $\delta_a = 0$, $\delta_f = 0$, SLATS CLOSED
RUN
1
3
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 22(a)

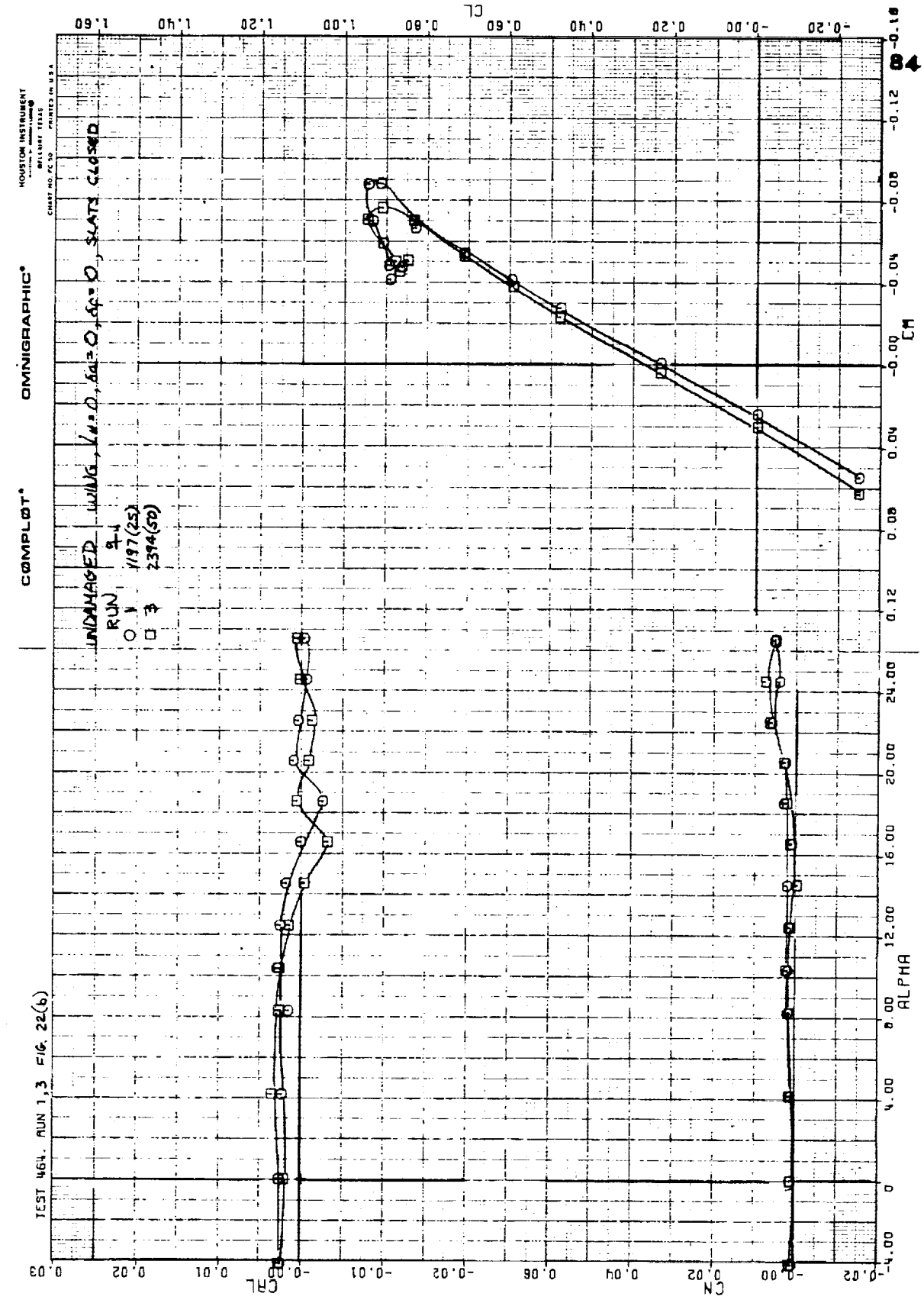

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
UNDAMAGED
RUN 1 1197(25) 2394(50)
3
TEST 464. RUN 1,3 FIG. 22(b)
CL
CM
CN
CAL
ALPHA
84

Figure 22(b)

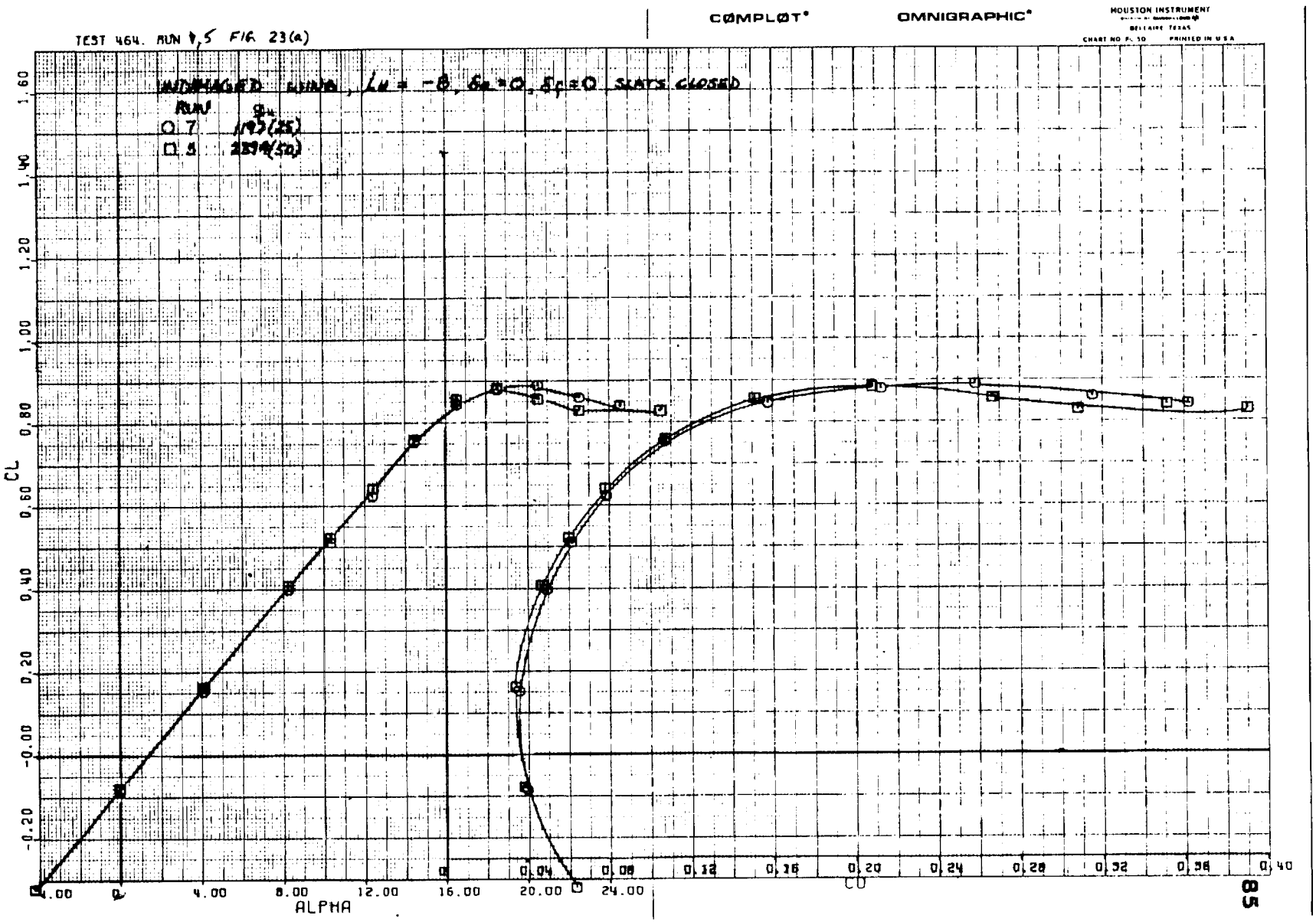

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. P. 10
PRINTED IN U.S.A.
TEST 464. RUN 7,5 FIG. 23(a)
UNBRAGED WINGS, Lw = -8, δw = 0, δf = 0 SLATS CLOSED
RUN
7
5
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 23(a)

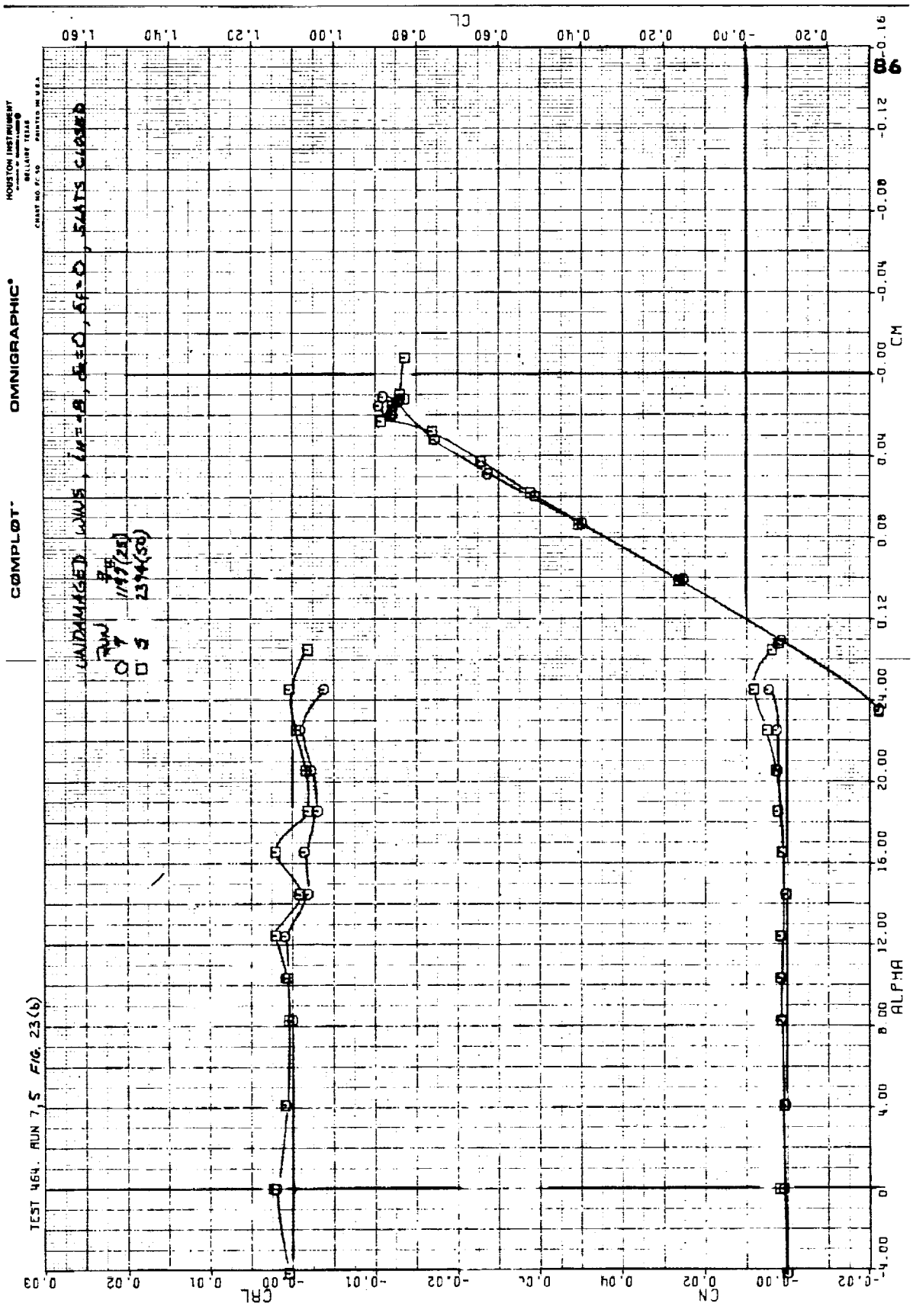

COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
86
CL
CM
ALPHA
CN
CRL
TEST 464. RUN 7,5 FIG. 23(b)

Figure 23(b)

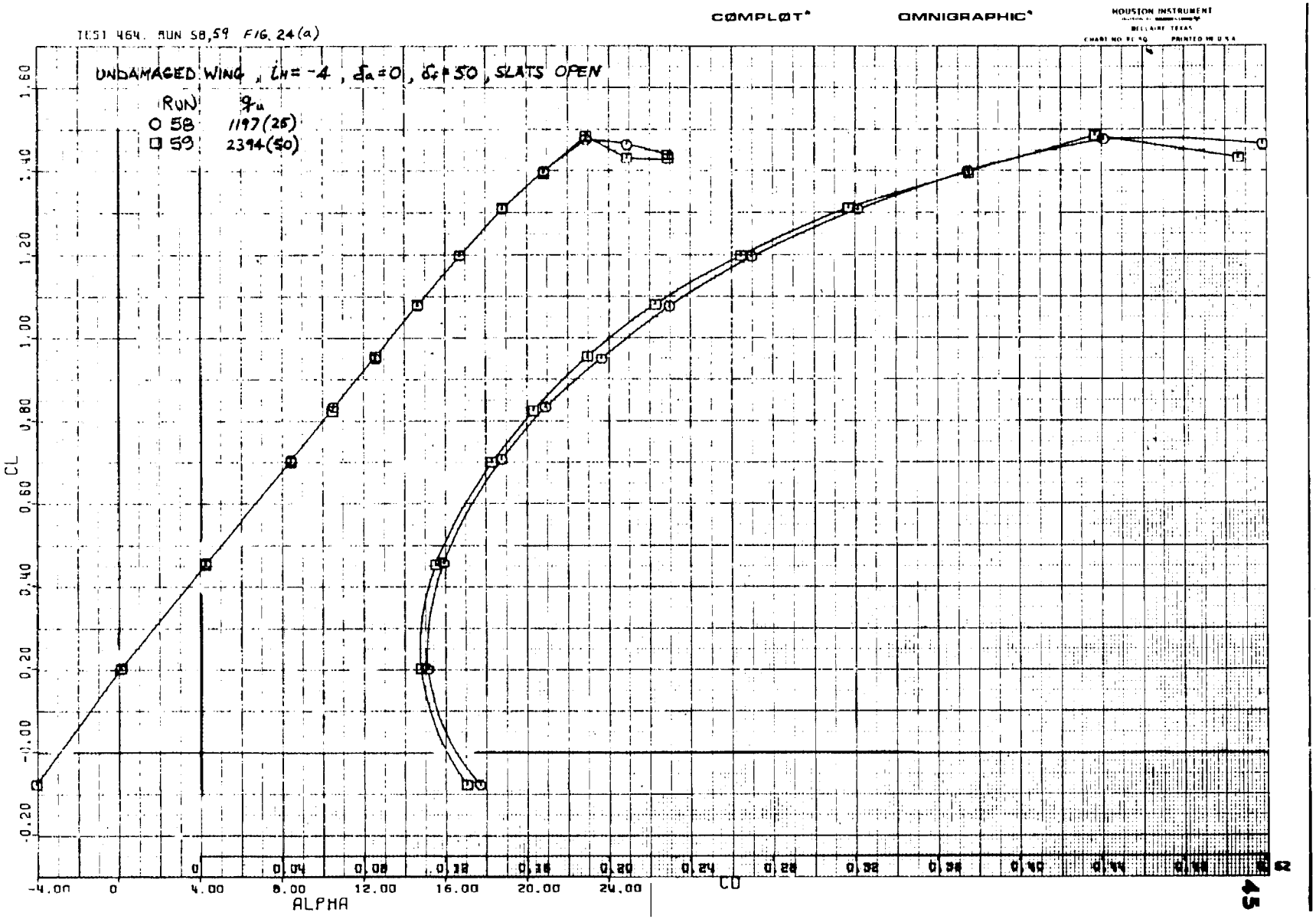

TEST 464. RUN 58,59 FIG. 24(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
UNDAMAGED WING, $i_H = -4$, $\delta_a = 0$, $\delta_f = 50$, SLATS OPEN
RUN q_u
O 58 1197(25)
□ 59 2394(50)
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
0.44
0.48
0.52

Figure 24(a)

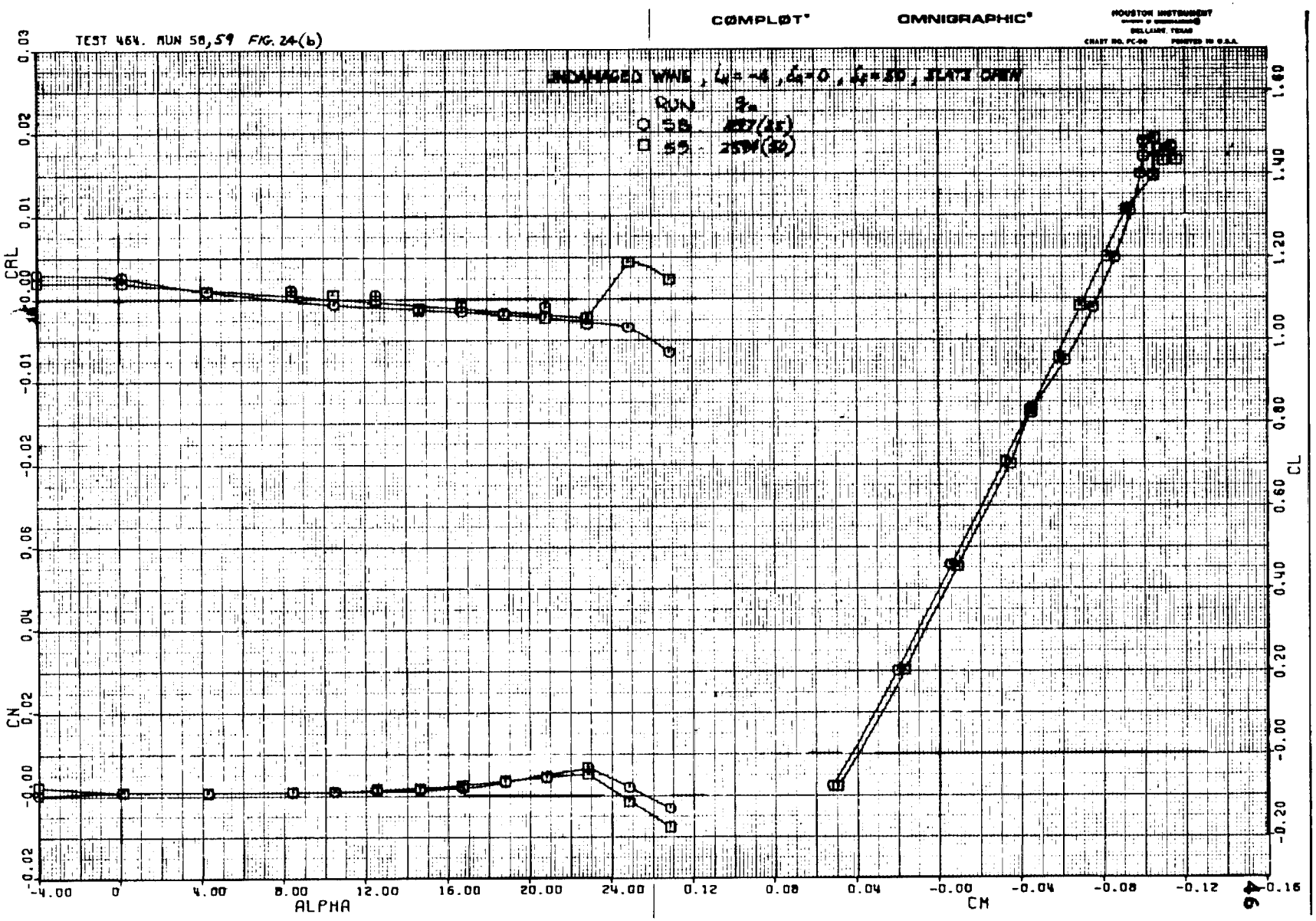

COMPLOT®
OMNIGRAPHIC®
TEST 464. RUN 58,59 FIG. 24(b)
UNDAMAGED WING , i_w = -4 , δ_a = 0 , δ_f = 30 , SLATS OPEN
RUN
58
55
CRL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16
0.03
0.02
0.01
0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20

Figure 24(b)

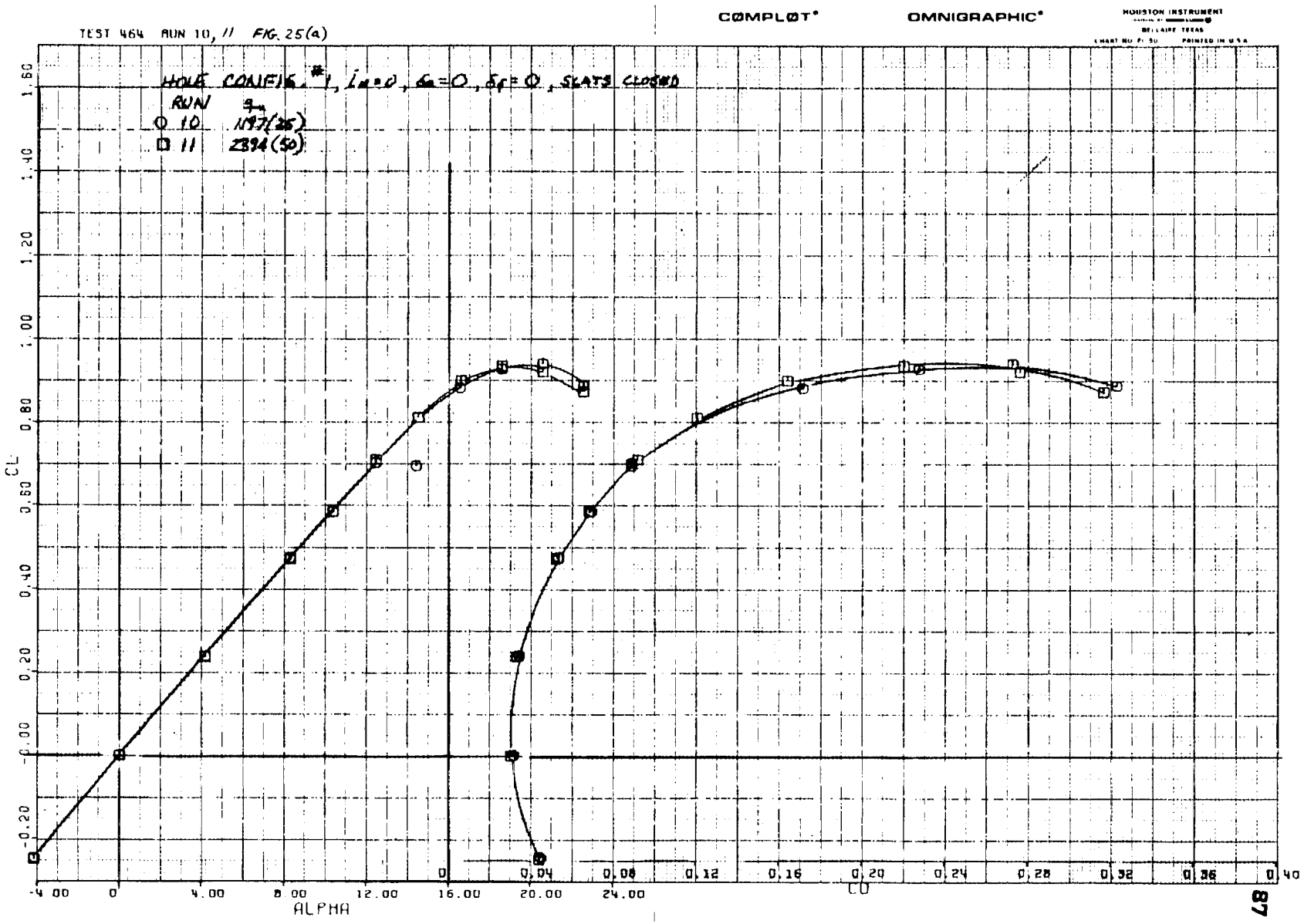

TEST 464 RUN 10, 11 FIG. 25(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
HOLE CONFIG. #1, $i_w = 0$, $\delta_a = 0$, $\delta_f = 0$, SLATS CLOSED
RUN q_∞
10 197(25)
11 2394(50)
CL
ALPHA
CD
87

Figure 25(a)

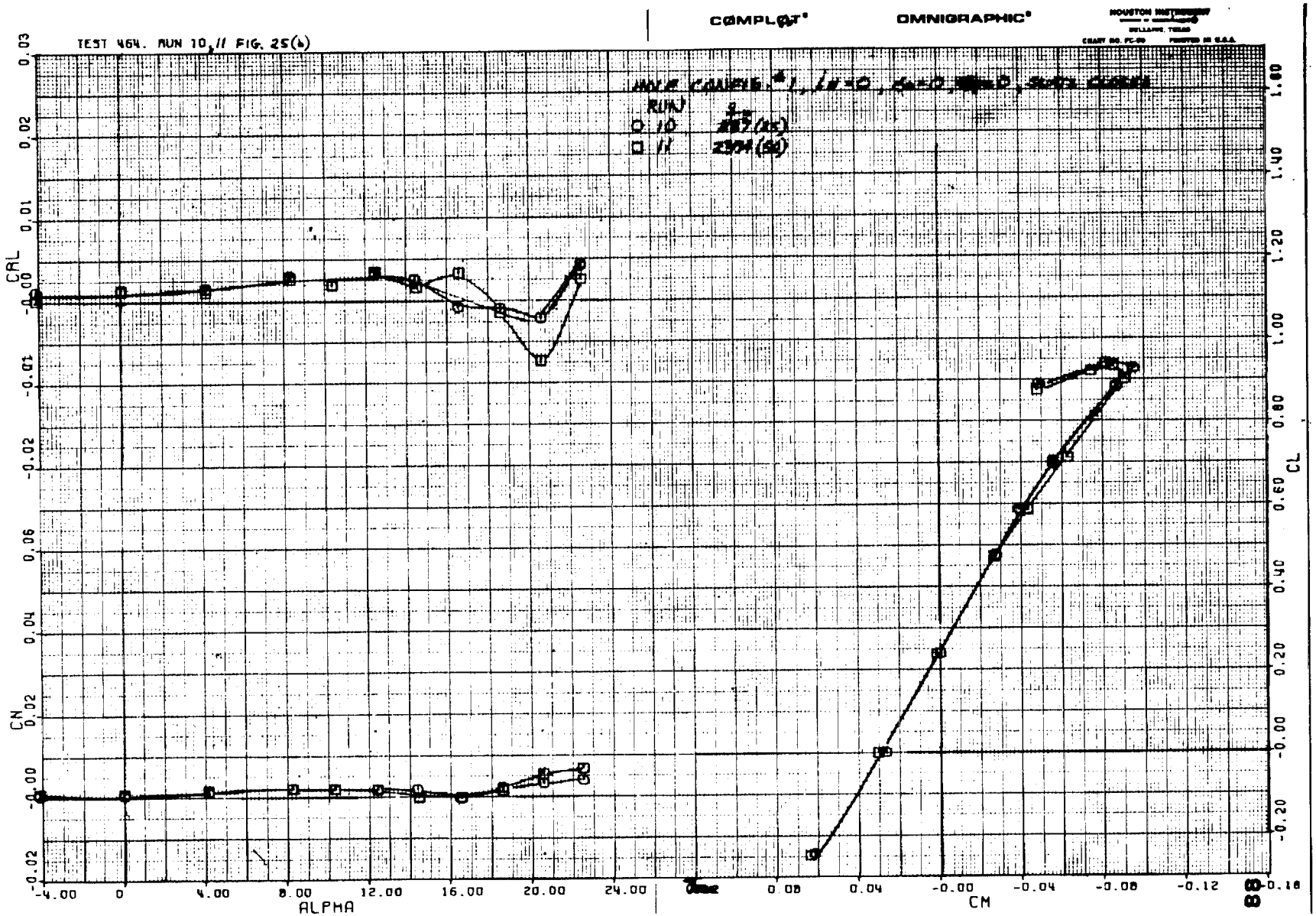

COMPLOT®
OMNIGRAPHIC®
TEST 464. RUN 10, 11 FIG. 25(b)
RUN
10
11
CRL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 25(b)

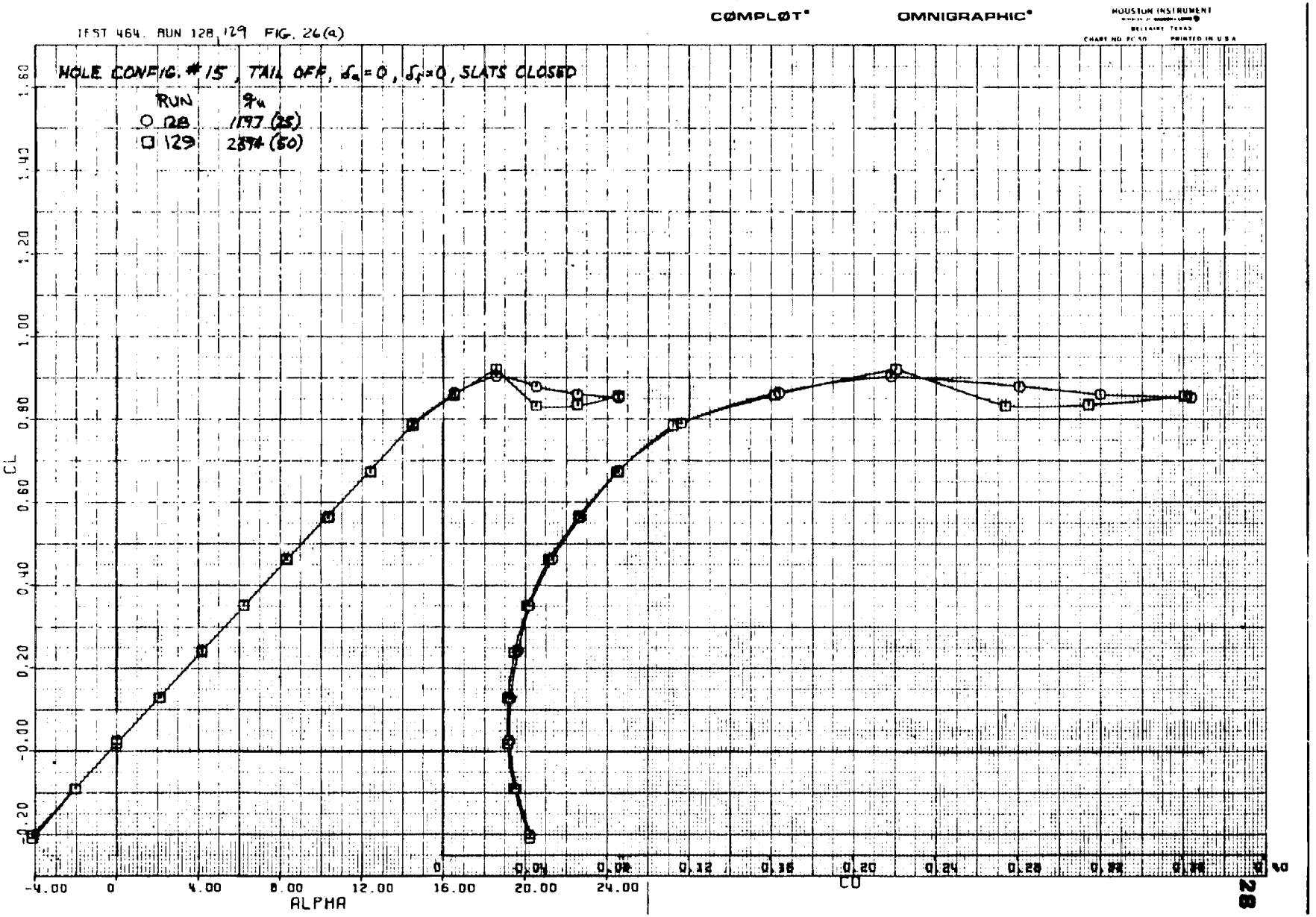

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 128, 129 FIG. 26(a)
HOLE CONFIG. #15, TAIL OFF, $\delta_a = 0$, $\delta_f = 0$, SLATS CLOSED
RUN q_∞
O 128 1197 (25)
□ 129 2394 (50)
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
ALPHA
0
0.04
0.08
0.12
0.16
0.20
0.24
0.28
CD

Figure 26(a)

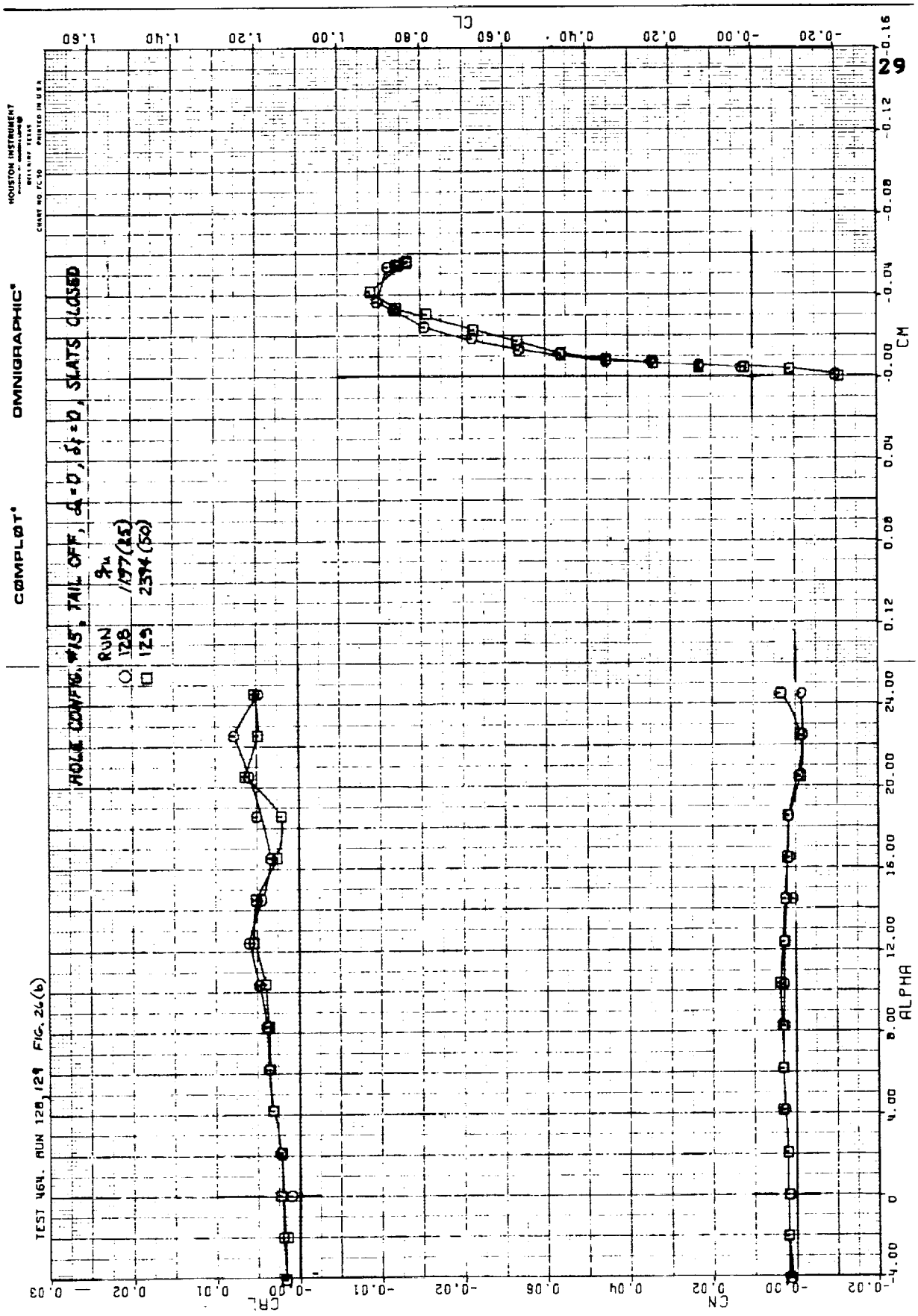

COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
29
CL
CM
CN
CRL
ALPHA
ROLL CONFIG, #15, TAIL OFF, δe = 0, δf = 0, SLATS CLOSED
RUN
128
129
1197(25)
2394(50)
TEST 464, RUN 128, 129 FIG. 26(b)

Figure 26(b)

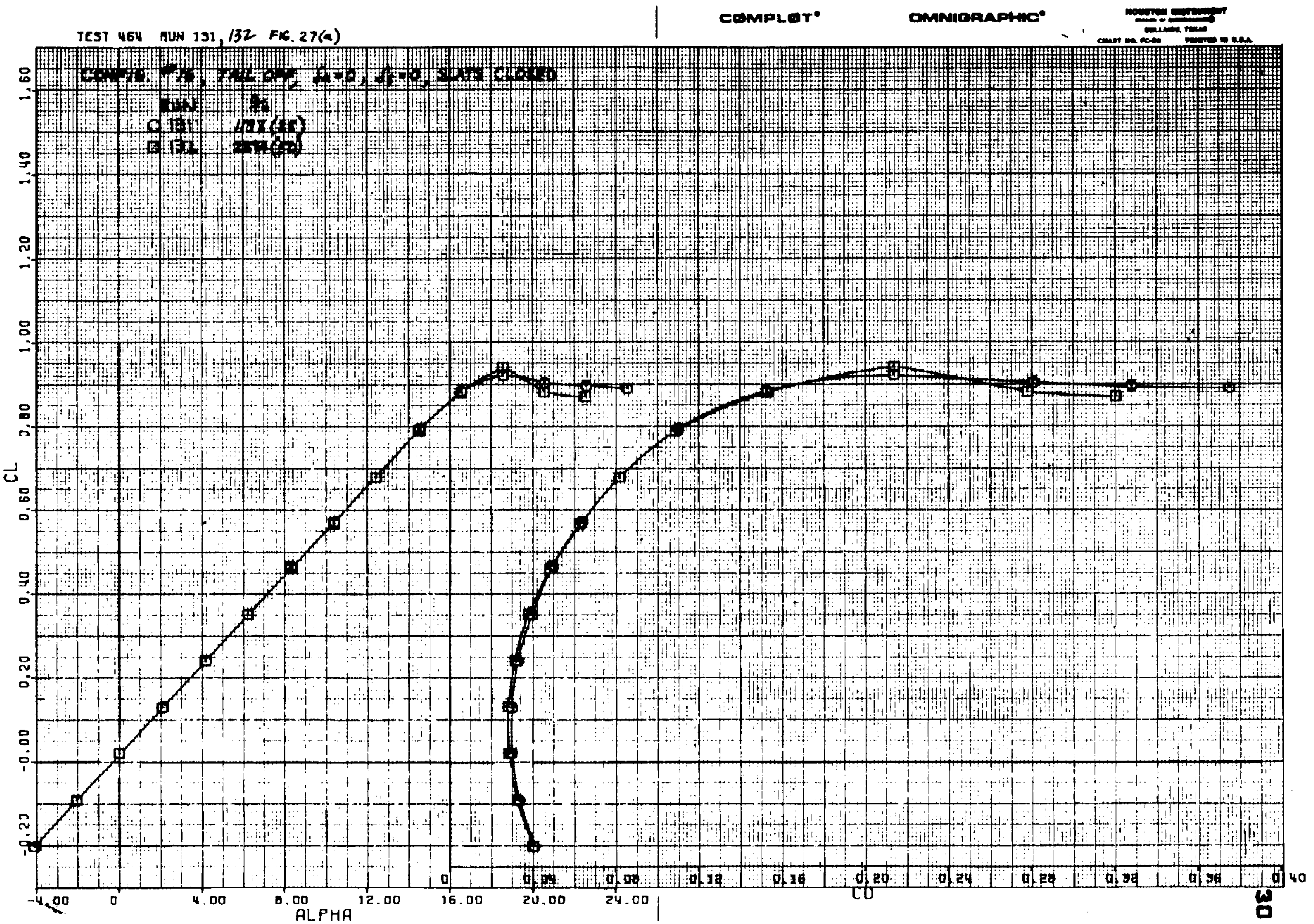

TEST 464 RUN 131, 132 FIG. 27(a)
COMPLOT
OMNIGRAPHIC
SLATS CLOSED
RUN
131
132
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
CD
0
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 27(a)

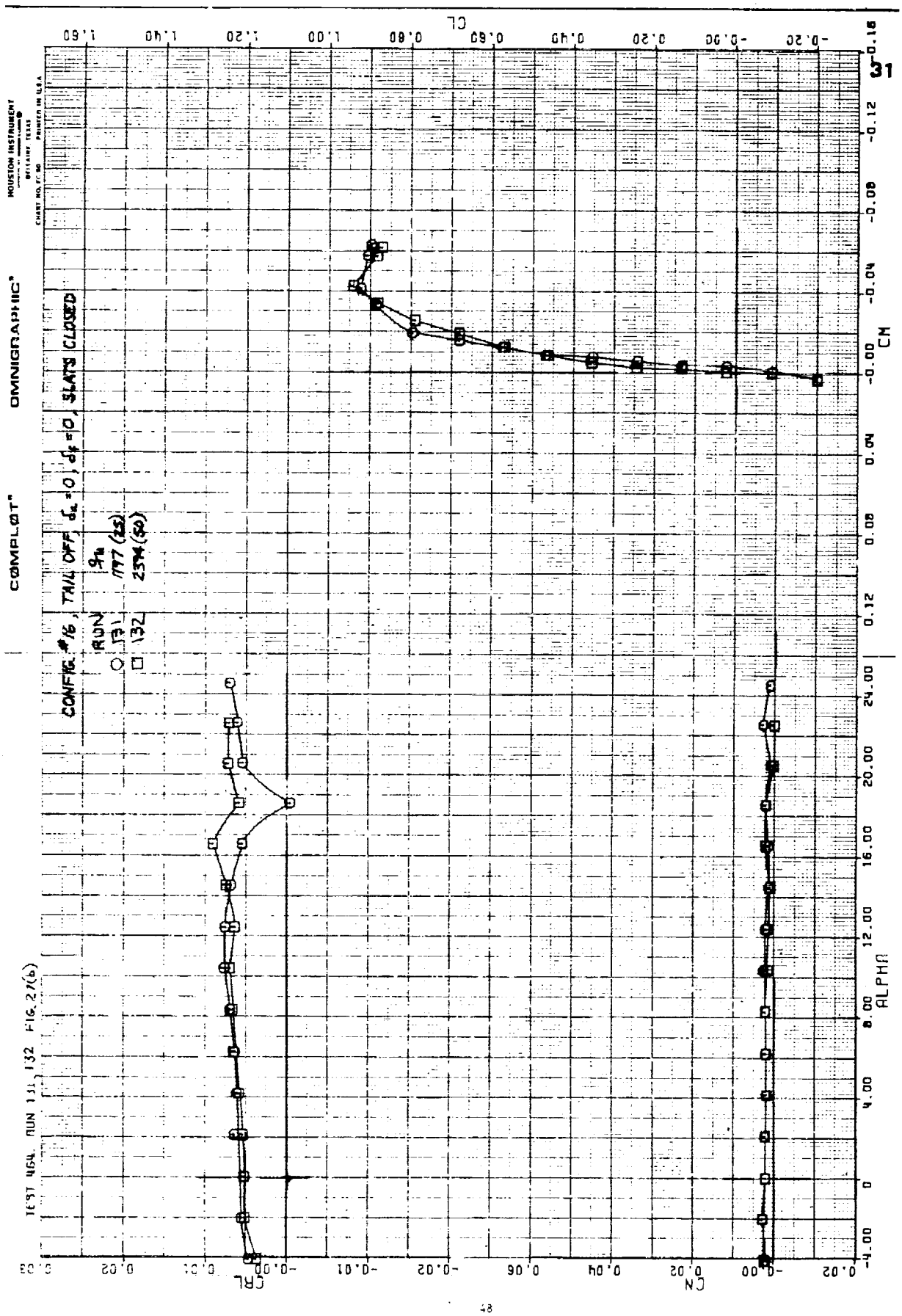

COMPLOT"
OMNIGRAPHIC"
HOUSTON INSTRUMENT
CONFIG. #16, TAIL OFF, d_{HL} = 0, d_F = 0, SLATS CLOSED
RUN 131 q_∞ 1777 (25)
132 2374 (50)
TEST 464 RUN 131, 132 FIG. 27(b)
CL
CM
CN
CRL
ALPHA
31

Figure 27(b)

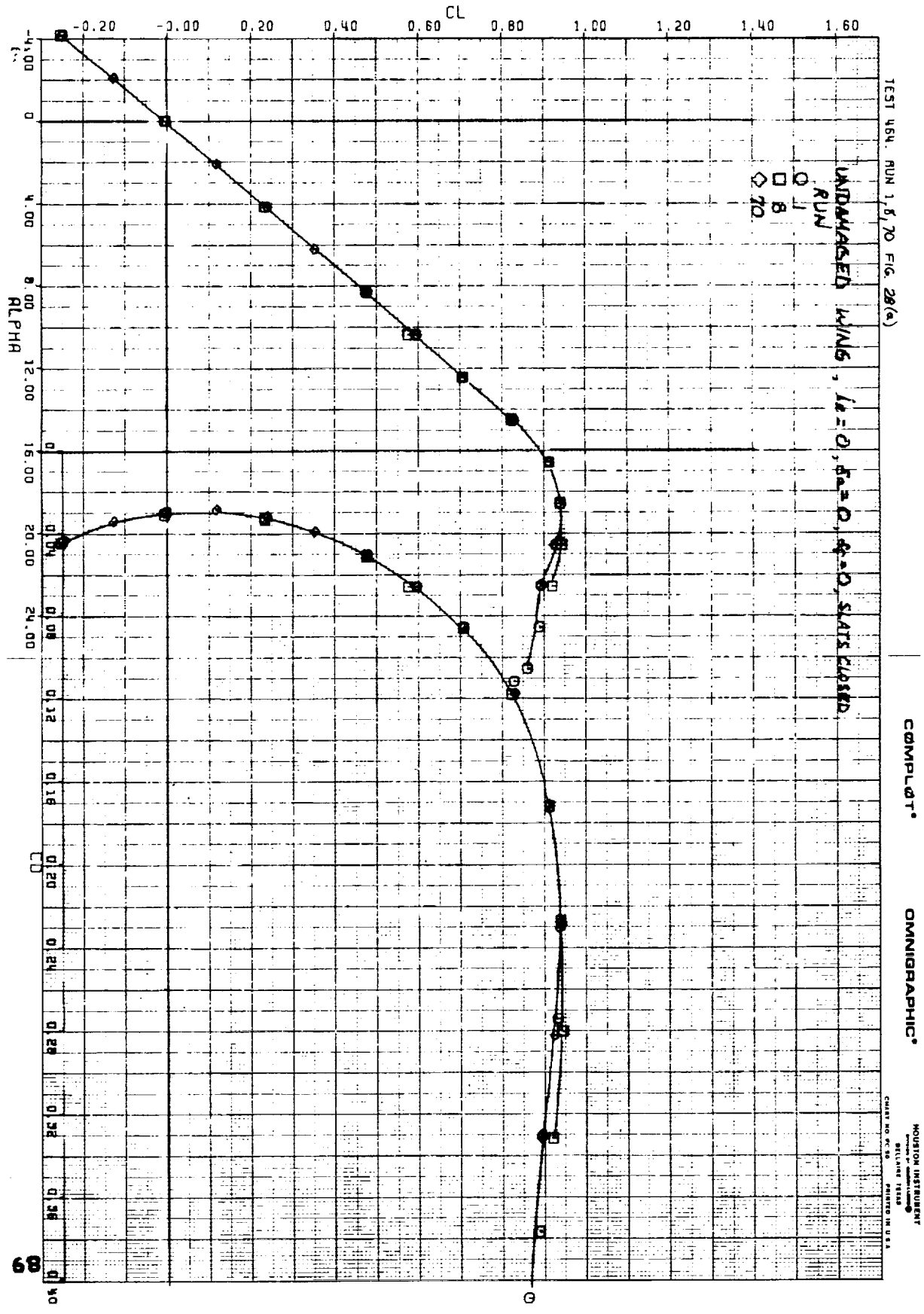

CL
-0.20
-0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
CD
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
TEST 464, RUN 1,5,70 FIG. 28(a)
UNDAMAGED WING, δe=0, δa=0, δr=0, SLATS CLOSED
RUN
1
8
70
COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
BELLAIRE TEXAS
PRINTED IN U.S.A.

Figure 28(a)

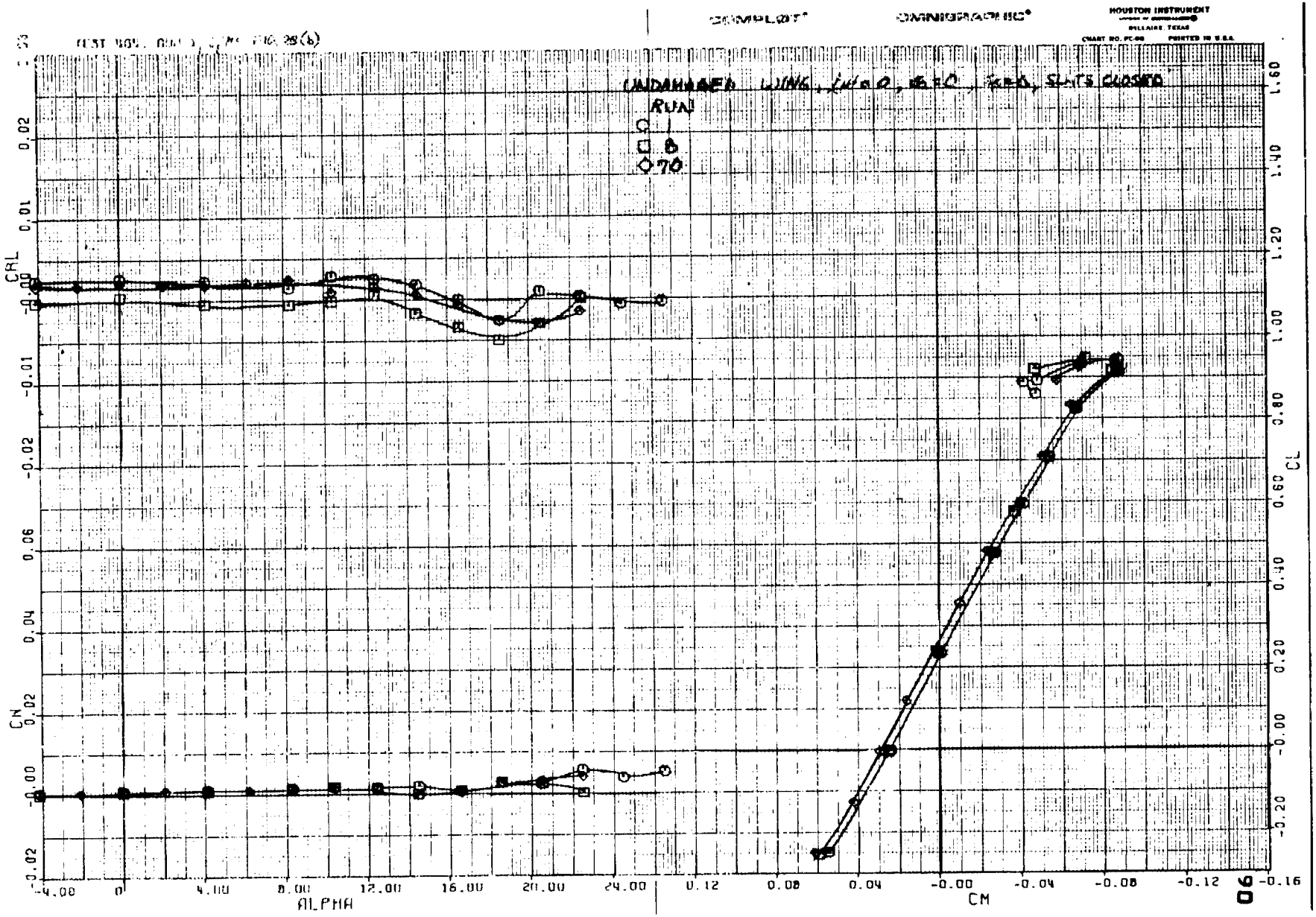

UNDAMAGED WING, i_w=0, δ_{LE}=0, δ_{TE}=0, SLATS CLOSED
RUN
6
70
CRL
CN
CL
CM
ALPHA
0.02
0.01
0.00
-0.01
-0.02
0.06
0.04
0.02
0.00
-0.02
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20

Figure 28(b)

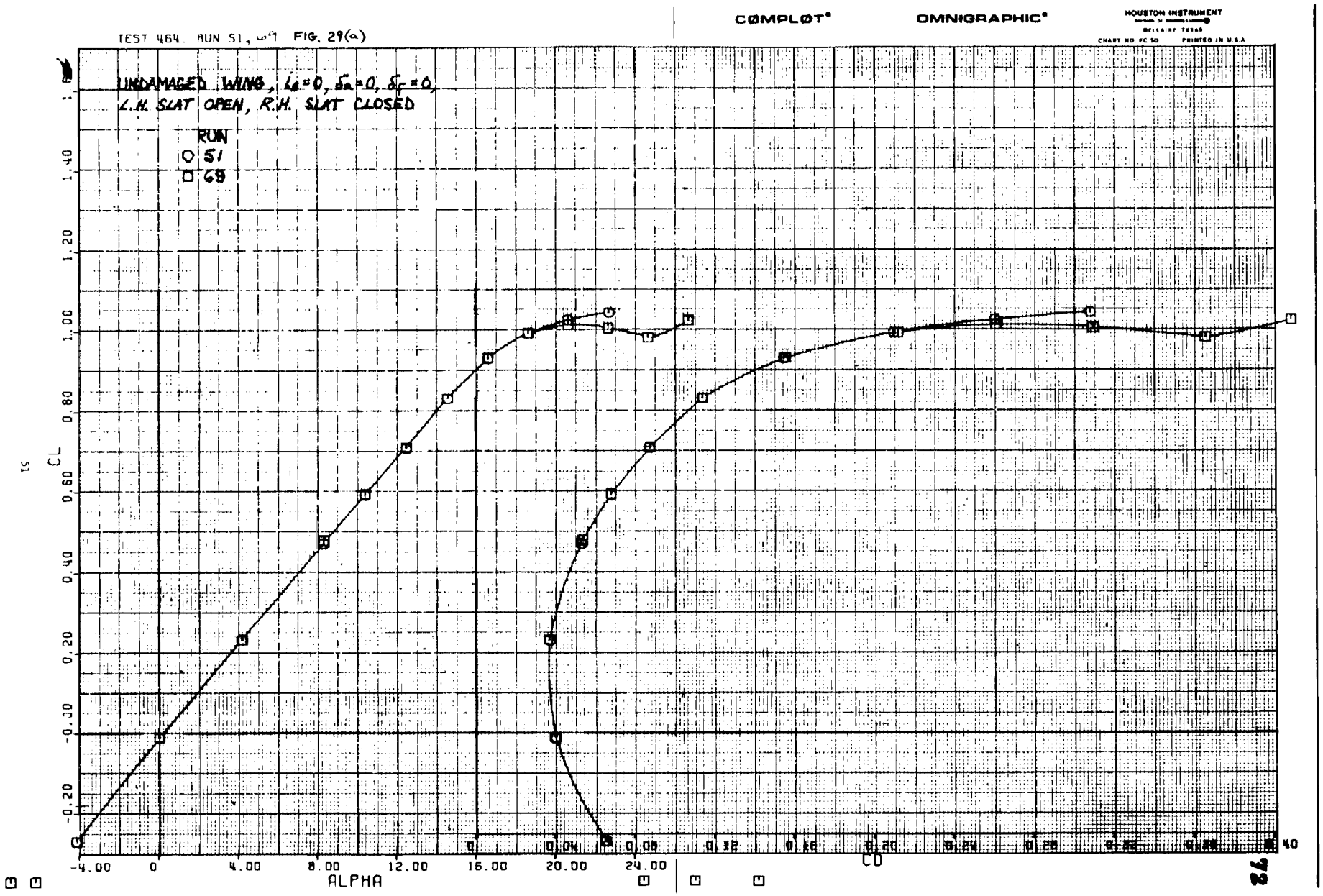

TEST 464. RUN 51, 69 FIG. 29(a)
UNDAMAGED WING, $i_w = 0$, $\delta_a = 0$, $\delta_f = 0$,
L.H. SLAT OPEN, R.H. SLAT CLOSED
RUN
51
69
CL
ALPHA
CD
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
-0.20
-0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT

Figure 29(a)

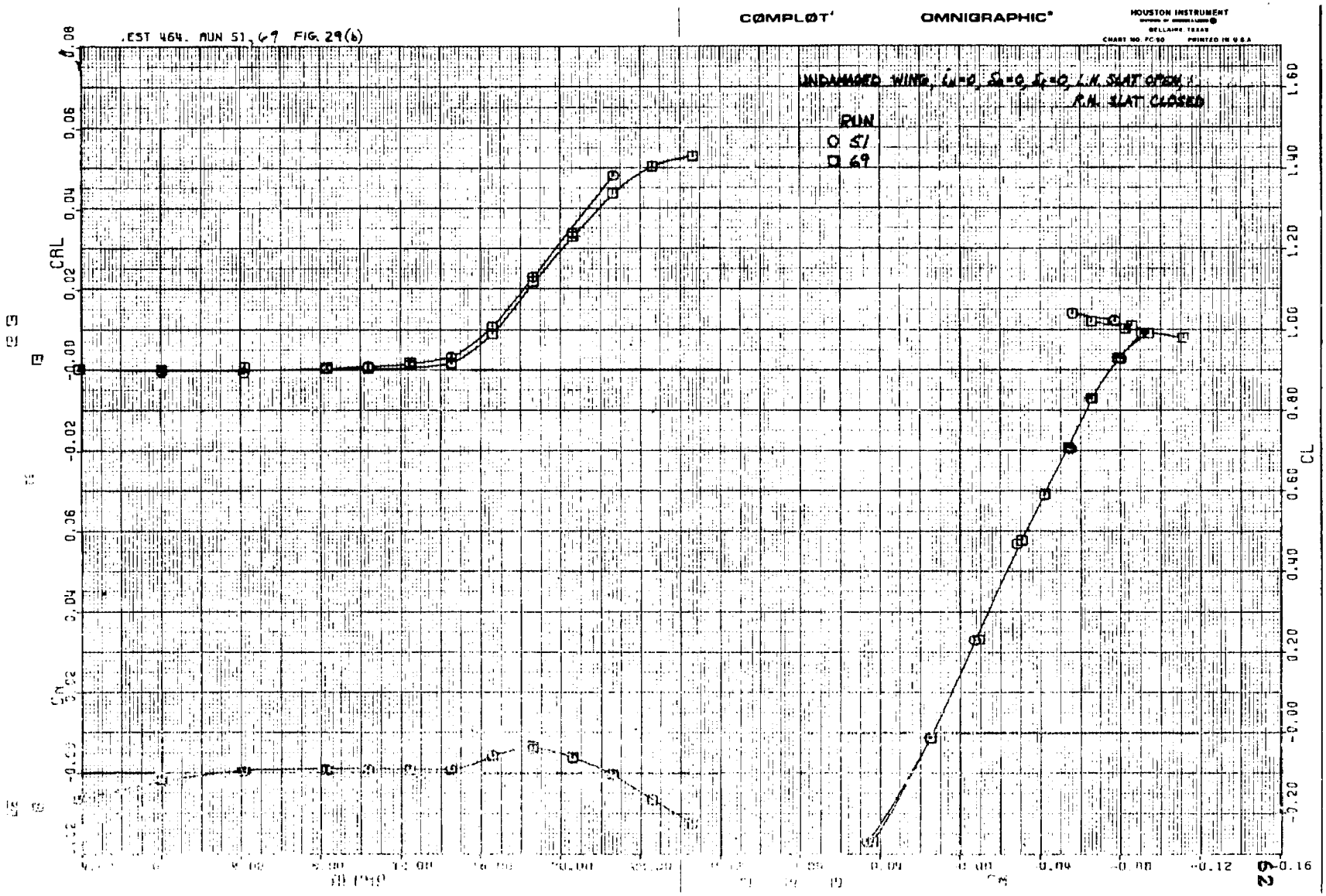

CØMPLØT'
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 51, 69 FIG. 29(b)
UNDAMAGED WING, i_w=0, δ_a=0, δ_f=0, L.H. SLAT OPEN, R.H. SLAT CLOSED
RUN
51
69
CRL
CL
CD
CM
0.08
0.06
0.04
0.02
-0.00
-0.02
0.06
0.04
-0.00
-0.04
-0.08
-0.12
-0.16
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20

Figure 29(b)

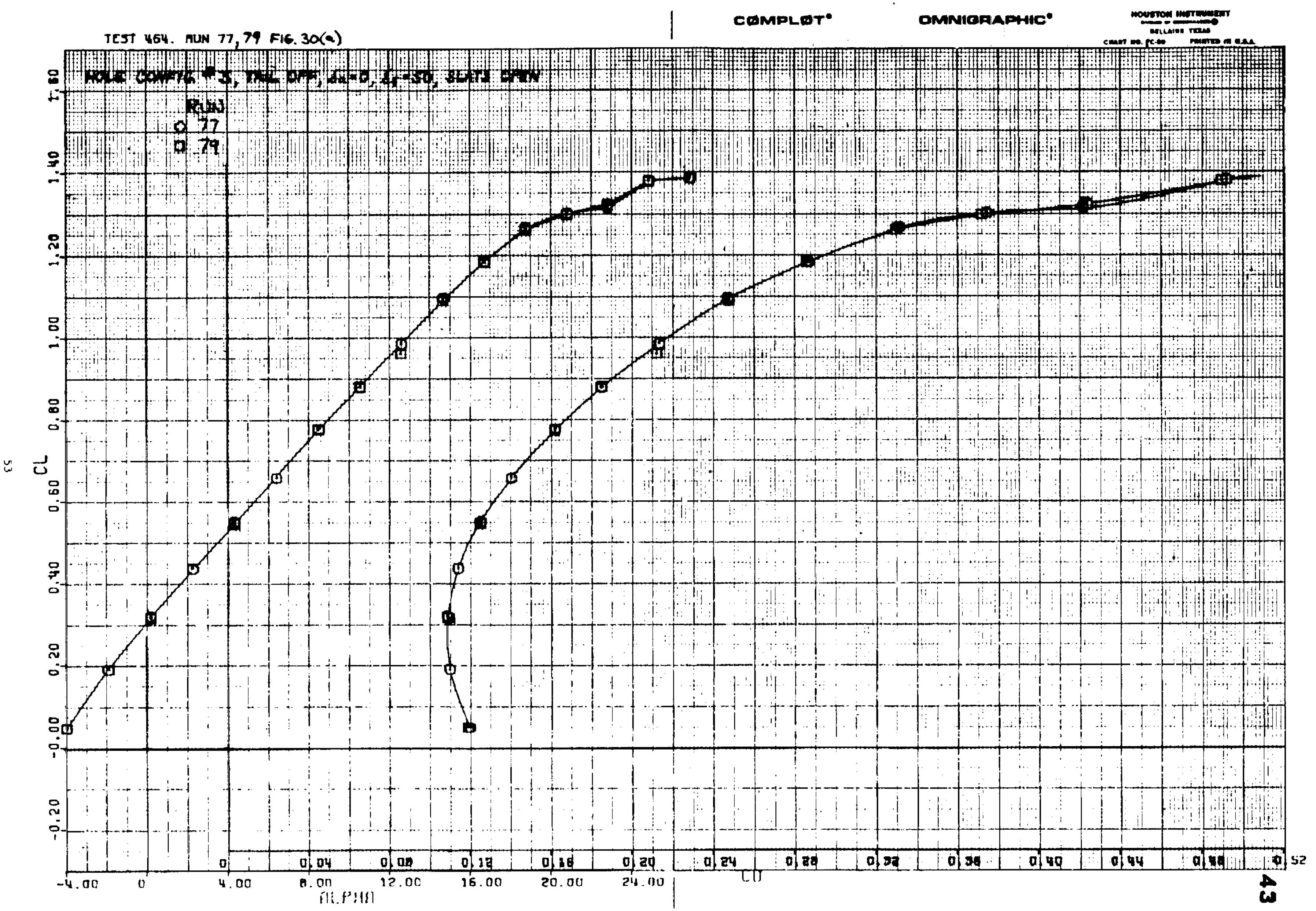

TEST 464. RUN 77, 79 FIG. 30(a)
Run
77
79
CL
ALPHA
CD
COMPLOT
OMNIGRAPHIC
43

Figure 30(a)

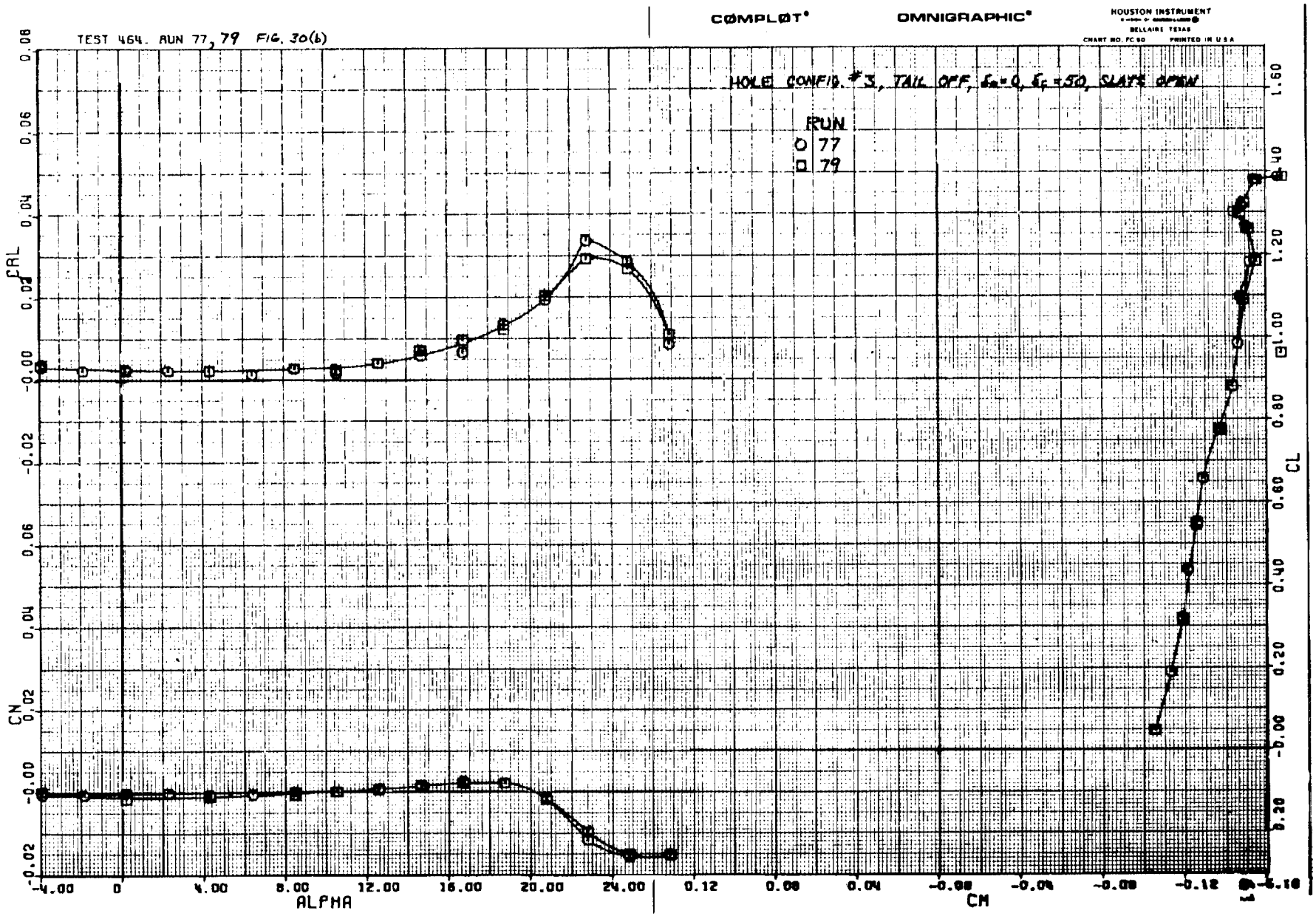

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. FC 50
PRINTED IN U.S.A.
TEST 464. RUN 77, 79 FIG. 30(b)
HOLE CONFIG. #3, TAIL OFF, δe = 0, δf = 50, SLATS OPEN
RUN
77
79
CAL
CN
CL
CM
ALPHA
0.08
0.06
0.04
0.02
-0.00
-0.02
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
0.12
0.08
0.04
-0.08
-0.12
-0.16

Figure 30(b)

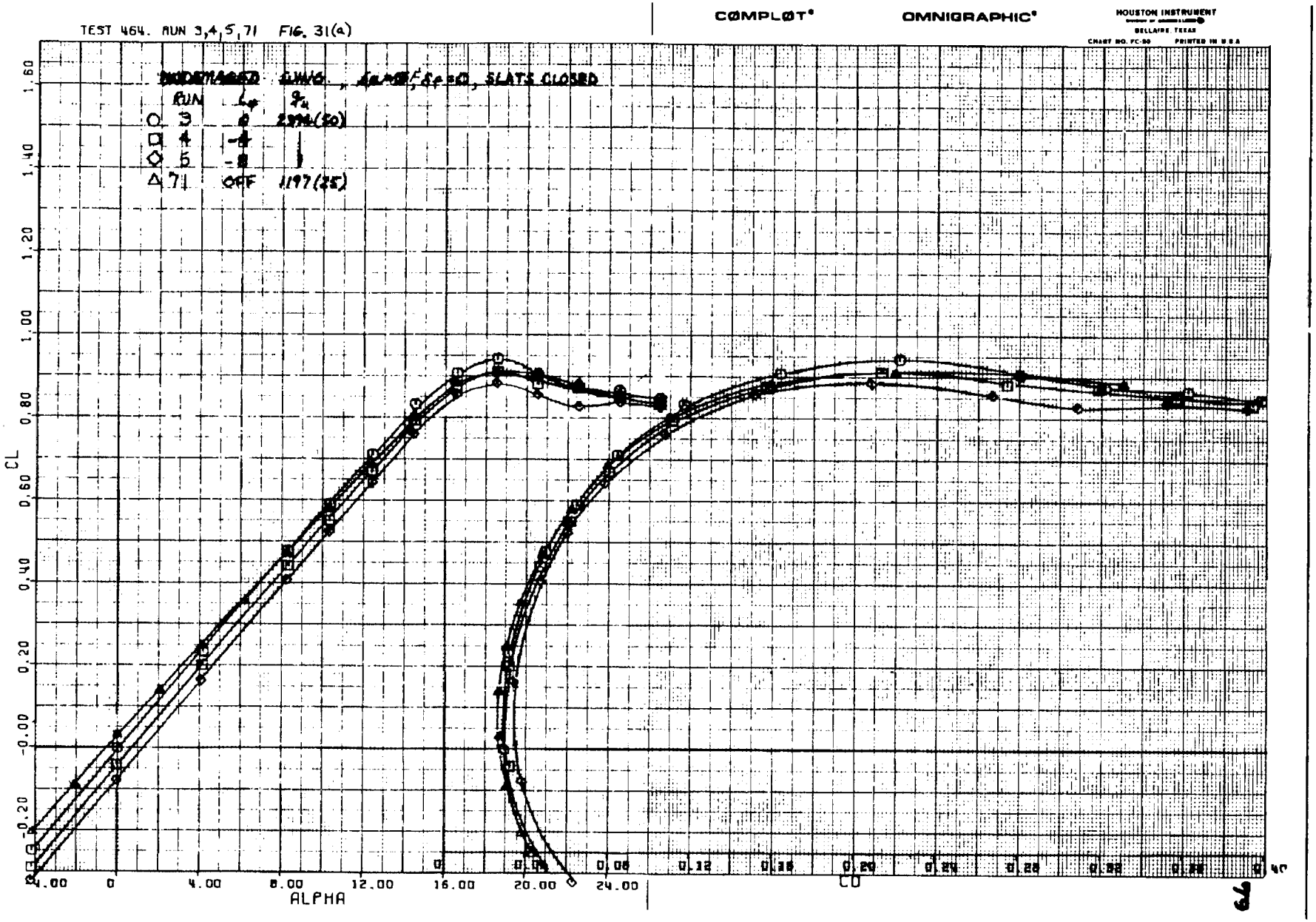

TEST 464. RUN 3,4,5,71 FIG. 31(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE, TEXAS
CHART NO. FC-80
PRINTED IN U.S.A.
UNSWEPT WING, δf=0°, SLATS CLOSED
RUN
3
4
5
71 OFF 1197(25)
CL
ALPHA
CD

Figure 31(a)

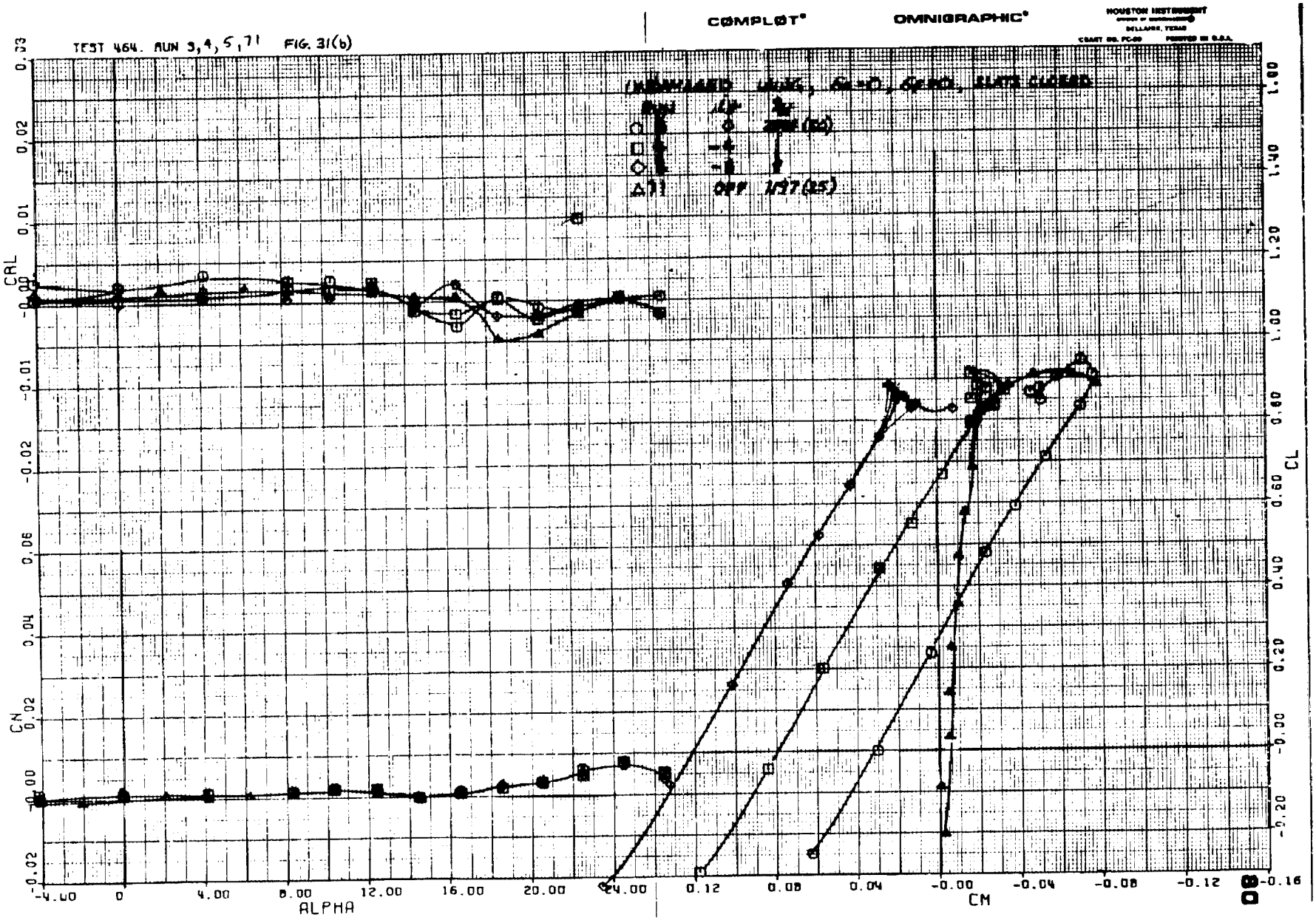

COMPLOT®
OMNIGRAPHIC®
TEST 464. RUN 3,4,5,71 FIG. 31(b)
CAL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 31(b)

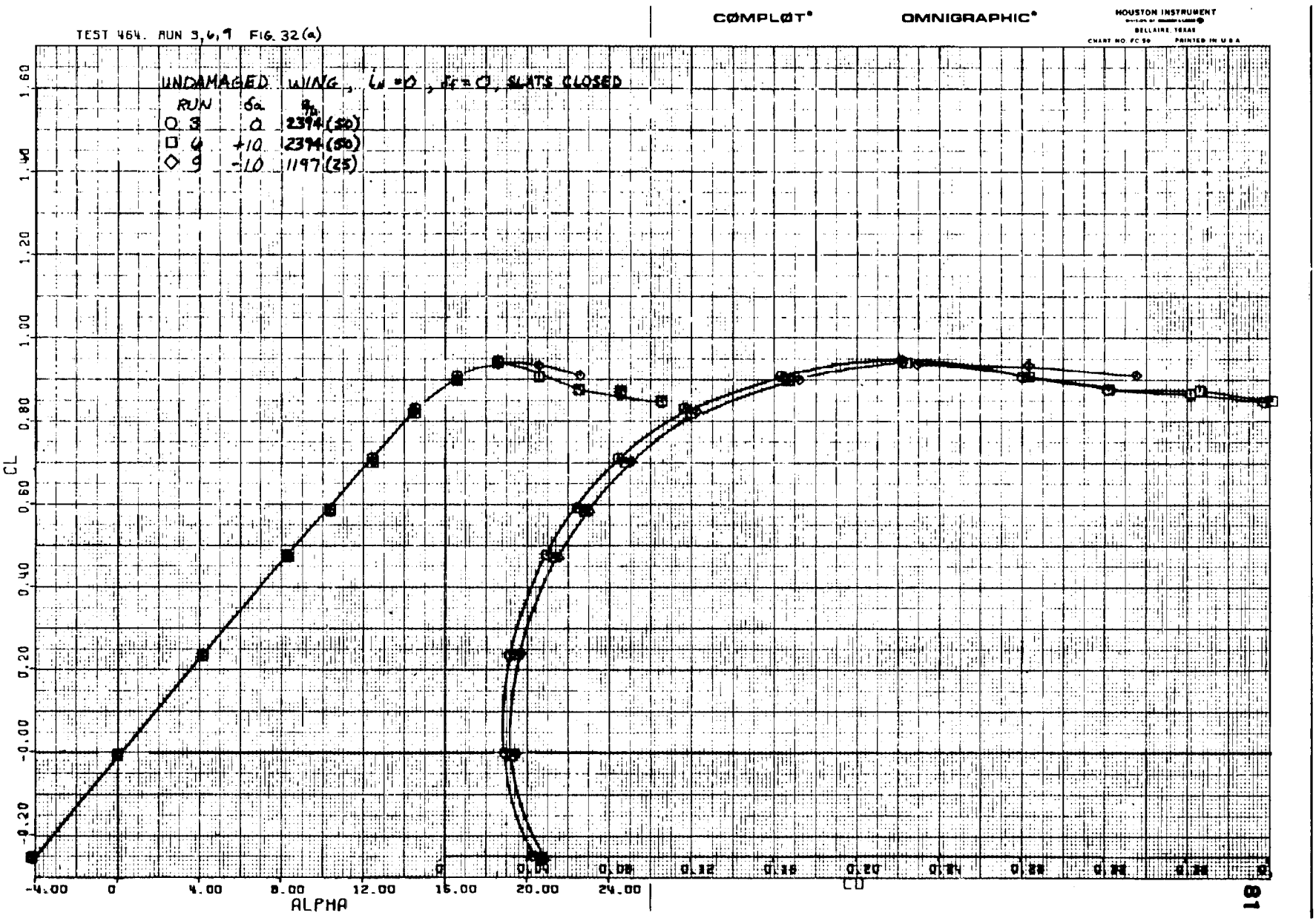

TEST 464. RUN 3,4,9 FIG. 32(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
UNDAMAGED WING, i_w = 0, δ_f = 0, SLATS CLOSED
RUN δ_a q_∞
3 0 2394 (50)
4 +10 2394 (50)
9 -10 1197 (25)
CL
ALPHA
CD

Figure 32(a)

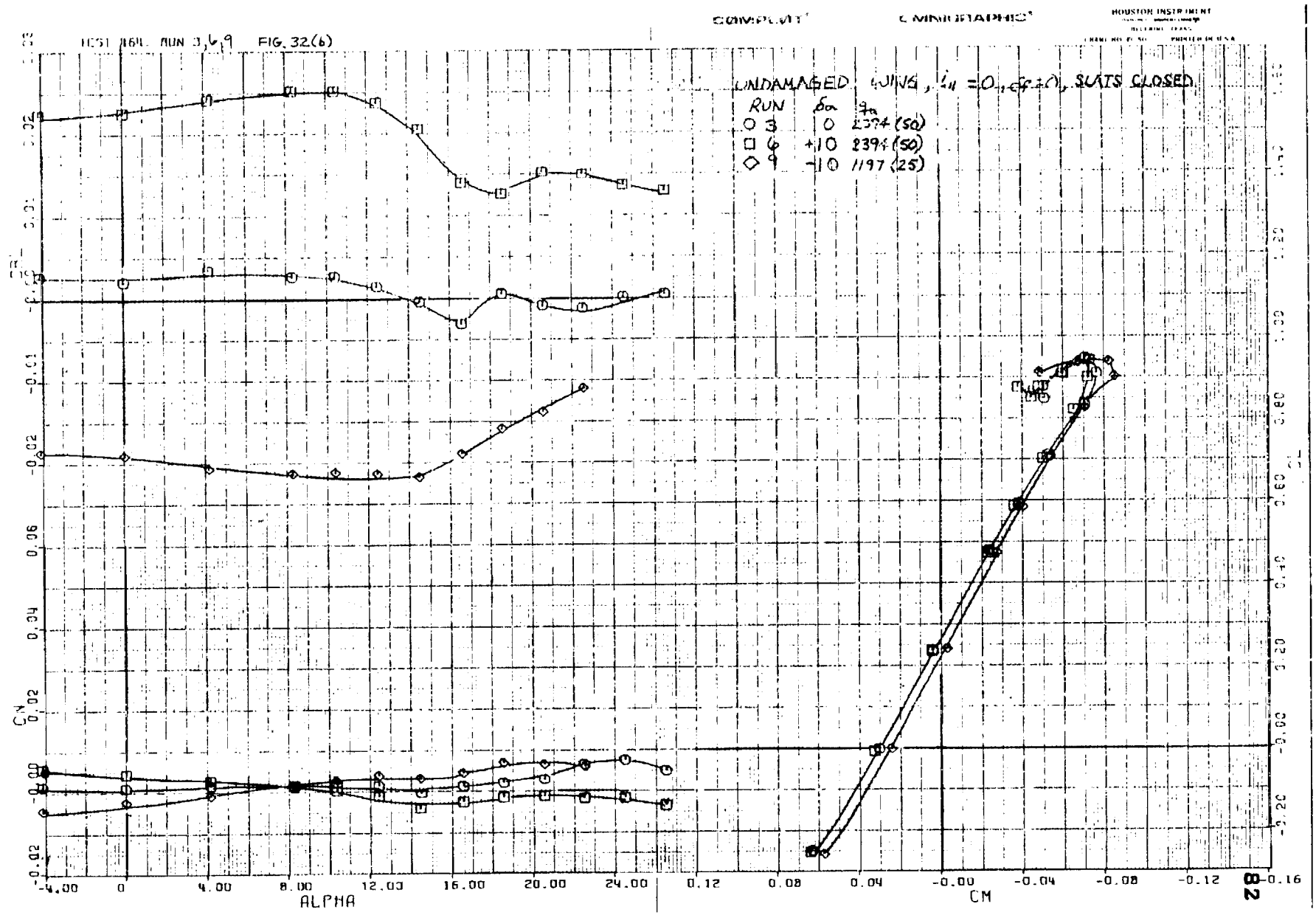

COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
TEST 16L RUN 3,6,9 FIG. 32(6)
UNDAMAGED WING, i_H = 0, ε_f = 0, SLATS CLOSED
RUN δa δf
3 0 23°F (SQ)
6 +10 23°F (SQ)
9 -10 11°F (25)
CN
ALPHA
CM

Figure 32(b)

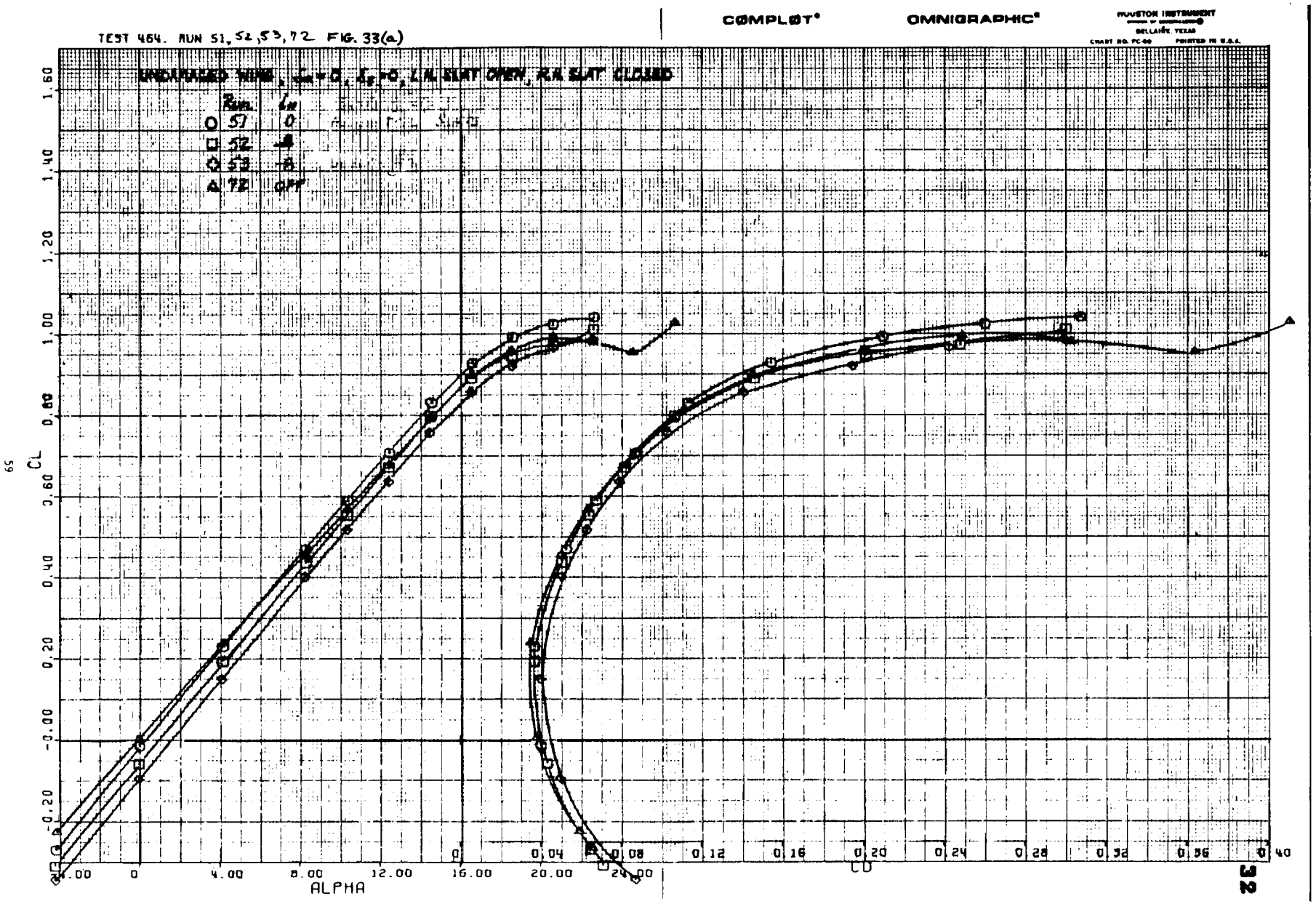

COMPLOT®
OMNIGRAPHIC®
TEST 464. RUN 51, 52, 53, 72 FIG. 33(a)
UNCAMBERED WING, $C_m = C_{m_0}$, $\delta_f = 0°$, L.E. SLAT OPEN, R.E. SLAT CLOSED
Run i_w
51 0
52 -4
53 -8
72 OFF
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 33(a)

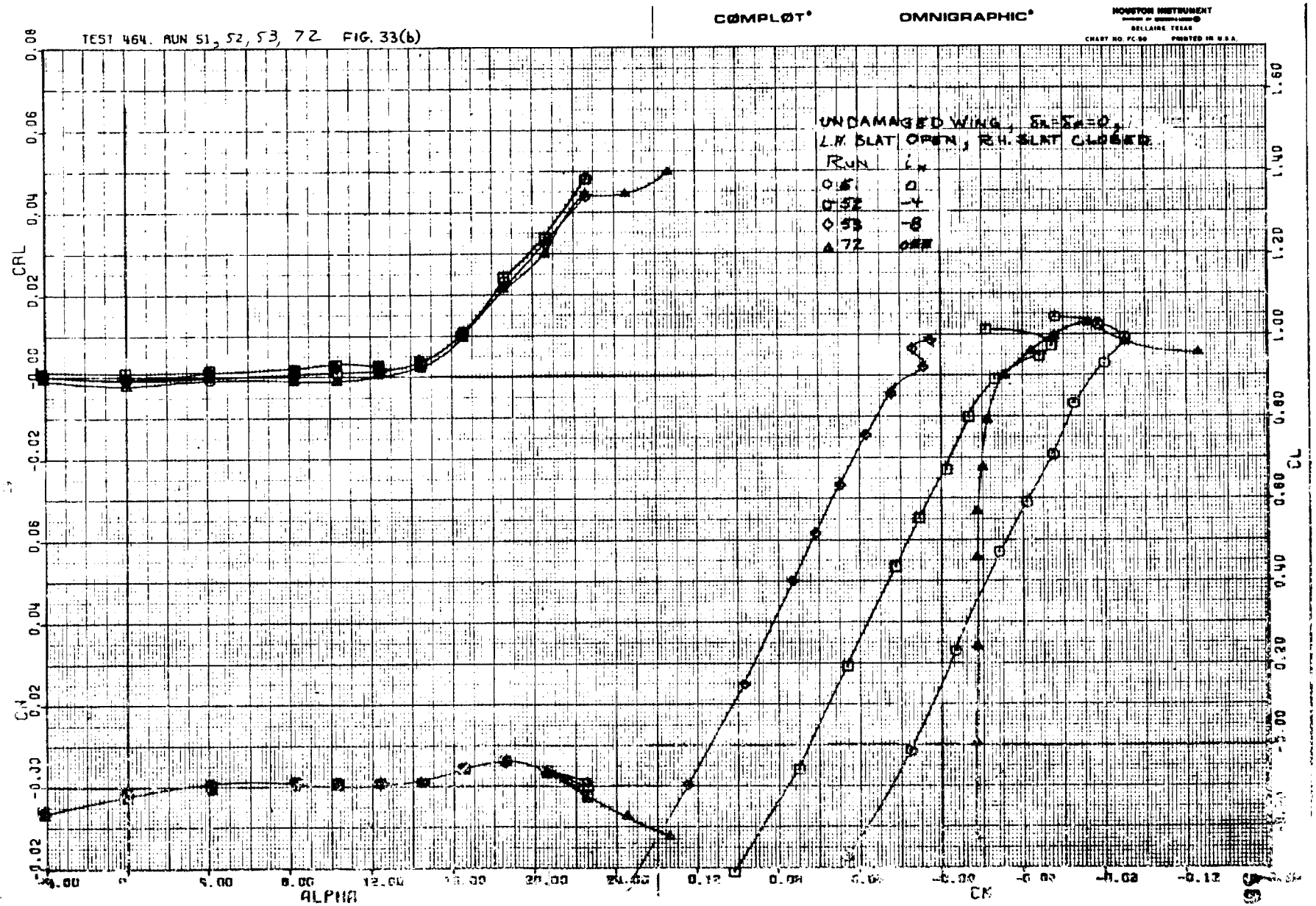

COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
BELLAIRE, TEXAS
TEST 464. RUN 51, 52, 53, 72 FIG. 33(b)
UNDAMAGED WING, δA=δR=0,
L.W. SLAT OPEN, R.H. SLAT CLOSED
Run
51
52
53
72
CRL
CN
CL
CM
ALPHA

Figure 33(b)

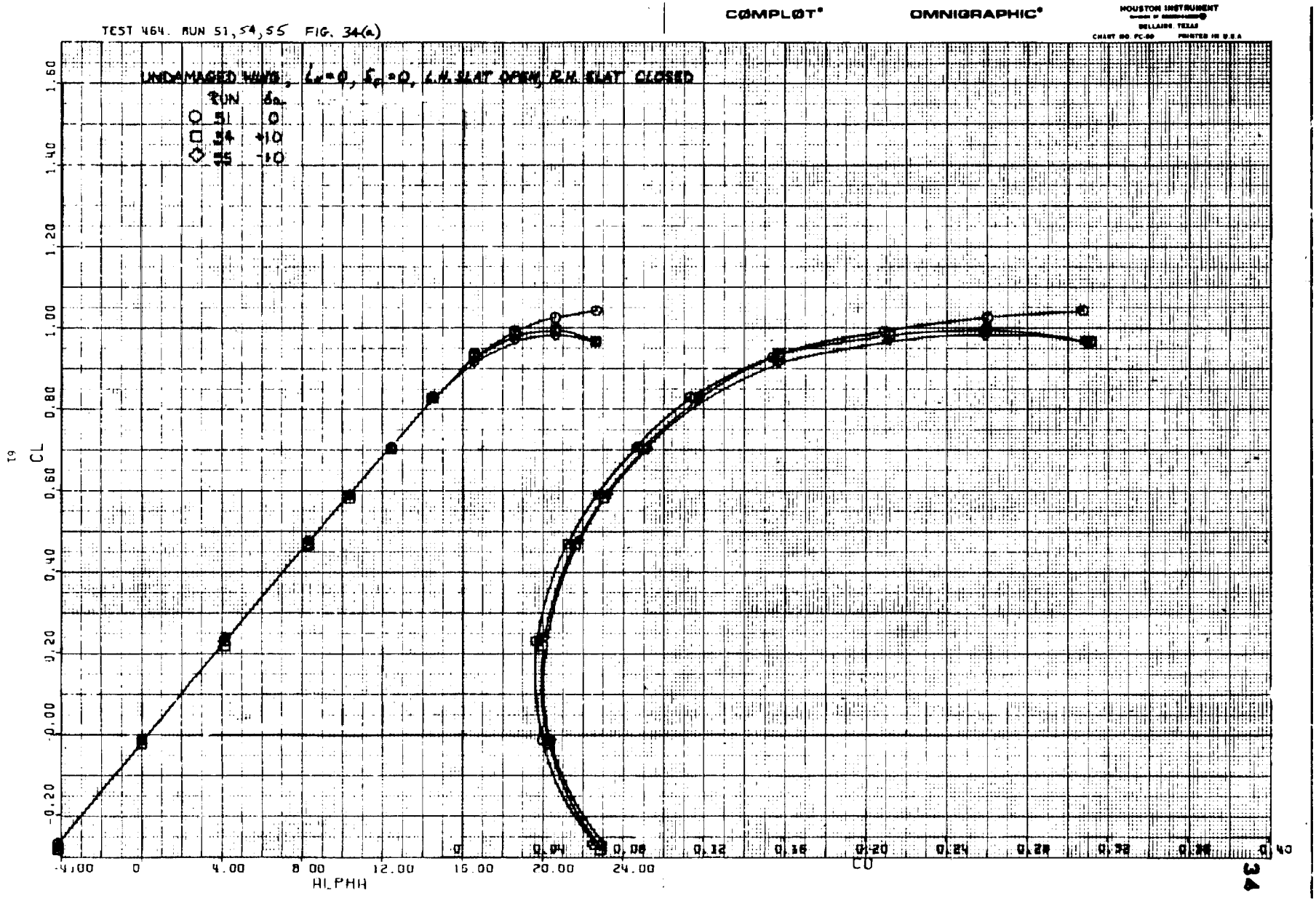

TEST 464. RUN 51, 54, 55 FIG. 34(a)
CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
UNDAMAGED WING, i_w=0, δ_f=0, L.H. SLAT OPEN, R.H. SLAT CLOSED
RUN δ_a
51 0
54 +10
55 -10
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 34(a)

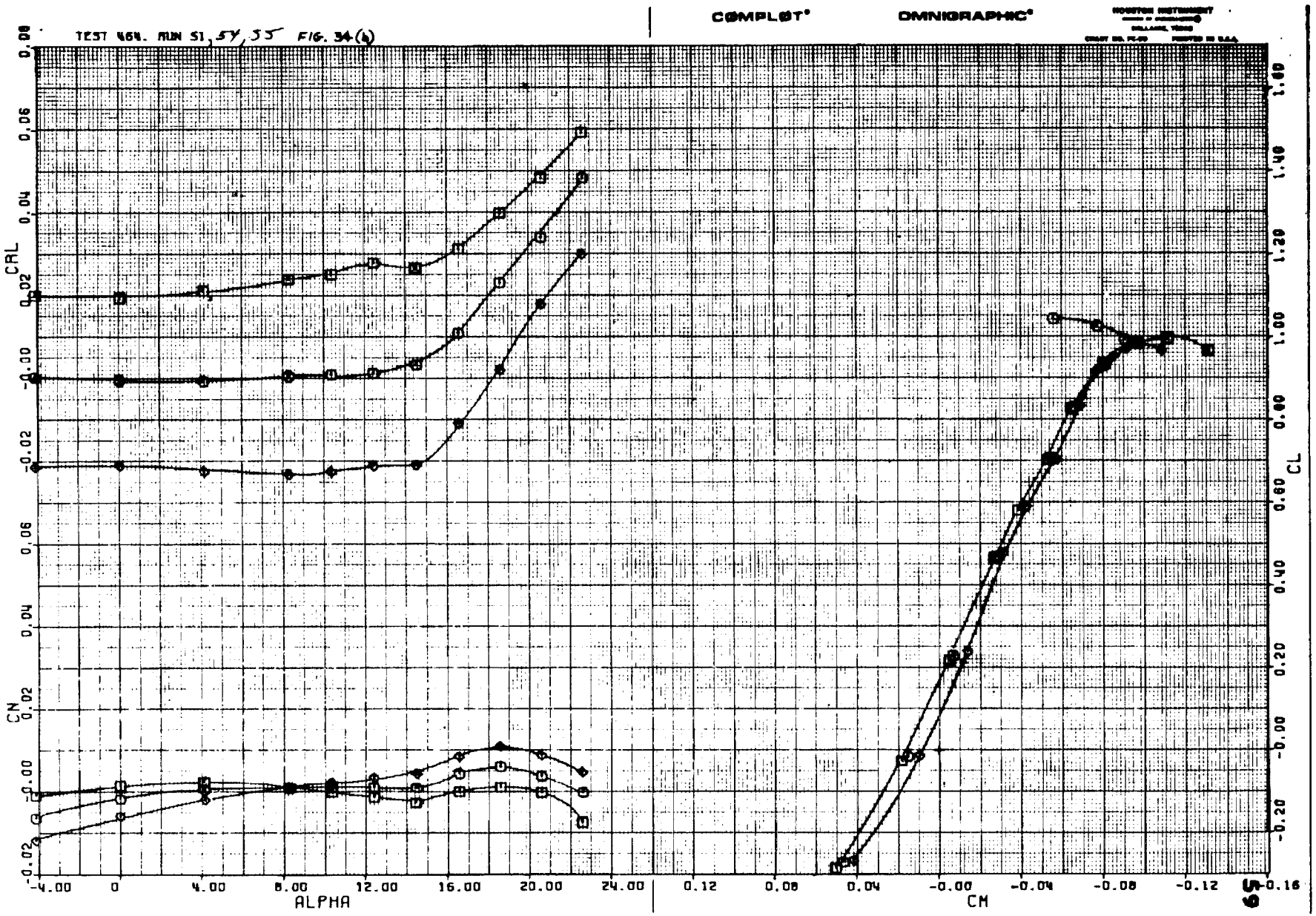

TEST 468. RUN 51, 54, 55 FIG. 34(b)
COMPLOT®
OMNIGRAPHIC®
CRL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 34(b)

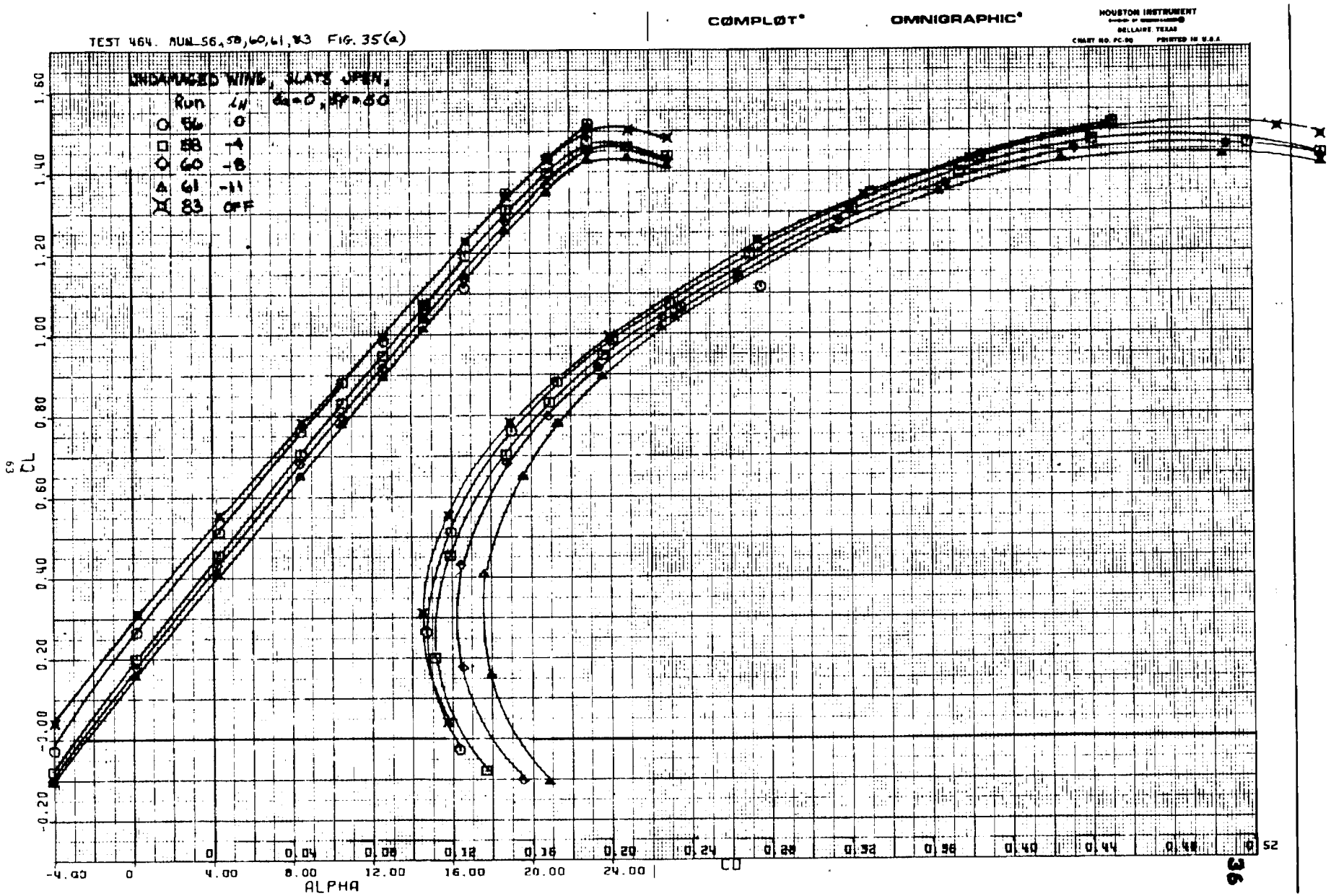

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE, TEXAS
TEST 464. RUN 56, 58, 60, 61, 63 FIG. 35(a)
UNDAMAGED WING, SLATS OPEN,
δf=0, RP=.80
Run δH
56 0
58 -4
60 -8
61 -11
63 OFF
CL
ALPHA
CD
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
0.44
0.48
0.52

Figure 35(a)

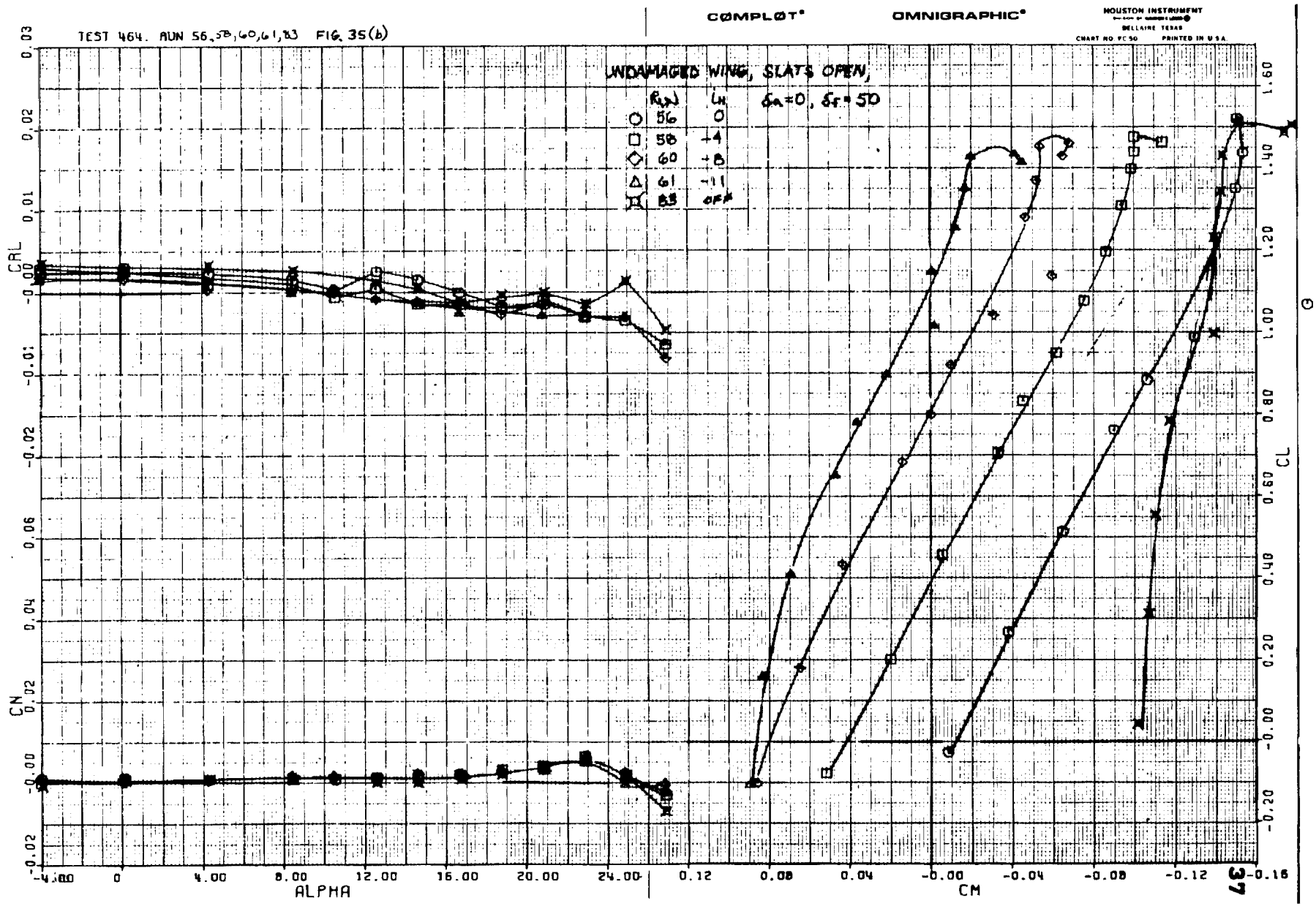

CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. FC 50
PRINTED IN U.S.A.
TEST 464. RUN 56,58,60,61,63 FIG. 35(b)
UNDAMAGED WING, SLATS OPEN,
δ_a=0, δ_s=50
R(x) i_H
56 0
58 +4
60 +8
61 -11
63 OFF
CRL
CN
CL
CM
ALPHA
α
37

Figure 35(b)

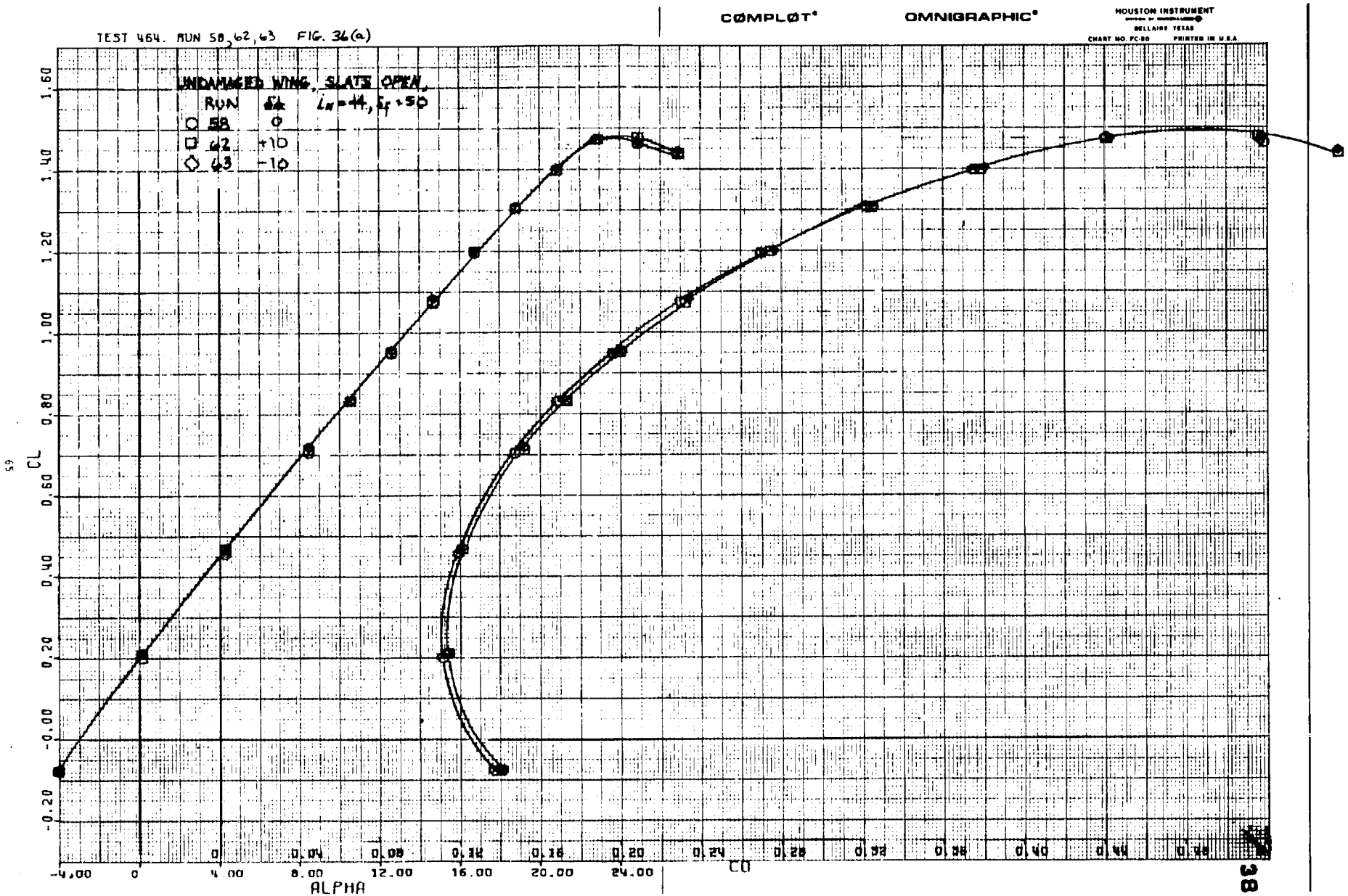

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
TEST 464. RUN 58, 62, 63 FIG. 36(a)
UNDAMAGED WING, SLATS OPEN
RUN δf
58 0
62 +10
63 -10
CL
ALPHA
CD

Figure 36(a)

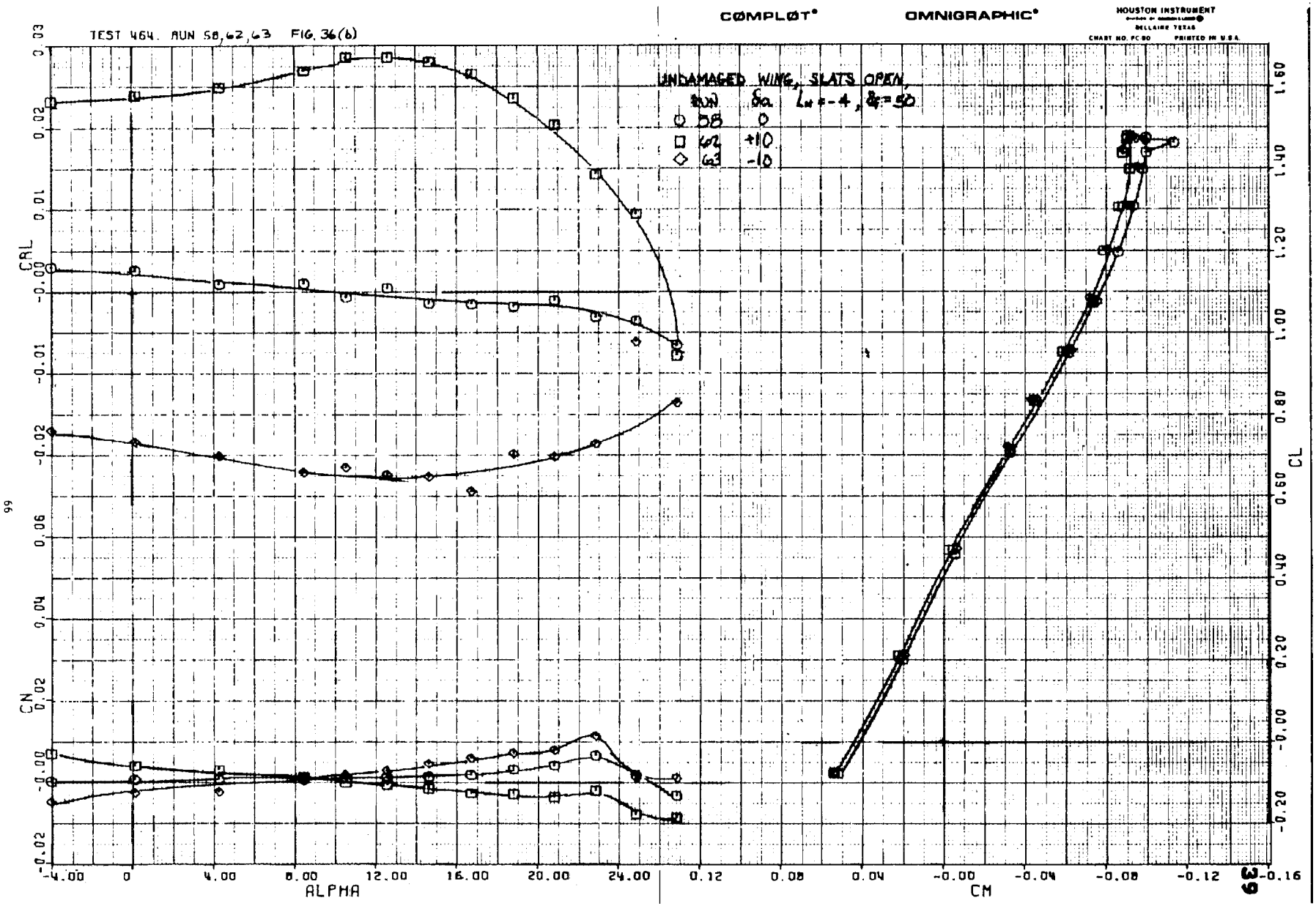

CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 58,62,63 FIG. 36(b)
UNDAMAGED WING, SLATS OPEN,
RUN δa
58 0
62 +10
63 -10
CRL
CN
ALPHA
CM
CL

Figure 36(b)

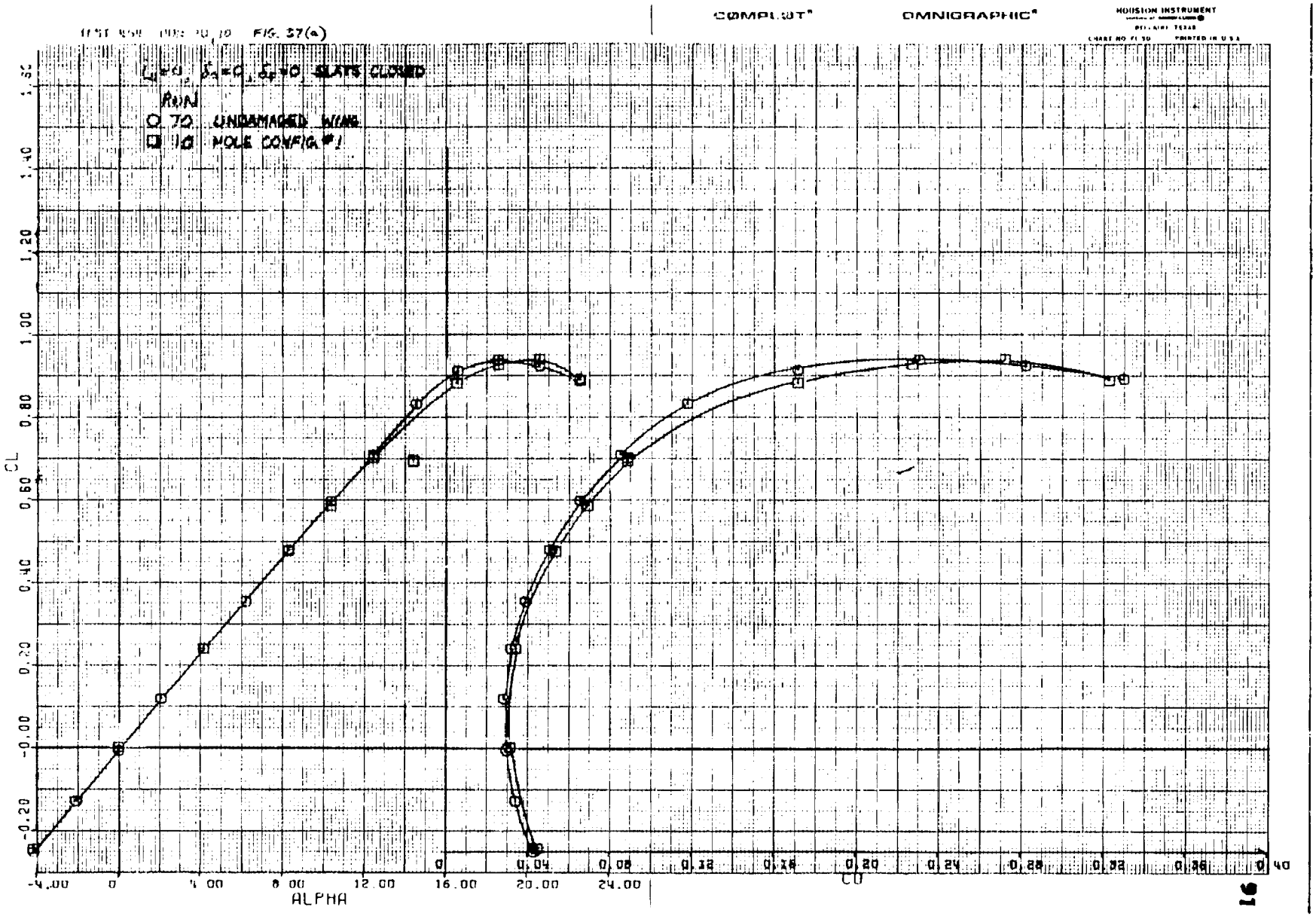


FIG. 37(a)
i_t=0, δ_a=0, δ_f=30, SLATS CLOSED
RUN
70 UNDAMAGED WING
16 HOLE CONFIG #1
CL
ALPHA
CD
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
-0.20
-0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 37(a)

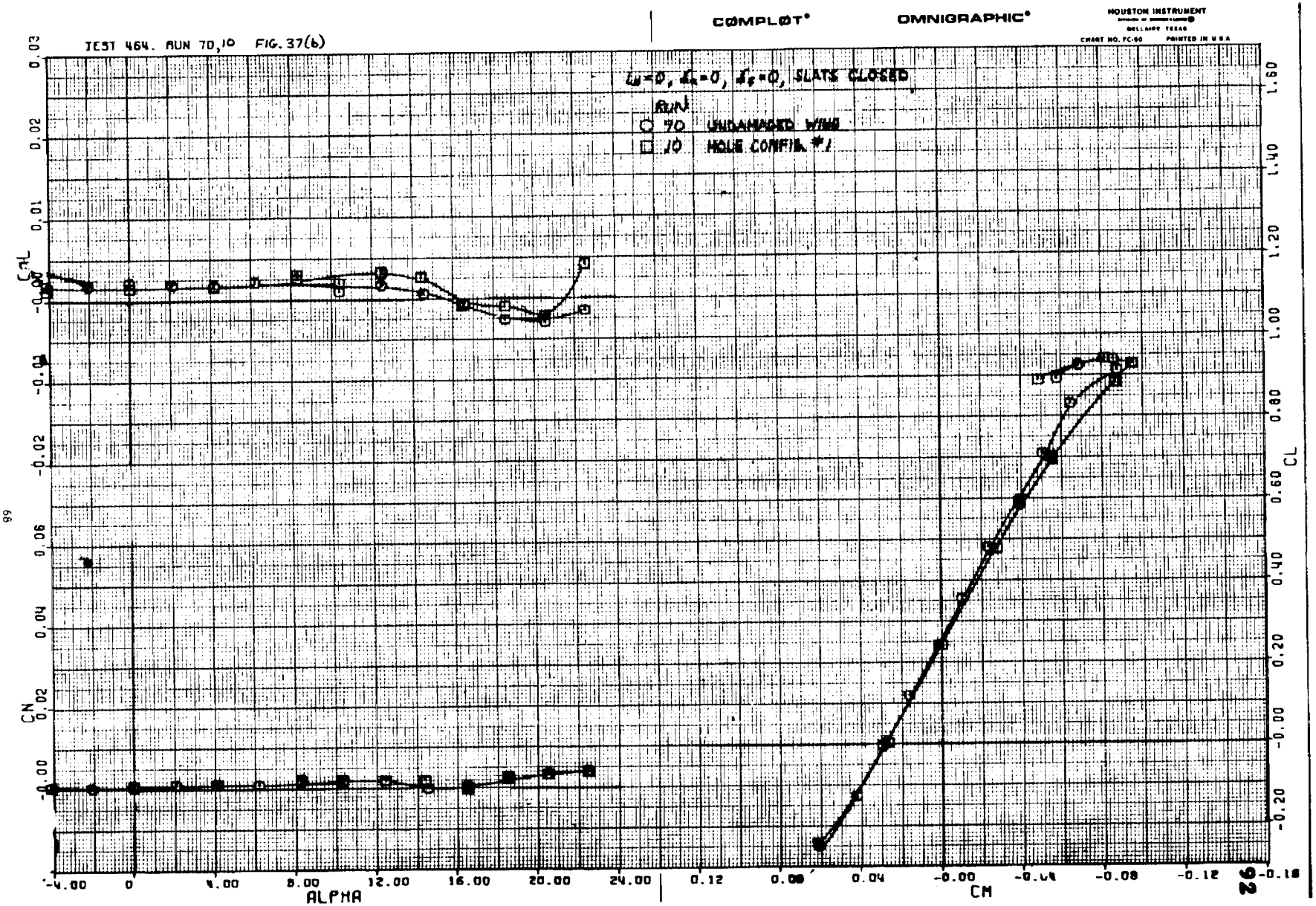
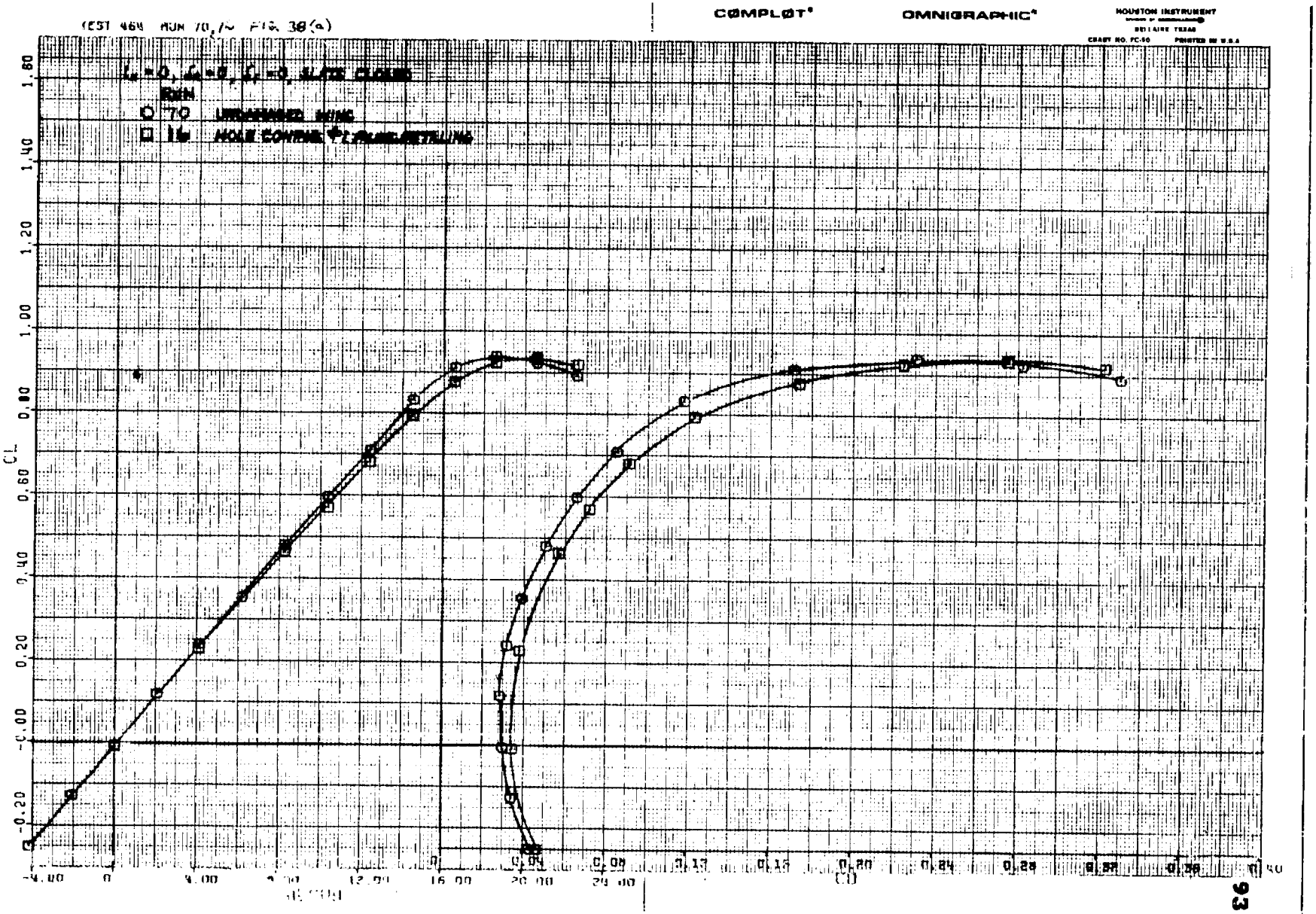

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 70,10 FIG. 37(b)
i_w=0, i_t=0, δ_f=0, SLATS CLOSED
RUN
70 UNDAMAGED WING
10 HOLE CONFIG. #1
CRL
CN
CL
CM
ALPHA
0.03
0.02
0.01
-0.00
-0.02
0.06
0.04
0.02
-0.00
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 37(b)



93

Figure 38(a)

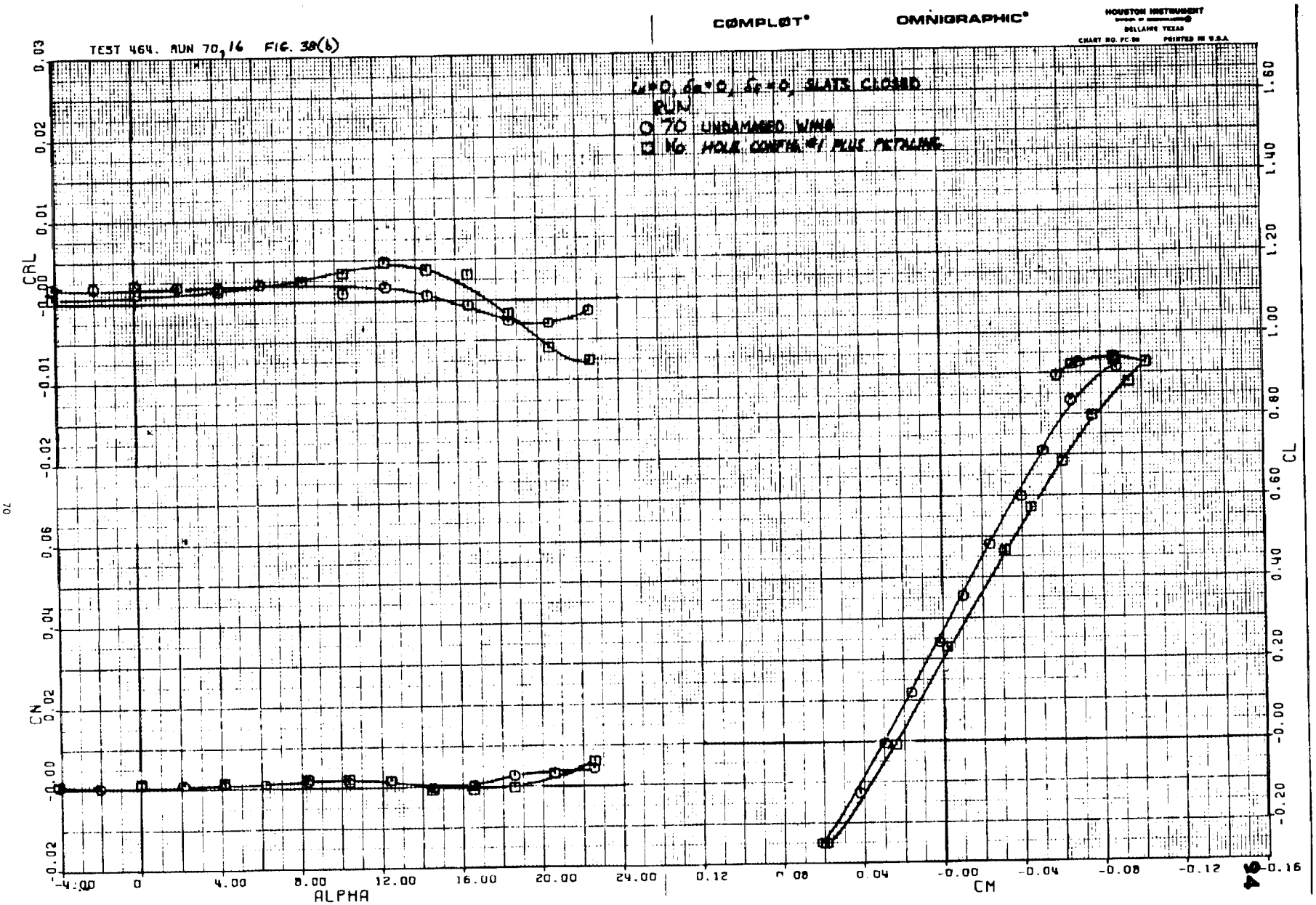

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 70, 16 FIG. 38(b)
i_w=0, δ_a=0, δ_e=0, SLATS CLOSED
RUN
70 UNDAMAGED WING
16 HOLE CONFIG #1 PLUS PITOTLINE
CRL
CN
CL
CM
ALPHA
0.03
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 38(b)

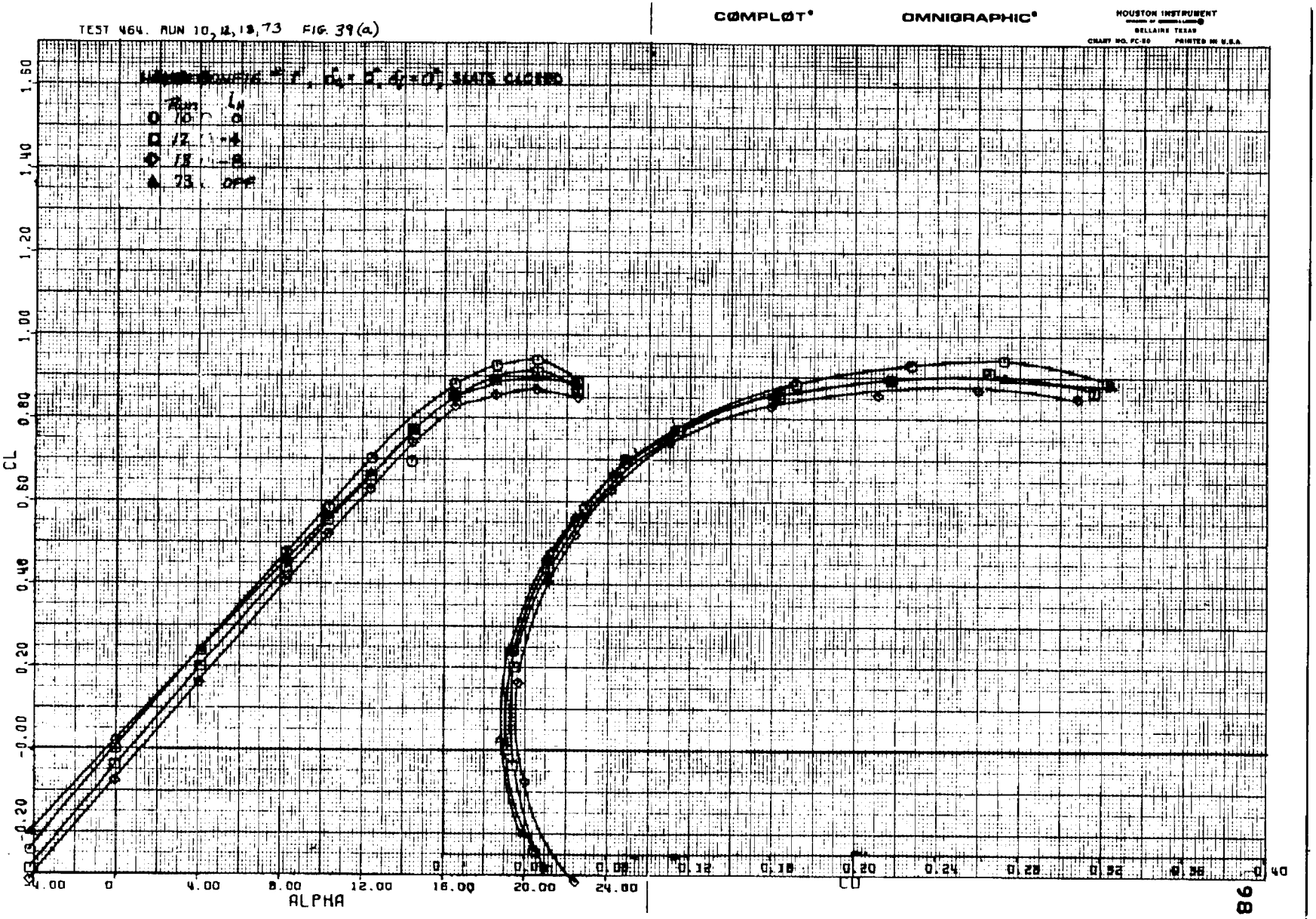

TEST 464. RUN 10, 12, 13, 73 FIG. 39(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CL
ALPHA
CD

Figure 39(a)

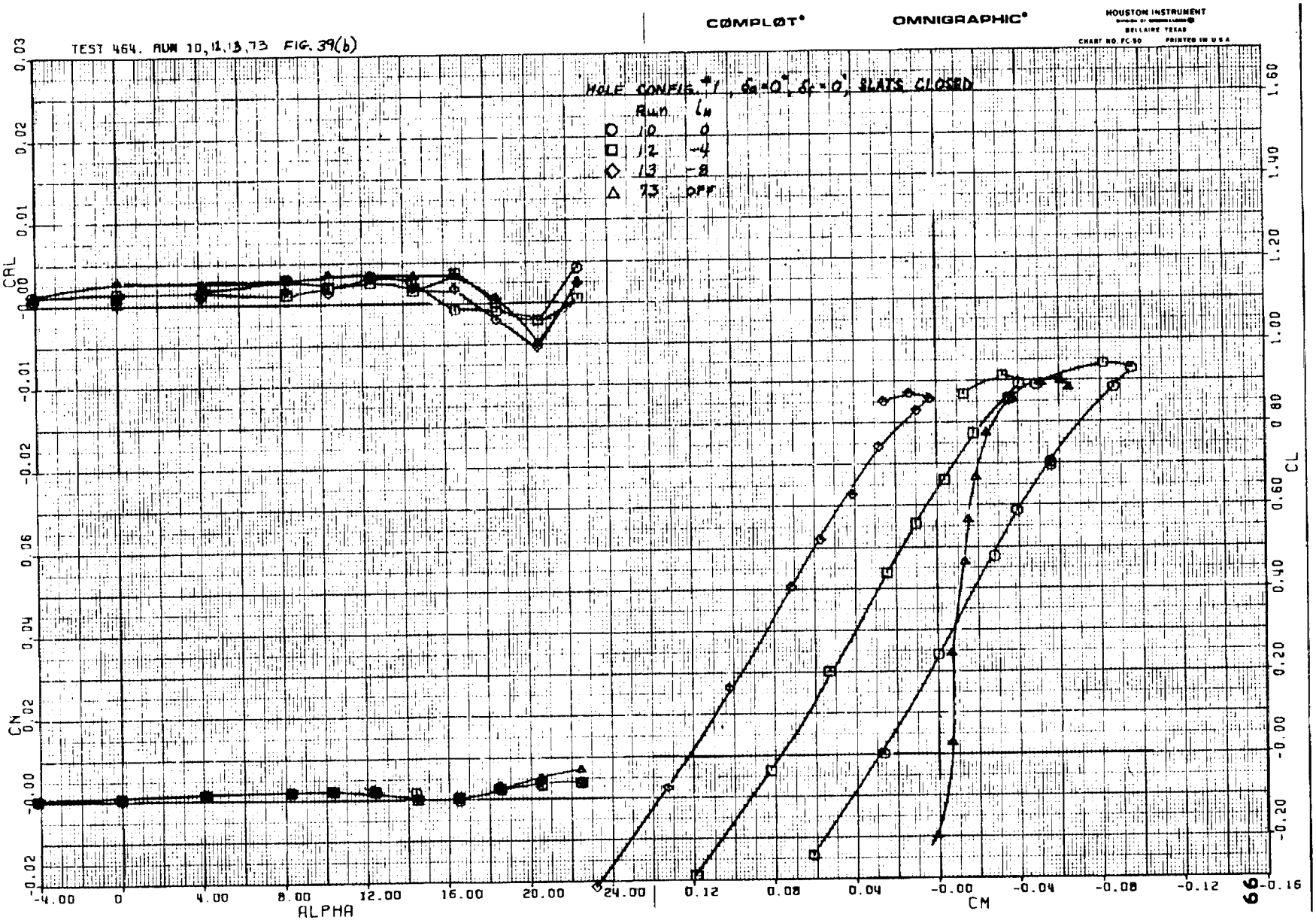

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. FC-50
PRINTED IN U.S.A.
TEST 464. RUN 10,12,13,73 FIG. 39(b)
HOLE CONFIG. #1, δn=0°, δf=0°, SLATS CLOSED
Run i_w
10 0
12 -4
13 -8
73 OFF
CRL
CN
CL
CM
ALPHA
0.03
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 39(b)

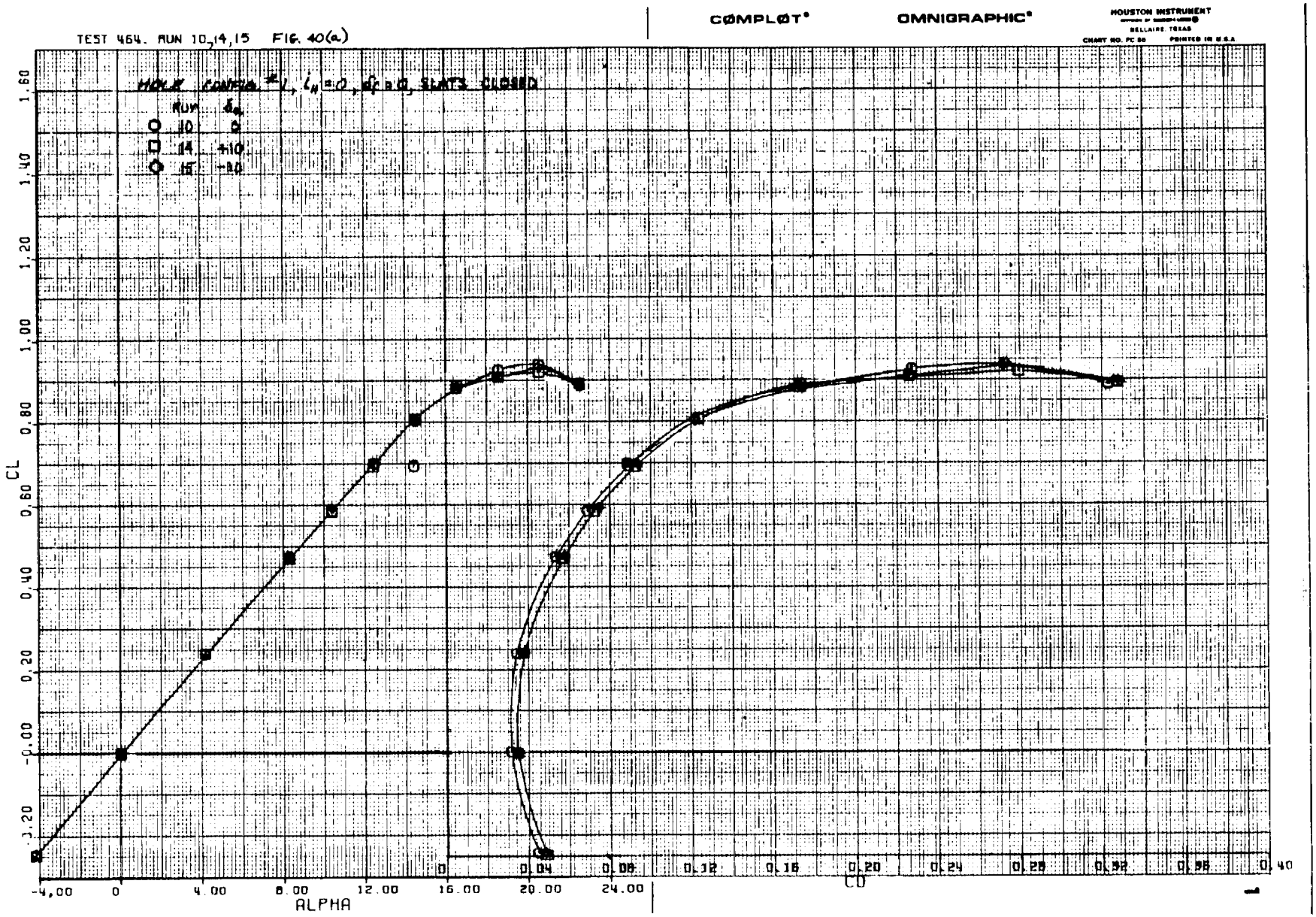

CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE, TEXAS
TEST 464. RUN 10,14,15 FIG. 40(a)
RUN
10
14
15
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 40(a)

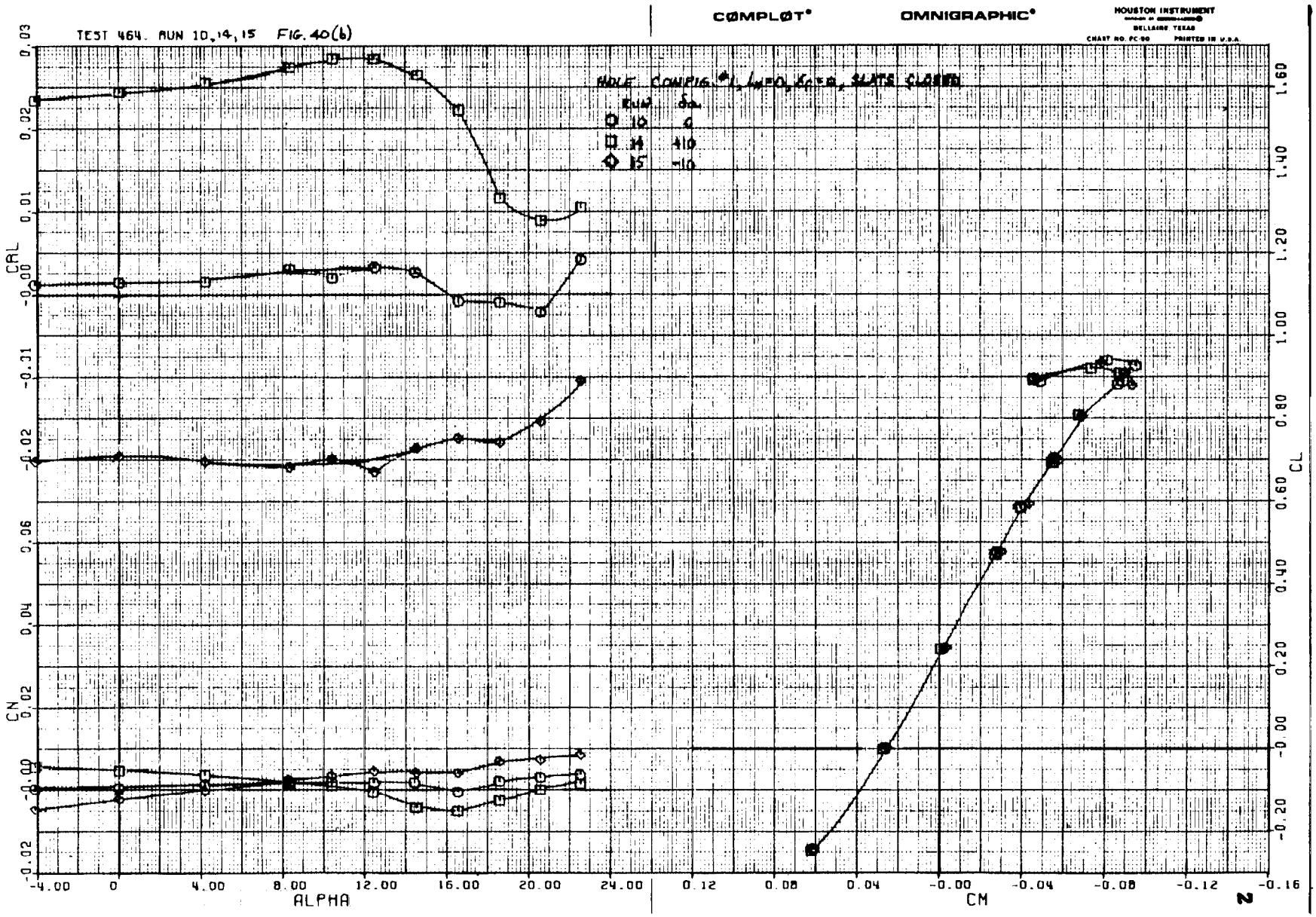

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. PC-90
PRINTED IN U.S.A.
TEST 464. RUN 10, 14, 15 FIG. 40(b)
HOLE COMPIG. ϕ_1, i_M=0, K_0=0, SLATS CLOSED
RUN δ_{SL}
10 0
14 +10
15 -10
CAL
CN
CL
CM
ALPHA
0.03
0.02
0.01
0.00
-0.01
-0.02
0.06
0.04
0.02
0.00
-0.02
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 40(b)

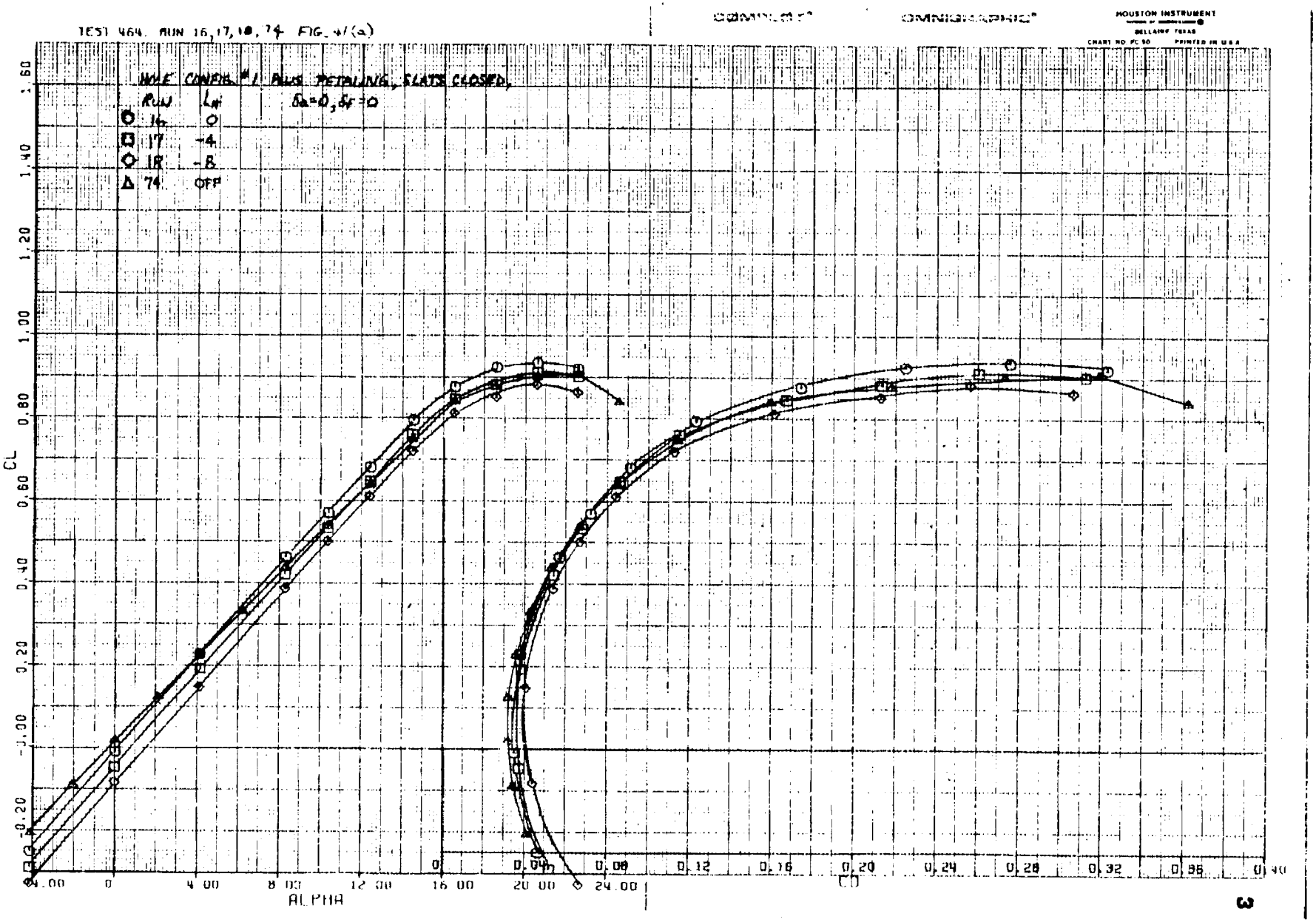

TEST 464. RUN 16,17,18,74 FIG. 41(a)
WING CONFIG. #1 PLUS FLAPLING, SLATS CLOSED,
δa=0, δf=0
RUN Lw
16 0
17 -4
18 -8
74 OFF
CL
ALPHA
CD

Figure 41(a)

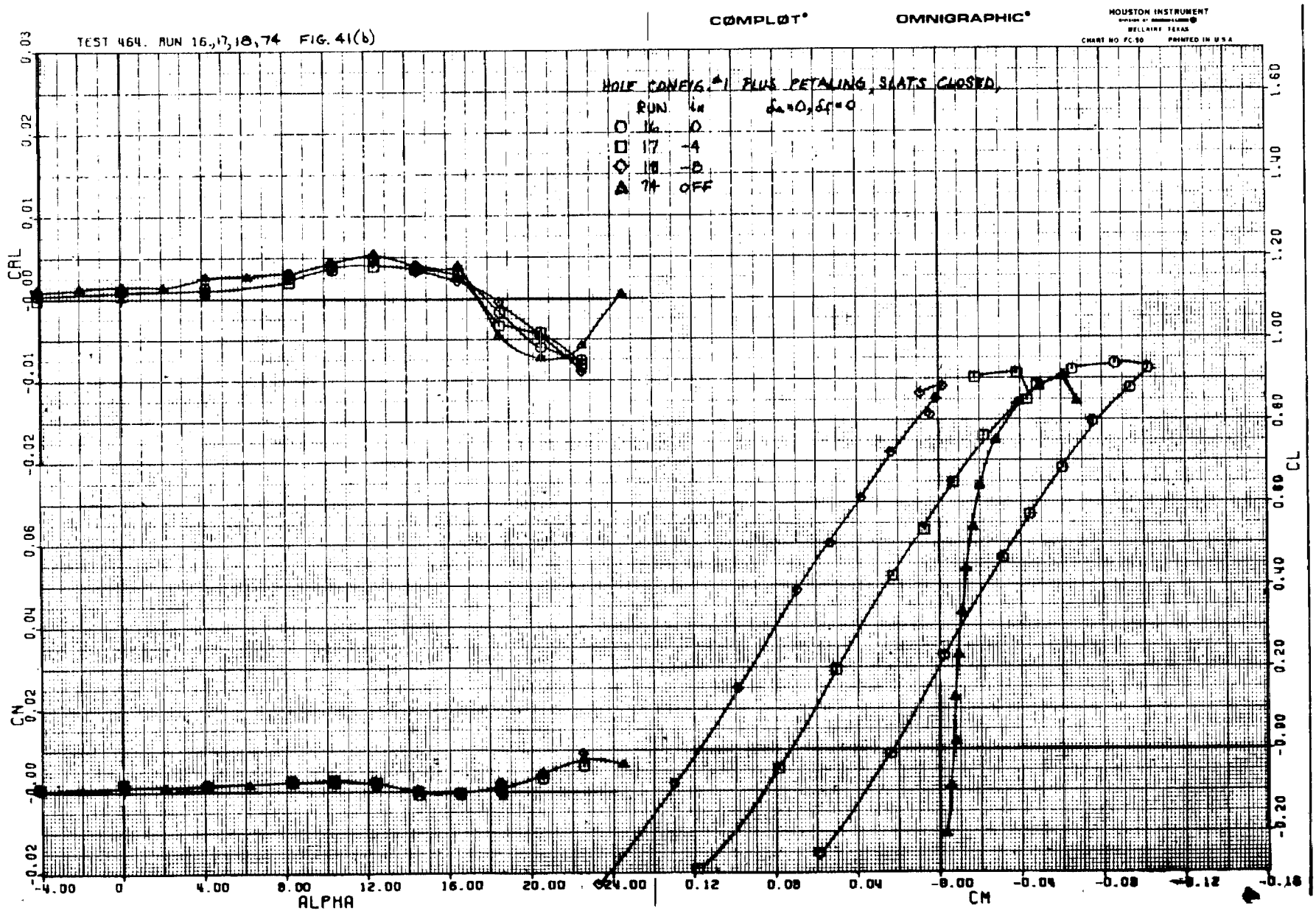
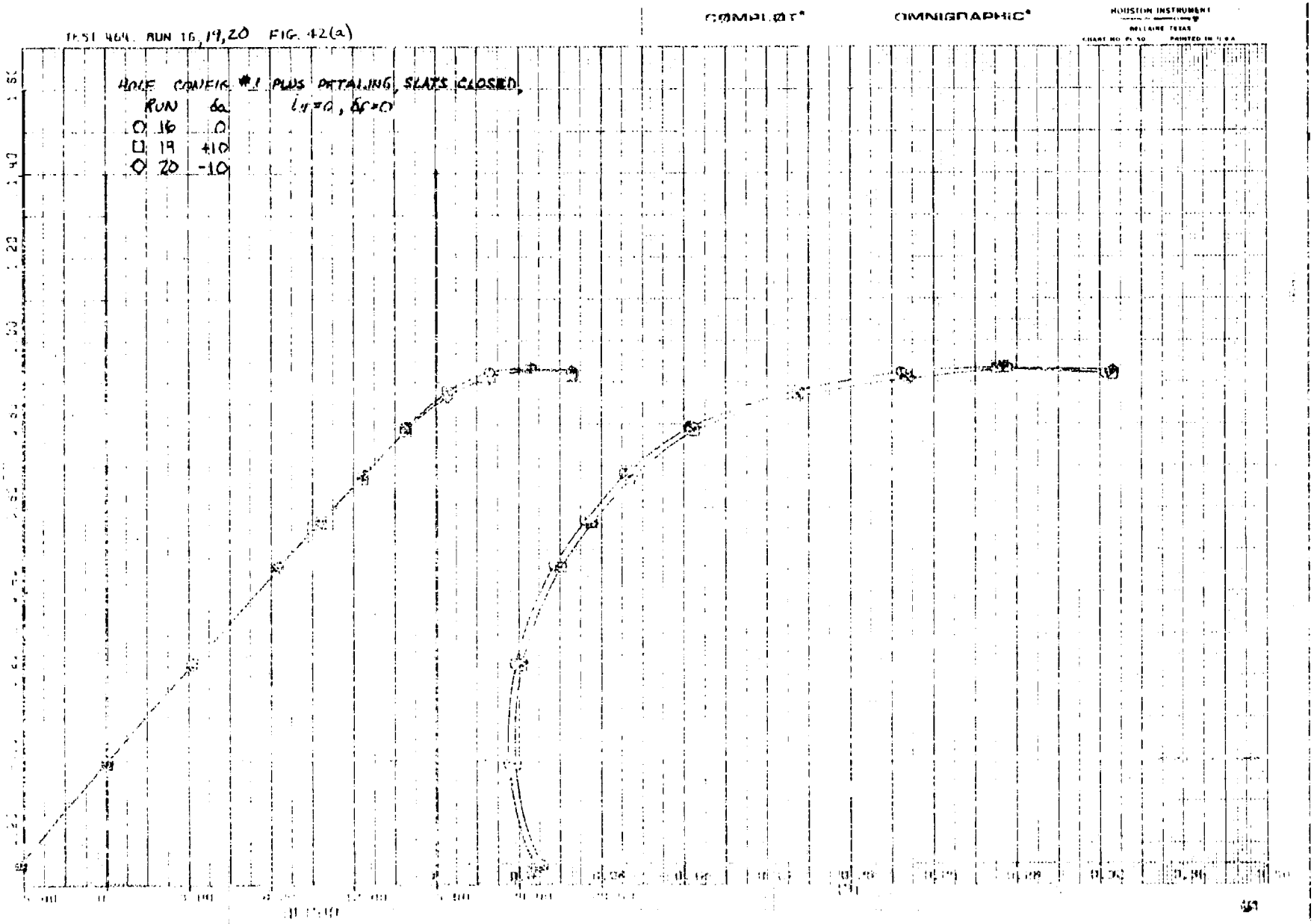

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO FC-90
PRINTED IN U.S.A.
TEST 464. RUN 16.,17,18,74 FIG. 41(b)
HOLE CONFIG. 1 PLUS PETALING, SLATS CLOSED,
δ_a=0, δ_f=0
RUN i_H
16 0
17 -4
18 -8
74 OFF
CAL
CN
ALPHA
CL
CM
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 41(b)


TEST 464 RUN 16,19,20 FIG. 42(a)
COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
HOLE COVER #1 PLUS PETALING, SLATS CLOSED
RUN δα
l_f=0, δc=0
16 0
19 +10
20 -10

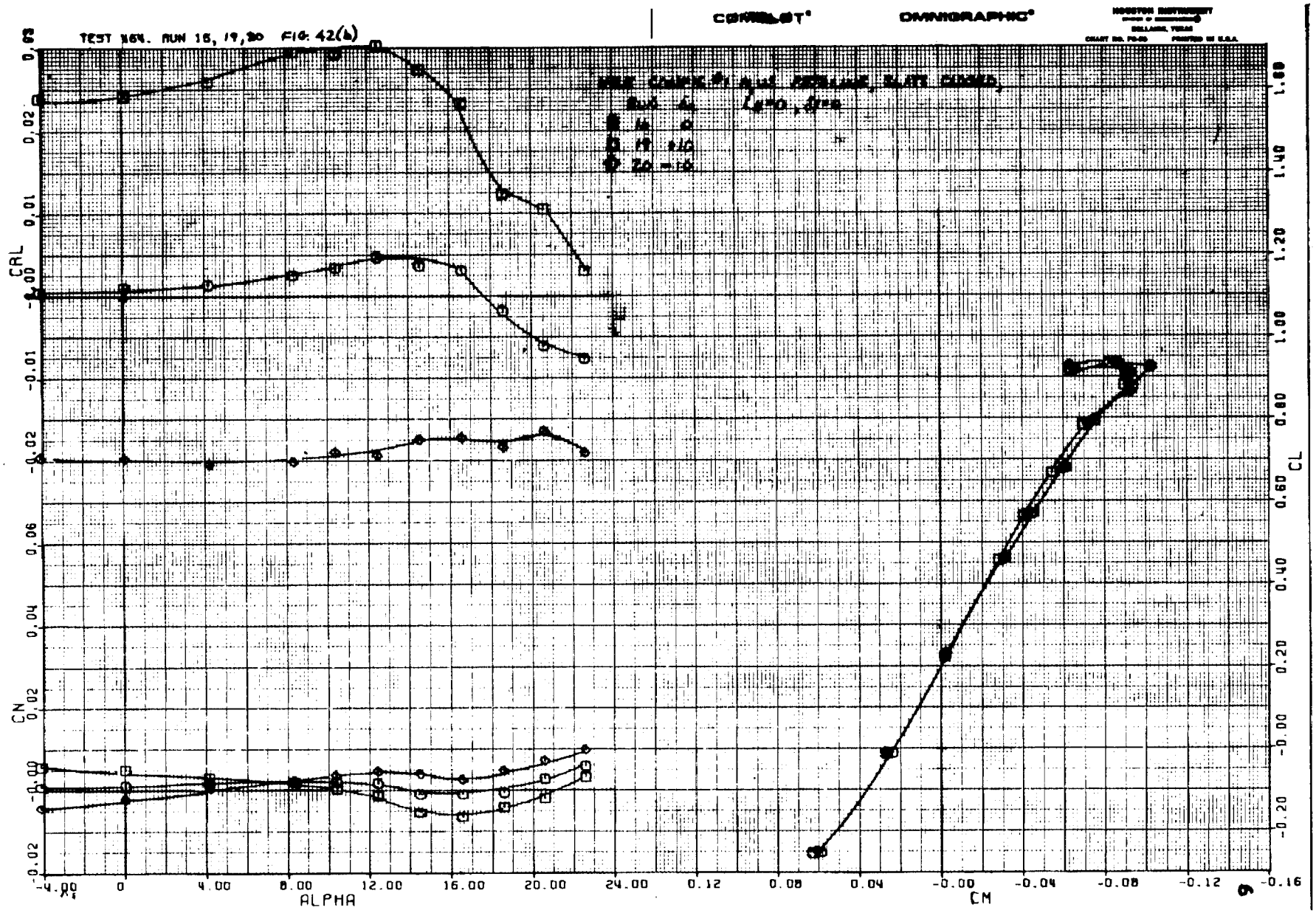

TEST 164. RUN 18, 19, 20 FIG. 42(b)
CORVETTE
OMNIGRAPHIC
CRL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 42(b)

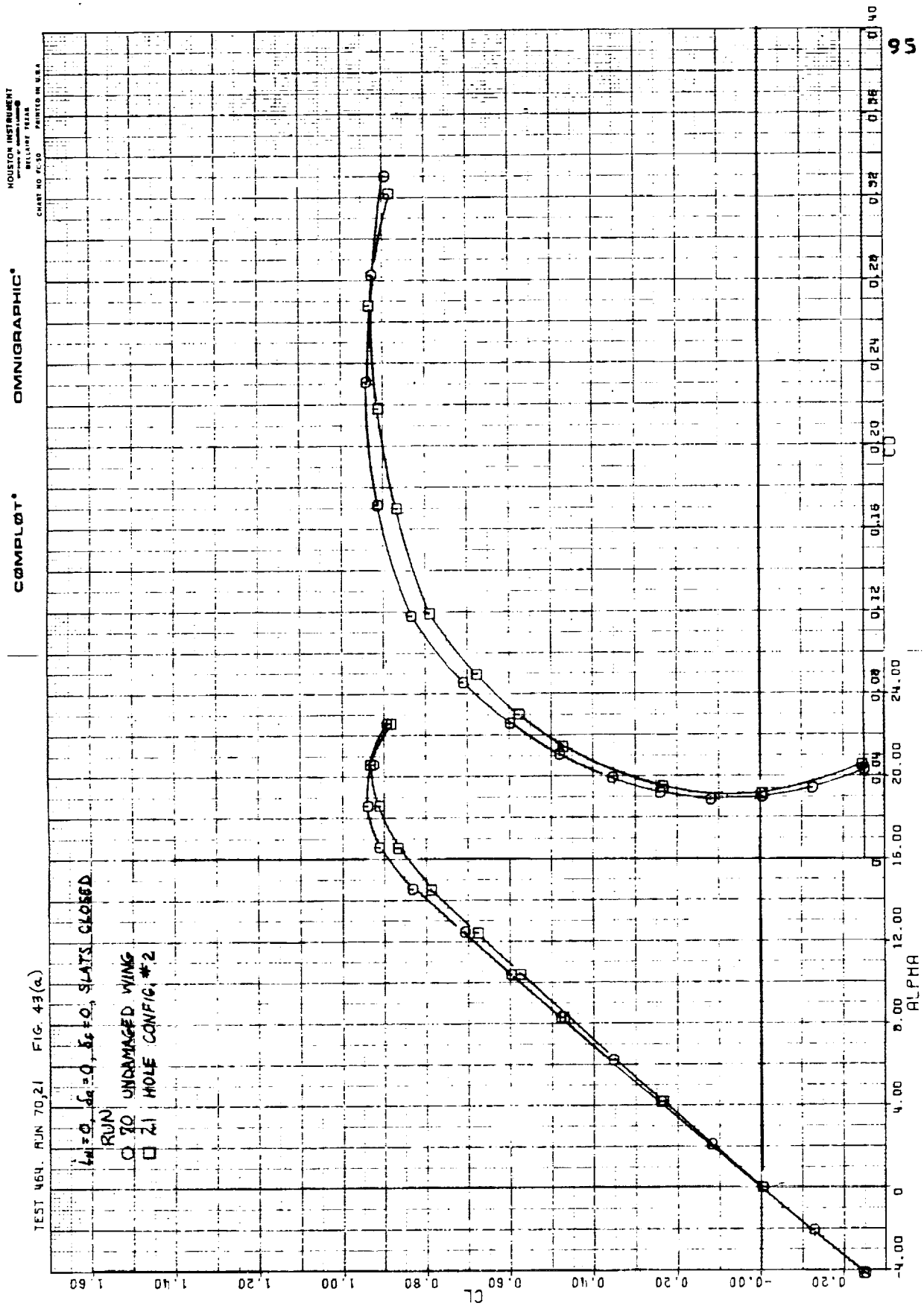

COMPLOT® OMNIGRAPHIC®
HOUSTON INSTRUMENT
95
TEST 464, RUN 70,21 FIG. 43(a)
$i_w=0$, $\delta_a=0$, $\delta_E=0$, SLATS CLOSED
RUN
20 UNDAMAGED WING
21 HOLE CONFIG. #2
CL
CD
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
-0.20
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 43(a)

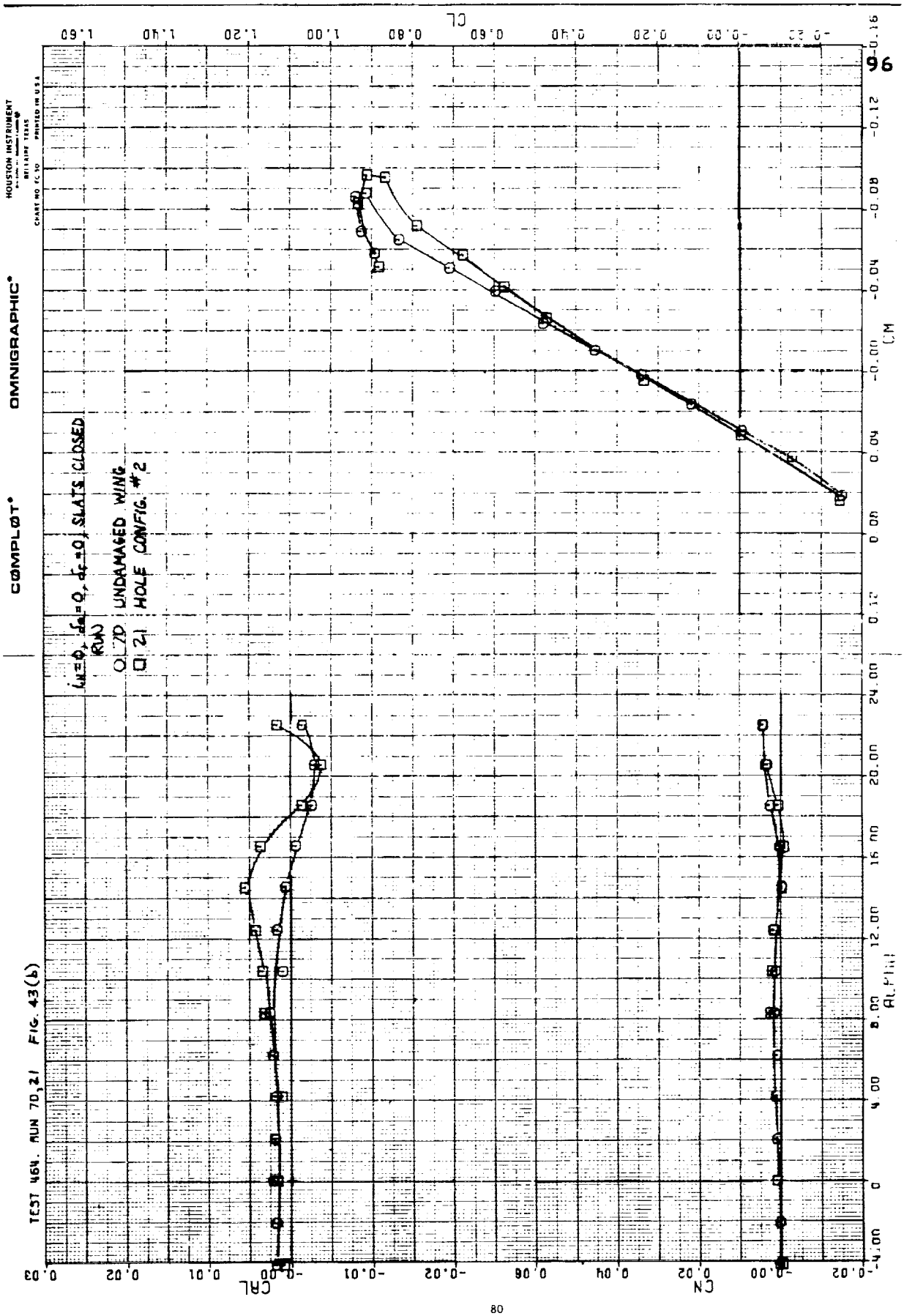

COMPLOT® OMNIGRAPHIC®
HOUSTON INSTRUMENT
CHART NO FC 10 PRINTED IN U.S.A.
96
TEST 46N. RUN 70,21 FIG. 43(b)
$i_w=0, \delta_a=0, \delta_f=0$, SLATS CLOSED
RUN
70 UNDAMAGED WING
21 HOLE CONFIG. #2
CL
CM
CN
CRL
ALPHA

Figure 43(b)

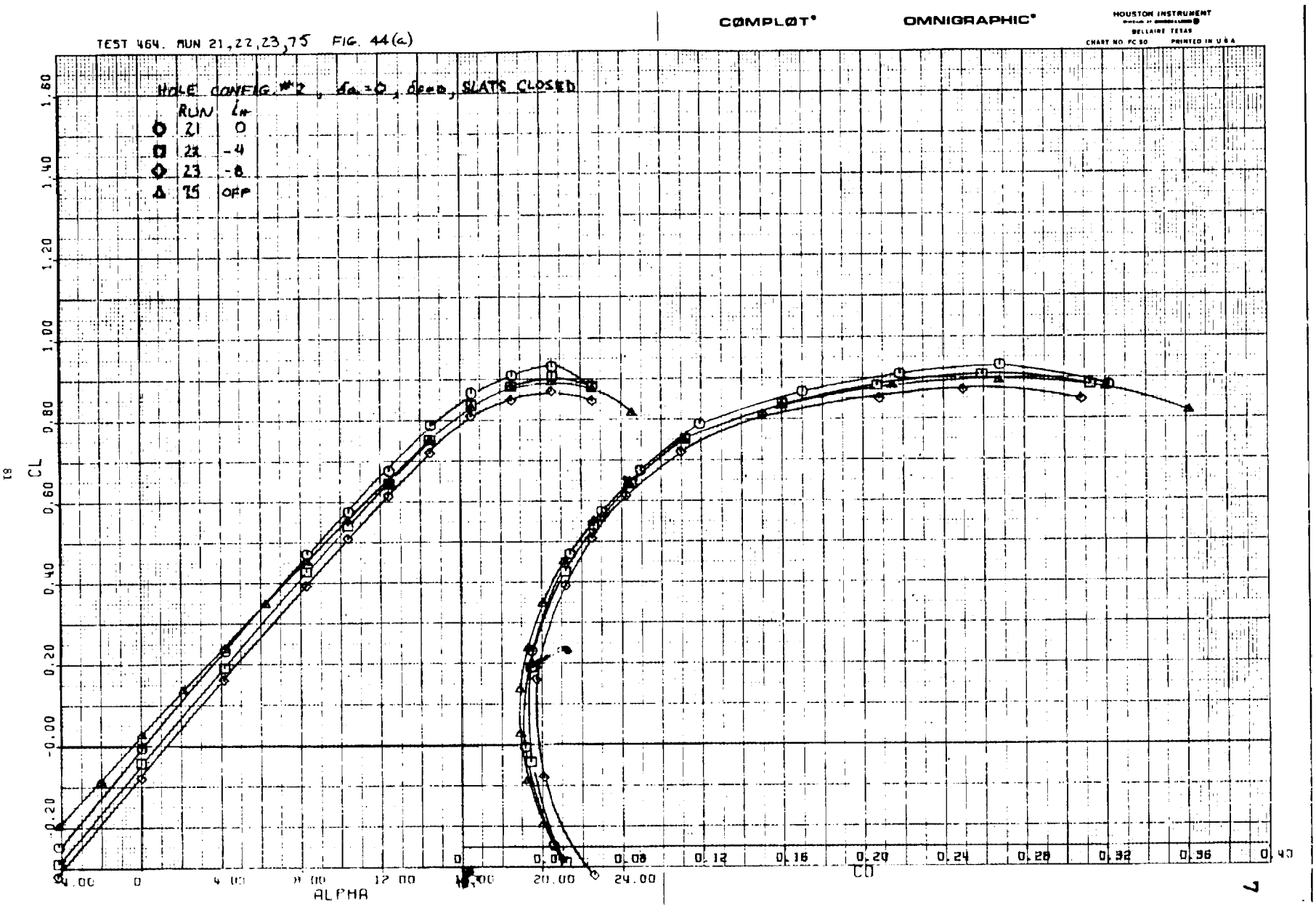

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
TEST 464. RUN 21,22,23,75 FIG. 44(a)
HALE CONFIG. #2, δa=0, δe=0, SLATS CLOSED
RUN i_H
21 0
22 -4
23 -8
75 OFF
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 44(a)

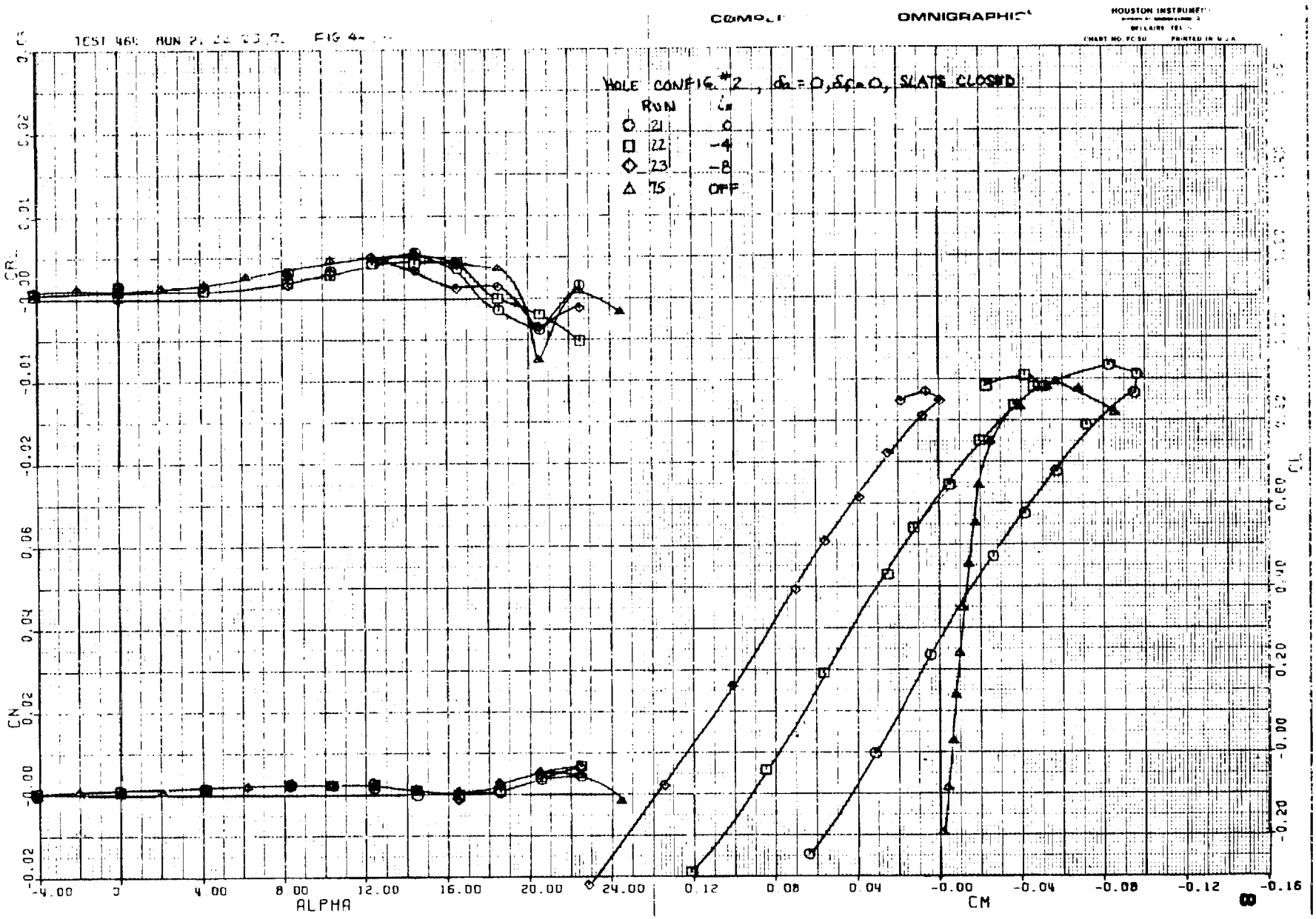

OMNIGRAPHIC
HOUSTON INSTRUMENT
WHOLE CONFIG. #2, $\delta_h = 0, \delta_c = 0$, SLATS CLOSED
RUN
21 0
22 -4
23 -8
75 OFF
CN
CR
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 44(b)

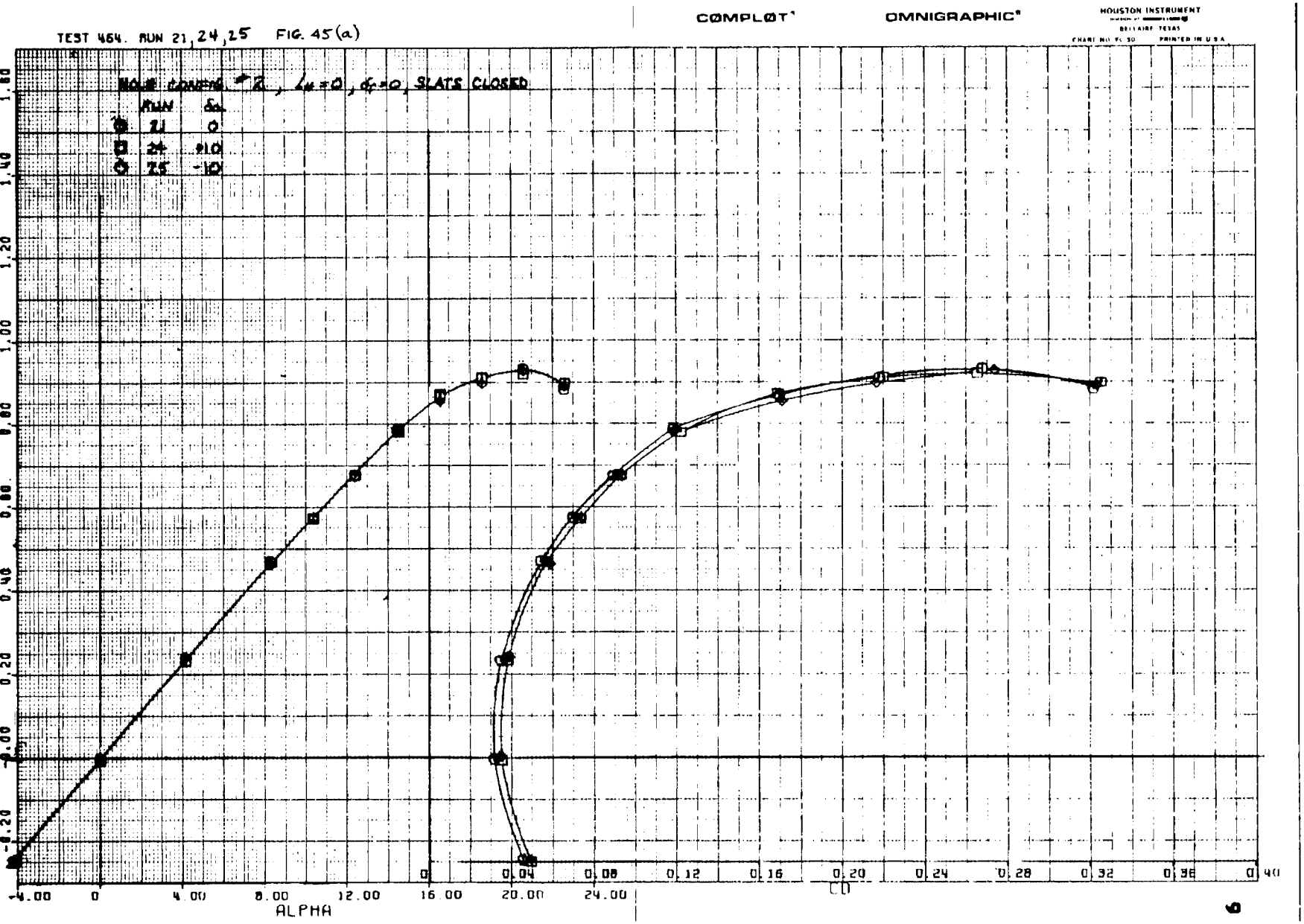
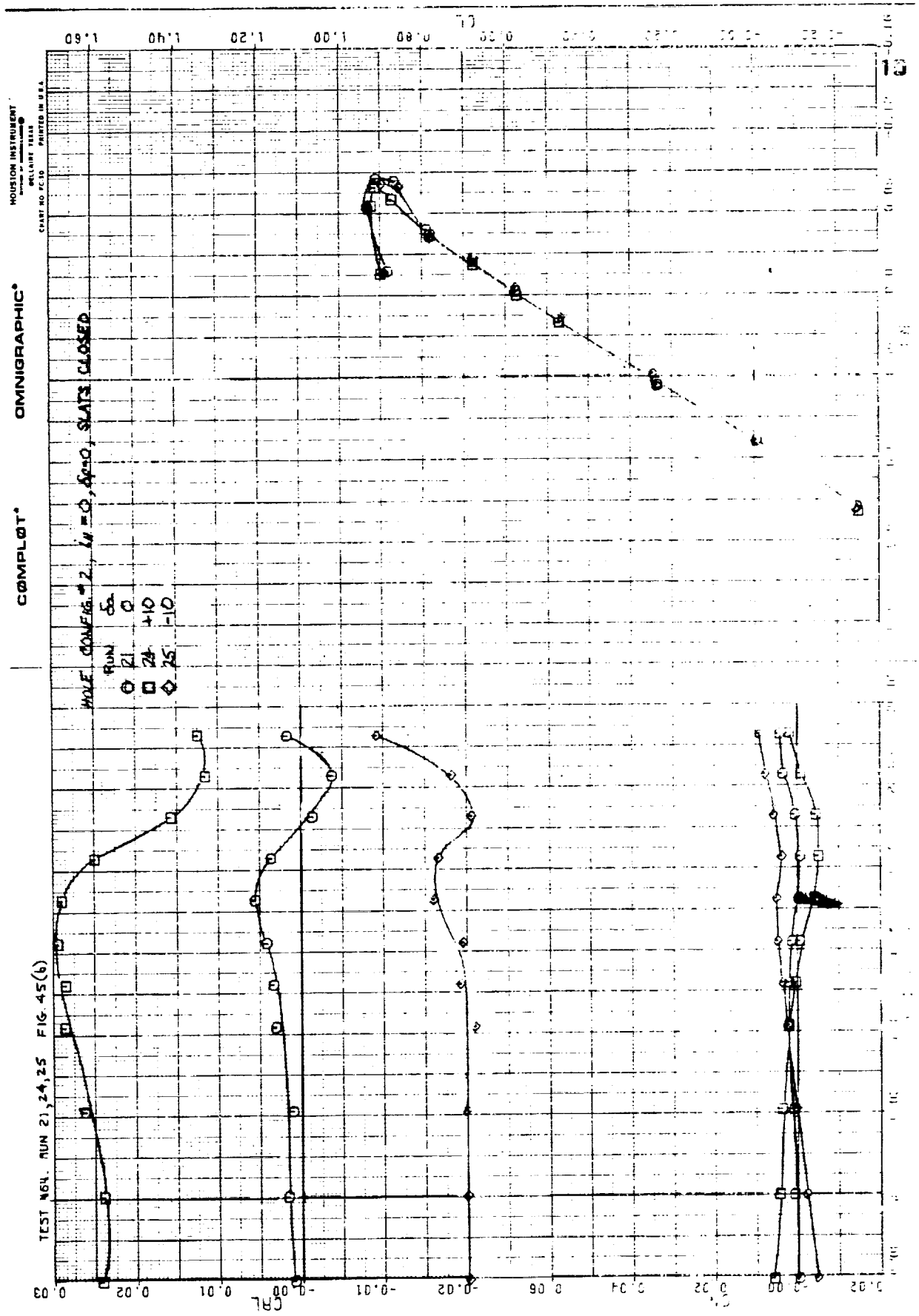

COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
TEST 464. RUN 21, 24, 25 FIG. 45(a)
NOSE COVERS, δ_a, M=0, δ_f=0, SLATS CLOSED
RUN δ_a
21 0
24 +10
25 -10
CL
ALPHA
CD
1.80
1.40
1.20
1.00
0.80
0.40
0.20
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 45(a)


COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
CHART NO. FC10
PRINTED IN U.S.A.
WING CONFIG. #2, δf=0, δs=0, SLATS CLOSED
RUN
21
24
25
δa
0
+10
-10
CL
CRL
TEST N64, RUN 21, 24, 25 FIG. 45(6)

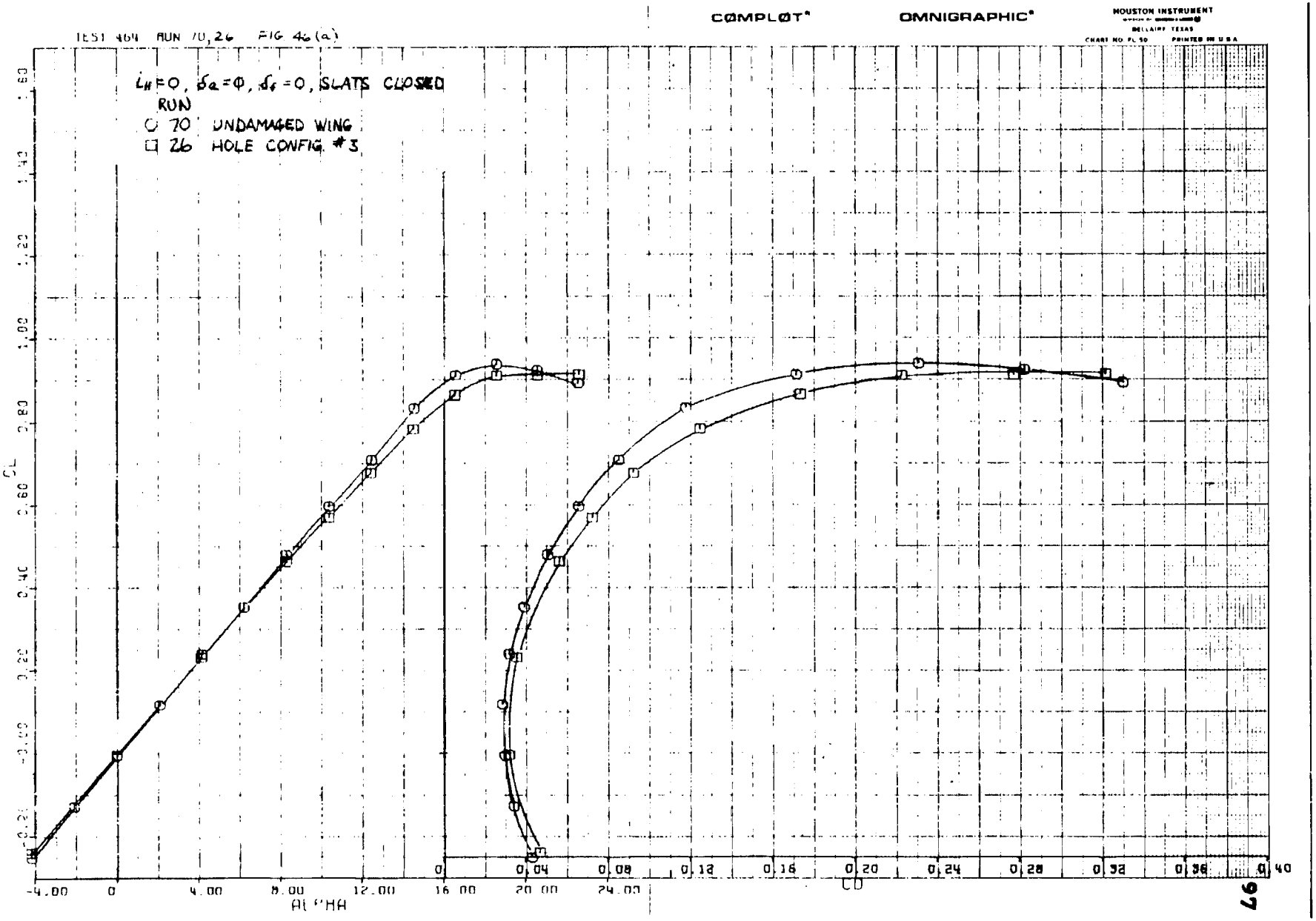

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464 RUN 70,26 FIG 46(a)
i_H=0, δ_e=0, δ_f=0, SLATS CLOSED
RUN
70 UNDAMAGED WING
26 HOLE CONFIG. #3
CL
ALPHA
CD
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
97

Figure 46(a)

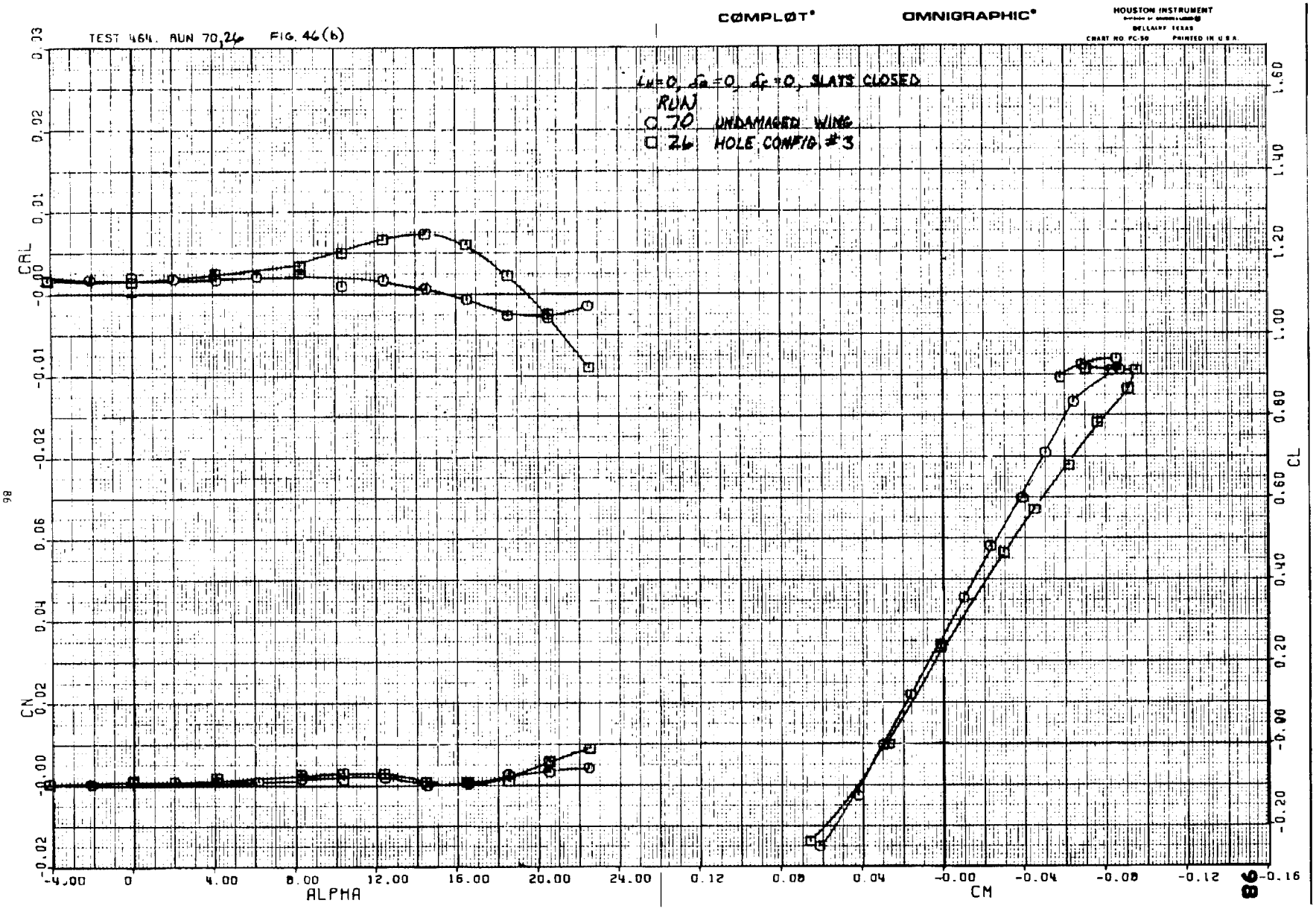

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 70,26 FIG. 46(b)
i_H=0, δ_a=0, δ_f=0, SLATS CLOSED
RUN
70 UNDAMAGED WING
26 HOLE CONFIG #3
CRL
CN
CL
CM
ALPHA
0.03
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 46(b)

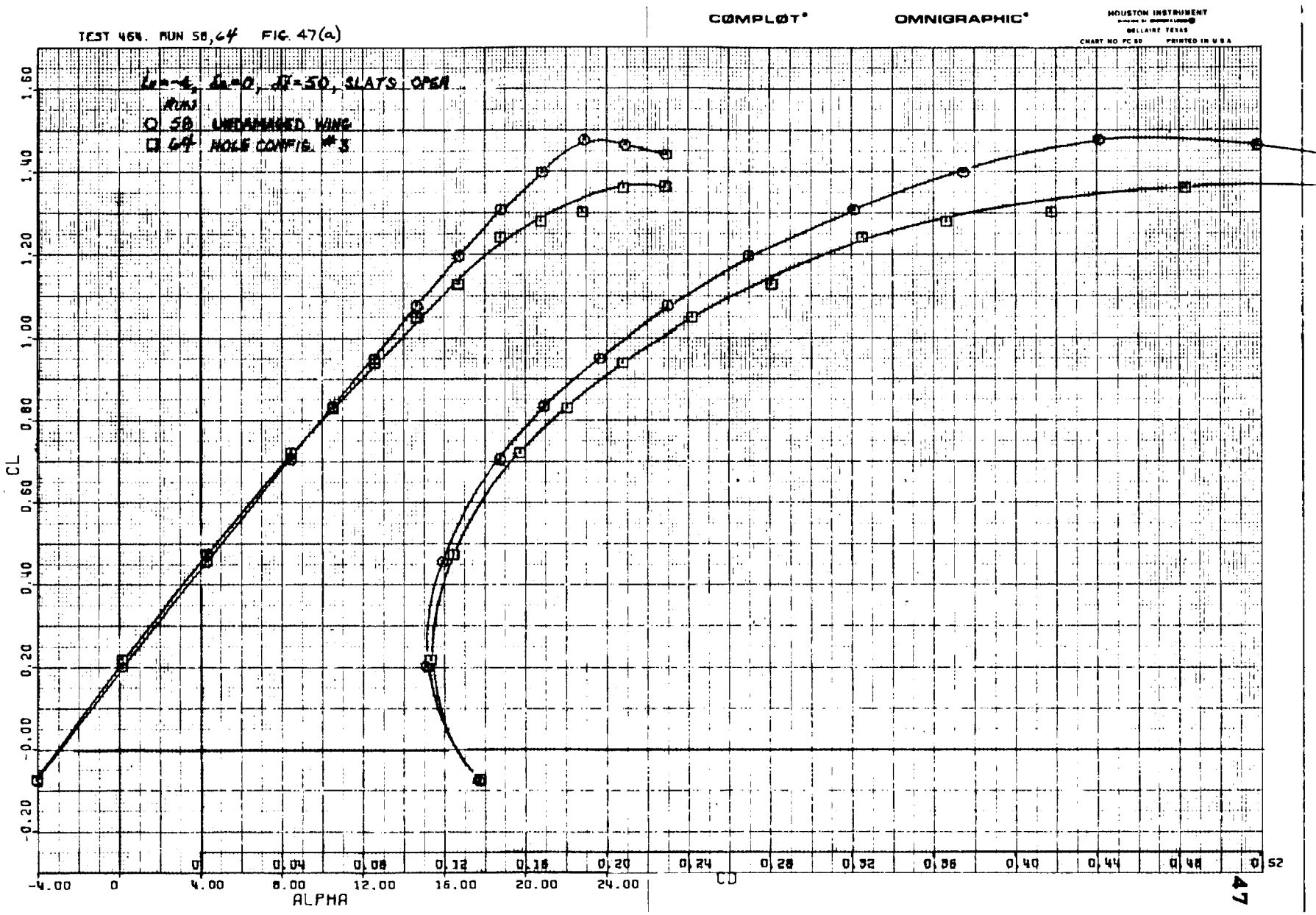

TEST 464. RUN 58,64 FIG. 47(a)
COMPLOT® OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. PC 50 PRINTED IN U.S.A.
i_w=-4, i_h=0, δ_f=50, SLATS OPEN
RUN
58 UNDAMAGED WING
64 HOLE CONFIG. #3
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
ALPHA
0
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
0.44
0.48
0.52
CD
47

Figure 47(a)

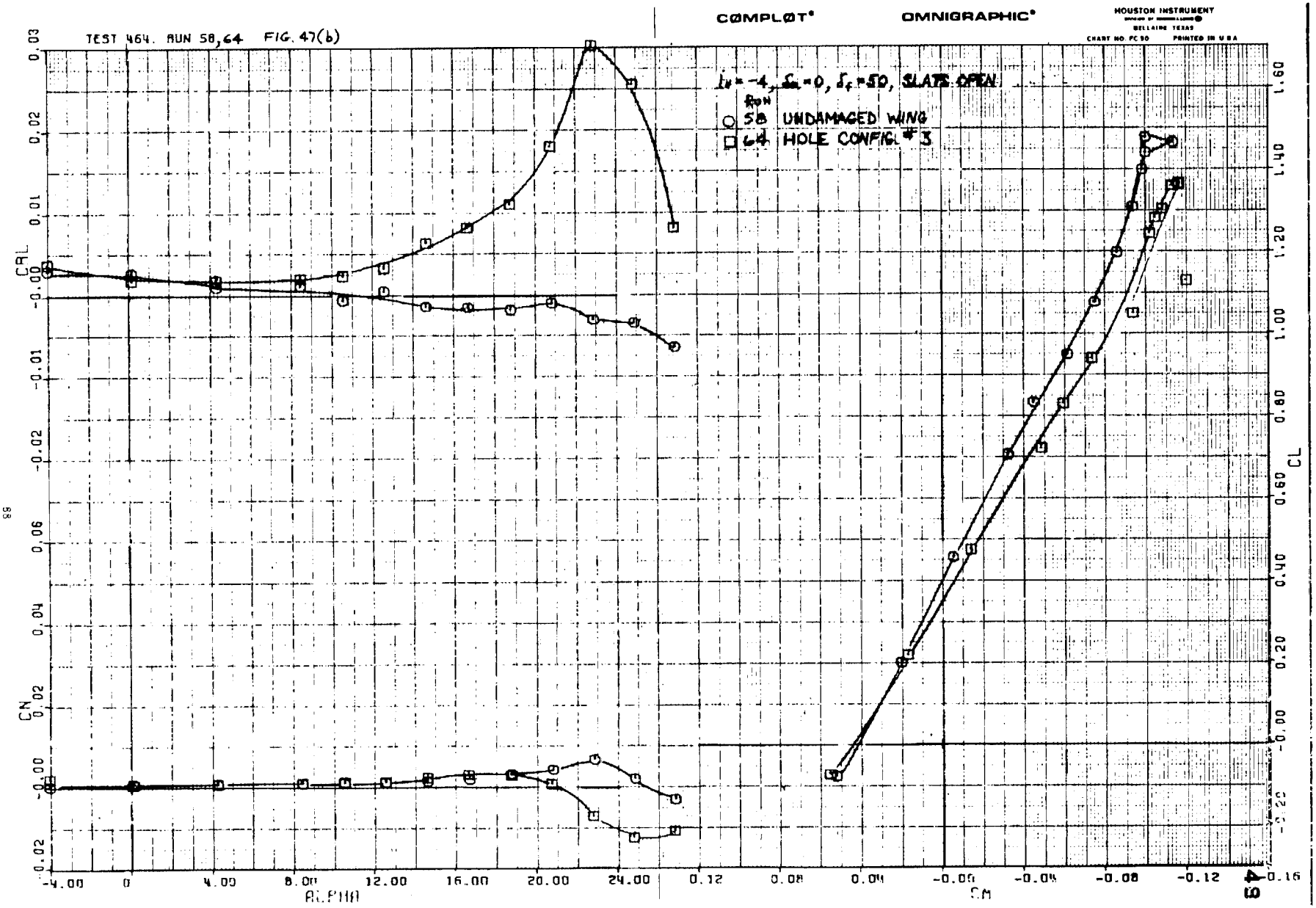

TEST 464. RUN 58,64 FIG. 47(b)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. PC 50
PRINTED IN U.S.A.
$i_w = -4$, $\delta_a = 0$, $\delta_f = 50$, SLATS OPEN
RUN
58 UNDAMAGED WING
64 HOLE CONFIG. #3
CRL
CN
CL
CM
ALPHA
0.03
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-0.16
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12

Figure 47(b)

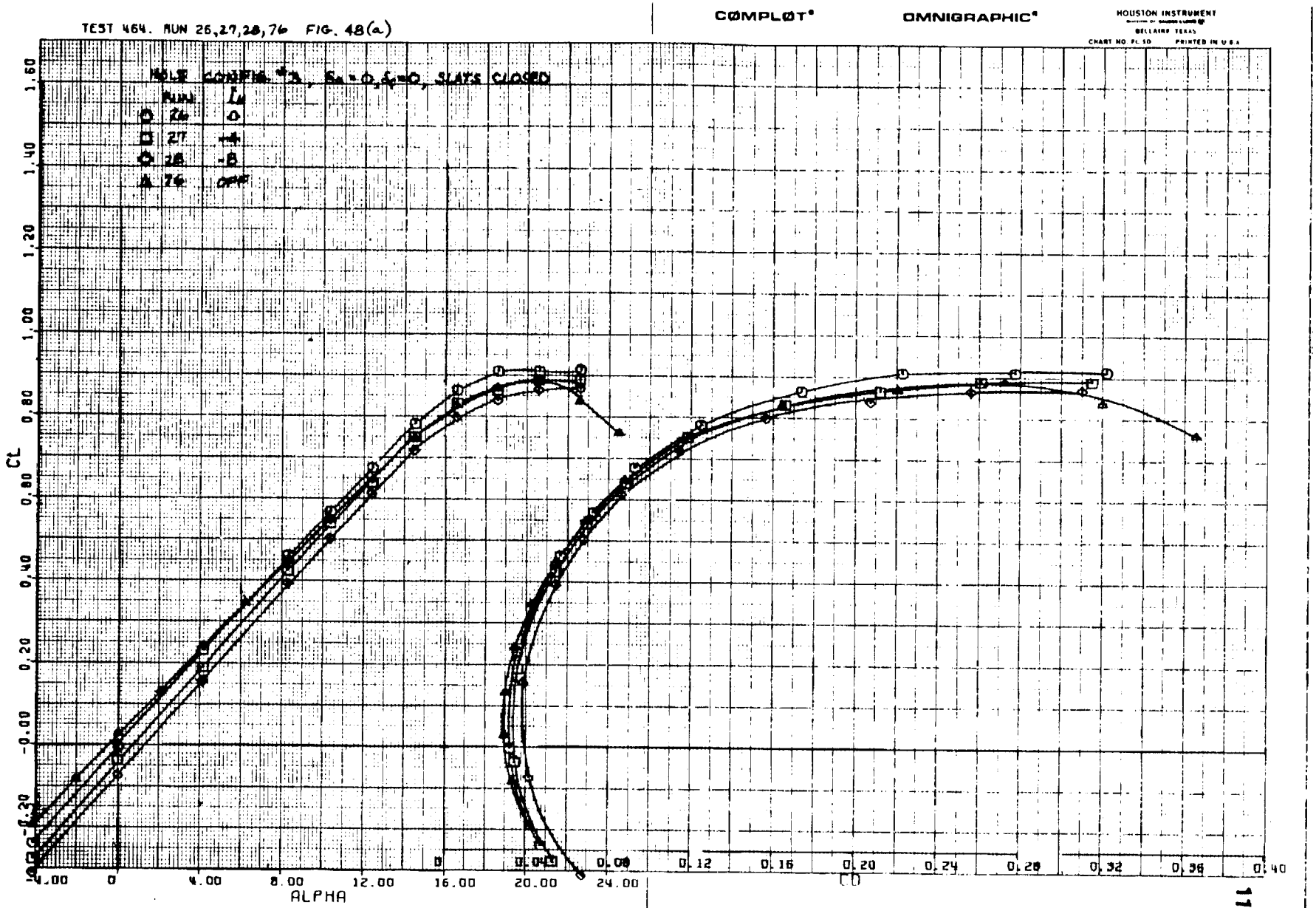

TEST 464. RUN 26,27,28,76 FIG. 48(a)
COMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. PL 50
PRINTED IN U.S.A.
RUN
26
27
28
76
CL
ALPHA
CD

Figure 48(a)

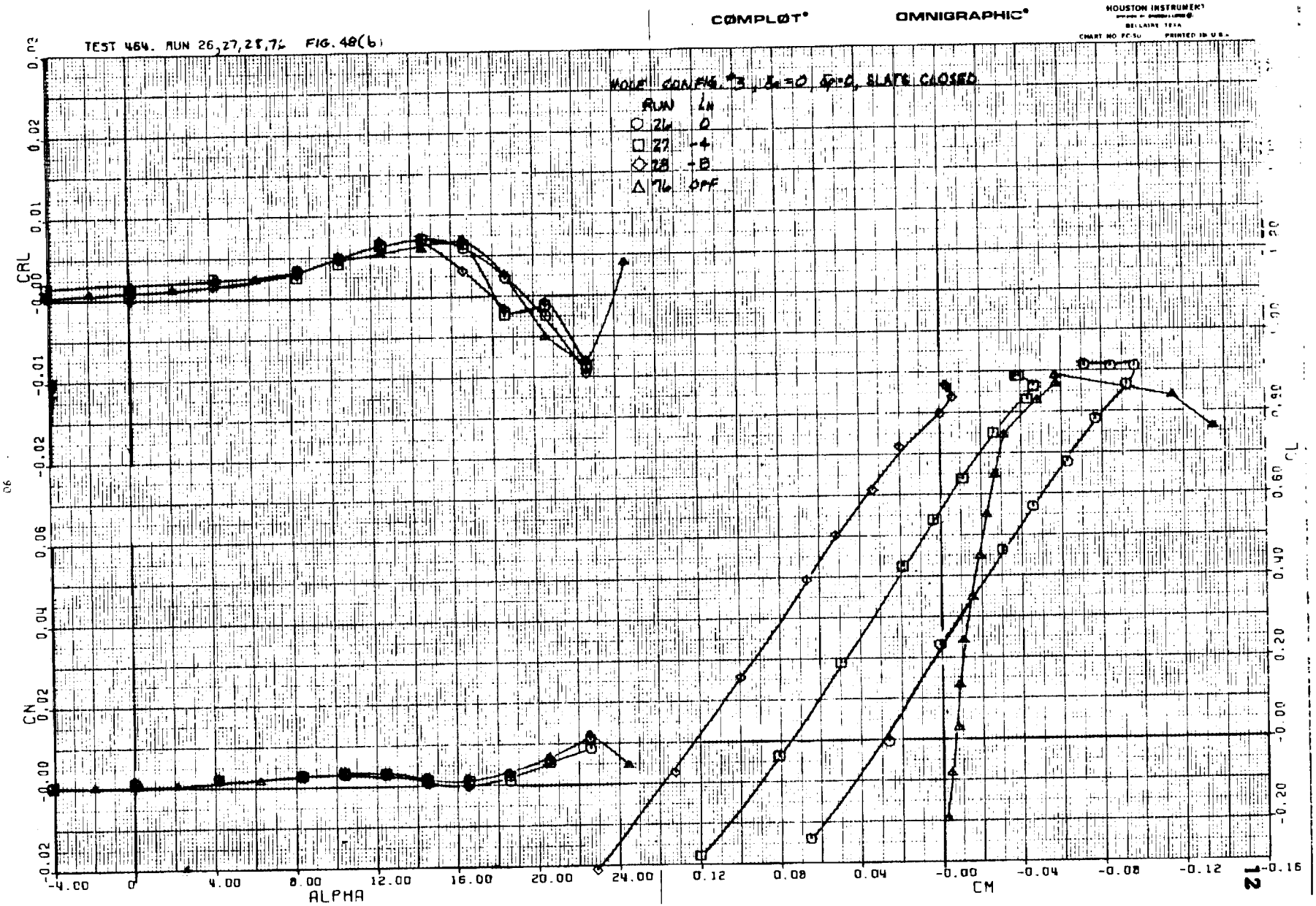

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 26,27,28,76 FIG. 48(b)
WING CONFIG. 3, δa=0, δf=0, SLATS CLOSED
RUN iH
26 0
27 -4
28 -8
76 OFF
CRL
CN
CL
ALPHA
CM
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 48(b)

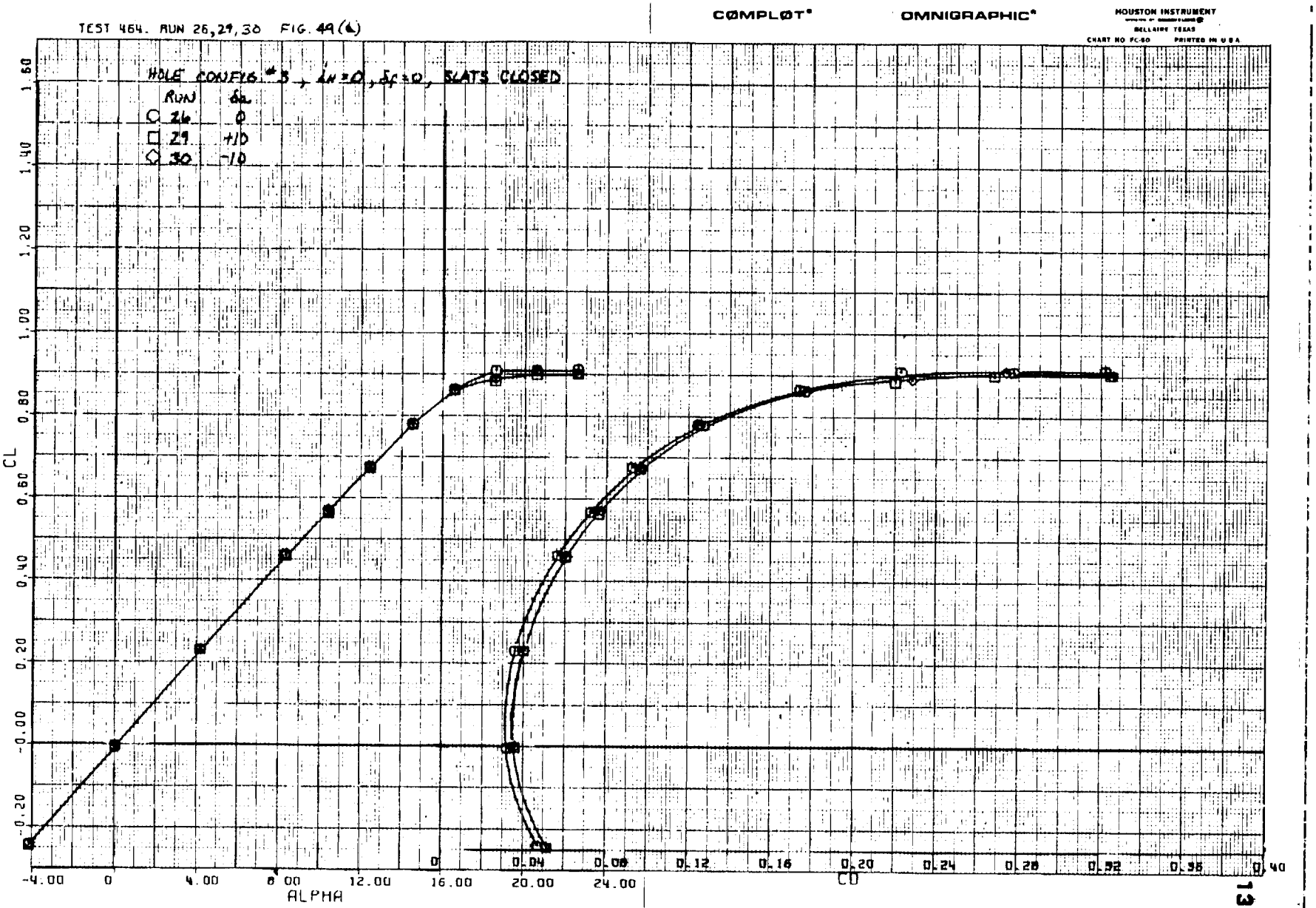

TEST 464. RUN 26,29,30 FIG. 49(a)
CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. FC-60
PRINTED IN U.S.A.
HOLE CONFIG. #3 → iN = 0, δf = 0, SLATS CLOSED
RUN δh
26 0
29 +10
30 -10
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 49(a)

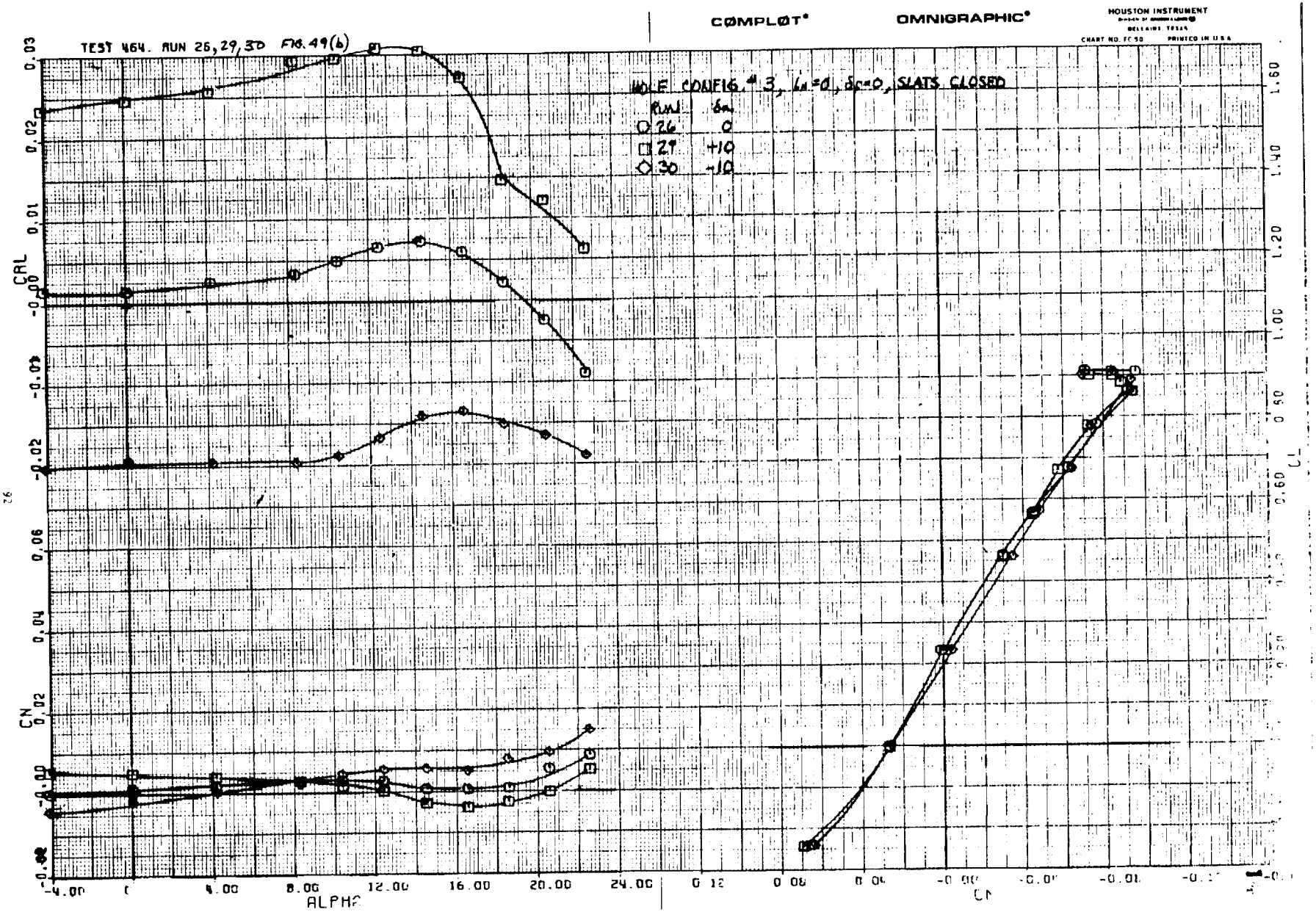

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 26,29,30 FIG.49(b)
WOLF CONFIG. #3, i_H=0, δ_F=0, SLATS CLOSED
Run δm
26 0
29 +10
30 -10
CRL
CN
CL
ALPHA
CM

Figure 49(b)

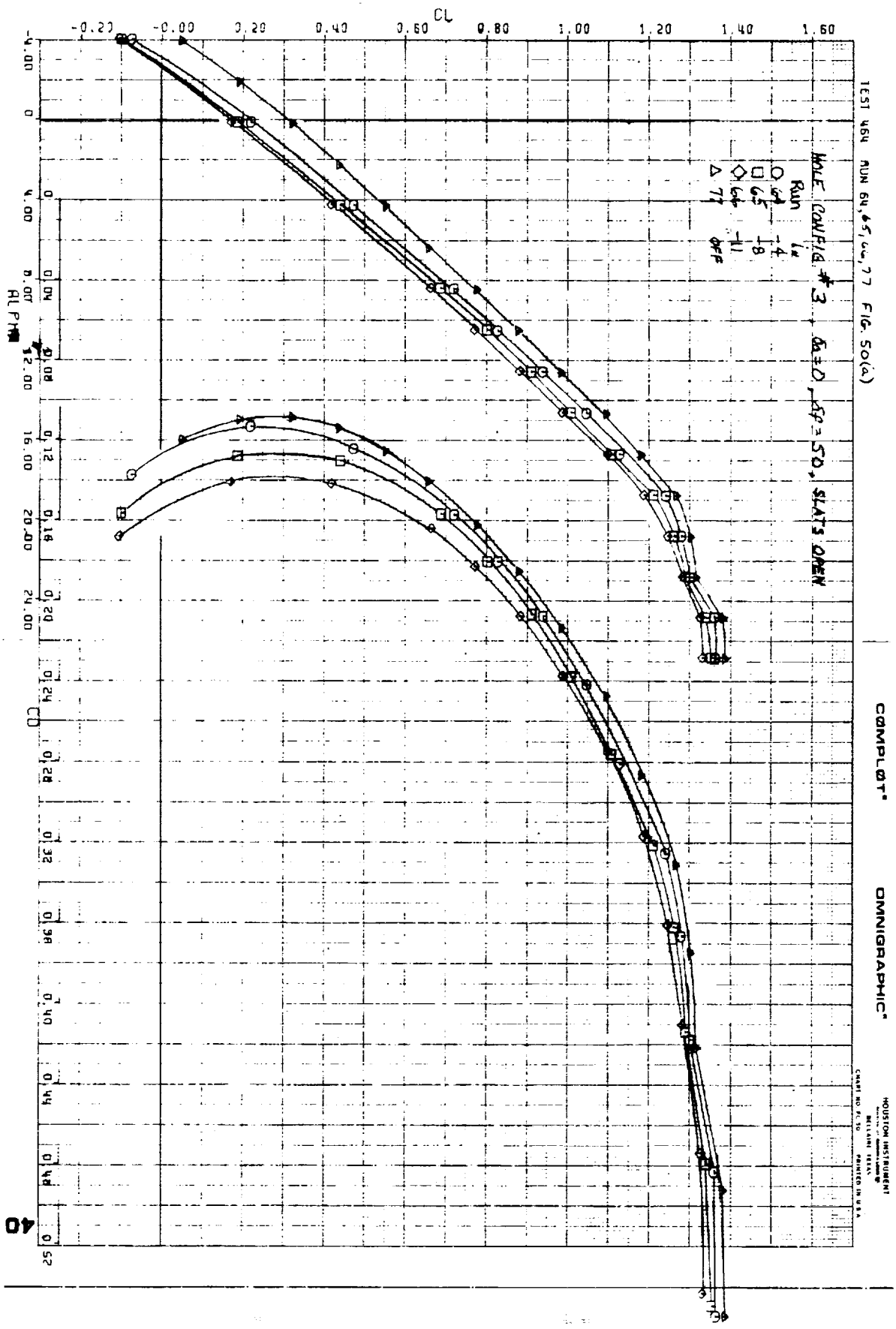

TEST 464 RUN 64,65,66,77 FIG. 50(a)
WING CONFIG. #3 δa=0 δf=50 SLATS OPEN
Run
64
65
66
77
-4
-8
-11
OFF
CL
CD
ALPHA
-0.20
-0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
0.44
0.48
0.52
COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
BELLAIRE, TEXAS
CHART NO. FC-50
PRINTED IN U.S.A.

Figure 50(a)

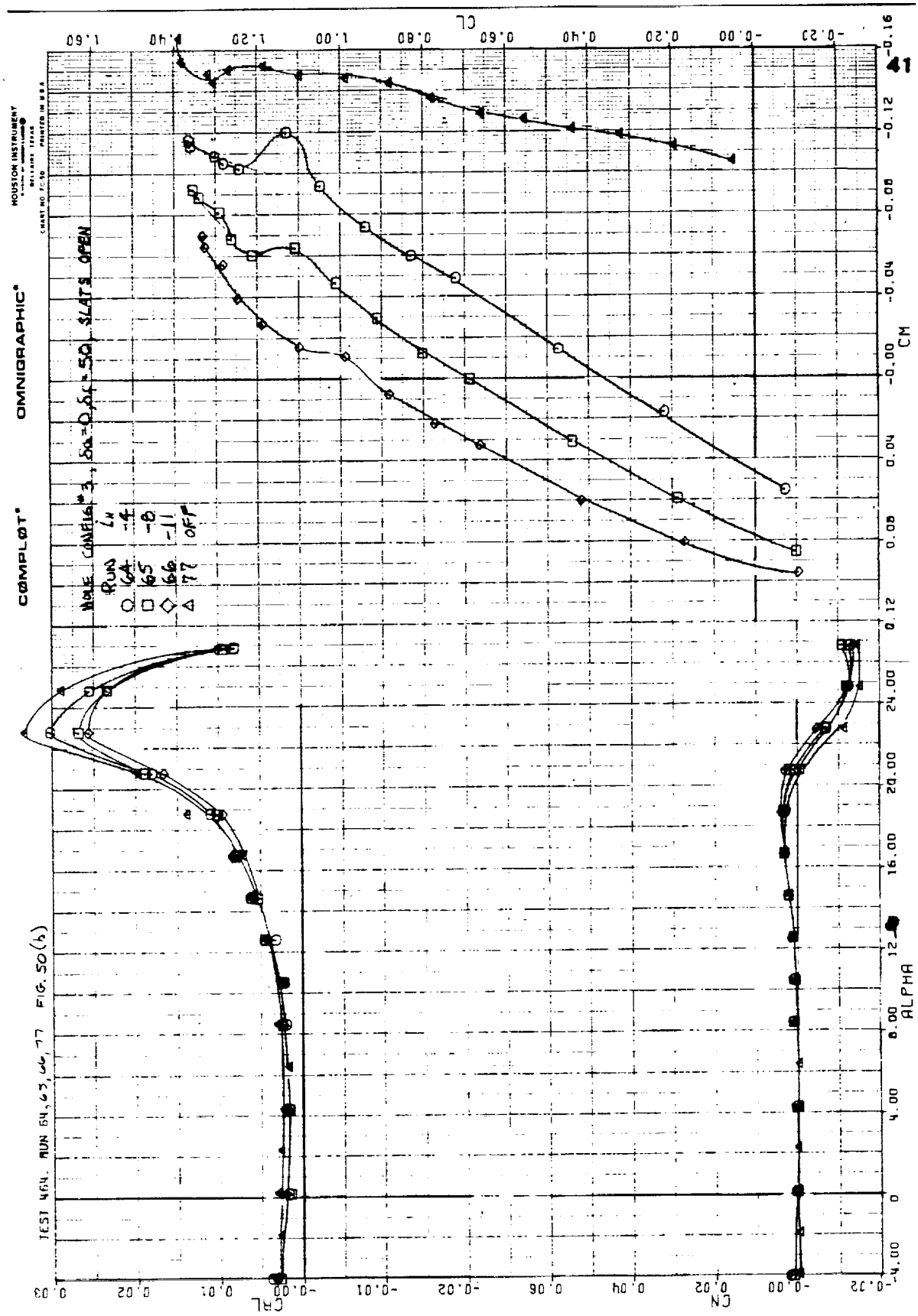


Figure 50(b)

C.2

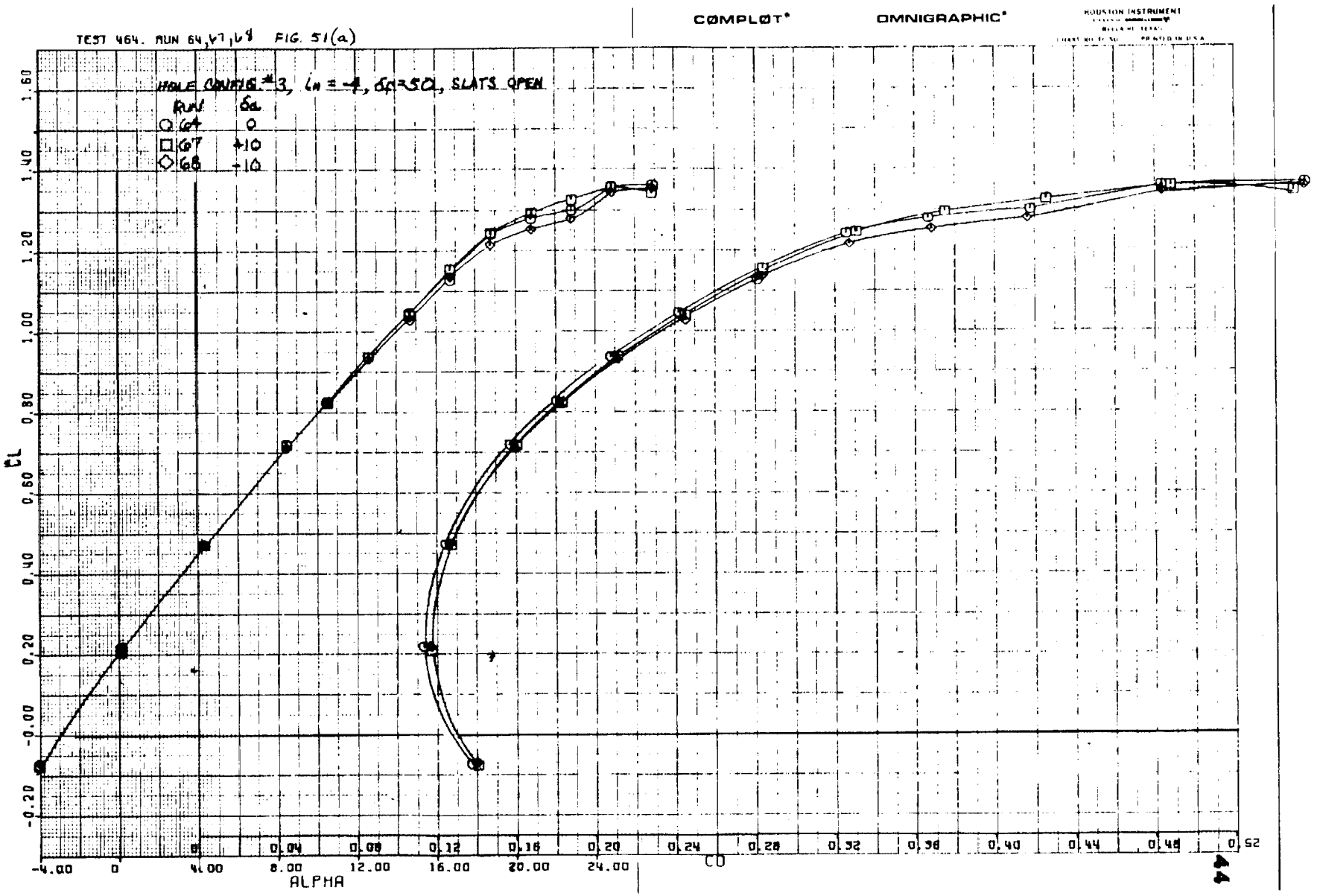

TEST 464. RUN 64,67,68 FIG. 51(a)
HOLE COVERS #3, $i_H = -4$, $\delta_f = 50$, SLATS OPEN
RUN δa
64 0
67 +10
68 -10
CEMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
0.44
0.48
0.52

Figure 51(a)

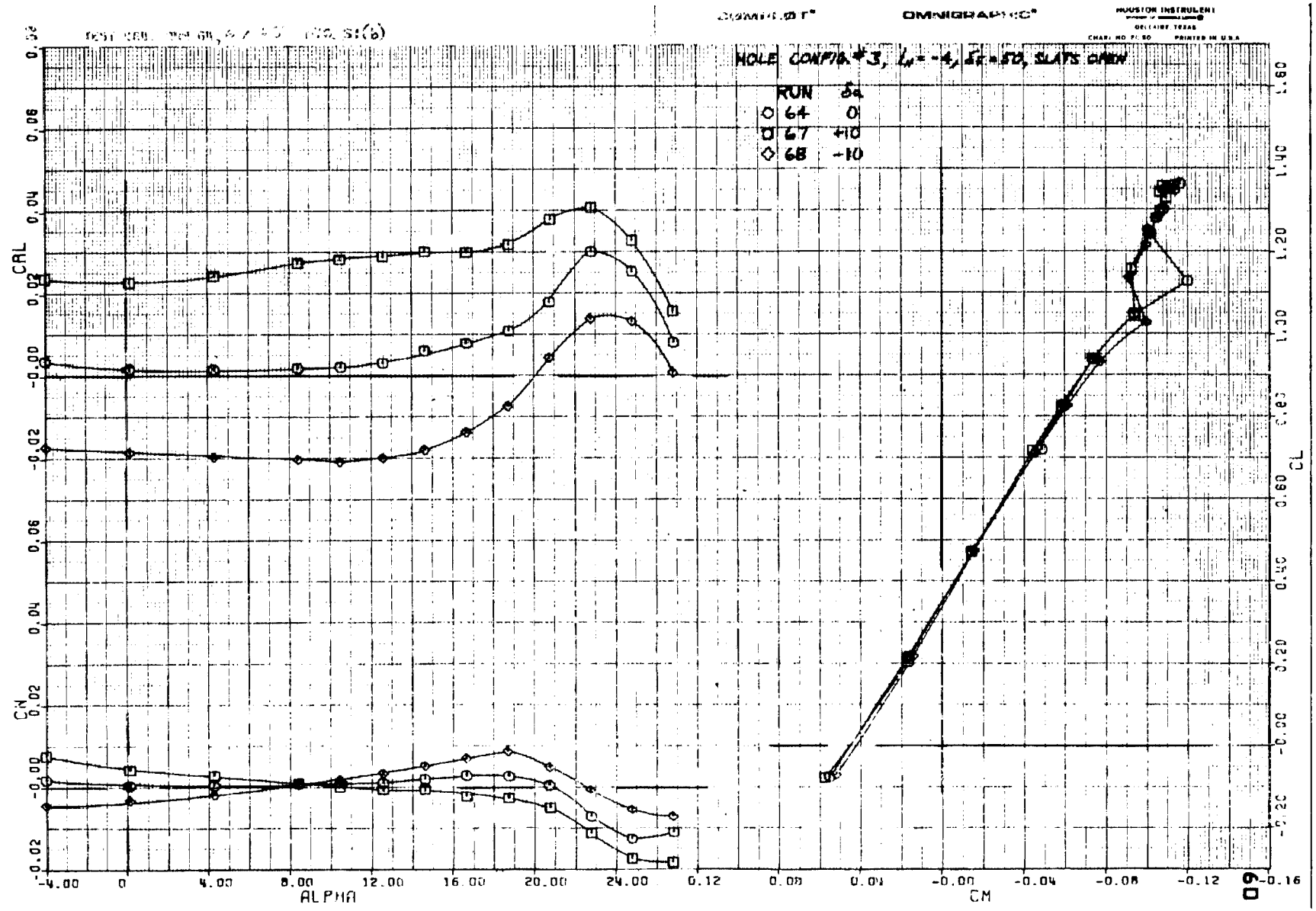

HOLE CONFIG #3, i_w = -4, δ_F = 50, SLATS OPEN
RUN δ_A
64 0
67 +10
68 -10
CN
CAL
ALPHA
CM
CL

Figure 51(b)

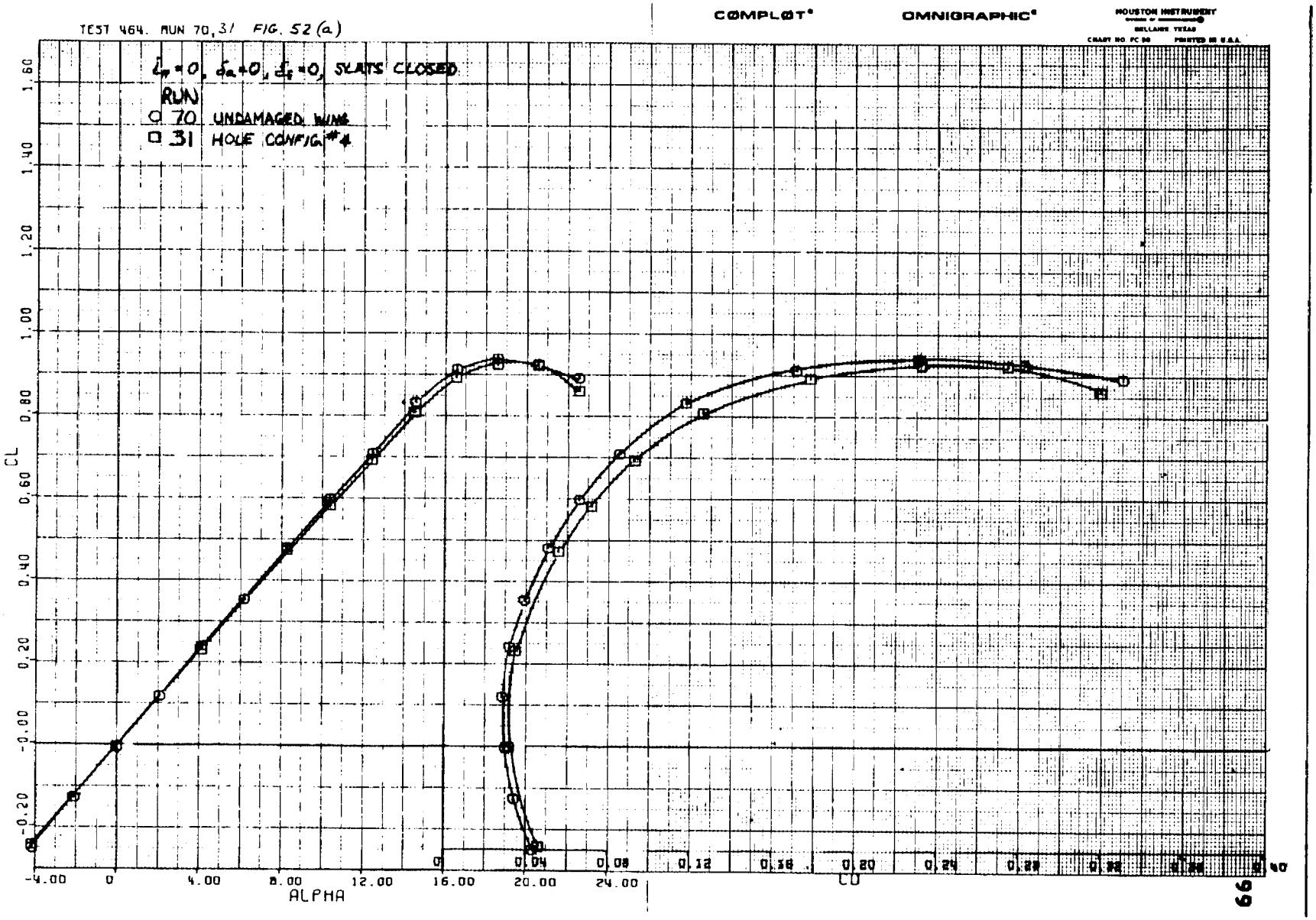

TEST 464. RUN 70, 31 FIG. 52 (a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
$\delta_f = 0$, $\delta_a = 0$, $\delta_r = 0$, SLATS CLOSED
RUN
70 UNDAMAGED WING
31 HOLE CONFIG #4
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
66

Figure 52(a)

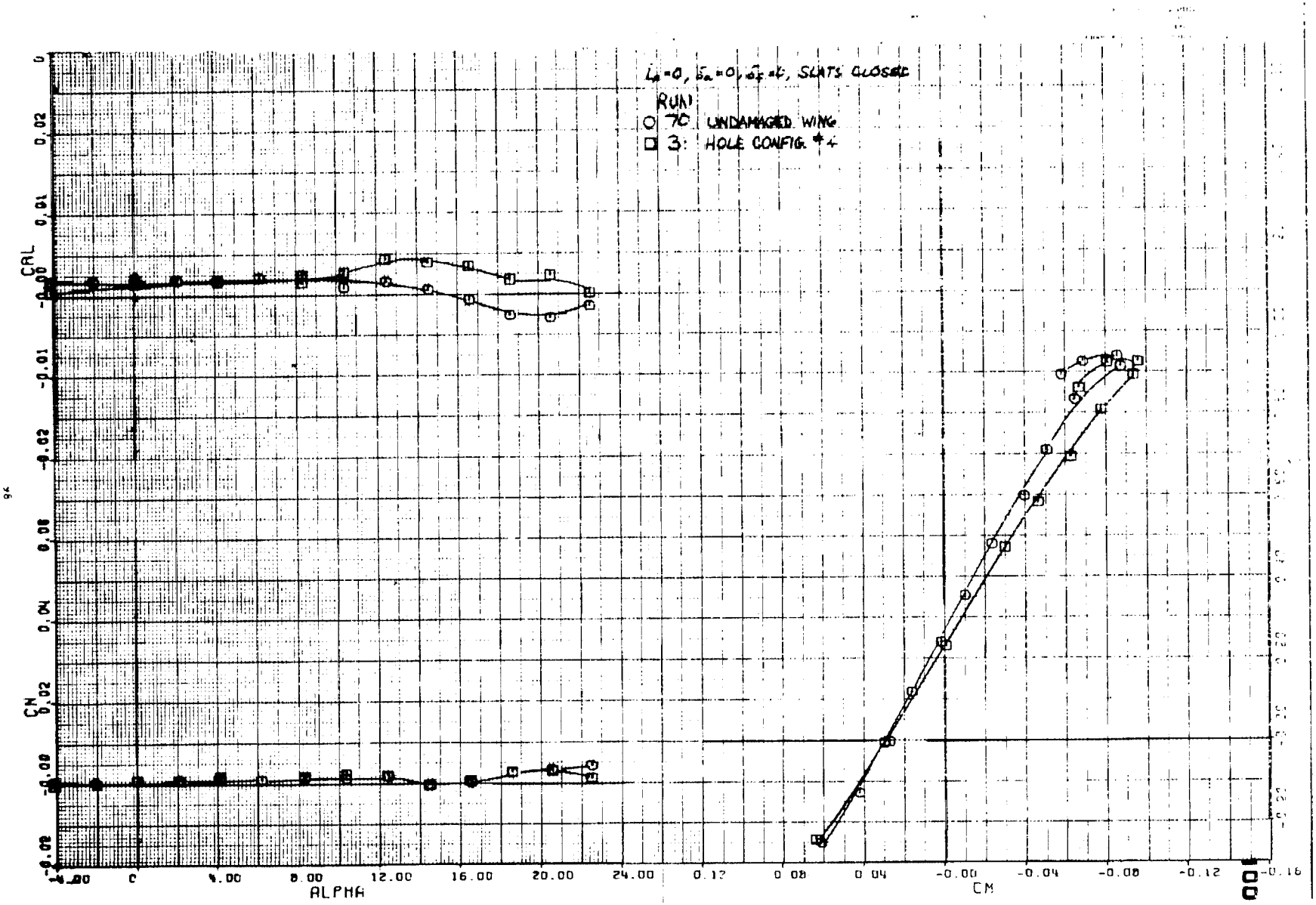

L_g=0, δ_a=0, δ_f=0, SLATS CLOSED
RUN
70 UNDAMAGED WING
3: HOLE CONFIG. #4
CAL
CN
ALPHA
CM
0.02
0.01
0.00
-0.01
-0.02
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04

Figure 52(b)

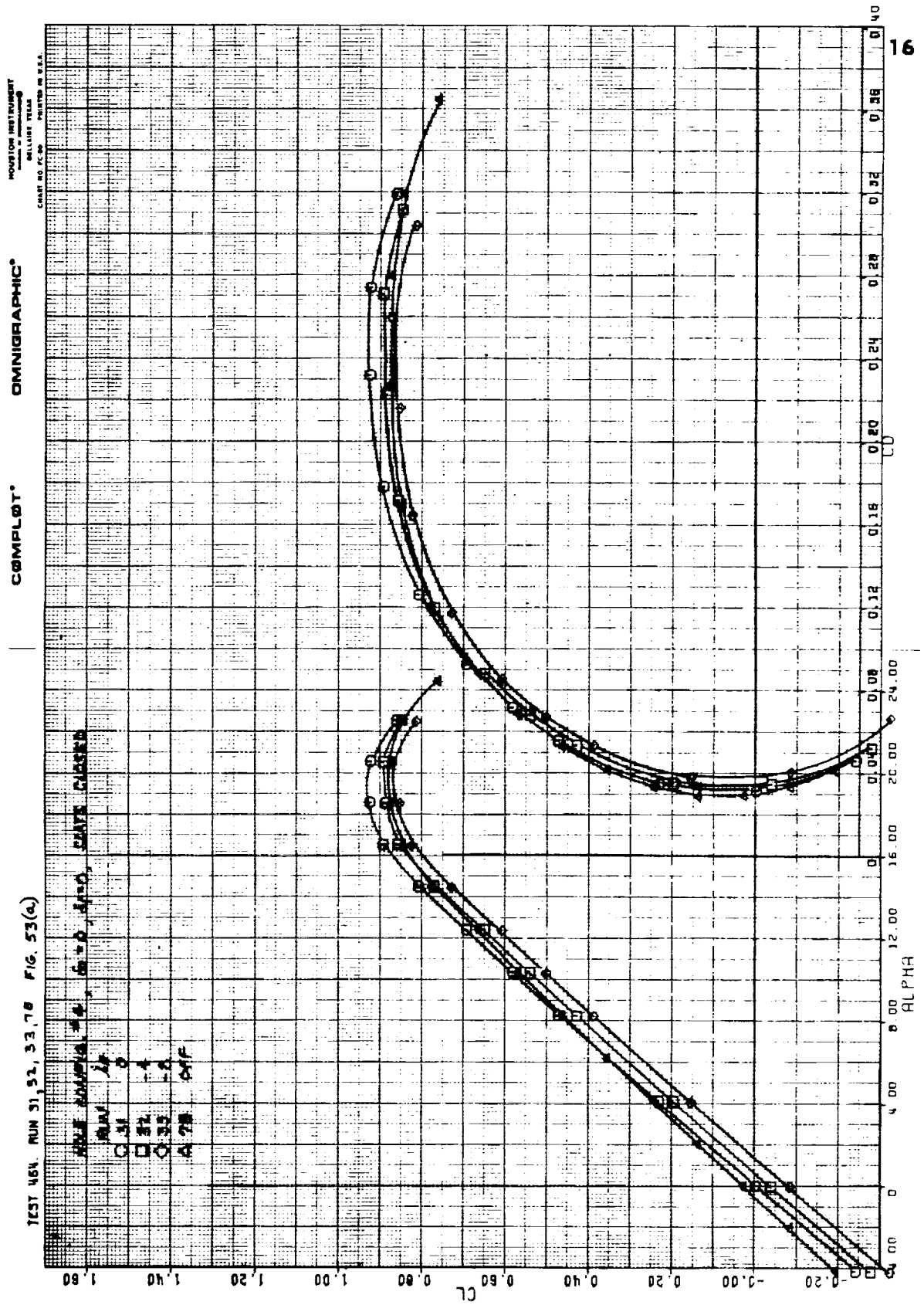
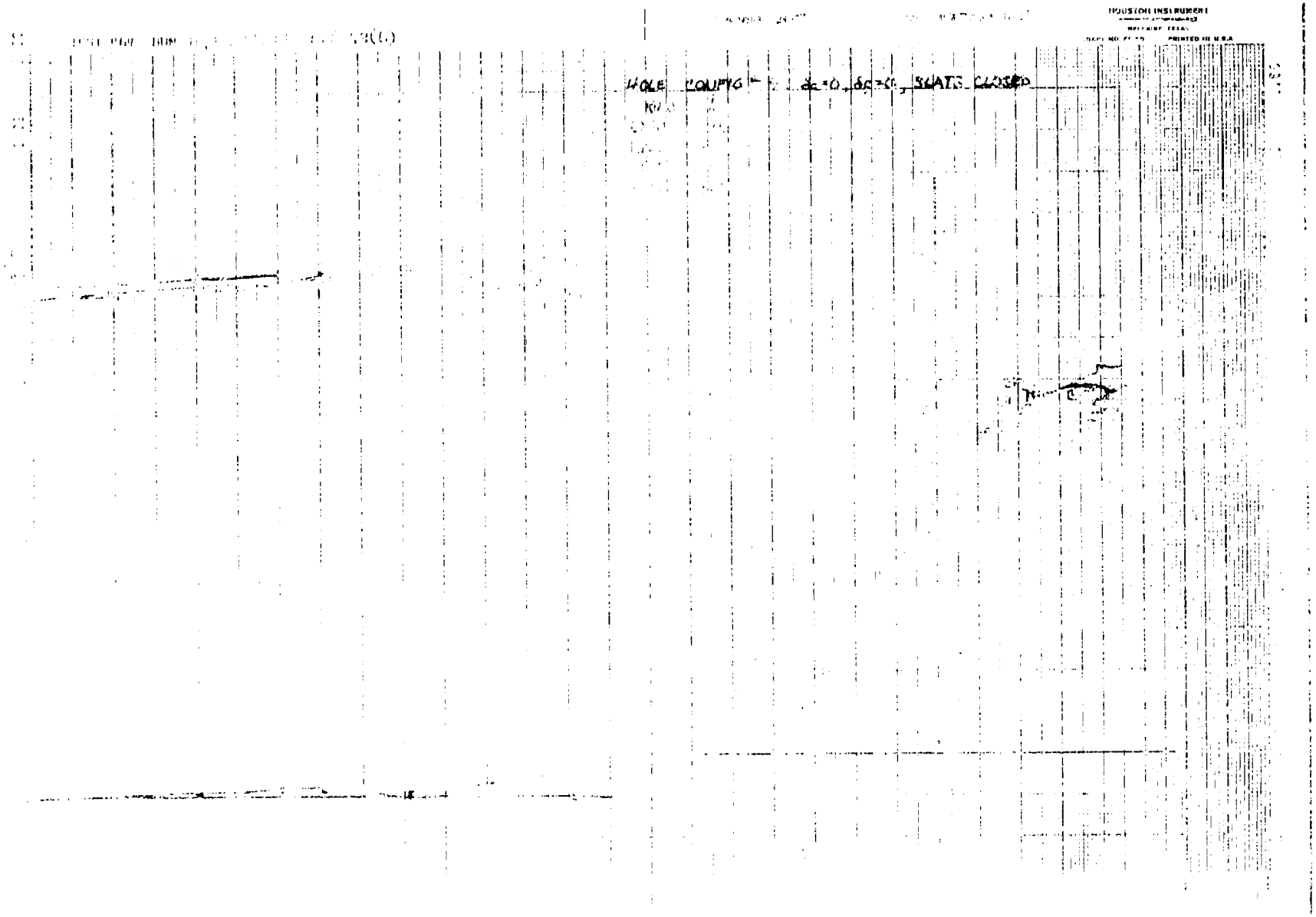
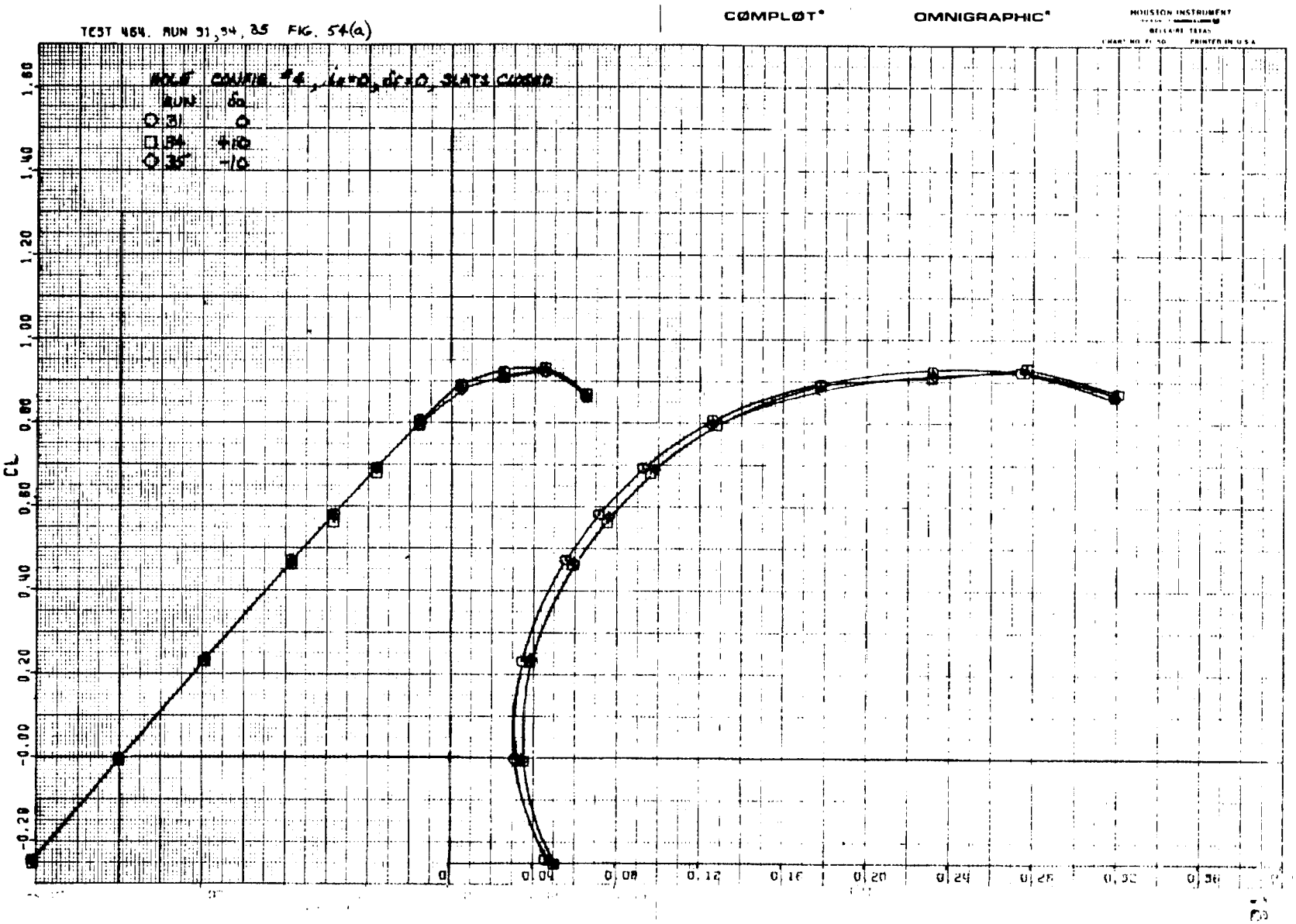


Figure 53(a)


WOLF COUPLG
SEATS CLOSED


TEST 464. RUN 31, 34, 35 FIG. 54(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
PRINTED IN U.S.A.
WING CONFIG. #6, i_t=0, δ_f=0, SLATS CLOSED
RUN δ_e
31 0
34 +10
35 -10
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
0
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36

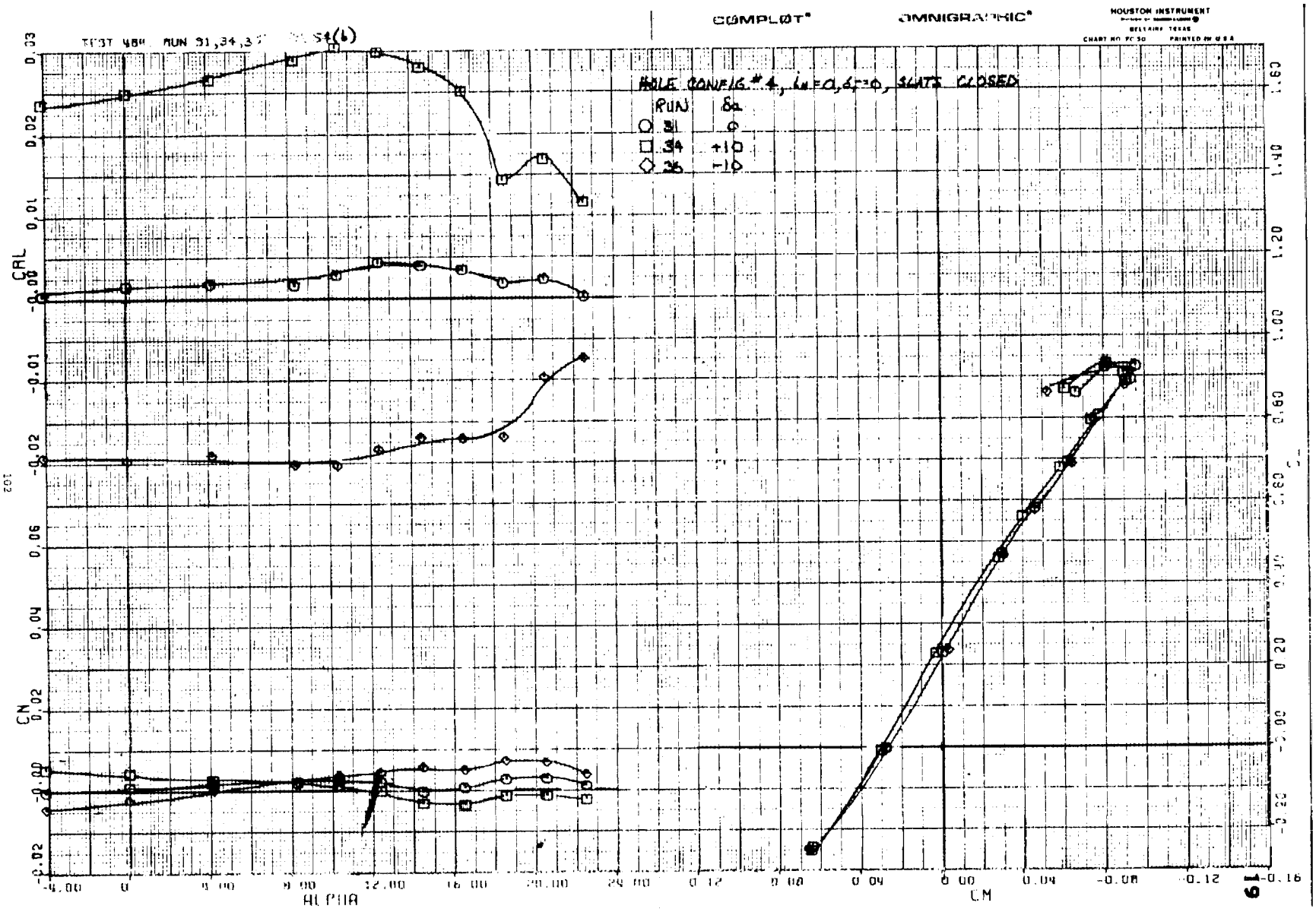

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 48H RUN 31,34,3? 54(b)
HOLE CONFIG.#4, iw=0,δf=0, SLATS CLOSED
RUN δa
31 0
34 +10
36 -10
CRL
CN
CM
ALPHA
0.03
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
0.00
0.04
-0.08
-0.12
-0.16
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20

Figure 54(b)

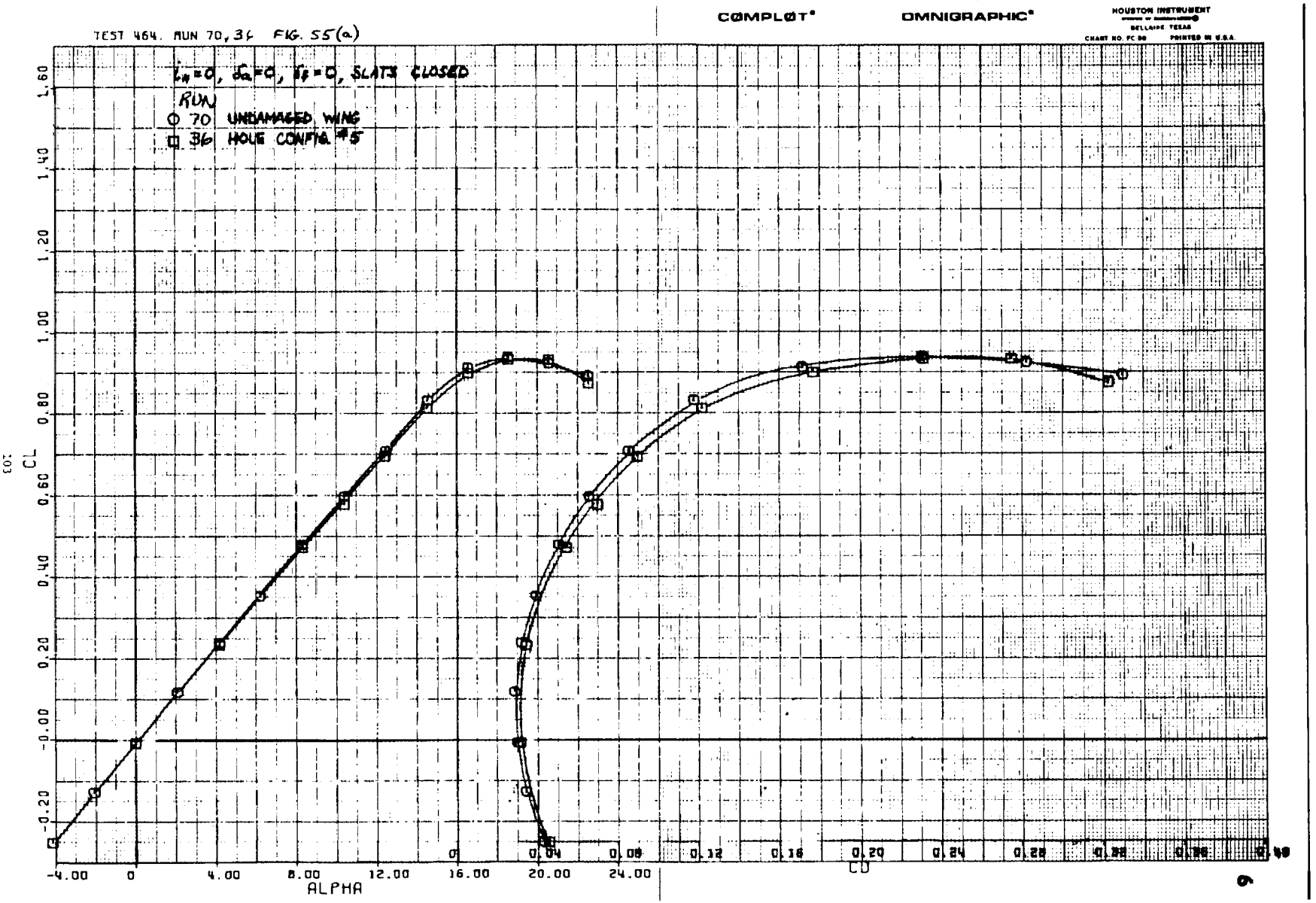

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 70, 36 FIG. 55(a)
i_H=0, δ_a=0, δ_F=0, SLATS CLOSED
RUN
70 UNDAMAGED WING
36 HOLE CONFIG #5
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28

Figure 55(a)

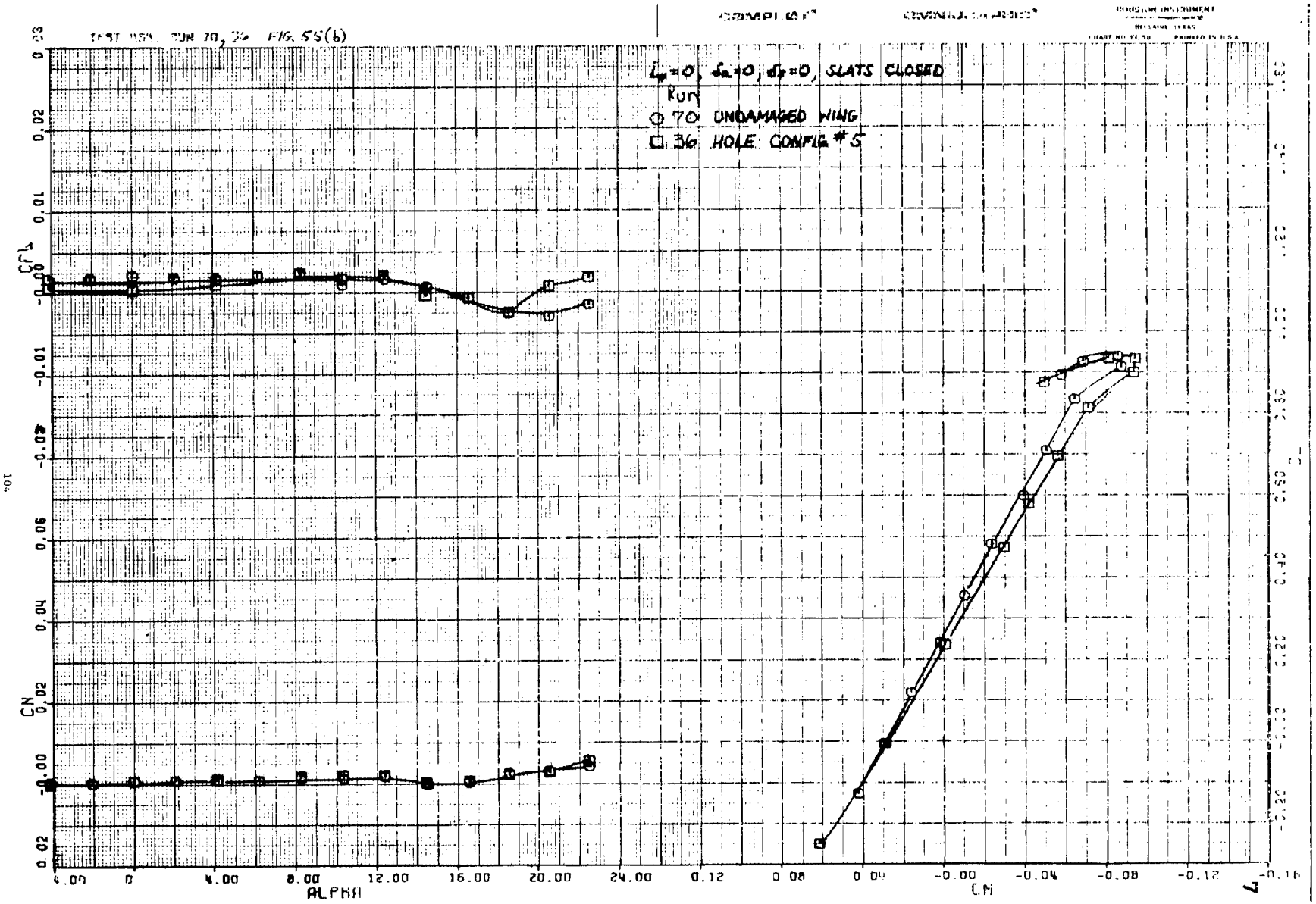


FIG. 55(b)
i_w=0, δ_a=0, δ_f=0, SLATS CLOSED
Run
○ 70 UNDAMAGED WING
□ 36 HOLE CONFIG #5
CRL
CN
ALPHA
CM

Figure 55(b)

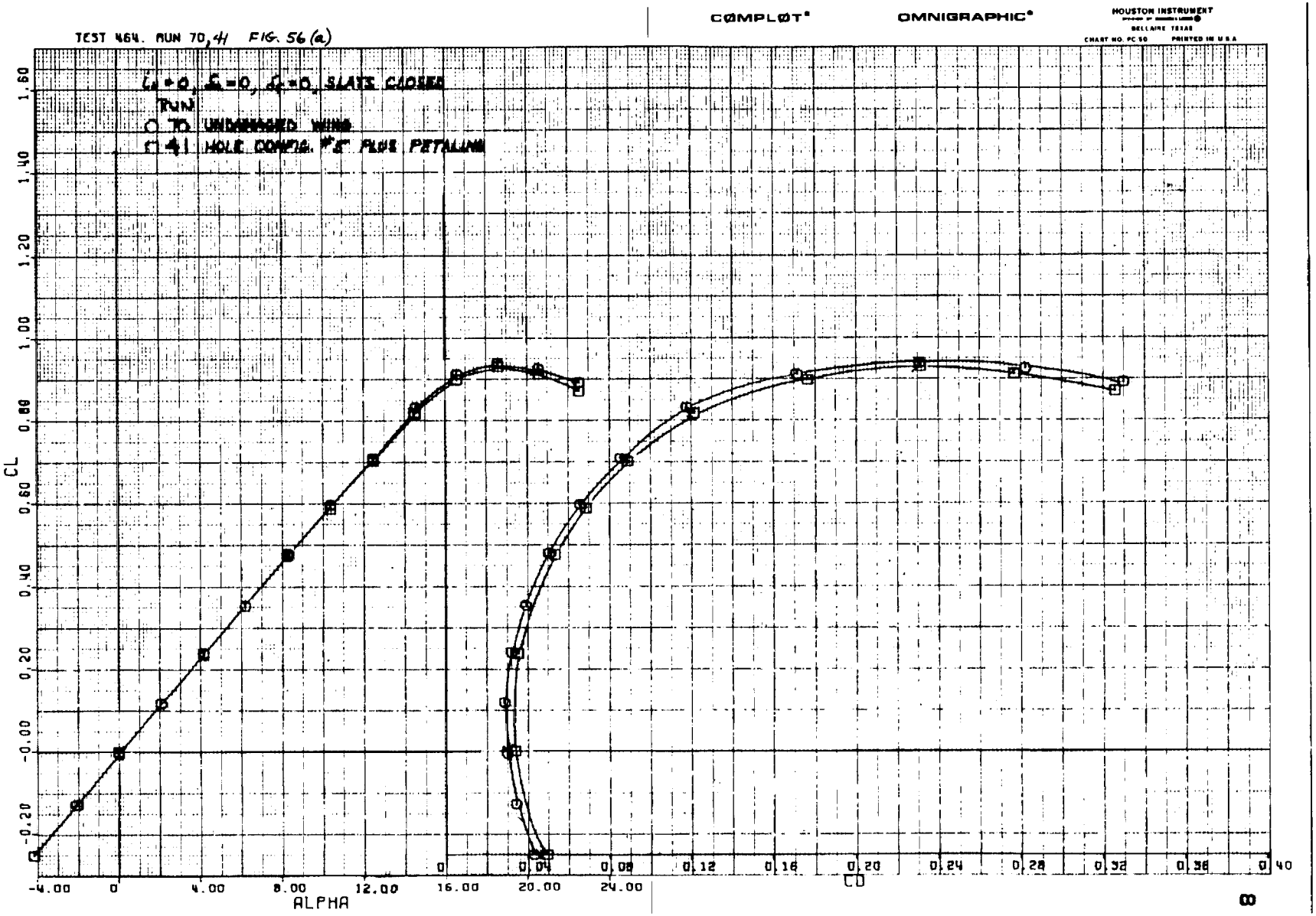

TEST 464. RUN 70,71 FIG. 56(a)
CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. PC 50
PRINTED IN U.S.A.
$i_H = 0$, $\delta_e = 0$, $\delta_f = 0$, SLATS CLOSED
RUN
70 UNDAMAGED WING
71 HOLE CENTER "F" FLAP PETALING
CL
ALPHA
CD
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
-0.20
-0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 56(a)

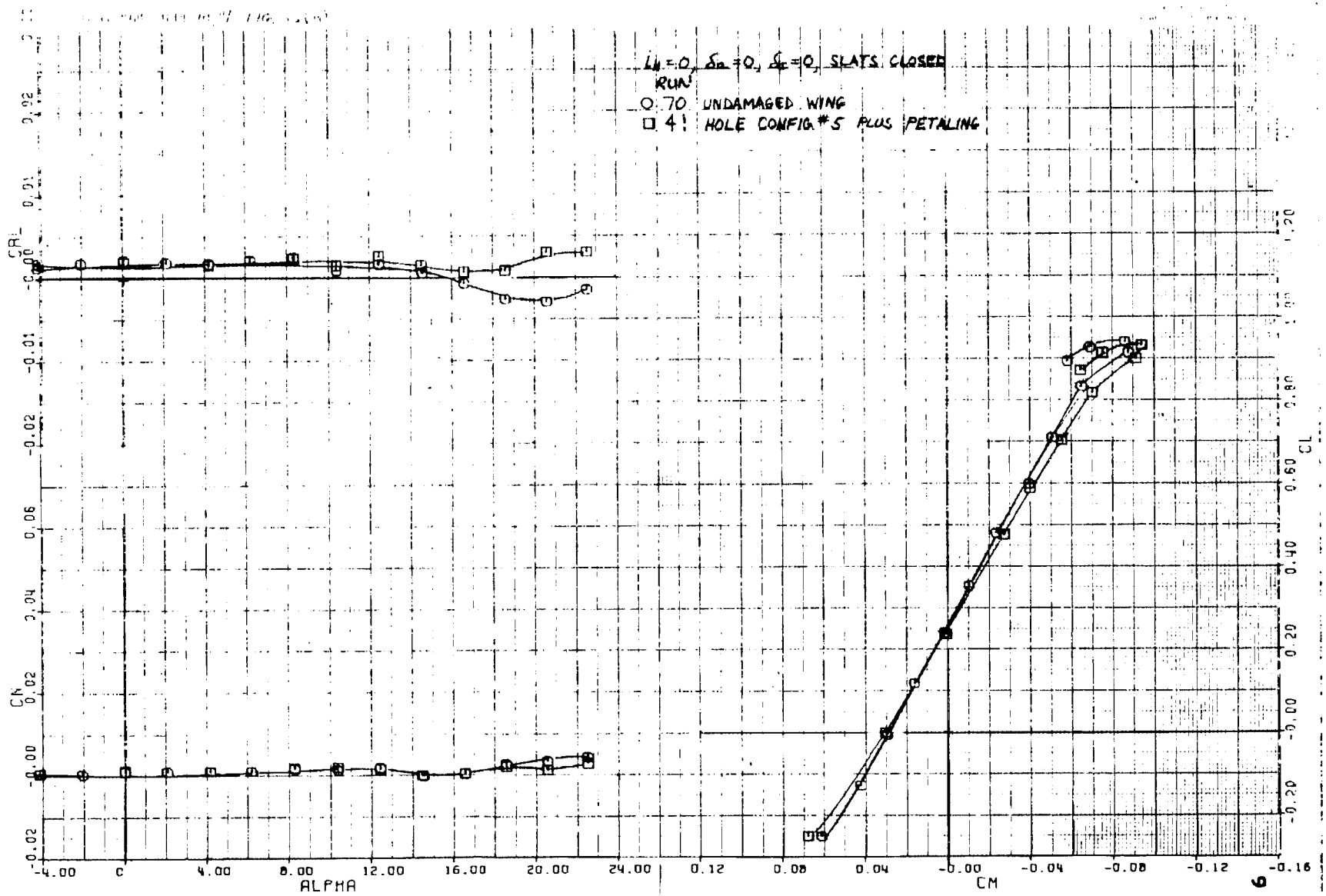

$i_H = 0$, $\delta_a = 0$, $\delta_f = 0$, SLATS CLOSED
RUN
○ 70 UNDAMAGED WING
□ 41 HOLE CONFIG #5 PLUS PETALING
CRL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16
0.92
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
6

Figure 56(b)

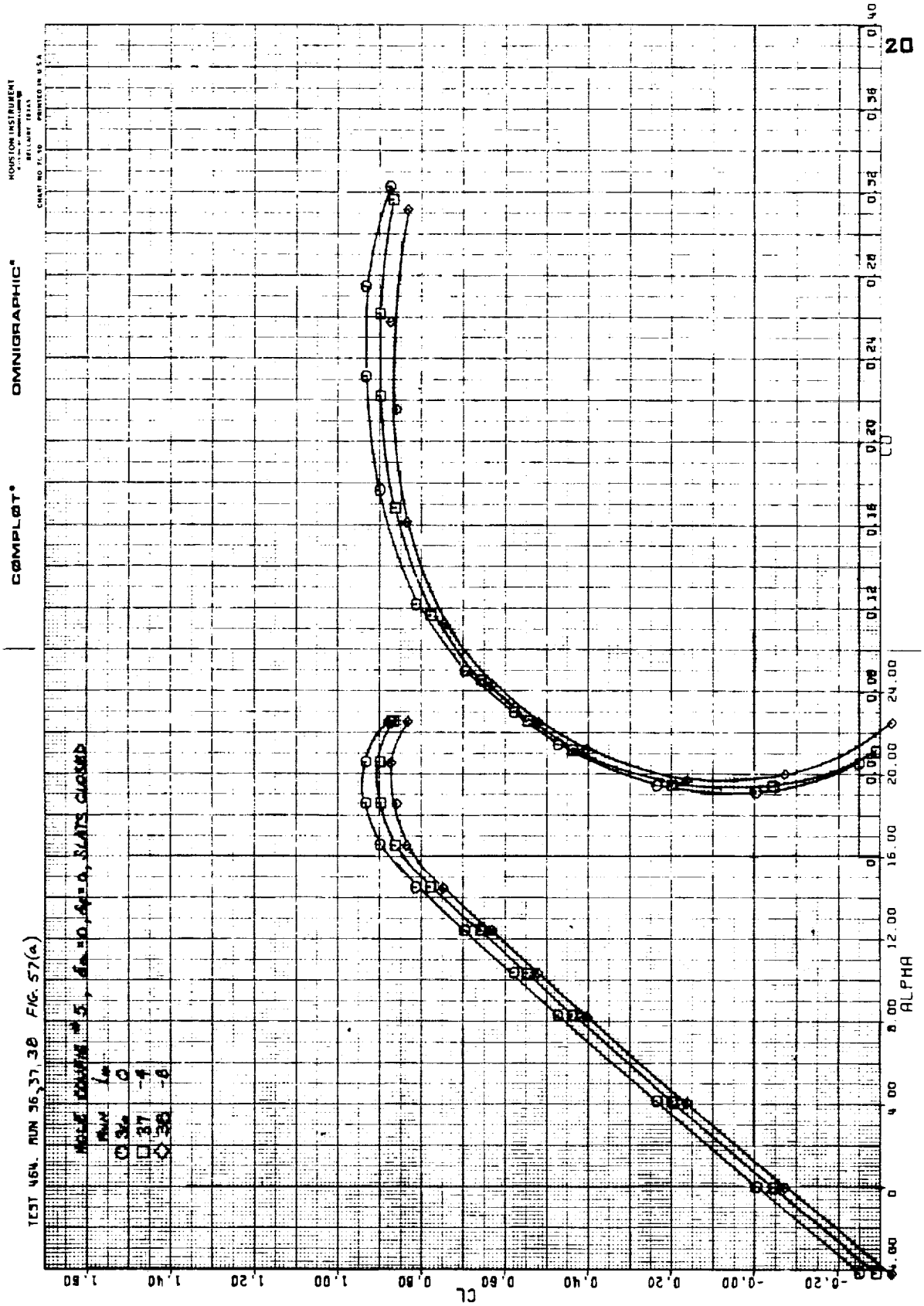
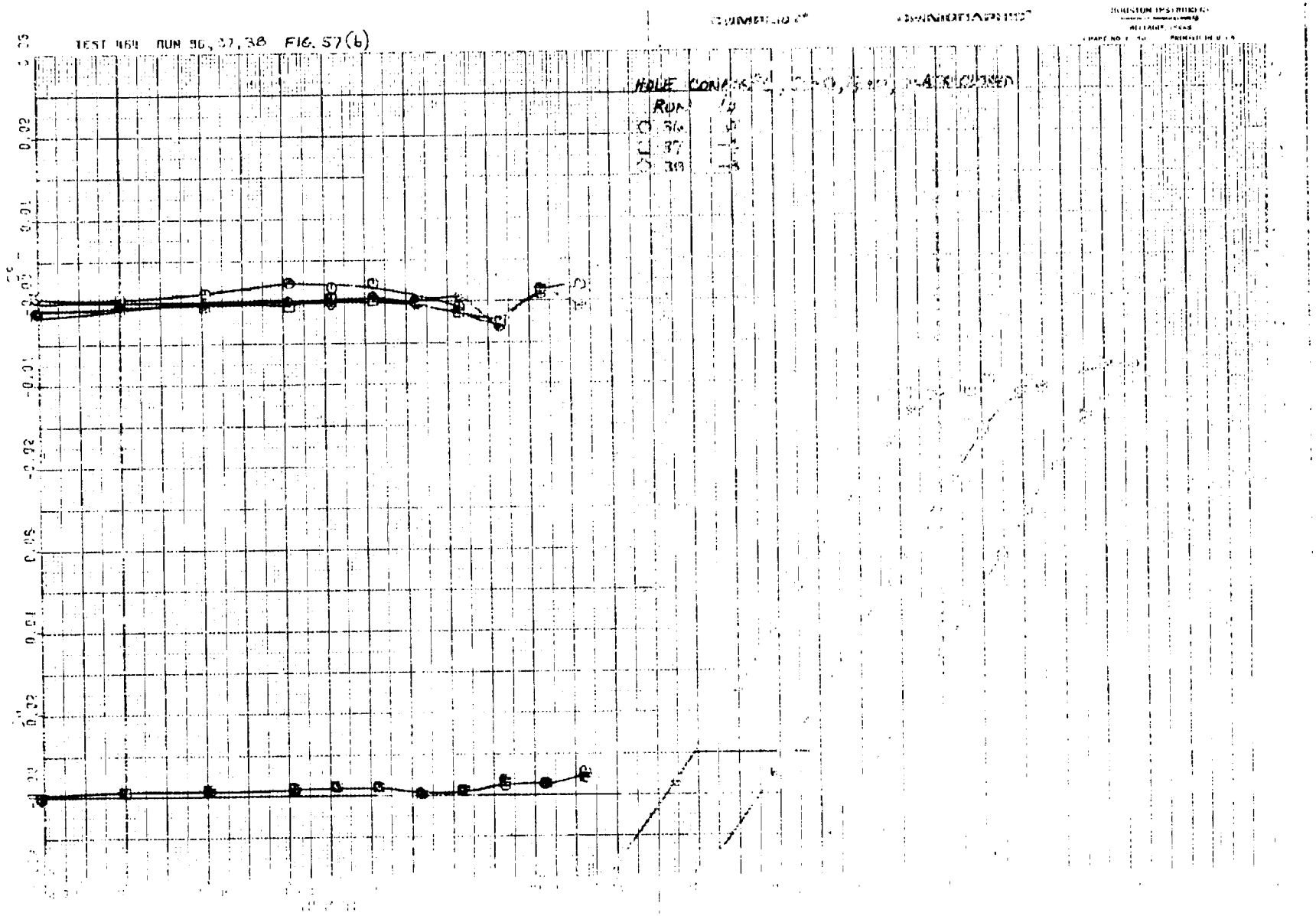

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
CHART NO. 7, 10
PRINTED IN U.S.A.
TEST 464. RUN 36,37,38 FIG. 57(a)
CL
ALPHA
20

Figure 57(a)


TEST 464 RUN 36, 37, 38 FIG. 57(b)
HOLLE CONE
RUN
36
37
38
0.02
0.01
-0.01
-0.02

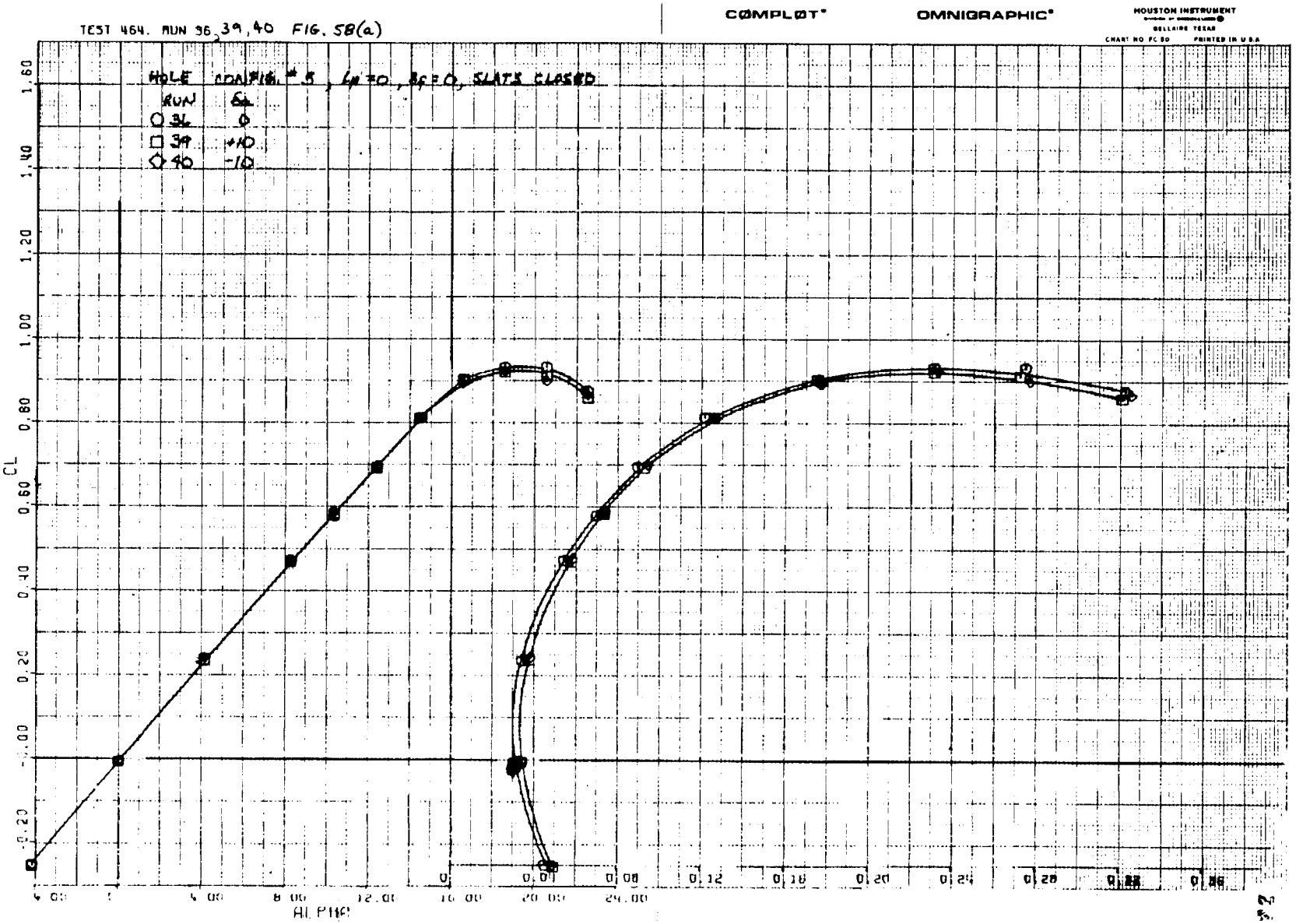

TEST 464. RUN 36, 39, 40 FIG. 58(a)
CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
HOLE CONFIG. #5, i_w=0, δ_f=0, SLATS CLOSED
RUN δs
36 0
39 +10
40 -10
CL
ALPHA

Figure 58.a

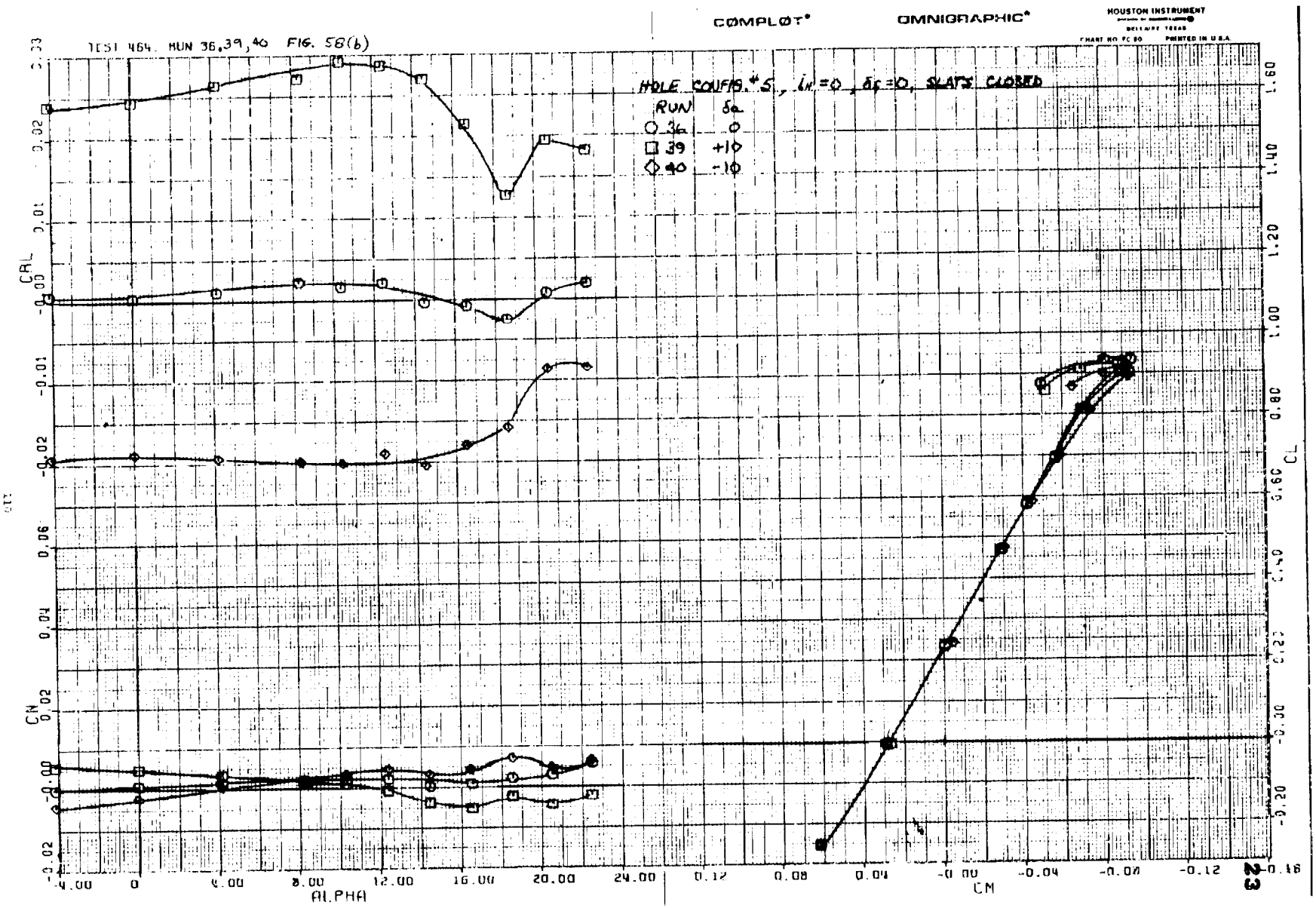

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 36,39,40 FIG. 58(b)
HOLE COUPS. #5, i_H=0, δ_f=0, SLATS CLOSED
RUN δe
36 0
39 +10
40 -10
CRL
CN
CL
CM
ALPHA

Figure 58(b)

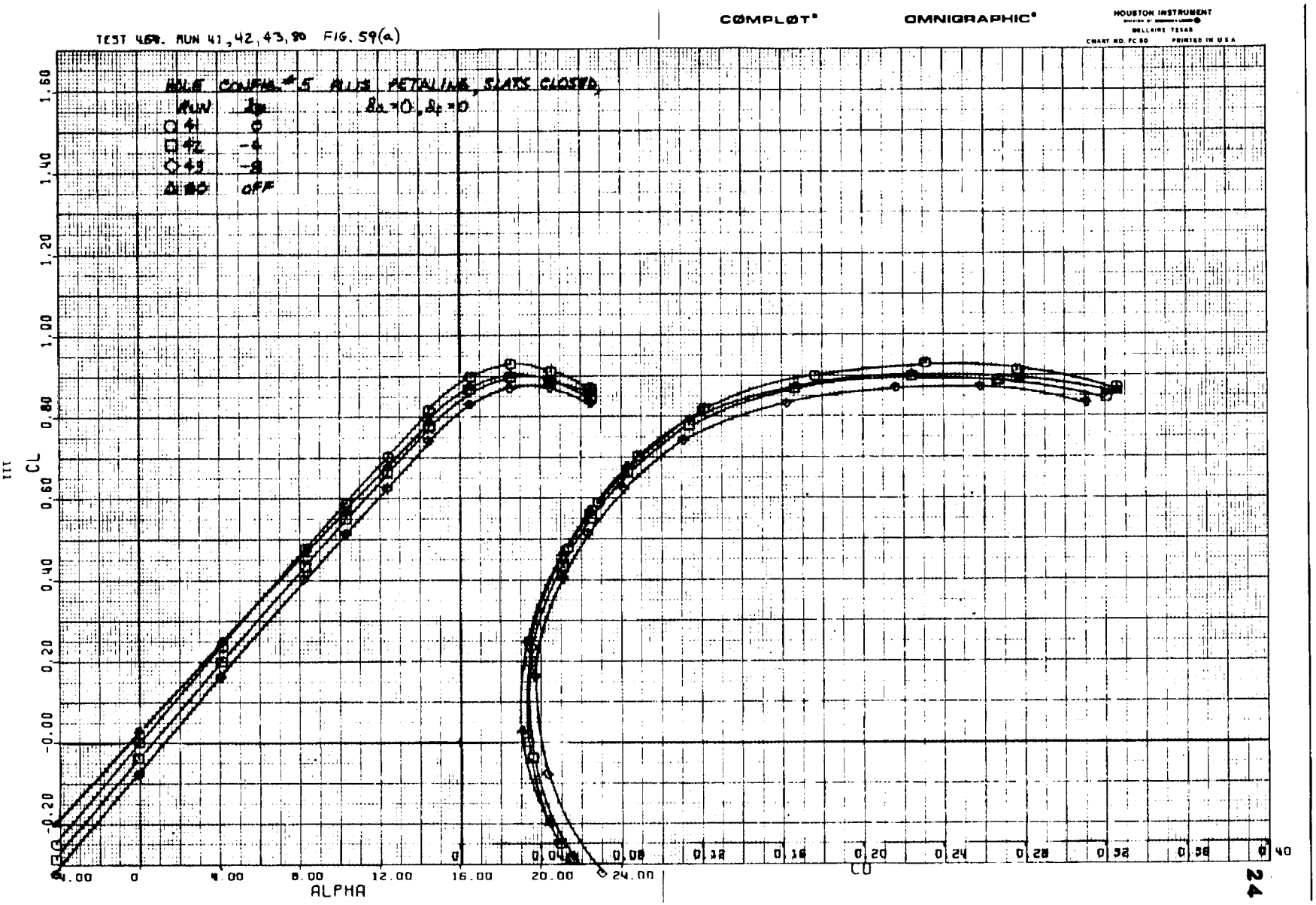

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
TEST 468. RUN 41, 42, 43, 90 FIG. 59(a)
WING CONFIG. #5 FLAPS RETRACTED, SLATS CLOSED
RUN
41
42
43
90
OFF
CL
ALPHA
CD

Figure 59(a)

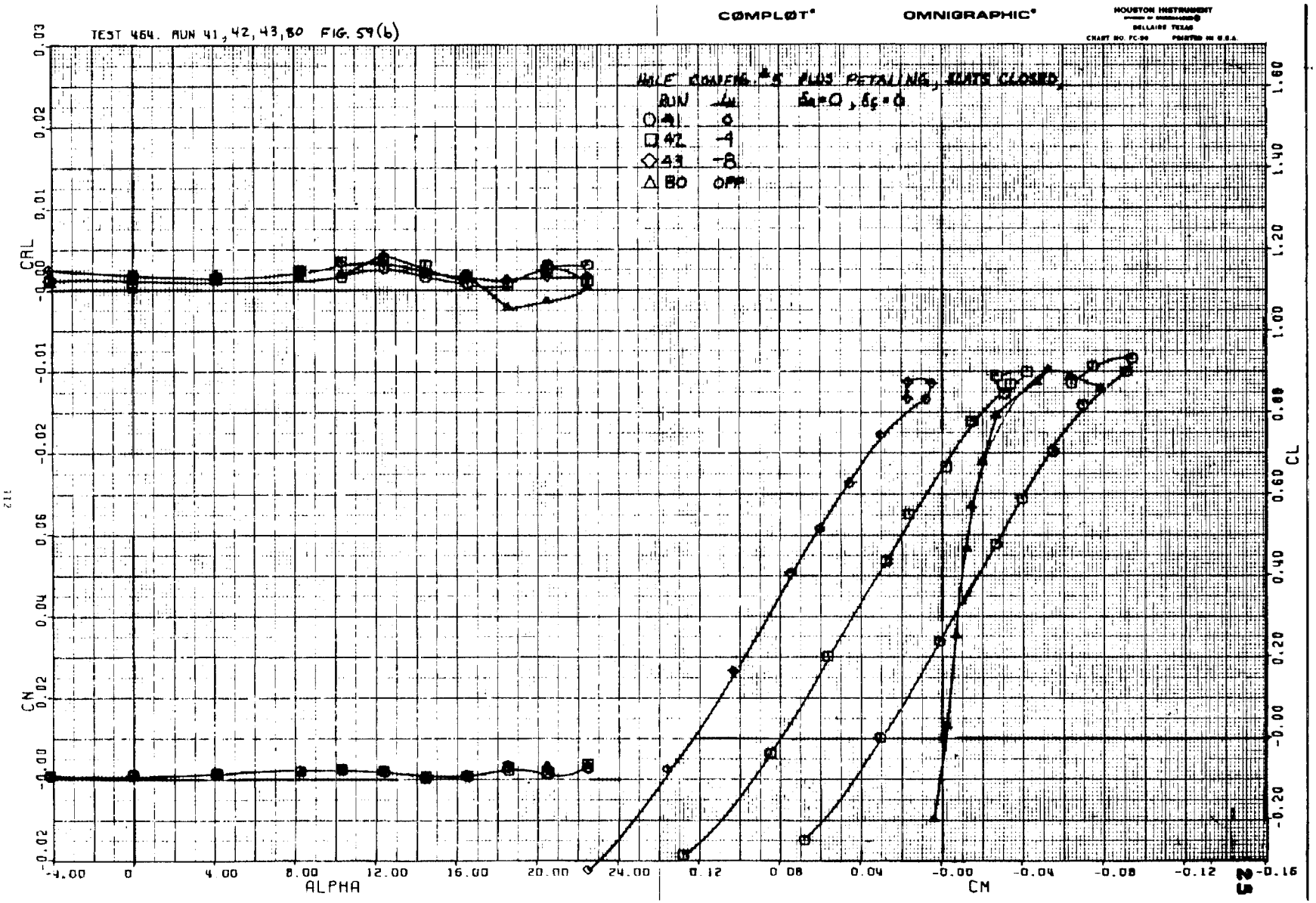

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
TEST 464. RUN 41, 42, 43, 80 FIG. 59(b)
NOSE CONFIG. #5 PLUS PETALING, FLAPS CLOSED
RUN
41
42
43
80
OFF
CRL
CN
ALPHA
CL
CM

Figure 59(b)

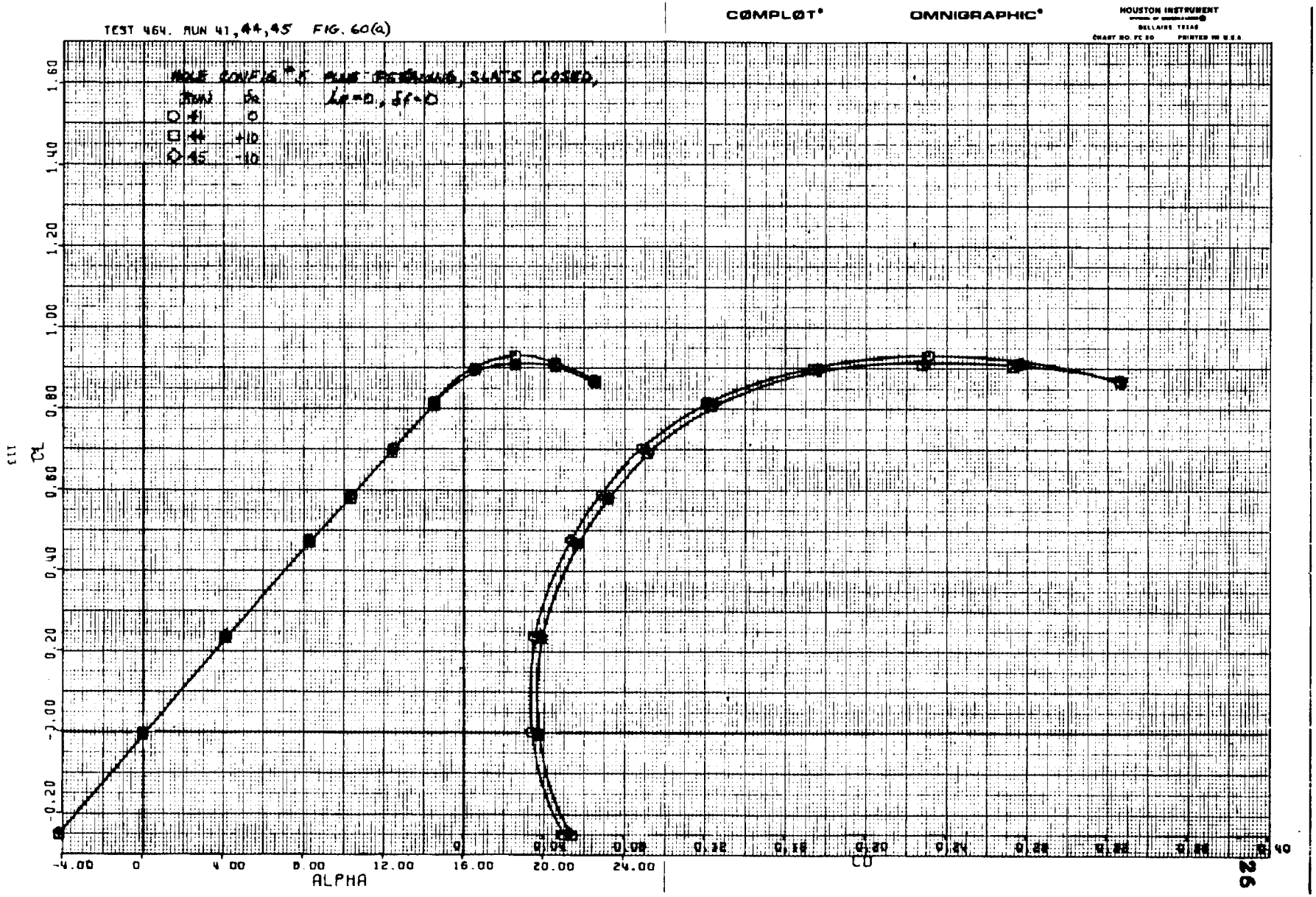

TEST 464. RUN 41, 44, 45 FIG. 60(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
RUN δe
41 0
44 +10
45 -10
δf=0
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 60(a)

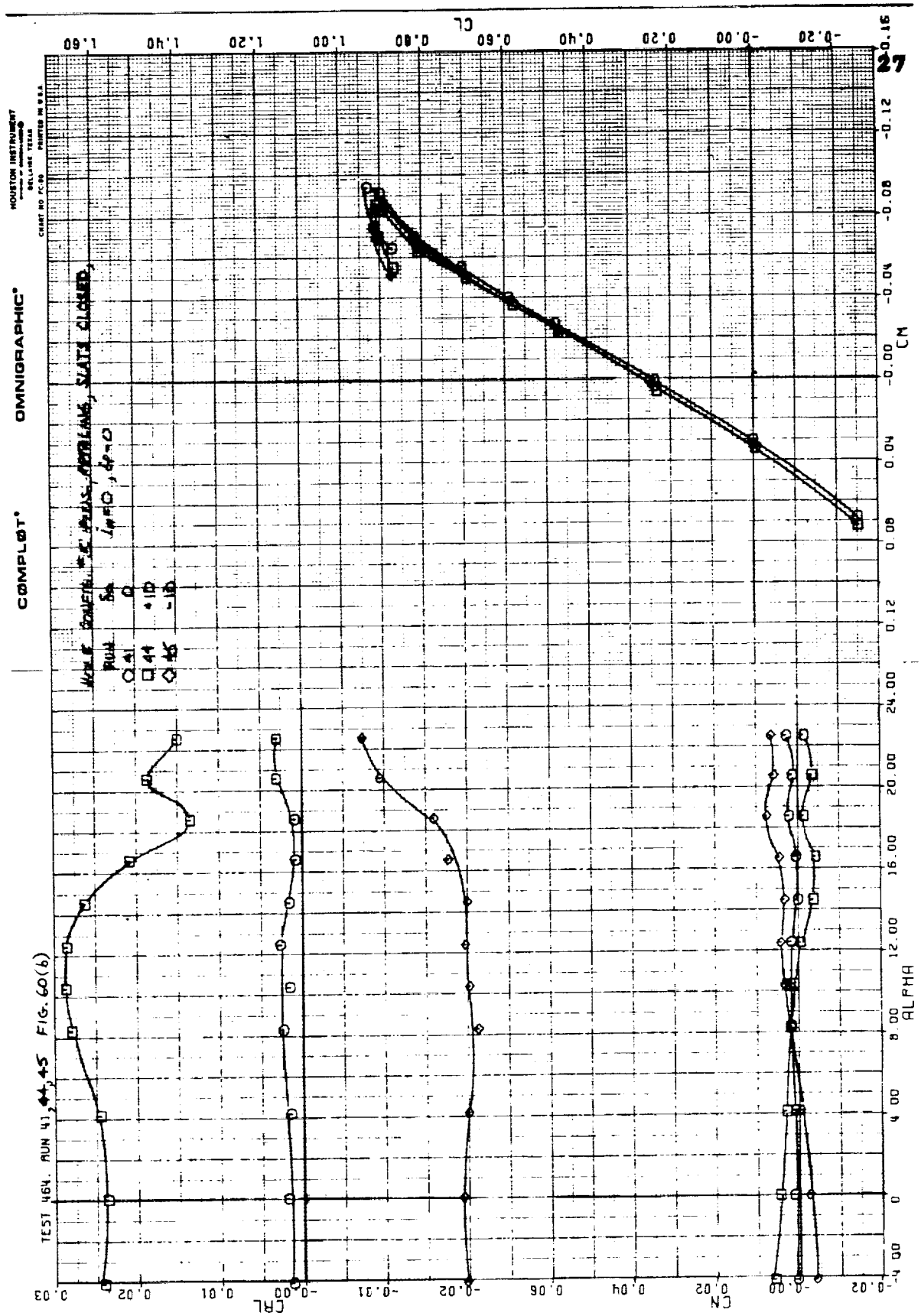

COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
CL
CM
CN
CRL
ALPHA
TEST 464, RUN 41, 44, 45 FIG. 60(b)
Run
41
44
45

Figure 60(b)

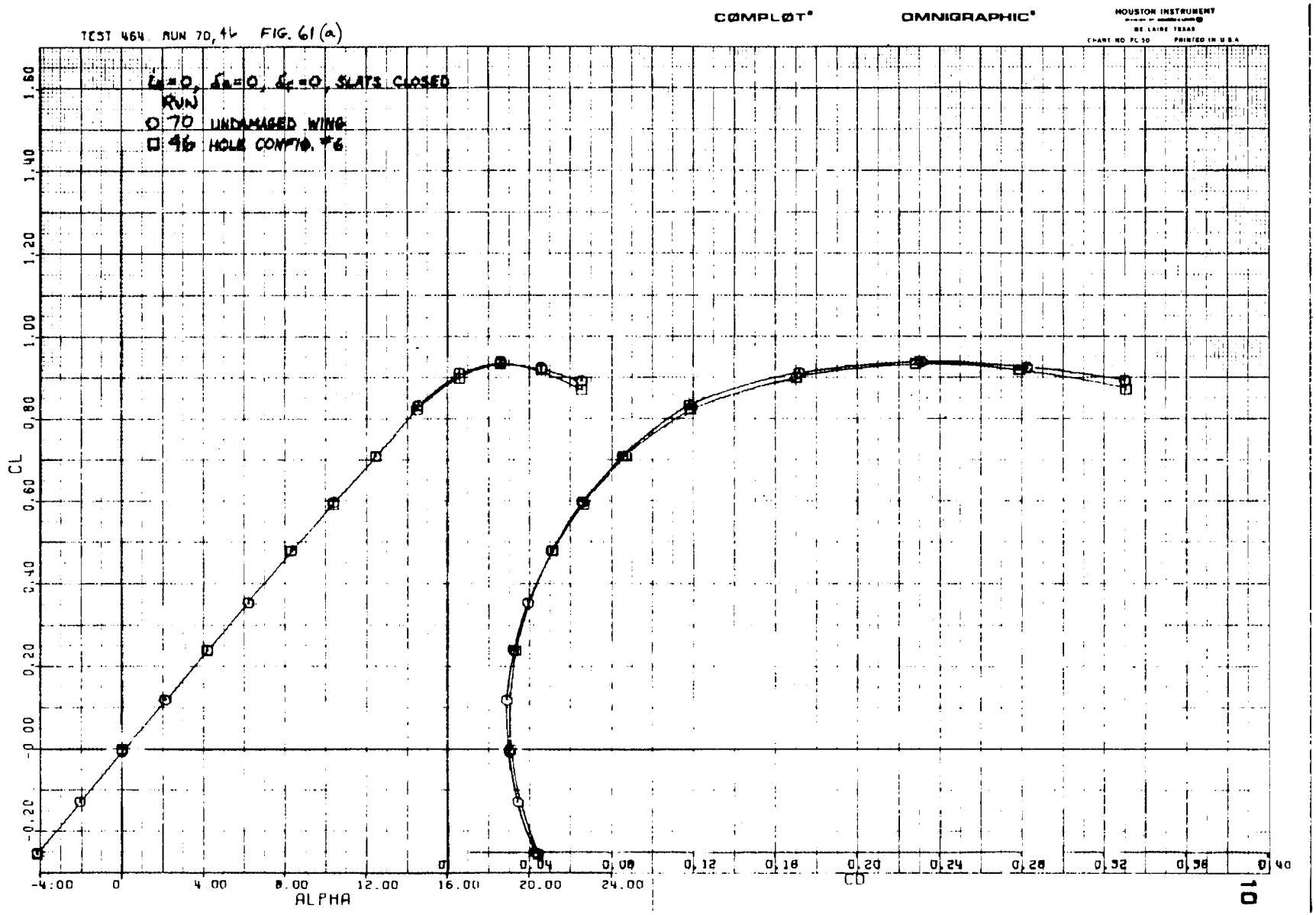

TEST 464 RUN 70, 46 FIG. 61(a)
COMPLOT® OMNIGRAPHIC®
HOUSTON INSTRUMENT
i_H=0, δ_{ds}=0, δ_f=0, SLATS CLOSED
RUN
70 UNDAMAGED WING
46 HOLE CONFIG. #6
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 61(a)

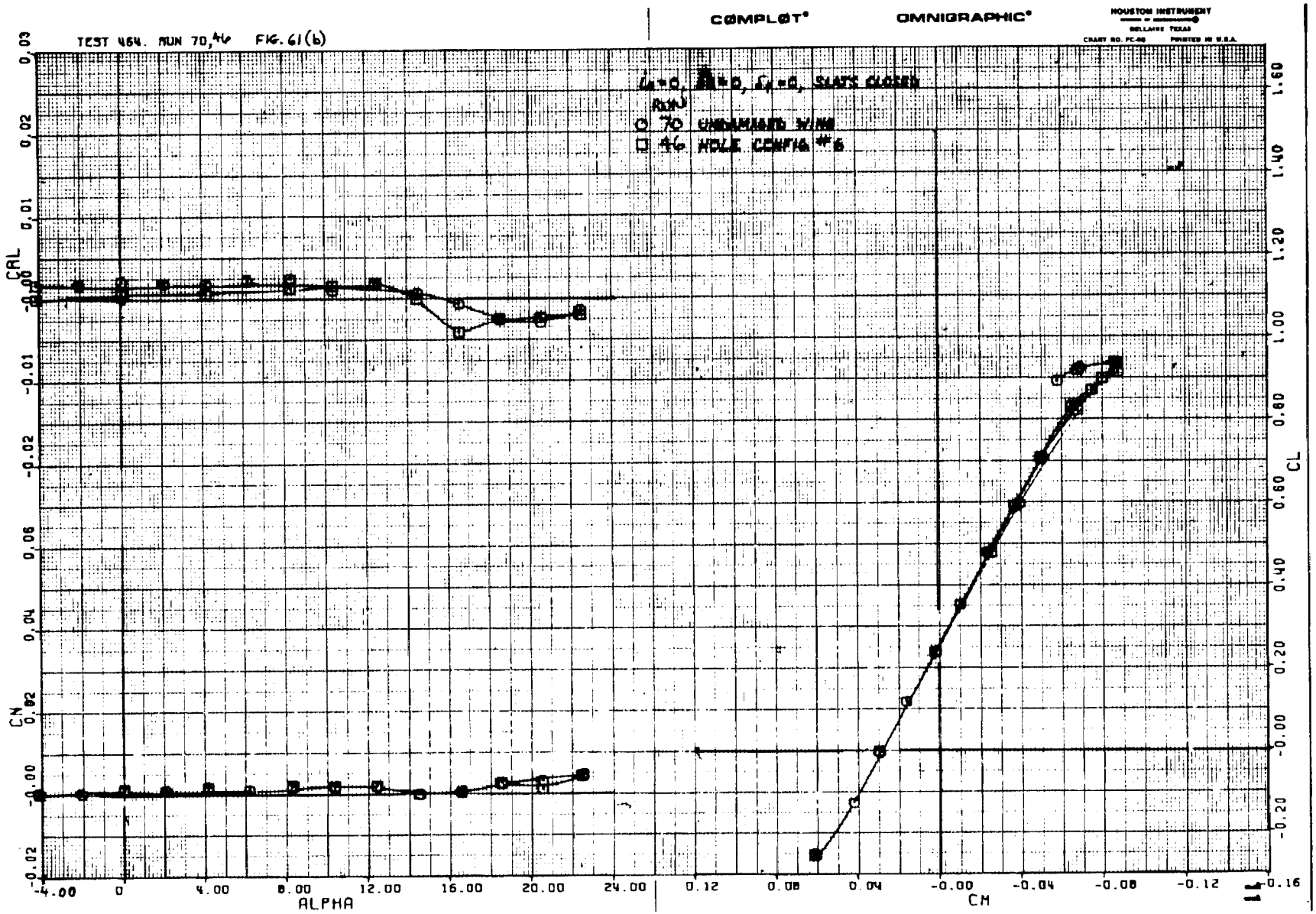

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 70,46 FIG. 61(b)
RUN
70 UNDAMAGED W/NB
46 HOLE CONFIG #6
CAL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16
0.03
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20

Figure 61(b)

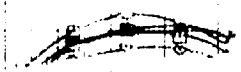
TEST 464. RUN 46,47,48,81 FIG. 62(a

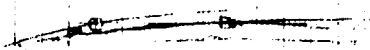
COMPLOT® OMNIGRAPHIC® HOUSTON INSTRUMENT

WING CONFIG. #6, $\delta_f = 0$, $\delta_s = 0$, SLATS CLOSED

	RUN	δ_H
○	46	0
□	47	-4
◇	48	-8
△	81	OFF

1.60
1.40
1.20
1.00
.80





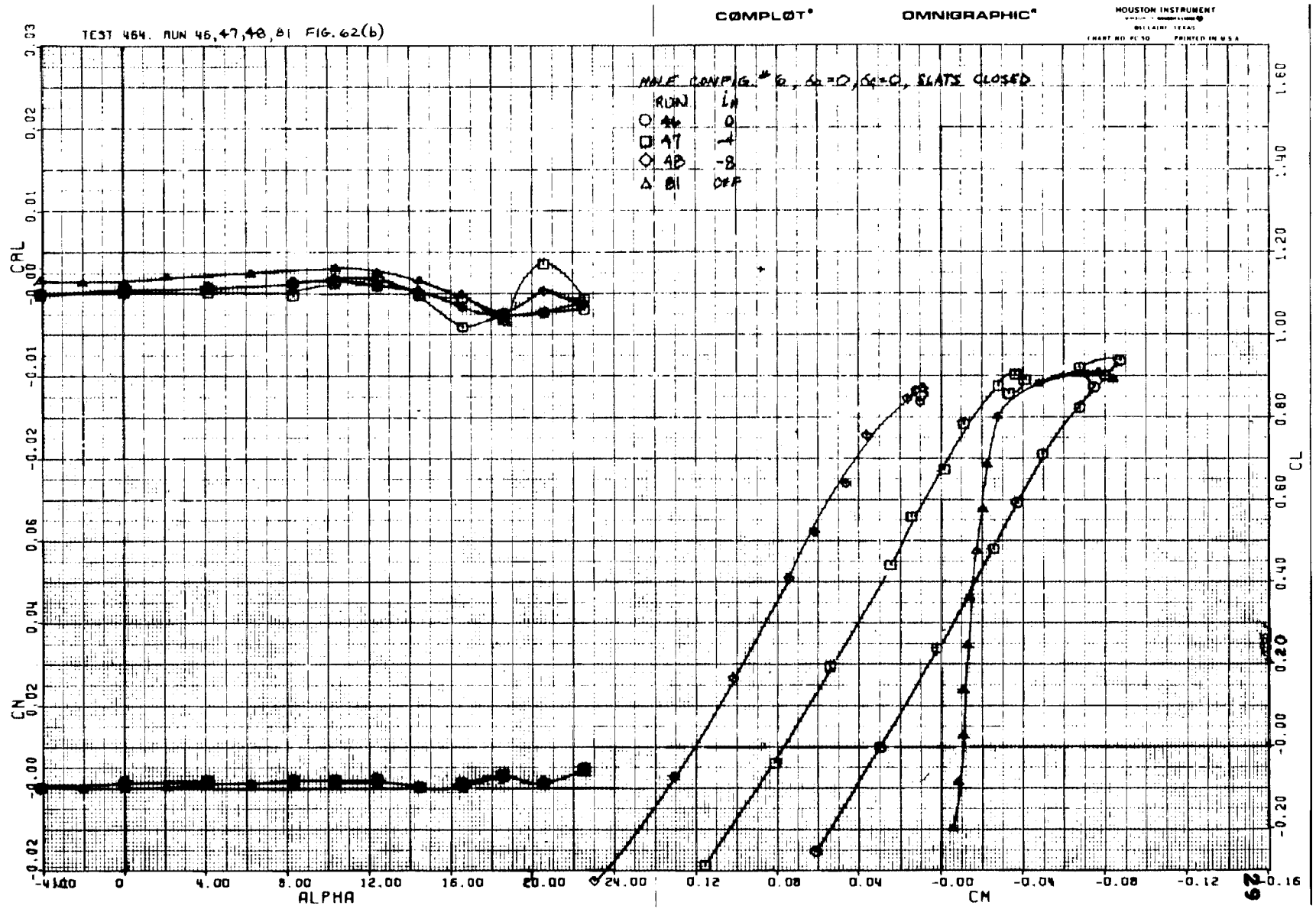

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 46,47,48,81 FIG. 62(b)
MDLE CONFIG. #6, δa=0, δf=0, SLATS CLOSED
RUN i_H
46 0
47 -4
48 -8
81 OFF
CAL
CN
ALPHA
CM
CL
62

Figure 62(b)

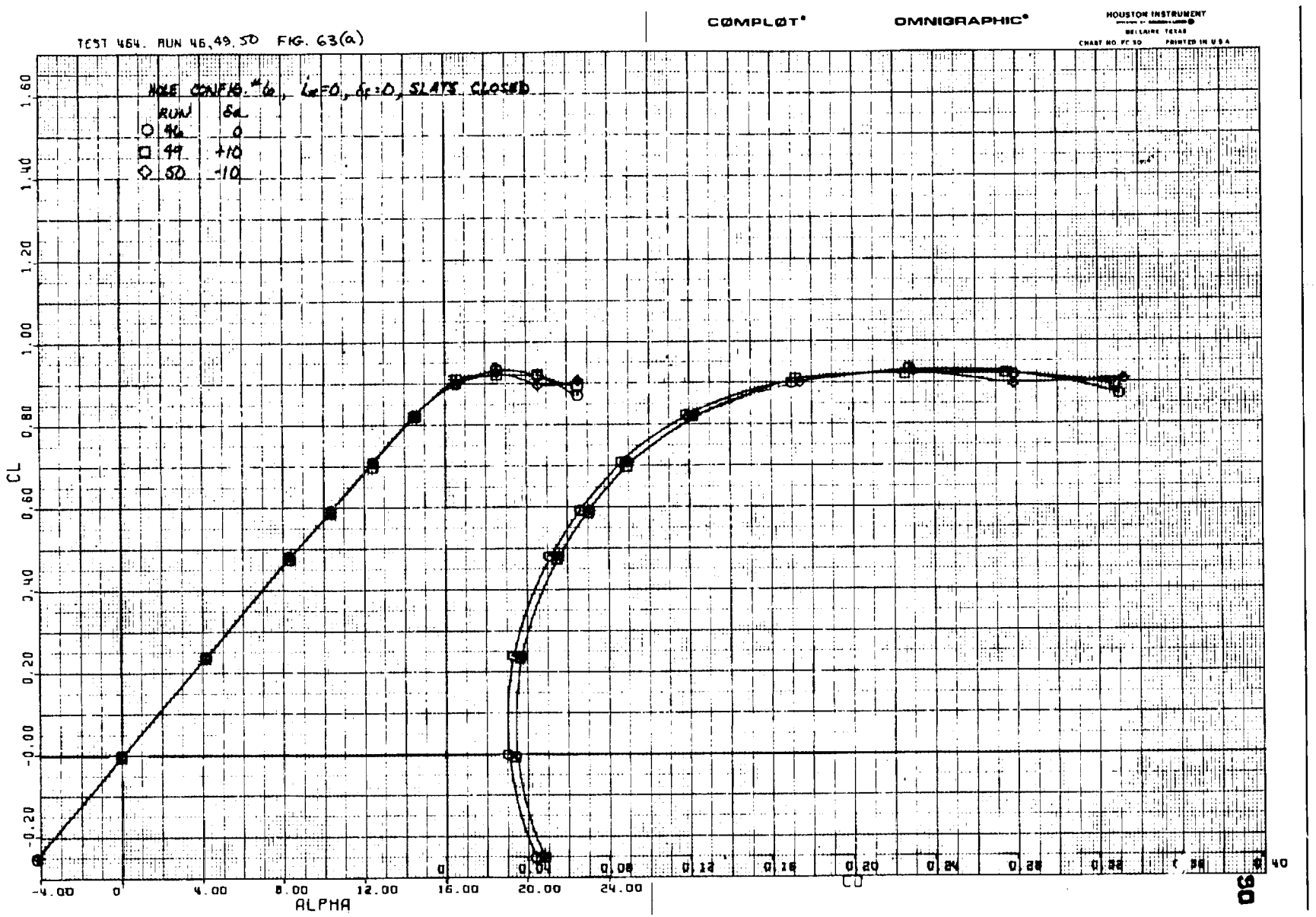

CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 46,49,50 FIG. 63(a)
NOSE CONFIG. #6, i_w=0, δ_f=0, SLATS CLOSED
RUN δ_e
46 0
49 +10
50 -10
CL
ALPHA
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
CD
90

Figure 63(a)

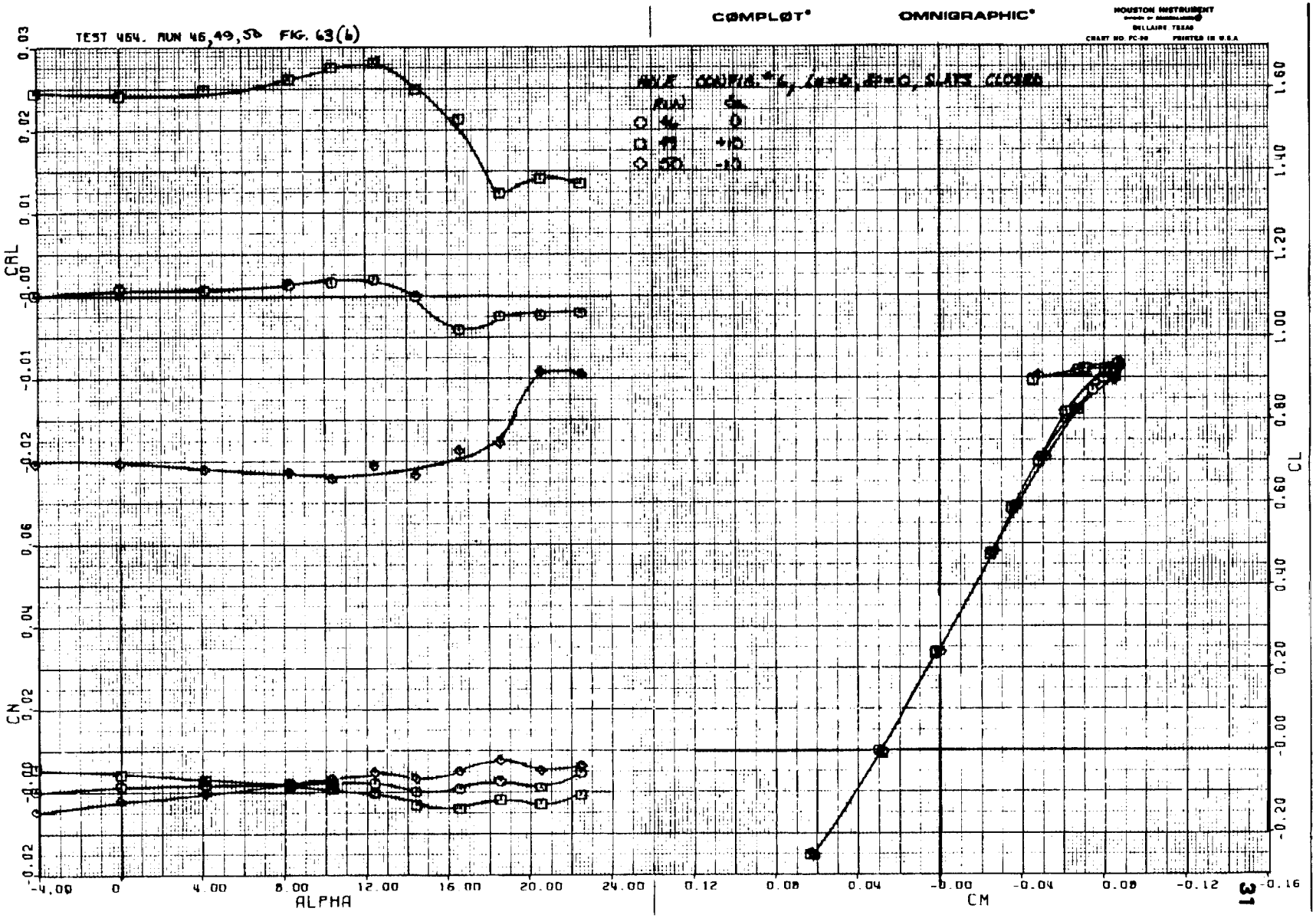

TEST 464. RUN 46,49,50 FIG. 63(b)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
PRINTED IN U.S.A.
RUN
CRL
CN
CL
CM
ALPHA
0.03
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 63(b)

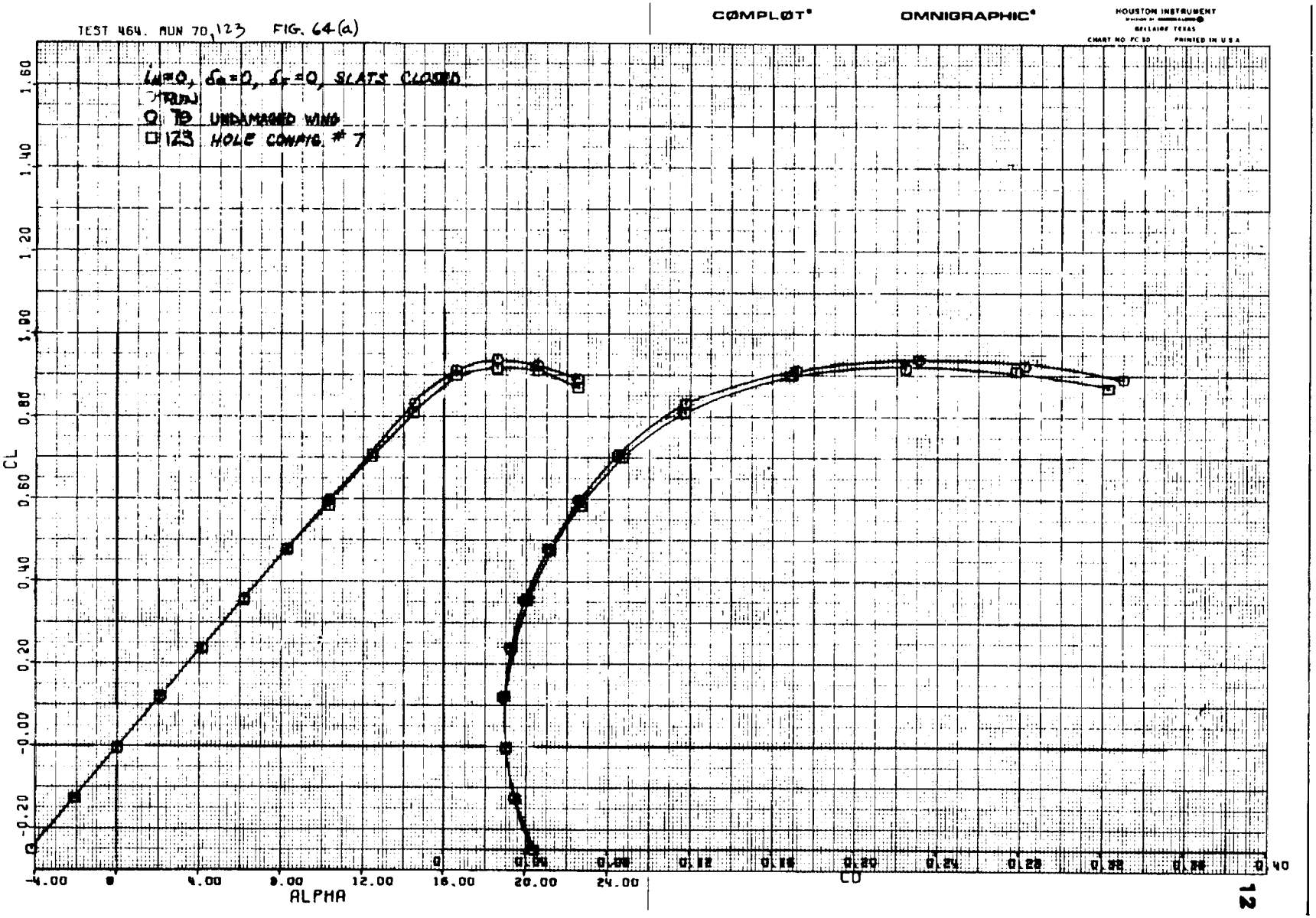

TEST 464. RUN 70,123 FIG. 64(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. FC 30
PRINTED IN U.S.A.
M=0, δa=0, δf=0, SLATS CLOSED
RUN
70 UNDAMAGED WING
123 HOLE CONFIG. # 7
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
ALPHA
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
CD
12

Figure 64(a)

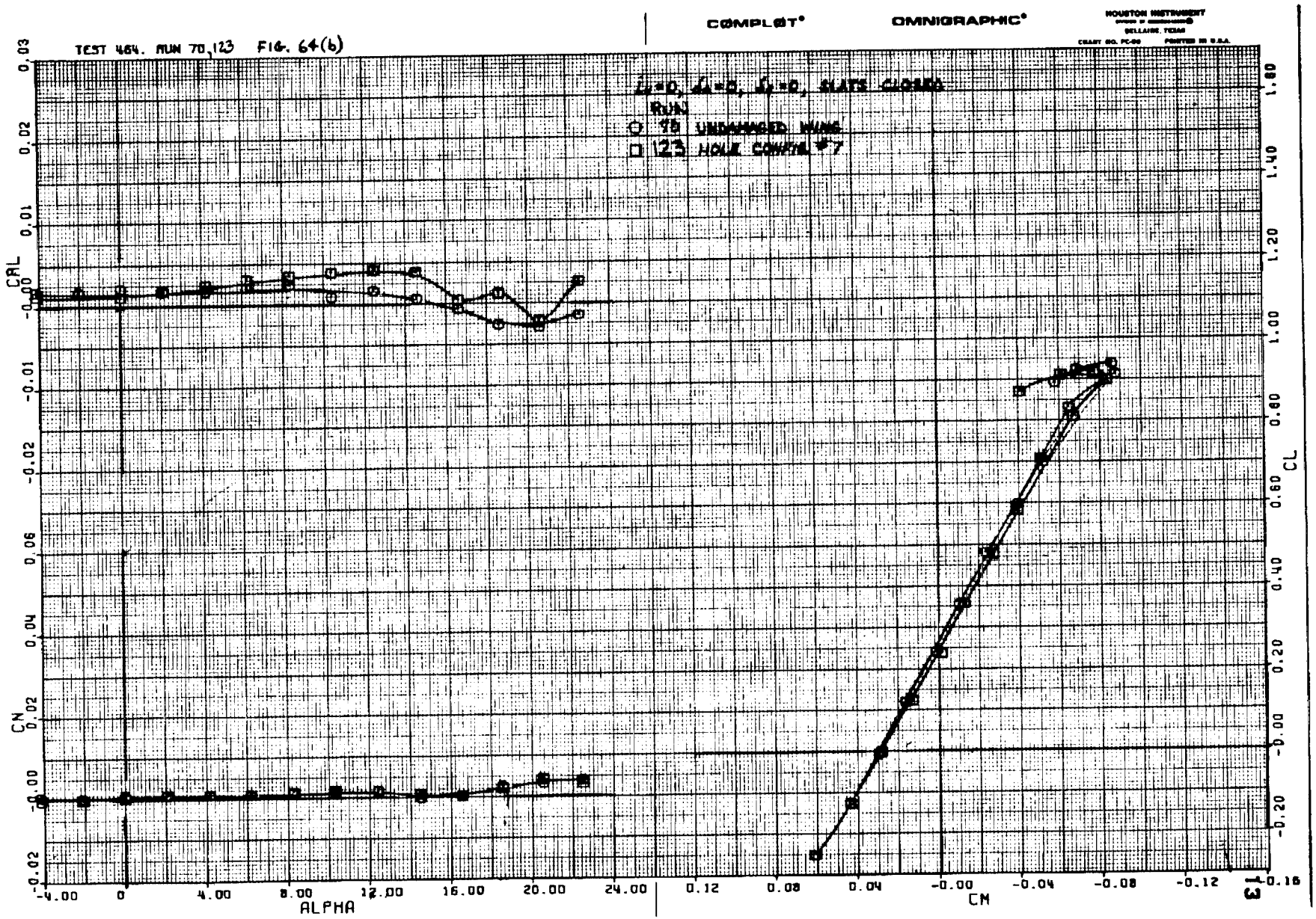

COMPLOT®
OMNIGRAPHIC®
TEST 484. RUN 70,123 FIG. 64(b)
i_H=0, δ_A=0, δ_R=0, SLATS CLOSED
RUN
75 UNDAMAGED WING
123 HOLE CONFIG #7
CAL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 64(b)

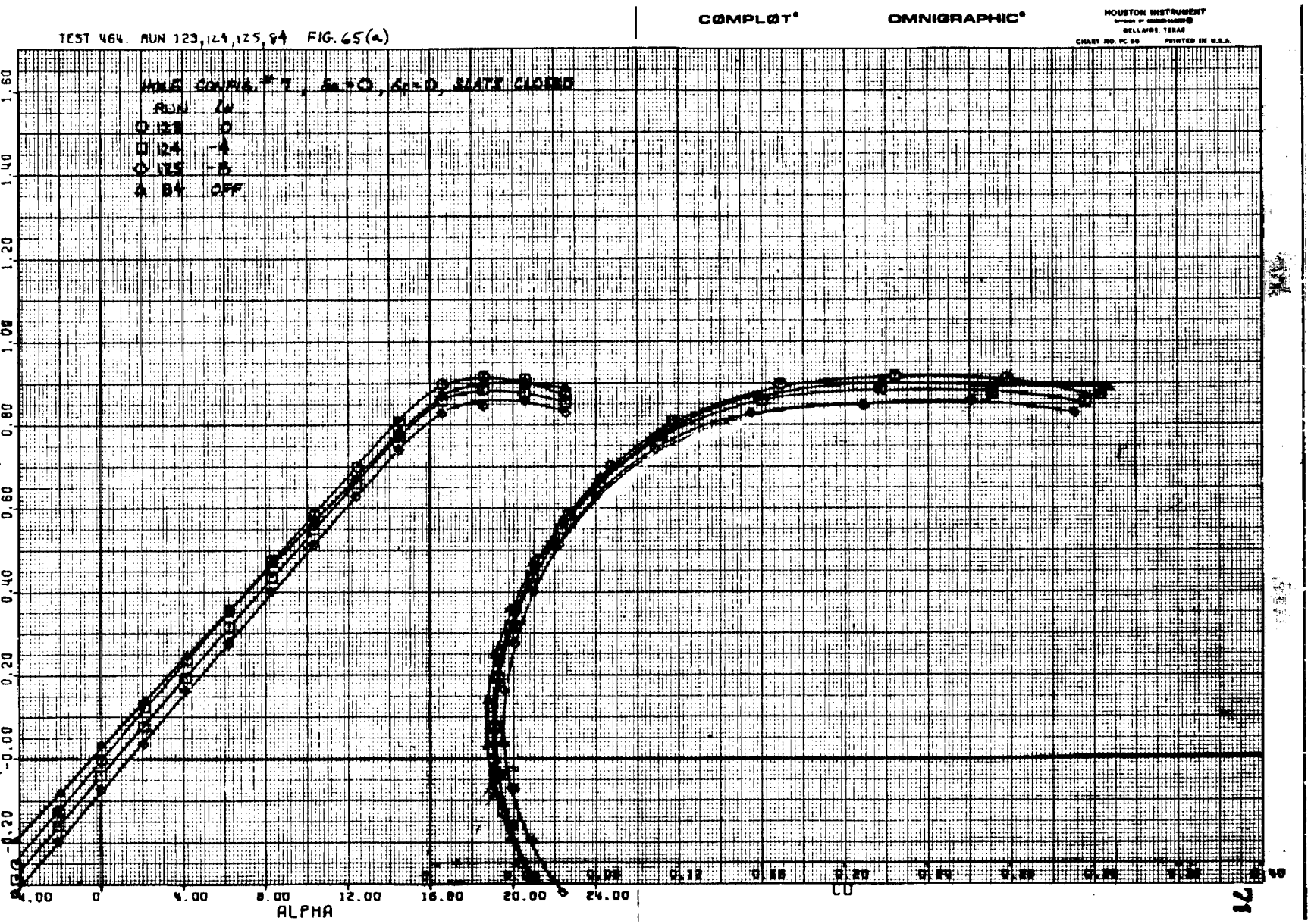

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 123,124,125,84 FIG. 65(a)
RUN
123
124
125
84
OFF
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12

Figure 65(a)

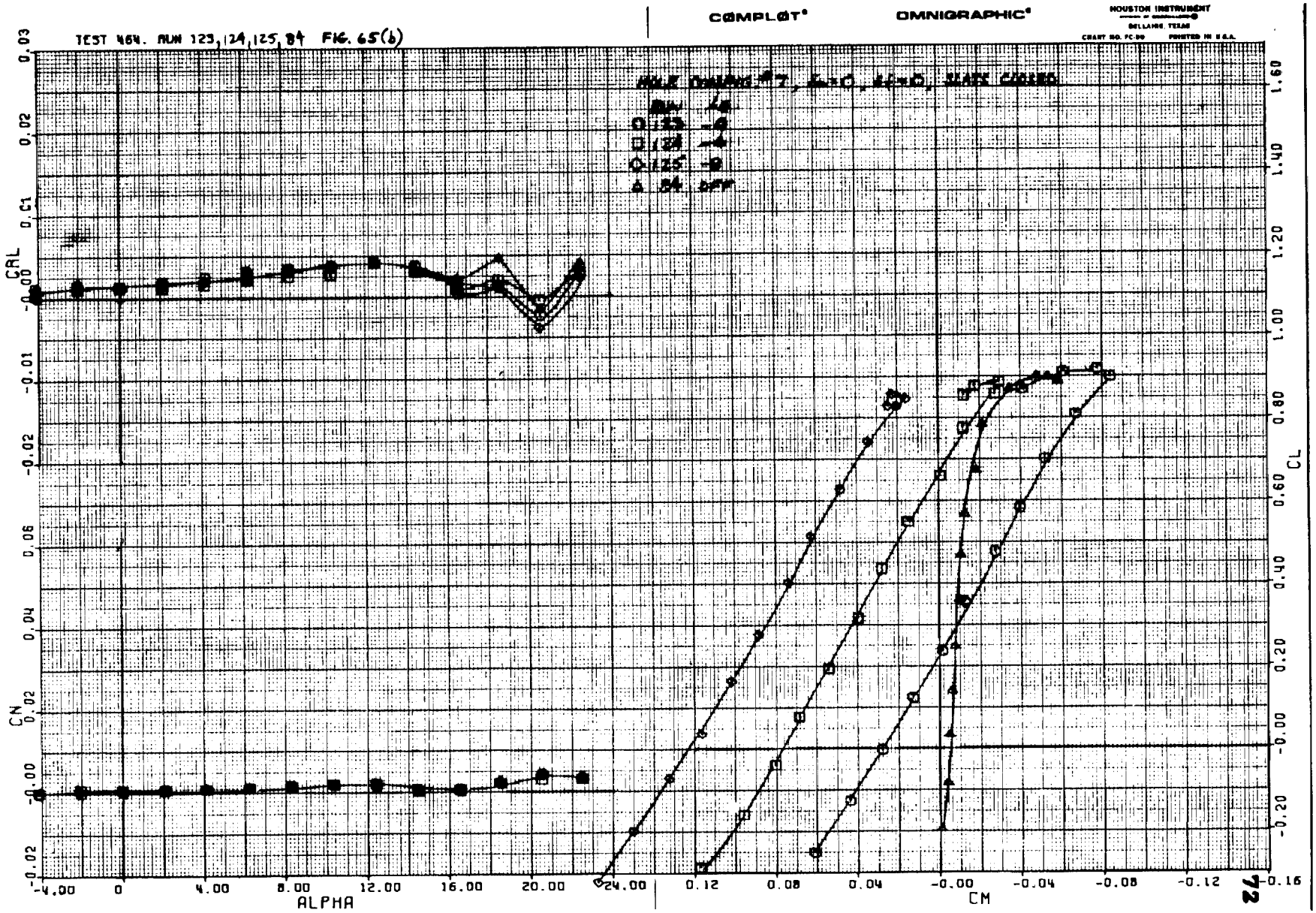
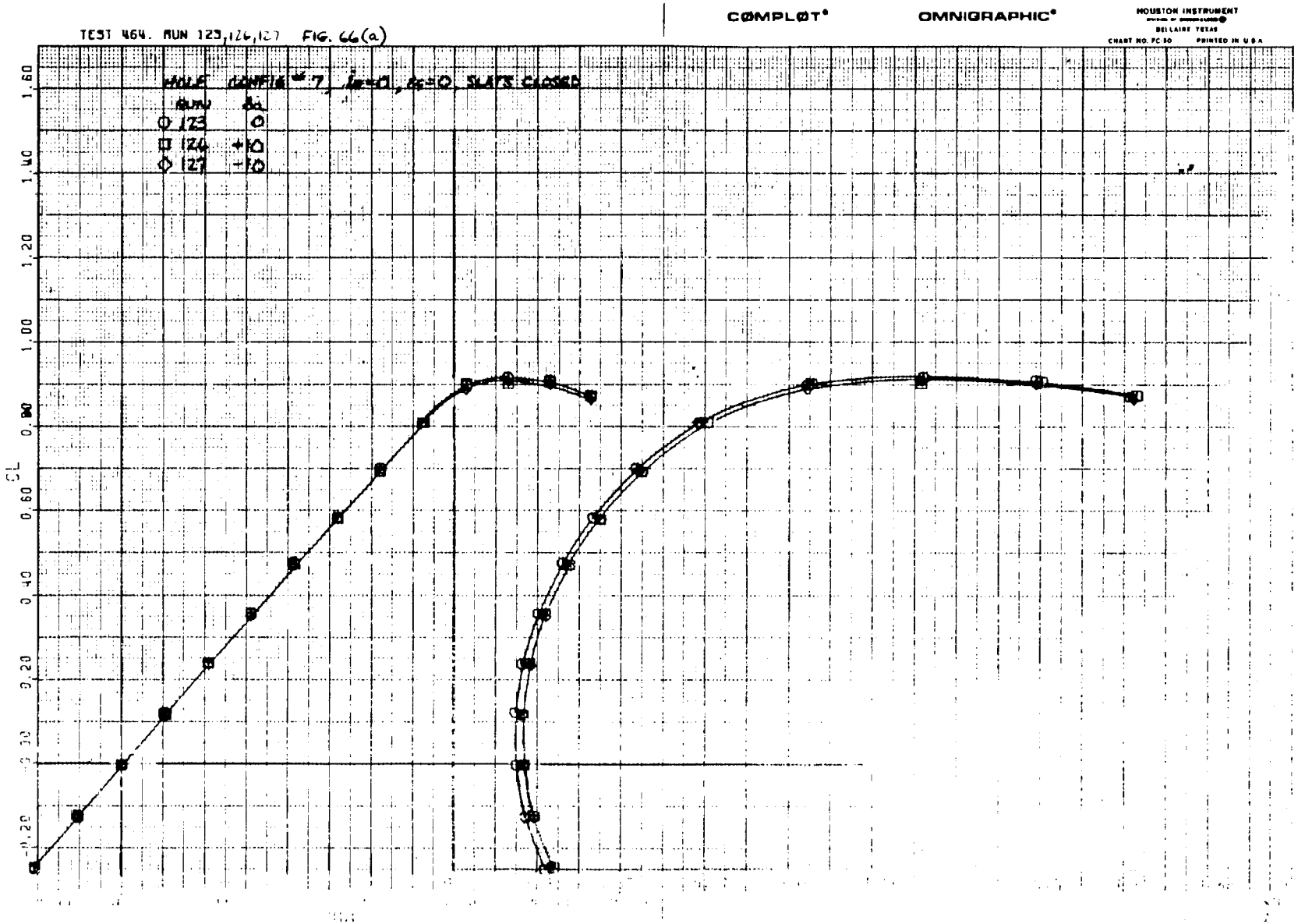

COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
TEST 464. RUN 123,124,125,84 FIG. 65(b)
CRL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 65(b)


COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. PC-50
PRINTED IN U.S.A.
TEST 464. RUN 123,126,127 FIG. 66(a)
HOLE CONFIG = 7, δf=0, δs=0 SLATS CLOSED
Run δa
123 0
126 +10
127 -10
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.20

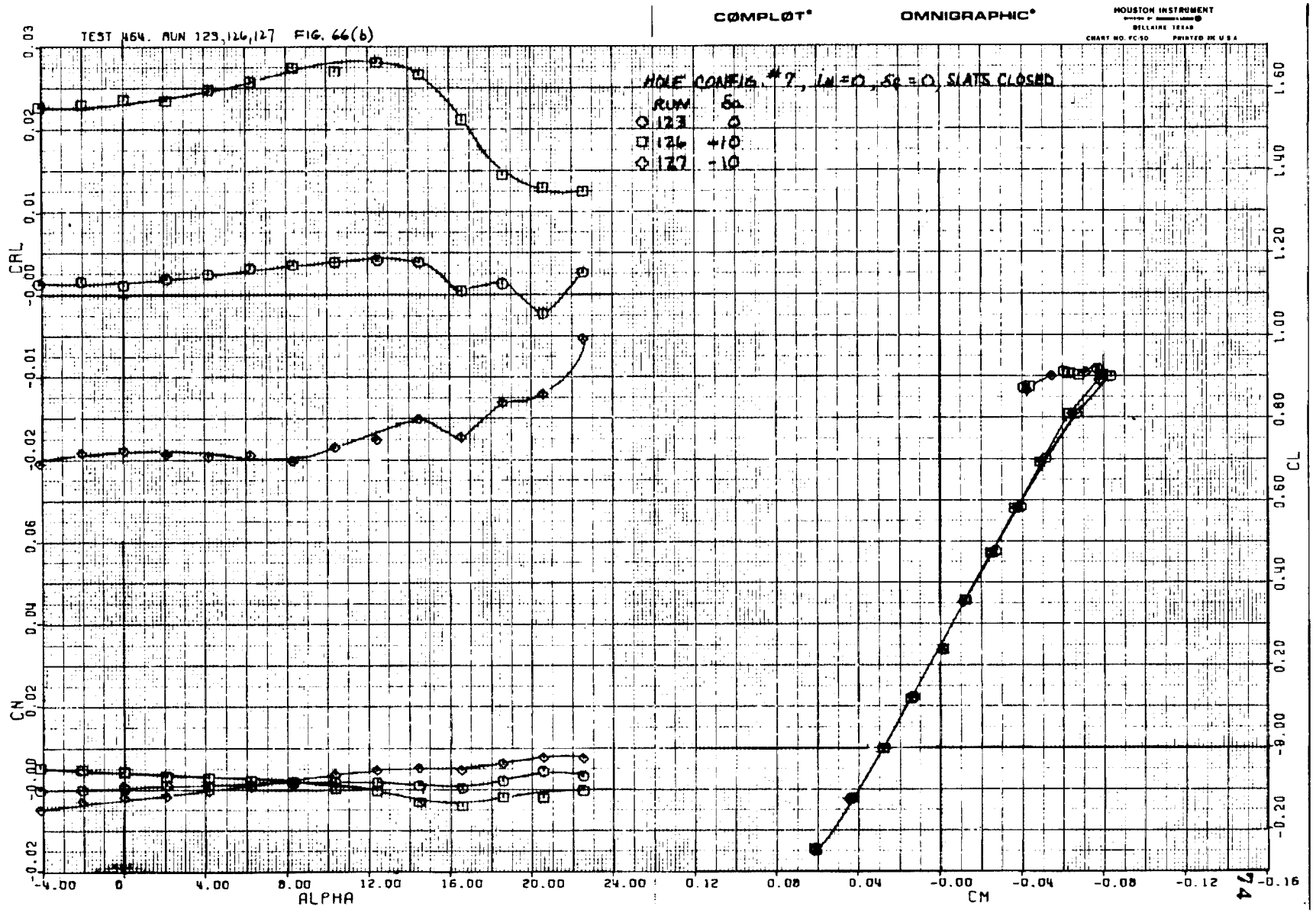

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. FC-50
PRINTED IN U.S.A.
TEST 464. RUN 123,126,127 FIG. 66(b)
HOLE CONFIG. #7, iH = 0, δe = 0, SLATS CLOSED
RUN δa
123 0
126 +10
127 -10
CRL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16
0.03
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20

Figure 66(b)

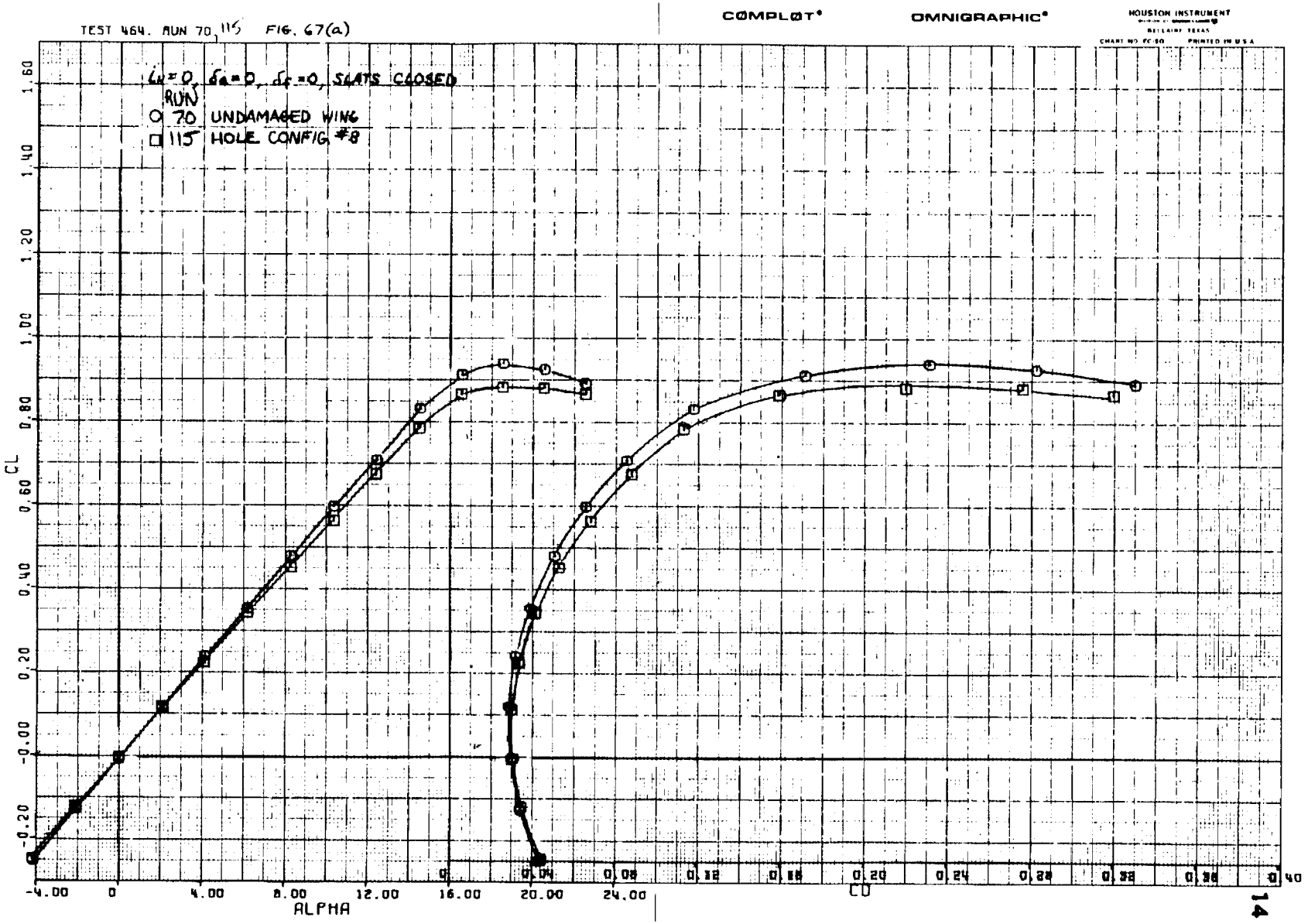

TEST 464. RUN 70, 115 FIG. 67(a)
COMPLOT® OMNIGRAPHIC®
HOUSTON INSTRUMENT
$i_H = 0$, $\delta_a = 0$, $\delta_f = 0$, SLATS CLOSED
RUN
○ 70 UNDAMAGED WING
□ 115 HOLE CONFIG #8
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
ALPHA
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
CD

Figure 67(a)

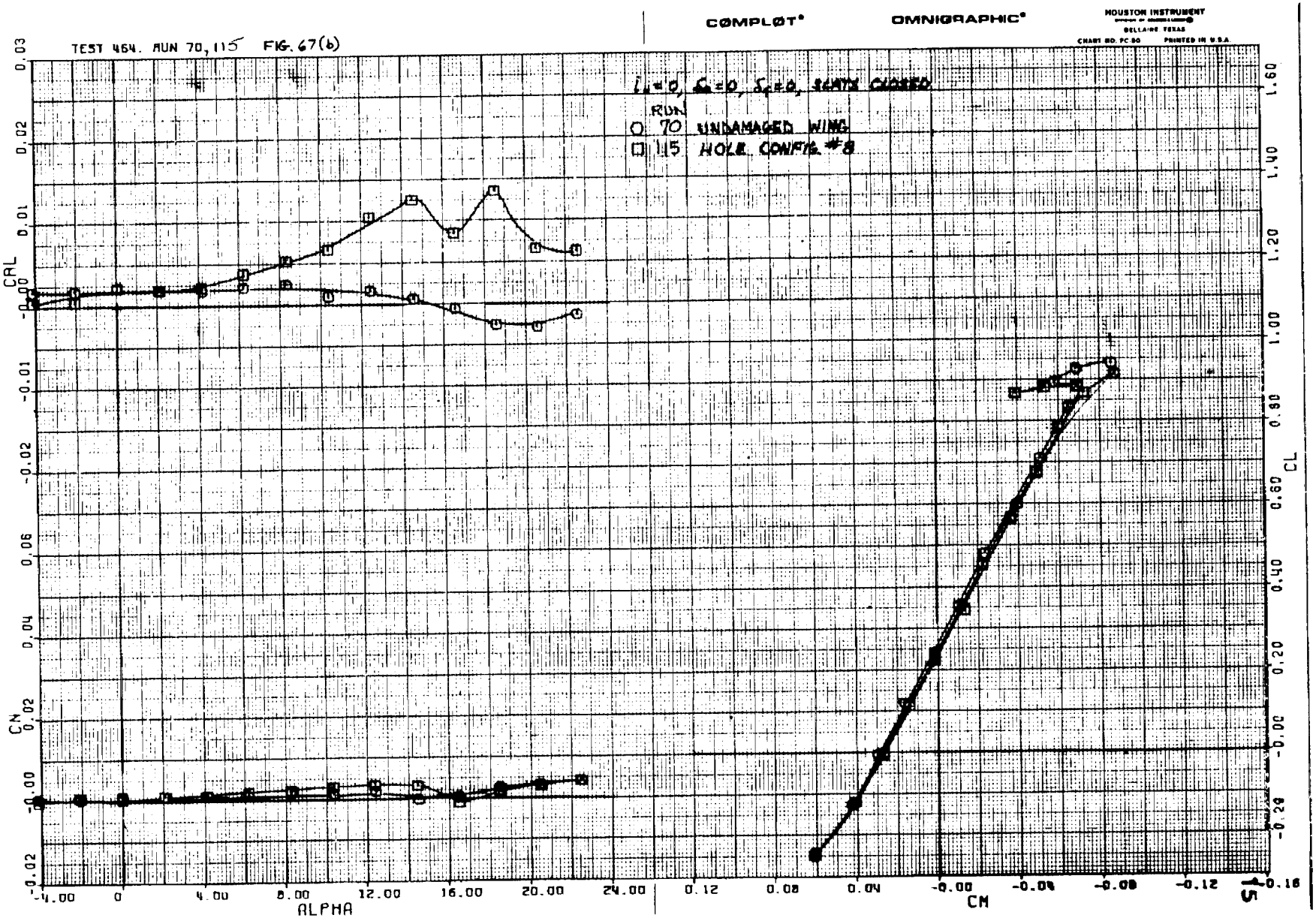

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 70, 115 FIG. 67(b)
$i_w = 0$, $\delta_a = 0$, $\delta_r = 0$, SEATS CLOSED
RUN
○ 70 UNDAMAGED WING
□ 115 HOLE CONFIG. #8
CRL
CN
ALPHA
CM
CL
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16
0.03
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20

Figure 67(b)

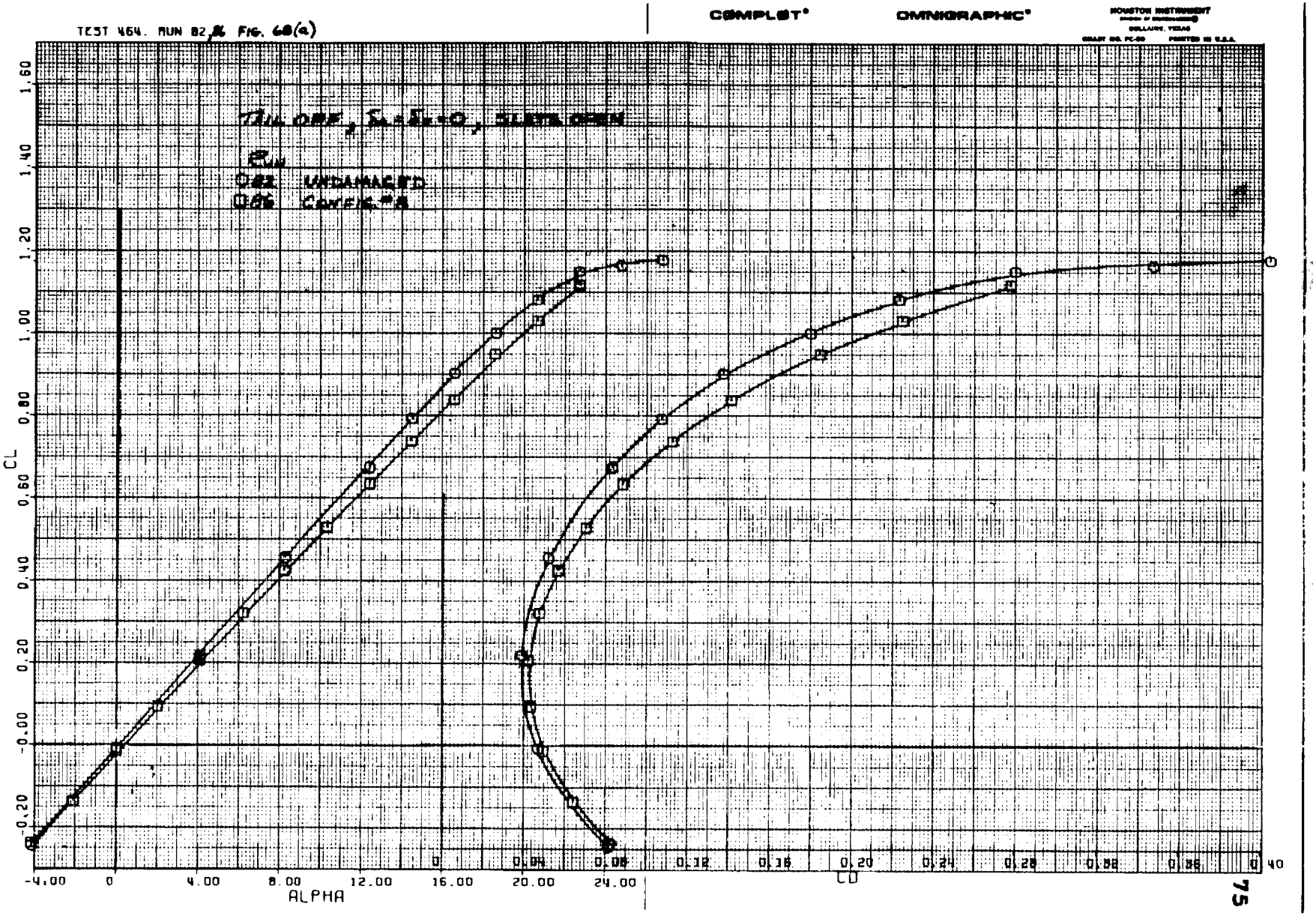

TEST 464. RUN 82 & FIG. 68(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
75

Figure 68(a)

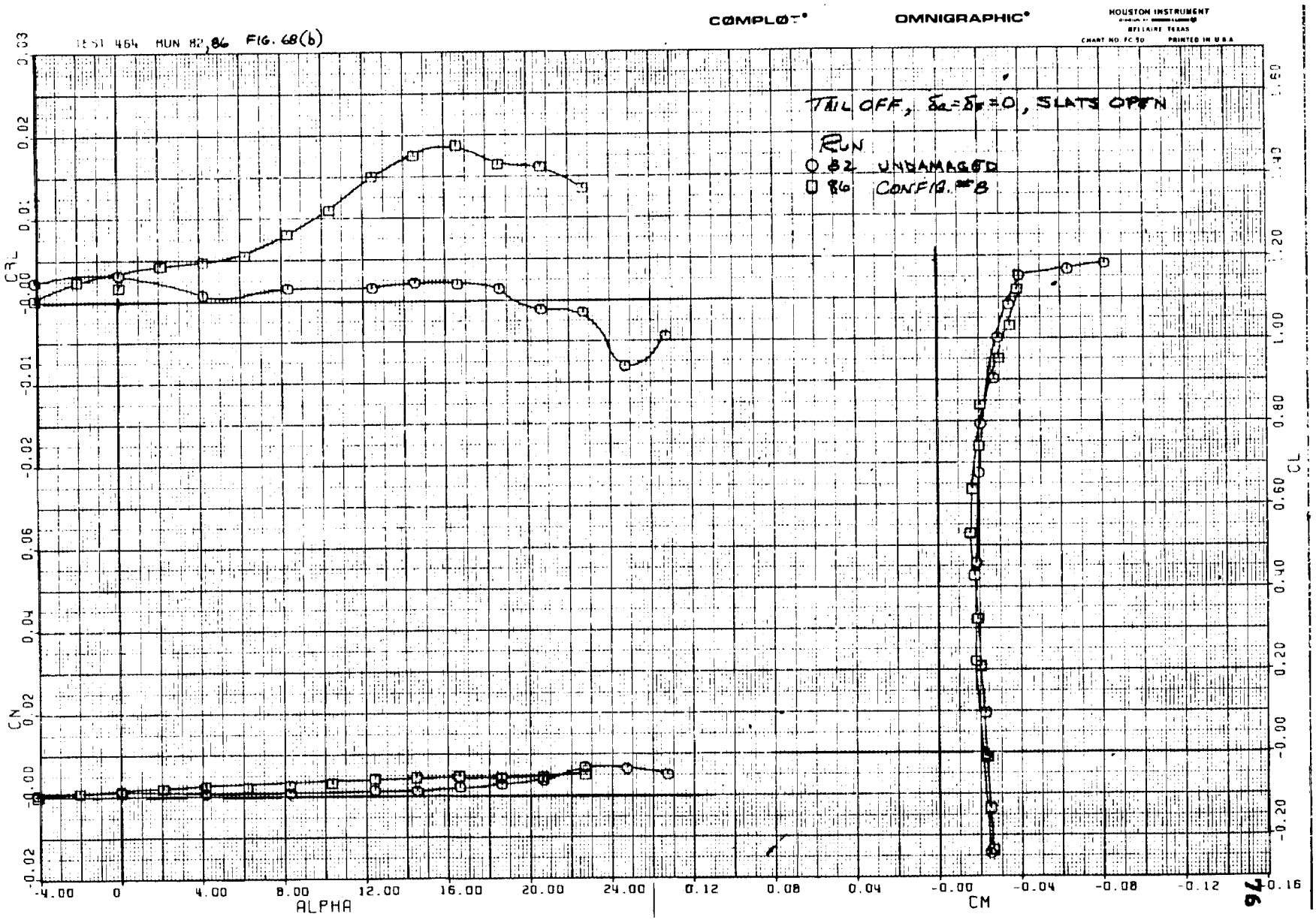

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464 RUN 82,86 FIG. 68(b)
TAIL OFF, δe=δf=0, SLATS OPEN
RUN
82 UNDAMAGED
86 CONFIG. #3
CRL
CN
CL
CM
ALPHA
0.03
0.02
0.01
0.00
-0.01
-0.02
0.06
0.04
0.02
0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16
76

Figure 68(b)

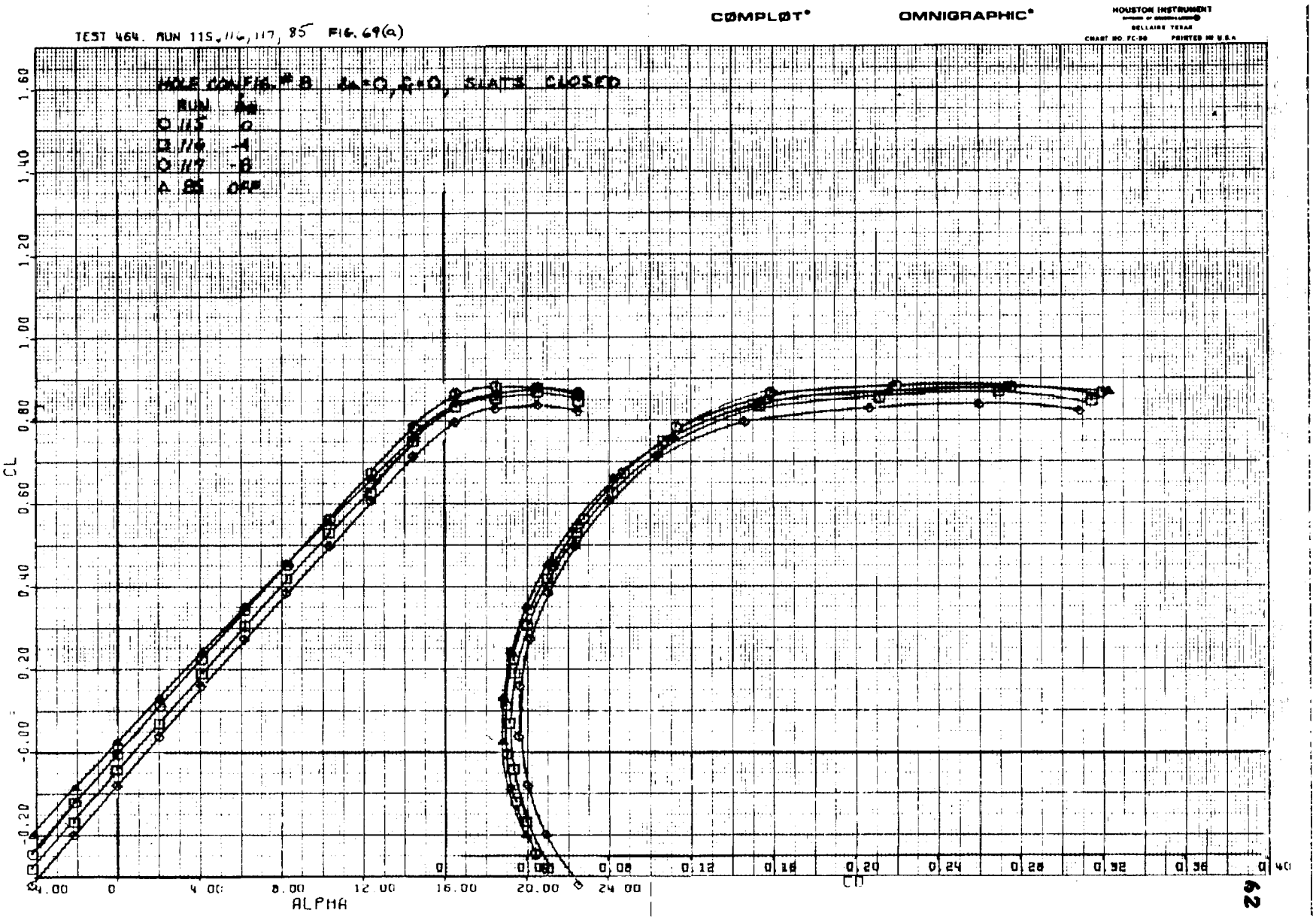

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 115, 116, 117, 85 FIG. 69(a)
HOLE CONFIG. # B δf=0, δs=0, SLATS CLOSED
RUN δm
115 0
116 -4
117 -8
85 OFF
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 69(a)

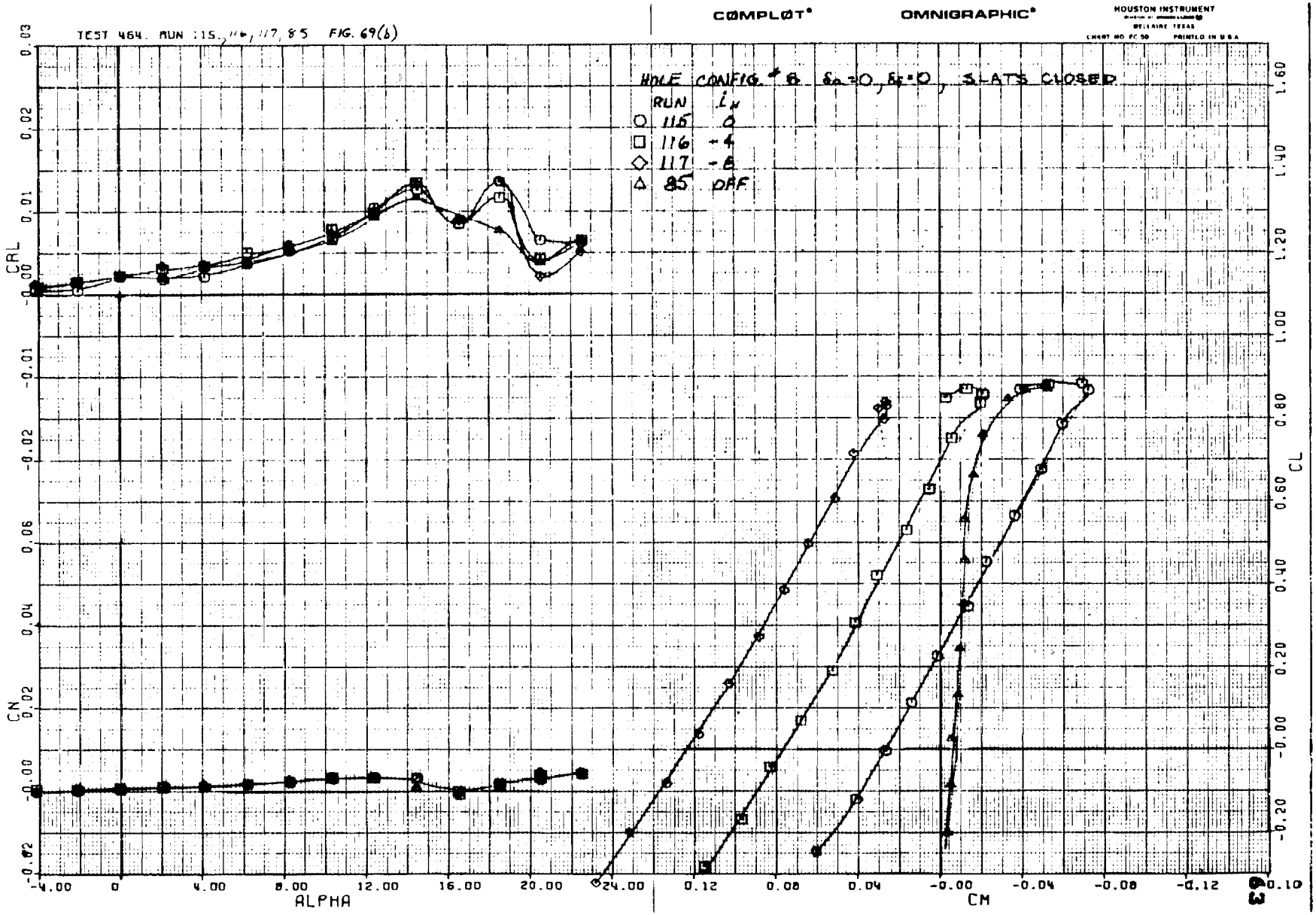
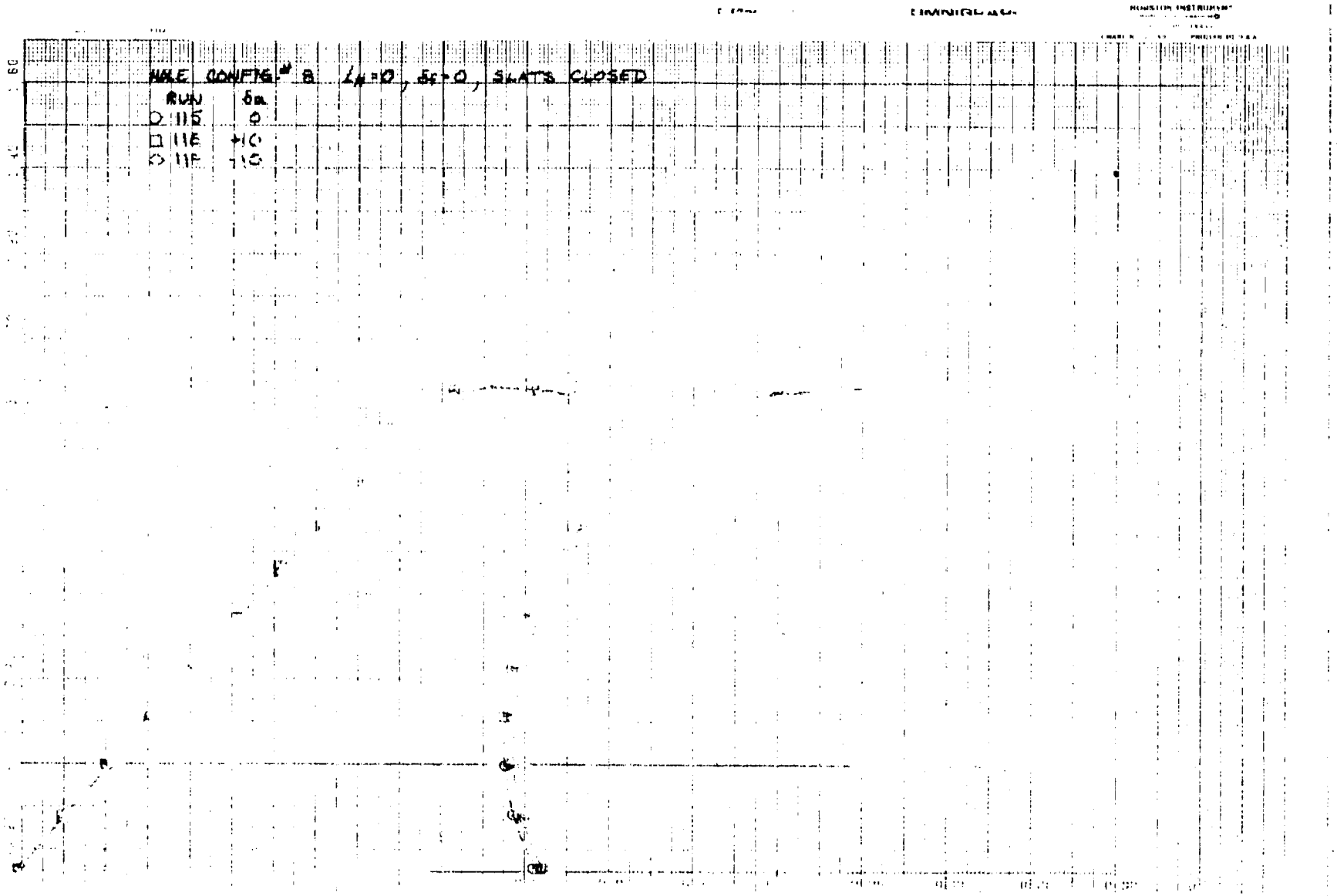

CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 115, 116, 117, 85 FIG. 69(b)
HOLE CONFIG. 6 δa=0, δr=0, SLATS CLOSED
RUN iN
115 0
116 -4
117 -8
85 DAF
CRL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 69(b)


WALE CONFIG. B L_H=10, S_F=0, SLATS CLOSED
RUN δ_{EL}
115 0
116 +10
117 -10

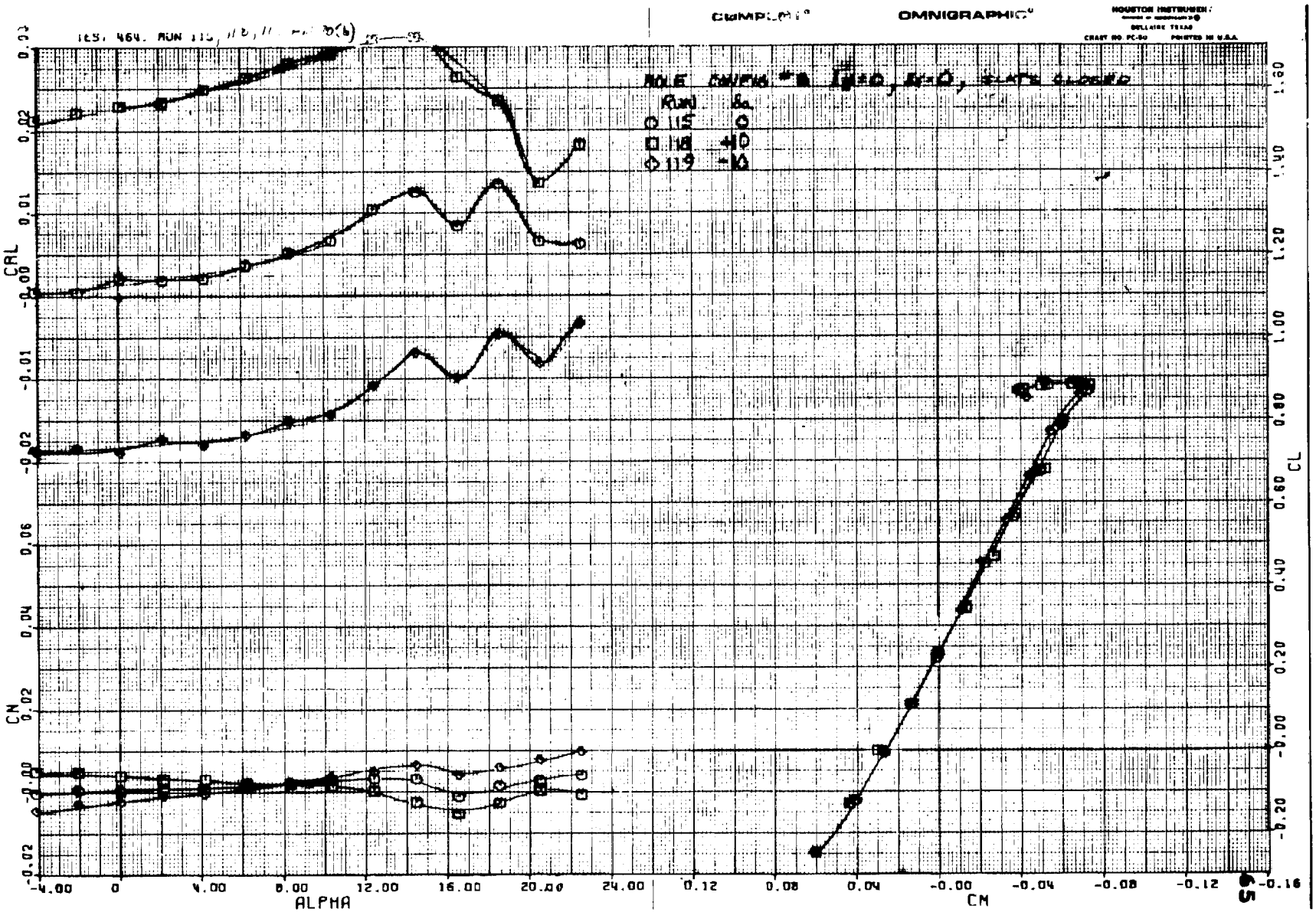

OMNIGRAPHIC
Run δa
115 0
118 +10
119 -10
CAL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 70(b)

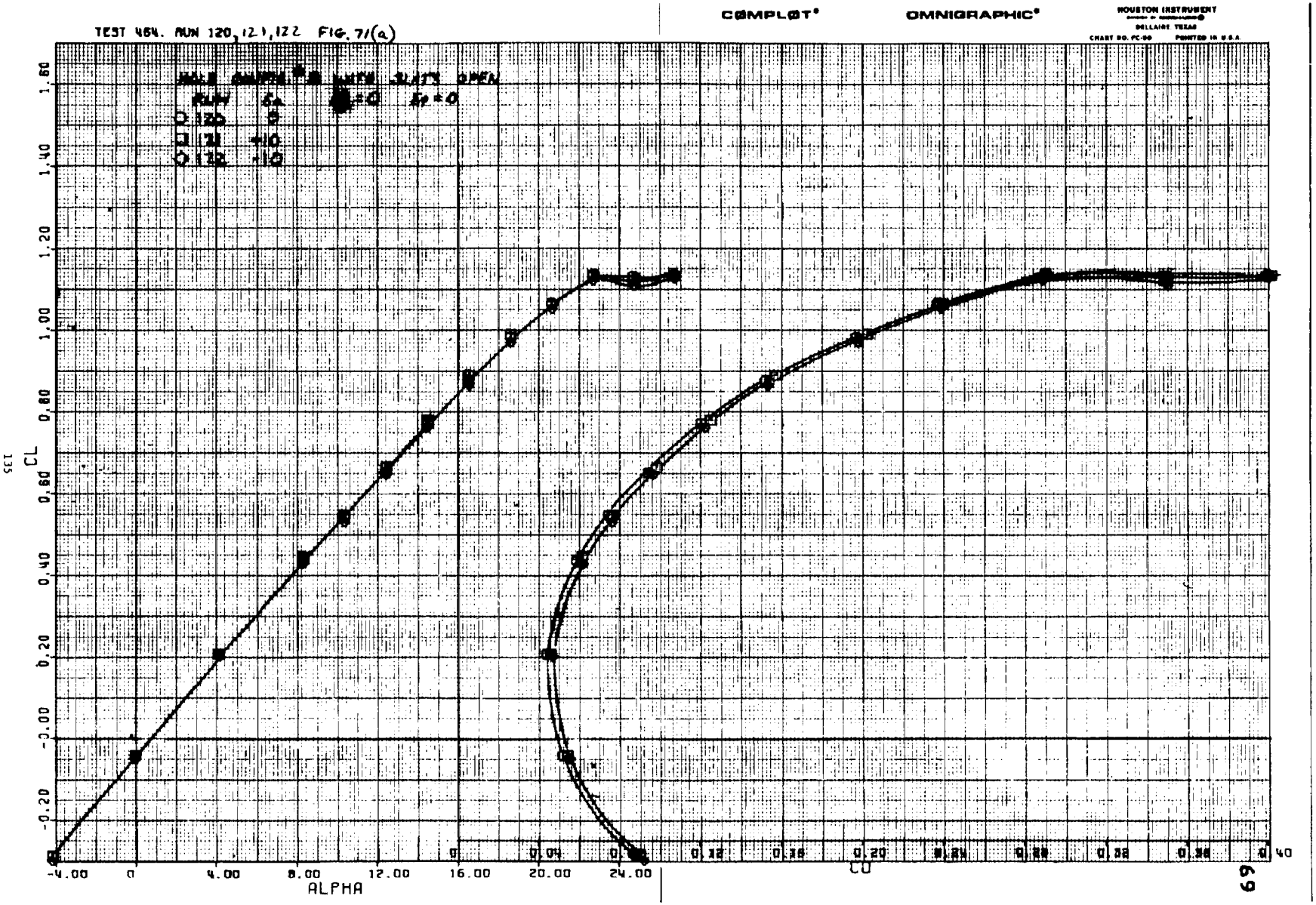

TEST 464. RUN 120, 121, 122 FIG. 71(a)
CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
RUN δa
120 0
121 +10
122 -10
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 71(a)

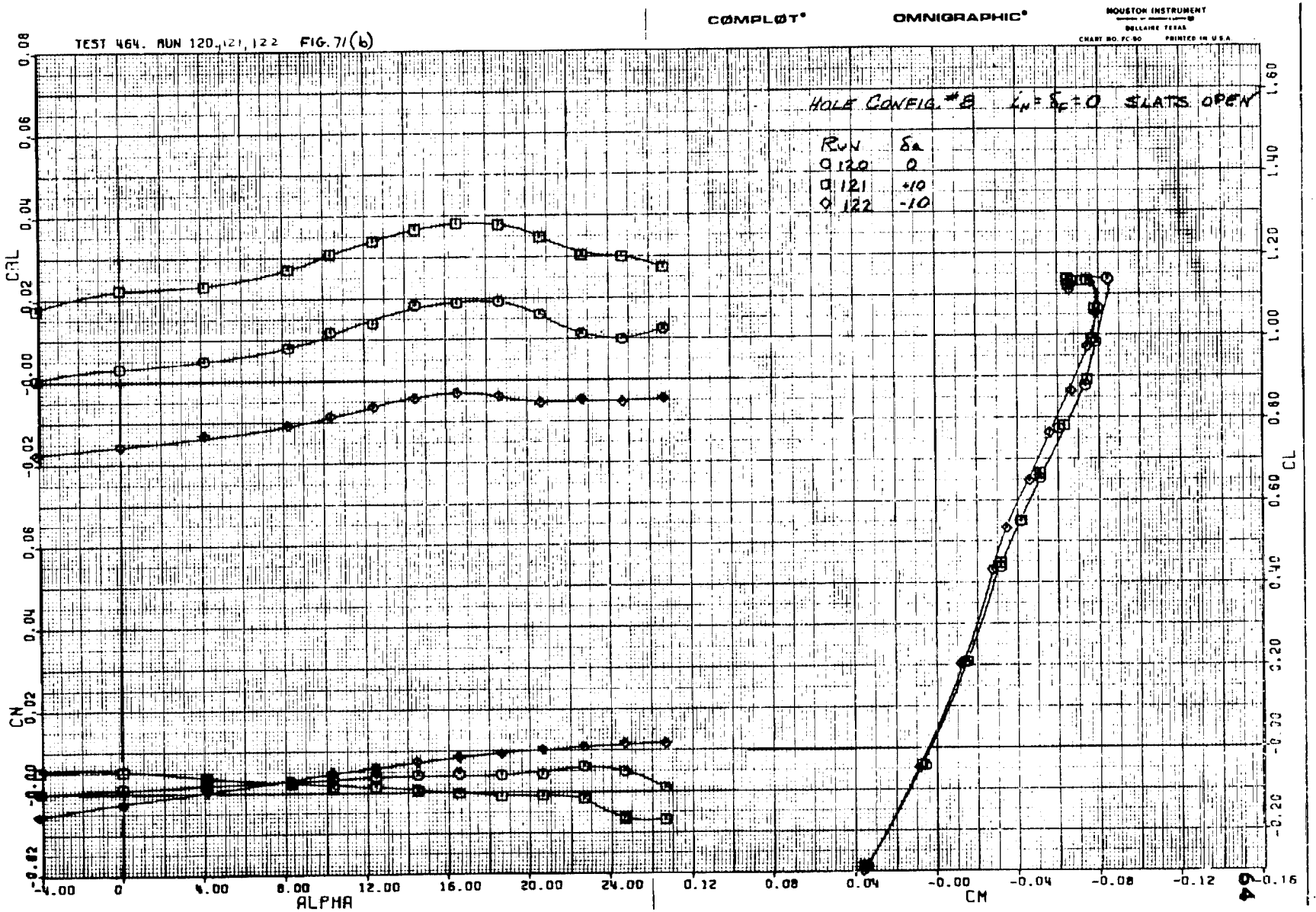

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 120,121,122 FIG. 71(b)
HOLE CONFIG. #8 $i_N = \delta_F = 0$ SLATS OPEN
RUN δ_a
120 0
121 +10
122 -10
CRL
CN
ALPHA
CL
CM

Figure 71(b)

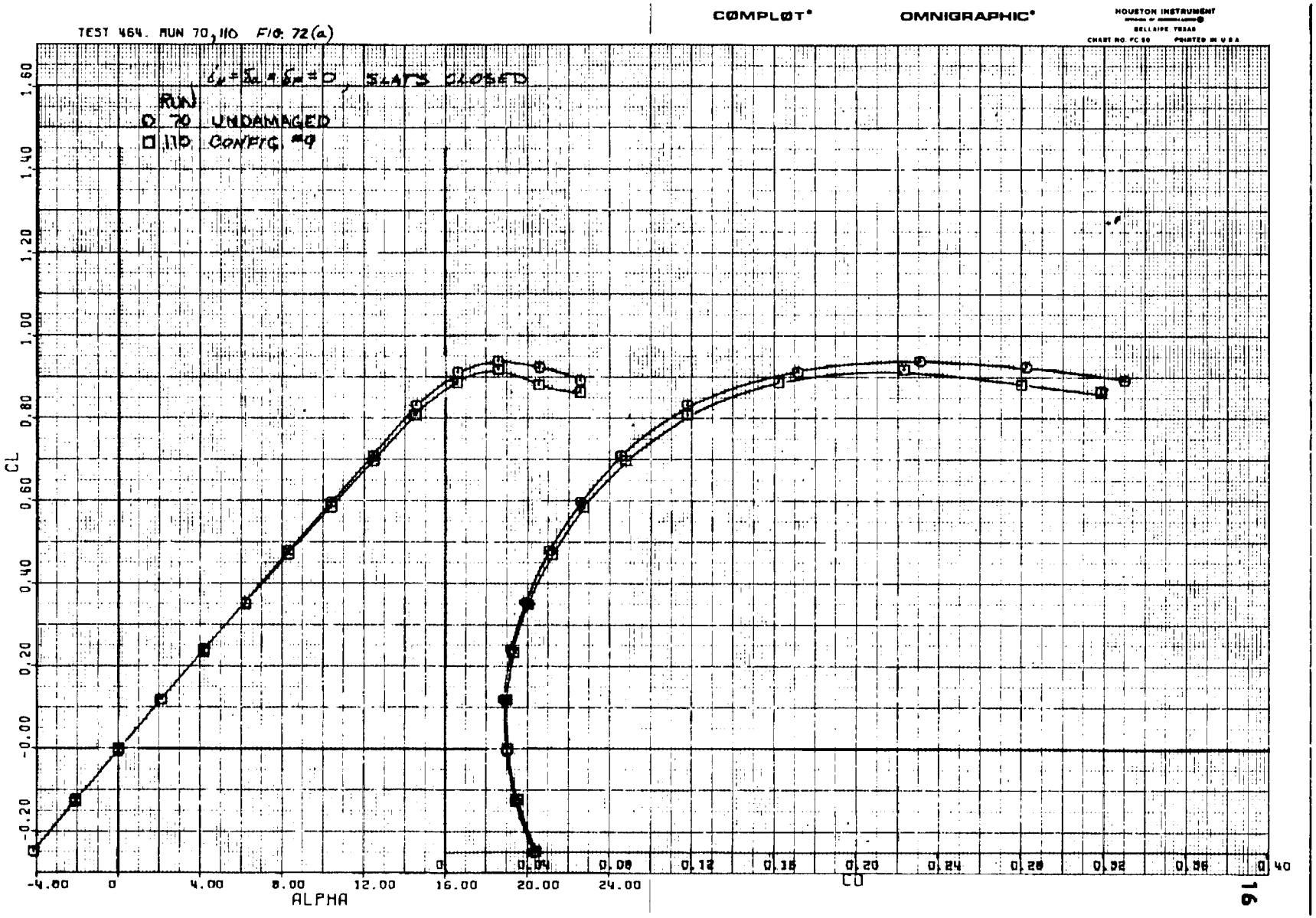

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 70, 110 FIG. 72(a)
$\delta_{LE} = \delta_{TE} = \delta_{FE} = 0$, SLATS CLOSED
RUN
70 UNDAMAGED
110 CONFIG #9
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
ALPHA
0
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
CD
16

Figure 72(a)

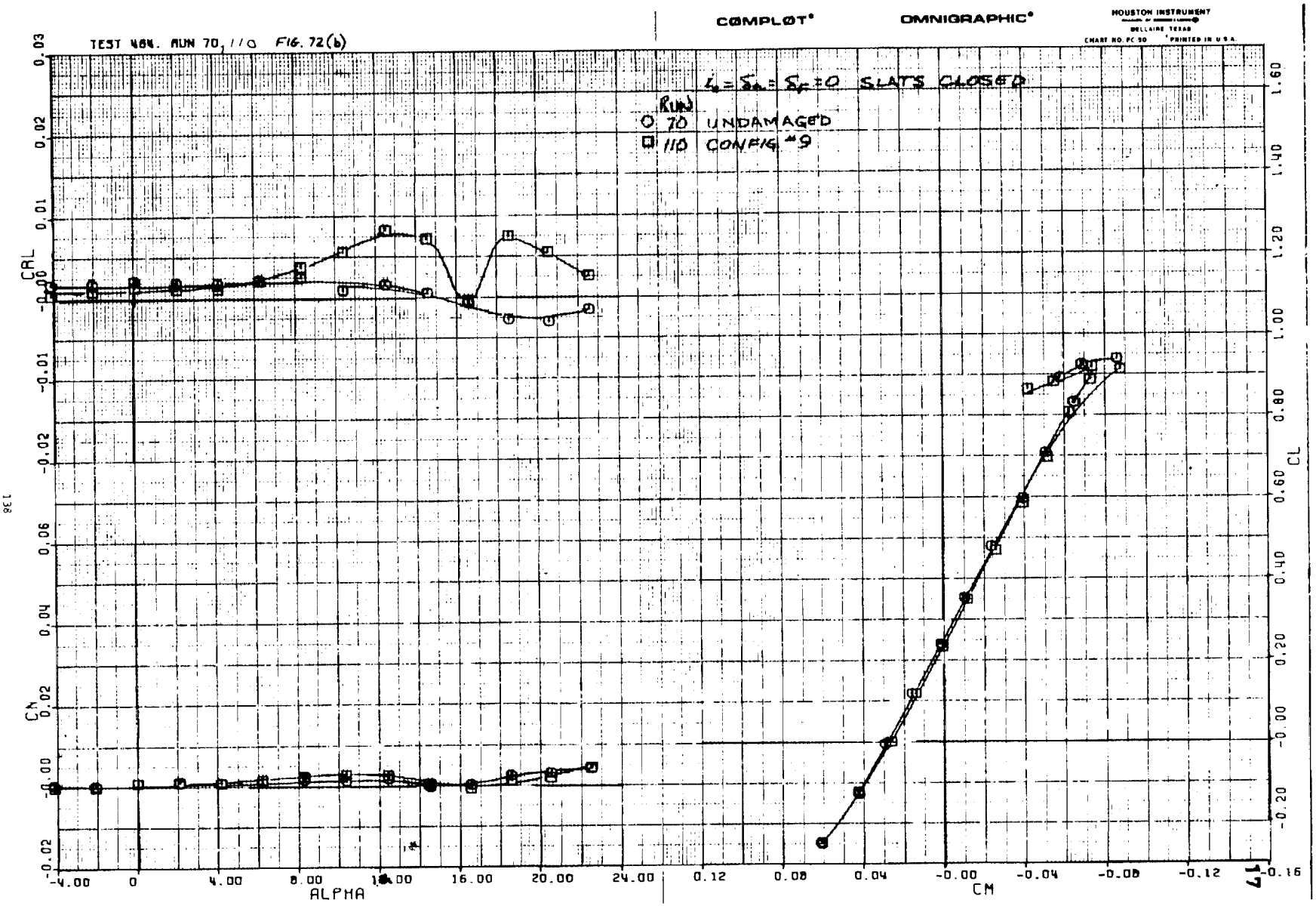

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 70, 110 FIG. 72(b)
$i_h = \delta_{ss} = \delta_f = 0$ SLATS CLOSED
RUN
70 UNDAMAGED
110 CONFIG "9
CRL
CN
ALPHA
CM
CL
0.03
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
-4.00
0
4.00
8.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20

Figure 72(b)

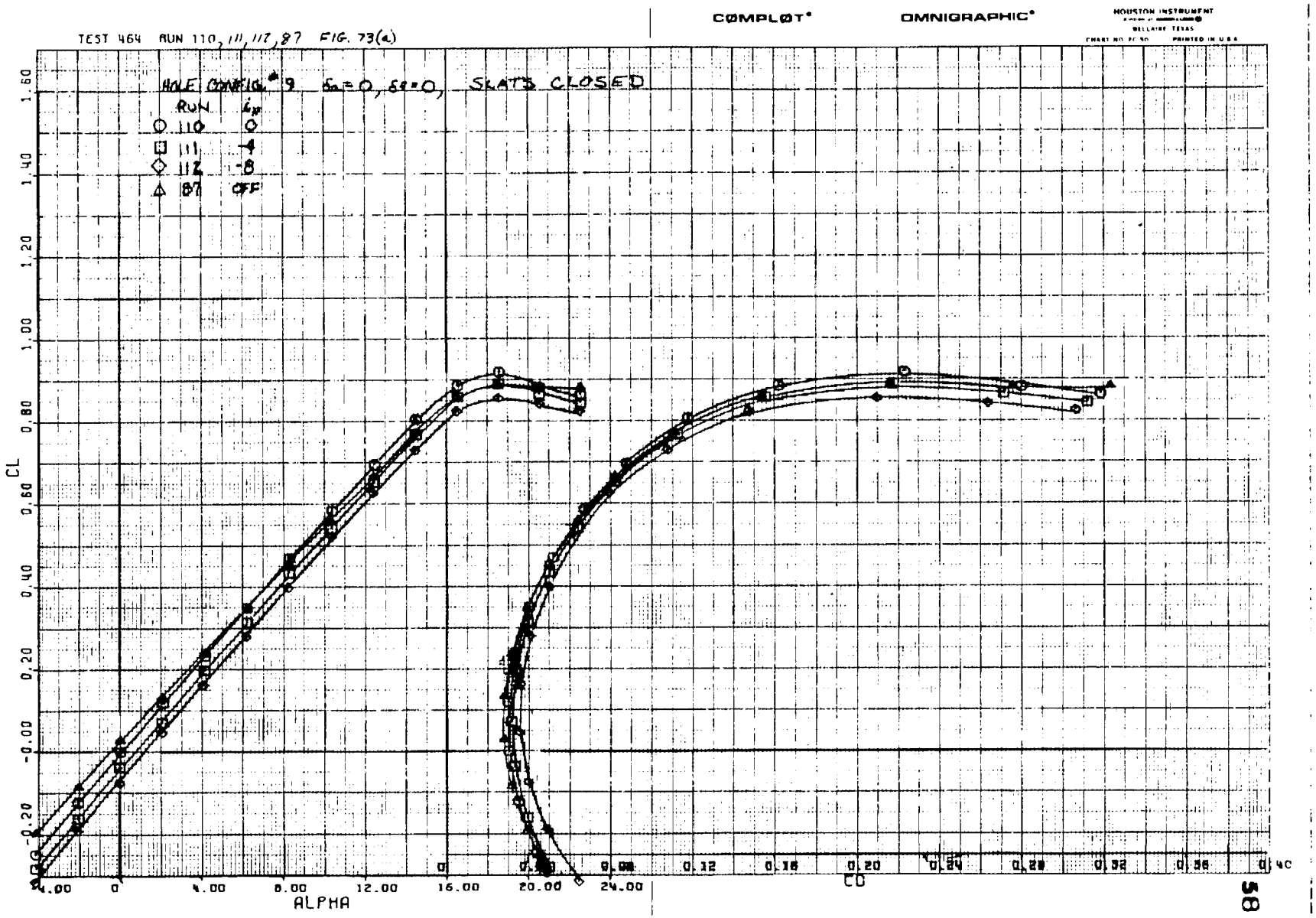

TEST 464 RUN 110, 111, 112, 87 FIG. 73(a)
COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
BELLAIRE TEXAS
PRINTED IN U.S.A.
HALF CONFIG. 9 δa=0, δs=0, SLATS CLOSED
RUN iw
110 0
111 -4
112 -8
87 OFF
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
ALPHA
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
CD
96

Figure 73(a)

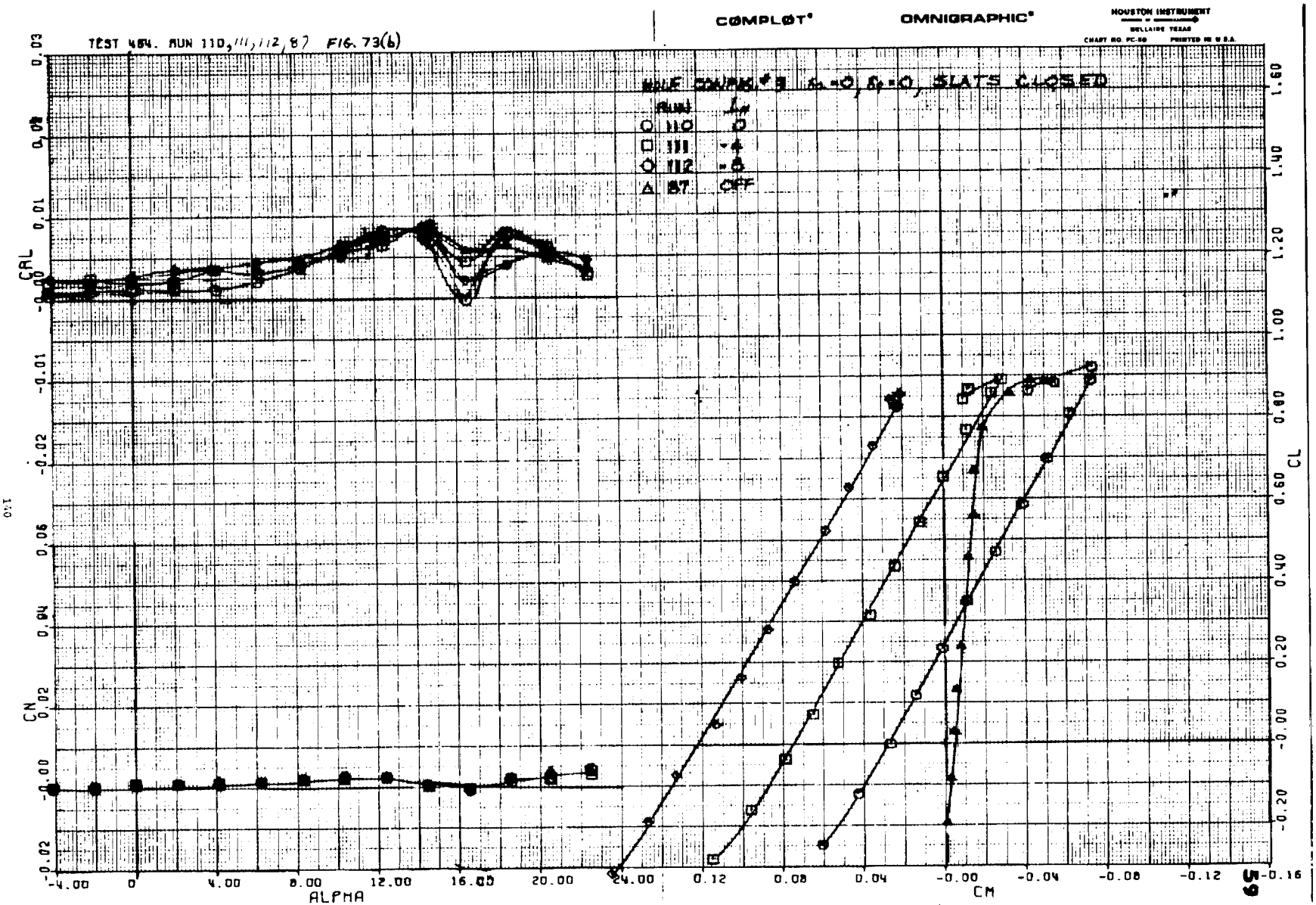
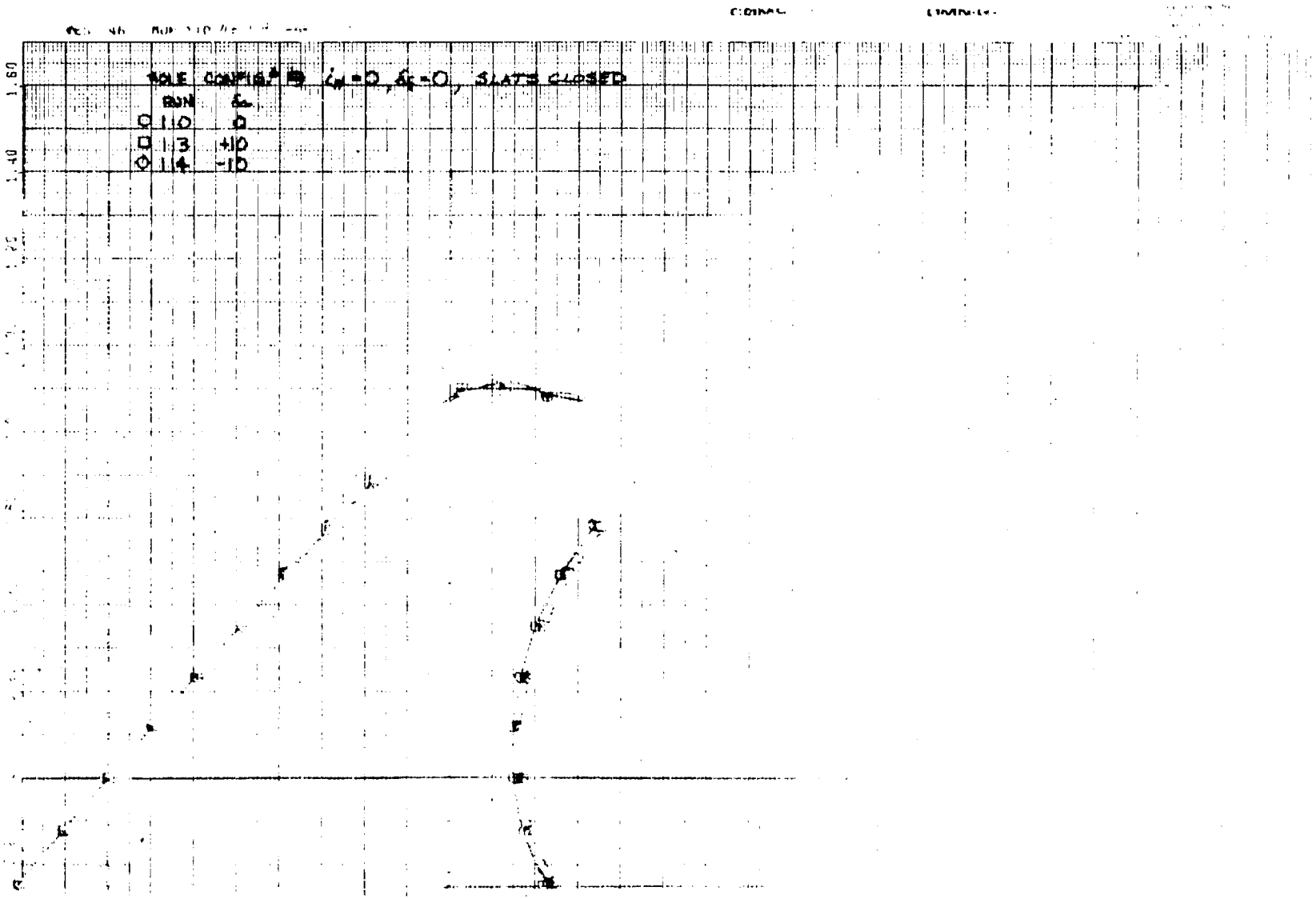

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 484. RUN 110, 111, 112, 87 FIG. 73(b)
WING-BODY, δa=0, δr=0, SLATS CLOSED
RUN δf
110 0
111 -4
112 -8
87 OFF
CAL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 73(b)


1.60
1.40
RUN
110
113
114
+10
-10
SLATS CLOSED

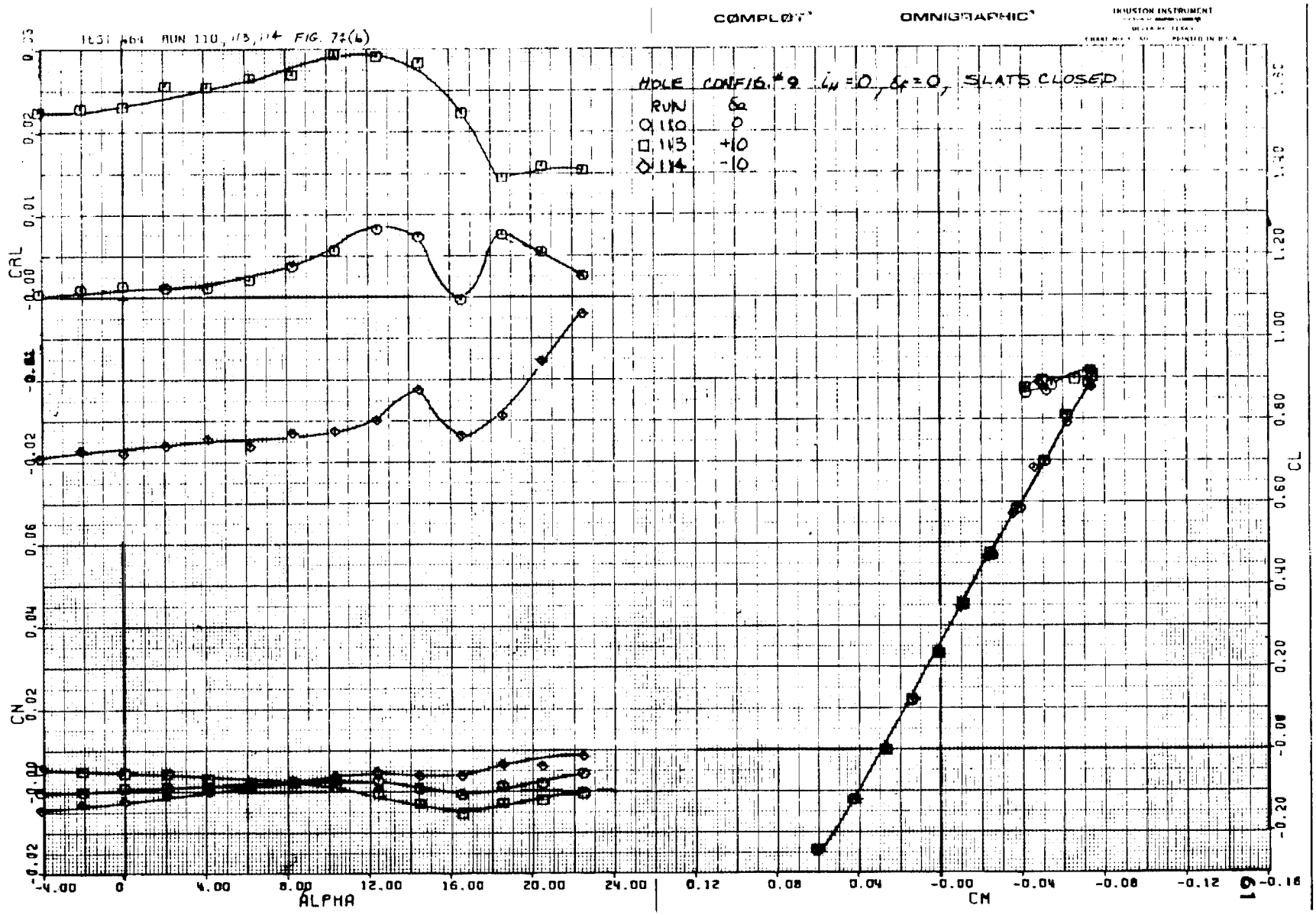

COMPLOT
OMNIGRAPHIC
HOLE CONFIG. #9 i_H =0, δ_f =0, SLATS CLOSED
RUN δa
○ 110 0
□ 113 +10
◇ 114 -10
CRL
CN
CL
CM
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 74(b)

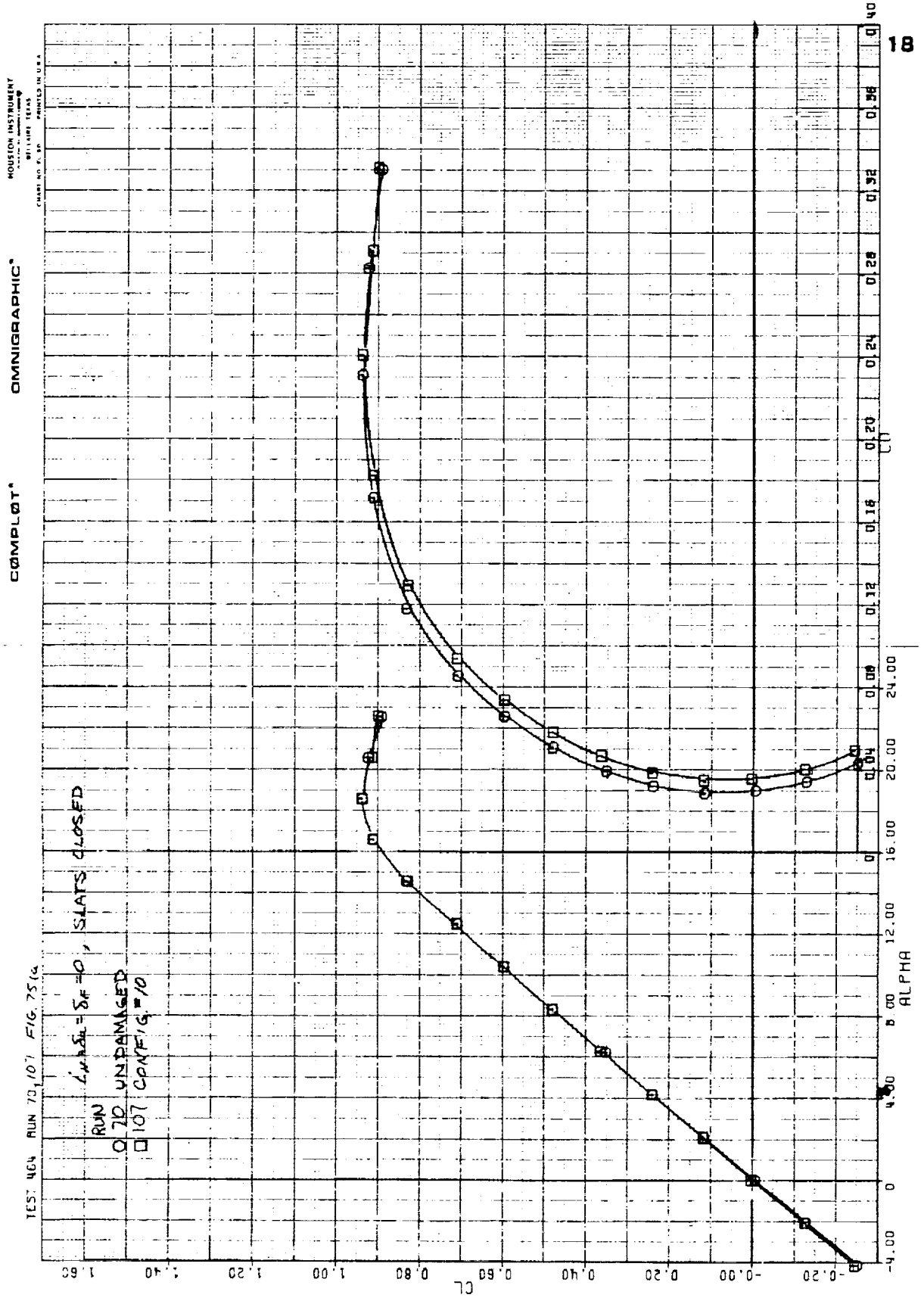
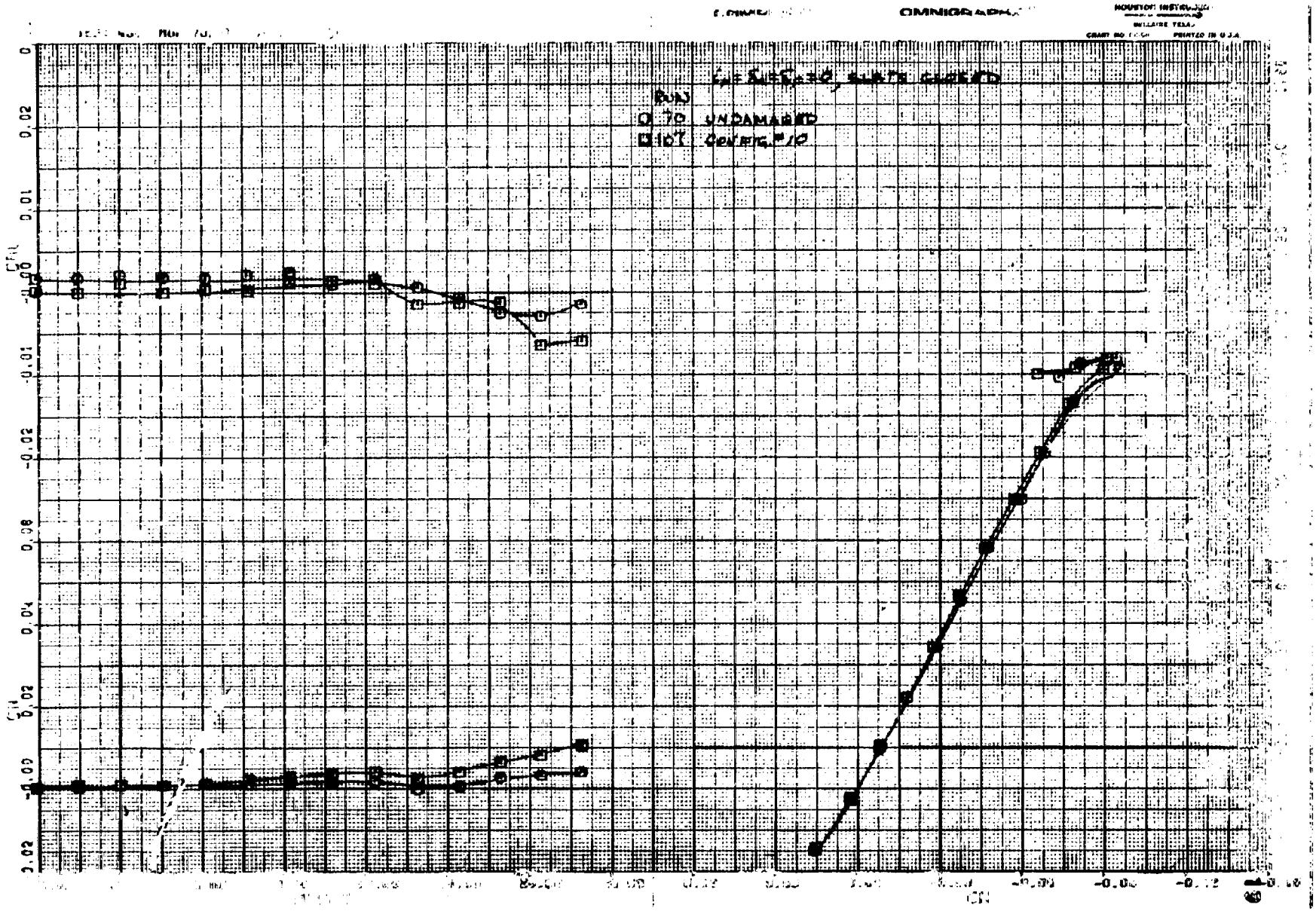

COMPLOT® OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464 RUN 70,107 FIG. 75(a)
RUN
70 UNDAMAGED
107 CONFIG. #10
$\delta_{LE} = \delta_F = 0°$, SLATS CLOSED
CL
ALPHA
18

Figure 75(a)


OMNIGRAPH
RUN
UNDAMAGED
0.02
0.01
0.00
-0.01
-0.02
0.08
0.04
0.02
-0.00
-0.02

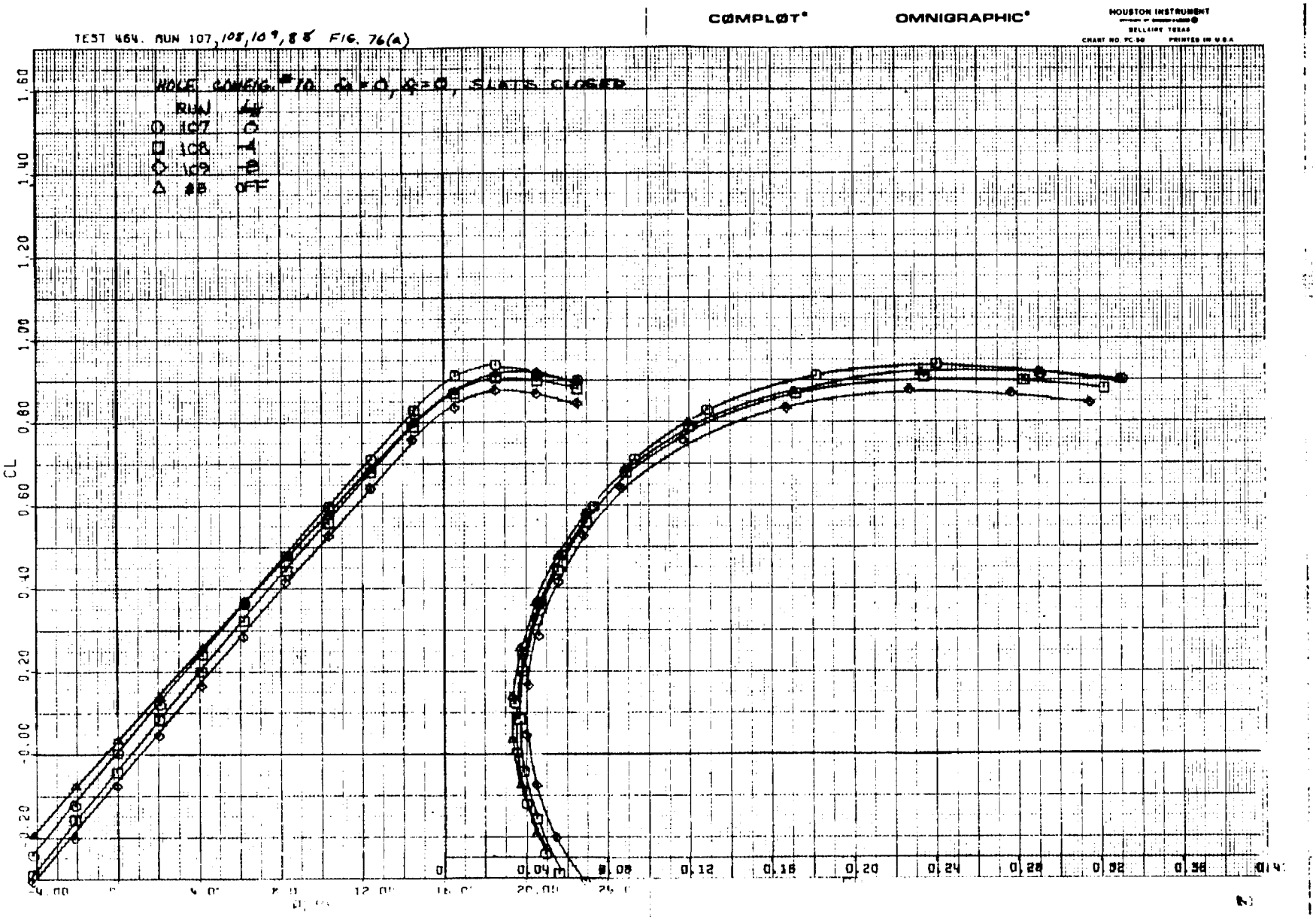
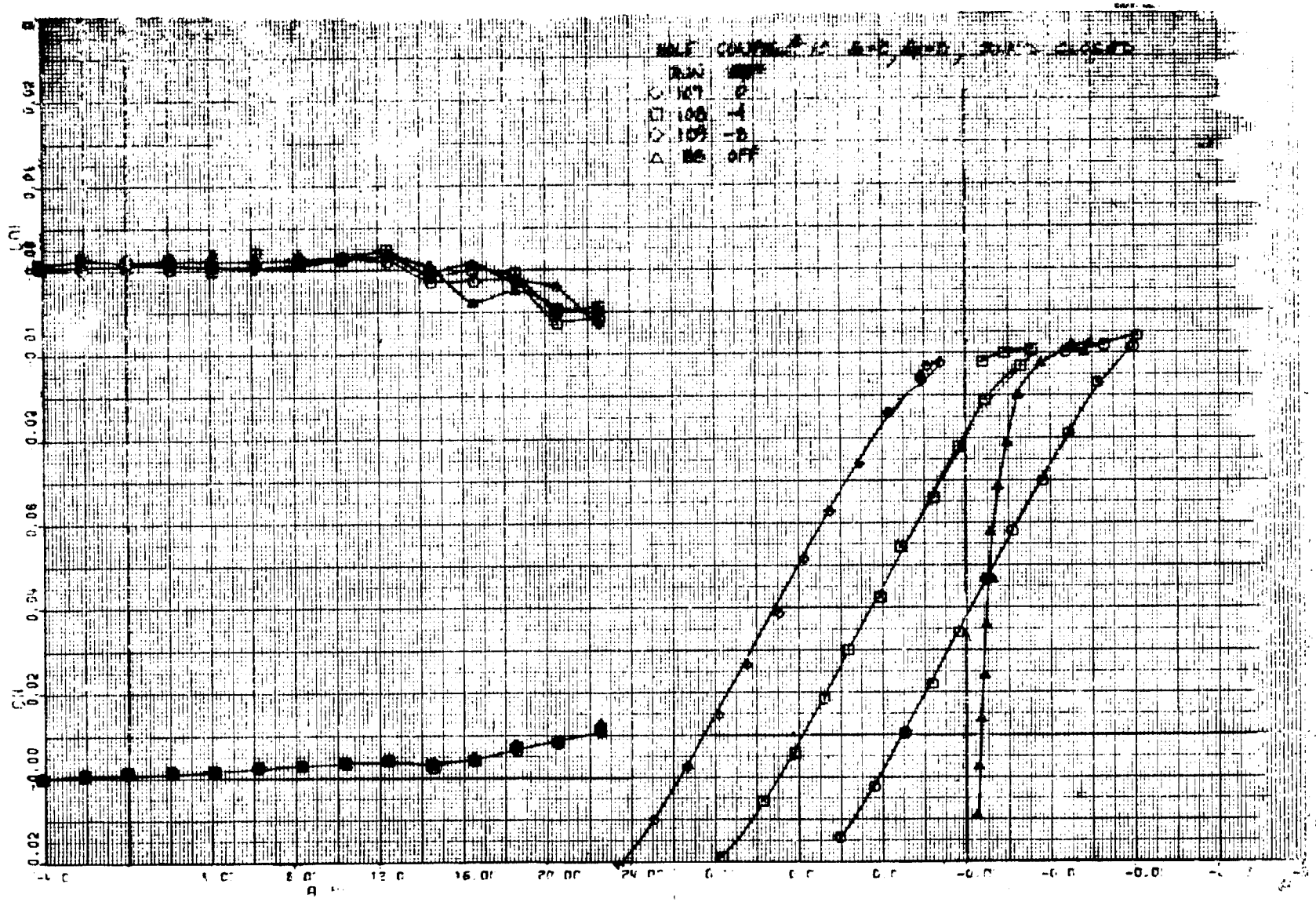

CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 107, 108, 109, 88 FIG. 76(a)
WING CONFIG. #10 δf = 0, δs = 0, SLATS CLOSED
RUN δsp
107 0
108 -4
109 -8
88 OFF
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36

Figure 76(a)


0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
0.08
0.04
0.02
0.00
-0.02
-4.0
4.0
8.0
12.0
16.0
20.00
-0.0
-0.0
-0.0

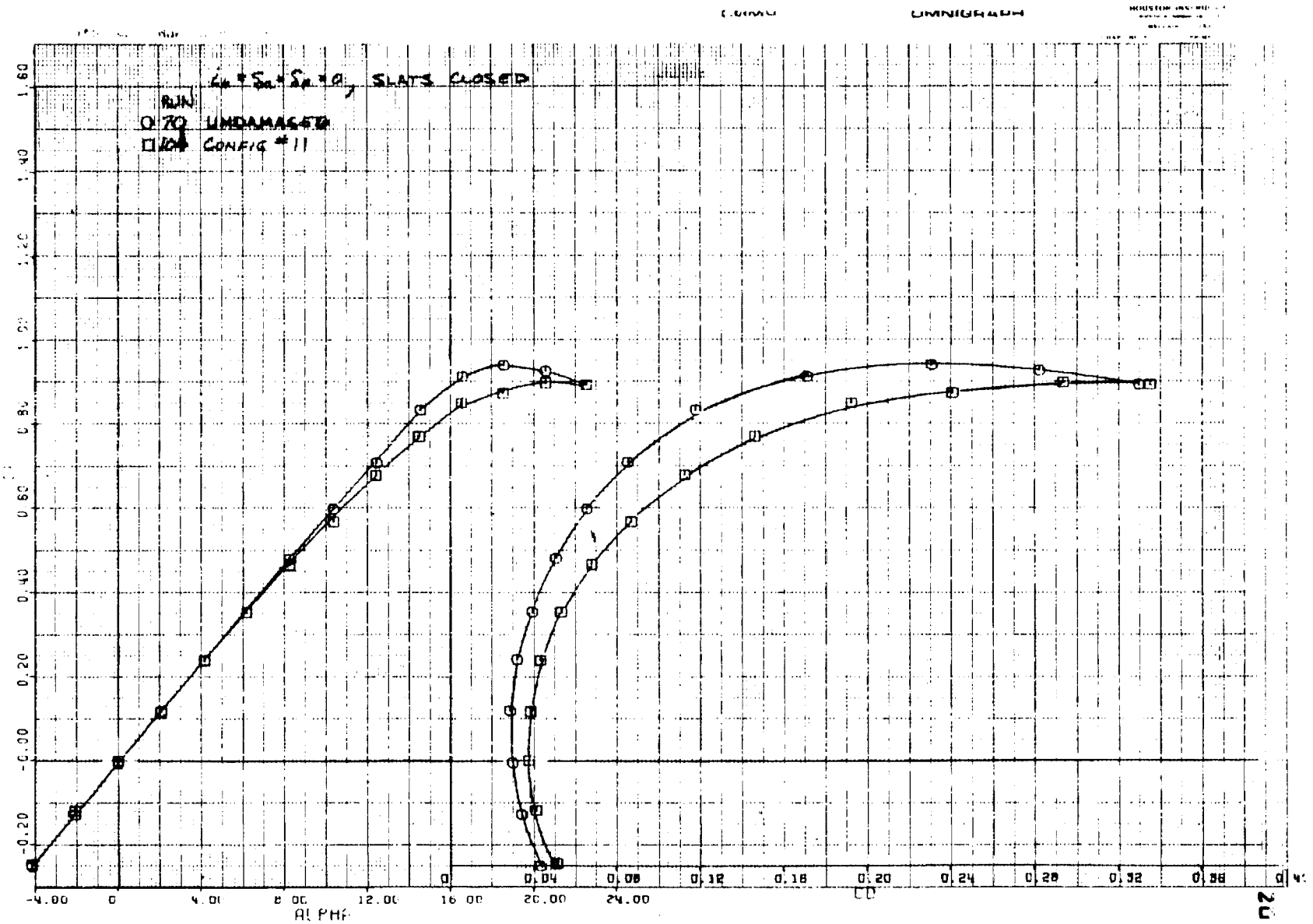
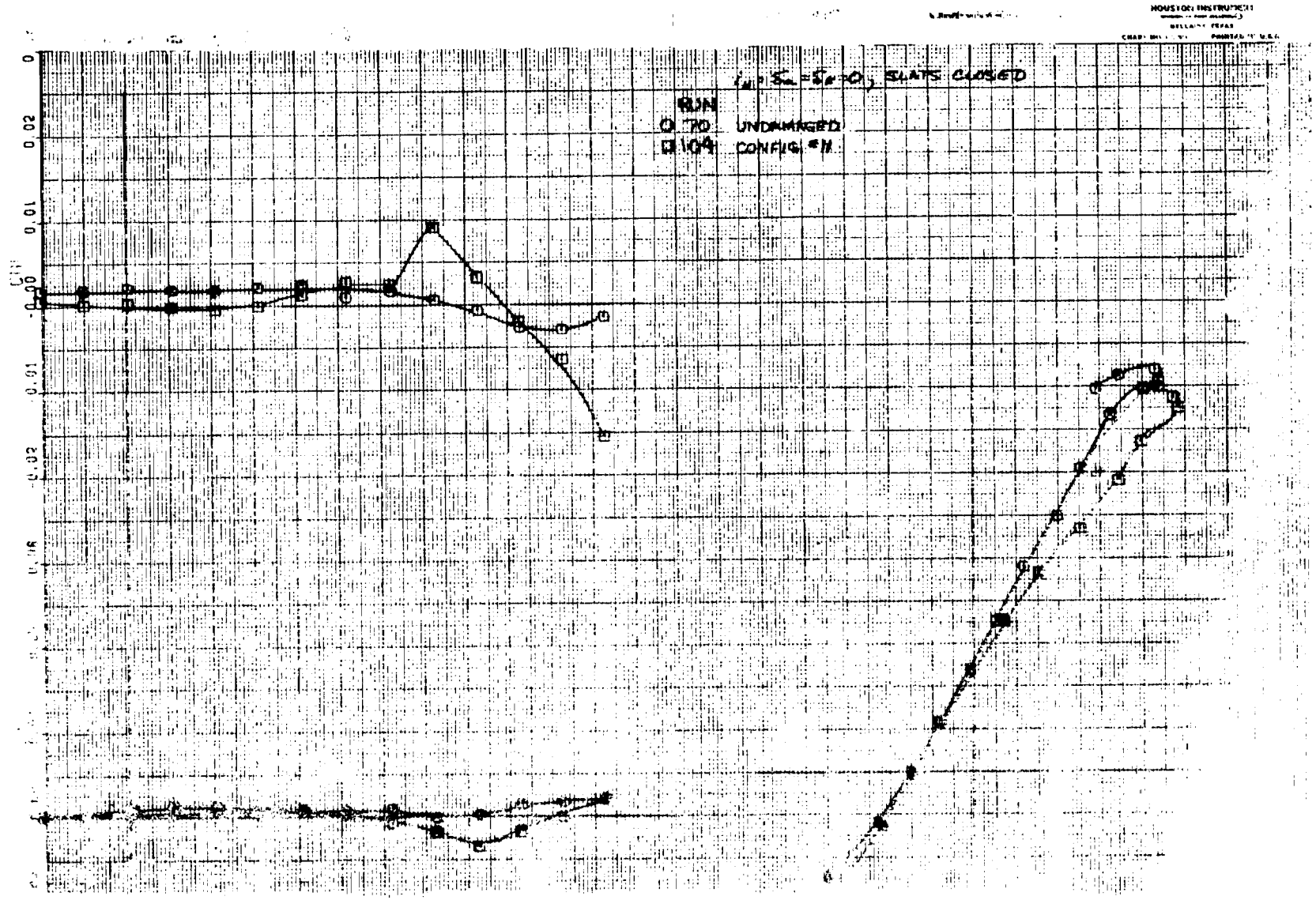
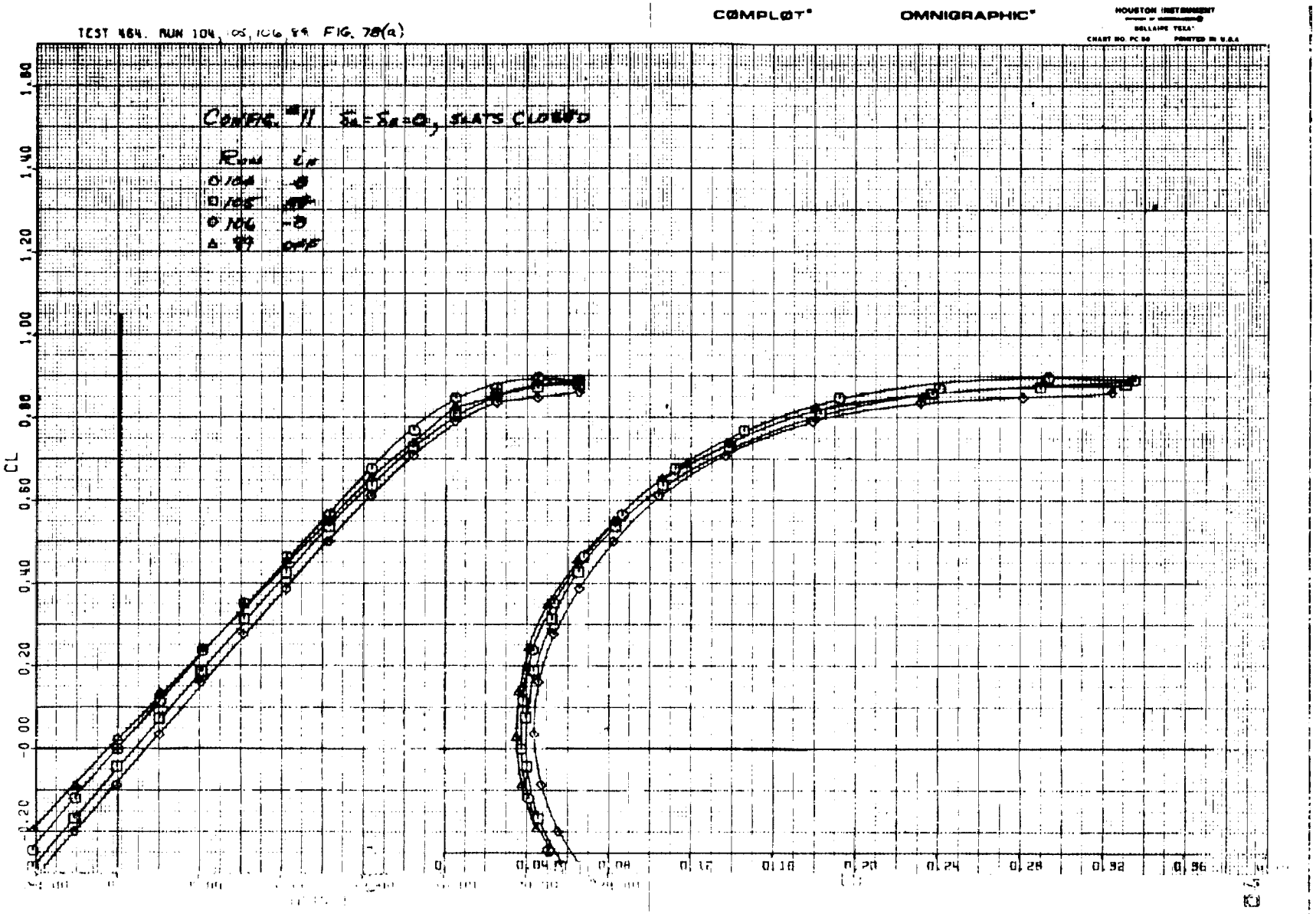

OMNIGRAPH
$\delta_f = \delta_s = \delta_a = 0$, SLATS CLOSED
RUN
70 UNDAMAGED
104 CONFIG #11
1.60
1.40
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
ALPHA
0
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
CD

Figure 77(a)


RUN
70 UNDAMAGED
104 CONFIG. #11
0
0.02
0.01
-0.00
-0.01
-0.02


TEST 464. RUN 104, 105, 106, 89 FIG. 78(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
CONFIG. "H" $\delta_{le} = \delta_{se} = 0$, SLATS CLOSED
CL
1.80
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36

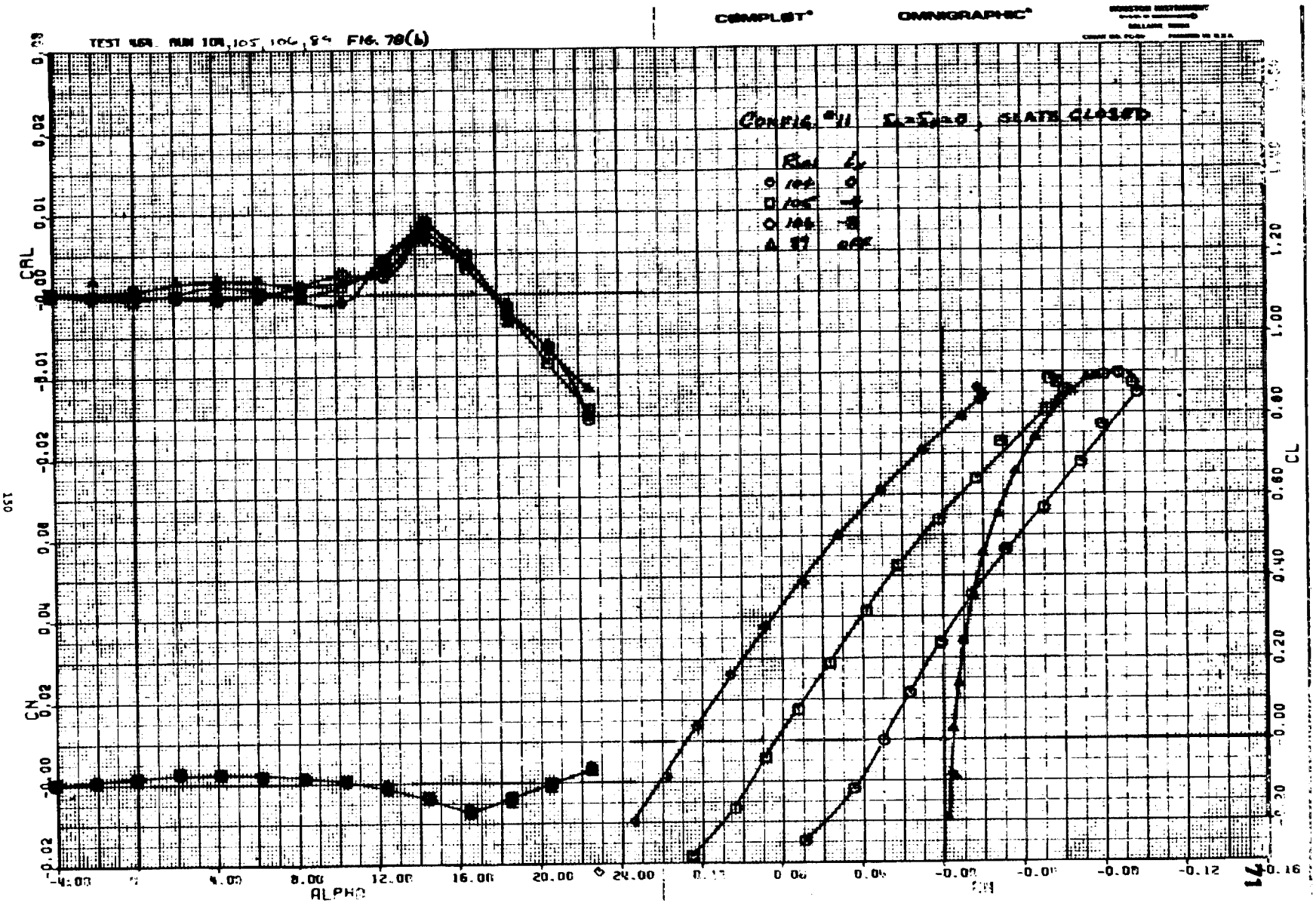

COMPLET®
OMNIGRAPHIC®
TEST 468 RUN 104,105,106,84 FIG. 78(b)
CONFIG. #11 SLATE CLOSED
CAL
CN
CL
ALPHA
-4.00
0.00
4.00
8.00
12.00
16.00
20.00
24.00
0.20
0.40
0.60
0.80
1.00
1.20
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 78(b)

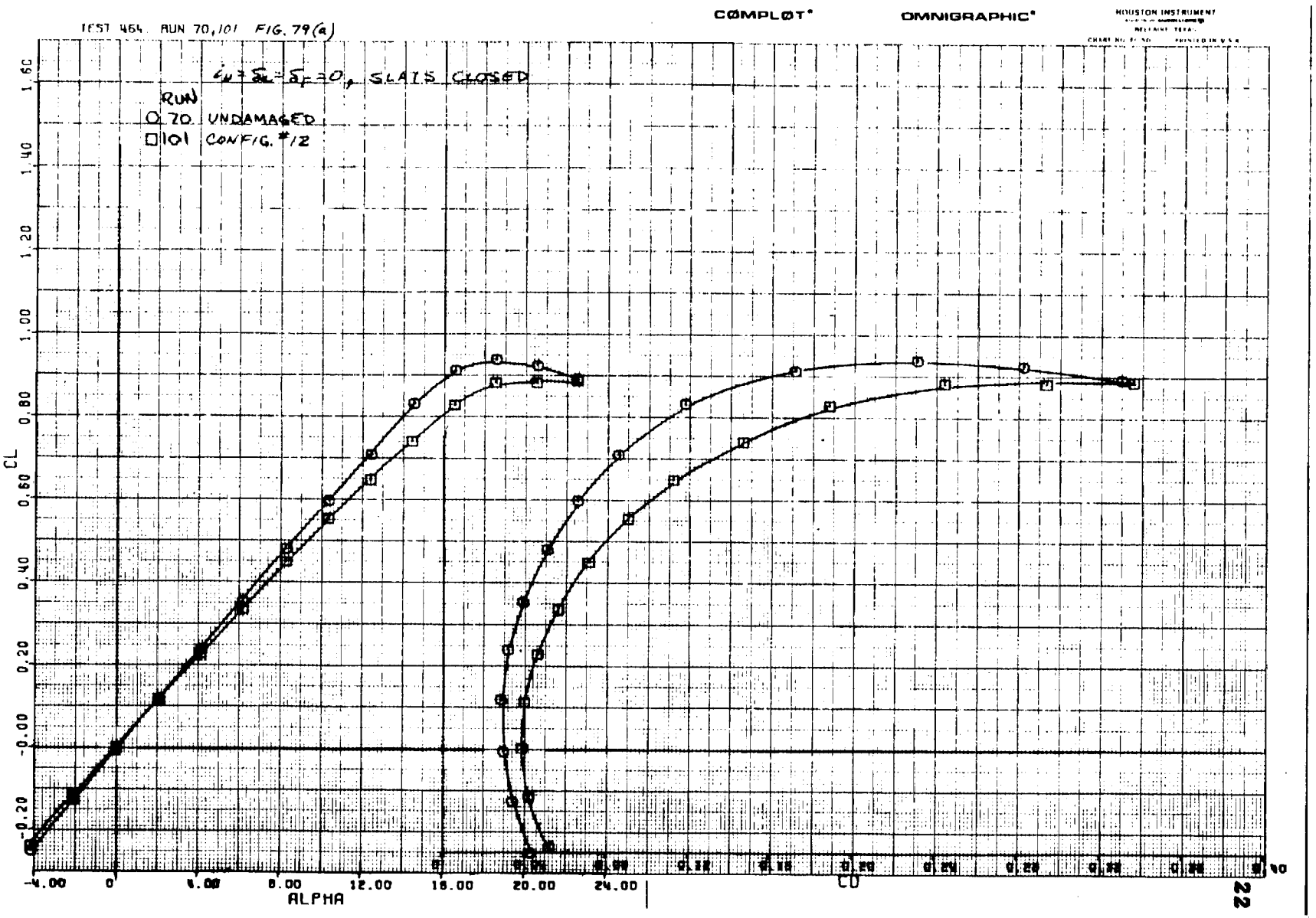

TEST 464 RUN 70,101 FIG. 79(a)
COMPLOT* OMNIGRAPHIC*
HOUSTON INSTRUMENT
$i_w = \delta_{le} = \delta_f = 30°$, SLATS CLOSED
RUN
○ 70 UNDAMAGED
□ 101 CONFIG. #12
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
ALPHA
CD
22

Figure 79(a)

CN
CRL
1.02
-0.00
0.02
0.04
0.06
-0.02
-0.01
-0.00
0.01
0.02

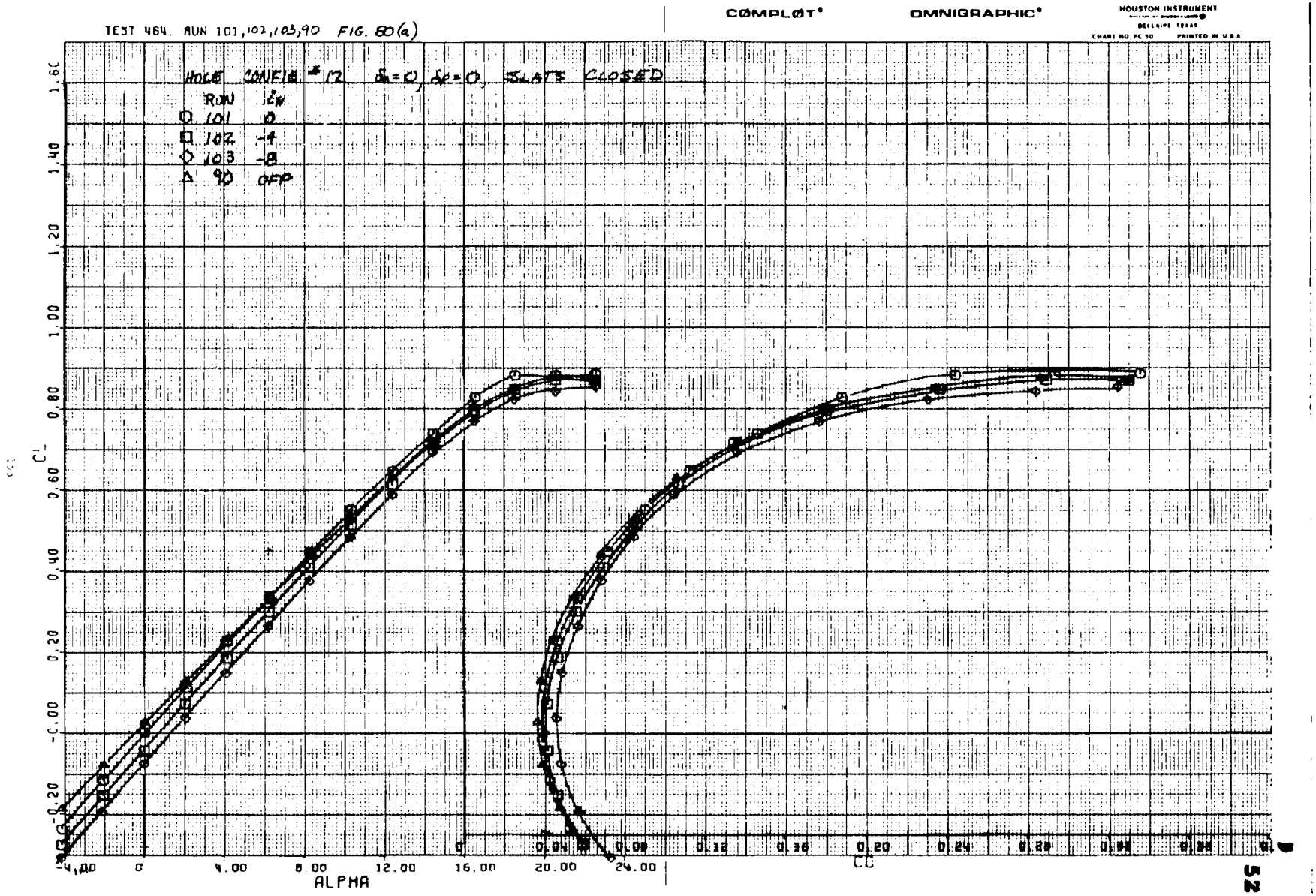

TEST 464. RUN 101,102,103,90 FIG. 80(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
HOLES CONFIG #12 δf=0, δs=0, SLATS CLOSED
RUN iH
101 0
102 -4
103 -8
90 OFF
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36

Figure 80(a.

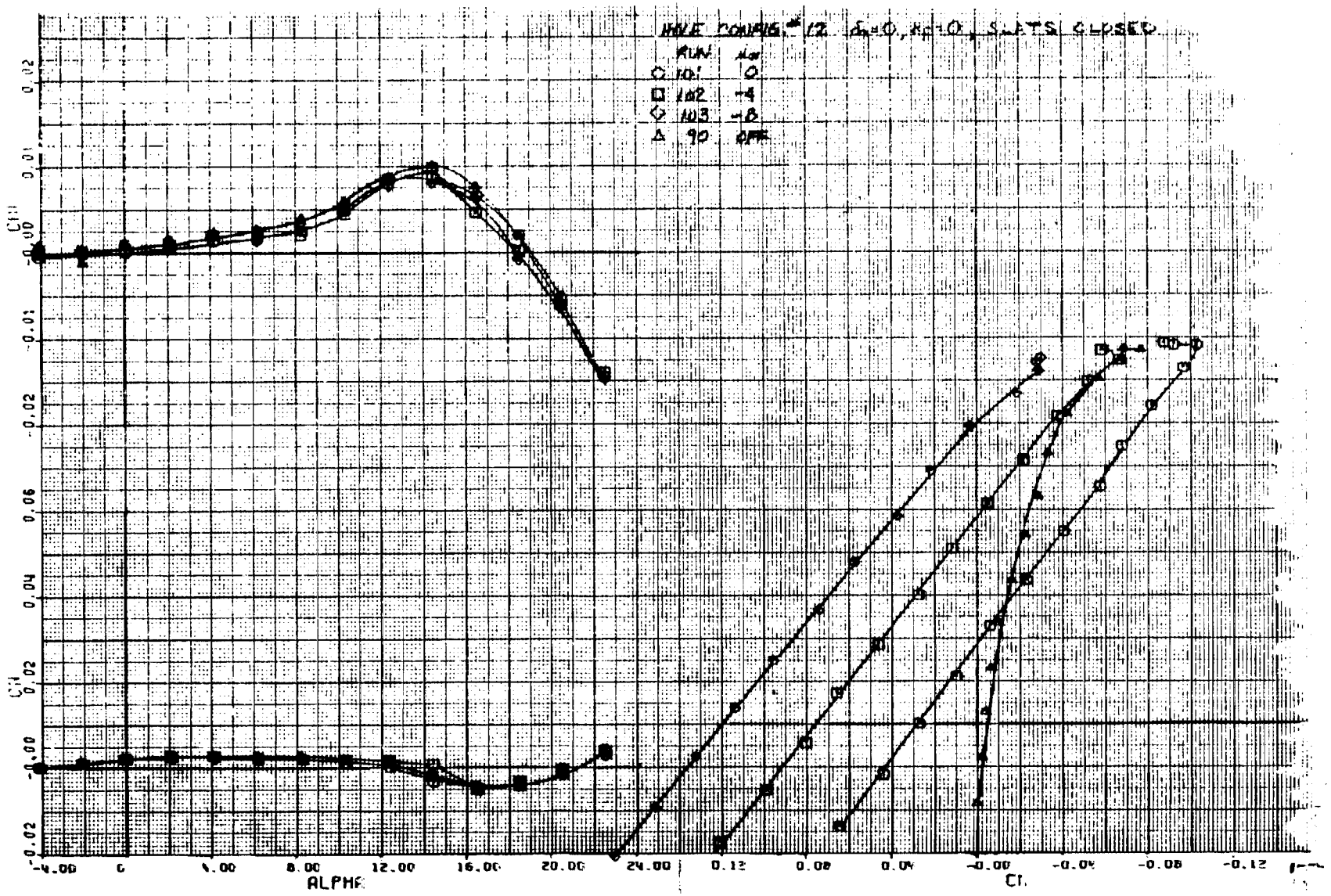

WING CONFIG. #12 δf=0, Rf=0, SLATS CLOSED
RUN α
101 0
102 -4
103 -8
90 OFF
ALPHA
CL

Figure 80(b)

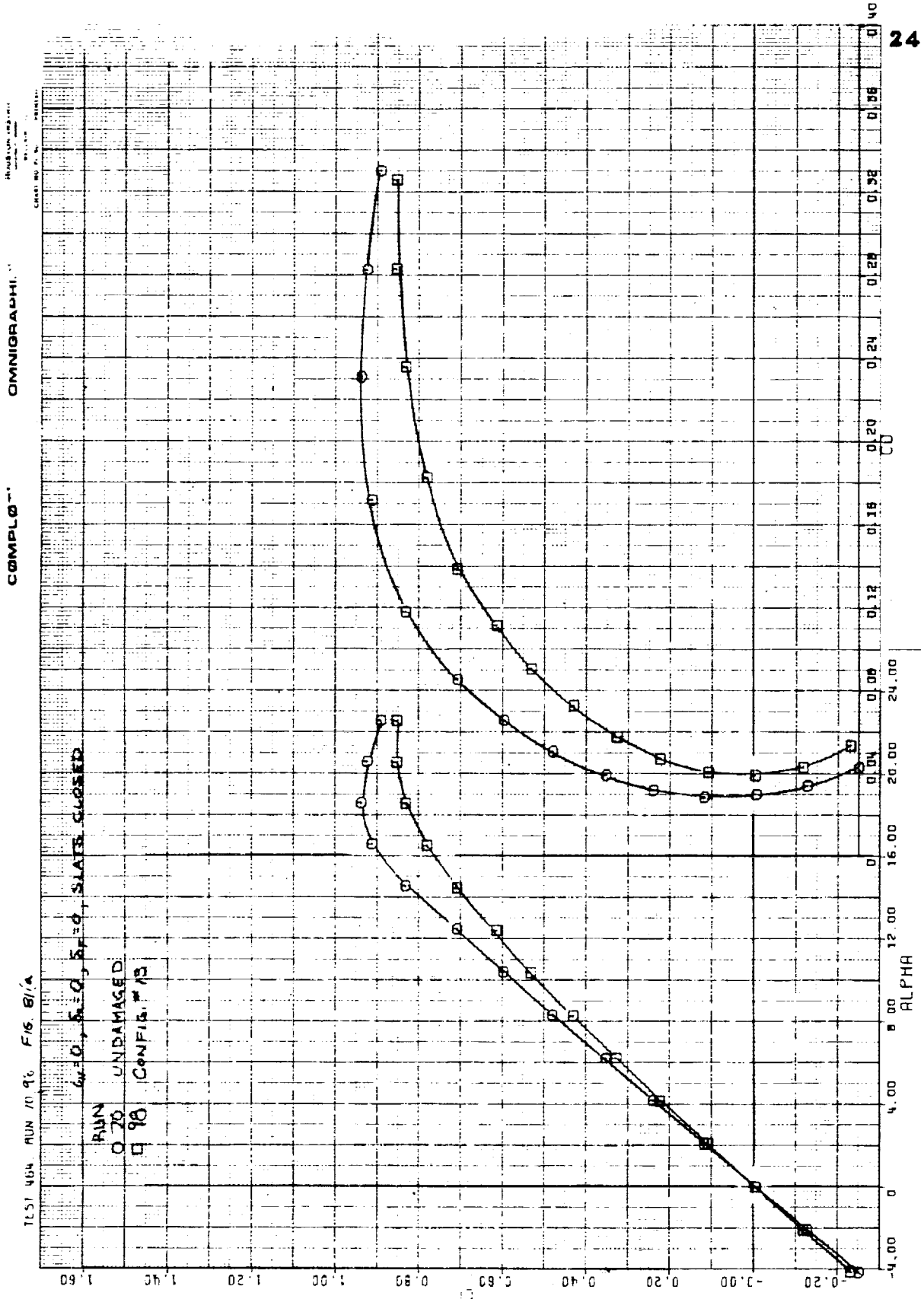
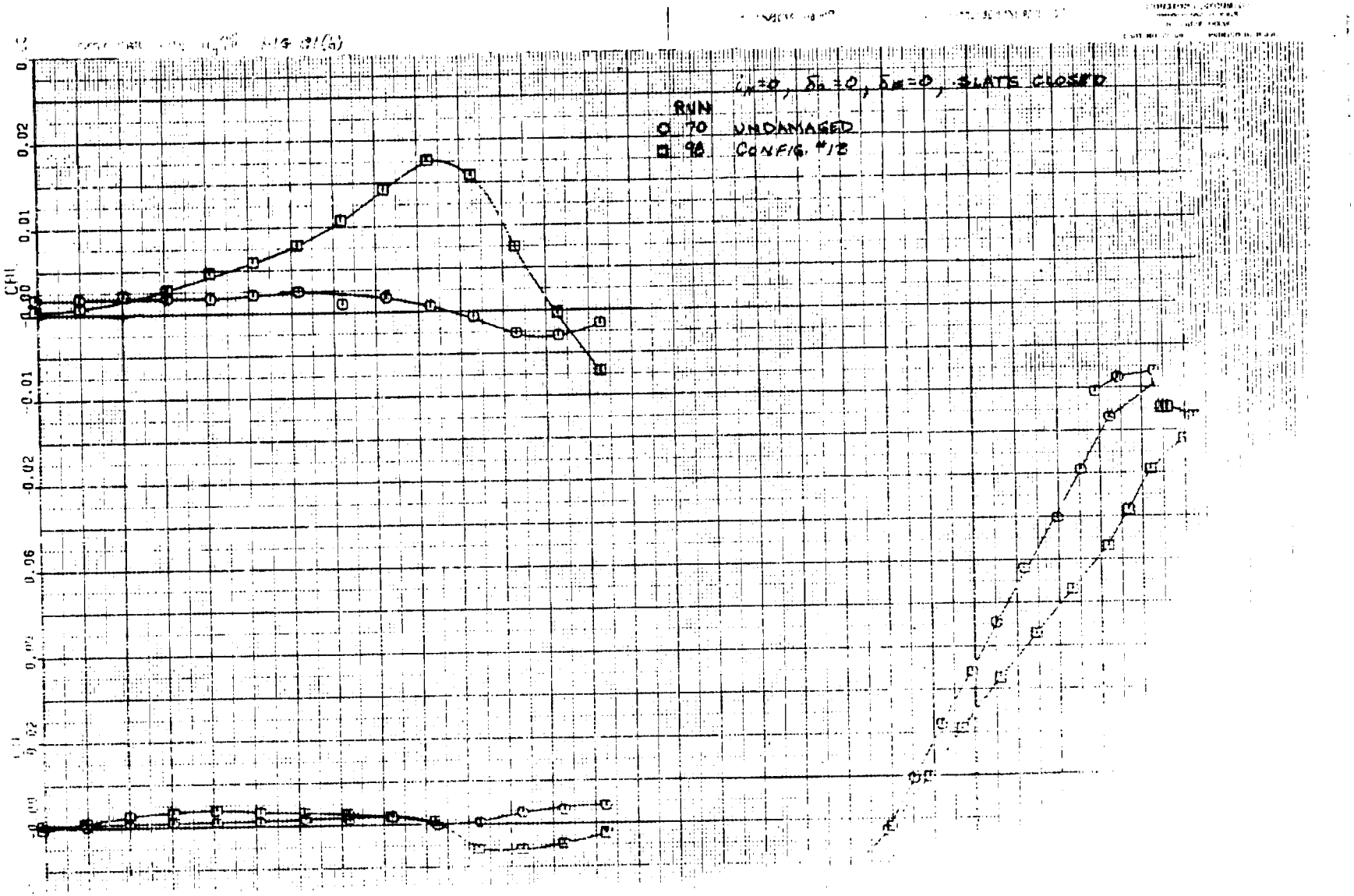
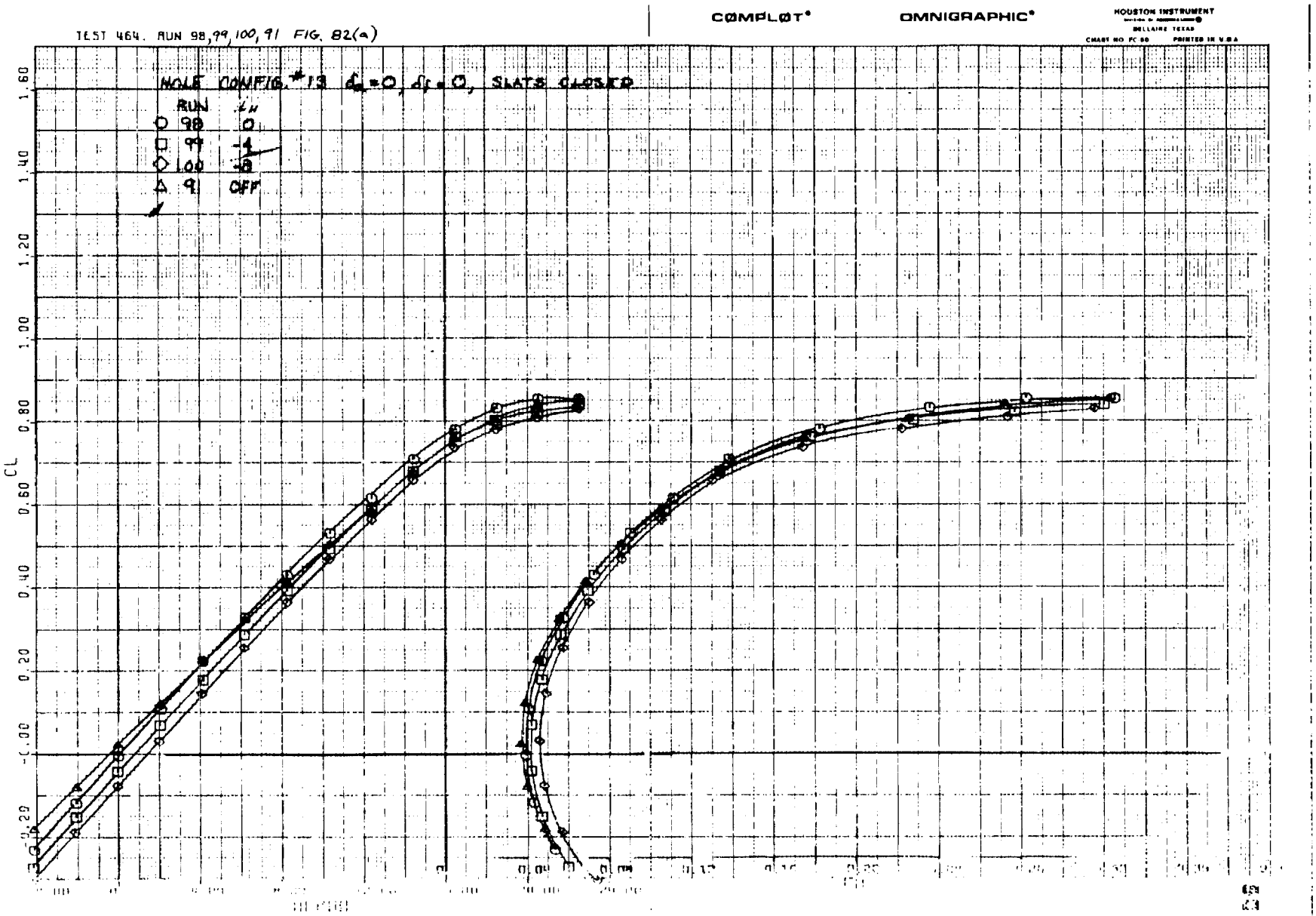

COMPLØT
OMNIGRAPH
TEST 464 RUN 10 96 FIG. 81A
$\delta_w=0$, $\delta_e=0$, $\delta_F=0$, SLATS CLOSED
RUN
○ 70 UNDAMAGED
□ 98 CONFIG. # 13
CD
ALPHA
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
-0.20
-3.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 81(a)


$\alpha_w = 0$, $\delta_a = 0$, $\delta_{ail} = 0$, SLATS CLOSED
RUN
70 UNDAMAGED
98 CONFIG. #12
CM
0
0.02
0.01
-0.00
-0.01
-0.02
0.06


COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
CHART NO. PC 50
PRINTED IN U.S.A.
TEST 464. RUN 98,99,100,91 FIG. 82(a)
HOLE CONFIG. #13 $\delta_a = 0$, $\delta_f = 0$, SLATS CLOSED
RUN δ_H
98 0
99 -4
100 -8
91 OFF
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20

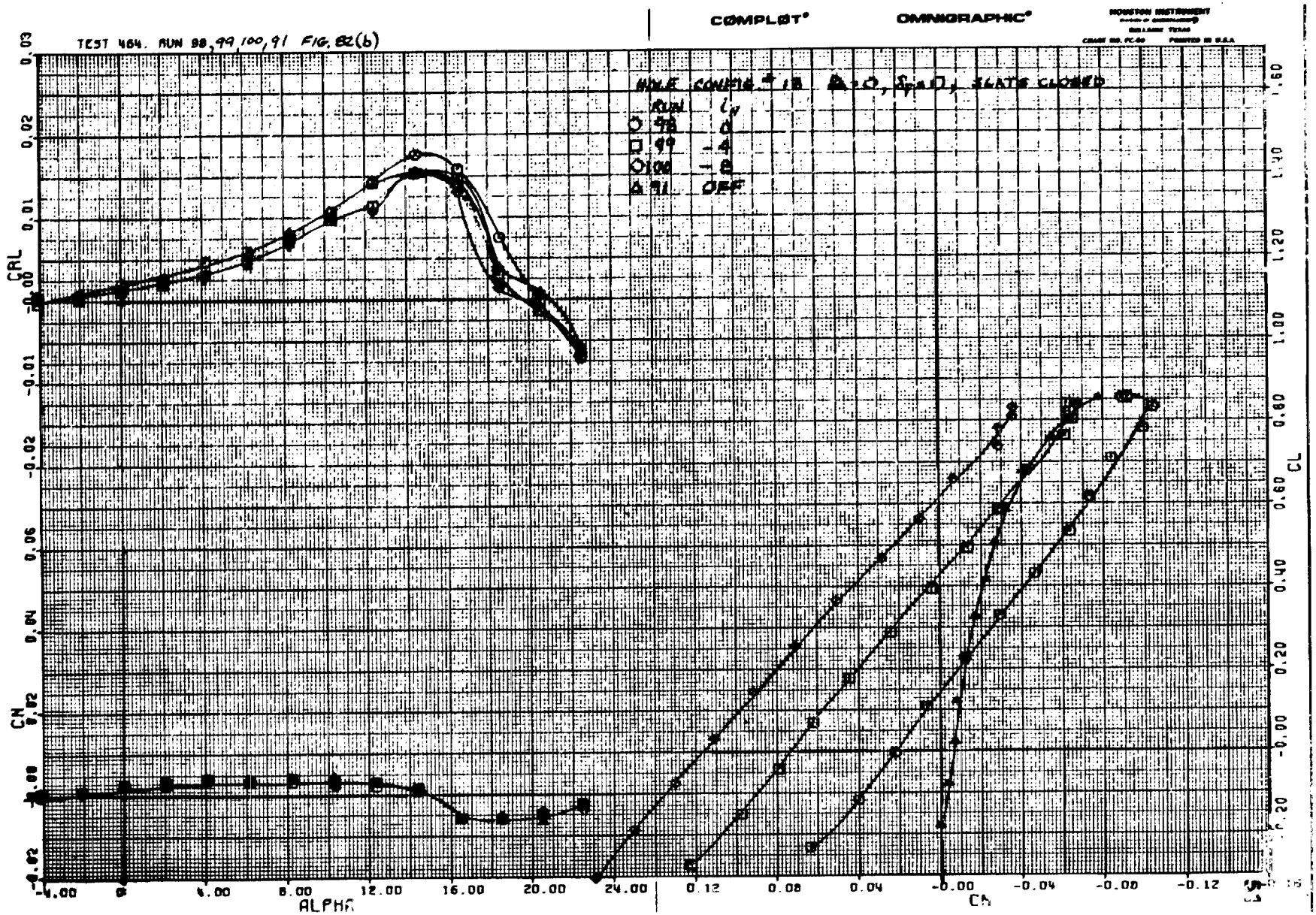

COMPLOT®
OMNIGRAPHIC®
TEST 464. RUN 98, 99, 100, 91 FIG. 82(b)
WING CONFIG. # 18 δf=0, δsp=0, SLATS CLOSED
RUN
98
99
100
91
CRL
CN
CL
CA
ALPHA

Figure 82(b)

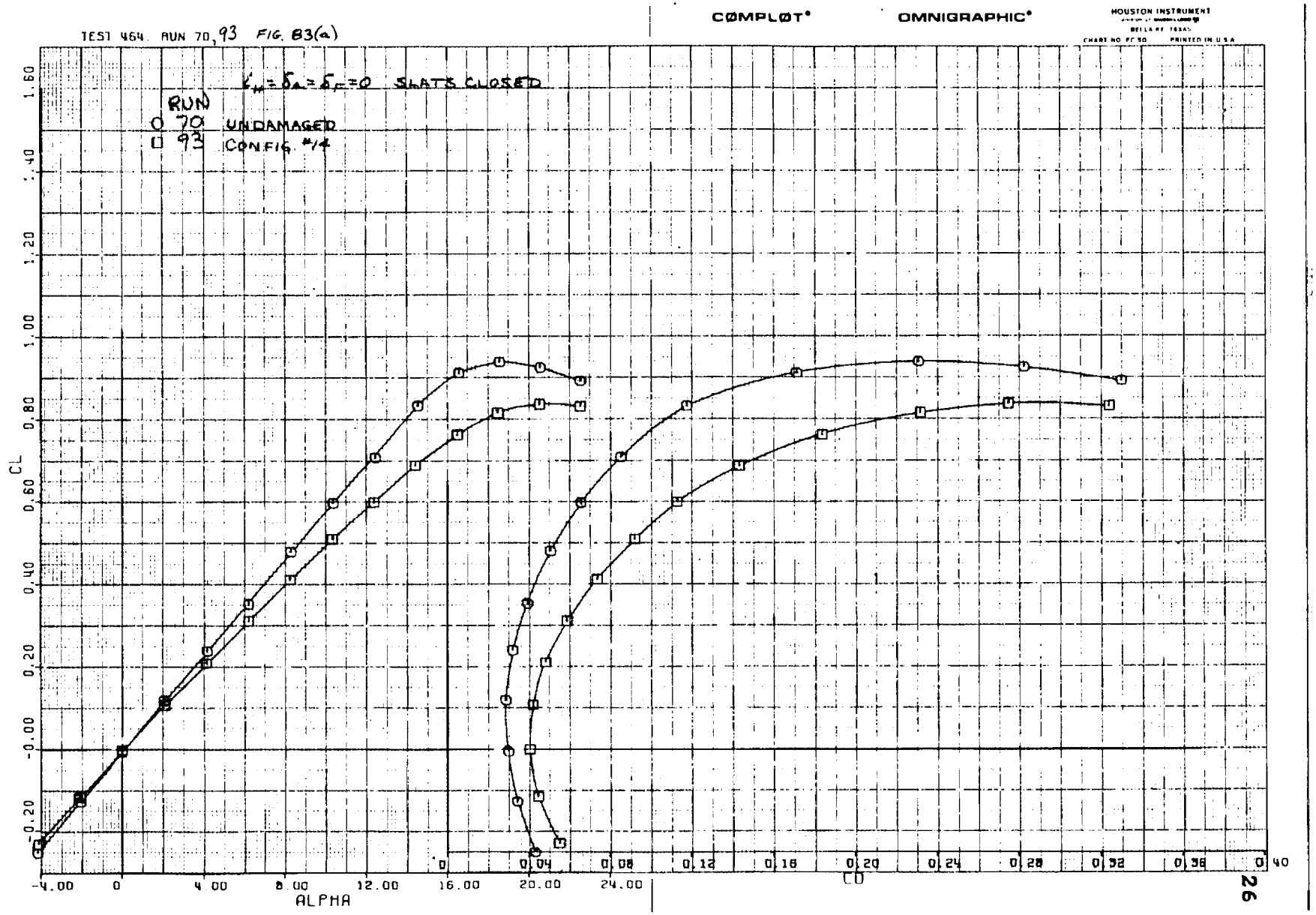

TEST 464 RUN 70, 93 FIG. 83(a)
$\delta_H = \delta_A = \delta_F = 0$ SLATS CLOSED
RUN
70 UNDAMAGED
93 CONFIG. #4
CØMPLØT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
CL
ALPHA
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 83(a)

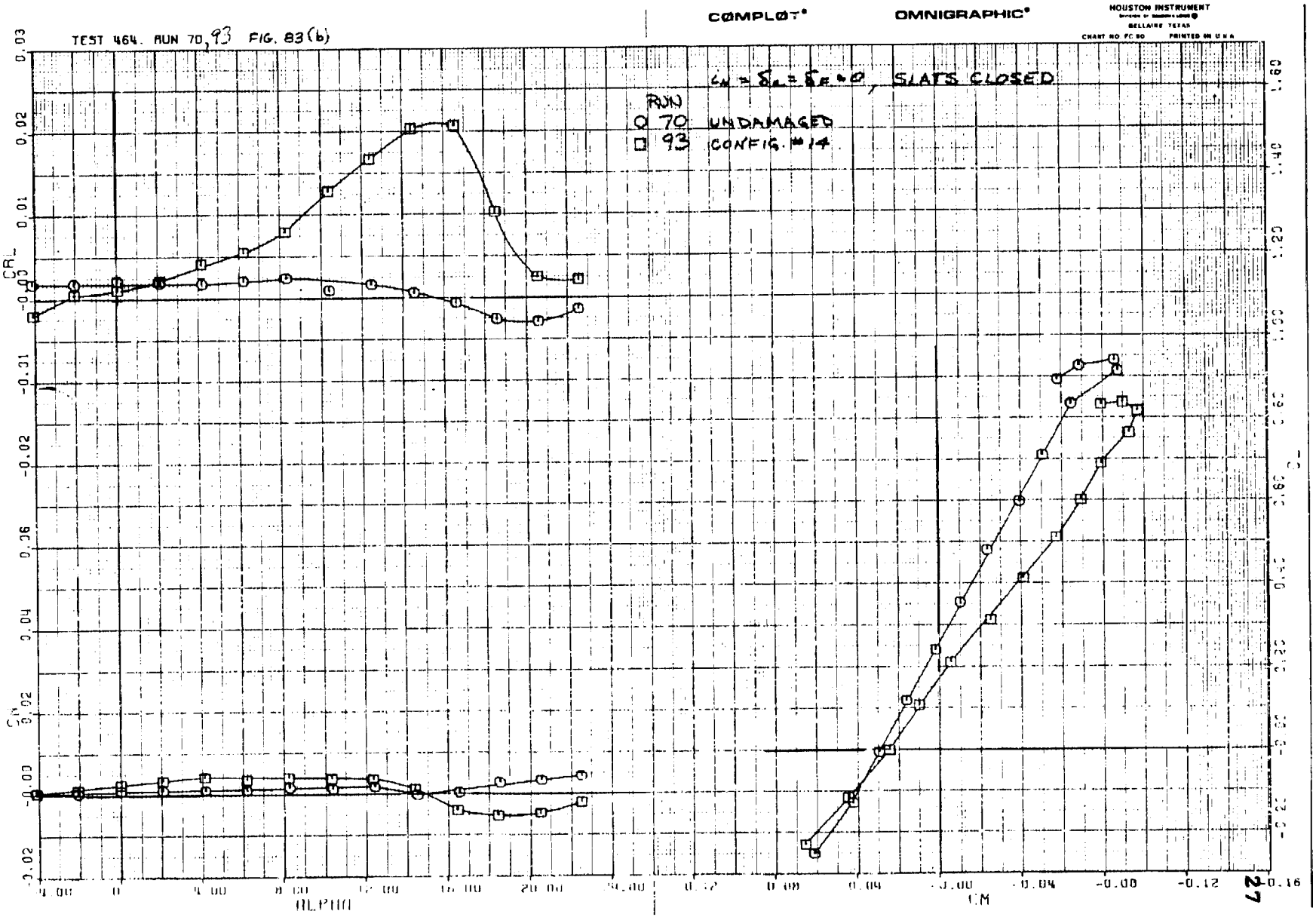
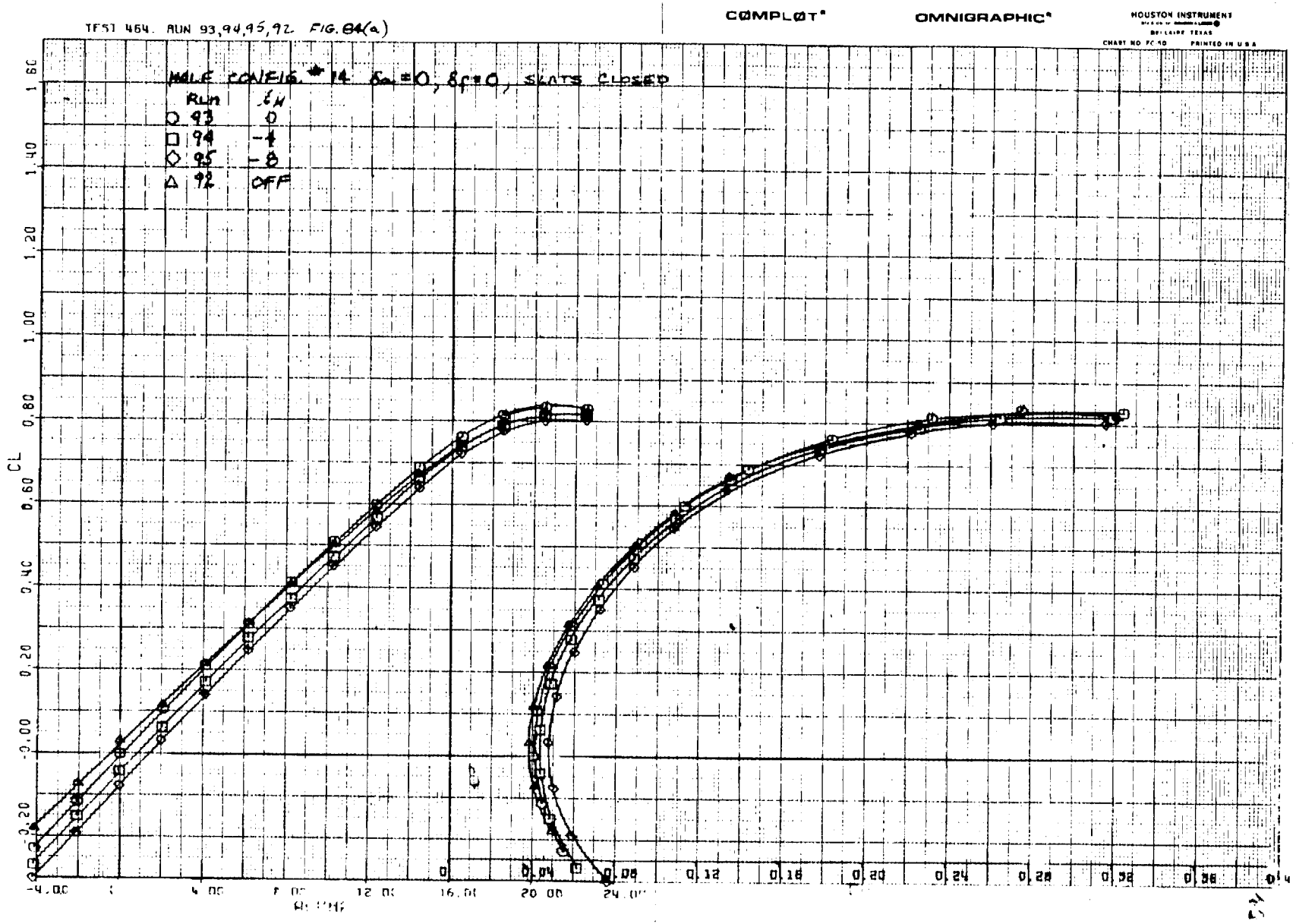

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 70,93 FIG. 83(b)
$i_w = \delta_{LE} = \delta_F = 0$, SLATS CLOSED
RUN
70 UNDAMAGED
93 CONFIG. #14
CRL
CN
CM
ALPHA
27

Figure 83(b)


TEST 464. RUN 93,94,95,92. FIG. 84(a)
COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
HALF CONFIG. #14 δa=0, δf=0, SLATS CLOSED
Run
93
94
95
92
εM
0
-4
-8
OFF
CL
CD
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
4.00
8.00
12.00
16.00
20.00
24.00

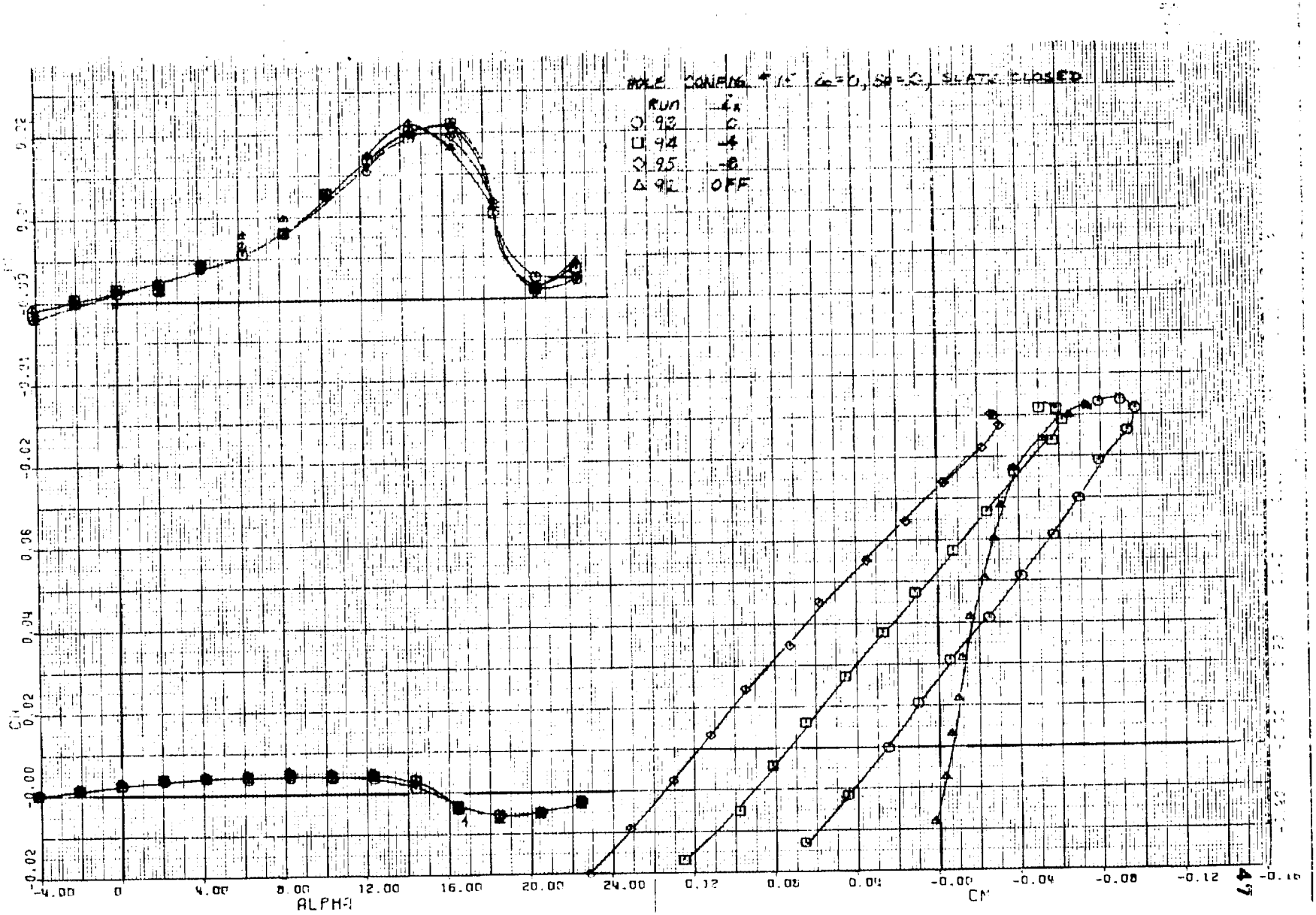


Figure 84(b)

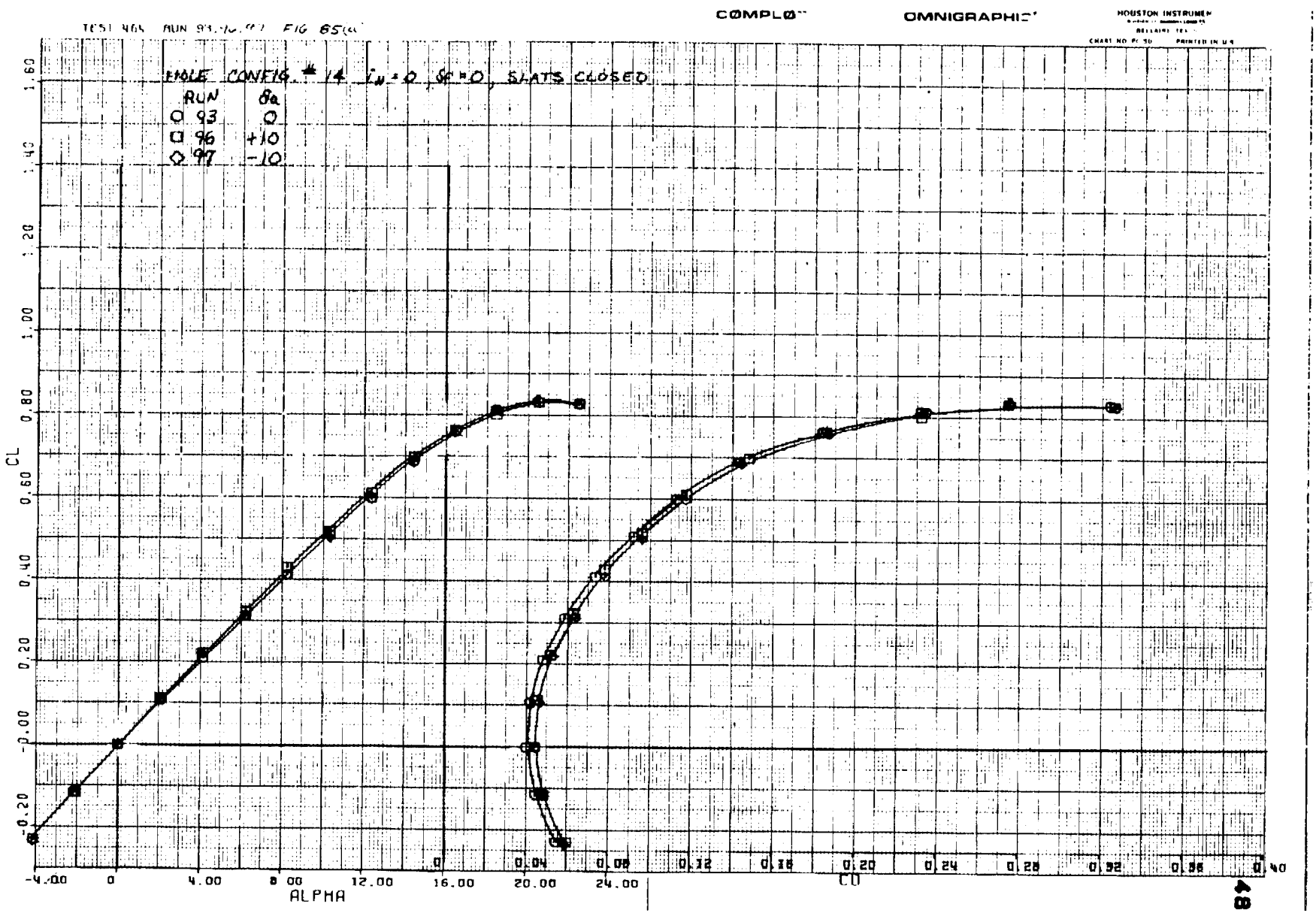
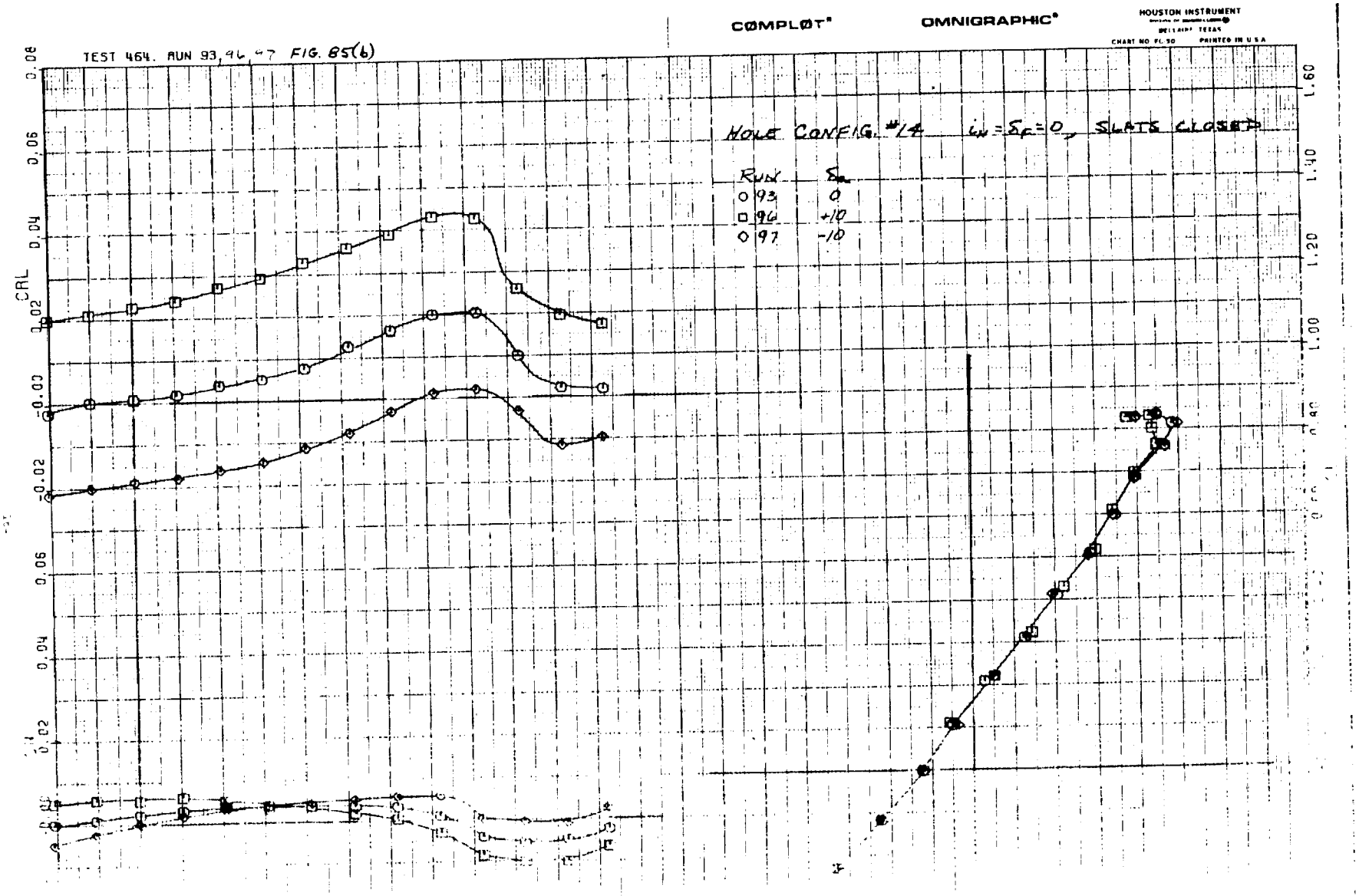

COMPLOT
OMNIGRAPHIC
HOUSTON INSTRUMENT
TEST 465 RUN 93-10-97 FIG 85(a)
ENGLE CONFIG. #14 i_w = 0, δ_f = 0, SLATS CLOSED
RUN δa
93 0
96 +10
97 -10
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
ALPHA
0
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
CD

Figure 85(a)


COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 93, 96, 97 FIG. 85(b)
HOLE CONFIG. #14 $i_w = \delta_f = 0$, SLATS CLOSED
RUN δ_e
○ 93 0
□ 96 +10
◇ 97 -10
CRL
0.08
0.06
0.04
0.02
-0.02
-0.04
-0.06
1.60
1.40
1.20
1.00

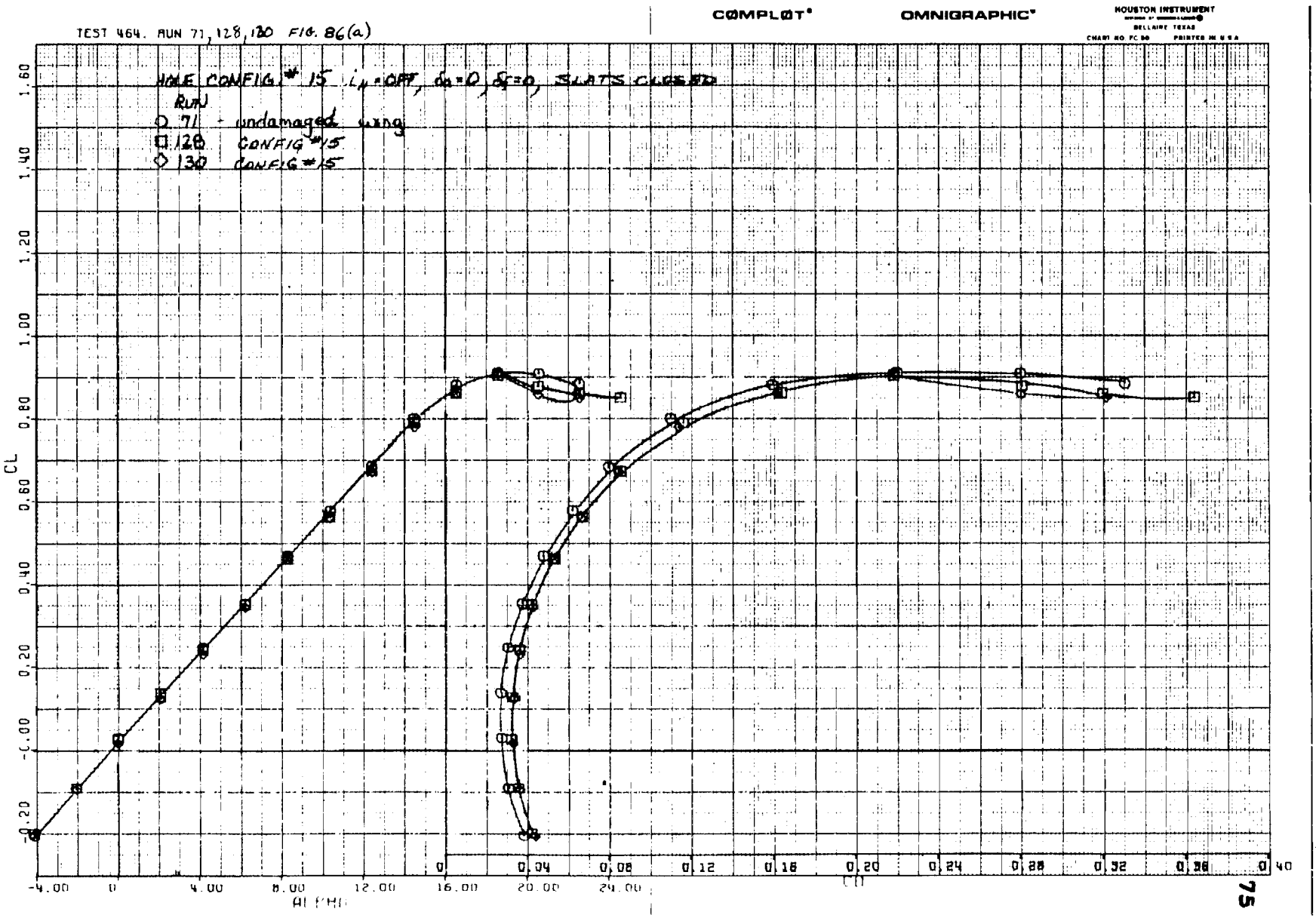

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
TEST 464. RUN 71, 128, 130 FIG. 86(a)
HALE CONFIG.# 15 i_H=OFF, δ_a=0, δ_f=0, SLATS CLOSED
RUN
○ 71 - undamaged wing
□ 128 CONFIG #15
◇ 130 CONFIG #15
CL
ALPHA
CD
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
-0.20
-0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
0
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40

Figure 86(a)

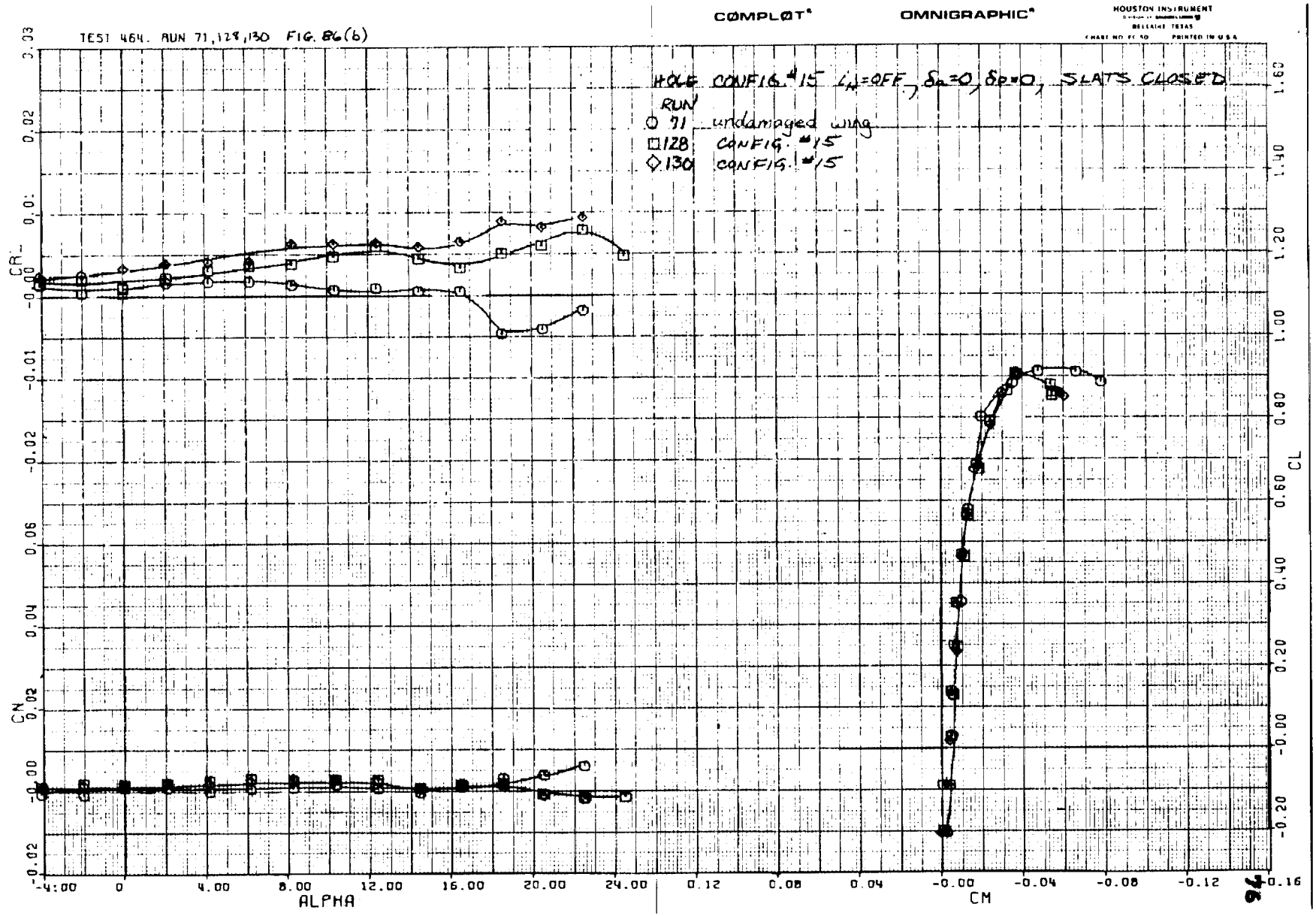

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 71,128,130 FIG. 86(b)
HOLE CONFIG. #15 LH=OFF, δa=0, δp=0, SLATS CLOSED
RUN
71 undamaged wing
128 CONFIG. #15
130 CONFIG. #15
CR
CN
CL
CM
ALPHA
3.33
0.02
0.01
-0.00
-0.01
-0.02
0.06
0.04
0.02
-0.00
-0.02
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.12
0.08
0.04
-0.00
-0.04
-0.08
-0.12
-0.16

Figure 86(b)

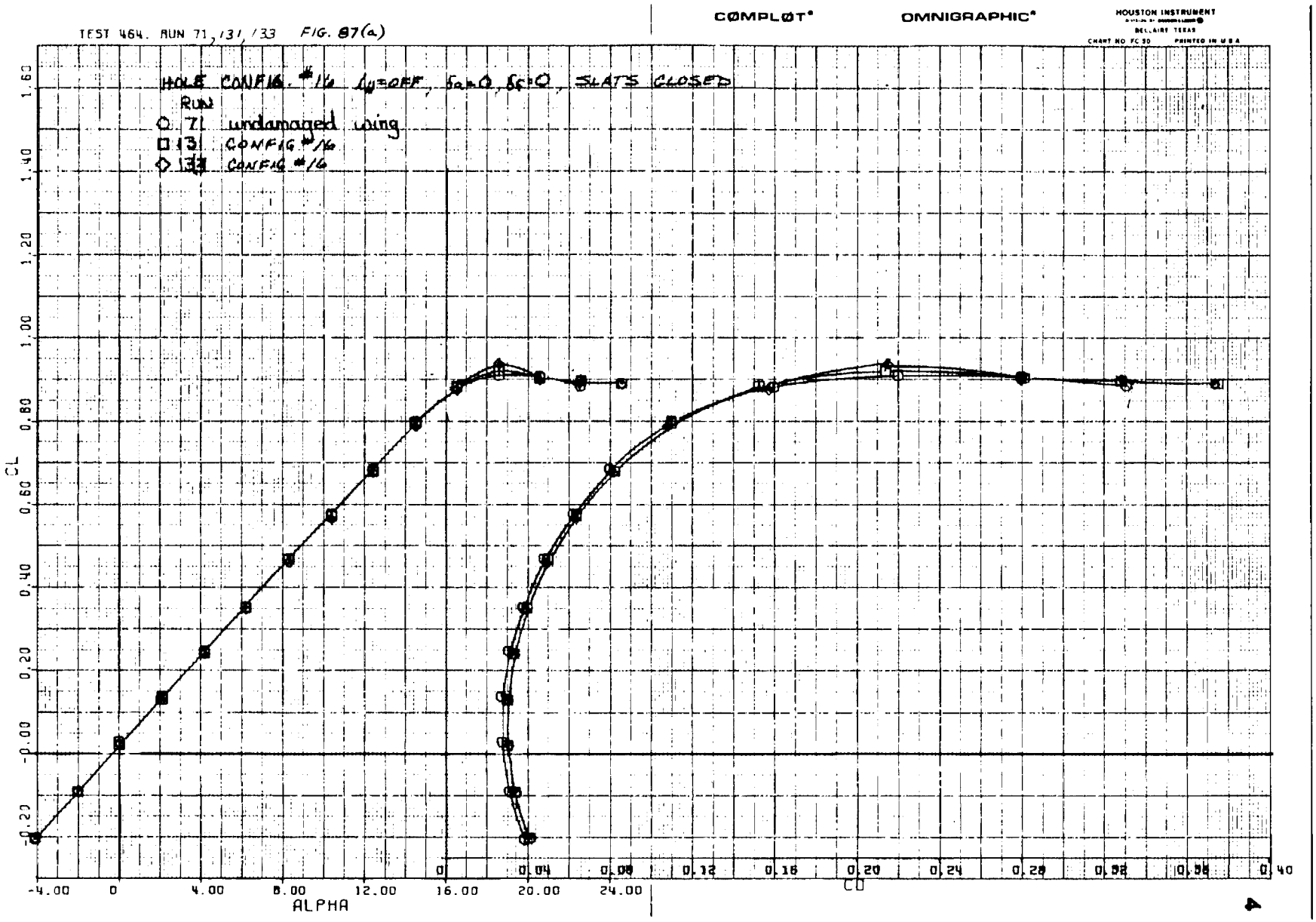

TEST 464. RUN 71, 131, 133 FIG. 87(a)
COMPLOT® OMNIGRAPHIC®
HOUSTON INSTRUMENT
BELLAIRE TEXAS
HOLE CONFIG. #16 δf=OFF, δa=0, δc=0, SLATS CLOSED
RUN
71 undamaged wing
131 CONFIG #16
133 CONFIG #16
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
ALPHA
0
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
CD

Figure 87(a)

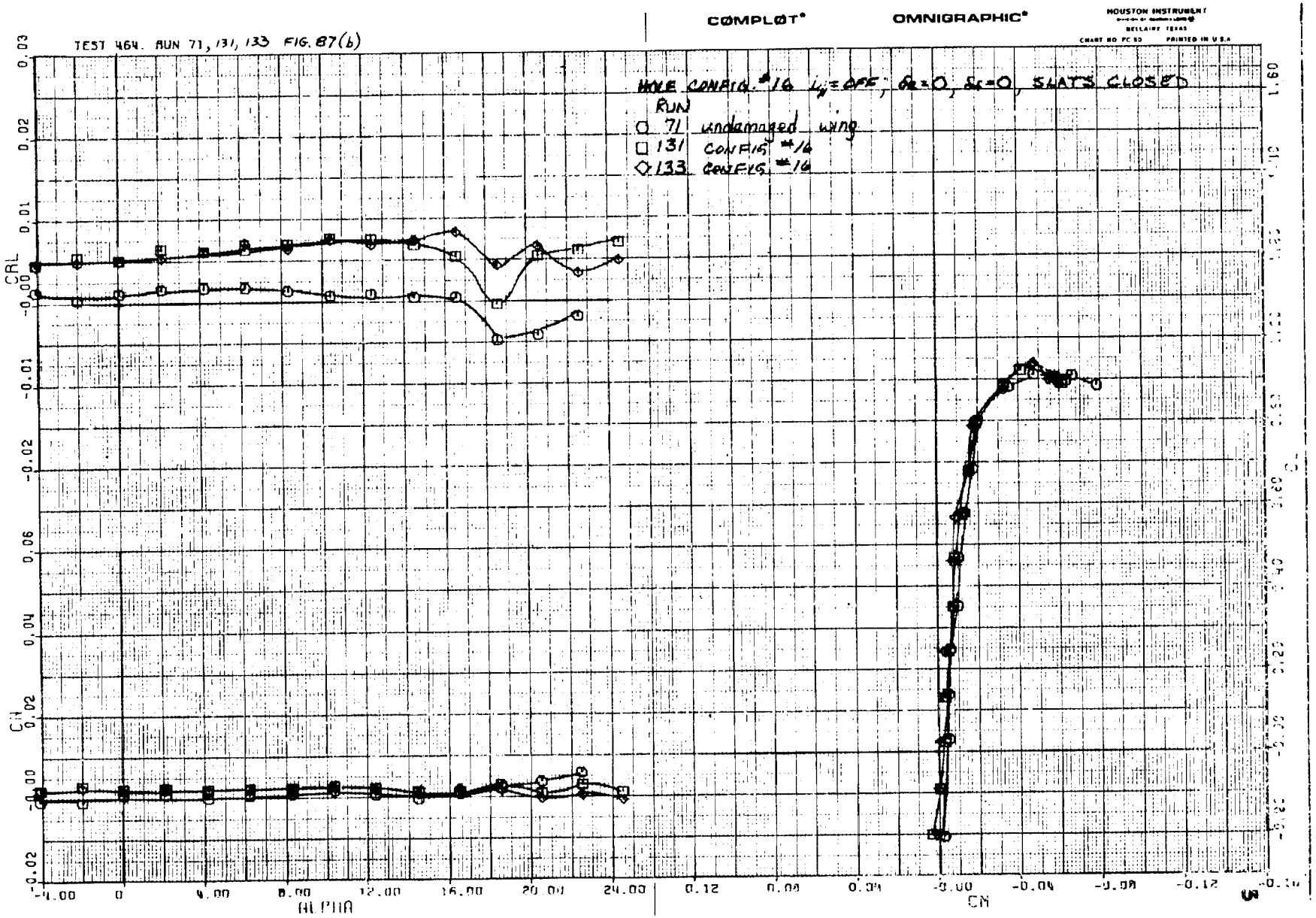

COMPLOT®
OMNIGRAPHIC®
HOUSTON INSTRUMENT
TEST 464. RUN 71, 131, 133 FIG. 87(b)
WING CONFIG. #16 i_w=OFF, δ_e=0, δ_c=0, SLATS CLOSED
RUN
71 undamaged wing
131 CONFIG #16
133 CONFIG #16
CRL
CN
ALPHA
CM

Figure 87(b)

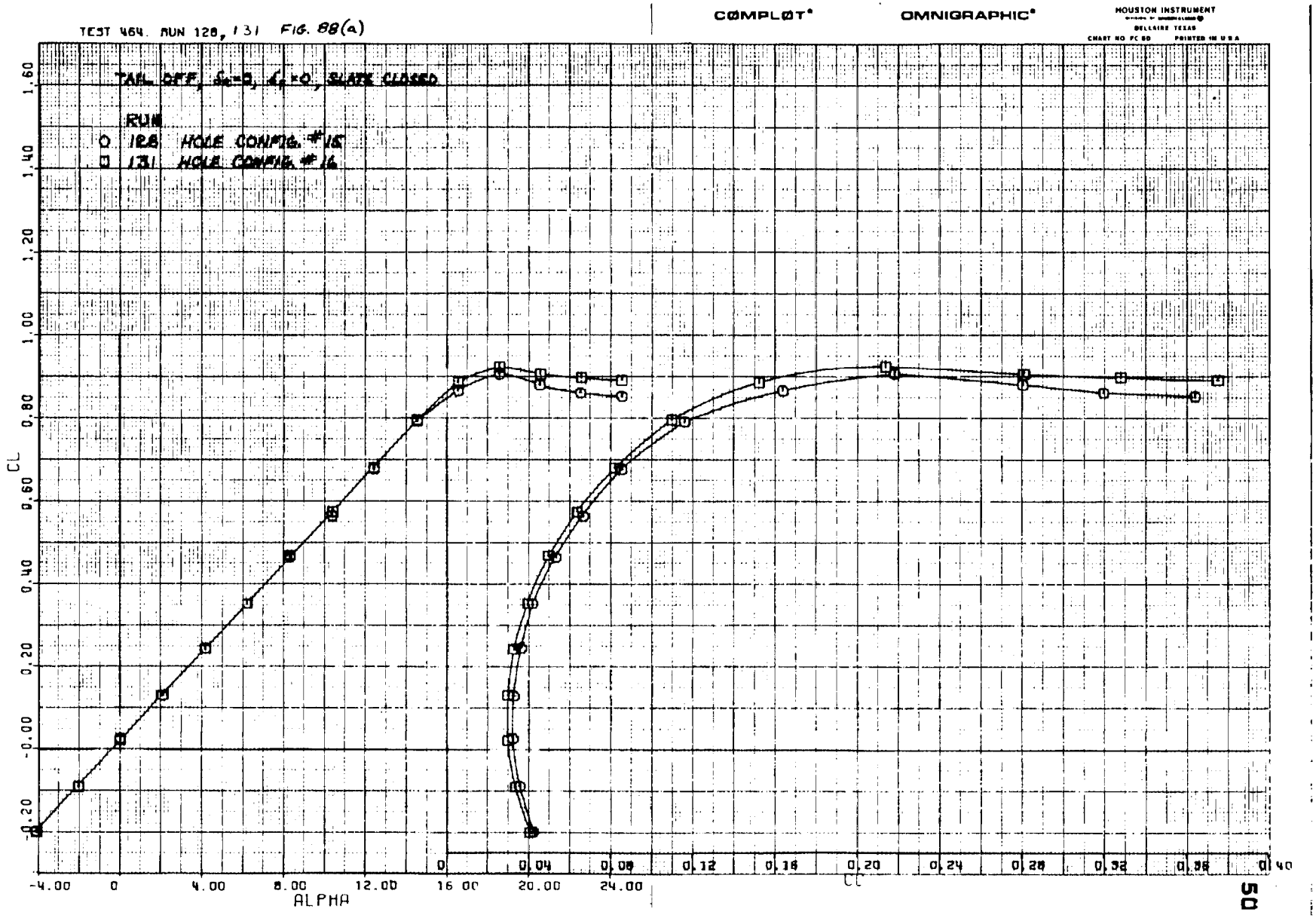

TEST 464. RUN 128, 131 FIG. 88(a)
COMPLOT® OMNIGRAPHIC®
HOUSTON INSTRUMENT
TAIL OFF, δ_e=0, δ_f=0, SLATS CLOSED
RUN
128 HOLE CONFIG. #15
131 HOLE CONFIG. #16
CL
ALPHA
CL
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
-0.00
-0.20
-4.00
0
4.00
8.00
12.00
16.00
20.00
24.00
0.04
0.08
0.12
0.16
0.20
0.24
0.28
0.32
0.36
0.40
50

Figure 88(a)

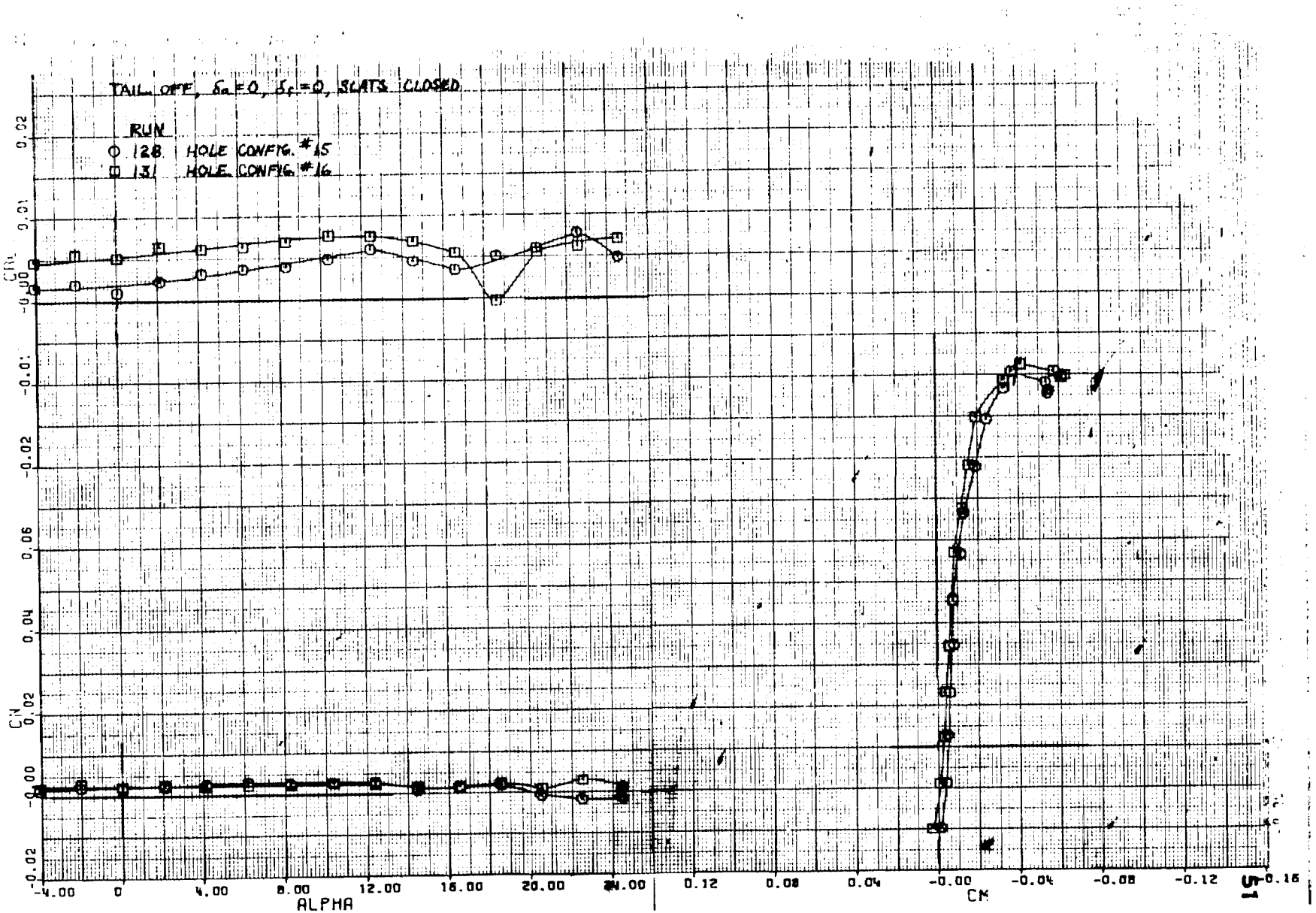

TAIL OFF, $\delta_a = 0$, $\delta_f = 0$, SLATS CLOSED
RUN
128 HOLE CONFIG. #15
131 HOLE CONFIG. #16
CN
ALPHA
CM

Figure 88(b)