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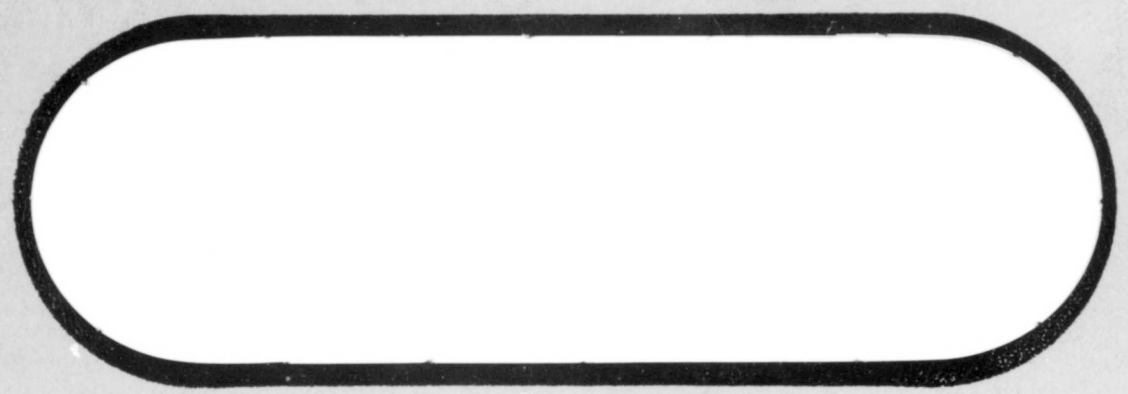
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PREPARED BY Harold M. Olsen FGE
O.R.S.

APPROVED BY Harold M. Olsen

APPROVED BY Stanley J. Jones

APPROVED BY Frank R. Dunlap

APPROVED BY H. H. Hopler

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PAGE 3-1

3.1 SUMMARY

- 3.1.1 A series of five leading edge concepts were subjected to three separate environment test programs. Each configuration was exposed to a sonic environment, a thermal gradient test, a second sonic exposure, and finally, a static load test. The purpose of these tests was to evaluate these five basic leading edge concepts and their various design features to obtain information for a production configuration and to verify analytical procedures.
- 3.1.2 The Phase A of the sonic test program (LT-5-617-1A-Reference 1) consisted of the exposure of each specimen to a random noise environment of 152.5 db SPL* (overall) for 30 minutes.
- 3.1.3 The heat test program (LT-5-617-2-Reference 1) consisted of subjecting each specimen to four 2700°F. heat cycles of forty minutes duration, and one 3000°F. heat cycle of ten minutes duration. The data collected was used to determine design temperature distribution.
- 3.1.4 After the heat program each specimen was exposed to a sonic environment of 152.5 db SPL (overall) for 30 minutes and then to 155.5 db for an additional 30 minutes, according to Phase B of LT-5-617-1-Reference 1).
- 3.1.5 The load program (LT-5-617-3-Reference 1) consisted of slow-load testing five specimen configurations (detailed on drawings number 25-20341, 25-20367, 25-20372, 25-20376, and 25-20378) at a rate of 180 pounds per minutes, and rapid-load testing of two specimen configurations (detailed on drawings number 25-20341 and 25-20376) at a rate of 94,000 pounds per minute. All specimens were instrumented with deflection clips used in conjunction with the photographic-deflection-measurement technique. Four of the slow-load tested specimens (25-20367, 25-20372, 25-20376, and 25-20378) were instrumented with rosette strain gages.

*SPL - Sonic Pressure Level

3.2

TABLE OF CONTENTS

	Volume I	Page
3.0	SECTION TITLE PAGE	3-1
3.1	SUMMARY	3-2
3.2	TABLE OF CONTENTS	3-3
3.3	REFERENCES	3-4
3.3.1	PHOTOGRAPH AND ILLUSTRATION INDEX	3-5 thru 3-8
3.4	INTRODUCTION	3-9
3.5	TEST SPECIMEN AND INSTRUMENTATION	3-10
3.6	TEST SETUP	3-12
3.7	TEST PROCEDURE	3-14
3.8	TEST RESULTS	3-16
3.9	TEST OBSERVATIONS	3-17
	DATA SHEETS	3-19 thru 3-199

Volume II

THERMAL GRADIENT TEST DATA

Volume III

THERMAL GRADIENT TEST DATA

LOAD TEST DATA

3.3

REFERENCES

1. D2-6783-1 Structural Integrity Development and Test Program - Detail Plan - Structures Technology
2. Leading Edge Segment - Forward Body (Test Only) 25-20372
3. Leading Edge Segment - Forward Body (Test Only) 25-20378
4. Leading Edge Segment - Stiffened (Test Only) 25-20367
5. Leading Edge Segment - Forward Body - Unstiffened (Test Only) 25-20341
6. Leading Edge Segment - Forward Body - Riveted (Test Only) 25-20376
7. Support Assembly of Leading Edge Segment - Forward Body (Test Only) 25-20355
8. Support Installation of Leading Edge Segment - Forward Body (Test Only) 25-20375

3.3.1

PHOTOGRAPH AND ILLUSTRATION INDEX

Fig. No.	Title	Page No.
3-1	Typical Leading Edge Specimen Mounted on Sonic Test Fixture	3-19
3-2	Typical Leading Edge Specimen with Heat Shields Installed	3-20
3-3	Sonic Test Instrumentation Locations	3-21
3-4	Thermocouple Probe Holders and Terminal Board	3-22
3-5 and 3-6	25-20372 Monitor Thermocouple Locations	3-23 3-24
3-7 and 3-8	25-20367 Monitor Thermocouple Locations	3-25 3-26
3-9 and 3-10	25-20378 Monitor Thermocouple Locations	3-27 3-28
3-11 and 3-12	25-20341 Monitor Thermocouple Locations	3-29 3-30
3-13 and 3-14	25-20376 Monitor Thermocouple Locations	3-31 3-32
3-15 and 3-16	Lamp and Zone Layout - Control Thermocouple Locations	3-33 3-34
3-17	Photographic Deflection Measurement Locations	3-35
3-18	25-20372-1 Rosette Strain Gage Location	3-36
3-19	25-20367-1 Rosette Strain Gage Location	3-37
3-20	25-20378-1 Rosette Strain Gage Location	3-38
3-21	25-20376-1 Rosette Strain Gage Location	3-39
3-22 and 3-23	25-20372-1 Strain Gage Instrumentation Before Load Test	3-40 3-41
3-24 and 3-25	25-20367-1 Before Load Test	3-42 3-43
3-26 and 3-27	25-20378-1 Before Load Test	3-44 3-45
3-28 and 3-29	25-20341-1 Before Load Test	3-46 3-47
3-30 and 3-31	25-20376-1 Before Load Test	3-48 3-49
3-32	Typical Leading Edge Positioned in Progressive Wave Horn for Sonic Testing	3-50
3-33	Progressive Wave Horn	3-51

3.3.1 (Continued)

Fig. No.	Title	Page No.
3-34	Sonic Test Facility Control System - Schematic Diagram	3-52
3-35	Thermal Gradient Test Fixture	3-53
3-36	Thermal Gradient Test Fixture in Open Position	3-54
3-37	Load Test Fixture	3-55
3-38	Sonic Test Program	3-56
3-39	Thermal Gradient Test Program (Maneuver Cycle)	3-57
3-40	Thermal Gradient Test Program (Trajectory Cycle)	3-58
3-41	25-20367-1 Displaying Typical Load and Deflection Measurement Technique	3-59
3-42	25-20372-1 After Sonic Test	3-60
3-43	25-20372-2 After Sonic Test	3-61
3-44	25-20367-1 After Sonic Test	3-62
3-45	25-20367-2 After Sonic Test	3-63
3-46	25-20378-1 After Sonic Test	3-64
3-47	25-20378-2 After Sonic Test	3-65
3-48	25-20341-1 After Sonic Test	3-66
3-49	25-20341-2 After Sonic Test	3-67
3-50	25-20376-1 After Sonic Test	3-68
3-51	25-20376-2 After Sonic Test	3-69
3-52	Deleted	3-70
3-53, 3-54, and 3-55	A Typical Trajectory Thermal Gradient Cycle	3-71 3-72 3-73
3-56, 3-57, and 3-58	A Typical Maneuver Thermal Gradient Cycle	3-74 3-75 3-76
3-59	25-20372-1 Before Heat Test	3-77
3-60	25-20372-1 After Heat Test	3-78
3-61	25-20372-2 Before Heat Test	3-79
3-62	25-20372-2 After Heat Test	3-80
3-63	25-20367-1 Before Heat Test	3-81
3-64	25-20367-1 After Heat Test	3-82

3.3.1 (Continued)

Fig. No.	Title	Page No.
3-65	25-20367-1 After Heat Test	3-83
3-66	25-20367-2 Before Heat Test	3-84
3-67	25-20367-2 After Heat Test	3-85
3-68	25-20367-2 After Heat Test	3-86
3-69	25-20378-1 Before Heat Test	3-87
3-70	25-20378-1 After 4 Heat Cycles	3-88
3-71	25-20378-1 After 4 Heat Cycles	3-89
3-72	25-20378-1 After 4 Heat Cycles	3-90
3-73	25-20378-1 After Heat Test	3-91
3-74	25-20378-2 After Heat Test	3-92
3-75	25-20378-2 After Heat Test	3-93
3-76	25-20341-1 Before Heat Test	3-94
3-77	25-20341-1 After Heat Test	3-95
3-78	25-20341-2 Before Heat Test	3-96
3-79	25-20341-2 After Heat Test	3-97
3-80	25-20341-2 After Heat Test	3-98
3-81	25-20376-1 Before Heat Test	3-99
3-82	25-20376-1 After Heat Test	3-100
3-83	25-20376-1 After Heat Test	3-101
3-84	25-20376-2 Before Heat Test	3-102
3-85	25-20376-2 After Heat Test	3-103
3-86	25-20376-2 After Heat Test	3-104
3-87	25-20372-1 Slow-Load Tested	3-105
3-88	25-20372-1 Slow-Load Tested	3-106
3-89	25-20372-1 Slow-Load Tested	3-107
3-90	25-20367-1 Slow-Load Tested	3-108
3-91	25-20367-1 Slow-Load Tested	3-109
3-92	25-20367-1 Slow-Load Tested	3-110
3-93	25-20378-1 Slow-Load Tested	3-111
3-94	25-20378-1 Slow-Load Tested	3-112
3-95	25-20378-1 Slow-Load Tested	3-113
3-96	25-20376-1 Slow-Load Tested	3-114
3-97	25-20376-1 Slow-Load Tested	3-115
3-98	25-20376-1 Slow-Load Tested	3-116
3-99	25-20341-1 Slow-Load Tested	3-117

3.3.1 (Continued)

Fig. No.	Title	Page No.
3-100	25-20341-2 Rapid-Load Tested	3-118
3-101	25-20376-2 Rapid-Load Tested	3-119
3-102	25-20376-2 Rapid-Load Tested	3-120
3-103	25-20376-2 Rapid-Load Tested	3-121
3-104	25-20376-2 Rapid-Load Tested	3-122
3-105	25-20372-1 X-ray After Load Test	3-123
3-106	25-20367-1 X-ray After Load Test	3-124
3-107	25-20378-1 X-ray After Load Test	3-125
3-108	25-20378-1 X-ray After Load Test	3-126
3-109	25-20376-1 X-ray After Load Test	3-127
3-110	Amplitude Distribution Limits for All Specimens Tested	3-128
3-111	25-20372-1 Sonic Test Spectrum	3-129
3-112	25-20372-2 Sonic Test Spectrum	3-130
3-113	25-20367-1 Sonic Test Spectrum	3-131
3-114	25-20367-2 Sonic Test Spectrum	3-132
3-115	25-20378-1 Sonic Test Spectrum	3-133
3-116	25-20378-2 Sonic Test Spectrum	3-134
3-117	25-20341-1 Sonic Test Spectrum	3-135
3-118	25-20341-2 Sonic Test Spectrum	3-136
3-119	25-20376-1 Sonic Test Spectrum	3-137
3-120	25-20376-2 Sonic Test Spectrum	3-138

INTRODUCTION

In November of 1960 five forward body leading edge concepts were chosen for evaluation. A total of ten specimens were subjected to simulated flight test conditions for comparative evaluation. The following sequence of tests were performed on the specimens:

1. Sonic - 152.5 db normal incident random sound.
2. Thermal cycles - Four cycles to 2700° F.
One cycle to 3000° F.
3. Sonic - 155.5 db normal incident random sound.
4. Ultimate Load - Load rates 180 pounds per minute and
94,000 pounds per minute.

These tests were conducted to obtain fatigue, thermal stress, and oxidation resistance properties since empirical test data was required to evaluate complex structures and to verify analytical design procedures.

This is the third section of three of D2-80085 covering the testing of X-20 leading edge concepts and consists of three volumes. See Sections 1 and 2 for plasma jet shroud testing of concepts having the same external configuration.

3.5 TEST SPECIMEN AND INSTRUMENTATION

3.5.1 Test Specimen

3.5.1.1 A typical leading edge test specimen assembly, mounted and ready for sonic testing, is shown in Figure 3-1. Each specimen assembly consisted of two parts: (1) A leading edge segment fabricated from molybdenum -0.5% titanium alloy with an oxidation-resistant coating of molybdenum disilicide; and (2) a backup structure from Rene' 41 material. During thermal cycling, simulated heat shields coated with Mo-.5Ti skin were added as shown in Figure 3-2 to provide the proper thermal environment on the leading edge and leading edge beam.

3.5.1.2 Two preliminary coating processes were used to apply the molybdenum disilicide coating: (1) SPZ-1 (pack cementation); and (2) SPZ-4 (fluidized bed). The process by which the coating was applied varied with each specimen and is tabulated below:

<u>Boeing Drawing Number</u>	<u>Specimen No.</u>	<u>Description</u>	<u>Coating Process</u>
25-20372	1	DS L.E. Unstiffened Single Shell	SPZ-1
25-20372	2	DS L.E. Unstiffened Single Shell	SPZ-1
25-20367	1	DS L.E. Double Skin Long Segments	SPZ-1
25-20367	2	DS L.E. Double Skin Long Segments	SPZ-4
25-20378	1	DS L.E. Double Skin Short Segments	SPZ-4
25-20378	2	DS L.E. Double Skin Short Segments	SPZ-4
25-20341	1	DS L.E. Unstiffened Shell Corners Reinforced Single Shell	SPZ-1
25-20341	2	DS L.E. Unstiffened Shell Corners Reinforced Single Shell	SPZ-1
25-20376	1	DS L.E. Riveted Ribs Single Shell	SPZ-4 Details SPZ-1 Assembly
25-20376	2	DS L.E. Riveted Ribs Single Shell	SPZ-4 Details SPZ-1 Assembly

1 Boeing drawing lot and specimen numbers are used interchangeably as dash numbers to the basic Boeing drawing number in this document.

3.5.2 Instrumentation

- 3.5.2.1 For the sonic test phase, two non-contact deflection pickups were used to monitor the specimen structural response and the sonic environment was monitored with one Altec 21BR-200 microphone located in front of each specimen as shown in Fig. 3-3.
- 3.5.2.2 For the thermal cycle test phase, each specimen was instrumented with eleven, 22 gage, refrasil insulated, chromel vs. alumel thermocouples, and eighteen platinum vs. platinum 13% rhodium alloy thermocouple probes.
- 3.5.2.2.1 The chromel vs. alumel thermocouples were spot welded to the Rene 41 backup structure, and the platinum probes were positioned on the leading edge segment and heat shields.
- 3.5.2.2.2 The probe type thermocouples consisted of a platinum vs. platinum 13% rhodium alloy thermocouple encased in a 12-inch long, 0.125-inch diameter alumina insulator. The thermocouple was spotwelded to a 0.025-inch thick platinum disc, 0.250-inch in diameter, which was then flame sprayed with a 0.005-inch layer of alumina to prevent reaction of platinum with the disilicide coating. Spring loaded holders (Fig. 3-4) were used to position the probes against the test specimen surface.
- 3.5.2.2.3 Monitor thermocouple locations are shown in Figs. 3-5 through 3-14. and control thermocouple locations are shown in Fig. 3-15 and 3-16.
- 3.5.2.3 All of the specimens that were load tested were instrumented with deflection clips used with the photographic-deflection-measurement technique. Clip locations are shown in Figure 3-17. Four of the specimens tested (detailed on drawings number 25-20367, 25-20372, 25-20376, and 25-20378) were also instrumented with rosette strain gages as shown in Figures 3-18 through 3-21. Photographs of each specimen in Figures 3-22 through 3-31 illustrate instrumentation before testing.

3.6

TEST SETUP

3.6.1

For sonic testing, the leading edge test specimen backup structure was bolted to a steel jig (Fig. 3-1) which was, in turn, bolted to floor tie-down rails such that the specimen leading edge was positioned approximately three feet inside the progressive wave horn chamber (Fig. 3-32).

3.6.1.1

The random noise source consisted of four Altec-Lansing Model 6786 electro-pneumatic transducers mounted at the throat of the progressive wave horn (Fig. 3-33). Power to the transducers was supplied by two 200 watt McIntosh Amplifiers. Shaping of the test spectrum was accomplished using an Allison 3-man-9 noise generator and octave band equalizer. A schematic diagram of the facility control system is shown in Fig. 3-34.

3.6.2

The test fixture used for thermally cycling the leading edge specimens is shown in Fig. 3-35. The specimens were held in position on a table of alumina brick with "L" shaped clamping bolts. A stainless steel support, shaped to conform to the curvature of the leading edge, positioned the lamps. The fixture was hinged so the lamp assemblies could be rotated up and away to facilitate specimen installation and inspection. Fig. 3-36 shows the test fixture in the open position.

3.6.2.1

General Electric 1600F3 quartz tube heating elements were used in air-cooled ceramic reflectors. The cooling air was distributed to each lamp assembly by means of an aluminum alloy manifold and copper tubing. The lamps were installed approximately one-half to three-quarters of an inch above the specimen surface.

3.6.2.2

Seven heat control zones were used. Each control zone required an ignitron power controller and an operator to manually control it. The required heat programs were drawn on the strip chart of the respective control recorders. During the test the operators manually adjusted the power to raise or lower the heat input to the specimen according to the program demand. A single Leeds-Northrup Speedomap G recorder was used for each control zone at a chart speed of six inches per minute. The temperature traces for each heat cycle were produced with a different color ink so the same programs could be re-used.

3.6.2.3

The external surface of the heat shield was not to exceed 2700° F. Since the control thermocouple was internally mounted, an extra recorder was used for each heat shield to monitor the external surface temperature. The chart speed for these recorders was one-half inch per minute.

3.6.3

The test fixture for load testing is shown in Figure 3-37. Load was applied through a loading head consisting of a curved rubber block backed up by wood and aluminum. The applied load was reacted through a back-up structure on which the specimen was mounted.

3.6.3.1

Two sheets of teflon were placed between the rubber and specimen to decrease friction and to minimize tangential loads on the curved surface of the specimen. Cutouts in the teflon which allowed clearance for the rosette gages and lead wires were filled with potting compound to maintain load continuity over the test specimen surface.

3.6.3.2

The setup sequence upon receipt of each specimen was to install gages and deflection clips, install teflon sheets, pot the cutouts, and mount the specimen in the test fixture.

3.7 TEST PROCEDURE

3.7.1 Sonic Test Program LT 5-617-1 (Fig. 3-38)

- 3.7.1.1 Each specimen was exposed to a random noise environment of 152.5 db SPL (overall) for 30 minutes. The microphone and deflection pickups were tape recorded during the initial portion of each test phase for later spectral analysis and amplitude distribution analysis. Octave band analysis was made at the start of each test.
- 3.7.1.2 The specimens, upon return from thermal cycling per LT 5-617-2, (see 3.7.2) were subjected to an additional 30 minutes at 152.5 db. An octave band analysis of the microphone and deflection pickup outputs were again tape recorded during the first 10 minutes of the test. After 15 minutes the test was interrupted for specimen inspection after which the remaining 15 minutes of testing were completed.
- 3.7.1.3 The final phase of the sonic test program consisted of subjecting each test specimen to a random noise environment of 155.5 db SPL (overall) for 30 minutes. The spectrum of this phase was 3 db higher in all octave bands than the previous phases. The specimens were visually inspected at 5 minutes, 15 minutes, and at the conclusion of the 30 minute test. The output of the microphone and the two deflection pickups were tape recorded at the beginning of the test. A 5 cps bandwidth power spectral density analysis was made of the microphone and pickup outputs for the first and final test periods for each specimen. This data was stored with sonic test facility.

3.7.2 Heat Test Program LT 5-617-2 (Figs. 3-39 and 3-40)

- 3.7.2.1 The test specimens were delivered to the Heat Laboratory after completion of the initial phase of the sonic test program. To facilitate the temperature control of the backup structure and simulated heat shields, the fibrefrax insulation between them was removed for testing and chromel vs. alumel thermocouples were spotwelded to the backup structure. The specimen was positioned on the alumina brick test bed and locked in place with "L" shaped bolts. One-eighth inch fibrefrax board was cut to fit snugly in the ends of the specimen to reduce air circulation. The final step in specimen preparation was to mount the thermocouple probe-type sensors on the external surface.
- 3.7.2.2 Each leading edge test specimen was subjected to the heat program shown in Fig. 3-39 and 3-40. The heat program consisted of four 40 minute heat cycles followed by a 10 minute heat pulse. Maximum temperatures of 2700°F during the 40 minute cycle and 3000°F during the 10 minute pulse were attained. The simulated heat shields were subjected to two or three of the above-mentioned heat programs because only four sets of heat shields were fabricated for the ten leading edge heat programs conducted. Where failures to the disilicide coating on the simulated heat shields had occurred, Sears Roebuck furnace cement was applied to retard further erosion.

3.7.3 Room Temperature Load Test LT5-617-3

- 3.7.3.1 Five specimens, 25-20367, 25-20372, 25-20376, 25-20378, and 25-20341, were slow-load tested at 180 pounds per minute, and two specimens, 25-20341-2 and 25-20376-2, were rapid-load tested at 94,000 pounds per minute.
- 3.7.3.2 The four slow-load specimens, 25-20367, 25-20372, 25-20376, and 25-20378, were instrumented with rosette strain gages and loaded in increments of 100 pounds. Strain data recorded was recorded at each load increment.
- 3.7.3.3 During the loading of the specimens, photographs were taken of the specimens and the load dial simultaneously at regular intervals (ten-second intervals for slow-loading and sixteen frames per second for the rapid-loading). The motion of graduated clips and pointed screws attached to the specimen at critical deflection points was recorded relative to a grid placed over the camera lens. Fig. 3-41 shows a typical specimen with zero load and maximum load. The grid indicates the deflection.

3.8 TEST RESULTS

3.8.1 Sonic Test

- 3.8.1.1 None of the ten specimens tested developed visible failures due to sonic excitation. Photos of the tested specimens are shown in Figs. 3-42 through 3-52.
- 3.8.1.2 All ten sonic environment amplitudes exceeded the required peak/rms ratio of 3. Plots showing the test runs with the minimum and the maximum amplitude distribution curves are on Fig. 3-110. All of the other test runs were within these limits.
- 3.8.1.3 Plots of the sonic test spectrum for each specimen tested are shown on Figs. 3-111 through 3-120.

3.8.2 Thermal Cycle Test

- 3.8.2.1 Time versus temperature strip chart records of each control thermocouple were obtained for each specimen. No data was reduced from these records except the plots for typical test runs as shown in Figs. 3-53 through 3-58.
- 3.8.2.2 The monitor thermocouple tabulated data has been included in this report in Volumes 2 and 3. For comparative purposes, photographs of specimens before and after heat cyclic testing are presented in Figs. 3-59 through 3-86.

3.8.3 Room Temperature Load Test

- 3.8.3.1 Load versus deflection data is tabulated for each of the slow-load specimens in Volume 3 of this document. All rosette strain gage data is presented in Volume 3.
- 3.8.3.2 Load versus time curves for the two rapid-load specimens and load versus deflection data are presented in Volume 3. For specimen 25-20376-2, the first load cycle was considered invalid (see 3.9.2.3), so none of the data was tabulated.
- 3.8.3.3 Photographs of all of the specimens after load testing are presented in Figs. 3-87 through 3-104. X-ray photographs of the slow-load tested specimens are presented in Figs. 3-105 through 3-109.

3.9

TEST OBSERVATIONS

3.9.1

Thermal Gradient Test

3.9.1.1

Specimen 25-20372-1

Before the heat test, the surface of the leading edge was mottled and pitted, but there were no breaks in the disilicide coating (Fig. 3-59). Three minutes after the start of the third cycle, the test was halted due to a short circuit between two lamps. The lamps and a thermocouple had to be repaired. Then testing was completed. No tabulated data was recorded after 700 seconds in the third cycle due to a cracked recording head in the digital data system. After the heat test (Fig. 3-60), there was no apparent coating failure.

3.9.1.2

Specimen 25-20372-2

Fig. 3-61 shows pretest condition, and Fig. 3-62 shows no coating failures after 5 tests.

3.9.1.3

Specimen 25-20367-1

Fig. 3-63 shows pretest condition. There was no noticeable damage to the specimen after 5 heat cycles (Fig. 3-64 and 3-65).

3.9.1.4

Specimen 25-20367-2

Fig. 3-66 shows pretest condition. The heat shields from a previous test were reused on this specimen. Fig. 3-67 and 3-68 show post test results. The eroded heat shields have been repaired with Sears Roebuck Furnace Cement. The coating on the leading edge segment became a little mottled, but no failures occurred.

3.9.1.5

Specimen 25-20378-1

Fig. 3-69 shows pretest condition. During the second heat cycle, a platinum thermocouple came in contact with the heat shield under Zone 1 and caused a small hole to erode (Fig. 3-70). The hole was patched with Sears Roebuck Furnace Cement and testing continued. After the fourth heat cycle, it was found that Zone 2 had been overheated an undetermined amount (Figs. 3-70 and 3-71). This was apparently caused by the control thermocouple shifting position during the test. Fig. 3-72 shows the Zone 7 side. Fig. 3-73 shows coating failure after 3000°F heat pulse.

3.9.1.6

Specimen 25-20378-2

Fig. 3-74 shows the heat shield on Zone 1 side of specimen eroded around edges. The coating failed around some of the rivets, and a one-quarter inch hole eroded under the control thermocouple. Fig. 3-75 shows the area under Zone 6 glazed due to over-heating, and a small hole eroded at the control thermocouple location.

3.9.1.7

Specimen 25-20378-2

3.9.1.7 Specimen 25-20341-1

Fig. 3-76 shows pretest condition and Fig. 3-77 shows no noticeable coating failure after heat tests. The ten minute heat pulse had to be repeated. An over-temperature switch was set incorrectly and the power to Zone 4 was cut off each time the temperature exceeded 2200°F.

3.9.1.8 Specimen 25-20341-2

Fig. 3-78 shows pretest condition. Figs. 3-79 and 3-80 show specimen after heat tests. A rivet on the Zone 7 heat shield failed during tests.

3.9.1.9 Specimen 25-20376-1

The hole around the rivet on the leading edge, seen in the pretest photo in Fig. 3-81, was a manufacturing error. The heat shields had been used previously on 25-20378-2. Fig. 3-82 and 3-83 shows post-test condition. Only noticeable damage was further erosion of heat shields.

3.9.1.10 Specimen 25-20376-2

Fig. 3-84 shows pretest condition. One of the heat shields was cracked when it was mounted on the backup structure (Fig. 3-85). It was sealed with furnace cement. During the heat cycles, two rivets eroded in the heat shield (Fig. 3-86). There was no coating failure to the leading edge.

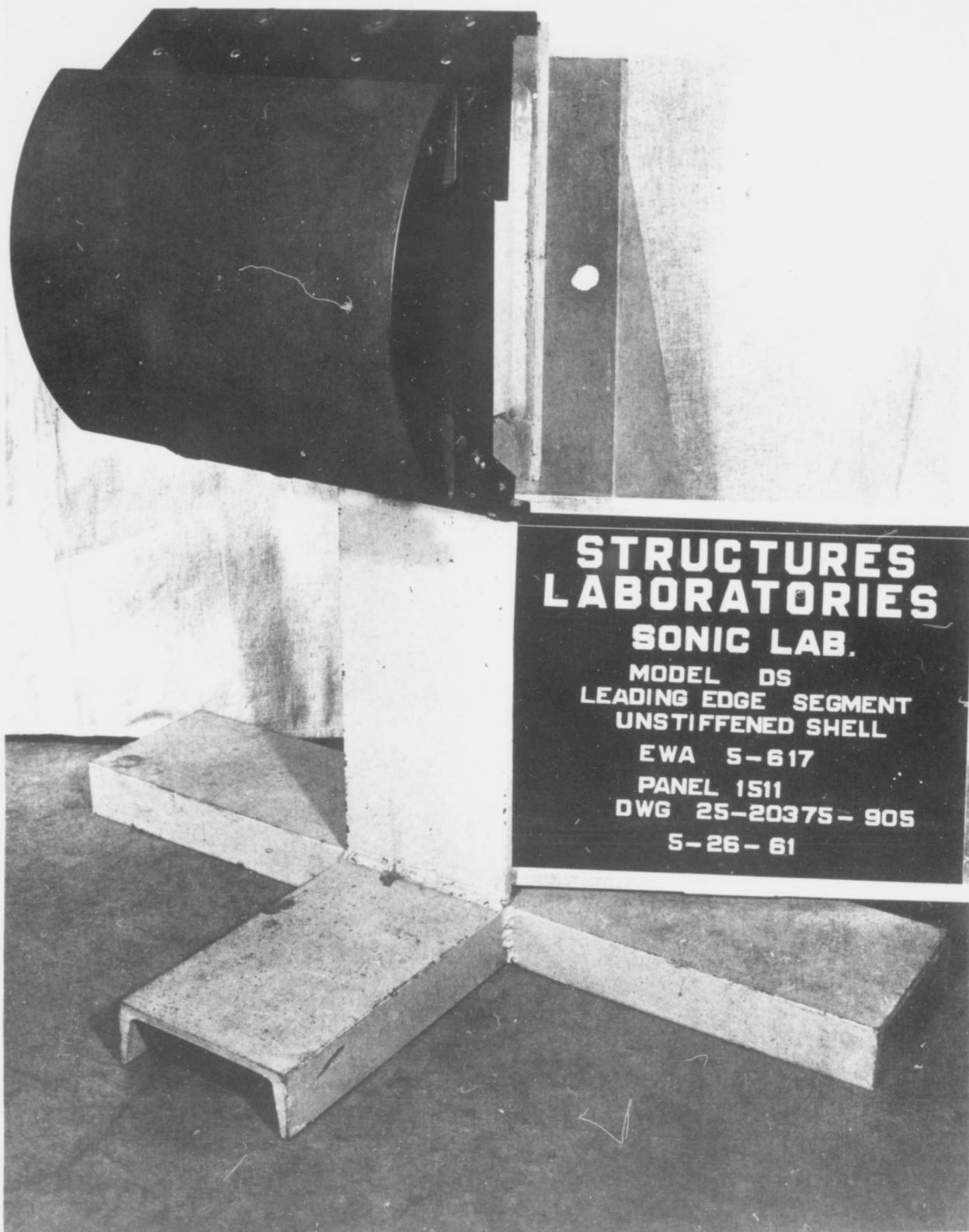
3.9.2 Load Test

3.9.2.1 Specimen 25-20376 failed at a load of 1988 pounds by brittle fracture of structural elements (Figs. 3-96, 3-97, 3-98, and 3-109) when it was slow-load tested.

3.9.2.2 The slow-load tests, on the first four specimens, resulted in unexpectedly high loads and plastic deformations. The possibility that strain-rate-sensitivity of the specimen material (Mo-0.5 Ti) would alter these results under higher load rates prompted further investigation through the rapid-load test program.

3.9.2.3 Both rapid-load specimens were inadvertently unloaded by an improperly set deflection switch. The switch was supposed to be set so the loading would be halted on failure of the specimen. Each specimen was loaded a second time to accomplish the desired test.

3.9.2.4 Specimen 25-20341-2 failed initially at a load of 1100 pounds when rapid-load tested. A delay in the test machine unloading system resulted in a maximum load of 2900 pounds being applied to the backup structure. Fig. 3-100 shows the failed specimen.



**STRUCTURES
LABORATORIES
SONIC LAB.**

**MODEL DS
LEADING EDGE SEGMENT
UNSTIFFENED SHELL**

EWA 5-617

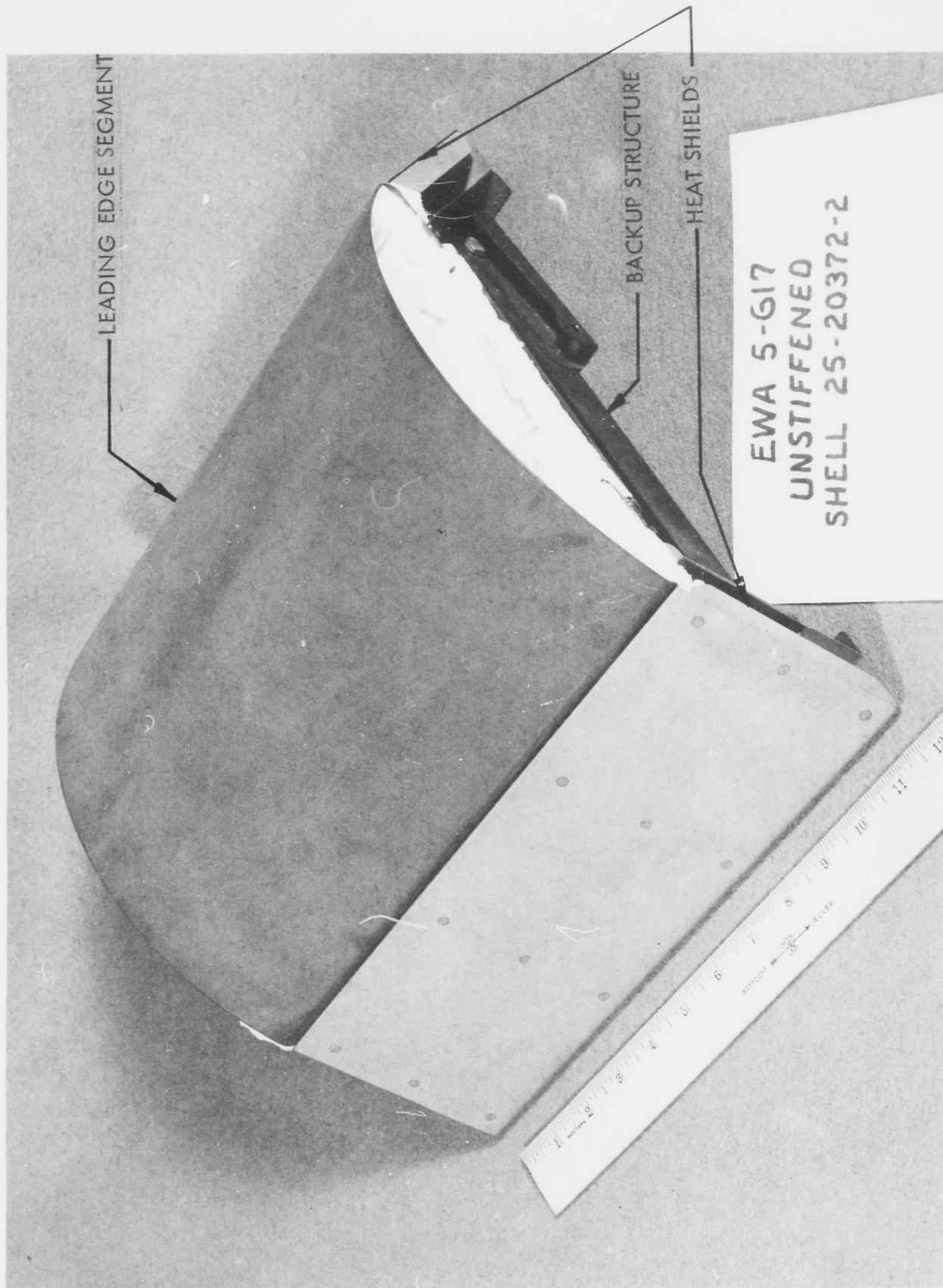
PANEL 1511

DWG 25-20375-905

5-26-61

TYPICAL LEADING EDGE ON SONIC TEST FIXTURE
SPECIMEN MOUNTED

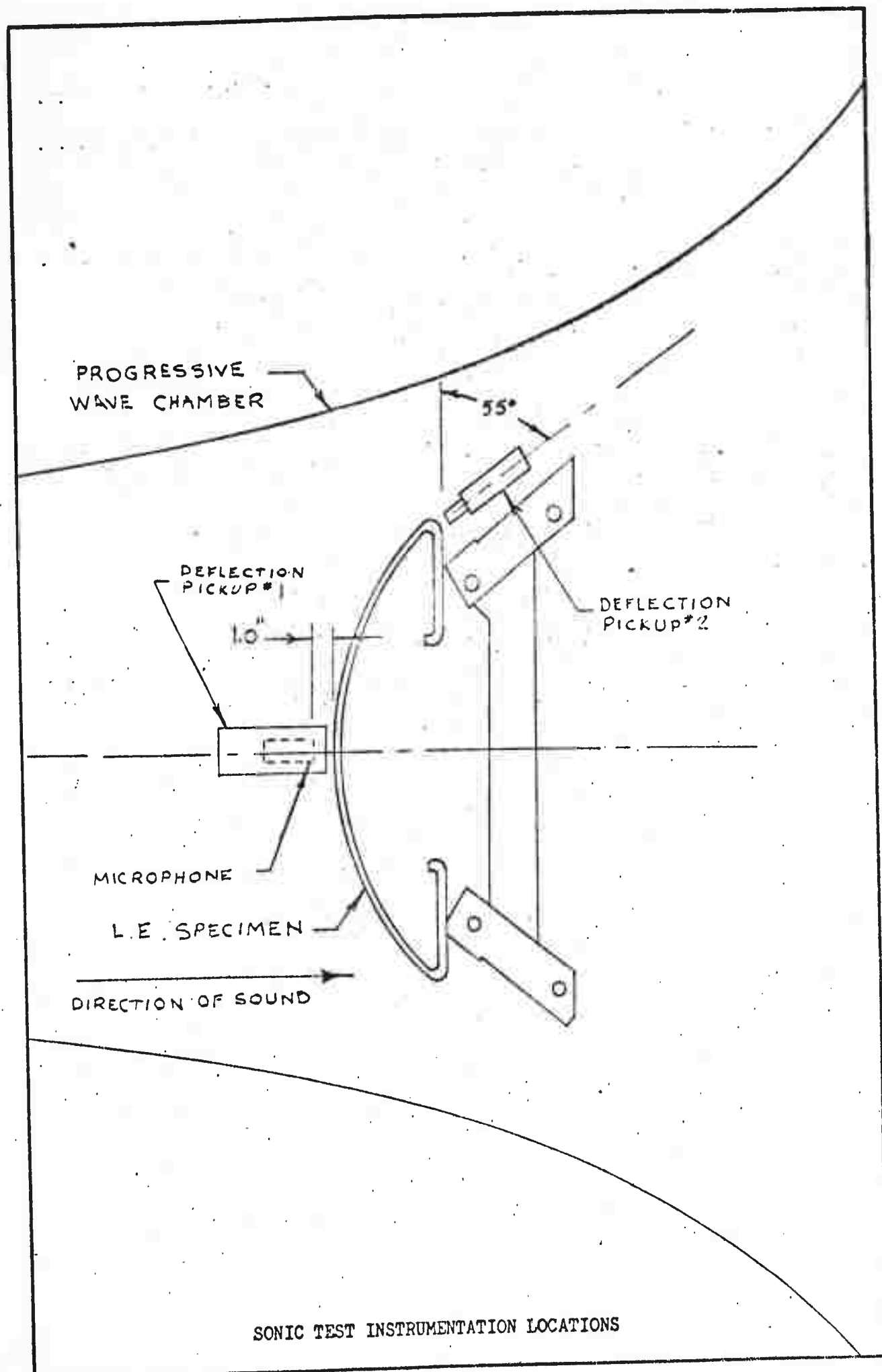




TYPICAL LEADING EDGE SPECIMEN WITH HEAT SHIELDS INSTALLED

9-3-63

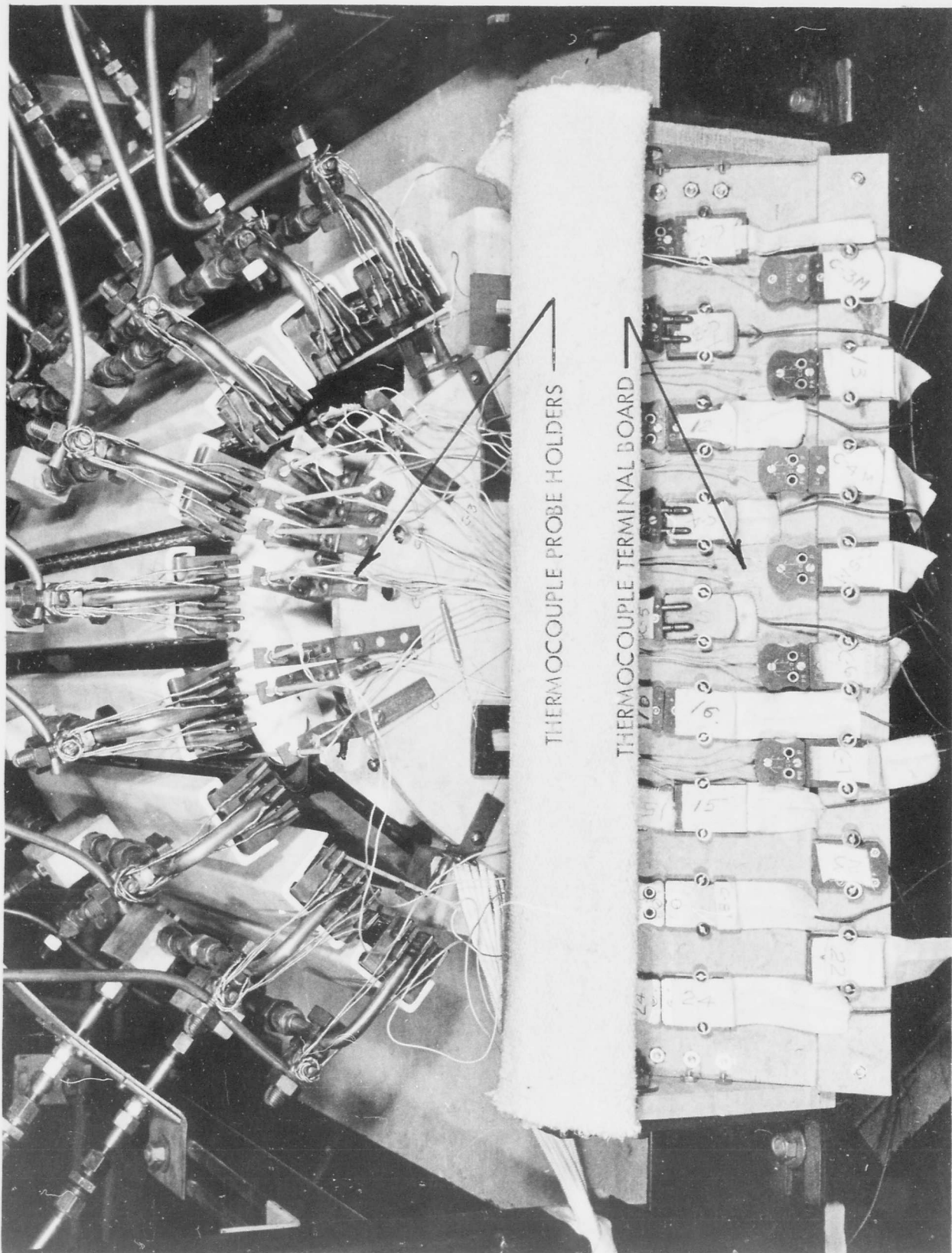




SONIC TEST INSTRUMENTATION LOCATIONS

U3-4071-1000

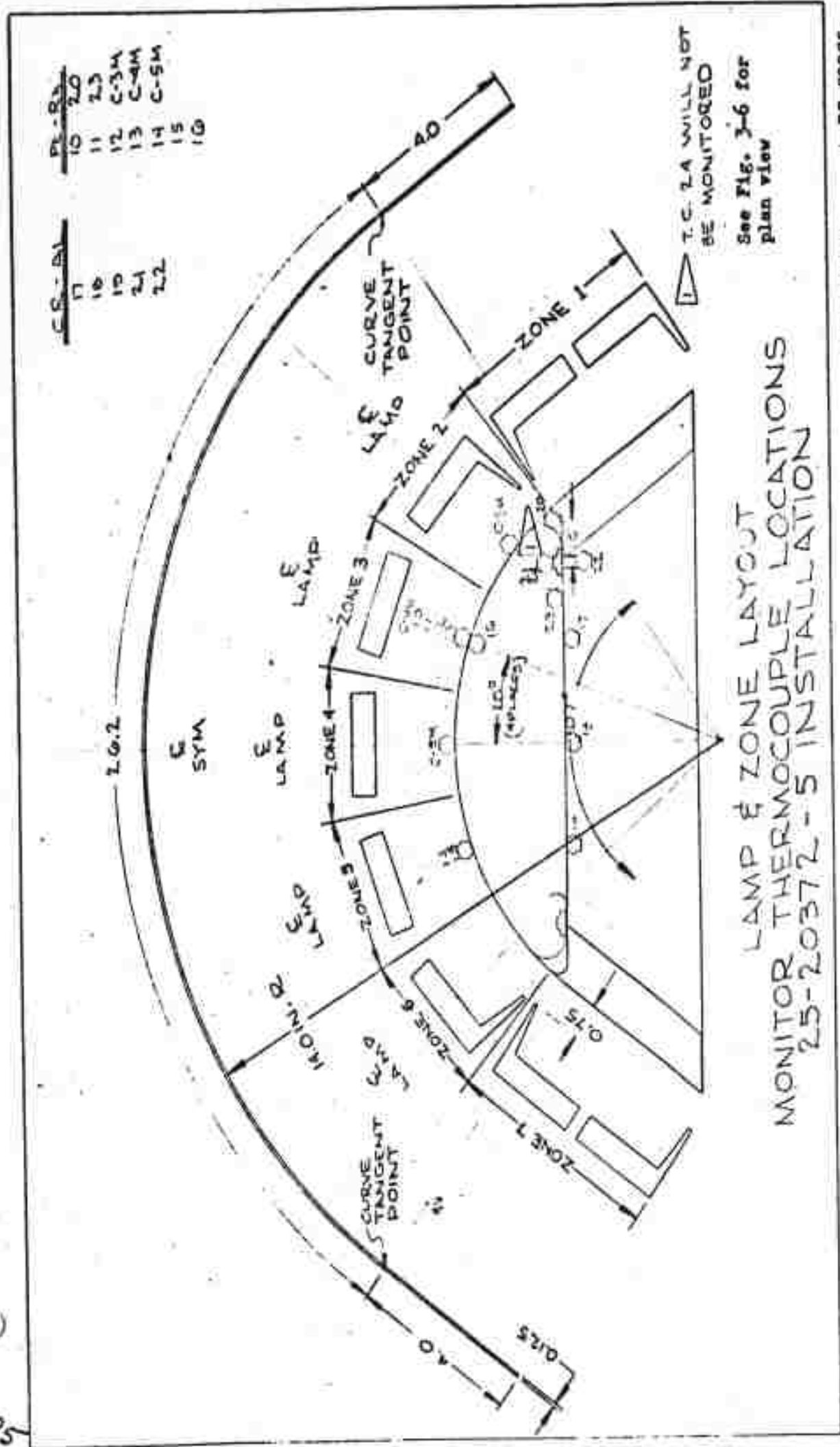
9-3-63



THERMOCOUPLE PROBE HOLDERS AND TERMINAL BOARD



35

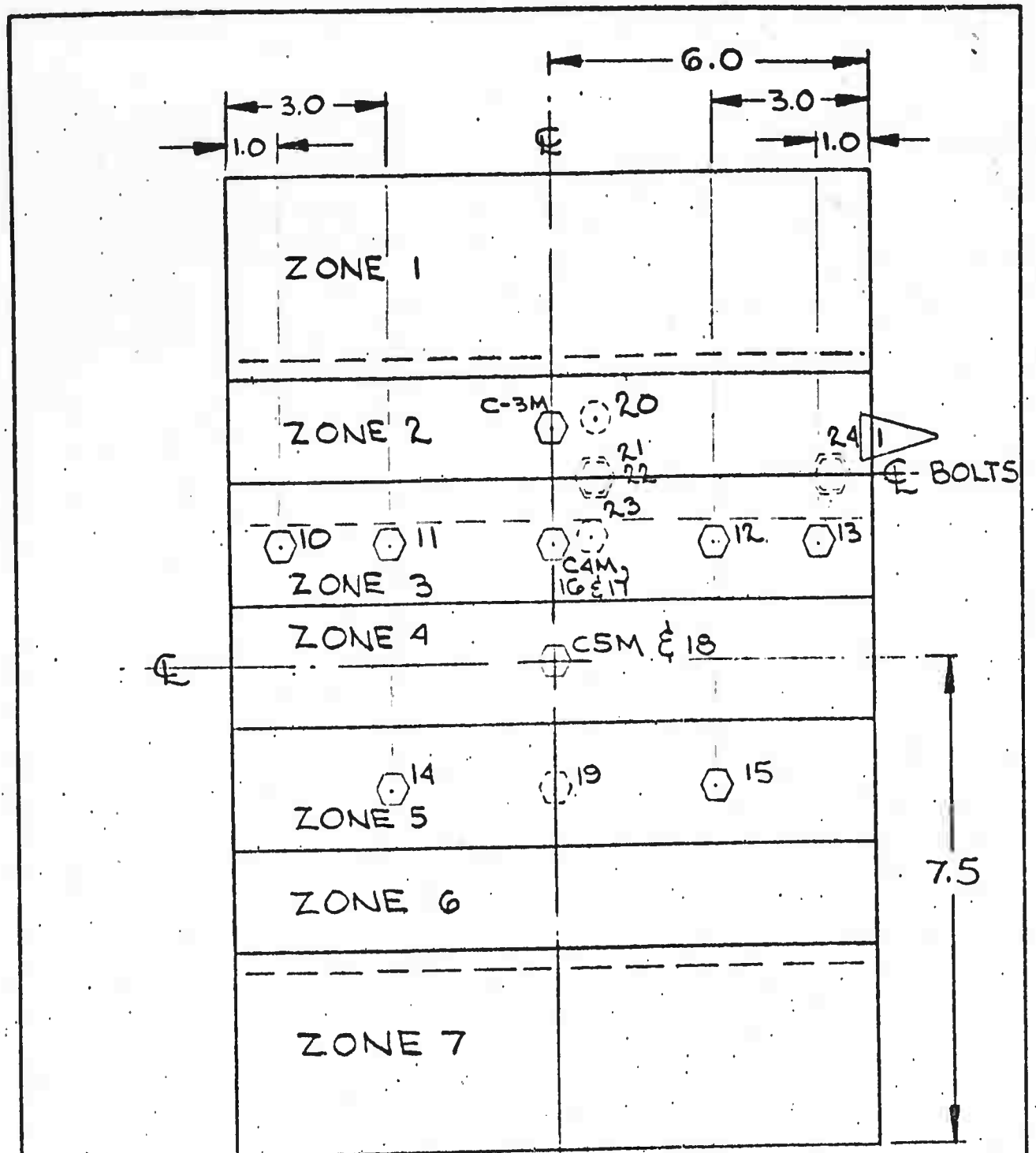


CS-B1	PL-B2
17	10
18	11
19	12
21	13
22	14
	15
	16

LAMP & ZONE LAYOUT
MONITOR THERMOCOUPLE LOCATIONS
25-20372-5 INSTALLATION

T.C. 2A WILL NOT
BE MONITORED
See Fig. 3-6 for
plan view

9-3-63

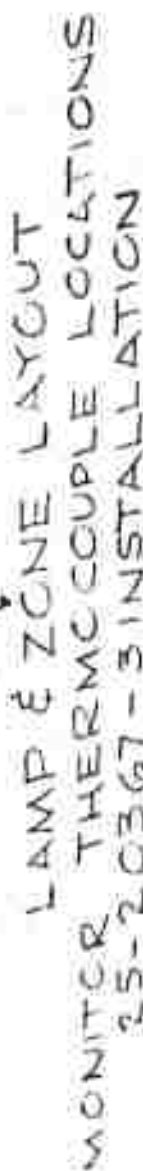


1 T.C. 24 WILL NOT BE MONITORED

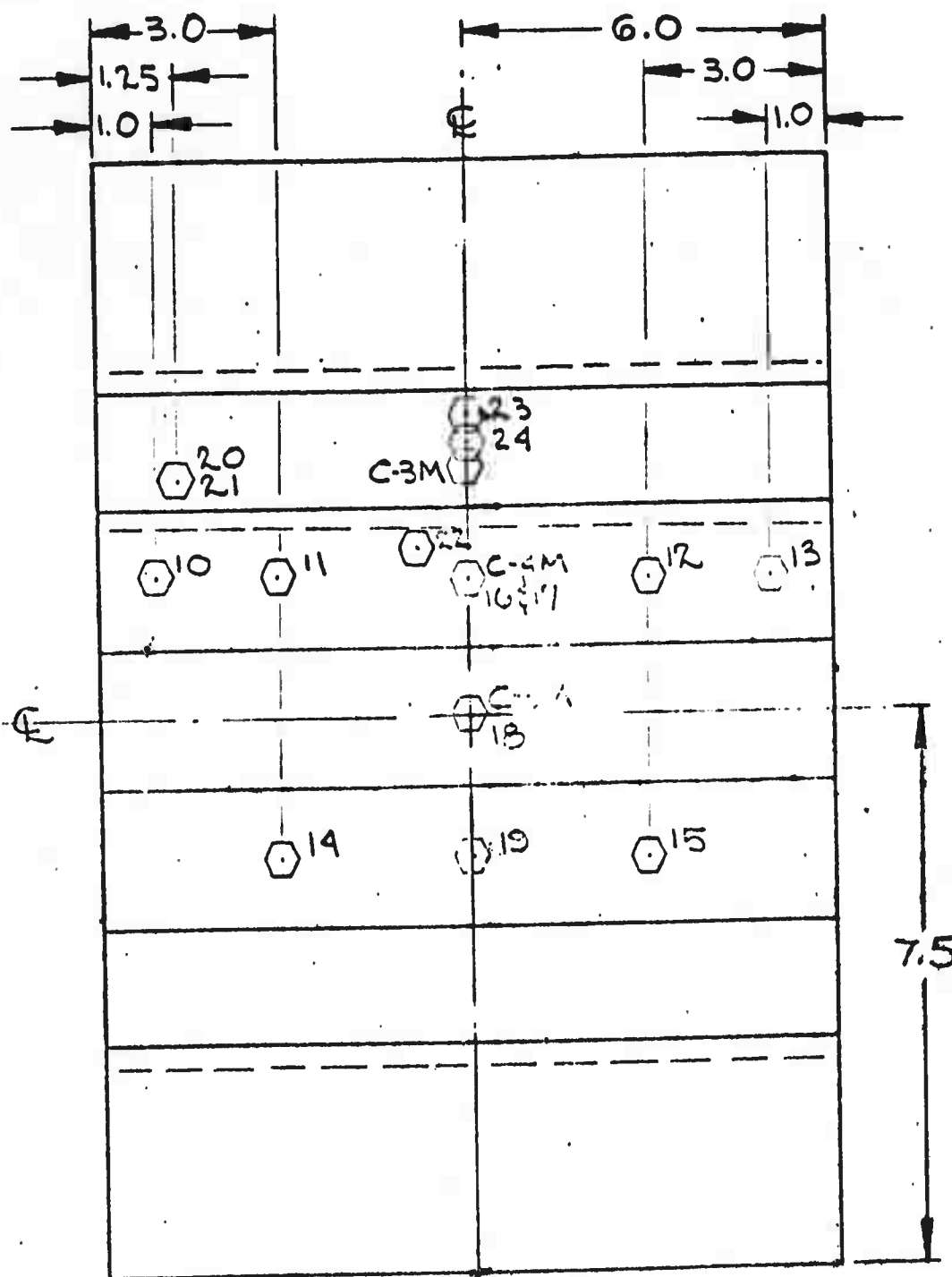
Pt - Rh		CR - AL
10	16	17
11	20	18
12	23	19
13	C-3M	21
14	C-4M	22
15	C-5M	

MONITOR THERMOCOUPLE LOCATIONS
25-20372 - 5 INSTALLATION

CH VS AL
17, 18, 19, 20
D L-5M PE VS P



See Fig. 3-8 for
plan view



Pt vs. PRh

10 22
11 23
12 24
13 C-3m
14 C-4m
15 C-5m
16

CH vs. AL

17
18
19
20
21

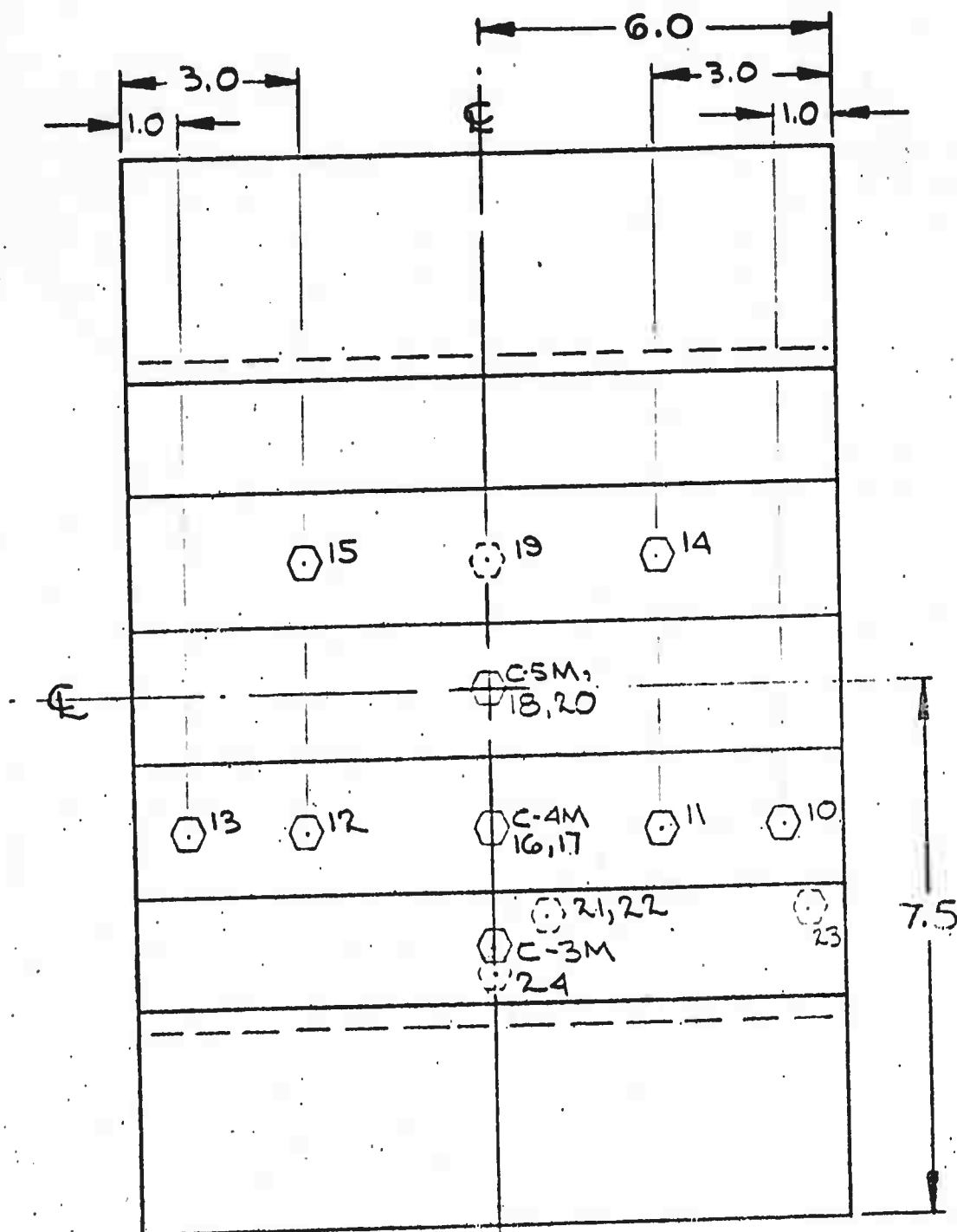
MONITOR THERMOCOUPLE LOCATIONS
25-20367 - 3 INSTALLATION

72.

26:2



See Fig. 3-10 for
plan view



Pt-Pt 87% RH 13%

10	16
11	20
12	24
13	C-3m
14	C-4m
15	C-5m

CR-AL

17
18
19
21
22
23

MONITOR THERMOCOUPLE LOCATIONS
25-20378 - 6 INSTALLATION

U1-4071-1000

9-3-63

BOEING

NO. D2-80085

Volume I Sect. 3

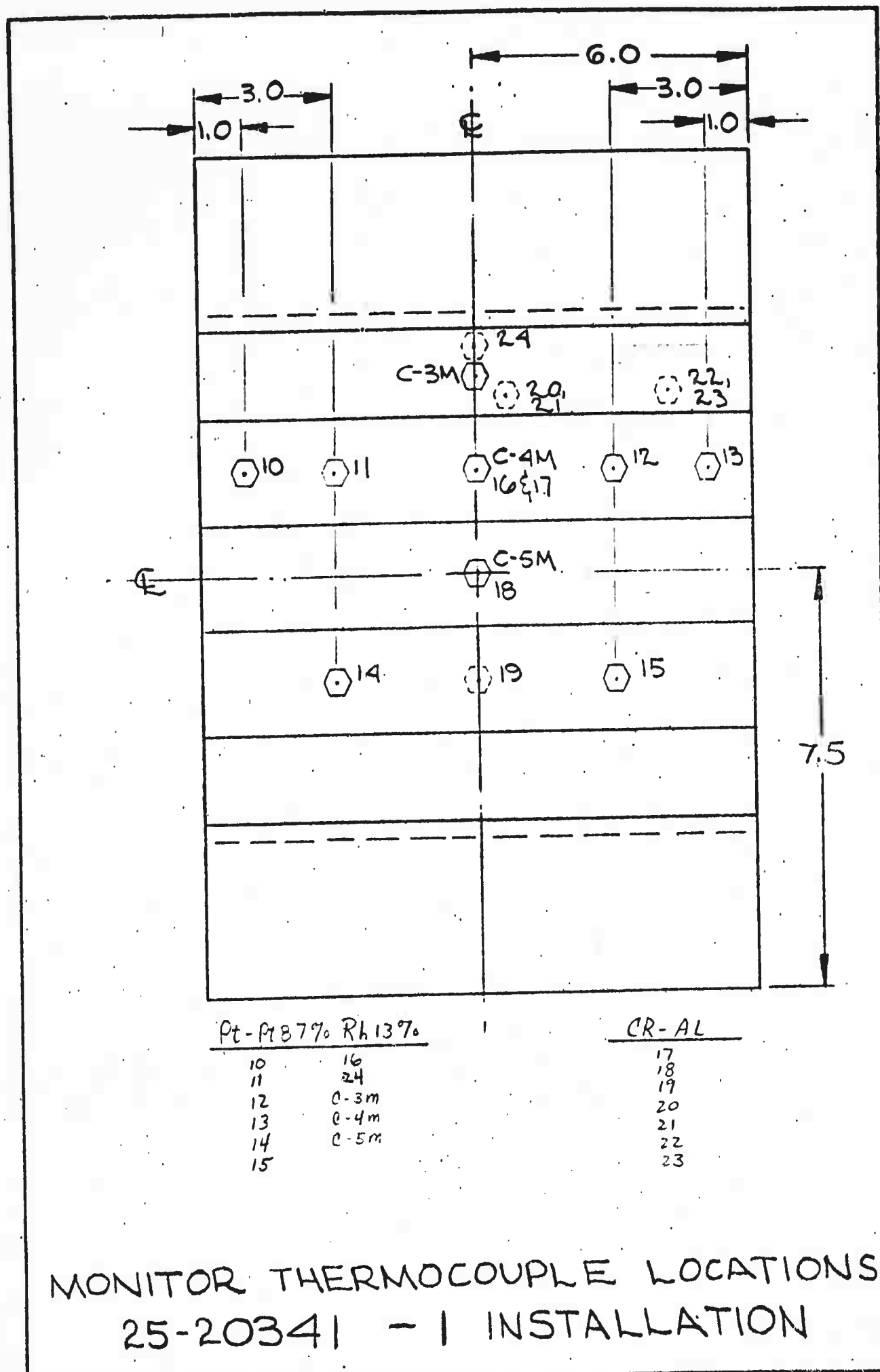
PAGE 3-20

Fig. 3-10

9-3-63



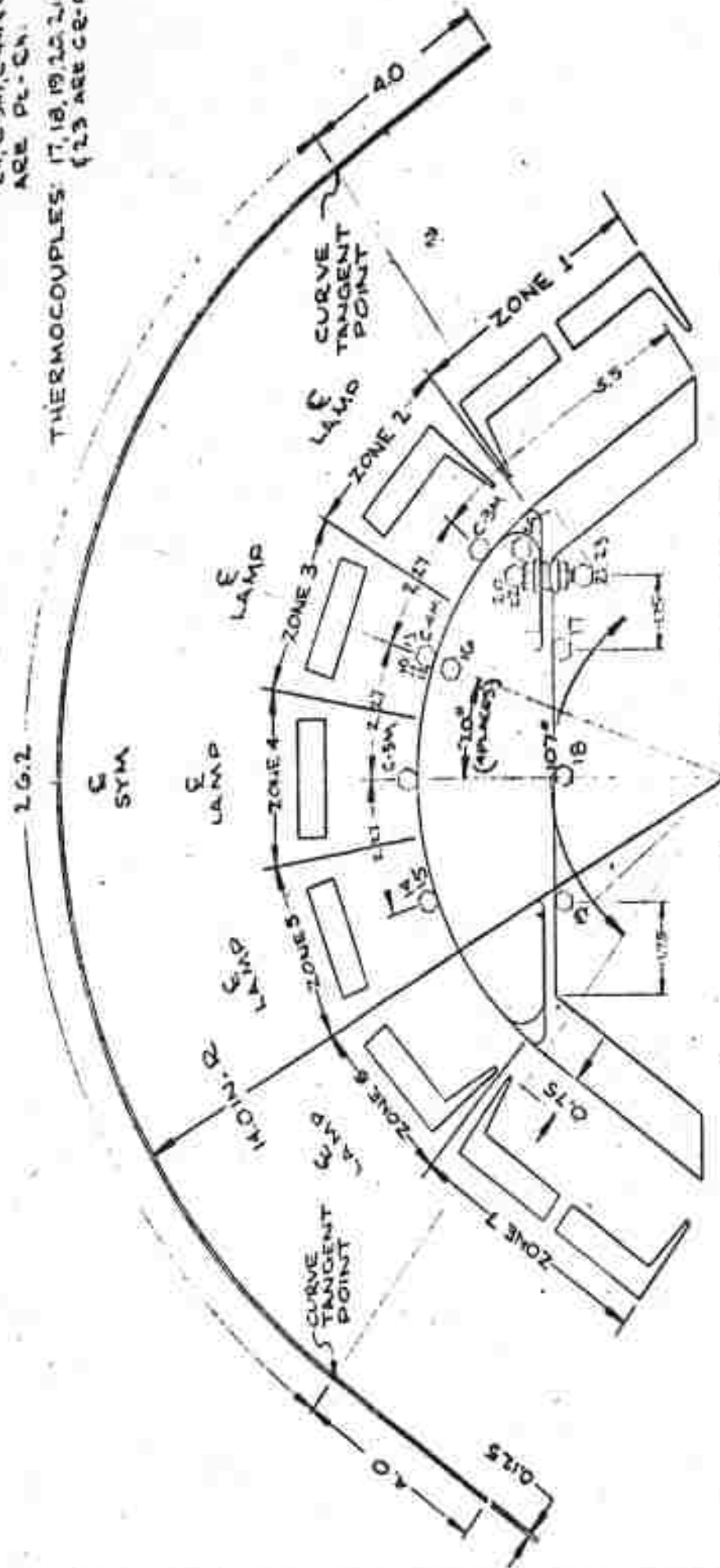
See Fig. 3-12 for
plan view



U3-4071-1-000

9-3-63

THERMOCOUPLES: 17, 18, 19, 20, 21, 22
 (23 ARE CE-AL)



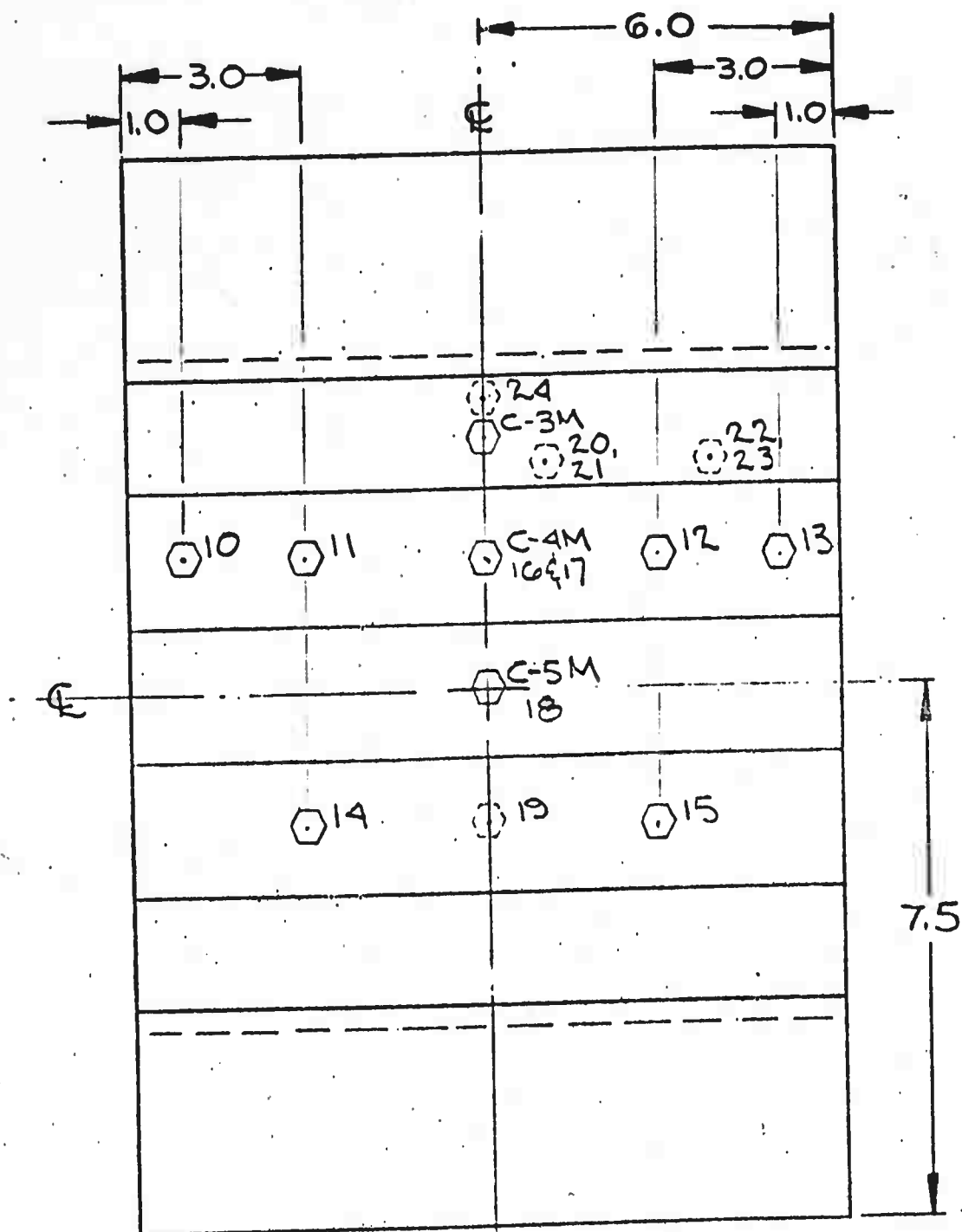
LAMP & ZONE LAYOUT
MONITOR THERMOCOUPLE LOCATIONS
25-20376-2 INSTALLATION

See Fig. 3-14 for
plan view

Volume I sec 3
FIG. 3-13
D2-800851
Page 3-31

10. *What is the purpose of the study?*

9-3-63



Pt-Rh	
10	16
11	24
12	C-3M
13	C-4M
14	C-5M
15	

CR-AL
17
18
19
20
21
22
23

MONITOR THERMOCOUPLE LOCATIONS 25-20376 - 2 INSTALLATION

U3-4071-1000

9-3-63

BOEING

NO. D2-80085

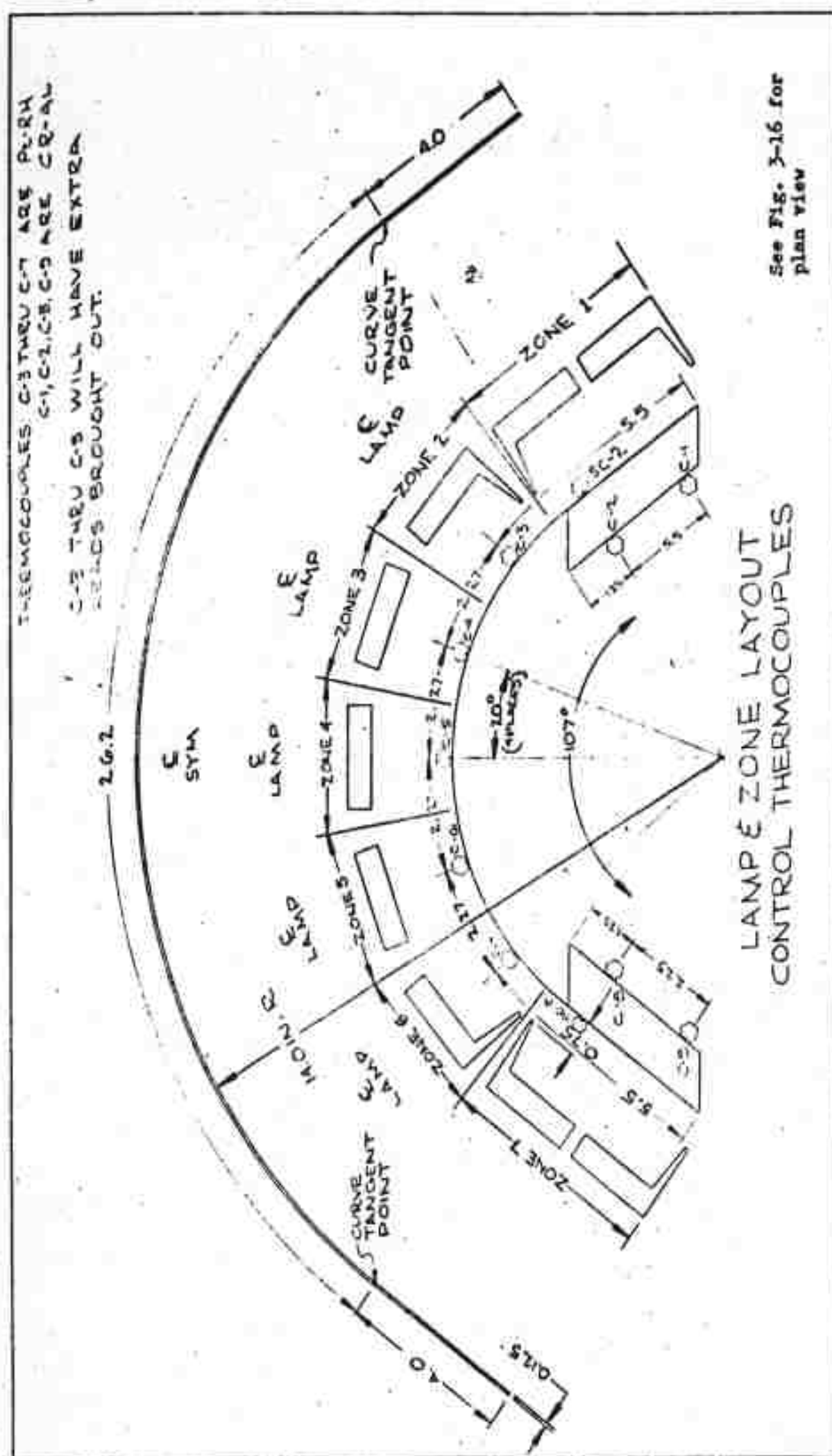
Volume I

Sect. 3

PAGE Fig. 3-14

3-32

9-3-63



See Fig. 3-16 for
plan view

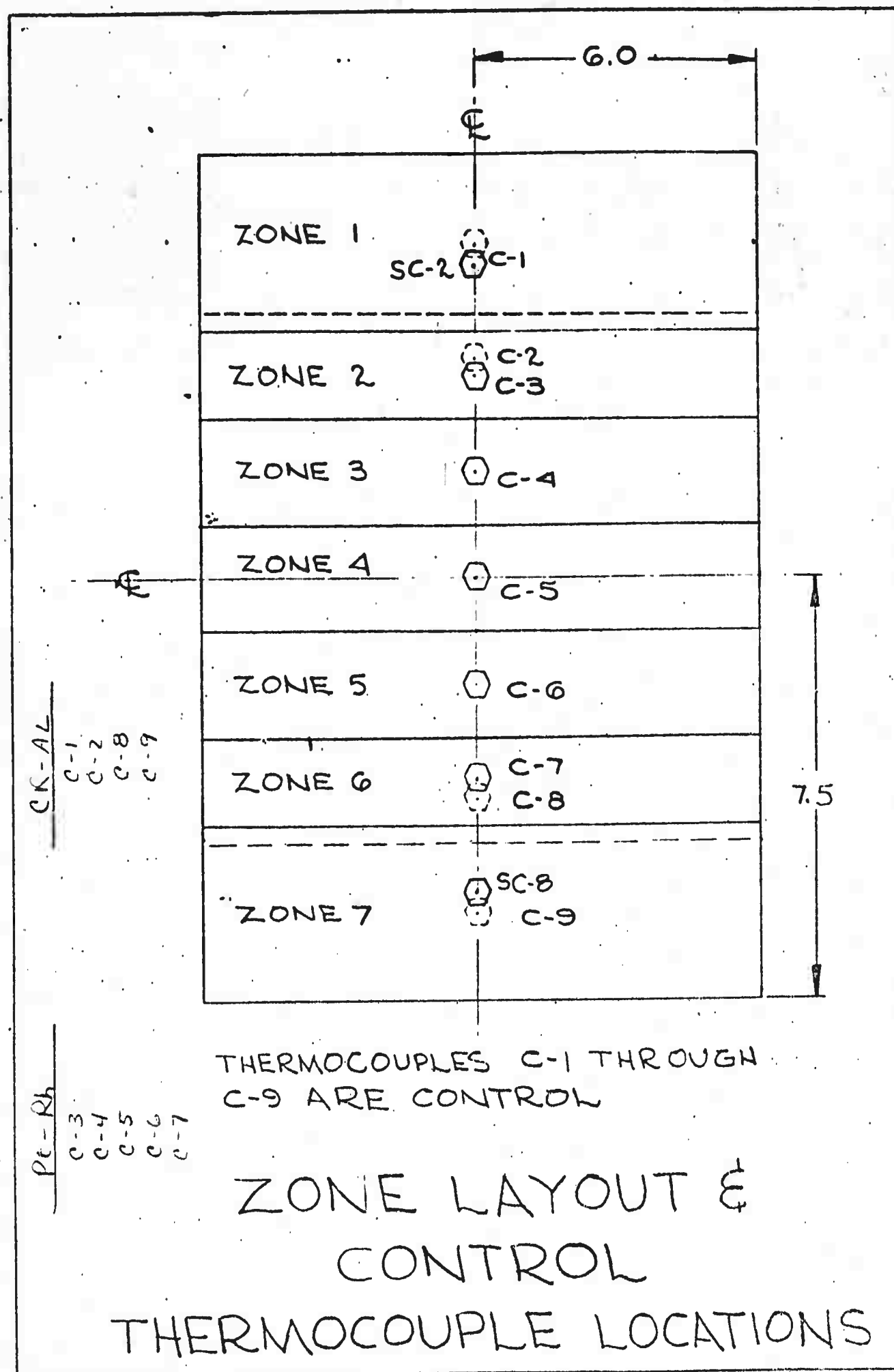
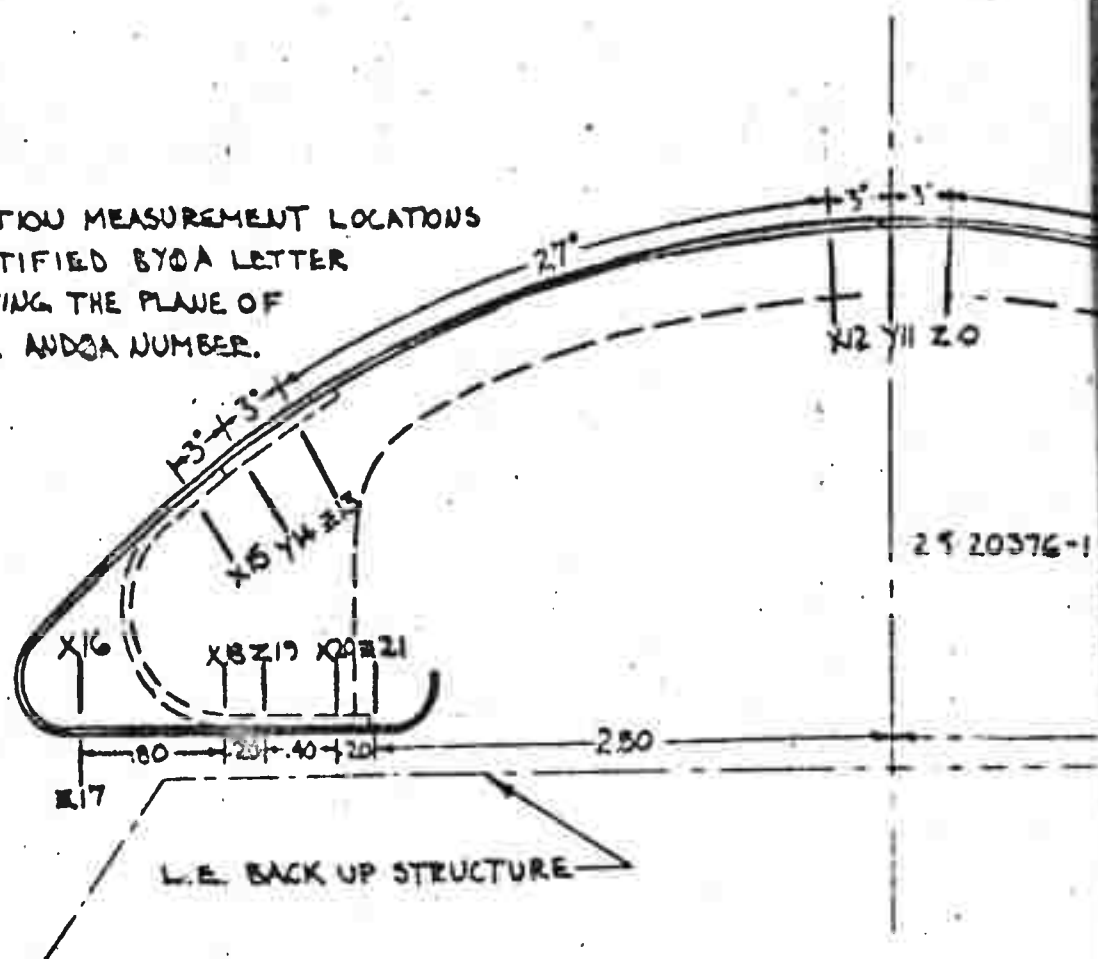


TABLE 1

LEADING EDGE ASSEMBLY NO.	DIMENSION X	DIMENSION Y	DIMENSION Z	LOCATIONS NOT USED	TOTAL NO. OF LOCATIONS
25-20372-1	0	3.00	6.00	—	21
25-20378-1	0.75	3.00	6.00	—	21
25-20367-1	0.80	3.00	6.00	—	21
25-20376-1	0 (on flange)	3.00	6.35 (on flange)	X2, Z3, X4, X7, Y8, Z9, Z13, Y14, X15, X18, Z19, X20	9
25-20341-1	0	3.00	6.00	—	21

DEFLECTION MEASUREMENT LOCATIONS ARE IDENTIFIED BY A LETTER DESIGNATING THE PLANE OF MOUNTING AND A NUMBER.

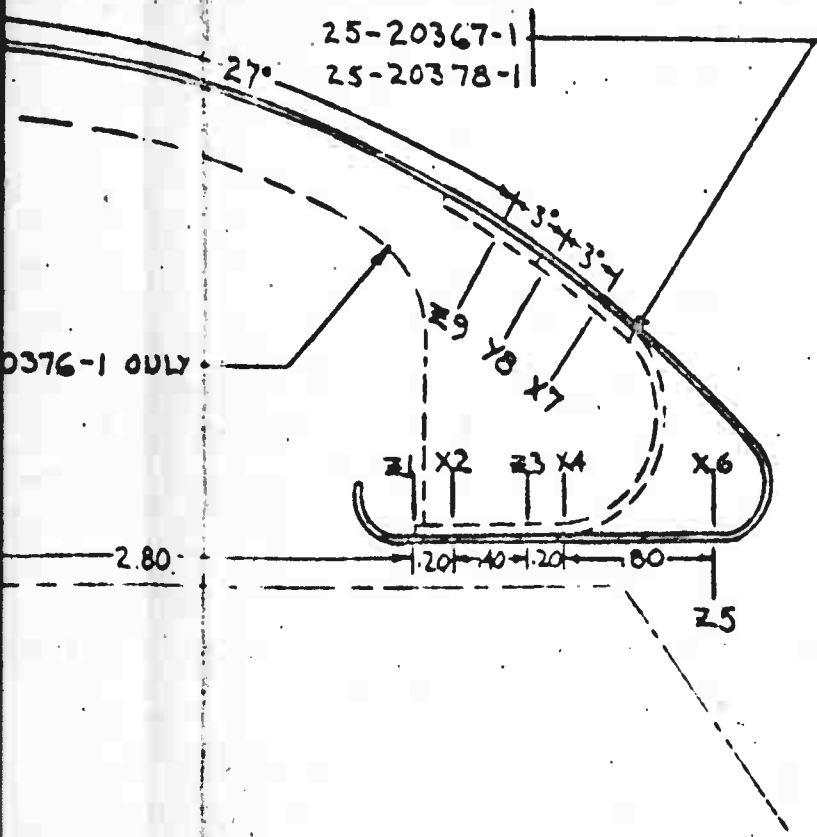
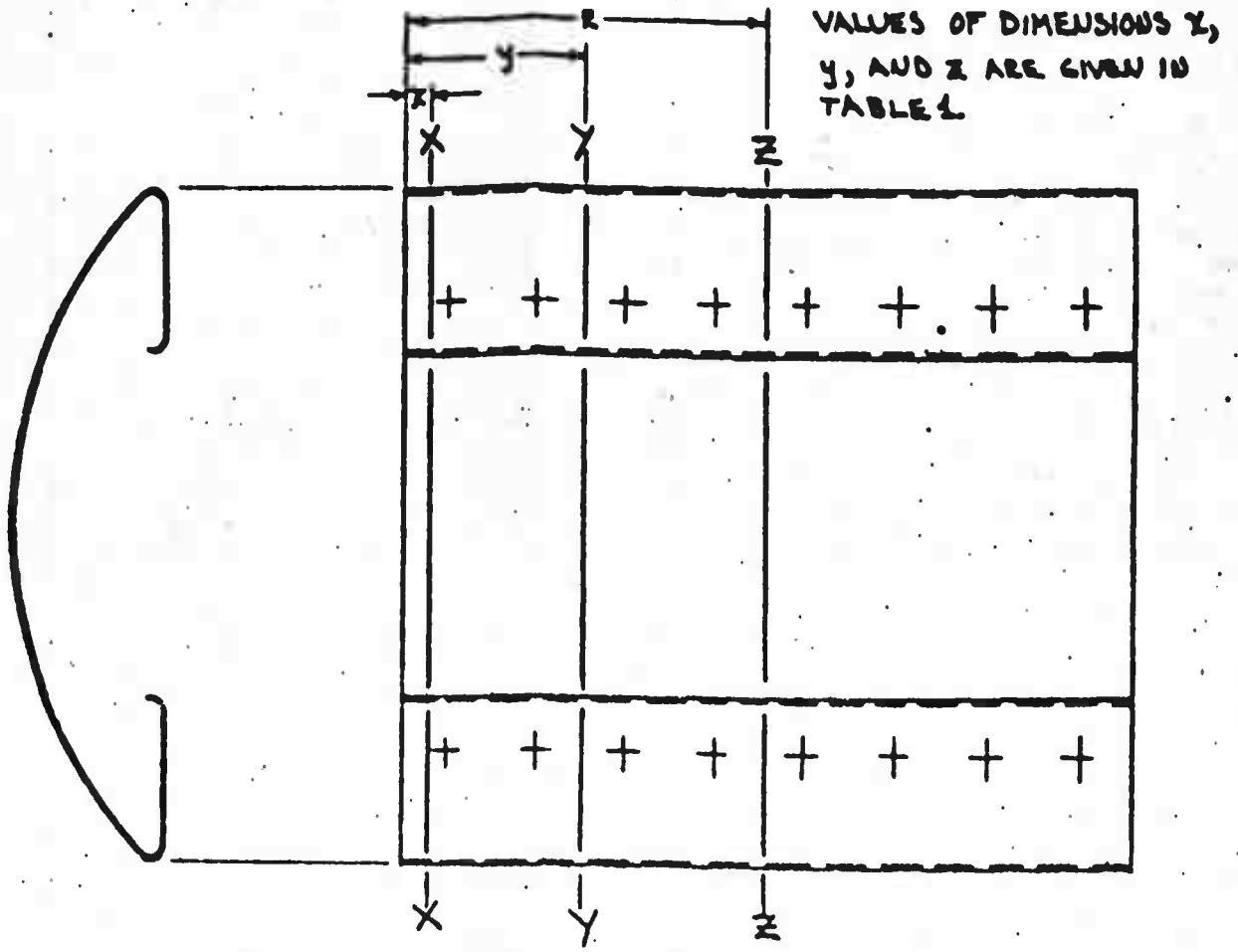


EWA 5-617 LEADING EDGE CROSS SECT

REVISED 9-3-63

BAC 4339

ALUMBER LOCATIONS
21
21
21
9
21

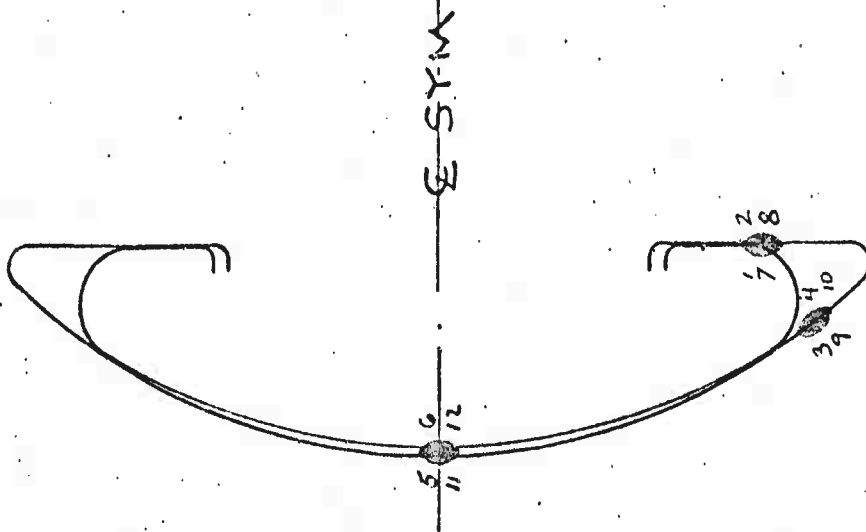


PHOTOGRAPHIC DEFLECTION
MEASUREMENT LOCATIONS
EWA 5-617 LT-3

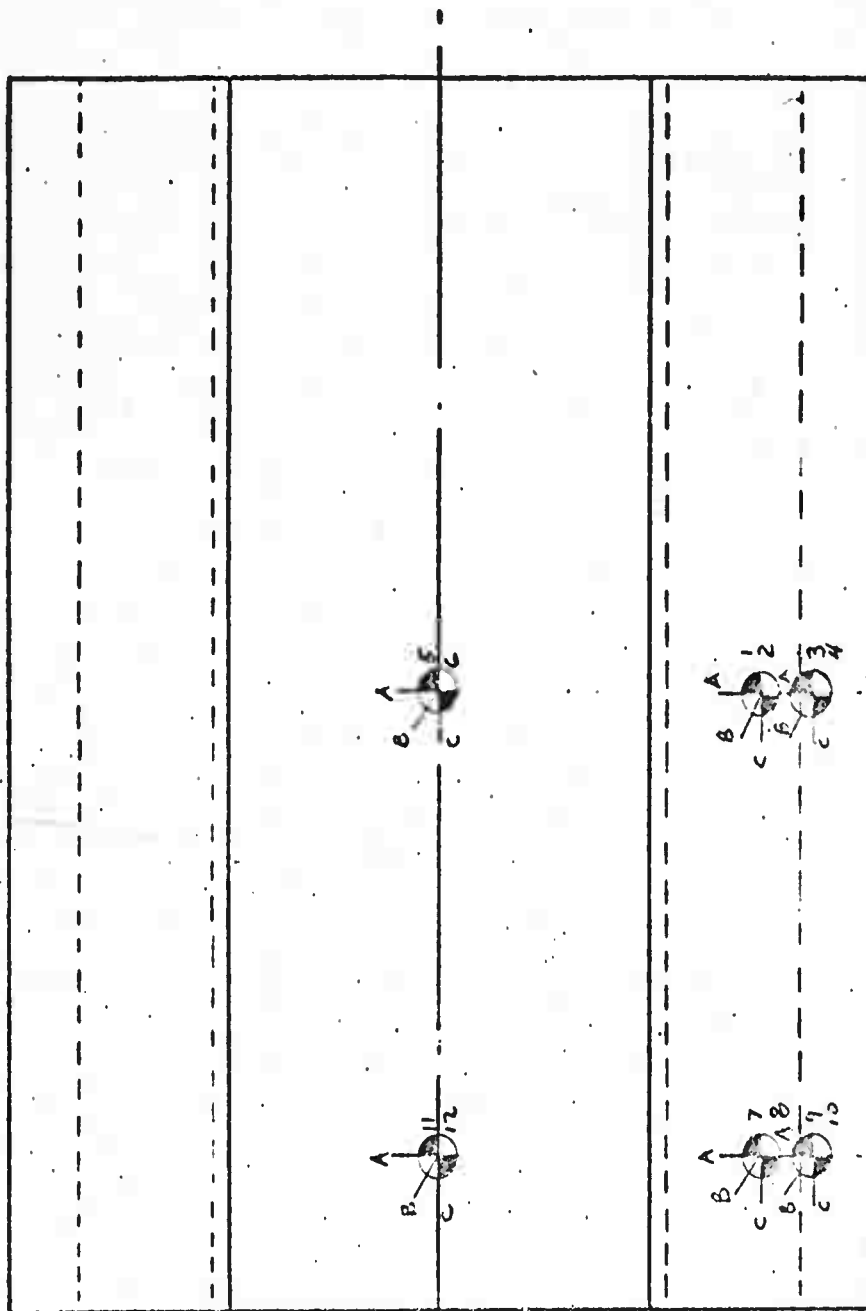
2

SECTION (FULL SIZE)

FIGURE 3-17



LOAD TEST
STRAIN GAGE INSTRUMENTATION ATTACHMENT 2



1/2 SCALE

25-20372

U3-4971-1 000

9-3-63

25-20372

BOEING

NO. D2-80085

Volume I

Sect. 3

PAGE 3-36

FIG. 3-18.

39

U3-4071-1 000

9-3-63

25-20367

Volume I

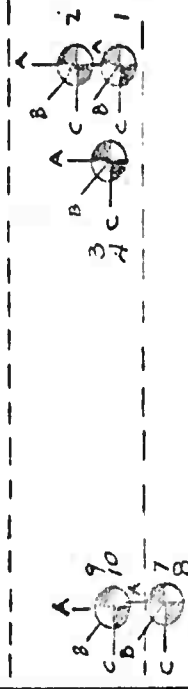
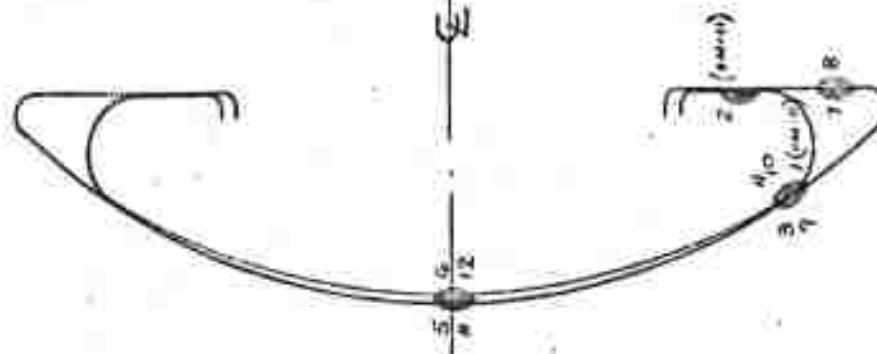
BOEING

Sect. 3

NO. D2-80085

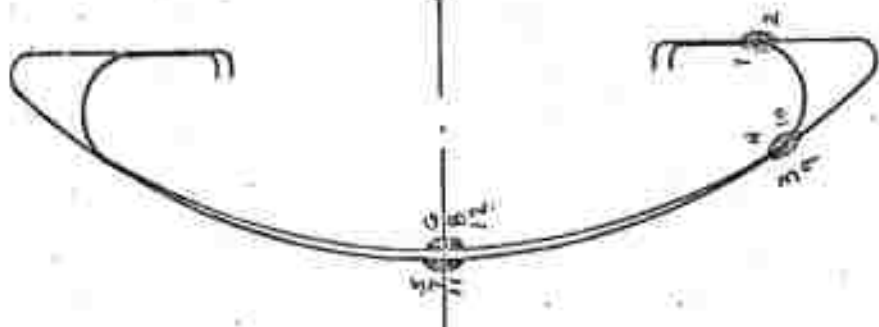
PAGE 3-37
FIG. 3-19.

LOAD TEST
STRAIN GAGE INSTRUMENTATION

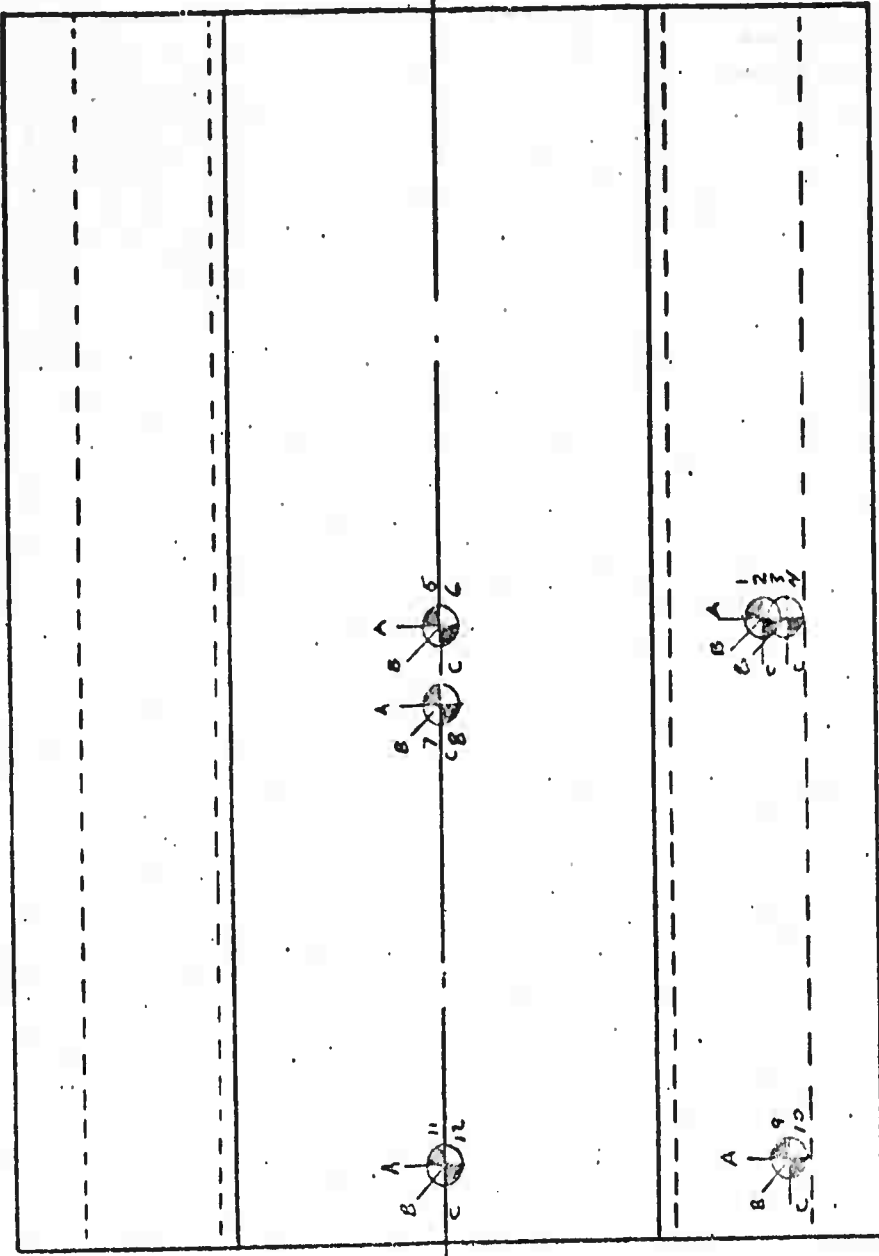


1/2 SCALE

25-20367



LOAD TEST
STRAIN GAGE INSTRUMENTATION ATTACHMENT A



1/2 SCALE

25-20378

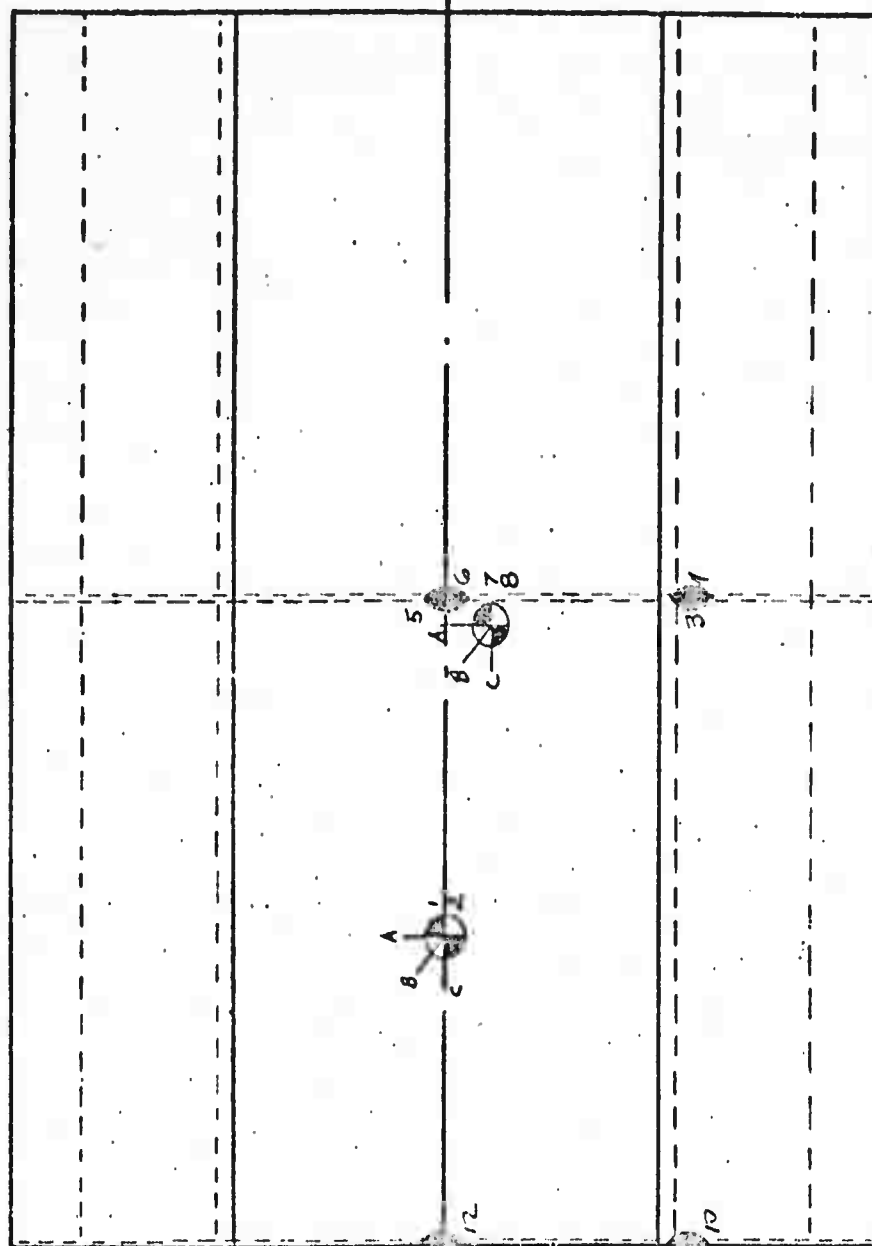
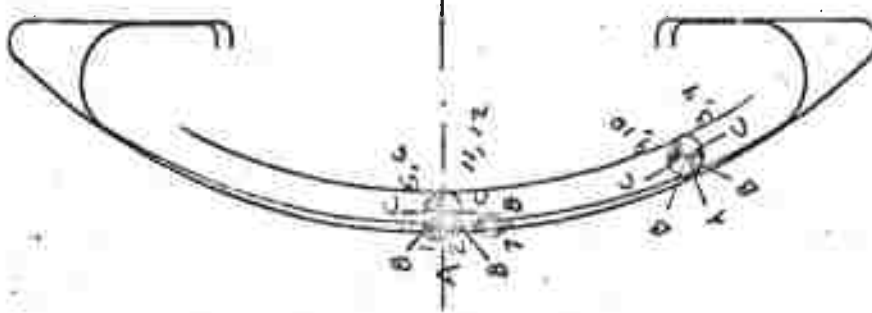
U3-4071-1000

9-3-63

25-20378

25-20376

1/2 SCALE



LOAD TEST
STRAIN GAGE INSTRUMENTATION
25-20376

ATTACHMENT 3

U3-4071-1000

9-3-63

Volume I Sect. 3

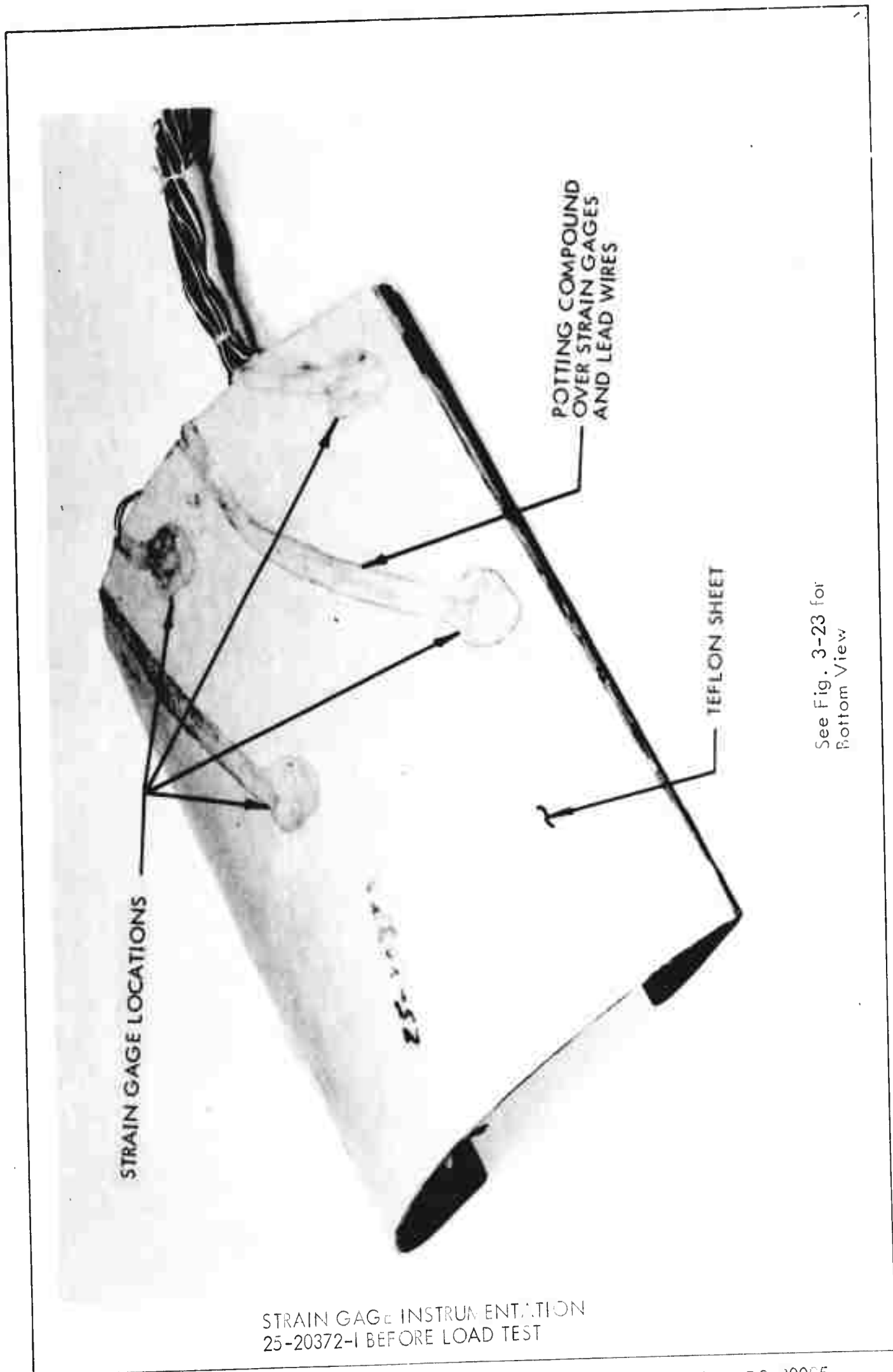
BOEING

NO. D2-80085

PAGE 3-39
FIG. 3-21

2A95729

US-1 LEADING EDGE #25-20372 BEFORE
TESTING - TOP VIEW



STRAIN GAGE INSTRUMENTATION
25-20372-1 BEFORE LOAD TEST

See Fig. 3-23 for
Bottom View

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

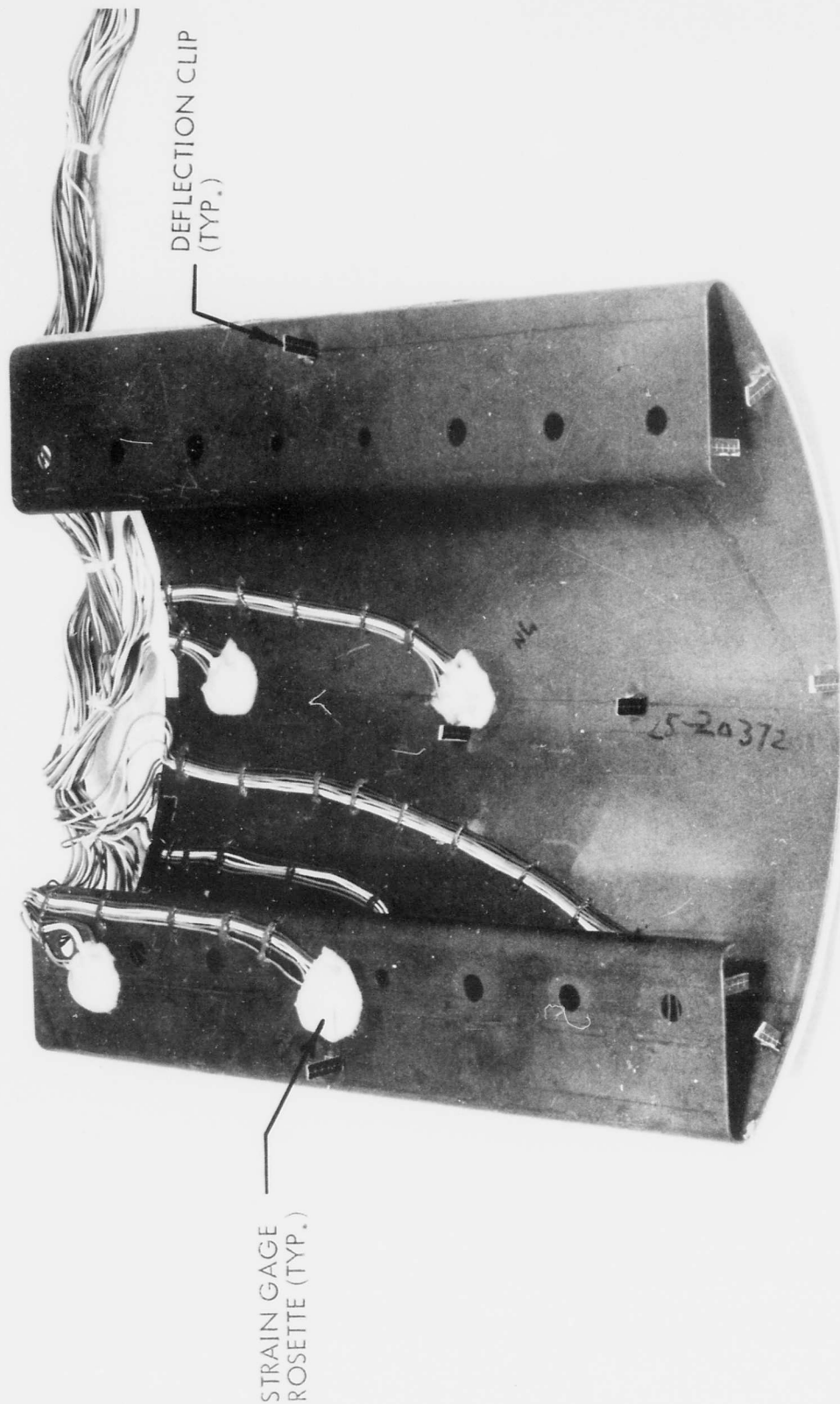
BOEING

NO. D2-30085

Fig 3-22

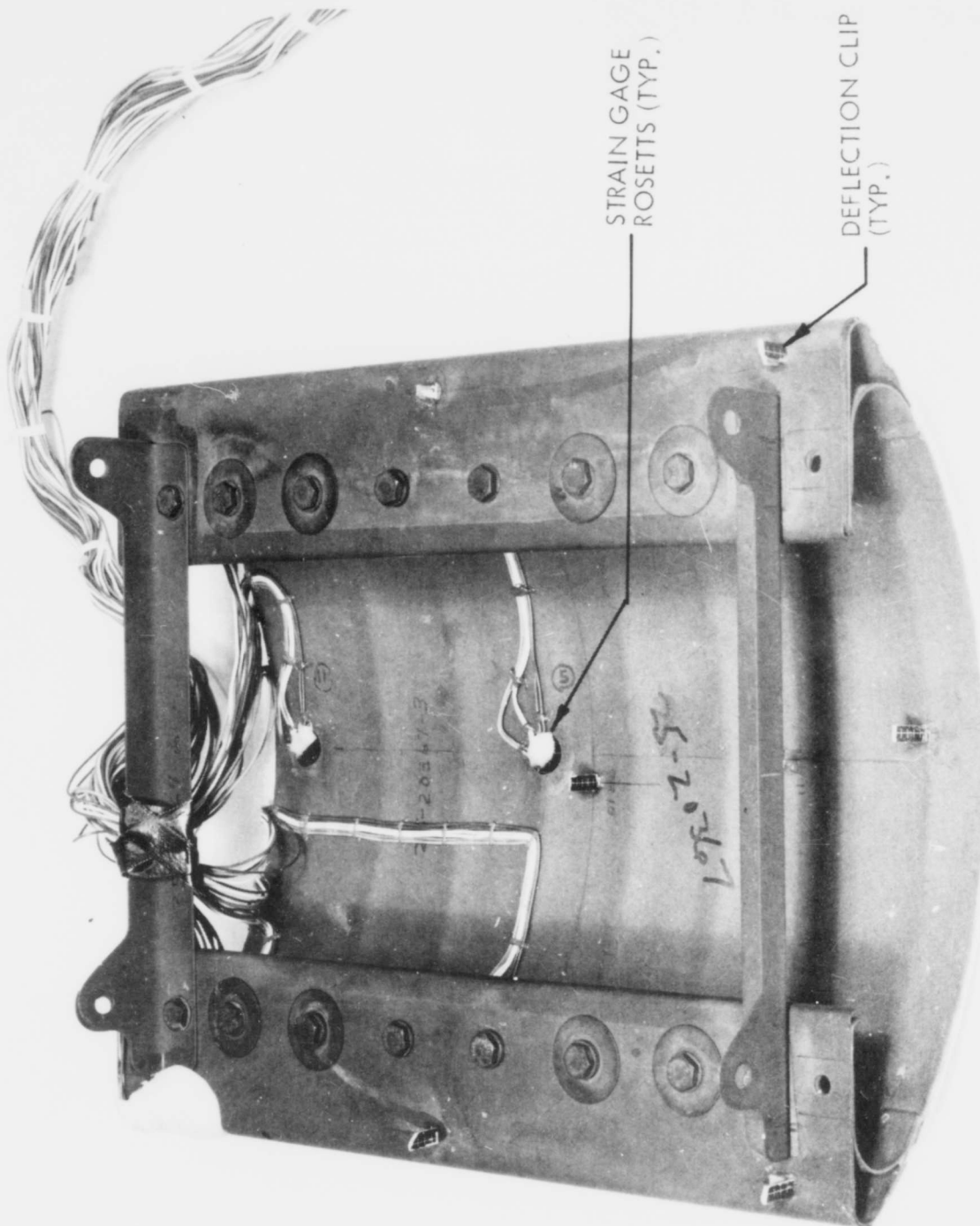
PAGE 3-40





25-20372-1 BEFORE LOAD TEST





See Fig. 3-25 for
Top View

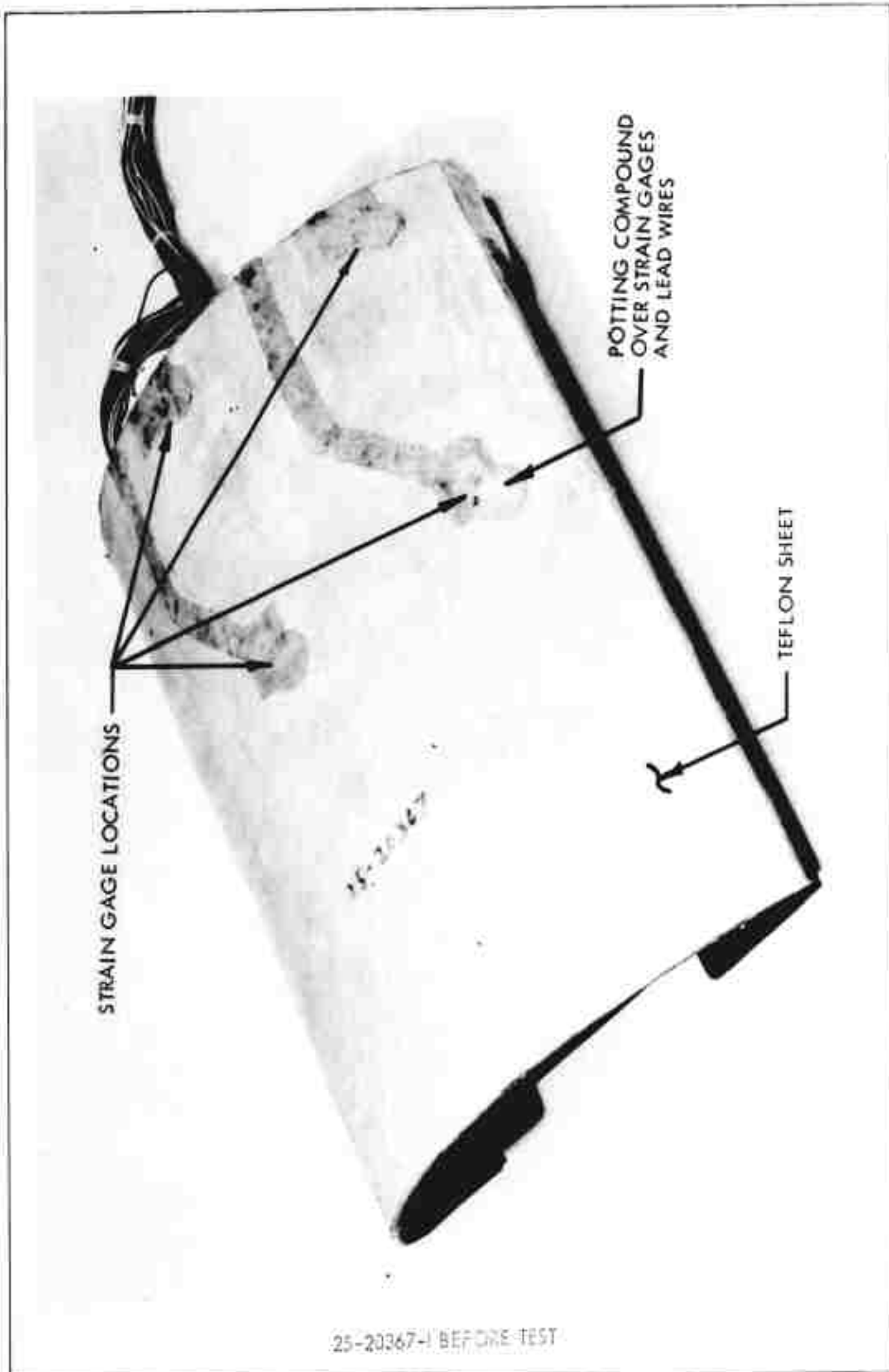
25-20367-1 BEFORE LOAD TEST

9-3-63



2495724

DS-1 LEADING EDGE #25-20367 BEFORE
TESTING - FRONT VIEW



U3-4071-1000 (was BAC 1546-L-R3)

Volume I

BOEING

Fig. 3-25

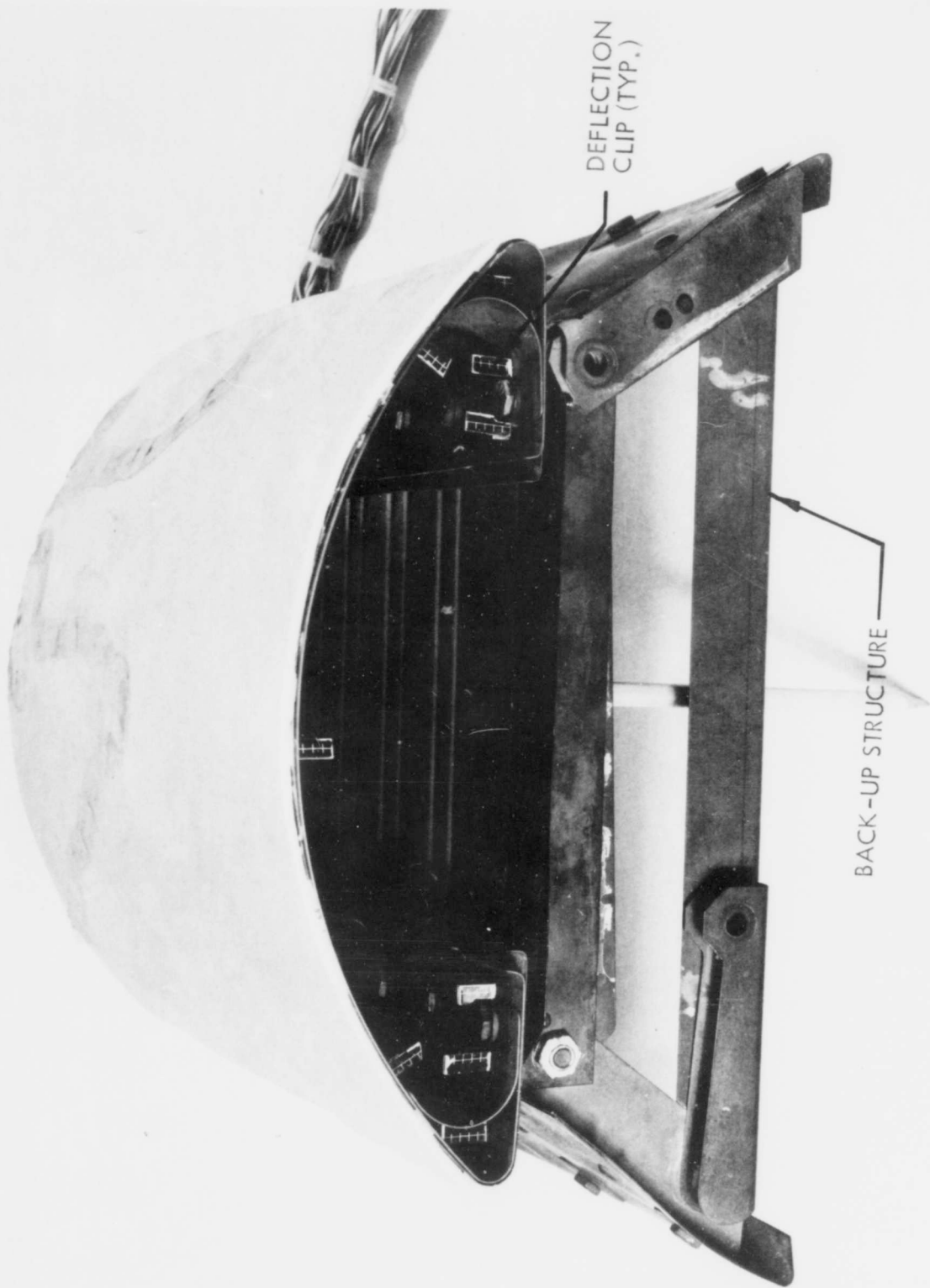
NO. D2-80085

PAGE 3-43



IS-I LEADING EDGE - BEFORE TESTING
END VIEW
1-7-62

2A95725

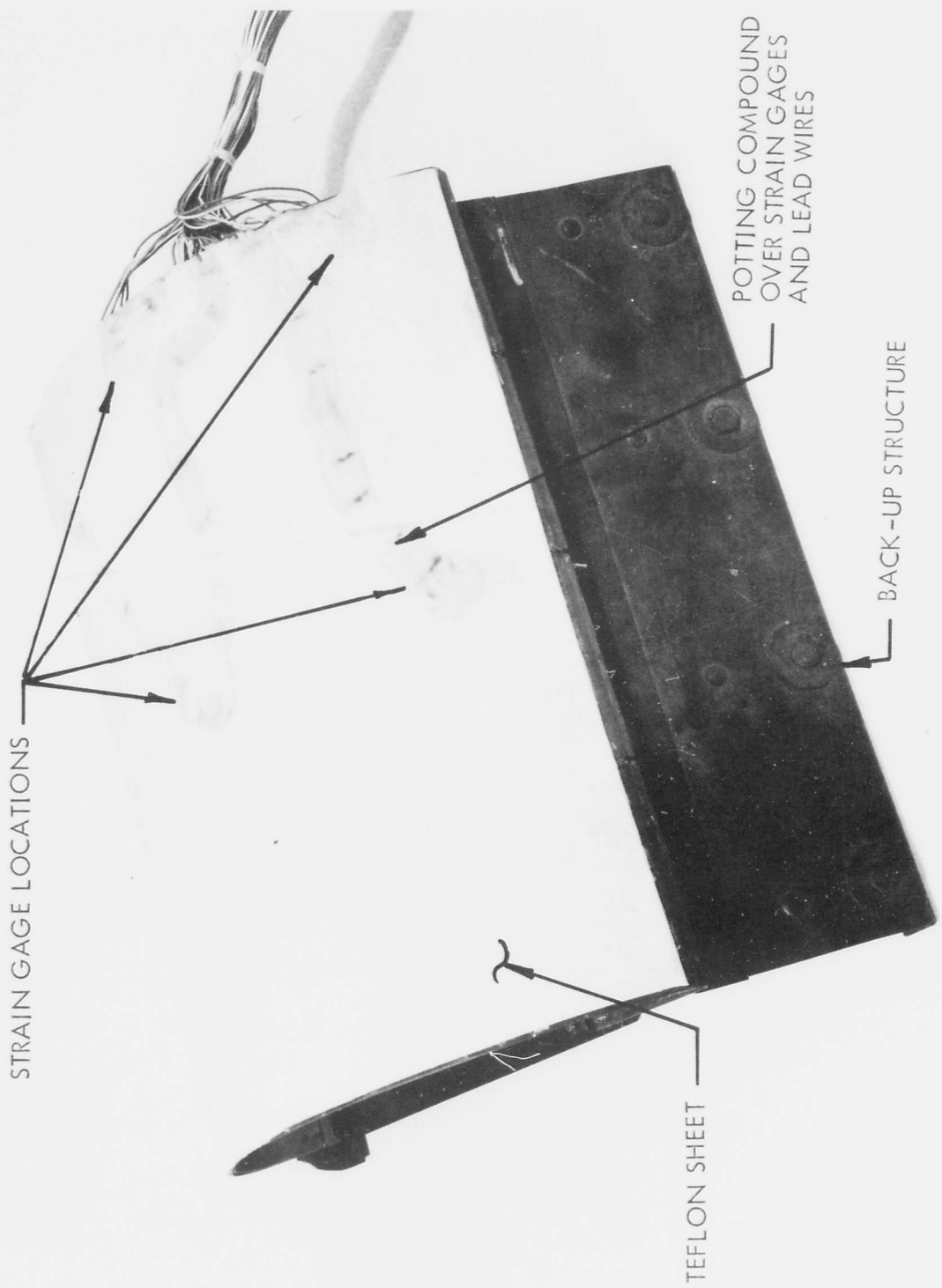


25-20378 BEFORE LOAD TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63





25-20378 BEFORE LOAD TEST



DS-I LEADING EDGE SPEC. 25-20341 - 2-27-62 2A1024 38



25-20341-1 BEFORE LEAD TEST

U3-4071-1000 (was BAC 1546-L-R3)

Volume I

BOEING

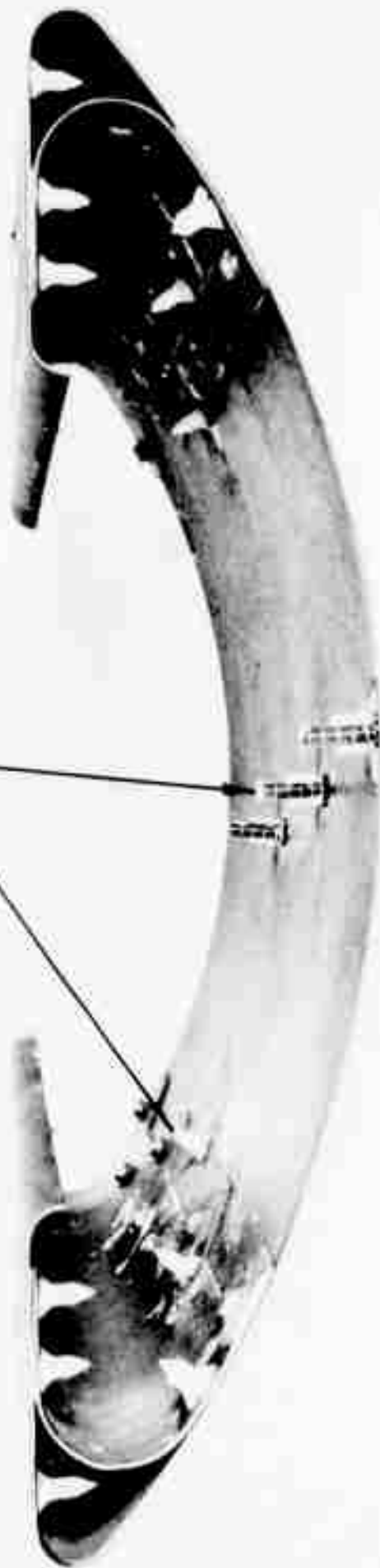
Fig. 3-23

NOD2-80085

PAGE 3-46



DEFLECTION CLIPS
(TYPICAL)

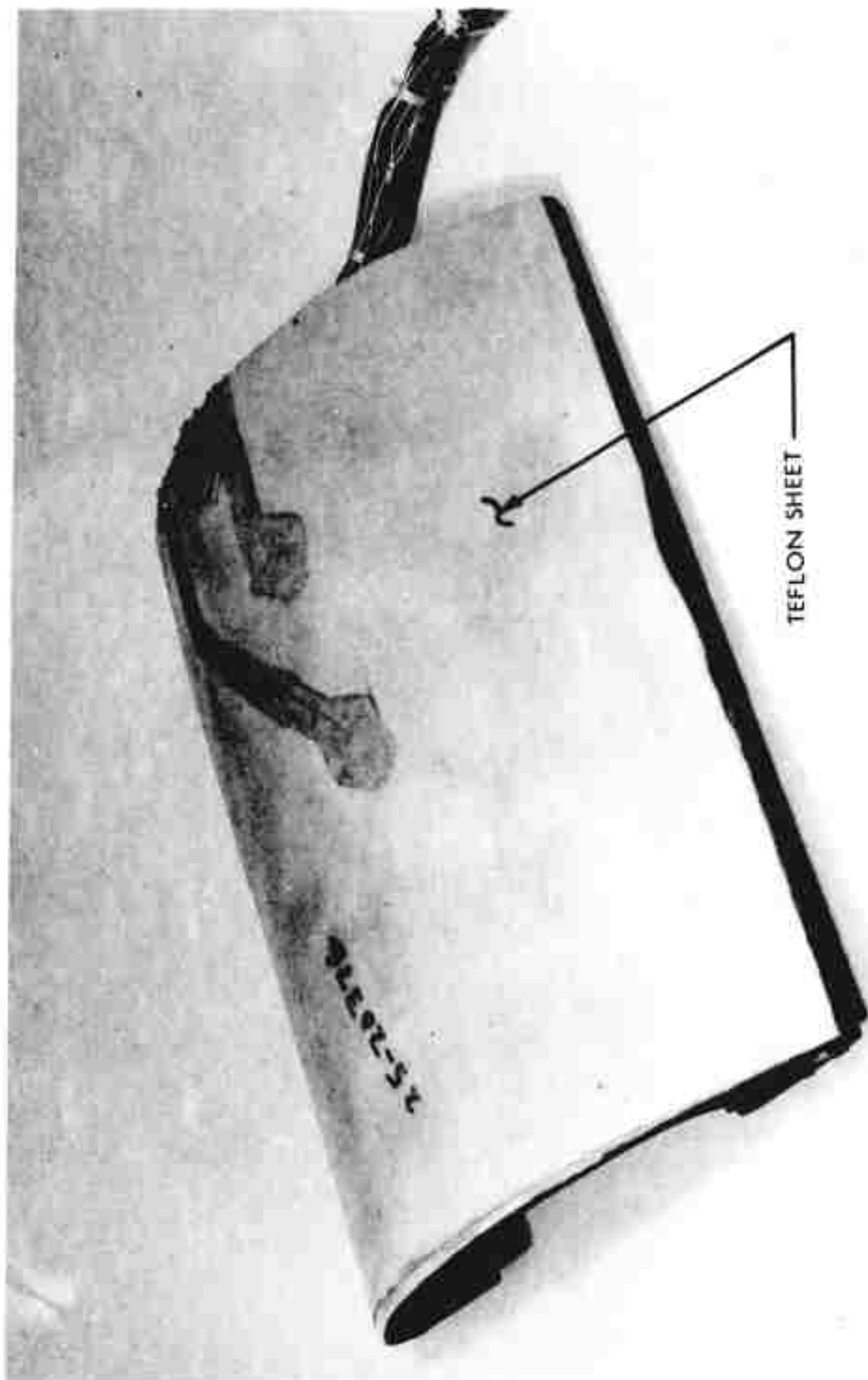


25-20341-1 B: F. L. LOAD TEST



2495728

DS-I LEADING EDGE #25-20376 BEFORE
TESTING - TOP VIEW
1-7-62



25-20376-1 BEFORE TEST

U3-4071-1000 (was BAC 1546-L-R3)

Volume I

BOEING

Fig. 3-30

NO. D2-80085

PAGE 3-4



2A95727

US-1 LEADING EDGE #25-20376 BEFORE
TESTING - BACK VIEW
1-7-62



25-20376-1 BEFORE TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-13-63

Volume I

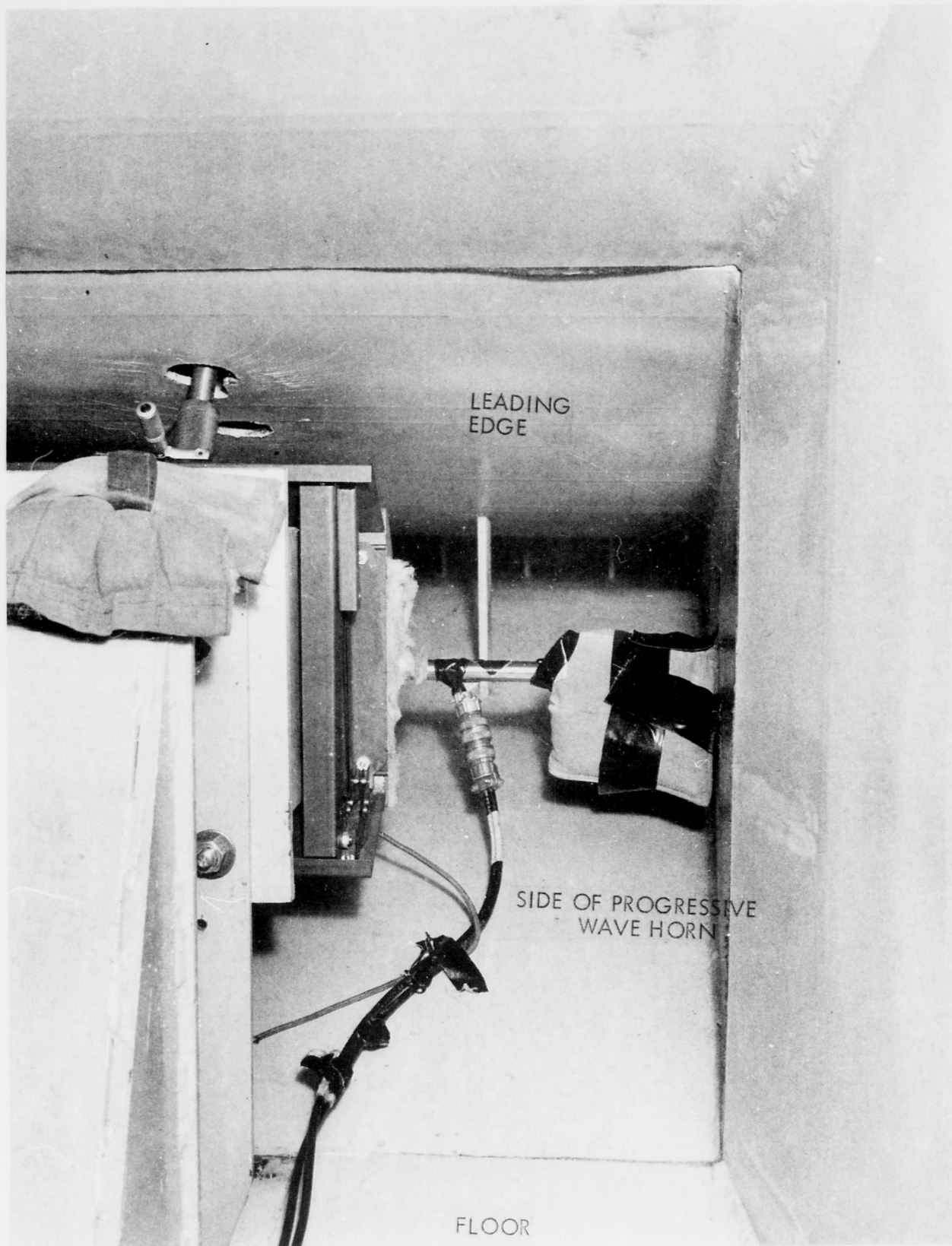
BOEING

Fig. 3-31

NO. D2-80085

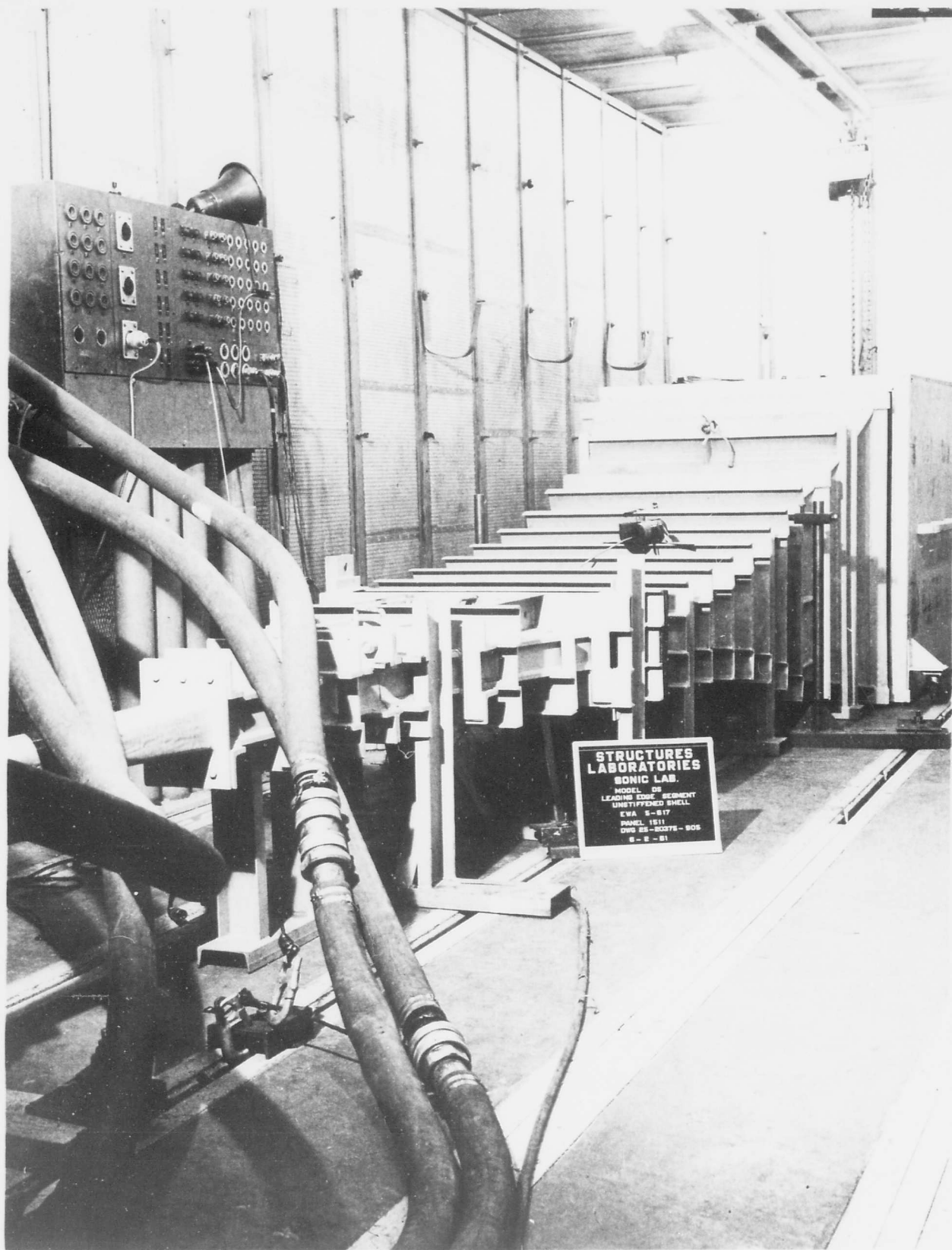
PAGE 3-47





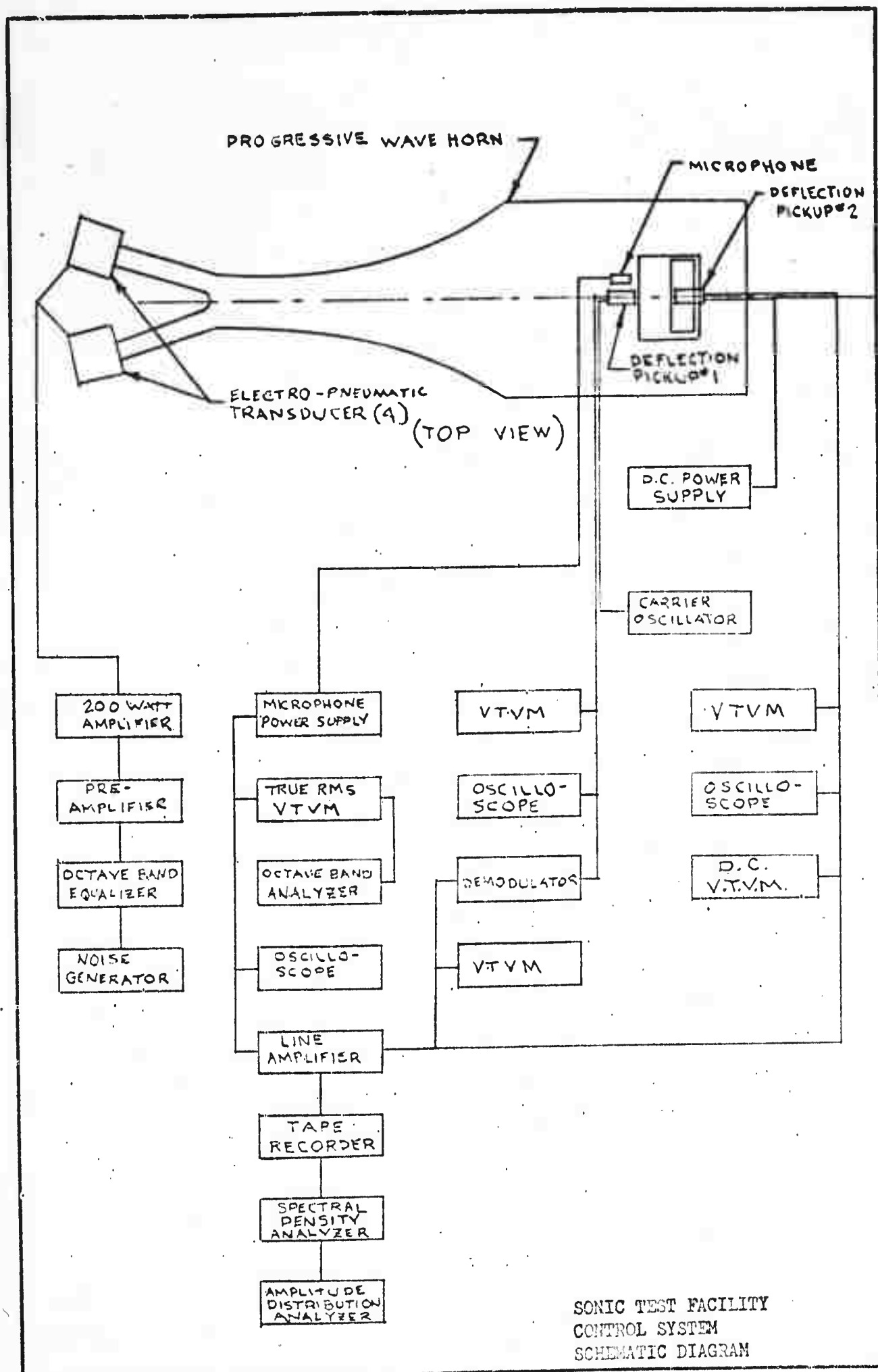
LEADING EDGE POSITIONED IN PROGRESSIVE
WAVE HORN FOR SONIC TEST





PROGRESSIVE WAVE HORN





U3-4371-1 000

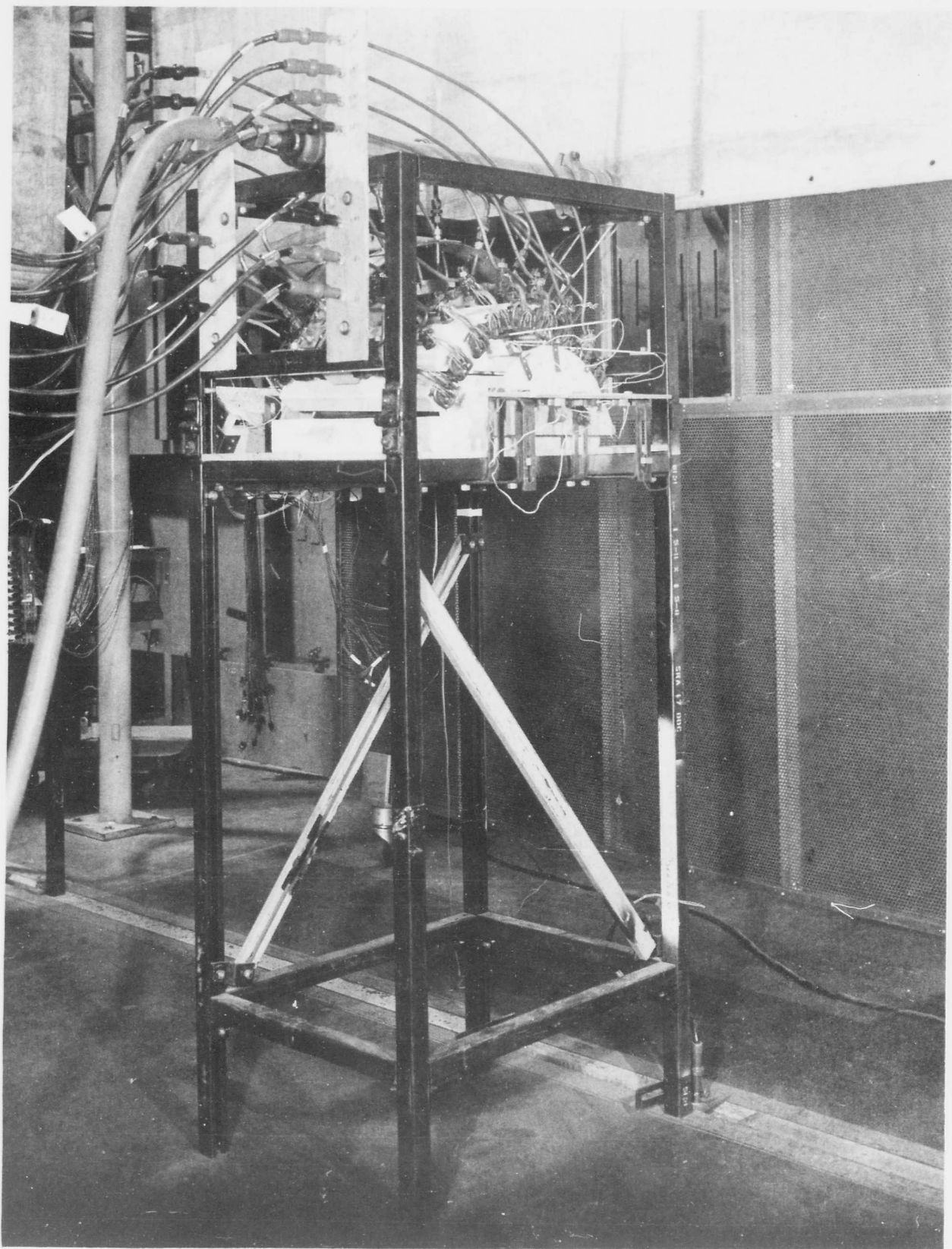
9-3-63

BOEING

NO. D2-80085

Volume I Sect. 3

PAGE Fig. 3-34
3-52



THERMAL GRADIENT TEST FIXTURE

U3-4071 1000 (was BAC 1546-L-R3)

9-3-63

Volume I

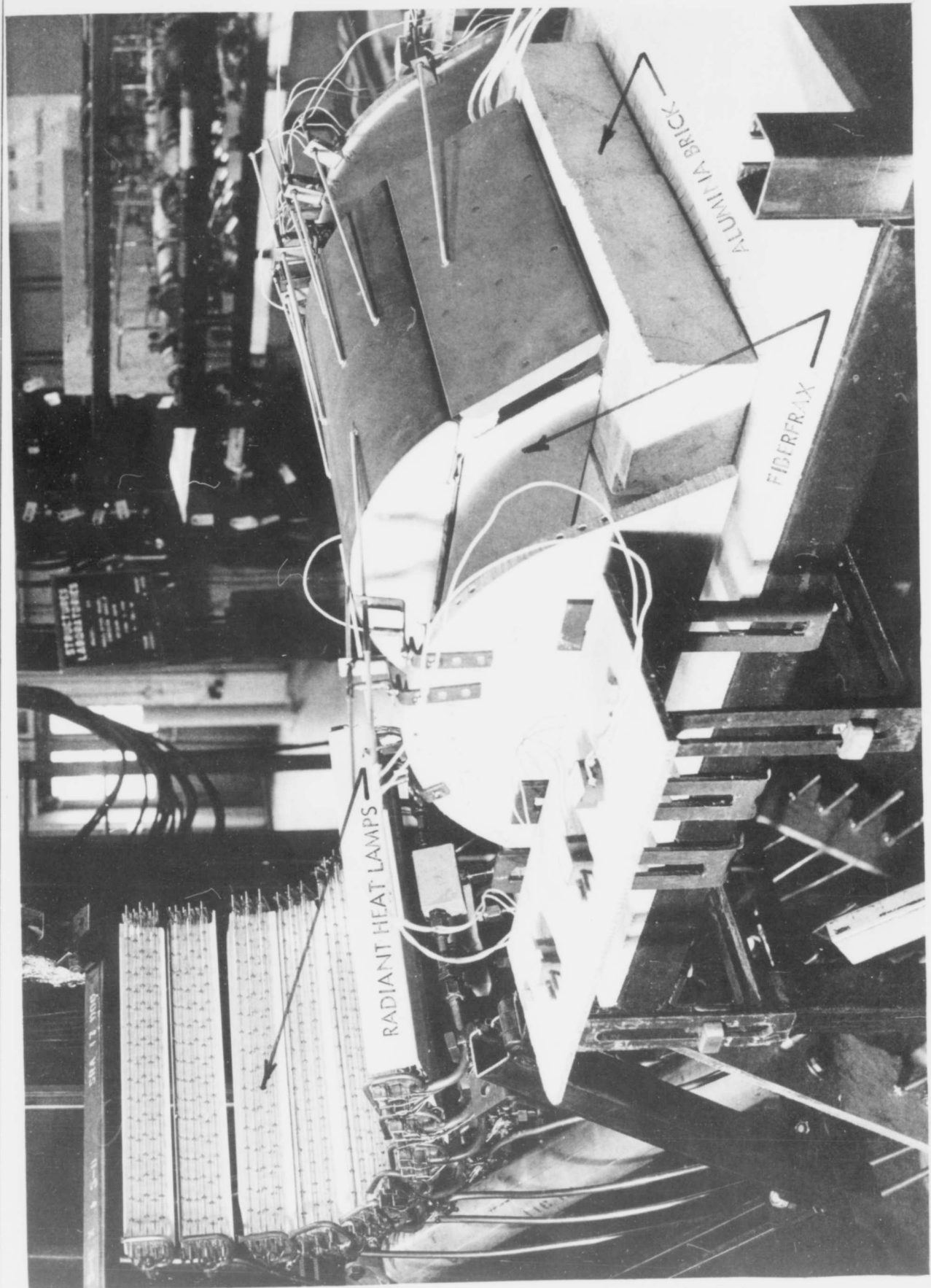
BOEING

Fig. 3-35.

NO D2-00085

PAGE 3-53





THERMAL GRADIENT TEST FIXTURE IN OPEN POSITION

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

Volume I

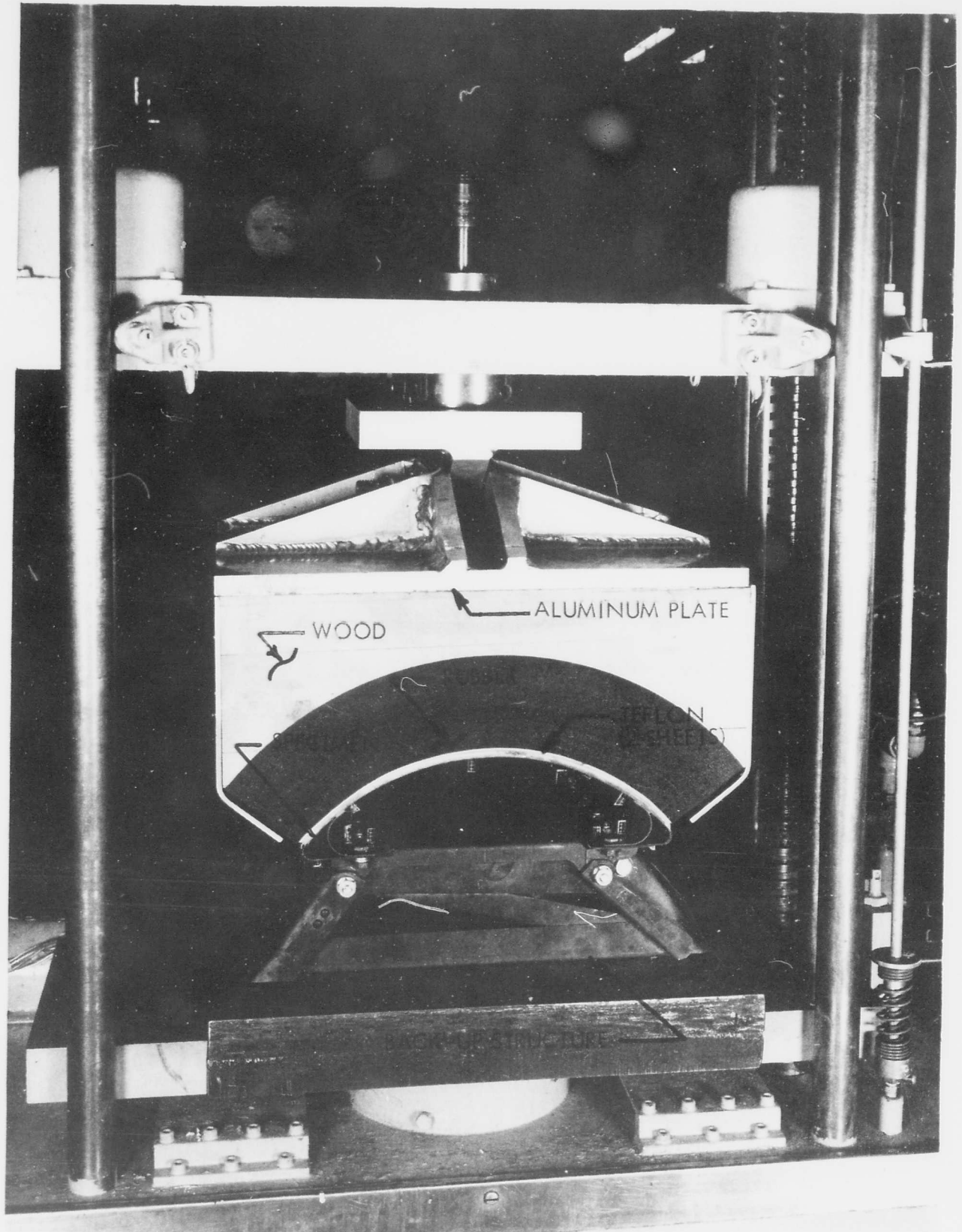
BOEING

Fig. 3-36

NO. D2-00085

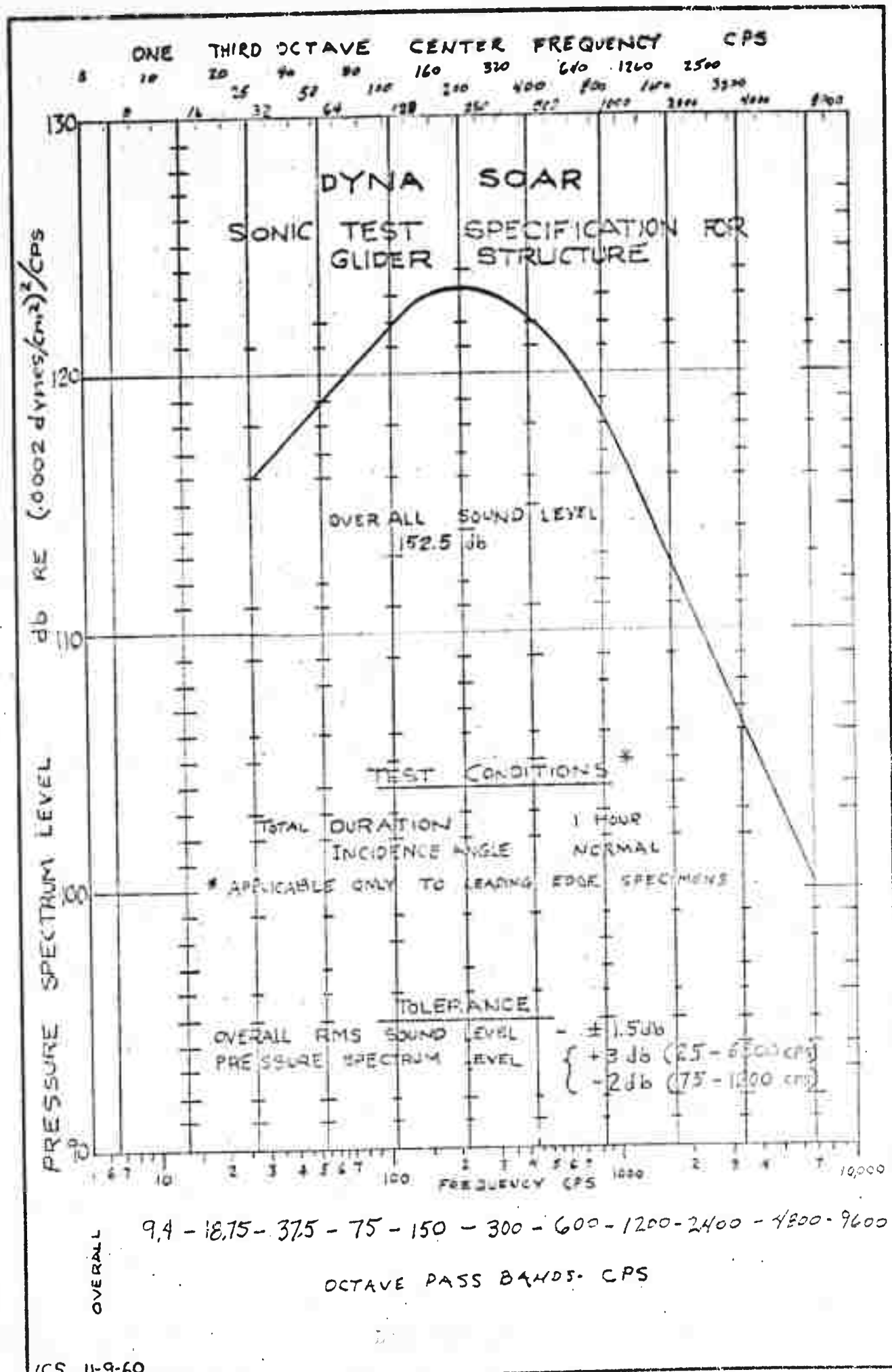
PAGE 3-54





LOAD TEST FIXTURE





U3-4271-1-000

9-3-63

BOEING

NO. D2-80085

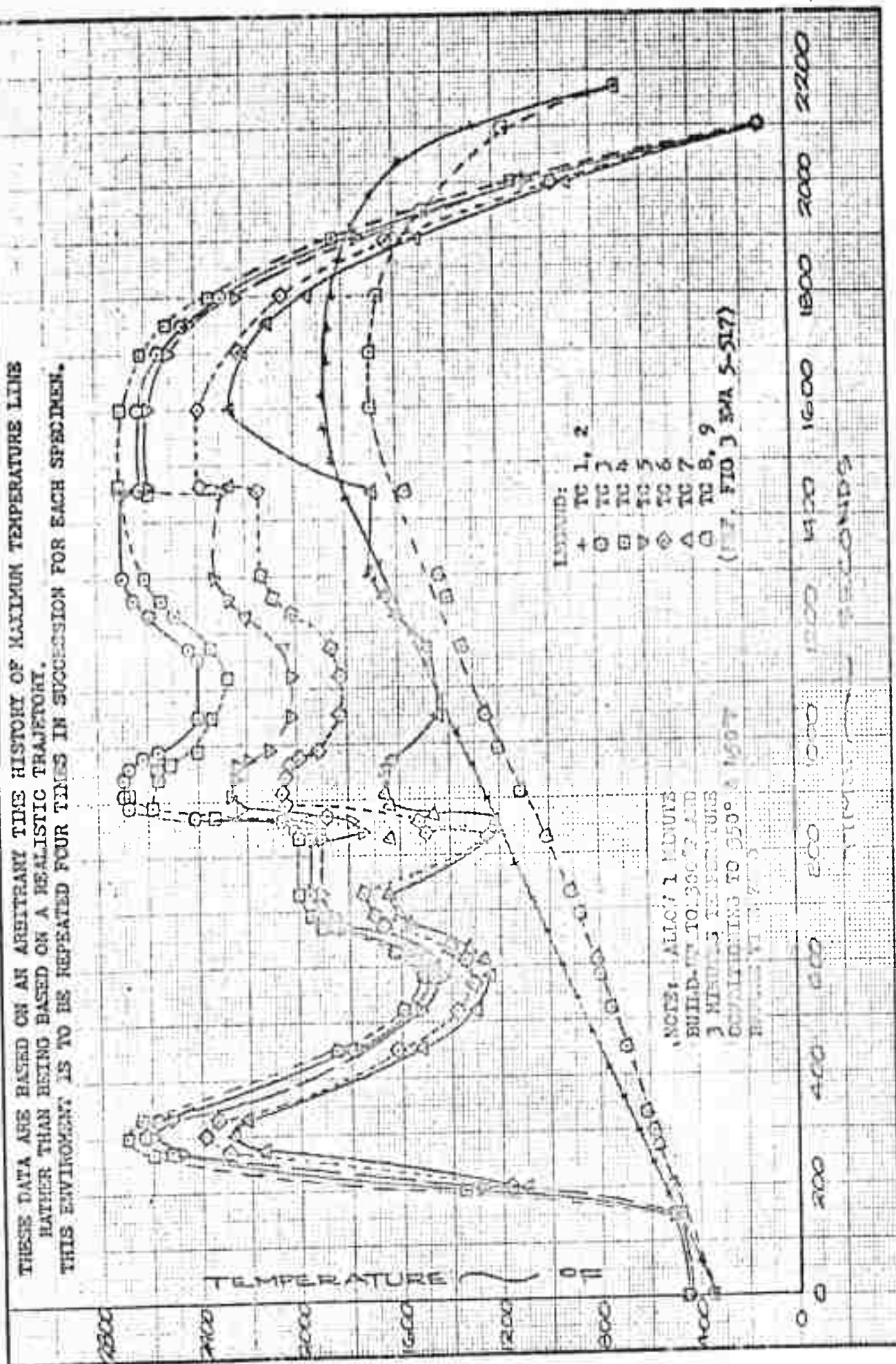
Volume I Sect: 3

PAGE Fig. 3-38

3-56

58

THESE DATA ARE BASED ON AN ARBITRARY TIME HISTORY OF MAXIMUM TEMPERATURE LINE
 RATHER THAN BEING BASED ON A REALISTIC TRAJECTORY.
 THIS ENVIRONMENT IS TO BE REPEATED FOUR TIMES IN SUCCESSION FOR EACH SPECIMEN.



U1-4071-1000

THERMAL GRADIENT TEST PROGRAM
 (MANEUVER CYCLE)

BOEING

NO. D2-80085

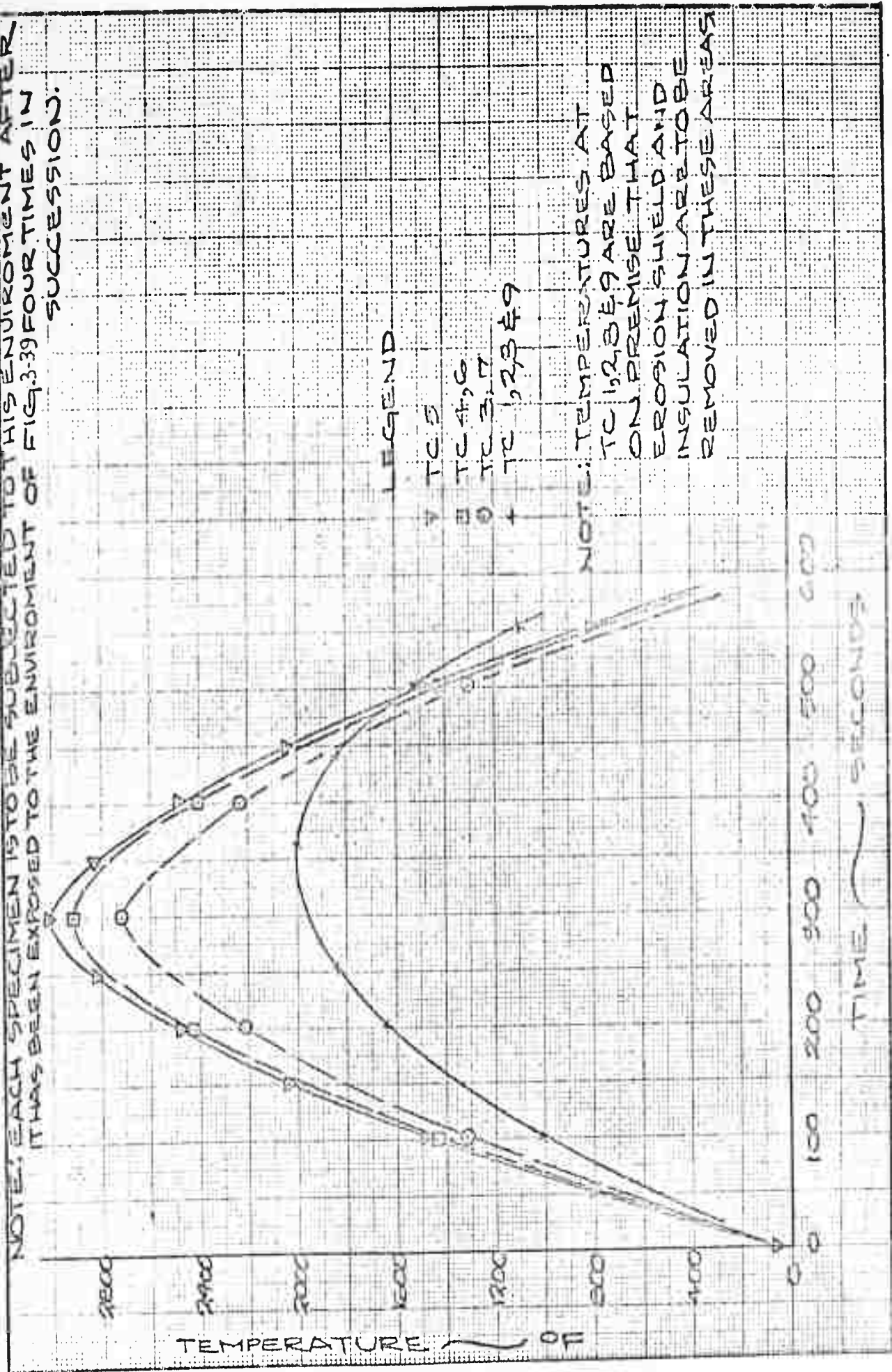
PAGE 1
 3-57 FIG. 3-39

9-3-63

Volume I Sect. 3

59

NOTE: EACH SPECIMEN IS TO BE SUBJECTED TO THIS ENVIRONMENT AFTER IT HAS BEEN EXPOSED TO THE ENVIRONMENT OF FIG. 3-39 FOUR TIMES IN SUCCESSION.



115-571-1008

9-3-63 THERMAL GRADIENT TEST PROGRAM (TRAJECTORY CYCLE)

Volume I

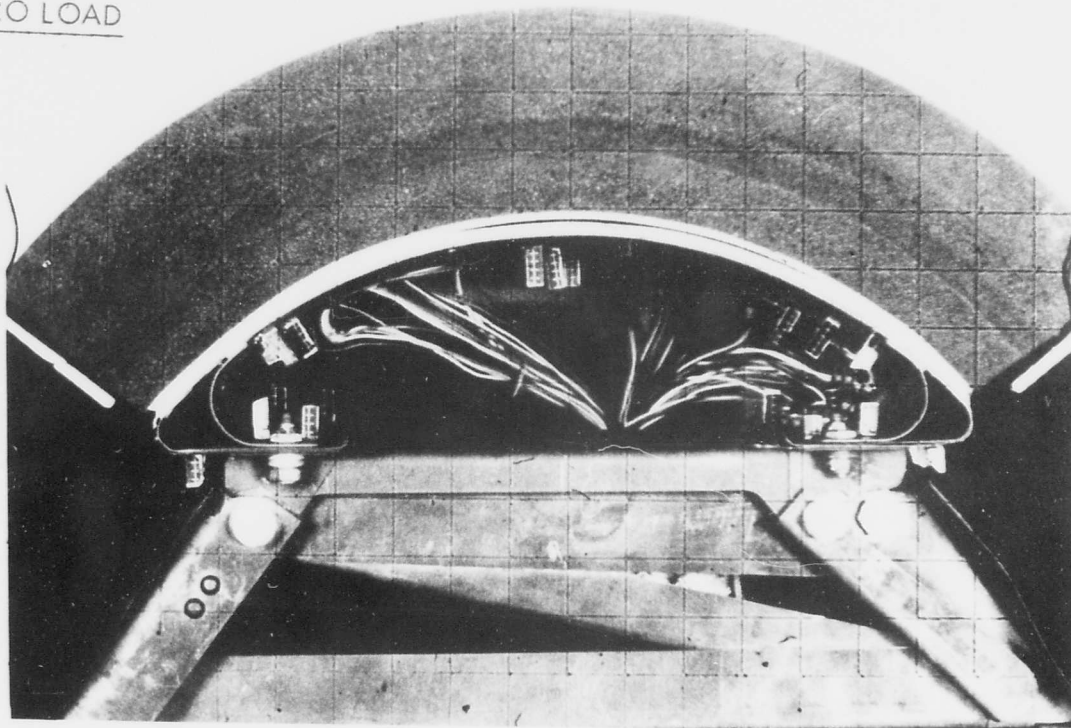
BOEING
Sect. 3

NO. D2-80085

PAGE

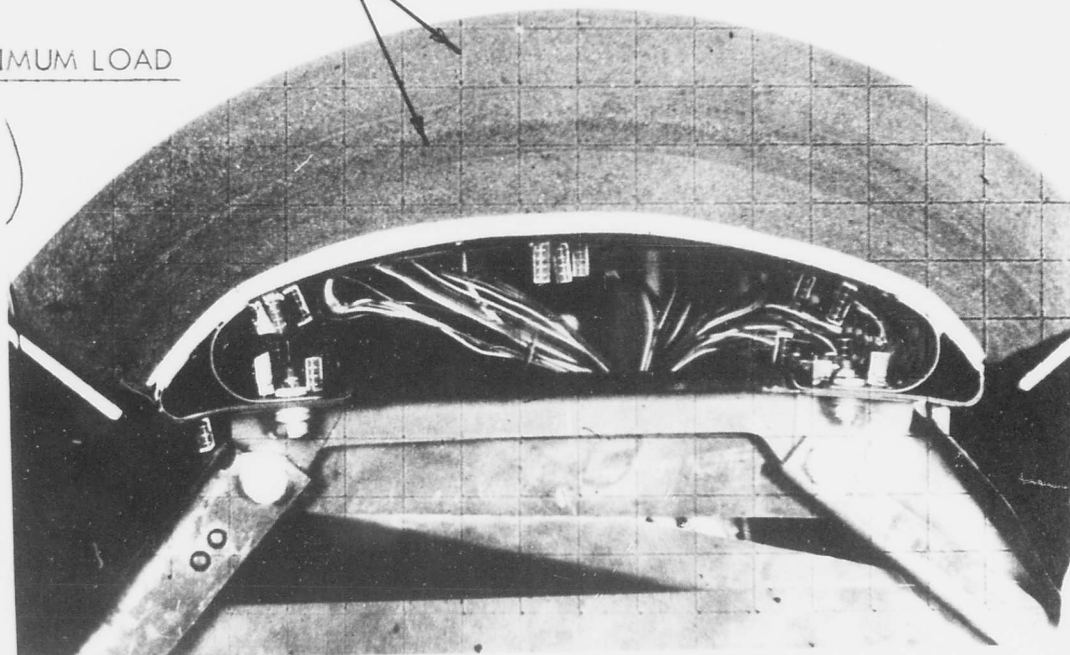
3-58 FIG. 3-49

ZERO LOAD



GRID LINES OVER LENS OF CAMERA FOR
PHOTOGRAPHIC DEFLECTION MEASUREMENT

MAXIMUM LOAD



SPECIMEN 25-20367-1 DISPLAYING TYPICAL LOAD AND
DEFLECTION MEASUREMENT TECHNIQUE

9-2-63



STRUCTURES
LABORATORIES

SONIC LAB.

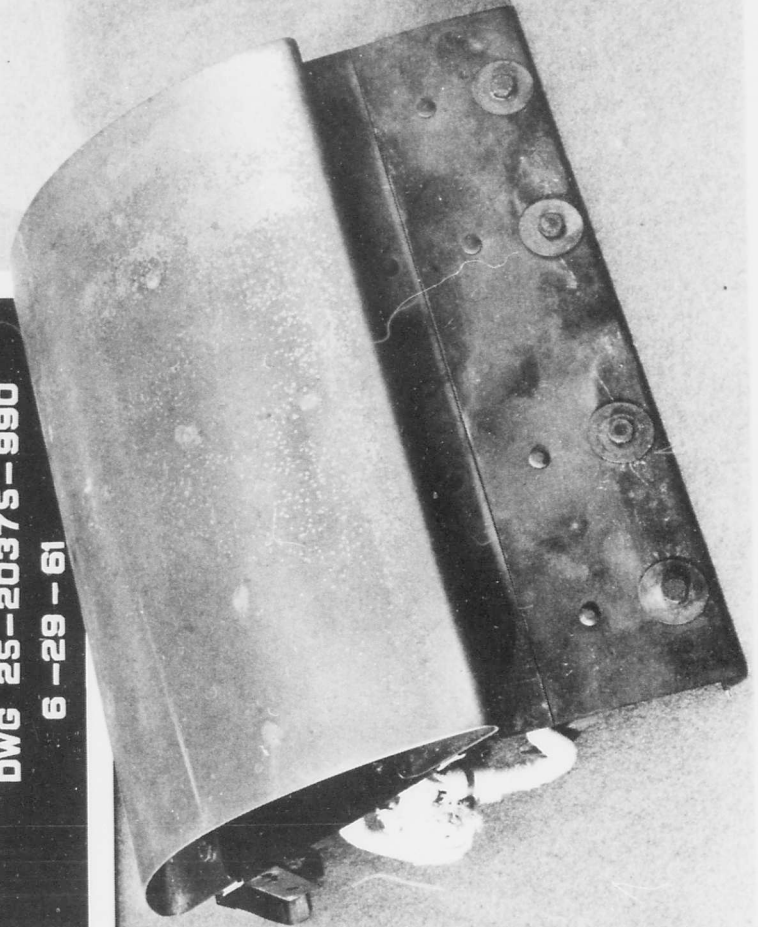
DS LEADING EDGE UNSTIFF
AFTER HEAT ENVIRON

EWA 5-617

SPECIMEN 1511

DWG 25-20375-990

6-29-61

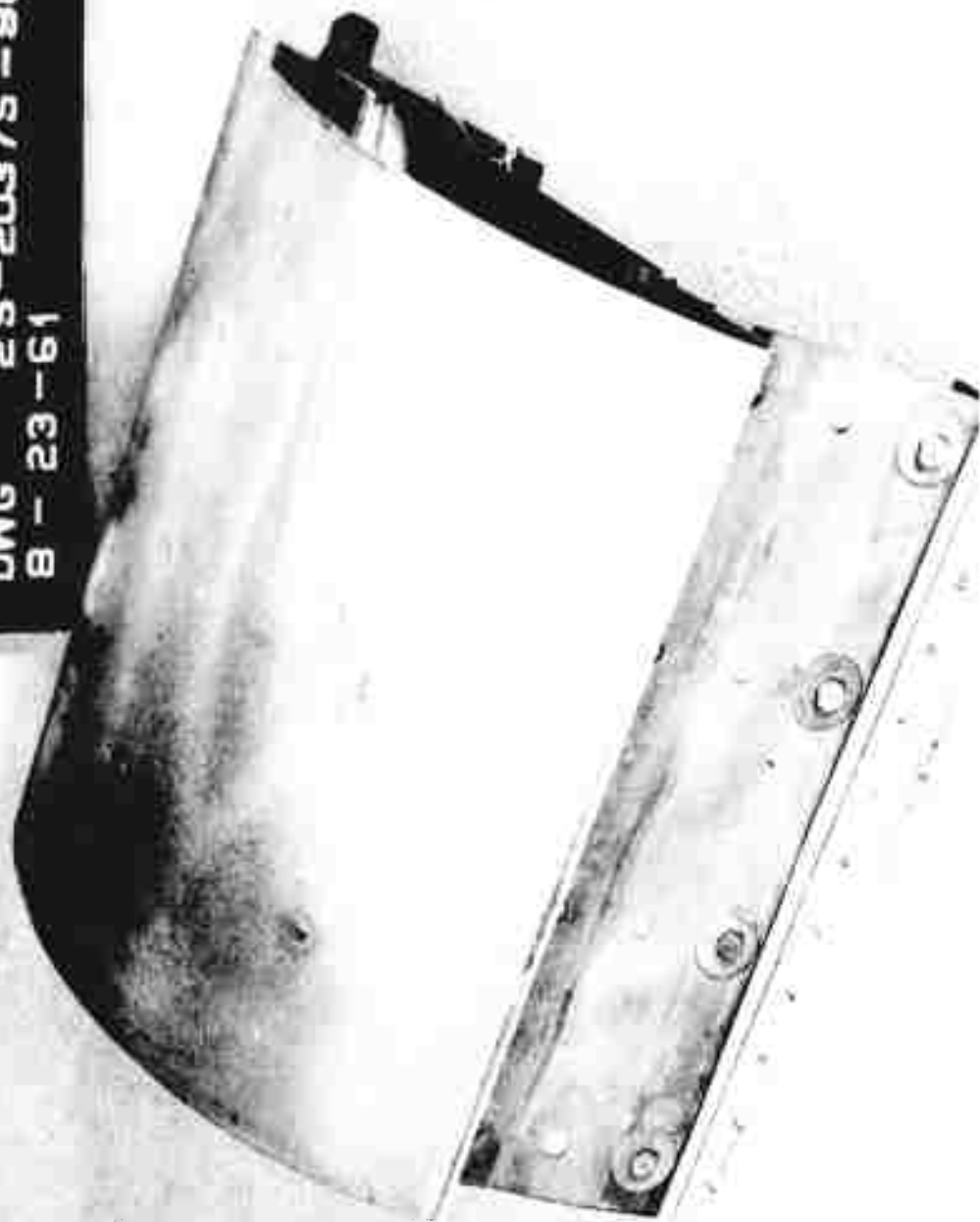


25-20372-1 AFTER SONIC TEST



DS-1- LEADING EDGE - SL 1517 (25-20375-905
LOT 2) TOP VIEW 2487159
8-24-61

STRUCTURE LAB. SONIC LAB.
MODEL - DS LEADING EDGE
SEGMENT, UNSTIFFENED SHELL
TEST COMPLETED
EWA 5-617 1 SPECIMEN 1517
DWG 25-20375-805 LOT 2
8-23-61



25-20372-2 AFTER SONIC TEST

UJ3407110000 (PAGES 000001 000002 000003)

9-3-63

Volume I

REMC

Fig. 3-43

INCD. D2-8003

PAGE 3-31



DS-1 REINFORCED LEADING EDGE - TEST COMPLETED 240627
EWA 5-617 #1528 25-20375-903 LOT 1 FRONT
VIEW 10-13-61

STRUCTURE LAB. SONIC LAB.
MODEL - DS
LEADING EDGE SEGMENT, REINFORCED
TEST COMPLETED
DWG 25-20375-903 LOT 1
EWA 5-617 SPECIMEN 1528
OCT 12 - 61



25-20367-I AFTER SONIC TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

BOEING

NO. D2-80085

Volume I

Fig. 3-44

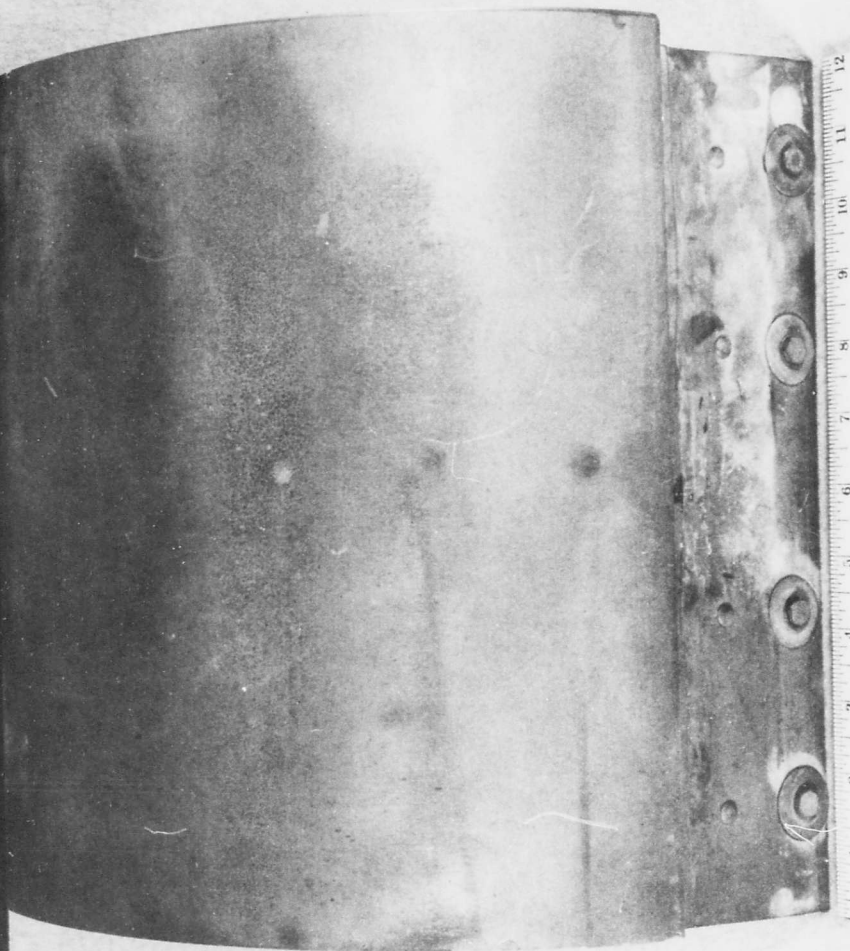
PAGE

5-32



STRUCTURE LAB SONIC LAB
MODEL DS LEADING EDGE
SEGMENT - DOUBLE SKIN
TEST COMPLETED

DWG 25 - 20375 - 903 LOT 2
EWA 5 - 617 SPECIMEN 1531
OCT 12 - 61

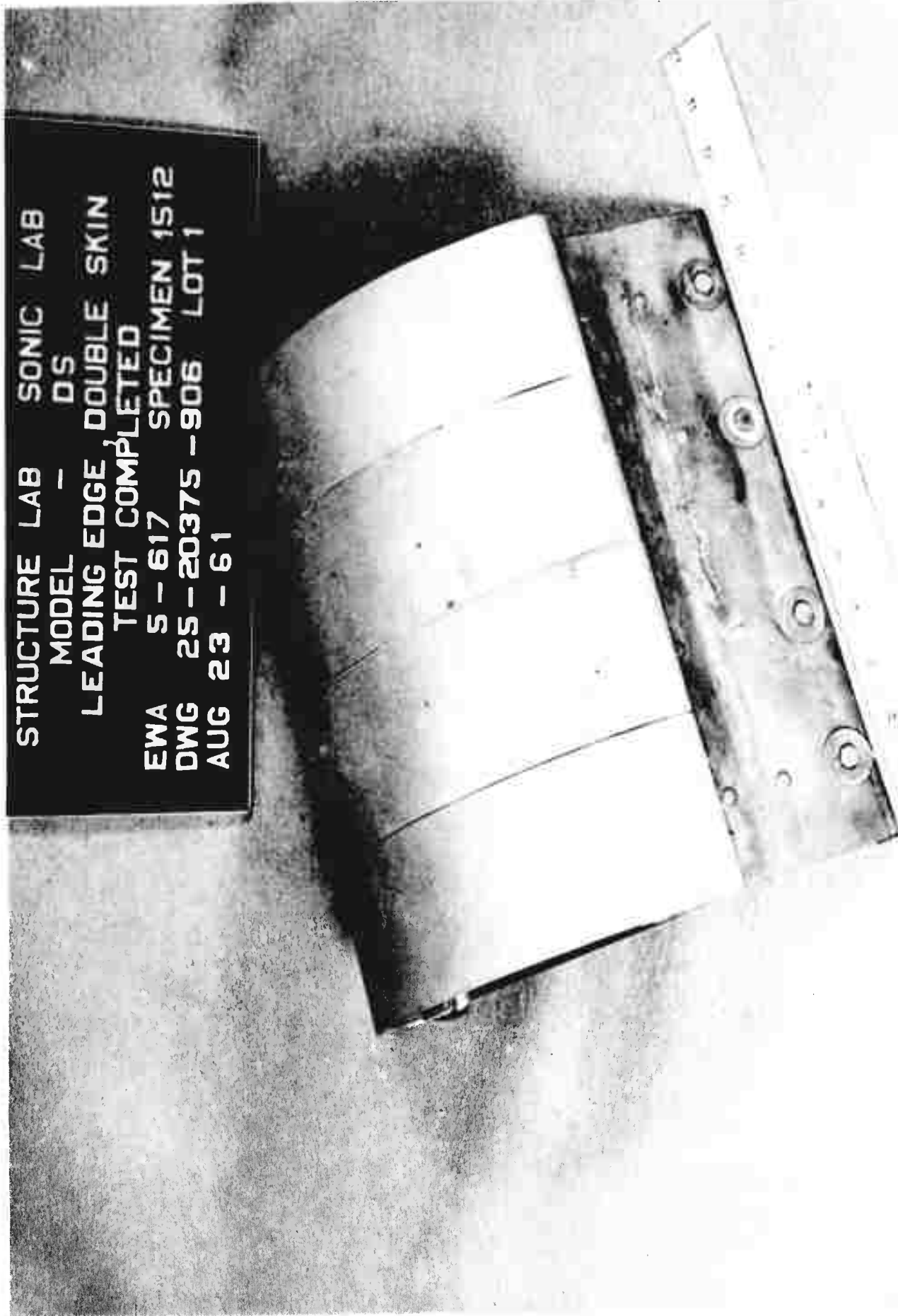


25-20375-2 AFTER SONIC TEST



DS-I-LEADING EDGE - SL 1512 (25-20375-906
LOT 1) TOP VIEW 2487157
8-24-61

STRUCTURE LAB SONIC LAB
MODEL - DS
LEADING EDGE, DOUBLE SKIN
TEST COMPLETED
EWA S - 617 SPECIMEN 1512
DWG 25-20375-906 LOT 1
AUG 23 - 61



25-20378-1 AFTER SONIC TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

BOEING

Fig. 3-46

NO. D2-90085

PAGE 3-4

Volume I



DS-1 LEADING EDGE DOUBLE SKIN AFTER SONIC
ENVIRON CLOSE UP SPEC. #1518 7-21-61 2483562



25-20375-2 AFTER SONIC TEST

U3-4071-1000 (was BAC 1546-L-R3)

9.3.63

BOEING

NO. D2-80085

Volume I

Fig. 3-47

PAGE 3-55



STRUCTURE LAB SONIC LAB
 MODEL - DS
 LEADING EDGE, UNSTIFF SHELL
 TEST COMPLETED
 EWA 5-617 SPECIMEN 1522
 DWG 25-20375-1 LOT 1
 SEPT 7 - 61



25-20341-I AFTER SONIC TEST



DS-1 LEADING EDGE SEGMENT BMA 5-617 - 1532 TEST 2492277
COMPLETED - FRONT VIEW
10-30-61

STRUCTURE LAB SONIC LAB
MODEL DS LEADING EDGE
SEGMENT - UNSTIFFENED
TEST COMPLETED
DWG 25 - 20375 - 901 LOT 2
EWA 5 - 617 SPECIMEN 1532
OCT 30 - 61

25-20341-2 AFTER SONIC TEST

U3-4071-1000 (was BAC 1546-L-R3)

7263

BOEING

NO. D2-8000

PAGE 3-67

Fig. 3-49

Vol. 1, 2, 3



DS-I LEADING EDGE, RENE TEST COMPLETED (BWA
5-617) #1523 BACE VIEW 25-20375-902 LOT 1
9-28-61 2A89134

STRUCTURE LAB. SONIC LAB.
MODEL - DS
LEADING EDGE SEGMENT, REINFORCED
TEST COMPLETED
DWG 25-20375-902 LOT 1
EWA 5-617 SPECIMEN 1523
SEPT -28-61

25-20376-1 AFTER SONIC TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

Volume I

BOEING

NO. D2-80006

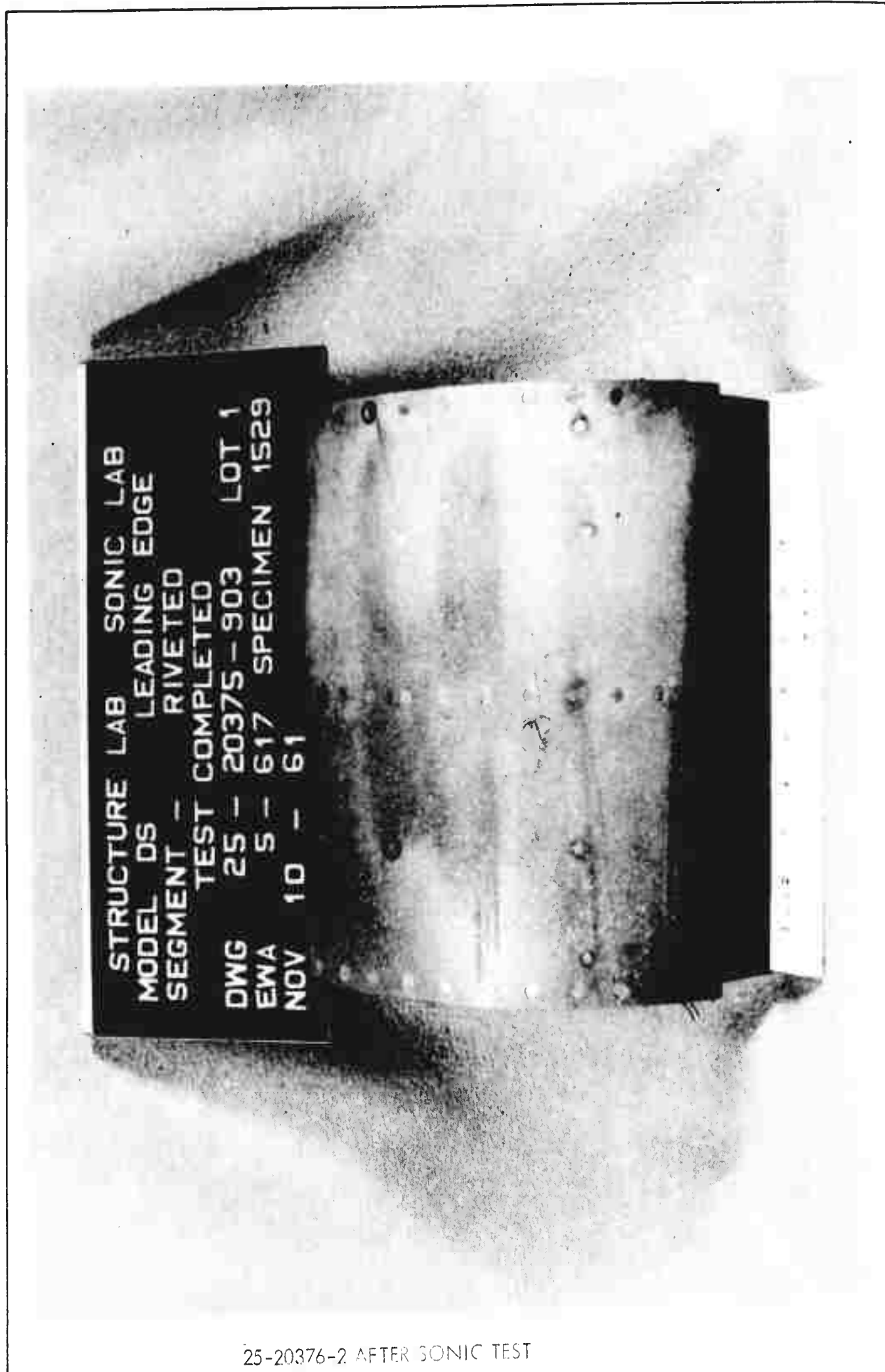
Fig. 3-50

PAGE

2-50



36-1 - LEADING EDGE (RIVETED) BMA 1529 PHOTO 2492674
11-11-61
VTM



STRUCTURE LAB SONIC LAB
MODEL DS LEADING EDGE
SEGMENT - RIVETED
TEST COMPLETED LOT 1
DWG 25 - 20375 - 903
EWA 5 - 617 SPECIMEN 1529
NOV 10 - 61

25-20376-2 AFTER SONIC TEST

U3-4071-1000 (was BAC 1546-L-R3)

9383

Volume I

BOEING

Fig. 3-51

NO. D2-8008

PAGE

439



DELETED

U3-4071-1000

9-3-63

BOEING

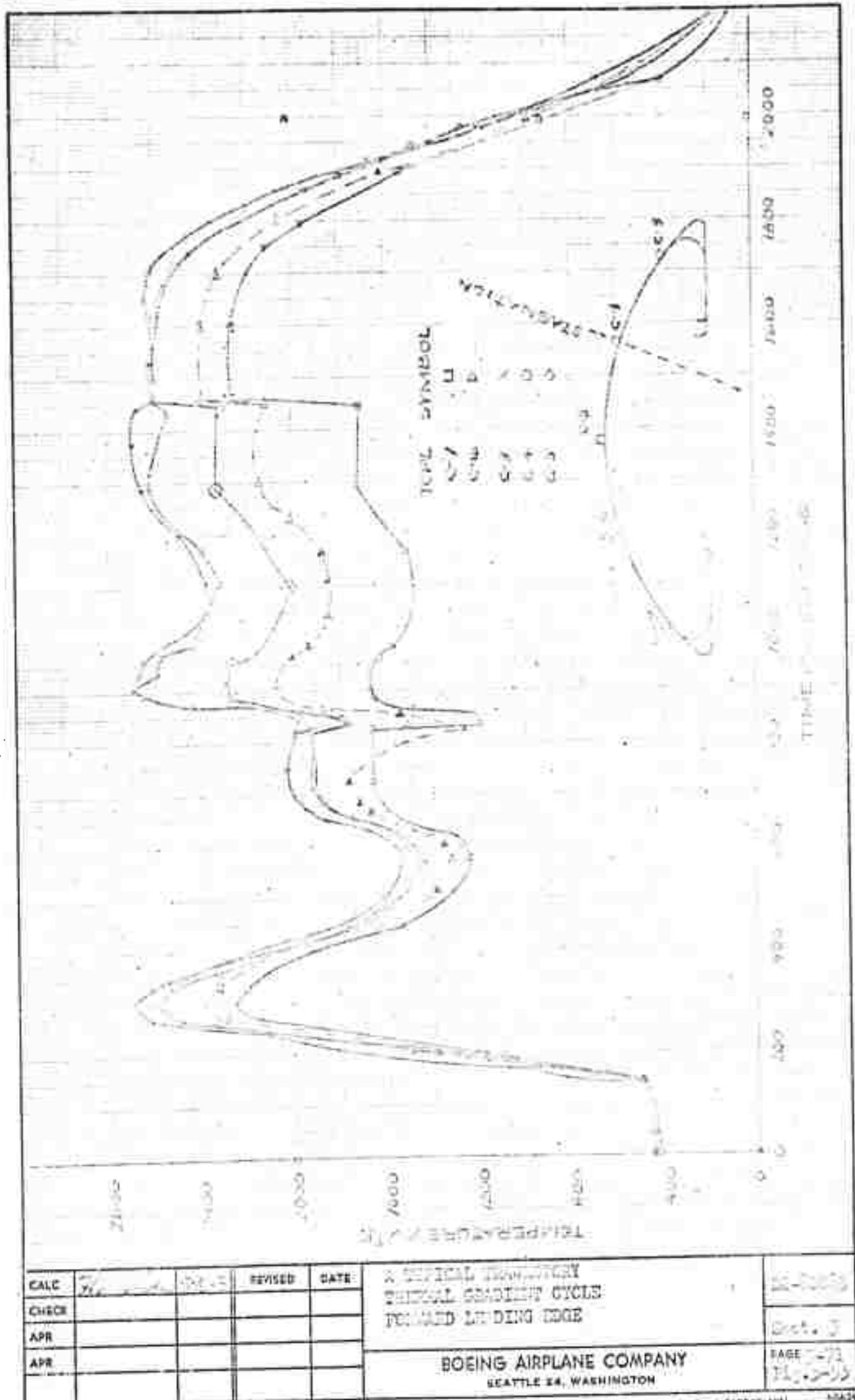
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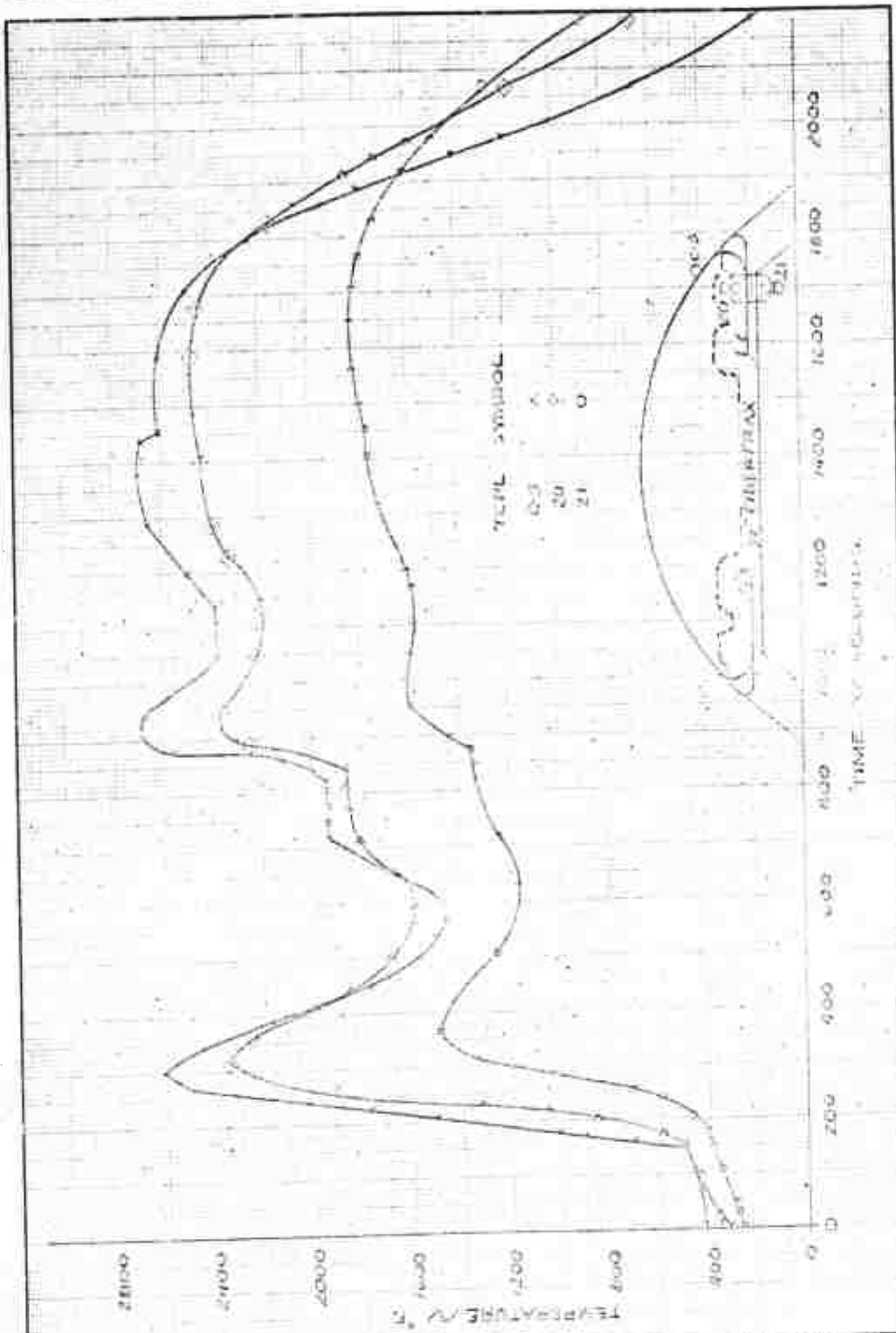
Volume I

PAGE 3-70

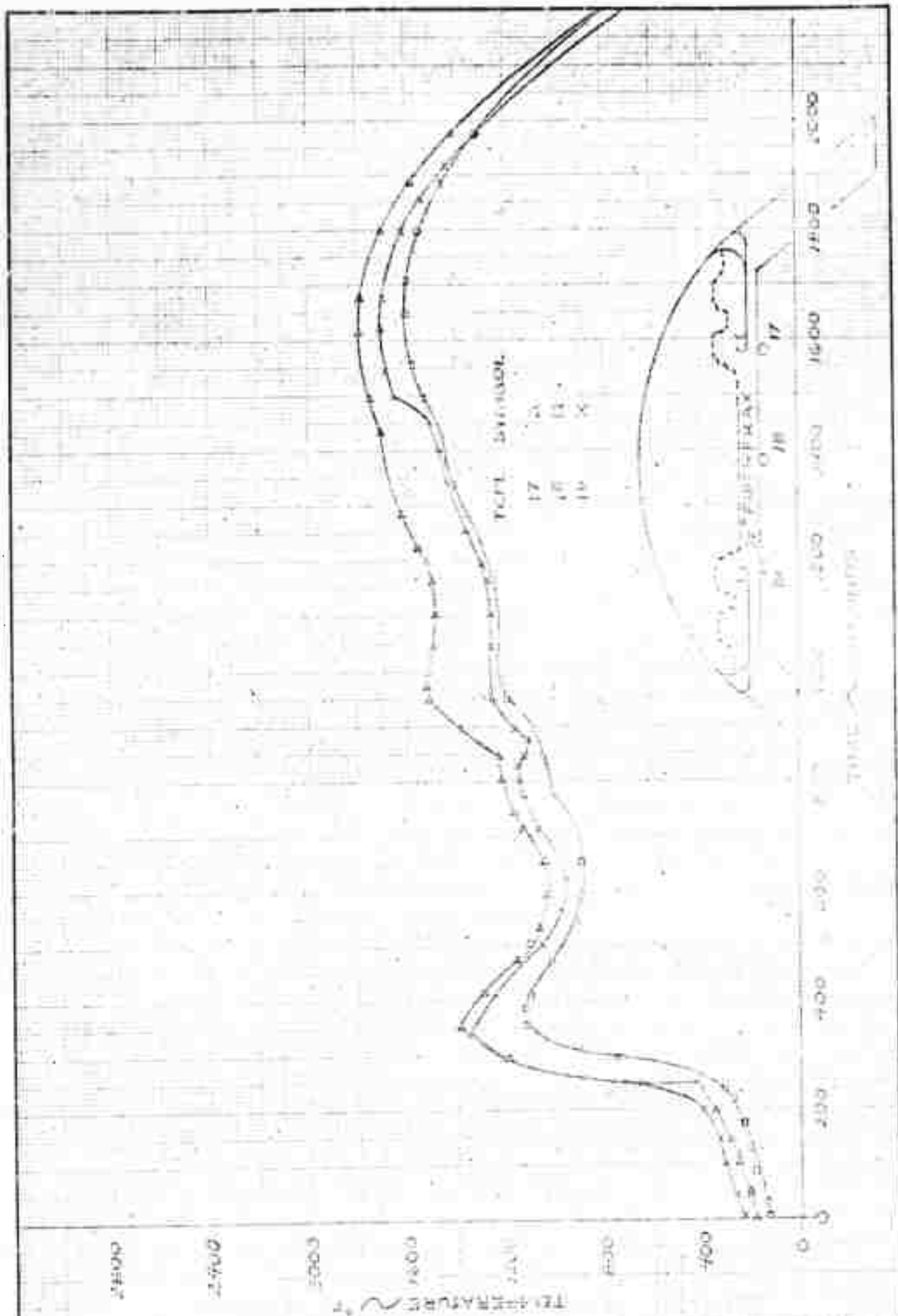


72





CALC	72	1000	2000	REVISED	DATE	A TYPICAL TRAJECTORY THERMAL GRADIENT CYCLE FORWARD LEADING EDGE BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	DL-2000
CHECK							DL-2000
APR							PAGE 1-2
APR							DL-2000



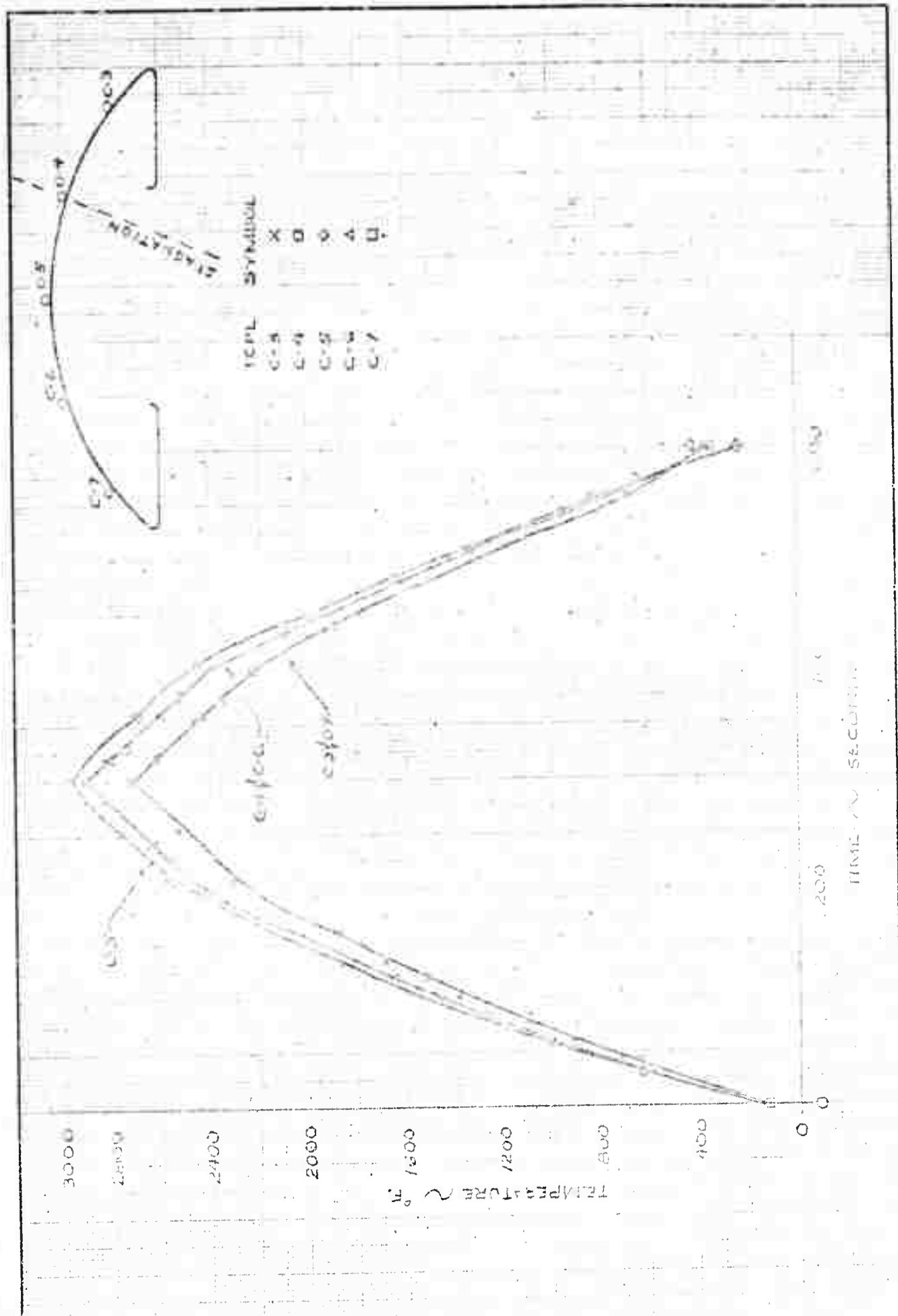
CALC	10-10-63	REVISED	DATE	A TYPICAL TEMPERATURE SURFACE CHARTING CYCLE FORWARD LANDING EDGE BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	10-10-63
CHECK					Sect. 3
APP					PAGE 2-10
APP					10-10-63

SAC 461 C-11 9-3-63

Volume I

KE 100279

75-



CALC	7/1/63	9-10-63	REVISED	DATE	A TYPICAL MANEUVER THERMAL GRADIENT CYCLE FORWARD LEADING EDGE	D2-00085
CHECK						
APR						Sect. 3
APR						PAGE 3-74 FIG. 3-56
BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON						

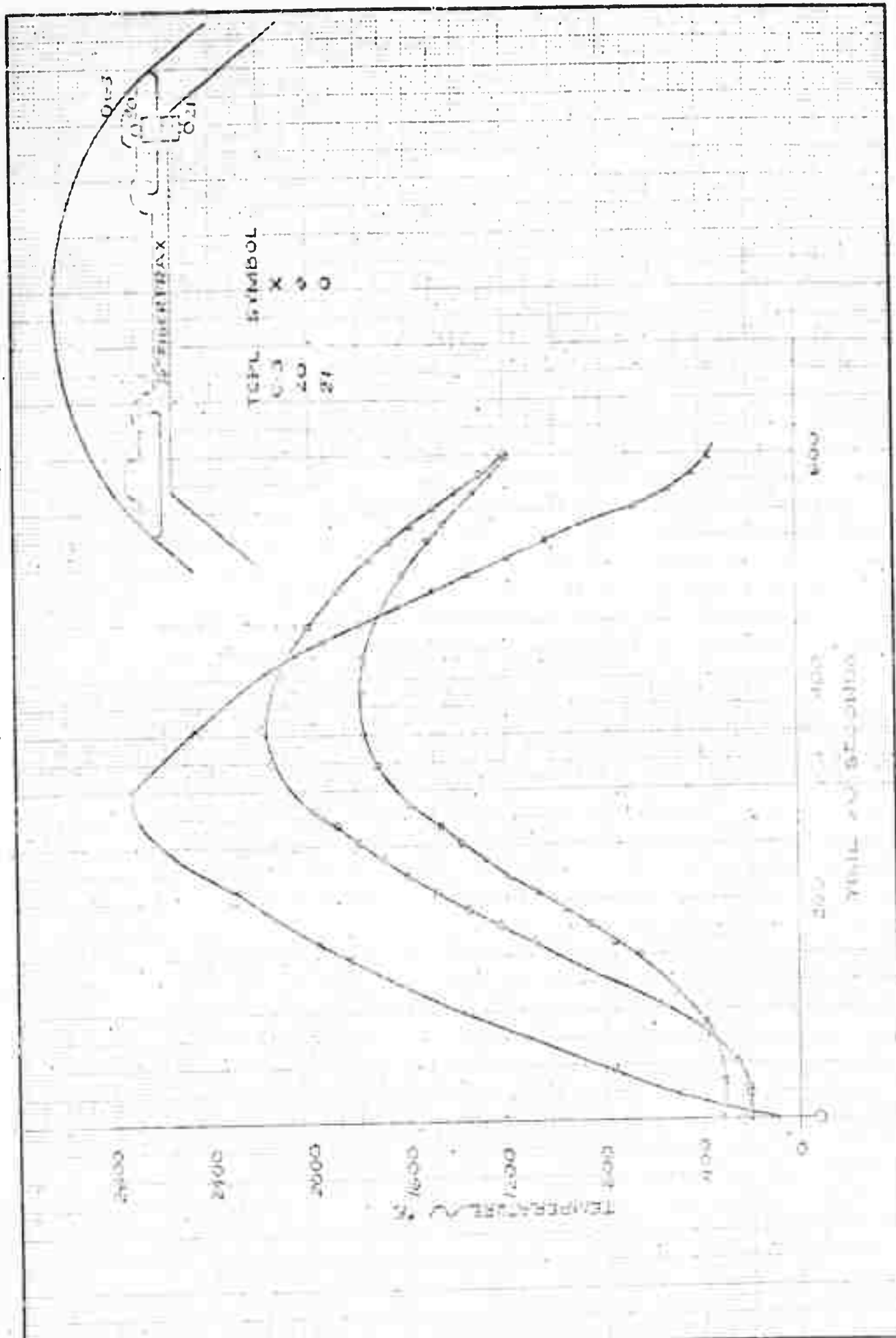
BAC 461 C-R4

9-3-63

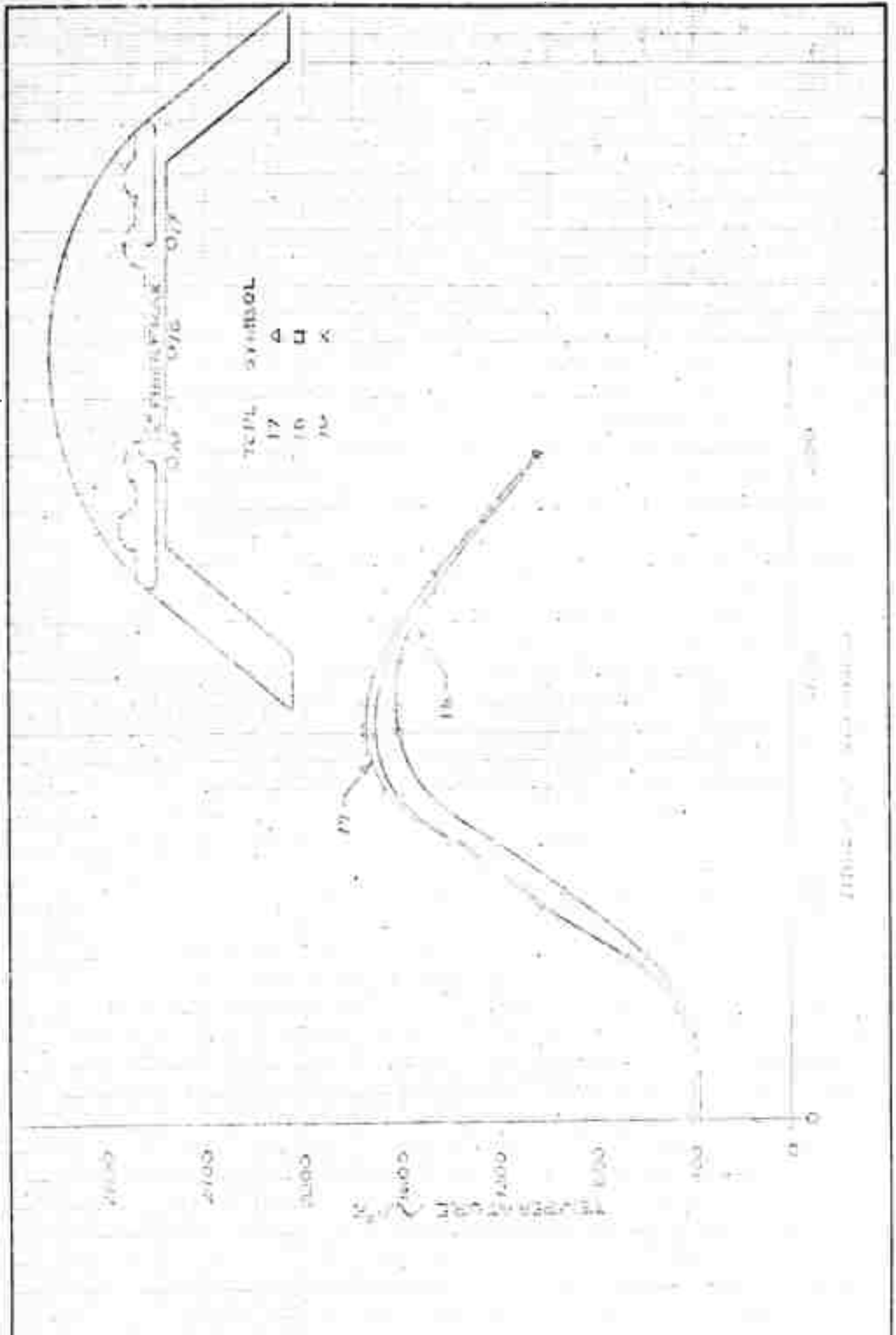
Volume I

K-E ALBANY 1961
® TRACING PAPER

60629



CALC	W. J. Lee	3-12-63	REVISED	DATE	A TYPICAL ENGINE THERMAL GRADIENT CYCLE FORWARD LEADING EDGE	32-3-63
CHECK						2-28-63
APP						PAGE 3-72
APP						313-2-57
					BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	



CALC	APR 24 1963	REVISED	DATE	BOEING AIRPLANE COMPANY SEATTLE 24, WASHINGTON	PAGE 1
CHECK					
APR					
APR					

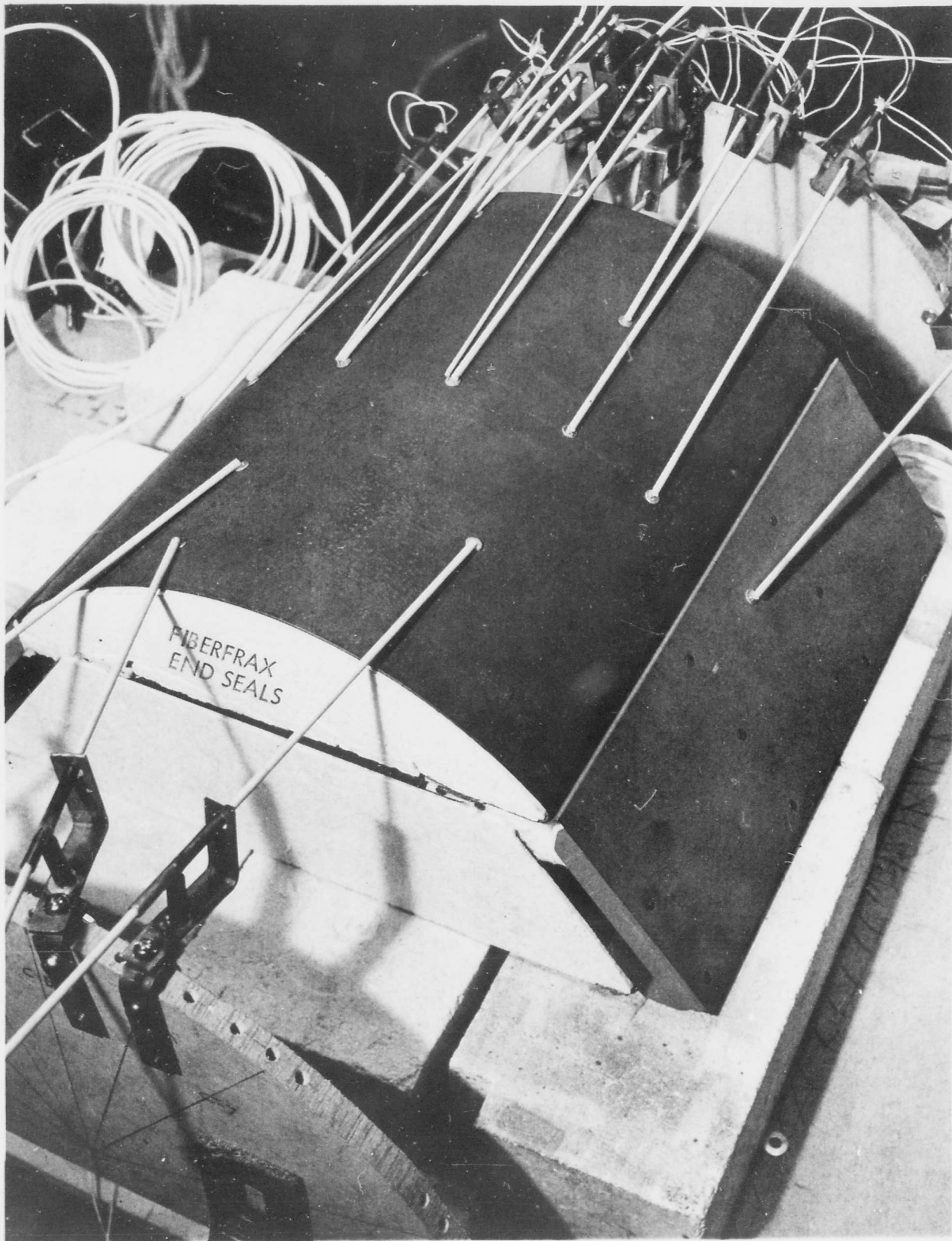
28

BAC 461 C-R4 9.3-63

Volume I

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60629



25-20372-1 BEFORE HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

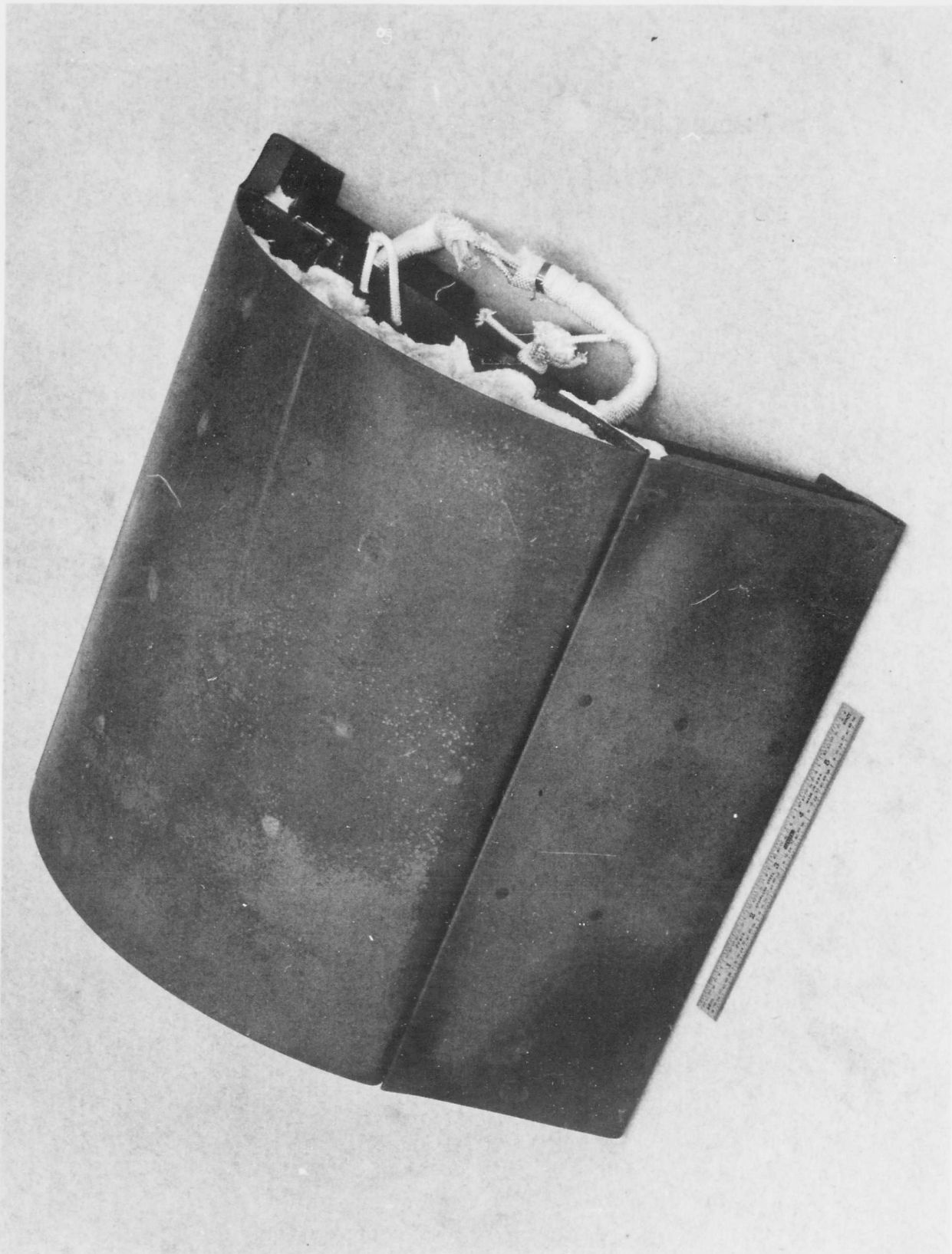
BOEING

NO. D2-L0085

Volume I Fig. 3-59

PAGE 3-77





25-20372-I AFTER HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

Volume I

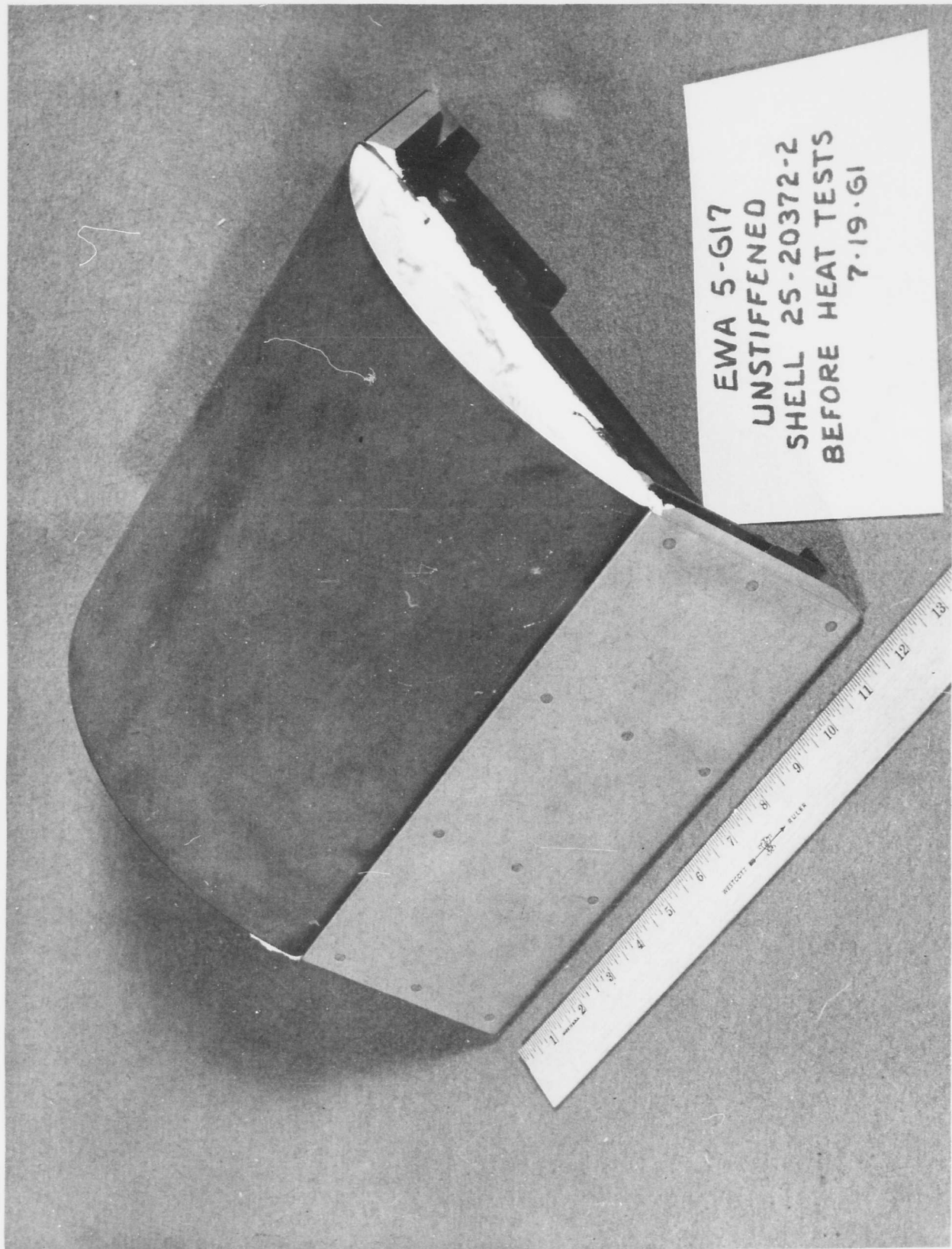
BOEING

Fig. 3-60

NO. D2-80085

PAGE 3-70





25-20372-2 BEFORE HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

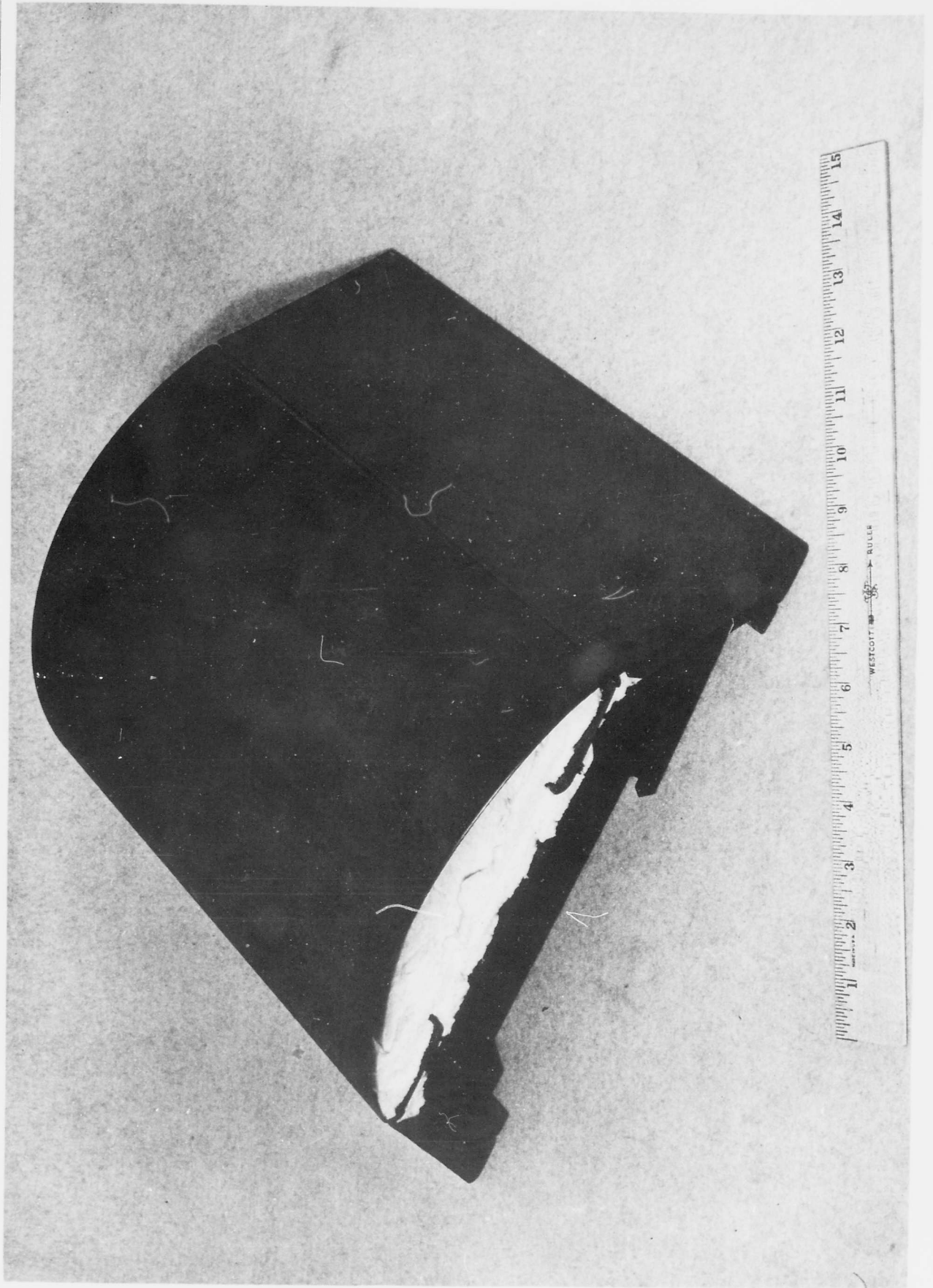
BOEING

Fig. 3-61

NO. D2-80085

PAGE 3-79





25-20372-2 AFTER HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

Volume I Fig. 3-62

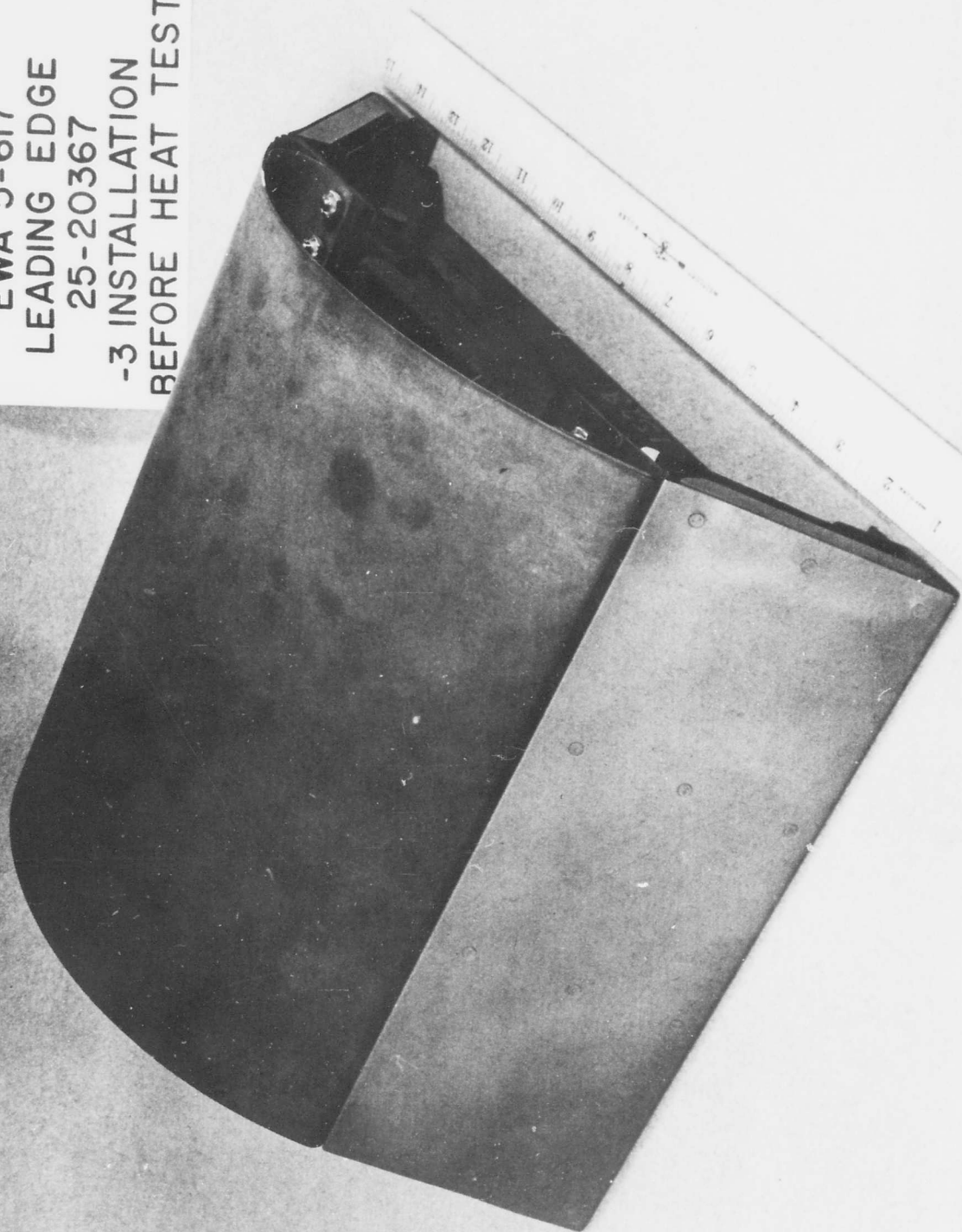
BOEING

NO. D2-00035

PAGE 3-10

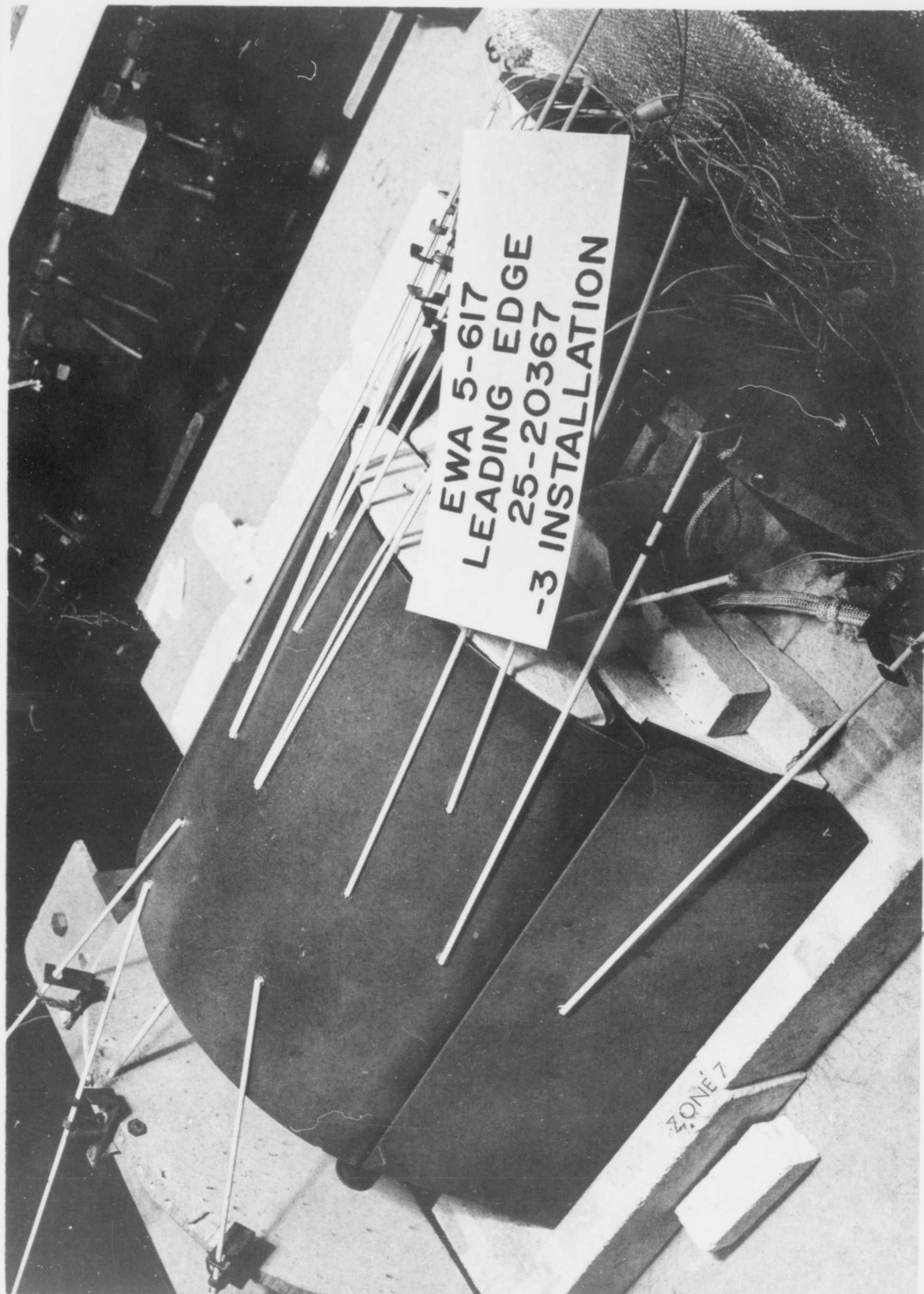


EWA 5-617
LEADING EDGE
25-20367
-3 INSTALLATION
BEFORE HEAT TEST



25-20367-1 BEFORE HEAT TEST





25-20367-1 AFTER HEAT TEST

BAC 1546 L-R3

9-3-63

BOEING

NO. D2-80085

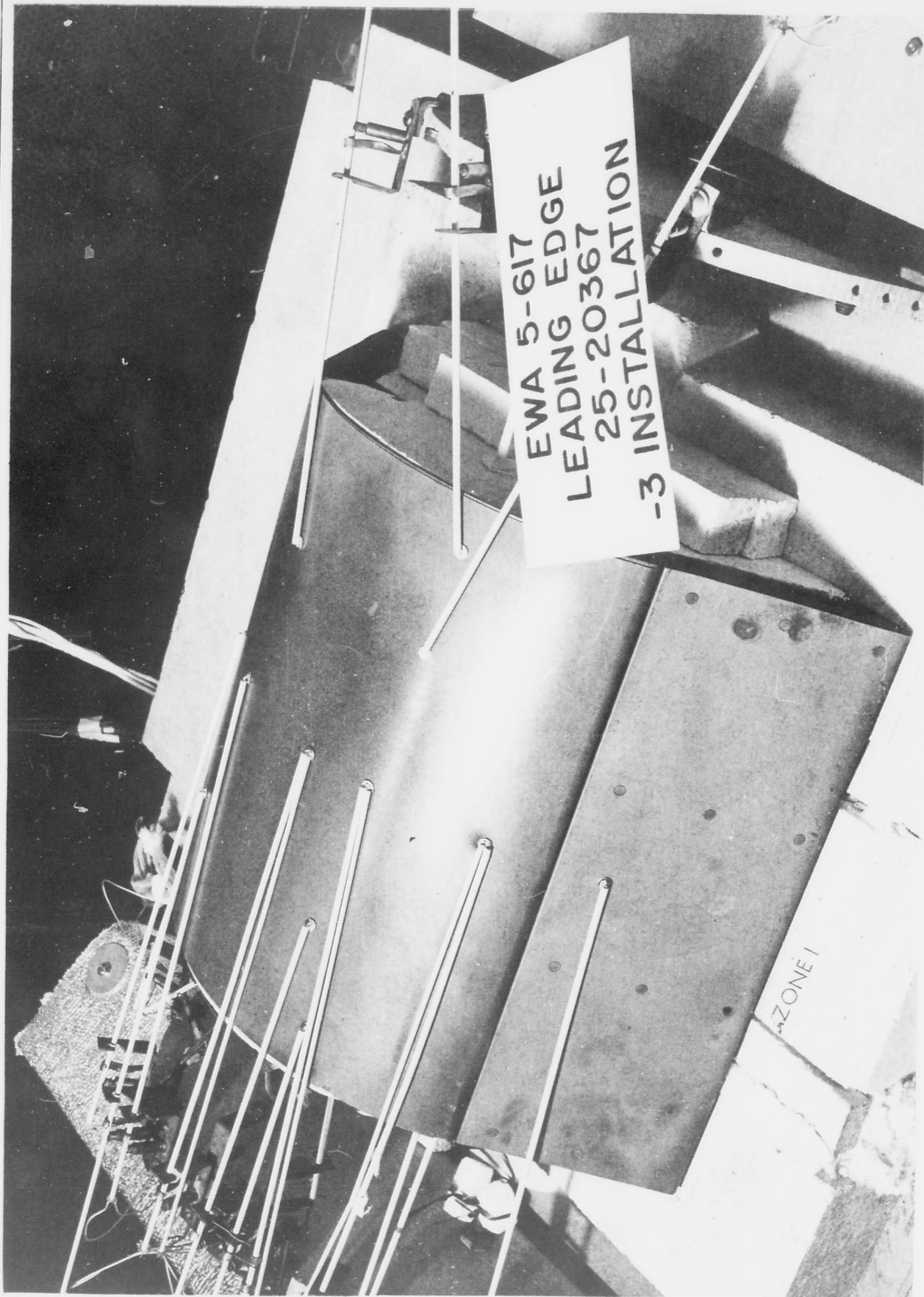
Fig. 3-64

PAGE

3-32



US-1 LEADING EDGE EWA 5617 25-20367-2
-3 INSTALLATION AFTER HEAT TEST 9-29-61
2489232



25-20367-1 AFTER HEAT TEST

BAC 1546 L-R3

9-3-63

BOEING

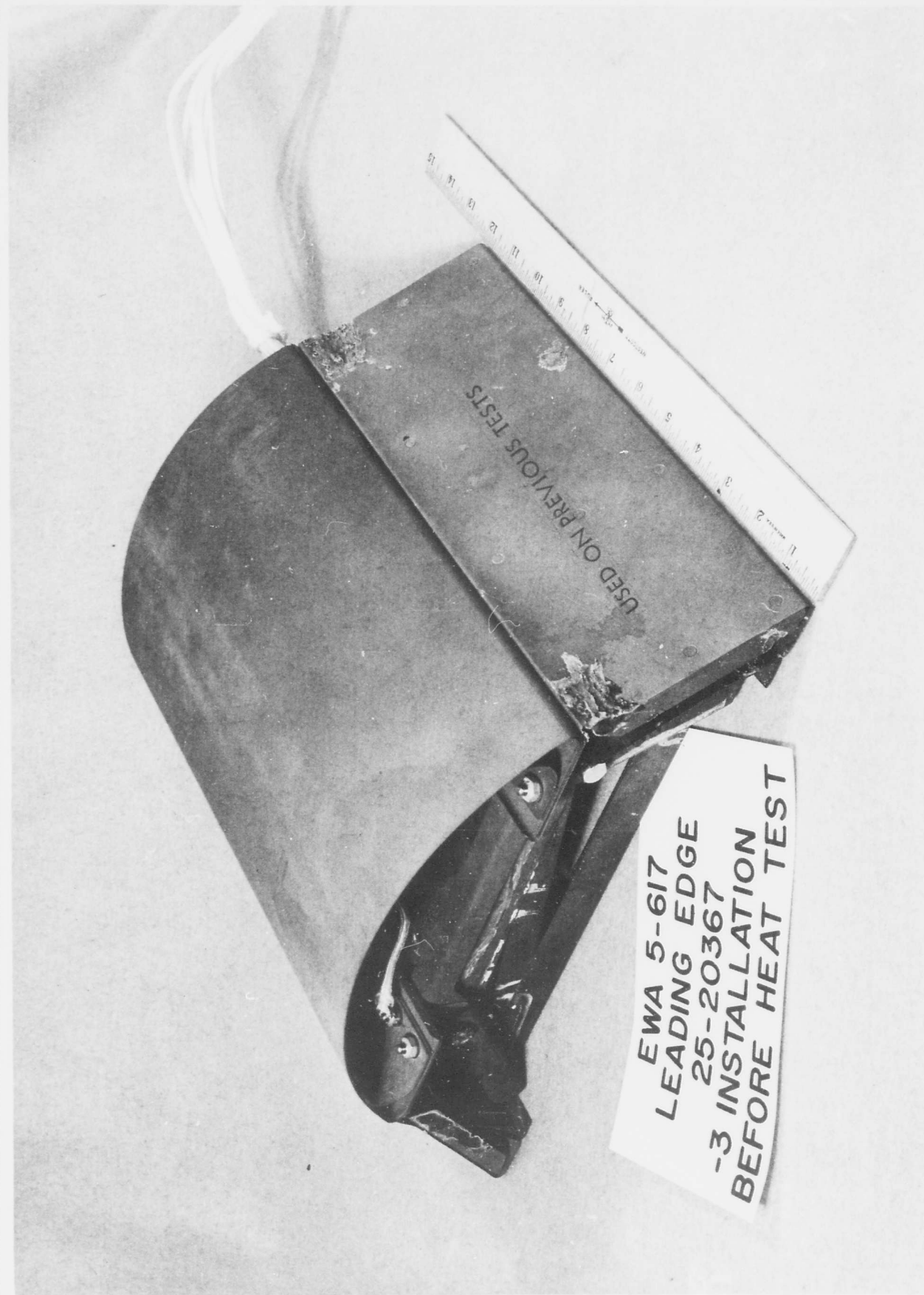
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View I Fig. 3-65

PAGE

3-83





25-20367-2 BEFORE HEAT TEST

BAC 1546 L-R3

93-63

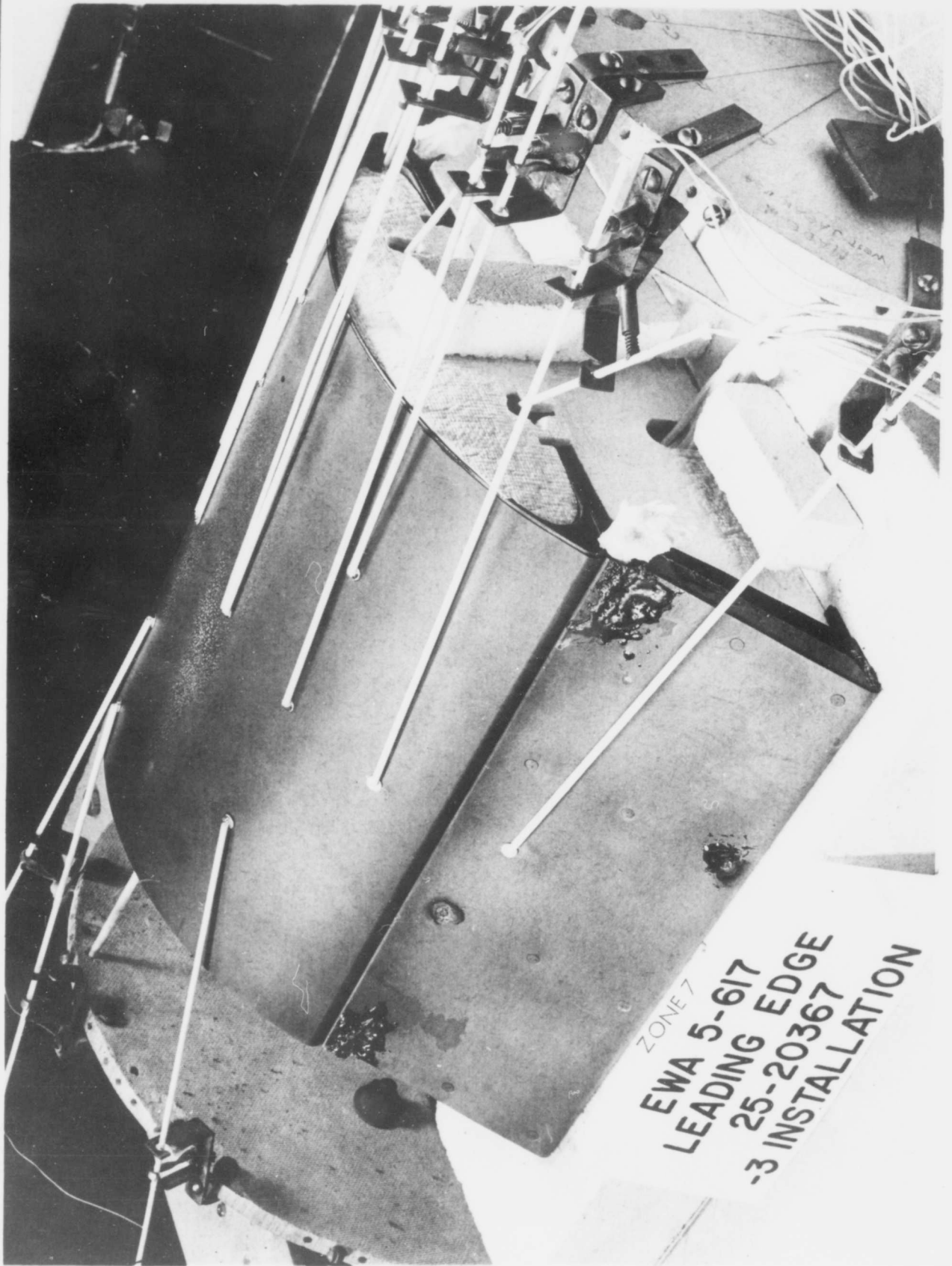
BOEING

NO. D2-00055

Volume I Fig. 3-66

PAGE 3-04





25-20367-2 AFTER HEAT TEST

BAC 1546 L-R3

9-3-63

Volume I

BOEING

Fig. 3-67.

NO. D2-80035

PAGE 3-85





EWAS-617
EDGE
LEADING 20367
25-20367-3
INSTALLATION

ZONE I

25-20367-2 AFTER HEAT TESTS

BAC 1546 L-R3

9-3-63

BOEING

NO. D2-60085

Volume I Fig. 3-68

PAGE 3-66





25-20378-1 BEFORE HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

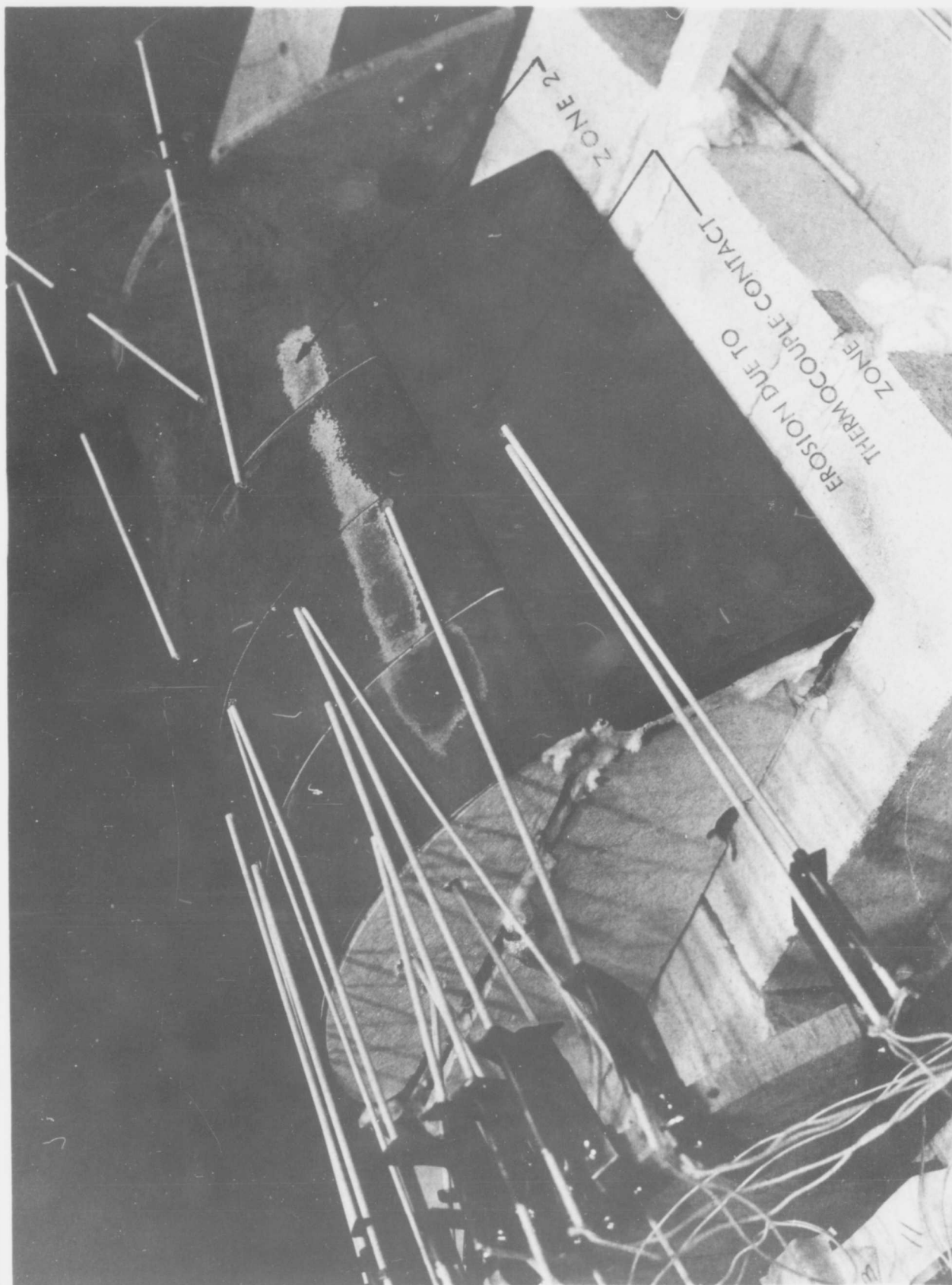
9-3-63

Volume I

BOEING
Fig. 3-62

NO. D2-80005
PAGE 3-87





25-20378-1 AFTER FOUR HEAT CYCLES

BAC 1546 L-R3

9-3-63

BOEING

NO. D2-80085

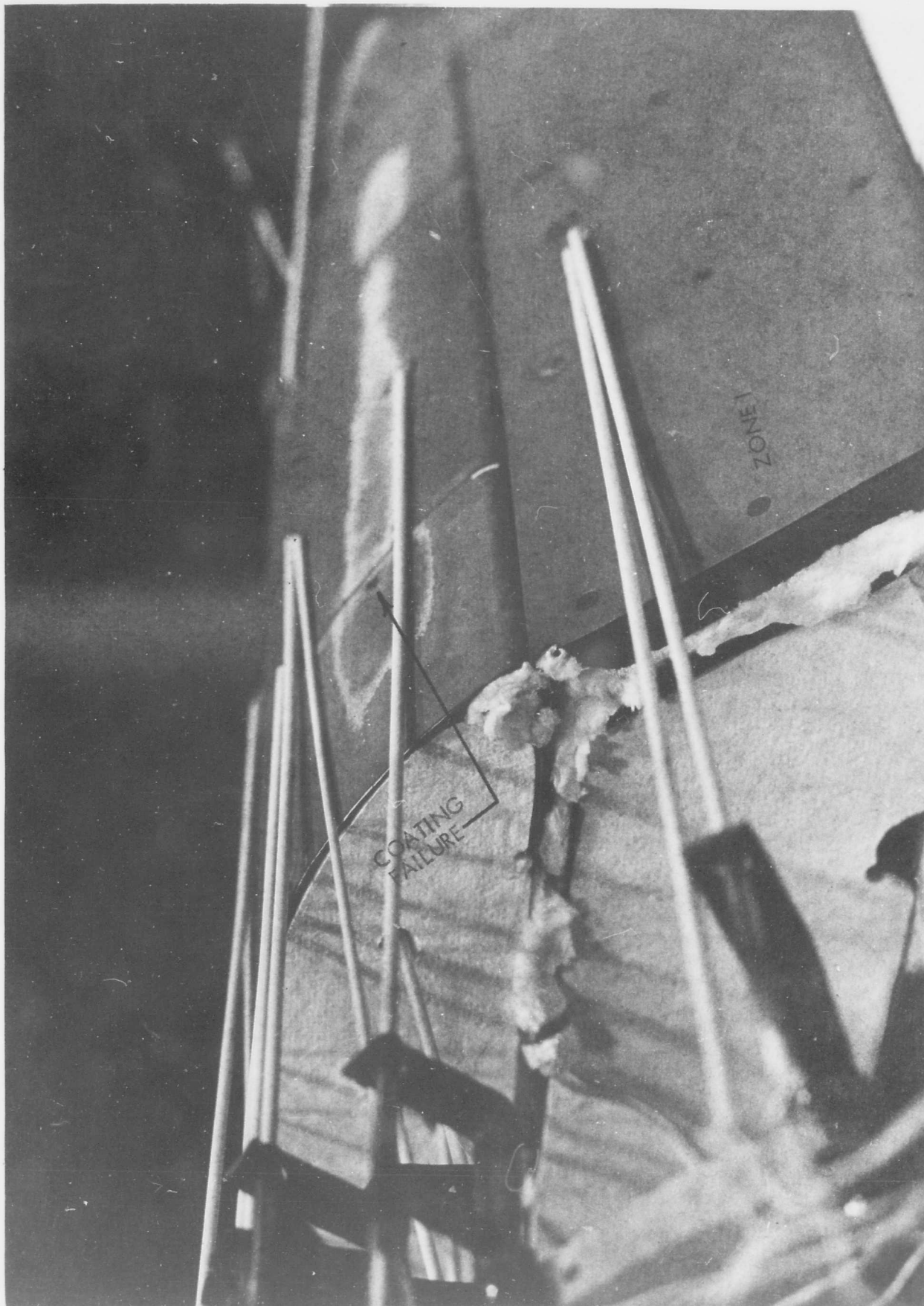
Volume I

Fig. 3-70

PAGE

3-28





25-20378-1 AFTER FOUR HEAT CYCLES

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

BOEING

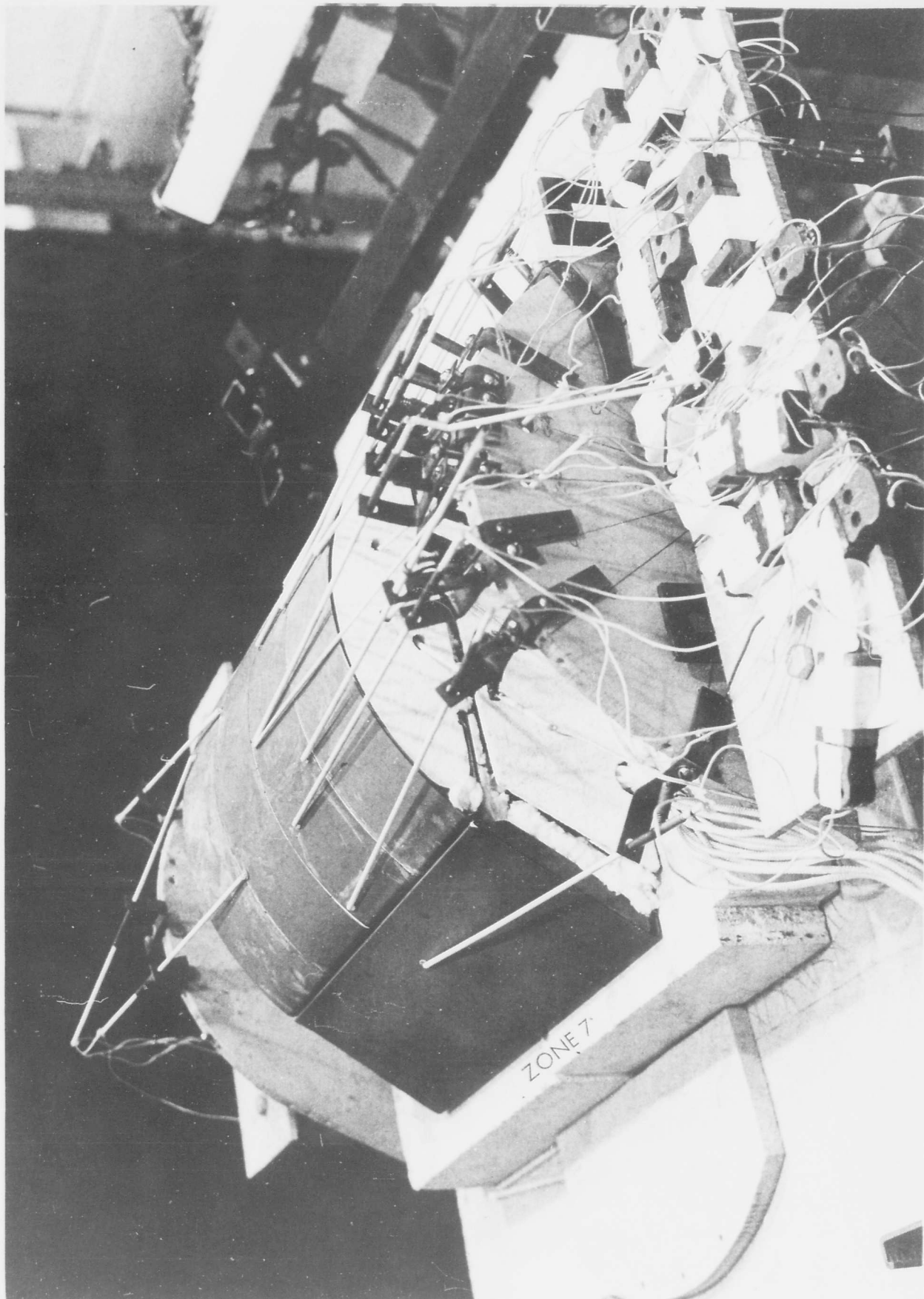
NO. D2-00085

Fig. 3-71

PAGE 3-89

Volume I





25-20378-I AFTER FOUR HEAT CYCLES

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

BOEING

NO. D2-80085

Volume I Fig. 3-72

PAGE 3-90





25-20378-1 AFTER HEAT TESTS

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

Volume I

BOEING

Fig. 3-73

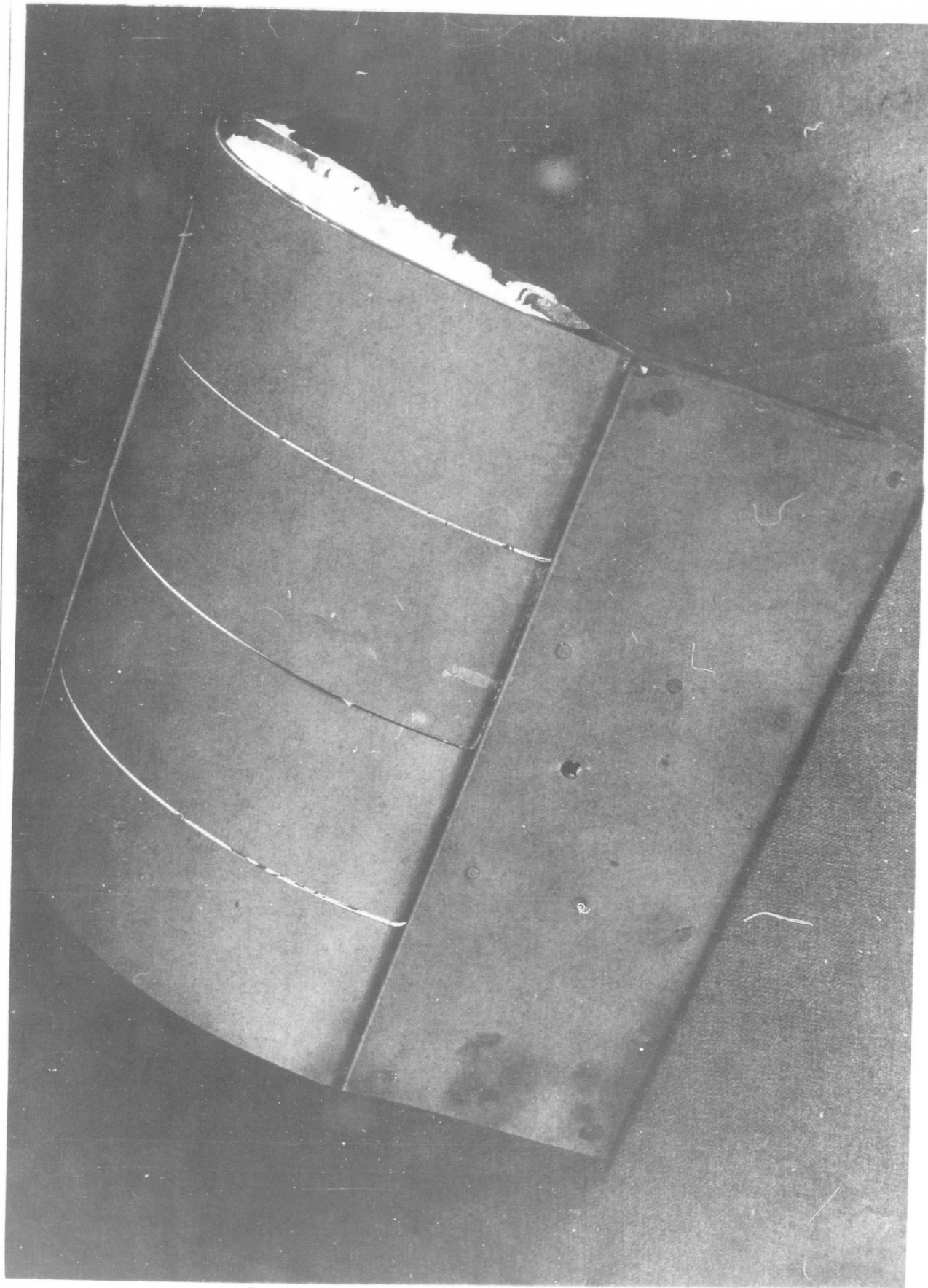
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D2-80085

PAGE

3-91





25-20378-2 AFTER HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

Volume II

BOEING

Fig. 3-74

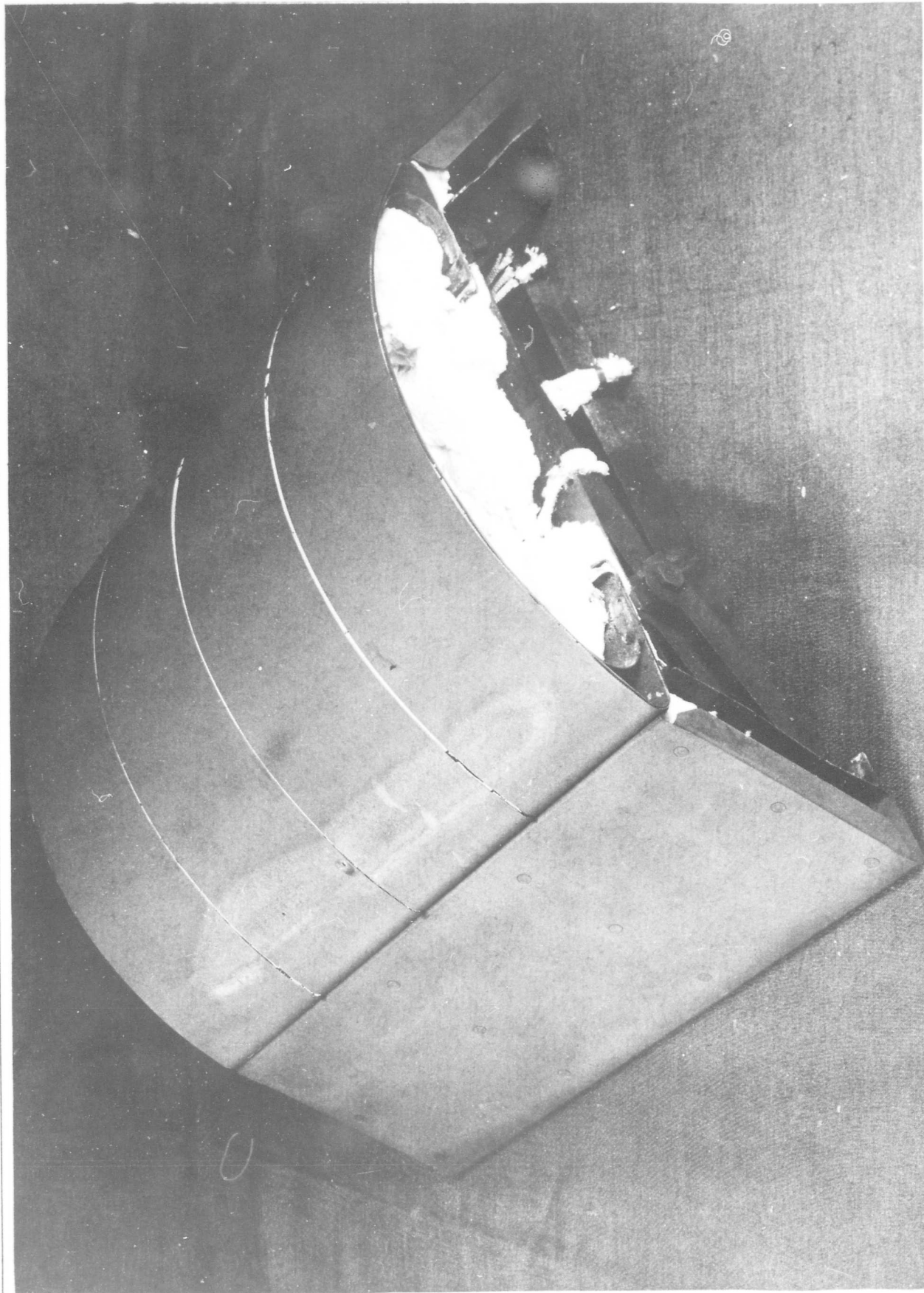
NO. D2-100-73

PAGE

8-92



2486355
DYNASOAR LEADING EDGE EWA 5617 25-20378-6
INSTALLATION AFTER HEAT TEST 8-8-61



25-20378-2 AFTER HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

VOLUME 2

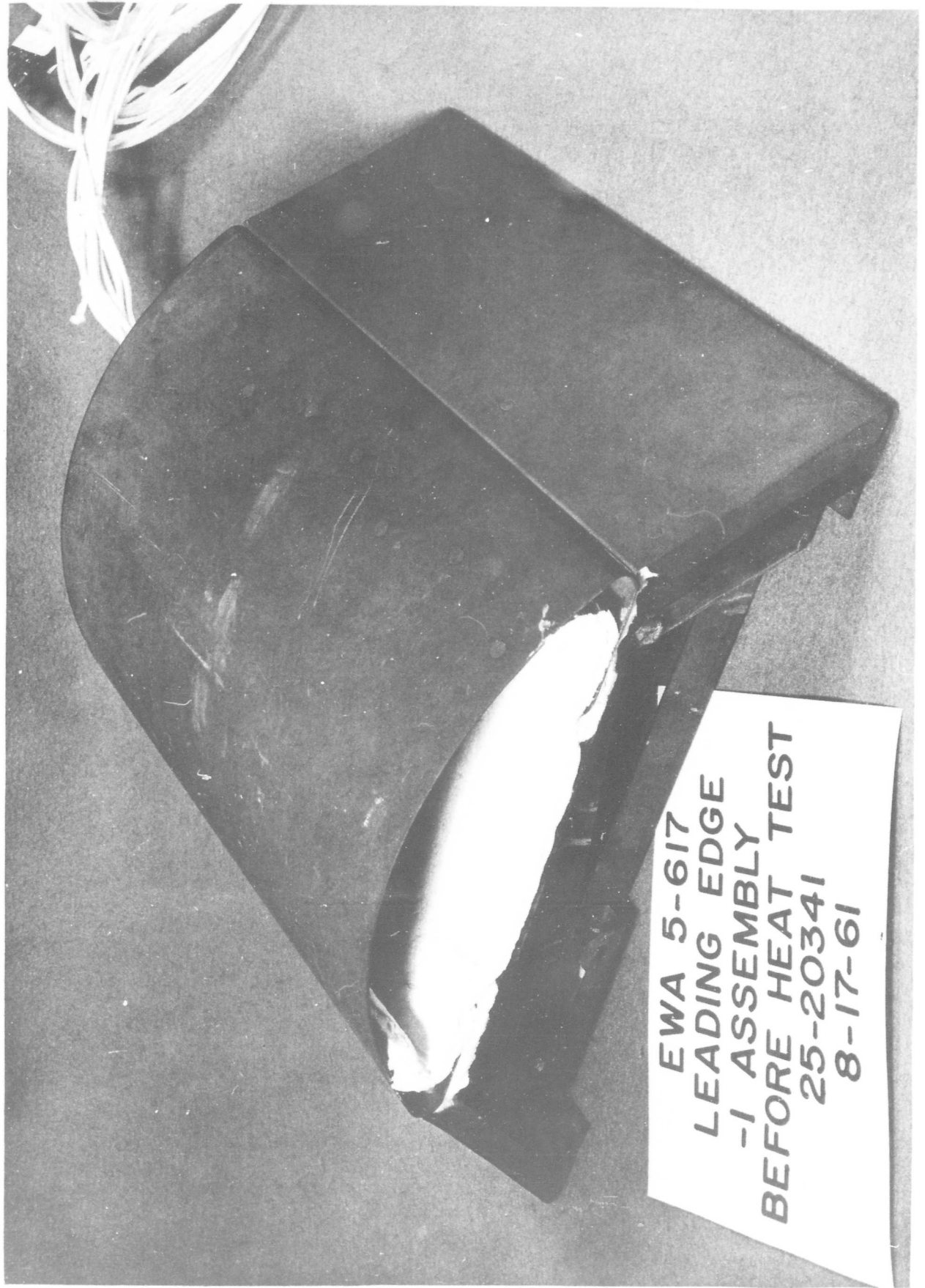
BOEING

Fig. 3-75

NO. D2-10007

PAGE 3-93





25-20341-I BEFORE HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

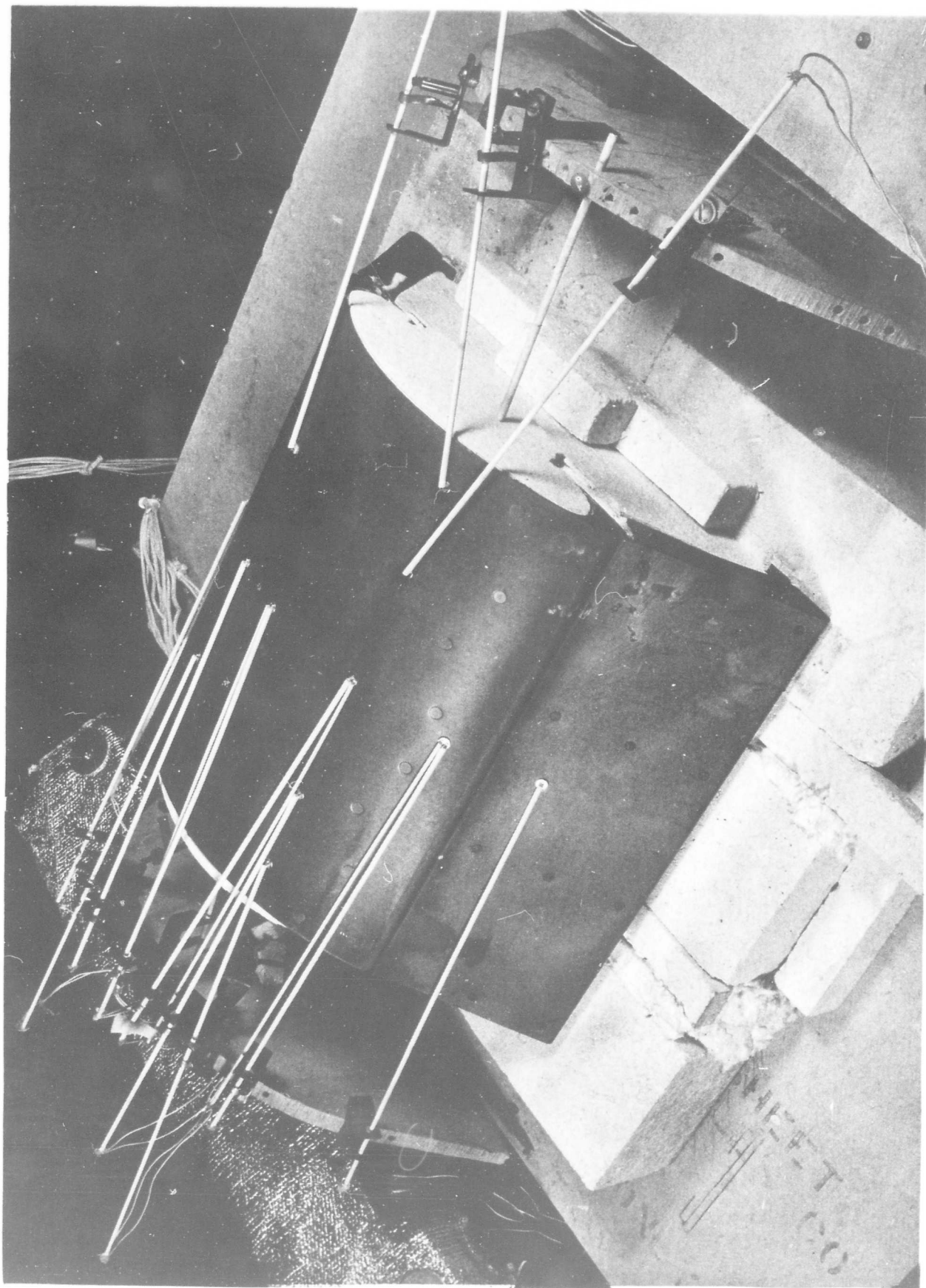
BOEING

Fig. 3-76

NO. D2-30033

PAGE 3-9A





25-20341-1 AFTER HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

9-3-63

Wing I

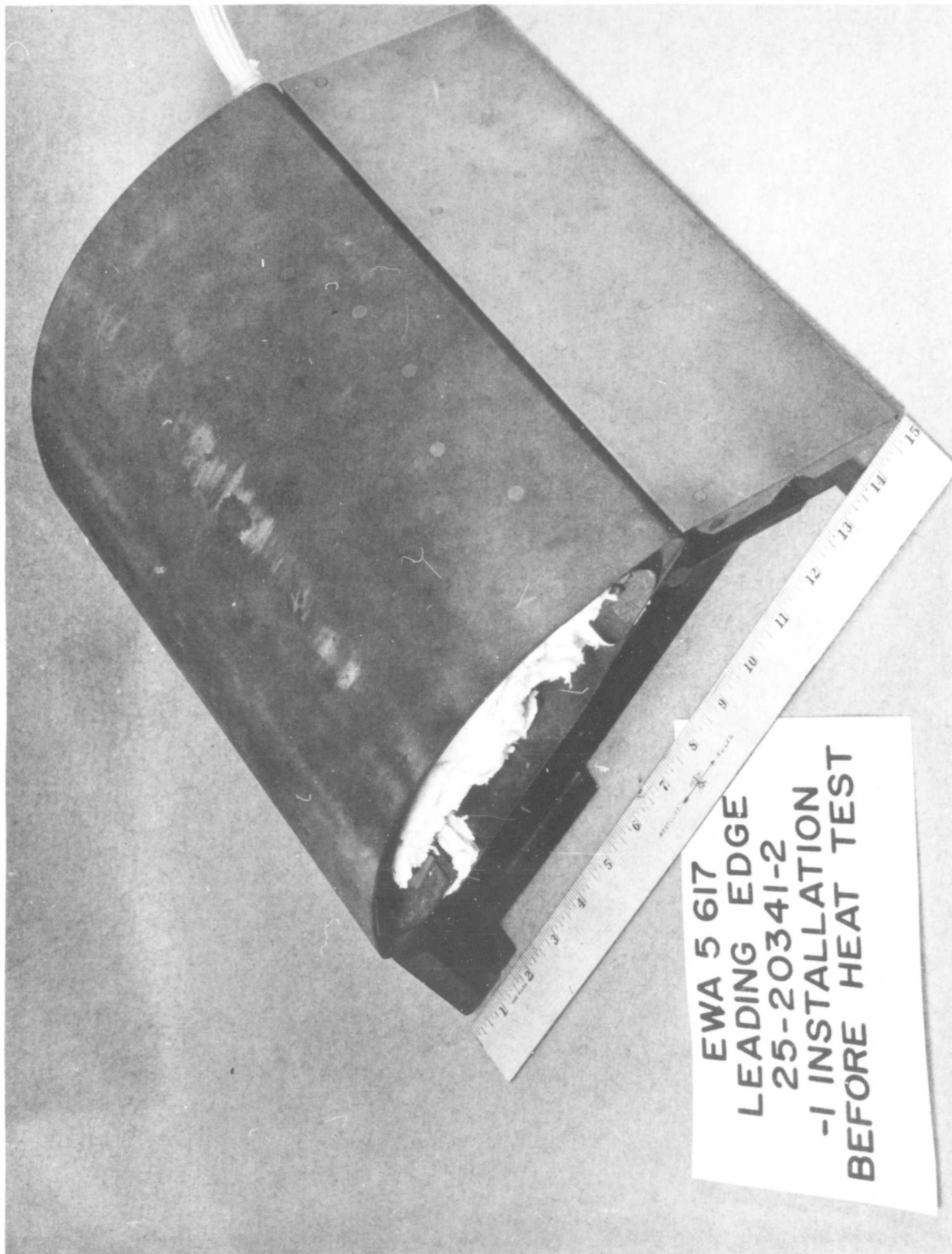
BOEING

Fig. 3-77

NO. D2-0085

PAGE 3-95





25-20341-2 BEFORE HEAT TEST





25-20341-2 AFTER HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

4-63

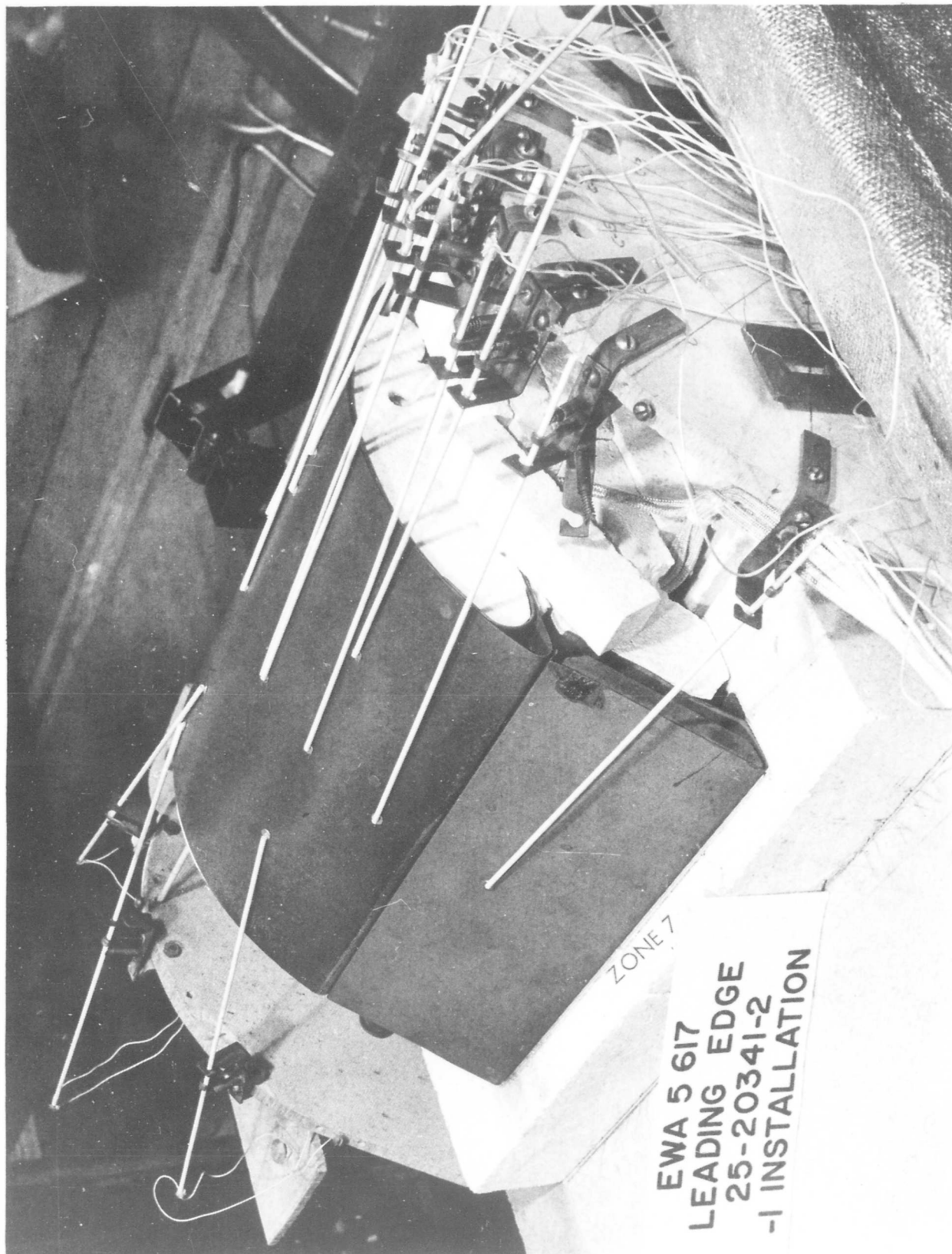
BOEING

NO D2-40003

Fig. 3-79

PAGE 3-97





25-20341-2 AFTER HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

BOEING

NO. D2-0085

Fig. 3-80

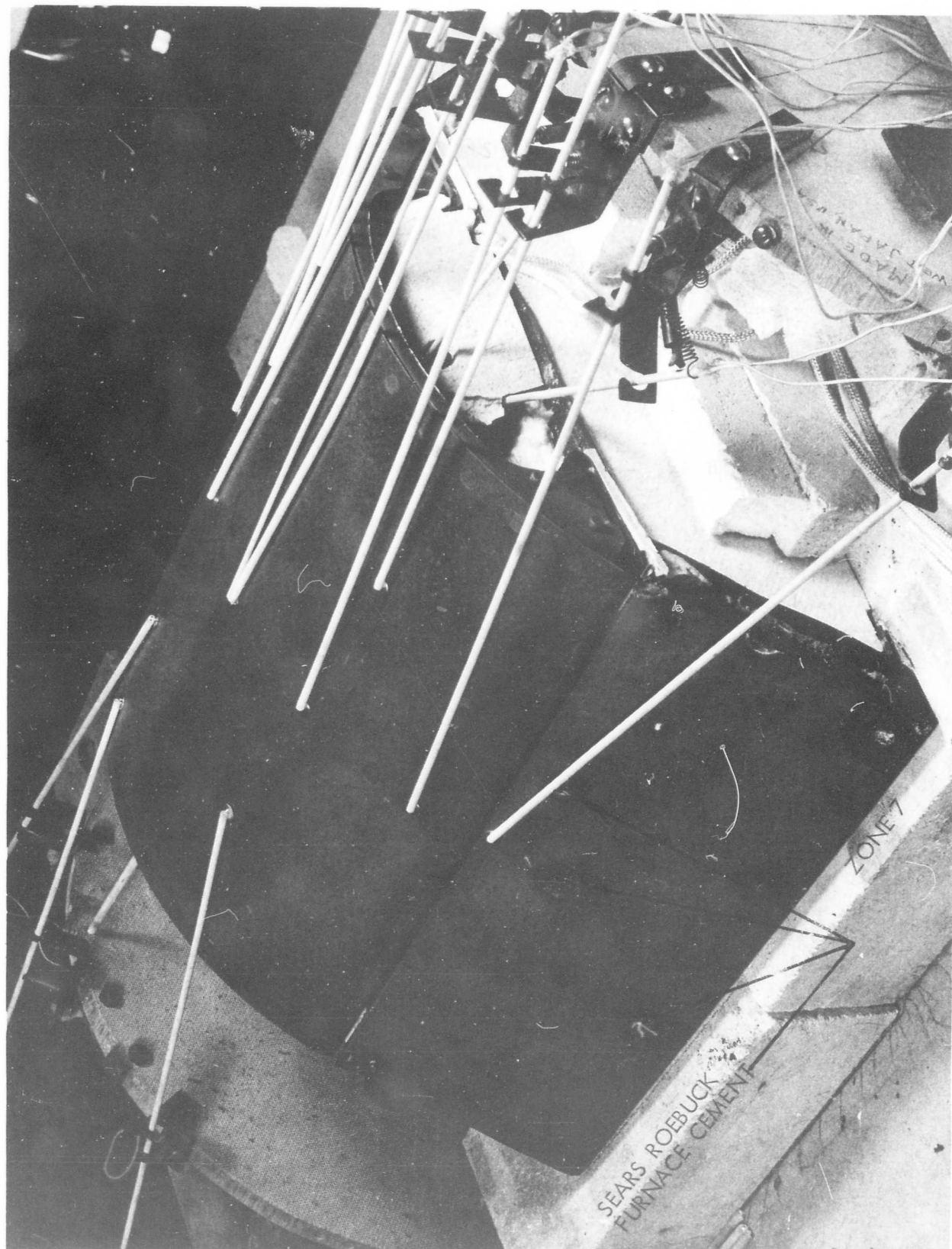
PAGE 3-90





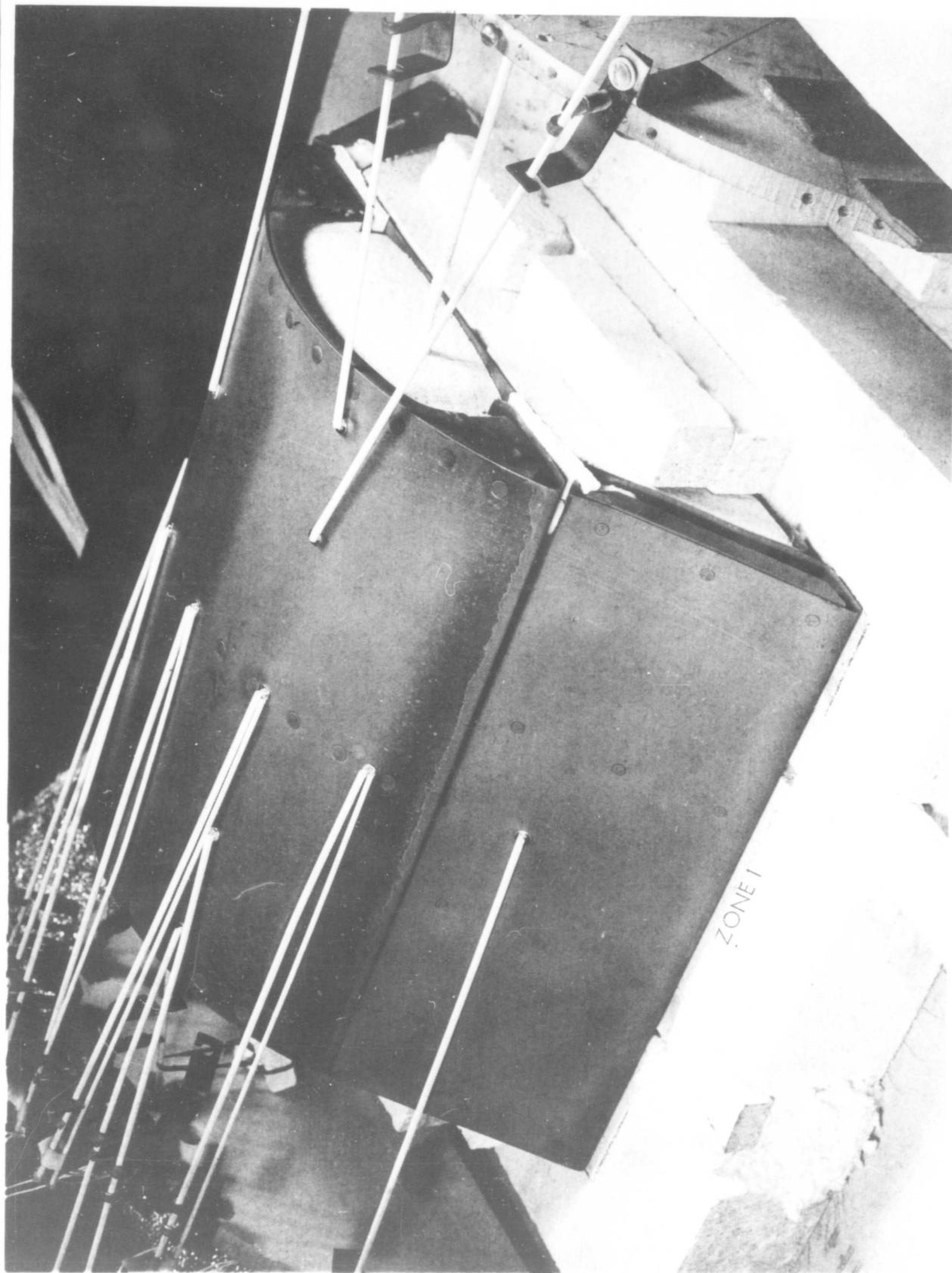
25-20376-1 BEFORE HEAT TEST





25-20376-I AFTER HEAT TEST





25-20376-1 AFTER HEAT TEST

U3-4071-1000 (was BAC 1546-L-R3)

BOEING

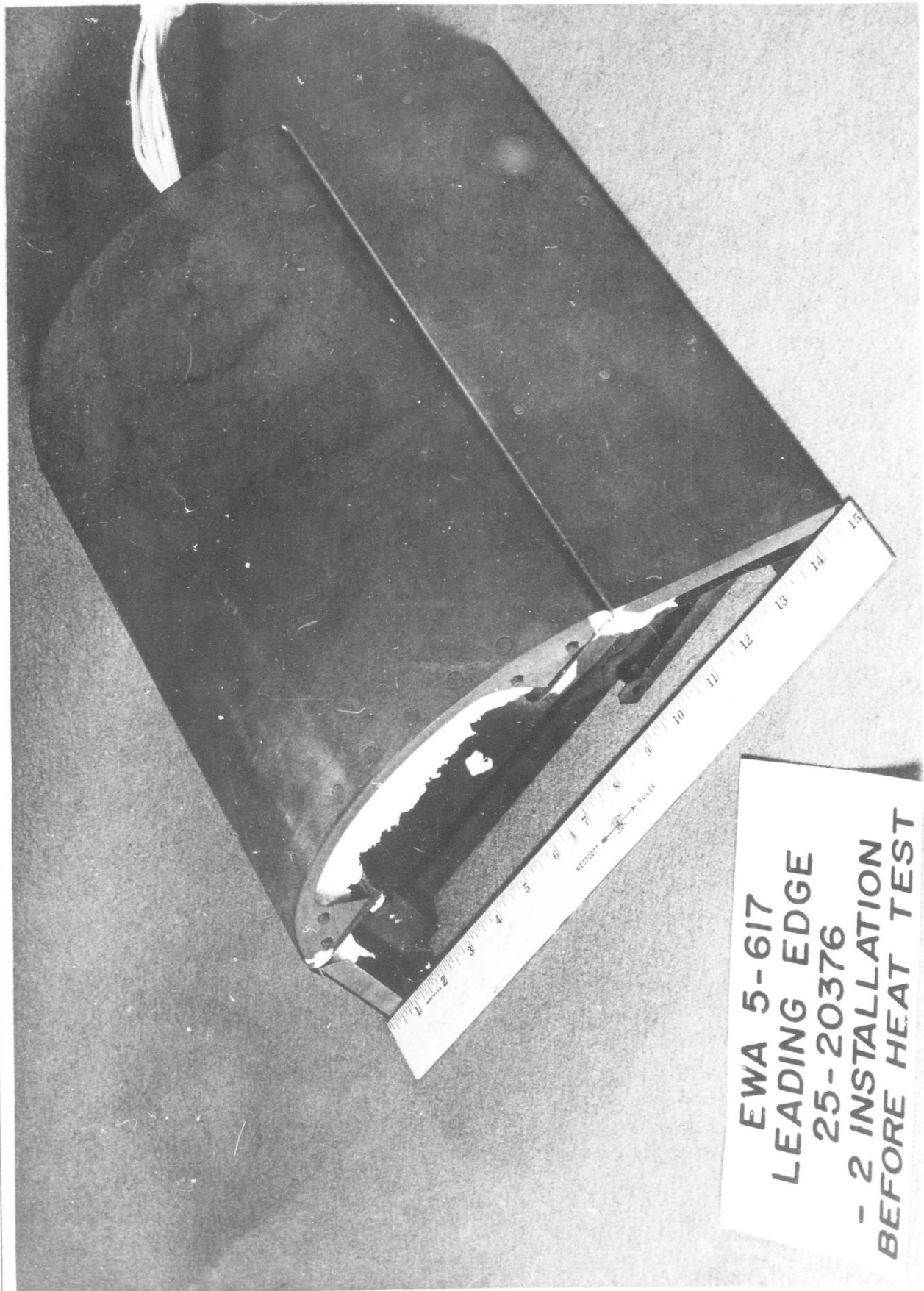
NO. D2-1000

Fig. 3-33

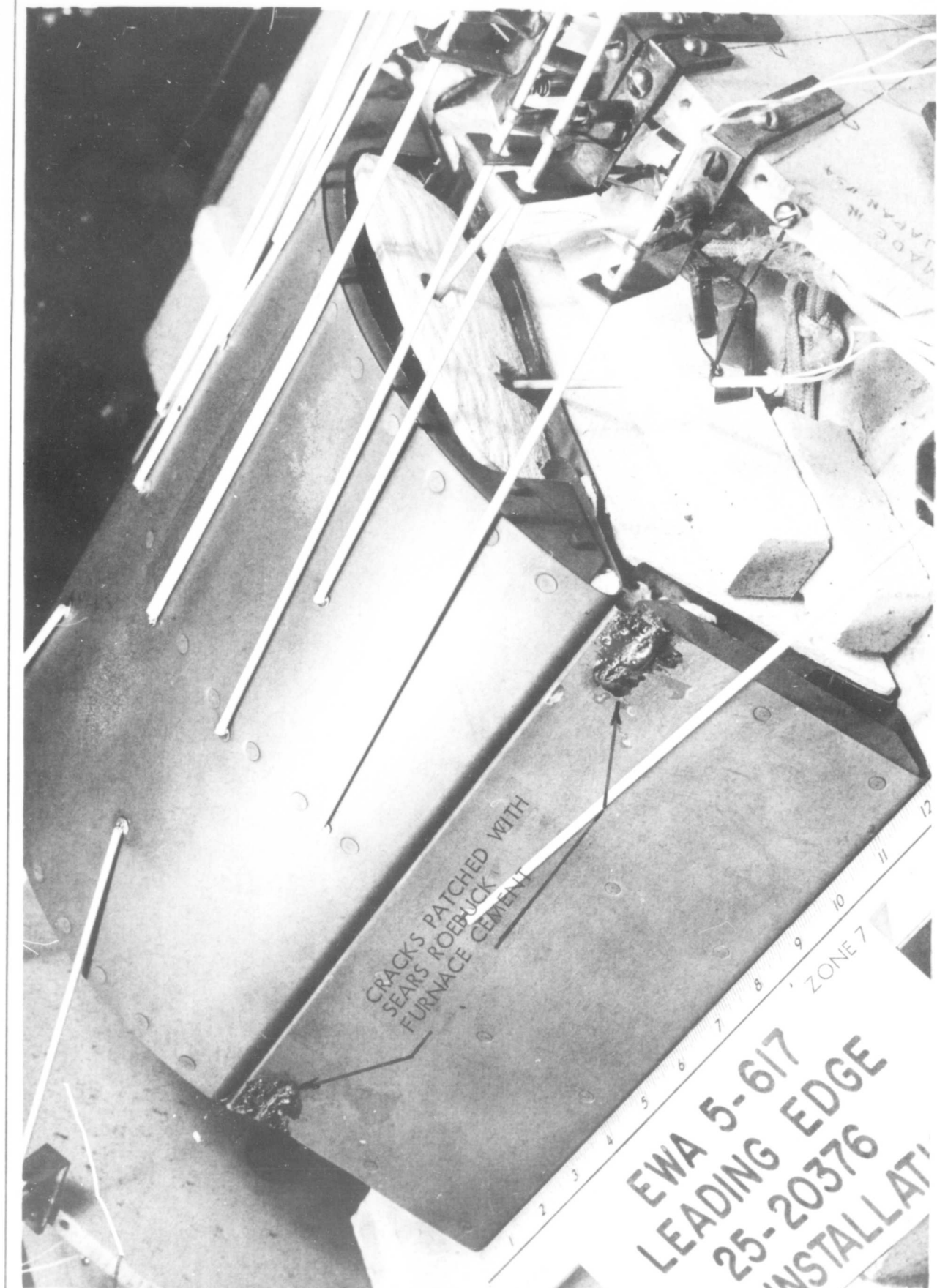
PAGE 3-101

Volume 1





EWA 5-617
LEADING EDGE
25-20376
- 2 INSTALLATION
BEFORE HEAT TEST



25-20376-2 AFTER HEAT TEST

BAC 1546 L-R3

9-3-63



25-20376-2 AFTER HEAT TEST ,

BAC 1546 L-R3

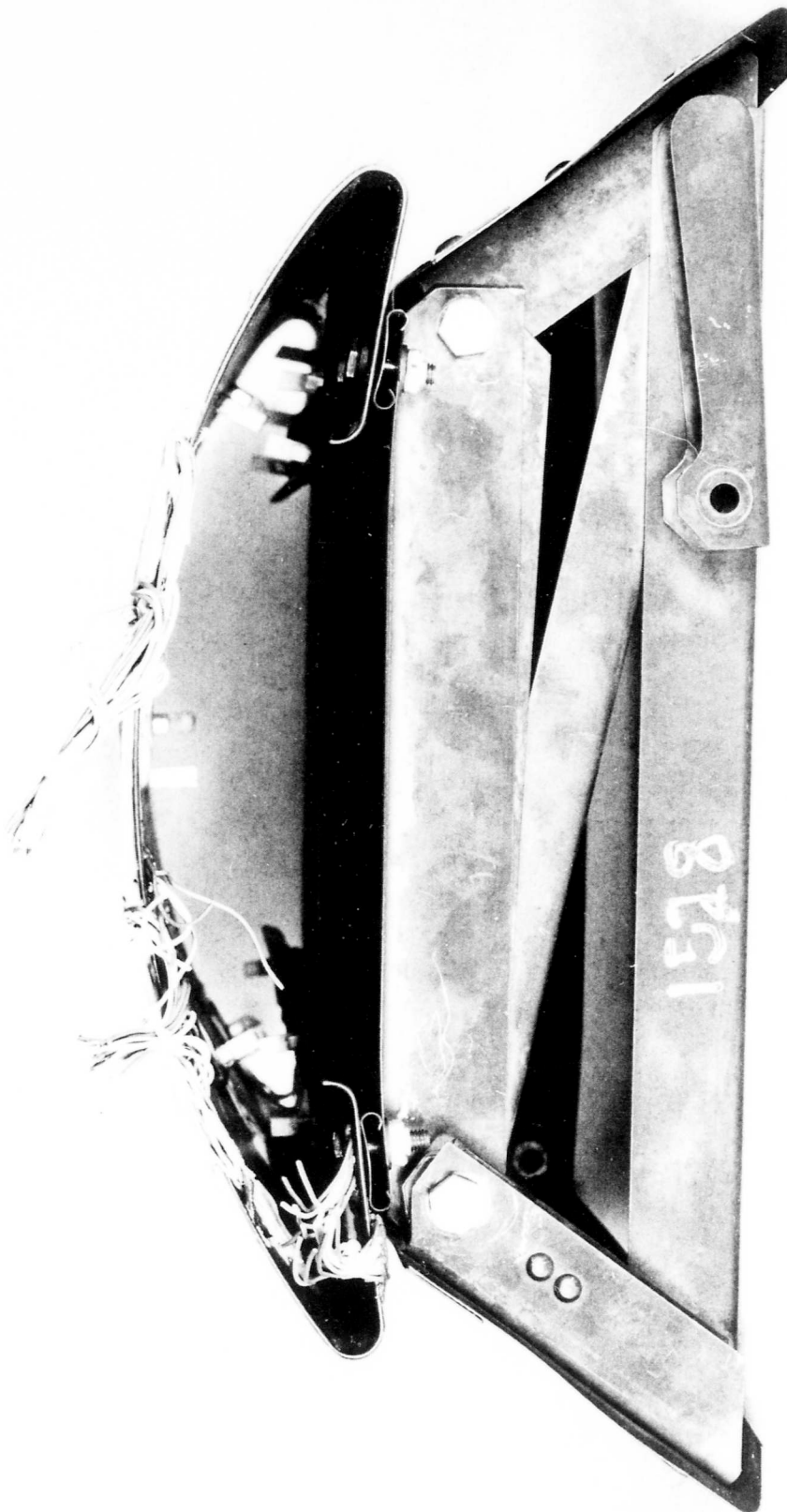
BOEING

NO. D2-100

Figure 1, Fig. 3-86

PAGE 3-104





25-20372-1 SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

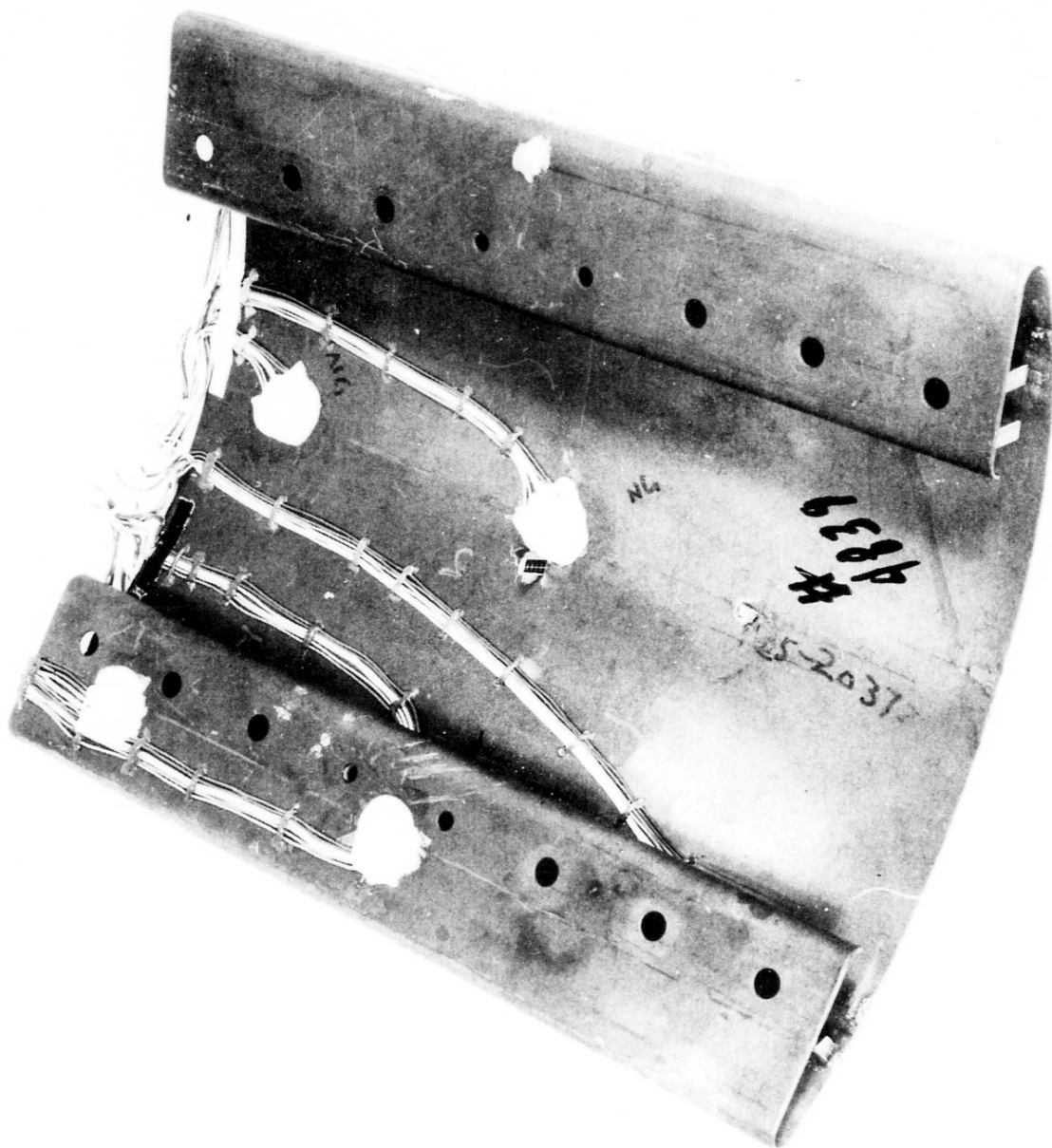
BOEING

NO. D2-80085

Volume I Fig. 3-87

PAGE 3-105

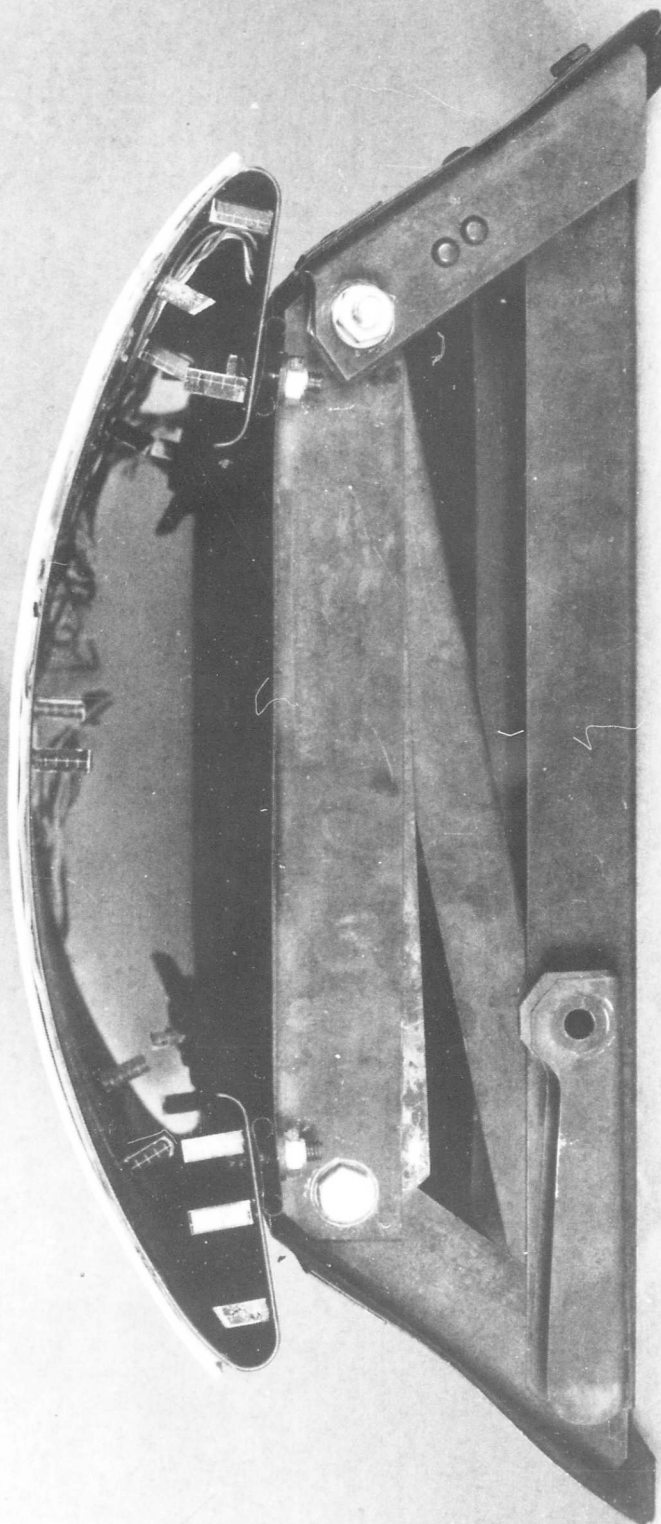




25-20372-1 SLOW-LOAD TESTED

1-17-62

#20-20372



25-20372-1 SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

Volume I

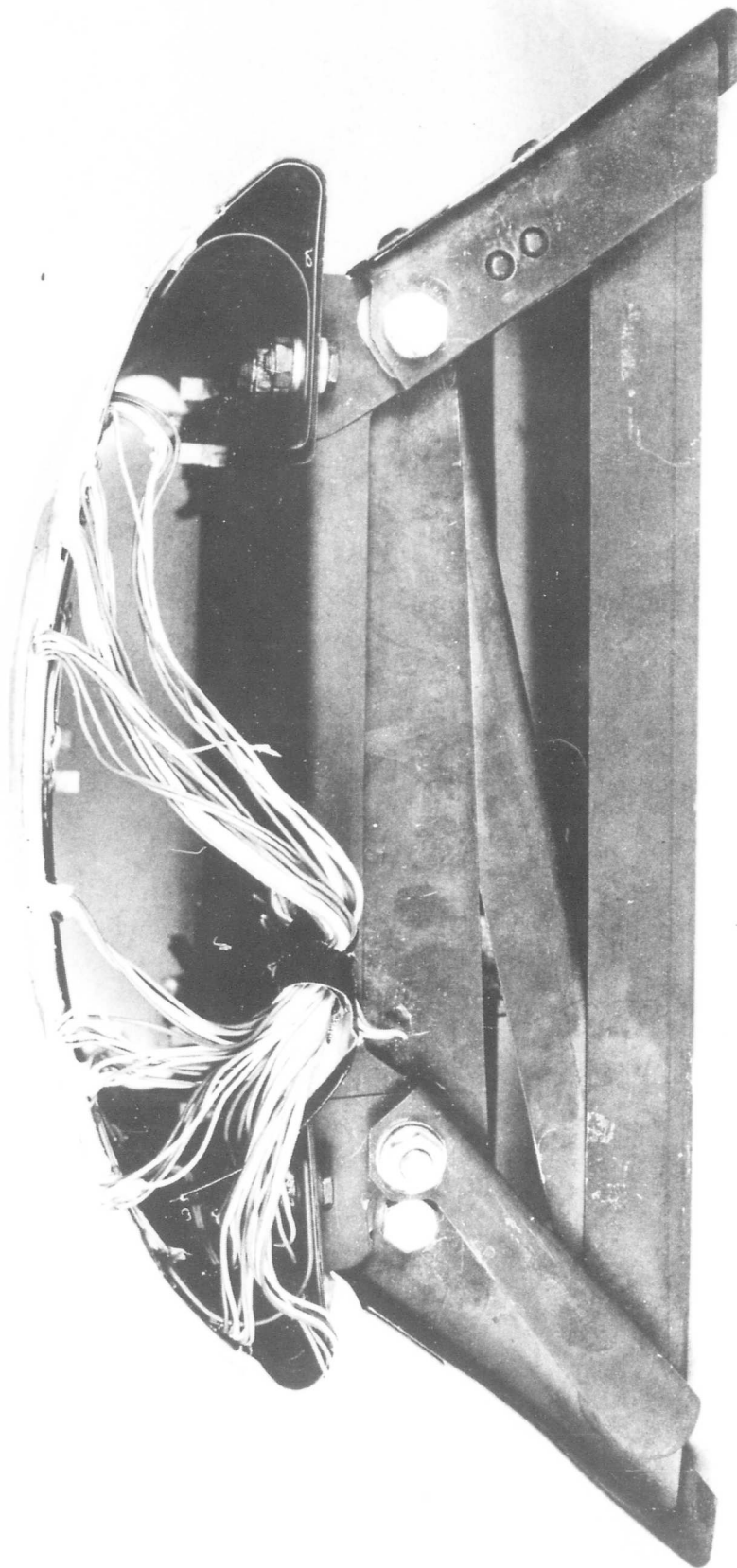
BOEING

Fig. 3-89

NO. D2-80085

PAGE 3-107





25-20367-I SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)



25-20367-1 SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

BOEING

NO. D2-80085

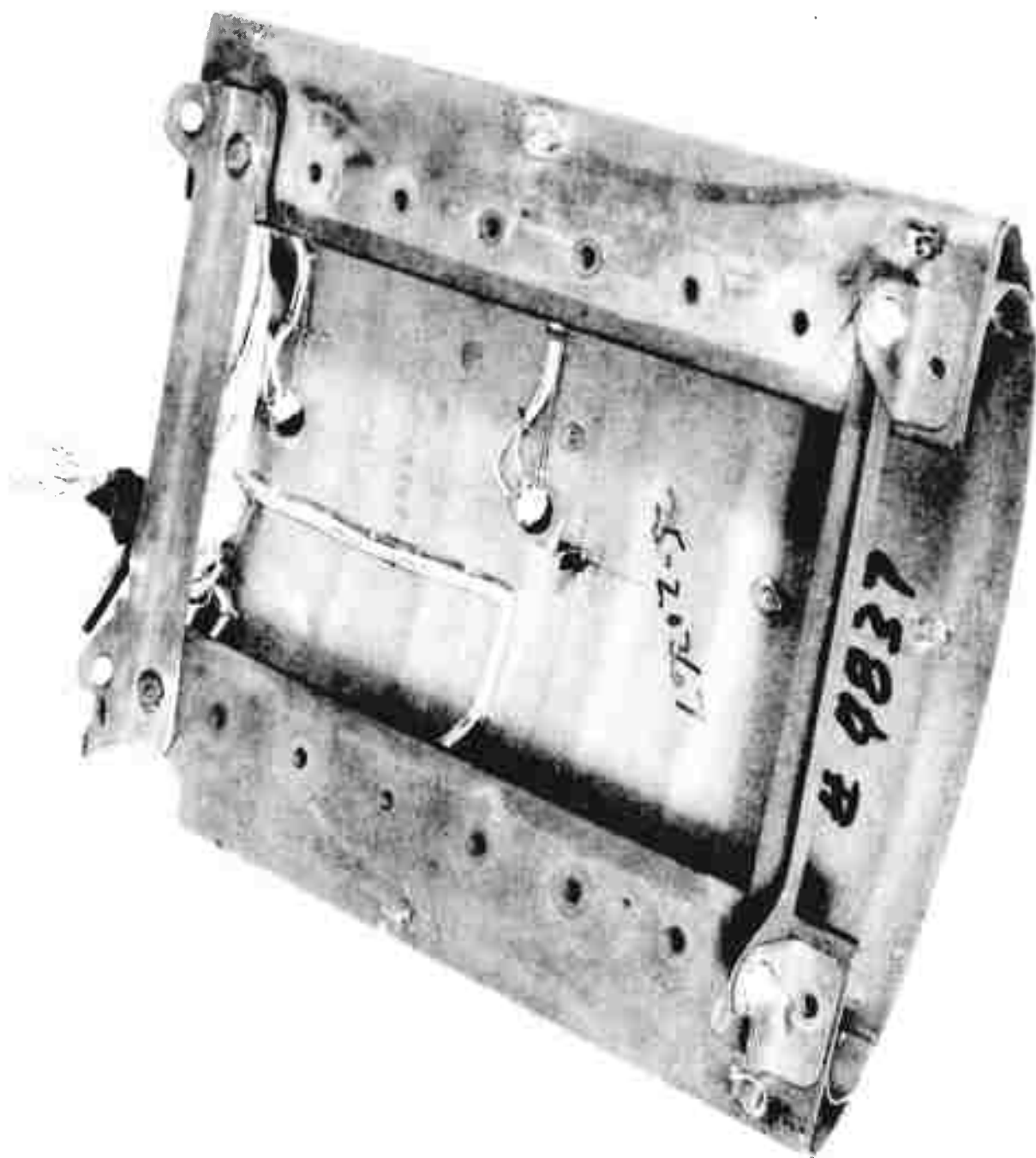
Fig. 3-91

PAGE 3-109

Volume I



DS-1 FAILED LEADING EDGE SPECIMEN 25-20367
1-30-62 24100966



25-20367-I SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

BOEING

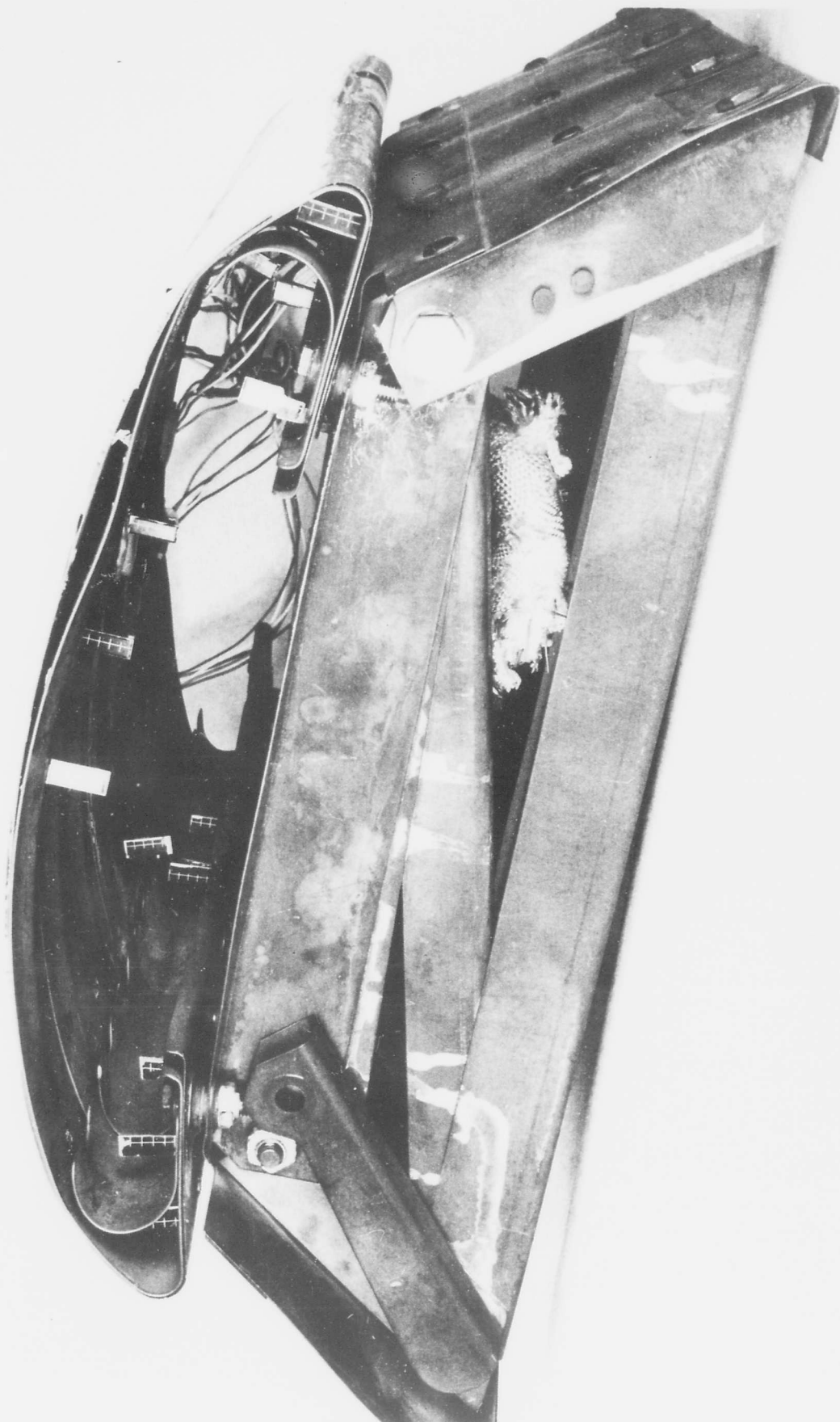
NO. D2-80085

Volume I

Fig. 3-92

PAGE 3-110





25-20378-I SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

BOEING

Fig. 3-93

NO. D2-80085

PAGE 3-III

Volume I

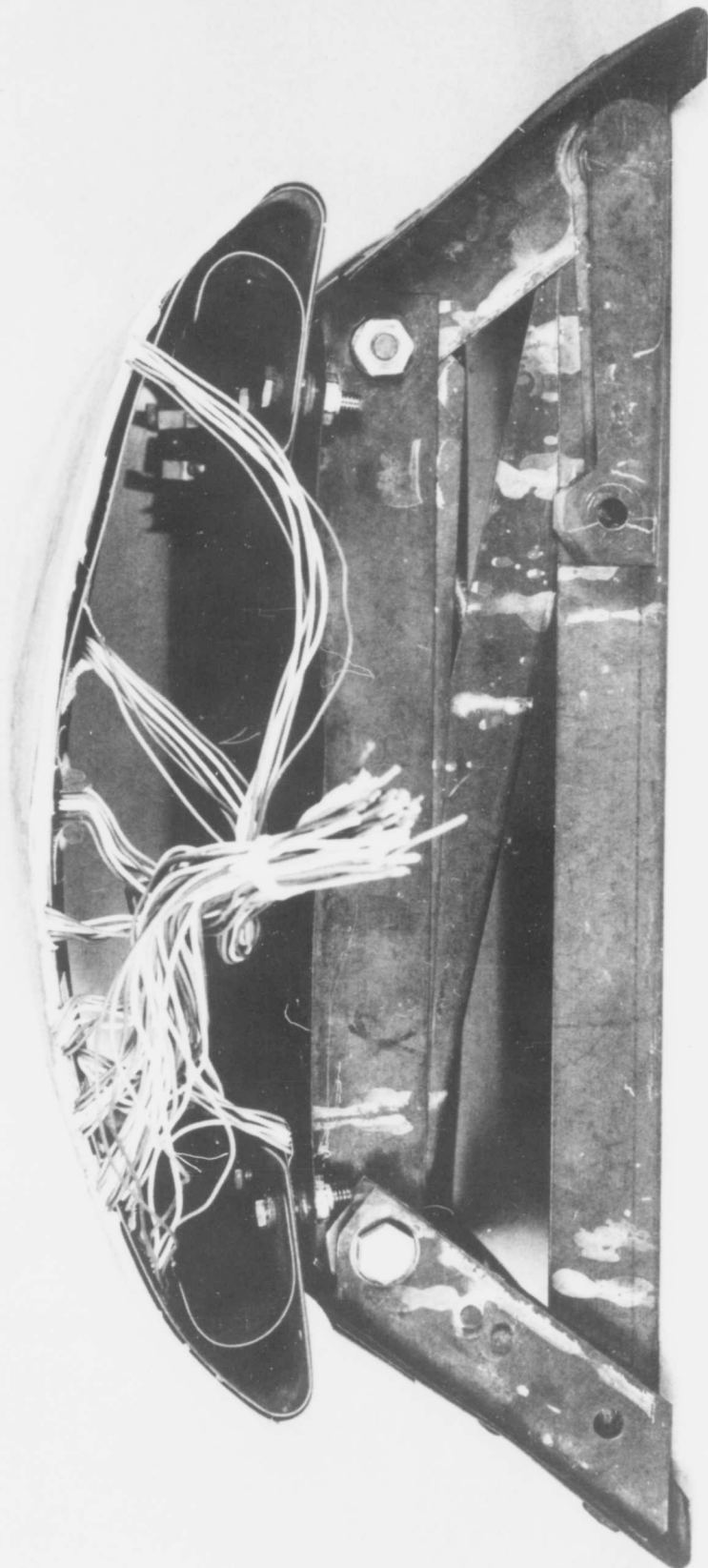


DS-I LEADING EDGE FAIRINGS
#25-20378 1-17-62

2496279

113

9-3-63



25-20379-1 SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

Volume I

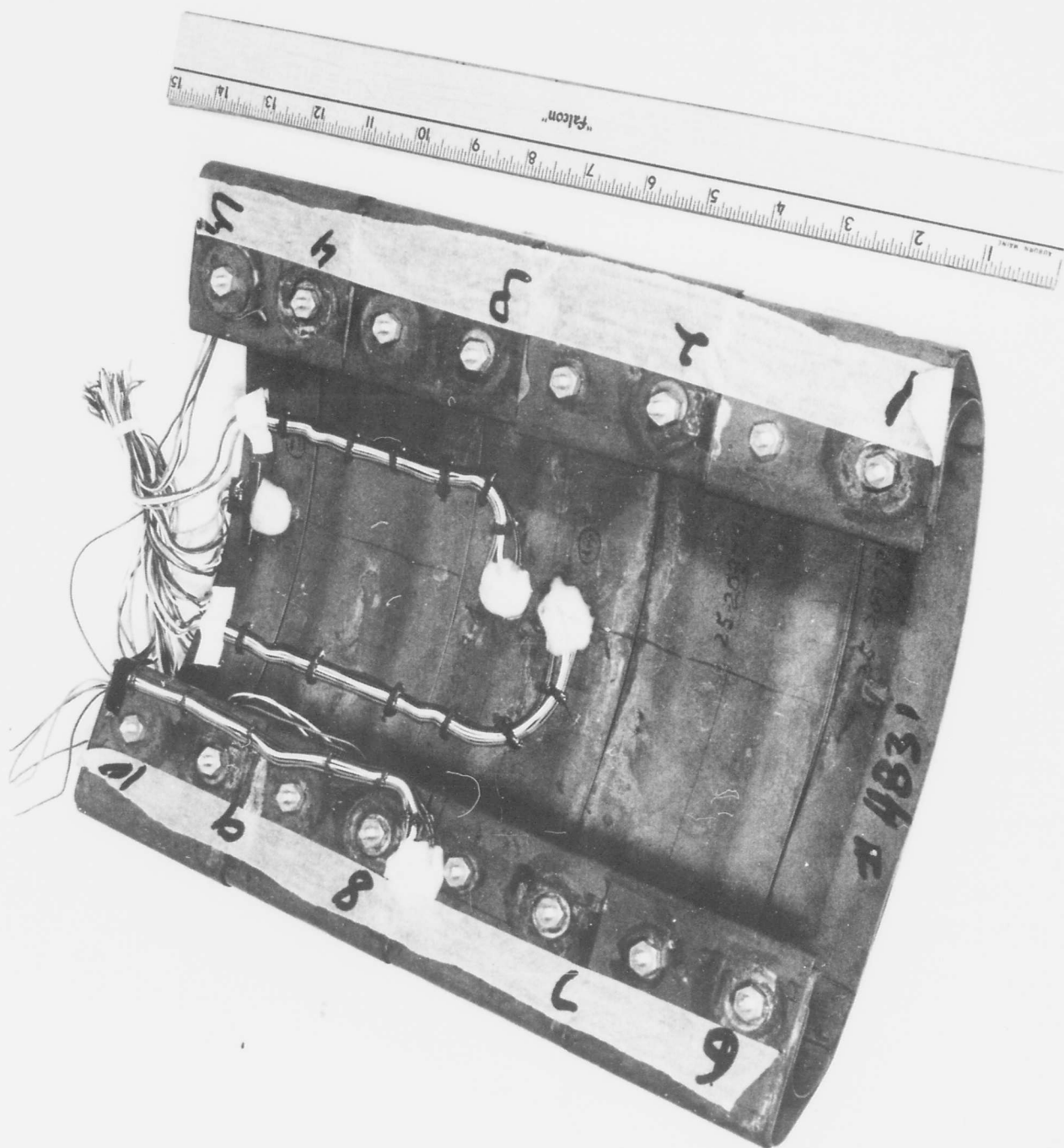
BOEING

Fig. 3-94

NO. D2-80085

PAGE 3-112





25-20378-1 SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

Volume I

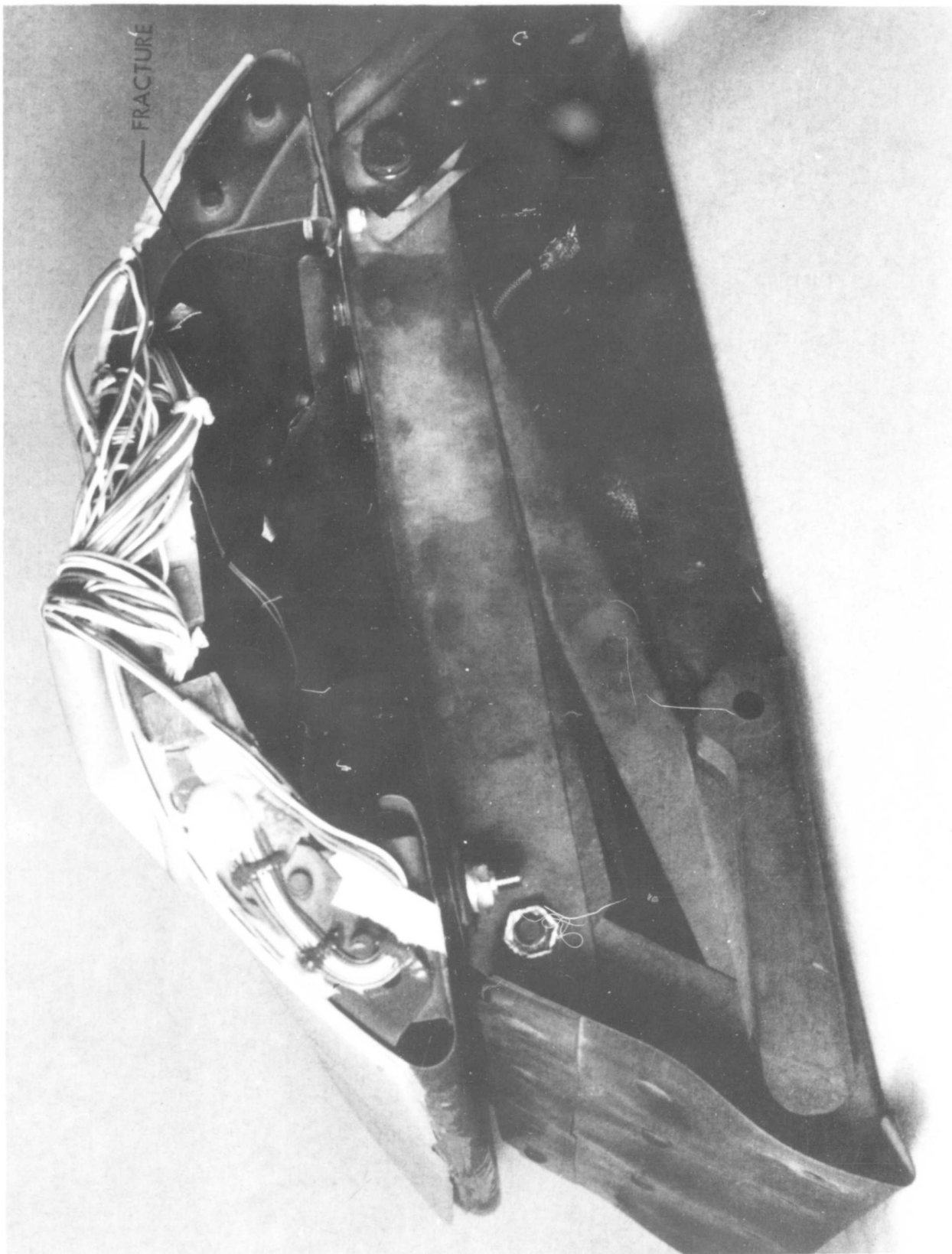
BOEING

Fig. 3-95

NO. D2-80085

PAGE 3-113





25-20376-1 SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

Volume I:

BOEING
Fig. 3-96

NO. D2-80085

PAGE 3-114



1-17-62

#25-20376

FRACTURE

25-20376-1 SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

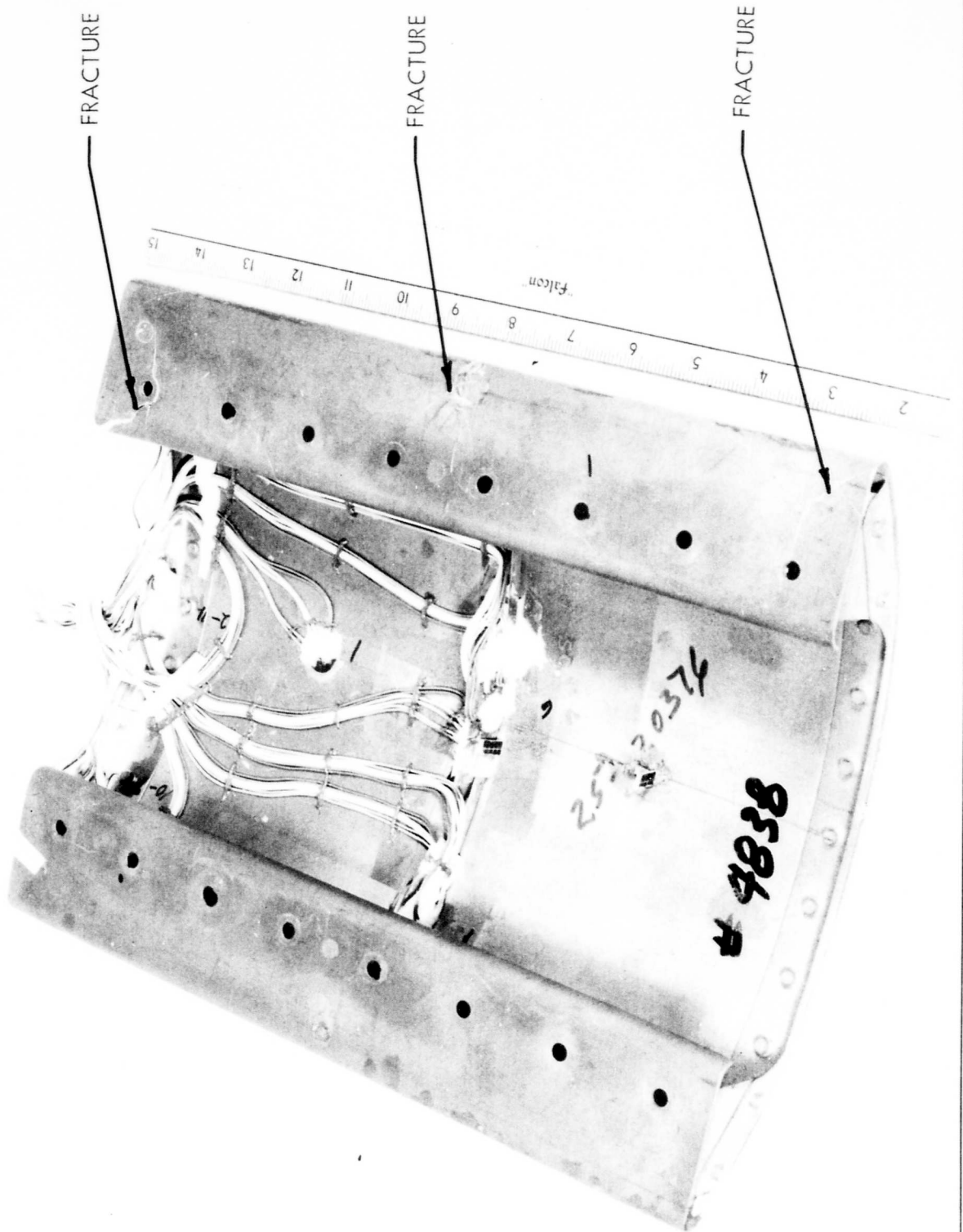
BOEING

NO. D2-80085

Volume I Fig. 3-97

PAGE 3-115





25-20376-I SLOW-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

BOEING

NO. D2-80085

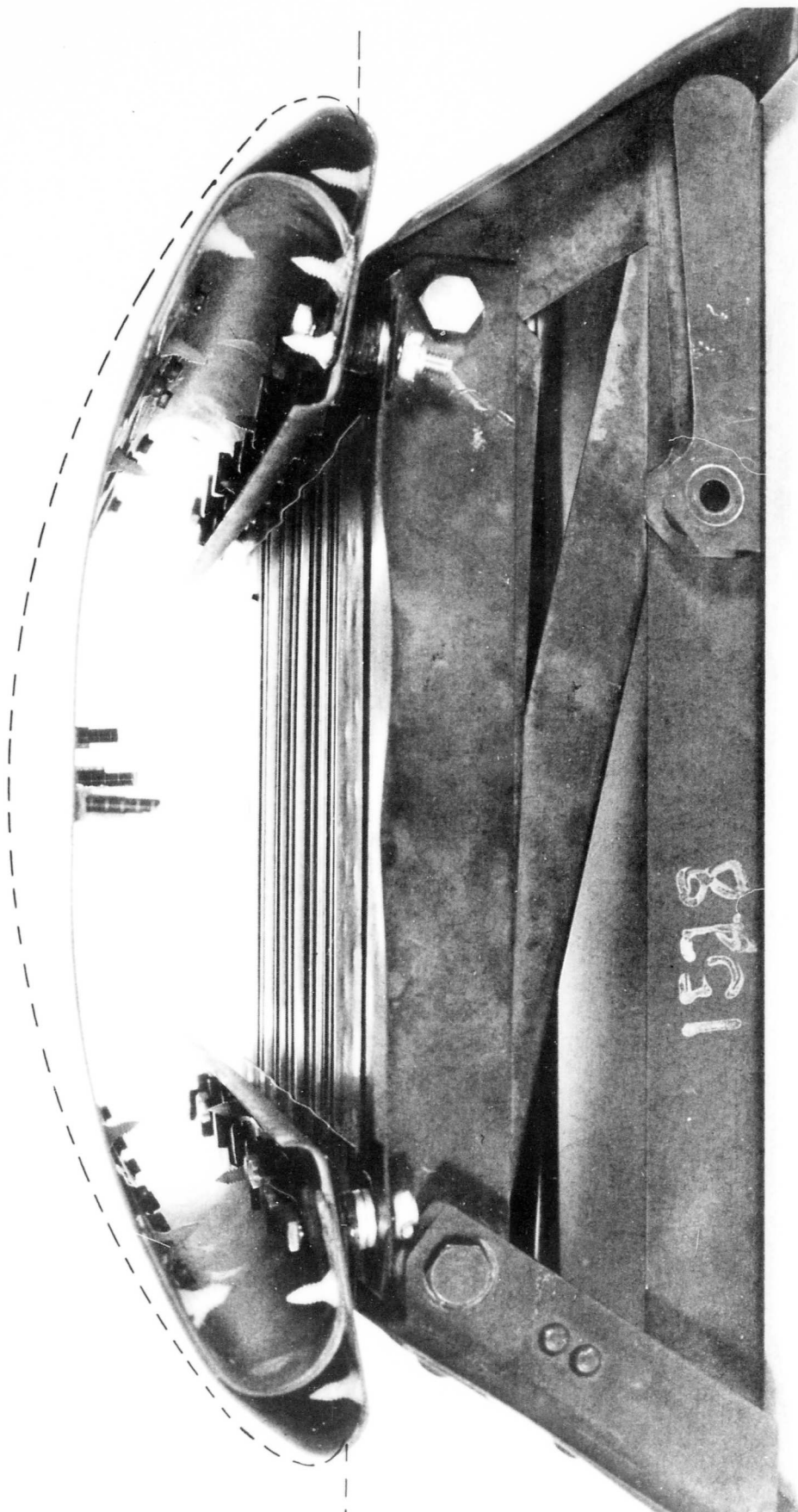
Volume I

Fig. 3-98

PAGE 3-116

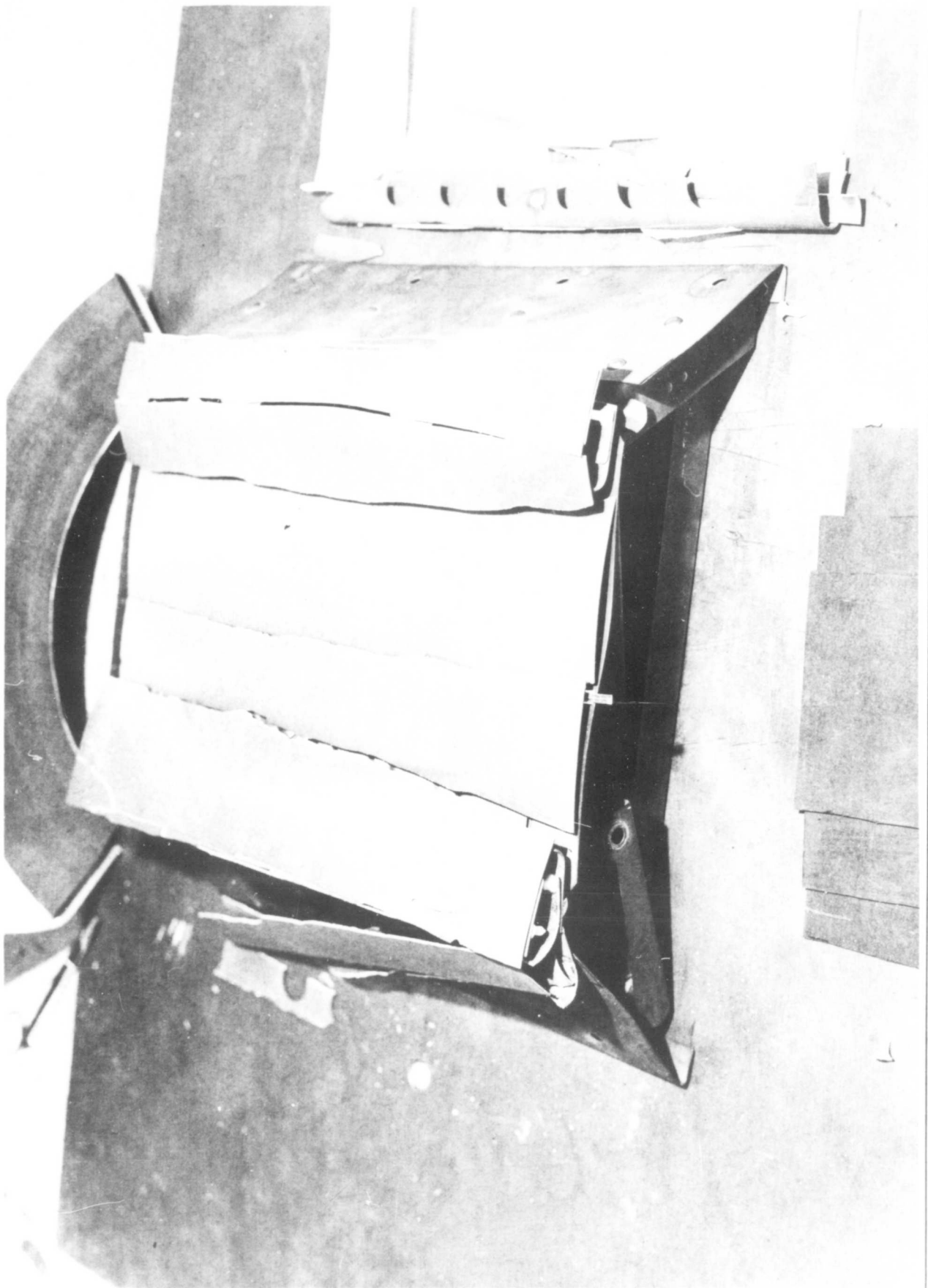


APPROXIMATE ORIGINAL CONTOUR



25-20341-1 SLOW-LOAD TESTED

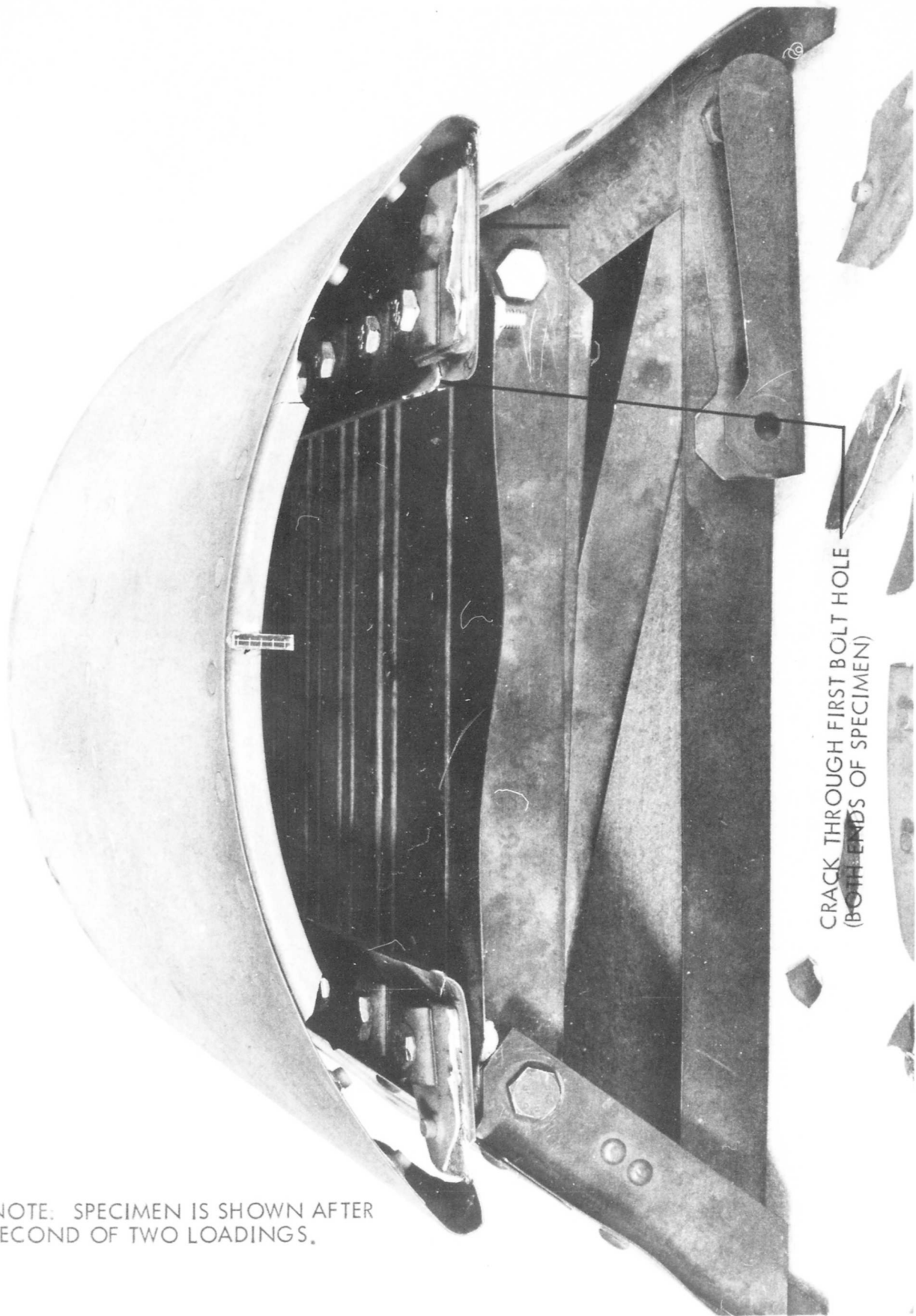




25-20341-2 RAPID-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)





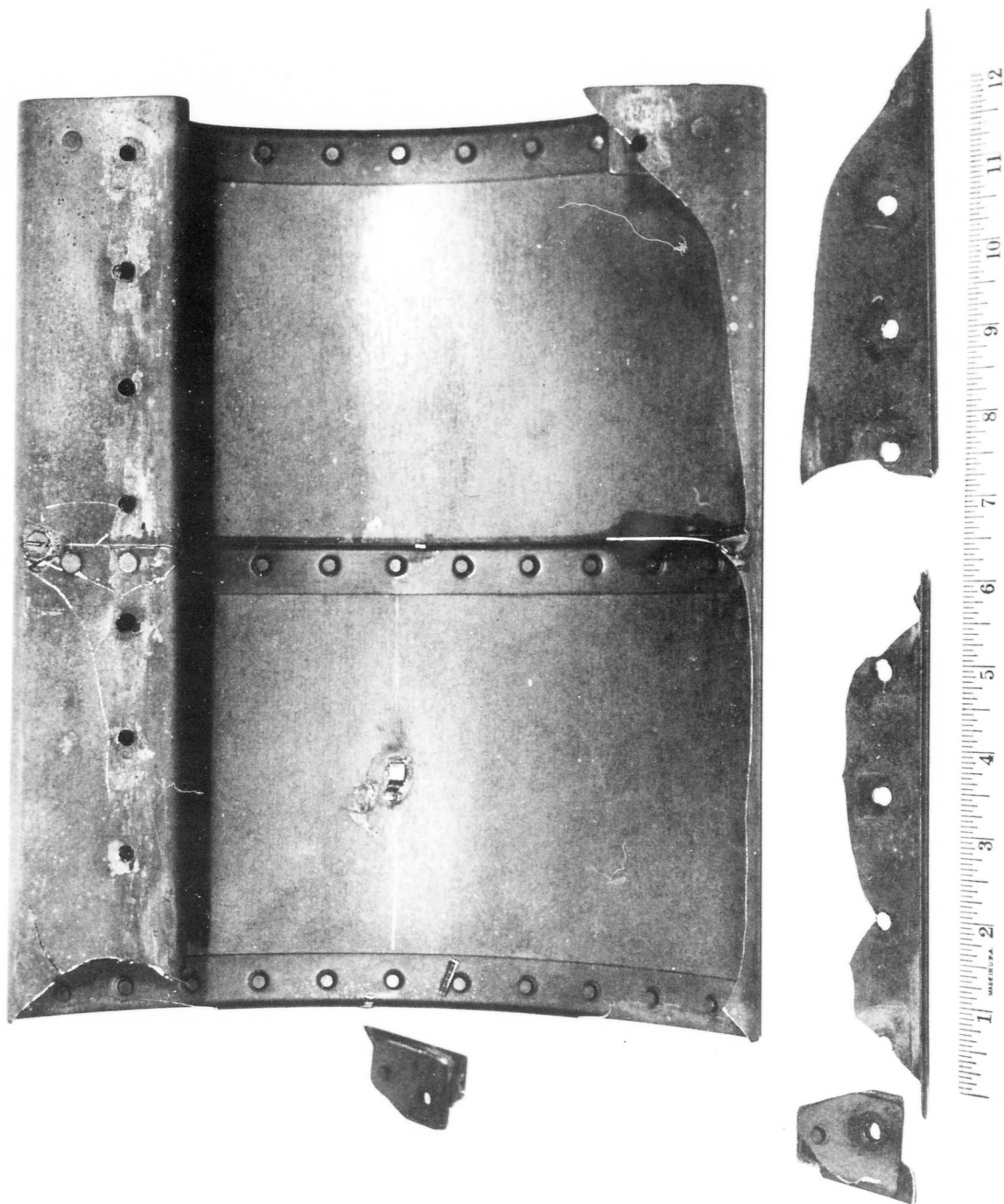
CRACK THROUGH FIRST BOLT HOLE
(BOTH ENDS OF SPECIMEN)

NOTE. SPECIMEN IS SHOWN AFTER
SECOND OF TWO LOADINGS.

25-20376-2 RAPID-LOAD TESTED



DS-1 LANDING GEAR FAILURE - ADAMS 1957
3-9-60



25-20376-2 RAPID-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)

BOEING

NO. D2-80085

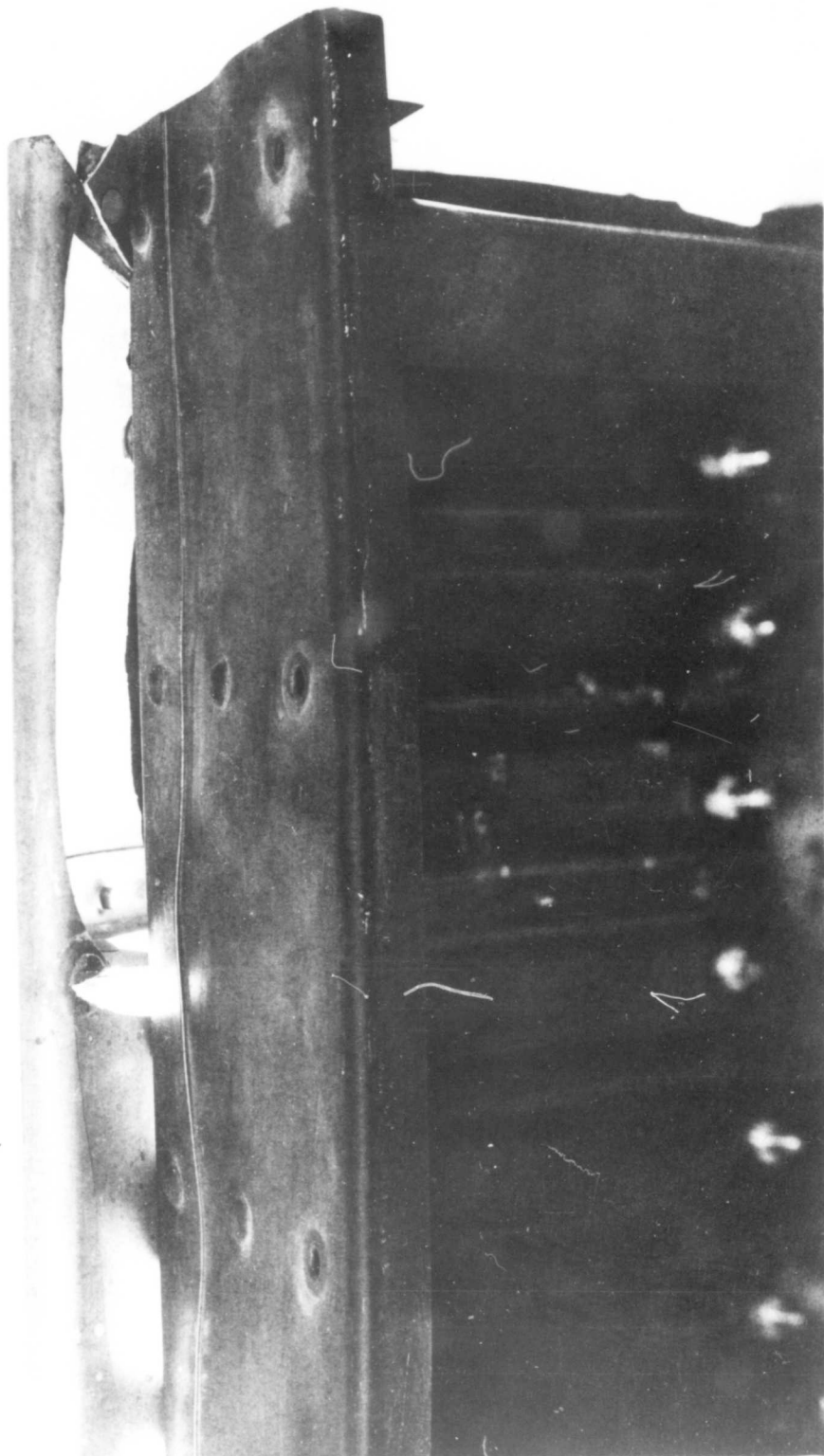
Volume I

Fig. 3-102

PAGE

3-120





25-20376-2 RAPID-LOAD TESTED

U3-4071-1000 (was BAC 1546-L-R3)



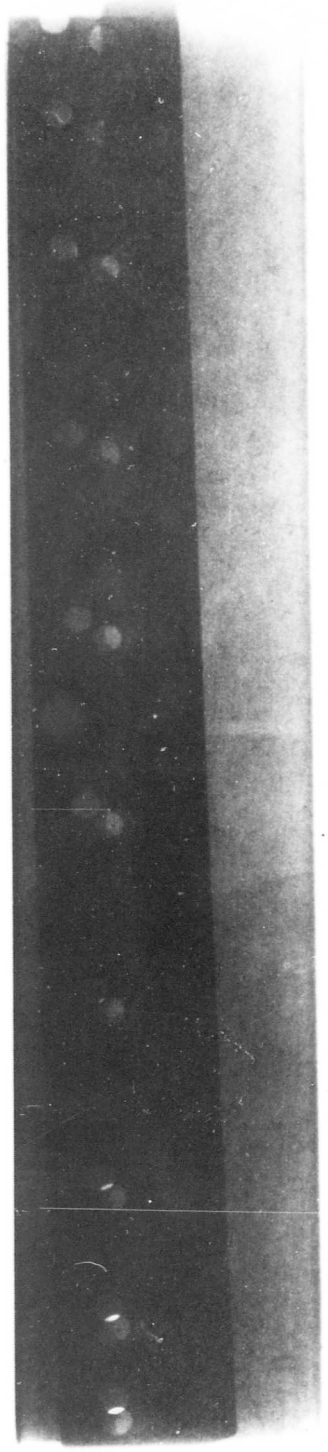
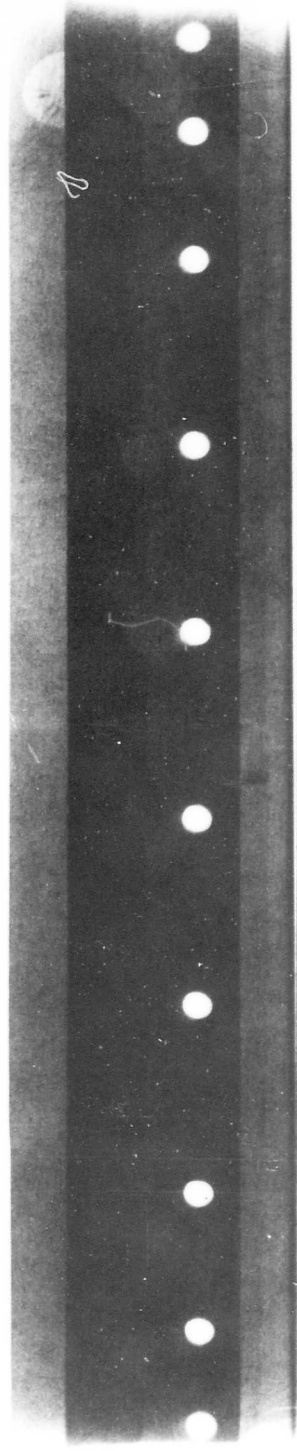
CRACK THROUGH
FIRST BOLT HOLE
(BOTH ENDS OF
SPECIMEN)

NOTE: SPECIMEN IS SHOWN
AFTER FIRST OF TWO LOADINGS.

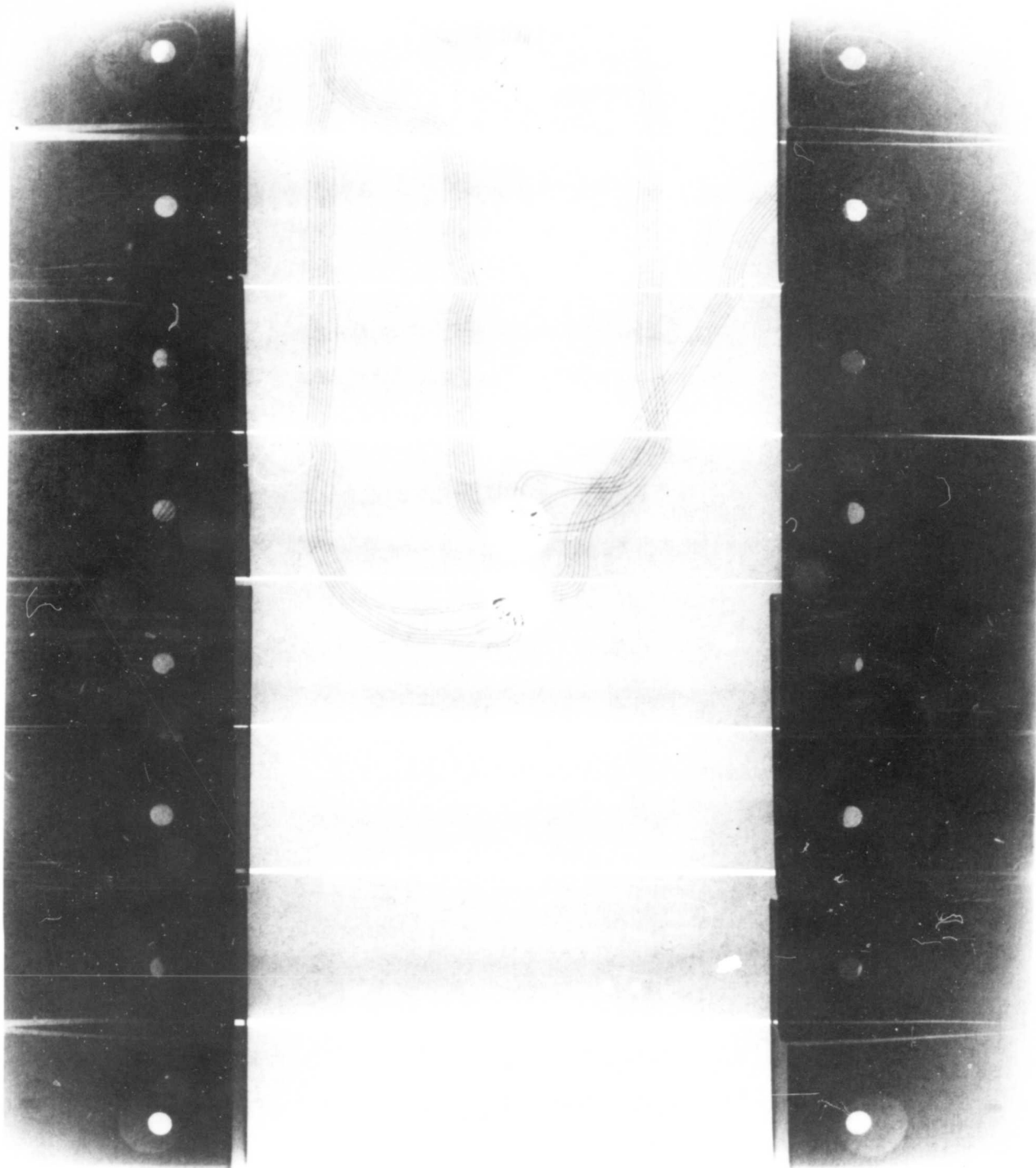
25-20376-2 RAPID-LOAD TESTED



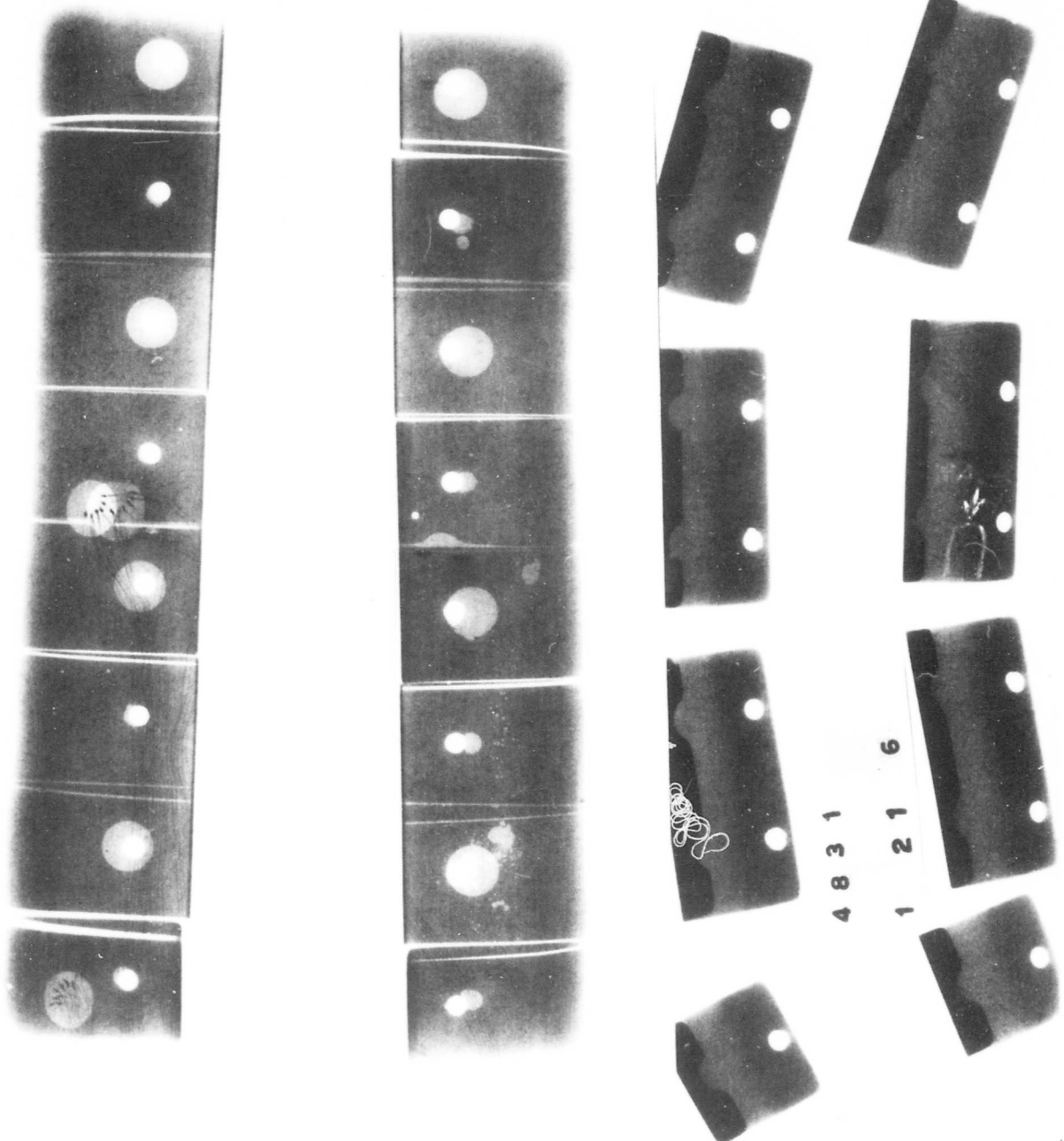
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CHECK						
APPD						BOEING AIRPLANE COMPANY Fig. 3-105
APPD						
						PAGE 3-123



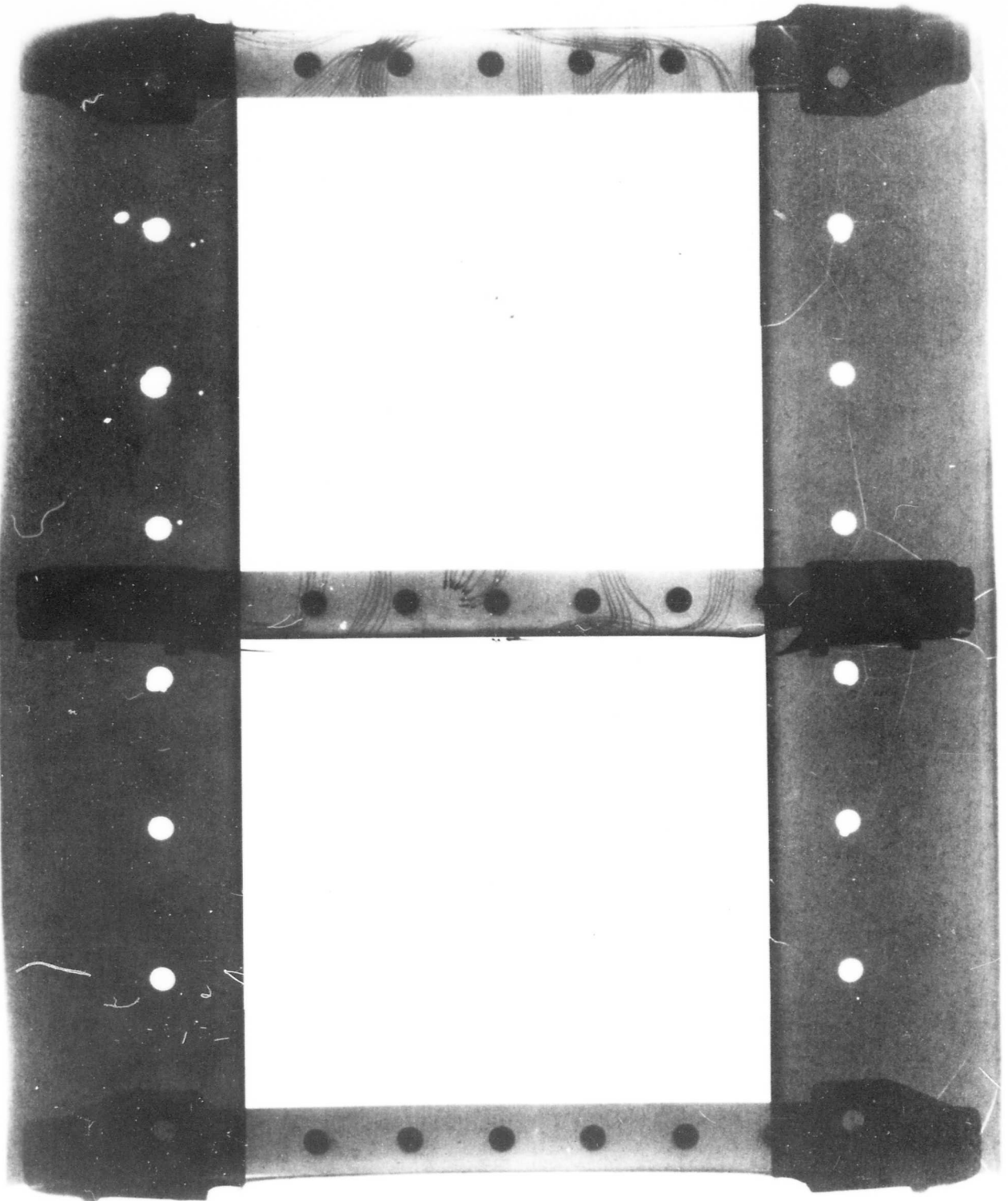
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CHECK						D2-80085
APPD						
APPD						
					BOEING AIRPLANE COMPANY	PAGE 3-124



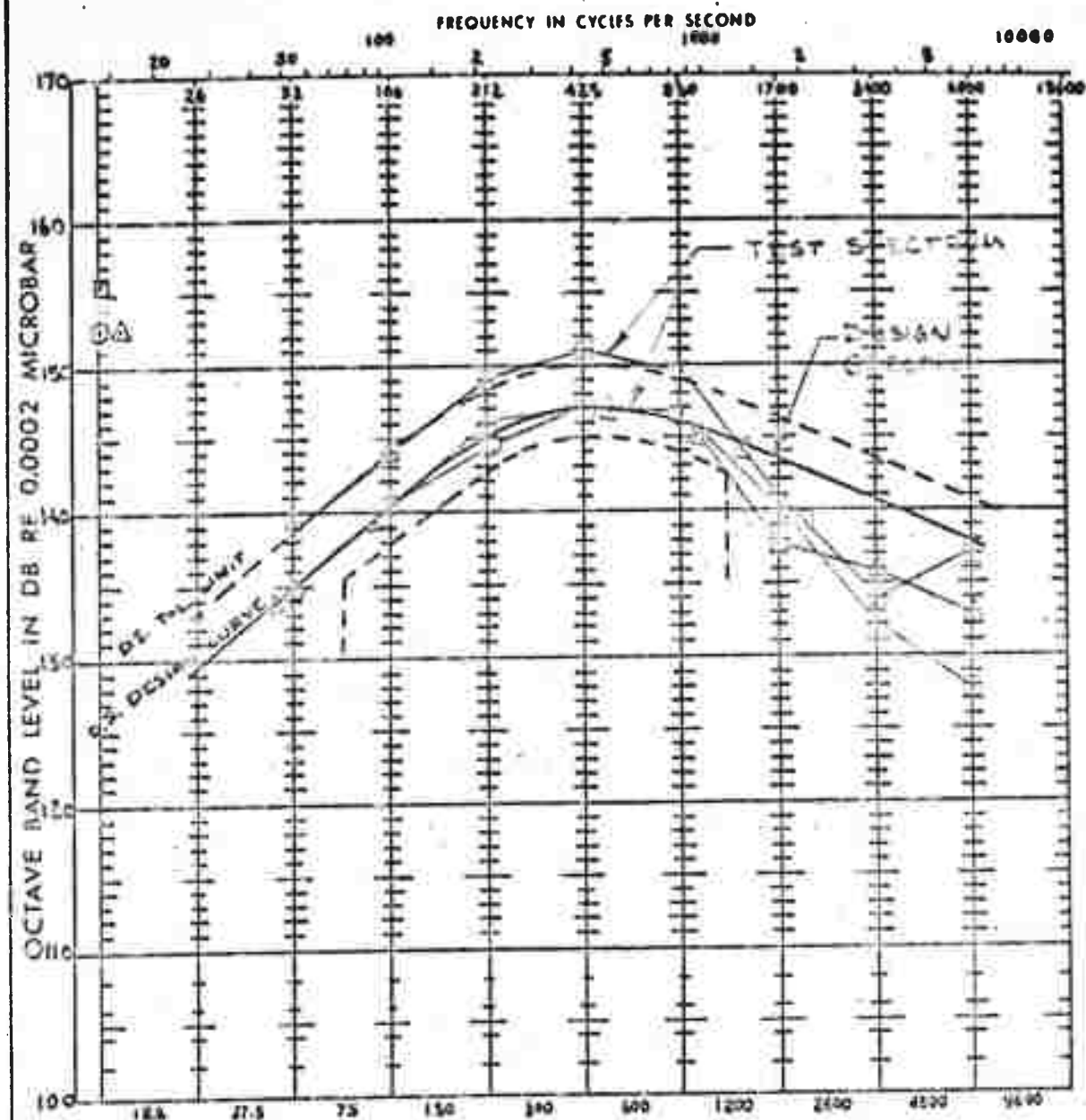
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CHECK						
APPD						D2-80085
APPD						
					BOEING AIRPLANE COMPANY Fig. 3-107	PAGE 3-125



CALC			REVISED	DATE	X-RAY OF LEADING EDGE SPECIMEN 25-20378 AFTER TEST DS-I LEADING EDGE LOAD TESTS	D2-80085
CHECK						
APPD						BOEING AIRPLANE COMPANY Fig. 3-108
APPD						



CALC			REVISED	DATE	X-RAY OF LEADING EDGE SPECIMEN 25-20376 AFTER TEST DS-I LEADING EDGE LOAD TESTS	
CHECK						D2-80085
APPD						
APPD						
					BOEING AIRPLANE COMPANY	PAGE 3-127
					Fig. 3-109	



OVERALL

OCTAVE PASS BANDS IN CYCLES PER SECOND

EQUILIZER SETTINGS

20 - 75	33
75 - 150	19.5
150 - 300	17.0
300 - 600	10.0
600 - 1200	30
1200 - 2400	-1.0
2400 - 4800	∞
4800 - 9600	∞
○ 3.6	40
△ 3.6	40
□ 4.0 AMPS	55 PSI

MIC. #1

25-20372-1

○ PHASE A

△ PHASE B

□ PHASE C

2-5353-7-7

9-3-63

CALC. DR. for A.B. DATE 6/5/63

BOEING

NO. D2-80085

SONIC LAB.

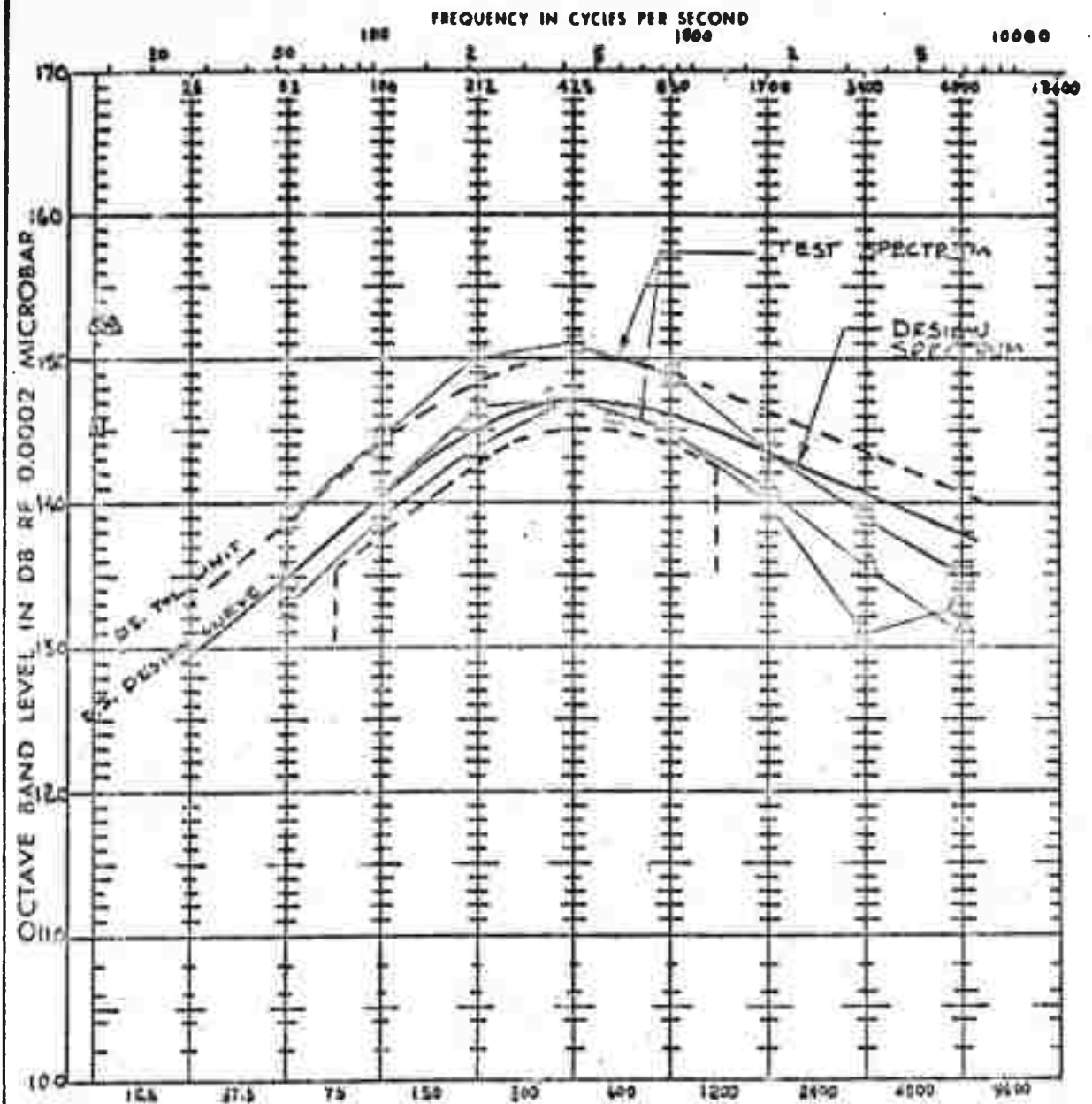
PAGE

2-129

Volume I Sect. 3

FIG. 3-111

EWA



OCTAVE PASS BANDS IN CYCLES PER SECOND		O		Δ		□	
EQUILIZER SETTINGS							
20 - 75		33	33				
75 - 150		19.5	24.0				
150 - 300		17	20				
300 - 600		10	11				
600 - 1200		3.5	3.8				
1200 - 2400		-1.0	-1.0				
2400 - 4800		∞	∞				
4800 - 9600		∞	∞				
O	3.3		36				
Δ	4.0		36				
□	4.2 AMPS		50 PSI				

MIC #1

25-20372-2

O PHASE A

Δ PHASE B

□ PHASE C

2-5353-7-7

9-3-63

CALC DH FOR AB DATE 6/7/63

BOEING

NO. D2-80085

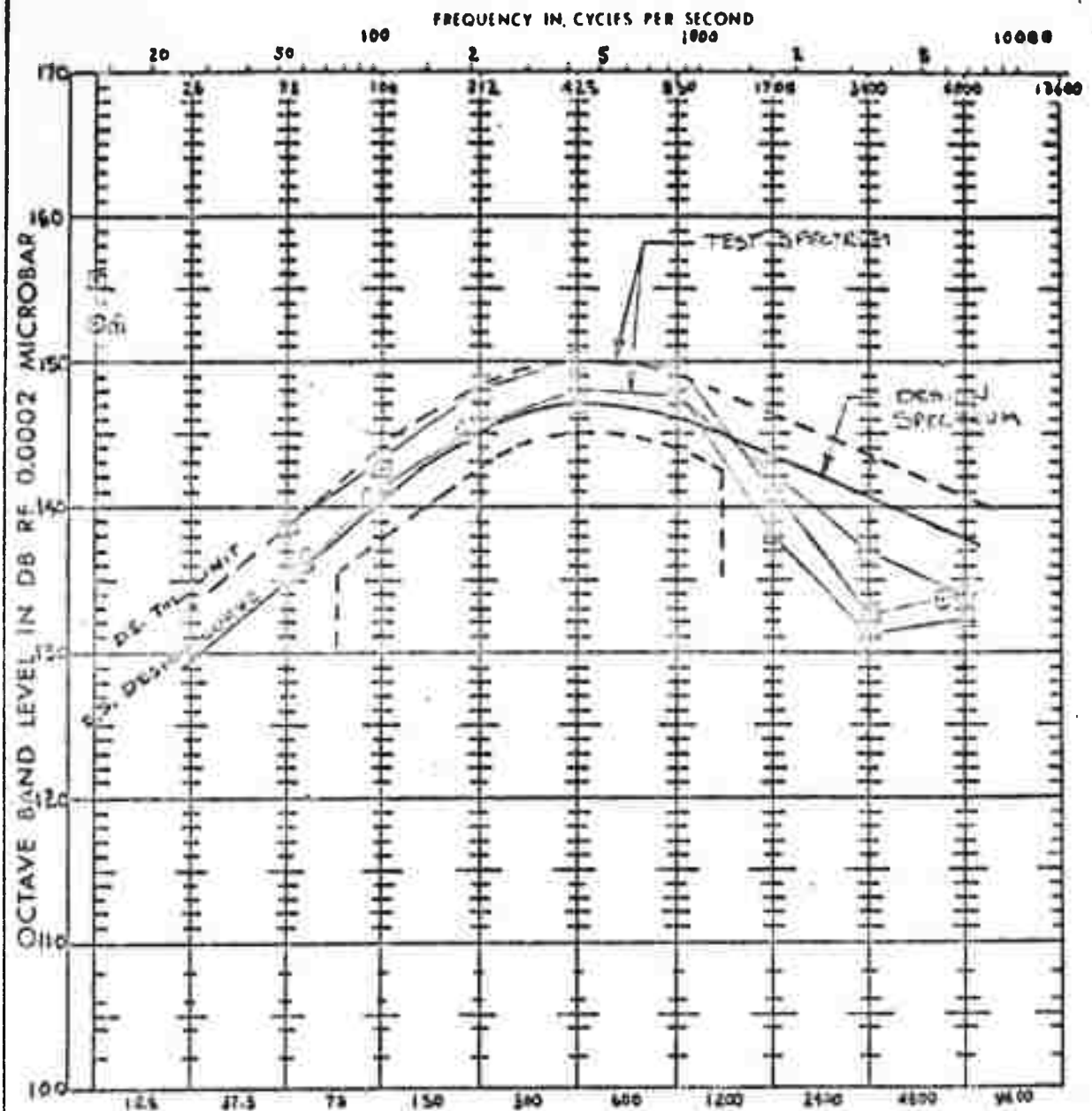
SONIC LAB.

PAGE Fig. 3-112

Volume I

3-130

132



OCTAVE PASS BANDS IN CYCLES PER SECOND		OCTAVE PASS BANDS IN CYCLES PER SECOND	
EQUILIZER SETTINGS		EQUILIZER SETTINGS	
20 - 75	18.0	20 - 75	18.0
75 - 150	15.5	75 - 150	15.5
150 - 300	16.5	150 - 300	16.5
300 - 600	10.0	300 - 600	10.0
600 - 1200	3.5	600 - 1200	3.5
1200 - 2400	-1.0	1200 - 2400	-1.0
2400 - 4800	∞	2400 - 4800	∞
4800 - 9600	∞	4800 - 9600	∞
0 3.4	52	0 3.4	52
Δ —	—	Δ —	—
□ — AMPS	—	□ — AMPS	—

MIC #1

25-20367-1

O PHASE A

Δ PHASE B

□ PHASE C

2-5353-7-7

9-3-63

CALC'D FOR AB DATE 6/7/63

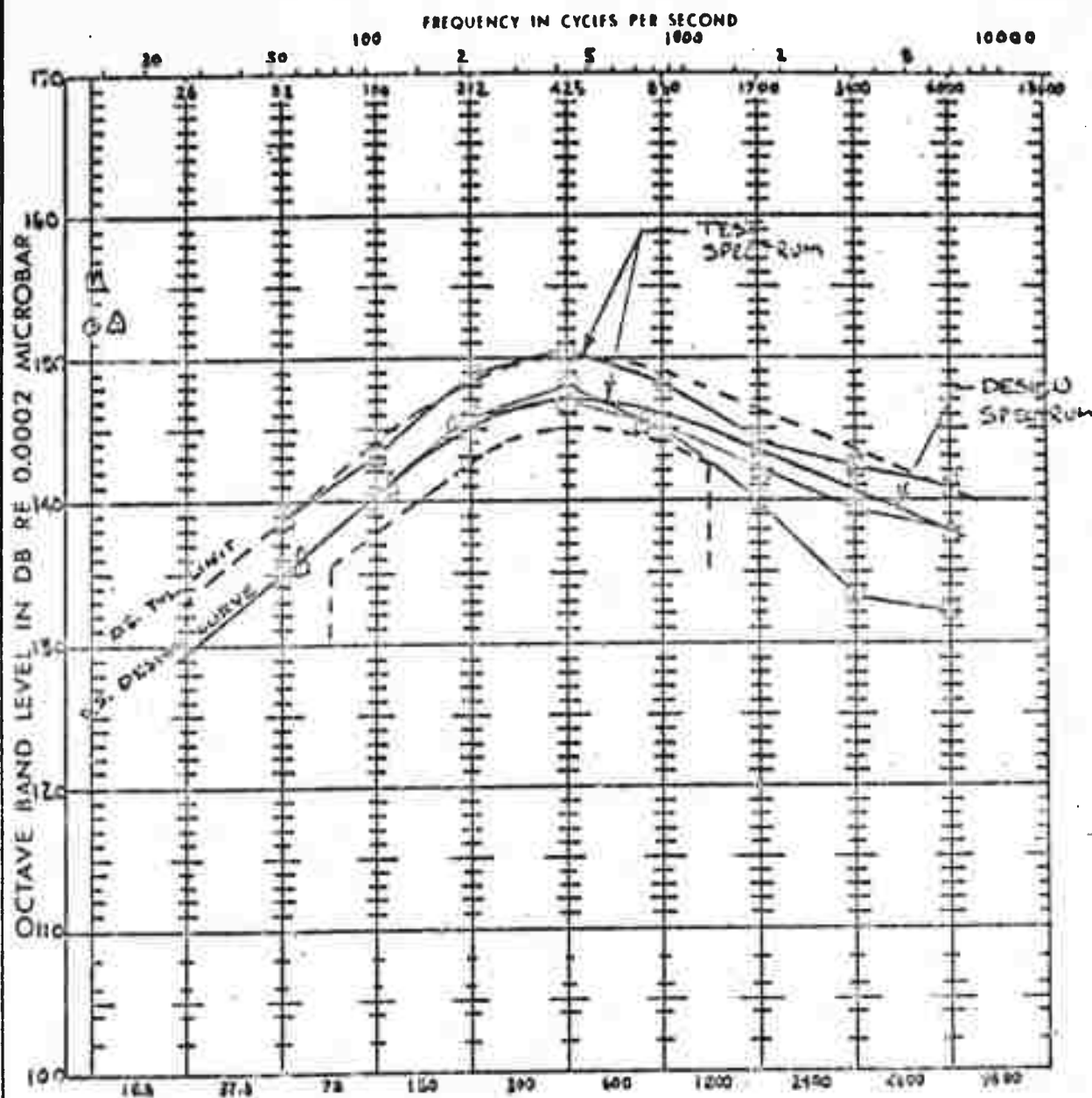
BOEING

NO. 22-80085

SONIC LAB.

PAGE 15. 3-113

Volume I Sect 3



OCTAVE PASS BANDS IN CYCLES PER SECOND	EQUILIZER SETTINGS	
	○	△ □
20- 75	23	29
75- 150	15.5	22
150- 300	16.5	20
300- 600	10	10
600- 1200	7	-1
1200- 2400	-1	-1
2400- 4800	∞	∞
4800- 9600	∞	∞
○ 3.2	40	
△ 4.0	50	
□ 4.0 AMPS	50	PSI

MIC #1
 25-20367-2
 ○ PHASE A
 △ PHASE B
 □ PHASE C

2-5353-7-7

CALC DH FOR AB DATE 6/7/63

BOEING

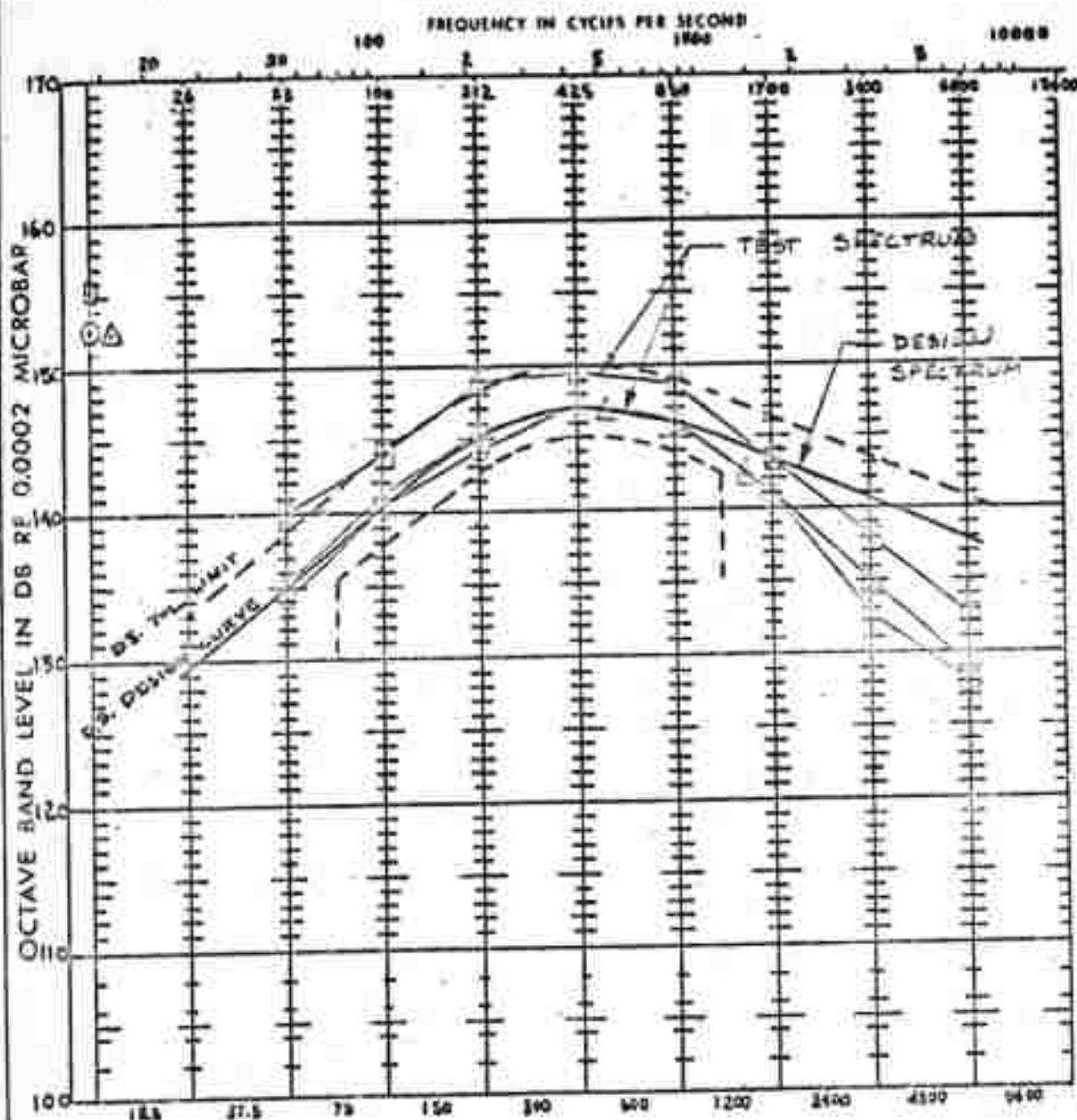
NO. D2-80085

SONIC LAB.

PAGE 16. 3-114

Volume I Sect. 3

E.WA



OVERALL

OCTAVE PASS BANDS IN CYCLES PER SECOND

MIC #1

EQUILIZER SETTINGS

20- 75	28.2
75- 150	19.5
150- 300	17.0
300- 600	10.1
600- 1200	28
1200- 2400	-1.0
2400- 4800	∞
4800- 9600	∞
○ 3.5	40
△ 3.5	40
□ 5.0 AMPS	50 PSI

25-20378-1

○ PHASE A

△ PHASE B

□ PHASE C

2-5353-7-7

9-3-63

CALC DH FOR AB. DATE 6/5/63

BOEING

NO. B2-80085

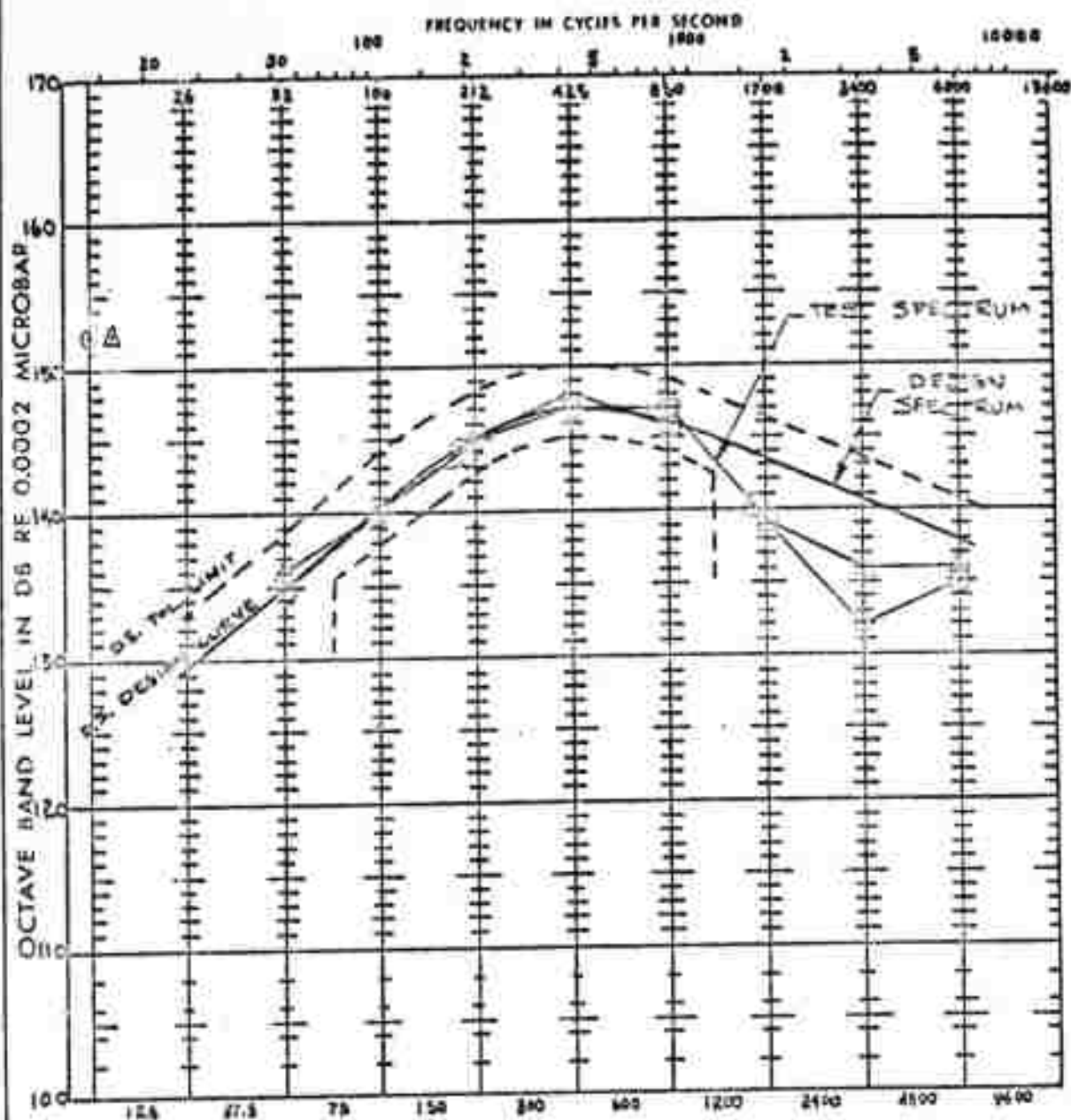
SONIC LAB.

PAGE 115-8. 3-115

Volume T Sect. 3

135-

E.WA



OVERALL

OCTAVE PASS BANDS IN CYCLES PER SECOND

EQUILIZER SETTINGS		O	Δ
20 - 75	75 - 150	23	23.5
150 - 300	300 - 600	15.5	15.3
600 - 1200	1200 - 2400	13	16.0
2400 - 4800	4800 - 9600	10	10.0
		3.5	4.5
		-1	-1
		∞	∞
		∞	∞

MIC #1
 25-2037
 O PHASE A
 Δ PHASE B

O 2.5
 Δ 3.1 AMPS

60
 36 PSI

MIC #1

25-20378-2

O PHASE A

 Δ PHASE B

2-5353-7-7

9-3-63

CALC'D FOR AB DATE 6/7/63

BOEING

NO. D2-20085

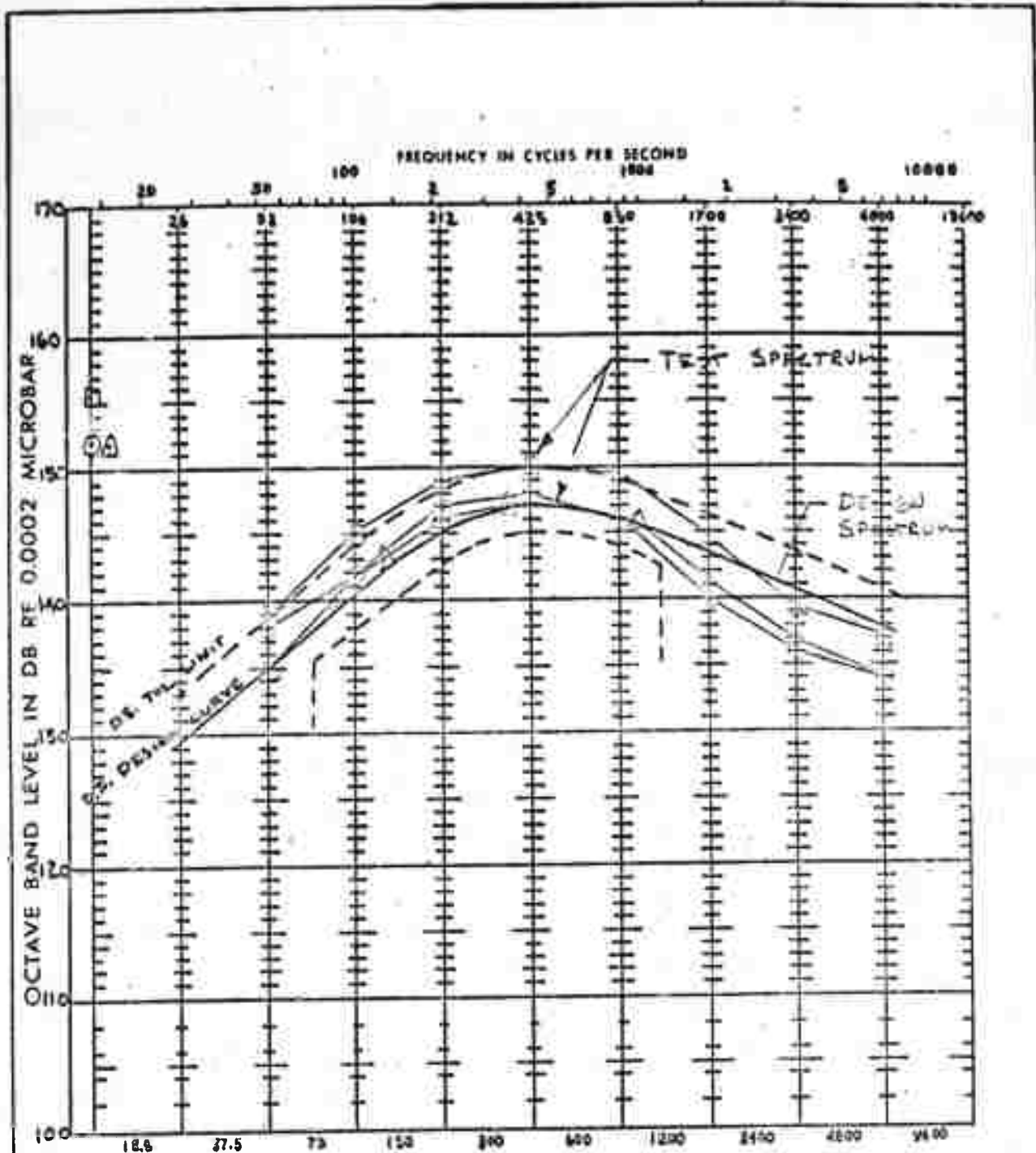
SONIC LAB.

Sect. 3

PAGE 3-134 Fig. 3-116

Volume I

EWA



OVERALL

OCTAVE PASS BANDS IN CYCLES PER SECOND

O Δ □

EQUILIZER SETTINGS

MIC #1

25-20341-1

O PHASE A

Δ PHASE B

□ PHASE C

20 - 75	24.7	23.0
75 - 150	15.5	15.5
150 - 300	13.0	16.5
300 - 600	10.3	12.5
600 - 1200	2.7	7.0
1200 - 2400	-0.8	-1.0
2400 - 4800	∞	∞
4800 - 9600	∞	∞

O	3.5	35	
Δ	3.4	52	
□	4.2 AMPS	52	PSI

PER BANK OF 2 TRANSDUCERS
(2 BANKS)

2-5353-7-7

9-3-63

CALC DH FOR AB DATE 6/7/63

BOEING

NO. DL-00085

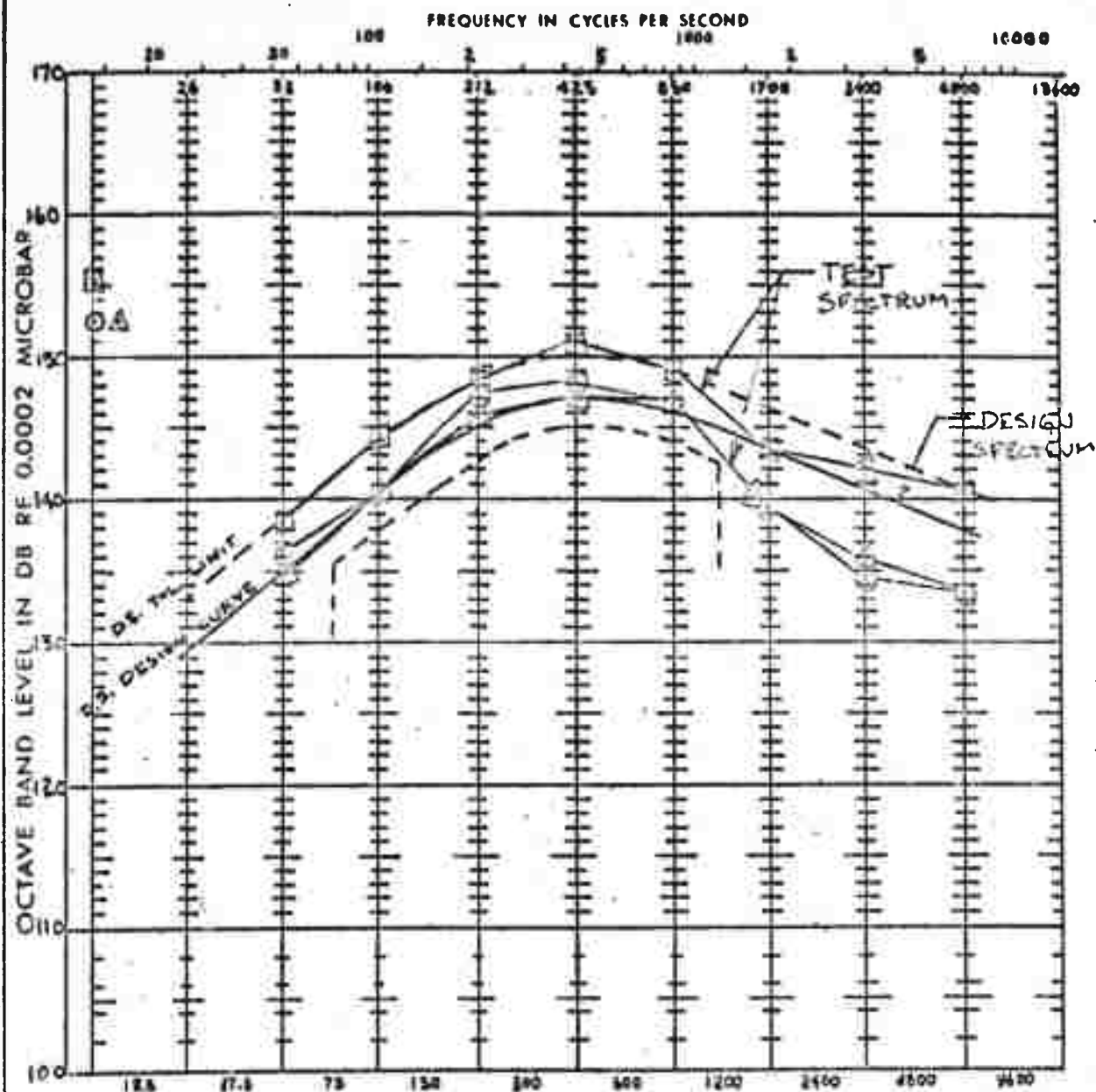
SONIC LAB.

PAGE 3-117

Sect. 3

Volume I

E.WA



OCTAVE PASS BANDS IN CYCLES PER SECOND			
EQUILIZER SETTINGS			
20 - 75	19	24	33
75 - 150	13	16	20.2
150 - 300	13	13	23.5
300 - 600	10	10	10.0
600 - 1200	3	3	-3
1200 - 2400	-1	-1	.7
2400 - 4800	∞	∞	∞
4800 - 9600	∞	∞	∞
0	2.2	50	
Δ	3.2	50	
□	AMPS		PSI

MIC #1

25-20341-2

O PHASE A

Δ PHASE B

□ PHASE C

2-5353-7-7

9-3-63

CALC DHFRAB DATE 6/7/63

BOEING

NO. D2-80085

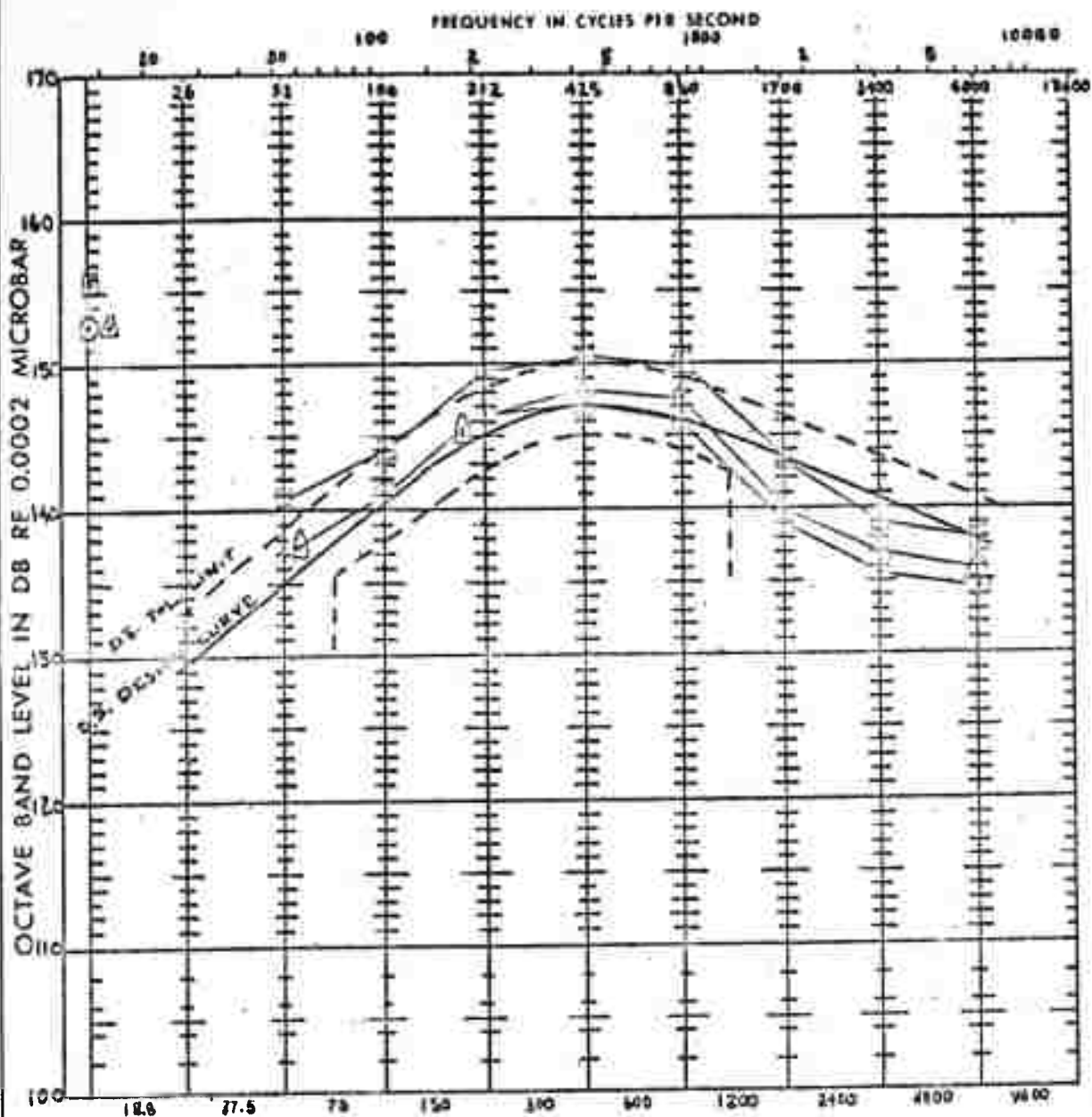
SONIC LAB.

PAGE FIG. 3-118

Volume I Sect. 3

3-136

EWA



OCTAVE PASS BANDS IN CYCLES PER SECOND		OCTAVE PASS BANDS IN CYCLES PER SECOND	
EQUILIZER SETTINGS		EQUILIZER SETTINGS	
20 - 75	23.0	23	
75 - 150	18.3	18	
150 - 300	13.0	10	
300 - 600	10.1	3	
600 - 1200	2.8	-1.0	
1200 - 2400	-1.0	8	
2400 - 4800	8	8	
4800 - 9600	8	8	
○ 4.0	50		
△ 4.0	50		
□ 4.3 AMPS	50	PSI	

MIC #1

20376-1

○ PHASE A

△ PHASE B

□ PHASE C

2-5353-7-7

9-3-63

CALC D4 FOR A.B. DATE 6/7/63

BOEING

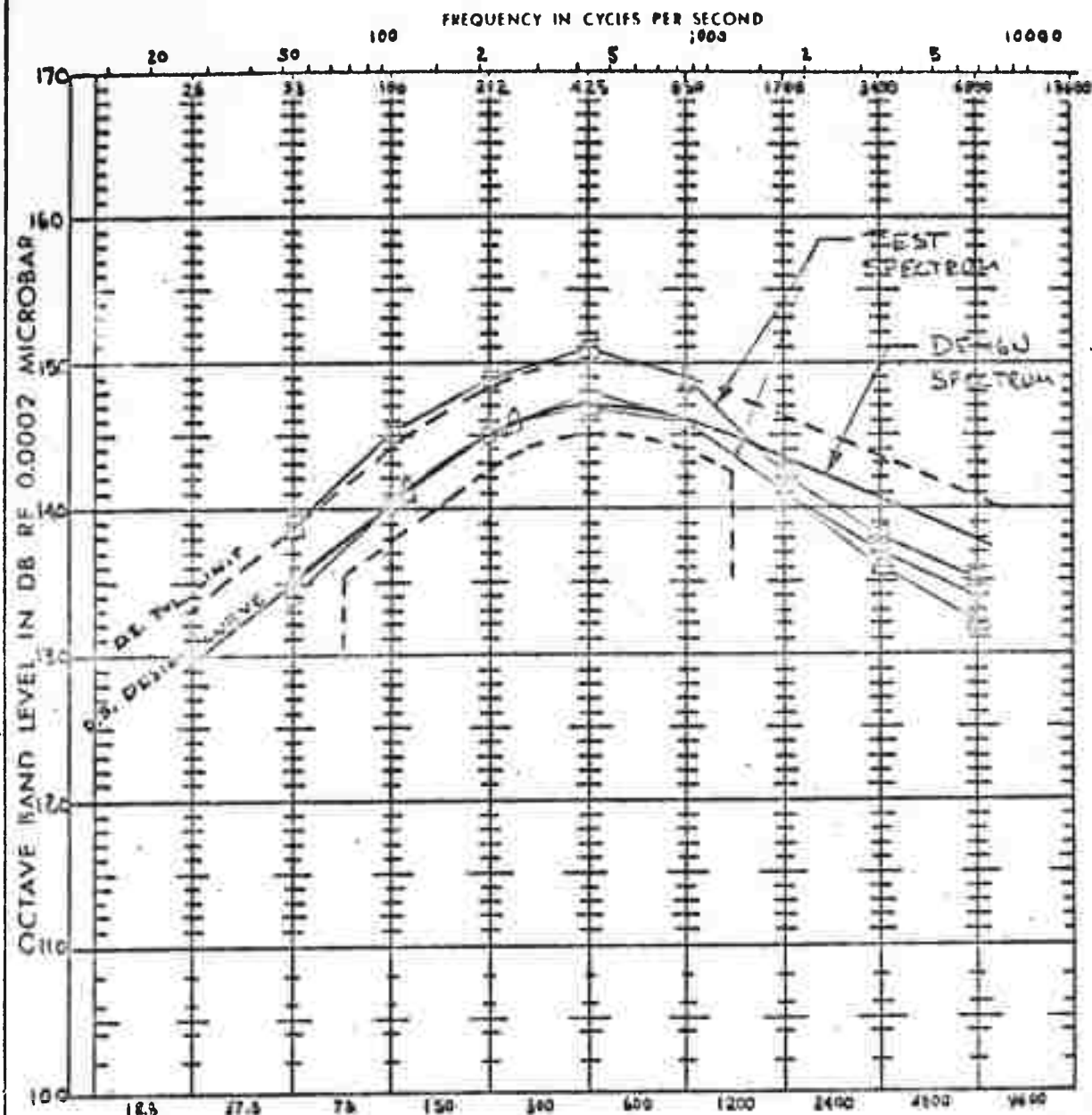
NO. D2-80085

SONIC LAB.

PAGE 3-119

Volume I Sect. 3

139



OCTAVE PASS BANDS IN CYCLES PER SECOND	EQUILIZER SETTINGS	
	0	Δ
20-75	23	28
75-150	15.5	21.5
150-300	16.5	22.0
300-600	10.0	11.7
600-1200	7.0	-1.0
1200-2400	-1.0	-1.0
2400-4800	∞	∞
4800-9600	∞	∞
0	3.4	52
Δ	4.5	50
□	- AMPS	50 PSI

MIC #1

25-20376-2

O. PHASE A

Δ PHASE B

□ PHASE C

2-5353-7-7

9-3-63

CALC DN FOR AB DATE 6/7/63

BOEING

NO. D2-90085

SONIC LAB.

PAGE 3-120

Volume I

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