



S-3A BALLAST BLOCK FINAL DESIGN AND ENGINEERING TESTS

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22 FEBRUARY 1984

NADC
Tech. Info.

19970605 009

DRUG QUALITY IMPROVED

FINAL REPORT
AIRTASK NO. F41400

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Prepared For
NAVAL AIR SYSTEMS COMMAND
Department of the Navy
Washington, DC 20361

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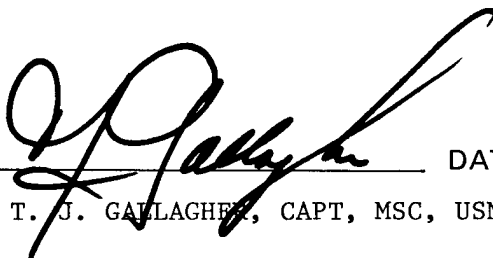
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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NADC-84015-60	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) S-3A Ballast Block Final Design and Engineering Tests		5. TYPE OF REPORT & PERIOD COVERED FINAL REPORT
7. AUTHOR(s) Dan Lorch and John Quartuccio		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Aircraft and Crew Systems Technology Directorate Naval Air Development Center Warminster, PA 18974		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS Naval Air Systems Command Code 5113K, Department of the Navy Washington, DC 20361		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS NAVAIR Task No. A059-44/ 001-2/1244-000-615
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE 22 February 1984
		13. NUMBER OF PAGES
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report)		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) Approved for Public Release; Distribution Unlimited		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) S-3A Aircraft Ejection Seats Escapac Seat Ballast Block		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The S-3A Ballast Block is a 169 pound (77 Kg) assembly of four (4) interlocking aluminum blocks. It is used to control the trajectory of an unoccupied 1E-1 ejection seat. Tests indicate that it meets all functional and structural requirements for use in the S-3A aircraft. It provides a simple cost effective replacement for anthropomorphic dummies presently being used as ballast.		

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S/N 0102- LF- 014- 6601

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

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SUMMARY

The third prototype S-3A Ballast Block weighs 169 pounds (77 Kg). It is an assembly of four interlocking aluminum blocks. One crewman can carry two blocks at a time into the aircraft where he can quickly assemble the unit either on the 1E-1 ejection seat or on the avionics aisleway step. Restraint on the ejection seat is obtained by connecting the four quick disconnect adjuster fittings on the ejection seat to fittings on the Ballast Block. When the Assembly is placed on the avionics aisle steps it is restrained with two aluminum locking plates which are bolted to the top block. These plates extend beyond the edges of the block and fit into keyways on either side of the main bulkhead forgings directly behind the aft ejection seats.

When the Block is secured on the 1E1-1 seat the overall center of gravity falls 0.72 inches below the centerline of rocket thrust. The Ballast Block meets all operational and structural requirements for safe function in the aircraft. It can be maintained at the Operational level; the only parts that may need replacement are straps which are readily available.

The S-3A Ballast Block provides a simple and cost effective replacement for anthropomorphic dummies presently being used to ballast unoccupied 1E1 ejection seats.

INTRODUCTION

BACKGROUND

The S-3A aircraft has (4) ejection seats. Both the pilot and copilot have Command Eject Selector levers which allow them the option to eject all crewmembers or "Self Eject." If one of the aft seats is unoccupied, and "Command Eject" is selected, the unoccupied seat will accelerate ahead of the occupied seat next to it. Two hazards exist; first, the crewmember next to the unoccupied seat could be burned by the rocket plume from the empty seat which has a higher acceleration; second, the empty seat could tumble into one of the other seats because the center of gravity and the center of rocket thrust are too far apart. To eliminate these hazards it is necessary to ballast the unoccupied seat. This is presently being done with anthropomorphic test dummies, if they can be obtained. Unfortunately these dummies have various weights and are usually damaged (i.e. arms, legs, or head missing). There is no guarantee that the center of gravity is in the proper location to prevent tumbling. To correct this potentially dangerous situation the Naval Air Systems Command tasked the Naval Air Development Center to design a ballast block. After the initial prototype was developed and tested, references (1) and (2) recommended changes to be incorporated into the final design. All of these recommendations have been incorporated into the final design.

DESCRIPTION OF FINAL DESIGN

The S-3A Ballast Block is an assembly of four (4) interlocking aluminum blocks that can be strapped into an ESCAPAC 1E-1 seat and can also be securely stored in the aisle on the avionics bay step of the S-3A aircraft (figures 1 & 2).

Two blocks at a time can be carried by one man (figure 3). Each block weighs about 42 pounds (19 Kg).

Straps on the top and bottom blocks have quick disconnect fittings that mate with the parachute/inertia reel straps and with the survival kit straps to mount the assembly on the 1E1 ejection seat (figure 11).

Each block has a handle and a finger ledge on two sides that enable the crewmember to assemble the blocks on the seat without danger of pinching fingers (figure 4).

The center of gravity of the block/seat assembly falls less than one inch (three centimeters) below the center of the rocket thrustline (figure 29).

Aluminum is used to make the assembly antimagnetic so as not to interfere with submarine detection systems.

Each block is stenciled with its number to simplify assembly (figure 1).

Two locking plates are bolted to the top block. They are used to lock the assembly in the aisle position for catapult, arrestment, and flight loads (figure 19).

DISCUSSION AND TEST RESULTS

After the second prototype S-3A Block Assembly (reference 1) was tested at the Naval Air Test Center several problems were uncovered (reference 2);

- a. The method for stowing the assembly in the aircraft aisle was not adequate.
- b. Steel blocks could possibly interfere with the aircraft Magnetic Anomaly Detector (MAD) system.

A third prototype Block was designed and fabricated using aluminum. It also was taken to the Naval Air Test Center for fit and function tests. In addition, static loads were placed on the assembly to determine if the seat restraint straps and the aisle restraint plates were adequate for 10 G crash, catapult, arrestment, and flight loads.

The final configuration of the Ballast Block is shown on the drawings (figures 21 through 28). It differs from the tested assembly as follows;

- a. The final design does not incorporate a rear finger ledge on each block because the crewmen did not use it during evaluation: this ledge was machined into the test blocks.
- b. The final — 1 block is 14.12 inches long in order to completely span the Avionics Bay step; the test — 1 block was 13.0 inches long.

These changes will improve the performance of the assembly by increasing its weight, and shifting the center of gravity a bit closer to the rocket thrustline.

CENTER OF GRAVITY TEST (figure 4)

Through a series of ESCAPAC seat suspension tests and mathematical calculations the eccentricity of the 1E1-1 seat/ballast block center of gravity was determined to lie 0.72 inches (1.8 cm) below the rocket thrustline (figure 29). Since the STAPAC rocket is capable of maintaining pitch stabilization of the seat up to an eccentricity of 2.0 inches (5.1 cm) the seat should be adequately stabilized.

The 1E1 ejection seat was designed so that the MK16 rocket thrustline lies about one inch below the seat/50 percentile-man center of gravity. During catapult acceleration the overall center of gravity will shift close to the rocket thrustline to minimize the torque rotating the seat. It is expected that the Ballast Block Assembly will not shift more than 1/8 inch (0.3 cm) downward during the catapult acceleration, and therefore the seat/block center of gravity will shift about half of this amount.

Pitch stabilization is further enhanced due to the lower moment of inertia of the seat/block compared to that of a seat/human, therefore the STAPAC rocket will have greater control on the seat at lower air speeds. At high airspeeds the aerodynamic forces control the seat trajectory more than the rocket force.

CENTER OF GRAVITY OF 1E-1 SEAT WITH S-3A BALLAST BLOCK

TEST CONDITIONS:

1. Ballast Block assembly tested without fore and aft extensions on bottom block.
2. IG-2 ESCAPAC seat used with parachute, empty RSSK, and empty catapult.
3. All measurements made from lower seat roller; Z along roller centerline.

DATA:

Weight of Ballast Block $W_B = 164.0$ pounds

Weight of IG-2 seat $W_{IG-2} = 108.3$

Weight of 1E-1 seat complete (empty) $W_{1E-1} = 146.9$

C.G. of IG-2 seat with Block $\begin{matrix} X \\ (12.9, 14.7) \end{matrix}$ inches

C.G. of IG-2 seat empty $(7.9, 17.2)$

C.G. of 1E-1 seat complete (empty) $(7.9, 15.0)$

MK 16 Rocket thrustline intercepts roller centerline 6.8 inches above bottom roller; 57 degrees from roller centerline

CALCULATIONS:

I LOCATION OF BLOCK C.G. RELATIVE TO BOTTOM ROLLER OF IG-2 SEAT

$$W_{IG-2} \cdot X_{IG-2} + W_B \cdot X_B = W_{IG-2/B} \cdot X_{IG-2/B}$$

$$(108.3) 7.9 + 164.0 X_B = (108.3 + 164.0) 12.9$$

$$X_B = 16.2$$

$$W_{IG-2} \cdot Z_{IG-2} + W_B \cdot Z_B = W_{IG-2/B} \cdot Z_{IG-2/B}$$

$$(108.3) 17.2 + 164.0 Z_B = (108.3 + 164.0) 14.7$$

$$Z_B = 13.0$$

II LOCATION OF 1E-1 SEAT/BALLAST BLOCK CENTER OF GRAVITY

$$W_{1E-1} \cdot X_{1E-1} + W_B \cdot X_B = W_{1E-1/B} \cdot X_{1E-1/B}$$

$$(146.9) 7.9 + (164.0) 16.2 = (146.9 + 164.0) X_{1E-1/B}$$

$$X_{1E-1/B} = 12.3$$

$$W_{1E-1} \cdot Z_{1E-1} + W_B \cdot Z_B = W_{1E-1/B} \cdot Z_{1E-1/B}$$

$$(146.9) 15.0 + (164.0) 13.0 = (310.9) Z_{1E-1/B}$$

$$Z_{1E-1/B} = 13.9$$

III. ROCKET THRUST ECCENTRICITY WITH 1E-1 SEAT/BLOCK CENTER OF GRAVITY

$$\begin{aligned}
 \text{slope of rocket thrustline} & \quad m = \tan (90^\circ - 57^\circ) = .649 \\
 \text{slope of perpendicular to thrustline} & \quad m_{\perp} = -\frac{1}{m} = -\frac{1}{.649} = -1.54 \\
 \text{rocket thrustline equation} & \quad Z = 0.649 x + 6.8 \\
 \text{line perpendicular to thrustline thru 1E-1/block C.G.} & \\
 & \quad Z = -1.54 x + b \\
 & \quad 13.9 = -1.54 (12.3) + b \\
 & \quad b = 32.8 \\
 & \quad Z = -1.54 x + 32.8
 \end{aligned}$$

INTERCEPT OF BOTH LINES (ROCKET THRUST AND PERPENDICULAR)

$$\begin{aligned}
 \left\{ \begin{array}{ll} Z = 0.649 x + 6.8 & Z = 0.649 (11.9) + 6.8 \\ Z = -1.54 x + 32.8 & Z = 14.5 \text{ inches} \end{array} \right. \\
 2.19 x = 32.8 - 6.8 \\
 X = 11.9 \text{ inches}
 \end{aligned}$$

C.G. ECCENTRICITY

$$\begin{aligned}
 e &= [(Z_2 - Z_1)^2 + (X_2 - X_1)^2]^{1/2} \\
 e &= [(14.5 - 13.9)^2 + (11.9 - 12.3)^2]^{1/2} \\
 e &= 0.72 \text{ inches below thrustline}
 \end{aligned}$$

ASSEMBLY AND DISASSEMBLY ON THE 1E-1 SEAT AND ON THE AISLE STEP

Two blocks at a time can be carried to the aircraft by one crewmember (figure 3).

The first block (-1 Block) should be placed on the RSSK-8A survival kit so that the aft tabs rest against the survival kit back fittings (figure 8). After the other three blocks are stacked onto the seat (figure 9) the shoulder restraint straps are routed up through the block handles and connected to the parachute risers (figures 10,11). Then the 'lap belt' on the top block is connected to the survival kit straps (figures 12, 13). All straps are then tightened, and the inertia reel lever is placed in the 'lock' position.

When the Assembly is to be stowed on the avionics aisle step the -1 Block is placed with the handle towards the aircraft's port side, and the block tangs slide under the lip of the step bulkhead (figure 14). The other three blocks are then stacked on top (figures 15, 16, 17), then the top locking plates are slid into the bulkhead forgings and secured by the two wing nuts (figures 18, 19, 20).

EJECTION SEAT STATIC LOADS

The existing seat lap belt/shoulder harness straps are used to restrain the Ballast Block Assembly. Since these straps are qualified for crash loads it was decided that one test would be sufficient to verify structural integrity of the assembly on the seat.

Forward — A forward load of 1000 pounds was applied to the block assembly simulating a -6 Gx arrested landing; no problems were encountered (figure 5).

Aft — When subjected to catapult loads the Block Assembly is prevented from moving aft by the lap belt strap and seat back. No test was conducted.

Vertical — For vertical loads the Assembly is restrained by the lap belt and seat bucket which are capable of handling all Gz flight or crash design loads on the aircrewman. No test was conducted.

Lateral — Lateral stability is assured by the bottom block side tabs (figure 8) which limit the block center of gravity movement to about 1/2 inch (1.3 cm); this translates to less than 1/4 inch (0.6 cm) of seat/block center of gravity movement. No test was conducted.

AISLE POSITION STATIC LOADS

Aft (Catapult) Loads (figure 6) — A ratchet winch was used to place a 1000 pound aft load on the block assembly to simulate a +6 Gx catapult launch. No problems were encountered.

Forward (Arrestment) Loads — No test was conducted because the Block Assembly contacts the lower section of the avionics bay bulkhead. The entire center aircraft structure would have to fail before the Block Assembly could break loose.

Upward (-Gz) Flight Loads (figure 7) — A ratchet winch was used to place a 500 pound upward load on the Assembly to simulate a -2Gz flight load. This exceeds the design flight loads of the aircraft. No problems were encountered.

Side ($\pm$ Gy) Loads (figure 20) — The aisle locking plates limit the lateral motion of the top block to $\pm 1/4$ inch (1 centimeter). The bottom block is limited to the same motion before contacting the sides of the aisle. No tests were necessary.

Downward (+Gz) Crash Loads — There is a requirement that all new equipment installed in the aircraft must be capable of withstanding a crash load of 10G without breaking loose from its support points. Since the bottom block of the assembly completely spans the avionics bay step the foam core aluminum step has no bending loads. All the load can easily be taken into the angles which support the step (figure 14). Even if the step should fail the Block Assembly would be limited in its vertical motion because of the electronic equipment directly beneath the step. No actual test was conducted.

CONCLUSIONS

1. The S-3A Ballast Block meets all operational and structural requirements for safe utilization in the aircraft.
2. The Ballast Block provides a simple and cost effective replacement for the anthropomorphic dummies presently being used to ballast unoccupied 1E-1 ejection seats.

ACKNOWLEDGEMENTS

Special thanks are due to CMDR Dick Asbell (Air 5113K), the sponsor of this project, for his guidance; to the personnel of the Naval Air Test Center responsible for test and evaluation, LT. CMDR Dave Architzel, CMDR R. H. Johnston, and Bob Rogers; to the NADC shop personnel for their design improvements and an excellent job of fabrication, Bill Funkbeiner, R. Pete Butkus, and John Rudolph.

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1. Lorch, Dan, 4 Nov 1981, Development of An Ejection Seat Ballast Block for the S-3A Aircraft, Report No. NADC-81272-60 Naval Air Development Center, Warminster, PA 18974.
2. Stark, G/Sparks, T., AME 1, July 1981 Feasibility Evaluation of Proposed S-3A Aircraft Ejection Seat Ballast Block Report No. SY-62R-82 Naval Air Test Center, Patuxent River, MD 20670.

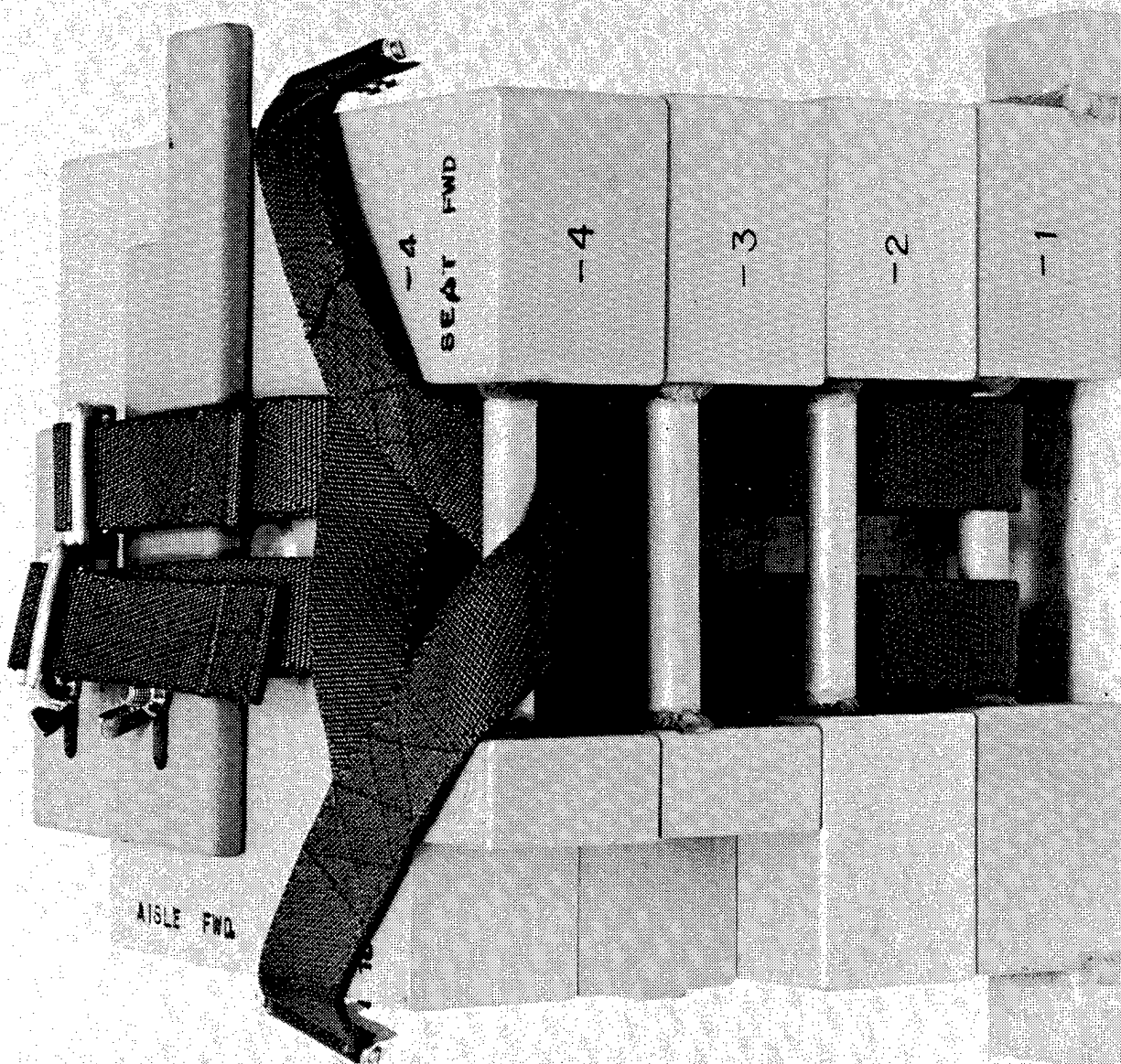


Figure 1. S-3A Ballast Block Assembled

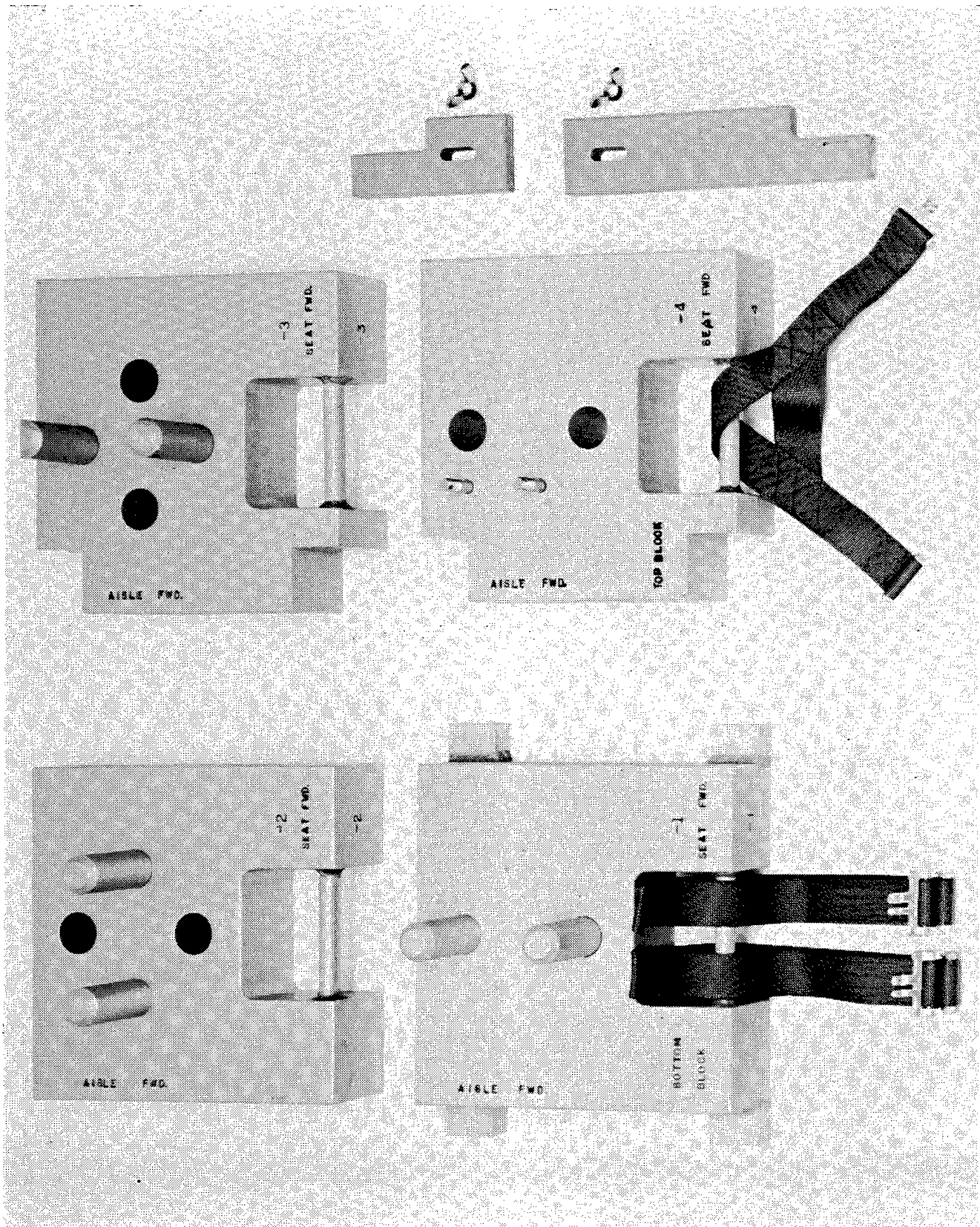


Figure 2. S-3A Ballast Block Disassembled

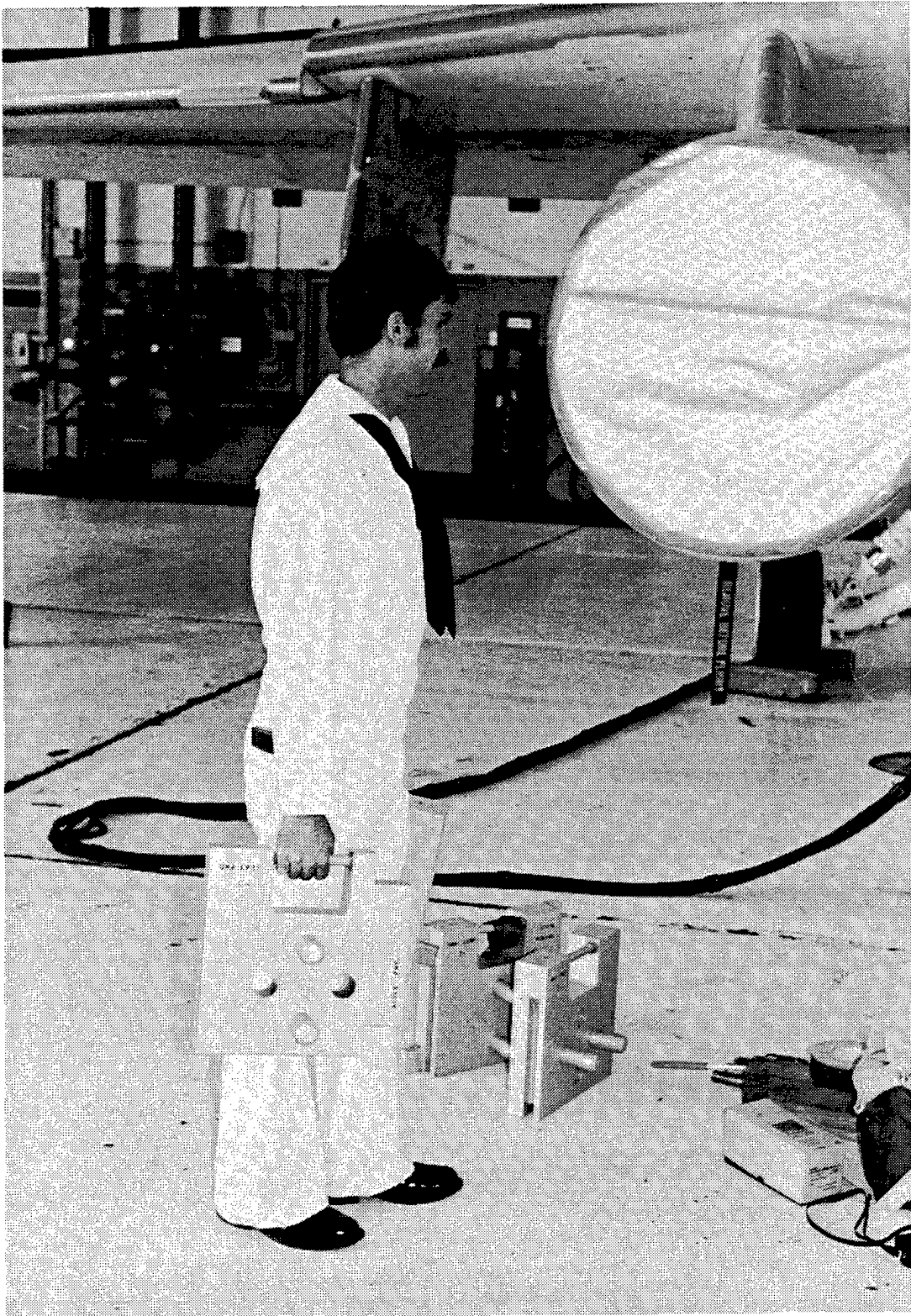


Figure 3. Crewman Carrying Ballast Block Components

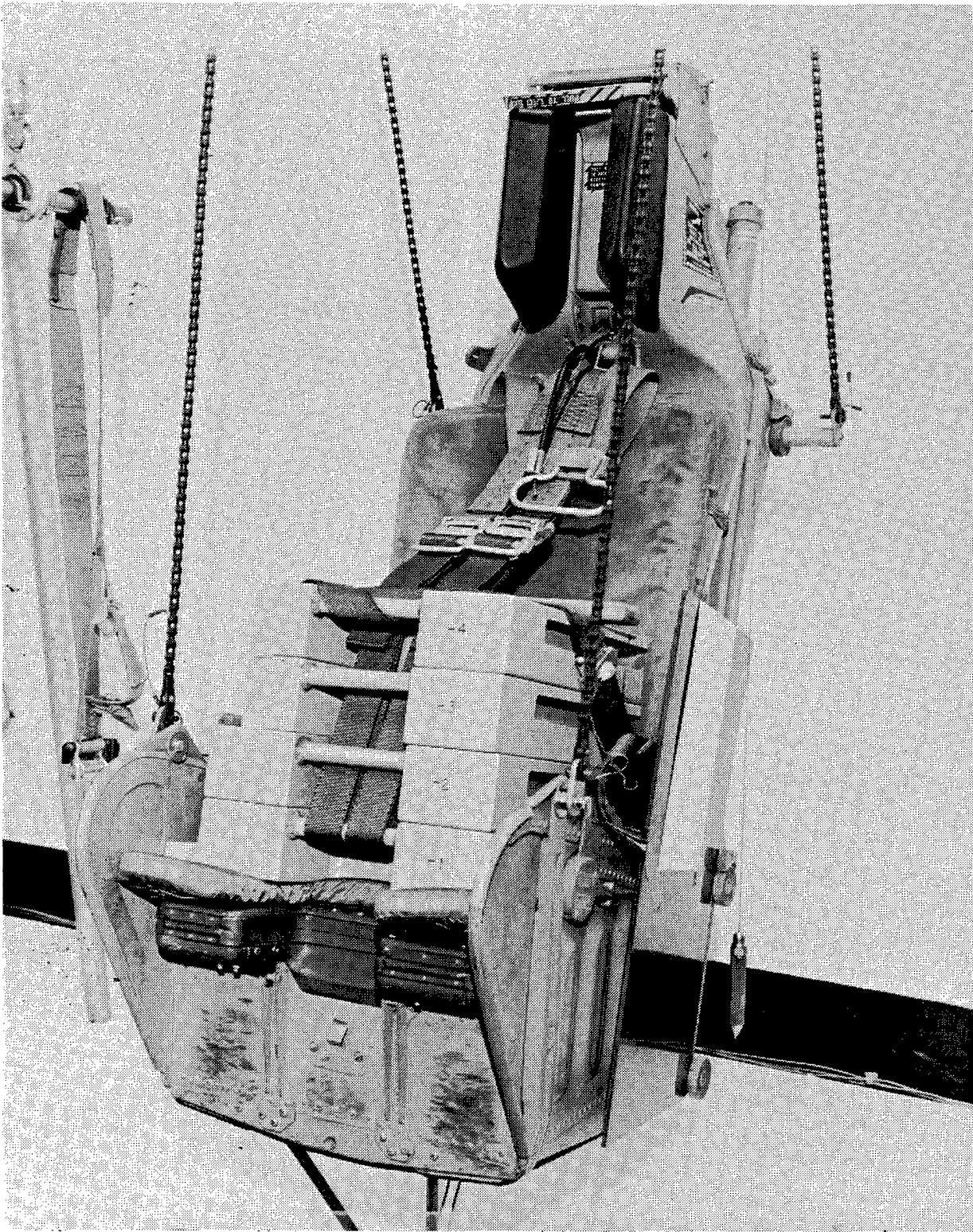


Figure 4. Center of Gravity Measurement

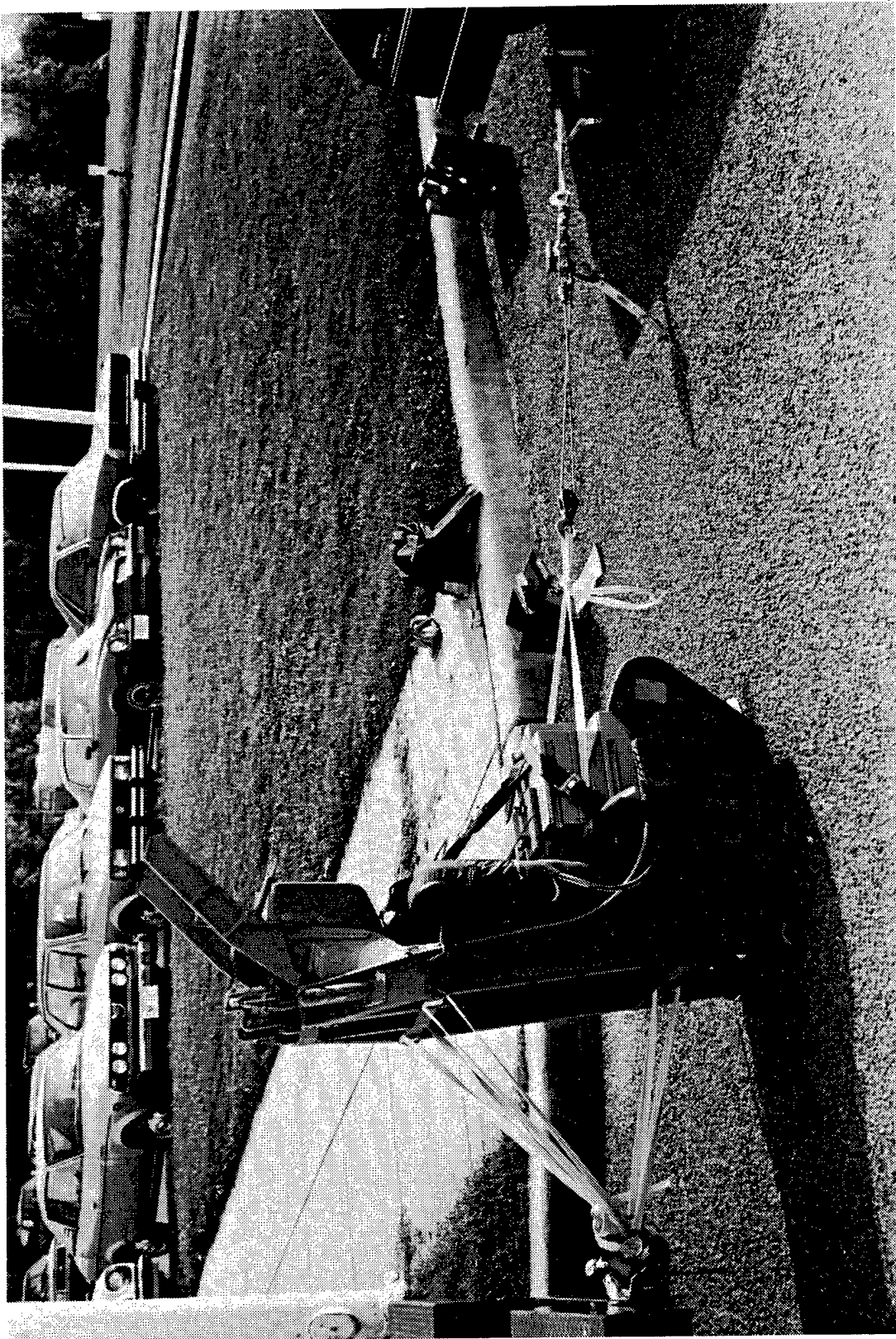


Figure 5. 1000 Pound -G_x Load On Seat

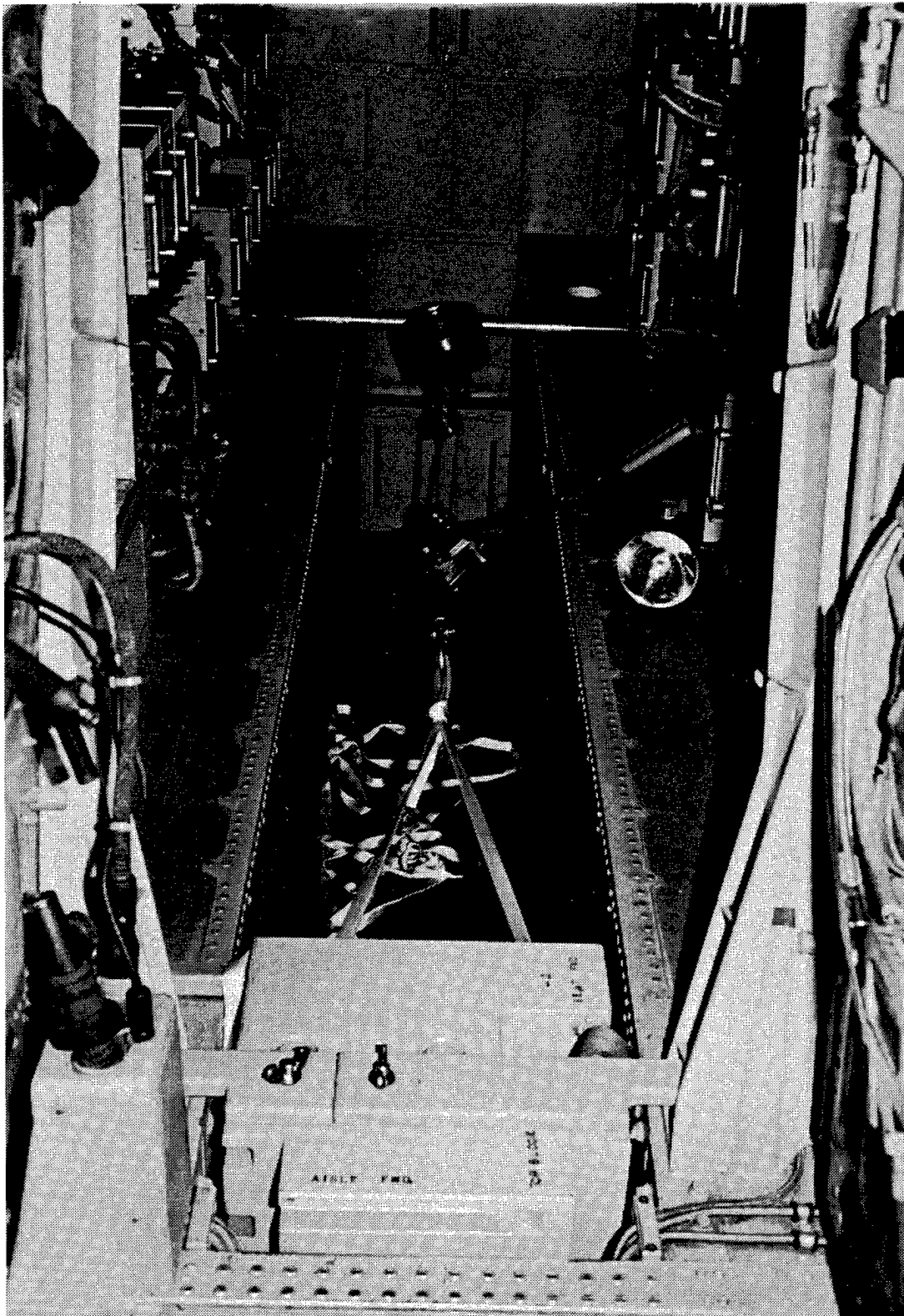


Figure 6. 1000 Pound +G_x Load in Aisle

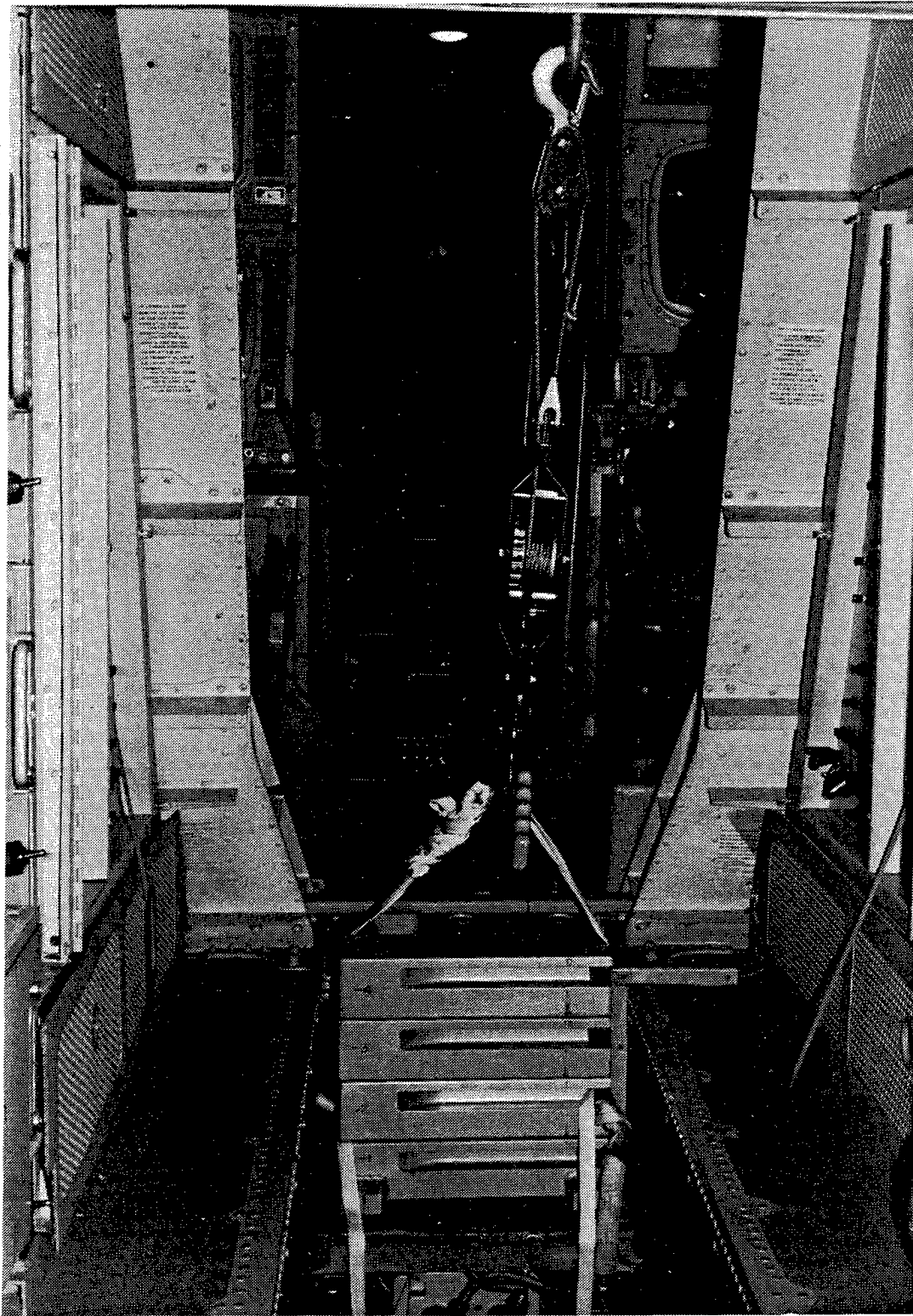


Figure 7. 500 Pound $-G_z$ Load in Aisle

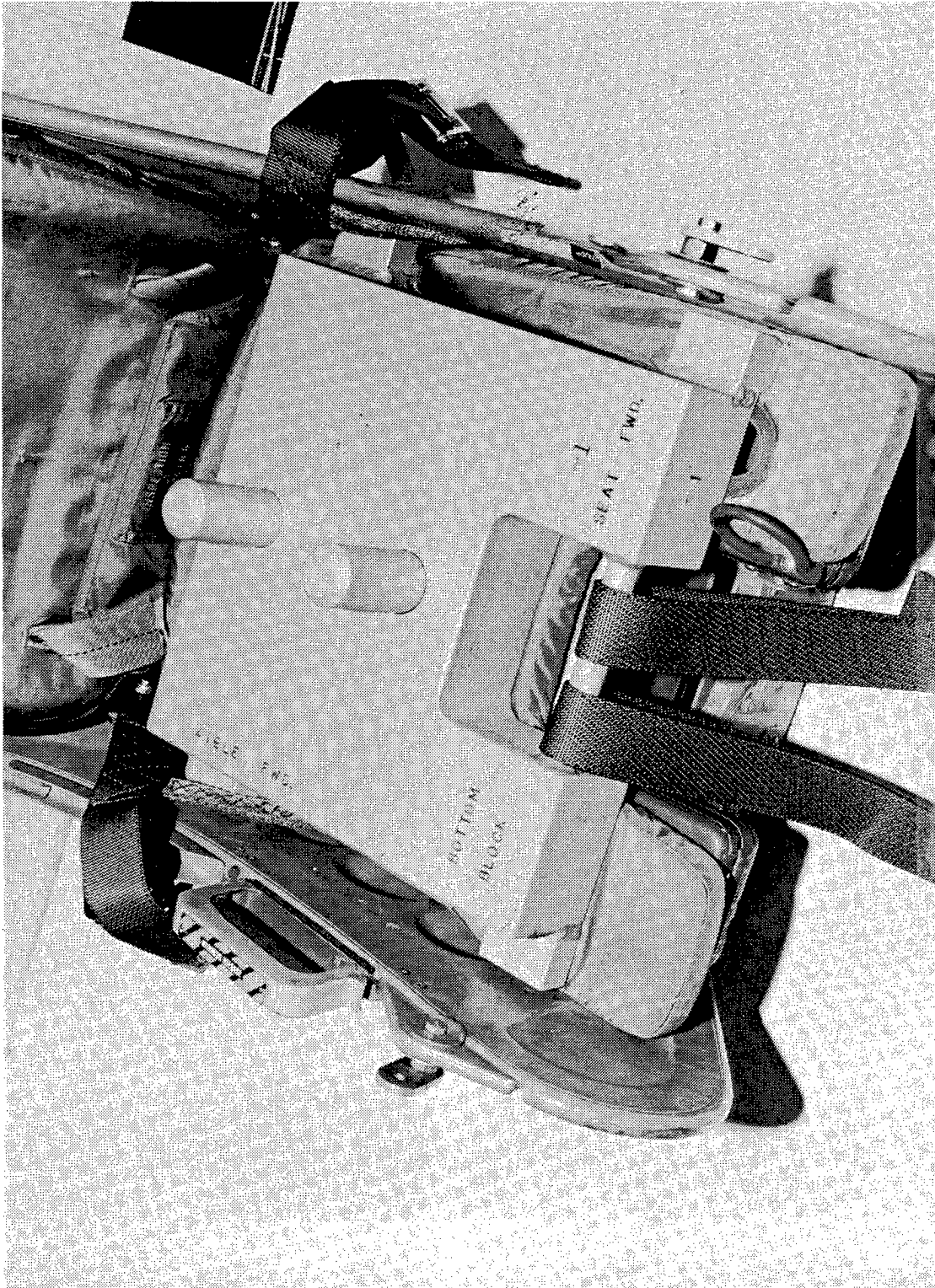


Figure 8. — 1 Bottom Block in Seat



Figure 9. -2 Block Placed in Seat

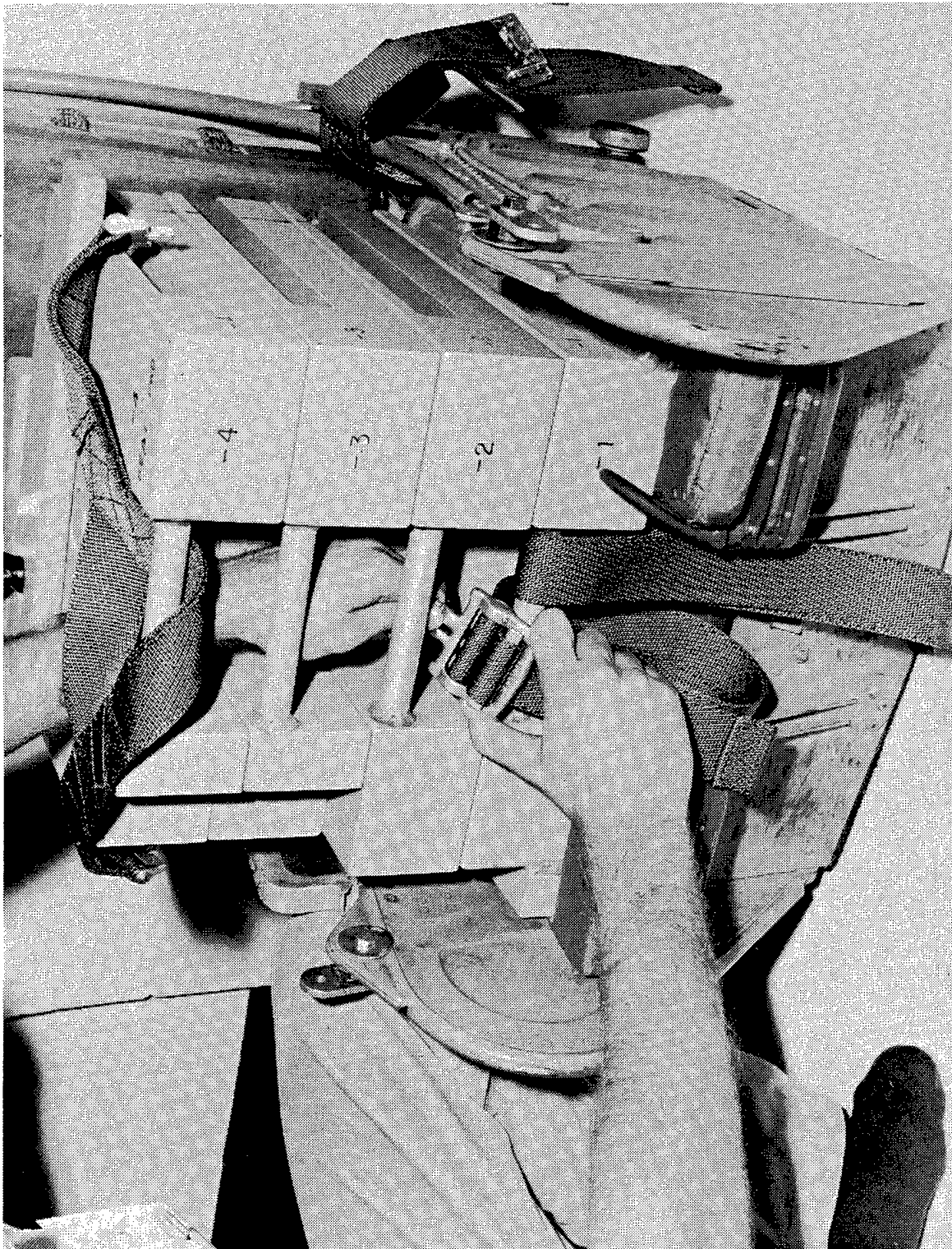


Figure 10. Routing of Shoulder Restraint Straps

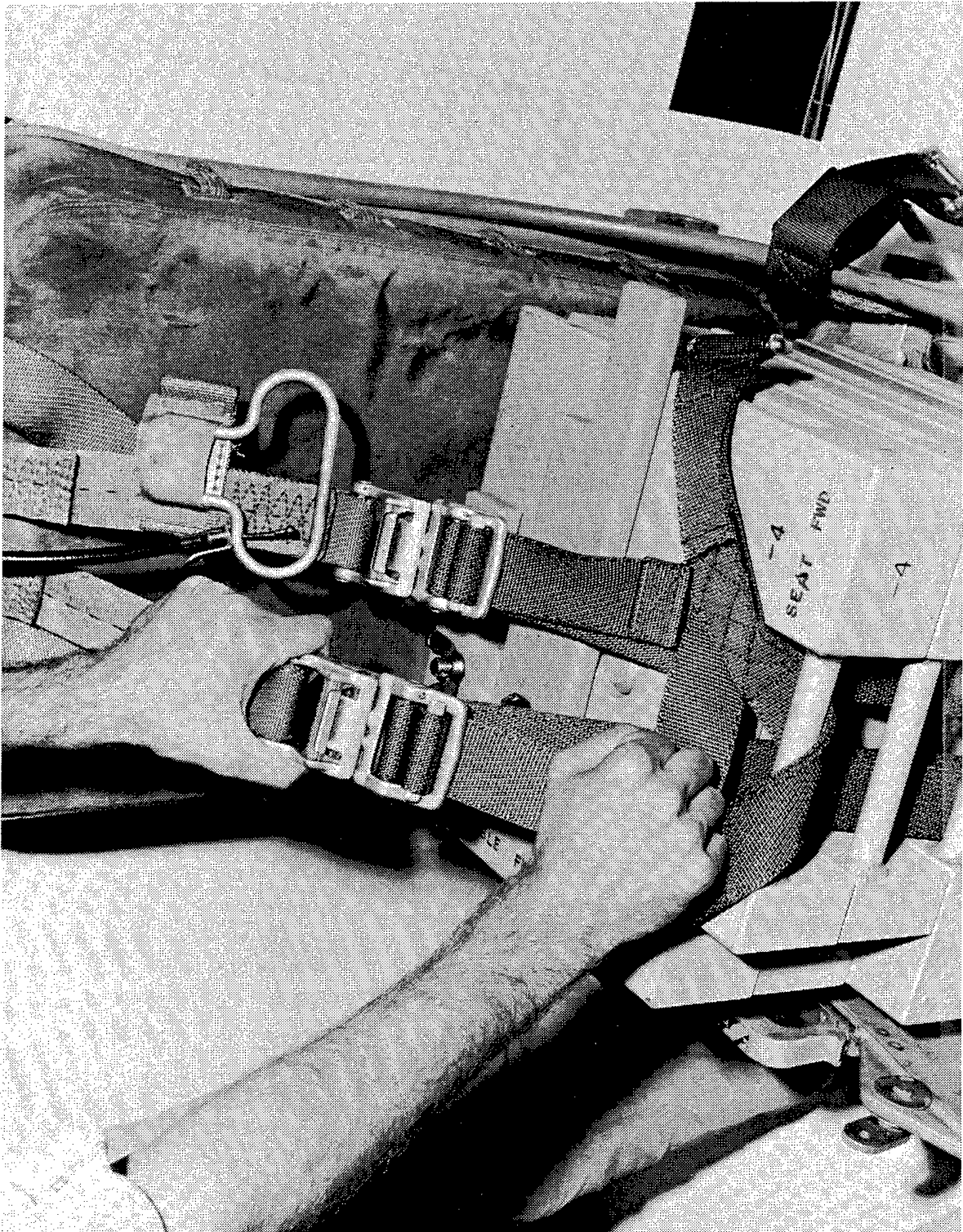


Figure 11. Connecting Parachute Riser Straps

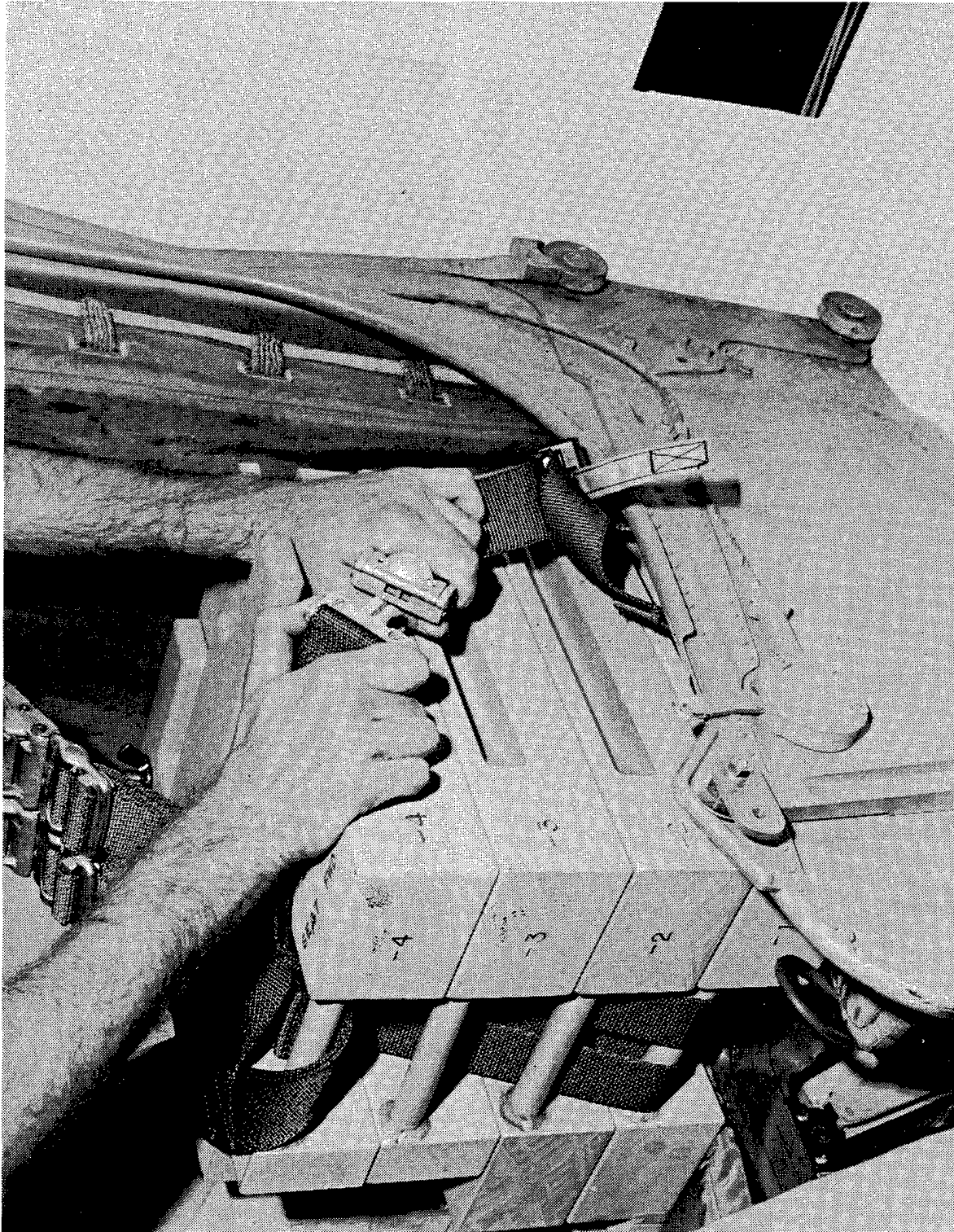


Figure 12. Connecting Lap Belt Fittings

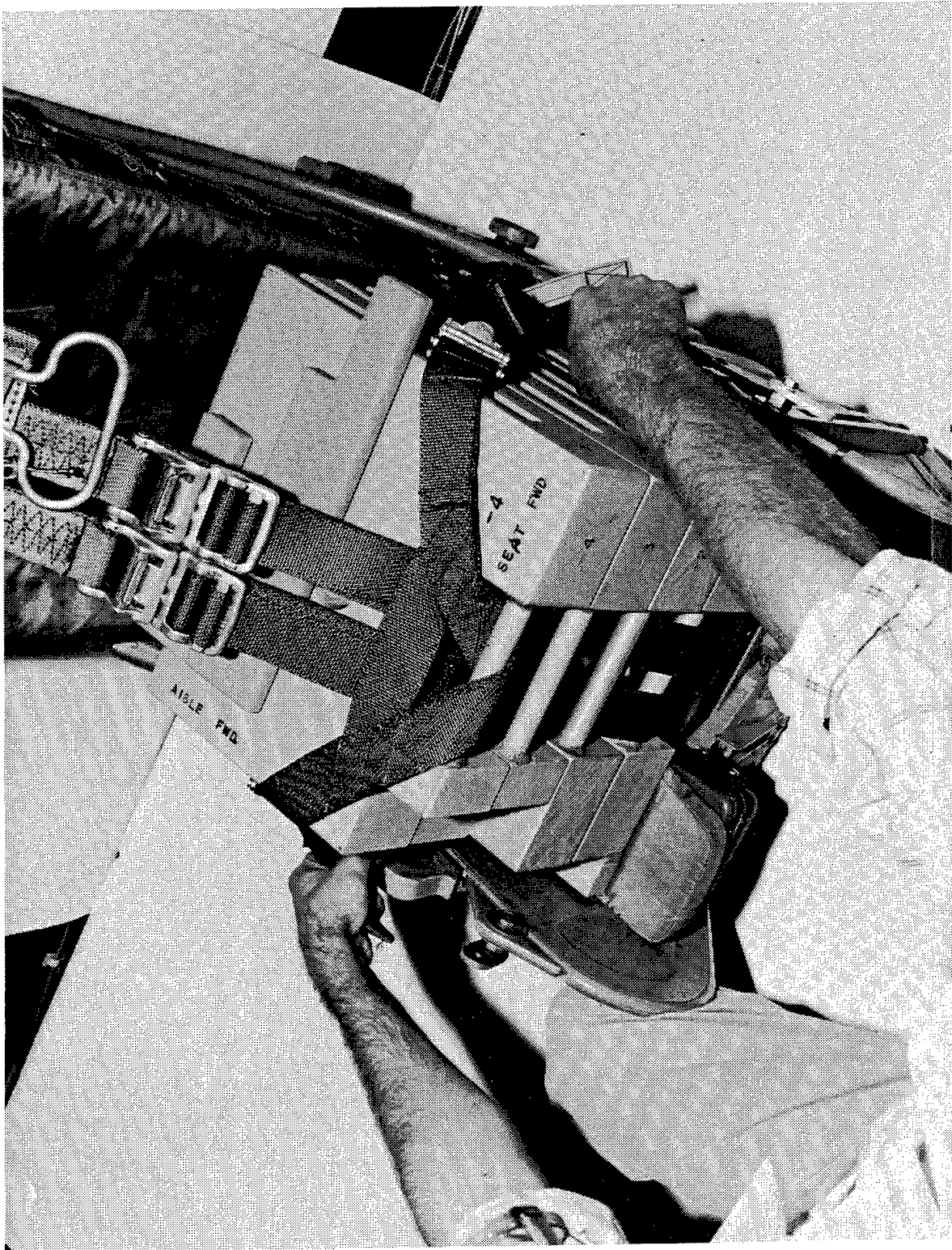


Figure 13. Tightening Straps on Seat

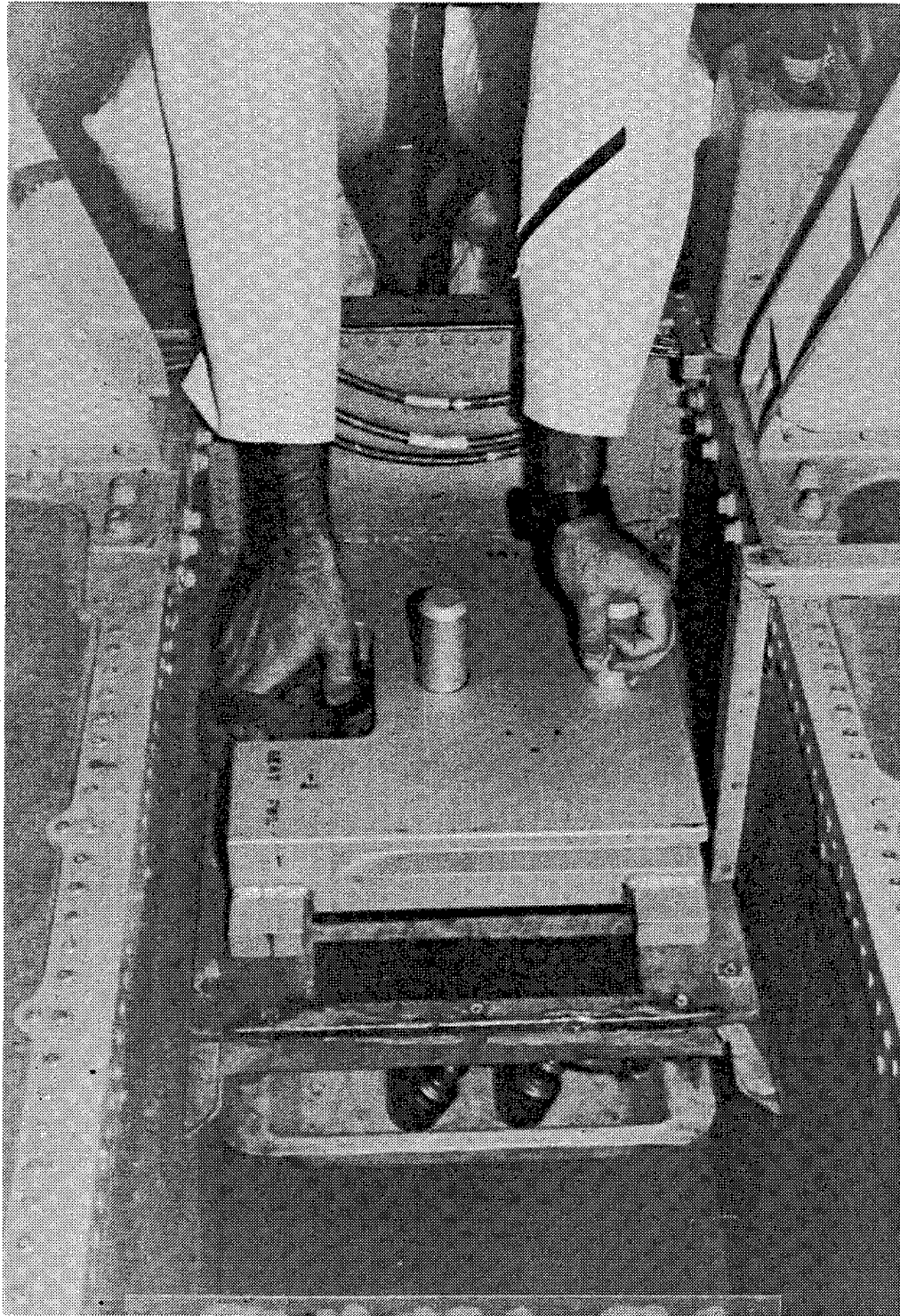


Figure 14. -1 Block on Aisle Step

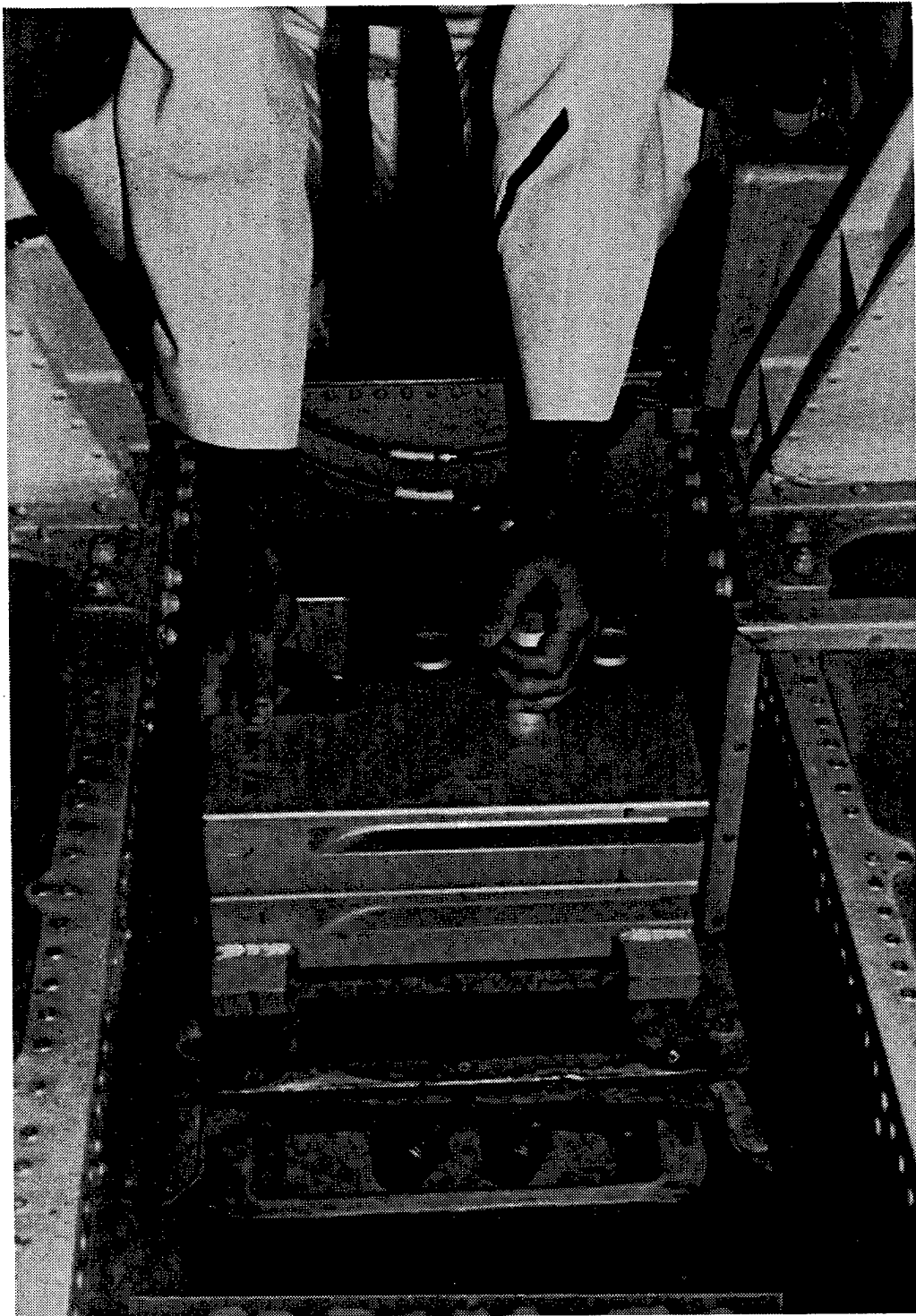


Figure 15. -2 Block on Aisle Step

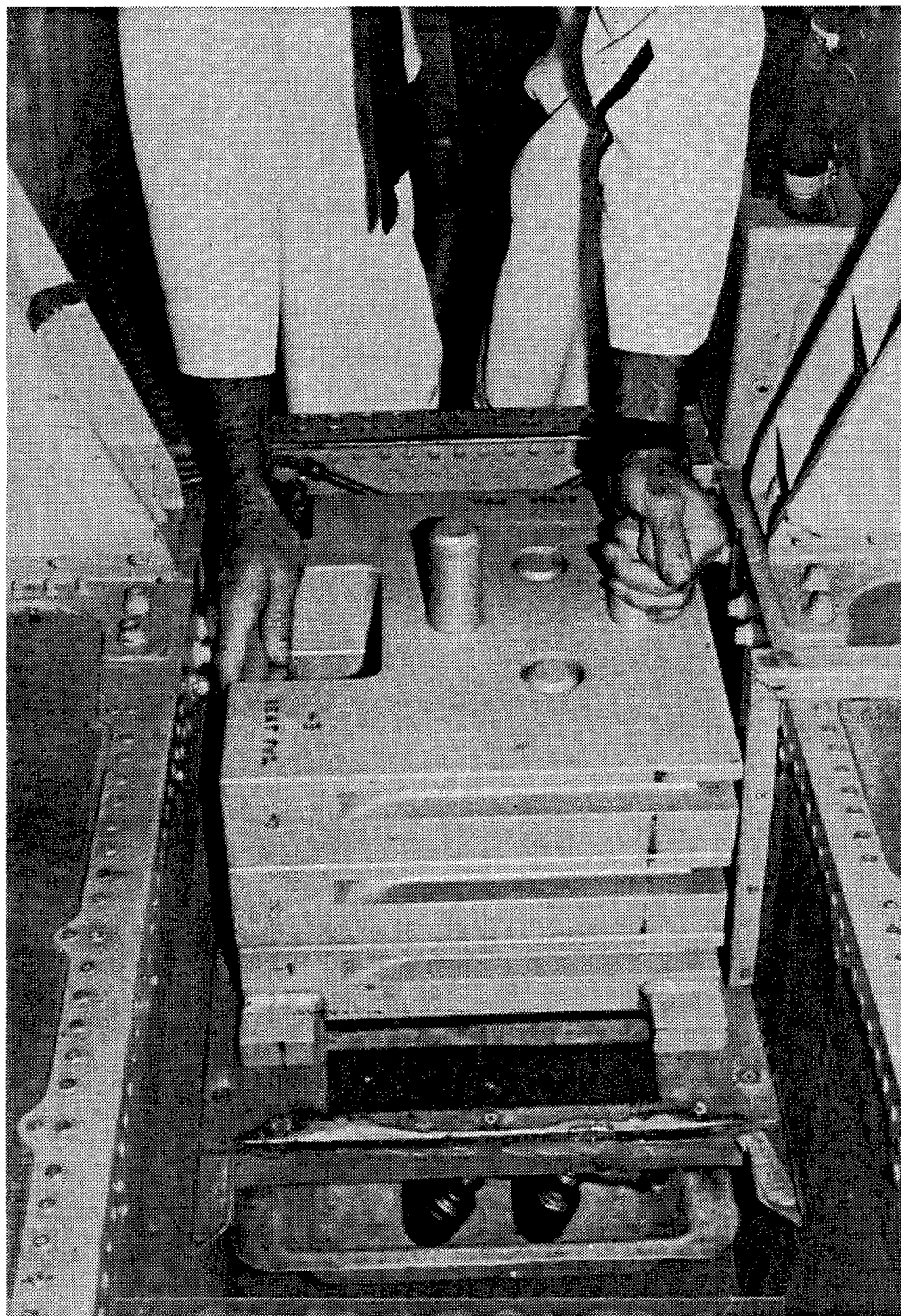


Figure 16. -3 Block on Aisle Step

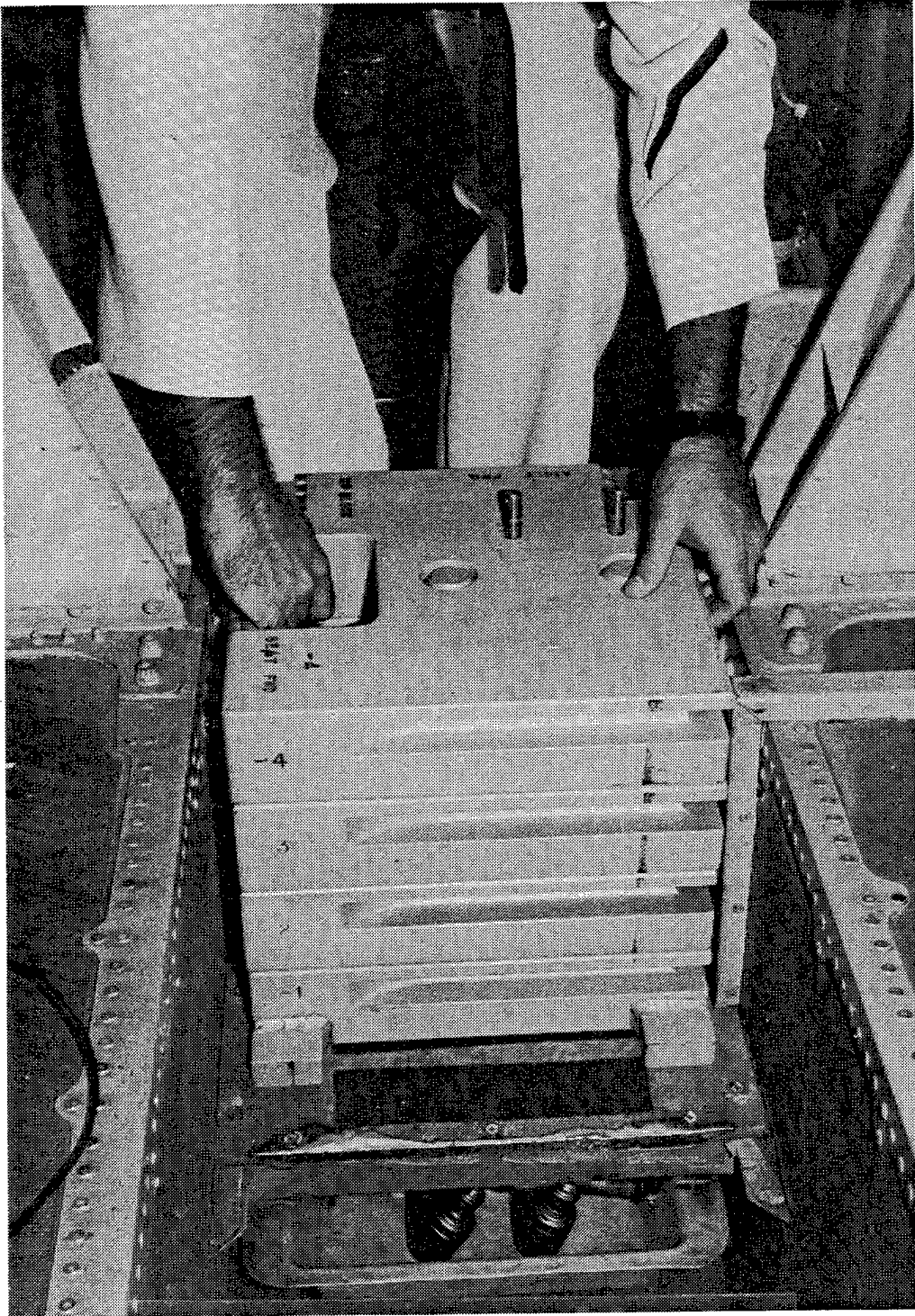


Figure 17. -4 Block on Aisle Step

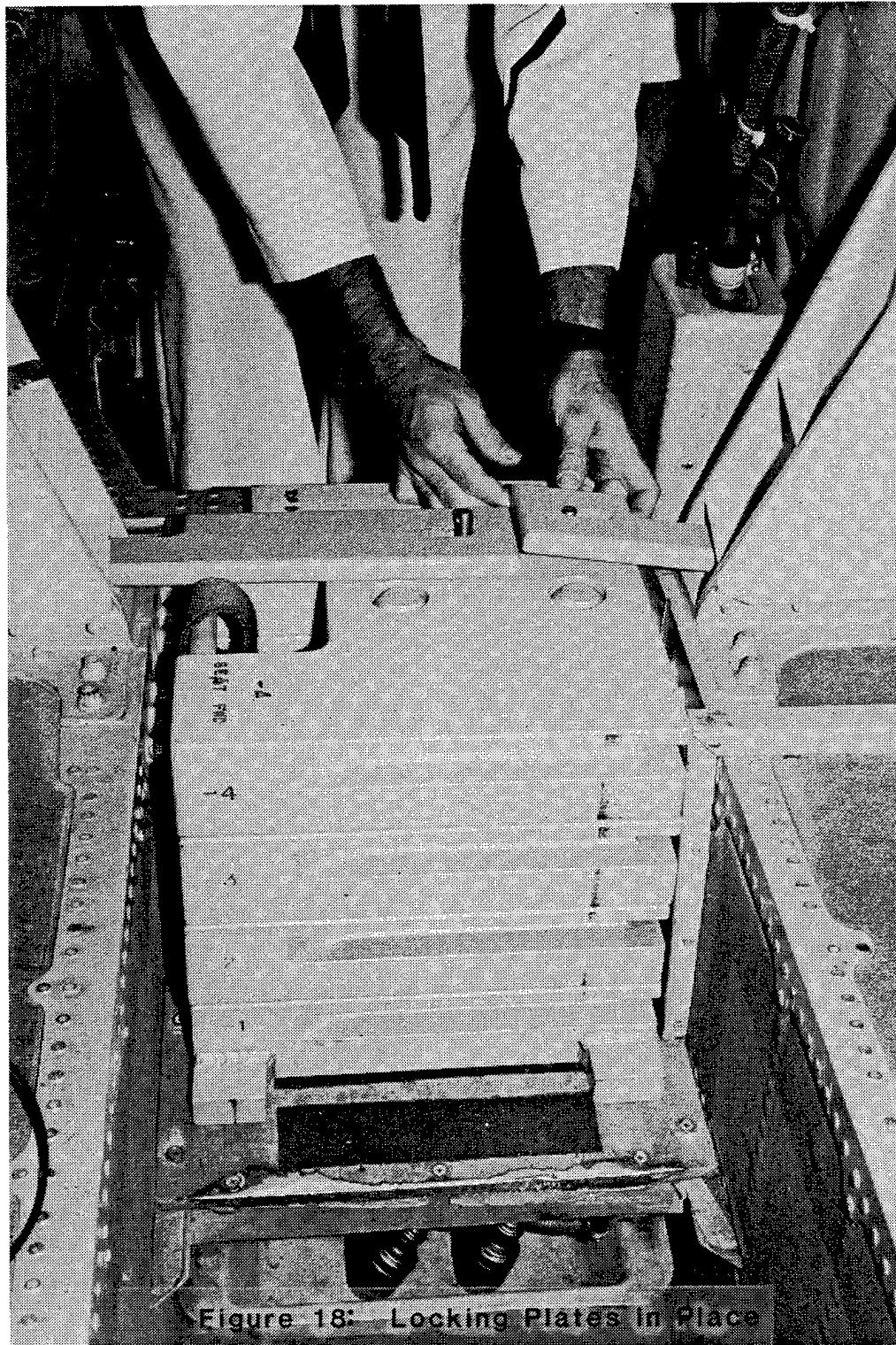


Figure 18. Lock Plates in Place

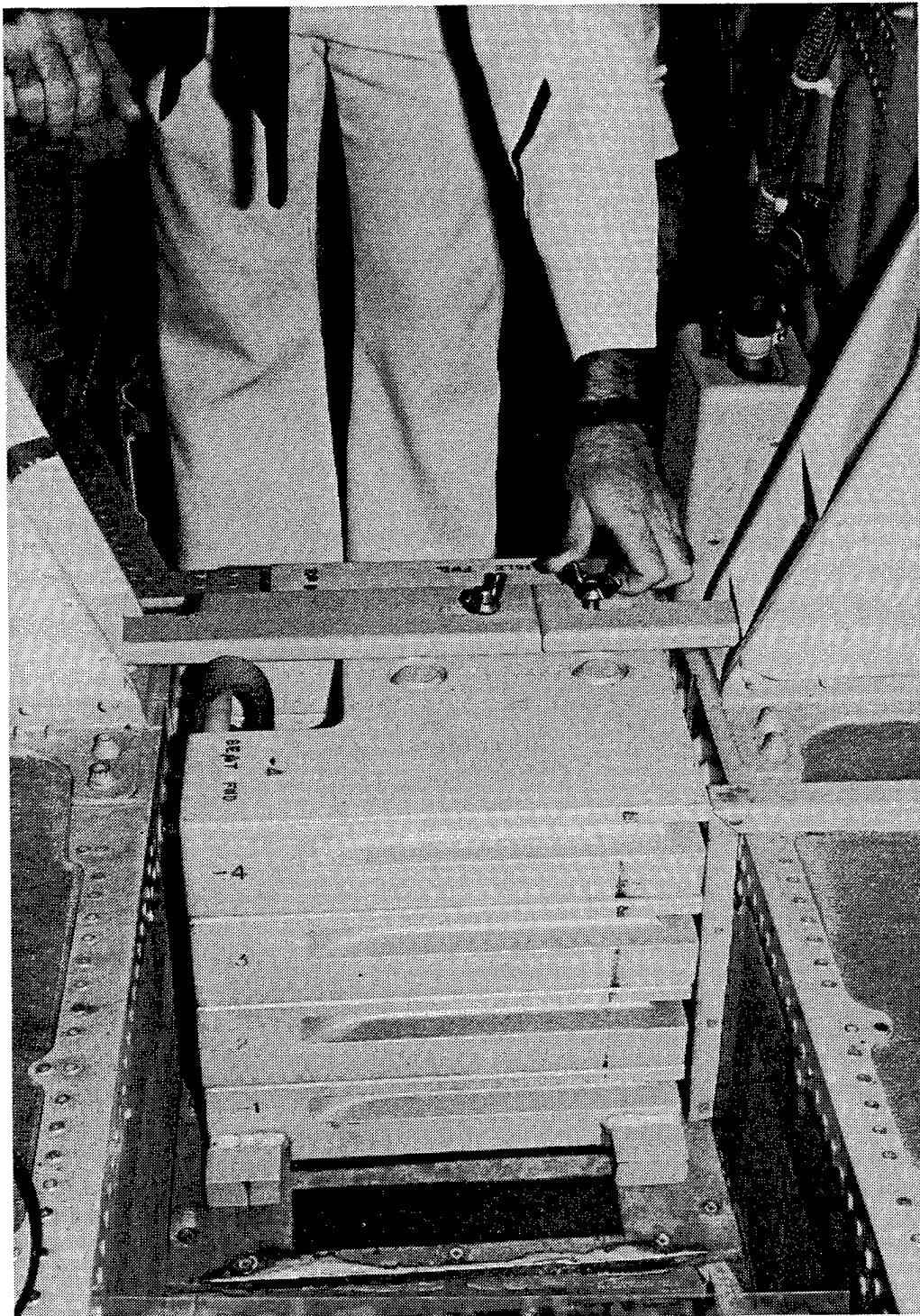


Figure 19. Wing Nuts on Locking Plates

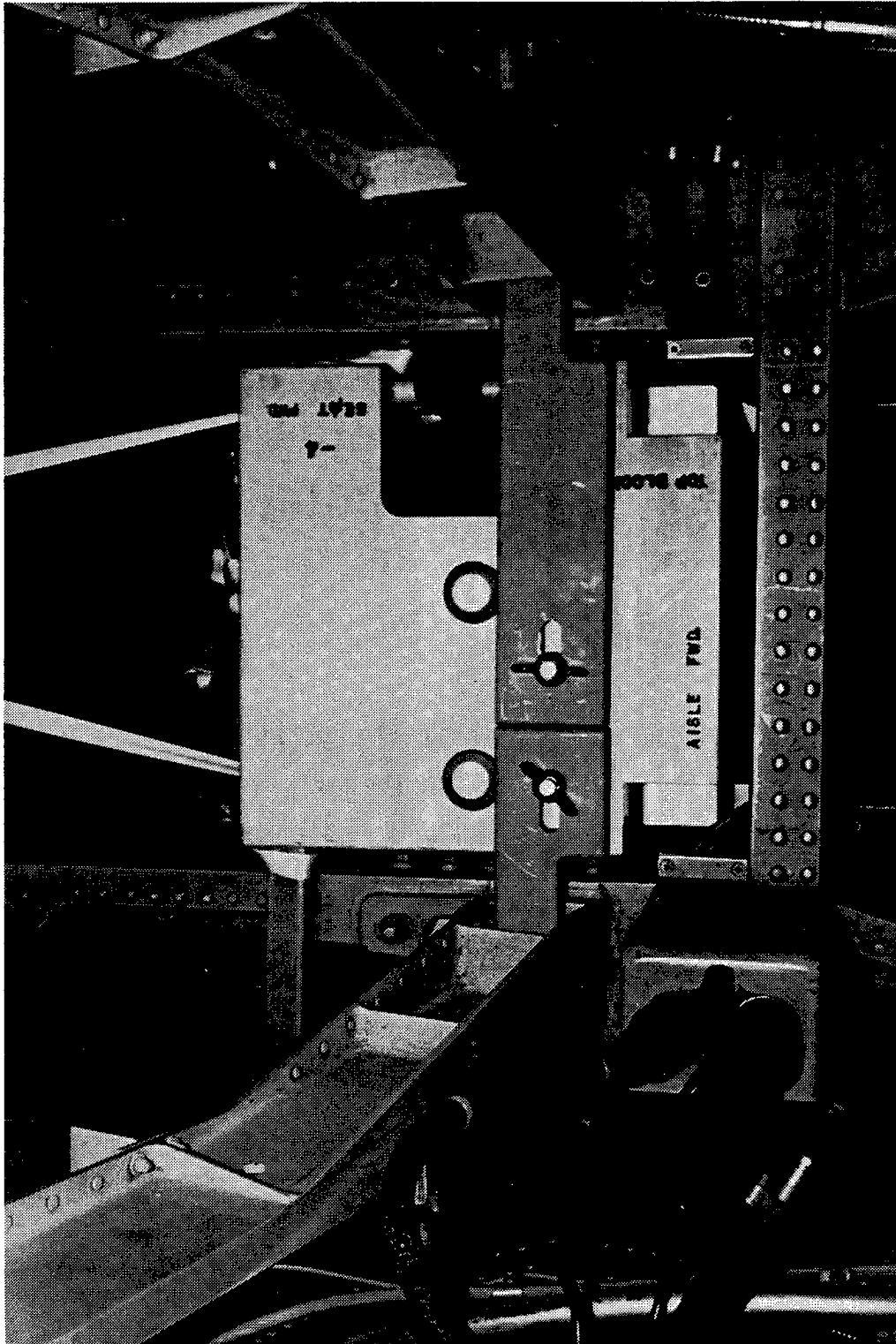


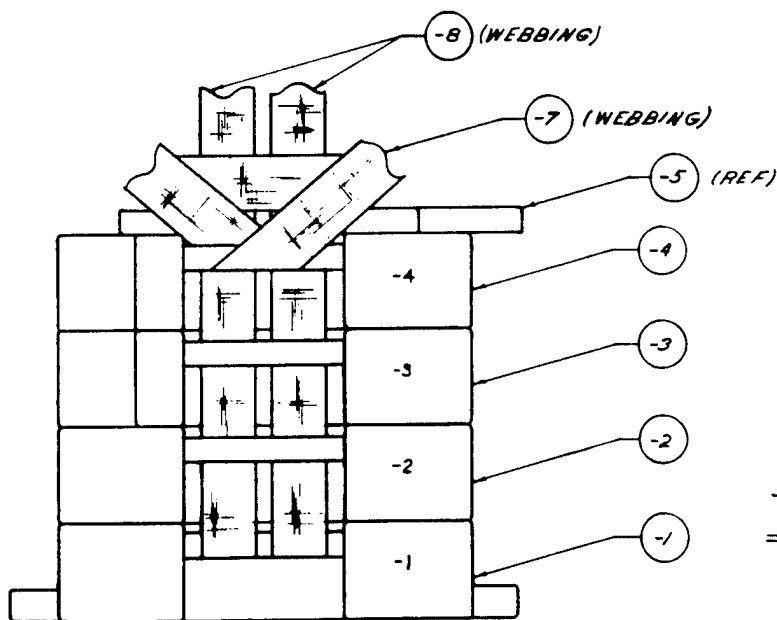
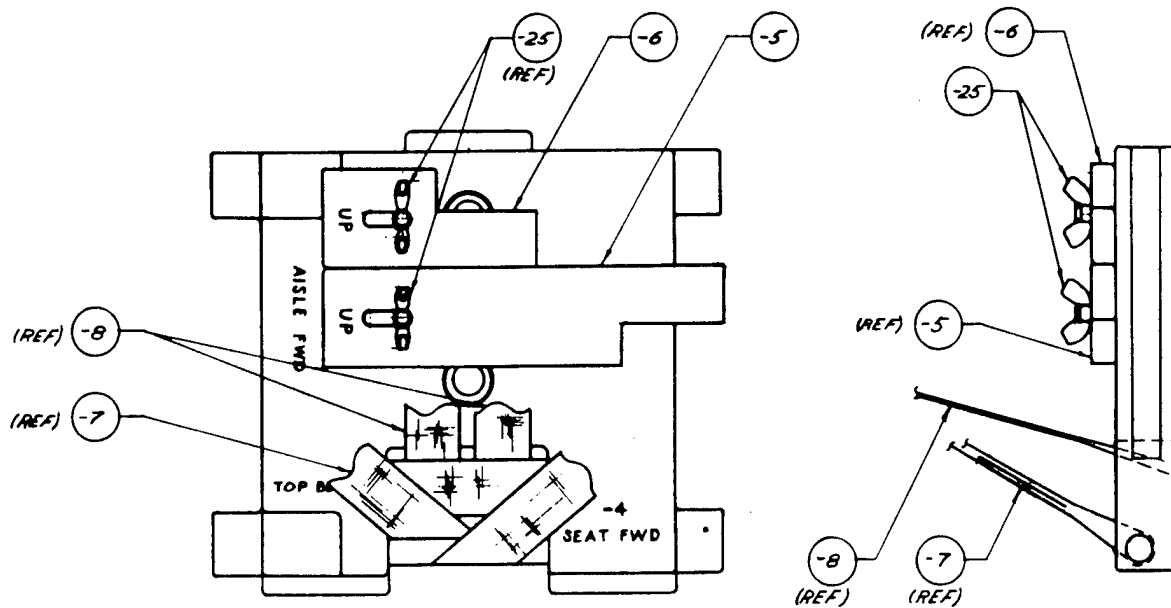
Figure 20. Top View of Assembly in Aisle

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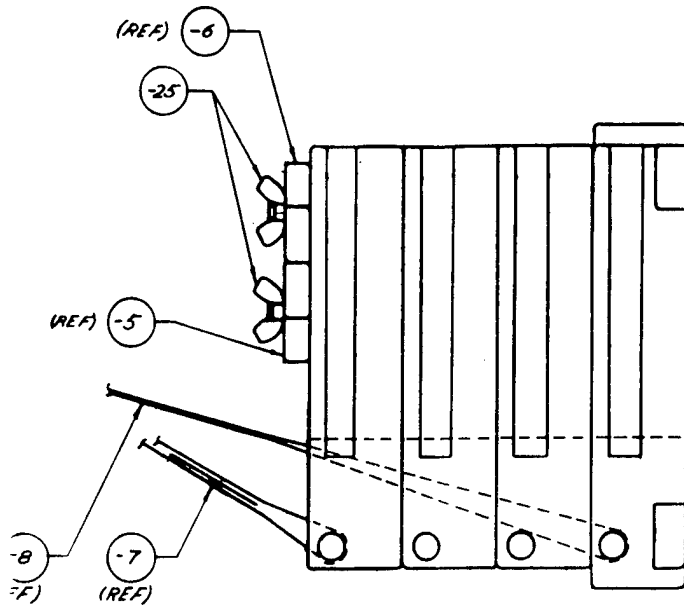
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A



-101 S-

Figur



FEBBING)

-5 (REF)

-4

-3

-2

-1

-101 S-3A BALLAST BLOCK ASSY.

2	-25	WING NUT	STEEL CADMIUM
2	-24	BOLT	STEEL CADMIUM
4	-22	TAB	6061 ALUM
4	-21	PLUG	
4	-20	HANDLE	
6	-19	POST	
1	-18	BLOCK	
1	-17	BLOCK	
1	-16	BLOCK	
1	-15	BLOCK	6061 ALUM.
2	-14	SHOULDER HARNESS QUICK RELEASE FTNG	
2	-13	LAP BELT QUICK RELEASE FITTING	
AR	-12	THREAD	NYLON 6 CDA
2	-11	STRAP	NYLON WEBB.
1	-10	CROSS STRAP	
1	-9	STRAP	NYLON WEBB.
2	-8	SHOULDER HARNESS STRAP ASSY.	
1	-7	LAP BELT STRAP ASSY.	
1	-6	LOCKING PLATE	6061 ALUMIN
1	-5	LOCKING PLATE	6061 ALUM.
1	-4	BLOCK ASSY.	
1	-3	BLOCK ASSY.	
1	-2	BLOCK ASSY.	
1	-1	BLOCK ASSY.	
		-101	S-3A BALLAST BLOCK ASSY.
NO. REQ'D	PART NO.	NAME OF PART	MATE.

LIST OF A

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FINISH HOLE ± .005 INCHES 3 PLACE DECIMALS ± .001 INCHES 1 PLACE DECIMALS ± .005 INCHES		CONTRACT NO. DATE: 11/20/83	
DO NOT SCALE THIS DRAWING MATERIAL:		DRAWN: J. QUARTUCCO CHECKED: J. Zorich APPROVED:	11/20/83 11/20/83

Figure 21. Dwg, S-3A Ballast Block, Assembly

NADC-84015-60

REV 181000					
QTY	SIZE	DESCRIPTION	MATERIAL	SIZE	SPECIFICATION
2	-25	WING NUT	STEEL, CADMIUM PLATE	$\frac{1}{2}$ DIA	MS35426-18
2	-24	BOLT	STEEL, CADMIUM PLATE	$\frac{1}{2}$ DIA, $3\frac{1}{2}$ GRIP	AN-8-36
4	-22	TAB	6061-T651 ALUMINUM	1.00 x 1.50 x 2.00	
4	-21	PLUG		$\frac{13}{16}$ DIA x 1.00	
4	-20	HANDLE		$\frac{3}{4}$ DIA x 9.00	
6	-19	POST		1.50 DIA x 5.90	
1	-18	BLOCK		3.00 x 13.00 x 13.00	
1	-17	BLOCK			
1	-16	BLOCK		3.00 x 13.00 x 13.00	
1	-15	BLOCK	6061-T651 ALUMINUM	3.00 x 13.00 x 14.12	
2	-14	SHOULDER HARNESS QUICK RELEASE FITTING			P/N OIS-710001-1 (KOCH)
2	-13	LAP BELT QUICK RELEASE FITTING			P/N OIS-11366-1 (KOCH)
AR	-12	THREAD	NYLON, SAGE GRN 6 CORD		V-T-295 NIN 00-539-5211
2	-11	STRAP	NYLON, SAGE GRN WEBBING	$1\frac{3}{4}$ x 54.0	MIL-W-4088 TY XIII
1	-10	CROSS STRAP		$1\frac{3}{4}$ x 11.0	
1	-9	STRAP	NYLON, SAGE GRN WEBBING	$1\frac{3}{4}$ x 44.0	MIL-W-4088 TY XIII
2	-8	SHOULDER HARNESS STRAP ASSY.			
1	-7	LAP BELT STRAP ASSY.			
1	-6	LOCKING PLATE	6061-T651 ALUMINUM	.75 x 3.00 x 6.75	
1	-5	LOCKING PLATE	6061-T651 ALUMINUM	.75 x 3.00 x 12.75	
1	-4	BLOCK ASSY.			
1	-3	BLOCK ASSY.			
1	-2	BLOCK ASSY.			
1	-1	BLOCK ASSY.			
X	-101	S-3A BALLAST BLOCK ASSY.			
NO. REQ'D	PART NO.	NAME OF PART	MATERIAL	SIZE	SPECIFICATION

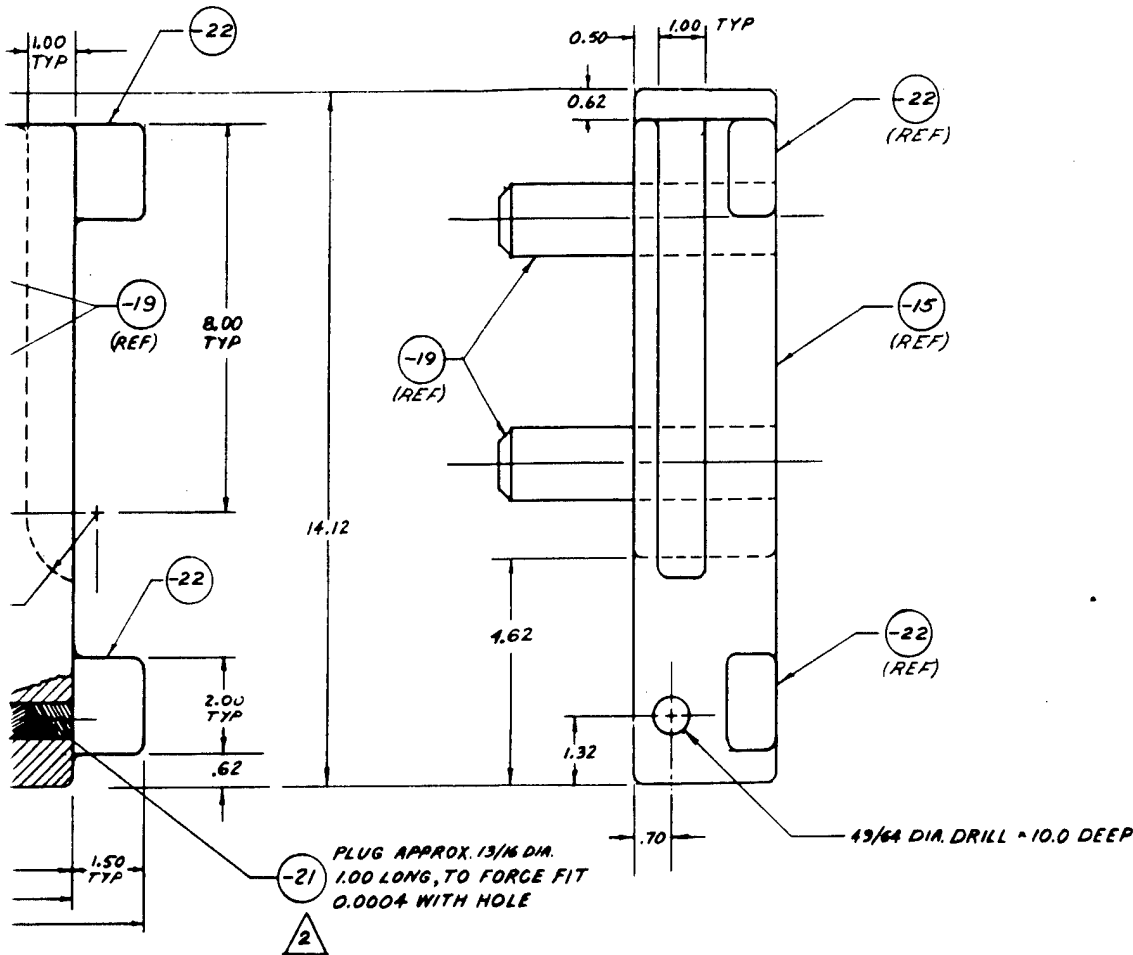
LIST OF MATERIALS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS 2 ANGLES 2 3 PLACE DECIMALS & 2 PLACE DECIMALS 2		CONTRACT NO. 		BAWL AIR DEVELOPMENT CENTER WARRIMSTER, PA. 18974	
DO NOT SCALE THIS DRAWING MATERIAL:		DRAWN J. QUARTUCCO 4/24/83 CHECKED J. Zurek 1/12/83	S-3A BALLAST BLOCK ASSEMBLY		
APPROVED 		APPROVED 	SIZE 1 DATE 8/20/83 DRAWING NO. 80206 SCALE 1/3	DATE 8/20/83 DRAWING NO. S3ABB4/1 SHEET 1 OF 8	REV

CK ASSY.

assembly





- NOTES: 1. ALL EDGES AND CORNERS HAVE $\frac{1}{8}$ R UNLESS OTHERWISE STATED.
2. ASSEMBLE TWO SHOULDER HARNESS STRAP ASSYS. (-B) AROUND HANDLE (-20) BEFORE FORCE FITTING PLUG (-21) INTO HOLE.
3. FOR CHARACTER STAMPING DETAIL, REFER TO SHEET B.

-1 BLOCK ASSY.

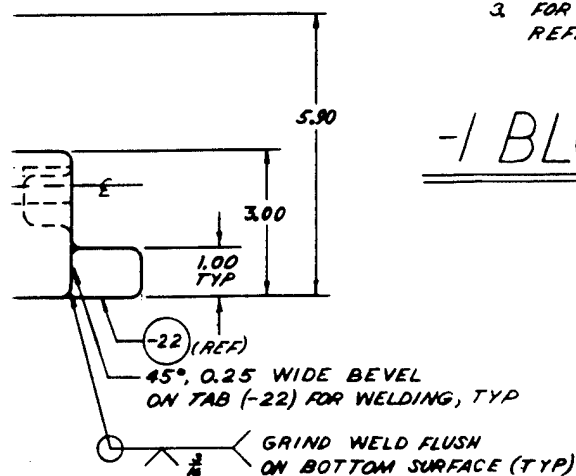


Figure 22. Dwg, S-3A Ballast Block, -1 Block

RELEASE INFORMATION SPECIFIED 6 MONTHS FROM DATE OF REVISION. UNLESS OTHERWISE SPECIFIED: PROJECT NO. 2 ANGLES 2 3 PLACE DECIMALS & 1 PLACE DECIMALS 2 - CV	CONTRACT NO.
DO NOT SCALE THIS DRAWING	DRAWN: J. QUARTUCCO
MATERIAL: 6061-T651 ALUMINUM	CHECKED: J. D. Ford
FINISH: GRAY ANODIZE MIL-A-8625	APPROVED:
	DATE: 11-15-65

0

REVISIONS			
ZONE	LTR	DESCRIPTION	DATE


 -22
 (REF)


 -15
 (REF)


 -22
 (REF)

- 43/64 DIA. DRILL - 10.0 DEEP

AVE
 TED
 WARESS
 D
 CE
 HOLE.
 DETAIL,

3Y.

Block

③

D

C

A

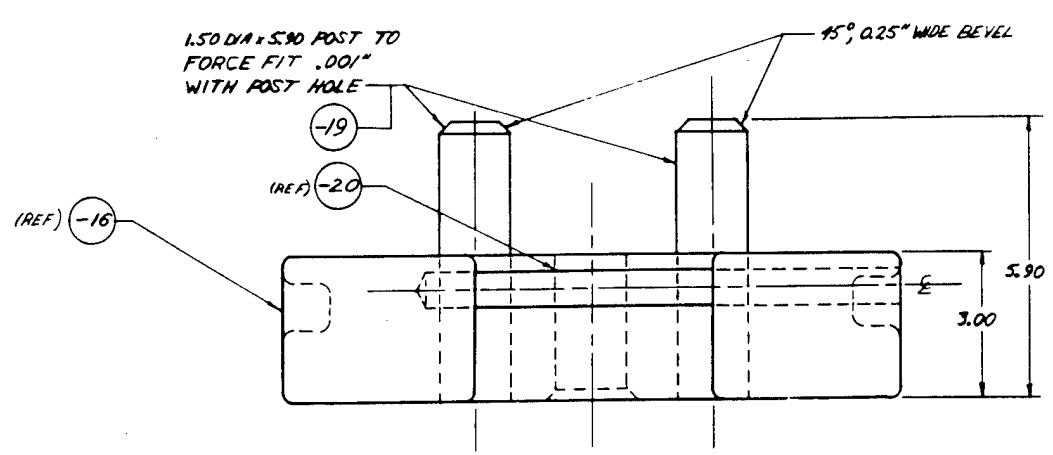
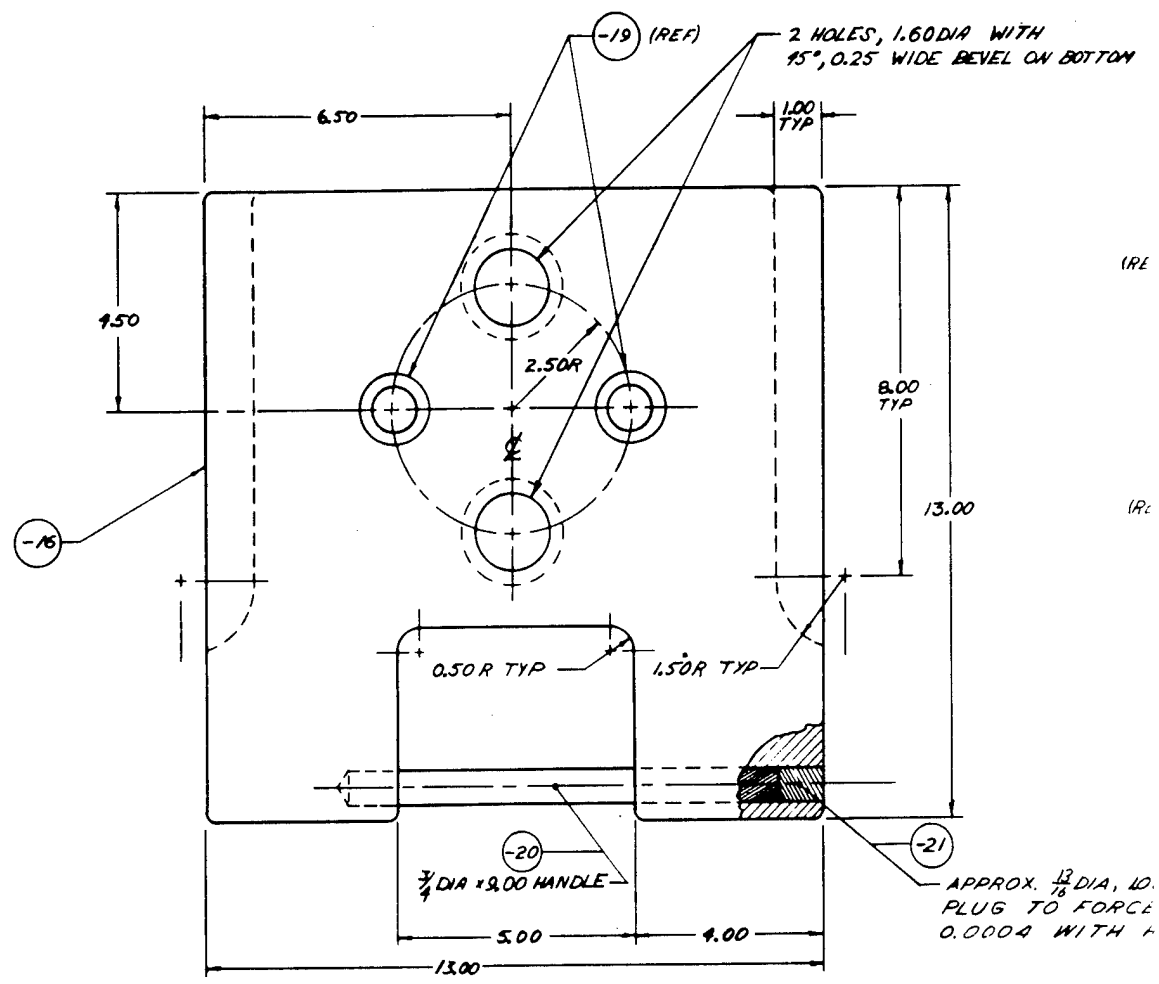
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS ± .005 ANGLES ± .01 DECIMALS ± .005 DECIMALS ± .01		CONTRACT NO.		NAVAL AIR DEVELOPMENT CENTER WARRINGTON, PA. 16974	
DO NOT SCALE THIS DRAWING		DRAWN: <i>QUARTUSCH</i> 11/20/75		S-3A BALLAST BLOCK -1 BLOCK	
MATERIAL: 6061-T651 ALUMINUM		CHECKED: <i>D. Noel</i> 11/20/75		DATE: D 80206	
FINISH: GRAY ANODIZE MIL-A-8625		APPROVED:		TRADE DOW NO. <i>S3ABB4/2</i>	
		SCALE 1/2		SHEET 2 OF 8	

D

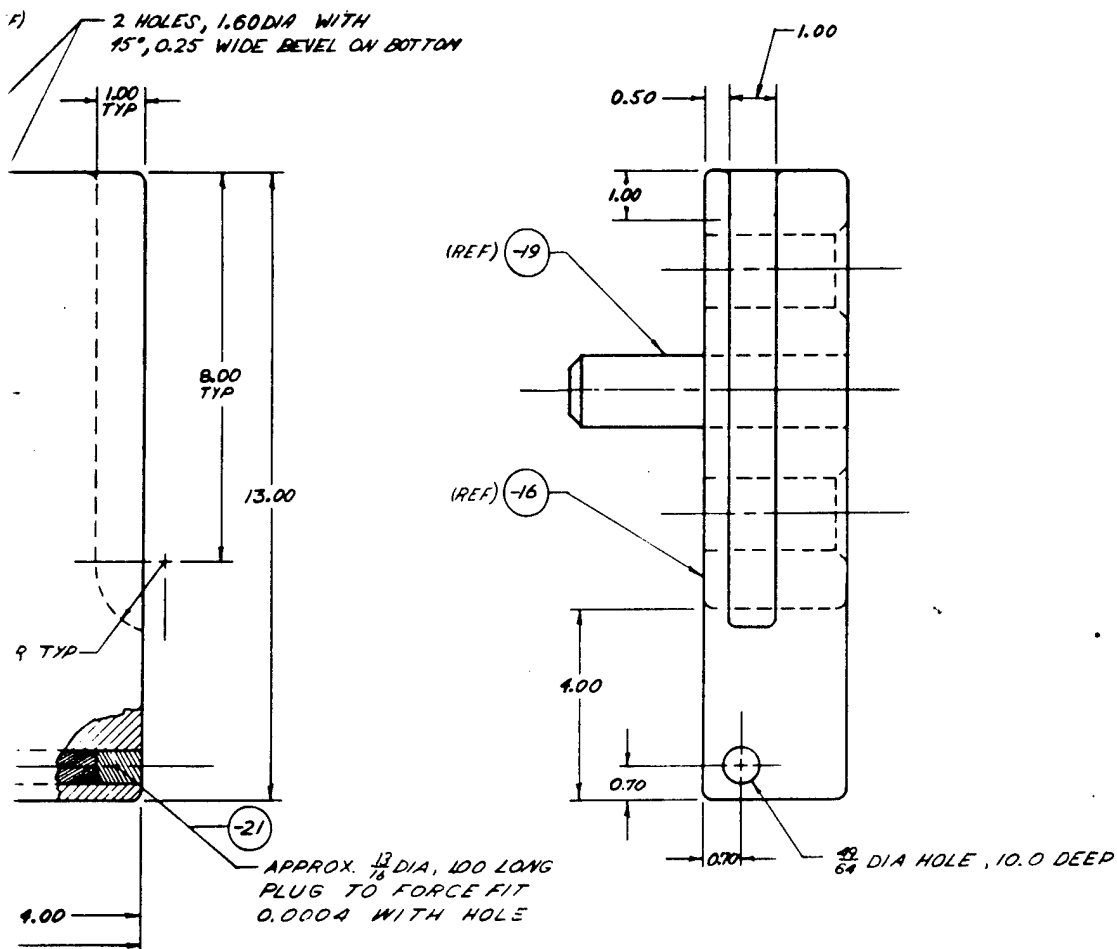
C

B

A

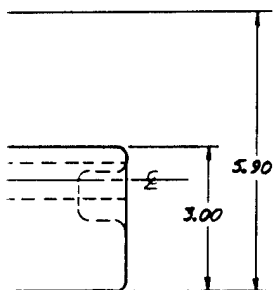


①



- NOTES: 4. ALL EDGES AND CORNERS HAVE $\frac{1}{4}$ R UNLESS OTHERWISE STATED.
5. FOR CHARACTER STAMPING DETAIL, REFER TO SHEET 8.

15°, 0.25" WIDE BEVEL



-2 BLOCK ASSY.

Figure 23. Dwg, S-3A Ballast Block, -2 Block

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS 2 3 PLACE DECIMALS 2 3 PLACE DECIMALS 2 .01		CONTRACT NO.	
DO NOT SCALE THIS DRAWING		Drawn	LQUAR
MATERIAL: 6061-T651 ALUMINUM		Checked	G. L. O.
FINISH: GRAY ANODIZE MIL-A-8625		Approved	
		Approved	

34015-60

REVISIONS			
ZONE	LYR	DESCRIPTION	DATE

D

C

DIA HOLE , 10.0 DEEP

S HAVE
STATED
PING DETAIL,

SSY

Block, -2 Block

(3)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS .5 ANGLES 2 3 PLACE DECIMALS 2 2 PLACE DECIMALS 2 .01	CONTRACT NO.	NAVAL AIR DEVELOPMENT CENTER WARRMINSTER, PA. 18974
DO NOT SCALE THIS DRAWING	DRAWN <i>L. QUARTUCCIO</i> 11/28/65	<i>G-3A BALLAST BLOCK -2 BLOCK</i>
MATERIAL: 6061-T651 ALUMINUM	CHECKED <i>G. Lord</i> 11/28/65	
FINISH: GRAY ANODIZE MIL-A-8625	APPROVED	SIZE CODE IDENT NO. NADC DWS NO. REV
APPROVED	D 80206	S3ABB4/3
SCALE 1/2	WT	SHEET 3 OF 8

DATE

A

D

C

B

A

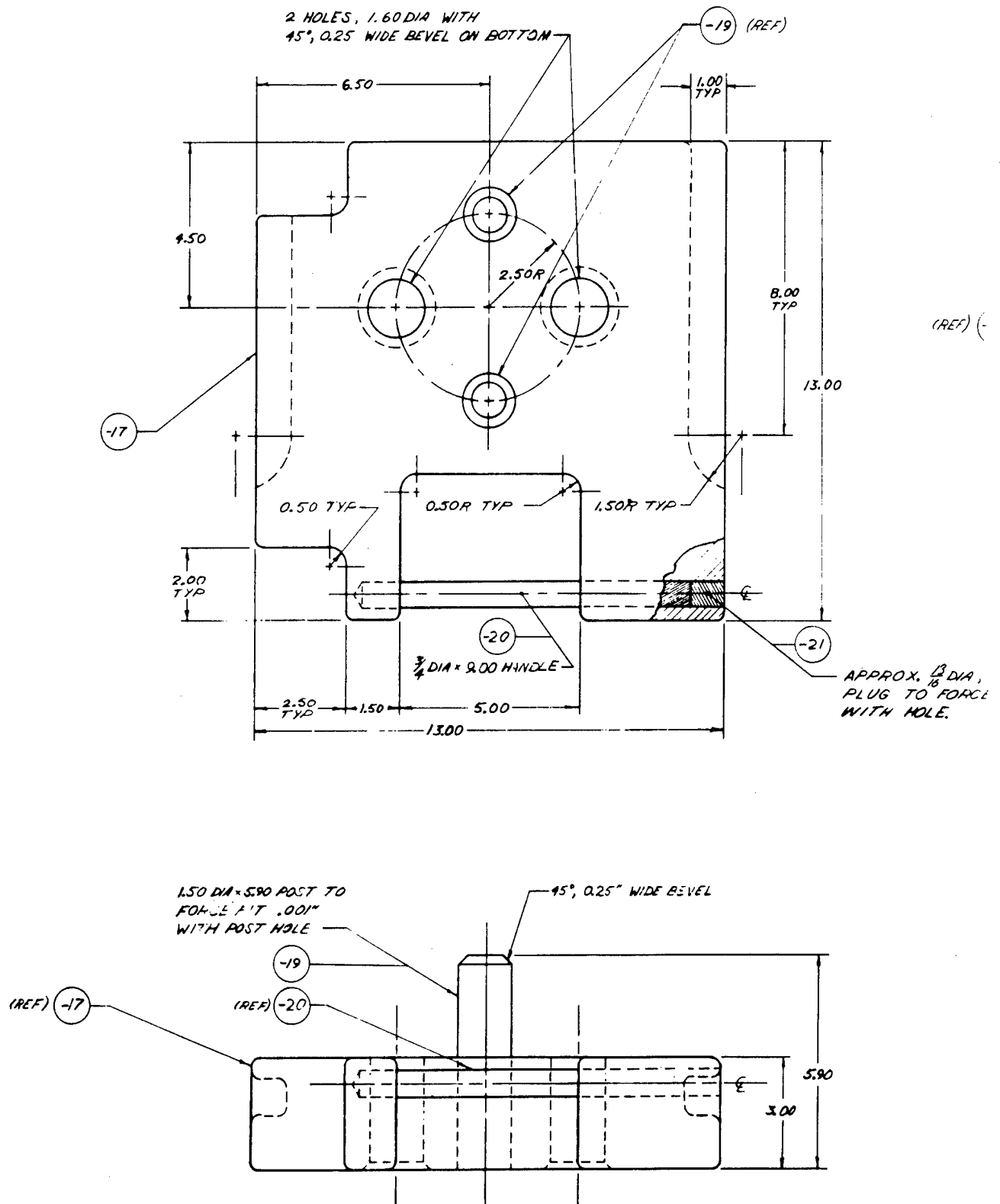
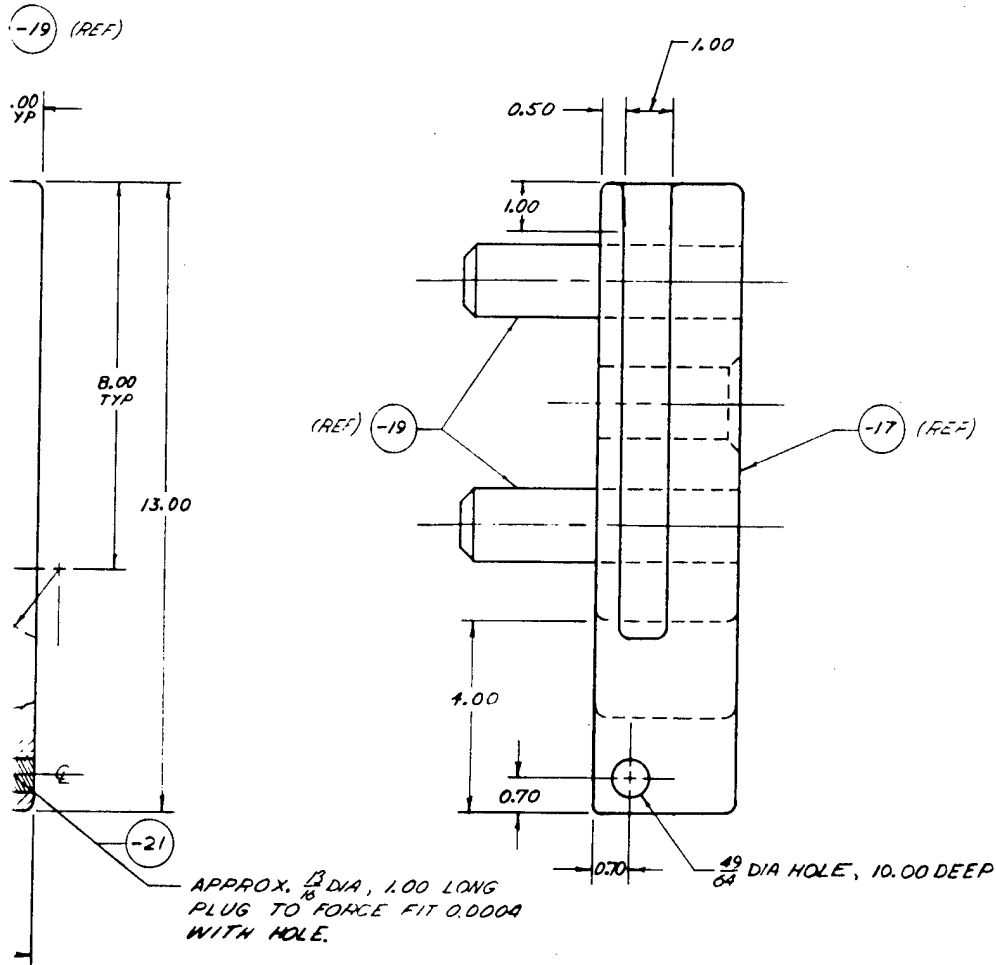


Figure 2c



NOTES: 6. ALL EDGES AND CORNERS HAVE
 $\frac{1}{4}$ R UNLESS OTHERWISE STATED.
7. FOR CHARACTER STAMPING DETAIL,
REFER TO SHEET 8.

-3 BLOCK ASSY.

Figure 24. Dwg, S-3A Ballast Block, -3 Block

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS 2 ANGLES 2 3 PLACE DECIMALS 2 2 PLACE DECIMALS 2 .01		CONTRACT NO.	
DO NOT SCALE THIS DRAWING		DRAWN	1. QUARTJCS10
MATERIAL: 6061-T651 ALUMINUM		CHECKED	4. J. Ford 11/20/83
FINISH: GRAY ANODIZE MIL-A-8625		APPROVED	
		APPROVED	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

(-17) (REF)

10.00 DEEP

STAIL,

/

(3)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS 1/16 ANGLES 2 3 PLACE DECIMALS 2 2 PLACE DECIMALS 2 .01 DO NOT SCALE THIS DRAWING MATERIAL: 6061-T651 ALUMINUM FINISH: GRAY ANODIZE MIL-A-8625	CONTRACT NO.		NAVAL AIR DEVELOPMENT CENTER WARRMINSTER, PA. 18974		
	DRAWN CHECKED APPROVED APPROVED	J. QUARTESIO P. J. [Signature] H. [Signature]	S-3A BALLAST BLOCK -3 BLOCK		
	DATE D 80206		CODE POINT NO. S3ABB4/4	REV	
	SCALE 1/2		WT	SHEET 4 of 8	

D

C

B

A

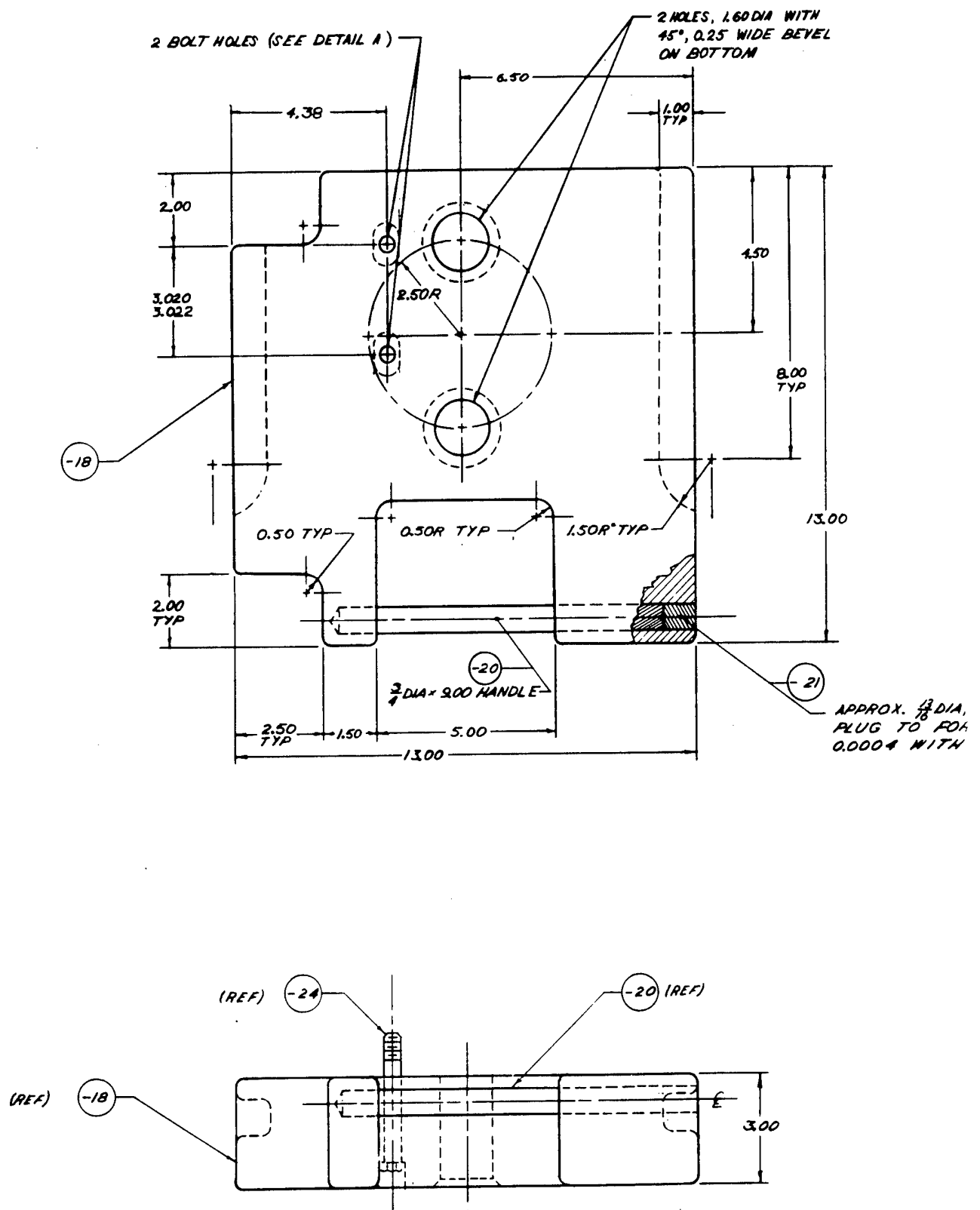
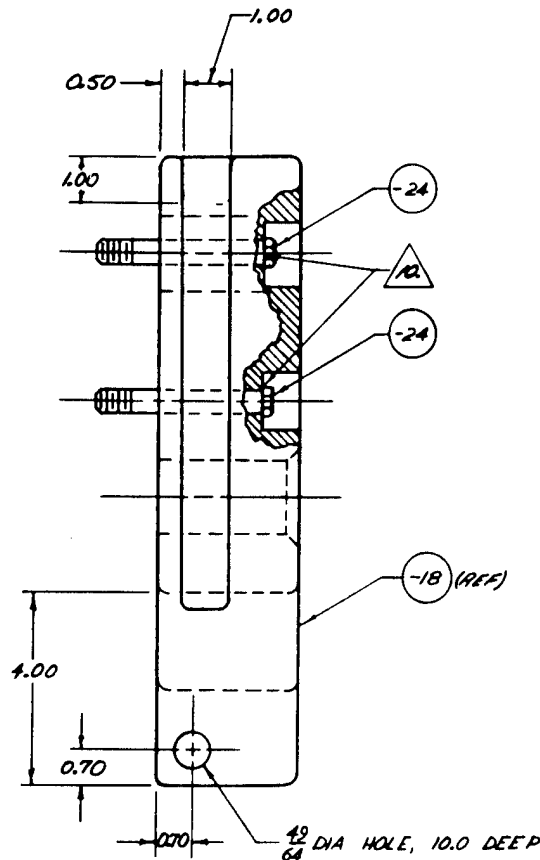
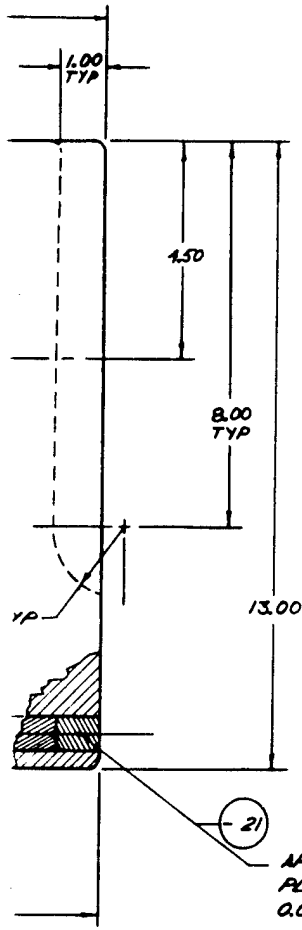


Figure 2:

NADC-84015-60

ZONE L

2 HOLES, 1.60 DIA WITH
45°, 0.25 WIDE BEVEL
ON BOTTOM



COUNTERSINK DETAILS

DETAIL A: E

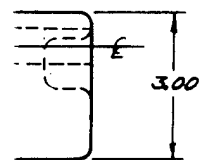
NOTES: & ALL EDGES AND CORNERS
HAVE $\frac{1}{4}$ R UNLESS OTHERWISE
STATED.

9 ASSEMBLE LABBELT ASSY (-7)
AROUND HANDLE (-20) BEFORE
FORCE FITTING PLUG (-21)
INTO HOLE.

10 APPLY $\frac{1}{2}$ IN. OF "LOCTITE" CEMENT BELOW
BOLT HEAD BEFORE INSERTING BOLT.

11. FOR CHARACTER STAMPING DETAIL, REFER
TO SHEET 8.

20 (REF)

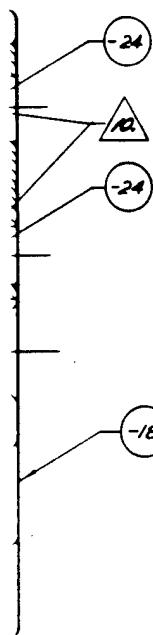


-4 BLOCK ASSY.

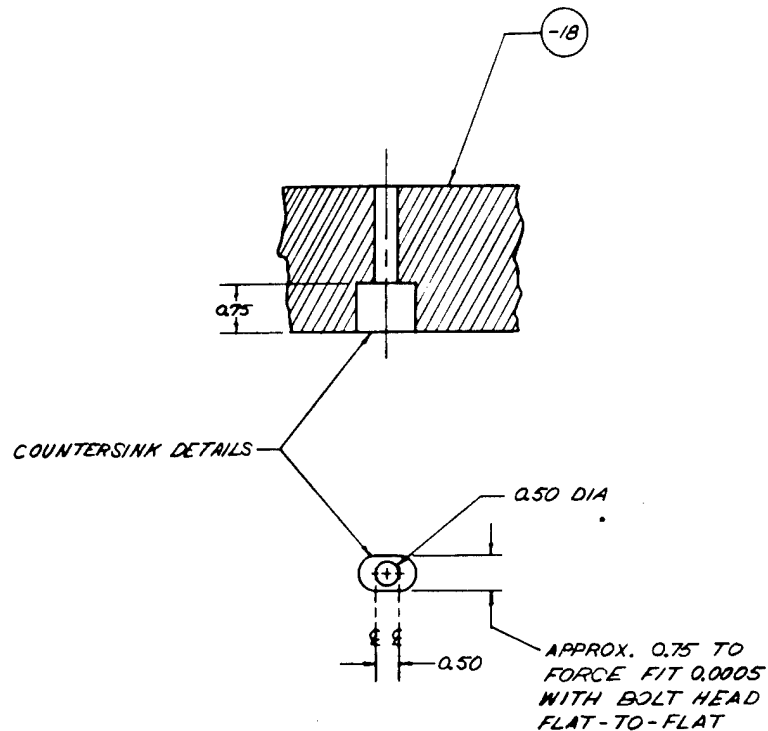
Figure 25. Dwg, S-3A Ballast Block, -4 Block

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS ± ANGLES 2 3 PLACE DECIMALS ± .001 2 PLACE DECIMALS ± .01	CONTRACT NO.	
	Drawn	QUARTUCCI
DO NOT SCALE THIS DRAWING	CHECKED	D. R. R.
MATERIAL: 6061-T6S1 ALUMINUM	APPROVED	
FINISH: GRAY ANODIZE MIL-A-8625	APPROVED	

REVISIONS				DATE	APPROVED
ZONE	LTR	DESCRIPTION			



$\frac{9}{16}$ DIA HOLE, 10.0 DEEP



DETAIL A: BOLT HOLE

CORNERS
S OTHERWISE

LT ASSY (-7)
-20) BEFORE
PLUG (-21)

LOCTITE" CEMENT BELOW
RE INSERTING BOLT.

STAMPING DETAIL, REFER

ASSY

-4 Block

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS ± .005 DECIMALS ± .001 ANGLES ± .01		CONTRACT NO.		NAVAL AIR DEVELOPMENT CENTER WARMINSTER, PA. 18974	
DO NOT SCALE THIS DRAWING		DRAWN	J. QUARTUCCIO	S-3A BALLAST BLOCK -4 BLOCK	
MATERIAL: 6061-T651 ALUMINUM		CHECKED	D. Ford 11/28/83		
FINISH: GRAY ANODIZE MIL-A-8625		APPROVED		SIZE	CODE IDENT NO.
		APPROVED		D	80206
				NASC DWS NO.	S3ABB4/5
				SCALE	1/2
				WT	
				SHEET 5 OF 8	

③

D

-6

-4

-5

C



B

A

PLATE ORIENTATION IN SEAT

FWD



①

-6 (REF)

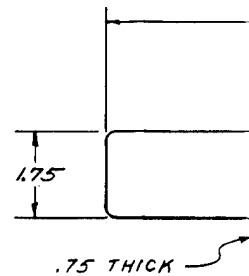
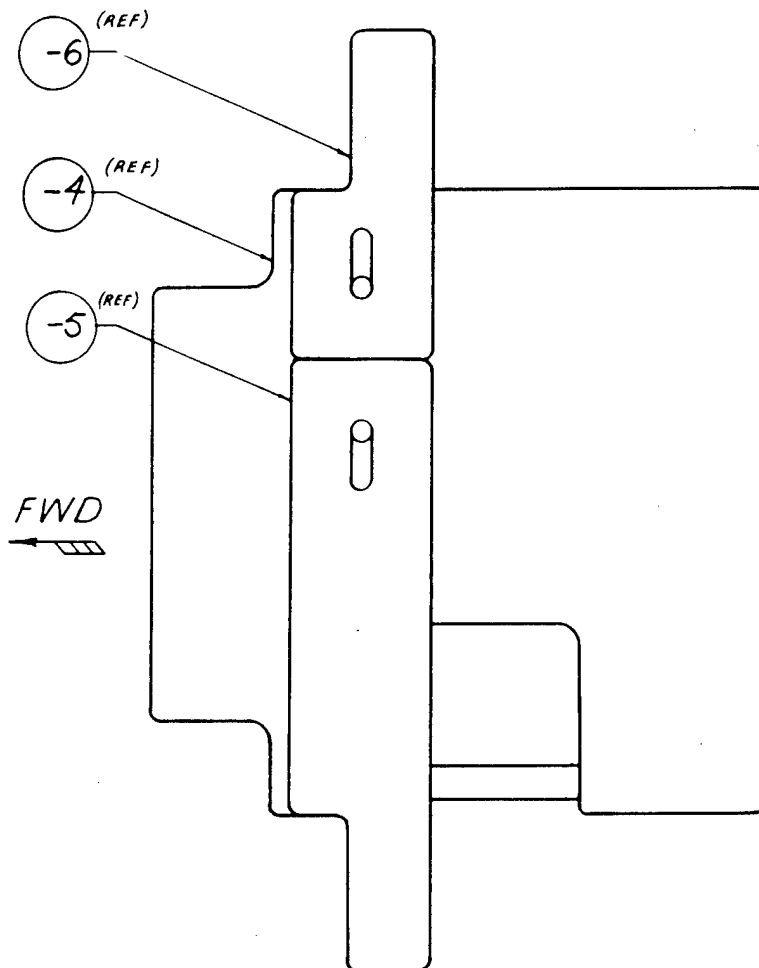
-4 (REF)

-5 (REF)

FWD

PLATE O₁

Figure 26. Dwg



NOTES: 12. ALL OUTER EDGES HAVE
13. SLOT EDGES
14. FOR CHARACTERISTICS REFER TO SHEET

-5 LOCKING

47

PLATE ORIENTATION IN AISLEWAY

NOTES: 15. ALL OUTER EDGES HAVE
16. SLOT EDGES
17. FOR CHARACTERISTICS REFER TO SHEET

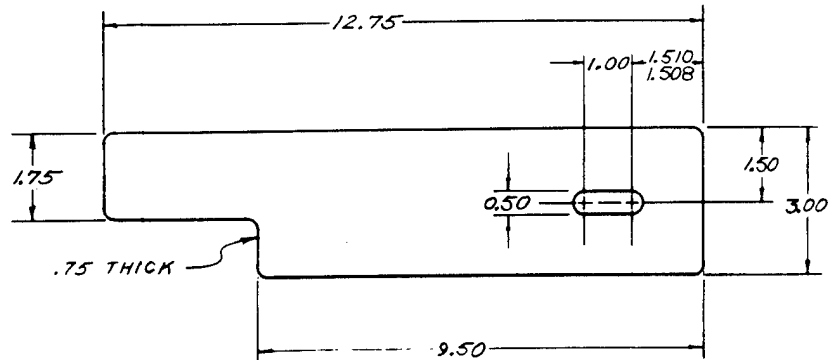
-6 LOCKING

Figure 26. Dwg, S-3A Ballast Block, Aisle Locking Plate



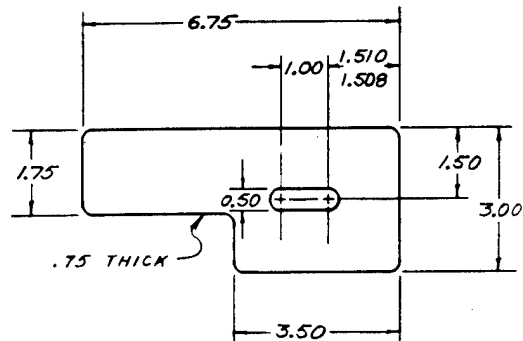
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS 2 3 PLACE DECIMALS ± .001 1 PLACE DECIMALS ± .001		CONTRACT NO.	
DO NOT SCALE THIS DRAWING		DATE	10
MATERIAL: 6061-T6 ALUMINUM		QUANTITY	1
FINISH: GRAY ANODIZE MIL-A-8625		APPROVED	
		DRAWN	

REVISIONS				DATE	APPROVED
ZONE	LTR	DESCRIPTION			



NOTES: 12. ALL OUTER CORNERS AND
EDGES HAVE $\frac{1}{4}R$
13. SLOT EDGES HAVE $\frac{1}{16}R$
14. FOR CHARACTER STAMPING DETAIL,
REFER TO SHEET B.

-5 LOCKING PLATE DETAIL



NOTES: 15. ALL OUTER CORNERS AND
EDGES HAVE $\frac{1}{4}R$
16. SLOT EDGES HAVE $\frac{1}{16}R$
17. FOR CHARACTER STAMPING DETAIL,
REFER TO SHEET B.

-6 LOCKING PLATE DETAIL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS DECIMALS ANGLES 3 PLACES DECIMALS ± .001 2 PLACES DECIMALS ± .001		CONTRACT NO.		NAVAL AIR DEVELOPMENT CENTER WARRINGTON, PA. 18974	
DO NOT SCALE THIS DRAWING		DRAWN: L. QUARTUCCIA		S-3A BALLAST BLOCK AISLE LOCKING PLATES	
MATERIAL: 6061-T651 ALUMINUM		CHECKED: J. J. [Signature]			
FINISH: GRAY ANODIZE MIL-A-8626		APPROVED:		DATE: 8/20/65	
		REVISED:		SHEET 6 OF 8	

AISLEWAY

Locking Plate

3

NOTES:

19. MATERIALS (REPEATED FROM SHEET 1):

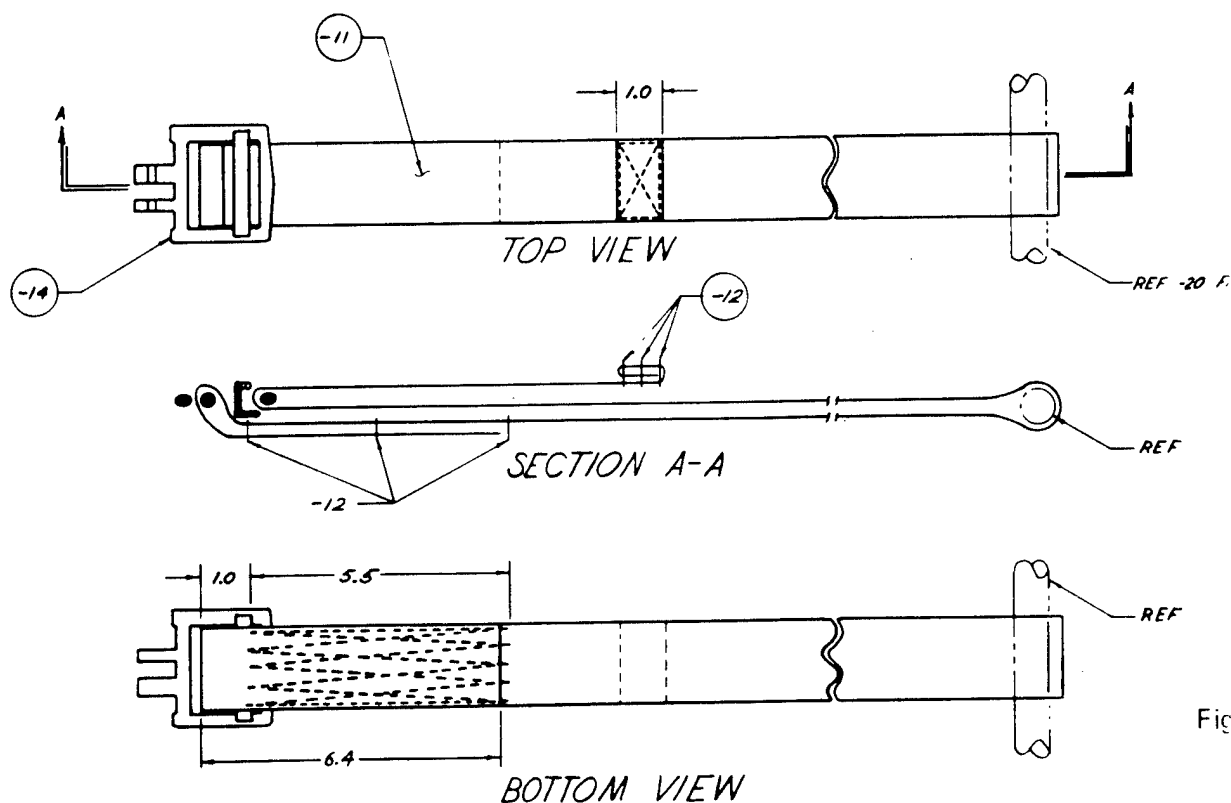
PART NO.	NO. REQD. PER ASSY.	DESCRIPTION	SIZE	MATERIAL	SPECIFICATION
-9	1	LAP BELT STRAP— ONE CONTINUOUS STRAP, LOOPED BACK ON ITSELF	$1\frac{3}{4} \times 44$	NYLON, SAGE GRN. WEBBING	MIL-W-4088 TY XII.
-10	1	CROSS STRAP	$1\frac{3}{4} \times 11$	" "	" "
-11	2	SHOULDER HARNESS STRAP	$1\frac{3}{4} \times 54$	" "	" "
-12	AS REQUIRED	THREAD		NYLON SAGE GRN., 6 CORD	V-T-295 NIIN 00-559-5211
-13	2	LAP BELT QUICK RELEASE FITTING			P/N 015-11366-1 (NOCH)
-14	2	SHOULDER HARNESS QUICK RELEASE FITTING			P/N 015-710001-1 (NOCH)

20. SEAR ENDS OF NYLON WEBBING TO PREVENT FRAYING, AVOID FORMING SHARP EDGES.

21. ALL STITCHING SHALL BE 4 TO 6 THREADS PER INCH.

22. STITCHING ALONG EDGE SHALL BE $\frac{1}{8}$ IN. AWAY FROM EDGE OF WEBBING.

23. ALL STITCHING SHALL BE BACKSTITCH $\frac{1}{2}$ MIN.



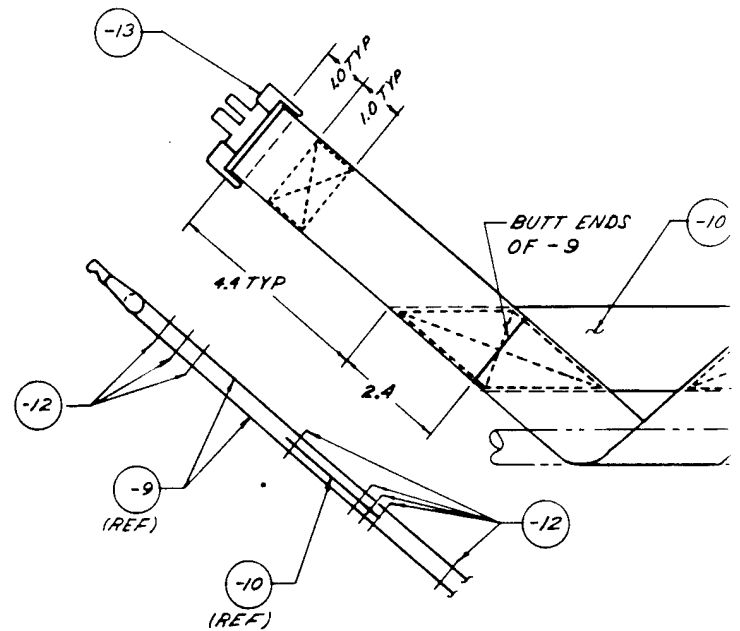
-8 SHOULDER HARNESS STRAP ASSY. (2 REQ)

①

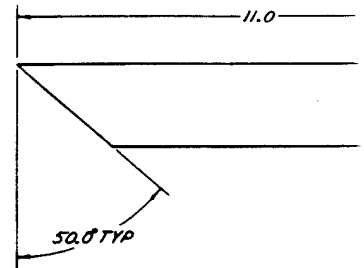
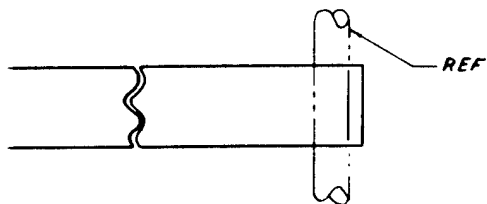
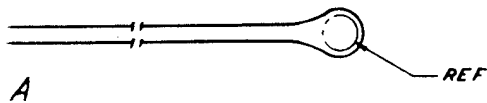
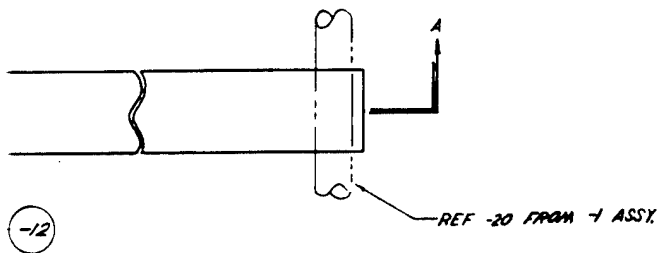
SIZE	MATERIAL	SPECIFICATION
$1\frac{3}{4} \times 44$	NYLON, SAGE GRN WEBBING	MIL-W-4088 TY XIII
$\frac{3}{4} \times 11$	" "	" "
$\frac{3}{4} \times 54$	" "	" "
	NYLON SAGE GRN, 6 CORD	V-T-295 NIIN 00-559-5211
		P/N 015-11366-1 (NOCH)
		P/N 015-710001-1 (NOCH)

2 FORMING SHARP EDGES.

OF WEBBING.



-7 LAP BELT



-10 CROSS

Figure 27. Dwg, S-3A Ballast Block, Strap Assemblies

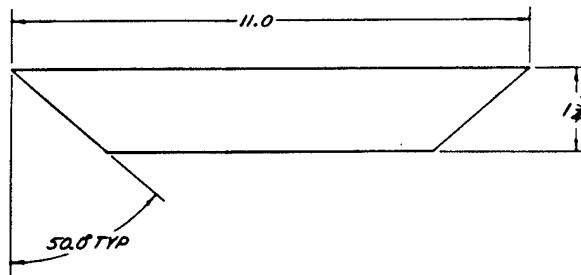
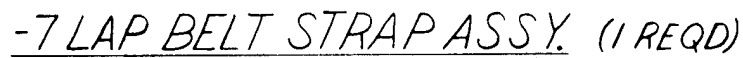
W

SS STRAP ASSY. (2 REQD)

2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS 2 DECIMALS 2 ANGLES 2 3 PLACE DECIMALS 3 2 PLACE DECIMALS 2		CONTRACT NO. ORDER NO. 10 QUANTITY 2 APPROVED APPROVED	
DO NOT SCALE THIS DRAWING MATERIAL: SEE NOTE 19.		ORDER NO. 10 QUANTITY 2 APPROVED APPROVED	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

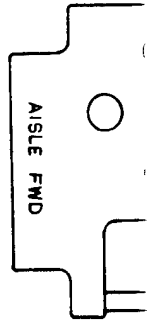
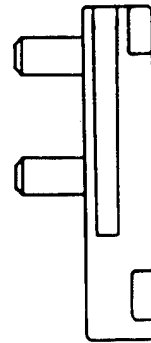
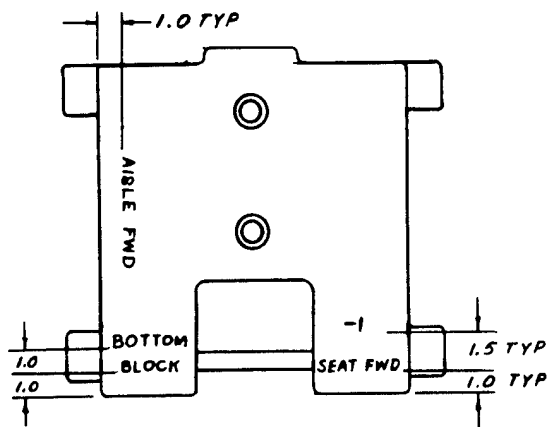


-10 CROSS STRAP

DURING OVERVIEW SPEC IF REQ 2 DIMED HOLE AND 10 THREADS TELESCOPING ARE: FRACT HOLE 2 2 PLACE DISC HOLE 2 2 PLACE DISC HOLE 2		CONTRACT NO. 		NAVAL AIR DEVELOPMENT CENTER WARRINGTON, PA. 10974	
DO NOT SCALE THIS DRAWING REMARKS: SEE NOTE 19.		DRAWN <u>W. J. M. R. C. C. C.</u> CHECKED <u>D. J. R. C. C. C.</u> <u>W. J. M. R. C. C. C.</u> 		S-3A BALLAST BLOCK STRAP ASSEMBLIES	
APPROVED APPROVED		SIZE D		QRGY IDENT NO. 80206	NAME QRGY NO. S3ABB4/7
		SCALE $\frac{1}{2}$		QTY 7	QRGY 7 of 8

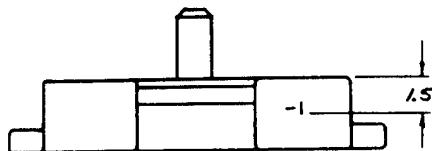
③

D



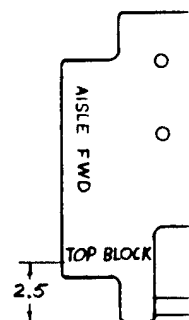
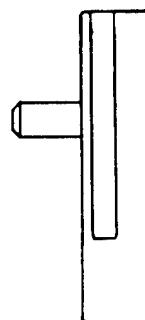
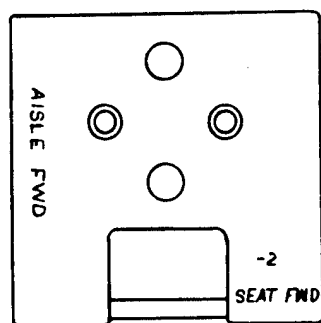
NOTE: 24 CENTER ALL LABELS
UNLESS OTHERWISE
STATED.

C

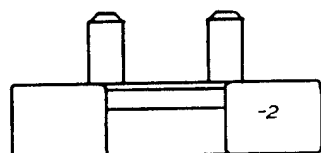


-1 BLOCK ASSY.

B



A

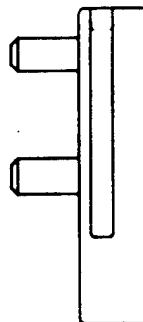
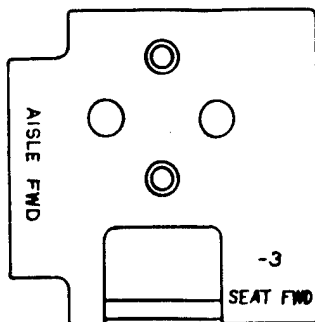
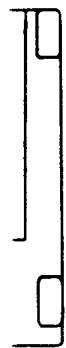


-2 BLOCK ASSY.

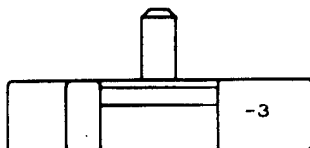
①

Figure 28

NADC-84015-60



ALL LABELS
OTHERWISE



-3 BLOCK ASSY.

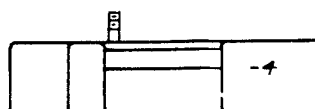
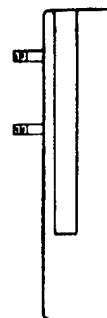
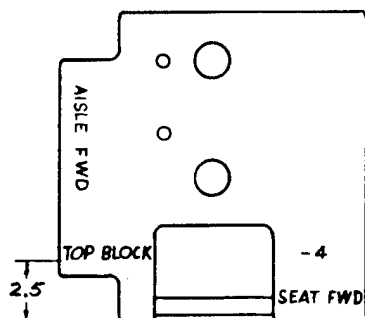


Figure 28. Dwg, S-3A Ballast Block, Stamping Detail

37

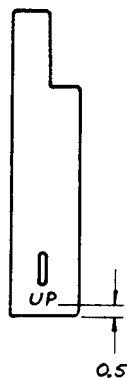
-4 BLOCK ASSY.

NOTES: 25. ALL STAMP.
26. SEE -1 BLOCK
27. STAMPING 12

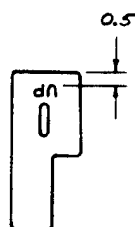
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS 1/16 ANGLES 2 3 PLACE DECIMALS 2 2 PLACE DECIMALS 2	DATE:
DO NOT SCALE THIS DRAWING	DATE:
MATERIAL: N/A	CHECK:
	APPRO:
	APPRO:



REVISIONS				
DATE	LTR	DESCRIPTION	DATE	APPROVED



-5 LOCKING PLATE



-6 LOCKING PLATE

NOTES: 25. ALL STAMPING IS $\frac{3}{8}$ IN. HIGH
 26. SEE -1 BLOCK FOR TYPICAL STAMPING LOCATION
 27. STAMPING IS NOT DRAWN TO SCALE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS 2 ANGLES 2 3 PLACE DECIMALS 2 1 PLACE DECIMALS 2	CONTRACT NO.		NAVAL AIR DEVELOPMENT CENTER WARRINGTON, PA. 16974	
	DRAWN J. QUARTUCCIO		S-3A BALLAST BLOCK STAMPING DETAIL	
	CHECKED D. K. [Signature]	11/20/83		
	DO NOT SCALE THIS DRAWING		DATE 0 80206	
MATERIAL: N/A	APPROVED		DATE 0 80206	
	APPROVED		DATE 0 80206	
	APPROVED		DATE 0 80206	
SCALE 1/4		SHEET 8 OF 8		PLATE NO. 10000

Detail

3

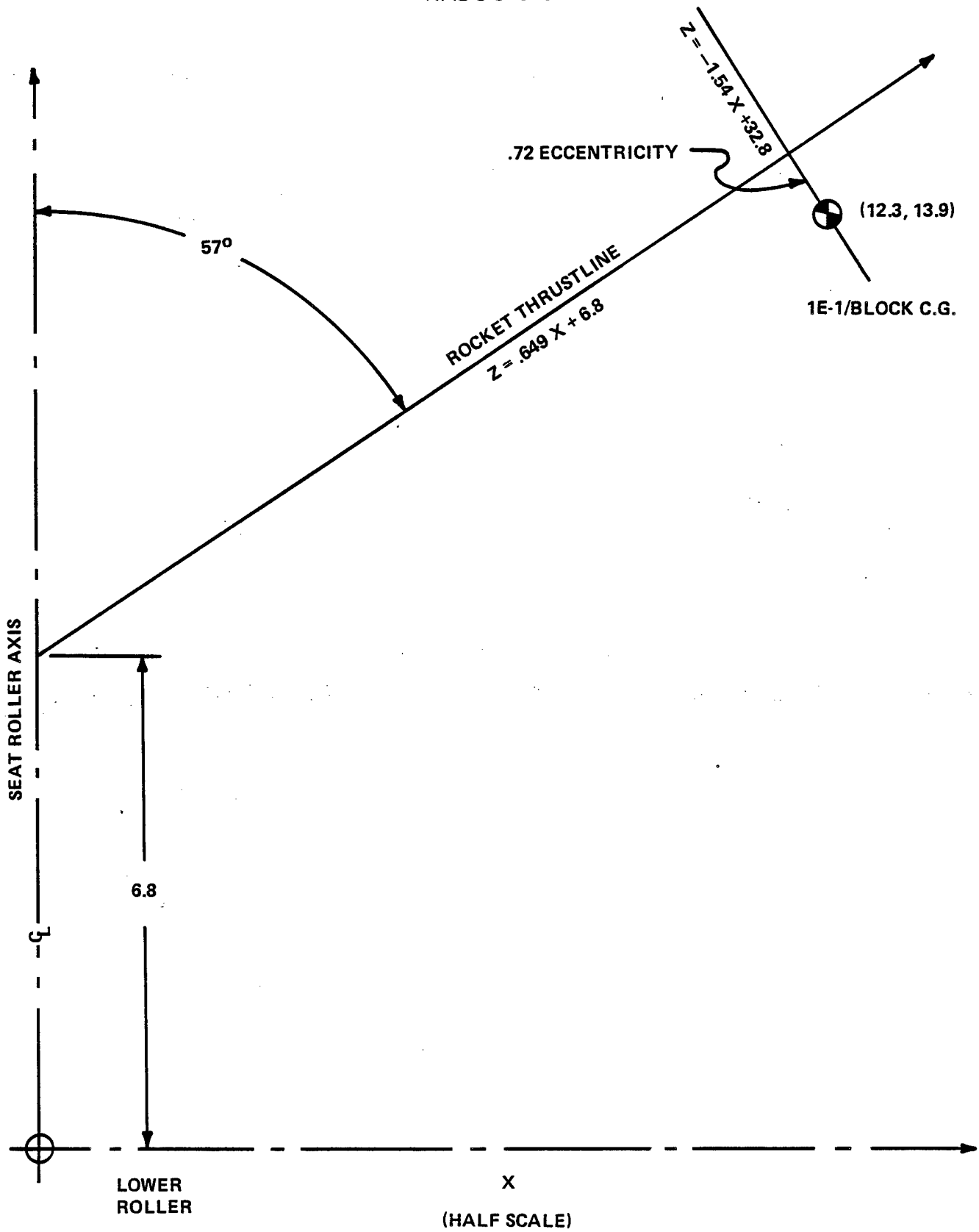


Figure 29. 1E-1 Ballast Block C.G. Eccentricity with Rocket Thrustline