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UNCLASSIFIED C-1713

REPORT

FIRST REPORT ON DETERMINATION OF POSSIBLE
MOVEMENT OF CORPS AND DIVISION ARTILLERY UTILIZING
C-47, B-17, AND B-24 AIR PLANES,

AND FIRST REPORT ON ORDNANCE PROGRAM NO. 6077 - /

ORDNANCE PROGRAM NO. 6077

UNCLASSIFIED

ABERDEEN PROVING GROUND
ABERDEEN, MARYLAND [redacted]

C. B. Reg. No. 06-58-TA-DC

3425(678-1102-084)

UNCLASSIFIED

[redacted]

FIRST REPORT ON THE DETERMINATION OF POSSIBLE MOVEMENT OF CORPS AND DIVISION ARTILLERY UTILIZING C-47, B-17, AND B-24 AIRPLANES

AND

FIRST REPORT ON ORDNANCE PROGRAM NUMBER 6077

ORDNANCE PROGRAM NUMBER 6077

Date of Test: 8 to 12 February 1944

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I. INTRODUCTION:

Numerous investigations have been conducted in recent months to develop procedures for the installation of miscellaneous weapons and automotive equipment in transport aircraft. It has now become desirable to investigate methods for the installation of division and corps artillery, together with necessary tools, accessories sighting and fire control equipment, communication equipment ammunition, and expedient prime movers in C-47, B-17, and B-24 aircraft.

II. OBJECT OF TEST:

To determine -

A. Major items of Corps and Division Artillery which can be loaded on C-47, B-17, and B-24 airplanes.

B. Best loading arrangements therefor.

C. Number of airplanes by type to move for a distance of 150 miles (airplane return to be made without refueling).

1. Corps artillery which can be air transported.

2. Division artillery which can be air transported.

3. 100 round units of ammunition therefor.

4. Practicable prime movers for Corps and Division Artillery and ammunition.

III. AUTHORITY FOR TEST:

A. Memorandum to Chief of Army Ground Forces, Chief of Army Air Forces, and Chief of Army Service Forces, from Chief of Staff, dated 8 February 1944.

B. Verbal instructions from Major General G. M. Barnes, Ordnance Department to Major General C. T. Harris, Jr., Aberdeen Proving Ground, Maryland.

C. Written memorandum from Brigadier General H. A. Craig, Army Air Forces, to Brigadier General M. E. Gross, Army Air Forces.

D. Verbal instructions Major General G. M. Barnes to Colonel H. A. Quinn, Ordnance Department.

[redacted]

[redacted]

IV. ASSUMPTIONS:

A. Only equipment readily available to field units may be used.

B. Disassembly must be the minimum practicable in order to insure rapid reassembly.

C. Airplanes will not drop equipment - unloading will be by hand with aid only of equipment transported.

D. Crew of airplane to consist of pilot, co-pilot, radio operator, navigator, crew chief and at least one other person who assisted in loading the airplane.

E. Where practicable, the complete weapon and its ammunition will be loaded in the same airplane.

F. Reassembly will be accomplished chiefly by the gun crews.

V. CONCLUSIONS:

A. The following loadings are considered impracticable.

1. Gun, 155 MM, M1 and Howitzer, 8", M1. The weight and length of the tubes of these weapons exceed the capacity of any of these airplanes.

2. Prime movers larger and/or heavier than the truck, 2-1/2 ton, 6 by 6 cannot be satisfactorily disassembled into small enough units for installation in these planes and subsequent reassembly under emergency conditions.

B. Loadings which were found to be practicable were shown in Appendix One (Summary).

C. The best loading arrangement of these items are shown in the individual test reports in Appendix Two.

D. The number of airplanes by type required to move normally assigned Corps Artillery units and organizational division artillery together with sufficient prime movers for each is shown in Appendix Three.

Mervin E. Gross.
MERVIN E. GROSS
Brig. Gen. U.S.A.
Chief, Requirements Div.
Headquarters, AAF

H. A. Quinn
H. A. QUINN
Col., Ord. Dept.
Chief,
Aircraft Armament Br.

John W. Cave
JOHN W. CAVE
Lt. Col., Ord. Dept.
Chief,
Arms & Ammunition Div.

J. W. Carlson
J. W. CARLSON
Capt., Ord. Dept.
Proof Officer

C. H. Johnson
C. H. JOHNSON
Maj., Ord. Dept.
Proof Officer

[redacted]

The following personnel were present at Aberdeen Proving Ground during the test:

Name	Organization	Office
Brig. Gen. M. E. Gross	AAF O.C.R.	Washington, D. C.
Col. F. B. Porter	F. A. Board	Fort Bragg, N. C.
Col. H. A. Quinn	Ord. Dept.	Washington, D. C.
Lt. Col. H. H. Berry	AAF 1st Bomber Command	Charleston Air Base, S. C.
Lt. Col. L. A. Peterman	AAF Materiel Command	Wright Field, Ohio
Major R. S. Bowles	Ord. Dept.	Washington, D. C.
Major R. T. Crane	AAF O.C.R.	Washington, D. C.
Major W. K. Gregory	AAF Materiel Command	Wright Field, Ohio
Major C. W. Hayhurst	Signal Corps	Philadelphia, Pa.
Major P. R. Shaffer	AAF Materiel Command	Wright Field, Ohio
Capt. R. J. Jerome	AAF	Westover Field, Mass.
1st Lt. B. R. Allen	AAF	Westover Field, Mass.
1st Lt. G. W. Holmes	Airborne Engineers	Richmond, Va.
2nd Lt. L. L. Moses	Signal Corps	Philadelphia, Pa.
Mr. O. L. Beardsley	Ord. Dept.	Washington, D. C.
Mr. A. B. Cella	Signal Corps	Philadelphia, Pa.
Mr. J. S. Dagilaltis	AAF	Washington, D. C.
Mr. V. M. Lucht	Ord. Dept.	Washington, D. C.
Mr. W. B. Miller	AAF Materiel Command	Wright Field, Ohio
Mr. E. A. Moraski	AAF Materiel Command	Wright Field, Ohio
Mr. A. Rubin	Signal Corps	Philadelphia, Pa.

APPENDIX 1

(PRACTICABLE LOADINGS)

SUMMARY

Items	C-47 In addition to crew			B-17 In addition to crew			B-24 In addition to crew		
	units per airplane	ammunition per airplane	cargo weight	units per airplane	ammunition per airplane	cargo weight	units per airplane	ammunition per airplane	cargo weight
Corps Artillery									
155 mm Howitzer, M1	1/2		7543	0			0		
	1/2		7400						
Note: This Howitzer can be carried in two C-47's with weights as shown. However, by using two C-47's with one B-17 or one B-24 (three airplanes), two Howitzers may be carried in three airplanes. Details of loadings shown in tests Nos. 16 a, b, c, d.									
4.5" Gun, M1	1/2		7797	0			0		
	1/2		7400						
Note: This gun can be carried in two C-47's with weights as shown. However, by using two C-47's with one B-17 or one B-24 (three airplanes), two guns may be carried in three airplanes. Details of loading shown in tests Nos. 16 a, b, c, d.									
155 mm Howitzer, M1 Ammunition		50	6166		56	7612		72	9072
4.5" Gun, M1, Ammunition		80	6235		90	6510		176	12888

Note: Weights include allowances for rigging.

APPENDIX 1 (cont'd)

Items	C-47 In addition to crew		B-17 In addition to crew		B-24 In addition to crew	
	units per plane	cargo weight	units per plane	cargo weight	units per plane	cargo weight
Prime Mover						
Cargo Truck 2-1/2 Ton 6 x 6 Short wheel base with winch.	1/2	5210	Impractical	Impractical	Impractical	Impractical
Cargo Truck 3/4 Ton 4 x 4 with winch	1	5500	Impractical	Impractical	Impractical	Impractical
Jeep, 1/4 Ton 4 x 4	2	5000	See Camp MacKall Report		See Camp MacKall Report	
Trailer Cargo 1 Ton 2 Wheel wood or steel body	*1 (assembled)	1500	Impractical	Impractical	2 Disassembled in rear bomb bays. Note: Two 1/4 ton trailers may be carried in same load in front bomb bays	3000
Trailer Cargo 1/4 Ton 2 Wheel	*1 (assembled)	550	2 Disassembled in bomb bay.	1100	2 Disassembled in front bomb bays. Note: Two 1 ton trailers may be carried in same load in rear bomb bays.	1100
Tractor, Clark Engineers, 20 HP	1	4135	Impractical	Impractical	Impractical	Impractical
Clark Fork Lift Truck (minus fenders)	1	6100	Impractical	Impractical	Impractical	Impractical

* One 1 ton and one 1/4 ton can be placed in C-47.

APPENDIX 1 (Cont'd)

Items	C-47 In addition to crew			B-17 In addition to crew			B-24 In addition to crew		
	units per airplane	ammunition per airplane	cargo weight	units per airplane	ammunition per airplane	cargo weight	units per airplane	ammunition per airplane	cargo weight
Division Artillery									
155 mm Howitzer, M1		Same as listed for Corps Artillery							
105 mm Howitzer, M2 *Including weight of accessories. **Test made at Camp MacKall.	1	18 Total	*5197 1032 6229	2		9800	**1		4900
105 mm Ammunition		105	6010		84	4816		163	10000
Army Special Troops									
4.2 Chemical Mortar *Including weight of accessories.	2	160	610 5280 5600	4	200	1220 6950 8170	8	208	*2980 7020 10000
105 mm Howitzer, M3 *Including weight of accessories. **Test conducted at Camp MacKall.	2	30	*5915 1720 7635	2	42	5400 2700 8100	**1		
105 mm Ammunition		105	6010		84	4816		163	9000
3" Antitank Gun, M1 *Test conducted at Camp MacKall.	1	12	5676 474 6150	2		10872	*1		
3" Ammunition		144	5763		144	6201		128	5656

Note: Weights include allowances for rigging.

The following tabulation shows the method employed for assignment of test numbers.

	MATERIEL			AMMUNITION		
	C-47	B-17	B-24	C-47	B-17	B-24
Mortar, 4.2"	1 (1)	2 (1)	3 (1)	25	26	27
Howitzer, 105 mm, M3	4	5	6	28	29	30
Howitzer, 105 mm, M2	7	8	9	31	32	33
Gun, 3", M1	10	11	12	34	35	36
Gun, 4.5", M1	13	14	15	37	38	39
Howitzer, 155 mm, M1	16	17	18	40	41	42
Gun, 155 mm, M1	19 (2)	20 (2)	21 (2)	43 (4)	44 (4)	45 (4)
Howitzer, 8", M1	22 (3)	23 (3)	24 (3)	46 (4)	47 (4)	48 (4)

PRIME MOVER	PLANES		
	C-47	B-17	B-24
Truck, 2-1/2 Ton	49	50	51
Truck, 3/4 Ton	52	53	54
Truck, 1/4 Ton	55	56	57
Tractor, Crawler	58	59	60
Trailer, 1/4 Ton	61	62	63
Trailer, 1 Ton	64	65	66
Clark Fork Lift	67	68	69
Signal Corps Equipment	70	71	72

(1) Details of tests nos. 1, 2, and 3 are not shown separately in this report. These tests were combined with tests nos. 25, 26, 27 since it was found practicable to load both materiel, in complete units, and ammunition in all three types of airplanes.

(2) Tests nos. 19, 20, and 21 were not conducted since the weight and length of tube, which is the heaviest component of the complete assembly, exceeded the weight carrying capacity of any position on any aircraft. The tube, which weighs 9595 pounds, can be hung on 4000 pound external bomb racks for the B-17 and B-24, but their strength is inadequate. Hence, though these planes can carry 15,000 pounds, the tube cannot be carried.

The weight of the tube exceeds the permissable pay load of a C-47. Further, the floor of a C-47 will not stand a concentrated load of this magnitude.

Therefore, no attempt was made to carry any other part of this weapon in any of the three aircraft.

(3) The same remarks apply to tests nos. 22, 23, and 24 as for the 155 gun except that the tube weighs 10,240 pounds.

(4) No installations of this ammunition were attempted since it was determined that the installation of the materiel was impracticable for these airplanes, as indicated in (2) and (3) above.

Test No. 4

INSTALLATION OF THE 105 MM HOWITZER, M3, ON CARRIAGE, M3A1, IN C-47 AIRPLANE

A. Two complete howitzers (no disassembly) were installed in this airplane together with a total of 30 rounds in 10 boxes (3-round bundles, crated) of ammunition and 2 boxes of battery accessories, 2 boxes of sights and 1 box of standard tools. Ramps were installed and the first howitzer was run into the plane after the seats had been folded back so that the muzzle of the tube was just inside the doorway leading into the radio compartment. The traveling lock was unlocked and the howitzer was elevated slightly. Six 3 round crates of complete rounds were then placed against the forward wall. The second howitzer was then man-handled into the main compartment of the ship in a similar manner until the spades of the first howitzer could be placed on top of the axles of the second howitzer. This union of spades and axles was made secure by lashing. Battery accessories, tools, and sights in their containers were then stored on the floor underneath the second howitzer and four cases of ammunition were lashed to the floor opposite the closed trails of the second howitzer. Diagram No. 4 shows the floor plan for this loading arrangement. Reference is made to appended APG Photographs Nos. 95788 and 99696 to 99699, inclusive. These photographs show respectively the complete 105 mm Howitzer, M3, loading operations in progress, progressive installation in plane, and final installation in plane.

B. In order to remove this equipment from the plane, the ammunition, tool boxes, sights, and battery accessories must be removed first and the howitzers removed in inverse order of loading. In moving the howitzers up or down the ramp, effective use can be made of the truck, 1/4-ton, 4 x 4, with two men as guides. Without the truck, installation may be accomplished by the efforts of eight men using a safety rope.

C. Material Used for Installation

1. Two pieces of planking, 2" x 10" x 16', four blocks, 3" x 10" x 12" thirty-two ten-penny nails.

2. Plane rigging. Sixteen lengths of one-half inch plane rigging for lashing material to the floor, each length fourteen feet. Two side ramps for loading material on ship.

3. No additional rigging was used.

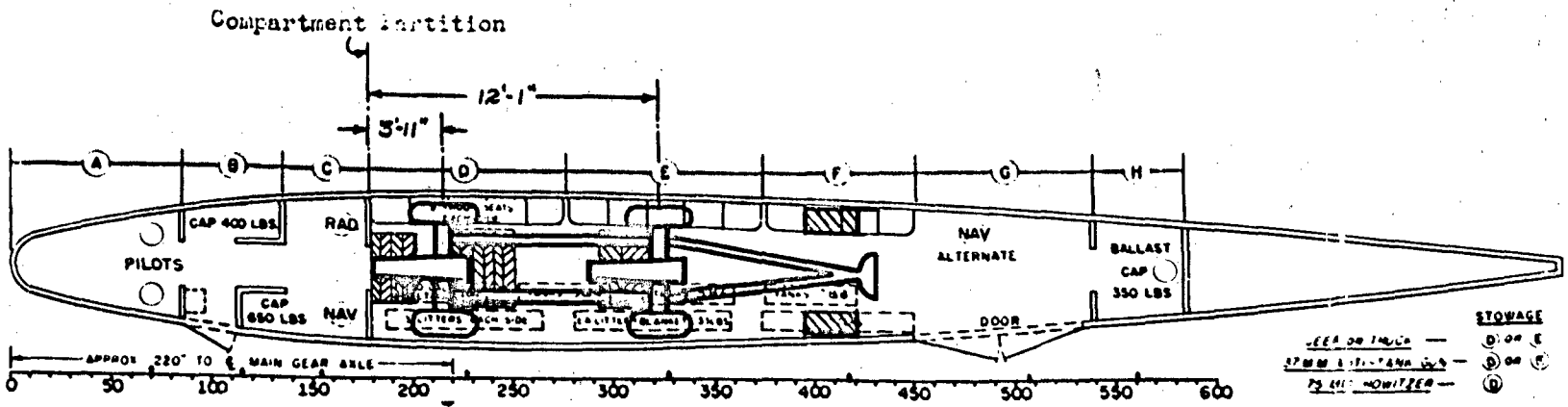
D. Weights

	Lbs.
Ten boxes of 105 mm Howitzer complete rounds	1720
Two boxes of battery accessories	240
Two boxes of sights	150
One box of tools	125
Two 105 mm Howitzers, M3	5400
Total Weight	7635

Test No. 4 (Cont'd)

NOTE: In addition to the assumed crew and cargo load 0 soldiers may be carried.

E. Disassembly time: None
Loading time: 1-1/4 hours
Unloading time: 1/2 hour
Reassembly time: None



Compt. D - Hub of 1st Howitzer directly on section 216½ - 3'11" from compartment partition.

Compt. E - Hub of 2nd Howitzer centered between sections 312½ and 3[illegible] - 12'1" from compartment partition.

Compt. D - (4 boxes ammunition against partition, under muzzle of 1st Howitzer.
(6 boxes ammunition against axle, under trails of 1st Howitzer.

Compt. E - Accessory boxes under Muzzle.

Compt. F - Tools and Sight boxes.

C.G. = 18.5 index units

Gross Cargo Wt. = 7635 lbs.

C-47
R4D-1, a-5

EXTERNAL STOWAGE

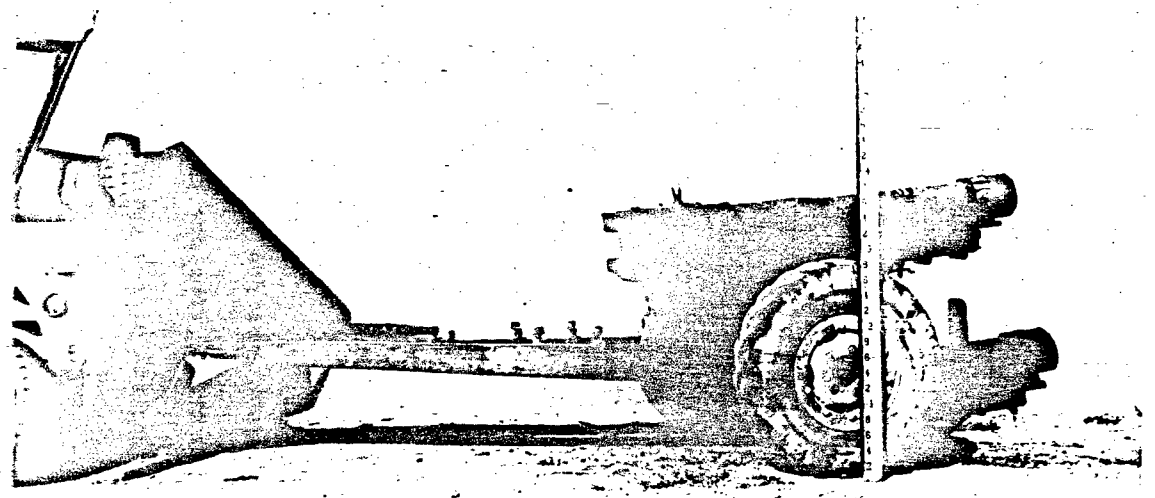
PACKS - FORWARD (D)
CENTER (E)
REAR (F)

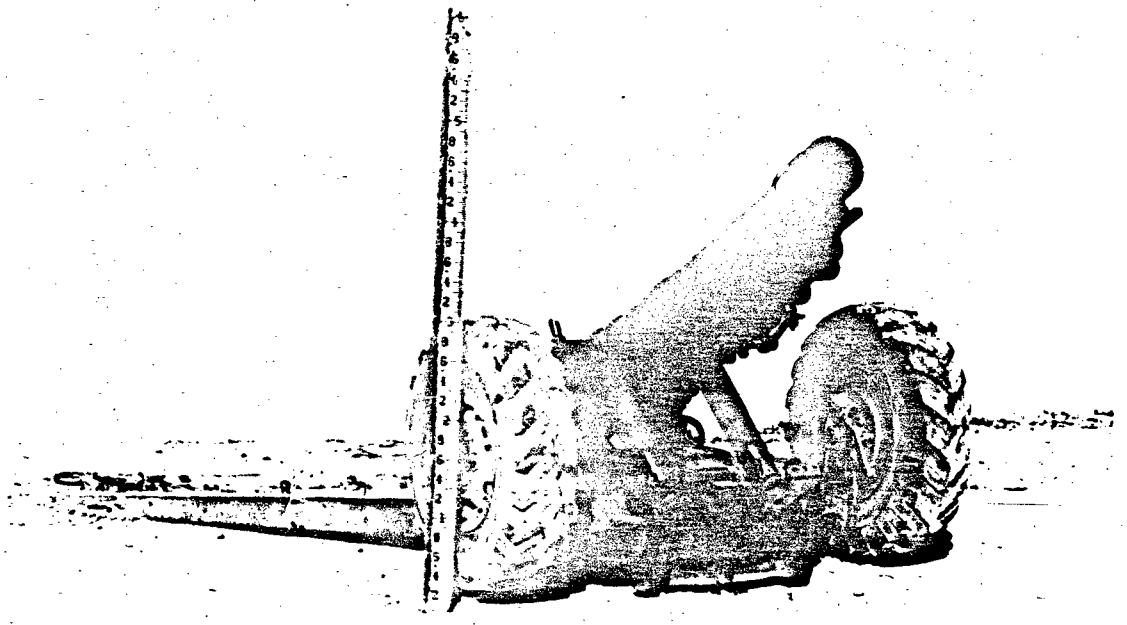
PROPS - REAR (G)

F'W'D - NO SCALE REQUIRED

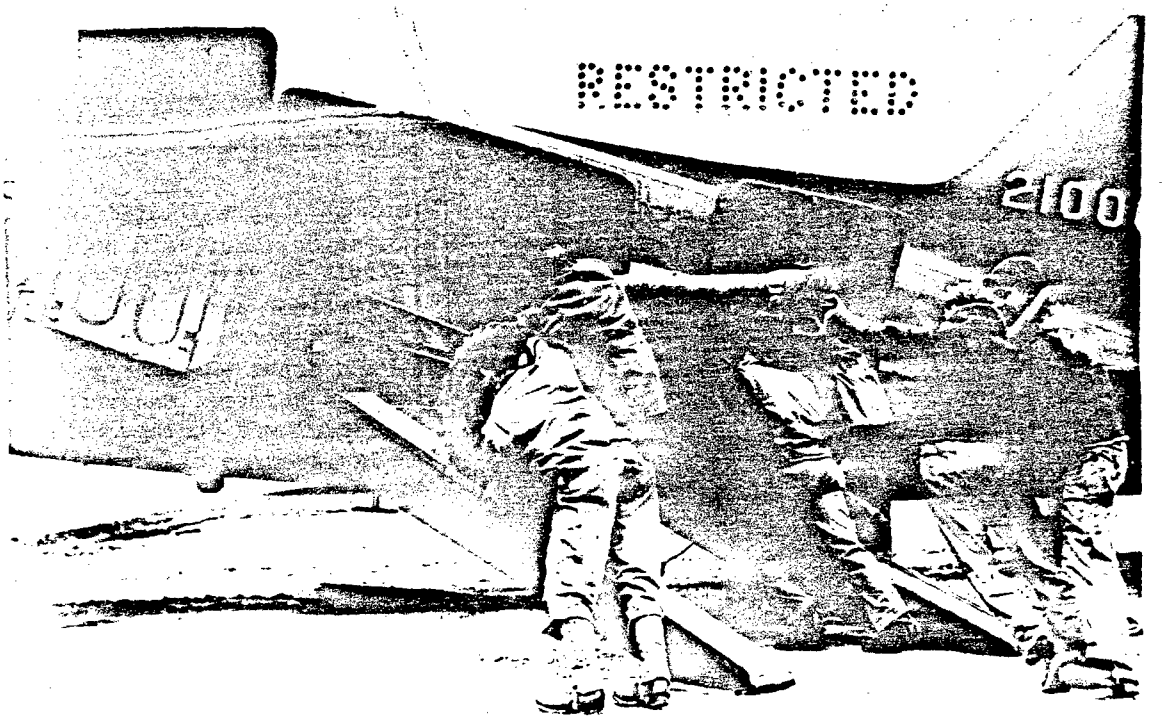
TEST NO. 4

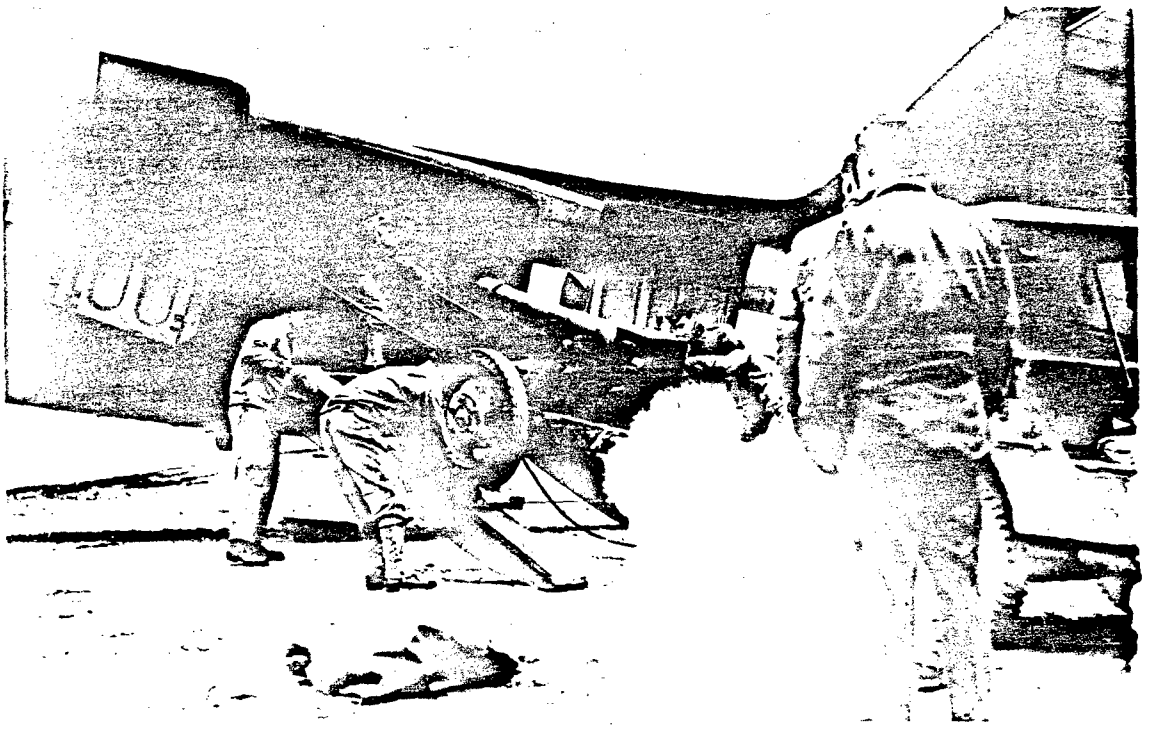
RESTRICTED





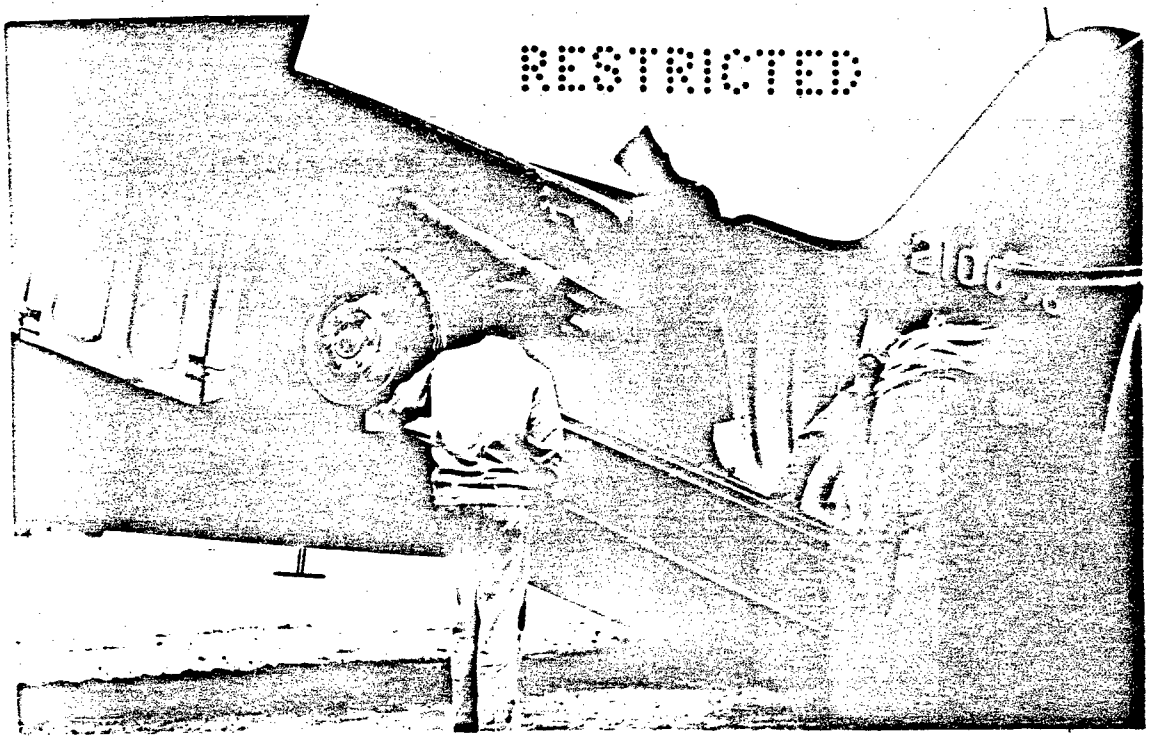
[illegible] -43 | ABERDEEN PROVING GROUND | ORDNANCE DEPT.
[illegible] Howitzer, M3, Carriage, M3, Recoil Mechanism, M3.

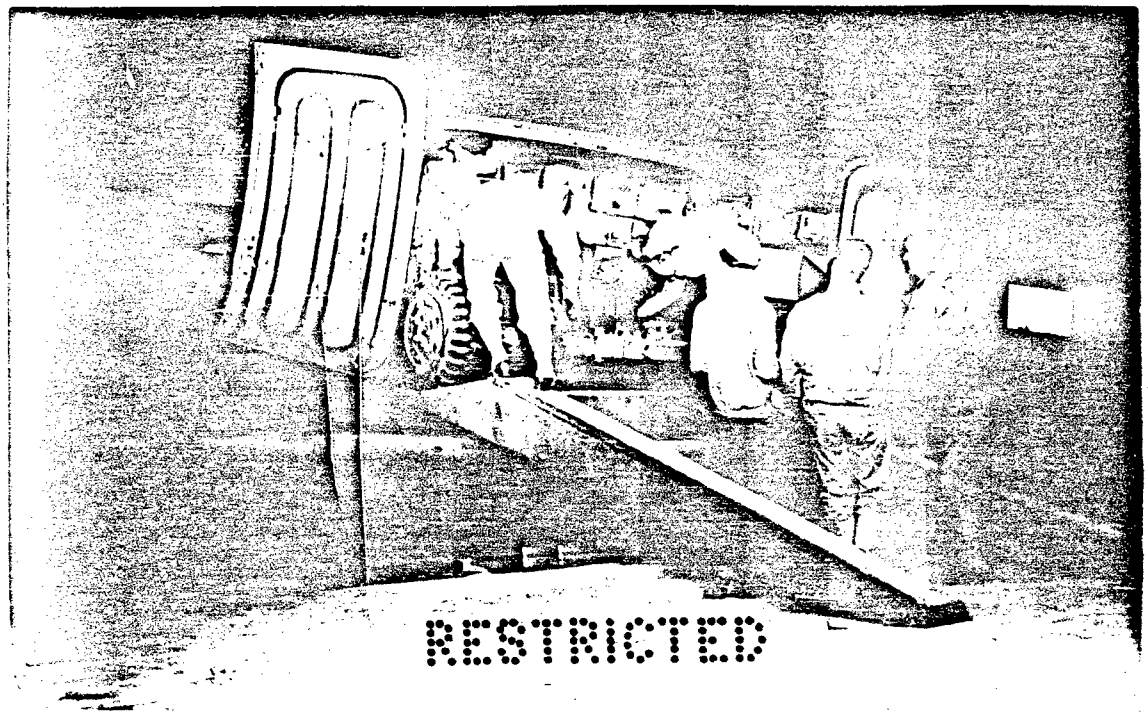




[illegible] 2-11-[illegible] | ABERDEEN PROVING GROUND | ORDNANCE DEPT.

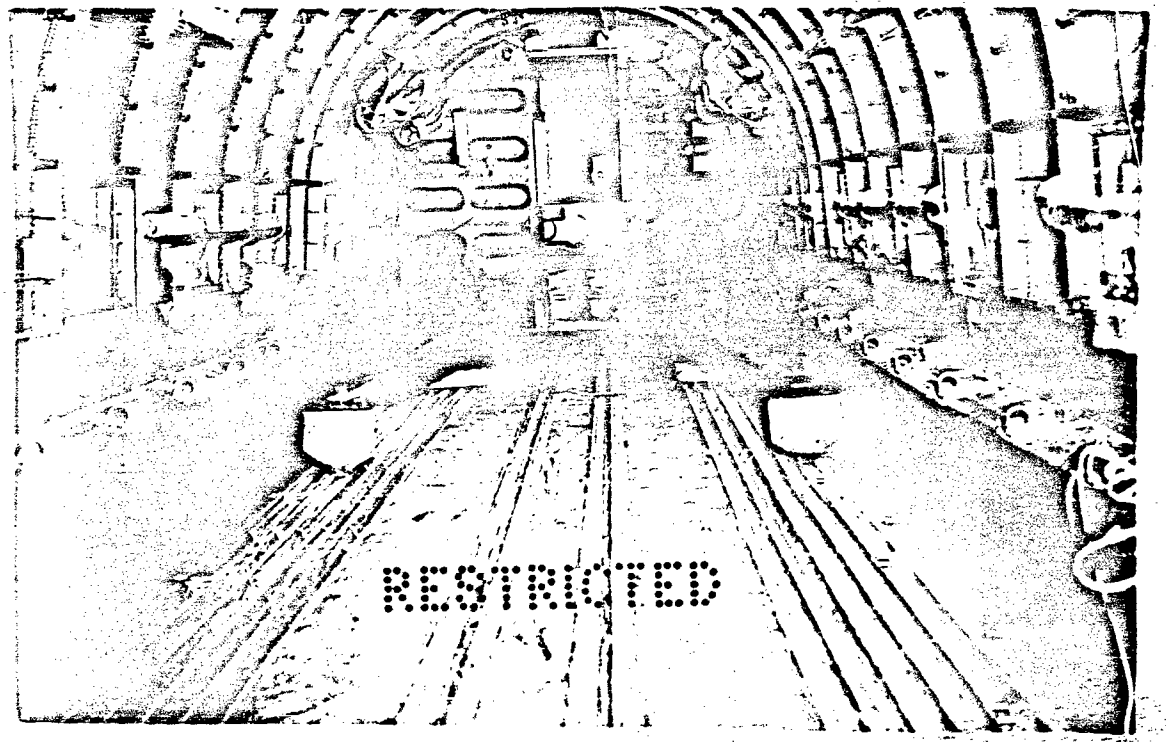
TOP: First attempt to load 105 mm Howitzer, M3 (Airborne) into C-47 Transport by block and tackle method. BOTTOM: Loading 105 mm Howitzer, M3, (Airborne) into C-47 Transport using 1/4 Ton 4x4 (Jeep) as Prime Mover.

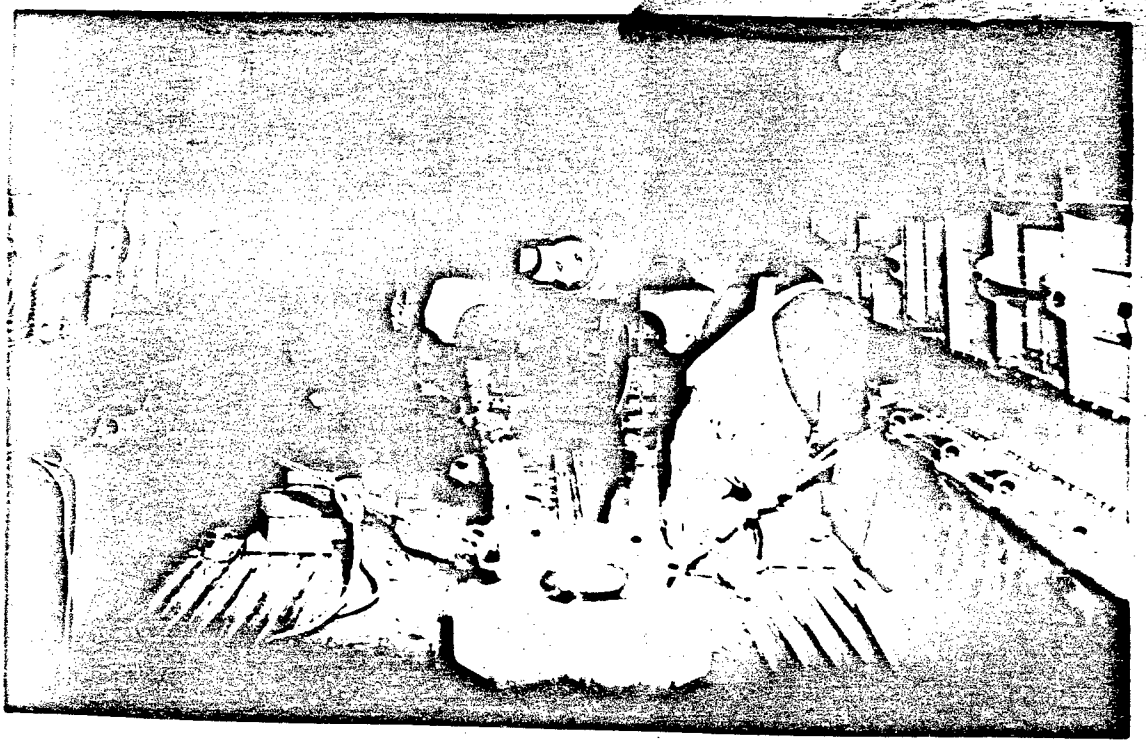




9969 7 2-11-44 | ABERDEEN PROVING GROUND | ORDNANCE DEPT.

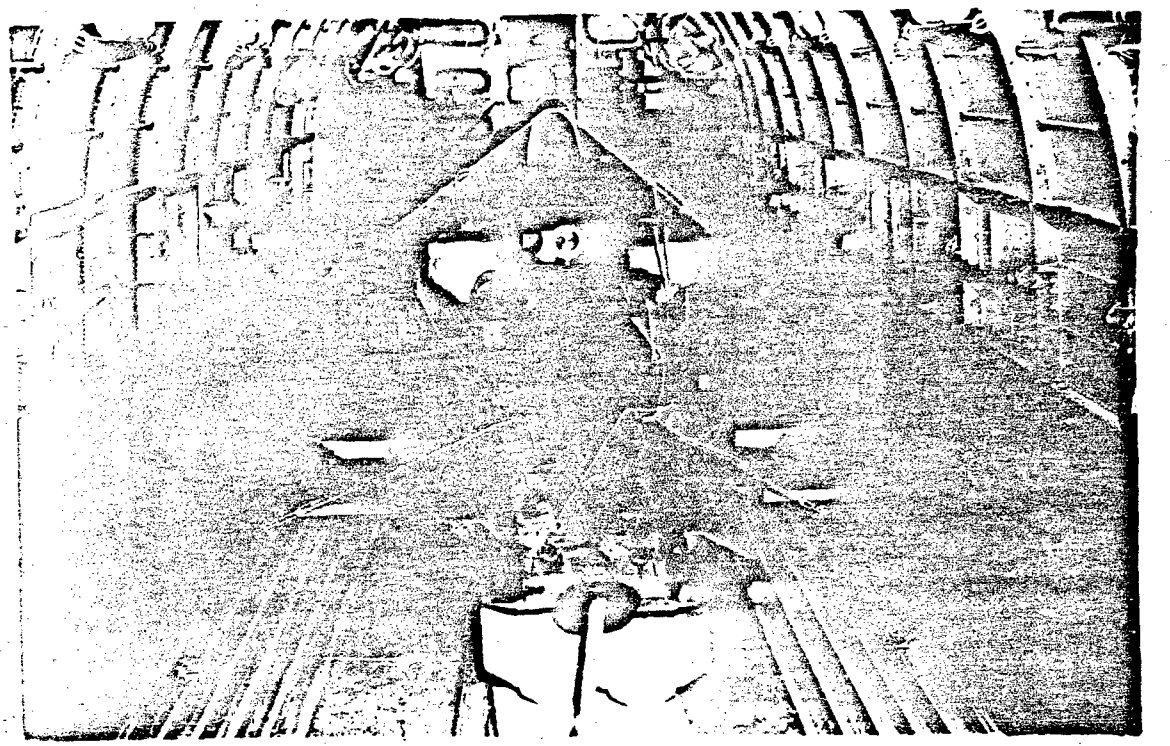
[illegible] Loading 105 mm Howitzer, M3 (Airborne) [illegible] (Jeep) as Prime Mover. BOTTOM: Ranhandling 105 mm [illegible] M3 (Airborne) into position in C-47 Transport.

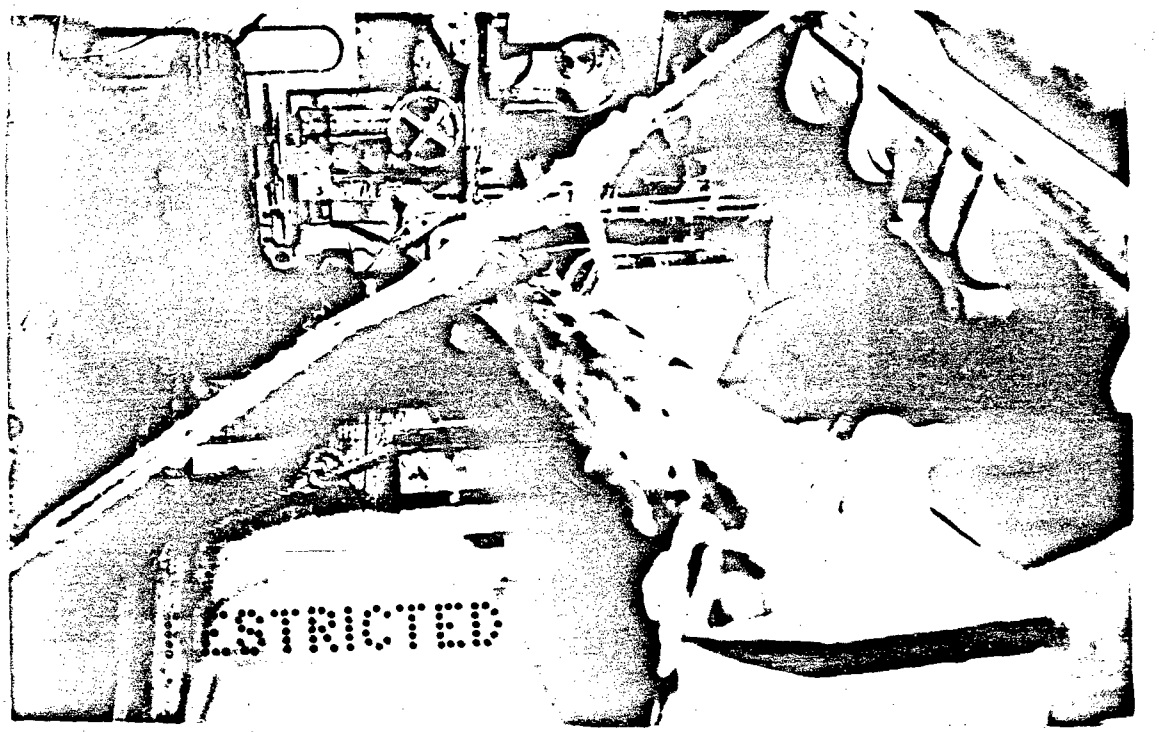




99698 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

Proof of 105 mm Howitzer, M3 (Airborne) in position (trail spread) for loading on second unit in C-47 Transport. BOTTOM: Blocking 105 mm Howitzer M3 (Airborne) in C-47 Transport.





99699 2-11-44 | ABERDEEN PROVING GROUND | ORDNANCE

TOP: 105 mm Howitzers, M7 (Airborne) blocked and lashed into position in C-47 Transport. BOTTOM: 105 mm Howitzers, M7, (Airborne) blocked and lashed into position in C-47 Transport (showing ammunition stores under forward weapon).

TEST NO. 5

105 MM HOWITZER, M3, ON CARRIAGE, M3A1, IN B-17

A. The carriage was rolled underneath the exterior bomb rack manually and placed in the firing position. Both wheel and tire assemblies were removed from the axle on each side. By removing the wheel brake drum assembly swivel nut, the entire wheel and brake drum assembly can be removed as a unit. The next step was to place the remainder of the howitzer and carriage assembly on two small bomb trucks and to elevate the howitzer to 10 degrees. By means of the bomb trucks, the unit was hoisted up to the exterior bomb rack. The next step was to fasten a 3/8" cable to one side of the axle, pass it over the top of the exterior bomb rack, and cut it to the desired length so that a turnbuckle could be installed to draw the entire assembly tightly to the bomb rack. In order to prevent any rearward motion of the load in flight, another cable was attached to one side of the axle and was passed around the front top of the bomb rack to the other side of the axle and a turnbuckle was installed so that the cable could be drawn tight to anchor the axle. Another cable was wrapped twice around the trails two feet from the spade and and was passed over the top of the bomb rack (approximately six inches from the end) and drawn securely by means of a turnbuckle. The next step was to install a piece of plywood 1/2" thick in the form of a trapezoid 30 inches high, 30 inches wide at the bottom and 12 inches wide at the top. This board rested between the axle and the muzzle of the tube. The purpose was to reduce wind resistance and prevent wind pockets from tearing off the canvas cover. The entire unit, after being suspended from the wing, was covered with the canvas. The canvas was tied securely at the muzzle, passed between the assembly and the ground, and the side portions were tied to the bomb racks at the top. To store the ammunition and wheels in the bomb bays, a floor was built under both bomb bays. Ten pieces of timber 2" x 8" x 36" and twelve pieces 2" x 6" x 7' were cut for use as flooring. The cross members were placed on 2" x 8" x 9" blocks resting on the middle girder and on the outer girder. (Build one side load and then build the other side load.) When the cross members are laid, use the 2" x 6" x 7' timbers as flooring, driving one nail through each overlap. Load seven boxes of ammunition in each side, and lash them securely in place with 1/2" rope and by using wedges. After the ammunition was loaded, the wheels were raised to the top of the bomb bay with the bomb bay winch. Two wheels were placed on each side of the bomb bay and were lashed with 1/2" rope to a 2" x 8" plank that had been fastened into the bomb bay by 3/8" cable. Progressive loading is illustrated by A.P.G. Photograph Nos. 99757, 99768, 99769, 99770, and 99813; final loading is shown by Diagram 5.

B. To remove the material, the procedure was reversed.

C. Materials Used:

60 feet 3/8" cable
6 - 10" turnbuckles
20 cable clevis clamps
1 piece tarpaulin - 16' x 10"
20 feet 1/2" rope
1 - 1/2" plywood strip 30" x 30"
2 boards 2" x 8" x 24"
50 ft. 2" x 8"
90 ft. 2" x 6"
10 ft. 2" x 4'
50 - 16 penny nails

TEST NO. 5 (cont'd)

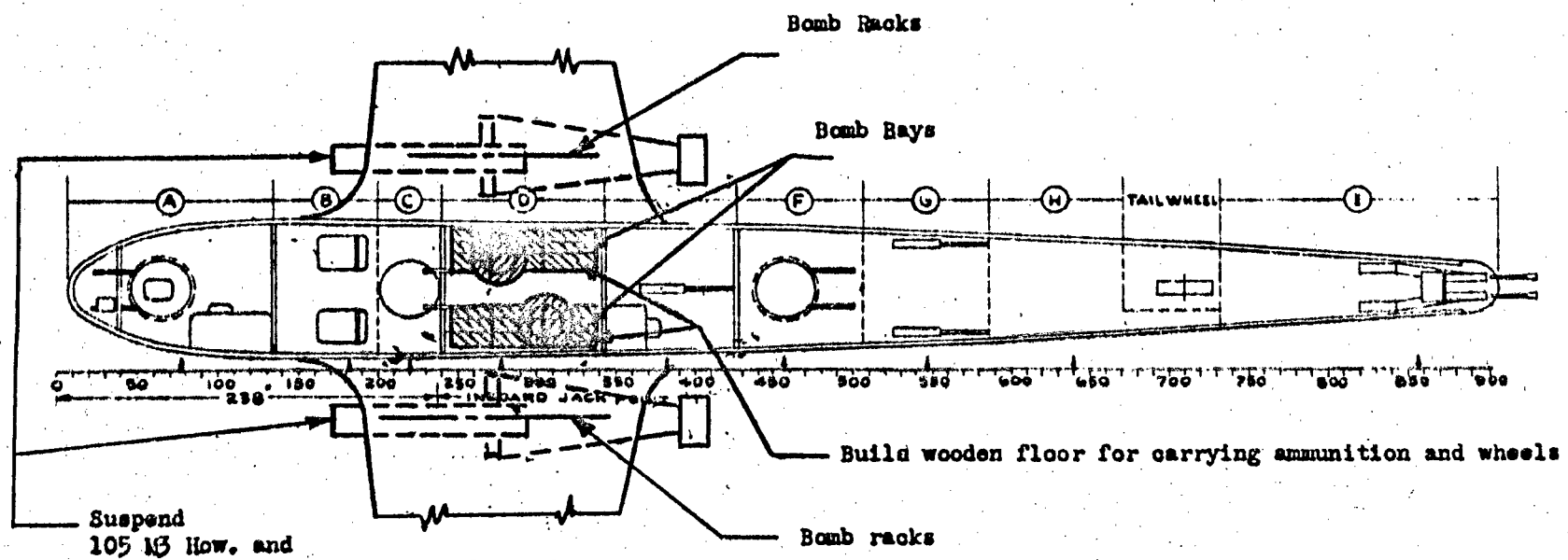
D. Weights:

Weight of M3 Howitzer Carriage (less wheels).....	2420 lbs.
Weight of Lumber	292 lbs.
Weight of 14 Ammunition Boxes	2408 lbs.
Weight of two 105 mm M2	5400 lbs.
Total Weight including lumber	8100 lbs.

E. Time to Load: 5 hours

F. Time to Unload: 2 hours

G. Number of soldiers which can be carried in addition to crew - 13



Suspend
105 M3 How. and
M3A1 Carriage complete less 2 wheels.

M3 How. and Carriage complete 2420 lbs. less wheels.

1 wheel 150 lbs.
4 wheels 600 lbs.

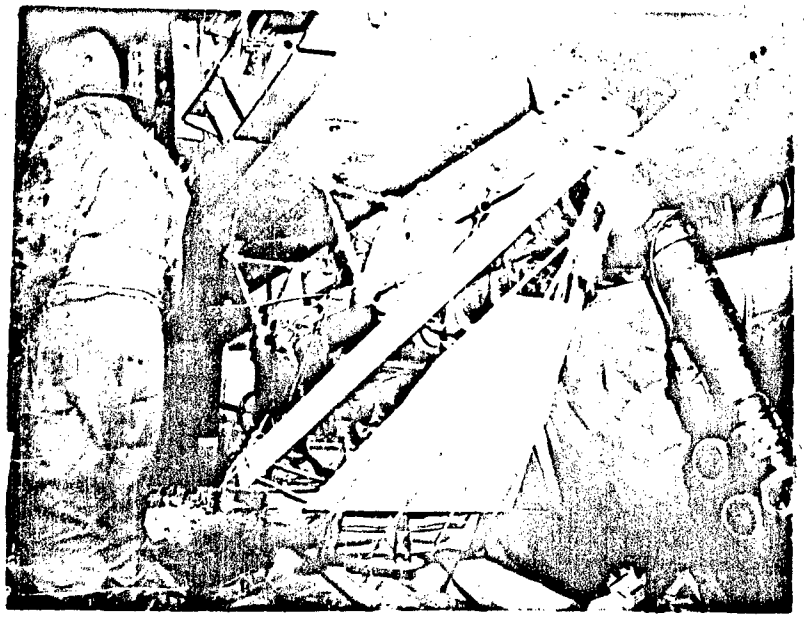
C. G. = 25.5 Index Units

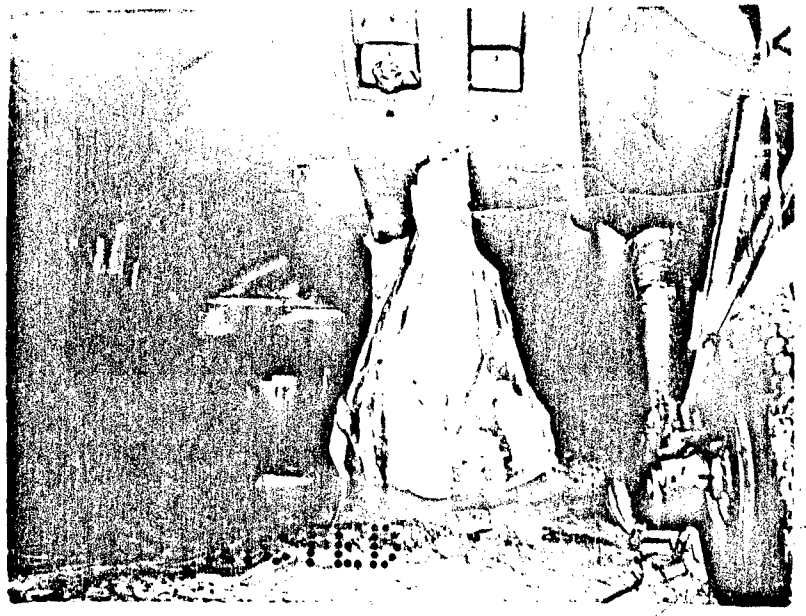
Cargo Wt. = 8100 including
300# lumber

B-17G

14 boxes ammunition - 172# per box

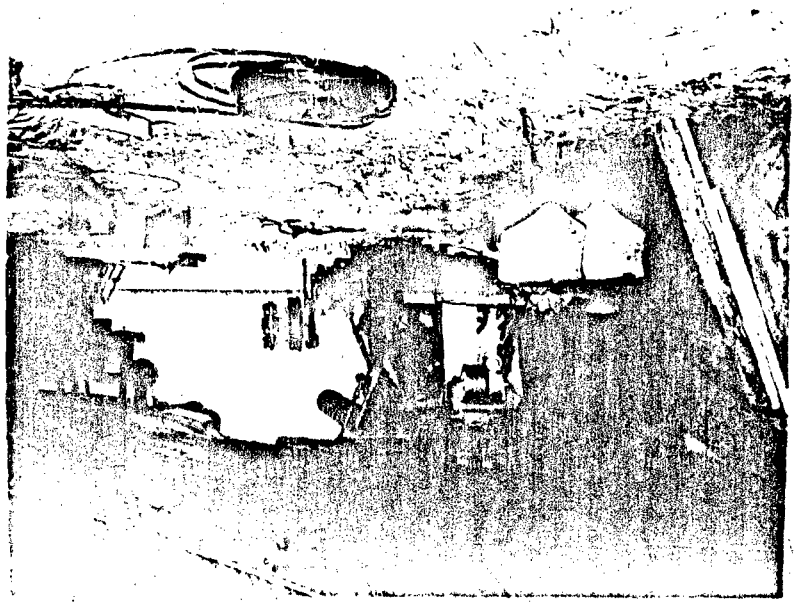
TEST NO. 5

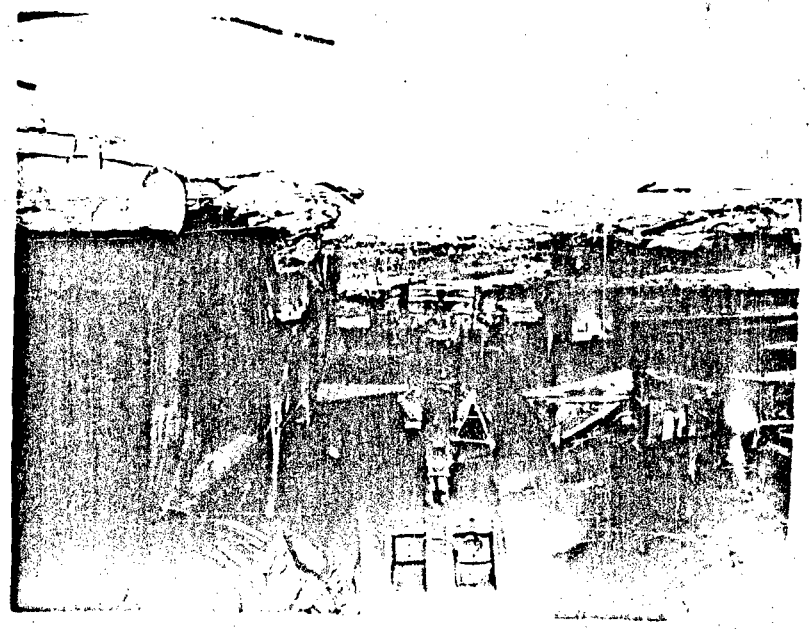


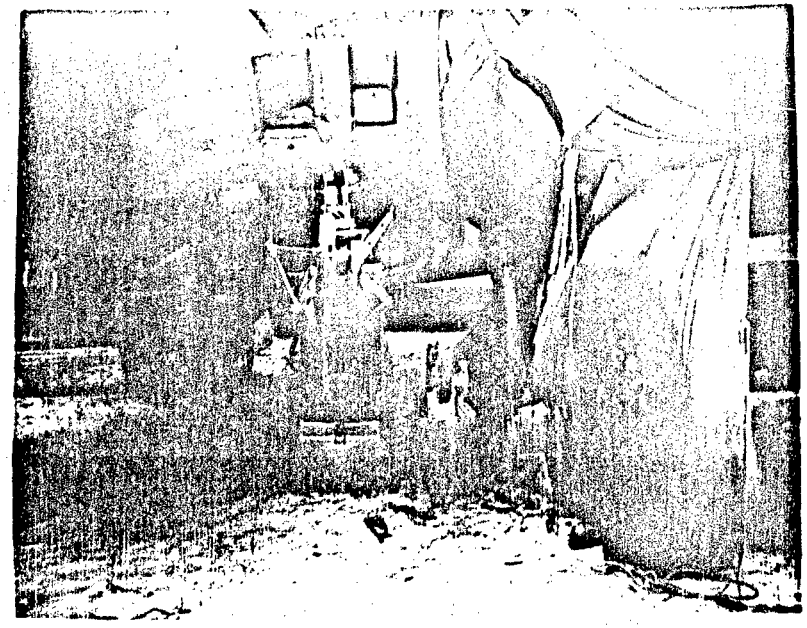


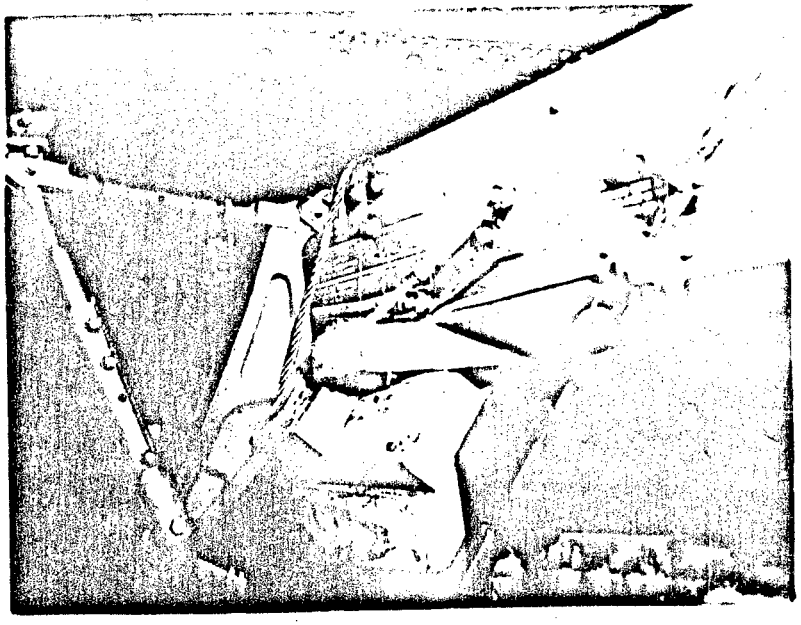
99757 27-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

[illegible] over 105-mm Howitzer, M3, (complete) attached to exterior [illegible]



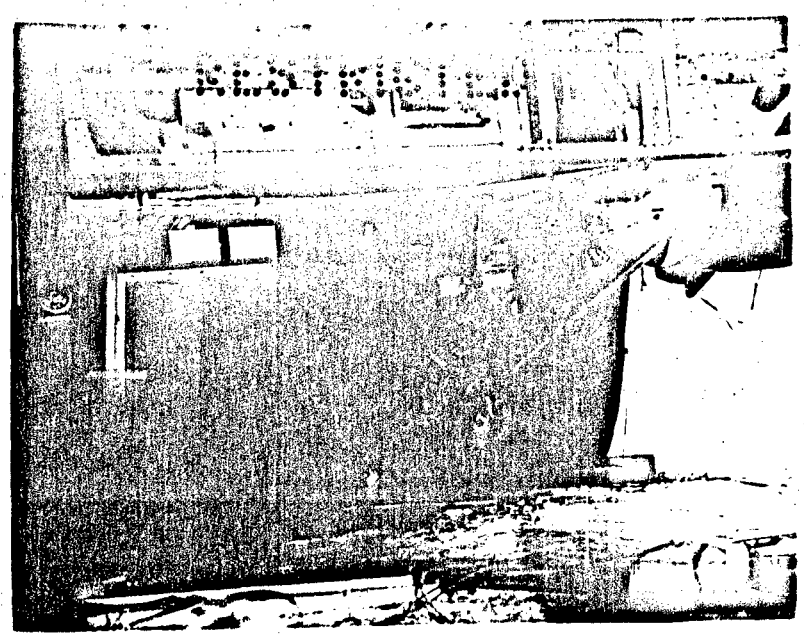






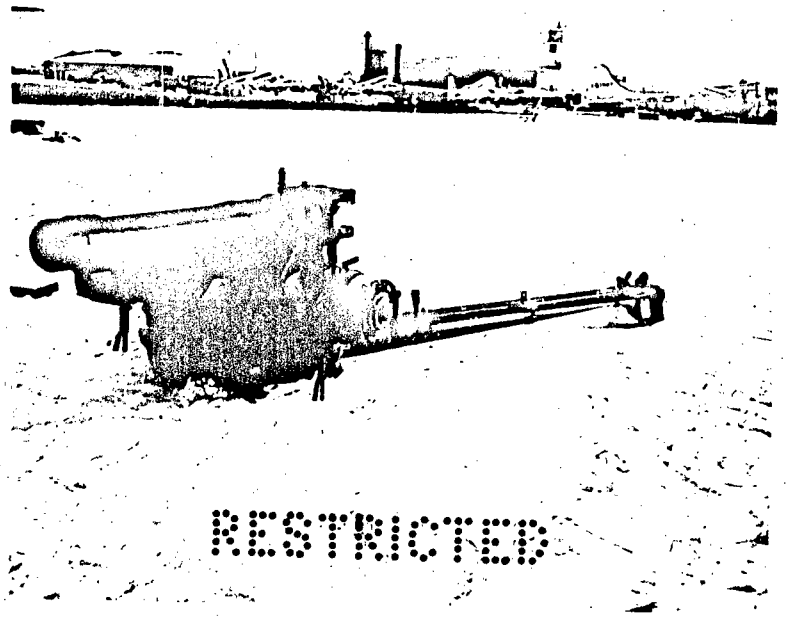
Bomber. Looking [illegible]

loss wheel and tire [illegible]



99770 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

105 mm Howitzer, M3 (Airborne), [illegible] rack of B170 Bombay.



99813 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

105mm Howitzer, M7, Complete [illegible] Bomber [illegible] back of B17

TEST NO. 6

INSTALLATION OF 105-MM HOWITZER, M3 in B-24

A. This howitzer was installed, disassembled, in the B-24 airplane. The details of this installation are recorded in the Airborne Command report of tests conducted at Camp Mackall.

Test No. 7

INSTALLATION OF 105 MM HOWITZER, M2A1, WITH CARRIAGE, M2A2
IN C47 AIRPLANE

A. One complete howitzer (disassembled into five major units; howitzer cradle with recoil mechanism, equilibrator, carriage, and the trails) was installed in this airplane, together with a total of 18 complete rounds of ammunition (in six bundles crated for overseas shipment) and one accessory chest. A 3/4 ton truck with an "A" frame was required for disassembly and lifting the component units into the plane. The equilibrator was removed prior to the disassembly of the tube, which was followed by the removal of the cradle and recoil mechanism. It was necessary to lift most of the weight off the carriage with the boom in order to remove the trails. The carriage (composed of wheels, axle and bottom carriage) was lifted into the plane and worked forward into Compartment D by alternately rolling one side of the carriage crosswise to the longitudinal axis of the plane and sliding it forward. The tube was lifted into the plane manually and carried to the left side of Compartment E and placed on 2" by 10" planking. The recoil and cradle were lifted into the plane and carried to the right side of Compartment E and placed on 2" by 10" planking. The trails were laid between the cradle and tube in the center of the plane, and the equilibrator was placed under the carriage. Two boxes of ammunition were placed on top of the trails and four boxes, with the accessory chest, were placed on the floor in Compartment F. All units of the howitzer and the boxes of ammunition were secured with lashing to prevent any movement. Diagram No. 7 shows the floor plan of this loading arrangement. Reference is made to appended A.F.S. Photographs 99700, 99701, 99702-A, which illustrate details of the loading operations and the final installation in the plane.

B. In order to remove this equipment the loading operation was reversed.

C. Material Used for Installation.

1. Six pieces of planking 2" x 6" x 8'.

2. Five pieces of planking 3" x 8" x 10'.

3. Two pieces of 2" x 4" x 3' planking.

4. Plane rigging. Lashing and tools.

5. Additional rigging. Single and double block plus 100' of 3/4" rope to lift carriage. 3/4 ton 4 x 4 with an "A" frame was required for all lifting operations. 1/2" rope 75' long for lashing parts into plane.

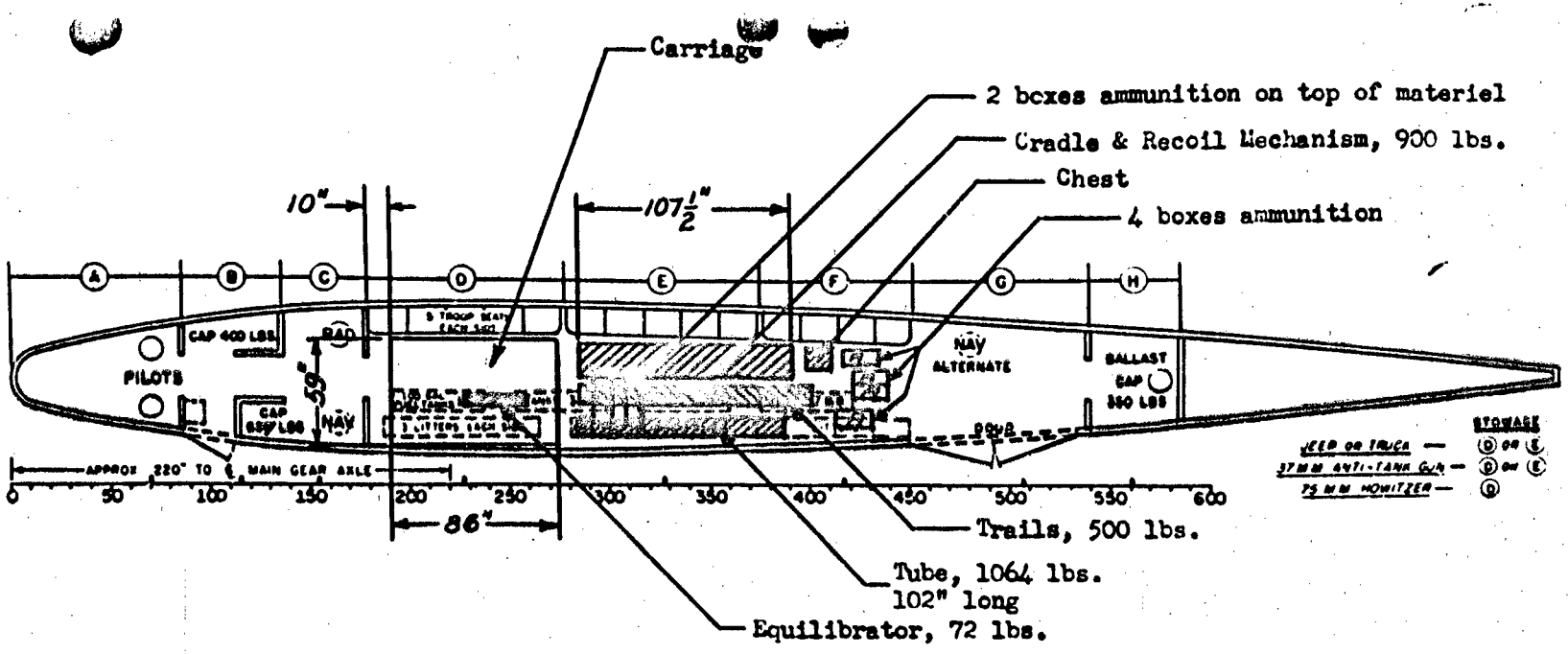
Test No. 7 (Cont'd)

D. Weights.

	Lbs.
Howitzer, complete	1064
Cradle	333
Carriage	2433
Right trail	280
Left trail	255
Recoil Mechanism	463
Six Bundles of Ammunition	1032
Battery Accessory Chest	215
Lumber	154
Total	6229

E. Time to disassemble - 2 hours
Time to load - 2 hours
Time to unload - 1-1/2 hours
Time to reassemble - 3 hours

F. Number of soldiers which can be carried in addition to crew - 6



Compartment "D" Carriage - 1500 lbs. - Equilibrator

Compartment "E" Recoil Mech., Tube, Trails

Compartment "F" Ammunition & Accessory Chest

Center of Gravity falls at Index of 50.1

Total Cargo Weight - 6229

C-47
R4D-1, a-5

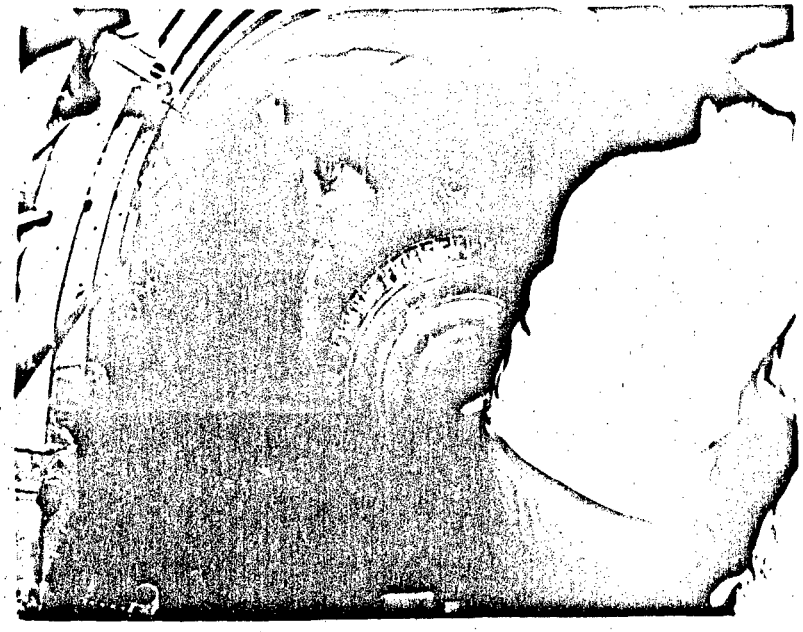
EXTERNAL STOWAGE

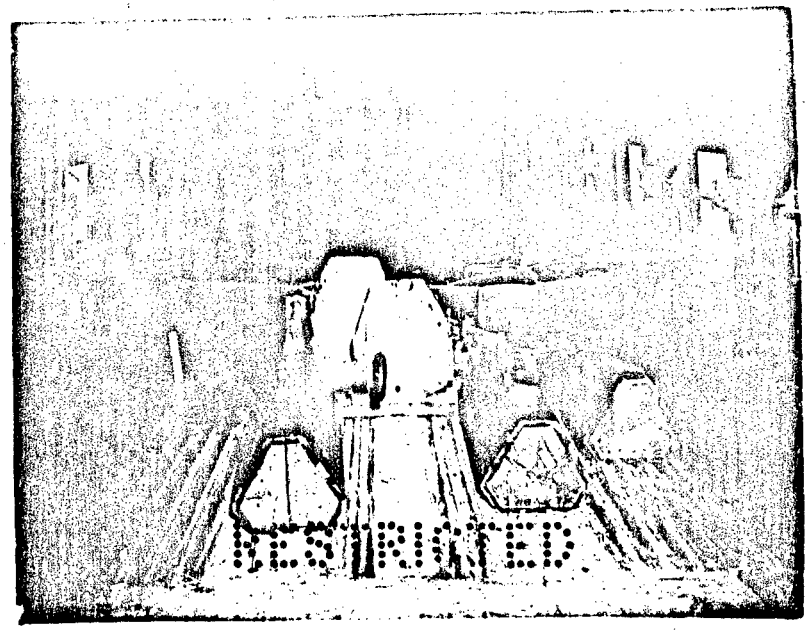
PACKS — FORWARD (D)
CENTER (E)
REAR (F)

PROPS — REAR (G)
F'W'D - NO SCALE REQUIRED

TEST NO. 7

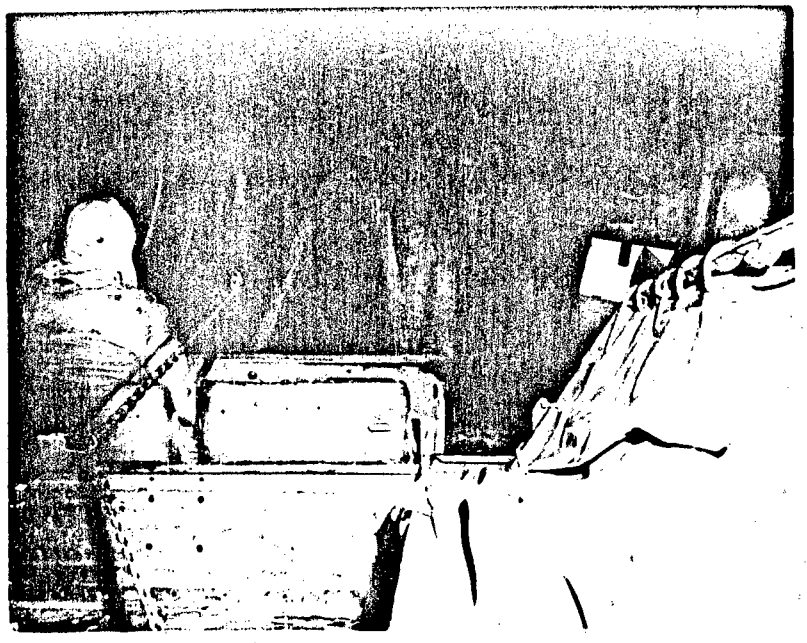
ABERDEEN PROVING GROUND ORDNANCE DEPT.





99701 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

LEFT: Sliding [illegible] position in C-15 Transport. RIGHT: 105 mm Howitzer [illegible] in position in C-15 Transport.



99702A 2-11-44 | ABERDEEN PROVING GROUND | ORDNANCE DEPT.

Unloading wheel, axle and bottom carriage assembly of 105 mm Howitzer, M2A1. Material from C47.
Transport, using A-frame mounted on 3/4-Ton 4x4 Truck.

TEST NO. 8

LOADING OF 105 MM HOWITZER, M2A1, ON CARRIAGE, M2A2, IN B17 AIRPLANE

A. The howitzer, recoil mechanism, and cradle (which were attached to the external bomb rack) were removed as a complete unit from the carriage. This unit was placed upright on two blocks, 8" x 8" x 1'4", one under either end of the cradle. The trails, which had been removed from the carriage, were centered lengthwise on top of the tube, with the spade end of the trails toward the muzzle of the howitzer, supported at the muzzle by a piece of 6" x 6" x 1'6" timber and at the other end by a thin piece of wood placed on top of the breech ring to protect the quadrant seats. The trails were locked together by the trail lock, and wedged apart by two 2" x 4" x 12" blocks. This group was bound together by means of two 3/8" cables, each placed 3 feet from either end of the bundle and drawn tight by means of turn buckles. The entire bundle was then inverted, using a four (4) ton wrecker.

Two special pieces of steel plate, fabricated as shown by sketch, were centrally secured to the top of the bundle by 3/8" cable placed around it and tightened by turn buckles so that the slotted holes of the plate were engaged by the bomb lifting hooks. The bomb hooks were then lowered to engage the slotted hole of the plate, and the entire bundle was then raised into the rack by means of the bomb rack winches. Two 3/8" cable were then placed over the top of the bomb rack, one at either end, and around the bundle, and tightened by turn buckles.

The two bomb winch cables of the main bomb bay were lowered and hooked around either end of the axle, and the axle assembly and carriage were raised slightly. The wheels were then removed, and the carriage hoisted as high as possible into the bomb bay. A piece of 2" x 8" timber, 30" long, was placed underneath the axle across the bomb bay, resting on the outer girder, and on a 10" block placed on the inner girder. The axle assembly was then lowered onto this block and lashed by means of 3/8" cable connecting one pair of bomb hooks and the opposite end of the assembly. In order to prevent sideward motion, a 2" x 8" x 36" timber was placed between the assembly and the outer side of the bomb bay, and a 6" x 8" x 12" block between the assembly and the inner side of the bomb bay. One of the wheel assemblies was lifted manually and placed flat against the bottom of the axle assembly, and secured to it by means of a 3/8" cable passed over the axle assembly through the hub and around a 6" x 6" x 12" block on the opposite side of the hub and tightened securely with a turn buckle. The other wheel was then secured in a similar manner on top of the axle assembly. The shield, broken down to its separate components, was placed in the radio room behind the bomb bay and secured by short lengths of 1/2" rope in a position least inconvenient to the crew members. The material and the loading operations are illustrated in A.P.G. Photographs 97573 and 99746 to 99751 inclusive, 99766, 99758, 99778 and 99820. The distribution of the load is shown in Diagram 8.

B. Disassembly is accomplished in the opposite manner to assembly.

C. Materials used:

TEST NO. 8 (Cont'd)

50 ft. - 3/8" cable
16 - 10" turn buckles
50 - cable clevis
12 ft. - 2 x 4 Timber
8 ft. - 2 x 8 Timber
25 - 2 x 8's 14 ft. long
70 - 16-penny nails
50 ft. - 1/2" rope
1 Double Sheave 6" block
1 - 4-Ton Cargo Carrier with Winch
200 ft. - 3/4" rope

D. Weights

	Lbs.	
Howitzer, recoil mechanism, top carriage and trails	2418	(Exterior Mounting)
Wheels (2)	300)	Interior Mounting
Axle Assembly and bottom carriage	1832)	
Armor shields	350)	
	4900	on each side of plane.
Total .....(2 units).....	9800	

E. Time of Disassembly - 3 hours
Time of Loading - 5 hours
Time of Unloading - 1-1/2 hours
Time of Reassembly - 4 hours

F. In addition to assumed crew (6) and above load, 12 fully equipped men may be carried.

The 105-mm Howitzer M2A1 on Carriage M2A2 (disassembled) has been installed in the B17 Airplane successfully and reported by the Airborne Command.

TEST NO. 8 (Cont'd)

105-mm Howitzer, M2A2

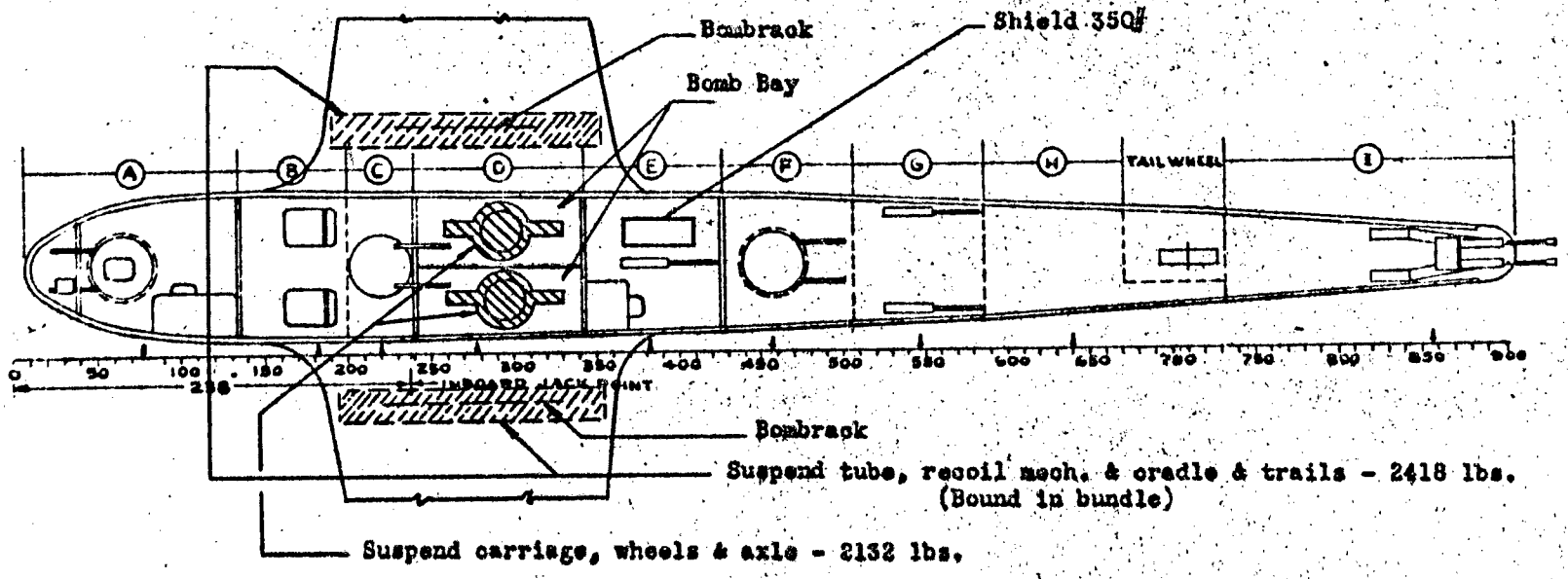
	Howitzer	Complete Unit Weight 4900#	
Weight	1061#	4900	463#
Width	3-1/2"	82"	12"
Height	15"	60"	19"
Length	101-1/2"	238"	62"

1 wheel complete w/tire & tube	276#
Left Trail Assembly	255#
Right Trail Assembly	280#
No Shield Weights	
Top Carriage & Elevating & Traversing Mechanism	172#
Bottom Carriage	

Center of Gravity:

(a) Rear of wheel hub 5-1/2") In traveling position

(b) Above wheel hub 12-3/4")



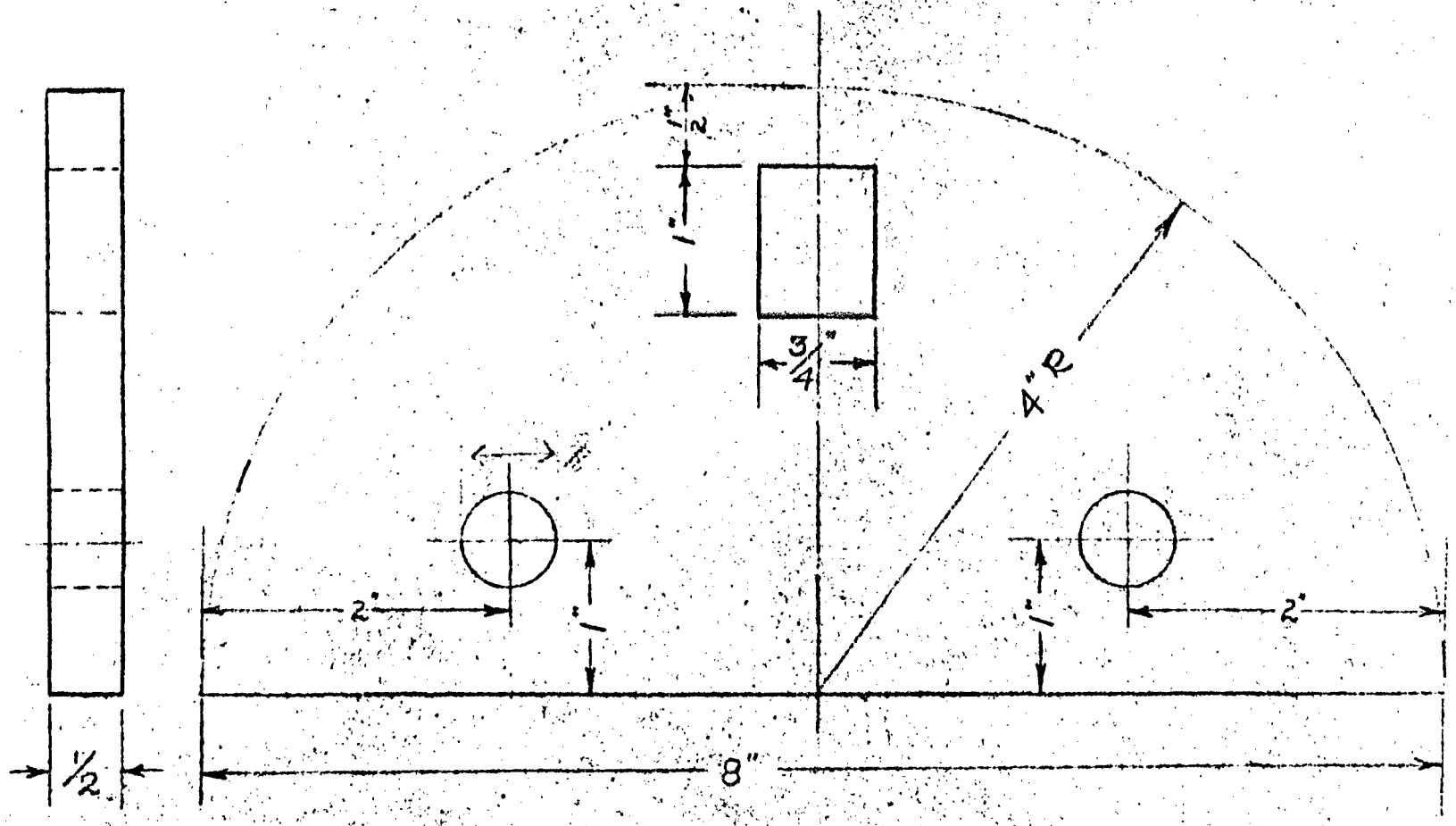
B-17G

C.G. - 18.2 Index Units
Cargo Wt. - 9800 lbs.

For 105-mm, M2

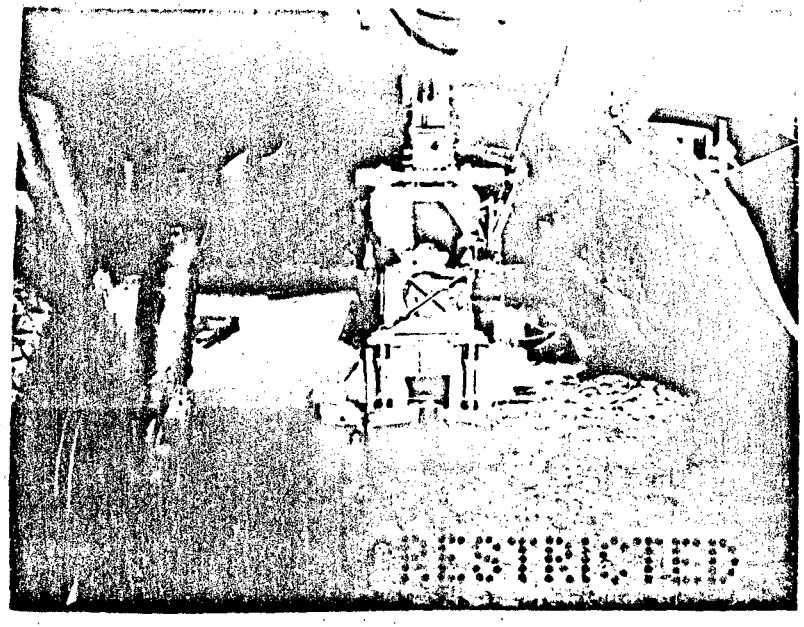
Test No. 8

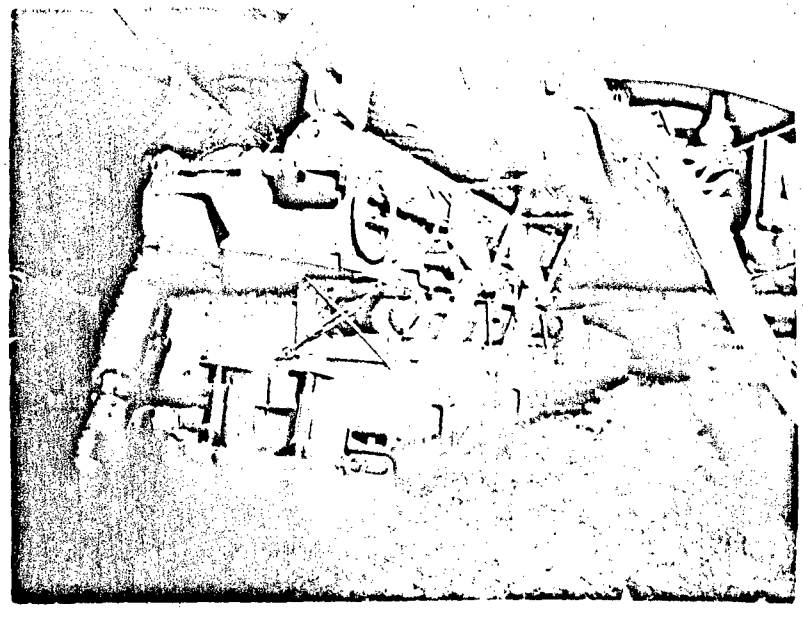
TH NO: 8



MATERIAL :- 1/2" BOILER PLATE

SCALE :- 1/1





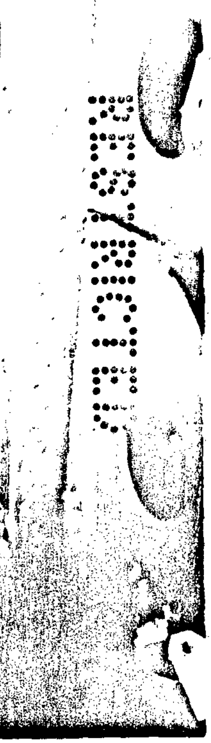
99759 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

105-mm Bord Lees, M2A3, Mesilla and Trafilo [illegible]

RESTRICTED

RES

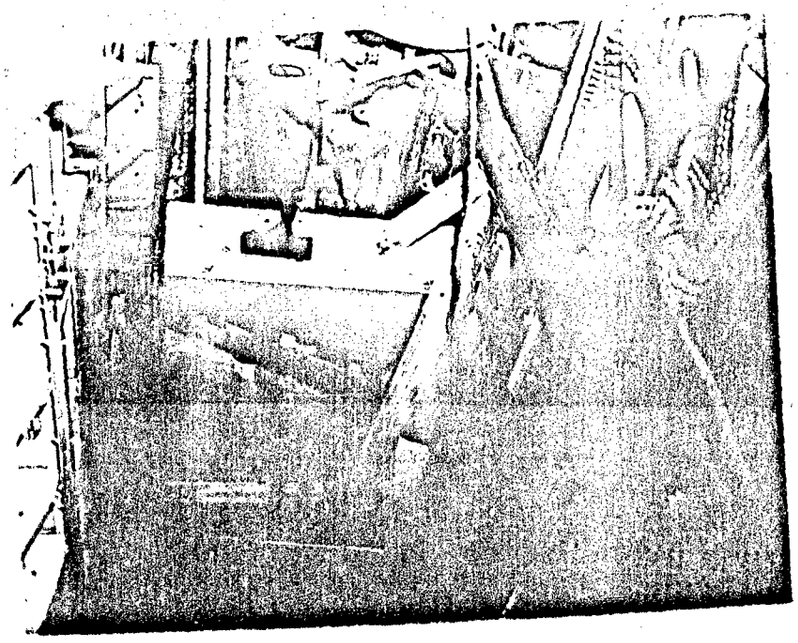
ORDNANCE DEP

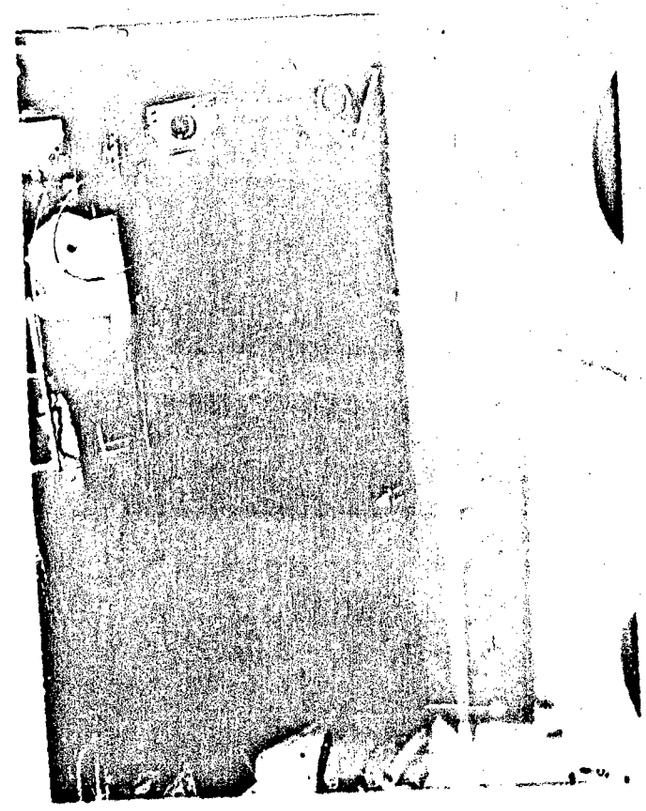


97[illegible]7 2-1[illegible]-44 [illegible] PROVING GROUND ORDNANCE DEPT

LEFT: Hoisting and manoeuvering [illegible] 105-mm Howitzer Carriage, M2A2, in bomb bay of B17G Bomber preparatory to blocking and [illegible]. RIGHT: Axle and bottom carriage assembly of 105-mm Howitzer Carriage, M2A2, partially blocked and lashed in position in bomb bay bo B17G Bomber.

RESTRICTED

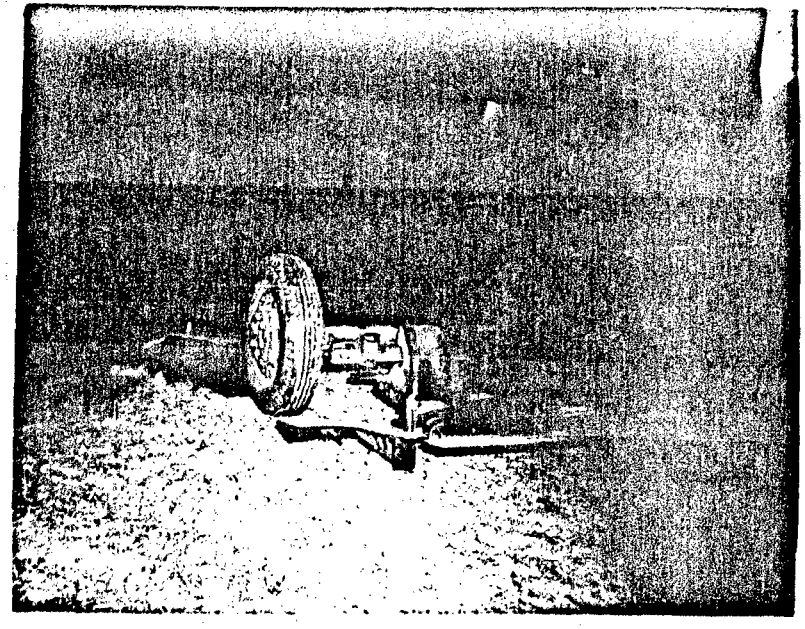


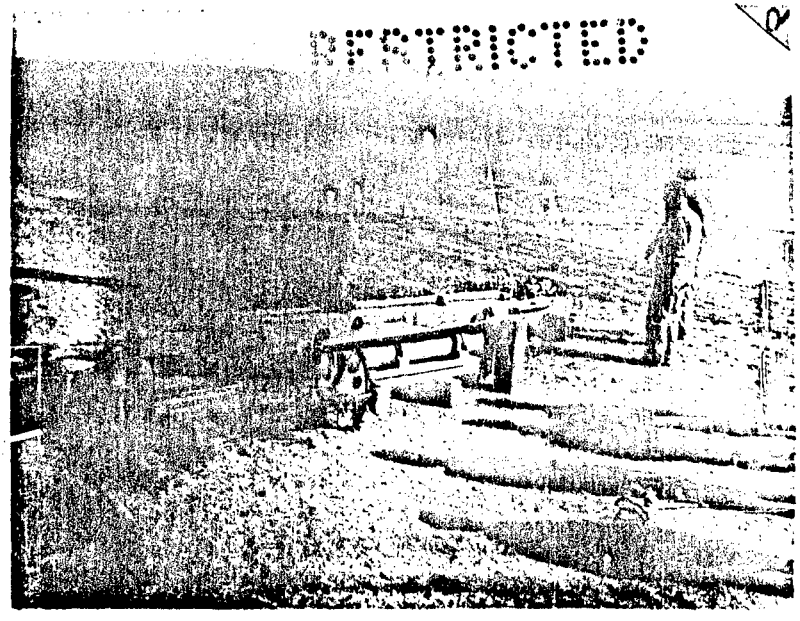


ABERDEEN PROVING GROUND

ORDNANCE DEPT

Axle and bottom [illegible] in position in bomb bay of B17G Bomber.





99745 [illegible] ABERDEEN PROVING GROUND ORDNANCE DEPT.

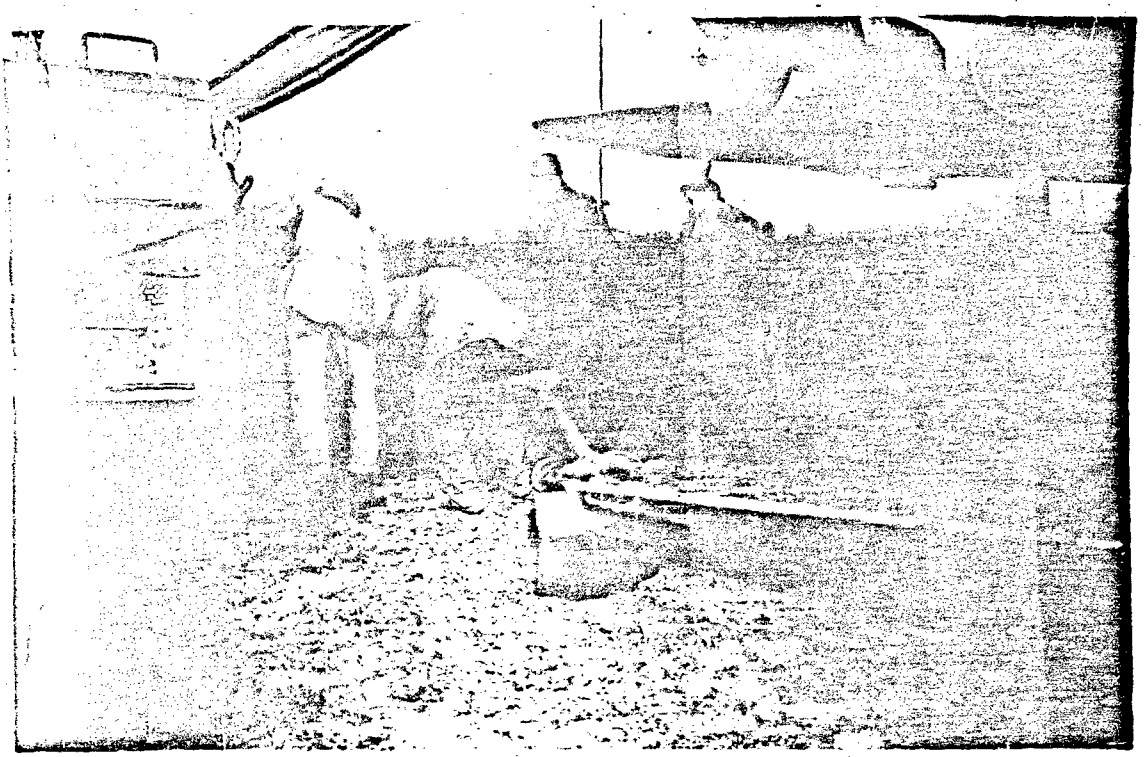
LEFT: View of disassembled [illegible] Lashing 105-mm Howitzer, M2A1, Recoil [illegible] assembly and trails of Carriage, M2A2, together preparatory [illegible]

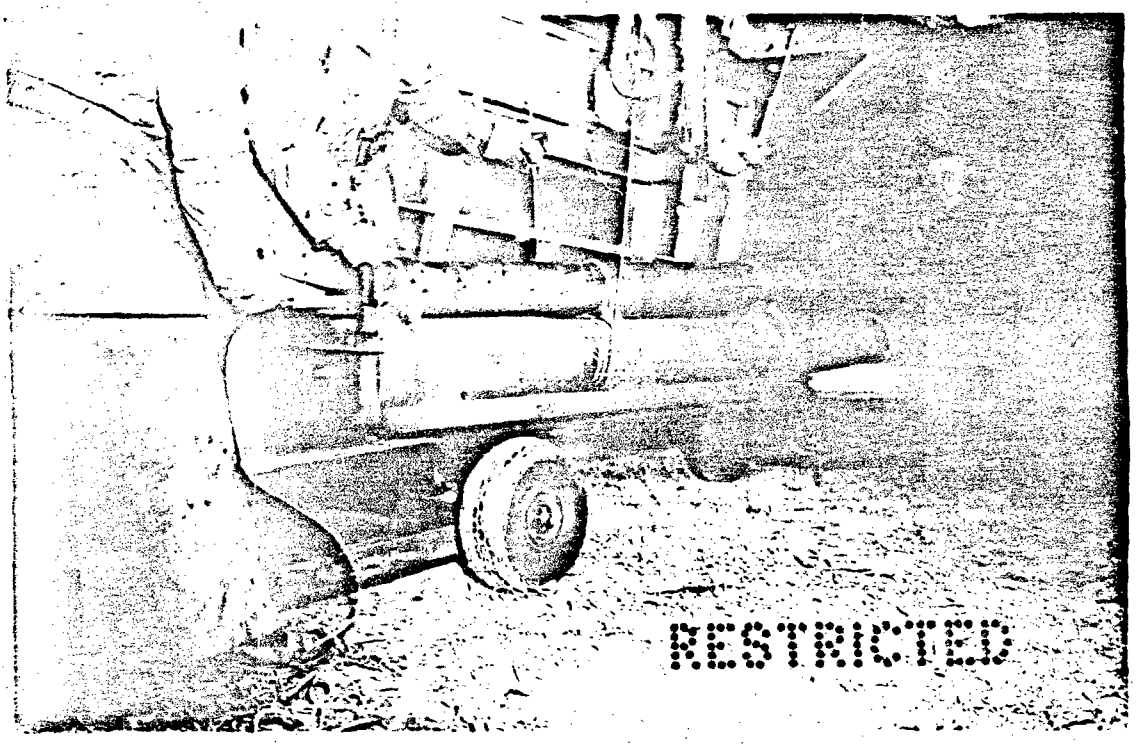
997.[illegible]

[illegible]

M2A2, Ipshed [illegible]

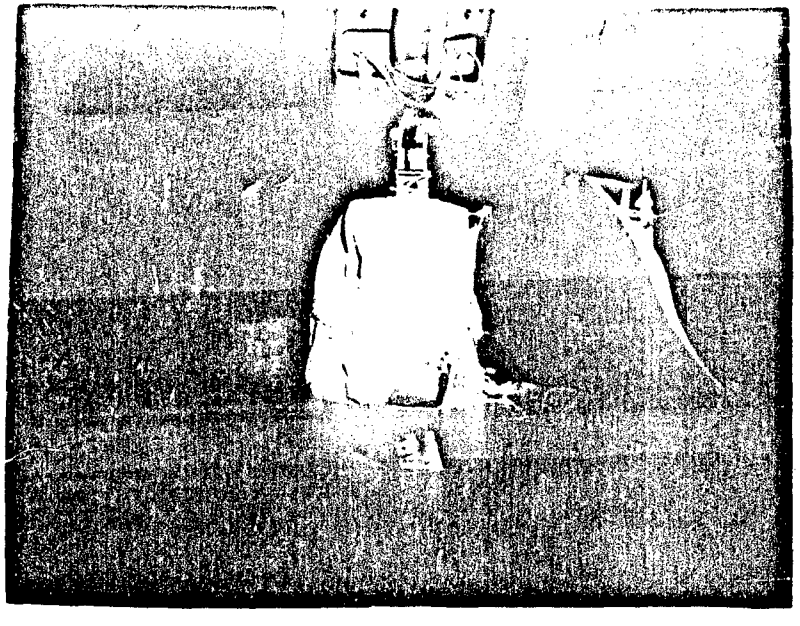
B17G Bomber.

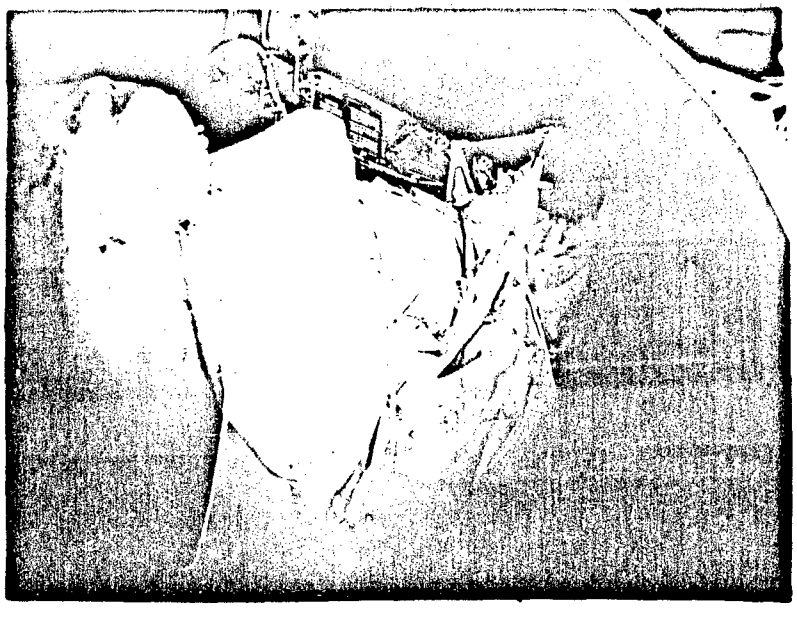




[illegible] ERDEEN PROVING GROUND [illegible] ORDNANCE [illegible]

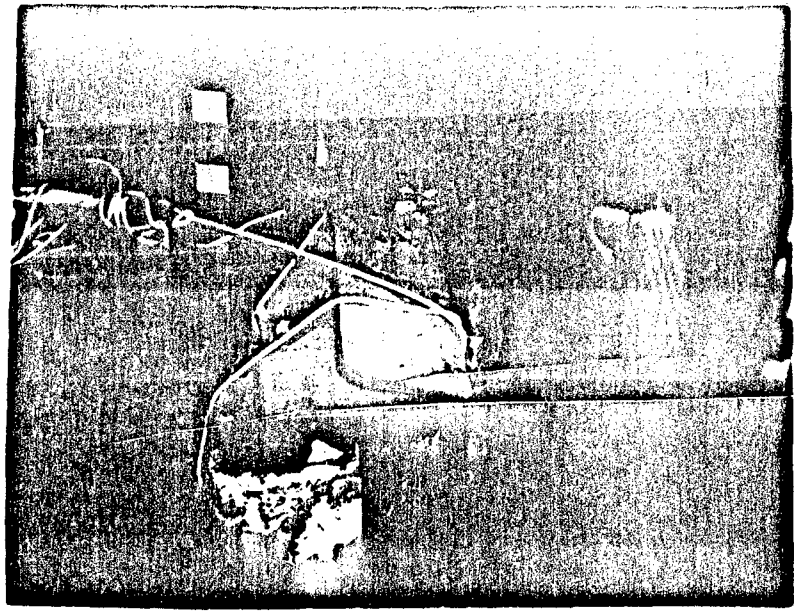
[illegible] Recoil Mechanism [illegible] preparatory [illegible] Recoil Mech- [illegible] of B17 Bomber.

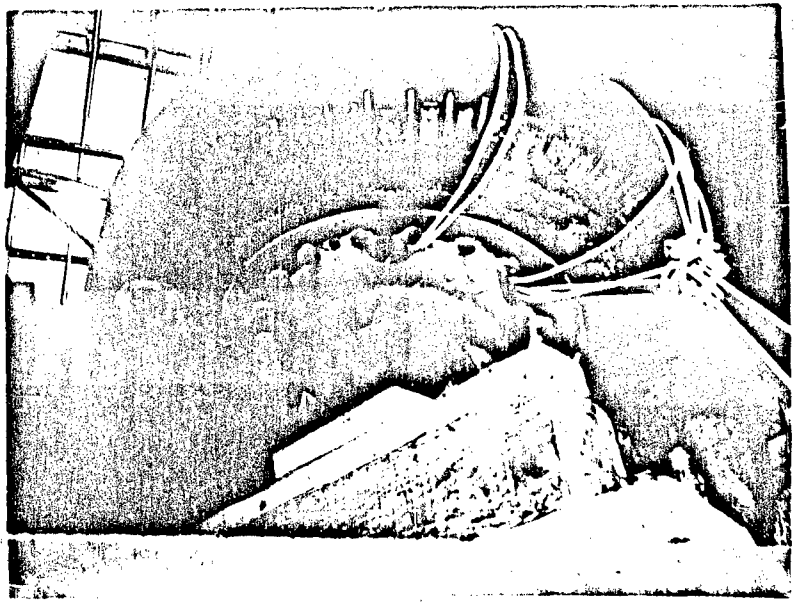




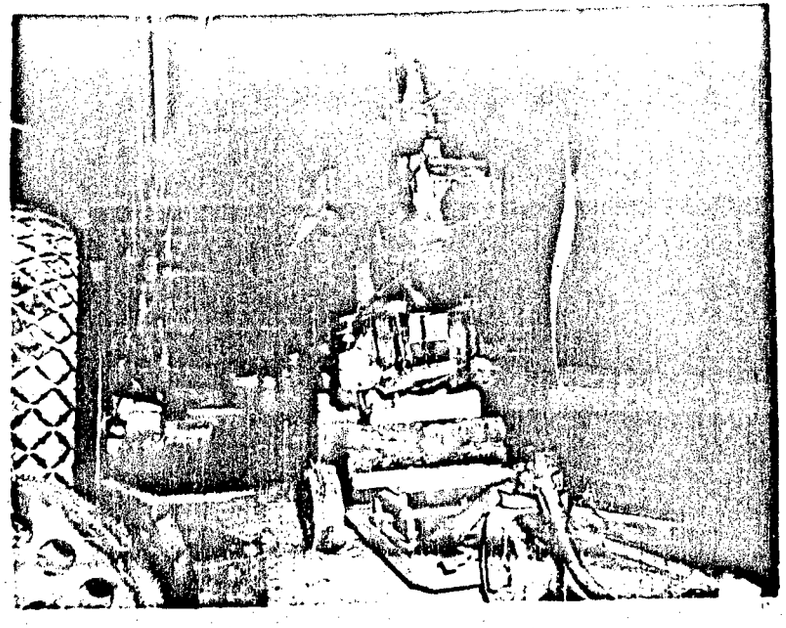
99758 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

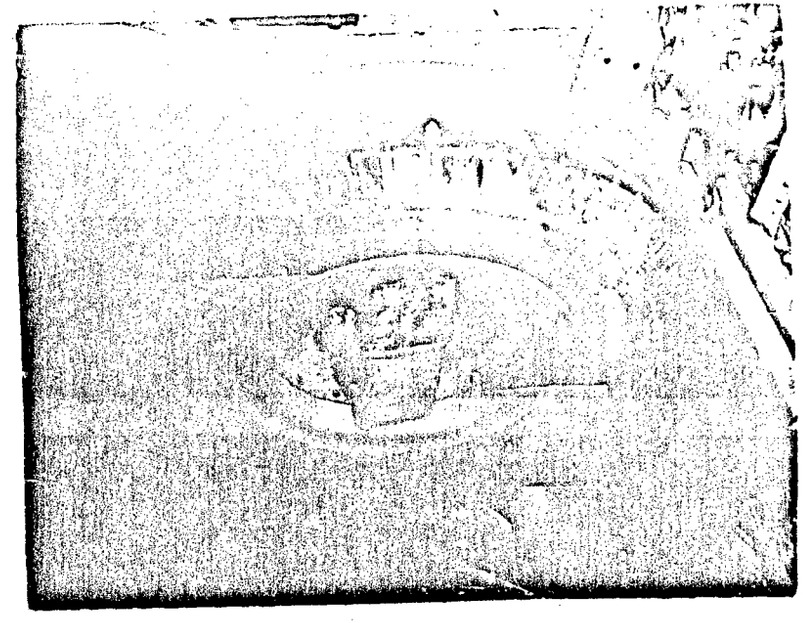
Covering for 105-mm Howitzer, M2A2, Cradle and trail plugs on exterior bomb rack of B-17.





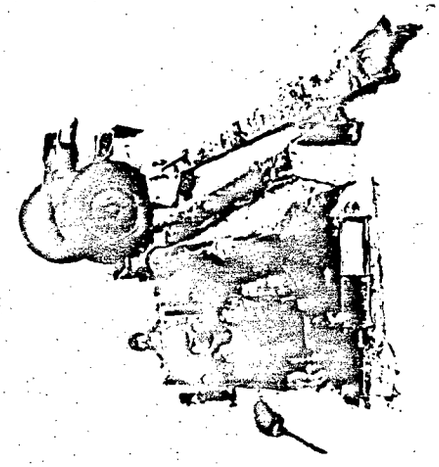
RIGHT: Wheel and tire case
Bomber.



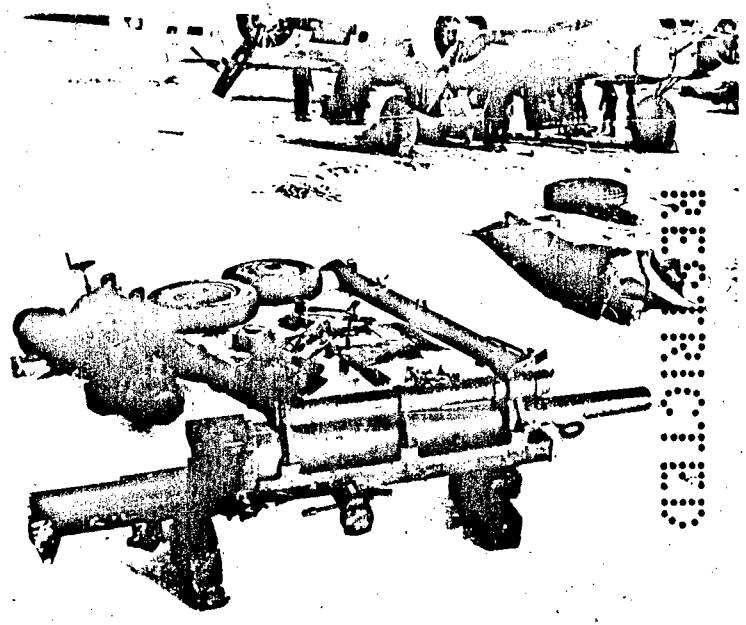


Assembly [illegible] Howitzer Carri[illegible]

RESTRICTED



99820 2-11-44 ORDNANCE DEPT
ABERDEEN PROVING GROUND



99816 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

105mm Howitzer, M2A1 (complete unit). Breakdown for loading on B170 Bomber.

TEST NO. 9. INSTALLATION OF HOWITZER 105 MM, M2, in B-24 AIRPLANE

Details of this installation may be found in the report of the Airborne Command of tests conducted at Camp MacKall, North Carolina. No loading diagrams or photographs of this installation are available for this report.

TEST NO. 10.

INSTALLATION OF 3" GUN, M5 ON CARRIAGE, M1, IN THE C-47 AIRPLANE.

A. One complete weapon (disassembled into six major units; Gun, Equilibrator, Cradle, two (2) Trails and Carriage) was installed in the airplane together with two (2) boxes of ammunition containing four (4) rounds each, and the accessory chest. A 3/4-ton truck with an "A" frame was used to disassemble the weapon and to lift the various units into the plane. A counterbalance load was required on the rear of the 3/4-ton truck when the Carriage was picked up. Six (6) men were required to handle the equipment. The carriage was moved to the forward portion of the compartment by rolling from side to side and moving it forward. The wheels were lashed to the floor to prevent any longitudinal or lateral movement. The cradle was placed on 2" x 10" planking and lashed to the right side of the floor. The gun, which was lifted into the cabin, muzzle first, was pulled into position with a block and tackle just to the left of the center of the cabin. The forward end of this block and tackle was tied to the wheel of the carriage in this operation. The left trail was placed to the right of the center of the cabin with the spade to the rear and the right trail placed on the extreme left of the cabin. The trails were manually handled within the plane and placed on 2" x 10" planks. The equilibrator brackets were placed on the right side of the cabin in compartment "C" and securely lashed. Two (2) boxes of ammunition were placed end to end in the extreme right side of the cabin with the rear end under section 312½. The accessory chest was lashed in place in the center of compartment "F". Diagram No. 10 shows the floor plan for this loading arrangement. Reference is made to appended A.P.G. Photographs Nos. 55266 and 99702. These photographs show the complete 3" Gun Carriage, M1, loading operations in progress, progressive installation, and final installation in the plane.

B. In order to remove this equipment, the loading operation is reversed.

C. Material Used for Installation.

1. Two (2) pieces of planking - 2" x 10" x 8' and four (4) blocks 3" x 10" x 12".

2. Plane rigging, lashings, and tools.

3. Additional rigging - 3/4 ton 4x4 Truck with winch and "A" frame
   one (1) Single block
   one (1) Double block
   1" Rope.

D. Weights.

Tube .....1640 lbs.

Right Trail ..... 280 lbs.

Left Trail ..... 255 lbs.

TEST NO. 10 (cont'd)

D. Weights (cont'd)

Carriage, less trails	2433 lbs.
Equilibrator	72 lbs.
Recoil Mechanism and Cradle	796 lbs.
2 Boxes Ammunition	316 lbs.
Accessory chest	215 lbs.
Lumber	143 lbs.
Total Weight	6150 lbs.

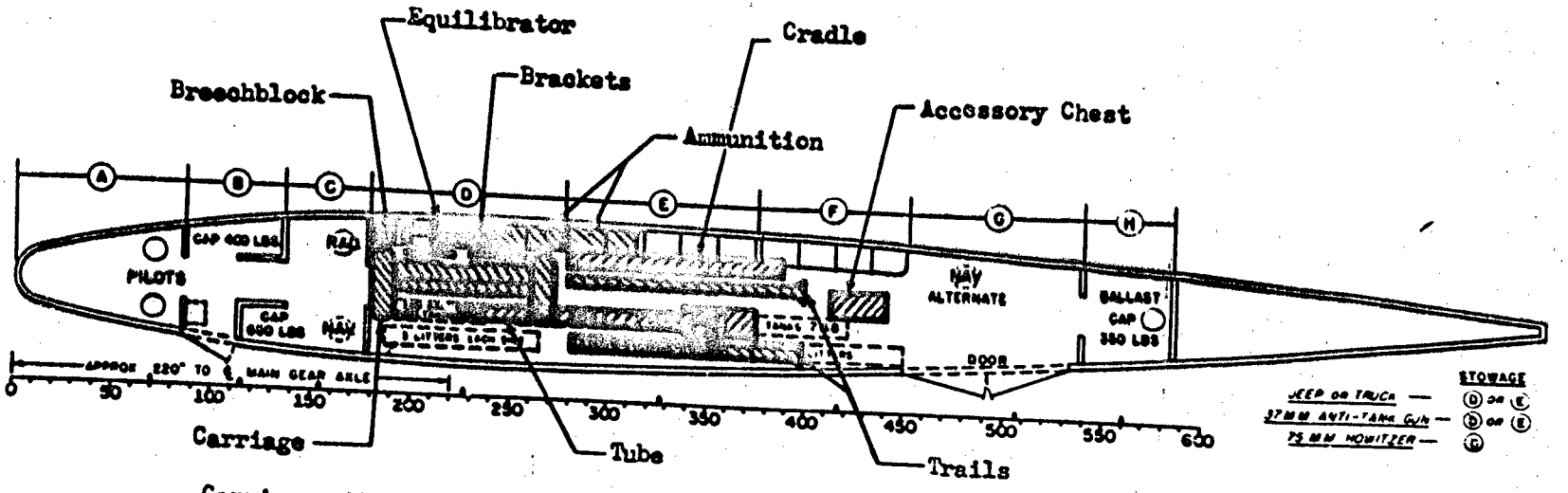
E. Time required to disassemble - 2 hours

Time required to load - 2 hours

Time required to unload - 1½ hours

Time required to reassemble - 3 hours

F. Number of soldiers which can be carried in addition to crew - 1.



Carriage with shield facing up and bottom of carriage facing right side of plane.
Rear face of breech ring on tube between sections 351½ and 372½.
Rear face of spades centered between sections 390½ and 411½.
Accessory chest in center of plane w/front under section 411½.
Cradle on right side muzzle end first, rear end between sections 372½ and 390½.

Center of Gravity - 29.5 index units

Cargo Weight - 6150

C-47
R4D-1, a-5

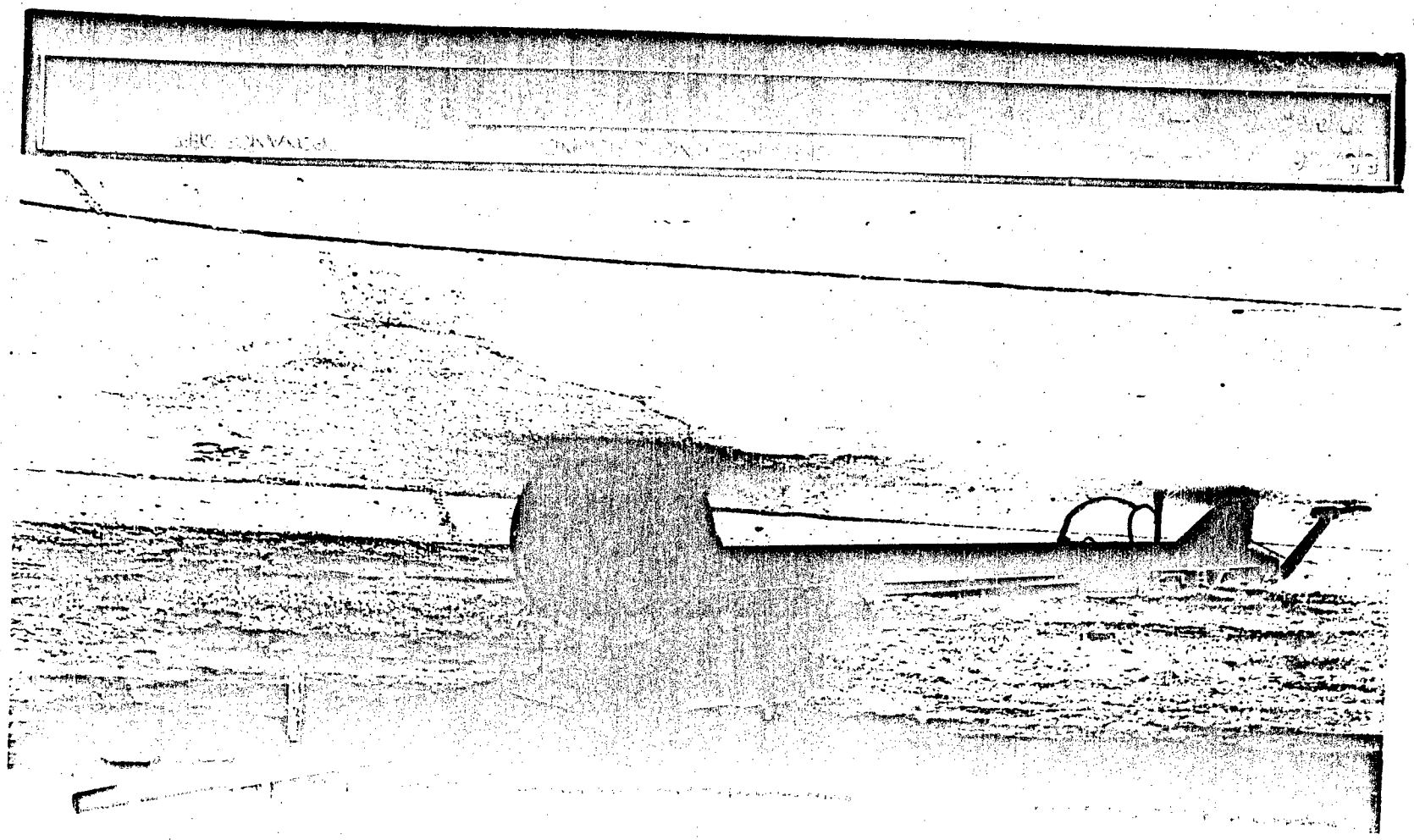
EXTERNAL STOWAGE

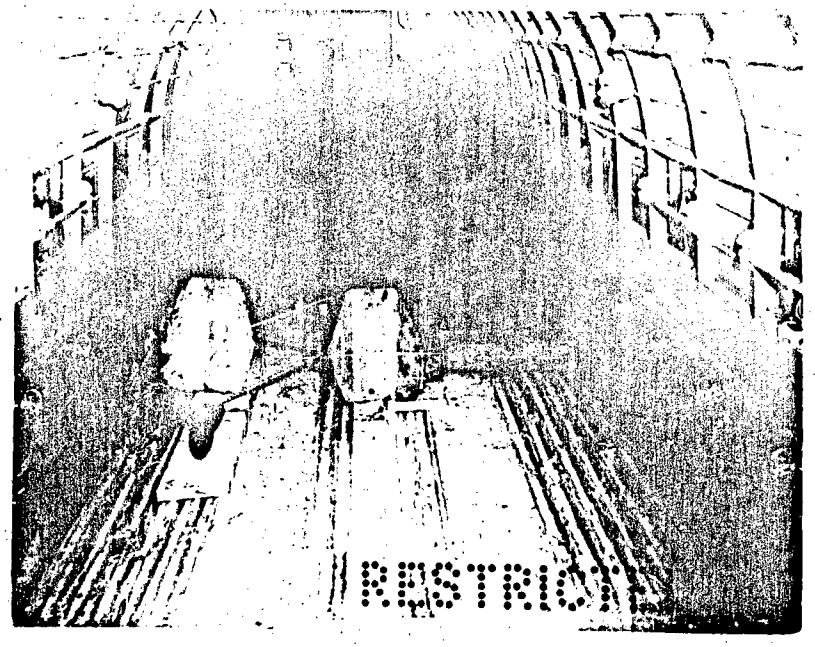
PACKS — FORWARD D
CENTER E
REAR F

PROPS — REAR G

F'W'D - NO SCALE REQUIRED

TEST NO. 10





99702 -11-44 | ABERDEEN PROVING GROUND | ORDNANCE DEPT

[illegible] Antitank Gun, M1A1, Material [illegible] Transport

TEST NO. 11

INSTALLATION OF 3" GUN, M5, ON CARRIAGE M1, INTO B-17 AIRPLANE

A. Details of Loading.

1. The tube was rolled into position under the open left-hand bomb bay by means of two bomb dollies, one at the breech, the other at the muzzle. One bomb hoist cable was fastened to the muzzle approximately 4 feet from the muzzle. The hoist was cranked up, and at the same time the bomb dolly supporting the breech was slowly pushed toward the bomb bay. The muzzle was guided through the radio compartment door as the breech came into the bomb bay. When the breech was under the bomb bay, the second bomb hoist was fastened around the tube near the breech ring, and the breech was raised into the bomb bay until the breech was approximately 2' below the radio compartment door sill. Approximately 5' of the tube projected into the radio compartment. This will not interfere with the radio operator in the performance of his duties. The tube was secured with 2 pieces of 3/4" wire rope approximately 5' long. Each cable was wrapped once around the tube approximately 2-1/2" forward of the breech. The ends of the cables were fastened to the shackles of the outboard and inboard bomb racks. The hoist cables were left in place for quick unloading, but could be disconnected if desired. A 3/8" cotton rope was used to lash the tube to prevent fore and aft movement and vertical movement. The muzzle end of the tube was also lashed to prevent movement on the door sill. A.P.G. Photograph 99773 illustrates the loading operation.

B. Unloading is accomplished by the reverse of the procedure.

C. Material Used.

2 pieces 3/8" wire rope, 5 ft. long
275' of 3/8" cotton rope
4 cable clamps, 3/8"

D. Weights.

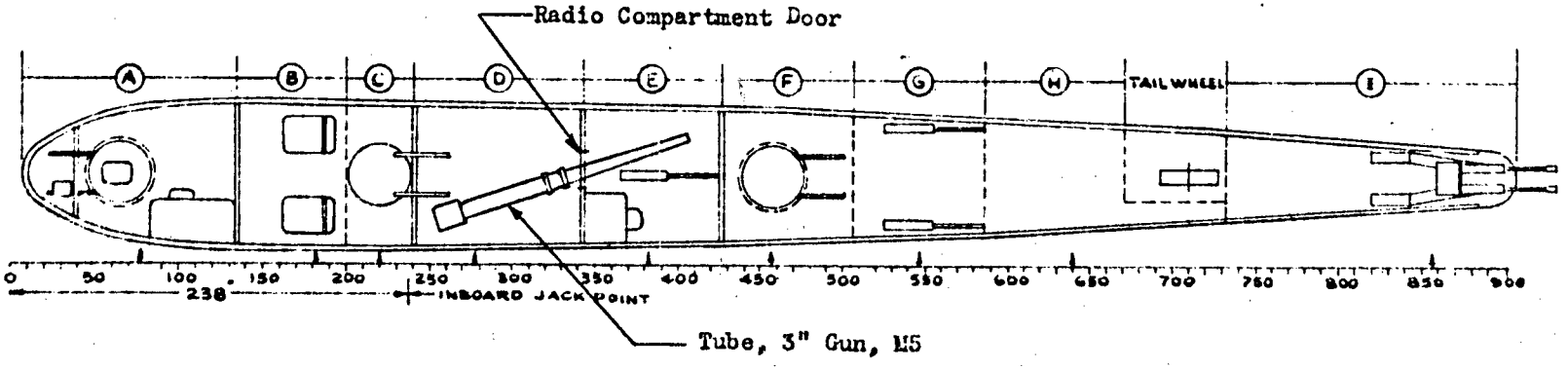
Gun tube, breech ring, and breechblock ..... 1640 lbs.

E. Data for tube alone.

Loading time - 1 hour
Unloading time - 30 minutes

F. Number of soldiers carried in addition to crew -

NOTE: The other parts of the gun have been loaded in an airplane at Camp Mackall and are not shown in this report for other details of this loading see the Mackall report on the same subject.



B-17G

C.G. - 36.5 Index Units
Cargo Wt. - 1640 lbs.

Test No. 11

BERLIN

TEST NO. 12

INSTALLATION OF 3" GUN, M5 ON CARRIAGE, M1 INTO B-24 AIRPLANE

A. Details of Loading.

1. Before attempting to load the gun tube into the airplane, the airplane was tipped backwards until its tail skid rested in a hole approximately 12" deep, which had been dug before tipping. Tipping was accomplished by having 5 men walk inside the airplane to the tail. The nose wheel was blocked up as far as possible (approximately 10") to prevent the nose coming down from the weight of the gun tube, refer to A.P.G. Photograph No. 99774. To maneuver the tube into the plane, one bomb hoist was fastened to the muzzle while the breech was supported by a hydraulic bomb carriage. Refer to A.P.G. Photograph No. 99771. As the hoist was cranked up, the bomb carriage was slowly moved toward the bomb bay until the breech was in position beneath the bomb bay with the muzzle projecting into the left rear bomb bay. The front bomb bay hoist was fastened near the breech and the rear bomb bay hoist was fastened near the muzzle. The tube was hoisted into place and secured to the bomb shackles with 3/8" wire rope and cable clamps. The bomb hoists were left connected to the tube, but could be disconnected if desired. The tube was secured to prevent fore and aft and sidewards movement by additional lashing with 1" Manila rope.

2. It was considered impractical to load the Carriage, M1 intact into thisairplane (A.P.G. Photograph No. 99704). Loading of the carriage in a disassembled condition was successfully accomplished at Camp MacKall, North Carolina, by the Airborne Command. In connection with the loading of Howitzer, 105-mm, M2 in B-24 airplane.

B. Unloading was accomplished by the reverse procedure.

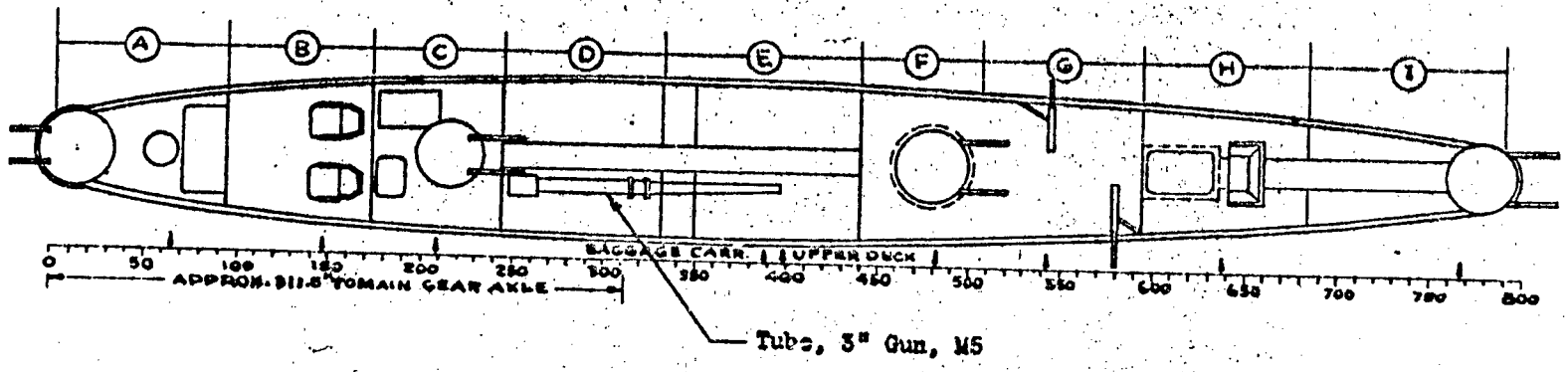
C. Material used.

2 pieces 3/8" wire rope approximately 48" long.
4, 3/8" cable clamps.
Approximately 50' of 1" Manila rope.

D. Weights.

Gun tube, breech ring, and breech block ..... 1640 lbs.

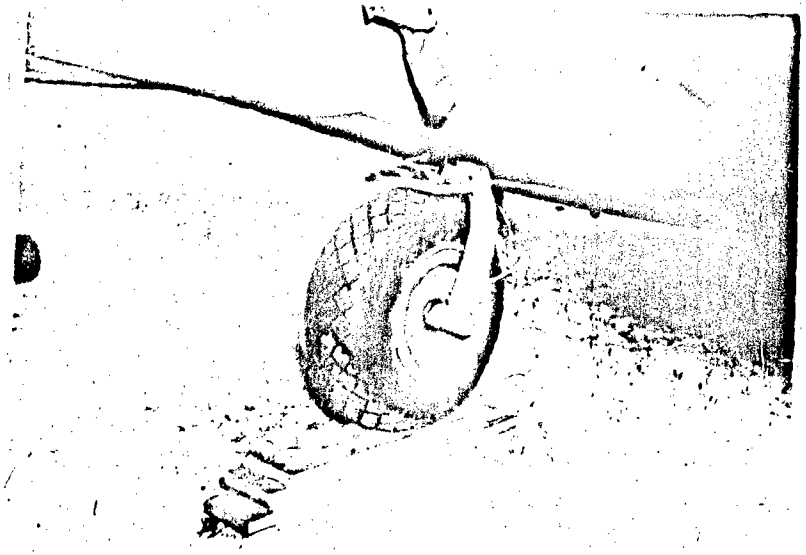
E. Disassembly time - None.
Loading Time - 1 hour.
Unloading Time - 30 minutes.
Reassembly Time - None.

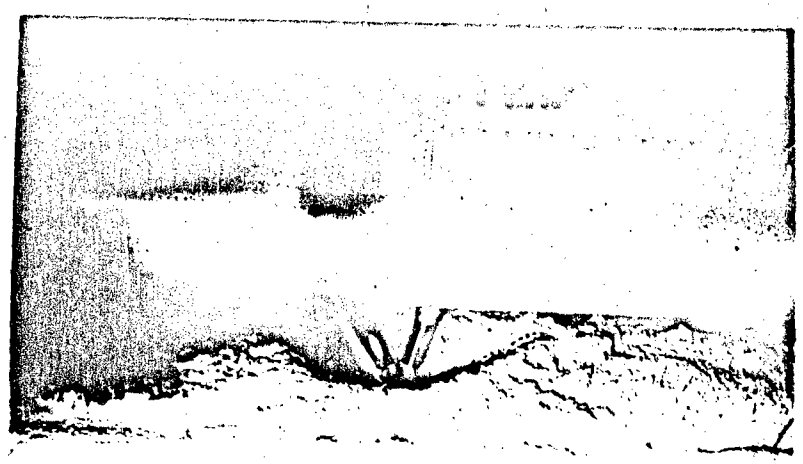


B-24D,E,G,H,& J
PB4Y-1

C.G. - 51.4 Index Units
Cargo Wt. - 1640 lbs.

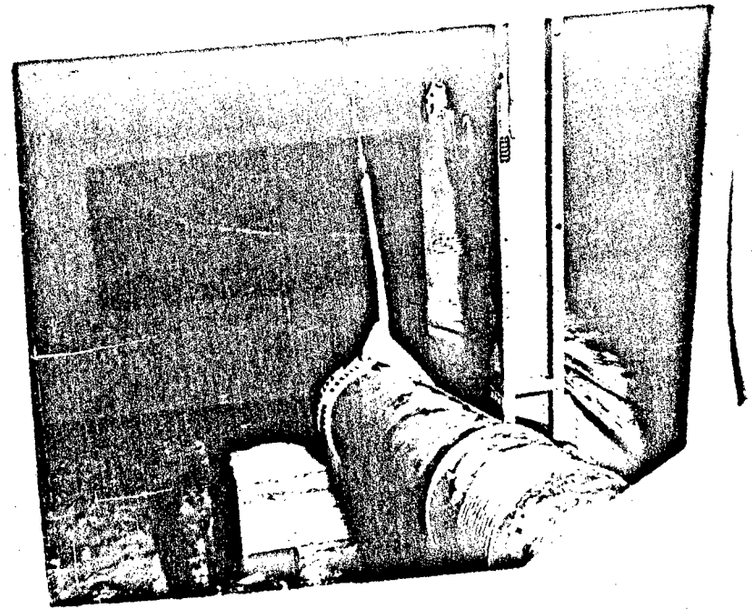
Test No. 12

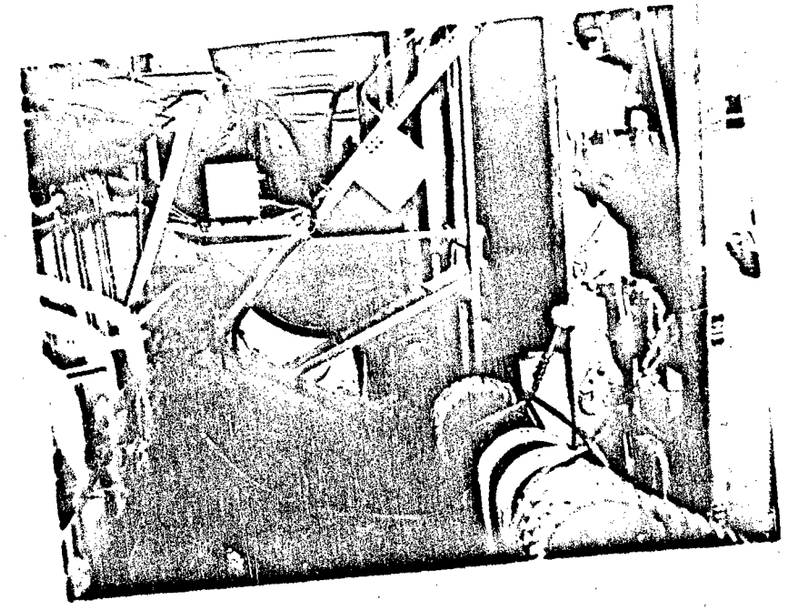




99774 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

Left: Block-up of nose wheel of B24 Bomber [illegible]
Position of tail skid of B24 Bomber with [illegible] blocked-up.

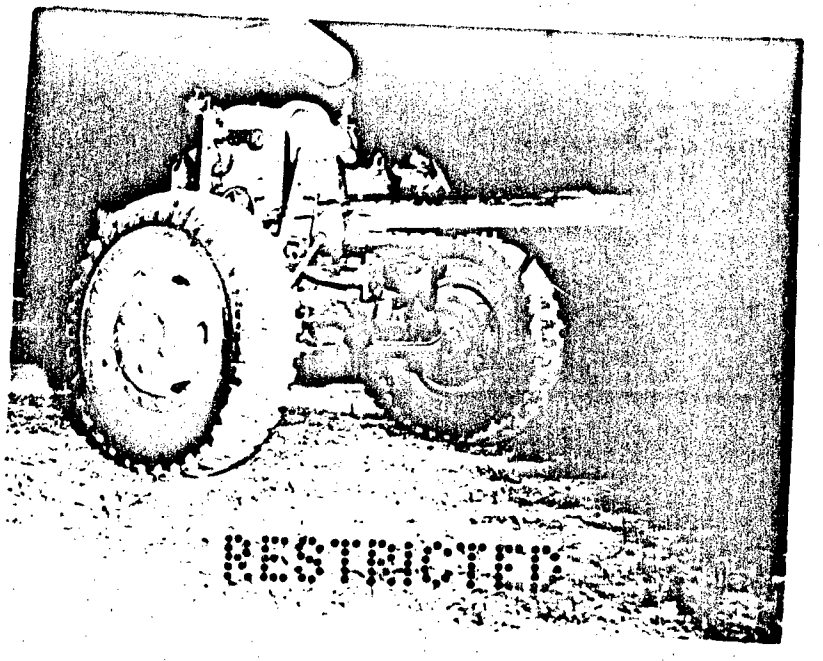


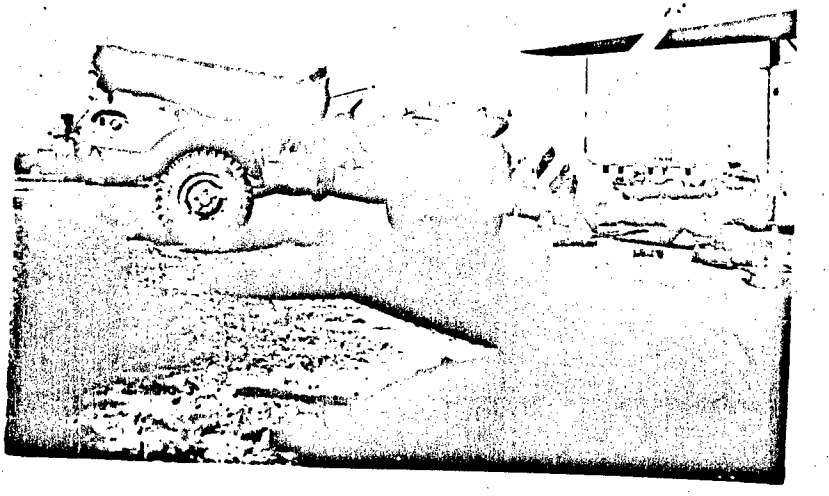


ORDNANCE DEPT.

997[illegible] 2-[illegible]-44

LEFT: Hoisting 3" A.T. Gun, M[illegible], into left position in left bomb bay of B[illegible] Bomber.

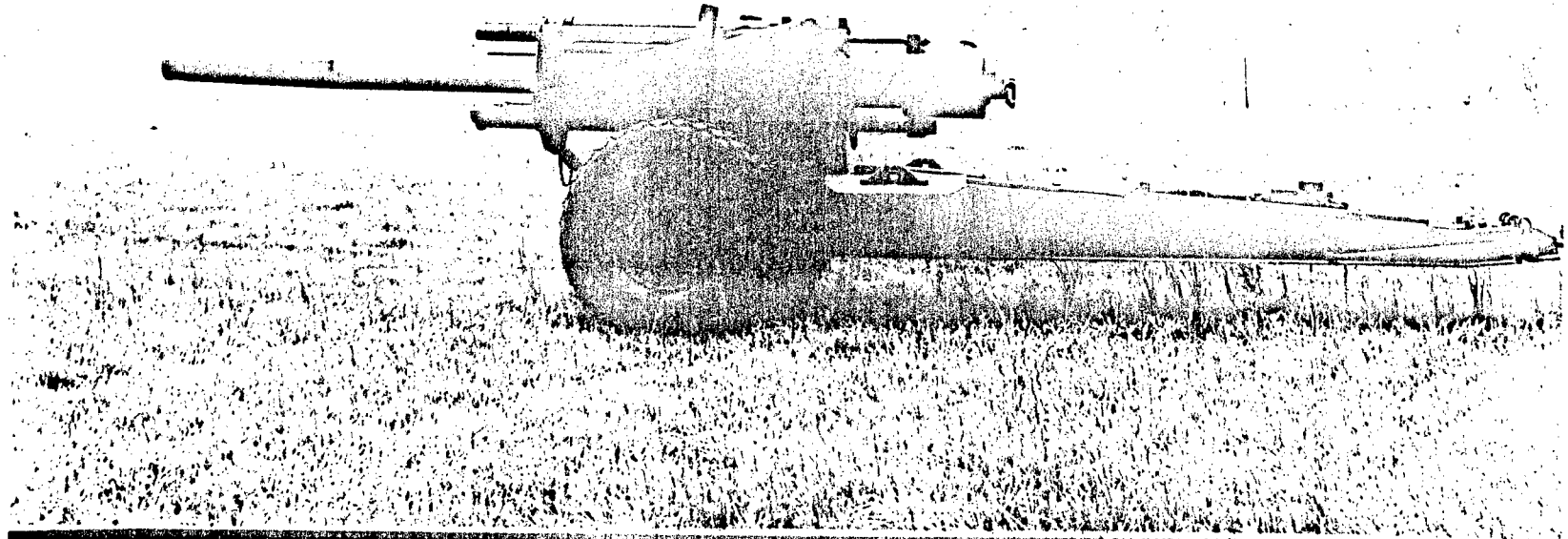

DESTRUCTOR



TEST NOS. 13, 14, AND 15

INSTALLATION OF 4.5" GUN CARRIAGE, M1A1 MATERIEL ON C-47, B-17, AND B-24 AIRPLANES

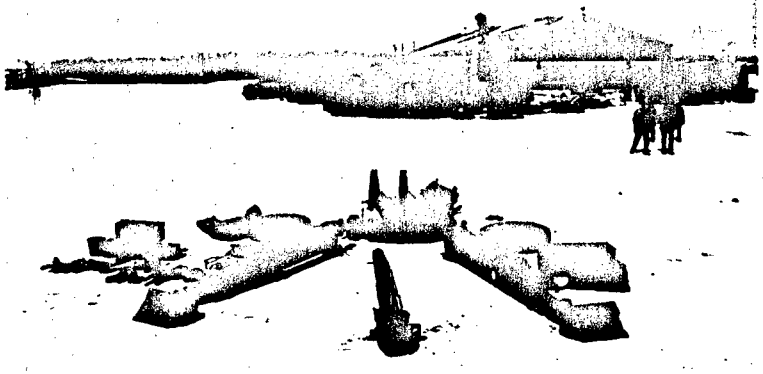
These tests were not conducted because the carriage for the 4.5" Gun, M1, is identical with the carriage for the 155-mm Howitzer, M1. The difference between the two units lies in the weight and length of the tube. 4.5" Gun weighs 4075 lbs. while the 155-mm Howitzer weighs 3825 lbs. Tests of the 155-mm Howitzer Materiel are reported in Test Nos. 16, 17, and 18.



63856 [illegible] DELN PROVING GROUND ORDNANCE DEPT.

4.5" Gun, Mi, [illegible]

RESTRICTED



TEST NO. 16 GENERAL

155MM HOWITZER, M1, AND 4.5 INCH GUN, M1, LOADING

A. Installation of the 155mm Howitzer, M1, with Carriage, M1, in two C-47 Airplanes, was accomplished with the following loads in each airplane.

C-47 (Test 16A)	C-47 (Test 16B)
155mm Howitzer	1 Top and Bottom Carriage
2 Trails	1 Recoil Mechanism
2 Wheels	2 Equilibrators
	2 Spades
	1 Float
	Tools and Accessories

B. Two 155mm Howitzers and Carriages can be loaded successfully in two C-47 Airplanes and one B-24 Airplane.

C-47 (Test 16C)	B-24 (Test 16D)	C-47 (Test 16C)
1 Top and Bottom Carriage	2 155mm Howitzer Tubes (mounted on the external bomb racks)	1 Top and Bottom Carriage
2 Trails	2 Recoil Mechanisms in the rear bomb bays	2 Trails
2 Equilibrators	2 Wheels in front bomb bays	2 Spades
1 Wheel		1 Float
2 Spades		1 Wheel
1 Float		2 Equilibrators
Tools and Accessories		Tools and Accessories

C. Two 155mm Howitzers and Carriages can be loaded successfully in two C-47 Airplanes and one B-17 Airplane.

C-47 (Test 16C)	B-17 (Test 16E)	C-47 (Test 16C)
1 Top and Bottom Carriage	2 155mm Howitzer Tubes (mounted on the external bomb racks)	1 Top and Bottom Carriage
2 Trails	1 Recoil Mechanism and 1 Wheel in the right bomb bay	2 Trails
2 Equilibrators	1 Recoil Mechanism and 1 Wheel in the left bomb bay	2 Equilibrators
1 Wheel		1 Wheel
2 Spades		2 Spades
1 Float		1 Float
Tools and Accessories		Tools and Accessories

D. The 4.5 inch Gun can be loaded successfully in place of the 155mm Howitzer in the C-47, B-17 and B-24 Airplanes. The carriages and recoil mechanisms for both cannon are identical.

E. The details of the above loadings are recorded in Test Nos. 16A, 16B, 16C, 16D and 16E.

TEST NO. 16A

INSTALLATION OF THE 155 MM HOWITZER, M1, WITH TRAILS AND WHEELS IN C-47 AIRPLANE.

A. One complete 155 mm Howitzer, M1, consisting of the tube, breech ring, and breech block assembly were installed in a C-47 airplane along with the 155 mm howitzer carriage, trails and wheels. Flooring was first laid in the plane using 3" x 10" planks 16' long. After the tube was placed in the doorway of the plane by a ten-ton wrecker, it was pried into the center of the plane. A sixteen foot plank, 3" x 10", was sawed 30" down on each side enough to allow the 30" length to go into the breech end of the cannon. In the other end of the plank, a hole was drilled to allow a rod to be inserted, making a lunette to be utilized in lifting the board with a wrecker, which in turn lifted the breech end of the tube. This allowed the tube to be pushed to the front of the plane by swinging the boom of the wrecker and guiding the front end of the tube with bars. The tube was blocked in all four directions as shown in A.P.G. Photograph No. 99741. The trails were next loaded as follows with the same procedure used for each. The trail was placed into "G" compartment by means of the wrecker with one chain around the C. of G. of the tube and the heavy end of the trail toward the front end of the airplane. There was sufficient space for the trails to be laid on their sides between the tube and the sides of the airplane. The trail was pulled into position by means of a block and tackle anchored to eye bolts of "C" and "D" compartments and guided with crowbars. The trail was blocked into position as shown in A.P.G. Photograph No. 99741. The wheels were loaded into "G" compartment by means of the wrecker. The wheels were lifted to a vertical position by four men, and rolled into compartments "E" and "F" respectively, where they were lowered to a horizontal position and lashed down. The wheels were first placed in "D" compartment as shown in A.P.G. Photograph No. 99741, but this distribution of weight placed the C. of G. beyond acceptable limits. Therefore, the wheels were shifted to "E" and "F" compartments, as illustrated in Loading Diagram 16.

B. To remove the material from the plane, a wooden ramp 4 ft. high, 10 ft. wide and 18 ft. long, extending approximately 5 ft. horizontally from the loading door, then sloping to the ground, was assembled and placed at the doors. The wheels were then rolled down the ramp and onto a bomb dolly, where they were laid flat. Four men were required to do the job. The trail on the right hand side was skidded out of the plane by means of crowbars and ropes. Ropes were fastened to the forward end of the trails to act as guides and also to pull. Planking was placed under the trails to prevent damage to the floor of the plane. The trail was pried and pulled down the ramp onto a 2" x 12" plank extending from the ramp to the bomb dolly. The tube, which was in the center of the plane, was next removed. A rope was fastened around the breech ring and tied to a block and tackle which was anchored to a 6x6 truck. Four men were required to pull on the block and tackle, while two men guided the tube. A rope was attached to the muzzle and as a safety precaution. The truck was then parked parallel to the plane to get a straight pull to bring the tube out of the plane. Planking was also kept under the tube to protect the floor. The tube was first pulled out of the plane a distance of approximately 3 feet. The truck was then moved to face the door of the plane. The tube was guided down the ramp with crowbars so that it would not slide off the ramp. A snubber rope was used on the tube as a safety precaution. A 2" x 12" plank was placed between the ramp and the bomb dolly and the tube was slid upon the bomb dolly. The left trail, which was all that was left in the plane, was brought out in the same manner as the right trail.

TEST NO. 16A
(cont'd)

C. Material Used:

1. 90 - 16 penny nails.
2. 50 ft. 1/2" Manila rope (for lashing).
3. 3 - 8" x 8" timber, 18' long.
4. 1 double sheave (6" block).
5. 1 single sheave (6" block).
6. 200 ft. - 3/4" rope.
7. 3 - 5 ft. crowbars.
8. 9 Planks 3" x 10" x 16' long.
9. 16 Blocks - 2" x 6" x 12"
10. 30 Blocks - 2" x 4" x 8".
11. 2 Planks - 2" x 4" x 6'
12. 2 Planks - 2" x 6" x 6'.
13. 2 Blocks - 6" x 6" x 1'.
14. Tools used:
    a. 1 Claw Hammer
    b. 1 Crosscut Saw.
    c. 1 Large Bomb Dolly.

D. Weights:

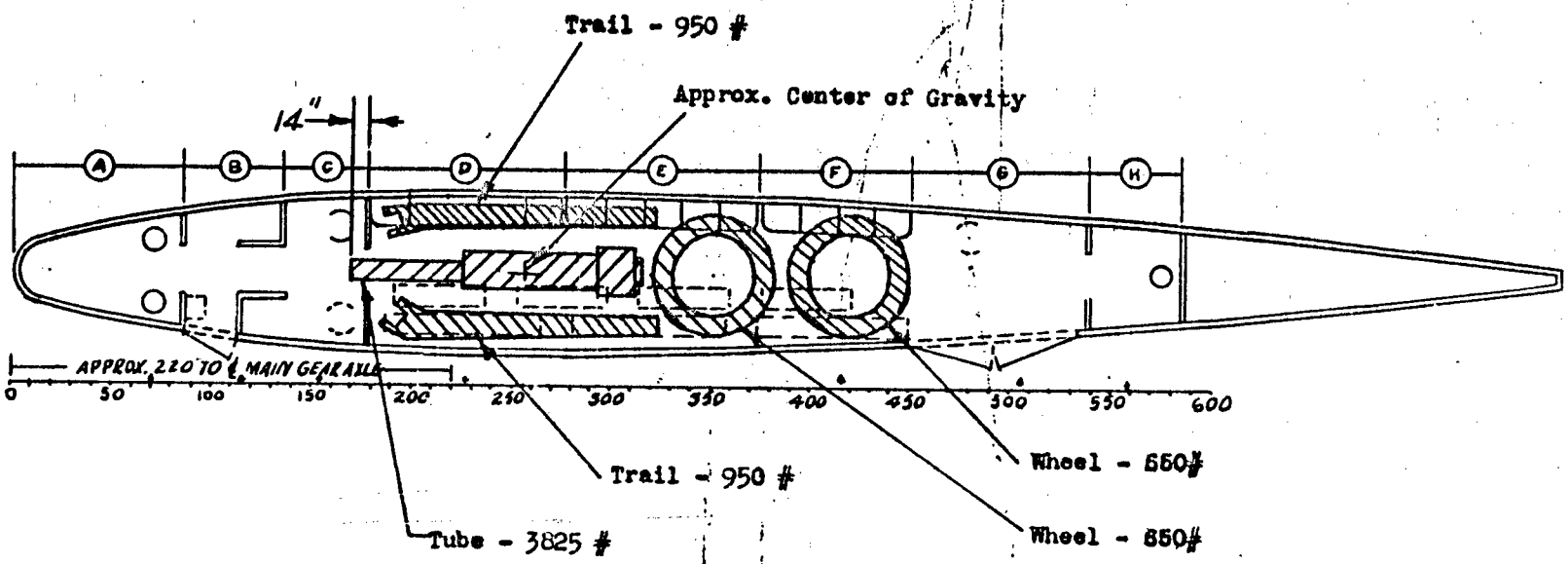
Tube	3825 lbs.
2 Wheels (complete with tire and tube) at 650 lbs. each	1300 lbs.
Left Trail Assembly - 950 lbs.) Right Trail Assembly- 950 lbs.)	1900 lbs.
Total.....	7025 lbs.

E. Time (estimated)

To disassemble: 5 hours
To load: 3 hours
To unload: 2 hours
To reassemble: 7 hours

F. The number of soldiers that may be carried in addition to the crew members: 0

G. A.P.G. Photograph Nos. 55816, 99859, 99739, 99741 thru 43 inclusive.

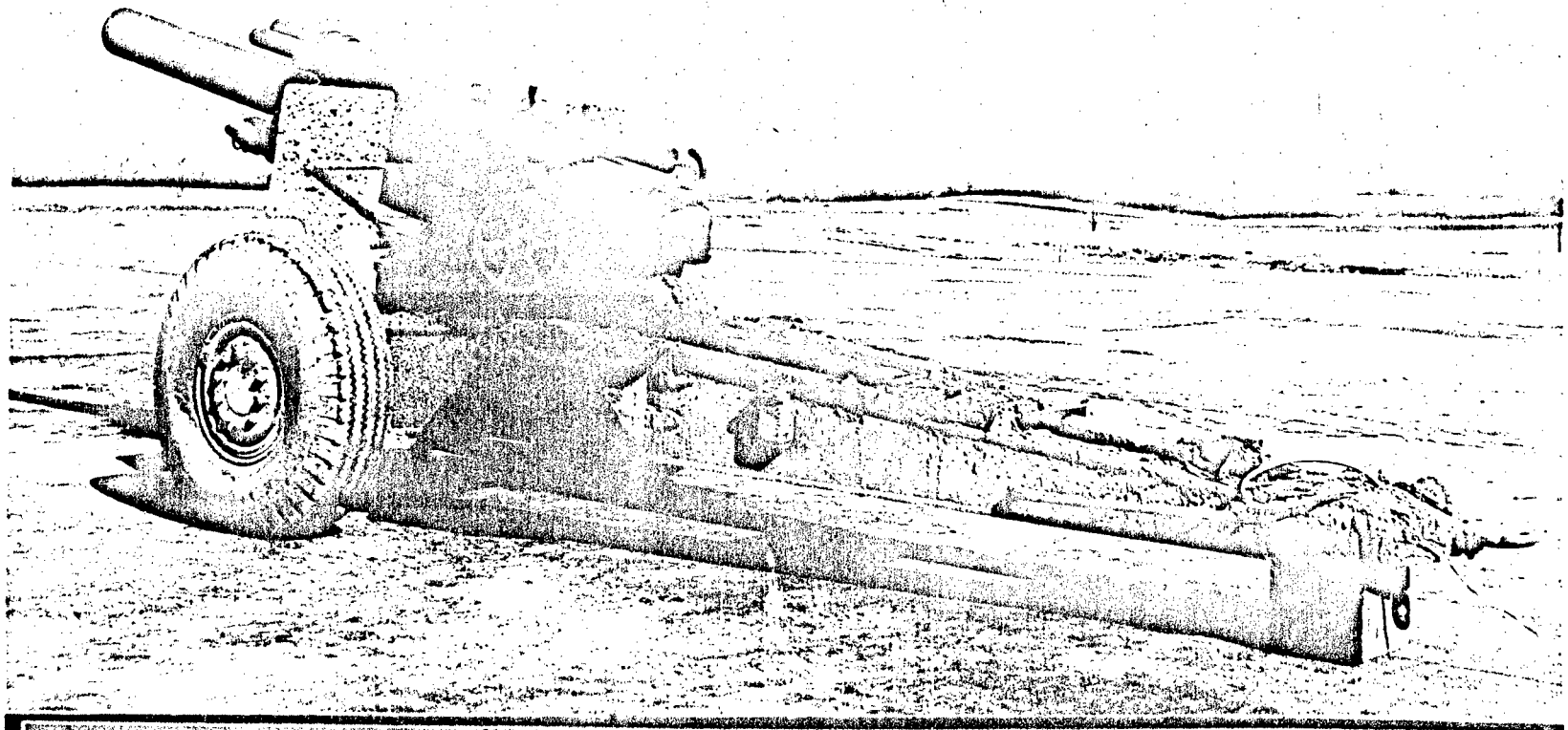


Cargo Weight = 7025 lbs.

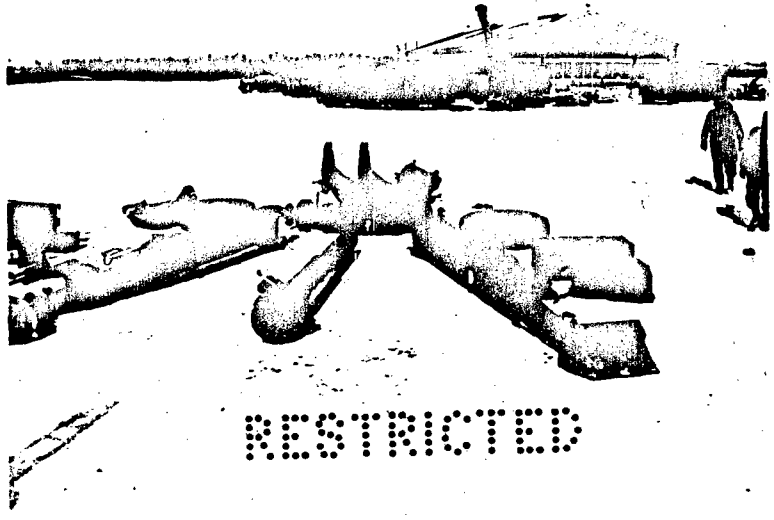
Wheels should be moved from "D" Compartment to "E" and "F" Compartments for C.of G. to be in limits. After this change C. of G. will be 20.4 index units.

C-47

TEST NO. 16A

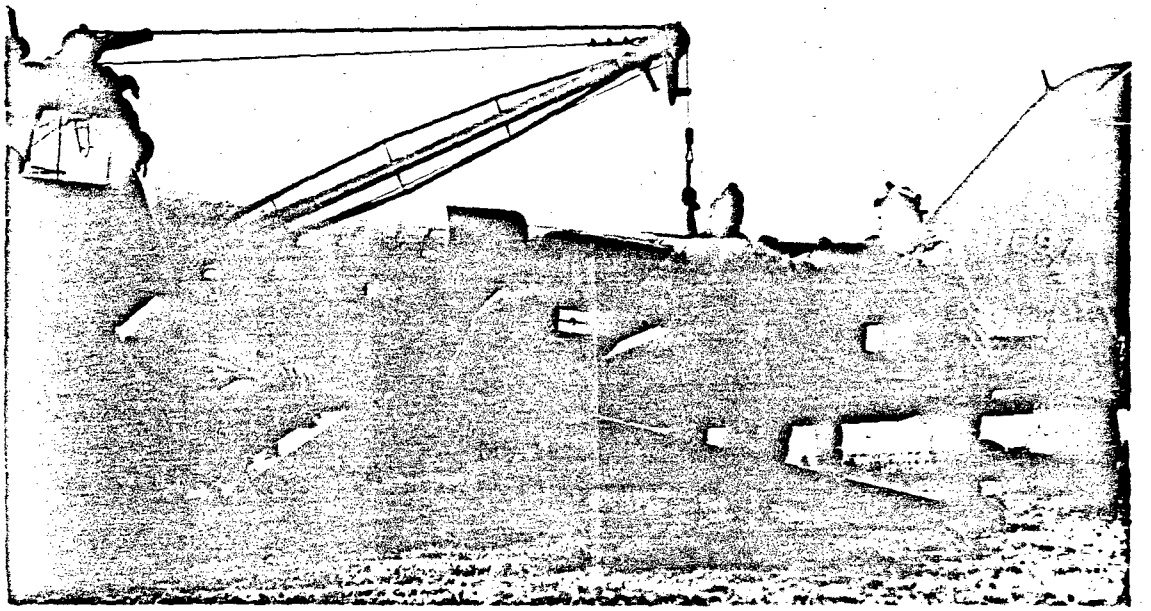


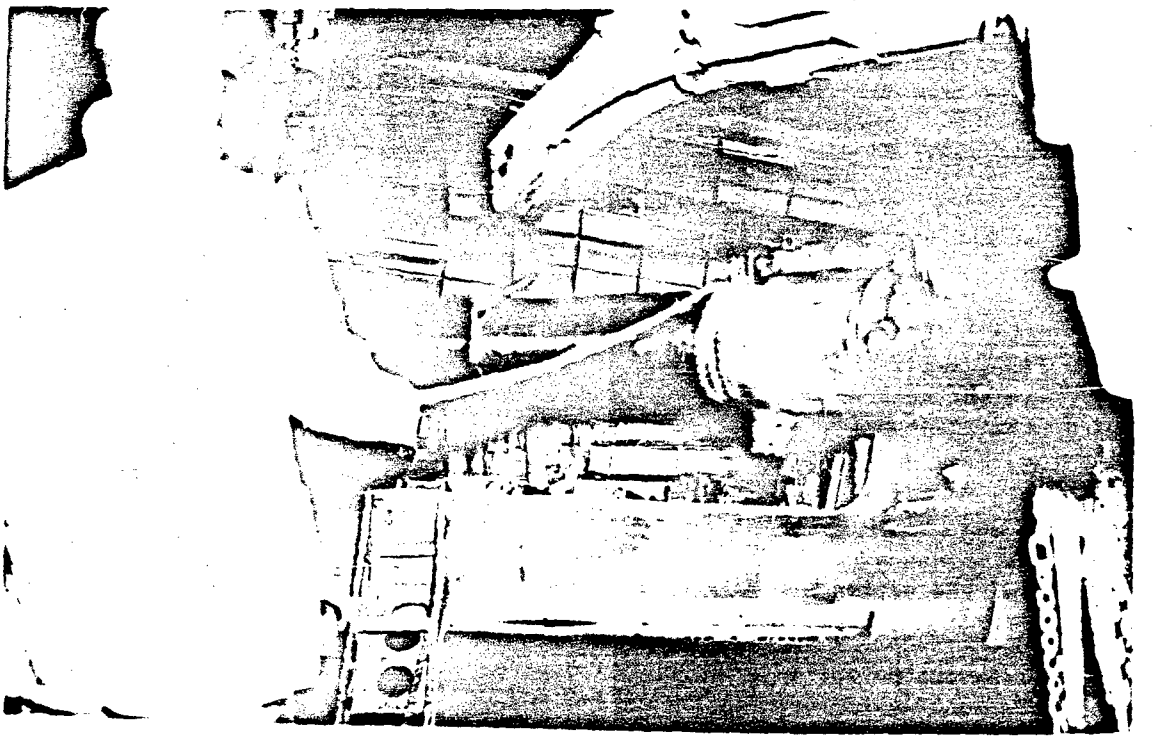
68	ABERDEEN PROVING GROUND	ORDNANCE DEPT.
155 mm [illegible]		



99838	2-11-74	ABERDEEN PROVING GROUND	ORDNANCE DEPT
155mm Howitzer, M1 (complete unit)			

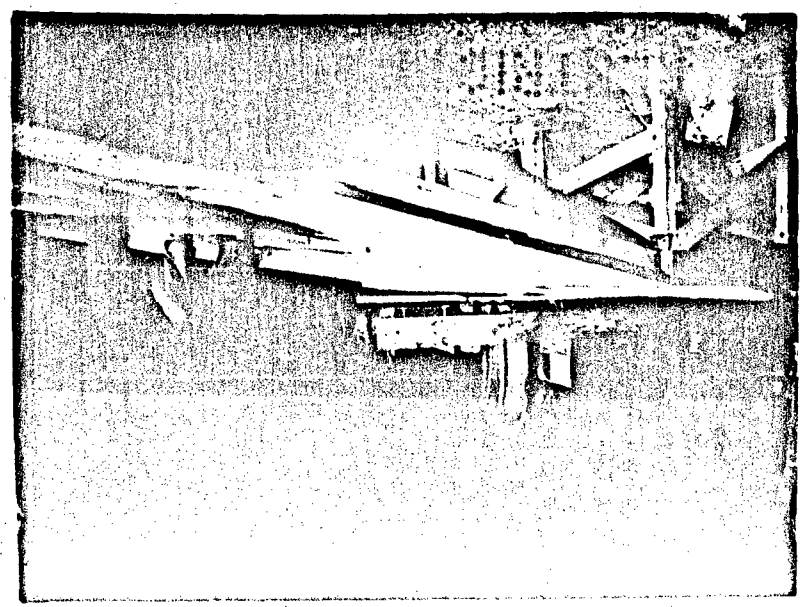
RESTRICTED

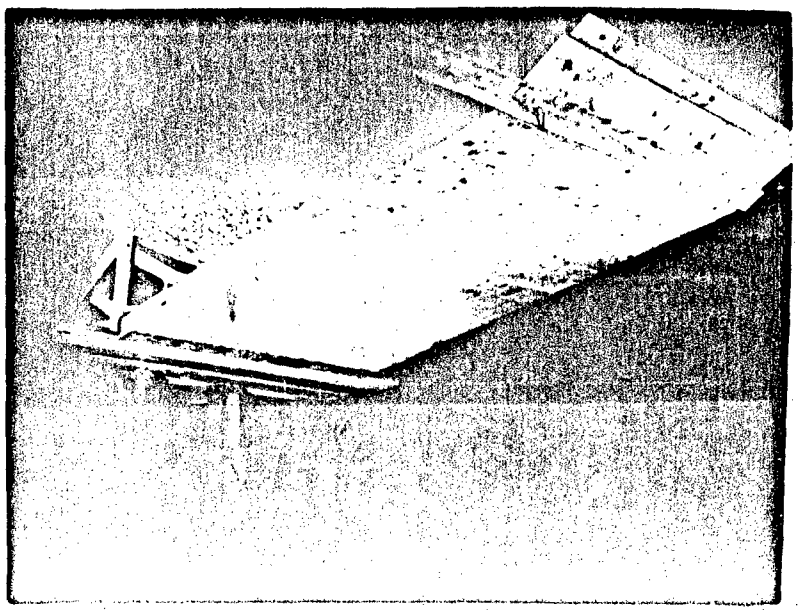


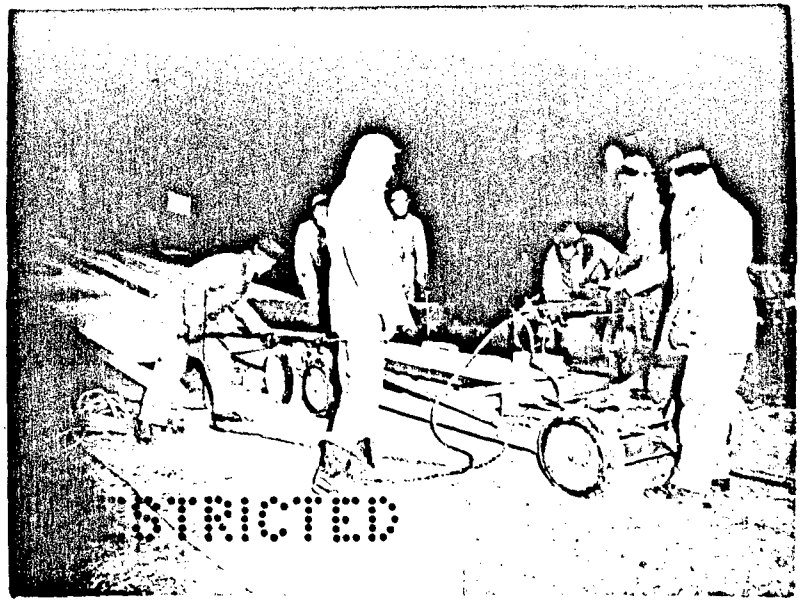


997 [illegible] -11 | ABERDEEN PROVING GROUND | ORDNANCE DEPT.

TOP: Disassembly of 15 [illegible] Howitzer [illegible] Transport BOTTOM [illegible] Transport with [illegible] Ton 6x6 [illegible] Diamond T Wrecker.







99743 2-11-44 | ABERDEEN PROVING GROUND | ORDNANCE DEPT.

LMT: Unloading 155-mm Howitzer, M1, from [illegible] Transport. RIGHT: Unloading 155-mm Howitzer, M1, from [illegible] Transport and loading on bomb dolly.

TEST NO. 16B

INSTALLATION OF THE 155 MM HOWITZER CARRIAGE, M1-(LESS TRAILS AND WHEELS) IN C-47 AIRPLANE

A. The 155-mm Howitzer, Carriage, M1, less the trails and wheels was installed in the C-47 Airplane together with all tools and accessories. The various units were hoisted aboard using a 4-Ton wrecker and were placed as shown in floor plan 16 B. The top and bottom carriage unit, the most bulky, was placed first. It was skidded forward aided by rollers and a block and fall fastened to the central large floor eyebolt near the door to the radio room. All units were thoroughly lashed to the floor and to the ship side rails using 1" rope. This lashing is shown in A.P.G. Photographs Nos. 99775 Right and 99776.

B. Removal.

The units were removed in reverse order. A.P.G. Photo 99801 Left shows the removal of the recoil mechanism. The heavy items were hoisted out of the rear door using a 4 x 4 "A" frame hoist mounted on the front of a 3/4 Ton 4 x 4 (Dodge) weapons carrier.

C. Material used for installation.

Sufficient 2 x 8 timbering to cover the entire cargo space timbered lengthwise and in addition twenty (20) 2 x 8 timbers placed crosswise. About 1,000 lbs. of timber were used.

D. Weights.

	Wt. (lbs.)
Top and Bottom Carriage	1850
2 Equilibrators, 250# each	500
2 Spades	368
Recoil Mechanism	1582
Tools and Accessories	576
NET LOAD	4876
Timber	1000
GROSS LOAD	5876

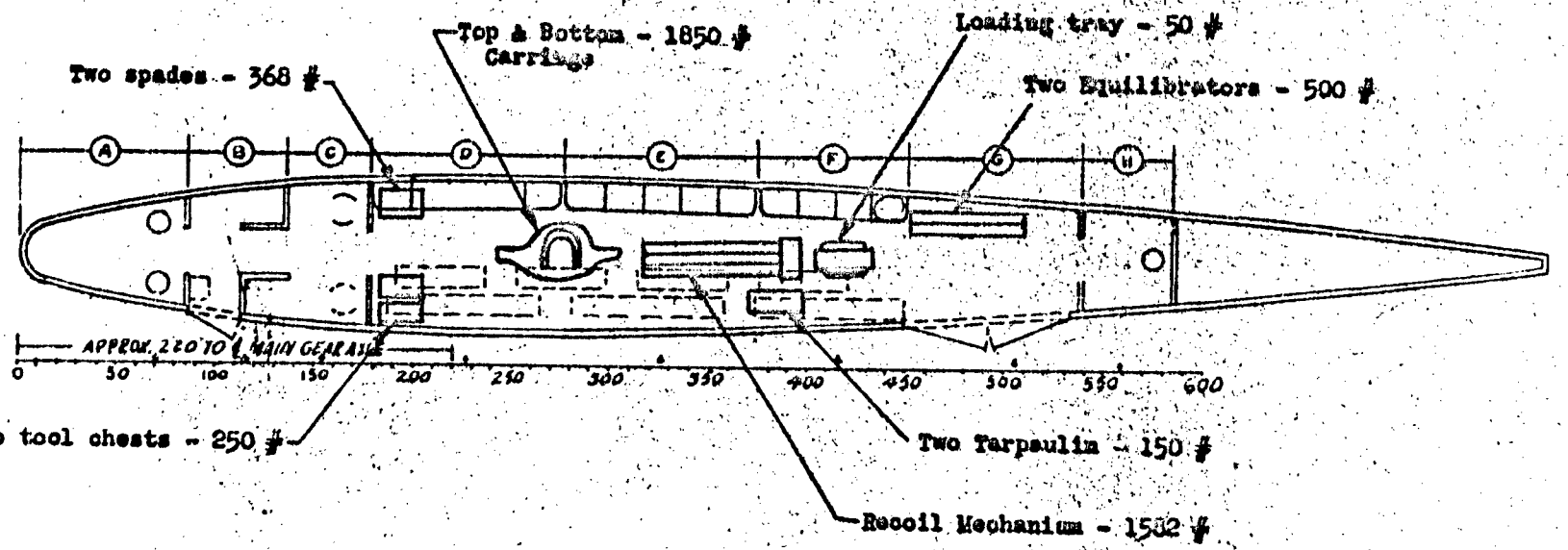
E. Time to Disassemble ..... 5 hours

F. Time to Load ..... 3 hours

G. Time to unload ..... 2 hours

H. Time to reassemble ..... 7 hours

I. Number of soldiers as passengers - None.



Weight

Planking - 1000 #

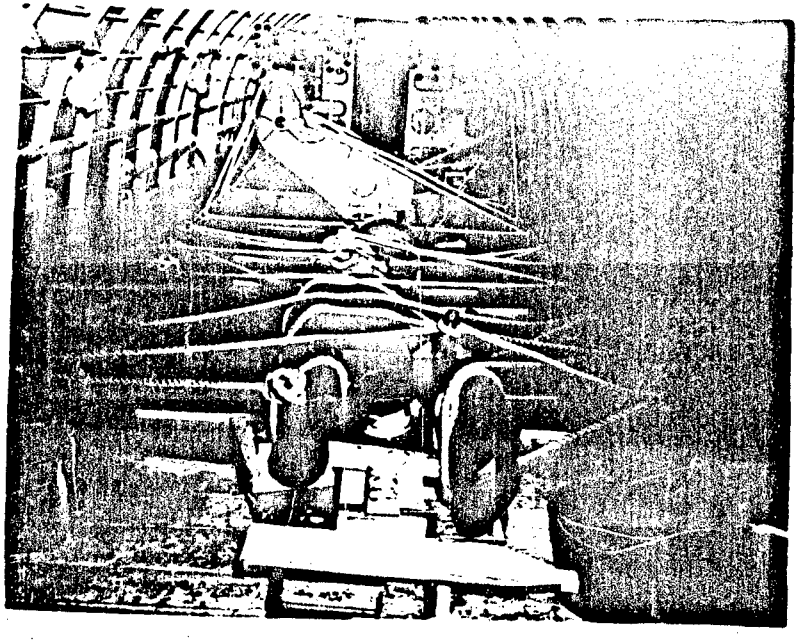
C. G. = 39 Index Units

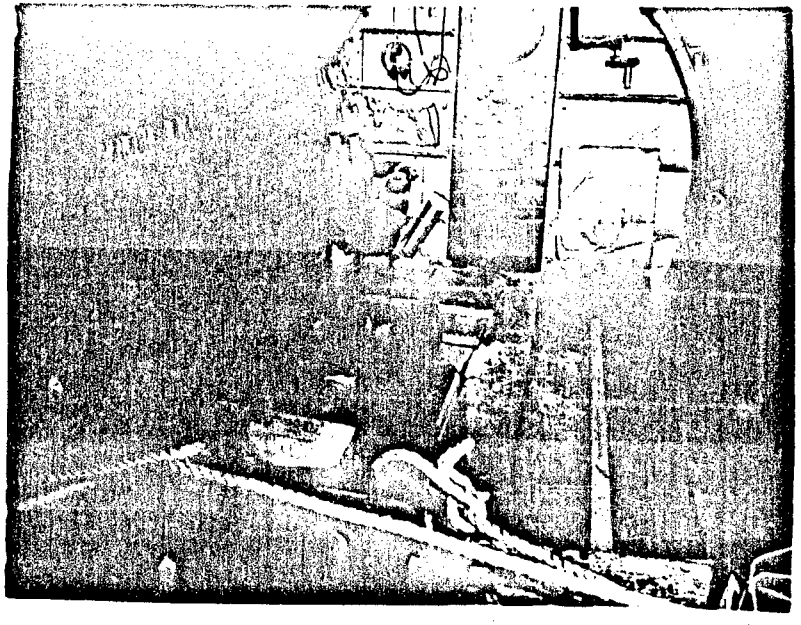
Cargo Wt. = 4830 lbs.

C-47

155 MM Howitzer

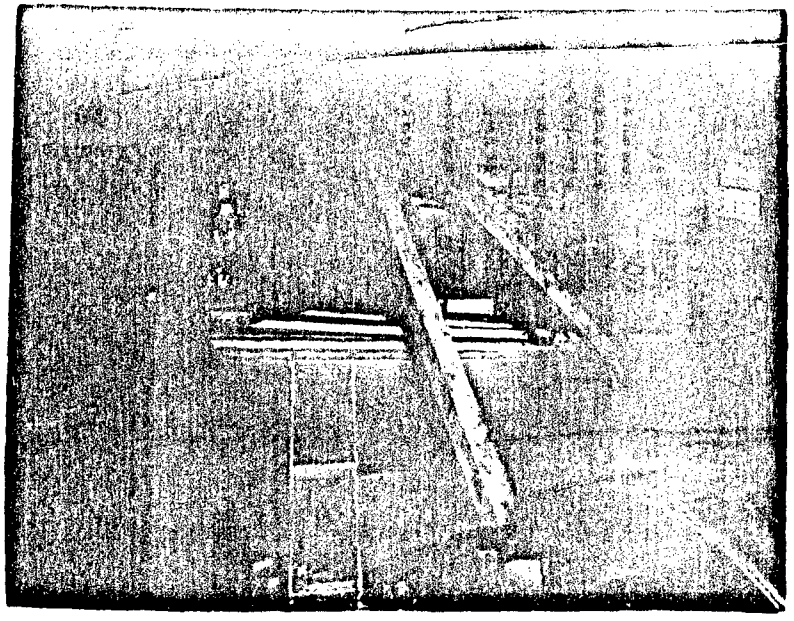
TEST NO. 16B

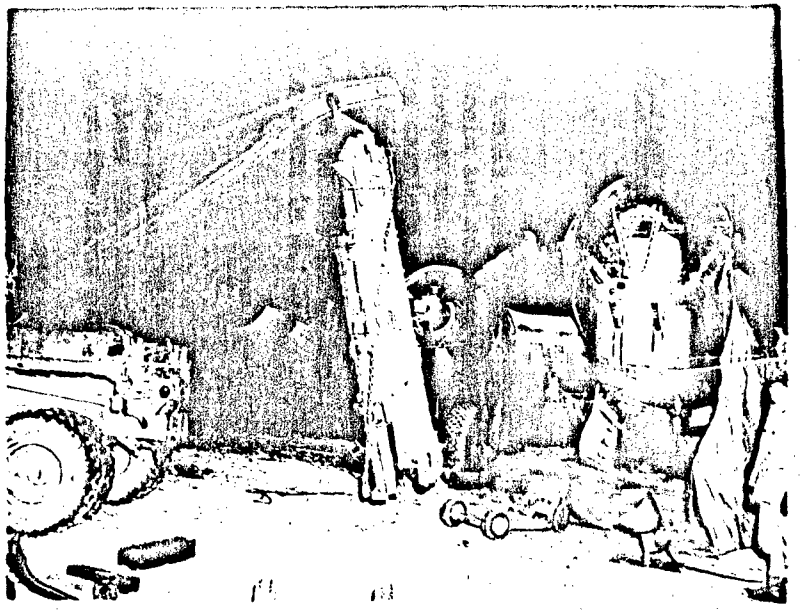




96776 [illegible] | [illegible] GROUND | ORDNANCE DEPT

[illegible] Carriage, M1A1, blocked and lashed in position [illegible] Carriage, M1A1, blocked in position in [illegible]





99[illegible] [illegible] ORDNANCE [illegible]

LEFT: Unloading 155 mm Howitzer Recoil [illegible] Ton [illegible] Truck with front mounted A-frame. RIGHT: [illegible] M2A1 Recoil Mechanism.

M2A1 cradle and top carriage [illegible] Bomb Gallery preparatory to [illegible] Diamond T Wrecker).

TEST NO. 16C

INSTALLATION OF THE 155 MM HOWITZER CARRIAGE, M1 (LESS RECOIL MECHANISM AND ONE WHEEL) IN C-47 AIRPLANE

A. The 155 mm Howitzer Carriage, M1, less the recoil mechanism and one wheel, was installed in the C-47 Airplane together with all tools and accessories and in addition a heavy pipe tripod to be used in assembly operations. The various units were hoisted aboard using a 4-ton wrecker and were placed as shown in floor plan 16C. The top and bottom carriage unit, the most bulky, was placed first. It was skidded forward aided by rollers and a block and fall fastened to the central large floor eyebolt near the door to the radio room. It is necessary to block under the hubs of the carriage to distribute the concentrated load sufficiently over the floor. The trails were similarly skidded forward aided by the block and fall. All of these units were thoroughly lashed to the floor and to the ship side rails using 1" rope. This lashing is shown in A.P.G. Photographs Nos. 99792 and 99791 (right side) showing this loading. The remaining units were hoisted aboard and placed as shown in the floor diagram and securely lashed. The weight of the trail units was distributed by placing 2 x 8 timbers underneath them, and blocking to carry the weight. The tool chests were spaced above and lashed to the equilibrators at the forward left corner of the cargo space. The large pipe lifting tripod was lashed, two members on the right resting on and lashed to the trail and the spades, and the third member on the left side resting on and lashed to the tool chests and the trail. The smaller items were placed as shown in the floor plan 16C and A.P.G. Photograph No. 99791 (right side) and securely lashed.

B. Removal

The units were removed in reverse order. The heavy items, wheel, trails, and the combined top and bottom carriages were hoisted out of the rear door using a 4 x 4 "A" frame hoist mounted on the front of a 3/4 ton 4 x 4 (Dodge) weapons carrier.

C. Materiel used for installation

Sufficient 2 x 8 timbering to cover the entire cargo space timbered lengthwise and in addition twenty (20) 2 x 8 timbers placed crosswise. About 1,000 lbs. of timber was used.

D. Weights

	Lbs.
Top and bottom carriage	1850
2 Equilibrators, 250 lbs. each	500
2 Spades	368
Right and left trails	1900
1 Wheel	650
2 Shields	165
Tools and Accessories	578
1 Lifting Tripod	600
Net Load	6500
Timber	1000
Gross Load	7500

Test No. 16C (Cont'd)

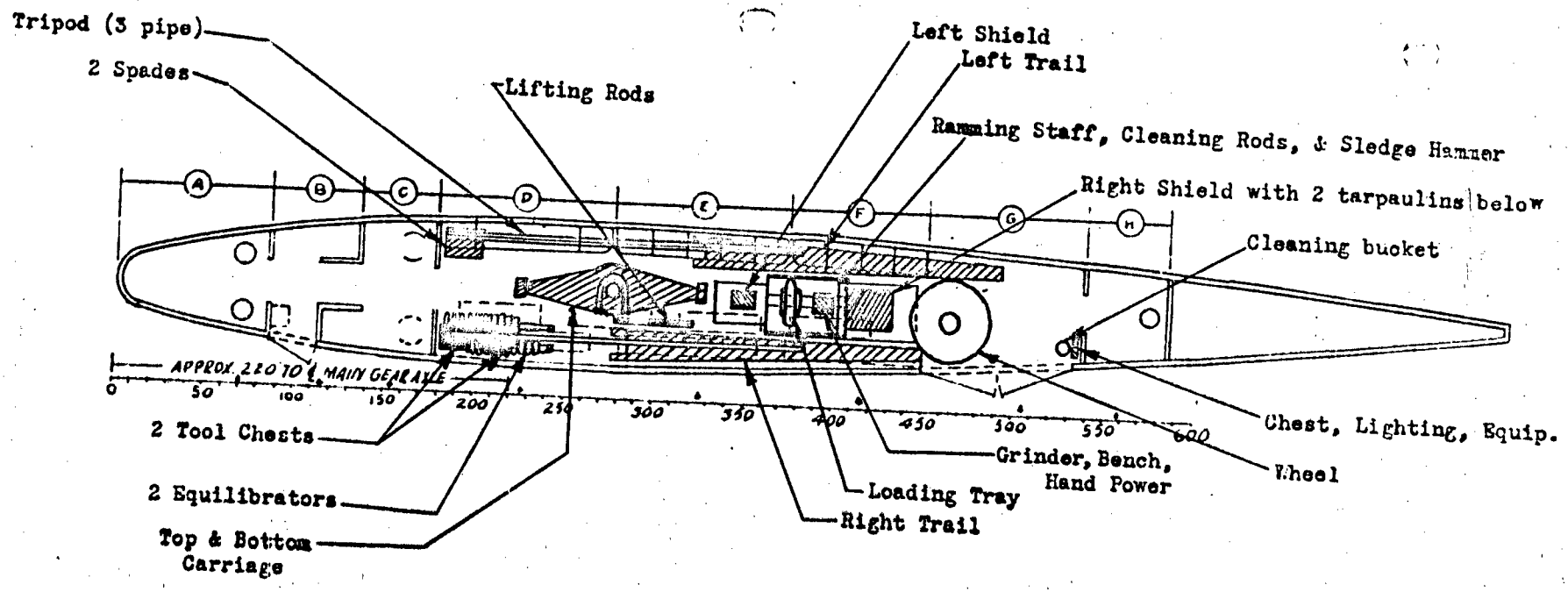
E. Time to disassemble - 5 hours

F. Time to load - 5 hours

G. Time to unload - 2 hours

H. Time to reassemble - 7 hours

I. No. of soldiers (passengers) - None



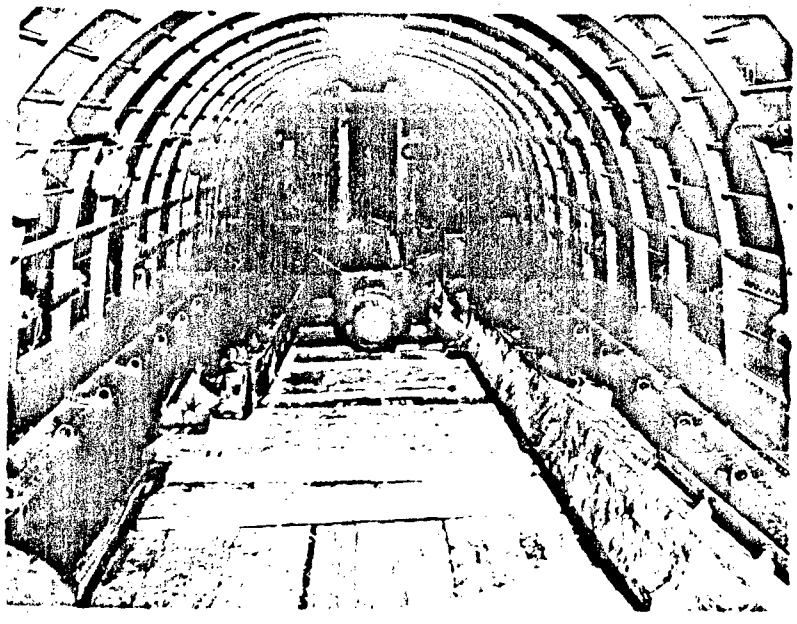
TEST NO. 16C

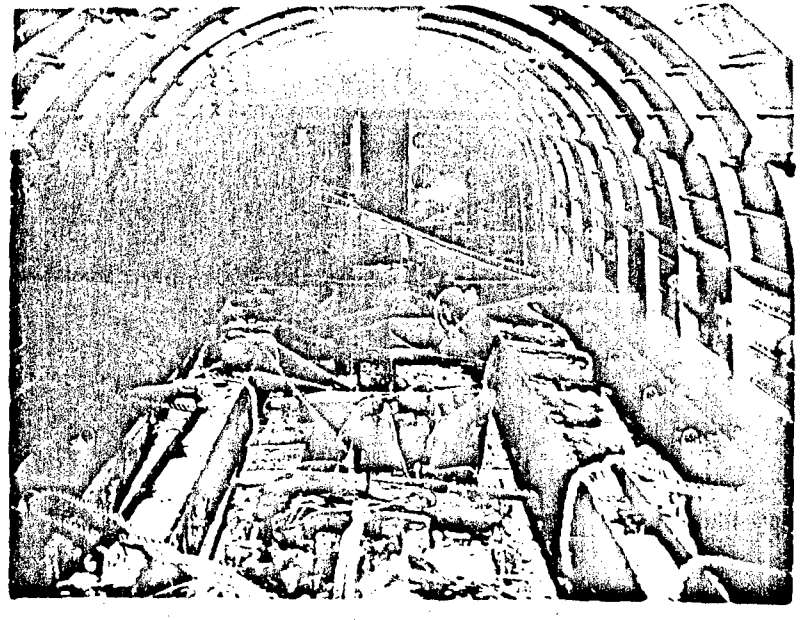
INSTALLATION OF THE 155-MM HOWITZER CARRIAGE, M1 (Less Recoil Mechanism and one wheel) in C-47 Airplane

Cargo Weight	6500 lbs.
Planking	1000 lbs.
Gross Wt.	7500 lbs.

C.G. Location - 48.8 Index Units

NOTE - This floor plan supersedes A.P.G. Photographs (With regard to location of tool chests and three pipe tripod



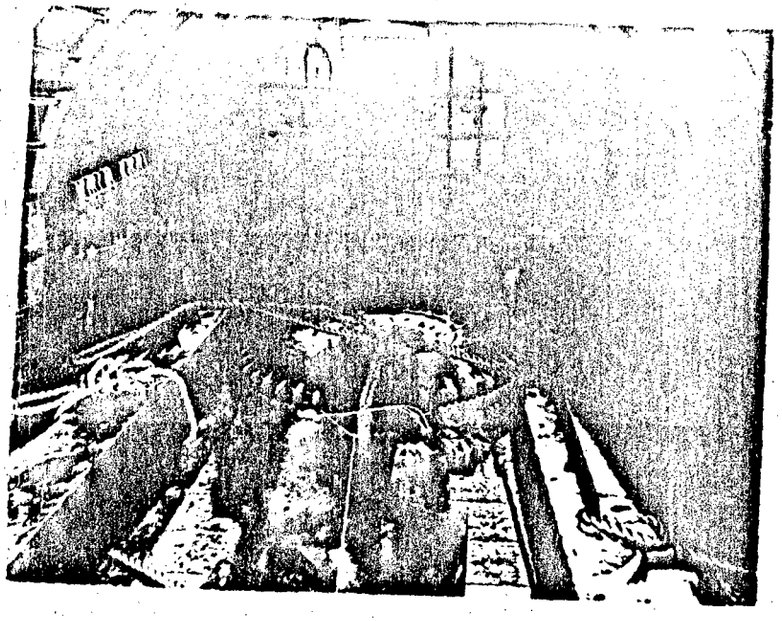


[illegible]

[illegible]

[illegible]

in position [illegible]



99792 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

LEFT: Blocking and lashing of [illegible]
155 mm Howitzer Carriage, M1A1, in [illegible]
M1A1, blocked and lashed in position [illegible]

TEST NO. 16 D

Part I

INSTALLATION OF RECOIL MECHANISM, M6, AND WHEEL OF CARRIAGE FOR 155 MM HOWITZER CARRIAGE IN B-24 AIRPLANE

A. The recoil mechanism and wheel were installed in the right rear and right front bomb bays, respectively, of airplane, B-24. The recoil mechanism, placed on a small dolly, was wheeled under the plane and lifted into the bomb bay by means of the bomb hoisting winch. The elevating arc was toward the front of the plane. A 3/8" cable lashed the top cylinder (and complete unit) to the bomb rack frame in the center of the plane. Two wood planks wedged the ends tightly in the bay. Cables of 1/4" lashed the forward and rear ends of the recoil mechanism to the left center bomb rack frame. The wheel, placed flat on ground under the plane with hub to ground, was lifted by means of the bomb hoisting winch. Sufficient height could not be obtained so a small bomb dolly with blocks was used to raise the wheel seven inches higher and permitted closing of the bomb bay door. A 3/8" cable was fastened to the front top bomb shackle hook, passed through the center of the wheel, and anchored to the opposite top bomb shackle hook. The winch was released and the bottom lashed to the bottom of the bomb rack with a wire. See loading diagram 18. A.P.G. Photograph No. 99794 illustrates the installation.

B. Disassembly was accomplished in reverse order.

C. Material used:

1. Wood plank ..... 7' x 10" x 3"
2. Wood plank .....22" x 10" x 2"
3. Wood plank .....35" x 10" x 2"
4. 18 feet 1/4" cable.
5. 18 cable clamps.
6. 4 - 6" turnbuckles.
7. 15 feet 3/8" cable.

TEST NO. 16 D

PART II

INSTALLATION OF THE 155 MM HOWITZER M1 ON EXTERNAL BOMB RACK B-24 AIRPLANES

A. One complete assembled 155 MM Howitzer, M1, consisting of the tube, the breech ring, and the breechblock assembly, was installed on the external 4,000 lb. bomb rack of the B-24 Airplane. The howitzer was installed with the breech end forward with the breech turned clockwise 90° from the normal position when looking at the breech. The center of gravity of the howitzer was located midway between the supporting lugs on the bomb rack. The howitzer was raised to the bomb rack by means of a six wheel bomb dolly, M22. The howitzer was supported on the dolly by blocking, which raised it approximately three feet above the bed of the bomb dolly, as shown in A.P.G. Photograph No. 99857. It was placed on the dolly by means of an automobile wrecker. The howitzer was held in place in the bomb rack by means of two steel bands, 1/8" x 2" as per Sketch No. 1, appended. Each band was located directly in line with the bomb support hook and was fastened to the hook by a 5/8" bolt which passed through the open space between the lugs located at each end of the band. It was found necessary to cut down the top edge of each lug so that there was only 7/16" between it and the tops of the bolt holes. 2" parachute tape was wrapped twice around the howitzer tube and inserted under each band. A 3/8" cable, approximately 9 ft. long, including a clevis approximately 1 ft. long in the extended position, was placed around the breech and the lugs on the front band, which was attached to the bomb rack. Sideway was prevented by using the standard transverse braces on the bomb rack. Reference is made to A.P.G. Photograph No. 99858, which shows the final installation on the bomb rack.

B. In order to remove this equipment, the loading operation was reversed.

C. Materiel used for installation:

1. Two special 1/8" x 2" Steel bands, shown on the attached sketch.
2. Two 5/8" steel cap screws 3" long with 4 nuts and 4 flat washers.
3. One 3/8" steel cable which was approximately 9 ft. long overall.
4. One six wheel bomb dolly, M22
5. Wrenches:
   1 Box wrench, 15/16"
   1 Open end wrench 7/8" x 15/16"
   1 Open end wrench 13/16" x 3/4"
   1 Socket wrench 3/8"
6. 1 Pr. Pliers
7. 1 8" Screwdriver
8. Blocking as shown in A.P.G. Photograph, which is referred to in Paragraph A.
9. Two connected straps are necessary as shown in Sketch No. 2 appended.

PART III

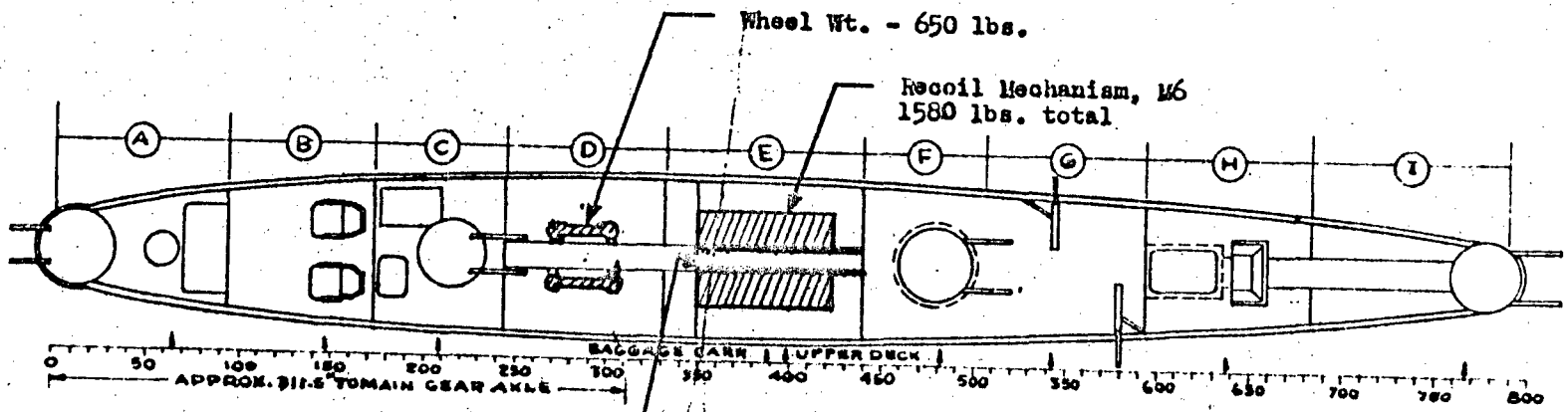
Weights:

1.	Recoil Mechanism	1580 lbs.	Interior
2.	Wheel	650 lbs.	
3.	Tube	3825 lbs.	Exterior
	Total	6055	On each side of plane.
4.	Timber, bands, and cable.....	120	
	One unit	6175	
	Two units, Gross Load	12350 lbs.	

Time to load - 4 hours

Time to unload - 1-1/2 hours.

Number of soldiers which may be carried in addition to crew - 6.



Wood Plank 3" X 10" X7' - 100 lbs. for each side of bay

155 Howitzer Recoil Mechanism and Wheel in B-24 and Tubes

C. G. = 60.0 Index Units

Cargo Wt. = 12,350 lbs.

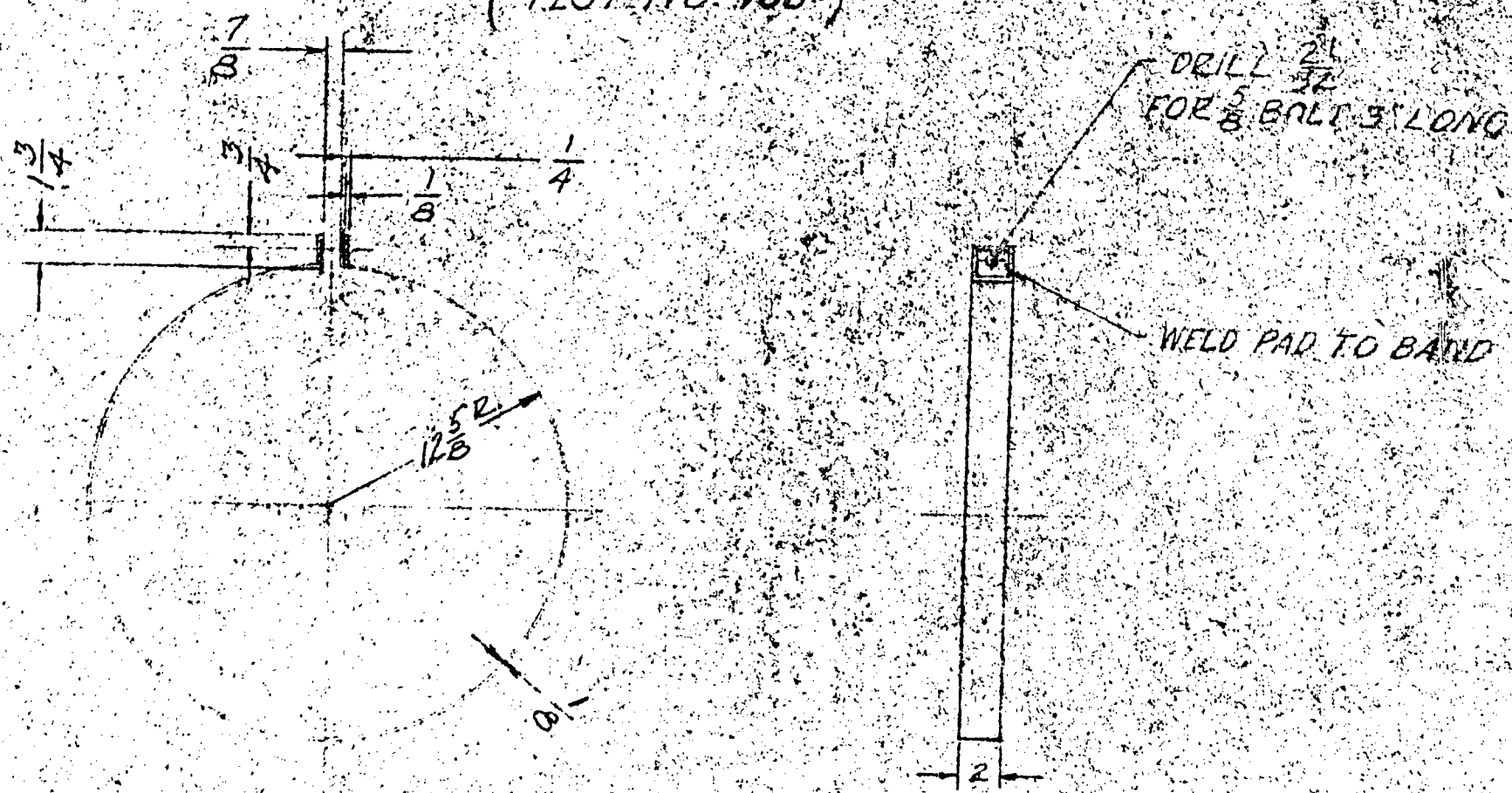
B-24D,E,G,H,&J
PB4Y-1

Note: Two tubes can be carried in the external bomb racks in addition to the load shown in the diagram.

One 155-mm Tube - 3825 lbs.
Bands & Cables
for one tube - 20 lbs.

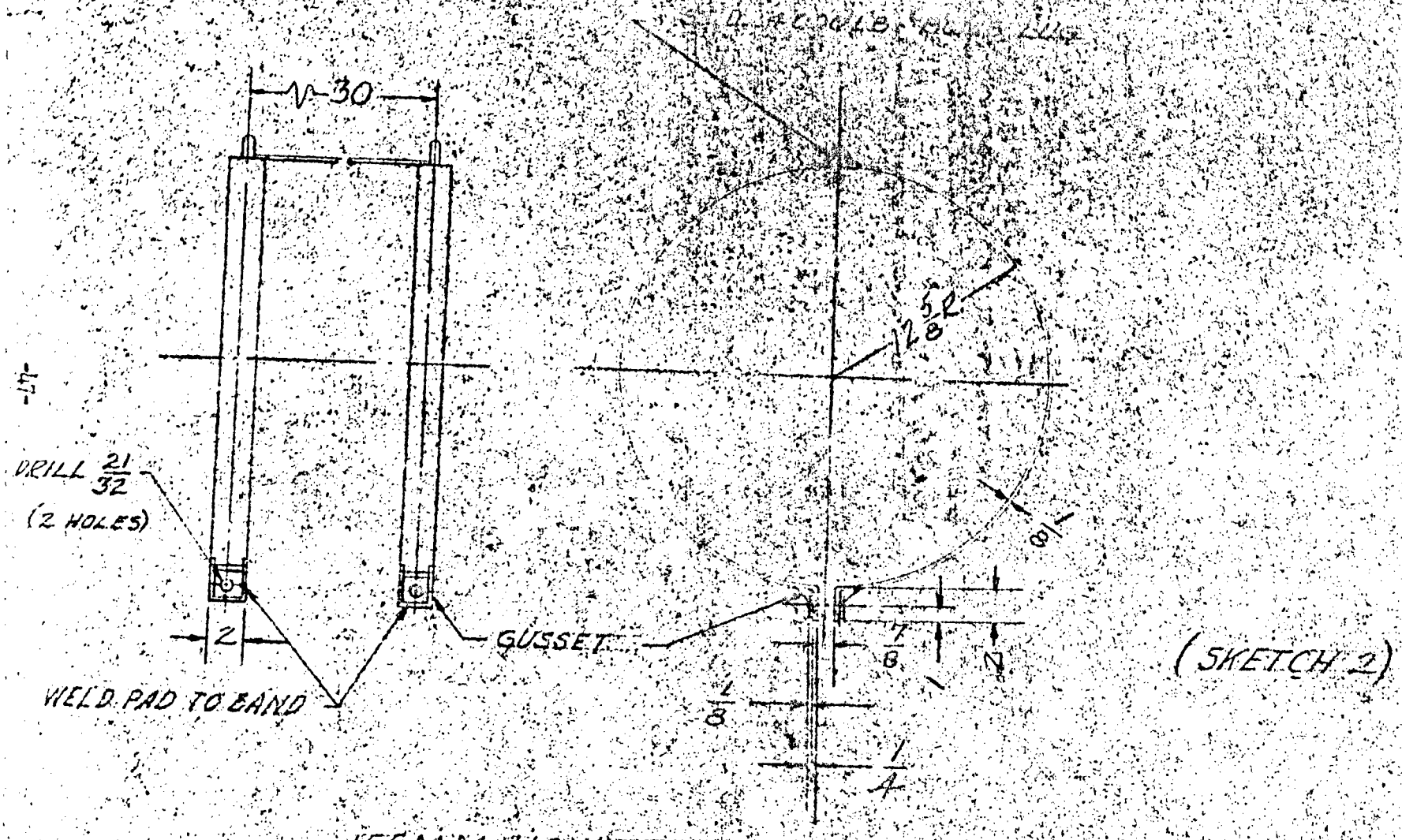
TEST NO. 16 D

(TEST NO. 160)



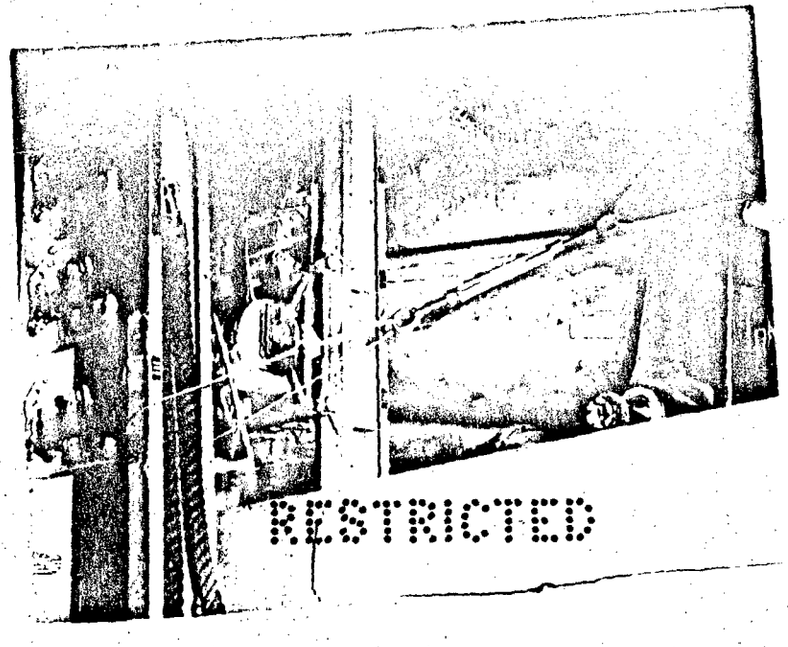
155 M.M. HOWITZER M1 INSTALLATION
IN EXTERNAL BOMB RACK ON B24
PLANE (SKETCH 1)

(TABLE OF CONTENTS)



(SKETCH 2)

155MM HOWITZER M1 INSTALLATION
IN EXTERNAL BOMB RACK ON B-47
PLANE

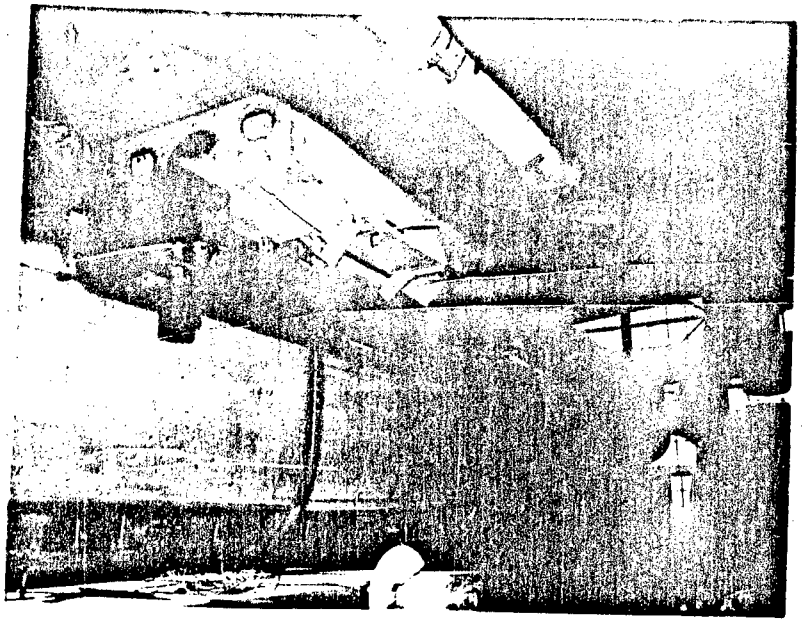


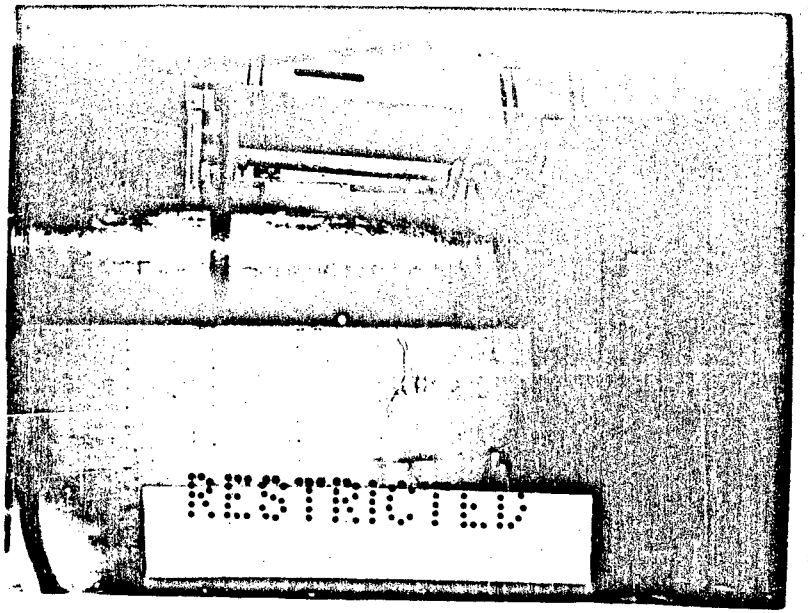
99794 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

155 mm Bordtzen Recoil Mechanism, M6, [illegible]

99857 2-11-44 | ABERDEEN PROVING GROUND | ORDNANCE DEPT.

[illegible] blocked up on bomb dolly preparatory to leaching to wing bomb rack of B24 Bomber.





Declassified

TEST NO. 16E

INSTALLATION OF 155 MM HOWITZER, M1, RECOIL MECHANISM AND WHEEL AND TIRE ASSEMBLY IN B 17 AIRPLANE

PART I

A. DETAILS OF LOADING.

Both recoil mechanism and wheel were loaded inside the right bomb bay. Refer to A.P.G. Photograph No. 99806. Identical loading is required for the left bomb bay. The wheel was raised as high as possible into the right bay using one bomb hoist and a 3/8" wire rope sling 22" long. The tire was secured to the outboard bomb shackle carrier by hooking the sling to the bomb shackle. The recoil mechanism was lifted to approximately 12" above the keel of plane with both bomb hoists. The recoil mechanism was put into the bomb bay with the elevation arc up and toward the nose of the plane. Extreme care must be used to insure that the ends of the recoil mechanism do not damage wiring, hydraulic lines and bomb bay door closing mechanism. Three 4" x 4" x 48" timbers were placed beneath the Recoil Mechanism, spanning the bomb bay and resting on the outer truss of the ship's frame at one end and on blocks cut to fit the center truss (keel) at the other end. Refer to A.P.G. Photograph No. 99805. 2" x 4" blocking was nailed to the 4" x 4" timbers to prevent side motion. Care must be taken that no weight is supported by the howitzer tube cradle when installed in the plane or at any time during handling. 2" x 6" x 12" blocking was installed between the elevation arc and the center bomb shackle carrier. 2" x 6" and 4" x 4" blocking was placed at each end of the recoil mechanism to prevent fore and aft movement. Refer to Photograph No. 99806. Care must be taken to insure that this blocking bears on the main structural members of the plane. Three 3/8" wire rope slings with turnbuckles were placed around the counter-recoil cylinder and the keel of the plane and the turnbuckles were tightened to secure the load.

B. The unloading operation is reversed. After removing the wire rope slings and end blocking, the recoil mechanism was lifted with both bomb hoists, and the cross bracing beneath the recoil mechanism was removed. The recoil mechanism was lowered with both bomb hoists, taking care to clear the airplane accessories at each end of the bomb bay, and then removed from beneath the plane. Using one bomb hoist cable, the tire was raised and released from the bomb shackle, lowered to the ground, and rolled from under the plane.

C. Material used.

Wire rope:

1 piece - 3/8" diameter, 22" long (to secure wheel)
1 " " " 34" long, with turnbuckle to secure recoil mechanism
1 piece - 3/8" diameter, 55" long, with turnbuckle to secure recoil mechanism

1 piece - 3/8" diameter, 69" long with turnbuckle to secure recoil mechanism

Lumber used to secure recoil mechanism:

4" x 4"

3 pieces 48" long (under recoil mechanism)
1 piece 10" long (rear end block)

2" x 6"

1 piece 6-3/4" long (front end block)
1 piece 14" long (front end block)
1 piece 5" long (rear end block)
1 piece 12" long (side block)

2" x 4"

1 piece 21" long (side brace)
1 piece 16" long (side brace)
1 piece 13" long (side brace)

Three blocks, shown in attached sketch, were required to provide supports for the 4" x 4" timbers under the recoil mechanism. No additional rigging was required.

INSTALLATION OF 155 MM HOWITZER, M1, ON EXTERNAL BOMB RACK OF B-17 AIRPLANE

PART II

A. One complete assembled 155-mm Howitzer, M1, consisting of the tube, breech ring, and breech block assembly, was installed on the external 4000 lb. bomb rack in a B-17 Airplane. The howitzer was installed with the breech end forward and with the breech in an upright position. The howitzer was raised by means of a six wheel bomb dolly, M22. It was lashed in place by means of three 3/8" steel cables each approximately thirteen feet long including a clevis which was approximately one foot long in the extended position. One loop of a cable was placed around the breech and front bomb beam support and the second loop was placed around the tube and bomb rack beam. The other two cables were placed at approximately the same location as the two hooks on the bomb racks. Each cable was wrapped completely around the tube once with two additional wraps around the tube and bomb rack beam. Light metal sheeting was placed over the sharp upper corners of the beam to protect the cables. Two 2" by 4" blocks were placed between the beam and tube. Each block was cut to the shape of the tube on one side with the flat side against the beam. Two blocks were placed underneath the breech cable one resting on the beam and the other resting between the cable and the beam's front support. Reference is made to A.P.G. Photograph No. 99786 which show the howitzer installed on the bomb rack. The center of

gravity of the howitzer was approximately 1/2" to the rear of the mid point between the two bomb support hooks..

B. In order to remove this equipment, the loading operation was reversed.

C. Material used for installation:

1. Three 3/8" cables each approximately thirteen feet long.

2. Two 2" by 4" wooden blocks approximately 18" long with one side cut the same arc as the diameter of the tube.

3. One 2" x 4" block approximately 6" long and one 1" x 4" block approximately 18" long.

4. Three pieces of sheet iron 8" wide and one foot long.

5. Additional blocking was placed on the bomb dolly to support the howitzer.

PART III

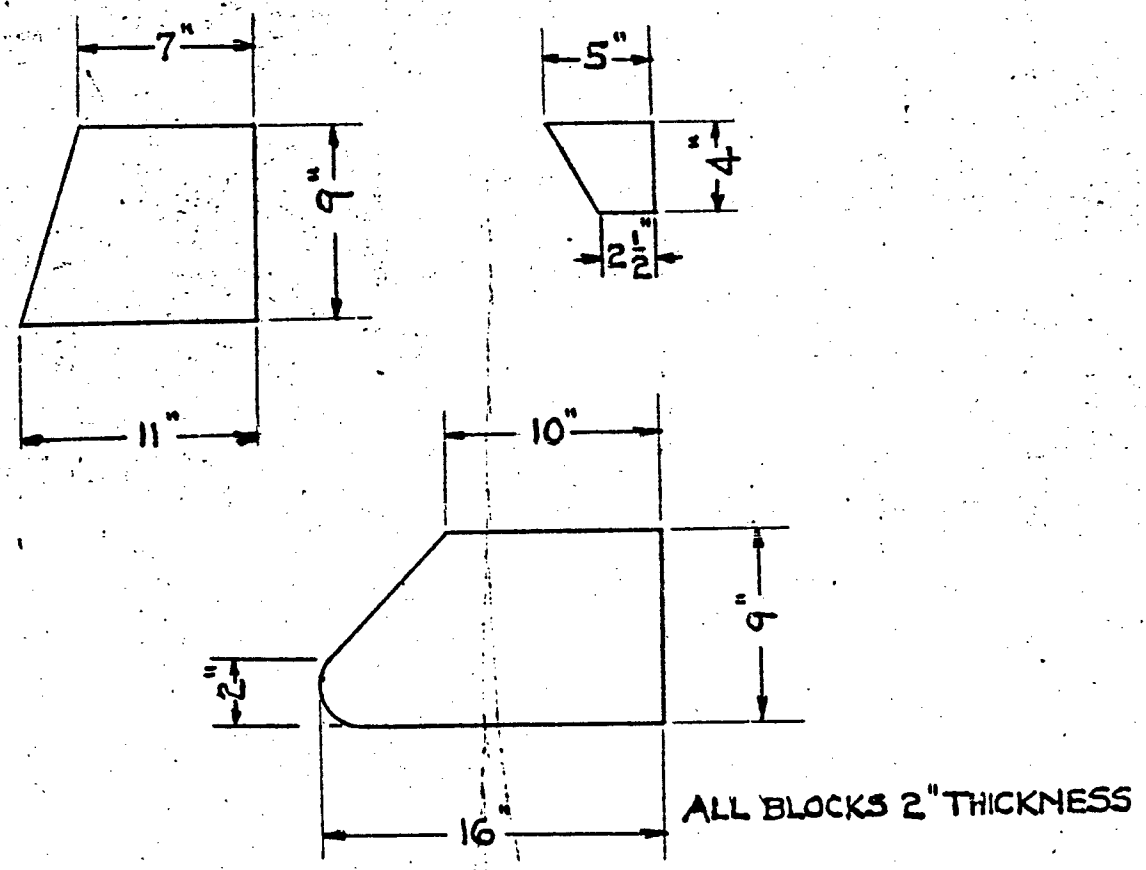
Weights:	Lbs.
Wheel and Tire	650
Recoil Mechanism	1580
Total interior load	2230
Tube	3825
Total weight per side of plane	6055
Total Gross Weight	12460

Time to load - 4 hours

Time to unload - 1-1/2 hours

Number of soldiers which may be carried in addition to crew - ten.

BLOCKS FOR INSTALLATION OF 155 MM HOWITZER RECOIL MECHANISM IN B-17 AIRPLANE



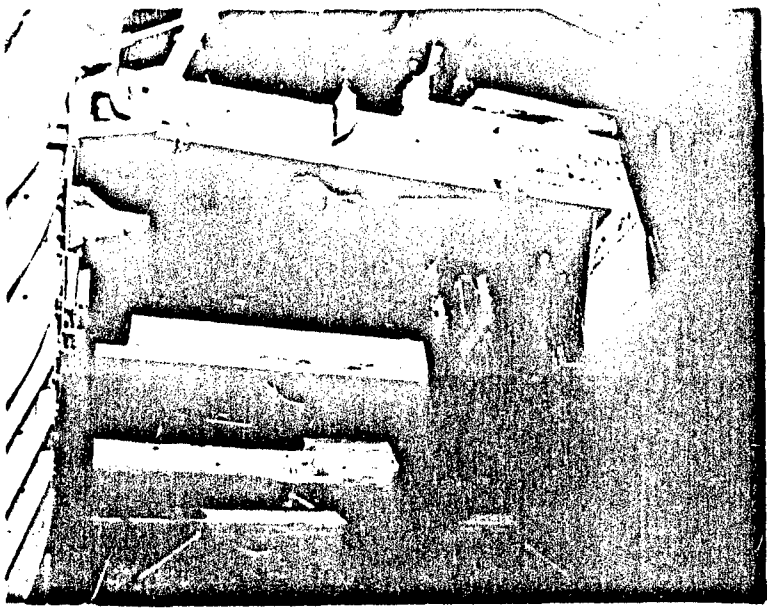
RESTRICTED

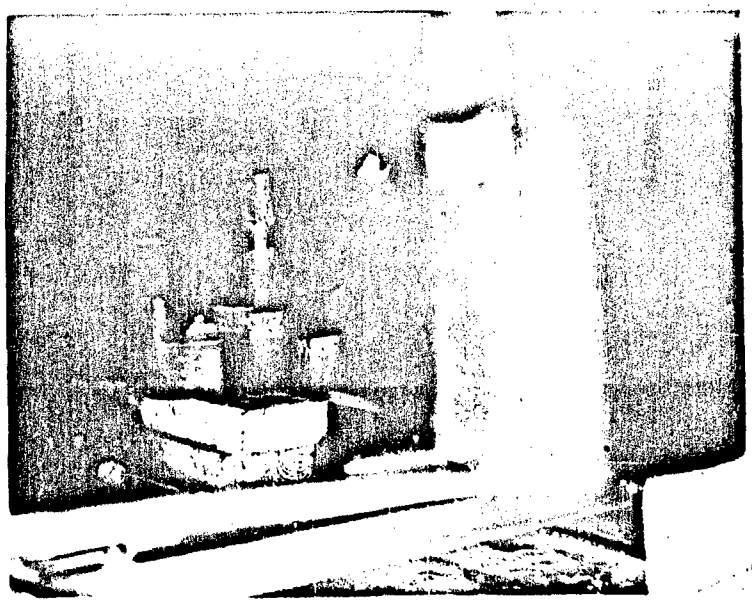
RESTRICTED

RESTRICTED

[illegible] ORDNANCE DEPT

LEFT: 155mm How. Recoil Mechanism, M6. [illegible] loaded in bomb bay of B17G Bomber. RIGHT: Side-blocking [illegible] Recoil Mechanism, M6, loaded in bomb bay of B17G Bomber.



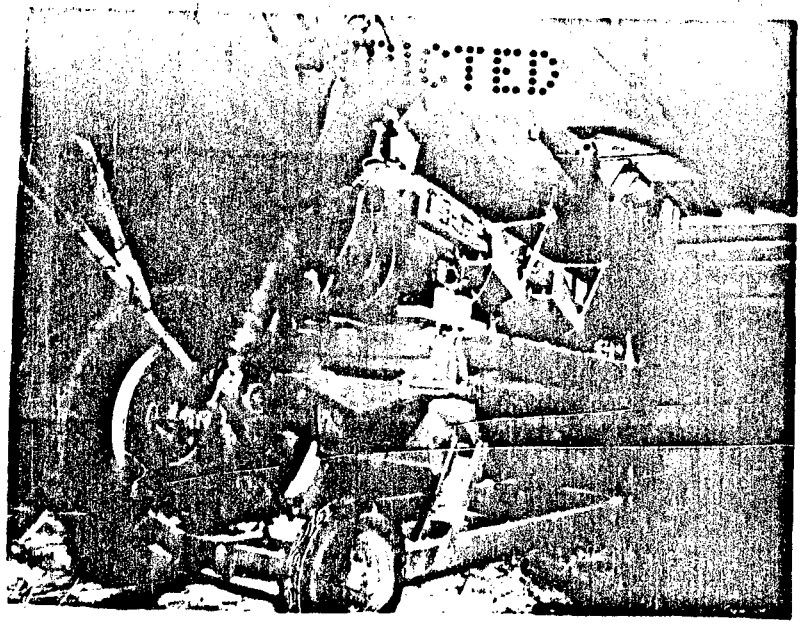


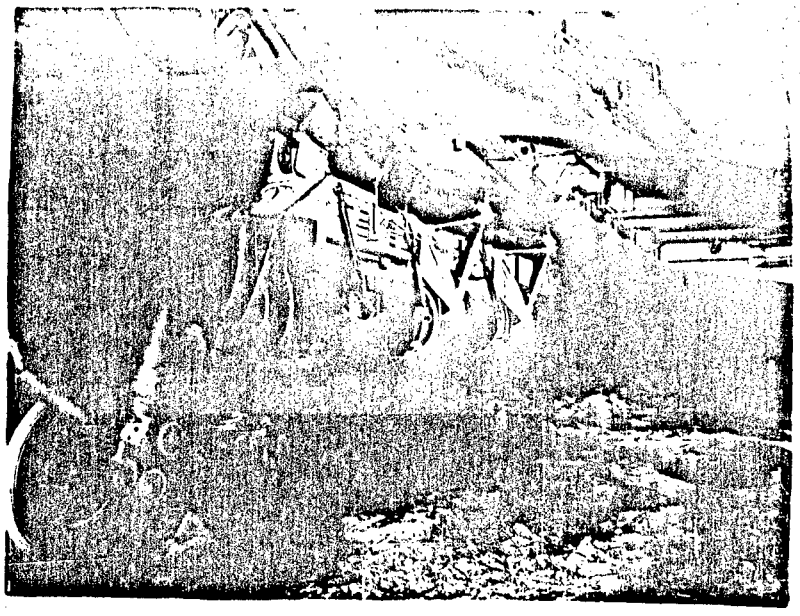
[illegible] ABERDEEN PROVING GROUND [illegible] ORDNANCE DEPT

[illegible]

155mm How. Carr., M1A1, [illegible] Hoc[illegible]

anism, [illegible], and bomb [illegible] [illegible]





98786 2-11-44 [illegible] ORDNANCE DEPT

155 mm Howitzer, M1. [illegible]
Bomber. RIGHT: Lashed in position [illegible]

TEST NO. 25

INSTALLATION OF 4.2" MORTAR AND AMMUNITION IN C-47 AIRPLANE

A. Two complete 4.2" Mortars (disassembled into crated components, namely; barrel, standard, and base plate) were installed in the plane together with two Sights, M2, and 144 complete rounds in 72 boxes. The complete loading was accomplished manually. Two rows (two boxes high) of ammunition boxes were placed in Compartment E on each side of the plane with the long axis of the boxes parallel with the longitudinal axis of the plane. Additional boxes were placed in the center with the long axis transverse to the longitudinal axis of the plane. To the rear of the ammunition 2" x 10" planks were placed on the floor to support the base plates, which were securely lashed to the planking. The standards were fastened on top of the base plates and the barrels were placed parallel to the longitudinal axis of the plane and directly behind the base plates. Diagram No. 25 shows the floor plan for this loading arrangement. Reference is made to appended A.P.G. Photograph No. 99754A. This photograph shows the 4.2" mortars and ammunition installed in the plane.

B. In order to remove this equipment from the plane each unit is carried out manually in reverse order of loading.

C. Material used for installation.

1. Four pieces of planking 2" x 10" x 6'.
2. Plane rigging. Lashings.
3. Additional rigging. 3/4" rope 200' long to lash ammunition and mortars.

D. Weights:

	Lbs.
2 Barrels	200
2 Base plates	300
2 Standards	106
2 Sights, M2 and accessories	40
72 Boxes of ammunition	4824
Lumber	130
Total Weight	5600

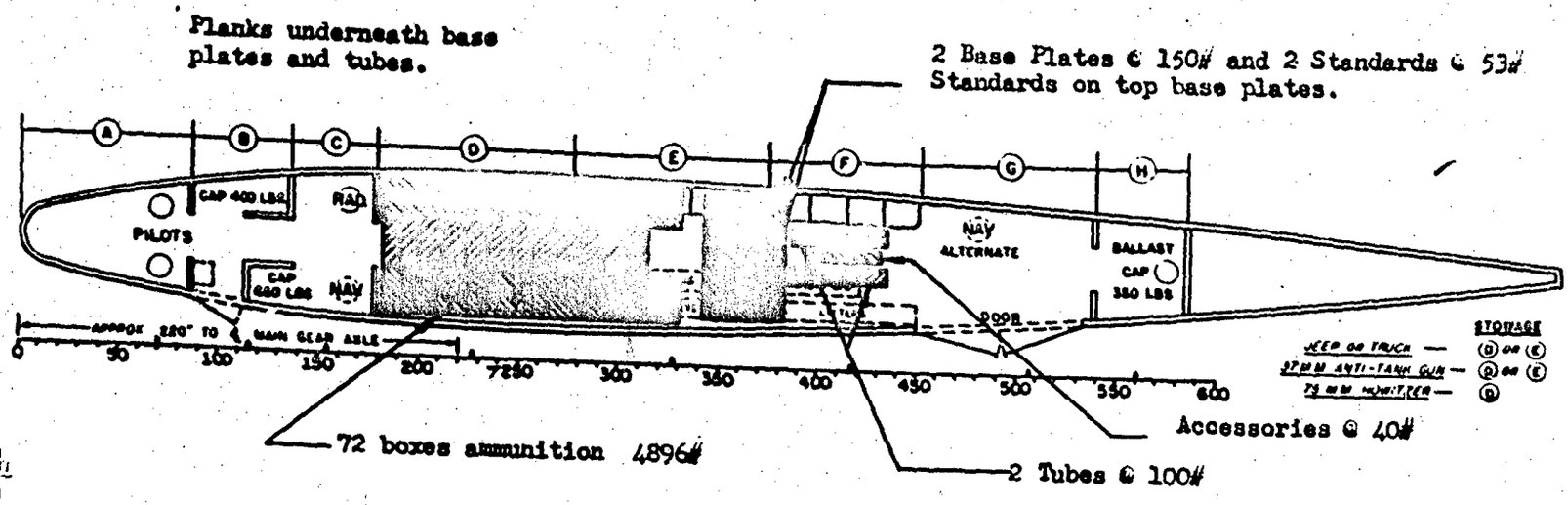
E. Time to disassemble - 10 minutes.

F. Time to load - 1 hour.

G. Time to unload - 30 minutes.

H. Time to reassemble - 10 minutes.

J. Number of soldiers which may be carried in addition to crew - 3.



Stacking of Ammunition

Center row piled crossways two boxes high
Two rows on each side of center row piled lengthways with plane, two boxes high.

Complete load - 5600 #

C. of G. - 16.5 index units.

C-47
R4D-1, a-5

EXTERNAL STOWAGE

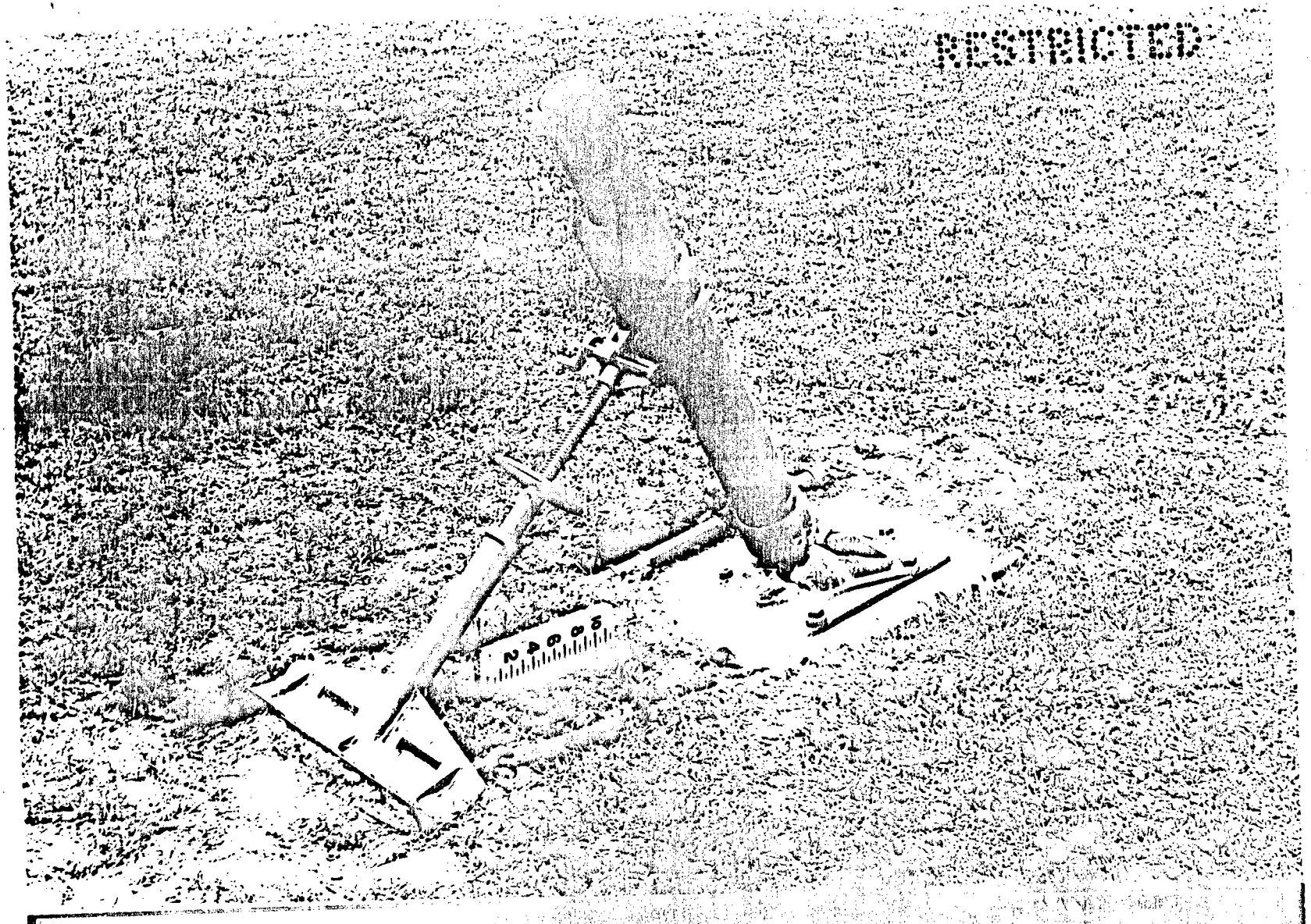
PACKS — FORWARD D
CENTER E
REAR F

PROPS — REAR G

F'W'D - NO SCALE REQUIRED

TEST NO. 25

RESTRICTED



TEST NO. 26

INSTALLATION OF 4.2 INCH MORTARS AND AMMUNITION IN B-17 G AIRPLANE

A. A floor was laid in bomb bay. This floor was constructed by first laying 5 timbers 2" x 8" x 3'0" perpendicular to the longitudinal axis of the plane, with the outer ends of the timber resting on the outer bottom girder. The inner ends rested on blocks, 2" x 8" x 9", placed on the center girder. After the five cross-timbers were in position, six 2 x 6 inch timbers, 7 feet long, were laid equidistantly apart on the five cross-timbers. The floor was then nailed together with 16 penny nails. Two complete 4.2 inch Mortars (disassembled into barrel, base plate and standard) together with Sights, M4, accessories and 100 rounds of ammunition in two round boxes were manually loaded into the bomb bay in the following manner.

1. The fifty boxes of ammunition were loaded and blocked.

2. The component parts of the mortars, sights and accessories were then stacked on top of the ammunition in the most convenient manner.

3. The load was then securely lashed together with ropes. See loading diagram 26. A.P.G. Photograph No. 99779 illustrates the complete installation.

The loading was accomplished in one bomb bay only for the purpose of this test. A similar procedure would be carried out to load the other bomb bay.

B. Removal of this load was carried out manually after first unlashing the ropes and removing the blocking.

C. Material used for installation.

1. Forty-four feet of 2 x 8 inch timbers.

2. Eighty feet of 2 x 6 inch timbers.

3. Fifty 16 penny nails.

D. Weights.

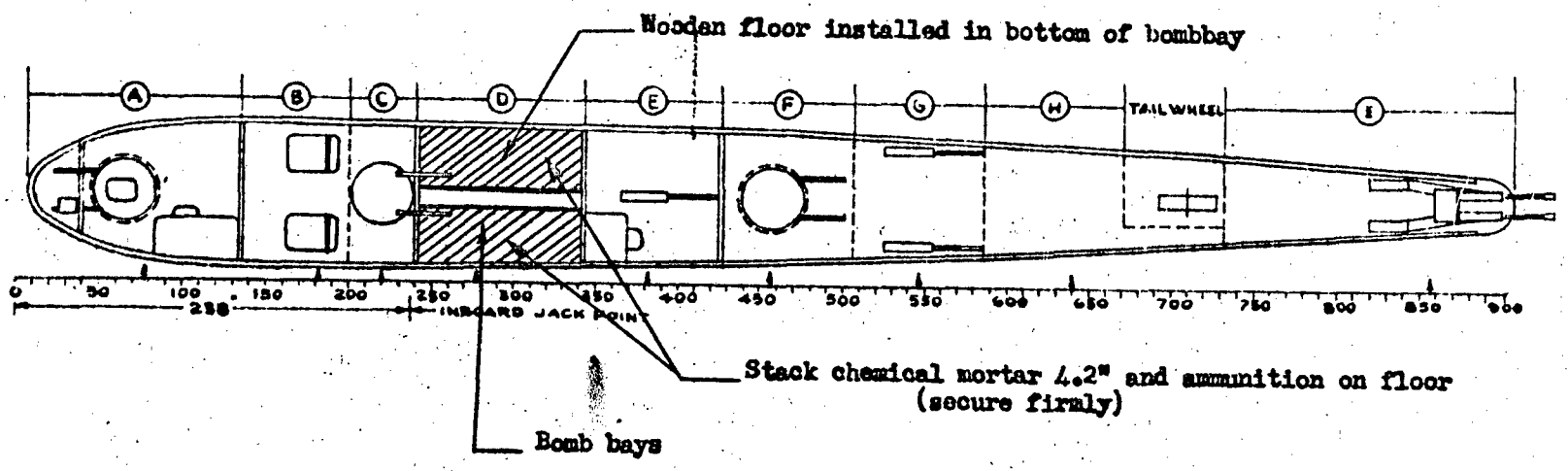
Weight of mortar (two)	610
Weight of ammunition (50 boxes)	3380
Weight of floor	200
Weight of accessories	20
Total weight in one bomb bay	4210
Total weight of load	8420

TEST NO. 26 (cont'd)

E. Operational time.

1. Disassemble mortar - 10 minutes.
2. Loading - 2 hours.
3. Unloading - 1 hour.
4. Reassemble mortar - 10 minutes.

F. Number of soldiers which may be carried in addition to crew - 26.



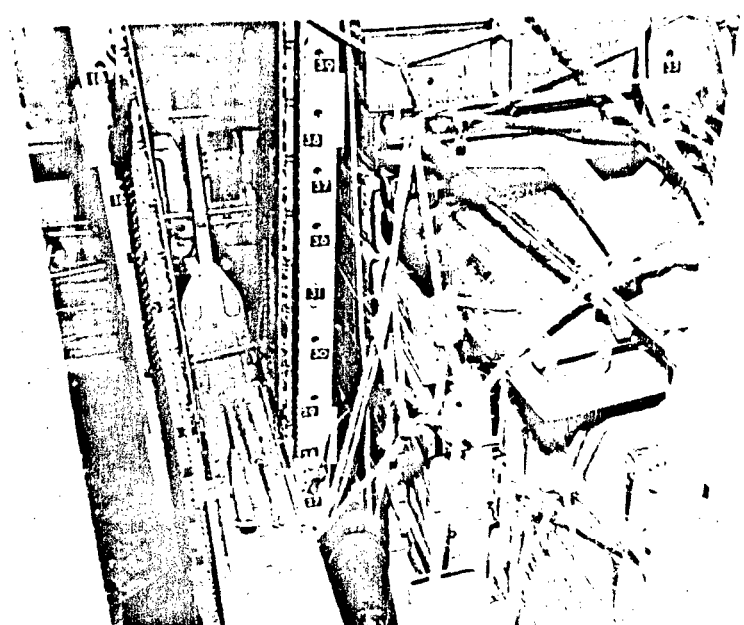
Capacity - 100 boxes at 67.5lb. ea.

B-17G

Weight of mortar (two) - - - - -	610
Weight of ammunition (50 boxes) -	3380
Weight of floor - - - - - - - - - -	200
Weight of accessories - - - - - - -	20
Total weight in one bomb bay -	4210
Total weight of load - - - - -	8420

C.G. - 12.6 index units

TEST NO. 26



99779 2-11-44 [illegible] ORDNANCE DEPT.

Exp. [illegible] Chemical Mortars and Ammunition [illegible]

Test No. 27

INSTALLATION OF 4.2 INCH CHEMICAL MORTARS IN B-24 AIRPLANES

A. Eight complete mortars, disassembled, and crated in component parts - namely, tube, standard, and base plate, were installed in this airplane together with a total of 208 rounds of ammunition (in 104 boxes) and eight sights in case, M2. Two lengths of 2" by 10" plank were laid on the catwalk to which was nailed an inclined floor of 2" by 10" planks. The joists of this flooring ran transversely with the longitudinal axis of the plane and were beveled on the outer end which rested on the spars which accommodate the cables. Lengths of 2" by 10" timbers were placed vertically, approximately one foot on centers, on each side of the catwalk to permit free passage of personnel. These timbers were nailed to the joists of the flooring and were supported by the transoms at the top. One plank was omitted in each section of the bomb bay to permit the entry of the materiel and ammunition. The base plates were loaded first directly on the platform and the barrels were placed on top of them. The standards were placed on top of the barrels, with the accessories alongside. The ammunition in the boxes was then stowed on the top of disassembled parts of the mortars with a total of 26 boxes in each section. All materiel and ammunition were lashed to the uprights, bomb racks, and floor boards progressively during the loading operations (due to the limited amount of space in which there was to work) to make the load secure during transit. Diagram No. 3 shows the floor plan of this loading arrangement. Reference is made to appended A.P.G. Photographs Nos. 91934* and 99745. These photographs show the mortar in firing position and the load complete in one section of the bomb bay, respectively. The platform structure and uprights are shown in A.P.G. Photograph No. 99744.

B. In removing this equipment from the plane, the loading operation was reversed.

C. Material used for installation

1. Plane rigging - Two lengths of 1/2" rope fifty feet long.

2. Additional rigging - 1/2" rope three hundred feet long and 1/4" rope six hundred feet long for lashing materiel and ammunition.

D. Weights

104 - boxes of 4.2" mortar complete rounds	6864 lbs.
8 - 4.2" mortar barrels total of	800 lbs.
8 - base plates, M2	1200 lbs.
8 - standards, M1	424 lbs.
8 - sights in case, M2	16 lbs.
Lumber - Estimated weight	700 lbs.
Total weight	10,004 lbs.

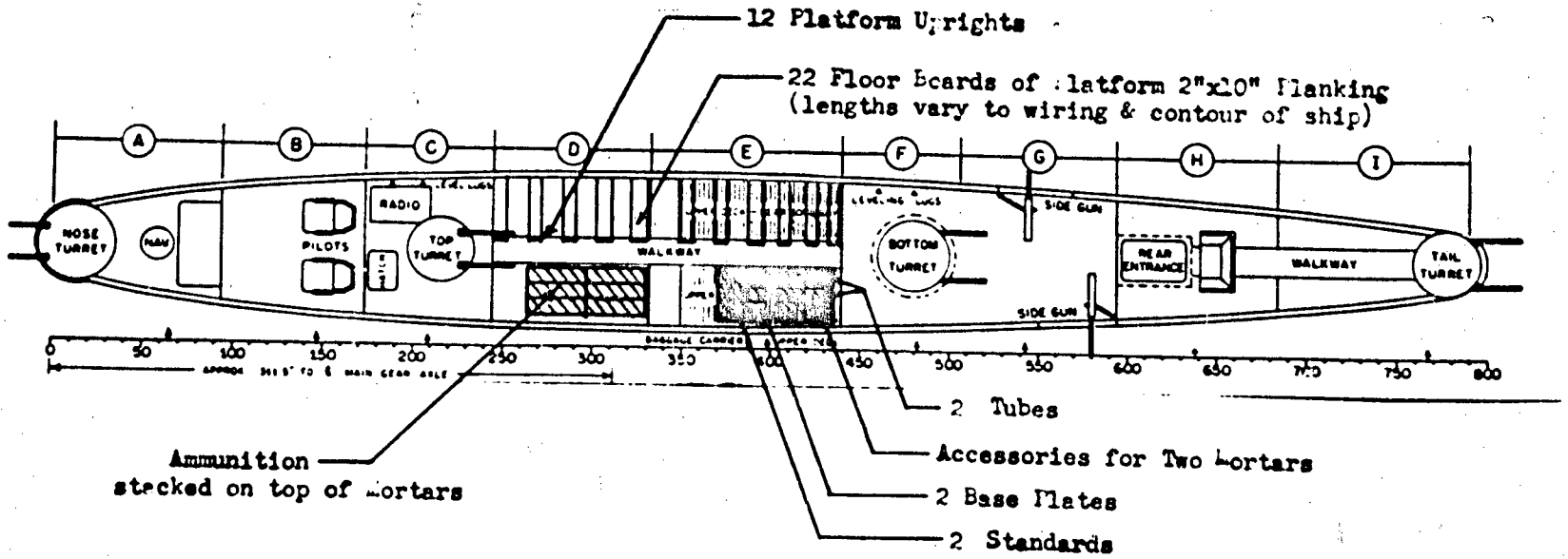
*- See Lot #25

Test No. 27 (Cont'd)

E. In addition to plane load and crew (see assumptions) a maximum of 15 men can be carried.

F. Time required for:

Disassembly	- 10 min.
Loading	- 1.5 hrs.
Unloading	- .5 hrs.
Reassembly	- 10 min.



4 Sections of Bomb Bay
Per Section
2 complete 4.2 Mortars
26 boxes ammunition (2 rounds per box)

Center of Gravity - 86 Index Units
Cargo Weight - 10,000 lbs.

B-24D,E,G,H, & J
PB4Y-1

JIG POINT
LEVELING LUGS

TEST NO. 27

60

ARCHDIOCESE OF SAN FRANCISCO
CHANCERY OFFICE
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ARCHIVES

RESTRICTED

TEST NO. 22

INSTALLATION OF AMMUNITION FOR 105 MM HOWITZER, M3, IN C-47 AIRPLANE

A. One hundred and five complete rounds, crated for overseas shipment were manually loaded into the plane in 35 crates. Three crates were nested on each side of center aisle with the long axis parallel to the longitudinal axis of the plane, with the forward ends of the crates butting against the wall of Compartment D. Another row was placed just to the rear of the first row, and, to the rear of the second row, two crates were placed transversely in the cabin. The arrangement of the crates in Compartment E was similar to that used in Compartment D. Three crates were placed transversely in the cabin in Compartment F, on each side of a center aisle with one crate placed transversely in the center aisle. All crates were lashed to the seat and center aisle eyebolts. Diagram No. 28 shows the floor plan for this loading arrangement. Reference is made to A.F.C. Photograph No. 99793 which shows the final installation in the plane.

B. In order to remove this ammunition from the plane, the loading operation is reversed.

C. Material used for Installation

1. Two pieces of planking 2" x 4" x 4 feet long and one piece 2" x 4" x 1 foot long.

2. Plane rigging: normal lashings issued with the plane.

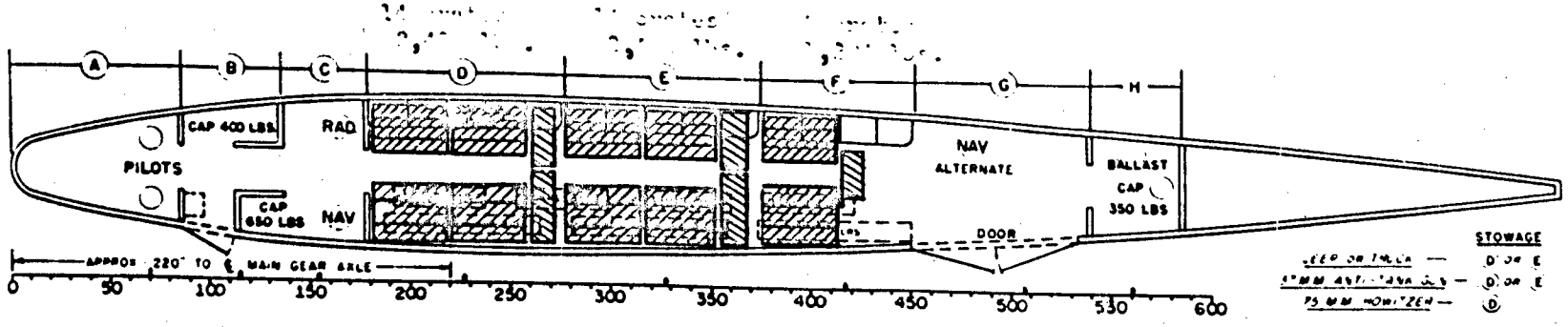
3. No additional rigging was used.

D. Weights

	Lbs.
Thirty-five crates of 105 mm Howitzer complete rounds	6010
Total Weight	6010

E. Time for loading - 1.5 hours
Time for unloading - .75 hours

F. No. additional men who can be carried - 2.



Lash Ammunition Boxes through eye bolts on floor and above seats.

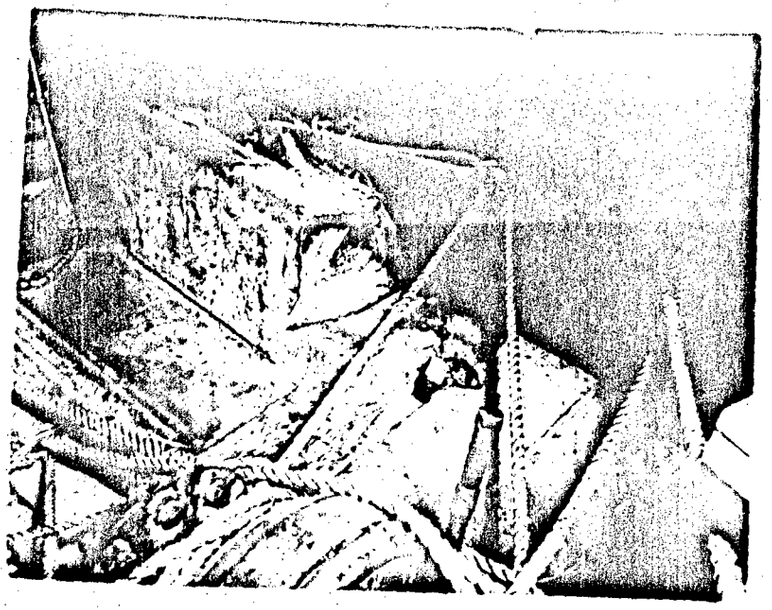
C-47
R4D-1, a-5

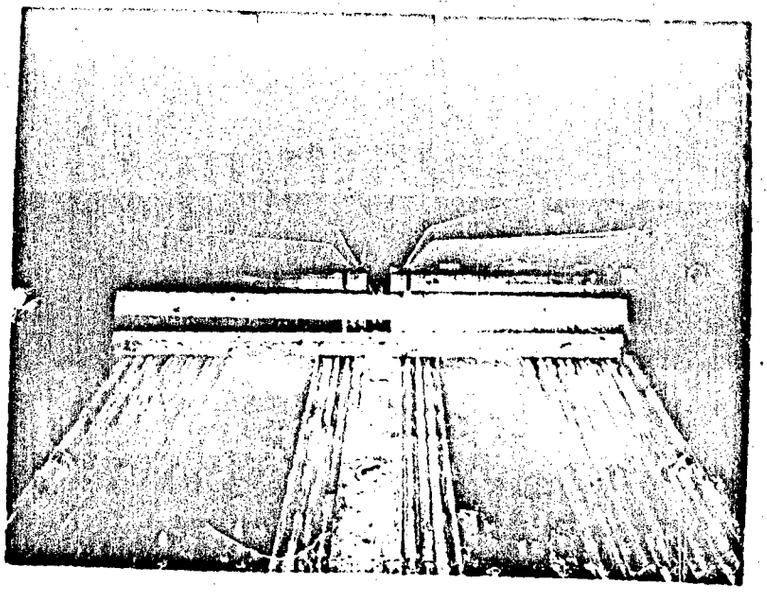
EXTERNAL STOWAGE

PACKS — FORWARD (D)
CENTER (E)
REAR (F)

PROPS — REAR (G)
F'W'D - NO SCALE REQUIRED

[illegible] = 38.7 Index Units
[illegible] = 6010 lbs.





[illegible] 2-[illegible]-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

LEFT: Spades of 155 mm Howitzer Carriage, [illegible] Transport. RIGHT: Stowage of 105 mm Howitzer [illegible] Transport.

TEST NO. 29

INSTALLATION OF 105 MM AMMUNITION IN B-17 BOMBER

A. Assembly in Plane.

To give support to cross beams as a platform, 2" x 6" boards were cut to fit between the girders below the bomb bay catwalk, and 2" x 6" boards, the length of the bay, were bolted to these on each side. Five 2" x 12" boards were nailed to these boards and rested at the other end upon girders at the side of the bay. Across the 2" x 12", 2" x 6" boards were placed to make a platform. 2" x 4" boards the length of the bay were wedged against girders at the ends and the bomb racks at the side and were nailed to 2" x 6" uprights which had been nailed to the platform. The uprights were also held in place by boards nailed crosswise between two of them, thus forming the frame of a box. Fourteen boxes with three complete rounds each were placed lengthwise in two stacks. The rear stack was two tiers of four boxes each; the front stack, two tiers of three boxes each. The boxes were lashed with 1/2" rope running from the side bomb rack to the ends of the catwalk. See loading diagram No. 29. A.P.G. Photograph Nos. 99755, 99756, 99783, 99784 illustrate this installation.

B. Removal from Plane.

The ropes having been removed, the boxes were removed over the supporting frame by two men on the ammunition and three men on the ground.

C. Material used for Installation:

1. 5 boards 2" x 12" x 48".
2. 2 boards 2" x 6" x 99".
3. 4 boards 2" x 6" x 36".
4. 4 boards 2" x 6" x 90".
5. Additional boards 2" x 4" - 8' total.
6. Additional boards 2" x 6" - 10' total.
7. 4 dozen nails.
8. 18 each, nuts and bolts, 7" long.
9. 25 feet rope (1/2" min.).

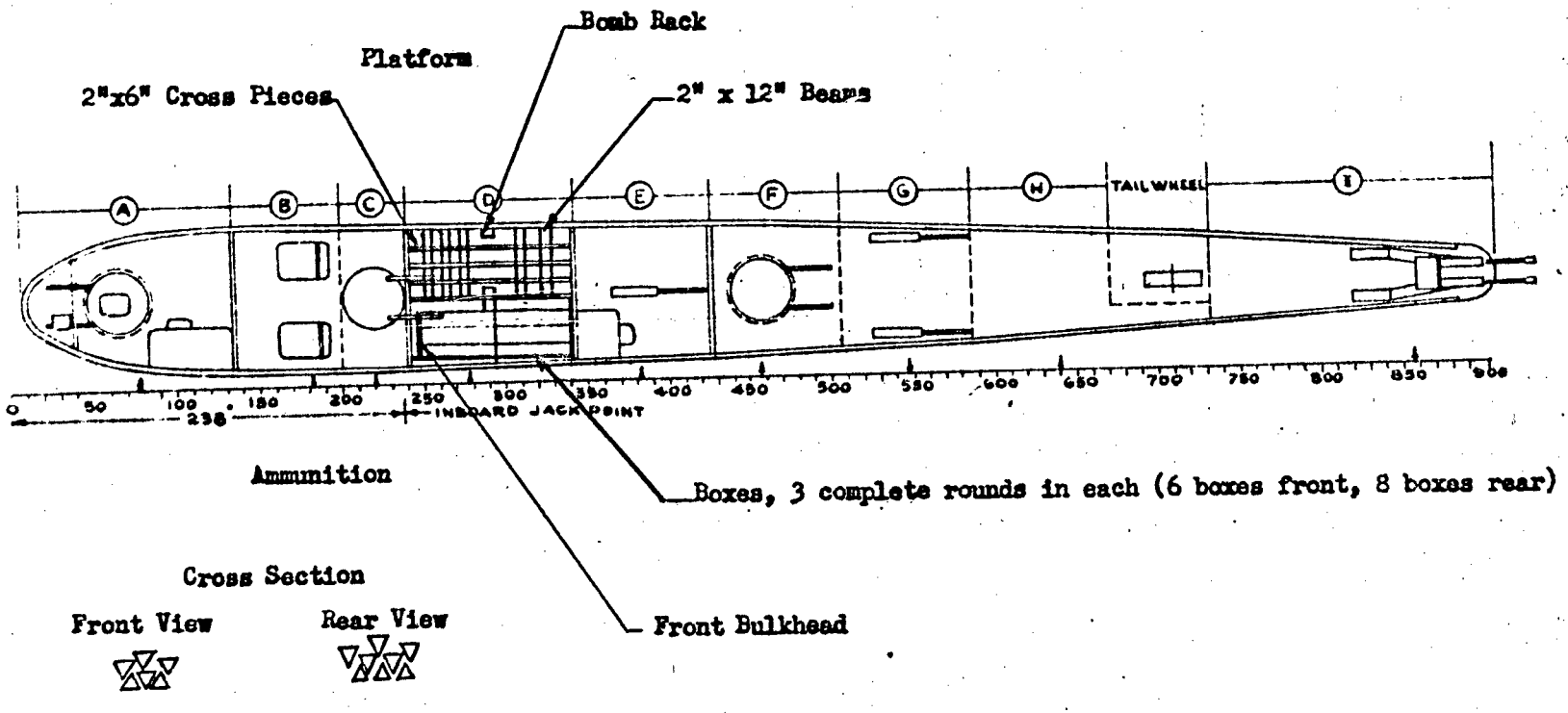
D. Weights

1. 28 Boxes Ammunition, 105 mm, H.E., M1 (3 rds.)	4816 lbs.
2. Weight of lumber	500 lbs.
Total	5316 lbs.

E. Number of soldiers carried in addition to crew, and above load - 15

F. Time to load - 1-3/4 hrs. (including mfgr. of platform)

G. Time to unload - 30 minutes.



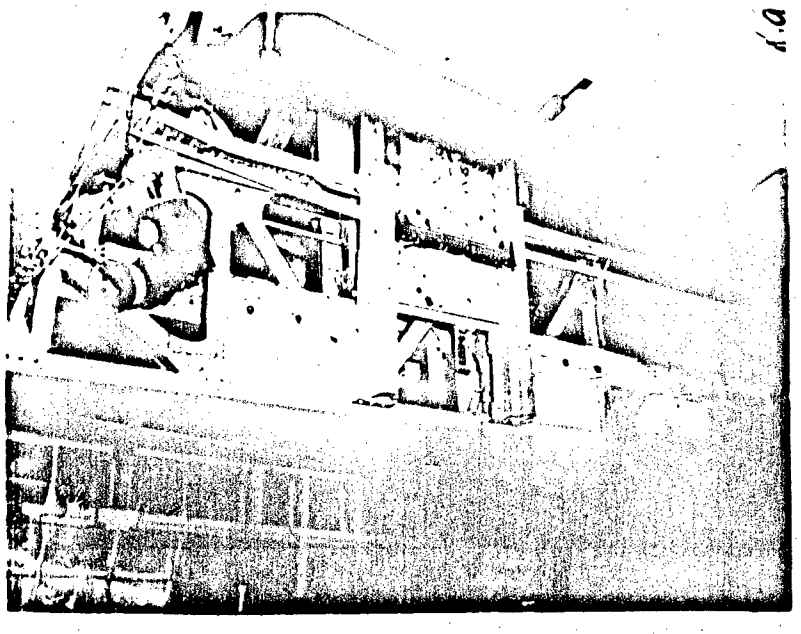
B-17G

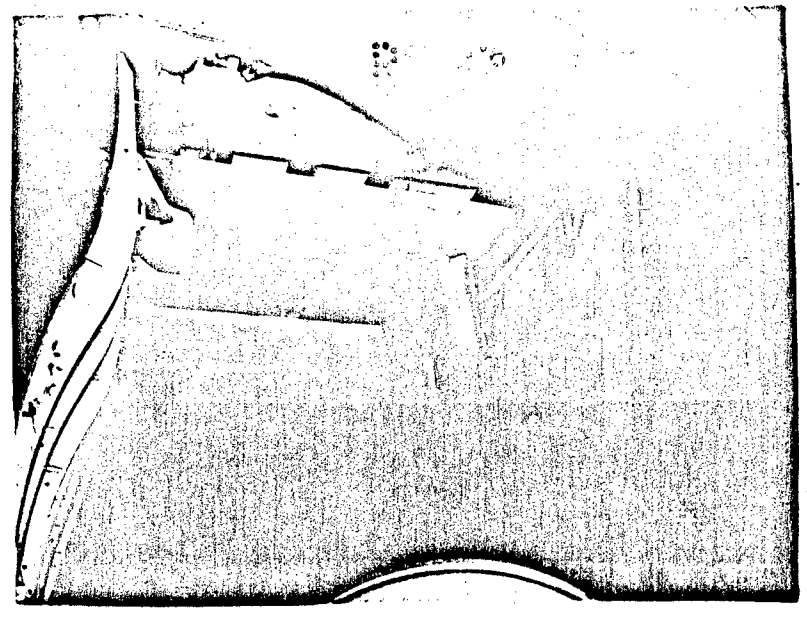
Loading 105 mm Ammunition in B-17 G Bomber

Center of Gravity - 18.8 Index Units

Cargo Weight - 5316 lbs.

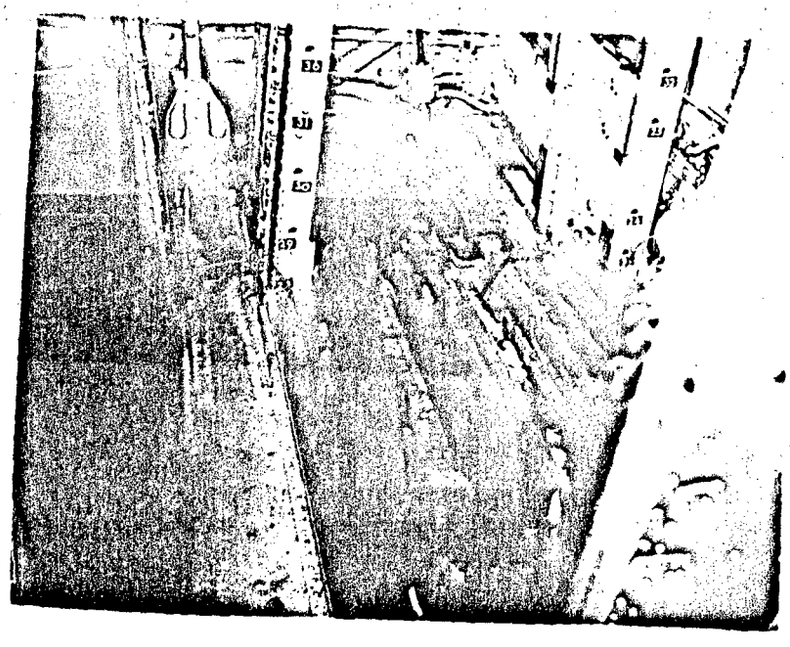
TEST NO. 29

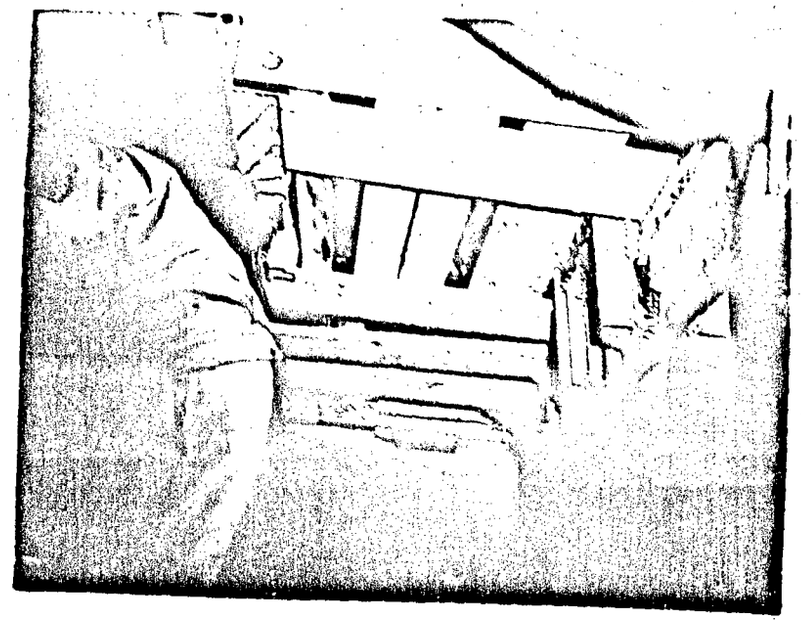




99756 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

LIFT: Platform supports secured to [illegible] Platform laid in bomb bay of B17G Bomber for stowage of ammunition and small parts.





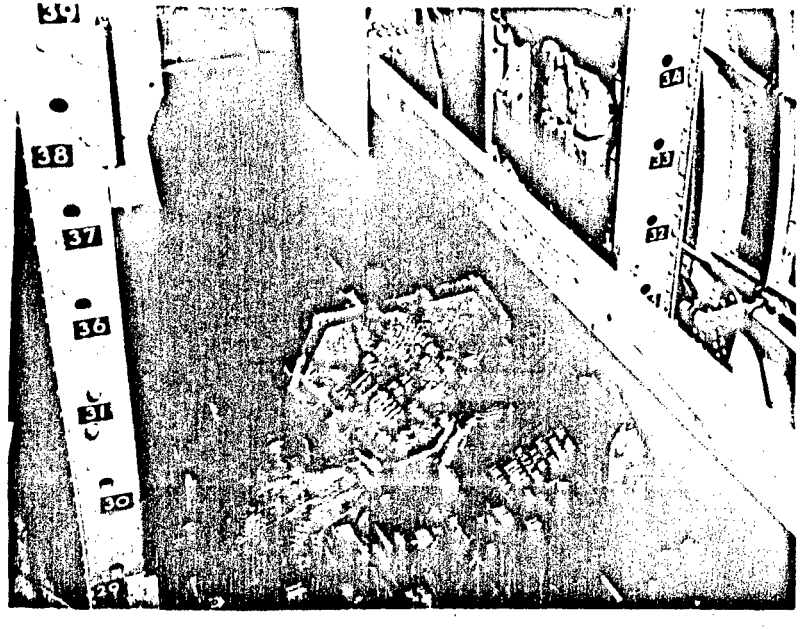
99756 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

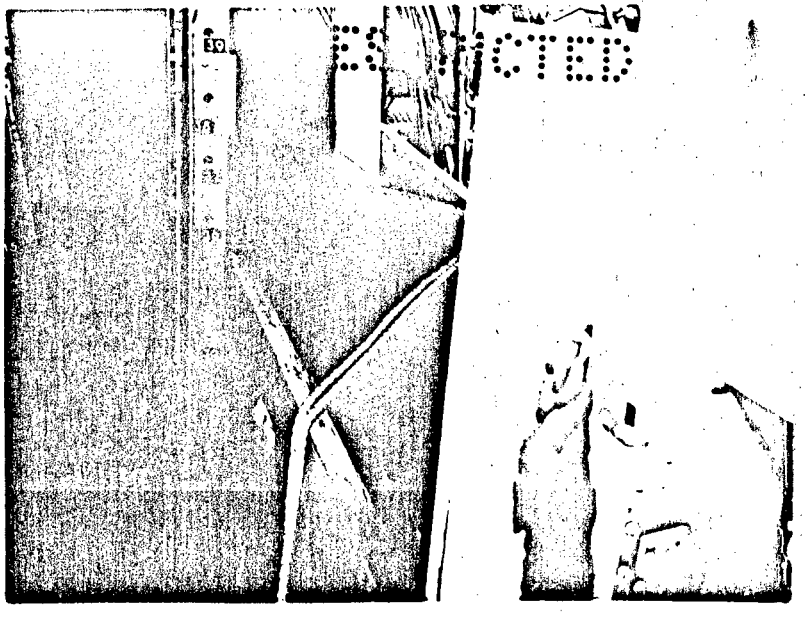
LEFT: Installation of 105-mm B/c. Shell, H.T. [illegible] in right half of bomb bay of B-17.

RIGHT: Cribbing in right half of bomb bay of B-17 for supporting 105-mm B/c.

99783 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

105 mm Howitzer Ammunition (3-Round [illegible]). [illegible] rear supports and braces. RIGHT: View [illegible] and braces.





99794 [illegible] ORDNANCE DEP

105 mm [illegible]

Completed [illegible]

TEST NO. 30.

INSTALLATION OF AMMUNITION FOR 105 MM HOWITZER, M3 in B24 AIRPLANE.

A. A total of 24 bundles, which consisted of 3 complete rounds, crated for overseas shipment, were placed in the front section, Compartment D, and the same number of bundles were placed in the rear section, Compartment E. The platform arrangement was identical to that used for loading the 4.2" chemical mortar. One floor board and one upright support were removed on either side directly to the rear of the bomb racks in the front section to permit the loading of the ammunition. It was not necessary to remove any of the planking for loading the rear section as the ammunition could be loaded into the compartment between the floor boards. It was necessary to load the forward portion of each section first to facilitate handling. The crated ammunition was securely lashed to the floor and the uprights to prevent any movement during transit. Diagram No. 30 shows floor plan for this loading arrangement. Reference is made to appended A.P.G. Photographs * Nos. 99783, 99784. These photographs show the crated ammunition and the final installation in the plane.

B. In order to remove the ammunition from the plane, the loading operation was reversed.

C. Material Used for Installation.

1. Plane rigging. Two lengths of 1/2" rope 50' long.

2. Additional rigging. 1/4" rope 500' long.

D. Weights.

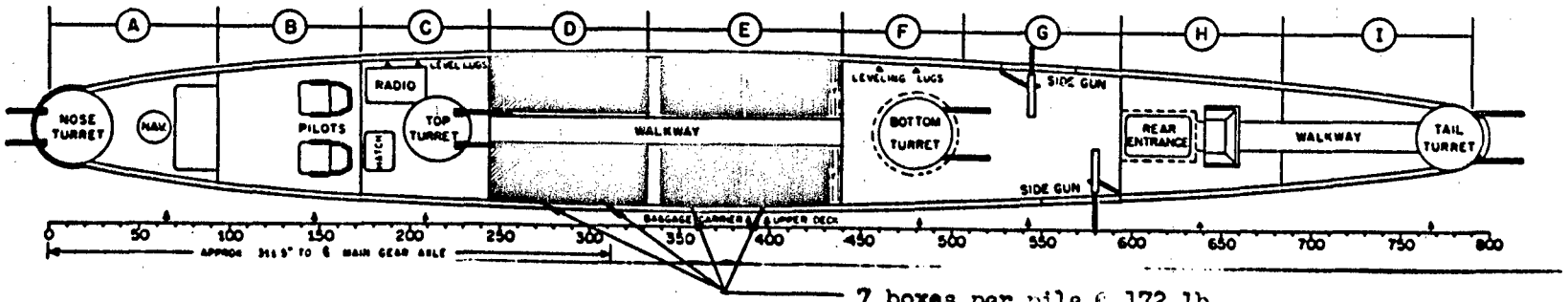
	Lbs.
48 boxes of 105 mm Howitzer complete rounds	8256
3 boxes of fuzes	240
Lumber estimated	1504
Total Weight	10,000

E. Disassembly time - none
Time to load - 4 hours
Time to unload - 1 hour
Reassembly time - none

Note:

In addition to assumed crew and cargo load, 20 soldiers may be carried.

* - See test No. 29



7 boxes per pile @ 172 lb.

Use same loading platform as for 4.2 Mortar & Ammunition.

Weights

Comp. "D" - 5000 with Platform
Comp. "E" - 5000 with Platform

Total Cargo - 10000
C. of G. - 67 Index Units

B-24D,E,G,H, & J
PB4Y-1

JIG POINT · STATION 41 AT 244 INCHES AFT OF STATION "D"
LEVELING LUGS · ON BELT FRAMES 3.1 AND 3.2 — RIGHT HAND SIDE BENEATH FLIGHT DECK
ON BELT FRAMES 6.1 AND 6.2 — RIGHT HAND SIDE

TEST NO. 30

TESTS NOS. 31, 32, 33

These tests pertained to the loading of ammunition for Howitzer, 105 mm, M2, in the C-47, B-17, and B-24 airplanes respectively. Inasmuch as the difference in this ammunition and that for the Howitzer, 105 mm, M3, is so little as to be negligible, the same type of loading is used. The tests for the loading of the ammunition for the Howitzer, 105 mm, M3, is covered in Tests No. 28, 29 and 30; and, therefore, is not repeated.

TEST NO. 34

INSTALLATION OF AMMUNITION FOR THE 3" GUN, M5 IN C-47 AIRPLANE

A. 144 complete rounds in 36 boxes were installed in the plane with the long axis of the boxes parallel to the longitudinal axis of the plane. Complete loading of the ammunition was a manual operation. Three rows, two boxes deep, were placed on each side of a 9" center aisle with the forward edge of the boxes behind the second side eye hook. Two additional rows were placed directly behind the first row. 2" x 4" timbers were placed between the outside edges of the boxes and the fuselage and wedges were used to prevent any lateral movements. The center eye hooks should remain accessable. Diagram No. 34 shows the floor plan for this loading arrangement. Reference is made to A.P.G. Photograph No. 99767 which shows the completed installation.

B. In order to remove this ammunition from the plane the rear boxes were unloaded first.

C. Material used for installation.

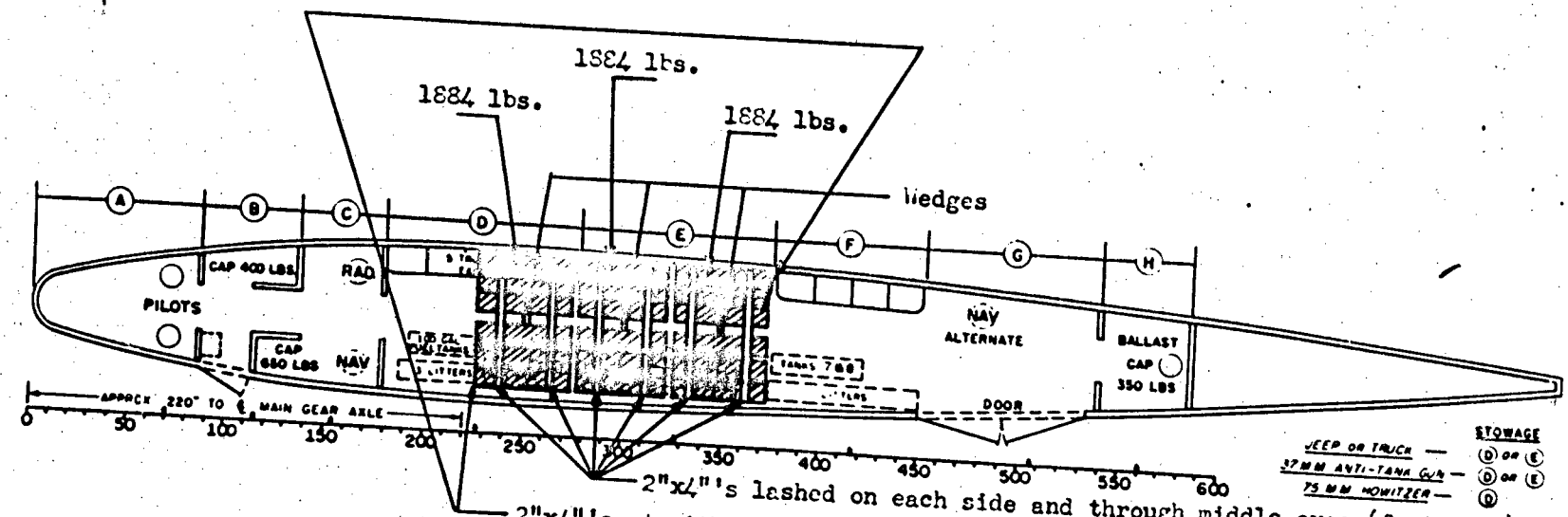
1. Plane rigging. None.
2. Additional rigging. 1/2" rope, 100' long.

D. Weights.

36 boxes of 3" complete rounds	5088
Lumber	75
Total	5163

E. Disassembly time - none.
Time to load - 1 1/2 hours.
Time to unload - 1/2 hour.
Reassembly time - none.

F. Number of soldiers which may be carried in addition to assumed crew and cargo load is 2.



Shift load back so ammunition completely fills "E" Compartment and only half of "D" Compartment.

When loading start piling ammunition four (4) feet from bulkhead. This correction supercedes photograph.

Total weight - 5700 lbs.

C. of G. - 28.5 Index Units.

C-47
R4D-1, a-5

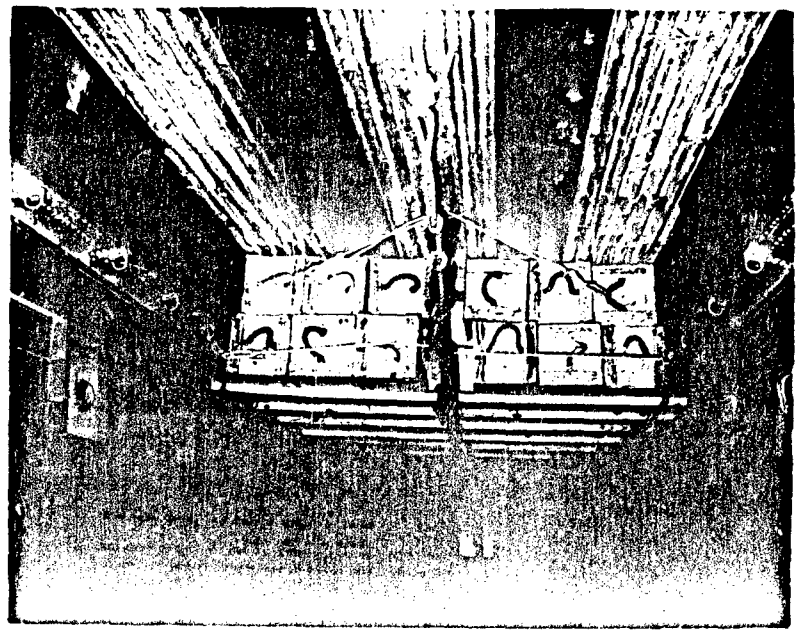
EXTERNAL STOWAGE

PACKS — FORWARD D
CENTER E
REAR F

PROPS — REAR G

F'W'D - NO SCALE REQUIRED

TEST NO. 34



TEST NO. 35

INSTALLATION OF AMMUNITION FOR GUN, 3", M5, in B-17

A. With the bomb bay doors open, a floor was built in the bomb bays on each side of the airplane. Five timbers 2" x 8" x 36" were cut and placed from the outer girder to the middle of the ship. Four short 2" x 8" timbers about 9" long were placed on the middle girder to support the cross members of the flooring. Timbers 2" x 6" x 7' long were laid over the top of longitudinal cross members in order to obtain floor strength. Ammunition was manually loaded into the bomb bay, and the boxes were placed longitudinally in the ship. The boxes were pushed together and wedges were pushed between the sides and edges of the ship and the boxes. By means of lashing, the ammunition was secured in place. When a floor was installed on both sides, it was necessary to load and unload one side through the rear door.

B. Removal is the reverse of the loading procedure.

C. Materials used:

30' of 2" x 8"
30' of 2" x 6"
20' of 2" x 4"
20 - 16 penny nails
Hammer and saw.

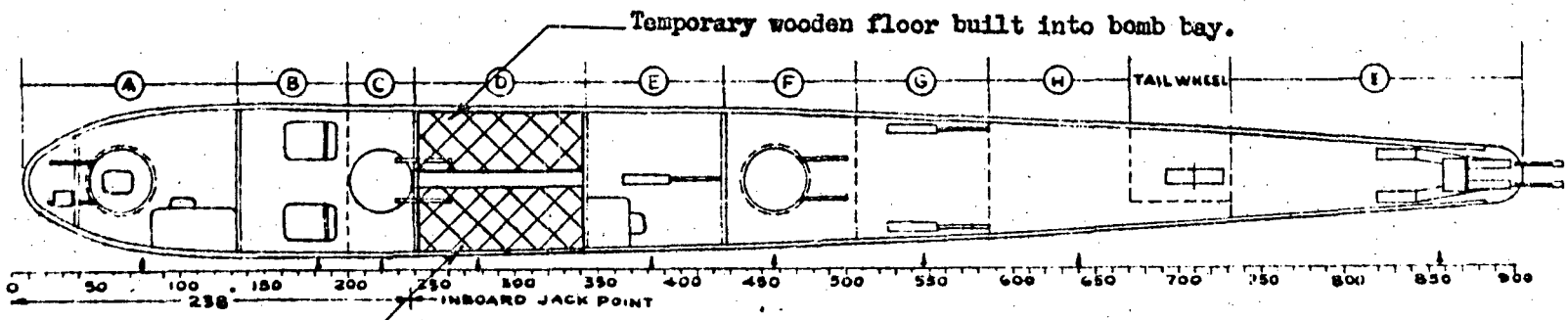
D. Weights:

36 boxes ammunition - 158 lb./box	-	5688
Lumber	-	600
Total	-	6288

E. Time to load - 2 hours.

F. Time to unload - 1 hour.

G. Soldiers which can be carried in addition to regular crew - 34.



Boxes of 3" Ammunition stacked longitudinally with the length of the ship.

18 boxes could be stacked per side in bomb bay.

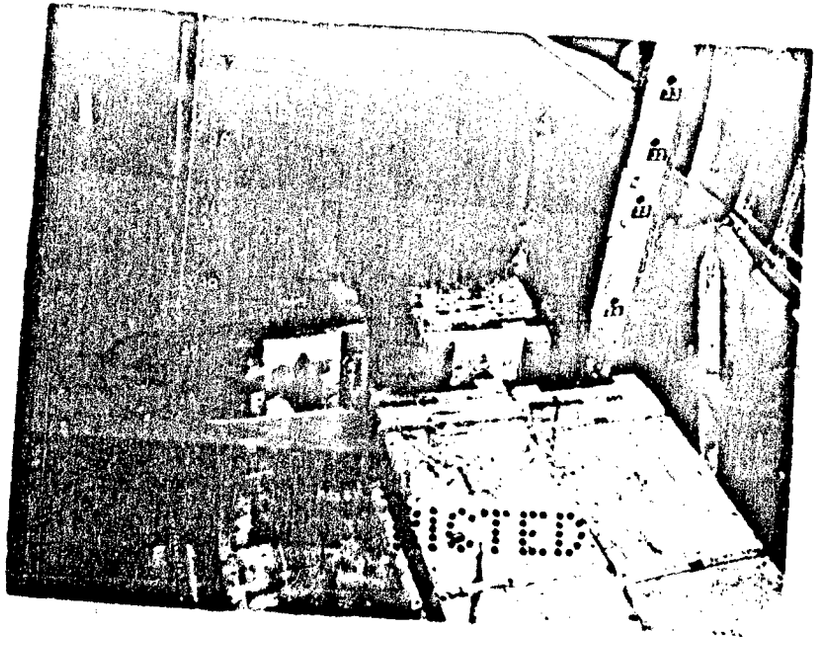
1 box of four weighs	- 158 lb.
Complete Load	- 5688 lb.
Lumber	- 600 lb.
Total	- 6288 lb.

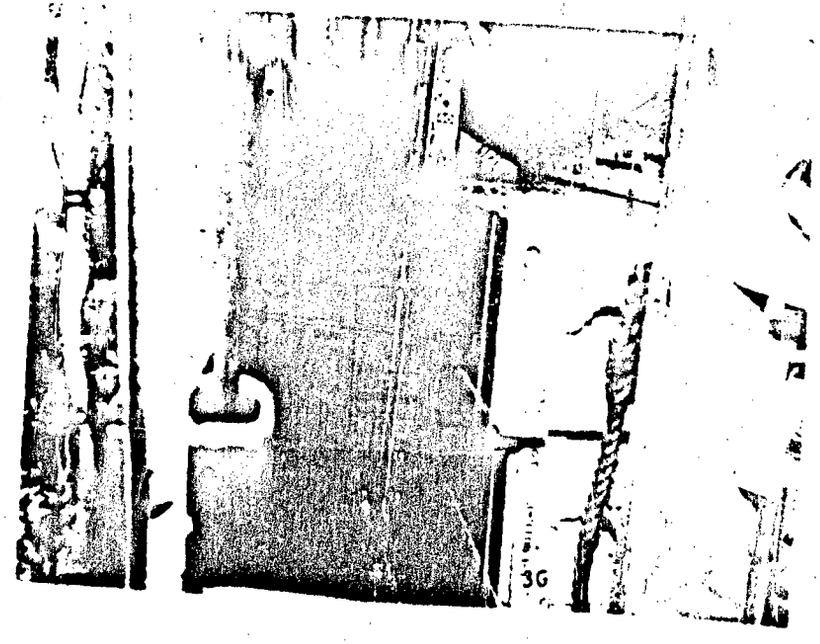
C. G. - 26.9 index units
Cargo Wt. 6288

B-17G

TEST NO. 35

RESTRICTED





99753 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

[illegible] Stowage of Ammunition for [illegible] Gun, M5 (4 round boxes) [illegible] Bomber, Boston [illegible]
of boxes [illegible] Stowage of Ammunition for [illegible] Gun, M5 (4 round boxes) in bomb bay of [illegible]
Right [illegible]

TEST NO. 36.

INSTALLATION OF 3" A.T. GUN AMMUNITION IN THE B-24 AIRPLANE.

A. One hundred twenty-eight (128) complete rounds of 3" A.T. Gun ammunition were installed in this airplane, four (4) rounds of ammunition per box. All ammunition was to be installed in the bomb bays. Six crosspieces of 2" x 10" lumber were placed in each section and spaced equi distant along the floor of the bomb bay. A 2" x 10" was laid along the walkway so that the crosspieces could be spiked to it to prevent displacement. As the walkway is lower than the structural rest for the opposite end of the crosspiece, the flooring sloped toward the center of the ship at an angle of approximately 30 degrees. Two vertical uprights and the bomb racks prevent the load from sliding to the center. It was then possible to load three sections of bomb bay before placing the final six crosspieces for the fourth section. Eight crates can easily be placed in the first 3 bay sections. In order to get the same loading in the fourth section, five crates should be placed while one of the cross members is still out. Three crates can be placed on end in the center of the walkway and the final 2" x 10" fitted in position. The remaining three crates are then manhandled into their respective positions. Great care should be taken at all times to prevent damage to control cables, brackets, and fittings. When the final position of the load is obtained, it should be lashed securely in place, with 1/4" rope, reference loading Diagram No. 36, A.P.J. Photograph No. 99790 (right view). This photograph is included in Test 37.

B. Material is removed in a manner opposite to assembly.

C. Material used:

1. Twenty-four pieces of flooring ..... 2" x 10" x 3'9"

2. Eight vertical uprights ..... 2" x 10" x 4'8"

3. Approximately 200' of 1/4" rope.

D. Weights.

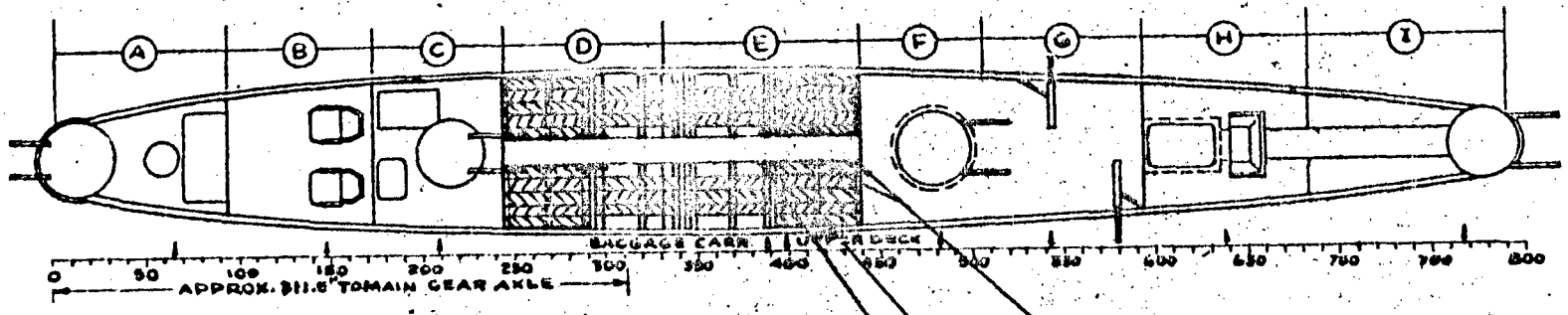
1. 32 cases ammunition ..... 5056 lbs.

2. Weight of lumber ..... 600 lbs.

E. Time to load: 2 hours

F. Time to unload: 1 hour

G. Number of soldiers which may be carried in addition to crew and above load - 15.



2 - 2" X 10" Uprights

6 - 2" X 10" Crosspieces

Bomb Rack

This is typical of four sections.

Weights:
32 cases ammunition - 5056 lbs.
Weight of lumber - 600 lbs.

3" A.T. Ammunition

B-24D,E,G,H,& J
PB4Y-1

C. G. = 62.0 Index Units

Cargo Weight = 5056 lbs.

TEST NO. 36

TEST NO. 37

INSTALLATION OF AMMUNITION FOR 4.5" GUN, M1 IN C-47 AIRPLANE

A. Eighty (80) projectiles, 100 fuzes, and 81 propelling charges, M7, packed for overseas shipment, were loaded into a C-47 transport in manual operations. The seats on either side were protected by the use of a 3/4" x 1" x 14' strip and the flooring by the use of 2" x 10" x 72" planks. The projectiles were placed on the floor planking with their longitudinal axes parallel to that of the plane, six on either side of the center aisle. Individual shell were separated by wood strips cut to size and held in place by the weight of the shell (except for the aisle strips which were nailed securely). 2" x 10" planks were placed with the 10" dimension against the base plates of the shell in order to prevent any rearward movement. 2" x 9" planks were laid over the top of the shell and lashed down to the center aisle eyebolt to prevent any upward movement of the shell. This process was repeated for three sections in compartment "D", comprising 36 shell. Six (6) propellant powder crates (18 charges) were lashed, using seat and center aisle eyebolts on either side of the center aisle, with their longitudinal axes parallel to that of the plane. The same set up was repeated for Compartment "E", making a total of 72 shell and 72 propellant charges. The remaining eight shell were secured in a similar manner, four on a side of the aisle. The remaining 3 propellant crates were lashed to the rear of the shell. The four boxes of fuzes were lashed securely, using seat and center aisle eyebolts. Diagram No. 37 shows the floor plan for the loading arrangement. A.P.G. Photograph No. 99790 (left view) shows this installation in Compartment "D" in the plane.

B. The operation is reversed in order to remove the ammunition from the plane.

C. Materials used for installation:

	No. Pieces	Size
Lumber	12	2" x 4" x 72"
	10	2" x 6" x 72"
	10	2" x 10" x 72"
	84	4" x 3/4" x 22"
	4	1" x 3/4" x 14"

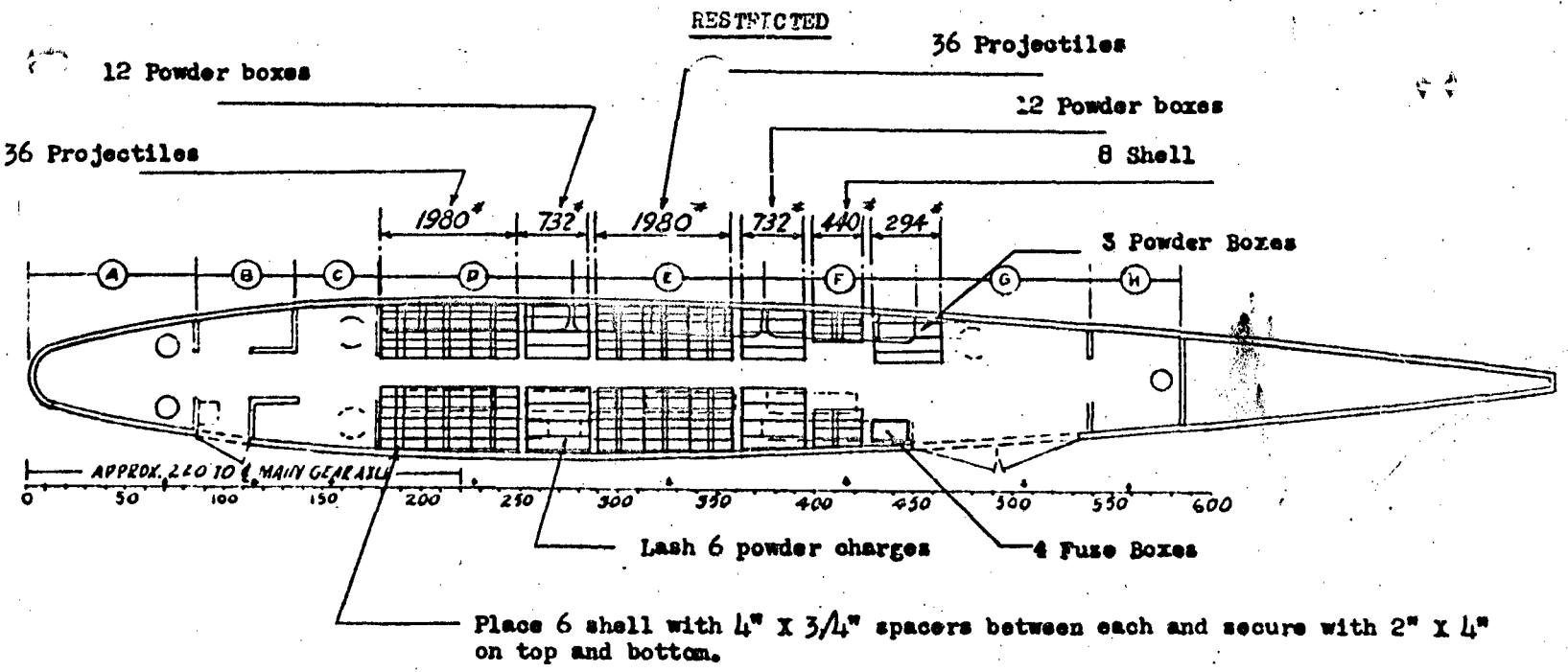
Plane rigging is normal issue with plane.
No additional rigging was used.

D. Weights.

Ammunition	6158 lbs.
Lumber	250 lbs.
TOTAL WEIGHT	6408 lbs.

E. Time to load - 2 hours.

F. Time to unload - 1 - 1/4 hours.



Weights

Ammunition - 6047 lbs.

Primers and fuzes - 111 lbs.

Lumber - 250 lbs.

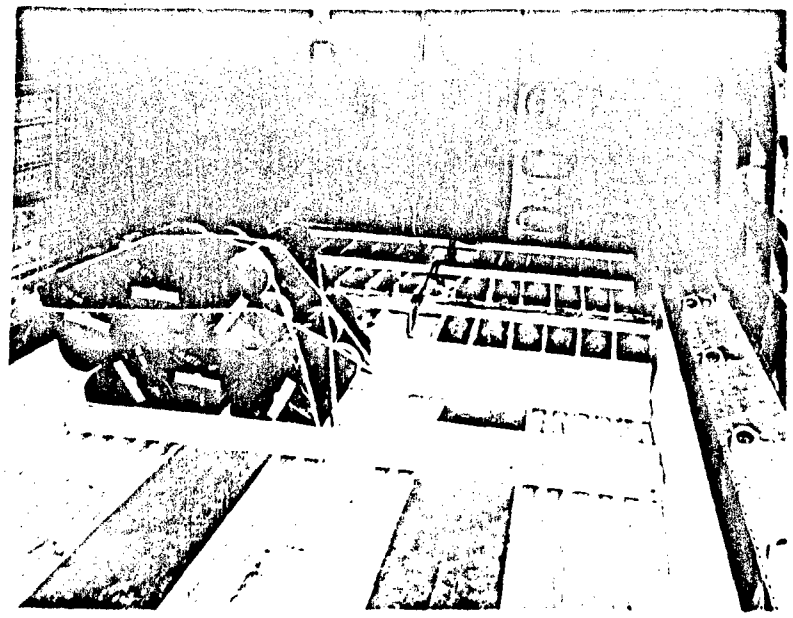
C. G. = 39 Index Units

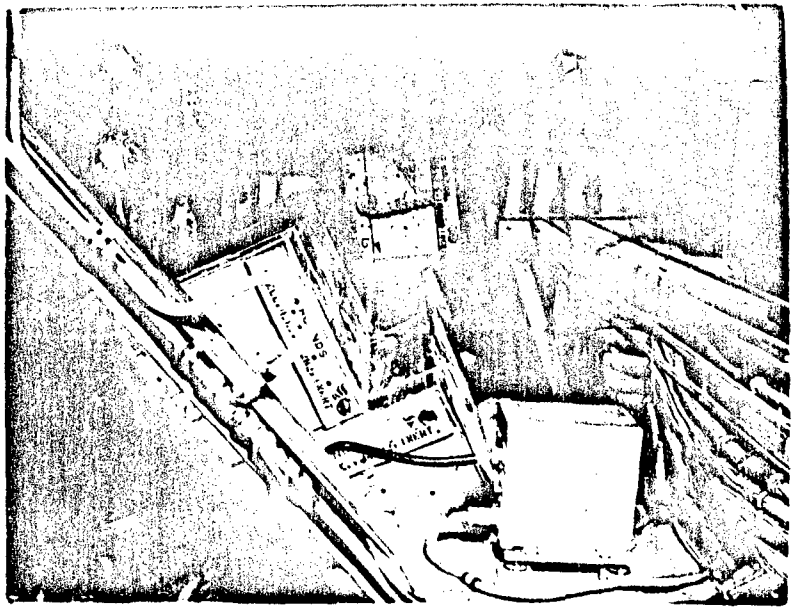
Cargo Wt. = 6408 lbs.

C-47

Stowage of 4.5" Ammunition in C-47

TEST NO. 37





compartment

TEST NO. 38

INSTALLATION OF 4.5" AMMUNITION IN B-17 BOMBER

A. Assembly in plane. (Platform identical to that used with 105 mm Ammunition). To give support to crossbeams as a platform, 2" x 6" boards were cut to fit between the girders below the catwalk, and 2" x 6" boards the length of the bay were bolted to these on both sides. Five 2" x 12" boards were nailed to these boards and rested at the other end upon girders at the side of the bay. Across the 2" x 12", 2" x 6" boards were placed to make a platform, 2" x 6" boards, slightly shorter than the length of the bay, were placed one upon the other on the inside faces of the bomb racks, forming the sides of a box, about 3 ft. high. 2" x 6" boards, cut to length, were nailed to the side boards in a similar position to form the ends of the box. 45 projectiles and 15 boxes of 3 powder charges were placed in one of the two bomb bays. 23 shells placed lengthwise, nose to tail, 6 wide, rear to front (last 4 placed crosswise) formed the first layer. The second layer was composed of 22 projectiles placed in the same manner. The top layers were composed of powder containers (3 charges in each), placed lengthwise in 3 rows of 5 each; 2, 1, and 2 in the third, fourth and fifth rows, respectively. The ammunition was then lashed to the box, platform, and girders with rope tied to the side bomb rack and the ends of the catwalk. See loading diagram No. 38. A.P.G. Photograph Nos. 99755* and 99855 illustrate this installation.

B. Removal from Plane. When the ammunition was unlashed, 2 men on the ammunition and 2 men on the ground were able to unload the ammunition.

C. Material used for Installation:

14 boards 2" x 6" x 90"
14 boards 2" x 6" x 30"
5 boards 2" x 12" x 48"
2 boards 2" x 6" x 99"
4 boards 2" x 6" x 36"
4 boards 2" x 6" x 90"
Odd boards 2" x 6" - 8' total
Odd boards 2" x 6" - 10' total
6 doz. nails
25 ft. rope (1/2" min.)
18 ea. bolts and nuts - 7" long.

D. Weights.

(Shell, H.E.	55 lbs.)
(Box, Powder Charge	52 lbs.)
90 Shells	4950 lbs.
30 boxes, Powder Charge	1560 lbs.
Weight of Ammunition	6510 lbs.
Weight of Lumber	600 lbs.
TOTAL WEIGHT	7110 lbs.

E. Number of soldiers carried in addition to crew: 31

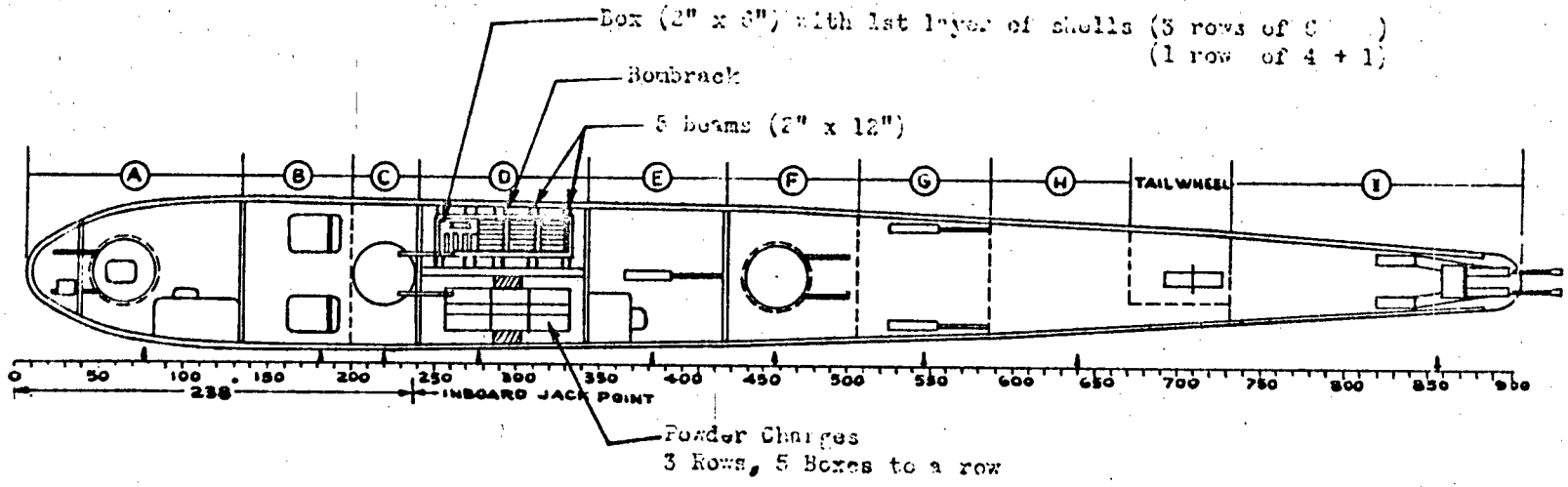
F. Loading Time: 2 hours.

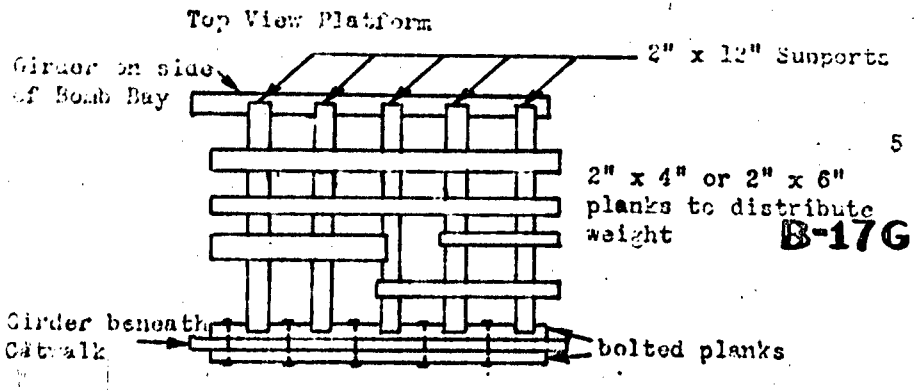
* = See Test No. 29

G. Unloading Time: 1 hour.

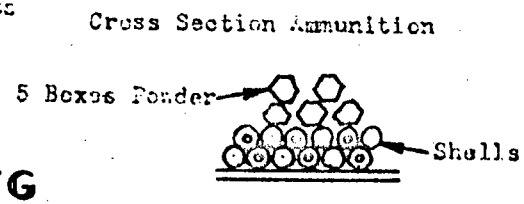
RESTRICTED

INSTALLATION OF 4.5 AMMUNITION



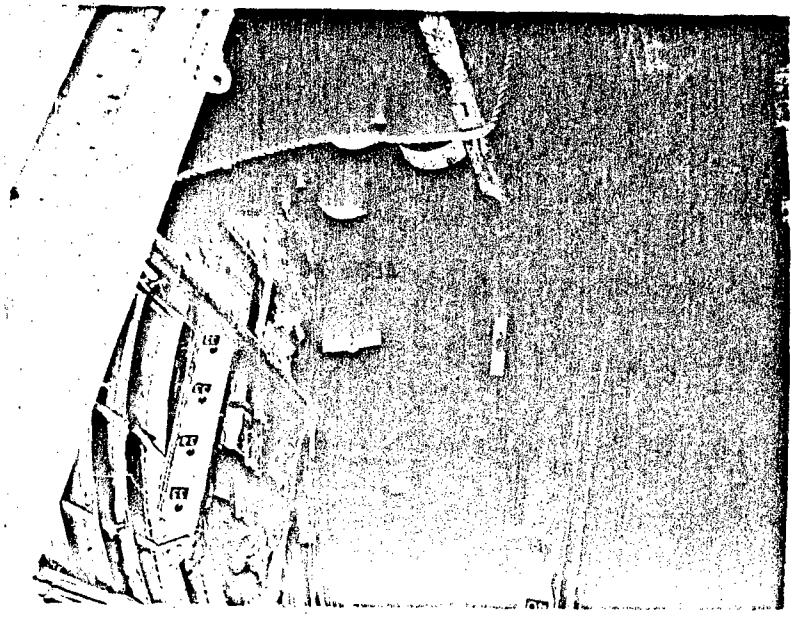


B-17G



C.G. -24.9 Index Units
Cargo Wt. - 7110

Test No. 36



TEST NO. 39

INSTALLATIONS OF 4.5" GUN AMMUNITION IN B-24

A. One hundred seventy-six 4.5" Gun Projectiles, 60 cases of propellant, (3 rds./case) and the necessary fuses were installed in this airplane. Four 2" x 4"'s, approximately 55" long, were lashed horizontally to the outer side of each bomb rack about 1' apart. Starting with the bottom 2" x 4", 11 projectiles were suspended across its entire length. 1/4" rope was used to fasten each projectile individually in place. As each row of 11 was completed, a rope was lashed around the entire row to prevent any swinging motion. Four 2" x 10"'s were sloped from a structural member at the outer edge of the bomb bay to a 2" x 10" placed on the walkway. In the rear bomb bay, three of the 2" x 10" crosspieces were placed to the rear of the bomb rack and one crosspiece was placed forward. In the forward bay, the three crosspieces were placed ahead of each bomb rack in each bay section. After all the projectiles had been hung in place, a plank 2" x 10" x 72" was spiked longitudinally between the projectiles and the side of the fuselage. In loading the three sections of the bomb bay, 15 cases (3 rds./case) can easily be placed in each section. To facilitate loading the final section, one crosspiece should not be placed until several cases are in position. The crosspiece should then be placed and the remaining cases passed in from the center of the walkway. Two vertical uprights in each section prevent the load from shifting. Care should be taken to prevent damage to cables or fittings, reference loading diagram No. 39. A.F.G. Photograph No. 99809 illustrates this installation.

B. Removal of the load can be affected by reversing the loading procedure.

C. Material

1. Sixteen crosspieces, 2" x 10" x 54"
2. Four planks, 2" x 10" x 72"
3. Sixteen 2" x 4"'s, 55" in length
4. Eight vertical uprights, 2" x 10" x 56"
5. 800' - 1/4" rope.

D. Weights

176 - 4.5" projectile at 55.5 lb./projectile	9768 lbs.
60 - cases propellant at 52 lb./case	3120 lbs.
Weight of lumber	470 lbs.
Total Weight	13,358 lbs.

E. Time to load - 4 hours

F. Time to unload - 2 hours

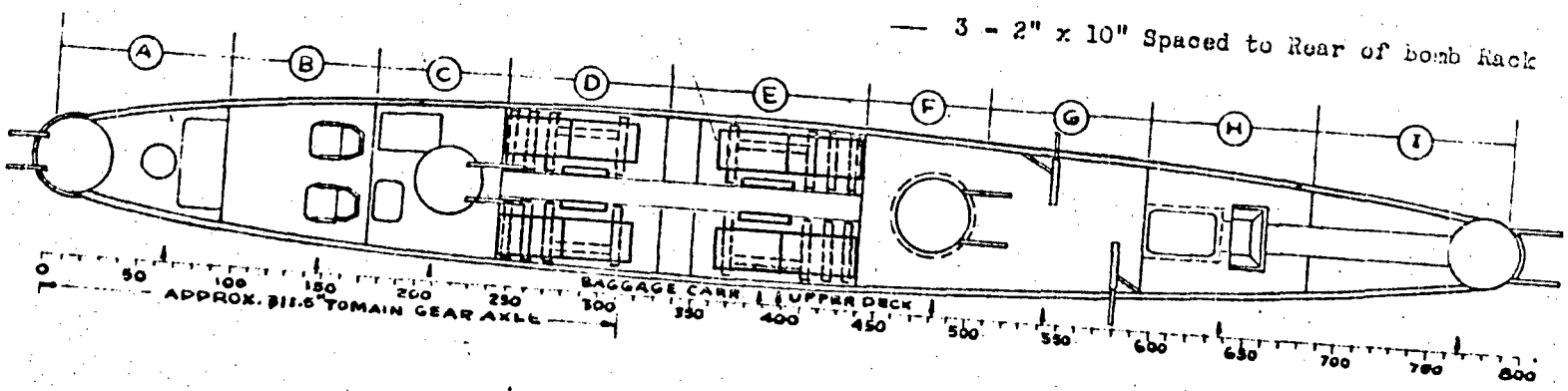
G. Number of soldiers which can be carried in addition to crew - 6.

1 - 2" x 10" Forward of Bomb Rack

15 Cases
on 2" x 10" Cross Pieces

1 - 2" x 10" Between Fuselage Side and Projectiles

3 - 2" x 10" Spaced to Rear of bomb Rack



Bomb Rack

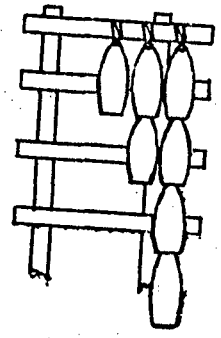
11 - 4.5 Shells Lashed
to Each 2" x 4" Member

4 - 2" x 4" x 5' lg.
Spaced on 12" Centers

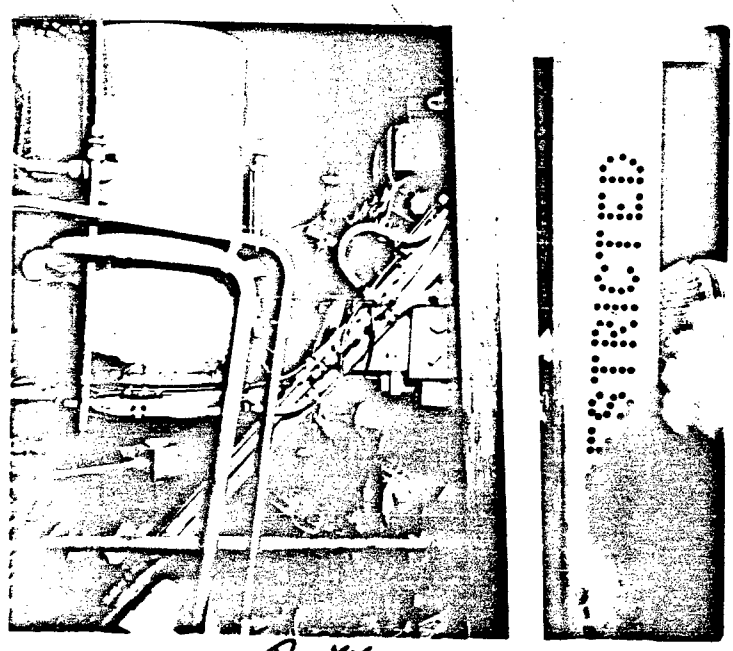
B-24D,E,G,H, & J
PB4Y-1

C.C. - 70 Index Units
Cargo Wt. - 12,888 lbs.
Wt. of Lumber - 470 lbs.

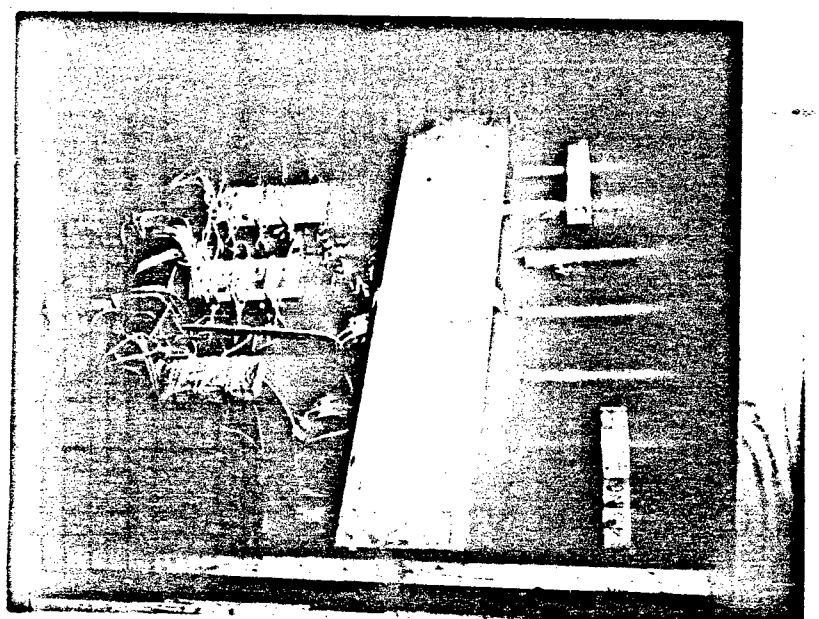
4.5" AMMUNITION



TYPICAL ELEVATION



Bottom



Bottom

99809 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.
Loading of Shell, M65, and propelling charges for [illegible] Gun, [illegible] Field [illegible]

TEST NO: 40

INSTALLATION OF AMMUNITION FOR 155 MM HOWITZER, M1,

IN C-47 AIRPLANE

A. Fifty Projectiles, 27 - M4 Charges in nine bundles and 24 - M3 Charges in four bundles, crated for overseas shipment, fifty fuzes in two boxes, and one box of fifty primers were installed in the airplane. Two pieces of 1" x 10" x 18' of board were placed on edge parallel to the longitudinal axis of the plane along the seats with the forward end butting against the D compartment wall. Two pieces of 2" x 6" x 73" planking were placed transversely on the floor one piece being located six inches from D compartment wall and an 18 inch space between planks. One piece of 2" x 6" x 73" planking was placed transversely with the flat side against the D compartment wall. Twenty shell separated by 1" x 4" x 2'2" boards were placed in two rows with the longitudinal axis parallel to the longitudinal axis of the plane. A free space was left in the center for the floor hook eye and a 2" x 6" x 6'1" plank was placed at the rear end of shell, forming a box frame and nailed together. Four pieces of 2" x 4" x 6'1" long were placed transversely across top of shell and lashed to center eyes in the floor of the plane. One bundle of propelling charge M3 was placed at each end of the planking and lashed securely to the sides and center with the centers of the planks being lashed to the aisle eye hook. Three cases of propellant, M4, were placed on each side of the cabin directly behind shell framework and lashed to center and side eye hooks. One plank 2" x 10" x 6'1" was placed on edge across cabin, with the flat side against the rear ends of the bundles of powder and lashed to forward, center and side eye hooks to prevent the bundles from slipping to the rear. The second section of framework was started 2'6" behind the bundles of powder utilizing the same type cribbing and frame as in the forward compartment. The M3 powder bundles were used to secure the ends of the top planks as in the first section. The third section was started 21 inches to the rear of the second section, utilizing the same type cribbing except that only a single row of shell were placed, and one box of fuzes, at each end of the planking, took the place of the M3 powder bundles as used in the other two sections. Three bundles of M4 propellant and one box of primers were placed 11" to the rear of third section of shell and in the center of the cabin and lashed securely to floor eye hooks.

B. Removal:

In order to remove ammunition from plane, the reverse procedure is applied.

TEST NO. 40 (Cont.)

C. Material used for installation

1. Plane rigging - Evans tie down equipment and lashings.

2. Additional rigging: 10 pounds of 8 penny nails, 2 pcs. 1" x 10" x 18', 8 pcs. 2" x 6" x 73", 5 pcs. 2" x 10" x 73", 10 pcs. 2" x 4" x 73", 50 pcs. 1" x 4" x 26" wedges from scrap wood.

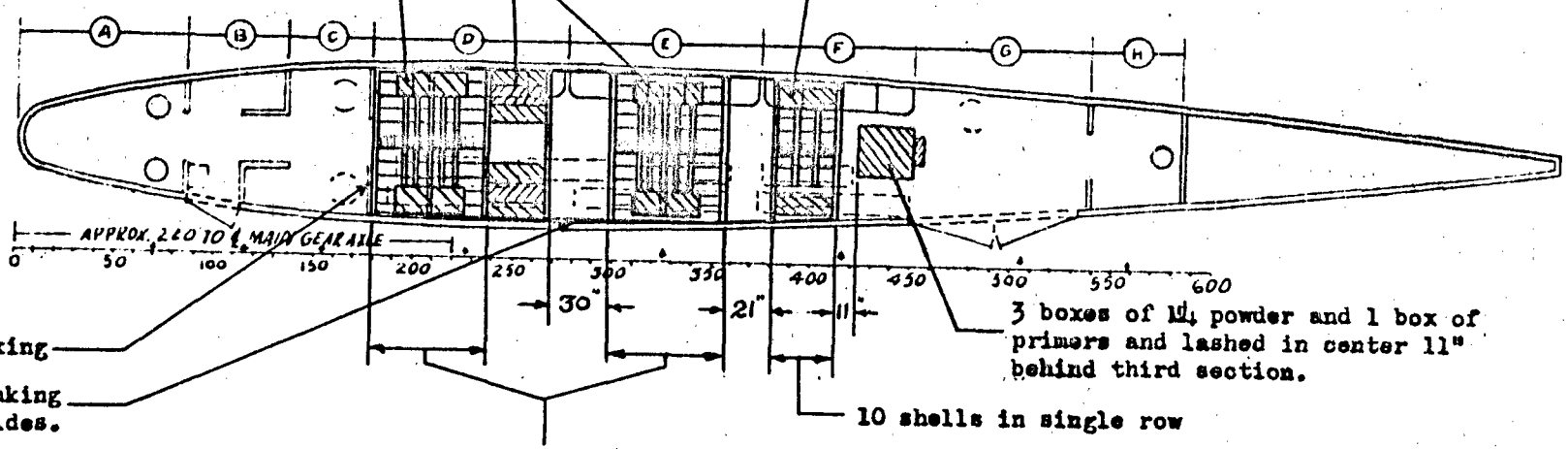
D. Total Weights:

	Lbs.
50 Projectiles	4800
9 Boxes M4 Powder Charges	711
4 " M3 " "	300
2 " PDM51A1 Fuzes	154
1 Box Primers	1.+
Lumber	200.
Total	6166.+

E. Time to load - 2 hrs.

F. Time to unload - 1-1/2 hrs.

G. Soldiers which may be carried in addition to regular crew - 2



1 Case, M3, Powder [illegible]ch side holding down 4 - 2" X 4" top of shells. [illegible]hed to side rings and center ring.

3 Cases of M4 powder on each side lashed to center floor and side rings.

1 box of fuzes tied down on top with two 2" X 4" lashed to sides and center ring.

2" X 6" Planking

1" X 10" Planking along both sides.

3 boxes of M4 powder and 1 box of primers and lashed in center 11" behind third section.

10 shells in single row

2 Sections - 10 shells in each row - 2 rows = total 40 shells

155 MM Amm. in C-47

C. G. = 37 Index Units

Cargo Wt. = 6166 lbs.

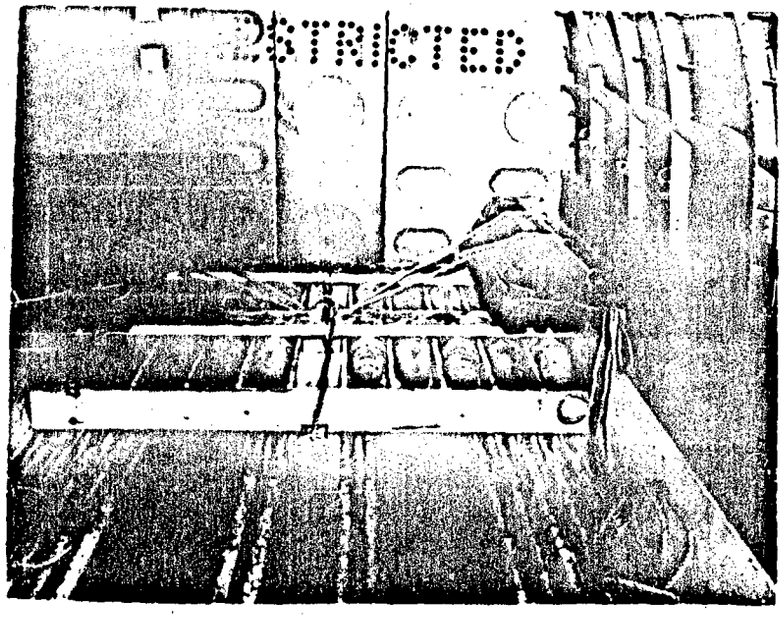
"D" - 2624 lbs.
"E" - 2150 lbs.
"F" - 1392 lbs.

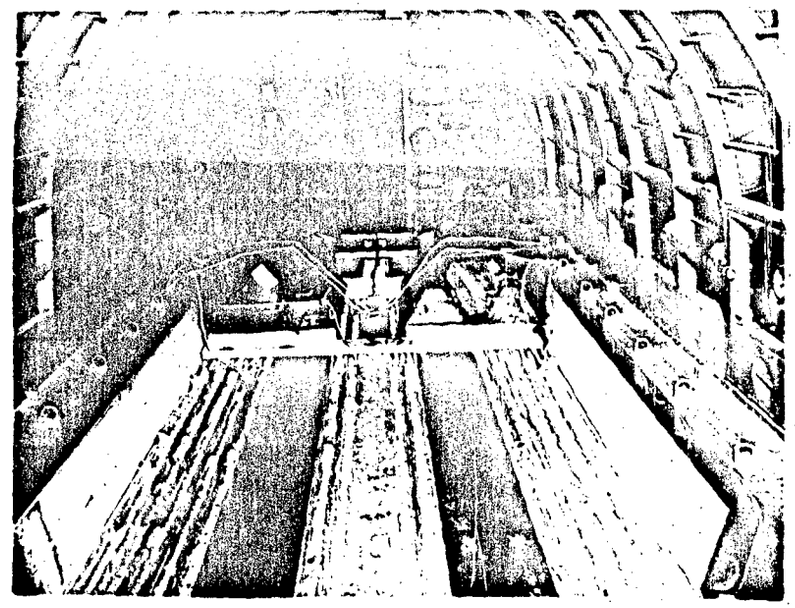
C-47

Evans' Tie Down equipment used.

M3 Powder - 38-1/2" long.
M4 Powder - 27-1/2" long

TEST NO. 40





99780 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

105 mm Howitzer Shell, M107, and Propelling Charges, M3, stowed in [illegible] Transport

TEST NO. 41.

INSTALLATION OF AMMUNITION FOR 155 MM HOWITZER, M1, IN B17-G AIRPLANE

A. Fifty-six shell, six bundles of propelling charge, M3, eight bundles of propelling charge, M4, two boxes of fifty fuzes, two boxes of primers, and two accessory boxes were installed in the bomb bay of this plane. A box was constructed for one section of the bomb bay and assembled between the longitudinal strut and the fuselage, as shown in sketch which is appended. The complete loading was a manual operation of lifting all components through the open section of the bomb bay and placing in the box. When a similar box was installed in the other section of the bomb bay, it was necessary to load all components through the rear doorway and carry forward for placement in the box. The construction of the box for one section of the bomb bay is indicated in the sketch appended. The shell were placed transversely in the boxes in two layers with two 2" x 4" timbers 7'0" long placed between the layers. The bundles of charges were placed on top of the shell with one box of fuzes and primers on top of the bundles. A.P.G. Photograph Nos. 99789 and 99808 which are appended, show the shell partially loaded into the boxes, and bundles installed respectively. Diagram No. 41 shows the floor plan for this loading.

B. Removal from plane. To remove the ammunition from the plane the loading operation is reversed.

C. Material used.

5 pieces 2" x 6" x 7'0" planking

5 pieces 2" x 8" x 20'0" planking

4 pieces 2" x 6" x 7'6" planking

4 pieces 2" x 6" x 2'3-1/2" planking

4 pieces 2" x 4" x 2'6" planking

Plane rigging - None

Additional rigging - None

D. Weights.

	Lbs.
155 mm Howitzer Shell	5376
M3 Propelling charges	450
M4 Propelling charges	632
Fuzes	154
2 Accessory boxes	400
Lumber	600
Total	7612

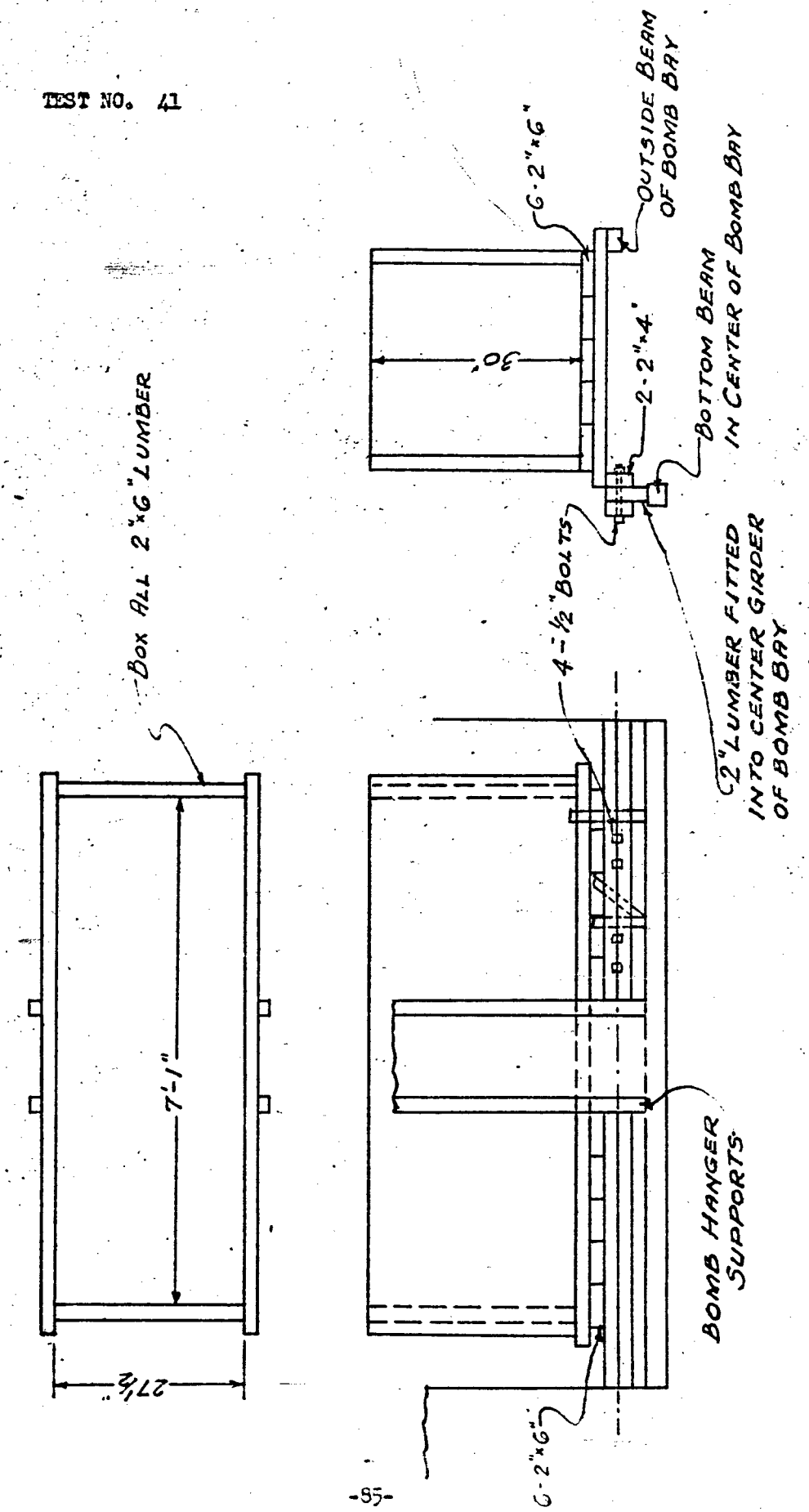
TEST NO. 41 (cont'd)

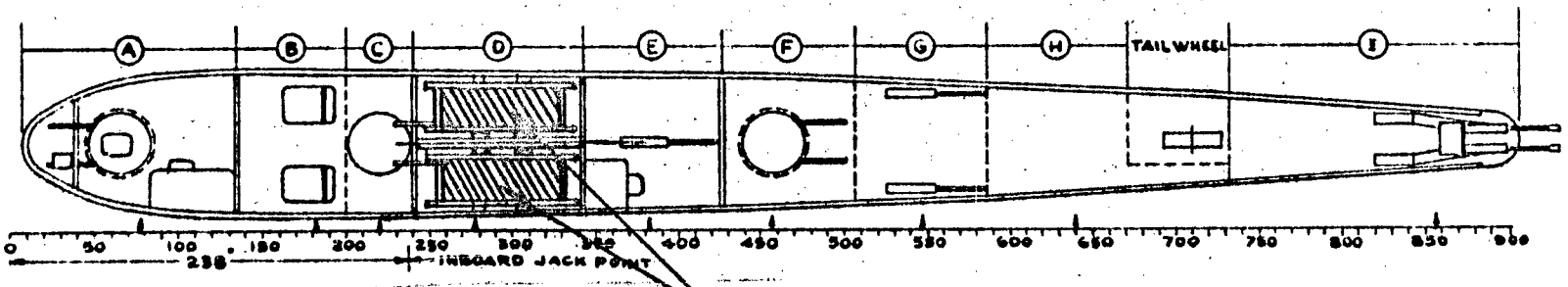
E. Time required to load - 4 hours

Time required to unload - 2-1/2 hours

F. Number of men who can be transported in addition to the cargo - 29.

TEST NO. 41


BOX ALL 2"x6" LUMBER
7'-1"
27½"
30"
6-2"x6"
OUTSIDE BEAM OF BOMB BAY
2-2"x4"
BOTTOM BEAM IN CENTER OF BOMB BAY
4-½" BOLTS
2" LUMBER FITTED INTO CENTER GIRDER OF BOMB BAY
BOMB HANGER SUPPORTS
6-2"x6"



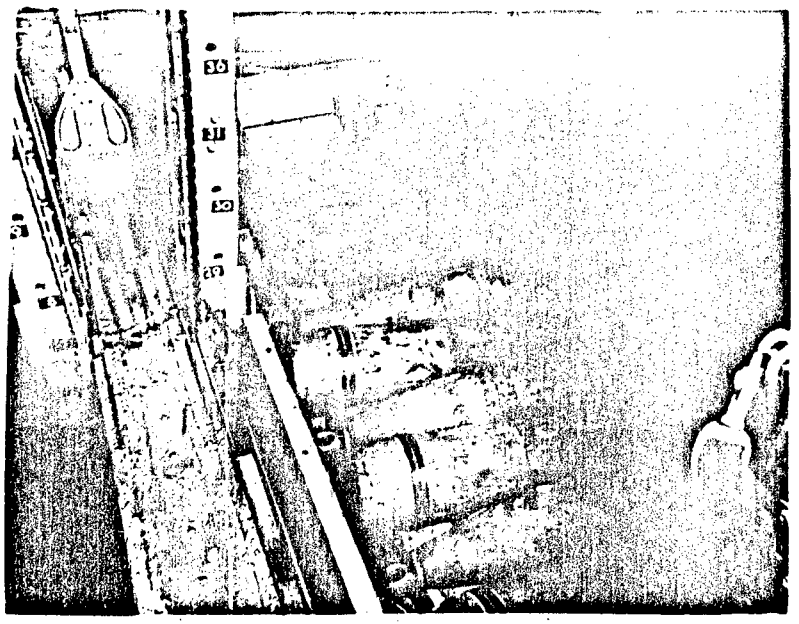
Each Side

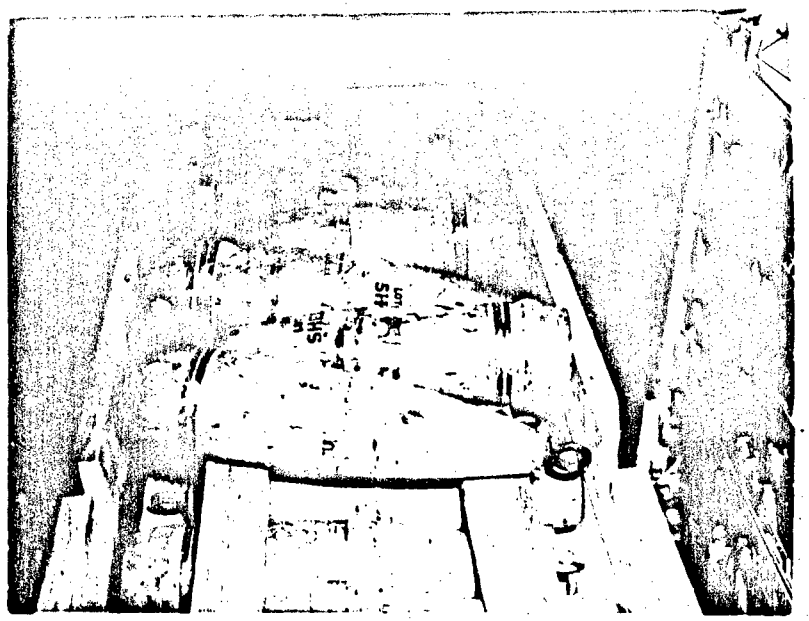
28 Shell, placed transversely	-	688 lbs.
3 Bundles of M3 Charge	-	225 lbs.
4 Bundles of M4 Charge	-	316 lbs.
1 Box Fuzes	-	77 lbs.
1 Accessory Box	-	200 lbs.
Total	-	3506 lbs.

B-17G

C. G. - 14 Index Units
Cargo Wt. - 7612

TEST NO. 71





99789 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

155 mm Howitzer Shell, M107. Storage in [illegible]

RESTRICTED

TEST NO. 42

LOADING OF AMMUNITION FOR 155 MM HOWITZER, M1, IN B-24 AIRPLANE.

A. The same platform was used as for the 4.2" Mortar. The ammunition was passed by hand through a hole formed by removing a plank of the platform at the bomb rack. The boxes of charges were piled on the platform before the projectiles were installed. Using parachute harness D rings, one 2" x 4" x 4' timber was lashed to each of the three top bomb shackles. Six (6) projectiles were suspended by the lifting ring in a cluster from each 2" x 4". The projectiles were lashed with 1/4" rope to each other and to the bomb rack. The boxes were also lashed with 1/4" rope to the uprights, floor boards, and to the bomb racks. The container of fuzes and boosters was also lashed in position. Loading is as shown by Diagram No. 42. Photograph Nos. 99781, 99787, 99785, 99779A, and 99767A show details of the completed installation.

CAUTION: The bottom row of projectiles must not be hung so low as to interfere with the opening and closing of the bomb bay doors.

B. The ammunition is removed in a manner opposite to installation.

C. Materials used for installation:

1. Platform material as for 4.2" Mortar.

2. Six (6) 2" x 4" x 4' Timbers

3. 500 ft. - 1/4" rope.

D. Weights:

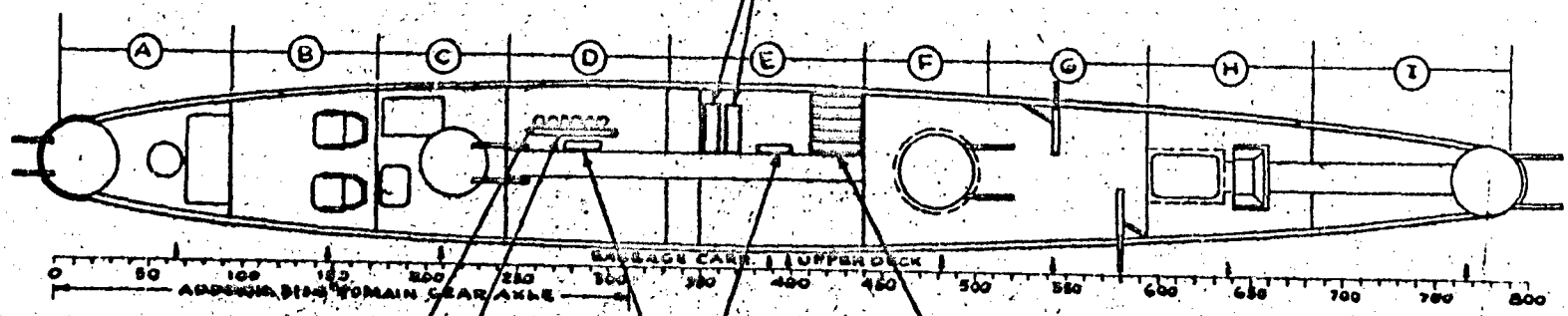
Shell	96.1 lbs.
Charge, Propelling, M3, per unit (6 charges per unit)	75 lbs.
Charge, Prop., M4, per unit (3 charges per unit)	79 lbs.
Fuzes, P.D., M51A1 assembled w/M21A1 Booster, per unit (25 per unit)	77 lbs.
Projectile, weight per bomb rack	1720 lbs.
Propelling Weight per section, M3	225 lbs.
Propelling Weight per section, M4	234 lbs.
Weight of Fuzes	77 lbs.
Weight of Planking	500 lbs.
TOTAL LOAD	2553 lbs.

TEST NO. 42 (cont'd)

E. Time to load - 2 hours

Time to unload - 45 minutes.

F. Number of soldiers which may be carried in addition to crew and above load - 15



Two boxes M4 charges

Bomb Racks

Three boxes M3 charges
One box M4 charges
One box fuzes (25 per box)

Six projectiles suspended from 2" X 4" board in cluster formation(used three 2" X 4"). Total of 18 rds. per section.

2" X 4" X 4' lashed to shackles with "D" rings

B-24D,E,G,H,& J
PB4Y-1

C. G. = 70 Index Units

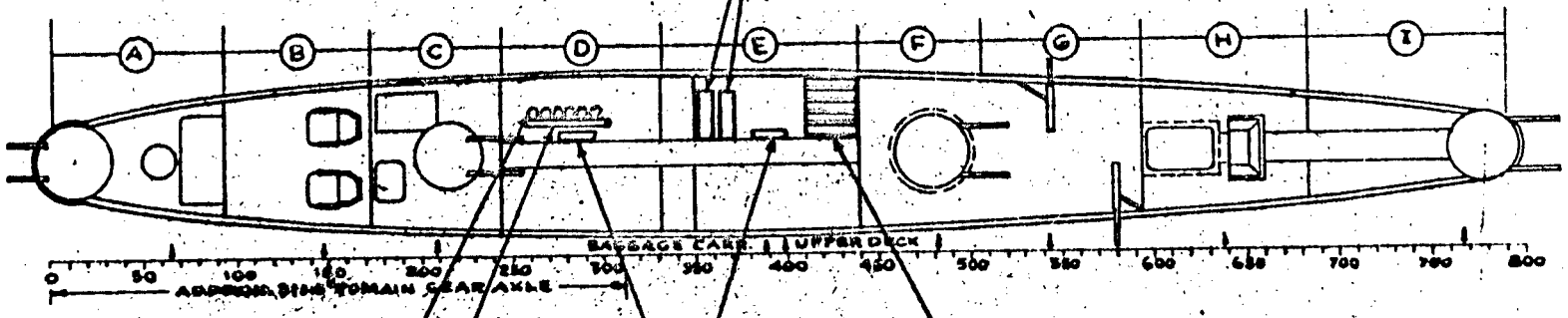
Cargo Weight = 9556 lbs.

155 Ammunition for How., M1.

Weights
Projectile weight
Per Bomb Rack - 1728 lbs.
Propellant Weight, M3 - 225 lbs.
Per section M4 - 234 lbs.
Weight of fuzes - 77 lbs.
Planking - 500 lbs.

TEST NO. 42

RESTRICTED



Two boxes M4 charges

Bomb Racks

Three boxes M3 charges
One box M4 charges
One box fuses (25 per box)

Six projectiles suspended from 2" X 4" board in cluster formation(used three 2" X 4"). Total of 18 rds. per section.

2" X 4" X 4' lashed to shackles with "D" rings

B-24D,E,G,H,& J
PB4Y-1

C. G. = 70 Index Units

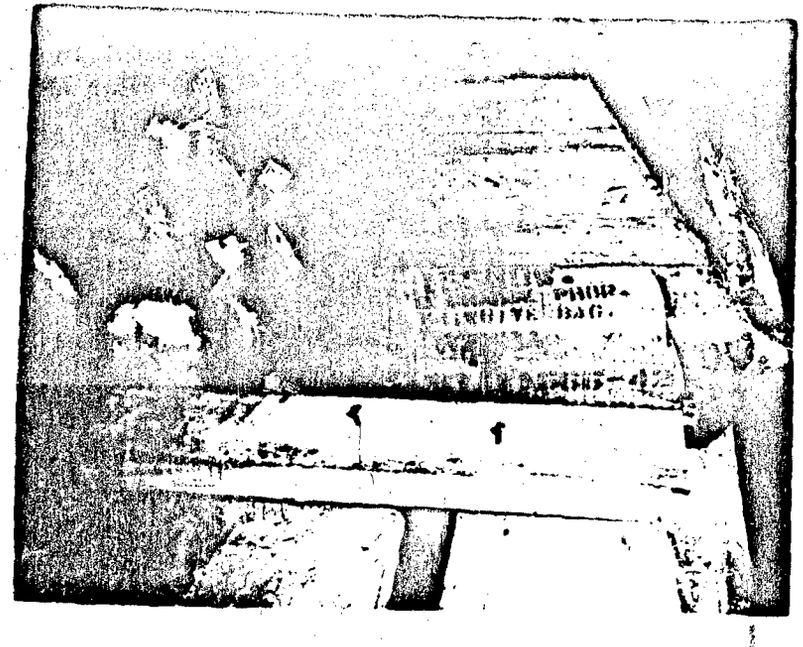
Cargo Weight = 9556 lbs.

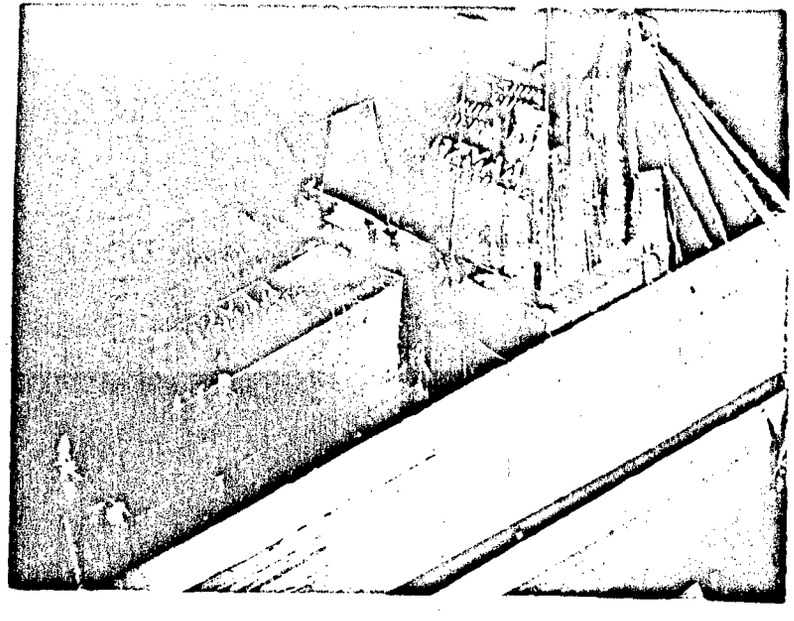
Weights
Projectile weight
Per Bomb Rack - 1728 lbs.
Propellant Weight, M3 - 225 lbs.
Per section M4 - 234 lbs.
Weight of fuses - 77 lbs.
Planking - 500 lbs.

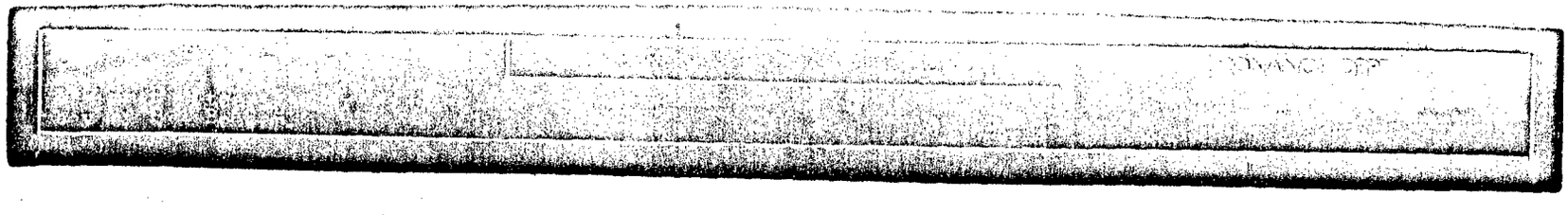
155 Ammunition for How., M1.

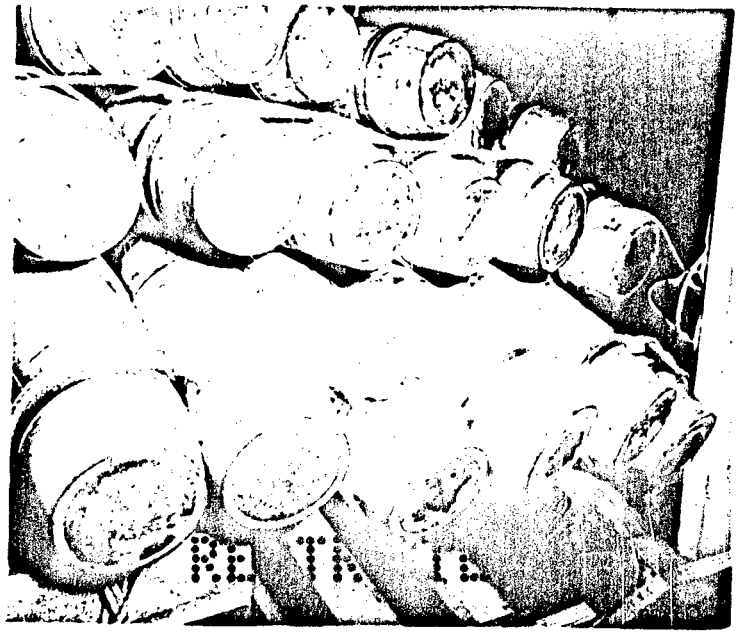
TEST NO. 42

RESTRICTED





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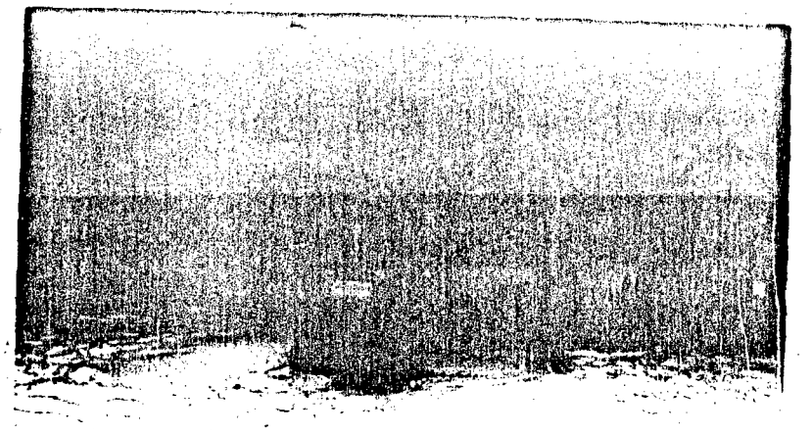


Test No. 49

Loading Truck, 2-1/2 Ton, 6 x 6, GMC Cargo Truck w/Winch in

C-47A Cargo Plane

A. 1. Description: The weight and physical dimensions of this vehicle are such that loading and transporting it in the C-47 Cargo plane requires the chassis and body to be divided into two separate loads. This is accomplished by using the frame splicing kit developed by Office, Chief of Ordnance Detroit, and the Truck and Coach Division of General Motors Corporation. This kit is installed and the vehicle modified as shown in APG Photographs 99194, -196, -197, -202, -207, -210, -212, -215, -219, -220. The modified vehicle completely assembled is shown in APG Photograph 99339 and the front and rear chassis sections ready for loading in Photograph 99349 and 99348 respectively. Note the one-wheel dolly supporting the rear end of the forward chassis section. Loading is facilitated by using a special wooden ramp as shown in Photograph 99355. This ramp is entirely demountable, and is a duplicate of the ramp used in the Pacific theater where the airborne modification of this vehicle was pioneered.

2. Disassembly: The disassembly procedure requires approximately one hour's time with a crew of 5 men.

3. Loading: The forward section of the chassis with a one-wheel dolly installed at the rear is driven up the ramp and into the cargo compartment of the plane under its own power. The rear chassis section is rolled into place manually. Both sections may be pulled into place by means of a snatch block and line, using a 1/4-ton truck as motive power. The remaining portion of each load can be manually loaded by a crew of four men. Diagram No. 49 (both load No. 1 and load No. 2) and Photographs 99352 and 99353 show the loading arrangement of each load. Estimated loading time with crew of six men: First load - 45 minutes, second load - 30 minutes.

B. 1. Unloading: Unloading is accomplished by first manually removing the body sections, paulin, running boards and other miscellaneous equipment in each load. The chassis sections are then easily rolled back out of the plane and down the ramp. Estimated unloading time with crew of six men: First load - 30 minutes, second load - 20 minutes.

2. Re-assembly: Re-assembly is just the reverse of the disassembly procedure and requires approximately 2 hours' time with a crew of 5 men.

C. Material used for installation:

1. a. Two pieces of planking 2" x 6" x 6' under wheels.

b. Two pieces of planking 2" x 6" x 6' for blocking.

c. Three pieces of lumber 1" x 6" x 36" under dolly.

d. Two blocks 6" x 6" x 8" for blocking.

e. Special wooden ramp using approximately 600 board feet of lumber and weighing about 900 lbs. See Photograph 90355.

2. Plane rigging. The Evans airborne tie-down equipment furnished with the plane proved entirely adequate and satisfactory.

3. No additional rigging was used.

D. Weights

	Lbs.
1. First load - total	5360
a. Chassis front section	4600
b. Body front section	470
c. Fenders, running boards, bows, paulin, sills, etc.....	290
2. Second load - total	5210
a. Chassis rear section	3120
b. Body rear section	615
c. Six wheels and tires	765
d. Fuel tank and spare wheel carrier	375
e. Body racks, windshield, muffler, frame slicing, etc.....	336
Total Weight	10,570

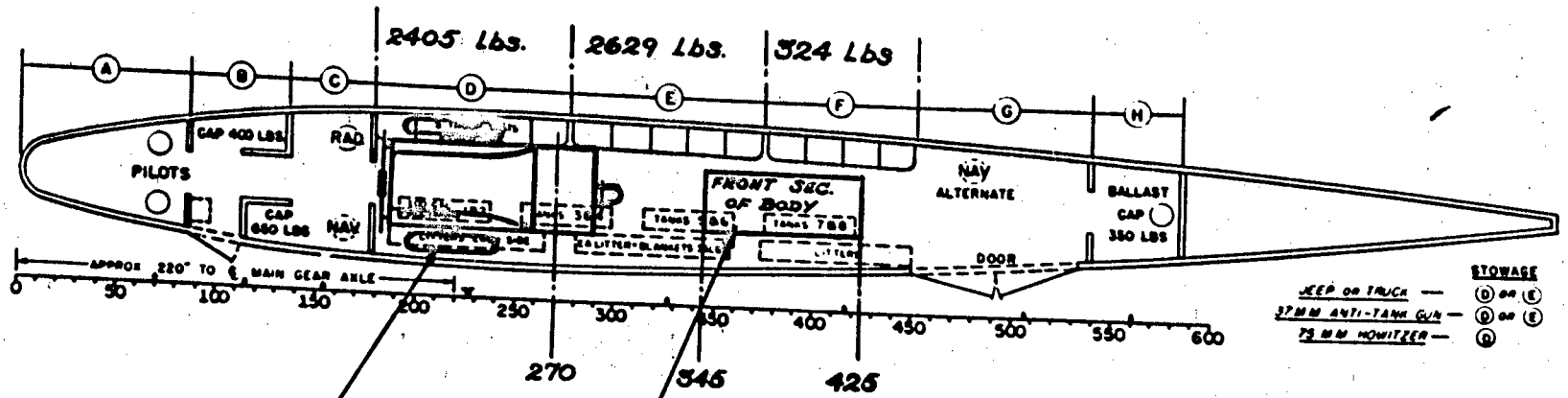
E. For more detailed information, attention is invited to Second Report on O.P. No. 5732, titled "Trucks, Cargo, Airborne (KI 417)" and Motion Picture Film 593, airborne 2-1/2 ton GMC 6 x 6 cargo truck, both of which will be available at the Ordnance Research Center, Aberdeen Proving Ground, Maryland.

Time:	Disassembly:	1 hr. (5 men)
	Loading:	45 min. 1st load; 30 min. 2nd load (5 men)
	Unloading:	30 min. 1st load; 30 min. 2nd load (5 men)
	Reassembly:	2 hrs. (5 men)

NOTE: In addition to assumed crew and cargo load 9 soldiers may be carried, (4 in the 1st load and 5 in the 2nd load).

2-1/2 TON, [illegible]x [illegible] SWB CARGO TRUCK W/WINCH

1st Load



Front Section of Chassis (C.G. at Rear Spring Shackle at Station 270)

Fenders, Running Boards, Body Sills, Bows, Paulin, Chains, Tools, & Windshield inside and around body, refer to photo 99352

C-47
R4D-1, a-5

EXTERNAL STOWAGE

PACKS — FORWARD D
CENTER E
REAR F

PROPS — REAR G

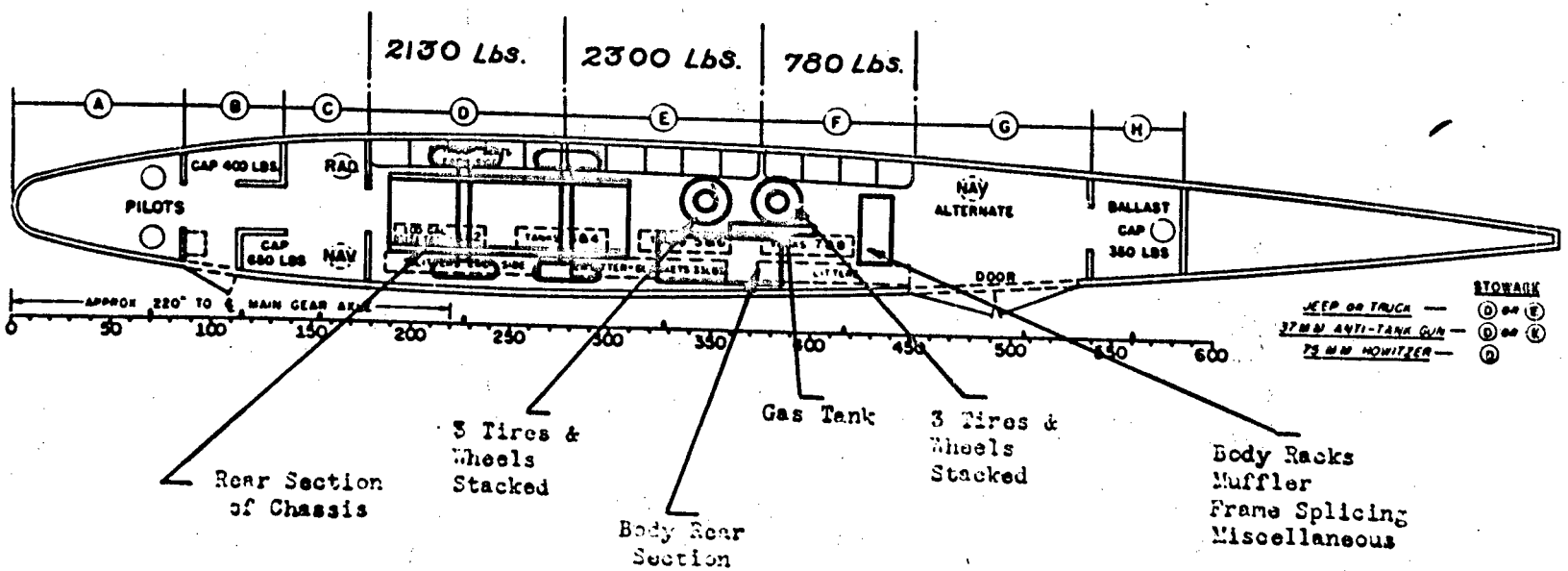
F'W'D - NO SCALE REQUIRED

Cargo Wt. - 5360 lbs.
C. of G. - 25.5 Index Units

Test No. 49

2-1/2 TON, 6 x 6, SWB CARGO TRUCK W/WINCH

2nd. Load



C-47
R4D-1, a-5

EXTERNAL STOWAGE

PACKS — FORWARD (D)
CENTER (E)
REAR (F)

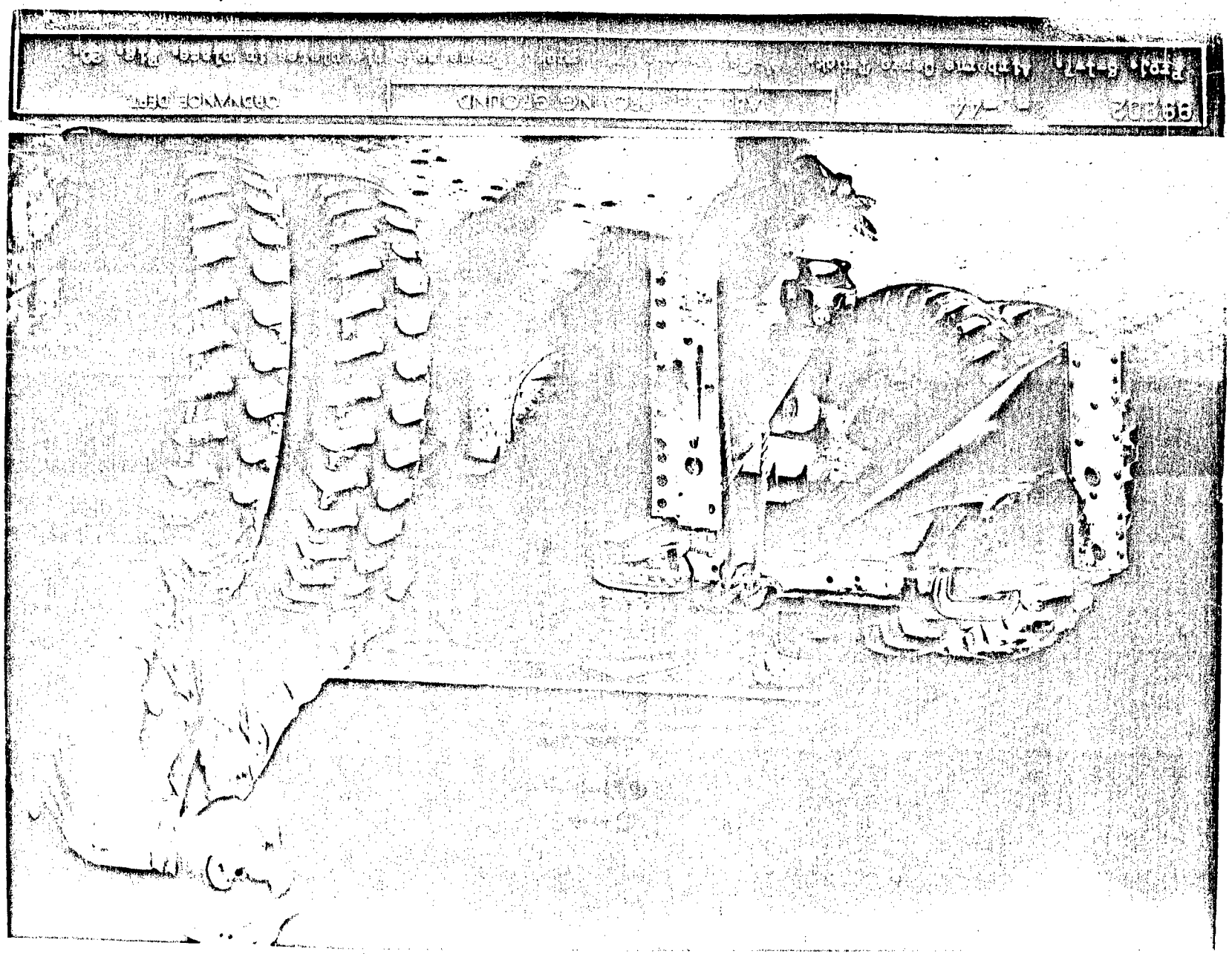
PROPS — REAR (G)
F'W'D - NO SCALE REQUIRED

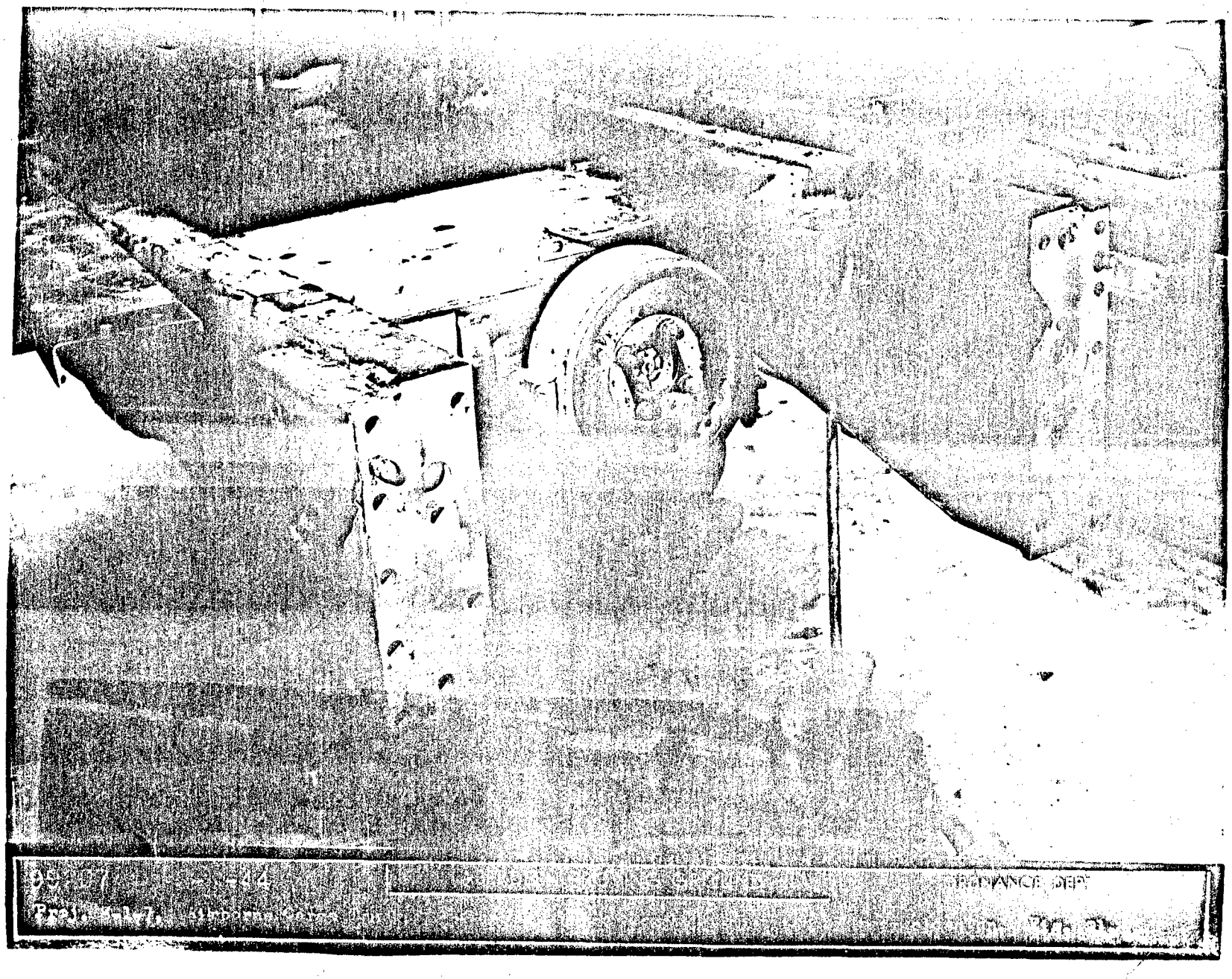
Cargo Wt. - 5210 lbs.
C. of G. - 30 Index Units

Test No. 49

DEPARTMENT OF ECONOMICS

DECLASSIFIED





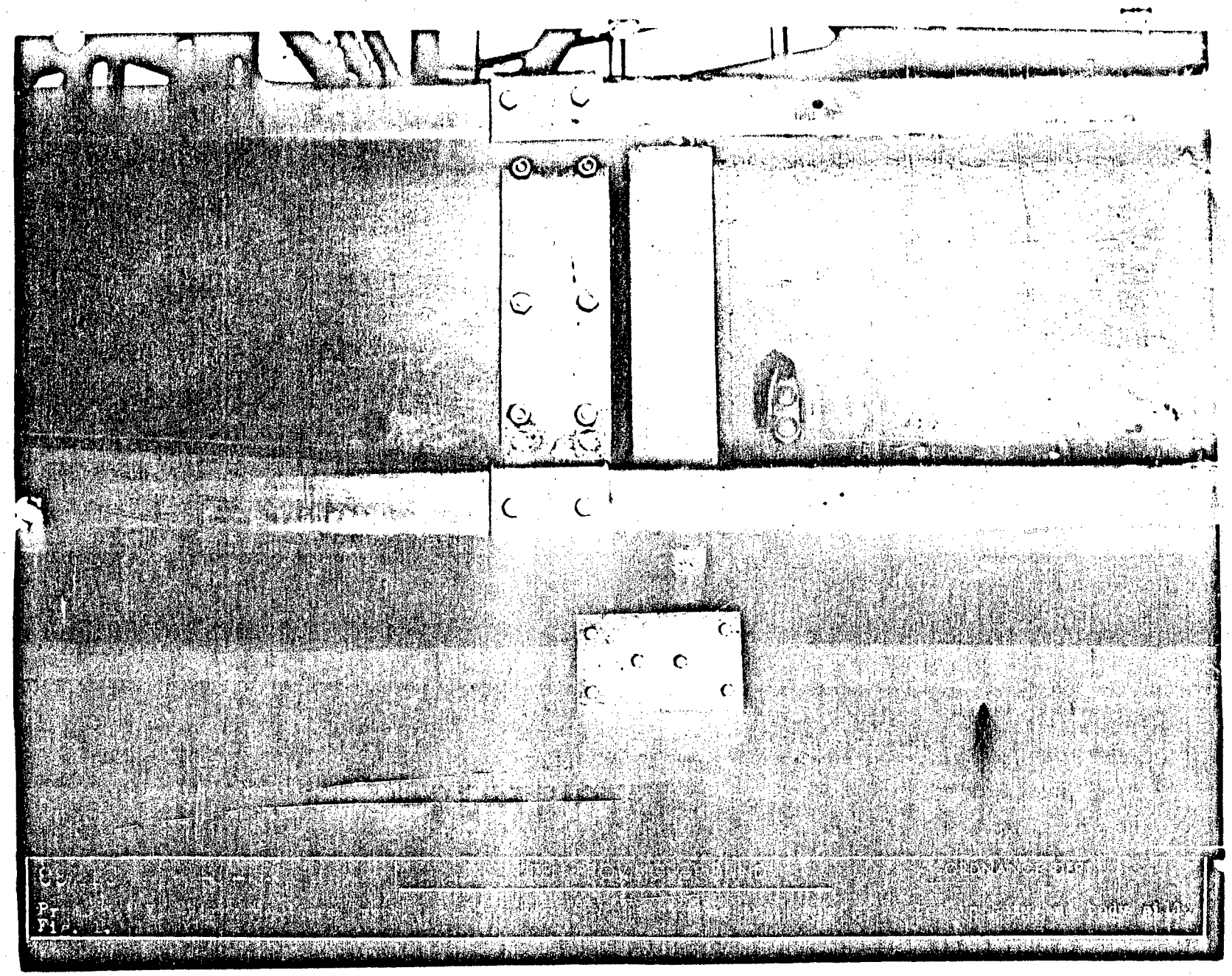
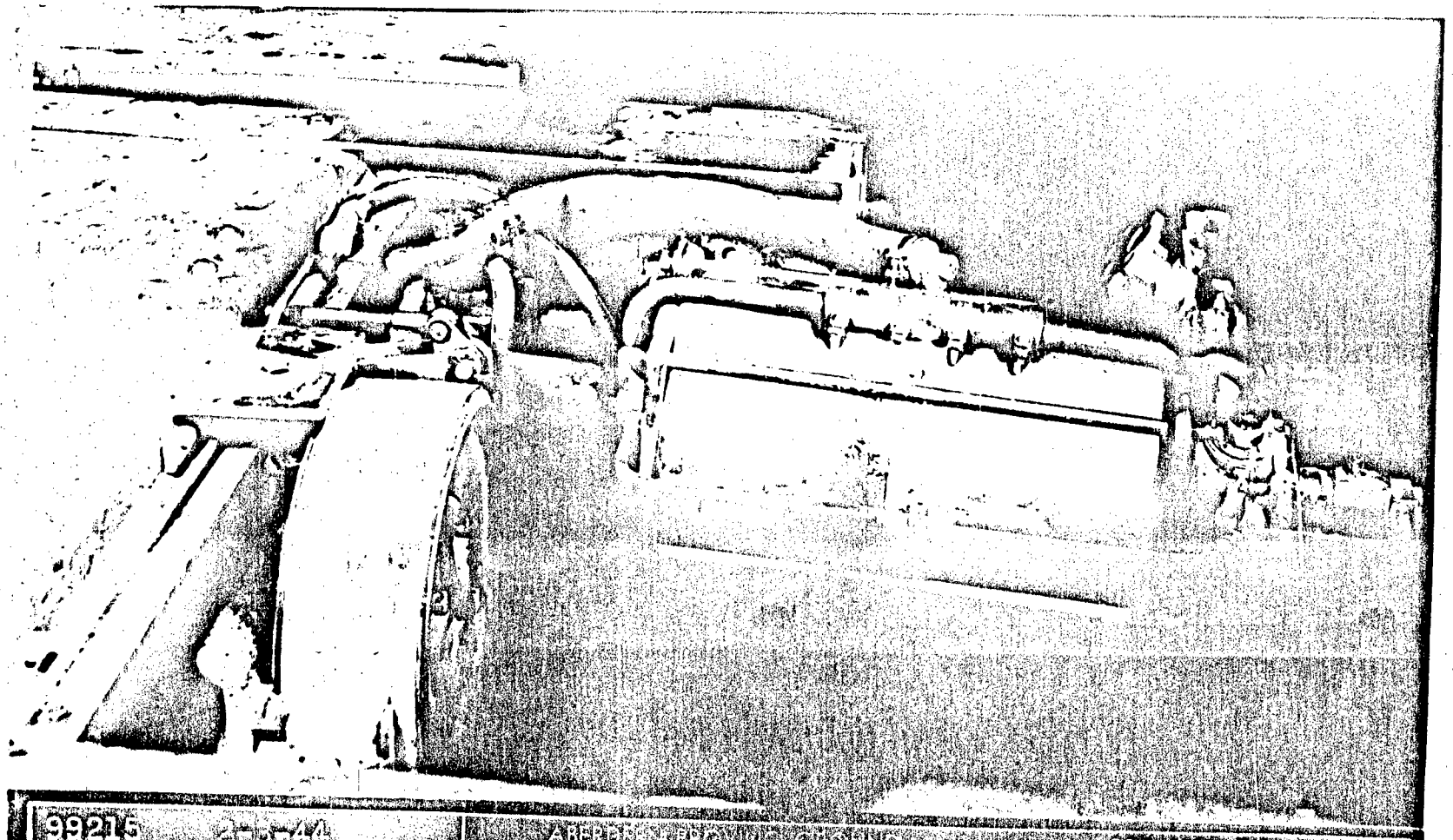


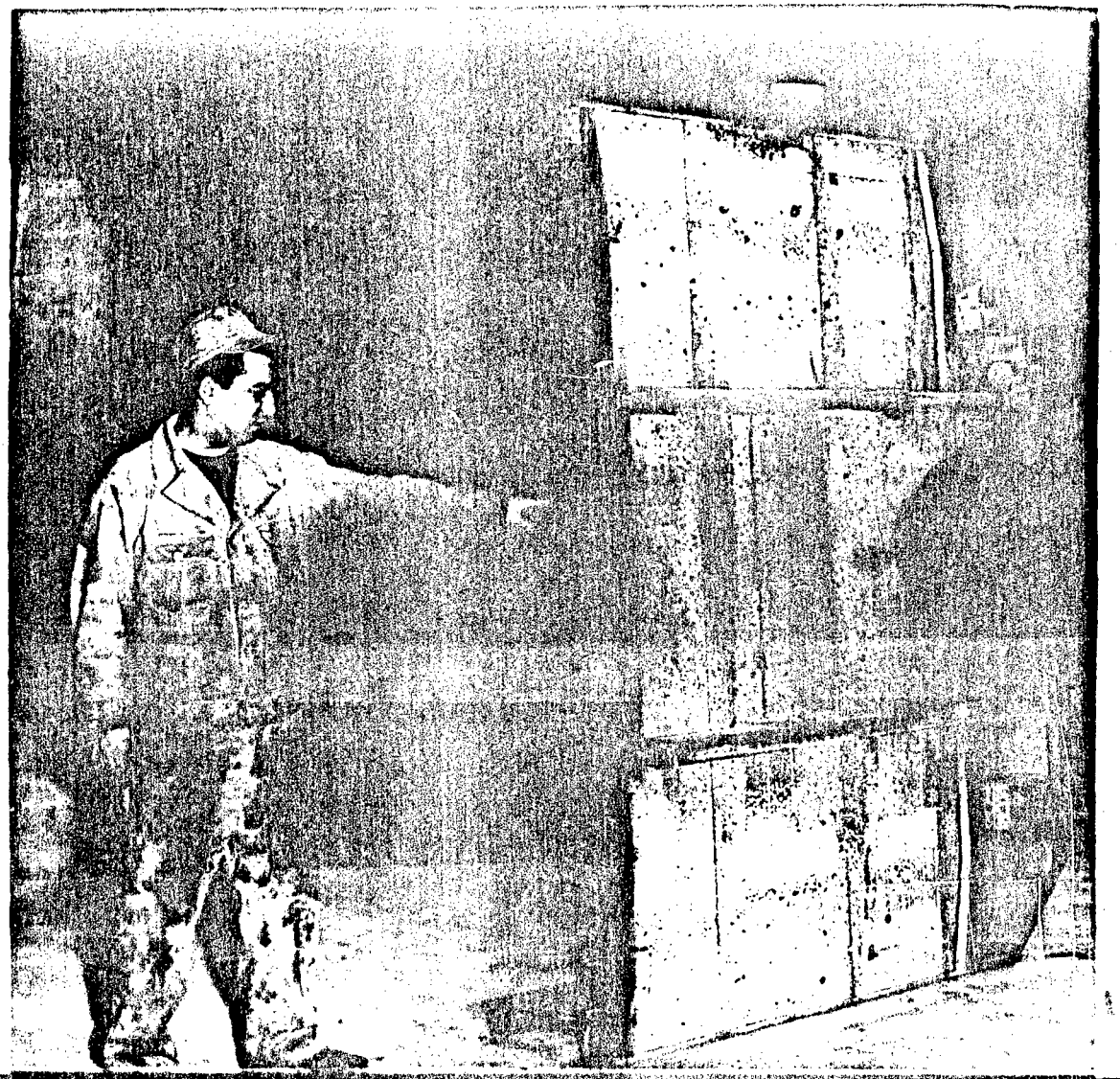
Fig. 1.

RESTRICTED



99215 2-5-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

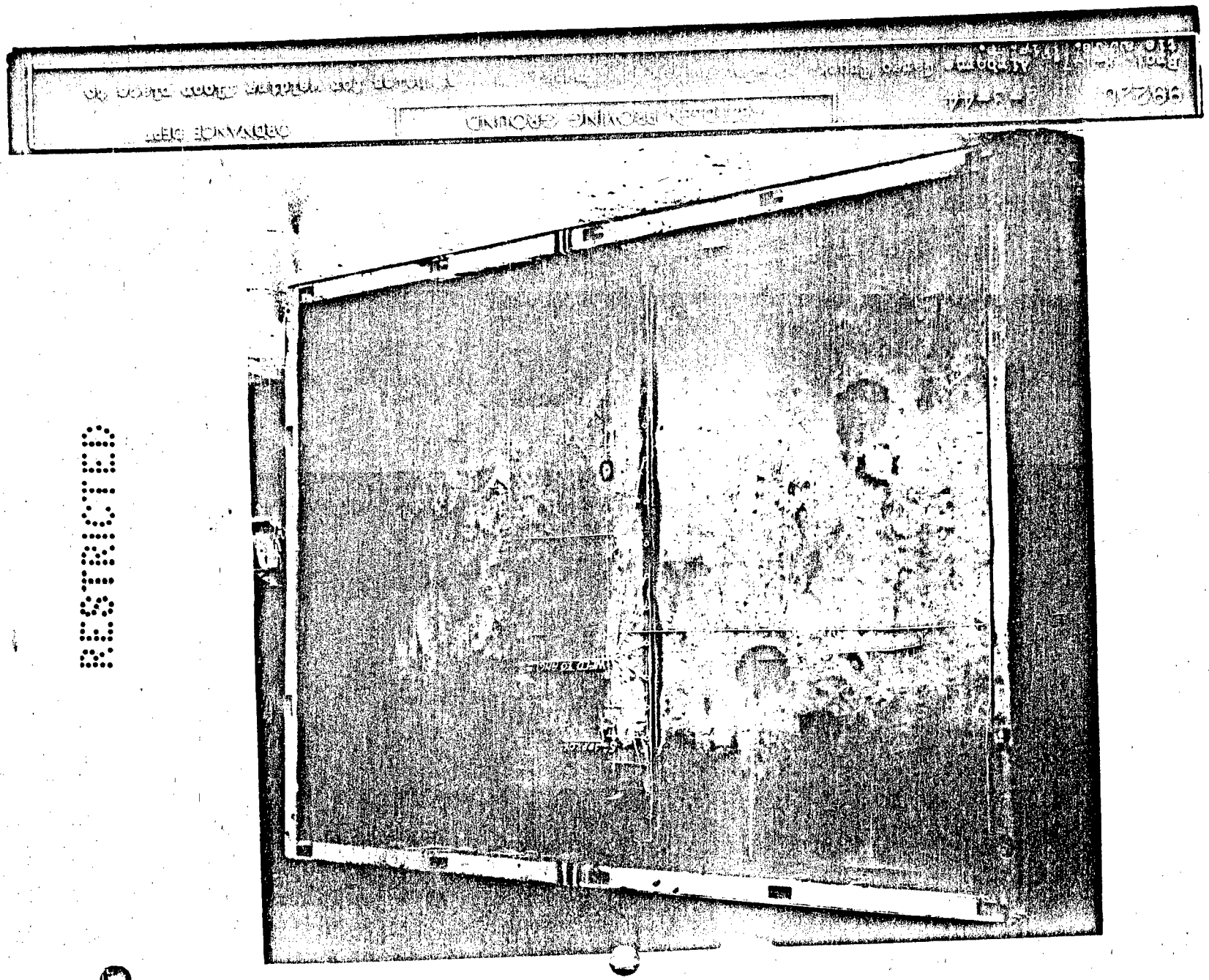
Proj. 8-1-7. Airborne Cargo Truck [illegible] Assembly. Fig. 26.



99216 2-3-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

Proj. 3-1-7. Airborne Cargo Truck. 2-Ton [illegible] Truck. [illegible] apple belted in place. Fig. 5.

RESTRICTED



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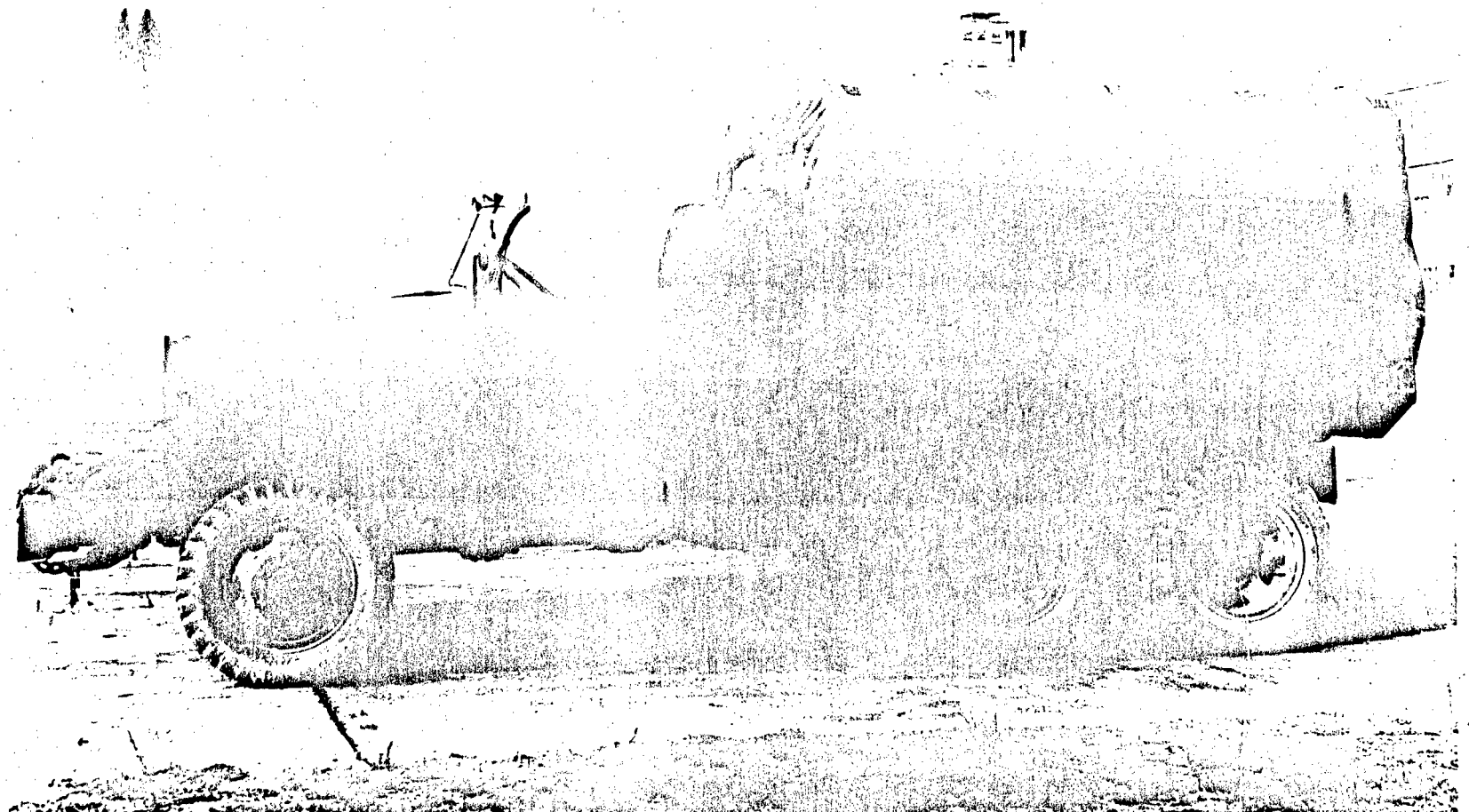
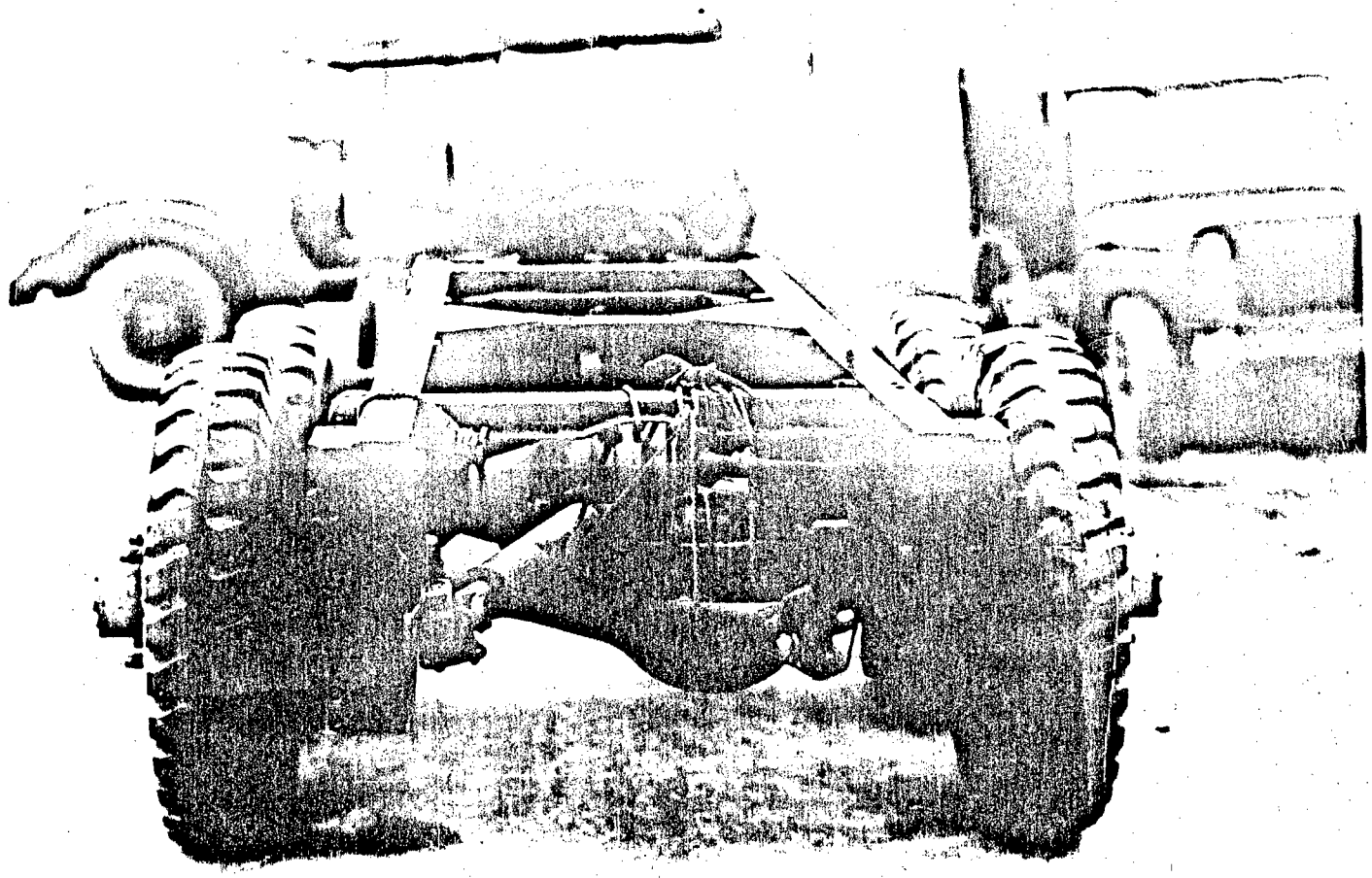


99339 2-8-44	ABERDEEN PROVING GROUND	ORDNANCE DEPT.
Truck, Airborne, 2½-Ton 6x6 G.H.P.	Short wheel base	

ORIGINAL

RESTRICTED



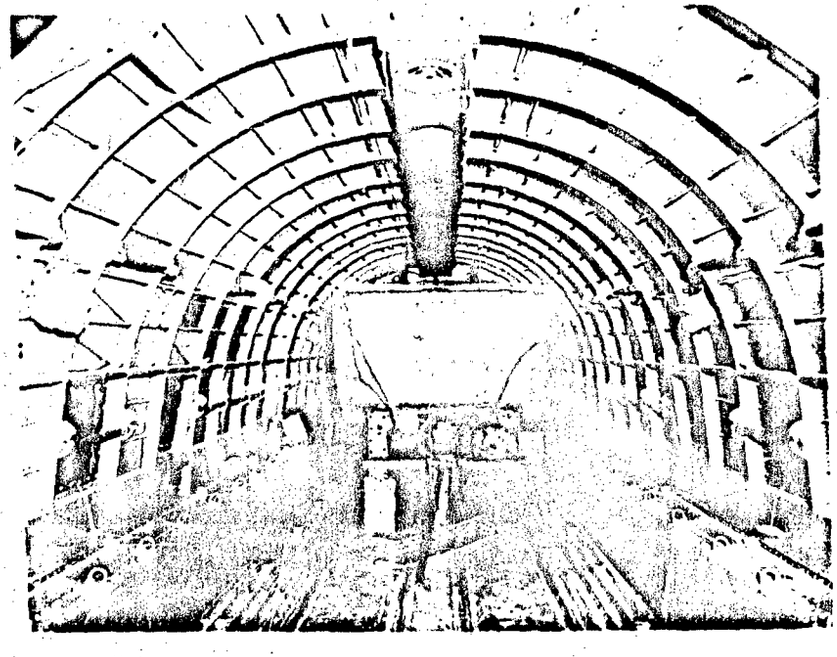
99348 2-5-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

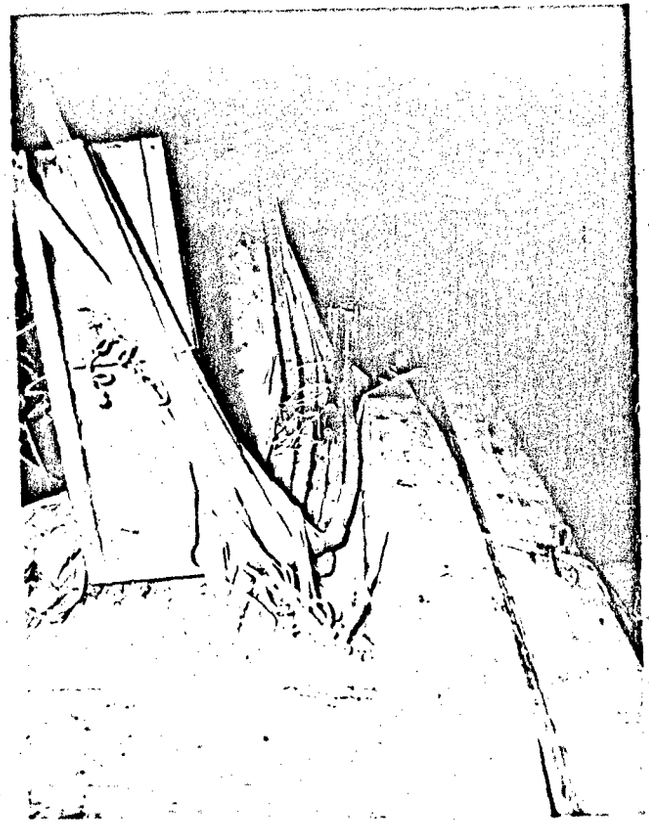
Truck, Airborne, 2½-Ton 6x6 G.M.C. Rear section.

RESTRICTED

99355	2-6-44	ABERDEEN PROVING GROUND	ORDNANCE DEPT.
Truck, Airborne, 2½ Ton 6x6 G.M.C.		Unloading Construction of Chassis	

RESTRICTED





[illegible] PROVING GROUND ORDNANCE DEPT

[illegible]

Tests Nos. 50 and 51

INSTALLATION OF HRUSH, 2-1/2 TON, 6 x 6 IN B-17 AND B-24

A. This installation was found to be entirely impractical since a complicated disassembly procedure is required for loading into the bomb bays of these ships.

Test No. 52

LOADING TRUCK, 3/4-TON, 4 X 4, WEAPONS CARRIER WITH WINCH IN C-47A TRANSPORT PLANE

A. 1. Description: Loading and transporting this vehicle in the C-47 Transport Plane requires that the chassis be stripped of paulin, top bows, body, fenders, running boards, rear axle assembly, driver's seat and right tail light as shown in photograph 99852-3. The same one-wheel dolly photograph 99762 used with the forward chassis section of the 2-1/2 ton truck is used on the chassis section of this vehicle. The same wooden ramp used in loading the 2-1/2 ton truck is also used. The only modifications required to the truck itself are on the cab floor sill as shown in photograph 99762 and the hydraulic brake lines at the rear axle as shown in photograph 99798.

2. Disassembly: Disassembly of the truck preparatory to loading into the plane requires approximately 3 man hours of labor.

3. Loading: The chassis section with the one wheel dolly at the rear is driven up the ramp and into the cargo compartment of the plane under its own power. The rear axle assembly is rolled up the ramp by hand and the remaining parts of the truck are manually loaded. Diagram No. 52 and photograph 99764 show the loading arrangement inside the plane. Note that the dimensions of the body section are such that it cannot be set up on the edge or laid flat on the floor of the plane, but must be supported above seat height by two 2" by 4" by 92" wooden timbers placed crosswise of the cargo compartment with ends resting on the seat ledges. Estimated loading time with crew of six men is 30 minutes. **Reference also A.P.G. Photographs 99781 and 99797.**

B. 1. Unloading: Unloading is accomplished by first manually removing the spare wheel, rear axle assembly and body parts. The chassis section is then easily backed out of the plane and down the ramp under its own power. Estimated unloading time with crew of six men is 20 minutes.

2. Reassembly: Reassembly is just the reverse of the disassembly procedure requires approximately 6 man hours of labor.

C. Material used for installation:

1. a. Two pieces of planking 2" by 6" by 6" under wheels.

b. Two blocks 8" by 8" by 21".

c. Three pieces of lumber 1" by 6" by 36" under dolly.

d. Two pieces of planking 2" by 4" by 92" under body.

e. Special wooden ramp using approximately 600 board feet of lumber and weighing about 900 lbs. See photograph 99355. (See Test No. 49).

2. Plane rigging: The tie-down equipment (Evans Skyloader Kit) furnished with the plane proved entirely adequate and satisfactory.

3. No additional rigging was used.

Test No. 52 (Cont'd)

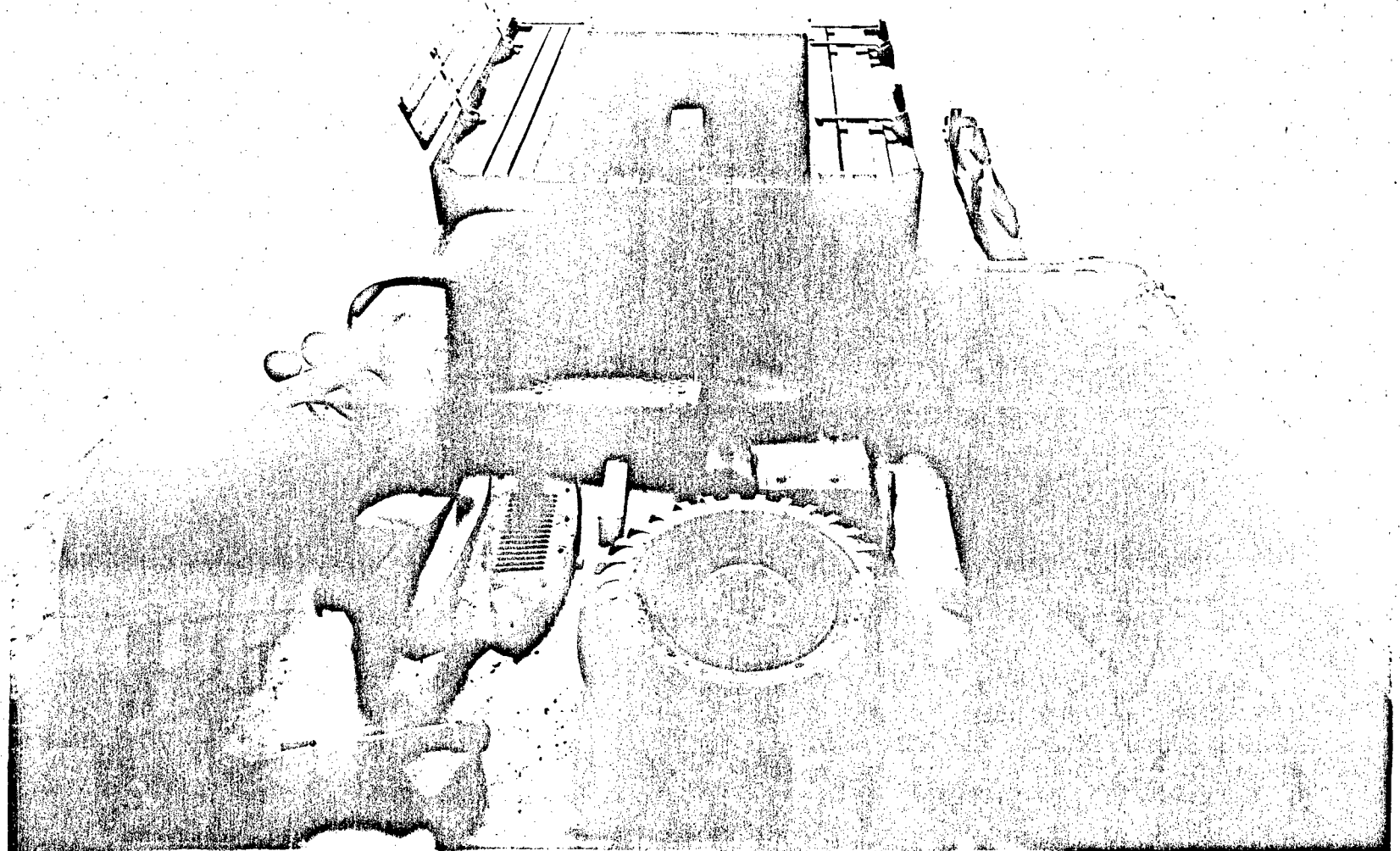
D. Weights

1. Chassis section .....3515 lbs.
2. Chains, tools, and fuel ..... 450 lbs.
3. Body, fenders, bows, paulin, etc..... 950 lbs.
4. Rear axle assembly ..... 450 lbs.
5. Spare wheel ..... 150 lbs.
6. Total weight .....5515 lbs.

Time of disassembly - 45 min. (4 men)
Time of loading - 30 min. (6 men)
Time of unloading - 20 min. (6 men)
Time of reassembly - 1-1/2 hrs. (4 men)

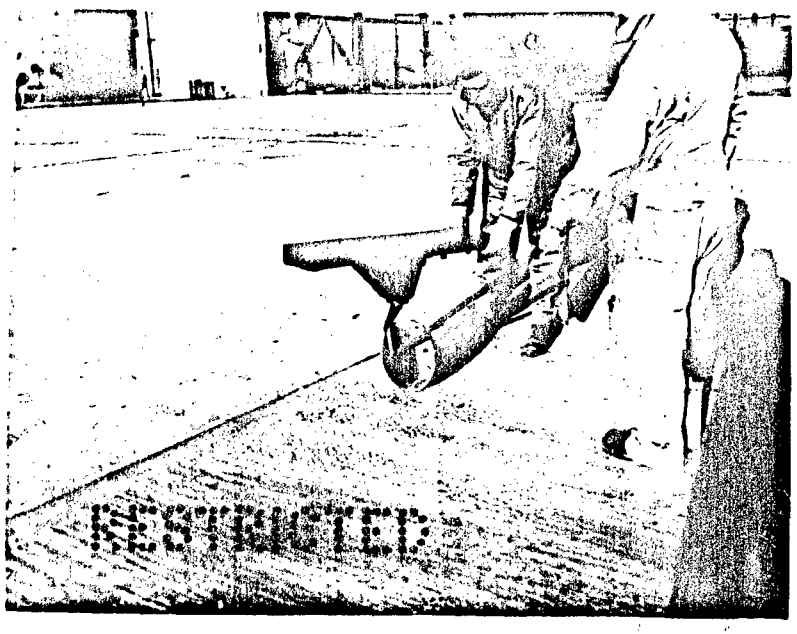
NOTE: In addition to assumed crew and cargo load 3 soldiers may be carried.

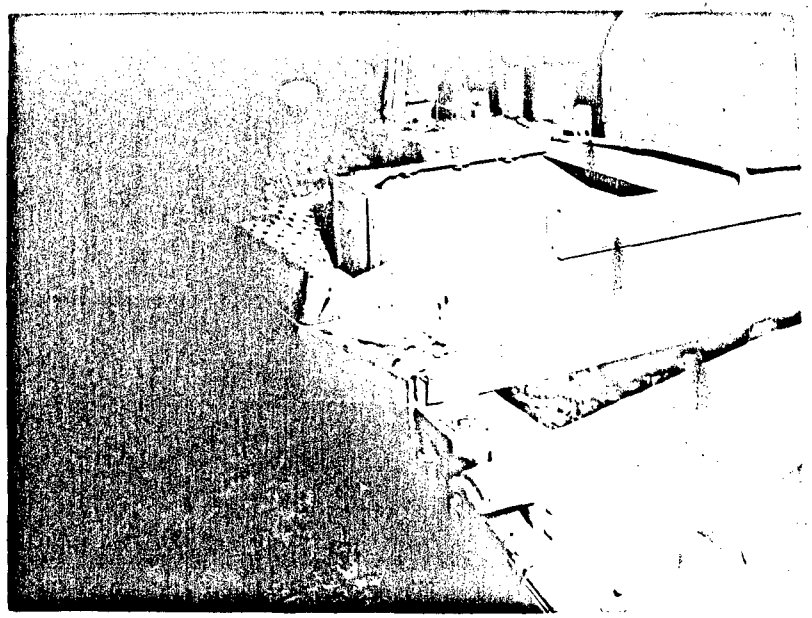
RESTRICTED



99853 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

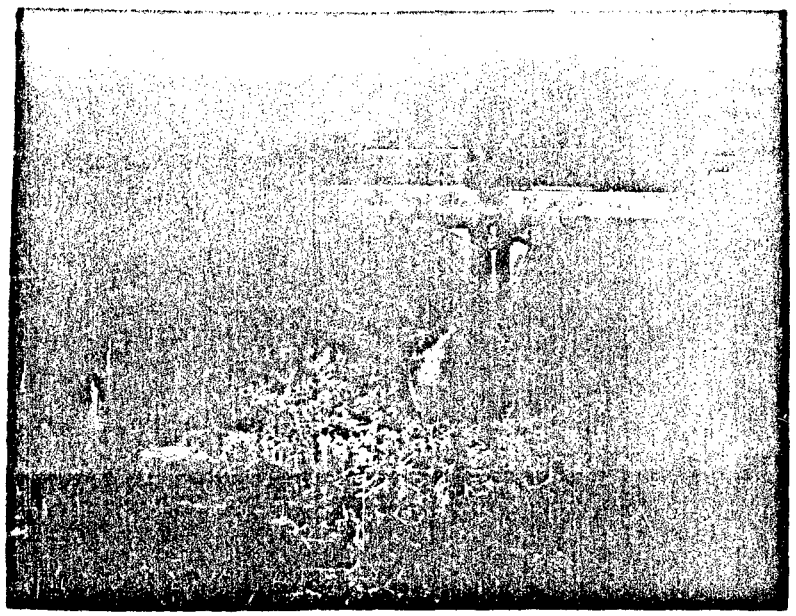
Truck, 3/4-Ton, 4x4, Weapons Carrier, [illegible] Greenwood Plant.

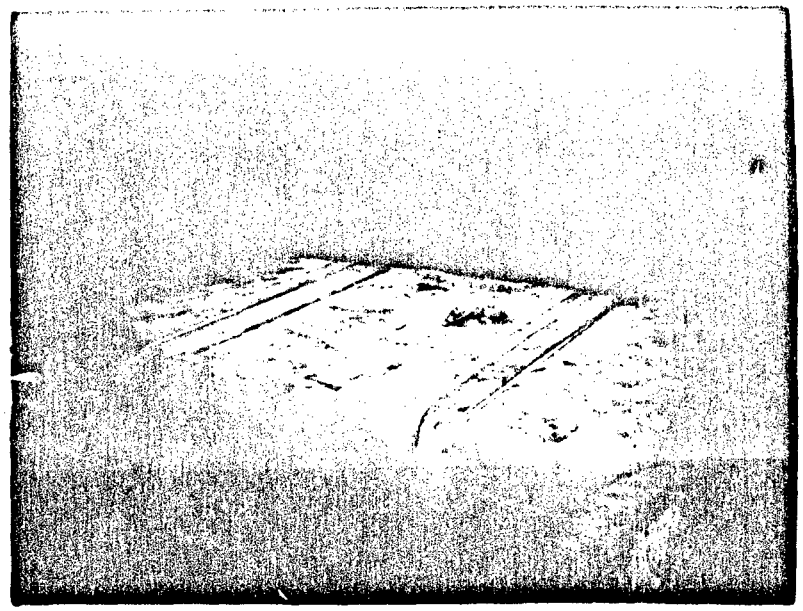


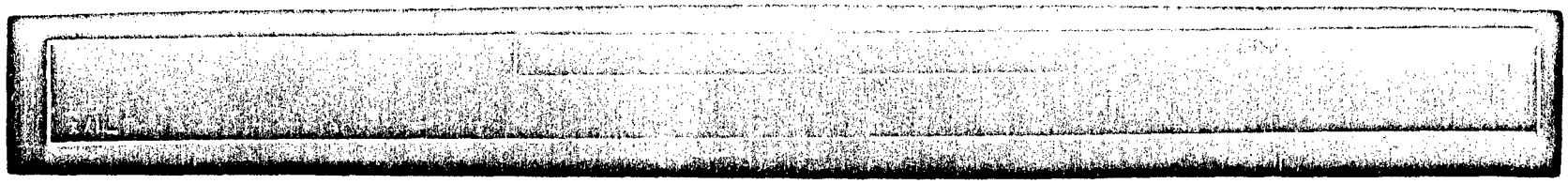


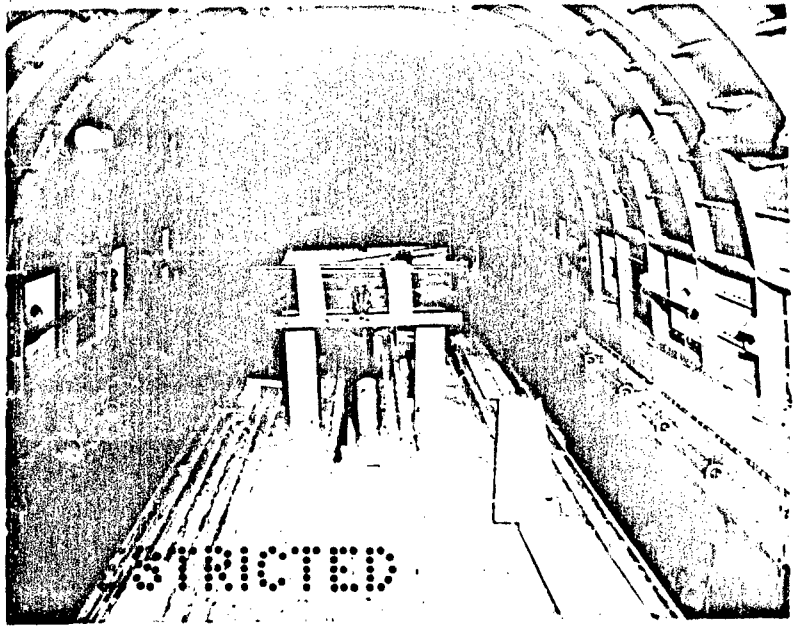
99762 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT.

LEFT: Loading dolly used for loading [illegible] section and 3/4 ton truck chassis section into C-47 Cargo Plane. RIGHT: Truck [illegible] Modification required in cab floor sill for clearance in loading onto C-47 Cargo Plane.





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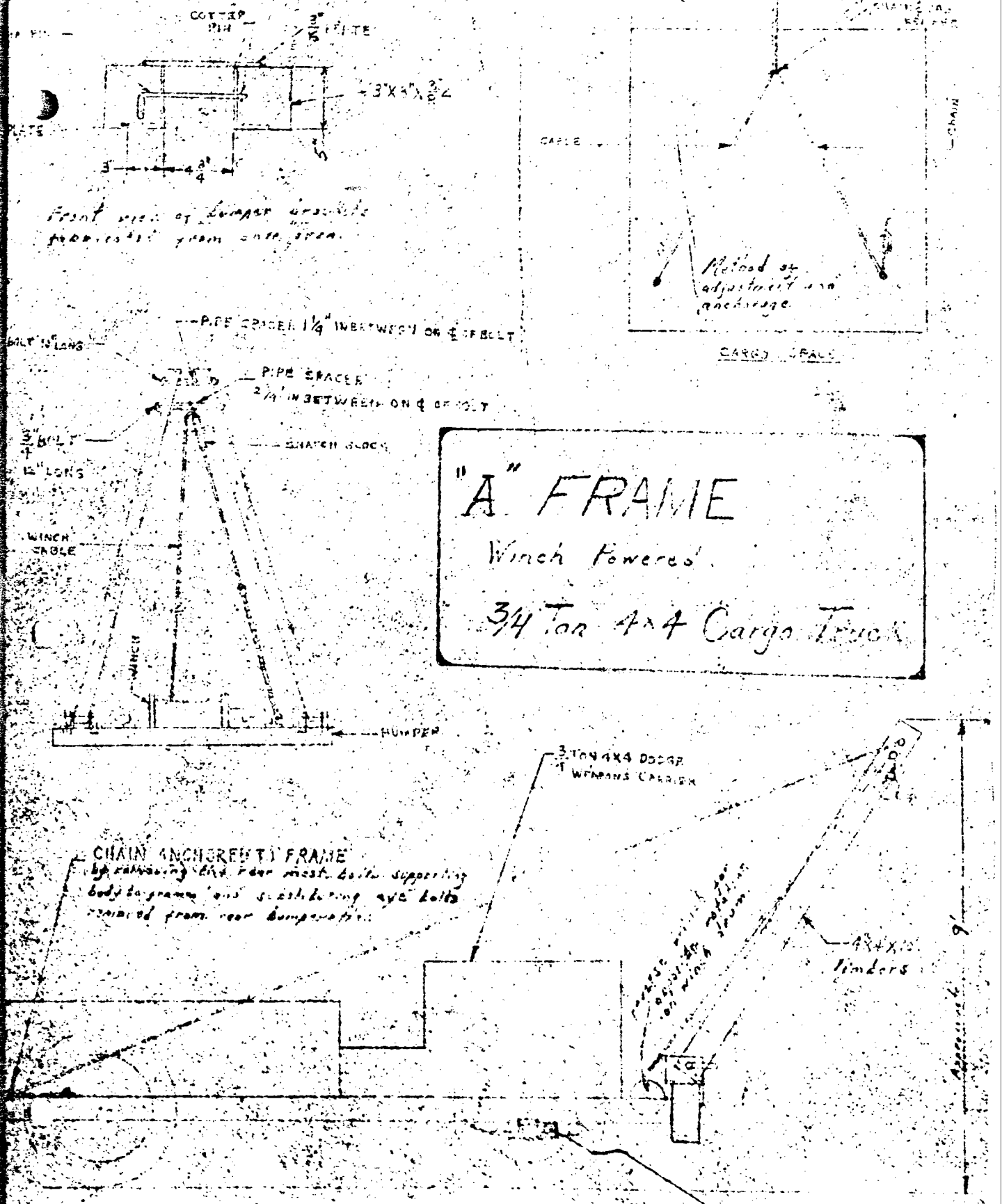
TEST NO. 52A

FRONT-MOUNTED "A" FRAME ON TRUCK, 3/4 TON, 4 X 4, WEAPONS CARRIER WITH WINCH

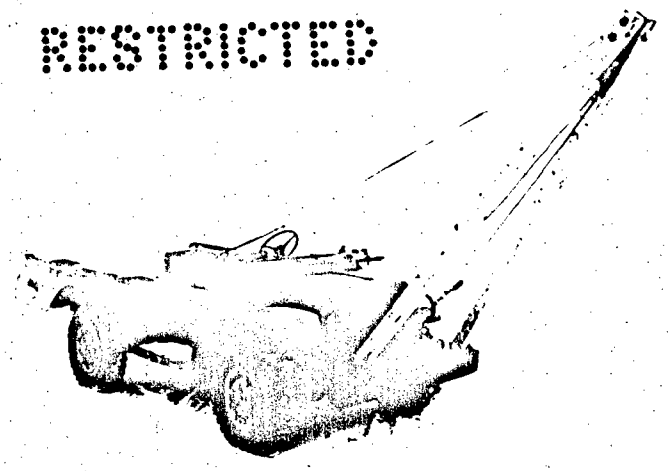
A. The need for an airborne means of unloading heavy parts and facilitating the assembly of partially disassembled equipment after it is unloaded from planes during airborne transportation prompted the construction of a simple "A" frame and mounting it on the 3/4 ton 4 x 4 truck. Since the 3/4 ton truck has been found to be transportable in a C-47 transport plane, this "A" frame answers that requirement.

B. Various photographs throughout this report show it in operation and testify to its usefulness. In lifting parts weighing about 4000 lbs. and over, the cargo body of the truck must be heavily loaded with ballast and an additional snatch block employed at the point of attachment to multiply the winch effort is desirable.

C. A.P.G. Photographs 99759A and 99760 show this "A" frame mounted on the truck while A.P.G. Sketch No. DS-5050A gives details of construction. The "A" frame complete with snatch block and stay cable weighed about 130 lbs. The "A" frame itself can if necessary be manufactured of salvage materials in any field or base shop and with minor modification is adaptable to the 2-1/2 ton 6 x 6 SWB cargo truck (Airborne) with winch.


COTTER PIN
3/16" PLATE
3"X3"X3/8"∠
PLATE
3"
4 3/4"
Front view of bumper brackets fabricated from axle area.
CABLE
CHAIN
Method of adjustment and anchorage
CARGO SPACE
PIPE SPACER 1 1/4" INBETWEEN ON ℄ OF BOLT
BOLT 12" LONG
PIPE SPACER
2 1/4" INBETWEEN ON ℄ OF BOLT
3/4" BOLT
12" LONG
SNATCH BLOCK
WINCH CABLE
WINCH
BUMPER
"A" FRAME
Winch Powered
3/4 Ton 4x4 Cargo Truck
3/4 TON 4X4 DODGE WEAPONS CARRIER
CHAIN ANCHORED TO FRAME
by removing the rear most bolts supporting body to frame and substituting eye bolts removed from rear bumpers
4"X4"X10' timbers
9'
BLOCK INBETWEEN

RESTRICTED



99760 [illegible] [illegible] ORDNANCE DEP
[illegible]

Tests Nos. 53 and 54

INSTALLATION OF TRUCK, 3/4-TON, 4 x 4 IN B-17 AND B-24

A. This installation was found to be entirely impractical since a complicated disassembly procedure is required for loading into the bomb bays of these ships.

TEST NO. 55. INSTALLATION OF TRUCK 1/4 TON 4 x 4 IN C-47 AIRPLANE

Details of this installation are shown in the report of the Airborne Command of tests conducted at Camp MacKall, North Carolina. Numerous other installations of the 1/4 ton truck have been made in this plane and it has been found that no particular problems are involved since it is necessary to merely drive the truck up the ramp into the ship under its own power.

TEST NO. 55A

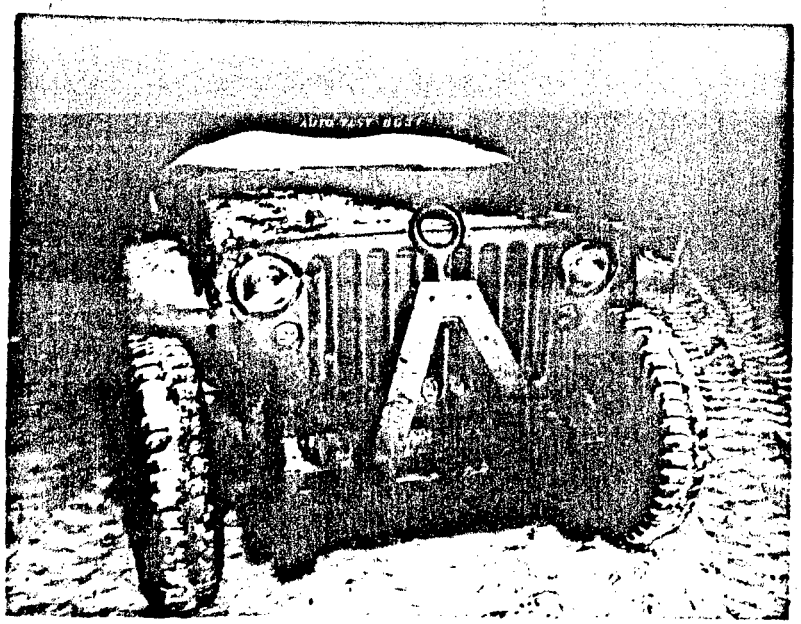
TANDEM HITCH FOR 1/4 TON 4 X 4 TRUCK

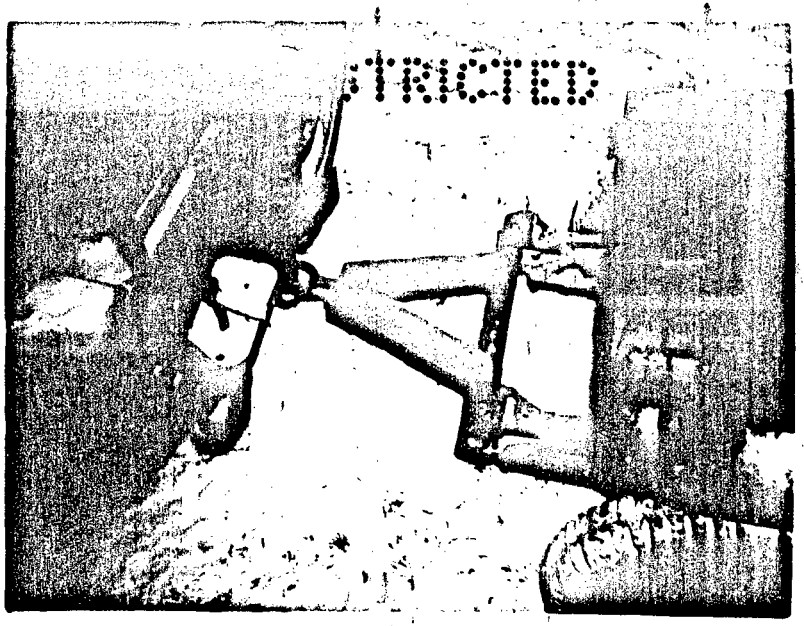
A tandem hitch for the 1/4 ton 4x4 truck has been developed and put to limited use by the Field Artillery to move artillery weighing in excess of 2500 lbs.

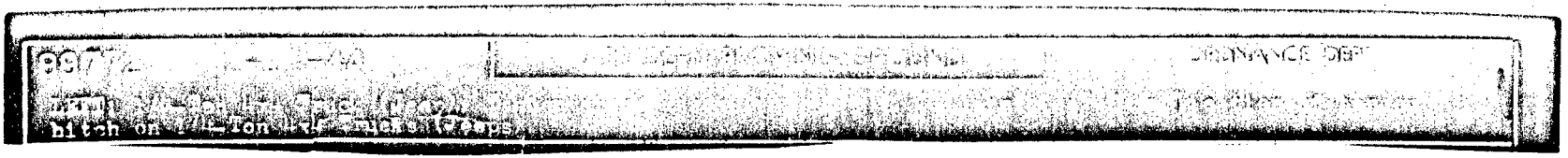
A.P.G. Photograph 99772 shows the hitch in its folded position when not in use and its position when coupled to a companion 1/4 ton 4 X 4 military vehicle.

As shown in the photograph the design of the hitch is such that it could be easily duplicated with the facilities available in any third or higher echelon shop.

Two 1/4 ton trucks coupled in this manner provide a prime mover that could be airborne and put into service with the least possible delay after the plane has landed.




TRICTED


ORDNANCE DEPT

Tests Nos. 56 and 57

INSTALLATION OF TRUCK, 1/4-TON, 4 x 4 IN B-17 AND B-24

A. This truck was installed, disassembled in the B-17 and B-24 airplanes. The details of this installation are recorded in the Airborne Command report of tests conducted at Camp Mackall.

TEST NO. 53

INSTALLATION OF CLARK AIRBORNE TRACTOR WITH DOZER AND WINCH 20 DB HP in C-47 AIRPLANE

A. This information was extracted from a tentative airborne aviation Engineer Manual. This unit was designed as cargo for the C-47 Airplane and, therefore, no difficulty was experienced during the installation operation. The standard C-47 loading ramps were used and 1" x 6" planking was placed on the tread ways within the cabin to protect the plane flooring. It was found necessary to back the tractor into the plane. When the center of gravity of the tractor was between the D and E Compartments, the dozer blade was lowered and the ignition disconnected. The transmission gears remained engaged and the forward reverse clutch was also engaged. The steering brake controls were locked and the tractor lashed in place to available eyebolts in the floor. Chock blocks may be placed in front of and to the rear of each track tread to increase the security against any movement. Diagram No. 53 shows the floor plan of this loading arrangement. No photographs were available as this test was not conducted.

B. To remove the tractor from the plane, the loading operation is reversed, but care must be exercised in approaching the inclined portion of the loading ramp to prevent the tractor from crossing the balance point too rapidly as it is likely to slide and jump off the ramp.

C. Material Used for Installation.

1. Two pieces of 1" x 6" planking 12' long.

2. Plane rigging. None required.

3. Additional rigging. Two lashings of 5/8" rope 10' long.

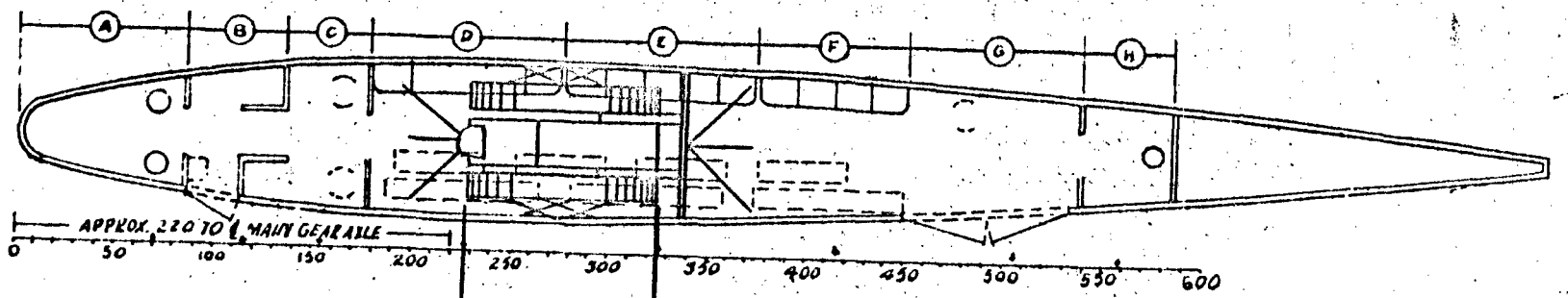
D. Weight.

Tractor ..... 4135 lbs.

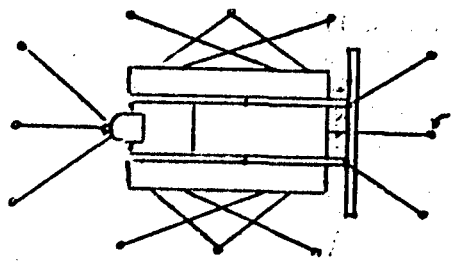
In addition to assumed A/P crew and above load, 7 soldiers may be carried.

Time for loading - 25 min.

Time for removal - 25 min.



Overall Length of Tractor - 96"
Weight of Tractor - 4135 lbs.



LASHINGS

C-47

C. G. - 17 Index units
Cargo Wt. - 4135

TEST NO. 58

Tests Nos. 59 and 60

INSTALLATION OF TRACTOR, CRAWLER, 20 H. P. IN B-17 AND B-24

A. This installation was found to be entirely impractical since a complicated disassembly procedure is required for loading into the bomb bays of these ships.

TEST NO. 62

LOADING 1/4-TON CARGO TRAILER INTO B-17 BOMBER

A. Description.

Loading and transporting this trailer in the B-17 Bomber requires that it be completely disassembled. The body of the trailer is placed edgewise in one side of the bomb bay with the bottom toward the center catwalk and lifted into place by means of the bomb hoists. The upper side of the trailer body was lashed with the cable to the uppermost bomb shackles and the lower side supported on wooden cross-members placed across the catwalk to longitudinal members of the fuselage. The disassembled parts were all placed within the body of the trailer and braced in place with 2" x 4" planking from the bomb racks. The entire unit was then lashed to the bomb racks with rope. A second trailer can be loaded similarly in the opposite bomb bay. Estimated loading time with a crew of four men is 30 minutes per trailer. Loading diagram No. 62 shows the arrangement of the trailers in the bomb bay. Reference A.P.G. Photograph No. 99861.

B. Unloading.

Unloading was accomplished manually by a 4-man crew in 15 minutes per trailer.

C. Materials Used For Installation.

1. Lumber.
   a. Four pieces of planking, 2" x 4" x 30"
   b. 30 ft. of 2" x 4" planking cut to length for bracing
   c. 7 ft. of 5/16" wire cable
   d. Four 5/16" cable clamps
   e. 100 ft. of 3/8" rope

D. Weights.

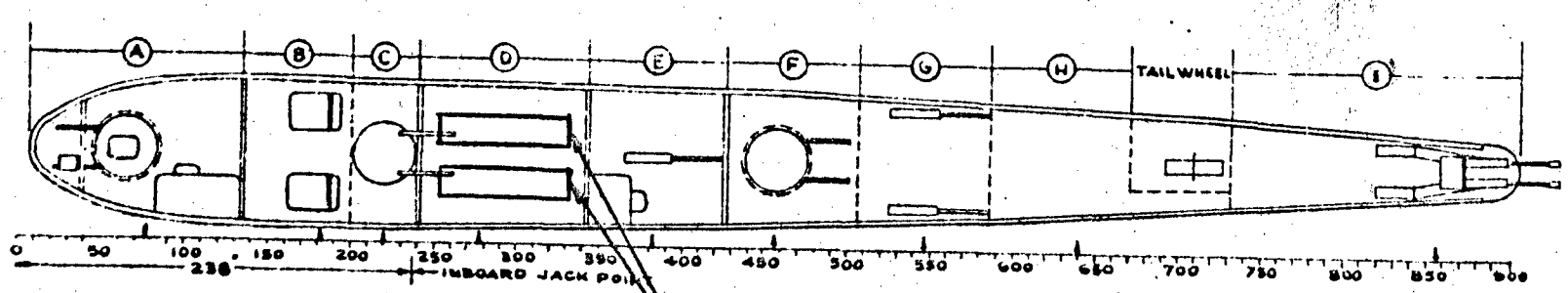
Two (2) 1/4-Ton Cargo Trailers .....1,100 lbs.

E. Estimated Time (Four (4) Man Crew) Per Trailer.

1. Disassembling ..... 30 min.
2. Loading ..... 30 min.
3. Unloading ..... 15 min.
4. Reassembling ..... 30 min.

Note; In addition to assumed crew, 9,500 lbs. can be added in bomb bay and 12 soldiers may be carried.

1/4 Ton 2 Whee. argo Trailer



1/4 Ton 2 Wheel Cargo Trailer (complete)
550 lbs. each

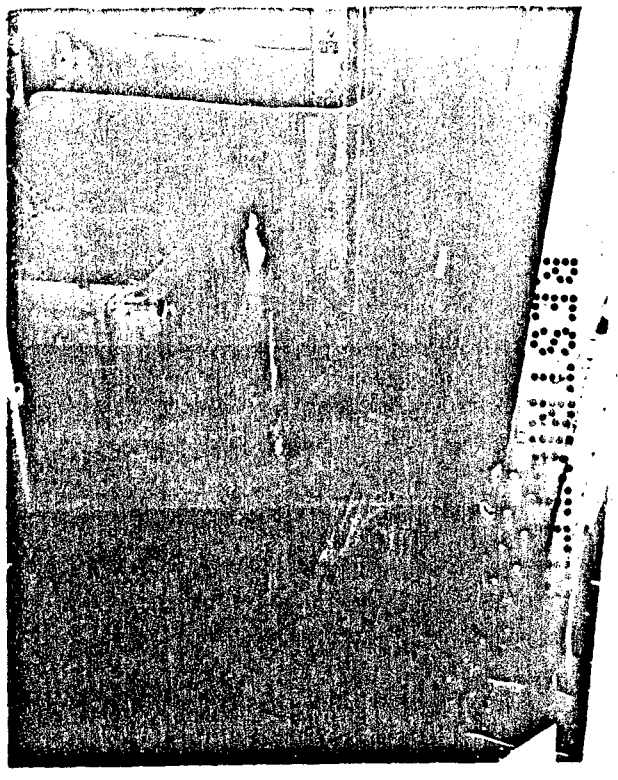
C.G. = 20.5 Index Units

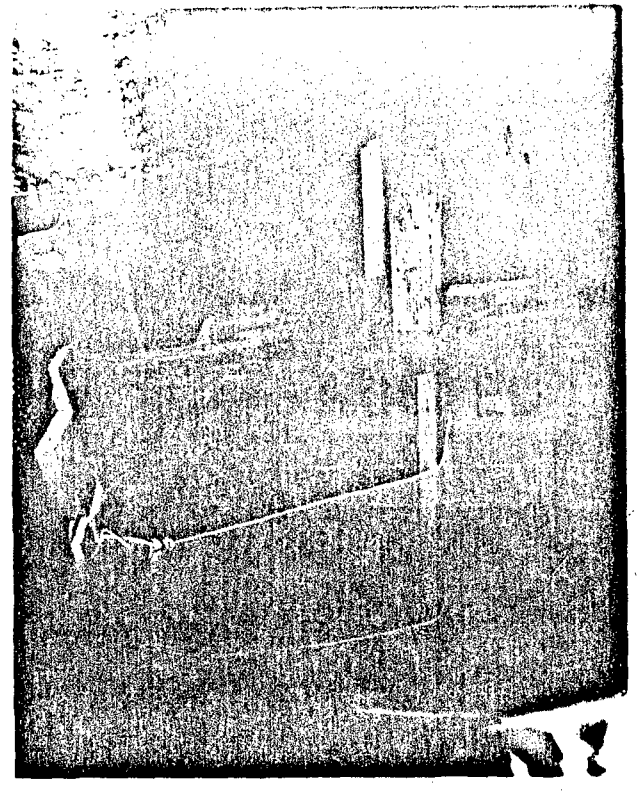
Cargo Wt. = 1100 lbs.

Note: Additional weight may be added in Bomb bay up to 9,500 lbs.

B-17G

TEST NO. 62





99861 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

1/4" Top Cargo Trailer loaded and lashed

Test No. 61 and 64

Loading 1/4-Ton and 1-Ton Cargo Trailers Into C-47 Transport Plane

A. The weights and physical dimensions of these trailers are such that both of them can be loaded into the C-47 Transport Plane without any modification or disassembly except removing the paulin and body racks on the 1-ton trailer and placing these parts in the trailer body. The 1/4-ton trailer was actually loaded by using the special wooden ramp (Photograph 99355)* built for loading the 2-1/2 ton and 3/4 ton trucks, but the standard C-47 loading ramp can be used as well. The additional maneuverability afforded by using the special wooden ramp greatly facilitates loading the 1-ton trailer, but the standard C-47 loading ramp can be used if necessary. The 1-ton trailer is rolled backwards up the ramp and into the forward end of the cargo compartment in the plane. The 1/4-ton trailer can then be rolled into the plane, either end foremost and lashed down behind the 1-ton trailer. Since the combined weight of both trailers is only 2050 lbs., an additional load of approximately 4000 lbs. can also be carried simultaneously. Loading diagram No. 61 and 64 shows the loading arrangement and designates the additional load that may be carried in each compartment of the plane. Reference is also invited to Photograph 99764 showing the two trailers loaded into the plane. Estimated loading time of two trailers only with crew of 4 men is 15 minutes.

B. Unloading: Unloading is simply accomplished by manually rolling the trailer out of the plane and down the ramp. Estimated unloading time of the two trailers only with crew of 4 men is 10 minutes.

C. Materials used for installation:

1. Lumber

a. Four pieces of planking, 2" x 6" x 42" under wheels.

b. One block, 6" x 6" x 12" for blocking under trailer "A" frames.

2. Plane rigging: The rigging furnished with the plane proved entirely satisfactory and adequate.

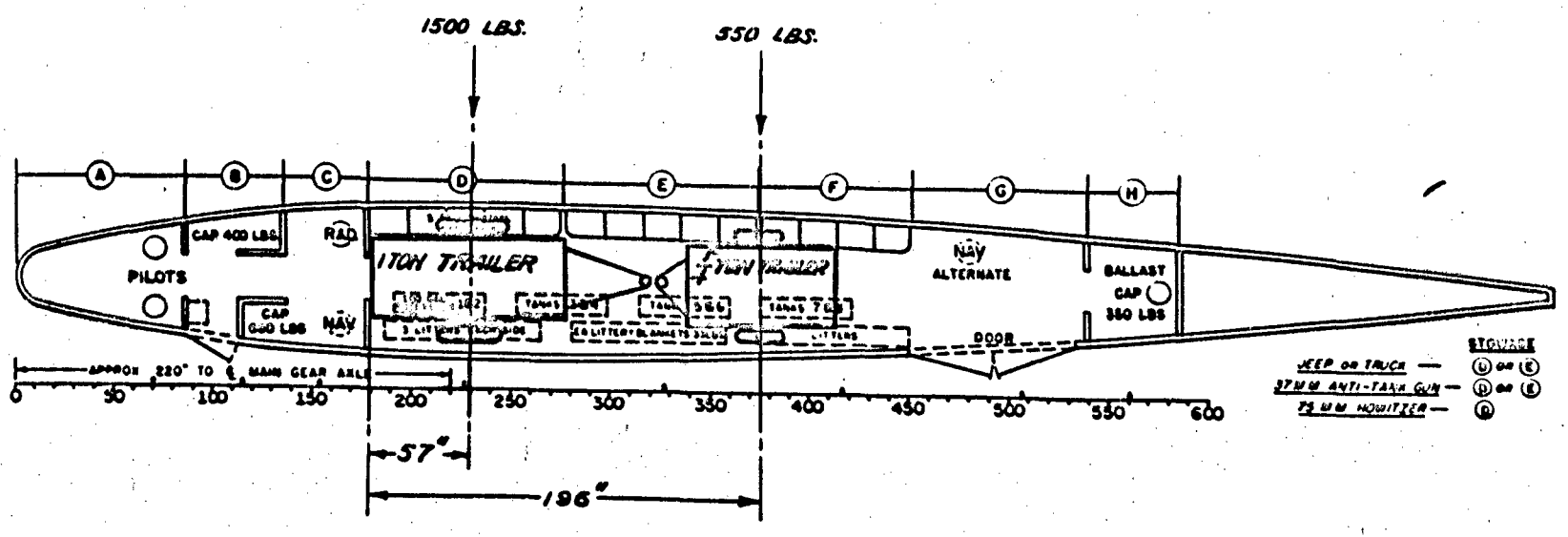
3. No additional rigging was used.

D. Weights:

	Lbs.
1-ton trailer	1500
1/4-ton trailer	550
Total Weight	2050
Permissible additional load	4000

* See Test No. 40.

1 TON AND 1/4 TON 2 WHEEL CARGO TRAILERS



4000 lbs. additional cargo may be carried and must be loaded as follows:

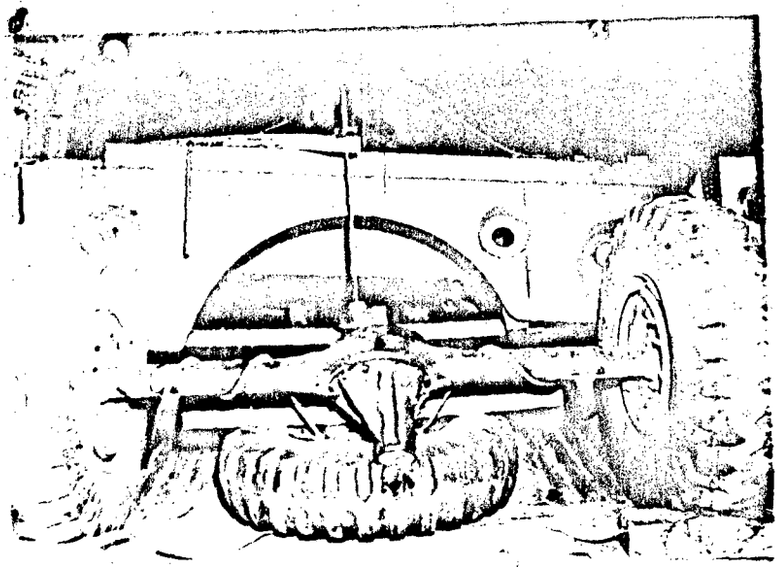
Compartment	Weight
D	1000 lbs.
E	1500 lbs.
F	1500 lbs.

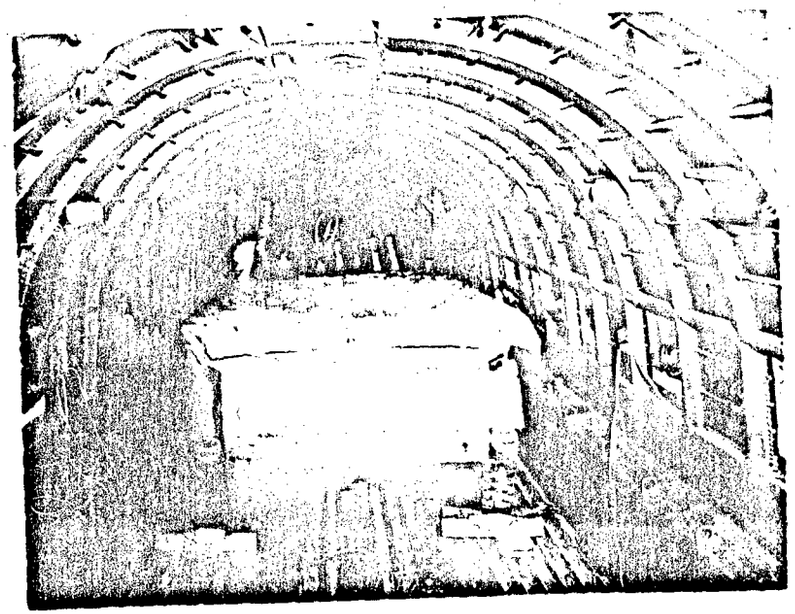
C.G. - 39.5 Index Units
Wt. - 6050 lbs.

C-47
R4D-1, a-5

EXTERNAL STOWAGE
PACKS — FORWARD D
CENTER E
REAR F
PROPS — REAR G
F'W'D - NO SCALE REQUIRED

Tests No. 61 and 64





LEFT: Truck, 3/4 ton, [illegible] Loaded into C-17

Test No. 65

LOADING OF ONE (1) TON CARGO TRAILER INTO B-17 BOMBER

A. Loading of the one-ton Cargo Trailer into this plane is impractical because the physical dimensions of the Trailer body are such that it must be cut into at least two pieces to permit installation. Since this trailer body is not supported by sills, it cannot be welded or bolted together sufficiently well to maintain its structural strength after it is once divided.

TEST NOS. 63 and 66

LOADING 1-TON AND 1/4-TON CARGO TRAILERS INTO B-24 BOMBER

A. Description.

Loading and transporting these trailers in the B-24 Bomber requires that both of them be completely disassembled. See A.P.G. Photographs Nos. 99254 and 99816. The cargo body of the 1-Ton trailer can then be loaded edgewise into one side of the rear bomb bay, manually filled with all the disassembled parts, and lashed into place as shown in Photograph 99777. A second 1-Ton trailer can also be loaded on the opposite side of the rear bomb bay. The cargo body of the 1/4-Ton Trailer is loaded edgewise into one side of the forward bomb bay, manually filled with all the disassembled parts and lashed into place as shown in A.P.G. Photograph No. 99788. A second 1/4-Ton trailer is similarly loaded in the opposite side of the forward bomb bay. The bomb hoists furnished with the plane are entirely adequate and satisfactory for lifting the trailer bodies into place. Loading diagrams Nos. 63 and 66 show the loading arrangement of these trailers in the plane.

B. Unloading.

Unloading is accomplished manually with the aid of the bomb hoists.

C. Materials used for installation.

1. Lumber.

a. Eight (8) pieces of planking, 2" x 4" x 60"

b. Eight (8) pieces of planking 2" x 4" x 36"

c. 10 ft. of 2" x4" planking cut to length for blocking.

d. 200 ft. of 3/8" rope for lashing.

e. 20 ft. of 5/16" wire cable.

f. Eight 5/16" cable clamps.

D. Weights.

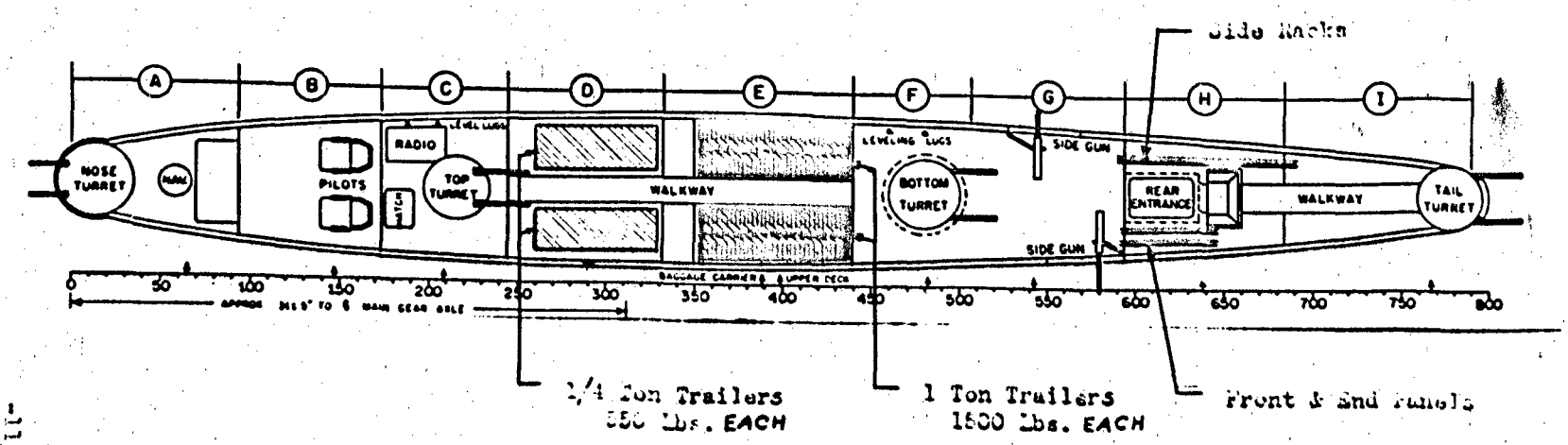
Two 1-Ton Cargo Trailers	3,000 lbs.	each
Two 1/4-ton Cargo Trailers	1,100 lbs.	each
Total	4,100 lbs.	

E. Estimated Time.

	1-Ton	1/4-Ton
Disassembly	30 min.	30 min.
Loading	30 min.	30 min.
Unloading	30 min.	30 min.
Reassembly	30 min.	30 min.
Total	2 hrs.	2 hrs.

Note: In addition to assumed crew and cargo load, 9 soldiers may be carried.

1/4 ... 1 TON 2 WHEEL CARGO TRAILERS

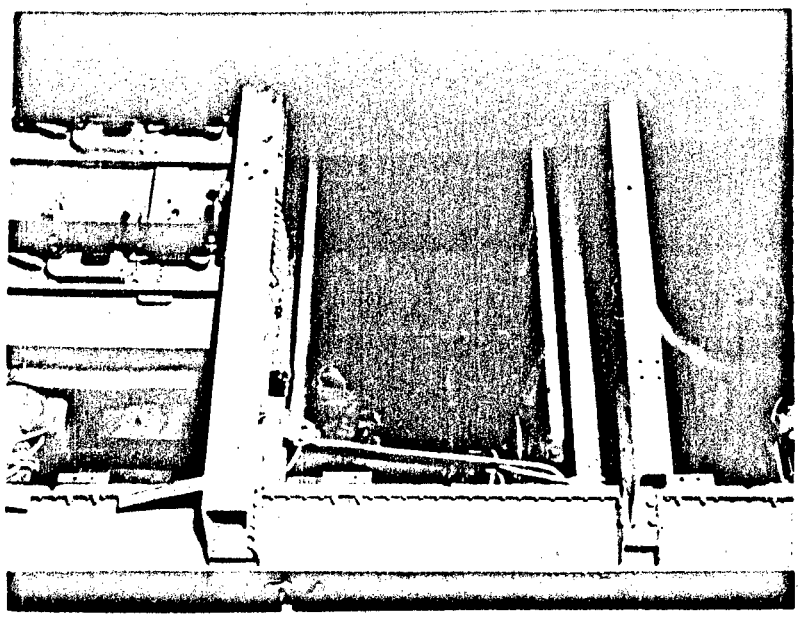


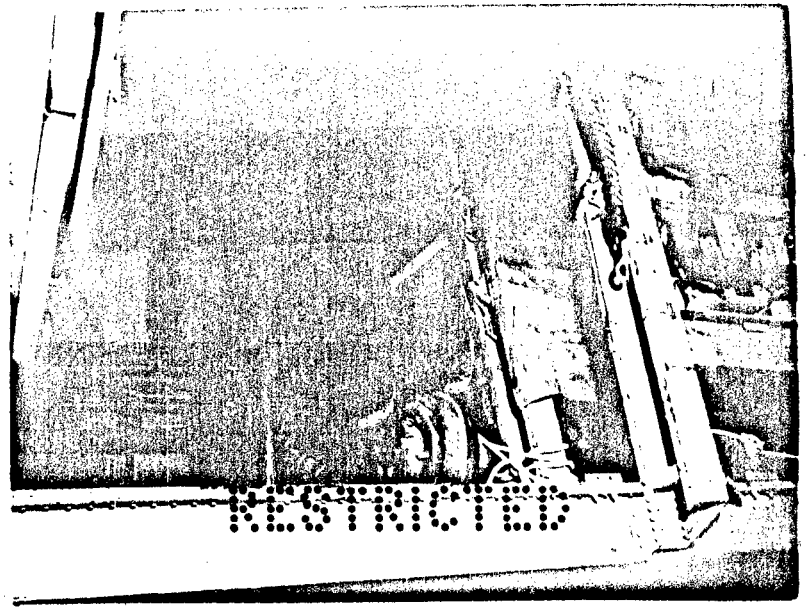
B-24D,E,G,H, & J
PB4Y-1

JIG POINT · STATION 41 AT 244 INCHES AFT OF STATION "B"
LEVELING LUGS ON BELT FRAMES 3.1 AND 3.2 — RIGHT HAND SIDE BENEATH FLIGHT DECK
ON BELT FRAMES 6.1 AND 6.2 — RIGHT HAND SIDE

C. of G. - 67.5 Index Units
Cargo Wt.- 4100 lbs.

Tests Nos. 63 and 66

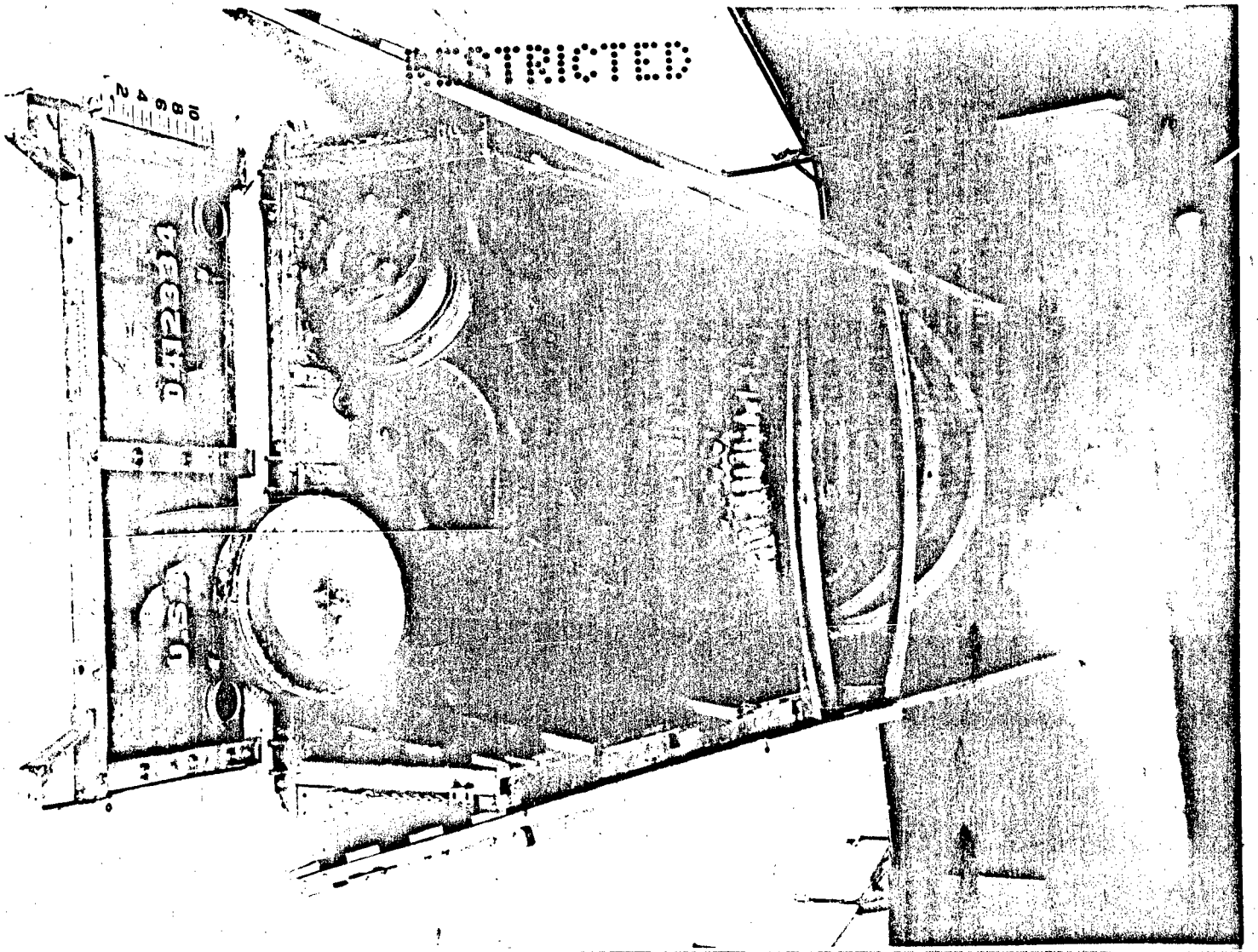




99788 2-11-44 ABERDEEN PROVING GROUND ORDNANCE DEPT

1/4 Ton 2 Wheel Cargo Trailer Blocked

RESTRICTED



99854 2-11-44 | ABERDEEN PROVING GROUND | ORDNANCE DEPT.

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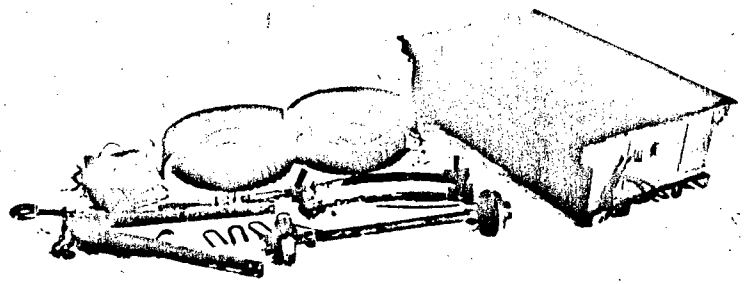

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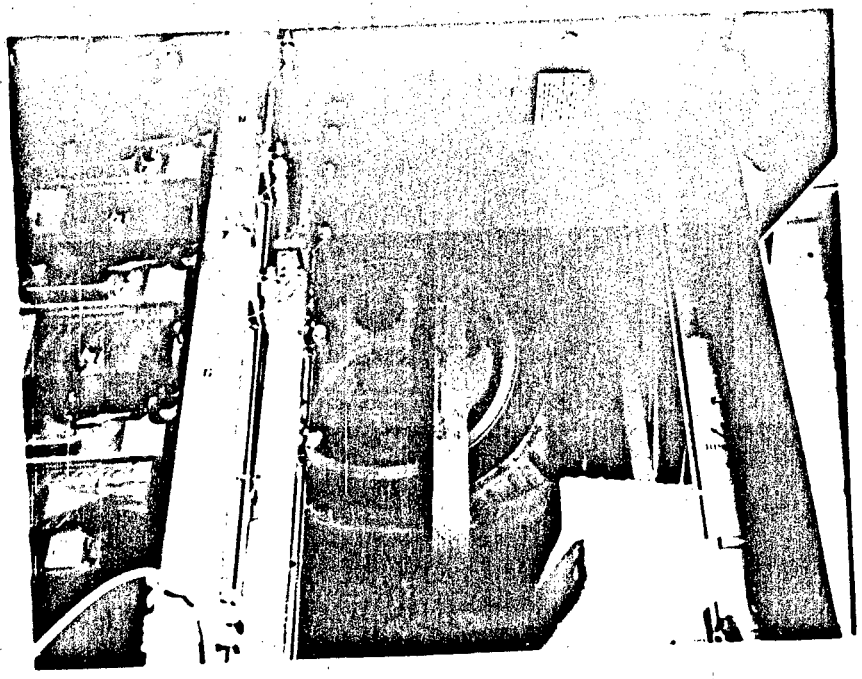
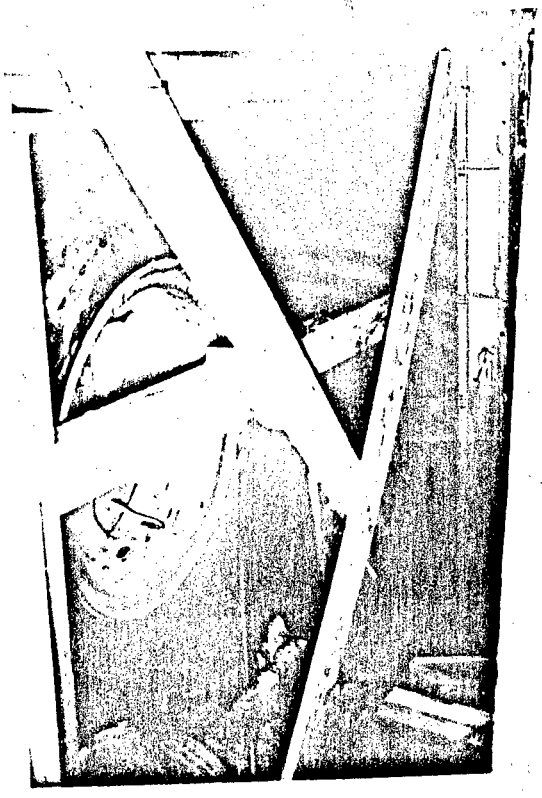




TEST NO. 67

LOADING MOVER, CLARK, FORK LIFT INTO C-47 TRANSPORT PLANE

A. (1) Description.

Loading and transporting the Clark fork-lift mover in the C-47 transport plane requires partial disassembly of the unit to the extent of removing the fenders, fork-lift and outer tires from the dual front wheels. Total weight of the unit disassembled for installation was 6100 lbs. minus the fenders, which can be dispensed with for this operation.

(2) Loading.

Loading of the tractor proper was accomplished by backing it under its own power into the cargo compartment of the plane over a special wooden ramp. See A.P.G. Photograph No. 99355 under Test No. 49 and A.P.G. Photograph No. 99765. Loading of the fork-lift hoist assembly onto the ramp was accomplished by using the "A" frame mounted on the front end of a 3/4 ton 4 x 4 truck equipped with winch. It was then slid into its tie-down position on 2" x 12" timbers placed on the floor of the plane, using a block and tackle as shown in A.P.G. Photograph 99803. The two outer tires and rims removed from the dual front wheels, as well as the two lift forks were lifted onto the ramp by the "A" frame on the 3/4 ton truck and placed in proper position in the plane by hand. The Evans tie-down equipment furnished with the plane was used to lash down the equipment as shown in A.P.G. Photograph 99804.

B. Material Required for Installation.

1. Lumber
   a. Two pieces of planking, 2" x 10" x 8' under wheels.
   b. Four pieces of planking, 2" x 10" x 4' under hoist.
2. Block and tackle.
3. Special ramp as used for loading 2-1/2 ton and 3/4 ton trucks.

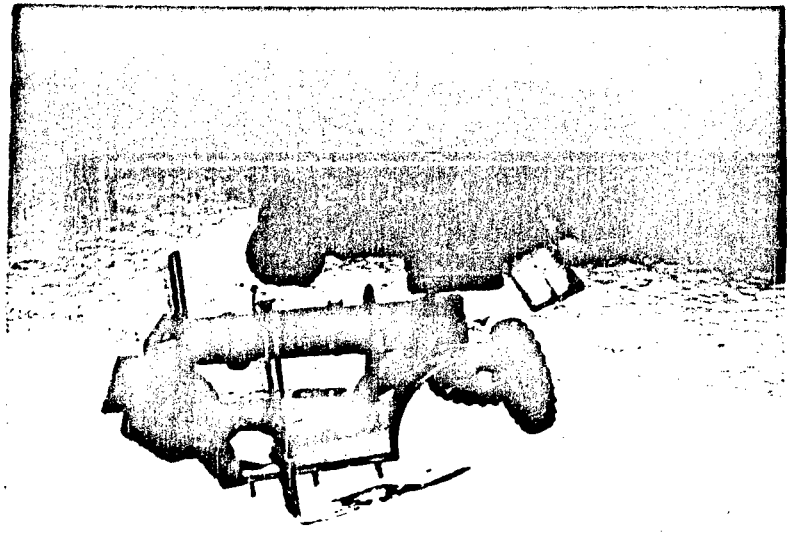
C. Weights

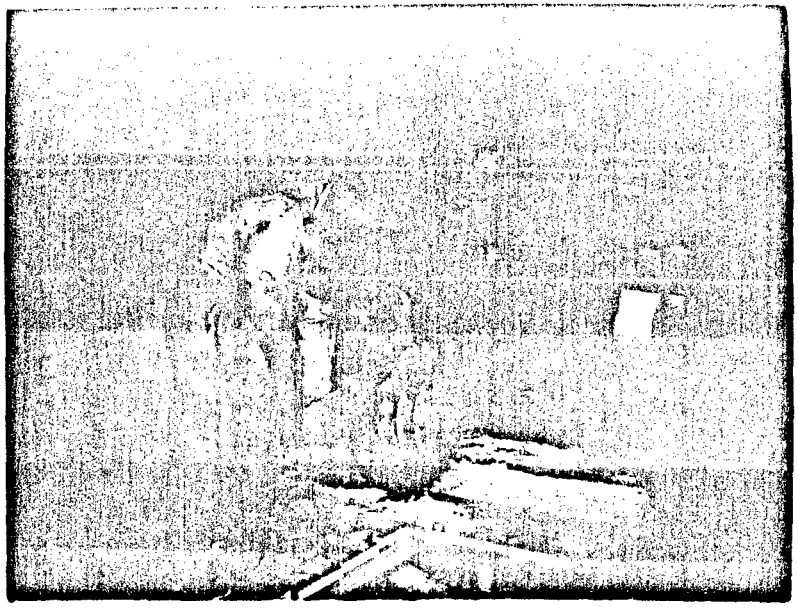
Total	6100	lbs. (minus fenders)
1. Tractor	4800	
2. Hoist	1000	
3. Tires and rims	300	

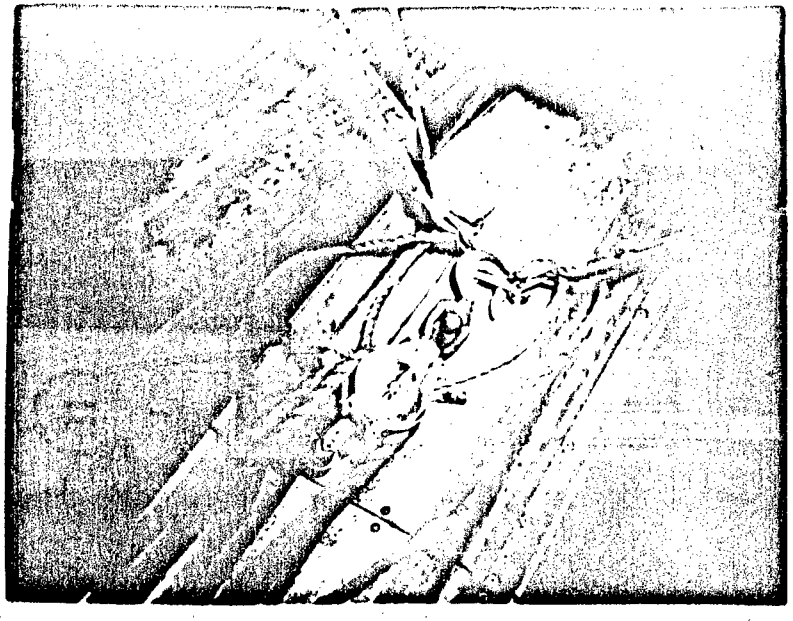
D. Estimated time (4-man crew)

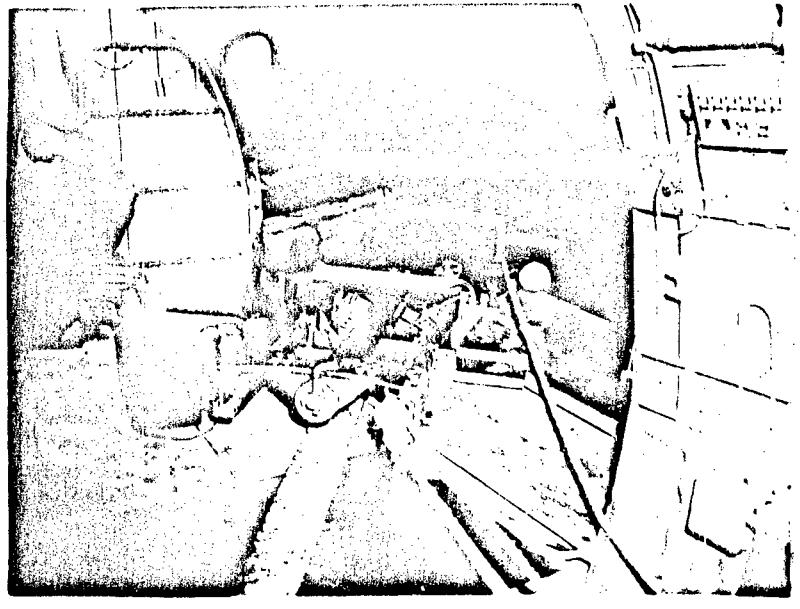
1. Disassembly - 45 min.
2. Loading - 45 min.
3. Unloading - 45 min.
4. Reassembly - 45 min.

In addition to assumed A/C crew, 1 soldier may be carried.









UNCLASSIFIED

Tests Nos. 68 and 69

INSTALLATION OF CLARK FORK LIFT IN B-17 AND B-24

A. This installation was found to be entirely impractical since a complicated disassembly procedure is required for loading into the bomb bays of these ships.

TEST NO. 70

INSTALLATION OF ONE COMPLETE SET OF RADIO EQUIPMENT

IN C-47 AIRPLANE

A. The complete set of radio equipment consisted of four radio sets, SCR-608, SCR-610, SCR-284 and SCR-194 and related equipment consisting of reel carrier, reel stand, antenna mountings and spare parts. This complete set was mounted starting 21 inches in rear of loading zone D and was entirely contained in Zone E.

1. The SCR-284 and SCR-608 were placed on the sides and blocked on the front end against a 2" x 4" x 6'4" and 2" x 10" x 6'4". These planks were lashed to hooks on the corners and blocked forward against a center floor eye bolt. The SCR-610 was placed against the SCR-608 in two pieces and the two sets lashed to the side hooks and center eye bolts. Two canvas covered boxes of spare parts were placed next to SCR-284 and these were lashed to the side hooks and center eye bolts. The antenna in its canvas carrier was also lashed on top of the SCR-284. All of the above equipment was blocked from the rear by 2" x 10" and 2" x 4" against a center eye bolt. Two small generators were mounted and firmly blocked to the 2" x 10" piece immediately in rear of SCR-284.

2. The reel carrier complete with a heavy reel was mounted on 2" x 10" pieces under each wheel with the drawbar or tongue across the ship's floor. This piece was blocked at the wheels immediately in rear of the SCR-608. The tongue was lashed down to a center eye bolt. The small reel was placed under the carrier and blocked against the wall. This blocking also held the antenna mounting brackets. The SCR-194 came in two pieces and was lashed directly to the handle bars which extended across the windows. If the SCR-203 is also to be used it may be lashed down across the tongue of the reel carrier. This equipment was not on hand for test. The stationary reel stand was lashed between the wheeled reel carrier and the wall. All parts with the reel carrier were lashed tight to the side hooks.

3. All 2" x 10" and 2" x 4" boards running transversely were blocked on the side in the direction of the axis of the fuselage. Spare parts must be carried loose and not in carton boxes and may be tied up in a tarpaulin and lashed to the side. Reference is made to A.P.G. Photograph No. 99056.

B. Unloading Operations:

1. Since all the above equipment was not nailed down but lashed to the sides and the center it may be removed from the rear, piece by piece, as soon as the ropes are removed. The reel carrier is the bulkiest piece and will come out first. Since the spare parts are loose and consist of radio tubes, fuses, and batteries care should be taken in handling these parts outside of the plane. In general all of this equipment may be removed in the reverse order of emplacing it.

TEST NO. 70 (continued)

C. Materials for Installation:

1. Three pieces of planking 2" x 10" x 6'4", three pieces 2" x 4" x 6'4", one piece 2" x 4" x 2'11" approximately, one piece 2" x 4" x 1'8", one piece 1" x 4" x 3'0", and two dozen two-penny nails.

2. Plane rigging:

Four lengths 1/2" plane rigging for lashing material to floor, each length 15 feet, three lengths 3/8" rope, three feet long for lashing tongue of reel carrier and 2 x 4's to the side hooks.

D. Weights:

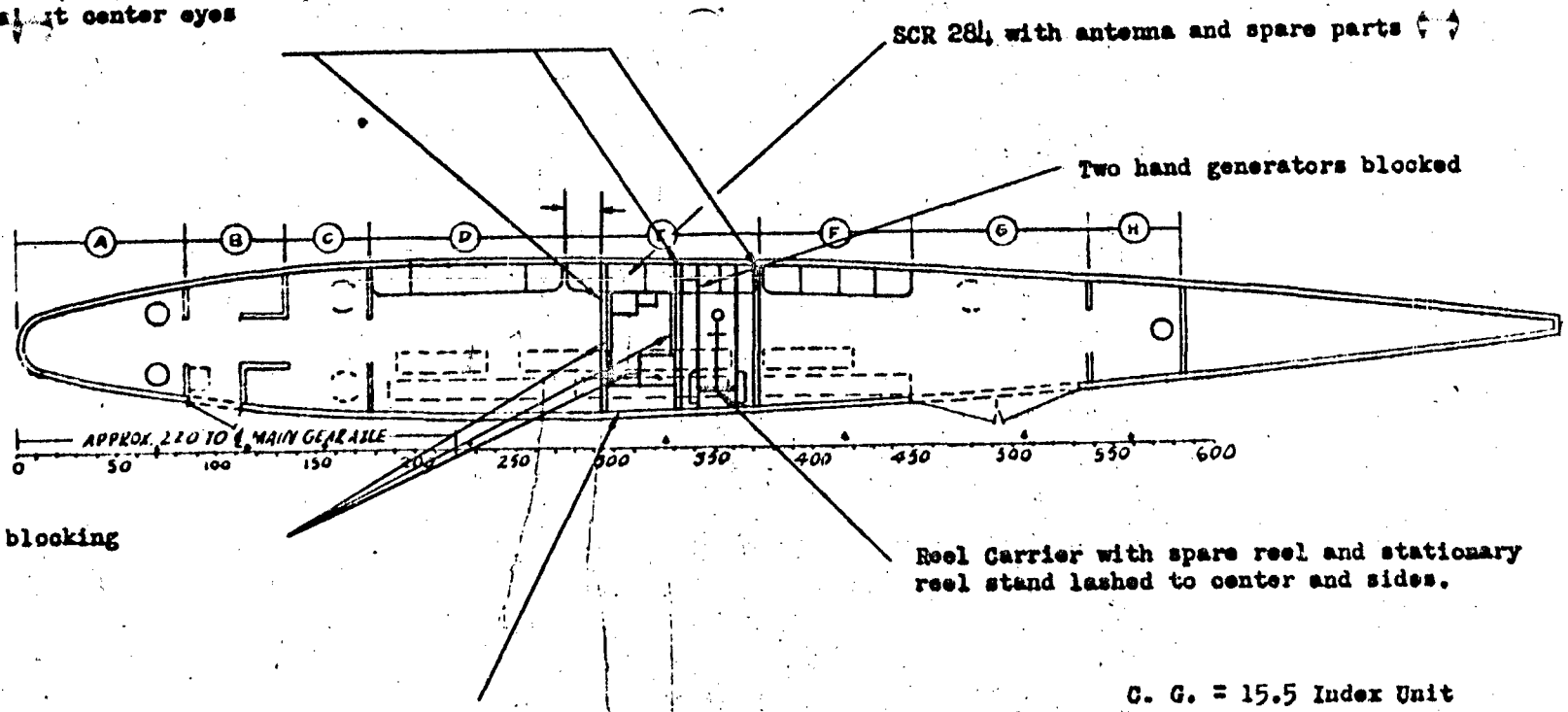
	Lbs.
Radio set SCR-284	260
Radio set SCR-610	50
Radio set SCR-608	275
Radio set SCR-194	26
Reel carrier with two reels	75
Spare parts	15 (maximum)
Lumber	50
Total	760

E. This is only a part of many other loadings and may be superimposed upon any other typical loading where space permits.

F. Time of operation:

Loading time	40 minutes
Unloading time	20 minutes

3 each 2" X 10" X 76" and 2" X 4" X 76"
blocked against center eyes



C. G. = 15.5 Index Unit

Cargo Wt. = 760 lbs.

C-47

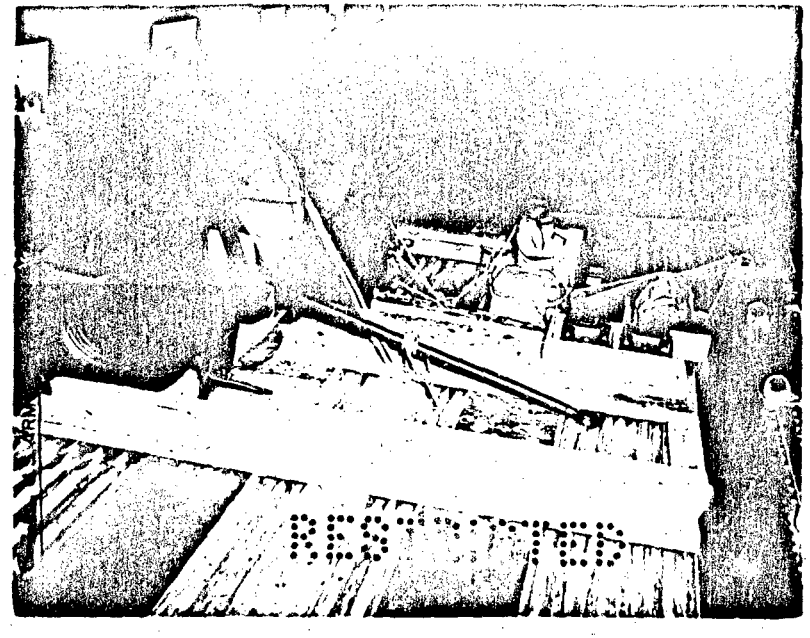
Weights

SCR 608 - 275#
SCR 610 - 50#
SCR 284 - 269#
SCR 194 - 26#

Reel carrier and related equipment - 75#
Spare parts - 15# max.
Lumber - 50# approximately
Total - 760 lbs.

Note: SCR 194 in two parts lashed to side hand railing (not shown)
Other spare parts in tarpaulin also lashed to side (not shown)

TEST NO. 70



99856 2-11-44 | ABERDEEN PROVING GROUND | ORDNANCE DEPT

Seat Stand, Pitt, and accessories, loaded and lashed in position in the Transport Plane.

TEST NO. 71.

INSTALLATION OF MOBILE REEL CARRIER FOR RADIO EQUIPMENT IN B24 AIRPLANE.

A. As a result of lack of time and the fact that the complete radio sets were light and easily assembled it was only believed necessary to find a method of mounting the bulky reel carrier in this ship. A 2" x 10" plank was placed along the full length of the catwalk and mounted two 2" x 10" pieces from this one to the side frame. These pieces about 30" long, form an angle of approximately 45 degrees with the horizontal. These 2" x 10" pieces were placed under the axle with the hub of the wheel against one bulkhead. Two 2" x 4" blocks were placed on either side of the wheels and two 2" x 10" pieces blocked the wheels from the inside. The tongue of the carrier was lashed to the roof of the bomb bay section. The wheels were blocked in front and rear with two pieces of 1" x 10" x 3'2' of planking and the axle was lashed to the 2" x 10" pieces in the center. The large reel was also carried on the reel carrier. Reference A.P.I. Photograph No. 99862 which shows the carrier installed.

B. The reel carrier may be unloaded by removing the lashing ropes and lowering the tongue to the ground. Reels are then picked up from the blocking and they are also lowered to the ground. It may be rolled out from under the plane with the bomb bay doors open. The blocking and wood frame are then removed.

C. Materials used:

One piece of 2 x 10 x 15 feet, approx.

Two pieces of 1 x 10 x 30 inches, approx.

Two pieces of 2 x 4 x 30 inches, approx.

Two pieces of 1 x 4 x 38 inches

Two pieces 1/2" hemp rope, four feet long.

D. Weights:

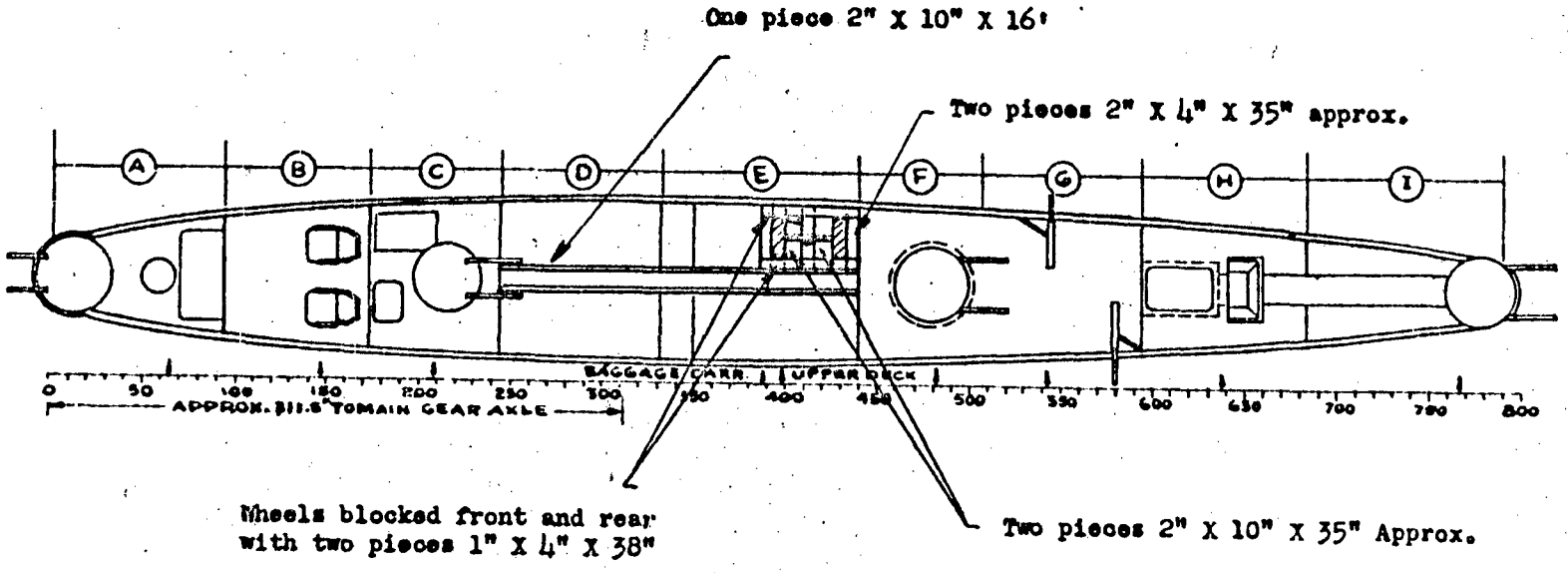
Reel carrier with spare reel	75 lbs.
Lumber	15 lbs.
Total weight	90 lbs.

E. This report is only to indicate one position in which this item can be carried and has no relation to entire cargo capacity of the airplane.

F. Time of Operation:

1. Loading Time ..... 1/2 hour

2. Unloading Time ..... 5 min.



Weights

1 Mobile Reel Carrier with spare reel - 75 lbs.
Lumber - 15 lbs.
Total - 90 lbs.

C. G. = 50.5 Index Units

Cargo Wt. = 90 lbs.

B-24D,E,G,H,& J
PB4Y-1

Note: Axle of reel carrier lashed to two 2" X 10" pieces. Tongue lashed to roof of bomb bay section.

TEST NO. 71

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TEST NO. 72

INSTALLATION OF MOBILE REEL CARRIER FOR RADIO

EQUIPMENT IN B-17 AIRPLANE

A. As a result of lack of time and the fact that the complete radio sets were light and easily assembled, it was only believed necessary to find a method of mounting the bulky reel carrier in this ship. This was done by removing the spare reel and pulling the carrier into the rearmost door of the fuselage. The wheels were placed on the floor next to the bulkhead immediately in rear of the door with the tongue pointing to the tail of the ship. The axle was lashed to two vertical structural members and the wheels were lashed to the floor boards. The tongue was lashed to a bulkhead to the rear. No blocking was used for this installation.

B. The reel carrier may be unloaded by removing the lashing ropes and carrying it out the door in the reverse manner of emplacing.

C. Materials used:

Four pieces 3/8" hemp rope five feet long

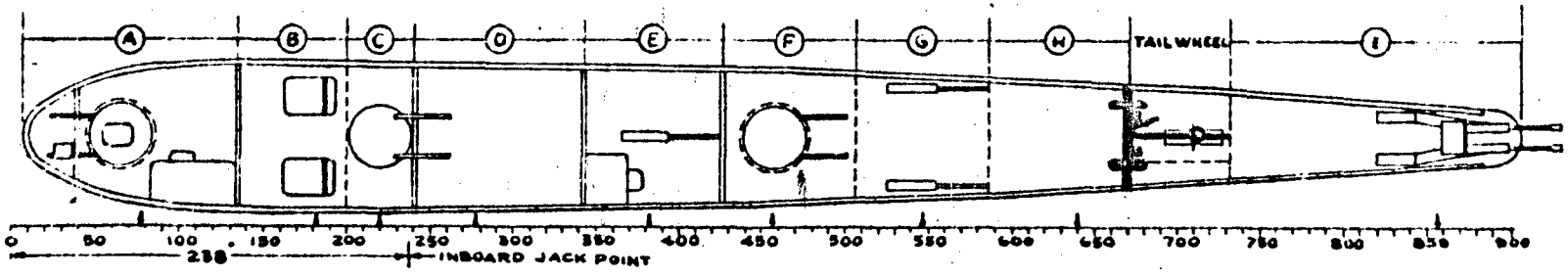
D. Weights:

Reel carrier without spare reel . . . . 65 lbs. total

E. Time of Operation:

1. Time of loading . . . . . 15 min.

2. Time of unloading . . . . . 5 min.



B-17G

Note: Axle lashed to two vertical structural members.
Wheels lashed to floor.
Tongue lashed to rear bulkhead.
No blocking used.

Reel Carrier total Wt. - 65#

TEST NO. 72

RESTRICTED

APPENDIX 3

No. of Airplanes by type required to move Corps and Division Artillery

APPENDIX 3

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Section I

Analysis and inspection indicate that the 155 mm Gun, the 8" Howitzer, the 8" Gun, and the 240 mm Howitzer (All Corps Artillery) are too large, and heavy to be carried in C-47's, B-17's, and B-24's. Therefore, the tables below have been prepared to indicate the weight of men and materiel only in light or medium artillery battalions of reduced strength. In each case only the minimum prime movers, fire control equipment, and signal equipment considered necessary to initiate and maintain fire have been included. It is obvious that these estimates are subject to considerable revision, depending upon the exact mission to be accomplished. But, since the principal weights are in the guns, prime movers, and ammunition, the calculations on the number of aircraft required will be significant. (Tables Nos. 1 and 2, showing battalion weights, are attached).

Section II

The table below has been prepared to indicate the number of aircraft necessary to transport both 105 mm and 155 mm Howitzer Battalions.

Table No. 3

Number of aircraft of various types required to carry a 105 or 155 mm Battalion.

Percentage Distribution of Aircraft for carrying the Battalion.	Total Aircraft Required: 105 mm Bn. Wgt. 294,575 lbs. C-47's	B-17's or B-24's	Total	155 mm Bn. Wgt. 498,480 lbs. C-47's	B-17's or B-24's	Total (1)
100% C-47's	49	0	49	84	0	84
75% C-47's 25% B-17's or B-24's	28	10	38	47	16	63
67% C-47's 33% B-17's or B-24's	22	11	33	37	19	56
50% C-47's 50% B-17's or B-24's	14	14	28	24	24	48

Note (1) Using Tables 1 and 2, a proportion of less than 50% C-47's will not be practical because of the necessity for carrying vehicles and gun carriages in C-47's.

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Note (2) Only normal materiel is included. Such items as chemical mortars, Clark lift trucks, and 3" AT guns are elsewhere considered.

(a) In order to prepare the table and make the necessary calculations, the following assumptions were made:

(1) 100 rounds per gun carried for the artillery.

(2) 1/2 unit of fire for all other weapons.

(3) Anti-aircraft and anti-tank protection are necessary.

(4) The smallest possible prime mover is desirable.

(5) All aircraft to be loaded to maximum weight carrying ability.

(6) Division and Corps HQ and HQ Battery will not be carried.

(b) All personnel, and items such as ammunition, tools, radios, etc. can be loaded into either the C-47, B-17, or B-24. However, prime movers must be loaded into C-47's and some parts of the heavy weapons may be carried by the heavy bombers. Since a breakdown of the precise loading is neither necessary nor desirable in this case, the following method will be used to calculate the number of necessary aircraft:

(1) The C-47 will be assumed to carry 6000 lbs. net load; the B-17 15000 lbs., and the B-24 15000 lbs.

(2) The aircraft are grouped into several combinations of C-47's and heavy bombers to facilitate evaluation of various types of loading.

(3) The aggregate carrying ability of the above group is determined, and divided into the total battalion weight. From this the total number of aircraft is recorded in tabular form.

Section III - Aircraft Required for 105 mm Battalion

Since the vehicles must be carried in C-47's, the proportion of C-47's to heavy bombers will be determined by the number of necessary vehicles. Listed below is a breakdown of the number of aircraft necessary to carry a 105 mm Howitzer Battalion, using the minimum number of C-47's.

Vehicles	No. C-47's	Total Weight
4 trucks, 3/4 Ton	4	23000
8 trucks, 1/4 Ton	4	18600
6 tractors, Clark, 20HP	6	24810
Total	14	66410

APPENDIX 3

RESTRICTED

Table No. 1

Table of Major Items to be carried by air for a 105 mm Howitzer Battalion.

Item	Number Units	Wgt. each Pounds	Total Wgt.
Personnel			
HQ and HQ Battery (1)	113	220	24900
Firing Batteries (1)	243	220	53500
Service Battery (2)	0		
Medical Detachment (3)	12	240	2880
Ordnance Equipment (4)			
Chest, Tools	3	200	600
Gun and tripod, Cal. .50, HB	17	134	2280
Circles, Aiming	7	60	420
Howitzer, 105 mm, M2	12	4950	59400
Launcher, Rocket AT, M1	30	25	750
Telescopes, B3	4	75	300
Vehicles (4)			
Truck 3/4 T, command	4	5750	23000
Truck, 1/4 T, 4 x 4 (5)	8	2325	18600
Tractor, Engineers, Clark, 20HP	6	4135	24810
Trailer, 1/4 T, 2 wheel	6	550	3300
Signal			
Chest SC-5	1	50	50
Panel Sets	12	25	300
Radio SCR 284	1	250	
Radio SCR 608	1	275	250
Radio SCR 610	10	50	500
Reel, RL4, 1 per 3/4 T truck	4	89	360
Reel, DR5	5	165	825
Misc. headsets, etc.		140	140
Switchboard BD71	1	72	70
Telephones TE8	10	8	80
Quartermaster			
Picks, shovel, and misc. equip		2000	2000
Ammunition			
Cal. .50 (1/2 unit/gun)	17 cases	90	1530
Proj. Rocket M2, 3/launcher	90	7	630
105 How. complete round	1200	51	61200
Miscellaneous			
Dunnage (Average)		10000	10000
Water, gasoline, etc.		2000	2000
Total			294875

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APPENDIX 3 - 4

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The C-47's can carry 6000 lbs. each, a total of 84,000 lbs., and hence would be loaded also with

Ammunition, Cal. .50	1530
Ammunition, AT, Rocket	630
Machine Guns, Cal. .50	2280
Medical Detachment (12 men)	2880
Enlisted Men (47)	10270
Total	84000 lbs.

Balance of the battalion is composed of men, Howitzers, ammunition, and equipment weighing 210,675 lbs. Since B-17's and B-24's can carry 15,000 lbs. each, 15 will be required, and there will be more than enough to carry one howitzer per plane. Thus -

	No. B-17's or B-24's required	Weight
12 Howitzers 105 mm (1 per plane, 4950 lbs.) (12 B-17's or B-24's can carry a total of 180,000 lbs.)	12	59400
Ammunition 105 mm 2600 lbs./plane	12	31200
Signal and Quartermaster Equipment 215 lbs. per plane	12	2575
Miscellaneous Ordnance Equipment 170 lbs./plane	12	2070
Personnel 288 men. (24/plane	12	63400
Miscellaneous Dunnage etc. 1790 lbs./plane	12	21425
	Total	180000

Average Loading/plane 15,000 lbs.

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The total weight thus far is 84,000 plus 180,000 or 264,000 lbs. and the balance of the equipment is yet to be carried. This can be done in 3 B-17's or B-24's as follows:

	No. B-17's or B-24's	Weight
Personnel 21 men (7/plane)	3	4660
Ammunition 105 mm Howitzer (10,000 lbs. per plane)	3	30000
Trailers 1/4 Ton (2/plane)	3	3300
		37,900 lbs.

Average Loading /plane 12,600 lbs.

Summary - A typical loading of a reduced 105 mm Howitzer Battalion has been shown. 14 C-47's and 15 B-17's or B-24's are required. The loading of a 155 mm Battalion would be similar except that the howitzers would necessarily be carried disassembled in two aircraft, and the total number of aircraft would be larger.

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Table No. 2

Table of Major Items to be carried by air for a 155 Howitzer or 4.5" Gun Bn.

Item	No. Units	Wgt. each Pounds	Total Weight
Personnel			
HQ and HQ Battery (1)	96	220	21100
Firing Batteries (1)	249	220	57000
Service Battery (2)	0		
Medical Detachment (3)	10	240	2400
Ordnance Equipment (4)			
Chests, tool	3	200	600
Gun and tripod, Cal. .50, HB	17	134	2280
Circles, Aiming	7	60	420
Howitzer, 155 mm, M1	12	12900	155000
(or Gun 4.5", M1)	(12)	(12450)	
Launcher, Rocket, AT, M1	30	25	750
Telescopes, BC	4	75	300
Vehicles (4)			
Truck, Cargo, 2-1/2T, 6 x 6	6	11000	66000
Truck, 3/4T, Command	4	5750	23000
Truck, 1/4T, 4 x 4	8	2325	18600
Signal (4)			
Chest BC-5	1	50	50
Panel Sets	12	25	300
Radio, SCR 284	1	250	250
Radio, SCR 608	1	275	275
Radio, SCR 610	10	50	500
Reel, RL4, 1 per 3/4 T-truck	4	89	360
Reel, DR 5	5	165	825
Misc. head sets, etc.		140	140
Switchboard BD 71	1	72	70
Telephones TE-8	10	8	80
Quartermaster			
Picks, shovels, & misc. equip.		2000	2000
Ammunition			
Cal. .50 (1/2 unit/gun)	17 cases	90	1530
Proj. Rocket M1 3/launcher	90	7	630
155 How. compl. round	1200	110	132000
Miscellaneous			
Dunnage (average)		10000	10000
Water, gasoline, etc.			2000
Total			498400

RESTRICTED

Notes for Tables 1 and 2

(1) Less 11 basics, 6 truck, drivers, 2 mechanics for each battery.
(2) It is assumed that the service battery is unnecessary for this operation.
(3) Because of reduced Battalion size 2 enlisted men are eliminated. 20 lbs. per man allowed for medical supplies.
(4) Equipment has been reduced to the minimum estimated for successful fire.
(5). Trucks, 1/4T, 4 x 4 could be substituted for this item to save weight but produce less drawbar pull. This tractor is equipped with dozer blade.

[redacted]

WEI S AND DIMENSIONS OF AMMUNITION

Ammunition	Weights Crated lbs.	Weights Uncrated lbs.	No. Per Unit	Dimensions Crated for Overseas Shipment Length	Width	Ht.	Area Sq. ft.	Dimensions Uncrated for Domestic Shipment Length	Width	Ht.	Area Sq. ft.	REMARKS
R/C Shell, H.E., 4.2", M3	67.5	67.3	2	25-1/8"	11"	7"	1.12	25-1/8"	11"	7"	1.12	In boxes
R/C Shell, A.P., H.E. 3", M62	156	158	4	3.47'	.96'	.96'	3.33	3-47'	.96'	.96'	3.33	In boxes
R/C Shell, H.E., 105-mm, M1	172	147	3	3.14'	1.10'	.95'	3.47	2.80'	.88'	.82'	2.47	
Shell, H.E., 4.5", M65	55.2	55.2	1	1.83'	.42'	.42'	.77	1.83'	.42'	.42'	.77	
Charge, Prop., M7	61	39	3	2.49'	1.03'	.89'	2.56'	2.15'	.82'	.76'	1.76	
Charge, Prop., M8	73	49	3	2.49'	1.23'	1.09	3.06	2.15'	.99'	.93'	2.13	
Fuze, P.D., M51A1, Assembled w/M21A1 Booster	77	77	25	1.45'	1.32'	.75'	1.92	1.45'	1.32'	.75'	1.92	In boxes
Primer, Perc. 21 Gr. MkIIA1	1.50	1.80	50	5-3/4"	3.00"	1-15/16"	33.36"	5-3/4"	3.00"	1-15/16"	33.36"	In boxes
Shell, H.E., 155-mm, M107	96.1	96.1	1	2.23'	.55'	.55'	1.23	2.23'	.55'	.55'	1.23	
Charge Prop. M3	75	53	6	3.26'	1.23'	1.06'	4.00	2.92'	.99'	.93'	2.89	
Charge Prop., M4	79	58	3	2.32'	1.42'	1.23'	3.28	1.98'	1.16'	1.09'	2.30	
Fuze, P.D., M51A1, Assembled with M21A1 Booster	77	77	25	1.45'	1.32'	.75'	1.92	17.44"	15.88"	9.03"	1.92	In boxes
Primer, Perc. 21 Gr. MkIIA1	1.50	1.80	50	5-3/4"	3.00"	1-15/16"	33.36"	5-3/4"	3.00"	1-15/16"	33.36"	In boxes

[redacted]

[redacted]

AMMUNITION FOR 6,500 LB. LOAD

Type of Ammunition	No. of Units	Amt. Per Unit	Wt. Per Unit Lbs.	Total Wt.	Remarks
Round, Complete, Shell, H.E., M3, with Fuze, P.D., M3, for 4.2" Chemical Mortar	97	2	67	6,499	Boxes
Round, Complete, Projectile, A.P.C., H.E., M62, w/B.D. Fuze, M66A1, for 3" A.T. Gun, M5.	41	4	158	6,478	Boxes
Round, Complete, Shell, H.E., M1, with M42A1, P.D. Fuze, for 105 mm How., M2/or M3.	38	3	172	6,536	Fiber Containers Crated.
Shell, H.E., M65, with lifting plug, for 4.5" Gun, M1.	81	1	55	4,455	Unarated
Charge Propelling, M7 (Normal) for 4.5" Gun, M1.	13	3	61	793	Fiber containers Crated.
Charge Propelling, M8, (Super) for 4.5" Gun, M1.	14	3	73	1,022	Fiber containers Crated.
Fuze, P.D., M51A1, with M21A1, Booster	4	25	77	221	Boxes
Primer, Percussion, 21 Grain, Mk IIA1	2	50	2	4	Tin Containers
TOTAL WEIGHT of Ammunition Components for 4.5" Gun, M1				6,495	

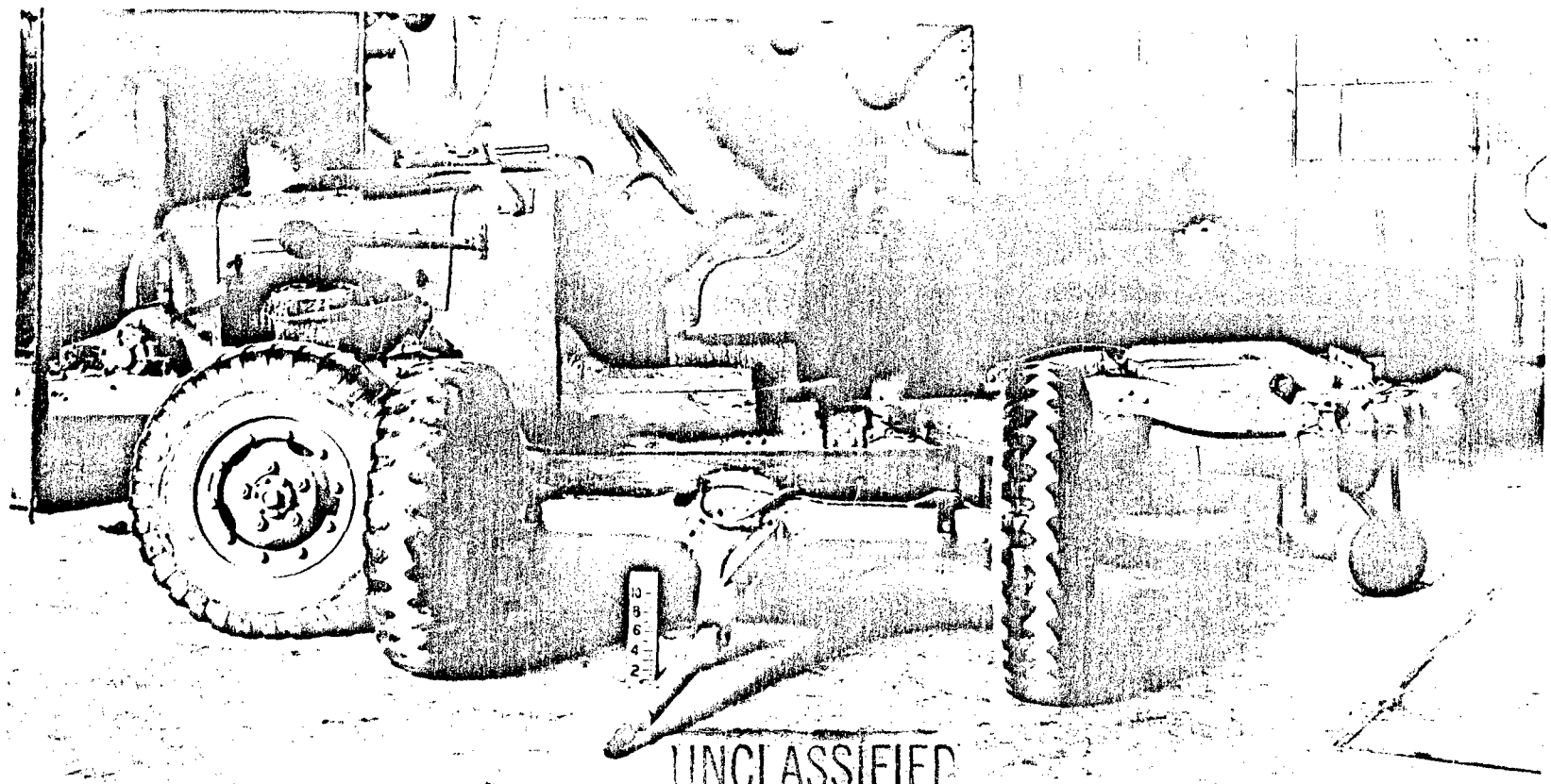
(continued on next page)

[redacted]

AMMUNITION FOR 6,500 LB. LOAD

Type of Ammunition	No. of Units	Amt. Per Unit	Wt. Per Unit lbs.	Total Wt.	Remarks
Shell, H.E., M107 with lifting plug, for 155 mm Howitzer, M1	57	1	96	5,471	Uncrated.
Charge Propelling, M3, (Green), for 155 mm How., M1	5	6	75	375	Fiber containers Crated.
Charge Propelling, M4, (White) for 155 mm. How., M1	9	3	79	711	Fiber containers Crated.
Fuze, P.D., M51A1 with M21A1 Booster	3	25	77	221	Boxes
Primer, Percussion, 21 Grain, Mk IIA1	2	50	2	4	Tin containers
TOTAL WEIGHT of ammunition components for 155 mm How., M1				6,782	

UNCLASSIFIED

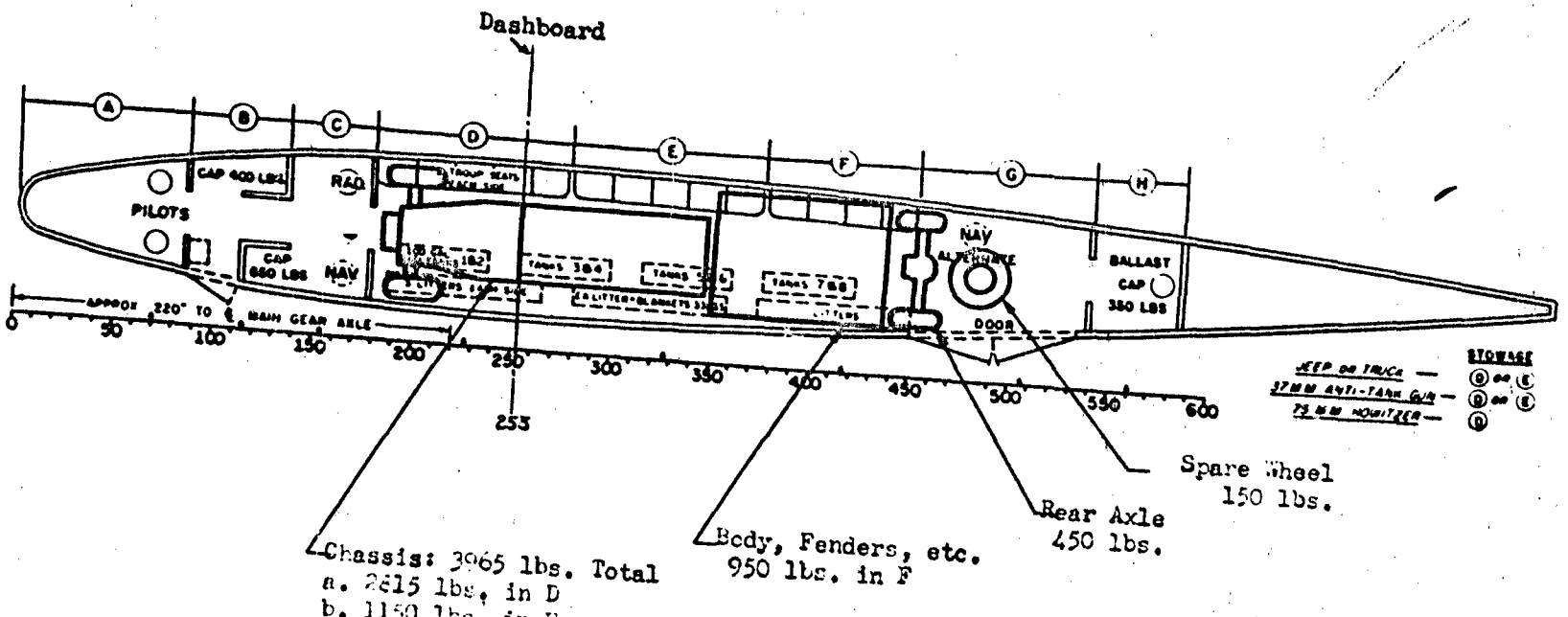


UNCLASSIFIED

99852	2-11-44	ABERDEEN PROVING GROUND	ORDNANCE DEPT.
[illegible]			

TRUCK, 3/4 TON, 4 x 4 [illegible] CARRIER, w/WINCH

UNCLASSIFIED



Spare Wheel
150 lbs.

Rear Axle
450 lbs.

Body, Fenders, etc.
950 lbs. in F

Chassis: 3965 lbs. Total
a. 2815 lbs. in D
b. 1150 lbs. in E

C-47
R4D-1, a-5

C. of G. - 35.6 Index Units

Cargo Weight - 5515 lbs.

EXTERNAL STOWAGE

PACKS — FORWARD D
CENTER E
REAR F

PROPS — REAR G

F'W'D - NO SCALE REQUIRED

TEST NO. 52

UNCLASSIFIED

DEPARTMENT OF THE ARMY
U. S. ARMY ABERDEEN TEST CENTER
400 COLLERAN ROAD
ABERDEEN PROVING GROUND, MARYLAND 21005-5059

REPLY TO
ATTENTION OF

15 JUN 1998

STEAC-SC (25-55A)

AD-B237 370

MEMORANDUM FOR Director, Defense Technical Information Center,
ATTN: DTIC-RSM (FOIA 98-93) (Kelly Akers),
8725 John Kingman Road, STE 0944, Fort Belvoir,
VA 22060-6218

SUBJECT: FOIA Request for First Report on Determination of Possible Movement of Corps and Division Artillery Utilizing C-47, B-17, and B-24 Air Planes **(ATI 40075)**

1. We have released the report to the requestor:

Mr. Ian D. W. Sutherland, First Assistant Prosecuting Attorney
Courthouse
100 Court Street
Jackson, Missouri 63755

2. Please remove the distribution limitation from the report.

3. Point of contact for this action is David A. O'Steen, (410) 278-2350.

FOR THE COMMANDER:

JUDITH L. SHELLEY
Director of Services

CF:
AMSTE-TM-I (Mrs. Matthews)
Department of the Army Freedom of Information and Privacy Acts Office
(Ms. Christensen)

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