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Final Report  
SEPTEMBER 1989

EVT 29-89

TRANSPORTABILITY TEST OF AIR  
TRANSPORTABLE LIFTING DEVICE (ATLD)

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91-00963



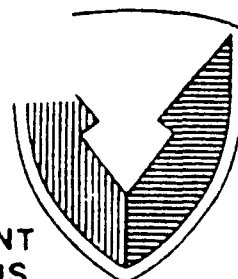
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EVALUATION DIVISION  
SAVANNA, ILLINOIS 61074-9639

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| 1a. REPORT SECURITY CLASSIFICATION<br>UNCLASSIFIED                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |                                                   | 1b. RESTRICTIVE MARKINGS                                                                 |                                                         |                                 |
| 2a. SECURITY CLASSIFICATION AUTHORITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |                                                   | 3. DISTRIBUTION / AVAILABILITY OF REPORT                                                 |                                                         |                                 |
| 2b. DECLASSIFICATION / DOWNGRADING SCHEDULE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |       |                                                   | UNLIMITED                                                                                |                                                         |                                 |
| 4. PERFORMING ORGANIZATION REPORT NUMBER(S)<br><br>EVT 29-89                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |                                                   | 5. MONITORING ORGANIZATION REPORT NUMBER(S)                                              |                                                         |                                 |
| 6a. NAME OF PERFORMING ORGANIZATION<br>U.S. Army Defense Ammunition<br>Center and School                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       | 6b. OFFICE SYMBOL<br>(If applicable)<br>SMCAC-DEV | 7a. NAME OF MONITORING ORGANIZATION<br>U.S. Army Defense Ammunition Center<br>and School |                                                         |                                 |
| 6c. ADDRESS (City, State, and ZIP Code)<br><br>ATTN: SMCAC-DEV<br>Savanna, IL 61074-9639                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                   | 7b. ADDRESS (City, State, and ZIP Code)<br>ATTN: SMCAC-DEO<br>Savanna, IL 61074-9639     |                                                         |                                 |
| 8a. NAME OF FUNDING, SPONSORING<br>ORGANIZATION U.S. Army Belvoir<br>Research, Development and<br>Engineering Center                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       | 8b. OFFICE SYMBOL<br>(If applicable)<br>STRBE-FMR | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER                                          |                                                         |                                 |
| 8c. ADDRESS (City, State, and ZIP Code)<br><br>ATTN: STRBE-FMR<br>Fort Belvoir, VA 22060-5606                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                                   | 10. SOURCE OF FUNDING NUMBERS                                                            |                                                         |                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                                   | PROGRAM<br>ELEMENT NO                                                                    | PROJECT<br>NO                                           | TASK<br>NO                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                                   | WORK UNIT<br>ACCESSION NO                                                                |                                                         |                                 |
| 11. TITLE (Include Security Classification)<br><br>Transportability Test of Air Transportable Lifting Device (ATLD)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                                                   |                                                                                          |                                                         |                                 |
| 12. PERSONAL AUTHOR(S)<br>A.C. McIntosh, Jr.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |                                                   |                                                                                          |                                                         |                                 |
| 13a. TYPE OF REPORT<br>FINAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       | 13b. TIME COVERED<br>FROM _____ TO _____          |                                                                                          | 14. DATE OF REPORT (Year, Month, Day)<br>1989 September |                                 |
| 15. PAGE COUNT<br>22                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |                                                   |                                                                                          |                                                         |                                 |
| 16. SUPPLEMENTARY NOTATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |       |                                                   |                                                                                          |                                                         |                                 |
| 17. COSATI CODES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |       |                                                   | 18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)        |                                                         |                                 |
| FIELD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | GROUP | SUB-GROUP                                         |                                                                                          |                                                         |                                 |
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| 19. ABSTRACT (Continue on reverse if necessary and identify by block number)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |                                                   |                                                                                          |                                                         |                                 |
| <p>The U.S. Army Defense Ammunition Center and School (USADACS), Evaluation Division (SMCAC-DEV), was tasked by the U.S. Army Belvoir Research, Development and Engineering Center (BRDEC), STRBE-FMR, to develop a tiedown procedure and perform a rail impact test for the Air Transportable Lifting Device (ATLD). From information provided, the Storage and Outloading Division developed tiedown procedures transporting the ATLD on a flatcar. These procedures were then tested to Association of American Railroads (AAR) rail impact test requirements. The ATLD, as tie down on a flatcar, passed these requirements. The results of this is contained in this report.</p> |       |                                                   |                                                                                          |                                                         |                                 |
| 20. DISTRIBUTION / AVAILABILITY OF ABSTRACT<br><input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |                                                   | 21. ABSTRACT SECURITY CLASSIFICATION<br>UNCLASSIFIED                                     |                                                         |                                 |
| 22a. NAME OF RESPONSIBLE INDIVIDUAL<br>THOMAS J. MICHELS, Chief, Evaluation Division                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |                                                   | 22b. TELEPHONE (Include Area Code)<br>815-273-8080                                       |                                                         | 22c. OFFICE SYMBOL<br>SMCAC-DEV |

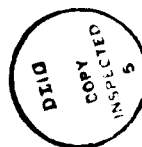
U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL  
Evaluation Division  
Savanna, IL 61074-9639

REPORT NO. EVT 29-89

TRANSPORTABILITY TEST OF THE  
TRANSPORTABLE LIFTING DEVICE (ATLD)

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## PART 1

### INTRODUCTION

#### A. BACKGROUND

The U.S. Army Defense Ammunition Center and School (USADACS), Evaluation Division (SMCAC-DEV), was tasked by the U.S Army Belvoir Research, Development and Engineering Center (BRDEC) STRBE-FMR, to develop a tiedown procedure and perform a rail impact test for the Air Transportable Lifting Device (ATLD). From information provided, the Storage and Outloading Division, developed tiedown procedures transporting the ATLD on a flatcar. These procedures were then tested by the Evaluation Division to AAR rail impact test requirements.

#### B. AUTHORITY

This test was conducted in accordance with mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL 61299-6000. Reference is made to Change 4, 4 October 1974, to AR-740-1, 23 April 1971, Storage and Supply Operations; AMCCOM-R 10-17, 13 January 1986, Mission and Major Functions of USADACS.

#### C. OBJECTIVE

The objective of this test was to determine if the ATLD was transportable on a rail flatcar when tested to AAR rail impact test requirements and the developed tiedown procedure.

#### D. CONCLUSIONS

The tiedown procedure for the ATLD satisfied the AAR rail impact test requirements.

#### E. RECOMMENDATIONS

It is recommended that the tiedown procedure for transportation of the ATLD be approved.

PART 2

ATTENDEES

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### PART 3

#### TEST PROCEDURES

##### RAIL IMPACT TEST.

The test load or vehicle should be positioned in/on a railcar. For containers, the loaded container shall be positioned on a container chassis and securely locked in place using the twist locks at each corner. The container chassis shall be secured to a railcar. Equipment needed to perform the test includes the specimen (hammer) car, five empty railroad cars connected together to serve as the anvil, and a railroad locomotive. These anvil cars are positioned on a level section of track with air and hand brakes set and with the draft gear compressed. The locomotive unit pulls the specimen car several hundred yards away from the anvil cars and, then, pushes the specimen car toward the anvil at a predetermined speed, disconnects from the specimen car about 50 yards away from the anvil cars, and allows the specimen car to roll freely along the track until it strikes the anvil. This constitutes an impact. Impacting is accomplished at speeds of 4, 6, and 8 mph in one direction and at a speed of 8 mph in the opposite direction. The 4 and 6 mph impact speeds are approximate; the 8 mph speed is a minimum. Impact speeds are to be determined by using an electronic counter to measure the time required for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars.

PART 4

TEST RESULT

RAIL IMPACT DATA

TEST NO. 1

DATE: 4 APR 1989

TEST SPECIMEN: AIR TRANSPORTABLE LIFTING DEVICE on a flatcar.

TEST CAR NO. BN606824 LT. WT. 50,700 pounds

LADING AND DUNNAGE WT. 25,000 pounds

TOTAL SPECIMEN WT. 75,700 pounds

BUFFER CAR (5 CARS) WT. 250,000 pounds

| <u>IMPACT NO.</u> | <u>END STRUCK</u> | <u>VELOCITY</u><br>(MPH) | <u>IMPACT</u><br>FORCE | <u>REMARKS</u>                                                     |
|-------------------|-------------------|--------------------------|------------------------|--------------------------------------------------------------------|
| 1                 | forward           | 4.08                     |                        | no damage                                                          |
| 2                 | forward           | 6.03                     |                        | no damage                                                          |
| 3                 | forward           | 8.43                     |                        | Outriggers, left side<br>front and rear,<br>extended after impact. |
| 4                 | forward           | 8.62                     |                        | Tiedown cable<br>loosened, in forward<br>direction.                |

PART 5

TEST PLANS

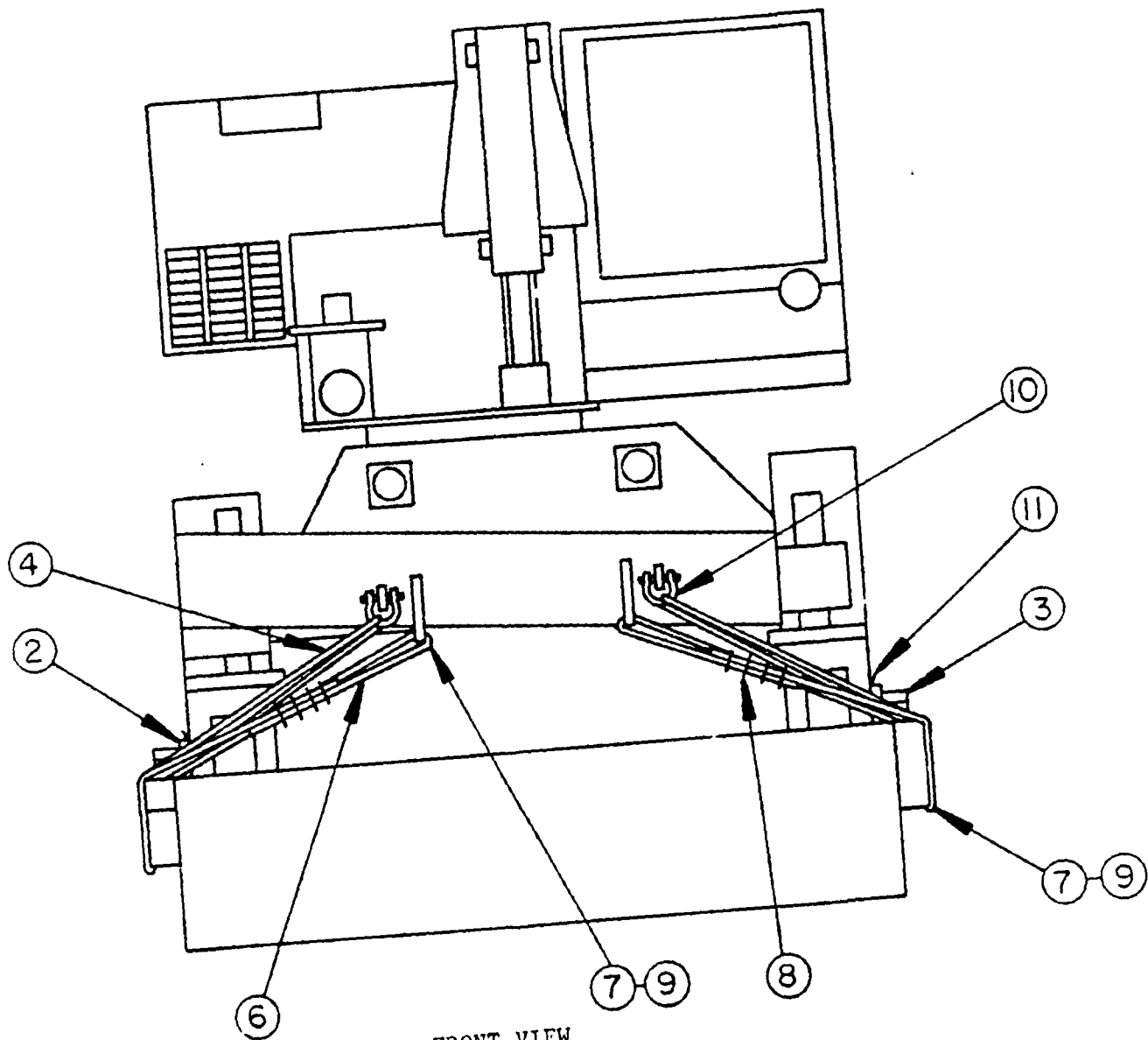
#### KEY NUMBERS

- ① Wheel block (4 reqd). See the detail on page 6. Locate 45° end of block against wheel. Nail through heel of block w/3-40 and 2-60d nails. Toenail each side to floor w/2-40d nails.
- ② Rubbing strip, 2" x 6" x 36" (4 reqd). Position on edge and nail to a lower piece ③ w/4-12d nails.
- ③ Side blocking, 2" x 4" x 36" (tripled) (4 reqd). Nail first piece to floor w/4-30d nails. Nail each additional piece in a like manner.
- ④ Tiedown cable, 1/2" dia (2 reqd). Install cable to approximate the angle shown and to form a complete loop from the stake pocket on flat car thru the shackle, piece marked ⑨, and back to flat car stake pocket.
- ⑤ Tiedown cable, 1/2" dia (2 reqd). Install cable to approximate the angle shown and to form a complete loop from the stake pocket on flat car around the rear axle and back to flat car stake pocket.
- ⑥ Tiedown cable, 1/2" dia (4 reqd). Install cable to approximate the angle shown and to form a complete loop from the stake pocket on flat car thru the tiedown device on lading and back to flat car stake pocket.
- ⑦ Thimble, standard, size 1/2" (14 reqd). Use one (1) per stake pocket and one (1) per lading tiedown facility, except for those cables around the axle of the vehicle. Secure to cable with 1 clip per thimble. Note that an "open pattern" thimble is recommended.
- ⑧ Clip, wire rope, 1/2" (32 reqd). Use 4 per cable joint. See the "Cable Joint" detail on page 6.
- ⑨ Clip, wire rope, 5/8" (14 reqd). Use to secure thimble, piece marked ⑦, to the wire rope, alt: no. 14 gage wire may be used in lieu of a clip for securement of the thimble to the tiedown cable.
- ⑩ Shackle, 1-1/8" (2 reqd). See "Front View" on page 5.
- ⑪ Anti-chafing paper (as reqd). Position under and so to extend 2" above piece marked ②.

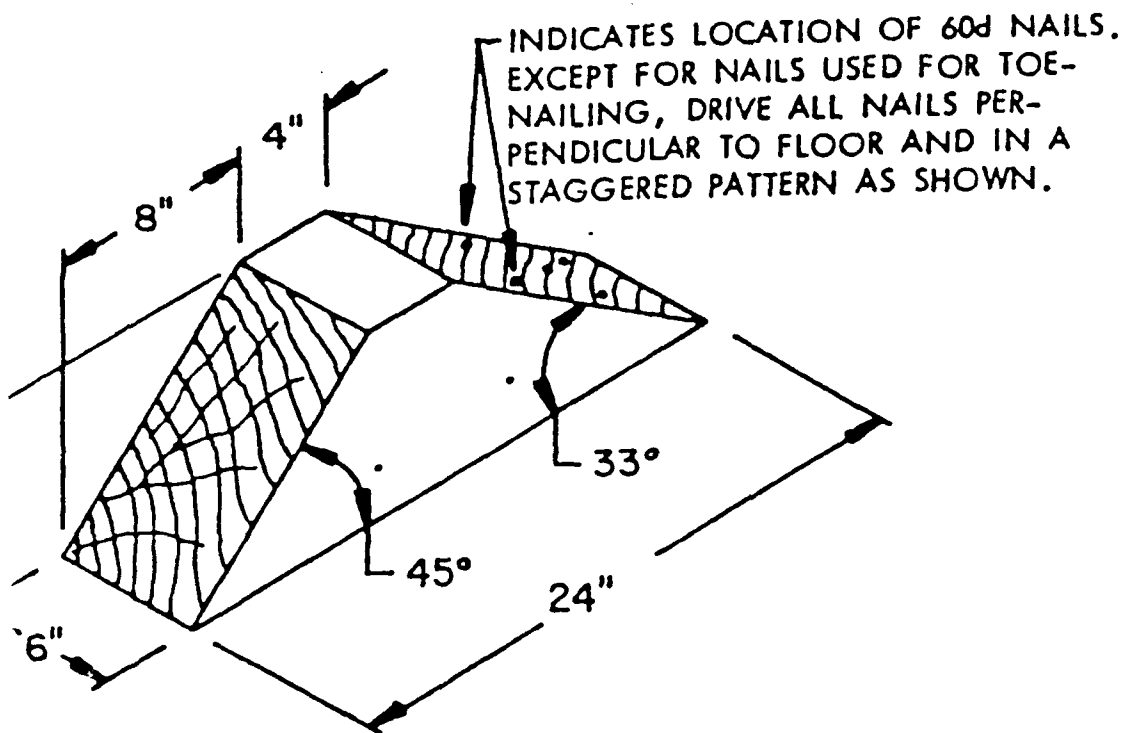
| BILL OF MATERIAL                                                                                                                                                                                                                                             |             |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------|
| LUMBER                                                                                                                                                                                                                                                       | LINEAR FEET | BOARD FEET |
| 2" x 4"                                                                                                                                                                                                                                                      | 36          | 24         |
| 2" x 6"                                                                                                                                                                                                                                                      | 12          | 12         |
| 6" x 8"                                                                                                                                                                                                                                                      | 6           | 24         |
| NAILS                                                                                                                                                                                                                                                        | NO. REQD    | POUNDS     |
| 12d (3-1/4")                                                                                                                                                                                                                                                 | 16          | 1/4        |
| 30d (4-1/2")                                                                                                                                                                                                                                                 | 48          | 2-1/2      |
| 40d (5")                                                                                                                                                                                                                                                     | 28          | 1-1/2      |
| 60d (6")                                                                                                                                                                                                                                                     | 8           | 1          |
| 1/2" Cable ----- 98' Req'd ----- 43 LBS<br>1/2" Clips ----- 32 Req'd ----- 14 LBS<br>5/8" Clips ----- 14 Req'd ----- 9 LBS<br>1/2" Thimbles ----- 14 Req'd ----- 4 LBS<br>Anti-Chafing ----- As Req'd ----- NIL<br>1-1/8" Shackle ----- 2 Req'd ----- 14 LBS |             |            |

LOAD AS SHOWN

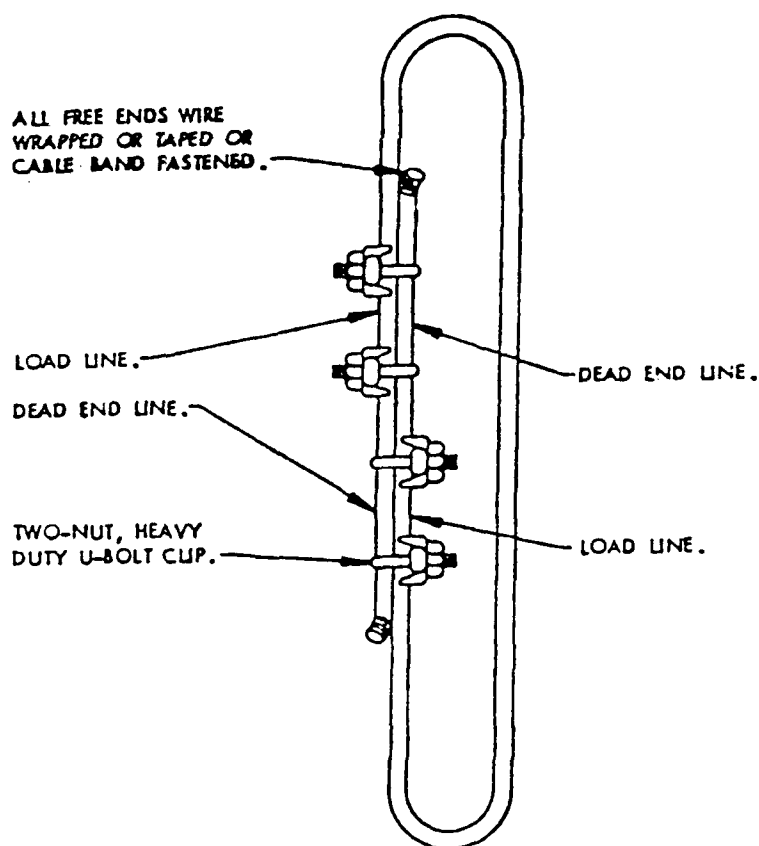
| <u>ITEM</u>          | <u>QUANTITY</u> | <u>WEIGHT</u> (Approx) |
|----------------------|-----------------|------------------------|
| Lifting Device ----- | 1 -----         | 25,000 Lbs             |
| Dunnage -----        | -----           | 209 Lbs                |
| Total Weight -----   |                 | 25,209 Lbs (Approx)    |



FRONT VIEW



WHEEL BLOCK

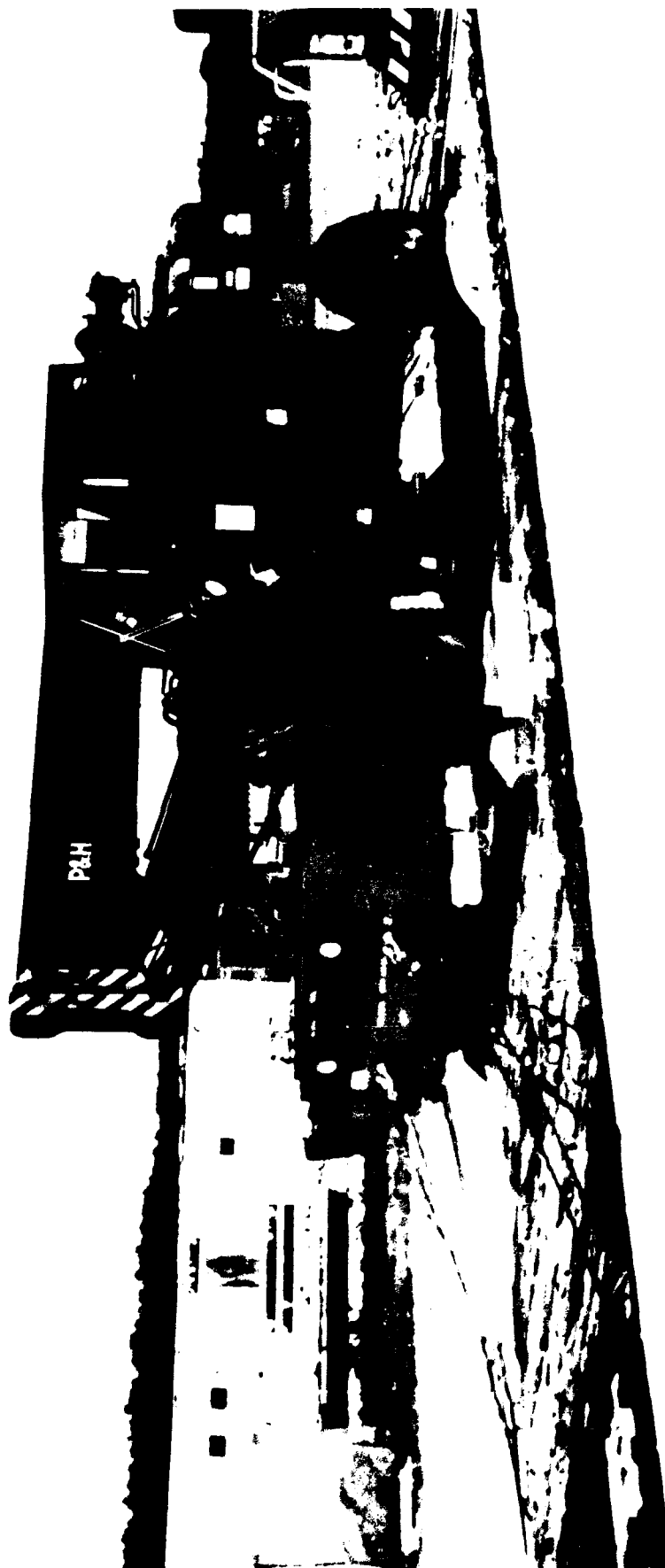


CABLE JOINT

PROPER TIGHTENING OF THE WIRE ROPE CLIP NUTS CAN BE ACCOMPLISHED BY UTILIZING A PROPER SIZED TORQUE WRENCH. AFTER THE NUTS HAVE BEEN INITIALLY TIGHTENED, THE "U" SIDE OF EACH CLIP MUST BE STRUCK SEVERAL TIMES WITH A HAMMER TO INSURE PROPER SEATING INTO THE DEAD END LINE. FINAL TORQUE WILL BE ACQUIRED BY REPEATEDLY AND ALTERNATELY TIGHTENING EACH CLIP NUT.

PART 6

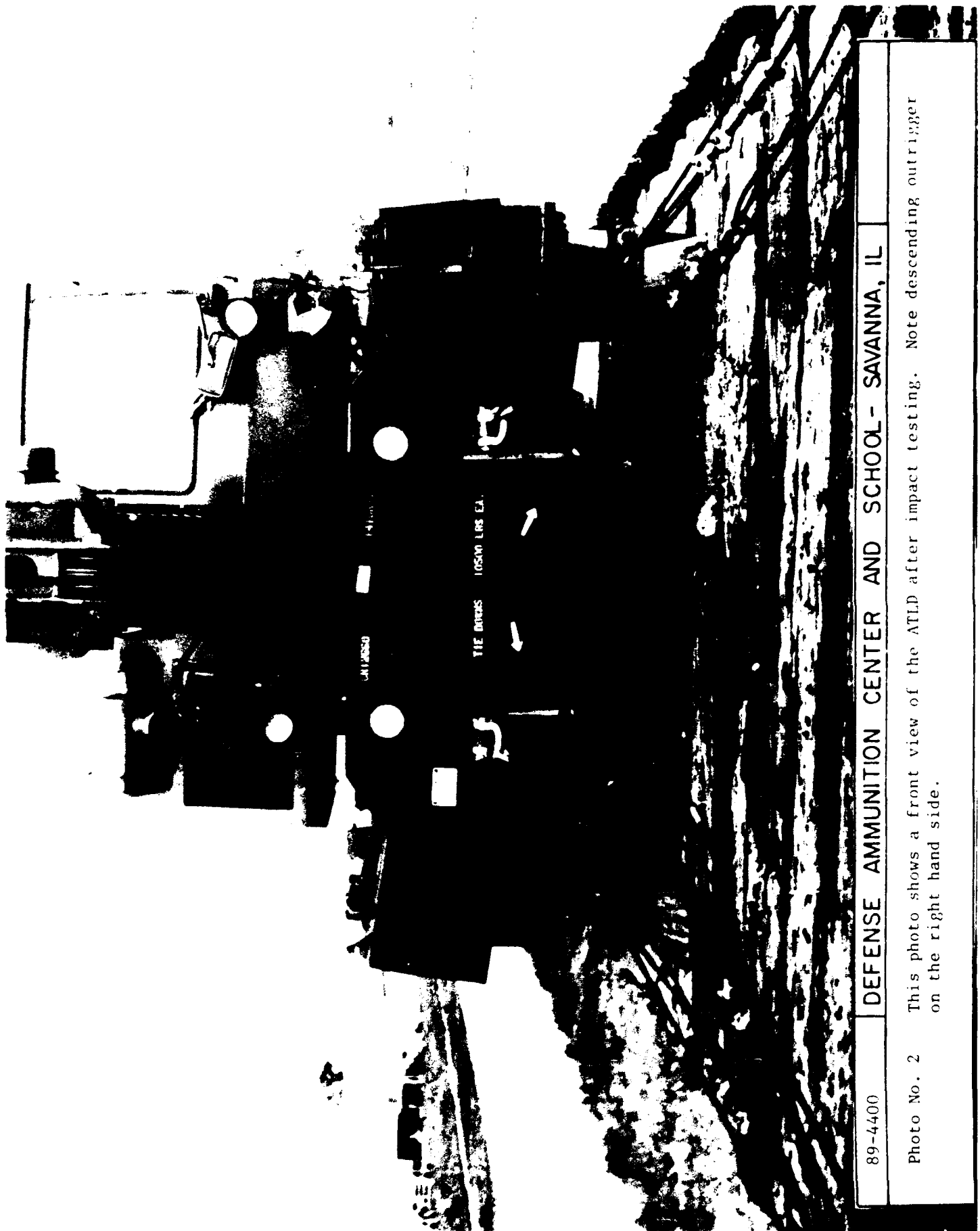
PHOTOGRAPHS



6-2-3900

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

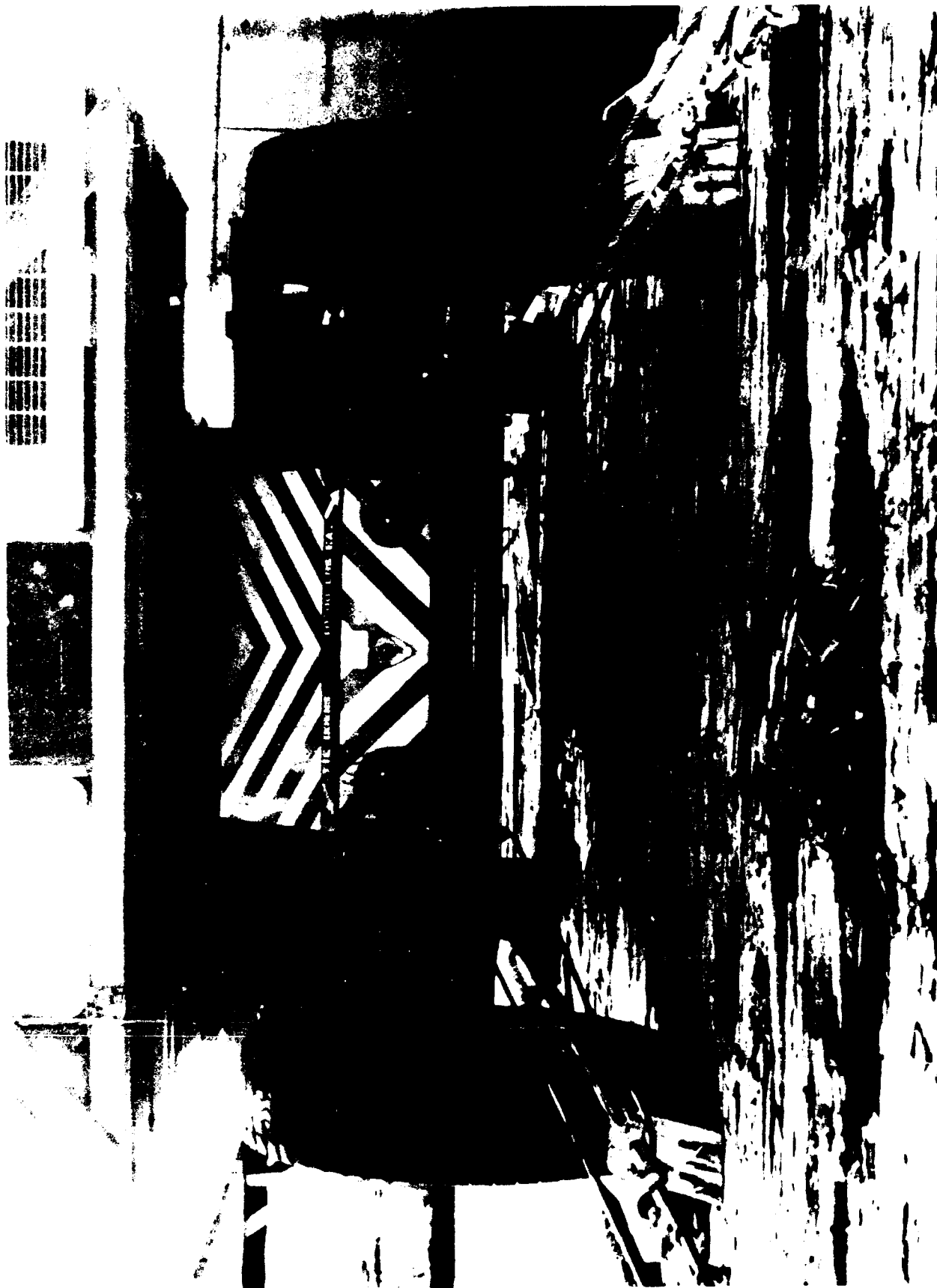
Photo No. 1 This photo shows the interior of the ammunition center. The photo was taken at the time of the inspection.



89-4400

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 2 This photo shows a front view of the ATLID after impact testing. Note descending outrigger on the right hand side.



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89-4306

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 4

This photo is a close up of the cycling cylinder on the ATR. As a result of rail impact testing and a missing locking pin, the attachment pin of the ground plate to the cylinder, has been partially breeched. Normally the securing pin would be pushed completely through and retained in place by a safety pin. Also, under normal shipping conditions, the cylinder would remain retracted.



89-4393

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 5

This photo shows a close up of Burlington Northern railcar 606824. This car was used to test the ATLD. It is not a typical example of railcars received used in testing; however, it is more the exception. This photo does point out that rolling stock of condition can be expected occasionally for use in transporting military materials.