TRANSPORTABILITY TEST OF AIR
TRANSPORTABLE LIFTING DEVICE (ATLD)
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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 (RDECC), STRBE-FMR, to develop a tie-down procedure and perform a rail impact test for the Air Transportable Lifting Device (ATLD). From information provided, the Storage and Outloading Division developed tie-down 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.
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>PART</th>
<th>PAGE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. INTRODUCTION</td>
<td>1-1</td>
</tr>
<tr>
<td>A. Background</td>
<td>1-1</td>
</tr>
<tr>
<td>B. Authority</td>
<td>1-1</td>
</tr>
<tr>
<td>C. Objective</td>
<td>1-2</td>
</tr>
<tr>
<td>D. Conclusions</td>
<td>1-2</td>
</tr>
<tr>
<td>E. Recommendations</td>
<td>1-2</td>
</tr>
<tr>
<td>2. ATTENDEES</td>
<td>2-1</td>
</tr>
<tr>
<td>3. TEST PROCEDURES</td>
<td>3-1</td>
</tr>
<tr>
<td>4. TEST RESULT</td>
<td>4-1</td>
</tr>
<tr>
<td>5. TEST PLANS</td>
<td>5-1</td>
</tr>
<tr>
<td>6. PHOTOGRAPHS</td>
<td>5-1</td>
</tr>
</tbody>
</table>
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) STREN-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.
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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, 5, and 9 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 9 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.
### 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

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

4-2
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 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.


11. Anti-chafing paper (as reqd). Position under and so to extend 2" above piece marked 2.
## BILL OF MATERIAL

<table>
<thead>
<tr>
<th>LUMBER</th>
<th>LINEAR FEET</th>
<th>BOARD FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; x 4&quot;</td>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td>2&quot; x 6&quot;</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>6&quot; x 8&quot;</td>
<td>6</td>
<td>24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAILS</th>
<th>NO. REQD</th>
<th>POUNDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12d (3-1/4&quot;)</td>
<td>16</td>
<td>1/4</td>
</tr>
<tr>
<td>30d (4-1/2&quot;)</td>
<td>48</td>
<td>2-1/2</td>
</tr>
<tr>
<td>40d (5&quot;)</td>
<td>28</td>
<td>1-1/2</td>
</tr>
<tr>
<td>60d (6&quot;)</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

- 1/2" Cable ---------------------- 98' Reqd ---------------------- 43 LBS
- 1/2" Clips ---------------------- 32 Reqd ---------------------- 14 LBS
- 5/8" Clips ---------------------- 14 Reqd ---------------------- 9 LBS
- 1/2" Thimbles -------------------- 14 Reqd ---------------------- 4 LBS
- Anti-Chafing --------------------- As Reqd ---------------------- NIL
- 1-1/8" Shackle ------------------- 2 Reqd ---------------------- 14 LBS

**LOAD AS SHOWN**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (Approx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting Device</td>
<td>1</td>
<td>25,000 Lbs</td>
</tr>
<tr>
<td>Dunnage</td>
<td></td>
<td>209 Lbs</td>
</tr>
</tbody>
</table>

Total Weight ---------------------- 25,209 Lbs (Approx)
INDICATES LOCATION OF 60d NAILS. EXCEPT FOR NAILS USED FOR TOE-NAILING, DRIVE ALL NAILS PERPENDICULAR TO FLOOR AND IN A STAGGERED PATTERN AS SHOWN.

WHEEL BLOCK

ALL FREE ENDS WIRE WRAPPED OR TAPED OR CABLE BAND FASTENED.

LOAD LINE.

DEAD END LINE.

TWO-NUT, HEAVY DUTY U-BOLT CUP.

LOAD LINE.

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
Photo No. 1: This photo shows the Defense Ammunition Center and School - Savanna, IL. It was taken at the beginning of February.
Photo No. 2  This photo shows a front view of the ATLD after impact testing. Note descending outrigger on the right hand side.
Photo No. 4  This photo is a close-up of the ejection cylinder on the AT&B. As a result of rail impact testing and a misfire 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.
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 materiels.