FINAL REPORT
JULY 2007
REPORT NO. 06-04H

EVALUATION TRANSPORTABILITY TESTING OF THE
JOINT MODULAR INTERMODAL PLATFORM (JMIP) UNIT #4
TP-94-01,
"TRANSPORTABILITY TESTING PROCEDURES"

Prepared for:

Distribution Unlimited:

TACOM/ARDEC
Logistics Research and Engineering Directorate
ATTN: AMSRD-AAR-AIL-F
Picatinny Arsenal, NJ 07806

DEFENSE AMMUNITION CENTER
VALIDATION ENGINEERING DIVISION
MCALESTFR, OKLAHOMA 74501-9053

2008030505040
AVAILABILITY NOTICE

A copy of this report will be furnished each attendee on automatic distribution.

Additional copies or authority for reprinting may be obtained by written request from:

Director
U.S. Army Defense Ammunition Center
ATTN: SJMAC-DEV
1 C Tree Road, Bldg. 35
McAlester, OK 74501-9053

DISTRIBUTION INSTRUCTIONS

Destroy this report when no longer needed. Do not return.

***

Citation of trade names in this report does not constitute an official endorsement.

***

The information contained herein will not be used for advertising purposes.
EVALUATION TRANSPORTABILITY TESTING OF THE JOINT MODULAR INTERMODAL PLATFORM (JMIP) UNIT #4

TP-94-01, REV. 2, JUNE 2004, “TRANSPORTABILITY TESTING PROCEDURES”

ABSTRACT

The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV), was tasked by the Logistics Research and Engineering Directorate (AMSRD-AAR-AIL-F), Picatinny Arsenal, NJ, to conduct evaluation transportability testing on the Joint Modular Intermodal Platform (JMIP) Unit #4 manufactured by SEA BOX, Inc, East Riverton, NJ. The testing was conducted in accordance with TP-94-01, Revision 2, June 2004 “Transportability Testing Procedures.” The test payload consisted of pallets of 155MM Separate Loading Projectiles (SLPs) and Joint Modular Intermodal Containers (JMICs).

The objective of the testing was to identify the adequacy of the JMIP for demonstration use and not final approval when transportability tested in accordance with TP-94-01, Revision 2, June 2004.

The following observations resulted from the testing of JMIP Unit #4:

1. Prior to the start of testing the pins that hold the A-frame in the container transport position were replaced, the loose hex head rivets on the top of the deck were tightened, and the bolts holding the rear bumpers were tightened.
2. Forward and aft web restraints (crossing straps) were used at each end of the 155MM SLP payload. Traditionally, restraining straps across the end of the load are not used on 155MM SLP payloads. The restraint straps were added to reduce the stress imposed during testing on the intermediate gates.
3. The SEA BOX intermediate gates were used to restrain the payload.
4. The connection between the JMIC interface rings and the intermediate gates had enough tolerance to allow the gates and dunnage to go past vertical during testing.

5. The engage/disengage mechanism on the intermediate gate is only accessible from one side. Therefore, the gates have to be properly oriented or the mechanism may be blocked by the payload. The gate design should be uniform, with access to the mechanism on each side so that they do not have a front or back.

6. The operation of the engage/disengage mechanism was unsafe when installing/removing the intermediate gates due to problems with finger pinching.

7. The intermediate gates need a location where nails can be driven in and cinched to prevent movement of the dunnage between the gate and the payload.

8. The JMIP slid side-to-side throughout the STS testing. The movement of the adjustment bolt on the cams occurred during the testing. Future designs of the cam locking devices should prevent the bolts from moving in and out.

9. The main rails scuffed and dug into the container floor during the STS testing.

10. The bolts on the rear bumpers were loose at the end of the testing.

11. The lock rings on the roller shafts disengaged during testing and were found on the container floor.

12. The hex head rivets had loosened in several positions along the JMIP main rail.

13. The rail safety system pins that hold the main rails in position backed off during testing and had to be retightened.

The JMIP, as currently designed, is adequate to be used to transport the mixed load of 155MM SLPs and JMICs when using the intermediate gates and restraint straps on the end of the payload during the demonstrations.
The operational condition of the JMIP should be closely monitored during the demonstrations. Also, the Defense Ammunition Center, Transportation Engineering Division, shall be consulted for the ammunition loading and bracing instructions.

Prepared by: PHILIP W. BARICKMAN
Lead Validation Engineer

Reviewed by: JERRY W. BEAVER
Chief, Validation Engineering Division
U.S. ARMY DEFENSE AMMUNITION CENTER
VALIDATION ENGINEERING DIVISION
MCALESTER, OK 74501-9053

REPORT NO. 06-04H
Evaluation Transportability Testing of the Joint Modular Intermodal Platform (JMIP) Unit #4
TP-94-01, Revision 2, June 2004 “Transportability Testing Procedures”

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>1-1</td>
</tr>
<tr>
<td>D. OBSERVATIONS</td>
<td>1-1</td>
</tr>
<tr>
<td>E. CONCLUSION</td>
<td>1-2</td>
</tr>
<tr>
<td>2. ATTENDEES</td>
<td>2-1</td>
</tr>
<tr>
<td>3. TEST EQUIPMENT</td>
<td>3-1</td>
</tr>
<tr>
<td>4. TEST PROCEDURES</td>
<td>4-1</td>
</tr>
<tr>
<td>A. RAIL TEST</td>
<td>4-1</td>
</tr>
<tr>
<td>B. ON/OFF ROAD TESTS</td>
<td>4-3</td>
</tr>
<tr>
<td>1. HAZARD COURSE</td>
<td>4-3</td>
</tr>
<tr>
<td>2. ROAD TRIP</td>
<td>4-4</td>
</tr>
<tr>
<td>3. PANIC STOPS</td>
<td>4-4</td>
</tr>
<tr>
<td>4. WASHBOARD COURSE</td>
<td>4-4</td>
</tr>
<tr>
<td>C. OCEAN-GOING VESSEL TEST. Shipboard Transportation Simulator</td>
<td>4-4</td>
</tr>
<tr>
<td>5. TEST RESULTS</td>
<td>5-1</td>
</tr>
<tr>
<td>TESTING DATE –23-30 May 2007</td>
<td>5-1</td>
</tr>
<tr>
<td>A. RAIL TEST</td>
<td>5-2</td>
</tr>
<tr>
<td>B. ON/OFF ROAD TESTS</td>
<td>5-3</td>
</tr>
<tr>
<td>1. HAZARD COURSE</td>
<td>5-3</td>
</tr>
<tr>
<td>2. ROAD TRIP</td>
<td>5-4</td>
</tr>
<tr>
<td>3. PANIC STOPS</td>
<td>5-5</td>
</tr>
<tr>
<td>4. HAZARD COURSE</td>
<td>5-5</td>
</tr>
<tr>
<td>5. WASHBOARD COURSE</td>
<td>5-6</td>
</tr>
<tr>
<td>C. RAIL TEST</td>
<td>5-6</td>
</tr>
</tbody>
</table>
D. ON/OFF ROAD TESTS .................................................................5-7
1. HAZARD COURSE .................................................................5-7
2. ROAD TRIP ............................................................................5-8
3. PANIC STOPS ........................................................................5-9
4. HAZARD COURSE .................................................................5-9
5. WASHBOARD COURSE ..........................................................5-9
E. SHIPBOARD TRANSPORTATION SIMULATOR (STS) ...............5-10
F. OBSERVATIONS .......................................................................5-10
G. CONCLUSIONS .......................................................................5-10
6. DRAWINGS .............................................................................6-1
PART 1 – INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV), was tasked by the Logistics Research and Engineering Directorate (AMSRD-AAR-AI-F), Picatinny Arsenal, NJ, to conduct evaluation transportability testing on the Joint Modular Intermodal Platform (JMIP) Unit #4 manufactured by SEA BOX, Inc, East Riverton, NJ. The testing was conducted in accordance with TP-94-01, Revision 2, June 2004 “Transportability Testing Procedures.” The test payload consisted of pallets of 155 MM Separate Loading Projectiles (SLPs) and Joint Modular Intermodal Containers (JMICs).

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Joint Munitions Command (JMC), Rock Island, IL. Reference is made to the following:


C. OBJECTIVE. The objective of the testing was to identify the adequacy of the JMIP for demonstration use and not final approval when transportability tested in accordance with TP-94-01, Revision 2, June 2004.

D. OBSERVATIONS.
1. Prior to the start of testing, the pins that hold the A-frame in the container transport were replaced, the loose hex head rivets on the top of the deck were tightened, and the bolts holding the rear bumpers were tightened.
2. Forward and aft restraint web straps were used at each end of the 155MM SLP payload to reduce the stress imposed during testing on the intermediate
gates. Traditionally, restraint straps across the end of the load are not used on 155MM SLP payloads.

3. The SEA BOX intermediate gates were used to restrain the payload.

4. The connection between the JMIC interface rings on and the intermediate gates had enough tolerance to allow the gates and dunnage to go past vertical during testing.

5. The engage/disengage mechanism on the intermediate gate is only accessible from one side. Therefore, the gates have to be properly oriented or the mechanism may be blocked by the payload. The gate design should be uniform, with access to the mechanism on each side so that they do not have a front or back.

6. The operation of the engage/disengage mechanism was unsafe when installing/removing the intermediate gates due to problems with finger pinching.

7. The intermediate gates need a location where nails can be driven in and cinched to prevent movement of the dunnage between the gate and the payload.

8. The JMIP slid side-to-side throughout the Shipboard Transportation Simulator (STS) testing. The movement of the adjustment bolt on the cams occurred during the testing. Future designs of the cam locking devices should prevent the bolts from moving in and out.

9. The main rails scuffed and dug into the container floor during the STS testing.

10. The bolts on the rear bumpers were loose at the end of the testing.

11. The lock rings on the roller shafts disengaged during testing and were found on the container floor.

12. The hex head rivets had loosened in several positions along the JMIP main rail.

13. The rail safety system pins that hold the min rail in position backed off during testing and had to be retightened.
E. CONCLUSIONS.

1. The purpose of the testing was to identify the adequacy of the JMIP for demonstration use and not final approval. Testing has identified deficiencies with the current design.

2. The JMIP, as currently designed, is adequate to be used to transport the mixed load of 155MM SLPs and JMICs when using the intermediate gates and cross straps on the end of the payload during the demonstrations.

3. The operational condition of the JMIP should be closely monitored during the demonstrations. Also, the Defense Ammunition Center, Transportation Engineering Division, shall be consulted for the ammunition loading and bracing instructions.
## PART 2 - ATTENDEES

<table>
<thead>
<tr>
<th>ATTENDEE</th>
<th>MAILING ADDRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philip Barickman</td>
<td>Director</td>
</tr>
<tr>
<td>DSN 956-8992</td>
<td>U.S. Army Defense Ammunition Center</td>
</tr>
<tr>
<td>(918) 420-8992</td>
<td>ATTN: SJMAC-DEV</td>
</tr>
<tr>
<td></td>
<td>1 C Tree Road, Bldg. 35</td>
</tr>
<tr>
<td></td>
<td>McAlester, OK 74501-9053</td>
</tr>
<tr>
<td>Michael Bartosiak</td>
<td>Director</td>
</tr>
<tr>
<td>DSN 956-8083</td>
<td>U.S. Army Defense Ammunition Center</td>
</tr>
<tr>
<td>(918) 420-8083</td>
<td>ATTN: SJMAC-DET</td>
</tr>
<tr>
<td></td>
<td>1 C Tree Road, Bldg. 35</td>
</tr>
<tr>
<td></td>
<td>McAlester, OK 74501-9053</td>
</tr>
<tr>
<td>Joseph Cappetta</td>
<td>U.S. Army Armament Research,</td>
</tr>
<tr>
<td>(973) 724-7197</td>
<td>Development and Engineering Center</td>
</tr>
<tr>
<td></td>
<td>Logistics Research &amp; Engineering Dir.</td>
</tr>
<tr>
<td></td>
<td>ATTN: AMSRD-AAR-AIL-F</td>
</tr>
<tr>
<td></td>
<td>Picatinny Arsenal, NJ 07806-5001</td>
</tr>
<tr>
<td>Bob Cook</td>
<td>U.S. Army Armament Research,</td>
</tr>
<tr>
<td>(973) 724-2115</td>
<td>Development and Engineering Center</td>
</tr>
<tr>
<td></td>
<td>Logistics Research &amp; Engineering Dir.</td>
</tr>
<tr>
<td></td>
<td>ATTN: AMSRD-AAR-AIL-F</td>
</tr>
<tr>
<td></td>
<td>Picatinny Arsenal, NJ 07806-5001</td>
</tr>
</tbody>
</table>
PART 3 - TEST EQUIPMENT

1. Joint Modular Intermodal Platform Unit #4
   Manufactured by SEA BOX, Inc., East Riverton, NJ
   Model Number: J-MIP
   Serial Number: 00004
   Date of Manufacture: 26 January 2007
   Tare Weight: 4,240 lbs (without straps, rings and end gates)

2. Joint Modular Intermodal Container
   Designed by Naval PHST Center - Earle, NJ
   Length: 51-3/4 inches
   Width: 43-3/4 inches
   Height: 43 inches

3. Palletized Load System Truck
   Model #: M1074
   Manufactured by Oshkosh Truck Corporation, Oshkosh, WI
   ID #: 10T2P1NH6N1044011
   NSN: 2320-01-304-2277
   Serial #: 44011
   Curb Weight: 55,000 lbs

4. Truck, Tractor, MTV, M1088 A1
   ID #: J0231
   NSN: 2320 01 447 3893
   VSN: NL1FR5
   MFG Serial #: T-018447EFJM
   Weight: 19,340 lbs
5. Semitrailer, flatbed, breakbulk/container transporter, 22.5 ton
   Model #: M871
   Manufactured by Southwest Truck Body, St. Louis, MO
   ID #: NX03PJ – 0063
   NSN: 2330 00 122 6799
   Weight: 15,630 lbs

6. Railcar DODX 42353
   Manufactured by Thrall Car
   Length: 89 feet – 4 inches
   Empty Weight: 85,000 lbs.

7. Intermodal Container
   ID # USAU 020112-1
   Date of Manufacture: 05/95
   Manufactured by Med Union Containers, Izmir, Turkey
   Tare Weight: 4,920 lbs
   Maximum Gross Weight: 52,910 lbs
PART 4 - TEST PROCEDURES

The test procedures outlined in this section were extracted from TP-94-01, "Transportability Testing Procedures," Revision 2, June 2004, for validating tactical vehicles and outloading procedures used for shipping munitions by tactical truck, railcar, and ocean-going vessel.

The rail impact will be conducted with the test load secured directly to the railcar. Inert (non-explosive) items were used to build the load. The test loads were prepared using the blocking and bracing procedures proposed for use with munitions (see Part 6 – Drawings for procedures). The weight and physical characteristics (weights, physical dimensions, center of gravity, etc.) of the test loads were similar to live (explosive) ammunition.

A. RAIL TEST. RAIL IMPACT TEST METHOD. The test load or vehicle will be secured to a flatcar. The equipment needed to perform the test will include the specimen (hammer) car, four empty railroad cars connected together to serve as the anvil, and a railroad locomotive. The anvil cars will be positioned on a level section of track with air and hand brakes set and with draft gears compressed. The locomotive unit will push the specimen car toward the anvil at a predetermined speed, then disconnect from the specimen car approximately 50 yards away from the anvil cars allowing the specimen car to roll freely along the track until it strikes the anvil. This will constitute an impact. Impacting will be accomplished at speeds of 4, 6, and 8.1 mph in one direction and at a speed of 8.1 mph in the reverse direction. The tolerance for the speeds is plus 0.5 mph, minus 0.5 mph for the 4 mph and 6 mph impacts, and plus 0.5 mph, minus 0 mph for the 8.1 mph impacts. The impact speeds will be determined by using an electronic counter to measure the time for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars (see Figure 1).
ASSOCIATION OF AMERICAN RAILROADS (AAR)

STANDARD TEST PLAN

4 BUFFER CARS (ANVIL)
WITH DRAFT GEAR
COMPRESSED AND AIR BRAKES IN A SET
POSITION

ANVIL CAR TOTAL WT. 250,000 LBS (APPROX)

SPECIMEN CAR IS RELEASED BY SWITCH ENGINE
TO
ATTAIN: IMPACT NO. 1 @ 4 MPH
IMPACT NO. 2 @ 6 MPH
IMPACT NO. 3 @ 8.1 MPH

THEN THE CAR IS REVERSED AND RELEASED BY
SWITCH ENGINE TO ATTAIN:

IMPACT NO. 4 @ 8.1 MPH

Figure 1. Rail Impact Sketch
B. **ON/OFF ROAD TEST.**

1. **HAZARD COURSE.** The test load or vehicle will be transported over the 200-foot-long segment of concrete-paved road consisting of two series of railroad ties projecting 6 inches above the level of the road surface. The hazard course will be traversed two times (see Figure 2).

![Figure 2. Hazard Course Sketch](image)

- The first series of 6 ties are spaced on 10-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.
- Following the first series of ties, a paved roadway of 75 feet separates the first and second series of railroad ties.
c. The second series of 7 ties are spaced on 8-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 48 feet.

d. The test load is driven across the hazard course at speeds that will produce the most violent vertical and side-to-side rolling reaction obtainable in traversing the hazard course (approximately 5 mph).

2. **ROAD TRIP.** The test load or vehicle will be transported for a distance of 30 miles over a combination of roads surfaced with gravel, concrete, and asphalt. The test route will include curves, corners, railroad crossings and stops and starts. The test load or vehicle will travel at the maximum speed for the particular road being traversed, except as limited by legal restrictions.

3. **PANIC STOPS.** During the road trip, the test load or vehicle will be subjected to three (3) full airbrake stops while traveling in the forward direction and one in the reverse direction while traveling down a 7 percent grade. The first three stops are at 5, 10, and 15 mph while the stop in the reverse direction is approximately 5 mph. This testing will not be required if the Rail Impact Test is performed.

4. **WASHBOARD COURSE.** The test load or vehicle will be driven over the washboard course at a speed that produces the most violent response in the vertical direction.

C. **OCEAN-GOING VESSEL TEST.** Shipboard Transportation Simulator (Test Method 5). The Shipboard Transportation Simulator (STS) is used for testing loads in 8-foot-wide by 20-foot-long intermodal freight containers. The specimen shall be positioned onto the STS and securely locked in place using the cam lock at each corner. Using the procedure detailed in the operating instructions, the STS shall begin oscillating at an angle of 30 degrees, plus or minus 2 degrees, either side of vertical center and a frequency of 2 cycles-per-
minute (30 seconds, plus or minus 2 seconds) for a duration of two (2) hours.
This frequency shall be observed for apparent defects that could cause a safety
hazard. The frequency of oscillation shall then be increased to 4 cycles-per-
minute (15 seconds, plus or minus one second per cycle) and the apparatus
operated for two (2) hours. If an inspection of the load does not indicate an
impending failure, the frequency of oscillation shall be further increased to 5
cycles-per-minute (12 seconds, plus or minus one second per cycle), and the
apparatus operated for four (4) hours. The operation does not necessarily have
to be continuous; however, no changes or adjustments to the load or load
restraints shall be permitted at any time during the test. After once being set in
place, the test load (specimen) shall not be removed from the apparatus until the
test has been completed or is terminated.

![Washboard Course Sketch](image)

Figure 3. Washboard Course Sketch
PART 5 - TEST RESULTS

5.
Test Specimen: SEABOX Joint Modular Intermodal Platform Unit #4
Payload: Mixed Load of 155MM Separate Loading Projectiles (SLPs) and Joint Modular Intermodal Containers (JMIC).
Testing Date: 23-30 May 2007
Gross Weight: 26,180 lbs (JMIP and payload)

Note:
1. Prior to the start of testing the pins that hold the A-frame in the container transport were replaced, the loose hex head rivets on the top of the deck were tightened, and the bolts holding the rear bumpers were tightened.
2. Forward and aft restraint web straps were used at each end of the 155MM SLP payload. Traditionally, restraint straps across the end of the load are not used on 155MM SLP payloads to reduce the stress imposed during testing on the intermediate gates.
3. The SEA BOX intermediate gates were used to restrain the payload.
4. The connection between the JMIC interface rings and the intermediate gates had enough tolerance to allow the gates and dunnage to go past vertical during testing.
5. The engage/disengage mechanism on the intermediate gate is only accessible from one side. Therefore, the gates have to be properly oriented or the mechanism may be blocked by the payload. The gate design should be uniform, with access to the mechanism on each side so that they do not have a front or back.
6. The operation of the engage/disengage mechanism was unsafe when installing/removing the intermediate gates due to problems with finger pinching.
7. The intermediate gates need a location where nails can be driven in and cinched to prevent movement of the dunnage between the gate and the payload.
A. RAIL TEST.

Photo 1. Rail Impact Testing of the JMIP (Prior to Testing)

<table>
<thead>
<tr>
<th>Description</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flatcar Number: DODX 42353</td>
<td>85,000 lbs.</td>
</tr>
<tr>
<td>JMIP</td>
<td>26,180 lbs.</td>
</tr>
<tr>
<td>M1 Flatrack with MLRS Pods</td>
<td>28,265 lbs.</td>
</tr>
<tr>
<td>Total Specimen Wt.</td>
<td>139,445 lbs.</td>
</tr>
<tr>
<td>Buffer Car (four cars)</td>
<td>257,900 lbs.</td>
</tr>
</tbody>
</table>

Figure 4.

Remarks: Figure 4 lists the test components and weights of the items used during the Rail Impact Tests.
Impact Number | Avg. Velocity (mph)
---|---
1 | 5.2
2 | 6.9
3 | 8.0
4 | 9.1
5 | 8.9

**Remarks:**
1. Figure 5 lists the average speeds of the specimen car immediately prior to impact with the anvil. Impact #5 is the reverse impact.
2. Impacts #3 was determined to be a “no test” due to the insufficient velocity at impact. The test was repeated.
3. The JMIP was secured directly to the railcar for testing.
4. Inspection did not reveal any damage to the JMIP.

**B. ON/OFF ROAD TESTS.**

1. **HAZARD COURSE.**

![Photo 2. Hazard Course Testing of the JMIP](image-url)
Pass No. | Elapsed Time | Avg. Velocity (mph)
---|---|---
1 | 24 Seconds | 6
2 | 23 Seconds | 6

Figure 6.

Remarks:
1. Figure 6 lists the average speeds of the test load through the Hazard Course.
2. The JMIP was secured to the M871 trailer.
3. Inspection did not reveal any damage to the JMIP.

2. ROAD TRIP:

Remarks:
1. The Road Trip was conducted between the Hazard Course Passes #2 and #3.
2. Prior to the start of the Road Trip the safety system pins that hold the main rails in position had all backed off. They were all retightened and testing was continued.
3. The hex head rivet along the main rail at the forklift pocket was loose.
4. Inspection following the Road Trip revealed no damage or movement of the JMIP.

Photo 3. Main Rail System Safety Pins
3. **PANIC STOPS:** Testing was not required since the load was rail impact tested.

4. **HAZARD COURSE:**

<table>
<thead>
<tr>
<th>Pass No.</th>
<th>Elapsed Time</th>
<th>Avg. Velocity (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>26 Seconds</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>23 Seconds</td>
<td>6</td>
</tr>
</tbody>
</table>

**Figure 7.**

**Remarks:**

1. Figure 7 lists the average speeds of the test load through the Hazard Course.
2. Inspection did not reveal any damage to the JMIP.
5. **WASHBOARD COURSE:**

![Photo 5. Washboard Course Testing of the JMIP](image)

**Remarks:** Inspection following the Washboard Course revealed no damage to the JMIP.

C. **RAIL TEST.**

![Photo 6. Rail Impact Testing of the JMIP (Prior to Testing)](image)
<table>
<thead>
<tr>
<th>Description</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flatcar Number: DODX 42353</td>
<td>85,000 lbs.</td>
</tr>
<tr>
<td>JMIP in the Intermodal Container</td>
<td>31,100 lbs.</td>
</tr>
<tr>
<td>M1 Flatrack with MLRS Pods</td>
<td>28,265 lbs.</td>
</tr>
<tr>
<td>Total Specimen Wt.</td>
<td>144,365 lbs.</td>
</tr>
<tr>
<td>Buffer Car (four cars)</td>
<td>257,900 lbs.</td>
</tr>
</tbody>
</table>

**Figure 8.**

**Remarks:** Figure 8 lists the test components and weights of the items used during the Rail Impact Tests.

<table>
<thead>
<tr>
<th>Impact Number</th>
<th>Avg. Velocity (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.6</td>
</tr>
<tr>
<td>2</td>
<td>7.0</td>
</tr>
<tr>
<td>3</td>
<td>8.9</td>
</tr>
<tr>
<td>4</td>
<td>8.1</td>
</tr>
</tbody>
</table>

**Figure 9.**

**Remarks:**
1. Figure 9 lists the average speeds of the specimen car immediately prior to impact with the anvil. Impact #4 is the reverse impact.
2. Following Impact #4, the JMIP moved 0.25 inches in the direction of the impact and the rubber end blocks compressed.
3. Inspection did not reveal any damage to the JMIP.
4. The JMIP was secured in the intermodal container.

**D. ON/OFF ROAD TESTS.**

1. **HAZARD COURSE.**
Figure 10. Remarks:
1. Figure 10 lists the average speeds of the test load through the Hazard Course.
2. The JMIP was secured in the intermodal container.
3. Inspection did not reveal any damage to the JMIP.

2. ROAD TRIP:

Remarks:
1. The Road Trip was conducted between the Hazard Course Passes #2 and #3.
2. Inspection following the Road Trip revealed no damage or movement of the JMIP.
3. **PANIC STOPS:** Testing was not required since the load was rail impact tested.

4. **HAZARD COURSE:**

<table>
<thead>
<tr>
<th>Pass No.</th>
<th>Elapsed Time</th>
<th>Avg. Velocity (mph)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>25 Seconds</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>24 Seconds</td>
<td>6</td>
</tr>
</tbody>
</table>

**Figure 11.**

**Remarks:**
1. Figure 11 lists the average speeds of the test load through the Hazard Course.
2. Inspection did not reveal any damage to the JMIP.

5. **WASHBOARD COURSE:**

**Photo 8. Washboard Course Testing of the JMIP**

**Remarks:**
1. Inspection following the Washboard Course revealed no damage to the JMIP.
2. The cam on the driver’s side backed off during testing.
E. **SHIPBOARD TRANSPORTATION SIMULATION (STS).**

Remarks:

1. The JMIP slid side to side throughout the STS testing. The movement of the adjustment bolt on the cams occurred during the testing. Future designs of the cam locking devices should prevent the bolts from moving in and out.
2. The main rails scuffed and dug into the container floor during the STS testing.

F. **OBSERVATIONS:**

1. The bolts on the rear bumpers were loose at the end of the testing.
2. The lock rings on the roller shafts disengaged during testing and were found on the container floor.
3. The hex head rivets had loosened in several positions along the JMIP main rail.

G. **CONCLUSIONS:**

1. The purpose of the testing was to identify the adequacy of the JMIP for demonstration use and not final approval. Testing has identified deficiencies with the current design.
2. The JMIP, as currently designed, is adequate to be used to transport the mixed load of 155MM SLPs and JMICs when using the intermediate gates and restraint straps on the end of the payload during the demonstrations.
3. The operational condition of the JMIP should be closely monitored during the demonstrations. Also, the Defense Ammunition Center, Transportation Engineering Division, shall be consulted for the ammunition loading and bracing instructions.
PART 6 – DRAWINGS

The following drawing represents the load configuration that was subjected to the test criteria.
TEST SKETCH

LOADING AND BRACING OF MIXED LOAD OF 155MM PROJECTILES AND JOINT MODULAR INTERMODAL CONTAINERS (JMICS) ON THE JOINT MODULAR INTERMODAL PLATFORM (JMIP)

THIS SIX PAGE DOCUMENT DEPICTS D864 155MM PROJECTILES AND JMICS ON A SEABOX JMIP FOR EVALUATION TRANSPORTABILITY TESTING

NOTE: FORWARD AND AFT RETAINING WEB STRAPS WERE ADDED TO ATTEMPT TO PREVENT PERMANENT DAMAGE TO THE INTERMEDIATE GATES SECURING THE D864 155MM PROJECTILES.

PREPARED DURING MAY 2007 BY:
U.S. ARMY DEFENSE AMMUNITION CENTER
ATTN: SJMAC-DET
POC: MICHAEL BARTOSIAK
DSN 956-8083
COMM (918) 420-8083
FAX (918) 420-8811
E-MAIL: MICHAEL.BARTOSIAK@US.ARMY.MIL

LAURAA. FIEFFER
CHIEF, TRANSPORTATION ENGINEERING DIVISION
NOTE: FORWARD AND AFT RETAINING WEB STRAPS WERE ADDED TO ATTEMPT TO PREVENT PERMANENT DAMAGE TO THE INTERMEDIATE GATES SECURING THE D864 155MM PROJECTILES.

FORWARD END OF JMIP.

KEY NUMBERS (CONTINUED)

1. FORWARD RESTRAINT STRAP, 3-INCH WIDE WEB STRAP ASSEMBLY FOR CROP (2 REQD). INSTALL ONE WEB STRAP ASSEMBLY TO EXTEND FROM THE EIGHTH TIEDOWN PROVISION ON ONE SIDE OF CROP, AROUND THE FRONT FACE OF THE D45 PALLET UNITS, AND BACK DOWN TO THE TWELFTH TIEDOWN PROVISION ON THE OPPOSITE SIDE OF THE CROP. ALIGN SCUFF SLEEVES OVER ALL SHARP EDGES AND FIRMLY TENSION STRAP.

2. AFT RESTRAINT STRAP, 3-INCH WIDE WEB STRAP ASSEMBLY FOR CROP (2 REQD). INSTALL ONE WEB STRAP ASSEMBLY TO EXTEND FROM THE TWELFTH TIEDOWN PROVISION ON ONE SIDE OF CROP, AROUND THE REAR FACE OF THE D45 PALLET UNITS, AND BACK DOWN TO THE EIGHTH TIEDOWN PROVISION ON THE OPPOSITE SIDE OF THE CROP. ALIGN SCUFF SLEEVES OVER ALL SHARP EDGES AND FIRMLY TENSION STRAP.

3. HOLD-DOWN STRAP, 3-INCH WIDE WEB STRAP (6 REQD). INSTALL EACH STRAP TO EXTEND FROM THE DESIGNATED TIEDOWN PROVISION ON ONE SIDE OF JMIP, AROUND THE TOP OF THE PALLET UNITS, TO THE CORRESPONDING TIEDOWN PROVISION ON THE OPPOSITE SIDE OF JMIP. ALIGN SCUFF SLEEVES OVER ALL SHARP EDGES AND FIRMLY TENSION STRAP.

4. FORWARD RETAINER STRAP, 3-INCH WIDE WEB STRAP ASSEMBLY (1 REQD). INSTALL TO EXTEND FROM THE SECOND TIEDOWN PROVISION ON ONE SIDE OF JMIP, OVER THE TOP OF THE FORWARD BLOCKING ASSEMBLY STRAPPING BOARD, TO THE SECOND TIEDOWN PROVISION ON THE OPPOSITE SIDE OF JMIP. ALIGN SCUFF SLEEVES OVER ALL SHARP EDGES AND FIRMLY TENSION STRAP.

5. FIRST AFT RETAINER STRAP, 3-INCH WIDE WEB STRAP ASSEMBLY (1 REQD). INSTALL TO EXTEND FROM THE EIGHTEENTH TIEDOWN PROVISION ON ONE SIDE OF JMIP, OVER THE TOP OF THE AFT BLOCKING ASSEMBLY STRAPPING BOARD, TO THE EIGHTEENTH TIEDOWN PROVISION ON THE OPPOSITE SIDE OF JMIP. ALIGN SCUFF SLEEVES OVER ALL SHARP EDGES AND FIRMLY TENSION STRAP.

6. SECOND AFT RETAINER STRAP, 3-INCH WIDE WEB STRAP ASSEMBLY (1 REQD). INSTALL TO EXTEND FROM THE TWENTY-SIXTH TIEDOWN PROVISION ON ONE SIDE OF JMIP, OVER THE TOP OF THE AFT BLOCKING ASSEMBLY STRAPPING BOARD, TO THE TWENTY-SIXTH TIEDOWN PROVISION ON THE OPPOSITE SIDE OF JMIP. ALIGN SCUFF SLEEVES OVER ALL SHARP EDGES AND FIRMLY TENSION STRAP.

(CONTINUED AT LEFT)
BILL OF MATERIAL

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D684 Pallet Unit</td>
<td>1.8</td>
<td>15,732 LBS</td>
</tr>
<tr>
<td>JMIC Unit Load</td>
<td>2</td>
<td>5,942 LBS</td>
</tr>
<tr>
<td>Dunnage</td>
<td></td>
<td>289 LBS</td>
</tr>
<tr>
<td>JMIP</td>
<td></td>
<td>4,240 LBS</td>
</tr>
<tr>
<td><strong>TOTAL WEIGHT</strong></td>
<td></td>
<td>26,203 LBS (APPROX)</td>
</tr>
</tbody>
</table>

2" X 4" LUMBER LINEAR FEET BOARD FEET

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QUANTITY</th>
<th>WEIGHT (APPROX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; X 4&quot;</td>
<td>34</td>
<td>23 LBS</td>
</tr>
<tr>
<td>2&quot; X 8&quot;</td>
<td>71</td>
<td>95 LBS</td>
</tr>
<tr>
<td>NAILS</td>
<td>NO. REqd</td>
<td>POUNDS</td>
</tr>
<tr>
<td>10D (3&quot;)</td>
<td>136</td>
<td>2.06 LBS</td>
</tr>
</tbody>
</table>

2" WEB STRAP TIEDOWN ASSEMBLY - 3 REqd - 18 LBS
INTERMEDIATE GATES - 4 REqd - 33 LBS

INTERMEDIATE GATE
(4 REqd)

HEADER, 2" X 8" X 7'-4" (2 REqd). NAIL TO STRUTS W/3-10d NAILS AT EACH JOINT.

STRAPPING BOARD, 2" X 4" X 7'-4" (1 REqd). NAIL TO STRUTS W/10d NAILS AT EACH JOINT AFTER ALIGNING WITH SECOND TIEDOWN PROVISION.

UPPER STRAPPING BOARD, 2" X 4" X 48" (1 REqd). CENTER ON STRAPPING BOARD AND NAIL TO STRAPPING BOARD W/4-10d NAILS EVENLY SPACED.

FORWARD BLOCKING ASSEMBLY
(1 REqd)
UPPER STRAPPING BOARD, 2" X 4" X 48" (1 REQD). CENTER ON STRAPPING BOARD AND NAIL TO STRAPPING BOARD W/4-10d NAILS EVENLY SPACED.

CENTER ON STRAPPING BOARD AND NAIL TO STRAPPING BOARD W/2-10d NAILS AT EACH JOINT. EVENLY SPACED.

STRAPPING BOARD, 2" X 4" X 7-4" (1 REQD). NAIL TO STRUTS W/2-10d NAILS AT EACH JOINT AFTER ALIGNING WITH THIRTEENTH TIEDOWN PROVISION.

STRAP, 2" X 8" X 9-7/8" (4 REQD).

HEADER 2" X 8" X 7-4" (2 REQD). NAIL TO STRUTS W/2-10d NAILS AT EACH JOINT.

STRAPPING BOARD, 2" X 4" X 7-4" (1 REQD). NAIL TO STRUTS W/2-10d NAILS AT EACH JOINT AFTER ALIGNING WITH THE EIGHTEENTH TIEDOWN PROVISION.

STRUT, 2" X 8" X 9.75" (6 REQD).

FIRST AFT BLOCKING ASSEMBLY (1 REQD)

UPPER STRAPPING BOARD, 2" X 4" X 48" (1 REQD). CENTER ON STRAPPING BOARD AND NAIL TO STRAPPING BOARD W/4-10d NAILS EVENLY SPACED.

STRAPPING BOARD, 2" X 4" X 7-4" (1 REQD). NAIL TO STRUTS W/2-10d NAILS AT EACH JOINT AFTER ALIGNING WITH THE EIGHTEENTH TIEDOWN PROVISION.

HEADER 2" X 8" X 7-4" (2 REQD). NAIL TO STRUTS W/2-10d NAILS AT EACH JOINT.

STRUT, 2" X 8" X 9.75" (6 REQD).

SECOND AFT BLOCKING ASSEMBLY (1 REQD)

D864 PALLET UNIT DETAIL
155MM SLP, LARGE PALLET (12 REQD)

874 LBS (APPROX)
TOP FILL ASSEMBLY (1 REQD). SEE DETAIL ON PAGE 6.

M548 BOXES (20 REQD).

SIDE FILL ASSEMBLY (2 REQD). SEE DETAIL ON PAGE 6.

FRONT/REAR FILL ASSEMBLY (2 REQD). SEE DETAIL ON PAGE 6.

JMIC UNIT LOAD (2 REQD)

20 M548 BOXES @ 125 LBS = 2,500 LBS
DUNNAGE --- --- ---
CLOSED PANEL NAVY JMIC --- --- ---

TOTAL WEIGHT = 2,971 LBS (APPROX)
CUBE = 56.4 CU FT (APPROX)

BILL OF MATERIAL

<table>
<thead>
<tr>
<th>LUMBER</th>
<th>LINEAR FEET</th>
<th>BOARD FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; x 4&quot;</td>
<td>52</td>
<td>18</td>
</tr>
<tr>
<td>2&quot; x 4&quot;</td>
<td>64</td>
<td>43</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAILS</th>
<th>NO. REQD</th>
<th>POUNDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3d (1-1/4&quot;)</td>
<td>84</td>
<td>.16</td>
</tr>
<tr>
<td>6d (2&quot;)</td>
<td>60</td>
<td>.35</td>
</tr>
<tr>
<td>10d (3&quot;)</td>
<td>36</td>
<td>.54</td>
</tr>
</tbody>
</table>

NAVY PANEL JMIC  ---  1 REQD  ---  325 LBS
1/2 PLYWOOD      ---  17 SQ FT  ---  23 LBS
PLYWOOD 40-1/2" X 29" X 1/2" (1 REQD). NAIL TO VERTICAL PIECES W/1-3d NAIL EVERY 4".

VERTICAL PIECE 2" X 4" X 29" (3 REQD).

HORIZONTAL PIECE 2" X 4" X 40 1/2" (3 REQD). NAIL TO VERTICAL PIECES W/2-10d NAILS AT EACH JOINT.

SIDE FILL ASSEMBLY (2 REQD)

VERTICAL PIECE 1" X 4" X 29" (3 REQD). NAIL TO HORIZONTAL PIECES W/2-3d NAILS AT EACH JOINT.

HORIZONTAL PIECE 1" X 4" X 41-1/4" (3 REQD).

FRONT/REAR FILL ASSEMBLY (2 REQD)

SECONDARY LONGITUDINAL PIECE, 1" X 4" X 40 1/2" (5 REQD). NAIL TO LATERAL PIECES W/2-6d NAILS AT EACH JOINT.

LATERAL PIECE 2" X 4" X 40-1/2" (3 REQD). NAIL TO LONGITUDINAL PIECES W/2-6d NAILS AT EACH JOINT.

LONGITUDINAL PIECE 2" X 4" X 40 1/2" (5 REQD).

TOP FILL ASSEMBLY (1 REQD)