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Technical Report ARASI-TR-06002

TEST AND EVALUATION OF VALUE ENGINEERING PROPOSAL: REMOVAL OF RUBBER
PAD IN 120 mm PA153 AMMUNITION FIBER CONTAINER

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October 2006

Please note spelling correction of container to container in title of report and replace old cover with new.

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ARMAMENT RESEARCH, DEVELOPMENT AND
ENGINEERING CENTER

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Picatinny Arsenal, New Jersey

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14. ABSTRACT Rubber pad - expanded neoprene is currently positioned in the container body assembly. It is fastened with adhesive to the metal end, which is crimped to the outer body portion of the fiber container. Extensive testing was performed on the cartridge support during design, pre-production, and FAT testing on past and current contracts by U.S. Army Armament Research, Development and Engineering Center personnel. The cartridge support has shown excellent strength at both elevated and negative temperatures. The container itself is designed and manufactured in a way as to add additional strength to the support. The fiber container, by forming an exterior barrier around the cartridge support also helps in controlling the amount of expansion the cartridge support can achieve. By removing the rubber pad, an initial cost savings of \$0.32 per container would be achieved.					
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CONTENTS

	Page
Introduction	1
Objectives	2
Test Procedure and Results	2
Conclusions	3
Recommendation	4
Distribution List	5

INTRODUCTION

United Ammunition Containers (UAC), Inc. is the current producer of PA153/PA167 fiber containers for 120 mm mortar ammunition. UAC submitted a Value Engineering Change Proposal (VECP) proposing the removal of a rubber pad secured behind the cartridge support as it is asserted that this component has little to no value or function in the protection of the fuze in fiber container (fig. 1). The rubber pad is currently positioned in the fiber ammunition container assembly to protect and cushion the mortar fuze in case the cartridge support was to fail allowing the mortar to fall to the bottom of the container. It is fastened with adhesive to the metal end which is crimped to the outer body portion of the fiber ammunition container. Elimination of this part of the container will result in a cost savings, as the material itself plus the labor involved in ordering/cutting/applying will become obsolete.

Based on the \$0.32 estimated cost savings per container the following information will show the accumulated savings based on a range of quantities:

10,000 containers x \$0.32 = \$3200.00 savings

25,000 containers x \$0.32 = \$8000.00 savings

50,000 containers x \$0.32 = \$16000.00 savings

Based on multi year contracts, which can have production quantities in excess of 250,000 containers, there is the possibility of cost savings reaching \$80,000.00 or more just by the removal of this pad.

This report focuses on the details of the testing conducted on the pad-less version of the fiber ammunition container.



Figure 1
Inside the 120 mm fiber tube container

OBJECTIVES

In response to UAC's VECP, the Packaging Division of U.S. Army Armaments Research, Development and Engineering Center, Picatinny Arsenal, New Jersey initiated a limited test and evaluation (T&E) program to verify that the removal of the rubber pad from the end of the fiber ammunition container would not have an adverse effect on the protection provided to the 120 mm ammunition cartridge. The T&E was limited to include 7 ft drop tests at temperature extremes as this would produce the most likely failure event for the plastic cartridge support during rough handling.

TEST PROCEDURE AND RESULTS

Eight 120 mm mortar rounds were loaded into fiber ammunition containers and then into four metal containers (PA154) (two per each metal container). Two metal containers were then loaded into a -65°F cold chamber and the other two metal containers into a +160°F hot chamber for a period of 24 hrs. For the cold chamber, one metal container had rounds packed in the opposite directions. The second metal container had the two rounds packed in the same direction. The same was applied to the two metal containers in hot chamber as well. Note: Rounds normally face the opposite direction when they are loaded into the metal container with exception of fiber containers that contain illumination mortar rounds. As a result, we need to take all different aspects into consideration when performing this test.

Immediately following removal from the conditioning chambers, each metal container was dropped from a height of 7 ft in the following orientations: once flat on the cover and once flat on the bottom for those metal containers containing fiber containers that were positioned in opposite directions. For fiber containers positioned in the same direction within the metal containers, these were dropped twice on the side where the mortar fuzes were facing the metal container's bottom. Note: with the removal of the rubber pad, the fuze area on the mortar round and package was our main concern.

Drop Tests - 7 ft

Tests conducted at -65°F - After the temperature conditioning period, the two metal containers were subjected to the 7 ft drop test in accordance with MIL-STD-1904. The mortar fuze inside of fiber tube showed no damage.

Test conducted at +160°F - After the temperature conditioning period, the two metal containers were subjected to the 7 ft drop test in accordance with MIL-STD-1904. The mortar fuze inside of fiber tube showed no damage.

Figure 2 shows the cartridge support inside of the fiber container after the drop with no damage.



Figure 2
Fuze support

Figure 3 shows the fin shaped bulge formed into the cover of left fiber container. As described in the Test Procedure and Result section, two out of four metal containers contain fiber tube containers that were positioned in opposite directions. The fin shaped bulge occurs when a metal container is dropped - once flat on the cover and once flat on the bottom. No damaged was observed on the mortar rounds when they were inspected.



Figure 3
Top of the fiber container

CONCLUSIONS

Extensive qualification testing was performed by the U.S. Army Armament Research, Development and Engineering Center's Packaging Division and the contractors on the cartridge support during design, pre-production, and first article testing under vigorous conditions. No failures of the cartridge support were observed that would have allowed the mortar ammunition to move within the fiber container. The 7 ft drop tests cited in this report again proved that the

plastic cartridge support had adequate strength to support the cartridge at both elevated and negative temperatures. The removal of the cushioning pad will not cause negative impact on the cartridge survivability during transport and storage in the proposed packaging configuration.

RECOMMENDATION

The original design incorporated the “pad” to protect and cushion the mortar fuze in case the cartridge support were to fail allowing the mortar to fall to the bottom of the container. However, given the design of the cartridge support and the design of the fiber container itself, the test results verified the cartridge support is strong enough to support the cartridge during rough handling at temperature extremes. The pad added no value to the packaging design. As a result of this testing and design analysis, this office recommends removal of the expanded neoprene pad from the 120 mm mortar fiber container as it is cost effective and will not affect the item package system performance.

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