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RDT&E PROJECT NO. 1X279191D686

USATECOM PROJECT NO 3-8-0201-50

USARADBD PROJECT NO GM-848

ARCTIC SERVICE TEST OF XM237 MOUNTING KIT, VEHICLE, GUIDED MISSILE SYSTEM (READY-RACK) FOR REDEYE WEAPONS

LETTER REPORT OF TEST

BY

1LT JAMES A. STEPHENS, JR.

FEBRUARY 1969

US ARMY AIR DEFENSE BOARD

FORT BLISS, TEXAS

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DEPARTMENT OF THE ARMY
HEADQUARTERS, U. S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005

AMSTE-BA
3-8-0201-50

25 MAR 1969

SUBJECT: Letter Report of Test, Arctic Service Test of XM237 Mounting Kit, Vehicle, Guided Missile System (READY-RACK) for REDEYE Weapons, RDT&E No. 1X279191D686, USATECOM Project No. 3-8-0201-50

Project Manager, REDEYE
U. S. Army Missile Command
ATTN: AMCPM-RE
Redstone Arsenal, Alabama 35809

1. Reference letter, AMSTE-BA, U. S. Army Test and Evaluation Command, 16 January 1969, subject: Final Report, Service Test of XM237 Mounting Kit, Vehicle, Guided Missile System (Ready-Rack) for REDEYE Weapons, RDT&E Project No. 1X279191D686, USATECOM Project No. 3-8-0201-45.

2. Subject letter report is approved and forwarded as inclosure.

3. The XM237 Mounting Kit (READY-RACK) was subjected to Temperate Service Test by the U. S. Army Air Defense Board (USARADBD) during the period 13 September thru 3 October 1968. Results of this test were reported by referenced letter. One deficiency, inadequacy of the latch, clamp, and band assembly, and three shortcomings; (1) mounting nuts vibrated loose and were lost, (2) vehicle modification requirements were not included in the installation procedure, and (3) tools required in the installation procedure to mount the READY-RACK are not available to units having REDEYE teams attached were reported. The latch, clamp, and band assembly were modified to correct the deficiency and self-locking mounting nuts were provided. The READY-RACK was resubmitted for service testing in the arctic climatic zone. The Arctic Service Test of the READY-RACK was conducted by the USARADBD at Fort Greely, Alaska, during the period 14 through 24 January 1969.

4. Subject report lists one deficiency. The deficiency is the same as that reported in referenced letter, i.e., the inadequacy of the latch, clamp and band assembly. During the temperate test, one latch completely separated. Modification of the READY-RACK as a result of this latch failure provided for a heavier duty latch. This latch did not separate during the Arctic Service Test; however, enlargement of the latch fastener hole and erosion of the latch fastener pivot was

reported. The latches were subjected to a significantly lesser number of operations in the arctic test then in the temperate test. Based on this information, it is this command's consideration that continued operation of the latches would result in latch separation.

5. Results of the arctic test show that, but for two exceptions, the findings reported in referenced letter are valid. The two exceptions are as follows:

a. Required: The READY-RACK must permit a weapon to be removed by a gunner in less than 5.0 seconds.

Findings: Due to the limited area inside the M151 A1 vehicle fitted with hardtop closure kit, two men were required to remove the weapons from the READY-RACK and from the vehicle. Average times to remove one weapon from the READY-RACK and clear the vehicle was 6.8 seconds with complete arctic gear including arctic mittens and 5.8 seconds with complete arctic gear and work gloves.

b. Required: The READY-RACK must transport REDEYE weapons in a readily available position in the ¼-ton truck. A weapon transported in the READY-RACK may be exposed to a combination temperate-arctic zone or a temperate-tropic zone environment, but would rarely be exposed to a combination of all three zones.

Findings: Requirement not tested. Testing of this configuration READY-RACK was conducted only in the arctic climate zone at Fort Greely, Alaska. Due to the deficiency found during arctic testing, further testing of this READY-RACK configuration in the temperate and tropic zones was not conducted.

6. The conclusions of the subject report are summarized herewith:

a. The self-locking nuts provided for mounting the READY-RACK have corrected the problem of the mounting nuts loosening and being lost as reported in referenced letter.

b. The latch and clamp assemblies, modified after temperate test, are more durable than these used during temperate test; however, the conditions of the enlargement of the latch fastener hole and erosion of the latch fastener pivot still exist.

25 MAR 1969

AMSTE-BA
SUBJECT: Letter Report of Test, Arctic Service Test of XM237 Mounting Kit, Vehicle, Guided Missile System (READY-RACK) for REDEYE Weapons, RDT&E No. 1X279191D686, USATECOM Project No. 3-8-0201-50

c. Gunner reaction time is increased using the READY-RACK in the M151 A1 vehicle equipped with winterization kit.

d. Tools required in the installation procedure to mount the READY-RACK are not available to units having REDEYE teams attached. Substitute tools are available in the organization common tool kits.

e. Vehicle modification requirements should be included in the installation procedure.

7. Recommendation: The configuration of the XM237 Mounting Kit (READY-RACK) tested is considered unsuitable for Army use.

FOR THE COMMANDER:

WILLIAM H. HUBBARD
Colonel, GS
Deputy Chief of Staff

1 Incl
as (5 cys)

Cy Furn: (w/incl)
DA, OACSFOR, ATTN: FOR AD (1 cy)
CG, USAMC, ATTN: AMCRD-MA (2 cys)
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CG, USACDC, ATTN: USACDC LnO, USATECOM (12 cys)

DEPARTMENT OF THE ARMY
UNITED STATES ARMY AIR DEFENSE BOARD
FORT BLISS, TEXAS 79916

STEBD-PO February 1969

SUBJECT: Letter Report of Arctic Service Test of XM237 Mounting Kit, Vehicle, Guided Missile System (Ready-Rack) for REDEYE Weapons, RDT&E Project No. 1X279191D686, USATECOM Project No. 3-8-0201-50 (GM-848)

TO: Commanding General
US Army Test and Evaluation Command
ATTN: AMSTE-BA
Aberdeen Proving Ground, Maryland 21005

1. REFERENCES.

a. Letter, CSGAD-M, US Army Combat Developments Command, 8 September 1967, subject: Tactical Requirements for the M151A1 Ready-Rack and the XM49E3 Trainer.

b. Plan of Test, USATECOM Project No. 3-8-0201-45 (GM-3467), US Army Air Defense Board, December 1967, Service Test of XM237 Mounting Kit, Vehicle, Guided Missile System (Ready-Rack) for REDEYE weapons.

c. Letter, STEBD-PO, US Army Air Defense Board, March 1968, subject: Change 1, Test Plan, Service Test of XM237 Mounting Kit, Vehicle, Guided Missile System (Ready-Rack) for REDEYE weapons, RDT&E Project No. 1X279191D686, USATECOM Project No. 3-8-0201-45, USARADBD Project No. GM-3467.

d. Interim Letter Report, USATECOM Project No. 3-8-0201-45 (GM-3467), US Army Air Defense Board, August 1968, "Service Test of XM237 Mounting Kit, Vehicle, Guided Missile System (Ready-Rack) for REDEYE Weapons."

e. Report of Test, USATECOM Project No. 3-8-0201-45 (GM-3467), US Army Air Defense Board, November 1968, "Service Test of XM237 Mounting Kit, Vehicle, Guided Missile System (Ready-Rack) for REDEYE Weapons."

2. DESCRIPTION.

a. The XM237 Mounting Kit, Vehicle, Guided Missile System (Ready-Rack) consists of an assembly capable of holding two XM41E2 Intercept-Aerial Guided Missile Systems (REDEYE weapons) in a combat ready condition in the rear of an M151A1 1/4-ton, 4 x 4 Utility Truck.

b. The Ready-Rack is emplaced on the M151A1 vehicle with minor modification to the vehicle. The Ready-Rack is secured to the vehicle with four bolt assemblies which require the drilling of two holes in each of the rear fenders. The REDEYE weapons are secured to the Ready-Rack with quick release clamp and band assemblies.

3. BACKGROUND.

a. The XM237 Mounting Kit (Ready-Rack) was designed by the Ground Support Equipment Laboratory, Research and Development Directorate, US Army Missile Command (USAMICOM), Redstone Arsenal, Alabama, to provide a vehicular "ready-mount" for the XM41E2 REDEYE weapon. Tactical requirements for the Ready-Rack were developed by the US Army Combat Developments Command (reference 1a).

b. In July 1967, the US Army Test and Evaluation Command (USATECOM) was requested to test the Ready-Rack, and in November 1967, USATECOM directed the US Army Air Defense Board to conduct a service test of the Ready-Rack. The US Army Air Defense Board submitted a plan of test to USATECOM in December 1967 (reference 1b) and the plan of test was approved in January 1968. A Change 1 to the Plan of Test (reference 1c) was submitted to USATECOM in March 1968, and was approved in April 1968.

c. A Service test of a prototype of the current Ready-Rack commenced in June 1968. During testing of the prototype Ready-Rack, the over-center latches were damaged through use. An Interim Letter Report on the results of the Initial Service Test was published in August 1968 (reference 1d).

d. A second Ready-Rack, different in configuration from that tested earlier, was delivered to the Air Defense Board for service testing. The Service Test of the Ready-Rack was conducted at Fort Bliss, Texas during the period 13 September through 3 October 1968. The Report of Test was submitted by the Air Defense Board to USATECOM in November 1968 (reference 1e) and approved in January 1969.

e. The Service test of the Ready-Rack revealed one deficiency. Specifically, the latch and clamp assemblies of the Ready-Rack were not durable and did not permit the rapid removal of weapons from the Ready-Rack, or repeated opening and closing without the possibility of damage to the weapon or the clamp assembly.

f. Subsequent to the publication of the Service Test Report, the Ready-Rack was modified and resubmitted for service testing in the arctic climatic zone. The Arctic Service Test of the Ready-Rack was conducted by the Air Defense Board at Fort Greely, Alaska, during the period 14 through 24 January 1969. The results of this arctic test are reported herein.

4. TEST OBJECTIVES.

a. The over-all objective of the Arctic Service Test was to determine the suitability of the Ready-Rack in an arctic field environment.

b. Specific objectives were to determine:

(1) The capability of the XM41E2 REDEYE weapon, while carried on the Ready-Rack, to withstand the rigors of tactical field environment in the arctic climatic zone.

(2) The compatibility of the Ready-Rack with the winterization kits (-25°F heater kit and hardtop closure kit) for the M151A1 vehicle.

(3) Ease of handling and installing the weapon on the Ready-Rack in an arctic winter environment.

5. DISCUSSION.

a. One XM237 Mounting Kit, modified after the temperate test, was delivered to the Air Defense Board in December 1968 for further testing. Modifications made after temperate testing consisted of adding production latches and self-locking nuts and strengthening the hinge band assembly. The Ready-Rack required these modifications to increase the durability of the latch and clamp assemblies and to prevent loss of attachment nuts during transport.

b. The XM237 Mounting Kit was delivered to the Arctic Test Center, Fort Greely, Alaska on 4 January 1969. The XM237 Mounting Kit was inventoried for any shortages and physically inspected to determine if any damages were incurred during shipment.

c. Testing began on 14 January 1969 when the Ready-Rack was placed in open storage to determine the effect of temperature on the subsequent usage of the Ready-Rack. The Ready-Rack was exposed to prevailing arctic winter conditions for a period of 8 days at ambient air temperatures ranging from -3°F to -53°F.

d. The Ready-Rack was removed from storage on 21 January 1969 and inspected for physical damage. The latch and clamp assemblies were opened and closed to evaluate the modifications made to the assemblies.

e. Following inspection, the Ready-Rack was installed in an M151A1 1/4-ton truck using the installation procedures outlined in the 1-1/2 page document provided with the Ready-Rack (applicable DA publications were not provided). The M151A1 vehicle used during the test was equipped with a winterization kit consisting of a -25°F heater kit and a hardtop closure kit.

f. Road testing of the Ready-Rack was conducted during the period 21-24 January 1969 using three XM141E2 REDEYE weapons. The three weapons were transported under conditions described in Inclosure 2.

g. Each weapon was transported the following number of miles:

WEAPON NO	TOTAL MILES TRANSPORTED
305584	513.5
307372	512.9
307336	250.0

h. Throughout the entire testing period the Ready-Rack was transported a total of 957.6 miles. Of this total, 736.5 miles were traveled with the Ready-Rack containing weapons and 194.1 miles were traveled with the Ready-Rack empty.

i. Human factors engineering tests were conducted on 24 January 1969, using two gunners. The gunners were required to install and remove ballasted XM41E2 (Block III) REDEYE launchers from the Ready-Rack using written procedures provided with the Ready-Rack. The gunners prepared for simulated target engagement by removing the ballasted launchers from the Ready-Rack, clearing the vehicle, removing the battery receptacle cap, and sighting on the target. Gunner reaction times were recorded with gunners wearing protective arctic clothing. Arctic clothing consisted of normal combat clothing plus an arctic parka with liner and with arctic mittens or work gloves.

6. SUMMARY OF RESULTS.

a. A maintenance support package was not provided with the Ready-Rack furnished for service testing

b. Exposure of the Ready-Rack to the arctic winter environment resulted in a stiffening of the hinges of the clamp assemblies. The stiffened hinges restricted the complete opening of the clamp assemblies.

c. After opening and closing the latch and clamp assemblies, the latch fastener hole began to enlarge where the latches attach to the clamp band. Erosion of the latch fastener pivot was also observed.

d. During installation it was noted that the scribe, required in step 2a(3) of the installation document furnished with the Ready-Rack, is not available to organizational motor pools for installation of the Ready-Rack. The nonavailability of the scribe was also noted and reported during the temperate test

e. The three XM41E2 REDEYE weapons were transported on the Ready-Rack without any apparent degradation All three weapons satisfactorily passed Guided Missile Test Set (GMTS) checkout upon completion of each phase of transportation

f. Loosening or loss of the self locking nuts of the bolt assemblies for the Ready-Rack was not encountered during transportation.

g. The -25°F heater kit and hardtop closure kit did not interfere with the Ready-Rack during transport; however, the hardtop closure kit resulted in difficulty to the gunner during attempts to install or remove the ballasted launcher from the vehicle The problems noted between the Ready-Rack and the hardtop closure kit are as follows:

) During installation of the launcher in the Ready-Rack, the limited maneuver area inside the M151A1 vehicle with hardtop closure kit restricted the gunner. As a result, the gunner was forced to assume an extended, off-balance position that caused discomfort during installation.

(2) During removal of the launcher from the Ready-Rack, the limited maneuver area inside the M151A1 vehicle required the driver of the vehicle to assist the gunner (passenger) by handing him the weapon once the gunner had cleared the vehicle. With the AN/GRC-125 radio (organic to the REDEYE team) installed in the vehicle, the gunners were required to lift the weapon up and out of the Ready-Rack. This further increased the difficulty in removing a weapon and forced the gunners to assume awkward and uncomfortable positions.

(3) The limited space within the M151A1 vehicle with hardtop closure kit and Ready-Rack is inadequate to contain all the equipment organic to each REDEYE team. In addition, the M416 1/4-ton trailer, associated with the REDEYE team contains Monopaks or Unipaks and is not available to assist in the storage of organic equipment.

h. Average reaction time required to prepare for engagement was as follows:

(1) Time required for the gunner (passenger) to remove the weapon from the Ready-Rack and clear the vehicle:

(a) With arctic mittens - 6.8 seconds

(b) With work gloves - 5.8 seconds.

(2) Total time required from sighting the target to "prepared for engagement":

(a) With arctic mittens - 10.8 seconds.

(b) With work gloves - 8.6 seconds.

i. After the driver assisted the gunner (passenger) as described in paragraph 6g(2) above, the amount of time for the driver to prepare the second weapon for engagement exceeded that of the gunner by approximately 3-5 seconds.

j. During gunner reaction tests, the following problems (also noted during the temperate test and reported as a deficiency in reference 1e) were noted with the latch and clamp assemblies:

(1) The clamp assemblies of the Ready-Rack did not permit quick release or unobstructed removal of the weapon from the Ready-Rack. When the clamp assemblies were opened, the latch hook located on the forward band of the rear rack prevented the complete opening of the forward rack. This was a result of the latch hook catching the weld joint of the rear band of the forward rack and preventing the forward clamps from opening

(2) After the latch assemblies were opened and closed repeatedly, the enlargement of the latch fastener hole and erosion of the latch fastener pivot was slightly more pronounced.

7 CONCLUSIONS

a The XM41E2 REDEYE Weapon can satisfactorily withstand transportation in the XM237 Mounting Kit (Ready-Rack) in the arctic winter environment without degradation to missile performance.

b. Gunner reaction time is increased using the Ready-Rack in the M151A1 vehicle equipped with winterization kit and the AN/GRC-125 radio An XM41E2 REDEYE Weapon cannot be extracted from the Ready-Rack and removed from the vehicle in 5.0 seconds.

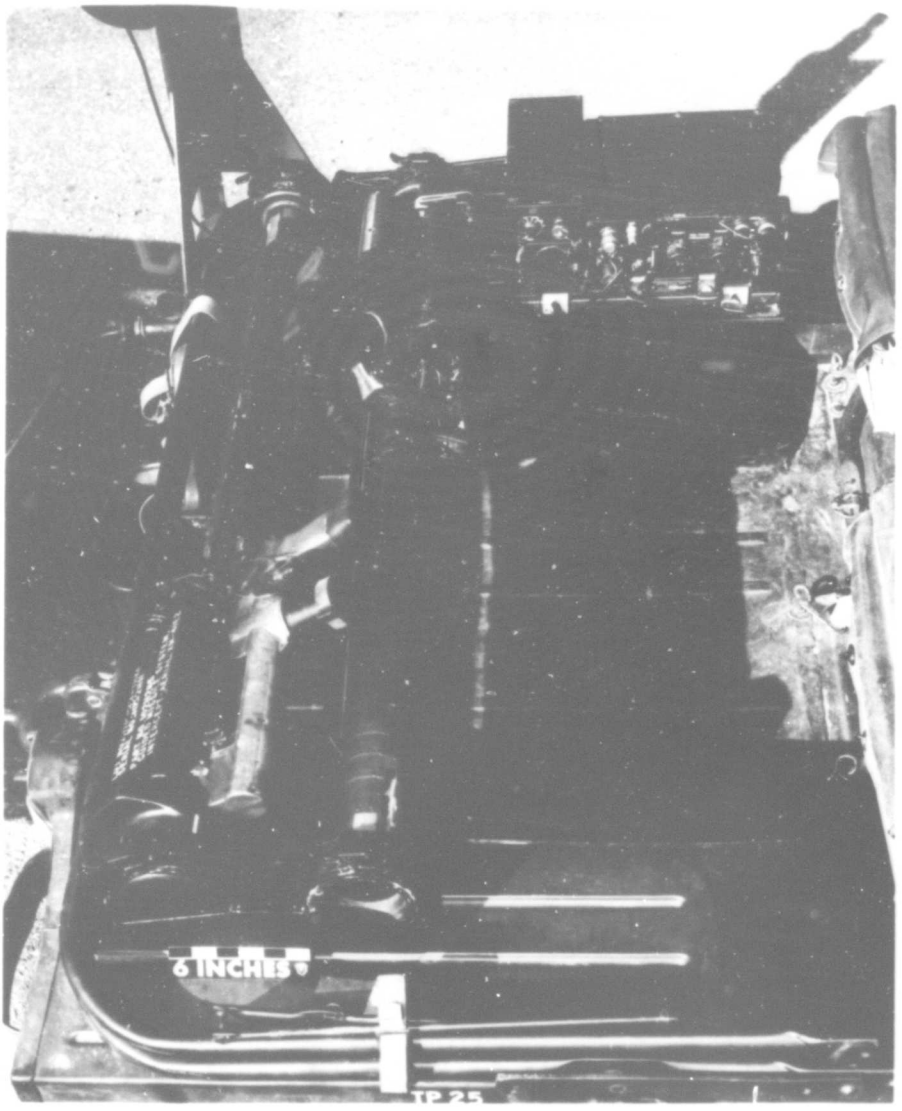
c. The latch and clamp assemblies, modified after temperate test, are more durable than those used during temperate test; however, the interference between the clamp bands of the Ready-Rack and the enlargement of the latch fastener hole with erosion of the latch fastener pivot have not been corrected. This is still considered a deficiency.

8. RECOMMENDATIONS

The US Army Air Defense Board recommends that the XM237 Mounting Kit (Ready-Rack) be considered unsuitable for use until the deficiency of the latch and clamp assembly (noted in paragraph 7c, above, and reported in reference 1e) has been corrected.

2 Incls
1. Photo
2. Conditions for Transport of Wpn

Joseph Russo
JOSEPH RUSSO
Colonel, ADA
President



XM237 MOUNTING KIT, VEHICLE,
GUIDED MISSILE SYSTEM (READY-RACK)

US ARMY AIR DEFENSE BOARD — FORT BLISS, TEXAS
PROJECT NO 3-8-0201-50 (GM-848) — NEGATIVE NO M-675-13

INCLOSURE 1

INCLOSURE 2

PHASE	WEAPON NUMBER	LOCATION WITHIN READY-RACK	AMBIENT AIR TEMPERATURE	STATUS OF -25°F HEATER	TEMPERATURE RANGE WITHIN VEHICLE	TYPE TERRAIN	NO OF MILES
1	305584 307372	Forward Rack Rear Rack	-2°F to -7°F	ON	72°F to 38°F	Ice & Snow covered secondary roads	262.9
2	305584	Rear Rack	+1° to -3°F	ON	70°F to 40°F	Ice & Snow covered secondary roads	250.6
3	307372 307386	Forward Rack Rear Rack	*-3°F to -13°F	OFF	*-6°F to -20°F	Ice & Snow covered secondary roads	250.0

*NOTE: Differences in temperature range within the vehicle and ambient air temperatures for the third phase of road test are due to the speed of the vehicle moving through the ambient air temperature.

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5. AUTHOR(S) (First name, middle initial, last name)

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11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
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13. ABSTRACT

An Arctic Service Test of the modified XM237, Mounting Kit, Vehicle, Guided Missile System (Ready-Rack) was conducted by the Air Defense Board at Fort Greely, Alaska, from 14 through 24 January 1969. The Arctic Service Test was conducted to determine the suitability of the Ready-Rack in an arctic field environment.

The Ready-Rack was exposed to prevailing arctic conditions for a period of 8 days at ambient air temperatures ranging from -3°F to -53°F. During the testing period the Ready-Rack was transported a total of 957.6 miles.

Testing revealed that even though the latch and clamp assemblies are more durable than those used in the temperate test, interference still exists between the clamp bands, and the latch fastener hole still enlarges from erosion.

It was concluded that the difficulties experienced with the latch and clamp assemblies of the Ready-Rack are still considered a deficiency. The US Army Air Defense Board recommends that the Ready-Rack be considered unsuitable for use until this deficiency has been corrected.

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

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