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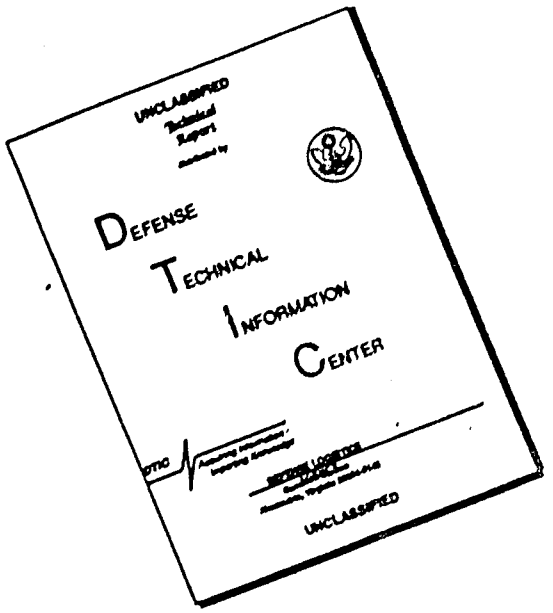


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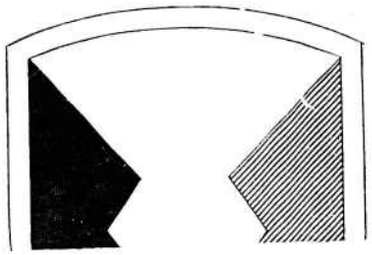
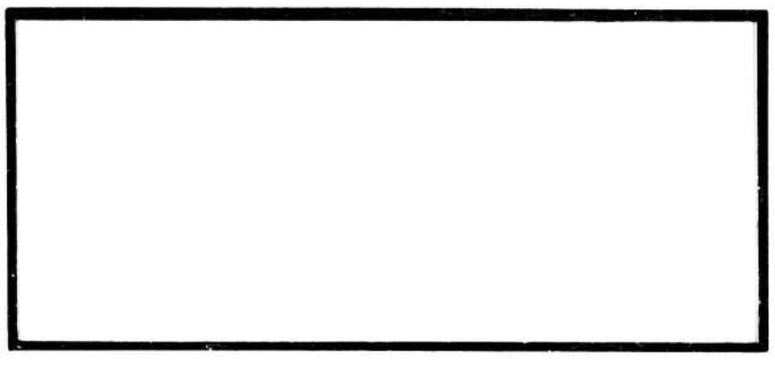
# TEST & EVALUATION COMMAND









US ARMY

INFANTRY BOARD

FORT BENNING, GEORGIA

REPORT OF SERVICE TEST PHASE OF
USATECOM PROJECT NO 8-3-4410-03 D,
INTEGRATED ENGINEERING/SERVICE TEST OF
ENTAC ATGM WITH MOUNTING KIT FOR
M151, 1/4-TON TRUCK (U)
DECEMBER 1963

CONFIDENTIAL ((C O P Y))

HEADQUARTERS
U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND

AMSTE-BC-4410 19 FEB 1964

SUBJECT: Reports on USATECOM Project Nos. 8-3-4410-01, -03, -05 and -08, Engineering-Service Test of ENTAC Antitank Guided Missile with Mounting Kit for M151, ¼ Ton Truck (U)

TO: Commanding General
U. S. Army Materiel Command
ATTN: AMCRD-D
Washington, D. C. 20315

1. (U) References:

a. Message TT, AMSMI-XBT-71-63, 1 Nov 63 to CONARC, SMOTA-REG and AMSTE-BC.

b. Report, STEAP-DS, Nov 63, subject: Report on USATECOM Project No. 8-3-4410-01B, Engineering Test of ENTAC Antitank Guided Missile with Mounting for M151, ¼ Ton Truck, Report No. DPS-1149.

c. Report, STEBC-SW, Dec 63, subject: Report of Service Test Phase of USATECOM Project No. 8-3-4410-03, Integrated Engineering/Service Test of ENTAC ATGM with Mounting Kit for M151, ¼ Ton Truck.

d. Report, STEYT-TMW, Nov 63, subject: YPG Report 3064, Report of USATECOM Project No. 8-3-4410-05, Engineering Phase of Integrated Engineering/Service Test of ENTAC ATGM with Mounting Kit for M151, ¼ Ton Truck (Desert Phase).

e. Report, STEBF-AB1263, 22 Nov 63, subject: Report of USATECOM Project No. 8-3-4410-08 (AB 1263), Integrated Engineer/Service Test of ENTAC ATGM with Mounting Kit for M151, ¼ Ton Truck.

2. (C) Reference 1a directed cancellation of ENTAC M151 Mounting Kit Program with the exception of action required by this command to finalize the Engineering-Service Test Program. All ES testing was completed prior to receiving this notice, therefore, final test reports were prepared and are hereby forwarded in five copies for your review and retention.

3. (C) Based on testing conducted to date, it is apparent that one of the major problems associated with the ENTAC ATGM System is selecting and training proficient missile gunners. Since the missile must be manually guided to the target, the gunner becomes one of the most important factors in determining hit probability. The Engineering-Service Tests of the ENTAC/M151 Mounting Kit, as reported by reference 1b, 1c, 1d and 1e, provide sufficient data to conclude that:



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AMSTE-BC-4410 19 FEB 1964

SUBJECT: Reports on USATECOM Project Nos. 8-3-4410-01, -03, -05 and -08, Engineering-Service Test of ENTAC Antitank Guided Missile with Mounting Kit for M151, ¼ Ton Truck (U)

a. The Mounting Kit has no significant effect on missile performance or the ability of the gunner to launch and control the missile.

b. With the exception of the acid shield and the gunner's seat (which threatens the gunner's inguinal area during mounting, dismounting and transit), the Mounting Kit is considered safe for Army use.

c. The Missile System and Mounting Kit are not adversely affected by extreme temperatures of -22°F or +122°F.

d. The malfunction rate of approximately 17% for missiles fired during this test program appears excessive, but there were no indications that the Mounting Kit could in itself cause missile malfunctions.

e. The Mounting Kit is not suitable for US Army use until the deficiencies and as many shortcomings as feasible are corrected.

f. The ENTAC ATGM System with M151 Mounting Kit is suitable for air drop and air transport.

g. Hit probability against moving targets in a desert environment is reduced because excessive dust clouds around moving vehicles obscure the target.

4. (C) It is recommended that:

a. The Adaption Kit for mounting the ENTAC ATGM System on the M151, ¼ Ton vehicle, not be considered suitable for type classification until the deficiencies and as many of the shortcomings as feasible have been corrected.

b. The test item be subjected to a Check Test by this command after correction of all deficiencies and as many as feasible of the shortcomings.

5. (U) This headquarters concurs in the conclusions and recommendations of subject reports, references 1b, 1c, 1d and 1e.

FOR THE COMMANDER:

(S i g n e d)
PAUL J. LETSCHER
CWO, W-3 USA
Asst Admin Officer

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CONFIDENTIAL ((C O P Y))

UNITED STATES ARMY INFANTRY BOARD
Fort Benning, Georgia 31905

STEBC-SW

6 DEC 1966

SUBJECT: Report of USATECOM Project No 8-3-4410-03 D

TO: See Distribution

1. (U) This letter transmits final report of subject project.

2. (C) Test Results.

a. The Adapter Kit for mounting the ENTAC Antitank Guided Missile [illegible] Truck, Utility, 1/4-Ton, 4x4, M151 was tested under field conditions in the temperate zone.

b. It met the characteristics prescribed by the USCONARC Approved Performance Characteristics and the User-Developer Guidance except those pertaining to durability, safety, maintenance, reliability, and dual guidance equipment.

(1) The durability and reliability were improvements over the already available item of like type.

(2) The failure to meet the requirements for safety, maintenance, and reliability were deficiencies.

(3) The durability and lack of dual guidance equipment were shortcomings.

3. (C) Conclusions. The US Army Infantry Board concludes that the Adapter Kit for mounting the ENIAC Antitank Guided Missile on the Truck, Utility, 1/4-Ton, 4x4, M151 (test kit):

a. Is not suitable for US Army use in its present configuration.

b. Is not safe for its intended use in its present configuration.

c. Must be modified to correct all the deficiencies.

d. Should be modified to correct as many shortcomings as feasible.

e. Contains no nonessential or "nice-to-have" components.

f. Should be completely installed on the vehicle before it is issued to the user.

STEBC-SW 6 DEC 1968
SUBJECT: Report of USATECOM Project No 8-3-4410-03 D

4. (C) Recommendations. It is recommended that:

a. The Adapter Kit for mounting the ENTAC Antitank Guided Missile System on the Truck, Utility, 1/4-Ton, 4x4, M151 (test kit), be modified to correct all the deficiencies and as many as feasible of the shortcomings.

b. Upon correction of all the deficiencies and as many as feasible of the shortcomings, one Adapter Kit for mounting the ENTAC Antitank Guided Missile System on the Truck, Utility, 1/4-Ton, 4x4, M151, be provided the US Army Infantry Board for check test.

FOR THE PRESIDENT:

RANDALL M. REGNIER
CWO, W-3, USA
Adjutant

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Part IV

CONTENTS

CONFIDENTIAL

UNITED STATES ARMY INFANTRY BOARD
Fort Benning, Georgia 31905 Maj Wahle/kb/545-1092

STEBC-SW (P-2993) 6 December 1963

REPORT OF SERVICE TEST PHASE OF
USATECOM PROJECT NO 8-3-4410-03 D,
INTEGRATED ENGINEERING/SERVICE TEST OF
ENTAC ATGM WITH MOUNTING KIT FOR M151, 1/4-TON TRUCK (U)
1 July 1963 - 16 October 1963

PART I - (C) GENERAL

A. (U) REFERENCES. Annex A, Part III.

B. (U) AUTHORITY.

1. Directive. Letter, AMSTE-BC, USATECOM, 11 Mar 63, subject: "Integrated Engineer-Service Test of ENTAC ATGM with Mounting Kits for M151 1/4-Ton Truck and M113 Armored Personnel Carrier," as amended by letter, AMSTE-BC, USATECOM, 3 Apr 63, subject: "Amendment of Test Directives, USATECOM Project Nos. 8B-344-01 and 8D-3441- Series 01 thru 09."

2. Purpose. To determine if the Adapter Kit for mounting the ENTAC Antitank Guided Missile System on the Truck, Utility, 1/4-Ton, 4x4, M151, is suitable for US Army use.

3. Scope.

a. The data contained herein were acquired from:

(1) Service tests conducted by the US Army Infantry Board (USAIB) at Fort Benning, Georgia.

(2) Integrated Engineering-Service tests conducted jointly by the USAIB and the US Army Development and Proof Services (USAD&PS) at Aberdeen Proving Ground (APG), Maryland.

(3) Integrated Engineering-Service tests conducted jointly by the USAIB and Yuma Test Station (YTS) at Yuma, Arizona.

(4) Participation by the USAIB in the firing phase of Air Drop tests conducted by the US Army Airborne, Electronics and Special Warfare Board (USAAESWBD), Fort Bragg, N. C.

b. These tests were conducted employing the standard ENTAC Antitank Guided Missile System mounted on the standard Truck, Utility, 1/4-Ton, 4x4, M151, by means of the prototype Adapter Kit. Results were

compared with appropriate criteria. In those cases where the criteria were not met the results were analyzed to determine if the failures were attributable to the Adapter Kit. Failures attributable solely to the ENTAC Antitank Guided Missile System are the subject of a separate letter.

c. In addition to the purpose shown in 2 above the Engineering Tests had the additional objectives of determining the dynamic penetration of the ENTAC 130-mm, HEAT warhead and the effects of low and high temperature environments on the missile system.

C. (U) DESCRIPTION OF MATERIEL.

1. Photographs and Sketches. Annex B, Part III.

2. Test Item. The Adapter Kit for mounting the ENTAC Antitank Guided Missile System on the Truck, Utility, 1/4-Ton, 4x4, M151, is hereinafter referred to as the test kit. The test kit consisted of various modifications to the Truck, Utility, 1/4-Ton, 4x4, M151, that permitted it to transport and serve as a launching platform for the ENTAC Antitank Guided Missile System. The principle features of the test kit were:

a. Two Launching Platforms which, by means of their supporting members, could be swung out on either side of the vehicle into firing position. The Launching Platforms would each support two ready-to-fire ENTAC Missiles.

b. A traversable Gunner's Seat that mounted the Guidance Control Unit and permitted the gunner to launch and control the ENTAC Antitank Missile while seated in the vehicle.

c. Stowage or mounting facilities for three spare ENTAC Missiles and necessary fire control and check-out equipment.

3. Associated Items.

a. The ENTAC Antitank Guided Missile System, hereinafter referred to as the ENTAC system, is the standard Antitank Guided Missile System in Infantry units. Major components of the ENTAC system are:

(1) The 130-mm ENTAC Antitank Missile, hereinafter referred to as the missile, which is a lightweight (27 pounds), gyro-stabilized, remote-controlled, wire-guided, aerodynamically maneuvered missile. The missile has two major components, the warhead and the body, which are packed separately in a shipping container (ref 10, Annex A, Part III).

(2) The Guidance and Launching Station, TR-10, hereinafter referred to as the Guidance Station, which consists of the following major components: one Guidance Control Unit (Guidance Unit); three 12-Volt Batteries; one 8x30 Binoculars; two Missile Selection Boxes; one Test

Set, Guidance and Launcher Station Circuit; ten 10-Meter Cable Assemblies; two 100-Meter Cable and Reel Assemblies; and three Battery Chargers (ref 10 and 11, Annex A, Part III).

b. The Truck, Utility, 1/4-Ton, 4x4, M151 (Modified), hereinafter referred to as the vehicle, is a standard US Army 1/4-ton truck modified by installation of a heavy-duty suspension system which increases the load carrying capability of the vehicle to 1,640 pounds (ref 9, Annex A, Part III). The vehicle, when further modified by installation of the test kit, will receive, transport, and serve as a firing platform for the ENTAC system. For purposes of this test the vehicle was considered as part of the test system described in paragraph 4 below.

4. Test System. The test kit, ENTAC system, and vehicle, described in paragraphs 2 and 3 above, when employed collectively are hereinafter referred to as the test system. When installed on the vehicle, the test kit provided the following features:

a. Four missiles with warheads attached and in their launching containers could be mounted on the two Launching Platforms (Annex B-2 and 5, Part III).

b. Three spare missile bodies in their launching containers could be carried on the spare missile racks (Annex B-1, 3, and 4, Part III).

c. Three spare missile warheads could be carried in the Warhead Stowage Box (Annex B-3, Part III).

d. The Guidance and Control Unit with 12-volt battery inserted and 8x30 binoculars mounted could be installed on the pintle affixed to the gunner's seat (Annex B-1, 13 and 14, Part III).

e. One Missile Selection Box could be mounted in the cradle on the rear of the beam (Annex B-2 and 3, Part III).

f. The Test Set, Guidance and Launcher Station Circuit, could be carried in the left stowage container (Annex B-3, Part III).

g. Six 10-Meter Cable Assemblies could be carried in the right stowage container (Annex B-3, Part III).

h. One 100-Meter Cable and Reel Assembly could be carried on the Reel Chassis (Annex B-1 and 4, Part III).

i. Two spare 12-volt batteries could be carried in the Charger, Socket, and Base Plate Assembly (Annex B-1, Part III).

j. Two members of the 5-man crew (the asst gunner/driver and the gunner) could ride in the vehicle.

k. The remaining three crew members and the following components of the ENTAC system had to be carried in the 3/4-ton ammunition resupply vehicle that is organic to the ENTAC squad:

(1) One Missile Selection Box.

(2) Four 10-Meter Cable Assemblies.

(3) One 100-Meter Cable and Reel Assembly.

(4) Three Battery Chargers.

D. (C) BACKGROUND.

1. The ENTAC system (105-mm warhead), both ground and vehicularly mounted (on the Truck, Utility, 1/4-Ton, 4x4, M38A1C), was service tested by the USAIB during the period, May 1960 through January 1961. Based on findings resulting from these tests the USAIB recommended that:

a. "The French ENTAC T581 Antitank Missile System (ground launch installation) be adopted for Army use and type classified as Standard A" (ref 3, Annex A, Part III).

b. "The ENTAC 1/4-Ton Truck-Mounted Installation (M38A1C) be retested by this Board after correction of discrepancies and all shortcomings possible" (ref 5, Annex A, Part III).

2. USCONARC concurred in these recommendations (ref 4, Annex A, Part III) and further recommended to the Chief, Research & Development, DA, that:

a. "The ENTAC 1/4-Ton Truck, Mounted Installation (M38A1C) be type classified Limited Production Type after correction of the discrepancies and all shortcomings possible.

b. "Suitable launcher mountings for the M151, 1/4-Ton Truck be provided as soon as possible for Joint Engineer-User Test at Fort Benning, Georgia, to be conducted by the US Army Infantry Board and Technical Services" (ref 6, Annex A, Part III).

3. In March 1961 the ENTAC system (ground launched) was classified Standard A (ref 8, Annex A, Part III).

4. In March 1962 USCONARC was advised by the Office, Chief of Ordnance, DA, that design and fabrication of "ENTAC Missile System Mount(s) for the M151 1/4-Ton Truck" was being "accomplished offshore (France)" (ref 9, Annex A, Part III).

5. A prototype test system was received for test by the USAIB from USAD&PS in June 1963.

6. The test kit is not proposed for quadripartite standardization.

7. A formal Safety Release for firing the missile from the test system was received on 22 July 1963 (ref 13, Annex A, Part III). Testing was initiated prior to receipt of a safety release under provisions of paragraph 5b, USATECOM Regulation No 385-7, and after receipt of a verbal safety release.

E. (U) TEST OBJECTIVES.

1. The service test phase of this project was conducted to find the extent to which the test system met each applicable characteristic presented by the USCONARC Approved Performance Characteristics (ref 1, Annex A, Part III) and the User Guidance (ref 7, Annex A, Part III) in order to determine suitability of the test kit for US Army use.

2. The following tests were conducted:

a. Test No 1, Physical Characteristics.

b. Test No 2, Accuracy.

c. Test No 3, Ruggedness and Durability.

d. Test No 4, Reliability and Adequacy.

e. Test No 5, Time Required to Go In and Out of Action.

f. Test No 6, Rate of Fire.

g. Test No 7, Maintenance and Repairs.

h. Test No 8, Safety.

i. Test No 9, Flexibility of Employment.

j. Test No 10, Human Factors Engineering .

F. (C) FINDINGS. The test system met the USCONARC Approved Performance Characteristics and User Guidance to the extent indicated below:

1. USCONARC Approved Performance Characteristics (ref 1, Annex A, Part III):

| REQUIREMENT | FINDINGS |
|---|---|
| "a. Lethality. Defeat 150-mm of rolled homogeneous armor at 60° obliquity and its associated equivalent targets. | Not applicable (Engineering Test (ET)). |

| REQUIREMENT | FINDINGS |
|---|---|
| "b. Accuracy. | |
| (1) From minimum range of the system to maximum range, single shot hit probability shall be at least 90 percent against a stationary 7 1/2' by 7 1/2' vertical target. | Requirement not met by the test system; however, the failure is attributed to the ENTAC system and not to the test kit (Test No 2). |
| (2) From minimum range of the system to maximum range, single shot hit probability shall be at least 75 percent against a vehicle approximating a medium tank in size moving at 20 MPH at all angles of approach and departure, to include climb and descent. | Requirement not met by the test system; however, the failure is attributed to the ENTAC system and not to the test kit (Test No 2). |
| "c. Range. | Not tested. |
| (1) Maximum - 2,000 meters. | |
| (2) Minimum - Not more than 350 meters. | |
| "d. Reliability. A high order of reliability is required for the system. | |
| (1) At least 95 percent of the missiles removed from storage and issued for use must pass all prefiring checkout tests. | Requirement met (Test No 4). |
| (2) Those missiles which launch must have an in-flight reliability as near 100 percent as possible. | Requirement not met by the test system; however, the failure is attributed to the ENTAC system and not to the test kit (Test No 4). |
| "e. Simplicity. The system shall be simple to operate. The amount of specialized training required to obtain crew proficiency shall be kept to a minimum. Prefiring checkout procedures shall be of the simple 'go-no-go' type and be performed in less than 1 minute. | Requirement not met by the test system; however, the failure is attributed to the ENTAC system and not to the test kit (Tests No 5 and 10). |
| "f. Size and weight. The size and weight of the missile, its container, the launcher, and the guidance equipment must be kept to an absolute minimum consistent with the required accuracy, lethality, and range characteristics stated above. The system shall be constructed so that all elements can be crew transported. Breakdown features are acceptable. | Not tested since this requirement pertains only to the ENTAC system in the ground-launch role. |

| REQUIREMENT | FINDINGS |
|---|---|
| "g. Human Factor. Design of the system shall be such that the degradation of the system performance attributable to human operator functions shall be minimized. | Requirement not fully met by the test system; however, the failure is attributed to the ENTAC system and not to the test kit (Test No 10). |
| "h. Rate of Fire in an engagement. Rate of successive missiles in an engagement after the first missile has been fired depends on:<br>(1) Time of flight of missile to target.<br>(2) Speed in sighting on new target.<br>(3) Number of missiles which are initially prepared for launch and are in a firing position.<br>(4) Reload time.<br>A high rate of fire is desired so that an engagement with enemy armor will be continuous; therefore after the initial group of missiles has been launched, reloading of a missile and aiming of the launcher should be accomplished within the limits of the missile time of flight. | Requirement met (Test No 6). |
| "i. Launcher separation. In order to fire the missile with the launcher in defilade, the system shall permit a separation between the launcher and guidance operator of 0 - 100 meters (required) or 0 - 300 meters (desired). | Requirement met (0 - 100 meters only)(Test No 9). |
| "j. Durability. The system shall be rugged and as a minimum permit operation and normal handling by troops operating under adverse conditions. | Requirement not met (Test No 3). This is a shortcoming. |
| "k. Safety. Safety provisions shall be incorporated in the system to reduce hazards to using troops and friendly personnel and installations. | Requirement not met (Test No 8). This is a defienciency. |
| "l. Maintenance. The system should facilitate maintenance in the field at all applicable echelons in the minimum practicable time with the least possible degree of skill, variety and complexity of tools and equipment and supplies. | Requirement not met (Test No 7). This is a deficiency. |

| REQUIREMENT | FINDINGS |
|---|---|
| "m. Countermeasures. The system shall be capable to the maximum extent practicable of delivering the missile on its intended target without regard to enemy countermeasures. | Not tested. |
| "n. Position disclosure. Back blast, flash, and other effects which tend to disclose the position of the launcher shall be held to a minimum. (The capability of firing with the launcher in defilade or mounted in a vehicle minimizes the need for this characteristic.) | Not tested. |
| "o. Environment. The missile system shall be capable of operation and storage under extreme temperature and environmental conditions as set forth in AR 705-15, 14 August 1957." | Not applicable (ET). |

2. User Guidance (ref 7, Annex A, Part III).

| REQUIREMENT | FINDINGS |
|---|---|
| "a. General. Vehicle mounts should be characterized by simplicity, reliability, and durability. | Requirement not met (Test No 4). This is a deficiency. |
| Dual guidance equipment (one set vehicle mounted, one set carried for ground use), such as is now provided by TOE 7-19D for each Antitank Guided Missile Squad, is desirable because it gives the squad a double capability in many situations. | Requirement not met (Test No 1). This is a shortcoming. |
| Mounts should include the capability, similar to that now provided in the ENTAC mount on the M38A1 1/4-ton truck, for using the vehicle power source to maintain a full charge in the missile system batteries. | Requirement met (Test No 4). |
| Providing essential characteristics can be met, it is desirable that mounts be made as kits which can be installed by Ordnance field maintenance units. | Not tested. |
| "b. M151 1/4-Ton Truck Mount. A basic design similar to the ENTAC mount on the M38A1 1/4-ton truck is recommended. Reference 1f mentions the discrepancies and shortcomings to be overcome in the M38A1 mount. | Requirement not met (Tests No 2 and 4). One deficiency and one shortcoming in the M38A1 mount not corrected (para 1, Section I and para 5, Section III of reference 5, Annex A, Part III). |

| REQUIREMENT | FINDINGS |
|---|---|
| The capability to fire either forward or rearward is a distinct advantage and should be incorporated in the mount, if it does not compromise other essential characteristics." | Requirement met (Test No 1). |

G. (C) DISCUSSION. A total of 28 missiles was fired from Lot 6NA62. Fourteen of these missiles had previously been transported on the test kit during road testing. Five of these fourteen missiles malfunctioned after launch, yielding a malfunction rate of 35.7 percent. Of the remaining 14 missiles that were not transported on the test kit during road testing, two malfunctioned after launch, yielding a malfunction rate of 14.3 percent. While other variables present preclude an unqualified finding, the much higher malfunction rate suffered by the missiles transported on the test kit during road testing indicates a possibility that transport on the test kit had an adverse effect on the missiles.

H. (C) CONCLUSIONS. The US Army Infantry Board concludes that:

1. The Adapter Kit for mounting the ENTAC Antitank Guided Missile on the Truck, Utility, 1/4-Ton, 4x4, M151 (test kit):

a. Is not suitable for US Army use in its present configuration.

b. Is not safe for its intended use in its present configuration.

c. Must be modified to correct all the deficiencies.

d. Should be modified to correct as many shortcomings as feasible.

e. Contains no nonessential or "nice-to-have" components.

f. Should be completely installed on the vehicle before it is issued to the user.

2. The malfunction rate sustained with Lot No 6NA62 is unacceptably high.

I. (C) RECOMMENDATIONS. It is recommended that:

1. The Adapter Kit for mounting the ENTAC Antitank Guided Missile System on the Truck, Utility, 1/4-Ton, 4x4, M151 (test kit), be modified to correct all the deficiencies and as many as feasible of the shortcomings.

2. Upon correction of all the deficiencies and as many as feasible of the shortcomings, one Adapter Kit for mounting the ENTAC Antitank Guided Missile System on the Truck, Utility, 1/4-Ton, 4x4, M151, be provided the US Army Infantry Board for check test.

3. Appropriate Engineering Tests be conducted to determine if the malfunction rate sustained with Lot No 6NA62 is attributable to the Adapter Kit for mounting the ENTAC Antitank Guided Missile System on the Truck, Utility, 1/4-Ton, 4x4, M151 (test kit).

4. Where possible, those failures attributed solely to the ENTAC Antitank Guided Missile System should be corrected.

R. C. WILLIAMS
Colonel, Infantry
President

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PART II - (C) TEST DATA

TEST NO 1, (C) PHYSICAL CHARACTERISTICS.

1. (U) PURPOSE. To determine the physical characteristics of the test system.

2. (U) METHOD. The test system was inspected, weighed, measured, and photographed.

3. (U) RESULTS.

a. The test kit was examined and was found to consist of the following general assemblies:

(1) The Superstructure Assembly (Annex B-1, 2, and 3, Part III) whose purpose was to provide adjustable platforms from which four missiles could be launched. The components of the Superstructure Assembly were:

(a) The Beam (Annex B-2 and 3, Part III) which was the basic structural member on which all other components of the Superstructure Assembly were mounted.

(b) The Left and Right Arms (Annex B-2 and 3, Part III)which were mounted on the left and right ends, respectively, of the Beam. Each Arm was pivoted to the Beam in such a way that it could be rotated to the rear for traveling or to one of several forward positions for firing. The Left Arm could be oriented in the forward direction from $15^{o}$ inboard to $45^{o}$ outboard with intermediate positions at $15^{o}$ increments. The Right Arm could be oriented in the forward direction from $30^{o}$ inboard to $45^{o}$ outboard with intermediate positions at $15^{o}$ increments. The Arms could be locked into one of the firing positions by means of a lever located near the pivot end of the Arm. Moving the lever up caused a lug to be inserted into a slot on the Beam. This prevented the Arm from rotating and also completed the firing circuit. When the lever was moved down to rotate the Arm the firing circuit was opened and the missile could not be fired.

(c) The Left and Right Extensions (Annex B-2 and 5, Part III) which were affixed to the free ends of the Left and Right Arms respectively. The Extensions were mounted at right angles to the long axis of the Arms. When the Arms were oriented in the forward direction the Extensions extended in the outboard direction. When the Arms were oriented to the rear, the Extensions extended in the inboard direction.

(d) The Left and Right Launching Platforms (Annex B-2 and 3, Part III) which were mounted on the free ends of the Left and Right Extensions, respectively. Each Launching Platform would accept two

missile launching containers. The Launching Platforms were mounted on the Extensions by means of pivots and could be locked in either the forward or rearward position. When the Launching Platform was locked in the forward position, the direction of fire was coincident with the orientation of the Supporting Arm. When the Launching Platform was locked in the rearward position, the direction of fire differed by 180° from the orientation of the Supporting Arm.

(e) The Left and Right Elevating Mechanisms (Annex B-6 and 16, Part III) which were located on the Left and Right Arms respectively. Each Elevating Mechanism consisted of a crank located on the bottom of the Arm; gears, levers, and connectors located within the Arm and Extension; and 2 scales located on top of the Arm. Turning the crank in the appropriate direction would elevate the Launching Platform to a maximum angle of 63.8° above the vehicular horizontal or would depress it to a maximum angle of 10.8° below the vehicular horizontal. An indicator scale was provided for use when the Launching Platform was oriented to the front and one for use when it was oriented to the rear. When the index number obtained from the Guidance Station line-of-sight scale was placed on the Elevating Mechanism indicator scale, the Launching Platform had an 8° superelevation above the line of sight.

(f) The Selection Box Cradle (Annex B-2 and 3, Part III) which was affixed to the right rear of the Beam. The Cradle housed the Selection Box.

(g) The Cable Assembly which provided necessary electrical connections between the Guidance Unit, Selection Box, and Launching Container.

(2) The Reinforcement Assemblies (Annex B-1, Part III) whose function was to distribute the load of the Superstructure between the wheel-well and the vehicle bed and to reinforce the metal comprising the top of the wheel-well.

(3) The Spare Missile Rack Assembly (Annex B-1 and 3, Part III) which was located on the rear of the vehicle bed and consisted of a Warhead Stowage Box which would hold three spare warheads in an upright position, Racks which would accommodate three missiles without warhead, and two Stowage Containers which were recessed into the bed of the vehicle in such a way that their tops were flush with the vehicle bed.

(4) The Gunner's Seat Assembly (Annex B-1, Part III) which replaced the assistant driver's seat normally found in the vehicle. The seat could be rotated 360° and locked in any orientation desired. Mounted on the front of the seat was a bracket to which was welded a pintle for mounting the Guidance Unit.

(5) The Blast Shield Assembly (Annex B-1 and 3, Part III) which, when the Superstructure was oriented in a firing position, protected the gunner from the heat and blast effect of the missile when it was launched.

(6) The Charger, Socket, and Base Plate Assembly (Annex B-1, Part III) which was located under the right Reinforcement and consisted of two cylindrical receptacles into each of which a battery could be inserted. When the batteries were so inserted they were continuously charged by the vehicular power supply.

(7) The Reel Chassis Assembly (Annex B-1, 3, and 5, Part III) which was a rack mounted on the right rear of the vehicle on which the 100-meter Cable Reel was carried.

(8) The Spare Wheel Fastener Assembly (Annex B-1, Part III) which consisted of three straps arranged in a Y configuration and which secured the spare wheel in its position flat on the bed of the vehicle.

(9) The Hood Support Assembly (Annex B-1, Part III) which consisted of the supports, fasteners, and fittings that supported the canvas top of the vehicle.

(10) A Plexiglass Shield (Annex B-12, Part III) which could be affixed to the support for the 8x30 Binoculars on the Guidance Unit.

b. Tabulated Data.

(1) Weight (pounds).

| | | |
|---|---|---|
| (a) Vehicle with heavy-duty suspension system and test kit installed | | 2560.0 |
| (b) Components of ENTAC system carried on test kit: | | |
| 1. Seven missiles | 264.6 | |
| 2. Components of the Guidance Station: | | |
| a. One Guidance Control Unit with 8x30 Binoculars | 25.6 | |
| b. Three 12-volt Batteries | 9.0 | |
| c. One Box, Missile Selection | 11.0 | |
| d. One Test Set, Guidance and Launcher Station Circuit | 5.5 | |
| e. Six Cable Assemblies, 10-meter | 21.0 | |
| f. One Cable and Reel Assembly, 100 meters | 47.3 | |
| | 119.4 | |
| | | 384.0 |
| (c) Weight of test system | | 2944.0 |
| (d) Two combat equipped soldiers | | 492.0 |
| (e) One AN/PRC-10 Radio | | 26.0 |
| (f) Total weight combat loaded test system | | 3462.0 |

(2) Height, test system, windshield down (inches) . . 60.6

(3) Width, test system, travel position (inches) . . 69.0

(4) Length, test system (inches) . . . . . 136.5

c. No maintenance package, maintenance instructions, nor operating instructions were received with the test kit.

d. Photographs of the test system are shown in Annex B, Part III.

4. (C) ANALYSIS.

a. The total weight of the combat loaded test system consisted of the weight of the vehicle, 2,273 pounds, and a payload of 1,189 pounds. This is 451 pounds less than the rated cross-country payload of 1,640 pounds of the vehicle equipped with the heavy duty suspension system.

b. The height of the test system with windshield down was 8.6 inches more than the height of the standard Truck, Utility, 1/4-Ton, 4x4, M151. The height of the test system with windshield down was determined by the distance from the ground to the top of the Blast Shield Assembly.

c. The width of the test system was 6.7 inches more than the width of the standard Truck, Utility, 1/4-Ton, 4x4, M151. The width of the test system was determined by the distance from one end of the Beam to the other.

d. The length of the test system was 5.25 inches more than the length of the standard Truck, Utility, 1/4-Ton, 4x4, M151. The length of the test system was determined by the distance from the front bumper to the rear edge of the Rear Chassis Assembly.

e. The test system did not meet the requirement that "Dual guidance equipment (one set vehicle mounted, one set carried for ground use), ***, is desirable because it gives the squad a double capability in many situations" (ref 7, Annex A, Part III). Although the Guidance Unit could be readily removed from the test kit and employed in a ground role, an additional Guidance Unit would permit a portion of the squad to employ four missiles in the ground role while the remainder of the squad employed the test system in its vehicular role. This is a shortcoming.

f. The fact that no maintenance package, maintenance instructions, nor operating instructions were received is a deficiency.

g. The test system met to a satisfactory degree the requirement that "The capability to fire either forward or rearward is a distinct advantage and should be incorporated in the mount if it does not compromise other essential characteristics" (ref 7, Annex A, Part III).

TEST NO 2, (C) ACCURACY.

1. (U) PURPOSE. To determine the accuracy of the test system.

2. (U) METHOD.

a. This test was conducted in three phases in conjunction with all firing tests.

b. During the conduct of this test crew members were fully equipped with combat uniform and equipment.

c. When possible, missile firing was conducted in a simulated combat environment provided by using demolition charges and accompanying rifle and machinegun fire.

d. Phase I - Stationary Targets - Gunner in the Vehicle.

(1) This phase was conducted in conjunction with Engineering Tests 4.1, 4.3, 4.7, 4.9, 4.11, and 5.3 as outlined in reference 12, Annex A, Part III.

(2) The targets consisted of 7 1/2-ft by 7 1/2-ft OD panels with no distinctive markings or aiming points; a panel on which had been painted the frontal silhouette of a tank; and a target tank. The targets were located at ranges of 400, 1,100, and 1,750 meters.

(3) The gunners fired and controlled the missiles while seated in the gunner's seat on the vehicle.

e. Phase II - Stationary Targets - Gunner Offset from the Vehicle.

(1) This phase was conducted in conjunction with Engineering Tests 4.3, 4.5, and 4.9 as outlined in reference 12, Annex A, Part III.

(2) The targets consisted of 7 1/2-ft by 7 1/2-ft OD panels with no distinctive markings or aiming points. The targets were located at ranges of 400 and 1,100 meters.

(3) The gunner fired and controlled the missile from positions offset from 2 to 100 meters from the vehicle.

f. Phase III - Moving Targets.

(1) This phase was conducted in conjunction with Engineering Tests 4.1 and 4.11 as outlined in reference 12, Annex A, Part III.

(2) The targets consisted of a 7 1/2-ft by 7 1/2-ft OD panel, with no distinctive markings or aiming points, that moved laterally across the front at 20 miles-per-hour and an M48 target tank that moved laterally across the front at 15 miles-per-hour. The targets were located at a range of 1,750 meters.

(3) The gunners fired and controlled the missiles while seated in the gunner's seat on the vehicle.

3. (C) RESULTS.

a. Factual Data.

(1) Phase I, Stationary Targets - Gunner in Vehicle.

(a) Tabulated Data.

| GUNNER | NUMBER MISSILES FIRED I | | | NUMBER MALFUNCTIONS II | | | NUMBER HITS III | | | PERCENT HITS(%) IV* | | | SINGLE SHOT HIT PROBABILITY (%) V** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Range (Meters) | | | Range (Meters) | | | Range (Meters) | | | Range (Meters) | | | Range (Meters) | | |
| | 400 | 1100 | 1750 | 400 | 1100 | 1750 | 400 | 1100 | 1750 | 400 | 1100 | 1750 | 400 | 1100 | 1750 |
| A | - | 3 | 9 | - | 1 | 0 | - | 1 | 7 | - | 50.0 | 77.7 | - | 33.3 | 77.7 |
| B | 2 | 3 | 6 | 0 | 2 | 2 | 0 | 0 | 3 | 0.0 | 0.0 | 75.0 | 0 | 0 | 50.0 |
| C | 2 | 3 | 5 | 0 | 1 | 1 | 1 | 1 | 1 | 50.0 | 50.0 | 25.0 | 50.0 | 33.3 | 20.0 |
| D | 2 | - | 4 | 0 | - | 0 | 1 | - | 1 | 50.0 | - | 25.0 | 50.0 | - | 25.0 |
| Total | 6 | 9 | 24 | 0 | 4 | 3 | 2 | 2 | 12 | 33.3 | 40.0 | 57.1 | 33.3 | 22.2 | 50.0 |

* Percentage of hits (IV) is a measure of accuracy and is defined as the percentage of hits obtained with those missiles which launched and flew without malfunction. It was calculated by dividing the number of hits (III) by the difference between the number of missiles fired (I) and the number of malfunctions (II).

** Single shot hit probability (V) is a measure of both accuracy and reliability and is defined as the percentage of hits obtained with all missiles fired. It was calculated by dividing the number of hits (III) by the number of missiles fired (I).

(b) Average percent of hits = $\frac{16}{32} \times 100 = 50\%$.

(c) Average single shot hit probability = $\frac{16}{39} \times 100 = 41\%$.

(d) Two of the missiles fired at 1,100 meters were fired with the vehicle canted 15 degrees. One of these missiles malfunctioned after launch and the other missed the target.

(2) Phase II, Stationary Targets - Gunner Offset from the Vehicle.

(a) Tabulated Data.

| GUNNERS POSITION RELATIVE TO VEHICLE (Meters) | NUMBER MISSILES FIRED I | | NUMBER MALFUNCTIONS II | | NUMBER HITS III | | PERCENT HITS (%) IV** | | SINGLE SHOT HIT PROBABILITY (%) V*** | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Range (Meters) | | Range (Meters) | | Range (Meters) | | Range (Meters) | | Range (Meters) | |
| | 400 | 1,100 | 400 | 1,100 | 400 | 1,100 | 400 | 1,100 | 400 | 1,100 |
| 2m Left | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2m Right | - | 1 | - | 1 | - | 0 | - | 0 | - | 0 |
| 100m Rear | - | 6* | - | 0 | - | 4 | - | 66.7 | - | 66.7 |
| 100m Right | - | 1* | - | 0 | - | 1 | - | 100.0 | - | 100.0 |
| 50m Right | - | 1* | - | 0 | - | 1 | - | 100.0 | - | 100.0 |
| 100m Right Rear | - | 1* | - | 0 | - | 1 | - | 100.0 | - | 100.0 |
| 50m Right Rear | - | 1* | - | 0 | - | 1 | - | 100.0 | - | 100.0 |
| Totals | 1 | 13 | 0 | 2 | 0 | 8 | 0 | 72.7 | 0 | 61.5 |

* HEAT warhead.

** Percentage of hits (IV) is a measure of accuracy and is defined as the percentage of hits obtained with those missiles which launched and flew without malfunction. It was calculated by dividing the number of hits (III) by the difference between the number of missiles fired (I) and the number of malfunctions (II).

*** Single shot hit probability (V) is a measure of both accuracy and reliability and is defined as the percentage of hits obtained with all missiles fired. It was calculated by dividing the number of hits (III) by the number of missiles fired (I).

(b) Average percent of hits = $\frac{8}{12} \times 100 = 66.7\%$.

(c) Average single shot hit probability = $\frac{8}{14} \times 100 = 57.1\%$.

(d) Two of the missiles fired at 1,100 meters were fired with the vehicle canted 30 degrees. Both missiles malfunctioned after launch.

(3) Phase III, Moving Targets.

(a) Tabulated Data.

| TYPE TARGET | NUMBER MISSILES FIRED I | NUMBER MALFUNC-TIONS II | NUMBER HITS III | PERCENT** HITS (%) IV | SINGLE SHOT HIT (%) *** PROBABILITY V |
|---|---|---|---|---|---|
| 7 1/2-Ft x 7 1/2-Ft Panel moving 20 mph at range of 1,750 meters | 5 | 1 | 1 | 25 | 20 |
| Target Tank moving 15 mph at range of 1,750 meters | 4* | 1 | 0 | 0 | 0 |
| Total | 9 | 2 | 1 | 14.3 | 11.1 |

* These 4 missiles were fired in the desert at Yuma Test Station. The moving tank created a dust column that completely obscured the tank from the gunner. The gunner guided the missiles into the head of the dust column.

** Percentage of hits (IV) is a measure of accuracy and is defined as the percentage of hits obtained with those missiles which launched and flew without malfunction. It was calculated by dividing the number of hits (III) by the difference between the number of missiles fired (I) and the number of malfunctions (II).

*** Single shot hit probability (V) is a measure of both accuracy and reliability and is defined as the percentage of hits obtained with all missiles fired. It was calculated by dividing the number of hits (III) by the number of missiles fired (I).

(b) Average percentage of hits = 1/7 x 100 = 14.3%.

(c) Average single shot hit probability = 1/9 x 100 = 11.1%.

(4) Combining data from Phase I and II, the overall average percent of hits against stationary targets was 24/44 x 100 = 54.5%.

(5) Combining data from Phases I and II, the overall average single-shot hit probability against stationary targets was 24/53 x 100 = 45.3%.

(6) During the conduct of Phase I and Phase II missiles were fired with the Launching Platforms oriented with respect to the long axis of the vehicle as follows:

(a) With the front of the vehicle facing the target the left Launching Platform was oriented at 15° inboard, 0°, 15° outboard;

30° outboard, and 45° outboard. The right Launching Platform was oriented at 30° inboard, 15° inboard, 0°, 15° outboard, 30° outboard, and 45° outboard.

(b) With the rear of the vehicle facing the target the left and right Launching Platforms were oriented at 0°, 15° inboard, 30° inboard, and 45° inboard.

(7) When the front of the vehicle was facing the target and the right Launching Platform was oriented 30° inboard, the gunner had to dismount from the vehicle and emplace the Guidance Unit on the ground.

(8) With the exception noted in (7) above, none of the firings described in (6) above adversely affected the vehicle, the gunner, or the accuracy of the test system.

(9) When the missiles were fired excess electrolyte from the missiles on-board battery was sprayed to the rear as an aerosol. The electrolyte spray was an irritant to the eyes. On the first missile fired during this test electrolyte spray blew behind the plexiglass shield into the gunner's eyes momentarily blinding him. This caused him to lose control of the missile and consequently to miss the target. A shield that provided adequate protection to the gunner's eyes was improvised by the test personnel and was used while firing the remaining 61 missiles. No adverse effects from electrolyte spray were noted during the firing of these 61 missiles (Annex B-12, Part III).

b. Observations of Test Personnel.

(1) The accuracy achieved during the tests at APG and YTS was less than that achieved during the tests at Fort Bragg, at Fort Benning, or during the training course attended by the test gunners at Fort Benning. It is the opinion of the test personnel that this was partly caused by the difference in the terrain over which the missiles were flown. At Fort Benning and Fort Bragg the firing points and the targets were located on parallel ridge lines separated by a wide depression. This condition permitted the missile to dip below the level of the target without striking the ground. At APG and YTS the terrain was level and flat between the firing point and the target, therefore the gunner did not have as much latitude in achieving vertical stabilization.

(2) The gunners stated that the rifle fire, machinegun fire, and demolitions used to create a simulated combat environment had no effect on their ability to fire and control the missiles.

4. (C) ANALYSIS.

a. The single shot hit probability of the test system against stationary targets as shown in 3a(1), (2), and (5) above failed to meet the

requirement that "From minimum range of the system to maximum range, single shot hit probability shall be at least 90 percent against a stationary 7 1/2-ft by 7 1/2-ft vertical target " (ref 1, Annex A, Part III).

b. The single shot hit probability of the test system against moving targets as shown in 3a(3) above failed to meet the requirement that "From minimum range of the system to maximum range, single shot hit probability shall be at least 75 percent against a vehicle approximating a medium tank in size moving at 20 mph at all angles of approach and departure, to include climb and descent" (ref 1, Annex A, Part III).

c. The failure of the plexiglass shield to afford adequate protection to the gunner's eyes from the electrolyte sprayed to the rear when a missile was fired could be a bar to employment and is a deficiency. This was indicated as a discrepancy in reference 5, Annex A, Part III).

d. With the exception noted in 3a(9) above, no indication could be found that the test kit adversely affected the accuracy of the test system.

e. Although the plexiglass shield that was a component of the test kit adversely affected the accuracy of the test system, this condition was corrected after the first missile was fired as explained in 3a(9) above. Therefore the failure of the plexiglass shield adversely affected the accuracy of only one of the 62 missiles fired during this test.

f. For the reasons given in d and e above, the test kit did not have a material adverse effect on the accuracy obtained during this test.

g. As noted under Observations of Test Personnel in Test No 4, Reliability and Adequacy, the test kit may have adversely affected the in-flight reliability of the missiles.

h. Excluding in-flight reliability from the determination of single shot hit probability results in the single shot hit probability becoming equal to the percentage of hits.

i. Since the percentage of hits also fails to meet the requirements stated in a and b above, and for the reason given in f above, these failures are attributed to the ENTAC system and not the test kit.

TEST NO 3, (C) RUGGEDNESS AND DURABILITY.

1. (U) PURPOSE. To determine if the test system is rugged and durable.

2. (U) METHOD.

a. Data pertaining to ruggedness and durability were noted during all other tests.

b. At Fort Benning, the combat-loaded test system with the Launching Platforms in the travel position was driven 450 miles cross-country. Periodic inspections of the test system and circuit tests were made.

c. At Fort Benning, the combat-loaded test system with the Launching Platforms in the firing position was driven 50 miles cross-country. Periodic inspections of the test system and a circuit test were made.

d. At YTS the combat-loaded test system was driven 20 miles on the Dust Course. An inspection of the test system and a circuit test were conducted upon completing the 20 miles.

e. At YTS the combat-loaded test system was driven 180 miles cross-country and over desert trails. Periodic inspections of the test system and circuit tests were conducted.

f. Missiles transported on the test system during the road tests described in d and e above and a separate road test conducted by USAD&PS were subsequently fired during Test No 2, Accuracy.

3. (C) RESULTS.

a. The latches on the lids of the two stowage containers were of light construction and were easily bent out of line. These latches frequently failed to function and it was necessary to either pound on the lids to jar them open or to forcibly pry the lids open (Annex B-3, Part III).

b. With the exception noted in a above the results of this and all other tests indicated that the test system was rugged and durable.

4. (C) ANALYSIS. In view of the failure of the latches on the lids of the stowage containers described in 3a above the test system did not fully meet the requirement that "The system shall be rugged and as a minimum permit operation and normal handling by troops operating under adverse conditions" (ref 1, Annex A, Part III). This is a shortcoming.

TEST NO 4, (C) RELIABILITY AND ADEQUACY.

1. (U) PURPOSE. To determine the reliability and adequacy of the test system.

2. (U) METHOD.

a. Data pertaining to reliability and adequacy were noted during all other tests.

b. Throughout the conduct of all tests, a log was maintained for each major component. These logs reflected the performance of each major component and pertinent comments of the test personnel.

3. (C) RESULTS.

a. Factual Data.

(1) During the road testing at YTS described in Test No 3, Ruggedness and Durability, the latch on the Warhead Stowage Box (Annex B-3, Part III) repeatedly came open. As a result the compartment lid bounced open allowing dirt and other foreign matter to accumulate in the Warhead Stowage Box.

(2) At the conclusion of the road testing at YTS it was found that the Elevating Mechanism (Annex B-6, Part III) would not function properly. The left elevating crank would not turn and the right elevating crank required excessive force to turn. Disassembly revealed that the elevating mechanism was jammed by dust and grit on the gears.

(3) At the conclusion of the portion of the road testing conducted on the Dust Course at YTS it was found that a large quantity of dust had gotten inside the Guidance Unit cover onto the Guidance Unit (Annex B-10, Part III).

(4) At the conclusion of the road testing conducted on the Dust Course at YTS it was found that great quantities of dust had accumulated on the on-vehicle missiles. It was necessary to clean off the threads on the missile bodies before the warheads could be installed and to clean off the spoilers so they were free to vibrate (Annex B-10, Part III).

(5) The Launching Container Securing Latch (Annex B-3, Part III) is designed to close over the lower edge of the Launching Container thus holding the Launching Container down on the Launching Platform. On 11 of the 62 missiles fired during Test No 2, Accuracy, the Launching Container Securing Latch would not fit over the lower edge of the Launching Container. It was necessary to use a pair of pliers to force the lower edge of these 11 Launching Containers down sufficiently to allow the Launching Container Securing Latch to close.

(6) The following in-flight malfunctions occurred during the conduct of Test No 2, Accuracy (Annex B-11, Part III).

| MALFUNCTION | LOT NO | GUNNER | PLATFORM ELEVATION | TRANSPORTED ON ROAD TEST | VEHICLE CANTED | PRIOR STORAGE TEMPERATURE |
|---|---|---|---|---|---|---|
| 1. Hit 25 - 100m from vehicle | 1APX62 | B | 10° | No | 0° | 75° - 85°F |
| 2. " | 1APX62 | C | 10° | No | 0° | 75° - 85°F |
| 3. " * | 1APX62 | B | 10° | No | 0° | 75° - 85°F |
| 4. " | 1APX62 | B | 10° | No | 0° | 75° - 85°F |
| 5. " | 6NA62 | B | 10° | No | 0° | 75° - 85°F |
| 6. " ** | 6NA62 | B | 10° | No | 0° | 75° - 85°F |
| 7. " | 6NA62 | A | 12° | Yes | 0° | +122°F |
| 8. " | 6NA62 | C | 12° | Yes | 15° | 75° - 85°F |
| 9. " | 6NA62 | A | 12° | Yes | 30° | 75° - 85°F |
| 10. " | 6NA62 | A | 12° | Yes | 0° | 8 Wks Desert |
| 11. Failed to respond to Command | 6NA62 | C | 12° | Yes | 30° | 75° - 85°F |

* Suspect Guidance wire broke.
** Suspect Gyro wire broke.

(a) A total of 19 missiles was fired from Lot 1APX62 with 4 malfunctions.

(b) A total of 28 missiles was fired from Lot 6NA62 with 7 malfunctions.

(c) A total of 5 missiles was fired from Lot 4NA62 with no malfunctions.

(d) A total of 10 missiles was fired from Lot 8APX61 with no malfunctions.

(7) Storage space for the components of the ENTAC system and spare missiles was adequate.

(8) Seating space for the two members of the crew who ride in the vehicle was adequate.

(9) The vehicle power supply was capable of maintaining a full charge on the Guidance Unit 12-volt batteries.

(10) All missiles successfully passed all prefiring check-out tests. These tests consisted of a circuit test and visual inspection. Dust and grit had to be cleaned off those missiles transported during road testing prior to firing.

b. Observations of Test Personnel.

(1) As shown in 3a(6)(b) above, a total of 28 missiles was fired from Lot 6NA62. Seven of these missiles malfunctioned after launch. Five of the seven missiles that malfunctioned had previously been transported on the test kit during road testing. The exact cause of the malfunctions could not be determined. Although other variables present preclude an unqualified finding, the high incident of malfunctions among missiles transported during road testing indicates that transport on the test kit had an adverse effect on the missiles.

(2) No unnecessary or "nice-to-have" features were noted.

4. (C) ANALYSIS.

a. The failure of the Warhead Stowage Box latch to remain closed during cross-country operation of the vehicle, thus allowing dirt and other matter to accumulate in the Warhead Stowage Box, is a shortcoming.

b. The failure of the Elevating Mechanism to operate properly because of the accumulation of dust and grit in the gears after cross-country operation of the vehicle could be a bar to employment of the test system and is a deficiency.

c. The failure of the cover on the Guidance Unit to protect it from dust during operation of the vehicle over dusty terrain is a shortcoming. This was indicated as a shortcoming in reference 5, Annex A, Part III.

d. The failure of the test kit to provide an adequate means of protecting the on-vehicle missiles from dust or weather is a shortcoming.

e. The failure of the Launching Container Securing Latches to readily secure 11 out of 62 Launching Containers to the Launching Platforms could be a bar to employment of the test system and is a deficiency.

f. The 11 in-flight malfunctions described in 3a(6) above resulted in an in-flight reliability of 82.3%. This failed to meet the requirement that "Those missiles which launch must have an in-flight reliability as near 100% as possible" (ref 1, Annex A, Part III). As indicated in 3b above this failure cannot be directly attributed to the test kit and is therefore considered a failure of the ENTAC system and not the test kit.

g. As indicated in a through e above, the test system failed to meet the requirement that "Vehicle mounts should be characterized by simplicity, reliability, and durability" (ref 7, Annex A, Part III).

h. The test system met to a satisfactory degree the requirement that "At least 95% of the missiles removed from storage and issued for use must pass all prefiring checkout tests" (ref 1, Annex A, Part III).

i. The test system met to a satisfactory degree the requirement that "Mounts should include the capability ... for using the vehicle power source to maintain a full charge in the missile system batteries" (ref 7, Annex A, Part III).

TEST NO 5, (C) TIME REQUIRED TO GO IN AND OUT OF ACTION.

1. (U) PURPOSE. To determine the time required to place the test system in and out of action.

2. (U) METHOD. This test was conducted in four phases as follows:

a. Phase I, Missiles and Gunner on Vehicle.

(1) Prior to the command "ACTION" the Launching Platforms were level and in the inboard travel position; the Guidance Unit was in the travel position; the combat clothed and equipped two-man crew was in the vehicle; the combat-loaded vehicle was moving cross-country at 5 miles-per-hour.

(2) At the command "ACTION" the vehicle was stopped; the Launching Platforms were oriented in the direction of fire and elevated to $12^{o}$; the gunner laid on the target and fired.

(3) At the command "OUT OF ACTION" the test system was returned to the condition described in (1) above.

(4) Six repetitions of drills described in (2) and (3) above were conducted in the rain during daylight and again during the hours of darkness. Each repetition was timed by two stop watches and an average time was determined.

b. Phase II, Missiles On Vehicle - Gunner Offset 100 Meters.

(1) Prior to the command "ACTION" the test system was in the condition described in 2a(1) above.

(2) At the command "ACTION" the vehicle was stopped; the Launching Platforms were oriented in the direction of fire and elevated to

12°; the gunner, unreeling the 100-meter cable, displaced the Guidance Unit 100 meters from the vehicle, set it up for ground launch, and fired.

(3) At the command "OUT OF ACTION" the test system was returned to the condition described in 2a(1) above.

(4) Six repetitions of the drills described in (2) and (3) above were conducted in the rain during daylight and again during the hours of darkness. Each repetition was timed by two stop watches and an average time was determined.

c. Phase III, Missiles and Gunner Off Vehicle - Heavy Method of Employment.

(1) Prior to the command "ACTION" the test system was in the condition described in 2a(1) above and was followed at a distance of 100 meters by the 3/4-ton ammunition resupply vehicle containing the remaining three men of the crew, three spare missiles, and those components of the ENTAC system not carried on the test system.

(2) At the command "ACTION" the Guidance Unit and 10 missiles were emplaced on the ground as described in paragraph 15, reference 10, Annex A, Part III.

(3) At the command "OUT OF ACTION" the test system was returned to the condition described in (1) above.

(4) Three repetitions of the drills described in (2) and (3) above were conducted during daylight. Each repetition was timed by two stop watches and an average time was determined.

d. Phase IV, Time Required to Conduct Circuit Test.

(1) Prior to the command "TEST" the test system was in the condition described in 2a(1) above except that the vehicle was stationary.

(2) At the command "TEST" the gunner and assistant gunner/driver conducted a circuit test of the four missiles mounted on the Launching Platforms as described in Chapter 2, reference 11, Annex A, Part III.

(3) Three repetitions of the drill described in (2) above were conducted. Each repetition was timed by two stop watches and average times to perform a circuit test on the first missile and on all four missiles were determined.

e. Prior to conducting any of the phases of this test the missiles were inspected and cleaned if necessary. Therefore, the times obtained do not include the time devoted to removing dust and grit that had accumulated due to road testing.

3. (C) RESULTS.

a. Tabulated Data.

| PHASE | AVERAGE TIME | | | |
|---|---|---|---|---|
| | IN ACTION | | OUT OF ACTION | |
| | DAY | NIGHT | DAY | NIGHT |
| I | 28.6 sec | 27.8 sec | 10.7 sec | 10.1 sec |
| II | 1 min 35 sec | 1 min 29.7 sec | 1 min 23.6 sec | 1 min 26 sec |
| III | 10 min 46 sec | -- | 7 min 0.3 sec | -- |

b. Average time to perform circuit test on one missile was 1 minute 52 seconds.

c. Average time to perform circuit test on four missiles was 3 minutes 39 seconds.

4. (C) ANALYSIS.

a. The time required to place the test system in action with the missiles and the gunner on the vehicle is satisfactory.

b. The time required to place the test system in action with the missiles on the vehicle and the gunner offset 100 meters is satisfactory.

c. The test kit did not have any adverse effect on the ease and speed with which the test crew could place the ENTAC system in action using the Heavy Method of Employment.

d. As indicated in 3b and c above the test system failed to meet the requirement that " ... Prefiring checkout procedures shall be of the simple 'go-no-go' type and shall be performed in less than 1 minute" (ref 1, Annex A, Part III). This failure is attributed to the ENTAC system and is not considered a failure of the test kit.

TEST NO 6, (C) RATE OF FIRE.

1. (U) PURPOSE. To determine the rate of fire of the test system.

2. (U) METHOD.

a. The test system was tactically emplaced with four missiles mounted on the Launching Platforms, two spare missiles on the ground

on one side of the vehicle and another spare missile on the ground on the other side of the vehicle.

b. The gunner fired four missiles in succession as rapidly as he could at a target tank at a range of 1,750 meters.

c. During the flight of the four missiles the assistant gunner attempted to reload the Launching Platforms with the three spare missiles and to aim them at the target.

d. During the conduct of this test rifle fire, machinegun fire,and demolitions were used to create a simulated combat environment.

3. (C) RESULTS.

a. Factual Data.

(1) The elapsed time from the moment the first missile was fired until the fourth missile hit the target was 1 minute 36 seconds.

(2) The elapsed time from the moment the first missile was fired until the third spare missile was loaded on the Launching Platform was 1 minute 42 seconds.

(3) Three of the four missiles hit the target.

b. Observations of Test Personnel. The gunner stated that the rifle fire, machinegun fire, and demolitions had no effect on his ability to launch and control the missiles.

4. (C) ANALYSIS.

a. When the fourth missile hit the target, two of the spare missiles were loaded and ready to fire and within 6 seconds the third spare missile was loaded and ready to fire. In view of this, the reloading and aiming operation had no adverse effect on the rate of fire.

b. Based on the above the test system met to a satisfactory degree the requirement that " ... after the initial group of missiles had been launched, reloading of a missile and aiming of the launcher should be accomplished within the limits of the missile time of flight" (ref 1, Annex A, Part III).

TEST NO 7, (C) MAINTENANCE AND REPAIRS.

1. (U) PURPOSE.

a. To determine whether first echelon maintenance and repair could be readily accomplished on the test system.

b. To determine if the maintenance package was adequate.

c. To accumulate parts usage data.

2. (U) METHOD.

a. This test was conducted concurrently with all other tests.

b. The test crew performed routine first echelon maintenance on the vehicle as prescribed in Chapter 3, reference 2, Annex A, Part III, and on the ENTAC system as prescribed in Chapter 3, reference 11, Annex A, Part III.

c. References 2 and 11, Annex A, Part III, were used as a guide in establishing those functions that constituted routine first echelon maintenance for the test kit.

d. Unduly difficult or time-consuming maintenance or repair operations were noted.

3. (C) RESULTS.

a. Average daily time required for the 5-man crew to perform routine first echelon maintenance was 15 minutes. This is equivalent to 1.25 man-hours.

b. In addition to the prescribed routine maintenance the following periodic maintenance tasks were found to be necessary:

(1) The pivot by which the gunner's seat is affixed to the vehicle required lubrication daily.

(2) The Elevating Mechanism and the pivots on the Launching Platforms and Arms required lubrication two times a week during normal operation and daily during operation in dusty areas.

(3) The lenses of the binoculars had to be washed after firing on-vehicle missiles to remove the electrolyte that had sprayed on them.

(4) The vehicle had to be washed or wiped with a wet cloth after firing on-vehicle missiles to remove the electrolyte that had sprayed on it.

(5) After cross-country operation dirt and other foreign matter had to be removed from the missiles carried on the vehicle, the Guidance Unit, and the Cable Assembly fasteners.

c. After road testing at YTS the Elevating Mechanism failed to function (see para 3b, Test No 4, Reliability and Adequacy). It took

two soldiers approximately 1 hour to place it in a usable condition. However, to be put into normal operating condition the Elevating Mechanism had to be disassembled and cleaned.

d. The bolts, nuts, and washers used in the construction of the test kit rusted easily.

e. No maintenance package was received and therefore no evaluation could be made.

f. No spare parts for the test kit were required.

4. (C) ANALYSIS.

a. With the exception of repairing the Elevating Mechanism, as described in 3c above, the maintenance of the test kit was simple and did not require any special degree of skill to perform.

b. A grease gun was necessary to perform the lubrication described in 3b above.

c. The failure of the elevating mechanism was reported as a deficiency in Test No 4, Reliability and Adequacy, and therefore the test kit failed to meet the requirement that "The system should facilitate maintenance in the field at all applicable echelons in the minimum practicable time with the least possible degree of skill, variety, and complexity of tools and equipment, and supplies" (ref 1, Annex A, Part III).

d. A maintenance package was not received. This is a deficiency as noted in Test No 1, Physical Characteristics.

TEST NO 8, (C) SAFETY.

1. (U) PURPOSE. To determine:

a. If the test system was safe to operate.

b. Any safety limitations on the employment of the test system.

2. (U) METHOD.

a. Data pertaining to safety were noted during all other tests.

b. Mechanical safety features provided on the test system were tested for adequacy.

c. Safety instructions pertaining to the ENIAC system were adhered to.

3. (C) RESULTS.

a. When the Guidance Unit is not mounted the pintle affixed to the front of the gunner's seat could injure the gunner when mounting or dismounting the vehicle or when riding over rough terrain (Annex B-13, Part III).

b. Ten of the eleven missiles that malfunctioned after launch impacted from 25 to 100 meters in front of the vehicle. After impact the booster and sustainer motors of the missiles continued to burn and the missiles were propelled along the ground until they broke up or became lodged in the dirt or brush. All of these ten missiles had inert warheads.

c. After continued use the lock that prevents the gunner's seat from rotating failed to function reliably. When the vehicle was turned sharply, momentum caused the gunner's seat to rotate throwing the gunner against the vehicle dashboard (Annex B-15, Part III).

d. The mechanical safeties provided on the test system all functioned properly.

e. During the conduct of Test No 6, Rate of Fire, it was necessary for the assistant gunner to be reloading one Launching Platform while the gunner fired from the other. To prevent the gunner from accidently selecting and firing from the Launching Platform being reloaded, the assistant gunner put the mechanical safety located on the Arm to the SAFE position.

4. (C) ANALYSIS.

a. The failure of the test kit to provide a means of preventing the gunner from injuring himself on the exposed pintle on the gunner's seat when mounting or dismounting the vehicle or when riding over rough terrain is a deficiency.

b. The ten missiles that impacted 25 to 100 meters in front of the vehicle constituted a safety hazard to the gun crew and to other friendly troops in the area and precluded overhead fire with the test system. As indicated in Test No 4, Reliability and Adequacy, this failure is attributed to the ENTAC system and not the test kit.

c. The failure of the gunner's seat lock to function reliably constituted a safety hazard and is a deficiency.

d. The reloading procedure described in 3e above was potentially dangerous since it was subject to human error on the part of either crew member. This should be emphasized in training literature prepared for the test system.

e. For the reasons given above the system failed to meet the requirement that "Safety provisions shall be incorporated in the system to reduce hazards to using troops and friendly personnel and installations" (ref 1, Annex A, Part III).

TEST NO 9, (C) FLEXIBILITY OF EMPLOYMENT.

1. (U) PURPOSE. To determine the flexibility of employment of the test system with respect to the relative location of the crew and the missile launching site.

2. (U) METHOD.

a. Data pertaining to flexibility of employment were accumulated during the conduct of all tests.

b. The test system was fired with the gunner in the vehicle and the assistant gunner dismounted and acting as loader.

c. The test system was fired with both the gunner and assistant gunner dismounted.

d. The test system was fired with the gunner displaced up to 100 meters to the flank, at an angle of $45^{o}$ toward the rear, and directly to the rear of the vehicle.

e. The test system was not fired with the gunner displaced forward of the vehicle because of safety considerations.

3. (C) RESULTS.

a. The gunner was able to launch and successfully control the missiles from any of the positions described in 2b through d above.

b. When the gunner was located 50 to 100 meters off the launcher-target line he had to quickly apply a large turn command to the missile to bring it on the gunner-target line.

c. The assistant gunner was not able to reload the Launching Platforms from within the vehicle.

4. (C) ANALYSIS.

a. The gunner can best control the missile when he is in the vicinity of the launcher-target line.

b. The assistant gunner can best reload the Launching Platforms from a position on the ground beside the vehicle.

c. The test system met to a satisfactory degree the requirement that "The test system shall permit a separation between the launcher and guidance operator of 0 - 100 meters (required) or 0 - 300 (desired)" (ref 1, Annex A, Part III).

TEST NO 10, (C) HUMAN FACTORS ENGINEERING.

1. (U) PURPOSE. To determine if the test system had any features or operating characteristics which adversely affected its safe operation by, or were unduly fatiguing to, the using soldiers.

2. (U) METHOD. This test was conducted concurrently with all other tests. Observations were made and the test soldiers were instructed to report all difficulties experienced while operating the test system. Particular attention was devoted to determining the following:

a. Accessibility and adequacy of control devices and safety levers.

b. Fatiguing body positions or operations requiring undue physical effort.

c. Compatibility of the test system with individual and crew equipment.

d. Compatibility of the test system with the skills and proficiency of the test soldiers and any special training or equipment required.

3. (C) RESULTS.

a. All control devices and safety levers were adequate and readily accessible.

b. No fatiguing body positions or operations requiring undue physical effort were noted.

c. For those ranges for which binoculars are not required the gunner could launch and control the missile while wearing the standard protective mask.

d. The 8x30 binoculars could not be used to control the missile while wearing the standard protective mask because of the restricted field of view.

e. The standard 7x50 Binoculars, M17A1, could be mounted on the Guidance Unit.

f. The 7x50 Binoculars, M17A1, were used successfully to control a missile while wearing the standard protective mask (Annex B-14, Part III).

g. The test kit did not impose any unusually difficult or time-consuming training requirements on the test soldiers. All of the test soldiers had previously completed a 3 1/2-week gunner training course on the ENTAC system.

h. With the exception noted in d above the test system was compatible with the individual and crew equipment.

4. (C) ANALYSIS.

a. The limitations on employment caused by the small field of view of the 8x30 binoculars as described in 3d above is attributed to the ENTAC system and is not considered a failure of the test kit.

b. The missile had to be observed and controlled by the gunner continuously while it was in flight and was thus very vulnerable to gunner error. For this reason the test system failed to meet the requirement that "Design of the system shall be such that the degradation of the system performance attributable to human operator functions shall be minimized" (ref 1, Annex A, Part III). This failure is attributed to the ENTAC system and is not considered a failure of the test kit.

c. Prospective ENTAC gunners are carefully screened and tested to select those who possess the requisite intelligence, coordination, and stability. Selected gunners attend a 3 1/2-week training course during which they fire five to ten missiles. The cost to train one gunner is approximately $10,000.00. Those gunners who successfully complete the training course are required to practice frequently on the ENTAC Simulator S-58 to maintain their proficiency. For this reason the test system failed to meet the requirement that "The system shall be simple to operate. The amount of specialized training required to obtain crew proficiency shall be kept to a minimum..." (ref 1, Annex A, Part III). This failure is attributed to the ENTAC system and is not considered a failure of the test kit.

## ANNEX A - REFERENCES


1. Letter, ATDEV-4 471.94(C)(4 Mar 59), USCONARC, 4 Mar 59, subject: "Performance Characteristics for Antitank Guided Missile Systems (U)."

2. TM 9-2320-218-10, DA, May 60, Operator's Manual, Truck, Utility, 1/4-Ton, 4x4, M151.

3. First Partial Report of Project No 2900, USAIB, 21 Jun 60, Service Test of ENTAC Antitank Missile System - Phase I, Test of Basic System (U).

4. Letter, ATDEV-4 471.94(C), USCONARC, 6 Oct 60, subject: "First Partial Report of Project No 2900, Service Test of ENTAC Antitank Missile System (U)."

5. Second Partial Report of Project No 2900, USAIB, 7 Dec 60, Service Test of ENTAC Antitank Missile System - Phase II, Test of 1/4-Ton Truck-Mounted Installation (U).

6. Letter, ATDEV-4 471.94(C), USCONARC, 10 Jan 61, subject: "Second Partial Report of Project No 2900, Service Test of ENTAC Antitank Missile System (U)."

7. Letter, AJIIS-R, USAIS, 11 Aug 61, subject: "Vehicular Mounts for ENTAC Antitank Guided Missile System (U)."

8. Technical Information Report 1-4-5, Harry Diamond Laboratories, Mar 62, Development of Antitank Guided Missile, ENTAC (U).

9. Letter, ATDEV-2 451.6(C), USCONARC, 27 Mar 62, subject: "Weapon Mounts for M151, 1/4-Ton Truck and M113 Armored Personnel Carrier (U)."

10. Training Circular No 23-6, DA, 21 Jun 62, Antitank Guided Missile (ENTAC).

11. TM 9-1400-455-12, DA, Apr 63, Operator and Organizational Maintenance Manual: ENTAC Antitank Guided Missile System.

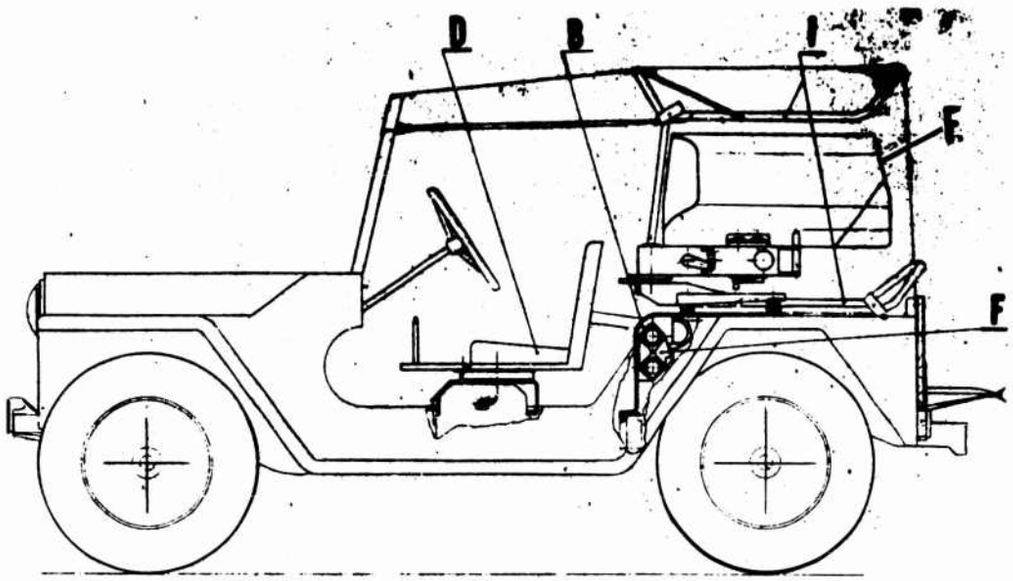
12. Test Plan, STEAP-DS-TI, USAD&ES, May 63, Revised Engineering-Service Test Plan, M151/ENTAC and M113/ENTAC Systems.

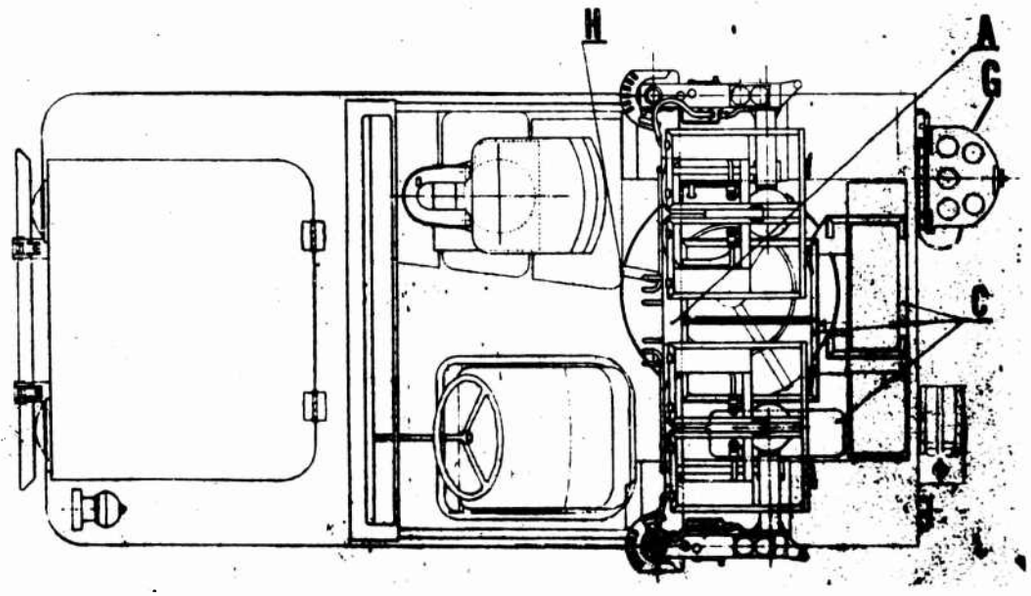
13. Message TT12187, AMSTE-BC, USATECOM, 18 Jul 63, reference Safety Release.

14. Letter, STEBC-SW (P-2993), USAIB, 12 Aug 63, subject "Report of Equipment Failure (U)." with 6 incl.

15. Letter, STEYT-TMW, Yuma Test Station, 3 Sep 63, subject: "Report of Equipment Failure, USATECOM Project No 8-3-4410-05," with 11 incl.

16. Letter, STEBC-SW (P-2993), USAIB, 17 Sep 63, subject: "Report of Equipment Failure," with 3 incl.

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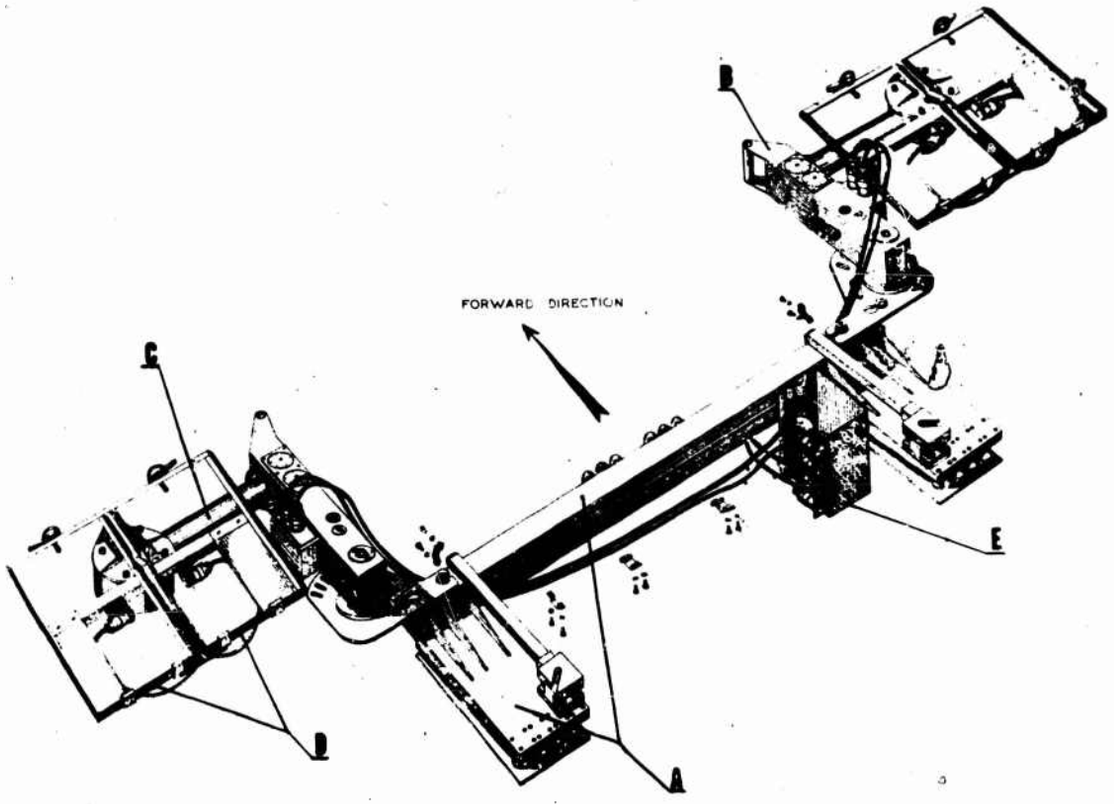
USATECOM PROJECT NO 8-3-4410-03 D, INTEGRATED ENGINEERING/SERVICE TEST OF THE ENTAC ATGM WITH MOUNTING KIT FOR M151, 1/4-TON TRUCK

A. Superstructure.
B. Reinforcement.
C. Spare Missile Rack.
D. Gunner's Seat.
E. Blast Shield.
F. Charger, Socket, and Base Plate.
G. Reel Chassis.
H. Spare Wheel Fastener.
I. Hood Support.

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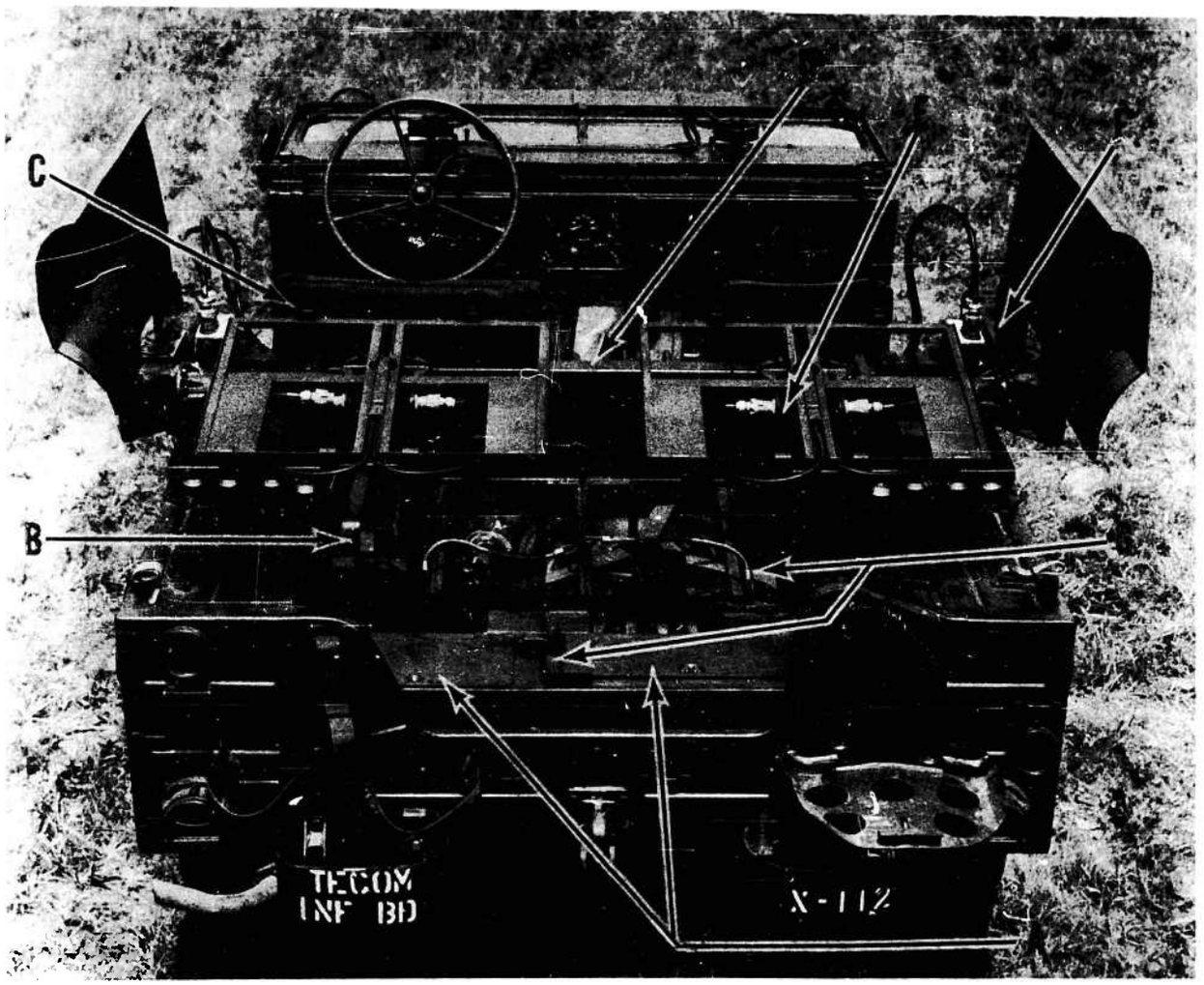
Superstructure Assembly

A. Beam.
B. Arm.
C. Extension.
D. Launching Platform.
E. Cradle.

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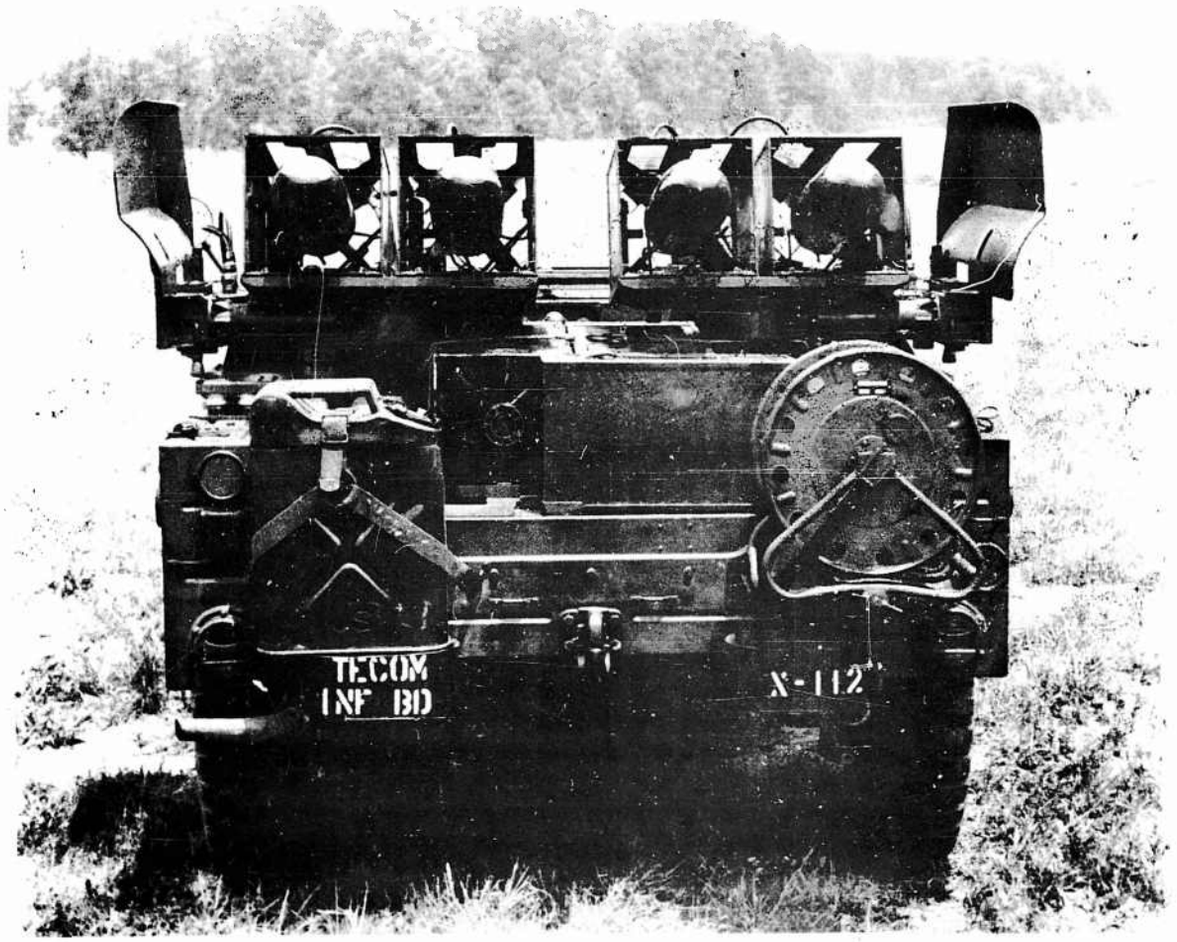
OF THE ENTAC ATGM WITH MOUNTING KIT FOR M151, 1/4-TON TRUCK

Test Kit Installed in Vehicle

A. Left and Right Stowage Containers and Latches.
B. Warhead Stowage Box Latch.
C. Launching Container Securing Latch.
D. Beam.
E. Cradle.
F. Arm.
G. Spare Missile Racks.

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ENTAC System installed on Test Kit.


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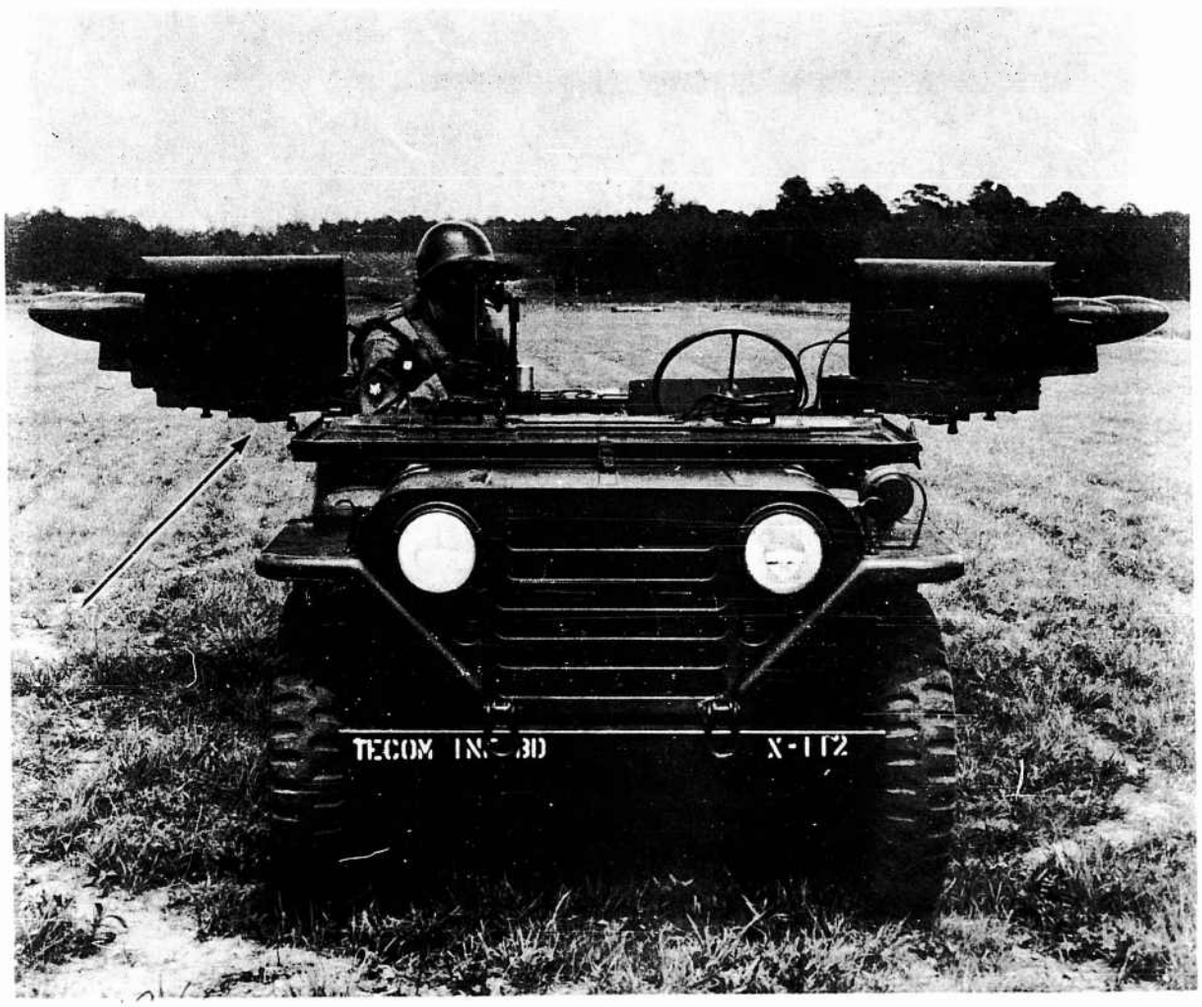
Gunner and Missiles on the Vehicle. Direction of Fire to the Front.

Arrow Indicates Extension.

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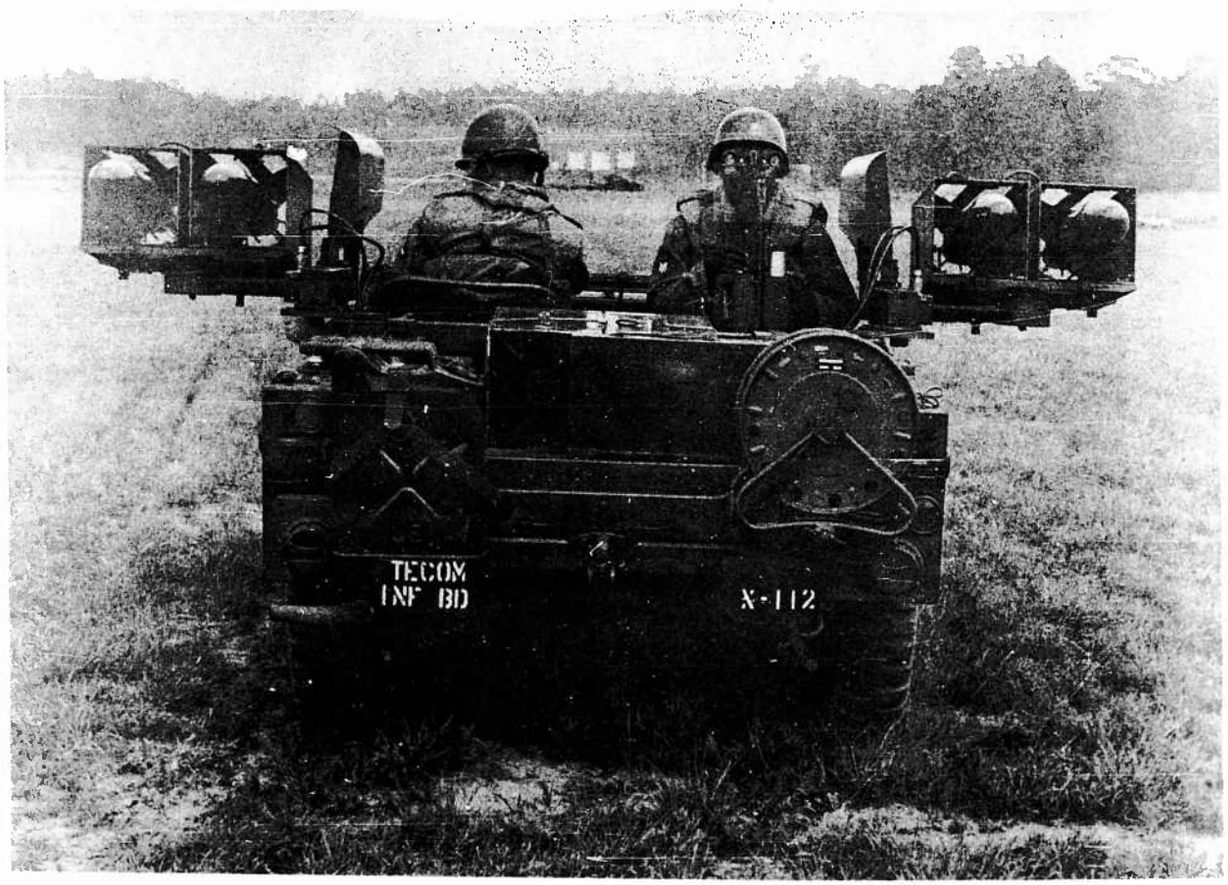
Gunner and Missiles on the Vehicle Direction of Fire 45° Outboard

Arrow Indicates Elevating Mechanism.

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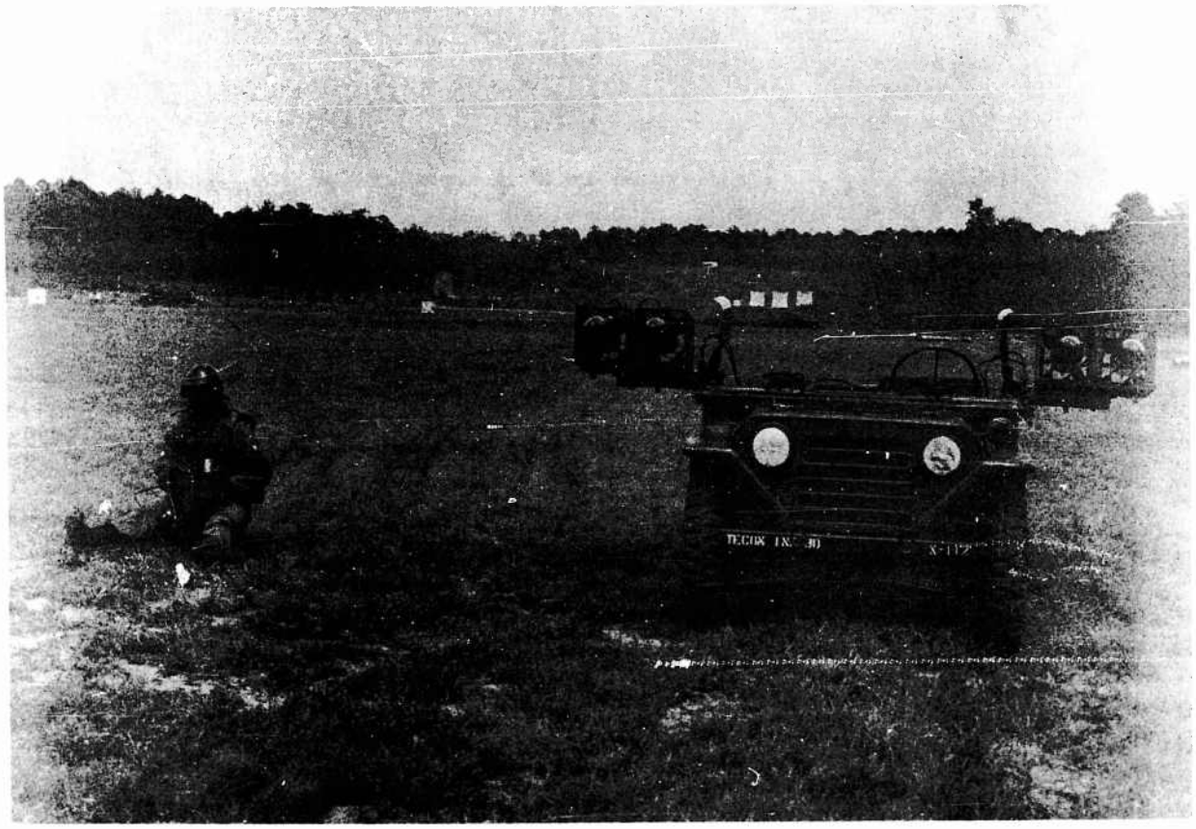
Gunner and Missile on the Vehicle.

Direction of fire to the rear.



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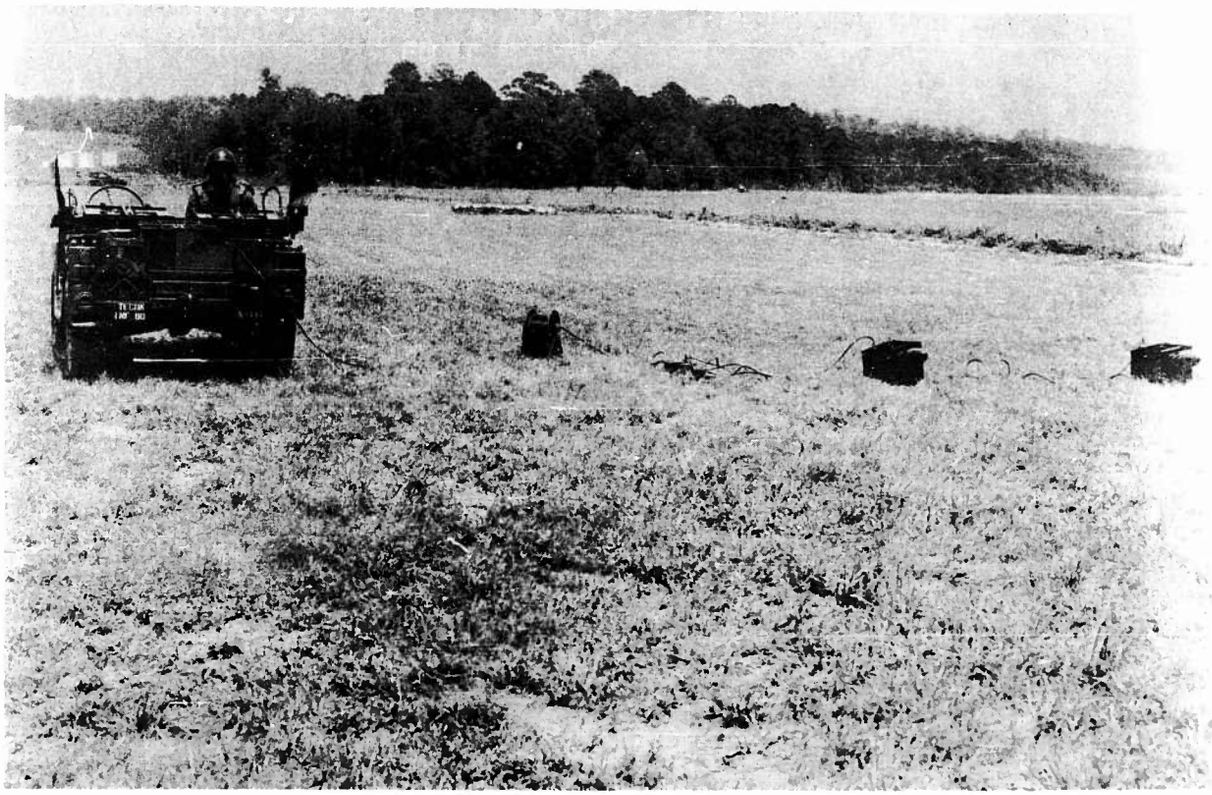
Gunner displaced. Missiles on the Vehicle.



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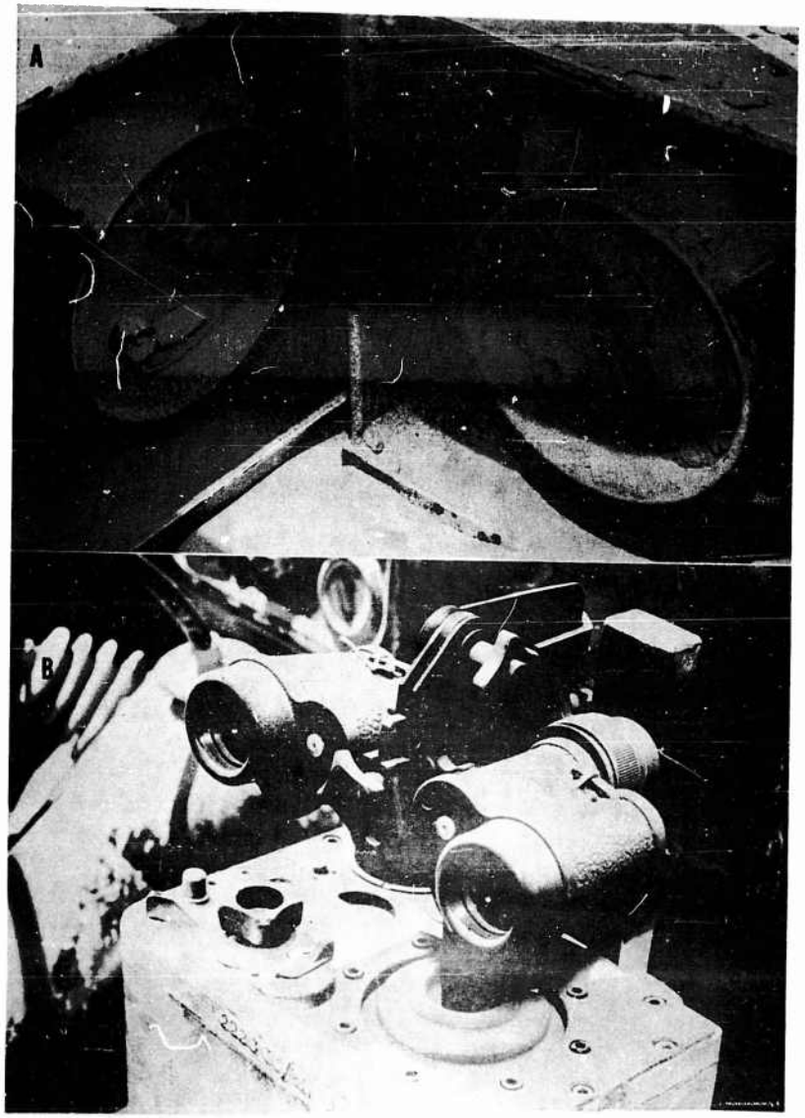
Gunner on the Vehicle. Missiles displaced.

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USATECOM PROJECT NO 8-3-4410-03 D, INTEGRATED ENGINEERING/SERVICE TEST
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Results of driving Test System 20 miles over Dust Course at YTS.

A. On-vehicle missiles.
B. Guidance and Control Unit.


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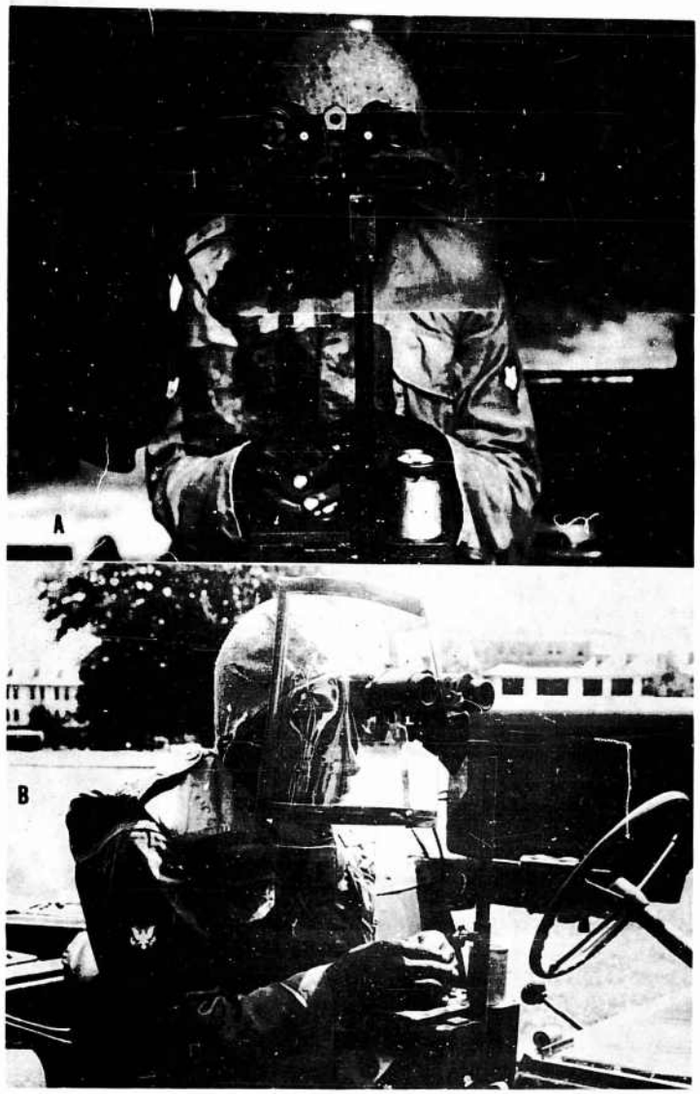
A. A Normal Launch and Flight.

B. A Typical Malfunction. This Missile Impacted 150 Meters in Front of the Vehicle.

Arrows Indicate Missiles. Note Difference in Attitude.

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USATECOM PROJECT NO 8-3-4410-03 D, INTEGRATED ENGINEERING/SERVICE TEST OF THE ENTAC ATGM WITH MOUNTING KIT FOR M151, 1/4-TON TRUCK

A. Plexiglass Shield.
B. Improvised Shield.


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Arrow Indicates Guidance and Control Unit Mounting Pintle.

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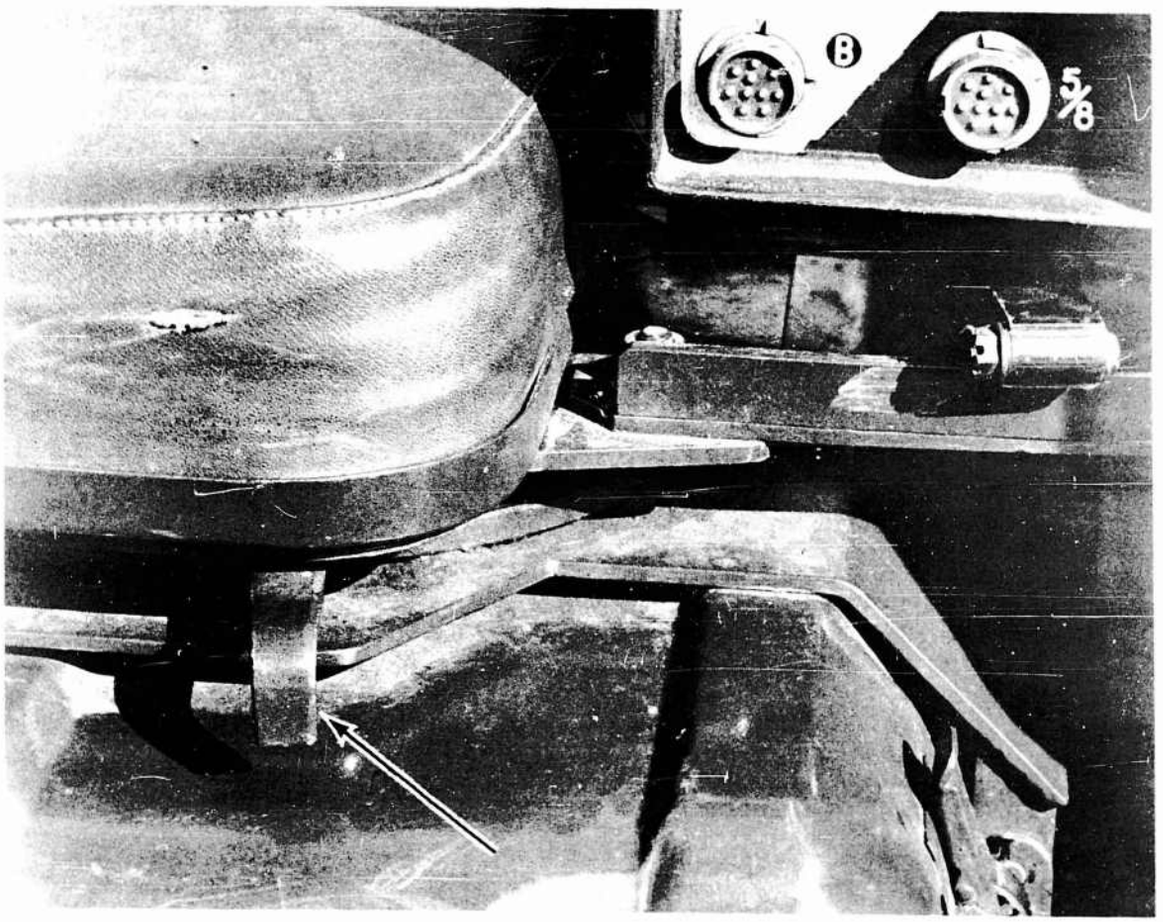
7x50 Binocular M-17A1 Mounted on Guidance and Control Unit.

Gunner wearing standard Protective Mask.

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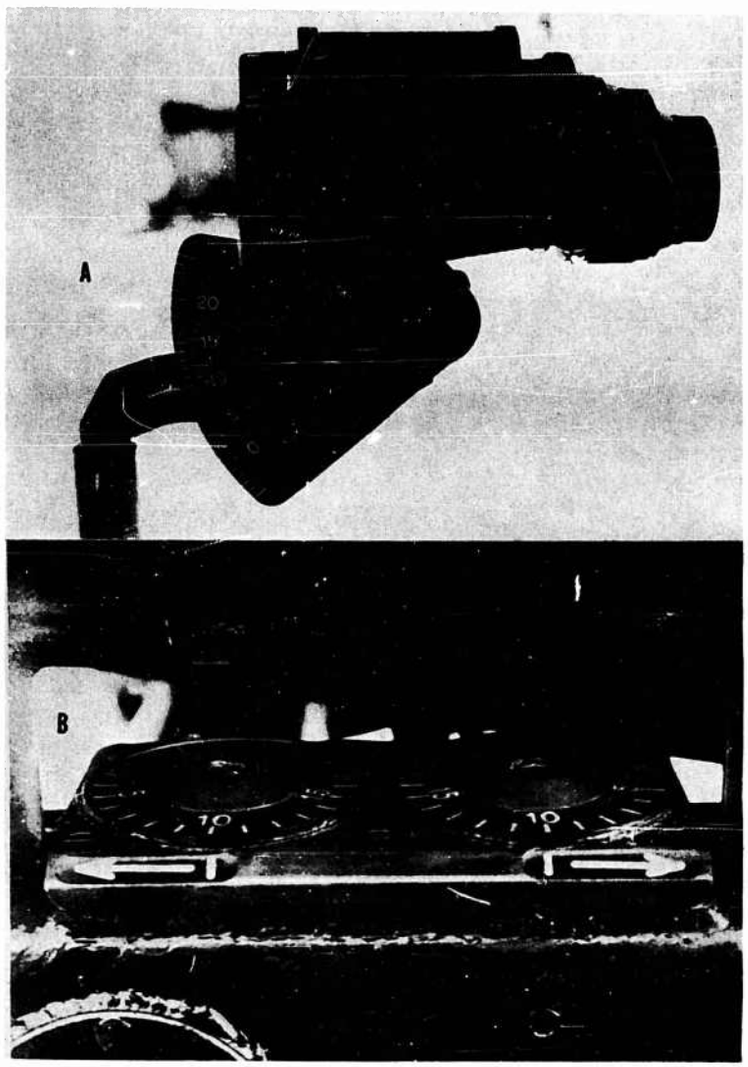
Handle of Gunner's Seat Lock.

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USATECOM PROJECT NO 8-3-4410-03 D, INTEGRATED ENGINEERING/SERVICE TEST OF THE ENTAC ATGM WITH MOUNTING KIT FOR M151, 1/4-TON TRUCK

A. Line of Sight scale on Guidance Station.
B. Elevation scale on Elevating Mechanism.

ANNEX C

DEFICIENCIES/SHORTCOMINGS

SECTION 1

(C) This section contains deficiencies requiring elimination in order to make the test item acceptable.

| Deficiency | Suggested Corrective Action | Remarks |
|---|---|---|
| 1. The plexiglass shield did not afford adequate protection to the gunner's eyes from the electrolyte sprayed to the rear when a missile was launched. | The shield should be redesigned to be larger and to curve around the sides of the gunner's face to prevent electrolyte from being blown behind the shield into the gunner's eyes (Annex B-12). | USAIB Report of Equipment Failure (REF) No 1 (ref 14, Annex A). Test No 2. This was indicated as a discrepancy in reference 5, Annex A. |
| 2. The test kit did not provide a means of preventing the gunner from injuring himself on the exposed pintle on the gunner's seat when mounting or dismounting the vehicle and when riding over rough terrain. | Provide an easily removable, padded cover for the pintle. | USAIB REF No 3 (ref 14, Annex A). Test No 8. |
| 3. The Launching Container Securing Latches failed to readily secure 11 out of 62 Launching Containers to the Launching Platform. | The clearance between the Launching Platform and the bearing surface of the Launching Container Securing Latch should be increased by approximately .05 inch. Closer tolerances should be established on the acceptable thickness of the lower edge of the Launching Container. | USAIB REF No 4 (ref 14, Annex A); and YTS REF No E1 (ref 15, Annex A). Test No 4. |
| 4. The Elevating Mechanism failed to operate properly because of the accumulation of dust and grit in the gears after cross-country operation of the vehicle. | A rubber grommet or similar device should be provided to prevent dust and grit from entering the Arm through the slot in the front plate. The Elevating Mechanism should be redesigned to provide greater clearance between the pinion gears and the bottom inside surface of the Arm. | USAIB REF No 9 (ref 16, Annex A); and YTS REF No E3 (ref 15, Annex A). Test No 4. |

| Deficiency | Suggested Corrective Action | Remarks |
|---|---|---|
| 5. No maintenance package, maintenance instructions, nor operating instructions were received with the test kit. | A maintenance package, maintenance instructions, and operating instructions should be included with the test kit. | Test No 1. |
| 6. The gunner's seat lock failed to function reliably. | Provide a positive lock for the gunner's seat. | YTS REF No E2 (ref 15, Annex A). Test No 8. |

SECTION 2

(C) This section contains shortcomings which should be corrected, if it can be done without unduly complicating the item or inducing another undesirable characteristic.

| Shortcoming | Suggested Corrective Action | Remarks |
|---|---|---|
| 7. The latches on the lids of the two Stowage Containers were of light construction and were easily bent. These latches frequently failed to function and it was necessary to either pound on the lids to jar them open or to forcibly pry the lids open. | The two Stowage Containers should be equipped with reliable, rugged latches. | USAIB REF No 2 (ref 14, Annex A). Test No 2. |
| 8. The test kit failed to provide an adequate means of protecting the on-vehicle missiles from dust or weather. | An easily and quickly removable dust cover should be provided to protect the on-vehicle missiles. | USAIB REF No 7 (ref 16, Annex A). Test No 4. |
| 9. The Warhead Stowage Box latch failed to remain closed during cross-country operation of the vehicle thus allowing dirt and other matter to accumulate in the Warhead Stowage Box. | The Warhead Stowage Box should be equipped with a reliable, rugged latch. | USAIB REF No 8 (ref 16, Annex A). Test No 4. |
| 10. Dual guidance equipment (one set vehicle mounted, one set carried for ground use) was not provided. | An additional Guidance Unit should be issued with the test kit. | Test No 1. |
| 11. The cover on the Guidance Unit did not protect it from dust during operation of the vehicle over dusty terrain. | A tighter seal between the two parts of the cover should be provided. | YTS REF No E4 (ref 15, Annex A). Test No 4. This was previously listed as a shortcoming in reference 5, Annex A. |

SECTION 3

(C) This section contains those shortcomings discovered during testing and satisfactorily corrected prior to completion of the test. They no longer represent a defect in the test item. The correction must be applied to the production model of this item.

| Shortcoming | Corrective Action Taken | Remarks |
|---|---|---|
| 12. As described in paragraph 3a(1)(e), Test No 1, Part II, use of the Elevating Mechanism scale in conjunction with the Guidance Unit line-of-sight scale resulted in the Launching Platforms having a superelevation of $8^{o}$ above the line of sight. Information received from the developer of the test kit indicated that a superelevation of $12^{o}$ was recommended based on French experience with the ENTAC System. | The dials on the Elevating Mechanism were realigned to provide a $12^{o}$ superelevation. | Instructions for calibration of the Elevating Mechanism should be included in the operating instructions for the test kit. |

((C O P Y))

## PART IV
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United States Army Infantry Board, Fort Benning, Georgia
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_____ 39 pp. 16 photos. CONFIDENTIAL REPORT.
Tests were conducted to determine suitability of Adapter Kit for Mounting the ENTAC ATGM on Truck, M151, for US Army use. The Adapter Kit had four deficiencies that could serve as a bar to employment, two deficiencies that constituted safety hazards, and six shortcomings. It was concluded that the Adapter Kit was neither suitable nor safe for U.S. Army use. It was recommended that upon correction of the deficiencies and shortcomings, an Adapter Kit be furnished the US Army Infantry Board for check test.

AD_____ Accession No_____
United States Army Infantry Board, Fort Benning, Georgia
FINAL REPORT/SERVICE TEST OF USATECOM PROJ NO 8-3-4410-03 D, INTEGRATED ENGINEERING/SERVICE TEST OF ENTAC ANTITANK GUIDED MISSILE WITH MOUNTING KIT FOR M151, 1/4-TON TRUCK.
ETA_____ 39 pp. 16 photos. CONFIDENTIAL REPORT. Tests were conducted to determine suitability of Adapter Kit for Mounting the ENTAC ATGM on Truck, M151,for US Army use. The Adapter Kit had four deficiencies that could serve as a bar to employment, two deficiencies that constituted safety hazards, and six shortcomings. It was concluded that the Adapter Kit was neither suitable nor safe for U.S. Army use. It was recommended that upon correction of the deficiencies and shortcomings, an Adapter Kit be furnished the U.S. Army Infantry Board for check test.