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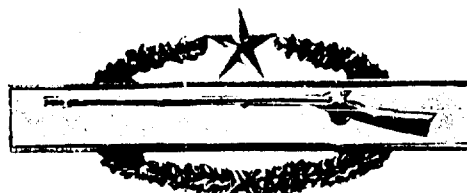
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REPORT OF PROJECT

REPORT OF USATECOM PROJECT NO 8-3-3250-04,
SERVICE TEST OF
KIT FOR MOUNTING DAVY CROCKETT XM29 ON
TRUCK, UTILITY, 1/4-TON, 4X4, M151
9 JULY 1963



UNITED STATES ARMY INFANTRY BOARD
Fort Benning, Georgia 31905

LtCol Daems/kb/545-1092

STEBC (P-3001)

9 July 1963

SUBJECT: Report of USATECOM Project No 8-3-3250-04

TO: See Distribution

1. This letter transmits final report of subject project.

2. Test Results.

a. The Kit for mounting DAVY CROCKETT XM29 on Truck, Utility, 1/4-Ton, 4x4, M151 (M151 vehicle), was tested under actual field conditions in the temperate zone. The Kit consisted of a Primary Kit for mounting and firing the DAVY CROCKETT XM29 and transport of accessories and ammunition for one fire mission and a Secondary Kit for transport of ammunition for one fire mission on an additional M151 vehicle.

b. The Kits were compatible with the DAVY CROCKETT XM29 with the exception that crew space was inadequate, space was not available for mounting the AN/VRC-10 radio, and a safety hazard existed because of the location of the locking handle of the travel lock on the Primary Kit.

c. Three deficiencies and three shortcomings were noted during this test.

d. The Primary Kit on the M151 vehicle provides 1,045 mils more useable traverse for firing than that provided by the DAVY CROCKETT XM29 kit on the M38A1D vehicle it is designed to replace.

3. Conclusions. The US Army Infantry Board concludes that:

a. The Kit for mounting DAVY CROCKETT XM29 on Truck, Utility, 1/4-Ton, 4x4, M151, is not suitable for US Army use under temperate climatic conditions until the deficiencies and as many of the shortcomings as feasible have been corrected.

b. The Secondary Kit for stowing ammunition for one fire mission is not considered suitable for US Army use as there is insufficient space remaining in the M151 vehicle to accommodate the balance of a complete squad or mount the necessary AN/VRC-10 radio.

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9 July 1963

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c. The Primary Kit for mounting DAVY CROCKETT XM29 on Truck, Utility, 1/4-Ton, 4x4, M151, will be safe for its intended use after correction of the safety hazard. The Secondary Kit is safe, though inadequate, for its intended use.

d. The Kit for mounting DAVY CROCKETT XM29 on the Truck, Utility, 1/4-Ton, 4x4, M151, and the Heavy Duty Suspension should be installed on the vehicle prior to its issue to the user.

4. Recommendations. It is recommended that:

a. The Kit for mounting DAVY CROCKETT XM29 on the Truck, Utility, 1/4-Ton, 4x4, M151, be considered unsuitable for type classification until the deficiencies and as many of the shortcomings as feasible have been corrected.

b. The deficiencies and as many of the shortcomings as feasible of the Primary Kit be corrected and that verification of corrections be made by US Army Infantry Board inspection in lieu of a Confirmatory Test.

c. The Secondary Kit for stowing ammunition for one fire mission on the Truck, Utility, 1/4-Ton, 4x4, M151, be considered unsuitable for type classification and that development be terminated.

d. The Truck, Cargo, 3/4-Ton, 4x4, M37B1, currently authorized in the DAVY CROCKETT XM29 squad be retained and that the stowage kit for this vehicle, previously tested in Project No 2848 (ref 5, Annex A, Part III), be modified to correct the reported shortcoming and to provide space for:

(1) The driver and two other soldiers.

(2) The AN/VRC-10 radio.

(3) Spotting and major caliber ammunition for as many fire missions as possible without exceeding the off-road payload of the Truck, Cargo, 3/4-Ton, 4x4, M37B1.


e. The stowage kit for the Truck, Cargo, 3/4-Ton, 4x4, M37B1, modified as indicated above, be provided to the US Army Infantry Board for Check Test.

f. The Kit for mounting DAVY CROCKETT XM29 on Truck, Utility, 1/4-Ton, 4x4, M151, and Heavy Duty Suspension be installed on the vehicle prior to its issue to the user.

FOR THE PRESIDENT:

DISTRIBUTION:

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43 - Part IV


A. B. CANNON
Captain, AGC
Adjutant

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UNITED STATES ARMY INFANTRY BOARD
Fort Benning, Georgia 31905

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9 July 1963

REPORT OF USATECOM PROJECT NO 8-3-3250-04,
SERVICE TEST OF
KIT FOR MOUNTING DAVY CROCKETT XM29 ON
TRUCK, UTILITY, 1/4-TON, 4X4, M151
10 September 1962 - 4 June 1963

PART I - GENERAL.

A. References. Annex A, Part III.

B. Authority.

1. Directive. Letter, AMSTE-BC, USATECOM, 31 Aug 62, subject: "Service Test of Kits for Mounting DAVY CROCKETT XM28 and XM29 on Truck, Utility, 1/4-Ton, 4x4, M151."

2. Purpose. To determine the suitability of the Kit for Mounting DAVY CROCKETT XM29 on Truck, Utility, 1/4-Ton, 4x4, M151, for US Army use under temperate climatic conditions.

C. Description of Materiel.

1. The Kit for mounting DAVY CROCKETT XM29 (XM29) on Truck, Utility, 1/4-Ton, 4x4, M151 (M151 vehicle), consists of two modification kits which are mounted on two different M151 vehicles. The modification kits are designated the Primary and Secondary Kits.

a. The Primary Kit (Annex B-1, Part III):

(1) Consists of the following components:

- (a) XM29 Mount.
- (b) Sight Case Rack.
- (c) Piston Rack.
- (d) Travel Lock.
- (e) Aiming Circle Tripod Rack.
- (f) Aiming Post Light Case Rack.
- (g) Propellant Rack (1 Each, Zone I and Zone II).

- (h) Major Caliber Projectile Rack (1 Projectile).
- (i) Spotting Ammunition Rack (10-Cartridge Case).
- (j) Ground Tripod Rack.
- (k) Aiming Circle Case Rack.

(2) Provides a means of vehicular mounting and firing the XM29 equipped with the 37-mm Spotting Gun, XM77E2 (spotting gun), and of stowing sufficient fire control equipment, accessories, and spotting and major caliber ammunition to fire one mission. Space in the M151 vehicle is available for the driver and one soldier. The rear suspension system of the M151 vehicle is modified through use of double coil springs to increase the payload to 1,642 pounds. This suspension system (Heavy Duty Suspension) is not part of the Primary Kit. The M151 vehicle with the loaded Primary Kit is shown in Annex B-2, Part III.

b. The Secondary Kit (Annex B-3, Part III):

(1) Consists of the following components:

- (a) Major Caliber Projectile Rack (1 Projectile).
- (b) Spotting Ammunition Rack (10-Cartridge Case).
- (c) Piston Rack (1 Each).
- (d) Propellant Rack (1 Each, Zone I and Zone II).

(2) Provides a means of stowing and transporting sufficient spotting and major caliber ammunition for one fire mission. Space in the M151 vehicle is available for the driver and one other soldier. There is no Heavy Duty Suspension on this vehicle. The M151 vehicle with the loaded Secondary Kit is shown in Annex B-4, Part III.

c. The XM29, equipped with the spotting gun, and with sufficient fire control equipment, accessories, and spotting and major caliber ammunition for one fire mission, is hereinafter referred to as the XM29 system.

2. A maintenance package consisting of installation instructions was received.

D. Background.

1. The Truck, Utility, 1/4-Ton, 4x4, M151, was classified standard A in 1957 (ref 2, Annex A, Part III). In May 1959, USCONARC recommended that development on and test of various adapter/modification kits for the

light and heavy versions of the DAVY CROCKETT be undertaken (ref 3, Annex A, Part III). The latest requirements for mounting kits for both the XM28 and XM29 were established by OTCM action in April 1962 (ref 6, Annex A, Part III).

2. The developing agency was the US Army Tank-Automotive Center, Warren, Michigan. One Primary and one Secondary Kit, each installed on M151 vehicles were received by the US Army Infantry Board on 10 September 1962. Testing commenced on that date. On 5 October 1962, test of the Primary Kit was suspended because the body of the vehicle began breaking up. The kit and vehicle were returned to the developer for redesign of the kit. On 1 February 1963, a redesigned Primary Kit mounted on the M151 vehicle was received and testing was resumed. Testing was completed on 4 June 1963.

3. A redesigned Primary Kit was also provided to US Army Development and Proof Services (USAD&PS) for test. Report of Engineering Test has been received and reviewed.

4. A safety release was not provided.

5. The Primary and Secondary Kits are not proposed for tripartite standardization.

E. Test Objectives.

1. Determine the suitability of the Kit for mounting DAVY CROCKETT XM29 on Truck, Utility, 1/4-Ton, 4x4, M151, for US Army use under temperate climatic conditions.

2. The following tests were conducted:

- a. Physical Characteristics.
- b. Compatibility for Transport.
- c. Elevation and Traverse Limits.
- d. Ruggedness and Durability.
- e. Silhouette.
- f. Organizational Maintenance.
- g. Human Factors Engineering.
- h. Safety Confirmation.

F. Findings.

1. There are no military characteristics which delineate performance requirements.

2. The Primary Kit is compatible with the M151 vehicle and the XM29 system with the exception that crew space is inadequate and a safety hazard exists (Test No 2).

3. The weight of the Primary Kit, XM29 system, and two soldiers with full field equipment is within the rated payload of the M151 vehicle with Heavy Duty Suspension (Test No 1).

4. The useable traverse for firing the XM29 from the Primary Kit on the M151 vehicle is 1,045 mils greater than that provided on the M38A1D vehicle (Test No 3).

5. The ruggedness and durability of both the Primary and Secondary Kits are adequate (Test No 4).

6. The Secondary Kit is compatible with the M151 vehicle, ammunition for one fire mission and the crew it was designed to transport; however, additional transport or the substitution of a 3/4-ton truck is required to provide transport for the complete crew and the AN/VRC-10 radio (Test No 2).

7. With the exception noted in paragraph 2 above the Primary and Secondary Kits are safe for their intended use (Test No 2).

8. The Primary Kit and the Heavy Duty Suspension on one M151 vehicle and the Secondary Kit on another M151 vehicle were installed prior to issue for this test and should, if standardized, be installed on the vehicles prior to issue to the users.

9. The following deficiencies and shortcomings were noted:

a. Deficiencies.

(1) The lack of space to transport one remaining man of the five-man XM29 squad (Test No 2).

(2) The travel lock in its present location and configuration is a safety hazard (Test No 2).

(3) The angle at which the main gun tube crosses the right front seat reduces crew space (Test No 2).

b. Shortcomings.

(1) Limits of elevation and traverse are not marked on the cradle or mount (Test No 3).

(2) Kit installation instructions are incorrect as they were written prior to redesign of the Primary Kit (Test No 6).

(3) Wheel bolts to secure the spare wheel have heads that are not the same size as the wheel nuts to secure the running wheels (Test No 8).

G. Conclusions. The US Army Infantry Board concludes that:

1. The Kit for mounting DAVY CROCKETT XM29 on Truck, Utility, 1/4-Ton, 4x4, M151, is not suitable for US Army use under temperate climatic conditions until the deficiencies and as many of the shortcomings as feasible have been corrected.

2. The Secondary Kit for stowing ammunition for one fire mission is not considered suitable for US Army use as there is insufficient space remaining in the M151 vehicle to accommodate the balance of a complete squad or mount the necessary AN/VRC-10 radio.

3. The Primary Kit for mounting DAVY CROCKETT XM29 on Truck, Utility, 1/4-Ton, 4x4, M151, will be safe for its intended use after correction of the safety hazard. The Secondary Kit is safe, though inadequate, for its intended use.

4. The Kit for mounting DAVY CROCKETT XM29 on the Truck, Utility, 1/4-Ton, 4x4, M151, and the Heavy Duty Suspension should be installed on the vehicle prior to its issue to the user.

H. Recommendations. It is recommended that:

1. The Kit for mounting DAVY CROCKETT XM29 on the Truck, Utility, 1/4-Ton, 4x4, M151, be considered unsuitable for type classification until the deficiencies and as many of the shortcomings as feasible have been corrected.

2. The deficiencies and as many of the shortcomings as feasible of the Primary Kit be corrected and that verification of corrections be made by US Army Infantry Board inspection in lieu of a Confirmatory Test.

3. The Secondary Kit for stowing ammunition for one fire mission on the Truck, Utility, 1/4-Ton, 4x4, M151, be considered unsuitable for type classification and that development be terminated.

4. The Truck, Cargo, 3/4-Ton, 4x4, M37B1, currently authorized in the DAVY CROCKETT XM29 squad be retained and that the stowage kit for this vehicle, previously tested in Project No 2848 (ref 5, Annex A, Part III), be modified to correct the reported shortcoming and to provide space for:

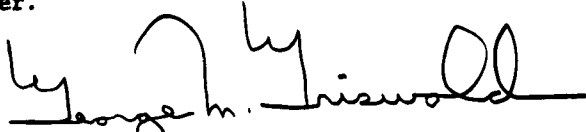
a. The driver and two other soldiers.

b. The AN/VRC-10 radio.

c. Spotting and major caliber ammunition for as many fire missions as possible without exceeding the off-road rated payload of the Truck, Cargo, 3/4-Ton, 4x4, M37B1.

5. The stowage kit for the Truck, Cargo, 3/4-Ton, 4x4, M37B1, modified as indicated above, be provided to the US Army Infantry Board for Check Test.

6. The Kit for mounting DAVY CROCKETT XM29 on Truck, Utility, 1/4-Ton, 4x4, M151, and Heavy Duty Suspension be installed on the vehicle prior to its issue to the user.

A handwritten signature in black ink, appearing to read "George M. Griswold". The signature is fluid and cursive, with a large loop at the end.

DISTRIBUTION:

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GEORGE M. GRISWOLD
Colonel, Infantry
Acting President

PART II - TEST DATA

Test No 1, PHYSICAL CHARACTERISTICS.

1. Purpose. To determine the physical characteristics of the Primary and Secondary Kits with the related M151 vehicles, weapon, crew, and equipment.

2. Method.

a. The Primary and Secondary Kits installed on the M151 vehicles were inspected, measured, and weighed with and without the XM29 system mounted or stowed as appropriate.

b. For comparison purposes, an M151 vehicle without the Kits or Heavy Duty Suspension was weighed.

c. Photographs were taken.

d. Data obtained were recorded and analyzed.

3. Results. Factual Data.

a. <u>Weights.</u>	<u>Pounds</u>
(1) M151 Vehicle	2,210.00
(2) M151 Vehicle w/Heavy Duty Suspension . . .	2,269.65
(3) M151 Vehicle w/Primary Kit and Heavy Duty Suspension.	2,530.00
(4) M151 Vehicle w/Primary Kit, Heavy Duty Suspension, and XM29 System.	3,207.13
(5) Weight of Average Soldier and Full Field Equipment (ref 11, Annex A, Part III).	246.00
(6) M151 Vehicle w/Primary Kit, XM29 System, and Two Soldiers w/Full Field Equipment.	3,699.13
(7) Load Weight - (2) above subtracted from (6) above.	1,429.48
(8) Off-Road Rated Payload of M151 Vehicle w/Heavy Duty Suspension.	1,642.00
(9) M151 Vehicle w/Secondary Kit and Ammunition for One Fire Mission.	2,558.58

	<u>Pounds</u>
(10) M151 Vehicle w/Secondary Kit, Ammunition for One Fire Mission and Two Soldiers w/Full Field Equipment (does not include AN/VRC-10 Radio)	3,050.58
(11) Load Weight - (1) above subtracted from (10) above.	840.58
(12) Off-Road Payload of M151 Vehicle w/Standard Suspension.	800.00

b. Measurements. The overall dimensions of the M151 vehicle with the Primary and Secondary Kits and the XM29 system mounted or stowed as appropriate thereon were:

(1) Primary Kit.

	<u>Maximum (Inches)</u>	<u>Reducible (Inches)</u>
(a) Height	65 1/2	63 1/4 (By lowering windshield)
(b) Width	73 1/2	69 1/4 (By removing spare wheel)
(c) Length	148	--

(2) Secondary Kit.

(a) Height	65 1/8	52 1/2 (By lowering windshield)
(b) Width	63 3/4	--
(c) Length	138	--

c. Load Distribution. The load described in paragraph 3a(4) and (6) caused the vehicle with the Primary Kit to list approximately 1 1/2 inches to the right.

d. Crew Space. Space was provided for a driver and one other soldier each with full field equipment in each of the M151 vehicles equipped with the Primary and Secondary Kits.

e. Photographs. Annex B-1 through B-4, Part III.

4. Analysis.

a. The XM29 system and two soldiers, each with full field equipment, comprised a load that was 212.52 pounds less than the off-road rated payload of the M151 vehicle with the Primary Kit and Heavy Duty Suspension.

b. The weight of the Secondary Kit, ammunition for one fire mission and two soldiers with full field equipment exceeded the off-road rated payload of the M151 vehicle by 40.58 pounds.

Test No 2, COMPATIBILITY FOR TRANSPORT.

1. Purpose. To determine the compatibility of the Primary and Secondary Kits with related vehicles, weapon, crew, and equipment for transport.

2. Method.

a. The XM29 system on the Primary Kit and one fire mission on the Secondary Kit were mounted or stowed, as appropriate, for travel. Two soldiers with full field equipment rode in each vehicle. The loaded vehicles were driven over hard-surfaced and dirt roads, trails, and cross-country. At intervals the weapon was placed in action using alternately the ground and vehicular mounts. Portions of this test were conducted in conditions of dust, mud, rain, and during hours of darkness. The M151 vehicle with Primary Kit was driven 4,400 miles and 800 miles of this was put on the vehicle during and after firing in Test No 3. The M151 vehicle with Secondary Kit was driven for 2,340 miles.

b. Data were recorded.

3. Results. Factual Data.

a. Damage. (See Test No 4, Ruggedness and Durability.)

b. Stowage. The draft TOE for the Infantry Battalion ROAD indicates that each XM29 squad will be equipped with the AN/VRC-10 radio (ref 12, Annex A, Part III). No space was available for mounting the AN/VRC-10 radio in either the Primary or Secondary Kit.

c. Offloading and Loading.

(1) No problems were encountered in offloading and loading incident to going into and out of action. Placing the weapon into action consisted of starting with the XM29 system loaded on the Primary Kit in the transport position and ending when the main gun and spotting gun were loaded with major caliber and spotting cartridges and the sight laid on an aiming point (direct-fire) and leveled. The time does not include time required to take propellant temperature. Going out of action consisted of going from the firing position to the vehicle transport position both from a mission fired and not-fired situation.

(2) The average time for a five-man squad to go from the travel position into action with the XM29 system vehicularly mounted was 1 minute 15 seconds. Time required to go out of action from the vehicular mount to the travel position was: fired - 32 seconds; not fired - 1 minute 23 seconds.

(3) The average time for the same squad to go from the travel position into action using the ground mount was : 1 minute 28 seconds. The average time to go out of action from the ground mount to the vehicular travel position was: fired - 59 seconds; not fired - 1 minute 49 seconds.

(4) The average time to load the second fire mission from the Secondary Kit was 35 seconds.

d. Adequacy of Crew Space.

(1) Space was provided in each vehicle for only a driver and one other soldier, each with his full field equipment. Therefore, additional transportation was required for one remaining man of the five-man XM29 squad. (Annex B-2 through B-6, Part III).

(2) The travel lock in its present location and configuration is a safety hazard because the travel lock handle is alongside of the passenger's head (Annex B-1, Part III) (Sec 1, Annex C, Part III).

(3) The angle at which the XM29 gun tube crosses the right front seat causes this space to be reduced and riding in this seat to be uncomfortable and tiring (Annex B-2, Part III) (Sec 1, Annex C, Part III).

e. Weight and Load Distribution.

(1) When completely loaded the vehicle with Primary Kit listed approximately 1 1/2 inches to the right side, but this had no noticeable effect on the driving of the vehicle.

(2) The weight of the complete load exceeded rated off-road payload of the vehicle with the Secondary Kit by 40.58 pounds, but had no noticeable effect on the driving of the vehicle.

f. Adverse Conditions. Dust, mud, and rain had no adverse effects on the kits or items transported other than the requirement for routine organizational maintenance.

4. Analysis.

a. The Primary Kit was compatible with the M151 vehicle and the XM29 system for transport with the exception that the crew space was inadequate and that the location of the travel lock handle is a safety hazard. The inadequate crew space and the location and configuration of the travel lock handle are deficiencies (Sec 1, Annex C, Part III).

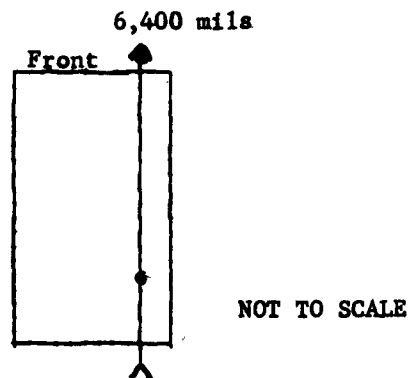
b. The Secondary Kit was compatible with the ammunition it was designed to transport; however, the M151 vehicle lacks space for mounting the AN/VRC-10 radio and space for the remaining man of the XM29 squad (Annex B-2 through B-6, Part III). This lack of space for the remaining man of the XM29 squad is a deficiency (Sec 1, Annex C, Part III). The AN/VRC-10 radio weighs over 120 pounds and would further overload the M151 vehicle if spaces for mounting were available. The draft TOE for infantry battalion, ROAD, includes authorization for one 1/4-ton vehicle and one 3/4-ton vehicle (ref 12, Annex A, Part III). It is considered that the 3/4-ton vehicle could provide each squad with adequate crew transport and space for mounting the AN/VRC-10 radio. Additional ammunition also could be carried on the 3/4-ton vehicle (ref 5, Annex A, Part III).

Test No 3, ELEVATION AND TRAVERSE LIMITS.

1. Purpose. To determine the useable firing limits of elevation, depression, and traverse imposed on the weapon by the Primary Kit and the M151 vehicle.

2. Method.

a. The XM29 system was mounted on the M151 vehicle with the Primary Kit. All traverse measurements were measured from 6,400 mils. That point was established with the gun parallel to the longitudinal axis of the vehicle with the muzzle forward (see diagram below).



b. Starting with the vehicle level the following elevation and traverse limits were determined by observation, manipulation, and measurement.

(1) The minimum quadrant elevation where 6,400 mils traverse could be attained.

(2) The minimum quadrant elevation where 6,400 mils traverse could be attained and the spotting gun fired without the recoiling mechanism striking any part of the vehicle or on-vehicle equipment.

(3) The maximum limits of traverse at all elevations from the minimum determined in (1) above to 800 mils.

c. On completion of b above the spotting gun was fired at angles of elevation to achieve minimum, mid, and maximum ranges and at varying angles of traverse to determine where damage to the vehicle was excessive or the weapon sight inaccessible. A total of 19 major caliber projectiles and 125 spotting cartridges was fired. During all firing the vehicle was fully loaded; however, the windshield was removed because results of previous tests have indicated that it would be broken (ref 5, Annex A, Part III).

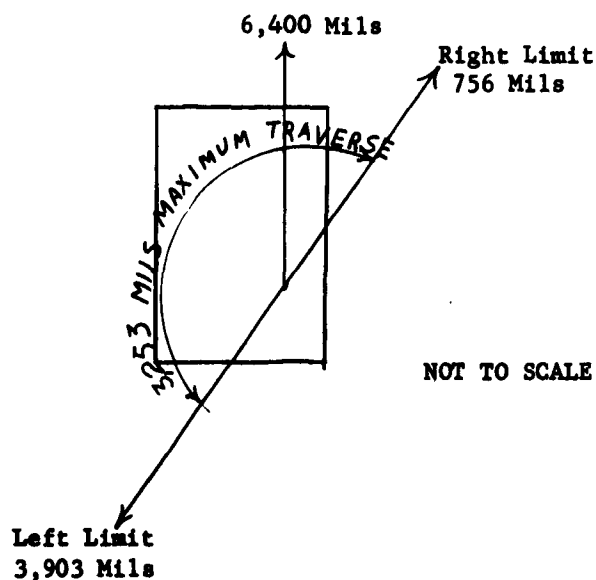
3. Results. Factual Data.

a. Nonfiring Data.

(1) The minimum elevation with which 6,400 mils traverse could be attained was 121 mils.

(2) The minimum elevation with which 6,400 mils traverse could be attained and the spotting gun could be fired without the recoiling mechanism striking any obstruction was 140 mils.

(3) The right and left limits of traverse between which all elevations from 121 mils to 800 mils could be achieved were 756 mils and 3,903 mils respectively. This provided a total traverse of 3,253 mils (see diagram below).



b. Firing Data.

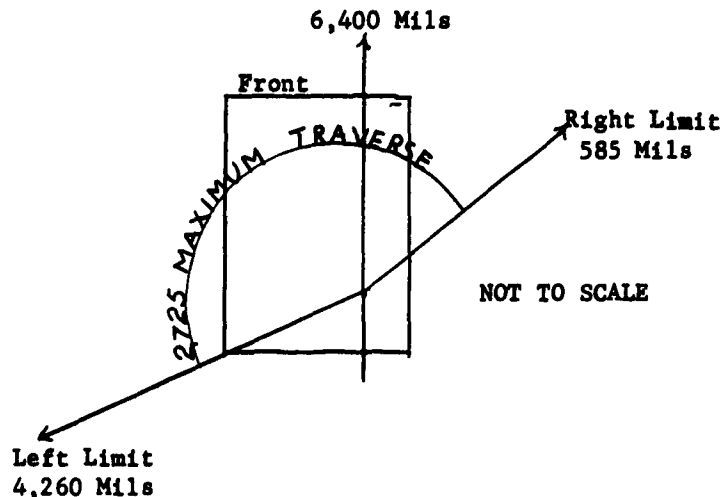
- (1) Firing of the spotting cartridges caused no damage.
- (2) Results of firing the major caliber projectiles.

Round No	Zone No	Deflection (Mils)	Quadrant Elevation (Mils)	Gun/Vehicle Angle (Mils)	Range (Meters)	Remarks
1	II	6,400	213	213	1,700	No damage.
2	II	585	213	213	1,700	No damage.
3	II	585	213	288	1,700	No damage.
4	II	4,800	695	827	3,780	No damage.
5	II	6,400	695	827	3,780	No damage.
6	II	3,960	695	751	3,780	The right front wheel well wall was bulged inward and upward which caused the fender to bend (See Annex B-5, Part III) and the hood was blown open.
7	II	6,200	376	196	2,700	Right hook latch broken. Hood blown open and warped. Mirror left side broken.
8	II	6,200	380	380	2,700	No damage.
9	II	5,800	380	380	2,700	No damage.
10	I	4,500	324	324	1,300	No damage.
11	I	4,300	322	147	1,300	No damage. Right hook latch and rear-view mirror replaced.
12	I	3,960	323	223	1,300	Hood blown open and warped.
13	I	6,400	131	176	579	Right hood latch broken.
14	I	4,260	131	131	579	No damage.
15	I	4,260	616	666	2,000	No damage.
16	I	4,160	616	666	2,000	Hood blown open and warped.
17	I	4,160	131	131	579	No damage.
18	I	6,400	621	771	2,000	No damage.
19	II	4,260	380	780	2,700	No damage.

c. Limits of elevation and traverse were not marked on the cradle or mount (Sec 2, Annex C, Part III).

4. Analysis.

a. Results of firing indicated that the Primary Kit on the M151 vehicle would permit firing of the XM29 throughout a span of traverse of 2,725 mils at gun/vehicle angles from 131 mils to 780 mils without causing damage to the vehicle or stowed equipment except when firing over the hood of the vehicle. When firing over the hood of the vehicle at elevations below 200 mils, damage occurred to the vehicle. The left limit of 4,260 mils was the limit beyond which damage to the vehicle could be expected. Since the gunner cannot climb on the M151 vehicle while laying the XM29 as the lay is disturbed when he dismounts to fire, the right limit of 585 mils was the limit beyond which sighting of the weapon could not be accomplished (see diagram below).



b. No disabling damage occurred to the vehicle when these limits, paragraph a above, were exceeded by 200 mils left traverse. Minor damage that did occur indicates that continuous firing could result in severe vehicle body damage.

c. A method of physically marking the limits of elevation and traverse on the cradle and mount, respectively, is required. These markings should reflect the limits (para a above) determined by this test. The lack of these markings is a shortcoming (Sec 2, Annex C, Part III).

d. The span of traverse recommended in paragraph a above exceeds the span of traverse of the XM29 mounted on the M38A1 vehicle by 1,045 mils (ref 5, Annex A, Part III).

e. The recommended minimum and maximum elevations will allow the weapon to be fired at all ranges, from minimum to maximum, newly established by permanent waivers to the XM29 system military characteristics (ref 4, Annex A, Part III).

Test No 4, RUGGEDNESS AND DURABILITY.

1. Purpose. To determine the ruggedness and durability of the Primary and Secondary Kits.

2. Method. All damage that occurred to the Primary and Secondary Kits, the M151 vehicles, and the XM29 system was recorded and analyzed. This test was conducted concurrently with Tests No 2 and No 3.

3. Results. Factual Data.

a. No immobilizing damage occurred to either of the kits, the XM29 system, or the M151 vehicles.

b. After 1,366 miles of road test, the replenisher line on the recoil mechanism of the spotting gun began to leak. In addition, the boresight alignment screws for the spotting gun vibrated loose resulting in loss of boresight.

4. Analysis.

a. The results of this test indicate that the ruggedness and durability of the Primary and Secondary Kits were adequate.

b. The failures of the spotting gun will be reported under a separate project pertaining to service test of that gun.

Test No 5, SILHOUETTE.

1. Purpose. To determine if the M151 vehicles with the Primary Kit and the XM29 system mounted and the Secondary Kit with ammunition for one fire mission stowed was readily distinguishable from other weapons mounted on the same type vehicle.

2. Method. The M151 vehicles with the Primary and Secondary Kits, XM29 system mounted, and the M151 vehicle with the 106-mm rifle mounted were displayed in various locations and at various ranges while stationary and moving. Observations were made from both ground and air.

3. Results. Observations of Test Personnel.

a. There was sufficient contrast between the Primary Kit with the XM29 system mounted and the M151 with the 106-mm rifle mounted to make each readily distinguishable from the other.

b. It was difficult to distinguish the Secondary Kit from any other M151 vehicle, particularly with the top up.

4. Analysis. The silhouette of the XM29 system mounted on the M151 vehicle is readily distinguishable and since efforts will be concentrated on detection of nuclear delivery systems on the battlefield, camouflage cover and concealment should be stressed.

Test No 6, ORGANIZATIONAL MAINTENANCE.

1. Purpose. To determine whether organizational maintenance of the Primary and Secondary Kits could be readily accomplished and if the maintenance package was adequate. Simultaneously, this test was designed to accumulate parts usage data.

2. Method. During the service test normal organizational maintenance was performed on the Primary and Secondary Kits. The installation instructions were reviewed and analyzed.

3. Results. Factual Data.

a. No unusual problems were encountered in performing organizational maintenance on either of the kits, nor did the kits interfere with maintenance of the vehicle.

b. The wheel bolts to secure the spare wheel of the vehicle with the Primary Kit had heads of a different size than the wheel nuts to secure the running wheels. No wrench was furnished to remove the spare wheel (Sec 2, Annex C, Part III).

c. No spare parts were required.

d. The installation instructions were incorrect as they were written prior to the redesign of the Primary Kit (Sec 2, Annex C, Part III).

4. Analysis.

a. Organizational maintenance could be performed readily on both the Primary and Secondary Kits; however, the wheel bolts to secure the spare wheel should have heads of the same size as the wheel nuts to secure the running wheels. This is a shortcoming (Sec 2, Annex C, Part III).

b. No information is available as to which level of maintenance will install the Primary and Secondary Kits or the Heavy Duty Suspension. It is desirable that M151 vehicles be issued to the user with these installations accomplished. The incorrect installation instructions are a shortcoming and should be up-dated (Sec 2, Annex C, Part III).

Test No 7, HUMAN FACTORS ENGINEERING.

1. Purpose. To determine whether the Primary and Secondary Kits had any features which adversely affected accuracy, ease of maintenance or firing.

2. Method. Throughout all tests the compatibility of the Primary and Secondary Kits with the skills of the user were noted and recorded.

3. Results. Factual Data.

a. The Primary and Secondary Kits did not have features that adversely affected accuracy of firing or the ease of maintenance.

b. Human factors engineering characteristics having safety and crew compatibility implications are reported in Test No 2.

4. Analysis. Other than the two deficiencies reported in Test No 2, the human factors engineering was considered adequate.

Test No 8, SAFETY CONFIRMATION.

1. Purpose. To determine the safety characteristics of the Primary and Secondary Kits.

2. Method. Throughout all tests features of the Primary and Secondary Kits which were or could be hazardous to the users were noted.

3. Results. Factual Data.

a. The XM29 when fired from the Primary Kit within the limits defined in Test No 3 was safe.

b. A safety hazard of the travel lock handle is reported in Test No 2.

4. Analysis. Other than the deficiency reported in Test No 2, the safety characteristics are considered satisfactory.

ANNEX A - REFERENCES

1. OTCM Item 34266, OCofORD, DA, 22 May 52, subject: "TRUCK, UTILITY, 1/4-TON, 4X4, XM151 -- Initiation of Project for Supplemental Development and Revision of Military Characteristics of."
2. OTCM Item 36575, OCofORD, DA, 11 Jul 57, subject: "TRUCK, UTILITY, 1/4-TON, 4X4, M151 - Classification as Standard Type; TRUCK, UTILITY, 1/4-TON, 4X4, M38A1 - Reclassification as Limited Standard Type; TRUCK, UTILITY, 1/4-TON, 4X4, M38A1C - Reclassification as Limited Standard Type (U)."
3. Letter, ATDEV-3 428/1(S) (27 May 59), USCONARC, 27 May 59, subject: "Vehicle Adaptation Modification Kits for DAVY CROCKETT (U)."
4. DF, CRD/G 34569 (CRD), OCRD, DA, 17 Jan 62, subject: "DAVY CROCKETT Program (U)."
5. Report of Project No 2848, USAIB, 3 Feb 62, Service Test of Battle Group Delivery System, XM29 (DAVY CROCKETT) (Less XM388 Projectile) (U).
6. OTCM Item 38104, OCofORD, DA, 30 Apr 62, subject: "Vehicle Modification Kits for DAVY CROCKETT (DA 512-15-018; OMS Code 553-12-533) (U)."
7. DA Project No 5N12-15-018.
8. DA Priority 1A.
9. DOD Test Objective AW-1.
10. CDOG paragraph 1137a.
11. Final Report, USAICDA, 1962, subject: "A Study to Reduce the Load of the Infantry Combat Soldier."
12. TOE 7-16E Draft (Headquarters & Headquarters Company, Infantry Battalion, ROAD).



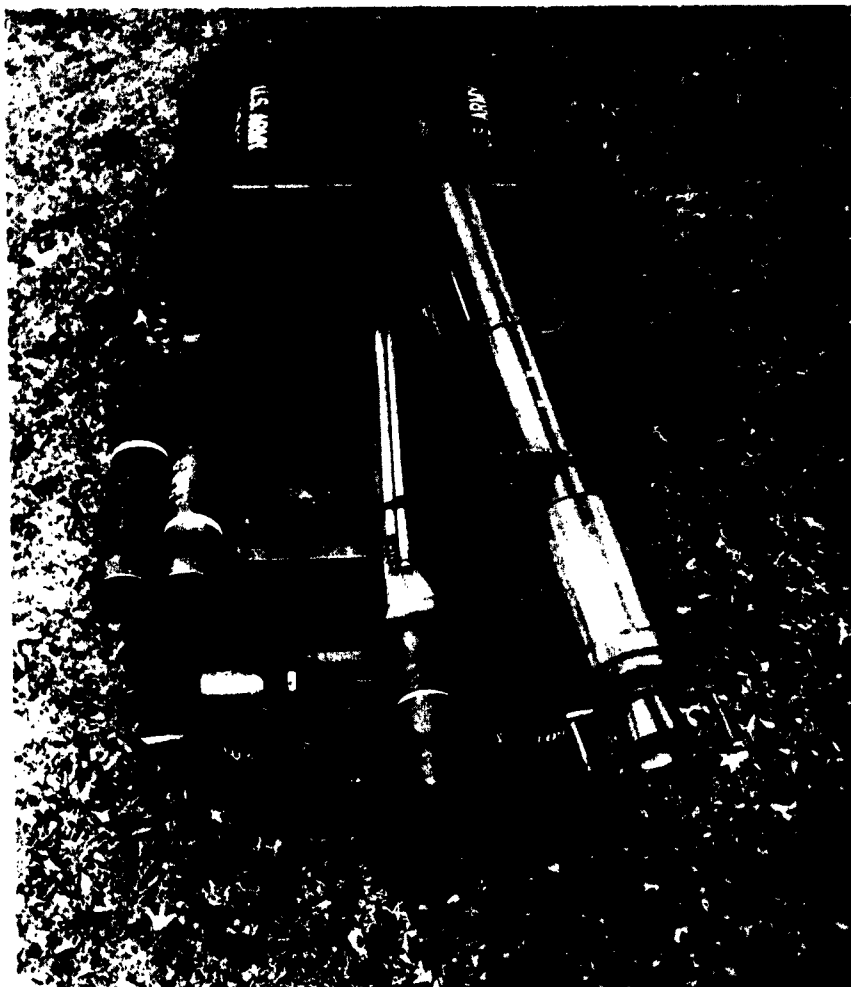
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USATECOM PROJECT NO 8-3-3250-04
SERVICE TEST OF KIT FOR MOUNTING DAVY CROCKETT XM29
ON TRUCK, UTILITY, 1/4-TON, 4X4, M151

Primary Kit

- | | |
|---|--|
| A. XM29 Mount. | H. Major Caliber Projectile Rack
(1 Projectile). |
| B. Sight Case Rack. | I. Spotting Ammunition Rack (10-
Cartridge Case). |
| C. Piston Rack. | J. Ground Tripod Rack. |
| D. Travel Lock. | K. Aiming Circle Case Rack (Forward
of and Hidden by Base of Travel
Lock). |
| E. Aiming Circle Tripod Rack. | |
| F. Aiming Post Light Case Rack. | |
| G. Propellant Rack (1 Each,
Zone I and Zone II). | |

Annex B-1

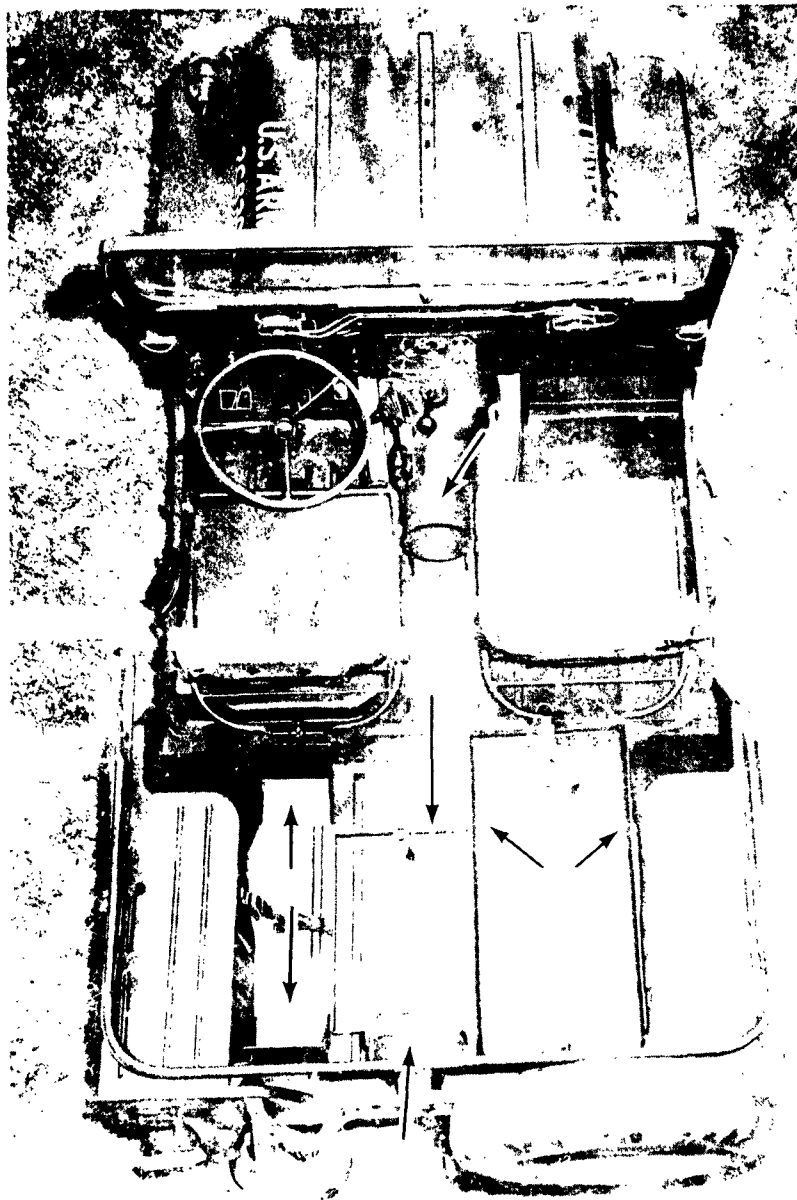


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SERVICE TEST OF KIT FOR MOUNTING DAVY CROCKETT XM29
ON TRUCK, UTILITY, 1/4-TON, 4X4, M151

Primary Kit with XM29 System

Annex B-2

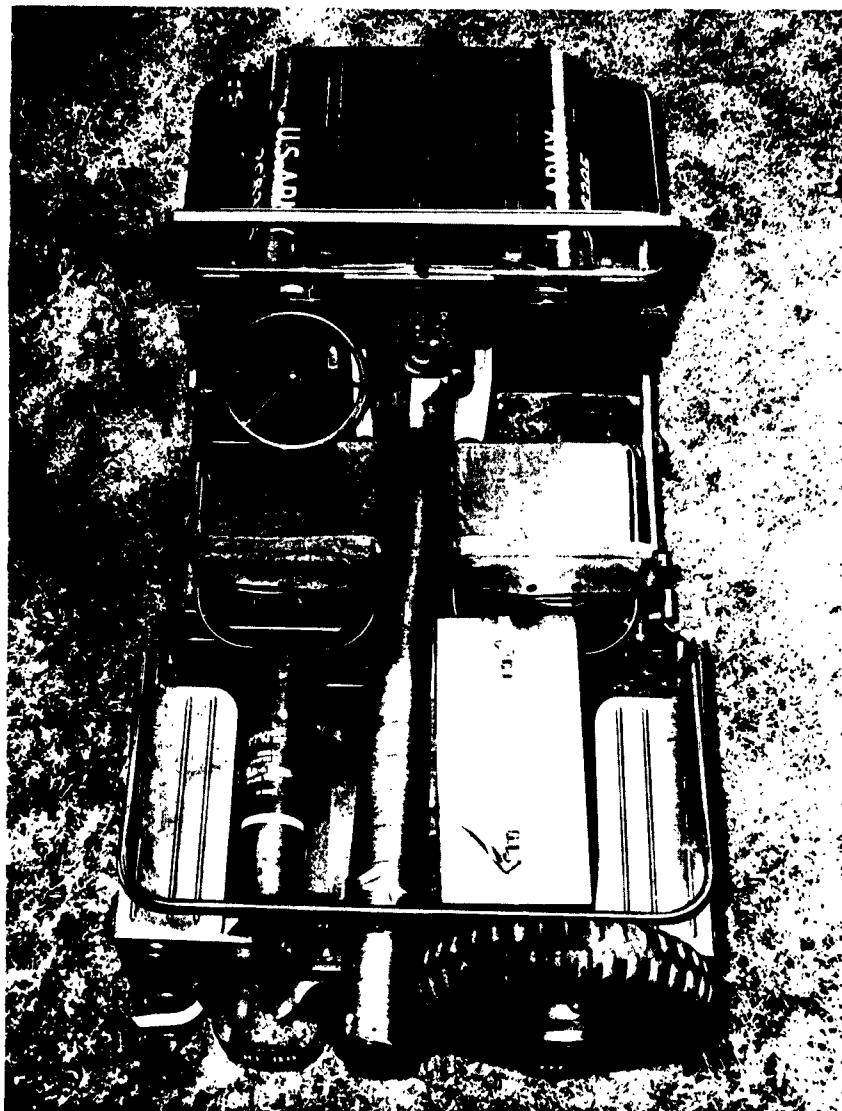


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SERVICE TEST OF KIT FOR MOUNTING DAVY CROCKETT XM29
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Secondary Kit

- A. Major Caliber Projectile Rack (1 Projectile).
- B. Spotting Ammunition Rack (10-Cartridge Case).
- C. Piston Rack (1 Each).
- D. Propellant Rack (1 Each, Zone I and Zone II).

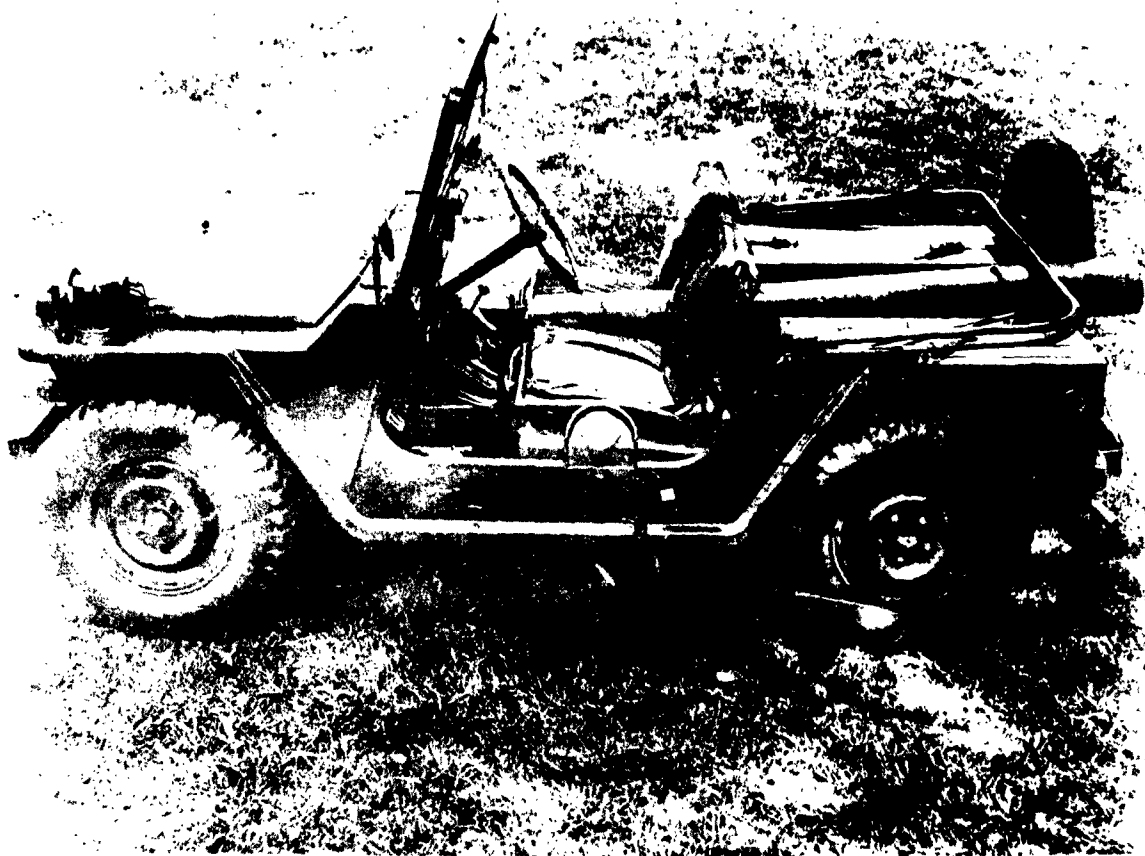


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SERVICE TEST OF KIT FOR MOUNTING DAVY CROCKETT XM29
ON TRUCK, UTILITY, 1/4-TON, 4X4, M151

Secondary Kit with Ammunition for One Fire Mission

Annex B-4

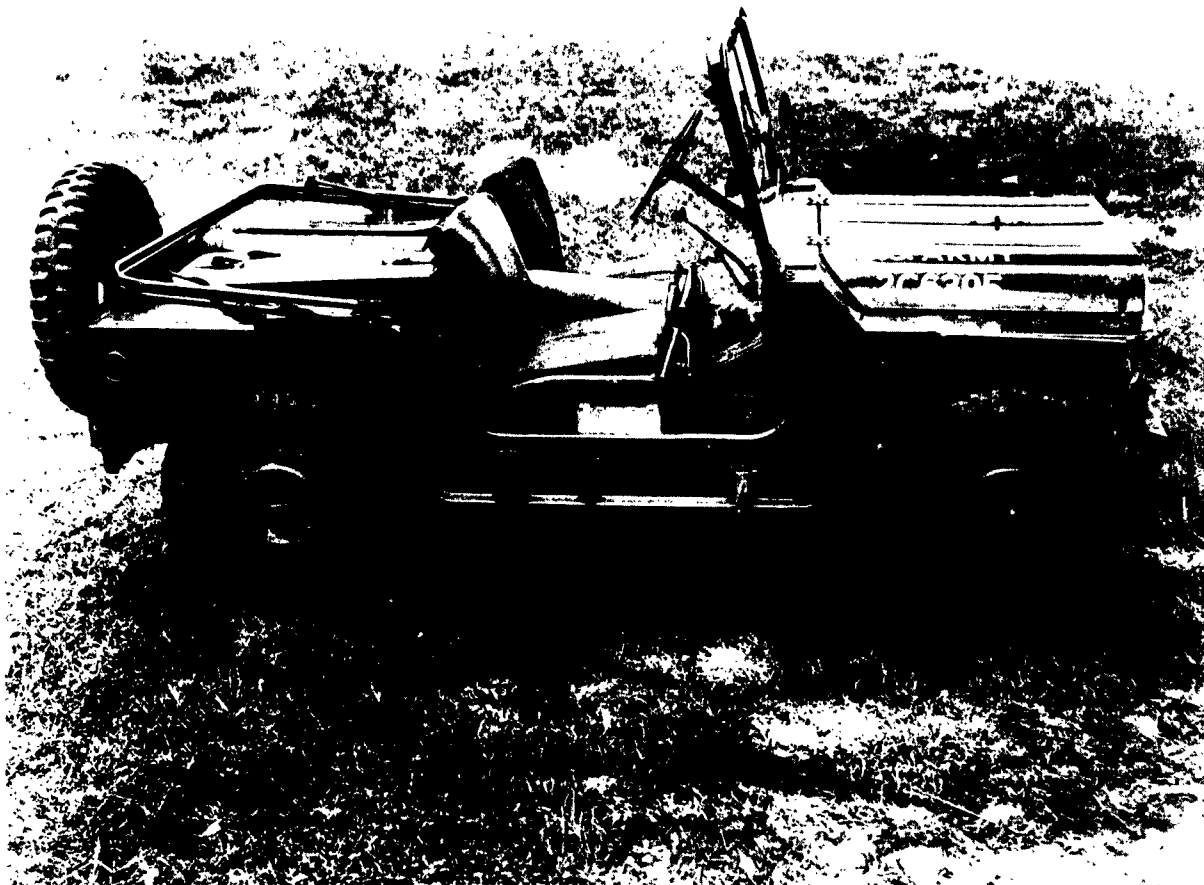


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SERVICE TEST OF KIT FOR MOUNTING DAVY CROCKETT XM29
ON TRUCK, UTILITY, 1/4-TON, 4X4, M151

Secondary Kit (Left Side View)

Annex B-5



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SERVICE TEST OF KIT FOR MOUNTING DAVY CROCKETT XM29
ON TRUCK, UTILITY, 1/4-TON, 4X4, M151

Secondary Kit (Right Side View)

Annex B-6



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SERVICE TEST OF KIT FOR MOUNTING DAVY CROCKETT XM29
ON TRUCK, UTILITY, 1/4-TON, 4X4, M151

Damaged Right Front Wheel Well and Fender Sustained
while Firing the Major Caliber Projectile, Zone II,
with the Gun Elevated 751 Mils with Respect to the
Vehicle Body, at a Deflection of 3,960 Mils

Annex B-7

ANNEX C

DEFICIENCIES/SHORTCOMINGS

SECTION 1

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

<u>Deficiency</u>	<u>Suggested Corrective Action</u>	<u>Remarks</u>
1. The lack of space to transport one remaining man of the five-man XM29 squad.	Provide 3/4-ton truck as the secondary vehicle.	The 3/4-ton truck is authorized by TOE as the secondary vehicle for XM29 squad (Test No 2, Part II).
2. The travel lock in its present location and configuration is a safety hazard.	Redesign.	USAIB Report of Equipment Failure No 1, 28 May 63 (Test No 2, Part II).
3. The angle at which the XM29 tube crosses the right front seat reduces crew space.	Redesign and/or reposition travel lock.	USAIB Report of Equipment Failure No 1, 28 May 63 (Test No 2, Part II).

SECTION 2

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

<u>Shortcoming</u>	<u>Suggested Corrective Action</u>	<u>Remarks</u>
4. Limits of elevation and traverse were not marked on the cradle and mount, respectively.	Provide marks defining recommended limits.	Test No 3, Part II.
5. Kit installation instructions were incorrect as they were written prior to redesign of the Primary Kit.	Up-date instructions.	Test No 6, Part II.
6. Wheel bolts to secure the spare wheel had heads that were not the same size as the wheel nuts to secure the running wheels.	Make same size as running wheel nuts.	Test No 8, Part II.

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FINAL REPORT OF SERVICE TEST OF KIT FOR MOUNTING DAVY
CROCKETT XM29 ON TRUCK, UTILITY, 1/4-TON, 4X4, M151. Final
Report. _____, DA Proj No 5N12-15-018. 21 pp.
7 Photos. UNCLASSIFIED Report. Tests were conducted to
determine the suitability of the Primary and Secondary Kits
for use by the US Army in the temperate zone. The Primary
and Secondary Kits were rugged and reliable. The Primary
Kit was compatible w/the M151 vehicle and the XM29 system
w/the exception that crew space is inadequate and a safety
hazard exists. The Secondary Kit was compatible with the
M151 vehicle & ammunition it was designed to transport; how-
ever, additional transport is required. It was recommended
that the deficiencies and as many of the shortcomings as
feasible be corrected on the Primary Kit and that the 3/4-
ton vehicle be issued to XM29 squads in lieu of the Second-
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