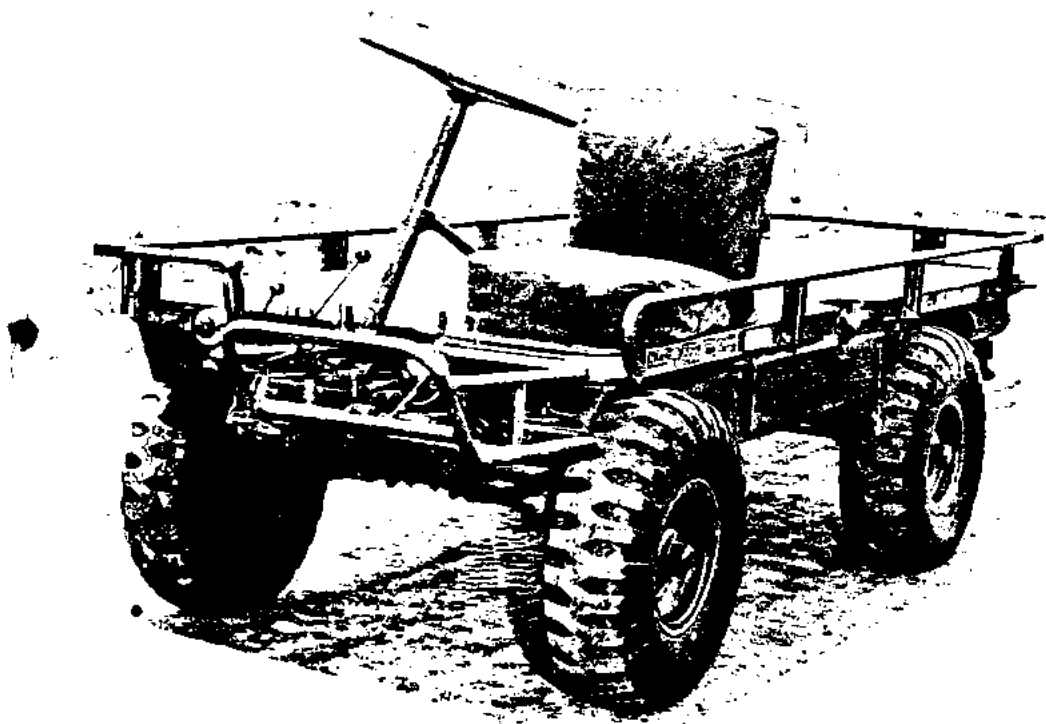


**M274 SERIES  
1/2 TON PLATFORM  
UTILITY TRUCK (MULE)**



**INITIAL ASSESSMENT**



**28 FEBRUARY 1979**

**U.S. ARMY TANK-AUTOMOTIVE  
MATERIEL READINESS COMMAND**

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## SECTION I - DEVELOPMENT HISTORY

### 1.1 System Description.

a. The M274 Truck, Platform, Utility, 1/2 Ton, 4X4 vehicle is a small, light-weight, cross-country carrier designed to transport supporting equipment and ammunition of airborne and infantry units over adverse terrain. The vehicle features a high degree of simplicity, a capability of air delivery by helicopter or cargo aircraft, and minimum driver training and maintenance. The vehicle is not employed as a prime mover but can be towed in a manner similar to a trailer.

b. The vehicle is essentially a flat, one-piece platform mounted on four wheels. The engine is mounted under the rear of the platform.

c. The transaxle, transfer case and clutch housing are integral with the rear axle and all four wheels are constantly engaged and driven through drop gears at the axle ends, which provide generous ground clearance.

d. The Mechanical Mule, with its eight gallon fuel tank, has a cruising range of 100 miles. It is designed for a top road speed of 25 miles per hour (MPH) but is primarily for use over all sorts of terrain at a much lower speed. When so employed, it may be driven by one man, either riding it, walking or crawling in front or beside it.

e. This vehicle has neither springs or shock absorbers, with shock being absorbed by its low pressure tires. A magneto, rather than battery ignition, is employed to start the vehicle. The engine is started by pulling a starter cable that rewinds itself when released.

1.2 Original Design Objectives. The M274 truck design objectives are depicted in Military Specification MIL-T-45317, dated 21 February 1973.

### 1.3 Test Results.

a. A multi-year production contract was awarded to Baifield Industries, Dallas, Texas in June 1965 for a quantity of 1,800 M274A5 trucks for the U.S. Marine Corps and 600 for the Army. Tests of the initial production vehicles were suspended at 2,000 miles due to failures of the transmission and axle housings. The vehicles were corrected at a depot. Subsequent production of the M274A5 vehicles by Brunswick Corporation, Muskegon, Michigan required initial production tests (IPT) to determine suitability for troop issue in accordance with DARCOMR 700-34.

b. Testing of three vehicles (Phase I) was completed but, due to recurring failures of the clutch and transmission, a Phase II IPT was directed. The 2,000 mile Phase II test consisted of four vehicles, produced by the same manufacturer, incorporating corrective measures for the deficiencies found during the previous tests.

c. The test conclusions are as follows:

(1) All modifications, incorporated in the Phase II test vehicle to correct previous deficiencies, were satisfactory.

(2) Vehicle performance was satisfactory except for the turning diameter and maximum sustained road speed of 25 MPH on a 5% incline. This was achieved on a paved, level road.

(3) The endurance and reliability of the Phase II vehicles was satisfactory.

1.4 Safety Hazards. During testing, no safety hazards, due to design deficiencies, were evident.

## SECTION II - FIELD PERFORMANCE

2.1 Initial Field Performance. The overall performance and reliability, availability, maintainability and durability (RAM-D) was considered satisfactory. The M274A5 truck meets the RAM-D requirements depicted in Military Specification MIL-T-45317E, dated 21 February 1973. The purpose of this vehicle was to improve the infantryman's effectiveness by reducing his burden and increasing his mobility. The vehicle was designed initially as a low-cost, super light-weight vehicle, requiring minimum driver training and maintenance, for use in combat zones by infantry, airborne and other troops. The primary use was for battle-field performance in forward areas to transport weapons and ammunition. In addition, it could be used as a general cargo vehicle for rifle companies and battalions forward of regimental train bivouac. The vehicles secondary use would be for rear area performance supplementing such duties as communications, emergency evacuation of wounded, general light cargo, etc., which can be accomplished without modification of the vehicle. The basic configuration and application of the M274/A1/A2 and A5 are practically identical with no change in payload capability of 1,000 pounds.

2.2 System Changes. Numerous changes have been made to the M274 vehicle system since the release of the initial basic vehicle configuration. These are:

- a. Aluminum platform and wheels in lieu of magnesium metal.
- b. Solid rear axles in lieu of steerable rear axles.
- c. Engine Assemblies. The current engine is a 14 HP, 2 cylinder Military Standard (A042) configuration.
- d. A PIP action, intended for the 101st Airborne Division, Fort Campbell, KY, only was initiated by TARADCOM in 1975. It concerned itself with improvements to the starting reliability and mobility characteristics, low maintenance requirements, and maximum off-road mobility. Approximately 400 vehicles assigned to the 101st Airborne Division, Fort Campbell have been modified incorporating these PIP items and are identified as the "High Mobility Mule".

2.3 Performance Today. Today's performance of the Mule will be discussed thoroughly in Section IV - User Opinion.

2.4 Logistics Support. Logistics support, based on TARCOM indicators, is considered good. Specifics, such as repair parts support and operational readiness statistics are presented in subsequent sections of this assessment.

### SECTION III - REBUILD/STORAGE RELIABILITY

3.1 Shelf Life. There are no problems identified to shelf life of the M274 Series Truck components. No special handling or facilities are required. The required storage instructions are cited in TM 9-2320-246-20, dated July 1967.

3.2 Storage Reliability. There are no problems identified to stock pile reliability. No special facilities are required in support of the M274 Series Truck.

3.3 Rebuild/Overhaul.

a. There are no overhaul programs planned for the M274 vehicles. Expenditure limits have been extended for repair at user facilities by requested deviation.

b. A program for the rebuild and conversion of transaxles is in progress.

## SECTION IV - USER OPINION

The major Army users for this system are the 101st and 82d Airborne Divisions, Fort Campbell, KY and Fort Bragg, NC respectively. They utilize 80% of the Army inventory for the Mule at these two installations. We queried all users and we have received written assessments from the following:

DARCOM Materiel Readiness Support Agency, Lexington, KY  
82d Airborne Division, Fort Bragg, NC  
101st Airborne Division, Fort Campbell, KY

### 4.1 User Opinion. A synopsis of user opinion follows:

#### a. Initial Field Performance:

(1) The system's performance in the field was marginal because the Mule was not big enough to carry equipment needed on most missions. The vehicle did not have a system to fasten down and secure any equipment that was loaded on it.

(2) The system had low tractability in wet or sandy terrain. It could not carry a payload in steep terrain.

(3) The system was too delicate for most field requirements and required constant maintenance.

(4) Starter problems were continuous with drivers damaging pull-start cables.

(5) Engines were unreliable in cold weather.

b. Performance Today. This will be discussed in two parts: General Comments and Specific Comments on the High Mobility Mule located at Fort Campbell, KY:

(1) General Comments. Operationally, the M274 vehicles suffer from these major shortcomings:

(a) Insufficient carrying volume.

(b) Unreliable starting. The hand pull crank tends to freeze during cold weather.

(c) There is excessive noise when running. The distinctive high pitched whine of the blower and blower belt assembly can be easily detected from several kilometers away keying the enemy to movement, especially in voluntary withdrawal operations.



(d) Lack of an alternate power source for operation of the radar or other equipment. The vibration affects the accuracy of the AN/PPS-5 personnel seeking radar and damages the radar unit.

(e) The body is made of aluminum/magnesium metal and because of no suspension, a continuous problem of cracking exists.

(f) The Mule is not capable of speeds required for rapid displacement either to extricate it from tight situations or to keep up its security elements. The turning radius is too large. Also, the M274 is extremely unstable in rough terrain at anything over walking speed and has a tendency to overturn causing injury to the crew and damage to the equipment.

(g) The vehicle does not offer any protection to the driver, who is also the only crew member.

(h) Several problems exist with the steering components: Steering gear failures and long delays in getting them; tie rod ends are permanently lubricated and water enters by the seal causing premature failure (average life estimated at 3 months); and the tie rod ends are too small and break if the wheel hits a solid object.

(i) The fuel tanks are cracking and causing fuel leaks. This was attributed to vibration and the fact that the tank is easily damaged during cross-country operations.

(j) The tie rod wear is excessive during prolonged field training.

(k) There is a clutch throw-out bearing failure. This failure was attributed to water getting into the bearing during washing and fording. The vehicles are supposed to ford 18" of water, however, personnel reported that water enters the clutch at this depth.

(2) High Mobility Mule. The tactical performance is poor due to the following reasons:

(a) The system is highly inadequate to be the main vehicle authorized by the MTOE for an air assault infantry battalion. The system does not have the capability to support an air assault unit in a fluid tactical situation due to the time distance factors involved. The system requires constant and repetitious maintenance to stay in an operational readiness condition thus making it both unreliable and unavailable.

(b) As a TOW weapons carrier, the M274 is deficient in major areas that affect weapon system effectiveness and survivability in combat. Without crew space for passengers, the weapon system is condemned. Maximum speeds of 2.5 MPH under a full load is a major

shortcoming when rapid movement is necessary to insure anti-tank defense.

(c) Problems with cold weather starts are still commonplace even though the vehicles now have electric starters. Starter relays have a high rate of failure. The relay is not well shielded and is subject to damage from brush and other objects encountered in tactical field environments. The relay is subject to electrical shorts from moisture. The starters are not sealed and fail due to the accumulation of dirt and moisture.

(d) Large tires make sling load "hook-up" difficult and place excessive strain on the steering system. These wide tires and rims pose unique problems. Tires often go flat after striking sticks and short stumps which causes the tire bead to separate from the rim. Tires have to be partially deflated and reinflated depending upon the type of road surface the vehicle is moving on.

(e) The wheels are cracking and replacements are not available at the unit level. The cracks are the result of design weakness and personnel reported that they cannot airdrop the vehicles for this reason. The wide wheels are easily cracked in spite of frequent checks for the development of hairline cracks around the big bolts. Locally fabricated backing plates are unsatisfactory. An increased incidence of cracked axles and failure of gear boxes may also be attributed to the additional stress created by the wider, deep-dished wheels.

(f) Wide fenders, necessitated by the wider tires and wheels, are reasonably durable but will not retain any type of available paint. The smooth aluminum fenders, even when roughened with wire brushes and coarse sandpaper, shed paint rapidly, leaving a shiny surface of bare metal that is difficult to conceal or camouflage.

(g) Alternators and pulley alignment are problems because of the substantial number of modifications. Extremely rapid wear of the bearings and belts are frequently experienced.

(h) Batteries are poorly shielded and are subject to rapid corrosion and frequent damage due to both location and the minimal protection afforded by the battery boxes. The batteries in the vehicle are often drained.

c. Safety Hazards.

(1) The steering system appears to be a safety hazard. The steering lock mechanism for towing cannot be engaged and creates a safety hazard when towing a loaded vehicle.

(2) The PIP vehicles at Fort Campbell sustain cable damage when the battery box is pulled out for servicing. This can result in a short circuit and/or a fire.

(3) The lack of lights make night movement hazardous. During limited visibility, movements are extremely hard to make with this equipment.

(4) Drivers have no protection against road hazards, tree limbs or weather. Goggles do not give the protection visibility and security which a windshield would offer.

(5) The system becomes top heavy after loading.

d. Training. User complaint is that, at battalion level, there is a lack of trained, qualified mechanics for the Mule and the personnel who use the vehicle are undertrained. It requires a lot of OJT to gain confidence due to the open drivers area and the offset steering.

e. Technical Support.

(1) Technical inspection standards have not been made readily available for all components of the system.

(2) In general, technical support is very good.

f. Maintenance.

(1) The M274 Series Trucks exceed the repair expenditure limit outlined in TB 43-0002-81 and are reported to be a constant maintenance problem. Personnel report that more annual maintenance manhours are required than for the M561 Gama Goat and the M151 Utility Truck.

(2) There is a lack of mechanics to perform the maintenance.

g. Manuals.

(1) The current TM's do not address the new standards for inspection using Reliability Centered Maintenance (RCM) logic for preventive maintenance checks and services to determine operational readiness of the vehicle fleet.

(2) Adequate manuals are on hand to perform operator and organizational maintenance. Some parts are not listed in organizational manuals but must be replaced by organizational maintenance.

h. Operational Readiness. Problems are created in this area due to the large NORS time created by waiting for repair parts. The major problem is the steering gear box.

i. Logistics Support.

(1) General Comments:

- (a) Repair parts are hard to obtain.
- (b) System wears rapidly under normal use.
- (c) Very few limited parts are available at the cannibalization point.

(2) High Mobility Mule:

- (a) Problems associated with the modifications performance on the Mule have created logistical/maintenance problems.
- (b) The only way to obtain many parts especially, if electrical, is by going local purchase.

j. Supply.

- (1) Supply of repair parts is inadequate with long lag times prior to receiving them.
- (2) The direct exchange (DX) of the steering gear box is unsatisfactory.

4.2 Synopsis of User Opinion.

a. The overall stated opinion is that these vehicles are too difficult to maintain and support and they are constructed too lightly to perform in the role in which they are currently deployed.

b. In an air assault infantry battalion, the system serves best as a general cargo carrier for mortars, communications equipment and assorted cargo. It is easily transportable and space efficient for transport by Army and Air Force aircraft.

## SECTION V - CURRENT PROBLEMS

### 5.1 System Performance.

a. The following data recaps RAM-D status of the M274A5 truck as reflected in TARCOM Major Item RAM-D Summary, dated January 1975, prepared by the Product Assurance Directorate:

<u>Test Results</u>	<u>Status - 69 IPT</u>	<u>Required</u>
MMBF (Mean Miles Between Failure)	874	2150*
Aa (@ 10 MPH) (Achieved Availability)	96%	96.5%
MR (@ 10 MPH) (Maintenance Ratio)	.075	.065

\*At 50% confidence for 24,000 miles.

b. The status given is based upon Product Assurance's independent assessment of the data without regard to corrective action planned or implemented subsequently. The M274A5 vehicle was released with consideration for corrective action, thus meeting the RAM-D requirements.

c. The vehicle is no longer in production. An IPT retest in 1970 resulted in MMBF of 4,000 miles after the manufacturer adapted stringent quality control procedures and corrected problems of previous tests. Thus, those values exceed normal reliability trends and are not considered representative of all production.

5.2 Operational Readiness. The M274 Series Trucks have maintained a world-wide historical availability average of 91% for the past eight quarters. The eight quarters range from several percentage points above average to .3% below average.

### 5.3 Manuals.

a. Official DA Publications are used to support the M274 Series vehicles. These manuals include instructions for the operator and crew members as well as the necessary maintenance and repair parts instructions for support of the M274 1/2 ton series truck.

b. A Supplemental Maintenance and Repair Parts Instruction, SMARPI 9-2320-246, dated September 1978 was developed for the 101st Airborne Division (AA), Fort Campbell, KY. This manual contains commercial mobility support drawings, a list of items along with Ordnance part numbers, manufacturer's part numbers and the names and addressees of the manufacturers where the items can be procured.

5.4 Training. There are no special training requirements for the operation and maintenance of the M274 Series Trucks. Operator and crew training is conducted as mandatory on-the-job training (OJT) by direction of local commanders.

5.5 Personnel.

a. The occupational specialties of the personnel and their authorized equipment is adequate at the Organizational, Direct Support and General Support levels for the required tasks to be performed.

b. Personnel having skills of the basic auto mechanic are used to support the Mule fleet.

5.6 Maintenance. Basic operator/crew organizational, direct support and general support maintenance is all that is required to support this truck fleet.

5.7 Supply.

a. Of the repair parts required for support of the Mule fleet, TARCOM manages approximately 1/3 of the items. The stock availability for the 320 TARCOM managed items is 87%. The DARCOM norm is 85%.

b. For the remaining 13% of the TARCOM managed items, we are experiencing tremendous difficulties in obtaining the repair parts which we are either unable to procure, have excessive unit costs and/or long production lead times. Of the very hard to buy items, such as transaxles, steering gears and tie rods, sources have been found at extremely high costs.

c. Fort Campbell recently requested that PIP Mod Kit items be stocked even though this was not the original intent. TARADCOM, when supplying the kits, also purchased a three year's support.

5.8 System Safety.

a. Accident History. A review of DA world-wide accident statistics, FY72 through FY78, did not disclose any significant accident history involving M274 Series Trucks. The accidents reported involved operator error, i.e., excessive speed and improper operations.

b. Safety Hazards identified in User Opinion. The steering lock mechanism and battery box problem have not been previously reported through Safety or Maintenance channels. The ROC did not require the vehicle to be equipped with lights and a windshield. The system becoming top heavy after loading and drivers overdriving established speed limit are attributed to operation outside the design envelope of the vehicle.

c. Based on information available through accident reports and EIR's, the M274 Series Trucks are considered safe to operate when utilized within the design envelope by trained personnel.

5.9 Technical Support. Technical assistance/support is provided to the user by TARCOM Field Maintenance Technicians (FMTs) located at major posts, camps and stations world-wide.

5.10 Stockpile Reliability and Special Facilities. There are no problems identified to stockpile reliability and no special facilities are required in support of the M274 Series Fleet.

5.11 Depot Experience. There is no expected overhaul/rebuild program for these vehicles. However, during a recent Limited Depot Overhaul (LDO) program on three vehicles, there were no problems experienced. Overhaul of the vehicles was completed in accordance with the inspection and repair guidance in TB 9-2300-390-50, Subject: Limited Depot Overhaul of all Tactical Wheeled Vehicles (Trucks and all Trailers), dated 30 April 1976.

5.12 Equipment Improvement Reports. Over the past few years, very few Equipment Improvement Recommendations (EIRs) have been received. In 1978, only 3 EIRs were received. Failures reported were those that would be expected from normal usage.

5.13 Modification Work Orders. There have been no Modification Work Orders (MWOs) released for vehicles supported by Active Army.

5.14 Foreign Sales and International Marketability. There have been no inquiries of availability from foreign governments.

SECTION VI - DEVELOPMENT INITIATIVE FOR REPLACEMENT

6.1 Letter of Agreements (LOAs) or Required Operational Capability (ROCs) in Process for Replacements. There are no documents in the system to replace the Mule in all its roles; however, there is an approved TOW ROC for the High Mobility Weapons Carrier, XM966, dated 4 April 1977, that is a proposed replacement for the TOW Mules.



## SECTION VII - IMPROVEMENT ACTIONS

### 7.1 Alternatives for Problem Area.

a. The problems cited by the users were not reported through the EIR/QDR (Equipment Improvement Report/Quality Deficiency Report) program. However, those maintenance significant areas will be investigated and field corrections will be made where feasible. A follow up report of corrective actions will be provided by 30 June 1979.

b. We will provide information to the major users indicating the intended design characteristics of the vehicle, i.e., airliftable not droppable, speed limits and loads.

c. Although the Mule is not particularly liked by Army users, it will remain in the system until it is replaced in all its roles by other vehicles.

d. Already one major user, the 82d Airborne Division, has had an MTOE change approved deleting all of its Mules in a cargo carrying role replacing them with 1/4 ton trucks and trailers.

e. Mules in the TOW role are expected to be replaced by the High Mobility Weapons Carrier, XM966 in the FY83-85 timeframe. In view of this, any major improvement actions are not contemplated and would not be cost effective, since the vehicle fleet has reached its expected useful life. Support of the remaining fleet will continue to be simplified by concentrating the fleet with as few users as possible.

7.2 Recommended Corrective Action. Provide DESCOM Depots with engineering drawings and technical data on repair parts that are no longer procurable or available and determine if parts can be fabricated at a reasonable cost. For parts that cannot be fabricated at a reasonable cost or obtained through cannibalization, the vehicles will be placed in disposal.

7.3 RAM Improvement of Selected Equipment (RISE) Candidates. We are not recommending any RISE actions for this item.

SECTION VIII - SYSTEM IMPROVEMENT PLAN

8.1 System Improvement Plan. Since the vehicles in the Mule fleet have reached or exceeded its expected life, there are no Product Improvement Programs (PIP) or other major system improvements planned for the M274 Series Vehicles.

SECTION IX - COMMANDER'S OVERALL ASSESSMENT

9.1 Commander's Assessment.

a. My overall assessment of the 1/2 Ton Utility Platform Truck, M274 Series (Mule) is that the system is no longer effective. Its mission has overtaken the original design intent.

b. The original role of the Mule was to support the Infantry and the infantry role was to forge ahead on foot at a slow pace. The Mule followed carrying the guns, ammunition and supplies. Now the infantry in its modern-day role, forges ahead by the fastest means (trucks, planes, helicopters). The Mule cannot perform at this pace.

c. From our standpoint, the logistics support posture is acceptable and operational readiness (OR) rates are within tolerance.

d. The maintenance significant problems, reported by the users, will be investigated, corrections addressed as required and if considered economical.

e. Since two representatives of the user (82d and 101st Airborne Divisions) consider the performance characteristics of the Mule no longer meet their needs, recommend that TRADOC clarify the requirements for the Mule or other high mobility type vehicle.

f. We will continue to support this vehicle until it is replaced in all its roles.