

UNITED STATES MARINE CORPS  
Motor Transport School Company  
Marine Corps Service Support Schools  
Marine Corps Base  
Camp Lejeune, North Carolina 28542

AOMC-III-24  
Sept 1981

PREPARATION OF TACTICAL VEHICLES  
FOR DEEP WATER FORDING

Student Outline

LESSON PURPOSE: The purpose of this period of instruction is to provide the student with the knowledge of related requirements and procedural techniques to enable him/her to effectively prepare certain tactical motor vehicles for deep water fording operations, and to perform post fording maintenance checks and services.

STUDENT REFERENCES:

1. TM-9-2320-260-10 Operators Manual M809 series trucks
2. TM-9-2320-260-20 Organizational Maintenance Manual
3. TM-9-2320-260-34-2 Direct and General Support Manual
4. MCO P4790.2 MIMMS Field Procedures Manual

LEARNING OBJECTIVES: After a period of conventional classroom instruction the student, through the medium of a closed book written examination consisting of multiple choice and/or true-false type test items, answers questions or completes statements to:

1. Describe the design characteristics and name the various components that provide deep water fording capabilities for the 809 series tactical motor vehicles as taught in class and contained in TM 9-2320-260-20 and TM 9-2320-260-34-2.
2. Name the items to be inspected and describe the procedures for performing preventive maintenance checks and services on deep water fording components of the 809 series vehicles, in accordance with procedures taught in class and contained in TM 9-2320-260-20 Table 3-7.
3. Identify the functions associated with the final inspection of vehicles to ensure their readiness for fording operations, as taught in class and contained in TM 9-2320-260-10 and TM 9-2320-260-20.
4. Describe the troubleshooting procedures required to isolate malfunctions and correct defects in components of the fording system of the 809 series vehicle, in accordance with procedures taught in class and contained in TM 9-2320-260-20, Table 3-8.
5. Identify the functions associated with post fording maintenance and servicing of tactical vehicles, in accordance with procedures taught in class and contained in TM 9-2320-260-10 and TM 9-2320-260-20.

## OUTLINE

1. Design characteristics and components of M-809 series vehicles that provide deep water fording capabilities.

a. Design characteristics that provide fording capability

(1) The deep water fording kit gives the vehicle deep water fording capability. The kit is designed to provide air for operation of the engine, and air pressure to certain components. Tactical motor vehicles are equipped with seals and gaskets for all components with a means of venting certain components for operation while submerged under water.

(2) Tactical vehicles also have a high ground clearance and all wheel drive to help from getting stuck in the water.

b. Components of the vehicle that are pressurized.

(1) When the deep water fording kit is installed on the vehicle and the control valve cable is pulled, the transmission bellhousing, and transmission are pressurized by air from the vehicles compressed air system.

(2) At this time the engine vent tube is closed off to atmospheric pressure allowing the engine to build up internal crankcase pressure to prevent water from entering the engine.

c. Components of the vehicle that are vented.

(1) The fuel tanks, master cylinder, air hydraulic cylinder, and power steering pump are all vented by means of low pressure vent lines allowing atmospheric pressure to be maintained underwater.

(2) In addition to these components, the three axles, and the transfer case have one way vent valves mounted on them. That allows internal pressure to escape and prevent water from entering.

d. All other components that provide fording capability

(1) Two control valves, operated by a control cable

(2) A pressure regulator that maintains proper air pressure cuts down the vehicles air system pressure, 3 To 4 psi

(3) All necessary adapters to connect lines, hoses, and clamps to secure all connections to all vehicle components that have to be vented or pressurized.

2. Preventive Maintenance Checks and Services

a. Before any vehicle is forded, a complete and systematic maintenance inspection must be performed. Items to be inspected are the:

(1) Control cable

(a) The control cable is located in the vehicle cab. It is of a push-pull type.

(b) Servicing of the control cable is done by \_\_\_\_\_

(2) Control valves

(a) The control valves are located at the top rear of engine. Both valves are connected to the control cable.

(b) When the control cable is pulled both valves must operate freely. One valve will open to pressurize the bellhousing, the other valve closes off the engine vent tube.

(3) Pressure relief valve

(a) The pressure relief valve is located next to the control valve

(b) Checking the pressure relief valve is accomplished by using a pressure gauge attached to the outlet side of the valve upon charging the vehicle compressed air system, a gauge reading of 3 to 4 psi is normal. Any other reading obtained indicates adjustment of the regulator is required.

(c) To adjust the regulator, loosen the lock nut and turn the slotted screw clockwise or counterclockwise until a proper pressure reading is obtained.

(4) Hoses

(a) There are several hoses located on the vehicle that are a part of the deep water fording kit. All hoses should be checked for cracks or deterioration. If found defective these items must be replaced.

(b) Checking the hoses for leaks must be done when the compressed air system is charged and the fording cable is pulled. A soapy solution is applied to the hoses. The hoses must be checked carefully for signs of air bubbles which indicate leakage.

(5) Lines

(a) There are also several vent and pressure lines made of copper in different locations throughout the engine compartment. Inspect these the same as the hoses looking for sharp bends or kinks. Replace or repair if found to be defective.

(b) Check pressure lines by charging the vehicle compressed air system and pull the control cable out, apply a soapy solution to line connections and check for air bubbles, tighten if necessary.

(6) Clamps

(a) Clamps are used to connect hoses and lines to each other. Ensure that all clamps are properly connected and tighten only enough to obtain a water and air tight fit.

(7) Connections

(a) Connections are used to join brass fittings to the lines that do not connect to hoses. All connections have to be water and air tight.

(b) Tighten all connections, charge the vehicle compressed air system, apply a soapy solution and check for air bubbles.

(8) Snorkel

(a) The snorkel is located on top of the vehicle air cleaner. It allows the engine to breathe when the vehicle is fording

(b) Check clamps securing snorkel to air cleaner for proper installation. Tighten only enough to ensure a water tight fit.

(9) Air cleaner cap

(a) The air cleaner cap is located on top of the snorkel. It prevents objects from entering the engine air cleaner.

(b) Check the air cleaner cap for proper fit around the snorkel

(10) Steering pump filler cap

(a) The steering pump filler cap is located on top of the steering pump. Ensure the cap has a gasket on the inside and that it is serviceable.

(b) Place the cap on the steering pump and check it to ensure it has a good tight seal

3. Final inspections of vehicles to ensure readiness for fording operations

a. After the deep water fording kit has been installed and has been inspected, it has to be tested. Final test to be performed in preparation for fording will include:

(1) The air intake snorkel, will be tested in the following manner. Remove air intake snorkel cap, start vehicle engine, place a flat object over intake opening, engine should begin to stall. A lack of air suction should be present.

(2) The fuel tank filler caps on the 809 series vehicles are the non-vented type, there isn't a valve on these caps. The caps have a rubber seal on the inside. Check seal for cracks, replace if necessary. Ensure that the caps are on tight.

(3) Battery filler caps must be the one way check valve type, they also have to have a rubber seal around the top of the threaded part. Check seals for cracks. If found to be defective, replace filler cap. A damaged filler cap will allow water to dilute battery electrolyte.

(4) Secure loose objects on the vehicle such as 782 gear. If objects that float are not secured when entering the water, they can be carried away.

(5) The last item to be installed before entering the water is the flywheel housing plug. When the plug is in place and the control cable is pulled out with the vehicle compressed air system charged, we will then have a pressurized bellhousing. Check plug for stripped threads.

b. A general lubrication of the vehicle will be performed prior to fording. This will include:

(1) All moving parts of the vehicle such as doors and cargo drop side hinge pins must be oiled to ensure proper operation and to prevent rusting of unpainted parts.

(2) Lubricate all grease fittings according to LO 9-2320-260-12 specifications.

c. A final inspection of all vent and pressure lines will be made to check for tightness. Check pressure lines with soapy solution and ensure that no air bubbles are present, this will ensure a good air tight seal. Check axle vent valves for proper operation. Rotate them to remove all dirt and grease from around them. To ensure free operation, clean as required.

4. Troubleshooting procedures and isolating malfunctions on fording system components.

a. In the event of a failure with one or more of the components of the fording kit, a systematic procedure will be followed to isolate the malfunction, probable cause, and corrective action. The following are samples of the most frequent malfunctions, probable causes and actions to correct the malfunction.

(1) Malfunction: The control cable does not operate.

(a) Probable cause-sharp bend in cable housing

1 Corrective action-straighten cable housing

(b) Probable cause-operating handle disconnected from cable

1 Corrective action-replace cable

(c) Probable cause-cable disconnected at control valves

1 Corrective action-connect cable to control valves

(d) Probable cause-broken control cable

1 Corrective action-replace control cable

(2) Malfunction: The control valves do not operate

(a) Probable cause-the control cable is disconnected at valves

1 Corrective action-connect the control cable to the valves

- (b) Probable cause-sharp bend in cable housing
  - 1 Corrective action-straighten cable housing or replace cable
- (c) Probable cause-control cable is broken
  - 1 Corrective action-replace the control cable
- (d) Probable cause-control arm is broken at valves
  - 1 Corrective action-replace the defective valve
- (e) Probable cause-control valves operate extremely hard or bind
  - 1 Corrective action-replace defective valve
- (f) Probable cause-defective valve
  - 1 Corrective action-replace defective valve

(3) Malfunction: Engine stalls while fording

(a) Probable cause-engine has taken in water

1 Corrective action-caution do not attempt to start or run engine.  
Recover vehicle from the water and notify direct support maintenance

(4) Malfunction: Engine does not draw fuel

(a) Probable cause-obstruction in fuel tank vent line

1 Corrective action-remove obstruction from vent line

(b) Probable cause-fuel tank vent line broken

1 Corrective action-replace or repair vent line

(c) Probable cause-control valves inoperative

1 Corrective action-replace defective valve

(d) Probable cause-pressure relief valve inoperative

1 Corrective action-replace pressure relief valve

(5) Malfunction: Fly wheel housing takes in water

(a) Probable cause-the pipe plug is missing from the fly wheel port

1 Corrective action-install pipe plug in fly wheel port

(b) Probable cause-air pressure line disconnected

1 Corrective action-connect air pressure line

(c) Probable cause-air pressure line broken

1 Corrective action-replace air pressure line

(d) Probable cause-control valves inoperative

1 Corrective action-replace defective valve

(e) Probable cause-pressure regulator valve inoperative

1 Corrective action-replace pressure regulator valve

(6) Malfunction: Brake master cylinder does not operate

(a) Probable cause-air pressure line disconnected

1 Corrective action-connect air pressure line

(b) Probable cause-air pressure line broken

1 Corrective action-replace air pressure line

(c) Probable cause-control valves inoperative

1 Corrective action-replace defective valve assembly

(d) Probable cause-pressure regulator valve inoperative

1 Corrective action-replace pressure regulator valve

##### 5. Post fording maintenance and servicing of tactical vehicles

a. As soon as possible after fording, a fresh water rinse is essential to prevent damage from dirt and other foreign objects. If the vehicle is forded in salt water, salt deposits will form over vehicle surface, these salt deposits will corrode metal parts, and result in component failure.

b. As in before fording maintenance checks and services, you must perform a complete and systematic post fording preventive maintenance check. After the fresh water rinse, remove fly wheel housing plug and air cleaner snorkel, all moving parts will be lubricated, wheel bearings will be checked for water contamination, if water is present, wheel bearings will be cleaned, repacked, and adjusted. All gear cases will be checked for water, drain and refill if found to be contaminated. If vehicle engine has been contaminated, notify direct support maintenance immediately.

