

CDC Z2T371

Vehicle Management Craftsman

Volume 1. Management Procedures, Responsibilities, and M-Series Vehicle Fundamentals



**Air Force Career Development Academy
The Air University
Air Education and Training Command**

Z2T371 01 1808, Edit Code 01

AFSC 2T371

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WELCOME to the 7-level career development course (CDC) for the 2T371 career field. This course has been designed to accommodate all vehicle maintenance career field shred-outs that merge at the 7-level. With this in mind, be aware that although some of the information contained in this course may have been taught at the 5-level in your shred-out, it has not been taught in others. In short, the nature of our career field has made it necessary to incorporate 5-level CDC material in this course. Your first volume will discuss vehicle management (VM) procedures, responsibilities, and fundamentals of M-series vehicles. In volume two, you will study base construction, aircraft and flight line servicing, and specialized vehicles and equipment.

In this volume, there are three units. In unit one, we discuss the work center supervisor and present you with the basic knowledge needed to lead a vehicle maintenance shop effectively. In unit two, we will turn your attention to VM, where you will learn more about some ancillary processes that must occur within a VM flight. We will also focus on fleet management and analysis, where you will learn the fundamentals of our fleet management counterparts' job, and how their efforts complement yours as a noncommissioned officer (NCO) in VM. Finally, you will finish the first volume off with unit three, which entails information on military-series vehicles. You will learn about light- and medium-duty military-series vehicles in addition to mine-resistant, ambush-protected (MRAP) vehicles.

A glossary is included for your use.

Code numbers on figures are for preparing agency identification only.

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This volume is valued at 12 hours and 4 points.

NOTE:

In this volume, the subject matter is divided into self-contained units. A unit menu begins each unit, identifying the lesson headings and numbers. After reading the unit menu page and unit introduction, study the section, answer the self-test questions, and compare your answers with those given at the end of the unit. Then complete the unit review exercises.

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Unit 1. Work Center Supervisor

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THIS UNIT addresses topics that will help you in transitioning from a floor mechanic to a vehicle maintenance manager. Although you may not be assigned as a shop supervisor upon completion of your 7-level upgrade, you will be expected to understand the concepts of running a vehicle management (VM) work center. In order to achieve this, you will need to be aware of various maintenance programs that assist in day-to-day operations, know how to handle the workload, and acquire knowledge in managing resources.

1-1. Managing Work Center Operations

There are numerous areas in VM that every maintenance manager must be familiar with in order to manage his or her shop effectively. In this section, we will discuss assigning and coordinating work within your work center, preparing depot maintenance plans, and conducting quality assurance (QA) inspections. You may already be familiar with some of these programs and concepts; however, there is always something new to learn. Try to be open-minded as you complete these lessons, and use the given references to expand your scope of understanding.

001. Coordinating workflow

No VM shop runs itself. There is always a key individual or group of individuals who coordinate the flow of work. More than likely, mission support requirements will dictate your style of coordinating the flow of work rather than personal preference.

Supervisory responsibilities

In order to coordinate workflow, you must understand your responsibilities. Your main responsibility is to implement approved policy by leading Airmen of lower grades. Air Force Instruction (AFI) 24-302, *Vehicle Management*, chapter 3, lists responsibilities for specific work centers. The following are specific areas of responsibility for all VM work center supervisors, per AFI 24-302, chapter 3.29. Familiarize yourself with them and try to associate them to day-to-day operations. As you read the responsibilities, take note of how most of them require coordination with others.

- Coordinate with Fleet Management and Analysis (FM&A) to ensure priorities are met and maintenance tasks are completed on time.
- Assign work to personnel commensurate with their skills.
- Ensure that proper tools and equipment are readily available and serviceable, and subordinate personnel are properly trained in their duties. The supervisor reports shortages and deficient equipment to the vehicle fleet manager (VFM) or vehicle management superintendent (VMS).
- Ensure that technicians comply with safety procedures and technical data.

NOTE: Complying with technical data does not mean an open-book reference for each repair task. However, it does require the technician to be familiar with the procedures for each job. Complex repair tasks, performance specifications, torque ratings, special tolerance

adjustments, and so forth, do require reference to technical data, and, in some cases, repeated reference at the job location. Technical data for vehicles or vehicular equipment, including nuclear certified assets, must be current. Any of the following data sources, in printed or digital form, are acceptable: technical orders (TO), commercial manuals, printed material, microfilm, or software provided by or procured from the asset manufacturer, commercially procured after-market parts and repair manuals, or digitized technical data.

- Inspect incoming vehicles and equipment not processed through the Customer Service Center (CSC). The supervisor coordinates with FM&A if additional repairs not listed on the vehicle work order are required and revises the repair completion time as needed.
- Inspect repaired vehicles and equipment to ensure all vehicles are in a safe serviceable condition.
- Brief newly assigned personnel.
- Assign personnel to duty positions to ensure full use and progression opportunities.
- Determine the most efficient and economical means of returning vehicles to service. The supervisor will carefully consider the repair or replacement of individual assemblies or subassemblies and components to make effective use of resources. In addition, adhere to any safety and serviceability standards, and avoid “over-maintaining” the vehicle.
- Inform FM&A of the requirement for more work so that maximum productivity may be obtained from assigned personnel.
- Check with materiel control on parts requirements and availability.
- Set up training needs, send training requirements to the VFM and VMS, and assist in on-the-job training (OJT).
- Ensure parts received for vehicles during the work phase are properly protected and not improperly stored on the vehicle’s seat or other soft trim.
- Ensure vehicles are properly prepared and maintained for storage when placed in not mission capable-supply (NMCS) status (see TO 36-1-191, *Technical and Managerial Reference for Motor Vehicle Maintenance*).

Coordination with other work centers

The key to good work center coordination is communicating effectively with personnel in other work centers. FM&A is the focal point for all work generated in VM. They provide you with production plans and priorities to meet mission needs. Materiel Control is another shop you will need to maintain a close relationship with, especially when you need to know the status of parts and be aware of procurement problems. When used properly, a good relationship with Materiel Control will greatly increase the likelihood that you will receive the parts you need when you need them.

The two other shops you may have daily coordination with are the body and tire shops. This is especially true for “main shop” supervisors. To best facilitate your coordination with these shops, first decide upon the quickest way of completing the required work. For example, suppose you have a vehicle in for brake work and you are waiting for parts. However, the vehicle also needs the rear tires and a seat cover replaced. How many times have you had a vehicle waiting for parts and gone NMCS with open repair line items because the vehicle could not be moved to another shop? On the other hand, did the vehicle have to be moved? The best way to coordinate this is to walk the tires down to the tire shop and have them replaced, and take the seat to the body shop to have a seat cover made. This will reduce not mission capable (NMC) time and improve the flow of work, through not only your shop, but others as well. Great workflow coordination requires that supervisors, or designated representatives, be involved in all parts orders, shop transfers, and NMCS, with the focus on expediting needed parts and required repairs between shops to reduce vehicle downtime. Sometimes there are conflicts during the coordination process. You must report any shop coordination problems, especially those affecting productivity, to the VFM/VMS for timely resolution.

What's the bottom line? You need to think creatively, communicate with the other shops effectively, and utilize the capabilities of each shop to get a quality job done in an efficient way. Effective coordination is your key to success.

002. Planning and assigning work requirements

Knowing what work needs to be accomplished, the capabilities of your shop and personnel, and how to determine priorities, are the keys to assigning work requirements in your shop. As a supervisor, you need to stay on top of any work assigned to your shop, in the form of vehicles or other tasks. More often than not, your priorities will be determined for you. You still need to be able to manage the priorities within your shop and be aware of what drives the priorities. Not everyone possesses the same skill level or experience, so it is imperative you know the capabilities of all your mechanics and utilize their abilities effectively. A good way to accomplish this is to conduct a one-on-one interview. Managing these areas effectively will yield good results and reduce some of the stresses and challenges of being a shop supervisor.

Shop workload

As stated earlier, the first thing you need to know is what work you have to do. It sounds simple, but there is more to being a shop supervisor than performing maintenance on vehicles and equipment. Vehicle workload is cut-and-dried; you generally will have several work orders in your shop at any given time. You can easily see how many work orders you have and what needs to be done. The remainder of your shop workload comes from taskers and other duties around the shop not directly related to vehicle repair. Taskers are straightforward; the boss gives your shop a task to complete with a suspense. Taskers are easy enough to complete if the amount of work assigned to the shop is low. Taskers are another matter altogether if you are swamped with work orders. Once you know how critical and time sensitive the tasker is, you will have to fit it into your workload. The other work you have to schedule consists of extra duties and programs needed to maintain your shop. They include, but are not limited to, the following:

- Shop safety program.
- Working stock/bench stock/work order residue.
- Shop equipment/tools.
- Shop environmental programs (chemical supplies and waste).
- TO libraries.
- Routine inspections (fire extinguishers, eyewash, etc.).
- Operator care of shop vehicles.
- Augmented duties.
- Other extra duties (physical training leaders, flight safety, self-inspections, etc.).

This list could go on for pages and may vary from base to base, but this is a general list. Some of these duties take precedence over all other work. Extra duties can pull personnel away from the shop for extended periods. Sometimes vehicles will have to sit untouched while personnel take care of a tasker or other duty. Be sure to communicate these situations to the VFM/VMS and FM&A; this will ensure everyone is aware of the situation and can then coordinate with using organizations if their assets are affected.

Interviewing

Once you have "sized-up" the work that must be accomplished, you then have to determine who is going to do it. You, as a shop supervisor, are not expected to do all the work yourself. You are expected to manage the work to ensure it is completed. A critical component in deciding who will be assigned specific work is knowledge of the capabilities of each individual in your shop. Since you need to know what your people are capable of, interviewing the individuals assigned to your shop will help you determine their capabilities. Interviewing individuals to see what they know about their jobs

can be accomplished in many ways. One of the best ways of doing this is to hold informal feedback sessions. During these sessions, you can identify weaknesses and strengths of an individual's job knowledge. To enhance this process, you should discuss training records to verify the items that individuals are certified on still apply. Like any other job in any organization, the tendency is to train individuals extensively on core tasks needed for upgrade training. An unfortunate impact of that tendency is developing mechanics that are not well-rounded. By interviewing the individuals working in your shop, you can effectively provide the necessary training your people need to become better qualified and more efficient at their jobs. Any time personnel are assigned to your work center, make sure you conduct and document initial interview sessions in the individual's training record.

Assigning work orders in accordance with priorities

So far, you know what work needs to be done and what the capabilities of your people are. The next step is to prioritize. We will focus on vehicle priorities, but keep in mind that there will be occasions where vehicles will have to wait for other priorities to be taken care of first. Maintenance work is assigned in accordance with (IAW) mission priorities and customer needs. It is a very good practice to make yourself familiar with the needs of your customers. Know what their mission is and how their assigned vehicles or equipment fit into the big picture. Having this insight will help you manage your priorities and will help you understand why certain priorities are dictated to you by your superiors or FM&A. FM&A, the focal point of VM, uses mission-essential levels (MEL), customer needs, mission requirements, and inputs from management to determine the priority and order of work requirements. This list serves as the vehicle maintenance priority repair list.

MEL for vehicles are developed and verified each year between using organizations and the logistics readiness squadron (LRS). The MEL shows the number of vehicles, by authorized type, that can be in the shop at one time and not seriously affect the user's mission. The VFM and VMS review the vehicle MEL for maintenance priorities and for backfilling primary vehicles when vehicles are in VM. Questions on the proposed vehicle MEL and any problems in maintaining the levels are resolved with the using organization before the final publication of the list. Normally, it is not possible to have 100 percent of any vehicle type in an organization listed as MEL. You must make allowances for scheduled maintenance, normal breakdowns, and so forth. The vehicle MEL is presented to the mission support group (MSG) commander or equivalent for approval.

FM&A assigns a "routine" priority to all vehicles, regardless of type or use, unless one of the following conditions applies. A "RED" priority will be assigned when one or more of these conditions exist:

- A unit is below the minimum-essential vehicle level, further loss of vehicles will degrade mission support, and other base assets cannot fulfill the need of a particular vehicle.
- A special project requires a certain type of vehicle in service.
- Severe weather or other circumstances create a need for a certain type of vehicle.

VM ensures that minimum-essential vehicle levels and mission needs are met. This may require withdrawing vehicles from organizations currently above their MEL or with lower priorities. Within VM, it may be necessary to consolidate the workforce, work overtime, cannibalize parts, delay work, or make temporary repairs to return priority vehicles to service IAW mission priorities and customer needs.

Installed emergency warning lights, military radios, or other such accessories do not automatically cause a vehicle to be a higher priority. Similar vehicles without such accessories are generally sufficient to perform the mission until the equipped vehicle is returned to service. When a replacement vehicle is temporarily given to a user, the prime vehicle receives a routine maintenance priority.

The section supervisor (or designated representative) is responsible for disseminating the workload to the shop. Upon receiving work orders, the supervisor must check to see if a priority has been placed

on that vehicle. Generally, FM&A will verbally coordinate priorities with the affected shop. Due to the workload, however, they may not have the time, so check all work orders for a priority status. If you receive a priority vehicle, you may have to take a mechanic from one job and put them on a job that has a higher priority to fulfill mission requirements. You may also have to put extra personnel on this job or have some of them work overtime to ensure the job is completed.

NOTE: If you have some of your personnel work overtime, make sure that parts support (Materiel Control) is available for their needs.

In addition, the section supervisor is responsible for informing FM&A of the shop's requirement for more work. This serves two purposes—coordinating workload and keeping your personnel employed. If the workload is low, you can use this time to improve your shop and complete projects and tasks that need attention.

The shop supervisor assigns work to each individual mechanic commensurate to his or her ability and knowledge that pertains to a particular job. When an individual is in upgrade training to the 5-skill level, the supervisor should assign a trainer to monitor him or her. The trainer should ensure all procedures are followed correctly and safety standards are adhered to when the trainee is performing his or her job. This way, if any violations are present, they can be corrected on the spot, allowing the trainee to see what procedure was violated and correct it at that moment. They must also document all training accomplished in the trainee's training records.

003. Depot repair plans and quality assurance inspections

The Air Force (AF) has a substantial investment in vehicles and equipment. As a supervisor, you have the obligation to ensure that investment is properly utilized and maintained. You will assist FM&A in preparing the depot repair plan and will conduct QA inspections. The depot program helps to maximize the service life of certain vehicles and components. The identified vehicles and components can be overhauled and placed back in service. Depot maintenance will add seven years to a vehicle's service life, and for components, it ensures serviceable parts are available for critical assets, maximizing the AF's return on its investment. QA inspections ensure that the vehicles leaving the shop are safe, serviceable, and properly maintained. Effective use of these programs is critical to mission success.

Preparing depot maintenance plans

The 441st Vehicle Support Chain Operations Squadron (VSCOS) manages depot-level maintenance for AF needs. FM&A is responsible for the effective use of the depot program. FM&A also initiates and plans depot repair needs according to TO 36-1-191. Depot supports intermediate maintenance shops by performing repairs or by providing technical aid on selected vehicles that are beyond base-level capabilities. This support may take the form of providing depot overhauled parts and assemblies, depot-funded local contract, or by shipping the vehicle to a repair site. The production manager determines the most economical and practical way of obtaining depot maintenance support.

Eligibility requirements

Not all vehicles are eligible for depot maintenance. Eligible vehicles are coded "S" in the repair column of the United States Air Force (USAF) management list in the federal supply catalogs. In addition, vehicle components coded "B", "G", or "R" are eligible and processed for overhaul according to Air Force Manual (AFMAN) 23-110, *USAF Supply Manual*. The following table lists current vehicles eligible for depot maintenance:

Nomenclature	Type
Truck, Refueler	A/S32R-9 (1980 model and later) and A/S32R-11
Truck Hydrant Hose	R-12 (BETA) R-12 Tri-State Hydrant Servicing Vehicle (HSV)

Nomenclature	Type
25K Truck, A/C Cargo Loading/Unloading 463L	A/S32H-5 and A/S32H-5A
60K Loader, A/C Cargo Loading/Unloading 463L	Tunner

A depot-eligible vehicle must meet the following conditions before it is approved for depot maintenance:

- The using command's inventory of the authorized item and suitable substitute must not exceed their authorization, and the command certifies the vehicle is essential to the mission.
- The requested vehicle is *not* being applied as an unsuitable substitute for another.
- The required repairs listed on the limited technical inspection (LTI) are clearly beyond the base vehicle maintenance capability.
- A serviceable replacement vehicle *cannot* be supplied from any source.
- The cost of overhaul and one-way transportation to the overhaul site must not exceed 75 percent of the replacement cost of a new vehicle.
- A replacement vehicle is *not* scheduled for delivery from new procurement within 1 year, and the command allocation is sufficient to allow replacement instead of overhaul.
- The vehicle is *not* assigned to the requesting command on allowance source code (ASC) 048 (retention authority).
- The vehicle is *not* designated by type and model by Robins Air Force Base (AFB) special equipment and vehicles (SE&V) as unworthy of continued depot overhaul.
- The LTI does *not* indicate that the vehicle has reached a condition wherein repairs would be impractical (e.g., all major systems require rebuild, major accident, major components missing, etc.).

Robins AFB SE&V evaluates and approves or disapproves all requests for vehicle depot overhaul. A list of vehicles eligible for depot overhaul is in TO 36-1-191.

Procedures for requesting assistance and depot maintenance

All requests for depot maintenance assistance on vehicles will be processed through the major command (MAJCOM) to Robins AFB SE&V. In order to receive depot support, you must first prepare an LTI on each vehicle you request depot maintenance assistance that reflects all needed repairs, parts, and labor cost. Coordinate with FM&A the desired quarter of input for overhaul on the LTI and on the vehicle repair projections report. Robins AFB SE&V uses LTIs to determine if overhaul is required and to prioritize the vehicles by their overall condition. Consequently, the LTI must be as accurate and complete as possible. The depot maintenance process involves two steps—forecasting vehicle requirements and scheduling repairs.

Forecasting vehicle requirements

Each year by 15 May, Robins AFB SE&V sends a printout of “Current Vehicle Requirements and Vehicle Repair Projections” to each MAJCOM. By 15 July, each base then submits to the 441 VSCOS a current-year revalidation and projected requirements spreadsheet for the next five years. The 441 VSCOS then validates those requirements and sends them to Robins AFB SE&V. To submit your requirements, use the methods prescribed by the 441 VSCOS. During this step, FM&A will request LTIs be performed on the vehicles eligible for depot support during the projected period. This could be a large task depending on how many vehicles need to be projected. As a supervisor, you will have to schedule your work accordingly, as this step is time sensitive. You may also be asked to help prioritize the vehicles from “worst-to-best” condition.

Repair scheduling

MAJCOMs obtain current LTIs (Air Force Technical Order [AFTO] Form 91, Limited Technical Inspection – Motor Vehicles) for vehicles requiring overhaul in the upcoming fiscal year (FY) from their bases. The 441 VSCOS consolidates command requirements with appropriate justifications and sends them to Robins AFB SE&V not later than 15 August each year.

Annotate your desired quarterly inputs for overhaul on the LTI and in the appropriate data system. LTIs are also used to determine if overhaul is required and to prioritize the vehicles by their overall condition. For this reason, the LTI must be accurate. When Robins AFB SE&V approves the overhaul of a vehicle, the instructions for shipment to the repair facility will be issued at the appropriate time. At the time the vehicle is shipped to an overhaul facility, a copy of the original LTI, updated to include any change in condition of the vehicle, must accompany the vehicle. Keep a copy of the LTI until the vehicle comes back. It notes the current condition of the vehicle, any damage during shipment, and accessories that may be missing. Be aware that missing accessories, removed by owning and using activities, will not be replaced by depot (i.e., crane attachments, servicing hose, dozer blades, firefighting equipment, etc.). To account for vehicle downtime, the work order that was opened to prep the vehicle for shipment and updated original LTI remains open while the vehicle is undergoing depot rebuild. Downtime ends when the vehicle returns from depot, the acceptance LTI is accomplished, and the vehicle is available for use. However, do *not* account for vehicle downtime if the vehicle will *not* return to your base.

There will be no substitution for vehicles scheduled for depot overhaul unless specifically authorized by Robins AFB SE&V. If an unprogrammed vehicle is to be substituted for a programmed vehicle, you must coordinate with your MAJCOM, and submit the forms or documents prescribed by the MAJCOM. Substituting vehicles must be fully justified and coordinated. For this reason, you must closely monitor the condition of vehicles programmed for overhaul to prevent fraud, waste, and abuse (FWA).

Return from depot repair facility

Upon receipt of a vehicle from depot, enter the year and month of depot repair in the Fleet Management Information System (FMIS). The vehicle is assigned replacement code “S”, which identifies depot-repaired vehicles. The FMIS is located in the Air Force Vehicle Management Neighborhood online at <https://cs2.eis.af.mil/sites/12690/default.aspx>. If the vehicle is repaired locally on an obligation authority (OA) citing depot maintenance funds, the item manager will tell the using activity whether to assign replacement code “S.”

The vehicle remains in this code for 60 months from the date of repair. FMIS releases the vehicle from code “S” after 60 months and reassigns a replacement code based on data loaded in FMIS. Vehicles returned from depot repair have an additional seven years of life expectancy from the date of repair.

Work specifications

Overhaul activities are accomplished in strict accordance with Robins AFB SE&V work specifications and applicable TOs. The depot maintenance facility is required to provide an overhauled vehicle capable of performing its intended purpose and function with the exception of tires and problems attributed to operator abuse, transportation damage, or negligence. Overhauled vehicle warranties vary according to the specific contract. Failures occurring during this period are the responsibility of the overhaul facility and are subject to the provisions of the contract.

If the vehicle returns from depot with noted warranted discrepancies, the VFM makes contact with the contractor to correct these items. For warranty problems that cannot be resolved between the VFM and contractor, contact Robins AFB SE&V for assistance.

Quality assurance inspection

A QA inspection is exactly what the name infers. It is an inspection used to ensure we are performing quality maintenance. Another set of eyes looking at completed jobs will help ensure the best possible repair work leaves the shop. Another reason for QA inspections is increased efficiency. QA inspections can also indicate training deficiencies or areas that need increased attention to detail. A weak and ineffective quality control program usually results in increased cost and a high “vehicle returned to shop” rate. Poor repairs could also contribute to an accident if not detected prior to releasing the vehicle back to the using organization.

The VFM or VMS typically publishes local guidance regarding QA inspections in an operating instruction (OI), which includes the extent of completed work to be inspected, the types of repairs and services to be inspected, and who will perform the inspections. The skill level of personnel, the vehicle complexity, and critical mission support are determining factors. Generally, all completed preventive maintenance and inspections (PM&I), steering repairs, and brake repairs receive an outgoing inspection. For instance, management might set a standard of a 100 percent QA inspection on all vehicles leaving the shop, conducted by the section noncommissioned officer in charge (NCOIC) or other designated (qualified) personnel. Again, what is inspected and by whom is directed through a locally developed OI. However, there are standards that must be established for individuals selected to conduct QA inspections. These are some areas that should be considered:

- Have a 5-skill level or higher.
- Have a wide range of expertise.
- Be able to maintain process integrity (show no favoritism or bias).

The CSC is normally the focal point for QA inspections, and supervisors often assume that the CSC will catch any discrepancies. Though the CSC may be inspecting vehicles leaving VM, it is a good practice to conduct QA inspections prior to the vehicle leaving the shop. If a trainee completed the work, their trainer should inspect his or her work prior to it moving on. Again, the more eyes checking work leaving the shop, the better the end product will be.

There are numerous ways to perform a QA inspection. There may not be a right or wrong way, but there are always good, better, and best ways to conduct your inspections. What works for you will depend on many factors such as local guidance, workload, personnel, or even the type of work performed. The most important part of performing a QA inspection is producing a safe and serviceable vehicle ready to perform its mission. At a minimum, you should consider inspecting the following:

- All line items performed on the work order.
- Proper documentation on all required forms.
- Proper operation of all vehicle systems to include fluid levels, etc.
- All safety-related systems (i.e., brakes), especially if repairs were performed on the system.

There are many checklists and guides you can use that will help you perform a QA inspection. This is not a complete list, but it should give you a good idea of what is available:

- Locally established inspection checklists.
- AF Form 1800, Operator’s Inspection Guide and Trouble Report (or AF Form 1807, Operator’s Inspection Guide and Trouble Report [Fuel Servicing Vehicles], for fuel servicing vehicles).
- AF Form 4354, Vehicle Preventive Maintenance and Inspection (PM&I).
- AF Form 4355, Vehicle Incoming Inspection.
- TO 36-1-191.
- Vehicle-specific TOs or commercial manuals.

- Aftermarket repair manuals.
- Digital technical data.

Follow your local guidance, and use the tools available to you. The quality of the work you and your subordinates produce should be a point of pride for your shop. After all, “Excellence in All We Do” is one of our core values.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

001. Coordinating workflow

1. List eight responsibilities of a VM work center supervisor.
2. What section is the focal point for all work generated in VM shops?
3. Other than FM&A and Materiel Control, what two shops will you likely coordinate with on a daily basis?
4. To whom must you report problems with shop interrelationships, especially those affecting productivity, for timely resolution?

002. Planning and assigning work requirements

1. What are the keys to assigning work requirements in your shop?
2. Other than vehicle work orders, what two areas will the remainder of your shop’s workload come from?
3. How is maintenance work assigned in a VM shop?
4. What conditions will cause FM&A to place a “RED” priority to be assigned to a work order?
5. What actions may be necessary for VM to ensure that minimum-essential vehicle levels and mission needs are met?

003. Depot repair plans and quality assurance inspections

1. Who manages depot-level maintenance for AF needs?
2. How does depot support intermediate maintenance?
3. Who determines the most economical way of obtaining depot maintenance support?
4. How is a vehicle eligible for depot maintenance identified?
5. What repair cost criteria must be met before a depot-eligible vehicle is overhauled?
6. State the purpose of the LTI in the depot-level maintenance program.
7. How are depot-level maintenance requirements forecasted?
8. What accompanies a vehicle to the depot repair facility?
9. What is the warranty period for a depot-overhauled vehicle?
10. Other than quality of maintenance, what can QA inspections indicate?
11. Who publishes local guidance regarding QA inspections, and where can that guidance be found?

12. What is the most important part of a QA inspection?
13. At a minimum, which items should you inspect during a QA inspection?
14. List at least four resources that can aid you during the QA inspection.

1-2. Managing Resources

The shop supervisor plays an important role within the structure of an organization. An important part of your job is to implement approved policy and properly manage all resources within your control. Moreover, you are a key individual to give input for manning and equipment needs for your shop. To accomplish this responsibility, you need to understand what your resources are. The following lessons break the resources down into manning, government property, tools, and equipment.

004. Manpower justification

Two of the biggest factors affecting productivity are manpower and personnel. Although directly related, and some people may use the terms interchangeably, there is a distinct difference between the two. Your job, Air Force specialty code 2T371, Vehicle and Vehicular Equipment Maintenance Craftsman, is a *manpower requirement*. In order to accomplish the mission of repairing vehicles, you must have mechanics, controllers, supply specialists, supervisors, and so forth. These are jobs or positions and can be found in your unit manning document (UMD). Some people call them “spaces” or “billets.” *Manpower* is the total number of jobs or positions required to do a particular mission. *Personnel* are the “faces,” people like you, who fill the required positions. The unit personnel management roster (UPMR) will reflect assigned personnel by name and rank. To see if you have enough faces for spaces, you can check your UPMR against your UMD (faces against spaces). When the number of jobs (spaces) diminishes, eventually, so will the personnel (faces). Since jobs are the basis for hiring personnel, how do we determine the number of spaces (manpower authorizations) needed at a particular base?

Manpower authorizations (funded)

The Air Force manpower standard (AFMS) dictates manpower authorizations (funded) and is the source document used to assign the “spaces for the faces” for AF functions. Although there are unfunded manpower authorizations, for our purposes, we will only discuss the funded ones. In VM, our manpower standard is AFMS 42B1. It identifies the main programming factor for determining manpower requirements to be the assigned vehicle equivalents (VE); these are reflected in the Air Force Vehicle Equivalent List in the Air Force Vehicle Management Neighborhood online.

The VE is a numeric value assigned to a vehicle, based on its maintenance complexity. For example, a sedan may be assigned a VE of 1.0, while a fire truck may have a VE of 15.0. Every time a vehicle is loaded in your base’s inventory, it is critical for the correct VE to be assessed. The Air Force Vehicle Equivalent List shows the VEs for vehicles in every management code category; these are the basic VEs. Vehicles may come with different options and equipment. When a VE is assigned in the master records, options for which additional VEs may be taken must be properly accounted for. Vehicle components and attachments for which you may be able to take additional VEs are also listed in the Air Force Vehicle Equivalent List. For example, a compact sedan (assigned a VE of 1.0) may

come with factory air conditioning (AC) (an additional VE of 0.1) for a total of 1.1 VE. When a vehicle arrives at a base, a shop will do the acceptance inspection, at which time shop personnel identify any options that count toward additional VEs.

If equipment or attachments are added to a vehicle, the appropriate equivalents should be added in the master records. On the other hand, if equipment or attachments for which additional VEs were credited are removed, the VE in the master records needs to be reduced accordingly. If you fail to reduce your VEs, you may be written up for fraud during an inspection. If you fail to add VEs where applicable, you could be inadvertently reducing the manning authorizations for your shop.

Manpower variances

There are other factors, called *variances*, that may affect manpower authorizations. Variances impact manpower authorizations positively, negatively, or may have a variable effect. A *positive variance* compensates for the additional workload generated due to operational environment, mission, or technical requirements of the law. A *negative variance* decreases your “normal” manpower authorizations when others are performing some workloads normally done by your shop. A variable variance may positively or negatively affect manpower authorizations. The one variable variance for VM is the *man-hour availability factor* (MAF). Simply stated, MAF is the amount of time an individual is normally available to do the tasks identified in the AFMS. Normally, this is based on 8 hours a day multiplied by the average number of working days in a month. Currently, the normal MAF is 160.7 hours per month. In some overseas locations, the MAF factor may be slightly higher or lower. In locations where the MAF is lower, this variance will be positive, because personnel have less time to do the work. In locations where the MAF is higher, this variance will be negative, because personnel have more time to do work. The following table identifies variances that are currently in effect:

Type of Variance	Explanation
Positive	Bases in extreme cold weather areas and heavy snowfall. Bases in excessively corrosive environments. Missile mobile maintenance support. Site support requirements. Privately owned vehicle (POV) inspection requirements. Technical requirements for special emission control systems as required by law. Split-location operations. “FLAG” exercise support.
Negative	Materiel Control function realigned under the appropriate LRS flight.
Variable	The MAF in certain overseas location impacts negatively or positively depending upon the country in which the base is located.

For specific bases that are affected by these variances, refer to the AFMS. If you examine the variances that may be applicable to your base, you will see that you do not have any control over these situations. For example, either you are in a cold weather area or not. If you are, the environmental variance for cold weather and snowfall may give you additional spaces. Nevertheless, as you learned in the preceding paragraphs, VE is the main factor for determining manpower authorizations for VM. Therefore, it is very important that you keep track of your VEs accurately.

005. Management of government property

Management of government property is the process of providing for the proper allocation, control, care, use, and safeguarding of government resources and assets under control of the AF. Every individual, military or civilian, regardless of duty assignment, is required to understand and practice supply security and discipline. As an individual, you have an obligation to care for and protect all

properties under AF control, whether or not issued to you for custody or for use. Effective management of property starts with and is applied by you, regardless of where you are assigned.

Principles of supply discipline

The tight fiscal environment in the AF makes it more important than ever to adhere to supply discipline. All of you are aware that you must utilize your equipment and supplies to the maximum economical use possible. You also know you must safeguard and preserve public property under your use and control. Contributions you can make toward supply discipline are as follows:

- Avoid requesting more than what is necessary to perform the job.
- Continually screen stocks and promptly report, redistribute, and dispose of excesses.
- Promptly send repairable assets through repair channels.
- Do not double-order parts from more than one source.

Remember, the primary objective of the Air Force Fraud, Waste, and Abuse Program is *preventing* FWA, rather than just reporting it.

Responsibilities for management of government property

When managing government property, there are three levels of responsibility—command, custodian, and the accountable individual.

Command

To ensure accomplishment of the mission, our equipment, supplies, and facilities must be operated and maintained in proper condition. Commanders are not exempt from pecuniary liability for properties within their command that are lost, damaged, or destroyed due to unauthorized use, willful misconduct, or negligence. Every commander is responsible for prudent management of government properties under his or her control.

Custodian

A property custodian is an individual designated by the commander to have custodial (watchful) responsibility for government property. If you have custodial responsibility for a piece of property, you are entrusted with its safety and proper use. A property custodian may be held liable for any damage or loss arising from his or her negligence.

Accountable individual

An accountable individual is anyone who is imposed by law, lawful order, regulation, or contract with the duty to safeguard and/or maintain government property, to include keeping accurate records of documents. As you can see, this broad statement includes anyone who uses government property. Each of us who uses government property is an accountable individual. As such, you may be held liable for the loss, damage, or destruction resulting from your negligence, willful misconduct, or unauthorized use.

Pecuniary liability

Pecuniary liability is the financial obligation to pay for the loss, damage, or destruction of property resulting from negligence, unauthorized issue or use, or misconduct. The responsible individual may readily accept a pecuniary liability, or the liability may be accessed through a Department of Defense (DD) Form 200, Financial Liability Investigation of Property Loss (fig. 1-1). Acceptance of pecuniary liability does not remove the possibility of receiving disciplinary action.

Categories of property

There are two categories of property in the supply system. Whatever you “buy” from supply is classified as either equipment or supplies. The items you buy are further broken down into two subcategories of each main category. They are *organizational* and *individual* equipment, and *repairable* and *consumable* supplies.

FINANCIAL LIABILITY INVESTIGATION OF PROPERTY LOSS					
PRIVACY ACT STATEMENT					
AUTHORITY: 10 USC 2775; DoD Directive 7200.11; EO 9397. PRINCIPAL PURPOSE(S): To officially report the facts and circumstances supporting the assessment of financial charges for the loss, damage, or destruction of DoD-controlled property. The purpose of soliciting the SSN is for positive identification.			ROUTINE USE(S): None. DISCLOSURE: Voluntary; however, refusal to explain the circumstances under which the property was lost, damaged, or destroyed may be considered with other factors in determining if an individual will be held financially liable.		
1. DATE INITIATED (YYYYMMDD) 2003-05-10		2. INQUIRY/INVESTIGATION NUMBER 03-073		3. DATE LOSS DISCOVERED (YYYYMMDD) 2003-04-24	
4. NATIONAL STOCK NO. 10436104 SLIN 0005A A	5. ITEM DESCRIPTION Toshiba Notebook computer		6. QUANTITY 1	7. UNIT COST \$2,910.18	8. TOTAL COST \$2,910.18
9. CIRCUMSTANCES UNDER WHICH PROPERTY WAS (X one) (Attach additional pages as necessary) Items were stolen from office. See attachment			<input checked="" type="checkbox"/> LOST	<input type="checkbox"/> DAMAGED	<input type="checkbox"/> DESTROYED
10. ACTIONS TAKEN TO CORRECT CIRCUMSTANCES REPORTED IN BLOCK 9 AND PREVENT FUTURE OCCURRENCES (Attach additional pages as necessary) Squadron Commander should develop a laptop prevention O/I.					
11. INDIVIDUAL COMPLETING BLOCKS 1 THROUGH 10					
a. ORGANIZATIONAL ADDRESS (Unit Designation, Office Symbol, Base, State/Country, Zip Code) 345TRS/TTAD Lackland AFB TX 78236		b. TYPED NAME (Last, First, Middle Initial) Jones, Don E., MSgt		c. DSN NUMBER 555-2779	
		d. SIGNATURE		e. DATE SIGNED 2003-05-12	
12. (X one) <input checked="" type="checkbox"/> RESPONSIBLE OFFICER (PROPERTY RECORD ITEMS) <input type="checkbox"/> REVIEWING AUTHORITY (SUPPLY SYSTEM STOCKS)					
a. NEGLIGENCE OR ABUSE EVIDENT/SUSPECTED (X one) <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		b. COMMENTS/RECOMMENDATIONS Concur with findings in block 9.			
c. ORGANIZATIONAL ADDRESS (Unit Designation, Office Symbol, Base, State/Country, Zip Code) 345TRS/TTAD Lackland AFB TX 78236		d. TYPED NAME (Last, First, Middle Initial) Gross, George P., Lt Col		e. DSN NUMBER 555-2718	
		f. SIGNATURE		g. DATE SIGNED 2003-05-14	
13. APPOINTING AUTHORITY					
a. RECOMMENDATION (X one) <input checked="" type="checkbox"/> APPROVE <input type="checkbox"/> DISAPPROVE		b. COMMENTS/RATIONALE Concur		c. FINANCIAL LIABILITY OFFICER APPOINTED (X one) <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
d. ORGANIZATIONAL ADDRESS (Unit Designation, Office Symbol, Base, State/Country, Zip Code) 345 LG/CD Lackland AFB TX 78236		e. TYPED NAME (Last, First, Middle Initial) Albrecht, Brett C., Col		f. DSN NUMBER 555-3859	
		g. SIGNATURE		h. DATE SIGNED 2003-05-20	
14. APPROVING AUTHORITY					
a. RECOMMENDATION (X one) <input checked="" type="checkbox"/> APPROVE <input type="checkbox"/> DISAPPROVE		b. COMMENTS/RATIONALE Concur, individual not liable.		c. LEGAL REVIEW COMPLETED IF REQUIRED (X one) <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> N/A	
d. ORGANIZATIONAL ADDRESS (Unit Designation, Office Symbol, Base, State/Country, Zip Code) 37 LG/CC Lackland AFB TX 78236		e. TYPED NAME (Last, First, Middle Initial) Dell, Richard P., Brig Gen		f. DSN NUMBER 555-4392	
		g. SIGNATURE		h. DATE SIGNED 2003-05-30	

DD FORM 200, OCT 1999

PREVIOUS EDITION IS OBSOLETE.

Figure 1-1. DD Form 200.

Organizational equipment

Organizational equipment items are items that are required by units in the field to do their jobs. You can find equipment authorizations in an applicable allowance standard (AS). The AS is an equipment allowance document, which prescribes basic allowances of organizational equipment. ASs can be

found using the Allowance Standard Retrieval System (ASRS) web version, which falls under the Air Force Equipment Management System (AFEMS). AFEMS can be accessed through the AF Portal.

Once on the AFEMS site, there are links to ASRS. You do not need an AFEMS account to access ASRS. Once in ASRS you will be able to view all ASs. The ASs that pertain to VM are listed in AFI 24-302 in the glossary of references and supporting information. As a shop supervisor, you should be familiar with AS 403, *General Purpose Tools*, and AS 457, *Vehicle Management, Locomotive Maintenance and Vehicle Operations*. The AS is further broken down into ASCs. The ASCs list the specific equipment authorized. For example, ASC 457 prescribes the number of 20-ton hydraulic jacks or the type and number of diagnostic equipment authorized in a shop. ASC 457 is separated into eight different parts or subdivisions and is the source document for required equipment that applies to all VM shops. These “subdivisions” refer to categories of equipment. The first part (A) lists the general vehicle maintenance equipment, and the remaining parts (B thru H) list all of the specialized equipment required for certain types of vehicles. The category definitions are listed in the table below.

Part	Definition
A	General Vehicle/Equipment Maintenance.
B	Construction Equipment.
C	Fuel Servicing Equipment.
D	Materials Handling Support Equipment.
E	M-Series Vehicles.
F	Vehicle Operations Support Equipment.
G	Vehicle Maintenance Equipment: Silver-Flag
H	Vehicle Maintenance Equipment: RED HORSE In Garrison

The specific authorization details of ASCs are found in the basis of issue (BOI) data in ASRS. There is a lot of information in the BOI data, and ASRS has a glossary to explain the different areas. We will focus on only a few areas that you need to know. The BOI is a spreadsheet that lists items by national stock number (NSN). Below the NSN is the nomenclature of the item. The configuration description will highlight the type of data that is required to calculate the authorized quantity for a particular NSN and organization. For example, an item may be authorized “per maintenance workload” (based on VEs) or a specific installation may be listed for an additional authorization. The allowance use code indicates the intended use of the item (mobility, support, joint-use, or war reserve materiel [WRM]). The BOI indicator column indicates how to determine the quantity allowed. The quantity allowed may be determined by a range of certain measurable factors (like VE), performing calculations, a preset fixed quantity, or by a narrative explaining what conditions warrant issue of an item (i.e., if your unit does *blank* then you get *blank* number of items). An “R” in this column would indicate a range—in our case a range of VE. The high- and low-range columns will contain the range of VE needed for a certain quantity. The last column is the quantity, as determined by the preceding columns. If an authorization is based on a range of VE, the equipment item will be listed in the BOI data for each VE range and the quantity associated with that specific range.

You would do well to study ASC 403 and ASC 457 in more detail than is covered in this lesson. A good understanding of these valuable tools goes a long way. Occasionally, there will be times when you need equipment items that are not covered by the ASC. In cases like this, your best option would be to talk to personnel in the equipment management section at your local base supply.

Individual equipment

The other types of equipment items are those that are required for individual use. For example, if you are stationed in a cold weather area, you will be issued cold-weather gear, like a parka, mukluks, and thermal underwear. The tools and mobility bags issued to you are *individual* equipment. When you permanent change of station (PCS), you will have to return most of these items. Therefore, you need

to take care of them because they are expensive, and you may be assessed pecuniary liability for loss or damage not caused by fair wear and tear.

Repair cycle assets (repairable supplies)

The items that are classified as repairable and are reused repeatedly are called *repair cycle assets*. These are commonly known as “recoverable items.” They have an expendability, reparability, and recoverability code (ERRC) of either *XD* or *XF*. The *XD* coded items (e.g., some engines and gearboxes) are repaired and primarily controlled by the depots (the *D* stands for depot). This means the depots control disposition of these items. The *XF* items (e.g., tires) are primarily controlled and repaired at the field level (the *F* stands for field). In other words, the base-level shops decide whether the item is worth repairing. A repairable item is as important as a serviceable one, since it may be your only source of supply. Repairable assets removed from vehicles must be promptly processed through repair channels and controlled throughout the repair cycle.

Consumable supplies

The other category of supplies is called *consumables*. These are expendable, non-repairable (or *XB*) items (i.e., *XB3*). These are repair parts or items that are disposed of when they are no longer serviceable or when they lose identity because they are attached to another assembly. Some supplies in this category are pens, paper, oil, and grease. You must be careful of how you dispose of these consumable items. Improper disposition may constitute FWA or violate environmental laws.

006. Tools and equipment justification

In order to conduct vehicle repairs, you must have tools and equipment. Frequently, poor vehicle reliability, high nonmission-capable rates, and excessive repeat maintenance can be attributed to the lack of required tools and equipment, failure to utilize the tools and equipment when they are available, or inadequate skills in their proper use. The latter is especially true for diagnostic equipment. In any event, tools and equipment must be properly procured, maintained, and stored. In this lesson, we will discuss tool and equipment justification and other areas associated with tool and equipment management.

Tools and equipment

For a list of authorized equipment for shop-specific operations (i.e. refueling, material-handling equipment, etc.), ASCs are your sources of information. For example, ASC 457 shows whether a shop is authorized to have a lift. If authorized, it also shows the type and quantity. The number of authorizations for a particular piece of equipment may depend on your VEs. Therefore, not only does VE determine your manpower authorizations, in many instances, it also determines your equipment authorizations.

To obtain the required tools and equipment for a shop, follow these procedures:

- Determine the types of vehicles that will be repaired by make, model, year, and number of end items (also consider if the vehicle or equipment item is part of a larger system).
- Determine the types of repairs you will accomplish (i.e., engine or transmission overhauls, welding, bodywork, etc.).
- Analyze the repairs to be performed, and then review sections 21 and 22 (hand tools—inch and metric) for information on hand tools, section 23 (tool-room items), and section 24 (shop equipment) of TO 36-1-50, *Motor Vehicle Maintenance Guide*.
 - Sections 21 and 22 list the stock numbers and nomenclatures of minimum-essential individual toolbox items used daily/weekly by a technician at the lowest dollar value possible. Use ASC 403 and General Services Administration (GSA) catalogs to determine additional requirements necessary to accomplish particular maintenance missions.

- Section 23 lists stock numbers and nomenclatures of tool-room items to be maintained in composite tool kits for inventory/issue convenience. ASCs 403 and 457 are source documents for this section.
- Section 24 lists essential shop equipment. Pictures, descriptions, and stock numbers aid in identifying and selecting the needed equipment. Use ASCs 403 and 457 and GSA catalogs to determine additional equipment required to accomplish particular maintenance missions.
- After determining the tools and equipment you need, coordinate with management and the Materiel Control section. Once approval is given, complete the order request forms. Generally, for tools, a locally generated parts request is utilized. For equipment, you must fill out the AF Form 601, Equipment Action Request.

The above information is general in nature and is meant only to provide you with the guidance needed to accomplish tool and equipment procurement. As stated, acquiring the proper tools and equipment for assigned maintenance missions can improve productivity. Proper care and use of tools and equipment is essential. You, as a supervisor, must ensure personnel are familiar with TOs 32-1-101, *Use and Care of Hand Tools and Measuring Tools*, and 32-1-151, *Hand, Measuring and Power Tool*, as well as how to properly operate equipment IAW manufacturer's directions. Remember, proper care and use of tools and equipment is key to productivity.

Vendor Product Evaluation Program

As technology advances, so do tools, equipment, and maintenance repair processes. The Vendor Product Evaluation Program is designed to enhance operations by identifying more effective and economical equipment through field evaluations. The program is the primary method between the AF and private industry in respect to evaluation of equipment, vehicles, tools, and related products.

The program operates on the "try-before-you-buy" concept. Evaluations are performed on vehicles, tools, and equipment to determine if they will improve performance, economy, or efficiency over items already in use by the AF.

How it works

The 441 VSCOS is the focal point and manager for the Vendor Product Evaluation Program. All product demonstrations must be suggested by at least two MAJCOMs, provide expected tangible benefits to the AF and vehicle community with a focus on enhancing forward deployed operations, and be approved by HQ USAF/A4RE prior to beginning product demonstration. Once HQ USAF/A4RE approves a product, the 441 VSCOS takes over and manages the evaluation process. The details of the Vendor Product Evaluation Program are located in AFI 24-302, Attachment 3.

Benefits

There are a couple of benefits to this process, which make it self-motivating and self-sustaining. Manufacturers do not have to prove the worth of their products. You do it for them! The government also gets several benefits from the program. By testing items in the area where they will ultimately be used, and before Uncle Sam spends your hard-earned tax money, he gets products, which are more cost effective, of high quality, easy to use, and safe. In addition, if the product is better than what is currently in use, the AF often chooses to replace the previous item.

Reports

The 441 VSCOS maintains product evaluation reports, both active and closed. At the time of writing this career development course (CDC), the reports were available in the Air Force Vehicle Management Neighborhood online in the VSCOS folder.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

004. Manpower justification

1. What is the difference between manpower and personnel?
2. What two documents do we use to verify number of personnel against number of positions available?
3. What source document is used to assign “spaces for faces”?
4. What is a VE?
5. How do manpower variances affect manpower authorizations?
6. What is the variable variance for VM?
7. Where do you find information on specific bases affected by variances?

005. Management of government property

1. Whose responsibility is it to understand and practice supply security and discipline?
2. How can you contribute to supply discipline at your level?
3. What is the *primary* objective of the Air Force Fraud, Waste, and Abuse Program?
4. What are the three levels of managing government property?
5. What is custodial responsibility?

6. Who is an accountable individual?
7. How is pecuniary liability assessed?
8. What are the two categories of property in the supply system?
9. What are the two subcategories of equipment?
10. With which ASs should you be familiar with as a VM supervisor?
11. What are the two subcategories of supplies?
12. Why is a repairable item important?
13. Why must you be careful when disposing of consumable items?

006. Tools and equipment justification

1. What are some indicators that might suggest your shop could be experiencing a lack of required tools and equipment?
2. What sections of TO 36-1-50 provide information on hand tools (individual toolbox items and composite tool kits)?
3. What form is used to order equipment?
4. What is the Vendor Product Evaluation Program designed to do?
5. What is the operating concept of the Vendor Product Evaluation Program?
6. Who manages the Vendor Product Evaluation Program?

Answers to Self-Test Questions

001

1. Any eight of the following responsibilities:
 - (1) Coordinate with FM&A to ensure priorities are met and maintenance tasks are completed on time.
 - (2) Assign work to personnel commensurate with their skills.
 - (3) Ensure that proper tools and equipment are readily available and serviceable, and that subordinate personnel are properly trained in their use.
 - (4) Ensure that technicians comply with safety procedures and technical data.
 - (5) Inspect incoming vehicles and equipment not processed through CSC.
 - (6) Inspect repaired vehicles and equipment to ensure all vehicles are in a safe serviceable condition.
 - (7) Brief newly assigned personnel.
 - (8) Assign personnel to duty positions to ensure full use and progression opportunities.
 - (9) Determine the most efficient and economical means of returning vehicles to service.
 - (10) Inform FM&A of the requirement for more work so that maximum productivity can be obtained from assigned personnel.
 - (11) Check with Materiel Control on parts requirements and availability.
 - (12) Account for labor hours for work center.
 - (13) Set up training needs, send training requirements to the VMM/VMS, and assist in OJT.
 - (14) Ensure parts received for vehicles during the work phase are properly protected and not improperly stored on the vehicle's seat or other soft trim.
 - (15) Ensure vehicles are properly prepared for storage when placed in NMCS status.
2. FM&A.
3. Body and tire shops.
4. VFM/VMS.

002

1. Knowing what work needs to be accomplished, the capabilities of your shop and personnel, and how to assign priorities.
2. Taskers and other duties not directly related to vehicle repair.
3. It is assigned IAW mission priorities and customer needs.
4. A unit is below the minimum-essential vehicle level; a special project requires a certain type of vehicle; and/or severe weather or other natural circumstances create a need for a certain type of vehicle.
5. Withdrawing vehicles from organizations currently above their MEL or with lower priorities consolidate the workforce, work overtime, cannibalize parts, delay work, or make temporary repairs to return priority vehicles to service IAW mission priorities and customer needs.

003

1. 441 VSCOS.
2. By performing repairs or by providing technical aid on selected vehicles that are beyond base-level capabilities; by providing depot overhauled parts and assemblies, depot funded local contract, or by shipping the vehicle to a repair site.
3. The production manager.
4. Eligible vehicles are coded "S" in the repair column of the USAF management list in the federal supply catalogs.
5. The cost of overhaul and one-way transportation to the overhaul site must not exceed 75 percent of the replacement cost of a new vehicle.
6. Robins AFB SE&V uses LTIs to determine if overhaul is required and to prioritize the vehicles by their overall condition.
7. Each year by 15 May, Robins AFB SE&V sends to each MAJCOM a printout of "Current Vehicle Requirements and Vehicle Repair Projections." By 15 July, each base then submits to the 441 VSCOS a

current year revalidation and projected requirements for the next five years. 441 VSCOS then validates those requirements and sends them to Robins AFB SE&V.

8. A copy of the original LTI, updated to include any change in condition of the vehicle.
9. Overhauled vehicle warranties vary according to the specific contract.
10. Training deficiencies or areas that need increased attention to detail.
11. The VFM or VMS in an OI.
12. Producing a safe and serviceable vehicle ready to perform its mission.
13. All line items performed on the work order; proper documentation on all required forms; proper operation of all vehicle systems; and all safety related systems, especially if repairs were performed on the system.
14. Any four of the following:
 - (1) Locally established inspection checklists.
 - (2) AF Form 1800.
 - (3) AF Form 4354.
 - (4) AF Form 4355.
 - (5) TO 36-1-191.
 - (6) Vehicle specific TOs or commercial manuals.
 - (7) Aftermarket repair manuals.
 - (8) Digital technical data.

004

1. Manpower is the number of job (spaces) required to do a particular mission and personnel are the people (faces) to do that particular job.
2. The UMD and the UPMR.
3. The AFMS.
4. A numerical value assigned to a vehicle based on its maintenance complexity.
5. They can have a negative, positive, or variable effect.
6. MAF.
7. The AFMS.

005

1. Every individual, military or civilian, regardless of duty assignment.
2. Avoid requesting more than what is necessary to perform the job, continually screen stocks and redistribute or dispose of the excess, promptly send repairable assets through repair channels, and do not double-order parts from more than one source.
3. Preventing FWA instead of just reporting it.
4. Command, custodian, and accountable individual.
5. Being entrusted with the safety and proper use of assigned property.
6. Anyone who is imposed by law, lawful order, regulation, or contract with the duty to safeguard and/or maintain government property.
7. Through a DD Form 200.
8. Equipment and supplies.
9. Organizational and individual.
10. ASs 403 and 457.
11. Repairable and consumable.
12. It may be your only source of supply for that item.
13. Improper disposition may result in FWA or violate environmental laws.

006

1. Poor vehicle reliability, high nonmission-capable rates, and excessive repeat maintenance.
2. 21 and 22.

3. AF Form 601.
4. Enhance operations by identifying more effective and more economical equipment through field evaluations.
5. Try before you buy.
6. 441 VSCOS.

Complete the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

1. (001) As a vehicle management (VM) work center supervisor, which are *specific* responsibilities that you have?
 - a. Ensuring proper tools are readily available, researching parts, troubleshooting vehicles.
 - b. Assigning work, enforcing safety procedures, filling work orders, and maintaining technical orders.
 - c. Assigning work, coordinating with other sections, scheduling-in maintenance, and monitoring bench stock.
 - d. Ensuring proper tools are readily available, assigning work, enforcing safety procedures, and meeting training needs.
2. (001) Who is the focal point for coordinating and generating *all* work through your shop?
 - a. Customer Service Center (CSC).
 - b. The work center supervisor.
 - c. Fleet Management and Analysis (FM&A).
 - d. Vehicle fleet manager or vehicle management superintendent (VFM/VMS).
3. (001) Aside from Fleet Management and Analysis (FM&A) and Materiel Control, what other two shops will “main-shop” supervisors coordinate with daily?
 - a. Customer Service Center (CSC) and Body.
 - b. Fire Truck and Refueling.
 - c. CSC and Tire.
 - d. Tire and Body.
4. (002) With whom should you communicate when vehicle repair work is *delayed* due to other shop priorities taking precedence?
 - a. Fleet Management and Analysis (FM&A) and using organization.
 - b. FM&A and Customer Service Center (CSC).
 - c. Vehicle fleet manager (VFM), vehicle management superintendent (VMS) and CSC.
 - d. VFM, VMS, and FM&A.
5. (002) To whom is the mission-essential level (MEL) presented for *final* approval?
 - a. Logistics readiness squadron (LRS) commander.
 - b. Mission support group (MSG) commander.
 - c. Major command (MAJCOM) commander.
 - d. Wing commander.
6. (002) When assigning work orders in accordance with priorities, which condition does *not* automatically cause a vehicle to have a higher priority than other vehicles?
 - a. A special project requires a certain type of vehicle in service.
 - b. Emergency warning lights, military radios, and other such accessories.
 - c. Severe weather or other natural circumstances create a need for certain types of vehicles.
 - d. A unit is below the minimum essential vehicle level and other base assets cannot fulfill the unit’s need.

7. (002) The section supervisor is responsible for
 - a. picking up work orders from Fleet Management and Analysis (FM&A), and setting the priority and order of work requirements.
 - b. disseminating the workload to the shop.
 - c. notifying FM&A of the requirement for more work and setting the work priority.
 - d. prioritizing work and providing FM&A with factual estimated completion times.
8. (003) What document accompanies a vehicle to the depot repair facility?
 - a. Original limited technical inspection (LTI).
 - b. Vehicle repair history (AF Form 1828).
 - c. Shipping repair work order (AF Form 1823).
 - d. An updated copy of the original LTI.
9. (003) Who *specifically* authorizes substitutions for vehicles already programmed for depot?
 - a. Major command (MAJCOM).
 - b. Robins Air Force Base (AFB) Special Equipment and Vehicles (SE&V).
 - c. Headquarters United States Air Force (HQ USAF).
 - d. Logistics readiness squadron (LRS) commander.
10. (003) How many years are added to the life expectancy of a depot-overhauled vehicle?
 - a. 5.
 - b. 7.
 - c. 10.
 - d. 12.
11. (003) What is the warranty period for all depot-overhauled vehicles?
 - a. 12 months, 12,000 miles.
 - b. 15 months, 12,000 miles.
 - c. According to specific contract specifications.
 - d. According to commercial manufacturer warranties.
12. (003) What guidance specifies the extent of completed work and types of repairs that receive quality assurance (QA) inspections?
 - a. Major command (MAJCOM) policy.
 - b. Local operating instruction (OI).
 - c. AFI 23-302, *Vehicle Management*.
 - d. TO 36-1-191, *Technical and Managerial Reference for Motor Vehicle Maintenance*.
13. (003) Areas that you should consider *prior to* assigning an individual to perform quality assurance (QA) inspections are
 - a. skill level, rank, and Air Force specialty code (AFSC).
 - b. skill level, rank, and experience.
 - c. skill level, broad expertise, and ability to avoid favoritism or bias.
 - d. prior inspection experience, rank, and ability to maintain process integrity.
14. (004) Which phrase *best* describes *manpower*?
 - a. The total number of positions assigned to an organization.
 - b. The total number of personnel assigned to an organization.
 - c. The total number of jobs or positions required to accomplish a particular mission.
 - d. The military personnel that fill the positions required to accomplish a particular mission.

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15. (004) Choose the phrase that *best* describes *personnel*.
- The total number of positions assigned to an organization.
 - The total number of personnel assigned to an organization.
 - The total number of jobs or positions required to accomplish a particular mission.
 - The individuals that fill the positions required to accomplish a particular mission.
16. (004) What is a vehicle equivalent (VE)?
- An alphanumeric code assigned to multi-role vehicles.
 - A numeric value assigned to a vehicle, based on its maintenance complexity.
 - An alphanumeric designator assigned to a vehicle, based on its mission role.
 - A numeric code assigned to a vehicle designating that it has multi-role capabilities.
17. (004) Factors that affect manpower authorizations are called
- variances.
 - standards.
 - change factors.
 - tenant agreements.
18. (004) Which statement *best* describes the man-hour availability factor (MAF)?
- The amount of time an individual is authorized to work on a task.
 - A list of industry standards used to determine how long a specific task should take.
 - The amount of time an individual is authorized to take to complete a task for their skill level.
 - The amount of time an individual is normally available to do the tasks identified in the manpower standard.
19. (004) Which is a *positive* manpower variance?
- Missile mobile maintenance support.
 - Material control function realigned.
 - Number of vehicles assigned.
 - Vehicle complexity.
20. (004) Which is a *negative* manpower variance?
- Missile mobile maintenance support.
 - Material control function realigned.
 - Number of vehicles assigned.
 - Vehicle complexity.
21. (005) What is one of the contributions you can make to supply discipline?
- Use the fraud, waste, and abuse (FWA) program.
 - Double order parts to prepare for the next job.
 - Avoid requesting more than is needed.
 - Maintain on-hand bench stocks.
22. (005) The financial obligation to pay for the loss, damage, or destruction of a vehicle resulting from abuse is known as
- report of survey.
 - supply discipline.
 - pecuniary liability.
 - property accountability.
23. (005) How many categories of property are in the supply system?
- One.
 - Two.
 - Three.
 - Four.

24. (005) What document is used when outfitting a vehicle maintenance (VM) shop with equipment?
- a. Air Force Equipment Management System (AFEMS).
 - b. Allowance Source Code (ASC) 457.
 - c. ASC 403.
 - d. Mission critical list.
25. (005) Items that are needed to outfit an individual stationed in a cold weather area are called
- a. supplies.
 - b. properties.
 - c. seasonal issue.
 - d. individual equipment.
26. (005) What is the code used to identify repairable cycle assets that are primarily under depot-level control?
- a. *ND*.
 - b. *XD*.
 - c. *NC*.
 - d. *XB*.
27. (006) Which publication is used to identify *shop-specific* equipment by type and quantity?
- a. Allowance Source Code (ASC) 403.
 - b. ASC 457.
 - c. Technical Order (TO) 36-1-50, *Motor Vehicle Maintenance Guide*.
 - d. TO 36-1-191, *Technical and Managerial Reference for Motor Vehicle Maintenance*.
28. (006) The Vendor Product Evaluation Program is designed to
- a. test after-market performance equipment that may be useful to the Air Force (AF).
 - b. conduct field evaluations on commercial products to verify the manufacturer's performance claims.
 - c. enhance operations by identifying more effective and economical equipment through field evaluations.
 - d. evaluate equipment that is new to the AF inventory and identify its economic effectiveness.

Please read the unit menu for unit 2 and continue ➡

Unit 2. Vehicle Management and Fleet Management and Analysis

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VEHICLE MAINTENANCE management includes several processes that contribute to providing high-quality maintenance to ensure safe and serviceable vehicles to support the mission. A successful vehicle maintenance shop requires personnel with the knowledge to do more than just fix a vehicle and get it out the door. As a 7-level craftsman, it is important that you have an overall understanding of the inner workings of VM. The following lessons will give you a better understanding of the functions where you might work. There could be a possibility of being assigned as, or filling in for, the VFM/VMS, and you will need to know the products that are produced by FM&A to run a successful VM flight.

The AF spends a great deal of effort managing its resources. Now, managers are doing more with less to support the mission of today's AF. As we proceed into the future, we will have to do even more with less, due to the limitations placed on our funding to support the mission. To do this, you will have to be able to analyze the data collected by DPAS effectively. The information collected can help you determine how to change a problem area into a winning performance for your shop.

2-1. Vehicle Management

In order to have a successful VM operation, you need to have highly skilled personnel who can perform their jobs well. Because of the constant personnel changes, the demand to develop an active training program that is adaptable and maintained at the highest standard ensures our personnel remain trained and ready to meet the mission requirements. By the time you become a 7-level craftsman, you must be knowledgeable and trained in both general- and special-purpose maintenance. It is important to have a dedicated training monitor and a high-quality training plan to ensure your personnel get the most current training and hands-on experience they need. VM's training program is IAW AFI 36-2201, *Air Force Training Program*.

007. Evaluate personnel training needs

Part of your 7-level requirements is to evaluate personnel training needs. One of your responsibilities is to evaluate any newly assigned personnel, or personnel rotating through your section, to finalize their upgrade training. There are some things you can do that will help you evaluate how much time you spend on each training objective and what tasks personnel will need to complete for either their 5- or 7-level upgrade training. The following list contains a few ways to help you evaluate each member's training requirements:

- Review the member's training records in the training business area (TBA).
- Conduct an interview with the member to see what he or she knows about each core task.
- What mechanical background did he or she have prior to joining the military?
- Review the student training report; it will tell you the strengths and weaknesses of each trainee as they attended technical school. This will help you focus on the training in the

areas where the member needs improvement. Just remember that you have to request this report from the training group registrar.

Another one of your responsibilities is to work with the unit training manager (UTM) to create a master training plan (MTP) and an individual training plan (ITP) for your work center. When working with the UTM, you can add shop-specific core tasks that you deem necessary for your work center.

NOTE: You and the UTM should review the MTP and ITP annually or any time there are changes to the career field education and training plan (CFETP).

Now that you have the basic understanding on how to evaluate training requirements, let's look at the responsibilities and programs that you will need to be familiar with to ensure that you build a successful training program.

Vehicle management training program responsibilities

The VFM/VMS shares overall responsibility for the VM training program with the UTM. The VFM/VMS should assign a qualified 2T3 as the VM training monitor. The appointee can be a civilian for continuity purposes. The person appointed is primarily responsible for establishing and monitoring upgrade/qualification training and should not be assigned additional duties that will prevent their full attention to the training program. The VM training monitor is also responsible for the following:

- Preparing and submitting AETC in-resident training requests in response to the base training manager's annual screening requests. (This should be prepared during the fourth quarter of the current FY for the next FY).
- Assisting supervisors in the development and use of training requirements and techniques.
- Coordinating with the UTM in obtaining any needed training from AETC and commercial training sources as outlined in <https://etca.randolph.af.mil> and AFI 36-2201.
- Conducting quarterly reviews of ITPs, within the TBA, for personnel in skill-level upgrade training assigned to VM.
- Conducting quarterly reviews on the training program using the VM training checklist in the Vehicle Management Neighborhood online.
- Briefing VFM/VMS regularly on the status of all personnel in upgrade training.

Training business area

You can find the automated training records and management application, TBA, on the Air Force Portal. TBA replaces the paper copies of the AF Form 623A, On-The-Job Training Record Continuation Sheet. The TBA application gives supervisors access to virtual training products, such as the CFETP and Air Force job qualification standards (AFJQS). The supervisor and UTM now have the capability to create MTPs and ITPs, document upgrade training, and accomplish other related actions that they used to do with paper and pencil. The following list contains other documentation that work center supervisors, trainers, certifiers, and UTMs can input into TBA:

- Supervisor initial journal entry.
- Supervisor monthly journal entry.
- Supervisor quarterly journal entry.
- Open and closing of core tasks.

NOTE: A supervisor journal entry is required within 60 days of the trainee being assigned to a work center. Personnel in upgrade training should receive a journal entry monthly or any time that a core task is signed off. Personnel who are not in upgrade training should receive a quarterly journal entry at a minimum. Remember that each journal entry needs to be signed off by the supervisor and trainee.

Training monitor responsibilities

The training monitor is responsible for qualification training of VM personnel after their initial upgrade training. The training monitor will work with the VFM/VMS and work center supervisors to develop a rotational training plan for mechanics in upgrade training to the 7-skill level. This allows the individual to gain a working knowledge of each section. An essential element of an individual's upgrade training is rotation. The plan may also include training qualified mechanics on new or improved troubleshooting techniques, specialized and test equipment, and advanced vehicle systems. Training within VM can be a challenge because of two factors: the influx of inexperienced 3-skill-level personnel and contingency taskings. There are cyclical periods when there will be more 3-skill-level personnel than 5-skill-level personnel, which creates an experience gap that you have to overcome.

On-the-job training

Training monitors will provide supervisors with assistance in obtaining literature and directives pertinent to the OJT program. OJT consists of career knowledge and task performance. Career knowledge is achieved by using the CDCs or other applicable technical references listed in the CFETP. Task performance is provided during the actual hands-on training and certifying of CFETP core tasks.

Career development course administration

CDCs contain information on basic principles and techniques common to VM. CDCs are now accomplished electronically, and the student/trainee can access a single set at a time since each set is a prerequisite to the following sets. The trainee, along with the UTM, will validate the member's enrollment using Course Development and Student Administration/Registrar System (CDSAR) for each set of CDCs. The trainee will have to read the CDC orientation prior to having access to the E-CDCs. With them now published online, the overall training upgrade time is significantly reduced by 4 to 6 weeks of waiting time between each set. This does not change the time requirement to complete CDCs. Trainees will have up to 30 days to complete each volume of their CDCs from the date the volume is issued to them (per AFI 36-2201). The UTM will ensure that the trainee is not issued more than one volume at a time. Once the trainee has completed each set of CDCs, he or she is still required to take the End of Course examination.

Core task certification

Training managers, with assistance from the work center supervisors, should develop projected timelines for core task completion. A proactive approach to core task certification will ensure the trainee is upgraded in a timely manner.

In-house training

The ever-increasing cost of maintaining vehicles demands that trained mechanics share their knowledge and lessons learned to other mechanics. In-house training accomplishes this through classroom and hands-on instruction.

The following list provides a starting point for developing an in-house training program:

- Determine your specific training needs.
- Have FM&A perform data analysis to locate negative trends, identifying weak areas that need correction.
- Obtain training aids/materials (you can use several media types to enhance classroom instruction).
- Select instructors (VM training managers are encouraged to recruit the supervisors to fill the role as classroom instructors).
- Schedule training (VM training leader should work closely with supervisors to ensure trainees are available for training).

A long-term indicator of an effective training program is the decline in previously identified negative management trends.

Some of the in-house training topics include the following:

- Engine, major service, and repair.
- Suspension/steering.
- Heating and AC.
- PM&I.
- Collision and structural repair.
- Painting techniques, paint materials, and finish techniques.

Qualification training

Qualification training is a continuous process, starting with the individual's entry into service. This portion of the program should train personnel on a specific duty position. An example of a need for qualification training would be a staff sergeant reassigned from an overseas to a continental United States (CONUS) base who is not familiar with certain vehicles in the local fleet.

Advanced training

Commercial and interservice training provides many excellent courses, as do manufacturers of vehicle/equipment at factory and regional locations. Some mobile commercial training courses can be scheduled on base. The training manager and supervisors should research these courses.

008. Develop budget inputs with justification

Two challenging tasks for leadership in the career field are to obtain funding and staffing with qualified and experienced personnel. A critical step in obtaining funding is creating a budget. Budgeting and tracking your expenses gives you a strong sense of the funding you need to support your mission. In addition, your shop needs sufficient manning to sustain its capability. Therefore preparing a budget and determining manning requirements are significant concerns.

Budgeting and financial planning

So, what is financial planning? It is the processes of allocating funds towards competing needs, taking into account your income and goal. Based on this definition, you can tell that there are three key elements of a financial plan—expenses, income, and goals. In a personal sense, you can do two things if your expenses exceed your income—increase your income or cut your expenses. In vehicle maintenance, you can only do the latter. Our goal is to keep the vehicle fleet in good repair. In order to do that, we must have funds to purchase parts, tools, supplies, and so forth. At base level, we allocate funds in different areas of spending called *element of expense/investment code* (EEIC). We spend money on many EEICs in vehicle maintenance, such as contract maintenance, contract parts, base supply, TDY (temporary duty), equipment, and so forth.

Your *first step* in preparing a financial plan is to find out how much you spent last year in each of the different EEICs. List those expenses. You can find your history of expenses in your responsibility center/cost center (RC/CC) manager's report. The base comptroller provides the RC/CC manager's report. This report lists all expenditures for your cost center by EEIC. This report is available to you through your budget monitor.

Once you find out your prior-year expenses, *the second step* is to ask yourself whether you are going to spend money on those areas again. If not, eliminate them. If there are new areas where you need to spend, add them.

Third, find out if there are upcoming items or projects that you may need to support or that may have an impact on the fleet.

The *fourth step* in your financial planning process is to estimate your expenses honestly and accurately. To do this, use your shop's purchase records, supply listings, and other source documents that you may have. If necessary, call vendors for actual price of items. Do not use inflation to inflate your estimates. Any estimate that you come up with, you must be prepared to prove. Finally, you must provide written justification for your financial plan. The justification must answer why you need the money, how much you need, where you will spend it, and what will happen if you do not get it. A good justification can help you get more of the funds you need.

When your budget estimates exceed the projected funds allocation (income) for your organization, you may have to cut your expense projections. Is there a more sensible way of cutting expenses other than arbitrarily reducing the numbers? In your personal life, if you were forced to cut back on your expenses because your income is not enough, how would you do it? You would likely prioritize your needs based on their importance: food, shelter, and clothing are probably your highest priority. Why?—because you cannot do without these things. You may also want to apply the same principle in building your shop budget. Again, be sensible in cutting expenses. Prioritize your needs and cut accordingly. If you have a legitimate need for additional funds, document it by establishing an unfunded requirement. Unfunded requirements need a narrative justification explaining the impact it creates to your mission if the funds do not become available. The importance of this is for management to know where to allocate the money should it become available. It can also explain productivity shortfalls if the need arises.

As with any other resource, control your funds. Otherwise, you will run out of money before the year is over. Controlling the vehicle maintenance budget is the responsibility of the VFM, but you play a very critical role. One way of controlling expenses is daily monitoring of contract and supply funds. When you reach a predesignated percentage of the quarterly programmed funds, inform the VFM. Other ways of controlling expenses include challenging high-priced items, taking full advantage of warranties, and doing the job right the first time.

Department of Defense fleet credit cards

We use the Department of Defense (DOD) fleet credit card to obtain fuel and services from off-base commercial service stations. The Defense Energy Support Center (DESC) is the program manager and provides policy oversight for the DOD card. As the host-base program manager, you must order the DOD fleet credit card, commonly referred to as the fleet service card, by establishing an account with the authorized vendor. You must emboss each fleet service card with the vehicle registration number and "United States Air Force". VM may obtain generic cards, embossed with the organizational designator for bulk-fuel issues. Your unit will develop local procedures that best fit the local mission.

Having credit cards that numerous individuals use can prove to be a challenge. Because the fleet services cards are vulnerable to misuse and pilferage, establish a filing and suspense system by using a control file to account for all credit cards. Your control file will contain, but is not limited to, receipt for on-hand credit cards; copies of documents certifying loss, investigation, destruction, turn-in, and semi-annual validation; and credit card control register.

You must use a locally developed control register to document the use of the fleet service card. If a control register is not available, create one! As a minimum, the control register should include the following:

- Card number.
- Responsible individual.
- Organization.
- Date issued.
- Return date.

- Delivery ticket number.

The control register will be valid for one FY. You must reissue all cards to customers in a new control register by 1 October each year. You should store unused cards in a suitable locked container.

Funding procedures

Ensure established accounts have specific payment procedures with the host base and are paid directly to the authorized vendors. Once a quarter, you must provide the accounting liaison office (ALO) a projected estimate of non-fuel purchases you expect the fleet service cards to incur for the upcoming fiscal quarter. Accomplish this by using the AF Form 616, Fund Cite Authorization (FCA), and forward the original plus one copy to ALO for approval at the beginning of each fiscal quarter. The approved copy is the authority to cite funds for purchases. Maintain a separate funding file for each account. The file should include copies of the AF Form 616, current quarterly funding documents, and requests for additional supplemental funds.

There are certain things that must be accomplished when the fleet service card is used. You must check all delivery receipts returned by customers for accuracy and correctness. You will retain all receipts until you receive the vendor's invoice. *Always* verify the invoice against the user's receipts—all the information and cost should match. Validate all entries and forward the invoice and receipts to the base comptroller for payment.

Disposition of the DOD fleet credit card

The VM staff or requisitioning agency destroys all credit cards that are no longer required, authorized, or have become unserviceable. Keep records of all credit card destruction and maintain them for one year after the expiration date of card. Make sure you notify the authorized vendor of all verified cases of lost or stolen cards.

Refundable/reimbursable list

Each month, the Defense Property Accountability System (DPAS) monthly processing will automatically generate a data file, which contains a list of expenditures for all organizations that are either refundable or reimbursable. Monthly processing belongs to the 441 VSCOS. The following information will explain the monthly listing and annual validation actions.

Understanding the refundable/reimbursable list

This listing contains expenditures for all refundable code 4 or reimbursable code 3 organizations. It reflects costs of direct maintenance hours, material, and services used in repairing vehicles. DPAS places costs in this file as it occurs, not when the work order closes.

An example in DPAS to perform an inquiry is as follows:

1. Go to "Inquiries">"Maintenance">"Work order."
2. Choose sub work order for query type, use cost center, and your own unit identification code (UIC), then click on "Fields."
3. Select the fields below:
 - a. Work order Id.
 - b. Sub work order Id.
 - c. Asset Id.
 - d. Maint activity/Owning UIC.
 - e. Work order state code.
 - f. Work order status code.
 - g. Actual labor cost.
 - h. Actual labor hours.

- i. Close Dt.
 - j. Team member first name; last name
 - k. Total actual cost.
 - l. Work plan type cd.
4. Click “submit” to view the results.

Reimbursable/refundable and resource center/cost center validation

At the beginning of each FY, and when a change is required, FM&A furnishes a list of supported tenant organizations to the base comptroller (through the budget office). The list will consist of three columns: (1) using organization, (2) existing reimbursable/distribution (R/D) codes, and (3) RC/CC codes. The budget office will validate and/or assign a reimbursable code 3 or refundable code 4 and the appropriate RC/CC codes for each tenant organization. Processing the listing through the budget office ensures a properly maintained reimbursable program. The budget office returns this validated list to FM&A, which, in turn, enters the correct R/D and RC/CC codes into FMIS.

Motor vehicle reimbursement/refund billing list

This list indicates work done for tenant organizations with a reimbursable or refundable code and transient vehicles. Each RC/CC is listed on a separate page. FM&A must review the list to ensure each organization is properly charged for work that is accomplished on its vehicles (e.g., military labor is not charged to an organization we support). The motor vehicle reimbursement/refunds billing list does not identify centrally obtained investment items (bench stock) issued by VM to an organization. FM&A must give the budget office the necessary documents to bill for this type of transaction.

009. War reserve materiel vehicle program

All the financial funding time and effort that we use in planning, organizing, and training are for one single purpose: to preserve our national security and way of life. When national security is threatened, and economic and political solutions don’t work, military actions will ensue as the final arbiter of conflict. When the “button” is pushed, will you be ready? It’s very important that you have a working knowledge of the wartime concept of operations.

Policies and responsibilities

The logistics readiness wartime mission is to mobilize, deploy, receive, and sustain combat forces. The AF policy is to have motor vehicles, manpower, tools, facilities, and shop equipment on hand to support the USAF War and Mobilization Plan (WMP). Logistics readiness planners have two tasks:

1. To provide the necessary forces to accomplish the in-theater mission.
2. To ensure the logistical requirements of all other deploying forces are met. There may not be much time during periods of tension or crisis, so much of the planning must be done before a crisis occurs.

The MAJCOMs provide manning, equipment, training, and specific guidance to their bases. Base-level VM has the following responsibilities:

1. Maintain WRM vehicles according to established guidelines.
2. Comply with the provisions of TO 36-1-191.
3. Identify problem areas (that cannot be solved locally) to MAJCOM.
4. Develop local guidance for VM wartime concept of operations as directed by MAJCOM, to include procedures for operating in chemical/biological contaminated environments and repair of contaminated vehicles.
5. Determine vehicles suited for deployment based on age, parts availability, interchangeability, and maintainability. If possible, select the newest vehicle for deployment, and contact the

MAJCOM if you are unable to ship the newest vehicle. In addition, ensure tasked vehicles are placed in TO 36-1-191 *PLUS* condition and accompanied with a complete temporary mission support kit (TMSK). (**NOTE:** TMSKs will be assembled according to guidance from the Air Force Vehicle Management Neighborhood.)

6. Deploy with sufficient skilled personnel and equipment resources to satisfy all contingency wartime and air expeditionary force (AEF) requirements.
7. Ensure VFM/VMS are familiar with current designed operational capability (DOC) statements, operation plans (OPLAN), base support plans, and unit type code (UTC) mission capabilities (MISCAP).
8. Ensure mobility use code “A” vehicles have mobility readiness spares packages (MRSP) established.
9. Document costs to prepare vehicles, spare parts, and tech data for shipment. Units will retain all expense data associated with the preparation of vehicles for shipment for possible reimbursement.
10. Monitor time-phased force deployment data (TPFDD) to ensure tasked vehicles are shipped to the correct location on time.
11. Maintain copies of TOs to support WRM out load and mobility.
12. Ensure deploying units’ individual members are trained and equipped for contingency operations.
13. Fill or shortfall personnel OPLAN or tasking as appropriate.
14. Refer to the “Vehicle Fleet Manager’s Pre-Contingency Checklist,” located on the VM Neighborhood.

Fundamentals of war reserve materiel program

The WRM program includes materials that are in addition to mobility equipment and primary operating stocks needed to support wartime activities within the USAF WMP. On the other hand, WRM vehicles are those vehicles required in addition to peacetime vehicles, which provide support for forces, missions, and activities listed in the USAF war plans.

441st Vehicle Support Chain Operations Squadron responsibility

The 441 VSCOS manages WRM vehicle assets according to AFI 25-101, *Air Force War Reserve Materiel (WRM) Guidance and Procedures*, and assigns one office as the primary WRM VM function within the headquarters as the overall primary responsible for management of WRM vehicles.

Base-level responsibility

The designated host unit at AF installations (active, guard, or reserve) manages the installation WRM program, to include oversight responsibility for budgeting, maintenance, accountability, storage, and processing monthly WRM reports. The installation commander has overall responsibility to ensure the readiness of assigned WRM, while the LRS commander or equivalent manages the installation WRM program to include appropriate planning, programming, budgeting, acquisition, distribution, storage, and maintenance of the assets assigned to WRM to include TMSKs.

Vehicle management responsibility

VM’s responsibility is to make certain storage and maintenance of WRM vehicles are IAW guidelines in AFI 24-302, AFI 25-101, and TO 36-1-191. General responsibilities are outlined as follows:

1. Ensure WRM assets are continuously maintained and ready for any authorized contingency, complying with the provisions of TO 36-1-191 and other shipping instructions as provided by Robins AFB or the 441 VSCOS.
2. Make sure organizations storing WRM vehicles are also responsible for ensuring the readiness of assigned WRM.
3. Store WRM vehicles in a serviceable, ready-to-use condition. Ensure joint-use WRM vehicles assigned to other units are included in the WRM Vehicle Management Program.
4. Identify WRM maintenance requirements through inspections or scheduling IAW TOs, AFIs and/or AFMANs, and command supplements.
5. Maintain WRM vehicle status to reflect vehicle registration number; unit; location; status; and specific not mission capable, maintenance (NMCM); NMCS; and estimated completion date and report status to the war reserve materiel officer (WRMO)/noncommissioned officer (NCO). (This information may be maintained in a computer database.)

Implementing the WRM program

MAJCOMs develop specific storage concepts for vehicles identified against OPLAN tasking. With so many guidelines and areas of responsibilities, how can you ensure that you're implementing the WRM program properly? Each base has different methods tailored to support their mission. One of the methods to ensure your office implements and complies with all the directives is to develop a self-inspection checklist. A good checklist provides an easy assessment of your WRM program, identifying strengths and weaknesses.

The checklist will need to incorporate all directives related to the program. You may develop the checklist as individual documents or combine all directive tasks. Referring to figures 2-1a and 2-1b, you can see that the checklist includes questions addressing each numerical tasking from the directives.

NOTE: The sample checklists (figs. 2-1a and 2-1b) pose questions about WRM vehicle fleet and equipment storage; all questions are derived from AFIs 25-101 and 24-302 and TO 36-1-191.

Creating a useful checklist is no easy task. Here are some basic steps to perform when developing your WRM checklist:

1. Study and familiarize yourself with all current directives relevant to WRM.
2. Focus on the task and define its intended use.
3. Determine the order of categories and decide if order is important for its intended use.
4. Generate questions (based on related reference) addressing each specific task(s).
5. Ask potential users for input and review/critique. Assess whether the checklist meets its intended use.
6. Finalize and/or print (as needed).
7. Apply the developed checklist to its intended use.
8. Finally, periodically review and revise/update as directives change.

WAR RESERVE MATERIEL (WRM) PROGRAM STORAGE CHECKLIST		PAGE 1 OF 2		
REFERENCE: TO 36-1-191, AFI 24-302 and AFI 25-101		30 JUNE 2011		
NO.	VM&A WRM ASSESSMENT QUESTIONS	YES	NO	N/A
1	During Storage/Storage Site (TO 36-1-191)			
1.1	- Is a major inspection accomplished IAW TO 36-1-191 and are inspection forms revised accordingly?			
1.2	- Is a serviceability inspection performed using AFTO Form 91 whenever storage inspection reveals damage through a failure in preservation (or any other cause)? (TO 36-1-191, 8.11.1.2)			
1.3	- Are vehicles previously listed as servicable scheduled into the vehicle management activity for repair, and return to a servicable condition? (TO 36-1-191, 8.11.1.2)			
1.4	- When reports indicate a possibility of general failure of a specific preservation application or a processing deficiency common to a certain type of vehicle; does the VFM direct inspection of a representative sample of like equipment in storage, and initiate further inspections as indicated by the results of such sampling to ensure that the equipment in storage is serviceable? (TO 36-1-191, 8.11.1.3)			
1.5	- At the storage site, are WRM vehicles stored on a surface which is not level having the wheels or tracks securely chocked to prevent movement? (TO 36-1-191, 8.12.4)			
1.6	- Outside Storage: (TO 36-1-191, 8.12.5) -- Is the most suitable hard standing or natural ground surface selected? -- When natural surface is selected, does it have good drainage, and maintain its texture under normal climatic conditions so as to be free from soft spots? -- To eliminate fire hazards during dry weather, is proper care taken to prevent accumulation of grass and weeds in the storage site and the areas immediately surrounding? -- Are WRM vehicles stored with one end slightly elevated so that the maximum amount of accumulated water will drain from the hull or body? -- Are WRM vehicles stored under trees?			
1.7	- Inside Storage: (TO 36-1-191, 8.12.6) -- Is inside storage used wherever available? -- Are fork lift trucks, fire trucks, and vehicles containing electronic equipment or other types of equipment as determined by the commander or VFM concerned, stored inside buildings or provided equal protection from weather conditions?			
2	WRM Vehicle Storage (AFI 24-302)			
2.1	- Are WRM vehicle authorized and maintained separately from active peacetime vehicle fleet and are normally preserved and stored IAW MAJCOM's specific storage concepts and identified against OPLAN tasking? (AFI 24-302, 2.11)			
2.2	- Are WRM vehicles stored in active (ready-to-roll) or inactive (deep stored) categories IAW MAJCOM directives? (AFI 24-302, 2.11.1)			
2.3	- Are WRM vehicles stored in Active Storage preserved to Level C as described in TO 36-1-191, or as specified by your MAJCOM? (AFI 24-302, 2.11.1.1)			
2.4	- Are WRM vehicles in Inactive Storage stored in an enclosed building and preserved to Level A Storage as described in TO 36-1-191 or as prescribed by MAJCOM guidance? (AFI 24-302, 2.11.1.2)			

Figure 2-1a. WRM storage checklist.

WAR RESERVE MATERIEL (WRM) PROGRAM STORAGE CHECKLIST		PAGE 2 OF 2		
REFERENCE: TO 36-1-191, AFI 24-302 and AFI 25-101		30 JUNE 2011		
NO.	VM&A WRM ASSESSMENT QUESTIONS	YES	NO	N/A
1	During Storage/Storage Site (TO 36-1-191)			
2.5	- Are WRM vehicles controlled according to AFI 25-101, as supplemented by the MAJCOM? (AFI 24-302, 2.11.2)			
2.6	- On active stored WRM vehicles, is lubrication accomplished at least annually on active stored vehicles and PM&I accomplished every two years? (AFI 24-302, 2.11.3)			
2.7	- Are WRM vehicles rotated into the active peacetime fleet (where like-vehicle peacetime authorizations exist) to ensure equipment dependability and equalize their use? (AFI 24-302, 2.11.4)			
2.8	- In general, are vehicles in WRM storage still under warranty? (AFI 24-302, 2.11.5)			
2.9	- Is a parking plan developed for each storage location? (AFI 24-302, 2.11.6)			
2.10	- Are fire extinguishers positioned in the vehicle storage area? (AFI 24-302, 2.11.7)			
2.11	- When inside storage cannot be provided, are outside storage areas well lit, have adequate drainage and are secured by a chain link or equivalent fence? (AFI 24-302, 2.11.8)			
2.12	- Are operational systems checks being performed and exercised every 30 days on WRM vehicles with the exceptions to Storage Policies? (AFI 24-302, 2.11.9)			
3	WRM Storage Objectives (AFI 25-101)			
3.1	- If storage shortfalls exist at the Planned Operating Base (POB), or if storage is unavailable/inaccessible at the POB, are WRM vehicles stored at an alternate storage location (ASL)? (AFI 24-101, 5.3.1)			
3.2	- Are WRM vehicles stored and marked to achieve and maintain continuous state of readiness and make assets readily identifiable and to prevent inadvertent use? (AFI 25-101, 5.3.2) - To support the timing established in the wartime aircraft activity, are WRM vehicles brought out of stored configuration and ready for use at the POB or ready to transport from the ASL to the POB? (AFI 25-101, 5.3.2)			
3.3	- Are storing activities able to store, perform scheduled rotations, and perform inspection intervals and required maintenance? (AFI 25-101, 5.3.3) -- Are local capabilities assessed to ensure adequate support can be provided? -- Are storing activities addressing shortfalls to the Storing Command so that support can be arranged or an ASL designated to meet WRM storage requirements?			
3.4	- Are pure WRM equipment (use code "D") and vehicle (use code "M") marked with a solid black triangle? -- Are markings an appropriate size in relation to the size of the equipment item being marked? (AFI 25-101, 5.3.7.1)			

Figure 2-1b. WRM storage checklist.

Organization during contingency operations

Contingency operations demand the flexibility and resourcefulness of vehicle maintainers, like you, to support the mission. However, it is ideal to run a shop in wartime the same as in peacetime environment. During contingency operations, you are able to fine-tune your abilities to respond to and recover from conventional and irregular events; this will help ensure that you are ready for any real-world event/scenario that may arise. Just remember that the organization at the deployed location could be different.

The terms in the following table relate to general maintenance concepts, especially during contingency operations:

Term	Explanation
Quick-reaction maintenance team (QRMT)	The QRMT is a team of fully qualified, mobile mechanics equipped to carry out repairs at any contingency location deemed necessary for ongoing mission support.
TMSK	The TMSK is a kit of flyaway spare parts that units with deployment vehicles must requisition, mark, and box to ship with each vehicle before its departure. The kit is to support the vehicle for at least 30 days. It is intended to fill the need for parts and bench stock for the initial deployment period until the in-theater supply capability is in-place.
Post-attack vehicle operability (PAVO)	A post-attack vehicle assessment of damage to rapidly determine maintenance priorities in the post attack period. Using the triage maintenance concept, vehicles with the highest priority and needing the least amount of repairs are returned to service soonest. Repair sortie-generating vehicles in triage category level A before vehicles in sortie-sustaining level A. Repair level B sortie-generating vehicles in a two-to-one ratio compared to level B sortie-sustaining vehicles (fig. 2-2). The PAVO assessment is accomplished by the QRMT and determines triage maintenance categories and the sequence of maintenance actions.
Triage maintenance	Triage maintenance is an immediate, temporary repair of a battle-damaged vehicle during post-attack recovery operations in order to support the immediate ongoing mission. Vehicle repair requirements are placed in one of three categories: Level A—immediately returnable to service with minimal or minor repair. Level B—repairable but requires over 30 minutes of work but less than four hours. Level C—need repairs taking over four hours or not repairable at all. Emphasis is placed on repairing the vehicles that have the highest priority and can be returned to service soonest.

Priority I Vehicles, Sortie Generating.

VEHICLE TYPE	MODEL OR SIZE
Aircraft Refuelers	R-9; R-11; R-12; Fuels Mobility Support Equipment (FMSE), Fuels Operational Readiness Capability Equipment (FORCE)
Aircraft Towing	MB-2, MB-4, U-30, Bobtail
Munitions Loading/Hauling	7.5T Crane; 50K Container Handler; Truck Tractor; 30/40 Foot Semi-Trailer; Forklift assigned to munitions functions
Aircraft Servicing	Potable Water Truck; Deicer; Lavatory Service Truck; Staircase Truck
Aircraft Cargo Loading/ Unloading	Aircraft Loader (25/40/60K) and Wide Body/Lower Lobe Loader, 10K Standard Forklift; 10K All Terrain Forklift; 40 Foot Rollerized Trailer
Aircraft Launch Vehicles	Various general purpose vehicles for crew transport and aircraft maintenance

Priority II Vehicles, Sortie Sustaining.

VEHICLE TYPE	MODEL OR SIZE
Firefighting Vehicles	Structural, Crash and Rescue Firefighting Vehicle
Medical	Ambulance Bus; Ambulance, Modular
Material Handling	Forklift; Truck, 9 Ton Hi-Lift
Explosive Ordnance Disposal	M-113 Armored Personnel Carrier (APC), M1116 High Mobility Multipurpose Wheeled Vehicle (HMMWV), Armored Conversion
Fuel Support	Truck Tank 1200 gallon, Trailer, Fuel 600 gallon
Rapid Runway Repair (RRR)	Truck, Dump; Tractor Dozer; Loader; Roller; Truck Tractor; Excavator; Grader; Sweeper Vacuum; Trailer; Farm Tractor, with broom
Snow and Ice Removal	Snow Plows, Blowers and Sweepers; Dump Trucks equipped with plows, blowers and/or brooms; Farm Tractors equipped with brooms
Security Forces Vehicles	HMMWV; M-113 APC; air conditioning equipped K-9 vehicles; other critical vehicles assigned to SFS

Figure 2-2. Mission critical list.***Organizational maintenance***

An increased level of operator maintenance will be essential during wartime. The local VFMs and vehicle control officers (VCO) will determine the scope of increased operator maintenance and the level of support (e.g., parts, tools, etc.) from VM. Using organizations must understand that in a wartime situation, VM will not be able to provide training to the users. Because of this, it may be advantageous during peacetime, when possible, to set-up a minor maintenance section that provides training for operators to perform minor repairs such as replacing starter and battery cables, drive belts, headlights, tire repairs, hoses, and so forth.

Expanded mobile maintenance

On-scene repair is the goal of expanded mobile maintenance. In using this concept, you can position VM personnel in key areas throughout the base for quicker response as well as to disperse VM assets. The capability for on-site repair or “quick turn-around” of critical sortie generating vehicles is essential to enhance wartime operation. For this to work, VFMs must determine the number and makeup of teams, and train and equip a specialized team to perform this task. If possible, each team must be equipped with their own mobile maintenance trucks, with tools, equipment, parts, and supplies necessary to sustain a 30-day operation.

Intermediate and minor maintenance

Each VM operation establishes a priority system that clearly identifies priority vehicles based on their mission support role. Assign the highest priority to sortie-generating vehicles. Sortie-sustaining vehicles have a lower priority (refer back to fig. 2-2). The concept of “minimum-essential levels” has to suffer based on established contingency maintenance priorities. Parts permitting, sortie-generating vehicles are worked on a 24-hours-a-day, 7-days-a-week basis until the vehicle is returned to service. An expanded cannibalization program is established to keep critical vehicles operational. VFMs have unlimited cannibalization authority on battle-damaged vehicles deemed a total loss.

Mission and spare parts availability may drive a lower standard of serviceability compared to peacetime operations. During wartime and contingency, you may waive repairs not affecting safe operation or operational capabilities of the vehicle. The senior maintenance technician at the site determines the safety and serviceability of a vehicle. As a rule, if the vehicle operates under its own power, goes to where you want it to go, stops when you want it to stop, attains a reasonable speed, and can carry the load, it may be considered safe and mission capable.

At deployed or dispersed locations, the VFM, or the senior maintenance technician, determines if maintenance capability exists. Perform PM&I only if capability exists and operational mission tempo allows. Perform unscheduled maintenance at the onset of hostilities to the maximum extent possible. As the situation allows, maintenance capability should return to fixed locations, accomplishing all actions at the local level to the maximum extent possible.

010. Time compliance technical orders/service bulletins

This lesson covers the time compliance technical order (TCTO), manufacturer safety recall, and service bulletin/one-time inspection program for AF vehicles. Managing this program is of vital importance to the safety and serviceability of the vehicle fleet. The 441 VSCOS monitors compliance with upward reporting to the appropriate Robins AFB SE&V. Accomplish all inspections with a vehicle and equipment work order, and document results on the vehicle historical record.

Time compliance technical order

TCTOs are managed differently than regular TOs. They must be requisitioned individually, and as a series, they must be identified for automatic distribution. The 441 VSCOS is notified by Robins AFB SE&V concerning newly released TCTOs. The 441 VSCOS will provide VFMs a list of vehicles requiring the TCTO to forward to their units in their command for action. VM must ensure they are on distribution for each TCTO series. These series are listed in the “-36” index for the type of vehicle they pertain to. The TO monitor should review the “-36” index on receipt and ensure there is an applicable TCTO series for each type of vehicle assigned. This ensures VM receives TCTOs published under that series.

TCTOs are generally the “fix” issued to a vehicle or equipment problem identified by a manufacturer or a deficiency report. Pay particular attention to the instructions given on the TCTO cover page to determine TCTO action (i.e., affected vehicles, when work will be done, parts requirements, etc.). FM&A manages the TCTO program in VM.

To do that, follow and observe these step-by-step procedures:

1. Date stamp each TCTO once received. Determine TCTO action and/or parts kit requirement by reviewing the TCTO cover page for affected vehicle registration numbers.
2. Notify Materiel Control to order required parts kits after determining and verifying base requirements.
3. Contact the appropriate item manager/equipment specialist for the affected vehicle type by telephone, fax, or electronic mail. Provide vehicle registration numbers and requisition due-in document numbers obtained from Materiel Control to enable kit release.
4. Schedule TCTOs according to availability of materials, number of vehicles, and so forth.

5. Take continuous supply follow-up action until receipt of kits.
6. Schedule affected vehicles as soon as possible after receipt of kits. A TCTO that is not completed by the “when work will be done” date is an “outstanding” TCTO, and places the affected vehicles’ serviceability in jeopardy. The 441 VSCOS may direct removal of these vehicles from service until the outstanding TCTO is accomplished. The VFM/VMS advises the 441 VSCOS within 24 hours after a TCTO becomes outstanding.
7. Record the completion of the TCTO on the vehicle historical record; file the completed TCTO (work order and instructions) in the permanent side of the record jacket; and advise the 441 VSCOS by message, letter, or electronic means when completed.
8. Maintain an active master TCTO file. A good practice is to make master files to contain two parts: the first part identifying current TCTOs with work to be accomplished and the second part with TCTOs already accomplished. Use a locally developed work sheet identifying registration number, TCTO number, dates, etc. TCTOs are active until the rescission date. A rescinded file may also be maintained when needed for special programs and projects. Follow the TCTO instructions for destroying inactive TCTOs.

Manufacturer recall program, service bulletins, and one-time inspection

From time to time, manufacturers must recall vehicles to fix a problem or a potential problem. Most of these problems involve safety. It may be unknown to you, but every time you send a deficiency report or send a warranty part exhibit, you are participating in this program. When you are notified of a recall, you must take action as soon as possible to have the work done for the vehicles involved. If not specified as to where you need to take the vehicle, contact the manufacturer’s local dealer nearest you to schedule the work. If there are numerous vehicles involved, explore the possibility of having the dealer do the work at your facility. If you do not have access to the manufacturer’s dealership, have the manufacturer send the part, and have the shop do the work and request reimbursement for the labor if possible. Because of liability, you must promptly have the work done. Document and record this in the historical records. To do this, follow the documentation procedures per FMIS and AFI 24-302. If Robins AFB SE&V or the 441 VSCOS notifies you of the recall, inform them when the work is finished.

Sometimes, there are “bugs” in a vehicle that a manufacturer does not foresee at the “drawing table” or at the assembly line. When this happens, repair or troubleshooting procedures are not included in the repair or service manual. Manufacturers address these problems by issuing “service bulletins. “If you experience the same problems indicated in a service bulletin and the vehicle is under warranty, pursue warranty action. Keep a file of the service bulletins that you receive for reference. For easier tracking, maintain a file the same as the TCTO program.

Consequently, a one-time inspection is directed by what is called an inspection TCTO, which is a non-configuration change TCTOs that determines equipment condition/configuration, also approved by the appropriate technical content manager (TCM) division. These one-time inspections may be issued as immediate-action, urgent-action, or routine-safety category TCTOs. They either are performed outside the normal periodic inspection schedule for the equipment or provide inspection criteria not covered in existing TOs. It may also require inspection only; inspection and replacement of hardware with like serviceable items; inspection with repair IAW repair manuals; or similar requirements that do not change form, fit, or function. All TCTOs directing a one-time inspection shall indicate whether previous inspections satisfy the one-time requirement and indicate whether the requirement is being included in the normal inspection manual.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

007. Evaluate personnel training needs

1. As a work center supervisor, who do you work with to build your MTP and ITP?
2. Who shares the overall responsibilities for the VM training program?
3. Can a civilian be appointed as the vehicle training monitor? If so, why?
4. What are the other responsibilities of the VM training monitor?
5. What are two of the *biggest* factors/challenges that the VFM/VMS and the training monitor have to overcome?

008. Develop budget inputs with justification

1. Define financial planning.
2. What are the five steps to creating a financial plan?
3. What do you do if you have a legitimate need for additional funds?
4. List some ways you can help control expenses.
5. What is embossed on the fleet service card?
6. As a minimum, what should the fleet service card control register include?
7. What information is reflected on the refundable/reimbursable list?

8. When does the FM&A furnish a list of supported tenant organizations to the base comptroller?

009. War reserve materiel vehicle program

1. What is the LRS wartime mission?
2. What is the AF policy regarding the support for the USAF WMP?
3. Match the tasks in column A with the responsible office or individuals in column B. Each item in column B may be used once, more than once, or not at all.

Column A

- ____ (1) Provide the necessary forces to accomplish the in-theater mission.
- ____ (2) Provide manpower and equipment to vehicle maintainers.
- ____ (3) Ensure logistics requirements of all other deploying forces are met.
- ____ (4) Determine vehicles suited for deployment.
- ____ (5) Deploy with sufficiently skilled personnel and equipment.
- ____ (6) Provide specific guidance to bases.
- ____ (7) Maintain WRM vehicles according to established guidance.

Column B

- a. VM.
- b. MAJCOM.
- c. LRS planners.

4. What is VM's responsibility concerning WRM vehicles?
5. What is one of the methods to ensure your office implements WRM program properly and complies with all the AF directives?
6. Match the descriptions in column A with the appropriate terms in column B. Each item in column B may be used once, more than once, or not at all.

Column A

- ____ (1) A damage assessment to determine priority.
- ____ (2) Temporary repair of battle damaged vehicles.
- ____ (3) A kit of flyaway spare parts.
- ____ (4) A team of fully qualified mobile mechanics.
- ____ (5) On-scene repair is the goal.

Column B

- a. TMSK.
- b. Triage maintenance.
- c. Expanded mobile maintenance.
- d. QRMT.
- e. PAVO.
- f. Intermediate and minor maintenance.
- g. Organizational maintenance.

010. Time compliance technical orders/service bulletins

1. How does VM ensure they receive a published TCTO?
2. To what part of a TCTO should you pay particular attention? Why?
3. What is the first step after receipt of a TCTO?
4. What may happen if a TCTO becomes “outstanding”?
5. How long are TCTOs active?
6. Why would you receive a service bulletin?

2-2. Fleet Management and Analysis

The purpose of interpreting maintenance and operations data is to aid management in accounting for, using, and maintaining the base vehicle fleet by the most efficient, economical means. The reports available in DPAS show essential information as a basis for formal analysis. The use of analysis helps management project existing capabilities into plans and schedules and institute controls against variation. The results of the review and analysis of collected data are needed in all successful planning phases. To be of benefit, use analysis and recommendations as soon as possible after completion. Your analysis presentations should be brief, factual, and easily understood and must show the picture as it presently exists.

011. Interpreting vehicle management products

The purpose of interpreting maintenance data is to aid management at all levels in accomplishing its maintenance mission by the most efficient and economical means. The FMIS has the ability to generate various reports (inquiries) as required, daily, monthly, and quarterly. The consolidation of these reports shows essential information to identify problems. Become familiar with these reports, because they contain valuable information to help you conduct your analyses.

Mission capable report

Use Logistics Installation and Mission Support Enterprise View (LIMS-EV) in the AF Vehicle Management Neighborhood to access the current mission capable (MC) rate status for your base. This report is helpful to tracking MC times on a daily, monthly, quarterly, and annual basis.

The MC report will give you a picture of how month-to-date NMCM/NMCS/NMC is going, and towards the end of the month, how the monthly rates look. Large amounts of NMCM or NMCS hours will cause high percentages until the NMC hours are absorbed by the large amount of available hours built up daily. For example, if one fire truck is vehicle out of commission (VOC) at the start of the

month and then stays in commission the rest of the month, the NMC rate will be lower each day. See figure 2-3 for an example of the LIMS-EV MC view.

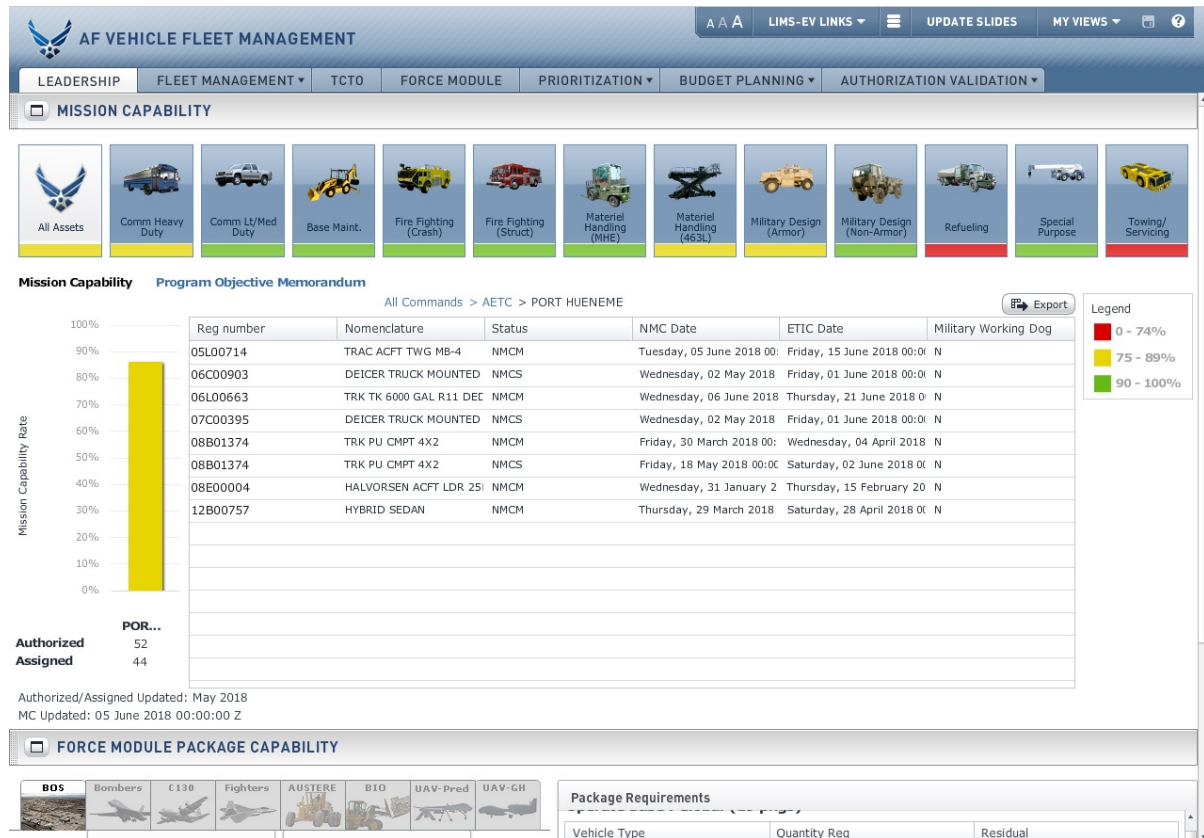


Figure 2-3. Sample LIMS-EV mission capable view.

Vehicle master inquiry

When requested, this listing can be printed in FMIS with specific data fields if you choose to view a master database on assets as follows:

- From the Inquiries menu, go to Maintenance, Main Asset. (**NOTE:** It will auto populate the first two fields for active assets and your current location.)
- Add any other fields you want, but if you just run it with the first two, it will give a master data report on assets.
- Click Fields to choose specific data fields you want to see.
- Click Submit to create an inquiry extract for an excel file.

This report contains data for all registered and nonregistered vehicles for which VM has primary maintenance responsibility. The maintenance asset inquiry lists static data, such as registration number, assigned organization, acceptance data, and vehicle equivalents. They also list changing data, such as replacement code, cumulative miles/hours/kilometers, and the one-time repair limit (OTRL).

Work order master inquiry

The work order master inquiry status report is produced when requested. You can use this report to keep track of work orders in DPAS, and you should review it to ensure the data is current. Since DPAS is a live database and does not require an end-of-day processing, it will be up to your leadership to make the decision to continue to generate the daily report. The VSCOS does not require the base level to pull daily data. FM&A still has the option to process by the following (fig. 2-4):

After “Inquiries,” “Maintenance,” and “Work Order,” complete the below:

1. Populate the first field *Query Type–Search By Value “Work Order.”
2. Populate the next two lines with Estbd Dt From and Estbd Dt To with the days needed.
3. Choose Maintenance Activity/Owning UIC on the next field.
4. Go to inquiries, then view the inquiry extract to pull it into an Excel file.

Figure 2-4. Work order master inquiry status report.

5. Click “Show Inquiry” and the results will display. You can also download the results into PDF, Word, or Excel documents (fig. 2-5).

Figure 2-5. Work order inquiry sample.

012. Analyzing vehicle management products

Effective VM includes continuing process improvement by constantly assessing customer needs; analyzing services; and monitoring efficiency, economy, and utilization of the vehicle fleet. You must validate and document recommendations from analysis. The LIMS-EV fleet management module compiles data necessary to accomplish these types of analyses.

Vehicle requirements

Federal law controls the purchase of passenger-carrying vehicles for government use. Congress authorizes the purchase of government vehicles through the Appropriations Act and sets statutory price limitations for purchasing certain types of vehicles. The quantities listed in the ASs determine budgetary requirements and must not include additional assets for in-maintenance replacements, pipeline, or vehicles in depot maintenance. HQ USAF sets and manages MAJCOM vehicle ceilings and implements the vehicle fleet growth policy. MAJCOMs must not exceed the established ceilings without prior approval from the 441 VSCOS or other Headquarters United States Air Force, Directorate of Logistics (HQ USAF/A4LE)-designated enterprise management authority. FM&A must support requests to exceed these ceilings by a verifiable mission change (i.e., new weapons system, etc.) To prevent an increase in total authorizations, fleet managers must offset any non-mission increase by adjusting other vehicle authorizations. Each MAJCOM has the responsibility to establish policy to maintain these ceilings.

Vehicle authorizations

You must conduct an analysis on all vehicle authorization requests. The objective of your analysis is to validate the requirement and determine whether a more cost-effective avenue, such as short-term lease or co-utilization of assets, can satisfy the requirement without adding an additional authorization. An authorization is an approved “slot” for a vehicle and is established based on justification and utilization of your current vehicles and your expected use of future vehicles. Submit requests for vehicle authorization changes on an AF Form 601. This change could be to increase, decrease, or establish a new authorization.

The acquisition process begins when an organization is in need of a vehicle to accomplish its mission. The unit VCO/vehicle control noncommissioned officer (VCNCO) will submit a vehicle authorization request explaining the intended use of the vehicle. The VCO/VCNCO must justify the request thoroughly and accurately. (**NOTE:** Use the MAJCOM-approved format to justify adjustments to vehicle requirements and initiate follow-up disposition action after 60 calendar days.)

To acquire a vehicle simply because a unit wants one is not a sufficient justification. Therefore, you must have a basic understanding of what constitutes a valid request before procuring a vehicle. You must also identify possible alternative means of support, as well as other factors before you ever consider establishing a new vehicle authorization. All valid requests must contain supporting data with the following:

- Utilize U-Drive-It (UDI) vehicles to the maximum extent to satisfy short-duration or one-time mission-essential requirements.
- Base types and quantities of vehicles required on the minimum number necessary to accomplish the mission.
- Except as stated in AFI 24-302, vehicles are unauthorized for reasons of grade, prestige, personal convenience, or assigned to individual persons.
- Review vehicles assigned that do not meet AF- or base-utilization goals for mission necessity, or other possible authorization or rotation actions.

When conducting the authorization analysis, ensure each of the following questions is addressed in the justification block of the AF Form 601, and answered with a “yes” before sending the request to MAJCOM:

1. Does the justification indicate the current master vehicle report (MVR) using activity or the proposed user?
2. Does the justification cite the directive, project, or publication that generated the request, if appropriate?
3. Does the justification fully explain proposed use of the vehicle?
4. Does the justification identify expected utilization information (miles, hours, passengers, equipment, supplies, materials, number of trips, etc.)?
5. Does the justification list the number of vehicles currently authorized and assigned to the requesting unit and justify why co-utilization will not meet mission requirements?
6. Does the request justify why transportation support from vehicle operations (taxi or UDI) cannot satisfy the vehicle requirement (FMIS data must substantiate lack of support)?
7. Does the justification include a mission impact statement on the organization, base, or wing if denied?
8. Does the justification cite any actions taken to realign other authorizations to accommodate the requirement?

Master vehicle report

The MVR (fig. 2-6) is the primary source document that lists the vehicle authorizations and the vehicles that occupy those authorizations. The MVR breaks down these authorizations by prime NSN. It is also used as the hand receipt that VCO/VCNCOs are required to receipt for permanently assigned unit vehicles.

The 441 VSCOS develops and maintains the MVR and is accessible through either LIMS-EV vehicle view or the transaction request tool (TRT). For alternative fuel (AF), low-speed vehicles (LSV), and other government motor vehicle conveyance (OGMVC), such as neighborhood electric vehicles, golf carts, scooters, and other small low-speed utility vehicles,, will be managed in several different categories with a prime NSN for each category (refer to AFI 24-302 for detailed instruction). However, for LSVs purchased with unit funds prior to June 2006, organizations may continue to manage these assets as equipment until the vehicle has reached its life expectancy. This category of LSVs will be assigned a prime NSN 2340-00-540-3900, AS 036, *Non-Registered Equipment Management System Vehicle*, and will be considered as Non-Registered Equipment Management System (REMS) reportable LSVs.

The MVR can only be updated by the 411 VSCOS (i.e., addition, increase, decrease, or deletion) once approval has been received from the host base FM&A section.

Master Vehicle Report	
Date of Report Generation:	06/06/2018
Report Generated by:	dylan.v.petersen
Email:	
Phone Number:	
Filters Applied:	Filters: AETC; LACKLAND (MOB); UNIT: 344 TPS

Auth NSN	Asset NSN	Vehicle Type Name	ALITH MGMT	MGMT Account	ASC	EQP CD	Auth Qty	Agency Reg Number	UC OC	Unit	User	Use CD	SC	Sub EOL	Dt EDD	Detail Doc #	MT LT AF V OR KR NG DO G
2330010366569		TRK CRL 4X2 15 PAX	B192			L	1					B					
	2330010366569	TRK CRL 4X2 15 PAX	B192	243DJ	01LDSH	L		G432056L	AF 07	344 TPS	FOURTH TRAINING SQ	K	A	S		E243D00000281	N
Sub Totals:	Authorized	1	Vacants	0	Assigned	1	0	0	Qty Dt 0	Qty EDD	0						
2330014846748		TRK 1/2T CREW CAB 4X4	B216			V	1					B					
	2330011720307	TRK CGO CMPT 4X4 3500G G	B227	243DJ	01LDSH	V		11B00952	AF 07	344 TPS	FOURTH TRAINING SQ	K	A	U	2035	E243D00000029	N
Sub Totals:	Authorized	1	Vacants	0	Assigned	1	0	1	Qty Dt 0	Qty EDD	0						
2330015041443		TRK PU 4X2 CREW CAB	B221			V	1					B					
	2330015761349	TRK PU 4X2 CREW CAB	B221	243DJ	01LDSH	V		10B00805	AF 07	344 TPS	FOURTH TRAINING SQ	K	A	S	2034	E243D00000307	N
Sub Totals:	Authorized	1	Vacants	0	Assigned	1	0	0	Qty Dt 0	Qty EDD	0						
393000566897CT		TRK FL 10K 463L	E956			V	1					C					
	3930015085498CT	TRK FL 10K AT 463L	E958	243DJ	01LDSH	V		05E00618	AF 07	344 TPS	FOURTH TRAINING SQ	L	A	U	2029	E243D00000658	N
Sub Totals:	Authorized	1	Vacants	0	Assigned	1	0	1	Qty Dt 0	Qty EDD	0						
3930014463515CT		HALVORSEN ACFT LDR 25K	E936			V	1					C					
	3930014463515CT	HALVORSEN ACFT LDR 25K	E936	243DJ	01LDSH	V		05E00007	AF 07	344 TPS	FOURTH TRAINING SQ	L	A	S	2034	E243D00000662	N
Sub Totals:	Authorized	1	Vacants	0	Assigned	1	0	0	Qty Dt 0	Qty EDD	0						

Total Authorized:	5
Total Assigned:	5
Total Vacants:	0
Total EOL:	0
Total Due-In:	0
Total EDD:	0
Total Unavailable Subs:	2

Figure 2-6. Master vehicle report.

Custodian Authorization/Custody Receipt Listing

The Custodian Authorization/Custody Receipt Listing (CA/CRL) (fig. 2-7) provides a list of all authorized and assigned vehicles for your vehicle account. The listing is a custody receipt for assigned vehicles and equipment when signed by the custodian. If a custodian has more than one organizational code assigned, a separate CA/CRL will print for each code. Items on this list are in authorized, preferred stock number sequence, with all substitutes listed immediately after the preferred number. These substitute items must always have the same in-use detail document number as the authorized preferred stock number. The custodian should check the CA/CRL to make sure all substitutions are valid. The authorizations on the CA/CRL must coincide with those listed on the MVR. When you receive your new CA/CRL and MVR, verify all changes and new authorizations.

Posting changes

As changes occur, enter the action, the equipment request control number, and the transaction serial number on the CA/CRL, if required. Draw a single line through the old data and enter the new data.

Entering new authorizations

Enter new authorizations at the bottom of the CA/CRL. However, where adequate space exists, you may make new entries between the lines and in the same sequence as the CA/CRL. All entries will include document number, NSN, nomenclature, ASC, quantity authorized, and quantity in-use or due-out.

Utilization/rotation analysis

Vehicles must be rotated between organizations when practical and economically feasible to help ensure they reach their programmed life expectancy. High-mileage vehicles should be rotated with low-mileage vehicles of the same type to prolong the life of the vehicle. For example, Deployment and Distribution has a pickup truck driven 50,000 miles over the past year, and VM has the same type truck driven 20,000 miles over the past year. By rotating between these two flights, you have taken steps to prolong the life of the high-mileage vehicle. For underused vehicles, you must consider authorization deletions, changes, or rotations. When determining if rotation actions are necessary, consider utilization data, mission requirements, and the cost of moving equipment.

Analyze LIMS-EV data to determine how well the fleet compares to established AF- and base-mileage averages, as well as other VM objectives. *Do not include* GSA and other leased vehicles in your analysis. Use vehicles listed in the VM index file as the basis for the annual utilization/rotation analysis. Document all analyses with recommendations and action taken, and include the rationale for action taken.

Consider the following steps when taking such actions for underutilized vehicles:

- Conduct an analysis of its vehicle's utilization data.
- Deletions/changes to its vehicle authorization.
- Validate its mission requirements.
- Cost (if any) of moving or rotating the vehicle/equipment.

05 OCT 11 /S 5270 01 NGV902/100706 11278 11278 PAGE

ORG TITLE	MXS/VEHICLE	ORG CODE 120	SHOP CODE	TYPE PRODUCT	CA/CRL	CE I U	IC C C UI	A-S-C	ASL -	UTC -	QNTY CE	UNIT PRICE	P CODE	WM A	MEMO	FIRM	ERC	MEC
DOC																		
NBR	STOCK NUMBER																	
0804	2320 01 549 0665																	
	TRUCK UTILITY	U	U	P	B	EA	010KACK	4	0	0	0	\$14000.00						
	EAID LOCATION -																	
SUB	2320 01 563 2569																	
	MINI-UVA-VAN																	
	EAID LOCATION -																	
SUB	2320 01 562 9471																	
	MINI-UTR-CREWCA	U	U	B	EA	010KACK												
	EAID LOCATION -																	
SUB	2320 01 563 1650																	
	MINI-UTK-TRUCK	U	U	B	EA	010KACK												
	EAID LOCATION -																	
SUB	2320 01 563 1650																	
	MINI-UTK-TRUCK	U	U	K	EA	010KACK	08B3474	A	T	0	0	\$12073.00						
	DEPLOYED RID -																	
SUB	2320 01 562 9471																	
	MINI-UTR-CREWCA	U	U	K	EA	010KACK	08B4154	A	T	0	0	\$13343.00						
	DEPLOYED RID -																	
SUB	2320 01 563 2569																	
	MINI-UVA-VAN	U	U	K	EA	010KACK	08B4191	A	T	0	0	\$13009.00						
	DEPLOYED RID -																	
SUB	2320 01 563 2569																	
	MINI-UVA-VAN	U	U	K	EA	010KACK	08B4192	A	T	0	0	\$13009.00						
	DEPLOYED RID -																	
4448	2320 01 123 3999																	
	TRK PU CMPT	4X2	U	P	B	EA	048KAEG	1		0	0	\$11561.00						
	EAID LOCATION -																	
4448	2320 01 123 3999																	
	TRK PU CMPT	4X2	U	P	K	EA	048KAEG	05B2037	I	R	0	\$11561.00						
	DEPLOYED RID -																	

I ACKNOWLEDGE RESPONSIBILITY FOR ALL PROPERTY
ON CUSTODY RECEIPT CONSISTING OF PAGE 1 THROUGH 5.

CUSTODIAN SIGNATURE..... DATE

CUSTODIAN TYPED/PRINTED NAME.....

I CERTIFY THAT I OR MY DESIGNATED REPRESENTATIVE
HAVE PERFORMED INVENTORY OF ALL PROPERTY
ON CUSTODY RECEIPT FOR CUSTODIAN ACCOUNT
AND ALL BALANCES AS INDICATED ON CUSTODIAN AUTH /
RECEIPT LIST DATED ARE CORRECT.

CUSTODIAN SIGNATURE

CUSTODIAN TYPED/PRINTED NAME

SHORT EXCESS ASC 000

IN-USE 33

AUTHORIZED 34

\$1,151,876.00

\$1,040,833.63

\$15,834.00

\$0.00

TOTAL UNITS 33

TOTAL DOLLAR VALUE

Figure 2-7. CA/CRL.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

011. Interpreting vehicle management products

1. What program is used to access the current MC rate for your base?
2. Which report contains data for all registered and nonregistered vehicles for which VM has primary maintenance responsibility?
3. What are some examples of vehicle static data?
4. What are some examples of vehicle changing data?
5. What report can you use to keep track of work orders in DPAS?

012. Analyzing vehicle management products

1. What does effective VM include?
2. What is Congress' role in the purchase of government vehicles?
3. How do fleet managers prevent an increase in total vehicle authorizations?
4. What is the objective of the vehicle authorization analysis?
5. How do you submit a request for a vehicle authorization change?
6. How can you satisfy vehicle requirements that are of short duration or one-time mission essential?
7. Who develops and maintains the MVR?

8. When can the MVR be updated?
9. What should you do when you receive a new CA/CRL and MVR?
10. How do you post a change to the CA/CRL?
11. Why may it be necessary to rotate vehicles between organizations?
12. When determining if rotation actions are necessary what factor should you consider?
13. What information do you use as the basis for the annual utilization/rotation analysis?

Answers to Self-Test Questions

007

1. UTM.
2. VFM/VSM and the UTM.
3. Yes, for continuity purposes.
4. Preparing and submitting AETC in-resident training requests in response to the base training manager's annual screening requests. (This should be prepared during the fourth quarter of the current FY for the next FY.) Assisting supervisors in the development and use of training requirements and techniques. Coordinating with the UTM in obtaining any needed training from AETC and commercial training sources as outlined in <https://etca.randolph.af.mil> and AFI 36-2201. Conducting quarterly reviews of ITPs, within TBA for personnel in skill-level upgrade training assigned to VM. Conducting quarterly reviews on the training program using the VM training checklist in AFI 24-302, Att. 5. Briefing VFM/VMS on status of all personnel in upgrade training on a regular basis.
5. The influx of inexperienced 3-skill-level personnel and contingency taskings. There are cyclical periods when there will be an overabundance of 3-skill-level personnel outnumbering 5-skill-level personnel, thus creating an experience gap that you will have to overcome.

008

1. The process of allocating funds towards competing needs, taking into account your income and goal.
2.
 - (1) Find out how much you spent last year in each of the different EEICs.
 - (2) Ask yourself whether you are going to spend money on those areas again.
 - (3) Find out if there are upcoming items or projects that you may need to support or that may impact on the fleet.
 - (4) Estimate your expenses honestly and accurately.
 - (5) Provide written justifications for your financial plan.
3. Document it by establishing an unfunded requirement.

4. Daily monitoring of contract and supply funds, challenging high-priced items, taking full advantage of warranties, and doing the job right the first time.
5. Vehicle registration number and United States Air Force.
6. Card number, responsible individual, organization, date issued, return date, and delivery ticket number.
7. Costs of direct maintenance hours, material, and services used in repairing vehicles.
8. At the beginning of each FY and when a change is required.

009

1. Mobilize, deploy, receive, and sustain combat forces.
2. To have motor vehicles, manpower, tools, facilities, and shop equipment on hand to support the USAF WMP.
3.
 - (1) c.
 - (2) b.
 - (3) c.
 - (4) a.
 - (5) a.
 - (6) b.
 - (7) a.
4. To make certain storage and maintenance of WRM vehicles are according to guidelines in AFI 24-302, AFI 25-101, and TO 36-1-191.
5. Develop a self-inspection checklist to assess your program and identify strengths and weaknesses.
6.
 - (1) e.
 - (2) b.
 - (3) a.
 - (4) d.
 - (5) c.

010

1. The TO monitor reviews the -36 index to ensure an applicable TCTO series for each type of assigned vehicle is on distribution.
2. TCTO cover page because it identifies affected vehicles, "when work will be done by", and parts requirements.
3. Date stamp each TCTO once received.
4. The 441 VSCOS may direct removal of these vehicles from service until the outstanding TCTO is accomplished.
5. Until the rescission date.
6. When repair or troubleshooting procedures are not included in the repair or service manual.

011

1. LIMS-EV.
2. Vehicle master inquiry.
3. Registration number, assigned organization, acceptance data, and vehicle equivalents.
4. Replacement code, cumulative miles/hours/kilometers, and the OTRL.
5. Work order master inquiry.

012

1. Continuing process improvement by constantly assessing customer needs, analyzing services, and monitoring efficiency, economy, and utilization of the vehicle fleet.

2. Authorizes the purchase of government vehicles through the Appropriations Act and sets statutory price limitations for purchasing certain types of vehicles.
3. They must offset any non-mission increase by adjusting other vehicle authorizations.
4. To validate the requirement and determine whether a more cost effective avenue, such as short-term lease or co-utilization of assets, can satisfy the requirement without adding an additional authorization.
5. Submit an AF Form 601.
6. Utilize the UDI fleet to the maximum extent possible.
7. 441 VSCOS.
8. Once approval has been received from base FM&A.
9. Verify all changes and new authorizations.
10. Draw a single line through the old data and enter the new data.
11. To help ensure the vehicles reach their programmed life expectancy.
12. Utilization data, mission requirements, and the cost of moving equipment.
13. Vehicles listed in the VM index file.

Complete the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

29. (007) As a work center supervisor, with whom would you work to create master training plans (MTP) and individual training plans (ITP)?
 - a. Vehicle fleet manager (VFM)/vehicle management superintendent (VMS).
 - b. Another work center supervisor.
 - c. Unit commander.
 - d. Unit training manager (UTM).
30. (007) When would you review master training plans (MTP) and individual training plans (ITP)?
 - a. Monthly or when any changes are made to the career field education and training plan (CFETP).
 - b. Quarterly or when any changes are made to the CFETP.
 - c. Annually or when any changes are made to the CFETP.
 - d. Bi-annually or when any changes are made to the CFETP.
31. (007) How often should the vehicle management (VM) training monitor review individual training plans (ITP) on upgrade trainees?
 - a. Daily.
 - b. Monthly.
 - c. Quarterly.
 - d. Annually.
32. (007) Within how many days after a trainee is assigned to a work center would a supervisor's *initial* journal entry be documented in the training business area (TBA)?
 - a. 30.
 - b. 60.
 - c. 90.
 - d. 120.
33. (007) Who does the training monitor work with to develop a rotational training plan?
 - a. Vehicle fleet manager (VFM)/vehicle management superintendent (VMS) only.
 - b. VFM/VMS and work center supervisors.
 - c. Work center supervisor only.
 - d. Commander.
34. (007) What two areas does on-the-job training (OJT) consist of?
 - a. Career knowledge and task performance.
 - b. Career knowledge and personal knowledge.
 - c. Task knowledge and task performance.
 - d. Task performance and personal knowledge.
35. (008) Which document gives a list of all the shop's expenditures by element of expense/investment code (EEIC)?
 - a. Vehicle master list.
 - b. Daily document register.
 - c. Vehicle management (VM) report.
 - d. Responsibility center/cost center (RC/CC) manager's report.

-
-
36. (008) Who is responsible for controlling the vehicle management budget?
- a. Materiel Control.
 - b. Base comptroller.
 - c. Vehicle fleet manager (VFM).
 - d. Vehicle management and analysis (VM&A).
37. (008) Which organization provides policy oversight for the Department of Defense (DOD) fleet credit card?
- a. Base fuels flight.
 - b. Defense fuels center.
 - c. Defense Energy Support Center (DESC).
 - d. General Services Administration (GSA).
38. (008) The Department of Defense (DOD) fleet credit card is reissued to customers in a new control register
- a. quarterly.
 - b. by 1 January of each year.
 - c. by 1 October of each year.
 - d. only upon receipt of a new vehicle.
39. (008) The Air Force (AF) Form 616, Fund Cite Authorization (FCA), is provided to the accounting liaison office (ALO) to report the projected estimate of Department of Defense (DOD) fleet credit card non-fuel purchases
- a. quarterly.
 - b. by 1 January of each year.
 - c. by 1 October of each year.
 - d. only upon receipt of a new vehicle.
40. (008) The Defense Property Accountability System (DPAS) places costs in the reimbursable/refundable file
- a. during end-of-week processing.
 - b. during end-of-day processing.
 - c. when the work order closes.
 - d. as the costs occur.
41. (008) Fleet Management and Analysis (FM&A) should furnish the base comptroller's budget office with a list of supported tenant organizations
- a. only when the budget office requests the data.
 - b. only at the beginning of each fiscal year.
 - c. only at the beginning of each calendar year.
 - d. at the beginning of each fiscal year and when a change is required.
42. (009) Which statement *best* describes a vehicle maintenance (VM) function in support of the United States Air Force War and Mobilization Plan (WMP)?
- a. Provide manning and training.
 - b. Develop mobility and contingency plans.
 - c. Determine suitable vehicles for deployment.
 - d. Develop the logistics readiness squadron (LRS) annex to the base mobility plan.
43. (009) What publication does the 441st Vehicle Support Chain Operations Squadron (VSCOS) use to manage war reserve materiel (WRM) vehicle assets?
- a. Air Force Instruction (AFI) 25-101.
 - b. Air Force Manpower Standard (AFMS) 52B1.
 - c. Air Force Computer System Manual (AFCSM) 24-1.
 - d. Technical Order (TO) 36A-1-1301.

44. (009) Who has overall base level responsibility to ensure the readiness of assigned war reserve materiel (WRM)?
- Logistics readiness squadron (LRS) commander.
 - Vehicle fleet manager (VFM).
 - Installation commander.
 - Group commander.
45. (009) Who develops *specific* storage concepts for vehicles identified against operation plan (OPLAN) tasking?
- Group commander.
 - Major command (MAJCOM).
 - Vehicle fleet manager (VFM).
 - Logistics readiness squadron (LRS) commander.
46. (009) A package of flyaway spare parts to be shipped with a vehicle before its departure is referred to as
- bench stock parts.
 - triage maintenance kit.
 - war readiness material kit.
 - temporary mission support kit (TMSK).
47. (009) An immediate, temporary repair of a battle-damaged vehicle during post-attack recovery operations is called
- triage maintenance.
 - quick-reaction maintenance.
 - organizational maintenance.
 - post-attack vehicle operability (PAVO).
48. (009) In regards to vehicle maintenance (VM), on-scene repair is the goal of which maintenance concept?
- Minor.
 - Triage.
 - Organizational.
 - Expanded mobile.
49. (009) During wartime, which factor would most likely drive a lower standard of serviceability in vehicle management (VM) compared to peacetime operations?
- Damage assessments.
 - Spare parts availability.
 - Skill level of personnel.
 - Operational speed of the vehicle.
50. (010) Who may direct removal of a vehicle from service until an “outstanding” time compliance technical order (TCTO) has been accomplished?
- Vehicle fleet manager (VFM).
 - Fleet Management and Analysis (FM&A).
 - Robins Air Force Base (AFB) Special Equipment and Vehicles (SE&V).
 - 441st Vehicle Support Chain Operations Squadron (VSCOS).
51. (010) Where do you file the completed time compliance technical orders (TCTO)?
- Technical order (TO) monitor files in TO library.
 - Materiel Control completed parts file.
 - Permanent side of the vehicle record jacket.
 - Temporary side of the vehicle record jacket.

-
-
52. (011) What program is used to access the current mission capable (MC) rate for your base?
- a. Vehicle Master List.
 - b. Transaction Request Tool (TRT).
 - c. On-Line Vehicle Interactive Management System.
 - d. Logistics Installation and Mission Support Enterprise View (LIMS-EV).
53. (011) Which report contains data for *all* the registered and nonregistered vehicles for which vehicle management (VM) has *primary* responsibility?
- a. Daily status report.
 - b. Automated analysis report.
 - c. Vehicle master inquiry.
 - d. Vehicle management report.
54. (011) Which report is used to keep track of work orders in the Defense Property Accountability System (DPAS)?
- a. Work order master inquiry.
 - b. Mission capable report.
 - c. Vehicle master inquiry.
 - d. Vehicle in commission report.
55. (012) Major commands (MAJCOM) must *not* exceed established vehicle ceilings without prior approval from
- a. Congress.
 - b. Headquarters (HQ) Standard Systems Group (SSG).
 - c. Robins Air Force Base (AFB) Special Equipment and Vehicles (SE&V).
 - d. 441st Vehicle Support Chain Operations Squadron (VSCOS).
56. (012) Request for vehicle authorization changes are submitted on an
- a. Air Force (AF) Form 2005, Issue/Turn-in Request.
 - b. AF Form 601, Equipment Action Request.
 - c. Department of Defense (DD) Form 1149, Requisition and Invoice/Shipping Document.
 - d. DD Form 1348-1, DOD Single Line Item Requisition System Document.
57. (012) The master vehicle report (MVR) breaks down vehicle authorizations by
- a. serial number.
 - b. stock record account number.
 - c. prime national stock number (NSN).
 - d. interchangeability and substitutability NSN.
58. (012) Post changes to the Custodian Authorization/Custody Receipt Listing (CA/CRL)
- a. at the bottom of the CA/CRL.
 - b. by whiting out old data and enter the new data.
 - c. between the lines and in the same sequence as the CA/CRL.
 - d. by drawing a single line through the old data and enter the new data.
59. (012) Before making a decision on underutilized vehicles, you *must* consider
- a. turning the unit into salvage.
 - b. deleting the authorization.
 - c. driving the unit to add mileage.
 - d. failing the vehicle during the assessment inspection.

60. (012) What vehicles are *not* included when conducting vehicle rotation analysis?
- a. General Services Administration (GSA) and other leased vehicles.
 - b. Only vehicles with high mileage.
 - c. Only vehicles with low mileage.
 - d. Non-registered equipment.

Please read the unit menu for unit 3 and continue ➔

Unit 3. Military-Series Vehicles

3-1. Light- and Medium-Duty M-Series Vehicles	3-1
013. High-mobility, multipurpose wheeled vehicle.....	3-1
014. 2½-ton M-series.....	3-18
015. 5-ton M-series.....	3-25
3-2. Mine-Resistant, Ambush-Protected Vehicles.....	3-39
016. Mine-resistant, ambush-protected fundamentals	3-39
017. Mine-resistant, ambush-protected maintenance.....	3-49
3-3. Combat Zone Maintenance	3-57
018. Battle damage assessment and triage maintenance.....	3-57

MILITARY-SERIES (M-series) vehicles are designed for tactical use. Each vehicle is unique and designed for a specific use, thereby enhancing the military's capability to support combat operations. However, M-series vehicles do share some of the same subsystems. In the following lessons, we will discuss these common subsystems for different types of vehicles. For example, we will discuss the three-lever headlight switch under the high-mobility, multipurpose wheeled vehicle (HMMWV) section. This system is shared by the M35 and the M939 but is not found on some models of mine-resistant, ambush-protected (MRAP) vehicles.

Presenting the material in this manner will provide fundamental information on M-series vehicles while preventing redundancy of information. The information covered in this unit is presented in two categories: light- and medium-duty M-series and the MRAP vehicles. In some cases, technicians may not have a chance to work on these types of vehicles while stationed at stateside bases. However, rest assured that when you are stationed overseas or deployed in support of military operations, you will need to have this basic knowledge. As a supervisor, it is your responsibility to ensure these vehicles are ready to support operations.

3-1. Light- and Medium-Duty M-Series Vehicles

Light-duty M-series vehicles include the many variants of the HMMWV. Medium-duty includes the 2½- and 5-ton M-series vehicles. In the following lessons, we will discuss the purpose of each type and some of the vehicle specific systems. Remember that for the most part, M-series vehicles use some off-the-shelf components and systems incorporated into a military-specific vehicle. We will discuss subsystems in detail.

013. High-mobility, multipurpose wheeled vehicle

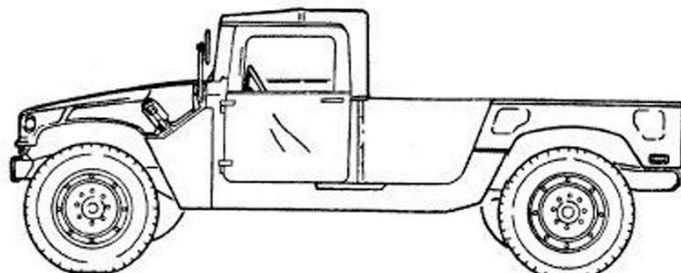
The 1¼ ton, 4x4, M998-series, HMMWV is a tactical vehicle designed for use over all types of roads, as well as cross-country terrain in all weather conditions. These vehicles have four driving wheels powered by a V-8, liquid-cooled, diesel engine.

Four-wheel hydraulic service brakes and a mechanical parking brake are common to all models in the M998 series. Vehicle tie-down and lifting eyes provide for air, rail, or sea shipment. Each model has a unique purpose and capability. It also shares some of the same components as other M-series vehicles such as 12/24 dual-voltage electrical systems and the standardized North Atlantic Treaty Organization (NATO) electrical jump system and the pintle-hook towing assembly.

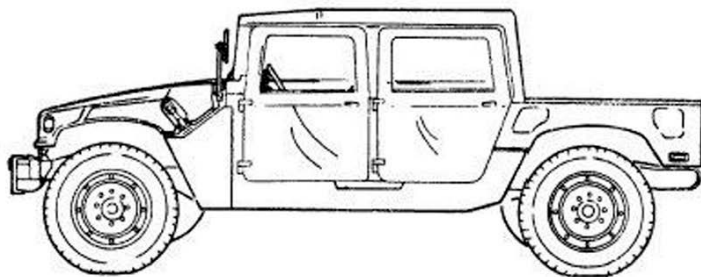
This lesson provides examples of different models and covers HMMWV fundamentals. Keep in mind that we are using Army classifications. After all, this vehicle was initially designed and produced for the United States Army.

M998 and M1038

Shown in figure 3-1, these models are used to transport cargo and troops. The M998 chassis and power train is the base platform for all other HMMWV variants. Some of your variants are just major models with winches added. For example, the M1038 model is a 998 that has a winch used for recovery operations. Both models can also use a troop seat kit for troop transport operations.



M998
(WITH 2-MAN SOFT TOP INSTALLED)



M1038 W/WINCH
(WITH 4-MAN SOFT TOP INSTALLED)

Figure 3-1. M998/M1038 model HMMWV.

M966 and M1036

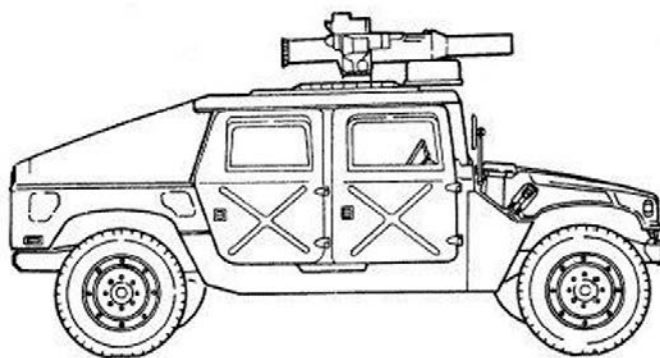
Shown in figure 3-2, these models transport, mount, and provide a platform for operating the tube-launched, optically tracked, wire-guided (TOW), missile-launcher system. The M966 and M1036 have armor for protection of crew, TOW system components, and ammunition. The M1036 model has a winch used for recovery operations.

M1116

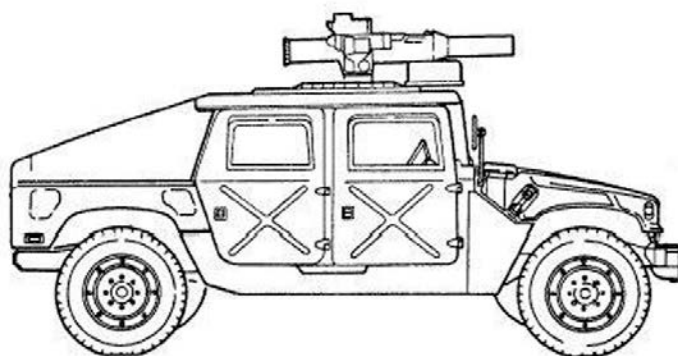
Another variant you need to be aware of is the up-armored HMMWV. The AF model is the M1116. It is built on the heavy chassis and utilizes a turbocharged 6.5-liter engine. The significant difference in this model is the armored body. The factory model has an armored cab and undercarriage. There have been several kits added to supplement or improve the armor over the past few years.

Mechanical system

The mechanical system converts horsepower (hp), derived from the engine, into a mechanical force called torque that drives the transmission. This torque through the transmission is used to move the vehicle. The mechanical part that makes this happen is referred to as the drive train. Reference figure 3-3 as we cover the major components of the mechanical system. The following information is referenced from the M998A2 model.

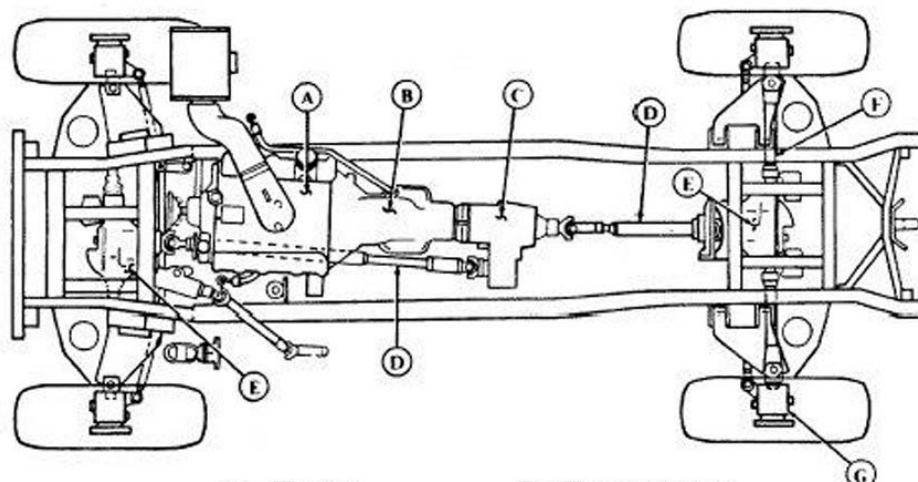


M966



M1036 W/WINCH

Figure 3-2. M966/ M1036 model HMMWV.



- | | |
|------------------|---------------------|
| A. Engine | B. Transmission |
| C. Transfer Case | D. Propeller shafts |
| E. Differentials | F. Halfshafts |
| G. Geared hubs | |

Figure 3-3. HMMWV mechanical system.

Engine

The water-cooled, naturally aspirated, 6.5-liter, V-8, diesel engine provides up to 160 hp at 3,400 revolutions per minute (rpm) to power the vehicle. The engine is identical on all M998A2 models except those equipped with a deep-water fording kit, which adds a specially sealed dipstick, dipstick tube, vented crankcase depression-regulator valve, and a manual throttle control. Fording is driving through a deep body of water.

The water-cooled, turbocharged, 6.5-liter, V-8 diesel engine on the heavy variants (M1113/M1114) provides up to 190 hp at 3,400 rpm. The cylinder block is a different design than the 6.5-liter naturally aspirated engine to accommodate the turbocharger components. If equipped with an arctic winterization kit, the engine has a special injection pump, specifically suited for use with arctic grade fuel for long engine run-times. These differences do not affect engine performance.

NOTE: In older HMMWV vehicles, you will find a water-cooled 6.2-liter diesel engine, which provides up to 150 hp at 3,600 rpm.

The cooling system is identical on all models covered in this lesson. The location of each of the cooling system components is identified in figures 3-4 and 3-5, which depicts the typical HMMWV cooling system arrangement. These figures also show the locations of the drain cock, oil cooler, and personnel water heater, which are not discussed.

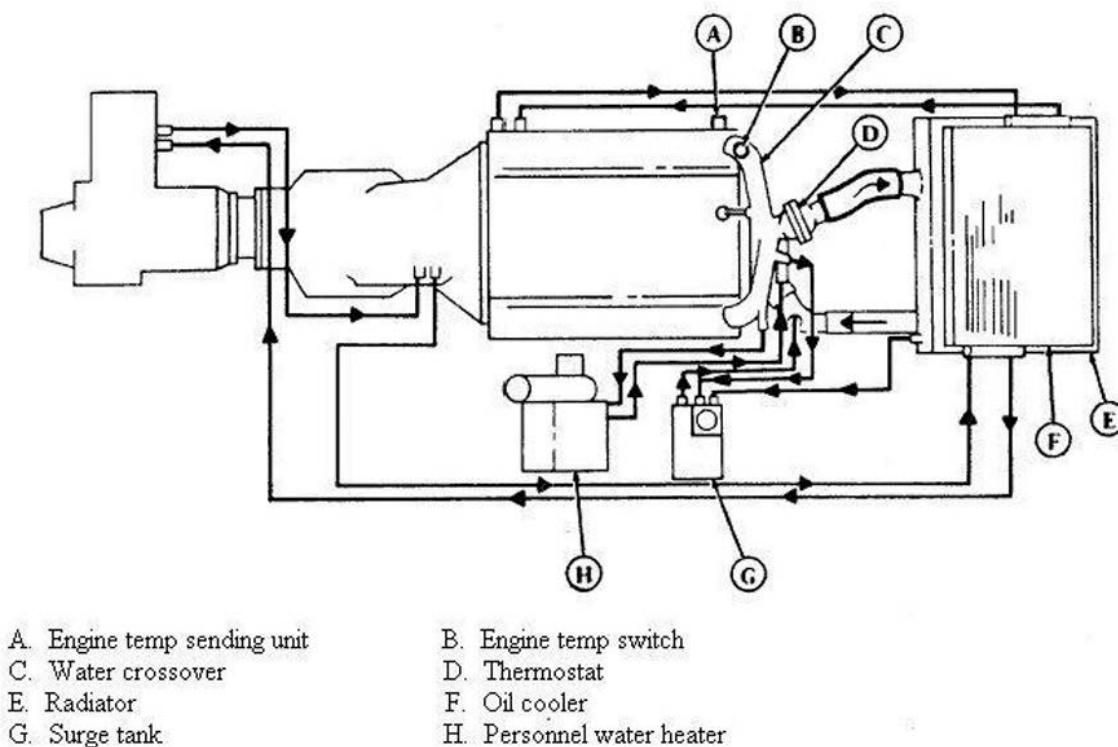


Figure 3-4. HMMWV cooling system (top view).

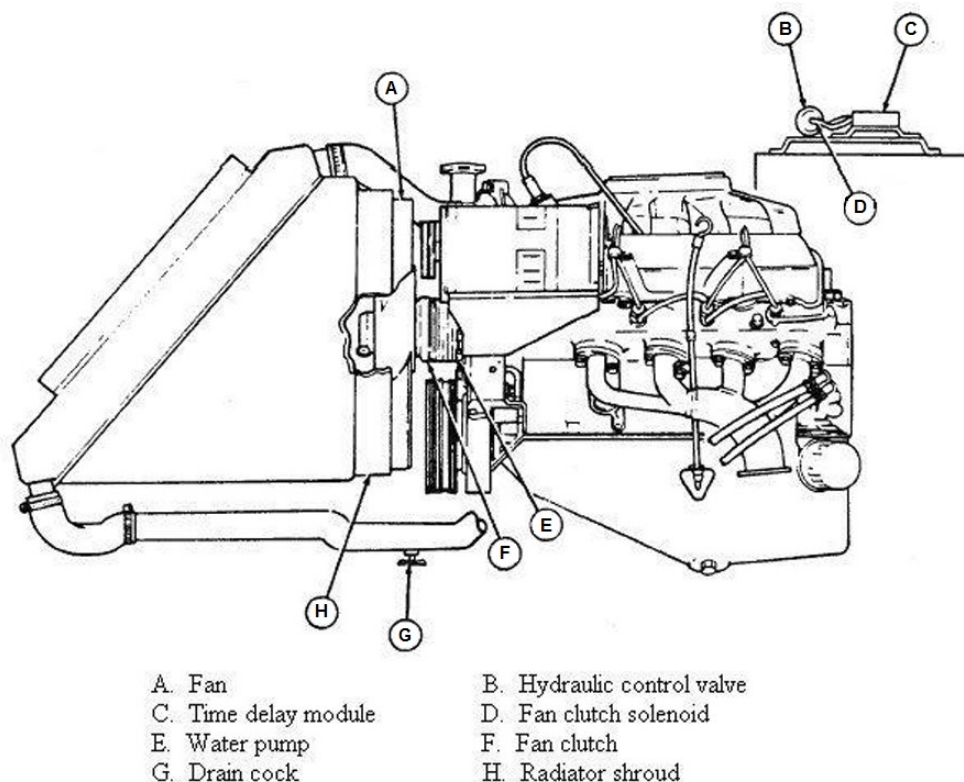


Figure 3-5. HMMWV cooling system (side view).

Radiator

The radiator is mounted at a 45-degree (°) angle for a lower-front vehicle profile. The radiator also provides for mounting of the transmission and power steering oil coolers.

Coolant pump

The coolant pump is mounted at the front end of the engine between the block and the radiator. The coolant pump, which is belt driven, consists of a housing with a coolant inlet and coolant outlet. Internally there is an impeller, which rotates, forcing the coolant through the housing. The coolant pump discharge rate (flow) is 70 gallons per minute (gpm), and the average coolant capacity is 6.2 gallons, which includes 3.2 gallons in the engine.

CAUTION: The coolant pump used on the M998 and M998A1, 6.2-liter engine is not interchangeable with the M998A2, 6.5-liter coolant pump due to opposite impeller shaft rotation. Using a coolant pump with incorrect shaft rotation will result in the engine overheating, leading to possible damage to internal engine components.

Engine temperature sending unit

The sending unit transmits an electrical signal to a temperature gauge mounted on the vehicle instrument cluster. The sending unit is mounted in a coolant passage on the left-front side of the left cylinder head adjacent to injector #1.

Coolant crossover pipe

The coolant crossover pipe collects coolant from the cylinder heads and channels it to the thermostat housing where it is redirected through the cooling system. It has threaded holes for installing a glow plug controller and a fan clutch thermostatic switch.

Fan clutch

The fan clutch is hydraulically actuated by pressure from the hydraulic control valve to control operation of the fan. The power steering pump provides the hydraulic pressure. The following table lists and describes the components used to operate the fan clutch.

Fan Clutch Components	
Component	Description
Fan Thermostatic Switch	Located in the coolant crossover. It sends a signal to activate the hydraulic control valve system, which operates the fan when engine temperature exceeds 230° Fahrenheit (F) and deactivates when engine temperature drops below 190° F.
Hydraulic Control Valve Electrical Solenoid	Opens and closes the control valve port controlling oil flow to the fan clutch.
Hydraulic Control Valve	Directs hydraulic fluid to provide required pressure to activate the fan clutch as required by engine temperature. The power steering pump supplies hydraulic pressure.
Time Delay Module	Sends a signal to the fan clutch solenoid to temporarily delay fan operation during heavy acceleration in order to free up hp, and/or protect the fan from damage during water fording. A safety feature prevents the operator from continuously deactivating the fan clutch to ensure adequate engine cooling and reduce the risk of overheating.

Drive train components

The drive train components on the HMMWV consist of the transmission, transfer case, propeller shafts, differentials, halfshafts, and the geared hubs. Refer to figure 3-3 as you review the drive train components.

Transmission

The transmission changes the engine power (torque) to meet different driving conditions. The automatic transmission has four forward speeds, reverse, park, and neutral. A neutral safety switch prevents the engine from being started with the transmission selector lever in any position except park or neutral. The transmission case is cast aluminum and is equipped with integral ribs for maximum strength and durability.

Transfer case

The transfer case provides three ranges of constant four-wheel drive: high, high-lock, and low-lock. It also has a neutral position. High range provides differentiated torque output to the front and/or rear differentials. The high-lock range provides undifferentiated torque output to the front and rear differentials. The low-lock range position provides undifferentiated torque output similar to high-lock range.

Propeller shafts

The HMMWV uses two tubular propeller shafts, sometimes referred to as the drive shaft, to transmit torque from the transfer case to the front- and rear-axle assemblies. Universal joints, located at both ends of the front and rear propeller shafts, permit in-line driving power between the transfer case and differentials even though they are mounted at different angles.

Differentials

The HMMWV uses a limited-slip differential in both the front and rear. Aside from the covers, the front and rear differentials are interchangeable and share the same part number. The limited-slip mechanism consists of “drive gears” (worms) and “driven gears” (worm wheels). The worms drive the worm wheels, but the worm wheels cannot drive the worms.

This gear arrangement is advantageous in distributing torque to both drive axles. It allows the HMMWV to make sharp turns without the gears binding, and if one wheel begins to slip, the differential automatically transfers torque to the wheel with the best traction. Therefore, the differential is torque biasing, torque sensing, and load sensing.

Halfshafts

The HMMWV uses three different length axle drive shafts (halfshafts) to accommodate the independent suspension system. The left-front and right-front halfshafts are unequal in length due to the off-centered positioning of the front differential. The rear halfshafts are equal in length, but not the same length as either of the front halfshafts.

1. Short shaft—left front.
2. Intermediate shaft—both rear.
3. Long shaft—right front.

The purpose of the halfshaft (fig. 3-6) is to transfer torque to the wheels from the differential through the geared hub. Each unit is basically a one-piece assembly with boots on both the inboard (differential) and outboard (geared hub) ends. The outer boot encloses a constant velocity joint, which transmits torque through various steering angles to the geared hub. The outer (splined) constant velocity joint end of the shaft assembly is held in place by the axle-shaft retaining bolt located opposite the pipe plug in the geared hub. The inner constant-velocity joint end is bolted to the differential output flange through the brake rotor.

NOTE: Removal of either the front or rear halfshaft requires that the respective tire be removed for removal of the access plug and retaining bolt (capscrew). Halfshafts transmit torque from differentials to the geared hubs.

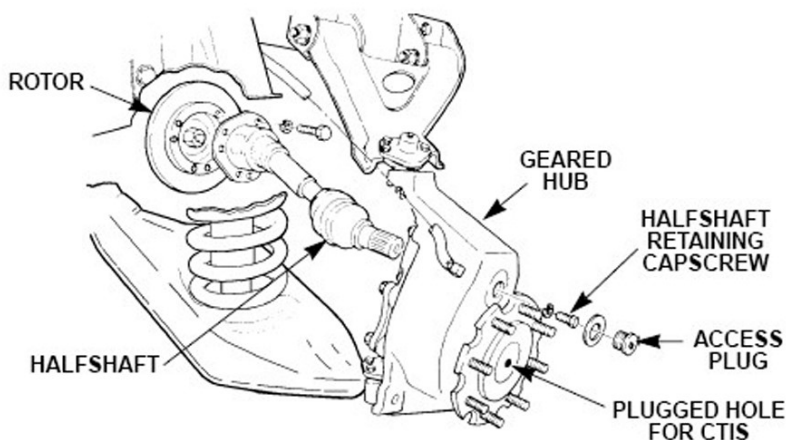


Figure 3-6. Halfshaft.

Geared hubs

Geared hubs (fig. 3-7) serve as front-wheel steering spindles and act as the final drive components to the front and rear wheels. Adjustable steering stops are located on the front-geared hubs to limit the vehicle steering radius. The geared hubs are the final gear reduction units for the HMMWV. Geared hubs are interchangeable from the left front to the right rear and the right front to the left rear. Geared hubs on the M998A2 series are not interchangeable with the M998 and M998A1 series. The differences are the input gear, spindle, and steering control arm.

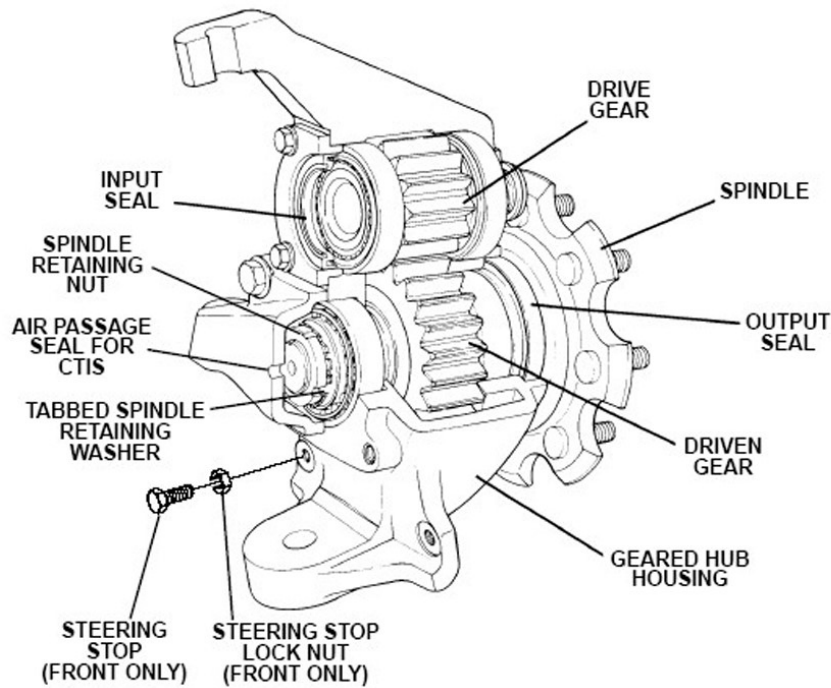


Figure 3-7. Geared hub.

Suspension system

The suspension system is identical for all models. It is an independent coil spring-type system. Refer to figure 3-8 as we discuss the major components of the HMMWV suspension system listed below.

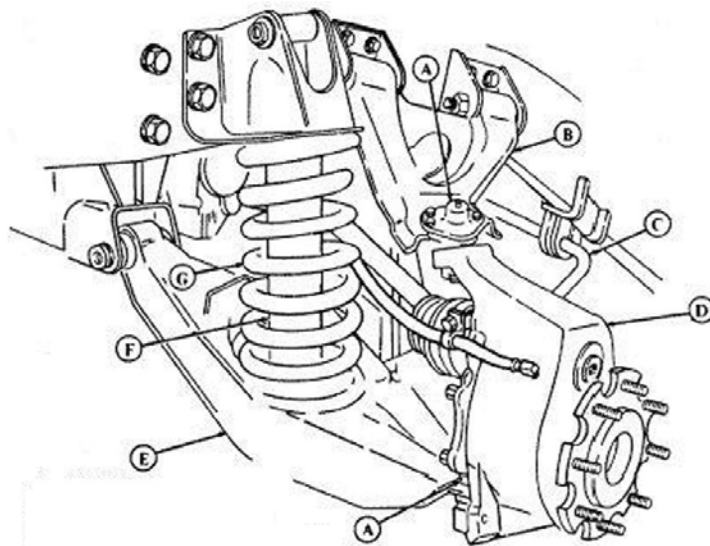


Figure 3-8. HMMWV suspension system.

- A. Ball joints—connects geared hubs to control arms, and allows change of angle between geared hub and control arms during suspension movement.
- B. Upper control arm—connects geared hub to frame rail.
- C. Stabilizer bar (front only)—reduces vehicle sway when cornering.
- D. Geared hub—serves as a mounting point for wheel and tire assembly and provides a 1.92:1 gear reduction to increase torque to the wheel and tire assembly.

- E. Lower control arm—connects geared hub to frame rail.
- F. Shock absorber—dampens suspension movement and limits amount of suspension travel.
- G. Coil spring—supports weight of the vehicle and allows suspension travel to vary depending on terrain and vehicle loading.

Steering system

As with the suspension, all HMMWVs use the same type of steering system. A power steering pump provides hydraulic power for a worm-type (recirculating ball) steering gearbox that has integral power steering. This means the power assist (power steering) components are built into the steering gearbox. The steering linkage is a parallelogram-type similar to most commercial designed vehicles.

The demands and stresses placed on an M-series vehicle require more strength and durability than a commercially designed vehicle. Due to operational demands, the HMMWV steering system components are made of heavy-duty parts. Always refer to the service manual or TO when making repairs and ordering parts for these vehicles.

Electrical system

All M-series vehicles have standardized wiring plans based on one set of circuit numbers and rubberized, waterproof in-line wire connectors that are the same for every vehicle. This makes it possible to use the same lights, switches, trailer connectors, and so forth, across the board, thus simplifying maintenance, spare parts inventories, and tools. To view the standard circuit numbering assignments, you can view the “Olive Drab” web site at http://www.olive-drab.com/od_mseries_circuits.php3.

NOTE: There are, however, exceptions to this standardization. Early M-series vehicles, for instance, used “Douglas connectors” with metal shells, not the rubber shells. Other vehicles use a multi-pin “cannon connector” for the lights instead of the rubber connectors, and so on. Before you do anything, check the TO for each particular vehicle.

Lighting system

The lighting system for the HMMWV is similar to all other M-series vehicles. With a requirement for blackout lights, as well as normal lighting operations, the main switch is somewhat cumbersome and confusing to operate. However, as with all M-series systems, once you learn it, you can work on all of them.

Headlight switch

Most M-series vehicles have the same three-lever headlight switch (fig. 3-9). There is also a newer push-button-type switch, which performs the same functions using buttons instead of levers.

The rear of the switch is set up to receive a large cable connector to tie it into the vehicle wiring harness. The circular, threaded rim on the switch back is notched so the connector can only go in one way. Small letters molded into the base material identifies the male pins. The letters are hard to see but they are there, running from A to N (with no G or I). The table below explains the connector pins circuit number and circuit usage.

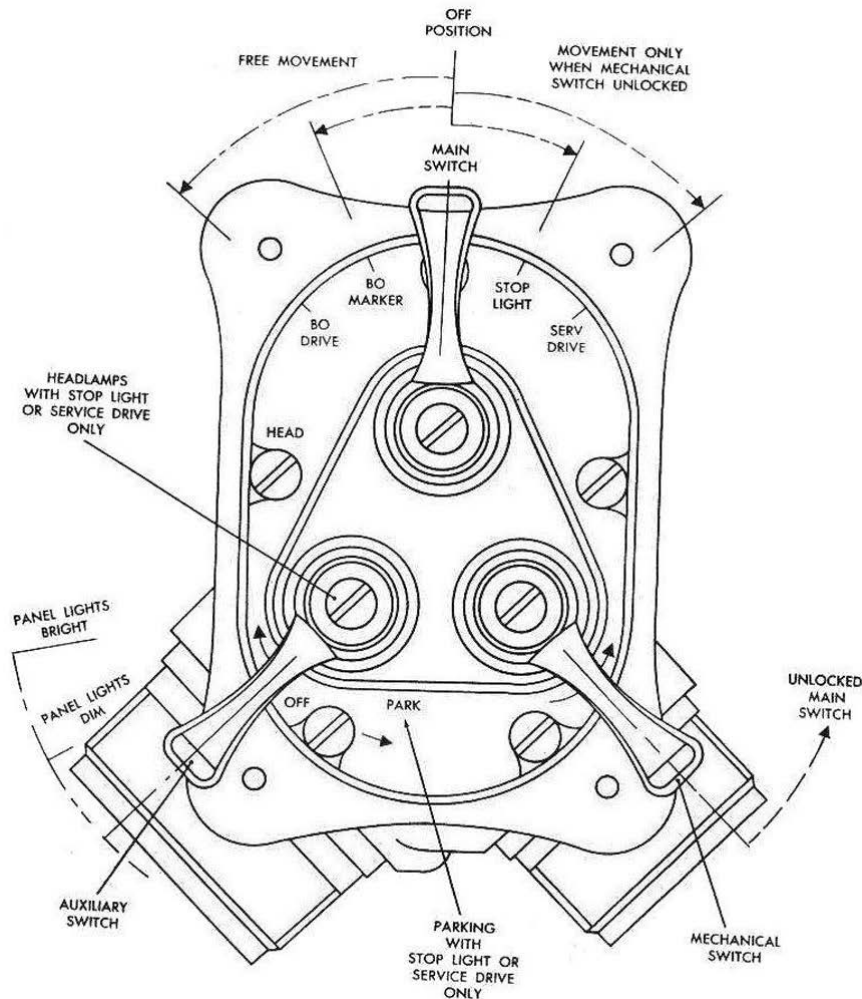


Figure 3-9. Three-lever headlight switch.

Connector Pins, Circuit Number, and Circuit Usage		
Connector Pin	Circuit Number	Circuit Usage
A	75	Stop Lamp Switch. Runs through brake light switch to Pin K.
B	40	Panel/Instrument Lights.
C	22	Stop Lights. Energized when brakes applied. Runs to turn signal switch if used.
D	19	Blackout Driving Lamp.
E	20	Blackout Marker and Tail Lamps.
F	15	Battery Power Lead.
H	21	Service Tail Lamps.
J	467	To Flasher Switch. Energized when stop or head lights on.
K	75	Stop Lamp Switch. Runs from pin A through brake light switch.

Connector Pins, Circuit Number, and Circuit Usage		
Connector Pin	Circuit Number	Circuit Usage
L	491	Parking Lights (if used).
M	16	Service Headlamps. To dimmer switch or headlight relay.
N	23	Blackout Stop Lamp.

The circuit numbers are the standard M-series circuits, which are common to most vehicles. If you have the military cables, the circuit numbers will be on metal tags crimped onto each wire in the cable bundle running from the female connector on the wiring harness. If you make up a cable, it would be best to tag the wires the same way since it will make it easier to hook up to other military components (i.e., turn signal switch, flasher, composite lights, etc.).

Although the switch is relatively easy to use, it is designed to facilitate blackout-driving conditions. This means you can turn on the blackout lights without having to unlock the switch. The purpose of this is so you don't inadvertently switch on your main lights at night while you're trying to go unnoticed.

Figure 3–10 shows the operation of the three-way headlight switch. Operation of the push-button switch (fig. 3–11) is as simple as pushing the button for the mode you need, then push the enter button to activate that mode. Again, keep in mind that the three-way or button-type switch is used on nearly all M-series vehicles.

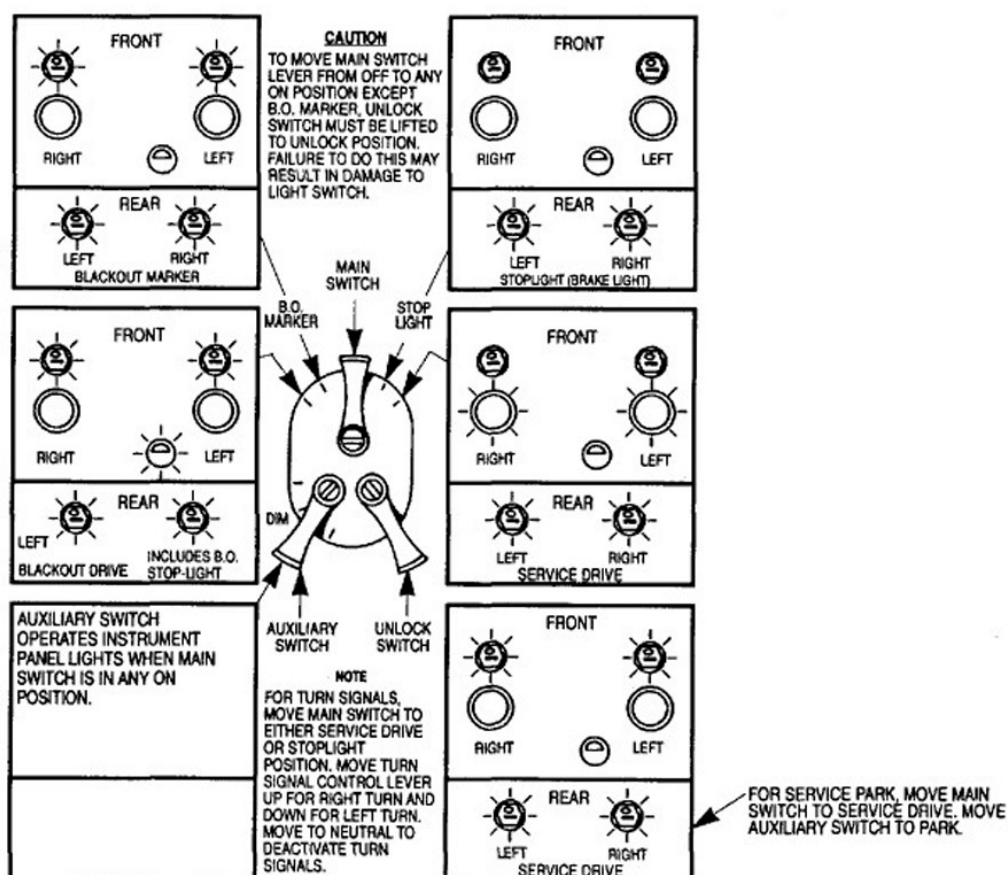


Figure 3–10. Operation of the three-lever headlight switch.



Figure 3-11. Push-button headlight switch.

Vehicle lights location and function

As stated earlier, the HMMWV requires normal lighting as well as blackout light capability. Figure 3-12 shows the location of standard and blackout light assemblies. Since you already know the function of a normal vehicle lighting system, we will briefly discuss the blackout light system.

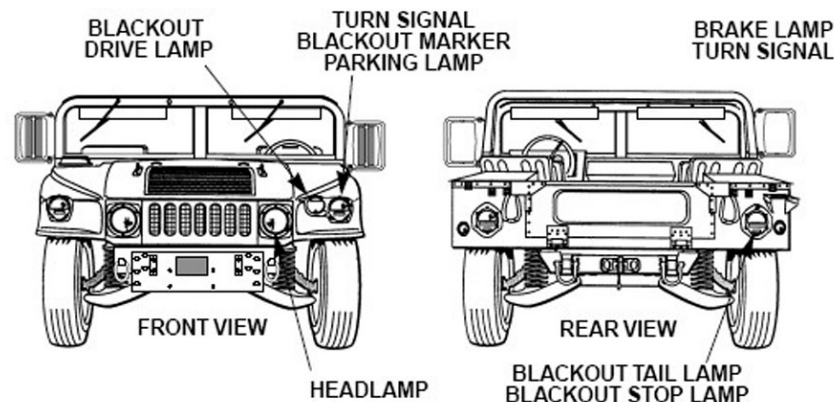


Figure 3-12. HMMWV lighting system.

The purpose of blackout driving lamp and markers is for use in night convoy operations. There are five blackout lights: front blackout driving lamp (1 each), front blackout markers (2 each), and rear blackout markers (2 each).

The blackout lamp (fig. 3-13) contains a low-watt light bulb, and the front of the assembly is hooded to prevent light from omitting upward. Its purpose is to provide minimal light for driving in blackout conditions.

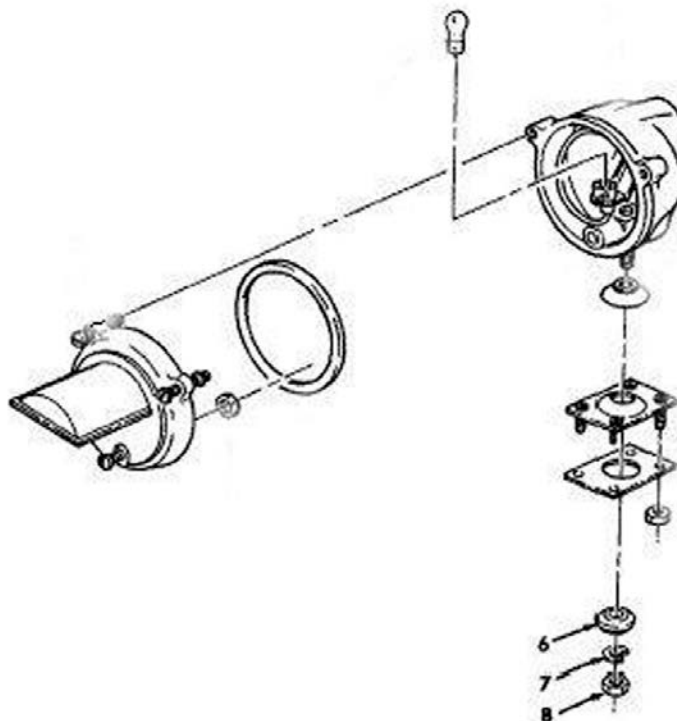


Figure 3-13. Blackout driving lamp.

The blackout marker lights, commonly referred to as “cat’s eyes,” are incorporated into the front (fig. 3-14) and rear composite light assemblies (fig. 3-15) that also contain the normal vehicle lighting functions (i.e., turn, marker, and stop).

Notice in figure 3-14 that there is one cat’s-eye strip, and in figure 3-15 there are two. The second, smaller strip on the rear lamp is the blackout stop lamp. Also, notice that the front light assembly in figure 3-14 has three wires to reflect the blackout stop lamp function, whereas the rear light assembly in figure 3-15 shows four.

The purpose of the blackout markers is to indicate the distance you are from another vehicle. This is accomplished by using a visual reference point concept by incorporating internal dividers within the light assemblies. This will allow a person directly in front or directly behind to only see certain images at certain distances.

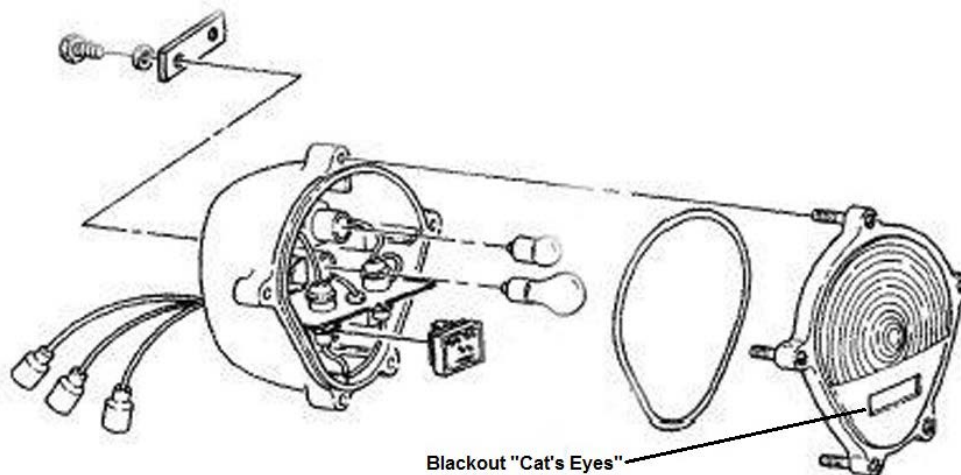


Figure 3-14. Front marker light.

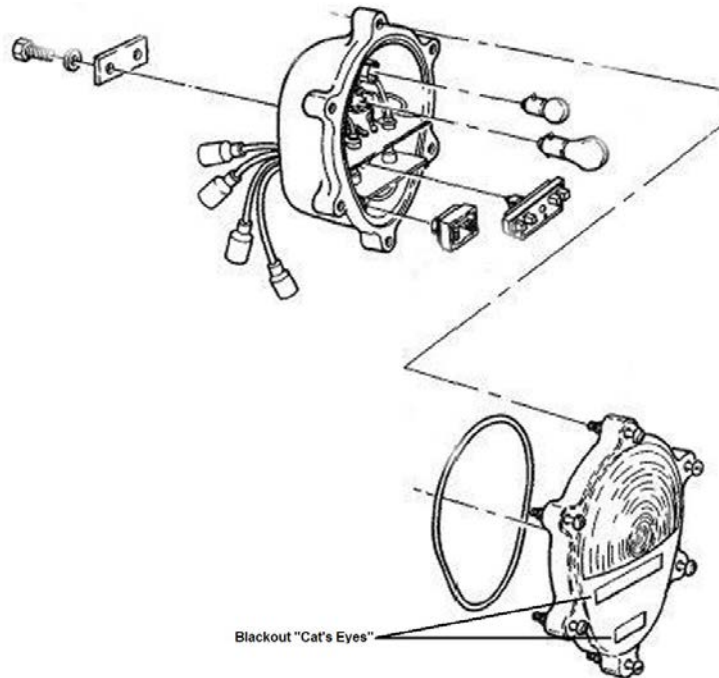


Figure 3-15. Rear marker light.

For example, when following another HMMWV in a night convoy and you see four red cat's-eye blackout markers, you are driving too close to the vehicle in front of you. If you see one red blackout marker on each side, you are too far from the vehicle in front of you. If you can see two red blackout markers on each side of the vehicle, you are about the right distance from the vehicle in front of you. If you don't see any lights, you're in trouble! The same principle applies for the front blackout markers: two white lights is too close; one white light is the correct distance.

Turn signal switch

The M-series turn signal switch is made of high-impact plastic and contains leaf switches operated by a plastic cam-like cylinder, which is rotated by the operating lever. The M-series turn signal has four modes of operation: off, right turn (lever up), left turn (lever down), and emergency. The emergency switch is activated by pulling out on a casting near the base of the lever, then moving the lever to the extreme up position.

Starting system

The starting system is identical for all vehicles covered in this lesson. As we discuss the starting system components and circuits, refer to figure 3-16. The table below lists and describes each component.

Starting System Components		
Figure Item	Component	Description
A	Rotary switch	In "START" position provides battery power to the starter solenoid and to the neutral start switch through circuit 14.
B	Neutral start switch	When transmission is in "N" (neutral) or "P" (park) position, this switch closes a relay in the protective control box through circuit 14 allowing battery power to the starter solenoid.
C	Protective control box	The electronic control center for all electrical circuits. This is also prevents the starter from being engaged during engine operation.
D	Starter motor	Cranks the engine for starting, and is supplied 24-volt battery power through circuit 6A.

Starting System Components		
Figure Item	Component	Description
E	Starter solenoid	A magnetic relay that transmits 24-volt battery power to the starter motor.
F	Batteries	There are two 12-volt batteries connected in series that supply 24-volts to the starter system through circuit 6A.
G	Glow plug(s)	Assists in cold starts and is connected through circuit 575 at the protective control box.
H	Glow plug controller	Cycles the glow plugs on and off during cold starts. It is connected to the protective control box through circuit 573A.

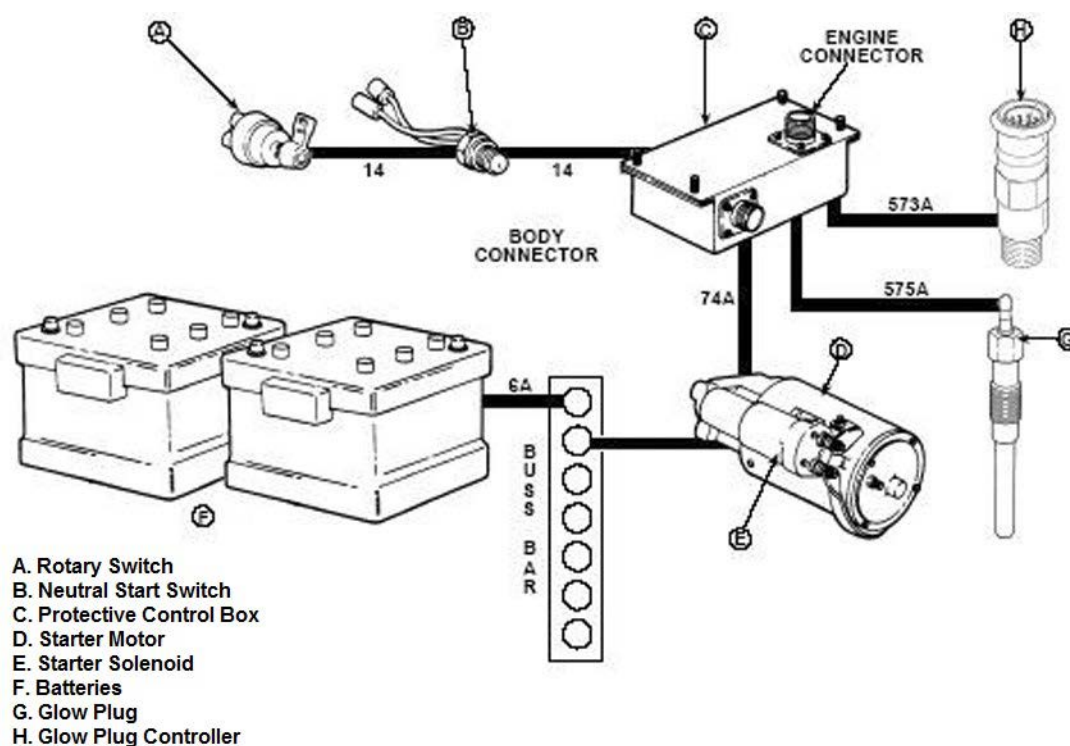


Figure 3-16. HMMWV starting system.

Generating system

The 100- or 200-ampere (amp) generating system maintains the battery charge and provides electrical power to operate the vehicle circuits. Major components and circuits of the generating systems are identified in figure 3-17 and are listed in the table below.

Generating System Major Components		
Figure Item	Component	Description
A	Battery gauge	Indicates electrical system voltage. It is connected to the electrical system through circuit 567.
B	Alternator (100 amp)	Rated at 12/24 volts, 100 amps. Assists and recharges the batteries during operation.
C	Alternator (200 amp)	Rated at 12/24 volts, 200 amps. Assists and recharges the batteries during operation.
D	Circuit 3	Provides a ground circuit to the alternator.
E	Circuit 6B	Provides 12 volts to the one battery that powers transmission functions.

Generating System Major Components		
Figure Item	Component	Description
F	Circuit 6E	Provides 24 volts to two batteries to power vehicle electrical functions.
G	Circuit 568	Senses vehicle voltage activating the field current in the alternator to generate current.
H	Protective control box	Protects the vehicle electrical system in the event battery polarity is reversed.
I	Buss bar	Electrical distribution point.

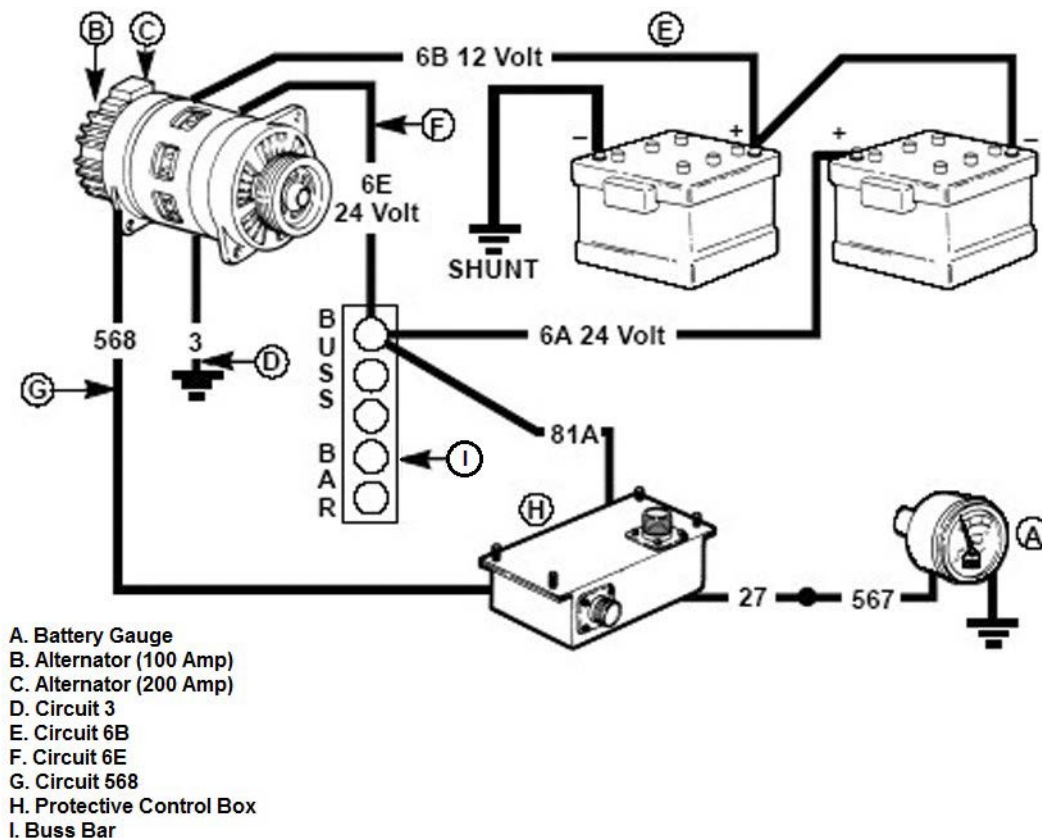


Figure 3-17. HMMWV generating system.

Battery system

The battery system is identical for all vehicles covered in this lesson. As we discuss the battery system, reference figure 3-18. The battery system components are listed and described in the following table.

Battery System Components and Description		
Figure Item	Component	Description
A	Circuit 6A	Connects the batteries to the starter and to the protective control box through circuit 81A.
B	Batteries	Two 6TN batteries provide 24 volts for the electrical starting system.
C	Slave receptacle	Links an external power source directly to the slaved vehicle's batteries to assist in cranking the engine when the vehicle's batteries are not sufficiently charged.
D	Shunt	Used to measure current draw from batteries when using simplified test equipment for internal combustion engines (STE/ICE).

Battery System Components and Description		
Figure Item	Component	Description
E	Protective control box	The electronic control center for all electrical circuits and is part of the starting system.
F	Rotary switch	When in "RUN" position, the rotary switch closes circuit 29, activating the instrument panel gauges through circuit 27.
G	Circuit 7	Connects the battery system to the starter negative terminal and chassis ground.
H	Starter solenoid	The junction point for battery positive lead (circuit 6A) and the vehicle electrical feed wire (circuit 81A).

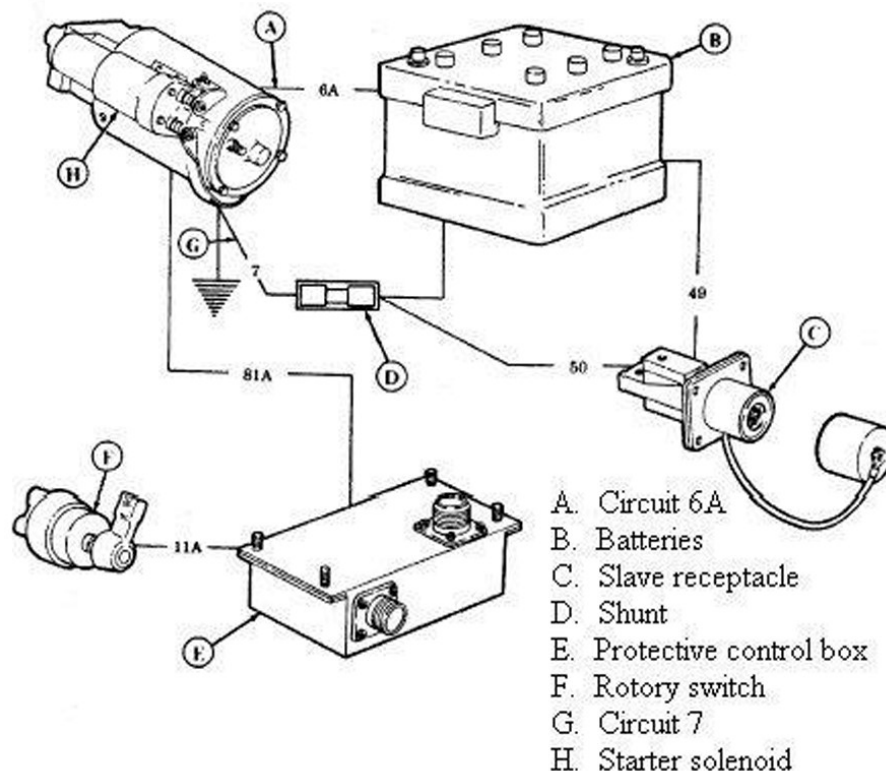


Figure 3-18. HMMWV battery system.

Runflat wheel and tire assembly

The wheel assembly (fig. 3-19), which includes a runflat device, allows the vehicle to be driven under emergency conditions with one or more flat tires. This does away with the immediate need for a spare tire and increases the vehicle mobility with flat tires. The radial tires are a tubeless-type, constructed of five plies consisting of: one nylon, two polyester, and two steel.

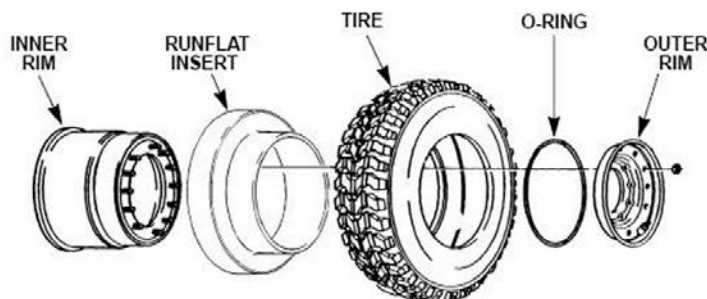


Figure 3-19. Runflat wheel and tire assembly.

In the event of a puncture or pressure loss in one of the tires, the operator can rely on the runflat devices within each tire. The runflat insert enables the vehicle to travel 30 miles at 30 miles per hour (mph) with no air pressure in the tire. In the event that only the two rear tires are flat, the maximum speed is 20 mph. The reduced speed is necessary for vehicle control because, unlike the front tires, there is no steering control for the rear tires. Two flat tires in the rear may cause the vehicle to sway from side to side at speeds above 20 mph. Removal of the one-piece runflat assembly requires the use of a special tool called a runflat compressor tool. Figure 3-20 illustrates the use of this special tool.

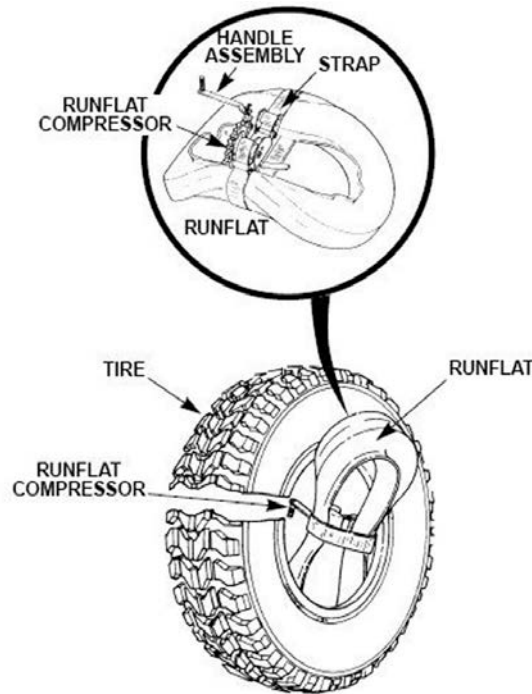


Figure 3-20. Runflat insert removal.

014. 2½-ton M-series

This lesson covers the 2½-ton M-series, specifically the M35A3, M35A3C, and M36A3 models, with and without a winch. The 2½-ton M-series plays an important role in equipment and troop transport during AF logistical operations. As a vehicle and equipment technician, you must be familiar with these trucks. Figure 3-21 shows the location of most major components on the M35. We will not cover all of these components in this lesson due to redundancy; instead, we will focus on fundamentals and unique systems.

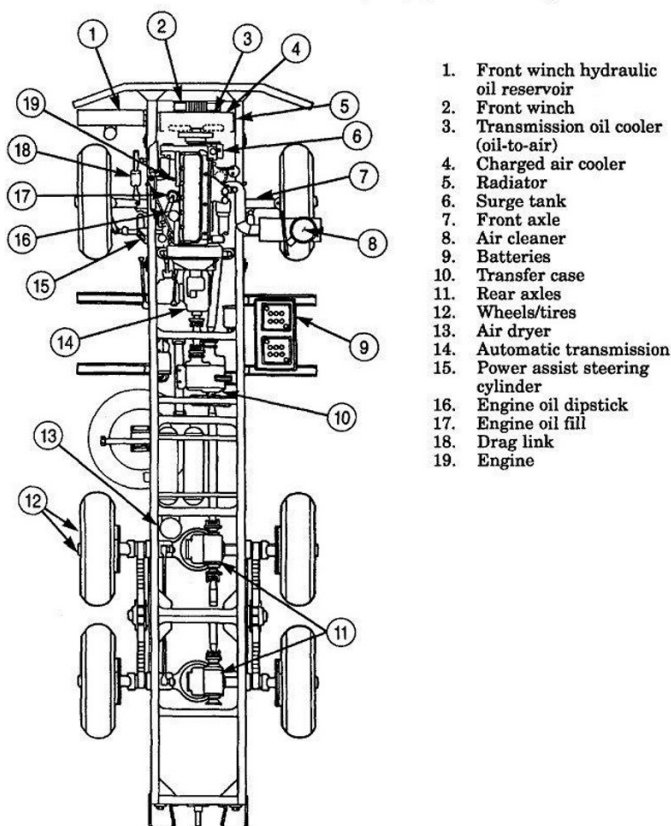


Figure 3-21. Location of major M35 components.

Fundamentals

There are many different models of the 2½-ton truck, but by far the most common is the M35 model. The primary purpose of the M35A3, M35A3C, and M36A3 is to transport troops or heavy loads up to 5,000 lb. The M35A3 (fig. 3-22) has permanent steel-welded sides and is the preferred vehicle for transporting bulky payloads that may shift during transit.

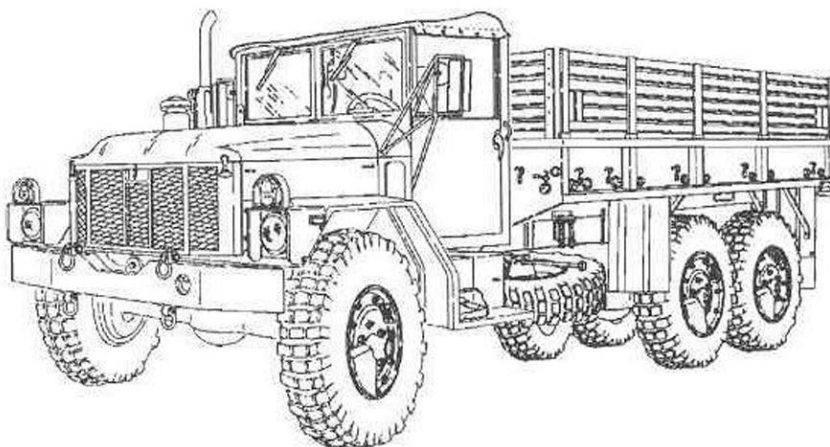


Figure 3-22. M35A3 2½-ton M-series (without winch).

The M35A3C (fig. 3-23) is a cargo truck with sides that are folded down or removed for easy side loading and unloading operations. The M36A3 (fig. 3-24) has a longer wheelbase than the other models, and is not suited for operations that require maneuverability in limited spaces. All of these

trucks are capable of fording through 30 inches of water without a fording kit and 72 inches of water with a kit. Additionally, these trucks may have a central tire inflation system (CTIS).

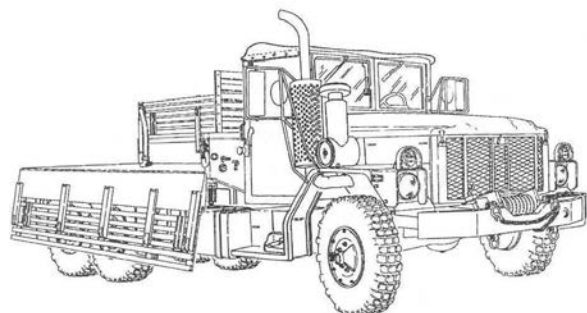


Figure 3-23. M35A3C 2½-ton M-series (with winch).

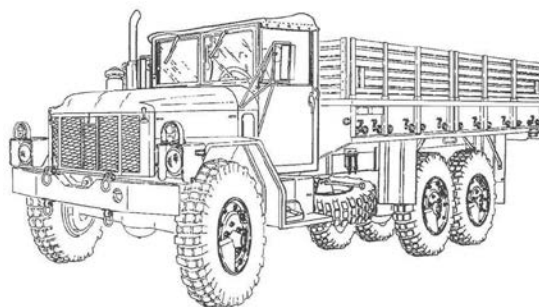


Figure 3-24. M36A3 2½ ton M-series (without winch).

Mechanical system

As we have discussed earlier, you are already familiar with standard mechanical (drive train) components. The 2½-ton M-series incorporates all of these components on a larger scale. The following are some of the specific models of various drive train components you will see in the medium-duty M-series vehicles.

Engine

The engine is a Caterpillar 3116, which has a 403 cubic-inch (6.6-liter) displacement. The engine is a four-stroke, in-line 6 cylinder, with direct fuel injection. It is turbocharged with an air-to-air aftercooler system and is rated 170 hp at 2,700 rpm. A gear-type pump supplies the engine lubricating oil, which is both cooled and filtered. Bypass valves provide unrestricted flow of lubrication oil to the engine parts when oil viscosity is high or if either the oil cooler or the oil filter elements become clogged.

Transmission

The transmission is an Allison AT-1545P. It is a four-speed automatic transmission. The transmission fluid dipstick and fill is located below the inspection cover on the passenger side floorboard.

Transfer case

The transfer case used on the M35A3, M35A3C, and M36A3 trucks is a two-speed Rockwell T-136. Used in conjunction with the transmission, these trucks have eight forward gears and two reverse gears.

Differential/axle

The front and rear differential/axle is a Rockwell C-240. Both front and rear assemblies are interchangeable.

Electrical system

The M35A3, M35A3C, and M36A3 electrical system operates similarly to other M-series vehicle electrical systems. The purpose of the electrical system is to supply electrical current to start the engine; operate lights, equipment, and accessories; and charge the batteries.

Fuel system

A mechanical governor, transfer pump, and high-pressure injection fuel system provide engine response and fuel economy. The transfer pump draws fuel from the fuel tank and pumps fuel under low pressure to the fuel/water separator where water and contaminants are removed. Filtered fuel is then delivered to the injectors.

The injectors use a plunger-and-barrel system to create the high pressures needed for the injection process to take place. Inside the injector, a spring-loaded needle valve lifts from its seat to allow high-

pressure fuel to be injected into each cylinder. Excess fuel is routed from the engine cylinder head back to the governor and then to the fuel tank. A fuel-shutoff solenoid mounted on the fuel pump stops the fuel flow to the injectors when the operator turns the accessory switch off.

Cooling system

The M35 has a pressurized cooling system that can safely operate at a temperature higher than the normal boiling point of water, which prevents pitting and wear inside the water pump. Major components of the cooling system are the radiator, charged air cooler, water pump, surge tank, thermostat, fan, and fan actuator.

Air system

The M35A3, M35A3C, and M36A3 trucks are equipped with a compressed-air system that supplies clean, dry filtered air to operate air-actuated or assisted accessories throughout the vehicle, including the CTIS system. An engine-driven air compressor supplies air through an air dryer to two air reservoirs where it is stored. The air from the reservoirs is piped along frame rails back to two rear couplings. The left-side air coupling is the service coupling and is used to supply the air to operate the trailer brakes. The right-side air coupling is the emergency coupling, which is used to release spring brakes, if trailer is so equipped, and allows connection of an air hose for manual tire inflation. The air reservoirs also supply air to an air pressure gauge, two air-hydraulic brake boosters, steering assist cylinder, drag link assist, air horns, transfer case air cylinder, front-axle engagement switch, and cooling fan actuator and clutch.

Chassis controls and indicators

Before you can maintain a vehicle, you need to know what controls what. You would think since we are all familiar with our personal vehicles, it would be easy to relate personal vehicle controls to government commercial-type vehicle controls. However, this is not true for M-series vehicles. Some of the most common problems in the field are that most technicians have never seen an M-series-type vehicle and, therefore, do not understand the military bells and whistles. The following lessons list the typical chassis controls and indicators that are on the medium-duty M-series vehicles. Reference figures 3-25 through 3-28 for component location.

Key item and function (part one)

As we discuss the first list of the M35 interior cab components, reference figure 3-25 for items 1 through 9 and figure 3-26 for items 10 through 16. The table below lists and describes the function of each component.

M35 Interior Cab Components (Part One)		
Figure item	Component	Function
1	Battery/accessory switch	Distributes power to the starter system, instrument panel gauges, fuel pump, and low-pressure warning buzzer.
2	Throttle control	Sets engine speed at desired rpm without maintaining pressure on the accelerator pedal. It locks in the desired position when pulled out. Rotating control handle clockwise or counterclockwise unlocks it.
3	Windshield washer lever	When pulled up, activates spray pump.
4	Air cleaner indicator	Displays yellow band when engine air cleaner filter needs servicing.
5	Fuel shutoff switch	Energizes fuel solenoid to shut off fuel flow from the transfer pump, which stops the engine.
6	Light switch	Operates vehicle lights.
7	Engine start switch	Distributes electrical current to the starter to crank the engine.
8	Personnel heater blower switch	Positioned in HIGH or LOW to control flow of forced air to personnel compartment (cab).
9	Quick-start switch	Is energized and held for two to three seconds to allow the quick-start valve to

M35 Interior Cab Components (Part One)		
Figure item	Component	Function
		open and fill with ether. When released, ether is injected through atomizers and into air intake.
10	Electronic control unit (ECU) power button	Turns on the ECU, which controls and monitors CTIS operation.
11	Liquid crystal display (LCD)	Provides the operator with current tire pressure and maximum speed for the selected terrain setting.
12	Four terrain buttons	For CTIS (highway, cross-country, mud/snow/sand, and emergency), represents pre-determined pressure set points.
13	Temperature control knob	Pulled out all the way to provide maximum amount of heat to personnel compartment.
14	Defroster knob	Pulled out to direct hot air flow onto windshield to prevent frosting.
15	Front wheel drive lever	Engages or disengages front wheel drive power.
16	Front wheel drive indicator light	Indicates front wheel drive is activated.

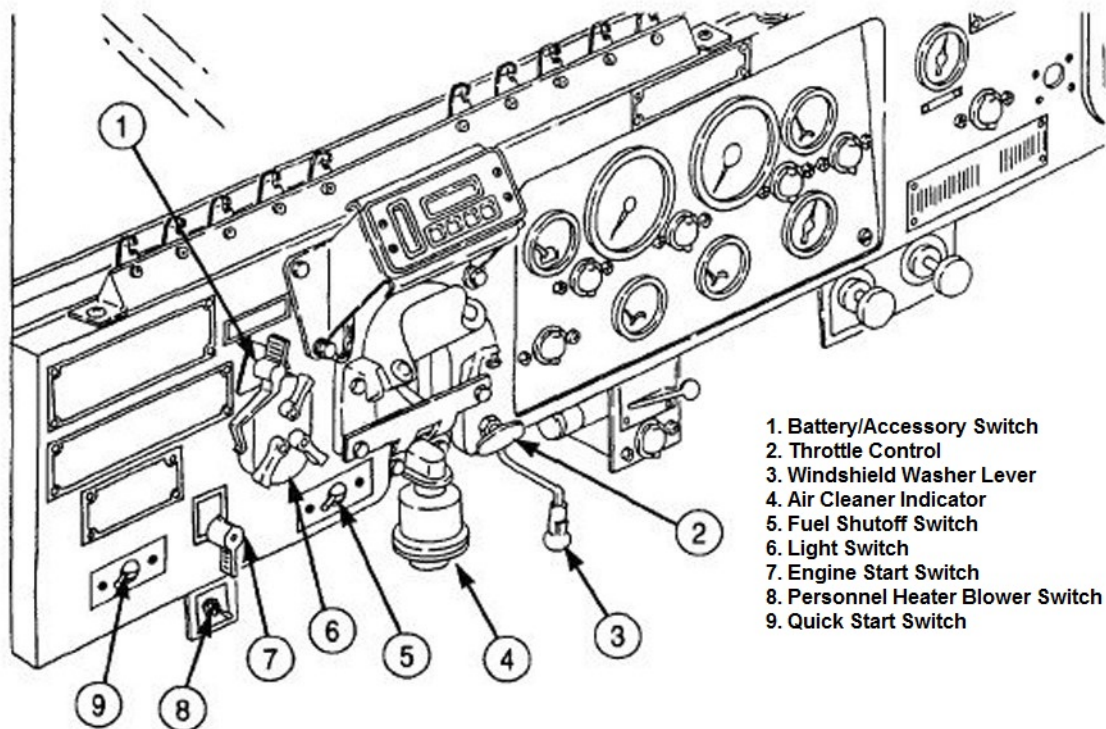


Figure 3-25. M35 cab interior, first view.

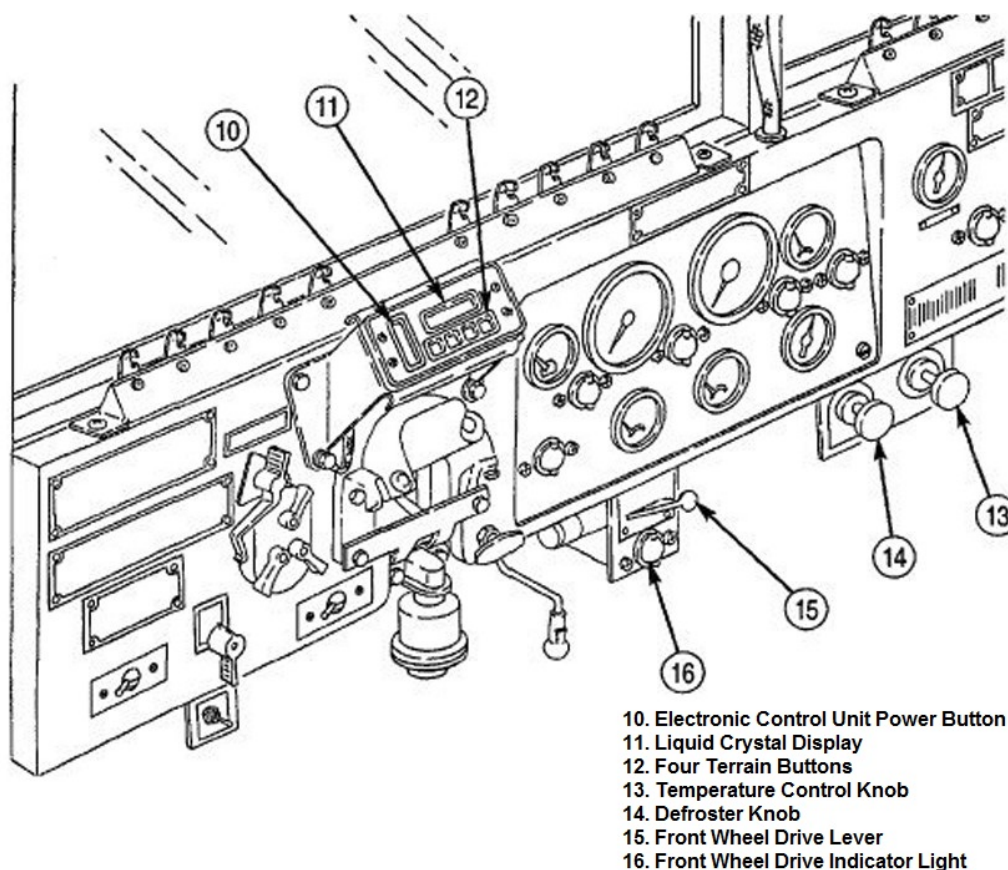


Figure 3-26. M35 cab interior, second view.

Key item and function (part two)

As we continue to discuss the second list of M35 cab interior components, refer to figure 3-27 for items 1 through 12 and figure 3-28 for items 13 through 20.

M35 Interior Cab Components (Part Two)		
Figure Item	Component	Function
1	Speedometer/odometer	Indicates vehicle speed in mph and total distance traveled in miles. Trip meter indicates distance traveled in kilometers.
2	Tachometer	Indicates engine speed in rpms and operating time in hours and tenths of hours. Normal idle speed is 750 to 850 rpm.
3	Engine coolant temperature gauge	Indicates engine coolant temperature. Normal operating temperature is 160° to 230° F.
4	Transmission temperature gauge	Indicates transmission oil temperature when engine is running. Normal operating temperature is 160° to 300° F.
5	Low air pressure indicator light	Indicates air pressure in reservoirs is at or below 60 pounds per square inch (psi).
6	Air pressure gauge	Indicates air pressure in reservoir tanks. Normal pressure is 90 to 120 psi.
7	Battery gauge	Indicates when batteries are charging or discharging.
8	Parking brake indicator light	Indicates parking brake has been engaged.
9	Fuel gauge	Indicates fuel level.
10	High beam indicator	Indicates headlights are on high beam.

M35 Interior Cab Components (Part Two)		
Figure Item	Component	Function
11	Oil pressure gauge	Indicates engine oil pressure when engine is running.
12	Diagnostic connector assembly (DCA)	Connects the VTM to the vehicle's test points for STE/ICE-reprogrammable (STE/ICE-R).
13	Dimmer switch	Depressed to raise or lower headlight beam.
14	Service brake pedal	Depressed to slow or stop vehicle.
15	Accelerator pedal	Controls engine speed. When pressed down, engine speed increases. When released, engine speed decreases.
16	Transmission select lever	Used to select vehicle drive gear.
17	Winch air control valve lever	A three-position valve that activates in or out of winch cable.
18	Winch air valve lever	Pulled up and out to engage bypass valve for winch operations.
19	Transfer case shift lever	Pushed down to LOW position for heavy-load operations, and pulled up to HIGH position for light-load operations.
20	Parking brake lever	Pulled up to apply parking brake. The knob at top of handle is turned to set brake cable tension.

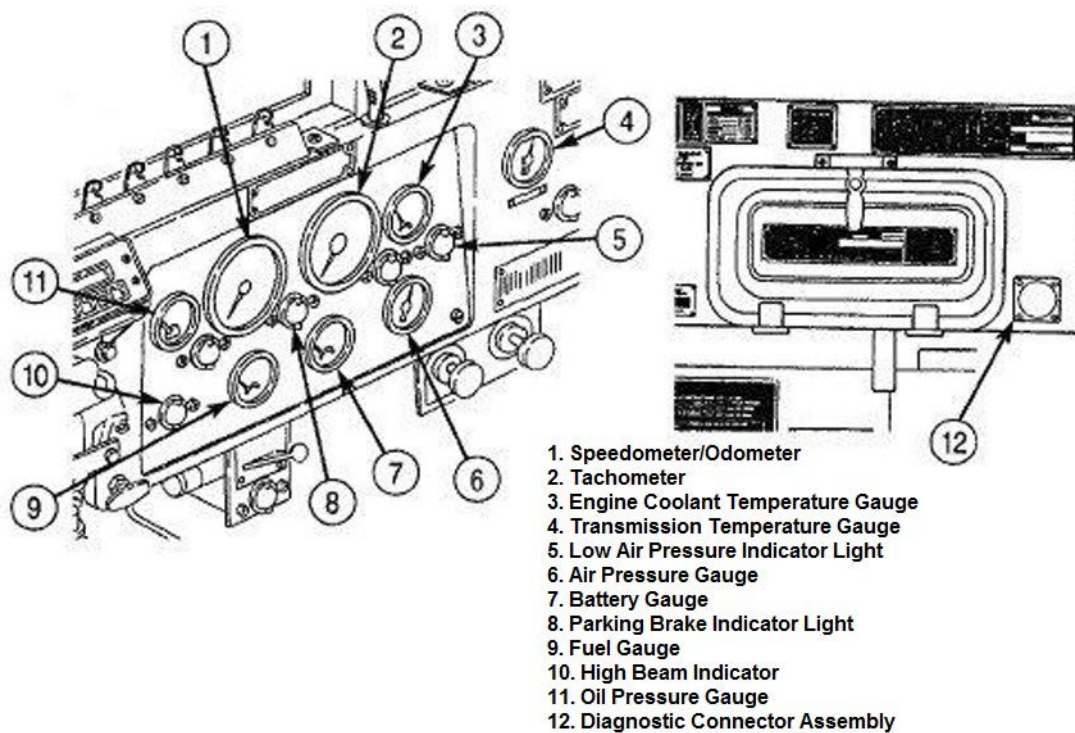


Figure 3-27. M35 cab interior, third view.

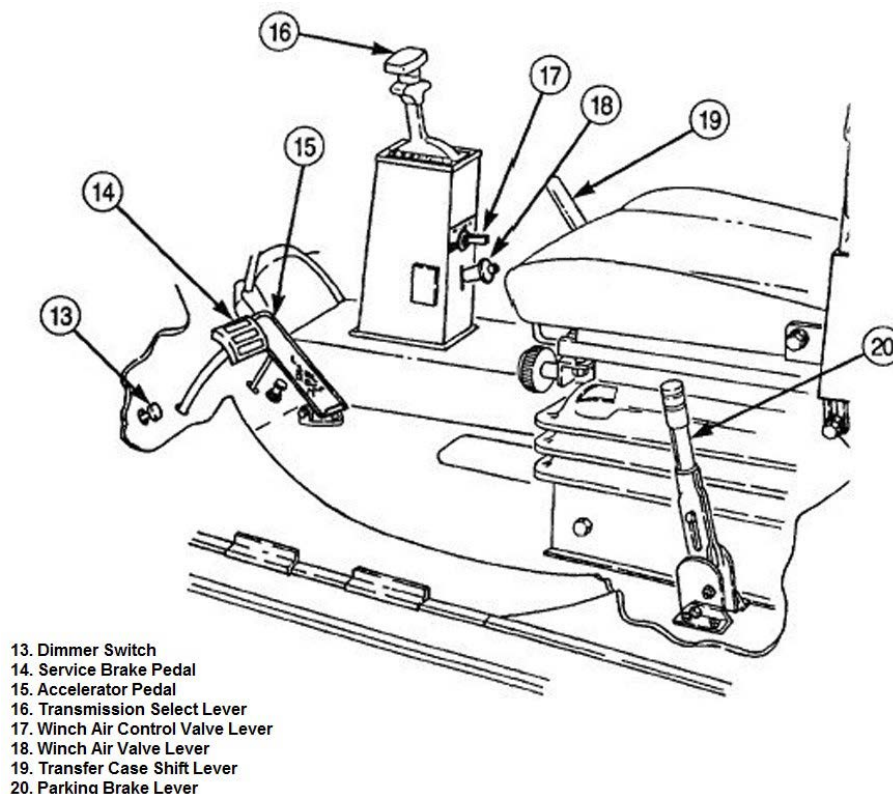


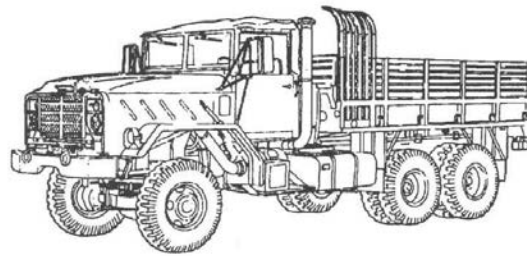
Figure 3-28. M35 cab interior, fourth view.

015. 5-ton M-series

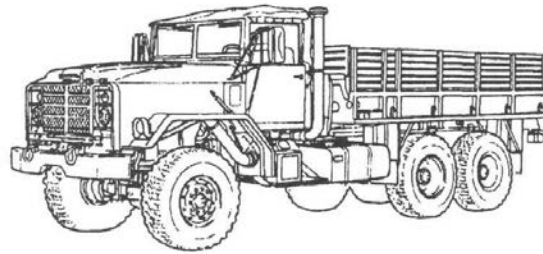
This lesson covers the M939, M939A1, and M939A2 5-ton, 6x6, M-series trucks. The M939, M939A1, and M939A2 series of vehicles varies in design and capabilities. The M939 was a redesign and retrofit of the M809 series of vehicles, providing enhanced capabilities. The basic M939 model provided features like automatic transmission, improved power steering, a complete air brake system, an improved cooling system, an improved electrical system, a three crew-member cab, a tilt hood, a hydraulically powered front winch and a simplified test equipment/internal combustion engine diagnostic connector.

The M939A1 added super single radial tires. The M939A2 added a new CTIS, a new (Cummins 6CTA) 8.3-liter diesel engine, and chemical-agent resistant paint. The following table and figures 3-29 and 3-30, show only a few examples of the different model designs of the M939, M939A1, and M939A2 series trucks, as well as the M936 series wrecker. For an all-inclusive list, reference the appropriate TO.

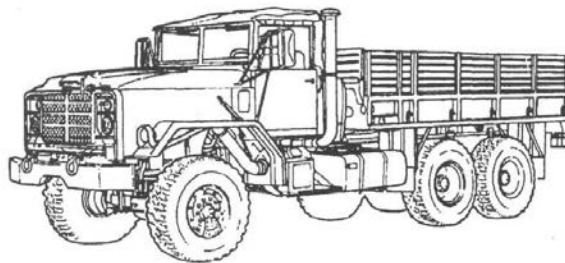
M939, M939A1, M939A2 Series Trucks	
TRUCK	MODEL
Cargo, Dropside	M923
Cargo, Dropside	M923A1
Cargo, Dropside	M923A2
Cargo, Dropside	M925
Cargo, Dropside	M925A2
Tractor	M931
Van, Expansible	M934
Medium Wrecker	M936



M923

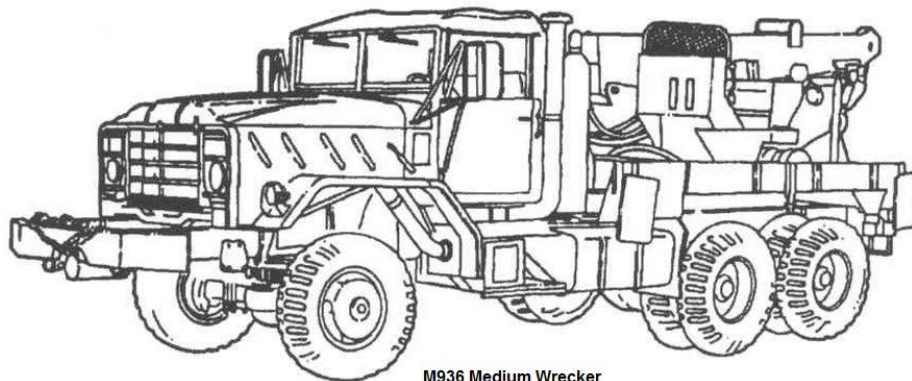


M923A1



M923A2

Figure 3-29. M923/A1/A2 dropside cargo.



M936 Medium Wrecker

Figure 3-30. M936 medium wrecker.

Mechanical, suspension, drive train, and towing system components

The mechanical, suspension, drive train, and towing system components listed in this lesson are common to most of the M939-, M939A1-, and M939A2-series trucks. The following are the major 5-ton vehicle components, followed by a brief description. Reference figure 3-31 as we discuss the components. Since you previously learned about some of the components listed in figure 3-31, we will not discuss their function.

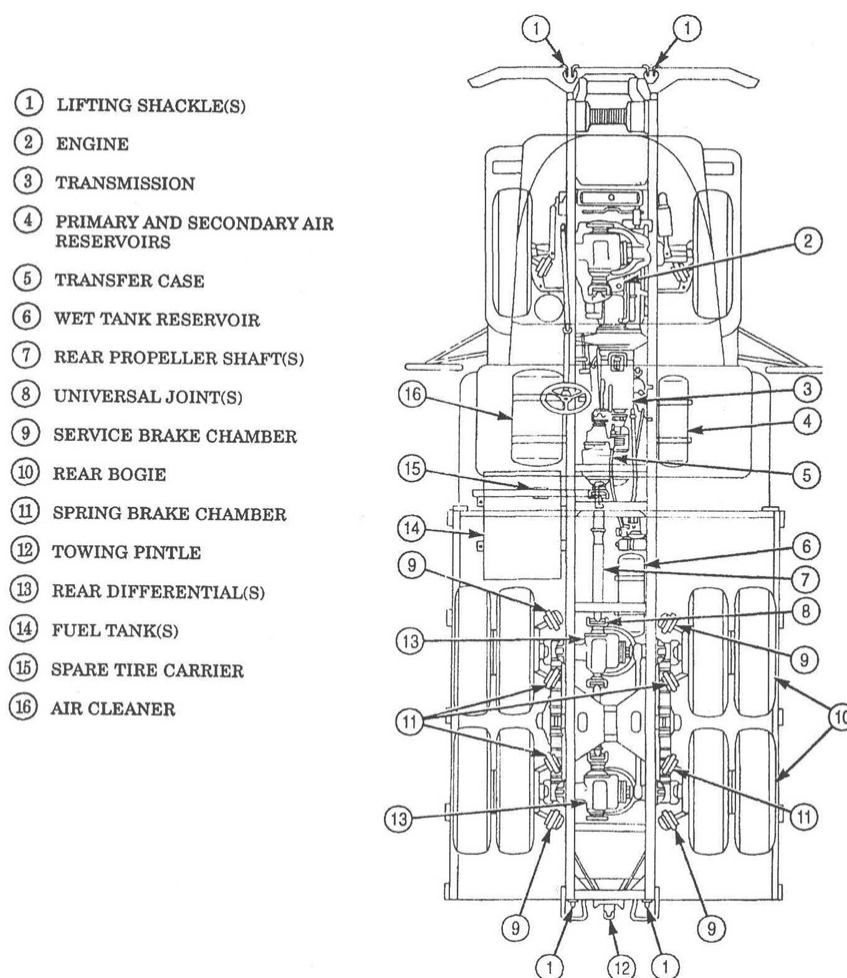


Figure 3–31. Major 5-ton vehicle components.

Major 5-Ton Components	
Component	Description
Engine	There are two different Cummins model engines used in the M939-, M939A1-, and M939A2-series trucks. The M939- and M939A1-series trucks have the Cummins model NHC 250 and the M939A2-series trucks have the 6CTA/8.3-liter diesel engines. The engine provides mechanical power to the vehicle and engine-driven subsystems.
Transmission	All M939-, M939A1-, and M939A2-series trucks use an Allison automatic transmission. The transmission adapts the engine's output for a varying range of operating speeds.
Transfer case	Directs the engine and transmission output to the specified axles and/or auxiliary equipment.
Rear propeller shafts	Transmits power between the transfer case and forward-rear axle assemblies, and between forward-rear and rear-rear axle assemblies.
Rear differentials	Transfers power from the propeller shaft to the axles and provide a straight-through connection to power additional propeller shafts.
Rear bogie	The suspension system comprised of both rear axles, upper and lower torque rods, springs, and seats that support the rear vehicle weight.
Towing pintle	Provides a secure quick-connect/disconnect for towing vehicles or equipment.
Lifting shackles	Mounted in the front and rear of the truck. They provide towing capability by another vehicle or are used for tie-down attachments when transporting.

Electrical system

The electrical system on the M939-, M939A1-, and M939A2-series trucks is broken down into the following sub-systems:

- Battery.
- Starting.
- Directional signal.
- Ether starting.
- Generating.
- Indicator, gauge, and warning.
- Heating operation.
- Trailer and semi-trailer connection.

Always follow TO procedures when troubleshooting the electrical system.

Steering system

The steering system on the M939-, M939A1-, and M939A2-series trucks is hydraulically assisted to provide the operator ease in turning and maintaining control of the vehicle. The major components of the steering systems are as follows:

- Pitman arm.
- Drag link.
- Steering wheel.
- Steering gear.
- Tie-rod assembly.
- Steering arm and knuckle.
- Power steering pump.
- Power steering assist cylinder.
- Steering column and universal joint.

Air system

The air system on the M939-, M939A1-, and M939A2-series trucks is similar to a standard truck system. This system also supplies compressed air to air-actuated accessories throughout the vehicle.

NOTE: The M939A2 is equipped with CTIS. Reference the appropriate TO when troubleshooting the CTIS.

Hydraulic system

Oil pressure (hydraulics) provides operating power for the auxiliary equipment on the M939, M939A1, and M939A2 series trucks. The most common components that use hydraulic power are as follows:

- Front winch.
- Rear winch (wrecker).
- Wrecker crane.

Front winch

A front winch is installed on M926/A1/A2-, M928/A1/A2-, M930/A1/A2-, M932/A1/A2-, and M936/A1/A2-series vehicles. The front-winch drive motor hydraulic system converts hydraulic power to mechanical power. The basic operating principles are the same for each model. Reference the front-winch system (fig. 3-32) as we discuss the front-winch system components listed and described in the table below.

Front-Winch System Components		
Figure Item	Component	Description
1	Clutch lever	A manual control that engages the winch drum gear to the drive gear of the winch motor.
2	Transmission power take-off (PTO) control	A manually operated control lever located inside the cab. The lever permits engagement or disengagement of the transmission PTO.
3	Winch control lever	A manually operated control lever that determines the hydraulic oil pressure flow from the control valve to the winch motor. The flow of the oil determines the direction the winch drum will turn.
4	Transmission PTO	It uses power from the transmission to provide mechanical power to the hydraulic pump.
5	PTO driveshaft	Transmits mechanical power from the PTO to the hydraulic pump.
6	Hydraulic pump	Driven by the PTO driveshaft, the hydraulic pump draws oil from the oil reservoir through hydraulic hoses, then pressurizes and directs oil through the control valve.
7	Oil filter	Filters used for bypassed oil from the control valve before the oil returns to the hydraulic oil reservoir.
8	Hydraulic oil reservoir	A storage tank for hydraulic oil.
9	Control valve	A four-port valve that receives pressurized oil from the hydraulic pump and directs it to the winch motor. Additionally, it directs oil returning from the winch back to the oil reservoir. The flow of oil from the valve determines the directional drive of the winch motor.
10	Winch motor	Converts hydraulic power into mechanical power as hydraulic oil is forced through the winch motor.

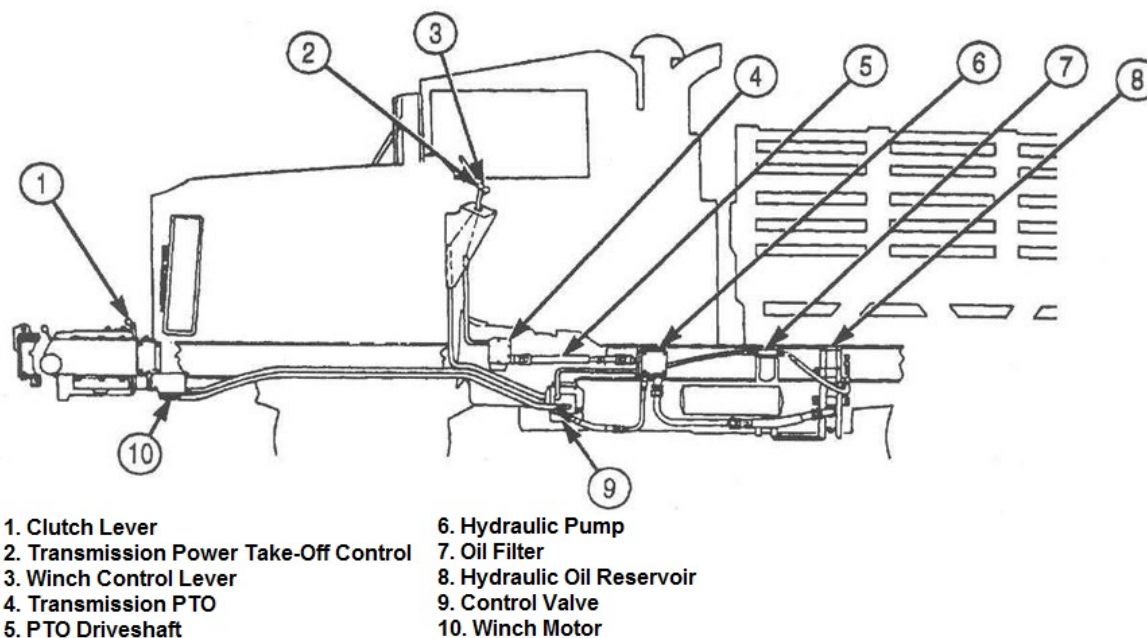


Figure 3-32. Front-winch system.

Rear winch (wrecker)

A rear winch is installed only on the M936/A1/A2 medium wrecker and is used primarily to rescue vehicles that are deeply stuck. The rear-winch hydraulic system converts engine mechanical power into fluid power using the hydraulic pump. The system then converts the fluid power back to mechanical power at the winch drive motor.

The main difference of the rear-mounted winch from the front-mounted winch is the use of two torque modes. This allows for increased pulling power for heavier loads. Reference the rear-winch system in figure 3-33 as we discuss the system components listed and described in the table below.

Rear-Winch System Components and Description		
Figure Item	Component	Description
1	Transfer case PTO control	A manually operated control lever located inside the cab that permits engagement or disengagement of the PTO.
2	Transfer case PTO	Uses driving power from the transfer case to provide mechanical driving power to the hydraulic pump.
3	PTO driveshaft	Transmits mechanical driving power from PTO to the hydraulic pump.
4	Hydraulic pump	Draws oil from the hydraulic oil reservoir and directs it to the rear-winch control valve and winch drive motor.
5	Oil filter	Filters used for bypassed oil from the control valve before it returns to the hydraulic oil reservoir.
6	Hydraulic fluid reservoir	A storage tank for hydraulic oil.
7	Torque control lever	Controls the operating winch drive motor gear ratio. Lever is pulled outward to HIGH for heavy loads or pushed inward to LOW for light loads.
8	Winch directional control lever	A manually operated lever that controls the wind and unwind direction of the rear-winch drum. The lever does this by opening and closing the directional control valve to the winch motor and reversing the direction of pressurized hydraulic fluid. The lever is pushed inward to wind and pulled outward to unwind the winch cable.
9	Directional control valve	Receives pressurized hydraulic oil from the hydraulic pump and directs it to the winch motor. The flow of hydraulic oil to and from this control valve provides forward or reverse driving power to the winch motor. The control valve also returns used oil back to the hydraulic oil reservoir from the winch.
10	Torque control valve	Hydraulically controls the hydraulic oil pressure to engage the rear-winch drum clutch in high- or low-gear range.
11	Winch motor	Converts hydraulic power back into mechanical power needed to turn the rear-winch drum.
12	Control linkage	Connects the transfer case PTO control to the transfer case PTO.

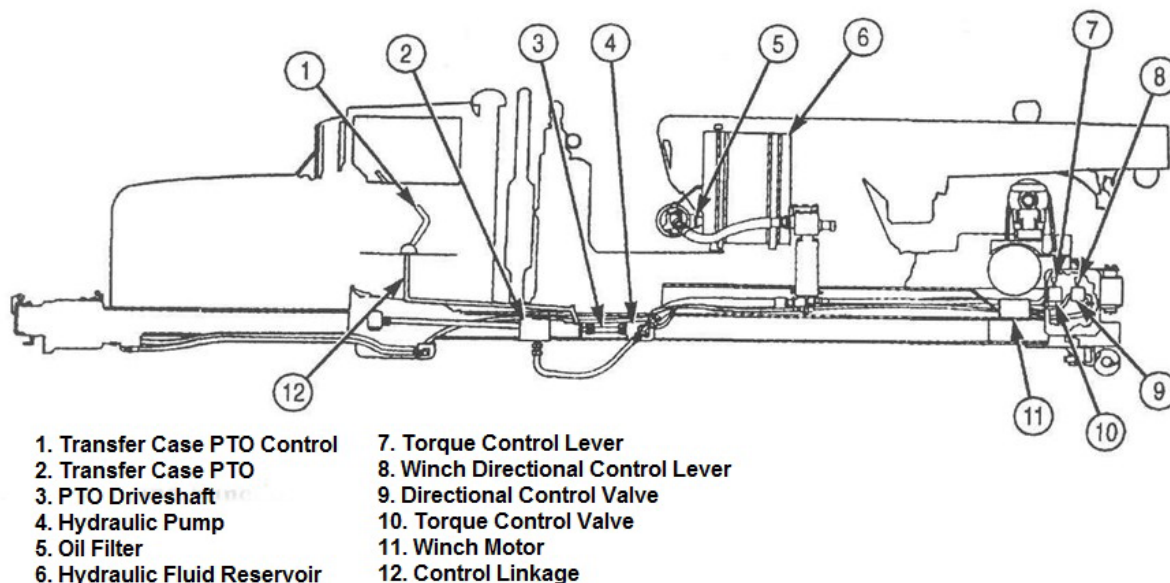


Figure 3-33. Rear-winch system.

Wrecker crane

The M936/A1/A2 wrecker is equipped with a hydraulically operated crane that extends a maximum of 18 feet, elevates 45°, and swings 360°. The wrecker is capable of lifting loads up to 20,000 pounds (lb.). The crane hydraulic system converts engine power (mechanical) into fluid power (hydraulic) for use by the hydraulic pump. At the pump, oil pressure is supplied to the following four crane control valves:

1. Boom.
2. Hoist.
3. Crowd.
4. Swing.

The major component locations, used for raising and lowering the wrecker boom, are depicted in figure 3-34. Reference it as we discuss the major components listed and described in the table below.

Wrecker Crane Major Components and Description		
Figure Item	Component	Description
1	Transfer case PTO control	A manually operated control lever located inside the cab that engages and disengages the transfer case PTO.
2	Transfer case PTO linkage	Connects transfer case PTO control to the transfer case PTO.
3	Transmission PTO	Uses transmission driving power to provide mechanical driving power for the hydraulic pump.
4	PTO driveshaft	Transmits mechanical driving power from the power takeoff to the hydraulic pump.
5	Hydraulic pump	Draws oil from the hydraulic oil reservoir and directs it to valves inside the crane control console.
6	Oil filter	Filters used for bypassed oil from the control valve before it returns to the hydraulic oil reservoir.
7	Hydraulic oil reservoir	The storage tank for hydraulic oil.
8	Swivel valve	Permits oil to channel through the pivot post while the crane is swinging, which eliminates twisting of the hydraulic lines connecting the reservoir to the stationary pump.
9	Boom lift cylinder	A hydraulically driven piston that extends upward when the boom control lever is pulled back to the UP position, raising the boom. A check valve located near the hydraulic oil inlet hose prevents the piston from lowering when control lever is in NEUTRAL. Oil returns through the boom control valve back to the hydraulic oil reservoir allowing the piston to lower when the control lever is pushed forward to the DOWN position.
10	Boom hydraulic lines	Carries the hydraulic oil to and from the boom lift cylinder. Oil pumped through the bottom lines pushes the lift cylinder piston upward, and oil pumped through the top lines pushes the lift cylinder piston downward. When this downward action occurs, the oil that originally pushed the cylinder upward is returned to the hydraulic oil reservoir.
11	Boom control lever	A manual control attached to the control valve that determines hydraulic oil flow for the raising and lowering action of the boom. The lever is pulled back to raise the boom and pushed forward to lower the boom.
12	Identification plate	Indicates each control lever.
13	Boom control valve	Located directly below the boom control lever. This valve directs hydraulic oil from the hydraulic pump to the boom lift cylinder for lifting or out of the lift cylinder and back to the hydraulic oil reservoir for lowering.

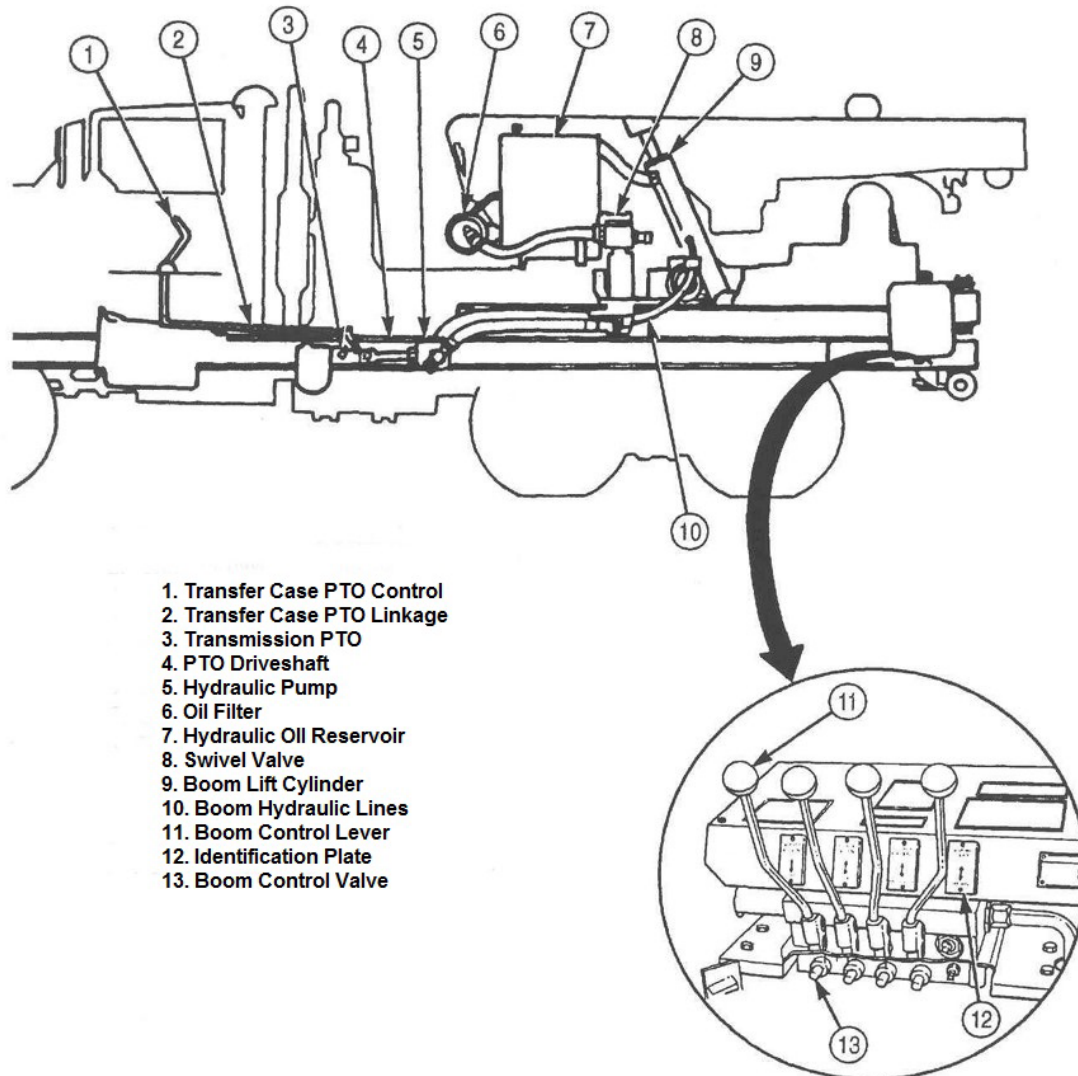


Figure 3-34. Major components for raising and lowering boom.

The major components used for raising and lowering the crane cable and hook for the hoist actions are depicted in figure 3-35. Reference it as we discuss the major components that are listed and described in the table below.

Major Components For Raising and Lowering The Crane Cable And Hook		
Figure Item	Component	Description
1	Sheaves	Grooved wheels that guide the hoist cable through the boom.
2	Hoist motor assembly	Converts hydraulic power back into mechanical power that is needed to turn the hoist drum.
3	Upper roller assembly	Prevents the cable from contacting the inner boom during winding and unwinding.
4	Crane hoist cable drum	Turned by the worm gear in the hoist motor assembly. Drum unwinds the cable when turning toward front of vehicle. Drum winds the cable when turning toward rear of vehicle.
5	Hoist control lever	A manual control attached to the control valve that determines hydraulic oil flow for the raising and lowering action of the crane hoist cable and hook. Lever is pulled back to raise cable and hook and pushed forward to lower cable and hook.

Major Components For Raising and Lowering The Crane Cable And Hook		
Figure Item	Component	Description
6	Hoist control valve	A two-way hydraulic valve located under the hoist control lever. The valve directs fluid from the hydraulic pump to the hoist motor assembly and back through the valve to the hydraulic oil reservoir.

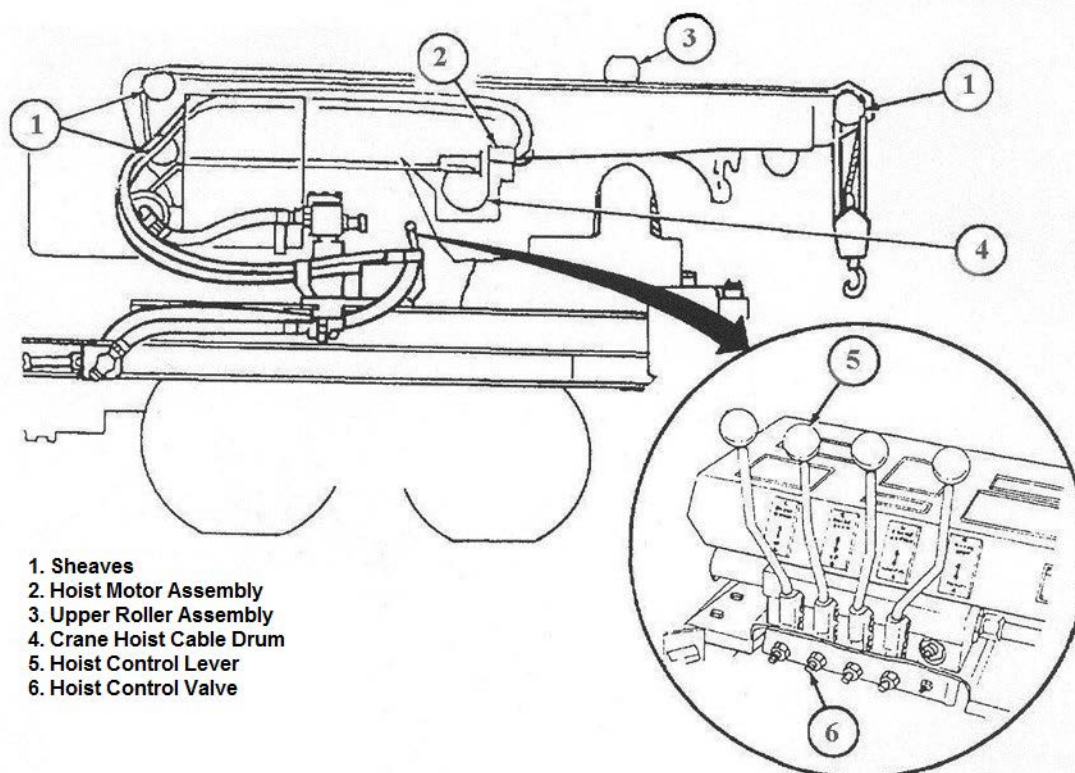


Figure 3-35. Major components for raising and lowering crane cable and hook.

The major components used for extending and retracting the boom for the crowd action are depicted in figure 3-36. Reference it as we discuss the components listed and described in the table below.

Major Components Used For Extending and Retracting The Boom		
Figure Item	Component	Description
1	Rollers	Rollers guide the inner boom assembly and permit smooth extension and retraction of the boom.
2	Inner boom assembly	Extends when the crowd control lever is pushed forward and retracts when the control lever is pulled back.
3	Crowd cylinder	A hydraulically driven piston that extends outward when the crowd control lever is pushed forward to the EXTEND position. The piston is hydraulically driven back into the cylinder when the crowd control lever is pulled back to the RETRACT position. This cylinder is contained in the inner boom assembly.
4	Crowd control lever	A manual control attached to the control valve that determines oil flow for extending and retracting the crane boom. The lever is pushed forward to extend the boom and pulled back to retract the boom.
5	Crowd control valve	A two-way hydraulic valve located directly below the crowd control lever. This valve directs hydraulic oil from the hydraulic pump to the crowd cylinder to extend and retract the inner boom assembly.

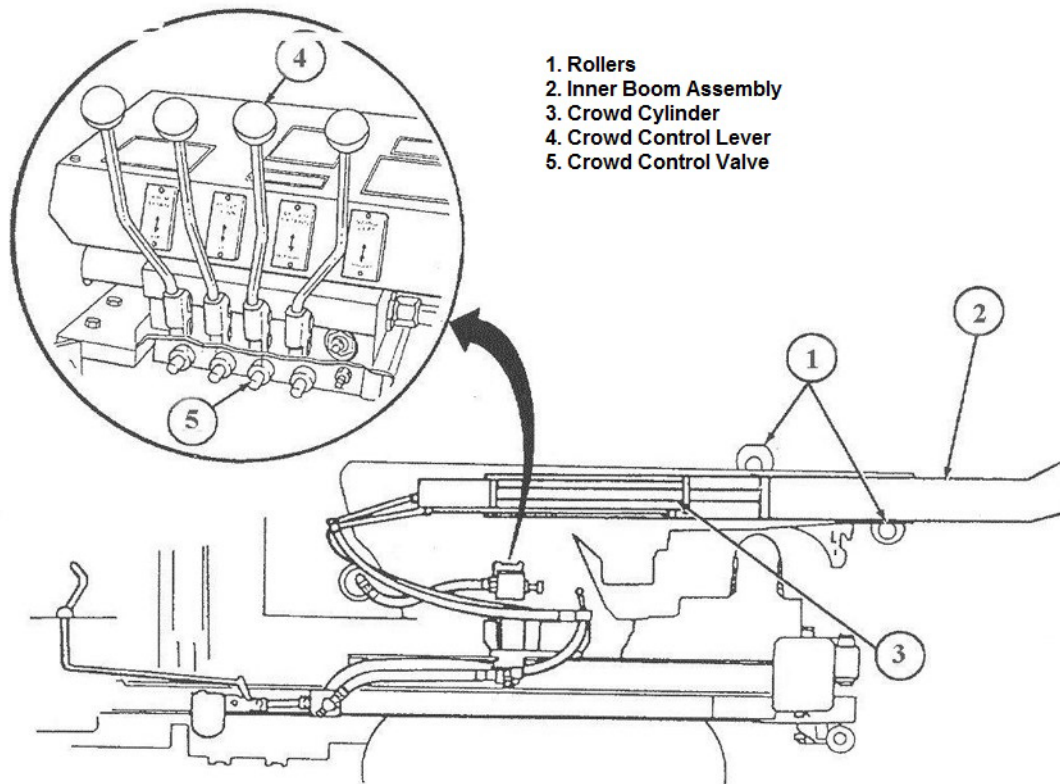


Figure 3-36. Major components for extending and retracting the boom.

Major component used for swinging the crane left and right for the SWING action are depicted in figure 3-37. Reference it as we discuss the components used for swinging the crane that are listed and described in the table below.

Major Component Used For Swinging The Crane		
Figure Item	Component	Description
1	Swing motor	Converts hydraulic power back into mechanical power needed to turn the crane turntable when hydraulic fluid is forced through its worm gear. This gear turns a large gear at the base of the turntable to swing the crane.
2	Turntable assembly	Driven by the swing motor through a ring gear at the base of the assembly that permits the crane to swing 360°.
3	Swing control lever	It is manually controlled and attached to the control valve that determines hydraulic oil flow for swinging the wrecker boom to the left and right. The swing control lever is pushed inward for left-boom movement and pulled outward for right-boom movement.
4	Swing control valve	A two-way hydraulic valve located directly below the swing control lever. This valve directs hydraulic oil from the hydraulic pump to the swing motor assembly and back through the valve to the hydraulic oil reservoir.

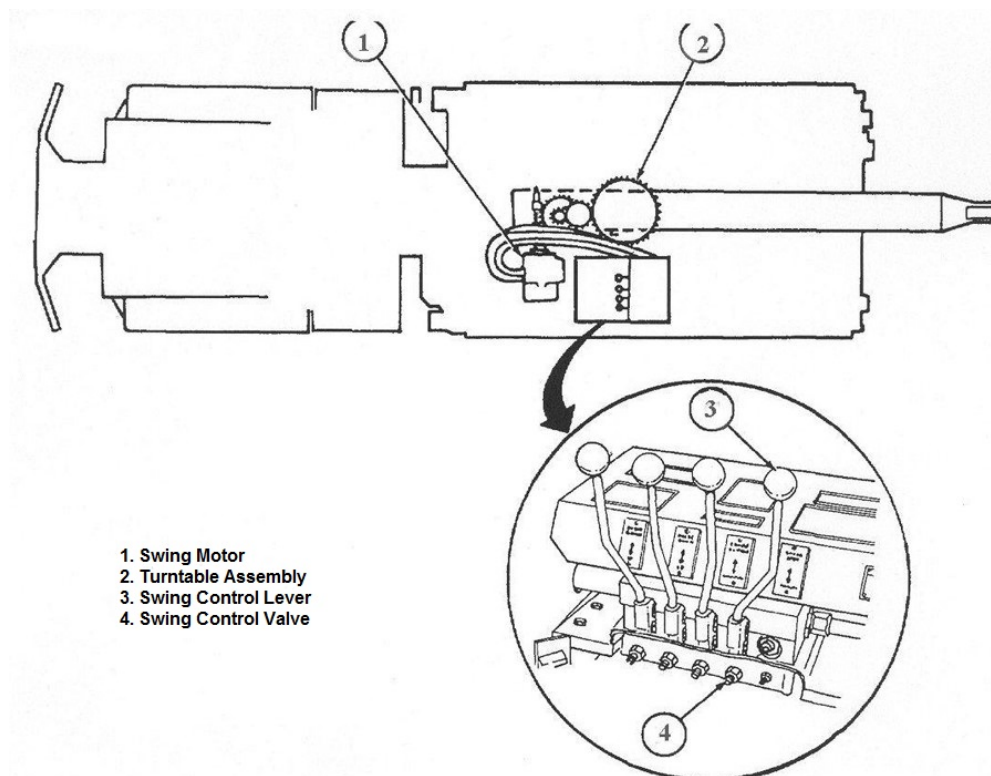


Figure 3-37. Major components for swinging the crane left and right.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

013. High-mobility multipurpose wheeled vehicle

1. For what purpose was the HMMWV designed?
2. What are the M998 and M1038 models used to transport?
3. What are the M966 and M1036 models used to transport?
4. The HMMWV engine is identical on all models except those equipped with a deep-water fording kit, which adds what components to the engine?
5. How is the HMMWV coolant pump driven?
6. Which component directs hydraulic fluid to activate the fan clutch?

7. What does the HMMWV transfer case provide?
8. What is the purpose of the halfshafts on the HMMWV?
9. What component serves as the front-wheel steering spindle?
10. What type of suspension system does the HMMWV have?
11. What provides gear reduction, increasing torque to the wheel and tire assembly?
12. What suspension system component supports the weight of the vehicle and allows suspension travel to vary depending on terrain and vehicle loading?
13. What type of common headlight switch is used on M-series vehicles?
14. What is the purpose of the blackout lamp and markers?
15. What does it mean if you see two red “cat’s-eye” blackout markers on each side of the vehicle in front of you during night convoy operations?
16. What does the rotary switch provide?
17. What generating system circuit provides a ground circuit to the alternator?
18. What circuit connects the batteries to the starter and to the protective control box through circuit 81A?
19. At what component is the junction point for the battery positive lead (circuit 6A) and the vehicle electrical feed wire (circuit 81A)?

20. What is the purpose of the runflat tire and wheel assembly?

014. 2½-ton M-series

1. Which 2½-ton M-series model truck is not suited for maneuvering in limited spaces? Why?
2. Which engine component allows unrestricted oil flow if the oil cooler and filter are plugged?
3. When used in conjunction with the transmission, the transfer case provides how many forward and reverse gears?
4. What type of fuel injector system is used in the M35 engine?
5. What are the M35 main cooling system components?
6. What is the purpose of the M35 throttle control located in the cab?
7. What provides the operator with the current tire pressure and maximum speed for the selected terrain setting?
8. At what psi will the M35 low air pressure indicator light illuminate?

015. 5-ton M-series

1. What is a rear bogie?
2. What major component of the 5-ton M-series permits the vehicle to be towed by another or tied down for transporting?
3. List the electrical sub-systems of the 5-ton M-series electrical system.
4. What are the most common components that provide hydraulic power on the 5-ton M-series?

5. What is the purpose of the control valve in the front winch of the 5-ton M-series?
6. What is the main difference between the front and rear winches on the 5-ton medium wrecker?
7. Which rear-winch component controls the hydraulic pressure to engage the winch clutch for high- and low-mode selection?
8. How many lb. is the 5-ton medium wrecker capable of lifting?
9. What major component, used for raising and lowering the wrecker boom, engages and disengages the transfer case PTO?
10. What major component, used for raising and lowering the wrecker boom, eliminates twisting of the hydraulic lines connecting the reservoir to the stationary pump?
11. What major component, used for raising and lowering the wrecker boom, directs hydraulic oil from the hydraulic pump to the boom lift cylinder for lifting?
12. What major component, used for raising and lowering the wrecker crane cable and hook, guides the hoist cable through the boom?
13. What major component, used for extending and retracting the wrecker boom, permits smooth extension and retraction of the boom?
14. What major component, used for swinging the wrecker crane left and right, is driven by the swing motor through a ring gear?

3-2. Mine-Resistant, Ambush-Protected Vehicles

The MRAP series of vehicles were developed for one purpose—protect our military men and women from the enemy. The enemy likes to use explosive devices to harm our troops. The threat comes from improvised explosive devices (IED), rocket-propelled grenades (RPG), mines, small-arms fire, and other types of weapons. MRAPs are produced by a variety of companies and each company offers different versions. They are differentiated by category (CAT). There are three categories of MRAP: CAT I, CAT II, and CAT III. The AF is using CAT I and CAT II MRAPs. In this section, we will cover the MaxxPro CAT I MRAP.

NOTE: The following lessons were built from technical data available on a specific MRAP revision at the time of CDC production. Expect variations in the MRAPs as options or improvements are added and variants are designed throughout the production run. Always use the most current TO specific to the model of MRAP you are maintaining.

016. Mine-resistant, ambush-protected fundamentals

The MaxxPro (fig. 3-38) can carry up to six personnel. It is a four-wheel-drive vehicle with a curb weight of 21,000 to 32,000 lb. and a gross vehicle weight (GVW) of 31,000 to 52,000 lb. This small MRAP is designed for small-unit missions in urban or confined areas. Missions performed by this CAT I MRAP include the following:

- Reconnaissance.
- Mounted patrols.
- Troop or cargo transport.
- Convoy security.
- Casualty evacuation.
- Communications/command and control.

The vehicle can operate in most weather and terrain conditions. It can ford water up to 36 inches deep and climb or descend grades up to 60 percent.

The major systems of the vehicle include the cab, mechanical system, electrical system, air system, suspension, steering, and winch. We will also cover the fire suppression; heating, ventilation, and air conditioning (HVAC); and life support system (LSS) systems.



Figure 3-38. MaxxPro.

Mechanical system

The majority of the mechanical (drive train) system on the MaxxPro consists of commercial off-the-shelf components. This allows for ease of maintenance and parts procurement as well as reliability and longevity. We will discuss the engine, transmission, transfer case, axles, suspension, steering, air system, and brakes as well as the wheel and tire assemblies.

Engine

The MaxxPro is powered by an International DT 530, in-line 6-cylinder, computer-controlled diesel engine capable of running on diesel or JP-8 fuel. The engine produces 330 hp and 950 foot-pound (ft. lb.) of torque. Maximum engine speed is governed at 2,200 rpm. The engine uses a conventional cooling system consisting of a radiator, fill reservoir, and surge tank, as well as a full-flow oiling system.

Fuel injection is accomplished using hydraulically actuated, electronically controlled unit injectors (HEUI). The high-pressure engine oil used to actuate the injectors is supplied by a high-pressure oil pump, lines, and a high-pressure oil manifold. A low-pressure fuel pump supplies fuel to the injectors through a fuel rail in the cylinder head. The engine has an air inlet preheater located in the intake for cold-weather starting.

Exhaust brake

The MaxxPro is equipped with an exhaust brake system. Using the exhaust brake allows the operator to slow the vehicle or maintain a constant speed when descending steep road grades. This reduces the need to use the service brakes in these conditions where prolonged use of the service brakes could cause brake failure. The exhaust brake should not be used in rain or other slippery conditions. Doing so may cause skidding and possible loss of control.

CAUTION: The service brakes should always be used as the primary vehicle braking system. The exhaust brake should never be considered a substitute for the vehicle's service brakes. The exhaust brake cannot bring the vehicle to a complete stop. Only the service brakes can bring the vehicle to a complete stop. Using the exhaust brakes in place of the service brakes may result in death or injury to personnel, or damage to equipment.

Diesel heater

The vehicle is equipped with an auxiliary diesel heater (fig. 3-39) to assist during cold-weather starting by heating the engine coolant to 149–176° F. Warm air is also provided for the interior of the vehicle. Once the engine is started, it uses the engine coolant to heat the engine block and provide heat to the interior of the vehicle. The auxiliary diesel heater is controlled by switches on the control panel of the HVAC and LSS system.

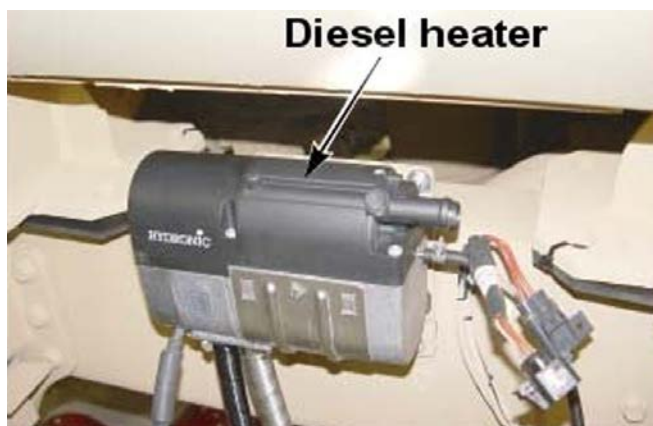


Figure 3-39. Auxiliary diesel heater.

Transmission

The engine drives an Allison 3000SP electronically controlled, automatic transmission. The transmission provides five forward gears and one reverse gear. The transmission uses an oil cooler attached to the radiator to help keep the transmission fluid cool under adverse conditions. The transmission control is a push-button-type, which allows the operator to choose reverse, neutral, or drive as well as change the drive range by using up and down arrow keys.

Transfer case

The transmission drives a two-speed transfer case equipped with an internal oil pump and external oil cooler. The transfer case is *not synchronized*. This means that the operator must stop the vehicle completely to change from rear-wheel drive to four-wheel drive or when changing between HI and LOW range. Failure to stop the vehicle can result in severe transfer case damage. The transfer case also has a neutral position that can be used when towing the vehicle. The transfer case mode and range is selected using rocker switches located on the instrument panel between the driver and passenger seats. The transfer case is shifted by air cylinders built into the assembly.

Axles and suspension

The MaxxPro utilizes heavy-duty, full-floating, commercial truck axles. The front axle has an 18,000 lb. capacity while the rear axle has a 23,000 lb. capacity. They attach to the vehicle frame through the use of a conventional leaf-spring suspension.

Steering

Steering is accomplished using a cross-steer linkage system. The power steering pump provides hydraulic power to an integral power steering gearbox. The left steering gearbox houses the control valve for the power steering. The left gearbox control valve also sends hydraulic fluid to a second “slave” gearbox on the right side of the truck (fig. 3-40).

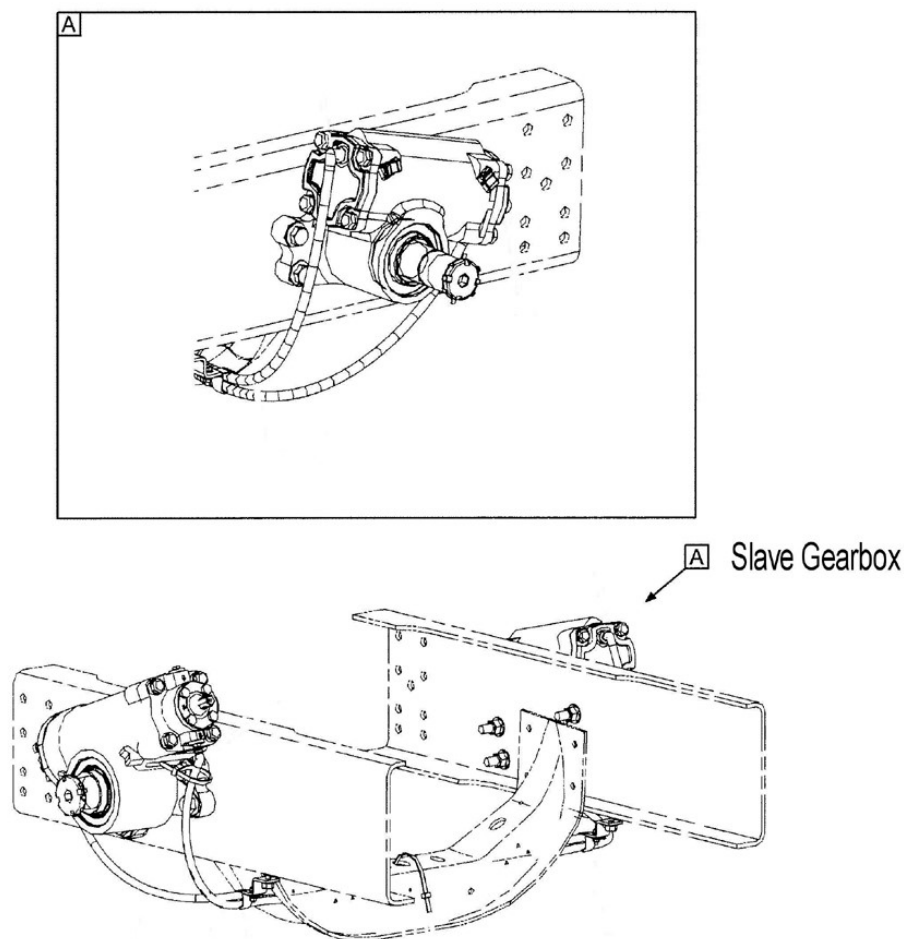


Figure 3-40. Dual steering gearboxes.

When the power steering is functioning properly, both gearboxes move in unison. Two power steering gearboxes provide for ease of steering as the steering system on this vehicle requires significant force to move. A pitman arm from each gearbox transmits movement through drag links to

the upper steering arm on both spindles (steering knuckles). A second steering arm on each spindle connects to a tie rod, which, in turn, connects the spindles together. This ensures the wheels turn together and maintains steering alignment.

Air and brake systems

The air system provides air for the service brakes, air assistance for the vehicle doors, and shifting of the transfer case. Opening and closing of the vehicle's doors is assisted by pneumatic (air) cylinders mounted inside each of the side doors. The air system components include the following:

- Air dryer.
- Governor.
- Engine-driven air compressor.
- Primary and secondary supply tanks.
- Associated valves and lines.
- External air connection—used to inflate tires or run small air tools.

The vehicle uses a standard air brake system. The front brakes are disk-type brakes that use service brake chambers to actuate the calipers. The rear brakes are the drum-type and are equipped with spring-applied parking brakes. There are gladhands on the front and rear of the vehicle. They can be used to supply air to a trailer or another MRAP that is being flat towed.

The MaxxPro is equipped with an ABS, which helps improve braking when excessive wheel slippage or wheel lock-up is detected. The ABS will take over and apply or relieve extra pressure to the wheel or wheels that need it. When activated, you will feel a fast pulsation on the brake pedal. This is normal; the ABS is taking over and stopping the vehicle or slowing it down.

As with other ABSs, apply steady pressure to the brake pedal; *do not pump the brakes*. The ABS is integral to the service brakes. The ABS components include an ECM, wheel-speed sensors, control valves, and an indicator light. If the ABS light stays illuminated or flashes during vehicle operation, a malfunction has been detected.

Wheel and tire assemblies

All MRAPs are required to have runflat capability. You definitely would not want to stop to change a flat tire in a combat situation. The wheel assembly consists of a two-piece, bolt-together rim; an O-ring to seal the two halves together; and a runflat (fig. 3-41). The whole assembly is like a larger version of a HMMWV wheel and tire assembly. The runflat capability allows the vehicle to operate at speeds of up to 35 mph for up to 30 miles.

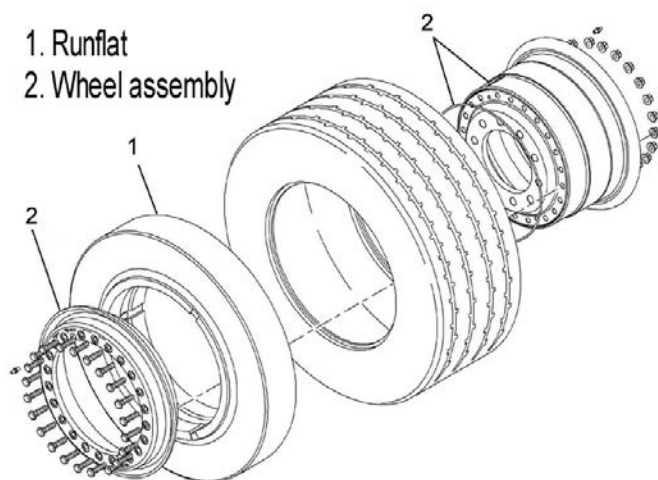


Figure 3-41. Wheel assembly with runflat.

Electrical system

The MRAP's electrical system is powered by a 24-volt alternator, which runs the vehicle while the engine is operating, and it charges the four 12-volt batteries. The batteries are connected in series-parallel and are located under the right-hand passenger front-side of the vehicle. These batteries provide 12- or 24-volt power.

A battery-disconnect system, controlled by a switch on the dash, protects the batteries from being drained if accessories were left on. There is a standard NATO slave receptacle, in the right-front storage box, for jump-starting disabled vehicles. The vehicle is also equipped with a power inverter box (fig. 3-42), which provides 110 volts, alternating current (VAC) at receptacles in the right-rear stowage box and in the cab. There are also several 12-volt receptacles located in the cab.



Figure 3-42. Inverter.

Just like other M-series vehicles, this vehicle has both conventional and blackout lighting systems. The conventional and blackout lighting systems are controlled by the newer style push-button light switch. There is also a remote-control spotlight mounted on the vehicle roof as well as an infrared (IR) light located on the front bumper for use with night vision.

HVAC, LSS, and fire suppression system

The purpose of the HVAC, LSS, and fire suppression system (FSS) is to protect the vehicle's occupants from heat; cold; nuclear, biological, and chemical (NBC) threats; and fire.

HVAC and LSS

The HVAC and LSS regulates the fresh and recirculated air within the cabin. It provides protection from outside extreme hot or cold temperatures. Fresh air (FA) is received into the vehicle's cabin through an inlet located on the vehicle's roof. The pre-treated air then moves through an evaporator and a heater, where FA is mixed with recycled air (RA). A blower injects the treated air into the cabin. In a wartime configuration, the system provides protection from NBC agents using special filters. The filters do not decontaminate or neutralize contamination, they only collect and contain it.

The HVAC unit is inside the vehicle, on the cab's right sidewall, behind the front passenger seat. The NBC filter is accessed externally. Vehicle occupants can control the HVAC system functions with a

mode selection panel, located directly behind the front seats (fig. 3-43). Controls consist of a group of switches. The HVAC system operates in the following modes:

- DRY – This is the defrost mode. When using this mode, open the handle above the driver to direct air to the window. Use the temperature level to adjust heat setting.
- HEAT – This setting provides maximum heat to the cab area.
- OFF – Turns off fresh and recirculating air in the cab area.
- VENT – Only FA received from the outside enters the cab through the NBC filter (if installed). You cannot adjust the fan speed.
- COOL – FA and RA are mixed and cooled to provide AC.

There are also controls for temperature level and fan speed.



Figure 3-43. HVAC/LSS control panel.

The LSS, integrated within the vehicle's HVAC system, provides a safe and comfortable indoor air supply for cabin occupants. The LSS is activated by a toggle switch on the HVAC control panel. The LSS unit has the following functions:

- Ventilation.
- Cabin pressurization with FA.
- NBC protection.
- Space AC.
- Dust and particulate removal.

The overpressure in the cab created by the LSS system prevents outside contaminants from entering the cab through small leaks in door seals or other areas of the cab. The overpressure causes clean air in the cab to be forced out through any leaks, in turn, keeping contaminants out. A pressure gauge on the dash allows personnel to monitor the pressure in the vehicle. It also will indicate if a significant leak is present.

FSS

The FSS utilizes a dry chemical to extinguish fires. It is designed to fight fires both inside and outside of the vehicle. The MaxxPro's FSS is actually comprised of two separate FSS systems: Kidde Automatic Fire Extinguisher System (AFES) and Firetrace Manual Fire Suppression System. The Kidde AFES protects the engine and interior, while the Firetrace protects the tires and fuel tank (fig. 3-44).



Figure 3-44. Kidde optical fire sensors.

The Kidde system can detect a fire situation by using five optical fire sensors mounted throughout the vehicle. Three sensors are mounted within the crew subsystem and two located in the engine subsystem. Each of these sensors detects two forms of IR light—short and long wavelength.

The engine and interior fire sensors will automatically operate the FSS when fire is detected. For reference during inspection and maintenance, the wire loom (a plastic sleeve that protects the wiring) that is connected to each sensor provides labels that number each sensor. This number represents its position in the circuit. For example, Sensor 1 comes first, then Sensor 2, followed by Sensor 3, which is the end-of-line (EOL) sensor for the interior circuit. There are no optical sensors used for the tires and fuel tank subsystem because the Firetrace system must be manually activated using a toggle switch.

The FSS control panel (fig. 3-45) has indicator lights and manual switches for each system, a dimmer, and a power indicator lamp. When a fire is present in one of the protected areas (engine, interior, tires, or fuel tank), the operator can manually activate the needed system by lifting up the switch cover and flipping the toggle switch up. Remember, the tire and fuel tank subsystem can only be activated manually. Each protected area has its own separate FSS bottle(s). The bottles for each area are located in or near that area. For example, the bottles for the interior are located behind the HVAC/LSS control panel and at the rear of the cab. The FSS operates on 24-volt power and uses a battery backup located under the driver seat. The backup provides up to 10 minutes of reserve power to activate the AFES when needed.

CAUTION: Prior to servicing the FSS, ensure the master battery disconnect switch is OFF and the FSS battery backup connector is removed from battery backup box. Failure to comply may result in accidental discharging of the system and injury to personnel.



Figure 3-45. FSS control panel.

Vehicle body and armor

The MaxxPro provides protection for the crew from blast, shock, and fragments, and effects explosive blasts. The V-shaped hull and other design features provide protection even when an explosive device is detonated under any wheel or directly under the crew compartment. The vehicle armor helps protect the crew against anti-tank mines, small-arms fire, IEDs, and overhead airburst. The four-point restraint system and shock-absorbing seats provide additional crew protection.

Cab

The base cab is constructed of metal-composite materials made of ceramic armor. External armor modules, called “catcher” plates (fig. 3-46) equipped with internal high-performance liners, are attached externally to the base armor. The panels are bolted together and sealed. The catcher plates are removable and can be replaced if damaged.



Figure 3-46. Catcher plates.

Another layer of armor that may be used is called “effector” assemblies (fig. 3-47). They are supplemental armor assemblies that attach to brackets that hold the effector plates several inches from the vehicle body. The armored windows, made from multiple layers of ballistic glass and laminate, are bolted on and do not open.

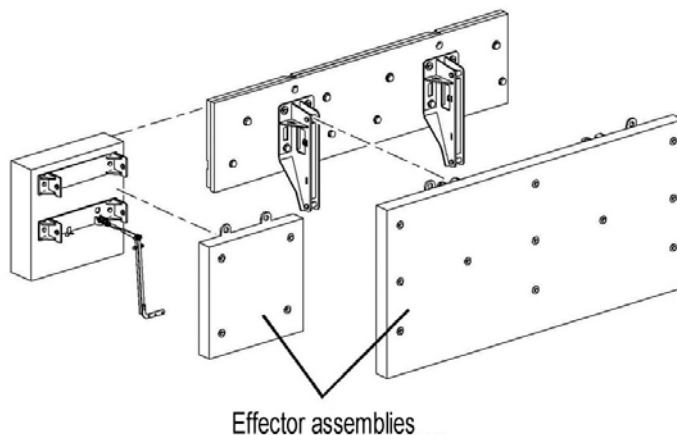


Figure 3-47. Effector assemblies.

Doors and hatches

The MaxxPro has several doors and hatches to provide entry and exit from the vehicle during normal and egress conditions. There are two forward doors—one for the driver and one for the front passenger. There is a rear door for crew or cargo. Located on the roof are two hatches: one is the gunner’s hatch and the other is strictly used for escaping the vehicle in an emergency. There are also six gun ports, three on each side of the vehicle.

Forward doors

As mentioned above, there are two forward doors. One is for the driver and the other for the vehicle commander. Because the doors are very heavy, air cylinders, which are located in each door, assist in opening and closing the doors. When you push open or pull close on the door handle linkage, it actuates an air valve. The valve sends air pressure to the cylinders that push or pull on a linkage assembly to assist in door operation. The doors are also equipped with a combat lock. The purpose of the combat lock is to secure the door from the inside to keep the enemy out and keep the door closed during an explosion, rollover, and so forth.

The combat lock consists of a lever, linkages, and locking plates. When the combat locks are engaged, the locking plates rotate into position effectively locking the door to the cab. The combat lock can be opened from the outside of the vehicle in the case an emergency evacuation is necessary. A small shaft protruding from the door connects to the linkage inside the cab. To rotate the shaft insert a screwdriver into a hole in the shaft and then turn the shaft counterclockwise.

Rear door

The MaxxPro has one large rear door, hinged at the bottom, which opens like a ramp. The ramp is equipped with stairs allowing for easy entry and exit by personnel. The rear door is opened and closed hydraulically but can be opened manually in an emergency. The door hydraulics can be operated electrically using toggle switches located on the center dash panel or on the hydraulic pump cover at the rear of the cab (fig. 3-48).



Figure 3-48. Rear door hydraulic pump assembly.

The hydraulic system operates one cylinder, which provides the power to lower and raise the rear door. The rear-door hydraulics may also be operated manually. To operate the ramp using the hydraulic pump located in the crew compartment, push the round plunger in and turn the plunger clockwise, insert the handle into the pump, and move the handle up and down to lower the ramp. To raise the ramp, turn the round plunger counterclockwise and push the plunger out. Insert the handle into the pump, and move the handle up and down to raise the ramp.

To operate the ramp manually, remove the safety pin from the lower connection point of the main cylinder. Using the pump handle, place it in the hole on the center bar and rotate the center bar to unlock the ramp. Remove the pin in the lower connection point of the main hydraulic cylinder to allow the ramp to fall open.

CAUTION: Ensure the area behind the rear door is clear prior to lowering it, especially when doing so manually. Anyone struck by the falling door may incur serious injury or be killed. DO NOT operate the door while the vehicle is in motion, and stay clear of pinch and crush points during door operation.

Hatches

As mentioned earlier, the vehicle has two hatches, one for the gunner and an escape hatch. The gunner's hatch is located in the roof just behind the driver. The hatch slides open and closed and is operated manually. To open the hatch, it must be unlocked and slid rearward until it locks in the open position. It must also be unlocked prior to being closed. The locking open feature prevents the gunner from being injured by the hatch sliding closed.

CAUTION: Ensure that the gunner's hatch is in the locked position before moving the vehicle. The gunner's sliding hatch can only be opened or closed when the vehicle is stationary and on a level surface. DO NOT attempt to open or close the hatch when the vehicle is in motion. Keep arms and hands clear of gunner's hatch when closing it. Failure to comply may result in serious injury or death.

The emergency hatch is located in the roof at the rear of the vehicle. This hatch allows for escape in the event of a rollover when the other doors are inoperable. The hatch is opened manually and held closed by a latch.

CAUTION: The vehicle must not be operated with the emergency hatch open. Use caution when opening or closing the hatch; it is heavy and can cause serious injuries.

Additional armor components

Although the armor on the MaxxPro is centered around the cab, there are other protected areas that help the vehicle's survivability. These armor components help protect critical vehicle systems such as the drive train, fuel tank, and batteries. The engine is protected by an armor plate assembly on each side and an armored grill in the front. The battery box and fuel tank are both protected by armored enclosures. The belly armor plate is large and helps protect the fuel tank, battery box, air tanks, and the transmission and transfer case. These additional armor components, along with the main cab, provide excellent protection to the vehicle and its occupants.

017. Mine-resistant, ambush-protected maintenance

Next, we will discuss some basic MRAP maintenance procedures. We will begin with electrical maintenance, followed by LSS and HVAC maintenance. Then, we will discuss inspecting the FSS, and finish with a discussion of body armor removal and installation.

Electrical maintenance

The electrical system is capable of running self-diagnostics via the electrical system controller (ESC), which alerts the operator by illuminating the check electrical system light on the electronic gauge cluster (EGC) and storing diagnostic trouble codes (DTC). These codes are viewable through the EGC. Now we will discuss how to access and read these codes to assist in troubleshooting the electrical system.

To place the EGC in diagnostic mode, turn the ignition switch to the ON or ACCESSORY position, then press the cruise control ON and RESUME switches simultaneously. If there aren't any faults, the EGC will display NO FAULTS. If there are faults present, the EGC will display the number of faults followed by the codes. Look at figure 3-49 for an example of how the DTC is displayed and read. The code will be displayed for 10 seconds, before automatically scrolling to the next entry and continuing to cycle. You can also manually cycle through the codes using the SELECT/RESET button on the cluster.

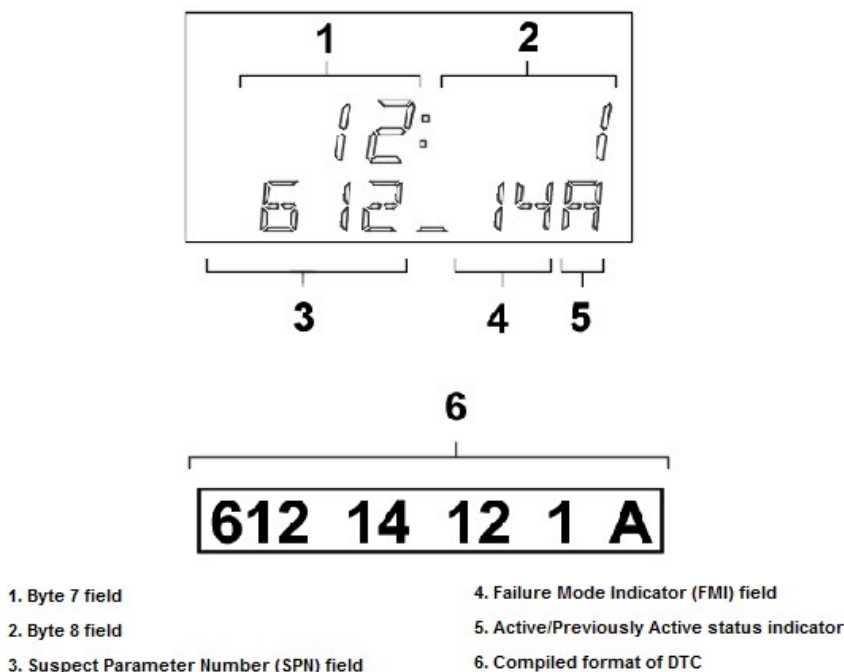


Figure 3-49. Electrical system DTC display.

Record the code in the following format: (SPN) (FMI) (Byte 7) (Byte 8), and compare it with the DTC listing in the appropriate TO.

DTCs will end with an “A” if the code is active, meaning the feature is turned on, and the fault is still detected. If the feature is turned off, or the fault is not detected, the code will be considered previously active and will end with a “P”.

While in the diagnostic mode, P diagnostic trouble codes may be cleared by turning the left-turn signal ON and pressing the cruise control ON and SET switches simultaneously.

To exit the diagnostics, cycle the ignition switch or release the parking brake.

NOTE: This diagnostic procedure will also initiate diagnostic flash codes for the engine controller and hydraulic anti-lock brake system (ABS) controller. However, these codes will not be affected by the clearing procedure.

LSS and HVAC maintenance

In order to troubleshoot the LSS and HVAC systems, it's best to begin with a thorough function check to identify all symptoms associated with the malfunction. To do this, begin by checking the AC.

COOL mode check

Perform the following procedures to complete the COOL mode check.

1. Connect an AC recovery/recharging unit. The valves on the tank and control panel should be CLOSED, with the high- and low-side hose valves near the service ports OPEN. This allows you to use the gauges to monitor pressures on the AC recovery/recharging unit during the operational check.
2. Place an AC thermometer in the forward side of the HVAC box near the RA temperature sensor.
3. Turn the main power switch on and start the engine.
4. Turn the LSS switch to the ON position.
5. Turn the mode control knob to the COOL position.
6. Turn the RA blower speed control knob to the MAX position.
7. Turn the temperature control knob to the coldest position.
8. Close all doors and hatches to seal the cabin.
9. Check for the following conditions:
 - Engine speed increases to 1,300 rpm (+/- 800 rpm) within 10 seconds.
 - RA blower is running at maximum speed.
 - FA blower is on. (It may be necessary to reduce RA speed to the minimum position so you can hear the FA blower operating.)
 - AC compressor clutch engages.
 - All four condenser fans should turn on and off as a group to regulate AC pressure between 174 (+/- 29) and 232 (+/- 25.4) psi.
 - Cabin pressure between 0.8–2.8 inches water column (WC), as measured on dash gauge.
 - Difference between outside air and thermometer is around 30° F after 30 minutes of run time (unless cabin temperature drops below 67° F).

HEAT mode check

Next, check the heater system by following these procedures:

1. Turn the mode control knob to the HEAT position.
2. Turn the temperature control knob to the warmest position.

3. Wait 5 minutes for system to stabilize.
4. Check for the following conditions:
 - Cabin temperature begins to rise.
 - AC compressor is off.
 - Condenser fans are off.
 - Engine returns to normal idle speed.

DRY mode check

Now, check the defrosting function by completing the following steps:

1. Turn the mode control knob to the DRY position.
2. Wait 5 minutes for the system to stabilize.
3. Check for the following conditions:
 - Engine speed increases to 1,300 rpm (+/- 800) within 10 seconds.
 - AC compressor clutch engages.
 - All four condenser fans should turn on and off as a group to regulate AC pressure between 174 (+/- 29) and 232 (+/- 25.4) psi.
 - 3-way valve opens or closes to regulate cabin temperature, depending on temperature control knob position. Vary the temperature control knob position to verify HVAC output air temperature changes.

VENT mode check

Finally, check the vent function using these procedures:

1. Turn the mode control knob to the VENT position.
2. Wait 5 minutes for the system to stabilize.
3. Check for the following conditions:
 - AC compressor is off.
 - Condenser fans are off.
 - Engine returns to normal idle speed.
 - HVAC output air temperature is near outside air temperature.

This completes the operational check. Record any deviations from the listed conditions and cross-reference them with the appropriate TO.

Fire suppression system inspection

All MRAPs are equipped with a FSS. Although they all differ, once you understand the Maxxpro's FSS inspection procedures, you can easily apply them to other MRAPs in the future. The MaxxPro AFES is critical to safe vehicle operation. Therefore, the vehicle maintenance technician must perform preventative maintenance checks during scheduled or unscheduled inspections.

WARNING: Prior to servicing the FSS, make sure the master battery disconnect switch is OFF and remove the FSS battery backup connector from battery backup box. Failure to comply may result in discharging of system and injury to personnel.

Preparations for testing

In order to test the Kidde AFES, obtain the correct test set (fig. 3-50). It consists of five valve simulators, a source simulator, and appropriate cables.



Figure 3-50. AFES test set.

Follow these steps to prepare for the test:

Step 1. Connect the valve simulators to all AFES valve cables. To minimize the chance of discharging the extinguishers, use the first-on, last-off rule. Always connect valve simulators to all extinguisher valve harness connectors prior to connecting the source simulator to vehicle power. Disconnect the power to the source simulator before removing valve simulators and connecting the harness connectors to the extinguisher valves.

Step 2. Connect the power cable J1 (grey cable in fig. 3-50) to the source simulator. Clip the power leads to 24 volts, direct current (VDC) at the positive and negative vehicle battery posts. The cable's positive is red and negative is black. Turn the vehicle master power switch ON. Verify that crew and engine TROUBLE LEDs are OFF after 4 seconds.

Step 3. Verify the source simulator has power. Press the TEST switch and watch, observing that it illuminates for approximately 4 seconds.

Step 4. Test the trouble detection function of the AFES by disconnecting the EOL sensor (highest number) wiring harness. Disconnecting the EOL sensor in the crew subsystem should make the crew TROUBLE LED blink. Disconnecting the EOL sensor in the engine subsystem should make the engine TROUBLE LED blink. Reconnect both EOL sensors and verify that both TROUBLE LEDs are off.

Step 5. Test the trouble detection function of the AFES by disconnecting the valve simulators one at a time. Disconnecting each crew valve simulator should make the crew TROUBLE LED turn on solid, and reconnecting it should make it turn off. Disconnecting each engine valve simulator should make the engine TROUBLE LED turn on solid, and reconnecting it should make it turn off.

FSS functional test

The purpose of this test is to ensure each of the fire sensors are able to detect and react to the sight of an IR light source, without accidentally discharging the dry chemical agents during the test. There are three functional tests to perform: dual, near, and far. The source simulator and fire sensor being tested must be at approximately the same temperature.

NOTE: Wait at least 10 seconds between each functional test to ensure valid results.

Dual test

The dual test consists of the following steps:

- Step 1. Place the source simulator switch in the DUAL position.
- Step 2. Place the source simulator in front of any crew fire sensor with the source simulator windows pointing into the sensor windows. Be sure to maintain correct alignment throughout the test period.
- Step 3. Press and release the TEST push-button switch and note that the amber indicator is ON. Hold the source simulator in place until the indicator turns OFF (about 4 seconds).
- Step 4. Be sure that all crew valve simulators activate during this test. The simulator will beep and the light-emitting diode (LED) light will illuminate when activated. It may be necessary to have multiple personnel or repeat the test to confirm. (**NOTE:** It is necessary to confirm all crew valve simulators activate for only one crew sensor. The crew TROUBLE LED on the FSS controller should remain OFF.)
- Step 5. The LED in the middle of the fire sensor being tested should begin flashing. This LED indicates which sensor has detected a fire situation.
- Step 6. Disconnect the AFES sensor power for about 4 seconds, and then reconnect the AFES sensor power. When the AFES sensor is disconnected, the LED light on the FSS controller should blink.

Near test

The near test consists of the following steps:

- Step 1. Place the source simulator switch in the NEAR position.
- Step 2. Place the source simulator in front of the same crew fire sensor with the source simulator windows pointing in the sensor windows. Be sure to maintain correct alignment throughout the test period.
- Step 3. Press and release the TEST push-button switch and note that the amber indicator is ON. Hold the source simulator in place until the indicator turns OFF.
- Step 4. No valve simulator should activate during this test.
- Step 5. If a valve simulator activates, this fire sensor is not functioning properly and may give false alarms. Replace and retest this sensor if a valve simulator activates.

Far test

The far test consists of the following steps:

- Step 1. Place the source simulator switch in the FAR position.
- Step 2. Place the source simulator in front of the same crew fire sensor with the source simulator windows pointing in the sensor windows. Be sure to maintain correct alignment throughout the test period.
- Step 3. Press and release the TEST push-button switch and note that the amber indicator is ON. Hold the source simulator in place until the indicator turns OFF.
- Step 4. No valve simulator should activate during this test.
- Step 5. If a valve simulator activates, this fire sensor is not functioning properly and may give false alarms. Replace and retest this sensor if a valve simulator activates.

Repeat all tests at the remaining crew and engine fire sensors associated with the AFES. Use the AFES test summary (fig. 4-51) to assist in completing all recommended tests.

TEST	RESPONSE
Test all Crew Sensors	
Dual	<ul style="list-style-type: none"> All crew Valve Simulators alarm Sensor LED blinks
Far	No Valve Simulator alarm
Near	No Valve Simulator alarm
Maintenance Shutdown	AFES ON LED OFF
Power up	Crew sensor and CE LEDs in normal operation
Test all Engine Sensors	
Dual	<ul style="list-style-type: none"> Engine 1 Valve Simulator alarms except for manual-only engine system Engine FIRE LED ON for ~ 1 second Engine TROUBLE LED double blinks except for manual-only engine system (OFF for manual) Sensor LED blinking
Far	No Valve Simulator alarm
Near	No Valve Simulator alarm
Maintenance Shutdown	AFES ON LED OFF
Power up with RESET	Engine sensor and CE LEDs in normal operation
Crew MANUAL DISCHARGE	<ul style="list-style-type: none"> All crew Valve Simulators alarm AFES ON LED: 9 sec. ON, 1 sec. OFF
Maintenance Shutdown	AFES ON LED OFF
Power up with RESET	CE LEDs in normal operation
Engine MANUAL DISCHARGE	<ul style="list-style-type: none"> Manual-only: engine Valve Simulator alarms Auto/Manual (1 extinguisher): engine Valve Simulator alarms immediately and/or after 5 seconds Auto/Manual (2 extinguishers): Engine 2 Valve Simulator alarms immediately and Engine 1 Valve Simulator alarms after 5 seconds Engine TROUBLE LED double blinks AFES ON LED: 9 sec. ON, 1 sec. OFF
Maintenance Shutdown	AFES ON LED OFF
Power up with RESET	CE LEDs in normal operation

Figure 4-51. AFES test summary appendix.

Body armor removal and installation

The body armor that makes an MRAP so effective in protecting our brothers and sisters outside the wire also makes it significantly more dangerous and difficult to work on when it comes into the shop for maintenance. While we cannot cover all aspects of removing and installing armor, we will provide a few basic guidelines and things for you to keep in mind when you are tasked to do so.

First, body armor is heavy. While this may seem obvious, even small pieces of armor can be deceptively heavy. For example, the battery box armor weighs 120–150 lb., and the plates protecting the sides of the engine weigh 100–120 lb. each. As a result, it is always best to ask for some help when removing armor components. Additionally, it is a good idea to leave at least one bolt in place during removal. Before removing this bolt, support the weight of the armor to keep it from falling and causing injury or damage.

A second point to remember is that the TO is your best reference to identify unique requirements or concerns when removing a piece of armor. For instance, when removing the belly pan on a MaxxPro, the TO identifies a special tool to be used, and the need for five personnel (one mechanic and four crew members) to complete the job. Armed with this information, you can gather the necessary equipment and enlist the help to complete the job safely. Lastly, the TO provides the proper torque specs and identifies any single-use hardware that must be replaced when reinstalling body armor. This helps to ensure the armor performs its job correctly if the truck is hit.

Our third and final piece of advice is do not be afraid to remove the armor when the job warrants it. The armor was designed to protect the crew first and critical components of the truck second. Ease of repairs was a much lower priority. Spending a few extra minutes removing the recommended components can save you both time and frustration and will enable you to perform higher quality maintenance on the MRAP.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

016. Mine-resistant, ambush-protected fundamentals

1. What do the majority of MaxxPro CAT I MRAP drive train components consist of? Explain the benefit of using these components.
2. What does the MaxxPro exhaust brake allow the operator to do?
3. Why must the MaxxPro be completely stopped before changing the transfer case mode or range?
4. What type of suspension does the MaxxPro use?
5. Why are two steering gearboxes used on the MaxxPro?
6. How would you know if there is a malfunction in the ABS?
7. How far and at what maximum speed can the MaxxPro be driven on the runflat?
8. In wartime configuration, how does the HVAC and LSS system protect against NBC agents?
9. How does the LSS prevent contaminants from entering the vehicle cab?
10. What areas of the MaxxPro are protected by the FSS?
11. Which two MaxxPro fire sensors will automatically operate the FSS when fire is detected?

12. What MRAP armor panels attach externally to the base armor?
13. What assists in the opening and closing of the MRAP forward cab doors?
14. How is the MRAP rear door ramp opened and closed?
15. What MRAP armor component protects the fuel tank, battery box, air tanks, transmission, and transfer case?

017. Mine-resistant, ambush-protected maintenance

1. What gives the MaxxPro MRAP electrical system the capability of running self-diagnostics? How is the operator alerted when a problem is detected?
2. How can you manually cycle through MaxxPro MRAP electrical system trouble codes while in diagnostic mode?
3. What is indicated by an “A” in a MaxxPro MRAP electrical system trouble code? What is indicated by a “P”?
4. Why do you begin troubleshooting a MaxxPro MRAP’s LSS and HVAC system with a thorough function check?
5. When function checking the MaxxPro MRAP’s COOL mode, how much difference in temperature (outside air and thermometer) should be observed after 30 minutes of run time?
6. What should the MRAP’s engine speed be when performing a functional check on the MaxxPro MRAP’s HEAT mode?
7. What two things must be done prior to servicing the MaxxPro MRAP’s FSS to avoid system discharge and injury to personnel?
8. When testing the MaxxPro MRAP’s FSS, how do you verify that the source simulator has power?

9. What is the purpose of the FSS functional test on the MaxxPro MRAP?
10. How long should you wait between tests to ensure valid results when performing the MaxxPro MRAP FSS functional test?
11. What MaxxPro MRAP's FSS valve simulator actuates during the "far test"?
12. Approximately how many lb. does the MaxxPro MRAP's battery box armor weigh?
13. Why is it important to know the proper torque specs and what hardware is single-use when installing a MaxxPro MRAP's body armor?

3-3. Combat Zone Maintenance

As we conclude our discussion of the vehicles our forces rely on as they defend our perimeter and travel beyond, it's appropriate to discuss maintenance operations in the combat environment. Among the key skills a vehicle maintenance NCO requires when forward deployed are the ability to assess battle damage and to triage vehicles requiring maintenance.

018. Battle damage assessment and triage maintenance

Battle damage assessment is just as it sounds; it is an assessment of damages to facilities and equipment following an attack. All assigned personnel must be familiar with vehicle battle damage assessment. They must be able to respond to and assess vehicle damage caused by air and ground attacks. All battle damage assessments need to be reported through the appropriate channels and relayed to the wing leadership. Fast and accurate damage assessment is the key to critical decision making.

Closely related to damage assessment, and done in conjunction with it, is vehicle triage. *Triage* is the process of assessing damage, putting the priority vehicles first, and doing cannibalization or whatever it takes to get those vehicles back in commission. Triage occurs during post-attack recovery operations in order to support the immediate ongoing mission. Based on MELs and any other guidance received from wing leadership, you should do triage as part of the damage assessment process. Vehicle repair requirements are placed in one of three condition levels:

1. Level A—Immediately returnable to service with minimal or only minor repair.
2. Level B—Repairable, requiring more than 30 minutes of repair work but less than 4 hours.
3. Level C—Repairs will take over 4 hours, or vehicle not repairable at all.

TO 36-1-191 standards may be waived as necessary during active conflict. Field repairs may be the norm. Many vehicles can still do their jobs without a fender or non-critical component. Refer to TO 36-1-181, *Recovery and Battle Damage Assessment and Repair*, for additional guidance. Immediately after an attack, a PAVO assessment determines triage maintenance priorities.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

018. Battle damage assessment and triage maintenance

1. Who must be familiar with vehicle battle damage assessment?
2. Define triage, as it relates to vehicle maintenance.
3. List and describe the condition levels of triage maintenance.

Answers to Self-Test Questions

013

1. A tactical vehicle, for use over all types of roads, as well as cross-country terrain in all weather conditions.
2. Transport cargo and troops.
3. Transport, mount, and provide a platform for operating the TOW missile launcher system.
4. Specially sealed dipstick, dipstick tube, vented crankcase depression regulator valve, and a manual throttle control.
5. By belt.
6. Hydraulic control valve.
7. Three drive ranges of constant four-wheel drive.
8. Transfer torque to the wheels from the differential through the geared hub.
9. Geared hubs.
10. An independent coil spring-type system.
11. The geared hub.
12. The coil spring.
13. Three-lever light switch.
14. Night convoy operations.
15. You are at the correct distance from the vehicle in front of you.
16. Battery power to the starter solenoid and to the neutral start switch through circuit 14.
17. Circuit 3.
18. Circuit 6A.
19. Starter solenoid.
20. Allows the vehicle to still be driven under emergency conditions with one or more flat tires.

014

1. The M36A3. Because of the longer wheelbase.
2. Bypass valves.
3. Eight forward and two reverse.
4. Plunger and barrel.
5. Radiator, charged air cooler, water pump, surge tank, thermostat, fan, and fan actuator.
6. To set the desired engine rpm without maintaining pressure on the accelerator pedal.
7. LCD.
8. 60 psi or below.

015

1. Suspension system comprised of both rear axles, upper and lower torque rods, springs, and seats that support the rear vehicle weight.
2. Lifting shackles.
3. Battery; starting; ether; generating; directional signal; heating operation; indicator, gauge, and warning; and trailer and semi-trailer connection.
4. Front winch, rear winch (wrecker), and wrecker crane.
5. It is a four-port valve that receives pressurized oil from the hydraulic pump and directs it to the winch motor.
6. The rear winch has two torque selections.
7. Torque control valve.
8. 20,000 lb.
9. Transfer case PTO control.
10. Swivel valve.

11. Boom control valve.
12. Sheaves.
13. Rollers.
14. Turntable assembly.

016

1. Commercial off-the-shelf components. Ease of maintenance and parts procurement, reliability, and longevity.
2. Slow the vehicle or maintain a constant speed when descending steep road grades.
3. The transfer case is not synchronized; failure to stop can result in severe transfer case damage.
4. Conventional leaf spring.
5. Ease of steering.
6. ABS light stays on or flashes during vehicle operation.
7. 30 miles at 35 mph.
8. Through the use of special filters.
9. Creating an overpressure in cab.
10. Engine, interior, tires, and fuel tank.
11. Engine and interior.
12. Catcher plates.
13. Air cylinders located in each door.
14. Hydraulically.
15. Belly armor plate.

017

1. The ESC makes it possible; it alerts the operator by illuminating the check electrical system light on the EGC and stores the DTCs.
2. By using the SELECT/RESET button on the cluster.
3. DTCs will end with an "A" if the code is active, meaning that "feature" is turned on and the fault is still detected. If that feature is turned off or the fault is not detected, the code will be considered previously active and will end with a "P".
4. It's best to begin with a thorough function check to identify all symptoms associated with the malfunction.
5. Should be around 30° F after 30 minutes of run time (unless cabin temp drops below 67° F).
6. Normal idle speed.
7. Make sure the master battery disconnect switch is OFF and remove the FSS battery backup connector from battery backup box.
8. Press the TEST switch and watch, observing that it illuminates for approximately 4 seconds.
9. Ensure each of the fire sensors are able to detect and react to the sight of an IR light source, without accidentally discharging the dry chemical agents during the test.
10. At least 10 seconds.
11. No valve simulator should activate during this test.
12. 120–150.
13. Helps to ensure the armor performs its job correctly if the truck is hit.

018

1. All assigned personnel.
2. The process of assessing damage, putting the priority vehicles first, and doing cannibalization or whatever it takes to get those vehicles back in commission.
3. Level A—Immediately returnable to service with minimal or only minor repair.
Level B—Repairable, requiring more than 30 minutes of repair work but less than 4 hours.
Level C—Repairs will take over 4 hours, or vehicle not repairable at all.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

61. (013) What is the *significant* difference between the M1116 high-mobility, multipurpose wheeled vehicle (HMMWV) as compared to the other HMMWV models?
 - a. Armored body.
 - b. Winterization kit.
 - c. Time delay module.
 - d. Front and rear winch.
62. (013) At what angle is the radiator mounted in a high-mobility, multipurpose wheeled vehicle (HMMWV)?
 - a. 35 degrees.
 - b. 40 degrees.
 - c. 45 degrees.
 - d. 50 degrees.
63. (013) What high-mobility, multipurpose wheeled vehicle (HMMWV) drive train components transfer torque to the wheels from the differential through the geared hubs?
 - a. Halfshafts.
 - b. Transfer cases.
 - c. Propeller shafts.
 - d. Recirculating ball gearboxes.
64. (013) What high-mobility, multipurpose wheeled vehicle (HMMWV) drive train components act as the final drive components to front and rear wheels?
 - a. Halfshafts.
 - b. Differentials.
 - c. Geared hubs.
 - d. Propeller shafts.
65. (013) What high-mobility, multipurpose wheeled vehicle (HMMWV) suspension system component provides a gear reduction to increase torque to the wheel and tire assembly?
 - a. Ball joint.
 - b. Geared hub.
 - c. Shock absorber.
 - d. Upper control arm.
66. (013) What type of headlight switch do most M-series vehicle lighting systems use?
 - a. Three-lever.
 - b. Two-lever.
 - c. Automatic.
 - d. Rheostat.
67. (013) How many blackout light positions are on the high-mobility, multipurpose wheeled vehicle (HMMWV)?
 - a. 1.
 - b. 3.
 - c. 5.
 - d. 7.

68. (013) What provides a ground circuit to the alternator for the high-mobility, multipurpose wheeled vehicle (HMMWV) generating system?
- a. Circuit 3.
 - b. Circuit 5.
 - c. Circuit 29.
 - d. Circuit 568.
69. (014) How many forward and reverse gears are available when using the transmission in conjunction with the transfer case on the 2½-ton M-series?
- a. Eight forward and one reverse.
 - b. Eight forward and two reverse.
 - c. Six forward and one reverse.
 - d. Six forward and two reverse.
70. (014) The air system on the 2½-ton M-series contains how many rear couplings?
- a. 1.
 - b. 2.
 - c. 3.
 - d. 4.
71. (014) How do you unlock the throttle control setting on a 2½-ton M-series?
- a. Rotate handle clockwise or counterclockwise.
 - b. Rotate handle clockwise only.
 - c. Step on the accelerator pedal.
 - d. Step on the brake pedal.
72. (014) What position should the 2½-ton M-series transfer case lever be in during *heavy* load operation modes?
- a. Pushed in to HIGH position.
 - b. Pulled out to LOW position.
 - c. Pulled up to HIGH position.
 - d. Pushed down to LOW position.
73. (015) What *major* component of the 5-ton M-series permits towing by another vehicle?
- a. Pintle hook.
 - b. Tie down hooks.
 - c. Lifting shackles.
 - d. Tie-down shackles.
74. (015) What provides operating power for the auxiliary equipment on the 5-ton M-series truck?
- a. Engine.
 - b. Hydraulics.
 - c. Electronics.
 - d. Transmission.
75. (015) Which component on the 5-ton M-series front winch engages the winch drum gear to the drive gear of the winch motor?
- a. Clutch lever.
 - b. Hydraulic control valve.
 - c. Winch control switch.
 - d. Power take-off (PTO) control switch.

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76. (015) What *major* component of the 5-ton M-series medium wrecker is used to control the operating gear ratio of the rear winch drive motor?
- a. Control linkage.
 - b. Torque control valve.
 - c. Torque control lever.
 - d. Directional control valve.
77. (015) What *major* component for raising and lowering the wrecker crane cable and hook guides the hoist cable through the boom?
- a. Pads.
 - b. Rollers.
 - c. Sheaves.
 - d. Sprockets.
78. (016) The MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle can carry up to how many personnel?
- a. 4.
 - b. 6.
 - c. 8.
 - d. 10.
79. (016) Which areas, protected by the fire suppression system (FSS) on the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle, operate automatically?
- a. Tires only.
 - b. Fuel tank and tires.
 - c. Engine and interior fire sensors.
 - d. Interior, engine, fuel tank and tires.
80. (016) Which area(s), protected by the fire suppression system (FSS) on the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle, can *only* be operated manually?
- a. Tires only.
 - b. Fuel tank and tires.
 - c. Engine and interior.
 - d. Interior, engine, fuel tank, and tires.
81. (016) On the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle, which armor component is made of ceramic composite?
- a. Base cab.
 - b. Spall liners.
 - c. Catcher plates.
 - d. Effector assemblies.
82. (016) On the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle, which armor component attaches externally to the base armor?
- a. Base cab.
 - b. Spall liners.
 - c. Catcher plates.
 - d. Effector assemblies.
83. (016) On the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle, which armor component attaches to brackets and is held several inches from the vehicle body?
- a. Base cab.
 - b. Spall liners.
 - c. Catcher plates.
 - d. Effector assemblies.

84. (017) On the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle, to place the electronic gauge cluster (EGC) in diagnostic mode, turn the ignition switch to ON or ACCESSORY and then press the cruise control
- ON switch followed by RESUME switch.
 - ON switch followed by CANCEL switch.
 - ON and RESUME switches simultaneously.
 - RESUME and CANCEL switches simultaneously.
85. (017) While in the electrical system diagnostic mode on the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle, what action is *not* required to clear diagnostic trouble codes?
- Turn the left turn signal ON.
 - Press the cruise control ON switch.
 - Press the cruise control SET switch.
 - Hold the SELECT/RESET button on the cluster.
86. (017) On the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle, you connect an air conditioning (AC) recovery/recharging unit to the vehicle while performing a COOL mode check during the life support and heating, ventilation, and air conditioning (HVAC) systems' function check to
- recover refrigerant.
 - monitor pressures.
 - control pressures.
 - add refrigerant.
87. (017) On the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle, what should the engine speed be during the COOL mode check while performing the life support and heating, ventilation, and air conditioning (HVAC) systems' function check?
- Idle.
 - 1,300 revolutions per minute (rpm).
 - 1,700 rpm.
 - 2,100 rpm.
88. (017) On the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle, what should the engine speed be during the VENT mode check while performing the life support and heating, ventilation, and air conditioning (HVAC) systems' function check?
- Idle.
 - 1,300 revolutions per mile (rpm).
 - 1,700 rpm.
 - 2,100 rpm.
89. (017) During the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle fire suppression system (FSS) inspection, which of the following is *not* one of the three functional tests to be performed?
- Far.
 - Near.
 - Dual.
 - Combination.
90. (017) How much do the armor plates on the sides of the MaxxPro Mine-Resistant, Ambush-Protected (MRAP) vehicle's engine weigh?
- 65–80 pounds each.
 - 80–100 pounds each.
 - 100–120 pounds each.
 - 120–150 pounds each.

91. (018) The process of assessing damage, putting the priority vehicles first, and doing cannibalization or whatever it takes to get those vehicles back in commission is called
- a. expanded mobile maintenance.
 - b. organizational maintenance.
 - c. intermediate maintenance.
 - d. triage maintenance.
92. (018) What level of triage maintenance requires more than 30 minutes of repair work but less than four hours?
- a. Level A.
 - b. Level B.
 - c. Level C.
 - d. Level D.

Student Notes

Glossary of Abbreviations and Acronyms

°	degree
ABS	anti-lock brake system
AC	air conditioning
AEF	air expeditionary force
AF	Air Force; alternative fuel
AFB	Air Force base
AFEMS	Air Force Equipment Management System
AFES	Automatic Fire Extinguisher System
AFI	Air Force instruction
AFJQS	Air Force job qualification standard
AFMAN	Air Force manual
AFMS	Air Force manpower standard
AFTO	Air Force technical order
ALO	accounting liaison office
amp	ampere
AS	allowance standard
ASC	allowance source code
ASRS	Allowance Standard Retrieval System
BOI	basis of issue
CA/CRL	Custodian Authorization/Custody Receipt Listing
CAT	category
CDC	career development course
CDSAR	Course Development and Student Administration/Registrar System
CFETP	career field education and training plan
CONUS	continental United States
CSC	Customer Service Center
CTIS	central tire inflation system
DESC	Defense Energy Support Center
DOC	designed operational capability
DOD	Department of Defense
DPAS	Defense Property Accountability System
DTC	diagnostic trouble code
EEIC	element of expense/investment code
EGC	electronic gauge cluster

EOL	end-of-line
ERRC	expendability, reparability, and recoverability code
ESC	electrical system controller
F	Fahrenheit
FA	fresh air
FCA	fund cite authorization
FM&A	Fleet Management and Analysis
FMIS	Fleet Management Information System
FSS	fire suppression system
ft. lb.	foot-pound
FWA	fraud, waste, and abuse
FY	fiscal year
gpm	gallons per minute
GSA	General Services Administration
GVW	gross vehicle weight
HEUI	hydraulically actuated, electronically controlled unit injector
HMMWV	high-mobility, multipurpose wheeled vehicle
hp	horsepower
HQ USAF/A4LE	Headquarters United States Air Force, Directorate of Logistics
HSV	hydrant servicing vehicle
HVAC	heating, ventilation, and air conditioning
IAW	in accordance with
IED	improvised explosive device
IR	infrared
ITP	individual training plan
lb.	pound
LCD	liquid crystal display
LED	light-emitting diode
LIMS-EV	Logistics Installation and Mission Support-Enterprise View
LRS	logistics readiness squadron
LSS	life support system
LSV	low-speed vehicles
LTI	limited technical inspection
MAF	man-hour availability factor
MAJCOM	major command
MC	mission capable

MEL	mission-essential level
MISCAP	mission capability
mph	miles per hour
MRAP	mine-resistant, ambush-protected
MRSP	mobility readiness spares package
MSG	mission support group
MTP	master training plan
MVR	master vehicle report
NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, and chemical
NCO	noncommissioned officer
NCOIC	noncommissioned officer in charge
NMC	not mission capable
NMCM	not mission capable-maintenance
NMCS	not mission capable-supply
NSN	national stock number
OA	obligation authority
OGMVC	other government motor vehicle conveyance
OI	operating instruction
OJT	on-the-job training
OPLAN	operation plan
OTRL	one-time repair limit
PAVO	post-attack vehicle operability
PCS	permanent change of station
PM&I	preventive maintenance and inspection privately
POV	owned vehicle
psi	pounds per square inch
PTO	power take-off
QA	quality assurance
QRMT	quick-reaction maintenance team
R/D	reimbursable/distribution
RA	recycled air
RC/CC	responsibility center/cost center
REMS	Registered Equipment Management System
RPG	rocket-propelled grenade

rpm	revolutions per minute
SE&V	special equipment and vehicles
STE/ICE	simplified test equipment for internal combustion engines
STE/ICE-R	simplified test equipment for internal combustion engines-reprogrammable
TBA	training business area
TCM	technical content manager
TCTO	time compliance technical order
TDY	temporary duty
TMSK	temporary mission support kit
TO	technical order
TOW	tube-launched, optically tracked, wire-guided
TPFDD	time-phased force deployment data
TRT	transaction request tool
UDI	U-Drive-It
UIC	unit identification code
UMD	unit manning document
UPMR	unit personnel management roster
USAF	United States Air Force
UTC	unit type code
UTM	unit training manager
VAC	volts, alternating current
VCNCO	vehicle control noncommissioned officer
VCO	vehicle control officer
VDC	volts, direct current
VE	vehicle equivalent
VFM	vehicle fleet manager
VM	vehicle management
VMS	vehicle management superintendent
VOC	vehicle out of commission
VSCOS	vehicle support chain operations squadron
WC	water column
WMP	War and Mobilization Plan
WRM	war reserve materiel
WRMO	war reserve materiel officer

Student Notes

AFSC 2T371
Z2T371 01 1808
Edit Code 01