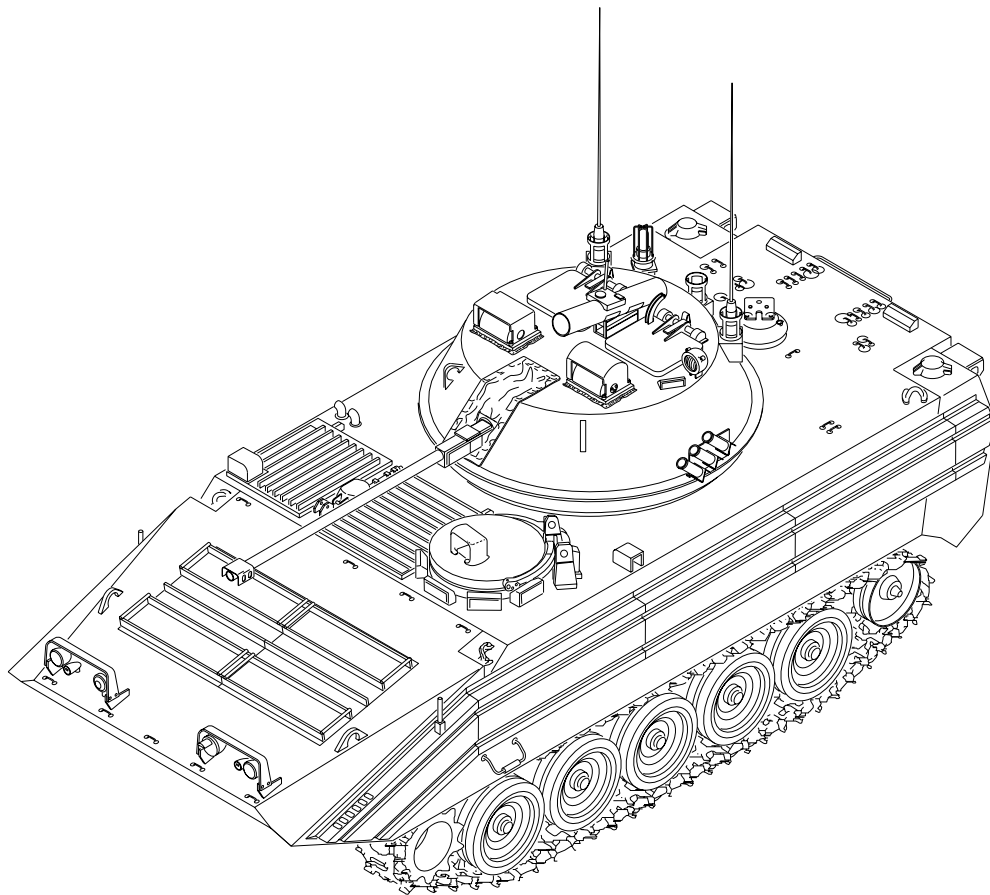


TECHNICAL MANUAL

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

**FOR
OPPOSING FORCES SURROGATE VEHICLE (OSV)
M113A3/BMP-2
6920-01-420-4716 (EIC AUK)
HULL**



DISTRIBUTION STATEMENT A — Approved for public release: distribution is unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

26 JULY 2001

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 26 JULY 2001

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REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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HOW TO USE THIS MANUAL

HOW TO USE THIS MANUAL

The safest, easiest, and best way to maintain the OSV hull is to use this manual. Learning to use this manual is as easy as reading it. Knowing what is in this manual and how to use it will save you time. Becoming familiar with the work, procedures, and cautions will help you in your job and reduce your exposure to unnecessary hazards.

WHERE DO YOU START

This TM is divided into chapters and front and rear matter. The chapters are further divided into Work Packages (WPs) for ease of use. Go to the area within the manual that covers what you are to do and follow the instructions. Be sure to read and follow the Warnings, Cautions, and Notes.

HOW THIS MANUAL IS ORGANIZED

The WARNING SUMMARY section provides safety and first aid information. This section includes general warnings not found in the TM text and a list of the most important detailed warnings extracted from the WPs. All of these warnings cover hazards that could kill or injure personnel.

The TABLE OF CONTENTS lists the WPs in each chapter.

CHAPTER 1 covers General Information, Equipment Description and Data, and Theory of Operation. The Equipment Description WP gives a brief description of major parts and features of the OSV hull. The Theory of Operation WP provides information that will help you understand how the hull components work.

CHAPTERS 2 through 16 include all Direct Support Maintenance WPs for the OSV hull. [At this time, there are no General Support Maintenance WPs in this document.]

CHAPTER 17 contains supporting information, such as lists of references, tools, expendable/durable items, etc.

The INDEX is an alphabetical listing of all the WPs in this manual. Each entry is cross-referenced to the WP number and page number.

DA FORM 2028 is used to report errors and to recommend improvements for procedures in this manual. Three blank DA Forms 2028 are in the back of this manual.

The back cover includes a METRIC CONVERSION CHART that can be used to convert U.S. customary measurements to their metric equivalents. Measurements in this manual are given in U.S. customary unit with metric units in parentheses.

HOW TO USE THE WORK PACKAGES

Pick a key word from the hull part or system to be repaired. Look in the INDEX for this key word or the name of the action you will perform. Turn to the WP and page indicated.

How to read the WP

WPs provide either descriptive/supporting information or detailed procedures for maintaining/repairing the equipment.

Pay attention to all **warnings**, **cautions** and **notes**. These can appear in all types of procedures. They help you avoid harm to yourself, other personnel, and equipment. They also tell you things you should know about the procedure.

Before you start a procedure, get all the tools, supplies, and personnel you need to do the procedure. These items will be listed in the INITIAL SETUP of the WP.

Start with step 1 and do each step in the order given. Numbered primary steps tell you WHAT to do. Alpha substeps tell you HOW to do it.

Look at the illustrations. Locators show you where the parts are located on the hull or assembly. Close-up illustrations show the details you need to do the procedure.

The words END OF TASK will tell you when you have finished the procedure.

HOW TO USE THIS MANUAL (cont)

DEFINITION OF WP TERMS

Warnings, Cautions, And Notes

Pay attention to all warnings and cautions within the WP. Ignoring a warning could cause death or injury to yourself or other personnel. Ignoring a caution could cause damage to equipment. Notes contain facts to make the procedure easier. Warnings, cautions, and notes always appear just above the step to which they apply.

WARNINGS	Call attention to things that could kill or injure personnel. Warnings are also listed in the Warning Summary section (page a).
CAUTIONS	Call attention to actions or materials that could damage equipment.
NOTES	Contain important facts to make the procedure easier.

Helper

Helpers are needed in procedures that require more than one person. A helper may be needed to help lift objects or act as an outside observer.

If a helper is needed to perform a procedure, the INITIAL SETUP will list “Helper (H)” under the PERSONNEL REQUIRED heading.

If a helper assists with a step, the step will include: “Have helper assist”.

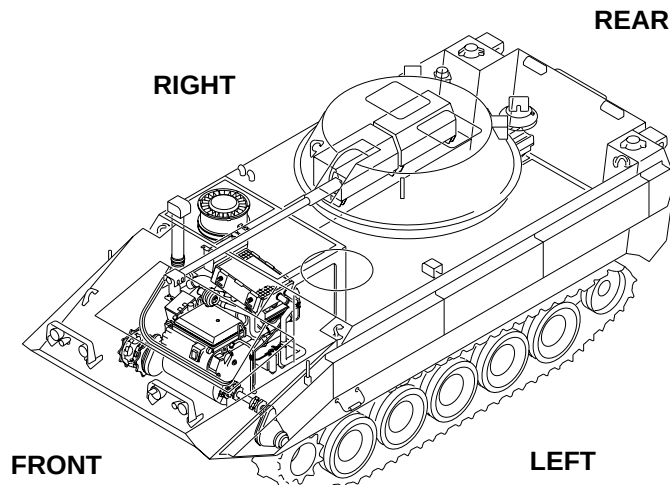
If a helper performs the action alone, the step will start with “(H):”.

Location Terms

The terms “front”, “rear”, “left”, and “right” are used to indicate where items are located on the vehicle, turret, and power unit.

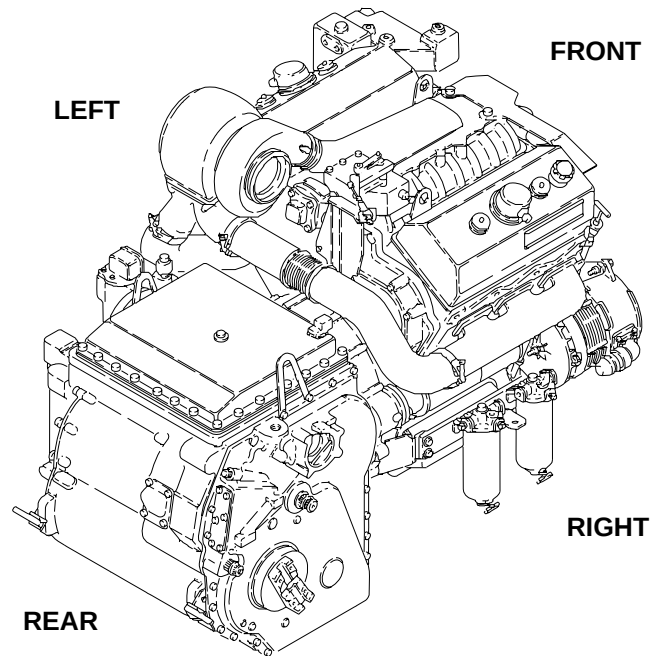
THE POINT OF REFERENCE IS DIFFERENT FOR VEHICLE ITEMS AND POWER UNIT ITEMS. Vehicle items are items not on the power unit. Power unit items are items on the engine or transmission.

If you are working with vehicle items, think of the locations as if you were standing on the ramp facing the inside of the vehicle or sitting in the turret facing the 30mm gun.



HOW TO USE THIS MANUAL (cont)

If you are working with power unit items, think of the locations as if you were standing at the transmission end of the power unit and facing the flywheel. This rule applies whether the power unit is IN or OUT of the vehicle.



CHAPTER 1

INTRODUCTORY INFORMATION WITH THEORY OF OPERATION

WORK PACKAGE INDEX	
<u>Title</u>	<u>Sequence No.</u>
GENERAL INFORMATION.....	0001 00
EQUIPMENT DESCRIPTION AND DATA.....	0002 00
THEORY OF OPERATION.....	0003 00
REPAIR PARTS, SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.....	0004 00

GENERAL INFORMATION

0001 00**SCOPE**

This manual tells you how to perform Direct Support and General Support Maintenance on the automotive/hull parts of the OSV M113A3/BMP-2. It contains information you need to know in order to maintain and repair the hull and hull systems. It tells you what to do and what not to do, and how to protect the safety of yourself and others. TM 9-2350-366-34-2 tells how to maintain/repair the turret parts of the M113A3/BMP-2.

Type of Manual: Direct Support and General Support

Equipment Name: Opposing Forces Surrogate Vehicle M113A3/BMP-2 — Hull

Purpose of Equipment: Visually and tactically represent the Soviet BMP-2 Infantry Fighting Vehicle

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS).

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your M113A3/BMP-2 needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to us: Director, U.S. Army Armament Research, Development, and Engineering Center, ATTN: AMSTA-AR-QAW-A (R), Rock Island, IL 61299-7300. We will send you a reply.

CORROSION PREVENTION AND CONTROL (CPC)

Corrosion Prevention and Control (CPC) of Army materiel is a continuing concern. It is important that any corrosion problems with this item be reported so that the problem can be corrected and improvements can be made to prevent the problem in future items.

While corrosion is typically associated with rusting of metals, it can also include deterioration of other materials such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

If a corrosion problem is identified, it can be reported using Standard Form 368 (Quality Deficiency Report). Use of key words such as "corrosion", "rust", "deterioration" or "cracking" will assure that the information is identified as a CPC problem. The form should be submitted to: Commander, US Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E, Warren, MI 48397-5000.

DESTRUCTION OF ARMY MATERIEL TO PREVENT ENEMY USE

The following manuals tell you how and when to destroy Army materiel to prevent enemy use:

TM 43-0002-33

TM 750-244-2

TM 750-244-6

TM 750-244-7

PREPARATION FOR STORAGE OR SHIPMENT

See DA PAM 738-750 for information about administrative storage of the IFV, CFV, and components. See TM 55-2350-252-14 for information about transportability of the vehicles.

NOMENCLATURE CROSS-REFERENCE

The following list provides nomenclature cross-references for common terms used in this manual.

<u>Common Name</u>	<u>Official Nomenclature</u>
Bilge pump	Rotary pump unit
Cleaning solvent	Cleaning compound solvent
Dipstick with tube	Rod gauge with tube
Dust cap	Connector plug
Fan control box	Vent fan controller
Hydroelectric power unit	Ramp power unit
Jack	Receptacle
Lead	Terminal
Lock screw	Self-locking bolt
Lock wire	Nonelectrical wire
Locknut	Self-locking nut
O-ring	Preformed packing
Personnel heater	Compartment vehicle heater
Plastic face hammer	Inserted hammer face
Plug	Connector
Prussian blue dye	Prussian blue paste
Pulsation damper	Inertia damper
Push rod cover	Push tube cover
Snap ring pliers	External retaining ring pliers
Sealing washer	Packing with retainer
Transmission coupling	Vibration damper

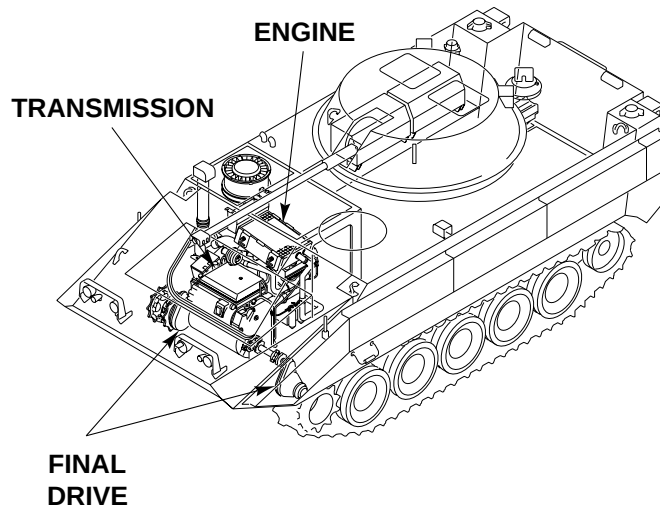
SAFETY, CARE, AND HANDLING

Read warnings in Warning Summary (page a) and within the WPs.

EQUIPMENT DESCRIPTION AND DATA

0002 00**EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES**

For equipment characteristics, capabilities, and features, see TM 9-2350-366-10-1.

LOCATION AND DESCRIPTIONS OF MAJOR COMPONENTS**ENGINE, MECHANICAL:**

The turbocharged diesel engine is the primary power source for the vehicle. It is located in the power plant compartment.

TRANSMISSION:

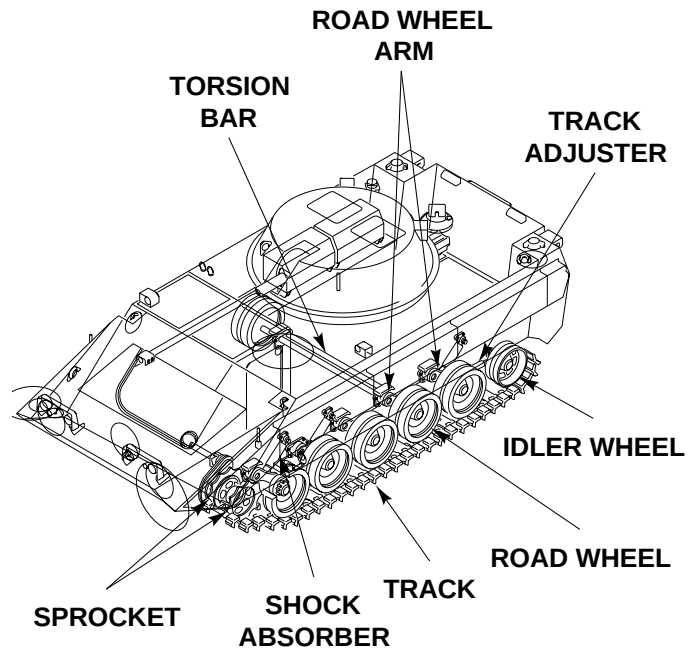
An automotive transmission connects to the engine and powers the final drive.

FINAL DRIVE:

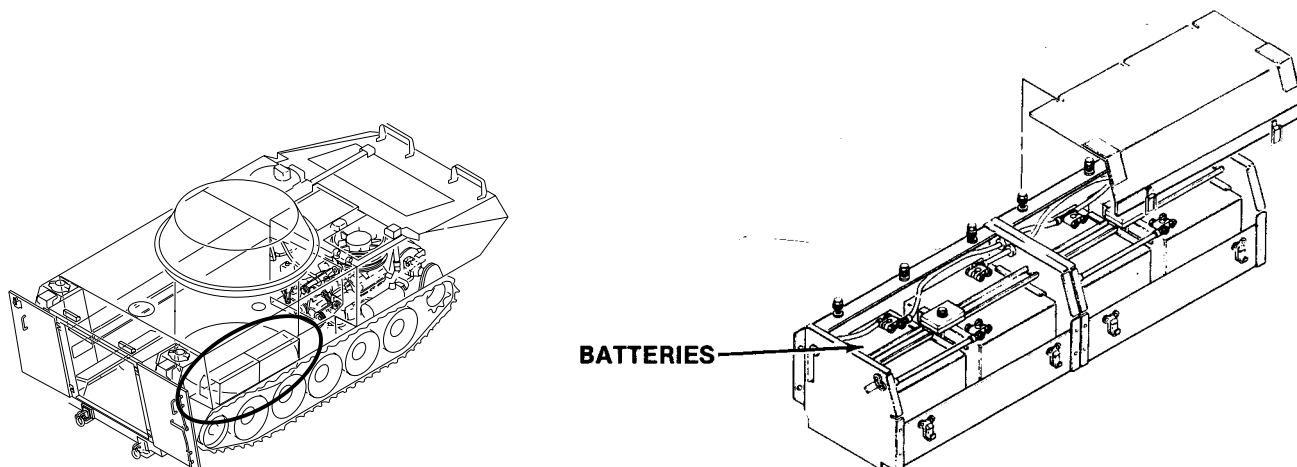
Final drives attach to the transmission by propeller shafts. They deliver power to drive sprockets at the front of the vehicle.

TRACK AND SUSPENSION:

Drive sprockets at the front of the vehicle drive track. Torsion bars and shock absorbers attach to road wheels and provide suspension.

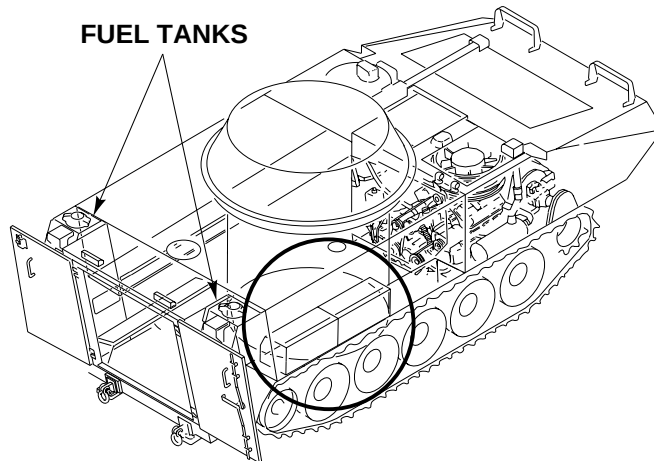
**ELECTRICAL:**

Four batteries, connected in a parallel series arrangement, supply electricity through the distribution box to the vehicle. On the OSV, the four batteries are located on the right sponson.

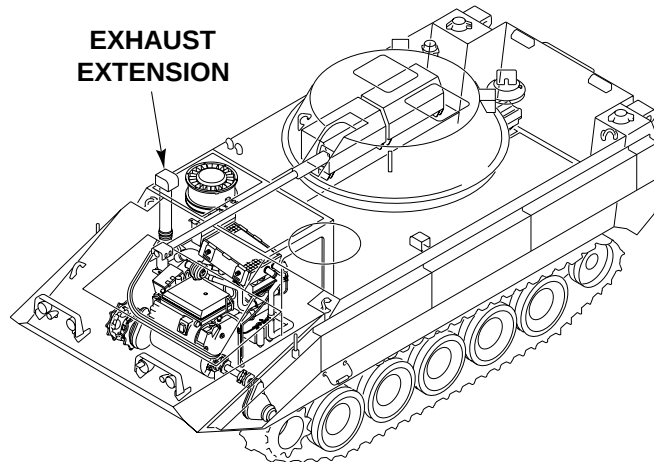


FUEL SYSTEM:

The OSV vehicles have two external fuel tanks located at the rear of the vehicle on each side of the ramp. Total capacity is 95 gallons.

**EXHAUST SYSTEM:**

The exhaust system drives the turbocharger and carries exhaust gases through manifolds and the muffler.

**EQUIPMENT DATA**

For equipment data, see TM 9-2350-366-10-1.

THEORY OF OPERATION

0003 00**SCOPE**

This section describes the functions of the M113A3/BMP-2 hull systems, including the power unit, auxiliary automotive systems, suspension system, and electrical system.

POWER PLANT

The OSV power unit includes the engine, transmission, DC generator, exhaust system, cooling system, and air intake system.

Engine, Diesel:

The diesel engine is the primary power source for the vehicle. The engine changes air and diesel fuel into energy and delivers this power to the transmission. The diesel engine consists of three major systems: fuel, oil, and starting.

In the fuel system, diesel fuel is stored in the fuel tanks. The fuel is drawn through one filter and pumped through the other filter to the engine. The injectors force fuel into combustion cylinders where it is mixed with air and changed into energy.

The oil system provides lubrication for the engine. Oil is cycled throughout the engine by a pump. The pump is located at the lower front of the engine. An oil filter cleans the oil, and an oil cooler reduces oil temperature.

The engine is equipped with a heavy-duty starter. The starter, with built-in solenoid, is used to crank the engine for starting.

Transmission:

The vehicle uses a hydromechanical transmission with hydrostatic steering. The transmission has its own oil system with filter and separately mounted oil cooler. This transmission oil system is separate from the engine oil system.

The transmission delivers power from the engine to the left and right final drives. The left and right final drives are driven by propeller shafts. The final drives deliver power to drive sprockets in the suspension system.

DC Generator:

The DC generator is part of the vehicle electrical system. It is driven directly by engine power. The generator charges the batteries in the vehicle when the engine is running. A regulator mounted near the driver keeps the voltages at the correct level.

Exhaust System:

Major exhaust system parts are the turbocharger, exhaust manifolds, and muffler.

The turbocharger is driven by exhaust gases from the engine. The turbocharger helps the engine develop more power and operate more efficiently. The exhaust manifolds carry the exhaust gases to the turbocharger from the engine. The muffler cuts down engine noise and allows exhaust to escape outside the vehicle.

Cooling System:

The cooling system cools the engine and transmission. It consists of a fan, fan drive, fan speed control assembly, radiator, coolant pump, auxiliary tank, transmission oil cooler, and thermostats. The cooling system contains approximately 53 quarts of liquid coolant. The liquid coolant is cycled through the engine and transmission oil cooler by the coolant pump. This process keeps the engine and transmission temperature in a safe operation range.

As coolant flows through the engine, it absorbs heat from the engine and transmission oil coolers. The heated coolant then flows to the radiator to remove coolant heat. The coolant fan pulls outside air in and through the radiator to remove heat. The fan is powered by the engine through a fan drive.

The variable-speed fan drive system is designed to modulate the cooling fan speed to maintain relatively constant coolant temperatures despite vehicle load or ambient temperature. The cooling fan speed is controlled by the fan drive assembly. The fan drive assembly is driven by the engine crankshaft through a splined coupling. The fan drive assembly contains a multiplate clutch pack that regulates the fan drive output speed. The thermostatic control valve senses engine coolant

temperature and regulates the hydraulic pressure to the fan drive assembly clutch pack. The higher the coolant temperature, the higher the hydraulic pressure, which results in less clutch slip and higher fan speed.

The surge tank acts as an overflow tank to keep the cooling system from overpressuring. It also removes air from the engine coolant. There is a low coolant level transmitter to signal the operator if more coolant is needed.

Air Intake System:

The engine air intake system allows air to enter the engine. The air cleaner cleans air that enters the engine. Dust is drawn out through a scavenge outlet. Air is filtered through a reusable filter element before delivery to the engine. An air filter indicator shows when the element is clogged and needs cleaning or replacing. After being filtered, the air moves through the turbocharger and into the engine cylinders.

AUXILIARY AUTOMOTIVE SYSTEMS

The auxiliary automotive systems includes driver controls, fuel tanks, personnel heater, bilge pumps, and fire extinguisher system.

Driver Controls:

The driver controls regulate the engine, transmission, steering, and braking systems of the vehicle.

The fuel shut-off control is used to stop the supply of fuel to the fuel pump. To start the engine, the driver must open the valve. The throttle linkages are used to control the engine speed. The gear selector allows the driver to choose the proper gear for the vehicle. The steering system controls the vehicle direction. The steering control consists of a steering yoke and linkage connected to the transmission.

The brake system allows the driver to stop a moving vehicle and hold the vehicle in position. The braking system consists of the service brake and the parking brake. The service brakes are hydraulic and are applied by pedal. The parking brake mechanically locks the transmission to prevent vehicle movement. Also, the system has levers, rods, shafts, and linkages connecting to the transmission's brake shaft.

Fuel Tanks:

Diesel fuel is stored in two separate fuel tanks. They are located on the back of the vehicle hull. The fuel is drawn from the fuel tanks through the primary fuel filter by the fuel pump. The fuel then flows through the secondary fuel filter to the injectors. The injectors regulate the amount of fuel which enters the engine.

Personnel Heater:

The personnel heater system provides heat inside the vehicle. Major parts are the combination combustion chamber/heat exchanger, blowers, a fuel pump, and an electric control and safety system. The heater is operated by diesel fuel drawn from the fuel tanks. Fuel is delivered to the combustion chamber from the fuel pump. Outside air is drawn into the combustion chamber by one of the blowers. A blower draws air from the crew compartment into the combustion chamber. The air is warmed by heat from the combustion process and then returned to the crew compartment.

Bilge Pumps:

One electrically driven bilge pump removes water and other liquids from the hull. Water enters the pump through a screened inlet. The pump forces water out of the vehicle through an outlet tube. The bilge pump is controlled by a switch on the driver's instrument panel.

Fire Extinguisher System:

The fire extinguisher system will detect and put out fires in the vehicle. It consists of two Carbon Dioxide (CO₂) cylinders. CO₂ can put out fires quickly and effectively. The cylinders are operated manually by pulling cables located in the hull.

There is a fire extinguisher located in the driver's compartment that is manually discharged into the engine compartment. Another extinguisher is located in the personnel compartment.

SUSPENSION SYSTEM

The suspension system supports the vehicle and delivers engine power to the road. It allows the vehicle to maneuver and be stable. Suspension system parts are the drive sprockets, tracks, idler wheels, track adjuster, road wheels, and road wheel support arms. Also, there are torsion bars and shock absorbers.

The drive sprockets drive the tracks. They are powered by left and right final drives from the transmission. The tracks consist of two flexible chains of track shoes. The tracks ride on the drive sprockets and are guided by idler wheels. The idler wheels can be adjusted to maintain correct track tension.

There are five pairs of road wheels per side. Track guides fit between each pair of road wheels. All road wheels are connected to road wheel support arms.

ELECTRICAL SYSTEM

The electrical system provides power for the vehicle. The system operates on wet cell batteries and includes charging, regulating, and monitoring equipment. The batteries provide a normal operating 24 volts with an amperage capability of 200 amps per hour.

The batteries supply the vehicle with electricity when the engine is off. All electrical power is delivered through the distribution box, except for the engine coolant heater and personnel heater, which are directly powered from the batteries. Electrical power flows from the batteries through the distribution box, cables, and wiring assemblies to the hull. The hull is a ground for the electrical system.

The DC generator recharges the batteries and supplies electricity while the engine is running. The DC generator has 200 amps per hour capability.

There are several electrical subsystems within the hull. Each subsystem contains at least one wiring assembly. Major electrical subsystems and assemblies include the interior and exterior lights, fuel supply, starting and charging systems, ventilation, heating, and bilge pump.