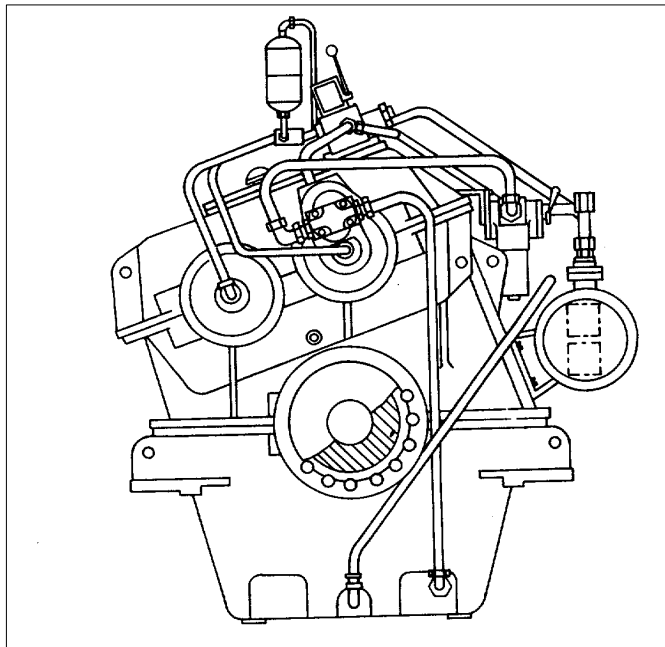


TECHNICAL MANUAL
UNIT, INTERMEDIATE DIRECT
SUPPORT
AND INTERMEDIATE GENERAL
SUPPORT
MAINTENANCE INSTRUCTIONS

MAIN REDUCTION GEAR
FOR
LANDING CRAFT UTILITY (LCU)
NSN 1905-01-154-1191



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HEADQUARTERS, DEPARTMENT OF THE ARMY
17 JANUARY 1989

TECHNICAL MANUAL

No. 55-1905-223-24-2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 17 January 1989UNIT, INTERMEDIATE DIRECT SUPPORT, AND INTERMEDIATE GENERAL SUPPORT
MAINTENANCE INSTRUCTIONS

MAIN REDUCTION GEAR

For

Landing Craft Utility (LCU)

NSN 1905-01-154-1191

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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CHAPTER 1

INTRODUCTION

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Section I. GENERAL INFORMATION

1-1. Scope. The scope of this manual is as follows:

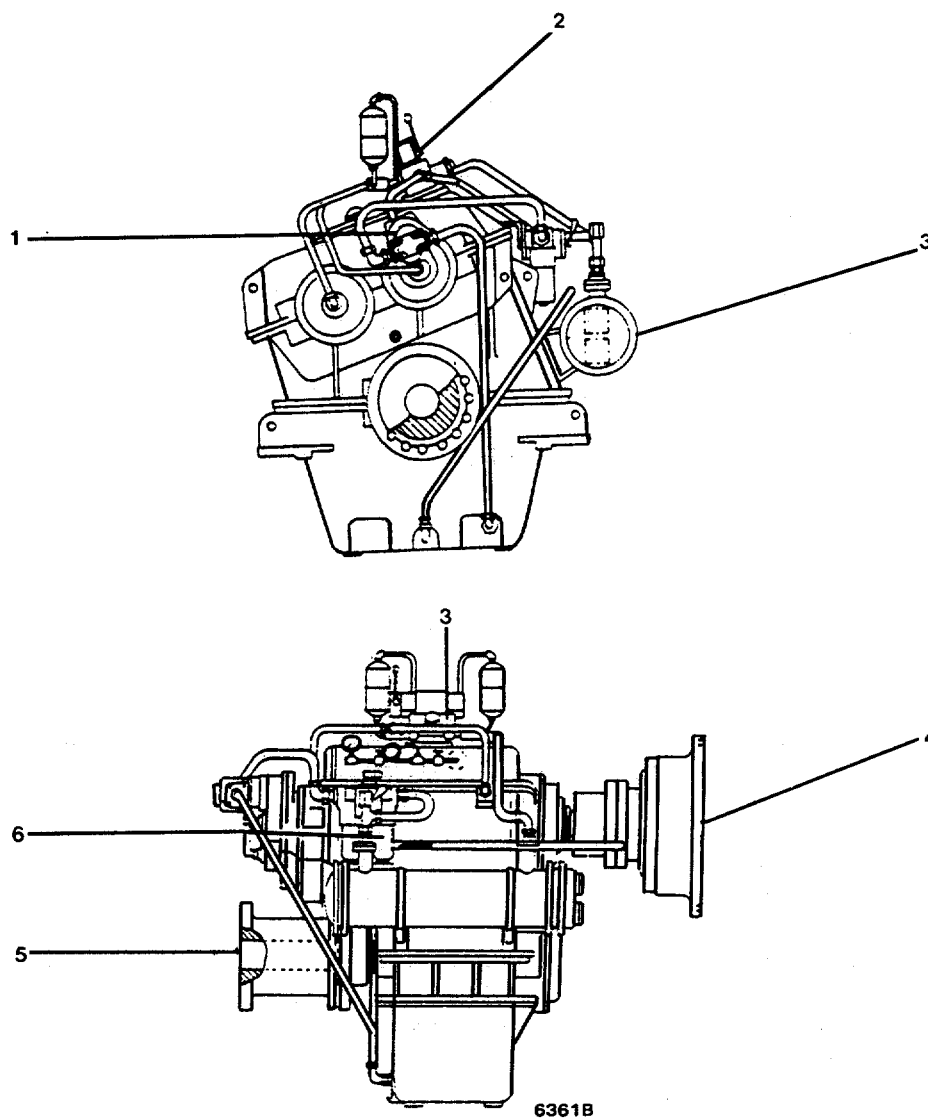
- a. Type of Manual. Unit, intermediate direct support, and intermediate general support maintenance manual.
- b. Name of Equipment. The equipment covered in this manual is the REINTJES WAV-850 Model Marine Reverse Reduction Gearbox. See FIGURE 1-1.
- c. Purpose of Equipment. The two gearboxes (one per engine) transmit torque from the engines to the propeller shafts.

1-2. Maintenance Forms, Records, and Reports. Department of the Army forms and procedures used for equipment maintenance are prescribed by DA Pam 738-750, The Army Maintenance Management System.

1-3. Destruction of Army Materiel to Prevent Enemy Use. Refer to TM 750-244-3 for instructions covering the destruction of Army materiel to prevent enemy use.

1-4. Reporting Equipment Improvement Recommendations. If your equipment 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. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, U. S. Army Troop Support Command, ATTN: AMSTR-QX, 4300 Goodfellow Blvd., St. Louis Missouri 63120-1798. We'll send you a reply.

1-5. Preparation for Storage or Shipment. Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the Preventive Maintenance Checks and Services (PMCS) charts before storing. When removing the equipment from administrative storage, the PMCS should be performed to assure operational readiness. Disassembly, and repacking of equipment for shipment or short term storage, are covered in paragraphs 2-22, 3-13, and 4-14.



LEGEND

- 1. LUBRICATING OIL PUMP
- 2. CONTROL VALVE
- 3. HEAT EXCHANGER
- 4. INPUT SHAFT
- 5. OUTPUT SHAFT
- 6. LUBRICATING OIL FILTER

FIGURE 1-1. WAV-850 Gearbox.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-6. Description and Characteristics. The WAV-850 Model Marine Reverse Reduction Gearbox transmits torque from the engine to the propeller shaft. The unit is capable of providing either forward or reverse rotation to the shaft. Speed reduction is the same in both directions, 4.941:1. The LCU 2000 Class watercraft is equipped with two gearboxes, one per engine, turning the propeller shafts in opposite (counter rotating) directions. Direction of rotation is shown on the equipment nameplate and cannot be changed except by factory modification. Therefore, units cannot be replaced without first making sure that the rotation of the new unit is the same as that of the unit to be removed.

1-7. Characteristics, Capabilities and Features. A very broad view of the reduction gear is as follows:

- a. Characteristics
 - (1) Three-piece housing design provides for ease of maintenance in the craft.
 - (2) Self-lubricated by means of a shaft powered pump.
 - (3) Operation delay tanks soften shifting action to reduce shock to propulsion system components.
- b. Capabilities and Features
 - (1) Uses the same lubricating oil as the engine.
 - (2) Rugged construction assures minimum breakdown.
 - (3) Lubricating oil drained by a sump pump common with the engine. Valve positioning permits draining either the engine or gearbox.

1-8. Location and Description of Major Components. FIGURE 1-1 shows the location of the lubricating oil pump (1), control valve (2), heat exchanger (3), input shaft (4), output shaft (5), and lubricating oil filter (6). Table 1-1 gives the specification data for the gearbox.

a. Controls. The gearbox is controlled from the bridge by a single lever which also controls engine speed. Center position is NEUTRAL or STOP with the engine at idle speed. Movement of the control lever forward from the center or STOP position shifts the gearbox to the FORWARD or AHEAD mode. Engine speed increases proportionally to the degree of movement away from the center position. To reverse the gearbox to ASTERN, the lever is moved rearward until the desired speed is attained.

(1) The air-operated bridge controller moves a hydraulic actuator at the gearbox control valve, directing operating oil pressure to effect the proper operating mode, i.e. STOP, AHEAD, or ASTERN.

NOTE

The arrangement of the control is such that the gearbox cannot be engaged in either direction without first going through the NEUTRAL position with the engine at idle speed.

- (2) The gearbox can be operated locally, if required, by turning the handle on the control valve either clockwise or counterclockwise from the center position.
- b. **Instrumentation and Alarms.** An oil pressure gauge is located on top of the gearbox. Normal operating pressure is 260 to 280 psi. A low pressure alarm will sound if the pressure falls 5 to 10 psi. A temperature gauge is located just above the clutch packs where the higher oil temperature is generated. Normal operating temperature is 1750 to 1950F.

1-9. Equipment Data. Reference data for the reduction gear is given in Table 1-1. Also see the equipment data given in the operator's manual TM 55-1905-223-10.

Table 1-1. Gearbox Equipment Data

Characteristics	Reference Data
Model	WAV-850
Manufacturer	REINTJES
Weight	4472 lbs. dry-4582 lbs. wet
Height	57 inches
Width	49 inches
Length	50 inches (including coupling)
Oil Cooling Method	Fresh water heat exchanger (25 gal. cap.)
Engine Speed Reduction	4.941:1
Oil Type	Same as propulsion engine (10.6 gal. cap.)
Normal Operating Oil Pressure	260 to 280 psi (all modes of operation)
Normal Operating Oil Temperature	175°-195°F

1-10. Safety, Care and Handling. Safety precautions must be observed at all times while performing maintenance. General WARNINGS and first-aid data appear in the front of this manual. Review all safety information before starting any task. Carefully read through an entire maintenance procedure before performing any maintenance function. Make sure the task can be done safely. All WARNINGS, CAUTIONS, and NOTES are of great importance to your personal safety and the safety of the equipment.

Section III. PRINCIPLES OF OPERATION

Overview of marine reverse reduction gearbox. The Principles of Operation section will tell you basic information about how this reduction gear works.

1-11. General. Power is transmitted by disk clutches and pinion gears. The direction of rotation is changed with a counter (or intermediate) shaft arranged on the side. The reduction ratio is the same at AHEAD and ASTERN. The disk clutches are operated by oil pressure through the control valve, and do not need to be adjusted. See FIGURE 1-2.

a. Lubrication. Operating oil pressure is built up by the gear driven pump (4), as soon as the engine is started, and is controlled by a spring-loaded over-pressure valve. Overflow oil from this valve is used for lubrication, which allows operation in the STOP position as long as necessary without damage. The gearbox is equipped with a changeover-type (two-cartridge) oil filter so operation can continue if the cartridge in use becomes clogged. A fouled up (clogged) cartridge is indicated by a red pin popping up from its normally seated position on the top of the filter head. Changeover from one cartridge to the other is accomplished by turning the handle on the filter board. Normal oil pressure is 260 to 280 psi, and can be adjusted if required by turning a set screw located on the oil control valve. Operating oil is the same type as that used in the engine.

b. STOP Position. In the STOP position, the control valve diverts the oil through the non-return valve (11) directly to the sump. The annular pistons (4) are forced to their original position by return springs (2). Clutches are disengaged and the output shaft is stationary.

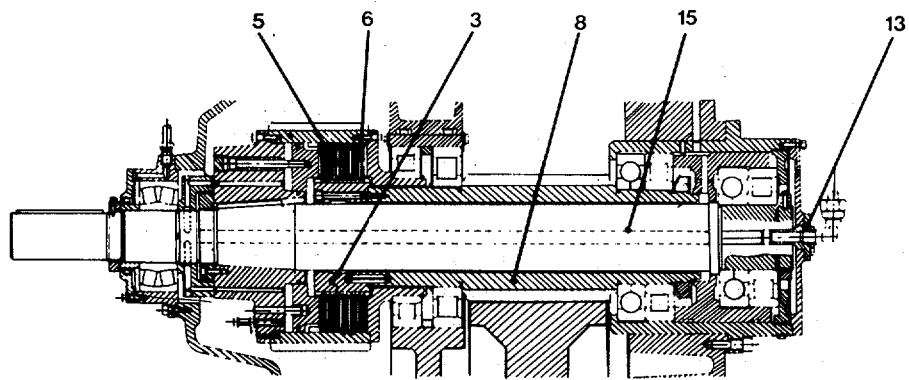
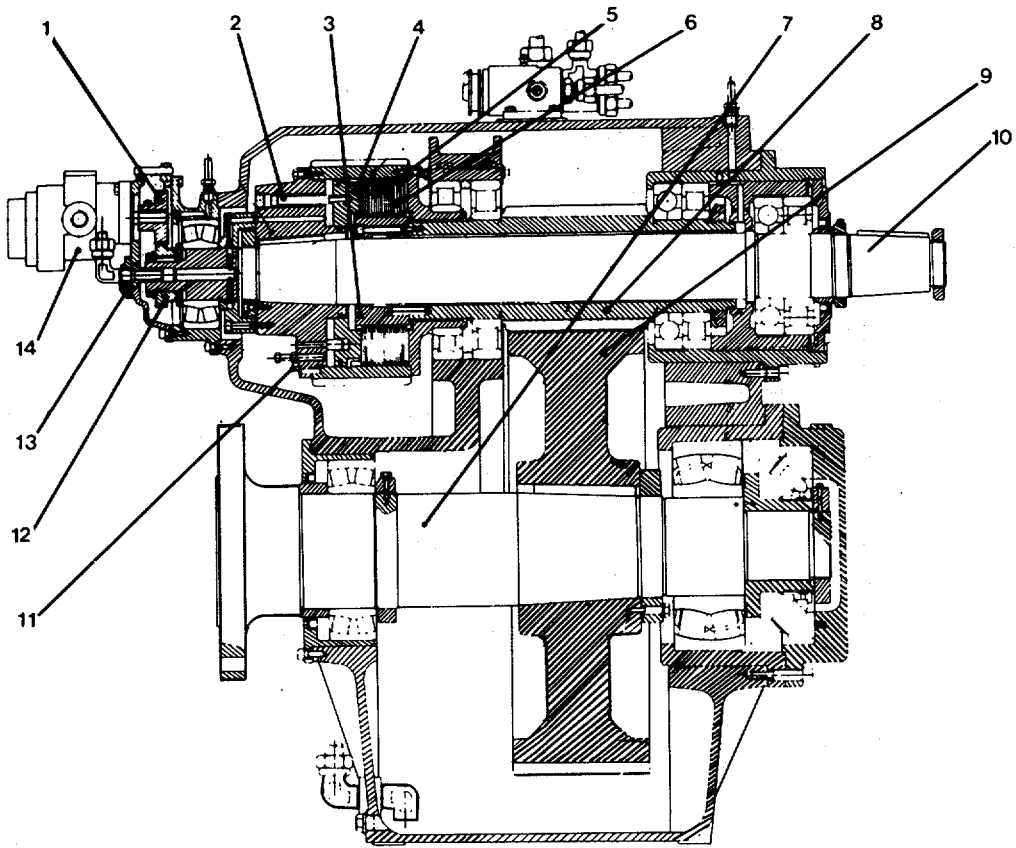
c. Counter Rotation (to Engine Rotation). The output shaft, and thus the propeller shaft, rotates in the direction opposite to that of the drive shaft. This is the normal condition, that is, the intermediate shaft is not employed.

(1) The oil pump (14) is driven by the input shaft (10) via the spur wheels (12 and 1). The pressure oil distributor (13) delivers the pressure oil through the bore in the drive shaft behind the piston (4).

(2) The piston (4) presses the inside and outside disks (5 and 6) together. Through the force locking of the disks, the carrier (3) and the pinion (8) are carried along, and the power is transmitted to output shaft (7) via the wheel (9).

d. Identical Rotation (to Engine Rotation). The oil pressure is supplied by the oil distributor (13) and the hollow intermediate shaft (15) behind the annular piston (4). The intermediate shaft clutches are engaged and the power is transmitted by the intermediate shaft pinion to the output gear (9). Thus, the output shaft, by engagement of the intermediate shaft, is reversed and engine and gearbox rotate in the same direction.

e. Direction of Rotation. The direction of rotation registered on the name plate indicates the direction of input rotation and the direction of output rotation as seen in the direction of travel. Since the two gearboxes counter rotate, you can see that one has the intermediate shaft clutches engaged while the other has the drive shaft clutches engaged in either drive mode.



INTERMEDIATE SHAFT

FIGURE 1-2. Gearbox Assembly.

CHAPTER 2

UNIT MAINTENANCE INSTRUCTIONS

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Section I. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

2-1. Common Tools and Equipment. For authorized common tools and equipment refer to the Modified Table of Organization and Equipment (MTOE) applicable to your organization.

2-2. Special Tools, TMDE, and Support Equipment. Special tools; test, measurement, and diagnostic equipment; and support equipment requirements are listed and illustrated in the Repair Parts and Special Tools List (RPSTL), TM 55-1905-223-24P. These items are also listed in the Maintenance Allocation Chart (MAC), Appendix B of this manual.

2-3. Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List (RPSTL), TM 55-1905-223-24P.

Section II. SERVICE UPON RECEIPT

2-4. Checking Unpacked Equipment.

- a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage in accordance with the instructions in DA Pam 738-750.
- b. Check the equipment against the packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions in DA Pam 738-750.

- c. Check to see whether the equipment has been modified.

2-5. Preliminary Servicing and Preparation for Installation, and Adjustment. Perform the following procedures to prepare the reduction gear for installation and operation.

Overview The steps for preliminary servicing of the reduction gear are very important. The steps will cover:

- o Preparing the gearbox.
- o Filling with oil.
- o Checking oil level and checking for leaks.

WARNING

Acid may be extremely dangerous to personnel and machinery. Always provide a tank of strong soda water as a neutralizing agent.

NOTE

All bright parts on the outside of the gearbox (flange on the propeller side, drive shaft) are protected by an anti-corrosion agent. Connections (such as oil and water) that cannot be fitted until the unit has been installed are closed with plugs. Piping that could be damaged in shipment is packaged separately. Connections and pipes that must be modified (that is, renewed) in the course of installation must be acidified and cleaned before use. Adjustable units (pressure limiting valves and pressure controllers) have been set for the specified pressure before delivery.

- a. Remove protective caps, plugs, inserts, wrappings, and tape. Inspect piping openings for damage. Wipe off dirt, grease, or protective films.

NOTE

The gearbox is supplied without an oil filling and is treated with an anti-corrosion treatment. It is not necessary to flush the anti-corrosion treatment from the gearbox before filling with oil. The treatment is oil soluble and will not affect any properties of the oil.

- b. Fill gearbox with oil.

CAUTION

Never operate the gearbox with oil below the low level mark, or above the upper level mark. The oil level can be checked only when the propulsion engine is shut down.

- (1) Fill gearbox with the same oil as used in the propulsion engine until the oil level reaches the upper dipstick mark. Reference LO 55-1905-223-12.
- (2) Start the engine. Refer to TM 55-1905-223-10. Check for evidence of external leakage. Secure capscrews, fittings, and connections as necessary. Check oil dipstick and filler tube caps to see that they are tightened securely. After 5 to 10 minutes, shut the engine down and recheck the oil level. Add oil as necessary to bring it up to the upper dipstick mark.

NOTE

A significant amount of oil will be required to bring the oil up to the proper level due to the initial filling of the piping system, oil cooler, and filter.

CAUTION

The first oil and filter cartridge change must be made after 100 hours of operation. Thereafter, strict adherence to the preventive maintenance schedule must be maintained. Failure to change the oil and cartridge at this time could cause severe damage to the gearbox and void the manufacturer's warranty. During the first 100 hours of operation particular attention must be paid to the fouling indicator on the oil filter (see PMCS, Item 4).

- c. Check water flow rate. Refer to TM 55-1905-223-10.

Section III. UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-6. Explanation of PMCS Table. PMCS is designed to keep the equipment in good working condition. This is accomplished by performing certain tests, inspections, and services. Table 2-1 lists items to be serviced and the procedures needed to accomplish the PMCS.

2-7. Column Headings. The "Interval" column tells you when to perform a check or service. If needed, PMCS may be performed more frequently than the indicated interval. The "Procedures" column tells you how to perform the required checks and services. If your equipment does not perform as required, see Table 2-2, Troubleshooting. Report any malfunctions or failures on DA Form 2404. In the Item Number column on DA Form 2404, record the appropriate Item Number from the PMCS table.