COMMANDANT INSTRUCTION M16114.41

01 MARCH 2012

Subj: 45FT RESPONSE BOAT-MEDIUM (RB-M) OPERATOR’S HANDBOOK

1. PURPOSE. This Manual provides technical orientation, performance characteristics, and basic operating procedures for the 45 FT Response Boat – Medium (RB-M). It also standardizes boat outfit, storage and equipment layout.

2. ACTION. All Coast Guard unit commanders, commanding officers, officers-in-charge, deputy/assistant commandants, and chiefs of headquarters staff elements shall comply with the provisions of this Manual. Internet release is authorized.

3. DIRECTIVES AFFECTED. None.

4. DISCUSSION. This Manual contains information necessary to safely and efficiently operate the 45FT RB-M. The operational capabilities, limitations, and emergency procedures are clearly stipulated. The fittings, outfit list, and physical characteristics of the boat are pictured and described in detail. This Manual is directive in nature and applies to all 45FT RB-M crews, operational, and supervisory commands. This guidance is not intended to, nor does it, impose legally-binding requirements on any member of the public or affect the public’s behavior or interaction with the Coast Guard. Its exclusive intended audience is Coast Guard personnel.

5. SUMMARY OF CHANGES. This revision provides new policies and procedures, makes modification and clarification to other existing policies, and makes several minor clerical changes. The majority of these changes originated from feedback received from the field. In addition to illustrations that were replaced throughout the Manual, the following major areas of change were made:
6. **PROCEDURE.** District, operational, and unit commanders for all units with a 45FT RB-M shall ensure the procedures and limitations detailed within this Manual are followed. Boat crews shall become familiar with the changes made within this handbook, but are not required to recertify solely based on changes within this revision. Forward any comments, corrections, recommendations, and questions regarding this Manual to the 45FT RB-M Facility Manager in accordance with Section 1.C. of this Manual. Design and structural change requests shall be submitted as outlined in the Naval Engineering Manual, COMDTINST M9000.6 (series).

7. **ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS.** Environmental considerations under the National Environmental Policy Act (NEPA) were examined in the development of this Manual. This Manual included preparation of guidance documents that implement, without substantive change, the applicable Commandant Instruction or other Federal agency regulations, procedures, manuals, and other guidance documents. It is categorically excluded from further NEPA analysis and documentation requirements under Categorical Exclusion (33) as published in the National Environmental Policy Act Implementing Procedures and Policy for Considering Environmental Impact, COMDTINST M16475.1 (series), Figure 2-1. An Environmental Checklist and Categorical Exclusion Determination (CED) are not required.

8. **FORMS AVAILABILITY.** None.

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Rear Admiral, U. S. Coast Guard
Assistant Commandant for Capability

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Chapter 1
Introduction

Introduction

This handbook contains information necessary for the safe and efficient operation of the 45FT Response Boat-Medium (RB-M). It defines operational capabilities, limitations, and emergency procedures. In addition, it shows or describes the fittings, outfit list, and physical characteristics of the boat.

In this chapter

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## Introduction

The following definitions apply to Warnings, Cautions, and Notes found throughout the handbook.

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Section B. Facility Manager

Introduction

Commandant (CG-731), the Office of Boat Forces, is the facility manager for the RB-M. The RB-M is a standard boat as defined in the Boat Management Manual, COMDTINST M16114.4 (series), and the Naval Engineering Manual, COMDTINST M9000.6 (series). The RB-M Standardization Team (STAN Team) provides expertise in all aspects of the RB-M’s operation and maintenance. The STAN Team reviews the boat, its equipment, crew procedures, operational reports casualty report (CASREP), training management tool (TMT), abstract of operations (AOPs), etc., and technical manuals continuously to update the information in this handbook.
Section C. Changes

Introduction
Commandant (CG-731) promulgates this handbook and its changes. Submit recommendations for changes to Commandant (CG-731) via standard memo or electronic mail. For more information, contact Commandant (CG-731), RB-M Facility Manager.

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US COAST GUARD
2100 2ND ST SW STOP 7356
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C.1. Time Compliance Technical Orders (TCTOs)
All TCTO’s issued since the RB-M has been in service are provided in Appendix B. TCTOs approved after the promulgation of this handbook supersedes information in the RB-M Operator’s Handbook, where applicable.
Section D. Action

**Introduction**

Operating, supervisory, and maintenance support commands and boat crews will comply with the procedures and limitations specified in this publication and any duly issued changes.

**D.1. Configuration control**

Configuration control for the RB-M is critical for standardization of equipment and safety of operations. The boat’s speed, performance and range characteristics are extremely sensitive to excess weight.

**NOTE**

Prototype testing of RB-M configuration changes may only be carried out with the specific authorization of the Office of Naval Engineering, Commandant (CG-45). Under most circumstances, prototype testing is done at the Prime Unit, STA Little Creek.

**NOTE**

To maintain fleet wide standardization, unit commanders shall not change or vary the type or location of equipment carried except where noted. Design or structural alterations are prohibited unless specifically authorized by the Office of Naval Engineering, Commandant (CG-45).
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Chapter 2
Boat Characteristics

Introduction
This chapter describes standard RB-M features. The general location of the major hull and system components is presented in this chapter. Detailed information about hull and system components is provided in Chapter 3.

NOTE
All illustrations and photographs in this operator’s handbook are for familiarization only. The location of hull fittings and system components in these illustrations may not accurately reflect proper placement and installation on all hulls.

NOTE
Where differences exist in RB-Ms, they are specifically identified in the text by hull designation.

In this chapter
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<td>Masts</td>
<td>2-94</td>
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</tbody>
</table>
### Section A. General Description

<table>
<thead>
<tr>
<th>A.1. Design</th>
<th>The RB-M (Figure 2-1) is designed by Camarc LTD of Sussex, England.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.3. Missions</td>
<td>The RB-M is an aluminum, self-righting, high-speed, multi-mission capable boat, operable from Coast Guard shore stations. The RB-M is able to respond rapidly to Coast Guard missions, or conduct planned patrols and training.</td>
</tr>
</tbody>
</table>

**WARNING**

The ability to recover from a rollover requires that all doors, hatches and windows be securely shut.
Figure 2-1
Response Boat-Medium (RB-M)
The following provides a list of RB-M boat specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hull Length</td>
<td>43 FT 9 inches (w/o fender)</td>
</tr>
<tr>
<td>Length Overall</td>
<td>44 FT 9 inches (incl. fender)</td>
</tr>
<tr>
<td>Hull Beam</td>
<td>13 FT 8 inches (w/o fender)</td>
</tr>
<tr>
<td>Beam Overall</td>
<td>14 FT 8 inches (incl fender)</td>
</tr>
<tr>
<td>Freeboard</td>
<td></td>
</tr>
<tr>
<td>Bow</td>
<td>4 FT 9 inches</td>
</tr>
<tr>
<td>Amidships</td>
<td>1 FT11 inches (deck recess)</td>
</tr>
<tr>
<td>Aft</td>
<td>2 FT 11 inches</td>
</tr>
<tr>
<td>Draft</td>
<td>3 FT 4 inches</td>
</tr>
<tr>
<td>Highest Points:</td>
<td></td>
</tr>
<tr>
<td>Fixed</td>
<td>13 FT 1 inch (mast down)</td>
</tr>
<tr>
<td>Unfixed</td>
<td>20 FT 9 inches (mast up)</td>
</tr>
<tr>
<td>Engines</td>
<td>Twin Detroit Diesel series 60 diesel engines</td>
</tr>
<tr>
<td>Rated Horsepower</td>
<td>825 BHP at 2300 RPM</td>
</tr>
<tr>
<td>Reduction Gear (RG)</td>
<td>Twin Disc MG-5114-SC, 1.02:1 reduction</td>
</tr>
<tr>
<td>Fuel Type</td>
<td>Diesel</td>
</tr>
<tr>
<td>Fuel Capacity</td>
<td></td>
</tr>
<tr>
<td>100%</td>
<td>510 gallons</td>
</tr>
<tr>
<td>95% (usable)</td>
<td>485 gallons</td>
</tr>
<tr>
<td>Potable Water</td>
<td>5 gallons</td>
</tr>
<tr>
<td>Electrical Generation</td>
<td>Dual engine mounted</td>
</tr>
<tr>
<td></td>
<td>8.5 KW generators</td>
</tr>
<tr>
<td>Waterjets</td>
<td>Kamewa Rolls Royce FF</td>
</tr>
<tr>
<td></td>
<td>Model Number 375S</td>
</tr>
<tr>
<td>Displacement</td>
<td></td>
</tr>
<tr>
<td>Hoisting condition</td>
<td></td>
</tr>
<tr>
<td>[Full fluids (fuel water, oil) plus 600 lb service life margin. No crew or cargo]</td>
<td>36,700 lbs</td>
</tr>
<tr>
<td>Hoisting condition</td>
<td>(plus 4 crewmembers @ 210 lbs ea)</td>
</tr>
<tr>
<td>Operational characteristics and parameters</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---</td>
</tr>
<tr>
<td>Maximum Personnel (including crew)</td>
<td>24 (210 lbs each)</td>
</tr>
<tr>
<td>Maximum Seas</td>
<td>12 FT</td>
</tr>
<tr>
<td>Maximum Winds</td>
<td>50 KTS</td>
</tr>
<tr>
<td>Maximum Operating Distance from Shore</td>
<td>50 NM</td>
</tr>
<tr>
<td>Range at 30 KTS in calm water</td>
<td>250+ NM</td>
</tr>
<tr>
<td>Maximum RPM</td>
<td>2350 RPM</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td>40+ KTS</td>
</tr>
<tr>
<td>Cruising RPM</td>
<td>1950 RPM</td>
</tr>
<tr>
<td>Cruising Speed</td>
<td>30 KTS</td>
</tr>
<tr>
<td>Towing Capacity</td>
<td>100 Displacement Tons</td>
</tr>
<tr>
<td>Ice Breaking Capability</td>
<td>Light surface ice and slush at idle speeds</td>
</tr>
</tbody>
</table>

**CAUTION !**

Acceptable fuel types for the RB-M engines are Diesel 1-D, 2-D (ASTM D 975-09 Compliant). JP5 fuel is not authorized for use in the RB-M engines. Failure to adhere to this caution can result in equipment damage.

**NOTE ❂**

The 45FT RB-M was not designed for transport on a boat trailer. Over-the-road delivery should be performed by a licensed commercial shipping company.

**NOTE ❂**

Environmental temperatures for human endurance may be reached long before environmental temperatures adversely impact the mechanical functioning of the 45FT RB-M. Unit and operational commanders shall perform a thorough risk assessment in accordance with the Coast Guard’s Operational Risk Management Instruction, COMDTINST M3500.3 (series), when deploying the 45FT RB-M in adverse weather conditions.

**NOTE ❂**

Additional guidance on passenger capacity and stability can be found in Section 5.A.6.

**A.5. Superstructure**

The Pilothouse and the overhead of the Survivors’ Compartment are made of aluminum alloy type 5083-H116. They are welded to the hull between Frame 6 (aft) and Frame 14 (forward). The mast base assembly is attached to the Pilothouse top at Frame 6 and Frame 8. The radar antenna and fold down mast are connected to the mast base assembly.
A.6. Hull

The RB-M incorporates a planing hull form with a double chine and a 20 degree dead rise at the transom.

A.6.1. Hull construction

The boat’s hull is made of aluminum alloy type 5083-H116 plating with 5086 H112 extrusions. A keel shoe runs the length of the hull for additional hull plating protection and improved maneuverability. Appendages extending below the hull include the keel shoe, and two strakes extending forward from the transom and outboard of the waterjets, port and starboard.

A.6.2. Hull reference points

Frames are numbered from transom to bow. Spacing from the transom to Frame 2 is at 24 inch intervals. Spacing from Frame 2 forward is at 28 inch intervals. Table 2-1 provides frame references.

### Table 2-1

<table>
<thead>
<tr>
<th>Hull Frame References</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boat’s numbers and a Coast Guard identification stripe with emblem.</td>
<td>On each side of the hull between Frames 14 and 17.</td>
</tr>
<tr>
<td>“U.S. COAST GUARD” in black letters.</td>
<td>On each side of the hull between Frames 2 and 5.</td>
</tr>
<tr>
<td>Boat’s number and station name in black letters (EC-002).</td>
<td>Displayed on the stern.</td>
</tr>
<tr>
<td>Fixed fenders or rub rails.</td>
<td>At the gunwale level from the bow to around the stern to the end of the swim platform.</td>
</tr>
<tr>
<td>Survivors’ Compartment Sink Overboard Discharge.</td>
<td>Port side between Frames 11 and 12.</td>
</tr>
</tbody>
</table>
Table 2-1 (con’t)
Hull Frame References

<table>
<thead>
<tr>
<th>Hull Frame Reference</th>
<th>Location and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth sounder transducer.</td>
<td>Lazarette: Between Frames 1 and 2.</td>
</tr>
<tr>
<td>Sea suction valves.</td>
<td>Between the transom and Frame 1 on both sides of the keel in the Lazarette.</td>
</tr>
<tr>
<td>The boat’s deepest draft.</td>
<td>Between the transom and Frame 2.</td>
</tr>
</tbody>
</table>
A.7. Fendering system

The RB-M fender is a D-shaped ionomer foam designed to protect the hull from damage during boarding and alongside towing missions. The fendering system extends around the perimeter of the boat except the transom. (Figure 2-2).

Figure 2-2
Fendering System
Section B. Compartments

Introduction

The RB-M is constructed with four watertight bulkheads located at Frames 2, 7, 10 and 14. The compartments are (Figure 2-3):

1) Forepeak: Frame 14 to Bow
2) Survivors’ Compartment: Frame 10 to Frame 14
3) Auxiliary Machinery Compartment: Frame 7 to Frame 10
4) Engine Compartment: Frame 2 to Frame 7
5) Lazarette: Transom to Frame 2
6) Pilothouse: Frame 6 to Frame 10 above the Main Deck

The RB-M has been designed to a one-compartment damage stability criteria. Any single compartment in the hull can be flooded and the RB-M will have sufficient damage stability.
Figure 2-3
Compartments
B.1. Forepeak  The Forepeak is a watertight compartment located forward of the Survivors’ Compartment.

CAUTION!

Use caution when entering or leaving the Forepeak during inclement weather. Press on the hatch locking tab and be sure it is fully seated. Avoid bumping the locking tab while entering and exiting the forepeak.

B.1.a. Access  Access to the Forepeak is through a 24 inch diameter round watertight hatch on the main deck, just forward of Frame 14 (Figure 2-4). The hatch cover has a locking tab to hold the hatch cover in the open position (Figure 2-5). Press on the tab to fully seat the tab. A ladder is provided for entry.

Figure 2-4
Forepeak Hatch
Figure 2-5
Locking Hatch Tab

<table>
<thead>
<tr>
<th>B.1.b. Interior</th>
<th>The Forepeak contains the following items:</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.1.b.1. Lighting</td>
<td>The compartment has a locally switched dome light producing either red or white light. The dome light receives power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console. The combined On/Off/Dimmer switch is located on the starboard side of the ladder (Figure 2-6). Press the outboard side of the rocker switch to turn on the red light. Continue to press the switch to turn on the white light and increase the light to full intensity. Press the inboard side of the rocker switch to reduce the intensity of the white light. Continue to press the switch to change the white light to red and to turn the light off.</td>
</tr>
<tr>
<td>B.1.b.2. Anchor line reel</td>
<td>The anchor line reel (Figure 2-7) contains 300 FT of 2 ¾ inch circumference double braided nylon (DBN) line, with one end spliced into a thimble and shackled to 9 FT of stainless steel chain. The anchor line reel is equipped with a locking pin and handle. During anchoring evolutions the anchor rode is routed to the main deck through the hawse pipe. The anchor hawse pipe cap has a J-hook to attach the chain to the cap (Figure 2-8).</td>
</tr>
</tbody>
</table>
Figure 2-6
Light Switch

Figure 2-7
Anchor Reel

Figure 2-8
J-Hook
B.1.b.3. Deck gear

The following items are secured and hang from a bar extending from the overhead (Figure 2-6) on both sides of the ladder in the Forepeak:

1) A small drogue with 200 FT of line stowed in a flotation bag
2) Mooring lines
3) Fenders

B.1.b.4. Bilge pump

A bilge pump (Figure 2-9) and float switch are located below the ladder and deck grating. The bilge pump is controlled by a switch at the Engineer’s console and receives power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console.
B.1.b.5. Ventilation

The Forepeak is naturally ventilated by two gooseneck vents with ball check valves (Figure 2-10).

Figure 2-10
Forepeak Vents
B.2. Survivors’ Compartment

The Survivors’ Compartment is located between the Auxiliary Machinery Compartment and the Forepeak. The forward bulkhead is watertight and the aft bulkhead is watertight to the main deck. The Survivors’ Compartment provides a space that is protected from the weather and for administering first aid.

B.2.a. Access

The Survivors’ Compartment is accessed through a double-sided door in the forward bulkhead of the Pilothouse. The door leading from the Pilothouse into the Survivors’ Compartment is not watertight.

Emergency escape is through a 24 inch x 24 inch watertight hatch in the compartment overhead (Figure 2-11). The hatch is secured by two dogs operated by a quick-acting single lever. The hatch cannot be opened from the outside. A webbed egress ladder is rolled up and secured to the overhead directly forward of the egress hatch. The ladder is unrolled and secured to the deck (Figure 2-12) with quick acting cam locks (Figure 2-13) for stable egress through the overhead hatch.

The bilge is accessed by four removable deck plates (Figure 2-14). Each deck plate has two twist latches.

The Survivors’ Compartment access ladder from the Pilothouse can be folded up for access to the bilge (Figure 2-15), head cassette tank and toolbox.
Figure 2-11
Survivors’ Compartment Escape Hatch

Figure 2-12
Escape Hatch Ladder
Figure 2-13
Escape Hatch Ladder Cam Locks

Figure 2-14
Survivors’ Compartment Bilge Access Plates
## B.2.b. Interior

The following items are found in the interior of the Survivors’ Compartment.

### B.2.b.1. Portlights

The compartment has three portlights. One additional portlight is located in the enclosed head. The portlights do not open, have acrylic glazing and are constructed with a cast aluminum frame.

### B.2.b.2. Lighting

The compartment has dome lights producing either red or white light. The dome lights receive power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console. The combined On/Off/Dimmer switch (Figure 2-16) is located on the port side of the access ladder from the Pilothouse. Press the upper side of the rocker switch to turn on the red light. Continue to press the switch to turn on the white light and increase the light to full intensity. Press the lower side of the rocker switch to reduce the intensity of the white light. Continue to press the switch to change the white light to red and to turn the light off.

A portable hand held searchlight (Figure 2-17) is stowed in the cabinet under the sink and is secured by nylon straps. The portable searchlight is rechargeable. The charger can be connected to a 120 VAC outlet plug located within the cabinet.
B.2.b.3. Seating  

Three seats are located on the port side (Figure 2-18) and two seats are located on the starboard side (Figure 2-19). All seats fold up and are fitted with safety belts. Hand holds are located under each seat.
B.2.b.4. Galley  

The galley is located on the port side of the Survivors’ Compartment (Figure 2-20). The galley contains a 5 gallon portable water cooler, a sink, a microwave oven, a paper towel dispenser, a sealed trash can, a 36 quart cooler with a locking lid, and additional storage. 120 VAC and 12 VDC outlets are located outboard of the microwave oven.

B.2.b.5. Head  

The head (Figure 2-21) is located on the starboard side of the Survivors’ Compartment. The door is fitted with a latch and lock for privacy. The toilet is a permanently installed unit with a removable cassette type holding tank. The compartment contains an exhaust fan that takes air from the Survivors’ Compartment and head and routes it overboard. The head also has a toilet paper holder, a small trash receptacle with a sealed top and a tissue paper dispenser. Additional items stowed in the head include five Type I adult personal flotation device (PFDs), two Type I child PFDs, wipes, toilet paper, paper towels and a stowage container for towing gear and a grapnel hook. All gear is stowed behind orange cargo netting to secure it in place while underway. There is a deck plate that allows access to the bilge.
### Figure 2-21

**Head**

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B.2.b.6. Medical equipment</strong></td>
<td>The Coast Guard EMT Kit (optional) can be stowed on the forward bulkhead (bulkhead 14) on centerline (Figure 2-12). A 10-person first aid kit is located in the Boat Outfit Locker. A stokes litter (Figure 2-22), medevac board (stored in halves) and swimmer harness with 70 FT of line are secured to the top of the starboard storage cabinet with nylon straps. The crew communications system port is located above the galley allowing a crewmember to maintain radio communications while performing medical assistance.</td>
</tr>
<tr>
<td><strong>B.2.b.7. Boat outfit locker</strong></td>
<td>The two-door boat outfit locker (Figure 2-23) is located on the starboard side, forward of the two folding seats. The locker contains two blankets, two pillows, push button signal horn with spare bottle of air, personnel retrieval strop, a 50 FT roll of fire fighting hose, fire nozzle, and ten-person first aid kit.</td>
</tr>
</tbody>
</table>

**WARNING** 🚨 Improper stowage of the stokes litter presents a high risk of injury to personnel while underway. The stokes litter must be properly secured to the bulkhead D rings by interweaving the nylon straps through the stokes litter top rail and medical bag handles (Figure 2-22).
Figure 2-22
Properly Secured Stokes Litter

Figure 2-23
Boat Outfit Locker
B.2.b.8. Ammunition and pyrotechnic lockers

The ammunition box (Figure 2-24) is located above the starboard folding seats, next to the head. The locker is fitted with a locking door and will hold four M19A1 ammunition containers. The pyrotechnics stowage container is stowed in a locked cabinet (Figure 2-25) forward of the port folding seats.

B.2.b.9. Gun locks

Gun locks (Figure 2-24) are located above the port and starboard seats. They provide stowage for two M240B light machine guns.

Figure 2-24
Ammunition Box and Gun Lock
B.2.b.10. Boat crew equipment

A lockable cabinet containing four boat crew survival vests is located forward of the port seats (Figure 2-25). Helmets, goggles, and heavy weather belts are stowed in the head.

B.2.b.11. Survivor PFDs

Five Type I Adult PFDs and two Type I child PFDs are stowed in the head.
B.2.b.12. Fire extinguishers

Two 5 lb dry chemical fire extinguishers are secured in brackets. One is on the forward bulkhead next to the Lifesaver Kit (Figure 2-12) and one is on the head bulkhead next to the seats (Figure 2-26).

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B.2.b.13. Heat, smoke and carbon monoxide detectors

Heat, smoke and carbon monoxide detectors are located in the overhead of the compartment. The smoke and carbon monoxide detectors are located near the galley (Figure 2-27). The heat detector is located to starboard of the escape hatch (Figure 2-28). The detectors receive power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console.

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**NOTE**

The heat detector is activated at 190°.
Figure 2-27
Smoke and Carbon Monoxide Detectors

Figure 2-28
Heat Detector
B.2.b.14. Toolbox

A toolbox is located under the Pilothouse access ladder (Figure 2-15). The toolbox is secured by two nylon straps.

B.2.b.15. Damage control and spare parts kits

There are three removable deck plates forward of the Pilothouse access ladder. A damage control kit is stowed under the second deck plate forward of the access ladder. A spare parts box is stowed under the deck plate immediately forward of the access ladder (Figure 2-29).

Figure 2-29
Damage Control Kit and Spare Parts Box
B.2.b.16. Bilge pump

The bilge pump and float switch (Figure 2-30) are located below the deck plate that is under the access ladder. The bilge pump is controlled by a switch at the Engineer’s console and receives power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console.

Figure 2-30
Bilge Pump and Float Switch
B.2.b.17. HVAC  A heating, ventilation and air conditioning (HVAC) unit is located behind the forward seat on the starboard side (Figure 2-31). The HVAC control for this compartment is located on the port side in the galley area (Figure 2-32). The HVAC unit receives power from the 240P1 AC Bus power distribution panel on the AC Power Island, located between the crew and navigator’s seats.

Condensate from the HVAC unit drains to a condensate pump (Figure 2-30) located below the deck plate that is under the access ladder. The pump receives power from the 24P3 Non-Vital Bus power distribution panel located at the Engineer’s console.

Figure 2-31
HVAC Unit
| B.2.b.18. 120 VAC and 12 VDC outlets | A duplex, 120 VAC electrical outlet and a 12 VDC outlet are located outboard of the microwave oven. An additional 120 VAC outlet is located in the handheld searchlight stowage cabinet. The 120 VAC outlets are GFCI, and receive power from 240P1 AC Bus power distribution panel on the AC Power Island, located between the crew and navigator’s seats. The 12 VDC outlet receives power from the 12 VDC Main Panel located at the Engineer’s console. |
| B.2.b.19. Crew communications ports | The crew communications connection port (Figure 2-32) is located on the port side in the galley area. |
| B.2.b.20. Wiper fluid tank | The windshield wiper fluid tank (Figure 2-20) is mounted on the aft bulkhead, port side, next to the Pilothouse access ladder. The reservoir holds 2.6 gallons of washer fluid. The reservoir is semi-transparent for easy verification of fluid level. |
B.2.b.21. HF secure radio

The HF radio secure communications component (KY-99) is mounted in an enclosed, security-locked box located on the port side above the galley. The HF radio receives power from the 24P3 Non Vital Bus power distribution panel located at the Engineer’s console.

B.2.b.22. Grounding wand

A grounding wand and clip for helicopter operations (Figure 2-33) is located in the head.

Figure 2-33
Helicopter Grounding Wand
B.3. Auxiliary Machinery Compartment

The Auxiliary Machinery Compartment is located between the Engine Compartment and the Survivors’ Compartment, below the Pilothouse.

B.3.a. Access

Access to the Auxiliary Machinery Compartment is through a non-tight 24 inch x 24 inch hatch on the centerline of the Pilothouse (Figure 2-34). This is the only access and emergency escape route from the compartment.

Figure 2-34
Auxiliary Machinery Compartment Access Hatch
B.3.b. Interior

The Auxiliary Machinery Compartment contains the following items:

B.3.b.1. Lighting

Compartment lighting is provided by white dome lights. Lights are controlled by a switch located next to the ladder (Figure 2-35). The lights receive power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console.

![Light Switch and Battery Box](image)

**Figure 2-35**
Light Switch and Battery Box

B.3.b.2. Ventilation

The compartment is ventilated by a gooseneck vent with a ball check valve on the port side of the Pilothouse and a powered exhaust fan (Figure 2-36) that discharges air into the Engine Compartment ventilation duct. The fan is located in the aft, starboard corner of the compartment. The fan is controlled by a breaker on the 24P3 power distribution panel located at the Engineer's console.

**NOTE**

The fan should be on whenever the boats electronics are energized.
B.3.b.3. Batteries and IPS ECU

Four batteries are enclosed in two battery boxes (Figure 2-35) secured to aluminum brackets. The batteries are located port and starboard of the centerline at the forward end of the compartment. An induction power source (IPS) electronic control unit (ECU) (Figure 2-35), is located outboard of each battery.
B.3.b.4. Battery charger

A battery charger (Figure 2-37) is located on the forward bulkhead, starboard side. The battery charger receives power from the 240P Power distribution panel located on the AC power island located between the crew and navigator’s seats.

Figure 2-37
Battery Charger
B.3.b.5. Battery solenoids

The battery solenoids and the automatic charging relay are located in a Battery Distribution Panel located behind a clear plastic cover, on centerline, on the forward bulkhead (Figure 2-38).

Figure 2-38
Battery Solenoids
WARNING ⚠️

Fuel tanks are Immediately Dangerous to Life and Health (IDLH) confined spaces and shall not be entered until certified gas free by a marine chemist.

B.3.b.6. Fuel tank

The forward portion of the fuel tank is located in the center of the compartment. Access to the tank is provided by two Tiona style hatch covers with a band clamping mechanism, located in the tank top. The fuel tank fill and vent lines are located on the starboard side of the tank, forward of the access ladder. (Figure 2-39).
B.3.b.7. Fire detection and suppression

Smoke and heat detectors are located in the overhead of the compartment. The detectors receive power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console. An FM 200 fire suppression system (Figure 2-40) is located at the forward bulkhead, port side. The system can be activated by valves at the Coxswain’s seat, and at the FM 200 cylinder in the Auxiliary Machinery Compartment.

NOTE

The heat detector is activated at 190°.

Figure 2-40
FM 200 Fire Suppression System
B.3.b.8. Bilge pumps

Two bilge pumps and float switches are located at Frame 7, one on each side of centerline, outboard of the fuel tank. (Figure 2-41). The bilge pumps are controlled by a switch at the Engineer’s console and receive power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console.

Figure 2-41
Bilge Pump and Float Switch
B.3.b.9. Air compressor

The air compressor (Figure 2-42) serves the air horn and pressurizes the pilothouse window seals. The compressor is located on the forward, starboard side of the compartment. It is controlled by an internal pressure switch. It receives power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console. The compressor has a relief valve setting of 165 psi.

Figure 2-42
Air Compressor
B.3.b.10. Electronics rack

An electronics rack (Figure 2-43) is located on the port side of the compartment. The rack holds the VHF-FM and UHF-FM radio transceivers, the AIS unit, the portable steering control console, and the HF SSB radio.

Figure 2-43
Electronics Rack
B.3.b.11. Shore power circuit breaker

The master circuit breaker for the shore power circuit (Figure 2-44) is located on the port side of the compartment, aft of the electronics rack.

Figure 2-44
Shore Power Breaker
B.3.b.12. Shore power transformer

A shore power transformer (Figure 2-45) is located on centerline at the forward end of the compartment. The transformer electrically isolates the boat’s 120 VAC power from the shore power source and steps the voltage up to 240 VAC.

Figure 2-45
Shore Power Transformer

B.3.b.13. Crew communications

The wireless radio interface box for the crew communication system is located on the port side of the compartment, forward of the shore power circuit breaker (Figure 2-44).
B.3.b.14. 24 VDC to 12 VDC Converters

Two 24 VDC to 12 VDC converters (Figure 2-46) are located on the starboard side of the Compartment, aft of the air compressor. The converters supply power to 12 VDC electronics equipment and the 12 VDC outlets. The converters receive power from the 24P1 Vital Bus power distribution panel at the Engineer’s console.

Figure 2-46
24 VDC to 12 VDC Converters
B.3.b.15. Vector system

The Vector system control unit and backup relay box are mounted on the aft bulkhead, starboard side (Figure 2-47). They receive power from the 24 VDC distribution panel located below the control unit.

Figure 2-47
Vector System
B.3.b.16. Main engine control, Ethernet, network sounder and rollover switch

The main engine control box, Ethernet switch box, network sounder and rollover switch are located on the aft bulkhead, on centerline (Figure 2-48). The main engine control box receives power from the 24P2 Engine Bus power distribution panel at the Engineer’s console. The Ethernet switch box receives power from the 12 VDC Main Panel on the power distribution panel at the Engineer’s console. The network sounder receives power from the 24P1 Vital Bus power distribution panel at the Engineer’s console. The rollover switch receives power from the Vector 24 VDC distribution panel on the Auxiliary Machinery Compartment aft bulkhead, starboard side.

Figure 2-48
Main Engine Control, Ethernet, Network Sounder and Rollover Switch
B.4. Engine Compartment

The Engine Compartment is a watertight compartment located between the Auxiliary Machinery Compartment and the Lazarette. The Engine Compartment can be monitored remotely from the Pilothouse using a closed circuit television (CCTV) system.

B.4.a. Access

Access to the Engine Compartment is through a watertight 24 inch x 24 inch hatch on the centerline of the aft deck (Figure 2-49). This hatch is the only access and emergency escape route from the compartment.

Two large bay hatches are provided for maintenance access. Each engine bay hatch is fitted with flush, adjustable dogs to provide a watertight seal, and gas struts to assist in opening and closing the hatch. The handles to operate the hatch dogs (Figure 2-50) are stowed in a bag on the back of the Engineer’s seat. These hatches have a 3000 lb maximum uniform load limit. Water is drained away from the hatch coaming by drains that lead to the overboard discharge openings at the upper edge of the hull fendering.

The center section of the aft deck is removable.

Figure 2-49
Engine Compartment Access Hatch
B.4.b. Interior

The Engine Compartment contains the following items:

B.4.b.1. Lighting

Engine Compartment lighting is provided by white lights powered directly from the 24P1Vital Bus power distribution panel located at the Engineer’s console. There is no local light switch.
B.4.b.2. Ventilation

The Engine Compartment air intakes are located port and starboard on the aft bulkhead of the pilothouse (Figure 2-49). The Engine Compartment is vented by two 11 inch fans (Figure 2-51). The fans extract hot air and pull outside ambient air into the space. The outlet ducts are located on the outboard sides of the Lazarette scuttle. (Figure 2-49).

The fans receive power from the 24P2 Engine Bus power distribution panel on the Engineer’s console. The fan control is located on the Engineer’s console.

Figure 2-51
Engine Compartment Vent Fan
B.4.b.3. Diesel engines

Two Detroit Diesel engines, each rated 825 HP at 2300 RPM are located in the Engine Compartment. Each engine (Figure 2-52) is equipped with a reduction gear, exhaust piping, water lift muffler, fuel and water piping, filter assemblies, and an AuraGen™ Induction Power Source (IPS).

Figure 2-52
Diesel Engine
B.4.b.4. Hydraulic system

Hydraulic pumps for the water jets are located on the forward end of each engine. The hydraulic fluid tank (Figure 2-53) is located on the port side of the Engine Compartment between Frames 5 and 6.
B.4.b.5. Fuel tank

The top of the fuel tank forms the walk space between the main engines. The tank top is fitted with two bolt-on Tiona type hatch covers for access to the tank. The tank is fitted with supply and return lines, and a fuel stripping pipe. The fuel tank supply lines are fitted with emergency shut off valves. The emergency shutoff valves (Figure 2-54) are located beneath the deck plate that is between the access assist steps.

B.4.b.6. Fire protection

The Engine Compartment is protected by the FM200 fire suppression system. Smoke and heat detectors (Figure 2-51) are located in the aft bulkhead. The detectors receive power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console.

NOTE

The heat detector is activated at 190°.
B.4.b.7. Bilge pump

The bilge pump and float switch for the Engine Compartment are located on centerline just aft of the diesel engines (Figure 2-55). The bilge pump is controlled by a switch at the Engineer’s console and it receives power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console.

Figure 2-55
Bilge Pump and Float Switch

B.4.b.8. 120 VAC outlet

Duplex, 120 VAC electrical outlets are located on the forward bulkhead, on centerline (Figure 2-56). The outlets receive power from the 240 P1 AC Bus power distribution panel on the AC Power Island, located between the crew and navigator’s seats.

B.4.b.9. Closed circuit TV camera

The Engine Compartment has a closed circuit TV camera located on centerline (Figure 2-56). The Engine Compartment can be monitored at the Engineer’s console. The TV receives power from the 12 VDC Main Panel on the power distribution panel at the Engineer’s console.
B.5. Lazarette

The Lazarette is a watertight compartment located between the transom and the Engine Compartment.

**CAUTION**!

Use caution when entering or leaving the Lazarette during inclement weather. Press on the hatch locking tab and be sure it is fully seated. Avoid bumping the locking tab while entering and exiting the Lazarette.

B.5.a. Access

Access to the Lazarette is through a watertight hatch on top of the Lazarette scuttle (Figure 2-49). Entry is by way of a vertical ladder. This hatch is the only access and emergency escape route from the compartment.
B.5.b. Interior

The Lazarette contains the following items:

B.5.b.1. Lighting

The compartment has a locally switched dome light producing either red or white light. The dome light receives power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console. The combined On/Off/Dimmer switch is located on the starboard side of the ladder (Figure 2-57). Press the upper side of the rocker switch of the switch to turn on the red light. Continue to press the switch to turn on the white light and increase the light to full intensity. Press the lower side of the rocker switch to reduce the intensity of the white light. Continue to press the switch to change the white light to red and to turn the light off.

Figure 2-57
Lazarette Light Switch
B.5.b.2. Ventilation

The Lazarette is vented by two gooseneck vents with ball check valves to prevent water intrusion (Figure 2-58).
B.5.b.3. Waterjets

This compartment contains two Kamewa FF-375S water jets (Figure 2-59) with associated hydraulic valves and cylinders.

---

B.5.b.4. Sea water intake

The sea chest, sea chest vent, main engine raw water valves, de-icing valves, and HVAC raw water strainer, are located at the foot of the access ladder (Figure 2-60). The propulsion raw water duplex strainers are located outboard of the water jets (Figure 2-61).

---

Figure 2-59
Starboard Waterjet
Figure 2-60
Lazarette Fittings

Figure 2-61
Duplex Strainer
### B.5.b.5. Exhaust

The aft portion of the engine exhaust pipes run through the Lazarette and exits through the transom.

### B.5.b.6. Equipment stowage

The Lazarette is fitted with a bar for hanging stowage and a 6 FT P6 pump standpipe connection hose.

### B.5.b.7. Bilge pump

A bilge pump is located on centerline at the forward bulkhead of the Lazarette (Figure 2-55 and Figure 2-60). The bilge pump is controlled by a switch at the Engineer’s console and it receives power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console.

### B.5.b.8. Depth sounder transducer

The depth sounder transducer is located port of the centerline in the Lazarette between Frames 1 and 2.

### B.6. Pilothouse

The Pilothouse is the main control station for all RB-M maneuvering, navigation and communication systems. The Pilothouse is a watertight space with 360 degree visibility. The Pilothouse also provides support for the mast, radar, communication antennas and ancillary equipment.

#### B.6.a. Access

The Pilothouse is accessed from the aft deck through a quick acting watertight door (QAWTD) located in the aft bulkhead of the Pilothouse (Figure 2-62). The door has a latch to hold it in the open position.

Emergency escape is through a non-tight double door (Figure 2-63) leading from the pilothouse into the Survivors’ Compartment and out through the hatch in the overhead of the Survivors’ Compartment. Emergency escape may also be made through the sliding windows on either side of the Pilothouse, however the window seals must be deflated before these windows can slide open.
Figure 2-62
Aft Door

Figure 2-63
Forward Door
B.6.b. Interior

The following items are found in the interior of the Pilothouse:

B.6.b.1. Windows

The three forward facing windows are heated. Heater controls are located at the Engineer’s Console. The heaters receive power from the 240P2 AC-2 power distribution panel located on the AC Power Island, located between the crew and navigator’s seats. Each forward facing window (Figure 2-64) has wipers and washer nozzles controlled from the Coxswain’s and navigator’s consoles. Overhead windows are located directly above the Coxswain’s and navigator’s seats.

Each side has one sliding window adjacent to the Coxswain’s and navigator’s seats and two fixed windows (Figure 2-65). The sliding windows are manually opened or closed. When fully closed and locked, an air seal, pressurized from the compressed air system, seals the window to make them watertight. Each window is fitted with a manual deflator valve (Figure 2-66) to depressurize the air seal.

The side and aft windows, except for the pilothouse door, are fitted with defrosters (Figure 2-67) to help control condensation. Controls for the defrosters are located at the Engineer’s console. The defrosters receive power from the 24P3 Non-Vital Bus power distribution panel located at the Engineer’s console.

NOTE

Keep the sliding windows closed to prevent salt accumulation in the window tracks and on the deflator valve. The salt is difficult to remove from the track and causes the air bladder to stick to the window frame. The salt spray also causes corrosion of the deflator valve.
Figure 2-64
Forward Windows

Figure 2-65
Side Windows
Figure 2-66
Deflator Valve

Figure 2-67
Defroster Fan
The windshield wiper/wash control pads are located on the Coxswain’s console and navigator’s console. The wipers and washers receive power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console (Figure 2-68).

Figure 2-68
Windshield Wiper/Wash Control Panel

1) Main ON/OFF Button: Turns the system ON and OFF.
2) Power Indicator: LED will illuminate when system power is ON.
3) Speed/Intermittent Button: Reduces the speed and increases the intermittent delay of the wiper.
4) Speed/Intermittent Button: Increases the speed and decreases the intermittent delay of the wiper.
5) Speed/Intermittent LED Indicator Bar: Indicates the speed/intermittent setting.
6) Individual Wiper ON/OFF Buttons: Turns each wiper ON or OFF.
7) Individual Wiper LED Indicators: LED will illuminate when the wiper is active.
8) Wipe/Wash Button: Initiates the wipe/wash function.
9) Wipe/Wash LED Indicator: LED will illuminate when the wipe/wash program is active.
B.6.b.3. Lighting

Compartment lighting is provided by dimmable combination red and white dome lights (Figure 2-69). Lights are controlled by a toggle switch located at the Engineer’s console. The lights receive power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console.

B.6.b.4. Detectors

Smoke, heat and carbon monoxide detectors (Figure 2-69) are located in the compartment overhead. The detectors receive power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console.

NOTE

The heat detector is activated at 190°.
B.6.b.5. Seating

The Pilothouse has individual seating for four crewmembers (Figure 2-70). The seats are shock mitigating with seat belts for crew safety. The Coxswain’s and navigator’s seats are equipped with propulsion and steering controls (joystick, tiller, trim/roll joystick) for boat operations.

WARNING

Keep all seat adjustments tight. Loose adjustments can result in unexpected movement of the seat and may cause injury.

NOTE

Seat belts should be secured and pulled tight when not in use to prevent damage from swinging belt buckles.

All seats have aircraft style seat belts. The seats are also adjustable to accommodate crewmember size. The seat adjustments are:

1) Seat Arm Rest: a lock button allows seats arms to raise and lower. The arm rest lock button is located on the arm rest pivot point.

2) Seat Rotation: a swivel clamp and swivel detent handle allow the seat to rotate toward center line. When seated, the swivel clamp and detent handle are located under the left side of the seat.

3) Seat Fore-Aft: a seat side clamp handle allows the seat to move forward and backward. When seated, the seat side clamp is located under the right side of the seat.

Seat Backrest: backrest locking handles allow the back of chair to recline under tension. When seated, the backrest locking handles are located on the side of the chair under the armrest pivot points.
Figure 2-70
Crew Seats
B.6.b.6. Operating stations

There are three main operating stations in the Pilothouse (Figure 2-71). These operating stations are outfitted for control and monitoring of boat functions using seven consoles:

1) Coxswain’s console
2) Coxswain’s upper console
3) Navigator’s console
4) Navigator’s upper console
5) Center console
6) Engineer’s console
7) AC Power island

Figure 2-71
Operating Station
The Coxswain’s console (Figure 2-72) is located on the forward starboard side of the Pilothouse. The console is hinged to open aft and has two latches for access to internal components and connections. The console has monitoring, controls and mounting for the following:

1) Furuno NAVnet2 radar display and chart plotter
2) Wiper/Washer control pad
3) Searchlight control
4) Air horn push button
5) Law enforcement light control
6) Forward looking infrared (FLIR) camera control
7) Furuno RD-30 display
8) NAVPILOT-500 Auto Pilot display
9) Magnetic compass
10) Motorola XTL-5000 VHF-FM radio control head
11) Motorola XTL-5000 VHF-FM radio microphone
12) Loudhailer microphone
13) Vector portable backup console connection (on forward side of console)
B.6.b.6.b. Coxswain’s upper console

The Coxswain’s upper console (Figure 2-73) is located on the forward, starboard side of the Pilot House, in the overhead. The console is hinged to open down and has two (2) locking pins for access to internal components and connections. The console has monitoring, controls and mounting for the following:

1) Main engine start and stop pushbuttons
2) Navigation light switch
3) Furuno RD-30 display
4) LH-3000 loudhailer
5) Clutch control panel
6) External alarm relay control switch
7) Motorola XTL-5000 VHF-FM radio speaker (forward side)

Figure 2-73
Coxswain’s Upper Console
The navigator’s console (Figure 2-74) is located on the forward port side of the Pilothouse. The console is hinged to open aft and has two latches for access to internal components and connections. The console has monitoring, controls and mounting for the following:

1) Furuno NAVnet2 radar plotter master display
2) Wiper/Washer control pad
3) Searchlight selection switch
4) Searchlight control
5) Air horn push button
6) FLIR camera control
7) Secure communications handset
8) Standard Horizon VHF-FM DSC radio telephone transceiver
9) Standard Horizon VHF-FM DSC radio telephone microphone
10) Motorola XTL-5000 UHF-FM radio control head
    Motorola XTL-5000 UHF-FM radio microphone
11) HF-SSB radio microphone

NOTE

The law enforcement light control on the navigator’s console will be removed by ECP-052. Hulls 45601-45608 have this light control on the navigator’s console. Hulls 45609 and later have this control only on the Coxswain’s console.
Figure 2-74
Navigator’s Console
The navigator’s upper console (Figure 2-75) is located on the forward, port side of the Pilothouse in the overhead. The console is hinged to open down and has two locking pins for access to internal components and connections. The console has monitoring, controls and mounting for the following:

1) Floodlight control
2) HF-SSB radio control head
3) Furuno GP-37 GPS receiver
4) Automatic Direction Finder (ADF) receiver
5) Clutch control panel
6) Secure communications speaker (forward side)

Figure 2-75
Navigator’s Upper Console
B.6.b.6.e. Center console

The center console (Figure 2-76) is located in the overhead between the navigator’s upper console and Coxswain’s upper console. The console is hinged to open down and has two (2) locking latches for access to internal components and connections. The console has monitoring, controls and mounting for the following:

1) Two Detroit Diesel Engine Display Modules (EDM)
2) Vector Alarm Display Panel with Alarm Light and Buzzer
3) Motorola XTL-5000 UHF-FM speaker (forward side)
4) HF-SSB radio speaker (forward side)
5) ADF speaker (forward side)
The Engineer’s console ([Figure 2-77](#)) is located on the starboard side of the Pilothouse aft of the Coxswain’s seat. The console has three sections with panels that can be removed for access to internal components and connections.

The upper section of the console has monitoring, controls and mounting for the following:

1) Detroit Diesel Engine Display Modules
2) Diesel engine emergency stop switches
3) Fuel gauge
4) Pilothouse vent fan control switch
5) FLIR/Engine Compartment camera select switch
6) Battery control switches
7) Furuno NAVnet2 radar display and chart plotter
8) AuraGen™ ICS control panels

Lower section:
1) Pilothouse lights switch
2) Low level lights switch
3) Instrument lights switch
4) Windshield heater controls
5) Engine Compartment exhaust fan Auto/Man control switch
6) Window defroster switches
7) Bilge pump control switches and indicators
8) Hull anode corrosion meter

Inboard section ([Figure 2-78](#)):
1) VDC bus voltage meters
2) VDC power distribution panel
3) HVAC control
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**Figure 2-77**
Engineer’s Console

**Figure 2-78**
Engineer’s Console – Inboard
B.6.b.6.g. AC power island

The AC Power Island (**Figure 2-79**) is located between the navigator’s seat and the crew seat. The AC Power Island has front and rear access panels that can be removed for access to internal components and connections. Monitoring, controls and mounting are located on the inboard side for the following:

1) Ground fault detection meter and test button
2) VAC bus voltage meters
3) VAC bus transfer switches
4) VAC power distribution panels
5) VAC power outlet

**Figure 2-79**
AC Power Island
B.6.b.7. Pilothouse weapons stowage

Gun locks (Figure 2-80) are located on each side of the Pilothouse door, on top of the vent boxes, for stowage of an M16 rifle and a shotgun. The shotgun can be stowed only in the starboard gun lock.

Figure 2-80
Gun Lock
B.6.b.8. Fire extinguishers

Two 5 lb dry chemical fire extinguishers are secured in brackets. One is stowed on the bulkhead behind the crew seat (Figure 2-81). The other is stowed on the bulkhead behind the Engineer’s seat (Figure 2-84).

Figure 2-81
Fire Extinguisher
B.6.b.9. Engine compartment fire suppression controls

Pull handles for the engine fuel shutoff valves are located below the Coxswain’s seat, on the inboard side (Figure 2-82). A pilot cylinder pull handle, also below the Coxswain’s seat, will discharge nitrogen from the pilot cylinder through the tubing to the pressure switch which activates the discharge of FM 200 fire suppression agent into the Engine Compartment.

Figure 2-82
Fuel Shutoff Handles and FM 200 Pilot Valve

B.6.b.10. HVAC

The HVAC unit for the Pilothouse is located aft of the crew seat (Figure 2-83). The HVAC control for this unit is located above the electrical power distribution panels at the Engineer’s console (Figure 2-78). The HVAC unit receives power from the 240P2 AC-2 Bus on the VAC power island located between the crew and navigator’s seats.

A stand alone heater (Figure 2-84) is located on the aft bulkhead, starboard side, behind the Engineer’s seat. The heater receives power from 240P2 AC-2 Bus on the AC power island located between the crew and navigator’s seats.
Figure 2-83
HVAC Unit

Figure 2-84
Stand Alone Heater and Fire Extinguisher
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.6.b.11. 120 VAC outlets</td>
<td>A duplex, 120 VAC electrical outlet is located on the AC power island located between the crew and navigator’s seats. The outlet receives power from the 120P AC Bus 1 panel on the AC Power Island.</td>
</tr>
<tr>
<td>B.6.b.12. Crew communications ports</td>
<td>Crew communications system connection ports (Figure 2-85) are located at each crew seat.</td>
</tr>
</tbody>
</table>

![Crew Communications Port](image)

Figure 2-85
Crew Communications Port
Section C. Main Deck Equipment

C.1. Bow chock
A chock is located at the bow (Figure 2-86) for fair leading anchor or tow lines. It has a quick-acting pin to open the chock.

C.2. Anchor line bitt
The anchor line bitt (Figure 2-86) is located just aft of the opening chock. It is used to belay the anchor line, or if the RB-M is being towed.

C.3. Anchor
The anchor (Figure 2-87) is stowed in brackets on the Survivor’s Compartment top, port side.

CAUTION!
The anchor should be removed with care due to close vicinity to the window.
### C.4. Gun mounts

A tripod weapon stand (Figure 2-86) is bolted to the foredeck to support the M240B light machine gun. The towing bit at Frame 2 (Figure 2-84) provides a mounting surface for the second M240B light machine gun mount.

### C.5. Handrails/ heavy weather attachment points

Hand and grab rails are located on bow decks, cabin sides, transom platform, and afterdecks port and starboard. Heavy weather attachment points (Figure 2-86) for securing heavy weather safety belts are located on approximately three foot intervals along the hand rails.

### C.6. Mooring Bitts/Side Chocks

Four 3 ½ inch mooring bitts (Figure 2-86) are located along each side of the boat. Four closed side chocks are located between the mooring bitts.

---

**Figure 2-87**

Anchor
C.7. Tow reel/tow bitt/tow line stop

The tow line reel (Figure 2-88) is located on the starboard side of the aft deck adjacent to the Lazarette scuttle. The reel is outfitted with 600 FT of 2 ³⁄₄ inch circumference double braided nylon line.

The tow line reel handle is removable and is with the tow line reel.

A diver’s knife is fastened to the starboard life rail near the life ring (Figure 2-88).

The tow bitt is located center of the aft main deck atop the Lazarette scuttle structure. The top of the tow bitt is designed to accept a bolted gun mount.

The handrails around the aft deck are reinforced to accept loads induced by the towline. Towline stops (Figure 2-88) are provided outboard of the towing bitt to prevent the towline from moving forward of the beam.

---

**Figure 2-88**

Aft Deck
C.8. Rescue recess

The rescue recesses (Figure 2-89) located port and starboard are designed for transferring or retrieving items or persons from the water. The rescue recesses are located within sight of the boat operator.

The fiberglass side deck grating may be secured in the up position during water rescue or in the down position to provide crewmembers a safe walkway over the recess area. The grating is secured by stainless steel pins on each end in both the up and down positions.

The rescue recess has two flush mounted low-level lights (Figure 2-89). The handrail has four D-rings to clip crew safety heavy weather belts.

NOTE

The rescue recess has three open 3 inch x 5 inch de-watering ports. Crew must beware of small items that can be washed overboard through the de-watering ports.
C.9. Stern platform

A secondary recovery position is provided by the stern platform (Figure 2-90) located above the water jet buckets. Access to the stern platform from the aft deck is through an opening in the handrail with steps on the starboard side. The stern platform has safety harness attachment points in a handrail at the bottom of the Lazarette access, and flush low level lights to illuminate the platform.

The platform has two hatch covers (Figure 2-90) that allow access and inspection of the water jet bucket and steering nozzle assembly as well as the grease fitting on top of the waterjet.

NOTE

Prior to departing the aft deck to the stern platform, the crewmember shall inform the Coxswain. Crewmembers working from the stern platform in the kneeling position can not be seen by the Coxswain. The crew communication system should be used in this situation.

Figure 2-90
Stern Platform
C.10. Fueling station

A fueling station (Figure 2-91) is located on the starboard side of the Pilothouse. The fuel fills and vent piping are sized and located such that water contamination during fueling is avoided, and spills are contained. The fueling station has a pocket with a drain plug to collect spilled fuel.

Figure 2-91
Fueling Station
C.11. Shore power connection

The shore power connection is located in the port rescue recess (Figure 2-92). The shore tie connection is rated for 100 amps at 120 VAC.

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C.12. Boat hooks

One 8 FT telescoping boat hook (Figure 2-89) is stowed in brackets on each side of the cabin. One of the boat hooks is fitted with a skiff hook attachment.
C.13. **P-6 pump**  
A USCG-P6 salvage pump (Figure 2-93) used for de-watering and firefighting is located on the port side of the Lazarette scuttle. When the pump is operational, it is secured to the deck using D-rings located next to the pump stowage ring. The suction for the pump (Figure 2-93) are located on the port side of the Lazarette scuttle. Two separate suction connections allow either de-watering of the Engine Compartment or taking suction from the sea chest for fire fighting.

![P-6 Pump and Suction Connections](image)

**Figure 2-93**  
P-6 Pump and Suction Connections

C.14. **Low level lighting**  
The deck lights for the RB-M are controlled from the Engineer’s console. 10-LED low intensity lights illuminate the port and starboard aft steps, aft port and starboard Pilot House, port and starboard Lazarette, and the port and starboard sides of the transom (Figure 2-90).

C.15. **Life rings**  
The life rings, marker distress lights, and throw bags (Figure 2-88) are located on the aft deck, mounted on the outward side of the handrails, port and starboard sides.
Section D. Pilothouse Top

Introduction
The Pilothouse top provides access to communication antennas, navigation lights, and other equipment. The air horn is mounted on the forward section of the top to port of the centerline. There are two non-opening windows located directly above the navigator and helm position for better visibility during turns, coming alongside larger ships, and for helicopter operations.

CAUTION!
Do not step on the Survivors’ Compartment escape hatch or the pilothouse top windows when accessing the pilothouse top.

D.1. Access
Access to the Pilothouse top is made from the top of the Survivors’ Compartment. Handrails and non-skid pads are located on the top for assisting personnel to gain access.

D.2. Lighting
The Pilothouse top has four fixed floodlights (Figure 2-94). One is centered forward, one is centered aft, and two are on the port and starboard sides, aft.

The navigation lights (Figure 2-94) are located forward of the windows.

Twin, blue, law enforcement lights (Figure 2-94) are located on the electronics pod.

D.3. Electronics Pod
The center, aft section of the Pilothouse top has an aluminum electronics pod (Figure 2-94) that holds the Furuno open array radar scanner, mast mount supports, loudhailer speaker, and the electrical junction box. The pod is bolted to the top of the Pilothouse so it can be removed for transport. The pod has two quick-acting inspection hatches to allow access to mounting hardware.

D.4. Air Horn
The air horn is located on the forward, port corner of the Pilothouse top.
Figure 2-94
Pilothouse Top
Section E. Masts

Introduction

The RB-M is equipped with a mast that can be lowered for navigation under low structures and can be removed for transporting the boat on a truck.

E.1. Mast Equipment

The following equipment is mounted on the mast (Figure 2-95):

1) ADF antenna
2) GPS/DGPS antenna
3) GPS antenna for AIS
4) anchor light, mast light and towing lights
5) remote control searchlight
6) remote control infrared camera

The mast junction box assembly is attached to the side of the mast mounting base.

Figure 2-95
Mast
E.2. Lowering the Mast

Lowering of the mast may be accomplished by one or more persons. The locking handle (Figure 2-96) located at the bottom of the mast and is secured with locking pin. After removing the locking pin, the locking handle is moved to free the mast. The installed gas strut will keep the mast temporarily in the upright position. The mast should then be lowered using the boat hook, with the installed gas strut as an assist. After the mast is horizontal, it should be secured with a light lanyard.

Figure 2-96
Mast Locking Handle
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Chapter 3
Boat Systems

Introduction
This chapter discusses the boat’s mechanical, electrical, and manual operating systems. It describes basic characteristics and provides information to allow the boat’s crew to operate effectively.

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Section A. Propulsion System

Introduction

The RB-M propulsion system (Figure 3-1) consists of the following systems:

1) Twin Detroit Diesel Series 60 engines with DDEC IV
2) Twin Disc MG5114SC reduction gears
3) Drive shaft
4) Twin Kamewa FF3755 waterjets
5) Vector propulsion control system

Each system and the Engine Compartment monitoring camera is described in this section.

Figure 3-1
Propulsion System
A.1. Engine

The RB-M is powered by twin Detroit Diesel Series 60 engines. The Series 60 engines are six cylinder, four stroke, and high speed diesels. The engine rating is 825 HP at 2300 RPM.

A.2. Engine control system

Each engine is fitted with Detroit Diesel Electronic Control (DDEC) (Figure 3-2). The DDEC monitors the engine systems and regulates fuel injection. The system automatically performs engine protection and self-diagnostic functions to identify malfunctions in engine components and provides data to the Engineer to aid in troubleshooting engine problems (Figure 3-3).

Figure 3-2

DDEC
Figure 3-3
Engine Monitoring Schematic
A.2.a. Engine display

Engine display modules (EDM) are located at the center console and the Engineer’s console (Figure 3-4).

A.2.b. Alarms

The engine’s computer monitors engine operating parameters. Acceptable values of some parameters, such as oil pressure vary with engine RPM. Any faults that occur are stored as codes in the engine control module’s (ECM) memory. The ECM sends an alarm signal to the EDM and display panel in the Pilothouse. The check engine light (CEL) indicates an engine condition that requires action as soon as it is convenient. The stop engine light (SEL) indicates a major fault has occurred and immediate action is required to avoid engine damage.
A.2.c. Engine starting

Engine starting is provided by an electric starting motor (Error! Reference source not found.) powered by the starting battery. An engine-driven charging generator (AuraGen™) and a battery charger maintain battery charge.

A.2.d. Engine emergency stop switches

Engine emergency stop switches are located in the Engine Compartment over the mufflers (Figure 3-6), and at the Engineer’s console (Figure 3-7). The engines can also be shutdown in an emergency, by pulling the emergency fuel shutoff handles located on the inboard side of the Coxswain’s seat (Figure 3-8).

Engine stop switches are located at the Coxswain’s upper console, below the navigation light switch (Figure 3-9).

The switches are wired to only shutdown the engine (port or starboard) associated with that switch.
Figure 3-6
Engine Emergency Stop Switches in Engine Compartment

Figure 3-7
Engine Emergency Stop Switches at Engineer’s Console
Figure 3-8
Engine Emergency Fuel Shutoff Pull Handles

Figure 3-9
Engine Stop Switches on Coxswain’s Upper Console
A.3. Marine gears

The marine gears are Twin Disc model MG5114SC (Figure 3-10). The gears may be placed in engaged (ENGAGE), disengaged (DISENG) or backflush (BACKFL) modes. The engaged position is the normal operating position and water will discharge from the water jet steering nozzle. The disengaged position disconnects the water jet from the engine and there is no discharge. The backflush position reverses the rotation of the pump impeller and water will discharge from the water jet intake. The backflush mode is only used when back-flushing the water jet propulsion unit. The gear oil pressure and temperature is monitored by the DDEC system. The gears are equipped with a Fast Lube Oil Change System (FLOCS) oil change port located on the inboard side of the engines, below the engine oil dipstick (Figure 3-11).
A.3.a. Reduction ratio

The reduction ratio is 1.02:1 in forward and reverse.

A.3.b. Control valves

Electronically-actuated control valves (Figure 3-12) are mounted on the marine gear. The clutch control panel sends signals to these valves to control gear function.
A.3.c. Gear lubricating oil

The gear uses approximately 2.8 gallons of 15W40 lubricating oil for clutch pressure and lubrication. The oil flows through an oil strainer mounted on the marine gear. Gear oil level is checked using a dipstick (Figure 3-10).

NOTE

Gear oil level must be checked with the engine at operating temperature and at idle speed.

CAUTION!

When the RB-M is under tow with an engine secured, water flowing through the waterjet may cause the propulsion shaft to rotate. Gear oil temperature must be maintained below 100º C (212º F) by idling the engine with the gear disengaged or by reducing the towing speed.

A.3.d. Temperature

A temperature regulating valve and gear oil cooler maintain oil temperatures between 54.4º C (130º F) to 85º C (185º F).
A.3.e. Cooler

The marine gear oil cooler is supplied with raw water from the engine raw water system to cool the gear oil. A cooler is mounted on the starboard side of each engine.

A.3.f. Clutch operation

All normal shifts to and from engaged (ENGAGE), disengaged (DISENG) or backflush (BACKFL) modes should be made at a maximum of 650 RPM ± 10.

NOTE

Only the active station that has helm control can disengage at any speed in any emergency.

A.3.g. Clutch pressure

Normal oil pressure with the clutch engaged is 185 to 250 PSI. When the clutch is disengaged the pressure is in the 15 to 45 PSI range. If power to the clutch engage panel (VP-3) is lost, the reduction gears will disengage. The gears are fitted with two manually operated solenoids (Figure 3-13) that can be used to engage the reduction gear in either normal or backflush modes. To operate the solenoids remove the cap, press down and turn the knurled knob counter-clockwise and let it pop up. Then manually push the knob back down until the RG engages.

A.4. Drive shafts

A Cardan shaft (Figure 3-14) couples each engine and its marine gear to the waterjet. U-joints at each end of the Cardan shaft accept any misalignment. The u-joints are fitted with grease fittings.
Figure 3-13
Solenoid Valve with Cover Removed

Figure 3-14
Cardan Shaft
The CCTV System allows for remote monitoring of the Engine Compartment during missions. The CCTV System consists of:

a) Engine Compartment Camera
b) Video Select Switch

A.5.a. Engine compartment camera

The Engine Compartment camera is located at the forward bulkhead, on centerline (Figure 3-15). The camera has a 68° viewing field that provides a color picture on the Engineer’s console chart plotter display and is only viewable from the Engineer console. The camera is mounted in an unbreakable enclosure.

The Engine Compartment camera receives power from the 12P1 12 VDC Main Panel on the power distribution panel located at the Engineer’s console.

A.5.b. Video select switch

The video select switch is located on the Engineer’s console. The switch provides for selection of video feed from either the Engine Compartment camera or the FLIR for viewing on the Engineer’s console chart plotter display.

Figure 3-15
CCTV
A.6. Waterjets  

Thrust is provided by two Kamewa Rolls Royce FF-325S waterjets (Figure 3-16). The jet drive allows the boat to have the minimum possible draft. This enables operation in shallow waters and in water with floating debris that might foul or damage a typical propeller driven boat. It also provides an increased safety margin for persons in the water near the boat.

A.6.a. Waterjet bearing housing  

The waterjet is connected to the Cardan shaft at a gearbox located at the aft Engine Compartment bulkhead (Figure 3-17). The gearbox uses the same oil as is used in the diesel engines. The oil level must be maintained between the maximum and minimum markings on the gearbox dipstick.

NOTE  

The waterjet will draw sand, mud and other debris from the sea bottom in water depths as much as 5 FT deep. Debris drawn through the waterjet will cause deterioration resulting in degraded performance. Operation in shallow water should be avoided unless necessary to accomplish the mission.
A.6.b. Waterjet pump

Water is drawn into the waterjet through an intake grate, which is mounted flush with the hull bottom. The waterjet pump consists of an impeller and a stator, which increase the pressure of the intake flow. Water is then discharged at high velocity by the steering nozzle. The reaction to this high velocity jet stream provides thrust to propel the boat. The steering nozzle position is controlled by the tiller at the navigator’s and Coxswain’s seats.

CAUTION!

The power of the water expelled by the waterjet, can cause injury even when maneuvering at low speeds. The suction in the inlet duct presents a risk to people and objects in the water under the boat and close to the inlet opening. There is a danger that these may be adhered to the inlet duct. It is the responsibility of the Coxswain to ensure that the area around the inlet opening is clear of people or objects.

A.6.c. Waterjet backflushing

Waterjet suction may cause debris, such as seaweed or a plastic bag to block the inlet of one or both waterjets. The clutch control panel, located on both helm consoles, allows running the waterjet in backflush mode to flush debris clear of the inlet. This procedure is detailed in Section E, Hydraulic Steering System, in this chapter.
A.6.d. Waterjet nozzles

The steering nozzle is mounted inside the steering housing on vertical pivot pins and is rotated to port or starboard by linkages attached to a steering cylinder (Figure 3-18). The hydraulic steering cylinder is connected to the port waterjet nozzle tiller. A tie rod connects the port waterjet nozzle tiller to the starboard waterjet nozzle tiller so that the steering nozzles move in tandem.

![Figure 3-18 Waterjet Steering Cylinder and Tie Rod](image)

A.6.e. Waterjet reversing bucket

An independent, hydraulically actuated, split-duct, reverse bucket directs the jet stream back underneath the hull to provide powerful stern thrust. The bucket may be set to a zero thrust position where the ahead and astern thrusts are balanced. Full steering is still available with the reverse bucket set in the zero thrust position. Infinitely variable forward and reverse thrust is obtained by varying the position of the bucket.

**NOTE**

Before shutting down the engines, place the gears in DISENGAGE mode and move the joystick to the ahead position. This will raise the reversing bucket and move the hydraulic cylinder rod inside the cylinder to protect it from corrosion.
A.6.f. Waterjet cleanout port

Each waterjet has an inspection port with a removable cover providing access to the waterjet impeller for removal of an obstruction. A black, cylindrical extension is mounted on the cover to prevent water from entering and flooding the Lazarette when the cover is removed (Figure 3-19). The following tools are required: ¾ dr 10mm hex head socket, ¾ dr 12 inch long extension, and ¾ dr ratchet.

Figure 3-19
Waterjet Inspection Port
Section B. Propulsion Cooling Water System

Introduction

There are two separate raw water systems on the RB-M. The primary system provides cooling for various elements of the propulsion system. The primary raw water system removes heat from engine coolant, engine fuel, engine combustion air, and marine gear oil to maintain proper operating temperatures and provides cooling and quieting for engine exhaust. The second raw water system serves the boat’s air conditioning system; this system is discussed in Section F, Heating Ventilation and Air Conditioning System of this chapter.

B.1. Engine raw water system flow

Each main engine has an independent sea water suction line. Both seawater suctions are piped from the sea chest in the Lazarette, through a shutoff valve. Seawater for each engine then passes through a duplex strainer.

The seawater pumps and heat exchangers are mounted on the engines. The seawater picks up the engine heat from the fresh water circulation inside the heat exchangers. Heated seawater is discharged into the engine exhaust system, where it is used to cool the exhaust and then ejected overboard through the muffler and exhaust piping. A section of this piping is fitted with a control valve and piping to divert some of the hot water back to the sea chest for operations in slush ice.

B.2. Intake valves

The seachest and intake valves are located in the Lazarette (Figure 3-20), at the base of the access ladder.
Figure 3-20
Intake Valves

Figure 3-21
Jacket Water System
CAUTION!

B.3. Raw water strainer

Raw water flows from the intake valve through a duplex strainer (Figure 3-22). There is a separate intake duplex strainer for each engine. The strainers are valved to allow the complete shutoff and clean-out of one strainer element without disruption of engine operation. The strainer element can be removed and cleaned by removing the strainer cover. The handle on top of the strainer points to the strainer that is in use. When the handle is centered, neither strainer receives water flow nor is there water flow to the engine.

During shallow water operations, the debris stirred up by the waterjet inlet suction will increase the likelihood of debris build-up in the strainer. Be alert to the possibility of low raw water flow and the need to switch strainer elements quickly to maintain engine operation.

Raw water strainers must be cleaned of debris after every engine operation, including daily checks at the pier.
B.4. Recirculating valves

Recirculating valves are located below the grating at the foot of the Lazarette access ladder (Figure 3-23). These valves allow heated engine cooling water to flow to the seachest to minimize water flow restriction when operating in slush ice.

Figure 3-23
Recirculating Valves Below the Grating
Section C. Engine Systems

Introduction

This section describes the engine cooling, lubrication and combustion air systems (Figure 3-24).

C.1. Engine coolant system

The engine cooling system is a closed loop system that absorbs heat from the engine and its components and releases that heat to the raw water cooling system in a heat exchanger. The recommended coolant is DDC POWER COOL Plus Marine (50/50) mix power cool off-highway pre-blend. The commercial equivalent coolant is Fully Formulated TMC RP-329 Type A Antifreeze & water.
C.2. Coolant flow

Coolant is circulated through the engine by a centrifugal-type water pump. The jacket water cooling system, including the heat exchanger, is a closed system. Heat is removed from the coolant by the heat exchanger. Control of the engine temperature is accomplished by thermostats that regulate the flow of the coolant within the cooling system (Figure 3-21).

C.3. Coolant expansion tank

Coolant level should be maintained at the neck of the heat exchanger filler cap on the forward end of the engine (Figure 3-25). A coolant expansion tank for each engine is located outboard of the engine (Figure 3-26). The expansion tank is equipped with a sight glass.

C.4. Engine coolant heaters

An electric heater is provided in the engine cooling system (Figure 3-21) for each engine. When connected to shore power, the engine jacket water is heated to provide rapid starting and engine warm up. The jacket water heating system is powered by the 240/120 VAC shore power panel only and is thermostatically controlled to provide a minimum of 120 Degree F jacket water.

Figure 3-25
Heat Exchanger Filler Cap
C.5. Engine lubrication system

The Series 60 engine uses API Service Category CI-4 15W40 oil. Full pressure lubrication is supplied to all main, connecting, camshaft and rocker assembly bearings and to other moving parts. A gear-type pump draws oil from the oil pan through a screen and delivers it to the oil filter. From the filter, a small portion of the oil is delivered directly to the turbocharger by an external oil line. The remainder of the oil flows to the oil cooler, or bypasses the cooler, and then enters a longitudinal oil gallery in the cylinder block where the supply divides. Part of the oil goes to the cylinder head where it feeds the camshaft bearings and rocker assemblies. The remainder of the oil goes to the main bearings and connecting rod bearings via the drilled oil passages in the crankshaft. Drilled passages in the connecting rod feed oil to the piston pin and the inner surface of the piston crown.

The oil pan capacity of the engine is:
32 quarts to the LOW mark, without oil filters
38 quarts to the FULL mark, without oil filters

The total oil capacity of the engine with oil filters installed and the oil galleries charged is 43 quarts.
C.6. Oil fill

The oil fill cap is located on the inboard side of the engine (Figure 3-11).

C.7. Oil dipstick

The oil dipstick is located inside the oil filler tube. Oil level should be checked with the engine stopped. If the engine has just been stopped and is warm, wait approximately 20 minutes to allow the oil to drain back into the oil pan before checking.

C.8. Oil filter

Each engine has one oil filter located on the aft end of the engine (Figure 3-27).

C.9. Fast Lube Oil Change System (FLOCS)

The FLOCS drains oil from the engines, marine gears and hydraulic oil tank. Oil is drained at the FLOCS port located on the inboard side of the engines (Figure 3-11). A station-provided waste oil container and pump must be connected to the fitting to collect the oil.
C.10. Lube oil sample valve  
Each engine is equipped with an lube oil sample valve located at the inlet to the oil filter (Figure 3-27).

C.11. Engine combustion air system  
Air required by the diesel engines is drawn from the Engine Compartment. It passes through an air filter before entering the turbochargers (Figure 3-28).

![Diagram of air components](image)

**Figure 3-28**  
Engine Air Components

C.12. Air intakes and exhausts  
Air enters the Engine Compartment through two air intake demisters located on the aft end of the Pilothouse (Figure 3-29). These feed through “Y” shaped intake ducts to the centerline of the forward end of the engine room. The ducts terminate at the fire stop damper, which is normally open, but closes in an emergency to allow the fire suppression system to work properly. Just below the fire stop damper is a diverter that ensures proper air flow to the engines. Air is exhausted through vents located in the Lazarette scuttle (Figure 3-30). The air system components are described in detail in Section F, Heating, Ventilation and Air Conditioning of this chapter.
Figure 3-29
Engine Compartment Air Intake Demisters

Figure 3-30
Lazarette Air Exhaust Vents
C.13. Turbocharger

A turbocharger is an air pump driven by the engine’s exhaust gases. The engine air intake system uses one turbocharger to provide the required amount of air for engine operation.

C.14. Air filter

The turbocharger and the engine are susceptible to damage from debris in the air drawn into the engine. An air filter (Figure 3-31) protects the engine. Over time debris trapped in the filter will restrict the air flow into the engine. A gauge (Figure 3-32) attached to the filter provides warning that the filter is restricting air flow.

The filter must be cleaned or replaced when the clear window in the gauge turns red.

NOTE

The air filter gauge may show a blockage when the engine is stopped. Press the button on the top of the gauge to reset it.
C.15. Engine exhaust system

The engine exhaust is seawater cooled, and hot sections are covered with removable insulation blankets. Seawater flows from the seawater cooling circuit into the engine exhaust system, where it is used to cool the exhaust, then discharged overboard with the exhaust gases. A stainless steel exhaust cooling water spray ring injects the cooling water. The exhaust system is designed to continue functioning during a knockdown or rollover.

The exhaust system also contains a high temperature alarm.

C.16. Mufflers

Each engine exhaust uses a wet lift muffler made of fiberglass reinforced plastic (FRP). The mufflers each have drain plugs for draining the mufflers and to prevent trapping water that could freeze during storage.

NOTE

The mufflers normally contain water and should be drained, using the drain plugs, before the boat is removed from the water to prevent freezing.
Section D. Fuel Oil System

Introduction
The fuel supply system provides fuel to the propulsion diesel engines (Figure 3-33). The system consists of the following:

1) Fuel tank
2) Suction valves with remote pull cables
3) Duplex fuel filter/separator
4) Secondary filter
5) Fuel return line check valve (at engine)
6) Fuel tank fill
7) Fuel tank vent
8) Fuel cooler
9) Fuel tank gauge and sending unit
10) Stripping line w/FLOCS
11) Restrictive orifice and fuel pump
D.1. Fuel tank

The fuel tank is located between Frames 3.5 and 10, along the centerline of the boat. The tank sides are approximately 17 inches off centerline at the inboard engine girders. The fuel tank is an integral component of the hull and the top forms the platform between the engines.

The fuel tank holds 510 gallons at 100% full, with 485 gallons at 95% of fuel. The fuel tank is fitted with a sending unit for displaying the fuel level at the Engineer’s console.

The two suction pipes terminate one half inch from the bottom of the tank. Baffles within the tank mitigate the free surface movement of fuel.

---

**CAUTION!**

Acceptable fuel types for the RB-M engines are Diesel 1-D, 2-D (ASTM D 975-09 Compliant). JP5 fuel is not authorized for use in the RB-M engines. Failure to adhere to this caution can result in equipment damage.

D.2. Fuel tank fittings

The fuel tank fittings are:

1) Fuel tank level sending unit
2) Fuel return lines
3) Fuel stripping line
4) Fuel pickup tubes and emergency shutoff valves
5) Access hatches in the Auxiliary Machinery Compartment (AMC) and the Engine Compartment
6) Fuel vent and fill hose fittings

D.2.a. Tank level sending unit

The tank level sending unit (Figure 3-34) is located at the forward bulkhead of the Engine Compartment to port of the centerline.

D.2.b. Fuel return lines

The fuel return lines (Figure 3-34) enter the tank at the forward bulkhead of the Engine Compartment, forward of the tank level sending unit.

D.2.c. Fuel stripping line

The fuel stripping line (Figure 3-35) is located at the forward bulkhead of the Engine Compartment on the centerline. The stripping line has a FLOCS type connection with a protective cap.
Figure 3-34
Tank Level Sending Unit and Fuel Return Connection

Figure 3-35
Stripping Hose Connection and Tank Hatch Covers
D.2.d. Fuel pickup and emergency shutoff valves

The fuel pickup tubes and emergency fuel shutoff valves (Figure 3-36) are located beneath the deck grating between the access assist steps.

D.2.e. Tank access hatches

Tank access hatches are located in the Engine Compartment and in the Auxiliary Machinery Compartment (Figure 3-35).
D.2.f. Fuel fill and vent fittings

The fuel fill and vent fittings (Figure 3-37) enter the tank in the Auxiliary Machinery Compartment, on the starboard side, just aft of the battery case. The vent is connected to the tank access hatch coaming.

Figure 3-37
Fuel Fill and Vent Connections
D.3. Emergency fuel shutoff valve pull handles

Emergency fuel shut-off valve (Figure 3-38) pull handles are located in the Pilothouse behind the Coxswain’s seat.

![Emergency Fuel Shutoff Valve Pull Handles](image)

**Figure 3-38**
Emergency Fuel Shutoff Valve Pull Handles

D.4. Fuel tank fill, vent, and sounding rod

The fuel tank fill pipe (Figure 3-39) is located on the starboard side of the Pilothouse.

The fuel tank fill pipe has a cam lock cap with a lanyard to prevent water intrusion into the fuel tank. The fuel cofferdam is designed to limit water intrusion during fueling and is fitted with a drain plug to contain small fuel spills. The fuel tank vent is located within the fuel cofferdam. The vent is fitted with an inverted ball check valve that prevents entry of water into the fuel tank in the event of a boat knockdown or rollover.

**NOTE**
Make sure the drain plug is installed prior to fueling.

The sounding rod (Figure 3-40) is located in the fuel tank fill pipe. The sounding rod is calibrated and marked with a divot every 25 gallons and a hash mark every hundred gallons. The upper end on the sounding rod is stamped “485 gallons 95%.”
Figure 3-39
Fuel Fill, Vent and Cofferdam

Figure 3-40
Sounding Rod
D.5. Primary fuel filters

Fuel for each engine flows through SEPAR 30 micron duplex fuel filter/water separators (Figure 3-41) located on centerline, aft of the engines. A selector valve is located between the filter elements. Rotating the valve isolates one of the filter elements so that it can be changed without interrupting engine operation. The filter in use is the one on the same side as the handle. A clear bowl and drain cock is located at the bottom of each element for inspection and removal of water and sediment. A fuel pressure differential gauge on the filter assembly indicates the amount of debris collected by the filter element. Change the filter when the gauge needle reads 15 inches Hg.

Figure 3-41
SEPAR Duplex Fuel Filter/Water Separator
D.6. Engine mounted fuel filter

Fuel flows from the primary fuel filter through the fuel pump to a second, 10 micron, engine-mounted fuel filter (Figure 3-42), located on the aft end of the engine.

---

D.7. Fuel priming pump

Fuel priming is accomplished by manually pumping the priming pump handle at the secondary fuel filter. Priming is not normally required if the filter elements are filled with clean fuel when installed and the engine manifolds are not drained of fuel.

---

Figure 3-42
Engine Fuel Filter
D.8. Fuel oil flow

Fuel oil circulates through the system as follows (Figure 3-43):

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fuel is drawn through the suction lines, through the fuel shut off valves. These valves can be operated locally or by a remote pull cable located in the pilothouse at the Coxswains seat.</td>
</tr>
<tr>
<td>2</td>
<td>Fuel flows through the duplex fuel filters. Fuel exits the duplex fuel filter/separator through a long life 30 micron filter element.</td>
</tr>
<tr>
<td>3</td>
<td>Fuels travels to the engine fuel pump. The fuel pump is engine-driven.</td>
</tr>
<tr>
<td>4</td>
<td>Fuel flows to the secondary 10 micron fuel filter.</td>
</tr>
<tr>
<td>5</td>
<td>Fuel flows through a shut-off valve and then to the fuel injection system in each cylinder head. As fuel travels through the cylinder heads, it is used for injection. Fuel not used for combustion cools the cylinder heads and cleans and lubricates the fuel injectors.</td>
</tr>
<tr>
<td>6</td>
<td>Fuel flows out the cylinder head through a restrictor fitting. The restrictor fitting provides a small back pressure to maintain system pressure.</td>
</tr>
<tr>
<td>7</td>
<td>Fuel flows through a fuel oil cooler to prevent a loss of power due to the heat build up in the fuel.</td>
</tr>
<tr>
<td>8</td>
<td>Fuel returns to the tank through a check valve located on the engine.</td>
</tr>
</tbody>
</table>
Figure 3-43
Fuel Oil Flow
(numbers coincide with step above)
Section E. Hydraulic Steering and Trim System

Introduction

The RB-M has a joystick and tiller controlled thrust vectoring system for maneuvering. Joystick and tiller controls are mounted on the armrests of the forward seats in the Pilothouse (Figure 3-44). The joystick is mounted on the right hand armrest and the tiller is mounted on the left hand armrest. Joystick/tiller movements operate hydraulic solenoid control valves which actuate the waterjet nozzle steering cylinder for port/starboard movement, or the waterjet bucket control actuators for fore/aft movement. A second, small joystick is located on the left armrest to raise and lower the interceptors that provide trim control.

Figure 3-44
Tiller and Joysticks
The steering system (Figure 3-45) consists of the following components:

1) Hydraulic fluid reservoir
2) Hydraulic pumps driven by the main engine power takeoff
3) Hydraulic fluid filters
4) Hydraulic control valves which regulate the flow of hydraulic fluid to the waterjet steering and bucket hydraulic cylinders
5) Hydraulic steering cylinder and tie rod
6) Hydraulic waterjet reversing bucket actuator cylinders
7) Hydraulic safety relief valve
8) A waterjet mounted hydraulic fluid cooler
9) A master control unit that translates movement of the joystick, tiller and clutch switches into control signals for the hydraulic control valves
10) A joystick and tiller at each helm position
11) An engine clutch and reversing switch panel
12) A Vector alarm and display panel that displays the position of the buckets and steering nozzles
Figure 3-45
Steering and Trim System Schematic
E.2. Hydraulic system

The steering nozzles, reversing buckets and interceptors tabs are actuated by hydraulic cylinders. (Figure 3-46). The hydraulic pressure is supplied by two hydraulic pumps (Figure 3-47) located on the main diesel engines. The hydraulic pumps operate when the engines are running. Hydraulic fluid is cooled by oil coolers located on top of the waterjet inlet ducts in the Engine Compartment.

Figure 3-46
Hydraulic System Components
WARNING

The water jet unit hydraulic system operates under extremely high pressure. This pressure may be high even when the engine is not operating. Always take great care when opening connections. Carelessness can result in injury. In addition, the oil may be hot and cause scalding.

CAUTION!

Make every effort to prevent any contamination of the hydraulic fluid. Wipe the tank cap and surrounding surface before removing the cap. Keep the cap dry and protected from dirt while it is removed. Protect the tank opening so that dirt or water does not enter the tank. Use only fresh, clean hydraulic fluid when replenishing the tank.
E.2.a. Hydraulic fluid tank

The hydraulic tank (Figure 3-48) is located in the Engine Compartment on the port side. The hydraulic tank holds nine gallons of hydraulic fluid and has a built in FLOC fitting system for changing fluid. A hydraulic fluid filter is located aft of the tank.

Figure 3-48
Hydraulic Tank

E.2.b. Control valves

Joystick and tiller movements generate electronic signals to solenoid operated hydraulic valves on the port and starboard hydraulic manifolds in the Lazarette. The port manifold (Figure 3-49) has control valves for the steering cylinder, port waterjet reversing bucket and interceptor. The starboard manifold (Figure 3-50) has control valves for the starboard waterjet reversing bucket and interceptor. The solenoids are active when the Kamewa Control system is energized. In the event of an electrical failure, the valves can be operated manually by pushing in or pulling out the round valve stem handle.
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Figure 3-49
Port Hydraulic Valve Manifold

Figure 3-50
Starboard Hydraulic Valve Manifold
E.2.c. Hydraulic cylinders

The steering cylinder (Figure 3-51) is located above the port waterjet. A tie rod connects the tillers on the port and starboard waterjet steering nozzles.

Each waterjet has a hydraulic cylinder that controls the position of the reversing bucket (Figure 3-52).

Each interceptor is controlled by a hydraulic cylinder (Figure 3-53).

Figure 3-51
Steering Hydraulic Cylinder
Figure 3-52
Reversing Bucket Hydraulic Cylinder

Figure 3-53
Interceptor Hydraulic Cylinder
### E.3. Steering nozzle

Turning the boat is controlled by the steering nozzle. Moving the tiller to port or starboard moves the steering nozzles to port or starboard and causes the boat to turn in that direction.

### E.4. Reversing bucket

The ahead/astern movement of the boat is controlled with the reversing bucket. The reversing bucket is infinitely variable between three main positions:

1) **Full ahead position.** When driving full ahead the reversing bucket is in its upper position, i.e. completely raised. The jet of water is unaffected by the reversing bucket and the maximum ahead thrust is obtained.

2) **Zero thrust position.** At the zero thrust position the boat is neither moving ahead nor astern. Zero thrust is obtained when the reversing bucket is lowered about 70%. Do not confuse zero thrust position with DISENG position on the clutch panel.

3) **Full astern position.** At full astern position the reversing bucket fully deflects the jet of water in a forward/downward direction.

The reversing bucket has two water discharging ports. When the reverse bucket is in the down position and the tiller is centered, water flows through both ports and the boat moves astern. When the Docking/Transit switch is in the Docking mode, moving the joystick port or starboard directs the force of the thrust to one side of the bucket. This causes the boat to move sideways.
E.5. Vector control system

The Vector thrust vectoring system integrates control of water jet steering and reversing functions and engine speed in such a way that boat fore and aft movement and rotation are achieved by moving the joystick in the desired direction and moving the tiller to steer the boat.

The system controls the steering nozzle angle and the reversing bucket position of the water jet, along with RPM of the engines.

E.5.a. Control system components

The control system consists of the following components:

1) Control unit
2) Joystick (2)
3) Tiller (2)
4) Trim/roll joystick (2)
5) Display panel
6) Transducers (5)
7) Portable backup console

The Vector thrust vectoring system receives power from the 24P2 Engine Bus on the power distribution panel located at the Engineer’s console.

E.5.b. Control unit

The control unit (Figure 3-54) is a sealed enclosure that contains the electronics and software required for positioning the steering nozzles and reversing buckets and interceptors as well as controlling engine RPM. The control unit is located on the aft bulkhead, starboard side of the Auxiliary Machinery Compartment.
E.5.c. Joysticks, tillers, and trim/roll joysticks

The joystick, tiller, and trim/roll joystick controls are located on the hand rests of the Coxswain’s and navigator’s seats in the Pilothouse.

1) The joysticks (Figure 3-55) are located on the right hand rest of the seats and control the waterjet reversing buckets and engine speed for ahead and astern thrust.

2) The tillers (Figure 3-56) are located on the left hand rest of the seats and control the water jet steering nozzles.

3) The interceptor joysticks for trim and heel control are located on the left hand rest of the seats and control the interceptor trim tabs to maintain boat performance in turns.
Figure 3-55
Joystick
E.5.c.1. Control functions

Each joystick and tiller has identical functions, but only one joystick and tiller combination at one helm position can be in use at a time. Control cannot be split between a joystick at one helm position and tiller at the other helm position.

Each tiller has identical functions and controls boat heading through port and starboard movement of the waterjet nozzles. When an operator takes joystick control, that operator’s tiller also becomes operational.
E.5.c.2. Transferring control

Depressing the pushbutton on the joystick panel twice (Figure 3-55) gives that joystick control. Both joysticks must be in approximately the same fore and aft position and both tillers must be in approximately the same port and starboard position before control can be transferred from one joystick to the other. The following procedure should be carried out when transferring station control:

1) Place the joystick levers at both stations in their center detent positions.
2) Quickly press the activation push button twice at the station taking control.
3) Move the steering tiller through its range of operation to match the tiller positions of the two stations. If the positions of the two stations are not matched within 10 seconds, the operation is canceled.

Once the steering helms are aligned within 10% of each other, transfer will take place immediately, and the button LED will provide the appropriate status:

1) Not Illuminated - Station not in control
2) Flashing - Control transfer pending joystick and tiller position matching
3) Illuminated steady - Station in control

E.5.c.3. Transit mode

A lever switch on the joystick panel (Figure 3-55) allows operation in TRANSIT or DOCKING mode. The joystick must be in the center (detent) position before switching modes. The center position places the buckets in a zero thrust position.

In TRANSIT mode, moving the joystick forward raises the jet buckets and increases engine RPM proportional to the amount of joystick movement, moving the boat forward. Moving the joystick aft lowers the buckets and increases engine RPM proportional to the amount of joystick movement, moving the boat astern. Steering is accomplished with the tiller.

E.5.c.4. Docking mode

The docking mode is used for low-speed maneuvering. With the switch in DOCKING position, the joystick controls forward, astern and side to side motion. The boat can be moved forward, aft and sideways, port and starboard by moving the joystick in the desired direction. The speed of movement is proportional to the amount of movement of the joystick.
### E.5.c.5. Rotating the boat

In all conditions, rotation is controlled through movement of the steering tiller. Whether thrusting ahead, astern or transversely, adding or subtracting small amounts of steering nozzle motion will superimpose a small turning moment. The additional nozzle displacement is increased as the required moment increases. Pure rotation is obtained by placing the reversing buckets at the zero thrust position and turning the nozzles using the tiller. Small tiller movements will cause small heading changes, and large adjustments will cause large heading changes.

### E.5.c.6. Interceptor control

The interceptor trim tabs are integrated with the steering system to improve performance in turns. Interceptor trim tabs are located on the transom, below the waterjets. The interceptor trim tab is operated by a hydraulic cylinder (Figure 3-53) and will control the attitude of the boat only when underway at speed. A trim tab in the lowered position creates lift on the stern of the boat. Lowering a trim tab on one side will create lift on that side and therefore correct a list. Lowering both trim tabs will create lift evenly on the stern and assist in reducing bow rise.

### E.5.d. Vector control alarm and display panel

The Vector control alarm and display panel (Figure 3-57) is located in the Pilothouse in the center console between the Engine Display Modules. The panel displays the position of the reversing buckets, steering nozzles and interceptors, and also displays control system alarms.
E.5.d.1. Bucket, nozzle and trim tab position displays

When the reversing buckets are in the zero thrust position, only the center bar is darkened on the respective graph. When the reversing buckets are moved in either the up or down direction, the display incrementally darkens additional bars to reflect the actual position of the bucket.

When the steering nozzles are in the center position, only the center bar is darkened on the respective graph. When the steering nozzles are moved in either the port or starboard direction, the display incrementally darkens additional bars to reflect the actual position of the nozzles.

When the interceptors are in the fully raised position, only the top bar is darkened on the respective graph. When the interceptors are lowered, the display incrementally darkens additional bars to reflect the actual position of the unit. When the interceptors are fully lowered, the bar graph display is fully darkened.
E.5.d.2. Display control

To change the screen display at any time, press any one of the first four buttons (beginning on the left) on the display. This action displays the button function menus.

To change the LCD backlight and/or contrast, press the fifth button (furthest to the right). This displays the function menus for increasing or decreasing the screen contrast and the backlight intensity. Once this submenu opens, pressing the buttons under the respective +/- icons causes the screen display to change accordingly.

E.5.d.3. Alarms

Alarms generated by the engine monitoring system, and the steering control system will be displayed on the panel. A buzzer and a visual alarm are flush mounted into the center console above the alarm panel to call attention to alarms.

When a control system fault occurs, a warning icon displaying the word “FAULT” flashes on the main display screen to alert the operator. Pressing any one of the first four buttons on the display will display the button function menu on the bottom of the display. The operator may choose one of the following options for alarm handling:

1) View faults– When this option is selected, the display changes to the “FAULTS” screen. The faults screen provides a real time text display of up to 20 active alarms.

2) Acknowledge (“Ack”) alarm– When this option is selected the fault icon stops flashing, diminishes in size, and remains in the center of the main display screen.

E.5.e. Transducers

The control system receives feedback on the position of water jet components from five (5) transducers. The transducers are located on the following water jet components:

1) Port reversing bucket
2) Port interceptor
3) Starboard reversing bucket
4) Starboard interceptor
5) Steering cylinder

The transducers provide position feedback of each component for display on the alarm and display panel on the center console.
E.5.f. Portable backup console

A portable backup console (Figure 3-58) is stowed in the electronics equipment rack in the Auxiliary Machinery Compartment. In the event of a partial or total electronic failure in the propulsion control system, the portable backup console can be connected to control the steering nozzles, reversing buckets, interceptor trim tabs, and engine RPM. The portable backup console plugs into a port on the forward inboard face of the Coxswain’s console (Figure 3-59).

The portable backup console is electrically isolated from the propulsion control system and has the following controls.

1) Auto/backup rocker switches (4)
2) Port waterjet/port interceptor jog lever
3) Starboard waterjet/starboard interceptor jog lever
4) Port engine RPM rotary knob
5) Starboard engine RPM rotary knob

The console has four Auto/Backup rocker switches, one for each water jet and engine. The switches allow for selection of the automatic control system or use of the controls on the portable backup console. Each switch individually switches its equipment between the automatic and backup controls. When “BACKUP” is selected, the joysticks and tillers at the Coxswain’s and navigator’s seats have no influence on the operation of the affected water jet/interceptor/engine.

The jog levers are two-axis levers that are rotated left and right to select control of the water jet or interceptor.

When the water jet function is selected:

1) Left/Right movements with the upper left lever only, correspond to Port/Starboard movement of the steering nozzle. Left/Right movements of the upper right lever have no affect on any waterjet component.

2) Up/Down movements with the lever correspond to Up/Down movement of the reversing bucket.
When the interceptor function is selected:

1) Up/Down movements with the lever correspond to Up/Down movement of the interceptor trim tab.
2) Left/Right movements have no affect on any waterjet component.

The engine RPM rotary knobs control the speed of the engines. Rotation of the knob clockwise will increase engine RPM and rotation of the knob counterclockwise will decrease engine RPM.

Figure 3-58
Portable Controller
The control system has two (2) external inputs that directly affect boat operations:

1) Autopilot
2) Roll-over switch
E.6. Autopilot

The Autopilot signal comes from the Furuno NAVPILOT 500 Autopilot System. The system is made up of the following components:

1) Control Unit
2) Computer Processor Unit
3) Rudder Reference Unit

E.6.a. Autopilot control unit

The control unit (Figure 3-60) is located on the lower left corner of Coxswain’s console. It contains a LCD readout for autopilot data, various mode keys and a rotary course knob.

Figure 3-60
Autopilot Control Unit
E.6.b. Autopilot computer processor

The autopilot computer processor unit (CPU) (Figure 3-61) is located on the aft bulkhead, port side of the Auxiliary Machinery Compartment. The CPU receives data from the autopilot control unit, the rudder reference unit, the PG 500R heading sensor and the Coxswain’s chart plotter and generates control signals for the Vector thrust vectoring system.

Figure 3-61
Autopilot CPU

E.6.c. Rudder reference unit

The rudder reference unit is located in the Lazarette and is mechanically linked to the tiller arm on the starboard jet-drive. The rudder reference unit transforms the angular travel of the tiller arm position to a digital signal, which is transmitted to the autopilot CPU.
E.7. Rollover switch

When a 90° or greater knockdown or rollover event occurs, the rollover switch automatically reduces engine speed to idle to minimize the amount of water that enters the Engine Compartment. Once the event is completed, the joystick and tiller must be returned to the zero thrust position in order to reset the control system and increase engine speed.

The rollover switch (Figure 3-62) is located in the Auxiliary Machinery Compartment at the aft bulkhead, port of centerline, above the fuel tank.

Figure 3-62
Rollover Switch
E.8. Clutch control panel

A clutch control panel (Figure 3-63) is flush-mounted in the Coxswain’s and navigator’s upper consoles.

NOTE

The outer push button of the clutch panel (DISENG) is the neutral position for the main gears.

Figure 3-63
Clutch Panel
E.8.a. Clutch control modes

The clutch panel controls the ENGAGE, DISENGAGE, and BACKFLUSH (reverse) functions of the clutch. All three states are mutually exclusive and are controlled with two, three-position momentary rocker switches per engine. When the ENGAGE button is pressed, it energizes a latching circuit which keeps the clutch engaged until the DISENGAGE button is pressed.

The clutch panel also houses the backflush function for the waterjets. When it is suspected the boat has sucked material into the nozzle, the backflush forces water back through the nozzle attempting to clear the nozzle port.

The clutch panel is active only at the station that has helm control.

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**NOTE**

RPMs for Backflushing are not to exceed 1200 RPM.

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E.8.b. Engage/disengage function

When the ENGAGE side of the switch (top) is pressed, it energizes a latching circuit which keeps the clutch engaged until the DISENGAGE side of the switch (bottom) is pressed. The following safety interlocks are integrated into the clutch panel circuit:

1) Neutral start interlock - If the gear is engaged, the clutch panel provides an interlock to inhibit the engine from starting.
2) Engine at idle interlock - If the engine is not at idle speed, the clutch panel provides an interlock to prevent the engagement of the clutch.
3) Reversing bucket interlock - If the reversing bucket is not in the zero thrust position, the clutch panel provides an interlock to prevent engagement of the clutch.

The ENGAGE switch LED flashes to indicate that the clutch may be engaged.
Chapter 3 – Boat Systems

WARNING  🟢

If the interlock override is performed and the engines are throttled up, thrust will be produced when the gear engages causing the boat to be set in motion instantaneously.

E.8.c. Interlock override

If it is necessary to engage the gear while the LED is *not* flashing, the interlock may be over-ridden as follows:

1) Simultaneously hold down both the BRIGHT and DIM switch sides.

2) While holding down both switches, press the ENGAGE switch side for the respective clutch.

3) When the green ENGAGE LED is illuminated, the BRIGHT and DIM switches may be released. The clutch output will remain energized until the DISENGAGE switch side is pressed.

E.8.d. Backflush operation

The BACKFLUSH switch engages the reverse clutch to operate the waterjet in reverse. This is often effective in flushing debris from the waterjet inlet. The BACKFLUSH function will not engage while the forward gear is engaged. Place the joystick in the center position before pressing the BACKFLUSH button. The BACKFLUSH operates only while the button remains depressed.

E.8.e. Engine idle speed control

The clutch panel is equipped with an idle knob to control RPM independent of the joystick. Rotation of the idle knob clockwise increases RPM, while rotation counterclockwise decreases RPM. The RPM range of the idle knob is limited to 1200 RPM.

E.8.f. Panel indicator lights

LEDs are provided on the switches to indicate the status of each clutch:

1) Not Illuminated - Clutch is not engaged and the reversing bucket not at the zero thrust position.

2) Flashing - Clutch is disengaged and the reversing bucket is at the zero thrust position; Ready to be engaged.

3) Illuminated steady - Clutch is engaged.

4) All four LEDs flashing simultaneously at the helm station not in control indicates an electrical fault between the stations.

To decrease the brightness of the LEDs, press down the lower portion of the rocker switch labeled DIM. To increase the brightness of the LEDs, press down the lower portion of the rocker switch labeled BRIGHT. Press and hold the applicable button until the desired LED intensity is achieved.
Section F. Heating, Ventilation, and Air Conditioning System (HVAC)

Introduction

The HVAC system heats, cools and ventilates the compartments on the RB-M (Figure 3-64). The system consists of:

1) Machinery space ventilation
2) Non-machinery space ventilation
3) Air conditioning systems
4) HVAC cooling water system
5) Electric heating
6) Window defrosters

F.1. Machinery Space Ventilation

Machinery space ventilation uses air moved by fans to replenish air in the Engine Compartment and Auxiliary Machinery Compartment (Figure 3-65). Machinery space ventilation consists of the following components:

1) Engine Compartment demisters (2)
2) Engine Compartment supply damper
3) Engine Compartment exhaust fans (2)
4) Engine Compartment exhaust dampers (2)
5) Auxiliary Machinery Compartment vent valve
6) Auxiliary Machinery Compartment exhaust fan
Figure 3-64
Air Conditioning System

Figure 3-65
Heating System
There are two Engine Compartment demisters that are located on the external aft bulkhead of the Pilothouse on either side of the Pilothouse door (Figure 3-66). The demisters provide the initial air flow path for air in the Engine Compartment. The demisters keep water and large particulate matter from entering the Engine Compartment ventilation system.
The Engine Compartment supply damper allows air to flow into the Engine Compartment. The damper has a damper control valve (Figure 3-67) that is connected to the fixed fire suppression system. When the system is activated, the supply damper will close, isolating air to the space. Once activated, the valve must be reset manually.
F.1.c. Engine Compartment exhaust fans

There are two Engine Compartment exhaust fans (Figure 3-68) mounted to exhaust dampers on port and starboard sides of the aft bulkhead in the Engine Compartment. The exhaust fans draw air into the space through the demisters and supply damper. Air is then moved through the exhaust dampers and out through the louvers on the sides of the Lazarette scuttle. The exhaust fans receive power from the 24P2 Engine Bus power distribution panel at the Engineer’s console. They are controlled by an AUTO/MAN switch on the Engineer’s Console. The switch is normally kept in the AUTO mode. The MAN position of the switch is provided to allow running the fans in port with the engines not running.

F.1.d. Engine Compartment exhaust dampers

Each Engine Compartment exhaust fan has an associated exhaust damper (Figure 3-68). The exhaust dampers are mounted on the aft bulkhead of the Engine Compartment. Each damper has a damper control valve that is connected to the fixed fire suppression system. When the system is activated, the supply damper will close, isolating air to the space. Once activated, the valve must be reset manually.

Figure 3-68
Exhaust Fan and Damper Valve
F.2. Auxiliary Machinery Compartment ventilation

The Auxiliary Machinery Compartment receives air through a vent valve. Air is exhausted by a powered fan.

F.2.a. Auxiliary Machinery Compartment vent valve

The Auxiliary Machinery Compartment vent is located on the port side at the rescue recess (Figure 3-69). The vent provides supply ventilation to the space. It is fitted with an inverted ball check valve that limits water entry in event of a knockdown or rollover.

Figure 3-69
Auxiliary Machinery Compartment Vent Valve
F.2.b. Auxiliary Machinery Compartment exhaust fan

The Auxiliary Machinery Compartment exhaust fan is a centrifugal fan located on the starboard side of the compartment in the overhead (Figure 3-70). The fan draws air into the space through the vent valve and discharges it into the Engine Compartment supply ventilation between the demisters and the supply damper.

The AMC exhaust fan receives power from the 24P3 Non Vital Bus on the power distribution panel at the Engineer’s console.

Figure 3-70
Auxiliary Machinery Compartment Exhaust Fan
Non-machinery space ventilation applies to the Forepeak, Lazarette, Survivors’ Compartment and Pilothouse. This ventilation consists of natural ventilation and forced ventilation.

F.3.a. Natural ventilation

The Forepeak and Lazarette are ventilated through four vent valves (two per compartment). The vent valves are inverted ball check valves that allow for the natural flow of air through the compartments. The check valves minimize flooding of the compartments during a knockdown or rollover.

F.3.b. Forced ventilation

The Pilothouse and head each have an installed centrifugal fan. These fans work together to provide air flow through the Survivors’ Compartment, Pilothouse and head. The Pilothouse fan is located on the aft bulkhead of the Survivors’ Compartment and the head fan is located in the overhead of the head (Figure 3-71). The Pilothouse fan is controlled by a single switch located on the Engineer’s Console. The head fan is powered directly from the 24P3 Non Vital Bus on the power distribution panel at the Engineer’s console.

The Pilothouse also has four Hella air circulating fans (Figure 3-72) mounted in the overhead near each crew seat. Each fan has a pushbutton control switch in the center of the fan and can be positioned as required by the crewmember.

The Pilothouse, head and Hella fans receive power from the 24P3 Non Vital Bus on the power distribution panel at the Engineer’s console.

**NOTE**

Operating the pilothouse and head centrifugal fans with the dampeners closed can damage the fans.

**NOTE**

There is NO GUARD on the back of the Hella fans.
Figure 3-71
Head Ventilation Fan

Figure 3-72
Hella Fan
The air conditioning (A/C) system consists of the following components:

1) Air conditioning unit
2) Air conditioning unit controller
3) Air conditioning unit condensate drain
4) Pump relay panel

There are two self-contained 16,000 BTU A/C units, one is located in the Pilothouse (Figure 3-73) and the other in the Survivors’ Compartment. Each unit has HCFC R-22 refrigerant.

The A/C units can effectively cool the compartments in up to 90°F raw water temperature.

Both A/C units receive power from the 240P1 AC distribution panel through individual circuit breakers.

NOTE

ECP-128 replaced the 2 16,000 BTU A/C units with 2 self contained 27,000 BTU units which use 410A refrigerant. Hulls 45602-45635 may have the old units installed.
Each A/C unit has an associated programmable control panel (Figure 3-74). The control panel retains the last settings and all programming parameters. The control panel has the following controls/indicators:

1) **ON/OFF Button**: starts and stops the A/C unit.
2) **Digital Display**: indicates room temperature when the system is on. The display is blank when the system is off.
3) **UP Button**: indicates the current temperature set-point on the digital display and increases the temperature set-point.
4) **DOWN Button**: indicates the current temperature set-point on the digital display and decreases the temperature set-point.
5) **FAN Button**: changes the fan mode between auto and manual and selects the fan speed when in manual mode.
6) **MODE Button**: selects the operating mode of the A/C unit.
7) **FAN Speed Indicators**: indicates the selection of fan speed (Auto or Manual (High, Medium, Low)).
8) **MODE Indicators**: indicates the operating mode of the A/C unit (Auto, Cool Heat, Moisture Control).

The control panel receives power from its A/C unit.
Figure 3-74
A/C Control Panel
F.4.c. Air conditioning unit condensate drain

Each A/C unit has a condensate drain line to remove condensate that is produced during unit operation. The Pilothouse A/C unit condensate gravity drains directly overboard through a hose and check valve on the port side. The Survivors’ Compartment A/C unit condensate gravity drains directly to a condensate sump located in the bilge of the Survivors’ Compartment next to the bilge pump.

The Survivors’ Compartment HVAC condensate sump pump (Figure 3-75) is a self-contained unit that contains an electric pump and float switch. When the sump level actives the float switch, condensate is pumped directly overboard through a hose and check valve on the starboard side at Frame 13.

The Survivors’ Compartment HVAC condensate sump pump receives power from the 24P3 Non-Vital bus on the power distribution panel at the Engineer’s console.

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Figure 3-75
Condensate Sump Pump
The pump relay panel (Figure 3-76) is located in the overhead of the Auxiliary Machinery Compartment, port side, aft. The pump relay panel is a two-unit solid state relay that controls the HVAC raw water pump. When either of the A/C units is in operation, the pump relay panel energizes the HVAC raw water pump to provide cooling water to the A/C unit.

The pump relay panel receives 240 VAC power from both A/C units.

Figure 3-76
HVAC Pump Relay Box
The HVAC cooling water system (Figure 3-77) provides seawater to the HVAC units in the Pilothouse and Survivors’ Compartment. The cooling water system consists of:

1) Suction strainer  
2) HVAC raw water pump  
3) Needle valve  
4) Overboard check

Seawater is drawn from the sea chest through a suction valve and simplex suction strainer by an electric pump. The pump sends the water to the HVAC units through a needle valve and isolation valves before discharging overboard through check valves.
F.5.a. Suction Strainer

The suction strainer (Figure 3-78) is a simplex strainer that prevents foreign debris from clogging the cooling system and damaging cooling system components. The strainer has a removable monel strainer basket. The suction strainer receives water from the starboard side of the sea chest. The suction strainer is located forward of the sea chest, starboard of the centerline, next to the grating in the Lazarette.

Avoid stepping on the brass strainer and hoses. This may cause the hose clamps to leak or cause damage to the strainer.
F.5.b. Cooling water pump

The HVAC cooling water pump (Figure 3-79) is located in the Engine Compartment, off centerline to starboard, aft of the access assist steps. The pump provides cooling water to both HVAC units when the HVAC units are in operation.

The pump receives 120 VAC power from the pump relay panel and the 120P2 AC Bus-2 panel on the AC Power Island located between the crew and navigator’s seats.

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F.5.c. Needle valve

The HVAC units are located at different heights above the cooling pump. A needle valve, located in the Auxiliary Machinery Compartment, is installed in the Survivors’ Compartment cooling water line to ensure an equal amount of cooling water is supplied to both HVAC units.

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F.5.d. Overboard discharge

Cooling water exiting each HVAC unit is routed overboard. Each overboard discharge line has an installed check valve to prevent water from backflowing when the system is secured or system maintenance is performed.
F.6. Electric heating

The Pilothouse and Survivors’ Compartment are outfitted with electric heaters (Figure 3-80). The two types of electric heaters are:

1) 1500W electric stand alone heater
2) 3000W duct heater

Each space has one of each type of heater. The heaters operate independently of each other.

CAUTION!

Avoid blocking heaters with bags or survival gear. This could become a fire hazard.

Figure 3-80
Compartment Heating System
Each 1500W stand alone heater (Figure 3-81) contains a heating element, motor driven blower, thermal overload protection and a thermostat controller. When energized, the motor driven blower forces air over the heating element and fin plates, warming the air and distributing it into the space. The thermal overloads secure power to the heating elements when the temperature is above the set limit.

The stand alone electric heater receives power from the 240P1 AC Bus-1 distribution panel on the AC Power Island and is controlled by the HVAC controller.
F.6.b. Duct heater

Each 3000W duct heater (Figure 3-73) is used to provide heat when sea water temperatures are too cold. The duct heater is installed in the discharge air ducting of the A/C unit (Figure 3-73). The “heater” switch on each unit must be in the “ON” position for it to produce heat, and the heater will provide heat anytime it is desired.

Each heater receives air flow from the A/C unit blower fan to distribute heat to the space. To prevent overheating during air flow loss, the heater has a 2-stage thermal protection system:

1) 140°F - Auto Reset
2) 180°F - Manual Reset

The duct heater receives 240 VAC power from the A/C unit heater relay.

---

CAUTION!

Ensure the fan remains running for 3 minutes before securing the heater. If this is not done, the protection device will trip.

---

F.7. Window defroster

The pilothouse windows are defrosted by six Heater Craft defrost heaters (Figure 3-82). Each defroster has two adjustable heads for directing air flow onto the side and aft windows. The forward windshields have heating trace wires for defrosting and defogging. The defrosters receive power from the 24P3 Non-Vital Bus power distribution panel located at the Engineer’s console.
Section G. Electrical System

Introduction

The RB-M electrical system includes both AC and DC power distribution systems (Figure 3-83 through Figure 3-85). The systems consist of:

1) AuraGen™ power system
2) Batteries
3) Battery controls
4) Battery charger
5) AC power distribution
6) Shore power distribution
7) DC power distribution
8) DC-DC converters
9) Exterior lighting
10) Interior lighting

G.1. AuraGen™ power system

Electrical power is supplied by two AuraGen™ power generation systems. The AuraGen™ power generation system consists of:

1) AuraGen™ Viper G8500X induction power source (IPS)
2) Electronic Control Unit/Inverter Charging System (ECU/ICS)
3) ICS control panel

G.1.a. AuraGen™ IPS

The IPS is an induction power unit that is mounted at the front of each diesel engine (Figure 3-85). Each IPS is belt-driven through the diesel engine crank shaft, and is rated 8.5 kW. The IPS provides AC power to the ECU/ICS for conditioning and distribution to the AC and DC power distribution systems.
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Figure 3-83
AC Power Distribution System

Figure 3-84
DC Power Distribution System
G.1.b. AuraGen™ ECU/ICS

The ECU/ICS receives power from the AuraGen™ IPS and converts it to DC voltage. Once converted, the ECU/ICS provides a regulated 24 VDC for battery charge and the DC power distribution system. It also inverts the DC voltage to AC voltage, when selected by the AC Power ON/OFF control switch on the ICS Control Panel for the AC power distribution system.

The ECU/ICS units (Figure 3-86) are located outboard of the batteries at the forward end of the Auxiliary Machinery Compartment. They are mounted to the hull using vibration isolation mounts. Each ECU/ICS has two cooling fans to keep the internal electronic components within normal operating temperatures.
Each AuraGen™ ECU/ICS has an associated control panel for control and monitoring of the AuraGen™ power generation system. The control panels are located in the Pilothouse at the Engineer’s Console (Figure 3-87). The control panel provides the following controls and indicators:

1) AC Power ON/OFF control switch
2) BAT indicator: indicates the status of the battery charge
3) GEN indicator: indicates the status of the AuraGen™ IPS
4) CHG indicator: indicates the status of the ECU/ICS battery charger
5) AC indicator: indicates the status of AC Power output from the ECU/ICS

Each indicator has three different color LEDs (Green/Yellow/Red) to indicate the status of the AuraGen™ power generation system. The normal indicators are shown in Table 3-1. Table 3-2 and Table 3-3 list fault indications.
### Figure 3-87
Control Panels

### Table 3-1
Control Panel Normal Indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>LEDs</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAT Indicator:</td>
<td>Green</td>
<td>Battery Charge Full</td>
</tr>
<tr>
<td>GEN Indicator</td>
<td>Green</td>
<td>Normal</td>
</tr>
<tr>
<td>CHG Indicator</td>
<td>Green</td>
<td>Normal</td>
</tr>
<tr>
<td>AC Indicator</td>
<td>Green</td>
<td>AC Out On</td>
</tr>
<tr>
<td></td>
<td>Flashing Green</td>
<td>AC Output is starting up (occurs when AC Power Control Switch is placed in the “ON” position)</td>
</tr>
<tr>
<td>FAULT TYPE</td>
<td>CONTROL PANEL INDICATION</td>
<td>SYSTEM RESPONSE</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Generator OK</td>
<td>Gen: Green</td>
<td>None</td>
</tr>
<tr>
<td>Battery Charging ON</td>
<td>Chrg: Green</td>
<td>None</td>
</tr>
<tr>
<td>AC out starting up</td>
<td>AC: Green Slow Flash</td>
<td>None</td>
</tr>
<tr>
<td>AC out ON</td>
<td>AC: Green</td>
<td>None</td>
</tr>
<tr>
<td>Battery charge full</td>
<td>Bat: Green</td>
<td>None</td>
</tr>
<tr>
<td>Battery charge partial</td>
<td>Bat: Yellow</td>
<td>None</td>
</tr>
<tr>
<td>Battery voltage low</td>
<td>Bat: Red</td>
<td>Horn/Alarm Activated</td>
</tr>
<tr>
<td>RPM sensor fail</td>
<td>Gen: Yellow or Off</td>
<td>Gen Turned off</td>
</tr>
<tr>
<td>Gen over-current</td>
<td>Gen: Red Slow Flash</td>
<td>Gen Turned off</td>
</tr>
<tr>
<td>Gen over temp</td>
<td>Gen: Yellow Fast Flash</td>
<td>Gen Turned off</td>
</tr>
<tr>
<td>Generator Temp Sensor Open</td>
<td>Gen: Yellow Slow Flash</td>
<td>Gen Turned off</td>
</tr>
<tr>
<td>AC out over load</td>
<td>AC: Red</td>
<td>AC out turned off</td>
</tr>
<tr>
<td>AC out fail</td>
<td>AC: Red Fast Flash</td>
<td>AC out turned off</td>
</tr>
<tr>
<td>ECU over Temp</td>
<td>AC: Yellow</td>
<td>System shutdown</td>
</tr>
<tr>
<td>ECU H/W fault</td>
<td>Gen: Red</td>
<td>System shutdown</td>
</tr>
<tr>
<td>Battery over current</td>
<td>Bat :Red Fast Flash</td>
<td>System shutdown</td>
</tr>
<tr>
<td>Battery under voltage</td>
<td>Bat: Red Slow Flash</td>
<td>AC out turned off</td>
</tr>
<tr>
<td>LV or HV over temp</td>
<td>Chrg: Yellow</td>
<td>System shutdown</td>
</tr>
<tr>
<td>LV or HV drive fault</td>
<td>Chrg: Red</td>
<td>System shutdown</td>
</tr>
<tr>
<td>ECU serial link error</td>
<td>AC: Yellow Slow Flash</td>
<td>System shutdown</td>
</tr>
<tr>
<td>Bus over voltage or unbalance</td>
<td>Chrg :Red Fast Flash</td>
<td>System shutdown</td>
</tr>
<tr>
<td>LED</td>
<td>CONDITION</td>
<td>STATUS INDICATED</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>GEN</td>
<td>Green</td>
<td>Normal</td>
</tr>
<tr>
<td>GEN</td>
<td>Yellow</td>
<td>RPM Sensor fail</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEN</td>
<td>OFF</td>
<td>RPM Sensor fail</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No 24 VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEN</td>
<td>Red</td>
<td>ECU Hardware Faults</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEN</td>
<td>Alternating Green/Red SF</td>
<td>Generator overspeed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEN</td>
<td>Yellow SF</td>
<td>Generator Temp Sense Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3-3
LED Fault Indication (Continued)

<table>
<thead>
<tr>
<th>LED</th>
<th>CONDITION</th>
<th>STATUS INDICATED</th>
<th>CODE</th>
<th>POSSIBLE PROBLEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEN</td>
<td>Yellow FF</td>
<td>Generator Over-Temp</td>
<td>ECU=113</td>
<td>Generator not getting sufficient ventilation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Faulty temp sensor – R/R Generator</td>
</tr>
</tbody>
</table>

G.1.d. Power system operating modes

Normal modes of operation for the power generation system are:

1) Engine Running/AC power control switch ON: The ECU/ICS is receiving power from the AuraGen™ IPS, providing power to the DC power distribution system, charging the batteries, and providing power to the AC power distribution system.

2) Engine Off/AC power control switch OFF: The ECU/ICS is de-energized.

3) Engine Off/AC power control switch ON: The ECU/ICS is receiving DC power from the batteries and converting it to AC Power for the AC power distribution system.

4) Engine Running/AC power control switch OFF: The ECU/ICS is receiving power from the AuraGen™ IPS, providing power to the DC power distribution system, charging the batteries, and providing power to the DC power distribution system only.

5) Once the diesel engine has been started, the AuraGen™ IPS provides power to the ECU/ICS. The ECU/ICS provides DC power for boat operations and to maintain the battery charge. When the AC power control switch is placed in the “ON” position, AC Power is directed to the AC power distribution system.

G.2. Batteries

There are two separate battery banks that provide power to the DC power distribution system. Each battery bank has two 12 VDC absorptive glass mat (AGM) batteries (Figure 3-88), connected in series to provide 24 VDC to the DC power distribution bus. The batteries are maintenance-free and designed for high discharge and recharge rates to maximize battery usage and make battery charging more efficient.

The Start battery bank provides 24 VDC power for diesel engine starting and the 24P2 Engine Bus on the power distribution panel at the Engineer’s console. The House battery bank provides 24 VDC power to the 24P1 Vital Bus and 24P3 Non-Vital Bus on the power distribution panel at the Engineer’s console. During normal operations, the battery banks operate independent of each other. In the event of an emergency, the battery banks can be cross-connected through manual operation of the automatic charging relay. The cross-connect switch is located on the Engineer’s console.
G.3. Battery controllers

The battery controllers are used to control DC power from the start and house battery controls banks to the DC power distribution system. The battery controls consist of:

1) Battery solenoids and control switches
2) Automatic power selector (APS)

The battery controllers receive 24 VDC from the batteries.
G.3.a. Battery solenoids and control switches

Each battery bank has a battery solenoid and control switch. The solenoids (Figure 3-89) are located on centerline, on the forward bulkhead of the Auxiliary Machinery Compartment and the control switches are located in the Pilothouse at the Engineer’s console (Figure 3-90).

The control switch is a two-position switch that operates the battery solenoid as follows:

1) ON: The solenoid closes, applying power to the DC power distribution system.
2) OFF: The solenoid opens, isolating the associated battery bank from the DC power distribution system.

Each battery solenoid and associated control switch operate independent of the other.

Figure 3-89
Battery Solenoids
G.3.b. Automatic power selector (APS) Unit

The automatic power selector (APS) provides continuous power to the battery solenoids, control switches, automatic charging relay (ACR), and remote switch panel from redundant power sources. The APS is located in the Auxiliary Machinery Compartment.

The APS receives DC power from the start and house battery banks as separate inputs. The APS directs the higher battery voltage to the battery controls, ACR and remote switch panel.

G.4. Battery charger

The battery charging system consists of:

1) Battery charger
2) Temperature compensation sensor
3) Automatic charging relay
4) Remote switch
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G.4.a. Battery charger

The battery charger (Figure 3-91) is located on the forward bulkhead, starboard side, of the Auxiliary Machinery Compartment. It receives 240 VAC power from the shore power distribution panel located on AC Power Island located between the navigator’s and crew’s seat in the Pilothouse.

The battery charger is a three-stage smart charger that provides for fast and safe battery charging.

The battery charger has an ammeter to monitor charging current and a time out circuit, which cycles the charger to the float stage after 8-10 hours of operation to prevent battery damage. The time out circuit can be reset by securing power to the battery charger, and then restoring power. The charger also has various protective devices to ensure safe operation.

Figure 3-91
Battery Charger

3-101
G.4.c. Automatic charging relay and remote switch

The Automatic Charging Relay (ACR) operates in conjunction with the three position remote switch to maintain battery charge when the generators are providing DC power and to provide an emergency cross connect between the start batteries and the house batteries. The ACR is located in the Auxiliary Machinery Compartment and the remote switch is located in the pilothouse at the Engineer’s console (Figure 3-90).

The remote switch controls the ACR as follows:

1) Off: The ACR is de-energized (Open), isolating the start and house battery banks from each other.

2) Auto: The ACR closes and opens dependent on start/house battery voltage and the charging voltage provided by the generator.

3) On: The ACR closes, cross connecting the start and house battery banks for engine starting and other DC power requirements.

The remote switch has a red LED to indicate when the ACR is closed.

G.5. 24 VDC to 12 VDC converters

Two 24 VDC to 12 VDC converters provide power to various communication/navigation/ancillary equipment. Both converters (Figure 3-92) are located on the starboard side of the Auxiliary Machinery Compartment. The converters are rated at 40 amps, continuous.

The DC-DC converters receive power from the 24P1 Vital Bus on the power distribution panel at the Engineer’s console, and distribute 12 VDC power to the 12P1 main panel on the power distribution panel at the Engineer’s console.
Figure 3-92
24 VDC to 12 VDC Converters

G.6. AC power distribution

The AC power distribution panel (Figure 3-93) located on the AC Power Island, receives power from the AuraGen™ power generation system and shore power. Each power source has its own feeder circuit breaker to provide connectivity and circuit protection. Each AuraGen™ system has a 50 amp circuit breaker located on the AC Power Island. Shore power is received through a 100 amp breaker. The shore power breakers are located in the Auxiliary Machinery Compartment.

The equipments served by each distribution panel are listed in Table 3-4.
Figure 3-93
AC Power Distribution Panel

Table 3-4
AC Power Distribution Panel Circuits

<table>
<thead>
<tr>
<th>Bus 1 (STBD AuraGen™)</th>
<th>Bus 2 (Port AuraGen™)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVAC 1 (Pilothouse HVAC unit)</td>
<td>HVAC 2 (Survivor Compartment HVAC unit)</td>
</tr>
<tr>
<td>Microwave</td>
<td>Plothouse Heater</td>
</tr>
<tr>
<td>SVR Cabin Heater</td>
<td>Window Heater (trace heaters)</td>
</tr>
<tr>
<td>Electrical Outlets (PLTHS, ER)</td>
<td>HVAC Circulation Pump</td>
</tr>
</tbody>
</table>
G.6.a. AC Bus transfer switch

The 240P VAC power distribution panel has two separate bus transfer switches (Figure 3-94) for power source selection. The bus transfer switch is a manually operated, three-position switch that provides the following selections:

1) Generator: selects power from the AuraGen™ power generation system
2) Off: no power source is selected
3) Shore: selects power from shore power

Each bus transfer switch controls AC power to a dedicated load bus within the power panel. This setup ensures electrical power to one of the load busses in the event of an AuraGen™ System/diesel engine failure:

1) Bus Transfer Switch One controls power to Bus-1
2) Bus Transfer Switch Two controls power to Bus-2

NOTE

AC Power CANNOT be cross-connected between the two load busses in the 240P1 Power Panel.

Figure 3-94
Bus Transfer Switches
The 240P power distribution panel has three monitoring devices that provide a status of the AC Power Distribution System.

1) Power Available Indicator: illuminates when power is available from the AuraGen™ Power Generation System or Shore Power. Each power source has its own indicator.

2) Bus Multimeter: provides monitoring of AC Power on the individual load busses. Each bus has its own multimeter.

3) Ground Fault Detection: provides for ground testing of both busses. When the test button is depressed, the Ground Fault Meter will indicate if a ground exists in the AC Power Distribution System.

All three monitoring devices function when the AuraGen™ Power Generation System or Shore Power is providing AC Power.

The shore power system consist of the following:

1) Shore power inlet receptacle.
2) Main shore power disconnect circuit breaker.
3) Shore power isolation transformer.
4) Shore power bus.

The shore power system receives 120 VAC, 60Hz, single phase power from the pier connection.

Shore power from the pier connection enters the RB-M through a cable connected to the shore power inlet receptacle. The shore power inlet receptacle is rated at 120 VAC 100 amps and is located in the port rescue recess.

The shore power system has a main power disconnect breaker between the shore power inlet receptacle and the shore power transformer, and provides circuit protection in the event of an overload or system fault. The disconnect circuit breaker is a 120 VAC, two-pole breaker rated at 100 amps and is located in the Auxiliary Machinery Compartment, port side, aft (Figure 3-95).

The shore power isolation transformer (Figure 3-96) receives the 120 VAC 60 Hz power input and steps it up to 240 VAC 60 Hz for the AC power distribution system.
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Figure 3-95
Shore Power Circuit Breakers

Figure 3-96
Shore Power Isolation Transformer
G.7.d. Shore power bus

The shore power bus provides power required to maintain specific equipment/systems during in port periods. The shore power bus is located in the AC power distribution panel in the Pilothouse.

The shore power bus powers the battery charger, the Kim hot start engine heaters and the 240P1 AC power busses through the bus transfer switches when the “Shore” position is selected.

NOTE

The shore power bus can only be energized when shore power is available. AC power from the AuraGen™ power generation system CANNOT be connected to any shore power bus loads.

G.8. 24 VDC power distribution

The 24 VDC power distribution panel (Figure 3-97) is located on the inboard side of the Engineer’s console in the Pilothouse. The panel provides power distribution and circuit protection for shipboard electrical and electronic equipment. The panel has three separate DC power busses for proper load distribution and survivability to meet mission requirements.

The 24P1 24 VDC Vital Bus– receives power from the house DC power bus.

1) The 24P2 24 VDC Engine Bus– receives power from the start DC power bus.

2) The 24P3 24 VDC Non-Vital Bus– receives power from the house DC power bus.
Figure 3-97
24 VDC Power Panel
The equipment served by each distribution panel are listed in **Table 3-5:**

**Table 3-5**  
**Equipment and Distribution Panels**

<table>
<thead>
<tr>
<th>Panel</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>24P1</td>
<td>Engine Panel (Secondary)</td>
</tr>
<tr>
<td></td>
<td>Radar/Chart Plotter (Nav)</td>
</tr>
<tr>
<td></td>
<td>Vector Alarm PLC</td>
</tr>
<tr>
<td></td>
<td>Bilge Pump Panel</td>
</tr>
<tr>
<td></td>
<td>Navigation Lights</td>
</tr>
<tr>
<td></td>
<td>Wiper/Washer System</td>
</tr>
<tr>
<td></td>
<td>DGPS</td>
</tr>
<tr>
<td></td>
<td>Crew Communications</td>
</tr>
<tr>
<td></td>
<td>Depth Sounder System</td>
</tr>
<tr>
<td></td>
<td>24/12 VDC Converter #1</td>
</tr>
<tr>
<td></td>
<td>24/12 VDC Converter #2</td>
</tr>
<tr>
<td></td>
<td>Air Compressor and Horn</td>
</tr>
<tr>
<td></td>
<td>Pilothouse Lighting</td>
</tr>
<tr>
<td></td>
<td>Survivors’ Compartment Lighting</td>
</tr>
<tr>
<td></td>
<td>Hull Compartment Lighting</td>
</tr>
<tr>
<td></td>
<td>Engine Compartment Lighting</td>
</tr>
<tr>
<td></td>
<td>Lazarette Lighting</td>
</tr>
<tr>
<td>24P2</td>
<td>Engine Compartment Ventilation Fans</td>
</tr>
<tr>
<td></td>
<td>Engine Panel (Primary)</td>
</tr>
<tr>
<td></td>
<td>Waterjet Controls</td>
</tr>
</tbody>
</table>
Table 3-5 (continued)
Equipment and Distribution Panels

<table>
<thead>
<tr>
<th>Panel</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>24P3</td>
<td>Automatic Identification System</td>
</tr>
<tr>
<td></td>
<td>Floodlights</td>
</tr>
<tr>
<td></td>
<td>Pilothouse/Auxiliary Machinery Compartment Ventilation</td>
</tr>
<tr>
<td></td>
<td>Low Level Lights</td>
</tr>
<tr>
<td></td>
<td>Law Enforcement Lights</td>
</tr>
<tr>
<td></td>
<td>Instrument Lighting</td>
</tr>
<tr>
<td></td>
<td>Search Light</td>
</tr>
<tr>
<td></td>
<td>Pilothouse/Head Ventilation Fans</td>
</tr>
<tr>
<td></td>
<td>Condensate Pump</td>
</tr>
<tr>
<td></td>
<td>STBD Fwd Window Defroster</td>
</tr>
<tr>
<td></td>
<td>STBD Mid Window Defroster</td>
</tr>
<tr>
<td></td>
<td>STBD Aft Window Defroster</td>
</tr>
<tr>
<td></td>
<td>PORT Fwd Window Defroster</td>
</tr>
<tr>
<td></td>
<td>PORT Mid Window Defroster</td>
</tr>
<tr>
<td></td>
<td>PORT Aft Window Defroster</td>
</tr>
<tr>
<td></td>
<td>Radar/Chart Plotter (Nav)</td>
</tr>
<tr>
<td></td>
<td>HF SSB Radio</td>
</tr>
<tr>
<td></td>
<td>Chart Plotter (Crew)</td>
</tr>
<tr>
<td></td>
<td>Chart Plotter (Helm)</td>
</tr>
<tr>
<td></td>
<td>Autopilot</td>
</tr>
<tr>
<td></td>
<td>Secure Communication System</td>
</tr>
</tbody>
</table>
G.9. 12 VDC distribution panel

A 12 VDC distribution bus is located in the 24 VDC distribution panel on the inboard side of the Engineer’s console in the Pilothouse. The 12P1 12 VDC Main Panel provides power distribution and circuit protection for electrical and electronic equipment that require 12 VDC power. The bus receives power through a 100 amp double pole circuit breaker from two 24/12 VDC converters powered from the 24P1 Vital Bus. DC Power for the bus is monitored at the top of the distribution panel with a digital voltmeter.

The following equipment is served by the 12P1 distribution panel:

1) Loudhailer
2) Ethernet hub
3) VHF-FM communications
4) VHF-FM DSC radio
5) UHF-FM communications
6) CCTV
7) Fuel gauge
8) Toilet pump
9) Radio Direction Finder
10) Auxiliary power outlets
Chapter 3 – Boat System

G.10. Exterior Lighting

The RB-M is fitted with a searchlight, floodlights, navigation lights and low level lights.

WARNING

The searchlight should not be energized when the mast is in the lowered position. Attempting to use the searchlight with the mast lowered can damage the internal gearing of the light.

G.10.a. Jabsco searchlight

The searchlight (Figure 3-98) is located on the mast. The searchlight is remotely operated from the Coxswain’s and navigator’s consoles. The navigator’s console has dual switches (Figure 3-99) that transfer the searchlight control between the Coxswain’s and navigator’s consoles. The control lever provides dual speed control for vertical and horizontal movement. If both switches are in the up position the Navigator has full control of the search light. If both switches are in the down position, the Coxswain has full control of the search light. If the switches are split, there will only be partial control from each station. The 8” searchlight is 500,000 candle power with a 370-degree turning radius and a 45-degree vertical radius. The searchlight receives power from the 24P3 Non-Vital Bus on the power distribution panel located at the Engineer’s console.
Figure 3-98
Searchlight

Figure 3-99
Searchlight Switch
G.10.b. Jabsco floodlights

Four 60W floodlights (Figure 3-100) are mounted on the pilothouse top and are controlled by a switch panel located on the navigator’s upper console. The floodlights receive power from the 24P3 Non-Vital Bus on the power distribution panel located at the Engineer’s console.
G.10.c. Navigation lights

The navigation lighting system consists of:
1) navigation lighting selector switch
2) side lights
3) mast lights

The navigation lighting system receives power from the 24P1 Vital Bus on the power distribution panel located at the Engineer’s console.

G.10.c.1. Navigation lighting selector switch

The navigation lighting selector switch is a multi-function rotary switch that allows selection of different navigational lighting combinations. The lighting combinations are as follows:
1) Off
2) Anchor
3) Underway
4) Towing astern
5) Towing alongside – International Rules
6) Towing alongside – Inland Rules

The navigation lighting selector switch is located in the Coxswain’s upper console.
G.10.c.2. Side lights

The navigation side lights (Figure 3-101) are located on each side of the Pilothouse top.

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G.10.c.3. Mast lights

The navigation lights located on the mast are the anchor/upper masthead light, stern/anchor light, upper and lower forward mast lights, upper and lower stern towing lights.
G.11. Low level lights

Low level lights (Figure 3-102) are located in the aft port and starboard steps, the stern platform, Pilothouse side and the Lazarette scuttle. The lights are controlled by a single dimmer switch located on the Engineer’s console. The dimmer switch controls the intensity of the lights from completely extinguished to full brightness.

The low level lights receive power from the 24P3 Distribution Panel.

Figure 3-102
Low Level Lights
G.12. Internal lights

The internal lighting uses LED illumination and can be varied in intensity as required. The two internal light types are white, and red/white combination.

The internal lighting receives power from the 24P1 Vital Bus on the power distribution panel at the Engineer’s console.

G.12.a. White lights

The white lighting is located in the Engine Compartment and the Auxiliary Machinery Compartment. The Engine Compartment has eleven lights and the Auxiliary Machinery Compartment has five lights. The Engine Compartment lights receive power directly from the distribution panel and have no control switch. The Auxiliary Machinery Compartment lights have an ON/OFF control switch next to the access ladder.

G.12.b. Red/white lights

Red/white lighting is located in the Forepeak, Survivors’ Compartment, Head, Pilothouse, and Lazarette. Each space has a dimmer control switch to vary the intensity of the lighting from all white and red illuminated, to red only illuminated, to all lights off.

The dimmer control switches for the Forepeak, Survivors’ Compartment, Head and Lazarette are located adjacent to the compartment accesses. The dimmer control switch for the Pilothouse is located on the Engineer’s console.
Section H. Emergency Systems

Introduction

The RB-M has the following systems for control of emergency situations:
1) Emergency engine shutdown
2) Engine Compartment fire suppression system
3) Portable fire extinguishers
4) P-6 fire fighting and dewatering pump
5) Bilge pump system
6) Engine Compartment dewatering suction

H.1. Engine emergency stop

Engine emergency stop switches are located in the Engine Compartment over the mufflers (Figure 3-103), and at the Engineer’s console (Figure 3-104). The engines can also be shutdown in an emergency, by pulling the emergency fuel shutoff handles located on the inboard side of the Coxswain’s seat (Figure 3-105).

Engine stop switches are located at the Coxswain’s upper console, below the navigation light switch (Figure 3-106).

The switches are wired to only shutdown the engine (port or starboard) associated with that switch.
Figure 3-103
Engine Emergency Stop Switches in Engine Compartment

Figure 3-104
Engine Emergency Stop Switches at Engineer’s Console
Figure 3-105
Engine Emergency Fuel Shutoff Pull Handles

Figure 3-106
Engine Start and Stop Switches at Engineer’s Console
### H.2. Fixed fire extinguishing system

The FM-200 fixed fire extinguishing system (Figure 3-107) is used for fire suppression in the Engine Compartment. All personnel should be evacuated from the compartment and all watertight hatches sealed prior to activation of the system.

The FM-200 fire extinguishing system consists of the following components:

1) Nitrogen pilot cylinder
2) Pressure switch
3) Damper control valves (3)
4) Nitrogen time delay cylinder
5) FM-200 agent cylinder with a lever/pressure operated head
6) Discharge nozzle

---

**WARNING 🚨**

Ensure all personnel have evacuated the Engine Compartment before activating the fire suppression system. Activating the system with personnel in the space can result in injury or death.

---

**WARNING 🚨**

Once the fire suppression system has been activated, the Engine Compartment is considered Inherently Dangerous to Life and Health (IDLH). The compartment should be certified as safe by a marine chemist prior to re-entry.
H.2.a. FM-200 Cylinder

The FM-200 cylinder (Figure 3-108) is located in the Auxiliary Machinery Compartment and contains the FM-200 fire suppression agent. The cylinder is charged with approximately 30 lbs of agent which changes from a liquid to a gas when it is released. The cylinder is fitted with a lever/pressure operated control head.

H.2.b. Activation Stations

The activations stations are located at the:

1) Nitrogen cylinder in the pilothouse
2) FM-200 cylinder in the Auxiliary Machinery Compartment

The system is normally activated by removing the locking pin on the nitrogen pilot cylinder lever control head and pulling upon the lever. This releases the nitrogen into the discharge manifold. The system can also be activated from the FM-200 cylinder.
Figure 3-108
FM-200 Cylinder, Time Delay Cylinder and Pressure Switch
H.2.c. Nitrogen pilot cylinder

The nitrogen pilot cylinder is located in the Pilothouse behind the Coxswain’s seat on the forward face of the Engineer’s console. The pilot cylinder has a lever operated control head with a locking pin. The lever is manually activated by the crew (Figure 3-109) upon direction from the Coxswain.

![Figure 3-109: Nitrogen Pilot Cylinder](image)

H.2.d. Pressure switch

The pressure switch is a three-position, double-throw switch that is located in the Auxiliary Machinery Compartment. The switch can be automatically activated by nitrogen from the nitrogen pilot cylinder, or manually at the switch. When the switch is activated, the following occurs:

1) Both diesel engines shut down
2) Both Engine Compartment exhaust fans shut down

The pressure switch is manually reset by depressing the stem on top of the switch. The engine air intake flaps must be reset on the engines prior to restarting the engines.
There are three damper control valves in the FM-200 fire extinguishing system. The damper control valves are mounted on the Engine Compartment supply damper, Engine Compartment port exhaust damper, and Engine Compartment starboard exhaust damper to isolate air to the Engine Compartment. The damper control valve (Figure 3-110) holds the ventilation damper open with the damper cam assembly. The damper control valve can be actuated in two ways:

1) Automatic: the damper control valves are automatically actuated when the fixed fire extinguishing system is actuated.

2) Manual: the damper control valve is manually actuated with the pull ring (3) on the valve. When the ring is pulled, the plunger retracts into the valve body (1) and releases the damper cam assembly (3), closing the ventilation damper.

Each ventilation damper must be manually opened to reset the damper control valve.

Figure 3-110
Damper Control Valve
H.2.f. Nitrogen time delay cylinder

The nitrogen time delay cylinder (Figure 3-108) is located in the Auxiliary Machinery Compartment on the port side of the forward bulkhead. This cylinder is activated automatically when the nitrogen pilot cylinder is activated and provides a 30-second time delay before the FM-200 fire extinguishing system is activated. The 30-second delay allows for the following:

1) Evacuation of the Engine Compartment
2) Securing of equipment from the pilothouse
3) Closing of Engine Compartment access hatch
4) Engine Compartment exhaust fans to stop turning

H.2.g. FM-200 agent cylinder

The FM-200 agent cylinder (Figure 3-108) is located in the Auxiliary Machinery Space on the port side of the forward bulkhead and contains the FM-200 fire suppression agent. The cylinder is fitted with a lever/pressure operated control head. Fire suppression agent is released automatically with nitrogen pressure from the time delay cylinder. The agent can also be released manually using the lever on the cylinder control head.

H.3. Portable fire extinguishers

The RB-M is outfitted with four 5-lb portable dry chemical fire extinguishers. The fire extinguishers are mounted on a heavy duty bracket in the following locations:

1) Pilothouse (2)
2) Survivor’s Compartment (2)

The Pilothouse extinguishers are secured to the bulkhead behind the Engineer’s and crew seats. In the Survivors’ Compartment, one extinguisher is secured to the forward bulkhead and the other is secured to the head partition next to the starboard folding seats.

These portable dry chemical fire extinguishers are designed to be used on Class “A”, “B”, and “C” fires.

H.4. P-6 Pump

A P-6 pump is located at the stern, port side (Figure 3-111).
H.5. Fire fighting policy

Fire fighting is not a primary mission of the RB-M. Because of its limited capability, all fire fighting activities should be limited to only those in accordance with Section 4.4.2.2 of the U.S. Coast Guard Addendum to the United States National Search and Rescue Supplement (NSS) to the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR), COMDTINST M16130.2 (series). Section 4.4.2.2 states that Coast Guard personnel shall not engage in independent fire fighting operations except to save a life or in the early stages of a fire to prevent a significant threat without undue risk. It also states that for fire fighting activities involving commercial vessels and waterfront facilities, Coast Guard personnel shall not actively engage in fire fighting except in support of a regular fire fighting agency under the supervision of a qualified fire officer.

H.6. P-6 Pump

The RB-M is equipped with individual firefighting and dewatering standpipes located on the port side of the Lazarette Lazarette scuttle (Figure 3-111). Each standpipe is 2 ½ inch diameter aluminum alloy and is fitted with male cam-lock adapters. The standpipes also have dust caps to prevent debris from getting into the pipe when not in use.

Figure 3-111
Standpipe Connections
H.6.a. P-6 pump dewatering standpipe (top connection)

The dewatering standpipe is used in conjunction with the P-6 firefighting/dewatering pump for dewatering the Engine Compartment. The standpipe originates in the Engine Compartment bilge and has a suction strainer to prevent clogging of the standpipe when in use. The standpipe terminates at the main deck on the port side of the Lazarette scuttle.

H.6.b. P-6 pump firefighting standpipe (bottom connection)

The bottom standpipe connection is used in conjunction with the P-6 firefighting/dewatering pump to provide water for fighting fires. The standpipe draws water from the seachest located in the Lazarette.

H.7. Electric bilge pump system

The electric bilge pump system consists of six installed submersible bilge pumps for the purpose of dewatering spaces, as required. Each installed bilge pump and associated equipment is segregated from the other bilge pumps. There is no ability to cross-connect with another bilge pump to facilitate dewatering of a space. The electric bilge pump system consist of:

1) Submersible bilge pumps
2) Discharge hoses
3) Check valves
4) Alarm switches
5) Bilge alarm float switch

H.7.a. Electric bilge pump

Each bilge space has a fixed, submersible bilge pump (Figure 3-112). The bilge pumps are rated at 2000 GPH (33 GPM). The bilge pumps are located in the following spaces:

1) Forepeak.
2) Survivors’ Compartment.
3) Auxiliary Machinery Compartment (port).
4) Auxiliary Machinery Compartment (starboard).
5) Engine Compartment.
6) Lazarette.
Chapter 3 – Boat System

Each bilge pump discharges through a 1-inch neoprene hose that connects to an overboard discharge check valve, which is hard-piped to the hull above the waterline. The check valve prevents backflow through the pump and into the space.

The electric bilge pumps receive power from the 24P1 Vital Bus power distribution panel located at the Engineer’s console through switches located on the Engineer’s console.

**H.7.b. Bilge alarm float switch**

Bilge alarm float switches (Figure 3-112) are alarm-only float switches and are separate from the bilge pumps. The switch float rises with the fluid level in the space, sending a signal to the integrated alarm system when the float switch contacts close. When the float switch contacts close, the audible and visual alarms in the Pilothouse, and the alarm page on the Vector control/display alarm panel are activated.

An external alarm arming switch is located on the Coxswain’s upper console, next to the navigation light switch. When the switch is in the ARM position, the bilge float switch will also activate the law enforcement light and the boat’s loadhailer “yelp” feature.

The bilge alarm float switch receives power from the 24P1 Vital Bus on the power distribution panel at the Engineer’s console.

**Figure 3-112**
Bilge Pump and Float Switch
H.7.c. Bilge pump controls and indicators

The bilge pump controls and indicators are located in the Pilothouse at the Engineer’s console. Each pump has an “ON/OFF” toggle switch and a red “Pump Run” indicator.

The bilge pump controls and indicators receive power from the 24P1 Vital Bus on the power distribution panel at the Engineer’s console.

NOTE

Bilge pumps must be activated manually.
Section I. Communications/Navigation System

Introduction
All of the standard marine communications and navigation equipment is located in the Pilothouse, Survivors’ Compartment and Auxiliary Machinery Compartment.

I.1. Communications equipment
The communications equipment consists of the following:

1) Motorola XTL 5000 VHF-FM radio
2) Motorola XTL 5000 UHF-FM radio
3) Mobat Micom 3T HF-SSB radio
4) Taiyo TD-L1550 radio direction finder
5) Furuno LH-3000 loudhailer
6) Horn
7) LVIS crew communication system
8) Standard Horizon GX5500S Class D VHF-FM radio
9) Emergency Position Indicating Radio Beacon (EPIRB)
10) L-3 Protec-M (AIS)

I.1.a. Motorola XTL 5000 VHF-FM radio
The Motorola XTL 5000 VHF-FM radio is used for communicating on VHF-FM marine band frequencies. The VHF-FM radio (Figure 3-113) consists of:

1) Motorola XTL 5000 VHF-FM transceiver
2) Remote O5 control head
3) VHF-FM antenna
4) Hand microphone and speaker
I.1.a.1. VHF-FM transceiver

The VHF-FM transceiver is located in an electronics rack on the port side of the Auxiliary Machinery Compartment and is the interconnection point for:

1) Remote O5 control head
2) VHF-FM antenna
3) LVIS crew communication system

The VHF-FM transceiver receives 12 VDC input from the 12P1 12 VDC Main Panel on the power distribution panel at the Engineer’s console.

I.1.a.2. Remote O5 control head

The remote control head is located atop the Coxswain’s console on the outboard side. It is connected to the transceiver through a control cable and receives 12 VDC input from the 12P1 12 VDC Main Panel on the power distribution panel at the Engineer’s console.

I.1.a.3. VHF-FM antenna

The VHF-FM antenna is a 3 ½ FT heavy duty whip antenna. It is located on the starboard aft corner of the Pilot House top.
I.1.a.4. Hand microphone and speaker

The hand microphone and speaker are located in the Pilothouse. The microphone is mounted atop the Coxswain’s console inboard of the remote control head. The speaker is mounted directly forward of the Coxswain’s upper console.

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I.1.a.5. Operation

The VHF-FM Radio is used for off-boat communications and is integrated with the crew communication system.

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I.1.b. Motorola XTL 5000 UHF-FM radio

The Motorola XTL 5000 UHF-FM radio is used for communicating on UHF-FM marine band frequencies. The UHF-FM radio (Figure 3-114) consists of:

1) Motorola XTL 5000 UHF-FM transceiver
2) Remote O5 control head
3) UHF-FM antenna
4) Hand microphone and speaker

---

Figure 3-114
Motorola XTL 5000 UHF-FM Radio
I.1.b.1. UHF-FM transceiver

The UHF-FM transceiver is located in an electronics rack on the port side of the Auxiliary Machinery Compartment and is the interconnection point for:

1) Remote O5 control head
2) UHF-FM antenna
3) LVIS crew communication system

The UHF-FM transceiver receives power from the 12P1 12 VDC Main Panel on the power distribution panel at the Engineer’s console.

I.1.b.2. Remote O5 control head

The remote control head is located atop the navigator’s console on the outboard side. The remote control head is connected to the transceiver through a control cable and receives power from the 12P1 12 VDC Main Panel on the power distribution panel at the Engineer’s console.

I.1.b.3. UHF-FM Antenna

The UHF-FM antenna is an approximately 3 FT heavy duty whip antenna. It is located on the port side, middle of the Pilothouse top.

I.1.b.4. Hand microphone and speaker

The hand microphone and speaker are located in the Pilothouse. The microphone is mounted atop the navigator’s inboard of the remote control head. The speaker is mounted directly forward of the center console towards the port side.

I.1.b.5. Operation

The UHF-FM Radio is used for off-boat communications and is integrated with the Crew Communication System.

I.1.c. Mobat Micom 3T HF SSB radio

The Mobat Micom-3T HF SSB radio is used for communicating on HF marine band frequencies with stations or maritime vessels. The HF Radio (Figure 3-115) consists of:

1) Micom-3T transceiver
2) Micom-3 Remote 2W control head
3) Hand microphone and speaker
4) HF antenna tuner
5) HF antenna
6) DC-DC converter
7) KY-99A COMSEC (secure speech)
8) Handset and speaker
I.1.c.1. Micom-3T transceiver

The Micom-3T transceiver is located in an electronics rack on the port side of the Auxiliary Machinery Compartment and provides the interconnection point for:

1) Remote 2W control head
2) Antenna tuner
3) Secure communication system

The Micom 3T Transceiver receives 12 VDC input from the MOBAT DC-DC Converter for radio operations.
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.1.c.2. Micom-3 remote control head</td>
<td>The Micom-3 remote control head is located in the Pilothouse mounted on the outboard side of the navigator’s upper console. The remote control head provides the following features: 1) LCD for channel and frequency monitoring 2) Keyboard for programming/set-up functions 3) Hand microphone</td>
</tr>
<tr>
<td>I.1.c.3. HF antenna</td>
<td>The Micom HF SSB antenna is a HamStick whip antenna. It is located on the aft port corner of the Pilothouse top adjacent to the HF antenna tuner.</td>
</tr>
<tr>
<td>I.1.c.4. DC-DC converter</td>
<td>The Mobat Micom-3T HF SSB Radio DC-DC Converter is located in the Auxiliary Machinery Compartment and provides 12 VDC for the radio system components. The converter is mounted above the Micom-3T Transceiver. The DC-DC converter receives 24 VDC from the 24P3 Non-Vital Bus on the power distribution panel at the Engineer’s console. There is a local on/off switch located on the converter.</td>
</tr>
<tr>
<td>I.1.c.5. KY-99 COMCSEC secure speech</td>
<td>The MINTERM KY-99A COMSEC Secure Speech device is used with the Micom-3T HF SSB radio for a secure voice and data encryption. The KY-99 is located on the port bulkhead of the Survivors’ Compartment above the galley area.</td>
</tr>
<tr>
<td>I.1.c.6. Handset and speaker</td>
<td>The H250U military style handset and MRC/67A speaker are used with the Micom-3T and KY-99A for secure communications. The handset is located on the port side of the navigator’s console. The MRC/67A speaker is mounted to the overhead forward of the navigator’s upper console on the port side.</td>
</tr>
</tbody>
</table>
I.1.d. Taiyo TD-L-1550 VHF-FM automatic direction finder system

The TAIYO VHF-FM Automatic Direction Finder System monitors the VHF-FM band to provide direction information of radio signals. The system (Figure 3-116) consists of:

1) TAIYO Automatic Direction Finder
2) TAIYO Automatic Direction Finder speaker
3) Adcock ADF antenna

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**Figure 3-116**

VHF-FM Automatic Direction Finder System

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I.1.d.1. TAIYO ADF

The TAIYO ADF is located in the Pilothouse and displayed in the navigator’s upper console. The ADF monitors the VHF-FM band from 156.050 Mhz-162.475 Mhz, including the 121.5 Mhz AM Aeronautical Distress Frequency.

The TAIYO VHF-FM ADF receives 12 VDC from the 12P1 12 VDC Main Panel on the power distribution pane at the Engineer’s console.

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I.1.d.2. ADF Speaker

The ADF speaker is located in the Pilothouse on the forward side of the center console.
I.1.d.3. ADF Antenna

The Adcock ADF antenna is mounted at the top of the mast.

I.1.e. Furuno LH-3000 Loudhailer

The Furuno LH-3000 Loudhailer is a stand-alone audible communication system. It consists of the following (Figure 3-117):

1) Loudhailer
2) 30-watt speaker
3) Hand microphone

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**Figure 3-117**
Loudhailer
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.1.e.1. Loudhailer</td>
<td>The LH-3000 loudhailer receives 12 VDC input from the 12P1 12 VDC Main Panel on the power distribution pane at the Engineer’s console. The loudhailer is located in the Coxswain’s upper console below the RD-30 Display and is the interconnection point for: 1) Loudhailer speaker 2) Hand microphone 3) External Alarm Relay (EAR) The LH-3000 loudhailer has the following characteristics/capabilities: 1) LED indicators for equipment status 2) Backlit keypad for nighttime operations 3) Six automatic international hailer warning signals (UNWY, SAIL, TOW, STOP, ANCH, AGND) 4) Two manual hail warning signals (YELP and “ON/OFF”) When the boat is in-port and the external alarm switch is turned to ARM, the loudhailer provides external warning to the station personnel for fire/flooding alarms.</td>
</tr>
<tr>
<td>I.1.e.2. Loudhailer speaker</td>
<td>The loudhailer speaker is located on the Pilothouse top, centerline, forward of the radar.</td>
</tr>
<tr>
<td>I.1.e.3. Hand microphone</td>
<td>The microphone is mounted atop the Coxswain’s console, inboard.</td>
</tr>
<tr>
<td>I.1.f. Kahlenberg air horn</td>
<td>The Kahlenberg air horn system is an audible communication device used during all types of weather conditions to inform/warn other boats/ships of operating status. The system (Figure 3-118) consists of: 1) Air horn 2) Horn pushbutton switches (2) 3) Horn solenoid valve</td>
</tr>
<tr>
<td>I.1.f.1. Air horn</td>
<td>The air horn is mounted atop the Pilothouse, forward, port side. The air horn uses low pressure air from the compressed air system.</td>
</tr>
</tbody>
</table>
I.1.f.2. Horn pushbutton switches

The horn pushbutton switches are momentary activated switches used to operate the air horn. The switches are located in the Pilothouse at the Coxswain’s console and the navigator’s console below the FLIR controls.

When the switch is depressed, the horn solenoid valve opens to allow low pressure air to flow to the air horn.

The horn pushbutton switch receives 24 VDC from the 24P1 Vital Bus on the power distribution panel located at the Engineer’s console.

I.1.f.3. Horn solenoid valve

The horn solenoid valve is located in the Pilothouse overhead forward of the center console.
The LVIS crew communication system is an integrated hardwired and wireless communication system. The communication system (Figure 3-119) consists of the following:

1) Intercom control
2) TruLink access point
3) Crew connection ports
4) Portable transceivers
5) Headsets
### I.1.g.1. Intercom control

The LVIS intercom control is located on the port side of the Auxiliary Machinery Room and provides the interface for the crew connection points and the RB-M communication systems. The intercom control can be programmed locally or remotely at the crew connection ports.

The intercom control receives power from the 24P1 Vital Bus on the power distribution panel at the Engineer’s console.

### I.1.g.2. TruLink access point

The TruLink access point is located in the Auxiliary Machinery Space and is integrated with the intercom control to provide for hands-free, wireless communication. Wireless communication is accomplished through the use of portable transceivers and a wireless antenna.

### I.1.g.3. Crew connection port

The LVIS System has five crew connection ports located at the:

1. Coxswain’s seat
2. Navigator’s seat
3. Engineer’s seat
4. Crew seat
5. Survivor’s Compartment

Each connection port provides the following:

1. Hardwired access for crew headsets
2. Independent selection of receive/transmit capability over any of the interconnected radio systems programmed through the intercom control.
3. Charging of portable transceivers.
I.1.g.4. Portable transceiver

Boat comes equipped with three portable transceivers that can be used on any connection point. The portable transceiver provides the crew with wireless communications. The transceivers have programmable push-to-talk (PTT) or voice operated transmitter (VOX) operation, independent listen level control, and programmable options similar to the crew connection ports.

The portable transceiver receives a maintenance (trickle) charge when it is connected to a crew connection port. The Crew Comms breaker must be energized and portable transceivers must also be energized. When a portable transceiver requires a full charge it must be placed in an external support station for a minimum of 12 hours.

If a portable transceiver does encounter a low battery condition it must be reset using the following steps:
1) Remove Batteries from Transceiver.
2) Reinstall batteries in Transceiver
3) Place Transceiver into the external support station for a minimum of 12 hours.

I.1.h. Standard Horizon GX5500S VHF-FM radio telephone

The Standard Horizon GX5500S Class D VHF-FM radio telephone is a multi-use radio for general communications and safety-at-sea. The system (Figure 3-120) consists of:
1) GX5500S transceiver
2) Antenna
Figure 3-120
VHF-FM Radio Telephone
I.1.h.1. Transceiver

The GX5500S transceiver is flush-mounted in the navigator’s console above the chart plotter. The 25-watt transceiver provides for Class D digital selective calling (DSC) operations and a Channel 70 watch receiver. The transceiver is connected to a VHF-FM antenna to support various communication requirements. The GX5500S has the following features:

1) LCD display
2) Microphone
3) Internal speaker
4) Distress pushbutton
5) Keypad
6) Miscellaneous controls

The transceiver provides for instant access to Channel 16 from any channel by depressing the red 16/9 key. National Oceanic and Atmospheric Administration (NOAA) Weather channels can also be accessed immediately by pressing the WX key.

The GX5500S transceiver is interconnected with the GPS System and navigator’s console chart plotter to receive GPS data. Units must program radio with their MMSI number. The transceiver also interfaces with the crew communication system.

The GX5500S transceiver receives 12 VDC from the 12P1 12 VDC main panel of the power distribution panel at the Engineer’s console.

I.1.h.2. Antenna

The antenna is a 3 ½ FT heavy duty whip antenna located on the starboard side, middle of the Pilothouse top.

I.1.i. L-3 Protec-M AIS

The L-3 Protec-M AIS is located in the electronics rack on the port side of the Auxiliary Machinery Compartment. The AIS is integrated with the Furuno 1934C/NT to display AIS tracks. The AIS receives electronic data messages from AIS equipped ships with position, and course/speed data. The AIS has a dedicated GPS channel which, when activated, transmits the RB-M’s position and course/speed information. Power for the radio comes from the 24P3 Non-Vital Bus on the power distribution panel located at the Engineer’s console.
I.1.j. **EPIRB**

A 406 MHz electronic position indicating radio beacon (EPIRB) is located on the aft bulkhead of the pilothouse (Figure 3-121).

**NOTE**

Units are responsible for ensuring the EPIRB is properly registered with the National Oceanic and Atmospheric Administration (NOAA).

![Figure 3-121](image)

**EPIRB**
I.2. **Navigation system**

The RB-M utilizes a scalable integrated navigation system (SINS) built around the Furuno NavNet radar/chart plotter system. The SINS includes the following systems/equipment:

1) Furuno 1934C/NT radar/chart plotter system
2) Furuno RD30 remote display
3) Differential global positioning system (DGPS)
4) Ritchie Voyager magnetic compass
5) Furuno PG500R heading sensor
6) Depth sounder system
7) Furuno NAVPILOT-500 auto pilot system
8) FLIR Navigator forward looking infrared system (IR)
9) Ethernet hub

I.2.a. **Furuno 1934C/NT radar/plotter system**

The Furuno 1934C/NT radar chart plotter system provides radar information for 1934C/ navigation and mission planning. The radar/chart plotter system consists of:

1) RDP 149/NT chart plotter (3)
2) Furuno radar array and antenna unit

I.2.a.1. **RDP 149/NT chart plotter**

There are three RDP 149/NT chart plotters located in the Pilothouse. The chart plotters function as follows:

1) The chart plotter located on the inboard side of the navigator’s console functions as the master surface radar/chart plotter.
2) The chart plotter located on the outboard side of the Coxswain’s console ([Figure 3-122](#)) functions as a chart plotter. This chart plotter receives input from the Ethernet hub to display data. The chart plotter also provides output to the RD-30 Remote Display in the Coxswain’s upper console.
3) The chart plotter located on the outboard side of the Engineer’s console functions as a chart plotter. This chart plotter receives input from the Ethernet hub and the AIS.

Each chart plotter can receive video input from the FLIR camera through the video amplifier. The chart plotter in the Engineer’s console receives video input from the FLIR camera or Engine Compartment camera through a video selector switch on the Engineer’s console.
I.2.a.2. Furuno radar array and antenna unit

The Furuno radar array is a 3 ½ FT open array antenna and is mounted on the antenna unit. The array has a maximum range of 48 NM. The Furuno antenna unit contains a robust gearbox that rotates the radar array at 24 RPM and contains a 4 kW transceiver. The antenna unit is mounted on the Pilothouse top, forward of the mast.
There are two RD-30 remote displays located in the Pilothouse. The display utilizes a wide variety of navigation data and displays it in digital and analog (graphic) formats. The multi-display uses input from the depth sensor, radar, WAAS/DGPS receiver/antenna, and the PG-500R heading sensor to provide essential navigational information. The unit features a 4 ½ inch backlit LCD and has five user programmable displays. The RD-30 has ten conditions that can trigger audio and visual alarms:

1) Speed
2) Water temperature
3) Depth
4) Arrival/anchor watch
5) XTE
6) Trip distance (two alarms)
7) Countdown timer
8) Alarm clock
9) No position fixing
10) No position data

The RD-30 display is located in the center of the console above the loudhailer. The display receives data from the chart plotter display located in the Coxswain’s console. The Coxswain’s upper console RD-30 receives power from the 24P3 Non-Vital Bus on the power distribution panel at the Engineer’s console.

The RD-30 display (Figure 3-122) is located on the inboard side of the console above the autopilot controller. The display receives data from the chart plotter display located in the Coxswain’s console. The Coxswain’s console RD-30 receives power from the 24P1 Vital Bus on the power distribution panel at the Engineer’s console.

The RD-30 should not be used to display depth. If the transducer signal is lost the RD-30 will continue to display the last known depth for up to 90 seconds.
The GP-37 is an integrated GPS receiver and video plotter that can apply differential corrections from Wide Area Augmentation System (WAAS) and DGPS. The receiver can track up to 13 satellites (12 GPS, 1 WAAS) simultaneously. The GP-37 provides the following position accuracy:

1) GPS: 10 meters  
2) DGPS: 5 meters  
3) WAAS: 3 meters

The GP-37 DGPS consists (Figure 3-123) of the following:

1) GP-37 display/receiver unit  
2) GPA-019 antenna unit

The GP-37 DGPS receives power from the 24P1 Vital Bus on the power distribution panel at the Engineer’s console.

NOTE

WAAS is not currently approved for use by Coast Guard vessels. In the AUTO mode, the GP-37 runs with DGPS as the default setting. If the DGPS signal is lost for any reason, the WAAS mode is automatically selected.
I.2.c.1. GP-37 display/receiver unit

The GP-37 display/receiver is flush-mounted in the navigator’s upper console (Figure 3-124). The display/receiver unit has an LCD that provides various display modes:

1) Plotter
2) Steering
3) Speedometer
4) Highway
5) Two customizable displays

The GP-37 also has five available alarm functions and a man overboard (MOB) feature.

I.2.c.2. GPA-019 antenna unit

The GPA-019 antenna unit is mounted on the starboard side of the mast. A 33 FT cable provides interconnection to the GP-37 display/processor unit.

Figure 3-124
Navigator’s Upper Console
A Ritchie magnetic compass is mounted directly in front of the Coxswain at the Coxswain’s console. Built-in compensators are provided for compass deviation adjustments. A deviation table shall be developed, kept up to date annually, and posted in the Pilothouse. The dial is calibrated in $5^\circ$ increment markings. Lubber lines are provided at $45^\circ$.

The compass has a 24 volt light powered from the 24P3 Non-Vital Bus on the power distribution panel located at the Engineer’s console. On some of the earlier boats the brightness of the light is controlled via a switch on the Engineer’s console. There is an approved engineering change to isolate the dimmer for the compass light and locate it on the Coxswain’s console. This change will be retrofitted on the earlier boats.

The PG-500R heading sensor ([Figure 3-125](#)) is mounted horizontally, on the centerline, below the aft-most deckplate of the Survivors’ Compartment. The sensor detects terrestrial magnetism and produces heading data, which is utilized by navigation system components that need accurate and stable heading input. The heading accuracy of the sensor is $\pm 1^\circ$. The PG-500R provides an output signal to the following systems:

1) Furuno 1934C/NT radar/chart plotter system

2) Furuno NAVPILOT-500 auto pilot system

The heading sensor has a self-test that checks the circuit board and keys for proper operation. The heading sensor front panel has four LED indicators and three keys for monitoring and control during startup and operation.

The PG-500R heading sensor receives power from the 24P3 Non-Vital Bus on the power distribution panel at the Engineer’s console.
I.2.f. Depth sounder system

The depth sounder system provides the depth of the water under the boat keel for sounder use in the Navnet navigation system. The system consists of:

1) Furuno network sounder
2) Furuno 555-SLDT/20 depth transducer.

I.2.f.1. Network sounder

The Furuno network sounder is located on the aft bulkhead of the Auxiliary Machinery Compartment (Figure 3-126) and receives a signal input from the depth transducer. The network sounder processes this signal and sends the information to the Navnet Ethernet hub for distribution to the navigation system.

The network sounder receives power from the 24P1 Vital Bus on the power distribution panel at the Engineer’s console.
Figure 3-126
Network Sounder, Ethernet and Rollover Switch
I.2.f.2. Depth sensor

The Furuno 555-SLDT/20 thru-hull depth transducer is located in the Lazarette aft and port of the centerline. The element inside the transducer is tilted at a fixed 20 degrees, compensating for the deadrise of the RB-M hull. This aims the transducer beam straight toward the bottom, resulting in stronger echo returns for more accurate depth readings. The depth transducer provides input to the Network Sounder.

I.2.g. NAVPILOT-500 auto pilot system

The NAVPILOT-500 autopilot system is described in Section E, Hydraulic Steering System in this chapter.

I.2.h. Forward looking infrared (IR) system

The IR camera system is a powerful thermal imager used for maritime navigation, search and rescue, and security applications. It makes navigation safer by providing the following abilities, regardless of lighting conditions:

1) See in total darkness
2) See through light fog
3) See through light smoke
4) Identify obstructions, buoys, and other vessels at night

The IR system consists of:

1) navigator pan and tilt camera assembly
2) two remote joystick control units

The imagery from the camera is sent to the 1934C/NT radar/chart plotter system for viewing at the navigator’s console, Coxswain’s console, and Engineer’s console chart plotters.

The IR camera system receives power from the 24P1 Vital Bus on the power distribution panel at the Engineer’s console.

I.2.h.1. Pan and tilt camera assembly

The pan and tilt camera assembly is located on the port side of the mast, below the searchlight. The assembly allows 360° pan view and +/-45° tilt view (relative to the horizon).

The IR camera is fully automatic, requiring no adjustments by the operator.
I.2.h.2. Remote Joystick Control Unit

Remote joystick control units (JCU) are located at the Coxswain’s console (Figure 3-122) and at the navigator’s console. Each JCU has a joystick to manipulate camera position and a touchpad to control the following camera functions:

1) ON/OFF touchpad control: Energize/de-energize the IR system
2) SCENE touchpad control: Cycles through the four camera settings (night running, man overboard, day running, and night docking).
3) ZOOM touchpad control: Selects between 1X and 2X zoom setting.
4) B/W touchpad control: Cycles through the video image modes (black hot, white hot, or red hot).
5) HOME touchpad control: Returns the camera to the home position.

Both JCUs are active at the same time to control the camera.

I.2.i. Ethernet Hub

The Ethernet hub (Figure 3-124) is located in the Auxiliary Machinery Compartment on the aft bulkhead, centerline. The hub is a 6-port, ethernet switch that routes navigation network information between the depth sounder and the three radar/chart plotters.

The Ethernet hub receives power from the 12 VDC panel.
Section J. Weapons Mounting Stowage

Introduction

Various weapons and ammunition are located throughout the RB-M (Figure 3-127). These items consist of:

1) Pedestal Stand on the foredeck.
2) Weapons mount integral with the towing bitt on the aft deck
3) Ammunition Stowage in the Survivor’s Compartment
4) Weapons Locks/Mounts in the Pilothouse and Survivor’s Compartment

Figure 3-127
Weapons Mounting/Stowage
### J.1. Pedestal stand

The pedestal stand is a weapon tripod that is mounted on the bow of the RB-M forward of the Forepeak quick-acting watertight hatch (QAWTH). The tripod is used to mount MK16 MOD 8 pintle type weapon stand which in turn supports the M240B light machine gun for various missions. The pedestal stand is mounted to the deck with hex head screws, washers, and locknuts. A sealant, SIK 291BLK, is used between the stand feet and deck to prevent moisture from leaking into the Forepeak.

### J.2. Towing bitt stand

The top of the aft towing bitt is configured to accept the MK16 MOD 8 pintle type weapon stand which in turn supports the M240B light machine gun for various missions.

### J.3. Ammunition stowage

Ammunition for RB-M weapons is stored in the Survivors’ Compartment. The ammunition storage locker is located forward of the head, above the seats, on the starboard side of the compartment.

### J.4. Weapon locks/mounts

There are four weapons that can be securely stowed in gun locks on the RB-M. The Survivors’ Compartment has gun locks mounted to the hull above the port and starboard folding seats. These gun locks provide for secure stowage for the two M240B light machine guns. The Pilothouse has gun locks mounted on each side of the Pilothouse door. The port gun lock provides for secure stowage of the Remington 870 shotgun and the starboard gun lock provides for secure stowage of the M16 rifle. Each gun lock can be secured with a lock to maintain security of the weapons.
Section K. Corrosion Control

Introduction
Sacrificial anodes are installed on the RB-M’s waterjets, hull and engines to minimize the corrosion of the hull and components that are exposed to seawater.

A hull reference meter provides for monitoring of boat corrosion.

K.1. Waterjet anodes
The waterjets have 13 anodes mounted on different components to minimize corrosion. The anodes are located:

1) Reversing bucket (2)
2) Guide vane chamber (2)
3) Guide vane chamber to impeller housing interface (2)
4) Jet drive aft exterior housing (2)
5) Guide vane chamber behind rubber bearing end of shaft (1)
6) Reversing bucket rod (1)
7) Inside zinc anode hatch (1)
8) Zinc inspection hatch (1)
9) Interceptor (1)

Each one is bolted in-place to facilitate replacement when required.

K.2. Hull anodes
There are two hull mounted anodes; one on the port side and one on the starboard side of the transom. Each one is bolted to the hull to facilitate replacement when required.

K.3. Seachest anodes
There are two anodes mounted inside the sea chest.

K.4. Engine/reduction gear anodes
There are three anodes in each engine’s raw water system. The anodes are located:

1) raw water pump discharge line elbow
2) raw water pipe to reduction gear oil cooler
3) reduction gear oil cooler

Each one is threaded to facilitate replacement when required.
K.5. Hull reference meter

The hull reference meter is located on the Engineer’s console. The meter reading indicates the current flow between the water and the boat and is a measure of the amount of corrosion that is taking place. The meter indicates three protection level zones for the boat:

1) SAFE (Green): indicates sufficient anode protection, whether the boat is moored or underway.
2) UNDER (Red): indicates insufficient anode protection, requiring immediate attention and correction of the problem.
3) OVER (Red): indicates too much anode protection, requiring immediate attention and correction of the problem.

The meter has a reference cell located on the transom just outboard of the starboard water jet. The corrosion process generates the electricity required to operate the hull reference meter.
Section L. Potable Water System

Introduction

The RB-M has a portable 5 gallon water dispenser located in the galley section of the Survivors’ Compartment (Figure 3-128). The water dispenser is secured in-place on the galley counter with two tie-down straps and has a fast flow spigot. The water dispenser spigot is located over the sink.

Drain water flows directly overboard through a check valve.

Figure 3-128
Freshwater System
## Section M. Sanitary System

### Introduction
The RB-M has a Thetford Cassette Toilet Model 402C sanitation device located in the head, which is located in the Survivors’ Compartment. The sanitation device consists of the following:

1) Toilet  
2) Fresh water tank  
3) Waste cassette

### M.1. Toilet
The toilet is secured and sealed to the head deck with an inspection plate forward of the toilet to ensure bolts are tight and to inspect the bilge below the head. There is a control panel located on the outboard side of the toilet that provides for flush control and LED indication when the waste cassette is full. The electric flush pump is located within the toilet assembly.

The toilet receives power for flush and LED operation from the 12P1 12 VDC Main Panel on the power distribution panel located at the Engineer’s console.

### M.2. Fresh water tank
The toilet fresh water tank is integrated with the toilet and holds 3.96 gallons of water. The freshwater tank can be filled with a garden hose or bottled water.

### M.3. Waste cassette
The toilet has a portable waste cassette with wheels and extendable carrying handles and holds 5.28 gallons. The waste cassette is removed from the toilet through a small door under the Pilothouse access ladder ([Figure 3-129](#)). The waste cassette has an integrated waste pour-out-spout transfer waste into sewer cleanouts or commercial pump-out stations and a built-in vent button allowing splash free operations while emptying.
Figure 3-129
Head Cassette Access
Section N. Compressed Air System

Introduction

The Kahlenberg low pressure air compressor is an “on-demand” system for the operation of the air horn and the pneumatically operated pilothouse window seals. The compressed air system consists of the following:

1) air compressor
2) air receiver
3) pressure switch and relief valve
4) water separator
5) air filter.

All air compressor components are located in the Auxiliary Machinery Compartment and receive power from the 24P1 Vital Bus on the power distribution panel located at the Engineer’s console.

N.1. Air compressor

The air compressor (Figure 3-130) is a single stage, oil-free, reciprocating type air compressor driven by a 24 VDC motor. The compressor is rated at 0.62 CFM at 100 PSI. The air compressor has an air filter, pressure gauge, and an internal thermal disconnect switch to prevent the unit from damage in case the unit is operated beyond design limits.

NOTE

Secure power to the air compressor when the boat is unmanned. Failure to do so can cause premature failure of the air compressor due to excessive operation.
The air receiver receives compressed air through a flexible nylon hose and stores 257 cubic inches of low pressure air. The receiver is fitted with a drain valve to allow for the removal of condensation. Air flows from the receiver to the air horn or pneumatic window seals as needed through flexible nylon hoses.

A pressure switch mounted on the compressor senses outlet pressure to the air receiver and cycles the air compressor to meet system demand:
When air pressure drops below 100 PSI, the air compressor will start.
When air pressure reaches 125 PSI, the air compressor will stop.
A relief valve is also mounted on the compressor and lifts at 165 PSI to protect the air compressor and prevent over-pressurization of the air receiver and system hoses.
### N.4. Water separator
The water separator removes moisture from the compressed air. It contains a resin-impregnated element designed to remove 99% of moisture from the air. It has a normally closed auto drain valve that will open at 21.7 PSI.

The water separator is located in the Auxiliary Machinery Compartment, starboard side, forward of the compressor.

### N.5. Air filter
The air filter removes particulate matter from the compressed air 5 microns or larger to prevent clogging of the window seal and air horn components. The filter has a normally closed automatic drain valve that will open when pressure in the filter exceeds 14.5 PSI.

The air filter is located in the Auxiliary Machinery Compartment, starboard side forward of the compressor.
The air receiver receives compressed air through a flexible nylon hose and stores 257 cubic inches of low pressure air. The receiver is fitted with a drain valve to allow for the removal of condensation. Air flows from the receiver to the air horn or pneumatic window seals as needed through flexible nylon hoses.

N.3. Pressure switch and relief valve

A pressure switch mounted on the compressor senses outlet pressure to the air receiver and cycles the air compressor to meet system demand:
When air pressure drops below 100 PSI, the air compressor will start.
When air pressure reaches 125 PSI, the air compressor will stop.
A relief valve is also mounted on the compressor and lifts at 165 PSI to protect the air compressor and prevent over-pressurization of the air receiver and system hoses.
N.4. Water separator

The water separator removes moisture from the compressed air. It contains a resin-impregnated element designed to remove 99% of moisture from the air. It has a normally closed auto drain valve that will open at 21.7 PSI.

The water separator is located in the Auxiliary Machinery Compartment, starboard side, forward of the compressor.

N.5. Air filter

The air filter removes particulate matter from the compressed air 5 microns or larger to prevent clogging of the window seal and air horn components. The filter has a normally closed automatic drain valve that will open when pressure in the filter exceeds 14.5 PSI.

The air filter is located in the Auxiliary Machinery Compartment, starboard side forward of the compressor.
Chapter 4
Crew Requirements

Introduction
The U.S. Coast Guard Boat Operations and Training (BOAT) Manual Volume I, COMDTINST M16114.32 (series), and Boat Operations and Training (BOAT) Manual Volume II, COMDTINST M16114.33 (series) provide minimum standards and guidelines for competence on board the RB-M. Each crewmember should be familiar with the duties of the other crewmembers in addition to their own duties. It is important for a crewmember to know and commit to memory all-important characteristics of the boat and its equipment, and which procedures to follow in the event of a casualty. Each crewmember should mentally rehearse the procedures each member of the crew would follow during any operational casualty. Teamwork is the common thread that allows the crew to succeed. Whenever the opportunity is available, the crew should get the boat underway to practice operational and emergency procedures.

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</table>
## Section A. Minimum Crew

### Introduction
Units shall comply with the minimum boat crew requirements prescribed in the *U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume I*, COMDTINST M16114.32 (series).

### A.1. Certified crewmembers
All crewmembers shall meet the qualification requirements prescribed in the *U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume II*, COMDTINST M16114.33 (series).
Section B. Coxswain

Introduction
The U.S. Coast Guard places great trust in each Coxswain and his or her ability to accomplish the assigned missions in a safe and professional manner, even under adverse conditions. The position of Coxswain is one of high regard and great responsibility.

The Coxswain is responsible for the boat and its crew during every mission. The Coxswain assigns and directs all onboard functions during each operation.

B.1. Authority and responsibility
The extent of the authority and responsibility of the Coxswain is specified in United States Coast Guard Regulations 1992, COMDTINST M5000.3 (series) as follows:

“The Coxswain shall be responsible, in order of precedence, for the safety and conduct of passengers and crew; the safe operation and navigation of the boat assigned; and the completion of the sortie or mission(s) assigned or undertaken pursuant to USCG policy and regulations. An underway Coxswain will at all time respond within the limits of capabilities and legal authority to observed hazards to life or property, and violations of law or regulations.”

The Coxswain is the direct representative of the Commanding Officer (CO) or Officer-in-Charge (OIC) and, as such (subject to Articles 88-89 of the UCMJ), has the authority and responsibilities that are independent of rank or seniority in relation to other personnel embarked. The authority and responsibility of the Coxswain exist only when the boat is engaged on a specific sortie or mission.

B.2. Relief of responsibility
The only person embarked in the boat who may relieve the Coxswain of the responsibility as described above is:

The CO/OIC, Executive Officer (XO), or Executive Petty Officer (XPO).

A senior officer at the scene of a distress emergency or other abnormal situation who exercises authority under the provisions of USCG Regulations, whether or not other units are involved.
B.3. Operating in heavy weather

Heavy weather for the RB-M is determined to exist when seas exceed 8 FT or winds are greater than 30 KTS.

Operating in heavy weather without an experienced Coxswain can seriously jeopardize the safety of the boat, its crew and the mission.

Coxswains operating the RB-M in heavy weather conditions must be certified as a Heavy Weather Coxswain in accordance with the U.S Coast Guard Boat Operations and Training (BOAT) Manual, Volume I, COMDTINST M16114.32 (series) and U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume II, COMDTINST M16114.33 (series).

Only Coxswains at designated heavy weather units that have received RB-M specific heavy weather training and a written authorization from the Office of Boat Forces, Commandant (CG-731), are permitted to operate and/or train on the RB-M in heavy weather.

Operations in surf or breaking wave conditions, or when seas are greater than 12 FT or winds are greater than 50 KTS, are not authorized.

NOTE

During all risk assessment decision making processes, crewmembers, Coxswains, unit commands and all elements exercising operational control over a boat shall consider individual boat capability, crew assignments, and the nature of distress when assigning response units when heavy weather conditions exist or are likely to be encountered.
### Section C. Engineer

**Introduction**
The position of Engineer is one of great responsibility. The knowledge and skill of the Engineer can make the difference in completing the mission under adverse conditions.

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<th>The Engineer must be a certified crewmember prior to obtaining certification as an Engineer since this individual is required to perform duties in both capacities.</th>
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<th>C.2. Responsibilities</th>
<th>The primary responsibilities of this position include operational and underway maintenance of the propulsion and auxiliary systems.</th>
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<td>The Engineer may also serve as:</td>
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<td>a) Senior Crewmember</td>
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<td></td>
<td>b) Safety Observer</td>
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<td>c) Boarding Officer</td>
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<td>d) Line Handler</td>
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<td>e) Crewmember</td>
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<td>f) Surface Swimmer</td>
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<td>g) Emergency Medical Technician (EMT)</td>
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<tr>
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<td>or other such duties as may be assigned by the Coxswain in support of operational and training sorties or missions.</td>
</tr>
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</table>
### Section D. Boat Crew Members

**Introduction**
Under direct supervision of the Coxswain, the crewmember is responsible for line handling, acting as lookout or Boat Crew Member, maintaining a towing watch, and assisting the Coxswain as required during all evolutions or maneuvers.

**D.1. Certified Boat Crewmember**
The Boat Crew Member must be certified in accordance with the *U.S Coast Guard Boat Operations and Training (BOAT) Manual, Volume I, COMDTINST M16114.32 (series)* and *U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume II, COMDTINST M16114.33 (series).*

**D.2. Additional crewmembers**
Additional crewmembers are assigned by the Coxswain and certified by the CO/OIC based upon mission requirements.
Section E. Passengers and Survivors

Introduction

Since passengers and survivors may not have any boat or equipment knowledge, it is important they receive a basic safety boat brief prior to getting underway or soon after coming aboard. They should be provided with adequate safety or personal protective equipment (PPE) based on the mission or situation. At a minimum, each shall wear an appropriate personal flotation device (PFD). When riding alone or rescued from adverse conditions, each person should be safely protected through use of boat crew safety belts or the installed seatbelts of the Survivors’ Compartment seats.
Section F. Training

Introduction
Qualification, certification and assignment as a crewmember on a RB-M require considerable time, effort and practice. The individual must learn the characteristics of the boat and its missions, as well as the adverse conditions of the sea and the environment in which the boat operates. Each break-in crewmember must take the time to study his or her duties in addition to the duties of the other crewmembers since it may be necessary to perform any given duty in the event of an emergency.

F.1. Standards for qualification
The U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume II, COMDTINST M16114.33 (series) provides the standards for qualification as Coxswain, Heavy Weather Coxswain, Engineer, and Boat Crew Member aboard the RB-M.

F.2. Training underway
Where staffing permits, additional personnel may ride the boat in a training capacity to enhance their familiarity with the boat. To become and remain proficient as a crewmember on this or any boat, an individual must get underway and practice his or her skills repeatedly.
Section G. Safety Equipment

G.1. Personal protective equipment

During all RB-M operations, crewmembers shall wear personal protective equipment as required by the *Rescue and Survival Systems Manual*, COMDTINST M10470.10 (series) and the *Boat Crew Seamanship Manual*, COMDTINST M16114.5 (series) for clarification.

**NOTE**

The Coxswain is responsible for ensuring that all required personal safety equipment is worn, and worn correctly.

G.2. Protective equipment during heavy weather

In accordance with the *Heavy Weather Addendum* of the *Boat Crew Seamanship Manual*, COMDTINST M16114.5 (series), crews operating in heavy weather must be properly equipped, as follows:

1) Required hypothermia protective clothing
2) Helmet (helmet strap must be secured and adjusted properly)
3) Survival vest and equipment
4) Waterproof footwear and boots should be worn
5) Eye protection may be necessary for visibility, particularly for persons wearing glasses, and will also protect against glass shards should a window be broken
6) Boat crew safety belt must be worn and adjusted correctly
7) Personal seat belt must be worn when in a seat
8) A GAR Model shall be conducted by the crew prior to launch including examination of all PPE for functionality and fit.

The Coxswain is responsible for ensuring that all required equipment is worn, and worn correctly.
G.3. Seat belts and helmets

Since the RB-M carries out a wide array of missions in an ever changing environment, the decision of when to wear seat belts and helmets, except as noted above for heavy weather, remains at the unit level. Commanding Officers and Officers in Charge shall routinely discuss seat belt and helmet use with their crews and establish unit policy. Sector Ready For Operations (RFO) teams shall ensure units have adequate seat belt and helmet policies in place. Prior to getting underway, as well as throughout the mission, boat crews shall continuously assess risks in accordance with Team Coordination Training, COMDTINST 1541.1 (series) and Operational Risk Management, COMDTINST 3500.3 (series). During these assessments the crew should consider whether or not seat belts and/or helmets should be worn. Factors for the crew to consider include: sea state, time of day, mission, and anticipated boat speed and maneuvering.

As always, the coxswain is ultimately responsible and accountable for the safety of the crew and the boat, as well as the mission. Adherence to seat belt and/or helmet policies and safe boat operations are expected at all times.

Crews are encouraged to “buckle up” regardless of the speed, sea state, or mission. Groundings, collisions, and the need to make sudden, unannounced maneuvers can occur at any time. Using seat belts is your best defense from injury. Wearing seat belts at all times is a good habit to learn and practice.

No single piece of Personal Protective Equipment (PPE) will completely eliminate the risk of personnel injury. A combination of PPE and prudent, responsible boat handling is required to prevent injury. Seat belts, helmets, and other PPE work only to reduce injury. The best way to prevent injuries is to operate the boat responsibly and follow the operational risk management process.

G.4. Waivers

In accordance with the Rescue and Survival Systems Manual, COMDTINST M10470.10 (series), COs/OICs, on a single mission basis only, may waive the requirement for wearing a hypothermia protective device only after a determination that the risk associated with crew performance degradation, thermal stress, and environmental considerations are offset by the benefits associated with the waiver.
Chapter 5
Operational Guidelines

Introduction
This chapter describes how to use the RB-M in the safest and most efficient manner. These policies and performance criteria should be used as guidelines for RB-M operations. Within these guidelines, consider local operating conditions, district regulations, and the skill of the crew to determine how the RB-M’s capability is to be used. These factors must be considered prior to each sortie or mission.

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Section A. Operating Parameters

Introduction

The readiness of the RB-M shall be continuously monitored to ensure that the boat is capable of unrestricted operations. This monitoring is accomplished through a variety of formal and informal inspection programs including daily boat checks, the boat PMS schedule, annual engineering inspections, Ready For Operations (RFO) evaluations, and STAN Team Assessments. Whenever a discrepancy is noted during any of these inspection programs, it must be classified and acted upon based on the following standards.

A.1. Disabling casualties

Disabling casualties are those which make the RB-M not mission capable. Appendix D contains a listing of disabling casualties.

A.1.a. Actions (underway)

In the event the RB-M sustains a disabling casualty while underway, the boat shall immediately return to the nearest safe mooring, if able, and immediately be placed into “Charlie” status. In many cases, the RB-M will require assistance from another boat.

A.1.b. Actions (dockside)

If a disabling casualty is identified while the RB-M is moored, the boat is not authorized to get underway until the casualty is corrected. The boat shall immediately be placed into “Charlie” status and repaired. Dockside materiel inspections may continue after discovery of a disabling casualty, but the RB-M shall not get underway for full power trial or underway exercises until all disabling casualties are fully repaired.

NOTE

Operational Commanders may authorize, in writing, the movement of the RB-M for short distances under its own power only to facilitate haul-outs or corrective maintenance. This authority may be delegated, but must remain higher than the unit CO/OIC.
A.1.c. Reports

Disabling casualties shall be reported to the Operational Commander by the most expeditious means, followed up by a boat status message as soon as possible, but no later than 12 hours after the casualty is discovered. Casualties shall be reported and corrected in accordance with the Small Boat Product Line (SBPL) Process Guide, CGTO PG-85-00-360-S. Operational Commanders are responsible for monitoring the status of repairs to disabling casualties.

A.2. Restrictive discrepancies

Restrictive discrepancies are those which restrict the operations of the RB-M such that it can perform some missions, but not all missions safely. RB-Ms with restrictive discrepancies shall only be operated if the Operational Commander has issued a written waiver. A verbal waiver is authorized as long as it is followed with a written waiver within 4 hours. The ultimate authority for RB-M waivers resides with the Sector or Group/Air Station Commander, but may be delegated to the Response/Operations Department Head.

Appendix E contains a listing of restrictive discrepancies.

NOTE

A written waiver may be a letter, memorandum, e-mail, or record message traffic. The written waiver shall: (1) identify the specific discrepancy which is waived, (2) describe the conditions under which the RB-M may be operated, and (3) concur on the measures to be taken to lessen or negate the hazard posed by the discrepancy. Written waivers shall be maintained as an annotation to Part 3 of the RB-M record.

A.2.a. Actions (underway)

In the event the RB-M sustains a restrictive discrepancy while underway, the Coxswain shall immediately notify the parent unit with all pertinent information and a recommendation whether to continue or abort the mission. The parent unit shall pass along the information pertaining to the casualty, the current mission, and recommendations to the Operational Commander who shall immediately notify the unit as to whether or not continuing the mission is authorized, the conditions under which the RB-M may be operated, and precautions to be taken to lessen the hazards posed by the discrepancy.

A.2.b. Actions (dockside)

The RB-M shall not get underway until the discrepancy is corrected or a waiver has been received. Dockside materiel inspections may continue after discovery of a restrictive discrepancy, but the RB-M shall not get underway for full power trial or underway exercises until all restrictive discrepancies are fully repaired or have been waived by the Operational Commander.
A.2.c. Reports

Restrictive discrepancies shall be reported to the Operational Commander if the discrepancy cannot be repaired within 1 hour. Casualties shall be reported and corrected in accordance with the Small Boat Product Line (SBPL) Process Guide, CGTO PG-85-00-360-S. Operational Commanders are responsible for monitoring the status of repairs to all restrictive discrepancies.

A.3. Major discrepancies

Major discrepancies are those that degrade the effectiveness of the boat to perform one or more missions. The occurrence of major discrepancies shall be documented, and a plan to correct these discrepancies shall be formulated and carried out by the unit. Operational Commanders are responsible for monitoring the status of the repairs to major discrepancies. It is suggested that, in conjunction with unit materiel inspections, Operational Commanders receive monthly reports as to the status of correction of major discrepancies.

Appendix E contains a listing of major discrepancies.

A.4. Minor discrepancies

Minor discrepancies do not affect the operational readiness of the boat. However, a boat with minor discrepancies does not meet the standardization criteria as established for that boat. The occurrence and repair of minor discrepancies shall be documented and monitored at the station/unit level.

In the event that the addition of portable equipment, not part of the standard boat outfit, is necessary to meet mission needs, units are authorized to temporarily carry this extra equipment. This authorization is on a case by case basis only, and care must be taken to properly secure any extra gear and to ensure it does not interfere with safe egress or the boat’s standard outfit/systems. Under no circumstances shall permanent alterations be made to power, stow, or in any way accommodate extra equipment.
Chapter 5 – Operational Guidelines

A.5. Environmental limits

The RB-M is built to operate safely under heavy weather conditions within its design limits which are:

1) 12 FT seas
2) 50 KTS sustained winds
3) 50 NM offshore
4) 100 displacement tons tow load

Operations in surf or breaking wave conditions, or when seas are greater than 12 FT or winds are greater than 50 KTS, are not authorized.

NOTE

These limits may be exceeded by approval of the operational commander ONLY after appropriate risk assessment for the situation at hand is made. On-scene conditions provided by the On-Scene Commander and RB-M Coxswain must be considered in the risk assessment process. The Coxswain retains the final on-scene decision as to whether or not an action may be safely executed.

A.6. Additional stability limits

Certain stability criteria were established so that the RB-M is capable of self-righting under adverse conditions.

Self-righting requires that all cabin windows, all hatches, and all doors be closed and secured watertight and that the window seals be inflated.

In an extreme mass casualty situation in adverse weather (upper end of operating limitations), the boat may carry up to 24 persons onboard within the limits of these stability criteria. These persons shall be distributed as evenly as possible throughout the length of the Pilothouse and Survivors’ Compartment, towards the centerline.

The RB-M has enough reserve buoyancy, stability and compartment watertight integrity to withstand flooding of any single main compartment.
A.7. Visibility

Coxswains and boat crew members must constantly remain aware of potential visibility limitations when operating Coast Guard boats. All seated or standing positions may be restricted by a cabin structure, console design, appendages such as handrails and gun mounts, or glare from electronics equipment. Visibility may be restricted when a boat is transitioning between displacement and planing mode or during turns when inboard heel may restrict visibility to the sides.

Environmental conditions such as rain, snow, sleet, fog and on-shore background lighting may also obscure visibility. Safe speed MUST be considered at all times. The Coxswain is ultimately responsible for properly assigning lookouts and ensuring that visibility limitations are taken into account during operations. Crewmembers are responsible for assisting in safe navigation by acting as lookouts at all times, unless specifically directed otherwise by the Coxswain.
Section B. Performance Data

B.1. Fuel consumption

The RB-M is capable of operating a maximum of 250 NM at 30 KTS with a normal load (full load of fuel, liquids in machinery at normal levels, crew of four). Fuel consumption at 2300 RPM (engine rated speed) is 44 GPH per engine.

Fuel consumption and operating range are affected by engine tuning, weather conditions, trim, type of evolution (towing, searching, etc.) and operating area (e.g. shallow water increases resistance, decreases range).

Figure 5-1 and Figure 5-2 shows typical fuel consumption at full load condition with no tow in calm weather conditions. Figure 5-3 and Figure 5-4 shows the operating range of the RB-M at various speeds.

CAUTION!

Acceptable fuel types for the RB-M engines are Diesel 1-D, 2-D (ASTM D 975-09 Compliant). JP5 fuel is not authorized for use in the RB-M engines. Failure to adhere to this caution can result in equipment damage.
Chapter 5 – Operational Guidelines

**Figure 5-1**
Fuel Consumption vs. Speed

**Figure 5-2**
Fuel Consumption vs. RPM
Figure 5-3
Range vs. Speed

Figure 5-4
Range vs. RPM
WARNING

The Coxswain is responsible for ensuring that all required personal safety equipment is worn, and worn correctly.

B.2. Seakeeping

Figure 5-5 shows the operating envelope of the boat as a function of sea height (head seas) and wind speed. Proper positioning of the boat with respect to the wind, seas, and other craft is essential to prevent injuries to the crew or damage to the hull and equipment.

The operating envelope represents “typical” wave conditions. Coxswains are responsible for adjusting speed to ensure safety.

When using Figure 5-5, first determine the sea height along the bottom axis and then read up vertically to determine the limits on operating speed.

For example when operating in “typical” seas with a significant wave height of 5 feet, speeds up to 12 knots are in the “Safe Zone” where there is minimal possibility of injuries to the crew or damage to the hull and equipment. Speeds from 12 knots to 25 knots are in the “Caution Zone” where there is an increasing risk of injury to the crew or damage to the hull and equipment. Speeds in excess of 25 knots should not be attempted as this would be in the “Unsafe Zone” where injury to the crew or damage to the hull and equipment is almost certain.
Chapter 5 – Operational Guidelines

Figure 5-5
Operating Envelope vs. Speed
CAUTION!

Use extreme care when operating in marinas; jet wash can push other boats, causing damage

B.3. Turning

Turning radius is affected internally by the boat’s speed, waterjet thrust angle interceptor positioning and hull design, and externally by wind, current and wave action. The RB-M will maintain a steady turn rate without skidding at all speeds and loading conditions. The boat will heel into the turn throughout the turns. The boat responds well to steering command and will exit a turn without the need for excessive tiller movement.

Figure 5-6 contains a tabulation of turn data taken during boat trials. Turn diameters using 50% and 100% helm to port and starboard are shown for various speeds, with interceptors retracted. On trials, the 45 FT RB-M in a full power, 100% helm turn with interceptors extended had a turn diameter of approximately 40 feet.

AVERAGE TURNING DIAMETER vs SPEED

Figure 5-6
Turning Characteristics
B.4. Stability

The RB-M is self-righting in all loading conditions, with or without the fendering. Positive righting arms are present at all values of heel from 0 to 180°.

**NOTE**

Do not use rapid accelerations from dead-in-the-water (DIW) to full speed except when necessary. This conserves fuel and helps prolong engine life.

**NOTE**

At speeds of 30 knots or greater, crew restraints are required to be used in accordance with the *U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume III, COMDTINST M114.32 (series).*

B.5. Speed

The RB-M can attain speeds in excess of 40 KTS in calm water. This top speed is intended as a “sprint speed”. The boat was designed based on an operating profile that limits high speed operation to 15% of the operating time. 85% of the time, the boat is assumed to operate at a cruising speed of 30 KTS or less.

Speeds in excess of 30 KTS shall ONLY be used for missions where high speed is absolutely necessary, such as SAR missions involving the potential loss of life and MLE / PWCS missions requiring the high speed interception of targets of interest.

Speeds in excess of 30 KTS may be used in training, but shall not constitute more than 15% of the training time, and the following cautionary provisions apply:

1) High speed operations increase the risk of injury to the crew and increase the risk of collision with other vessels, collision with objects and running aground.

2) Extended high speed operations will increase the loads on the boat and its equipment reducing the service life and resulting in increased maintenance and repair.

3) When operating at high speeds, the Coxswain’s ability to focus on the helm and throttle controls of the RB-M is critical. Maximum use shall be made of the headset crew communications system, multiple navigation displays and teamwork to maintain this focus.

4) Crewmembers shall remain in a secure position during high speed operations using the shock-mitigating seats and the seatbelts provided.

5) No one should move about the boat during high speed operations without first notifying the Coxswain and allowing the Coxswain to slow the boat to a speed that will reduce the risk to the crew.
6) Passengers may not be familiar with the requirements to secure themselves during high speed operations and the motions of the boat during these operations may be unpredictable and violent. High speed operations with passengers onboard should be avoided if possible.

7) Both the AIS system and the DDEC systems can be used to verify that crews comply with speed restrictions.

CAUTION!

Use a “emergency stop” only when absolutely necessary. A waterjet boat stops very rapidly. Severe injury is possible even to personnel who are wearing seat belts or otherwise warned and braced for the stop. Emergency stops place significant strain on the propulsion equipment.

B.6. Deceleration

The design of the RB-M allows it to move swiftly through the water when up on plane. When power is taken off the boat, it will settle rapidly and stop relatively quickly. Use of the waterjet buckets to create reverse thrust will stop the boat very quickly. In an extreme situation, the boat can be stopped rapidly by reversing the throttles from full ahead to full astern. This “emergency stop” deceleration will cause the bow to dive, the stern to rise, and bring the boat to a stop in approximately 1½ boat lengths.
Chapter 6
Mission Performance

Introduction

The actions and techniques described in this chapter are products of field experience. They are intended to give crewmembers information on how the RB-M performs and reacts in various mission scenarios. The information is not intended to provide the “only way” to perform an action or complete a mission. Boat crews should use effective communications and teamwork skills along with this general information to adapt their actions to each unique mission scenario.

Information in this section alone does not qualify a crewmember. Observe these procedures and apply skills developed through practice to effectively use the RB-M to perform missions.

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Section A. Starting Procedures

A.1. Pre-start

The following procedures must be followed before starting a cold engine and should be repeated before each mission. A copy of the starting procedures shall be posted at both operating stations.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Open port &amp; starboard engine raw water valves in the Lazarette.</td>
</tr>
<tr>
<td>2</td>
<td>Check raw water strainers for cleanliness. Ensure the sea strainer handle is selected to one side.</td>
</tr>
<tr>
<td>3</td>
<td>Open the air conditioner raw water valve (when required). Check the raw water strainer for cleanliness.</td>
</tr>
<tr>
<td>4</td>
<td>Check the security of water jet linkages and electrical connections</td>
</tr>
<tr>
<td>5</td>
<td>Check the engine block heaters; the engines should be warm to the touch with the back of the hand.</td>
</tr>
<tr>
<td>6</td>
<td>Ensure all bilges are clean, dry and free of unsecured equipment or materials. Clean and dewater as necessary.</td>
</tr>
</tbody>
</table>
| 7    | Check the following fluid levels:  
  - Engine oil level between the low and high marks.  
  - Marine reduction gear oil level between the low and full marks. The level must be checked again after the engine has run several minutes at idle speed.  
  - Water jet bearing housing oil level between the Low and Full marks.  
  - Engine coolant filled half-way on the sight glass of the recovery tank.  
  - Hydraulic fluid reservoir filled to Full mark on the sight glass. |
<p>| 8    | Check hydraulic system components for leaks, security and condition. |</p>
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| 9    | Inspect both engines (inboard, outboard, forward and aft) to ensure all external moving parts are clear of obstructions prior to starting the engines. Check the following engine systems for leaks, component condition, and security:  
  a) Fuel  
  b) Lubrication  
  c) Raw water  
  d) Electrical  
  e) AC Generator  
  f) Hydraulic  
  g) Air intake  
  h) Jacket Water  
  i) Exhaust |
| 10   | Ensure the port and starboard fuel tank suction valves are in the “OPEN” position. |
| 11   | Press any key or switch on the loudhailer other than the AUX or DIM key to disable the external alarm. |
| 12   | Place the external alarm switch on the Coxswain’s upper console to the “OFF” position. |
| 13   | Place the following switches on the AC Power Island in the positions indicated below:  
  a) Rotary switch on AC BUS1, 240 VAC Selection Power Panel, “OFF”.  
  b) Rotary switch AC BUS2, 240 VAC Selection Power Panel, “OFF”. |
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| 14   | Place the following switches on the Engineer’s console in the positions indicated below:  
   a) Port and STBD AURAGEN™ generator control panel switches "OFF"  
   b) Engine room exhaust fan switch “AUTO”  
   c) BATT START switch and the "BATT HOUSE” switch “ON”  
   d) Automatic Changeover Relay (ACR) switch “AUTO” |
| 15   | Place the following breakers located in the Auxiliary Machinery Compartment in the position indicated:  
   Forward bhd, starboard side:  
   a) Circuit Breaker 24B1-3 Battery DB, “ON”.  
   b) Circuit Breaker 24B1-3A Battery DB, “ON”.  
   c) Circuit Breaker 24B1-3B Battery DB, “ON”.  
   d) Aft bhd, starboard side, Vector 24 VDC Distribution Panel:  
   e) Circuit Breaker VP-2 Vector Control Unit, “ON”.  
   f) Circuit Breaker VP-3 Clutch Panel 1, “ON”.  
   g) Circuit Breaker VP-4 DISP/ALM PNL, “ON”.  
   h) Circuit Breaker VP-5 Roll Over SW, “ON”. |
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Place the following breakers on the DC Power Distribution panel at the Engineer’s console in the position indicated:</td>
</tr>
<tr>
<td></td>
<td>a) 24 VDC Vital Bus:</td>
</tr>
<tr>
<td></td>
<td>b) Circuit Breaker Main, “ON”.</td>
</tr>
<tr>
<td></td>
<td>c) Circuit Breaker CB1 Engine Secondary, “ON”.</td>
</tr>
<tr>
<td></td>
<td>d) Circuit Breaker CB3 Alarm PLC, “ON”</td>
</tr>
<tr>
<td></td>
<td>e) 24 VDC Engine Bus:</td>
</tr>
<tr>
<td></td>
<td>f) Circuit Breaker Main, “ON”.</td>
</tr>
<tr>
<td></td>
<td>g) Circuit Breaker CB1 E/R Exhaust Fans, “ON”.</td>
</tr>
<tr>
<td></td>
<td>h) Circuit Breaker CB2 Engine Primary, “ON”.</td>
</tr>
<tr>
<td></td>
<td>i) Circuit Breaker CB3 Water Jet Controls, “ON”.</td>
</tr>
</tbody>
</table>
A.2. Engine Starting

The following procedures must be followed for starting the engines:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Place the joystick levers at both stations in their full ahead position and tillers are in their center detent positions.</td>
</tr>
<tr>
<td>2</td>
<td>Switch the &quot;Docking/Transit&quot; switch at both Navigator and Coxswain stations to Docking.</td>
</tr>
<tr>
<td><strong>NOTE</strong></td>
<td>If the main engine start buttons are momentary pressed (approximately 1 second), the engine will not start. Only the electronic display modules (EDM) will energize.</td>
</tr>
<tr>
<td><strong>CAUTION!</strong></td>
<td>To prevent damage and overheating of the starter, if the engine does not start within 15 seconds, release the starter button and allow starter to cool for at least 15 seconds. Attempt restart after 15 seconds. If engine fails to start on fourth attempt, an inspection should be made to determine the cause.</td>
</tr>
<tr>
<td><strong>CAUTION!</strong></td>
<td>If engine oil pressure is not achieved within 10 seconds, secure engine and check lube oil system. If an oil pressure alarm is displayed, immediately secure engine and investigate. Do not increase engine RPM until the oil pressure gauge indicates normal.</td>
</tr>
<tr>
<td>3</td>
<td>Depress and hold the “engine start” button until the engine starts (approximately three seconds). Check for adequate lube oil pressure (30 PSI or higher) on the EDM after the main engine has started. Normal oil pressure is approximately 45 PSI.</td>
</tr>
<tr>
<td>4</td>
<td>Repeat the previous step for the second engine.</td>
</tr>
<tr>
<td><strong>CAUTION!</strong></td>
<td>If raw water overboard discharge is not present 30 seconds after starting engine, secure engine and check the raw water system.</td>
</tr>
<tr>
<td>5</td>
<td>Ensure raw water flow through the engines by observing overboard discharge.</td>
</tr>
</tbody>
</table>
**Step** | **Action**
---|---
**CAUTION !** | Run engines at idle for five minutes before applying a load.

6 | Check the following engine systems for leaks and security of components:
   a) Fuel  
   b) Lubrication  
   c) Raw Water  
   d) Hydraulic  
   e) Jacket Water  
   f) Exhaust

7 | Check proper operation of the EDMs at the Coxswain’s upper console and Engineer’s console for both main engines.
   a) Main engine lube oil pressure: greater than 41 PSI at idle.
   b) Reduction gear lube oil pressure: 15 PSI.
   c) Main engine jacket water temperature: 130° - 150° F.
   d) Main engine idle speed: 650 RPM±10 RPM.
A.3. Energizing equipment

Complete the following steps prior to getting underway:

The Auragen system does not need to be energized prior to getting underway unless you require AC power.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| 1    | Ensure the following switches on the Engineer’s console are placed in the positions indicated below:  
      a) Port Generator control panel (port AuraGen™), AC Control Switch, "ON".  
      b) Starboard Generator control panel (starboard AuraGen™) AC Control Switch, "ON". |
| 2    | Ensure the following indications on the Generator control panels are illuminated as follows:  
      BATT Indicator: YELLOW or GREEN (YELLOW indicates the batteries are charging and GREEN indicates the batteries are fully charged).  
      a) GEN Indicator: GREEN.  
      b) CHG Indicator: GREEN.  
      c) AC Indicator: Flashing GREEN for 15-35 seconds, then steady GREEN. |
| 3    | Ensure the following switches/breakers on the AC Power Island are placed in the positions indicated below:  
      a) 240 VAC Selection Panels:  
      i. Rotary switch AC BUS 1, “GENERATOR 1".  
      ii. Rotary switch AC BUS 2, "GENERATOR 2".  
      b) AC BUS 1: Circuit Breaker MAIN "ON".  
      c) AC BUS 2: Circuit Breaker MAIN, "ON".  
      d) Check the AC Volt Meters to ensure port and starboard AuraGen™ units are generating approximately 120 volts. |
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| 4    | Ensure the following indicators are illuminated on the AC Power Island 240 VAC Selection Panels:  
      a) AC BUS 1, GENERATOR 1 "POWER AVAILABLE".  
      b) AC BUS 2, GENERATOR 2 "POWER AVAILABLE". |
| 5    | Depress the ground fault meter test switch on the AC Power Island and ensure the meter reads zero. If a ground fault exists, determine the cause. |
| 6    | Energize all equipment circuit breakers on the DC power distribution panel at the Engineer’s console. |
| 7    | Test heaters and defrosters. |
| 8    | When engines have warmed up and with the joystick levers in central detent position, press the joystick activation button on the joystick panel twice. The button will illuminate confirming control. |
| 9    | Test both joysticks and tillers by transferring control. |
| 10   | Test marine gear ENGAGE and BACKFLUSH switches at idle. Push and hold backflush first and observe pressure increase on the EDM, prior to clutching in. Verify that indicator lights are on in the engaged positions and flashing in the disengaged positions. |

**CAUTION !** Both engine clutches must be disengaged prior to testing the joystick and tiller operation.

**NOTE ☝** Joystick control will not transfer unless the tiller positions at both stations are within 10% of one another. A flashing light on the button indicates the joysticks or tillers are not in alignment.

**NOTE ☝** Marine gear engagement will not take place unless the buckets are at zero thrust. A flashing light on the ENGAGE switch indicates the marine gears may be engaged. Backflush will not take place with the joystick positioned for forward motion.
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Check the Vector and engine display panels at both helm positions. Verify that joystick and tiller movements display correctly.</td>
</tr>
<tr>
<td>12</td>
<td>Test forward and astern propulsion at the Coxswain’s position by moving the joystick forward and aft slightly in both the TRANSIT and DOCKING modes. Transfer control and repeat at the navigator’s position.</td>
</tr>
</tbody>
</table>
| 13   | Energize and check all electronics equipment.  
  a) Energize all radios  
  b) Energize the SINS in the following order:  
    GP-37 DGPS  
    RDP-149 radar/chart plotter (lower Navigator’s console)  
    Autopilot (lower Coxswain’s console)  
    RD-30 Remote Display (lower Coxswain’s console)  
    RD-149 Chart Plotter (lower Coxswain’s console)  
    RD-30 Remote Display (upper Coxswain’s console)  
    RDP-149 Chart Plotter (primary Engineer’s console)  
  c) Energize AIS  
  d) Energize Crew Communication System |
| 14   | Check the following electrical equipment for proper operation:  
  a) Navigation lights (all positions)  
  b) Law Enforcement Lights  
  c) Flood lights  
  d) Searchlight  
  e) All Interior lights  
  f) Instrument lights  
  g) Chart Table light  
  h) Low Level lights  
  i) Horn  
  j) Windshield wipers and Washer Fluid Pump |
| 15   | Ensure gear is properly stowed and watertight integrity is set. |
| 16   | Inform Coxswain on the status of all engineering and electronic systems and if the boat is ready to get underway. |
Section B. Underway

**Introduction**

After getting underway, observe all appropriate display panels. If an abnormal condition develops, take corrective action to prevent further damage. Refer to the Casualty Control section of this handbook, the Boat Engineer Qualification Guide in the *U.S. Coast Guard Boat Operations and Training (BOAT) Manual Volume II*, COMDTINST M16114.33 (series), or the appropriate manufacturer’s technical publication.

**B.1. Personal protective gear**

Always observe requirements of this handbook, the *U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume I*, COMDTINST M16114.32 (series), and the *Rescue and Survival Systems Manual*, COMSTINST M10470.10 (series) for wearing protective clothing, PFD, and boat crew survival vests.

**B.2. Communication**

Crew communications and coordination is the key to safe operations. Crewmembers should inform the Coxswain of their location when moving about the deck. Engine noise can make crew communications difficult; speak loudly and clearly, repeating as necessary until acknowledged.

---

**NOTE ❁**

When operating in heavy weather conditions, effective crew communications are critical. Speak loud enough to be heard over the background noise. Ensure the receiver hears and understands the message being passed. A common strategy is to have the receiver repeat back the message that was sent. The crew communications system can be used to greatly improve communication among crewmembers.

**NOTE ❁**

The Pilothouse can create a sense of isolation from the elements and other marine traffic. Crewmembers should use all available means to maintain awareness of wave action, winds, currents and traffic.
The following are the steps necessary to change control stations aboard the RB-M:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Move the tiller to match tiller position within 10%.</td>
</tr>
<tr>
<td>2</td>
<td>Depress the activation push button <em>twice</em> on the joystick panel for the station taking control.</td>
</tr>
<tr>
<td>3</td>
<td>Station taking control should show a steady green light, confirming that the joystick now has control.</td>
</tr>
</tbody>
</table>
Section C. Handling Characteristics

Introduction

Boat handling is a complex skill that requires extensive knowledge and practical underway experience to build confidence and skill levels. Properly handling a RB-M requires forethought and finesse. Always know the boat’s handling features, monitor the prevailing weather conditions, and take into account the boat’s limiting factors.

In this section

This section contains the following information.

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<thead>
<tr>
<th>Topic</th>
<th>See Page</th>
</tr>
</thead>
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<td>C.3 C.3 Stern to Seas</td>
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<tr>
<td>C.7 C.7 Station Keeping</td>
<td>6-20</td>
</tr>
</tbody>
</table>
### C.1 Turning, Pivoting and Stopping

**Introduction**

The RB-M turns or pivots, for steering purposes, on its vertical axis at the aft bulkhead of the Pilot house.

<table>
<thead>
<tr>
<th>C.1.a. Joystick control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving the joystick forward will command the jet buckets up and the engines will accelerate, dependent on the amount of joystick forward displacement, to increase jet flow for forward motion. Moving the joystick aft will command the buckets down and the engines will accelerate, to increase jet flow for astern motion. A lever switch labeled TRANSIT and DOCKING is located on the joystick panel. In the TRANSIT position, the joystick has forward and aft control. In the DOCKING position, the joystick controls forward, astern, and side-to-side motion for docking maneuvers.</td>
</tr>
</tbody>
</table>

**NOTE**

Do not use rapid accelerations from dead-in-the-water (DIW) to full speed except when necessary. This conserves fuel and helps prolong engine life.

<table>
<thead>
<tr>
<th>C.1.b. Tiller control</th>
</tr>
</thead>
<tbody>
<tr>
<td>The tiller controls only the waterjet nozzle and interceptor for steering. When an operator has taken control by pressing the activation pushbutton on the joystick panel, only the controls at that station are operable.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C.1.c. Maneuvering and docking</th>
</tr>
</thead>
<tbody>
<tr>
<td>When maneuvering at slow speeds or docking, the control system may, at the Coxswain's discretion, be placed in DOCKING mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C.1.c.1. Entering docking mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>To enter the docking mode, rotate the switch lever to the DOCKING position. With the switch in the DOCKING position, the control system will switch to docking mode.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C.1.c.2. Sideways motion control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving the joystick port or starboard will cause the boat to move sideways in the same direction. If wind or current are acting on the boat at an angle, the tiller can be moved slightly to the opposite angle to oppose those forces.</td>
</tr>
</tbody>
</table>
### C.1.c.3. Heading control

Joystick placed at an angle will not cause the boat to rotate, it will move it diagonally. If the bow falls off, it can be corrected with gentle tiller movements.

The vector thrust maneuvering system allows very rapid turns in the DOCKING mode, using the tiller, by automatically opposing the waterjet buckets.

---

### C.1.d. Alarms

If while in docking mode, either of the outboard clutches is disengaged, or a fault exists with any reversing bucket or steering nozzle sensor, the following takes place:

1) A control system alarm output is generated.

2) The LCD display indicates the applicable fault.

Sideways movement of the joystick will have no effect on thrust imparted to the boat, while fore/aft movement of the joystick will function normally.

---

### C.1.e. Turning

When the RB-M is underway at speeds greater than 5 KTS, control should be in the TRANSIT mode. In TRANSIT mode, turns are made using the tiller.

---

### C.1.f. Interceptor turning assist

The control system deploys the interceptors to assist in the steering of the boat. When steering to starboard, the starboard interceptor deploys downward and the port interceptor retracts upward. Likewise, the port interceptor deploys downward when steering to port, while the starboard interceptor retracts upward.

---

**WARNING**

Avoid making high speed turns or turning on plane without warning the crew. Ineffective communication can result in personal injuries. High speed turning or turns on plane shall not be done when persons are outside the pilothouse or additional crewmembers are not seated.

**CAUTION !**

Do not overreact to chine walking by rapidly reducing or “chopping” power.

---

### C.1.g. Turning while on plane

The Coxswain must take into account weather and sea conditions and speed prior to making a high speed or turn on plane. High speed turns or turns on plane can occur in seconds. The slightest movement in the tiller can cause the boat to hook a chine. Hooking the chine can cause the boat...
to chine walk from side to side, creating a violent movement of the boat from side to side. Reduce speed gradually to recover from chine walking.

The Coxswain must be aware of waves created by boat wakes, waves refracted from breakwaters or structures, and swells when planning a high speed turn. Failure to read swells during turns can cause the boat kick free of the wave (also known as tripping). This will cause a violent re-entry back into the water possibly causing damage to the boat and injury to personnel. It is very important to work with the wave to make turns with the RB-M.

C.1.h. Stopping

Stopping is achieved using the reversing bucket, which is controlled by the joystick.

**CAUTION!**

C.1.i. Non-emergency stopping

Non-emergency stopping is achieved by the following steps:

1) Gradually decrease the RPM until the boat has slowed down.

2) When the boat has reached low speed, set the joystick in zero thrust position.

3) If necessary, move the joystick aft to create a reverse thrust until the boat has stopped.
WARNING

C.1.j. Emergency stopping

The reversing bucket can be moved from full ahead to full astern in three seconds, by movement of the joystick from full forward to full aft position.

This will give a shorter stopping distance, but also very high stopping force, which has to be considered in order to avoid personnel injury and material damage. Emergency stopping should therefore only be used when necessary.

Emergency stopping is achieved by the following steps:

1) Set the joystick to full aft position.

2) Maintain full aft position until the boat has slowed down (almost stopped).

3) Gradually move the joystick forward so that it is in the zero thrust position when the boat has stopped.

C.2 Head Seas

Introduction

The primary considerations when operating in head seas are to maintain forward momentum and keep the bow into the swell. The sturdy and buoyant construction of the boat allows it to ride up and over oncoming seas.

C.2. a Speed

Guidance on safe operating speeds in increasing sea states is provided in Chapter 5. Relatively smaller, but steeper seas (steep chop) may require that the speed be reduced in lesser sea states. Large open ocean ground swells typically pose no problem, however, and speeds can be increased and adjusted to accommodate crew comfort. The Coxswain must find a safe and comfortable speed and avoid burying the bow in a wave.
C.2.b Quartering the seas

Taking larger head seas slightly off of either bow can create a more comfortable ride, as the boat may descend more gently off the back of the wave instead of slamming violently. The speed and angle of approach will have to be adjusted as needed for the optimum ride. This is sometimes referred to as quartering the seas, which is not to be confused with taking a following sea on the quarter.

C.3 Stern to Seas

Introduction

Following seas up to 6 FT can be negotiated at full speed as long as the boat remains stable as it travels down the front of the swell. Following seas over 6 FT may require a reduction in speed to maintain stability and avoid injury to the crew.

WARNING

In large head seas, apply only enough power to climb the face of wave. Excessive power can cause the boat to become airborne as it exits the wave, resulting in a violent slam with possible boat damage and personnel injury.

The stern platform and open, low, aft deck of the RB-M make it susceptible to taking green water on the aft deck when operating stern to large seas. Coxswains must take this into account and position the RB-M to avoid these situations whenever possible.

The RB-M’s speed often allows the Coxswain to position the boat on the back of an incoming wave. Take care not to position the boat too high on the back of a wave that can quickly gain speed. If the boat is too high or traveling too fast, the boat may go over the face of the wave.

Despite its speed, it is possible for the RB-M to be overtaken by waves under certain conditions. Pay close attention to wave activity astern of the boat when proceeding inbound on large waves.

C.3.a. Riding the back of a wave

Inbound in large waves, position the boat on the back of a wave and adjust the speed so the boat will ride in on the back of the wave. While riding on the back of a wave in heavy weather, monitor the boat’s speed closely to avoid overtaking the wave as its speed toward shore decreases.
C.4 Beam Seas

C.4.a. Steering

Whenever possible, the Coxswain should avoid steering a course parallel (broadside) to heavy seas. Tack across the seas at an angle (30º to 40º). If necessary, steer a zigzag course, making each leg as long as possible, and adjust the boat speed for a safe and comfortable ride.

When transiting parallel to the seas, the boat will tend to ride the contour of the wave surface. This means that the boat’s vertical axis will remain perpendicular to the surface on which the boat is operated. A wave face of 20º will cause a 20º heel.

During high speed or turns on plane the RB-M will roll into the turn exposing the hull plate planing strake and aft fin to the next oncoming swell. This creates a flat surface that can be struck by the force of the swell or wave, causing the boat to heel to a high angle, suffer a knockdown or a rollover.

C.5 Effects of Wind

C.5.a. Turning the bow

In calm or negligible wind and seas, the RB-M responds well to joystick and tiller commands. In stiff winds, several design features combine to make handling this boat challenging. With the majority of weight aft, the bow is very susceptible to the effects of the wind. Winds exceeding 30 KTS have a dramatic effect on maneuverability and can often be the predominant environmental factor in maneuvering situations. In winds exceeding 30 KTS, it can be difficult to turn the bow into the wind at slow speeds (station keeping, towing approaches). Spilling whitecaps may combine with the wind to compound this problem, as they too will push the bow around. When towing, the bow becomes even more susceptible to the effects of the wind as the towed boat tends to hold the stern down.
C.6 Operating in Shallow Water

C.6.a. Shallow water operation

Avoid operating at high engine RPM in shallow waters, especially when reversing since the jet of water will move up sand etc. from the bottom. Sand and stones can be sucked through the water jet unit causing damage to the impeller and guide vanes.

C.7 Station Keeping

C.7.a. General

Station keeping in open water requires concentration to maintain a constant heading and position. The boat tends to work well with its stern to the wind as the bow tends to “weathervane” downwind. If stern-to station keeping is not an option, the operator must use extra care to counteract environmental factors.
Section D. Towing

Introduction
The RB-M has enough power and the right equipment to handle any emergency towing job likely encountered. The Coxswain should consider all factors concerning weather, sea state, distance to tow, and size of boat before attempting each tow. General towing limitations are set at 100 displacement tons.

NOTE 🌊
Using the crew communications system can greatly improve communication among crewmembers and the coxswain during towing.

CAUTION !
The Coxswain needs to be extremely vigilant when working the towline off of the transom or alongside the aft deck to avoid having the towline sucked into the waterjets. When possible, the Coxswain should disengage the waterjets if there is a line in the water adjacent to the boat.

D.1. Approaches
The prevailing winds and seas can greatly affect the ability to safely approach and take another boat in tow.

D.1.a. Bow to the wind
With higher freeboard forward and excellent maneuvering due to the waterjet propulsion, the traditional bow into the prevailing winds towing approach may prove to be the most effective.

D.1.b. Stern to the wind
Towing approaches that have the stern to the prevailing seas should be avoided. With a majority of its weight aft and approximately 2 FT 11 inches of freeboard at the transom, the RB-M is susceptible to taking green water over the stern. This should be taken into account when making towing approaches.

CAUTION !
A small boat may ride under the fender on the RB-M and not be protected by the fender when towing alongside.

D.1.c. Safe zone optimal position
In both the bow to and stern to the prevailing condition approaches, the most successful method of taking the boat in tow is to station keep with the towline worked off the beam.
D.2. Affects of wind with boat in tow

The Coxswain should be aware of the additional effect the wind may have on the RB-M with another boat in tow. The aft tow bitt tends to hold the stern down, further amplifying the effect of wind on the bow. In addition, the Coxswain should be aware of substantially increased fuel usage with a large boat in tow.

D.3. Taking up the tow

Once the towline has been secured to the other vessel, slowly maneuver away. The length of the towline must be considered and an adequate scope of towline should be pulled off the reel in advance.

The upper handrail around the aft deck is over-sized to accept towline loads. Towline stops are located on the handrail outboard of the towing bitt to prevent the towline from moving forward of the beam.

Take up the tow slowly. The water jets may project water up and aft for some distance.

Although the RB-M is capable of towing in the Transit or Docking mode, the Docking mode has been calibrated for the RB-M without tow and will not have the same response with a tow astern or alongside. With the vector thrust system in the Transit mode the boat will have a reduced response to power and steering commands depending on the size of the tow and the sea conditions.

D.4. Tow watch

The tow watch should be extremely vigilant in observing the condition and ride of the tow, because of the limited visibility the Coxswain has from inside the Pilothouse. When towing boats lower than the RB-M transom, or when towing with a long towline, chafing can occur along the transom. The tow watch should closely monitor this and react as necessary.
Section E. Anchoring

Introduction
The RB-M does not often drop anchor. However, the boat is fitted with an anchoring system designed for use when the boat must stand by a location or in an emergency.

E.1. Anchoring the boat
The Forepeak contains a reel holding 300 FT of 2 ¾ inch circumference double braided nylon (DBN) line, with one end spliced into a thimble and shackled to 9 FT of stainless steel chain. The reel is equipped with a locking pin. A 21 lb Fortress anchor is stowed in brackets on the outside top of the Survivor’s Compartment, starboard side.

Take the following steps to safely anchor the boat:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Open the Forepeak hatch and remove the locking pin from the anchor line reel.</td>
</tr>
<tr>
<td>2</td>
<td>Lead the chain through the hawse pipe, through the bullnose, outside the rail and shackle the chain to the anchor. Take all slack out of the line, and take it to the anchor line bitt with one round turn.</td>
</tr>
<tr>
<td>3</td>
<td>As directed by the Coxswain, the anchor line should be removed from the bitt and the anchor should be removed from the mounting brackets and dropped over the side well clear of the boat.</td>
</tr>
<tr>
<td>4</td>
<td>Once the anchor is tending “up and down”, the Coxswain should back down until the desired amount of scope is attained. Secure the anchor line to the bitt. The Coxswain can now back down to set the anchor.</td>
</tr>
</tbody>
</table>
E.2. Weigh anchor

Take the following steps to safely weigh anchor:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Position one crewmember at the bitt and one between the bitt and the bullnose. As the Coxswain moves the boat slowly forward, the forward crewmembers take up the slack in the line while maintaining one round turn at the bitt.</td>
</tr>
<tr>
<td>2</td>
<td>Once the anchor is at “short stay”, the anchor line should be secured at the bitt.</td>
</tr>
<tr>
<td>3</td>
<td>Crewmembers can then attempt to manually break the anchor free from the bottom. If unable to do so, the Coxswain should move the boat slowly forward until the anchor breaks free.</td>
</tr>
<tr>
<td>4</td>
<td>Once free, crewmembers can pull the remaining anchor line and the anchor onboard.</td>
</tr>
<tr>
<td>5</td>
<td>When the anchor is onboard, the Coxswain should take up a stable course so that the crewmembers can safely stow the anchor and ground tackle.</td>
</tr>
<tr>
<td>6</td>
<td>Once the line is stowed, insert the locking pin on the reel and secure the Forepeak hatch and hawse pipe cap.</td>
</tr>
</tbody>
</table>
Section F. Helicopter Operations

F.1. Hoist working area
The RB-M provides a stable platform for helicopter hoists; however, several design factors are worthy of consideration. First, the aft location of the boat’s mast makes for a small working area for the helicopter and boat crew. The trail line method is often the safest way to conduct the hoist. Secondly, noise from the helicopter makes radio communications difficult.

F.2. Crew placement
A common crew placement strategy is to have two crewmembers on the stern to work the hoist. A third crewmember remains by the cabin door as safety observer.

F.3. Procedures
Detailed procedures and instructions on helicopter operations are contained in the Boat Crew Seamanship Manual, COMDTINST M16114.5 (series).

CAUTION!
Crews conducting trail line hoist evolutions must tend the trail line at all times. The design of the aft deck will not contain slack line if left loose on the deck. This may result in the trail line fouling the RB-M’s waterjets if it goes over the side.

NOTE
Using the crew communications system can greatly improve communication among crewmembers and the coxswain during helicopter operations.
### Section G. Personnel Recovery

| **CAUTION!** | The power of the water expelled by the waterjet, can cause injury even when maneuvering at low speeds. The suction in the inlet duct presents a risk to people and objects in the water under the boat and close to the inlet opening. There is a danger that these may be adhered to the inlet duct. It is the responsibility of the Coxswain to ensure that the area around the inlet opening is clear of people or objects. |
| **CAUTION!** | During personnel recovery efforts in heavy weather or surf conditions, the deck recess is extremely vulnerable to wave action. |

| **G.1. Pick-up ports** | The port and starboard recesses or “pick-up ports” are designed to allow for recovery of personnel in the water. |
| **G.2. Controlling the boat** | The Coxswain can open the side window to assist in communicating with the crew during the recovery. |
| **G.3. Deck recess** | There are several D-ring attachment points in the vicinity of the deck recess that allow crewmembers to clip in while conducting personnel recovery. |
| **G.4. Stern platform** | The stern platform can be used for personnel recovery. However, it is not the preferred location due to the limited visibility from the helm position and the proximity to the waterjets. |
Section H.  Ice Conditions

H.1. General

The RB-M is not designed to break ice and should avoid operations in ice if at all possible. In slush conditions, ensure that the engine cooling water recirculating valves are open and that the sea water cooling system is checked regularly to ensure clogging has not occurred. Waterjet inlets are also susceptible to clogging in slush ice. Operations at high speed (during cold weather) will increase the likelihood of topside icing due to freezing spray. When operating in ice conditions, it is advisable to keep one recess grating raised to allow for rapid personnel recovery. If left down, it is possible the grating will be frozen in place, making it difficult to open.

WARNING

Excessive topside icing will greatly affect the boat’s stability and righting arm. ANY topside icing should be cause for the Coxswain to re-evaluate the conditions and re-assess the risks involved in the mission. Operation with topside icing should only be attempted during extreme emergencies after proper risk assessment and approval from the Operational Commander.

CAUTION!

When operating in ice, the Coxswain and engineer should closely monitor engine temperatures. Ice can collect in the sea chest, restricting the flow of cooling water to the engines and causing them to overheat.

NOTE

Be aware that freezing spray may seal hatches, windows, and doors, thus limiting immediate or emergency access.
# Section I. Securing Procedures

I.1. Procedure  The following procedures should be repeated after each mission:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Secure all electrical and electronic components.</td>
</tr>
<tr>
<td>2</td>
<td>Switch port and starboard generator (AuraGen™) control panels on the Engineer’s console to the “OFF” position.</td>
</tr>
</tbody>
</table>
| 3    | Place the following switches/breakers on the AC Power Island in the positions indicated below:  
  a) Switch AC BUS1 “OFF”.  
  b) Switch AC BUS2 “OFF”.  
  c) Circuit Breaker Main, AC BUS 1, “OFF”.  
  d) Circuit Breaker Main, AC BUS2, “OFF”. |
| 4    | Secure all circuit breakers on the DC Power Distribution panel at the Engineer’s console except for the following:  
  a) 24 VDC Vital Bus:  
     i. Circuit Breaker Main “ON”  
     ii. Circuit Breaker CB1 Engine Secondary “ON”  
     iii. Circuit Breaker CB3 Alarm PLC “ON”  
     iv. Circuit Breaker CB4 Bilge System "ON"  
     v. Circuit Breaker CB8 Crew Comms "ON"  
     vi. Circuit Breaker CB11 12VDC Converter #1 "ON"  
     vii. Circuit Breaker CB12 12VDC Converter #2, "ON"  
  b) 24 VDC Engine Bus:  
     i. Circuit Breaker Main, 24 VDC Engine Bus, “ON”  
     ii. Circuit Breaker CB1 E/R Exhaust Fans “ON”  
     iii. Circuit Breaker CB2 Engine Primary “ON”  
     iv. Circuit Breaker CB3 Water Jet Controls, “ON” |
### Step 6 – Mission Performance

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| **c)** 24 VDC Non-Vital Bus:  
  i. Circuit Breaker CB9 Law Enforcement Lights "ON"  
  ii. 12 VDC Main Panel  
  iii. Circuit Breaker Main "ON"  
  iv. Circuit Breaker CB1 Loudhailer "ON" |
| 5 | Ensure both "ENGAGE" button lights are flashing at the Clutch Panel. |
| 6 | Move the joystick to the full forward position. |
| 7 | Verify the Vector LCD Display and Alarm Panel shows the reversing buckets in the full up position. |
| 8 | Ensure the tillers are in their center detent position and the Vector LCD Display and Alarm Panel shows the steering nozzles are centered. |

**NOTE**

The external alarm will not work correctly if the propulsion controls are not matched with the steering nozzle and reversing bucket positions.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>If the engine has been operating at high RPM and/or high loads, run at low idle for at least three minutes before shutting down, to allow the engine to cool down. Low speed docking can be included as part of the engine cool down process.</td>
</tr>
<tr>
<td>10</td>
<td>Secure engines using push buttons in the Pilothouse.</td>
</tr>
</tbody>
</table>
| 11 | Secure the following breakers on the 24 VDC Power Distribution Panel at the Engineer’s console:  
  a) 24 VDC Vital Bus  
  b) Circuit Breaker CB1 Engine Secondary  
  c) 24 VDC Engine Bus  
  d) Circuit Breaker CB2 Engine Primary  
  e) Circuit Breaker CB1 E/R Exhaust Fans  
  f) Circuit Breaker CB3 Water Jet Control |
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Install shore-tie cable to the boat; energize dock side shore power.</td>
</tr>
<tr>
<td>13</td>
<td>Ensure the port and starboard engine sea suction valves in the Lazarette are in the normal operating position.</td>
</tr>
<tr>
<td>14</td>
<td>Ensure port and starboard fuel tank suction valves in the engine room are in the normal operating position.</td>
</tr>
</tbody>
</table>
| 15   | Place the following switches/breakers on the AC Power Island in the positions indicated below:  
  
  a) 240 VAC Selection Panels:  
  i. Rotary switch AC BUS 1, "SHORE".  
  ii. Rotary switch AC BUS 2, "SHORE".  
  
  b) SHORE POWER panel:  
  i. Circuit Breaker MAIN "ON".  
  ii. Circuit Breaker CB1 Battery Charger, “ON”.  
  iii. Circuit Breaker CB2 BLK Heater #2, “ON”  
  iv. Circuit Breaker CB3 BLK Heater #1, “ON”.  
  
  Ensure the battery charger and engine block heaters are operating normally. |
| 16   | Wipe down all engines and all attached accessories. |
| 17   | Ensure potable water tank is full of clean water. |
| 18   | Check fuel oil tank level. Maintain the tank at 95% full, 485 gallons. |

**WARNING**  
Observe safety precautions while working at or near hot surfaces or moving engine parts. Failure to adhere to this warning may cause serious personal injury.

**NOTE**  
The reduction gear oil level should be checked two minutes after stopping the engines.

**NOTE**  
Do not check engine coolant levels until engines are cold.
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| 19   | Check the Fixed Fire Extinguishing system:  
  a) Check agent cylinder pressure gauge. It should show 360 PSI @ 70°F, 288 PSI @ 32°F, 303 PSI @ 40°F. Use the temperature-to-pressure conversion chart posted in the Auxiliary Machinery Compartment.  
  b) Check all fixed fire extinguishing system components to make sure there is no visible damage or obstructions.  
  c) Ensure the actuating cylinder pressure gauge indicates 1800 PSI.  
  d) Ensure the tamper-resistant seals on actuating valves are intact. |
| 20   | Ensure P-6 salvage pump is properly secured and tamper-resistant seal on lid is intact. |
| 21   | **WARNING**  
  Use appropriate eye or face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, compressed air or potentially injurious light radiation.  
  Service air horn compressor receiver. Place a bucket directly under the air receiver drain valve to catch excess moisture. Open the drain valve to allow excess moisture to drain from the tank. Close the drain valve. |
| 22   | Empty the toilet waste tank (if necessary) and fill the toilet water tank. Thetford freshwater additive may be added to the water tank if desired. |
| 23   | Check windshield washer reservoir.  
  Add Windshield Cleaning Compound, P/N A-A-59664, as needed through the tank fill at the top of the reservoir until it is to the "Full" mark. |
<p>| 24   | Ensure seat slide clamp and seat swivel clamp is tight on all four seats. |</p>
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
</table>
| 25   | Arm the external alarm on the loudhailer using the following steps:  
   a) Ensure the Loudhailer is “ON”.  
   b) Place the External Alarm Switch on the Coxswain’s upper console to the “ARM” position.  
   c) Press the arrow key next to the YELP key, the YELP key should flash.  
   d) Press and hold the “FUNC” key for approximately 5 seconds, the ALL, FWD, AFT, and BOTH keys should be illuminated.  
   Ensure the external alarm system arms after approximately 5 minutes; system is armed when only the BOTH button flashes every 4 seconds. |
| 26   | Conduct a visual inspection of all compartments and their bilges for any obvious abnormalities. |
| 27   | Secure all watertight doors, windows, hatches and covers. |
| 28   | Wash the boat down with fresh water. |

**NOTE**

Keeping the boat clean and neat is very important to control corrosion. Having aluminum in contact with dissimilar metal, particularly a copper alloy, can cause major corrosion problems. Something as small as a penny left in the bilge can cause serious corrosion. Maintaining corrosion control is the responsibility of everyone in the crew.
Chapter 7
Emergency Procedures

Introduction

Responding to emergencies and equipment casualties aboard the RB-M should be second nature to all members of the crew. The ability of crewmembers to take immediate action to control emergency situations is critical to prevent a bad situation from getting worse. While every event is different, step-by-step procedures help gain control of the casualty and aid in troubleshooting.

Capsizing or Rollover in a vessel is the most demanding situation the crew of a boat could experience. Roll-over and capsizing prevention can be found in the Boat Crew Seamanship Manual, COMDINST M16114.5 (series). Preparation, both physical and mental, increases chances for survival during a capsizing or roll-over. The first step in preparation is to have a plan of action. This starts with extensive discussion and training on the boat, as well as in the classroom. Second, be thoroughly familiar with the equipment and physical layout of the boat.

The first step in all casualties is to protect the immediate safety of all crewmembers and to establish communication amongst the crew as to the nature of the casualty. It is the Coxswain’s responsibility to keep the station informed of all emergencies encountered during the operation of the boat.

The Coxswain and Engineer should work together to determine if equipment casualties can be safely repaired while underway. The Coxswain must decide whether a casualty has impacted the ability of the boat and crew to complete the mission. The Coxswain should not make the decision in a vacuum; input from other crewmembers, especially the Engineer, as well as communication with shore side personnel should be used to determine whether to continue with the mission. The following factors should be considered:

<table>
<thead>
<tr>
<th></th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The safety and physical condition of the crew and boat</td>
</tr>
<tr>
<td>2</td>
<td>Equipment limitations due to the casualty</td>
</tr>
<tr>
<td>3</td>
<td>Current and forecast weather and sea conditions</td>
</tr>
<tr>
<td>4</td>
<td>The urgency of the mission</td>
</tr>
</tbody>
</table>
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<th>Topic</th>
<th>See Page</th>
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</thead>
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<tr>
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<td>7-7</td>
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<td>M</td>
<td>Low Voltage Alarm/Loss of Electrical Charging System</td>
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<td>P</td>
<td>Carbon Monoxide Alarm</td>
<td>7-32</td>
</tr>
<tr>
<td>Q</td>
<td>Airborne Hazardous Material Exposure</td>
<td>7-34</td>
</tr>
<tr>
<td>R</td>
<td>High Wet Exhaust Temperature Alarm</td>
<td>7-35</td>
</tr>
</tbody>
</table>
Section A. Capsizing

A.1. Symptom(s)  
The RB-M is designed to be self-righting, with the pilothouse and cabin doors and windows watertight. When operating in high risk sea-states, ensure that the cabin door, windows and hatches remain closed and watertight. If the lower gunwale digs into the trough, a roll-over is more likely. In the event of a roll-over, the average time for the boat to re-right will be approximately 8 to 12 seconds. Although the boat was built to withstand a roll-over, there may be damage.

WARNING  💥  
A back up means of communication is critical after a capsizing or knockdown. A portable VHF-FM radio is the best means of passing critical situation reports immediately following this type of situation.

A.2. Actions after self-righting  
Once righted, assess the situation quickly and take the following actions:

a) You may be in a situation that will potentially capsize the boat again, so if possible, maneuver to a position that lessens the likelihood of a capsize.

b) Check the crew to ensure no one was lost overboard or injured.

c) Check for lines overboard that might get caught in the waterjets.

d) If the engines are still working, move to safe water.

NOTE 🔄  
A capsize or extreme roll of over 90° may cause the rollover switch to activate. This switch automatically brings the engines back to idle to prevent engine damage and reduce the amount of water that enters the Engine Compartment. In order to disengage the switch, and regain control of the engines, or “re-qualify the throttles,” it is necessary to bring the joy stick back to the zero thrust position.
Once the boat is in safe water take the following actions:

### A.3 Actions once in safe water

**WARNING**

Do not manipulate engine or steering controls while crewmembers are inspecting the Engine Room and Lazarette for damage.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Verify current position, move RB-M into a safe area or position, evaluate situation and contact station/OPCON.</td>
</tr>
<tr>
<td>2</td>
<td>Engineer investigates the condition of the engine compartment using the CCTV system, and by accessing the engine compartment via the hatch. The engine compartment may be coated with water and oil, presenting a fire hazard.</td>
</tr>
<tr>
<td>3</td>
<td>Engineer investigates the condition of the auxiliary machinery compartment and the Lazarette (if safe to do so).</td>
</tr>
<tr>
<td>4</td>
<td>Crew investigates the condition of the survivors’ compartment and the forepeak (if safe to do so).</td>
</tr>
<tr>
<td>5</td>
<td>At the direction of the Coxswain, begin de-watering by energizing the installed electric bilge pumps. If the engine compartment flooding is too severe to be handled by the electric bilge pumps, rig the P-6 pump on the aft deck and connect the suction line to the engine compartment suction standpipe.</td>
</tr>
<tr>
<td>6</td>
<td>Once dewatering is complete, check the oil in both main engines (engines must be secured to ensure an accurate reading). Add oil as necessary. If circumstances make securing the engines inappropriate, wait to check the oil levels until the situation has further stabilized. In the meantime, keep a close eye on the engine oil pressure. Closely check the material condition of each compartment. Report results to the Coxswain.</td>
</tr>
<tr>
<td>7</td>
<td>After damage has been assessed, determine whether it is safe to proceed with the mission.</td>
</tr>
<tr>
<td>8</td>
<td>Upon returning to the station, all electronic and electrical equipment must be inspected and removed and cleaned, if required.</td>
</tr>
</tbody>
</table>
### A.4. Actions after capsizing

In the unlikely event that the RB-M fails to self-right, every effort should be made to egress from a capsized boat. Crewmembers should take the following action:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Muster the crew and passengers and account for any missing occupants and possible damaged areas.</td>
</tr>
<tr>
<td>2</td>
<td>Open forward survivors’ cabin doors if not already open and proceed to forward survivor’s compartment to the location of the escape hatch.</td>
</tr>
<tr>
<td>3</td>
<td>Exit through the escape hatch with the strongest swimmer going first with a tag line if possible. Your next weakest swimmer should be followed by your second strongest swimmer.</td>
</tr>
<tr>
<td>4</td>
<td>Once outside the hull muster crew and passengers and account for any missing occupants.</td>
</tr>
<tr>
<td>5</td>
<td>Try to remain upwind or up current to prevent ingesting of fuel that may be present in the water.</td>
</tr>
<tr>
<td>6</td>
<td>Attempt to climb aboard the inverted hull.</td>
</tr>
<tr>
<td>7</td>
<td>Check for injuries and administer first aid to the best of your abilities.</td>
</tr>
<tr>
<td>8</td>
<td>Conduct an inventory of signaling equipment. Activate Personal Locator Beacon (PLB). Use signaling devices as needed for rescue.</td>
</tr>
</tbody>
</table>

*NOTE* If the escape hatch is blocked use the aft cabin door as secondary or the sliding windows as last means of egress. (The sliding windows may not open if power is lost in a rollover.)
## Chapter 7 – Emergency Procedures

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Stay with the boat and do not swim for shore. Distances to shore can be deceiving, and strenuous activities such as swimming in cold water can hasten the onset of hypothermia.</td>
</tr>
</tbody>
</table>

**NOTE**

The survivors compartment egress hatch located in the bow area is where most of the buoyancy is located in the RB-M. When the RB-M is in the inverted position, the bow will float up at angle 30-40 degrees above the water (hence, providing an area for safe egress). All hands should review the roll over video of the RB-M found on Boat Forces web page.
### Section B. Collision With Submerged Object (or Bottom)

**B.1. Symptom(s)**
The boat strikes a submerged object or temporarily runs aground.

**B.2. Actions**
Take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce engine RPM to idle and disengage both marine gears.</td>
</tr>
<tr>
<td>2</td>
<td>Notify crew of casualty.</td>
</tr>
<tr>
<td>3</td>
<td>Determine what was hit, where the object is located, and if it can still be seen.</td>
</tr>
<tr>
<td>4</td>
<td>Coxswain verifies position, depth of water, evaluates situation and contacts station/OPCON.</td>
</tr>
<tr>
<td>5</td>
<td>Engineer investigates the condition of the Engine Compartment using the CCTV system, and by accessing the Engine Compartment via the hatch.</td>
</tr>
<tr>
<td>6</td>
<td>Engineer investigates the condition of the Auxiliary Machinery Compartment and the Lazarette.</td>
</tr>
<tr>
<td>7</td>
<td>Crewmember investigates the condition of the Survivors’ Compartment.</td>
</tr>
<tr>
<td>8</td>
<td>Crewmember checks Forepeak for flooding or obvious damage.</td>
</tr>
<tr>
<td>9</td>
<td>Engineer checks for debris in the raw water strainers and proper cooling water circulation.</td>
</tr>
</tbody>
</table>

**WARNING 🚨**
Do not manipulate engine or steering controls while crewmembers are inspecting the Engine Compartment and Lazarette for damage.

**NOTE ☝️**
If flooding is observed proceed with Section N. Flooding Actions
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Coxswain conducts steering checks to insure full steering ability is available. Visually observe the stop to stop movement of the steering nozzle ram, the reversing bucket ram, and appropriate displays on the vector display panel.</td>
</tr>
<tr>
<td><strong>NOTE</strong></td>
<td>The idle adjust knob on the clutch control panel is used to increase engine RPM while DISENGAGED.</td>
</tr>
<tr>
<td>11</td>
<td>Coxswain checks engine RPM in both DISENGAGE and under load conditions at various speeds while the Engineer checks for vibration and flooding and assesses damage to the propulsion system. Engineer will observe for flooding and vibration at the waterjets.</td>
</tr>
<tr>
<td>12</td>
<td>Return to station at reduced speed or on one engine, if warranted, to prevent additional damage or vibration.</td>
</tr>
<tr>
<td>13</td>
<td>Coxswain coordinates with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operation.</td>
</tr>
<tr>
<td><strong>NOTE</strong></td>
<td>If possible, the boat should be hoisted to determine extent of damage; especially if there is a vibration.</td>
</tr>
</tbody>
</table>
Section C. Fouled Waterjet

C.1. Symptom(s) One or both of the engines have increased RPMs and decreased boat speed, or unusual noise and vibrations can be heard from the affected water jet units (s).

NOTE Scrap, twigs, seaweed, etc. will not usually block or damage the waterjets. However, avoid operating over such objects because they affect the performance of the waterjets.

CAUTION! If fishing nets or lines are sucked into the water jet unit, the water jet must be disengaged as quickly as possible to avoid damage to the impeller and impeller housing.

C.2. Actions When one or both waterjets become fouled take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce engine speed to idling speed and disengage both marine gears.</td>
</tr>
<tr>
<td>2</td>
<td>Notify crew of casualty.</td>
</tr>
<tr>
<td>3</td>
<td>From the aft deck, crew member checks to see if an obvious line or net has been ingested. If yes, do not back flush and go to step 8.</td>
</tr>
<tr>
<td>4</td>
<td>Back flush the water jet unit by pushing and holding the “BACKFLUSH” button on the Clutch panel. This reverses the impeller rotation. And causes water to flow backwards through the water jet Use low engine speed. (No greater than 1200 RPM’s).</td>
</tr>
<tr>
<td>5</td>
<td>Engage one at a time and increase RPM to determine affect engine.</td>
</tr>
<tr>
<td>6</td>
<td>If that was not successful:</td>
</tr>
<tr>
<td>Step</td>
<td>Action</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>7</td>
<td>Secure the affected engine and return to port to perform an inspection through inspection cover.</td>
</tr>
</tbody>
</table>

**NOTE**

The inspection cover should only be removed in port in calm seas condition.

**NOTE**

Never leave an open cover unattended.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>If the above steps have not removed the blockage, a diver may be able to remove the scrap from the inlet duct. If after all steps fail, the boat can be removed from the water to remove the blockage and inspect for damage.</td>
</tr>
</tbody>
</table>
Section D. Steering Casualty (Hydraulic)

D.1. Symptom(s)  The joystick and tiller operation produces no steering or reversing bucket response (caused by a failure within the hydraulic system).

The joystick and tiller movement produce no steering response or steering is not responding correctly. The vector alarm sounds, the buckets and/or nozzles remain in their last ordered position.

NOTE  If the hydraulic low alarm sound on the Vector alarm Panel the casualty is most likely hydraulic related.

D.2. Actions  When a partial or complete loss of steering control occurs, take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce engine RPM to idle and disengage both marine gears.</td>
</tr>
<tr>
<td>2</td>
<td>Notify crew of casualty.</td>
</tr>
<tr>
<td>3</td>
<td>Coxswain verifies position, evaluates situation and contacts station/OPCON.</td>
</tr>
<tr>
<td>4</td>
<td>Crewmember rig the anchor for emergency use (fair-lead line, but anchor remains in bracket) if directed by Coxswain.</td>
</tr>
<tr>
<td>5</td>
<td>Engineer investigates the condition of the Engine Compartment using the CCTV system, and by accessing the Engine Compartment via the hatch</td>
</tr>
<tr>
<td>6</td>
<td>Engineer enters Engine Room with crewmember as a safety observer. Engineer checks hydraulic fluid tank sight glass for fluid level, and checks valve alignment</td>
</tr>
<tr>
<td>7</td>
<td>Check bilges and look for obvious leaks. Secure engines if a leak is detected.</td>
</tr>
<tr>
<td>8</td>
<td>If no leak is detected, check the hydraulic pumps.</td>
</tr>
<tr>
<td>9</td>
<td>Engineer checks Lazarette using the access hatch to assess the situation.</td>
</tr>
<tr>
<td>Step</td>
<td>Action</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>10</td>
<td>Engineer enters Lazarette with crewmember as a safety observer. Engineer observes movement of the hydraulic control valves and cylinders in response to joystick and tiller movement.</td>
</tr>
<tr>
<td>11</td>
<td>Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operations.</td>
</tr>
</tbody>
</table>

**NOTE**

If one Hydraulic pump is damaged, and sufficient hydraulic fluid is present in tank, that pump may be removed and the intermediate shaft removed from back of pump, and pump bolted back to engine for operation.
Section E. Steering Casualty (Electrical)

E.1. Symptom(s)  Joystick and tiller movement produce no steering response or steering is not responding correctly. The vector alarm sounds, the engines return to idle and/or the buckets and/or nozzles lock in their last ordered position.

NOTE  If when checked, the hydraulic portion of the steering system is intact and moving the joystick or tiller does not activate the hydraulic cylinders on the waterjet, the casualty is most likely electrically related.

E.2. Actions  When a partial or complete loss of electrical steering control occurs, take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coxswain attempt to switch control station.</td>
</tr>
<tr>
<td>2</td>
<td>Notify crew of casualty.</td>
</tr>
<tr>
<td>3</td>
<td>Reduce engine RPM to idle and disengage both marine gears.</td>
</tr>
<tr>
<td>4</td>
<td>Check vector display panel for alarm code.</td>
</tr>
<tr>
<td>5</td>
<td>Coxswain verifies position, evaluates situation and contacts station/OPCON.</td>
</tr>
<tr>
<td>6</td>
<td>Crewmember rig the anchor for emergency use (fair-lead line, but anchor remains in bracket) if directed by Coxswain.</td>
</tr>
<tr>
<td>7</td>
<td>Engineer checks Lazarette using the access hatch to assess the situation.</td>
</tr>
<tr>
<td>8</td>
<td>Engineer checks electrical connections at the hydraulic control valves.</td>
</tr>
<tr>
<td>9</td>
<td>Engineer enters Lazarette with crewmember as a safety observer. Engineer observes movement of the hydraulic control valves and cylinders in response to joystick and tiller movement.</td>
</tr>
<tr>
<td>10</td>
<td>Engineer enters Auxiliary Machinery Compartment with crewmember as a safety observer.</td>
</tr>
<tr>
<td>11</td>
<td>Engineer checks circuit breakers at 24 VDC Vector power distribution panel, aft bulkhead, and starboard side.</td>
</tr>
<tr>
<td>Step</td>
<td>Action</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>12</td>
<td>Coxswain attempts to regain control using the portable backup controller.</td>
</tr>
<tr>
<td>13</td>
<td>Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operation.</td>
</tr>
</tbody>
</table>
## Section F. Marine Gear Failure

### F.1. Symptom(s)
One or both marine gear(s) fail to respond properly when the ENGAGE or BACKFLUSH buttons are operated.

### F.2. Actions
Take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ensure engine RPM is at idle 650 RPMs and joystick is at Zero thrust.</td>
</tr>
<tr>
<td>2</td>
<td>Notify crew of casualty.</td>
</tr>
<tr>
<td>3</td>
<td>Coxswain verifies position, evaluates situation and contacts station/OPCON.</td>
</tr>
<tr>
<td>4</td>
<td>Coxswain check engine display for marine gear pressures and secure engine if pressure is not within parameter. Normal operating pressure is 196 - 265 psi when the clutch is engaged and 15 - 65 psi when the clutch is disengaged.</td>
</tr>
<tr>
<td>5</td>
<td>Engineer checks the affected marine gear oil level and bilge for oil.</td>
</tr>
<tr>
<td><strong>NOTE</strong> ☠️</td>
<td>Marine gear oil must be checked when warm with engine at idle speed.</td>
</tr>
<tr>
<td>6</td>
<td>Coxswain attempt to regain marine gear control by switching control station.</td>
</tr>
<tr>
<td>7</td>
<td>Coxswain secure affected engine.</td>
</tr>
<tr>
<td>8</td>
<td>Crewmember rig the anchor for emergency use (fair-lead line, but anchor remains in bracket) if directed by Coxswain.</td>
</tr>
<tr>
<td>9</td>
<td>Engineer checks marine gear control valve electrical connections.</td>
</tr>
<tr>
<td>10</td>
<td>If no leaks are present and oil level is full, restart engine and recheck clutch applied pressure. Secure engine if pressure is not within parameters.</td>
</tr>
<tr>
<td>11</td>
<td>Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operation.</td>
</tr>
</tbody>
</table>
## Section G. Fire in the Engine Compartment

### G.1. Symptom(s)
Smoke is observed coming out from the Engine Compartment or the heat detector/smoke sounds.

### G.2. Actions
Should a fire occur in the Engine Compartment, take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce engine RPM to idle and disengage both marine gears.</td>
</tr>
<tr>
<td>2</td>
<td>Notify crew of casualty and account for all personnel on board.</td>
</tr>
<tr>
<td>3</td>
<td>Coxswain verifies position, evaluates situation and contacts station/OPCON.</td>
</tr>
<tr>
<td>4</td>
<td>Engine checks Engine Compartment using the CCTV camera.</td>
</tr>
<tr>
<td>5</td>
<td>Coxswain secures both engines with engine stop buttons at the Coxswain’s upper console.</td>
</tr>
<tr>
<td>6</td>
<td>Coxswain pulls emergency fuel shutoff handles.</td>
</tr>
<tr>
<td>7</td>
<td>Coxswain activates the Engine Compartment fire suppression system pilot cylinder.</td>
</tr>
<tr>
<td>8</td>
<td>Engineer secures all non essential electrical power breakers (all except 12 volt converter and VHF-FM radio) with the Coxswain’s concurrence.</td>
</tr>
<tr>
<td>9</td>
<td>Crewmember opens Survivors’ Compartment escape hatch and rigs escape ladder to establish an emergency escape route.</td>
</tr>
<tr>
<td>10</td>
<td>Crewmember rigs anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the Coxswain.</td>
</tr>
</tbody>
</table>

**WARNING**

It is extremely dangerous to enter the Engine Room during or after a fire. Any introduction of oxygen into the compartment may ignite a fire reflash. Keep the space sealed until moored and secured. Cool the aft deck with water.

**NOTE**

Ensure the Port and Starboard Generator panels (AuraGen™ controls) on the Engineer’s console are turned to the “OFF” position.
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Coxswain discusses relocating CG-P6 portable pump forward away from Engine Compartment (ensure pump is secured).</td>
</tr>
<tr>
<td>12</td>
<td>Establish fire watch, with portable fire extinguishers readied in Pilothouse.</td>
</tr>
<tr>
<td>13</td>
<td>Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operation.</td>
</tr>
</tbody>
</table>
Section H. Fire in the Auxiliary Machinery Compartment

H.1. Symptom(s)  
Smoke is observed coming out from the Auxiliary Machinery Compartment. Smoke or heat alarm activates.

H.2. Actions  
Take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce engine RPM to idle and disengage both marine gears.</td>
</tr>
<tr>
<td>2</td>
<td>Notify crew of casualty and account for all personnel on board.</td>
</tr>
<tr>
<td>3</td>
<td>Coxswain verifies position, evaluates situation and contacts station/OPCON.</td>
</tr>
<tr>
<td>4</td>
<td>Engineer isolates the affected electrical/electronic components.</td>
</tr>
<tr>
<td>5</td>
<td>Engineer proceeds to the compartment with a safety observer and the portable fire extinguishers from the Pilothouse and Survivors’ Compartment and extinguishes the fire.</td>
</tr>
<tr>
<td>6</td>
<td>Crewmember establishes fire watch with portable fire extinguisher.</td>
</tr>
<tr>
<td>8</td>
<td>Crewmember prepares P-6 pump for fire fighting, at the direction of the Coxswain.</td>
</tr>
<tr>
<td>9</td>
<td>Crewmember opens Survivors’ Compartment escape hatch and rigs escape ladder to establish an emergency escape route.</td>
</tr>
</tbody>
</table>

NOTE: Ensure Pilothouse window and door are open prior to opening Auxiliary Machinery space to minimize smoke in Pilothouse.
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Crewmember to rig anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the Coxswain.</td>
</tr>
<tr>
<td>11</td>
<td>Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operation.</td>
</tr>
</tbody>
</table>
Section I. Loss of Control of Engine RPM

I.1. Symptom(s)
One or both engines fail to respond properly to joystick control.

I.2. Actions
Identify the cause, prevent further damage, and take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Disengage the marine gear.</td>
</tr>
<tr>
<td>2</td>
<td>Confirm control station is active.</td>
</tr>
<tr>
<td>3</td>
<td>Coxswain informs crew of casualty, verifies position, evaluates situation and contacts station/OPCON.</td>
</tr>
<tr>
<td>4</td>
<td>Engineer verifies that all engine control circuit breakers are on.</td>
</tr>
<tr>
<td>5</td>
<td>Coxswain attempt to shift control to other station to regain control.</td>
</tr>
<tr>
<td>6</td>
<td>If unable to regain control, use engine stop button on the Coxswain’s upper console to secure affected engine.</td>
</tr>
<tr>
<td>7</td>
<td>If engine fails to secure, use emergency stop button at the Engineer’s console to secure affected engine.</td>
</tr>
<tr>
<td>8</td>
<td>If engine fails to secure, Coxswain pulls emergency fuel shutoff for the affected engine.</td>
</tr>
<tr>
<td>9</td>
<td>Coxswain maneuvers the RB-M safely using one engine if problem was not found.</td>
</tr>
<tr>
<td>10</td>
<td>Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operation.</td>
</tr>
</tbody>
</table>
Section J. Loss of Fuel Oil Pressure

The engine runs rough with a rapid loss of power.

J.1. Symptom(s)

J.2. Actions

Take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Coxswain should reduce engine RPMs to idle, determine which engine has lost power, disengage and secure that engine.</td>
</tr>
<tr>
<td>2</td>
<td>Coxswain informs crew of casualty, verifies position, evaluates situation and contacts station/OPCON.</td>
</tr>
<tr>
<td>3</td>
<td>Crewmember to rig anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the Coxswain.</td>
</tr>
<tr>
<td>4</td>
<td>Engineer checks Engine Compartment using the CCTV or the Engine Compartment hatch to assess situation.</td>
</tr>
<tr>
<td>5</td>
<td>Engineer enters Engine Compartment with crewmember as a safety observer.</td>
</tr>
<tr>
<td>6</td>
<td>Engineer check pressure gauge at the primary fuel filters. If filter is found to be clogged, switch the valve handle to use the other filter.</td>
</tr>
<tr>
<td>7</td>
<td>Check the primary fuel filters for accumulated sediment and water in the bowls. Drain bowl if required.</td>
</tr>
<tr>
<td>8</td>
<td>Engineer check bilge for fuel oil.</td>
</tr>
<tr>
<td>9</td>
<td>Check the emergency fuel shutoff valves to ensure that they are open.</td>
</tr>
<tr>
<td>10</td>
<td>Check the entire fuel system for obvious leaks; check fuel tank level.</td>
</tr>
<tr>
<td>11</td>
<td>Identify and correct source of problem or request additional assistance from station.</td>
</tr>
<tr>
<td>Step</td>
<td>Action</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>12</td>
<td>Coxswain maneuver RB-M safely using one engine if problem was not found.</td>
</tr>
<tr>
<td>13</td>
<td>Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operation.</td>
</tr>
</tbody>
</table>
### Section K. Loss of Lube Oil Pressure

#### K.1. Symptom(s)

The engine display module (EDM) presents a low oil pressure alarm.

#### K.2. Actions

Take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Coxswain should reduce the engine RPMs to idle and disengage both marine gears. Determine which engine has loss of lube oil pressure.</td>
</tr>
<tr>
<td>2</td>
<td>Coxswain immediately secures the affected engine, informs the crew of the casualty, verifies position and contacts the station/OPCON.</td>
</tr>
<tr>
<td>3</td>
<td>Crewmember rigs anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the Coxswain.</td>
</tr>
<tr>
<td>4</td>
<td>The Engineer checks Engine Compartment using the Engine Compartment CCTV or Engine Compartment hatch to assess the situation.</td>
</tr>
<tr>
<td>5</td>
<td>If it is safe to enter, Engineer enters the Engine Compartment with another crewmember as a safety observer. Engineer checks the bilge for oil and obvious lube oil leaks.</td>
</tr>
<tr>
<td>6</td>
<td>Engineer checks the engine lube oil for quantity and quality after the engine has been shut off for a few minutes.</td>
</tr>
<tr>
<td>7</td>
<td>If the cause is not correctable, do not restart the engine.</td>
</tr>
<tr>
<td>8</td>
<td>Return to station on one engine, as necessary, if cause cannot be determined or repaired.</td>
</tr>
<tr>
<td>9</td>
<td>Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operation.</td>
</tr>
</tbody>
</table>
Section L. Main Engine High Water Temperature

L.1. Symptom(s)
The engine display module (EDM) presents a high cooling water temperature alarm, indicating that coolant water temperature exceeds 185° F.

L.2. Actions
Take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coxswain reduces both engines’ RPM to idle and determines which engine has overheated.</td>
</tr>
<tr>
<td>2</td>
<td>Crewmember observes exhaust outlets on transom for raw water discharge.</td>
</tr>
<tr>
<td>3</td>
<td>Coxswain disengages and secures engine showing the alarm.</td>
</tr>
<tr>
<td>4</td>
<td>Coxswain notifies crew of casualty, verifies position and contacts the station/OPCON.</td>
</tr>
<tr>
<td>5</td>
<td>Engineer checks Engine Compartment using the CCTV or Engine Compartment hatch to assess the situation.</td>
</tr>
<tr>
<td>6</td>
<td>Engineer enters Engine Compartment with crewmember as safety observer.</td>
</tr>
<tr>
<td>7</td>
<td>Engineer checks bilges and engine for obvious leaks.</td>
</tr>
<tr>
<td>8</td>
<td>Engineer checks the raw water system piping and hoses.</td>
</tr>
</tbody>
</table>

**WARNING**

IF steam is flowing from the expansion tank vent, the engine(s) should be secured and cooled naturally. Do not remove the expansion tank cover. The coolant will either flash to steam or boil with a serious potential for injury.

<table>
<thead>
<tr>
<th>Step</th>
<th>IF …</th>
<th>THEN …</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Raw water pipe/hose is cool</td>
<td>The raw water system for that engine is probably operating normally; the Engineer should make initial casualty control checks for the jacket water system.</td>
</tr>
<tr>
<td></td>
<td>Raw water pipe/hose is hot</td>
<td>The Engineer should make casualty control checks for the raw water system.</td>
</tr>
</tbody>
</table>
### L.3. Raw water system checks

Take the following actions to check the function of the raw water system:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Verify that the sea suction valves are open.</td>
</tr>
<tr>
<td>2</td>
<td>Isolate one strainer at a time and clear any debris from the strainer.</td>
</tr>
<tr>
<td>3</td>
<td>If the strainers are clean, touch the raw water pump cover lightly with the back of the hand for coolness. If the impeller is burned up, the cover will be very hot. If the cover is hot, secure the engine and replace the impeller.</td>
</tr>
</tbody>
</table>

**NOTE**

If one engine has overheated due to a clogged sea strainer, the other engine may be close to overheating for the same reason.

### L.4. Jacket water system checks

Take the following actions to check the function of the jacket water system:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check the engine and bilge for leakage. Correct casualty and then replace fluid if necessary.</td>
</tr>
<tr>
<td>2</td>
<td>Inspect the jacket water pump for normal function.</td>
</tr>
<tr>
<td>3</td>
<td>Check the lube oil for proper quantity and quality.</td>
</tr>
</tbody>
</table>

**CAUTION !**

Never add coolant to an overheated engine. Engine damage may result. Allow the engine to cool first.

**CAUTION !**

Anti-freeze is poisonous. Do not inhale the fumes.
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>If jacket water leaks are found, the pump is inoperative, or temperatures continue to climb, secure the engine.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> ⚠️ Oil alarms and sensors are directly related to engine temperature. An overheating engine will often set off lube oil alarms.</td>
</tr>
<tr>
<td></td>
<td><strong>CAUTION !</strong> If after all efforts have been made at casualty control, including reducing the engine load, the engine temperatures do not decrease, secure the engine.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE</strong> ⚠️ If no leaks are detected and pumps are operating, a possible cause of the failure is a failed thermostat regulator.</td>
</tr>
<tr>
<td>5</td>
<td>Coxswain coordinate with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operation.</td>
</tr>
</tbody>
</table>
Section M.  Low Voltage Alarm/Loss of Electrical Charging System

M.1. Symptom(s)
A significant drop in voltage is indicated by dimming lights, and/or electronics dropping off line and/or low voltage reading on the voltmeter. AuraGen™ Control Unit display lights are out, yellow, or red.

M.2. Actions
Taking the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce engine RPM to idle and disengages both marine gears.</td>
</tr>
<tr>
<td>2</td>
<td>Coxswain notifies crew of casualty, verifies position and contacts the station/OPCON.</td>
</tr>
<tr>
<td>3</td>
<td>Engineer checks position of battery isolator switches on Engineer’s console.</td>
</tr>
<tr>
<td>4</td>
<td>Engineer checks status of AuraGen™ control unit lights on Engineer’s console and voltmeters on AC and DC power islands.</td>
</tr>
<tr>
<td>5</td>
<td>Engineer checks the Engine Compartment using the CCTV or Engine Compartment hatch to assess the situation.</td>
</tr>
<tr>
<td>6</td>
<td>Engineer enters Engine Compartment with another crewmember as safety observer.</td>
</tr>
<tr>
<td>7</td>
<td>Engineer check condition of both AuraGen™ generators.</td>
</tr>
<tr>
<td>8</td>
<td>Check electrical connections on generators on both engines.</td>
</tr>
<tr>
<td>9</td>
<td>Engineer enters Auxiliary Machinery Space with another crewmember as safety observer.</td>
</tr>
<tr>
<td>10</td>
<td>Check AuraGen™ IPS/ECUs and all main battery connections in Auxiliary Machinery Space. Tighten and clean as necessary.</td>
</tr>
<tr>
<td>11</td>
<td>Engineer secures all non-vital equipment at the 12 and 24 VDC and 240 VAC power panels.</td>
</tr>
</tbody>
</table>

WARNING!
The AuraGen™ Generator is belt-driven and operates at a high speed. DO NOT touch the AuraGen™ generator, drive belt, or drive components during engine operation.
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Engineer place start and house batteries in parallel by placing the ACR switch from auto to manual.</td>
</tr>
<tr>
<td>13</td>
<td>Engineer determines extent of electrical power loss, probable cause, and expected service duration for platform. Crew discusses impact on mission.</td>
</tr>
<tr>
<td>14</td>
<td>Coxswain establishes secondary communications with station/OPCON (handheld portable VHF-FM radio) in case primary power is lost.</td>
</tr>
<tr>
<td>15</td>
<td>Coxswain coordinates with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continuous operation.</td>
</tr>
</tbody>
</table>
## Section N. Flooding

### N.1. Symptom(s)

Bilge high water level alarm sounds on the Vector Display Panel.

### N.2. Actions

Take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coxswain notifies crew of casualty, verifies position and contacts the station/OPCON.</td>
</tr>
<tr>
<td>2</td>
<td>Engineer checks the Vector display panel to identify the space where flooding is indicated. Engineer notifies the Coxswain and silences the alarm.</td>
</tr>
<tr>
<td>3</td>
<td>Engineer and another crewmember proceed to the flooded space. The Engineer uses hatches to assess the situation. If safe, enter the space to investigate.</td>
</tr>
<tr>
<td>4</td>
<td>Engineer reports to the Coxswain the extent, cause and corrective actions necessary to control or stop the flooding.</td>
</tr>
<tr>
<td>5</td>
<td>Engineer activates compartment bilge pump(s) as required.</td>
</tr>
<tr>
<td>6</td>
<td>Crewmembers prepare to apply basic casualty control procedures, make ready the damage control kit and CG-P6 pump as required.</td>
</tr>
<tr>
<td>7</td>
<td>Crewmembers check the material condition of each compartment. Report results to the Coxswain.</td>
</tr>
<tr>
<td>8</td>
<td>Coxswain coordinates with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continuous operation.</td>
</tr>
</tbody>
</table>

### CAUTION!

The bilge flooding alarm system is designed to notify the crew of an onboard EMERGENCY underway as well as dockside. This system should be confirmed operational prior to and upon return from any missions or sorties.
Section O. Hard Grounding

O.1. Symptom(s)
The RB-M hits bottom and becomes hard aground (unable to initially float free).

O.2. Actions
Assess the resulting damages; take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reduce the engine RPM to idle and disengage both marine gears.</td>
</tr>
<tr>
<td>2</td>
<td>Notify crew of casualty and assess condition of crew.</td>
</tr>
<tr>
<td>3</td>
<td>Evaluate the situation. Verify current position and depth of water, and notify the station/OPCON.</td>
</tr>
</tbody>
</table>

**NOTE**
If flooding is observed proceed with Section N. Flooding Actions.

<p>| 4    | Engineer checks Engine Compartment using the CCTV or Engine Compartment hatch to assess the situation. |
| 5    | Engineer enters the Engine Compartment with another crewmember as a safety observer. Check bilges for flooding or obvious damage. |
| 6    | Engineer checks Auxiliary Machinery Compartment, and Lazarette for any signs of flooding or damage. |
| 7    | Engineer checks for proper cooling water circulation or debris in strainers, and cleans as necessary. Secure engine if cooling is inadequate or excessive debris (especially sand) is observed. |
| 8    | Crewmember checks Survivors’ Compartment for flooding or obvious damage. |
| 9    | Crewmember checks Forepeak for flooding or damage. |
| 10   | Crewmember rigs anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the Coxswain. |
| 11   | Crewmember takes depth soundings all around the boat. Coxswain determines deepest water, extent of grounding, and potential for underwater damage. |</p>
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Consider present and future state of tide, current or other weather conditions with regard to re-floating or salvage operations.</td>
</tr>
<tr>
<td>13</td>
<td>Deploy anchor if situation involves potential for being set further aground due to conditions.</td>
</tr>
<tr>
<td>14</td>
<td>Coxswain determines safest direction to deep water and method for extracting boat safely with least damage.</td>
</tr>
<tr>
<td>15</td>
<td>Coxswain and Engineer conduct checks of propulsion system integrity prior to attempting re-floating or salvage. Take caution to reduce further damage.</td>
</tr>
<tr>
<td>16</td>
<td>Coxswain and Engineer conduct check of steering system integrity. Check movement of waterjet steering nozzles.</td>
</tr>
<tr>
<td>17</td>
<td>Coxswain maneuvers boat into safe water.</td>
</tr>
<tr>
<td>18</td>
<td>Coxswain conducts steering check, including joystick control, to identify any limitations, while Engineer checks for debris in engine sea water strainers.</td>
</tr>
<tr>
<td>19</td>
<td>Coxswain checks engine RPM in both neutral and engaged individually, at various speeds, while the Engineer checks for vibration and damage in the Engine Compartment.</td>
</tr>
<tr>
<td>20</td>
<td>Return to station or appropriate haul-out facility at reduced speed/one engine to prevent additional damage, if necessary.</td>
</tr>
<tr>
<td>21</td>
<td>Coxswain coordinates with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continuous operation.</td>
</tr>
</tbody>
</table>

**CAUTION!**

If the boat’s hull has been holed, the Coxswain and Engineer should discuss and decide whether it may be more prudent to remain grounded as opposed to possibly sinking the boat after extraction.
## Section P. Carbon Monoxide Alarm

### P.1. Symptom(s)
Carbon Monoxide alarm illuminates at the Vector Display Panel in the Pilothouse for the Survivors’ Compartment or the Pilothouse.

### P.2. Pilothouse actions
If the display indicates a carbon monoxide alarm for the Pilothouse, take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coxswain maneuvers to a safe area, disengage both marine gears and secure the engines.</td>
</tr>
<tr>
<td>2</td>
<td>Coxswain notifies crew of casualty, verifies position and contacts the station/OPCON.</td>
</tr>
<tr>
<td>3</td>
<td>Engineer secures AuraGen™ and all non-vital equipment at the 12 and 24 VDC power panels with the exception of the Pilothouse Vent breaker.</td>
</tr>
<tr>
<td>4</td>
<td>Evacuate the Survivors’ Compartment. Close the Survivors’ Compartment doors.</td>
</tr>
<tr>
<td>5</td>
<td>Open Pilothouse windows and door. Ensure Pilothouse ventilation fans are energized and operating. Evacuate the Pilothouse.</td>
</tr>
<tr>
<td>6</td>
<td>Crewmember rigs anchor (fair-lead the line through the bull nose to the anchor, but keep the anchor in the bracket) as directed by the Coxswain.</td>
</tr>
<tr>
<td>7</td>
<td>Engineer investigates cause of alarm.</td>
</tr>
<tr>
<td>8</td>
<td>Coxswain coordinates with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continuous operation.</td>
</tr>
</tbody>
</table>
**P.3. Survivors’ Compartment actions**

If the display indicates a carbon monoxide alarm for the Pilothouse, take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Close the Survivors’ Compartment doors.</td>
</tr>
<tr>
<td>2</td>
<td>Ensure Pilothouse ventilation fans are energized and operating.</td>
</tr>
<tr>
<td>3</td>
<td>Evacuate the Pilothouse.</td>
</tr>
<tr>
<td>4</td>
<td>Investigate for cause of alarm and ventilate the space.</td>
</tr>
<tr>
<td>5</td>
<td>Coxswain coordinates with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continuous operation.</td>
</tr>
</tbody>
</table>
## Section Q. Airborne Hazardous Material Exposure

**Q.1. Symptom(s)**

The boat has been exposed to, or is about to be exposed to, airborne hazardous materials (HAZMAT) including chemical, biological, or radiological contaminants that may be released accidentally or intentionally into the environment.

**Q.2. Actions**

Should exposure occur or be imminent, take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Close all compartment doors, hatches, and scuttles and ensure they are dogged down completely.</td>
</tr>
<tr>
<td>2</td>
<td>Close the Pilothouse QAWT door and ensure it is dogged down completely.</td>
</tr>
<tr>
<td>3</td>
<td>Coxswain and navigator close the Pilothouse port and starboard sliding windows and ensure each air seal activates.</td>
</tr>
<tr>
<td>4</td>
<td>Engineer secures the “P/H VENT FAN” switch on the Engineer’s console.</td>
</tr>
<tr>
<td>5</td>
<td>Engineer closes the blast gate above the ventilation fan in the Head.</td>
</tr>
<tr>
<td>6</td>
<td>Engineer closes the blast gate above the port passenger seats in the overhead of the Survivors’ Compartment.</td>
</tr>
<tr>
<td>7</td>
<td>Coxswain notifies station of situation, current position and current status.</td>
</tr>
<tr>
<td>8</td>
<td>If possible, Coxswain transits away from the HAZMAT source and seek a clear environment.</td>
</tr>
<tr>
<td>9</td>
<td>Coxswain coordinates with station for instructions on where to proceed for decontamination.</td>
</tr>
</tbody>
</table>

**WARNING**

Do not operate the head ventilation fan with the blast gate closed. This could overheat the fan and cause irreparable damage to the fan and cause a fire.
Section R. High Wet Exhaust Temperature Alarm

R.1. Symptom(s)  Vector Alarm Display sounds and flashes an Alarm Code (High Wet EGT). No raw water discharge from the engine exhaust.

R.2. Actions  If the Vector alarm display sounds and flashes an Alarm Code (High Wet EGT), take the following actions:

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coxswain brings the joystick to the center position to reduce RPMs, disengages the marine gear, immediately secures the affected engine, and informs the crew.</td>
</tr>
<tr>
<td>2</td>
<td>Engineer assesses the Engine Compartment using the CCTV or Engine Compartment hatch.</td>
</tr>
<tr>
<td>3</td>
<td>Engineer enters the Engine Compartment with a crewmember as an observer to check the raw water cooling system and exhaust system for leaks.</td>
</tr>
<tr>
<td>4</td>
<td>Engineer enters the Lazarette to check the raw water cooling system for leaks. Visually inspects the online raw water strainer for debris, and shifts strainer.</td>
</tr>
<tr>
<td>5</td>
<td>If the cause is not correctable or cannot be identified, do not restart the engine.</td>
</tr>
<tr>
<td>6</td>
<td>Return to station on one engine, as necessary, if cause cannot be determined or repaired. Coxswain coordinates with station for tow or other assistance when risk assessment indicates crew or boat safety will be jeopardized through continued operation.</td>
</tr>
</tbody>
</table>

WARNING  If casualty is caused by a loss of cooling water or insufficient cooling water flow, raw water piping, exhaust piping, and/or heat exchangers may be very hot and present a serious potential for injury.
Appendix A. Outfit List and Stowage Plan

Introduction
This appendix contains the standard stowage plan for the RB-M outfitting. No deviation from this list is authorized, except in the event that the addition of portable equipment, not part of the standard boat outfit, is necessary to meet mission needs; units are authorized to temporarily carry this extra equipment.

This deviation authorization is on case by case basis only, and care must be taken to properly secure any extra gear and to ensure it does not interfere with safe egress or the boat’s standard outfit/systems. Under no circumstances shall permanent alterations be made to power, stow or in any way accommodate extra equipment.

In this appendix
This appendix contains the outfit list and stowage plan for the following areas of the RB-M:

<table>
<thead>
<tr>
<th>Topic</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survivors’ Compartment</td>
<td>A-2</td>
</tr>
<tr>
<td>Pilothouse</td>
<td>A-4</td>
</tr>
<tr>
<td>Auxiliary Machinery Compartment</td>
<td>A-4</td>
</tr>
<tr>
<td>Forepeak</td>
<td>A-5</td>
</tr>
<tr>
<td>Deck</td>
<td>A-5</td>
</tr>
<tr>
<td>Lazarette</td>
<td>A-6</td>
</tr>
<tr>
<td>ITEM</td>
<td>SUB-LOCATION</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Survivors’ Compartment</td>
<td></td>
</tr>
<tr>
<td>Pyrotechnics Storage Container</td>
<td>Pyro Locker</td>
</tr>
<tr>
<td>Stokes Litter W/Flotation - Folding</td>
<td>STBD Forward</td>
</tr>
<tr>
<td>Medivac Board; Folding</td>
<td>STBD Forward</td>
</tr>
<tr>
<td>Hearing Protection; Foam Insert; Disposable</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>Blankets, Wool</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>Blankets, Emergency</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>Pillows</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>Push Button Portable Signal Horn; 8 oz</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>Spare 8 oz Propellant for Portable Horn</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>Swimmer Harness 70 FT Line</td>
<td>STBD Forward</td>
</tr>
<tr>
<td>First Aid Kit; 10 Person</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>Personnel Retrieval Strap</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>Gun Mount Tethers</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>P6; Firefighting Hose; 50 FT</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>P6; Firefighting Nozzle</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td>P6; Quick Connection Coupling</td>
<td>Locker, STBD Forward</td>
</tr>
<tr>
<td><strong>ITEM</strong></td>
<td><strong>SUB-LOCATION</strong></td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Damage Control Kit</td>
<td>Under Deck Plate</td>
</tr>
<tr>
<td>Onboard Spare Parts</td>
<td>Under Deck Plate</td>
</tr>
<tr>
<td>Paper Towels</td>
<td>Sink</td>
</tr>
<tr>
<td>5 gallon Potable Water Container</td>
<td>Sink</td>
</tr>
<tr>
<td>Searchlight; Portable</td>
<td>Under Sink</td>
</tr>
<tr>
<td>36 gallon Cooler</td>
<td>Under Microwave</td>
</tr>
<tr>
<td>Handi-Wipes/Clorox wipes</td>
<td>Under Sink/Head</td>
</tr>
<tr>
<td>Tool Box</td>
<td>Under Ladder</td>
</tr>
<tr>
<td>Towing Pelican Storage Container</td>
<td>Head</td>
</tr>
<tr>
<td>Shackle Galvanized; 1 ¼ inch</td>
<td>Head</td>
</tr>
<tr>
<td>Nylite Shackle; Towing Size 4-Orange</td>
<td>Head</td>
</tr>
<tr>
<td>Towing Bridle (Optional)</td>
<td>Head</td>
</tr>
<tr>
<td>Folding Grapnel; 7lbs</td>
<td>Head</td>
</tr>
<tr>
<td>Toilet Paper</td>
<td>Head</td>
</tr>
<tr>
<td>Personal Flotation Device; Type I Adult</td>
<td>Head</td>
</tr>
<tr>
<td>Personal Flotation Device; Type I Child</td>
<td>Head</td>
</tr>
<tr>
<td>Ground Wand (Helo Ops)</td>
<td>Head</td>
</tr>
<tr>
<td>Ground Wand Clip</td>
<td>Head</td>
</tr>
<tr>
<td>Medium Duty Wipes</td>
<td>Head</td>
</tr>
<tr>
<td>Boat Crew Safety Belts; HW</td>
<td>Head</td>
</tr>
<tr>
<td>Boat Crew Safety Helmets (Optional)</td>
<td>Head</td>
</tr>
<tr>
<td>Boat Crew Goggles (Optional)</td>
<td>Head</td>
</tr>
</tbody>
</table>
### Appendix A - Outfit List and Stowage Plan

#### Pilothouse

<table>
<thead>
<tr>
<th>Item</th>
<th>Location</th>
<th>Quantity</th>
<th>NSN Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binocular; 7 x 50 Marine waterproof</td>
<td>Helm Seat Bag</td>
<td>2 ea</td>
<td>NSN 6650-01-224-2555</td>
</tr>
<tr>
<td>Hearing Protection; Ear Muff Style</td>
<td>Eng Seat Bag</td>
<td>2 ea</td>
<td>Peltor H10 Twin Cup</td>
</tr>
<tr>
<td>Flashlights, Pelican Non-Explosive w/batteries</td>
<td>Crew Seat Bag</td>
<td>2 ea</td>
<td>Lifesaving System #605</td>
</tr>
<tr>
<td>Engine Hatch; Dogging Wrench</td>
<td>Crew Seat Bag</td>
<td>2 ea</td>
<td></td>
</tr>
<tr>
<td>Window Covers</td>
<td>Navigation Seat Bag</td>
<td>2 ea</td>
<td></td>
</tr>
<tr>
<td>Navigation Kit*</td>
<td>Navigation Pouch</td>
<td>1 ea</td>
<td>Stubbies</td>
</tr>
</tbody>
</table>

*Required Contents of Navigation Kit*

1. Corrected Charts (as required)
2. Pencils (as required)
3. China Markers (as required)
4. Stop Watch
5. Search Pattern Slide Rule
6. Parallel Rule
7. Weems Plotter
8. Anemometer
9. Gum Eraser
10. Pencil Sharpener
11. Tide Book(**)
12. Coast Pilot(**)
13. NAVRULS
14. Light List(**)
15. Nautical Slide Rule
16. Chart One
17. Note Pad
18. Compass Deviation Table (or posted on chart table)
19. Flashlight with Red Lens
20. Compass and dividers

(**) Appropriate pages as required

#### Auxiliary Machinery Compartment

<table>
<thead>
<tr>
<th>Item</th>
<th>Radio Rack</th>
<th>Quantity</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portable Back-Up Console</td>
<td>Radio Rack</td>
<td>1 ea</td>
<td>Vector</td>
</tr>
</tbody>
</table>
## Forepeak

<table>
<thead>
<tr>
<th>Item</th>
<th>Location</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchor Reel with handle</td>
<td>Forepeak</td>
<td>1 ea</td>
<td>Acrylic fabric</td>
</tr>
<tr>
<td>Anchor Line; DBN 2 ¾ inch (Cir) 7/8 inch (Dia), 5/16 inch S/S jaw-to-jaw swivel, 3/8 inch S/S shackle D-Wide S/S shackle</td>
<td>Forepeak</td>
<td>300 ft</td>
<td></td>
</tr>
<tr>
<td>Drogue; Small w/ Flotation Bag, 200 FT 1 ½ inch Cir DBN, plastic thimble, 5/16 inch S/S swivel, 3/8 inch S/S shackle</td>
<td>Forepeak</td>
<td>1 ea</td>
<td>Stubbies</td>
</tr>
<tr>
<td>14 FT6 inch (min) black DBN w/Snap hook (Skiff Hook), 2 inch cir, 5/8 inch diameter</td>
<td>Forepeak</td>
<td>1 kt</td>
<td>Lifesaving System #367/#377</td>
</tr>
<tr>
<td>Mooring Lines; 2 ¾ inch (Cir) DBN 30 FT</td>
<td>Forepeak</td>
<td>2 ea</td>
<td></td>
</tr>
<tr>
<td>Mooring Lines; 2 ¾ inch (Cir) DBN 60 FT</td>
<td>Forepeak</td>
<td>6 ea</td>
<td></td>
</tr>
<tr>
<td>Fenders; Cylindrical; Color White</td>
<td>Forepeak</td>
<td>4 ea</td>
<td></td>
</tr>
<tr>
<td>Towing Bridles (optional)</td>
<td>Forepeak</td>
<td>As required</td>
<td></td>
</tr>
<tr>
<td>Heaving Line W/Bag; 100 FT Line</td>
<td>Deck</td>
<td>1 ea</td>
<td>Lifesaving System #227H</td>
</tr>
</tbody>
</table>

## Deck

<table>
<thead>
<tr>
<th>Item</th>
<th>Location</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchor, 21 lb</td>
<td>Deck</td>
<td>1 ea</td>
<td>Fortress FX-37, Garelick Floating #55170</td>
</tr>
<tr>
<td>Telescoping Boat Hooks 8 FT</td>
<td>Deck</td>
<td>2 ea</td>
<td>Garelick Floating #55170</td>
</tr>
<tr>
<td>Boat Hook Mounting Clamps</td>
<td>Deck</td>
<td>2 sets</td>
<td></td>
</tr>
<tr>
<td>Ensign, National (16 inch x 24 inch)</td>
<td>Mast</td>
<td>1 ea</td>
<td>NSN 8345-00-245-2040</td>
</tr>
<tr>
<td>Ensign, U.S. Coast Guard (15 inch x 24 inch)</td>
<td>Mast</td>
<td>1 ea</td>
<td>NSN 8345-00-242-0275</td>
</tr>
</tbody>
</table>
### Appendix A - Outfit List and Stowage Plan

**30 inch Life Ring Buoy; W/ reflective tape, RB-M # and U S COAST GUARD**
- **Location:** Deck
- **Quantity:** 2 ea
- **NSN:** 4220-00-275-2157

**Light Marker Distress; SM2**
- **Location:** Deck
- **Quantity:** 2 ea
- **Provider:** Electronic Inc. #SM2

**Snap Hook for attaching Distress Light Lanyard**
- **Location:** Deck
- **Quantity:** 2 ea
- **Provider:** Lifesaving System #365

**Throw Bag; 75 FT Line**
- **Location:** Deck
- **Quantity:** 2 ea
- **Provider:** Lifesaving System #237P

**Snap Hook for Throw Bags**
- **Location:** Deck
- **Quantity:** 2 ea
- **Provider:** Lifesaving System #365

**Knife With Case**
- **Location:** Deck
- **Quantity:** 1 ea
- **NSN:** 4220-00-141-1909

**Heaving Line W/Bag; 100 FT Line**
- **Location:** Deck
- **Quantity:** 2 ea
- **Provider:** Lifesaving System #227H

**Tow Line; DBN 2 ¾ inch (Cir) ¾ inch (Dia)**
- **Location:** Deck
- **Length:** 600 ft

<table>
<thead>
<tr>
<th>Item</th>
<th>Location</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-6 Pump Container Cover</td>
<td>Deck</td>
<td>1 ea</td>
<td>Acrylic fabric</td>
</tr>
<tr>
<td>Coast Guard P-6 Pump Kit</td>
<td>Deck</td>
<td>1 ea</td>
<td>NSN 4320 01 F99 0342</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Location</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P6 Standpipe Connection Hose; 6 FT</td>
<td>Lazarette</td>
<td>1 ea</td>
<td>NSN 4720-01-372-5726</td>
</tr>
</tbody>
</table>
Appendix B. Time Compliance Technical Orders

Introduction
This appendix contains a list of authorized Time Compliance Technical Orders (TCTOs) for the RB-M, and can be accessed via the Surface Forces Logistics Center (SFLC) website.

NOTE
For a complete breakdown of the TCTO Number, see the Naval Engineering Manual, Chapter 041, COMDTINST M9000.6 (series).

In this appendix
This appendix contains the engineering changes:

<table>
<thead>
<tr>
<th>Topic</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Compliance Technical Orders (TCTOs)</td>
<td>B-2</td>
</tr>
</tbody>
</table>
### Time Compliance Technical Orders (TCTOs)

<table>
<thead>
<tr>
<th>TCTO Number</th>
<th>Subject</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>TF2000.0</td>
<td>Automatic Identification System (AIS) Firmware Upgrade</td>
<td>16 NOV 2009</td>
</tr>
<tr>
<td>TF2000.1</td>
<td>Automatic Identification System (AIS) Firmware Upgrade (Amendment 1)</td>
<td>15 APR 2010</td>
</tr>
</tbody>
</table>
Appendix C. Materiel Inspection Checklist

Introduction

This appendix is meant to be a systematic means to inspect any RB-M and ensure the entire boat is prepared to meet mission demands. Also, this appendix should be used in conjunction with Appendix A and B.

This checklist may be locally reproduced.

In this appendix

This appendix contains the Materiel Inspection Checklist for the RB-M. This inspection list covers the following areas of the boat:

<table>
<thead>
<tr>
<th>No.</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Forepeak</td>
<td>C-4</td>
</tr>
<tr>
<td>II</td>
<td>Survivors’ Compartment</td>
<td>C-5</td>
</tr>
<tr>
<td>III</td>
<td>Auxiliary Machinery Compartment</td>
<td>C-7</td>
</tr>
<tr>
<td>IV</td>
<td>Engine Compartment</td>
<td>C-9</td>
</tr>
<tr>
<td>V</td>
<td>Lazarette</td>
<td>C-13</td>
</tr>
<tr>
<td>VI</td>
<td>Pilothouse</td>
<td>C-15</td>
</tr>
<tr>
<td>VII</td>
<td>Pilothouse Top</td>
<td>C-20</td>
</tr>
<tr>
<td>VIII</td>
<td>Deck</td>
<td>C-22</td>
</tr>
<tr>
<td>IX</td>
<td>Hull</td>
<td>C-24</td>
</tr>
<tr>
<td>X</td>
<td>Dockside Trials Port Engine</td>
<td>C-25</td>
</tr>
<tr>
<td>XI</td>
<td>Dockside Trials Starboard Engine</td>
<td>C-26</td>
</tr>
<tr>
<td>XII</td>
<td>Under Way Trials Port Engine</td>
<td>C-27</td>
</tr>
<tr>
<td>XIII</td>
<td>Under Way Trials Starboard Engine</td>
<td>C-28</td>
</tr>
</tbody>
</table>
Materiel Inspection Checklist

Boat Number: __________________________

Station: __________________________

Date: __________________________

References:
1) RB-M Operators Handbook, COMDTINST M16114.41 (series)
2) Naval Engineering Manual, COMDTINST M9000.6 (series)
3) Coatings and Color Manual, COMDTINST M10360.3 (series)
4) Rescue and Survival Systems Manual, COMDTINST M10470.10 (series)
5) U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume I, COMDTINST M16114.32 (series)

Inspection Standards: The following inspection standards apply to the RB-M’s hull, superstructure, machinery, equipment, outfit, and installed systems and accessories:
1) Operates smoothly and correctly.
2) Free of grease, oil, rust, and corrosion.
3) All fluid levels and pressure readings are within parameters.
4) Protective coatings applied correctly and neatly.
5) Free of rips, tears, abrasions, and cracks.
6) Labels/test dates/placards properly indicated.
7) Outfit and equipment correctly installed/adjusted.
8) Outfit and equipment stowed according to specifications and stowage plan.
9) Free of non-standard/unapproved installations or equipment.
10) Maintained according to current manufacturer’s guidelines and Commandant Directives.
**Inspection Guidelines:**

Inspection requires a minimum of two personnel, preferably one Boatswains Mate and one Machinery Technician, both of who possess extensive RB-M experience and a strong working knowledge of the references listed above. This materiel inspection checklist is only applicable to boats in a “Bravo” or “Ready for Sea” condition. Each item on the checklist should be judged against the applicable standard(s) and reference(s). Additional discrepancies such as uninstalled TCTOs, etc. should be listed.

---

**Inspected By:**

---

C-3
## I. Forepeak

<table>
<thead>
<tr>
<th>Item</th>
<th>SAT</th>
<th>UNSAT</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>QA\WTH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bilge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulkhead</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frames/longitudinals</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overhead</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anchor line reel and locking pin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anchor reel handle and locking pin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hawse fitting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step bar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light and light switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bilge pump</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Float switch</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS:**

---

---
### II. Survivors’ Compartment

<table>
<thead>
<tr>
<th>Item</th>
<th>SAT</th>
<th>UNSAT</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escape hatch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Escape ladder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilothouse access doors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilothouse access steps</td>
<td></td>
<td></td>
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**REMARKS:**

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**REMARKS:**

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**REMARKS:**

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**REMARKS:**

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### VI. Pilothouse

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## Materiel Inspection Checklist

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**REMARKS:**

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VII. Pilothouse Top

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<td>Loudhailer speaker</td>
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## Appendix C – Materiel Inspection Checklist

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**REMARKS:**

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<td>Fuel fill and cofferdam – stbd</td>
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<th>SAT</th>
<th>UNSAT</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stern rescue platform, inspection hatches and locking pins.</td>
<td></td>
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</table>

**REMARKS:**

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# IX. Hull

<table>
<thead>
<tr>
<th>Item</th>
<th>SAT</th>
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<tbody>
<tr>
<td>Port hull plating</td>
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<td></td>
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</tr>
<tr>
<td>Starboard hull plating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transom</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Underwater body paint</td>
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<tr>
<td>Exhaust ports</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Bilge pump discharge ports (6 each)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A/C sea water discharge ports (2)</td>
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</tr>
<tr>
<td>A/C condensate discharge ports (2)</td>
<td></td>
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</tr>
<tr>
<td>Port fender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starboard fender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waterjet zincs</td>
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<tr>
<td>Hull zincs</td>
<td></td>
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</tr>
<tr>
<td>Hull numbers, letters and decals</td>
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**REMARKS:**

____________________________________________________________________________________

____________________________________________________________________________________
# X. Dockside Trials Port Engine

<table>
<thead>
<tr>
<th>Item</th>
<th>SAT</th>
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<tbody>
<tr>
<td>Proper operation of engine display unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proper operation of Vector display and alarm unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil pressure (10 psi minimum at idle)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water temperature (minimum 140°F, maximum 185 °F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine gear oil pressure (186-250 psi engaged)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine gear oil pressure (15-65 psi disengaged)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low idle speed (650 RPM)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max RPM no load (2350 RPM)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine start and stop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steering operation (2 locations)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable backup/emergency console</td>
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**REMARKS:**

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_________________________________________________________________
XI. Dockside Trials Starboard Engine

<table>
<thead>
<tr>
<th>Item</th>
<th>SAT</th>
<th>UNSAT</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>Proper operation of engine display unit</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Proper operation of Vector display and alarm unit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil pressure (10 psi minimum at idle)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Water temperature (minimum 140°F, maximum 185 °F)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Marine gear oil pressure (186-250 psi engaged)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine gear oil pressure (15-65 psi disengaged)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low idle speed (650 RPM)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max RPM no load (2350 RPM)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine start and stop</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steering operation (2 locations)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portable backup/emergency console</td>
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REMARKS:________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
### XII. Under Way Trials Port Engine

<table>
<thead>
<tr>
<th>Item</th>
<th>SAT</th>
<th>UNSAT</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil pressure (greater than 41 psi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water temperature (140-185° F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine gear oil pressure (186-250 psi engaged)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full power (2200-2350 RPM)</td>
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</tr>
</tbody>
</table>

**REMARKS:**

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### XIII. Under Way Trials Starboard Engine

<table>
<thead>
<tr>
<th>Item</th>
<th>SAT</th>
<th>UNSAT</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil pressure (greater than 41 psi)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water temperature (140-185° F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine gear oil pressure (186-250 psi engaged)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full power (2200-2350 RPM)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REMARKS:**

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________


Appendix D. Disabling Casualties

Introduction
This appendix contains disabling casualties for the RB-M. Refer to Chapter 5, Section A, for steps to follow if any of these casualties occur.

In this appendix
The appendix contains the following information:

<table>
<thead>
<tr>
<th>Topic</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Parameters</td>
<td>D-2</td>
</tr>
<tr>
<td>Engineering System Components</td>
<td>D-2</td>
</tr>
<tr>
<td>Electronic/ Navigation</td>
<td>D-2</td>
</tr>
<tr>
<td>Safety</td>
<td>D-3</td>
</tr>
<tr>
<td>General Materiel</td>
<td>D-3</td>
</tr>
</tbody>
</table>
## Disabling Casualty List

### Engine Parameters
1. Reduction gear pressure below 186 psi (while engaged).
2. Reduction gear pressure below 15 psi or above 65 psi (while disengaged).
3. Reduction gear oil temperature above 193° F at 2300-2350 RPM
4. Engine lube oil pressure below 31 psi at 2300-2350 RPM
5. Engine lube oil pressure below 10 psi at 650 RPM
6. Engine coolant temperature below 140° F or above 211° F.

### Engineering System Components
1. Engine fails to start.
2. Uncontrollable overheat.
4. Excessive waterjet, shaft or engine vibration.
5. Engine surging/over speed (over 50 RPM).
7. Marine gear fails to engage.
8. Fuel oil dilution 2.5% or above.
10. Lube oil in engine jacket water:
    a) More than a light sheen.
    b) Floating unmixed lube oil separated from the water.
11. Battery(ies) will not charge or hold a charge.
12. Complete loss of charging system. (i.e. both AuraGens inoperative)
13. Continuous electrical breaker trip.
15. Engine motor-mount hardware loose or missing.

### Electronic/Navigation
1. No electronic means of signaling distress (i.e. no radio etc.).
2. Electronics won’t energize.
Appendix D – Disabling Casualties

<table>
<thead>
<tr>
<th>Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Any fuel oil or lube oil dripping* on a hot surface (hot surface is defined as a surface greater than 400° F, even if covered by insulation).</td>
</tr>
<tr>
<td>2) Electrical arcing and sparking.</td>
</tr>
<tr>
<td>3) Fixed (FM-200) fire fighting system or engine room air damper inoperative, PLUS no portable fire extinguishers (unserviceable).</td>
</tr>
<tr>
<td>4) Emergency alarms and indicator lights, where applicable, inoperative (fire, bilge, hydraulic, lube oil pressure, high water temp).</td>
</tr>
<tr>
<td>5) Any water or oil leaking from the water jet bearing housing weep hole.</td>
</tr>
</tbody>
</table>

* To determine if fuel oil or lube oil dripping is occurring, a clean sheet of paper may be placed under a suspected leak to collect and detect any drops that fall.

<table>
<thead>
<tr>
<th>General Materiel</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Hull breach below the waterline.</td>
</tr>
<tr>
<td>2) Inoperative (open/closed) sea chest valve, fuel shut off valve, or engine shut down damper.</td>
</tr>
</tbody>
</table>
This page intentionally left blank.
Appendix E. Restrictive Discrepancies

Introduction
This appendix contains restrictive discrepancies for the RB-M. Refer to Chapter 5, Section A, for steps to follow if any of these casualties occur.

In this appendix
This appendix contains the following information:

<table>
<thead>
<tr>
<th>Title</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine and Boat Systems</td>
<td>E-2</td>
</tr>
<tr>
<td>Boat Outfit</td>
<td>E-3</td>
</tr>
<tr>
<td>Electronics/ Navigation</td>
<td>E-3</td>
</tr>
<tr>
<td>General Materiel and Safety</td>
<td>E-3</td>
</tr>
</tbody>
</table>
1) Engine performance:
   a) Maximum RPM under load (norm 2300) – less than 2200 RPM.
   b) Engine coolant temperature between 186° F and 211° F.

2) Leaks more than 15 drops per minute:
   a) Jacket Water
   b) Raw Water
   c) Lube Oil
   d) Hydraulic Fluid
   e) Marine Gear Oil

3) Fuel oil dripping* (falling onto a surface which is not hot). One drop within ten (10) minutes.

4) Bilge pumps and/or pump high water level sensors inoperative.

5) Inaccurate pressure/temperature/fire alarms.

6) Any detectable exhaust leaks.

7) Missing exhaust lagging.

8) Failure of any emergency system:
   a) Fuel shut off valves do not fully close.

9) Loose/missing fittings, nuts, bolts, brackets, etc.:
   a) Missing or loose shafting bolts:
      i.) Torsional coupling
      ii.) Cardan shaft
      iii.) Gear output flange
      iv.) Waterjet gearbox flange
   b) Steering and bucket system:
      i.) Hydraulic cylinder mounts
      ii.) Tie rod
      iii.) Feedback sensor mounting

10) Undersized engine mounting bolts and/or constructed of inferior grade material.

11) Battery box cover missing or not secured properly.

12) Unauthorized batteries.

* To determine if a fuel oil dripping is occurring, a clean sheet of paper may be placed under a suspected leak to collect and detect any drops that fall.
# Appendix E – Restrictive Discrepancies

## Boat Outfit

1. Fire extinguishers not secured in brackets.
2. Loose/missing fittings, nuts, bolts, brackets, etc.:
   a) Missing/loose/undersized crew chair mounting hardware.
   b) Mast latches loose/missing.
3. Engine Compartment fire suppression system pressure switches not operating properly.
4. Missing boat crew survival vest.
5. Missing boat pyrotechnics.
6. Portable dewatering pump kit incomplete/inoperative/missing.
7. Towline less than 100 FT of required length.

## Electronics/Navigation

1. Compass:
   a) Deviation table missing.
   b) Compass deviation greater than 5°.
2. Electronics:
   a) VHF-FM radio inoperative.
   b) Depth sounder inoperative.
   c) DGPS/GPS inoperative.
   d) Radar inoperative.

## General Materiel and Safety

1. Water Tight Integrity:
   a) Holes/cracks in a watertight structure.
   b) Cracks through a watertight scuttle/hatch.
   c) Failure of a watertight closure/window seal.
   d) Any noticeable gap at gasket seams.
2. Applied non-skid on main decks ineffective/missing (any traffic/working area without non-skid for an 8 ½ inch x 11 inch area).
3. Navigation light(s) inoperative or incorrect configuration / displaying incorrect lighting characteristics.
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Appendix F. Major Discrepancies

Introduction
This appendix contains major discrepancies for the RB-M. Refer to Chapter 5, Section A, for steps to follow if any of these casualties occur.

In this appendix
This appendix contains the following information:

<table>
<thead>
<tr>
<th>Title</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine and Boat Systems</td>
<td>F-2</td>
</tr>
<tr>
<td>Electronics/ Navigation</td>
<td>F-2</td>
</tr>
<tr>
<td>General Materiel and Safety</td>
<td>F-3</td>
</tr>
</tbody>
</table>
Appendix F – Major Discrepancies

**Engine and Boat Systems**

1) Leaks less than 15 drops per minute:
   a) Jacket Water
   b) Raw Water
   c) Lube Oil
   d) Hydraulic Fluid
   e) Marine Gear Oil

2) Any fuel leak (piping/fittings/tank) that drips less than one drop within ten minutes.

3) Bilge pump hoses missing hose clamps.

4) One Auragen not operating properly.

5) Loose/missing fittings, nuts, bolts, brackets, etc.:*
   a) Hardware on the engines used for attaching equipment.
   b) Battery terminals loose or corroded.
   c) ECM cables loose or disconnected.

* For fasteners utilizing nyloc nuts, the bolt must engage and pass through the nylon insert, but not more than five threads.

6) Flexible hoses and gauge lines used for petroleum based products not either fire rated or fire sleeved (fire sleeve properly banded at both ends).

7) Fluid levels below minimum required.

8) Engine guards inadequate/missing around moving machinery.

9) Protruding exhaust lagging securing wire.

Any standard boat machinery, with the exception of those listed on the disabling or restrictive list, not operating properly.

**Electronics/Navigation**

1) Compass light inoperative.

2) Expired deviation table.

Any standard boat electronics, with the exception of those listed on the restrictive list, not operating properly.
1) Watertight Integrity:
   a) Improperly filled holes.
   b) Hardware bolted through a watertight hatch, scuttle, or bulkhead.
   c) Loose dogs/dogging arms on watertight hatch, scuttle, or bulkhead.
2) Scuttle not flush with the deck, causing a tripping hazard.
3) Inability to open or close doors, hatches, or scuttles.
4) Hatch and scuttle safety locks do not engage when item is in the open position.
5) Missing breaker or open hole in any power circuit breaker panel.
6) 1 portable fire extinguisher missing, unserviceable including improper PMS completion and recording.
7) Any standard boat machinery or system, with the exception of those listed on the disabling or restrictive lists, not operating properly.
Appendix G. Full Power Trial

**Introduction**
This appendix contains the full power trial requirements for the RB-M to ensure that the boat operates to prescribed standards.

**In this appendix**
This appendix contains the following information:

<table>
<thead>
<tr>
<th>Topic</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducting a Full Power Trial</td>
<td>G-2</td>
</tr>
</tbody>
</table>
Procedures

Conducting a Full Power Trial

Follow these procedures when conducting a full power trial.

<table>
<thead>
<tr>
<th>Step</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Get the boat underway for a five (5) minute transit on a relatively straight course. Bring the engine up to full speed.</td>
</tr>
<tr>
<td>2</td>
<td>After approximately three (3) minutes, check engine speed on the engine display panel. Normal engine speed range is 2200-2350 RPM.</td>
</tr>
</tbody>
</table>
| 3    | Check for the following abnormalities, which occasionally occur during the full power trial:  
   a) Any fuel or lube oil dripping* on a hot surface is a disabling casualty (hot surface is defined as a surface greater than 400°F, even if covered by insulation).  
   b) Any fuel oil drop* falling within 5 minutes, not on a hot surface, is a restrictive discrepancy.  
   c) Any anti-freeze, raw water, lube oil, or hydraulic fluid leaks greater than 15 drops per minute are a restrictive discrepancy.  
   d) Any anti-freeze, raw water, lube oil, or hydraulic fluid leaks less than 15 drops per minute is a major discrepancy.  
   e) Any fuel oil leak on the fuel tank access covers greater than 1 drop in 5 minutes is a restrictive discrepancy.  

* To determine if any drop(s) have occurred, a clean sheet of paper may be placed under a suspected leak for up to ten minutes to collect and detect any drops that fall.
Step | Procedure
--- | ---
1 | Check all pressures and temperatures on the EDMs and record the readings. Refer to **Figure G-1** for allowable ranges and results:
2 | Return to the mooring. Secure both engines and check all fuel fittings.

*Note: The following parameters coincide with the Standardization Program*

<table>
<thead>
<tr>
<th>Categories</th>
<th>Disabling</th>
<th>Restrictive</th>
<th>Major</th>
<th>Normal</th>
<th>Major</th>
<th>Restrictive</th>
<th>Disabling</th>
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<tr>
<td>Oil Pressure (psig) @ 2300-2350 RPM</td>
<td>&lt;31</td>
<td></td>
<td></td>
<td>&gt;41 psi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Pressure (psig) @ 650 RPM</td>
<td>&lt;10</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coolant Temp (°F) @ 2300-2350 RPM</td>
<td>&lt;140</td>
<td>140-185</td>
<td></td>
<td>186-211</td>
<td></td>
<td>&gt;211</td>
<td></td>
</tr>
<tr>
<td>Coolant Temp (°F) @ 650 RPM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;211</td>
</tr>
<tr>
<td>Red. Gear Pressure (psig) (engaged)</td>
<td>&lt;186</td>
<td>186-250</td>
<td></td>
<td></td>
<td></td>
<td>&gt;250</td>
<td></td>
</tr>
<tr>
<td>Red. Gear Pressure (psig) (disengaged)</td>
<td>&lt;15</td>
<td>15-65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red. Gear Oil Temp (°F) @ 2300-2350 RPM</td>
<td></td>
<td>130-185</td>
<td></td>
<td></td>
<td></td>
<td>&gt;193</td>
<td></td>
</tr>
<tr>
<td>Engine RPM</td>
<td>&lt;2200</td>
<td>2300-2350</td>
<td></td>
<td></td>
<td></td>
<td>&gt;2350</td>
<td></td>
</tr>
</tbody>
</table>

*Figure G-1*

**Allowable Ranges and Results**
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Appendix H. List of Acronyms

Introduction
This appendix contains a list of acronyms used throughout the handbook.

In this appendix
This appendix contains the following information:

<table>
<thead>
<tr>
<th>Topic</th>
<th>See Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Acronyms</td>
<td>H-2</td>
</tr>
<tr>
<td>ACRONYM</td>
<td>DEFINITION</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>AC</td>
<td>Alternating Current</td>
</tr>
<tr>
<td>A/C</td>
<td>Air Conditioning</td>
</tr>
<tr>
<td>ACR</td>
<td>Automatic Charging Relay</td>
</tr>
<tr>
<td>ADF</td>
<td>Automatic Direction Finder</td>
</tr>
<tr>
<td>AGM</td>
<td>Absorbed Glass Mat</td>
</tr>
<tr>
<td>AH</td>
<td>Amps/Hour</td>
</tr>
<tr>
<td>AIS</td>
<td>Automatic Identification System</td>
</tr>
<tr>
<td>AOPs</td>
<td>Abstract of Operations</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>APS</td>
<td>Automatic Power Selector</td>
</tr>
<tr>
<td>CASREP</td>
<td>Casualty Report</td>
</tr>
<tr>
<td>CCTV</td>
<td>Closed Circuit Television</td>
</tr>
<tr>
<td>CEL</td>
<td>Check Engine Light</td>
</tr>
<tr>
<td>CO</td>
<td>Commanding Officer</td>
</tr>
<tr>
<td>COMDTINST</td>
<td>Commandant Instruction</td>
</tr>
<tr>
<td>CPU</td>
<td>Computer Processor Unit</td>
</tr>
<tr>
<td>DBN</td>
<td>Double Braided Nylon</td>
</tr>
<tr>
<td>DC</td>
<td>Direct Current</td>
</tr>
<tr>
<td>DDEC</td>
<td>Detroit Diesel Engine Control</td>
</tr>
<tr>
<td>DGPS</td>
<td>Differential Global Positioning System</td>
</tr>
<tr>
<td>DIW</td>
<td>Dead-in-the-Water</td>
</tr>
<tr>
<td>DO</td>
<td>Defense Operations</td>
</tr>
<tr>
<td>DSC</td>
<td>Digital Selective Calling</td>
</tr>
<tr>
<td>ECM</td>
<td>Electronic Control Module</td>
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<tr>
<td>ECU</td>
<td>Electronic Control Unit</td>
</tr>
<tr>
<td>EDM</td>
<td>Electronic Display Module</td>
</tr>
<tr>
<td>ELC</td>
<td>Engineering Logistics Center</td>
</tr>
<tr>
<td>ELT</td>
<td>Emergency Locator Transmitter</td>
</tr>
<tr>
<td>ACRONYM</td>
<td>DEFINITION</td>
</tr>
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