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United States Coast Guard

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COMDTNOTE 16114

OCT 9 2002

COMMANDANT NOTE 16114

Subj: CH-1 TO THE 49' BUOY UTILITY STERN LOADING (BUSL) BOAT OPERATOR'S HANDBOOK, COMDTINST M16114.22

1. PURPOSE. This Notice publishes changes to the 49' Buoy Utility Stern Loading (BUSL) Boat Operator's Handbook, COMDTINST M16114.22.

2. ACTION. Area and district commanders, commanders of maintenance and logistics commands, commanding officers of headquarters units, assistant commandants for directorates, Chief Counsel, and special staff offices at Headquarters shall ensure adherence to the content of this Notice at all units which operate and/or maintain 49' BUSLs. Internet release authorized.

3. DIRECTIVES AFFECTED. None.

4. SUMMARY OF CHANGES. The changes to this Manual incorporate grammar corrections, boat operating characteristic updates, and the inclusion of Cold Weather securing procedures to further refine the 49' Buoy Utility Stern Loading (BUSL) Boat Operator's Handbook. A black line in the right-hand margin of each page identifies changes to this Manual.

5. PROCEDURE.

a. Remove and insert the following pages:

Remove	Insert
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2-17 thru 2-18	2-17 thru 2-18
2-41 thru 2-42	2-41 thru 2-42
3-3 thru 3-4	3-3 thru 3-4
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D. S. BELZ
Assistant Commandant for Operations

Encl: (1) CH-1 to the 49' Buoy Utility Stern Loading (BUSL) Boat Operator's Handbook, COMDTINST M16114.22

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Section A. General Description

A.1. Design

The Boat Engineering Branch of the USCG Engineering Logistics Center designed the 49' BUSL **(figure 2-1)**.

A.2. Manufacturer

Maritime Contractors, Inc. of Bellington, Washington, built the two pre-production BUSL boats (CG 49401 and CG 49402). The Coast Guard Yard completed the detailed design and built the initial production 49' BUSL (CG 49403). A total of twenty-six 49' BUSLs will be constructed.

A.3. Missions

The 49' BUSL is designed primarily to service aids to navigation within the inland waters of the United States. It is capable and equipped to support multi-mission operations. The 49' BUSL has a 4,500-pound lifting capacity and a 6-inch ice-breaking capability.

A.4. Boat specifications

The following provides a list of all 49' BUSL boat specifications.

A.4.a. Physical characteristics

Length Overall (LOA):	49' 2 ¼" (14.99 meters)
Beam (Maximum):	16' 10" (4.9 meters)
End of Service Draft (Deepest, at the Bottom of the Skegs, Full Load + 2000lbs growth):	5' 6" (1.6 meters)
Current Draft (Deepest, at the Bottom of the Skegs, Full Load):	5' 4" (1.6 meters)
Current Draft (Deepest, at the Bottom of the Skegs, Water & Fuel, No Load):	4' 8" (1.4 meters)
Freeboard at Transom (Maximum):	3' 4" (0.9 meters)
Highest Fixed Point Above Waterline (with Mast Lowered, Boom Forward, and Preventers Removed):	15' (4.57 meters)
Highest Unfixed Point Above Waterline:	27' (8.2 meters)
Hoisting Weight:	71,690 pounds (32,517 kg)
Propulsion Machinery:	Two Cummins, 6CTA8.3M1
Reverse Reduction Gear:	Twin-disc, model MG 507A-1, reduction ratio 2.54 to 1
Propellers:	Twin, fixed pitch, 4-blade, 31-inch diameter, 22-inch pitch
Generator Rating:	20-kW, single-phase, 120-VAC, 60-Hz unit, operating at 1800 RPM

Fuel Tank Capacity:	783 gallons (2,963 liters) at 95%
Potable Water Capacity:	300 gallons (1,135 liters) at 95%
Crew Capacity:	Four crew, three spare/passenger

A.4.b. Operating characteristics

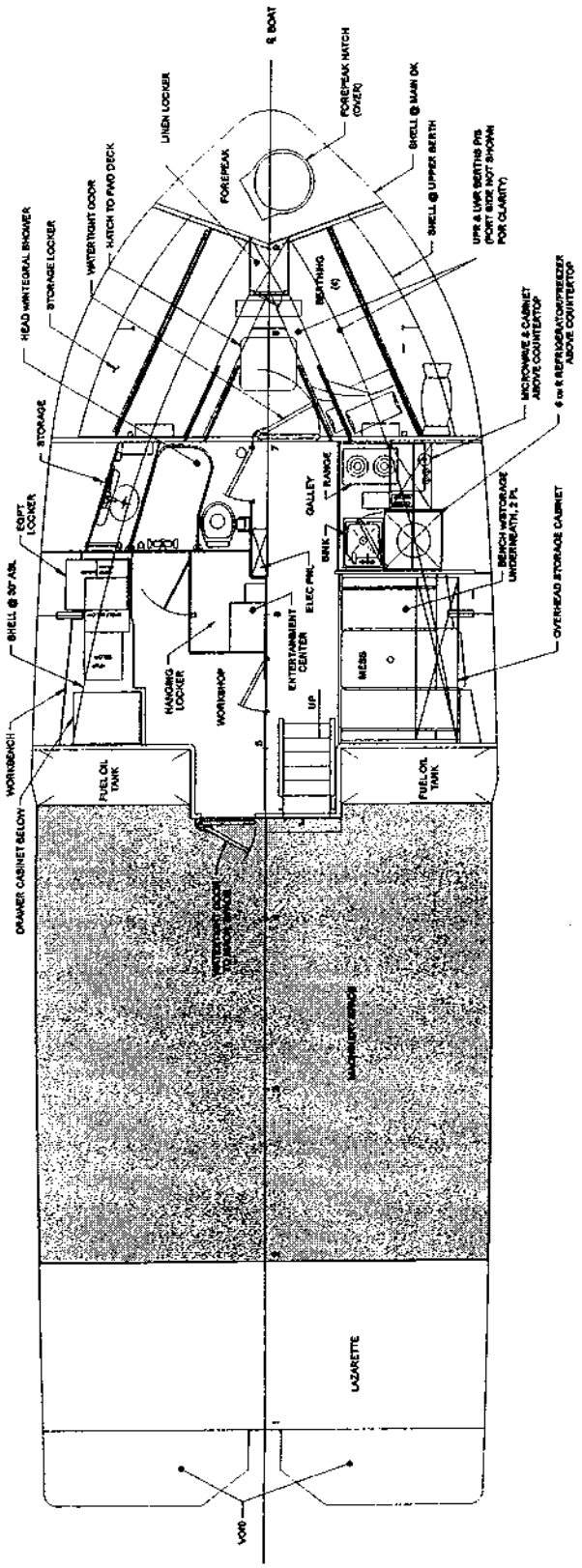
Maximum Speed:	10.5 knots at 2300 RPM
Cruise Speed:	7 knots
Maximum Range:	400 nautical miles at 10 knots (12 gph @ 2300 rpm equates to 560 NM range)
Endurance:	4 days
Maximum Seas:	4 feet (1.2 meters)
Maximum Towing Capacity Bollard Pull:	11,000 lbs (4,950 kg), aft 8,300 lbs (3,735 kg), bow
Maximum Hoisting Capacity (Buoy, Safe Working Load):	4,500 lbs (2,025 kg)
Outside Air Temperature:	0 °F (-18 °C) to 95 °F (35 °C)
Outside Water Temperature (Seawater):	28 °F (-2 °C) to 85 °F (30 °C)
List Limit (Full Load):	Not to exceed ½ degree from vertical
Maximum Sea State for Buoy Operations:	3 feet (0.91 meter)
Maximum Sea State for Transiting:	6 feet (1.83 meters)

A.5. Superstructure

The boat's deckhouse is made of aluminum plate and sheet and complies with ASTM B209, Alloy 5086-H116. The aluminum deckhouse is joined to the steel main deck using bonded aluminum to steel transition joints. The superstructure contains the steering stations, buoy handling controls, and all electronic systems navigation. The superstructure is fixed to the hull at frame 5, aft and frame 7, forward. The fold-down mast platform is attached to the superstructure at frame 5.

A.6. Hull

The hull is made of ASTM A36 steel and is a displacement design with frames numbered from transom to bow. The deepest draft, 5 feet 6 inches, is at the bottom of the two skegs. The propulsion system is a straight drive configuration with the engines and reduction gears close-coupled in the engine room. The propeller shaft runs aft from the reduction gear through the skegs between frames 3 and 4.



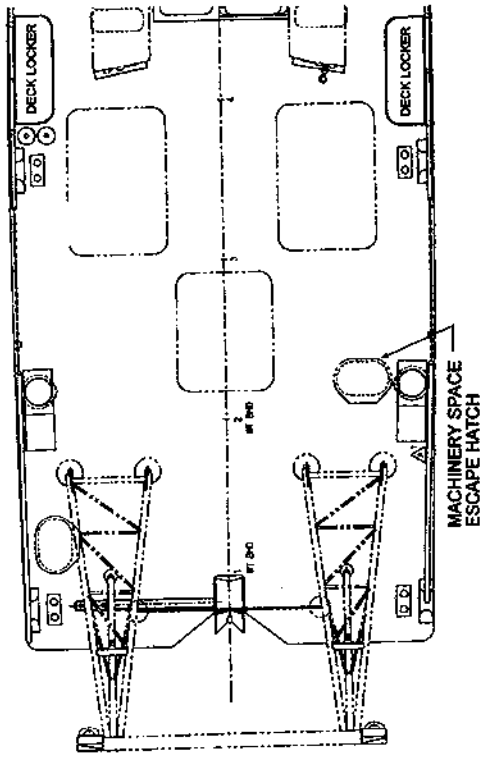


Figure 2-6
Machinery Space

Fuel Tanks

B.7. Location

The fuel tanks are located forward of the machinery space on the port and starboard sides between bulkheads 4A and 5. Access covers are located at bulkhead 4A, inside the machinery space. **(See figure 2-7.)**

B.8. Physical characteristics

The two fuel tanks have a combined capacity of 783 gallons at 95 percent and feed into a common supply header for both propulsion engines and the diesel generator set.

Each fuel tank is constructed of steel and has a separate 2-inch fill connection, sounding rod, stripping connection, and flameproof vent with 40-mesh screen and inverted ball check valve. Fuel supply and return piping is constructed of stainless steel.

The fill connection, sounding rod, stripping connection and vent are located within a spill containment coaming located above the tanks on the port and starboard side of the main deck, forward of the cross deck winches.

Life Raft

E.11. Location

One 6-person life raft is stored in a weather-tight, fire-retardant container atop the pilothouse, forward of the mast, in a float-free life raft cradle. **(See figure 2-20.)**

E.12. Physical characteristics

The life raft container is attached to a shackle on top of the pilothouse by a weak link. In the event the boat is sinking, the weak link will automatically cast off the life raft before any damage is incurred to it.

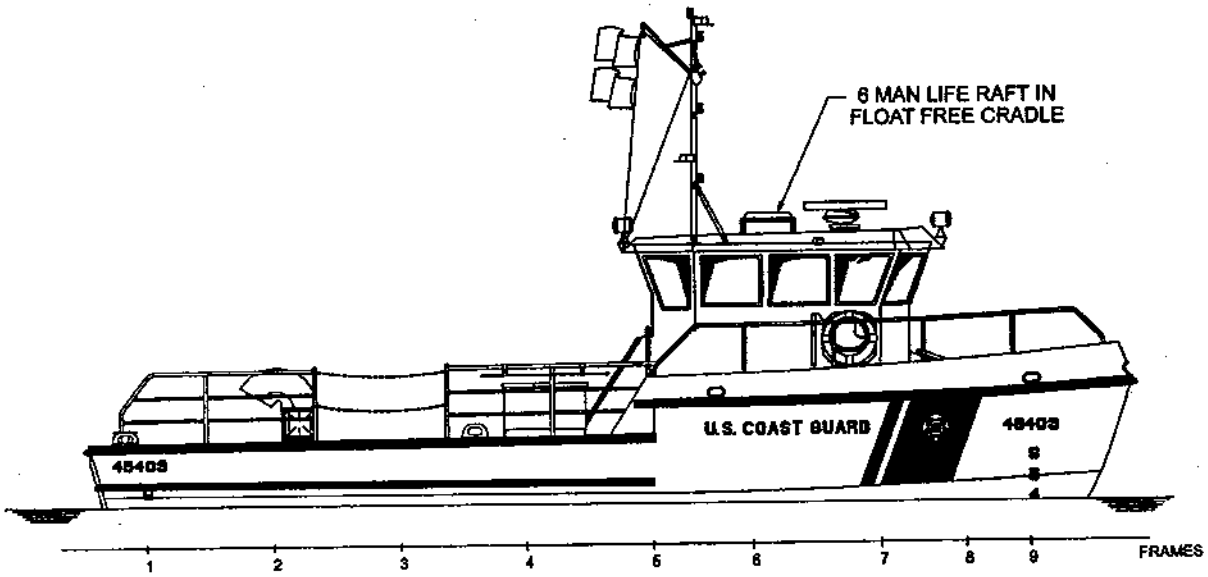


Figure 2-20

Life Raft

Boat Hooks

E.13. Location

Two boat hooks are mounted horizontally port and starboard on the outboard side of the fixed handrails, at the forward end of the buoy deck. **(See figure 2-21.)**

E.14. Physical characteristics

The boat hooks are fastened to the handrails by a leather strap. They are bronze or brass with wooden handles, and are approximately 10 feet long.

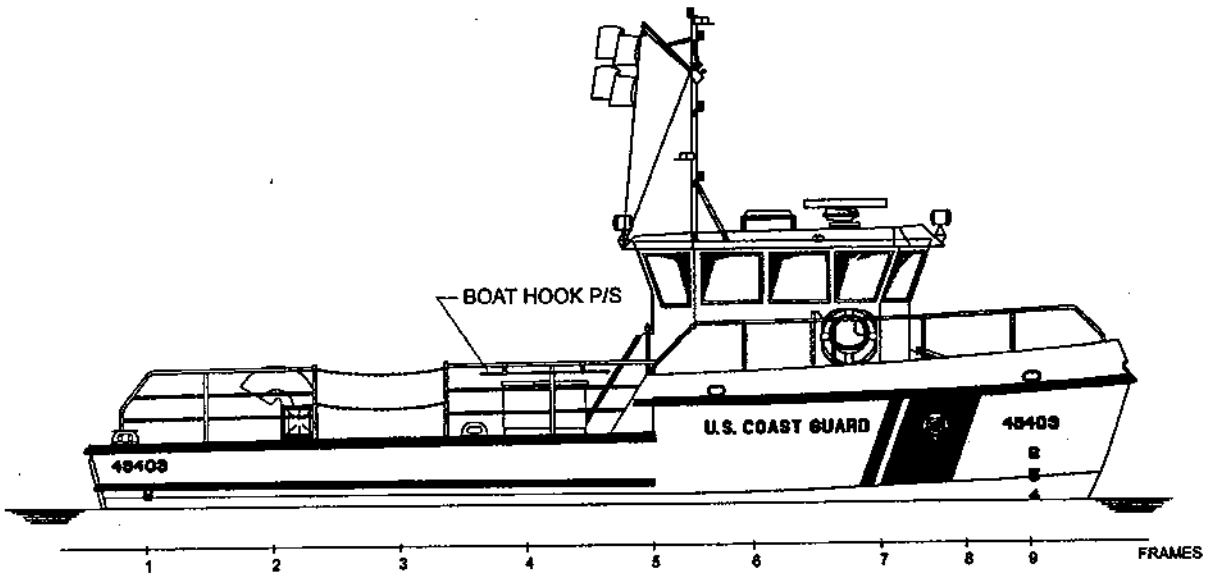


Figure 2-21

Boat Hooks

Section A. Propulsion System

A.1. General

The propulsion system **(figure 3-1)** is comprised of two marine diesel engines each driving a fixed propeller through a reverse reduction gear and solid, continuous shaft. The propellers are installed for right-hand ahead rotation on the starboard shaft and left-hand ahead rotation on the port shaft.

A.2. Engines

The 49' BUSL is equipped with two Cummins (6CTA 8.3M1) 6-cylinder, turbocharged, marine diesel engines. The engines are located in the machinery space. Minimum brake horsepower (hp) for each engine is 305 hp at 506 cubic inches (8.3 liters) displacement, 2300 RPM. The lubricating oil system capacity is 23.2 U.S. quarts (22 liters) of 15W-40 or 20W-40W oil. The cooling system capacity is approximately 7 gallons. The engines and transmissions are controlled by a Mathers Micro Commander Marine Propulsion Control System, utilizing a DC actuator. The actuator is mechanically connected to the main engine throttle system for speed control and to the transmission for direction control.

A.3. Marine transmission/ reduction gear

The 49' BUSL uses a Twin-Disc Model MG-507-A1 transmission/reduction gear mounted on each engine flywheel housing. The transmission provides for ahead, astern and trolling operations. The reduction ratio is 2.54 to 1 in forward and reverse. Each MG-507-A1 transmission utilizes an independent oil system. The oil system capacity is 1.72 U.S. gallons, conforming to the requirements of MIL-L-2104B, SAE 30 or SAE 40 weight oil (according to operating temperatures). The oil system consists of an oil pump, filter screen, filter and heat exchanger (oil cooler). The heat exchanger uses engine jacket water cooling at approximately 135 - 185 °F as the cooling median for the transmission oil. The heat exchanger should maintain the oil operating temperature for the transmission at 150 - 210 °F with a maximum temperature of 210 °F.

A selector valve mounted on the rear of the unit is used to hydraulically engage the desired clutch for forward and reverse operation. Normal clutch application pressure is from 250 - 310 PSI with a trolling valve incorporated for trolling in the ahead and astern mode of operation. The selector valve can be manually operated in the event of an electronic failure to the selector valve.

A.4. Propeller shafts

The propeller shafts are hardened stainless steel (Sea Shaft 22 or equivalent) shafts, 2 ½ inches in diameter and approximately 125 inches (10 ½ feet) long. The shaft is attached to the reduction gear utilizing a keyed, 6-bolt flange with a keeper ring set located in a groove between the end of the shaft and the flange. The tapered, threaded and keyed end of the shaft that mounts the propeller is equipped with a plain nut, jam nut and cotter pin hole to retain the propeller to the shaft. Each shaft is housed in a shaft tube, 4 ¾-inch OD with ¼-inch wall thickness, which passes through the skeg. The shaft tube is equipped with a Duramax shaft seal **(figure 3-2)** with a clamp-on adapter for the forward end of the shaft. The shaft seals are supplied with pressurization and flushing water via a valve and flow meter. The aft end of the propeller shaft is supported in the shaft tube by the shaft bearing mounted in the shaft bearing carrier. The shaft bearing is a Thordon XL marine bearing manufactured from a polymer type material. The shaft bearing is provided with lubrication and flushing water that is into the shaft tube via the pressurization and flushing water at the shaft seal end of the shaft.

A.5. Propeller

Each 4-bladed propeller is of cast, nickel aluminum bronze material. The propellers are 31 inches in diameter with a 22-inch pitch. Each propeller weighs 128 pounds.

B.8. Emergency shutdown controls (main engines)

Emergency shutdown pull knobs for the main engines are located on the center of the forward vertical panel on the aft control console in the pilothouse **(figure 3-7)**. The top pull knob is for the generator, the center is for the port main engine, and the bottom is for the starboard main engine. Push/pull cables connect the shutdown knobs to the engine remote air shut-off valve to secure air to the engine for emergency shutdown. The generator emergency shutdown will be discussed with the ship service AC generator system.

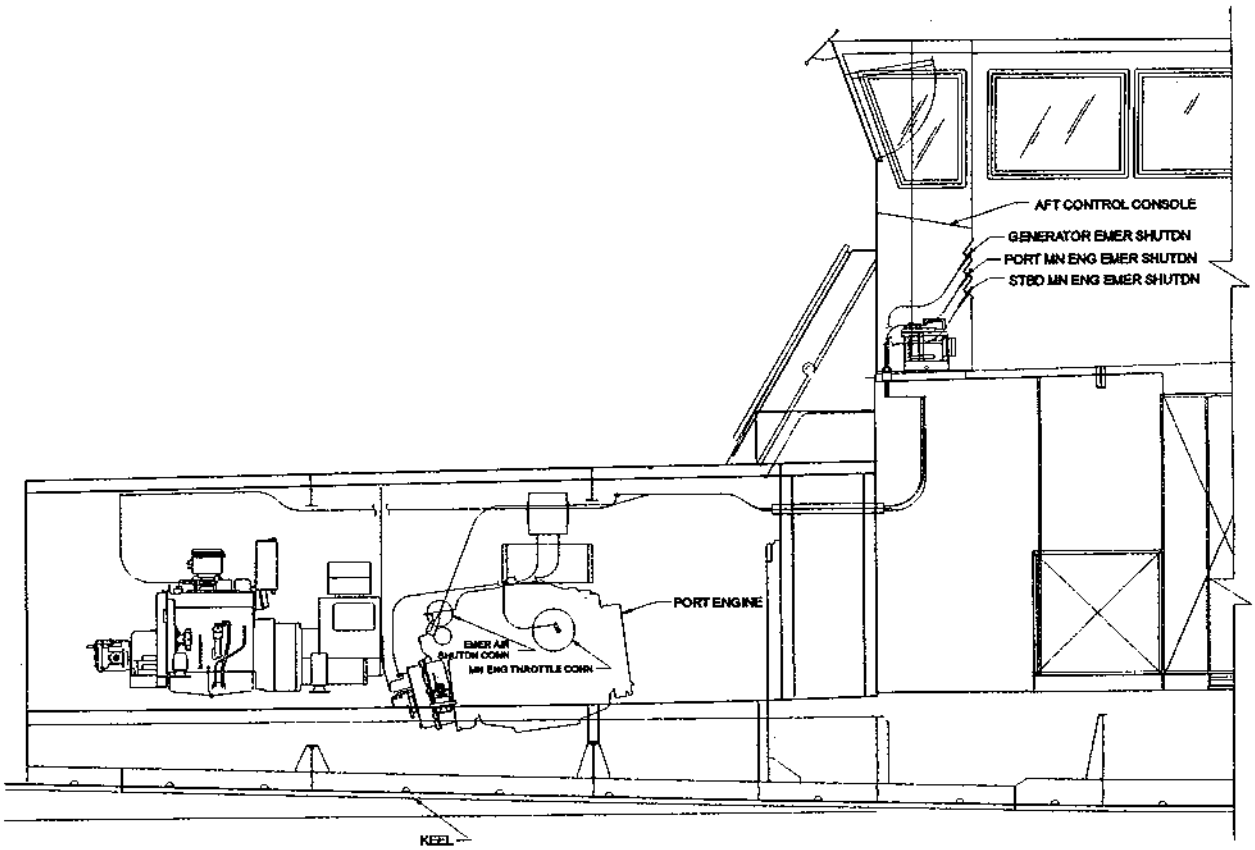


Figure 3-3

Propulsion Control System

(portside from keel to outboard)

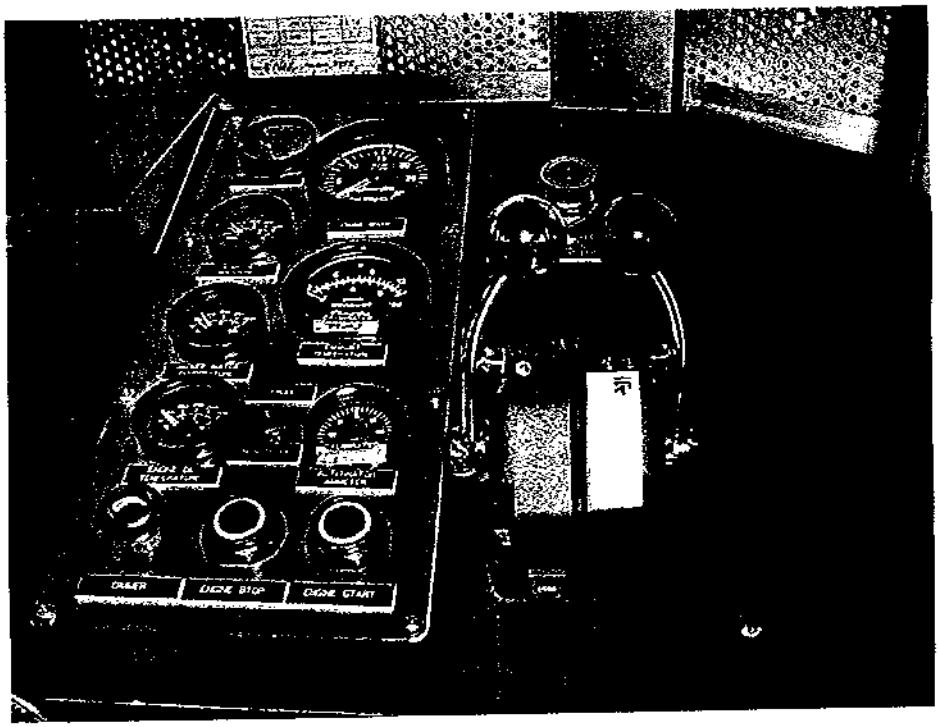


Figure 3-4

Pilothouse Forward Control Console

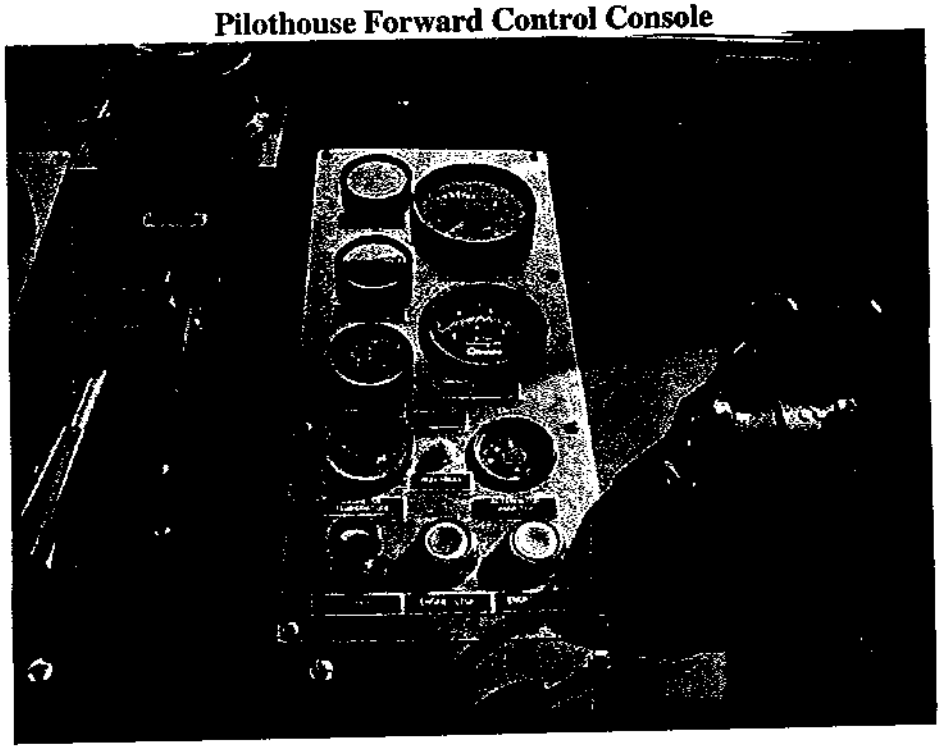


Figure 3-5

Pilothouse Aft Control Console

Section D. Engine Systems

Introduction

This section provides information about systems or components that are required for or support the operation of the marine diesel main propulsion engines.

In this section

This section contains the following information:

Topic	See Page
Engine Lubrication System	3-18
Engine Crankcase Ventilation System	3-20
Fuel Oil System	3-22
Engine Exhaust System	3-26
Engine Jacket Water Heaters (Hot Start)	3-28
Fast Lubricating Oil Change System (FLOCS)	3-29
Engine Starting System	3-30

Engine Lubrication System

D.1. General

The main diesel engines are equipped with a pressure type, wet sump oil system **(figure 3-10)**. The system consists of:

- pump and suction screen
- spin-on cartridge filter
- filter bypass valve
- pressure regulating valve
- oil cooler bypass valve

D.2. Pump and suction screen

The generator oil pump, which is gear driven by the engine, takes suction on the sump through an oil screen. The pump creates oil flow through the oil cooler.

D.3. Spin-on cartridge filter and bypass valve

The oil filter is mounted on the engine, starboard side aft of the alternator. It is a spin-on type disposable cartridge filter.

D.4. Filter bypass valve

A bypass valve is provided to divert oil around the filter element should it become clogged.

D.5. Pressure regulating valve

The pressure regulating valve is located on the discharge side of the oil filter. The valve regulates the engine oil pressure to maintain 30 to 75 PSI throughout the normal engine operating range. The valve is located in the bottom of the oil cooler housing.

D.6. Oil cooler bypass valve

The oil cooler is located on the engine, inboard of the spin-on lube oil filter mounting flange. The cooler uses jacket water cooling to cool the engine oil. A thermostatic bypass valve diverts cold oil around the core of the cooler. Oil flows from the cooler to the filter.

Section F. Ship Service AC Generator

F.1. General

The AC generator **(figure 3-19)** set is a 20-kW, single-phase, 120-VAC, 60-Hz unit, operating at 1800 RPM. The generator set is mounted in the machinery space aft, on the centerline.

F.2. Diesel engine

The generator set is powered by a 4-cylinder, 4-cycle, naturally aspirated Cummins diesel engine. The generator is directly coupled to the diesel engine.

F.3. Duplex fuel oil filter assembly (primary fuel filter)

The diesel engine for the generator set has a primary filter mounted on a frame assembly, directly port of the generator set. The duplex filter is on the suction side of the engine-driven fuel pump. The filter is rated at 30 microns. The separator portion of the filter is designed to remove large particles and to coalesce small amounts of water. A drain plug on the bottom of the filter bowl is provided to remove collected contaminants and water.

F.4. Emergency shutdown control (generator)

The generator emergency shutdown control **(figure 3-7)** is located on the center of the forward, vertical panel on the aft control console in the pilothouse. Pulling the generator shutdown knob will mechanically close the remote butterfly valve located between the inlet air separator and intake manifold, thus starving the engine of air.

F.5. Fuel pump and filter

The engine-driven fuel pump and filter are mounted on the engine directly above the oil fill standpipe and cap. The engine-mounted fuel filter (the secondary filter) filters the fuel on the discharge side of the engine-driven fuel pump, prior to the fuel injection pump unit.

F.6. Lubrication system

The engine lubrication system is a self-contained (Use API CC/CD SAE 15W40 or 20W40 good down to 14 °F), wet sump system, incorporating a spin-on, full-flow filter and 11.5-quart oil system capacity. The lubrication filter is located on the opposite side of the engine from the lube oil dipstick and filler cap.

F.7. Jacket water system

The jacket water system consists of a reservoir/expansion tank, a pump and a keel cooler. The reservoir, with a 2.1-gallon capacity, requires a 50-50 mixture of freshwater and ethylene glycol antifreeze. The reservoir is fitted with a 15-PSI pressure cap. The centrifugal engine-driven pump pumps the jacket water through the engine and keel cooler. The system is designed to keep the jacket water below 210 °F.

F.8. Saltwater system

The generator saltwater system provides cooling water to the buoy handling hydraulic oil cooler when the boat is not making headway. The system uses a centrifugal type pump with a neoprene impeller that is mounted on the inboard side of the engine near the oil filler cap and dipstick. The pump is rated at approximately 13.5 GPM at 10 PSI. A suction strainer with a 0.060-inch mesh basket protects the pump from damage.

F.9. Engine jacket water heater (hot start)

A 1500-watt, 120-VAC, 60-Hz electric heater is installed in the jacket water system for the generator diesel engine. The heater is controlled by a thermostat that turns the heater *on* when the jacket water temperature drops below 80 °F, and *off* when the temperature reaches 100 °F.

F.10. Engine exhaust system

The generator engine uses a separate dry type exhaust system. Bellows type flex connections (manufactured from 321 stainless steel) are installed between the engine exhaust port and the exhaust piping system on the inlet side of the muffler, and also on the outlet side of the muffler for piping that interfaces with the shell penetration point. The exhaust is above the waterline port side, forward of the engine room aft bulkhead, forward of watertight bulkhead 2.

F.11. Engine crankcase ventilation system

The crankcase ventilation system routes the fumes produced by the engine oil system back through the engine air intake system. An air separator filter, mounted on the air intake, receives the fumes from the engine crankcase via a crankcase regulator and manifold assembly attached to the tappet cover. The air separator body is designed to remove oil from the engine oil fumes and return the oil back to the engine oil pan via check valve and hose connected to the bottom of the separator and the oil pan.

F.12. Power takeoff (PTO) assembly

A power takeoff (PTO) assembly is mounted on the aft end of the engine. The PTO is rated at 28 hp and drives an axial piston hydraulic pump for the buoy handling system rated at 29.5 GPM, and 2150 PSI at 1800 RPM. An electro-magnetic clutch, mounted between the PTO assembly and the pump, provides for pump engagement.

F.13. Diesel engine control panel (generator)

A control panel located in the machinery space adjacent to the generator set provides the following controls and indicators:

- oil temperature gauge
- tachometer
- hourmeter
- oil pressure gauge

J.9. Electronic chart system (ECS)

The electronic chart system (ECS) consists of a CPU (SWIII), keyboard, 15-inch monitor, and required power supplies and interface cables. The equipment is located on and under the chart table in the center of the pilothouse. The ECS system utilizes CAPN Voyager Navigational software for navigation and plotting, and provides a clear picture of the relative location of navigational aides such as buoys or channel markers. CAPN Voyager combines the GPS (Global Positioning System) and NOAA (National Oceanographic and Atmospheric Association) charts and plotting packages. The ECS interfaces with the DGPS, the Autopilot System and all the navigation sensors except radar. The SWIII also utilizes the Aids to Navigation Information System (ATONIS) for buoy positioning. The ECS system CPU is powered by 120 VAC and utilizes a 1.25-KVA Uninterruptible Power Supply (UPS) receptacle mounted on the chart table in the pilothouse for transfer of power from ship to shore.

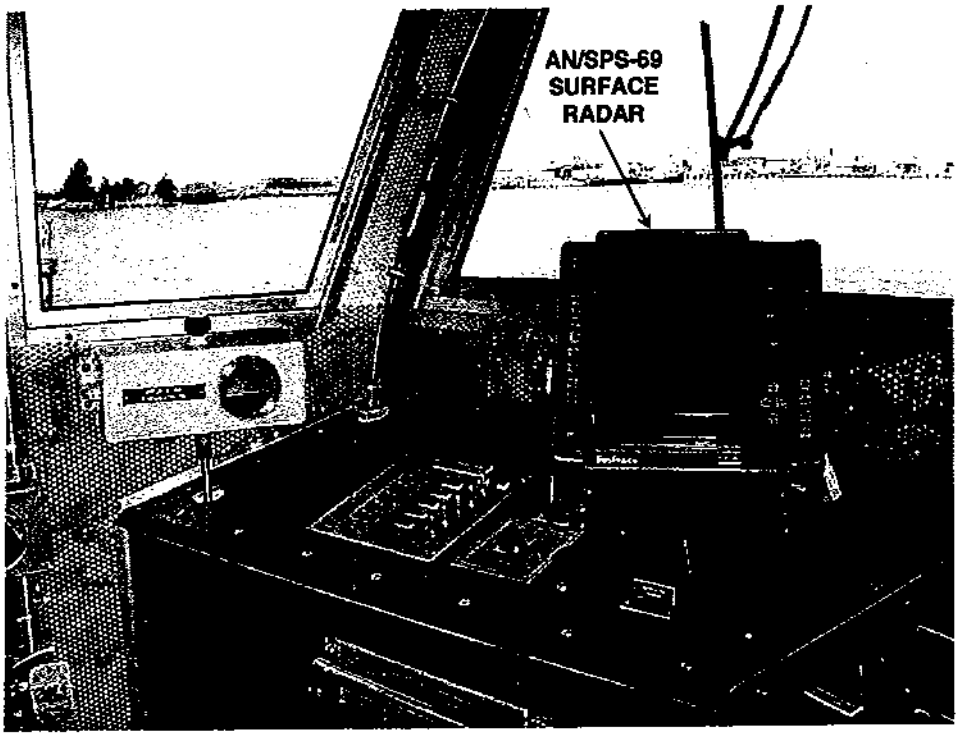


Figure 3-37

AN/SPS-69 Surface Radar

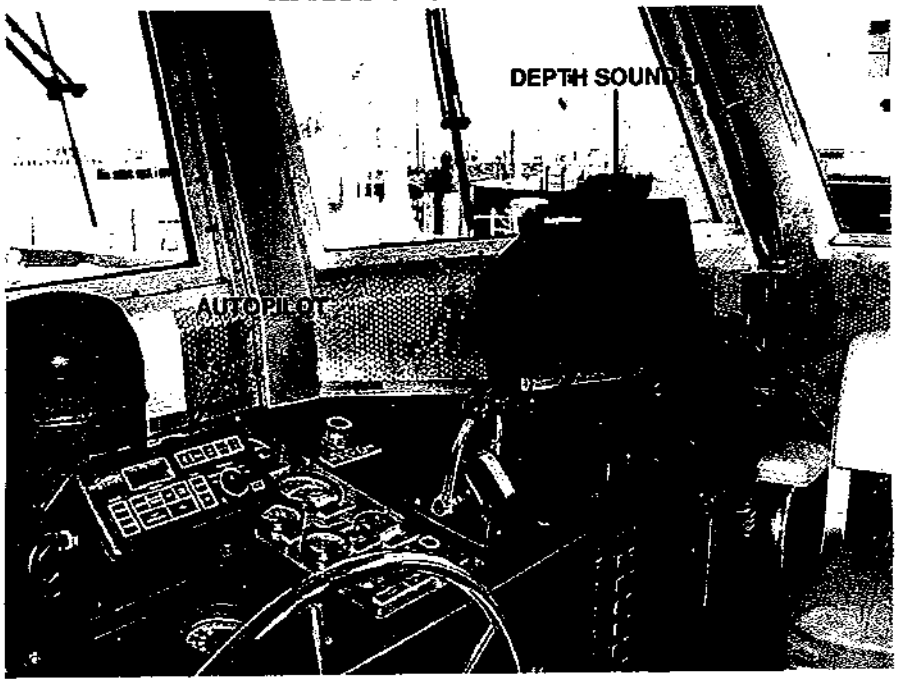


Figure 3-38

Autopilot System and Depth Sounder

Section N. Fire Extinguishing Systems

N.1. General

A fixed carbon dioxide (CO_2) flooding system **(figure 3-47)** is provided to extinguish a fire in the machinery space. The system can be locally actuated by a lever on the CO_2 bottle control head or remotely from a pull station located in the pilothouse on the aft console.

N.2. CO_2 cylinders

Three 35-pound CO_2 cylinders are designed to dump CO_2 through three nozzles in the machinery space. The cylinders are installed under the inclined ladder in the mess area and slightly forward of the machinery space bulkhead.

N.3. Indicator light box

An indicator light box outside the machinery space quick-acting watertight door provides status of the CO_2 system as follows:

- red lens - carbon dioxide pre-discharge
- red lens - carbon dioxide discharged
- white lens - power available

N.4. Audible alarm and rotary beacon

An audible alarm and rotary beacon will sound and flash in the space to indicate CO_2 pre-discharge and to ensure personnel evacuate the space. A time delay of approximately 30 seconds is provided to allow for space evacuation.

N.5. Switches and remote indicator

Pressure switches, actuated by discharging CO_2, will close the machinery space ventilation fire dampers. Electrical switches, actuated by CO_2 will stop the machinery space ventilation fans and shut down the engines. A remote indicator on the aft console in the pilothouse illuminates when the CO_2 system is actuated.

N.6. Portable fire extinguishers

Both 10-pound PKP and 5-pound CO_2 hand-held fire extinguishers are provided throughout the boat. Ten-pound PKP extinguishers are located in the mess area, pilothouse and machinery space. Five-pound CO_2 extinguishers are located in the workshop, pilothouse and lazarette.

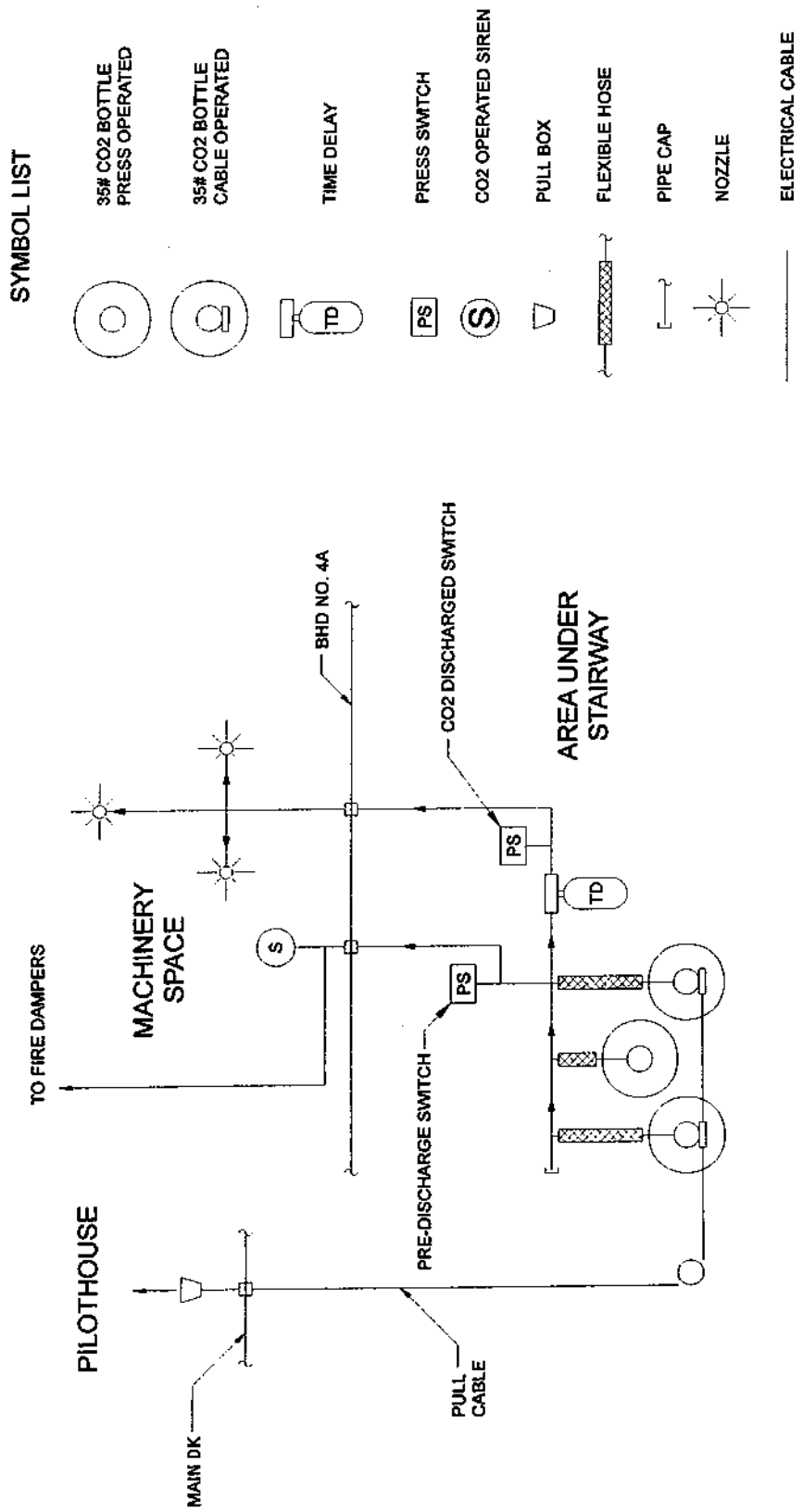


Figure 3-47
Fire Extinguishing Systems

Section S. Potable Water System

S.1. General

The potable water system **(figure 3-53)** consists of the following:

- potable water tanks
- service pump
- pressure tank
- hot water heater
- water chiller
- hose connection

S.2. Potable water tanks

Two potable water tanks with a combined capacity of 316 gallons are located in the machinery space, aft, port and starboard side. A 1 ½-inch fill connection is located on the port side of the main deck, just forward of bulkhead 2. Protected sight glasses are mounted on both potable water tanks.

S.3. Service pump

The service pump for the potable water system is a belt-driven diaphragm pump, powered by a 24-VDC motor. The pump is located in the machinery space, port side, next to the hot water heater. The pump operates automatically from an internal pressure switch, turning the pump *on* at 20 PSI and *off* at 40 PSI. The pump takes suction on the potable water tanks and discharges to the pressure tank.

S.4. Pressure (accumulator) tank

The pressure (accumulator) tank is a steel shell containing a vinyl bladder with a 15-PSI pre-charge. The pressure tank has a capacity of 0.9 gallons and keeps a positive pressure on the potable water system to reduce pump cycling and prevent pulsations and water hammer. The pressure tank is located on the port side of the machinery space next to the hot water heater.

S.5. Hot water heater

The hot water heater has a 10-gallon capacity and utilizes a submersible 120-VAC heating element. The thermostat on the heater is set at 120 °F. A relief valve on top of the heater is set at 75 PSI and relieves excessive pressure to the bilge. The heater will automatically shut off if the water temperature in the heater reaches 210 °F. The heater is located in the machinery space next to the pump.

S.6 Water chiller

An electric refrigerated water chiller is installed in the potable water system and provides water at 50 °F and 0.8 GPH to a drinking spigot at the galley sink. The chiller is located in the workshop, behind the shelf located directly under the storage cabinet (directly across from the hanging locker).

S.7. Hose connection

A ¾-inch hose connection is located on the main deck adjacent to the fill connection for the potable water tanks. This connection provides freshwater for cleaning and deck washdown when in port.

Section B. Performance Data

B.1. Fuel consumption

Fuel consumption and operating range is 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 shows typical fuel consumption at full load condition; 2300 engine RPM at 10 knots. The range at 10 knots (full load) is 400 nautical miles.

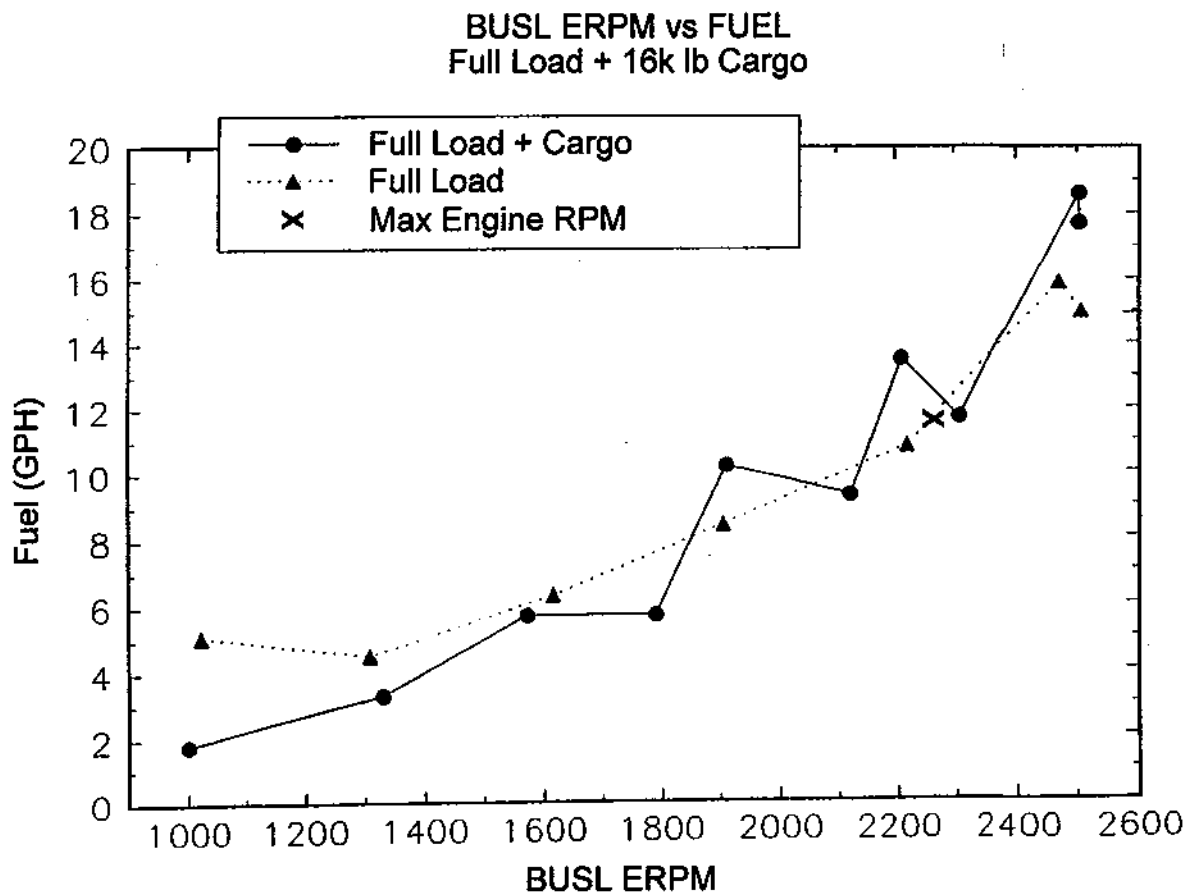


Figure 5-1

Fuel Consumption vs. Speed

B.2. Seakeeping Positioning the vessel with respect to the wind, seas, other craft, and established routes of navigation is essential to prevent damage to the hull or injuries to the crew.

WARNING

> The coxswain is responsible for ensuring that all required personal safety equipment is worn, and worn correctly.

B.2.a. Operating in beam seas

Operating with the seas on the beam is more uncomfortable than dangerous when following basic small boat handling guidelines. The danger exists when operations occur in conditions that approach or exceed wind and sea limitations. Use the following techniques to minimize danger:

- Tacking - With large seas on your beam, tack across the seas at a slight angle in a zigzag fashion. This prevents exposure of the beam to heavy swells.
- Changing Course - To change course heading, allow the boat to lose headway, turn the wheel hard over, and apply power to come smartly to the new heading.

WARNING

> The position of the boat in relation to a breaking wave crest is critical. Severe wave slap will occur in the area approximately two boat lengths in either direction of the breaking water, however, this area presents less danger of capsize.

CAUTION !

> When operating in beam seas, do not allow the boat to become "dead-in-the-water" and be hit broadside by a wave.

B.2.b. Operating in following seas

Following seas present the greatest dangers to the 49' BUSL. The utility boat does not have the balanced buoyancy or ability to lay-to in a following sea like a motor lifeboat. With the wide, flat stern, large following seas become a serious problem. The operational limitations are the controlling guideline and must be followed at all times. Consider the following points and techniques when operating under these conditions:

- Operation in a following sea involves a risk of surfing on the face of a swell or breaker. This situation is extremely dangerous. Control of the boat may be impossible.
- Do not power the boat over the crest of a wave and into the trough of the next wave or bury the bow into the back of the next wave.
- The 49' BUSL has the tendency to slip down the back of the seas, heeling heavily at the bottom of the trough.

Chapter 6
Mission Performance

Overview

Introduction

The actions and techniques described in this chapter are products of field experience. They are intended to give boat crewmembers information on how the 49' BUSL 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 BUSL to perform missions.

In this chapter

This chapter contains the following sections:

Section	Topic	See Page
A	Starting Procedures	6-3
B	Underway	6-9
C	Handling Characteristics	6-11
D	Aids to Navigation Operations	6-21
E	Towing	6-27
F	Anchoring	6-29
G	Personnel Recovery	6-31
H	Ice Conditions	6-33
I	Securing Procedures	6-35
J	Securing Procedures (Cold Weather)	6-37

Section A. Starting Procedures

A.1. Pre-start

The following procedures must be completed before starting a cold engine, and should be repeated before each mission.

Step	Action
1	Inspect bilges for excessive amounts of water. Look for signs of spilled fuel or oils. Pump and clean as necessary.
2	Sound fuel oil tank. Ensure fuel oil is maintained at 95 percent (783 gallons). Fuel sounding tubes are port and starboard side forward of the buoy deck.
3	Check the following fluid levels: **CAUTION !** Do not open the coolant expansion tank cap on a hot engine. • Engine oil level filled to FULL mark. • Reduction gear oil filled at least to FULL mark. **NOTE** Reduction gear oil will normally be above the "H" mark when the reduction gear is not turning. The reduction gear oil level must be checked again with the engine running at low idle. At low idle, the level must be between the "L" and the "H" marks on the dipstick. • Check coolant by removing cap and looking into the expansion tank, it should be full. The fluid recovery tank should be 1/4 to 1/2 full.
4	Ensure air intake is clear and machinery space ventilation flapper is *open*.
5	Check sea strainers for cleanliness and open sea suction valves.
6	Ensure fuel supply valves are *open* to fuel tank.
7	Check all belts for proper tension.
8	Ensure all breakers on 120-VAC power panel are *on* including: • LC1 • Lighting and power panel (01-7-1) • Galley panel (2-6-0) • Machinery panel (2-4-1)

Step	Action
9	Ensure all breakers on all 24-VDC power panels are *on* including: • LC2 (Machinery Space) • Pilothouse

A.2. Lighting off the generator set

A.2.a. Preparation

The following procedures must be performed in preparation for generator light off:

CAUTION ! Always let the engine cool down before removing the expansion tank coolant pressure cap. Turn the cap slowly and do not open fully until the pressure is relieved. Do not open the cap on a hot engine.

Step	Action
1	Verify the coolant expansion tank level is full.
2	Check the oil level. It should be just below the HIGH level mark on the dipstick.
3	Ensure that the fuel system is aligned to support operation of the diesel generator set.
4	Visually inspect the bottom of the duplex fuel oil filter bowl for the presence of water and sediment. Drain and dispose of as required.
5	Visually inspect the engine for loose or missing components and repair as required.

A.2.b. Light off

The following procedures must be performed to light off the generator set:

CAUTION ! Excessive cranking can overheat the starter motor and cause it to fail. Do not crank the engine for more than 30 seconds at a time. If engine fails to start, wait two minutes prior to attempting another start.

Step	Action
1	Hold the START-RUN-STOP switch at the local panel in the START position.

Effects of Wind

C.9. Turning the bow	The 49' BUSL, with its high cabin area near the bow and low freeboard aft, will tend to ride stern to the wind. The BUSL will make leeway (drift downwind) at a speed proportional to the wind velocity and the amount of sail area.
C.9.a. Restricted maneuvering	In restricted maneuvering situations (AtoN operations, alongside, at marinas, piers, wharves, etc.), analyzing the environmental conditions and using them to help rather than hinder operations is the way to deal with the large sail area created by the bow and superstructure.
C.9.b. Towing in winds	Bow into weather towing approaches become very difficult if the wind exceeds 30 knots. Once the wind catches the bow, it can be difficult to turn the bow back up into wind while station keeping. Stern-to approaches often solve this problem.

Effects of Current

C.10. Vessel stability in current

One of the environmental forces that affects the vessel is the current. It is important to remember that the Coxswain has no control over the current or any other environmental force. The design of the 49' BUSL, with its high cabin area near the bow, low freeboard aft, twin engines and responsive rudder control, makes it a stable vessel if the Coxswain observes and is aware of existing current conditions. Coxswains should also be familiar with the effects the current might impose on the skegs.

C.10.a. Operating in current conditions

Current will act on the vessel's underwater hull. Current will generally cause a vessel to drift over the ground. A one-knot current may affect the 49' BUSL to the same degree as 30 knots of wind. A strong current will move a vessel upwind.

C.10.b. Recognizing current conditions

The Coxswain and other crewmembers should be aware of existing signs of current flow and where current shear might be present. Large stationary objects such as a breakwater or jetty will cause a major change in the amount and direction of the current. On the downstream side of a jetty or breakwater, the crewmembers should be aware of current eddy. Caution should be taken when in current around floating piers or those with open pile supports. Crewmembers should look for current wake or flow patterns around buoys or piers. When current goes against the wind, the wave pattern will be steeper and closer together. Extreme caution should be taken when operating in conditions where current and wind are funneled one against the other. Tide rips, breaking bars and gorge conditions will make handling the 49' BUSL extremely challenging. Making leeway when drifting downstream (down current) requires a change in approach (actual track vs. intended track) to prevent overshooting your landing.

Step	Action
	pilothouse to the *ENGAGE* and *LOAD* position.
3	Verify system pressure and temperature.
4	Establish communications with buoy deck crew prior to actuating winch or A-frame controls.
5	Perform required system check-out of hydraulic buoy deck handling equipment prior to engaging a buoy.

D.4. Hoisting the buoy

NOTE The following information is provided as general guidance.

The boat is maneuvered to the buoy and is maintained in a steady position. When the coxswain is ready, "hook it when you can" is passed. The Buoy Deck Supervisor now has permission to bring the buoy aboard. Perform the following procedures to properly hoist the buoy:

WARNING Perform safety brief prior to buoy operations.

Step	Action
1	Hook both whips into the buoy and lift the buoy until the whips are supporting the weight of the aid.
NOTE	The hooks should always be placed opposite of each other during the lifts.
CAUTION !	Do not use weather hitches to mouse the hooks.
2	Boom forward, snugging the buoy hull into the V-notch. Attach the cross deck and mouse the hooks.
3	Boom aft enough to facilitate scraping the hull if conditions permit.
4	Lift the buoy high enough to clear the chain stopper and boom forward while keeping the cross deck taut. Ensure the load is kept close to the deck. The chain will fair lead into the chain stopper and the chain stopper will automatically engage when the buoy is slacked off or lowered. Use a maul to ensure that the chain is properly seated in the chain stopper.

Step	Action
5	Lower the buoy to the deck (the use of dunnage under the buoy is recommended). Set the pelican, gripe the buoy and disconnect the buoy from the mooring.

D.5. Pulling chain

Perform the following procedures to properly pull chain:

Step	Action
1	Rig the horse collar. Clear the pelican from the chain. If conditions permit, use the cross deck to pull the chain to short stay.
2	If unable to pull chain using the cross deck, position the boom to pull chain with the whips. Use the cross deck as necessary to seat the chain in the stopper.
NOTE	When pulling chain with the whips, use a shackle (modeer) to allow a single point pull of chain.
3	Once at short stay, set the chain in the stopper and advise the coxswain.
CAUTION !	Always use the pelican when breaking or dragging a sinker.
4	If the mooring is caught down, clear the whips from the chain, set the pelican, remove the horse collar and trip the stopper. Come ahead on the boat and break the sinker from the bottom.
5	To reset the stopper to the upright position, use the cross deck while the crewman applies tension to the stopper retrieval line.
6	Rig the horse collar and then put the whip hooks into the shackle. Pull the chain until the rock is in sight.
7	Remove the horse collar. Position the boom so that when the sinker is lifted it will clear the stern. Utilize the cross deck to stabilize the sinker while bringing it aboard.
8	Bring the sinker on deck and set it on dunnage and gripe.

Section I. Securing Procedures

I.1. Procedures The following procedures should be repeated after each mission:

Step	Action
1	Secure all electrical and electronic components in the pilothouse.
2	Secure engines using pushbuttons in the pilothouse or engine room following procedures in *Chapter 6, Section A.4.*
3	Shift electrical load from ship to shore power following procedures in *Chapter 6, Section A.3.b* of this handbook.
4	Energize equipment breakers in the 120-VAC power panel in the machinery space. Ensure battery charger is operating normally.
5	Secure all breakers in the 24-VDC power panel in the machinery space except for those required to maintain fire, flooding, and lighting systems.
6	Secure start system BATTERY CUTOUT switch.
7	Secure fuel supply valves to engines.
8	*Close* generator seawater suction valve.
9	Check all machinery fluid levels and refill as necessary.

CAUTION ! Do not check engine coolant levels until temperature has dropped to 140 °F or below.

NOTE It may be necessary to wait 30 minutes to obtain an accurate reading on engine lube oil levels.

8	Conduct a visual inspection of the engine room bilges for any obvious abnormalities.
9	Clean engine room bilges and machinery.
10	Sound fuel oil tank and refill to 95 percent (783 gallons).
11	Secure all watertight doors, hatches, and covers. Close all weather-tight doors.
12	If directed, wash the boat down with freshwater.

Step	Action
NOTE	Keeping the boat clean and neat is very important to control corrosion. Maintaining corrosion control is the responsibility of everyone in the crew.
NOTE	The mission is not complete until the boat is ready for the next mission.

Section B. Steering Casualty

B.1. Symptoms

While steering the boat, the wheel turns sluggishly or steering controls have no effect at all. When a complete loss of steering occurs, the coxswain or helmsman can continue to the steer the boat with the engines alone.

B.2. Actions

When a partial or complete loss of steering control occurs, take the following actions:

NOTE Loss of hydraulic oil pump will not affect the use of the manual steering system.

Step	Action
1	Reduce engine RPM to clutch ahead and inform the crew. Ensure the steering station is active. Check steering at both fore and aft stations. Keep the engines operating to maintain maneuverability.
2	Check the expansion tank level in the pilothouse and steering gear hydraulic reservoir and components in the lazarette.
3	Check the machinery space for presence of hydraulic oil leaks on lines that pass through the space.
NOTE If system is intact and pump failure is suspected, rudders may be centered by using the local control valve.	
4	Verify that the steering system HPU breaker on the 24-VDC panel LC2 in the engine room is *closed/on.*
5	Verify that the autopilot and steering control power breaker at the 24-VDC power panel in the pilothouse is *closed/on.*

Machinery Space (Engine Room)

Item	Quantity	Location
Anti-Freeze	2 gallons	Locker
Anti-Freeze Solutions Tester	1 each	Locker
Hand-Operated Lubricating Gun	1 each	Locker
Hand-Operated Oiler	1 each	Locker
Hand-Operated Portable Bilge Pump	1 each	
Hearing Protector	4 each	
Oil Viscosity Comparator	1 each	Locker
Portable Eye Wash Station	1 each	

Workshop, Galley/Mess, and Head

Workshop

Item	Quantity	Location
Adjustable Wrench (12-inch)	1 each	Drawer
Adjustable Wrench (6-inch)	1 each	Drawer
Adjustable Wrench (7-inch)	1 each	Drawer
Anti-Exposure Stearns (size L)	2 each	Hanging Locker
Anti-Exposure Stearns (size M)	2 each	Hanging Locker
Auger Bit Set	1 set	Drawer
Backing Out Punch	2 each	Drawer
Bench & Pipe Vise	1 each	Bench
Bench Dusting Brush (9-inch)	2 each	
Blacksmith's Chisel	2 each	Drawer
Bolt Cutter (36-inch)	1 each	Drawer
Cold Hand Chisel Set	1 set	Drawer
Cold Survival Suit (swimmer)	1 each	Hanging Locker
Combination Box & Open-Ended Wrench Set	1 set	Drawer
Combination Wrench Set (box & open end, 10-17 mm, 12 pt)	1 set	
Cross Tip Screwdriver Set	1 set	Drawer
Crosscut Hand Saw	1 each	Drawer
Diagonal Cutting Pliers	1 each	Drawer
Dustpan	2 each	
Electrical Insulation Tape	2 rolls	Drawer
Electrical Insulation Tape	2 rolls	Drawer

Pilothouse

Item	Quantity	Location
Aneroid Barometer	1 each	Bulkhead
General Purpose First Aid Kit	1 each	Bulkhead
Hand-Held Binocular	1 each	Bulkhead
Manual Reed Type Horn	1 each	
Medical Splint & Bandage Kit	1 each	Chart Table Storage
National Flag (USA)	1 each	Chart Table Storage
Nautical Slide Rule	1 each	Chart Table Storage
Navigator's Drafting Instrument Set	1 set	Chart Table Storage
Organizational Flag (USCG Ensign)	1 each	Chart Table Storage
Parallel Ruler	1 each	Chart Table Storage
Pencil	1 dozen	Chart Table Storage
Ship's Bell	1 each	Bulkhead
Signal Horn	1 each	Chart Table Storage
Sounding Weight (7-pound)	1 each	Chart Table Storage
Stopwatch	1 each	Chart Table Storage
Thermometer	1 each	Chart Table Storage
Walking Cane (deadman stick)	1 each	Bulkhead
Wastepaper Basket	2 each	

Main Deck

Item	Quantity	Location
Alloy Chain Assembly (½-inch x 3-foot, grade 8)	1 each	Locker
Ball-Diamond-Ball (boat) Dayshape	1 set	Locker
Coupling Link (½-inch, Hammerloc quik-alloy system 8)	1 each	Locker
Cutting & Welding Torch Outfit	1 each	Locker
Line Reeving Device	1 each	Buoy Deck, Bulwark Mounted
Load Binder	8 each	Locker
Nonmetallic Hose Assembly (25-foot garden hose)	2 each	Buoy Deck, Port Side Aft, Bulkhead Rack
Nonmetallic Hose Assembly (fire fighting with nozzle)	1 each	Storage Locker
Nonmetallic Hose Assembly (P-6 pump discharge hose)	1 each	Storage Locker
Nonmetallic Hose Assembly (P-6 pump suction hose)	1 each	Storage Locker
Portable Pump and Kit (P-6)	1 each	Mounted Frame
Potable Water Hose (.75-inch, Swan Marine hoses)	2 each	Locker
Potable Water Hose (1.5-inch)	1 each	Locker
Ratch Load Binders (minimum working load limit 5,400 pounds)	4 each	Locker
Shackle (steel/modeer/second class)	2 each	Locker
Shipping & Storage Drum (P-6 pump can)	1 each	

II. Buoy Deck

ITEM	SAT	UNSAT	REMARKS
Port			
Fuel Tank Vent			
Fill Pipe			
Stripping Pipe			
Emergency Fuel Shutoff Lever			
Cofferdam and Plugs			
Engine Intake Vent			
Emergency Damper Lever			
Deck Winch			
Cable			
Hook Assembly			
Roller Assembly			
Guard			
Hydraulic Motor			
Hydraulic Hoses			
Rescue Heaving Line			
Drop Pump w/Can			
Drop Pump Bracket			
Deck Box			
O_2/Acetylene Brackets			
Fwd Handrails			
Boat Hook			
Chocks/Cleats			
Safety Chains			
Aft Handrail			
120-Volt Receptacle			
Engine Room Exhaust Vent			
Emergency Damper Lever			
Deck Washdown Station			
Deck Hose			
Potable Water Vent			
Potable Water Fill			
Potable Water/Deck Supply			

ITEM	SAT	UNSAT	REMARKS
Port (Cont.)			
A-Frame (Boom)			
Date of Last Weight Test			
Winch			
Cable			
Hook Assembly			
Hydraulic Hoses/Piping			
A-Frame Limiting Cables			
Upper Cable Guides			
Ram			
Chain Stopper Assembly			
Starboard			
A-Frame (Boom)			
Winch			
Cable			
Hook Assembly			
Hydraulic Hoses/Piping			
A-Frame Proximity Switch			
A-Frame Limiting Cables			
Upper Cable Guides			
Ram			
Aft Safety Chain			
Aft Handrail			
Chock/Cleats			
Sewage Discharge			
Engine Room Exhaust Vent			
Emergency Damper Lever			
120-Volt Receptacle			
Engine Room Scuttle			
Hinges			
Gasket			
Knife Edge			
Dogs & Wedges			
Locking Device			
Alignment			
Safety Chains			
Chocks/Cleats			
Fwd Handrails			

ITEM	SAT	UNSAT	REMARKS
Starboard (Cont.)			
Boat Hook			
Deck Box			
Compress Air Supply			
Fuel Tank Vent			
Fill Pipe			
Stripping Pipe			
Emergency Fuel Shutoff Lever			
Cofferdam and Plugs			
Engine Intake Vent			
Emergency Damper Lever			
Deck Winch			
Cable			
Hook Assembly			
Roller Assembly			
Guard			
Hydraulic Motor			
Hydraulic Hoses			
Deck Padeyes (12ea)			
Buoy Deck Equipment			
Saddles			
Hammers			
Buoy Scraper			
Pelican Hook Assembly			
Gripe Down Chains			
Steamboat Jacks			
Mooring Lines (4ea)			
Fenders (3ea)			
Heaving Lines (2ea)			
Lead Line			

REMARKS:_____

VII. Pilothouse Cabin Top

ITEM	SAT	UNSAT	REMARKS
Deck			
EPIRB			
Fwd External Speakers			
Radio Antenna P/S			
Horn			
Spotlights(fwd/aft)			
DGPS Antenna			
Running Lights			
Radar Antenna			
Life Raft			
Date			
Life Raft Bracket			
Life Raft Weak Link			
TV Antenna			
Mast			
VHF-FM Radio Antenna			
Nav Lights			
Anchor			
Mast			
Restricted Maneuvering			
Towing			
Wiring/Stuffing Tubes			
Halyards			
Ensigns			
Deck Work Lights			

REMARKS:_____

VIII. Interior Pilothouse

ITEM	SAT	UNSAT	REMARKS
Overhead			
Insulation			
Wiring			
Labels			
Stuffing Tubes			
Lighting			
Window Heater/Wiper Control			
Fwd			
Port			
Starboard			
Aft			
Heated Window Switches			
Fwd			
Port			
Starboard			
Aft			
Deck Light Switch			
Window Defrosters			
Port			
Starboard			
Fwd Console			
120-Volt Electrical Panel			
Labels			
Depth Finder			
Engine Controls			
Helm			
Rudder Angle Indicator			
Auto Pilot			
Binnacle/Magnetic Compass			
Deviation Table/Date			
Gauges			
Redlined			
Labeled			

ITEM	SAT	UNSAT	REMARKS
Fwd Console (Cont.)			
Horn Electric			
Searchlight Control			
Radar			
Steering Station Control			
Bilge Pump Panel/Labels			
Oily Water Discharge Placard			
Loudhailer Mike			
Under Console			
Wiring			
Bulkhead			
Port Bulkhead			
Hydr Strg Expansion Tank			
Battle Lantern			
Date			
Fwd A/C Unit Control			
DES Speaker			
PKP Extinguisher			
Date			
Alarms Panel			
CO_2 Extinguisher			
Date			
24-Volt Electrical Panel			
Labels			
Pilothouse Light Switch			
Deck Light Switch			
110 Outlet			
Wire Runs			
Window/Latch			
Weather Door Port			
Latch			
Gasket			
Aft Control Console			
Aft A/C Control Unit			
Loudhailer Mike			
Wire Run			
Searchlight Control			

X. Workshop

ITEM	SAT	UNSAT	REMARKS
Overhead			
Insulation			
Heater			
Lights			
Junction Boxes/Stuffing Tubes			
Wiring			
Hydr Pipes			
Fwd Bulkhead			
Eyewash Station			
Pipes/Valves			
Port			
Insulation			
Storage Lockers			
Battle Lantern			
Date			
1MC Speaker			
120-Volt Receptacle			
Hearing Protection Storage Box			
Compress Air/Hose Station			
Water Chiller			
AtoN Battery Storage Racks			
Shore Power Transformer			
Storage Cabinet			
Starboard Cabinet			
A/C & Heating Unit			
Ducting			
Piping			
Wiring			
PKP Extinguisher			
Dates			
Door Latch			
Aft Bulkhead			
Insulation			

ITEM	SAT	UNSAT	REMARKS
Aft Bulkhead (Cont.)			
Wiring/Stuffing Tubes			
CO_2 Control Panel			
A/C Saltwater Pump Switch			
Deck			
Deck Matting			
Deck Plates			
PFD/PYRO/First Aid			
Exposure Suits (6ea)			
Survival Vest (6ea)			
Pyrotechnics			
MK79 Signal Kit (2ea)			
MK13 Signal Kit (l2ea)			
Remove			
First Aid Kit			
Rescue Swimmers Harness			
Rescue Swimmers Kit			

REMARKS:_____

XI. Galley/Mess

ITEM	SAT	UNSAT	REMARKS
Overhead			
Insulation			
Wire Run			
Stuffing Tubes			
Heater			
Light Fixtures			
Junction Boxes			
Smoke Detector			
Curtain Rail			
1MC Speaker			
Port Bulkhead			
Head Fan Switch			
Light Switch			
110 Outlet			
Battle Lantern			
Date			
CO_2 Fire Extinguisher			
Date			
120-Volt Electrical Panel			
Labels on Breakers			
Entertainment Unit			
TV			
Radio			
Vent			
Light Switch			
110 Outlet			
Starboard Bulkhead			
Upper Cabinets			
Microwave Oven/Bracket			
Toaster			
Refrigerator			
Coffee Maker			
Stove Top			

ITEM	SAT	UNSAT	REMARKS
Starboard Bulkhead (Cont.)			
Sink/Faucet			
Lower Cabinets			
Latches			
Piping/Valves Under Sink			
110 Outlet			
A/C Control			
Central Alarm Remote Switch			
Clock			
Cabinets			
Speakers			
125 Volt Receptacle			
Table			
Cushions			
Storage			
Deck			
Deck Matting			
Deck Plates			
Bilge Access Cover			
Ladder			
Engine Room CO_2 System			
Dates of Inspection			
Dates Hydro Stat Inspection			

ITEM	SAT	UNSAT	REMARKS
Bilge			
Wiring			
Stuffing Tubes/Junction Boxes			
Float Switch			
Bilge Alarm Switch			
Grease Trap			
Bilge Pump			
Gray Water Tank			
Macerator Pump/Tank			
Toilet Vac Pump			
Gray Water Pump & Hoses			
A/C Condensation Tank			
Transducer			
Piping/Hoses			
Bilge (paint & corrosion)			

REMARKS:_____

XII. Head

ITEM	SAT	UNSAT	REMARKS
Overhead			
Insulation			
Lighting			
Wiring & Stuffing Tubes			
Vent Pipe			
Hydraulic Lines			
Curtain Runners			
Curtain			
Forward Bulkhead			
Towel Dispenser			
Port Bulkhead			
Insulation			
Drain Vent Pipe			
Upper Cabinet			
Light			
Mirror			
Sink/Faucet			
Lower Cabinet			
Pipes/Valves			
Aft Bulkhead			
Shower Fixture			
Toilet			
Piping			
Deck			
Deck Matting			
Deck			
Shower Drain			
Door			
Hinges			
Vent			
Latch			

REMARKS:_____

_____

_____

Disabling Casualty List

Engine parameters	• Reduction gear pressure below 230 PSI (while engaged). • Engine lube oil pressure below 30 PSI (at cruising speed). • Engine fresh water temperature below 140 °F or above 205 °F.
Engineering system components	• Engine fails to start. • Uncontrollable overheating. • Metallic/non-metallic noise: metal on metal/fuel-knock/bearing/clicking. • Excessive shaft or engine vibration. • Engine surging/over speed (over 50 RPM). • Loss of engine governor control. • Reduction gear fails to engage (forward or reverse). • Fuel oil dilution 5 percent or above. • Water in engine lube oil (emulsified white milky oil). • Lube oil in engine jacket water. - More than a light sheen. - Floating unmixed lube oil separated from the water. • Continuous electrical breaker trip. • Starting batteries won't charge. • Steering system inoperative. • Engine motor mount hardware loose or missing. • Excessive shaft packing leak: - Packing leak while rotating, steady stream or more. - Packing leak while not rotating more then 15 drops per minute.
Electronic/ navigation	• No electronic means of signaling distress (i.e., no radio, etc.). • Electronics won't energize.

Safety

- 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).
- Electrical arcing and sparking odor of insulation overheating.
- Turbocharger lube oil supply line leaking onto hot surface or not fire rated/fire sleeved.
- Return fuel oil line leaking in the vicinity of the turbocharger where the turbo attaches to the saddle.
- Fixed CO_2 flooding system inoperative, PLUS no portable fire extinguishers (unserviceable).
- Emergency alarms inoperative (fire, bilge, lube oil pressure, high water temp).

* 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.

General material

- Hull breach below the waterline.

Restrictive Discrepancies

Engine and vessel systems

1. Engine performance:
   a. Maximum RPM (norm 2100 - 2200) – less than 2350 RPM.
   b. Engine freshwater temperature below 205 °F and above 185 °F.
2. Leaks more than 15 drops per minute:
   a. Jacket water.
   b. Lube oil.
   c. Hydraulic oil.
   d. Reduction gear oil.
3. Excessive shaft packing leak:
   a. Packing leak while rotating, limit RPM to speed where leak starts.
4. Any fuel oil dripping* (falling onto a surface which is not hot) within ten (10) minutes.
5. Bilge pumps inoperative.
6. Bilge system check valves installed improperly or unserviceable.
7. Inoperative/inaccurate pressure/temperature alarms or gauges.
8. Any detectable exhaust leaks into machinery space/hull.
9. Missing exhaust lagging or system blankets.
10. Failure of any emergency system:
    a. Fuel shut-off valves do not fully close.
    b. Engine blower shutdown is inoperative (manually from open or enclosed steering).
    c. Engine room air dampener shutdown system.
10. Loose/missing fittings, nuts, bolts, brackets, etc.:
    a. Missing or loose shafting bolts:
       1) Gear output flange.
       2) Propeller shaft coupling.
       3) Propeller shaft flange.
    b. Steering system:
       1) Rudder post nuts.
       2) Steering ram mounts.
11. Buoy handling equipment inoperative or damaged:
    a. A-frame actuators and winch hardware, hoses, fittings, cables.

b. Cross deck winch hardware, hoses, fittings, cables.

c. Chain stopper and roller for physical damage, distortion.

12. Undersized engine mounting bolts and/or constructed of inferior grade material.
13. AC generator inoperative.
14. Sea chest valve inoperative (closed).

* To determine if fuel oil is dripping, a clean sheet of paper may be placed under a suspected leak to collect and detect any drops that fall.

Boat outfit

1. Fire extinguishers not secured in brackets, expired weight test.
2. Mast support bracket hardware loose/missing.
3. Underweight CO_2 bottle.
4. CO_2 system pressure switches not operating properly.
5. Boat pyrotechnics unserviceable/missing.
6. Portable dewatering pump kit incomplete/inoperative/missing.

Electronics/ navigation

1. Compass:
   a. Deviation table missing.
   b. Compass deviation over 5 degrees.
   c. Fluxgate compass inaccurate over 5 degrees.
2. Electronics:
   a. VHF radio inoperative.
   b. Depth sounder inoperative.
   c. DGPS inoperative.
   d. Radar inoperative.
   e. Electronic Charting System inoperative.
   f. ATONIS/APPS Program inoperative.

General materiel and safety

1. Watertight integrity:
   a. Holes/cracks in a watertight structure.
   b. Cracks through a watertight scuttle/hatch.
   c. Failure of a watertight closure to seal.
   d. Loose dogs/dogging arms on watertight doors/hatches/scuttles.
   e. Any noticeable gap at gasket seams.
2. Stern dunnage missing.
3. Navigation lights inoperative.

Procedure

Conducting a full power trial

Follow these procedures when conducting a full power trial:

Step	Procedure
1	Get the boat underway for a 10-minute transit on a relatively straight course. Bring the engine up to full speed.
2	After approximately 8 minutes, check engine speed. Normal engine speed range is 2200-2300 RPM.
3	Check for the following abnormalities, which occasionally occur during the full power trial: • 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). • The turbocharger lube oil supply hose leaking onto a hot surface or not fire rated or fire sleeved is a disabling casualty. • A leak from the shaft seal, equivalent to a trickle or steady stream, while rotating is a disabling casualty. • Any leak from the shaft seal, in excess of 15 drops per minute, while not turning is a disabling casualty. • Any fuel oil drop* falling within 10 minutes, not on a hot surface, is a restrictive discrepancy. • Any anti-freeze, lube oil, or hydraulic oil leak greater than 15 drops per minute is a restrictive discrepancy. • Any anti-freeze, lube oil, or hydraulic oil leak less than 15 drops per minute is a major discrepancy. * To determine if any oil has dripped, 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
4	Check all gauges on the console and record the readings. Refer to the following chart for allowable ranges and results:

Categories	Disabling	Restrictive	Major	Normal	Major	Restrictive	Disabling
Oil Pressure (PSI)	<30			30-70			
Water Temperature (°F)	<140			155-185		205	>205
Reduction Gear Pressure (PSI)	<230			230-290			>350
Engine Speed (RPM)		<2100		2200-2300		>2350	

5	Return to the mooring. Secure both engines and check all fuel fittings. • Any fuel oil leak on the fuel tank access covers greater than 15 drops per minute is a restrictive discrepancy. • Any fuel oil leak on the fuel tank access covers less than 15 drops per minute is a major discrepancy.