BOAT INFORMATION BOOK (BIB)

FOR

NAVY 44 MK II SAIL TRAINING CRAFT

AT

THE UNITED STATES NAVAL ACADEMY

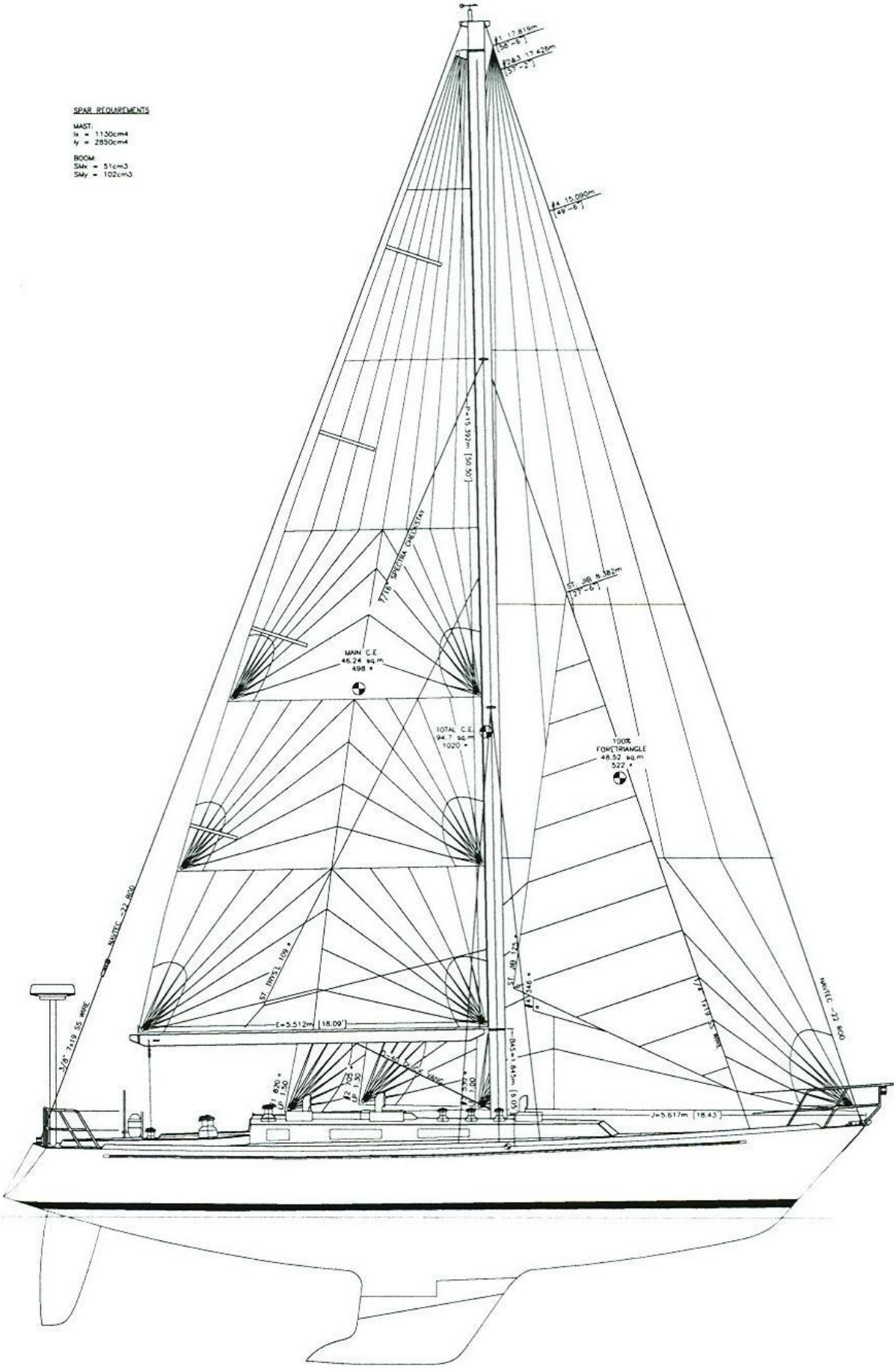
SECOND EDITION
April 15, 2017

Revision 4
April 30, 2020

SPAR REQUIREMENTS

MAST:
Ix = 1130cm4
Iy = 2850cm4

BOOM:
SMx = 51cm3
SMy = 102cm3



FORWARD

SCOPE

The Boat Information Book (BIB) for the Navy 44 MK II is published by the Vanderstar Chair and issued by the Director of Naval Academy Sailing as the model manager for this Sail Training Craft (STC). The BIB contains information on the boat systems, performance data and operating procedures required for safe and effective operations. It should be used in conjunction with the system owner's manuals where available. However, it is not a substitute for sound judgment. Compound emergencies, available facilities, adverse weather or sea conditions, or considerations affecting the lives and property of others may require modification of the procedures contained herein. Read this BIB from cover to cover prior to embarking. It's your responsibility to have a complete knowledge of its contents. The bottom line, however, is that you use your best deductive reasoning for each unique situation and THINK as you employ this BIB.

AVAILABILITY OF THIS PUBLICATION

The BIB will be distributed on each Navy 44 MK II as part of the publication loadout. It is your responsibility to ensure that it's onboard. It will also be posted online on the Navy Sailing website and on the USNA Intranet Blackboard for midshipmen, faculty and staff who are granted access to this program.

REVISIONS

This is the second edition, fourth revision of the BIB for the Navy 44 MK II. New changes are summarized in a revision log. Requests for revisions shall be made on the Revision Request Form on the following page. Subsequent revisions will track changes and be published annually, with changes posted online and as an addendum to the current edition in the interim.

WARNINGS, CAUTIONS AND NOTES

These annotations shall be inserted adjacent to the procedure to which they apply. The following definitions apply:

WARNING: AN OPERATING PROCEDURE, PRACTICE, OR CONDITION WHICH MAY RESULT IN INJURY OR DEATH TO PERSONNEL, IF NOT CAREFULLY OBSERVED OR FOLLOWED.

CAUTION: ***An operating procedure, practice or condition which may result in damage to equipment if not carefully observed or followed.***

NOTE: An operating procedure, practice or condition which is essential to emphasize**.**

WORDING

"Shall" has been used only when application of the procedure is mandatory.
"Should" has been used when application of a procedure is recommended.
"May" and "Need not" have been used when application of a procedure is optional. "Will" is used to indicate future actions and does not indicate a requirement.

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NAVY 44 MK II BIB
REVISION REQUEST FORM

INSTRUCTIONS: This form provides a feedback mechanism for this document. In your comments, please be specific and provide the rationale for making the suggested revision. Submit any proposed modifications or suggestions using this form to the appropriate program Director for review.

DATE:

CHAPTER, PAGE, SECTION:

RECOMMENDED CHANGE:

RATIONALE:

Submitted by: _____

APPROVAL:

Director, VOST _____
Director, OSTS _____
Vanderstar Chair _____
DDNAS _____
DNAS _____

Date completed:_____

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Navy 44 Boat Information Book Revision Log Edition 2/Rev 4 APR 2020

Revision Log Ed 2/Rev 4 APR 2020

Section	*Revision Description*
	(Paragraph = p, Sentence = s, p3/s1 is paragraph 3, sentence 1)
Forward	CHANGE "third revision" to "fourth revision", p3/s1.
TABLE OF CONTENTS	
Chapter 1	Rename 1-5.1 to "Running Backstays (Checkstays)
Chapter 1	Rename 1-7.4.3.4 to, "SIRIUS XM WEATHER"
Chapter 1	Delete Figure 1-20, and renumber existing 1-21 to 1-20.
Chapter 1	Delete item 1-9 and move contents to a new Appendix 2 - Boat Loadout Equipment"
Chapter 3	Rename item 3-5.3.2.1. to "Running Backstays (Checkstays)
Chapter 3	Add new item 3-5.3.2.2, "Backstay Tension"
Chapter 4	Add new item 4-12, "AIS/VHF Radio Antenna Splitter"
Appendix 1	Rename to "HF Radio Operations Guide". Move Appendix 1 after Chapter 6.
Appendix 2	New, contains contents of N44 MK II Loadout Equipment. Add after Appendix 1
CHAPTER 1	
1-4.1	Change p2/s1 to "...has internal halyard sheave boxes with integrated sheaves welded to the masthead."
1-4.2	Change p1/s3 to, "Two rope clutch reef locks inside the boom at the forward end secure the reef line..."
1-4.4	Change p2 to, "The reaching strut is used with the spinnaker when the apparent wind angle is equal or less than 95 degrees. This reduces chafe on the afterguy and increases the mechanical advantage of the afterguy to help keep the spinnaker pole from touching the headstay when close reaching, especially in a seaway."
1-4.5.3	Replace p1 with "The backstay tensioner (backstay) is a manually operated hydraulic ram used to control headstay sag and to bend the mast to adjust the aerodynamic shape of the mainsail. Add tension using the backstay to pull the head of the mast aft as the wind speed increases. The headstay will tighten to reduce sag, which will reduce the sail's camber for improved efficiency. The opposite force exerted on the mast is seen as a bending of the mid-section of the mast forward. This will also reduce the camber in the mainsail for improved efficiency as the wind speed increases." Add "The NAVTEC tensioner has a gauge..." p2/s1. Add new sentence p2, "The Harken backstay does not have a gauge." Add "See Figure 1-9 and 3-5.3.3 Backstay Tension" at end of second bullet point p2, and Delete "/WXFAX" in p3/s1 under "CAUTION".
1-5.1	Change title to, "Running Backstays (Checkstays)
1-5.6	Replace the first 3 sentences with, "The outhaul is a block and tackle system contained mostly inside the boom, A line from the block and tackle portion leads through a sheave at the aft end of the boom and attaches to the aft end of the slider car on top of the aft end of the boom. The clew of the mainsail is attached to the forward end of the car using a D shackle. The outhaul is used to adjust the camber in the lower sections of the mainsail; tighten to flatten the camber for stronger winds and loosen in lighter winds or when sailing downwind."
1-5.8	Replace the first 2 sentences with, "The boom vang (vang) controls the tension on the leech of the mainsail (twist) when reaching and running (when the mainsheet is not pulling the boom down). The vang is usually set so the aft section of the top batten is parallel to the boom (the boom will be roughly parallel to the deck)."

1-5.9	Replace p1 with, "A preventer system has been installed on the N 44 to help keep the boom from crossing the boat dangerously because of an accidental gybe or other inducement. It should be deployed when the apparent wind angle is greater than 120 degrees off the bow. " Change p2/s4 to, "... and crosses inside the boom and exits through a sheave on the opposite side of the boom near the gooseneck." Change p2/s8 to, "The other preventer lin is then taken in to control the boom (to prevent an accidental gybe)."
1-5.12	Change p1/s1 to, "The vessel has twelve different winches for adjusting and controlling running rigging. See Table 1-3." Change p2/s1 to, "Winch handles are used to employ mechanical advantage of the winch through its internal gearing."
1-6.2	Replace p1 with, "All sails set forward of the mast are generically called “headsails”. The N 44 is usually provided with four (4) Dacron headsails. A genoa is a headsail that fills the foretriangle (area between the mast, deck and headstay) and extends aft of the mast. A jib is a smaller headsail that fills only the foretriangle or any percentage of it (also called a working jib)." Delete p2/s1. Replace all after new p2/s1 with, "The genoa sheets are led outboard of the shrouds, inboard of the lifelines and stanchions, through the genoa car lead blocks on the aft headsail tracks, then to the primary winches when sailing to windward (see Figure 3-5), or outboard of all shrouds, stanchions and lifelines to snatch blocks on the toerail then to the primary winches when reaching (see Figure 3-7). The #2 reaching genoa is designed with a high clew to allow for better visibility of the forward leeward bow area and to reduce damage from waves. The #2 reaching genoa is not designed for upwind sailing and should be rigged per Figure 3-7." Change p3/s2 to, "The #4 jib has a pennant attached to the head to allow the halyard to reach full hoist even though the head of the sail does not." Add to end of p3, "See Figure 3-6." Replace p4 and p5 with, "Jibs/genoas have two methods of attachment. 1) They are hooked directly onto the rod headstay with #3 piston hanks attached to the sail, OR 2) Some racing sails have a small boltrope luff tape sewn on the sail that fits into a plastic twin-grooved headfoil system mounted over the headstay. A block and tackle system is used to adjust the position of the headsail cars on their respective tracks (one forward and one aft). This system is attached to the forward end of the forward car and the adjustment line is led aft to a cam cleat mounted on the outboard side of the cabin near the cockpit. The genoa and jib cars are connected and adjust simultaneously. The lead adjuster, along with the halyard and backstay adjustments are used to control the headsail’s camber and twist."
1-6.3	Replace p1 with, "Spinnakers are used for sailing at apparent wind angles greater than 80 degrees in light to moderate winds when more power is desired, and control of the boat can be maintained. Spinnakers are typically made of nylon cloth of a weight structurally suited for a certain range of wind speeds. The standard spinnaker for the N 44 is 1.0 oz cloth, recommended for apparent wind speeds below 18 knots. Racing boats may have other weight spinnakers to cover a broader wind range.

1-6.4	Change p1/s2 to, "...orange in color for better visibility by other vessels or aircraft." Add,"See Figure 3-6 and 3-7." Replace p2 with, "The running backstays (checkstays) must be used with the storm jib. The windward one should be led to the windward side secondary winch and tensioned against the inner forestay. CAUTION: Do not over tension the checkstay and cause the mast to invert (middle of the mast bows aft). Both running backstays may be rigged at the same time, but the leeward one is generally left slack, particularly if it interferes with the mainsail or storm trysail."
1-7.2.1	Add to "Visual Indicators" bullet points - "Water in fuel filter (Racor). See Figure 1-14" and "Sea Fire engine fire extinguisher. See Figure 1-15"
1-7.2.4	Change end of p1/s3 to, "...compartment and activating the engine compartment's Seafire fire extinguisher system." Delete p3, "A third Rule exhaust blower is located underneath the refrigeration compressor. Ducting will deliver air to the back of the house alternator. It will come on automatically whenever the engine is running."
1-7.2.5	Add to end of last sentence, "...and rust or damage to the clamps."
1-7.3.8	Replace p1 and p2 with, "There are two sets of navigation lights, only one should be in use at a time: -Navigation Lights: Aqua Signal combination red/green side light on the bow pulpit, and Aqua Signal aft-facing white stern light on the radar post, used in combination with the masthead (steaming) light when operating under mechanical propulsion (motoring). -Tricolor Light: Aqua Signal combination Tricolor light with red, green, white sectors at the masthead, used ONLY when operating under sail power alone. A white forward-facing, mast-mounted "masthead" or steaming light is located on the front of the mast (not the masthead), just above the lower spreaders, to be used in combination with deck level navigation lights while motoring. It should NOT be used in combination with the Tricolor light."
1-7.4.2.2	Delete sentences 2-4.
1-7.4.3.1	Change "weather fax" to SiriusXM weather" in s2.
1-7.4.3.4	Change title to SiriusXM WEATHER. Delete p1 and NOTE and replace with, "The BBWX4 SiriusXM weather receiver is integrated into the Furuno NavNet TZT14 display. It has two components, a satellite antenna mounted on the radar post, and a receiver located behind the DC panel. There is a breaker labeled "XM Weather" for the system on the DC panel, which must be turned "ON" prior to turning on the Furuno display. Zone forecasts, marine warnings and tropical information are available in text format. This information can be accessed via the home menu or RotoKey on the Furuno. There is a weather screen on the Furuno Multi Function Display (MFD) that will show the following graphic and text information: wind strength, wave height, sea surface temperature, current weather information from buoy and city icons, storms, storm tracks and lightning. Refer to the Furuno Navnet TZT14 COTS operators manual for instruction. NOTE: NavCenter Weather is also loaded into the Furuno NavNet, but is not functional because it relies on an active internet connection.
1-9	Move contents of this section to a new Appendix 2. Add new sentence at end of p1, "Each section is assigned to a billet."
Table 1-1	Change "Consumption (approximate)" specification to, "2.5 GPH @ 2800 RPM, 1 GPH @ 2000 RPM, .75 GPH @ 1800 RPM"

Table 1-1	Change "Navigation System" specification to replace "WeatherFax" with "SiriusXM weather"
Table 1-1	Change "Weather" specification to, "SiriusXM weather, incorporated in NavNet."
Table 1-6	Replace "Weather" description with, "SiriusXM weather"
Figure 1-20	Delete this figure.
Figure 1-21	Renumber to new Figure 1-20, "Through-Hull Diagram"
CHAPTER 2	
2-1	Change p1, s2 to, "...accomplish the missions of experiential leadership, seamanship and navigation training through...(OSTS)."
2-6	Add to end of last sentence, "...for active duty military."
CHAPTER 3	
3-2	Delete s2 and s3 and replace with, "Use full throttle (3000 RPM) only for emergencies. The engine is most efficient, with the highest torque between 1800 and 2000 RPM, per specification graphs from Yanmar. The engine will provide 5 knots of speed at 1800 RPM, (depending on wind, current, and sea state) and will be most fuel-efficient between 1800 and 2000 RPM."
3-2.1	Move "NOTE" to position just above "WARNING". Delete bullet points 3 - 5 and replace with the following, "C Type Engine Panel (Key): See Figure 1-7.3. Turn the key switch to ON. This provides power to the panel, and enables the alarms to work while the engine is running. The panel will light and you will hear the oil pressure alarm, indicating the alarms are normal. Turn the key switch to START, then release back to ON position once started. The key is spring loaded and will automatically return to ON once released. CAUTION: Ensure the key switch springs back to the 'ON' position to avoid damaging the starter. C-35 Type Engine Panel (Push Button): See Figure 1-7.3. Push and hold the power switch (bottom switch) for 2-3 seconds. This provides power to the panel, and enables the alarms to work while the engine is running. The panel will light and you will hear the low oil pressure alarm, indicating the alarms are normal. Push the top start switch and release when the engine starts and the low oil pressure alarm is no longer heard. Follow procedures below if the engine does not start."
3-2.2.1.	Add, "See Figure 3-2." to end of p1.
3-2.2.2.	Add, "See Figure 3-3." to end of p1.
3-2.3.	Insert, "C Type Engine Panel (Key): " after bullet 1. Delete, "or push power button OFF (model C35 panel)." from bullet 3. Add, "C35 Type Engine Panel (Push Button): Push and hold the stop switch (second from the top) until the engine stops and the low oil pressure alarm is heard. If the engine does not stop, ensure that there is power to the C35 panel. Push and hold the power switch (bottom button) until the panel lights go off and the oil pressure alarm is silenced." after bullet 3. Change last 2 bullet points to "NOTE(s):"
3-5.1	Add, "See Table 3-2" at end of s1.

3-5.3.2.2 (new)	BACKSTAY TENSION "Resting" backstay tension at the dock should be 500 psi, per the SOP Chapter 9 checklist. You may need to ease tension to attach the forestay, but the minimum should be 500. The new Harken backstays do not have a tension gauge. Tension is measured by tape marks on a batten that is attached to the hydraulic cylinder. A guide to sailing backstay tension is: 0-10 knots TWS (true wind speed) 500 psi. 11-18 kts TWS 750 psi. 19-28 kts TWS 1000 psi. 29+ kts TWS 1500 psi.
3-5.4.1.	Change s1 to, "HELM assigns positions and calls out..." Add to item 1, s2, " and HELM ensures there are no contact hazards on the new course."
3-5.4.2	Change item 6 to, "GRINDER gets a double handled winch handle, stands by the lazy sheet winch, and reports "Ready" to HELM. Delete items 7-9 and renumber the remaining items. Insert the following after item 6, "OSTS: -After receiving "Ready" reports from the crew, HELM calls out "Center the main", and MAINSHEET centers the boom. -After receiving "Mainsheet centered" report from MAINSHEET, HELM calls out "GYBING" and slowly turns the stern toward the wind. -WORKING SHEET eases jib to maintain trim. TAILER keeps taking on the sheet to minimize slack. VOST: -After receiving "Mainsheet centered" report from MAINSHEET, HELM calls out "GYBING" and slowly turns the stern toward the wind. -MAINSHEET and WORKING SHEET ease sail to maintain trim. -TAILER keeps taking on the sheet to minimize slack. -When wind reaches 150-160 degrees apparent, MAINSHEET trims the mainsail, timing it so that the main is amidships before the boat is dead downwind. An extra crew member can help with the trim by taking in on the other mainsheet winch. -The designated crew for PREVENTER takes “line in hand” on the “new” side of the preventer.
3-5.5.1.1	Change NOTE s2 to, "Consider rolling smaller headsails from the clew to the hanks/luff tape....it can be taken out of the bag and hanked on at the bow before unrolling."

3-5.5.2	1. HELM assigns positions, then calls out "Prepare to reef" and crew takes positions. 2. MAST ensures cunningham is loose and off the reefing hook, then ensures the correct reef line is led fair (directly to the winch from the block) and places necessary wraps on winch. Takes position on the windward side of the mast and reports" Ready Mast" to HELM. 3. MAIN HALYARD ensures halyard is clear to run, puts balance of halyard coil aft, removes halyard from the self-tailer, and reports "Ready Halyard" to HELM. NOTE: If the second reef is being set, ensure that the first reef line clutch in the boom is set before the line for first reef is taken off the winch. 4. MAINSHEET ensures that the reef lines are tied in correctly, and bight around the boom is slightly aft of the reef cringle. Mainsheet eases vang and removes sheet from self-tailor, takes position facing the main and reports "Ready Mainsheet" to HELM. 5. Receiving "Ready" reports, HELM calls out "Take the reef" and maintains a close reach course, anticipating the boat's tendency to bear away once the main is eased. 6. MAINSHEET eases sheet until sail luffs and reports, “Main eased”. 7. MAIN HALYARD eases halyard after the sheet is eased. 8. MAST assists sail slides down the track, puts reefing cringle onto the reefing hook, and calls out "Made". 10. MAIN HALYARD trims halyard after hearing "Made". MAST ensures cringle stays on the reefing hook. MAINSHEET calls “HIGH” when proper luff tension is achieved. 10. As soon as MAST hears “HIGH" from MAINSHEET, MAST trims the reefing line, listening to MAINSHEET for when to stop. 11. MAINSHEET directs REEFING LINE to grind until the clew is snug against the boom and under tension, then reports “Made”. 12. Once halyard and reefing line are trimmed, MAINSHEET trims sheet and vang. MAST ensures the reef stoppers are closed. 13. MAIN HALYARD and REEFING LINE coil and make off respective lines. 14. Excess sail cloth is pulled to windward, rolled, and tied with sail ties reeved through
Figure 3-1	Insert new Figure 3-1 "Fuel Consumption". Renumber remaining figures.
CHAPTER 4	
4-3.2	Replace s6 with, "Lift the starboard side of the cover enough to clear the floorboards, slide the entire aft half to starboard, then rotate it onto the aft floorboard."Add new p3, "To replace the cover, seat the forward cover onto the starboard, forward corner of the engine pan area, and lower at an angle to clear the alternator. Ensure sail ties are clear, and exercise caution so that the coolant expansion tank does not come dislodged. Position the aft cover to starboard 6-8” and slide it into place so it clears the Racor filter support. Tap the forward flange at the floorboard level with your toe to seat it inside the floorboards. Close all latches and replace the steps. "

4-12	Add new section, "The N 44 is equipped with a Vesper Marine antenna splitter. It may be necessary to troubleshoot this system, or disconnect the AIS in order to receive radio transmissions. The splitter is located behind the breaker panel. Indicators: • Green power indicator. The splitter must have power for the AIS to work. • Amber VHF TX is illuminated whenever the VHF radio is transmitting. • Amber AIS TX is illuminated briefly whenever the AIS transponder is transmitting. • Red “Check Ant” indicates an antenna problem such as a short or open circuit. This indicator will light only when the VHF is transmitting on high power. You can check your installation by switching to high power and pressing the talk button. Although this indicates a potential antenna problem, it is only an indicator and does not affect the splitter’s functions.
CHAPTER 5	
	NO CHANGES
CHAPTER 6	
6-3.1	Delete s1 p2. Change new s1, p2 to, "Take the jackstay end loop (without the pennant) forward to the large padeyes aft of the bow pulpit ...". Add to end of p2, "Rig on both sides of the boat."
6-3.2.1.	Add new item 2, "Tension backstay to 1500 psi." Add to new item 5, s3, "...if broad reaching, from outside the boat, under the lifelines and through the permanently attached block ...". Add new item 6, "Uncoil the running backstays (checkstays) from around the shrouds and attach the tails. Lead the tails on the inside of the lifelines, through the large snatch blocks, and then to the secondary winches, and tension the windward one. Ensure the running backstay isn’t chafing on the lifeline when tensioned (you may need to lead the runner between the upper and lower lifeline for a fair lead)."
6-3.2.4.	Add new item 1, "Prior to lowering the mainsail, unclip the preventers, and pull the preventer tail at the winch so the shackle is flush at the end of the boom. Ensure the shackle doesn't hit anyone or get tangled."
APPENDIX 1	
Title	Change to "APPENDIX 1 - HF RADIO OPERATIONS GUIDE AND EMERGENCY COMMUNICATIONS"
1-3.c.	Delete this item, renumber remaining items.
2-1	Delete this section, renumber remaining.
2-1 (new)	Rename to, "EMERGENCY COMMUNICATIONS AND ASSISTANCE". Replace p1 with, "The use of the Digital Select Calling (DSC) function on both the HF/SSB and VHF radios is the preferred method to initiate a distress call from your boat, followed up by a voice MAYDAY message on 8291 kHz (monitored 24/7 by the USCG), or VHF radio channel 16. If you are within 20-25 nm offshore, VHF radio channel 16 is the best way to hail the U.S. Coast Guard for assistance. If you are greater than 25 nm offshore, unable to raise the U.S. Coast Guard on VHF radio channel 16 directly, via DSC, or through ship relay, or via the OTC satellite phone, then initiate the following procedure on the HF radio to send a distress call to other ships near you, and the U.S. Coast Guard." Delete item b, and re-label remaining items.

2-2 (new)	Change item c to, "Tune your HF/SSB radio to the DSC default, or if needed, one of the other frequencies in Table 4 to contact the US Coast Guard." Delete p3. Delete NOTE 1 (now incorporated in new 2-1 p1).
Table 4	Add to title, "GMDSS DSC HF Distress Frequencies"
APPENDIX 2	
Appendix 2 (new)	MK II BOAT LOADOUT
High Value Items	Change "Flashlights" QTY to "2"
Deck	Add, "Wheel Cover (blue), QTY 1, On wheel"

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CHAPTER ONE
THE BOAT

1-1 INTRODUCTION

The Navy 44 Mark II Sail Training Craft (N 44) is the latest of four generations of one-design offshore cruiser/racers to be authorized and funded by Congress for training midshipmen. The end of World War II brought the first fleet of 12 matched 44' wooden yawls designed by Naval Architect Bill Luders to the Naval Academy. After 25 years of hard service they were replaced by 12 fiberglass Luders 44' yawls, designed with the same exterior lines as the original boats, but with an interior that accommodated an auxiliary engine and navigation space with a chart table. After 25 years of offshore and Chesapeake Bay sailing, these boats were ready for replacement. The competition for the Navy 44 Mark I design was won by the firm of McCurdy & Rhodes, Inc. of Cold Spring Harbor, New York. The construction contract was awarded to Tillotson-Pearson, Inc. of Warren, Rhode Island. The first boat was delivered in 1987 and the 20th and last boat was delivered in 1991. The Mark I's were sailed for 20 years of near daily use.

The N 44 was designed by David Pedrick Designs with construction awarded to Pearson Composites, Inc of Warren, RI. The first hull (NA-21) was delivered in September 2007.

1-2 PRINCIPAL CHARACTERISTICS

Table 1-1 Specifications

Length, Overall	44.3 ft. 0 in. (13.51 meters)
Length, Waterline	36.75 ft. (11.2 meters)
Beam, Maximum	12.725 ft. (3.84 meters)
Draft	7.638 ft. (2.327 meters)
Mast Height, from Waterline	63.09 ft. (19.23 meters)
Displacement, Lightship trim	29,156 pounds
Ballast	10,472 pounds
Sail Area	1020 square feet mainsail and 100% jib
Engine, Diesel Auxiliary	Yanmar Model 4JH4E (NA 21-25) and 4JH4AE (NA 26-36), 50 H.P. @ 3000 RPM w/ Yanmar reverse reduction gear model KM4A, with Max Prop 483mm diameter, 356 mm pitch, feathering 2 blade prop.
Fuel Capacity	55 Gallons (50 useable)
Consumption (approximate)	2.5 GPH @ 2800 RPM, 1 GPH @ 2000 RPM, .75 GPH @ 1800 RPM
ELECTRICAL	12 volts D.C., 120 VAC, 30 Amp.
Alternators	Ship's Service/House alternator, Balmar 90-100 D 100 Amp Engine Start Battery alternator, Yanmar 60 Amp
Batteries	
Ship's Service/House Batteries	4 batteries in 1 SS bank; Lifeline AGM GPL-31T (420 total Amp hrs)
Engine Start Battery	1 - Lifeline AGM GPL-31T (105 Amp hrs)
COMMUNICATIONS	
VHF	ICOM IC-M 506 with ICOM HM-195Command Mic IV
HF/SSB	ICOM IC-M802
ELECTRONIC EQUIPMENT	
Navigation System	Furuno NavNet_TZT14 Multifunction Display: Chartplotter, Radar, AIS, SiriusFX weather.
Sailing Instruments	Brooks & Gatehouse Hercules H5000 with Graphic and Triton Displays
Radar	4kW 24" High Definition Digital Radome Model DRS4D incorporated in NavNet
GPS	GPS/WAAS Sensor Model GP330B incorporated in NavNet
Weather	SiriusXM weather incorporated in NavNet.
AIS FA50	Furuno Automatic Identification System, incorporated in NavNet.
Instrument interface	MiniPlex-41BT provides interface for up to four NMEA instruments, and has a laptop serial port access. Bluetooth capable for PDA or computer.
POTABLE WATER	175 Gallons in 3 tanks (35 gal day tank, 2-70 gal tanks under settee berths)
REFRIGERATION	Technautics Coastal 12 (12 VDC)
MSD HOLDING TANK	50 gal (PVC)
TANK TENDER SYSTEM	Hart Systems Model S 30-6 or S 60-5

1-2.1 LOADING

The vessel should never be loaded above its maximum recommended load of 34,755 lbs (15,765 kg) with a deadweight maximum of 5,600 lbs (2540 kg). This deadweight (weight above lightship including crew, stores, fuel, water, etc).is broken down as follows:

Crew	1,984 lbs	(900 kg)
Crew Effects	800 lbs	(363 kg)
Stores	661 lbs	(300 kg)
Fuel	384 lbs	(174 kg)
Water	1,413 lbs	(641 kg)
Sewage	357 lbs	(162 kg)

1-2.2 STABILITY INFORMATION

A maximum total load has been used for assessing stability and buoyancy comprising:

- manufacturer's maximum recommended load 34,755 lbs (15,765 kg)
- fuel, fresh water, other fluids to maximum capacity of fixed tanks 2,154 lbs (977 kg)
- crew, stores and crew effects 3,446 lbs (1,563 kg)

This assessment has been made assuming that the boat in light craft condition has a mass of 29,156 lbs (13,225 kg), and all standard equipment is aboard.

1-2.3 MAST and DRAFT

The N 44 has an overall height above the waterline of 63.09 ft (19.23 m) and a draft of 7.638 ft (2.327 m).

WARNING*: Do not attempt to pass under a bridge or overhead power lines with less clearance than 65 feet or operate in water depths of less than 10'.*

1-2.4 HULL OPENINGS/FLOOD POINTS

The hatches, ports and seacocks that should remain closed at sea are at the discretion of the Skipper of the vessel.

The N 44 is equipped with a small forward watertight collision bulkhead to lessen the likelihood of water intrusion in case of damage to the bow. **The watertight hatch, located in the forepeak, must remain closed except for inspections.** ***Recommend emptying watertight compartment through drain valve located beneath hatch periodically (before each block).***

1-2.5 DOWN FLOODING ANGLES

Down flooding openings are openings in the hull or deck (including the edge of a recess) that might admit water into the interior or bilge of a boat. Down flooding angle is the angle of heel at which down flooding openings become immersed, when the boat is in calm water and in the appropriate loading condition. Down flood points and angle of down flooding for the N 44 in ascending order, calculated with Full Deck Model at Minimum Operating Condition (ISO 12217-2:2015);

Foredeck Hatch	62.88°
Opening Side Port	88.48°
Companionway	110.64°

1-2.6 HULL CONFIGURATION & LAYOUT

The N 44 has a trimmed waterline length of 36.75 feet. A fixed hydrodynamic keel, flared at the bottom and containing 10,472 pounds of cast lead ballast, is arranged amidships. The rudder is a spade type. The N 44 has a continuous main deck around the raised cabin top and cockpit. Cockpit combing and cabin top are fitted with an array of winches, blocks, cleats and fittings sufficient for offshore training and racing. Deck surfaces are covered with Treadmaster non-skid. The main deck perimeter is fitted with fore and aft stainless steel pulpits, with stanchions that have double life lines port and starboard.

1-2.7 CONSTRUCTION INFORMATION

Basic layup of hull includes clear gelcoat and several layers of inner and outer skin of woven roving and biaxial glass matting with Detrakane resin over ATC Corecell. The hull is reinforced at the keel, mast, bow and chainplate areas.

The deck is laid up in a similar fashion as the hull, using a separate mold and joined to the top of the hull at the deck edges. Sufficient biaxial/matting reinforcing is overlapped to assure proper bonding at the joint

The bottom of the hull includes a stepped seat for bolting on the lead keel with ten (10) stainless steel bolts. The inner bottom of the hull (below cabin sole) incorporates a hollow fiberglass grid pattern of longitudinal and transverse members bonded to the inner skin which provides the necessary hull stiffness as well as support for the cabin sole.

1-3 HULL & EXTERIOR/INTERIOR ARRANGEMENTS

The N 44 is divided into three sections: deck, cockpit and cabin.

1-3.1 DECK - Supports the mast at the partners and is arranged with winches, cleats, stanchions, pulpits, lifelines, navigation lights, hatches, and fittings suitable for offshore sailing. See Figure 1-2 Hull and Deck Profile, and Figure 1-5 Deck Layout and Cockpit.

1-3.1.1 MOORING, ANCHORING AND TOWING FITTINGS

There are two closed chocks amid-ship and two closed chocks aft. There are two 8" cleats forward of the aft chocks. There are no forward chocks. Mooring lines attach directly to the bow mooring cleats.

In addition to dockside mooring, these fittings may be used for anchoring, towing, and being towed.
Four (4) 45', 5/8-inch diameter, three strand twist nylon lines are stowed aboard for docking and mooring lines. See Chapter 6 for towing, mooring arrangements and anchoring.

There is a removable anchor roller that attaches to a stainless steel bracket welded on the port side of the bow pulpit.

1-3.1.2 PORTS AND HATCHES

The N 44 has the following ports and hatches:

- Two fixed ports either side of the cabin trunk. Ports are through-bolted Lexan.
- Two Bomar opening ports on either side of the cabin trunk aft of the fixed Lexan ports.
- One Bomar opening port in the starboard side of the cockpit to ventilate the quarter berth.
- One large custom deck sliding hatch on the foredeck.
- Companionway slider is fiberglass with an acrylic drop washboard. Stowage for the washboard is provided in chocks in the port wet locker aft of the navigation station. A line and clip are provided so that the washboard can be secured to the boat while underway and is therefore immediately accessible in case of inversion.
- Bomar opening hatches are on the cabin trunk top, port/starboard forward of the mast, and one Bomar hatch is forward of the companionway slider.

1-3.1.3 DORADE VENTILATION

The N 44 deck is equipped with Dorade boxes for ventilation. The Dorade boxes have limber holes on deck and screw in cowls.

1-3.2 COCKPIT

A large well on the afterdeck accommodates the crew that will steer, and work the sails. See Figure 1-5 Deck Layout and Cockpit.

1-3.2.1 ANCHOR STOWAGE

There are two (2) anchors on board the N 44. Lashing chocks are provided for secure stowage.
One (1) 35-pound Hi-Tensile Danforth anchor is stowed vertically against the inside of the watertight bulkhead in the forepeak. Six feet of 3/8-inch chain and 250 feet of 5/8-inch diameter 3-strand nylon anchor line are stowed with the anchor.

One (1) 20-pound Hi-Tensile Danforth anchor is stowed in the bottom of the port cockpit line locker with six feet of 3/8-inch chain and 250 feet of ½-inch 3-strand nylon anchor line.

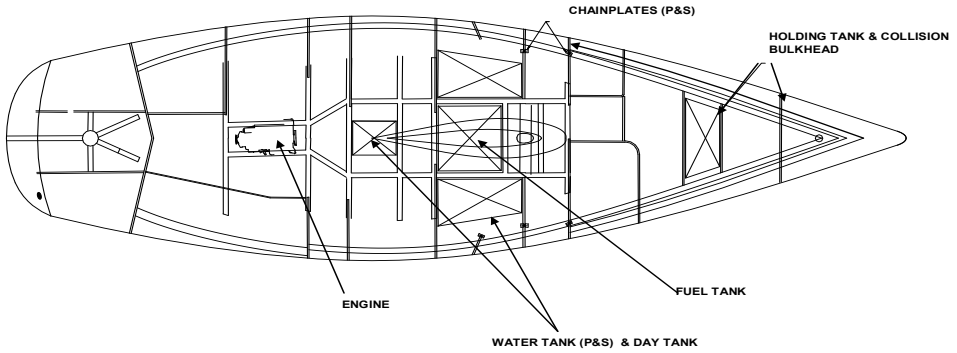


Figure 1-1 Bottom Grid

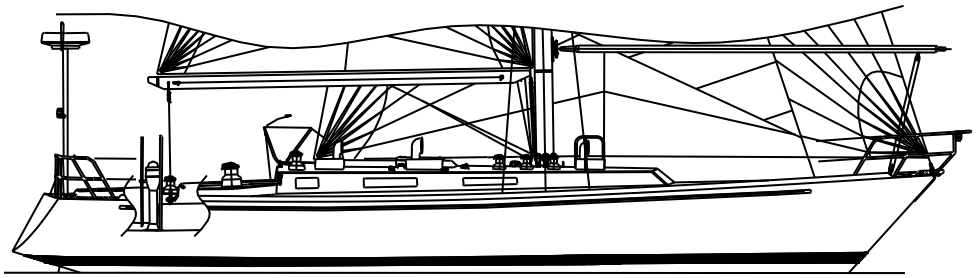


Figure 1-2 Hull and Deck Profile

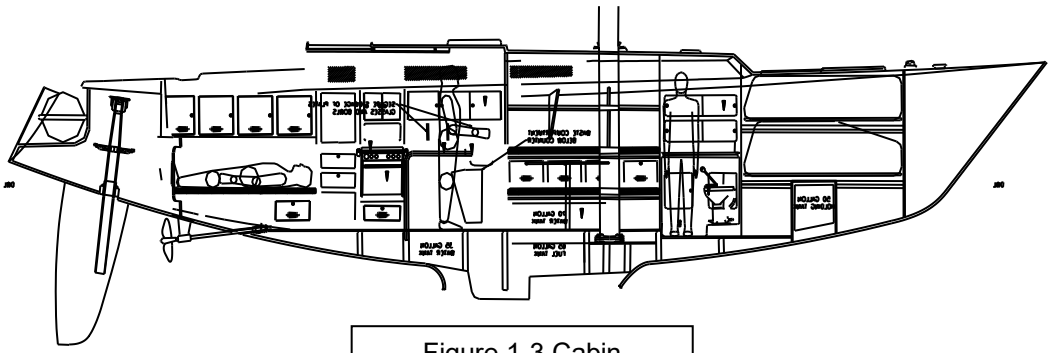


Figure 1-3 Cabin

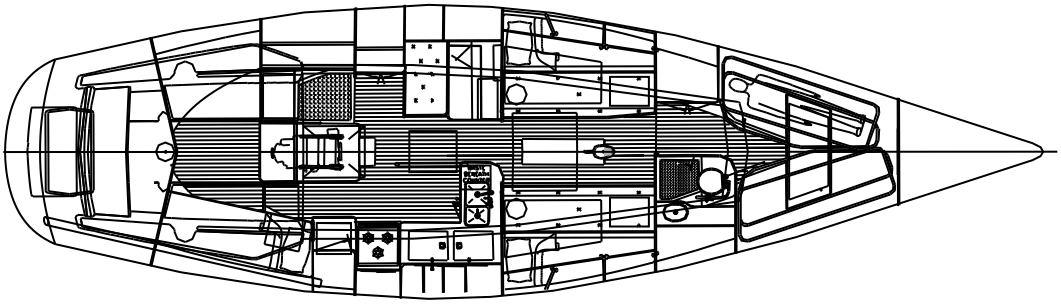
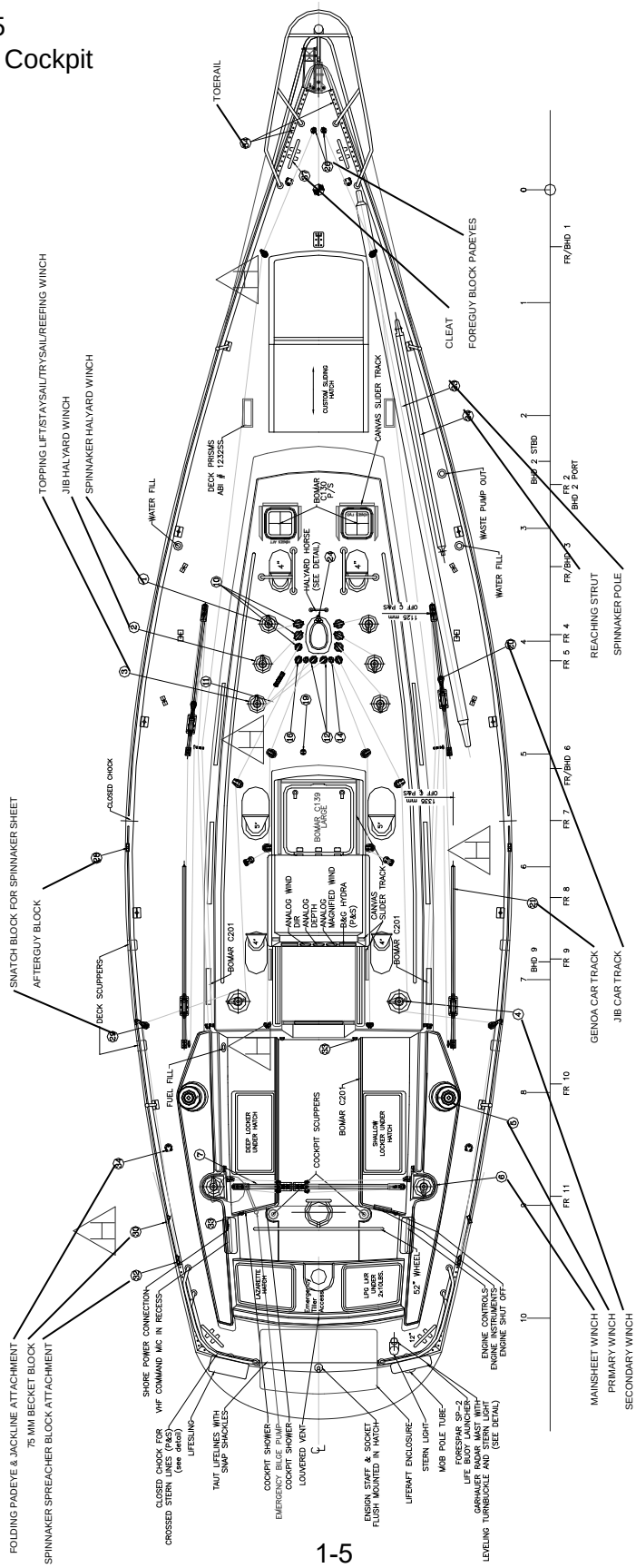


Figure 1-4 Cabin Interior

Figure 1-5
Deck and Cockpit



1-3.3 CABIN

The cabin consists of habitable spaces, storage, electronics, and the auxiliary engine. Habitable spaces include berths, head/shower and galley. Water tanks are under the settee berths. Below the cabin sole is the mast step, water (day) tank, fuel tank, bilge pumps, engine start battery, and through-hull fittings. The engine compartment is below the companionway. See Figure 1-1 Bottom Grid, Figure 1-3 Cabin and Figure 1-4 Cabin Interior.

1-3.3.1 BERTHING

The N 44 is arranged with five (5) berths with mattresses in the main cabin as follows:

One (1) pilot berth and one (1) settee berth to Port.
One (1) pilot berth and one (1) settee berth to Starboard.
One (1) quarterberth aft of the galley on the starboard side.

Additionally four (4) hinged pipe berths are in the forward compartment, two to each side. Berth dimensions are approximately 76 inches by 25 inches. The berths in the main cabin have 4-inch foam cushions and are fitted with lee cloths and adjusting block and tackle to allow for heeling. The pipe berths have adjusting block and tackle and are usually used for sail storage.

1-3.3.2 GALLEY

The galley is located inside the cabin to starboard amidships and consists of a stove, refrigerator, sink and stowage compartments. The galley is fitted with Formica countertops, sea rails, and pantry locker with racks and shelves.

1-3.3.3 MESS TABLE

A Formica-topped mess table is available for mounting on centerline aft of the mast (between settee berths) and is fitted with hinged drop leaves, sea rails and lift-out panels for stowage. The table is normally removed to ease crew movement forward and aft and for sail storage when racing.

1-3.3.4 HEAD COMPARTMENT

The head is located forward, and to starboard inside the cabin and consists of the marine head, sink, shower unit, mirror**,** and stowage shelves.

1-4 SPARS

The N 44 is a masthead sloop rig whose spars include a single mast, a boom, a detachable spinnaker pole and a detachable reaching strut (optional).

1-4.1 MAST

The mast is a section 6210 aluminum alloy tube from Chesapeake Rigging. The mast is finished with Awlgrip paint. It has an external mainsail Antal track with matching cars on the mainsail luff. The headboard attaches to a separate double Antal car. The double headboard car stays on the track through the use of the track “stopper” when removing the mainsail.

With the exception of the spinnaker halyard external sheaves, the masthead has internal halyard sheave boxes with integrated sheaves welded to the masthead. Aluminum spreader bars with airfoil sections and through-mast mounting are fitted at about the middle and the top quarter of the mast.

A separate track is located on the port side of the mainsail track for the storm trysail. A 12 foot spinnaker pole track with single toggle car is fitted on the forward side of the mast. A conduit inside the mast houses wiring for navigation lights, deck light, anchor light, Windex light, wind instruments and antennas; these wires exit at the base of the mast. The mast goes through the deck, is fitted with a mast collar, wedges and a boot for watertight integrity. The mast steps on an adjustable plate that is mounted to an alloy mast step bolted to the structural grid.

WARNING: ***Controlling height of the mast for bridge clearance is 65 ft, passing through the center span of the bridge, due to the electronic wind sensor and VHF antenna at the masthead.***

Figure 1-6 Standing Rigging

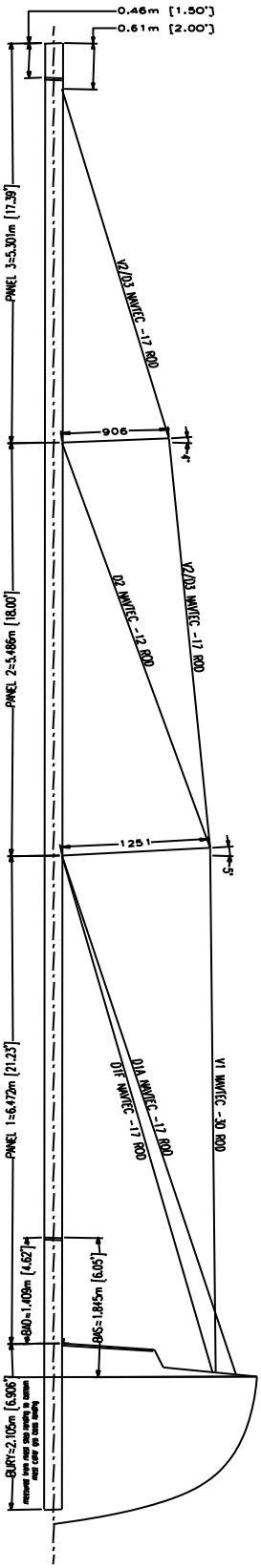
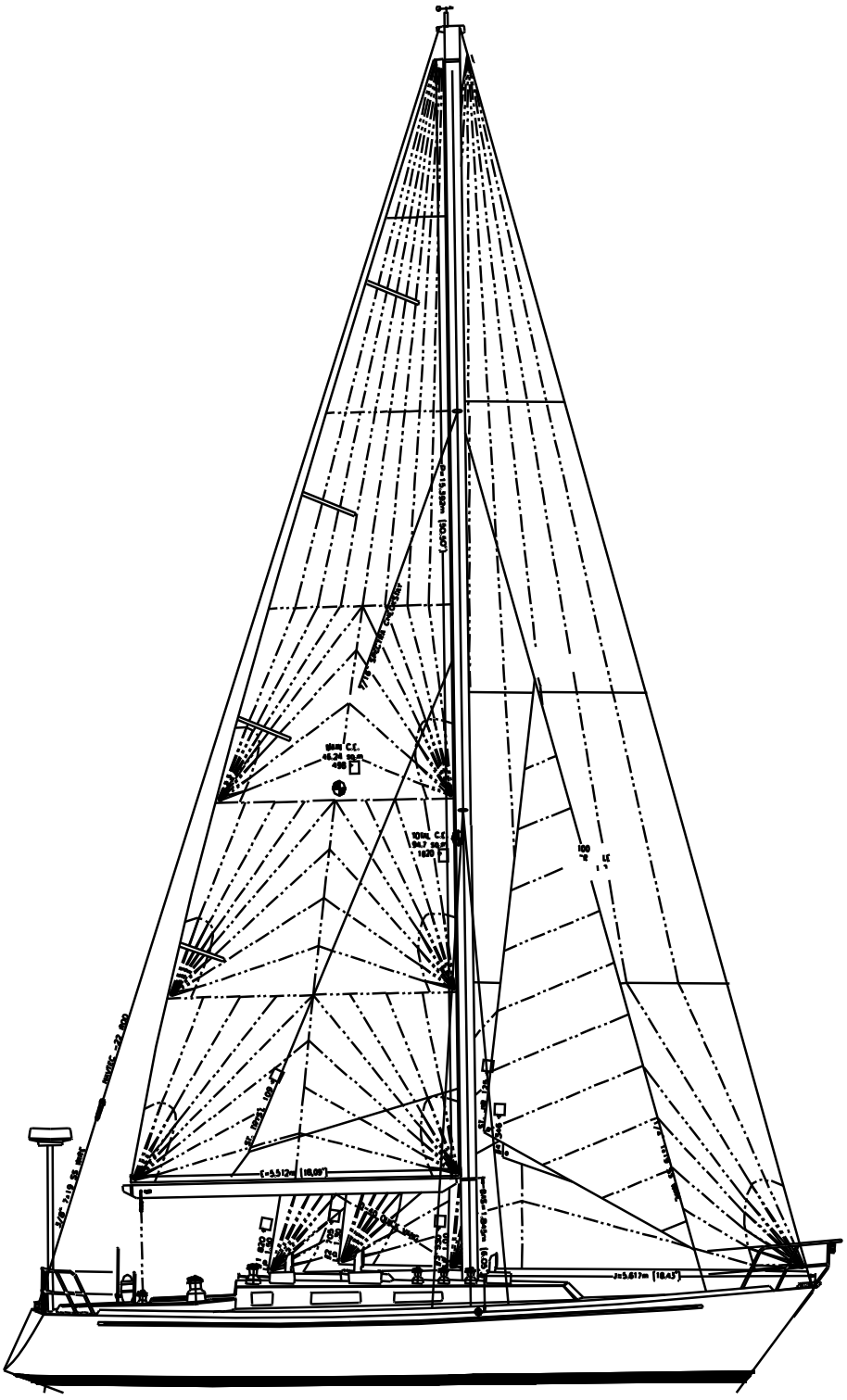


Figure 1-7 Sail Plan



1-4.2 MAIN BOOM

The main boom is an aluminum extrusion (6061-T6) manufactured by Chesapeake Rigging and is finished with Awlgrip paint. Two reefing sheaves are internally mounted on the aft end with another two internal sheaves on the gooseneck end. Two rope clutch reef locks inside the boom at the forward end secure the reef line when it is set to free the reefing line winch for other evolutions. The boom is fastened to the mast with a gooseneck approximately five (5) feet above the cabin top and is fitted with a Hall Spars Quik Boom Vang size D40. The control lines can be led back to the cam cleats both sides of the companionway or through the swivel cam cleats for trimming either from the cockpit or the weather rail.

1-4.3 SPINNAKER POLE

The spinnaker pole is 4-inch diameter aluminum alloy tubing 18 feet, 4 inches long, manufactured by Chesapeake Rigging. The inboard end is equipped with a socket that attaches to a fitting on the spinnaker track car. The outboard end of the pole has a fitting to accept the spinnaker afterguy. When not in use, the spinnaker pole is stowed in starboard deck chocks on the foredeck.

1-4.4 REACHING STRUT

The reaching strut is a 7 foot, 3-inch, aluminum alloy tubing, manufactured by Chesapeake Rigging. It is equipped with an inboard socket fitting that attaches to a fitting mounted on the outboard side of the mast approximately two (2) feet above the cabin top. The outboard end has a fitting to accept the spinnaker afterguy to route it outboard of the stanchions. The reaching strut must be rigged before easing the pole to the headstay to prevent the afterguy from bending the stanchions.

The reaching strut is used with the spinnaker when the apparent wind angle is equal or less than 95 degrees. This reduces chafe on the afterguy and increases the mechanical advantage of the afterguy to help keep the spinnaker pole from touching the headstay when close reaching, especially in a seaway.

1-4.5 STANDING RIGGING

The mast is held vertical by a combination of stays and shrouds which collectively make up the standing rigging. It consists of a permanent rod headstay attached from the stem chainplate to the masthead, a rod rigging backstay that is split at deck level and rod rigging shrouds. See Figure 1-6 Standing Rigging.

1-4.5.1 SHROUDS

An upper shroud attached with a fixed terminal fitting fastened to the masthead passes through the outboard end of the upper spreaders and attaches to the outboard end of the lower spreader.

The lower vertical shroud attaches to the outboard end of the lower spreader and leads to a chainplate on the deck. This lower vertical shroud also supports the load on the upper diagonal shroud. The forward lower shroud attaches to the mast below the lower spreader with a fixed terminal fitting and leads to a chainplate on the deck approximately two feet forward of the vertical shroud.

The aft lower shroud attaches to the mast below the lower spreader with a fixed terminal fitting. The lower aft shroud leads to a chainplate on the deck approximately two feet aft of the vertical shroud. Each lower shroud and upper diagonal shroud is fitted with a turnbuckle to adjust tension when tuning the mast. See Figure 1-8 Typical Turnbuckle.

Tuning is the process by which the standing rigging is adjusted so that the mast remains in column, directly on centerline when exposed to typical operating loads. The mast is tuned by Small Craft Repair Department or VOST support personnel and is not to be tuned by N 44 skipper or crew unless supervised by the former. See Table 1-2 Standing Rigging.

1-4.5.2 SPREADERS

The N44 mast has two sets of aluminum spreaders which extend with a four degree dihedral angle from the mast at approximately 21 feet and 39 feet above the deck for the lower and upper sets respectively, thus the rig is referred to as a "double spreader rig". The spreaders assist the shrouds in keeping the mast in column. See Figure 1-6 Standing Rigging.

Table 1-2 Standing Rigging

ITEM	SIZE	MATERIAL	QUANTITY
Upper Shrouds - V2/D3	17	NAVTEC 22-13-5	2
Vertical Shrouds – V1	30	NAVTEC 22-13-5	2
Middle Shrouds – D2	12	NAVTEC 22-13-5	2
Lower Shrouds – D1A/D1F	17	NAVTEC 22-13-5	4
Forestay	22	NAVTEC 22-13-5	1
Backstay	22 rod with 3/8 wire below insulator	NAVTEC 22-13-5	1
Inner Forestay (Collapsible)	1/4" Dia	1x19 Stainless Steel Wire	1
Running Backstay (Collapsible)	7/16" Dia	T-900 Sta-Set or equivalent.	2

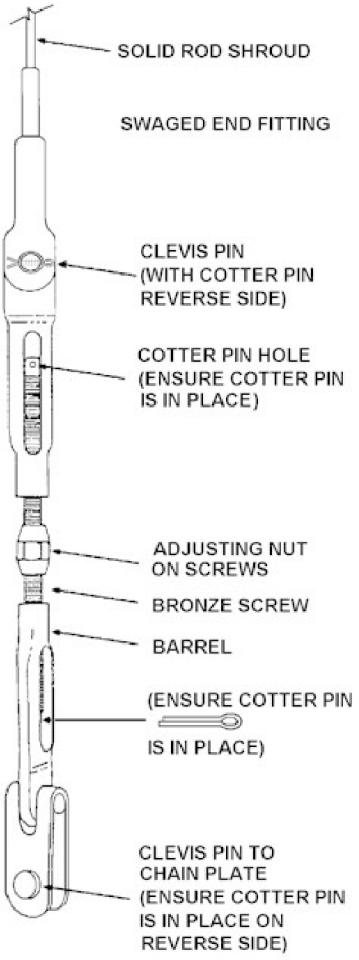


Figure 1-8 Typical Turnbuckle

Figure 1-9 Backstay Tensioner

NOTE: ***At the beginning of each block or prior to embarking on an offshore voyage, always ensure cotter pins are installed and the ends are separated so they don't fall out. Tape cotter pins with white electrical or rigging tape after inspecting.***

1-4.5.3 NAVTEC OR HARKEN HYDRAULIC BACKSTAY TENSIONING DEVICE

The backstay tensioner (backstay) is a manually operated hydraulic ram used to control headstay sag and to bend the mast to adjust the aerodynamic shape of the mainsail. Add tension using the backstay to pull the head of the mast aft as the wind speed increases. The headstay will tighten to reduce sag, which will reduce the sail's camber for improved efficiency. The opposite force exerted on the mast is seen as a bending of the mid-section of the mast forward. This will also reduce the camber in the mainsail for improved efficiency as the wind speed increases.

The NAVTEC tensioner has a gauge that gives load on the system in thousands of pounds. The gauge is located at the top of the cylinder. The Harken backstay does not have a gauge.

- To increase the load on the system, turn the load release valve (bleed valve) clockwise until finger tight. The valve is located on the lower part of the cylinder on the side opposite to the pressure gauge. Use the hand pump to increase pressure to the desired load.
- To release the load turn the bleed valve counterclockwise approximately 1/4 turn. Close the bleed valve when the desired load is attained. Minimum pressure for a static system at rest is 500 pounds. **Maximum pressure is 1700 pounds.** See Figure 1-9 Backstay Tensioner and 3-5.3.3 Backstay Tension.

CAUTION: The SSB antenna is attached to the backstay. It has an intentional amount of slack in the antenna to accommodate adjusting the backstay. DO NOT tension the antenna to remove the slack. This will result in the antenna disconnecting from the radio when the backstay is released, causing permanent damage to the instruments, and may shock personnel.

1-4.5.4 COLLAPSIBLE INNER FORESTAY

A collapsible inner forestay, of 1/4"- 1X19 stainless steel wire, is attached to the front of the mast with an aluminum welded tang at a point 18 feet, 9 inches below the masthead. The lower end of the inner forestay is attached to the deck with a shackle and is adjusted with a folding handle attached to a threaded fitting.

When deployed, the inner forestay will lessen the flexing of the mast due to strong winds and seas. It also serves as the stay to which the genoa staysail and the storm jib are attached. When not in use the lower end can be led through the fairlead on the port side of the base of the mast, and attached to the block and tackle and small stainless steel O-ring at the padeye on the cabin top aft of the mast.

The running backstays are attached to the back of the mast at the same height as the inner forestay and must be used when the inner forestay is set.

1-5 RUNNING RIGGING AND HARDWARE

Running rigging is the equipment and lines used to hoist and trim the sails. It includes running backstays; halyards to raise and lower sails; sheets for headsails; spinnaker sheets and after guys, spinnaker pole topping lift and foreguy (down haul); main sheet, traveler, cunningham, vang, outhaul and reefing lines for the mainsail. Hardware includes (but is not limited to) snatch blocks, spreacher blocks, rope clutches, winches and winch handles.

1-5.1 RUNNING BACKSTAYS (CHECKSTAYS)

There are two running backstays, or checkstays, one on each side, attached to the sides of the mast at the same height as the collapsible inner forestay. They provide stability to the mid-mast region when the inner forestay is used for setting the storm jib or genoa staysail and help to keep the mast from pumping in a rough seaway. The stays can also be used as checkstays to straighten the mast for optimum sail trim while racing. The windward running backstay must be set when the genoa staysail is used. Both running backstays may be set when the storm jib is used. They are stowed against the after lower diagonal shroud turnbuckles and tied off with shock chord.

1-5.2 HALYARDS

The masthead is fitted with five (5) Delrin sheaves on which the halyards turn; one for the mainsail, one for the port jib/genoa, one for the starboard jib/genoa, and two spinnaker sheaves. The halyards all are rigged to travel internally through the mast to deck level.

- The two spinnaker halyards pass through external blocks attached to welded cranes on each side of the forward face of the masthead. At the base of the mast, they are led through turning blocks to the forward port and starboard winches on the cabin top.
- The two jib/genoa halyards are led through turning blocks to the middle port and starboard winches on the cabin top.
- The main halyard is led through a turning block at the base of the mast to the aft winch on the starboard side of the cabin top. **NOTE: Do not over tension main halyard.**
- The topping lift/staysail halyard controls the vertical position of the outboard end of the spinnaker pole and is a halyard for the staysail and storm jib. It is led to a sheave located on the front of the mast just below the inner forestay attachment and descends inside the mast, exiting on the lower port side to a deck-mounted swivel turning block. The line is led through a rope clutch, then to the aft port side winch.

The main halyard is equipped with a captive pin shackle. The jib/genoa and spinnaker halyard shackles are trigger type snap shackles. The topping lift is fitted with a swivel snap shackle.

NOTE: ***The mainsail, jib/genoa halyards are 1/2" T-900 or equivalent, 140'. The topping lift/staysail halyard is 7/16" Endura Braid or equivalent, 110'. The spinnaker halyards are 7/16" Sta-Set or equivalent, 140'.***

1-5.3 SHEETS AND GUYS

A sheet is a line that controls the clew of a sail. A guy is a line that is led to the spinnaker pole outboard jaw end to control the spinnaker and pole to windward. The spinnaker guy, typically called the after guy, is a low stretch spectra line. It includes a snap shackle attached to the sheet. A "donut" stopper is fitted to prevent chafe and keep the snap shackle from fouling in the spinnaker pole jaw. The foreguy is rigged along both sides of the deck and attaches to the bottom of the outboard end of the spinnaker pole to exert downward pressure and stabilize the pole.

1-5.4 MAINSHEET

The mainsheet is double ended with sheet tension controlled by two self-tailing winches mounted on the cockpit coaming for trimming from either rail. The mainsheet runs through a block on the end of the boom to a block mounted on each end of the traveler car and then to a winch. Since the mainsheet runs through a block on the end of the boom, each end of the mainsheet has a 2:1 mechanical advantage in addition to the winch power.

Figure 1-10 Mainsheet System;
Traveler, Winch and Cleat

1-5.5 MAINSHEET TRAVELER

A traveler (consisting of two Harken cars mounted end to end) is fitted to a track in the cockpit in front of the helm. The car is controlled by a continuous line, dead-end spliced to the double fiddle blocks at the ends of the traveler track. It exits through a block and bulls-eye fairlead at the end of the traveler and leads to a cam cleat on the cockpit wall forward of each mainsheet winch. This control is used to adjust the mainsail angle of attack to the wind. When sailing close-hauled the traveler is pulled up to center the boom. It is let down to leeward in strong wind to reduce heeling and decrease weather helm.

1-5.6 OUTHAUL

The outhaul is a block and tackle system contained mostly inside the boom, A line from the block and tackle portion leads through a sheave at the aft end of the boom and attaches to the aft end of the slider car on top of the aft end of the boom. The clew of the mainsail is attached to the forward end of the car using a D shackle. The outhaul is used to adjust the camber in the lower sections of the mainsail; tighten to flatten the camber for stronger winds and loosen in lighter winds or when sailing downwind. The outhaul control line exits to a cam cleat on the bottom of the boom between the boom vang and gooseneck. See Figure 3-6.

1-5.7 CUNNINGHAM

The cunningham is a light duty block and tackle used to tension the luff of a fully hoisted mainsail. It is primarily used to keep the maximum draft of the mainsail forward as the wind increases. To relocate the draft to the proper position, to about the forward 40% of the chord of the sail, increase tension on the cunningham.

1-5.8 BOOM VANG

The boom vang (vang) controls the tension on the leech of the mainsail (twist) when reaching and running (when the mainsheet is not pulling the boom down). The vang is usually set so the aft section of the top batten is parallel to the boom (the boom will be roughly parallel to the deck). The vang also supports the boom when the mainsail is not hoisted.

1-5.9 PREVENTER SYSTEM

A preventer system has been installed on the N 44 to help keep the boom from crossing the boat dangerously because of an accidental gybe or other inducement. It should be deployed when the

apparent wind angle is greater than 120 degrees off the bow. On each side of the boom, a red preventer line is installed. When not in use, a snap shackle on the forward end of the line attaches to a padeye on the boom near the gooseneck. When in use, the line is led outboard of shrouds and stanchions and attached by the snap shackle to a pennant led to one of the bow mooring cleats. The other end enters the boom through an internal sheave near the aft end of the boom and crosses inside the boom and exits through a sheave on the opposite side of the boom near the gooseneck. It then passes to a turning block at deck level and to the cabin top winch. The advantage of this arrangement is that the preventer can be adjusted from the weather rail and the boom gybed without detaching either preventer. During a gybe, the leeward preventer line is eased as the boom gybes. The other preventer line is then taken in to control the boom ("prevent" an accidental gybe). The lines are permanently mounted on the boom so they can be deployed quickly. See Figure 1-11.

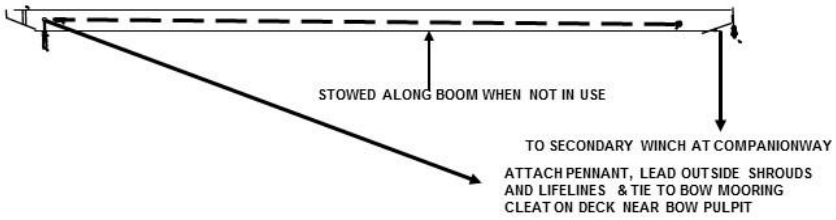


Figure 1-11 Preventer Deployed

1-5.10 REEFING LINES

The N 44 is equipped with a double reefing system led internally in the boom. The first reefing line leads from a deck mounted swivel block at the base of the mast, up to a sheave in the forward end of the boom, into the boom through a rope clutch, exiting to a sheave at the aft end of the boom then up through the first reef cringle and tied back onto the boom. The second reefing line has the same run pattern but is rigged on the other side inside the boom. When not in use the reefing lines are secured at the aft end of the boom with a figure eight knot in each to keep it from running out through the sheave. See Chapter 3.

1-5.11 ROPE CLUTCHES

There is one Spinlock clutch port side, aft of mast for the staysail/topping lift halyard, and two reefing line clutches inside the bottom of the boom at the forward end. These are used to lock off the line, which enables the crew to free up a winch to use for a working line.

1-5.12 WINCHES

The vessel has twelve different winches for adjusting and controlling running rigging. See Table 1-3.

Table 1-3 Winches

Qty	Description	Manufacturer	Part Number
2	48 ST-SS Spinnaker Halyard winch	Lewmar	49048057
2	48 ST-SS Jib Halyard winch	Lewmar	49048057
2	48 ST-SS Reefing/Main Halyard winch (starboard) and Spinnaker Pole Topping Lift (port)	Lewmar	49048057
2	64 ST-SS Secondary winch	Lewmar	49064004
2	77 ST-SS Primary winch	Lewmar	49077004
2	54 ST-SS Mainsheet winch	Lewmar	49054004

Winch handles are used to employ mechanical advantage of the winch through its internal gearing. All the handles on the N 44 are "locking" type. A small spring-loaded lever on the handle head engages and disengages the lock device. There are single-handed handles, (short handgrip), and double-handed handles, (long handgrip).

Deploy winch handles to the winch handle pockets in following locations: The combination sheet bags/winch handle holders on the forward face of the cockpit for cabin top winches and for the primary winches (double handles for primaries). Mainsheet winch handle holders are mounted just below the traveler track on the inboard side of the cockpit seats. Winch handles for the halyard winches are stowed in the dorade cowls.

1-5.13 SNATCH BLOCKS

Snatch blocks provide a lead block where needed. Typical locations are on the toe rail:

- Four holes forward of the midship closed chock, as a lead block for spinnaker guys.
- At the midship lifeline stanchion for outboard jib lead, staysail, and genoa sheet reaching leads.
- As a lead block for the spinnaker to keep the spinnaker sheet from rubbing on the boom.
- As a lead block for the running backstays.

1-5.14 SPREACHER BLOCKS

Spreacher blocks are double blocks attached to the toe rail tang below the lower rail of the stern pulpit. They are used as turning blocks for the spinnaker sheets, and for leading other lines such as the storm trysail sheet, or a changing spinnaker sheet.

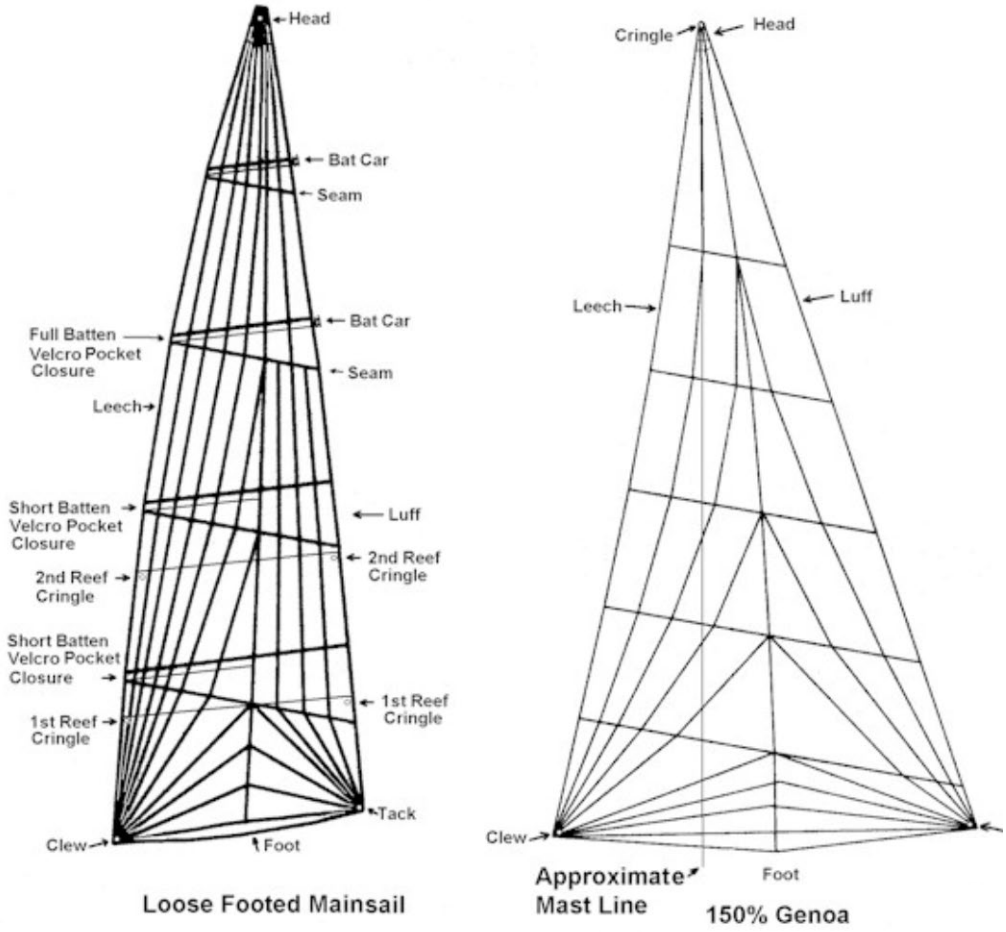


Figure 1-12 Mainsail and Genoa Nomenclature

1-6 SAILS

- Mainsail
- No. 1 Head sail 150 %
- No. 2 Head sail (high-clewed reacher)
- No. 3 Head sail 100 %
- No. 4 Head sail 85 %
- Stay sail
- Storm jib
- Storm trysail
- Tri-radial spinnaker

1-6.1 MAINSAIL

The mainsail is made of 9 oz Dacron material with a total sail area of 498 square feet. The first reef can reduce sail area to 350 square feet (70%) and the second reef to 270 square feet (54%).

The mainsail is not an exact triangle. The mainsail is constructed of multiple panels in a tri-radial pattern so that it forms an airfoil. The curve of the airfoil is the camber of the sail. When air flows across it, lift is created. Lift is the aerodynamic principle that makes it possible for the sail to propel the boat, even in a vector toward the wind. This is a key concept in sailing. The extra material along the trailing edge (leech) of the sail that

extends beyond a straight line between the head and clew of the sail is called "roach" and serves to slightly increase the sail area.

The mainsail has four battens to support the roach of the sail. The top batten is a full-length batten that extends from luff to leech, supports the roach, and gives the draft definition. A batten car supports the luff end of the full batten. The three lower battens support only the aft portion of the sail. The edges of the sail are seamed with extra layers of material (called tabling) to prevent chafe. The aft ends of the batten pockets have a Velcro closure to retain the batten. The sail is loose footed and is attached to the boom only at the tack and clew.

Once the mainsail has been installed, or “bent on,” it is normally left attached to the mast and flaked on the boom. It is secured with sail ties and covered with an acrylic sail cover to prevent ultraviolet light deterioration. The three corners of the sail (head, tack and clew) are reinforced with extra fabric to withstand strain. The mainsail is fitted with a cringle to attach the Cunningham to help control draft position and luff tension and reef cringles. Additional cringles are fitted along the luff and leech for the first and second reef points. See Figure 1-7 for Sail Plan, Figure 1-12 for Mainsail and Genoa Nomenclature.

NOTE: Keep cover on mainsail until ready to raise the sail, and as soon as it is lowered to preserve life of sail and prevent sun damage.

1-6.2 JIBS/GENOAS

All sails set forward of the mast are generically called “headsails”. The N 44 is usually provided with four (4) Dacron headsails. A genoa is a headsail that fills the foretriangle (area between the mast, deck and headstay) and extends aft of the mast. A jib is a smaller headsail that fills only the foretriangle or any percentage of it (also called a working jib).

The #1 (150 percent) genoa is the largest headsail and is made of cloth weighing 6.3 oz. per square yard. The genoa sheets are led outboard of the shrouds, inboard of the lifelines and stanchions, through the genoa car lead blocks on the aft headsail tracks, then to the primary winches when sailing to windward (see Figure 3-5), or outboard of all shrouds, stanchions and lifelines to snatch blocks on the toerail then to the primary winches when reaching (see Figure 3-7). The #2 reaching genoa is designed with a high clew to allow for better visibility of the forward leeward bow area and to reduce damage from waves. The #2 reaching genoa is not designed for upwind sailing and should be rigged per Figure 3-7.

A #3 (100 percent) jib and the #4 (85 percent) jib are also provided. The #4 jib has a pennant attached to the head to allow the halyard to reach full hoist even though the head of the sail does not. For beating or close reaching, the jib sheets for both the # 3 and #4 jibs are led outside of the forward lower shrouds and inboard of both the cap (middle) shrouds and the aft lower shrouds to the forward jib car lead bocks on the forward headsail track. See Figure 3-6.

Jibs/genoas have two methods of attachment. 1) They are hooked directly onto the rod headstay with #3 piston hanks attached to the sail, OR 2) Some racing sails have a small boltrope luff tape sewn on the sail that fits into a plastic twin-grooved headfoil system mounted over the headstay.

A block and tackle system is used to adjust the position of the headsail cars on their respective tracks (one forward and one aft). This system is attached to the forward end of the forward car and the adjustment line is led aft to a cam cleat mounted on the outboard side of the cabin near the cockpit. The genoa and jib cars are connected and adjust simultaneously. The lead adjuster, along with the halyard and backstay adjustments are used to control the headsail’s camber and twist.

See Table 3-1 Sail Management, for sail selection for a given wind condition, and recommended starting sheet lead positions.

1-6.3 SPINNAKER

Spinnakers are used for sailing at apparent wind angles greater than 80 degrees in light to moderate winds when more power is desired, and control of the boat can be maintained. Spinnakers are typically made of nylon cloth of a weight structurally suited for a certain range of wind speeds. The standard spinnaker for the N 44 is 1.0 oz cloth, recommended for apparent wind speeds below 18 knots. Racing boats may have other weight spinnakers to cover a broader wind range.

1-6.4 STORM SAILS

Storm sails provided on the N 44 are a storm jib and a storm trysail. These are small sails, made of heavy Dacron, reinforced to withstand high winds, and are orange in color for better visibility by other vessels or aircraft. The storm jib is hanked to the collapsible inner forestay and has a pennant attached to the tack to raise the foot of the sail above the deck to avoid seas breaking over the foredeck. The sheets are led through the forward jib car or to an outside lead, depending on the point of sail. See Figure 3-6 and 3-7.

The running backstays (checkstays) must be used with the storm jib. The windward one should be led to the windward side secondary winch and tensioned against the inner forestay. CAUTION: *Do not over tension the checkstay and cause the mast to invert (middle of the mast bows aft).* Both running backstays may be rigged at the same time, but the leeward one is generally left slack, particularly if it interferes with the mainsail or storm trysail.

The storm trysail is used in lieu of the mainsail in severe weather and is hoisted on its own track on the port aft side of the mast next to the mainsail track. The tack of the sail has a pennant line spliced through the tack cringle. This pennant must be attached to the padeye on the mast below the trysail track prior to hoisting and is pre-set to allow the sail to be hoisted above the boom and secured with the tack above the head of the mainsail. The permanently attached sheets lead to spreacher blocks attached to the toe rail aft. Both sheets are set at the same time to make the storm trysail self-tending. See Chapter 6, 6-3.1

1-7 SYSTEMS

1-7.1 STEERING SYSTEM

The steering system consists of an anodized Edson quadrant attached to the rudder stock. The quadrant is fixed around the rectangular stock section with clamping pressure and a set screw bolt. Stainless steel wire rope (3/16” 1x19) is reeved around the quadrant then to sheaves that lead up into the Edson pedestal. The wire ropes are connected to the roller chain coming down within the pedestal from the sprocket that drives the wheel.

The steering system on the vessel consists of:

- Edson 402 ST-6-211 pedestal with wheel dampener. (NOTE: Dampener is not a brake and should not be used as a brake while sailing. DO NOT OVERTIGHTEN).
- Edson steering wheel with leather covered rim, 48-inch diameter.
- Edson 802-10 aluminum alloy radial drive (with centerline markings) attached to the rudder stock.
- 6.4mm 7 x 19 stainless steel wire rope cables from pedestal to drive.
- Stainless steel roller chain within pedestal (15.9mm pitch nonmagnetic stainless).
- Steering stops are installed to limit rudder angle either side of centerline.

1-7.1.1 RUDDER

The rudder is a composite FRP/epoxy molded unit with an integral carbon rudder stock. It is a balanced spade type with an elliptical profile for low drag. The rudder is supported by two roller bearings; one at the hull – the other at the deck. Both bearings are by PYI-Jefa. A neoprene gaiter creates the watertight seal between the hull and rudder shaft. The rudder stock has a stainless steel fitting (receptacle) that is bonded onto the top of the post on deck. The receptacle has a machined female recess with flat sides.

1-7.1.2 EMERGENCY TILLER

An emergency tiller is provided with the N 44. It is stowed in the port cockpit locker. In the event of main steering system failure, open the inspection port on the aft cockpit seat using a winch handle and fit the tiller into the receptacle on top of the rudder stock. The tiller arm extends out to the side, so it is not necessary to remove the wheel to steer.

The emergency tiller has a yoke that ends in a machined stainless steel tiller head that fits into the receptacle on the top of the rudder stock. A stainless steel bolt connects the tiller head to the socket on the rudder stock with a wing nut to restrain the tiller from becoming detached from the socket. The tiller is stowed in the port cockpit locker when not in use.

Figure 1-13 Emergency Tiller Setup

1-7.2 PROPULSION

The N 44 is equipped with a Yanmar diesel auxiliary engine. The engine is a 4-cylinder, vertical, water cooled engine. Vessels NA 21-25 have model 4JH4E rated at 41kw (55hp) at 3000 rpms, with a manual fuel lift pump lever on the starboard side of the engine. Vessels NA 26-36 have model 4JH4AE rated at 40kw (54hp) at 3000 rpm, and an electric fuel pump activated by turning the ignition key to the "on" position. The engine is naturally aspirated (there is no turbocharger). The engine drives a two-bladed Max-Prop feathering propeller via a Yanmar Marine reverse reduction gear (KM4A1) (2.63:1 ratio) and standard prop shaft that is supported by a strut and cutlass bearing attached to the bottom of the hull.

1-7.2.1 VISUAL INDICATORS AND ALARMS

The Yanmar engine instrument panel is located in the cockpit at the aft end of the port cockpit locker. It has visual indicators and audible alarms. See Figure 1-16. A fuel filter water alarm is located just aft of the engine box, on the bulkhead next to the exhaust vented loop. A propane alarm gauge and additional engine hour meter are located on the panel in the nav station, below the Tank Tender. The primary meter for logging engine hours is the one in the nav station.

WARNING: When engine alarms activate, check which alarm it is, then shut down engine and engine battery switch. When the Sea-Fire alarm activates, shut down engine, engine battery switch and engine blower immediately.

Visual Indicators

- Engine RPM (Tachometer).
- Hour meter (use meter in nav station).
- Engine panel coolant temperature (light on gauge for high temp)
- Engine oil pressure (light on gauge for low oil pressure).
- Water in fuel filter (Racor). See Figure 1-14
- Sea Fire engine fire extinguisher. See Figure 1-15.
- Propane

Figure 1-14
Fuel Filter Water Sensor

Audible Alarms

- Engine coolant high temperature.
- Engine oil low pressure.
- Water in fuel filter (Racor).
- Sea Fire engine fire extinguisher.
- Propane.

Figure 1-15
Sea Fire Discharge Alarm

The Sea-Fire fire extinguisher system located inside the engine box has a discharge alarm unit mounted in the navigation station, below the AC distribution panel. A second alarm unit is mounted at the throttle quadrant in the cockpit. It will provide visual and audible warning of system discharge.

1-7.2.2 COOLING SYSTEM

The Yanmar engine is cooled by a seawater/jacket water heat exchanger. The engine has an antifreeze/freshwater coolant mixture in it like an automobile engine. This is passed through a fin/tube heat exchanger. Seawater is passed through the heat exchanger in the opposite direction. The seawater takes the heat out of the engine coolant. The seawater is then discharged through the wet exhaust system. Normal operating temperature is between 160-190 degrees F.

1-7.2.3 LUBRICATION

The Yanmar diesel engine uses Yanmar 15W-40 oil to lubricate, clean and cool the engine. The oil filter is located on the starboard side of the engine. The engine has an oil pan like an automobile engine. The oil level should be checked before every use of the engine. See 4-3.5 Engine Oil and Filter.

WARNING: ***The engine should not be operated when the boat is heeling more than 20º. An inclinometer is installed above the Furuno in the nav station.***

1-7.2.4 POWERED VENTILATION

The engine compartment is served by a Rule exhaust blower. The exhaust blower is plumbed to air vents on the transom. The blower has a separate circuit breaker on the DC distribution panel and must be operated whenever the engine is running and for 15 minutes after engine shutdown to prevent overheating the engine compartment and activating the engine compartment's Seafire fire extinguisher system.

A second Rule exhaust blower is located in the bilge. It is located under the port floorboard just aft of the navigation station seat and the breaker on the DC panel must be "ON" when the stove is in operation.

1-7.2.5 EXHAUST SYSTEM

The diesel engine has a water-cooled exhaust system. A marine exhaust hose carries the exhaust from the engine to the muffler. Used cooling water is injected into the exhaust system at the muffler. The exhaust exits the muffler and travels through a hose to a through-hull fitting on the transom. All exhaust hoses are connected to the engine, muffler or through-hull with double, stainless steel band clamps with a worm drive tensioning device. It is critical to the operation of the engine that the exhaust system is in good working order. The exhaust system should be inspected regularly. Hose clamps and hoses should undergo physical examination for loose screws or cuts, chafes or crimping in the exhaust hose and rust or damage to the clamps.

1-7.2.6 DRIVE TRAIN

The engine's propulsive power is delivered from the engine and gear to the propeller by a standard shaft. The shaft is a 1-1/4" diameter (32mm) length of Aquamet 22 boat shafting. The shaft has a split coupling at the gear end and a standard SAE taper at the aft end. The shaft passes through a PYI dripless shaft seal at the hull intersection. The shaft seal is attached to an FRP stern tube with a 2" OD (50.8mm). The shaft is supported at the aft end by a BF Goodrich, cutlass rubber bearing which is mounted in a cast silicon bronze strut attached to the hull. The propeller is attached at the SAE taper with a prop nut, jam nut and cotter pin.

NOTE: ***The shaft seal must be purged of air whenever the boat is launched after dry storage. Open the inspection port in the cabin sole aft of the engine box, pull aft on the fluted rubber gasket around the shaft until a small amount of water flows from the fitting, displacing the air.***

1-7.2.7 PROPELLER

The N 44 is equipped with a PYI Max-prop right hand feathering propeller. The propeller is made of cast bronze. The propeller is 483mm diameter with a 356mm pitch and a 1-1/4" bore. The propeller feathers to a streamlined shape when the vessel is not under power. See 3-3.2.1 for feathering instructions.

1-7.2.8 FUEL SYSTEM

The engine burns No. 2 diesel fuel. The N 44 has a 55-gallon (208 liter) aluminum fuel tank installed on centerline amidships between frames 5 and 6. The tank is built to USCG standards. The tank has fittings for a fuel supply line, a fuel return line, vent, fill, gauge and gauge sender. The tank has two (2), 150 mm diameter inspection plates. One plate has a 25mm (1") pipe cap with an integral dipstick to measure the fuel level in the tank.

The fuel tank fill plate is a chrome-plated bronze fitting with a 38mm diameter (1.5") hose barb. The fill \plate is marked DIESEL and is located mid ships on the port side (side deck) above the navigation station.

The vent is a 19mm (3/4") ID hose led to a vent fitting on the transom with a down turned fitting and a flame screen. The fuel valves are packless Kerotest and can be accessed through the inspection port over the bilge sump.

- The fuel supply line is USCG approved hose for fuel use (3/8" diameter, color = blue). The fuel supply to the engine has a stop valve at the tank.
- Excess fuel is returned to the tank via the fuel return line. The fuel return line is also 3/8" USCG-approved hose for use with fuel. The return line has a stop valve at the tank.

1-7.2.8.1 FUEL AND FLUID TANK GAUGES

The N 44 is equipped with a Tank Tender system (either Model S30-6 or S60-5) located on the distribution panel, (see Figure 1-19) to monitor the levels of fluids in all tanks on board the vessel. The Tank Tender

Table 1-4

Fuel Tank Level Conversion Chart

Fuel Tank #4

Monitor	Gallons	Height
1.5	2	0.5
2.25	4	1.25
2.75	6.5	3
3.5	8	3.5
3.75	10	4
4	12	4.5
4.5	14	5
4.75	16	5
5	18	5
5.5	20	5.25
5.75	22	5.75
6	24	6
6.25	26	6.25
6.75	28	7.5
7	30	7.75
7.25	32	7.9
7.75	34	8
8	36	8
8.2	38	8.2
8.5	40	8.3
9	42	8.75
9.5	44	9
9.75	46	9.3
10	48	9.75
10.25	50	10
10.5	52	10.2
10.75	53	10.3
11	54	10.75
	55	10.8

operates on pneumatic pressure.

Select the tank to be tested, push button, and pump very slowly, 1-2 times only. Gauge needle should rise slightly above the level of the fluid in the tank then settle back to the level of the fluid. If the needle pegs over the red line there is probably a kink or blockage in the tubing between the instrument and tank. If the needle goes up then slowly back to zero, the tank is empty or there is a leak between the instrument panel and the Tank Pressure Fitting (TPF). Occasionally, after filling a tank the additional head from the fill pipe will force liquid up into the TPF causing an unusually high reading. Should this be the case, pump very slowly to force liquid out of the TPF to obtain an accurate reading. The Tank Tender Calibration Table posted in the navigation station provides the fluid level in gallons that corresponds to the tank tender gauge number. Note that there are two rings on the gauge, one for water, one for fuel.

Each tank fill cap (except holding tank) is equipped with a dipstick welded to the bottom of the cap. The dipstick is marked, and the marks correspond to readings on the tank tender calibration table in the “Height” column. All readings are in inches from the bottom of the tank. See Table 1-4 Fuel Tank Level, Table 1-7 Water Tank Level and Table 1-8 Holding Tank Level Conversion Charts.

NOTE: All capacity may not be usable due to heel conditions. A 20% reserve should be kept. FUEL is read on the outer dial; all other tanks are read from the inner dial.

CAUTION: ***If fluid exists in the deck fill pipe, the gauge needle will charge up. Should you observe this, release the push button and use enough liquid to empty the fill pipe before testing again.***

1-7.2.8.2 FUEL FILTER

To ensure that the fuel delivered to the engine is clean and moisture free, a supply line to the engine has an in-line Racor filter fuel filter/water separator. It is mounted inside the engine compartment on the port bulkhead. It can be accessed through the aft access hatch on the top of the engine box. This filter removes moisture from the fuel through centrifugal and gravitational forces while also trapping particles in a replaceable element. In addition to these filters, each engine is fitted with its own paper element filter. See BIB Chapter 4, engine owner's manual and Racor filter manual for more information.

CAUTION: ***The RACOR filter should be inspected for water and sediment prior to starting the engine.***

1-7.2.9 CONTROLS

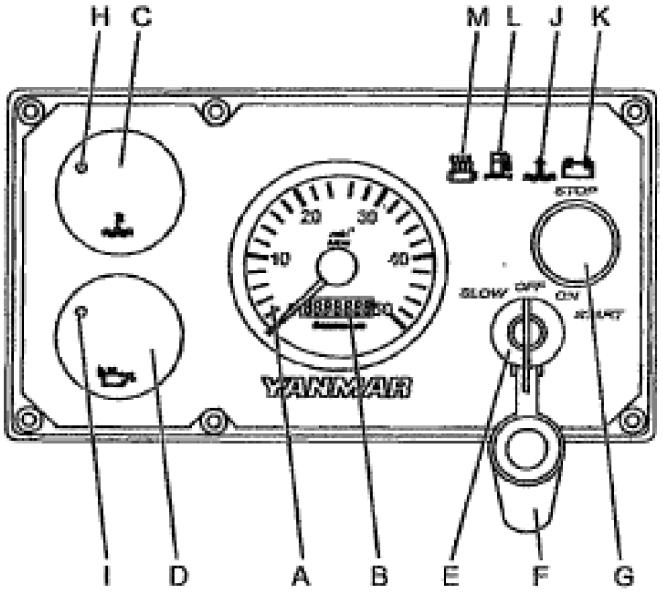
The engine has either a single lever Morse MV2 or Teleflex control for putting the engine in forward, neutral or reverse as well as for increasing/decreasing throttle. The engine gear is engaged by pushing the transmission button IN before advancing the throttle. The engine gear is disengaged by pulling the transmission button OUT when the lever is in the vertical or neutral position. The engine will only start when the transmission button is disengaged, due to the neutral safety cut off mechanism.

Forward operation is achieved by pushing the transmission button in, then pushing the throttle lever forward, reverse by pushing it aft. The more the lever is displaced in either direction, the more the throttle is increased.

1-7.2.10 ENGINE INSTRUMENT PANEL

There are two models of instrument panels on the N 44. The original model is a C-type with a key start, the replacement model is C35-type with a push button start. Both have a tachometer, coolant temperature gauge, engine oil pressure gauge, alarm lamps and engine hour readout. See Figure 1-16.

C-Type Engine Instrument Panel



A Tachometer
B Hour meter (do not use, see 1-7.2.1)
C Coolant temperature gauge
D Engine oil pressure gauge
E Key switch
F Not installed (cap for key switch)
G Stop button switch
H Coolant high temperature indicator
I Engine oil low pressure indicator
J Not installed
K Battery low charge indicator
L Water in fuel filter indicator
M Seawater insufficient flow indicator

C35-Type Engine Instrument Panel

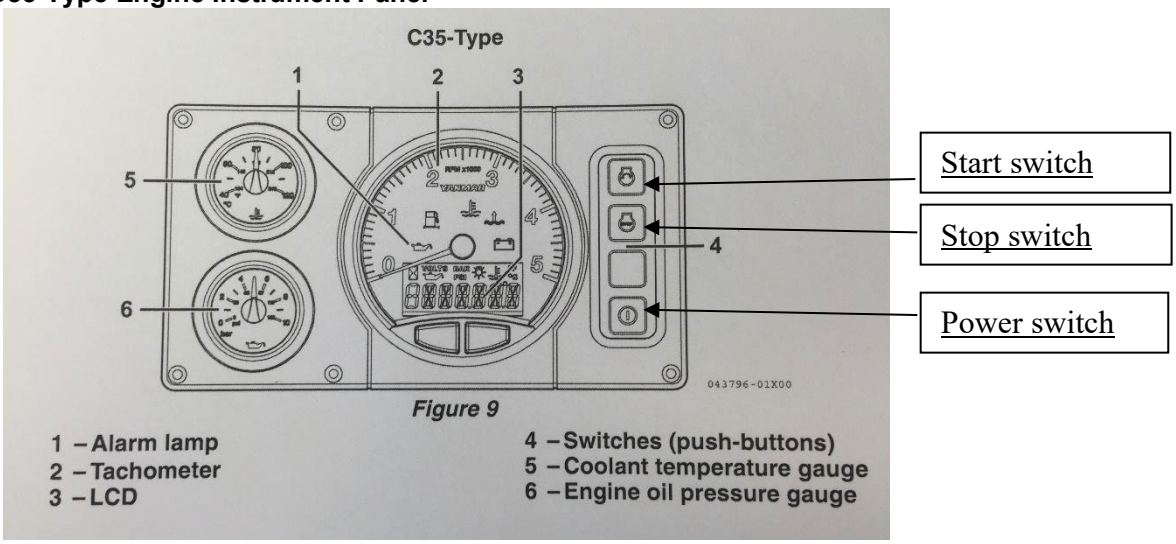


Figure 1-16 Engine Instrument Panels

1-7.3 ELECTRICAL SYSTEM

The electrical systems generate, store and distribute 12-volt (12v) direct current (DC) power. The system consists of two electrically separate subsystems, each with its own engine-driven alternators, battery bank and battery selector switches:

- The engine start system supplies power to the engine for starting and engine instruments.
- The ship's service (SS), or house system supplies all other loads (navigation systems, pumps, lights, fans, refrigerator, etc) via a power distribution switchboard panel. The house system also directly (not via battery bank selector switch) supplies the 24-hour circuit breaker module located under the nav seat. It provides constant power to the bilge pump, bilge alarm, LPG control panel and fire extinguisher alarm monitors.

Special circuitry permits the engine start and house circuits to be connected in emergency situations, such as alternator or battery failures. See 1-7.3.1.

A 120v AC, single-phase, 30-amp, 60Hz shore power connection provides AC power when in port to the 120v AC Charles Marine 50-amp automatic battery charger that charges both the House and Engine battery banks and to AC outlets at the navigation station.

1-7.3.1 ALTERNATORS AND ALTERNATOR PARALLEL SWITCH

Two 12v DC alternators are mounted on and driven by the auxiliary diesel engine

- The house alternator is a Balmar 90-100-D 100-amp unit with a Balmar ARS four-stage regulator
- The engine start alternator is a Yanmar 60-amp unit.

If the alternator fails, a switch can be closed to make electrical output from the remaining good alternator available to charge the other bank providing that the battery selector switches are energized. The Cole Hearsee M-284-01 Alternator Parallel Switch is installed on the inboard face of the seat at the navigation station, and accessed by removing the clear cover. “OFF” position is with lever pointer toward 2200 position, and arm at approximately 1600 as shown in Figure 1-17. Rotate lever clockwise to turn “ON”, counterclockwise to turn back “OFF”.

1-7.3.2 BATTERY BANKS

DC electric power is supplied from five batteries configured in two battery banks. The House bank consists of four LifeLine Model 31T Absorbed Glass Mat (AGM) 105 ampere-hour deep cycle batteries This bank provides 420 Amp-hours (20 hr rate) at 12v DC. These batteries are located in a fiberglass tray in a compartment beneath the seat at the navigation station. All are connected in parallel. The positive terminals of the batteries are connected via a heavy cable to the DC distribution panel. The negative terminals are connected to the distribution system ground bus bar. Each individual battery has a disconnect switch (on-off) located next to the battery.

The Engine Start bank consists of one LifeLine Model 31T Absorbed Glass Mat (AGM) 105 ampere-hour deep-cycle battery, located in a plastic battery box beneath the cabin sole just forward of the engine compartment. There is a 60-ampere circuit breaker located next to the battery for protection of the battery charger circuit, and a disconnect (on-off) switch under the seat at the navigation station. The positive cable from the battery is led to the engine starting solenoid, and the negative, to the engine block.

There is a Smart Battery Monitor connected to the House Battery bank to monitor the State of Charge (SoC%) and State of Health (SoH%) of the House Batteries. It is in the nav station, on the outboard end of the instrument cabinet above the desk.

1-7.3.2.1 ENGINE START BATTERY EMERGENCY PARALLEL

In the event of insufficient charge on the Engine Start battery, the parallel switch on the DC distribution panel will parallel the engine and house battery banks to start the engine. The “Parallel Start” push button on the DC distribution panel must be pushed and held while the key at the engine control panel on deck is used to start the engine.

Figure 1-17 Battery Selection Switches and Emergency Alternator Parallel Switch

1-7.3.3 BATTERY BANK SELECTOR SWITCHES

Two rotary master selector switches are located on the inboard face of the navigation station seat. The emergency Alternator Paralleling switch is located between the rotary switches.

1-7.3.4 DC DISTRIBUTION PANEL

The BEP NC32YD distribution panel in the nav station has 29 circuit breakers (with 4 spares). Every circuit on the N 44 is protected by these breakers and can be isolated for troubleshooting or secured in the event of an electrical fire. The panel also includes separate BCP 600-DCM battery monitors for the House and Engine Start battery banks, an emergency momentary parallel start indicator light, ammeters and volt

meters, and a bilge pump indication light. The panel is hinged on the left (or aft) edge to allow access to the wiring behind it.

NOTE: The House and Engine battery bank monitors should be read so that the LED readout matches the printed label (House on the left, Engine on the right). They are hard-wired to those locations. The readout will vary otherwise. See Figure 1-18.

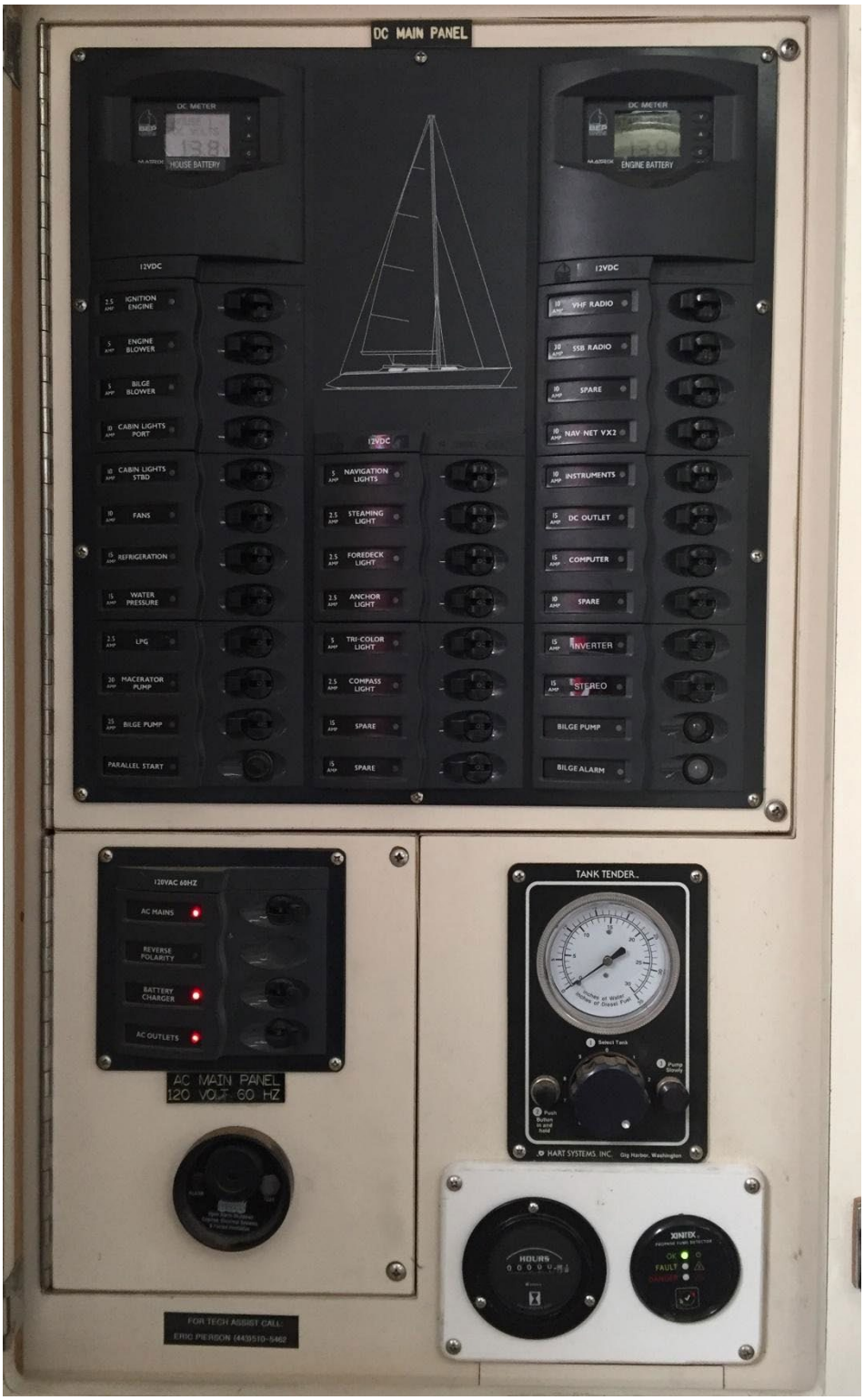


Figure 1-18 DC Panel, AC Panel, Tank Tender Gauge, SeaFire/ propane alarms and engine hour meter.

1-7.3.5 AC PANEL AND SHORE POWER

The 30 amp, single-phase 120v AC shore power inlet is located in the cockpit, aft of the wheel, on the port side. The connection on the boat is notched to match the threads on the shore power retainer ring and is connected by matching up the notches and turning the retainer ring a quarter turn (not fully threaded).

Fig 1-19 AC Main Breaker Panel - Aft Compartment

The receptacle is connected to the AC distribution panel via a double pole main circuit breaker located to port in the aft quarter berth compartment. It is labeled “120 VOLT 60 HZ MAIN BREAKER” The small panel underneath labeled “POWER FAULT” is for a galvanic isolator that has been replaced by an isolation transformer, therefore the POWER FAULT is disconnected. An isolation transformer feeds a separate AC distribution panel, located immediately under the DC distribution panel in the nav station. This panel features the AC main circuit breaker (for shore power), a reverse polarity indicator light, a
circuit breaker for the two 120v AC outlets at the navigation station and the battery charger breaker. The Charles Marine 5000SP 50 ampere battery charger is located in the port compartment aft of the engine box near the seawater through-hull. See Figure 1-18 and Figure 1-19.

Reverse polarity occurs when the hot and neutral on the incoming AC current are backwards. This can cause the ground on board the vessel to be energized and can be an indication of a faulty cord or faulty wiring on the dock. The isolation transformer in the system prevents galvanic current. To check operation if the shore power doesn’t turn on: unplug the shore end of the power cord first, then unplug the boat end.

Examine the ends of the cord for the proper number of prongs (on the male, shore end) and corresponding slots (on the female, ship end). Reconnect the cable in the same order, boat first, then shore outlet. If the problem persists, ask for assistance from the Cutter Shed or marina manager to determine if the problem lies in their infrastructure or your cord.

1-7.3.6 BONDING AND GROUNDING

The N 44 has an electrical ground bonding system installed for “cathodic protection” that connects all metallic parts of any mass. The purpose of the bonding system is to provide a low resistance path for electrical connections between all underwater fittings, fuel fills, fuel tank tanks, and engine. This keeps all equipment at essentially the same electric potential (ground). This reduces the effects of galvanic corrosion and electrolysis. In addition, this vessel has an isolated lightning protection system where the chainplates, sea cocks and the mast are connected directly to the keel as required by ABYC boat building standards.

1-7.3.7 LIGHTING AND FANS

The N 44 is outfitted with a 12v DC lighting system throughout the boat for navigation, deck floodlight, and cabin lights. The cabin overhead of the N 44 is fitted with nine (9) night vision red or white dome lights; the red light is LED, the white light is a 10 watt halogen light. Each light can be individually controlled with its own switch. The cabin light system is energized with switches for Cabin Lights Port, and Cabin Lights Stbd at the switchboard panel. See Figure 1-18.

Five DC electric fans help cool the interior. The fans are located in the galley, the navigation station and in the berthing areas. The fans are on one circuit on the DC panel and they are controlled locally with an integral switch.

1-7.3.8 NAVIGATION LIGHTS

There are two sets of navigation lights, only one should be in use at a time:

- Navigation Lights: Aqua Signal combination red/green side light on the bow pulpit**,** and Aqua Signal aft-facing white stern light on the radar post, used in combination with the masthead (steaming) light when operating under mechanical propulsion (motoring).
- Tricolor Light: Aqua Signal combination Tricolor light with red, green, white sectors at the masthead, used ONLY when operating under sail power alone.

A white forward-facing, mast-mounted “masthead” or steaming light is located on the front of the mast (not the masthead), just above the lower spreaders, to be used in combination with deck level navigation lights

while motoring. It should NOT be used in combination with the Tricolor light.

A 360° white anchor light is located immediately beneath the Tricolor and is activated by a switch on the switchboard panel marked “anchor”.

The DC Distribution panel has a vessel silhouette with small red LEDs that indicate which navigation lights have been selected and are “ON”. **NOTE: LED does not indicate if light is operational, just that switch is turned “ON”.** See Table 1-5 for replacement bulb specifications.

1-7.4 COMMUNICATION AND NAVIGATION SYSTEMS

Communication and navigation systems are located at the navigation station inside the cabin. This area includes a chart table for the storage of paper charts, navigation tools and a bookshelf for publications. See Table 1-6 for a list of all systems.

1-7.4.1 NAVIGATION STATION AND CHART TABLE

The chart table is approximately 3 feet 7 inches long by 2 feet 2 inches wide, with a hinged top that provides access to chart stowage underneath. The house battery bank occupies the space under the navigation station seat. The controls and displays for the electronic navigation and communication systems are mounted on the port and forward bulkheads of the navigation station.

Table 1-5 Navigation Light Specifications

LIGHT	REPLACEMENT TYPE, SIZE, WATTAGE
Tricolor light	Ancor 529340 25w
Bow light	Ancor 529340 25w
Stern light	Ancor 521158 10w
Anchor light	Ancor 521158 10w
Foredeck light	Ancor 521125 (MR16 Xenon) 20w
Steaming light	Ancor 522122 (festoon end caps) 10w
Compass light	Ritchie CS-0002KIT

Table 1-6 Communication and Navigation Systems

SYSTEM	MAKE/MODEL
VHF Radio	ICOM IC-M506 & Command Microphone IV
HF Radio	ICOM IC-M802
Radar	Furuno 4Kw 24” High Definition Digital Radome Model DRS4D.
Display/Chart Plotter	Furuno NavNet TZT14
Weather	SiriusXM Weather
GPS	Furuno GPS/WAAS Model GP330B.
AIS	Furuno FA50
Fathometer	B&G H5000
Knot meter	B&G H5000
Compass	B&G RC42 electronic compass

1-7.4.2 VOICE COMMUNICATIONS

The voice communications systems aboard the N 44 include:

- A Very High Frequency (VHF) radio for primary (RF line of sight) communications on low power (1 watt) and up to 25 nm on high power (25 watts).
- A High Frequency (HF) / Single Sideband (SSB) radio for long range communications.

1-7.4.2.1 VHF RADIO

The ICOM IC-M506 VHF radio has preprogrammed USA, international and Canadian channels, as well as 10 marine weather channels. It can scan any number of selected channels. Several different scanning patterns are available. A dual or tri-watch mode permits monitoring Channel 16 while listening on a different channel. There are two microphones: one in the cockpit (with built-in channel and volume controls, which also displays latitude/longitude) and one at the navigation station.

NOTE: ***The remote HM-195 CommandMic IV in the cockpit tends to get knocked into, and should be checked periodically to ensure that the desired channel or scan is still operating.***

The radio also has Maritime Mobile Identity Service (MMSI) capability. This is an emergency broadcast on Channel 70. The radio has a dedicated Channel 70 secondary receiver, but it uses the same antenna as the normal receiver. **Lift the protective cover, push and hold the red "distress" button on the radio for three seconds to transmit a distress call.** The boat is programmed with a number that identifies the boat to the receiver of the call. If the GPS is turned on, the distress location will be transmitted automatically; otherwise, the vessel's location must be entered manually.

1-7.4.2.2 HF/SSB RADIO

The ICOM IC-M802 HF/SSB transceiver can store up to 160 operator-programmed channels. The insulated backstay of the vessel is used as an antenna. See Appendix 1 for HF/SSB operation instructions.

1-7.4.3 NAVIGATION SYSTEMS

1-7.4.3.1 FURUNO NAVNET TZT14

The Furuno NavNet TZT14 is a multi-function display with a touch screen monitor. It is a networked navigation system equipped with GPS, radar, SiriusXM weather, chartplotter, and AIS. NOAA raster and vector charts can be displayed, along with an overlay of radar, tides, weather and depth shading. It is also networked with the sailing instruments and VHF radio.

1-7.4.3.2 GLOBAL POSITIONING SYSTEM

A Furuno GP-330B GPS system is integrated into the NavNet display unit. The antenna is mounted atop the radar antenna. The GPS receiver has WAAS (Wide Area Augmentation System) capability. WAAS, available in North America, is a provider in the worldwide SBAS (Satellite Based Augmentation System) navigation system. An SBAS provider furnishes GPS signal corrections to SBAS users, for even better position accuracy, typically within three meters.

1-7.4.3.3 RADAR

A Furuno model DRS4D high definition digital Radome radar with a 4kW antenna is mounted on a radar mast on the starboard quarter of the vessel. The radar display is integrated into the Furuno GPS/Chart Plotter display unit.

1-7.4.3.4 SIRIUS XM WEATHER

The BBWX4 SiriusXM weather system is integrated into the Furuno NavNet TZT14 display. It has two components, a satellite antenna mounted on the radar post, and a receiver located behind the DC panel. There is a breaker labeled "XM Weather" for the system on the DC panel, which must be turned "ON" prior to turning on the Furuno display. Zone forecasts, marine warnings and tropical information are available in text format. This information can be accessed via the home menu or RotoKey on the Furuno. There is a weather screen on the Furuno Multi-Function Display (MFD) that will show the following graphic and text information: wind strength, wave height, sea surface temperature, current weather information from buoy and city icons, storms, storm tracks and lightning. Refer to the Furuno NavNet TZT14 COTS operator's manual for instruction.

NOTE: NavCenter Weather is also loaded into the Furuno NavNet but is not functional because it relies on an active internet connection.

1-7.4.3.5 AUTOMATIC IDENTIFICATION SYSTEM (AIS)

A Class-B AIS transponder/receiver is integrated in the Furuno display unit, with an overlay on the chart plotter. This unit receives AIS information from other vessels equipped with AIS A or B, and displays their position on the electronic chart with course/speed over the ground, heading, rate of turn and other data such as safety messages in a data box when the cursor is placed over the vessel icon. It also transmits this data from the N 44 to other vessels.

1-7.4.3.6 SAILING PERFORMANCE INSTRUMENTS

The Brooks & Gatehouse (B&G) H5000 system has a Hercules software-driven Central Processor Unit which integrates and calculates raw data from sensors and makes it available to; a display at the chart table, displays on the panel over the companionway, and to external devices that are interfaced with the

system. It includes an ethernet port to connect to a router via smartphone, tablet or PC. It can be updated with the latest software via a USB port. The browser-based configuration of the system allows advanced calibration, set-up and diagnostics.

System components include the following:

- There are three Graphic Displays, one at the chart table, and two above the companionway hatch, which can be viewed by the helmsman. They are a 5", sunlight viewable, color displays. The displays show sailing data in digital and/or graphical form and can be used to calibrate individual sensors of the system through the settings function.
- Two B&G Triton^2 4.1" full color displays are mounted above the companionway hatch, between the two Graphic Displays. They can be configured to display multiple pages of information. SailSteer technology is included; a graphic page with heading, wind, laylines, true and apparent wind angle indicators, tide and boatspeed.
- The B&G masthead unit measures the wind speed and angle at the masthead.
- Heading is obtained via the RC42 compass, a high performance electronic fluxgate compass. The RC42 compass has the ability to 'learn' the magnetic effect of the vessel on the compass and automatically apply deviation corrections during the calibration process.
- Two removable paddlewheel speed sensors provide boat speed and sea temperature. Plastic dummy plugs are provided to insert when the paddlewheels are out for cleaning, maintenance, or when the boat is at the dock for a week or more, to prevent marine growth. Paddlewheels are removed by unscrewing the smaller diameter retaining ring. The gravity switch for the speed log transducers is located in the forward port locker opposite the head compartment, on the forward face of the bottom compartment. The standard setting is "auto", it can be switched to the port or starboard transducer if one isn't working.
- The depth finder unit is a through hull unit. The depth datum is fully adjustable. Sensors for the N44 are normally calibrated to the waterline, to read total water depth. The offset calibration is +3.3, to read depth from the waterline.

1-7.4.3.7 NMEA ELECTRONIC INTEGRATION AND LAPTOP INTERFACE

A MiniPlex-41BT provides interface for up to four NMEA 0183 and NMEA 2000 systems. This unit has a BlueTooth interface, and a serial port access to connect the Furuno system to a laptop computer at the navigation station. The GPS, B&G instruments and VHF/HF radios are all integrated, so that, for example, GPS location is available on the VHF display screen and is broadcast via the MMSI distress button as long as the GPS is turned on.

1-7.4.4 NON-ELECTRONIC NAVIGATION INSTRUMENTS

Non-electronic navigation instruments on board include magnetic compasses and a barometer. ***A sextant may be requested from the Sailing Center***.

1-7.4.4.1 MAGNETIC COMPASS

The main magnetic compass is a 6-inch RITCHIE Globemaster, Model D-615EP mounted on the Edson steering pedestal in the cockpit and is used by the helmsman. The compass card is scribed in 5-degree increments and is equipped with 45 degree and 90 degree offset lines. It is equipped with low level 12v DC lighting. A removable sliding door anodized stainless steel hood helps to protect the face of the compass.

1-7.4.4.2 BAROMETER

A barometer is mounted on the forward bulkhead of the navigation station to monitor weather changes.

1-7.5 FRESHWATER SYSTEM

The potable freshwater system has three welded, Type 316L, stainless steel storage tanks. Two 70-gallon port and starboard tanks are installed under the main cabin berths. These water tanks are connected to the potable water system via the smaller 35-gallon "day tank" installed beneath the cabin sole on centerline

Each tank has a fill connection, a vent connection and a supply connection to the pumps, with a shut off valve (ITT Jabsco Model 45570). The water tanks are filled via deck plates (marked **WATER**) located on the port and starboard side decks just forward of the mast. ***Make sure to securely close the water fill deck plate once the tanks are filled, ensuring o-rings are in proper position*.**

Each tank also has two 6" inspection plates. The aft plate on each tank has a 25 mm pipe cap with an integral "dip" stick to gauge the water level in the tank***. This is a manual back-up for the tank monitor***

system described in 1-7.2.8.1.
The starboard tank shut off valve is inside the galley sink cabinet, under the floorboard. The port tank shut off is accessed by removing the bottom drawer of the navigation table.
The vented loops are 1/2" hose and are led up to deck level and back down to the cabin sole in the port forward equipment locker and in the starboard head compartment.

All hose lines have drains at low points to allow the system to be drained completely.

Table 1-7 Water Tank Level Conversion Chart

Port Water Tank #2			**Stbd Water Tank #3**			**Day Tank #5**		
Height	**GAL**	**Monitor**	**Height**	**GAL**	**Monitor**	**Height**	**GAL**	**Monitor**
3	5	3	3	5	4	1.75	4	1
5	10	7	5	10	7	2.5	6	1.75
6.5	15	8.5	7	15	8.5	3	8	2.5
8	20	10	8.5	20	10	3.5	10	3
9	25	11	9	35	11	4	12	3.5
10	30	12	10	30	12	4.75	14	4.5
11	35	13	11	35	13	5.25	16	5
12	40	14	12	40	14	6	18	6
13	45	15	13	45	15	6.25	20	7
14	50	16	14	50	16	6.75	22	7.5
15	55	17	15	55	17	7.75	24	8
16	60	17.5	16	60	18	8.75	26	8.5
17	65	19	17	65	19	9	30	9.5
18	68.5	20	18	68	20	9.5	32	10
						9.75	33	10.5

NOTE: ***Read the monitor from the tank tender on the electrical circuit breaker board in the navigation station. The height from the bottom of the tank is read from the dipstick that is attached to the bottom of the fill lid on top of the water tank.***

1-7.5.1 PRESSURIZED FRESHWATER SYSTEM
A DC-powered Jabsco 31620-0092 Marine Par Max 4 High Pressure Water System Pump with an accumulator tank provides pressurized freshwater to the galley sink, cockpit shower and head sink. The pump has a switch to turn on at 20 psi (pounds per square inch) and shut off at 40 psi. The accumulator allows some pressure retention so that the pump does not run every time water is used. The galley sink and the head sink each have a shower/mixer faucet. The galley sink has an in-line filter to trap solid particles introduced from the supplied water or collected in the tank(s).

1-7.5.2 MANUAL FRESHWATER SYSTEM
A Gusher Mk III type foot pump supplies fresh water to the galley and head sinks.

1-7.5.3 GRAY WATER SYSTEM
Gray water (drain water) is discharged in two ways. The galley sink drain goes to a through-hull installed below the galley, and the head sink goes to a through-hull outside the head door. The water from the shower in the head is drained directly to the bilge sump and is pumped overboard by the bilge pump.

1-7.6 SEAWATER SYSTEM
A sea water plumbing system is installed. The system serves only the galley sink. The system has a single seacock and a PAR Pumpguard No 36400-0000 in-line strainer. The hose is ½" Nautical Rubber series 164. The system is manual only with a Gusher Mk III foot pump below the galley sink.

1-7.7 BILGE PUMPING SYSTEM
The N 44 is equipped with one automatic electric bilge pump and two manual bilge pumps.

1-7.7.1 AUTOMATIC BILGE PUMP

A Rule model 3700 SSS (3700 GPH) electric pump with an integral strainer is located in a sump under the cabin sole on centerline inboard of the navigation table. The electric bilge pump will pump water overboard through a vented loop and discharges through the manual bilge pump overboard through-hull.

NOTE: ***The electric bilge pump is located in the upper part of the main bilge sump area. It is always powered via the 24 hour circuit module and will come on when water reaches the float switch, or if the breaker is activated. The manual pump located in the bilge is used to empty the sump for normal operations, since it reaches into the deepest part of the keel sump.***

Warning: If the bilge pump is activated by the automatic switch, an audible alarm will sound, indicating high water in the bilge.

1-7.7.2 MANUAL BILGE PUMPS

The N 44 is also equipped with two manual bilge pumps. A 40 GPM Edson aluminum diaphragm pump, model 638A is located under the cabin sole near the navigation desk. The handle to the pump is secured to the forward bulkhead of the wet locker. This is the pump normally used to empty the main bilge. A 17 GPM Whale Gusher 10 aluminum diaphragm pump is located in the cockpit under the aft end of the port cockpit seat. The handle is located on the inside, inboard face of the cockpit locker. The pumps are activated by pumping the lever on the pump. Each pump has its own strainer (strum box), which should be checked periodically for debris, and cleared.

The Edson pump discharges via a vented loop out a through-hull that it shares with the automatic electric pump. The Gusher pump discharges through the transom.

1-7.8 THROUGH-HULL FITTINGS

For a tabulation of fittings below the waterline that have seacocks installed see Table 1-9, Through-Hull Fittings. Figure 1-21 shows fitting location. Not included on the list are the hull penetrations for the propeller shaft and rudder.

1-7.9 INTERIOR SYSTEMS

1-7.9.1 STOVE

The galley stove is a Force 10 three-burner stove with an oven and broiler and has an automatic oven fuel shutoff. The stove burns liquefied petroleum gas (LPG). The LPG is stored in two 4.5kg (10lb) tanks in a separate and dedicated bin in the aft starboard lazarette locker. The cockpit container is fume tight and has a "drain" that leads overboard**. LPG is heavier than air, and thus sinks. It is critical that this "drain" is kept clear.**

The system is equipped with a Trident LPG control system and a Fireboy LPG alarm. The system has a single hose gas bottle connection with a pressure regulator and pressure gauge. An electrically controlled remote solenoid valve on the tank controls the gas flow from the tank. When the solenoid valve is off, there is no gas in the hose leading up to the stove. Each time the stove is used – the gas valve must be opened on the tank in the cockpit and closed afterward. In the event that the LPG alarm sounds, turn off gas at the bottle, then the stove and investigate for propane leaks (see Section 4.5).

NOTE*: When operating the stove, be sure to turn off the tank valve before the burners and/or oven and the LPG solenoid control located adjacent the galley fan control. This ensures the flame consumes all the gas in the line between the tank and the stove.*

WARNING: LPG has a sulfurous odor added so it's more easily detectable. If you smell sulfur, evacuate personnel from the cabin, secure the LPG system immediately and open hatches for air ventilation.

To change propane supply from one bottle to the other;

1. Manually turn off the supply valve on the empty bottle.
2. Undo the supply line at the bottle using a crescent wrench.
3. Transfer supply hose to full propane bottle.
4. Tighten supply hose using a crescent wrench. Do not over tighten.
5. Open supply valve. Check for leaks at bottle.

1-7.9.2 REFRIGERATOR

The N 44 is equipped with a two door, top opening, 6 cubic foot refrigerator located in the galley countertop, starboard side. All boats have the Technautics Coastal 12 VDC system. The compressor unit is located on the aft side of the bulkhead at the foot of the quarterberth. The holding plate is located in the refrigerator (reefer) compartment. A thermostat located inside the aftermost door of the reefer controls the temperature of the reefer box. The thermostat should be set such that the refrigeration system cycles to maintain temperature. Once the unit is cold, a setting of 2-3 is usually sufficient. This system draws power from the house battery banks through the DC switchboard panel.

Running the refrigerator in port requires the DC portion of that switchboard to remain energized via the house battery switch. Underway, it takes longer to charge batteries with the refrigerator running, depending on the thermostat setting. Close monitoring of the house battery bank is recommended.

A thaw drain line leads from the bottom of the reefer compartment to the Whale Gusher MK III foot pump located on the front face of the galley sink at floor level.

1-7.9.3 GALLEY SINK

A double stainless steel sink is mounted in the countertop of the galley and is fitted with three spigots, and three foot pumps. The main spigot is a Grohe G-1/2 31 634 fitted with a six-foot hose allowing the spigot to be pulled out of the sink receptacle as a telescoping faucet. A selector lever in the top of the spigot selects direct flow or spray. The blue knob controls pressure fresh water. The red knob controls fresh water supplied by the foot pump located on the front face of the sink compartment at floor level. The other two spigots are (2) Fynspray WS6 swiveling spouts: one for the reefer drain, (starboard side of the sink), and one for sea water, (port side of sink). These spigots are connected to the foot pumps at the base of the sink.

Table 1-8

Holding Tank Level

Holding Tank #1		
Monitor	**Gallons**	**Height**
1	2	N/A
2.5	4	N/A
4.5	6	N/A
6	8	N/A
7.5	10	N/A
8	13	N/A
8.5	14	N/A
9	16	N/A
9.5	18	N/A
10	20	N/A
11	22	N/A
11.5	24	N/A
12	26	N/A
13	28	N/A
13.5	30	N/A
14.5	33	N/A
15	35	N/A
15	36	N/A
16	38	N/A
16.5	40	N/A
17	42	N/A
20	43	N/A

monitor in inches of water

1-7.9.4 MARINE HEAD

The vessel is equipped with a Wilcox Crittenden “Skipper II” hand operated marine toilet. The head will
normally drain to the stainless steel holding tank. Seawater for flushing is pumped into the head via a through-hull and seacock located just outside the head door. There is a strainer in line. There is a bronze Y-valve under the head vanity that allows selection between discharge to the on-board holding tank or direct discharge overboard. The discharge line is fitted with a cast bronze vented loop. The holding tank can be pumped out to a shore disposal facility through a deck plate or emptied via the macerator.

1-7.9.5 Y-VALVE

The Y-valve allows the waste from the toilet to be pumped directly overboard. When the Y valve is in the “overboard” position, the waste is pumped up through a vented loop and then overboard through a through-hull located under the starboard settee berth at the waterline. The vented loop ensures that this path is only one way (i.e. from toilet overboard) and water cannot backflood from outside the vessel into the hull through the toilet.

1-7.9.6 MACERATOR AND HOLDING TANK PUMP-OUT

The holding tank can be emptied two ways. Black water (holding tank contents) can be taken out through the pump-out deck fittings at approved pump-out stations or from pump-out boats. The contents of the holding tank can also be emptied overboard by using the macerator pump when the N 44 is the appropriate distance offshore. See 3-4.3 for instructions.

1-7.9.7 HOLDING TANK

The holding tank is a 50-gallon Type 316L stainless steel tank. The tank is located in the forepeak beneath the lower pipe berths and is secured to its foundation with stainless steel straps.

Table 1-9 Through-hull Fittings

	THRU-HULL DESCRIPTION	*SIZE*	*LOCATION*
1	Depth Transducer	40 mm	Fwd, Centerline
2	Galley Salt Water Intake	1.25"	Fwd, Centerline
3	Head Intake & Head Sink Discharge	1.25"	Fwd, Centerline
4	Speed Transducers (Port)	50 mm	Fwd Cabin by Mast (Port)
5	Speed Transducers (Stbd)	50 mm	Fwd Cabin by Mast (Stbd)
6	Head & Holding Tank Discharge	1.5"	Stbd Fwd of Water Tank
7	Galley Sink & Ice Box Discharge	1.5"	Under Galley Sink
8	Manual & Electric Bilge Pump Discharge	2"	Port Aft End of Wet Locker
9	Engine Salt Water Intake	1"	Port Side Compartment Aft of Engine Box
10	Cockpit Drain (Port)	1.5"	Rudder Quadrant Compartment
11	Cockpit Drain (Stbd)	1.5"	Rudder Quadrant Compartment

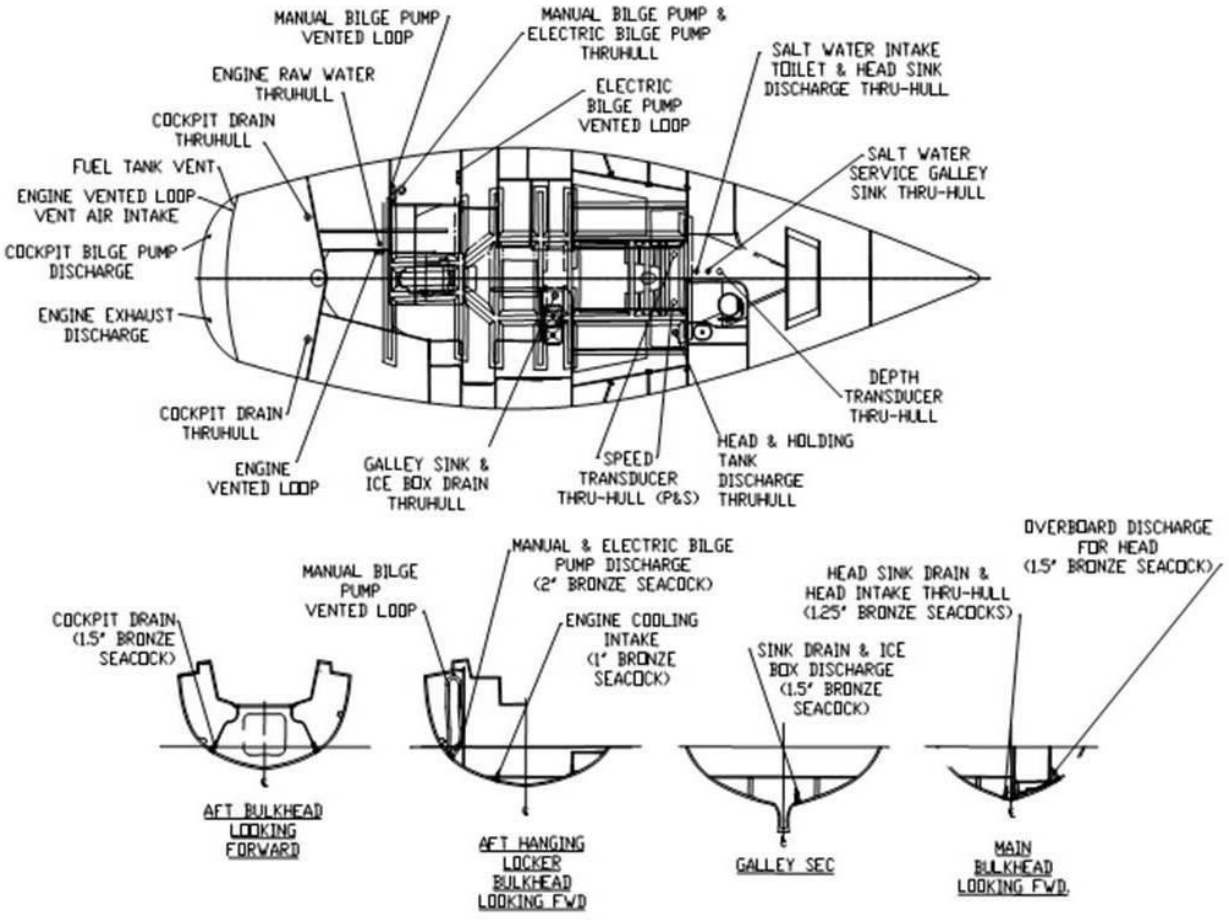


Figure 1-20 Through-hull Diagram

The tank has two 1-1/2” female threaded ports:

- one is the intake from the head.
- the other is for shore-side pump out.

The tank has a 5/8” port for venting. The vent leads overboard to a vent fitting on the starboard side of the boat outboard of the head compartment.

All hoses used in the system are expressly built for sanitation service. This hose is specially manufactured to make it resistant to absorbing sewage and other chemicals. It is also made of special materials that make it impervious to odors. If these hoses are ever replaced – the replacement hose shall be specifically rated for sanitation service.

1-8 LIFE SAVING EQUIPMENT

The safety equipment required aboard the N 44 for local sorties and offshore passages is governed by US Coast Guard requirements, the World Sailing Offshore Special Regulations Governing Offshore Racing for Monohulls & Multihulls, Category 1, and/or US Sailing Safety Equipment Regulations (SER) and the Notice of Race for VOST events. Additional information on procedures and equipment can be found in Chapter 5 and the Standard Operating Procedures (SOP).

There are three 5 lb and one 10 lb Type ABC fire extinguishers located onboard, one in the port line locker in the cockpit, one at the aft end of the quarterberth, one behind the navigation station and one on the forward starboard bulkhead of the main salon. A fire blanket for galley fires is located on the port side of the companionway ladder. A heat activated Sea Fire inert gas extinguisher is mounted inside the engine box. This will activate automatically or can be manually activated by a T-handle in the cockpit next to the throttle.

A Winslow 10-man liferaft is located in a locker on the stern of the N 44. The locker cover is not attached to the boat and is designed to be tossed away when the cover is opened. Ensure the liferaft is tied to the boat with the painter line prior to embarking.

Crew overboard recovery equipment is located on the aft pulpit (pushpit). This includes the Lifesling with a strobe light, which should be tied to the boat. The heaving line should be in close proximity to the helmsman and attached to the boat. The Dan Buoy/strobe/horseshoe buoy should be tied to each other, but not the boat. These should be deployed immediately for the person in the water and to mark their location.

An EPIRB (Emergency Position-Indicating Radio Beacon) unit is a tracking transmitter used by Search and Rescue (SAR) teams to locate a vessel in distress. Digital signals are broadcast to a satellite system to triangulate SAR efforts. Each beacon is registered with NOAA and has a unique code for each boat; therefore you need to ensure you have the proper beacon on board.

Emergency exits are the companionway hatch, the large Bomar deck hatch between the galley and navigation station and the forward sliding hatch.

CHAPTER TWO
CREW REQUIREMENTS & TRAINING

2-1 INTRODUCTION

The N 44 is the principal U.S. Naval Academy Large Sail Training Craft. The fleet was designed and is equipped to accomplish the missions of experiential leadership, seamanship and navigation training through the Offshore Sail Training Squadron (OSTS) and competitive racing through the Varsity Offshore Sailing Team (VOST) for 3/C, 2/C and 1/C midshipmen.

Crew qualifications for these training and racing missions are published by the Director of Naval Academy Sailing (DNAS) in the Coastal and Offshore Personnel Qualification Standards (PQS) for Large Sail Training Craft (STC).

Guidance concerning operating the N 44 with limited crew, introductory/indoctrination and proficiency sailing missions is contained in the STANDARD OPERATING PROCEDURES (SOP).

2-2 CREW DESIGNATIONS, QUALIFICATIONS & REQUIREMENTS

Persons participating in the Naval Academy Sailing offshore training program and N 44 assigned operational duties shall be designated in accordance with the current PQS.

The following qualifications define levels of experience, and mastery of sailing theory, systems knowledge and operational procedures for N 44 offshore personnel:

- Trainee - all participants not otherwise designated as Senior Crew, Watch Captain, XO, Skipper, or Master Skipper.
- Senior Crew - individuals who through experience and training are familiar with sail theory, safety procedures, and basic engineering of cruising auxiliaries similar to the N 44.
- Watch Captain - individuals who through experience and training have mastered theory, boat systems, and demonstrated competence in all routine aspects of operating a large offshore cruising auxiliary.
- XO - individuals who through experience and training have demonstrated their ability to command a large offshore sail training craft (N 44 or equivalent) over a wide range of weather conditions, in coastwise piloting waters as well as offshore passages.
- Skipper - individuals who through experience and training have demonstrated their ability to command a large offshore sail training craft (N 44 or equivalent) over a wide range of weather conditions, in coastwise piloting waters as well as offshore passages.
- Master Skipper – individuals who through extended blue water sailing time and continued training have demonstrated their advanced ability to command a large offshore sail training craft over a wide range of conditions.

2-3 FAMILIARIZATION TRAINING

Prior to participating in the operation of the N 44 it is advisable to complete familiarization training on the systems, cautions, emergency procedures and practices which are unique to this fleet of boats.

Individuals who have previously been assigned as Skippers and XOs but who have no documented N 44 sailing experience within the past 12 months should complete a review and refresher program. Individuals must demonstrate capability and knowledge of applicable topics listed in the following:

Shore-side Syllabus

1. Review crew responsibilities and tasks aboard the N 44, including use of ship's bills and checklists.
2. Discuss and complete the "Sail Training Craft Request Form" for operations in the local sailing area.
3. Inventory, locate and describe operation of all required safety equipment.
4. Discuss heavy weather techniques, emphasizing use of inner forestay, running backstays and storm sails as provided to the N 44.
5. Discuss Quick-Stop and Lifesling type recovery procedures, noting location of applicable deck hardware, safety equipment and its location in the boat stowage plan, and materials available to affect victim recovery.

6. Discuss and demonstrate use of communications and navigation equipment. Discuss boat's fuel capacity, fuel consumption and cruising range under power.
7. Discuss the list of manuals, publications and documents included as standard load-out. Discuss the maintenance documentation system, the discrepancy report process and equipment tag-out steps.
8. Describe and discuss a plan of action for steering failure, engine failure, broken through-hull fitting and other emergency procedures contained in Chapter 5 and the SOP Chapter 8.

Underway Syllabus

9. Demonstrate appropriate helmsman and crew coordination for departure under power: line handling, fending-off, and a recovery plan for an engine failure in a crowded basin or harbor.
10. Demonstrate ability to maneuver under sail in close quarters: short tacks and controlled jibes.
11. Demonstrate Crew Overboard procedure: evaluating ability to maintain visual contact with the victim, minimizing distance traveled away from victim, and ability to direct and deploy safety equipment.
12. Demonstrate use of check-sheets for daily checks of engine, and communicate status of all boat systems, weather, position and water/fuel levels aboard the N 44 during daily situational reports to the Squadron Officer of Tactical Command.
13. Demonstrate safe use of galley equipment, stove, oven, and refrigeration systems.
14. Understand and demonstrate proper navigation doctrine, ensuring use of applicable tide tables, piloting and dead reckoning procedures.
15. Demonstrate the correct use of hand bearing compass, fixing boat position, estimating time/speed calculations, use of danger bearings, and other accepted plotting and labeling techniques.
16. Demonstrate heavy weather procedures: shortening sail, use of preventer, and sailing with storm sails.
17. Select an anchorage and demonstrate appropriate helmsman and crew coordination skills for anchoring under power and the ability to pick up a mooring.
18. Demonstrate correct operation of advanced electronics such as the sail instruments, VHF and SSB radios, GPS, radar and weather fax.
19. Demonstrate the correct hoisting, trimming, dousing and packing of the spinnaker.

2-4 WAIVERS

DNAS may waive certification or participation in the syllabus training for special cases where an individual can demonstrate the requisite knowledge and proficiency of skills for Command at Sea. USCG licensing and personal logbooks are ways, but not the exclusive avenues upon which such waivers can be granted. See *Challenge Procedures* in the PQS “The Qualification Process”.

2-5 UNDERWAY WATCH ORGANIZATION

A typical underway watch organization for each of the N 44 mission areas can be found in the SOP Manual.

2-6 RECORDS

The Naval Academy Sailing Program provides a PQS and sailing logbook analogous to the Official Naval Aviator's Logbook that is intended for documenting your sailing experience and time on the water and recording mastery of specific skills at each qualification level. Skipper, XO and Master Skipper Certificates will be awarded by DNAS. Skipper qualification will be recorded as an Additional Qualification Designator (AQD 113) for active duty military.

CHAPTER THREE
NORMAL PROCEDURES

3-1 PRE-UNDERWAY PROCEDURES

Conduct pre-underway checks on all systems using the check lists in the SOP, Chapter 9. The Skipper or Coach must verify that they have all been performed prior to getting underway.

3-2 OPERATING UNDER POWER

While operating under power, engine RPM at cruising speed should be 2800 RPM or lower. Use full throttle (3000 RPM) only for emergencies. The engine is most efficient, with the highest torque between 1800 and 2000 RPM, per specification graphs from Yanmar. The engine will provide 5 knots of speed at 1800 RPM, (depending on wind, current, and sea state) and will be most fuel-efficient between 1800 and 2000 RPM. Do not operate the engine if the boat's heel is greater than 20 degrees, or the engine will not get lube oil. Each N 44 is equipped with an inclinometer installed on the cabin overhead amidships or in the navigation station.

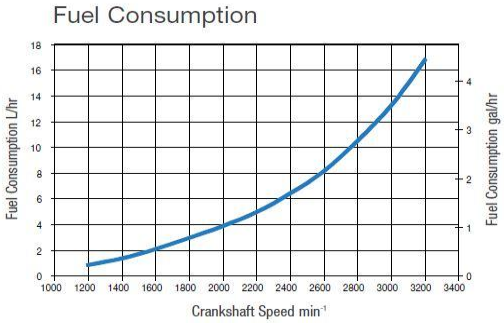


Figure 3-1 Fuel Consumption

3-2.1 ENGINE STARTING PROCEDURES

- Turn ON Engine Ignition and Engine Blower switches at the DC panel in the navigation station.
- Pull clutch out (or ensure it's not pushed in on NA 35 and 36) to disengage (neutral). Safety equipment should make it impossible to start the engine in any other position than NEUTRAL.

C Type Engine Panel (Key): See Figure 1-7.3.

- Turn the key switch to **ON**. This provides power to the panel and enables the alarms to work while the engine is running.
- The panel will light, and you will hear the low oil pressure alarm, indicating alarms are normal.
- Turn the key switch to START, then release back to ON position once started. The key is spring loaded and will automatically return to ON once released.

CAUTION*: Ensure the key switch springs back to the 'ON' position to avoid damaging the starter.*

C-35 Type Engine Panel (Push Button): See Figure 1-7.3.

- Push and hold the power switch (bottom switch) for 2-3 seconds. This provides power to the panel and enables the alarms to work while the engine is running.
- The panel will light, and you will hear the low oil pressure alarm, indicating alarms are normal.
- Push the top start switch and release when the engine starts, and the low oil pressure alarm is no longer heard. Follow procedures below if the engine does not start.

NOTE: THE "GLOW PLUG" IS NOT INSTALLED ON ANY BOAT.

WARNING: ***Turn the key (or push the start button) for a MAXIMUM of 15 seconds in the start position. After the engine has started, the key should remain in the ON position, or power switch button should stay ON. Alarm devices will not work when the key/power button is in the OFF position***

- If the engine does not start the first time, wait for about 15 seconds before trying again.
- ***Before attempting to start again, be sure to confirm that the engine has stopped completely. If the engine is restarted while the engine still has not stopped, the pinion gear of the starter motor will be damaged. If several attempts fail, consider the following possibilities:***
  - ***Excess back pressure caused by water in the muffler (see Chapter 4)***
  - ***Air in the fuel lines (see Chapter 4)***

- After the engine starts, immediately check for seawater flow through exhaust port on transom, if not, shut down and ensure seacock is open.
- Check that panel instrumentation is functioning properly.
- Check oil pressure. Shut down engine if normal oil pressure (8-78 psi) does not show on gauge immediately after starting or if low oil pressure alarm sounds.
- If oil has just been changed, stop engine and check oil level in crankcase after allowing a few minutes for oil to drain back into the crankcase.
- Check that voltage meter reads 12-14 volts after batteries have been recharged. If voltmeter shows abnormal values, the engine should be stopped and the cause investigated.
- Never turn battery switch off with engine running as this will damage the alternator.
- Check tachometer idle RPM. (600-800 rpm range).
- Advance the throttle to a fast idle position (1,200 to 1,500 rpm). Check instrument panel gauges for proper engine operation.
- After operating engine temperatures have been achieved, return the throttle lever to the idle position.
- Check the operation of the propeller by:
  - Return the throttle to idle
  - Push the knob beside, or on the throttle **IN**.
  - Move the throttle forward and observe that forward propulsion occurs
  - Return throttle to neutral and pull into reverse to check for backward propulsion
  - Return throttle to idle in neutral.
- Record readings in engine log.
- Check engine operating temperatures periodically during operation. ***Do not rely totally on alarm systems – check gauges***.

3-2.2 THROTTLE OPERATIONS

Pull clutch out (or ensure it's not pushed in on NA 35 and 36) to disengage (neutral). Safety equipment should make it impossible to start the engine in any other position than NEUTRAL.

3-2.2.1 MORSE MV2 THROTTLE

Silver knob is the clutch, pull out to disengage, push in to engage. Throttle must be in neutral (clutch disengaged) to start engine. To engage throttle in gear, push in clutch, pull up on semi-circular ring under knob at top and push forward on handle to go in forward, or aft to go in reverse. Neutral is achieved when the handle is straight up. Pause in idle when switching between forward and reverse while clutch is engaged. See Figure 3-2.

3-2.2.2 TELEFLEX THROTTLE

Black round knob in bottom of throttle handle is clutch and neutral safety. Throttle must be in neutral or clutch disengaged (knob out) to start engine. To engage throttle in gear, push knob in and hold while pulling up on semi-circular ring under knob at top of throttle and pushing forward to go in forward, or aft to go in reverse. Neutral is achieved when the handle is straight up. Pause in neutral (idle) when switching between forward and reverse when the clutch is engaged. Clutch button is spring loaded and will revert to neutral after pushing it while it is engaged (pushed in position). See Figure 3-3.

3-2.3 STOPPING THE ENGINE

- Allow the engine to idle until engine temp is 160º-180º F (see WARNING below).

C Type Engine Panel (Key):

- Push the black **STOP** button on the engine panel.
- Turn key to **OFF** position.

C35 Type Engine Panel (Push Button):

- Push and hold the stop switch (second from the top) until the engine stops and the low oil pressure alarm is heard. If the engine does not stop, ensure there is power to the C35 panel.
- Push and hold the power switch (bottom button) until the panel lights go off and the oil pressure alarm is silenced.

NOTE: Leave the engine blower on for 15 minutes after shut-down to remove excess heat from the engine compartment.

NOTE: The ***emergency*** stop (pull lever) is located in close proximity to the engine control panel. This method of stopping is for emergency use only.

> **WARNING:** ***NEVER stop the engine immediately after high-speed operation, except as required in an emergency situation. Reduce throttle to idle, and check the temperature gauges to verify that the engine has cooled to 160º-180º F before shutting it down. The engine blower must be on for 15 minutes after shutdown to cool the engine compartment so the fire extinguisher does not activate.***

Figure 3-2 Morse MV2 Throttle NA 21-34

Figure 3-3 Teleflex Throttle NA 35-36

3-2.3.1 ENGINE SHUTDOWN PROCEDURE TO FEATHER PROP UNDER SAIL

These procedures will ensure the propeller is properly feathered.

- Ensure that the engine is operating in forward propulsion. The prop will not feather with the engine operating in reverse.
- Operate engine to get 2 to 3 knots in forward gear.
- Secure the engine with the “STOP” button while still in forward gear.
- If the shaft is still spinning, engage the transmission in reverse to stop the freewheeling.
- Take the engine out of gear. If the prop has not feathered, the shaft will continue to freewheel. In this case start the engine and repeat steps 1 through 3.
- The engine must be left out of gear with the throttle in neutral position (**do not leave in reverse**) after the propeller is feathered.

3-3 DEPARTURE

These procedures will vary according to the configuration of the slip, dock, or mooring, and whether you are departing Santee Basin and leaving lines behind or departing from another location and taking lines with you.

3-3.1 TYPICAL SLIP DEPARTURE

- Ensure that all personnel are onboard and assign crew to “Stand by your lines”.
- Order crew to “Take lines in hand” and bring vessel to windward side or center of slip if necessary.
- Check for lines overboard
- At Santee Basin, request permission from Santee Basin Control via VHF 82A to exit the basin
- Issue a Sécurité call via VHF 12 to advise local traffic when you are exiting.
- Selectively CAST OFF or TAKE IN LINES as necessary for departure.

NOTE: Depending on number of crew, departure procedures under power call for crew to take lines in hand by leading lines outside the lifelines and preparing to cast off.

- When backing out of a slip, REVERSE the throttle, and report “Backing”. Use throttle bursts, then idle down in gear to minimize twist of stern to port.

NOTE: The N 44 is typical of a single right-hand screw vessel. It will back to port. The propeller shaft is offset to starboard to minimize this tendency.

- Hold the bow lines to control the boat orientation in the slip until no longer needed then toss them neatly to the quay or take them in.
- Walk the spring and stern lines forward to the widest part of the boat to maintain control of boat orientation. Then take them in or drape them on the pilings for access upon return.

3-3.2 TYPICAL DOCKSIDE DEPARTURE

- Ensure that all personnel are onboard except for those required to cast off or take in lines from the dock.
- Normal procedure is a departure under engine.
- Make the appropriate signal.
- Hold a spring line and operate the engine to work against this line. This will warp the boat out from the dock. Aft spring, engine in reverse for warping the bow away from the dock. Forward spring, engine in forward to warp stern away from the dock.
- Operate the engine in the direction required for the departure.

3-3.3 TYPICAL MOORING DEPARTURE

Unless there is a strong current opposing the direction of the wind, the N 44 is most likely to respond to the wind. Departing a mooring under sail is therefore an option.

- Ensure that all personnel are onboard.
- Single-up the mooring pennant if applicable.
- Normal procedure is a departure under engine. Hoist sails if a departure under sail is to be accomplished.
- Make the appropriate signal. Cast off the mooring.
- Operate the engine in reverse to back off from the mooring OR back the jib to throw the bow to one side of the mooring to clear.
- Operate the engine in forward to clear OR sheet the jib properly and sail away.

3-4 SYSTEMS PROCEDURES

3-4.1 ELECTRICAL POWER MANAGEMENT

The N 44 has a 12v DC electrical system. It is provided through two banks of batteries. The battery banks are: House Battery Bank (Ship Service or SS) and Engine Start Battery.

The SS Bank is comprised of four 105 amp-hour AGM batteries. The Engine Start consists of one 105 amp-hour AGM battery. Battery power is a limited resource that requires close management. While the batteries can be recharged using the engine-mounted alternators, frugal management of electrical power will ensure that power is available for necessary usage. When operating under sail the batteries are not being charged, only depleted.

For maximum battery life, do not discharge the battery bank below 50%. Table 3-1 below lists the open circuit (no load) voltages corresponding to states of charge

Since batteries age and lose capacity over time, load voltage may not provide a true reflection of house battery state of charge. Whenever the Smart Battery Monitor indicates that the state of charge (SoC%) is 50%, begin charging the batteries. When the monitor reads 100%, begin charging the batteries. The Smart Battery Monitor also provides an indication of battery state of health (SoH%) and when the battery needs to be replaced. Maintainers will use this feature to monitor the battery life.

The battery can be recharged by turning the engine ON and running it out of gear at 1500-1800 rpms for approximately 1 to 1.25 hours. When operating the refrigeration system or the radar underway, a longer charging time will be required to bring the system back to a comfortable operating level. Conserve battery power while sailing by turning off unnecessary lights and other equipment.

State of Charge	Open Circuit Voltage
100%	12.80 V or greater
75%	12.55 V
50%	12.20 V
25%	11.75 V
--0%	10.50 V

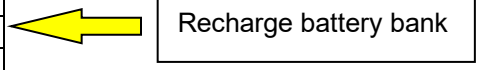


Table 3-1 Battery State of Charge

3-4.1.1 ELECTRICAL SYSTEM LINEUP

The ENGINE BATTERY rotary switch on the inboard face of the nav station seat must be on to operate the engine. The HOUSE BATTERY rotary switch must be turned on to operate any of the systems on the DC electrical panel. The HOUSE BATTERY rotary switch must also be "ON" when connected to AC shore power at the dock to operate any of the systems on the DC panel (refrigerator, lights, VHF radio, etc.).

3-4.1.2 BATTERY POWER SOURCE AND CHARGING PROCEDURE

The batteries can be charged either using shoreside 120V AC power or by running the engine and charging with the two alternators.

3-4.2 FRESHWATER MANAGEMENT

With only 175 gallons of fresh water this limited resource must be managed frugally on long passages. Water is stored in two 70-gallon tanks, one under each settee berth in the main cabin, and one 35-gallon tank (day tank) located beneath the floorboard in the galley. Water is measured by recording how much is used through the day tank, as a backup if the tank tender system becomes inoperable.

To fill the tanks and manage use underway:

- Open the gravity feed valve for one of the 70-gallon tanks.
- Remove the port and starboard tank caps under the aft inspection ports on top of the tanks.
- Fill all tanks from the deck fills port and starboard. Monitor level through the open tank caps to avoid overfilling. (**WARNING**: **Ensure you are not putting water in the fuel fill**).
- Ensure both gravity feed valves from the 70-gallon tanks are closed after tanks are full. Replace the tank caps. Water will be drawn only from the 35-gal day tank. When the water spigot spits air, the day tank is empty.
- Open the gravity feed valve for one of the 70-gallon tanks to refill the day tank, close the valve for the 70-gal tank.
- Record in the logbook when all tanks are filled (175 gal = 100% capacity). Subtract 20% each time 35 gallons is transferred to the day tank (to reach current capacity). Record capacity and what tank water was transferred from.

To empty the tanks at the end of each block, or when the boat is not in use:

NOTE: ENSURE THERE IS NO OIL/DIESEL IN THE BILGE PRIOR TO EMPTYING TANKS.

- Remove the lid on the 35-gallon day tank.
- Open the gravity feed valves for both 70-gallon tanks. Water will flow into the bilge. Pump the bilge using the manual pump while the tanks drain.
- When water is no longer coming out of the top of the day tank, close the gravity feed valves for both 70-gallon tanks. Replace the tank cap on the 35-gallon tank.
- Remove the rest of the water in the 35-gallon tank using either the foot pump or the electric pump through the galley sink and/or cockpit shower (ensure through-hulls are open).

NOTE: IF RETURNING FROM BLOCK, RECOMMEND OFF-WATCH EMPTIES 70-GAL TANKS AND PUMPS BILGE PRIOR TO ENTERING SANTEE BASIN, AND CREW USES REMAINDER OF 35-GAL TANK FOR CLEANING.

3-4.3 MARINE HEAD OPERATION

The Wilcox Crittenden Skipper II 1550 Marine Toilet operation procedures are:

- Ensure head sea-water intake through-hull fitting is open.
- Check position of discharge Y-valve, located in cabinet under head sink. It should go to holding tank for inshore operations, or overboard if 12 miles offshore. A plaque with correct position is located inside the cabinet door.
- If overboard discharge is chosen, ensure head discharge through-hull fitting is open.
- To add water to the bowl, press down on foot pedal while operating pump handle.
- Release the foot pedal to pump waste out.
- Repeat if necessary.
- Pump an additional 5-10 times to ensure there is no standing water in the bowl.
- Upon securing STC for greater than 24 hours, rinse bowl with fresh water and pump through system (minimum of 5 pumps) leaving approximately 3" of standing water in bowl, to reduce/eliminate algae growth and foul odors from developing.

WARNING: ***Do not put anything other than human waste and marine grade toilet paper down the head, because it WILL clog the pipes.***

3-4.4 HOLDING TANK MANAGEMENT

The holding tank can be emptied two ways. Contents can be removed at a pump-out station or by a pump-out boat, or the contents can be emptied overboard when 12 or more miles offshore, using the macerator pump. NOTE: The Y-valve can be in either overboard or holding tank position to empty the holding tank.
To empty holding tank via pump-out:

- Open deck fitting on starboard side.
- Follow instructions from pump-out station on hooking up pump.
- Monitor tank level while pumping out to determine when tank is empty.
- Replace deck fitting lid.

To empty holding tank via macerator pump:

- Ensure head and holding tank discharge through-hull fitting is open.
- Set Macerator Pump switch on DC main panel to "ON".
- Monitor tank level while pumping out to determine when tank is empty. If pumping out while underway and the engine is off, you can also monitor the DC battery load, which will drop when the pump is operating under less load when the tank nears empty.
- Check under sink cabinet in head for leaks at the macerator pump connections.

3-4.5 PROPANE STOVE OPERATION

The Force 10 stove and oven/broiler uses Liquid Petroleum Gas (LPG) to operate. Follow these procedures to operate safely:

- Turn bilge blower on prior to use.
- Turn gas on (rotate tank valve to "open") at tank in aft starboard lazarette.
- Turn "LPG" breaker to "ON" on the DC panel.
- Turn solenoid in galley "on".
- Follow instructions on stove to light burners or oven.

To turn off:

- Turn gas at tank off (rotate tank valve to "closed"), leave burner or oven on until flame extinguishes.
- Turn solenoid in galley off.
- Turn knobs for burner and/or oven off.
- Turn bilge blower off.
- Turn "LPG" breaker to "OFF" on the DC panel.

3-5 OPERATING UNDER SAIL

It is not the purpose of this document to teach an individual how to sail. Basic sailing terms and maneuvers are covered from the viewpoint of how they can be accomplished in the N 44. The procedures listed here describe the requirements to execute a maneuver and are not offered as the ONLY way to accomplish the action, rather are the result of many hours of training novice sailors and represent a point of departure. Heavy Weather Sails (Storm Jib and Storm Trysail) are covered in Chapter 6, Special Operations.

3-5.1 SAIL SELECTION

Selecting sails for the conditions and trimming for maximum efficiency will improve performance. See Tables 3-2 and 3-3.

3-5.2 BENDING ON SAILS

3-5.2.1 MAINSAIL

1. Attach the tack cringle to the gooseneck with the clevis pin provided on the boom.
2. Attach the clew to the outhaul car with a clevis pin. See Figure 3-3.
3. Attach the head of the sail to the headboard sail slide; this slide is permanently attached to the mast.
4. Remove the sail slide stop on the mast and feed the remaining sail slides of the luff onto the mast track.
5. Replace the sail slide stop.
6. Rig the “first reef” line at the end of the boom through the “first reef” cringle on the leech of the sail.
7. Bring the line straight down, pass it between the foot of the sail and the boom, then down around the boom and back up.
8. Tie the end of the line around the standing part with either a Bowline or Timber Hitch. See Figure 3-4 How to Tie a Reef Line.
9. Flake the sail on the boom, secure it in place with sail ties, and put on the sail cover.

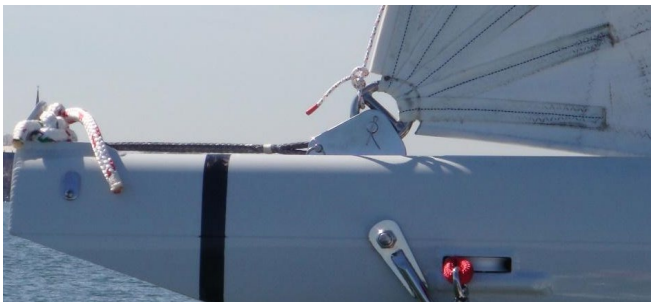


Figure 3-4 Outhaul Attachment

Rigging the cunningham is easier to accomplish after the main is hoisted. Lead the line through the lower cringle on the luff of the mainsail. Attach the eye splice to the reefing horn on the boom. The tail of the cunningham is led through a four-part block and tackle below the boom and exits through a cam cleat.

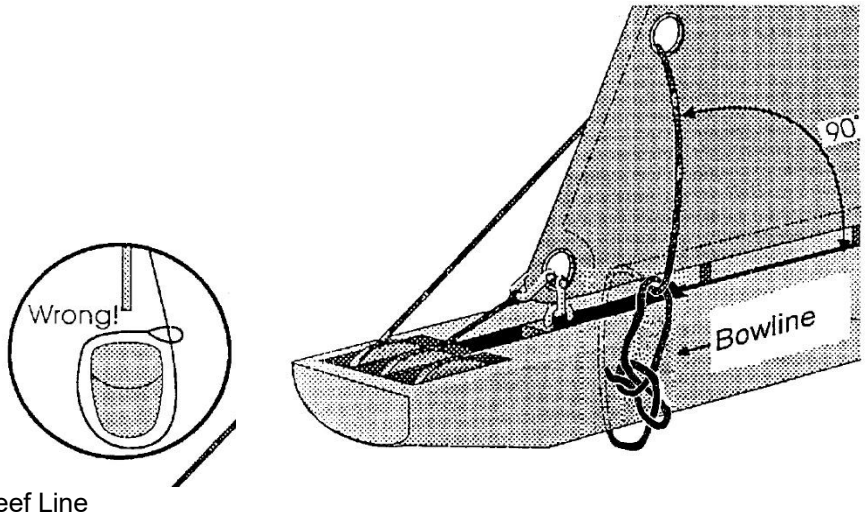


Figure 3-5 How to Tie a Reef Line

Table 3-2 Sail Selection Management Chart

SAIL	TRUE WIND SPEED	SHEETING POSITION	MAIN SAIL
# 1 GENOA	0 - 15	Adjust genoa cars for optimum trim	Full
# 2 GENOA HIGH CLEW REACHER	0 – 18 19 - 25	Snatch block on toerail for optimum sailing angle trim	Full 1st Reef
GENOA STAYSAIL	0 - 12 12 - 25	Fwd cars adjusted for optimum trim	Full 1ST Reef
#3 WORKING JIB	16 - 22 22 - 25 25 - 30	Fwd cars adjusted for optimum trim	Full 1ST Reef 2ND Reef
#4 HEAVY WX JIB	30 - 35	Fwd cars adjusted for optimum trim	2ND Reef
STORM JIB	35+	Snatch block at max girth toe rail aft of stanchion	2ND Reef or storm trysail
STORM TRYSAIL	35 +	Spreacher blocks	Trim both sheets simultaneously, adjust tack height to control twist.

Table 3-3 Recommended Racing (Advanced) Sail Selection Cross Over Chart

TRUE WIND SPEED IN KNOTS	TRUE WIND ANGLE (TWA) IN DEGREES														
	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
40	ST	ST	ST	ST	ST	ST	ST	ST	ST	ST	ST	ST	ST	ST	
38	STORM JIB		R2	R2	R2	R2	R2	R2	R2	R2	R2	R2	R2	R2	
36	R2	R2	R2	R2	R2	R2	R2	R2	R2	R1	R1	R1	R1	R1	
34	R2	#4	R2	R2	R2	R2	R2	R2	R2	R1	R1	R1	R1	R1	
32	R1	R1	R1	R1	R1	R2	R1	R1	R1						
30	R1	R1	R1	R1	R1	R1				#2 R					
28	R1	R1	R1	R1	R1		GS	GS	GS						
26	R1	R1	R1	R1		GS	GS	GS	GS			2.2oz SPIN			
24	R1	R1	R1			GS	GS	GS	GS						
22		#3			GS	GS	GS	GS	GS		SS				
20				GS	GS	GS		GS		SS	SS	1.0 oz SPIN			
18			GS	GS	GS	GS		GS	SS	SS	SS				
16			GS	GS	GS			GS	SS	SS	SS				
14			GS	GS	GS		GS	GS	SS	SS	SS				
12			GS	GS	GS			GS	SS	SS	SS				
10		#1 GENOA													
8															
6							0.5 oz SPIN								
4															
2															

R1&R2 = 1&2 Reefs in Mainsail
GS&SS = Genoa & Spinnaker Staysails
ST = Storm Trysail
Shaded Areas: "No Go Zone"

3-5.2.2 JIB/GENOA WITH HANK-ON ATTACHMENT

1. Select the desired sail depending on the wind/sea conditions. See table 3-2. Sail Management.
2. Bring the sail up on the foredeck and place near the forward lower shrouds.
3. Roll the sail toward the forestay taking care not to let the sail fill in the wind and go overboard.
4. Attach the tack to one of the two snap shackles at the stem fitting. This will leave the second one open for a sail change.
5. Hank on the luff hanks, (all pistons to the same side), to the headstay taking care not to twist the sail.
6. Attach the jib sheets to the clew cringle with a bowline. Lead genoa (overlapping headsail, #1) sheets outside the shroud, inside the lifelines, through the aft track car and to the primary winches. Lead jib sheets (non-overlapping headsail; #3, #4, storm jib) outside the forward lower shrouds and inside the upper and aft lower shrouds, then through the forward track jib car, and the aft track jib car to the primary winch.
7. Tie a figure eight stopper knot in the tail of the sheet.
8. Attach the desired jib halyard to the head of the sail.

3-5.2.2.1 JIB/GENOA SHEET LEAD POSITIONS

1. Inboard Lead Upwind - # 1 Genoa (see Figure 3-5).
   a. True wind speed 0-15 knots.
   b. Apparent wind angle 30-80 degrees.
   c. Sheet lead: outboard of all shrouds, through aft jib car block to primary winch.
   d. Jib car position: front of aft portlight, adjust for optimal sail trim.
2. Inboard Lead Upwind - #3 Jib, #4 Jib, Storm Jib (See Figure 3-6).
   a. True wind speed 15-35+ knots.
   b. Apparent wind angle 30-80 degrees.
   c. Sheet lead: outboard of forward shroud, inboard of middle and aft shrouds, through forward jib car block and aft jib car block to primary winch.
   d. Jib car position: slightly aft of forward shroud, adjust for optimal sail trim.
3. Outboard Lead Reaching - #1 Genoa, #2 Genoa, #3 Jib, #4 Jib, Storm Jib (See Figure 3-7).
   a. True wind speed 0-35+ (see sail selection chart).
   b. Apparent wind angle 80-175 degrees.
   c. Jib sheet lead: from clew of sail, over lifelines, then from outside the boat, under lifelines and through forward block on toerail or large snatch block positioned as needed, directly to primary winch.
   NOTE: Do not lead through the jib car block as this will induce side-loading.

3-5.2.3 GENOA STAYSAIL

The genoa staysail is hanked on the collapsible inner forestay. The topping lift is used as the halyard. Sheets are led the same as for a #3 or #4 jib for upwind, outboard of the forward lower shroud, inboard of the upper shroud and the aft lower shroud.

1. Set up and tension the collapsible inner forestay.
2. Set windward running backstay.
3. Bring the sail onto the foredeck and place where it won't fall overboard. Remove the sail from the bag.
4. Roll the sail toward the collapsible inner forestay taking care not to let the sail fill in the wind.
5. Attach the tack to the swivel snapshackle at the base of the collapsible inner forestay.
6. Hank on and work up the luff.
7. Run sheets as for a #3 headsail.
8. Attach the T-lift to the head of the sail after making sure it is not wrapped around the inner forestay.
9. Hoist the sail.
10. Trim the sail.
11. Adjust the control blocks as necessary for the wind condition.
12. Adjust the running backstays as necessary.

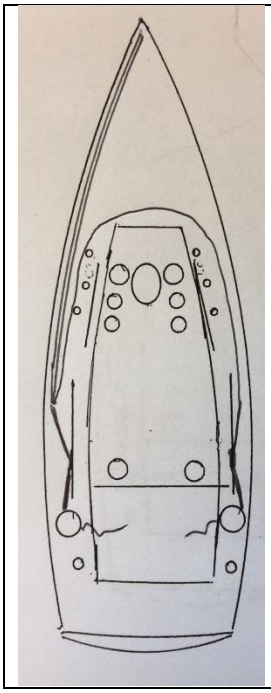


Figure 3-6 Inboard Genoa Lead

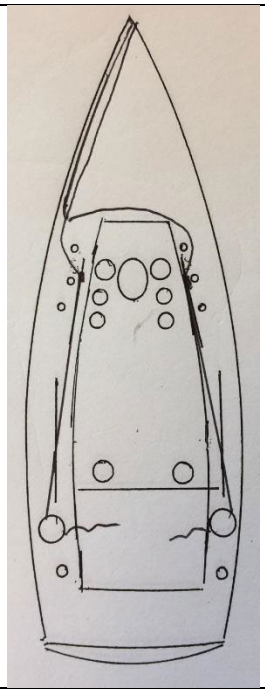


Figure 3-7 Inboard Jib Lead

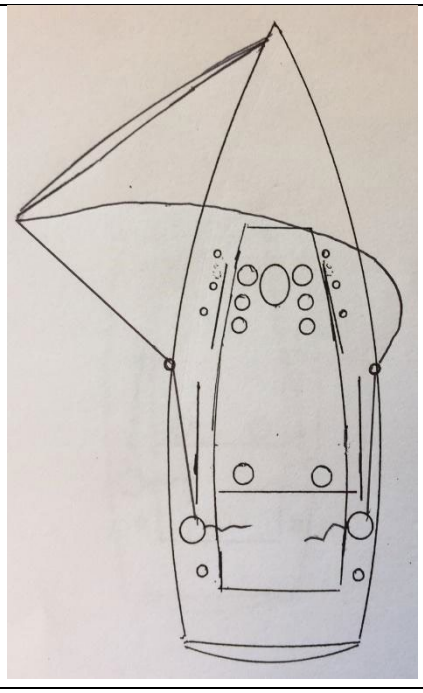


Figure 3-8 Outboard Jib/Genoa Lead

3-5.3 SAIL TRIM

3-5.3.1 JIB/GENOA TRIM

In order to derive full power potential from the sails, they should be trimmed to best advantage. The following is offered as helpful hints to approach optimum trim.

- To select the correct sail for the conditions, note the wind velocity and check the sail management table below.
- Check the lower set of telltales in the luff of the sail. Both the inside and outside telltales should be streaming. The inside telltale will probably be at a higher angle than the outside telltale.
  a) If the sail is trimmed all the way in and the inside telltale is floating, you are “light”, or “pinching”, (not as much pressure in the sail as should be), sailing too close to the wind. Bear off, away from the wind, until the telltales are parallel.
  b) If the outside telltale is floating you are "fat", (too far away from the wind for the trim of the jib). Either bring the boat up toward the wind until both telltales are streaming, or maintain heading and ease sails until the telltales are in trim
- Check the higher set of telltales against the lower telltales. Slowly bring the boat toward the wind and note which set breaks first.
  a) If the higher set breaks first, the sail needs more leech tension, (the upper portion of the sail is too loose and at a greater angle of attack than the lower portion). Move the lead block forward on the genoa track.

If the lower set breaks first, the sail needs more foot tension, (to close up the lower portion of the sail). Move the lead block aft on the genoa track.

3-5.3.2 MAINSAIL TRIM

The sail has been cut by the sailmaker to create an airfoil shape. Improper trim can effectively distort this airfoil. The most common tendency is to “over trim”. Use the memory crutch - “When in doubt, let it out”. This helps to ensure that the sail is not over trimmed. The two controls that are used to control the positioning of the mainsail are the sheet and the traveler.

- For gross adjustments the sheet is used to control all movement of the boom, (in and out, as well as up and down). When making the final fine adjustments the sheet is used to control the “up and down” movement of the boom or twist. Easing the sheet will induce more twist and effectively de-

powers the sail by spilling more air in the upper portion of the sail. The mainsail can also be de-powered by flattening the mainsail by use of halyard tension, outhaul, backstay tension and cunningham.

- The boom vang can be used to “lock in” the desired position and ensure that it will be replicated when the boat is tacked or the mainsail eased. The traveler is used to control the mainsail angle of attack to the wind.
- Check the luff area of the sail. It should be firm or “breathing” slightly in heavier air. "When in doubt, let it out". The sail should be “let out” with the sheet and or traveler until the sail stalls, (a distortion of the sail shape will occur just aft of the luff called “luffing”). Trim to stop the “luffing”.
- There are telltales at the leech ends of the batten pockets. They give an indication of the wind flow where the windward and leeward airstream meet at the leech of the sail.
  a) If the telltales are all falling way to leeward, the sail is over trimmed, (too close to the centerline of the boat). “When in doubt-let it out”. Ease the sheet until the telltales stream straight aft from the leech. At reaching sailing angles, the upper mainsail telltale may stall part of the time.
  b) If the telltales are floating, or hooking to windward, the sail is too far away from the centerline of the boat. Bring in the sail until the telltales stream straight aft from the leech. Fine adjustments can then be made. Trim in the sail until the top telltale does not stream anymore, and then ease the sail out until the top telltale just starts to stream aft.
- Check the telltales in the draft of the sail. If the inside telltale is floating, the draft is probably too far aft in the sail. Increase cunningham tension. The fattest part of the airfoil, (camber), should be between 40-50% of the sail at that point, (chord). Check the draft stripes to observe the curvature of the airfoil.
- The mainsail affects the helm forces on the steering wheel. The center of effort of the mainsail is aft of the center of lateral resistance. If the mainsail is trimmed too tight this will cause the boat to heel excessively and “round up” toward the wind. This is called “weather helm”, and excessive pressure on the wheel will be required to steer a straight course. As the boat heels over, the center of lateral resistance moves forward due to the increased size of the leeward bow wave. The center of effort of the sail plan must also move forward to counter the shift in lateral resistance. A “heavy helm” can be trimmed out by easing the mainsail. Adjusting the mainsail in the following ways can keep the boat’s helm in balance.
  a) Ease the mainsheet traveler control line.
  b) Ease the mainsheet.
  c) Ease the boom vang.
  d) Reef the mainsail.

3-5.3.2.1 RUNNING BACKSTAYS (CHECKSTAYS)

The running backstays can be used as checkstays to straighten the mast for optimum sail trim while racing. To use the backstays:

1. Free up the running backstay. Ensure there is a fair lead back from the mast.
2. Locate the runner tail (an additional length of line with a snap shackle at the end of it). Attach the runner tail with the snap shackle to the eye splice on the end of the running backstay.
3. Lead the runner tail to a snatch block rigged to the toe rail between the primary and mainsheet winches, then to the primary winch.
4. Tie a stopper knot in the end of the runner tail.
5. Add reasonable tension, not heavy, to the windward running backstay with the winch and secure the line in the self-tailer.
6. When tacking, release the loaded running backstay as the boat comes through the wind.
7. Load and tension the new windward backstay before the sails fill and put a load on the mast.

3-5.3.2.2 BACKSTAY TENSION

“Resting" backstay tension at the dock should be 500 psi, per the SOP Chapter 9 checklist. You may need to ease tension to attach the forestay, but the minimum should be 500. The new Navtec backstays do not have a tension gauge. Tension is measured by tape marks on a batten that is attached to the hydraulic cylinder. A guide to sailing backstay tension is:

- 0-10 knots TWS (true wind speed) 500 psi.
- 11-18 kts TWS 750 psi.
- 19-28 kts TWS 1000 psi.

- 29+ kts TWS 1500 psi.

3-5.4 SAILING MANEUVERS

3-5.4.1 TACKING

Safety Considerations:

- Ensure jib/Genoa sheets are clear both in the cockpit and forward.
- Ensure intended course is clear of other boats, shipping, and navigation hazards.
- Ensure crew members are alerted to the maneuver and in “safe zones” for the maneuver.

General Situation:

- Required Positions:
- HELM (steers the boat).
- MAINSHEET (trims mainsheet as needed)
- TAILER (works the tail of the new sheet).
- WORKING SHEET/GRINDER (casts off old sheet, grinds the wind on new sheet). Can be one or two jobs, depending on number of personnel on deck.

Sequence of Events:

1. HELM assigns positions and calls out "Prepare to tack". If known**,** HELM lets crew know what point of sail they should trim to on the new tack, and HELM ensures there are no contact hazards on the new course.
2. TAILER places sufficient turns (2-3) for wind conditions on the windward winch, takes the slack out of the lazy sheet, and stands in the cockpit. Discusses with WORKING SHEET/GRINDER whether they have all the turns needed or will be putting more on before the winch handle is inserted. Reports "Ready (port or starboard)" to HELM
3. GRINDER (if enough people on deck) gets double handled winch handle, and stands forward of the windward winch facing aft with one foot against the toe rail and the other in the cockpit. Reports "Ready" to Helm
4. WORKING SHEET uncleats the leeward sheet, removes excess turns from the leeward winch. Reports "Ready (port or starboard)" to HELM.
5. After receiving "Ready" reports from crew, HELM calls out "Tacking”.
6. WORKING SHEET, as the boat comes into the wind, watches the luff of the jib or genoa and as it begins to luff, stands up on the seat and takes <u>all</u> the turns off the winch. Once the turns are off, watches the sheet go through the block ensuring it does not foul. Gets into position to grind, with winch handle, as needed.
7. TAILER, as the old sheet is cast off, tails as hard and fast as possible, taking more turns on the winch as needed.
8. GRINDER asks if TAILER has the required turns, inserts handle and commences grinding in the high speed direction as soon as the working sheet is cast off. Switches to low speed when the load becomes great and completes the trim of the jib
9. TAILER keeps tension on the sheet and once GRINDER switches to low speed, sits on the cockpit seat facing forward. Watches to see the trim of the genoa/jib and that the sail is clear of the spreader to tell GRINDER when to stop.
10. HELM reports “On course” to sail trimmers to determine exact trim.

HELPFUL HINTS AND COORDINATION:

- HELM can overshoot the desired new close-hauled \course slightly so that the boat will match the jib trim position and the jib will start to drive the boat sooner in the turn.
- As GRINDER brings in the jib trim, HELM can pace wheel movement to come up to new course. Calls "Course" when arrives at new course
- Communications is required between TAILER and HELM to determine exact trim and whether HELM wants to "point" or “foot”.
- Mainsheet trimmer trims to match the "overshoot” position and adjusts the main to “point” or “foot” as boat speed is gained on the new tack.

3-5.4.2 GYBING

WARNING: ***The gybe is a potentially dangerous maneuver. The mainsheet and boom can exert deadly force. Crew coordination is vital. Crew must take care to keep their heads down below boom level and stay clear of the mainsheet as it arcs through the cockpit area.***

Safety Considerations:

- Ensure Jib/Genoa sheets are clear both in the cockpit and forward.
- Ensure mainsheet tail is clear.
- Check to ensure intended course is clear of other boats, shipping, and navigation hazards.
- DO NOT allow boom to gybe without trimming to centerline, even in light wind.
- HELM is in charge and in control of the evolution. HELM must be cognizant of the respective jobs and chronology. Specifically, HELM should time the rate of turn. He should not cross the wind until the mainsail is centerline. He can slow down or speed up the gybe for a smooth, safe gybe.
- If the coordination is not going right, HELM should slow or stop the turn until everyone is in sync.

General Situation:
The description below starts with the boat on a broad reach aiming to arrive at a broad reach on the other tack.

Required Positions:

- HELM.
- GRINDER (grinds the winch to take in the new sheet).
- TAILER (works the tail of the new sheet).
- WORKING SHEET This person can double as GRINDER.
- MAINSHEET.
- PREVENTER. This can be an added responsibility of GRINDER, TAILER, or WORKING SHEET. Depending on conditions, one person may be WORKING SHEET, TAILER, PREVENTER and GRINDER.

NOTE: A PREVENTER is a safety device used to guard against an accidental gybe. It will be used anytime the wind is at a greater angle than 120 degrees either side of the bow. It should be rigged prior to the gybe maneuver. For rigging procedures and crew deployment requirements see Chapter 1, The Preventer System 1-5.9.

Sequence of Events:

1. HELM calls out "Prepare to gybe" and lets crew know what point of sail they should trim to upon completion of the gybe
2. PREVENTER eases the loaded side of the preventer. and reports, "Preventer is clear" to HELM.
3. MAINSHEET takes the sheet out of the self-tailing winch and removes excess turns from winch, checks the position of the traveler, and that both ends of the traveler control line are cleated. He then reports "Ready Mainsheet" to HELM.
4. WORKING SHEET uncleats sheet, removes excess turns from the winch, ensures sheet is clear to run, stands in cockpit, and reports "Ready" to HELM
5. TAILER places one or two turns on the winch, makes the sheet snug, and reports "Ready" to HELM
6. GRINDER gets a double-handled winch handle, stands by the lazy sheet winch, and reports "Ready" to HELM.

OSTS:

- After receiving "Ready" reports from the crew, HELM calls out "Center the main", and MAINSHEET centers the boom.
- After receiving "Mainsheet centered" report from MAINSHEET, HELM calls out "GYBING" and slowly turns the stern toward the wind.
- WORKING SHEET eases jib to maintain trim. TAILER keeps taking on the sheet to minimize slack.

VOST:

- After receiving "Mainsheet centered" report from MAINSHEET, HELM calls out "GYBING" and slowly turns the stern toward the wind.
- MAINSHEET and WORKING SHEET ease sail to maintain trim.
- TAILER keeps taking on the sheet to minimize slack.
- When wind reaches 150-160 degrees apparent, MAINSHEET trims the mainsail, timing it so that the main is amidships before the boat is dead downwind. An extra crew member can help with the trim by taking in on the other mainsheet winch.
- The designated crew for PREVENTER takes “line in hand” on the “new” side of the preventer.

7. HELM calls, "Gybe HO!" as the stern passes through the wind, and the boom is crossed to the other side of the boat.
8. WORKING SHEET eases, then casts off the sheet as the TAILER trims the new sheet to the expected point of sail.
9. MAINSHEET eases the main to the expected point of sail.
10. If sailing with wind abaft 120 degrees apparent, PREVENTER resets the preventer.

3-5.5 SAIL HANDLING

3-5.5.1 CHANGING A HEADSAIL - HANK ON JIB/GENOA

There are three basic sail change situations that will vary the sequence and rapidity of the change. Each has its appropriate place. The hank on boat will be "bald headed" while the change is made. A change can be made by:

- Changing tacks.
- Maintaining the same point of sail.
- Bearing away to sail off the wind. (This is a smart consideration during heavy weather).

The “tack change” is typically used in restricted waters situations when there is an urgency to complete the evolution. Changing while remaining on the same tack is useful when on a long passage, when there is more time and/or, there is no room to tack. Finally, a change wherein the boat bears away until the wind is abaft the beam to reduce pitching and water coming on deck is best in more severe conditions at sea with plenty of sea room.

3-5.5.1.1 TACK CHANGE

Safety Considerations:

- Depending on time of day and prevailing conditions, harnesses may be required.
- Talk through the evolution so the crew understands each person's responsibilities.
- Check the area for other boats, shipping, and navigation hazards which might impact the timing of the evolution.

General Situation:
Assume going upwind in moderate conditions and changing from a larger to a smaller headsail.

Required Positions:

- HELM.
- GENOA SHEET
- FOREDECK #1 (boss of the foredeck).
- FOREDECK #2
- MAST

NOTE: ***A MAINSAILTRIMMER may be assigned for the tack; however, it isn't imperative that the sheet and/or traveler be adjusted.***

Sequence of Events:

1. HELM announces what type of change and what sail will be raised: "Standby to change to the #3, this will be a tack change". HELM also assigns crew positions and indicates whether the new sail

will be brought on deck through the forward hatch (normal route), or through the companionway (taking weather into account).GENOA SHEET using either the lazy sheet or a changing sheet sets the new lead position and leads the new sheet to the foredeck; reports "New Lead Made"

2. FOREDECK #1 and 2 bring new sail on deck, remove it from the bag, unroll it toward the forestay, and hank on the new sail on the weather side of the headstay below the first hank of the sail already set. Attach the new Genoa/jib sheet ensuring it is properly led and that the sheet is clear. Report **"**Ready" to HELM.
3. MAST readies the working jib halyard for release by taking the halyard out of the self-tailer and checking for knots and tangles. Removes excess turns from the winch. Reports "Ready" to HELM.
4. After receiving "Ready" reports from crew, HELM calls out "Tacking, change to the #3" and turns the boat into and through the wind.
5. GENOA SHEET casts off when appropriate and stands by to trim the new sail.
6. MAST watches for the boat to come up, and for the genoa sheet to be eased, then begins to lower the halyard. Removes excess turns as the load decreases but leaves at least one turn on the winch.
7. FOREDECK #1 un-hanks the sail as it comes down the headstay. Once the sail is un-hanked, changes the halyard to the new sail and calls "Made" to MAST.
8. FOREDECK #2 gathers the sail as it comes down and pulls it aft and to weather. Crew on the rail hold sail. After sail is down, moves aft to help MAST hoist the new sail.
9. MAST when halyard is shifted to new sail, hoists the sail. When hoisted, calls "HIGH" to GENOA SHEET. Makes up tail and secures it.
10. GENOA SHEET when "HIGH" call is received trims to course.
11. FOREDECK 1 and 2 re-lead lazy sheet to new sail. Fold, bag, and stow old sail.

NOTE: Under most conditions it is not prudent to leave a sail on deck for a prolonged period (whether bagged, hanked, or lashed). Consider rolling smaller headsails from the clew to the hanks/luff tape so that in heavy weather when the sail is brought on deck it can be taken out of the bag and hanked on before unrolling. This becomes a single person job as opposed to a two-person job.

3-5.5.1.2 SAME TACK

The same procedures apply as for CHANGING ON A TACK. Omit the tack in Step 4. GENOA SHEET should ease the genoa about a foot and secure in the self-tailer.

3-5.5.1.3 BEARING AWAY

The same procedures apply as for changing on SAME TACK. Amend Step 4 to "HELM calls out “Bearing Away" to a comfortable point of sail as determined by wind and sea conditions. Amend Step 5 to “GENOA SHEET should ease the genoa about a foot or more as needed for the conditions.

3-5.5.2 REEFING THE MAINSAIL

As the wind strength increases and the headsail is changed down to a smaller sail, the size of the mainsail can be reduced through reefing in order to keep from overpowering the boat.
Safety Considerations:

- When wind/weather conditions require a reef, harnesses may also be required.
- Avoid stepping in the bight of the main halyard.
- Ensure personnel remain clear of the boom and mainsheet tackle to prevent injuries from erratic movements.
- This evolution requires constant communications.

General Situation:
Assume sailing on a beam reach or closer to the wind in moderate to heavy conditions.

Required Positions:

- HELM
- MAST
- MAIN HALYARD
- MAINSHEET

Sequence of Events:
1. HELM assigns positions, then calls out "Prepare to reef" and crew takes positions.
2. MAST ensures cunningham is loose and off the reefing hook, then ensures the correct reef line is led fair (directly to the winch from the block) and places necessary wraps on winch. Takes position on the windward side of the mast and reports" Ready Mast" to HELM.
3. MAIN HALYARD ensures halyard is clear to run, puts balance of halyard coil aft, removes halyard from the self-tailer, and reports "Ready Halyard" to HELM.

NOTE: If the second reef is being set, ensure that the first reef line clutch in the boom is set before the line for the first reef is taken off the winch.

4. MAINSHEET ensures that the reef lines are tied in correctly, and bight around the boom is slightly aft of the reef cringle. Mainsheet eases vang and removes sheet from self-tailor, takes position facing the main and reports "Ready Mainsheet" to HELM.
5. Receiving "Ready" reports, HELM calls out "Take the reef" and maintains a close reach course, anticipating the boat's tendency to bear away once the main is eased.
6. MAINSHEET eases sheet until sail luffs and reports, “Main eased”.
7. MAIN HALYARD eases halyard after the sheet is eased.
8. MAST assists sail slides down the track, puts reefing cringle onto the reefing hook, and calls out "Made".
10. MAIN HALYARD trims halyard after hearing "Made". MAST ensures cringle stays on the reefing hook. MAINSHEET calls “HIGH” when proper luff tension is achieved.
10. As soon as MAST hears “HIGH" from MAINSHEET, MAST trims the reefing line, listening to MAINSHEET for when to stop.
11. MAINSHEET directs REEFING LINE to grind until the clew is snug against the boom and under tension, then reports “Made”.
12. Once halyard and reefing line are trimmed, MAINSHEET trims sheet and vang. MAST ensures the reef line stoppers are closed.
13. MAIN HALYARD and REEFING LINE coil and make off respective lines.
14. Excess sail cloth is pulled to windward, rolled, and tied with sail ties reeved through the reef points and between the foot and the boom. (Use a slip knot).
Helpful Hints:

- If the reef will be in place for a while, tie a sail tie through the new clew and around the boom as a safety measure.
- The reefing lines are color coded. First reef has a RED TICK, (PORT side of the mast). Second reef has a GREEN TICK, (STBD side of mast).

Sequence of Events:

1. HELM calls out "Prepare to reef" and crew takes positions.
2. MAST checks mast ensuring sail slides are free to run and reefing hooks are free. Takes position on the windward side of the mast and reports” Ready Mast" to HELM.
3. MAIN HALYARD ensures halyard is clear to run, removes halyard from the self tailer, puts balance of halyard aft, and reports "Ready Halyard" to HELM.

   NOTE: If the second reef is being set, ensure that the first reef line clutch in the boom is set before the line for first reef is taken off the winch.

4. MAST ensures the correct reef line is led fair and places necessary wraps on winch. Ensures that the reef lines are tied in correctly at the correct places. Reports "Ready" to HELM.
5. MAINSHEET ensures vang and sheet are clear to run, takes position facing the main and reports "Ready" to HELM.
6. Receiving "Ready" reports, HELM calls out "Take the reef" and maintains course, anticipating the boat's tendency to bear away once the main is eased.
7. MAINSHEET eases sheet until sail luffs and eases vang.
8. MAIN HALYARD eases halyard when the sheet is eased.
9. MAST assists sail slides down the track, puts reefing cringle onto the reefing hook, and calls out "Made".
10. MAIN HALYARD trims halyard after hearing "Made". MAST ensures cringle stays on the reefing

hook. MAINSHEET calls “HIGH” when proper luff tension is achieved.
11. As soon as MAST hears “HIGH" from MAINSHEET, MAST trims the reefing line, listening to MAINSHEET for when to stop
12. MAINSHEET directs REEFING LINE to grind until the clew is snug against the boom and under tension.
13. Once halyard and reefing line are trimmed, MAINSHEET trims sheet and vang. MAST ensures reef clutch is engaged, then eases the reef line off the winch and onto the reef clutch.
14. MAIN HALYARD and REEFING LINE make off and coil respective lines.
15. Excess sail cloth is pulled to windward, rolled, and tied with sail ties reeved through the reef points and between the foot and the boom. (Use a slippery reef knot).

Helpful Hints:
- If the reef will be in place for a while, tie a sail tie through the new clew and around the boom as a safety measure.
- MAIN HALYARD and REEFING LINE should exercise caution to ensure the tail of the main halyard or topping lift do not go over the side of the N 44.
- The reefing lines are color coded. First reef has a RED TICK, (PORT side of the mast). Second reef has a GREEN TICK, (STBD side of mast).

3-5.5.2.1 SHAKING A REEF
Safety Considerations:
- Avoid stepping in the bight of the main halyard.
- Ensure personnel remain clear of the boom and mainsheet tackle to prevent injuries from erratic movements.
- This evolution requires constant communications.

General Situation:
Assume sailing on a beam reach or closer to the wind in moderate to heavy conditions.
Required Positions:
- HELM
- MAST
- MAIN HALYARD
- MAINSHEET
- REEFING LINE

Sequence of Events:
1. HELM calls out "Prepare to shake the reef". Crew removes sail ties from reef points and clew and takes positions.
2. MAST checks mast ensuring sail slides are free to run, takes position on the windward side of the mast, and reports "Ready Mast" to HELM.
3. MAIN HALYARD ensures halyard is clear to run, removes halyard from the self tailer, removes excess turns from winch, and reports "Ready Halyard" to HELM.
4. REEFING LINE loads reef line onto the winch and takes tension, then opens the rope clutch on the boom, ensures that all sail-ties are removed, removes line from self tailer ensuring it is clear to run, and removes excess turns from winch. Reports "Ready Reef Line" to HELM

   NOTE: If “Shake Both Reefs” is commanded, ensure that both rope clutches are open, and reef lines are free to run. If only the second reef is commanded to be shaken, REEFING LINE ensures that the first reef line is set correctly.

5. MAINSHEET ensures vang and sheet are clear to run, ensures that all sail-ties are removed from the mainsail, takes position facing the main and reports "Ready MAINSHEET" to HELM.
6. After receiving "Ready" reports from crew, HELM calls out "Shake the reef" and maintains course, anticipating the boat's tendency to fall off once the main is eased.
7. MAINSHEET eases sheet until sail luffs and eases vang and is ready to trim as needed to prevent excess luffing as the reefing line is eased.
8. REEFING LINE eases reefing line simultaneously with sheet and halyard easing; continues easing

as halyard is tensioned, ensuring the reefing line is slack.
9. MAIN HALYARD eases halyard as the sheet is eased; halyard is eased only enough to remove the cringle from reefing hook.
10. MAST unhooks the cringle as the halyard is eased then jumps halyard once the cringle is freed.
11. MAIN HALYARD trims halyard after cringle is freed, putting on extra turns as the halyard comes under tension. Works with MAST to watch luff tension as halyard is ground in; person watching sail tension calls "High".
12. Once halyard is "High", MAINSHEET trims sheet and vang.
13. MAIN HALYARD and REEFING LINE make off and coil respective lines.

3-5.5.3 HEADSAIL MANAGEMENT - LUFF GROOVE JIB/GENOA

The NAVY 44 MK II can be rigged with a foil headstay for more efficient sail changing during racing. The foil is a plastic extrusion that fits over the rod headstay and has two grooves that accommodate boltropes sewn onto the luff of the headsail. The advantage is that a new sail can be set and trimmed before the old sail is dropped, thus the need to make a "Bald Headed" change is eliminated.

3-5.5.3.1 BENDING ON A JIB/GENOA

Many of these sails are usually stowed in a sausage bag, with a breakaway zipper to facilitate setting and changing the sail. It is good practice to keep a sail tie around the luff of the headsail in the bag.

1. Select the desired sail depending on the wind/sea conditions.
2. Bring the sail up on the foredeck and place near the headstay. Tie the bag down.
3. Attach the tack cringle to the snap shackle at the stem fitting.
4. Attach the jib sheets to the clew cringle with a bowline. Lead the sheets to the proper track fairleads and to the corresponding winches at the cockpit. Genoas lead outside the shrouds. Jibs lead outside the forward lower shroud and inside the upper and aft lower shrouds.
5. Foredeck takes off the sail tie and taking care not to twist the sail, feed luff tape into the pre-feeder on the forestay, then into the luff grove on the forestay that corresponds to the shackle used for the tack, (port shackle = port groove).
6. Attach the jib halyard that corresponds to the shackle/groove used.
7. Take tension on the jib halyard to keep the head from falling out of the groove.
8. Tie stopper knots in the tail of the sheets according to skipper preference.
9. Lead the jib sheet to the winch.
10. Control the genoa fairlead position with the fairlead adjuster system at the forward end of the cockpit port and starboard, outboard of the cabin top.

    NOTE: The run of the jib sheet from the block that determines the sheeting angle of the sail, to the winch, needs to be controlled. When this distance is great the sheet will whip as it is being sheeted in and may cause a winch over ride.

3-5.5.3.2 CHANGING A HEADSAIL

The advantage is that with two luff grooves in the forestay a new sail can be hoisted on the second groove while the old sail is still flying and providing power. The boat does not have to be sailed "bald headed" while the new sail is raised. This is an important consideration while racing. Four methods can be employed depending on which side the free luff groove is located: Easiest to most difficult:

- INSIDE set INSIDE peel (tack change).
- OUTSIDE set INSIDE peel away (same tack).
- INSIDE set OUTSIDE peel away (same tack).
- OUTSIDE set OUTSIDE peel away (tack while changing) The importance of "Bearing Away" to change is diminished because sailing with a headsail continuously flying contributes to boat stability.

3-5.5.3.3 INSIDE SET, INSIDE PEEL

Crew positions involved:

- HELM
- FOREDECK
- FREECREW
- CAST OFF

- TAILER (works the tail of the new sheet)
- GRINDER (grinds the winch to take in the new sheet)
- MAST
- HALYARD WINCH (works halyard winches)

Sequence of Events:

1. HELM Calls for the sail change, announces the type of change (e.g. “This will be a tack change!”) and directs FOREDECK in what headsail to use
2. FOREDECK goes below and gets the new sail ready to bring up on deck. Normally the new sail is brought up on deck through the fore hatch.
3. FREECREW stands by on deck until FOREDECK gives signal that new sail ready.
4. FOREDECK opens forehatch and starts new sail up.
5. FREECREW pulls sail on deck.
6. FOREDECK comes up through the hatch and closes the hatch.
7. FOREDECK and FREECREW take the sail bag forward, to windward of the sail that is set, with the head of the bag facing forward.
8. FOREDECK opens the front of the sausage bag and attaches the tack to the weather shackle. If conditions warrant, tie head of sail to the bow pulpit with a sail tie to ensure it does not go overboard while FOREDECK goes aft to get new halyard.
9. FREECREW unties the lazy sheet from the working sail and re-leads the sheet through the proper turning block and ties it to the new clew, ensuring the zipper of the sail bag will not be fouled when the bag is opened
10. FOREDECK attaches the new jib halyard, ensuring that it is clear of fouling other halyards or rigging.
11. HALYARD WINCH takes up slack in new halyard with one wrap on the winch drum and readies the working halyard to be eased.
12. FOREDECK takes the sail tie off the front of the headsail, then feeds head of the sail into the pre-feeder.
13. HALYARD WINCH watches FOREDECK and takes up on the halyard at each successful entry into the prefeeder and headfoil feeder.
14. FOREDECK calls “Ready Hoist, Ready Tack Set” when the sail is through the pre-feeder and started in the luff groove
15. HELM calls “HOIST” when all is ready to hoist the sail.
16. MAST is back at the new halyard to “Jump” the halyard while HALYARD WINCH tails the halyard.
17. FOREDECK watches the pre-feeder to ensure that there are no snags in the luff tape.
18. FOREDECK calls “High” when sufficient halyard tension is set.
19. HELM calls for the tack “Ready About" and listens for response from CAST OFF TAILER, FOREDECK/MAST and TRIMMER checks the area the boat will be sailing into after the tack
20. CAST OFF TAILER prepares the winch for tacking and calls “Ready (port/stbd)”
21. TAILER adds two wraps of the new headsail sheet on the new winch and calls “Ready port/stbd Sheet”
22. HELM calls “Tacking” as he turns the wheel.
23. MAST goes to the old halyard winch and eases off that halyard quickly as the boat comes about.
24. CAST OFF may just ease the old headsail sheet enough so that the sail “backs” against the wind a bit remembering that the sail is usually collected on the windward side of the boat.
25. FOREDECK pulls the luff tape down with force to expedite getting the old headsail to the deck, then uses the sail tie to secure the head of the sail.
26. TRIMMER & GRINDER take in on new sheet as the boat tacks and trims to course.
27. FOREDECK skirts the new headsail.
28. FOREDECK, MAST & FREECREW take the old headsail to windward and flake into the sail bag.

With practice, this method of inside tack set takes 30 seconds from the time the new headsail enters the feeder until the old sail exits the feeder.

HELPFUL HINTS AND COORDINATION:

- Crew communication will assist in making the evolution smooth.

- A "changing sheet" can be used. This allows for the new sheet to be run and tied to the new sail without disconnecting the lazy sheet from the loaded sail. The boat can continue to sail, AND TACK while the boat is being prepared for the sail change.
- Under most circumstances it is not prudent to leave a headsail on deck for a prolonged period. Consider lashing the old sail to the toe rail aft or bag the sail and tie the bag down.
- Consider not releasing the old sail from the tack fitting until it has been bagged. This will prevent losing the sail over the side.

3-5.5.5.4 OUTSIDE SET, INSIDE PEEL

This procedure differs from the easiest**;** inside set, inside take down**,** in the following manner:

1. The new sail must be led outside the working jib before the head is fed into the pre-feeder and the luff groove.
2. The new halyard must be led forward and attach it to the new jib outside the working sail.
3. A changing sheet must be employed since the load will continue to be on the same side.
4. The possibility for fouled lines is increased.

3-5.5.5.5 INSIDE SET, OUTSIDE PEEL

In this procedure setting the sail is identical to the easiest case. The differences are that:

1. Care must be exercised on the take down to ensure that the sail is hauled in under the new sail that is already flying to keep it from falling overboard. Positioning FREECREW mid-way down the foot to haul in the sail from under the working jib is helpful.
2. The old halyard will have to be led aft and around to the leech of the new sail before being brought in and stowed at the base of the mast.
3. A changing sheet is required since the load will not be changed to a lazy sheet.

3-5.5.5.6 OUTSIDE SET, OUTSIDE PEEL

This is the most difficult of the four maneuvers since both the set and peel away are on the outside. Positions involved:

- HELM
- FOREDECK
- FREECREW
- CAST OFF
- TAILER (works the tail of the new sheet)
- GRINDER (grinds the winch to take in the new sheet)
- MAST
- HALYARD WINCH

Sequence of Events:

1. HELM announces the type of change “This will be a tack change!” and directs FOREDECK as to what headsail is to be used.
2. FOREDECK goes below and gets the new sail ready to bring up on deck.
3. FREECREW stands by on deck until FOREDECK gives signal that new sail is ready.
   - FOREDECK opens foredeck hatch and starts bringing the new headsail up.
   - FREECREW pulls sail on deck to the toe rail with the head near the tack fitting.
   - FOREDECK comes up through the hatch and latches the hatch.
4. FOREDECK and FREECREW tie the bag to the toe rail.
5. FOREDECK ensures that the new halyard is clear, leads the new headsail halyard around the leech of the old headsail, pulling ample slack, and attaches the shackle to the bow pulpit outside the old headsail. FOREDECK then brings the head of the new sail under the foot of the old headsail, inside the pulpit, through the pre-feeder and into the leeward groove, and attaches the halyard to the new headsail, directing HALYARD WINCH to “take up slack”.
6. FOREDECK wedges into the pulpit to ensure that the new sail feeds fairly into the luff groove.
7. FREECREW, MAST AND FOREDECK unzip the bag.

8. MAST attaches the CHANGING SHEET, ensuring the sheet is through the appropriate lead block, around and underneath the old headsail, and attaches it to the clew of the new headsail. The sheet

will be trimmed on the secondary winch until the tack.
9. FOREDECK calls “READY FOR CHANGE” and awaits response from HELM.
10. HELM calls “HOIST”
11. MAST jumps the halyard as HALYARD WINCH tails.
12. As the headsail is being hoisted, FOREDECK attaches the tack of the new headsail to the appropriate tack shackle and calls “TACK MADE”
13. HALYARD WINCH takes final tension on new headsail halyard as directed by FOREDECK, who calls “HIGH!”, then coils the tail of the new sail halyard.
14. TAILER has been taking up slack and now trims new headsail when the “High” call is announced, makes final adjustments with adjustable lead system.
15. MAST removes working sheet from old headsail, attaches to new headsail and re-leads it as the new windward sheet, led to the primary. The old windward sheet is led through a snatch block then to the secondary winch.
16. FOREDECK surveys the foredeck to be sure it is clear and reports, "Clear to tack", and stays in the pulpit.
17. HELM orders, "Ready About” and checks the area the boat will be sailing into after the tack to be sure it is clear.
18. HELM orders, "Tacking", and tacks.
19. FREECREW takes up slack in the old sail jib sheet through the tack.
20. CAST OFF takes the jib sheet in hand and casts off.
21. TAILER, as the old sheet is cast off, tails as hard and fast as possible, taking more turns on the winch as needed.
22. GRINDER asks if TAILER has the required turns, inserts handle and commences grinding in the high speed direction as soon as the working sheet is cast off. Switches to low speed when the load becomes great and completes the trim of the jib
23. TAILER calls the trim.
24. HALYARD WINCH moves to old headsail halyard winch, carefully removes the coils from the halyard of the old jib winch so they can run without fouling and eases halyard down at a rate dictated by FOREDECK.
25. FOREDECK pulls the old sail down underneath the new sail with help from FREECREW in the middle of the sail and MAST at the clew of the sail.
26. FOREDECK removes the halyard from the old sail and passes it to MAST.
27. MAST stows the old halyard taking care not to foul it.
28. FREECREW unties the sheet from the old sail, coils and stows it. FREECREW then re-leads windward jib sheet to the primary winch and reports, "Ready to tack", to FOREDECK
29. FOREDECK surveys the foredeck and when satisfied that it is clear, reports "Foredeck is clear to tack".
30. FOREDECK directs FREECREW and MAST in the bagging of the old sail.
31. The tack is released from the tack fitting.
32. FOREDECK directs FREECREW and MAST in stowing the old sail below.

HELPFUL HINTS AND COORDINATION:
- Crew communication will assist in making the evolution smooth.
- Under most circumstances it is not prudent to leave a headsail on deck for a prolonged period. Bag the sail and tie the bag down aft of the foredeck, or stow below.

3-5.5.6 SETTING THE GENOA STAYSAIL

A good sail combination for reaching is the #2 genoa (high clew for better visibility to leeward), and the genoa staysail. Consult Table 3-3 for wind speed and true wind angle.
1. Rig the inner forestay and tension, keeping the halyards clear and the windward genoa sheet forward of the forestay.
2. Rig the running backstays. See BIB 3-5.3.2.1.
3. Set the #2 genoa with any of the methods previously discussed.
4. Bring the genoa staysail up on the FOREDECK and place it near the forward lower shrouds. Tie the bag down.
5. Unroll the sail toward the inner forestay taking care not to let the sail fill in the wind.
6. Attach the tack to the tack shackle at the base of the inner forestay.

7. Hank the staysail to the inner forestay.
8. Lead the sheets from the sail, over the lifelines, then from outside the boat, under lifelines and through the forward block on the toerail or a large snatch block positioned on the toerail, directly to the cabintop winch. Tie a figure eight knot in the end of the sheet.
9. Attach the topping lift (T-Lift) to the head of the staysail as the halyard ensuring it is not fouled on the forestay.
10. Hoist the sail on command from the Helmsman.
11. Trim the sheet so as to create a “slot” between the #2 genoa and the staysail. Read the tell tails on both head sails for this procedure.

3-5.5.6.1 TACKING WITH THE GENOA STAYSAIL

Tack the boat as with a single headsail remembering that the lazy #2 genoa sheet is forward of the forestay thus hindering the passing of the #2 genoa across the foredeck. Back the staysail in the initial phase of the tack to give the #2 genoa a surface upon which to slide as it crosses from one side to the other, thus alleviating the problem of sheet hangup on the forward lower shroud. When the #2 genoa has crossed and is in the process of being trimmed, release the genoa staysail and tack the sail. It has been found that the use of the genoa staysail on close reaching or greater angle off the wind will yield an increase of at least ½ knot of boat speed.

3-5.5.7 SPINNAKER

The spinnaker is a special purpose sail used to augment speed when the boat is "off the wind".

3-5.5.7.1 SPINNAKER GEAR AND POSITIONS REQUIRED

The evolution described herein is for a "BEAR-AWAY" set.
Gear required:

- Spinnaker (packed)
- Spinnaker pole
- Spinnaker foreguy
- Spinnaker halyard
- Topping lift
- Two spinnaker sheets
- Two spinnaker guys
- Two large snatch blocks

Positions required:

- HELM
- GENOA TRIMMER
- MAIN TRIMMER
- SPINNAKER SHEET TRIMMER (COULD BE THE GENOA TRIMMER)
- SPINNAKER GUY TRIMMER (trims the spinnaker guy)
- GRINDER
- FOREDECK
- BOW (works the functions on the bow. Foredeck could be a distinct position to allow for overall supervision.)
- MAST (works the halyards, pole height at the mast)
- PREVENTER (tends the foreguy periodically, set and tend preventer, tends the topping lift).

3-5.5.7.2 RIGGING THE BOAT

This procedure can be done ahead of time in anticipation of using the spinnaker.

- Rig one snatch block to the port toe rail between the primary and the cabintop winch.
- Rig the other snatch block to the corresponding starboard side.
- Attach the PORT spinnaker sheet at the port side of the bow pulpit, lead it outboard of the lifelines and shrouds, through the larger sheave in the spreecher block attached to the base of the stern pulpit at the end of the toe rail, then inside the lifelines to the cockpit, through the snatch block on the rail and up to the cabintop winch.
- Rig the starboard spinnaker sheet to match.

- Attach the PORT afterguy snap shackle to the port spinnaker sheet bale at the port side of the bow pulpit, lead the guy outside of the lifelines to the permanently attached snatch block aft of the shrouds, then into the cockpit.
- Rig the starboard afterguy to match. Make sure the spinnaker sheets are not trapped inside the guys.

NOTE: The guy is attached to the sheet bale so that in light air it can be disconnected to reduce the weight hanging on the clew of the spinnaker and the spinnaker can be controlled with a single sheet arrangement.

NOTE: The foreguy is a continuous line that starts at a cam cleat on the outboard face of the cabin top, goes forward to a single block at a pad eye on the foredeck, to a bale on the bottom of the outboard end of the pole, and back down the opposite side of the boat.

3-5.5.7.3 RIGGING THE SPINNAKER

The spinnaker pole is set to the windward side. Helm announces what jibe the spinnaker will be set on, what kind of set, (bear away set or gybe set), and when to start rigging.

1. Take the pole out of the deck chocks, pass the lazy jib sheet over pole and install the socket end of the pole to the spinnaker pole car on the track on the forward face of the mast. The outboard end of the pole is on the foredeck, on what will be the windward side of the boat when the spinnaker is set. In this configuration the boat can continue to be tacked, the jib passing over the pole.
2. Attach the spinnaker bag (turtle) to the lower and upper lifeline on what will be the leeward side of the boat for the set. Use the snap hooks on the bag, being careful not to trap the sheet and guy.
3. Unclip the windward spinnaker sheet/guy, take it outside the lifelines and pulpit, forward of the forestay, back over the leeward lifeline, under the jib and attach the sheet/guy snap shackle to the forward to the clew of the spinnaker. Open the jaw, lay the GUY in the jaw and close the jaw. Make sure the sheet stays on top of the pole.
4. Take the leeward spinnaker sheet/guy over the lifeline, under the genoa and attach it to the after clew.
5. The deck line for the preventer on what will be the leeward side can be rigged to the boom mounted pennant.
6. Attach the topping lift to the outboard end of the pole.
7. Take the spinnaker halyard corresponding to the leeward side of the boat at the set and lead it aft to the clew of the jib, pass it outboard above the trimmed headsail sheet, lead it down between the sail and the lifelines, under the foot of the jib, and attach it to the head of the spinnaker.
8. Re-check that the sheets, halyard, and topping lift are clear. Look Up. The spinnaker is ready to be hoisted.
9. This is as far as the rigging for spinnaker can go until the boat is on the last point of sail before setting the spinnaker.

3-5.5.7.4 SETTING THE POLE

1. Helm announces, "Standby to set the spinnaker".
2. BOW goes forward to pulpit, lifts the outboard end of the pole while PREVENTER takes in the topping lift. -MAST can "Jump" the topping lift at the mast to assist.
3. BOW re-checks to make sure the lazy sheet is on top of the pole. Re-check that lines are clear to run without fouling, particularly on lifeline stanchions. Report "Ready forward"
4. MAST lays out the working jib halyard tail so it is free to run and readies the spinnaker halyard for hoist.
5. MAST pre-sets a likely height for the spinnaker car on the mast track (higher in heavy air, lower in light air). Ensures both cleats for inboard end control line on the mast are engaged. Adjust topping lift to make pole perpendicular to the mast. Reports "Ready Mast".
6. SPINNAKER GUY puts appropriate number of wraps on the winch. Pre-set the foreguy for the anticipated angle of the pole and cleat the foreguy. Snug the topping lift. Report "Ready Guy".
7. SPINNAKER SHEET puts several wraps on the secondary winch on the cabintop. Make sure the lazy guy is clear. If this position is doubling as the GENOA TRIMMER, be prepared to ease the genoa slightly when the spinnaker is hoisted. Cleat the Genoa sheet. Standby to trim the spinnaker

sheet when hoisted. Report "Ready Spinnaker sheet".
8. One SPINNAKER GRINDER is normally required. Two for higher wind strengths.
9. MAINSHEET TRIMMER ensures the sheet is clear, take the sheet in hand and report "Ready Mainsheet".

3-5.5.7.5 PRE-TRIM

Just prior to the set, SPINNAKER GUY takes on the guy to bring the clew out of the bag and up to the pole. The spinnaker pole should be about 3 feet off the headstay for hank-on headsail boats. The after guy (primary) winch must have 4 to 6 wraps on the drum at this point.

3-5.5.7.6 THE SPINNAKER SET

1. HELM gives command, "Set the Spinnaker".
2. HELM “bears off" to the appropriate course.
3. MAST tails while BOW hoists, hand over hand until spinnaker is all the way up. BOW calls “HIGH” so the trimmers can begin to trim the sail. MAST moves to jib halyard.
4. SPINNAKER GUY takes on the guy to expose the spinnaker to the apparent wind. Pole will eventually be trimmed to be perpendicular to the apparent wind.
5. SPINNAKER SHEET takes on the sheet to fill the spinnaker.
6. BOW or FOREDECK goes to the pulpit to take in the jib. FOREDECK (PREVENTER) can go to the mid-girth of the foot to help with the drop.
7. MAST keeps at least one turn on the winch, and lowers the jib quickly.
8. BOW disconnects the genoa halyard and connects it to the tack fitting. Depending on the length of time the spinnaker is expected to stay in the air, BOW can either bag the jib or lash it to the toe rail.
9. MAST makes up the spinnaker halyard tail. Ensures lazy sheet is overhauled and that shackle end is run over the top of the outboard end of the pole and wrapped a few times around the working guy from the inside out to prevent trapping the pole after its tripped.
10. MAINSAIL TRIMMER eases main to square it to the wind. Can assist with topping lift, foreguy and preventer when the apparent wind is > 120 degrees.
11. SPINNAKER GUY adjusts pole to be at right angles to the apparent wind. Respond to call from SPINNAKER SHEET for pole adjustments.
12. FREECREW stands by foreguy to maintain tension when the spinnaker pole is adjusted.
13. SPINNAKER SHEET keeps spinnaker full by easing sheet until the spinnaker luff curls, but pops out. Calls adjustments for pole up and down at mast and at outboard end, as well as fore and aft.
14. PREVENTER works the preventer line for the appropriate side and ensures that all lines are lead fair.

HELPFUL HINTS AND COORDINATION.

- Communication is the key to successful spinnaker work.
- It is sometimes helpful to say "Pole to Port [STBD]" when announcing the preparation for spinnaker.
- Basic tenets for spinnaker trim:
- Pole perpendicular to the apparent wind.
- Pole perpendicular to the mast.
- Clew heights equal.
- Keep position of pole as constant as possible.
- Ease spinnaker sheet.
- Call for course change (to include gybe) if wind shift is major.
- Ensure that the cleats for the spinnaker pole car adjustment line are well secured.
- Never allow the loaded spinnaker pole to contact the headstay.
- Never trim the pole so far aft that it contacts the forward lower diagonal shroud.

3-5.5.7.7 GYBING THE SPINNAKER

Safety Considerations:

- Ensure sheets and guys are clear forward and in the cockpit.
- Visually check that the intended course is clear of other boats, shipping, and navigation hazards.
- Ensure crew members are in "safe zones" for the maneuver.

WARNING: ***STAY AWAY FROM THE MAINSHEET TRAVELER. BE MINDFUL OF THE MAINSHEET TACKLE AS THE GYBE IS EXECUTED.***

WARNING: ***TRIM THE BOOM TO CENTERLINE BEFORE "GYBE HO!" AN OUT OF CONTROL BOOM CAN CAUSE SERIOUS INJURY TO PERSONNEL AND MAY CATCH ON THE BINNACLE GUARD.***

- Trim the boom to centerline before the boom is crossed to the other side of the boat.
- HELM is in control of the maneuver.
- Communications is the key to a safe gybe.

General Situation:
Assume sailing on a broad reach in moderate conditions.

Positions Required:
- HELM
- SPINNAKER SHEET
- SPINNAKER GUY
- GRINDER/PREVENTER
- TOPPING LIFT
- MAINSHEET
- FOREDECK
- BOW
- MAST

Sequence of Events:
1. HELM calls "Prepare to Gybe". When possible include what point of sail the boat will be on upon completion of the maneuver.
2. FOREDECK checks to see that the windward spinnaker sheet is not fouled under the spinnaker pole end. Procedure must be stopped and remedied before continuing if sheet is fouled.
3. SPINNAKER SHEET stands forward in cockpit, ensures both sheets are clear, places sufficient turns on the new secondary winch, stands in cockpit, continues to trim, maintains tension on lazy sheet, and reports "Ready Sheet" to HELM.
4. SPINNAKER GUY stands aft if spinnaker trimmer, ensures both guys are clear, places sufficient turns on the new primary winch, stands in cockpit, continues to trim, and reports, "Ready Guy" to HELM.
5. GRINDER breaks the preventer.
6. MAINSHEET removes sheet from the self-tailer, ensures sheet is clear, cleats traveler on both sides, and reports, "Ready Main" to HELM.
7. TOPPING LIFT ensures topping lift and foreguy are clear, takes topping lift out of self-tailer, and reports, "Ready Topping Lift", to HELM.
8. MAST ensures inboard end of pole is at the proper height for dipping outboard end and tripping line is clear. Reports, "Ready mast", to HELM.
9. BOW (FOREDECK) takes bight of lazy guy to pulpit, positions himself forward of the headstay facing aft with lazy guy in hand, and reports, "Ready bow", to HELM.
10. After receiving ready reports from the crew, HELM, calls "Bearing away" and turns the boat away from the wind. MAINSHEET, SPINNAKER SHEET ease, and SPINNAKER GUY squares the pole back to the apparent wind, while FREECREW eases the foreguy. Basically the pole should be as far aft as possible before tripping. Care is required to avoid forcing the spinnaker pole against the forward lower shroud. SPINNAKER SHEET begins to trim in.
11. When wind reaches 150-160 degrees apparent, MAINSHEET trims the mainsail, timing it so that the boom is amidships before the boat is dead down wind. An extra crew member can help with the trim on the leeward mainsheet winch.
12. HELM calls "Trip" with the stern to the wind. HELM should momentarily delay with the boat DOWNWIND until steps 13 through 18 are completed.
13. At the "trip " MAST trips outboard end to release the afterguy, TOPPING LIFT eases the pole

smartly to pre-determined position so that pole end will clear inside forestay, and above lifeline. SPINNAKER GUY casts off the old guy. SPINNAKER SHEET (new) has all the load.

14. As the pole dips and swings through the fore triangle, BOW/FOREDECK snaps new after guy into open jaw at the end of the pole ensuring that the shackle is on the trailing edge of the pole. Once the jaw closes, ensures pole has cleared the headstay to the new side and calls out, "Made".
15. At the call "Made", MAST jumps topping lift and adjusts inboard end as necessary.
16. TOPPING LIFT trims topping lift to proper height and stands by to adjust foreguy as necessary.
17. SPINNAKER GUY begins to trim new guy. Positions pole to apparent wind.
18. SPINNAKER SHEET begins trimming on new sheet, eases off old sheet as new guy approaches the outboard pole end. The spinnaker is rotated across the bow of the boat by trimming it as the boat turns.
19. HELM calls out "GYBE HO!" and turns the boat so the wind is about 160 degrees on the new gybe.
20. MAINSHEET EASES THE MAINSHEET to the expected point of sail once on the new heading.
21. HELM continues the turn.
22. GRINDER sets the new preventer line and assists as necessary. (Usually the new spinnaker sheet winch needs grinding first).
23. SPINNAKER SHEET does not ease old sheet until the guy has taken the load.

HELPFUL HINTS:

- Mark the topping lift with a whipping, Sharpie pen or colored tape at the position where it is in contact with the winch when the pole is able to clear above the lifelines and pulpit, yet low enough to pass inside the headstay.
- Hold the boat downwind until the spinnaker guy is "made" on the new side. Trim the mainsheet in close, to place the boom on or near the centerline of the boat. Wind is channeled from “dead aft” to the spinnaker on both sides so that it can continue to fly without the aid of the pole.

3-5.5.7.8 SPINNAKER TAKE-DOWN (DOUSE)

The genoa is usually hoisted before the spinnaker is doused. This aids in two ways:

- Maximum power is kept on the boat through the maneuver.
- The genoa creates a "LEE" for the controlled collapse of the spinnaker.

Safety Considerations:

1. Ensure sheets and halyards are clear to run and not tangled.
2. DO NOT STAND IN ANY BIGHTS!
3. Always keep at least one turn on the spinnaker halyard winch while dousing...even in light winds.
4. If you lose control of the halyard, do not attempt to grab it to stop it if you’re not wearing gloves.
5. Communication is the key to a safe take down.

General Situation:

Assume beam to broad reaching in moderate conditions. The jib should be raised before the spinnaker is doused. This sequence of events assumes the spinnaker will be dropped behind the jib (a leeward take-down). There are other methods of dousing the spinnaker in racing situations.

Required Positions:

- HELM
- BOW
- MAST
- MAINSHEET
- TOPPING LIFT
- SPINNAKER GUY
- SPINNAKER SHEET
- GENOA SHEET (this may be covered by spinnaker sheet).
- GATHERERS and FREECREW

3-5.5.7.9 PREPARATION

Sequence of Events:

1. HELM calls out "Stand by to raise the jib".

2. BOW ensures the genoa is ready to hoist on the proper side; that the genoa halyard is clear; and reports "Ready to hoist the genoa", to HELM.
3. MAST ensures the genoa sheets are clear, stands by to jump genoa halyard, reports "Ready genoa halyard" to HELM.
4. GENOA SHEET ensures at least two turns on the primary winch on the new leeward side, and reports, "Ready genoa sheet", to HELM.
5. GATHERERS are deployed forward of the leeward shrouds, take the lazy guy in hand, lead it over and inside the lifelines and underneath the jib forward of the jib sheets and report, "Ready Gatherers", to HELM.

3-5.5.7.10 THE SPINNAKER TAKE-DOWN

1. HELM calls out, "Hoist the Genoa".
2. MAST jumps Genoa Halyard.
3. FREECREW tails on the genoa halyard winch, then goes forward to help gather.
4. MAST assists by taking winch handle and grinds, then shifts to spinnaker halyard. Takes it from the self tailer, assumes position to be able to see gatherers and reports, "Ready spinnaker halyard", to HELM.
5. BOW calls, "High", when the genoa is fully hoisted.
6. BOW opens forward hatch, hands lazy guy to gatherer in forepeak, reports “Ready" to HELM.
7. GENOA SHEET trims the genoa for the expected point of sail.
8. After receiving "ready” from BOW, HELM calls out, "Douse the Spinnaker".
9. SPINNAKER GUY makes sure guy is free to run and stands by to ease once bulk of spinnaker is in forepeak.
10. SPINNAKER SHEET eases the sheet and makes sure both sheets are free to run.
11. BOW and GATHERERS take in on the lazy afterguy, then gather as much of the foot as possible, then start taking in on the spinnaker itself.
12. MAST watches the gatherers and eases the halyard so as to feed the spinnaker to the gatherers as they are able to take it in.
13. TRY TO KEEP THE SPINNAKER OUT OF THE WATER.
14. Spinnaker is passed to crewmember down below in the forepeak as it is doused, SPINNAKER GUY eases afterguy when gatherers request ease to complete take-down.
15. Once the spinnaker is doused, TOPPING LIFT lowers the outboard end of the pole so that BOW can handle it.
16. MAST lowers the Inboard end.
17. All hands ensure all lines are onboard and not trailing in the water.
18. The spinnaker halyard is returned to the stowed position ensuring that it is clear of the headstay and all other halyards and rigging.
19. The spinnaker is re-packed, and all lines are either re-led for the next spinnaker hoist, or the spinnaker, lines and pole are stowed.

3-5.5.8 REACHING #2 GENOA

The reaching #2 genoa is a great sail for when the wind is abaft the beam. It can be rigged in combination with the genoa staysail when sailing with the wind between a close reach to broad reach. Follow the instructions for rigging the staysail in BIB 3-5.5.6.

The spinnaker pole can also be used to hold the clew of the sail to windward for sailing “wing-on-wing” when sailing on a run.

Rigging the #2 for reaching with an outside lead:

1. Set up the genoa and rig for an “outside lead” by running the genoa sheets from the clew, over and outside the lifelines and shrouds and back into the boat through a snatch block on the toerail in the vicinity of the closed cleat amidships, directly to the primary winches.
2. Hoist the genoa, trim on the normal leeward side.

Rigging the #2 for running wing-on-wing, using an outside lead and the spinnaker pole:

3. Rig the spinnaker pole to the mast, attach the topping lift and foreguy.
4. Clip the windward genoa sheet into the forward end of the spinnaker pole fitting, being careful not to twist it or trap it in the pulpit.
5. Raise the inboard end of the pole so that it is even with the clew of the sail, while raising the outboard end so it is perpendicular to the mast, and remains on the windward side of the boat.
6. Ensure the preventers are rigged and the leeward side is tensioned.
7. Bear away until the genoa starts to collapse, or “wink”, then trim on the windward genoa sheet to pull the sail to windward. DO NOT gybe the mainsail.
8. Prior to gybing the boat, gybe the genoa back to the leeward side.
    - WORKING SHEET eases (rather than casting off) the windward sheet while TAILER trims on new side.
    - Lower the topping lift while FOREDECK guides the spinnaker pole outboard end into the bow pulpit. Secure the topping lift at the base of the mast, make sure not to trap the windward sheet inside the halyard.
9. Gybe and follow steps 3-7 to go wing-on-wing on the opposite gybe.

CHAPTER 4
PREVENTATIVE MAINTENANCE AND REPAIRS

4-1 INTRODUCTION

This chapter contains the maintenance and repair procedures that can be accomplished by the crew while the boat is in their custody, in a remote port or underway. A tool kit, sail repair kit, electrical spares kit and engine spares kit are provided on each N 44. Prior to embarking, and every time an item of equipment is used it should be inspected for condition and operation, according to billet responsibilities.

4-2 CARE OF SAILS AND RIGGING

- Simple repairs can be accomplished onboard with the sail repair kit.
- A torn sail should not be hoisted, use the next best suitable alternate, i.e., use the #3 jib if the #1 genoa needs repair.
- Inspect for and tape (with white electrical tape) sharp objects on the boat that may cause chafe or rips, i.e. exposed cotter pins.

4-3 AUXILIARY DIESEL ENGINE

Inspections and corrective procedures on the following engine systems are to be performed according to the SOP checklists and equipment manuals. The recommended practices are designed to prolong equipment life and assist in the handling of same. The engine log checklist must be filled out to ensure all points of inspection are completed prior to starting.

- fuel system
- cooling system
- starter
- lubricating oil
- alternators
- refrigeration compressor

The Yanmar Diesel is a four cylinder directly injected naturally aspirated water-cooled four-cycle engine. A complete listing and description of the engine is in the Operation Manual.

NA 21-NA 25 have model 4JH4E.
NA 26-NA 36 have model 4JH4AE

Figure 4-1 Yanmar Engine

4-3.1 ENGINE START-UP TROUBLESHOOTING

The Yanmar engines are generally reliable, but there are a number of problems that can contribute to inability to start the engine that are covered in this chapter.

- If the engine does not start the first time, wait for about 15 seconds before trying again.
- ***Before turning the key switch/pushing start button again, be sure to confirm that the engine has stopped completely. If the engine is re-started while the engine still has not stopped, the pinion gear of the starter motor will be damaged. If several attempts fail, consider the following possibilities:***
  - **Excess back pressure caused by water in the muffler**
  - **Air in the fuel lines**
- Check oil pressure. Shut down engine if normal oil pressure (8-78 psi) does not show on gauge immediately after starting or if low oil pressure alarm sounds.
- If oil has just been changed, stop engine and check oil level in crankcase after allowing a few minutes for oil to drain back into the crankcase.
- Check that voltage meter reads 12-14 volts after batteries have been recharged. If voltmeter shows abnormal values, the engine should be stopped and the cause investigated.
- Never turn off battery switch with engine running as this will damage the alternator.
- Check engine operating temperatures periodically during operation. ***Do not rely totally on alarm systems – check gauges***.

WARNING: ***NEVER USE ETHER TO START THE ENGINE.***

NOTE: **The low oil pressure alarm will sound until the engine has started and oil pressure is established. The Racor alarm will sound briefly when ignition key is turned on.**

4-3.2 ENGINE ACCESS

Figure 4-2 Engine Cover Access Hatches

The engine is protected by a sturdy fiberglass cover, which has hinged inspection hatches for access to selected components. A normal engine inspection prior to getting underway requires complete removal of the cover. Close the companionway hatch before removal of the cover to prevent topside crew from falling into the engine. Remove the ladder and step and open all latches on the engine cover. The aft half must be removed before the forward portion due to the overlapped construction. Lift the starboard side of the cover enough to clear the floorboards, slide the entire aft half to starboard, then rotate it onto the aft floorboard. Rotate the forward cover onto the starboard, forward corner and tilt that direction to clear the alternator, then lift away from the forward half of the engine. The protruding box on the forward starboard corner seen in Figure 4-2 allows room for the house bank alternator. Take care to avoid damaging the insulation inside the cover. The insulation reduces noise and heat in the cabin.

Safe removal of the cover in a seaway requires two crew. Each half of the cover requires a large space away from the engine for stowing. Exercise caution in the handling of the forward half due to the stanchion rail protecting the galley.

To replace the cover, seat the forward cover onto the starboard, forward corner of the engine pan area, and lower at an angle to clear the alternator. Ensure sail ties are clear, and exercise caution so that the coolant expansion tank does not come dislodged. Position the aft cover to starboard 6-8” and slide it into place so it clears the Racor filter support. Tap the forward flange at the floorboard level with your toe to seat it inside the floorboards. Close all latches and replace the steps.

NOTE: Regular engine checks while underway should be performed when the boat is level and can be done through the inspection ports. Ensure Engine Ignition breaker is OFF to prevent accidental starting while conducting engine checks.

4-3.3 FUEL SYSTEM

All diesel fuel supplied to the engine is passed through a primary filter/water separator (Racor) and a secondary engine mounted filter, before reaching the injectors.

WARNING: ***WORK ON THE FUEL SYSTEM ONLY WHEN THE ENGINE IS COOL TO AVOID BURNS.***

4-3.3.1 PRIMARY FUEL FILTER – REMOVING WATER/DEBRIS AND REPLACING FILTER

The primary Racor filter/separator is mounted on the port bulkhead inside the engine compartment. The filter element should be replaced if fuel is visibly contaminated or known to be contaminated. Look for water or debris in the clear glass bowl on the bottom of the filter assembly. Remove water or debris, then replace filter. See Figure 4-3 Racor fuel filter.

Before starting this procedure, ensure that the following are on hand:

- RACOR replacement filter element, (from Yanmar repair kit, or see service manual for part number) and new gasket seal.

- Clean oil absorbent cloth.
- A spill container, (bucket or drip pan).
- A container with clean diesel fuel.
- An empty container to store contaminated fuel (empty drink container with screw top lid)
- Manual oil change pump with small hose, or empty spray bottle nozzle.

Figure 4-3 Primary (Racor) Fuel Filter

NOTE: ***Do not use Biobore /other fuel additives with the Yanmar engine.***
NOTE: Contaminated fuel removed from the system or used in the cleaning of fuel system components should be delivered to a contaminated fuel disposal station. Do not dump it at sea.

1. Place an oil absorbent cloth and/or drip pan under the filter to prevent fuel from getting into the bilge.
2. Unscrew the T-handle and set it aside, ensuring the orange O-ring for the T-handle is in place for reassembling.
3. To empty water from the fuel filter glass bowl, insert either the small hose from the manual oil change pump, or the “straw” (pick up tube) from a spray bottle nozzle into the bottom of the filter bowl where the water is visible. You may need to remove the filter first. Carefully pump or spray the water into an empty, sealable container for proper disposal ashore. Go to step 4 if replacing the filter, or step 5 if not.
4. To replace filter, remove the disposable filter by lifting, and place in a sealable container for proper disposal ashore. Remove any debris and leave the excess fuel in the filter housing. Insert a new filter cartridge and seat it carefully. Remove the gasket seal from the filter lid and replace with a new one. Apply a thin film of clean diesel fuel to the sealing surface of the new seal.
5. Carefully top up the filter bowl with clean fuel, to displace as much air as possible. Reseal by placing the filter top on the body and rotating the T-handle until hand tight (do not over tighten).
6. Clean the exterior of the assembly.
7. See “Bleeding the Fuel System” (4-3.3.3) to bleed the low-pressure side of the fuel system.
8. Start the engine and let run at a fast idle to ensure the positive fuel continues to flow.

Continue to check the RACOR filter for water or debris and remove, as necessary. If there is water in the fuel tank, remove the filler cap from the top of the tank and use the manual oil change pump to remove the water from the bottom of the tank.

4-3.3.2 SECONDARY FUEL FILTER REPLACEMENT

Before starting this procedure, ensure that the following are on hand:

Figure 4-4 Secondary Fuel Filter (top center)

- Replacement fuel filter (see service manual for part number) and new gasket seal.
- Open-end 12 mm wrench for NA 21-25, 10 mm wrench for NA 26-44.
- Clean lint-free rags.
- A spill container, (bucket).
- A container with clean diesel fuel.

The secondary filter is an engine mounted unit located on the uppermost starboard forward side of the engine (Figure 4-4). This filter removes any impurities which have bypassed the primary filter. Replace it when the primary fuel filter is replaced.

1. This filter is removed by unscrewing. If the filter cannot be turned by hand use a filter strap wrench.
2. Remove the filter element by lowering into the waste bucket which was placed under the filter. Discard the element and old gasket seal.
3. Clean the seating surfaces and visually inspect the housing. Apply a thin film of clean diesel fuel to

the sealing surface of the new seal and place on the new filter. Carefully fill the new filter with clean fuel, center in position and tighten hand tight. Clean the exterior of the filter assembly.

4. See “Bleeding the Fuel System” (4-3.3.3) procedures below Start the engine and let run at a fast idle to ensure the positive fuel continues to flow.

4-3.3.3 BLEEDING THE FUEL SYSTEM

When any component of the fuel system is opened to the atmosphere, it must be bled of any trapped air from the low-pressure side of the fuel system. The Yanmar engine has a low- and high-pressure side. The fuel injector pump delivers exact amounts of fuel to each cylinder as needed during compression which causes ignition. The injection pump has little or no maintenance which can be performed by the operator.

WARNING*: THE HIGH-PRESSURE SIDE OF THE FUEL SYSTEM IS 3000 PSI. DO NOT CRACK THE INJECTORS OR OTHERWISE ATTEMPT TO BLEED THE HIGH-PRESSURE SIDE OF THE ENGINE.*

CAUTION: ***Do not attempt to turn over engine without attaining ignition for more than 15 seconds at a time. If engine is cranked more than 15 seconds, close the seacock to avoid hydrolock in the muffler, then crank again to get air out. When engine starts, open seacock IMMEDIATELY.***

If the engine only idles or won't start after several attempts, there may be air in the fuel system. If air is in the fuel system, fuel cannot reach the fuel injection pump. Vent or “bleed” the air in the system according to the following procedures.

Figure 4-5 Air Vent Bolt for NA 21-25

Fuel System Air Venting Procedures for NA 21-25:

1. Ensure both the fuel supply and return valves at the tank are open.
2. Check the fuel level in the fuel tank. Replenish if insufficient.
3. Loosen the air vent bolt (Figure 4-5) on top of the secondary fuel filter by turning it 2 or 3 turns. Position an oil zorb below the filter to catch fuel.
4. Feed fuel with the fuel lift feed pump by moving the lever on the left side of the feed pump up and down.
5. Allow the fuel containing air bubbles to flow out from the air vent bolt holes. When the fuel coming out no longer contains bubbles, tighten the air vent bolt.
6. This completes the air venting of the fuel system. Try starting the engine again.
7. In subsequent engine operation after the start-up, the automatic air-venting device on the high-pressure side works to purge the air in the fuel system.

Fuel System Air Venting Procedures for NA 26-36: (self-bleeding system)

1. Ensure both the fuel supply and return valves at the tank are open.
2. Check the fuel level in the fuel tank. Replenish if insufficient.
3. Turn engine ignition key to “ON” position to activate electric fuel pump and hold for no more than 15 seconds at a time to bleed the engine. Wait one minute between attempts. After the second time turn to “START” position for C-type panel. For the C-35 engine panel, push the “START” button for a maximum of 15 seconds. If ignition not attained, stop and go to step 4.
4. If engine does not start, position an oil zorb or rag underneath the secondary filter, remove hose clamp and hose indicated by arrow, and turn engine ignition key to “ON” position for 15 seconds. You will be able to see the fuel coming out of the T-fitting on the filter lid where the hose was removed. Once the fuel runs free of bubbles, reinstall hose and clamp. Turn key to “ON” for 15

Figure 4-6 Secondary Fuel Filter NA 26-36

seconds, then to the “START” position, or push the start button (C35 panel) for a maximum of 15 seconds. Repeat this step if the engine doesn’t start.

5. Once ignition is attained, air venting of the fuel system is complete.

After start-up, the automatic air-venting device on the high-pressure side works to purge air in the fuel system. After the engine has started, check the following items at a low engine speed:

1. Check that the gauges and alarm devices on the instrument panel are normal.
2. Check for water, fuel or oil leakage from the engine.
3. Check that exhaust color, engine vibrations and sound are normal.
4. When there are no problems, keep the engine at low speed with the boat still stopped to send lubricating oil to all parts of the engine.
5. Check that sufficient cooling water is discharged from the seawater outlet pipe. Operation with inadequate seawater discharge will damage the impeller of the seawater pump. If seawater discharge is too small, stop the engine immediately. Identify the cause and repair.
   - Is the seacock open?
   - Is the inlet strainer on the hull bottom clogged?
   - Is the seawater suction hose broken, or is the hose sucking in air due to a loose connection?

The engine will seize if it is operated when cooling seawater discharge is inadequate or if load is applied without any warming up operation.

4-3.4 ENGINE EMERGENCY STOP

If the engine doesn’t stop by pushing and holding the black STOP button on the cockpit engine panel, check to ensure the key is in the “ON” position, or the power button is ON for C35 panel. The secondary method of stopping the engine should be the T-handle located next to the throttle. Pull up on the handle to stop the engine, push the handle back down after the engine stops. The last option is to use the emergency stop switch located on the starboard side of the engine. It is a red push button located at the aft end of the fuel pump. NEVER use the emergency stop switch for a normal engine shutdown.

5-4.5 ENGINE OIL AND FILTER

Engine oil level should be checked as specified in the SOP checklists and recorded in the maintenance log.

1. The engine should be as level as possible before checking the oil level to get an accurate reading.
2. Remove the dipstick and wipe with a clean cloth.
3. Fully reinsert the dipstick, remove and check the level. The oil level should be between the upper and lower marks on the dipstick.
4. If oil is low, check it a second time before filling. Fully reinsert the dipstick and wait 30-45 seconds before pulling out and checking.
5. Remove the yellow filler port cap at the top of the rocker arm cover and fill with Yanmar 15W-40 engine oil supplied with the boat.
6. Fill with oil to the upper limit on the dipstick. Insert the dipstick fully to check the level.
7. NEVER overfill the engine with oil. Full = 5.0 liters or 5.3 quarts
8. Tighten the filler port cap securely by hand.

Figure 4-7 Oil Filter Access

NOTE*: Do not overfill the oil.*

Regular PMS will be performed by maintenance personnel at prescribed time intervals (50 hours for the first change, every 250 hours thereafter). Oil and filter changes should only be performed underway if the system is contaminated. Before starting this procedure, ensure that the following are on hand:

- Oil filter wrench
- Clean lint-free rags
- Container for dirty oil

- Transfer pump
- Replacement oil filter
- Engine oil (do not mix different types or brands)
- Yanmar 15W-40 weight

NOTE: It is easiest and most effective to drain the engine lubricating oil after a few minutes of operation which warms the oil.

1. Remove the lubricating oil dipstick. Attach the oil drain pump to the top of the dipstick tube and pump out the oil. Beware of oil splashes if extracting the oil while it is hot.
2. For easier draining, remove the oil filler cap (yellow) at the top of the rocker arm cover.
3. Remove the lubricating oil filter with the filter detach/attach tool (Turn counterclockwise.)
4. Clean the filter installation face. Apply a thin film of oil to the new seal, seat on the filter and attach the new filter, tightening by hand until the seal touches.
5. Turn an additional 3/4 of a turn with the attachment tool. (Turn clockwise. Tightening torque: 20 - 24 Nm (177-212 lb-in).
6. Fill with new lubricating oil.
7. Perform a trial run and check for oil leaks.
8. Approximately 20 minutes after stopping the engine, remove the oil dipstick and check the oil level. Add oil if the level is too low.

Use only the oil filter specified in the service manual since the high pressure will damage or bypass other brands of filters. Refer to the service manual for the Yanmar filter number.

4-3.6 GEAR LUBRICATING OIL

Marine gear (transmission) oil is checked with the orange cap oil dipstick accessed through the aft engine box inspection hatch, on top of the transmission. The marine gear has a 1.1 Liter (2.3 pints) capacity (do not overfill), and uses Yanmar 30 weight oil.

To check oil:

1. Make sure engine is level.
2. Remove filler cap (dipstick is attached to bottom of cap) and wipe with clean cloth.
3. Re-insert dipstick, (do NOT screw cap back in) remove and check oil level. Oil level should be between upper and lower lines.
4. If oil is low, fill with marine gear lubricating oil, being careful not to overfill.

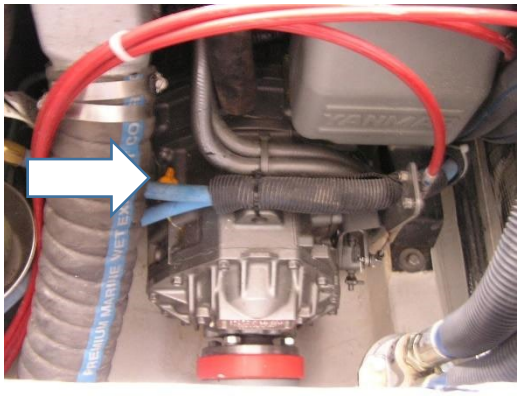


Figure 4-8 Marine Gear Oil Dipstick and Orange Filler Port Cap

Re-insert the dipstick fully and tighten the filler port cap securely by hand. Do not overtighten, it may break the cap.

4-3.7 COOLING SYSTEM

There are two cooling systems: freshwater (coolant/anti-freeze) and seawater (or raw water). The engine's combustion heat is cooled by the freshwater/coolant on a closed circuit. The freshwater is cooled by seawater using a heat exchanger. The seawater also cools the engine and gear oil.

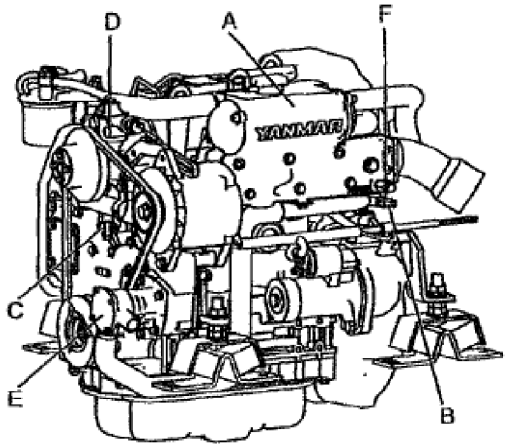
The engine has a captive anti-freeze/water internal cooling system. The coolant plumbing is run through a heat exchanger that uses raw sea water to cool the internal coolant.

Figure 4-9 Battery Charger, Seawater Strainer, and Engine Seawater Intake Seacock; *port locker aft of engine box*

4-3.7.1 SEA WATER COOLING SYSTEM

Maintenance items in this system are:

- Sea water strainer.
- Replacement of the pump impeller.



A Coolant tank
B Drain cock for seawater
C Drain cock for fresh water
D Fresh water pump
E Seawater pump
F Drain cock for fresh water

Figure 4-10 Engine Cooling System

4-3.7.1.1 CLEANING THE SEA WATER STRAINER

If there is debris in the strainer:

1. CLOSE the ENGINE SEAWATER INTAKE seacock.
2. Unscrew the top cover plate and remove.
3. Lift out the mesh strainer and clean as needed.
4. Clean the top access cover mating surfaces.
5. Insert strainer and ensure it is properly seated in détente.
6. Return top access cover to original position and hand tighten.
7. OPEN the Engine Seawater Intake seacock.

4-3.7.1.2 REPLACE SEA WATER PUMP IMPELLER

Before starting this procedure ensure that the following are on hand:

- Two blade type screwdrivers and wrench set.
- Replacement impeller: refer to Yanmar service manual.

1. Close the ENGINE SEAWATER INTAKE seacock.
2. The seawater pump is located on the forward, port lower corner of the engine outside of the drive belt cover (See Figure 4-10, item E).
3. The forward-facing plate secured with four bolts must be removed exposing the pump impeller.
4. Pull out the damaged impeller from the shaft, making sure all loose, damaged parts are removed. Loosen hose clamp and remove hose from bottom of impeller housing and tap to remove any impeller parts. Remove hose in the aft starboard part of the engine and flush with water. This will cycle water through the pump impeller. If impeller parts are unaccounted for, do not run engine until inspection is accomplished by a certified mechanic.
5. Submit maintenance chit upon return to home port if impeller is replaced underway.
6. Insert the new impeller onto the shaft, it may be placed with either side out.
7. Install cover plate, hand thread the four bolts and tighten down evenly for a snug fit.
8. Open the SEAWATER INTAKE seacock and check for leaks.
9. Operate the engine and observe the overboard discharge, and check for leaks at the impeller cover.

WARNING: ***IF NO OVERBOARD DISCHARGE IS SEEN SHUT DOWN THE ENGINE IMMEDIATELY.***

4-3.7.2 FRESHWATER COOLING SYSTEM

Yanmar brand pre-mixed coolant/anti-freeze is used for boil/freeze engine protection. Each N 44 should have a supply of red Yanmar UltraLife YG coolant on board.

NOTE: Do not mix coolant brands, and do not use green or yellow coolants in the engine, it may damage the engine.

4-3.7.2.1 ADDING COOLANT

Check the coolant level at the plastic recovery tank while the engine is cold.

WARNING: ***NEVER OPEN THE EXPANSION TANK WHEN ENGINE IS HOT. THERE IS DANGER OF BURNS FROM ESCAPING STEAM. FILL ONLY WHEN SYSTEM IS COOL.***

WARNING: ***IF THE FILLER CAP IS LOOSE, STEAM AND HOT WATER WILL ESCAPE WHICH MAY CAUSE BURNS.***

If level is close to the lower limit mark:

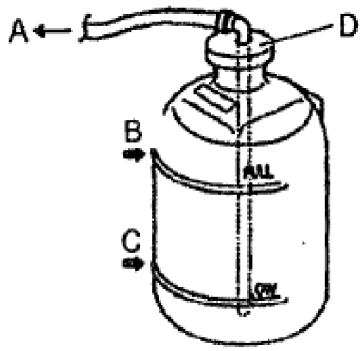
1. Remove the engine cover and open the coolant tank fill cap on top of the engine.
2. Fill the tank with coolant.
3. Close the cap on the coolant tank and make sure the hose between the coolant tank and the recovery tank is properly connected.

If the fluid level is below the “low” level.

1. Check the bilge for coolant leaks.
2. Check to see if hoses are attached properly, reattach if necessary.

Report to Skipper/Coach or Cutter Shed if based at USNA or upon return to USNA.

Figure 4-11 Coolant Recovery Tank



A To fresh water cooler C Lower limit
B Upper limit D Cap

When coolant leak has been found and fixed, follow the steps below to refill:

1. Remove the filler cap of the engine coolant tank.
2. Pour coolant slowly into the tank so that air bubbles do not develop. Pour until the coolant overflows from the filler port into the recovery tank.
3. After supplying coolant, replace the filler cap and tighten it firmly. Failure to do so will cause water leakage. To replace the cap, align the tabs on the bottom of the cap with the notches on the filler port, push down and turn clockwise 1/3 of a turn.
4. Remove the coolant recovery tank cap and fill with coolant if needed.
5. Replace the cap. The coolant recovery tank capacity is 0.8 L(1.7 pints}
6. Check the rubber hose connecting the coolant recovery tank to the freshwater cooler. Be sure the hose is securely connected and there is no looseness or damage. When the hose is not watertight, an excessive amount of cooling water will be used.

4-3.8 ALTERNATORS

The engine has two alternators, an engine start and a house bank, located on opposite sides of the engine. The engine start alternator is mounted on the port outboard side of the engine. The house bank alternator is located on the starboard lower corner of the engine. The house bank alternator extends into the attached “box” on the forward starboard corner of the cover. This alternator supplies 100 amps to charge the house bank of batteries. There is a breaker for the 100-amp alternator located inside the engine box, (front half of box must be removed to access) mounted in the forward starboard corner of the engine pan. Check this breaker if the house batteries are not charging.

Figure 4-12 100-amp Alternator Breaker

4-3.8.1 CHECKING DRIVE BELT TENSION

The Yanmar engine in the N 44 has two drive belts. The belt on the port side drives the engine start alternator and the impeller pump. The belt on the starboard side drives the house bank 100-amp alternator. Both are powered by the crankshaft. Checking the belt tension for proper deflection on either alternator is done along the longest unsupported belt length. Drive belts should have no more than 3/8” for a new belt and 3/8 to 1/2-inch of play for an older belt.

4-3.8.2 ADJUSTING THE DRIVE BELTS

Before starting this procedure ensure that the following are on hand:

- Appropriate size wrenches.
- Pry bar.
- Replacement drive belts. **Drive Belt sizes may not be substituted.**

1. Shutdown the engine.
2. Loosen the bolt on the adjustable bracket and tension the belt for proper deflection by prying the alternator outward and retighten the securing bolt. Repeat the procedure for the alternator on the opposite side if needed.
3. Start the engine to insure proper function.

4-3.8.3 HOUSE ALTERNATOR DRIVE BELT REPLACEMENT

1. Loosen the adjustment bolt and slide the alternator inboard and remove the defective belt and replace with new belt (unless engine belt needs replacing too).
2. DO NOT replace the house alternator drive belt at this time if the engine start alternator belt must also be replaced. ***The engine drive shaft has a double pulley mounted on it. The drive belt for the house alternator traps the belt for the engine start alternator.***

4-3.8.4 ENGINE ALTERNATOR DRIVE BELT REPLACEMENT

1. Close the sea water intake through hull seacock.
2. Disconnect the raw water pump inlet hose, placing the hose in an upward position to minimize spillage of raw water.
3. Remove the house belt from the pulley to allow access to the engine belt
4. Loosen the engine start alternator to remove the defective belt.
5. Replace the ES drive belt.
6. Now replace the house drive belt.
7. Reconnect water pump inlet hose.
8. Pull/pry the house bank alternator outward to exert tension on the belt.
9. Maintain pressure on the alternator and tighten the lower sliding bracket bolt and the top mounting bracket.
10. Check the belt tension and readjust as necessary.
11. Repeat the procedure for the engine start alternator.
12. Open the sea water intake through hull seacock.

Complete safety checks and start the engine. After the engine is started, check for discharged seawater (**if none is visible, stop the engine immediately**). Observe the engine while running to insure proper operation. Stop the engine after a few minutes of running and recheck tension on both belts.

4-3.9 BATTERY CHARGING PROBLEMS

If the house batteries are not charged after running the engine for 1-1.25 hours (1.5 hrs if refrigerator breaker is ON) while underway, check the following:

1. The engine should be running at a minimum of 1500 rpms during charging, either in or out of gear. Select LED readouts so they match pre-printed labels (House on the left, Engine on the right). Battery monitor on DC panel should read between 13.1 to 14.7 volts while charging.
2. If the house or engine alternators are not charging the batteries:
   a) Check the house alternator breaker located inside the forward, starboard corner of the engine box for house batteries, reset if needed.
   b) For engine alternator, check the breaker located next to the engine battery under the floorboard just forward of the engine box, reset if needed.
   WARNING: *only reset either of the breakers once, do not reset a second time if it trips again.*
   c) Check belt tension. See sections above if the belt needs to be tightened or replaced.
   d) If the above steps don't work, utilize the alternator parallel switch to charge both battery banks, and inform the OTC during your next SITREP.

4-3.10 STARTER

The starter is mounted on the PORT side of the engine. The operator can do very little maintenance. Refer all problems to an experienced service person. **While inspecting the starter ensure the engine cannot be started by turning the Engine Ignition breaker on the DC panel OFF.**

4-3.11 THROTTLE

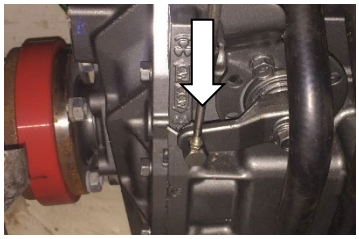


Figure 4-13 Engine Throttle Shift Lever

If the throttle is left in gear, in reverse, when the engine is turned off, it can sometimes become difficult to get the throttle into the neutral position that is required in order to start the engine. When this happens, adjust the shift lever (Figure 4-13) on the starboard side of the engine where the throttle cable attaches, to get the transmission back into neutral. The lever must be in a horizontal position to start the engine. Move it into position by hand or **very gently** tap gently with a rubber mallet.

Figure 4-14 Throttle Cable Bracket

Another area to check is the forward end of the throttle cable. There is a bracket (Figure 4-14) that holds it in place, and occasionally the top nut loosens, and the cable slides fore and aft.

4-3.12 ENGINE BLOWER FAILURE

In the event of an engine blower failure, the faulty blower can be exchanged with the bilge blower. The engine blower is located in the wet locker bench seat to port of the companionway stairs. It is contained in the two boxes built into the interior of the seat. To access and replace the pump;

1. Secure the engine blower and bilge blower breakers on the DC panel.
2. Remove the top of the box section that is inboard, then forward side
3. Remove the top of the box section that in the aft part of the seat, then the forward side.
4. There are two screws that hold the blower in place, one on the top and one on the bottom, remove these.
5. Remove the hose clamp that holds the pump to the exhaust hose.
6. Unplug the bullet connectors or cut if butt connectors.
7. Install bilge blower, ensuring that the molded arrow on the blower is pointing to the port side of the boat, so that air is blowing out of the engine compartment.

CAUTION*: Care must be exercised when operating the propane stove/oven without the bilge blower.*

4-4 TANK TENDER GAUGE OVERFILL CORRECTION PROCEDURE

Occasionally, after filling a tank, the additional head from the fill pipe will force liquid up into the small diameter clear plastic tube attached to the tank, causing an unusually high reading. Should this be the case, pump very slowly to force liquid out of the tube and thus obtain an accurate reading.

NOTE: ***If fluid exists above the top of the tank (i.e., in the deck fill pipe) the gauge needle will charge up. Should you observe this, release the push button and use enough water or fuel to empty the fill pipe before testing again. Do not operate the tank tender with the deck fill pipe full*.**

4-5 PROPANE ALARM

In the event the propane alarm sounds, immediately close the valve on the propane tank. Once the burner goes out, turn off the propane control switch and the stove burners. Investigate for propane leaks. Propane leaks can be determined by a sulfur smell. Propane is heavier than air, so lift the floorboards and sniff close to the bilge. Test for leaks using soapy water at fittings (look for bubbles to indicate a leak). If the tank was recently switched, ensure the fitting is properly seated and tightened (do not overtighten). If source of propane leak cannot be determined, disconnect tanks and discontinue use of stove until repairs can be made ashore.

The propane alarm is very sensitive and will activate if any strong fumes or spray are in the vicinity. Do not use spray suntan lotion, strong smelling hand sanitizer, WD-40 or cooking spray in the galley area.

Silence the alarm by pressing the check/test button on the propane alarm, once you determine it is not a

WARNING: ***Assume the alarm is a valid propane alarm until investigated. Immediately ensure the propane tank valves are closed.***

propane leak. Fan the area of the propane sensor, located at base of stove. The alarm may come back on if not properly ventilated. Continue to ventilate the area until the alarm clears.

If attempts to clear the alarm are unsuccessful, the alarm can be disconnected by disconnecting the right hand most connector on the 24-hour essential circuit module in the house battery box. The stove can still be operated, but exercise extreme caution in doing so, as there is increased risk of not being able to detect an actual propane leak. Ensure bilge blower is used when stove/oven are operated. Communicate your plan to the OTC.

CAUTION: Operating the stove/oven with the propane alarm <u>disconnected</u> must be done with caution. Remain vigilant about the smell of propane inside the boat and use the bilge blower whenever the stove is used.

4-6 CLEARING A SINK CLOG

The check valves that were previously installed in the galley sink drain hose have been removed, to eliminate the frequent problem of sink clogs. The check valves prevented water from coming into the boat in adverse conditions. Should heavy seas cause sea water to surge into the sinks, the through hull should be closed when not in use. It is still possible to form a clog if excessive grease and food are poured down the drain, but far less likely. Best practice is to scrape all food waste off dishes and pots prior to washing, and do NOT pour grease down the sink. If a clog does develop, bail all standing water out of the sink into a bucket and empty overboard. Pour boiling water mixed with some dish soap down the drain. If that is unsuccessful, use a straightened wire coat hanger down the starboard sink drain to try and push the clog through.

4-7 HEAD REPAIR

If you don't want to fix the head at sea, DO NOT put anything other than marine grade toilet paper and human waste into the head. Baby wipes, paper towels, and feminine products should go in a trash bag that you place in the head area. The two areas that typically jam are at the joker valve at the base of the head, and the Y-valve under the sink. They should be taken apart in that order. Use Personal Protective Equipment (PPE) to prevent infection. Latex gloves are in the first aid kit, Tyvek suits and protective eyewear is in the head cabinet.

4-8 FRESH WATER SYSTEM

For foot pump problems in galley or head, check to ensure that water supply valve is open, and that there is water in the day tank. For the pressure system, if not working, ensure both the faucet valve and the toggle button on the faucet head/handle are open. If water is still not working, check the hose underneath the sink doesn't have a kink in it. If no water in the head sink, ensure the ball valve underneath the head sink, inside the cabinet, in line with the faucet fitting, is open. <u>If you are unable to pressurize the freshwater system, ensure all faucet valves are shut to prevent sucking air into the system</u>.

4-9 DECK CHECKS

The assigned First LT should conduct daily deck checks on all topside equipment. Items that should be checked are as follows:

- Ensure winch top retaining rings are finger tight.
- Ensure deck shackle keys are tight, and the spinnaker spreacher block and mainsail bale blocks are secured with seizing wire.
- Visually check rigging for missing cotter pins. Tape any sharp edges.
- Check lifeline attachment point are secured with cotter pins and taped.
- Check halyards are not frayed.
- Check all mechanical attachments at deck level are secure (nuts on gooseneck and vang attachments, ring dings and shackle keys.)

- Ensure safety equipment is properly stowed; lines faked into heaving line and Lifesling bags, strobe lights are operational, and stowed bulb down.
- Sails are not torn.

4-10 CHANGING LIGHTBULBS ON THE MAST

There are four light bulbs on the mast. Mid-mast are the foredeck light and steaming light in a combination fitting, and at the top are the anchor and tri-color lights in a combination fitting. See BIB Table 1-5 replacement bulb specifications.

4-10.1 FOREDECK LIGHT

To change the foredeck light, remove the retaining ring by twisting gently and pulling down. It has a notched slot in the fixture, it is not threaded. The light has two prongs that plug into the plastic plug receptacle. Replace the bulb, push back up into the fitting, and reinstall the retaining ring. See Figure 4-15.

4-10.2 STEAMING LIGHT

The cover for the steaming light also has a notched slot, there is no retaining ring, the whole cover comes off by twisting gently and pulling off. Be careful not to drop the black gasket. The bulb is held in place by the metal retainer at the top of the fitting. When replacing the cover, ensure the foil covered side faces the mast. See Figure 4-16 and Figure 4-17.

4-10.3 MASTHEAD LIGHTS

The anchor and tricolor lights are located at the top of the mast, and are stacked one on top of the other, with a single light cover. There are two separate bulbs, one for each light. The cover is held on by a retaining ring, that fits into a notched slot (not threaded) and can be removed with a slight turn. There is a split ring just below the retaining ring. The base of the bulb has two protrusions, one high and one low on either side. These fit into corresponding notches on the light receptacle and are spring loaded. Insert the bulb, twist slightly and release. Reinstall light cover, ensuring that the red/green lenses are facing forward. See Figure 4-18.

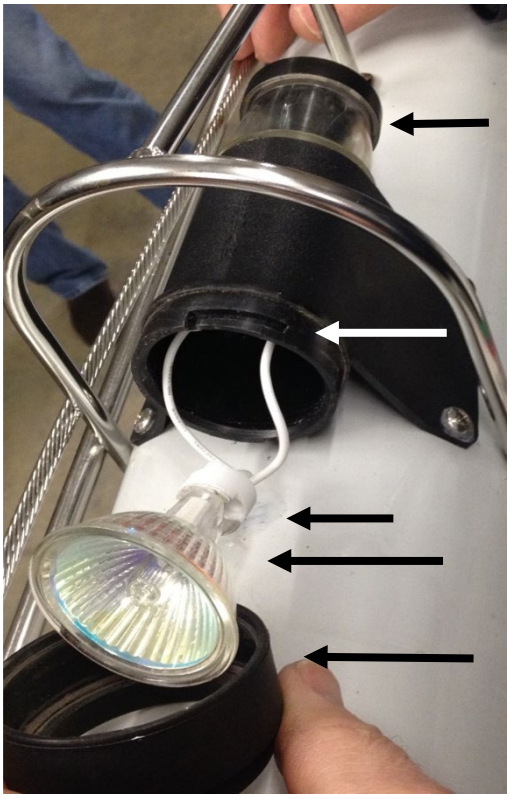


Figure 4-15 Foredeck and Steaming Light

Steaming light cover, whole cover twists off, no retaining ring.

Notched slot for foredeck light retaining ring

Bulb attached via a two-prong attachment, pull gently between bulb and plastic plug receptacle to remove.

Foredeck light bulb

Retaining ring for foredeck light

Figure 4-16 Steaming Light Bulb Placement

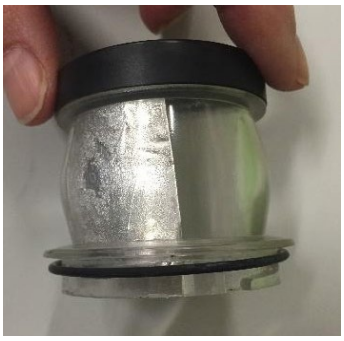


Figure 4-17 Steaming Light Lens Cover

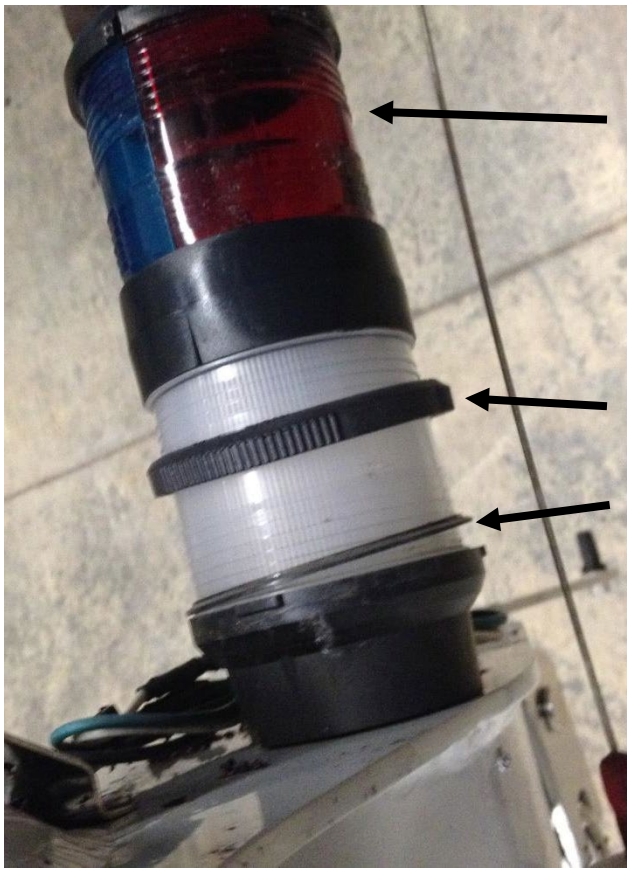


Figure 4-18 Masthead light cover

Masthead light cover (single unit)

Retaining ring (notched, not threaded)

Split ring.

4-11 RIGGING EMERGENCY MASTHEAD NAVIGATION LIGHT

In the event of a power failure, there is alternate, short term solution to provide power to the tricolor light. The electrical spares kit has two 6volt batteries, which can be connected to provide a 12V battery.

1. Connect positive and negative terminals of two 6V batteries using a short wire with connectors from the spares kit to get a 12V power source. See Figure 4-19.
2. Cut two 1-foot pieces of wire from spare wire provided.
3. Strip the plastic off approximately ½" of both end of each piece of wire, using the wire strippers in the tool kit, and twist exposed strands together.
4. Remove screw from "COMMON", wrap wire around it and re-install screw. (black wire in junction box)
5. Attach other end of wire to the negative terminal on the 6V battery (ground).

Figure 4-19 6V Batteries in Series

6. Remove screw from "TRICOLOR", wrap wire from second piece around it and re-install screw. (White or green wire in junction box, should be inboard, top row).
7. Attach other end of wire to the positive terminal on the 6V battery (hot).
8. Set batteries in a waterproof container in the bilge below the junction box and secure in place.

NOTE: ***Check that wires are attached to studs coming from the mast, not going to the switchboard. Trace wires from the base of the mast to verify. Verify that Tricolor is operational, you may need to try the other three studs to locate the Tricolor light.***
CAUTION: ***This battery solution has a very short lifespan. This fix is intended to be used to transit to the closest contingency port to effect repairs. Travel with a buddy boat and use the light only when in the vicinity of other vessel traffic. The spotlight can be used to alert other vessels to your presence by shining the light briefly on the mainsail, while issuing a Sécurité call***

Figure 4-20 Emergency Light Setup

4-12 AIS/VHF RADIO ANTENNA SPLITTER

The N 44 is equipped with a Vesper Marine antenna splitter. It may be necessary to troubleshoot this system or disconnect the AIS in order to receive radio transmissions. The splitter is located behind the breaker panel.

Indicators:
• Green power indicator. The splitter must have power for the AIS to work.
• Amber VHF TX is illuminated whenever the VHF radio is transmitting.
• Amber AIS TX is illuminated briefly whenever the AIS transponder is transmitting.
• Red "Check Ant" indicates an antenna problem such as a short or open circuit. This indicator will light only when the VHF is transmitting on high power. You can check your installation by switching to high power and pressing the talk button. Although this indicates a potential antenna problem, it is only an indicator and does not affect the splitter's functions.

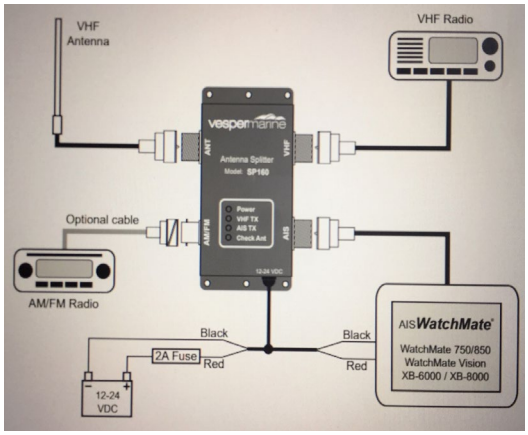


Figure 4-21 AIS/VHF Antenna Splitter

CHAPTER FIVE
EMERGENCIES AND DAMAGE CONTROL

5-1 INTRODUCTION

A ship that goes to sea is traveling into harm's way. While we train how to use our vessel in a safe manner to accomplish the mission and through good, thorough planning achieve success, there will come a time that even though not intended, events will occur that put us in extremis. In an emergency, a good team with sound judgment, logical thinking, determined effort, and a good plan, can minimize problems and prevent total disaster. The procedures contained in this chapter are the result of knowledge gained from situations that have occurred and the methods determined to best deal with them. **See the SOP Chapter 8** for all general emergency procedures. N 44 specific information is contained in this chapter.

5-2 DAMAGE CONTROL EQUIPMENT

Each N 44 is provided with a Damage Control (DC) Kit and sufficient tools, supplies and equipment for use in emergency situations. The DC Kit is stowed in the forward port locker in a water-resistant orange box.

Soft, wood tapered DC plugs should be tied next to each through-hull fitting. They should be inserted in the fitting and fit with a hammer if the through-hull breaks. There are additional plugs in the DC Kit.

An emergency running light and electrical spares kit is located in the port forward locker. The kit contains two six-volt batteries, spare navigation light bulbs, and fuses, along with approximately 20 feet of #8 wire. To create a 12-volt power source, connect the two 6-volt batteries together in series (plus to minus) then connect the pair to the tri-color mast wires at the junction box for emergency running lights.

The sail repair kit is in the port forward locker.

Other equipment and materials on board the boat may be re-purposed in an emergency. The storm jib can be draped over a hole in the bottom of the boat to slow down water ingress. Tie lines on the corners and slide across the hull from the bow, pull tightly and tie to the toe rail. Water pressure from the outside will slow water flow into the boat, The Galerider drogue can be used to recover an injured or hypothermic crew overboard. Tie a halyard onto the drogue, lower it overboard and maneuver the person into the drogue and raise the halyard. Bunk cushions and floorboards can be used from the inside to jam into a hole in the hull. Use the floorboard (or spinnaker pole) to wedge the cushion in by placing it horizontally against the cabin ceiling and wedge it into a secure position.

5-3 CREW OVERBOARD (COB) RECOVERY EQUIPMENT

In the event that a person does become separated from the boat, every effort must be made to get the victim back aboard in the absolute minimum amount of time to prevent hypothermia and shock.

Crew overboard recovery equipment onboard the N 44 includes:

- Lifesling - tied to the boat and equipped with an automatically activated strobe light.
- Heaving line - made of polypropylene line that floats on top of the water and can be used to pull a person closer to the STC, shall be kept within reach of helmsman.
- Horseshoe buoy attached to an automatically activated strobe light and a 6' pole flying the Oscar flag, which should NOT be tied to the boat. This may be a self-inflating Man Overboard Module (MOM) on some racing boats.
- Type I PFD – shall be kept within easy reach of the helmsman while underway, to be thrown to the victim immediately upon hearing the "Man Overboard" call.
- Galerider Drogue – can be used to recover injured personnel. Attach jib halyard, lower basket, position person in basket and hoist aboard.

5-4 ALARMS AND EMERGENCY PROCEDURES

There are several audible alarms on the N 44 listed in order of severity. Determine which alarm is sounding and proceed with emergency procedures as listed below or in the SOP Chapter 8, General Emergency Bill:

- HIGH WATER BILGE ALARM. Audible and visual alarms indicate high water in the bilge and a possible flooding problem.
- SEA-FIRE ENGINE FIRE EXTINGUISHER ALARM. This alarm will sound when the inert gas fire extinguisher alarm is activated in the engine box.

- PROPANE ALARM. This alarm will sound when there is a propane leak or other fumes are detected in the vicinity of the stove.
- ENGINE HIGH TEMPERATURE ALARM. A high-pitched whistle alarm in the cockpit engine panel indicates a possible engine cooling system problem.
- ENGINE LOW OIL PRESSURE ALARM. The same high-pitched whistle indicates a possible engine oil starvation problem. When the alarm sounds, immediately check the engine panel in the cockpit to determine if low oil pressure or high engine temperature activated the alarm.
- ENGINE WATER IN FUEL FILTER (RACOR) ALARM. A high-pitched whistle may indicate water in the fuel filter. Check the engine panel in the cockpit and the gauge down below aft of the engine box to determine if it is source of alarm.

5-4.1 FLOODING and the HIGH-WATER BILGE ALARM

The electric bilge pump is located at the top of the keel sump area, on the centerline of the boat, directly beneath the inspection port on the floorboard between the galley and nav station. Bilge water will accumulate in the turn of the leeward section of the bilge (not the sump area) when the boat is heeled over, therefore a regular inspection of the bilge for high water should be conducted and logged as indicated in standing orders. The ALARM will be an indication of severe flooding if the boat has been heeled over. Lift the floorboard next to the galley sink and check the water level. The high-water float is located on the aft face of the bilge cavity near the top. Water will be up to that level to trigger the alarm.

Turn ON the electric BILGE PUMP on the electrical panel and man the manual bilge pumps in the cabin and cockpit. The pump handle for the cabin is on the forward face of the wet locker bulkhead behind the nav station, between the anti-siphoning loop. The cockpit pump handle is located in the port-side line locker.

5-4.2 SEA FIRE ENGINE FIRE EXTINGUISHER ALARM

The Sea Fire engine box fire extinguisher has a discharge alarm unit mounted in the navigation station, below the AC distribution panel. It will provide visual and audible warning of system discharge. See SOP Chapter 8 for fire-fighting procedures.

5-4.3 PROPANE ALARM

The propane sensor is located in the galley, on the cabinet just below the stove. The sensor is very sensitive and will sound if any type of aerosol sprays are used in the galley area. If a propane leak is suspected, do not use the stove/oven. See BIB, Chapter 4 for instructions on troubleshooting a propane leak, or disconnecting the alarm if the problem is other than propane.

5-4.4 ENGINE HIGH TEMPERATURE ALARM

If the alarm sounds, check the engine panel in the cockpit to determine whether the problem is high engine temperature or low oil pressure. If high temperature is the problem, the most probable causes are loss of sea water cooling, loss of fresh water (coolant) engine cooling or a damaged impeller.

1. Check to see if water is coming out of the exhaust in the transom, if not:
   - Secure the engine by pushing the engine stop button on the engine panel in the cockpit.
   - Check that the raw (sea) water inlet seacock in the port locker behind the engine box is OPEN. Open it if closed and restart the engine, see if water discharges.
2. Inspect the raw water strainer near the raw water intake seacock. If clogged, secure the engine, and close the raw water inlet seacock. Open the strainer, remove the basket, clean and replace it. Open the raw water seacock and restart the engine, see if water discharges.
3. Open engine compartment access. Check for water in the engine bilge. TASTE the WATER.
   - If the water tastes “salty”, a leak in the raw water-cooling system is possible. Check the hoses in this system for integrity and tighten clamps. Restart the engine and see if water discharges over the transom.
4. If there is still no discharge over the transom, the water pump impeller could be defective. See Chapter 4. Replace raw water pump impeller.
5. If the water is NOT salty, a loss of anti-freeze/water fluids is possible. Check fluid level in the overflow tank located on the engine compartment. If it is below the “low” level, check that filler caps

on the recovery tank and coolant tank were properly closed, check hoses and tighten clamps in this system.

6. If it is necessary to replace coolant in the coolant tank (heat exchanger), place a rag or the "HOT MITT" from the galley over the freshwater filler cap. SLOWLY, crack the filler cap to allow steam to escape. LOOK to see that there is coolant visible in the top of the tank and refill per instructions in the Yanmar manual.
7. If freshwater system integrity check is ok, disassemble and inspect the water pump impeller. If defective, replace impeller. If pieces have broken off the impeller, make sure you retrieve all pieces prior to restarting engine. If you can't locate all pieces, do NOT restart the engine.
8. RESTART engine.

WARNING: ***OPENING THE CAPTIVE COOLANT TANK WHEN THE ENGINE IS HOT CAN RESULT IN SEVERE BURNS TO THE OPERATOR. BEWARE OF HOT ENGINE SURFACES AND OTHER HOT ENGINE LIQUIDS IN THE EVENT OF ENGINE HIGH TEMPERATURE WARNING.***

5-4.5 ENGINE LOW OIL PRESSURE ALARM

1. If the alarm sounds, check oil pressure on the oil pressure gauge on the cockpit engine instrument panel before shutting the engine down. The alarm will sound when the threshold pressure of 15 psi is not achieved.
2. Ensure that oil filler cap is in place.
3. Ensure that oil dip stick is in place.
4. If there is oil in the bilge:
   - CLEAN OIL from bilge.
   - INSPECT for loose hose clamp and/or ruptured hose. Tighten clamp and/or replace hose.
   - INSPECT oil filter for signs of leakage. Tighten if loose.
5. Check oil level. If low, refill, then recheck oil level and continue until dip stick reads "FULL".
6. RESTART engine.

5-4.6 RACOR CONTAMINATION ALARM

A visual inspection during engine checks will indicate if there is water or solid material contamination in the fuel at the RACOR filter. An alarm will sound if water or contamination builds up during operation. Follow the procedures in Chapter 4 for primary fuel filter/separator cleaning and/or replacement. If water or contamination is found, it is advisable to change the secondary filter. The low pressure side of the engine will need to be bled after opening the fuel system. If bad fuel is suspected, the filters will likely need replacing again. DO NOT use any type of fuel additives unless clearance is obtained from SCRD maintenance or an authorized Yanmar marine dealer.

5-5 LOSS OF STEERING

When the boat fails to respond to the wheel, balance the sails to keep the boat on a steady heading. This will facilitate the procedures to diagnose the problem. Install the emergency tiller if the problem is with the wheel or cables. The Galerider drogue may be used for emergency steering if the rudder is lost. See BIB Chapter 8 for rigging the Galerider and SOP Chapter 8 for additional procedures for lost rudder.

5-5.1 WHEEL DETACHES

If the wheel detaches from the wheel shaft, a metal key may also fall out. To reinstall the wheel, the key must be found and inserted in the matching keyway on the wheel hub. The retaining nut should be reinserted with Loc-Tite.

5-5.2 EMERGENCY TILLER INSTALLATION

1. Remove cover over the rudder post using a winch handle.
2. Remove the emergency tiller from its stowage position in the port sheet locker and install on the rudder stock so that the tiller is pointed laterally parallel to the wheel.
3. Ensure that the tiller is fully seated on rudder post and that the retaining device is secured.
4. Steer with the emergency tiller. Lines led to winches may be required.

NOTE: Weigh the merits of releasing/cutting the wire rope leading to the radial chain drive and removing the wheel. Do this only if the cable is jamming the movement of the rudder or the wheel makes it difficult to steer the N 44.

5-6 LOSS OF ALL ELECTRICAL POWER

1. Check the rotary battery switches for the engine and house banks to ensure they have not been inadvertently shut off. If they are off, turn them on.
2. Check the batteries for proper storage, charge, connections, and a proper grounding. Turn battery switches off, clean terminals as needed, try power again.
3. Cut off power at each individual circuit breaker on the switchboard panel.
4. Selectively, turn on individual circuit breakers until the circuit causing the electrical problem is located.
5. Cut off power to that circuit.

CHAPTER 6
SPECIAL OPERATIONS

6-1 INTRODUCTION

The N 44 is designed for night operations, heavy weather, restricted visibility, and offshore passages. Prior to operating in these conditions, the crew should familiarize themselves with the DC ELECTRICAL DISTRIBUTION PANEL; the physical location of the switches for RUNNING LIGHTS, navigation lights, tri-color light, compass light, cabin lights, foredeck light, DC outlets, safety gear and flashlight stowage locations.

6-2 NIGHT AND RESTRICTED VISIBILITY OPERATIONS

RUNNING LIGHTS. There are two sets of navigation lights.

- The NAVIGATION LIGHTS set includes the bi-color combination light located on the bow pulpit and the stern light located on the radar post.
  - Select NAVIGATION and STEAMING lights when motoring or motor-sailing.
- The TRICOLOR set is the tri-color light located at the masthead.
  - Select TRICOLOR when sailing.

NOTE: *COLREGS require either the high or low running lights for night or reduced visibility, but state that both may not be used at the same time.*

The STEAMING LIGHT on the mast is required by COLREGS to be shown with the NAVIGATION LIGHTS when operating the engine for propulsion.

The ANCHOR LIGHT is located immediately under the TRICOLOR light at the masthead. It is a white light visible through 360 degrees and must be displayed when at anchor.

The FOREDECK LIGHT is the lower of two lights housed in the same unit as the STEAMING LIGHT. It illuminates the deck.

The COMPASS LIGHT is mounted in the binnacle to illuminate the compass.

The SAILING INSTRUMENTS, SSB and VHF RADIOS and NAVNET (radar/GPS/weather fax) switches are on the forward (right-hand) column.

COLREGS requires use of sound signals and radar in restricted visibility. See SOP Chapter 8 for restricted visibility procedures.

Figure 6-1 DC Distribution Panel - Center Column

6-3 HEAVY WEATHER OPERATIONS

Awareness of changing weather conditions is imperative for timely sail changes to ensure the vessel is manageable. The time to change a sail or take a reef is the first time the thought occurs. Prudence is required for all heavy weather operations. The urgency of the mission must be considered. If there is no urgency to conduct the sortie, prudence would dictate that the vessel remain in port. Once committed to the sea, the decision to seek the safe haven of a secure port must be weighed against the hazards of making a landfall in adverse weather. Once committed to the sea, employment of the following procedures and SOP Chapter 8 will help to ensure a safe passage for the crew as well as the boat.

6-3.1 INSTALLING JACKLINES

Twenty-four hours before departure, place each jackline in a bucket full of water and soak them overnight. This will make the webbing more pliable and allow it to be stretched easier. When they dry out after installation, they will become even tighter. It is important to get the jacklines as tight as possible as this will give you more stability when hooked in and walking fore and aft on the deck, creating a tripod effect.

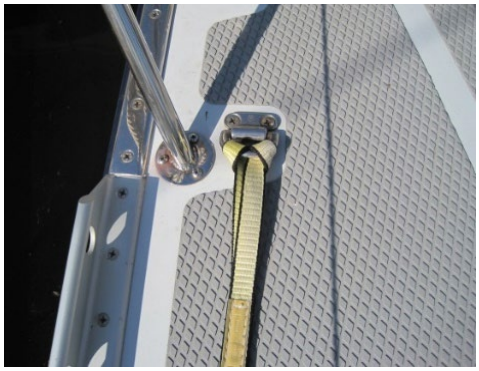


Figure 6-2 Jackline Installation Forward

Take the jackstay loop (without the pennant) forward to the large padeye aft of the bow pulpit and attach with a Cow Hitch (Figure 6-2). Put the loop through the pad eye and slip the long part of the jackline through the loop, pull on the webbing to make the hitch as tight as possible. Rig on both sides of the boat.

Lead the jacklines aft along the edge of the cabin (inside the shrouds) and on top of everything on side decks port and starboard, except for the part of the foreguy that runs from the end of the spinnaker pole to the deck block. Rig the jacklines before any sheets are rigged. Pull them tight by hand and then twist them about eight to ten times. The twists will keep them from lying flat against the deck, making it easier to clip onto.

Put the handle end of a small screwdriver through the aft loop, this will make it easier to lace the pennant through the loop. See Figure 6-3. Run the bitter end of the running backstay pennant through the jackline pad eye and then tie a bowline around the loop in the jackline. Run the running backstay pennant around the primary winch and tension with a winch handle until the jackline is taut (within approximately 4 inches of the padeye). See Figure 6-4.

Lace the white jackline pennant through the pad eye and the jackline loop four times, pulling each loop tight. At the pad eye tie three half-hitches around the standing part of the pennant. Tuck in the remaining tail. Finally remove the running backstay pennant and screwdriver.

Figure 6-3 Use of Screwdriver Handle to Secure Pennant through Jackline Loop Aft

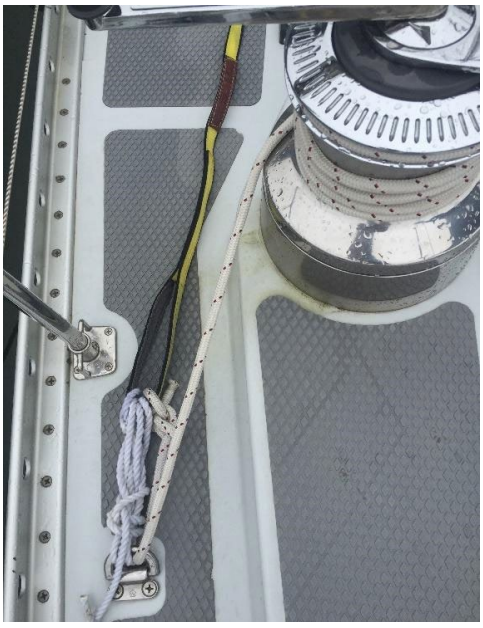


Figure 6-4 Tensioning the Jacklines

6-3.2 STORM SAILS

The N 44 is a sailboat designed to sail. The stability of the boat under sail, even in heavy weather, is preferred to that of proceeding under engine alone.

General Situation: high winds and heavy seas.

Safety Considerations:

1. Safety harnesses are required.
2. DO NOT rig the inner forestay without rigging running backstays.
3. There will be enormous forces acting on the rig during conditions when these sails will be rigged.
4. Ensure the tackline of the storm trysail is secured to the padeye on the mast, port side, to prevent the sail from being hoisted off the luff track.
5. Once the mainsail is lowered, ensure positive control of the boom is maintained at all times.
6. Exercise extreme care when transferring the halyard from the mainsail to the trysail.

6-3.2.1 BENDING-ON THE STORM JIB

NOTE: *The spinnaker topping lift, (T-Lift), is used as the halyard for the storm jib to provide the same hoisting angle as the inner forestay.*

1. Rig and tension the inner forestay.
2. Tension backstay to 1500 psi.
3. Rig one large snatch block between the primary and secondary winches for the running backstays. Rig to both sides of the boat.
4. Hank the storm jib onto the inner forestay and attach the topping lift to the head of the jib. Ensure that jib sheets are attached. Use a sail tie to secure the jib until ready to hoist.
5. Lead the sheets the same as a number 3 or 4 jib if planning to sail to weather. Tie a stopper knot in the tail of each sheet. Lead the jib sheets outboard of the shrouds and lifelines if broad reaching, from outside the boat, under the lifelines and through the permanently attached block five holes forward of the closed chock on the toerail, to the primary winches.
6. Uncoil the running backstays (checkstays) from the around the shrouds and attach the tails. Lead the tails on the inside of the lifelines, through the large snatch blocks, and then to the secondary winches, and tension the windward one. Ensure the running backstay isn't chafing on the lifeline when tensioned (you may need to lead the runner between the upper and lower lifeline for a fair lead).

6-3.2.2 HOISTING THE STORM JIB

1. Untie restraints used to hold the jib in place prior to hoisting.
2. Hoist the jib using the topping lift.
3. "Take" on the sheet and set to desired trim.

6-3.2.3 BENDING ON THE STORM TRYSAIL

The storm trysail is used in winds of 35+ knots instead of the mainsail.

1. Bring the storm trysail up on deck. Tie the bag down in the vicinity of the mast.
2. Tie the line from the tack of the sail to the padeye on the mast below the bottom of the track.

> **WARNING:** ***Care must be taken to control the sail as the cars are loaded onto the storm trysail track to prevent the wind from filling the sail prematurely.***

3. Open the mast track keeper on the dedicated storm trysail track on the port side of the mast.
4. Load the cars for the trysail into the storm trysail track on the port side of the mast and put the mast track keeper back on to keep the cars on the track.
5. This completes the bend on procedures to this point because;
   - The halyard cannot be attached to the head of the trysail until the mainsail is lowered.
   - The sheets attached to the storm trysail cannot be led to the spreacher blocks in the quarter of the boat until the mainsail is lowered.

6-3.2.4 HOISTING THE STORM TRYSAIL

1. Prior to lowering the mainsail, unclip the preventers, and pull the preventer tail at the winch so the shackle is flush at the end of the boom. Ensure the shackle does not hit anyone or get tangled.
2. Lower the mainsail, flaking it on the boom.
3. Lash the mainsail to the boom with at least four sail ties.
4. Tension the boom vang (being careful not to over tension).

NOTE: *The actions of steps 4 and 5 are intended to immobilize the boom in a position that presents the least obstruction.*

4. Secure one of the preventers directly to the toe rail, abeam of the end of the boom, (downwind side is a consideration). Make "snug". This imparts a force vector down and to the rail of the boat.

5. Move the traveler to the same side, this exerts a force vector down and toward midships. Tie off the mainsheet to the standing part of the mainsheet between the traveler and the boom, taking as much tension as possible by hand. This will free up the mainsheet winches.
6. Lead the attached sheets of the STORM TRYSAIL through the spreacher blocks to the mainsheet winches.
7. Remove the halyard from the mainsail taking extreme care not to let go of it. Attach it to the head of the trysail and hoist.
8. Trim BOTH sheets to centerline. This will make the STORM TRYSAIL "self-tending" when the boat is tacked.

NOTE: Do not hoist the trysail higher than the top of the trysail track on the mast, there is not a stopper on the track.

The boat will make way to weather with these sails set enabling the boat to work its way off a lee shore.

6-4 ANCHORING

There are two (2) anchors on board the N 44.

1. A 20-pound Hi-Tensile Danforth anchor is secured in chocks in the bottom of the port cockpit line locker, with 6 feet of 3/8 inch chain and 250' of ½" rode. This is the anchor most often used for short term anchoring in fair weather.
2. A 35-pound Hi-Tensile Danforth anchor is stowed in the forward cabin, in chocks on the forward bulkhead, with 6 feet of 3/8 inch chain and 250' of 5/8" rode. This is the heaviest and most secure anchor.

There is a removable anchor roller that is attached to a stainless steel bracket welded into the port bow that functions as a fairlead for the anchor rode. There is a retaining pin that keeps the rode in place once the anchor is set. It is stored under the port hanging locker aft of the nav station when not in use.

NOTE: The N 44 has a tendency to swing on the current when there is no wind and strong current. The N 44 may swing on the anchor and foul the anchor rode on the keel when the current and light winds are from opposing directions. Two possible solutions exist and may be employed at the Skipper's discretion. A second anchor can be dropped from the transom, which will hold the boat in position. If the duration of the anchorage is short, the scope may be reduced, but position must be closely monitored to ensure the anchor is holding firm.

Complete anchoring procedures can be found in the SOP Chapter 8.

6-5 GALERIDER DROGUE

The Galerider drogue is designed to be trailed off the stern of the boat, with the intention of keeping the stern to the wind in heavy seas and high winds. It will slow the boat down and help prevent pitchpoling, extreme yawing or broaching. The objective in deploying your Galerider is to set it in the second sea following your vessel with enough - but not too much - stretch in the tow line. This could require 300-600' of line depending on the conditions (use anchor rode).

The line should lead through one of the closed chocks on the stern, to the primary winch on the same side as the chock. Form a bridle to keep it centered behind the boat by tying another line to the drogue line (aft of the closed chock) with a prussic hitch. That line should lead through the closed chock on the opposite side to the other primary winch. This facilitates pulling the drogue in after the bridle is disconnected by using the winch to grind it in.

For training demonstration purposes, rig a bridle as you would for towing astern.

To use the drogue for emergency steering due to a lost rudder, attach the spinnaker sheets to the drogue. Run the sheets through the spring line closed chocks amidships, and back to the primary winches.

Deploy the drogue after checking that all equipment will be clear, outside the boat. To increase control, attach a length of chain (taken from the anchor rode) to the drogue, which will help keep it submerged. Steer the boat by trimming the sheets to port or starboard, and by balancing the sails (mainsail with one or two reefs when sailing between 30-90 degrees apparent, and jib between 90-130 degrees apparent).

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APPENDIX 1 - HF RADIO OPERATIONS GUIDE AND EMERGENCY COMMUNICATIONS

1-1 ICOM IC-M802 HIGH FREQUENCY (HF) MARINE TRANSCEIVER

a. Each N44 has a specific 9-digit MMSI (Maritime Mobile Service Identity: Digital Select Calling or DSC self-ID) code pre-programmed into each radio (HF and VHF). This number is used to identify the craft when making a distress call on DSC.

b. The HF Marine Transceiver should be programmed with the frequencies in Table 1. The Navigator should verify this using the steps in 1-3.

c. General rules for HF frequency selection when making a call:
- The higher the sun, the higher the frequency.
- The lower the sun, the lower the frequency.
- The longer the distance, the higher the frequency.
- The shorter the distance, the lower the frequency.

d. OSTS HF radio calls will be made on Channels 13-17 according to the OPORDER and OTC Supplement.

e. USCG distress calls and initial contact will be made on Channels 2-6. These are simplex channels. USCG duplex working channels are Channels 8-12 and can be used for further communications and to receive scheduled offshore and high seas broadcasts (see section 1-4).

Table 1 - Preprogramed Channel Number – Frequency kHz (Channel Name)

CH 1 - 2182.0 kHz (no longer USCG monitored)	CH 11 – 13089.0 (“USCG 1205”)
CH 2 – 4125.0 kHz (“SOS 4s”)	CH 12 – 17314.0 kHz (“USCG 1625”)
CH 3 – 6215.0 kHz (“SOS 6s”)	CH 13 – 2070.0 kHz (“OSTS A”)
CH 4 – 8291.0 kHz (“SOS 8s”) – DSC default	CH 14 – 4037.0 kHz (“OSTS B”)
CH 5 – 12290.0 (“SOS 12s”)	CH 15 – 6793.5 kHz (“OSTS C”)
CH 6 – 16420.0 kHz (“SOS 16s”)	CH 16 – 8187.0 kHz (“OSTS D”)
CH 7 – 2670.0 kHz (“USCG Local”)	CH 17 – 12417.0 kHz (“OSTS E”)
CH 8 – 4426.0 kHz (“USCG 424”)	CH 18 - Undefined
CH 9 – 6501.0 kHz (“USCG 601”)	CH 19 - Undefined
CH 10 – 8764.0 kHz (“USCG 816”)	CH 20 - Undefined

1-2 CALL PROTOCOL

a. Give your call sign each time you call another station.

b. Give your call sign at the end of each transmission that lasts for more than 3 minutes.

c. You must break and give your call sign at least once every 15 minutes during long ship-to-shore calls.

d. Do not repeat a call for 2 minutes.

e. All distress, emergency, and safety calls must be recorded in the offshore log.

1-3 PROCEDURES

a. Ensure the [SSB Radio] breaker is ON at the DC Main panel.

b. Turn the radio on by pushing [POWER] for 1 second.

c. If SQL appears on the lower left of the LED display, then push [F] and then push [2 SQL] to turn the squelch function OFF.

d. If CLAR appears on the upper right of the LED display, then push [F] and then push [CLAR/RX] to turn the clarity function OFF.

e. Push [FREQ/CH] to toggle between channel indication display or frequency indication display. Select Channel mode to use pre-programmed OSTS channels, and ensure screen displays CHxx in the middle of the LED display. To select a specific channel, push the numbers desired on the keypad, (i.e. [1] then [3] for channel 13), then push [ENT]. The channel dial can also be used to change channels.

f. Push [F] then push either [7 Lo], [8 Mid], or [9 Hi] to select low, middle, or high output power, respectively. Repeat process to select a different setting. Default to high power if unsure of desired setting.

g. Adjust [VOL] to the desired audio level.

h. Push [SET MODE] to select upper sideband (USB) operating mode.

i. Push [THRU TUNE] to tune antenna for given frequency selected.

NOTE: repeat steps h. and i. after switching to a new channel.

j. To transmit on the selected channel, push and hold the PTT switch on the microphone.

k. Speak into the microphone at your normal voice level and talk a little slower than normal clearly speaking your words.

l. Release PTT switch when done and standby to receive a voice response (listen).

1-3.1. MANUALLY ENTER A FREQUENCY USING KEYPAD

a. Push [CLAR RX]. A triangle will appear beside the receive indicator in the upper left of the display (RX), and the right-most digit of the frequency will have an underline cursor.

b. Enter desired frequency using the keypad, and then push [ENT]. Do not enter decimal point, but input all numbers (i.e., 6793.5 is entered on the keypad as 67935 [ENT]).

c. Transmit your message on the programmed frequency. The frequency will not be saved after you complete step d. below, to return to normal operations.

d. Push [CLAR RX] to shift back to [GRP] and [CH] functionality.

1-4 HF NATIONAL WEATHER SERVICE VOICE BROADCASTS

The U.S. Coast Guard broadcasts National Weather Service high seas forecasts and storm warnings from six high seas communication stations. These broadcasts are prepared cooperatively by the Ocean Prediction Center, National Hurricane Center and Honolulu Forecast Office. U.S. Coast Guard HF voice broadcasts are performed in USB mode using a synthesized voice.

The weather broadcasts are made on the HF pre-programmed channels 8-12 (see Table 1 for USCG shore station frequencies and ITU channel identifiers). These are forecasts for offshore zones (greater than 20 nm), high seas (North Atlantic zone) and hurricane information. Tune into VHF weather forecasts for coastal zone information.

The broadcast schedule for the East Coast is via USCG station call sign NMN, located at Chesapeake, VA. Times have been converted from Zulu or UTC to Eastern Daylight Savings Time (EDT) which is in effect from Mar-Nov. (See Table 2).

Follow procedures in 1-3 to listen to the broadcast. You may need to change channels to determine best reception for the time of day and meteorological conditions.

Table 2 - USCG Station (NMN) HF Voice Broadcast Schedule

CH 8, 9, 10	2330(a)	0115(b)	0530(a)	
CH 9, 10, 11	0715(b)	1130(a)	1730(a)	1915(b)
CH 10, 11, 12	1315(b)			

(a) Offshore Forecasts, hurricane information
(b) High Seas Forecast, hurricane information

2-1 EMERGENCY COMMUNICATIONS AND ASSISTANCE

The use of the Digital Select Calling (DSC) function on both the HF/SSB and VHF radios is the preferred method to initiate a distress call from your boat, followed up by a voice MAYDAY message on 8291 kHz (monitored 24/7 by the USCG), or VHF radio channel 16. If you are within 20-25 nm offshore, VHF radio channel 16 is the best way to hail the U.S. Coast Guard for assistance. If you are greater than 25 nm offshore, unable to raise the U.S. Coast Guard on VHF radio channel 16 directly, via DSC, or through ship relay, or via the OTC satellite phone, then initiate the following procedure on the HF radio to send a distress call to other ships near you, and the U.S. Coast Guard.

a. Turn the HF/SSB radio on by pushing [POWER] for 1 second.

b. Lift the red plastic DSC guard, then push and hold [DISTRESS] for 5 seconds or until the short beep becomes a long beep. A digital distress message will be sent, which contains the vessel's MMSI number and most recent GPS position if the GPS is operational. Digital calls will repeat automatically every 3-5 minutes. The receiver will be switched to 8291 kKz automatically when the radio is not sending the signal.

c. To initiate voice communications on distress frequency 8291 kHz, wait until the radio display shows "DISTRESS Wait for ACK", then push and hold the PTT button and speak slowly and clearly when transmitting.

d. To cancel the automatic DSC transmission, push [CANCEL/CALL].

2-2 GLOBAL MARINE DISTRESS AND SAFETY SYSTEM (GMDSS)

GMDSS is an International Maritime Organization (IMO) worldwide coordinated distress system designed to provide the rapid transfer of distress messages from vessels in distress to units best suited for giving or coordinating assistance. The system is mandated for vessels over 300 gross tons, which are part of the world-wide coverage. Equipment to support the system includes shore stations, ship stations, satellites, DSC, EPIRBS, NAVTEX messages, SAR transponders, and HF/SSB radios.

For emergencies that require immediate outside assistance:

a. Push the [DSC] button on the HF/SSB and/or VHF radio.
b. Activate the EPIRB.

c. Tune your HF/SSB radio to the DSC default, or if needed, one of the other frequencies in Table 4 to contact the US Coast Guard.

NOTE: The U.S. Coast Guard no longer maintains a watch on 2182 kHz, no longer guards DSC channel 2187.5 kHz, and no longer transmits Marine Information Broadcasts on 2670 kHz as of 01 August 2013.

Table 3 - GMDSS DSC HF Distress Frequencies

GMDSS Distress Frequencies	
DSC Distress Frequency	**Associated Voice Distress or SOS Frequency**
4207.5 kHz	4125.0 kHz (CH 2)
6312.0 kHz	6215.0 kHz (CH 3)
8414.5 kHz	8291.0 kHz (CH 4) -DSC Default
12577.0 kHz	12290.0 kHz (CH 5)
16804.5 kHz	16420.0 kHz (CH 6)

Upper sideband (USB) should be selected for any voice frequency used.

APPENDIX 2 - N 44 BOAT LOADOUT EQUIPMENT

The following lists include loadout items that should be carried aboard while operating during training sessions. These lists include equipment that is available from both the Vandergrift Cutter Shed and from the Robert Crown Sailing Center (note location in each section). Each section is assigned to a billet.

BOAT NUMBER/NAME: NA-				**BOAT CAPTAIN:**			
Item	**Qty**	**Qty Onboard**	**Location**	**BC Initials**	**Initials Received**	**Initials Returned**	**Remarks**
ITEMS ISSUED BY ROBERT CROWN SAILING CENTER, Inventoried by OIC:							
HIGH VALUE ITEMS							
Grab Bag	1		Wet Locker				
EPIRB, 406 MHz #	1						SER#
Hand Held GPS	1						SER#
Hand Held VHF w/AC and DC Charger	1						SER#
Hand Held Bearing Compass (Hockey Puck)	1						
Emergency VHF Antenna	1						
Re-arm kit for Inflatable Lifejacket	1						
Binoculars	1						
Knife	1						
Voltage Meter	1						
Flash Light	2						
Spare Batteries (six AA cell)	8						
30-50 Amp Shore Power Adapters (Port Specfic)	1						
First Aid Box, Yellow (Offshore)	1		Port FWD Locker				KIT #
Personal Locator Beacons (PLB)/AIS OSTS-4/N44	# crew						
Inflatable Man Overboard Module (MOM) VOST Only	1						
SAT Phone (OTC Only)	1		Nav Desk				SER#
Spare Mainsail (OTC Only - Cutter Shed issued)	1		Forepeak				
Yanmar Fuel Pump (OTC Only)	1		Port FWD Locker				
ITEMS ISSUED BY ROBERT CROWN SAILING CENTER, Inventoried by NAV:							
PUBLICATIONS							
Standard Operating Procedures (SOP)	1		Nav Desk				
Boat Information Book (BIB)	1		Nav Desk				
Boat-specific Technical Manuals (COTS)	2		Nav Desk				
Experiential Leadership Guide (OSTS only)	1		Nav Desk				
Offshore/Narrative Log and Bearing Record Book	1		Nav Desk				
NOAA Charts (per chart list) and nav kit	var		Nav Desk				
Advanced First Aid Afloat	1		Nav Desk				
Calder's Mech & Elec Manual	1		Nav Desk				
Chapmans Piloting and Seamanship	1		Nav Desk				
Eldridges Tides/Currents	1		Nav Desk				
Marine NAV (Duttons or Bowditch)	1		Nav Desk				
Waterways Guide	1		Nav Desk				
Chart No. 1	1		Nav Desk				
Nautical Rules of the Road	1		Nav Desk				
List of Lights (non-U.S. ports)	1		Nav Desk				
Laptop computer with List Lists/US Coast Pilots	1		Nav Desk				SER#
ITEMS ISSUED BY VANDERGRIFT CUTTER SHED, Inventoried by NAV:							
NAVIGATION							
Bell	1		Port FWD Locker				
U.S. Ensign (3' X 5' on 5' staff)	1		Stern/Wet Locker				
Foghorn, Mouth	1		Stbd Lazarette				
Foghorn, Compressed gas	1		Stbd Lazarette				
Spare cans for compressed gas airhorn	1		Stbd Lazarette				
Signal Flags (Port Specific)	1 bag		Aft Locker				

ITEMS ISSUED BY VANDERGRIFT CUTTER SHED, Inventoried by First LT:

LIFESAVING EQUIPMENT							
Inflatable Type V PFD (w/strobe, whistle, crotch straps)	11		Wet Locker				
Tethers; 10 single, 3 double	13		Wet Locker				
Deck Safety Lines (1port/1stbd jackline/1 Cockpit)	3		On Deck				
Horseshoe Buoy with whistle (in rack)	1		Stern Pulpit				
MOB Light (attached to buoy)	1		Stern Pulpit				
Small Drogue (attached to buoy)	1		Stern Pulpit				
MOB Pole w/Oscar Flag (attached to buoy)	1		Transom Tube				
Throw Sock (Tie on)	1		Stern Pulpit				
Lifesling w/MOB Light Attached (Tie on)	1		Stern Pulpit				
Life Raft, 10-man Canister (Tie on)	1		Stern Pulpit				
Type 1 PFD w/Whistle, Reflective Tape	10		Aft Lazarette				
RUNNING RIGGING							
Genoa Sheet (5/8"x70' white)	3		Line Lazarette				
Spinnaker Afterguy (1/2" red fleck w/shackle)	2		Line Lazarette				
Spinnaker Sheet (7/16" green fleck w/shackle)	2		Line Lazarette				
Foreguy	1		Foredeck				
Running Backstay Tail (7/16" white w/shackle)	2		Line Lazarette				
Preventer Tail (1/2" solid red)	2		Line Lazarette				
Sail Tie (6-foot, blue webbing)	8		Line Lazarette				
Line - Small Stuff (1/8-inch X 30-foot)	var		Stbd Lazarette				
GaleRider (Sea Drogue)	1		Forepeak (Port)				
DECK							
Anchor, Danforth 35HD w/chain	1		Forepeak				
Line, Anchor (5/8-inch X 250-foot)	1		Forepeak				
Anchor, Danforth 20HD w/chain	1		Line Lazarette				
Line, Anchor (1/2-inch X 250-foot)	1		Line Lazarette				
Spinnaker Pole	1		Foredeck				
Reaching Strut (By Request)	1		Forepeak				
Single Blocks (Becket w/shock cord)	4		On Deck				
Spreacher Blocks (w/shock cord)	2		On Deck				
Snatch Blocks (Antal or Harken w/shock cord)	2		Stbd Lazarette				
Radar Reflector	1		Mast 1st spreader (Port)				
Ball Dayshape	1		Port FWD Locker				
Triangle Dayshape	1		Port FWD Locker				
Winch Handle, Double-grip	2		Stbd Lazarette				
Winch Handle, Single-grip	3		Stbd Lazarette				
Cushions (bunk and Nav seat)	6		Racks				
Boat Hook	1		Stbd Handrail				
Boatswain Chair, Spinlock	1		Port FWD Locker				
Instrument Covers	6		Nav Desk				
Emergency Tiller	1		Line Lazarette				
Line, Mooring (5/8" x 50', black)	5		Line Lazarette				
Fenders, black (w/hanging lines)	2		Line Lazarette				
Wheel Cover (blue)	1		On Wheel				
SAILS							
#1 Genoa	1		Forepeak (Stbd)				
#2 Genoa (Reaching)	1		Forepeak (Port)				
#3 Jib	1		Forepeak (Stbd)				
#4 Jib	1		Forepeak (Port)				
Genoa Staysail (sheets attached)	1		Forepeak (Port)				
Storm Trysail (sheets attached - 5/8"x70')	1		Forepeak (Stbd)				Boat Specific
Storm Jib (same bag as Trysail)	1		Forepeak (Stbd)				
Spinnaker, 1-ounce	1		Forepeak (Port)				
Mainsail w/four Battens	1		Bent-on				Boat Specific
Mainsail Cover (blue w/NA-XX)	1		Bent-on				Boat Specific
SAIL REPAIR KIT							
Tool box, red/black	1	KIT #	Port FWD Locker				
Sewing Palm, Right-hand	1						
Sail Needles, Assorted	3						
Thread, Waxed	1						
Wire, Seizing	1						
Webbing, Dacron (1/2 in. X 2 ft.)	1						
Scissors	1						
Hanks, New Zealand Jib	1						
Yarn, Tell-tale, (red & green)	1						
Spin Cloth, Sticky-back (.75 oz.)	1						
Sticky-back Cloth (11 in. X 4 ft.)	1						
Sticky-back Cloth (4 in. X 10 ft.)	1						
Speed Dots, Sticky-back, Tell-tales	10						
HEAD REPAIR SUPPLIES							
Tyvek suit	2		Head Cabinet				
Goggles	2		Head Cabinet				
10' Sanitation Hose, 1 1/2"	1		Under Holding Tank Lid				
Stainless Steel Hose Clamps	4		Under Holding Tank Lid				
Hose Mender 1 1/2"	1		Under Holding Tank Lid				

ITEMS ISSUED BY VANDERGRIFT CUTTER SHED, Inventoried by SUPPO:

CLEANING GEAR							
Oil-Absorbent Sheets, White	6		Port FWD Locker				
Oil-Absorbent "Socks"	2		Port FWD Locker				
Simple Green, Spray Bottle	1		Port FWD Locker				
Paper Towel, Brown Roll	1		Port FWD Locker				
2-1/2-gallon Bucket (with lanyard)	2		Port FWD Locker				NOT for Oil
Scrub Brush, Long-handle	1		Hanging Locker				
Scrub Brush, Hand	1		Port FWD Locker				
Sponge	4		Port FWD Locker				
Scouring Pads, Green	5		Port FWD Locker				
Trash Bag	20		Port FWD Locker				
Toilet Paper, Roll	A/R		Head Cabinet				
GALLEY GEAR							
Cooler	1						
Flyswatter	1						
Butane Lighter	1						
Bowls, Small	10						
Mugs, 12-ounce	10						
Plates, Dinner	10						
Cooking Pot, 8-quart w/lid	2						
Frying Pan, Large	1						
Mixing Bowl LG/SM	2						
Oven Pan, Rectangle	1						
Kettle	1						
Forks, Table	10						
Knives, Table	10						
Paring Knife	1						
Boning Knife	1						
Spoons, Table	10						
Spoon, Serving	1						
Spoon, Slotted	1						
Can Opener	1						
Measuring Cup, 2-cup	1						
Measuring Spoons, Set	1						
Tongs	1						
Spatula	1						
Cutting Board	1						
Pot Holder, Cloth	2						
LPG Cylinder (10-pound vertical)	2		Propane Lazarette				

ITEMS ISSUED BY VANDERGRIFT CUTTER SHED, Inventoried by DCA:

SUPPORT EQUIPMENT							
Bilge Pump Handle, Whale Gusher	1		Line Lazarette				
Bilge Pump Handle, Edson	1		Wet Locker				
Fire Extinguishers	4		Various				
Fresh Water Hose (50-foot)	1		Forepeak (Port)				
12V DC Spotlight (plug-In)	1		Port FWD Locker				
Shorepower Cable	1		Port FWD Locker				
30 amp pigtail (ISAM-30A F)	1		Port FWD Locker				
Thirsty Mate Hand Pump	1		Port FWD Locker				
Fire Blanket	1		Aft Port Cabin				
HAZMAT Items (Empty Containers MUST be Returned to Cutter Shed for Re-fill or Disposal)							
Engine Oil, 15-40W	1		Port Bench Locker				
Gearcase Oil, 30W	1		Port Bench Locker				
Anti-Freeze, 50/50-mix (pink)	1		Port Bench Locker				
Diesel Engine Fuel, 1 Quart	1		Port Bench Locker				
PYROTECHNICS KIT							
Waterproof Container, Orange	1	KIT #	Port FWD Locker				
Orange Smoke	2						
Red Hand Held	4						
DAMAGE CONTROL KIT							
Water resistant dry box, orange	1	KIT #	Port FWD Locker				
SeaKit instruction/inventory booklet	1						
Soft wood plugs	4						
Soft wood wedges	2						
Pipe and hose repair kit	2						
Patch kit (4" x 12")	1						
Epoxy putty	1						
Neoprene rubber sheet	1						
Split fire hose	1						
Plywood block (8" x 10")	1						
Silicone sealing tape	1						
Duct tape	1						
Tarred marlin	1						
Stainless Steel hose clamps	10						
Self tapping screws	4						
Hatchet	1						
Folding saw	1						
Yachtsman's knife	1						
Waterproof flashlight (two D cell batteries)	1						
Flexible hose clamp driver	1						

ITEMS ISSUED BY VANDERGRIFT CUTTER SHED, Inventoried by ENG:							
Engine Logbook (Pick up/Return Daily)	1	Nav Desk					
TOOL BOX							
Tool Box, Red	1	KIT #	Port FWD Locker				
Awl	1						
Brush, S.S. Wire, Small	1						
Deck Key	1						
Drift Pin, Brass, Small	1						
Drift Pin, Brass, Medium	1						
Drift Pin, Brass, Large	1						
Drill Bitts, 1/16" to 1/4" w/case	1						
Drill, Hand	1						
File, Flat, 12-inch, Mill	1						
Hacksaw, Body, Dual Size	1						
Hacksaw Blades (metal cutting)	6						
Hammer, Ball Peen, 12-ounce	1						
Hex Key Set, Allen Large, Folding (SAE)	1						
Hex Key Set, Allen Small, Folding (SAE)	1						
Hex Key Set, Allen, Folding (Metric)	1						
Measuring Tape, 100' Std./Metric	1						
Nozzle, Hose	1						
Nut Driver, 5/16-inch, Socket Head	1						
Pliers, Channel Lock	1						
Pliers, Linesman	1						
Pliers, Electric, Stripper/Crimper	1						
Pliers, Needle Nose	1						
Pliers, Racor	1						
Pliers, Vice-grip Pipe Jaw w/cutter	1						
Pry Bar	1						
Punch, Center Solid	1						
Utility Knife, Razor	1						
Socket Set, 1/4-7/8"	1						
Socket Set, 8-18mm	1						
Socket Wrench, Ratchet	1						
Socket Extension, 6-inches	1						
Screwdriver, Large Slotted	1						
Screwdriver, Medium Slotted	1						
Screwdriver, Small Slotted	1						
Screwdriver, Large Phillips	1						
Screwdriver, Medium Phillips	1						
Screwdriver, Small Phillips	1						
Wrench, Adjustable Crescent, Large	1						
Wrench, Adjustable Crescent, Small	1						
Tool Roll, for Wrench Set (SAE 1/4-1")	1						
Tool Roll, for Wrench Set (Metric 6-19 mm)							
ENGINE REPAIR KIT							
Tool box, white	1	KIT #	Port FWD Locker				
Oil Filter, Yanmar #129150-35153	1						
Fuel Filter, Racor	1						
Fuel Filter, Yanmar #129470-55702 (NA 21-25)	1						
Fuel Filter, Yanmar #119802-55801 (NA 26-36)	1						
Gasket, Seawater O'ring #X0506590-01	1						
S/W Impeller #129670-42530	1						
V Belt 6430 #25152-004300 (With Teeth)	1						
V Belt 6930 #25132-003900 (Without Teeth)	1						
Funnel	1						
Deck Fill O-Ring Kit	1						
Hand Pump w/ hoses	1						

ITEMS ISSUED BY VANDERGRIFT CUTTER SHED, Inventoried by ELEC:

ELECTRICAL REPAIR KIT

Tool box, Orange	1	KIT #	Port FWD Locker				
Tackle Box, Clear	1						
10 Watt Light Bulb	2						
25 Watt Light Bulb	2						
Automotive Fuse 2A	2						
Automotive Fuse 10A	2						
Automotive Fuse 40A	2						
Glass Tube Fuse 1A	2						
Glass Tube Fuse 2A	2						
Glass Tube Fuse 3A	2						
Glass Tube Fuse 4A	2						
Glass Tube Fuse 5A	2						
Glass Tube Fuse 15A	2						
Glass Tube Fuse 30A	2						
Electical Wire	10'						
Electrical Zip Ties	15						
6 Volt Screw Top Batteries	2						
Festoon Bulb	2						
Xenon Bulb	2						
INVENTORY CHECKS							
Onload Complete		**Name/Rank**				**Date**	
Boat Captain							
Program Rep/OIC							
Offload/Turnover Complete		**Name/Rank**				**Date**	
Boat Captain							
Program Rep/OIC							