sea
explorer

ADVANCED SEAMANSHIP

instructor's guide

FOR SEA SCOUTING

BOY SCOUTS OF AMERICA

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BOY SCOUTS OF AMERICA

New Brunswick, New Jersey

Printed in U.S.A.

No. 6660 6M466

SEA EXPLORERS' OPTIONAL RECOGNITION PLAN

ADVANCED SEAMANSHIP

The Sea Explorers' Optional Recognition Plan is for ships whose members are not interested in following the advancement plan that leads to the Quartermaster Award. It is a much, less-rigid method of attaining recognition. Instead of each Sea Explorer achieving ranks through set requirements, the membership of the ship works as a group in this Advanced Seamanship course. Those who complete the series are awarded an attractive certificate and the Qualified Seaman bar. The main purpose of this program is to provide additional incentive for Sea Explorers to acquire the skills of seamanship, which enables them to participate in the program more successfully.

DESCRIPTION OF THE COURSE

Advanced Seamanship is an eight-session course that provides a more comprehensive study of seamanship than the Safe Boating course. This course is generally taken as advanced instruction following qualification in Safe Boating.

In its eight 2-hour sessions are included a practical study of boating that covers Seamanship, Aids to Navigation, Piloting, Rules of the Road, Safe Boating Operation, and Accident Prevention. The eighth and final session is an outdoor exercise that puts into practice most of the things learned in the preceding sessions.

METHODS OF CONDUCTING THIS TRAINING

The course may be conducted in one of these ways:

1. Once a week for 8 weeks.
2. Two or three times a week for 3 weeks.
3. Two weekend sessions of 8 hours per weekend.

Regardless of the pattern of meetings, each session should be followed exactly as presented in this guide with adjustments and additions made only to meet local conditions and facilities.

OVERALL COURSE CONTENT

Session 1: Aids to Navigation
Session 2: Rules of the Road
Session 3: Seamanship
Session 4: Accident Prevention—Safety
Session 5: Piloting—Compass and Errors
Session 6: Piloting—Charting
Session 7: Safe Boating Operation
Session 8: Operating a Boat

THE STAFF

The instruction is conducted by the Sea Explorer ship's adult leaders assisted by qualified consultants who are

secured locally. They should be men who have a thorough knowledge of the subjects and the ability to teach them.

REFERENCE BOOKS AND MATERIALS

The staff follows this guidebook closely for all eight sessions. Their main reference should be the technical chapters of the *Sea Exploring Manual.* Its resource chapter should be a guide in securing additional reference books and necessary materials.

Every course member must have the *Advanced Seamanship Workbook,* No. 6661, which contains illustrative aids necessary for this instruction.

QUALIFYING CERTIFICATE AND BADGE

Sea Explorers who satisfactorily complete the eight sessions receive an attractive Qualified Seaman Certificate signed by the instructor. They become eligible to wear the bar award illustrated on the cover of this guide. The bar is centered 3/8 inches below the leading edge of the pocket on the Sea Explorer blouse.

These Sea Explorers are qualified to operate as pilots and navigators aboard the floating equipment related to their ship. But the conditions and extent to which they may function are subject to the regulations set by their own ship and local government authorities.

AWARD AND RECOGNITION PROCEDURE

Sea Explorers qualifying for the Advanced Seamanship recognition do not have to be reviewed by the ship's officers. The Skipper approves the Advancement Report, No. 4417, and sends it in to the local council office.

The formal presentation of both the certificate and bar should be made at a bridge of honor along with other Sea Explorer recognitions.

SESSION 1

AIDS TO NAVIGATION

(Workbook, pages 1-9)

To the instructor:

This session is designed to be about 2 hours long. Do not attempt to put it on "cold." Read and study it first until the continuity of the session is apparent to you. Experimentation with the sessions has proved that many times it is difficult to hold the interest of the student throughout the entire period of time allotted. The sessions are therefore designed with cutoff points in several places to allow for breaks or, in the event regular meeting times are being used, for continuance of regular format of meetings. In this case a session could be presented at two different times without too much difficulty.

Every course member must have an *Advanced Seamanship Workbook* which contains illustrations for all eight sessions.

AIDS TO NAVIGATION

The varied and extensive buoyage system of the United States was designed to make the operation of vessels safer and easier. Every automobile driver knows the meaning of shapes and colors of highway signs, traffic signals, and lines painted on the pavement. Aids to navigation were designed to offer the same kinds of warnings to boat operators.

THE BUOYAGE SYSTEM

(Have the Sea Explorers color in buoys as you describe them.) All Federal waterways of importance are marked with an intricate buoyage system maintained by the U. S. Coast Guard (since 1940). All buoys of permanent nature are shown on the local charts and in the publication known as the "light lists." They tell their story by shape, color, number, and—when lighted—by their light.

THE RED BUOYS AND THEIR SIGNIFICANCE

Red buoys, even numbers, are passed with the buoy on the starboard or right side of the vessel when entering from seaward. These are usually a nun buoy, which is conical at the top, but may be any shape except a can.

BLACK BUOYS AND THEIR SIGNIFICANCE

Black, odd numbers, are passed with the buoy to the port or left-hand side of the vessel when entering from the seaward. These may be any shape also, except for nun shape, and are most likely to be a can.

OBSTRUCTION BUOYS

Horizontally striped buoys of red and black, usually not numbered, are found at junctions, middle ground, or over obstructions. Although they may be of any shape, they will sometimes take on the shape indicated by the topmost color. Thus, a horizontally striped buoy could very likely be a nun. When approaching this one then,

it would be treated as a red buoy and passed on the right-hand side (starboard) of the vessel when entering from seaward. Always give the obstruction buoys a wide berth. If the buoy thus described has no special shape such as nun or can, study the topmost band to determine the preferred channel.

MID-CHANNEL BUOYS

Vertically striped buoys of black and white, usually not numbered and of no special shape, indicate mid-channel or fairway. These are always passed close aboard on either side. A series may alternate, first a nun then a can, in which case they are placed in such a manner that they can be used according to shape.

FRAMEWORK BUOYS

Workbook, page 4. Many lighted or audible buoys are a framework of metal atop a floating base and are colored and numbered according to their usage. They may contain whistles, horns, bells, or other sound devices in addition to lights.

ANCHORAGE BUOYS

A white buoy of any type indicates the limits of an anchorage or an experimental area or may mark out the limits of a torpedo range off a naval base. Your chart will indicate what it is for.

A QUARANTINE BUOY

A yellow buoy indicates a quarantine area. These are usually spars, but may be of any shape, particularly when they are temporary.

FISHNET AND WEIR BUOY

White buoys with a horizontal black stripe are not widely seen. They are spars and mark the limits of legal areas for the setting of fishnets or weirs. They are numerous in the Chesapeake Bay and other areas on the east coast.

DREDGING BUOY

A white buoy with a green banded top indicates a dredging area. Caution is used here.

SPECIAL PURPOSE BUOYS

Buoys horizontally striped white and international orange have a special purpose that is indicated on charts.

STORM WARNINGS PUBLICATIONS AND CHARTS

Workbook, page 6. Storm warnings are posted in various locations in the United States and are listed by location in the publication known as *Coast Pilot.* In addition, full lists of points of display as well as weather broadcasts are in "storm warning facilities charts." These are 11 or 12 charts covering coastal waters and the Great Lakes. They are obtainable for 5 cents each from Superintendent of Documents, Washington, D. C. 20402.

Refer to the resource chapter in your *Sea Exploring Manual* for more complete instructions on how to obtain official nautical publications and charts that are issued by the U.S. Coast Guard, U.S. Coast and Geodetic Survey, and the U.S. Naval Oceanographic Office. Your ship should have all printed material that relates to the waters in which you will be operating. Use these aids to supplement this course. Become familiar with them in order to be able to use them at the exact time they are needed.

FLAGS USED, ETC.

Small craft consists of one red pennant. Two red pennants indicate a gale. A single red flag with a black square in the center means a whole gale, and two of these flags means that a hurricane is approaching.

NIGHT SIGNALS FOR STORM WARNINGS

The night signals for storm warnings are shown on page 6 as red and white lights in combination. A red over white means wind up to 38 mph and/or sea conditions dangerous to small craft. White over red indicates winds from 39 to 54 mph. Red over red means winds from 55 to 73 mph. Red over white over red means winds 74 mph and over.

DAYMARKS ON VESSELS

Workbook, page 7. Daymarks are shown on boats operating under special conditions such as when towing

or being towed, fishing or dredging. The signal is made by a ball or cone shape. Small boats are not required by law to display daymarks, but every operator should understand and be able to read them when displayed on other vessels.

VESSEL NOT UNDER CONTROL

A vessel not under control shows a daymark of two black balls vertically arranged. The same signal is displayed by self-propelled suction dredges under way with their suction on the bottom, according to the international rules of the road.

DREDGES

Dredges held in stationary position show two red balls in the daytime, arranged in a position where they can best be seen.

VESSELS MOORED AND LAYING PIPE OR MARINE CONSTRUCTION

Vessels moored or anchored and engaged in laying pipe or operating on submarine construction show two balls in a vertical line. The upper one has alternate black-and-white vertical stripes; the bottom one is bright red.

TOWING SUBMERGED OBJECTS

A vessel towing a submerged boat in the daytime shows two shapes, one above the other. Two double cones (base to base)—the upper is painted with horizontal black-and-white stripes; the lower one is red.

STEAM VESSELS UNDER SAIL ANCHORED VESSELS OVER 300 TONS

Steam vessels under sail alone and vessels of over 300 gross tons when anchored show a single black ball as a day signal.

VESSELS OVER WRECKS

Steamers, lighters, and other vessels made fast alongside or moored over a wreck, show two double red cones base to base.

CABLE-LAYING VESSEL

A cable-laying vessel in the daytime shows a daymark as follows: The top is a red ball, the center is two white cones base to base, and bottom is another red ball. This is for international rules.

FISHING VESSELS

A fishing vessel in the daytime may display a basket in the rigging.
Cutoff point—if your time allows.

DAYMARKS, DAYBEACONS (UNLIGHTED)

Workbook, page 8. Structures, not buoys, are called daymarks, beacons, or daybeacons. Daymarks (daybeacons) are not lighted and they may be of any shape depending upon how far they must be seen. They may be of masonry, single piling occasionally showing a board or arrow pointing out the channel, slatted towers, barrels, and a variety of others. Sometimes they are painted the appropriate color to indicate the passing side.

LIGHTED BEACONS

In some locations, particularly on rivers, lights are placed on pilings or dolphins along with boards painted white and containing numbers. These are "lighted beacons" and used for night piloting as well as a daybeacon. They indicate the channel or turns.

RANGES

Ranges or range markers are used in many locations. They are usually two marks, one behind and higher than the other and of shape to distinguish one from the other. They are used by lining them up like sights on a gun and following the course that they make.

PROJECT

Outline a portion of local waterways on a blackboard or on a large piece of paper. Ask the Sea Explorers to come forward, one at a time, and place a necessary buoy or daymark on the chart. Divide the group into teams to add a competitive atmosphere and create additional buoy and daymark situations as necessary.

INTRACOASTAL WATERWAY MARKINGS, BUOYS, AND AIDS

Intracoastal waterways run inland parallel to the sea. In places they overlap or form junctions with coastal waters. Intracoastal waterways have a similar system of buoys and beacons numbered on the Atlantic coast from north to south and along the Gulf of Mexico from east to west. The aids are distinguished by a yellow band or border. At junctions or overlaps with coastal waters, the buoys are marked with a yellow triangle. This lets the operator know he is converting to the intracoastal system or to inland rules, according to the direction he is traveling.

LIGHTSHIPS AND THEIR USES

Lightships are used the same as lighthouses, but in locations where it would be impractical to build a lighthouse. They are almost invariably painted red with the name of the station in large white letters on both sides. They ride a single anchor so that in addition to normal aids they also indicate the direction of current or tide. All signals aboard, in addition to the masthead light or lights, have distinguishing characteristics so that the ship is readily identified. The riding light on the forestay is to indicate the direction of her head. When the lightship is not on station for reasons of repairs, etc., it is replaced by another ship with the word "relief" painted on her sides. In addition to her other aids, in most cases, the lightship carries a radiobeacon. In some areas, lightships are being replaced by offshore towers.

Cutoff point—if your time allows.

LIGHTHOUSES

Probably the oldest aid to navigation is the lighthouse. These are placed on dangerous shores and on rocks in bays, harbors, etc. Some lighthouses are so brightly lighted that they can be seen 22 miles at sea, depending upon their height. These, as well as lightships, are completely described in the "light lists."

CHARACTERISTICS OF LIGHTS

(Refer to the bottom of workbook, page 9, "Characteristics of Lights.") Later in this course, charting will be discussed. Symbols on these charts indicate certain lights have individual characteristics as shown on page 9.

FIXED LIGHT

A fixed white light is a light that doesn't change: It is on and stays on. The same is true when the chart indicates a fixed red or fixed green light: It is a steady light.

FLASHING LIGHT WITH DETAIL OF ELIPSES

The flashing light is one that flashes on and off at regular intervals. But always the period of darkness is longer than the period of light. A quick flashing light is one that flashes on and off at a rate of not less than 60 flashes per minute. It is usually a cautionary light designating a sharp turn, etc. Light flashes will vary with 7 seconds, or others at every 4 seconds, etc. By time-lapse checks between the flashes, it can be determined which light on the chart is seen.

GROUP FLASHING LIGHTS

Group flashing lights are those that flash in groups of two or more. As an example, a light may flash twice and then be dark for several seconds, then flash twice again as shown in the illustration on page 9. It may also flash three times, be dark for several seconds and flash five times, dark again for several seconds and flash three again. Any number of combinations may be used and all are described on the charts. They may be white or colored.

OCCULTING LIGHTS

An occulting light is one in which the period of light is greater than the period of darkness. In other words, the light may last for 5 seconds, be dark for 3 seconds, and come on for 5 seconds again. Occulting lights may also appear in groups as do the flashing lights. They may also be colored.

FIXED AND FLASHING LIGHTS

A fixed and flashing light is one that appears to be a fixed light but at certain intervals becomes much brighter and then returns to its original intensity. It looks much like someone is turning up the wick on the lantern and then turning it down again.

ALTERNATING LIGHTS

Alternating lights are those that change colors. The illustrations on page 9 show how they may be in many

combinations. The characteristics of these lights should be remembered so that combinations described in the charts can be easily identified. *(If time allows during this period, continue on with the following.)*

RADIOBEACONS AND RDF

On most lightships and lighthouses and occasionally other coastal points, the U. S. Coast Guard maintains radiobeacons. Very simply, these radio transmitting sets that project an identifying signal with which the navigator, who is lucky enough to have a radio direction finder aboard, may orient himself. Full information on these is found in the "light lists," with changes posted in the *Notice to Mariners.*

THE SIMULTANEOUS RADIO-SOUND SYSTEM

A variation of this is the radiobeacon station equipped with a sound signal. The sound signal is timed with a stopwatch and the difference in time is converted into distance by dividing by 5.5. This gives the nautical miles from the sending station. For example, if the difference or interval between the sound and radio signals is 5 seconds, the distance to the sending station is 0.9 miles. This is explained by the fact that radio is instantaneous and sound travels at a rate of 1,100 feet a second at sea level.

GOVERNMENT PUBLICATIONS

The Coast and Geodetic Survey published the *United States Coast Pilot* and *Tide Tables* in order to supplement the information given on charts. In addition the U. S. Coast Guard publishes additional aids to navigation in the form of *Notice to Mariners* and "light lists." *Notice to Mariners* is sent free, weekly, to anyone applying to the nearest Coast Guard District Commandant. It contains permanent and temporary changes in the location of buoys or tells of the collapse of dredged channel walls, etc.

TIDE TABLES

The official *Tide Tables* is in two volumes and covers scores of reference stations in the Atlantic, Pacific, and the Indian Oceans. The bold-face type always denotes the p.m. time and the light faced the a.m. The heights indicate the difference in the height of that tide from the depths given in the chart.

UNITED STATES COAST PILOT

The *United States Coast Pilot* is a publication in series giving detailed information of value to navigators. It describes the water, shore installations, and lights in such a way that the area can be visualized before entering. It enables the operator to sail as safely as if in his own home waters.

LIGHT LISTS

While the "light lists" are not absolutely necessary to the navigator, they are extremely convenient and save him much searching on the chart—and eliminate the possibility of overlooking a light or buoy.

TEST

AIDS TO NAVIGATION

Hand out slips of paper and ask the Sea Explorers to number from 1 to 10 for the true and false test. When finished, have them exchange papers and mark the answers. (The correct answers are underlined on this page.)

1.	Returning from the sea, red buoys are left on the port side of the vessel.	**True**	**False**
2.	Odd-numbered buoys are on the port or left side of the channel when observed from seaward.	**True**	**False**
3.	A large vessel, 300 tons or more, will display a day signal of one black ball when anchored in a fairway.	**True**	**False**
4.	Lightships always use two anchors to stay in position.	**True**	**False**
5.	An occulting light has a period of light that is greater than the period of darkness.	**True**	**False**
6.	Intracoastal waterways range markers have yellow borders.	**True**	**False**
7.	A single red pennant indicates a small-craft warning.	**True**	**False**
8.	Obstruction buoys are vertically striped.	**True**	**False**
9.	An anchorage buoy is usually white.	**True**	**False**
10.	A fixed light is one that does not vary or blink.	**True**	**False**

SESSION 2

RULES OF THE ROAD

(Workbook, pages 10-15)

To the instructor:

This session is designed to be about 2 hours long. Study the material thoroughly before presenting it in order to become acquainted with the format. You may want to do the entire session from the illustrated aids furnished in the *Advanced Seamanship Workbook*. Attempt to involve the students as much as possible. For example, when using a blackboard, get the Sea Explorers to show the various positions of the sailboat boom for right-of-way situations.

PURPOSE OF RULES OF THE ROAD

The Rules of the Road were designed and passed in order to prevent collisions. Since boats can go anywhere on navigable waters, it is possible for many of them to arrive at the same point at the same time. In this case, some rule must be followed in order to prevent serious accident. Rules of the Road cover inland, international, Great Lakes, and govern all craft when under way—when the boat is not at anchor, made fast to the shore or dock, or aground. The first of the Rules of the Road to consider is the one regarding right-of-way.

DANGER ZONE

On page 10 of the workbook at the top is a diagram showing the "danger zone." This is based on the relative bearing of a boat. The area of concern here is from dead ahead of the boat to two points abaft the beam on the starboard side.

RIGHT-OF-WAY

Every vessel that shows itself in this area in relation to our boat has the right-of-way.

The exception to this rule concerns sailboats, which have the right-of-way over power vessels. There are exceptions to this, one being that a sailboat does not have the right-of-way when overtaking and passing.

BURDENED AND PRIVILEGED VESSELS

In right-of-way situations, a boat in another's danger zone is known as the *privileged* vessel and has the duty to maintain its course and speed. The other is identified as the *burdened* vessel and must stay out of the way. Wherever possible, the burdened vessel should cross astern of the privileged vessel.

COURTESY AND CONSIDERATION FOR TUGS, ETC.

The illustration on page 11 suggests that there are situations that arise when good judgment and courtesy are involved. Consideration of others and their problems can save embarrassment and make cruising more pleasurable.

SAILBOATS AND THE RIGHT-OF-WAY

Workbook, page 12. In order to determine the right-of-way for sailboats, the various points of sailing must be understood. *Close-hauled* is a term meaning that the wind is being taken from between two points forward of the beam and dead ahead. This necessitates hauling in the sheets so that the main boom is close to the center line of the boat in order to sail.

RIGHT-OF-WAY COMPARED TO SAIL POSITION

Running free is a term meaning that the wind is being taken from any direction aft to the location two points forward of the beam. As seen on page 12, there are several different designations of sail positions, such as *broad reach, close reach, broad off,* etc., that are used in sailboat operation.

DETERMINING TACK

Determining right-of-way depends also upon from which side the wind is taken. A boat with the wind over her starboard side is on a starboard tack, with the wind over her port side, a port tack.

RIGHT-OF-WAY SITUATIONS OF SAILBOATS

A sailboat that is running free shall keep out of the way of the sailboat that is close-hauled. In other words, the close-hauled boat has the right-of-way. A sailboat that is close-hauled on a port tack (wind over her port side) shall keep out of the way of the sailboat on the starboard tack. Starboard tack has the right-of-way.

RUNNING FREE

When both sailboats are running free with the wind over different sides, the one with the wind over her port side shall keep out of the way of the other. When both are running free with the wind over the same side, the vessel which is windward shall keep out of the way of the one to leeward. A vessel that has the wind aft shall keep out of the way of other vessels.

WHEN RIGHT-OF-WAY IS IMPORTANT

The Coast Guard describes these right-of-way situations and qualifies them by stating "When two sailing vessels are approaching each other so as to involve risk of collision—." Therefore these rules apply where there is risk involved. They do not mean that a course cannot be held if there is plenty of clearance and no risk involved.

FOG SIGNALS

Power vessels are required to have a whistle or siren for the purpose of sound signals during foggy conditions. The whistle or siren must be sounded by steam power or some substitute for steam such as compressed air. It must be placed on the vessel so that there is no obstruction in front of the sound instrument to interfere with its range.

DEFINITIONS OF BLASTS

Prolonged blast means a blast of from 4 to 6 seconds. A blast is shorter than the 4 second indication.

WHEN SIGNALS ARE USED

Sailing vessels and vessels being towed shall have a foghorn. A power vessel and a sailing vessel over 20 gross tons shall have a bell in addition to her foghorn. The signals are used during fog, mist, falling snow, heavy rains, and conditions either day or night when lack of visibility creates a hazard.

Fog signals are used when under way as follows:

Power Vessels.—A power vessel sounds a prolonged blast at intervals of not more than 1 minute.

Sailing Vessels.—At intervals of not more than 1 minute, a sailing vessel sounds one blast when on the starboard tack, two blasts when on the port tack, and three blasts in succession when running with the wind abaft the beam.

Vessels at Anchor.—At intervals of not more than 1 minute, vessels at anchor sound a rapid ringing of the bell for about 5 seconds.

Vessels Towing and Towed.—At intervals of not more than 1 minute, a power vessel towing sounds a prolonged blast followed immediately by two short blasts. The vessel being towed may also give this signal and may not give any other.

Hand-Powered Craft.—Any vessel or raft or other water craft propelled by hand power or current shall blast the foghorn or make an equivalent noise signal at intervals of not more than 1 minute.

Speed Considerations in Fog.—Speed under these conditions should be moderated according to the conditions. A good rule is to cruise at a speed that would allow the vessel to stop in one half the distance of visibility.

Cutoff point if your time allows.

PASSING SIGNALS

Courtesy, good judgment, and common sense come into play when passing situations arise. When visibility is good and the approaching vessels are in no danger of collision, passing signals are not needed. A vessel may signal her intended course by swinging the boat one way or the other when in sight of another boat. It is the duty of vessels to pass, as much as possible, port to port, using the right side of the channel.

Port to Port Passing Signals.—If the channel is narrow, traffic thick, or any other situation arises that causes the boats to approach each other head on, one signals with one blast of the horn and the other answers with one blast. Each swings so as to pass port to port.

Starboard to Starboard Passing Signals.—If the courses taken are too far to the starboard to allow a port to port passage, one boat signals to the other with two blasts, receives a like answer, and they pass starboard to starboard.

Cross Signals Never Used.—Cross signals such as answering one blast with two are not legal and are never given. If one vessel does not understand the intentions of the other, she immediately signifies this by not less than four short blasts of her horn or whistle. This being the danger signal, both vessels stop where they are until they can reach an accord.

Signals at Bends.—A vessel approaching a bend in a river or channel where the visibility is less than ½ mile, being obstructed by the bank or trees or other causes, shall signal by one long blast of the whistle when within ½ mile of this location. A vessel around the bend out of sight will answer with one blast. If no answer is received, the channel is considered to be clear.

Signal Leaving Moorage.—A long blast is usually given when leaving a moorage or dock into a channel.

Overtaking and Passing Signals.—When two vessels are running in the same direction and the one astern wishes to pass the other to starboard, she signals with one blast and leaves room for the maneuver.

Pass to Port.—To pass to port when overtaking, the signal is two blasts. The answer is given and the maneuver accomplished.

Unsafe To Pass and Danger.—If the vessel ahead does not consider it safe to pass at that location, she gives not less than four blasts of her whistle to indicate this. When it is clear, she whistles a passing signal and leaves room for passing. These signals are given only when vessels are in sight of each other and position easily determined.

Fog.—In fog, mist, heavy weather, etc., only fog signals are given.

Engines Going Astern.—The signal for indicating engines going astern is three short blasts.

PROJECT

Conduct the activity Tabletop Piloting in the *Sea Exploring Manual.* Concentrate on those Rules of the Road that apply most often in your local waters.

WHEN RUNNING LIGHTS ARE USED

Rules of the Road take into consideration the lights shown on vessels. Compliance with light regulations is required in all weather between sunset and sunrise. No other lights, which might be mistaken for the prescribed lights, are to be shown.

DEFINITION OF POWER VESSEL

A power vessel is any vessel using power whether she has sails in use or not.

DEFINITIONS OF PRESCRIBED LIGHTS

A 32-point light is one that shows all around the horizon.

A 20-point light is one that shows the light from dead ahead to two points abaft the beam on either side.

The 12-point light, used astern, shows six points on either side of the stern.

A 10-point light shows from dead ahead to two points abaft the beam. The side is indicated by the color.

CLASSES OF BOATS

Workbook, page 14. The Motorboat Act of 1940 divided motorboats into four classes according to length. Class A refers to boats 16 feet or less. Class 1 is from 16 to 26 feet. Class 2 is from 26 to 40 feet.

Class 3, from 40 to 65 feet. Many regulations, including lights, are determined according to the length of the boat or class.

LIGHTS ON CLASS A AND 1 BOATS

Class A and 1 boats display a combination red and green bow light. Red always designates the port side and green the starboard side. In effect these are each 10-point lights side by side, showing from dead ahead to two points abaft the beam on their respective sides. They are called combinations because they are actually one light with two colors divided in the middle. In addition to the combination light, these classes must have a 32-point white light aft and higher. An optional light which is legal and may be carried, is the 12-point stern light that shows white astern in an arc six points on either side and cannot be seen from any point ahead of this. Red and green lights must be visible 1 mile and the white lights for 2 miles.

LIGHTS ON CLASS 2 AND 3 BOATS

Class 2 and 3 boats carry separate running lights. On the starboard side is a green light so constructed as to show an unbroken light from dead ahead to two points abaft the starboard beam, visible 1 mile. The port side has a red light with the same specifications on the port side. Both the red and green lights are fitted with inboard screens that prevent them from being seen across the bow. In addition to the red and green lights, Class 2 and 3 boats carry forward a 20-point white light adjusted to show from dead ahead to two points abaft the beam on either side. Farther aft and higher they carry a 32-point white light visible all around the horizon. Each of these white lights is visible for 2 miles. These vessels may also carry the optional 12-point stern white light.

LEGAL STEERING ORDERS

Some people have such a desire to sound nautical that steering orders are given to the helmsman using the terms "port" and "starboard." An act of Congress in 1918 made it illegal to give steering orders in this manner aboard United States vessels. The Coast Guard pamphlet *Rules of the Road,* CG-169, page 39 states, "All orders to helmsmen shall be given as follows: 'Right Rudder' to mean 'Direct the vessel's head to starboard.' 'Left Rudder' to mean 'Direct the vessel's head to port.' "

ORDERS TO THE HELMSMAN

Normally when orders are given to the helmsman, the first part of the command designates the direction of movement. This prepares the helmsman to put the wheel over prior to the second part of the order, which states the amount to be used.

Full Rudder.—"Right (or left) full rudder," means all the way, but care is used not to jam it against the stops.

Standard Rudder.—"Right (or left) standard rudder," varies with different vessels. It usually means a fast turn but not hard over. For example, it may mean one complete revolution of the wheel.

Half Standard Rudder.—"Right (or left) half standard rudder," means one half of that which is considered standard rudder.

Increase and Decrease.—If the rudder needs to be increased to swing more sharply, the order is, "Give her more rudder." To decrease the angle, "Ease the rudder."

COOPERATION BETWEEN HELMSMAN AND OPERATOR

When the situation or the order is understood, the helmsman answers by saying, "Very well," or repeats the order given. Practice will determine the orders needed on each vessel.

TEST

RULES OF THE ROAD

Hand out slips of paper and ask the Sea Explorers to number from 1 to 10 for the true and false test. When finished, have them exchange papers and mark their answers. (The correct answers are underlined on this page.) Encourage discussion if time permits.

1.	When overtaking and passing a powerboat, a sailboat does not have the right-of-way.	**True**	**False**
2.	A sailboat close-hauled has the right-of-way over one running free.	**True**	**False**
3.	Power vessels must have a bell in addition to a horn or whistle for the purpose of making fog signals.	**True**	**False**
4.	Vessels at anchor use a bell for fog signals.	**True**	**False**
5.	When meeting another vessel, sound two blasts of the horn and pass port to port.	**True**	**False**
6.	Four blasts of the horn means "My engines are in reverse."	**True**	**False**
7.	32-point white lights show all around the horizon.	**True**	**False**
8.	Colored side lights are all 20-point lights.	**True**	**False**
9.	Order "Starboard rudder" when directing the helmsman to make a turn to the right.	**True**	**False**
10.	Class A refers to boats 16 feet or longer.	**True**	**False**

SESSION 3

SEAMANSHIP

(Workbook, pages 16-21)

To the instructor:

This session was designed to be about 2 hours. But considerable preparation by the instructor is necessary if the subject is to be covered in one session. Experienced instructors often take a longer time than novices and devote much more time in the activities of the session. If preparations are made and materials are on hand at the offset, much valuable time can be saved.

Provide a landship setup if you have one. If not, use chalk and hold the session where you have enough open space for outlining a ship on the floor or deck.

Provide, or have the Sea Explorers bring a short piece of line for tying knots. Either use a jackstay (large line tied some distance between two posts or supports) or rails, oars, pipe, etc., for the purpose of tying knots upon them. If a large class is present, several instructors should take smaller groups for the knot-tying session. If at all possible have several anchors to display. If time is critical, hurry through the anchor descriptions and emphasize the method of anchoring.

SEAMANSHIP

Seamanship is usually divided into two categories, deck seamanship and marlinspike seamanship. A good seaman is well rounded in both, as they go hand in hand with efficient boat operation. Each man depends on his shipmate to do his job well. By working together, cruising is made more enjoyable and a great deal safer. The Skipper of the vessel must rely on prompt and accurate information as well as a quick response to orders.

IMPORTANCE OF LOOKOUT

One of the more important jobs of the seaman, and one to which too little attention is paid, is that of the lookout. From his post, a lookout reports objects in relation to his vessel—not the compass or the wind. He always assumes that the bridge has not seen this object, so he calls his report to the bridge until it is acknowledged.

Refer to workbook, page 16, showing relative bearings —If at all possible set up your landship or outline a ship on the deck of your meeting place. Using chalk or some substance that will clean up easily, mark in the 32 points, but do not number them or otherwise identify them.

RELATIVE BEARINGS

The outboard perimeter of the ship is considered a circle and is divided into 32 sections or points—16 from ahead to astern on either side.

HOW TO REPORT OBJECTS

When an object is reported, it is identified and its location given in relation to the vessel, such as "nun buoy, 3 points on the starboard bow." It should be given with as much description as possible. For example, "Floating object, moving object, or small boat on the horizon, close aboard, or 100 yards." Each Sea Explorer with his relative bearing sheet for a reference, in turn assumes a position aboard the landship or inside the

outlined ship. The instructor walks to a point outside the vessel outlined and identifies himself in this manner: "I am a red buoy. What is my bearing." Each Sea Explorer identifies at least five positions. If the class is large, several such locations or landships should be used. Students take turns on the quarterdeck acknowledging the lookout's information. Do this until you are satisfied that each has a working knowledge of the relative bearings.

Could break here if necessary.

RULES FOR LOOKOUTS

There are some rules for lookouts. They shall be alert and attentive at all times. This means they do not divide their attention by conversing with a pretty girl or cleaning their fingernails. They remain on post until properly relieved and stay on their feet unless otherwise instructed. They have no other duty than to perform as lookouts.

THE LOOKOUT AT NIGHT

A lookout at night makes an inspection of his ship's running lights every 30 minutes and reports that all is well or that a malfunction has occurred and needs correction.

THE LOOKOUT IN DARK AND FOGGY WEATHER

In the dark the lookout avoids having any light in his eyes that would cause night blindness. In foggy weather he must be the ears as well as the eyes of his ship. Sound travels well over water, but in foggy weather the lookout can expect tricks from sound. Any noise should be reported to the bridge.

STERN LOOKOUT

The stern or after lookout has the responsibility of reporting overtaking boats and other hazards astern. In addition, he watches the passengers and crew in case one falls overboard. He must stay alert, watching everyone who moves about the vessel.

Break if necessary.

THE LEAD LINE

The lead line is one of the most useful instruments aboard. The hand lead or "blue pigeon" as sailors call it is usually 60 fathoms in length. The line is made of well-stretched American or Italian hemp and should be pliable. It is wetted and stretched before attaching the markings. It is also wetted before taking soundings in order to obtain the length necessary for accurate soundings.

WEIGHT AND ARMING

The lead is from 7 to 14 pounds, but can be any weight that will properly drop to the bottom. The bottom of the lead is hollowed out and "armed" with tallow or soft wax that picks up particles to be compared with the type of bottom indicated on the charts.

LEAD-LINE MARKINGS

The lead line is marked as shown in the workbook, page 25.

- 2 fathoms from the lead—two strips of leather
- 3 fathoms from the lead—three strips of leather
- 5 fathoms from the lead—white cotton rag
- 7 fathoms from the lead—red woolen rag

A fathom is 6 feet. Deeps are "marks" between the marks. Passing 20 fathoms, marks are at every 5 fathoms as follows:

- 25 fathoms—small line with one knot
- 30 fathoms—small line with three knots
- 35 fathoms—small line with one knot
- 40 fathoms—small line with four knots

Notice the knots convert 40 to four knots, 30 to three knots, etc.

TAKING SOUNDINGS

Taking soundings or casting the lead is an art done when the vessel is under way. The leadman casts the lead forward and gets the depth as the vessel passes over the lead. It is done in the following manner: The leadsman grasps the lead about 2 fathoms from the end, or at any distance from the lead itself that will allow a complete circle of swing. The lead is sent over the head for two full turns and released at the bottom of its swing almost parallel with the water. The lead line is coiled in the left hand so that it will run freely without kinks. As the line flows out and the lead reaches bottom, the leadsman grasps the running line with his right hand and plunges it up and down to feel the bottom. At the same time he watches the marks as the

ship passes over the lead and calls out the mark. He does not use the word "sir" in his report, but calls out "By the mark 5" or "Mark under water 5" or "By the deep 3."

MARLINSPIKE SEAMANSHIP

Marlinspike seamanship is the art of handling, splicing, knotting, using, and caring for fiber and wire rope. There are some 1,500 knots, hitches, and splices known; but a few useful knots and hitches will be of greater value if they are learned well—so that they can be tied in darkness, in ice and snow. Now refer to pages 18 and 19 in the workbook.

Overhand Knot.—The overhand knot is merely a line passed over and through itself and is used as a stop by itself. It is also used in starting most other knots, hitches, and bends.

Square Knot.—The square knot is the most commonly used knot. It should never be used in tying two lines together. It should be used for reef knots in sails, as awning stops, and for tying packages. It has a serious fault in that it jams and becomes difficult to untie.

Sheet Bend.—The sheet bend or becket bend, sometimes called the weaver's knot, is used for tying two lines together.

The Bowline.—The bowline is a particularly good seaman's knot. It does not slip, pinch, kink the rope, or become too difficult to untie. It is used wherever a secure loop is needed. It is also used on an anchor where there is not time to make a splice.

Figure of Eight.—The figure of eight is used mostly as a decoration but has been used when securing a flag or pennant to a line where there are no snaps.

Fisherman's Knot.—The fisherman's knot is used for securing two lines together when one is particularly slippery.

Clove Hitch.—The clove hitch is used for temporarily making fast a line to a pile or bollard. It must remain taut in order to hold well.

Two Half Hitches.—Two half hitches are best with the round turn as illustrated in the workbook, page 18. It also needs pressure to hold well.

Rolling Hitch.—The rolling hitch is one that can be moved along a spar by slacking off, then putting strain on again. It is also used to make fast to the standing part of another rope.

Midshipman's Hitch.—The midshipman's hitch is a loop that will not set up until hauled tight over an object within the loop, and will thereafter hold.

Fisherman's Bend.—The fisherman's bend is used to secure a ring or spar. When used as an anchor bend, the ends should be seized to the standing part.

PROJECT

Set up a jackstay or rail for tying knots. Supervise the action and make sure each can tie the important knots. If time does not allow instruction in all the knots, do the following and teach the others later.

The overhand, square knot, bowline, clove hitch, round turn, two half hitches, and midshipman's hitch. The sheet bend can be taught quickly. Take time to divide the group into crews and have them compete in knot tying for both speed and accuracy.

BELAYING TO A CLEAT

When belaying to a cleat make a turn around the cleat first, holding against the pull of the boat. Then make a bight in the fall, turn half over, and slip over the cleat ear. If a cleat is available, practice belaying to a cleat in the proper manner, being careful that each does it so that the line thus belayed will not jam and can be taken off quickly.

THE EYE SPLICE

The eye splice requires care in the "marrying." The first two tucks are shown from left to right, then the eye is turned over and the third strand tucked. Proceed over and under. Each student must submit an eye splice before the entire course is completed.

The short splice is done the same proceeding from both ends.

TYPES OF ANCHORS

Old Fashioned or Yachtsman's Anchor.—The old-fashioned or yachtsman's anchor is probably the most popular of anchors. It has been tested over centuries and found to hold well. Since descriptions of other anchors are compared to the parts of this anchor, look at the parts on the bottom of pages 20 and 21 in the workbook and become acquainted with them.

If possible, have an old-fashioned anchor aboard and use it for illustration.

Lately, the newer lightweight anchors have found favor with small-boat operators.

The Navy or Stockless Anchor.—The Navy or stockless anchor is a heavy cast anchor in essentially two parts, assembled by a joint at the crown that allows the arms or flukes to swing on either side of the shank. Insurance requirements demand that it be about ¼ heavier than other anchors. This can be a backbreaker when handled by hand line.

The Danforth.—The Danforth is designed to bury itself quickly because its flukes are long, sharp metal sheets. It has a round iron rod through the crown to prevent it from rolling instead of running the stock through the head as in the old-fashioned anchor. Its flukes fold flat for easy storage on deck and its has tremendous holding power.

The Northill.—The Northill is another lightweight anchor and has a stock at the crown instead of the ring end. The arms fold flat against the stock so that it lays well on deck also. The disadvantage of these lightweight anchors is that in heavy seas they may come loose with the bouncing of the boat.

The Mushroom.—The mushroom anchor is used primarily for moorings, anchoring buoys, and for permanent moorages. It works well in soft bottoms as it creates a suction and is difficult to work loose.

The Grapnel.—The grapnel is used primarily in weedy or rocky bottoms. Its five prongs become secure in these locations. It is difficult to store on board, however.

ANCHOR LINE OR "RODE"

Many small boats use manila or nylon rope as anchor line or "rode." Nylon has spring and elasticity and is impervious to rot and mildew. Many larger vessels use chain, wire rope, and winches to handle the rode. However, if the line is to be manipulated by hand, the manila and nylon are easier to use.

USING CHAIN TO AID LIGHTWEIGHT ANCHORS

Short pieces of chain from 3 to 8 feet in length shackled to the anchor itself and in turn shackled to the anchor rode will assist in giving the added weight at the bottom needed to make the lightweight anchors dig in.

ANCHORING, SCOPE

Shallow water is preferred in anchoring because less scope is required. (Scope is the length of line.) Always allow from 5 to 8 times the depth of water for the scope, letting the pull of the anchor line along the bottom set the anchor. Once it is set, scope can be reduced somewhat if desired, but an eye must be cast for heavy changing winds and rough water, which could bounce the anchor loose.

HOLDING POWER—A PIGGYBACK SECOND ANCHOR

Holding power is increased with scope, and adjustments should be made according to conditions. In times of rough weather a second (and smaller) anchor can be rigged with a loop around the original anchor rode and this second anchor let down piggyback on the anchor line until it reaches a point about halfway down. Its line is then secured, and the added weight on the line has a tendency to take up the bounce of the boat without bothering the set of the anchor at the bottom. Or the second anchor may be set out at an angle to the first, and the vessel may be riding to a bridle.

LOWERING THE ANCHOR

Never throw an anchor over. It may cause your craft to capsize, foul the line, or cause many other problems. It is best to lower the anchor over the side carefully and ease it down until it touches bottom. The line is then carefully tended, the depth noted, and *line watched for fouling a fluke.* Do not snub too quickly, as the anchor may not hold if lifted before the pull is along the bottom. Do not shut off the motor or relax until the boat is riding securely at anchor.

USING BOW AND STERN ANCHORS

Many times the boat will "tack" about on the anchor line when there is wind. This is prevented by using two anchors, bow and stern. When doing this, follow the normal procedures except that much more scope is needed until the stern anchor is lowered. Then the boat is hauled up on the bow anchor until the stern is set. Use care that waves or wind are not directly on the beam when riding on these two anchors. The boat should be headed into the wind.

KEDGING

Kedging, simply explained, is the maneuver of placing an anchor some distance from the boat for the purpose of pulling the boat off a sandbar or similar grounding.

SESSION 4

ACCIDENT-PREVENTION SAFETY

(Workbook, pages 22-29)

To the instructor:

Before attempting to present this session, careful study is indicated. The subject matter is extremely important, and consequently this challenges the instructor to develop a manner of presentation that will hold the attention of the student and drive home the salient points.

Testing in this session consists of having each student prepare a safety checklist and station bill. These should be designed for use aboard his own vessel. It may be that you would wish to include the actual construction of these items in the course, and if there is time there is no reason why this shouldn't be done. These two items must be submitted in satisfactory completion in order to obtain credit for the session.

Every course member must have a workbook that contains numbered aids for all sessions.

NECESSARY EQUIPMENT ABOARD

A boat that has been checked out for all the necessary safety equipment stands a much better chance of staying out of trouble.

CORRECTING HAZARDS GOOD HOUSEKEEPING

Correct the basic elements of a hazard or danger. Good housekeeping aboard a boat is essential. Clear the decks and other areas of debris and objects that could cause a fall. A spot of grease, a loose line, candy wrappers, or any small rolling object such as a peanut could cause someone to fall overboard. Sweep, scrub, inspect and reinspect until all such dangers have been eliminated.

INSPECT HULL, FUEL TANKS, ETC.

The hull should be inspected for leaks, sprung planks, tight through-hull fittings, and adequate lines. Then the bilges should be pumped and inspected inside for incoming water. Backfire traps on gasoline engines should be checked, and fuel tanks, fittings, lines, and valves checked for leaks. It is important to remember that gasoline vapors are heavier than air and settle in the bilge or lower compartments. The fumes from ½ cup of gasoline are enough to blow up most pleasure boats.

TAKING ON FUEL

A vessel should never put out without sufficient fuel. Proper fueling techniques must be followed. The first rule is to allow no smoking in the area, even if it means placing watches on the dock to warn sightseers away. All ports, windows, hatches, and doors should be closed during the fueling operation. All electric apparatus should be shut off, and all electric switches

closed. The fueling nozzle should be grounded securely against the tank intake to prevent static electricity. If outboard tanks are used, they are taken ashore to fill. Fire extinguishers must be handy during the operation. All vents such as doors, windows, etc., are opened, and the boat is aired out for a least 5 minutes. The blowers are used to clear out the bilges.

FIRE HAZARDS, HOW TO PUT OUT FIRE

There is a positive method of extinguishing any type of blaze. Alcohol can be extinguished by water. This means that for fighting this kind of fire a bucket should be aboard as well as the hand bilge pump, which is very handy for this.

Diesel oil, gasoline fires, and the like respond very well to CO_2 extinguishers. Although dry chemical extinguishers are popular today and do a very good job, they leave a fine residual dust that must be cleaned up with a vacuum cleaner.

Electrical fires also respond to a CO_2 extinguisher. Again, dry chemical may be used. Water on these fires is to be avoided. No carbon tetrachloride is allowed aboard anymore. It has been outlawed by the U. S. Coast Guard because it develops a highly poisonous gas (phosgene).

LIFE JACKETS

Life jackets should be thoroughly checked for damage and to see that there is an adequate supply aboard. They should be of the Coast Guard approved type as shown on the label. All lifesaving equipment must be aboard and in good working order.

RUNNING LIGHTS

Running lights should be checked to see if they are in good working order, and all switches checked to see if they work and are sparkproof.

HORN AND BELL

The horn and bell should be checked to make sure all is in working order.

EQUIPMENT NOT REQUIRED BY LAW

Up to this point all the equipment required by law has been checked. But many other things not required by Coast Guard regulations are needed.

ANCHORS AND LINES

How about anchors? Is there an adequate anchor aboard with enough anchor line to reach bottom and allow scope for the depth of water in which the vessel will be operating. The anchor rode must be in good shape so that it will not break when needed the most.

EMERGENCY PROPULSION

In the event of an engine failure, is there the necessary emergency method of travel? Oars, paddles, a sail, or other means of moving the boat may be needed.

AUXILIARY STEERING

An auxiliary method of steering the boat is important, too. If something happens to the rudder, the boat is helpless. A long sweep oar or spare rudder parts to affect repairs are a necessity.

CHARTS

Charts of the area are necessary. They help by showing water depths if it becomes necessary to anchor.

EMERGENCY LIGHTS

Emergency lights should be aboard. A few good flashlights would help.

METHOD OF SIGNALING

There should be a method of signaling—blinker or semaphore.

REPAIR KITS

A good repair kit for engines or for repairing leaks in the hull should be considered.

FIRST AID KIT

A good first aid kit is essential for Sea Explorers. The local Scout distributor is a good source.

PROJECT

Now is a good time for each trainee to construct a checklist for his own craft. Call a break if you wish, then involve the entire class in developing this list. Call on everyone to suggest things that should be

aboard. Each person then constructs a checklist that will suffice for his boat. You could have it duplicated later and make use of it. In the last session they make use of a checklist before boarding, so whether they use this one or one provided for your course, it will be good practice. A sample checklist is on pages 22 and 23 of the workbook.

HEAVY WEATHER, FOG, ETC.

Heavy fog, stormy weather, large seas, and unpredictable weather are situations when common sense is the best safety factor. Sometimes it is well to know when to leave a boat tied up and go home.

BOAT IN GOOD SHAPE

A boatman with judgment sails only when his boat is in good condition and fully equipped. He must also be prepared to meet any danger, including the danger of boat operators with less common sense and experience than his own.

STATION BILLS

Taking first things first, it is best to organize the crew so that everyone aboard knows where to go and what to do in an emergency. In the Workbook is an example of a station bill. It is merely an example of how to handle an emergency situation without adding confusion to an already serious situation.

ASSIGNMENTS FOR EVERYONE

Each person aboard has an assignment in event of an emergency, even if his duty is to stay out of the way. If he is in an assigned place, the Skipper knows where to obtain additional help if needed. And so the station bill should be added to the checklist before casting off.

PROJECT

The students are to construct a station bill in blank form to be completed when the boat is used in session 8. Have them do it under your supervision using the one in the workbook on pages 24 and 25 as an example.

DON'T JUMP INTO A BOAT

Never jump into a boat. It may cause the moorings to loosen or cause other damage to the hull. When loading a small boat, the operator tells each person the correct way to board. If the boat is small, he steadies it for them. He instructs them to stay low and in the center of the boat. Supplies and equipment are passed to a person already aboard, eliminating the problem of someone balancing himself with an armful of gear while trying to step aboard. If the boat used is an outboard, the motor's safety chains must be secured before leaving.

Regardless of the size of the boat used, a careful study of the wind and current patterns is necessary. A plan for casting off should be in effect.

POST STATION BILLS HAVE DRY RUN

Once station bills have been posted, everyone aboard should be made familiar with their assignments. Before casting off, there should be a "dry run" on each emergency situation to make sure everyone understands his station and duty.

FIRE ABOARD— POSSIBILITY OF PANIC

Fire aboard can cause panic if everyone is not familiar with his job. Panic can be a serious emergency in itself, and fire seems to be one thing that causes it. A calm attitude and businesslike approach to the problem of fire help to hold this tendency down. If fire does break out while cruising, it is good to close all hatches, portholes, and ventilators in order to keep the suppressing agent at the fire and not blown away.

GET FIRE LEEWARD

The burning end of the vessel should be headed away from the wind (leeward) and at a slow speed if forward of the helmsman. This blows the flames over the side instead of into more burnable material on the boat. The fire is to be kept away from the life jackets and other lifesaving equipment aboard.

FIGHT FROM WINDWARD SIDE USE OTHER METHODS OF FIRE FIGHTING

All fires are fought from the windward side wherever possible, and even after fire extinguishers have become useless, wet blankets and water can be used. Caution again, a burning boat headed into the wind will catch completely in a few seconds and drive everyone over-

board without a chance of fighting it or even securing life jackets. The Skipper should not hesitate to reverse engines or maneuver the boat to keep the flames from spreading. Getting ashore is secondary. Depending upon the type boat used, auxiliary fire-fighting gear might include a fire ax and several buckets of sand.

MAN OVERBOARD DRILLS

Man overboard drills are used frequently aboard Sea Explorer vessels. They develop good seamanship as well as provide training in rescue techniques.

WITNESS RESPONSIBILITY

The first person to see a man overboard is likely to be the stern lookout, but anyone who witnesses the fall becomes responsible for the cry, "Man overboard!" as well as keeping an eye on the victim.

POINTING AT VICTIM

The arm is extended and forefinger pointed at the victim at all times. This way, if the eyes must be taken off the victim, he can be quickly located again. The first action taken is to launch a life raft or ring buoy near but not at the swimmer.

SWINGING BOAT

The helmsman should stop the propeller at once and swing sharply toward the direction of the side over which the swimmer fell, thus swinging the stern away from him.

The searchlight or auxiliary light should be manned if by night. The rescue should always be attempted from the lee side. This also applies to the current such as in a river. One person, ready to swim, should be standing by with a line tied to him and tended by another. The victim may be exhausted and need help in the water in order to make the rescue.

LAUNCHING SEARCH

If a search must be launched, the course taken should be marked by any handy means such as leaving a trail of oatmeal or an oil slick so that the same water need not be covered twice. Again, proper preparation and elimination of hazards might have prevented this type of accident.

GROUNDING

Going aground for small boats is seldom more than an annoyance, but careful checking of the charts and good seamanship can prevent this, too. Such occurrences are handled in various ways. The easiest is in a tidal area where an incoming tide soon floats the boat clear.

EXAMINE HULL FOR DAMAGE

A thorough inspection of the hull should be made to determine damage and make repairs if necessary. If there is extensive damage, judgment should be used in whether to abandon ship to make immediate repairs or to wait until the vessel makes shore.

LIGHTENING THE BOAT

Where there is no tide, lightening the boat can sometimes bring her free. But if the crew goes over the side to accomplish this, they should secure lifelines to themselves and the boat so that they can return. Also, it is a good idea to rig a ladder.

HEELING TO REDUCE DRAFT

Heeling the boat to reduce her draft will sometimes work. Crew and equipment are shifted to the side and the keel brought out of the sand. Shifting crew weight fore or aft sometimes helps.

CALLING FOR ASSISTANCE

Sea Explorers should never hesitate to ask for help if it is needed. They should take help from the Coast Guard or other vessels. If it becomes necessary to signal for assistance, use any of the following signals that would be recognized by boatmen.

- Flares fired into the air
- Ringing of the ship's bell rapidly
- Blasting the horn continuously
- Flying the ensign upside down
- Waving a flag
- Moving the arms up and down slowly
- Shouting or making any noise or motion to attract attention

are feasible methods of getting help. A person who needs help can well afford to forget his dignity for the

moment. Sea Explorer ships should always be alert for opportunities to help others in trouble. Many ships train and practice the methods of rendering aid to boats in distress. They take great pride in their ability to perform rescues.

FIRST AID

At least one person aboard should be familiar with first aid. This course is not intended to teach the subject, but it is recommended that Sea Explorers be well acquainted with the procedures.

COURTESY

Courtesy is the mark of a good seaman. The boatman is alert to dangers to himself and of the dangers he may cause such as the wake from his vessel. He does not speed past any smaller boat or canoe, knowing he could swamp it. He is also alert for possible damage on shore.

SKIN DIVERS

One of the newer hazards requiring courtesy from boat operators is the rising popularity of skin diving or scuba diving. The red flag with the diagonal white stripe on a buoy or other buoyant apparatus should be universally recognized as designating a diver beneath the surface. This emblem may vary according to State and local regulations, so it would be wise to check with those authorities to determine this for a particular locality.

DON'T TIE TO BUOYS, ETC.

A ship should never tie to a navigational aid such as a buoy. It is dangerous to the vessel and to others because it could obstruct the buoy or cause it to move off its position.

NOW, HEAR THIS!

Review the sessions briefly by discussing the illustrations related to safety on pages 32-35 of the workbook.

SESSION 5

PILOTING— COMPASS AND ERRORS

(Workbook, pages 30-33)

To the instructor:

Careful consideration of the material is required before making this presentation. In the experiments with the course it was found that slow deliberate explanation of the first portion and encouraging the students to ask questions made the working of the variation and deviation problems much easier. Several props are in order if they are available. A compass, such as a lifeboat compass, which will show gimbal ring and lubber line would be a big help. Because of the difficulty in describing the parallel rules, one should be made available for examination and demonstration. Charts of the local waters are considered a necessity. They are used in session 6, as well. Testing consists of several problems dealing with variation and deviation. The questions are varied enough to cover problems in most locations. If a blackboard is handy, the instructor may want to demonstrate the problems, or he may prefer to issue blank paper to the students and have them work the problems out for themselves.

ALWAYS BELIEVE THE COMPASS

Probably the most instructive remark to be made in this entire session is the admonition, "Always believe your compass." True, the compass has errors, which we will discuss later, but once corrected it is as accurate as your watch, which you always believe when it is running. Believe your compass, and it will lead you to where you want to go. Accidents are caused by not having faith in this vital instrument.

A SIMPLE COMPASS

Refer to pages 30 and 31 in the workbook. The magnetic compass is merely a mechanical contrivance making use of the electrical attraction of the magnetic poles. A common needle, magnetized by drawing a toy magnet along it a few times, and suspended or pivoted from beneath, mounted on a directional card. Although radio direction finders, radiobeacon charts, and other navigational aids are available, the compass remains the mainstay of aids for the boatman.

THE 32 POINTS

You will note on page 30 that the compass card consists of 32 points, starting with N. or north, then N. by E., etc., around the circle. These are the 32 points in the relative bearings charts and in the point system of the visibility of lights.

These were used in the age of sailing vessels when these points were close enough for the wandering courses of the sailing ships.

PROJECT

Compass Boxing Contest—Divide the groups into two crews and have them assemble in separate circles to "box" the 32 points of the compass in the manner described here. One trainee starts by saying, *"north,"* the second, *"north by east,"* the third, *"north, northeast,"* and so forth around the circle. If a mistake is made, the group must start over. The first crew to get all the way around correctly is the winner. (Thirty-two players are not necessary for each crew; every one takes his turn.)

SAME AS ONE HUNDRED YEARS AGO

There has been little change in the mariner's compass for many years. In theory and construction, it is practically the same as it was one hundred years ago.

Refinements in the markings on the compass card are about the only changes. The older compasses were known as dry compasses. These were simply magnetic needles and a card pivoted at the center. They proved to be very sensitive and responded to the motion of the ship very easily.

NEED FOR CHANGE

When vibrations were set up with the introduction of steam and later with internal combustion engines, the compass card was set in constant motion, which made it unreliable as a navigation instrument. The development of the liquid compass followed and to a great extent overcame the difficulty experienced with the dry compass by dampening its motion.

THE LIQUID COMPASS

The liquid compass is practically the same as the dry compass except that a liquid, consisting of about 55 percent water and 45 percent alcohol, is included in the bowl of the compass and sealed in. The liquid not only absorbs the vibrations of engines and the sea, but floats the card to make it free on its pivot point. This allows it to move easily as the boat is turning under it.

GIMBAL RING, JOURNALS

The compass is also fitted with a gimbal ring to keep the instrument level as the ship rolls or pitches. The ring is connected to the binnacle or compass box by means of journals or knife edges.

LUBBER LINE

The lubber line is a line drawn down the exact center of the boat from the stem to the center of the transom or aft center of the boat. The keel is a lubber line.

SETTING THE COMPASS

All compasses should be set either exactly over this lubber line or exactly parallel to it so that the mark inside the compass bowl, also called the lubber line, will be exactly on line with the keel. Once the compass is correctly mounted there is a fixed pointer—the compass card.

It is important to remember that this card is fixed—it never moves in relation to the earth because the magnetic field holds it in this position. The boat moves around *under* it. Therefore, the lubber line inside the compass bowl indicates the number of degrees on either side of north that the boat is needed.

OPERATING BY VISUAL AIDS

Most small-boat navigation is done by using visual aids, soundings, and a great reliance on the lookout. The compass becomes necessary in thick weather or in areas where visual aids are beyond normal vision. Practice using the compass and apply the compass errors in clear weather to be able to apply them correctly when vision is restricted.

VARIATION

The compass always points to magnetic north. Magnetic north and true north are not always the same. The magnetic field that draws the compass needle is located in an area somewhat north of Hudson Bay, and true north is at the earth's extremity or axis. The vicinity of Lake Superior is in direct line with magnetic and true north. In New York City, the magnetic field is to the left, or west, of true north by about 12°. On the west coast near Portland, Oreg., the magnetic field is to the right, or east, of true north by about 21°. This magnetic field is some four hundred miles south of the North Pole and is constantly changing. But its changes are predictable.

TWO NORTHS, TRUE AND MAGNETIC

By now it is apparent that there are "two" norths. One is called *true north* and is at the earth's axis, the

other is called *magnetic north* and is located at the magnetic field. The amount of separation between these two points is called *variation* and is expressed in degrees on local charts according to the location on the globe. For charting purposes, variation is always expressed in degrees as "variation east" or "variation west" depending upon the location.

COMPASS ROSE

At the bottom and at the right of page 31 in the Workbook is an example of a compass rose similar to those found on a standard chart. In the center it gives the variation for the location covered by the chart, the date, and the decrease (or increase) per year. Using the figure shown, since the decrease is 3 minutes per year, if the chart were 5 years old the reduction would be 15 minutes. Since there are 60 minutes to the degree, the error would only change about ¼°. This would be negligible in charting. On long ocean voyages this would be important, but for shorter trips these annual increases or decreases can be disregarded unless they amount to a full degree at the time of charting. The best way is to keep charts current.

COMBINATION, INNER AND OUTER ROSE

On coastwise charts and certain inland waters, the compass rose on a chart is a combination having a second compass inside the other. This inside rose is corrected for variation. The outer one shows true north and all points, while the inner one reads the course necessary to make good the desired course.

WORKING A COURSE

Determining the proper course to take is called "working out a course." Although there are many instruments such as the protractor, which is made of celluloid with a protruding arm and containing a compass rose, charting is more thoroughly learned by using the parellel rule, or *parallels.*

USING THE PARALLELS

One side of these is placed on the course to be made good, such as a line between two buoys on a chart, and the other placed on the compass rose so that its edge crosses the mark dead center on the compass rose. The outer edge of the compass rose in the direction of the desired heading gives the number of degrees for the true course. If the compass rose also has an inner rose, it gives the corrected course to steer. For the purpose of this course, disregard the inner rose and learn to figure the course as if there were no inner rose.

WALKING THE PARALLELS

In using the parallels it is sometimes necessary to "walk" the rules to the nearest compass rose because it won't reach out far enough on the first extension. This is done by laying the edge along the desired course and holding that side down firmly and moving the other side as far as it will go. Then the extended side is held down solidly and the course side moved up to it. The procedure is reversed again and continued until the nearest compass rose is reached. Neither side must slip and assume a different angle than the desired one.

DIFFERENCE BETWEEN DEVIATION AND VARIATION

Workbook, pages 32 and 33. Another compass error is called deviation. Distinction must be made as to the difference in variation and deviation because of changes that are not constant in deviation. As noted on page 33 in the workbook, the simple explanation is that variation is the difference beween magnetic north and what the compass actually reads.

WHAT CAUSES DEVIATION?

Deviation is caused by magnetism within the vessel that affects the compass. Remember that the compass is a delicate instrument and that placement of iron on the boat causes it to vary. A knife on the helmsman or in his pocket causes the compass to be inaccurate. These things are watched closely in a taut ship. Engines, metal fittings, electrical currents—anything that could be attracted to a magnet has an effect on the compass.

COMPENSATING

This can be compensated for by placing compensating magnets or iron about the compass—and is only done by an expert. The balance or error is calculated and entered in a table to be used when working a course. Regardless, if the compass is compensated or not, the deviation table is necessary for accurate navigation. The deviation table on page 32 shows deviation every 15° around the compass.

USING LOCAL AIDS TO COMPUTE

There are many ways of determining this table, but using local navigational aids is the best. For example, a course line between two buoys can be determined from the compass rose, variation computed, and the course run in both directions. If the first course is due north, for example, according to the corrections, then the compass should read 000° (360°). If it does not, then the actual reading should be entered on the deviation chart figuring and the difference noted in the chart. Running the other way the compass should read 180°, but if it does not, the difference is entered on the deviation chart.

COMPASS NUMBERED CLOCKWISE

The compass is numbered in degrees in a clockwise manner with north being 000° or 360°. This is important to remember when working out a course to be made good. Variation nearly always affects the figuring. A boat in New York City wanting to go due north and heading north, 12° left of true north. Therefore, the navigator would have to turn the boat right 12° to go due north. His *compass* heading would be 012°. (The chart in this area shows 12° W. variation.) On the other hand, in Portland, Oreg., the chart shows 23° E. variation. A boat holding a compass course due north would in reality be heading for the magnetic field 23° to the right of true north. To correct this the operator must swing the boat to the left by 23° and his compass would then read 337°.

UNCORRECTING, FROM TRUE TO COMPASS

These two examples are known as "uncorrecting." This is attempting to go on the correct course by uncorrecting the error to obtain the course. In uncorrecting, westerly errors are added and easterly errors are subtracted. Very simply stated, when the true course is known, you uncorrect.

CORRECTING, FROM COMPASS TO TRUE

On the other hand, when the compass course is known the true course is wanted, you "correct" by adding easterly errors and subtracting westerly errors. Correcting and uncorrecting should be reviewed until the difference is understood.

OBTAINING COMPASS COURSE FROM KNOWN TRUE COURSE

When the errors are alike, such as deviation 10° W. and variation 5° W., the total error is 15° W., obtained by adding the errors together. When the errors are *unlike,* such as deviation 10° W. and variation 5° E., the lesser amount is subtracted from the greater and the name of the greater figure is assumed. In this case, the total error is 5° W. As an example, you are going to run a course from buoy 4 to buoy 7 which can be done in a straight line. With the parallels you determine from the compass rose that the course is 120° true. You find on the compass rose that the variation is 12° W., and on checking the deviation chart you find that the deviation on this course is 15° E. Subtracting 12° from 15° leaves a 3° easterly error. So you subtract the 3° from the 120° true course and find that running on a compass course of 117° will take you where you want to go.

PROJECT

Pass out paper for doing problems.

Figuring out these problems is simple arithmetic—just adding and subtracting. You are concerned only with what to add and what to subtract. (Work the problems on the board after the trainees have worked them out on their papers.) Remember that when determining your course from the chart in order to determine how to steer, you are uncorrecting and you subtract the east and add the west.

PROBLEM

Using the parallels you have determined that the true course from the lightship to the gong buoy is 224°. The variation is 23° E. and the deviation is 9° E. What compass course should you steer? (Answer, 192°) Second problem: The next leg is on a true course of 301° with the variation 23° E. and deviation 15° W. What is the compass course? (Answer, 293°)

JINGLES TO HELP REMEMBER

Sometimes jingles help in remembering which way to figure the errors. "True to compass is our quest, subtract the east and add the west," is one. Chapman uses the illustration CEED: "Correct easterly errors clockwise." Of course, in uncorrecting you would say, "Uncorrect westerly errors clockwise."

Now that you have had an opportunity to determine a course from the chart, try to determine the exact

direction by working from your compass course. The known element here is the course indicated by the compass; you want to know where you are really going.

PROBLEM

Your compass course is 051°. The variation is 12° W. and the deviation is 1° W. What is your true course? Remember to reverse the procedure and subtract the west and add the east. (Answer, 038°)

(Instructor: You may have to devise several problems to get this point across. At any rate, be sure they understand it before giving them the examination. There are six problems and four must be answered correctly for a passing grade.)

TEST

PILOTING–COMPASS AND ERRORS

1. From the beacon to buoy 5, the true course is 127°. Variation is 20° E., deviation 15° E. What compass course do you steer? (Answer, 092°)

2. From buoy 6 to buoy 8 the true course is 315°. The variation is 10° W., deviation 19°W. What compass course do you steer? (Answer, 344°)

3. You are running on compass course 090°. Variation is 12° W., deviation 7° E. What is the true course? (Answer, 085°)

4. The compass reads 015°. The variation is 23° E. and the deviation is 10° W. What is the true course? (Answer, 028°)

5. You figure a course from the chart as 210° true. The variation is 14° W. and the deviation 12° E. What compass course do you hold? (Answer, 212°)

6. You want to make good a true course of 007°. The variation is 20° E. and the deviation 10° W. What compass course should you hold? (Answer, 357°)

SESSION 6

PILOTING—CHARTS

(Workbook, pages 34-39)

To the instructor:

This is another session involving simple arithmetic. Become acquainted with the standard formulas and use a blackboard wherever possible to illustrate as you go. Provide blank paper for the students to figure speed problems on. The charts used in the last session may be used again here. It would be best to have charts in sufficient numbers to allow crews to each have one to identify the symbols. Have a pair of dividers to illustrate measuring distances, etc. Involve the students in making measurements. Since most of the instruction is done from the workbook, very little lecture material is furnished.

The most effective ways of combining the chart symbols and the speed problems are done by having the students measure the distances between objects and identifying them, and then working out the problems of speed concerning them. The test concerns the speed problems. Five problems are presented—four correct answers are needed to pass. Allow the student to check his formulas when working the problems.

DEFINITION OF A CHART

A chart is a detailed picture or representation on durable paper of the navigable waters of the world; it is not called a map. All charts are projected to overcome the curvature of the earth's surface and show it on a plane medium.

MERCATOR PROJECTION

The Mercator projection simply expands the spherical surface of the earth into a cylinder. The chart is part of that cylinder.

Although the parallels of latitude and the meridians of longitude are not square to each other, they are shown this way on the Mercator chart, making the chart simple and easy for the navigator.

ORIENTATION OF CHART

The chart is oriented to true or geographic north. Coastwise charts are also oriented to magnetic north as well by use of the inner compass rose. A scale of miles (nautical) and of yards is printed on all coastwise and harbor charts. Distance may be taken from these scales or from the east and west perimeters of the chart (the sides). On Mercator charts of large areas, the minutes of latitude are unequal, and there is no scale on the chart. Distance is measured from the latitude scale at a point opposite the area being worked.

DIVIDERS USED

Distances are measured with dividers, similar to the mechanical drawing compasses used in school to draw circles except that both points are stainless steel or bronze. These are set at given distances on the scale and then walked over the projected course to determine distances. Practice makes anyone adept at this.

DETAILS OF CHART

Charts show in detail *everything* of possible interest and aid to the mariner including the depth and character of the bottom over which he sails, nearby shorelines, land

contours, and objects that may be used for bearings. They show U. S. Coast Guard stations, aids to navigation, radio stations, towns, buildings, tidal and other currents as well as their intervals, and many other things. A careful study of chart symbols reveals the extent of information to be gleaned from a chart.

PROJECT

Furnish charts of the local waters and point out the chart symbols in the workbook, pages 34-40. Have the students find similar symbols on their chart. Continue until all are familiar with the basic chart symbols. If no charts are available, use a blackboard and have the students draw designated symbols on it. Point out that some chart symbols are colored, such as the radiobeacon which has a magenta outline of the location dot. Spend from 20 to 30 minutes on the chart symbols. Then continue the discussion with the abbreviations used with hydrographic symbols and the special notes on chart reading. If your ship steams on inland water or the Great Lakes, spend some time in the comparison of the special river chart symbols. Then consider the system used in your locality using Chart 1.

CUTOFF POINT, TAKE A BREAK IF NEEDED.

In seamanship speed, distance, and time are related. For example, an anchorage is 16 miles away and you are making 6 knots. How long before you get there? The experienced operator usually figures this in his head and comes up with a close answer since he is familiar with the boat, the water, and his speed. Logically, the first thing to determine is the speed.

Some boatmen keep a chart aboard showing boat speed as related to the r.p.m. of the engines. From this he deducts or adds whatever current or tide that is affecting him.

The formula generally used is:

$$\frac{\text{seconds in an hour (3600)} \times \text{distance}}{\text{elapsed time in seconds}} = \text{speed}$$

A sample problem: You cover 2½ miles in 11 minutes 8 seconds. What is your speed?

$$\frac{\text{seconds in hour (3600} \times \text{2.5)}}{\text{total seconds (668)}} = \text{13.47 knots}$$

In making a run for a speed check, pick two objects on the chart that can be accurately measured and run between them, using the stopwatch. Get an accurate check by running the same course in the opposite direction. Then use the above formula to determine speed. Note the r.p.m.'s at the time.

PROJECT

Using a blackboard, make up two other problems to illustrate this point. Then hand out blank sheets of paper and give them the formula to write at the top. Give them the following problems to work.

1. You cover 1 mile in 8 minutes 5 seconds. What is your speed?
   (7.5 knots or 7½ knots is close enough.)
2. You cover 3.2 miles in 34 minutes 55 seconds. What is your speed?
   (5.5 knots or 5½ knots)

Make sure all understand what they are doing. Then introduce the next formula.

$$\frac{\text{elapsed time in seconds} \times \text{miles per hour}}{\text{seconds in an hour}} = \text{distance}$$

Problem: You have traveled for 2 hours 30 minutes at an average speed of 8 knots. How far have you gone?

$$\frac{\text{time in seconds (9000)} \times 8}{\text{seconds in an hour}} = \frac{72000}{3600} = 20$$

Have them work the following:

- You have been traveling at 11 knots for 3 hours 15 minutes. How far have you gone? (35.75 miles)
- You have run steady at 14 knots for 1 hour 20 minutes. How far have you gone? (18.6 miles)

When they have mastered this formula, give them the last one.

$$\frac{\text{seconds in an hour} \times \text{distance}}{\text{speed}} = \text{time}$$

Return to the original problem which was not answered. The anchorage moorage is 16 miles away and you are making 6 knots. How long will it take to get there?

$$\frac{\text{seconds in an hour (3600)} \times 16}{\text{6 knots}} = \text{9600 seconds or 2 hours 39 plus min.}$$

Make up two more problems of this nature and have them worked out.

TEST

PILOTING–CHARTS

1. You have been traveling 1 hour 12 minutes at 11 knots. How far have you gone? (13.2 nautical miles)

2. You ran 4 miles in 16 minutes. How fast were you going? (15 knots)

3. From the lightship to buoy 5 is 28 miles. Your average speed is 12 knots. How long will it take you? (2 hours 20 minutes)

4. You made the 3 miles between buoys 5 and 8 in 21 minutes. What was your speed? (8.57 knots)

5. It takes you 10 minutes flat to run the measured nautical mile, what is your speed? (6 knots)

SESSION 7

SAFE-BOATING OPERATION

(Workbook, pages 40-53)

To the instructor:

This session can be made more interesting if careful preparation is considered. A little work in the woodworking shop to construct simple wooden outlines of a boat for demonstration purposes or the use of inexpensive models can enhance the session. The demonstration is done primarily from the workbook, and it is possible to present the entire session from it.

Testing is done with a group of questions after the lecture session. A total of 7 correct answers of the 10 true and false questions are needed for a passing grade.

PRINCIPLES OF SAILING

In boat handling, even for powerboat crews, knowledge of the principles of sailing can be of help. It has been said by some that a sailing man would have very little trouble in learning to handle a powerboat. You must learn something of sailing in order to recognize some of the problems and situations that arise from time to time when encountering a sailboat in your cruising vicinity.

FORE-AND-AFT RIGS COMPARED WITH SQUARE SAILS

Nearly all sailing today is done with the fore-and-aft rigs. The square sails handled deep water in a fine and safe manner when there was enough room to search out a trade wind or other steady and predictable wind abeam or astern. When it came time to attempt the coastal waters and areas that required quick maneuvering, the fore-and-aft rigs came into popularity. They are more easily handled and require less crew and are far more efficient in going to windward.

PRINCIPLES SAME ON ALL FORE-AND-AFT RIGS

The principles and basic handling of all fore-and-aft rigs are the same. For example, if a sailor understands the handling of a catboat, he can easily learn the more complex rigs such as a sloop, cutter, yawl, ketch, or schooner.

WHY BOATS MOVE INTO WIND

The phenomenon of a sailboat moving into the wind is explained by the fact that the force of the wind is changed through efficient design, sail setting, and handling. A vacuum is formed on the leeward side of the sail. This negative or lifting force changes the direction of the wind pressure. The sail, being flexible, becomes air-foiled. It becomes perfectly balanced between the two components of the wind—the wind—the eddies and the power. Naturally not all eddies can be eliminated, and create "dead" areas in the sail, mainly along the leach. The study of aerodynamics, which includes sailing, is a complicated and involved subject and an exact science.

GETTING FEEL OF THE BOAT

But it is possible to sail well without understanding the theory. But it should be understood that sailing becomes an art when the person and his boat become one, when the Skipper develops the "feel of the boat." No book or set of diagrams can teach a person to sail. Experience is the only real teacher.

THREE PRIMARY POSITIONS

Refer to pages 40-44 in the workbook. Sails are sheeted or adjusted in relation to the centerline of the boat in three primary positions. 1. On the wind or close-hauled. 2. Off the wind or reaching. 3. Running before the wind, sailing free, or scudding. If your boat has a centerboard it must also be adjusted according to the set of the sails. Refer back to page 12 in the workbook and notice the position of the sails for each of these positions. The centerboard or a fixed keel assists in eliminating leeway or sliding sideways. If the sails flutter you are heading too closely into the wind.

STARBOARD AND PORT TACKS

If the wind is blowing on the starboard (right) side of the boat and the boom extends to the port (left), the boat is sailing on the starboard tack. If the reverse is true, the boat is on the port tack.

TACKING

Tacking consists of the steps required to put the boat on the opposite tack from which she has been sailing. It is called coming about, and although there are several different wordings of the orders given, they are primarily the same and go something like this:

- On the *warning* given by the hail, "Ready about," the boat is headed slightly away from the wind to give it maximum speed.
- Just before commencing the maneuver a further warning is given, "Hard alee," and the helm is then pushed hard down leeward.

HOW TO COME ABOUT

When the boat points directly into the wind with the sails luffing, it is permitted to run ahead under its own momentum with the helm amidships. The helm is moved gently and the boat's head brought around so that the wind reaches the opposite side of the sail, and she is trimmed away on the new tack.

WEARING

Another way of coming about is "wearing." This is never done in anything but a light or very moderate breeze. It consists of bringing the boat about gently in the opposite direction with the wind crossing her stern and easing into the new tack. Good timing and practice are necessary in this maneuver.

CLOSE-HAULING

Sailing into the wind or close-hauled is the most thrilling and the most demanding of all. The sail should be as flat as possible, luff stretched fully along the mast and foot stretched fully along the boom. The boat heels at this point, and any sudden puff of wind can heel it at a dangerous angle. It is righted by heading up into the wind so that the sails flutter (luff). Letting the sheet (line that controls the boom) run out, but not cast free, brings her back up as the wind takes the sail out over the side, but not as straight up as coming into the wind. She does not lose as much way by letting the sheets run however.

HEELING AND DANGERS

The boat is designed to sail in a heeled position and this offers no danger if carefully tended. Do not belay the sheets to a cleat and do not sail her so far over that she labors or so as to reach the critical point where she is in danger of capsizing.

PROJECT

When you get to this point, involve the trainees by having them maneuver a model boat to illustrate the points of sailing you have discussed.

REEFING SAILS

In strong winds it well may be that the boat is over-canvased, in which case it is necessary to reef or shorten sail. This is done with the ties at the reef points, the sail being lowered until the sail is reefed, and then adjusted to the new contour of the sail.

LAZY REEFING

If this is impossible or where there are no provisions made for reefing, "lazy reefing" may be accomplished

in the following manner: Trim in the jib flat amidships. Start the mainsheet until the sail is about 50 percent luffing or until the "much drive" area next to the mast is destroyed. The boat will sail on providing it is not pinched in too closely to the wind.

REACHING

Reaching is the fastest and sportiest point of sailing. The boat moves faster and makes less leeway than when sailing close-hauled.

USING TOPPING LIFT

No special instructions are necessary except that in certain sea conditions, the boat will roll quite easily, and it is necessary to look to the topping lift (the line that lifts the end of the boom) and see that the end of the boom is kept out of the sea.

CENTERBOARD POSITION

When reaching, use about 60 percent of the centerboard unless the rolling is severe. In this case, the roll is controlled to some extent by lowering the centerboard further.

BEFORE THE WIND

About the only advice we can give you about running before the wind is to be sure you keep your live ballast (people) well aft to ensure good steering. The boom should be lifted enough to clear the water and increase the "belly" of the sail.

JIBE

One danger is the shifting of the wind causing the boom to swing to the opposite side with considerable force. This is called a *jibe*. Study the illustrations in the workbook to see how to "tune" your rigging. If the boat has a tendency to fall off the wind, rake the mast aft a little further and drop the centerboard further. Note that live ballast also can be shifted to help this situation.

LANDINGS, PREFERRED LEEWARD SIDE

The preferred landing for sailboats is on the leeward side of the dock. Note in the workbook that on the first approach the boat is sailed off the wind and swung sharply about and luffed in order to shoot for the dock. Sails need not be doused if they are kept luffing with no drive on until the boat is secured. Bring the sails down, however, until practice can make the maneuver safe.

INTO THE WIND LANDINGS

If you find it possible to make your approach into the wind, you'll discover that the helm is important. The sails may be luffed several times until you have gained experience. Watch when your boat is broadside to the wind at the dock to be sure that all sheets are free so the sails do not fill.

GETTING AWAY, LEEWARD SIDE USE OF JIB

When getting away from the leeward side of the dock, you'll find that the jib is a valuable tool. Held out into the wind, it will catch and sail the bow around to position to get on the proper tack to sail away.

USE OF MIZZEN

The illustrations in the workbook also show how to sail the stern around, particularly if the boat is a ketch or similar rig with a mizzen sail that is used similarly to the jib.

DANGER OF WINDWARD SIDE LANDINGS

Sailboat landings from the windward side are more difficult and dangerous than the leeward landings, because the wind could smash the boat into the dock. An anchor can make the landing easier and safer if there is a strong wind. Usually, the landing can be made safely if the wind is mild. In either case, be prepared with fenders.

PICKING UP AND GETTING AWAY FROM A MOORING

The same procedure is used in anchoring, except that the anchor is lowered away instead of picking up at the established mooring. Refer to the illustrations in the back of the workbook to instruct getting away from and picking up a mooring.

POWERBOATS AT SEA

Powerboats present no special problems at sea when there is plenty of space to handle them. Merely steer the desired course. Fix your attention on the visual aids to navigation, your compass, or whatever situation that exists.

POWERBOATS IN RESTRICTED AREAS

However, when in tight or restricted areas with little or no maneuvering room, powerboats can present a problem and force the operator into showing some skill. Again, experience and knowledge of the particular boat are necessary for good boat handling. Two boats of identical design have identical peculiarities which have to be "felt" much the same as with sailboats. Pages 46 to 53 in the workbook should be studied in advance and used as needed to supplement the rest of this session.

BOAT ACTION DURING TURNING MANEUVERS

Turning is not instant with the noticeability of an automobile. The boat advances or slides along over the water as the turn is made while running. Notice what causes the boat to turn. It is the pressure of moving water against the rudder. A boat dead in the water with her helm hard over will do nothing. But if you add a little current or put way on, causing the water to move under the boat or the boat to move over the water, you can watch her stern swing. Remember that a boat does not steer like a car, but turns from the stern.

SINGLE SCREW VESSELS

Normally, single screw vessels have right-hand engines. This means that from aft looking forward the screw turns clockwise. The right-hand propeller tends to swing the stern to port (left) with the rudder amidships, either while backing or going ahead. This is due to the fact that the upper and lower blades work in waters of different density with the lower blades exerting a thrust to port. Of course, if the propeller is left-handed and turns in the opposite direction, the boat has the opposite tendencies.

Going forward, the boat may exhibit slight port tendencies until the way has been increased to a point where the rudder overcomes this. But backing presents more of a problem.

BACKING, SINGLE SCREW

In backing, the boat shows much more of the port tendency. To what degree this is true depends on the boat. Experiments should be conducted to find out. See the diagrams in the workbook.

USING LINES ON LANDINGS

It is never considered lubberly to make landings at a dock using lines. Anything done to protect the boat, to keep out of trouble, and to care for the passengers in a safe manner is considered good seamanship.

WHY A LINE ASHORE

One of the reasons for getting a line ashore quickly is that engines have been known to "konk out" or quit when they are needed most. The sooner the line is put ashore and held, the safer the landing can be.

HOLDING LINES AND TENDING THEM

On larger vessels the loop or eye of the line is placed over a cleat or bollard on the pier and the line tended aboard the vessel. On smaller vessels where the line may be already secured to the boat, the line is tended ashore. A crewman is put ashore for this purpose. The crewman *never* attempts to hold a boat in position by sheer power of his arms or body, but rather takes a turn on a cleat, bollard, piling, or anything solid and handy. This way he prevents being pulled into the water by a stuck throttle, sudden burst of wind, or heavy current.

TEST

SAFE BOATING OPERATION

Hand out slips of paper and ask trainees to number from 1 to 10 for a true and false test. When finished, have them exchange papers and mark the answers. Encourage discussion if time permits.

1. Knowledge of sailboating can be of help to power boaters. **True** **False**

2. "Wearing" is the changing of tack by heading into the wind and through it to the other side. **True** **False**

3. Running close-hauled is faster than reaching. **True** **False**

4. "Shooting" is the maneuver of luffing the sails at a point where the way of the boat will carry it to the desired point for mooring. **True** **False**

5. Steering a boat consists of turning the bow in the desired direction with the stern following as with an automobile. **True** **False**

6. On single screw vessels, a right-hand engine produces "port tendencies." **True** **False**

7. Twin-screw vessels can be steered by the engines alone. **True** **False**

8. Spring lines run at right angles to the boat. **True** **False**

9. It is important to take wind and current into consideration in landings. **True** **False**

10. Any line may be taken ashore first when making a landing. **True** **False**

SESSION 8

OPERATING A BOAT

To the instructor:

This session is to be conducted on the water. The type of boat used is of little concern. The required demonstrations can be made to fit. There are five required demonstrations that should be accomplished to the satisfaction of the instructor or instructors.
There are five optional demonstrations and the student must select two of these to accomplish making seven demonstrations in all—two optional and five required.

REQUIRED DEMONSTRATIONS

1. Present a safety checklist to the instructor. As soon as it is approved, conduct a complete safety check of the boat. If fuel is needed, correctly fuel the boat. If not, demonstrate the correct method.

2. Present to the instructor a station bill for one emergency. After it has been approved, organize the crew and, with the boat tied to the dock, run through the drill until it is done satisfactorily.

3. Identify and demonstrate the use of the after bow spring line, forward quarter spring line, and breast line. Correctly belay a line to a cleat. Handle the lines on a landing.

4. Make one correct anchoring and then pick up the anchor correctly. This includes sounding the depth, checking the scope, and riding securely at anchor. The proper handling and stowing of the anchor and line are to be judged.

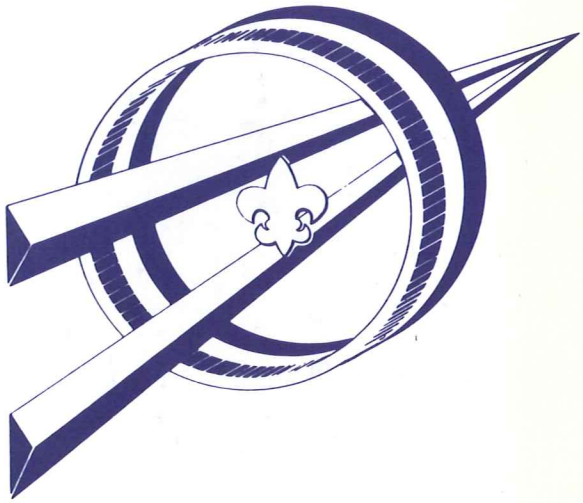
5. Using the charts, lay out a course from the mooring to an object or navigational aid at least 1 mile away, giving compass directions out and back. Run these courses correctly. If using a sailboat attempt to pick an object that will allow a straight course on a reach, also using the compass. (A sailboat can be fogged in as easily as a power vessel.)

OPTIONAL DEMONSTRATIONS (Complete any two.)

1. Run the boat close enough to three different aids to navigation and correctly identify them to the instructor. The instructor holds the chart and does not allow the student to refer to it.

2. Demonstrate proper passing, either by swinging the boat's head to indicate the direction to travel or by using correct passing signals on the whistle or horn. At the dock, demonstrate fog signals that are proper for the boat being used.

3. If a sailboat is used, demonstrate shooting up to a landing or mooring. Make one correct landing. Cast off once, using the jib to pay head around until a desired course is reached. (Do these in any order.)

4. If using an inboard engine, demonstrate turning the boat around in a limited area. Demonstrate backing, using forward bursts to keep the boat on the right heading.

5. Make a speed check using two points of reference from the chart. Make the run both directions to obtain correct "over the bottom" speed.