# Table of Contents

## CHAPTER 1  Masts, Yards, Rigging, and Sails

- Introduction ........................................ 1
- Standing Rigging .................................. 2
- Shouds ............................................. 3
- Stays .............................................. 3
- Backstays ......................................... 3
- Sails and Running Rigging ....................... 3
- Belaying Plan .................................... 6

## CHAPTER 2  Basic Seamanship

- Safety Precautions With Rope............... 6
- Belaying ........................................... 10
- Coiling and Stowing ............................. 11
- Flaking A Line For running .................... 12
- Knots ............................................. 12
- Overhand Knot ................................... 12
- Round Turn and Two Half Hitches .......... 13
- Single or Double Sheet Bend ................. 13
- Bowline .......................................... 13
- Gasket Knot ..................................... 14
- Gasket Coil Hitch ................................. 14

## CHAPTER 3  Setting and Handling Sail

- Working Aloft .................................... 15
- Safety Procedures For Working Aloft ...... 16
- Loosing Sail ....................................... 16
- Making Sail ....................................... 17
- To Set a Course .................................. 17
- To Set a Topsail ................................... 18
- To Set the Mitzzen ............................... 19
- To Dip the Mizzen ................................. 19
- To Set the Spritsail ............................... 20
- Taking In Sail ..................................... 21
- To Take In a Course .............................. 21
- To Take In a Topsail .............................. 21
- To Take In the Mitzzen ......................... 22
- To Take In the Mizzen ......................... 22
- To Take In the Spritsail ....................... 22
- To Furl a Course ................................ 22
- Spritsail and Mizzen ............................ 23
- To Furl a Topsail ................................. 23
Masts, Yards, Rigging, and Sails

**Learning Objects:**

- Name Parts of Masts and Yards, Sails, Standing Rigging, and Running Rigging
- Name Sails
- Understand Layout of Decks
- Locate Running Rigging – Belaying Plan

**Introduction**

Early seventeenth century English merchant ships displayed elements of sailing ships from throughout Europe. In the Mediterranean, medieval European sailors adopted a type of sail developed by the Arabs. This was a triangular sail that was laced to spars along the bottom and the leading edge. Such a sail allows a ship to sail fairly close to the wind and to maneuver well. The English named this sail *lateen* after its Latin origin.

Medieval ships from northern Europe, like those of the Vikings, had square sails that provided forward motion downwind, but did not lend themselves to sailing close to the wind or maneuvering. To allow square sails to work more efficiently closer to the wind, sailors rigged *bowlines*. These are lines attached to the leech, or vertical edge, of a square sail and lead forward. Hauling the weather bowline tight allowed square-rigged ships to sail closer to the wind.

*Susan Constant* and *Godspeed* are three-masted ships setting square sails on the bowsprit and fore and main masts and a fore-and-aft rigged lateen sail on the mizzen mast. This sail plan is known as a *bark* rig. The lower masts, topmasts, bowsprit and yards are solid wood and are all categorized as *spars*. The
three masts differ in size, the main mast being the largest and tallest reaching nearly 100 feet off the water. Yards and sails are named for their respective masts; for example:

- Fore mast—fore yard, fore course.
- Main topmast—main topsail yard, main topsail.

The spritsail is a small square sail set on a yard beneath the bowsprit. It serves as a balancing sail to the lateen mizzen, which is normally set at the after end of the ship. The spritsail counteracts the ship’s tendency to turn into the wind and is important when sailing close to the wind. The triangular jib eventually superseded this sail.

The foremost sets two sails. The lower sail is the fore course and the upper sail is the fore topsail. (Note: Discovery has no foremost.) Due to their forward position and turning effect, sails on the foremost can cause the bow to fall off the wind. The fore sails are especially useful in tacking and wearing maneuvers.

The main mast also sets two sails: a course and a topsail. These sails are close to the ship’s center of rotation and do not substantially affect maneuvering with all sail set.

The mizzen mast sets the lateen sail. The lateen, a narrow, three-sided sail, sets fore and aft on a long yard. This sail acts to balance the force of the sails set on the foremost and bowsprit. Like the spritsail forward, the lateen’s distance from the center of rotation makes this a useful steering sail. Acting like a weathervane, the lateen helps to bring the bow into the wind when desired. As a fore and aft sail, this sail is set on the leeward side of the mast to prevent chafe on the sail and mast.

**Standing Rigging**

In a sailing vessel there are two types of rigging:
CHAPTER 1. MASTS, YARDS, RIGGINING, AND SAILS

- **Standing rigging** supports the masts
- **Running rigging** is used to control the yards and sails.

Once set up, standing rigging is only subject to minor adjustment while running rigging is constantly in use when making sail, trimming, and taking in sail. Pieces of standing rigging are named for the respective spars they serve: main mast—main shrouds; fore topmast—fore topmast stay, etc.

There are three types of standing rigging: shrouds, stays, and backstays.

**Shrouds**

A mast is supported in an athwartship direction (to the sides) by shrouds which run from near the top, called the hounds, of the mast to chain plates on the outside of the hull opposite the mast. The lower ends of shrouds have blocks of wood called **deadeyes** turned-in which allows for tensioning by means of **lanyards** passed through the deadeyes. Several shrouds are used, spaced about two feet apart, to take the heavy strain on the masts exerted by large sails. **Futtock shrouds** provide support for the topmast shrouds by transferring the strain to the lower shrouds around the edge of the tops. Climbing over the futtock shrouds is one of the most challenging tasks when working aloft on the topsails. **Ratlines** are light lines tied across the shrouds to create a rope ladder to allow access aloft for work in the rigging and on the yards.

**Stays**

Stays are used to provide support for the mast in a fore-and-aft direction. The stays are led from the masthead forward to the mast ahead of it or to the bowsprit or longhead. They provide nearly all of the support for the masts when the sails are aback. Deadeyes are turned in to stays to allow for tensioning.

**Backstays**

Backstays are fitted to the topmasts to provide support against the pressure exerted by the sail when sailing downwind. Backstays are led from the topmasts to the deck and are adjusted by a block purchase.

**Sails and Running Rigging**

The sails are manufactured from an extremely durable woven Dacron cloth similar in look and feel to canvas.
The parts of a sail are:

- **Head**: Top of the sail. It is attached to the yard with light lines known as robands.
- **Earring**: Upper corners used to fasten the sail to the yardarm, or end of the yard.
- **Leech**: The side edges of the sail.
- **Foot**: The bottom of the sail.
- **Clew**: The lower corners of the sail.
- **Bunt**: The middle section of a square sail.

The sails are controlled by means of **running rigging**. All rigging that reeves through blocks and is used in hoisting, lowering or trimming sails or yards is known as running rigging. Running rigging gear can be grouped by function and is located at pin rails and masts in an orderly fashion. As with the standing rigging, individual pieces of rigging take the name of the mast or sail they serve (e.g., fore course—fore course clew garnet; main topsail—main topsail halyard, etc.).

The major pieces of **running rigging** used to control the sails are:

- **The halyard** is a line or tackle used for hoisting and lowering yards and sails. The heavy course yards are also hoisted by the **jeer**.

- **The tack** is used on the course and mizzen. On a square sail it is the line used to haul the weather clew forward and down. On the lateen mizzen, the tack hauls down the lower forward corner of the sail.

- **The sheets** attach to the clews of the sails and “sheet the sails home”, i.e. they haul the clews of a course, spritsail or mizzen down and aft toward the deck, and the topsail clews down to the yardarm below it.

- **The bowline** is a line that leads forward from a bridle on the leech of the course or topsail.
When hauled in hard, bowlines keep the weather edge of the sail taut and steady when the ship is sailing close-hauled to the wind. On the mizzen yard, the bowline is used to trim the sail by adjusting the angle of the yard to make the most of the wind.

- The **clew line** also attaches to the clew of the sail, but it opposes the downward pull of the sheet. The **clew garnet** is the clew line of a course. Clew lines lead up to the yard and are hauled when taking in sail.

- The **buntline** is secured to the foot of the sail and is used for hauling up the body of the sail when taking in sail.

- The **martnet** attaches to a bridle in the middle of the leech. It hauls the leech of the courses up to the yard for furling.

- Similar to the martnet, the **leech line** leads from the middle of the leech and hauls the leech of the topsail up to the yard for furling.

- The **foot brail** hauls the foot of the mizzen sail up to the yard.

The remaining pieces of running rigging are used primarily to control the yards. The major pieces are:

- **Braces** attach to the ends of the yards and brace, or swing the yards at different angles to the fore and aft line of the ship to make the most of the direction of the wind in relation to the ships course.

- The **lifts** are lines leading from the yardarms to the mast head. Lifts support and move the ends of the yard in an up and down direction. When the yard is not adjusted to the horizon, it is said to be **cockbilled**.
Belaying Plan

*Susan Constant* has nearly 100 lines, *Godspeed* has about 60, and *Discovery* has almost 40. All these lines have a purpose in the operation of the ship and the new sailor must learn the location of each. Knowing the location of lines allows for the safe operation of the ship. Tending the wrong line can cause damage to the ship or injury to others. Study the pin rail diagram until you feel confident that you can correctly identify any line on the ship and go to it when asked.

The accompanying pin rail diagrams will provide you with the location of the pins or cleats for each of the lines.
CHAPTER 1. MASTS, YARDS, RIGGINING, AND SAILS

Belaying Plan for Susan Constant
Basic Seamanship

Learning Objectives:

- Belay a line to a belaying pin, cleat and kevel
- Establish a proper lead for belaying
- Coil and stow lines
- Flake a line ready for running
- Understand safety precautions with rope

- Tie the following knots:
  - Overhand knot
  - Figure-eight knot
  - Rolling hitch
  - Double sheet bend
  - Bowline
  - Timber hitch
  - Gasket coil hitch
  - Round turn and two half hitches

Safety Precautions With Rope

- Never stand in the bight of a line.
- Coil right-hand-lay line clockwise.
- When surging around bitts cleats or capstan, take off enough turns so the line will not jerk but pay out smoothly.
- Do not drag line over sharp or rough objects.
- Use chafe gear where the line passes over rough, hard surfaces; or anywhere it might rub.
- Be sure loads are within safety parameters; then apply the load slowly and carefully.
- Since snap-back action is inevitable when a line parts under tension, never stand in the direct line of pull.
• Keep fingers and hands at least one foot away from blocks and pins to prevent injury.

• Never take a turn around your hand, wrist or other body part to help pull on a line. You may need to let go of a line quickly and this may prevent you from protecting yourself.

• Ask for help with heavy line loads.

Belaying

A few basic elements are required for belaying:

- A fair lead
- Control
- Security
- Ease of casting off
- Ability to surge

When a line is led to a belaying pin or cleat, it should be led with a fair lead. A fair lead allows the line to approach the pin or cleat in such a way that it does not cross over itself when applying the figure-eight turns to secure the line. A foul lead may cause the line to jam, making it difficult to untie. After a fair lead has been established, belay, or secure, a line by taking a turn under the pin or around the end of the cleat opposite to the direction of pull. Then take a turn around the other end of the pin or cleat from the same side as the line comes off the first end. Continue by taking a total of three figure-eight turns around the pin or cleat for security. All the turns will be made from the same side of the pin or cleat.

To prevent the turns from coming loose, make a half hitch in the last turn. In a properly made half hitch, the running part of the line will lie under the last wrap and alongside the next-to-last wrap.

Lines belayed or made fast to keel cleats do not receive a hitch. This is especially important for lines such as sheets and dock lines. Other lines that do not receive a hitch are lines that are not under load when sails are set:
When slacking away a line under load, do not just flip off the turns. Keep a little tension on the part of the line you are holding as you undo the figure-eight turns to maintain control of the force on the line. Leave the last turn on the pin or cleat to maintain control and be able to surge the line if necessary.

- For your personal safety, **always** keep hands and fingers well clear of pins and cleats when surging a line that is under load.

**Coiling and Stowing**

Most of the line used aboard ship is three-strand rope. All of the three-strand line used in the running rigging is *right-hand-laid* line. This means the strands, the three parts that make up the line, spiral to the right. This is important to know when making a coil. Right-hand-laid line is coiled “with the sun,” or clockwise. If it is coiled counterclockwise, the lay of the strands tightens when the line is uncoiled. This results in kinks and twists that may damage the line.

Most of the line used aboard ship is heavy enough or long enough that it is not comfortable to coil in your hand and must be coiled on deck before hanging on a pin. Begin coiling near where the line has been belayed, coiling clockwise toward the end of the line. Make the loops large enough so that there will be the fewest total turns in the coil, but small enough that the line won’t drag on deck when the coil is hung on a pin. The hung coil should allow a deck brush to pass under it.

To hang a coil on a pin, pick up the coil and reach through the center of the coil near the top to grab a bight of line near where it is belayed. Pull the bight of line through the coil, give the bight a counterclockwise twist or two and hang the twisted bight over the top of the belaying pin or horn of a cleat.

At times it is acceptable to forego the security of this method for hanging up a coil. Times when you may simply coil the line over the top of the pin may be when sails are set and we are short tacking or constantly maneuvering. The mast captain will provide guidance on the method to use.

When preparing to use a coil of line, lay it on deck with the standing part, or part closest to where the line is belayed, face up. Check to make sure that the bitter end is not twisted within the coil (it is helpful to have the end sticking out from under the coil) and that there are no snarls in the loops of the coil. If the line is under load, follow the instructions for maintaining control of a line in the section on belaying, above.
Flaking A Line For Running

Flaking a line is laying it down on deck so it is ready for running. The line is laid down in the same manner as for coiling, except that it is laid out in long flat bights, one alongside the other, instead of in round coils. The loop forming the turn at the end of each bight is laid so that the part that will run out first is on top. This allows the line to run off easily with little chance of fouling or kinking on itself.

Knots

Many different knots have evolved for use in different situations. However, a knot that is good in one situation may not be appropriate when used for a different purpose. Given this, it is in your best interest to have a range of knots to choose from and be able to match the knot, bend, or hitch to the particular circumstance.

- A knot in its broadest sense includes all complications in a rope except snarls and kinks.
- A bend unites two rope ends.
- A hitch makes a rope fast to another object.

Since many of the knots you tie will secure sails, parts of the rig, or the ship to the dock, be sure the knot is formed properly and drawn up tightly to ensure the security of the sails, rig, fellow crew, and the ship.

For tying knots, there are three parts of the line:

- The standing part is the part that does not move.
- The working part, or running part, is the section used for tying the knot.
- The bitter end is the end of the rope (i.e. the part that would be made fast to the bitts).

Overhand Knot

The overhand knot is the basis for many knots. It is simple to tie and difficult to untie after being placed under strain. It has its place only in the formation of other knots and generally should not be used by itself. To tie, make a loop in a line and pass the running end through the loop.

The figure-8 knot is a bulky knot used as a stopper to prevent the end of a line from running out of a block. It is preferred to the simpler overhand knot because it is larger and easier to untie. To tie, make an overhand loop (the running part passing above the standing part) in the end of a line. Pass the end behind the standing part, and then back down through the loop from above.
Round Turn and Two Half Hitches

The combination of the round turn with two half hitches may be used in a ring or around a spar or sheer pole. The round turn distributes strain and chafe across a greater number of rope fibers than a single turn would. The two half hitches provide jam-resistant security.

Rolling Hitch

The rolling hitch is one of the most useful and most important hitches used on deck. It can be tied close to an object instead of half hitches or it can be made around rings, spars, other ropes or even tied back on itself. The rolling hitch is always used for passing a stopper. It is suited to either perpendicular or lengthwise pull and will hold as long as there is a strain. It is easy to adjust if the strain is eased.

To tie, make two turns in the direction of the strain, and then tie a half hitch on the side of the turns away from the strain. If the material is slippery, tie a midshipman’s hitch. This is a variation made by jamming the second turn over the first. It has a tighter grip but is more difficult to adjust. Either variation can have a slippery hitch substituted for the last half hitch used to finish off this knot.

Single or Double Sheet Bend

A bend is a way to tie two pieces of line together. The origin of the sheet bend is presumably from the original use of bending the sheet to the clew of a sail. The formation of the sheet bend is very similar to the bowline.

To tie a sheet bend; bend one line into a U shape, take the end of the second line and pass it up through the U, then around behind both parts of the U, then back around the front and under the part that comes up from beneath (the “standing part”).

To double the sheet bend, take the running part around behind again and under the standing part beside and below the first pass.

Bowline

The bowline is the knot used for putting a loop in the end of the line. It can neither slip nor jam, yet it will untie easily.

To tie a bowline, make an overhand loop (the running part on top of the standing part) in a line and pass the end up through the loop. Then pass the end around behind the standing part and back down through the loop (“the rat comes out of the hatch, sees the cat and runs around the mast, then jumps down the hatch again”). Pull everything up smoothly.
Gasket Knot

When furling sail, the end of the gasket is secured in a variation on the timber hitch. To tie, pass the running end under the nearest standing part and pull up. Then pass the running end around the standing part again in the same direction, and pull up against the first passing. You have now made a complete wrap around the standing part. Put on two more wraps and the knot is finished. It is easiest to pass the running part under the standing part if you do it in the space created between the furled sail and the spar; then pull the wraps up so that they are pinched against the spar (or the sail).

Gasket Coil Hitch

The gasket coil hitch is used to secure furling gaskets while the sails are set. To make a neat coil, start about a foot-and-a-half or two feet from the yard and coil the gasket (clockwise). Then turn the coil and roll it up the standing part to wrap some of the gasket around the coil. Finally, reach through the coil above the wrapping and grasp the middle of the standing part; pull a bight through the coil, then slip it over the top of the coil and pull it down to the wrapping. Let the coiled gasket hang down on the front side of the sail.
Setting and Handling Sail

Learning Objectives

- Work aloft safely demonstrating procedures for: personal safety; use of a safety harness; communication between crew on the yards and between topmen and the deck.
- Loose, Furl, Set, and Take-in Sail

Working Aloft

Working aloft presents one of the highest risks to your personal safety aboard the ship. No amount of care and skill can make working aloft absolutely safe, so every precautionary measure is justified. Working in the rig may not be for everyone. Going aloft is a personal decision based on your interest and physical ability to participate in this aspect of ship operation. If you choose not to go aloft, remember there are miles of rigging to be tended on deck while the top men and yonkers work overhead.

All crew who choose to go aloft must first demonstrate sufficient upper body strength. Once you have passed this physical test, one of the mates will provide you with required training. After successful training, the mate will provide you with approval to work aloft.

Before going aloft you must first have the permission of the captain or one of the mates. After returning to the deck you must report that you are out of the rig.

Everything you take aloft must be tied to you with a lanyard. It is also advisable to empty your pockets of things that may fall out. We once had a crewmember lose a wallet from the main yard while underway. This unfortunate loss from aloft was turned into a man overboard drill and thanks to quick action by the crew the “victim” was recovered minus a few ATM receipts. If this wallet had fallen within the deck area, it may have struck someone with enough force causing injury and a real “victim.”

When preparing to go aloft you must put on a safety harness. It is available aboard, or you may bring one that is approved by the mate. A safety harness increases but does not guarantee your safety. The harness will not prevent you from falling but it may prevent serious injury or even death. A safety harness must be used when you stop to work anywhere aloft, for example, on the shrouds, top platform, or on the yards.
CHAPTER 3 SETTING AND HANDLING SAIL

Safety Procedures For Working Aloft

- Always use a safety harness. Examine the harness before use to ensure that it is not defective. Adjust the harness for a snug fit. Clip in once you are in a position to work. Attach the lanyard to a secure member of the standing rigging, mast, or jackstay on the yard.

- Always ascend and descend on the windward shrouds, unless ordered otherwise. The wind will tend to blow you toward the shrouds. Windward shrouds are tensioned by the pressure of the wind on masts, rigging, and sails. If the yards are braced up sharp it is very difficult to get around the yard on the leeward side.

- When you climb the ratlines, always hold onto the shrouds, not the ratline itself, in case the seizing lets go or a ratline breaks. Take your time as you climb, keeping three points of contact with the rig.

- Before standing on a footrope with other crew already on it, always call out “laying on port (or starboard).” This will alert other crew to your action.

- Do not move onto the footrope until you have been acknowledged. As additional crew lay on the footropes, the footropes will move and the distance between your feet and the yard will change—a potentially dangerous situation. If you are the one on the footrope, respond to the person and tell him or her whether the proposed move is okay.

- Once your work is complete, always call out “laying off on port (or starboard).” This will again alert other crew to your action. Wait for a response before stepping off. The footrope will move just as it did when you stepped on it and may present a dangerous surprise for those you were just working with.

- Maintain one hand for yourself and one hand for the ship whether you are clipped in or not.

Loosing Sail

Before sails can be set, they must be unfurled or loose. In preparing to set sail, the sailing master will give the command to lay aloft and loose all or a given sail. Before laying aloft, the mate will check the braces and lifts to ensure that the yard is secure and that the radar is on standby.

To loose a sail, lay out on the yard and cast off the gaskets beginning at the outermost and working back in toward the mast. If working on only one yardarm at a time, cast off the gaskets on the lee side first. When the gaskets are cast off from both yardarms, let go the bunt gasket. In loosing a topsail, let go the gaskets on the yardarms, and then let go the gasket around the bunt of the sail.

As you loosen the gaskets stow them using a gasket coil hitch.

(see Chapter 2 page 2-15 for the gasket coil hitch).
Making Sail

Organization of the crew and working as part of the team are essential elements to the safe and efficient operation of the ship. Throwing off the wrong line or failure to ease a line at the proper time can cause damage to the ship or injure crew. Correctly handling lines for the ordered maneuver virtually guarantees the success of the ship’s operation.

Nearly all pieces of running rigging will be used when making and taking sail. The order of setting and taking-in sail is determined by the strength and direction of the wind in relation to the ship’s course. In light winds all sail may be set whereas in a fresh breeze the courses may be the only sail set. With a trained crew it is possible to quickly set sail and respond to changes in the weather by setting more sail or taking-in sail as required.

To Set a Course

Loose the sail.

On deck, remove the coils for the appropriate running rigging from the pin/cleat and lay down on the deck with the working end on top ready to run. This includes:

- Tacks
- Sheets
- Martnets
- Buntlines
- Clew garnets
- Bowlines

On the command to set the course:

- Cast off the martnets, buntlines, clew garnets, and bowlines
- Haul down on the tacks and sheets to position the sail immediately below the yard.

If the ship is close hauled:

- Ease off the lee brace.
- Slack the weather lift.
- Slack the clew garnet.
- Get the tack well down.
If it is blowing fresh, you may need to take the tack to the capstan or windlass.

When the tack is well down:
- Sharpen the yard up again by the brace.
- Haul out the weather bowline
- Haul the lee sheet aft.

If the wind is on the quarter, the main course is carried with the weather clew hauled up and the sheet taken aft. This is known as *goosewinging* the main.

With the wind directly aft and the yards squared, the mainsail is usually not carried, but the foresail may be carried to advantage.

**To Set a Topsail**

Loose the sail.

Remove the coils for the appropriate running rigging from the pin/cleat and lay down on the deck with the working end on top ready to run. This includes:

- Sheets
- Clewlines
- Leechlines
- Bowlines
- Halyard
- Braces

One crew member will stay in the top to overhaul the leechlines and clewlines as they are cast off and to push the bunt of the sail clear of the forward side of the top.

Cast off the:

- Clewlines, leechlines, and bowlines
- Haul home the sheets. If the wind is fresh, set the weather sheet first, then the lee sheet.
- Raise the yard with the halyard. Slack the braces, particularly the weather brace, as the yard goes up, taking a turn on the pin/cleat if the wind is fresh.
- Tend the leechlines and clewlines.
- Hoist on the halyard until the leeches are taut.
- Trim the yard parallel with the lower yard.
- Haul out the weather bowline.
CHAPTER 3 SETTING AND HANDLING SAIL

To Set the Mizzen

Lower the yard with the halyard and topping lift as you tend the:

- Parrel
- Brails
- Martinets
- Bowlines
- Tack, when the bonnet is laced on.
- Sheet

Loose the sail.

Hoist the halyard and topping lift until the yard is at the proper height and angle. As the yard is hoisted, tend the:

- Parrel
- Brails
- Martinets
- Bowlines
- Tack, when the bonnet is laced on.
- Sheet

Cast off the foot brails and martinets.

Haul down on the sheet and board the tack when the bonnet is laced on.

Trim the yard with the bowlines.

To dip the mizzen

Cast off the tack and sheet.

Brail up the sail by the foot brail and martinets.

Peak up the yard by hauling in on the topping lift while easing the bowlines and the sheet.

When the yard is nearly vertical, untoggle the bowlines.

Shift the yard around the aft side of the mast.

Toggle the bowlines into the pendant.

Trim the yard with topping lift and bowlines.
CHAPTER 3 SETTING AND HANDLING SAIL

To re-set the sail tend the:

- Brails
- Martnets
- Tack
- Sheet

To Set the Spritsail

Lower the yard into the beakhead by easing the halyard as you tend the:

- Clewlines
- Braces
- Lifts
- Buntlines
- Sheet

Loose the sail.

Haul on the halyard to hoist the yard until it is near the fore stay collar. Tend the:

- Clewlines
- Braces
- Lifts
- Buntlines
- Sheet

Haul the sheets to position the sail below the yard.

If on the wind, create a leading edge for the sail by hauling the leeward brace and tending the leeward lift and windward brace and lift. This will cant the yard to raise the leeward yardarm. If running downwind, set the yard horizontal as with other square sail yards.
Taking In Sail

The procedure for taking in sail is usually the reverse of setting. The lines which were hauled upon are now eased; the lines which were eased are now hauled upon.

To Take In a Course:

If the wind is light-

Cast off the:
- Tack
- Sheet
- Bowline

Haul up on the:
- Clew garnet
- Buntlines
- Martnets

The clew garnets must lead the martnets and buntlines as the sail is hauled up.

If the wind is fresh:
First ease off the sheet and haul up on the:
- Lee clew
- Martnets
- Buntlines

Then cast off the bowline, ease off the tack, and haul up the:
- Weather clew
- Martnets
- Buntlines

To Take In a Topsail

The first command is “clew down”.

- Ease away the halyard, square the yard with the braces as it comes down, and haul in on the clewlines.

When the yard is in its lifts, the second command is “clew up”.
Ease away the sheets, and haul on the clewline and leechlines.

If the wind is fresh-

First “clew down” as above. Then “clew up” the weather side followed by the leeward side.

**To Take In the Mizzen**

Douse the sail with foot brails and martnets.

Tend the sheet as the sail is taken in.

As the yard is lowered to horizontal with the halyard and topping lift, tend the:

- Parrel
- Brails
- Martnets
- Bowlines
- Tack (if used)
- Sheet

**To Take In the Spritsail**

Cast off the sheets and haul up on the clewlines and buntline.

Lower the yard into the beakhead by easing the halyard and hauling in the clewlines while tending the:

- Braces
- Lifts
- Buntline
- Sheets

**To Furl a Course**

Before laying out on the yard make sure that the yard is steadied by tight lifts and braces.

Both clews should be hauled up two-blocks and the foot of the sail should be brought up parallel with the yard. If not, call down to the officer of the deck to have this done.

Lay out on the yards and uncoil the gaskets tossing them over the aft side of the yard.
CHAPTER 3 SETTING AND HANDLING SAIL

To furl sail:

First get hold of the foot rope on the sail and lay it on the yard.

Then take up an arm’s length bight of the body of the sail and lay it on the yard, one bight on top of the other.

When all sail is on the yard, make a skin from the last few feet of the upper part of the body of the sail large enough to cover all other bights of the sail. Lift the skin up and let the bights on top of the yard fall into the skin. Smooth the skin around the sail in a bundle now located under the yard.

Make fast the gaskets around the sail and yard being careful not to pass a gasket around another piece of running rigging, such as the topsail sheets. Pass the gaskets around the yard and sail several times spiraling from aft, under, forward and over the yard. At each turn, tension the gasket by pulling up toward you on the forward side of the yard. Secure the gasket back on itself with a gasket knot (see Chapter 5 for knot descriptions).

Spritsail and Mizzen

The description of furling given above applies, in principal, to the spritsail and mizzen except these sails are furled from the deck without the need to lay out on footropes.

To Furl a Topsail

Topsails are furled while working in the tops. Since the topsail has a broad foot, tall hoist and short head, it must be furled differently.

Make sure the yard is down on the cap, steadied by tight lifts and braces.

Furl the sail attached to the yardarms as described above, leaving the body of the sail drooping down alongside the masthead.

Form a skin from the center of the sail and bundle the body of the sail behind the skin compressing all into a tight roll, up and down the foot of the topmast.

Leave the clews out of the roll forming back-to-back J shapes.

To secure the sail, pass gaskets around the body of the sail and the mast.
CHAPTER 4 SAIL MANEUVERS

Sail Maneuvers

Learning Objectives

- Understand the general principles of working a ship
- Brace and trim yards
- Name points of sail
- Tack and wear ship

General Principles of Working a Ship

A ship is acted upon principally by the rudder and sails. When the rudder is fore-and-aft or in line with the keel, water passes by having no effect on the ship’s direction. When the rudder is shifted to one side or the other, water strikes against it forcing the stern in the opposite direction. For example, if the tiller is put over to port, the rudder moves to starboard which sends the stern to port. The ship turns around her center of rotation and the bow goes in the opposite direction, to starboard. If a vessel is going astern and the rudder is turned, water striking the back of the blade pushes the stern in the same direction the rudder was turned. For example, with sternway, the tiller is put to port, the rudder turns to starboard and the stern goes in the same direction while the bow falls off to port.

In addition to turning the ship, moving the rudder from a fore-and-aft position has the effect of slowing the ship’s forward motion due to the turbulence created by rudder movement. Therefore, it is beneficial to carry as little rudder as possible. To do this, a balanced sail plan is necessary and is usually achieved through trimming individual sails.

The principle of the wind acting upon the sails and the water upon the rudder is the basis of the science of working a ship. In a large vessel like Susan Constant, there are numerous sails, but they may be reduced to three classes: head sails, or those which are forward of the center of rotation and have a tendency to blow the ship’s bow off the wind; after sails, or those abaft the center of rotation which have the tendency to blow the stern off the wind and the bow into the wind; and the center sails which act equally on each side of the center of rotation and do not turn the ship off course.
one way or the other. The further a sail is from the center of rotation, the greater force it will apply in turning the ship. The center of rotation is generally found around the main mast on three-masted ships like Susan Constant. It can be shifted fore-and-aft by changing the trim or draft. Changing the trim and center of rotation will have an effect on how the vessel steers and responds to sail trim.

To show how the sails act upon a ship, suppose a ship is rigged with three sails—one in the forward part, one at the center and the third at the after part. The wind is blowing on the port beam or at a right angle to the keel. If only the forward sail were set, the effect would be that the wind would move the vessel ahead and blow the bow off the wind to starboard. If only the after sail were set, the vessel would move ahead while the stern would move off to starboard as the bow would come up into the wind like a weathervane. If only the center sail were set, the effect would be the same as all three sails set and the vessel would move ahead in a straight line.

If all three sails were set aback, they would tend to stop the headway and send the ship astern. As in the example above, if only the forward, center or after sail was set, the ship would be turned off course in the same direction as when set full.

**Bracing and Trimming the Yards**

Since the ships are dependent on the wind for propulsion, proper trimming of the sails is important to make the best speed through the water. Square sails are trimmed primarily by braces, followed by tacks and sheets.

When bracing the yards, there are many lines affected. Buntlines, clewlines, martnets, bowlines, sheets and tacks need to be properly handled when they become taut on the side of the yard being braced forward or slack on the side being braced aft. The lifts on the course yards are adjustable. As the yard is braced forward, the lift on the side which is being braced forward is eased to keep the yard horizontal and hauled on the opposite side. Due to differences in the purchases of braces and length of the yards, the topsail will come around faster than the lower yard. Once the yards are in position, all slack must be taken out of the braces when belaying to prevent the yards from slamming back and forth. With sail set, the wind usually strikes the sail at such an angle that the weather braces have a greater strain than the lee side braces. For this reason, more crew will be needed to haul the weather braces. However, those easing the braces must not lose control of the yard or it may slam into the shrouds or stays possibly causing damage. It is also important to have a proper number of crew assigned to the tacks and sheets.

**Common Sail Handling Commands**

**Avast**  An order to stop whatever you are doing. As, Avast heaving!

**Belay or Make Fast**  Secure a line to a belaying pin, cleat, bitt, etc.

**Board the Tack**  To haul the tack of the weather clew on the main or fore course forward and down toward the rail. Used when sailing close-hauled.

**Brace In**  The yards are hauled closer to square. Used when trimming the yards somewhere between sharp up and square. The opposite of bracing up.
Brace Up  Means to haul on the braces to bring the yards closer to fore-and-aft. May be used to trim the yards to sail the ship closer to the wind.

Cast Off or Throw Off  Take a line completely off a pin or bitt and allow it to run freely.

Clew Down  To haul on the topsail clewlines while holding the sheets in order to lower the yard and sail from its hoisted position.

Clew Up  Once the yard is in its lowered position, bring the sail up in its gear by slacking the sheets and hauling on the clewlines, buntlines, and leechlines.

Ease  Pay out slowly and with care. Used to check stoppers or give slack to halyards, sheets, etc.

Haul  To pull on a line, usually a rapid hand over hand on the halyards, sheets, or braces.

_____ halyard, haul away  This is the command to hoist the yard by hauling on the halyard. Clewlines, buntlines, braces, etc. are tended as the yard goes up.

Heave Around  Turn the capstan or windlass around for heavy tasks such as weighing anchor or sending up a topmast.

Let Go and Haul  To swing the yards of the foremast to the opposite tack when maneuvering under sail.

Loose ______  Cast off the gaskets securing the furled sail.

Man the _______  Lay down the coil, clear for running. Take off the hitch, but keep a turn on the pin. Wait for the next order.

Mainsail Haul  To swing the yards of the mainmast to the opposite tack when maneuvering under sail.

Rise Tacks and Sheets  To clew up the main course when maneuvering under sail. If short handed or in a fresh breeze, it may be desirable to reduce sail and the number of lines to be handled. After the evolution, the sail is re-set.

Set _______This is a command of delegation from the captain or mate on watch to whomever is acting as mast captain, who will then proceed to give the line-by-line orders for accomplishing sail setting.

Sheet Home  When setting square topsails, ease clewlines, leechlines and bowlines, and haul on the sheets until the clew in the sail is nearly two blocks at the yardarm.

Slack  Pay out a line rapidly and carefully, keeping it under control.

Square the Yards  Brace the yards square to the fore-and-aft line.

Stand By _______An order to be prepared to handle the ordered line or sail.

Take In _______This is a command of delegation from the captain or mate on watch. The mast captain will then proceed to give all further orders for lowering sails.
CHAPTER 4 SAIL MANEUVERS

Take Up  Take a strain on a line by pulling in a small amount usually under a heavy strain such as in working mooring lines.

That’s Well  Used to indicate a line has been hauled enough. A milder form of avast. Usually precedes an order to belay.

Up Behind or Come Up  Drop the line, tossing slack toward the person belaying.

Points of Sail

Modern sailing vessels are designed to sail to windward or to work into the wind. Square-rigged sailing vessels are designed to sail with the wind. Ships like Susan Constant cannot point more than six points or about 65 degrees to the wind compared to four points or 45 degrees for a contemporary fore-and-aft rig.

Tacking and Wearing

Whenever the ship’s destination lies farther upwind than she can sail in a straight line, it is necessary to work to windward by zigzagging back and forth. There are two basic methods we use to change direction while working upwind:

Tacking, where the bow is brought through the wind.

Wearing, where the stern passes through the wind.

Tacking is usually the preferred method as it is quicker than wearing and the ship gains some ground to windward. In wearing, the ship turns away from the wind losing ground to windward.

Wearing is resorted to in situations when the ship should not tack. For example, when tacking, the foremast square sails are taken aback against the mast where they act as a brake and force the bow off on the new tack. In high winds with a heavy sea it is dangerous to put the square sails aback. The only support on the forward side of the mast is the stay. If the stay were to part, the mast might collapse.

Tacking

To successfully tack, careful coordination is required among the crew, helmsman and officers. The crew must handle the correct lines at the proper time. If a line, like the weather main topsail bowline, were not cast off, the yard would not be able to swing around and the sail could tear. This action could cause the ship to miss stays.

In handling the helm, the steersman must put the whipstaff over slowly, gradually working toward full rudder so the ship will sail up into the wind. If the rudder is put over too quickly, it will act as a brake.
CHAPTER 4 SAIL MANEUVERS

On the quarterdeck, the sailing master must synchronize the movement of the ship and its sails and communicate the sequence of commands to the crew to allow the ship to pass through the wind without being caught in irons.

The tacking evolution proceeds as follows:

- **Ready About!** With the ship sailing along full and by or as close to the wind as possible without pinching, the crew are sent to their stations to man the tacks, sheets, braces, etc.

- **Helm’ s-a-lee!** With all ready, the helm is eased down gradually. Clew up spritsail and cast off main and fore bowlines.

- **Rise tacks and sheets!** At this point, the main course may be brought up into its gear. As the ship continues to turn, the sails will begin to come aback. As soon as the ship’s head is within a point of the wind:

- **Mainsail Haul!** The main course and topsail yards are now braced around to the new tack.

As the bow comes through the wind and begins to pay off, the spritsail yard is shifted and set on the new tack and the mizzen yard is shifted and set on the new leeward side of the mast. When the main topsail begins to draw, set the main course.

- **Let go and haul!** The fore yards are braced around quickly to the new tack and the spritsail is set. All sails are trimmed to their best advantage.

Wearing

Wearing consists of turning the stern of the ship through the wind. It proceeds as follows:

- **Stand By To Wear Ship!** With the ship on the desired point of sail, the crew are sent to their stations to man tacks, sheets, braces, etc.

- **Wear Ho!** The helm is put up and as the ship goes off the wind, the mizzen is taken in to accelerate the turning effect of the forward sails. As the ship continues to turn away from the wind the yards are braced perpendicular to the wind and are kept square to the wind until they are sharp on the new tack.

As the stern passes through the wind, the mizzen is set on the new tack and all sails are trimmed to advantage.
The above evolutions of tacking and wearing have been described in their simplest form. Rarely are these maneuvers this simple. Careful coordination and teamwork while handling the gear as quickly as possible are key elements to successful maneuvering under sail.

NOTES
Emergency Procedures

Station Bill

The ship and crew must be ready and able to meet and control any emergency or dangerous situation that may arise. Every member of the crew is expected to be alert to detect and prevent emergencies, but handling and controlling emergencies is the specific mission of various emergency parties.

The station bill sets forth the special duties and duty station of each member of the ship's company for various emergencies. Emergencies included in the station bill assignments are fire, general emergency, man overboard and abandon ship. The emergency alarm signal will be sounded to alert all crew.

- The signal for fire and emergency is a continuous blast of the ship's whistle for a period of not less than ten seconds supplemented by a rapid ringing of the bell for a period of at least ten seconds.

- The signal for abandon ship is more than six short blasts and one long blast on the whistle supplemented by a rapid ringing of the bell for more than ten seconds.

- Dismissal from fire and emergency stations is three short blasts of the whistle and three short rings of the bell.

The station bill will be posted in a conspicuous location in the hold, forecastle and aft cabin.

The following emergency procedures provide basic information. A more detailed description will be given with onboard training and drills.

Firefighting Procedures

Fire is one of the ultimate disasters onboard any ship. By being prepared, we have a chance to contain a fire and extinguish it.

Three components are required to start and sustain a fire: fuel, heat, and oxygen. A fire can be extinguished by breaking the chain reaction that supports the three components. If one element is removed or missing, fire cannot occur or exist. By removing the fuel, oxygen or heat, the fire will die out.
The extinguishing agents most commonly used aboard are:

- Water to remove the heat from a wood fire
- Carbon dioxide to remove the oxygen and smother the fire.
- Dry chemicals and Halon to break the chain reaction.

Fuel can also be removed to extinguish a fire by turning off the fuel supply such as in diesel fuel for the engines or propane for the stove.

There are four categories of fire:

- Class A fires involve solid fuels such as wood, paper and cloth.
- Class B fires involve liquid fuel such as gasoline, diesel, paint or oil.
- Class C fires are electrical in origin and occur in wiring, electronics and switches.
- Class D fires include pyrotechnics or metals such as magnesium.

It is far simpler to prevent a fire than extinguish it. If you must fight a fire, portable fire extinguishers are located throughout the ship for immediate use. Most portable extinguishers are of the ABC type. The engine room has a fixed Halon system installed. In addition, the ship is equipped with a fire hose on the main deck.

In the event of or suspicion of a fire, pass the word rapidly to the officer of the deck. Speed is essential. Report the location and type of fire. Make all crew in the fire area aware of the fire so they will be able to evacuate or assist. If the fire is small, go to it with a portable fire extinguisher and put it out. If the fire is large, those members of the crew chosen to work with the fire team will assume their duties working to put out the fire. All other crew will stand by on deck to assist as necessary.

- In addition to using extinguishers and the fire hose, other firefighting actions we may take include:
  - Shutting off the fuel to the engines and stove. Closing hatches and doors.
  - Maneuvering the ship to place the fire downwind to slow its spread and blow the smoke away.
  - Sending a distress call.

**Collision, Holes in the Hull**

Holes in the hull may result from collision with objects in the water. When discovered, pass the word rapidly to the officer of the deck. Speed is essential. Report the location and size of the hole. Make all crew in the area aware so they will be able to evacuate or assist.

Temporary repairs can be made by driving plugs or wedges in small holes. Larger holes through which water is pouring are difficult to control. They can be stuffed with a pillow or mattress to attempt to slow the flow of water. Alternately, a collision mat or thick piece of canvas can be maneuvered over the hole from outside the hull to slow the entry of water.
Ship Abandonment and Hypothermia

If fire or damage to the hull cannot be controlled and loss of the ship is imminent, the ship must be abandoned by the crew. If the master authorizes the abandonment of the ship, the abandon ship signal of more than six short blasts and one long blast will be sounded to alert all crew.

On the sounding of the alarm, those assigned to stations must move quickly and don a personal flotation device. Susan Constant is equipped with three inflatable life rafts and one inflatable rescue boat. The rescue boat is already inflated and launched from davits on the stern.

Life rafts are not inflated on deck. First the painter is tied onto a substantial part of the ship and then the life raft is thrown into the water. Once in the water, the painter is pulled, if necessary, to inflate the life raft.

It may be necessary to jump into the water from the side of the ship. If so, the closest point to the water should be chosen to minimize the risk of injury. When jumping from the side of the ship, you should keep your elbows at your side; cover your nose and mouth with one hand while holding the wrist or elbow firmly with the other hand. Once in the water, orient yourself, locate the life rafts and climb aboard the life rafts and rescue boat in an orderly fashion.

- If the crew were unprepared to abandon ship before going in the water or it is not possible for you to board a life raft, do not swim unless it is to reach a nearby craft, a fellow survivor or a floating object on which you can hold on to.

Unnecessary swimming will pump out any warm water between your body and layers of clothing, thereby increasing the rate of body heat loss. In addition, unnecessary movements of your arms and legs sends warm blood from the inner core to the outer layer of the body resulting in very rapid heat loss.

When in the water for extended periods of time assume the "HELP" position. This is the Heat Escape Lessening Position. Float as still as possible with legs together, elbows close to your side and arms folded across the front of your life jacket. This position minimizes the exposure of the body surface to cold water. Try to keep your head and neck out of the water. Another heat conserving position is to huddle closely to one or more persons afloat, making as much body contact as possible. A life jacket must be worn to be able to hold these positions in the water.

Finally, keep a positive attitude about your survival and rescue. This will improve your chance of extending your survival time. Your will to live does make a difference.

Man Overboard

A man falling overboard is one of the most hazardous situations a crew member can be subjected to at sea and is preventable by keeping the possibility in mind at all times. It must be realized that the danger of falling overboard is always there in calm and rough weather. By taking certain precautions, one can guard against the risk of falling into the sea. As discussed earlier, the use of a safety harness is required aloft and is useful on deck in rough conditions. Also, keeping your feet firmly on deck and not sitting on the caprail will ensure you don't fall off the ship.
When someone falls overboard:

- The man overboard signal is a loud shout by the person who saw the victim fall: "Man Overboard, port (or starboard) side!"
- The person who saw the victim go overboard should keep the person in sight while others heave the man overboard pole and personal flotation devices in the water.
- The lookout should not take his eyes off the victim until he is recovered. The lookout should point at the victim with the arm extended because the eye tends to follow the wave action and be led off target.

Simultaneous with the call of man overboard there are several actions, which are taken immediately:

- The MOB button on the G.P.S. is engaged to assist in tracking the victim.
- The emergency signal is sounded to alert the crew.
- Sails are taken in.
- The main engines are started and the ship is maneuvered back to the victim; the rescue boat is manned and launched with a hand held VHF aboard to assist in communicating the direction of the victim to the boat crew.
- The pilot ladder is rigged for the victim to climb back aboard, or a tackle may need to be rigged from the main yard if the victim is injured and unable to climb back aboard himself.

The person in the water should swim to a life jacket and put it on. Remove your boots or shoes to help you swim. Do not remove clothing or foul weather gear. Both provide insulation and buoyancy. Heat conservation is extremely important to someone in the water.

**Emergency Station Bill**

Form on page 35.
CHAPTER 5 EMERGENCY PROCEDURES

EMERGENCY STATION BILL

**FIRE AND EMERGENCY**  Continuous blast on the ship’s whistle and general alarm bell for a period of at least ten seconds.

**ABANDON SHIP**  More than six short blasts and one long blast on the whistle and a rapid ringing of the bell for more than ten seconds.

**MAN OVERBOARD**  Hail and pass the word “Man overboard” to the bridge.

**DISMISSAL**  From fire and emergency stations and boats stations is three short blasts on the whistle.

<table>
<thead>
<tr>
<th>NAME</th>
<th>FIRE &amp; EMERGENCY</th>
<th>MOB</th>
<th>ABANDON SHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMAND AFT</td>
<td>SAME</td>
<td>SAME</td>
<td>LAUNCHES RAFT #2</td>
</tr>
<tr>
<td>COMMAND EMERGENCY TEAM</td>
<td>SAME</td>
<td>SAME</td>
<td></td>
</tr>
<tr>
<td>FIX POSITION, RADIO USCG</td>
<td>SAME</td>
<td>SAME</td>
<td></td>
</tr>
<tr>
<td>MAN HOSE</td>
<td>RESCUE BOAT</td>
<td>LAUNCHES RAFT #4</td>
<td></td>
</tr>
<tr>
<td>MEDICAL ASSISTANCE</td>
<td>SAME</td>
<td>LAUNCHES RAFT #1</td>
<td></td>
</tr>
<tr>
<td>HELM</td>
<td>HELM</td>
<td>LAUNCHES RAFT #3</td>
<td></td>
</tr>
<tr>
<td>HELM</td>
<td>HELM</td>
<td>FLARES &amp; SIGNALS</td>
<td></td>
</tr>
<tr>
<td>EXTINGUISHER</td>
<td>RESCUE BOAT</td>
<td>DISTRIBUTES PFD'S</td>
<td></td>
</tr>
<tr>
<td>STARTS PUMP</td>
<td>STARTS ENGINES</td>
<td>RIGS LADDER</td>
<td></td>
</tr>
<tr>
<td>EXTINGUISHER</td>
<td>DISTRIBUTES PFD'S</td>
<td>BINOCULARS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>BINOCULARS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DISTRIBUTES PFD'S</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>HHVHF TO BOAT</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GPS &amp; HHVHF TO RAFT</td>
<td></td>
</tr>
<tr>
<td>ALL OTHERS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STBD</td>
<td>ASSIST AS NECESSARY ON DECK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PORT</td>
<td>ASSIST AS NECESSARY, EMERGENCY TEAM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Anchoring and Docking

Learning Objectives

Crew will be able to:

• Understand anchoring procedures: coming to anchor, flaking cable, using capstan, weighing anchor
• Understand docking procedures: name mooring lines, use heaving lines, flake lines, handle lines, make lines fast

Anchoring

NOTE: Using Susan Constant as an example. Godspeed and Discovery are similar.

Susan Constant has five anchors. The sheet anchor is the largest weighing roughly 700 pounds. The two bower anchors are the next largest weighing roughly 600 pounds. The smallest anchors are the stream and kedge anchors weighing roughly 200 pounds and 125 pounds respectively.

The shape and proportions of wooden stock anchors changed little over the centuries. The main section of the anchor is the shank. At the top of the shank is the ring where the anchor cable is attached. The curved arms cross the bottom of the shank and terminate in the triangular flukes. The point where the arms and the shank meet is known as the crown. The wooden stock was attached to the shank just below the ring, at a right angle to the arms.

Letting Go the Anchor

The anchor is usually stowed with the shank and fluke secured to the fore channel. Before the anchor can be hung from the stopper, the shank and flukes are lowered off the channel. The anchor is ready to let go once it is free of the channel, hanging vertically from the cathead off the bow by a heavy line known as the stopper. The stopper is fastened to the outer end of the cathead, passed through the ring and secured to a cleat on top of the cathead.
As the ship approaches an anchorage, the cable is ranged, ready for running on the tween deck. A sufficient length of cable to range out usually equals up to ten times the expected depth of water in the anchorage. The cable is *flaked*, that is, laid down on deck in long bights, one alongside the other, starting outboard and working inboard. The loop formed at the end of each bight is slipped under the preceding loop to allow the cable to run out freely without fouling. Once the desired length is on deck the cable is made fast to the *bitts*.

With the order to “Let go the port (or starboard) anchor,” the stopper is let go by hand which allows the anchor to fall freely to the bottom. Crew must be careful to stand clear of the stopper, which may whip back. Also keep clear of the cable in the tween deck as it races out.

Once the anchor is on the bottom, the pull of the cable causes a fluke to bury into the bottom. As the ship falls back, the cable runs out and is veered away until nearly at the desired length. At this point, the cable is checked and veered alternately until it is determined the anchor is “set.” The cable is then secured on the riding bitts in the forward end of the tween deck.
Weighing Anchor

Weighing anchor is the reverse of setting the anchor. The capstan is prepared by inserting the bars. Once the cable is brought to the capstan and all is ready, the command is given, “Heave round the capstan.” To heave up the anchor, up to twelve crew can work simultaneously rotating the capstan. When heaving on the capstan, do not push the bars with your hands; if your hands slip you could be injured. Instead, lay your chest across the bar and hook your elbows behind it. If it is desired to stop turning for some reason, engage the pawl, a steel bar on the deck. This prevents the capstan from turning backwards while there is a strain on the line.

As the anchor is being heaved in, the mate on the fore deck will indicate which direction the anchor is tending. Once the anchor cable is straight up and down, the weight of the anchor is broken free and lifted from the bottom. As soon as the anchor breaks free of the bottom the report is made, “Anchor aweigh.”

When the anchor stock clears the surface of the water, the command will come, “Avast heaving.” Next comes the order to, “Cat the Anchor.” The anchor is catted by hooking the ring with the cat tackle and hauling the anchor up to the cathead. Once the anchor is at the cathead, the stopper is passed again.

With the anchor catted, it is then fished. The fish tackle is hooked on one fluke of the anchor to haul the shank near horizontal allowing the anchor to be stowed on the channel. To prepare for sea, the anchor is securely lashed down.
Mooring

A ship is moored when it is made fast alongside a pier. In preparing for mooring the ship, crew will be assigned to various lines that are used to control the ship when maneuvering alongside, and to secure the ship to the pier.

The line that runs forward from the eyes of the ship is called the bow line. At the other end of the ship, the line that leads aft is the stern line. These lines usually lead well up and down the pier.

Lines leading forward away from amidships at an angle are forward springs. The lines leading aft are aft springs. The bow line and forward springs prevent the ship from moving astern. The stern line and after springs prevent the ship from moving ahead.

Breast lines are usually run from the bow and stern. They run at right angles to the keel and prevent the ship from moving away from the pier.

Prior to coming alongside a pier, the required lines should be flaked, ready for running and led to the proper location. Heaving lines (lighter lines with a weighted end that are easier to throw) should be tied onto the mooring lines near the splice or bowline and not in the end of the bight, where they will be jammed when the eye is placed over a bollard, cleat or piling. As soon as the ship is close enough, the captain will order deckhands to pass heaving lines to the pier.

After the lines are secure on the pier, they will be used to assist in maneuvering and securing the ship alongside. Using the spring lines in conjunction with the bow and stern lines works effectively to bring the ship close to the pier especially in situations where the wind or current is blowing or running at right angles away from the pier. Once the ship is close to the pier and is in its intended location, the breast lines are passed and secured to the pier.

With so many different cases of wind, current and docking situation possible, specific examples will not be discussed here. Training and onboard advance planning and communication with the crew will provide you with information on methods for coming alongside and leaving a pier.
If the eyes of two lines need to be placed over the same bollard, cleat or piling, the second one must be dipped, or led up through the eye of the first, and then placed over the bollard, cleat or piling. This makes it possible for either to be cast off independently of the other.

Orders For Crew Working Mooring Lines

Stand by your lines
Pass the _____
Slack the _____
Take a strain on the ___
Take in slack on the ___
Ease the _____
Avast heaving
Check the ____

Man the lines ready to cast off or moor.
Send the line ordered line to the pier. Place the eye over a bollard, cleat or piling but do not take a strain.
Pay out line being careful to keep it out of the water.
Put the ordered line under tension.
Heave in on the ordered line.
Pay out line enough to remove most of the tension.
Stop heaving.
Hold a strain on the ordered line but not to the breaking point. Allow it to slip as necessary.
Take enough turns on the cleat or bitt to prevent the line from slipping.
An order to secure the ordered line or all working lines to cleats or bitts on the ship.
Run another line parallel to the ordered line to make the mooring more secure.
Take in all extra lines, leaving the six primary lines in place.
Slack, cast off and pull back aboard the ordered line
A command to those tending lines on the pier to throw the line off the bollard, cleat or piling.
Ship Operations

Learning Objectives

- Lower and hoist the boat
- Serve as lookout
- Serve as helmsman
- Be ready for life aboard:
  - Crew duties
  - Watch system
  - Ship systems

Lowering and Hoisting the Boat

NOTE: using Susan Constant as an example.

Susan Constant is equipped with a small, rigid-bottom inflatable boat with an outboard motor. It is used as a rescue boat for man overboard or abandon ship and as a tugboat to assist in maneuvering the ship when alongside piers. The boat is stored, as if on davits, under the gallery in the stern. It is usually manned by one crewmember for maneuvering and by two crew members for man overboard retrieval. Crew in the boat always wear Type V inflatable life jackets with harnesses. They maintain communications with the ship through use of a hand held VHF radio.

When launching or retrieving a boat at sea, certain precautions must be observed in order to prevent damage to the boat and injury to the crew. With personnel in the boat, it is essential for their safety to maintain complete control of the tackles while launching or retrieving the boat. The task of handling the boat falls at the cleats is usually the responsibility of experienced crewmen.

Launching and retrieval is usually under command of the mate. To launch the boat:

- The crew climb in and prepare to be lowered.
- The ship is slowed to bare steerage way and the tackles are eased away at the command “Lower away together” to lower the boat into the water.
- The boat should be lowered into the water on an even keel.
- As soon as the boat is waterborne, the engine is started and the tackles are cast off from the lifting bridles in the boat.
After the mission is complete, the process is reversed to hoist the boat back aboard.

- Once the tackles are hooked to the bridles and everything is ready, at the command “Heave round together” the boat is hoisted from the water.
- If one end of the boat is hoisted faster than the other, the command is given, “Avast heaving port (or starboard)”. When the boat is again level, crew heave around together until the tackles are two blocked.
- After the boat crew has safely come back aboard, normal ship operations are resumed.

**Serving as Lookout**

While the ship is underway, a lookout is posted at all times during fair weather or foul, daylight and darkness. As lookout you will:

- Have no other duties.
- Usually be stationed on the foredeck. You may be assisted by another lookout stationed on the stern at certain times of low visibility.
- Be responsible for quickly reporting sightings through 360 degrees of the horizon.
- Be constantly alert and vigilant.

On lookout, you will spend most of your time looking and listening. Never assume the officer of the deck has already seen what you saw and that you do not need to report it. You are responsible for sighting and reporting:

- Lighthouses
- Buoys
- Other ships or boats
- Other navigational aids
- Possible dangers or obstructions in the water

Hearing something can frequently be of value if sighting an object is difficult, as in fog. You may be able to hear foghorns, buoys and ships that you may not be able to see. It is possible in fog or darkness to tell by sounds whether a ship is close or distant and in what direction it bears.
When reporting an object you have sighted, describe:

- What it is
- The bearing
- The estimated distance

Use the point system in the accompanying illustration when reporting the bearing of the object. Estimate the distance in nautical miles. On a clear day you can see about five miles to the horizon from the forecastle deck on Susan Constant. Objects that project up from the horizon allow you to see them farther away if the visibility is clear enough.

For example: A four-second, green light; bearing two points forward of the starboard beam; range two miles. Or a small, white-hull fishing boat; bearing broad on the port bow; range three miles.

**Steering**

Steering is the ability to change and to hold a course. The usual method of changing course is to shift the rudder from side to side. The action of the water on the rudder forces the stern of the vessel sideways and the vessel changes course. Susan Constant’s rudder is controlled by a whipstaff. Godspeed and Discovery are steered by a tiller.

The whipstaff consists of two main parts. The staff is a wooden lever held and moved by the helmsman. The staff is vertical when the helm is amidships. The whipstaff passes and slides through the pivoting rowle that is mounted in the deck. To complete the steering system, the whipstaff is attached to the forward end of the tiller by means of a metal gooseneck fitting. This allows the whipstaff to be disconnected from the tiller when necessary, so the ship can be steered by means of relieving tackle in heavy weather.

Steering is usually assigned to an experienced member of the crew who has a good feel for this challenging job. A good helmsman is able to keep the ship on course using the least amount of rudder movement possible.

There are two main methods of guiding the ship while steering. If under sail and on a close reach, the ship can be sailed “full and by” e.g., keep the sails full and steer as close by the wind as possible without pinching or stalling. With this method, steering a precise compass course is not required nor at times desirable if trying to work changes in the wind direction while working upwind.

The other method is steering by the compass. In steering by the compass, it is extremely important to steer the course given especially within the confines of a narrow channel.

**Steering Commands**

**Hard Right (Left)** This is the largest amount of rudder that can be applied. In the case of Susan Constant it is less than fifteen degrees limited by the throw of the whipstaff. In comparison, a modern vessel has at least thirty-five degrees of rudder throw.
CHAPTER 7 SHIP OPERATIONS

Come Right (Left) to ___ Is called to swing the ships head in the direction indicated and steady her on the course given.

Steer ___ Is usually given for a minor change in course.

Steady on ___ Is normally ordered while swinging to indicate the course the ship should be steadied on.

Rudder Amidships Means to put the rudder on the centerline.

Mind Your Helm Means to steer more carefully.

Nothing To The Right (Left) Is called when the presence of some object on one side or the other would make a set in that direction dangerous.

Communication between the helm and the officer of the deck is very important. The helmsman must repeat every command received in order to ensure that the conning officer knows you understood correctly. When you have completed the given order say, for example, “Rudder is hard right” or “Steady on one-three-five.” When making a turn, occasionally report the compass course so the conning officer may know how far the ship has gone through the turn.

When relieving the helm, find out what the course is and how the ship is handling. The helmsman being relieved should report to the officer that there is a new helmsman.

The Mariner’s Compass of 32 points (after a design by Williams, 1724). The North point was often designated by a Fleur-de-lys, and up to the present century some card makers also embellished the East point, which pointed towards the Holy Land.
Aids to Navigation marking the Intracoastal Waterway (ICW) display unique yellow symbols to distinguish them from aids marking other waters. Yellow triangles ▲ indicate aids should be passed by keeping them on the starboard (right) hand of the vessel. Yellow squares □ indicate aids should be passed by keeping them on the port (left) hand of the vessel. A yellow horizontal band ◼ provides no lateral information, but simply identifies aids as marking the ICW.
CHAPTER 7 SHIP OPERATIONS

VISUAL BUOYAGE GUIDE

REGION B - by day
Preferred Channel →
Secondary Channel →

REGION-B - by night
Preferred Channel →
Secondary Channel →
Appendix A. Dictionary of Sea Terms

A
Aback A sail is aback when the wind presses its forward surface against the mast, and tends to force the vessel astern.
Abaft Indicates a position toward the stern relative to some other object.
Abeam At right angles to a ship's fore-and-aft line.
Aboard Within a vessel.
About On the other tack.
Abreast Alongside of, side by side.
A-cockbill See Cockbill.
Adrift Broken loose from its moorings.
Afloat Resting on the surface of the water.
Afore Indicates a position closer to the bow relative to another object. The opposite of abaft.
Aft Near or toward the stern.
After Indicates an object located in the rear half of a vessel.
Aground Touching the bottom. Not having enough water to float the ship.
Ahead In the direction of the vessel's head. Wind ahead is from the direction toward which the vessel's head points.
A-hull When a vessel lies with all her sails furled and her helm lashed a-lee.
A-lee The helm is a-lee when the tiller is put to the opposite side from which the wind blows. (Note: the whipstaff or wheel moves in the opposite direction from the tiller.)
All Hands The whole crew.
Aloft Above the deck.
Amidships In the center of the vessel; either with reference to her length or to her breadth.
Anchor A heavy, hooked device that is used to attach a ship to the bottom. It is attached to the vessel by a cable.
Anchor watch A small watch of one or two men, kept while at anchor.
Apron 1. A piece of timber fixed behind the lower part of the stem, just above the fore end of the keel. 2. A covering to the vent or lock of a cannon.
Arm 1. The extremity of a yard. 2. The lower part of an anchor, crossing the shank and terminating in the flukes. 3. To put tallow or soap in the bottom of a sounding lead.
Arming A piece of tallow or soap put in the hollow in the bottom of a sounding lead to bring up a sample of the bottom.
Astern In the direction of the stern. The opposite of ahead.
Athwartship Along the beam of a vessel, in opposition to fore-and-aft.
Avast An order to stop doing what you are doing; as, “Avast heaving!”
A-weather The helm is a-weather when the tiller is put in the direction from which the wind blows. (Note: the whipstaff or wheel moves in the opposite direction from the tiller.)
A-weigh When the anchor is raised clear of the ground.
Awning A covering of canvas over a vessel’s deck, or over a boat, to keep off sun or rain.

B
Back To back an anchor, is to carry out a smaller one ahead of the one by which the vessel rides, to take off some of the strain.
To back a sail, is to throw it aback.
To back and fill, is alternately to back and fill the sails.
Backstays  Stays running from a masthead to the vessel’s side, slanting a little aft.
Bagpipe  To bagpipe the mizzen, is to lay it aback by bringing the sheet to the mizzen rigging.
Ballast  Heavy material, as iron, lead, or stone, placed in the bottom of the hold, to give a ship proper stability.
Bar  1. A bank or shoal at the entrance of a harbor or river.  2. Capsan-bars are heavy pieces of wood by which the capstan is hove round.
Bare-poles  The condition of a ship when she has no sail set.
Battens  Thin strips of wood put around the hatches, to keep the covering tarpaulin down. Also, put upon rigging to keep it from chafing.
Beams  Strong pieces of timber stretching across the vessel, to support decks.
  On beam-ends. The situation of a vessel when turned on her side so that her beams are inclined toward the vertical.
  On the beam. When the wind blows at a right angle to the keel (from abeam).
Bear  To bear down upon a vessel, is to approach her from the windward.
  To bear up, is to turn the vessel closer to the wind.
  To bear away, is to turn the vessel away from the wind.
Bearing  The direction from the ship to an object.
Beating  Going toward the direction of the wind, by alternate tacks, Beating to Windward.
Becalmed  Having no wind to fill the sails.
Belay  To make a rope fast by turns round a pin, cleat or other object.
Bend  A bend, is a knot by which one rope is made fast to another.
  To bend a sail is to make it fast to the yard.
  To bend a cable is to make it fast to the anchor.
Bends  The strongest planks of a vessel’s side. These are also called wales.
Berth  1. The place where a vessel lies.  2. The place in which a sailor sleeps.
Between-decks  The space between any two decks of a ship.
Bight  1. The double part of a rope when it is folded. Any part of a rope may be called the bight, except the ends.  2. A bend in the shore, making a small bay or inlet.
Bilge  The flat part of a ship’s bottom. That part of the floor of a ship upon which she would rest if aground.
  Bilge Water. Water which settles in the bilge.
Bill  The point at the extremity of the fluke of an anchor.
Billet-head  (See Head.)
Binnacle  A box near the helm, containing the compass.
Bitts  Perpendicular pieces of timber going through the deck on which the anchor cable is secured.
Bitter-End  That part of the cable that is abaft the bitts. The end of a rope.
Block  A piece of wood with sheaves, or wheels, in it, through which the running rigging passes, to add to the purchase.
Bluff  A bluff-bowed or bluff-headed vessel is one that is full and square forward.
Board  1. The distance a vessel makes upon one tack, when she is beating.
  Stern-board. When a vessel goes stern foremost
  2. A reference to the vessel itself.
  On board: contained within the vessel.
  By-the-board. Said of masts, when they fall over the side.
  Board the tack. To heave the tack down tight when sailing close to the wind.
Boat-hook  An iron hook with a long staff, held in the hand, by which something may be grabbed or pushed off.
Boatswain  (Pronounced BO-s’n.) A sailor who has charge of the rigging, and calls the crew to
**APPENDIX A: DICTIONARY OF SEA TERMS**

**Bolsters**
Pieces of soft wood, covered with canvas, placed on the trestle-trees, for the eyes of the rigging to rest upon.

**Bolts**
Long threaded rods of iron or other metal, used to secure or unite the different parts of a vessel.

**Bolt-rope**
Ropes sewn around the edges of sails. Bolt-ropes are sewn onto the after side of square sails, and the port side of fore-and-aft sails, such as the mizzen.

**Bonnet**
An additional piece of canvas attached to the foot of a sail by lacings to increase the area of a sail.

**Bound**
When a vessel is kept in port by an adverse wind it is said to be wind-bound.

**Bow**
The rounded part of a vessel, forward.

**Bower**
A working anchor, the cable of which is bent and rove through the hawse-hole. Best bower is the larger of the two bowers.

**Bowline**
(Pronounced BO-lin.) 1. A rope leading forward from the leech of a square sail, to keep the leech well out when sailing close hauled. A vessel is said to be on a bowline, or on a taut bowline, when she is close-hauled. Bowline-bridle. The span on the leech of the sail to which the bowline is attached. 2. A knot that forms a fixed loop in a piece of rope.

**Bowse, Bouse**
To pull upon a tackle.

**Bowsprit**
(Pronounced BO-sprit.) A large and strong spar, projecting from the bows of a vessel.

**Box-hauling**
A method of wearing a vessel by backing the head sails.

**Box**
To box the compass, is to repeat the thirty-two points of the compass in order.

**Brace**
A line by which a yard is turned about in the horizontal plane.

To brace a yard, is to turn the yard about.  
To brace up, is to lay the yard more fore-and-aft.  
To brace in, is to lay it nearer square.  
To brace aback, is to turn the yard so that the sail is aback.

To brace to, is to brace the head yards a little aback, in tacking or wearing.

**Brails**
Lines by which the foot or lower corners of fore-and-aft sails are hauled up.

**Break**
To break ground, is to lift the anchor from the bottom.

To break shear, is when a vessel, at anchor is forced the wrong way by the wind or current, so that she does not keep herself clear of her anchor. The break of the deck is the point where the quarterdeck and main deck meet.

**Breaching**
Cleaning a ship's bottom by burning.

**Breast-hooks**
Knees placed in the forward part of a vessel, across the stem, to unite the bows on each side.

**Breech**
The rear end of a gun.

**Breeching**
A strong line used to secure the breech of a gun to the ship's side.

**Bridle**
Spans of line, such as those attached to the leeches of square sails to which the bowlines are made fast.

**Broach-to**
To fall off so much when going free, as to bring the wind round on the other quarter and take the sails aback.

**Broadside**
The whole side of a vessel.

**Bulk head**
An athwartship partition to separate different parts of a vessel.

**Bull's eye**
A small piece of stout wood with a hole in the center for a stay or line to reeve through, without any sheave, and with a groove round it for the strap.

**Bulwarks**
The woodwork round a vessel, above her deck, consisting of boards fastened to stanchions and timber-heads.

**Bumpkin**
A piece of timber projecting from the stern of the vessel, to provide a lead for the mizzen sheet.
APPENDIX A: DICTIONARY OF SEA TERMS

Bunt  The middle of a square sail.
Buntlines  Lines used for hauling up the body of a sail.
Burton  A tackle used to tension standing rigging or handle cargo.
Butt  The end of a plank where it joins with the end of another. See also Scuttle-butt.
By  By the head. Said of a vessel when her head is lower in the water than her stern. If her stern is lower, she is by the stern.

C
Cabin  A room on board ship, especially one used for sleeping.
Cable  A large, strong rope, made fast to the anchor, by which the vessel is secured
       A unit of measure, generally equal to 120 fathoms.
Cable tier  The place in a hold or between decks where the cables are stowed.
Canvas  The cloth of which sails are made. No. 1 is the coarsest and strongest.
Cap  A thick, strong block of wood with two holes through it, one square and the other round, placed atop the mast and which helps secure the topmast to the lower mast.
Capsize  To overturn.
Capstan  A device for hauling on a rope by passing it around a vertical drum. Turning the drum with long bars produces a mechanical advantage.
Careen  To heave a vessel down upon her side by purchases upon the masts, to clean or repair the bottom.
Carlings  Short and small pieces of timber running fore-and-aft between the beams.
Carrick-bend  A kind of knot used for connecting heavy ropes together.
Carry-away  To break a spar, or part a rope.
Cast  To throw or heave.
       To pay a vessel's head off by backing the head sails when heaving up the anchor, so as to bring the wind on the side required.
Cat Block  The tackle used to hoist the anchor up to the cat-head.
Cat-harpin  Short ropes under the tops used to pull the shrouds closer together to give space to brace the yards at a sharper angle.
Cat-head  Large timbers projecting from the vessel's side at the bow, to which the anchor is raised and secured.
Cat's-paw  A kind of hitch made in a rope.
       A light current of air seen on the surface of the water during a calm.
Caulk  To fill the seams of a vessel with oakum.
Ceiling  The inside planking of a vessel.
Chafe  To rub the surface of a rope or spar.
       Chafing-gear is the stuff put upon the rigging and spars to prevent their chafing.
Chains  Strong links or plates of iron, the lower ends of which are bolted through the ship's side to the timbers. Their upper ends are secured to the bottom dead-eyes in the channels to which the shrouds are connected by lanyards.
Channels  Strong, broad planks bolted edgewise to the outside of a vessel. Used for spreading the lower rigging.
Chapelling  Wearing a ship round, when taken aback, without bracing the head yards.
Check  A term sometimes used for slacking off a little on a line, and then belaying it.
Cheeks  The projections on each side of a mast, upon which the trestletrees rest.
       The sides of the shell of a block.
Chess-trees  Pieces of oak, fitted to the sides of a vessel, abaft the fore chains with a sheave in them, used as a lead for the main tack.
APPENDIX A: DICTIONARY OF SEA TERMS

Clamps
Thick planks on the inside of vessels, to support the ends of beams.
Crooked plates of iron fore-locked upon the trunnions of cannon.

Cleat
A specially shaped piece of wood used to belay ropes.

Clew
The lower corner of square sails, and the after corner of a fore-and-aft sail.
To clew up, is to haul up the clew of a sail.

Clew-garnet
A line that hauls up the clew of a foresail or mainsail in a square-rigged vessel.

Clew-line
A line that hauls up the clew of a square sail. The clew-garnet is the clew-line of a course.

Close-hauled
Applied to a vessel that is sailing with her yards braced up so as to get as much as possible to windward. The same as on a taut bowline, full and by, on the wind, etc.

Coamings
Raised work round the hatches, to prevent water going down into the hold.

Coat
A mast-coat is a piece of canvas, tarred or painted, placed round a mast or bowsprit, where it enters the deck. (also referred to as mast boot)

Cockbill
To tilt up in the vertical direction. Said of a yard that is tilted up from the horizontal or an anchor at the cathead ready for dropping.

Coil
To lay a rope up in a circle, with one turn or fake over another. A coil is a quantity of rope laid up in that manner.

Collar
An eye in the end or bight of a shroud or stay, to go over the mast-head.

Come
Come home, said of an anchor when it is broken from the ground and drags.
To come up a rope or tackle, is to slack it off.

Companion
An entrance to a cabin from the deck. A companionway is a ladder leading into a cabin from the deck or from one deck to another.

Compass
The instrument that tells the course of a vessel. Compass-timbers are such as are curved or arched.

Conning
Directing the helmsman in steering a vessel.

Course
The point of the compass on which the ship sails.
The common term for the sails that hang from a ship’s lower yards. The foresail is called the fore course and the mainsail the main course.

Crank, Cranky
The condition of a vessel when she is inclined to lean over a great deal and cannot bear much sail. This may be owing to her construction or to her stowage.

Cringle
A short piece of rope with each end spliced into the bolt-rope of a sail. It is used for attaching a line to the sail.

Cross-trees
Strong pieces of wood placed athwartship at the mastheads and supported by the cheeks and trestletrees to mount the tops on the lower mast.

Crown
The crown of an anchor is the place where the arms are joined to the shank.
To crown a knot, is to pass the strands over and under each other above the knot

Cutwater
The foremost part of a vessel’s prow, which projects forward of the bows.

D
Dead-eye
A block of wood, with three holes through it, for the lanyards or rigging to reeve through.

Dead Reckoning
A method of determining a vessel’s approximate position by observing and recording her courses by the compass and distances by the log.

Dead-water
The eddy under a vessel’s counter.

Deck
The planked floor of a vessel, resting upon her beams.

Deep-sea Lead
(Pronounced DIP-see.) The lead used in sounding at great depths.

Departure
The bearing or position of an object on the coast or near offshore from which a vessel commences her dead reckoning.
APPENDIX A: DICTIONARY OF SEA TERMS

Dog-watches  Half watches of two hours each, from 4:00 to 6:00 and from 6:00 to 8:00 pm. These are used to avoid having sailors stand the same watch every day.

Douse  To lower suddenly.

Drabler  A piece of canvas laced to the bonnet of a sail, to increase the sail’s area even more.

Draft  The depth of water that a vessel requires to float her.

Draw  A sail draws when it is filled by the wind.

Dunnage  Loose wood or other matters placed on the bottom of the hold, above the ballast, to stow cargo upon.

E

Earing  Small ropes to secure the upper corners of square sails to the yard arms.

Even-keel  The situation of a vessel when she is so trimmed that she sits evenly upon the water, neither end being down more than the other.

Eye  A closed circle of material, such as the loop in the end of a shroud or stay, where it goes over a mast.

Eye-bolt. A long iron bar, having an eye at one end, driven through a vessel’s deck or side into a timber or beam, with the eye remaining out, to hook a tackle to. If there is a ring through this eye it is called a ring-bolt.

An Eye-splice is a loop spliced into the end of a rope.

Eyelet-hole. A hole made in a sail for a cringle or roband to go through.

The eyes of a vessel. A phrase for the forward part of a vessel.

F

Fair-lead, Fair-leader  A board or plank, with holes in it, for running rigging to lead through. Also, a block or thimble used for the same purpose.

Fake  One of the circles made in coiling a rope. Also flake.

Fall  The hauling part of a tackle.

Fashion-pieces  The timbers that form, or fashion, the shape of the stern.

Fast  A vessel is made fast when secured to a wharf or pier.

Fathom  A unit of measure equal to six feet.

Fenders  Devices hung over the side of a vessel or boat, to protect it from chafing against a dock or another boat.

Fid  A block of wood, placed through the hole in the heel of a mast, which supports the topmast on the trestle-trees of the mast below it. This supports the mast.

A wooden pin, tapered, used in splicing large ropes, in opening eyes, etc.

Fiddle-block  A long-shelled block, having one sheave over the other, and the lower smaller than the upper. As opposed to a double block which has the sheaves beside each other.

Fish  To strengthen a spar when sprung or weakened, by lashing or otherwise attaching a reinforcement.

To raise the flukes of an anchor upon the gunwale.

Fish-davit  The davit used for fishing an anchor.

Fish-hook  A hook at the end of the fish-tackle for catching the fluke of an anchor in raising.

Fish-tackle  The tackle used for fishing an anchor.

Flare  The condition in which the vessel’s sides go outward from the perpendicular. As opposed to falling-home or tumbling-in where the sides turn inward.

Flat  A sheet is said to be hauled flat, when it is hauled down close.

A sail is Flat-aback, when it is blown with its after surface against the mast.

Floor  The bottom of a vessel, on each side of the keelson.
Floor Timbers
Those timbers of a vessel which are placed across the top of the keel.

Flukes
The broad triangular plates at the extremity of the arms of an anchor, terminating in a point called the bill.

Foot
The lower end of a mast.
The lower edge of a sail.

Foot-rope
The rope slung under a yard, upon which men stand when reefing or furling, formerly called horses.

Fore
Used to distinguish items placed in the forward part of a vessel; as, fore mast, fore hatch, etc.; in opposition to aft or after.

Fore-and-Aft
Lengthwise with the vessel. In opposition to athwartships.

Forecastle
A raised deck in the forward part of the vessel.
The forward part of the vessel, under the deck, where the sailors live in merchant vessels.

Forefoot
A piece of timber at the forward extremity of the keel, upon which the lower end of the stem rests.

Forelock
A flat piece of iron, driven through the end of a bolt, to prevent it from drawing out.

Fore Mast
The forward-most mast of a vessel.

Forereach
To shoot ahead, especially when turned into the wind.

Foul
Entangled or otherwise hindered. The opposite of clear.
A foul bottom is one with a lot of marine growth on it.
A foul anchor is one that is tangled with its cable.
When the two cables are crossed or twisted, outside the stem it is referred to as a foul hawse.

Founder
A vessel founders, when she fills with water and sinks to the bottom.

Frap
To pass ropes round a sail to keep it from blowing loose.
To draw ropes round a vessel which is weakened, to keep her together.

Free
A vessel is sailing free, when she has a fair wind and her yards braced in.

Freshen
To prevent excessive chafe on a rope, by moving its position. To freshen the nip of a line, is to shift its bearing point to prevent its chafing through.

Full-and-by
Sailing close-hauled on a wind.
“Full-and-by!” The order given to the man at the helm to keep the sails full and at the same time close to the wind.

Furl
To secure the sails to the yards by the gaskets.

Futtock-plates
Iron plates crossing the sides of the top-rim perpendicularly. The deadeyes of the topmast rigging are fitted to their upper ends and the futtock-shrouds to their lower ends.

Futtock-shrouds
Short shrouds, leading from the lower ends of the futtock-plates to a bend round the lower shrouds, just below the top.

Futtock-staff
A short piece of wood or iron, seized across the upper part of the rigging, to which the futtock shrouds and catharpin legs are secured.

G
Galley
The place where the cooking is done. Know as the “cook room” in 17th century.
A vessel propelled by oars.

Gammoning
The lashing by which the bowsprit is held down.

Gangway
That part of a vessel’s side, amidships, where people pass in and out of the vessel.
The platform between the vessel and a dock to allow people to come and go.

Garboard
The range of planks next to the keel, on each side.
### APPENDIX A: DICTIONARY OF SEA TERMS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strake</td>
<td>A purchase on the main stay, for hoisting cargo.</td>
</tr>
<tr>
<td>Garnet Tackle</td>
<td>Ropes or pieces of plaited stuff, used to secure a sail to the yard when it is furled. They are called a bunt, quarter, or yard-arm gasket, according to their position on the yard.</td>
</tr>
<tr>
<td>Gaskets</td>
<td>A rope rove through a single block aloft, making a whip purchase, and used to hoist items aloft.</td>
</tr>
</tbody>
</table>
A vessel heels when it lies over on one side due to wind pressure.

**Helm**
The machinery by which a vessel is steered, including the rudder, tiller, whipstaff, etc.

**High and Dry**
The situation of a vessel when she is aground and above the water.

**Hogged**
The state of a vessel when, by any strain, she is made to droop at each end, bringing her center up.

**Hold**
The interior of a vessel, where the cargo is stowed.

**Home**
The sheets of a sail are said to be home, when they are hauled to their proper position. An anchor comes home when it is loosened from the ground and is hove in toward the vessel.

**Horse**
See Foot-rope.

**Hounds**
Projections at the mast-head serving as shoulders for the top or trestle-trees to rest upon.

**House**
To house a mast, is to lower it about half its length, and secure it by lashing its heel to the mast below.

To house a gun, is to run it in clear of the port and secure it.

**Hull**
The body of a vessel.

**I**

**Irons**
A ship is said to be in irons, when she lies head to wind and will not cast one way or the other.

**J**

**Jacob's Ladder**
A ladder made of rope, with wooden steps.

**Jeers**
Tackles for hoisting the lower yards.

**Jigger**
A small tackle, used about decks or aloft. See also handy-billy.

**Junk**
Condemned rope, cut up and used for making mats, swabs, oakum, etc.

**Jury-mast**
A temporary mast, rigged at sea, in place of one lost.

**K**

**Keckling**
Old rope wound round cables, to keep them from chafing. Also referred to as rounding.

**Kedge**
A small anchor, with an iron stock, used for warping.

To kedge is to warp a vessel ahead by a kedge and hawser.

**Keel**
The lowest and principal timber of a vessel, running fore-and-aft its whole length, and supporting the whole frame. It is composed of several pieces, placed lengthwise, and scarfed and bolted together.

**Keel-haul**
To haul a man under a vessel's bottom, by ropes at the yard-arms on each side. Formerly practiced as a punishment in ships of war.

**Keelson**
A fore-and-aft timber placed over the floor-timbers and bolted to the keel.

**Kevel**
A strong piece of wood, bolted to some timber or stanchion, used for belaying large ropes to.

**Kink**
A sharp twist in a rope.

**Knees**
Bent pieces of timber, often made of natural crooks, used to connect the beams of a vessel with her timbers. Lodging-knees are placed horizontally. Hanging knees are placed vertically.

**Knight-heads**
Strong vertical timbers on each side of the stem. They provide lateral support for the bowsprit. So called because they originally had a man's head carved on them. Also, a vertical timber through which halyards are rove.
**Knot**
A deliberate complication in a rope or string to serve a useful purpose.
A mark on the log-line, bearing the same relationship to a nautical mile that the sand in the glass bears to an hour.

**L**

**Labor**
A vessel is said to labor when she rolls or pitches heavily.

**Land-fall**
Approaching land after being at sea.

**Land ho!**
The cry used when land is first seen.

**Lanyards**
Ropes rove through dead-eyes for setting up rigging.
A line made fast to anything to secure it.

**Larboard**
The left side of a vessel, looking forward. Same as port.

**Large**
A vessel is said to be going large, when she has the wind free.

**Latchings**
Loops on the head rope of a bonnet, by which it is laced to the foot of the sail.

**Lay**
To come or to go as in, lay aloft, lay forward, or lay aft.
The direction in which the strands of a rope are twisted; described as right-hand or left-hand lay. All the ropes on the Jamestown vessels have a right-hand lay.

**Lead**
A piece of lead, in the shape of a cone or pyramid, with a small hole at the base and a line attached to the upper end used for sounding. (See Hand-lead, Deep-sea Lead.)

**Ledges**
Small pieces of timber placed athwart-ships under the decks of a vessel, between the beams to form hatch coamings.

**Lee**
The side opposite to that from which the wind blows. If a vessel has the wind on her starboard side, then that will be the weather, and the larboard will be the lee side.
A lee shore is a shore downwind from the vessel.
Under the lee of anything, is when you have that between you and the wind.
By the lee. The situation of a vessel, going free, when she has fallen off so much as to bring the wind round her stern, and to take her sails aback on the other side.

**Leech**
The vertical edge or edges of a sail.

**Leech-line**
A line used for hauling the leech of a sail up to the yard when furling.

**Leeward**
(Pronounced LEW-ard) In a direction opposite to that from which the wind blows. The opposite of lee is weather, and of leeward is windward.

**Leeway**
Distance a vessel loses by drifting to leeward.

**Lie-to**
To stop the progress of a vessel at sea, either by bracing the yards to opposite sides or by reducing sail so that she makes little or no headway, but will merely come to and fall off by the counteraction of the sails and helm.

**Lift**
A rope or tackle, going from the yard-arms to the mast-head, to support and move the yard in a vertical direction.

**Limbers, or Limber-holes**
Holes cut in the lower part of the floor-timbers, beside the keel, forming a passage for the water fore-and-aft.

**Line**
Any piece of cordage that is being put to a specific use. In general, Rope is spare cordage that becomes line when put to use.

**List**
The inclination of a vessel to one side; as a list to port, or a list to starboard. A temporary inclination caused by the wind is heel and an inclination caused by being out of trim is a list.

**Log**
A journal kept by the chief officer, in which the situation of the vessel, winds, weather, courses, distances, and everything of importance that occurs, is noted down. Also called a log-book.
A line with a piece of board, called the log-chip, attached to it, wound upon a reel, and used for ascertaining the ship’s speed through the water.

**Lubber’s Hole**
A hole in the top, next to the mast.
### Appendix A: Dictionary of Sea Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Luff</strong></td>
<td>To bring the ship up nearer to the wind so that the sails shake.</td>
</tr>
<tr>
<td><strong>Luff-tackle</strong></td>
<td>A purchase composed of a double and single block.</td>
</tr>
<tr>
<td><strong>Luff-upon-luff</strong></td>
<td>A luff tackle applied to the fall of another.</td>
</tr>
<tr>
<td><strong>Lurch</strong></td>
<td>The sudden rolling of a vessel to one side.</td>
</tr>
<tr>
<td><strong>M</strong></td>
<td><strong>Mallet</strong> A small hammer, made of wood; as, caulking-mallet; also, serving-mallet, used in putting service on a rope.</td>
</tr>
<tr>
<td><strong>Manger</strong></td>
<td>A coaming just within the hawse-hole.</td>
</tr>
<tr>
<td><strong>Man-ropes</strong></td>
<td>Ropes used as handrails as in a companionway.</td>
</tr>
<tr>
<td><strong>Marl</strong></td>
<td>To wind or twist a small line or rope round another.</td>
</tr>
<tr>
<td><strong>Marline</strong></td>
<td>(Pronounced MAR-lin.) Small two-stranded stuff, used for marling. A finer kind of spun yarn.</td>
</tr>
<tr>
<td><strong>Marline-hitch</strong></td>
<td>A kind of hitch used in marling. The running part is passed around the standing part from above rather than below.</td>
</tr>
<tr>
<td><strong>Marline-spike</strong></td>
<td>An iron pin, sharpened at one end, and having a hole in the other for a lanyard. Used both as a fid and a heaver.</td>
</tr>
<tr>
<td><strong>Marry</strong></td>
<td>To join ropes together by a worming over both.</td>
</tr>
<tr>
<td><strong>Mast</strong></td>
<td>A spar set upright from the deck, to support rigging, yards and sails.</td>
</tr>
<tr>
<td><strong>Mat</strong></td>
<td>A flat, rug-like object made of strands of old rope, and used to prevent chafing.</td>
</tr>
<tr>
<td><strong>Mate</strong></td>
<td>An officer under the master.</td>
</tr>
<tr>
<td><strong>Mess</strong></td>
<td>Any number of sailors who eat or lodge together.</td>
</tr>
<tr>
<td><strong>Messenger</strong></td>
<td>A rope wrapped around the capstan and used for heaving in the cable. A heaving line.</td>
</tr>
<tr>
<td><strong>Miss stays</strong></td>
<td>To fail of going about from one tack to another.</td>
</tr>
<tr>
<td><strong>Mizzen-mast</strong></td>
<td>The aftermost mast of a ship</td>
</tr>
<tr>
<td><strong>Moor</strong></td>
<td>To secure by two anchors which lead in opposite directions. By extension the term has come to include making fast to a pier or dolphins.</td>
</tr>
<tr>
<td><strong>Mouse</strong></td>
<td>To put turns of rope yarn or spun yarn round the end of a hook and its standing part, when it is hooked to anything, so as to prevent its slipping out.</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td><strong>Neap Tides</strong> Tides having a lesser range, or difference between high and low tide. They come at the middle of the moon’s second and fourth quarters. (Compare with Spring Tides.)</td>
</tr>
<tr>
<td><strong>Nip</strong></td>
<td>A short turn in a rope such as where it passes through a block or bull’s eye.</td>
</tr>
<tr>
<td><strong>Nippers</strong></td>
<td>A number of yarns marled together, used to secure a cable to the messenger.</td>
</tr>
<tr>
<td><strong>O</strong></td>
<td><strong>Oakum</strong> Stuff made by picking rope-yarns to pieces. Used for caulking, and other purposes.</td>
</tr>
<tr>
<td><strong>Offing</strong></td>
<td>Distance from the shore.</td>
</tr>
<tr>
<td><strong>Overhaul</strong></td>
<td>To overhaul a tackle is to let go the fall and pull on the leading parts so as to separate the blocks.</td>
</tr>
<tr>
<td></td>
<td>To overhaul a rope, is generally to pull a part through a block so as to make slack.</td>
</tr>
<tr>
<td></td>
<td>To overhaul rigging, is to examine it.</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td><strong>Painter</strong> A rope attached to the bows of a boat, used for making her fast or towing her.</td>
</tr>
<tr>
<td><strong>Palm</strong></td>
<td>A piece of leather fitted over the hand, with an iron for the head of a needle to press</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Against</strong></td>
<td>In sewing canvas.</td>
</tr>
<tr>
<td><strong>Fluke</strong></td>
<td>The face of an anchor fluke.</td>
</tr>
<tr>
<td><strong>Parcel</strong></td>
<td>To wind tarred canvas, (called parceling) round a rope.</td>
</tr>
<tr>
<td><strong>Parrel</strong></td>
<td>The fitting by which a yard is confined to a mast at its center.</td>
</tr>
<tr>
<td><strong>Part</strong></td>
<td>To break a rope.</td>
</tr>
<tr>
<td><strong>Partners</strong></td>
<td>A framework of short timbers fitted to the hole in a deck, through which a mast or pump, etc. passes.</td>
</tr>
<tr>
<td><strong>Pawl</strong></td>
<td>A short bar of iron, which prevents the capstan or windlass from turning in the wrong direction.</td>
</tr>
<tr>
<td><strong>Pay</strong></td>
<td>To pay: To cover over with tar or pitch. To pay off: When a vessel's head falls off from the wind. To pay out: To slack up on a cable and let it run out.</td>
</tr>
<tr>
<td><strong>Pendent, or Pennant</strong></td>
<td>A long, narrow flag, usually triangular, carried at the mast-head. A long strap fitted at one end to a yardarm or mast-head, with a hook or block at the other end, for a brace to reeve through, or to hook a tackle to.</td>
</tr>
<tr>
<td><strong>Pin</strong></td>
<td>The axis on which a sheave turns.</td>
</tr>
<tr>
<td><strong>Pintle</strong></td>
<td>A short, round piece of wood to belay ropes to.</td>
</tr>
<tr>
<td><strong>Pitch</strong></td>
<td>A resin taken from pine, and used for filling up the seams of a vessel. When a vessel alternately plunges her head into the sea and raises it again she is said to pitch.</td>
</tr>
<tr>
<td><strong>Poop</strong></td>
<td>A vessel is pooped when the sea breaks over her stern. The word “poop” is derived from a Latin word that means “precipice” and refers to a deck half the length of the quarter deck and one deck above it. See the Oxford dictionary for a more complete definition. The ships at Jamestown do not have a poop.</td>
</tr>
<tr>
<td><strong>Port</strong></td>
<td>The left side of a vessel looking forward. Now used instead of larboard.</td>
</tr>
<tr>
<td><strong>Port-hole</strong></td>
<td>Holes in the side of a vessel to let in light or to point a cannon out of.</td>
</tr>
<tr>
<td><strong>Puddening</strong></td>
<td>A quantity of yarns, matting or oakum, used to prevent chafing.</td>
</tr>
<tr>
<td><strong>Purchase</strong></td>
<td>The degree of mechanical power that increases the force applied. Usually applied to tackle.</td>
</tr>
<tr>
<td><strong>Q</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Quarter</strong></td>
<td>The part of a vessel’s side between the after part of the main chains and the stern. The quarter of a yard is between the slings and the yard-arm. The wind is said to be quartering, when it blows from between athwartship and astern.</td>
</tr>
<tr>
<td><strong>Quarter-block</strong></td>
<td>A block fitted under the quarters of a yard on each side of the slings, for the clew-lines and sheets to reeve through.</td>
</tr>
<tr>
<td><strong>Quarter-deck</strong></td>
<td>That part of the upper deck abaft the main-mast.</td>
</tr>
<tr>
<td><strong>Quoin</strong></td>
<td>A wooden wedge for the breech of a gun to rest upon. It is used to adjust the elevation of the gun.</td>
</tr>
<tr>
<td><strong>R</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td>A strong, rippling tide.</td>
</tr>
<tr>
<td><strong>Rack</strong></td>
<td>To seize two ropes together, with cross-turns.</td>
</tr>
<tr>
<td><strong>Rake</strong></td>
<td>The inclination of a mast from the perpendicular.</td>
</tr>
<tr>
<td><strong>Range of Cable</strong></td>
<td>A quantity of cable laid out neatly for letting go the anchor or paying out.</td>
</tr>
<tr>
<td><strong>Ratlines</strong></td>
<td>(Pronounced RAT-lins.) Lines running across the shrouds, horizontally, like the rungs</td>
</tr>
</tbody>
</table>
of a ladder, and used to step upon in going aloft.

**Reeve**
To pass the end of a rope through a block, or any aperture. (Past tense is reeved or rove.)

**Ribs**
A term for a vessel’s athwartships timbers to which the planking and ceiling are attached.

**Ride at anchor**
To lie at anchor.

**Rigging**
The general term for all the ropes of a vessel (see Running, Standing). Also, the common term for the shrouds with their ratlines; as, the main rigging, mizzen rigging, etc.

**Rim**
The edge of a top.

**Ring**
The iron ring at the upper end of an anchor, to which the cable is bent.

**Roach**
A curve in the foot of a square sail, by which the clews are brought below the middle of the foot.

**Road or Roadstead**
An anchorage at some distance from the shore.

**Robands**
Small line used to secure the head of the sail to the yard.

**Rolling tackle**
Tackles used to steady the yards in a heavy sea.

**Rope-yarn**
A thread of hemp, or other stuff, of which a rope is made. Yarns are twisted into strands, which are twisted into rope.

**Round in**
To haul in on a rope, especially a weather brace.

**Rubber**
A small instrument, usually of wood, used to rub or flatten the seams of a sail in sail-making.

**Rudder**
A flat plate or trim tab hung from the stern of a vessel by which it is turned.

**Run**
The after part of a vessel’s bottom, which rises and narrows in approaching the stern-post.

**Runner**
A whip attached to a tackle and used to increase its power.

**Running**
The ropes that reeve through blocks, and are pulled and hauled, such as braces, halyards, etc.; as opposed to the standing rigging, the ends of which are securely seized such as stays, shrouds etc.

**S**

**Sails**
Large pieces of canvas that catch the wind and provide the motive power for a vessel. They are of two kinds: square sails, which hang from yards, their foot lying across the line of the keel, as the courses, topsails, etc.; and fore-and-aft sails, which set upon yards, their foot running with the line of the keel.

**Sail ho!**
The cry used when a sail is first discovered at sea.

**Scantling(s)**
The dimensions of the pieces of lumber used in the construction of a vessel. A term applied to any timber, with regards to it’s breadth and thickness, when reduced to standard size.

**Scarf**
To join two pieces of wood at their ends by shaving the ends at an angle and overlapping them.

**Score**
A groove in a block or dead-eye.

**Scaper**
A sharpened, flat iron instrument, with a handle used for scraping wooden items.

**Scud**
To drive before a gale, with no sail, or only enough to keep the vessel ahead of the sea. Low, thin clouds that fly swiftly before the wind.

**Scuppers**
Holes cut in the waterways for the water to run from the decks.

**Scuttle**
A hole cut in any part of a vessel. Especially a hole cut in a vessel’s deck, such as a hatchway. To scuttle is to cut or bore holes in a vessel to make her founder.
APPENDIX A: DICTIONARY OF SEA TERMS

Scuttle-butt  A cask kept on deck to hold water for daily use.
Seams  The intervals between planks in a vessel’s deck or side.
Seize  To fasten ropes together by turns of small stuff.
Seizings  The fastenings of ropes that are seized together.
Selvagee  A skein of rope-yarns or spunyarn, marled together. Used as a strap for lifting or lowering.
Sennit, or Sinnit  A braid, formed by plaiting rope-yarns or spunyarn together.
Serve  To wind small stuff, as rope-yarns, spunyarn, etc., around a rope, to keep it from chafing. It is wound and hove round taut by a serving-board or mallet.
Service  Wrappings of small stuff around a rope to protect it from chafe.
Set  To set up rigging, is to tauten it by tackles. The seizings are then put on afresh.
Shank  The main piece in an anchor, at one end of which the stock is made fast, and at the other the arms.
Sharp up  Said of yards when braced as near fore-and-aft as possible.
Sheathing  A casing or covering on a vessel’s bottom.
Shears  Two or more spars, raised at angles and lashed together near their upper ends, used for putting masts in or taking them out.
Shear Hulk  An old vessel fitted with shears, etc., and used for taking out and putting in the masts of other vessels.
Sheave  The wheel in a block upon which the rope turns.
Sheave-hole, the place cut in a block for the ropes to reeve through.
Sheer  The line of plank on a vessel’s side, running fore-and-aft under the gunwale.
The curve of a vessel’s profile.
Sheet  A line attached to the clew of a sail and used in adjusting it.
Sheet Anchor  A vessel’s largest anchor; not carried at the bow.
Shell  The case of a block.
Ship  A vessel having three masts and square-rigged on all three. (Not common in period.)
To enter on board a vessel.
Shiver  To shake the wind out of a sail by bracing it so that the wind strikes upon the leech.
Shrouds  A set of ropes reaching from the mast-heads to the vessel’s sides, to support the masts. They are part of the standing rigging.
Sills  Pieces of timber put in horizontally between the frames to form and secure any opening; as, for ports.
Skin  The part of a sail that is outside and covers the rest when it is furled.
Slack  The part of a rope or sail that hangs down loose.
Slack in stays, said of a vessel when she works slowly in tacking.
Sling  To set a cask, spar, gun, or other article, in ropes, so as to put on a tackle and hoist or lower it.
Slings  The ropes used for securing the center of a yard to the mast.
A loop of rope fitted so as to go round any article that is to be hoisted or lowered.
Slip  To let the anchor cable run overboard so as to make a quick departure.
Small Stuff  The term for spunyarn, marline, and the smallest kinds of rope.
Snatch-block  A single block, with an opening in its side to receive the bight of a rope.
Sound  To determine the depth of water by a lead and line.
Span  A rope with both ends made fast, for a purchase to be hooked to its bight.
Spar  The general term for all masts, yards, booms, etc.
Spell  The common term for a portion of time given to any work.
To spell, is to relieve another at his work.
Spill  To shake the wind out of a sail by bracing it so that the wind may strike its leech and
Shiver it.

Spirketing
The planks that run from the waterways to the gun port sills.

Splice
To join two ropes together by interweaving their strands.

Spin-drift
Water swept from the tops of the waves by the violence of the wind in a tempest, and driven along before it, covering the surface of the sea.

Spray
Water dashed from the top of a wave by the wind, or by its striking an object.

Spring
To crack or split a mast or plank.
To spring a leak, is to begin to leak.

Spring tides
Tides having a greater range, or difference between high and low tide. They come, every new and full moon. (Compare with neap tides.)

Spunyarn
A cord formed by twisting together two or three rope-yarns.

Square
Yards are squared when they are horizontal and at right angles with the keel. Squaring by the lifts makes them horizontal; and by the braces, makes them at right angles with the vessel's line.
To square a yard, in working ship, means to bring it in square by the braces.

Staff
A pole or mast, used to hoist flags upon.

Stanchions
Upright posts of wood placed so as to support the beams of a vessel.
Upright pieces of timber, placed at intervals along the sides of a vessel, to support the bulwarks and rail, and reaching down by the side of the timbers, to which they are bolted.
Any fixed, upright support; as for an awning, or for the man-ropes.

Stand by!
An order to be prepared.

Standing
The standing part of a rope is that part which is fast, in opposition to the part that is hauled upon; or the main part, in opposition to the end.
The standing part of tackle is that part which is made fast to the blocks and between that and the next sheave, in opposition to the hauling and leading parts.

Standing rigging
That part of a vessel's rigging that is made fast and not hauled upon. (Compare with running rigging.)

Starboard
The right side of a vessel, looking forward.

Stay
To tack a vessel, or put her about, so that the vessel's head passes through the wind.
(See tack, wear.)
To stay a mast, is to incline it forward or aft, or to one side or the other, by the stays and backstays.

Stays
Large ropes, used to support masts, and leading from the head of some mast down to some other mast, or to some part of the vessel. Those which lead forward are called fore-and-aft stays; and those which lead down to the vessel's sides, backstays.
In stays, or hove in stays, the situation of a vessel when she is staying, or going about from one tack to the other.

Steady
An order to keep the helm as it is.

Steerage
That part of the between-decks which is just forward of the rudder.
The speed of a vessel at which she answers her helm.

Steeve
The angle a bowsprit makes with the horizon.

Stem
A piece of timber reaching from the forward end of the keel, to which it is scarfed, up to the bowsprit, and to which the two sides of the vessel are united.

Stemson
A piece of compass-timber, fixed on the after part of the apron inside. The lower end is scarfed into the keelson, and receives the scarf of the stem, through which it is bolted.

Step
A block of wood secured to the keel, into which the heel of the mast is placed.
To step a mast, is to put it in its step.

Stern
The after end of a vessel.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stern-board</td>
<td>The motion of a vessel when going stern foremost.</td>
</tr>
<tr>
<td>Stern-frame</td>
<td>The frame composed of the stern-post transom and the fashion-pieces.</td>
</tr>
<tr>
<td>Stern-post</td>
<td>The aftermost timber in a ship, reaching from the after end of the keel to the deck. The stem and stern-post are the two extremes of a vessel's frame. Inner stern-post. A post on the inside, corresponding to the stern-post.</td>
</tr>
<tr>
<td>Stiff</td>
<td>The quality of a vessel which enables it to carry a great deal of sail without lying over much on her side. The opposite of crank.</td>
</tr>
<tr>
<td>Stirrup</td>
<td>Ropes with thimbles at their ends, through which the foot-ropes are rove, and by which they are kept up toward the yards.</td>
</tr>
<tr>
<td>Stock</td>
<td>A beam of wood, secured to the upper end of the shank of an anchor, at right angles with the arms.</td>
</tr>
<tr>
<td>Stopper</td>
<td>A stout rope used for various purposes about decks; such as temporarily making fast a cable.</td>
</tr>
<tr>
<td>Strand</td>
<td>A number of rope-yarns twisted together. Three, four or nine strands twisted together form a rope. A rope is stranded when one of its strands is parted or broken by chafing or by a strain. A vessel is stranded when she is driven on shore.</td>
</tr>
<tr>
<td>Strap</td>
<td>A piece of rope spliced around a block to keep its parts well together.</td>
</tr>
<tr>
<td>Streak, or Strake</td>
<td>A range of planks running fore and aft on a vessel's side.</td>
</tr>
<tr>
<td>Stream</td>
<td>The stream anchor is one used for warping, etc., and sometimes as a lighter anchor to moor by, with a hawser. It is smaller than the bowers, and larger than a kedge.</td>
</tr>
<tr>
<td>Strike</td>
<td>To lower a sail or colors.</td>
</tr>
<tr>
<td>Surge</td>
<td>To surge a rope or cable, is to slack it up suddenly where it renders around a pin, or around a windlass or capstan.</td>
</tr>
<tr>
<td>Swab</td>
<td>A mop, formed of old rope, used for cleaning and drying decks.</td>
</tr>
<tr>
<td>Swig or Sway</td>
<td>A technique for hauling on a line by pulling it at right angles to the strain and then taking up the rope so gained on a pin or cleat. Page: 64 “S&amp;T” glossary says, “A term used by sailors for the mode of hauling off upon the bight of a rope when its lower end is fast.”</td>
</tr>
<tr>
<td>Tabling</td>
<td>The broad hem on the borders of sails, to which the bolt-rope is sewed.</td>
</tr>
<tr>
<td>Tack</td>
<td>To put a ship about, so that from having the wind on one side, you bring it round on the other by the way of her head. The opposite of wearing. The rope by which the weather clew of a course is hauled forward and down to the deck. An indication of the direction of a vessel in relation to the wind. For example, a vessel is on the starboard tack, or has her starboard tacks on board, when she has the wind on the starboard side. The tack of a fore-and-aft sail is the rope that keeps down the lower forward clew. Also, that part of a sail to which the tack is attached.</td>
</tr>
<tr>
<td>Tackle</td>
<td>(Pronounced TAY-cle.) A purchase, formed by a rope rove through one or more blocks.</td>
</tr>
<tr>
<td>Taffrail</td>
<td>The rail round a ship's stern.</td>
</tr>
<tr>
<td>Tail</td>
<td>A rope spliced into the end of a block and used for making it fast to rigging or spars. Such a block is called a tail-block. A ship is said to tail up or down stream when at anchor, according as her stern swings up or down with the tide; as opposed to heading one way or another, which is said of a</td>
</tr>
</tbody>
</table>
APPENDIX A: DICTIONARY OF SEA TERMS

vessel when under way

Tar
A liquid gum, taken from pine and fir trees, and used for caulking, and to put upon
yarns in rope-making, and upon standing rigging, to protect it from the weather.

Tarprotein
A piece of canvas, covered with tar, used for covering hatches, boats etc.

Taut
Tight.

Tend
To slack or keep the slack out of a line.

Tenon
The heel of a mast, made to fit into the step.

Thimble
An iron ring that has an exterior concave rim around which a rope or strap can fit
snugly.

Thrum
To stick short strands of yarn through a mat or piece of canvas: to make a rough
surface.

Tide-rove
The situation of a vessel, at anchor, when she swings by the force of the tide. Opposite
of wind-rove.

Tier
A range of casks.
The range of the fakes of a cable or hawser.
See also Cable tier.

Tiller
A bar of wood, put into the head of the rudder, by which the rudder is moved.

Timber
A general term for all large pieces of wood used in shipbuilding. More particularly, long
pieces of wood in a curved form, bending outward, and running from keel up on each
side, forming the ribs of a vessel.

Timber-heads
The ends of the timbers that come above the decks. Used for belaying hawsers and
large ropes.

Toggle
A pin placed through the bight or eye of a rope, block-strap, or bolt, to keep it in its
place; or to put the bight or eye of another rope upon and thus to secure them both
together.

Tompion
A plug placed in the mouth of a cannon.

Top
A platform placed over the head of a lower mast and resting on the trestle-trees, to
spread the rigging and for the convenience of men aloft.

To top up a yard or boom, is to raise up one end of it by hoisting it with the lift.

Top-block
A large block, hooked into a bolt under the lower cap, and used for the top-rope to
reeve through in sending up and down topmasts.

Top-lining
A lining on the after part of sails, to prevent them from chafing against the top’s rim.

Topmast
The second mast above the deck. Next above the lower mast.

Topgallant
(Pronounced: ’T’gallant) The third mast above the deck. (Note: the Jamestown ships
Mast
do not have topgallant masts.)

Top-rope
A rope used for sending topmasts up and down.

Top-sail
A sail set on the topmast.

Topgallant
A sail set on the topgallant mast.

Sail

Topping-lift
A line for topping up the after end of the mizzen yard.

Top timbers
The highest pieces on a vessel’s ribs, located above the main curve of the rib.

Tow
To draw a vessel along by means of a rope.

Transom
The timbers enclosing the stern of a vessel other than one that is double-ended.

Traverse
To sail on different courses.

Treenails, or
Long wooden pins, used for fastening a plank to a timber.

Trunnels

Trestle-trees
Two strong pieces of timber, placed horizontally and fore-and-aft on opposite sides of
a mast-head, to support the cross-trees and top, and for the fid of the mast above to
rest upon.

Trice
To haul up by means of a rope.
APPENDIX A: DICTIONARY OF SEA TERMS

Trick
The time allotted to a man to stand at the helm.

Trim
To arrange the sails by the braces with reference to the wind.
The condition of a vessel, with reference to her cargo and ballast. For example, a vessel is trimmed by the head if her head is lower than normal. “In ballast trim” refers to a vessel that has only ballast on board.

Trip
To raise an anchor clear of the bottom.

Truck
A circular piece of wood, placed at the head of the highest mast on a ship. It has small holes or sheaves for flag halyards to be rove through.
The wheel of a gun-carriage.

Trunnions
The arms on each side of a cannon by which it rests upon the carriage, and on which, as an axis, it is elevated or depressed.

Tumbling home
Said of a ship’s sides when they curve in above the bends. The opposite of wall-sided.

Turn
Passing a rope once or twice round a pin or kevel, to keep it fast.
Two crosses in a cable.
To turn in or turn out, terms for going to rest in a berth or hammock, and getting up from them.

Tye
A rope attached to a yard, to the other end of which a tackle is attached for hoisting.

U
Unbend
To cast off or untie. (See bend.)

Union
The upper inner corner of an ensign. The rest of the flag is called the fly. The union of the U.S. ensign is a blue field with white stars, and the fly is composed of alternate white and red stripes.

V
Veer
Said of the wind when it changes in a clockwise direction.
To slack a cable and let it run out.

Viol
A larger messenger sometimes used in weighing an anchor by a capstan.
The block through which the messenger passes.

W
Waist
That part of the weather deck between the quarter-deck and forecastle.

Wake
The track or path a ship leaves behind her in the water.

Wales
Strong planks in a vessel’s sides, running her whole length fore and aft. They stick out farther than the rest of the planking.

Wall
A knot put on the end of a rope to act as a stopper.

Wall-sided
A vessel is wall-sided when her sides run up perpendicularly from the bends. In opposition to tumbling home or flaring out.

Wear
Changing tacks by bringing the vessel’s stern through the wind. It is the opposite of tacking, where the vessel’s head is brought through the wind.

Warp
To move a vessel from one place to another by means of hauling on a rope made fast to some fixed object.
A warp is a rope used for warping.

Watch
A division of time on board ship. There are seven watches in a day, reckoning from 12:00 midnight through the 24 hours, five of them being of four hours each, and the two others, called dog watches, of two hours each (see dog watch).
A certain portion of a ship’s company, appointed to stand a given length of time. In the merchant service all hands are divided into two watches, port and starboard, with a
mate to command each.

**Watch-and-watch** The arrangement by which the watches are alternated every other four hours. In distinction from keeping all hands during one or more watches.

**Watch-tackle** A small luff tackle with a short fall, the double block having a tail to it, and the single one a hook. Used for various purposes about decks.

**Water-ways** Long pieces of timber, running fore and aft on both sides, connecting the deck with the vessel’s sides. The scuppers are made through them to let the water off.

**Weather** In the direction from which the wind blows.
A ship carries a weather helm when she tends to come up into the wind requiring you to put the helm up.
A vessel has the weather gage of another when she is to windward of her.
A weatherly ship is one that works well to windward, making but little leeway.

**Weigh** To lift up; as to weigh an anchor or a mast.

**Whip** A purchase formed by a rope rove through a single block.
Whip-upon-whip: One whip applied to the fall of another.

**Whipstaff** A vertical lever that connects with the inboard end of the tiller on the deck below. It is used to steer the ship by moving the tiller.

**Windlass** A device for hauling on a rope by turning a drum with bars giving a mechanical advantage. In general, a capstan has a vertical drum while a windlass has a horizontal drum.

**Windward** The direction from which the wind blows.

**Wind-rove** The situation of a vessel at anchor when she swings and rides by the force of the wind, instead of the tide or current (see tide-rove).

**Woold** To wind a piece of rope round a spar, or other thing.

**Work-up** To draw the yarns from old rigging and make them into spun yarn, sennit, etc.

**Worm** To fill the grooves between the lays of a rope with small stuff wound round spirally with the lay. Stuff so wound round is called worming.

**Y**

**Yacht** (Pronounced yot.) A vessel of pleasure or state.

**Yard** A long piece of timber, tapering slightly toward the ends, and hung by the center to a mast to spread the square sails upon.

**Yard-arm** The outboard ends of a yard.

**Yaw** The motion of a vessel when she swings off from her course.
Appendix B: History and Interpretation

Reprinted by permission from Spectre and Larkin, *A Goodly Ship*

In the afternoon of April 26, 1607, three tiny vessels entered Chesapeake Bay from the Atlantic Ocean and came to anchor near the mouth of what is now called the James River. They were the ships *Susan Constant* and *Godspeed* and the pinnace *Discovery*, under orders from the Virginia Company of London, 127 days out of England by way of the Canary Islands and the Caribbean.

The little ships were typical merchant traders of the beginning of the seventeenth century. The largest, the *Susan Constant*, was hardly bigger than a twentieth-century cruising yacht. The smallest, the *Discovery*, was not much larger than a lifeboat carried by one of today’s luxury liners. The vessels were crowded with passengers and crew; their holds were packed to the deckbeams with provisions and supplies for an expedition that would have to be self-sufficient for months at a time, perhaps even years.

These little ships, cockleshells by today’s standards, carried the core of what would become the Jamestown Settlement, the first successful permanent English colony in North America, which preceded the *Mayflower* landing and Plymouth Colony by thirteen years. The original settlers who survived and later immigrants would establish the Old Dominion of Virginia and lay the foundation for the English domination of North America at a time when it was thought the Spanish, who had had a vast head start, would inherit the continent.

A boat from the *Susan Constant* pushed off for the shore. “There wee landed,” wrote George Percy, one of the colonists, “and discovered a little way…faire meddowes and goodly tall Trees, with such Fresh-waters running through the woods, as I almost ravished at the first sight thereof.”

It had been a long voyage, almost four and a half months, in fair winds and foul, calms and violent storms, with seasickness, extreme discomfort, and death. Among the passengers and crew, even among the leaders, there had been endless disputes over the course to be taken and the appropriateness of the goal. Now, in the shelter of a peninsula jutting into Chesapeake Bay, in the gentle air of Tidewater Virginia in the spring, the men of the expedition strode the silver beaches, walked the woods, drank the pure waters, and thanked their lucky stars they were there and no longer on the heaving, lonely sea. They had survived an arduous voyage and found what they sought. They were eager to choose a site for their settlement and to get on with living in a land so full of promise.

Tidewater Virginia may have seemed promising that first afternoon ashore, but in the evening, as a portent of things to come, there were strange cries in the woods. The men, fearing for their lives, hastened back to the boat on the beach. “When wee were going aboard,” wrote Percy, “there came the Savages creeping upon all fours, from the Hills
The Jamestown Settlement, for all its fame, was not the first English colony in North America; rather, it was the first successful one. The Jamestown voyage had been preceded by a number of explorations by such Englishmen as John Cabot, Sebastian Cabot, and Bartholomew Gosnold, and by fishermen from the West Country of England who worked the banks off the Canadian Maritimes and New England. Martin Frobisher attempted a colony at Baffin Island as part of his search for a Northwest Passage; Sir Humphrey Gilbert tried the same thing on the coast of Newfoundland. In the late sixteenth century, Sir Walter Raleigh tried three times to set up a permanent colony on Roanoke Island, in what is now North Carolina. All failed.

The genesis of the Jamestown Settlement was the establishment of a small trading company a short time after the end of the Anglo-Spanish War, which ran from 1588 to 1604. A group of investors, seeing an opportunity for commercial gain in a period of peace, obtained a charter from King James I of England. Dated April 10, 1606, the charter in effect divided North America in half. The northern territory was reserved for petitioners from the cities of Bristol and Plymouth. The southern territory went to a joint-stock trading company known as the Virginia Company of London, of which there were seven principals: Sir Henry Montague and Sir William Wade, lawyers; Sir William Cope and Sir George Moore, both with close ties to King James’s court; and Sir William Romney, Sir Thomas Smythe, and John Eldred, all involved with the giant East India Company.

A royal patent to half a continent! Straightaway, the Virginia Company of London announced its intention to start a colony in the heart of their chartered territory. The stated purposes were:

First to preach and baptize into Christian Religion, and by propagation of the Gospell to recover out of the Armes of the Divell, a number of Poore and miserable soules [i.e., save the Indians]…

Secondly, to provide and build up for the pub like Honour and Safety of our Gratious King and his Estates. …

Lastly, the appearance and assurance of Private commodity to the particular undertakers, by recovering and possessing to themselves a fruitful land, whence they may furnish and provide this Kingdome, with all such necessities and defects (Copper, Iron, Steel, Timber for ships, yards, masts, cordage, sope ashes) under which we labor.

For all the noble intentions of the first two points, the last was the true operating principle. Commercial enterprise was, in fact, the primary function of the Virginia Company. Not only would great gain be realized, it was thought, by colonizing the New World, but also, with luck, explorers based at the settlement would find the fabled Northwest Passage to the unbelievable riches of the Far East.

But first a transatlantic expedition had to be organized—no mean feat in an era when it was difficult to plan for the future because the shape of the future was nearly impossible.
to discern. Money had to be raised, supplies purchased, and colonists recruited. Most important, transportation had to be arranged—ships, boats, and men to sail them.

The men of the Virginia Company were no fools. They recognized that there were two parts to the matter of choosing ships. Part one was to find deep-water vessels seaworthy enough to make the passage across the Atlantic. Part two was to arrange for coastal vessels suitable for extensive exploration of the shallow waters of Chesapeake Bay.

They settled on three vessels. Two were of great capacity and seaworthiness. The third had very little capacity and was barely large enough to make the ocean passage, but she was just the right size and draft for working her way through shoal waters and up narrow rivers and creeks. What’s more, the Company arranged for a fourth vessel, a sloop—a sloop-rigged open boat—to be built in England and then knocked down for transport in one of the ships.

Not counting the shallop, the smallest vessel, purchased especially for the voyage, was the pinnace *Discovery*, 20 tons burthen, commanded by John Ratcliffe. The next largest was the 40-ton *Godspeed*, leased from the Muscovy Company, which traded with Russia, and commanded by Bartholomew Gosnold. The largest—twice the size of the other two put together—was the *Susan Constant*, 120 tons burthen. She was commanded by Captain Christopher Newport, after whom Newport News would be named, and was leased from the firm of Colthurst, Dapper, Wheatley and Company of London. (The merchant Wheatley was involved in the sale of masts and deal boards. He would have had a great interest in the Jamestown expedition, as timber was expected to be one of the main exports from Virginia.)

The *Susan Constant* was the flagship of the squadron, and a famous ship in historical terms, yet few specifics are known about her. Nothing about who built her or where she was built, her precise dimensions, the color of her decorations or whether she had any decorations at all, and the shape of her hull.

All that is known is that about a month before the *Susan Constant* set sail for Virginia, she was involved in a collision with a smaller vessel, the *Philip and Francis*, in the Thames River just below London. The accident caused minor damage, but it was enough, nevertheless, to involve her owners in a lawsuit. It is from this suit that the size of the *Susan Constant* has been determined. Depositions in the case included statements that the ship was registered in London, that she was only about a year old (“The buildinge thereof which ys aboute a yeare past”), that she had traded with Spain, and that she was about 120 tons burthen (“The *Susan Constant* is of the burthen of one hundreth and twenty tonnes or thereabouts”).

Tons burthen, or burden, referred to the amount of cargo a ship could carry and was the then-standard way to describe a vessel. Ferdinand Magellan’s *Trinidad*, for example, was described as being of 110 tons burthen. She was said to have been of 200 tons displacement—that is, her hull displaced 200 tons of water—and measured 78 feet on the waterline, 22 ½ feet beam at the waterline, and had a mean draft, or depth, when loaded of 8 feet.
Naval architects and historians, taking into consideration what they know about merchant trading ships of the period, and assuming that the *Susan Constant* was a typical medium-sized vessel, have interpreted the 120-ton-burthen figure to mean she must have been about 55 feet length of keel, 96 feet length of hull, 23 feet width, and 9 ½ feet depth of hold.

Considering that the *Susan Constant* was registered in the port of London, most historians speculate she must have been built at one of the several shipyards operating on the banks of the Thames in the vicinity of London. Yards such as these had been constructing wooden ships for years, and the men who worked in them—ship’s carpenters, plankers, sawyers, caulkers, sparmakers—could draw on generations of tradition and experience.

The most important asset of the typical shipyard of the period was the land it sat on, as the working facilities themselves would have been limited. The land would be clear, sloping gradually to the water, with a few insubstantial buildings for housing a woodworking shop, a rigging and sail loft, a shipsmith's forge, and storage for tools and supplies. Most of the work was done right out in the open. There would be a sawpit for sawing out planks by hand, a slipway for launching vessels, a framing platform for getting out sawn frames, sheerlegs for lifting heavy objects, a mast yard for making spars, a storage yard for raw timbers and not much more.

The basic methods used for building ships like the *Susan Constant* were centuries old and would continue to be used for centuries to come. Virtually the only things a skilled wooden shipwright of today might miss in a seventeenth-century shipyard are power tools and a few materials that were then unavailable. Even the terms used to describe the processes of building and the parts of a vessel remain more or less the same.

The design of the ships, however, was quite different. To modern eyes, vessels like the *Susan Constant* seem topheavy and clunky, almost primitive when compared to the mighty clipper ships of two and a half centuries later and the yachts of today, but even so, their design, like their construction, was the result of careful consideration and years of experience. Here is what Sir Henry Mainwaring wrote about proper ship design of that period in *The Seaman’s Dictionary*:

*The bow is of great importance for this first breaks the sea and is that part which bears all the ship forward on when she is pressed down with sail, which is in a manner the bearing of the ship. If the bow be too broad the ship will not pass easily through the sea but carry a great deal of dead water before her; if it be too lean or thin, she will pitch or beat mightily into a hollow sea for want of breadth to bear her up, so that there must be a discreet mean betwixt both. The shaping of this part doth much import the ship's going by a wind; yet I have seen both sorts go well by a wind, but most commonly those have good bold bows; nevertheless it is certain that a ship's way after on--which is called her run--is of more importance for her sailing by a wind. The run is of main importance for the ship's sailing, for if the water come not swiftly to the rudder she will never steer well, and it is a general observation that a ship that doth not steer well will not sail well, and then she cannot keep a good wind, for if a ship hath not fresh way through the sea she must needs fall to leeward with the sea. We say a ship hath a good*
run when it is long and cometh off handsomely by degrees, and a bad run when it is short and that the ship is too full below.

“On Saturday, the twentieth of December in the yeere 1606,” wrote George Percy, who kept an account of the voyage, “the fleet fell from London.” Though it was a cold damp day and the heart of the winter was yet before them, the three vessels, plus the knocked-down shallop, got under way with a favorable tide and sailed down the Thames to the sea.

Conditions aboard all the vessels were unbelievably cramped. There were, of course, the passengers and crews: the Susan Constant carried 71 men; the Godspeed, 52; the tiny Discovery, 21. Then there were the provisions and water for the voyage and the material required for the operation of the ships. They carried cargo, tools, clothing, food, and other supplies to be landed with the colonists in Virginia, even livestock for both fresh meat and milk at sea and for farming in the new land. No list survives of the possessions the original colonists took with them, but here are excerpts of a list from a later voyage, in the 1620s:

**APPARELL FOR ONE MAN**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Monmouth Cap</td>
<td>One pair of garters</td>
</tr>
<tr>
<td>Three Shirts</td>
<td>One pair of Canvase sheets</td>
</tr>
<tr>
<td>One Waste-coate</td>
<td>Seven Ells of Canvas, to make a bed and boulster,</td>
</tr>
<tr>
<td>One sute of Canvase</td>
<td>to be filled in Virginia</td>
</tr>
<tr>
<td>One sute of Frize</td>
<td>One rug for a bed serving for two men</td>
</tr>
<tr>
<td>One sute of Cloth</td>
<td>Five Ells coarse Canvas, to make a bed at Sea for two men,</td>
</tr>
<tr>
<td>Three pair of Irish stockins</td>
<td>to be filled with straw</td>
</tr>
<tr>
<td>Foure pair of shooes</td>
<td>One coarse Rug at sea for two men</td>
</tr>
</tbody>
</table>

**VICTUALL FOR A WHOLE YEERE FOR ONE MAN**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eight bushels of Meale</td>
<td>One gallon of Aquavitae</td>
</tr>
<tr>
<td>Two bushels of Pease</td>
<td>One gallon of Oyle</td>
</tr>
<tr>
<td>Two bushels of Oatmeale</td>
<td>Two gallons of Vinegar</td>
</tr>
</tbody>
</table>

**ARMES FOR ONE MAN**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>One Armour, compleat, light</td>
<td>One Bandaleere</td>
</tr>
<tr>
<td>One long Piece, five foot or five and a halfe, neere Musket bore</td>
<td>Twenty pound of Powder</td>
</tr>
<tr>
<td>One Sword</td>
<td>Sixtie pound of shot or lead,</td>
</tr>
<tr>
<td>One Belt</td>
<td>Pistoll and Goose shot</td>
</tr>
</tbody>
</table>

**TOOLES FOR A FAMILY OF SIXE PERSONS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Five broad howes [hoes]</td>
<td>Two hammers</td>
</tr>
<tr>
<td>Five narrow howes</td>
<td>Three shovels</td>
</tr>
<tr>
<td>Two broad Axes</td>
<td>Two Spades</td>
</tr>
<tr>
<td>Five felling Axes</td>
<td>Two Augers</td>
</tr>
<tr>
<td>Two Steele Hand-sawes</td>
<td>Six Chissels</td>
</tr>
<tr>
<td>Two two-hand-saws</td>
<td>Two percers [awls]</td>
</tr>
<tr>
<td>One whip-saw, set and filed with boxe, file and wrest</td>
<td>Three gimblets</td>
</tr>
<tr>
<td></td>
<td>Two hatchets</td>
</tr>
<tr>
<td></td>
<td>Two froves [froes]</td>
</tr>
<tr>
<td></td>
<td>Two hand-bils</td>
</tr>
<tr>
<td></td>
<td>One Grindlestone</td>
</tr>
<tr>
<td></td>
<td>Nailes of all sorts</td>
</tr>
<tr>
<td></td>
<td>Two Pickaxes</td>
</tr>
</tbody>
</table>
APPENDIX B: HISTORY AND INTERPRETATION

HOUSEHOLD IMPLEMENTS FOR A FAMILY OF SIX PERSONS

- One Iron Pot
- One Kettle
- One large frying-pan
- One Griddiron

- Two Skillets
- One Spit
- Platters, dishes, Spoons of wood

In the best of conditions there was hardly enough room aboard ship for turning around, but in rough weather … Well, imagine a closet without enough headroom for standing up straight, packed with boxes, bales, rope, hammocks, and assorted gear.

Fill the spaces between with people who haven't been able to take a bath for weeks. Imagine the closet tossing and turning in a heavy seaway. Make the atmosphere damp and cold. Put the fear of the unknown in the minds of the occupants. Now you have a mild approximation of what it was like to be aboard any one of the ships of the squadron.

Keeping order in conditions like that was no easy task. It would have been difficult enough if one person had the authority of command, but as it was there were several, the captains of the individual ships: Bartholomew Gosnold, John Ratcliffe, and Christopher Newport, who as captain of the Susan Constant was also the leader of the squadron and carried the operational orders issued by the Virginia Company. (Both Gosnold and Newport had had considerable experience in North American waters and were familiar with the coast of Virginia.)

The crew of each vessel had their own organization. Besides the captain, there were four principal officers aboard the Susan Constant: the master, who was in charge of sailing the vessel; the pilot, who navigated within sight of shore; the navigator, who set the course on the open sea; and the ship's carpenter, who looked after the physical well-being of the vessel. The cook, the sailmaker, the rigger, the seamen, and others filled out the rest of the crew.

And then there were the leaders of the colonists: Edward Maria Wingfield, an experienced soldier of genteel background, who would be elected president of the governing council when the colonists became established in Virginia; George Kendall, known for his political connections; Captain John Smith, also an experienced soldier; and John Martin, a mariner.

No wonder the voyage was marked by disagreement, especially among the leadership! Hotheadedness may not have prevailed at all times, but it certainly wasn't uncommon. Before the squadron reached Virginia, Captain Smith, for example, was put in confinement after several arguments with other gentlemen of the expedition.

In 1606, the weather in England at the end of December was as poor as it ever has been. No sooner did the fleet reach the mouth of the Thames than it was struck by contrary winds and storms. “The fift of January we anchored in the Downes,” George Percy wrote in his journal, “but the winds continued contrarie so long, that we were forced to stay there some time, where wee suffered great stormes, but by the skilfulnesse of the Captaine wee suffered no great losse or danger.”
The fleet remained within sight of England for six weeks, much of the time at anchor, but finally they were blessed with fair winds and made their way to the Canary Islands to take on fresh water. Theirs was the classical trade-winds passage, guided by the old English mariners’ rule of thumb, “South ‘til the butter melts, then west”—a downwind romp under sunny skies, billowing clouds, and in relatively warm temperatures, with only the occasional storm, to the West Indies.

“The three and Twentienth day [of February],” Percy wrote, “we fell withe the Iland of Mattanenio [Martinique] in the West Indies.” To say the ships’ companies were delighted to reach solid land would be an understatement. The men visited the Caribbean islands with joy and thanksgiving, remaining there for several weeks, sailing from island to island. They rested, replenished their provisions, explored, stretched their legs ashore, traded with the natives, and gathered themselves for the last leg of the voyage.

“The tenth day [of April],” wrote Percy, “we set saile, and disimboged out of the West Indies, and bare our course Northerly.” They crossed the Tropic of Cancer on the fourteenth, enjoying fine sailing weather, but it was not to continue. “The one and twentieth day [of April], about five a clocke at night there began a vehement tempest, which lasted all the night, with winds, raine, and thunders in terrible manner. Wee were forced to lie at Hull that night, because we thought wee had beene nearer land than wee were.”

Indeed, they were not. They sounded for the depth of water with a lead line and found no bottom. They were far off shore—“off soundings” in the terminology of the mariner—to the east and south of their intended landfall, the capes of Virginia that define the mouth of Chesapeake Bay. But they found increasingly positive signs of land the farther they sailed, until finally, with great rejoicing, they spied the capes. “The six and twentienth day of Aprill,” Percy wrote, “about foure a clocke in the morning, wee descried the Land of Virginia: the same day wee entred into the Bay of Chesupioc directly, without any let or hindrance.”

The sea voyage was over. Now the exploration of the lower end of the Chesapeake would begin. The goal, as outlined in the detailed instructions provided by the Virginia Company, was to find an appropriate site for a colony. “When it Shall please God to Send you on the Coast of Virginia,” the orders said, “you shall Do your best Endeavour to find out a Safe port in the Entrance of Some navigable River making Choise of Such as one as runneth furthest into the Land. And if you happen to Discover Divers portable Rivers and amongst them any one that hath two main branches if the Difference be not Great make Choise of that which bendeth most towards the Northwest for that way shall You soonest find the Other Sea.” The “Other Sea” referred to here is the Pacific Ocean. European explorers still believed that the East Coast of North America was connected to the West Coast by a Northwest Passage through the heart of the continent.

The very next day, April 27, the ships’ carpenters began assembling the shallop. The Susan Constant and the Godspeed would explore the deeper waters and the channels of the bay; the Discovery and the shallop would work the shoals, rivers, and creeks. They were at it for more than two weeks, as the shoreline of Chesapeake Bay was as convoluted as any coast the sailors of the fleet had ever seen. One minute they would be
in water deep enough to float even the *Susan Constant*. The next, they would be over shoals of danger even to the shallop. Everywhere they went, they left a name as a remembrance of their experience there.

Old Point Comfort: “Wee rowed over to a point of Land, where wee found a channell, and sounded six, eight, ten, or twelve fathom: which put us in good comfort. Therefore wee named that point of Land, Cape Comfort.”

Cape Henry: “The nine and twentieth day [of April] we set up a Cross at Chesupioc Bay, and named that place Cape Henry.”

Archers Hope: “The twelfth day [of May] we went backe to our ships, and discovered a point of Land, called Archers Hope [after one of the gentlemen of the expedition].”

On May 13, 1607, they found their spot, a small island on the north bank of the James, a few miles upriver from the mouth, “where our shippes do lie so neere the shoare that they are moored to the Trees in six fathoms of water.” It seemed like the perfect place for a settlement, at least on first inspection.

“This River which wee have discovered,” wrote George Percy in a blaze of enthusiasm, “is one of the famousest Rivers that ever was found by any Christian, it ebbes and flowes a hundred and threescore miles where ships of great burthen may harbour in saftie. Wheresoever we landed up this River, we saw goodliest Woods as Beech, Oke, Cedar, Cypresse, Wal-nuts, Sassafras and Vines in great abundance, which hang in great clusters on many Trees, and other Trees unknowne, and all the grounds bespred with many sweet and delicate flowres of divers colours and kindes. There are also many fruites as Strawberries, Mulberries, Rasberries and Fruits unknowne, there are many branches of this River, which runne flowing through the Woods with great plentie of fish of all kindes, as for Sturgeon all the World cannot be compared to it. In the Countrey I have seene many great and large Meadowes having excellent good pasture for any Cattle. There are Beares, Foxes, Otters, Bevers, Muskats, and wild beasts unknowne.”

Later, when reality set in, Percy and his compatriots were a little less enthusiastic. Yes, the site for Jamestown had deep water, and yes, it was easily defended, and yes, there was abundant game for food and great stands of trees from which to cut lumber for housing. But much of the island was marshy, making it a breeding ground for mosquitoes; there were no fresh-water springs on the island itself, and the river water was brackish; and the territory belonged to a tribe of Indians that tended to be antagonistic more often than friendly.

But none of that deterred the colonists. They were happy to have finally picked a site and were eager to get established. Their instructions from the Virginia Company were explicit: “When you have Discovered as far up the River as you mean to plant Your Selves and Landed your victuals and munitions to the End that Every man may know his Charge you Shall Do well to Divide your Sixe Score men into three parts whereof one forty of them you may appoint to fortifie and build of which your first work must be your Storehouse for Victual 30 Others you may imploy in preparing your Ground and Sowing
your Corn and Roots the Other ten of these forty you must Leave as Sentinel at the
havens mouth The Other forty you may imploy for two Months in Discovery of the River
above you and on the Contry about you which Charge Captain Newport and Captain
Gosnold may undertake.”

And that is what they did. They named their river the James and their settlement
Jamestown (“We proclaimed James King of England to have the most right to it”). They
hauled their provisions, tools, and personal belongings ashore and began building a little
village, which, though crude, would be sufficient. “Wee did hang an awning (which is an
old Saile) to three or foure trees to shadow us from the Sunne,” wrote Captain John
Smith. “Our walles were rales of wood, our seats unhewed trees till we cut plankes, our
Pulpit a bar of wood nailed to two neighboring trees. In foule weather we shifted into an
old rotten tent.”

The names of these first settlers, the men who built Jamestown, were recorded by
Captain Smith:

**COUNCELL**

Maister Edward Maria Wingfield  Capataine John Smyth  Captaine John Martin
Captaine Bartholomew Gosnoll  Captaine John Ratlfife  Captaine George Kendall

**GENTLEMEM**

Maister Robert Hunt, Preacher  Ustis Clovill  William Tankard
Maister George Percie  Kellam Throgmorton  Francis Snarsbrough
Anthony Gosnoll  Nathaniell Powell  Edward Brookes
Captaine Gabriell Archer  Robert Behethland  Richard Dixon
Robert Ford  Jeremy Alicock  John Martin
William Bruster  Thomas Studley  George Martin
Dru Pickhouse  Richard Crofts  Anthony Gossnold
John Brookes  Nicholas Houlivrage  Thomas Wotton, Sierg. [Surgeon]
Thomas Sands  Thomas Webbe  Thomas Gore
John Robinson  John Waler  Francis Midwinter

**CARPENTERS**

William Laxon  Thomas Emry
Edward Pising  Robert Small

**OTHERS**

Anas Todkill  Jonas Profit Sailer  Edward Brinto, Mason
John Capper  Thomas Couper, Barber  William Love, Taylor
James Read, Blacksmith  John Herd, Bricklayer  Nicholas Skot, Drummer

77
### APPENDIX B: HISTORY AND INTERPRETATION

#### LABOURERS

<table>
<thead>
<tr>
<th>Name</th>
<th>Name</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Laydon</td>
<td>William White</td>
<td>John Dods</td>
</tr>
<tr>
<td>William Cassen</td>
<td>Ould Edward</td>
<td>William Johnson</td>
</tr>
<tr>
<td>George Cassen</td>
<td>Henry Tavin</td>
<td>William Unger</td>
</tr>
<tr>
<td>Thomas Cassen</td>
<td>George Golding</td>
<td>William Wilkinson, Surgeon</td>
</tr>
<tr>
<td>William Rods</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### BOYS

<table>
<thead>
<tr>
<th>Name</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samuell Collier</td>
<td>James Brumfield</td>
</tr>
<tr>
<td>Nathaniel Pecock</td>
<td>Richard Mutton</td>
</tr>
</tbody>
</table>

In fact, John Smith wasn't a member of the council, even though he had been chosen for it by the Virginia Company before the expedition set sail. A man of action and strong opinion, Smith was at first disliked and distrusted by his compatriots. After having been put in confinement aboard the *Susan Constant*, and after continuing to argue with the other leaders about the proper course of action, he was banned from the council by Edward Maria Wingfield. Later, in the colony's darkest hours, it was Smith who would be saved from death by the Indian maiden Pocahontas, and who would, through the force of his personality, save Jamestown from Indian attacks, starvation, and ruin.

With the storerooms and rudimentary housing complete, the settlers built a fort to defend themselves from the Indians, as well as from the Spaniards if the time should come when Spain might dispute England's tiny foothold in North America. And then, on June 22, when all was done that could be done, the *Susan Constant* and the *Godspeed*, the settlement's primary means of contact with the civilized world, got under way.

The two ships, flags and pennants flying from their mastheads, sailed down the James River, through Hampton Roads, between the Virginia capes, and out into the Atlantic Ocean. They were bound for London, from which they would never return, as the colony would be resupplied by other ships at other times. They left behind the little *Discovery* and the shallop, and a group of men who would suffer attacks from Indians, disease, starvation, and death. The survivors, nevertheless, would persevere.

And what would become of the *Susan Constant*? After she returned to London, her charter to the Virginia Company expired, and she went back to general trading around the British Isles and in European waters. She is known to have made a voyage from Bristol to Marseilles, and there are reports of her being involved in a case of piracy in 1618, though there is some speculation that the *Susan Constant* may have been a different ship of the same name. Nothing more is known. Our ship lived out her days and then disappeared into the mists of time.

In April 1957, to commemorate the 350th anniversary of the founding of Jamestown, the Jamestown Festival Park opened near the original site of the colony. Besides exhibits depicting the houses, occupations, and lives of the colonists, as well as a typical Indian village, the park also has a permanent waterfront display. For this, full-scale reproductions of the *Susan Constant*, the *Godspeed*, and the *Discovery* were built. Over
the years, thousands of people have visited the park, as much to see this unique collection of colonial vessels as to see the land-bound exhibits.

Time took its toll on the little ships, however, and by the 1980s all three were due for replacement. New reproductions of the Godspeed and the Discovery were launched in 1984. In early 1985 the new Godspeed was shipped by freighter to England and then was sailed from London on April 30 to reenact the original voyage of 1607. She returned to the Jamestown Festival Park in late October.

Meanwhile, significant advances in historical research and, especially, underwater archaeology had been made regarding colonial ships. More was known about the Susan Constant than ever before, and so the new reproduction would be based on the latest scholarship. Not only would there be a new Susan Constant, but she would also be as historically accurate as possible.

A master shipbuilder who had worked on several other historical reproductions was engaged to build the ship. A crew of experienced shipwrights was put together, a shop was erected, building stocks were set up, and the keel of the vessel was laid in December 1989 at the Jamestown Settlement, as it is now known, on the bank of the James River. For more than a year, visitors to the settlement were treated to the sights and sounds of an unfolding drama—the building of a wood ship.

Build me straight, O worthy Master!
Stanch and strong, a goodly vessel,
That shall laugh at all disaster,
And with wave and whirlwind wrestle!

"The Building of the Ship," 1849,
HENRY WADSWORTH LONGFELLO
Appendix C. What To Bring On A Voyage

What To Bring

Space onboard the ship is very limited for personal gear. Crew will either have a small bunk or area on the deck for stowage of gear and for sleeping. You will be expected to keep your gear neatly stowed within this space. It is recommended that you pack your personal gear in a canvas duffel bag or soft suitcase. An old sailor’s superstition is that hard suitcases are bad luck. Therefore, they will not be allowed aboard.

**Bedding:** Usually a sleeping bag or sheets and blankets and a pillow. We provide a bunk area with straw stuffed mattress.

**Clothing:** Be prepared for rain, warm, and cold temperatures. As with ship work sessions, the clothes you wear may get dirty. Items usually include:

- Long pants.
- Shorts.
- Bathing suit.
- T-shirts.
- Long sleeve shirts.
- Jacket.
- Gloves.
- Hat.
- Sweater.
- Underwear (long if it’s cold).
- Socks (heavy if cold weather).

**Footwear:** Comfortable shoes such as sneakers or deck shoes are recommended.

**Foul Weather Gear:** Be prepared for rainy weather. Bring good quality foul weather gear consisting of a waterproof jacket, pants and boots.

**Toiletries, bath towels and personal items.**

**Flashlight and batteries.**

**Insect repellent.**

**Sunglasses, hat and sunscreen.**

**Camera and film.**

**Rigging knife.**

**Unbreakable coffee mug.**

**Reading and writing materials.**

**Money.**