Niagara Seamanship

A Hands On Guide For Sail Trainees

1st Edition

By Capt. Wesley W. Heerssen
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The Slack of a Rope, etc.: That part which hangs loose.

To Slip a Cable: To let it run out to the end.

To Sound: To find the bottom by a leaden plummet.

To take a Spell: To be in turn on duty at the lead, the pump, the helm, etc.

To Spill: To take the wind out of the sails by the braces, halyard, etc. in order take the power out of the sail.

To Splice: To join two ropes together, by uniting and weaving the strands.

Spoondrift: A continued flying of the spray and waves over the surface of the sea.

To Spring a Mast: To crack or split it.

A Spring: A rope made fast to the cable at the bow, and taken in abaft, in order to expose the ship’s side to any direction.

Spring Lines: Mooring lines led forward from the quarter, aft from the bow, or either direction from midships to hold the ship so she does not sachet fore & aft alongside a pier.

To Stand on: To maintain the ship’s course.

To Stand by: To be ready.

Starboard: The right side of the ship.

To Steer: To manage a ship by the movement of the helm.

To Stopper the Cable: To keep it from running out, by fastening short ropes to it, called Stoppers.

Strand: One of the divisions of a rope. Strands are each made of fibers that are twisted into yarns, which are further twisted into strands.

Stranded: When one of the divisions of a rope is broken. Also when a ship is run on shore so that she cannot be got off, she is said to be stranded.

To Strike: To beat against the bottom. Also to lower the Flag in token of submission. Lowering the topmasts is commonly termed striking them. To rapidly douse sail.

To Surge the messenger: To slacken it suddenly.

To Swing: To turn a ship from one side of her anchor to the other, at the change of the tide or wind.

To Tack: To turn a ship by the sails and rudder into and across the wind so the wind comes across the other side of the ship.

Taut: A corruption of Tight.

Tending: The movement of a vessel in swinging at anchor.

Thimble: A bronze or steel eye, usually seized or spliced into a block strop, bolt rope of a sail, etc. to allow a strong and chafe resistant attachment point for a shackle or lashing.

Introduction

If you are joining Niagara for the first time, then you undoubtedly received this book with your copy of the US Brig Niagara Crew Handbook. If you have not finished reading the Crew Handbook, put this book down until you have read the former in its entirety. This book attempts to answer many of the mechanical questions likely to be in the forefront of a young sailor’s mind. The problem is that the most important questions are better answered in the Crew Handbook, so read it, then proceed here.

The Crew Handbook describes the roles and responsibilities of each professional crewmember and trainees. It also outlines the ship’s mission and history, standing orders, and other policies and procedures that everyone onboard must be familiar with. This book neither replaces, nor supercedes any information in the Crew Handbook. Niagara Seamanship focuses on the specific tasks the crewmembers perform in sailing the ship. It is a collection of information and technical illustrations to help trainees and new crewmembers in their study of Niagara, her rig, and seamanship.

This book has been written as an introduction to seamanship as practiced onboard the US Brig Niagara. It is intended not only as a hands-on guide for trainees to read during their off duty hours, but also as an instructor’s guide for professional crew to improve the quality of training onboard through reasonable standardization. It is not my intent to discredit the works or opinions of others, but on the contrary, to merely provide a starting point for the trainee or apprentice seaman to begin study. This book should not supercede the direction of the ship’s officers, but merely assist them in accomplishing their duty.

The nautical terminology described within may seem overwhelming to the new trainee during the first weeks onboard. Vocabulary builds from this point forward and most vocabulary questions can be answered in the glossary at the back of the book.

Finally, since most trainees are only on Niagara for a few weeks, it is a great improbability that all of the material in this book will be learned and mastered. No book can take the place of on-the-job training and practical experience. However, it may be helpful after the day is done, to read and consider the day’s work completed, to clarify what has been learned.

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Peak: The higher and aft end of a gaff-rigged sail.

Pooping: A ship is said to be pooped, when she is struck by a heavy sea, on the stern or quarter.

Port: The left side of the ship. Opposite of starboard.

Preventer: Any thing for temporary security; as, a preventer brace, a preventer guy, etc.

Purchase: Tackle. Mechanical advantage usually made by use of rope running through multiple blocks.

Quarter: That part of a ship’s side between the main chains and the stern.

Racking a Fall: Seizing the parts of a tackle-fall together by cross turns.

Rake: The projection of a ship at the stem and stern, beyond the extent of the keel - also the inclination of a ship’s masts either forward or aft from a perpendicular line.

To Rattle Down the Shrouds: To fix the ratlines on them.

To Reef: To reduce the size of a sail by tying reef nettles around the head of square sails or around the foot of a gaff-rigged sail. To remove oakum and cotton from plank seams with a reefing hook and mallet.

Reef Bands- See Bands

Reef Cringle- A cringle for reefing. -See Cringle.

Reef Nettles- Short and thin ropes secured through grommets in the reef band of a sail for the purpose of tying up the unwanted portion of a sail when reefing.

To Reeve: To put a rope through a block, etc.

To Ride: To be held by the cable. To “ride easy” is when a ship does not labor much. To “ride hard” is when the ship pitches with violence.

To Rig: To fit the rigging to the masts.

To Right: A ship is said to right when she rises to her upright position, after being heeled over by a large wave or squall.

To Right the Helm: To put it amidships, or in its fore and aft position, parallel to the keel.

To Round in: To haul in a brace, to bring a yard more square to the ship’s keel.

To Rouse in: To haul in the slack part of the cable.

To Scud: To sail before the wind in a storm.

To Scuttle a Ship: To make holes in her bottom to sink her.

To Serve: To wind any thing round a cable or rope, to prevent its being chafed.

To Seize: To make fast, or bind with rope or twine.

To Ship: To put any thing onboard. To “ship a sea,” when the sea breaks into the ship.

To Shiver: To make the sails point into the wind and shake.
Lizard: A small piece of rope with a thimble spliced into it for changing the direction a line leads.

Looming: The unfocused appearance of a distant object, such as a ship, the land, etc.

Lubber: A sailor who does not know his duty. A landsman.

Luff: The leading edge of a fore & aft sail. When a sail is not completely filled with wind and has the wind before it, just enough that its leading edge shakes mildly.

Luff Up: An order to the helmsman to put the helm to leeward and cause the sails to luff.

Luff Tackle: A tackle, consisting of a double and a single-sheave block.

Lying to: Hove to. See Heave To.

Lying A-hull: Underway, but stationary with no sails set. Drifting, usually beam to the wind with no sails set.

To Man the Yards: To send people upon them.

Messenger: A rope attached to the cable, to heave up the anchor by.

To Moor: To secure a ship by more than one cable.

Moorings: The place where a vessel is moored. Also anchors with chains and briddles laid in harbors for ships to ride by.

To Near the Land: To approach the shore.

No Near: An order to the helmsman to put the helm a little a-weather, to keep the sails full. To let her come no nearer to the wind.

Nippers: Rope plaiting or selveges to bind the cable to the messenger when using the capstan for anchor handling.

Off and on: Coming near the land on one tack, and leaving it on the other.

Offing: Out to sea - from the land.

Overboard: Out of the Ship.

Overhauling: To haul a fall of rope through a block till it is slack. Also examining a ship, etc.

Painter: A rope by which a boat is made fast.

Palm: See Fluke.

To Pass: To hand anything from one to another; or to place a rope or lashing round a yard, etc.

To Pay: To put pitch into a plank seam.

To Pay off: To make a ship’s head fall off and away from the wind by backing the headsails, etc.

To Peak up: To raise the after end of a gaff.

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Five Key Principles of Good Seamanship-

Follow orders. Follow all lawful orders from ship’s officers with diligence and report back to the officer when his/her orders have been carried out.

Be safety conscious. Regularly search for and report unsafe conditions to the officer of the deck. Be constantly mindful of your own personal safety and watch out for the safety of your shipmates. Do not attempt to do a job that you are not qualified to do. Officers should know your level of training, but occasionally they may mistakenly overestimate your abilities - tell them if you are unsure of what you are doing.

Be diligent, effective, and eager to learn. Do your assigned tasks to the best of your ability in a prompt, effective, and attentive manner. Be assertive with your own training and ask plenty of questions when in doubt.

Be neat, clean, and timely. Show up for musters, watch, and meals on time and properly dressed & equipped. Keep your gear properly stowed so you can find it quickly when you need it. Maintain healthy personal hygiene. Poor hygiene leads to sickness on a ship more quickly than on land - keep the ship and yourself clean and healthy.

Be a good shipmate. Serve the ship first, then your shipmates, and yourself last. Never publicly complain, always do tasks thoroughly and properly, and always demonstrate humility. Ego has no place on a ship. Overconfident, self-serving, egotistical people make the worst shipmates and worse leaders. A seaman’s work is hard work by its nature. Some times are harder than others, but the hard work never lasts forever. Try to maintain high spirits during times of hardship and try to promote positive attitudes in your shipmates. Negativity is a fast-spreading and debilitating plague in rough weather or when the watch or the workday seems unending.
Getting Your Bearings

The modern phrase “getting your bearings”, meaning “to figure out where you are”, is derived from the maritime tradition of taking compass bearings. Sailors in coastal waters use a nautical chart and a compass to take bearings on landmarks ashore to discern their location. The process of looking across the compass while sighting the landmark and recording the direction it is bearing is referred to as “taking bearings”. For the new trainee, the first step toward getting your bearings is learning the nautical terms related to finding directions onboard a ship.

The longitudinal centerline of the ship runs from the bow (at the forward end) to the stern (at the aft end). In the adjacent diagram, everything on the left side of this centerline is on the port side of the ship. Everything on the right side of it is on the starboard side of the ship. Remember that when on the ship and standing on the centerline, you must be facing forward, toward the bow, to have the port side be to your left, and the starboard side be to your right.

Inboard and outboard are terms used to describe whether something is “in” and toward the centerline, or “out” away from it. Overboard means off the ship. Inboard also means within the bulwarks, versus outboard being exterior topsides.

Hawser: A small cable such as for mooring or kedging.
Heave-to: To make a ship stationary, stopping her way by bracing some of the sails a-back and keeping others full, so that they counterpoise each other. Hove to (past tense).
To Heel: To incline to one side.
The Helm: A wooden bar put through the head of a rudder post - also called the tiller.
To Hitch: To make fast with a locking loop or successive locking loops of rope or twine.
The Hold: The lower compartment of a ship where the provisions and goods are stowed.
To Haul Home: To pull the clew of a sail, etc. as far as it will go.
Hockle: A kink that has badly deformed the strands of a rope.
Horse: A foot-rope made fast to the yard, near the yardarm, on which the crewmen stand. Also called a Flemish Horse, to infer that it is strong.
Hull: The body of a ship.
Jackstay: A rope that extends across the top of a yard or other spar, usually from one end to the other to provide an attachment point for a sail. Also, a jackstay provides a place for a sailor to put his hands and hold on while working on the yard (or other spar).
Jigger: A purchase used on what would be the standing end of a halyard, spanker clew outhaul, etc. to get extra mechanical advantage, after first hauling the working end of the line.
Junk: Pieces of old rope, out of which mats, gaskets, etc. are made.
Jury Masts: Temporary masts, stepped when the others are carried or shot away.
Keckling: Old rope passed round the cable at short distances to prevent chafe.
Kink: A twist or turn in a rope.
To Labor: To pitch and roll heavily.
Land-fall: That point in a voyage when land is first seen.
Larboard: The left side. Old term for Port.
Lee: The downwind side of an object or ship.
Leech: The vertical edges of a square sail. The after vertical edge of a fore & aft sail.
Leechline: A line used to haul in the leech of a sail.
Leeeward: That point towards which the wind blows.
Lee-way: The lateral movement of a ship to leeward.
Lee Tide: When the wind and tide are the same way.
List: Angle of heel caused by water in the bilges, or weights placed unevenly onboard.
Falling off: When a ship moves farther from the wind than she ought. Turning away from the wind.

Fid: A tapered piece of wood or iron to splice ropes with. Also a piece of wood or iron which supports one mast upon the trestle trees of another.

To Fill: To brace the yards so that the wind may strike the sails on their after surfaces.

Flog, Flogging: Harsh beating. When a sail is pointed into the wind, neither filled nor aback, and the entire sail shakes violently from the force of the wind running along it.

Flukes: The broad parts or palms of the anchors.

Fore: That part of the ship nearest to the bow.

Fore and Aft: The length-way of the ship, or in the direction of the keel.

Forging a-head: Forced ahead by the wind.

Foul Hawse: When the cables are twisted.

To Founder: To sink.

Full and by: A helm command to steer and accordingly change course as the wind changes in speed or direction, to keep the sails full, maintain forward way, and prevent stalling. Used often when beating to windward. When the wind is gusting, the helmsman will usually head up a bit on the puffs, and fall off a bit on the lulls.

Furling: Making fast the sails to the yards by the gaskets.

Gaff: A spar or yard to which the mizzen of a ship or the spanker of a brig is bent.

Gangway: A platform reaching from the quarter deck to the forecastle on each side. Also the place where persons enter the ship.

Gasket: A piece of plait or soft rope to fasten the sails to the yard.

Gin Pole: A temporary pole rigged to a mast head to assist in hoisting the tops, mast cap, or standing rigging for placement on (or removal from) the mast.

Girt: A ship is girted when her cables are too tight, which prevents her swinging.

Gripe: A line used to haul a boat into the ship while hanging in its davits to prevent it from swinging freely.

Guy: A rope to steady a boom, etc.

Gybing: When (by the wind being from astern) it is necessary to shift the boom of a fore and aft sail.

To Haul: To Pull.

To Sail: To call out to another ship.

A clear Hawse: When the cables are not twisted.

A foul Hawse: When the cables lie across, or are twisted.

Hawse Holes: The holes through which the cables pass.

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As you go down through the hatches on deck, and into the hull, you are said to be going below, not downstairs (as a landsman would say). The inside of the ship is divided into five watertight compartments. The main compartment, in the middle of the ship, is the Berth Deck, where trainees and ordinary seamen are berthed in hammocks. Other compartments are the Forepeak, the Galley, the Ward Room, and the Captain's Cabin. When leaving one of these compartments to go up, out of the hull, one is said to be going on deck. The deck is surrounded by high bulwarks, or thick wooden walls that are built up from the sides of the ship’s hull.

One of the most disorienting feelings for a new trainee can be the sense of motion when the ship is rolling heavily from side to side in a beam sea. A beam sea is a situation where the waves are moving across the beam of the vessel, or coming directly from the side the ship. A newcomer may wonder why the ship returns to the vertical rather than simply rolling over all the way until the hull is upside-down.

The answer is quite simple. Niagara has a hull made of wood. The hull floats not because it is made of wood, but because it is filled with air. It is the air within her that makes her buoyant (able to float).

The ballast in the ship is made of lead, and is located as low as possible on the keel and deep within the hull’s bilges. The ballast has a heavy enough weight to keep the ship upright, but not so much as to sink her. Because the ballast is located beneath the largest area of air within the hull, the ship remains upright. The buoyant part of the hull floats above the heavy part of the hull.

The bow of the ship is the front end of the vessel’s hull. Also called the head of the ship, it is the pointy end where the headrig protrudes sixty feet out from the hull. When standing in the middle of the ship looking forward, everything behind you is aft of you and if you were to turn around, and look the other way (toward the stern) you would be looking aft. So each of the primary directions on a ship (aft, forward, port, and starboard) can, like many other nautical terms, be used as either an adverb or an adjective.
Spars and Standing Rigging

Brig is a term that describes the design and construction of Niagara’s sails and spars, and the standing rigging that supports them. In simple terms, Niagara is a brig because she has two masts and a full suit of square sails on each. While she also has sails that set in a fore & aft orientation, it is the square sails that provide most of the sail area and driving force on each mast.

The fore and main masts are assemblies of three separate wooden masts; the foremast, fore topmast, and the fore topgallant mast. It is the same on the main mast assembly; the mainmast, main topmast, and main topgallant mast. To support the square sails, each mast has a yard on it; i.e. fore yard, fore topsail yard, and fore topgallant yard. The sails and yards are named after the mast they set from.

Shrouds lead from the top of a mast, down and a little aft on both sides of the mast, to prevent it from bending or falling to either side. Stays prevent it from falling aft.

Close-hauled: As near the wind as the ship can sail. When close hauled, yards are braced as sharp as they will go and trim of the fore & aft sail is adjusted to match the square sails- i.e. fore & aft sails trimmed in close, but not flat.

Close reach: A term used on schooners to mean a point of sail that is between close hauled and a beam reach.

Club-hauling: Tacking by means of an anchor.

Clues, or Clews: The lower corners of the square sails.

Clewline: A line used on square sails and fore & aft quadrangular staysails. A line used to haul the clew of a sail up to its yard or in to its mast.

Coamings: The borders of the hatchways which are raised above the deck.

Coiling: Laying a rope down in a circular form.

Companion: Wooden covering over the cabin hatchway.

Companionway: A ladder leading up or down through a hatch.

Course: The point of the compass on which the ship sails. The mainsail and foresail are also called courses.

To con the Ship: To direct the helmsman how to steer. To control the ship.

Crinkele: A rope eye and thimble spliced into the boltrope of a sail at either end of the reef band for passing a lashing through while reefing (shortening) the sail.

Cut-water: The knee of the ship’s bow, at the waterline.

Davit: A crane-like timber used for fishing the anchors.

Davits: Crane-like timbers used for hoisting ship’s boats from the water.

Dead Eye: A block with three holes in, to receive the lanyard of a shroud or stay.

To Douse: To let fly the halyards of a topsail - to lower away briskly. To Strike.

Down-haul: A rope to pull down the staysails, headsails, etc.

Drift: The speed in which the vessel is set downwind and/or down-current from her course and speed through the water. The speed of a tidal, river, or other current. Drifts are also iron or steel fastenings.

Dunnage: Wood, etc. laid beneath an object to keep it off the ground, deck, hold, etc.

Earrings: Rope eyes or iron rings to make fast the upper corners of square sails, etc.

Ease off: To slacken.

End for End: To replace a line oppositely, with the service end on deck and the bitter end in service, to prevent it from chafing further where it chafed before.

Fake: One circle of a coil of rope.

To Fake a line: To lay down a line on deck, ready to run, using overlapping circles so it will pay out quickly without fouling.
Canted: Any thing turned from its square position.

Canvas: Strong cloth, of which the sails are made.

Cap: A block of wood which secures the topmast to the lower mast.

Capsize: To turn over.

Capstan: A machine for drawing up the anchor by the messenger, which is taken round it, and applied to the cable by the nippers.

Careening: Heaving a vessel down one side, to clean or repair her bottom.

Carrick Bend: A kind of knot for bending hawsers together, which requires seizing the ends.

To Cast: To pay a ship’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: A large double or three-fold block used for drawing the anchor up to the cathead.

Cat-head: A large piece of timber or crane projecting over the bow, for drawing up the anchor clear from the ship’s side.

Cat-harpen: Short legs of rope seized to the upper part of the lower shrouds, and futtock staves, to keep them from bulging out by the strain of the futtock shrouds, and to permit the bracing up of the lower yards.

Cat’s Paw: A light Air perceived by its effect on the water, but not durable. Also a pair of twists made on the bight of a rope for attaching to a hook.

To Caulk: To drive oakum into the seams of the sides, decks, etc.

Chains: Links of iron bolted to the ship’s side, having dead eyes in the upper ends, to which the shrouds are connected by the lanyards.

Channels: Strong broad planks bolted to the sides, to keep the dead eyes in the chains from the side, to spread the rigging farther out.

Chapelling: A ship is said to build a chapel, when by neglect in light winds she turns round so as to bring the wind on the same part which it was before she moved.

Chase: A ship pursued by another.

Bow Chase: A gun in the fore part of the ship.

Stern Chase: A gun pointing a-stern in the after part of the ship.

To chase: To pursue, to follow.

Chock a-block: See Block and Block.

To clap on: To make fast, as “clap on the stoppers,” etc.

To claw off: To beat to windward from a lee-shore.

Cleats: Pieces of wood to fasten ropes to.

The head rig, in the head (bow) of the ship, is designed similarly to a mast assembly; it has three spars that each has standing rigging to support it. They are the bowsprit (the primary spar in the head rig) and moving outboard— the jibboom and the flying jibboom. The spars in the headrig are supported by stays that lead up to the foremost assembly. Three of the head stays (stays in the headrig) also support the three headsails. These stays, shown to the left (from left to right) are the fore topmast staysail, jib, and flying jib. The bobstays and martingale stays resist the upward pull of the head sails and head stays.

The jibboom and the flying jibboom each have guys on either side that act like shrouds and prevent these spars from bending sideways against the pressure of the wind on the headsails. The sprit yard not only spreads these guys outboard to improve their performance, but it also is readily braced to tighten the headrig guys. That is to say, either end of the sprit yard may be pulled upward on one side. When one side is braced up, the other side is eased down so that when the ship heels over while sailing, the sprit yard remains parallel to the horizon. This acts to put one side of the jibboom and flying jibboom guys under more tension than the other. When the ship is sailing, the windward guys are kept under more tension than the leeward guys by hauling on the lee sprit brace.
**Niagara Spar Plan**

1. Yawl Boat  
2. Spanker Boom  
3. Mainmast  
4. Main Yard  
5. Main Top  
6. Main Topmast  
7. Main Topsail Yard  
8. Main Topgallant Mast  
9. Main Topgallant Yard  
10. Main Royal Yard  
11. Fore Royal Yard  
12. Fore Topgallant Yard  
13. Fore Topgallant Mast  
14. Fore Topsail Yard  
15. Fore Topmast  
16. Fore Top  
17. Fore Yard  
18. Foremast  
19. Bowsprit  
20. Martingale  
21. Jibboom  
22. Flying Jibboom  
23. Cutter (Same on Port Side)

**Definitions:**

- **Bow of a vessel** to distribute the strain of the tow (or the mooring) to both sides of the vessel’s bow so she rides straight.

- **To bring by the Lee:** When a ship is sailing with the wind very large, and flies off from it so as to bring it on the other side, the sails catching a-back: she is then said to be brought by the lee - this is a dangerous position in a high sea.

- **Bulk-heads:** Partitions in the ship.

- **Bull’s Eye:** A wooden thimble for passing rope through.

- **Bunkin or Boomkin:** A short boom fitted to the bows of the ship for the purpose of hauling down the fore tack. It is supported on each side by a shroud.

- **Bunt:** The middle part of a square sail. Also the fore leech of a quadrangular staysail.

- **Buntlines:** Ropes attached to the foot of a square sail, to haul it and the bunt up.

- **Burton Pendants:** The first piece of rigging which goes over the topmast head, to which is hooked a tackle, to set up the topmast shrouds.

- **Butt End:** The end of a plank in the ship’s side.

- **Buttock:** That part of the ship’s hull under the stern, between the water line and wing transom.

- **By the Board:** Over the side. A mast is said to go by the board when it is carried or shot away just above the deck.

- **By the Head:** When a ship is deeper in the water forward than aft. By the bow.

- **By the Stern:** The reverse of by the head.

- **By the Wind:** When a ship is as near to the wind as her head can lie with the sails filled.

- **Cabin:** A room or apartment; also a bed place.

- **Cable:** A large rope by which the ship is secured to the anchor. Cables take their names from the anchors to which they belong, as the sheet cable, the best bower cable, etc. they are generally 120 fathoms in length.

- **To bitt the Cable:** See Bitts.

- **To heave in the Cable:** To pull it into the ship by the capstan or windlass.

- **To pay out the Cable:** To stick it out of the hawse hole.

- **To veer away the Cable:** To slacken it so that it may run out, as in paying out.

- **To serve the Cable:** To wrap it round with rope, plait, or horse hide, to keep it from chafing.

- **To slip the Cable:** To let it run clear out.

- **Cable Tier:** That part of the orlop deck where the cables are coiled.

- **To coil the Cable:** To lay it on the deck in a circular form.

- **Call:** A silver pipe or whistle used by the boatswain and his mates, by the sounding of which they call up the hands, direct them to haul, to veer, to belay, etc.
Boarding Netting: Network triced round the ship, to prevent the boarders from entering.

Boats: Small vessels - those belonging to ships are - the long boat, the launch, the cutter, the yawl, and the jolly boat.

Boatswain: The officer who has the charge of the cordage, boats, rigging, etc.

Bobstays: Ropes reeved through the cutwater, and set up with dead eyes under the bowsprit, to act against the power of the fore stays - sometimes one of these is taken to the end of the bowsprit, to act against the fore topmast stays.

Bolsters: Pieces of wood, or canvas stuffed, placed on the lower trestle trees, to keep the rigging from chafing.

Bolts: Iron fastenings, by which the ship is secured in her hull.

Bolt Ropes: Ropes sewn round the edges of the sails.

Booms: Large poles used to extend the studding sails, spanker, etc. Also spare yards, masts, etc.

Bows: The round part of the ship forward.

To Bowse: To haul upon and draw together two objects.

Bower: See anchor.

Bowlines: Ropes made fast to the leeches or sides of the sails, to pull them forwards.

Bowsprit: A mast projecting over the stem.

Box-hauling: A method of warping or turning a ship from the wind.

Boxing off: Turning the ship’s head from the wind, by backing the head sails.

Braces: Ropes fastened to the yard arms to brace them about. Also a security to the rudder, fixed to the stern post.

Brails: Ropes applied to the after leeches of the spanker, and some of the staysails to draw them up.

To Break the Sheer: To swerve from the proper direction in which a ship should be when at anchor.

Breaming: Burning the stuff which is collected on the ship’s bottom during a long voyage.

Breast Hooks: Pieces of timber placed across the bows of the ship, to keep them together.

Breast Work: Railings on the fore part of the quarter deck, where ropes are belayed.

Breeching: A stout rope fixed to the cascabel of a gun, fastened to the ship’s side, to prevents its running in.

Briddles: Ropes used to distribute load to two points rather than one, such as at the lower end of the spanker boom lifts. A towing bridle (or a mooring bridle) is rigged off the

Sails and Running Rigging

Each of Niagara’s fifteen sails are set, trimmed, and taken in by means of her running rigging. Memorizing the location and use of each of the lines in her running rigging may seem at first to be a daunting challenge, but it is actually quite simple. The lines are all grouped in order of their function. Lines have only a few functions; most of them act to set a sail, to gather in a sail, or to trim a sail to the breeze when set.

There are two rules to remember for guidance when looking for a specific line on a pinrail. The higher up the mast the sail is, the farther aft on the pinrail its lines will be. Also, on pinrails that are oriented athwartships (perpendicular to the keel), the higher up, the farther outboard the lines will be. It may help to remember the catchphrase, “Up your aft”.

Most of Niagara’s running rigging is associated with the square sails. The port and starboard sides of the square sails are symmetrical and have identical running rigging on either side. Also, the square sails on the foremast are nearly identical to those on the mainmast, and lines are thus grouped and located in the same way. The square sails on each mast are named in order from lowest to highest as follows: foresail (or mainsail), topsail, top gallant, and royal. The name of the mast usually precedes the name of the sail to avoid confusion.

The royals are the highest of all the square sails; above the topgallants on Niagara. While it is possible to rig them to be stowed aloft like the other square sails, they create unwanted windage in heavy weather. Therefore, they have been rigged to be set from the deck. When not in use, they are stowed on deck.
Niagara Sail Plan

Niagara

Sails

A. Spanker
B. Mainsail
C. Main Toppail
D. Main Topgallant
E. Main Royal

F. Fore Royal
G. Fore Topgallant
H. Main Topgallant Stay's
I. Fore Toppail
J. Main Topmast Stay'sail
K. Foresail
L. Foretopmast Stay'sail
M. Jib
N. Flying Jib

Main Staysail (not shown)

Battens: Slips of wood nailed on the slings of the yards, which are eight square - also over the tarpaulins of a hatch, to keep out the water in stormy weather.

Beams: Strong pieces of timber across the ship, under the decks, bound to the side by knees. They support the decks and keep the ship together.

On the Beam: When the wind blows at a right angle to the keel.

Beam Reach: A point of sail when the ship is sailing with the wind on the beam.

Before the Beam: When the wind or object bears on some point less than a right angle, or ninety degrees, from the ship's course.

Bearing: The point of the compass on which any object appears. It is also applied to an object which lies opposite to any part of the ship - thus the buoy, etc. bears on the beam, the bow, the quarter, etc. (relative bearing).

Beating to windward: Tacking, and endeavoring to get to windward of some head land.

Becalmed: (1) Having no wind to fill the sails. (2) The ship being deprived of the power of the wind by the intervention of high land, a larger ship, etc.

Becket: Loops to which one secures tools, lanyards, equipment, etc. -Or, older definition- short straps, having an eye in one end, and a double-walled knot on the other, for suspending a yard, etc. till wanted: such are the becket for the royal yards, for the bights of the sheets, etc.

To Belay: To make fast -or- secure a rope by taking multiply turns around a pin, cleat, or bitt.

Bend: A kind of knot, usually utilizing a U-shaped turn - such as a sheet bend, etc.

To Bend: To make fast by tying a bend or knot - as to bend the sails, the cable, etc.

Berth: A place of anchorage. A cabin, or apartment.

Bight: Any part of a rope between the ends. Also a collar or eye formed by a rope.

Bilge: The flat part of a ship's bottom.

Bilge Water: That which rests in the bilge, either from rain, shipping water, etc.

Binnacle: The frame, or box which contains the compass.

Bitt: Large upright pins of timber with a cross piece, over which the bight of the cable is put; also smaller ones to belay ropes, such as topsail sheets, etc.

To Bitt: To place a bight of the cable over the bitts.

Blocks: Instruments with sheaves or pulleys, used to increase the power of ropes.

Block and Block: When the two blocks of a tackle are drawn so close together that there is no more of the fall left to haul upon; it is also termed chock a-block.

To make a Board: To tack.

To make a stern Board: To drive a ship stern foremost, by laying the sails a-back.

Boarding: Entering an enemy's ship by force. These men are called boarders.
The Anchor is backed: i.e. another anchor is placed at a certain distance before it, and attached to it by the cable of the former being fastened to it, which fixes it firmly in the ground.

The Anchor is catted: i.e. drawn up to the cat-head.

The Anchor is fished: i.e. its inner arm is drawn up by the fish tackle.

To weigh the Anchor: To heave it up by the capstan or windlass.

The Sheet Anchor: is of the same size and weight as two bower anchors. It is a resource, and dependence, should either of the bower part, that it may be let go and used in an emergency.

Best Bower: the heaviest bower anchor (a bower anchor is a primary anchor, stowed on the rail cap, on the bow).

Small Bower: the smallest of the anchors, to which a hawser or cable is generally bent. Used when kedging- a process of running out two kedge anchors, first hauling back one, and then the other, re-setting each as it becomes aweigh, to move the ship across the beam of the ship.

To Take In Sheet: To use it’s running rigging to collapse the sail, and remove it from the wind so that it is no longer set.

To Furl Sail: To gather in a sail by hand, after it has been taken in, and to wrap rope gaskets around it so it is secured in a small bundle, away from exposure to the weather.

To Reef Sail: To reduce the surface area of a sail by shortening its width, length, and/or height.

The Sides and Corners of a Square Sail:

Head: The upper edge of the sail, which is lashed to the yard.

Foot: The bottom edge of the sail.

Leech: The vertical edge of the sail (on each side of a square sail).

Clews: The lower corners (either side) of the sail, where the sheets and clewlines attach.

Earrings: The upper corners (either side) of the sail, where the sail is outstretched and lashed to the yard with earring lashings.

Other Parts and Equipment:

Boltrope: a rope sewn into the edges of a sail, and all the way around the sail to strengthen the head, foot, and leeches.

Robands: Small lashings made of jute twine used to attach the head of the sail to the jacksay.

Reef Bands: narrow strips of cloth sewn across the topsails, foresail, and spanker. The bands are sewn horizontally across the sail to strengthen it where grommets are punched and sewn through to accommodate the reef nettles.

Reef Nettles: small rope pieces used to lash the unwanted portion of a sail to itself in order to minimize the sail size when reefing.

Reef Cringles: Rope eyes which are spliced into the boltrope on the leech of a sail, reef lashings are passed through the reef cringles and around the reef hooks to haul the reef band up to the yardarm, stretch it tight, and lash it securely in place.

Lizard: A small rope with a wooden bullseye seized into it to create a fair lead usually used for lines used to control a sail (as on a jacksay).
Running Rigging etc. for Topsails

Before furling, when a square sail is taken in, and the clewlines and buntlines are hauled tight, the sail is said to be “hanging in its gear”. The gear is the rigging that is hauled upon to collapse and contain the sail when it is not set. All of the square sails have clewlines and buntlines, but the only the topsails have reeflines, only the courses have leechlines, and the topgallants have a combination bunt-leechline. A leechline is like a buntline, except it is secured to the leech of the sail rather than the foot. A bunt-leechline is led through a lizard on the foot, then is secured to the leech.

In the following image, the topsail is set single-reefed (see the section on reefing topsails). The buntlines and reeflines are labeled and described. However, the clewlines are not visible because they are located on the aft side of the sail.

Glossary

Aback: A sail is aback when its forward surface is filled with wind.
Abaf: Behind of, and toward the stern. Thus, anything between the stern than the foremast is abaft the foremast.
Aboard: In the ship.
About: A ship is said to be coming about, when in the act of tacking; the order for which is “Ready about!”
Adrift: Broken loose from its moorings or attachments. Floating free.
Afloat: Floating - not touching the bottom.
Aft: Toward the stern- as “Stand farther aft” i.e. stand nearer to the stern.
After: Hinder, aft of the others, - as the after gun ports - those ports nearest the stern, - after sails, after hatchway, etc.
Aground: Not having water enough to float the ship, which rests on the ground.
Ahead: Before the ship. In front of the ship.
Alee . The helm is alee when the tiller is put to the lee side. Hard alee, when it is put as far as it will go.
A-loft: Up above. In the rigging, on the yards, at the mast head, etc.
Alongside: Close to the ship. Abreast of the ship.
Amidships: In the middle of the ship, either longitudinally, transversely, or both. The helm is amidships, when the tiller is not put over to one side or the other.
Anchor: Heavy iron hook, dropped on the sea bottom and designed to dig into and hold the ground; connected to a ship by means of a large and long cable, and used to hold a ship in one place against the force of the weather.
To Anchor: To set the anchor on the sea bottom so it may hold the ship.
To foul the Anchor: To let the cable be twisted round the upper fluke, stock, other obstruction, etc.
To drag the Anchor: When the ship pulls it with her, along or through the sea bottom, from the force of the wind.
Anchorage: Ground fit to anchor in.
The Anchor is a-trip: i.e. loosened from the ground by heaving in the cable.
The Anchor is aweigh: i.e. off the ground by heaving in the cable.
2. **Shiver the Main Yards! Take in the Spanker!** The main yards are braced to point into the wind so the square sails on the main mast are neither filled with wind nor aback, i.e. shivering. Then the spanker is quickly taken in and prepared to set again on the other tack. As the ship begins to turn, while the spanker is being taken in, the crew continue to brace the main yards to keep them shivering. Eventually the yards will become sharp on the other tack, which is when the crew belays the main braces. If short handed, the crew can shiver the main yards, delay the braces, go take in the spanker, and then go back to the main braces to continue bracing and shivering as the ship turns. If sailing off the wind, the spanker might not be set, but perhaps the mainsail set instead. In such case, the command to take in the spanker would (obviously) not be given.

3. **Up Helm!** The tiller (helm) is put up to the windward side of the deck. In the preceding illustration the rudder is put hard left. The tiller goes to windward so the ship will turn away from the wind.

4. **Square the Fore Yards!** The fore braces are hauled to square the yards on the foremast.

5. **Pass Fore and Aft!** The fore & aft sails- headsails and staysails are passed across to the new tack. The headsails are more important to pass across than the staysails. If short-handed pass the headsails first and then the staysails.

6. **Set the Spanker!** Crew sets the spanker to help push the stern downwind and allow the bow to come up on the wind. When warping ship on broad reaches, the spanker will probably not be set because the mainsail may be used instead.

7. **Brace Up Sharp, Port Tack**—The crew brace the fore yards sharp on a port tack and check that the main braces are sharp. By this point, the main braces should be sharp, because previously when the command was given to shiver the main yards, the crew kept the main yards shivering while the ship turned. So they kept bracing the main yards until they became sharp on the other tack.

8. **Steer ...** a new compass course is given to the helmsman.

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*Buntlines* are used to haul the foot of the sail up to its yard. They are led through lizards in the sail, which help gather the bunt (belly) of the sail. Buntlines haul the bunt and foot in tight against the yard to reduce windage and flogging when the sail is taken in.

*Reeflines* are used to haul the deep reefs outboard and up to the topsail yardarms to stretch out the deep reef in preparation for reefing the sail.

*Clewlines* directly oppose the sheets. Clewlines are used when taking in sail to haul the clews of the sail up to its yard and inboard toward the bunt. In addition to opposing the sheets, clewlines oppose the halyard, and will act as downhauls to help haul the yard down if it gets hung up in windy weather.

*Sheets* are bent to the clews of the sail, led down through the yardarms of the yard below, then inboard to turning blocks, and down toward the deck along the mast. The topsail sheets are hauled tight to stretch the clews out to the yardarms of the yard below. The sheets directly oppose the clewlines. Once the halyard is hoisted and the sail is set, the sheets directly oppose the halyard.

The term “*halyard*” is a derivative of the phrase “haul yard”, and is the name of the line which hauls a sail up during the process of setting the sail. The foresail and the mainsail do not hoist, and have no halyards. However, all of the other sails do. The topsails, top gallants, and royals are each bent onto their respective yards and the entire sail and yard must be hoisted when setting.

*Braces* lead from the yard arms to the opposite mast, then down to deck. By hauling on one side while easing the other, the yard (and sail) may be pivoted around the mast to adjust the sail’s angle to the breeze.

*Lifts* are used to hold the yardarms horizontal. They lead from the yard arm upward to the mast. The topsail and top gallant yard lifts are fixed; meaning they are not readily adjustable. They
go slack when their yard is hoisted with the halyard. The fore and main lifts are running lifts and are adjusted on deck each time the yards are braced. The fore and main lifts are adjusted as needed to hold the entire stack of square sails parallel to the horizon when they are set.

Since the topsail and topgallant lifts go slack when they are set and their yards are hoisted, these yards are held horizontal by the lower yard lifts. The topsail and top gallant yards are held parallel to the lower yard by the fact that their sails are set and held in place by their halyards and sheets. The fore and main lifts must be hauled tight before sending anyone onto a yard, especially when underway.

Foresail and Mainsail

The most recognizable difference between all of the square sails is that the courses (the foresail and the mainsail) do not hoist, and they have no yards beneath them. The foot of the foresail (and the mainsail) is hauled down to the rails of the ship and held in place by sheets and tacks, which are attached to the clews.

On the foresail, the tacks lead forward to the boomkins on the bow. On the mainsail, the tacks lead forward and through sweep ports in the sides of the ship between the masts. The image below shows the foresail set while the foreyard is braced square—sailing directly downwind.

Ware Ship—Commands and Procedure

A ware is a maneuver that involves turning the bow of the vessel downwind and placing the ship on the other tack. A ware is used for several possible situations. In the preceding illustration, the vessel is sailing close hauled on a starboard tack in order to sail as much as possible to windward. The ware is executed to turn the ship downwind and bring the ship on the wind to close hauled on a port tack. In weather conditions with high swells or waves, the vessel might not be capable of successfully executing a tack. In such heavy weather conditions, when it is important to gain ground to windward, a ware is a relatively easy way to turn the ship around.

A brig does not sail very fast going directly downwind. The sails on the mainmast fill with wind while the sails on the foremast get shadowed by the sails on the mainmast. In most circumstances it is far more effective to broad reach. A vessel is broad reaching when the wind is abaft the beam, but not dead astern (sailing about 135 degrees off the wind). When broad reaching, in order to get somewhere dead downwind, one must ware periodically to eventually arrive at the downwind destination. The image to the right shows how a brig would sail from one point to a downwind destination by executing several wares. The following are commands and the responding actions taken to ware Niagara.

1. Foresail (and perhaps Mainsail), Rise Tacks and Sheets! If the foresail is set, it is taken in at this point. If planning to re-set it, the officer will usually call “Foresail, rise tacks and sheets”, meaning take up the clew garnets only, do not haul in the foresail buntlines and leeclines. This way the sail can be set again easily, and the sheets and tacks can be cast off so they pay out with the foreyard as it is braced around. The same would be done at this point with the mainsail if it were set and the command would be “Mainsail, Rise tacks and sheets”
Each clew of a course has a sheet and a tack. When not sailing directly down wind, the windward tack is hauled tight and secured, and the lee sheet is hauled tight and secured. The clewlines on the foresail and mainsail are heavier and larger than on the topsails and topgallants. For this reason, the foresail and mainsail clewlines are called clew garnets, but for all intents and purposes, clew garnets and clewlines have the same function.

When the wind is coming from the starboard side of the ship, the ship is said to be sailing on a starboard tack, and the starboard foresail tack is hauled tight. In the image above, the ship is sailing on a port tack because the wind is coming from the port side of the vessel and the port foresail tack is hauled tight.

In the photo to the left, the ship is sailing on a broad reach, port tack (the wind is coming from abaft the beam, port side). In this configuration the foresail sheets and tacks on both sides of the sail are carefully adjusted to hold the foot of the sail directly under the yard.
Braces

Bracing yards is the process of pivoting them around the mast to change the sails' angle to the wind. Bracing yards is done by hauling on the braces on one side of the ship while easing the braces on the other. It is very risky business for an untrained newcomer. *Never adjust the braces when someone is on the yard!* He or she could be thrown off the yard.

The braces are often under extraordinary tension and should never be handled carelessly or by someone not properly trained. Newcomers should always haul the braces and let the able seamen ease. Mishandled braces can not only cause personal injury, but also could unexpectedly stop the ship's movement through the water, which in turn could cause more serious problems while navigating.

When bracing yards for a sail that is set, both the yard to which the sail is attached, and the yard below should be braced in relative unison. Also, all of the gear for the yards to be braced must either be cast off or belayed with a couple feet of slack in each line. This is usually done while setting sail or immediately after sails are set. The clewlines, buntlines, leechlines, and reeflines will all go tight when bracing.

There are also sheets, tacks, lifts, and truss tackles, for both the foresail and the mainsail, that must be cast off before bracing or tended throughout the maneuver. A detailed description of what these lines do and why they must be cast off, is beyond the scope of this text.

The topsail and topgallant yards each have “rolling tackles”. These tackles are used to prevent the yard from swinging side to side in a rolling sea. They are installed before furling sail and removed before setting. Rolling tackles must be removed and secured aloft before bracing or hoisting topsail and topgallant yards. If the sail is not set, the rolling tackles must be set taut (put on and hauled tight) before climbing on the yard. When underway and the sail not set, the windward rolling tackle alone may be used.

Commands for Bracing Yards

Yards are normally braced at angles to the ship's keel as ordered by the ship’s officers. An 11 ¼ degree point system is used to communicate the desired angle. If the officer wants the yards ninety degrees to the keel (yard arms pointing dead a-beam), he'll call to have the yards braced “square”. The point system for bracing is described as follows:

- **Square**: Yardarms are square to the ship, 90 degrees to the keel.
- **One point, port tack**: Port yardarms pointing 11 ¼ degrees ahead of the port beam.

Illustration, the ship begins the tacking evolution while sailing on a port tack. In this example, the crew let go the port main braces and haul on the starboard main braces to brace the square sails on the mainmast quickly and all the way around to sharp on the starboard tack. If the ship were beginning the tacking maneuver while sailing on the starboard tack, the braces would be handled oppositely.

4. Back the Head Sails! The ship is now head-to-wind, or pointing directly into the wind. On this command, the crew hauls on the headsail sheets in, and in such a way that the sails are held aback with the wind now on the other side of them. Simultaneously, the crew must tack the sprit yard’s braces so that the guys (standing rigging) for the jibboom and flying jibboom are put under tension on the side that will become the new windward side.

5. Rudder Amidships! –Pass Stay sails! The helm is placed amidships after the head sails are aback. Sometimes, the ship will gather sternway while she is head-to-wind. With the square sails aback, especially when waves or swells are more than four feet high, the ship will usually stop and begin to go backward through the water. The helm is placed amidships as soon as the head sails go aback because the ship’s way is usually nearly stopped at this point and going to the midships position allows water to pass by the rudder more easily, and the ship to continue making headway (going forward). Also, the helm can better be held in control when at the midships position. From this point, if the ship starts making a stern board (going backwards), then the helm is often shifted to the opposite side from where it was when beginning the tack so it will cause the stern to back up to windward.

Soon after being head-to-wind, as the ship begins to pay off onto the new tack, the order is given to pass the staysails (between the masts) across to the new tack. At about this time, other crew are organizing to clean up the spanker’s running rigging (tack its lifts, adjusts the vangs, etc.) Also, the spanker should be eased out on its sheet and quarter tackles to the new lee side.

6. Let Go and Haul! The crew hauling on the foremost’s yards let go the formerly lee braces (and now the windward braces) and haul on the formerly windward braces. In the preceding illustration, the ship begins the tacking evolution while sailing on a port tack. In this example, the crew let go the starboard fore braces and haul on the port fore braces to bract the square sails on the foremost all the way around to sharp on the starboard tack. If the ship were beginning the tacking maneuver while sailing on the starboard tack, the braces would be handled oppositely. Since at this point the square sails on the foremost are fully aback, this is a hard pull.

7. Pass the Head Sails! Once the square sails are tacked and filled with wind and the ship has successfully turned through the eye of the wind and begun sailing on the new tack, the order is given to pass the headsails. Once passed, they must be trimmed for the new course.
Tacking Ship - Commands and Procedure

Tacking is necessary to get the vessel to sail from a downwind starting point to an upwind destination. Often, especially when sailing in confined waters with obstructions or shorelines in the way, it is necessary to tack repetitively.

To tack the ship, the following commands and actions are executed:

1. Stand by to Come About! Crewmembers go to sail stations and prepare to tack ship. They lay down brace coils, headsail sheet coils, sheet and tack coils for courses, spanker quarter tackle and gaff vang coils, and cast off all gear for the square sails. Crew also cast off the lifts and truss tackles for the fore and main yards. Depending on which sails are set, there will be different things to do. In general, any lines that will be handled during the maneuver should have their coils laid down on deck as part of the “Stand by to come about” procedure. Any lines that will need to be cast off, should be cast off before the maneuver begins, provided that doing so will not have a negative result. For example, if the foresail is not set prior to the tack, its sheets and tacks can be cast off before the tack begins so the foreyard is ready for bracing. However, if the foresail is set and you just cast off its sheets and tacks before ordered to do so, the sail will start flogging, which would be a negative result.

2. Ease Down the Helm! Spanker Amidships! Helmsmen put the helm down (the tiller to the lee side of the deck). Crew haul the spanker quarter tackles and sheet until the spanker boom is to windward of the centerline of the deck, and the sail is amidships.

3. Mainsail Haul! The crew assigned to handle the braces on the mainmast’s yards cast off the windward braces and haul on the lee braces. If timed correctly and cast off quickly, the main yards should swing around most of the way on their own. The wind against the sails helps swing the main yards around. Also, the braces are initially so tight that there is a rubber band effect when they are cast off quickly. In the preceding

Two points, port tack: Port yardarms pointing 22 ½ degrees ahead of the port beam.
Three points, port tack: Port yardarms pointing 33 ¾ degrees ahead of the port beam.
Sharp, port tack: Port yardarms pointing 45 degrees ahead of the port beam, or as far as they will go without risk of damage. (Commands are the same for a starboard tack)

When giving bracing commands, the officers will call to “brace up” or “brace in” to a specified point position. For example, an officer would say “Hands to braces, brace up sharp, port tack”.

Sometimes yards are braced in opposite directions to keep the sails on one mast full of wind and the sails on the other mast aback. This technique can be used to slow the ship’s way (forward momentum) or it can be used to stop the ship’s way and cause her to drift nearly sideways (to “heave- to”).

Fore yards are braced for a port tack (as if the wind were coming from the port side to fill the sails). Note that the fore braces (dashed lines) lead from the yardarms aft to the mainmast, and then down to deck.

Main yards are braced for a starboard tack (as if the wind were coming from the starboard side to fill the sails). Note that the main braces (solid lines) lead from the yardarms forward to the foremast and down to deck.

Occasionally an order is given to shiver the yards on a mast or to shiver a particular sail. This means the officer wants the yards braced so the windward leeches of the sails are pointed directly into the wind so the sail is neither full, nor aback, but is shivering.
Setting Square Sails

When setting square sails, the topsails are set first. Usually the order for setting square sails is topsails, topgallants, foresail and mainsail, then royals. It is not possible to set a topgallant, if the topsail is not set first. Likewise, it is not possible to have a royal set if the topgallant is not set first. This is because topsails, topgallants, and royals are all set on hoisting yards, and their clews are pulled down to the next yard below with the sheets - see the image on page 19. The highest sails can’t be set if the sail beneath is not hoisted up. The clews of the sail would not reach the yard below.

Before setting sail, the sails must be loosed and the lines needed for setting the sail should be laid down on deck and made ready for use. This means that to be a useful hand on deck, each crew member should know which lines are needed to set a sail, and also the function and location of each. The foresail, mainsail, topsails, and topgallants will be discussed in this section. The royals will not be discussed here, as hands-on instruction is needed. However, to summarize, the royals are hoisted from the deck, and crew are needed aloft to lead their rigging each time the royals are set.
Finish the whipping by stitching the thread through one strand, stitching away from the bitter end for a distance that is at least three times the rope's diameter. When finished, cut the thread close to the strand by pulling the thread toward the bitter end and cutting it as shown in the photo above right.

**General Advice on Whippings**

Running rigging should have two whippings in the bitter end of each line. The whippings should be sewn in about two to three rope diameters apart.

When cutting new rope from a spool, a whipping should be sewn into the rope on either side of where the rope is to be cut. They should be sewn in at about two rope diameters apart. Then when the rope is cut, each end will have about one rope's diameter of line left above the whipping. If too much length is left on the bitter end of the whipping, it will fray and become a bulky bitter end that will be difficult to pass through the sheaves of blocks.

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**Setting Topsails and Topgallants**

Very often, when sailing with all hands on deck, the topsails are set simultaneously. This is why the fore topsail halyard is located on the port side of the foremast pinrail, and the main topsail halyard is located on the starboard side of the mainmast pinrail. One watch will haul aft on the fore topsail halyard, while the other watch hauls forward on the main topsail halyard.

Prior to setting topsails the officer of the deck will give orders to brace the yards to the desired angle, so the ship may sail on the wind as soon as possible, if so desired. However, the topsail yard will not brace sharper than two points until the yard is hoisted. Listed below are the commands and responsive actions taken to set topsails. These commands are the same for setting topgallants as well.

**Command Given** ............................................

**Action Taken** ............................................

- **Stand by to Set the (Name) Topsail!** ..........
  - The lines that will be needed are manned, coils are laid down on deck & ready to run, and all lines are taken to only one figure 8 turn on the pin, as the crew stand by to set. Lines that will be needed are the gear (clewlines, buntlines, and reeflines), also the halyard, sheets, and braces. Cast off the topgallant sheets.

- **Sheet Home!** .............................................
  - Cast off the gear, haul away the sheets.

- **Haul Away (Name) Topsail Halyard!** ..........
  - The topgallant sheets must be cast off for this action. Cast off the lee brace. Haul the windward topsail brace to keep the topsail yard from bearing on the topmast shrouds (it is the opposite on the main topsail because the braces lead forward from the yardarms rather than aft, as it is on the foremast's yards). -Haul Away the Halyard.

- **Avast (Name) Topsail Halyard!** .................
  - Stop hauling on the halyard.

- **Make Fast!** .............................................
  - Use a tail stopper to hold the load on the halyard while belaying the line. See Tail Stopper Illustration on Page 53
Setting the Foresail and Mainsail

The processes used for setting the foresail and the mainsail are identical, except that the foresail is larger than the mainsail and requires more manpower. Also, because the bulwarks turn inboard and the bow of the ship narrows forward of the foremast, the foresail tacks lead to boomkins or bumkins. Boomkins are short, stout spars protruding out from the hull, near the rail cap, on either side of the ship’s bow. Their purpose is to hold the lead of the tack outboard for better sail shape when sailing close to the wind. The tack is led through a large block on the boomkin and turned inboard and made fast to the large bitts on either side of the heel of the bowsprit.

The foresail (and mainsail) sheets lead aft from the clew of the sail and through a sheave in the bulwark. The gear is the same as on the topsail, except that the foresail has leechlines instead of reeflines.

Command Given          Action Taken

Stand by to Set the Foresail!.......................... The lines that will be needed are manned, coils are laid down on deck & ready to run, and all lines are taken to only one figure 8 turn on the pin, as the crew stand by to set. Lines that will be needed are the gear (clewlines, buntlines, and leechlines), also the halyard, sheets, and braces. Cast off the topgallant sheets.

Board the Tack! .......... Cast off the windward buntlines and leechlines, ease away smartly on the windward clew garnet (clewline), ease the lee gear and clew garnet a few feet, and haul away on the windward tack. The tack should be manned by at least six crewmembers on a moderate day.

Avast! Make Fast the Tack! Use a stopper to hold the load while making fast the tack.

Haul Aft the Sheet! .......... Haul the clew of the sail down and aft with the sheet. Cast off the lee gear and ease the lee clew garnet.

Avast! Make Fast the Sheet! ....................... Stop hauling and belay the sheet.

The first “frapping turn” is pulled tight, as shown above at left. The next stitch is again passed from left to right and under only one strand, but on the opposite side of the whipping (the bitter end-side). This second frapping turn stitch is made by following the arrow in the photo above left, and as shown in the photo above right. You must rotate the rope while stitching in the frapping turns so each turn is stitched into the next adjacent cont-line.

The third and final frapping turn is stitched in similarly to the previous frapping turns. The thread is pulled tightly away from the bitter end. Then begin sewing the thread down the nearest strand as shown in the photo above right.
Insert the needle in the same cont-line that the round-turns started from. Insert it from right to left and under only one strand as shown. Note: this is the same cont-line where the first turn of the whipping exited, after stitching the thread up the strand.

Pull thread tightly, then rotate the rope’s end and pass the needle under one strand on the opposite side of the whipping (the side away from the bitter end). The needle should enter the same cont-line that the thread is leading out of. Once the needle is pulled out and the thread is pulled tight, the thread will run along the cont-line, thus creating a frapping turn around the main turns of the whipping.

Loosing and Furling Square Sails

Loosing sail is the process of removing the rope gaskets that prevent the sail from becoming unfurled. Furling is the opposite; it is the process of gathering the sail into a tight sausage-shaped package, and lashing gaskets around it securely to stow the sail after it has been taken in.

Before laying aloft to loose or to furl any square sail the following details must be attended to:

1. All climbing crewmembers and trainees must be trained and approved as climbers, and wearing a ship-issued safety harness. The aloft safety policy outlined in the crew handbook, must be read, understood, and followed.
2. When the yards are not braced square, and especially when underway, ascend the rig only on the windward side.
3. Officers or their designates should direct the crew and trainees, and assign their places on the yard. Who’s going to the windward yardarm? The leeward yardarm? The bunt? Crewmembers should ascend in the order that they will man the yards (to avoid traffic jams aloft while climbing out onto the yard).
4. Prepare the sail for loosing or for furling by ensuring the gear is hauled up tight.
5. Make certain the yard is safe to climb on. The braces, lifts, truss tackles and rolling tackles must all be hauled tight and secured. When sailing, the leeward rolling tackle may be left off if the windward rolling tackle is properly put on and hauled tight.

Once aloft, and while stepping onto the yard’s footrope, say “Laying On” or “Stepping On” to forewarn others on the yard that you are about to cause the footrope to shake when you step onto it. Clip into the yard’s backrope or into the becket on the jackstay to secure your harness tether. Clip in as soon as possible and remind others who may forget to clip in. Use of the safety harness tether is mandatory.

Loosing

Once on the yard, remove the gaskets, and coil them in a gasket coil, on the forward side of the jackstay. All gasket coils should be the same size and hanging close to the jackstay. Never pull the gasket out from between the sail and the yard. Make gasket coils as shown in the following illustrations:
Remove gaskets from the lee side of the yard, and then work your way to windward, saving the bunt gasket for last. The bunt gasket is the one in the very center of the yard-holding most of the sail (and its weight). On windy days it is important to stay upwind of a flogging sail.

Removing Gaskets

After untying the gaskets, they must be properly stowed. Follow the next few diagrams to properly make a gasket coil.

**Step 1** - The gasket will fall below the yard after it is untied. It will hang between the sail and the yard. Pull it up from behind the yard and make a coil. Then shove a bight under the jackstay as shown in step 2.

**Remember:** Don't trap any rigging under the yard with the gasket! Pass the gasket between the yard and any rigging on the yard. The gasket stays close to the yard without trapping any other lines!

Pull the thread just until the bight of the last stitch disappears into the strand. Then begin passing turns around the rope in the direction that is **against the lay** (opposite to the direction in which the rope strands are twisted).

Pass the thread around the rope, against the lay, and each turn moving closer to the bitter end (as shown above). Make sure there are no gaps between each turn of thread around the rope’s end.

*It is important to note that in actual ship's service, whippings are sewn about one foot from the end of the frayed rope, so the rope does not become untwisted and the strands frayed while sewing in the whipping. After the whipping is sewn, the bitter end of the rope is cut at one rope’s diameter from the whipping. To better illustrate the correct direction to pass the turns around the rope, this whipping was sewn in a synthetic rope that was cut and the end melted beforehand. The whipping was started only a few inches from the rope’s end, so the end is visible in the photos.*
Sail Maker’s Whipping

Whippings are used to keep a rope’s end from untwisting and fraying.

Begin by cutting one and a half fathoms of waxed sail thread and middling it on a 2 ½” or No. 16 sail needle. Then insert the needle into a strand a few inches from the bitter end of the rope and push it up the strand shallowly toward the bitter end. Continue by stitching the thread a few inches up the same strand, toward the bitter end. The photo (above left) shows how the second stitch is started. The needle is inserted where it came out of the strand from the first stitch. Then pull the thread through carefully until the bight disappears into the strand (as shown above right and below left).

Continue stitching the thread up the line toward the bitter end until it has been sewn a distance that is at least three times the rope’s diameter up the strand. The final stitch should exit the strand at the cont-line (the groove between the strands) as shown above.

Step 2- A bight is a “U”-shape made in a rope. Pass the coil down through the bight that you shoved under the jackstay. Cinch it down snug to form a hitch around the jackstay. The coil will hang from this hitch when completed.

Step 3- Begin frapping the coil by passing turns around the coil. Be sure to wrap with the standing end of the line, which is leading from the jackstay. Do not wrap the coil with frapping turns by using the bitter end of the line. These frapping turns will contain the coil.

Step 4- Continue with frapping turns working upward and crossing over the first turn as shown to the right.
**Step 5**  Stop frapping when you have three or four frapping turns around the coil and the coil is about one foot from the yard. Make a bight and shove it through the top of the coil. Make sure your frapping turns are not wrapped too high on the coil. There should be enough space in the top of the coil to pass the bight in the standing end through.

4. While continuing to hold the strain on the twine with the left hand, use the right thumb to push the loop over the tip of the spike as shown above-left and then right.

**Step 6**  Complete the gasket coil by pulling the bight all the way through and flipping it over the top of the gasket coil. The standing end of the rope should be just long enough to pass the bight over the top of the coil. If the bight is too large, the finished product will be a coil that hangs too low from the jackstay. It could get fouled in the sail’s rigging. If the coil hangs more than about six inches below the yard, untie it, remove the frapping turns, put another loop in the coil itself, and then frap it up again. Then try step 6 again to complete the gasket coil correctly.

5. Place the right thumb over the twine in the center of the knot and press the twine against the spike. Pull the spike and twine firmly (against the seizing) while allowing the twine to slide under your right thumb as the knot cinches tight around the marline spike. Once the knot is tight, grab the spike in the right hand as shown above right and the knot will hold as you pull hard on the twine. That’s all there is to it. The images below show a top and an underside view of the finished marline spike hitch.

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As crewmen finish their gasket coils they may begin to lay off the yard. The man (or woman) at the yardarm should be well trained, because as he works his way inboard, he will check that all gaskets are properly removed from the sail, gasket-coiled without trapping any rigging, and hung on the jackstay. After all gaskets except the bunt gasket are removed and stowed, the last man on the yard will check the entire sail for mistakes made by others, then unhitch the bunt gasket, remove a turn or two, and be ready to let go. Then he will shout down to the officer on deck “*name of sail, i.e. fore topsail* is loose to the bunt!” The officer of the deck will then either order to “let fall”
Marline Spike Hitch

The marline spike hitch is used to help pull on small twine. Wrapping twine around your fingers to pull gets painful eventually, and a spike helps enormously when tightening twine or small diameter rope used on seizings, lashings, or other uses. The beauty of this hitch is that it unties itself when you pull the spike out of it.

1. Begin by laying the spike at a 90 degree angle over the twine with the spike in your right hand and the twine in your left. Grasp the twine with your right thumb and hold it against the bottom of the spike as shown above-left. Use the right thumb to hold the twine tight (as if pulling the twine as it leads off of a seizing). It is important to maintain the strain on the twine with the right thumb and spike. If you are tying a seizing, and you just tighten one turn and are about to tighten the next turn, you don’t want to loose tension in the first turn you passed. Hold steady strain on the twine throughout the entire process of making this hitch. Left handed people will need to mirror these instructions to make a left-handed marlinespike hitch.

2. With the left hand, pass the bitter end up and over the spike as shown above-right.

3. Rotate the spike tip so it points up and creates a loop in the twine. Grab the loop at its intersection with the left thumb and index finger and transfer holding the twine’s tension from the right thumb and spike to the left thumb and index finger. Pass the tip of the spike under the standing part of the twine as shown above-right.

Furling Sail- Harbor Stow

A harbor-stow is the tidiest means of stowing a sail. The quality of a ship’s harbor stows often reflects the quality of the seamanship used onboard. Soon after arrival in a port, a ship should have neat, tight, harbor stows. Square sails should be rolled up high on the yards into a tight cylindrical roll with the main body of the sail’s canvas evenly distributed underneath the yard cloth.

The yard cloth is a long and wide band of cloth, running along the head of the sail and for the entire width of the sail. It is sewn onto the aft side of the sail to protect it from chafing against the yard and from ultraviolet deterioration when harbor furl. The yard cloth will end up on the top of the furl after the sail is rolled up onto the yard, and it becomes the protective skin around the furl.

The procedure for furling square sails uses the same principles for each sail. However, there are some differences that are quite obvious while aloft and handling the sails. The foresail and mainsail each require 12 people on the yard for a proper harbor furl. In contrast, the topsails have reeflines, which gives them the advantage of having a “reef pocket” to dump the sail into, to ease the burden of containing the sail in the sailors’ arms. Eight people are required to harbor stow each topsail. In greater contrast, while the topgallants furl more similarly to the foresail and mainsail, they are quite light. Four people are required for a tidy and quick harbor furl in each topgallant.

When furling, people stand on the yard’s footropes. Their feet rise up behind them as they lean forward and over the yard to
reach down for flakes of sail. They begin reaching down and pulling up folds of sail by starting at the foot of the sail. The fôt is always found near the yard because it is held there by the buntlines that were hauled up when taking in the sail.

By beginning this “reach and pull” method at the foot of the sail, it is natural that the process will end at the head of the sail. You’ll know you are nearly there when you arrive at the yard cloth seam.

The clews will be in the way while trying to roll the sail up on the yard. They hang out of the bundle of sail considerably at first. They must be tucked into the furl with care so that the clews (on either side of the yard) will be equal lengths, especially after the sail is rolled up onto the yard. A small “dog ear” of the clew remains atop the furl and hangs down a few inches when the furl is completed. This detail is better studied through practice, and is not properly discussed here.

**Procedure for Harbor Furling:**

1. Uncoil and prepare all gaskets.
2. Find the foot. Find the boltrope on the foot of the sail
3. Cross the bunt! Cross the bunt as described: (see next diagram for illustrated details)
   a. On both the port and starboard sides of the yard, grab the boltrope of the sail a little outboard of where the inner buntlines attach to the foot.
   b. Make sure the other people on the yard are ready to cross the bunt, and are holding the foot of the sail. Then cast off the buntlines.
   c. Still grabbing near the inner buntlines, pass the port side of the foot over to the starboard side crewmembers, and then receive the starboard side of the foot from them and pull it over to port. In other words, pull the port side of the foot to starboard and the starboard side of the foot to port.
4. On topsails only: A “reef pocket” is created by the deep reef band and the reeflines that haul the deep reef cringles outboard, stretching the reef band tight. Dump the crossed bunt and all sail into the reef pocket by dropping it on the aft side of the deep reef band. Then pull the reef band up and reach for more bights of sail, as in the next step.
5. Reach and Pull! Begin reaching down and pulling up folds, or flakes, of sail. This is most effectively done with all hands on the yard reaching and pulling in unison so they pull the same horizontal fold of sail up to the yard at the same time. Each fold pulled up is tucked under the belly and held on top of the yard until the yard cloth is reached.

**Midshipman’s Hitch**

Used to tie onto a cylinder such as a wood pole or another rope, and to pull in a direction parallel to the pole without sliding.
The round turn and two half hitches is used to secure a line around a pole, or similar object. It has great holding power on a straight pull (as shown), but may slide when pulled parallel to the pole.

1. Round Turn and Two Half-Hitches-
2. Pre-set the Clews - estimate how much of each clew should be left out of the furl so they remain equal lengths. Tuck the rest into the furl. After rolling home, the bottom of the clews should lay over the forward side of the yard and be equal-height to the bottom side of the yard.
3. Roll it Home! Hold onto the gasket, while pulling it up and over the sail, and roll the sail up and onto the yard.
4. Tie Gaskets! - See tying gaskets, on the next page.

6. **Shake!** Shake the furl within the yard cloth to help the folds and flakes settle evenly into the cloth “skin”. Then tightly pack the cloth and roll it tight like a cigarette, squeezing the sail tight while you stretch the yard cloth up, over the top, and around the sail.
7. **Pre-set the Clews** - estimate how much of each clew should be left out of the furl so they remain equal lengths. Tuck the rest into the furl. After rolling home, the bottom of the clews should lay over the forward side of the yard and be equal-height to the bottom side of the yard.
8. **Roll it Home!** Hold onto the gasket, while pulling it up and over the sail, and roll the sail up and onto the yard.
9. **Tie Gaskets!** - See tying gaskets, on the next page.
Tying Gaskets for a Harbor Stow (view from aft)

Step 1: Take 3 turns around the sail. Tighten each turn as tight as you can. On the 4th turn, reverse the direction to form a bight and pass the bitter end under the yard from aft to forward and back up through the bight.

Step 2: Then, on the aft side of the sail, pass the bitter end under all of the turns and cinch up tight. There should be a gap between the sail and the yard to accommodate the thickness of the bitter end and make it easier to pass it through.

Step 3: Finally, repeat the process of passing the bitter end back and forth under the turns to create slippery bights under the turns.

View From Forward

Clove hitches are used to tie ratlines to shrouds. Also, they are a simple knot that may often be used in an application where a small line is to be tied around another object. Intended for light to moderate and steady loads, clove hitches may slide, become jammed, or come untied if used for heavy or dynamic loads.
5. Pass the working end behind and around the standing end from right to left. From this point, the knot is finished with the Boy Scout phrase, “The rabbit comes out the hole, around the tree, and back in the hole.”

6. Pass the working end back down through the smaller loop. For strength and reliability, the bitter end of the line must always finish on the inside of the knot. If the end is on the outside of the knot, you passed it the wrong way around the “tree”.

7. Finally, tighten the knot properly. The knot resembles a bight, which slid down upon a hitch. Hold both parts of the bight in one hand and hold the standing end in the other and pull the knot tight.

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Furling- Sea Stow

There are three methods used to stow a sail: the sea stow, the harbor stow, and the storm stow.

Sometimes it is necessary to stow a sail quickly, before approaching weather arrives, and there is no time for a proper storm stow. There may be lightning approaching with the weather, and the master will want the crew down as quickly as possible. A sea stow is a quick stow, tied tightly and securely, but with no time wasted trying to roll the sail into a tight sausage and up onto the yard.

In the case of the topsails, which have reeflines, the sail should be flipped into the “reef pocket”, and then merely gathered in tightly to the yard and tied with gaskets. A sea stow must be done quickly and a tidy, attractive appearance is not important. The gaskets are spiraled around the sail and yard, to lash them together and prevent the sail from flogging. Do not waste time trying to bust the sail up onto the top of the yard. Just get gaskets tied tightly around it and come down or move on to the next sail.

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Furling- Storm Stow

A storm stow should be a tight furl. It should keep water out, and it should have a clean skin over the furl to minimize windage. A storm stow does not have to be pretty; it may be lumpy, but it should have a tightly stretched skin and be rolled up on the yard, as best as the time available will allow.

In a best practice, storm stows are put in well before the storm arrives, and made like a harbor stow, but with an extra hitch on the gaskets for security. Also, the inboard gasket should be spiraled around the yard, sail, and other gaskets, and hitched off securely at the yardarm.
Taking In Square Sails

Sails are typically “taken in” in a calm, routine, and practiced manner. While it is the seaman’s hope to be able to “strike” sails with the same ease and comfort, striking a sail is a rapid procedure that involves rapidly easing the halyard and getting the sail down ASAP. Do not confuse the order to “take in” sails with the order to “Strike” sails.

To take in topsails and topgallants, the topgallants must be taken in before the topsails. The braces must be eased and tended when easing halyards to take in topsails or topgallants. Upon easing the halyard, the yard must be braced nearly square. At the very least it should be braced so it is prevented from dragging down the shrouds (when braced sharp, the yards lay against the shrouds).

When taking in the foresail or the mainsail the braces do not need to be eased and tended because the lower yards do not hoist. However, the lifts and truss tackles should be hauled tight before taking in these sails. The lower yard will swing violently after the foresail or mainsail is taken in if the ship is rolling in a seaway.

Procedure for taking in topsails or topgallants

Clew Down! 
Ease and tend the braces, round in the yard (brace it more square),
Cast off the gear (buntlines, reeflines)
Ease away the halyard
Haul away the clewlines

Clew Up! 
Cast off the sheets.
Haul away the gear, and keep hauling the clewlines.
Haul tight and make fast braces. Perhaps brace square.
Haul tight and make fast the lifts and truss tackles (after taking in a topsail).

Procedure for taking in Foresail or Mainsail

Clew Up! 
Ease the tack; haul away clew garnets, buntlines and leechlines.
Ease the sheet while allowing the windward clew to rise ahead of the leeward clew.

Bowline

The bowline is used to place a loop in the end of a line and has excellent holding strength. Tie the bowline as shown below.

1. Hold the standing end in the left hand and the working end in the right hand. Lay the working end across the standing end at a right angle, forming a large loop across your body. Pinch them together with the right index finger and thumb.

2. Push the part of the line in your left hand away from your body, to form a bight in the line where the standing part is captured by the right hand. Meanwhile, rotate the working end under and inward, toward your body, through the loop.

3. & 4. With the right hand, continue rotating the working end up and through the large loop. At the same time, rotate the right hand clockwise and twist the bight until it becomes a smaller loop (in the shape of a number 6). Note- This should be a smooth twist-with-the-wrist action that finishes with the standing end coming up through the smaller “six-shaped” loop—as shown in figure 4.

Make a “No. 6”
**Sheet Bend**

The sheet bend is used to tie two lines together. If they are unequal diameters, the larger line is used to form the bight in the knot. Tie as shown below:

1. Make a hitch with the thinner diameter line, around a bight formed in the larger diameter line.

2. Make sure the bitter ends are on the same side of the knot (on the right side, when knot is oriented as shown). The knot may be tied in exactly the opposite way (like in the mirror image shown below), but the larger line must be the bight, and the bitter ends must be on the same side of the knot.

3. For extra security, when making the hitch, you can pass one more round turn around the bight before tucking the end through the hitch, and it will make a double sheet bend (shown below).

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**Reefing Square Sails**

The topsails and the foresail may be reefed. The topsails have three reef bands, and the foresail has one. Reefing is a process whereby a sail is shortened or made smaller and ready for stronger winds. Sometimes sails are reefed to help balance the overall sail area that is set, usually to help balance the ship’s helm for the intended course.

The topsails and the spanker are the sails that are reefed first and most often. They each have three reef bands which allow for three different reefed positions (sail sizes).

When reefing topsails, the first step is to lower the yard into its lifts, leave the sail hanging in its gear, and haul the reeflines up until they can go no further. The crew then goes aloft to secure the yard with rolling tackles. Then they lay out onto the yard, and tie in the reef. They begin (on each side of the yard) passing the reef lashing by first placing its eye over the reef hook, and passing three turns through the reef cringle. In all, there will be a total of five individual parts of the lashing between the reef hook and the reef cringle. After each pass of the lashing, the man at the yardarm will pass the reef lashing to the other three crewmembers on the yard. They will grab the line as shown in the in
the adjacent photograph, and help haul the reef cringle out. With experience one learns about how far outboard the cringle should be hauled. The reef cringle on each side of the yard should each be about an equal distance from the end of the yard. The teams on each side of the yard must communicate to each other the length of their respective reef lashings to insure they are approximately the same length and the sail roughly centered on the yard. Don’t waste time getting it perfect; reef lashings that are within six inches in length of each other are fine as long as they are tight.

After making three passes through the reef cringle, begin taking turns around the yardarm. There should be a total of five parts of the lashing leading between the cringle and the reef hook. There should be a total of three turns around the yardarm and through the reef cringle. Finish by frapping the turns around the yard to the turns leading out to the reef hook. The reef lashing in the illustration below was drawn to look loose to better illustrate the manner in which the turns are passed. The cringle should be lashed up tight against the yard.

1- 2: Holding a bitter end in each hand, pass the end in your right hand over the end in your left hand creating an “over-hand knot” (an overhand knot is the first step done when tying your shoes.)

3- 4: Pass the end in your left hand over the end in your right, making an overhand knot the other way.

5- 6: Pull tight. When the knot is finished, it will form two (U-shaped) bights that cinch tight upon each other.

Reef Knot

The reef knot is used to tie reef nettles when reefing sail. May also be used to tie two lines of equal diameter together, but may slip under heavy strain. Not recommended for bending two hawsers together. Works best when used to wrap a line around or tie down something (as in reefing a sail or lashing an object in place).
Basic Knots

While working, you will need to tie knots often. When you need to tie a knot, you will need to know which knot to tie and how to tie it. Therefore the first thing you need to know about knots is how to select the right knot for the job. To do this, ask yourself these questions:

- “Is it an easy knot to tie, and can it be tied quickly?”
- “Will it serve its purpose?”
- “Will it hold?”
- “Will it be easy to untie later?”

If you can answer yes to each of these questions, the selected knot will be an efficient choice. However, to be correct, you must also ask yourself “Is there a specific knot required for this job?” If not, “Is there a better knot for the job?” If you are in doubt as to which knot to use for a specific task, don’t waste time thinking about it, ask an officer!

Some basic terms to know are bight, bitter end, working part, and standing part:
- The bight is the middle of a rope. Bight is also a term used in knot tying to describe a U-shaped bend in a rope.
- The bitter end is the end of a rope, but also means the end of a line on the ship which is on deck - the working end.
- The working part or working end is the part or end of the line that you move or haul upon when working the line.
- The standing part or standing end is the part or end of the line that is stationary, affixed to something, or does not move through a sheave, thimble, fair-lead, etc.

Figure Eight Knot

The figure eight knot is used to prevent the end of a line from running out of a block:

1. Twist a loop in the line
2. Pass the end through
3. Pull the knot tight

Fore & Aft Sails

Headsails

The headsails in the head-rigging of the ship are the fore topmast staysail, jib, and the flying jib. Each of the headsails has three sides: the foot, the leech, and the luff. The corners are the head, the clew, and the tack. Headsails are attached to their respective stays by means of wooden hanks. These hanks are steam-bent oak pieces that are shaped like the familiar fish-shaped Christian symbol. The hanks may be spread open and slid on or off the stays when bending on (installing) or unbending (removing) the sail. The luff is the leading edge of the sail, and has many grommets punched along its length so the hanks can be lashed to the sail.

A wooden block is attached at the head of each headsail to accommodate the halyard. In the case of the jib and the foretopmast staysail, the tack is lashed down to the headrig with a rope tack lashing. When the halyard is hauled up, the sail goes up, and stretches tight against the tack lashing. In the case of the flying jib, a line called the running tack is attached to the tack. This running tack is a line that leads from deck out to the end of the flying jibboom and through a block that is lashed there, and then the line is attached to the tack of the flying jib. When the flying jib halyard is hauled up, the sail (attached by hanks) slides up the flying jib stay and eventually (when the sail is nearly all the way up) the tack rises off the flying jibboom. The crew on deck allows the “running tack” to run out as the sail rises higher until the tack of the sail is about ten feet above the flying jibboom. On windier days, the officer of the deck may order the
running tack to be kept short, and thus the sail lower. On very light-wind days, he may want the sail ten or twelve feet above the flying jibboom.

Attached to the clew of each headsail are the sheets. On each headsail, one sheet leads to the starboard side of the deck, just aft of the anchor, and the other sheet leads to the port side of the deck. When sailing, the sheets are used to control the sail’s angle to the wind.

Commands and Actions for Setting Headsails:

“Stand by to Set the (Name of Sail)” Crew prepare the sail’s running rigging for setting the sail. Lay the halyard coil on deck, cast it off and prepare to haul on it. Flake out the downhaul (and running tack, if setting the flying jib) and stand by to cast it off. Make sure the sheets are clear in the headrig and not fouled on the boomkins or other obstructions. Take any excess slack out of the sheet that will be the lee sheet. Put plenty of slack into the windward sheet.

“(Name of Sail) Halyard, Haul Away!” Crew cast off the downhaul, haul away the halyard, and carefully tend the sheet to insure that the sheet is not so slack as to allow the sail to flog, but not so tight as to completely fill the sail with wind, thus making it harder for the halyard crew to haul the sail up. As the sail goes up, it also comes aft, so the lee sheet should become slacker as the sail goes up. Once the sail begins to stretch taut, the crewmembers who are hauling on the halyard should “sweat” the halyard up as tight as possible. Sweating a line is a procedure where your body weight is used more effectively than your muscles to get the line very, very tight. One person “tails the line” on the belaying pin, while several others jerk the line down and away from the pinrail, then hang on it while pushing the slack they created toward the pin. Then the person tailing the line gives a strong pull to take up the slack. This procedure will be demonstrated onboard.

“(Name of Sail) Halyard, Avast and Belay!” One or two people hold the strain on the line while the person who was tailing the pin belays the line. After the halyard is secured, the sail is trimmed to the breeze by hauling in the lee sheet.

Rain: Special Care for Manila Lines and Locking Hitches

When a line is made of manila rope, special care must be given to make sure that the hitch is not put on too tightly. Do not cinch the hitch down tight! When it rains, all the manila line onboard will get wet and swell. As each line swells, the expanding diameter causes the length of the line to shrink and get shorter. This means that the hitch on a pin will tighten up, often so tight that it takes a lot of effort and time to get the hitch off. This can be quite dangerous if a line must be handled immediately and the hitch is swollen and jammed. All manila lines except braces and lifts must be eased a foot or two before it rains! As the lines get wet and shrink, they get very tight and could break.

A locking hitch should be used only on the following lines:
- Braces
- Halyards
- Sheets
- Lifts
- Lines belayed on cleats
- Lines that are related to personnel safety.
hand with the left hand between the rail and the coil, and with the bitter end of the line away from the rail. Reach through the coil with the right hand, but first twisting the hand 180 degrees clockwise so the pinky finger is up and the thumb is down. Then grab the line about 4 to 8 inches below the pin (or cleat) with the right hand in the aforementioned orientation, and twist the line in a counter-clockwise direction (returning the hand to a more comfortable orientation). This will create a loop, which you will use to pull through the coil, and place up over the top of the pin (or cleat) to hang the coil.

**Belaying Lines**

When a line is properly secured to a belaying pin or cleat, it is said to be belayed or made fast (“fast” being the root of the word “fasten”, meaning affixed). When attempting to make a line fast, one must take the line to a pin on the pin rail, or to a cleat, and wrap the line around the pin so that the friction of the turns on the pin will prevent the line from slipping loose. Before doing this you must know how to take the line to the pin (or cleat); you must get a fair lead to the pin.

Getting a fair lead requires that you know from where (what angle to the rail) the line is coming. Is it leading down from above, or up from the deck? Is it leading from aft of the pin or from forward of the pin? Belaying has three prioritized rules:

- The first priority is to make sure that the first turn around the top and the first turn around bottom of the pin are made cleanly so the rope does not cross over itself and get jammed or cause inconsistent friction.
- The next priority is to make sure that the first lead of the line over the top of the pin, is led in a clockwise direction if possible (this helps when handling lines in the dark). Subsequent turns should be made in a “figure 8” direction. See illustrations below:

![A Foul Lead](image1)
![A Fair Lead](image2)

**Headsails and Sail Trim**

With headsails, it is important to learn the difference between luffing and flogging. A flogging headsail makes a loud snapping sound as it shakes wildly in a stiff breeze. If a sail is flogging, haul in the sheet until the sail flattens out and the flogging stops. Luffing, on the other hand, is when the luff (leading edge of the sail) is shaking moderately in the wind, but only the luff and perhaps the upper portion of the leech are shaking. When a sail is flogging, the entire sail including the clew shakes about considerably.

When sailing on the wind (near the direction the wind is coming from), headsail sheets should be trimmed (hauled in) just to the point of allowing a small amount of luffing. The headsails are supposed to luff a tiny bit, discernable only way up near the head of the sail. Depending on the ship’s course (relative to the wind direction) the uppermost part of the leech may sometimes shake before the luff does. However, most often the luff will shake first, particularly when the sail is properly trimmed and sailing on the wind.

When sailing off the wind (wind is abaft the beam), the sheets are eased out and sail shape balloons out with a large belly-shape. The idea here is to try to get most of the sail’s surface area relatively square to the wind.

Other points of sail (courses relative to wind direction) will not be discussed here. However one can visualize that if the headsails are hauled in tight when sailing on the wind (close hauled), and eased out considerably for a broad reach when sailing off the wind, then when sailing a beam reach, the sails should be trimmed somewhere in between. Finer details of sail trim will be reserved for on-board instruction.
**Staysails**

While the term “Staysail” is a generic term that means any sail that is set from a stay, on Niagara the plural form—“Staysails”—is usually in reference to the staysails that are set between the masts. These are the main staysail, the main topmast staysail, and the main topgallant staysail.

The main staysail is shaped, set, trimmed, and taken in much the same as a headsail. Therefore to avoid redundancy, the main staysail will not be discussed further here. The main topmast staysail and main topgallant staysails are four-sided sails.

The forward edge of the sail (the fore leech), is called the bunt. Many square-rig sailors today (perhaps incorrectly) call this edge the luff. The edge that runs along the stay is called the head, the lower edge of the sail is the foot, and the aft edge is the leech.

The corners are described in the photo above. On Niagara, the tack of the main topmast staysail is rigged with a tackle so it can be adjusted to improve the sails shape when trimming the sail.

**Coiling and Hanging**

Cowboys and farmers coil rope in their hands, sailors coil on deck. As un-seamanlike as cowboy-coiling is, all sailors do it occasionally, but only when the line is too short to coil on deck. When coiling in-hand, use your right hand to coil the rope in a clockwise direction into your left hand.

To make a proper coil on deck, straddle the rope so it leads from behind you, up from between your legs and into your hands. Then lean over with your feet spread wide across the deck and make a clockwise circle on the deck with the rope (about 5 to 6 plank-widths in diameter). Keep making clockwise circles until you finish and the bitter end of the line is laid on top of the coil. Always begin a coil from the part of the line that leads off the pin or cleat. Never coil a line by starting with the bitter end.

To hang the coil:

Make sure the coil is tidy, even, and appropriately sized to stay about one foot off the deck when hung. Hold the coil in the left
with the lee sheet. Like headsails, the staysails each have a halyard, a downhaul, and two sheets. However unlike the headsails, the downhauls for the main topmast staysail and the main topgallant staysail are each led from the nock (see previous photo) up the head of the sail, through a lizard at the peak, and then down to where it is bent onto the clew of the sail. When taking in the sail, this line pulls the clew up to the peak of the sail, then pulls the whole sail down in a bundle. For this reason, this downhaul is called the “Clew Brail”.

Procedures for Easing

When easing any line, only one person does the easing. The line should be on a belaying pin, cleat, or bitt. There should be as many turns on the pin as possible, but so the line still eases out smoothly and under control. If there is very little strain on the line, just a turn around one side of the pin may be sufficient to ease the line under control. If there is moderate strain on the line, a figure-eight turn may be required (a top and a bottom turn) on the pin.

For heavy strains, the line must be handled very carefully and at least a figure-eight plus one more top turn (or bottom turn) will be required and more turns may be needed. Always be prepared for inconsistent loads where at one moment the line is under very heavy load, then light load, then heavy load again. This happens often, for example, with the headsail sheets when the sails are flogging. Make sure to keep enough turns on the pin to hold the line when the strongest load occurs. In similar situations, if you do not understand how or why the strain on the line is changing, immediately ask a professional for assistance.

When a line is taken completely off the pin, it is said to be “cast off”. However, one could still hold the line in his hand, or it could get stuck and jammed on something. When the line is cast off and completely free to run, it is said to be “all slack”. When easing a line and the strain decreases to nil, the line goes all slack. If a line goes all slack at a time when you think it shouldn’t, there could be a problem aloft. In such case, be prepared for a sudden return of the strain, and immediately notify the officer of the deck that your line has gone all slack.
Spanker

The spanker is a four-sided gaff-rigged sail that is set on the aft side of the mainmast. It is the most complicated sail on the ship. Typically, it requires a minimum of ten people to set it and fifteen to take it in. The spanker can be lowered to deck, reefed, and then set as a lower and smaller sail.

The spanker gaff is a spar that holds the top edge (the head) of the sail. The sail is lashed to the gaff and the gaff is hoisted up the mast with halyards. The luff is the leading edge of the sail and is attached to a small thin mast (the snow mast) just aft of the mainmast. The luff is attached to the snow mast by means of parral beads on the upper half of the sail and a lacing line on the lower half of the sail (from the 2nd reef band and down). When the spanker is taken in, the gaff is not typically lowered. Brails are lines used to pull the sail in to the snow mast and contain it there. The sail is brailed in horizontally against the mast and the gaff.

The brails each have their own name and function and are mirrored with identical brails on each side of the sail. So there are always brails on the windward side of the sail, and identical brails in identical positions on the lee side of the sail. Since the sail naturally blows downwind into the lee brails, it is the brails on the lee side of the sail that work best to gather the sail in to the mast. Therefore, when taking in the sail, the lee brails require the most muscle power.

The horizontal spar beneath the spanker is the spanker boom which is the largest moving spar on the ship. When sailing, the spanker boom must be handled with great care to prevent it from everyone stops pulling and holds the line firmly without allowing any of the line they have hauled to ease out. The person in charge of the line (who was hauling downward) passes the tail stopper to hold the strain while the line gets belayed. A tail stopper is tied similarly to a midshipman hitch (see page 65). However instead of passing the final locking hitch, the tail of the stopper is passed around the halyard in an upward spiral. This upward spiral must be passed in the opposite direction than the first two turns of the knot. The spiraled turns are then married to the line by squeezing the stopper and the line tightly together. This is a complicated knot for a novice, and considering the heavy load involved, the stopper should be made only by an experienced crewmember or under direct supervision of an officer or able seaman.

Once the tail stopper is passed, the person holding the tail stopper (and in charge of the line) calls for everyone on the line to “Ease Up”. Everyone holding the line then takes two steps toward the pin to ease the strain on the line onto the tail stopper. Once it is clear that the tail stopper is holding the strain effectively, the person who is first in line behind the foot block shouts “Come Up!” Then everyone else drops the line so he can belay the line.

Sweating a line is a procedure where your body weight is used more effectively than your muscles to get the line very, very tight. One person “tails the line” on the belaying pin, while several others jerk the line down and away from the pinrail, then they hang on it while pushing the slack they created toward the pin. Then the person tailing the line gives a strong pull to take up the slack. This procedure will be demonstrated onboard.
Make sure when laying lines down on deck that the bitter end is clear of the coil, the line was coiled clockwise, the bitter end is on bottom, and the coil is tidy.

**Procedures for Hauling**

Most lines that lead down from aloft are belayed directly to the pinrails. However, many are passed through a turning block (also called a foot block) on deck before leading up to the pin rail. Most lines that are led through a foot block are led so they may be hauled horizontally across the deck. When hauling lines across the deck, everyone should be on the same side of the line. If hauling the line forward toward the bow or aft toward the stern, everyone should be on the inboard side of the line. Otherwise, the folks in the middle of the line are likely to get pinned against a carronade or against the bulwarks, and could potentially fall overboard through a gun port. There are nets on the gun ports to prevent this, but they are not guaranteed protection; the nets could be knocked loose.

Other lines that are not led through foot blocks are pulled straight down to the pinrail from above. So whoever is pulling nearest the pin or the foot block is at risk of getting fingers jammed in the block or against the pin. When hauling a line, never put your hands on the line closer than a foot from the block or pin! If you do get a finger stuck, shout out “Avast!” before the others seriously injure your finger as they haul it right through the block.

When many people are hauling a line, such as a topsail halyard, spanker clew outhaul, etc. and there is a lot of load on the line, special commands are used to get the line secured safely. One experienced crewmember or trainee should be hauling down on the line, above the foot block. Another experienced crewmember or trainee should be first in line behind the foot block. The crewmember hauling down on the line is in charge of the line and gives all commands to the others who are hauling.

When, for example, the officer calls “Fore Topsail Halyard, Haul Away!” the person in charge of the line repeats the command and sets the cadence for the others who are hauling. Many schooner sailors use the phrase “Two-Six-Heave” to establish cadence. They believe the phrase is historically derived from a gun drill command to haul out the guns. This is not accurate and is a myth that warrants correcting.

Choose any method of establishing cadence you wish. “One-Two-Heave” makes sense, but the Chief Mate will probably establish his own preferred method (hopefully not “Heave-Ho” in cheesy Hollywood/Pirate fashion). What is important is that there is an understood way of communicating and establishing cadence so everyone who is hauling on a line will haul at the same time.

After the officer calls “Fore Topsail Halyard, Avast and Belay!” the person in charge of the line repeats the command, swinging about uncontrolled. The forward end of the boom rests on a table that is built securely around the base of the snow mast.

The aft end of the spanker boom is held suspended by the boom lifts and is controlled from swinging about with the spanker sheet and the quarter tackles. The spanker sheet is a strong, heavy line that is led through two double-sheave blocks, and it leads from the boom down near the center of the deck by the tiller. There are two quarter tackles, each leading from the same area on the boom to the bulwarks on either side of the deck. The quarter tackles each consist of two double-sheave blocks and are lighter than the sheet. They are not designed to hold the strain of the wind in the sail for extended periods, but more to hold the boom from swinging side-to-side when the ship rolls.

The two boom lifts are rigged so that when the sail is set, the sail is between them. Thus one lift is on the windward side of the sail, and the other lift is on the lee side of the sail. The lifts are adjustable; they have a tackle rigged to give mechanical advantage so two or three people can haul on one of the lifts and hoist the aft end of the 1000-pound boom. The windward lift is kept taut while the spanker is set, in case the sail tears or its rigging breaks, to prevent the boom from landing on deck. The lee lift however, is kept very slack so it does not press into the sail and diminish the sail’s airfoil shape. Also, if not kept slack, the lee lift will chafe the sewn stitches in the seams of the sail.

Directly opposing the brails, which are used to take in the sail, is the clew outhaul, which is used to set the sail. As the name implies, the clew outhaul hauls the clew of the sail from its brailed-in position out to the end of the boom. The clew outhaul is made fast on a cleat on the boom, where it can easily be reached from deck.

A gaff is a unique spar on a square-rigger. It is the only spar with vangs. The vangs are two lines that are attached to the gaff, near its aft end, adjacent to the peak of the sail. When the sail is set and the wind is blowing, the gaff usually does not swing about excessively because the wind in the sail holds it pressed out to leeward. However, on light wind days the gaff can swing about violently in a rolling swell, and the gaff vangs are used to control and hold the gaff stabilized. In most sailing conditions, it is common to leave the gaff vangs adjusted so the gaff can swing about moderately. Taut gaff vangs are essential when the spanker is not set.

The halyards that hoist the gaff into position are belayed with a hitch and then seized with a small twine seizing to prevent them being accidentally cast off by a new crewmember. There are two halyards; the throat halyard hoists the forward end of the gaff, and the peak halyard hoists the aft end. Their names are derived from the names of the upper corners of the sail. The throat is the...
name of the forward upper corner of the spanker and the peak halyard is named for the aft upper corner (the peak of the sail).

The brails are identified in the following illustration. The throat brails pull the middle of the leech up to the area of the throat. Throat brails hold much of the sail’s weight up when the sail is taken in. Therefore they require the most muscle power.

**Line Handling**

New trainees must learn to handle lines safely on deck. They must learn how to haul on lines, how to safely use belaying pins and cleats, flake lines for running, how to lay coils down on deck for running out, and how to coil lines and hang them on the pinrails for stowage. There are many techniques involved and this sections aims to cover some of them. However, first one should understand how rope is constructed. First, with right-hand lay rope, fibers are twisted counter-clockwise to make each yarn, then many yarns are twisted clockwise to make each strand, and finally three strands are twisted counter-clockwise around each other to make the rope.

*Right-hand laid rope must be coiled clockwise.* If you coil it the wrong way, it will hockle, or disrupt the lay of the rope, and many twists and kinks will form. Once a kink is formed, it can get jammed in the sheave of a block and prevent the line from running through. Occurring in the wrong place at the wrong time, this can be a serious problem. If found in time, kinks may be manipulated out by massaging & untwisting the kinks toward the bitter end of the line, and then by recoiling the line.

When sail handling, one should always watch lines as they pay out to guard against fouled coils and kinks. If a line is laid down properly on deck, with the bitter end on the bottom of the coil, it should usually pay out without trouble. If laid down upside down, the line, when eased out, will feed off the bottom of the coil and is likely to get fouled (tangled).
foot and the reef band. From this fold, they begin to roll the sail up to the reef band very loosely. The roll should not be made into a tight roll, and the aft end of the roll must be made carefully. Since the sail is not square, and the foot is longer than the head, the roll gets sloppy at the aft end. The part of the leech which is between the clew and the reef cringle must be hauled forward and tucked carefully into the roll.

Once the sail is rolled up to the reef band, the crew begins to tie in the reef nettles. The reef nettles are the short bits of rope hanging out of the reef band every foot or so along its length. They must be very careful not to tie any running rigging into the reef as it is very easy to do. The reef nettles must be tied with reef knots in the very ends of the nettles so the reef is tied loosely. As the sail is set and the clew is hauled aft, the sail cloth will need to shift and become redistributed inside the rolled up reef. If a reef nettle is too tight, it could cause the sail to tear near the tight nettle.

Once all the nettles are tied, and the tack and clew lashings are lashed, the sail is ready to set. This is done by hauling the throat and peak halyards until the sail is at the proper height. Then the clew outhaul is hauled until the clew is the proper distance out the boom. On most gaff rigged sails, the gaff should be hauled up parallel to the horizon until the luff is stretched tight, then the peak is hauled up to its lofty home well above the throat. This is not so on Niagara.

Niagara’s gaff is different than a gaff on a schooner and must always be hauled up or sent down at the same angle as the gaff has when it is set. The peak must be kept up at a 45 degree angle to prevent excessive chafe against the snow mast. This makes the work on the throat halyard much harder than the work on the peak halyard, especially on the last few feet of hoist. It is an inherent cost of the rig’s design, but not necessarily a flaw since the gaff remains hoisted when taking in the sail anyway.

**Setting the Spanker**

Setting the sparker is quite simple in concept. Taking it in is not. The brails are prepared beforehand for setting; the throat brail and clew brail are married (brought together) and belayed on the same pin on either side of the mainmast fife rail. All of the other brails are married and belayed on another pin on either side of the mainmast fife rail. This way, when the sail is set, the clew and throat brails can be eased out under control together, and all of the other brails can be cast off.

While some crew members are preparing the brails, others are removing gaskets from the sail if necessary, coiling the spanker sheet and preparing to shift and pre-set the boom. The spanker boom should be shifted to the lee side of the deck and held there by the quarter tackles. When the sail is not set, the boom is kept lower than it needs to be when the sail is set. Officers stand on the bridge deck to navigate, and it can be difficult to get a clear line of sight with the boom up high, as it is when the sail is set. So, when preparing to set the sail, and shifting the boom to the lee side of the deck, the crew must also “top up” the boom, meaning haul the lifts up until the boom is a little higher than the correct height for sailing. This makes hauling the clew out much easier.

The term “top up” is derived from “topping lift”. Boom lifts on some vessels were rigged to the very end of the boom. This style of boom lift is called a topping lift. Niagara has *quarter lifts*. That is- the boom lifts are attached to a bridle that spans about a quarter of the boom’s length from the aft end of the boom. However, we still use the term “top up” to mean haul the boom lifts and raise the boom height.

Once the boom is pre-set on the lee side, crew members are stationed on the brails, windward gaff vang, and on the clew outhaul. On the command “*Set the Spanker*”, the leech brails, foot brails, and peak brails are cast off, the throat brails and clew brails are eased out smartly (quickly), and the clew outhaul is hauled upon until the clew is hauled to its correct position near the end of the boom. As the brails ease out, the person manning the windward gaff vang and flag halyard should ease them out to keep them slack, but under control until the sail is set (unless the ship is rolling excessively).

The deck officer will call “*Spanker Outhaul, Avast*” when the clew is hauled out far enough. Then a tail stopper is clapped on the clew outhaul, and when ready, the line is belayed on the cleat on the boom. After the sail is set, all of the brails must be belayed with some slack in them, and the sheet, quarter tackles, gaff vangs, and flag halyards must all be properly belayed and coiled. The sheet is left on deck, flaked out and ready to run, and all other lines are coiled and hung neatly.
**Taking in the Spanker**

Familiarity with handling the spanker is critical to taking it in safely. Typically, the main yard should not be braced up sharp when taking in the spanker. The leech of the sail will go slack as the clew outhaul is eased, and it may wrap around the lee main yardarm and get stuck there. Usually, to remedy this situation, someone must go aloft and push the sail clear, which is a risky and time-consuming endeavor. When braced up sharp and taking in the spanker, the order is given to round in the main yard or to brace it in about two points. Two points is enough to prevent the leech from getting caught.

On daysails and during the day on voyages, there are always plenty of people to handle the spanker. Handling it on deck at night with only one watch is entirely different. The basic procedure for taking in the spanker is as follows:

**Top up the boom:** as the clew outhaul is eased, the boom may come down a foot or so. The boom lifts should be hauled tight (at least on the windward side) to prevent the boom from dropping.

**Man the lee brails** with at least six, preferably eight crewmembers- two on the throat brail, two on the clew brail, and one person on each of the other (less important) brails. If short-handed the other less important brails can usually be hauled in by doubling up the brails- two brails per person.

**Man the windward brails** with same as above, if possible. Although if short handed, most people should go to the lee brails as they are most critical.

**Man the windward quarter tackle:** as the clew outhaul is eased and the boom drops down a few inches, the quarter tackles and sheet will go slack and the boom may begin to swing side to side. Take up the windward quarter tackle as needed. This is a two or three person job, but could require more people on windy days.

**Man the gaff vangs and flag halyard:** as the clew outhaul is eased, the sail will no longer be stretched tight, and since the gaff vangs normally have some slack in them, they will need to be hauled tight. Usually when the sail is full of wind, it is not possible to haul the gaff on centerline of the ship, so you have to wait until the clew outhaul is eased before hauling the vangs tight. The flag halyard on the gaff tends to foul up in the sail and must be led from its home on the boom out near the gaff vang while setting or taking in the spanker. The flag halyard should be held in hand and tended until the sail is in, and the vangs hauled taut.

**Man the Clew Outhaul:** This job should be done by an experienced crewmember or a trainee under direct supervision. The clew outhaul is under high strain and must be eased carefully.

**Take in the Spanker!** Crewmembers haul away brails, ease the clew outhaul, tend and take up the vangs, tend and take up the quarter tackles, and tend the flag halyard.

Once all the brails are hauled in, the boom is centered and lowered to its stowed position. The brails are sweated up tight, and the officer of the deck will call for gaskets to be put on the sail if needed. All lines are checked that they are on their correct pins and are then coiled and hung neatly.

**Reefing the Spanker**

Like the topsails and foresail, the spanker may be reefed. However, unlike the square sails, the spanker is reefed at the foot of the sail rather than at the head. The sail must be partially set to reef it. The clew must be hauled out about as far as is shown in the following photograph. Then the sail is lowered to deck and reefed.

The spanker has three reef bands. The reef bands, as previously mentioned in the section on reefing square sails, are the thin horizontal bands of canvas that extend from the leech of the spanker to the luff. The first reef band runs parallel to the foot and about eight feet above the foot. The second reef band is about eight feet above the first reef band.

The third reef band is called the balanced reef band. The balanced reef band runs from the leech of the sail, where the 3rd reef band is located, to the throat of the sail. The balanced reef band runs diagonally across the sail so that when the sail is reefed to the balanced reef, it becomes a triangular sail.

The balanced reef is handy when anchored to help keep the ship’s bow pointed into the wind. It is also handy when the weather is too rough to set a double reefed spanker, but sail is needed aft to help balance the ship. However, the balanced reef is very seldom set on Niagara.

When tying in a single or double reef, and the sail is partially set and lowered to deck, begin by tying the tack lashing. The tack of the sail must be hauled up to the forward end of the intended reef band and lashed to the forward reef cringle. Make sure that if you are tying a single reef, that you tie the tack to the cringle in the 1st reef band. If you attempt to tie it to the second reef band while tying reef nettles for the first reef band, obviously this will not work.

While the tack lashing is being tied, another crew member ties in the clew lashing. Like the tack, the clew of the sail is pulled up to the intended reef band and lashed to the aft reef cringle on the reef band.

While the tack and clew lashings are being tied, the rest of the crew available (at least ten) take the part of the sail between the foot and the reef band and fold it in half: they pull the foot up to the reef band and grab the fold that is created half way between the