Handbook

for sail trainees on board Statsraad Lehmkuhl

Stiftelsen Seilskipet Statsraad Lehmkuhl thanks the crew, photographers and everyone else who has contributed to this handbook.

Photo: Jesper S. Rosenmai

Welcome on board

Hearty thanks for choosing to be a sail trainee on the "Statsraad Lehmkuhl".

The purpose of this manual is to prepare you for the voyage and to introduce you to life on board. It will also serve as a handy reference tool when we are underway.

A sailing voyage is a lively and sociable endeavour. You will stand watch, sleep in a hammock, and help sail and generally run the ship. Initially, there will be a lot to take in, but don't despair! The ship's friendly, professional crew will provide all the training you need and you will soon master the tasks you are presented with. Don't forget that you can always ask the crew about anything you are unsure of.

Safety at all times is the watchword on board. Part 1 of the handbook contains key information about safety rules, your duties and life on board. **Please make sure you familiarize yourself with part 1 *before* the start of the voyage.**

Part 2 of the handbook goes into more detail about the ship's component parts, ship's orders and sailing theory. We recommend that you keep this manual at hand, and study it closer during quiet moments on board.

We look forward to sailing with you and hope you enjoy your time on Norway's largest and most beautiful sailing ship.

Heave ho! let's go!

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Illustration of the ship

Photo: Simon Wozniak

1 Before the voyage

Well in advance of the start of the voyage, it is essential for you to have registered with us all necessary personal information, notably:

- Passport number and expiry date
- Date of birth, name, address and phone number
- Contact details of your next of kin
- Food allergies/dietary requirements
- Relevant health information/use of medicines

Remember to bring your passport for international voyages abroad, even to Norway's neighbouring countries. Travel insurance is mandatory.

2 Boarding and mustering

Arrive on board in good time, preferably three hours before departure. You will be welcomed on board and registered when you arrive at the ship. Check-in closes one hour before departure.

Have your booking confirmation passport ready. At check-in, you will be assigned to one of three permanent watches: blue, red or white. You will also be assigned a berth number, which matches your locker number.

Voyage trainees are assigned mustering positions in accordance with their watch team and berth number. Every time your number or name is called, respond with a loud, clear "HOY!".

The first joint activity is mustering on the main deck following check-in. Here the crew will go over important safety information and demonstrate the lifesaving equipment. The ship's sergeant is the primary contact for trainees, but you can ask any crew member about things you are unsure of.

3 Safety

Safety at all times is the watchword on board. In order for you and your fellow sailors to enjoy a safe voyage, you must:

- **Pay close attention when the crew demonstrates safety equipment**
- **Familiarize yourself with the location of fire extinguishers and lifesaving equipment**
- **Ask the crew about anything you are unsure of**

Alarms
The ship's alarm bells will sound in an emergency. The alarms will be demonstrated at the first mustering. In an emergency, all trainees must go immediately to their mustering station on the main deck. The crew will issue further instructions. Instructions may also be issued over the loudspeaker system. The ship's other crew will muster in accordance with the emergency response plan.

Life jackets and survival suits
The Statsraad Lehmkuhl is equipped with internationally certified life jackets and survival suits for everyone on board.

Access control
The International Ship and Port Facility Security Code (ISPS) regulations require strict access control to the ship to be maintained at all times. Have your passport (for foreign voyages) and booking confirmation ready when boarding. In port, always report when you leave and when you return to the ship.

Drugs and weapons
It is not permitted to bring weapons, alcohol or other intoxicants on board. Smoking is permitted in designated areas on deck when you are off-duty.

Medical aid
The ship has a well-equipped sickbay and is able to provide medical aid in accordance with international norms. There is usually a doctor or nurse on board on voyages.

Hatches and portholes
The ship's portholes may only be opened or closed by the ship's crew. At sea, portholes and watertight hatches must be kept closed at all times.

Pin rails
The pin rails run along the ship's rails and are used for attaching the running rigging (lines). Do not sit on the pin rails, as you may risk falling overboard.

Evacuation plan

The life rafts are released and hauled into position by the crew. Evacuation takes place from the main deck.

4 Life on board

Mealtimes

- **Breakfast 07:20–08:30**
- **Lunch 11:20–12:30**
- **Dinner 17:30–18:30**

The night watch are offered a light. There are two fixed breaks every day, at 10:00 and 15:00. In addition to tea and coffee, a little snack is often served as well.

Trainee accommodation

The voyage trainees' sleeping and living area below deck is called a banjer. There are two of them: one fore, one aft. Here you live in close company with your fellow trainees. Therefore, please show consideration and take care of each other. Be especially considerate towards anyone who is sleeping. In port, there must be quiet in your banjer from 23:00. It is the shared duty of everyone to keep the banjer clean and amenable.

Photo: Statsraad Lemkuhl

Hammocks and lockers

The hammocks are attached to numbered hooks on the ceiling. The bunks are fitted with thin foam matressses. You need to bring your own sleeping bag, and pillow, if you want one. The hammocks of each watch team will be next to each other. There is limited space for personal belongings. You will be assigned a small locker, as well as space in a ship's chest. Bring your belongings in a soft, foldable bag or sailor's sack that can be easily stowed away. Suitcases are not allowed.

A tidy ship is a happy ship

Everyone on board has a shared responsibility to keep the ship clean and tidy. Avoid leaving any objects unsecured; they pose a safety risk and, or a possible a fire hazard. Personal belongings should be stowed away in lockers or chests. Obey the ship's rules for waste disposal and never throw waste or anything else overboard.

Showers and toilets

The ship has good sanitary facilities with separate showers. Access to fresh water on board is limited, so it is important not to waste water. The toilets are vacuum toilets that can only tolerate the ship's own toilet paper. All other waste must be disposed of in the designated trash containers.

Internet and phones

There is no Wi-Fi available for the trainees, and as the ship reaches open sea, mobile phone reception and therefor also internet access will be lost. The crew maintain daily shoreside contact and can relay important messages if necessary.

Seasickness

Some people will experience seasickness, but it usually passes after a day or two. Being out in the fresh air and joining in with the work on deck will help. Feel free to ask the crew for advice. Bring travel medicine as needed, but please note that you cannot go aloft if you are using medicines that carry a red warning triangle.

Slop chest and souvenir sales

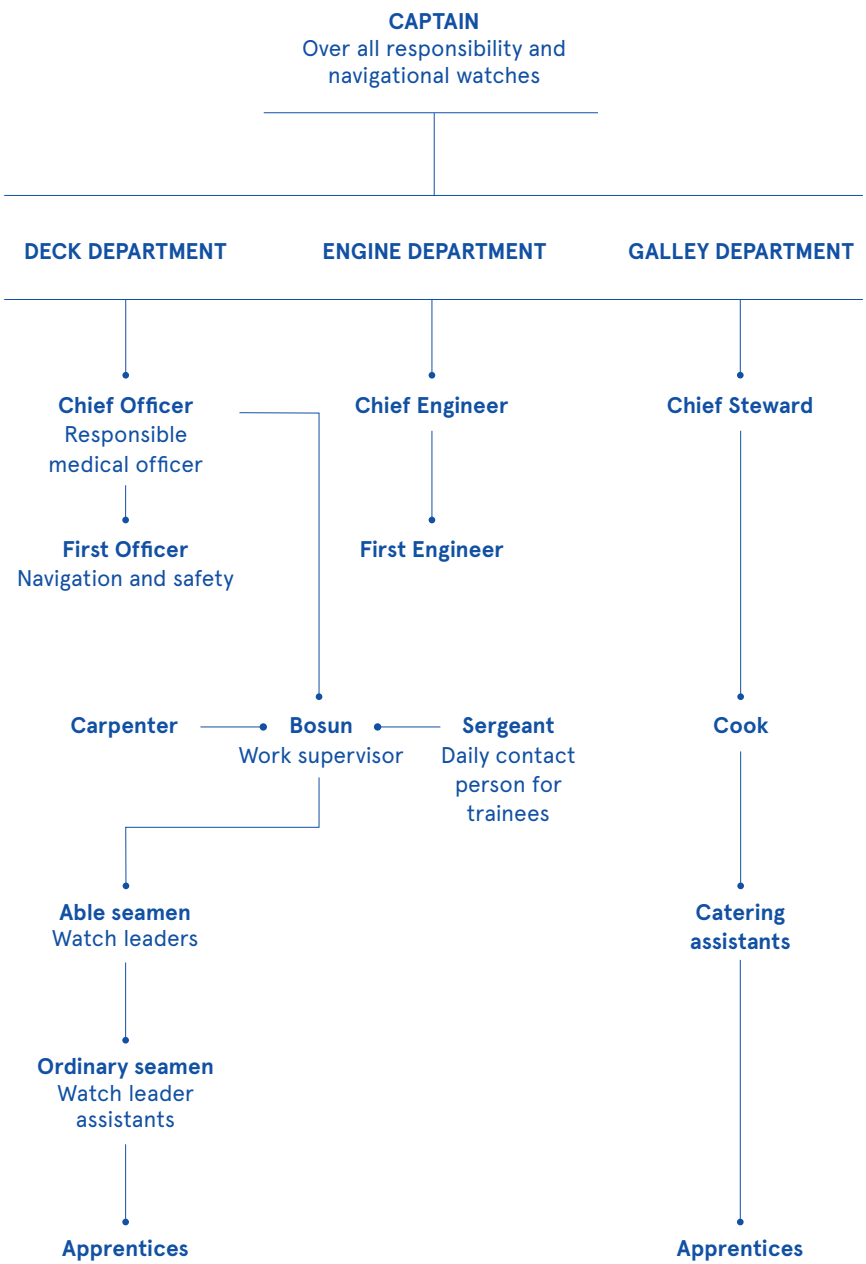
The slop chest is the ship's kiosk and duty-free outlet, and sells a modest range of kiosk and hygiene items. On international voyages, you can purchase your legal allowance of alcohol and tobacco. The items must be stored and customs-cleared in accordance with the ship's rules and the regulations at the port of arrival. The ship's souvenir shop is often open at the same time as the slop chest.

Crew areas

Certain areas of the ship, such as technical rooms and the crew's cabin areas, are not accessible to the trainees. These areas are clearly marked "Crew only".

5 The ship's complement

Photo: Jesper Rosenmai


CAPTAIN
Over all responsibility and navigational watches
DECK DEPARTMENT
ENGINE DEPARTMENT
GALLEY DEPARTMENT
Chief Officer
Responsible medical officer
Chief Engineer
Chief Steward
First Officer
Navigation and safety
First Engineer
Carpenter
Bosun
Work supervisor
Sergeant
Daily contact person for trainees
Cook
Able seamen
Watch leaders
Catering assistants
Ordinary seamen
Watch leader assistants
Apprentices
Apprentices
OFFICERS
PETTY OFFICERS
CREW

6 Watches

The watch teams are the mainstay of the running of the ship. As a voyage trainee, you will man two fixed four-hour watches per day and participate in a variety of duties under the direction of the ship's professional crew on watch. The watch is under the orders of the watch-officer and the watch team is led by an experienced watch leader.

- **Red watch: kl. 12–16 / kl. 00–04**
- **White watch: kl. 04–08 / kl. 16–20**
- **Blue watch: kl. 08–12 / kl. 20–24**

On the change of the watch, both departing and oncoming watches have to muster. Assemble 10 minutes before the start of the watch, dressed for the relevant weather conditions. Anyone asleep will be awakened before the change of watch. Phones and earplugs must not be used on watch or during training.

Physical watches

There are four permanent watches that are manned around the clock. The watch posts are rotated within the watch team, usually every hour. The crew is always present to guide the watch teams.

Helm watch

Stands at the helm and steers the ship under the direction of the crew. The helm watch has a critical role and needs to be fully ocused, never leaving the helm without a relief. Compass courses are always given as three digits, for example, 270 is stated as 2-7-0. Be careful to maintain course, and be patient with the ship when altering or correcting course, since she may respond more slowly than you expect. Ask the crew for help if you are in doubt.

Lookout watch

Is posted on the forecastle (the most forward part of the ship) and keeps a sharp lookout for any objects in the water. To maintain a good overview, the lookout must regularly move from side to side and report all observations with specific signals on the ship's bell:

- Object on the starboard side: 1 bell
- Object on the port side: 2 bells
- Object straight ahead: 3 bells

The helm watch will confirm by sounding the same signal on the ship's bell located at the helm. The lookout watch must ensure that the signal is identical. If the correct signal is not heard, wait a few seconds and try again.

MOB watch

The Man Overboard watchkeep is posted at the aftermost part of the ship and keeps a continuous lookout astern. In the unlikely event of a man-overbord situation, the MOB watch immediately calls out "man overboard" in order to get assistance from the crew quickly. Never lose sight of a person in the water and keep pointing in their direction. Throw out a lifebuoy.

Fire watch

Patrols the entire ship twice an hour. The fire watch raises the alarm for any fire or abnormality and checks that the trainees at the other watch posts are OK. All abnormalities must be reported, such as leaks, unsecured equipment and abnormal odours. Note the locations of firefighting equipment and fire alarms. In the event of a fire, it is crucial to raise the alarm quickly and evacuate the area. Shout "FIRE" repeatedly and activate the nearest fire alarm button. The fire watch's other duty is to mark the ship's time within each watchkeeping period by striking the ship's bell. Each half hour is marked by an increasing number of bells. Once 4 double bells are struck, the watch is over.

Photo: Valery Vasilevskiy

Photo: Jesper Rosenmai

For example, on the blue, 8-12 watch:

08.30 One bell (1 single strike)	**10.30** Five bells (2 double and 1 single)
09.00 Two bells (1 double strike)	**11.00** Six bells (3 double)
09.30 Three bells (1 double and 1 single)	**11.30** Seven bells (3 double and 1 single)
10.00 Four bells (2 double)	**12.00** Eight bells (4 double)

The signals are repeated on each watch using the same system.

Deck watch

Once the four physical watch posts are manned, the rest of the watch team constitutes the deck watch. The watch undertakes a variety of duties that are necessary for the running of the ship. You will learn to handle sails and lines, go aloft in the rigging and participate in sailing manoeuvres. You will also receive training in topics such as knots and hitches, principles of navigation, maritime expressions and the history of the Statsraad Lehmkuhl.

Orders

For safety reasons, precise communication and coordinated actions are very important when handling sails and lines. The crew will give clear orders on what to do. Typically, the order is in two parts: Firstly, a spoken command, which is then followed by a simple whistle to indicate start and stop. For example:

- **Spoken command: Ready**
- **A single whistle means: Start (hauling or handling your line as directed)**
- **Two whistles means: Stop (and hold fast)**

Pay close attention when orders are given. Ask if there is anything you do not understand. Part 2 of this handbook gives a more detailed description of orders.

7 In the rigging

The rigging means all parts of the ship that make her sail. To set the sails, most of them must be unfurled (unfastened) by sending people in the rigging before setting them from the deck.

Going aloft

Going aloft is a voluntary activity, although it is an exciting highlight of the sailing voyage for many. Anyone who is cleared by the crew can go aloft. The crew will provide thorough training in the safety rules and in the use of safety equipment. It is essential to follow the instructions precisely. Remember to do a "buddy check" to ensure that the harness is correctly fitted.

Everyone going into the rigging must wear a safety harness. Note that the sole purpose of the harness is to arrest your fall. It is not a climbing harness that you can use to support yourself if you get tired. If you do get exhausted or feel unsafe in the rigging, inform the crew immediately.

A good rule of thumb for avoiding injury is the common rule of 'one hand for yourself and one for the ship'. This means that you must keep at least one handhold and one foothold on the rigging at the same time, at all times.

Safety rules when going aloft:

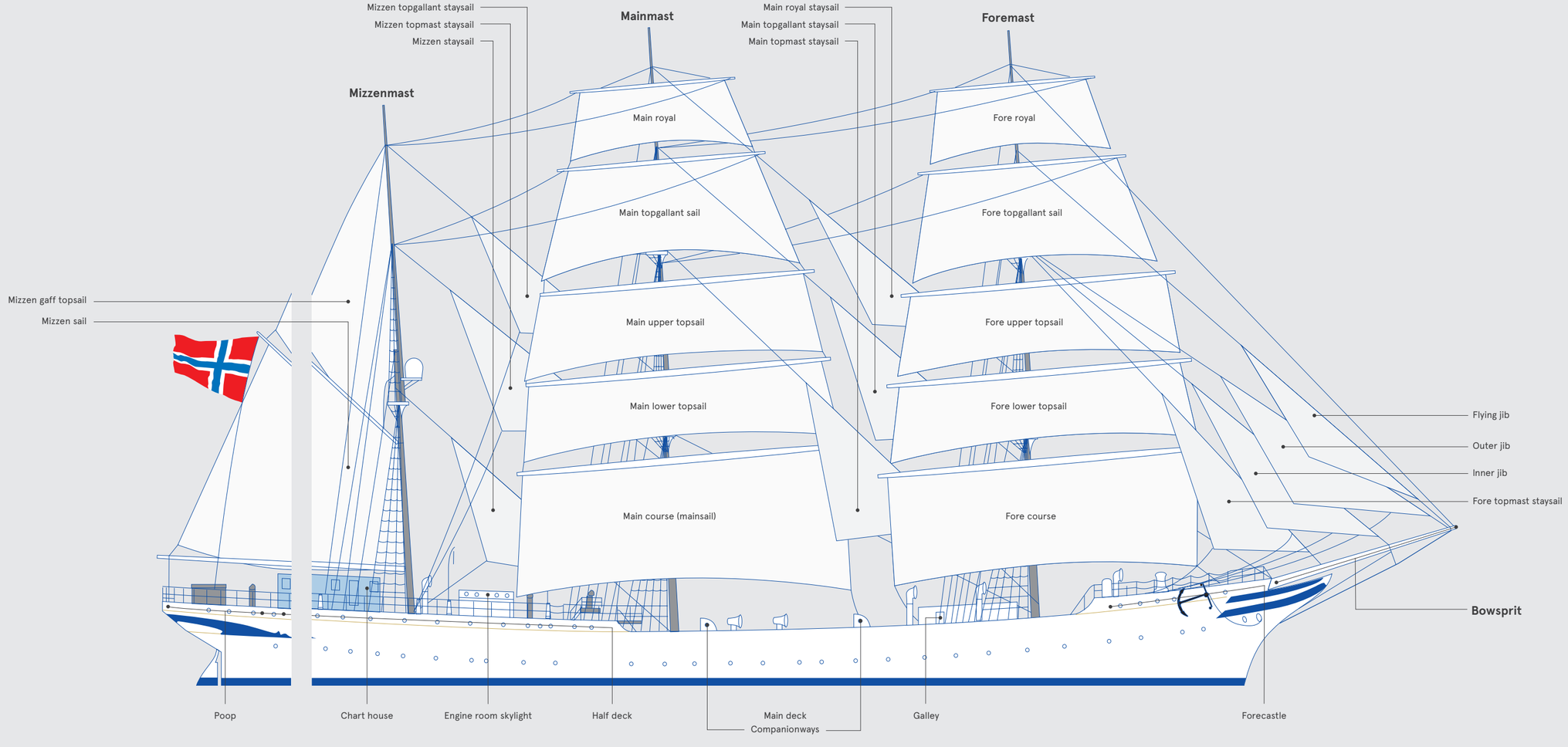
- It is not permitted to go aloft without the permission of watch leader or the officer of watch
- You cannot go aloft if you are under the influence of intoxicants or are using medicine with a warning triangle
- Remove any loose items from your pockets before going aloft
- You may not take mobile phones, earphones or similar items aloft
- It is not permitted to use gloves or mittens
- Always go aloft on the windward side, with the wind in your back
- Hold onto the shrouds (the vertical steel ropes), not onto the ratlines (horizontal ropes)

- Always use the safety wires where available
- Cameras may only be taken aloft after a safety check by the the watch leader or officer of the watch
- Be sure to secure yourself when you stop to perform a task or take a picture in the rigging
- Never secure yourself or hold on to the running rigging or sails

Photo: Eivind Senneset

8 Basic concepts

This illustration shows the ship's major above-deck components. There are more illustrations and more detailed descriptions of the ship in Part 2.



Part 2

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1 Statsraad Lehmkuhl

The Statsraad Lehmkuhl is one of the world's largest and oldest square-riggers still sailing. She was built as a training ship for the German merchant fleet over a hundred years ago, but today she is in better condition than ever. The Statsraad Lehmkuhl has sailed under the Norwegian flag and has been an icon in the port of Bergen since 1923.

Type of ship	Barque, training ship
Built	1914 by Joh. C. Tecklenborg at Bremerhaven
Owner	Stiftelsen Seilskipet Statsraad Lehmkuhl
Launched	January 14th 1914
Former names	"Grossherzog Friedrich August" (1914-1923) "Westwärts" (1940-1945)
Length	98 metres
Beam	12,6 metres
Draught	5,2 metres
Mast height	48 metres
Top speed	Under engine 11 knots Under sail 18.5 knots HSG approx. 7 knots (electric propulsion from shaft generator)
Canvas	22 sails
Sail area	2 026 m²
Main engine	1 125 HK, 6 syl. Bergen Diesel
Tonnage	1 516
Crew	20 (permanent crew)
Extra crew	10 (apprentices/volunteers)
Sail trainees	150

Photo: Valery Vasilevskiy

2 Rigging

The rigging covers all parts of the ship that actually make her sail. This handbook describes the rigging as it operates on the Statsraad Lehmkuhl. Most comparable ships are rigged using the same principles, but there are many variations depending on the size, type and age of the ship.

The rigging can be divided into the following categories:

- **Spars**
- **Standing rigging**
- **Sails**
- **Running rigging**

Components of the rigging that share a function usually share a name. They are differentiated by having their *position* prepended to the name. For example, there are several sets of topmast shrouds in the rigging, but only one set of *starboard fore* topmast shrouds. The wires that we use for access to and safety in the rigging are traditionally referred to as horses.

Photo: Valery Vasilevskiy

Spars

The term "spars" describes the rigid, rounded parts of the rigging, such as masts, topmasts, yards and booms.

Mast

Used to describe the full length of the mast. The fore and main masts are rigged almost identically. The mizzenmast is somewhat lower and is rigged with gaffsails and staysails.

Lower mast

The word "mast" is also often used to refer to the lower section alone, which is also called the "standing mast", as opposed to the topmasts. The lower mast is stepped on the keelson and extends through the decks and ends just above the upper topsail crosstrees.

Topmasts

Extend the masts to their full length.

- The fore and main masts are extended by two topmasts, first the topmast and above it, the topgallant mast.
- The mizzenmast's extension is a single topmast.

Flagstaff

The uppermost, bare pole that extends above the highest stays on the mast.

Bowsprit

The spar that protrudes forward of the ship and supports the forestays.

Boom

Horizontal spar mounted alongships, one end attached usually to a mast. Can be swung and topped (raised) to control a sail (mizzen and gaff booms) or to handle loads etc.

- Boom end: The outermost end of the boom
- Gooseneck: The attachment point of the boom to the mast
- Throat: The point where the gaff is attached to the mast.

Yard

Horizontal spar, attached crosswise to the masts. The square sails are attached to yards.

- Yardarm: The outermost end of the yard.
- Jackstay: Rod on the bowsprit and on the top of the yards for attaching sails and gaskets. Also used as a handrail when working aloft.
- Barrel: A component that holds a yard to the mast.

Standing rigg

The standing rigging is the wire rigging that does not move relative to the ship as she sails. It comprises primarily steel wires to hold the masts, yards and booms in place and prevent them falling. The elements of the standing rigging are named in accordance to which part of which mast they support, for example, fore stay or main topmast shrouds.

Stays (forestays)
Wires which run alongships and support the masts, preventing them from falling aftward. Compared with shrouds and backstays, the forestays are few in number, in order not to interfere with the square sails. The rigging can therefore withstand greater forces from athwartship and from aft, than from ahead.

Backstays
Wires that run athwartship and aft. Support the standing masts and topmasts, preventing them from falling laterally or forwards.

Shrouds
Wires that mainly provide lateral support, equipped with ratlines (steps) for going aloft.

Topping lifts
Wires that run from the mast down to the yardarms and support the yards horizontally. The lower topsail yards do not have topping lifts but are supported by the upper topsail yards above them.

Turnbuckles
Fitted to the end of a wire in order to tighten it. In the standing rigging, they are fitted on the lower end of the wires.

Crosstrees
Steel structures that spread out the shrouds where two masts join, in order to provide support for the upper one. The crosstrees have a grating to stand on, so they serve as platforms on the masts.

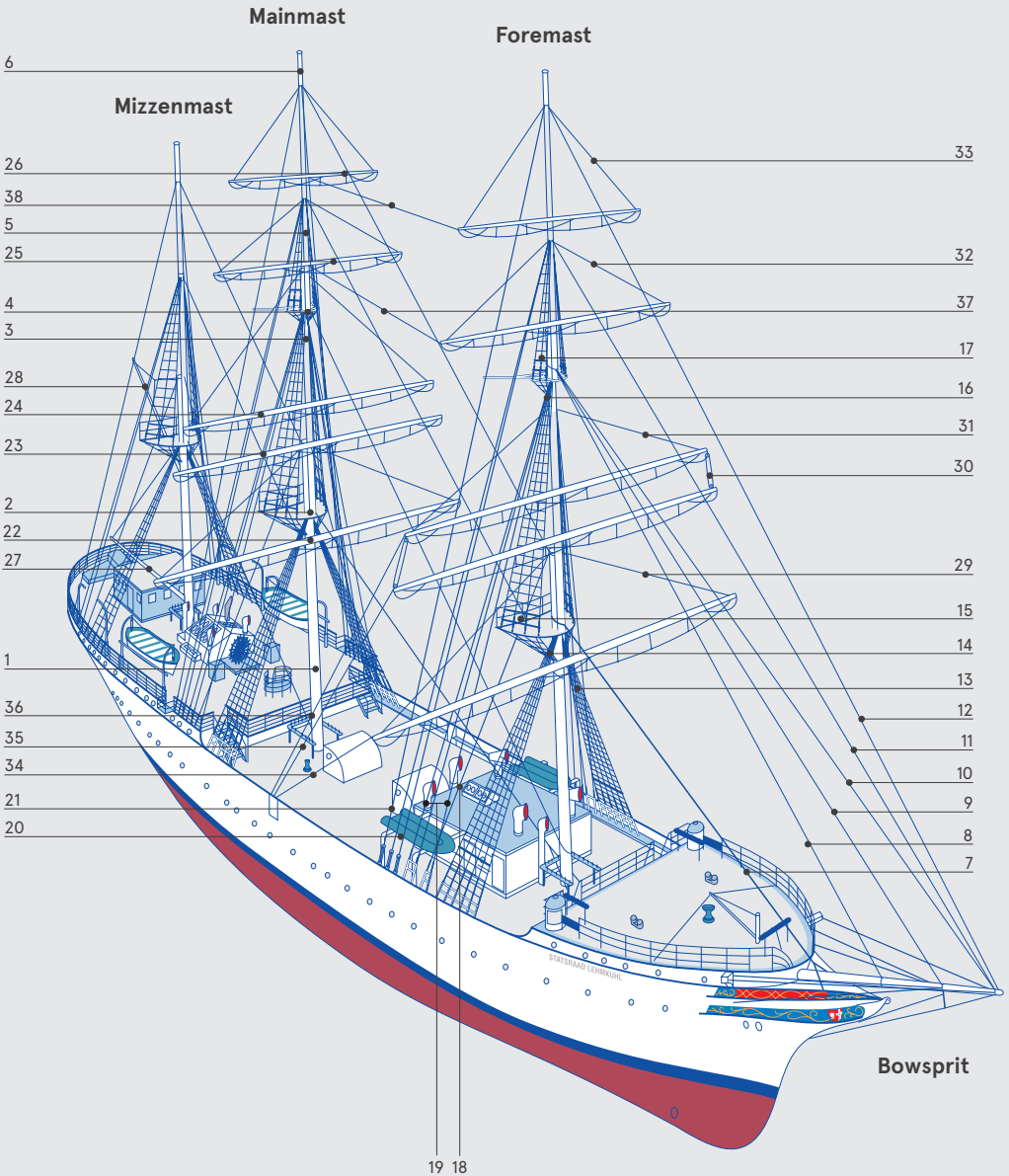
- Topmast crosstrees: The lowest crosstrees on the mast, where the standing mast is extended by the topmast.
- Topgallant crosstrees: The uppermost crosstrees on the foremast and mainmast, where the topmast is extended by the topgallant and royal mast.
- Spreaders: Members extending aft from the crosstrees used to angle the upper backstays.
- Futtock shrouds: Steel rods that anchor the shrouds below the crosstrees. Comprise an overhang that has to be climbed over when going higher aloft than the crosstrees.

Photo: Valery Vasilevskiy

Standing rigging and braces

This illustration shows the major components of the standing rigging. For clarity, not every individual component is depicted. The names of the stays and yards correspond with the names of the sails, as shown in the diagram in Part 1. The shrouds, backstays, topping lifts and braces are rigged identically on both sides. They are differentiated by placing port or starboard in front of the name, for example, starboard fore lower topsail brace. Braces actually form part of the running rigging, but are shown here to demonstrate how they support the yards.

1. Mainmast (lower mast)
2. Main topmast crosstrees
3. Main topmast
4. Main topgallant crosstrees
5. Main topgallant and royal mast
6. Mainmast flagstaff
7. Forestay
8. Fore topmast stay
9. Inner jib stay (on foremast only)
10. Outer jib stay (on foremast only)
11. Flying jib stay (called topgallant stays on the other masts)
12. Fore royal stay
13. Fore shrouds
14. Fore topmast futtock shrouds
15. Fore topmast shrouds
16. Fore topgallant futtock shrouds
17. Fore topgallant shrouds
18. Fore running backstay
19. Fore topmast backstays
20. Fore topgallant backstays
21. Fore royal backstay
22. Main yard
23. Main lower topsail yard
24. Main upper topsail yard
25. Main topgallant yard
26. Main royal yard
27. Mizzen boom
28. Mizzen gaff
29. Fore course topping lift
30. Fore upper topsail downhauls (running rigging, supports the lower topsail yard when the sail is not set)
31. Fore upper topsail topping lift
32. Fore topgallant topping lift
33. Fore royal topping lift
34. Fore course brace
35. Fore lower topsail brace
36. Fore upper topsail brace
37. Fore topgallant brace
38. Fore royal brace


Mainmast
Foremast
Mizzenmast
6
26
38
5
25
4
3
28
24
23
2
22
27
1
36
35
34
21
20
33
32
37
17
16
31
30
29
15
14
13
12
11
10
9
8
7
19
18
Bowsprit

Sails

The sails allow the ship to use wind power as her means of propulsion. The Statsraad Lehmkuhl is a square-rigger, which means that her primary propulsion comes from rectangular sails suspended from yards. We also set staysails on most stays and gaff sails on the mizzen mast. The terms main course (main sail), fore course (largest foresail) and mizzen (the large sail aft) specify the position and function of the sail, but not its *type*.

Square sail

A four-sided sail set underneath a yard, so-called because, in principle, it is rigged athwartships, square to the keel.

- Courses: The largest square sails, set low on each mast: main course and fore course.
- Square sails are typically rhomboid-shaped, with a curved foot, so are not named for their shape, so much as for how they are rigged.

Fore-and-aft sail

Sail that is set alongships, as opposed to the square sail that is set athwartships.

- Staysail: A triangular sail set along a stay. Named after the stay on which it is set.
- The mizzen sail is a gaff sail, because it is controlled by a boom and a gaff.
- Mizzen gaff topsail: A triangular sail set between the gaff of the mizzen sail and the top of the mast.

Fairleads

Round rings made from a smooth, hard material which guide the running rigging in the correct direction; notably, they guide the buntlines straight down the square sails.

Hanks

Rings that hold a sail in place on a stay or mast.

Edges: Leeches, luffs, foots, heads

The edges of the sails. They are reinforced in various ways. The names reflect their relative positions on the sail. A staysail, for example, has a luff on the windward (stay) side, a leech on the aft edge and a foot. A square sail has two leeches, a foot and a head.

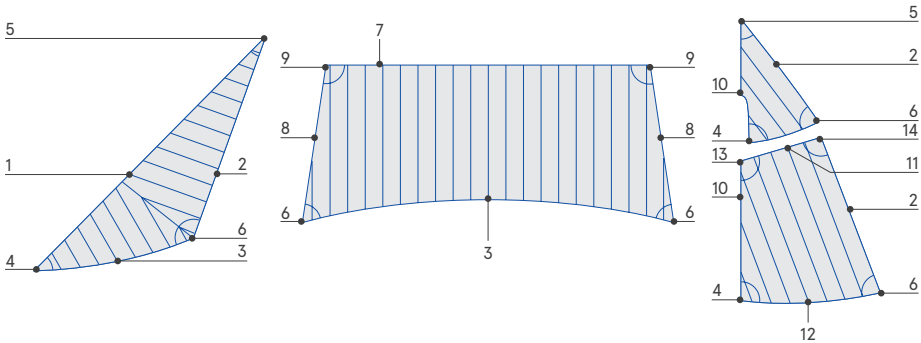
Corners: Tacks, peaks, clews etc.

The corners of sails often have a triangular reinforcement or a thimble sewn in. The names reflect their relative positions. For example, a staysail has a head (at the top), a tack (where the foot of the sail meets the stay) and a clew (from where the sail is sheeted), whereas a square sail has two clews (lower corners) and two head cringles or earrings (top corners).

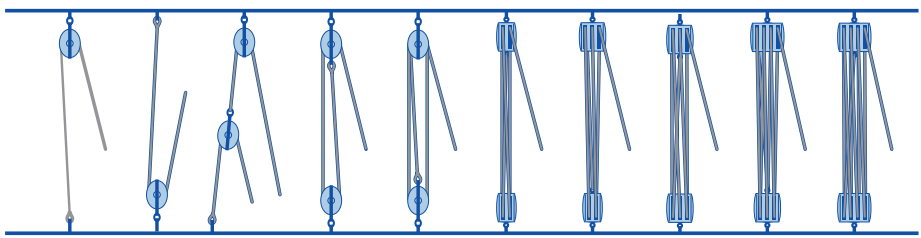
Gaskets

Lengths of rope for attaching sails once they are furled. Also used of working ropes for lashings etc.

Staysail **Square sail** **Gaffsail**



1. Luff
2. Leech
3. Foot
4. Tack
5. Head
6. Clew
7. Head
8. Leech
9. Head cringles or earrings
10. Luff
11. Head
12. Foot
13. Throat
14. Peak



Whip | Foot block | Spanish burton | Gun tackle | Luff tackle | Double tackle | Gyn tackle | Threefold purchase | Seven sheave purchase | Eight sheave purchase

To calculate the purchase of a tackle, we multiply the hauling force by the number of sheaves in the tackle and deduct for friction. From a threefold purchase (i.e. 6 sheaves) and above, friction can be high, as is the length of haul required to effect movement. Large tackles are subject to uneven loading and wear. They are often reeved in such a way that the hauled end of the rope exits from the centre of the final block.

Running rigging

The moving parts of the rigging used to control the sails. The running rig may consist of chains, wires and rope lines, which are controlled through blocks and fairleads. If we need more purchase, we use blocks and tackles. All running rigging terminates in ropes secured at attachment points along usually a pin rail or a fife rail.

Tail
The end of a line is called its tail. This is used for all lines and ropes that are used for handling sails and rigging. Where the tails of several lines are attached in the same location, those for the lower sails are always placed forward.

Braces
Swing the yards horizontally. Used to change the angle of the yards/square sails relative to the wind direction.

Halyard
Raises a sail or yard when setting sail.

Downhaul
Counteracts the halyard, hauls down a sail or yard when dousing sail.

Sheet
Controls a set sail downwards and aftward. Nearly all sails must have at least one sheet in order to draw. The mizzen sail is fitted with an outhaul (which hauls the clew out along the boom) and mizzen boom sheets (which control the mizzen boom rather than the sail itself).

Brail
Hauls the mizzen sail's leech in towards the mast when the sail is doused.

Tack
Controls the courses downwards and forward. Our fore-and-aft sails have fixed tacks. The tack is tightened on the windward side - the side on which the wind hits the sail - and this defines which tack (port or starboard) the ship is sailing on.

Clewline
Counteracts the square sail sheet, hauls up the clew when the sail is doused. Led via foot block to the pin rail ahead of the sail's buntlines.

Buntline
Hauls the square sail's foot up to the yard when the sail is doused. Named according to its position on the sail: inner, outer, centre. The line that pulls the leech of the sail inwards is called the leech line. On the pin rail, the innermost buntline is placed furthest forward.

Topping lifts
The topping lifts of the courses can be adjusted in order to trim the square sails horizontally as the ship heels to the wind.

Vang
Swings a boom or crane on the horizontal plane.

Boom lift
Wire that runs from the mast down to the boom end for holding and topping the boom.

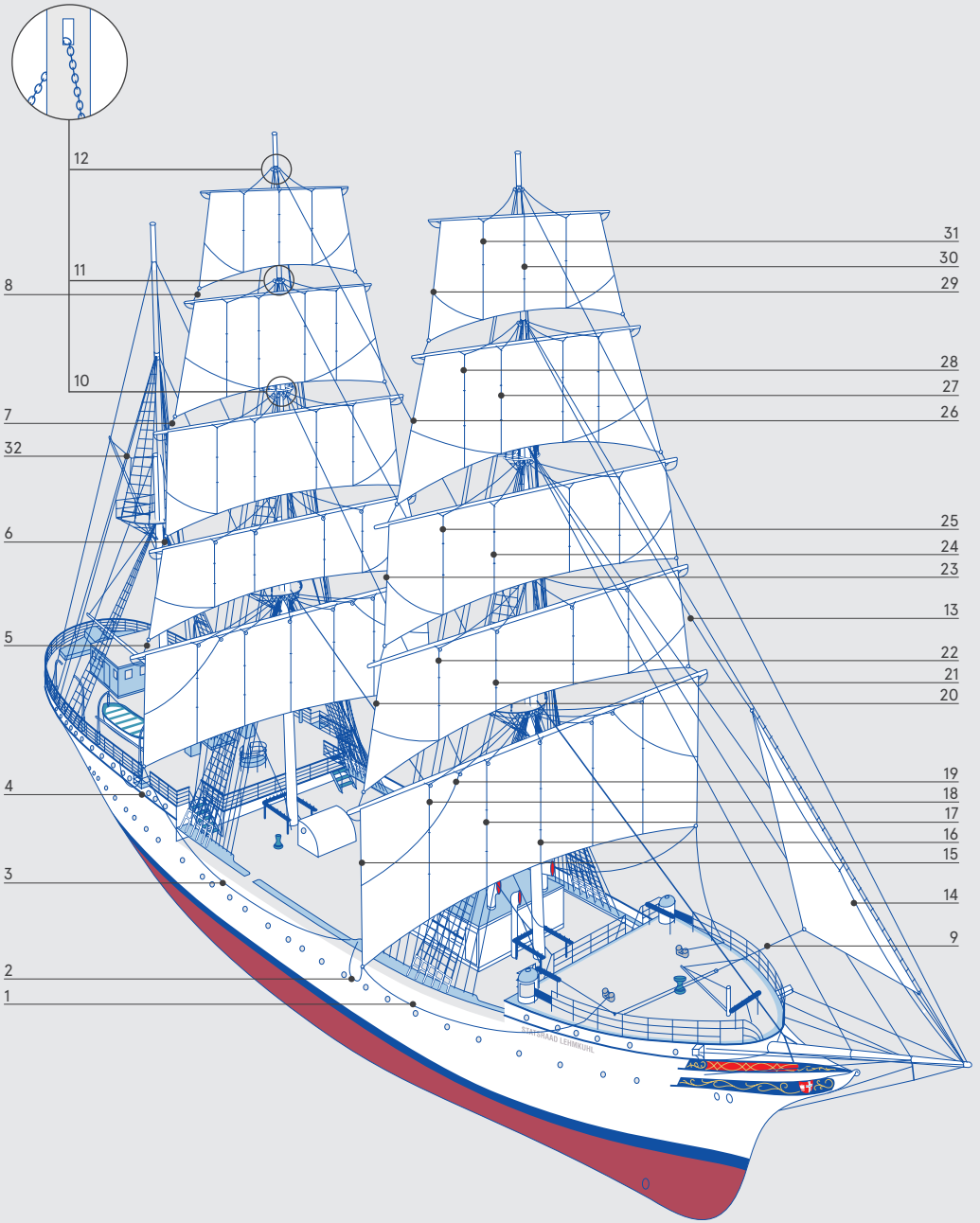
Uphaul, inhaul and outhaul
Describes the direction in which we affect a particular part of a sail when we haul on the line, for example mizzen staysail sheet uphaul.

Photo: Jesper Rosenmai

Running rig from afore

The following two illustrations show most of the functions of the running rigging. All lines that perform the same task have the same name. They are differentiated by adding the side, mast or other component of the rigging they act on. Some lines are identified in both diagrams. There is a full list of all the lines in the running rigging in the pin rail diagrams at the back of this manual.

1. Fore course tack
2. Fore course sheet
3. Main tack
4. Main sheet
5. Lower topsail sheet, starboard main lower topsail
6. Upper topsail sheet, starboard main upper topsail
7. Topgallant sheet, starboard main topgallant
8. Royal sheet, starboard main royal
9. Staysail sheet, flying jib
10. Upper topsail halyard tye, main upper topsail
11. Topgallant halyard tye, main topgallant
12. Royal halyard tye, main royal
13. Staysail halyard, flying jib
14. Staysail downhaul, flying jib
15. Clewline, starboard Fore course
16. Centre buntline, fore course
17. Inner buntline, starboard Fore course
18. Outer buntline, starboard Fore course
19. Leech line, starboard Fore course
20. Clewline, starboard fore Lower topsail
21. Inner buntline, starboard fore Lower topsail
22. Outer buntline, starboard fore Lower topsail
23. Downhaul, starboard fore Upper topsail
24. Inner buntline, starboard fore Upper topsail
25. Outer buntline, starboard fore Upper topsail
26. Clewline, starboard fore Topgallant
27. Inner buntline, starboard fore Topgallant
28. Outer buntline, starboard fore Topgallant
29. Clewline, starboard fore Royal
30. Centre buntline, fore royal
31. Buntline, starboard fore Royal
32. Peak halyard, mizzen gaff (not adjustable)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Running rig from abaft

1. Fore course sheet
2. Main tack
3. Main sheet
4. Lower topsail sheet, starboard main lower topsail
5. Upper topsail sheet, starboard main upper topsail
6. Topgallant sheet, starboard main topgallant
7. Royal sheet, starboard main royal
8. Main upper topsail halyard flying block
9. Main upper topsail halyard tackle
10. Main topgallant halyard flying block
11. Main topgallant halyard tackle
12. Main royal halyard flying block
13. Main royal halyard tackle
14. Clewline, starboard Fore course
15. Clewline, starboard fore Lower topsail
16. Downhaul, starboard fore Upper topsail
17. Clewline, starboard fore Topgallant
18. Clewline, starboard fore Royal
19. Mizzen boom lift
20. Mizzen boom sheets
21. Gaff vang
22. Mizzen boom vang
23. Mizzen sheet outhaul
24. Mizzen gaff outhaul
25. Mizzen sheet uphaul
26. Mizzen gaff inhaul
27. Mizzen brails (lower, middle, upper)
28. Gaff topsail halyard
29. Gaff topsail sheet
30. Gaff topsail tack
31. Downhaul, gaff topsail

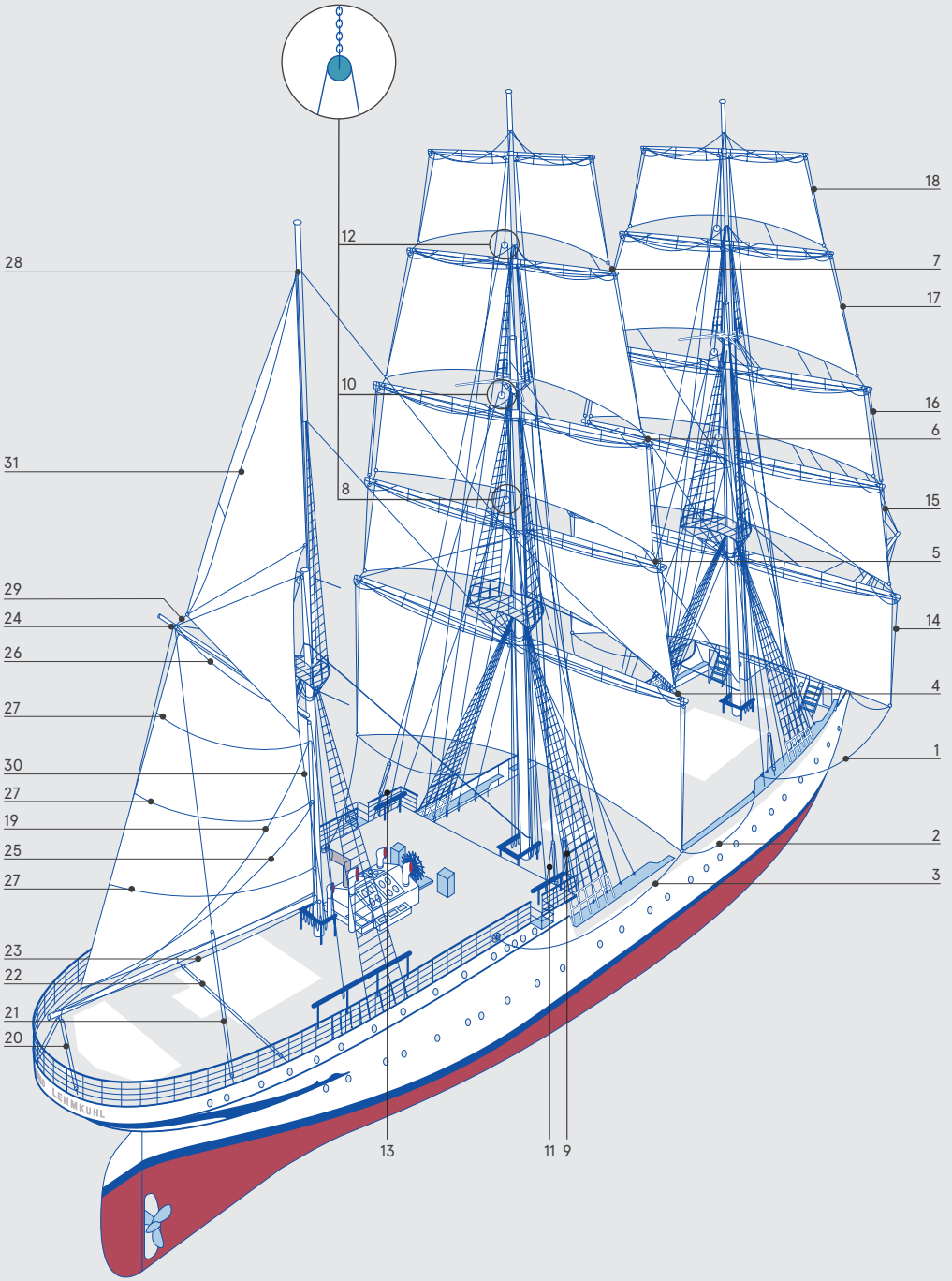
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Photo: Valery Vasilevskiy

Horses, footropes and safety lines

Footropes
Also called horses, these are wires to stand on when working on a yard or on the bowsprit. So that they maintain the right height over their entire length, stirrups are placed at suitable intervals.

Flemish horse
A short footrope at the outer end of the yards. Used when working with sails and on the rigging of the yardarm.

Back lines
Wires used to attach your safety harness behind you when moving along a yard or the bowsprit.

Safety wires
There are other safety wires and footropes in critical places: Footropes and safety wires between the shrouds and the lowest yards to facilitate entering the yards and lines to attach the safety lanyards when accessing the crosstrees. There are also lateral footropes between the shrouds, which are used when working on the staysails and mizzen sail.

Bowsprit netting
For safety when working on a footrope on the bowsprit.

Jacob's ladder
Ladder that runs abaft the mast from the top of the topgallant shrouds towards the flagstaff.

Jack line
In rough weather, extra safety ropes are rigged and stretched along the deck and below deck, for holding onto or securing harnesses to.

3 Orders

To avoid accidents, it is very important to pay close attention when the crew issues orders. Responding well to orders means that we sail quickly and efficiently. Initially, the crew will actively assist in carrying out orders. When it is considered safe, manoeuvres will increasingly be left to the sail trainees to perform.

During sailing manoeuvres, we repeat all orders and messages, so that everyone gets them. At first, it may be difficult to understand what to do, but give it a try, and your skills will develop very quickly! Usually the crew will give a brief introduction *before* the manoeuvre, focusing on who will be hauling in and slacking off. Afterwards, the manoeuvre will be reviewed more thoroughly.

Two-step order and whistle signals

Many lines counteract each other and we need to constantly monitor how our actions affect the rigging and sails. To haul in in one place, we usually have to slacken off somewhere else. We introduced the two-step order/whistle system in Part 1 of this handbook. Clear orders give trainees and crew time to position themselves correctly and understand their tasks. When the different posts are ready, the order to execute is given.

- **Spoken command: Ready**
- **A single whistle means: Start (hauling or handling your line as directed)**
- **Two whistles means: AVAST (hold fast)**

The whistle is a useful instrument, because the leader will often have to take up position some way away from the lines in order to see what is happening in the rigging. Between the whistle blows, the leader of the manoeuvre will issue spoken commands for guidance.

A long whistle is a signal to get the hands' attention and for them to assemble. It is most often used to assemble the deck watch, but also for mustering.

Photo: Jesper Rosenmai

Orders when handling lines

Standby to/Ready	Those taking part in the manoeuvre take turns off the belaying pins and position themselves ready for action. The crew checks that all posts are properly manned, so that the tasks can be performed safely and efficiently. Once everyone is correctly positioned, the manoeuvre starts.
Haul/heave	Pull on the line. Haul is usually the most precise expression. Heave is also used, but more strictly refers to lifting an object using a rope, cable, etc.
Slack off/Give up/Ease away/ Lower/Pay out	Different instructions to release the load on lines. Slack off or slacken is the general command. Ease and ease away are used for fine adjustment. Lower is used for objects that have been hoisted. Pay out means to release a line, usually hand over hand to maintain control. These commands can be supplemented with more precision: slowly, at will, handsomely, etc.
Let go	Release and let the line run freely (over the belaying pin).
AVAST	Stop the manoeuvre temporarily, but quickly. Stop and hold, referring to both slackening and tautening lines, as the case may be. Be ready to continue with the manoeuvre at short notice.
Turn on/belay	Turn the tail around something, often a belaying pin, in order to control the line better.
Haul taut /haul in	Take in the slack and tighten the line. Sometimes combined as haul and make fast, which then means take in all the slack on the line, tauten in and then secure it.

Make fast

The line is made fast to the belaying pin quickly and securely, without creating any slack. Before making fast, check whether the load on the line can be controlled. The crew will demonstrate different methods for stopping lines before making fast.

Square up

It is important not to make fast the tails we have slackened before the manoeuvre is over. All sailing manoeuvres are completed by tightening up the lines and coiling up all the tails.

Photo: Jesper Rosenmai

Photo: Valery Vasilevskiy

Orders for making fast

The orders for making fast are necessary to understand in order to avoid the risk of injury. These orders will be given in Norwegian. It is important not to make fast the tails we have slackened before the manoeuvre is over.

Så smått (Ease off)	Everyone holding the line slackens it slowly, without releasing it. Used to check that a stopper is holding. The sound is close to the sound in haul or law.
Haul taut /haul in	All hands pull on the tail until they manage to hold the load. Used when making ready to haul or if the stopper is not holding.
Come up	Slip the line immediately and cast it forward. The line leader makes fast.
Brekk ut (Sweat up)	All hands holding the line move together to increase the angle and friction where the line is to be made fast. An alternative to easing off against a stopper when making braces fast.

Hauling techniques

Hand over hand

Those who are hauling stand still and move one hand at a time, hauling the line towards themselves. Use your own body weight to exert more power.

Walk up the line

The hands who are hauling the rope pull it over a certain distance along the deck. In a smooth, non-stop movement, the rearmost person releases the rope and walks rapidly to the front of the line and claps on again to continue hauling. This process is repeated continuously.

Sweat or swig the line

When hauling in, a line under high tension can be belayed and then pulled sharply off its natural angle to create slack, which can then be taken in at the tail. This technique is used when ordinary hauling is no longer sufficient for the pull required. Used on halyards and on heavy lines under high tension, such as the fore course sheet.

Orders and expressions in sailing manoeuvres

Set sail	Stretch out a sail to let it draw.
Douse sail	Take the sail back in.
Clew up the sail	Douse a square sail by hauling it up to the yard using clewlines and buntlines.
Reduce sail	We take in parts of the sail to reduce the sail area. Most common is to reduce the courses in a following wind or when manoeuvring. We can also reduce sail in order to set parts of a sail in very strong winds. In that case, the doused part of the sail must be well lashed.
Furl sail	Pack the sails down and secure them by attaching gaskets around them.
Top	Trimming yards or booms vertically using topping lifts, boom lifts, etc.
Sheet home	Haul on the square sail sheets to set the sail.
Hoist	Heave on the halyard to set the sail.
Lower	Ease away the halyard to douse the sail.
Cast off	**Used in several contexts:** • Make a sail ready for setting, by releasing the gaskets and unfurling it. • Loosen a line and let it run freely. • Take in the mooring lines when the ship is about to leave the quay.

Photo: Jesper Rosenmai

Bracing

Bracing is making major adjustments to the angle at which the yards sit. This is done by hauling the braces down on the deck. Bracing affects the running rigging on the mast in question. Before the manoeuvre, we therefore have to slacken the lines that will tighten up. All the lines that run down the masts and shrouds are shortest when the yards are braced square and longest on the windward side. Topping lifts and mizzen downhauls are also affected by the braces and have to be handled by the crew.

When we are going to brace, an order such as "Standby to brace the lee main sails" is given. The words "lee"/"weather" or "port"/"starboard" will indicate the side to be hauled. The order also implies that some hands should be making ready to slacken the opposite braces. If the order is given in the plural, as here, it applies to all the braces on the mast in question. It is most efficient to brace them all together, because the sails and rigging connect the yardarms to each other. We can also brace only one or a few yards at a time. The order is adapted accordingly, for example: "Standby to brace the starboard fore upper topsail".

Photo: Valery Vasilevskiy

Expressions relating to braces and bracing

Brace round	Haul in the weather braces until the yards are at the opposite angle to where they started. We then switch the tacks on the square sails on the relevant masts.
Square the yard	Brace the yard so it stands athwartships.
Brace in and shiver	Brace the yards so they are parallel with the wind direction and the sails lose power. Called "shivering the sails", or "luffing the sails".
Brace sharp up	Brace the yards at a sharper angle to the ship and the sails fill closer up to the wind. This is often to do with the wind veering or backing towards the ship's direction of travel, or the ship squaring up to the wind when changing course.
Ease the braces	Brace the yards more square, ready for a wind more from aft in the sails. This may be to do with the wind shifting more aft, or the ship bearing away when coming about.
Trim	Fine-tune the angle of the yards or the sheets on the sails. The aim is to give the sails their optimum shape depending on the wind and waves, so that they perform as best they can.

Photo: Richard Sibley

4 Setting and dousing sails

We use these terms consistently for setting and dousing sails. Once we have set the sail, it remains in place and stable. When we have doused the sail, it hangs there until we furl it. Other ways of describing these actions are potentially confusing because some sails are hoisted and some are hauled down to set them.

Sail order

To determine the order in which the sails are set or doused, the navigator takes the balance of the ship in relation to the wind direction into account.

The lower staysail on each mast and the lower topsails have extra reinforcements and are considered to be storm sails. They are set first and doused last. Once the storm sails are set, the remainder are set from bottom to top.

We strive for uniform wind pressure along the length of the ship. As a basic principle, we therefore usually start by setting a sail on the main mast, balancing with the foremast, and finally setting on the mizzen mast. We then set the next sail on the main mast and continue with the same rhythm.

The two courses have a large influence on propulsion and balance. In some weather conditions they can be difficult to trim. They are therefore exempted from the general setting sequence. The courses are sometimes set after the lower topsails, often after the upper topsails, and occasionally last of all the square sails.

Orders for setting and dousing sail

Hauling on lines for setting a sail will often offer a reminder of the power of nature. As the wind fills the sails, the forces that have to be handled multiply ferociously. Once the sails are set, they stabilize. When we slacken lines in order to douse the sails, they can pull exceedingly strongly. Properly issued orders and the correct use of stoppers are therefore very important.

The orders for setting and dousing sails are used when preparing for a sailing manoeuvre. They are completed by appending the name of the sail involved, for example: Standby to hoist the fore topmast staysail. Once the manoeuvre is underway, whistles are usually used.

Photo:Valery Vasilevskiy

Photo: Valery Vasilevskiy

Setting and dousing staysails

Staysails are triangular sails that are set along the stays. When setting staysails, we normally start with the main topmast staysail. If the weather and manning permit, sails can be set on more than one mast at the same time. The jibs are usually set before the higher staysails on the other masts. Before the sails are set, the gaskets are cast off, the sails laid to leeward of the stay and other obstacles and the slack is taken out of the leeward sheet.

Note: It is dangerous to move about in the lee of or under the sails and sheets when staysails are being set or doused. The blocks on the sheets were known in the past as widowmakers. They can strike hard and fast, and the sheets must therefore be controlled carefully.

Orders for staysails (in this example, the main topmast staysail)

Hoist the main topmast staysail	Set the sail by hauling in the halyard, slackening the downhaul and hauling the sheet close in. In a fresh wind, we want to get the sheet in and belay it quickly. Once the halyard has been made fast, the sail is trimmed using the sheet.
Lower the main topmast staysail	Douse the sail by lowering the halyard, hauling in the downhaul and controlling the sheet. The sheet is eased off a little to begin with, held until it almost prevents the halyard/downhaul from running and then given up as needed.
Sheet in	Opposite to giving up, or easing away, a sheet.

Setting and dousing square sails

The square sails are permanently bent on to their respective yards and are stretched downwards by the sheets in order to be set. The courses are stretched down using the sheets or the leeward sheet and windward tack. The three top yards must also be lifted using the halyards when setting the sails.

General preparations

1. The yards are braced before we loose the sails.
2. All gaskets are cast off and hanked up. Make sure the end yardarm gaskets are loosened, since they are often forgotten. Make sure to push the sail right off the yard before you descend from the rigging, or it may get hooked up when the sail is set.
3. Braces, topping lifts and mizzen downhauls must be made fast when we are working aloft on square sails.
4. Normally, the weather topping lift on the fore course and main course will be slackened before we set square sails. We do this to allow the yards to lift to the lee, so make them as parallel as possible with the horizon.
5. When we are ready to set: Hold the clewlines and buntlines. When the order (whistle) comes, ease off immediately to let the sail fall and stretch out.
6. When we are ready to douse: Be careful in taking turns off belaying pins or bollards in order to slacken sheets and tacks. When the order (whistle) comes, give up the line quickly but in a controlled fashion.

Photo: Jesper Rosenmai

Orders for square sails

Courses (e.g. fore course)

Standby to set the fore course	Rig a tack tackle ready to windward. Loosen unloaded sheets and tacks. Slack off the weather topping lift.
Loose the fore course	Let go of the buntlines. Ease away the clewline. Haul in the sheet/tack. If the wind is fresh and we have a small crew, we can set one side at a time. In that case, we first have to haul in the sheet until the sail fills and belay it. We then haul the tack right down. Finally, we go back and haul in the rest of the sheet.
Standby the fore course	Unrig the tack tackle. Loosen unloaded sheets and tacks.
Clew up the fore course	Ease away tacks/sheet. Haul in clewlines and buntlines.

Lower topsails (example: main lower topsail)

Sheet the main lower topsail	Let go of the buntlines. Ease away the clewline. Haul the sheets.
Give up main lower topsail sheets	Give up the sheets. Haul in clewlines and buntlines.

Upper topsails (example: fore upper topsail)

Standby to hoist the fore upper topsail	Haul taut the sheets immediately the sail has been cast off, the sheet is lowered down in the end gasket on the yardarm. Cast off the outer buntlines and adjust the sheets before the sail is set. Cast off the topgallant sheets - they tighten up when the upper topsail yard is hoisted.
Hoist the fore upper topsail	Loosen downhauls and buntlines. Haul the halyard. Ease off the braces. The lee braces are slackened most. The yard must go clear of the lee shrouds and come up as straight trimmed as possible.
Lower the fore upper topsail	Lower the halyard. Haul the downhauls and buntlines. Take in the slack on the braces. The yard must be braced a little to weather, go clear of the lee shrouds and come down as parallel as possible to the lower topsail yard.

Once the yard is down, the braces, downhauls and buntlines must be adjusted and hauled taut. The sheets are kept fast until they are ready to be hauled up from the yard and topmast crosstrees. The outer buntline will then need to be hauled more from the deck.

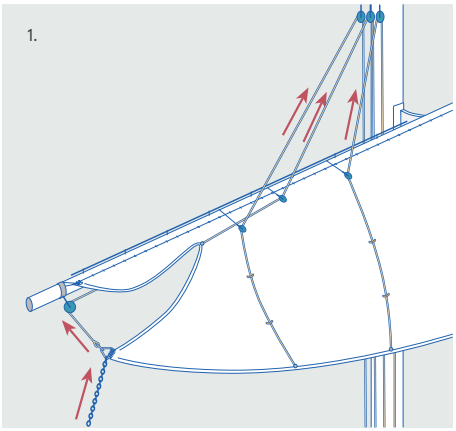
Photo: Valery Vasilevskiy

Topgallants and royals (example: main topgallant and fore royal)

Topgallants and royals are set and doused in the same way. This is a two-part operation. We have to sheet in the sail before we can hoist it. Similarly, we have to lower the yard, before we can give up the sheets. The topgallant sail must be set before and doused after the royal sail.

Sheet the main topgallant	Let go of the buntlines. Ease away the clewline. Haul the sheets. Leave the clewlines and buntlines lying loose during the manoeuvre.
Hoist the main topgallant	Haul the halyard and slacken off the braces, in the same way as when we hoist the upper topsail. The royal sheets must also be loose when the topgallant is hoisted.
Lower the fore royal	Lower the halyard. Haul the clewlines and buntlines. Take up the slack in the braces, as we did when lowering the upper topsail.
Give up the fore royal sheets	Give up the sheets. Haul in clewlines and buntlines.

Photo: Jesper Rosenmai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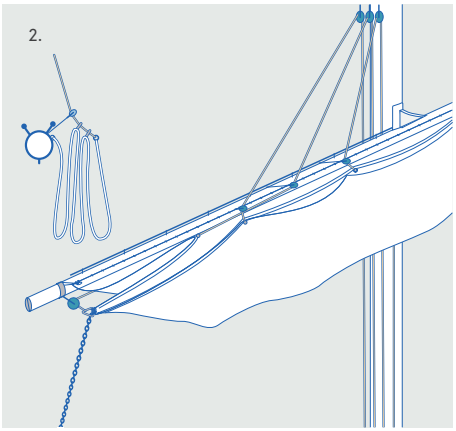
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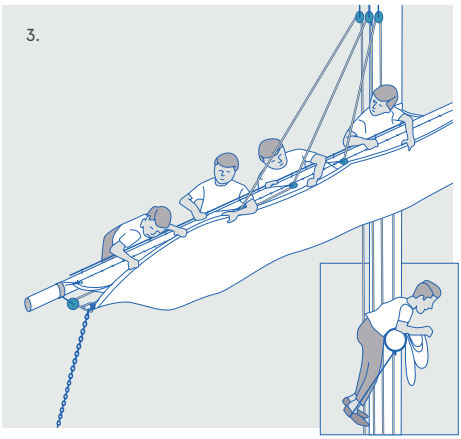
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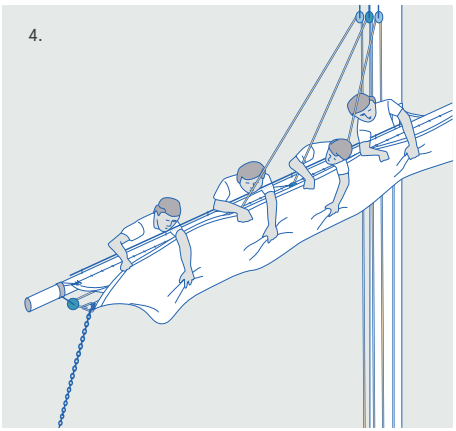
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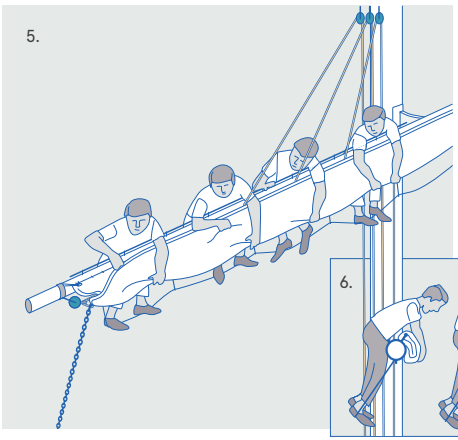
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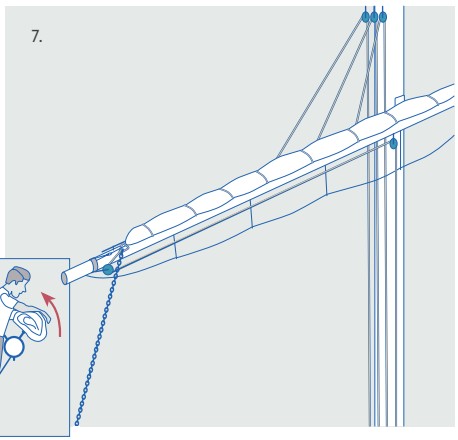
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Furling square sails

1. The sail is given up by hauling clewlines and buntlines.

2. The sail is clewed up.

3. At the end of the yardarm, where the leech is now doubled over, the sail is drawn up to the yard and held there. Everyone grabs the foot of the sail and pulls it up to the yard. Hold the leech and foot up on the yard using the weight of your trunk, to free up both of your hands.

4. "Fish" the sail up, an arms-length at a time. Cooperate with those next to you, so that folds and lumps are stretched out and distributed as evenly as possible.

5. Grab the protective doubling (the last fold) and hold it in front of you with one hand. Use the other hand to push all the sail you have gathered down into the fold. Use your fists and elbows to push it all properly down into the bag formed by the last fold.

6. Close the fold over the middle of the yard with one arm and hold it in place on the foreside of the yard. In a coordinated movement with the other hands on the yard, use the other arm to roll the sail up. The sails should now be in a tight roll between the jackstays on the top of the yard.

7. Hold the sail in place with your trunk and fasten the gaskets. The sail is furled.

Setting and dousing mizzen sails

On the mizzen mast, we can set the mizzen and mizzen gaff topsail. With its large area, the mizzen acts as a wind rudder. This is important for balancing the ship as we approach a full spread of canvas. It also plays a critical role during major sailing manoeuvres and tacks. Unlike the square sails, which are set on yards, the mizzen is bent on the mast and hauled out along the mizzen boom and gaff. We use a sheet outhaul and a gaff outhaul to set the mizzen sail. To douse it, we haul the gaff inhaul and sheet uphaul. The brails haul in the leech of the sail.

The mizzen gaff topsail is the nearest that the Statsraad Lehmkuhl comes to a light-wind sail. In the right wind conditions, after all the other sails have been set, the gaff topsail can be set to take advantage of the last empty area in the rigging. The gaff topsail is simply rigged with a downhaul that hauls in all the corners when the sail is doused. In nautical slang, this line is called the collapser. We have to slacken and haul in the correct order to ensure manoeuvres with this sail go smoothly.

Photo: Valery Vasilevskiy

Orders for the mizzen sails

Mizzen

Standby (to haul out the mizzen)	**1.** Slacken the boom lift to make space for the bunt (belly) of the sail **2.** The vang for the mizzen boom is rigged to lee **3.** The boom and gaff are hauled slightly to lee
Haul out the mizzen	**1.** Let go the brails and gaff inhaul. Haul in the gaff outhaul. **2.** Once the gaff outhaul has a good start, ease willingly the sheet uphaul and haul the sheet outhaul. **3.** Once the mizzen is set, trim the sail out in the lee using the weather mizzen sheet, the mizzen boom vang and gaff vangs.
Haul over the mizzen	When tacking and in a few other situations, we change the tack of the mizzen sail while it is set. The mizzen is hauled amidships using boom sheets and gaff vangs, the load on the boom lifts is switched, the mizzen boom vang is switched to the new lee side and the sail is trimmed for the new tack.
Haul in the mizzen	**1.** Haul the mizzen boom in amidships by hauling in the boom sheets and weather gaff vang. At the same time, the lee vang and mizzen boom vang are slackened. **2.** Ease away the sheet outhaul in a controlled manner. Haul in the sheet uphaul and brails. **3.** Ease away the gaff outhaul. Haul in the gaff inhaul and brails. **4.** Haul in the lee boom lift hard once the sail has been doused.

Mizzen gaff topsail

Hoist the gaff topsail	Ease away the downhaul Haul the halyard first, then the sheet. Finally, haul the mizzen gaff's weather tack down.
Haul down the gaff topsail	Haul in the downhaul. Give up the tack first, then the sheet and finally the halyard.

5 Simple sailing theory

Beating

No sailing vessel can sail straight into the wind. To reach a destination that is upwind, we must beat into the wind. Beating means sailing towards where we want to go, as close into the wind as we can manage, first on one tack, then on another. After a while on one tack, we turn and sail on the other tack. A stage sailed on one tack is called a leg. The usual turns are called tacking and wearing ship and are explained in chapter 6.

It is not very efficient for a large square-rigger to sail straight downwind, with the wind directly aft and some sails blanketed from the wind. It often pays to sail off the wind a little and fill all the sails on a reach instead. The ship sails further in reaching its destination, but also travels much faster. The natural thing is to sail a fairly short leg on a broad reach and wear the ship every few hours.

Sailing upwind or by the wind

The terminology to describe sailing close-hauled as directly into the wind as possible is extensive, and the physics involved are complicated. One thing is certain: the proper trimming of the sails is crucial. The very best upwind boats can sail efficiently at around 40˚ off the wind. But, as a square-rigger, the Statsraad Lehmkuhl is more of a downwind vessel. Even so, in normal conditions, she can sail efficiently at 60˚.

Making way

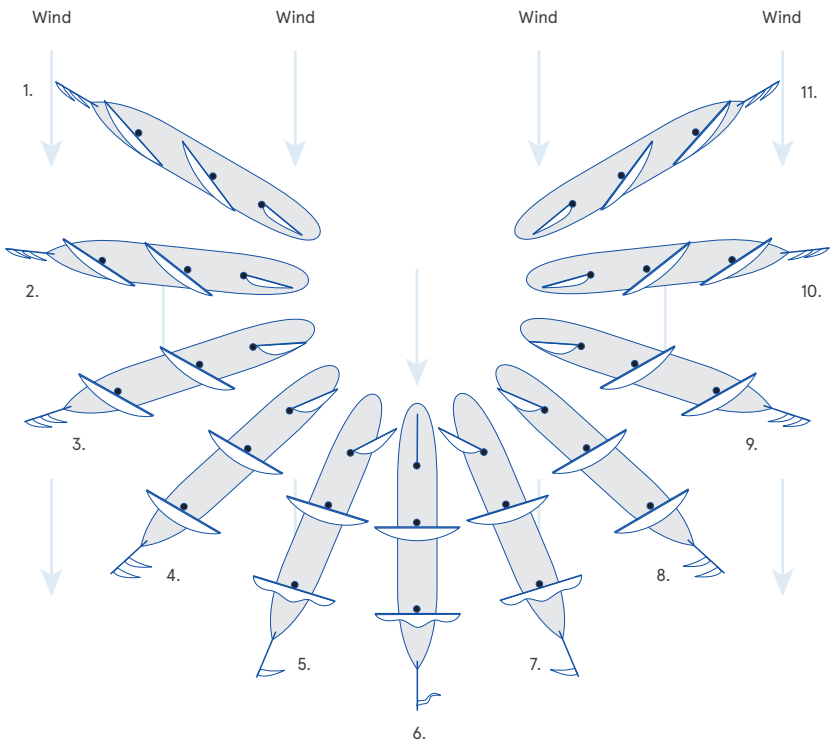
Approaching our destination by beating or reaching is referred to as making way. If we get further away from our destination as we are sailing, we lose ground. We can also set a course to account for an expected change in weather or wind. In that case, we change our course to sail to a more favourable starting point, so that we can sail optimally on an expected change in the direction and strength of the wind. For example, we may set a more northerly course to allow for the wind later veering to the north.

Photo: Valery Vasilevskiy

Sailing in different wind directions

The diagram shows a barque sailing on different courses relative to the wind. It also indicates how we brace the sails for the different wind directions.

1. The ship is sailing upwind on a starboard tack. There are degrees of sailing upwind: we can run free, sail by or bear up hard.
2. Sailing full and by on a starboard tack.
3. On a broad reach, with the wind abaft of beam, on a starboard tack.
4. Running with the wind on the starboard quarter.
5. Running downwind on a starboard tack. The sails on the foremast are in the lee of the main mast and filling badly. Most staysails that are not filling will now be doused. Often the weather (windward) side of the main course is reduced and the entire main mast braced off the wind, to allow the wind to reach the foremast.
6. Running straight downwind. The mizzen sail will usually be doused and nearly all staysails hauled down. If reducing the main course is insufficient, it will be fully doused. To maintain steerage way on the ship, it is important to ensure that the sails on the foremast fill.
7. Running downwind on a port tack. We can now set the mizzen and a reduced main course again. Staysails and jib that do not draw remain doused.
8. Running with the wind on the port quarter. All staysails and jibs can be set again and the main course set fully.
9. On a broad reach, with the wind abaft of beam, on a port tack.
10. Sailing full and by on a port tack.
11. The ship is sailing upwind on a port tack.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Fanning the yards

A square-rigger under sail braces the lower yards hardest and gradually eases the angles of those above. This is known as fanning the yards. In different weather and wind conditions, the fanning will be more or less pronounced. There are a number of reasons to fan the yards in this way.

The main ones are:

- The wind is usually stronger higher up, affecting the relative wind direction, so the wind comes more from abaft into the sails the higher up they are placed.
- The large courses are more rounded in shape. They require a greater angle to the wind to fill, than the sails higher up.
- If the wind increases, putting the sails in danger of backing, the top sails will show signs of shivering, or luffing, first. This gives the navigator and helm watch time to react before the sails back and the ship loses way.

If the yards are braced as far as possible, the royal will be at the sharpest angle and the yards below will fan in a *negative* direction. This only happens when we sail very close-hauled. This negative fanning can be effective in certain unusual weather conditions, but this trim is mainly used when we want to make ground more than we want to make speed, for instance when rounding an obstacle. When fanned negatively, it is usually only the top sails that draw.

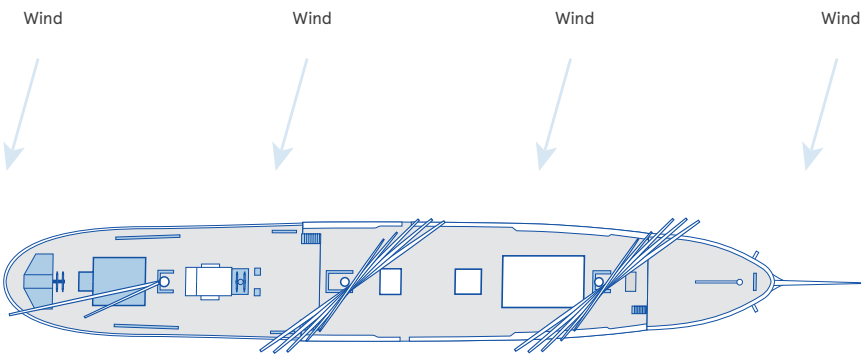


Photo: Valery Vasilevskiy

6 Sailing manoeuvres

Bracing aback and lying to

In some situations, we want to quickly stop the ship under sail, for example, due to crossing traffic or an incident on board. There are two different ways to do this: By bracing aback or by lying to.

Brace aback

In normal weather conditions, it is effective to brace aback. The basic principle of the manoeuvre is that the main mast is braced around, so that the square sails back. When the sails on the foremast and mizzen mast are drawing, while the main mast is backing, the ship will quickly lose propulsion and stop. With a few small adjustments to the course and sails, the ship will lie almost still in the water until we brace fully again. To practice carrying out the manoeuvre quickly, we normally brace aback at short notice with little preparation. The crew may well be in the process of carrying out other manoeuvres at the same time, such as launching a tender.

How the manoeuvre proceeds:

1. The Captain or navigator issues the order to make ready to brace aback
2. The watch team clews up the main course
3. If the watch leader has other duties, a petty officer takes over the deck and sends all available hands on deck to the main braces. Meanwhile, the crew ensures that necessary preparations for bracing are made.
4. The order to brace aback/brace round the main mast is executed, the lee braces being paid out until the sails back.
5. Various adjustments to other sails or braces are made to ensure the ship stops dead.
6. Square up and make ready to brace fully.

During the manoeuvre, the navigator will give orders to the helm and instructions to the deck crew. Bracing aback is effective, but in light winds it can be a lot of work for little gain, and in heavy weather a lot of forces strike the rigging from the wrong direction (from ahead).

Lie to

When we lie to, or heave to, to stop the ship temporarily, we exploit the following effects: The ship and the rig are designed so that we have a built-in margin of safety, in case we lose the ability to steer, for example if we lose control of the rudder. Under normal sailing, the ship has a small amount of weather helm, which means that if we left her to sail herself, she would go up into the wind until the sails backed. She would lose speed, come to a stop and gradually gain speed astern. When the ship backs under sail, she will fall off, so that the sails finally start refilling on the same tack.

When we lie to, we steer the ship up into the wind in a controlled manner until the sails stop drawing, until we bear away and she picks up speed again. The sails have to be adjusted somewhat as this happens, for example, we might douse the two courses, which do not like to lie aback. If we encounter a violent storm, the ship can be made to lie to by setting a few small sails fore and aft and lashing the helm hard to windward. She will then lie stably to the weather with little drift and can ride the storm in comfort.

Photo: Jesper Rosenmai

Photo: Jesper Rosenmai

Tacking

The principle of tacking is the same as on a sailing yacht. We turn into the wind, pass through the eye of the wind, and the sails then fill on the other tack. On a small boat, this is usually the safest way to come about. But on a large square-rigger like the Statsraad Lehmkuhl, this is the most difficult turn. To overcome the ship's natural reaction to going head to wind and to get all sails to switch over to the next tack requires flawless timing.

In strong winds, head seas may kill the ship's momentum. Strong forces stress the rigging from the wrong direction as the ship goes through the eye of the wind. In light winds, a misjudgement or a wave can stop the ship's momentum prematurely, and the ship will fall back to its previous tack. The benefit of tacking through the wind over wearing the ship round is that, if successful, less ground is lost. That is why we train to increase our chances of success and enlarge the window in which tacking is possible. In general, there is normally a good chance of tacking successfully if the ship is sailing by at between 2 and 12 knots.

In simple terms, we remove sail pressure forwards and increase pressure aft to get the ship to sail through the eye of the wind. As we do this, we must undertake each step precisely and quickly, to prevent the sails backing and putting us in irons, i.e. stopping us dead.

See illustration and explanation on the following pages.

Wearing ship

On a sailing yacht, this procedure is called gybing. On a schooner, it can be dangerous, with a risk of broaching as the boom changes side. Conversely, on a square-rigger this is a safe turn. If we wish, we can gently bear away, steer through the wind, bracing and adjusting sail as we go. This can be done in most weather conditions and with relatively few crew on deck. By wearing ship efficiently and precisely, we can lose a minimum amount of ground and this is a good alternative to an averagely successful tacking procedure. To get round quickly and efficiently, we remove as much sail pressure aft as possible and let the foremast drag us around with the wind.

See illustration and explanation on the following pages.

Procedure and orders when tacking

In this example, the ship is sailing upwind on a port tack. The orders that are highlighted are those you will hear on deck and which define the progress of the manoeuvre.

Preparations: All tails are made ready, braces are flaked out, the cook is notified. The crew is instructed and sent to their posts. Tacking usually requires all hands on deck. The various posts report that they are ready to act.

1. **Stand by to come about**
   The manoeuvre begins

2. The helm watch is ordered to fall away, so that the ship gains speed.

3. The helm watch is ordered to put the helm to port, to make the ship start turning into the wind.

   Clew up the main course
   Haul up the mizzen to weather
   Slack off the foresail sheets

   Foresail sheets refers to the staysails on the foredeck and the fore course sheet; the fore course might also be clewed up.

4. The ship is now almost fully head to wind.

   Haul round aft/Let go aft

   Haul away the port main braces and haul over the staysails and mizzen sail. Standby the fore braces.

5. The speed falls off. With the fore and main masts backed, the ship quickly turns to port.

6. Sails on the main mast begin to shiver, or luff.

   Brace round forward

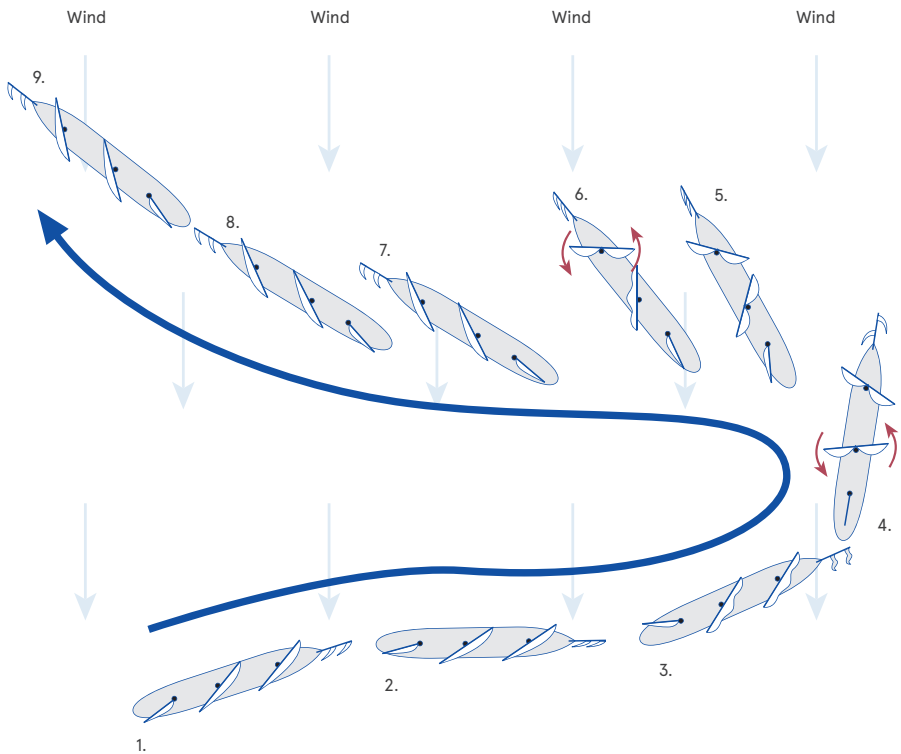
   Haul away the port fore braces and haul over the fore course sheet and tack. The fore course may be set as the mast comes around.

7. The ship bears away until the sails are filled.

   Loose the main course
   Trim to sail by the wind

8. The ship starts gathering speed and the wake returns to normal.

9. The ship is now close-hauled on a starboard tack. Square up all.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Procedure and orders when wearing ship

In this example, the ship is sailing upwind on a starboard tack. The orders that are highlighted are those you will hear on deck and which define the progress of the manoeuvre.

Preparations: All tails are made ready, braces are flaked out, the cook is notified. The crew is instructed and sent to their posts. The various posts report that they are ready to act. Sometimes we steer up into the wind a little, to reduce speed before wearing.

1. **Stand by to wear ship**
   The manoeuvre begins.

2. The helm watch is ordered to put the helm to port, so that the ship bears away.

   Clew up the main course
   Haul in the mizzen

   The crew makes ready on the main braces.

3. **Brace the main and shiver**

4. The main mast is braced so that the yards are parallel with the wind as the ship bears away. The ship now has almost no pressure on the sails abaft and readily bears away.

5. The ship is running straight downwind.

   Brace up sharp to windward

   The main braces are hauled in to the close-haul marks and made fast. The staysails are hauled over and the crew stands by the fore braces.

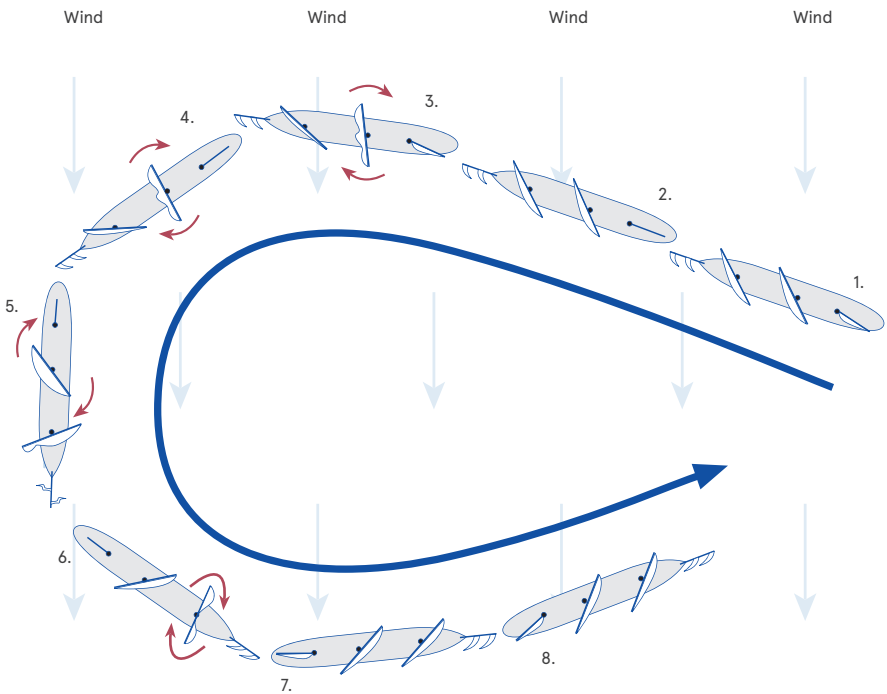
6. The foremast is now backed.

   Brace round forward

   The fore course is hauled round by sheet and tack.

7. **Loose the main course**
   Haul out the mizzen
   Trim to sail by the wind

8. The ship is close-hauled on a port tack. Square up all.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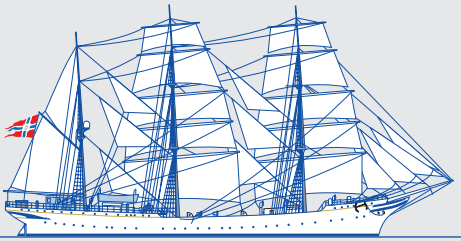
7 Common words and expressions

Forward	The front of the ship
Bows	The foremost part of the hull (the prow)
Aft	The rear of the ship
Stern	The rearmost tip of the hull
Counter	The overhanging aft of the ship
Midships	The centre part of the ship (longitudinally speaking). Also used to describe a rudder angle of zero.
Starboard	The right-hand side of the ship as seen from aft, indicated by green navigation lights
Port	The left-hand side of the ship as seen from aft, indicated by red navigation lights
Windward /weather	The side that the wind is blowing from. The weather braces, for instance, are those on the windward side.
Lee	The side that the wind is blowing towards
In the lee	Protected from the wind or weather by something
Below	Inside the ship
Sides	The hull, both inside and out
Bulkheads	Equivalent to interior walls in a house
Companion ladder/way	Equivalent to stairs in a house

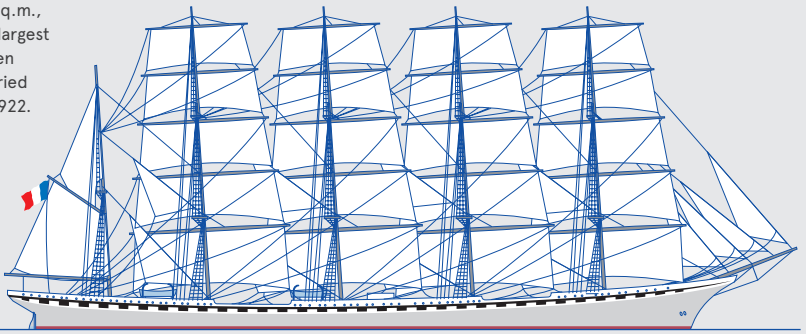
Large square-riggers

Barque
A vessel with three or more masts, where all but the after-most one are fully rigged.



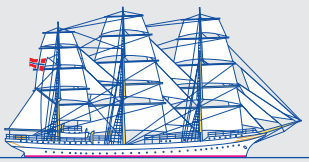
"Statsraad Lehmkuhl"

Five-masted barque
At 5,633 gross register tons and with a sail area of 6,350 sq.m., France II was the world's largest merchant sailing ship when built in 1912. She also carried passengers. Wrecked in 1922.

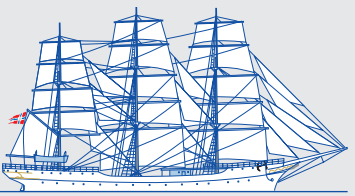


"France II"

Full-rigger
A vessel with three or more masts, all fully rigged.



"Sørlandet"



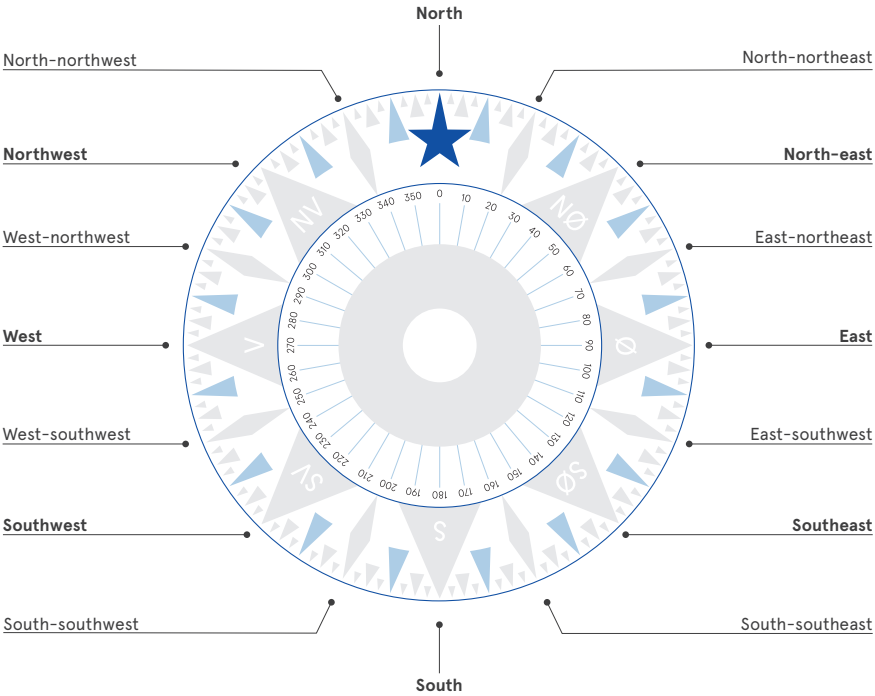
"Christian Radich"

Five-masted full-rigger
Preussen of Hamburg. The world's only five-masted fully rigged merchant ship. 4,650 sq. m. of sail, built in 1902, wrecked in 1910.

"Preussen"

Gutters	Channels between the side of the ship and the deck (both on and below deck) to carry water away
Scuppers	Drain from the gutters to the sea, the foremost of which is used to funnel food waste and seasick over board
Bulwark	The part of the ship's side that extends above the level of the weather deck
Freeing port	Hinged hatch in the bulwark to evacuate stormwater
Railings	Protective "fence" around a deck
Gunwhale/rail	Sits on top of the railings and bulwarks
Capstan /windlass	Large standing winch into which bars are inserted to provide leverage to haul in a rope or hawser
Knots, bends and hitches	Different ways of joining and attaching ropes for particular purposes. Bends are for joining two ropes together. Hitches are for attaching ropes to other things, such as spars or rings
Whipping	Lashing with thin twine, called small-stuff, to prevent rope ends and similar from fraying
Seizing	Hard set lashing using small-stuff or thin wire, finished with knots, to permanently assemble or attach something.
Lashing	Thin rope lashed or reeved several times around or through something in the same direction to hold it fast
Stopper	A strop for stopping, or taking the strain off, a loaded line or tail. For sail handling, we usually use braided stoppers.
Belaying pins	A pin/bolt in metal or wood for making lines fast. Usually placed in rows in pin rails along the ship’s rail or in fife rails around the base of the mast

Compass rose

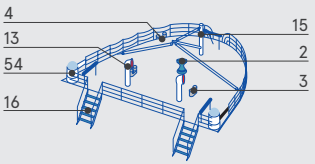


Navigate	Determine a course and find a navigable route across the sea.
Dead reckoning	Navigating by calculating the ship's course, speed and time taken. Depends on taking bearings and systematic observations to determine the ship's position accurately.
Electronic navigation	Determining the ship's position using electronic navigation systems, such as GPS, ECDIS and radar.
Astronomical navigation	Determining the ship's position by observation of celestial bodies. Requires nautical almanacs and instruments such as a sextant and chronometer.
Terrestrial navigation	Determining the ship's position by using a compass to take bearings of known landmarks.

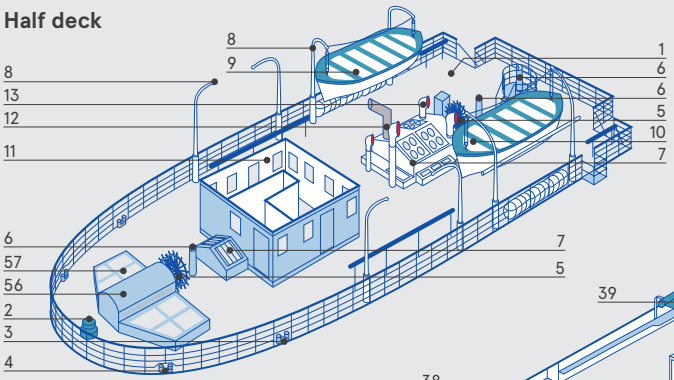
Deck layout

1. Half deck
2. Capstan
3. Bollard
4. Fairlead
5. Wheel
6. Binnacle with magnetic compass
7. Skylight
8. Davit
9. Port tender
10. Starboard tender
11. Chart house
12. Funnel
13. Vent
14. Forecastle deck
15. Anchor crane
16. Companion ladder, companionway
17. Captain's stateroom
18. Owner's cabin
19. Pantry
20. Chief Officer
21. First Officer
22. Cook
23. First Engineer
24. Chief Engineer
25. Deck office
26. Souvenir shop
27. Captain
28. Captain's WC
29. Steward
30. Doctor
31. Sergeant
32. Carpenter
33. Bosun
34. WC
35. Sickbay
36. Main deck
37. Companionway hatch
38. Pin rail
39. Galley
40. Engineering workshop
41. Bosun's shop
42. Carpenter's shop
43. Cathead
44. MOB boat
45. Cabin
46. Trainees' bathroom
47. Laundry
48. Aft trainee accommodation
49. Forward trainee accommodation
50. Cafeteria
51. 2-person cabin
52. Rudder
53. Transom
54. Lantern housing
55. Lantern house locker
56. Steering gear chest
57. Grating
58. Crew messroom

Forecastle deck

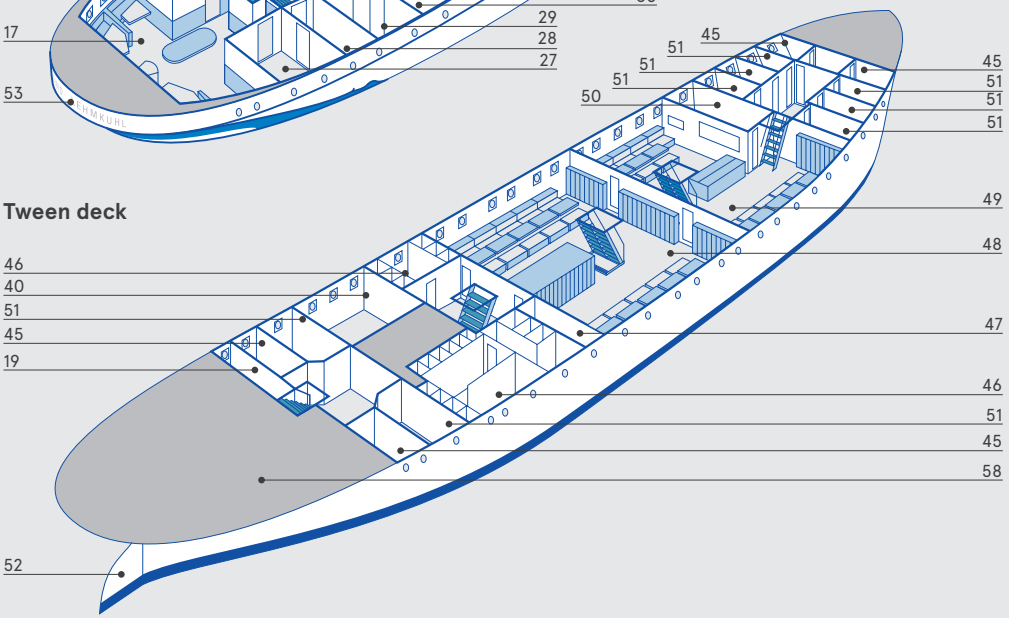


Half deck



Main deck

Tween deck

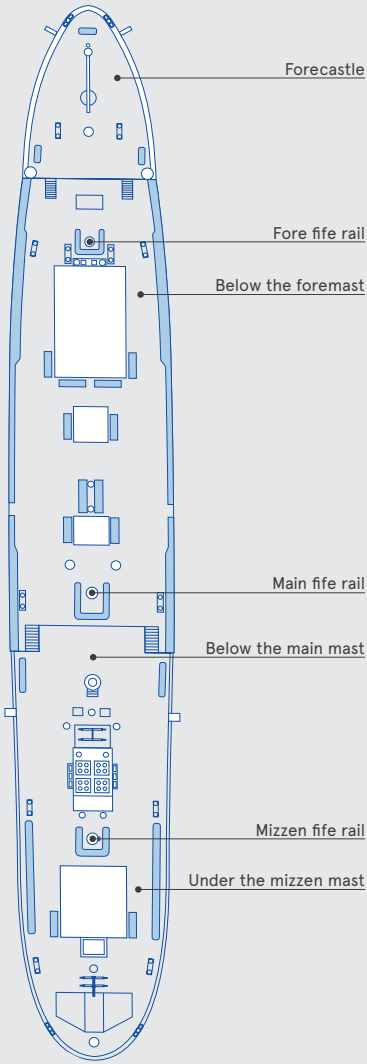


Pin rails

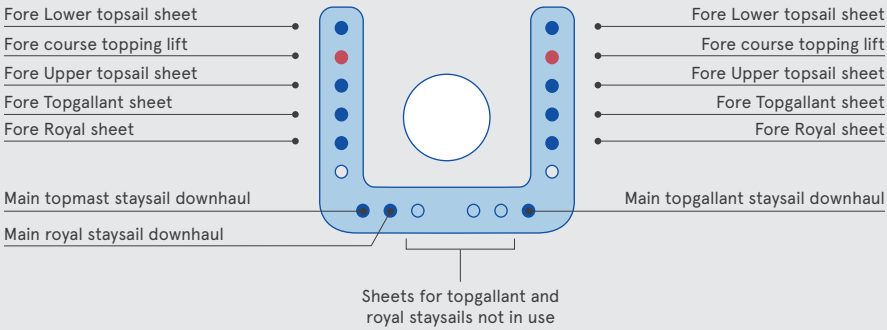
The parts of the ship shown here refer to the different pin rail and fife rail diagrams on the following pages.

Key:

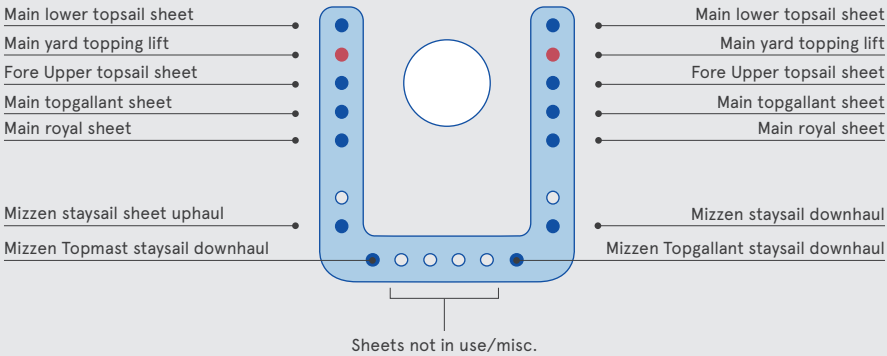
- Occupied
- Flexible position
- Vacant
- Painted white – particular care required
- Painted red – particular care required
- These belaying pins are used in pairs
- Small bollard
- Mooring bollard
- Fairlead



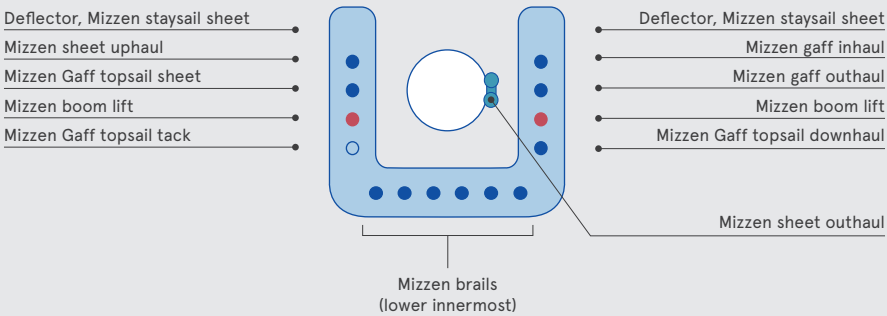
Fore fife rail



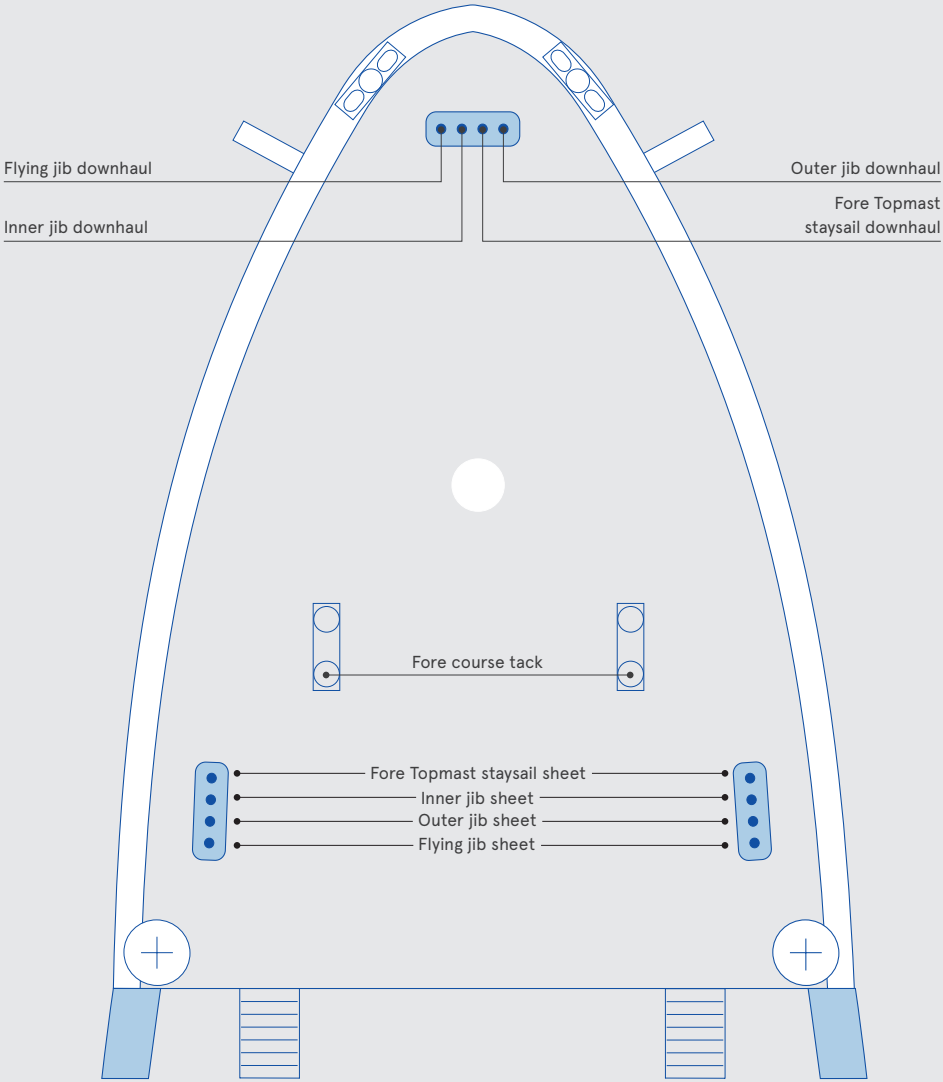
Main fife rail



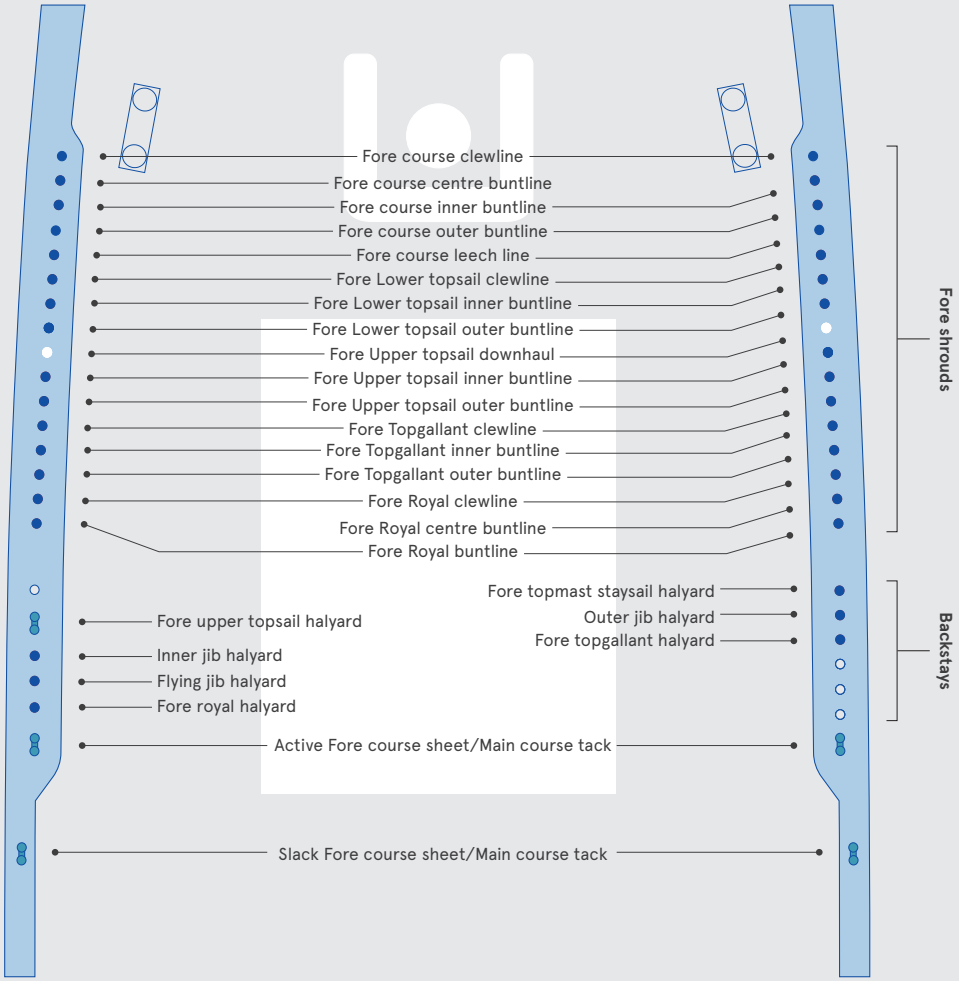
Mizzen fife rail



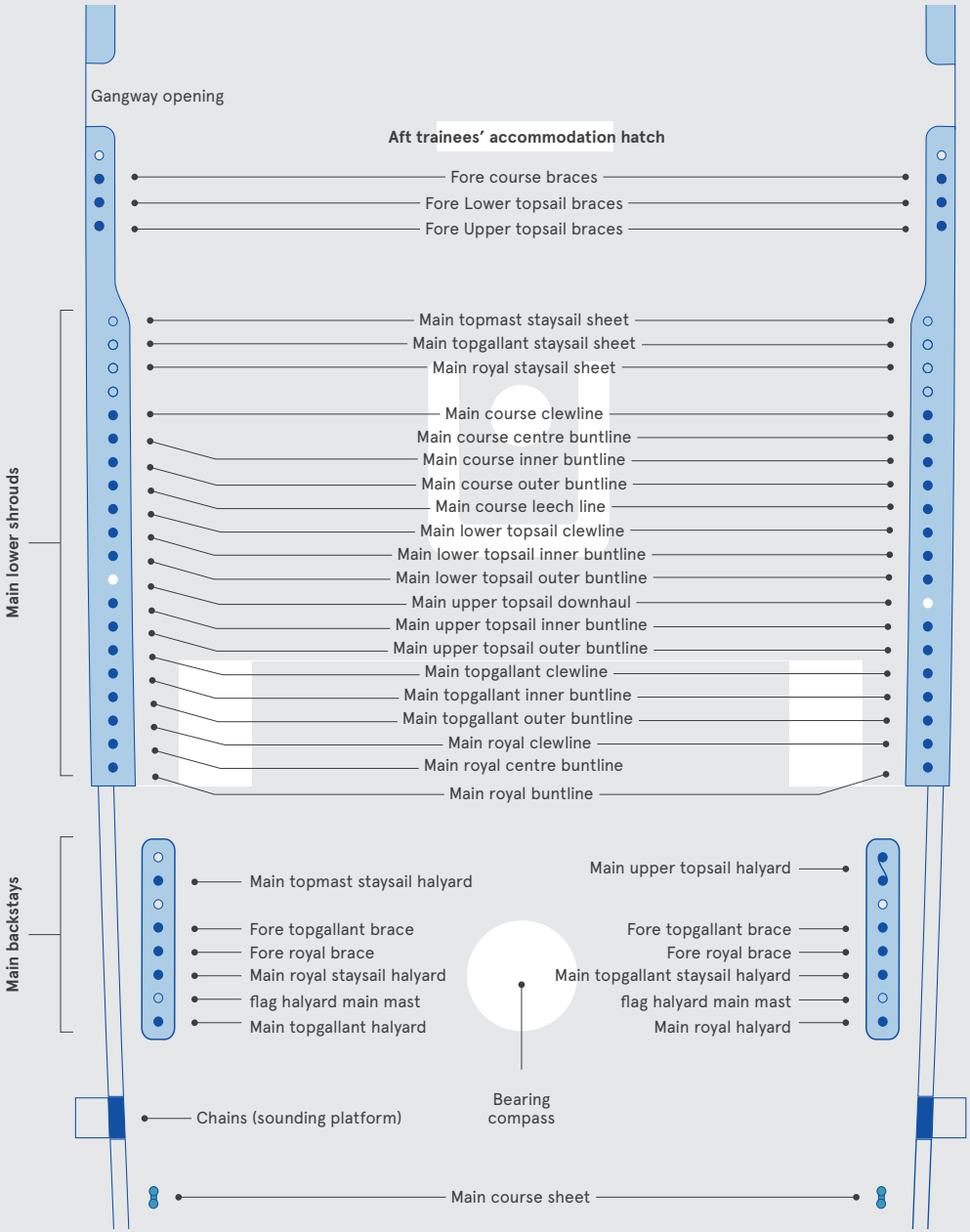
Forecastle


Flying jib downhaul
Outer jib downhaul
Fore Topmast staysail downhaul
Inner jib downhaul
Fore course tack
Fore Topmast staysail sheet
Inner jib sheet
Outer jib sheet
Flying jib sheet

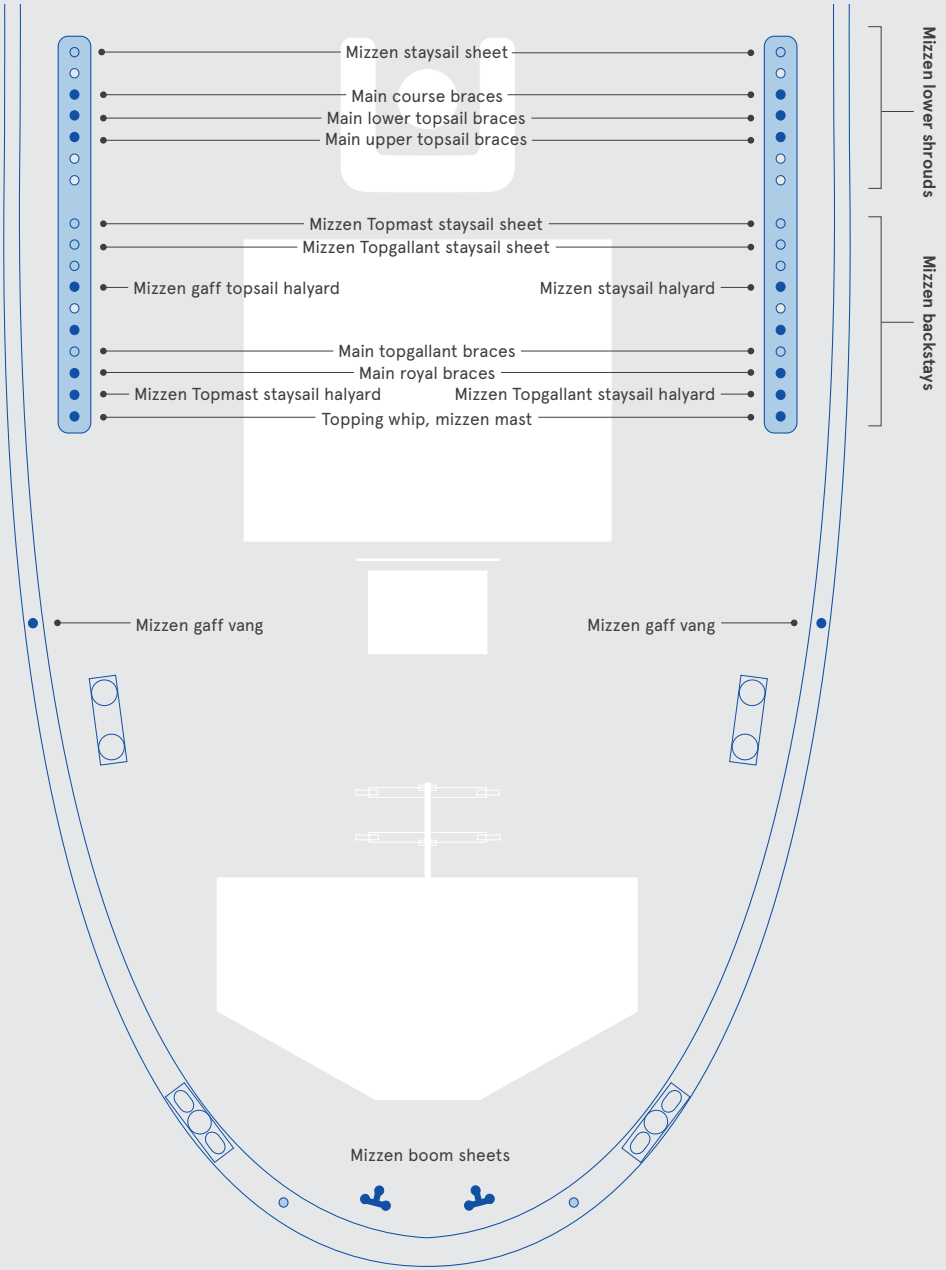
Below the foremast



Below the main mast



Below the mizzen mast



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