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SEA VOYAGE CHALLENGE



 Orpheus

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Spices

Your challenge

The year is 1593 and you have been summoned by the King of Portugal. Every year, he sends out a fleet of massive cargo ships to Portugal's colonies in India. Here the ships load up with pepper and luxury goods such as silks and spices to bring back to Europe where they are sold for a huge profit. The King wants you to captain the fleet from Portugal's capital, Lisbon, to the port of Goa in India. It is great honour to be asked, but the voyage is long and dangerous.

Some navigational aids

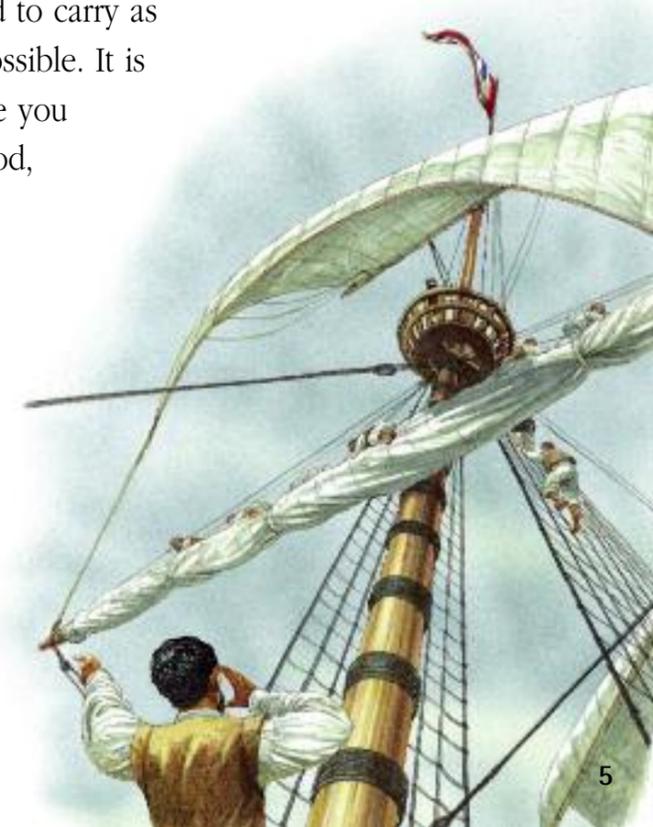
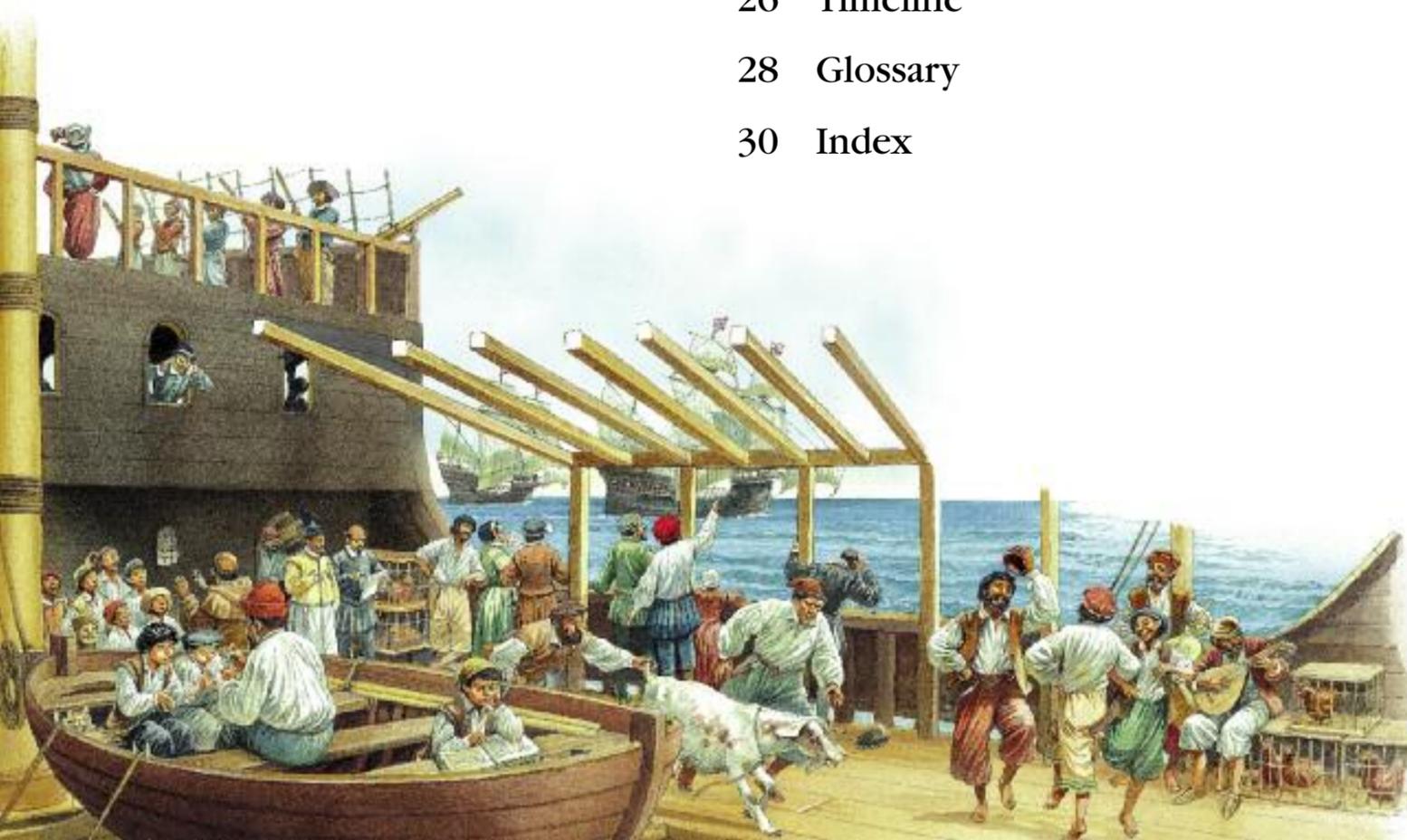


What to do if your ship is in danger of sinking

to complete the long journey. You must navigate thousands of kilometres across two oceans, surviving storms and possible encounters with pirates. You must keep your crew and passengers fit and well, and successfully negotiate the purchase of the King's precious spices. It is a massive challenge, demanding exceptional seamanship. Are you ready to accept it?

Your ship is newly built and waiting at the port of Lisbon to set sail. It is a massive vessel, called a carrack, or nau, specially designed to carry as much cargo as possible. It is your job to ensure you have the crew, food, water and other supplies necessary

"Furl the sails!"



Route to India

The route to India from Europe, is long and dangerous. You need to cross the open ocean and navigate the stormy seas around the tip of Africa. To be successful you must time your journey to avoid bad weather and take advantage of various currents and winds that will speed you on your way. Ensure you follow the quickest and safest route. Beware of pirates: they are a real danger to your ships. As well as illegal sea robbers there are also privateers. These are usually Dutch or English ships that have permission from their governments to attack ships from other countries and take their precious cargo.

Keep a sharp lookout for sea robbers.



KEY

- Outward journey
- ← Return journey



10 Arrive back in Lisbon in the late summer.

2 On the outward journey head southwest towards the Canary Islands.

3 Catch the northeast trade winds that will take you south and west, close to the coast of Brazil.

1 You must leave Lisbon in March to avoid getting caught up in the the stormy southwest monsoon in the Indian Ocean. This occurs between May and September and closes the port of Goa.

9 On the return journey use the southeast trade winds to sail northwest across the Atlantic Ocean.

4 Beware of storms around Africa's southern coast.

7 Aim to arrive in India in late September or early October. The last of the southwest monsoon winds will help you cross the Arabian Sea. Allow three months to trade your goods and load up with pepper and other cargo.

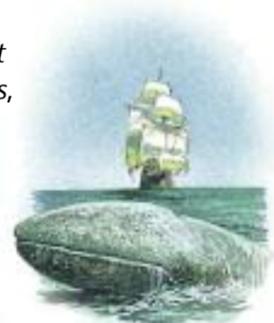
6 Travel on the inside channel between Africa and Madagascar on the outward journey so you can call in at Mozambique for supplies if needed.

5 Most shipwrecks occur along the coast of Natal.

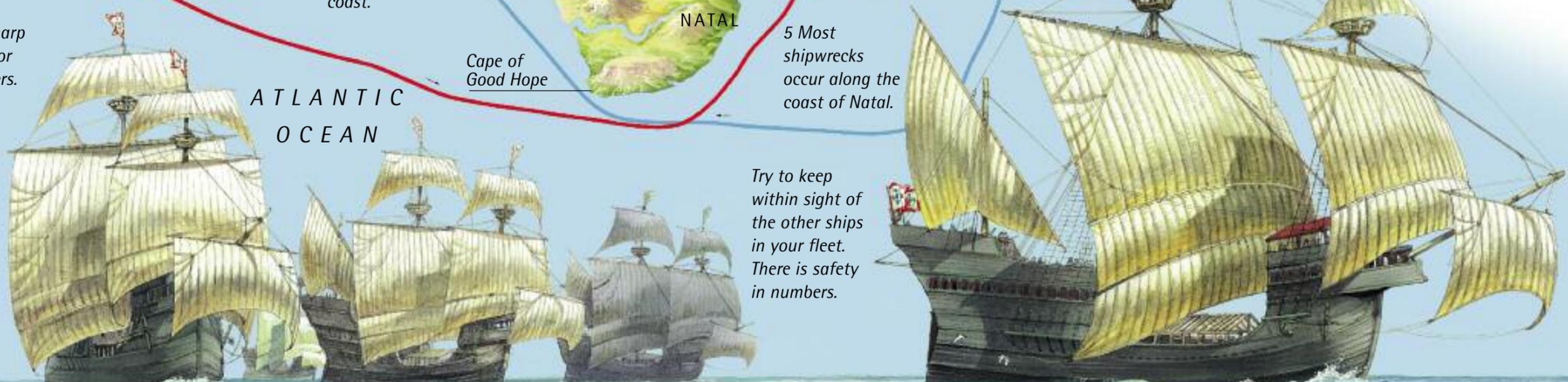
8 Leave with the northwest monsoon around Christmas, so that you can round the Cape of Good Hope before the violent storms of May.

Try to keep within sight of the other ships in your fleet. There is safety in numbers.

Avoid making stops on the outward voyage if possible because this causes delays. If you need supplies or repairs, dock at Mozambique on the east coast of Africa. But stay for as short a time as possible to reduce contact with diseases. On the return trip, call in at St. Helena or the Azores.



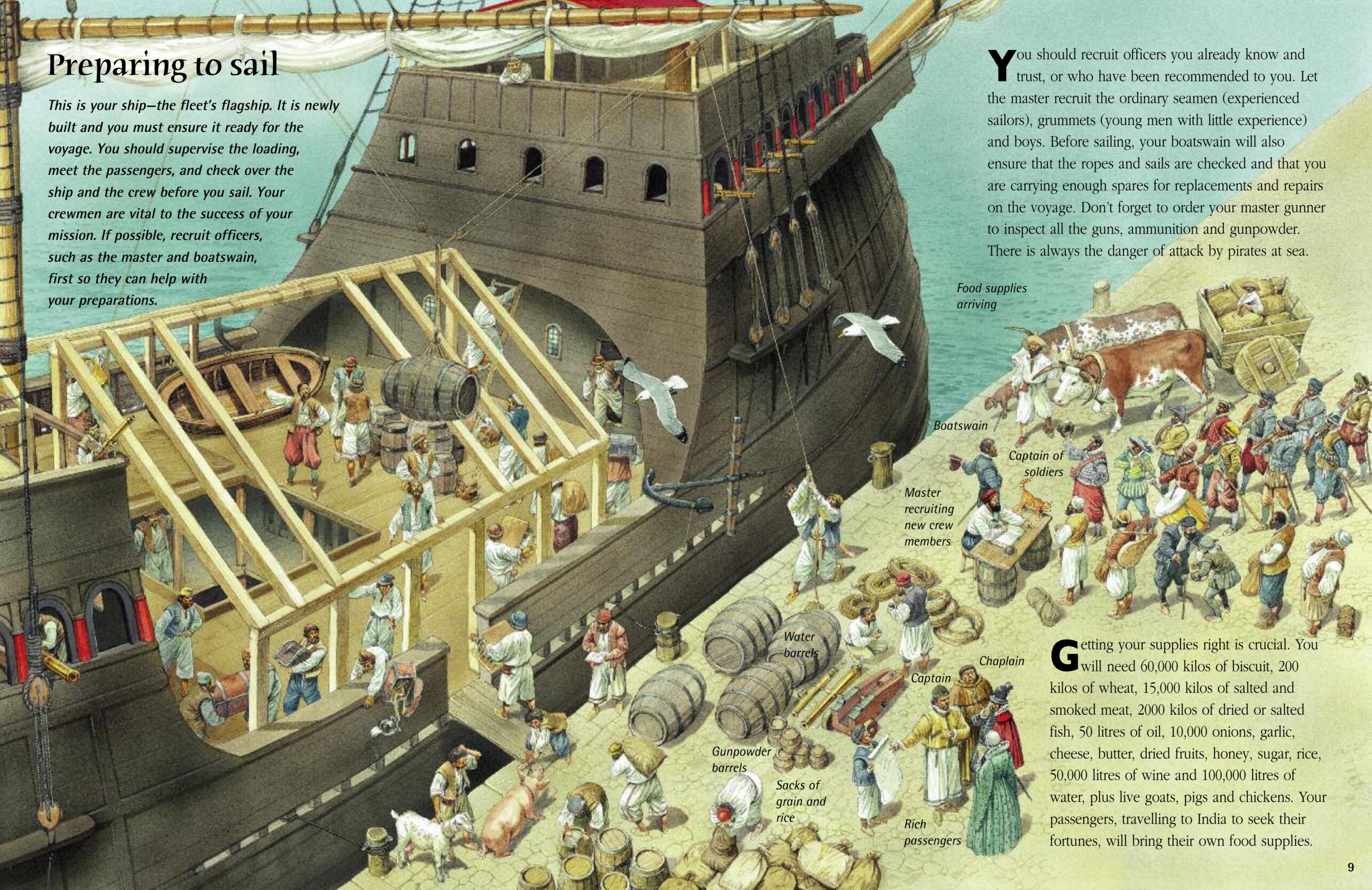
Whales have been known to sink unwary ships.



Preparing to sail

This is your ship—the fleet's flagship. It is newly built and you must ensure it ready for the voyage. You should supervise the loading, meet the passengers, and check over the ship and the crew before you sail. Your crewmen are vital to the success of your mission. If possible, recruit officers, such as the master and boatswain, first so they can help with your preparations.

You should recruit officers you already know and trust, or who have been recommended to you. Let the master recruit the ordinary seamen (experienced sailors), grummetts (young men with little experience) and boys. Before sailing, your boatswain will also ensure that the ropes and sails are checked and that you are carrying enough spares for replacements and repairs on the voyage. Don't forget to order your master gunner to inspect all the guns, ammunition and gunpowder. There is always the danger of attack by pirates at sea.



Food supplies arriving

Boatswain

Captain of soldiers

Master recruiting new crew members

Water barrels

Chaplain

Captain

Gunpowder barrels

Sacks of grain and rice

Rich passengers

Getting your supplies right is crucial. You will need 60,000 kilos of biscuit, 200 kilos of wheat, 15,000 kilos of salted and smoked meat, 2000 kilos of dried or salted fish, 50 litres of oil, 10,000 onions, garlic, cheese, butter, dried fruits, honey, sugar, rice, 50,000 litres of wine and 100,000 litres of water, plus live goats, pigs and chickens. Your passengers, travelling to India to seek their fortunes, will bring their own food supplies.

Passengers and crew

You will have at least 400 people on board, from soldiers and passengers, to your crew and servants. The captain of the soldiers is in charge of his 250 men-at-arms, but you are responsible for the passengers and crew. You have a number of key officers under your command. The most senior of these is the master. He is your second-in-command, has overall supervision of the crew and is responsible for the day-to-day running of the ship.



Pilot

Master Grummet Boatswain

The pilot is in complete charge of navigation. Either he, or his underpilot, is on duty on deck at all times. The boatswain has charge of the sails and rigging and supervises the men working at the stern of the ship. His deputy has responsibility for the men working at the bow.

(Canopy support cut away so deck is visible)

Chaplain and boys singing

Teaching knot tying

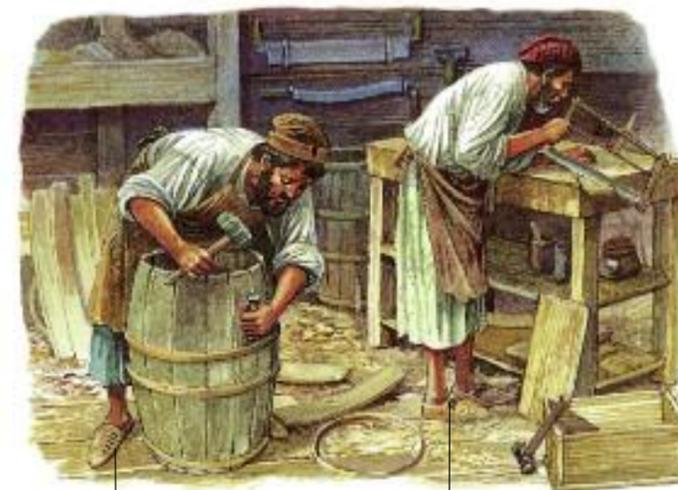
Captain and clerk

Passengers

Off-duty crewmen

Chickens

Skilled carpenters and coopers are essential members of your crew. The carpenter and his apprentices make any running repairs to the ship as required. The cooper will ensure that the barrels, in which food, wine and water are stored, are in good repair and do not leak. If your cooper does not do his job properly, you risk losing valuable food supplies with food rotting and wine and water going bad. This can, in turn, lead to unnecessary hunger, sickness and even death on board.



Cooper

Carpenter

Doctor



Your ship must have a doctor. He will keep an eye on your crew's general health and perform surgery, such as removing limbs, sewing up wounds or setting bones. Make sure your doctor has a good reputation and a fully stocked medicine chest.

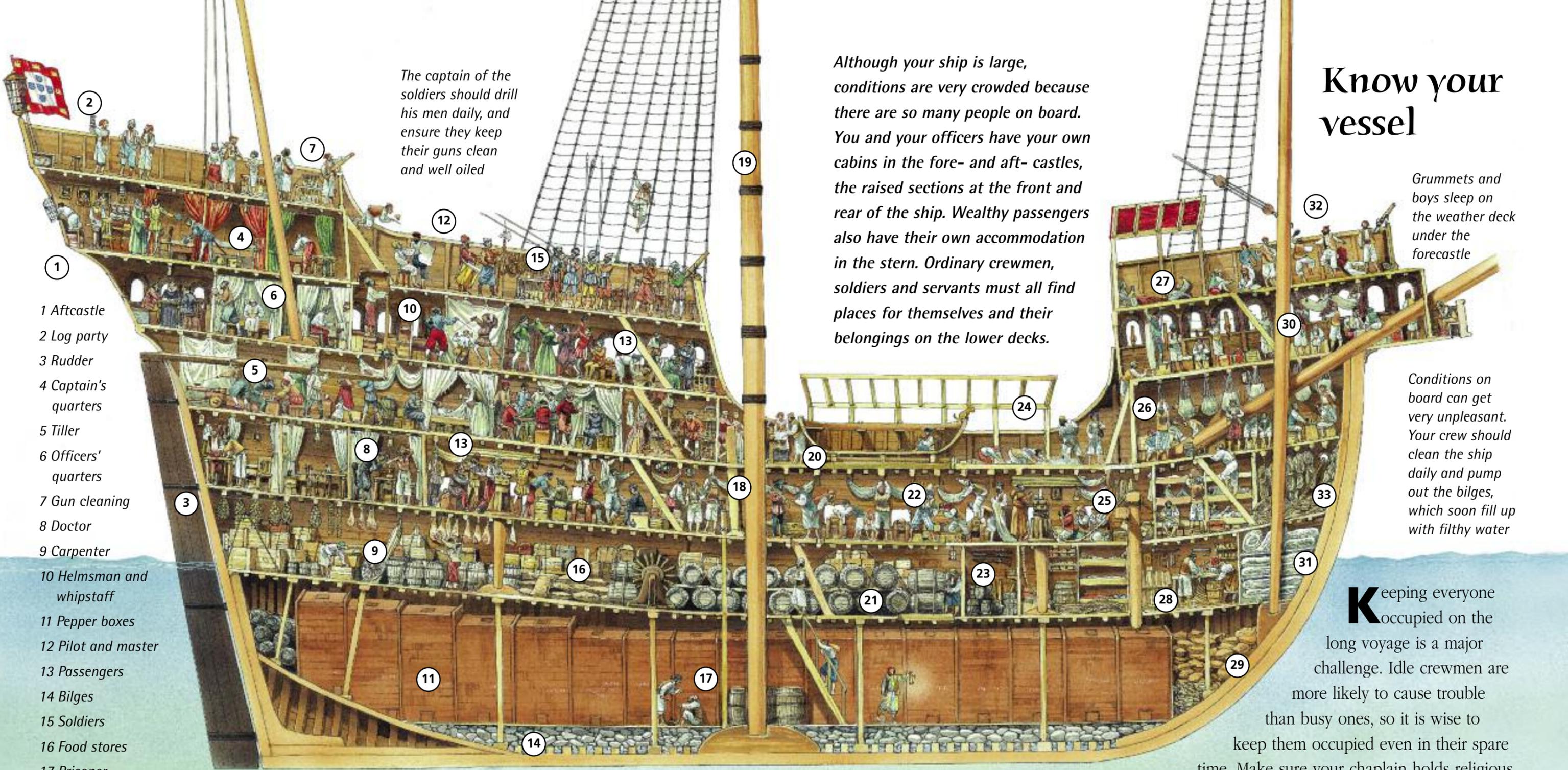
Your clerk is will help you keep track of business on the voyage. He records all use of food and other supplies, and will supervise the loading and unloading of cargo in India. He will also note any punishments you give out and any deaths on the voyage.



Clerk

Captain

The jobs of your ordinary seamen, grummetts and boys range from manning the sails to swabbing the decks and pumping the bilges. Entrust your chaplain with the boys' education and welfare. He will also conduct daily services for the entire ship. Your passengers include merchants, nobles and priests. You also have some women on board: mainly servants and passengers' wives.



The captain of the soldiers should drill his men daily, and ensure they keep their guns clean and well oiled

Although your ship is large, conditions are very crowded because there are so many people on board. You and your officers have your own cabins in the fore- and aft- castles, the raised sections at the front and rear of the ship. Wealthy passengers also have their own accommodation in the stern. Ordinary crewmen, soldiers and servants must all find places for themselves and their belongings on the lower decks.

Know your vessel

Grummetts and boys sleep on the weather deck under the forecastle

Conditions on board can get very unpleasant. Your crew should clean the ship daily and pump out the bilges, which soon fill up with filthy water

Keeping everyone

occupied on the long voyage is a major challenge. Idle crewmen are more likely to cause trouble

than busy ones, so it is wise to

keep them occupied even in their spare time. Make sure your chaplain holds religious services several times a day, and encourage the crew to play music, dance and entertain each other. Those with skills, such as reading the weather and operating the guns, should teach others—including interested passengers—their knowledge. Discourage gambling and card playing at all costs as these activities can lead to violent disputes.

- 1 Aftcastle
- 2 Log party
- 3 Rudder
- 4 Captain's quarters
- 5 Tiller
- 6 Officers' quarters
- 7 Gun cleaning
- 8 Doctor
- 9 Carpenter
- 10 Helmsman and whipstaff
- 11 Pepper boxes
- 12 Pilot and master
- 13 Passengers
- 14 Bilges
- 15 Soldiers
- 16 Food stores
- 17 Prisoner
- 18 Bilge pump
- 19 Main mast
- 20 Stove
- 21 Water barrels
- 22 Crew
- 23 Gunpowder store
- 24 Canopy support
- 25 Chapel

- 26 Grummetts and boys
- 27 Crew and soldiers
- 28 Coopers
- 29 Grain stores
- 30 Foremast
- 31 Spare sails
- 32 Forecastle
- 33 Spare ropes

Much of the space in the hold is taken up with boxes to store loose peppercorns—your main cargo from India. The rest of the hold is packed with other goods and food stores. Every centimetre of spare space will be filled with spices, silks and other luxury items on the return voyage from India.

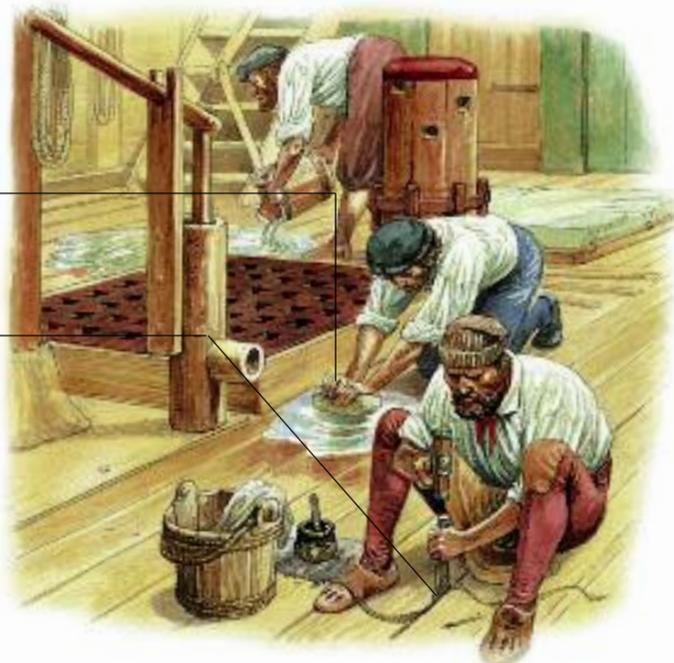
Seasickness is very common on board ship. Encourage those afflicted to get lots of fresh air and to walk around on deck until they become accustomed to the ship's movement. Another common ailment is scurvy which causes bleeding gums and boils. This tends to be worse on long voyages.

Keeping your vessel shipshape

All upper decks must be scrubbed clean each Sunday morning before prayers. A holy-stone, a block of sandstone, will help scrape off the grime. You'll need to have the gaps between the planks sealed regularly to stop water getting through. Your man should use a caulking iron to drive the tar-soaked rope between the planks.

Using a holystone

Caulking: sealing joints between planks



Bullock's horn filled with tallow

Sailmaker's palm



The sailmaker is a vital member of your crew. The sails tear frequently and he will be needed to repair them or make new ones. He uses a "sailmaker's palm", a thick piece of leather wrapped round the hand, to push the needles through the cloth. Note the bullock's horn filled with tallow (animal fat), which he uses to hold his needles.

Be sure to have the master gunner check and clean the guns at regular intervals. You may need to use them at any time. It is also a good idea to hold frequent firing drills. Your master gunner should ensure that all members of the crew know how to prepare and fire the guns. Even details such as how to use a shot gauge (which ensures the balls will fit the muzzle) should not be overlooked.

Using shot gauge

Playing dice (note: a punishable offence on the gun deck)

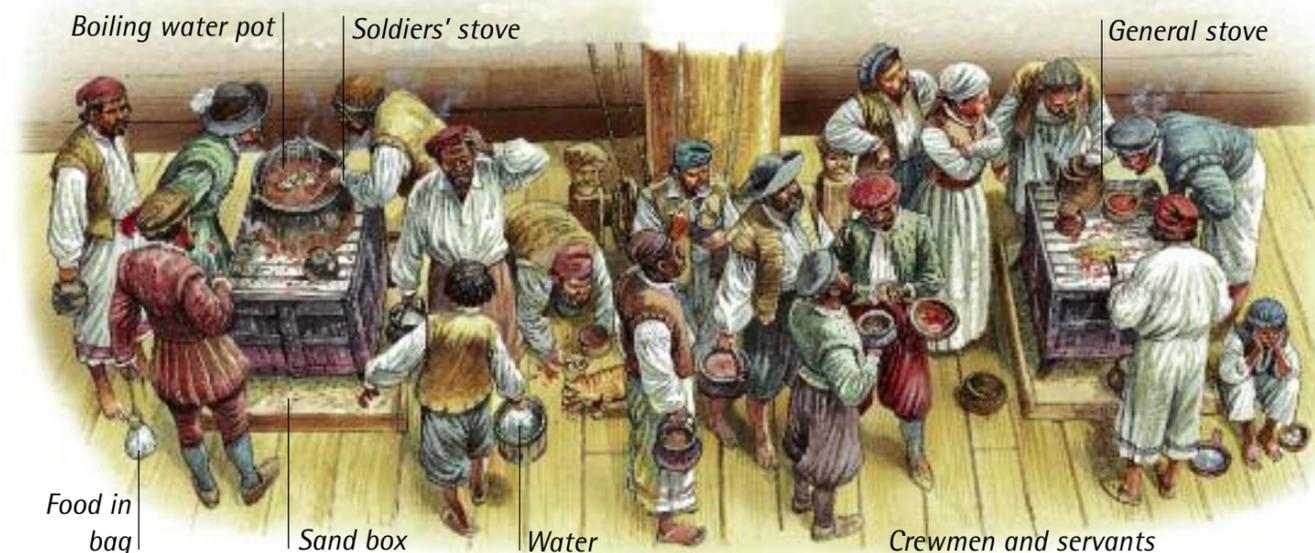
Barrel of gunpowder



Rammer for pushing balls and powder down the barrel

Master gunner

Rope to restrain movement of cannon



Cooking must be strictly organized. If you have two stoves, assign one to the soldiers and the other to passengers and crew. Set particular times for cooking, and impose a strict order on who has access to the stove—passengers and officers (or at least their servants) first, then crewmen, grummets and boys.

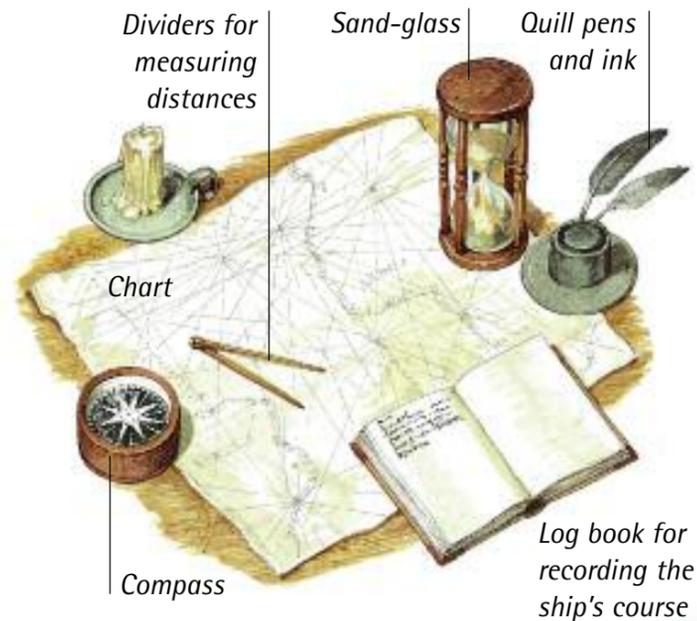


Officers dining

The stoves should be tiled or metal boxes placed in sand to reduce the danger of sparks escaping and causing fires. Do not allow the fires to be lit if seas are rough. Ensure there are buckets of water to douse the fires if necessary. The clerk should dispense food supplies daily. Communal cooking should be encouraged so that there are not too many people clamouring for the stove at once. For efficiency, several bags of food can be cooked in boiling water at the same time.

Navigation

Finding your way across thousands of kilometres of ocean is one of the greatest challenges of your voyage. For this you rely almost entirely on your pilot, so be sure you recruit the best. It is his job to work out your position, speed and direction, and to issue orders to the helmsman (who steers the ship) and the boatswain to adjust the rudder and the sails to maintain your course. The pilot uses several instruments and techniques to help him.



The compass is the pilot's most valuable navigational tool. The magnetic needle always points north, so he can always find out the direction of travel. Time is measured by turning sand-glasses. Charts are useful for plotting position and working out distances.

At night your pilot can use an astrolabe to work out latitude by measuring the angle between the Pole Star, his eye and the horizon. He turns the pointer on the astrolabe until it lines up with the star, then reads off the angle marked by the pointer on the outside rim of the instrument. Finding out longitude—how far east or west you are—is unfortunately much more difficult than working out latitude. The best way is to keep detailed records of your speed and direction throughout the voyage.



To work out your speed, a log line attached to a weight is thrown from the rear of the ship. The line has equally spaced knots tied in it. A sand-glass is used to time for one minute and the number of knots that reel out in that time is counted. Multiplying this by 60 gives speed in knots per hour.

Using a cross-staff

Adjust the cross-piece until the top is in line with the sun, and the bottom with the horizon.

To find your ship's latitude—her distance north or south of the Equator—your pilot uses a cross-staff to measure the height of the sun at noon. This changes with latitude, so he can work out the north-south position from this measurement, which is read off from the scale on the staff.

Swinging the lead

Winding out the log

Counting the knots

Timing using a sand-glass

Examining the lead for mud or sand stuck to the tallow

Tallow

Lead weight

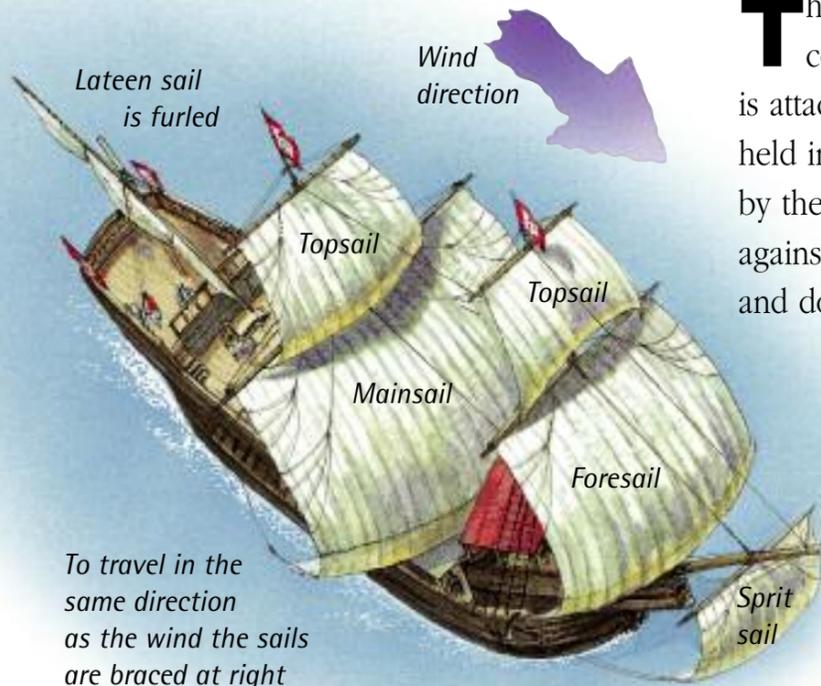
Log reel

Weighted log

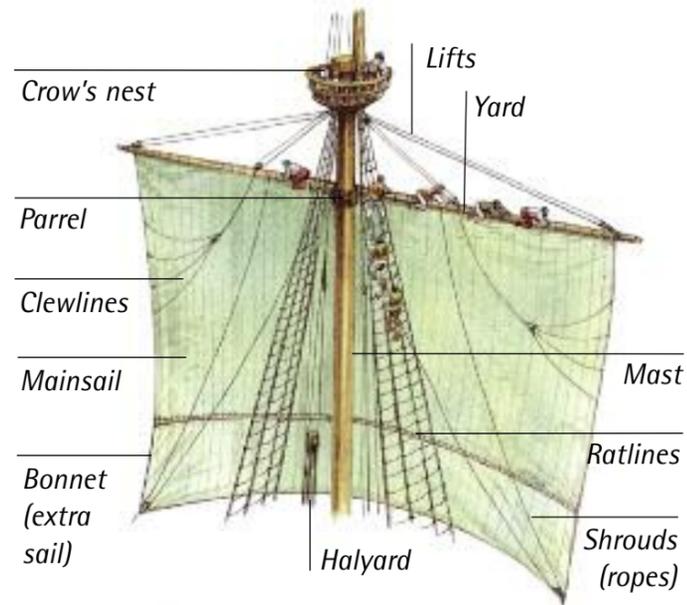
Near to shore you need to know the depth of water so that you don't run aground. A lead weight on a marked line dropped overboard can tell you this. Sticky tallow on the base of the lead weight will pick up mud from the sea bed. The type of mud can also indicate to a skilled navigator how close the ship is to shore.

Sailing your ship

You will need to sail your ship in all weathers and sea conditions, using only the power of the wind. Your crew, particularly the master, boatswain and helmsman, must be skilled in adjusting the sails to get the maximum advantage from the wind, and steering a safe passage through dangerous waters. Your ship has three masts: two have square sails and the third has a triangular, or lateen, sail.

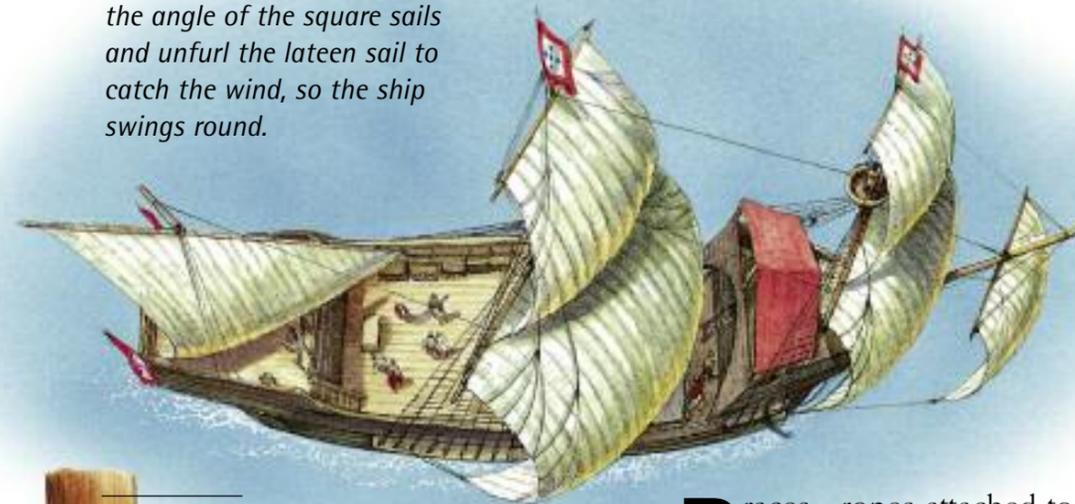


To travel in the same direction as the wind the sails are braced at right angles to the wind.

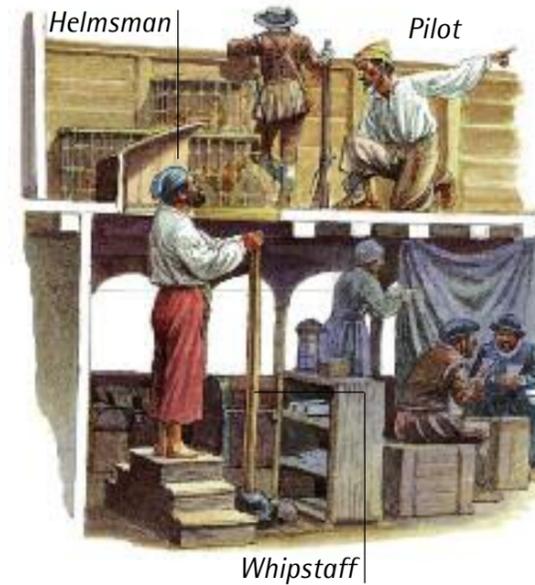
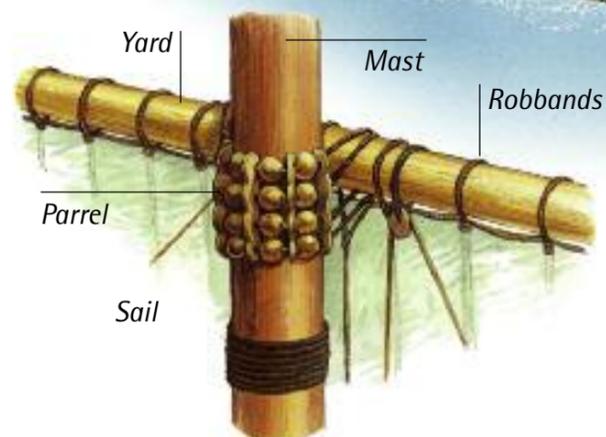


The sails, together with the ropes used to control them, are called the rigging. A sail is attached to the mast on a horizontal yard, held in place by lifts. It is hoisted into position by the halyards. Clewlines bunch the sail up against the yard when it is furled. Men climb up and down the rigging on rope ladders, called

To change direction, adjust the angle of the square sails and unfurl the lateen sail to catch the wind, so the ship swings round.

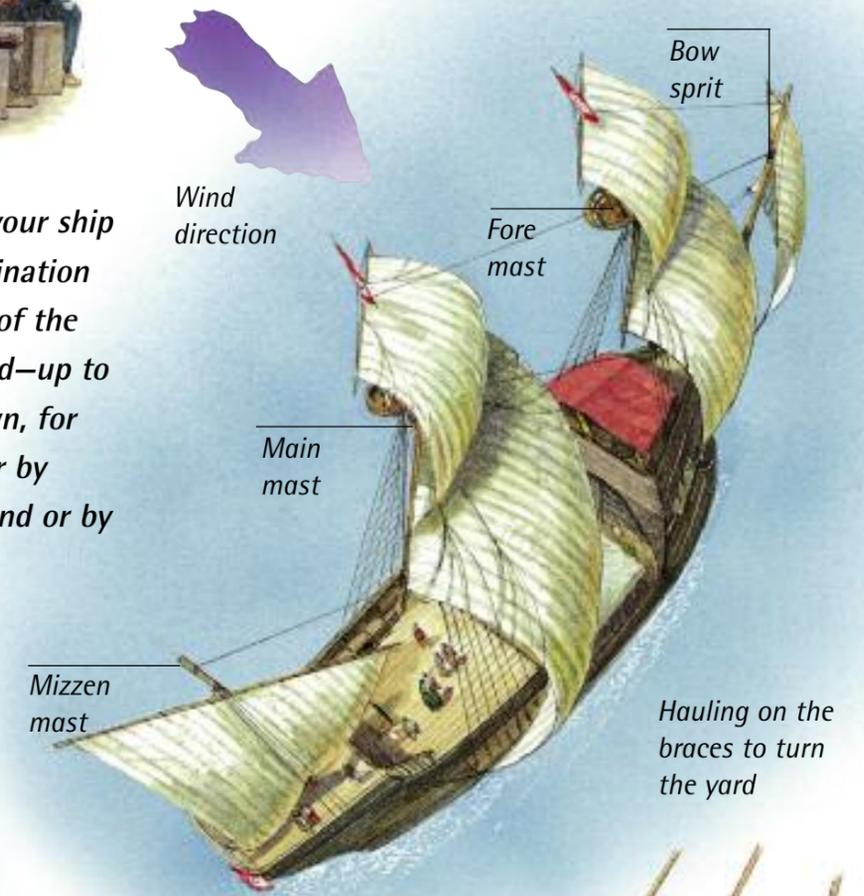


With the sails at an even sharper angle to the wind, the ship is able to make a tight turn.

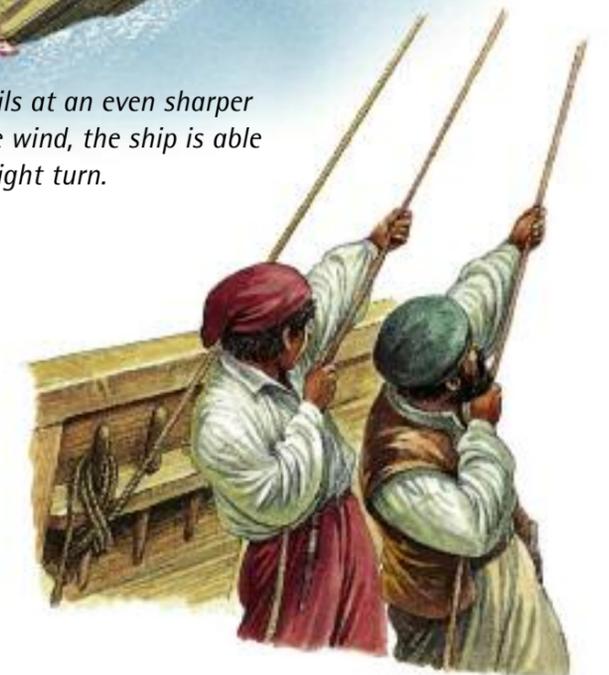


Wind provides the power to move your ship forwards. Steering requires a combination of adjustments to the sail and use of the rudder. Speed can also be controlled—up to a point—by use of sail. To slow down, for instance, reduce the sail area either by turning the yards parallel to the wind or by shortening (furling) sail.

Your ship is steered by the helmsman using a long handle, called a whipstaff. This is attached to the rudder at the back of the ship through a series of linked wooden rods. The helmsman stands on a platform below deck with a view of the sails through a hole in the ceiling. He receives instructions from the pilot.

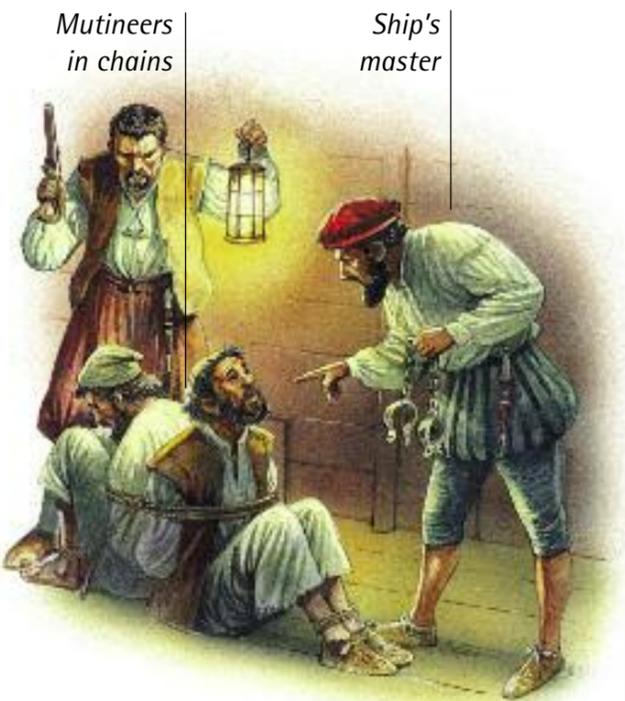


Braces—ropes attached to the end of the yards—are used to swing the yards around. To make full use of the wind, brace the yards at right angles to the wind direction so that the sails are filled. If you don't need the power of the wind because you want to slow down or maintain position, brace the sails parallel to the wind direction.

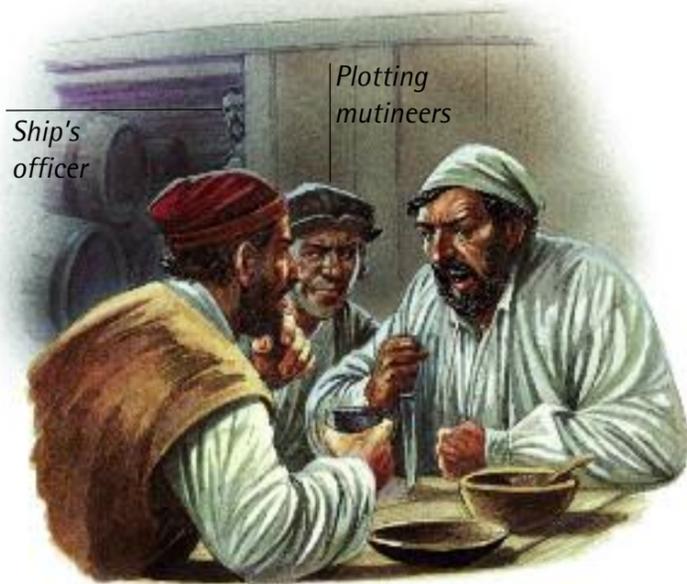


Mutineers and privateers

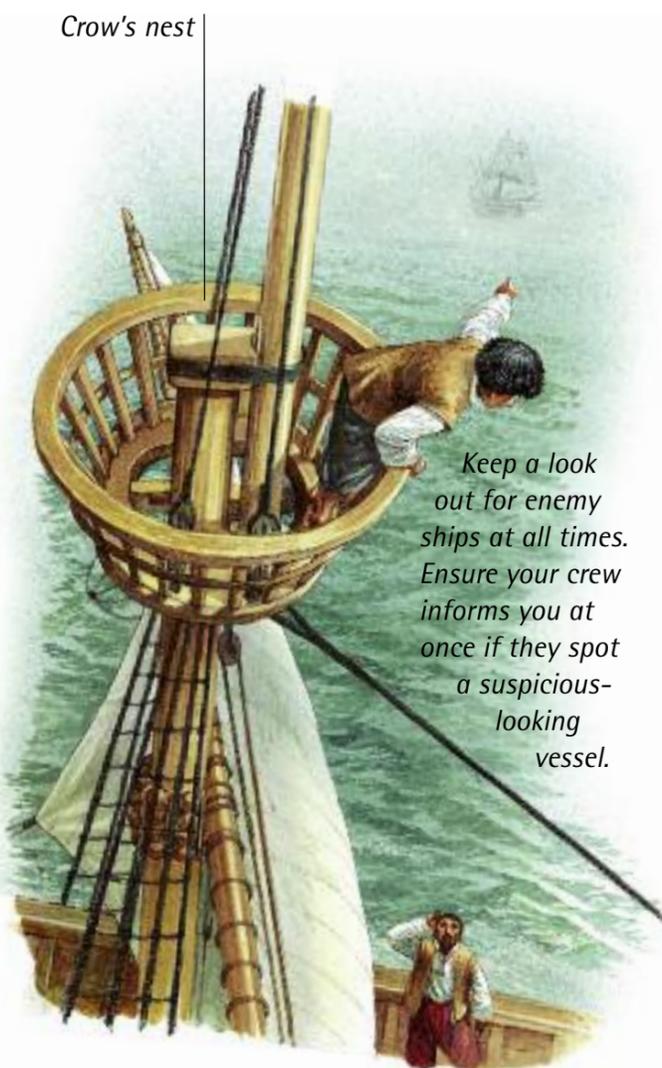
With so many people on board, it is vital you keep strict discipline among your men and punish any wrongdoing swiftly and fairly. Work closely with the captain of the soldiers to ensure he too keeps his men under strict control. Be aware that you also face the possibility of trouble from outside your ship. The risk of attack from pirates and privateers is a constant danger.



At the first sign of trouble, have your master arrest the ringleaders and lock them in the hold, away from the rest of the crew. Down here they can't spread their discontent to others, and will have a chance to cool down. You can then decide whether to flog them and return them to their duties, or have them officially charged once you reach port.

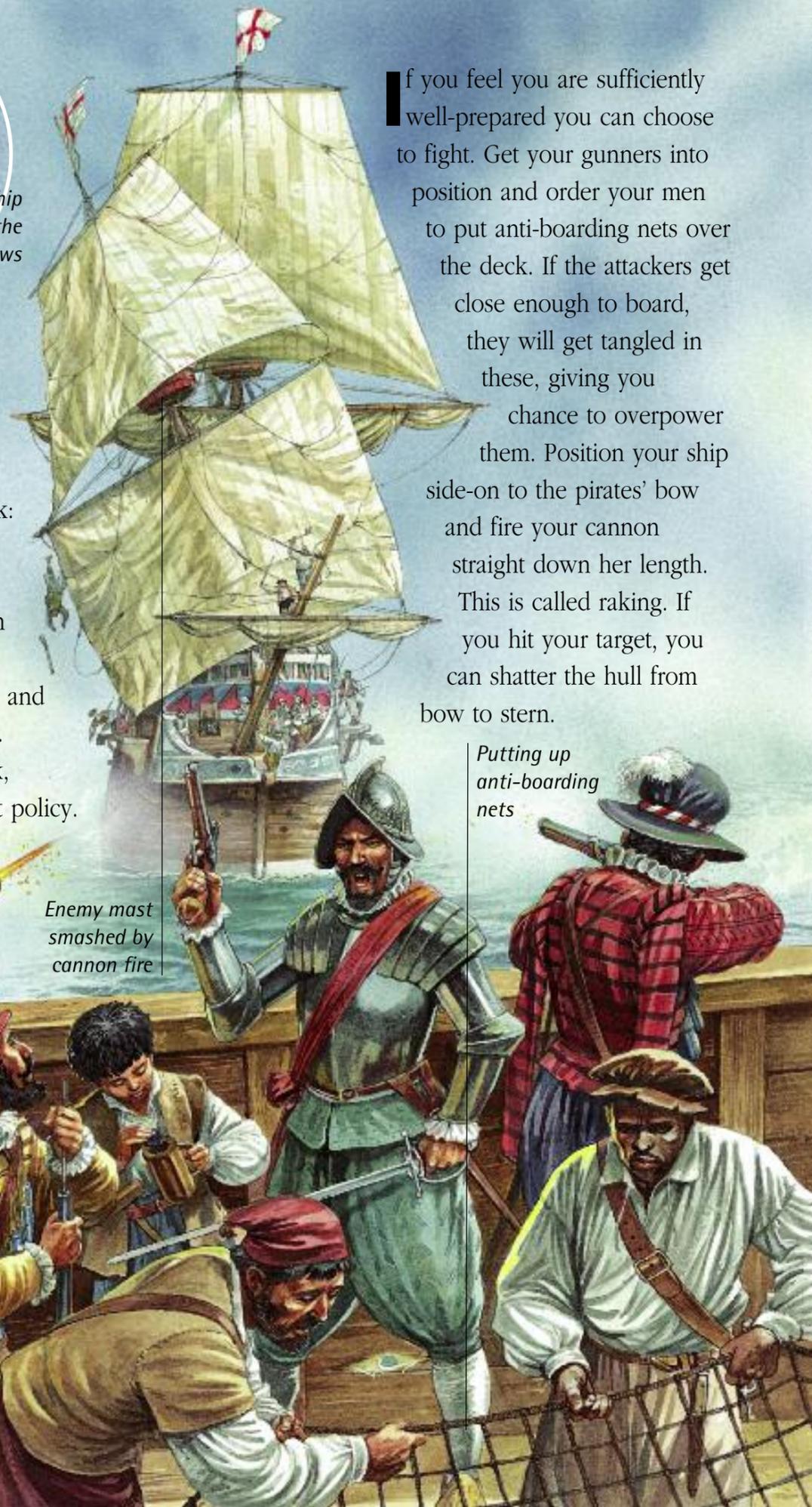


Have trusted officers keep an eye on the men's mood. Sailors often grumble about their harsh life, but if their grumbling becomes mutinous, you should act at once.



Raking is one attacking technique to use against an enemy you can't outrun, but you think you can out-fire.

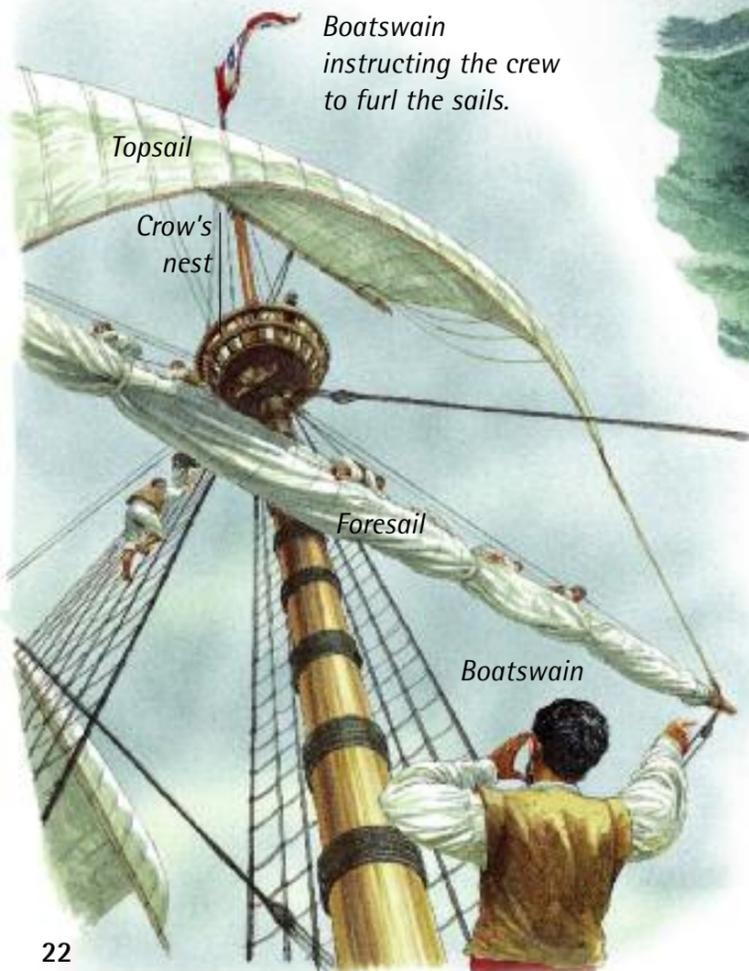
You have three choices when faced with attack: you can flee (but a fast pirate ship would almost certainly catch up); you can surrender, and hope your enemy will spare your ship and your lives; or you can fight. Against a determined attack, surrender is often your best policy.



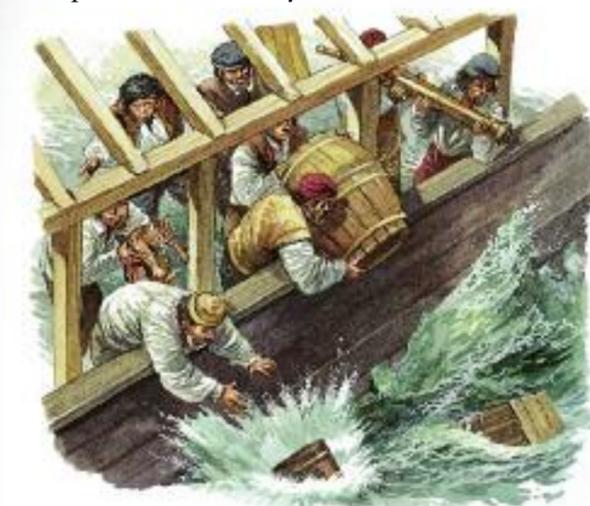
If you feel you are sufficiently well-prepared you can choose to fight. Get your gunners into position and order your men to put anti-boarding nets over the deck. If the attackers get close enough to board, they will get tangled in these, giving you a chance to overpower them. Position your ship side-on to the pirates' bow and fire your cannon straight down her length. This is called raking. If you hit your target, you can shatter the hull from bow to stern.

Storms and shipwrecks

Storms and bad weather are a risk on any voyage, but the seas around the southern coast of Africa are particularly rough, especially at certain times of year. If you time your arrival in these waters well, you should avoid the worst storms, but even so you must be prepared for any eventuality. Make sure your crew are well drilled so that they can man the sails quickly if necessary. Your lookout should warn you immediately if he sees bad weather approaching.



If you find yourself caught in a bad storm, there are several measures you should take to prevent a shipwreck. Douse all open fires on board to ensure fire does not break out. Keep the bilges pumped out around the clock so that any water getting into the ship is continuously removed.



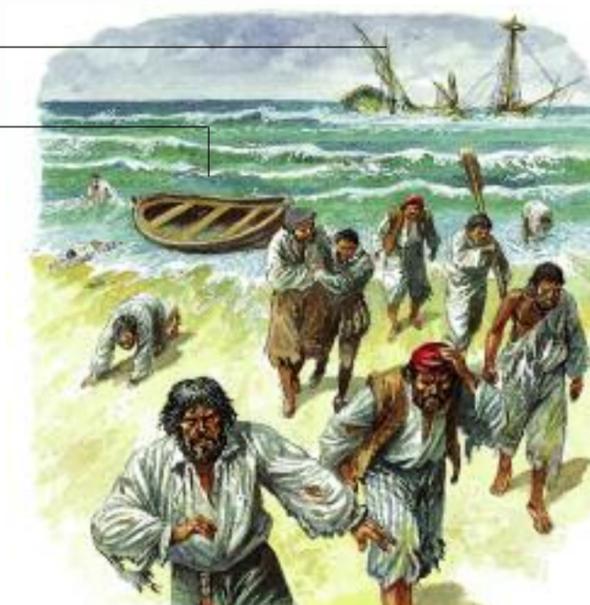
As a final resort, if the ship is in danger of sinking you must issue orders to passengers and crew to throw overboard any unnecessary weight. This may mean sacrificing cannon, ammunition, food stores, and even, on the return voyage, precious cargo.

Sinking ship

Launch

At the first sign of bad weather, instruct your boatswain to trim the sails. You need to furl most of the sails in, so that the ship is not flung in all directions by the wind, and the sails are not ripped apart by the gales. However, you need to leave some sail up, so that you still have control. If you have no sail at all, your ship will be tossed like a empty box on the sea.

Should you be unfortunate enough to have to abandon ship, try to get as many people off the vessel as possible using the launch. If you are close to shore, the launch can make several trips between ship and land. Collect as much in the way of food and supplies washed ashore from the wreck as you can. Don't stay on the beach. Organize your people to march inland in search of human settlement.

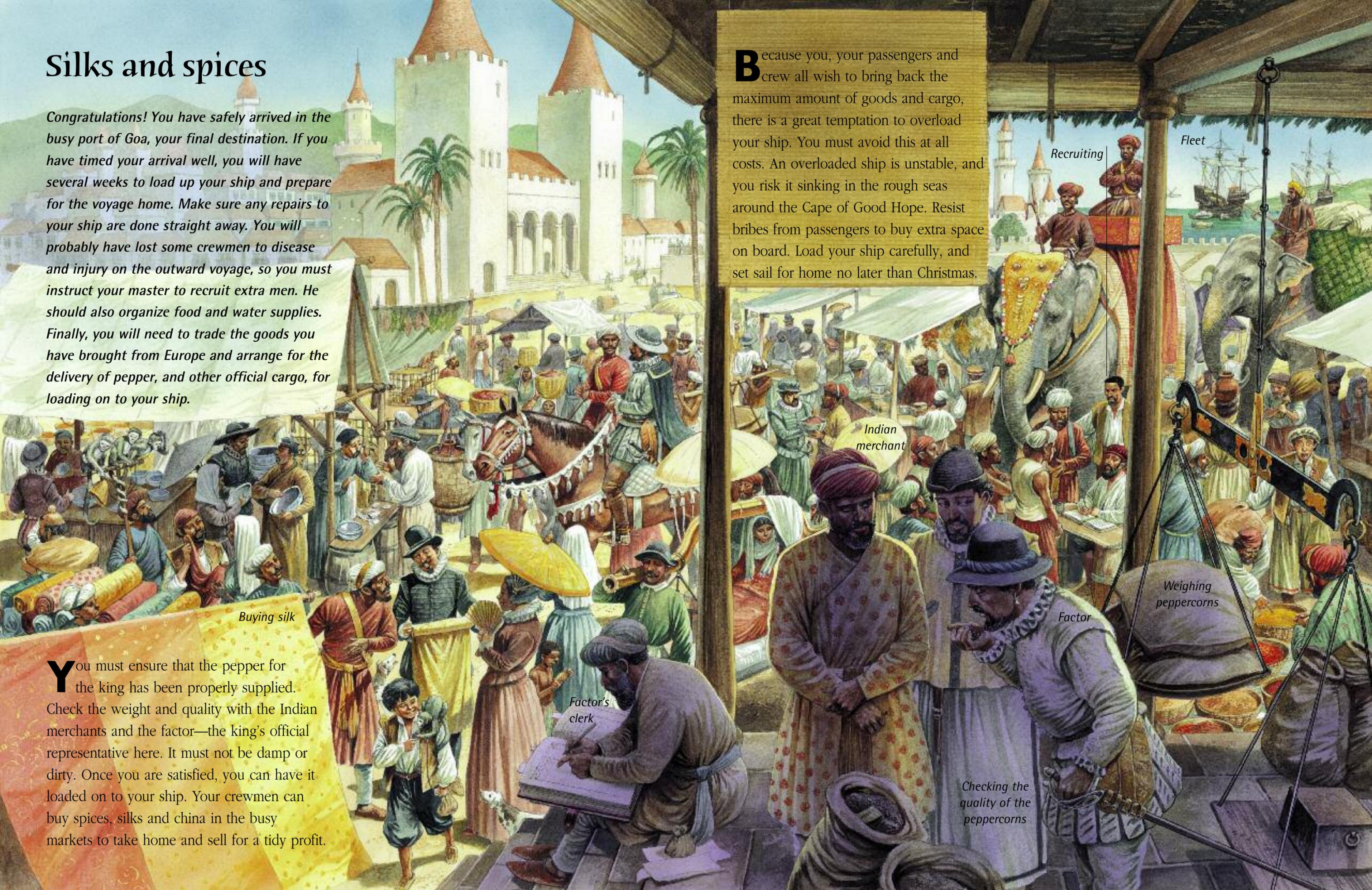


Silks and spices

Congratulations! You have safely arrived in the busy port of Goa, your final destination. If you have timed your arrival well, you will have several weeks to load up your ship and prepare for the voyage home. Make sure any repairs to your ship are done straight away. You will probably have lost some crewmen to disease and injury on the outward voyage, so you must instruct your master to recruit extra men. He should also organize food and water supplies. Finally, you will need to trade the goods you have brought from Europe and arrange for the delivery of pepper, and other official cargo, for loading on to your ship.

You must ensure that the pepper for the king has been properly supplied. Check the weight and quality with the Indian merchants and the factor—the king's official representative here. It must not be damp or dirty. Once you are satisfied, you can have it loaded on to your ship. Your crewmen can buy spices, silks and china in the busy markets to take home and sell for a tidy profit.

Because you, your passengers and crew all wish to bring back the maximum amount of goods and cargo, there is a great temptation to overload your ship. You must avoid this at all costs. An overloaded ship is unstable, and you risk it sinking in the rough seas around the Cape of Good Hope. Resist bribes from passengers to buy extra space on board. Load your ship carefully, and set sail for home no later than Christmas.



Buying silk

Factor's clerk

Indian merchant

Factor

Weighing peppercorns

Checking the quality of the peppercorns

Recruiting

Fleet

Timeline

In the 15th century Portugal was the first European country to send out voyages to explore the world beyond Europe. With the support of a member of its royal family, Prince Henry—known as the Navigator—Portugal enjoyed great success in its discoveries in North and West Africa. So when the Silk Road, the overland trade route running between Asia to Europe, was closed by Muslim rulers in the mid-1400s, Portugal set out to find a sea route to the East around the tip of Africa instead.

In 1487 Bartholomeu Dias was the first European to sail round the Cape of Good Hope. Ten years later, Vasco da Gama discovered a route around Africa, across the Indian Ocean to India. Portugal lost no time establishing colonies in India and from here, opened up trade with Southeast Asia, China and Japan. Trade in spices in particular brought great wealth and power to Portugal, who controlled the sea route from Lisbon to India for most of the 16th century.

1394

Henry the Navigator, son of King Juan I of Portugal, is born.

1415

Portugal conquers Ceuta on the north coast of Africa (Morocco), an important centre of the spice trade.



Vasco da Gama

1419

Madeira Islands discovered by Portuguese explorers Zarco and Tristão Vaz Teixeira.

1432

Portuguese navigator Diogo Silves discovers the Azores in the North Atlantic.

1434

Portuguese exploration of the west coast of Africa begins.

1450

Prince Henry the Navigator establishes a naval school for teaching navigation, map reading and cartography.

1453

The Turks overrun Constantinople, shutting off the overland trade routes from Asia to Europe.

1487

Bartholomeu Dias leads a Portuguese expedition around the Cape of Good Hope.

1492

Christopher Columbus, sailing on behalf of Spain, discovers the New World.

Columbus's ships sail across the Atlantic Ocean.



On board Magellan's ship

1494

Spain and Portugal sign the Treaty of Tordesillas, dividing any new land discoveries between them. Spain is entitled to any land to the west of a line drawn from north to south down the middle of the Atlantic Ocean, while Portugal may claim all new lands discovered to the east of this line.

1497–8

Vasco da Gama rounds the Cape of Good Hope and reaches India, opening up a major trade route to the East.

1500

Spanish explorer Pedro Alvares Cabral discovers Brazil.

1502

Amerigo Vespucci, an Italian who sailed on behalf of Portugal, returns from the New World. The Americas are named after him.

1511

Portugal takes control of the Spice Islands (Maluku) in Indonesia.

1519

Ferdinand Magellan leads the first voyage around the world for Spain.

1521

Hernando Cortés defeats the Aztec Empire in Mexico for Spain.

1530

Portugal sets up colonies in Brazil.

1533

Francisco Pizarro defeats the Inca Empire in South America for Spain.

1542

Portuguese sailors are the first Europeans to land in Japan.

1580

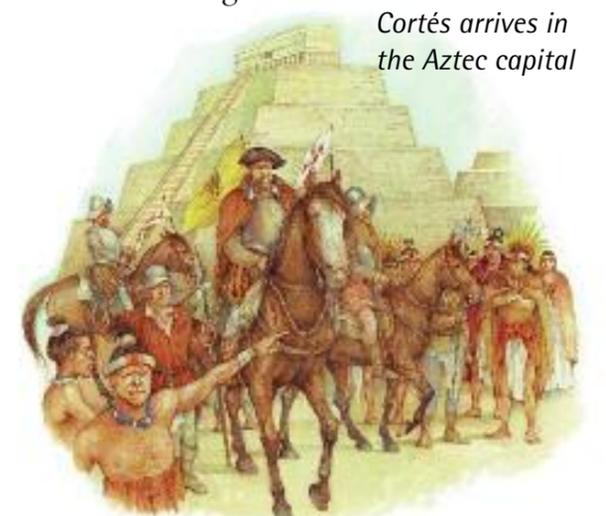
Phillip II of Spain defeats Portugal at the Battle of Alcantara, uniting the two countries. Despite this, Portugal remains relatively independent, and trade with India continues as normal.

1599

Holland establishes first Dutch trading posts in the Spice Islands.

1600s

Holland gradually wrests control of the spice trade from Portugal.



Cortés arrives in the Aztec capital

Glossary

Aft Towards the rear of the ship.

Astrolabe A navigational instrument that measures the height of the sun and stars and aids calculation of latitude.

Ballast Any heavy material, such as stones, placed low in a vessel to increase stability.

Bilges The lowest part of a ship where any water in the hull collects. The bilges need to be pumped free of water at intervals.

Carrack Large, square-rigged ship with two to four masts, called a nau in Portugal.

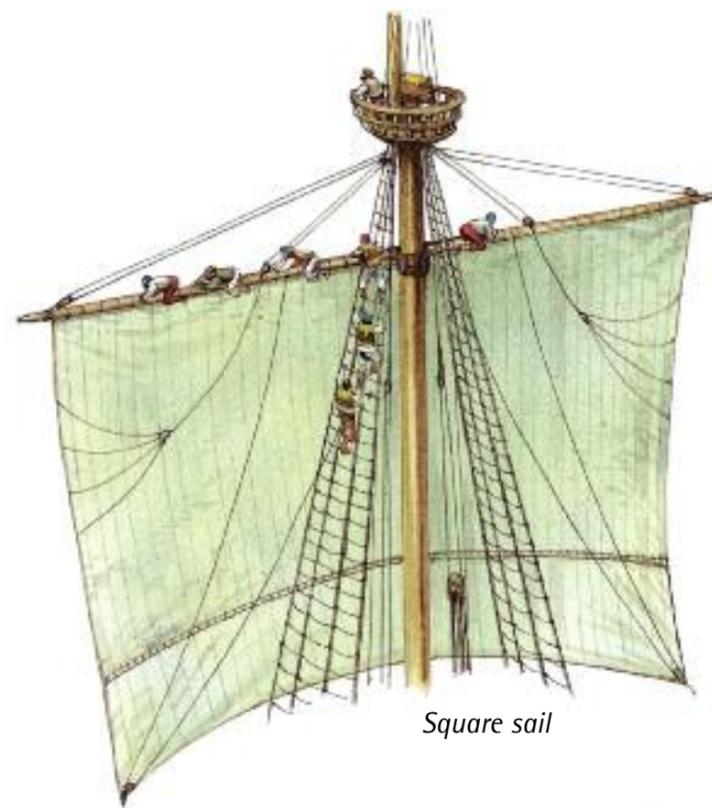
Compass A magnetic pointer device used in navigation that always points north.

Cross-staff An instrument for measuring the altitude of the sun or stars. It consists of a shaft and a sliding cross-piece.

Equator An imaginary circle around the Earth halfway between the poles.



A band of privateers



Square sail

Fore Towards the front of a ship.

Lateen A triangular **sail** set at an angle to a short **mast**.

Latitude The distance north or south of the **Equator**. The Equator has a latitude of zero degrees. The North Pole has a latitude of 90 degrees north; the South Pole has a latitude of 90 degrees south.

Lead line A rope, with length markings, attached to a lead weight used to find depth of water.

Log and reel A device for measuring a ship's speed. A piece of wood attached to a line with equally spaced knots tied in it is dropped into the water. The number of knots that reel out in a specified time determine the ship's speed.

Longitude The distance east or west of a particular location from a north-south line that passes through Greenwich, England. Greenwich has a longitude of zero degrees.

Mast A vertical pole, usually made of wood or metal, that supports **yards** and **sails**.

Nau *see* carrack.

Navigation Plotting or directing the course of a vessel. Determining a vessel's position using navigational instruments such as a **compass**, **cross-staff** and **astrolabe**.

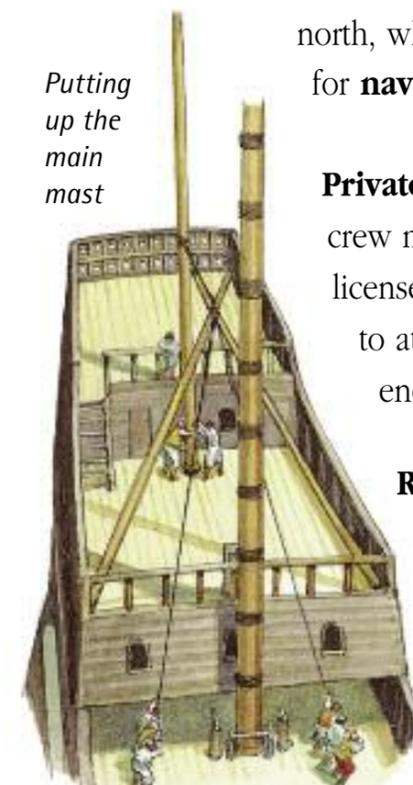
New World Another name for the Americas.

Parrel A swivel device that attaches a **yard** on to a **mast**.

Pilot A person who navigates a vessel.

Pole Star A star that is located almost due north, which makes it useful for **navigation**.

Putting up the main mast



Privateer A ship and its crew members that are licensed by one country to attack ships from an enemy country.

Rudder A device mounted near the stern of a vessel to control direction.



Sand-glass

Sail An assemblage of cloth cut to various sizes and shapes (i.e., square and triangular), and designed to catch the wind and use its force to propel a vessel.

Sand-glass A device for measuring time. Two glass globes are connected by a narrow neck. Sand empties from the top globe into the bottom one in a specific period of time.

Scurvy A disease caused by a lack of vitamin C which is found mainly in fresh fruit and vegetables. Many sailors on long trips developed scurvy, as they did not have access to fresh food.

Silk Road Overland trading routes between Asia and Europe.

Trade winds Strong easterly winds that blow from the northeast in the Northern Hemisphere and from the southeast in the Southern Hemisphere.

Whipstaff A vertical pole linked to the **rudder** and used to steer the ship.

Yard The pole on a mast that carries a sail.

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