The Anatomy of a Cruise Ship

Join Me on a Journey of Discovery

With
(Rear Admiral Retired)
Simon Hardern

Built with Passion Delivered with Pride

A Lady of Wondrous Beauty

SILVERSEA®

Silver Nova, the latest Nova Class ship, was designed and built at Meyer Werft in Papenburg, Germany

A Partnership of Excellence

Decades of collaboration between Silversea and Meyer Werft bring visionary design, precision engineering and unmatched craftsmanship to life

3,000+
Shipyard Experts

18 Months
Construction Time

2.5 Million
Man-Hours

Built to the Highest Quality Standards

Delivered Summer 2023

- **On Time**
  Delivered as promised
- **On Budget**
  Financial discipline from start to finish
- **To Specification**
  Exceeding expectations in every detail

Nova Class Innovation

Silver Nova represents a new era of sustainable luxury, advanced technology and guest comfort

Sustainable by Design

Built with a focus on environmental responsibility and a cleaner future at sea

Built to Inspire

Every detail crafted to create unforgettable experiences

The World's Major Cruise Ship Builders

Fincantieri
Italy

- Europe's largest cruise shipbuilder
- Multiple yards across Italy
- Builds for: Carnival, Princess, Norwegian, MSC
- Known for high volume and advanced technologies (LNG, mega-ships)

Meyer Group
Germany & Finland

- Meyer Werft (Germany) & Meyer Turku (Finland)
- Builds some of the world's largest cruise ships
- Key clients: Royal Caribbean, Disney, TUI
- Over 55 cruise ships delivered in recent decades

Chantiers de l'Atlantique
France

- Located in Saint-Nazaire
- One of the largest shipyards in the world
- Builds for: MSC Cruises, Royal Caribbean
- Known for engineering innovation and very large vessels

Other European Builders (Niche)

Neptun Werft (Germany)
River ships / modules

Brodosplit (Croatia)
Expedition / niche vessels

Vard (Norway)
Expedition cruise ships

Typical Current Construction Costs

New Ship Purchase Mechanism

Shipowner Equity

20%–40%
Owner's Investment

Export Credit Agency

Guarantees | Support | Facilitation

Bank Syndicate Loans

- Long-term Financing
- Syndicated Structure
- Secure Funding

Tax & Structure

Tax Efficiency | Optimized Structure | Regulatory Compliance

Eco-Incentives & Sustainability

Green Incentives | Sustainable Growth

Payment Milestones

Contract → Keel Laying → Float-Out → Delivery

Stage Payments & Refund Guarantees

Staying Ship Shape – Dry Dock Period

Mandated Every 4–5 Years for between 10–14 Days and up to 4 Weeks

Thousands of contractors onboard. It becomes a non-floating construction site

What Happens Below the Waterline

- Hull inspected for cracks and corrosion
- Bow thruster tunnels examined
- Sea valves and shell doors checked
- Marine growth removed
- Fresh anti-fouling paint applied (and hull painted)

Engineering Overhaul

- Thrusters/Azipods serviced
- Shaft seals replaced
- Scrubbers and exhaust systems inspected
- Machinery opened-up and tested

The Importance of the Port of Registry

Ranked by Gross Tonnage (GT)

Rank	Flag State	No. of Vessels	Gross Tonnage (GT)	Market Share (%)
1	Liberia	5,052	271 million	16.4
2	Panama	4,900	244 million	14.6
3	Marshall Islands	4,500	186 million	11.2
4	Hong Kong (China)	2,600	130 million	7.9
5	Singapore	2,400	120 million	7.2
6	Malta	2,200	110 million	6.6
7	China	2,000	100 million	6.0
8	**Bahamas**	**1,800**	**95 million**	**5.7**
9	Greece	1,600	88 million	5.3
10	Cyprus	1,200	65 million	3.9

The Bahamas ranks 8th globally - a significant open registry, particularly for cruise ships and yachts

Safety
- Compliance with SOLAS, MARPOL and STCW
- Load and Stability Rules
Inspections and Surveys

Crew
- MLC
- Certification and Manpower
- Working Conditions

Environment
- Emissions and Fuel Rules
- Waste Management
- Ballast Water Controls

Law
- Legal Jurisdiction at Sea
- Accidents and Investigations
- Certificates and Compliance

Our ship's Port of Registry is Nassau (The Bahamas)

In sum, the Flag State controls and closely regulates the Ship wherever it sails

Regulations to Live By - Designed to Keep Us All Safe, Secure and Happy

SOLAS

International Convention for the Safety of Life at Sea

Keeps the Ship Afloat!

STCW

Standards of Training, Certification and Watchkeeping

Keeps the Crew Competent!

MLC

Maritime Labour Convention

Ensures the Crew is Treated Properly

MARPOL

International Convention for the Prevention of Pollution from Ships

Keeps the Sea Safe!

- No Oil
- No Trash
- No Sewage

Typical Pay by Trade and Branch - The Basics

In Summary

It's hard to give precise averages because pay depends a lot on the cruise line, the size of the ship, the worker's nationality, contract length and role

Tips Matter

For many service roles (waiters, bartenders, cabin stewards), a significant portion of income comes from tips or gratuities

Contract Length

Many cruise staff are on fixed contracts (eg, 4-10 months) rather than year-round work. They only get paid when they work

Tax Status

Depending on the flag of the ship, the crew's nationality and where they contract from, tax obligations may vary

My Interpretation

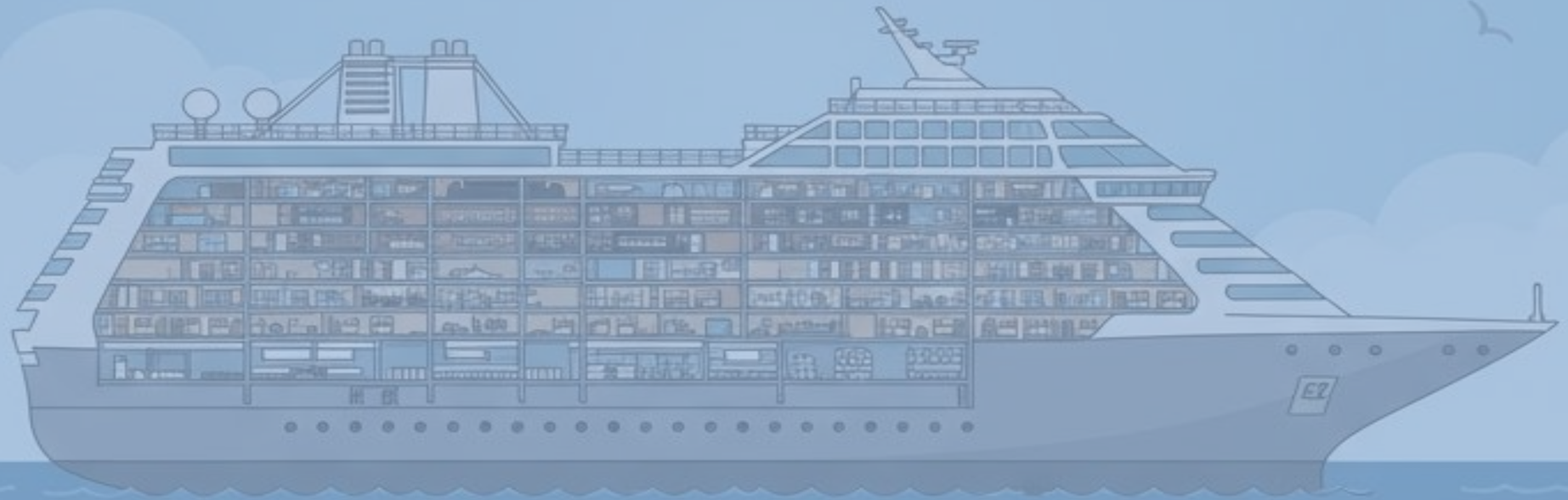
Entry-level hospitality (eg, housekeeping) tends to be on the lower end of pay, but the free/cheap room and board/meals can make it more attractive than comparable land jobs in some places. Technical and officer roles (engineering, navigation) are where pay jumps significantly, especially for senior/experienced crew.

Entertainment and guest-facing roles can make more, especially when performance or leadership (cruise director) is involved, but pay is variable. Medical and highly specialised roles (engineers, captains) are among the highest paid on board

Typical Pay by Trade and Branch – Scores on the Door

Department / Branch	Role Examples	Typical Monthly Pay (USD)
Culinary / Kitchen	Executive Chef, Chef de Partie, Assistant cook	Executive Chef: $5,000–$8,000; Chef de Partie: $2,000–$3,500; Assistant cook: $1,200–$1,800
Deck / Navigation	Captain, Staff Captain, 3rd Officer, Able Seaman, Ordinary Seaman	Captain: $10,000–$15,000+; Staff Captain: $7,000–$10,000; 3rd Officer: $2,800–$4,000; AB: $1,300–$2,000; OS: $900–$1,400
Engineering / Technical	Chief Engineer, 3rd Engineer, HVAC Technician, Wiper/Oiler	Chief Engineer: $8,000–$12,000+; 3rd Engineer: $3,000–$4,500; HVAC Technician: $1,800–$2,800; Wiper/Oiler: $900–$1,500
Entertainment	Cruise Director, Entertainment staff	Cruise Director: $4,000–$7,000; Entertainment staff: $2,500–$5,000
Food & Beverage / Service	Bartenders, Waiters, Restaurant staff	Bartenders: $1,500–$3,000 + tips; Waiters: $1,200–$2,200 + tips
Hotel / Hospitality	Cabin steward, housekeeping, laundry	$1,000–$1,500
Medical	Ship's Doctor, Nurse	Ship's Doctor: $6,000–$10,000+; Nurse: $3,000–$4,500
Security	Security guards / officers	$1,300–$2,200

The Anatomy of a Cruise Ship



Some Definitions and Explanations of the Softer Issues

The International Maritime Organisation (IMO) Number

Unique ID Number
7 digits assigned by the IMO
Silver Nova
IMO Number is 9886213

Permanent Identifier
Never changes throughout life of a vessel even if there is an ownership, name or flag change

Tracking and Safety
Supports port inspections, regulatory compliance and Record of ship history. All passenger ships and all ships/boats over 100 tons must have one

History
Based originally around numbers assigned by the Lloyds of London Shipping Registry from 1970. Was formally agreed and introduced in 1987

Are We on an Ocean or Sea

In Simple Terms - An Analogy

Ocean = the entire global library of water
Sea = a specialised section within that library

Ocean

- Vast, deep, and continuous body of saltwater
- Five main ones: Pacific, Atlantic, Indian and Southern, Arctic
- Covers about 71% of Earth
- Has no clear boundaries except continental landmasses
- Much deeper than seas

Sea

- Smaller than an ocean
- Usually partly enclosed by land (eg, Mediterranean, Caribbean, North Sea)
- Can be connected to an ocean, but is more localised
- Often shallower than oceans
- Sometimes still not fully enclosed (eg, the Arabian Sea), but always smaller and regionally defined

For This Cruise

For this cruise, we are sailing on an Ocean (Atlantic)

When is it (Officially) Sunrise and Sunset

In Summary

Sunrise and sunset at sea are among the most striking experiences you can have afloat, and they're shaped by the unique conditions of the open ocean. Sunrise times vary with date, latitude, longitude and local time zone. Calculated using the Admiralty Nautical Almanac/Online

Sunrise

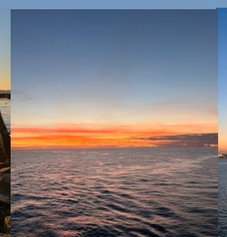
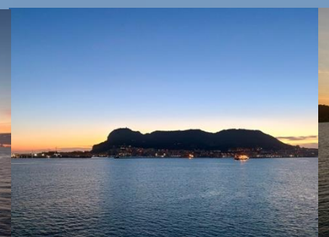
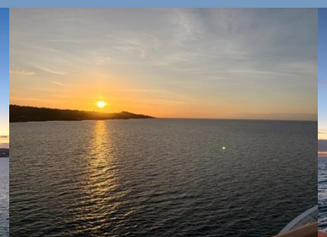
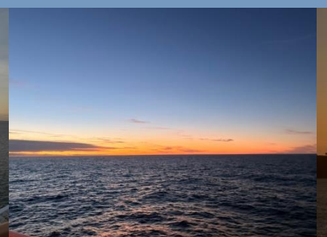
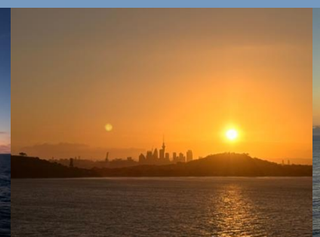
Official sunrise is **the moment the upper edge of the Sun first becomes visible above the horizon**. This is the definition used by meteorological offices, almanacs, and navigation sources

Sunset

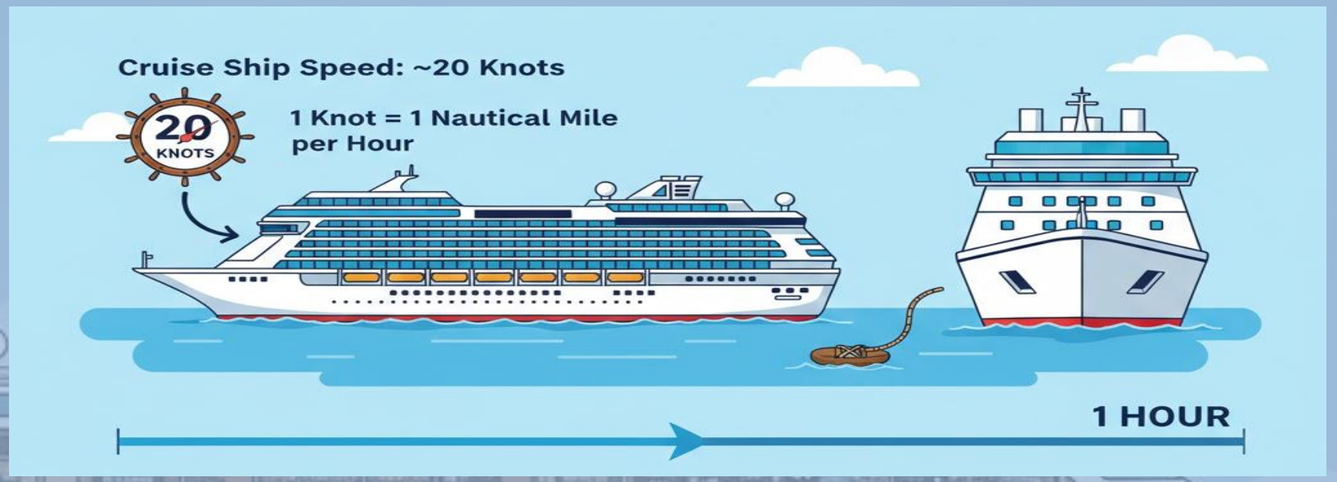
Official sunset is defined as **the moment the upper edge of the Sun's disc disappears below the horizon**. It marks the last visible moment of the Sun, not when the centre sets

Why They Are Special

- 360° view with no land or buildings to interrupt the spectacle
- The ocean surface often acts like a mirror, doubling the colours
- Free from light pollution, offering crisp, natural light transitions

What is a Knot



A Knot

One knot equals one nautical mile per hour, which is 1.15 mph or 1.85 km per hr

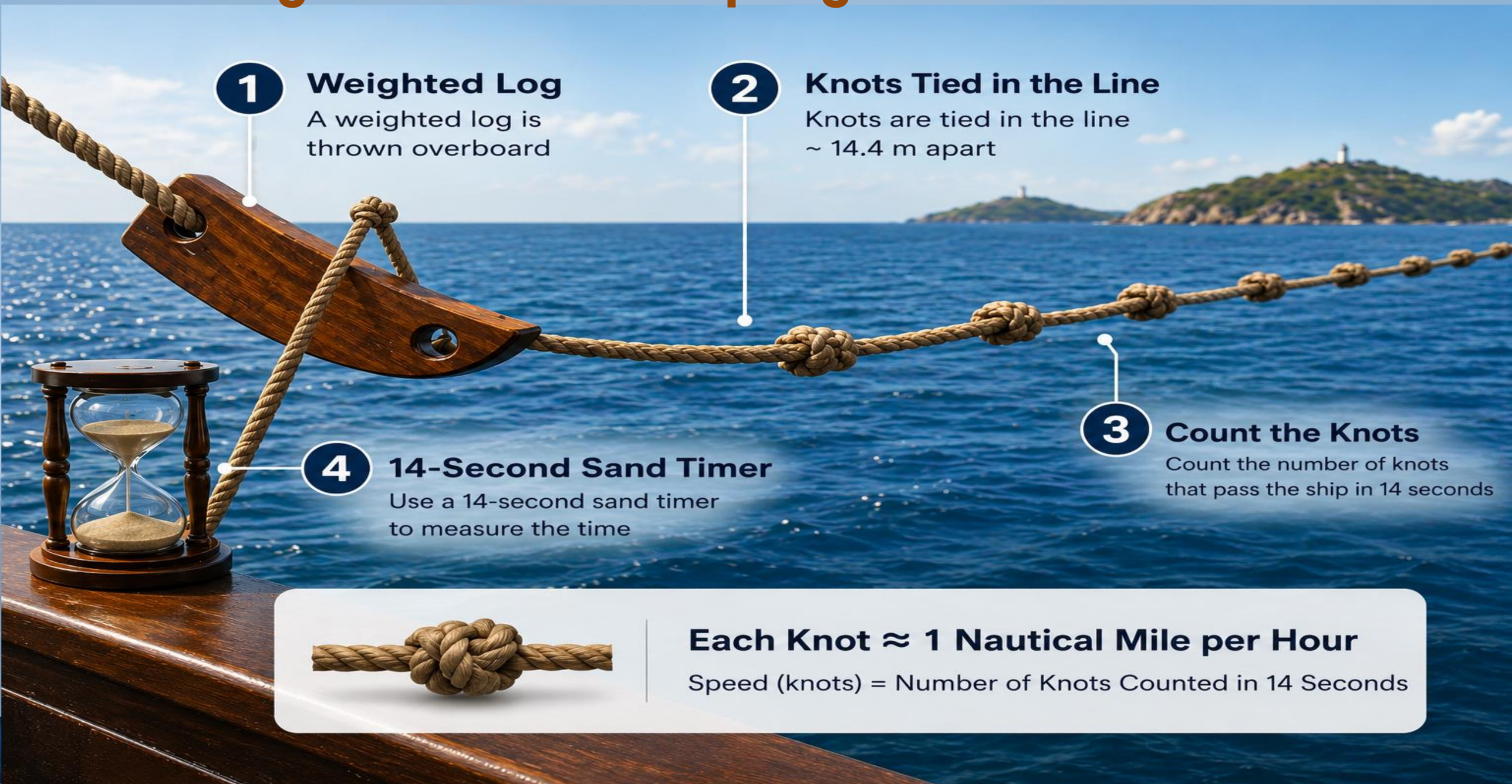
So, if you are traveling at 1 knot, that means you cover 1 nautical mile in 1 hour

Why Use Knots

Nautical miles are based on the Earth's latitude/longitude grid, so they link directly to navigation. Using knots makes chartwork, course plotting and distance calculations much easier

Our cruise ship can go at 20 knots maximum … which is approximately 23 mph

Measuring a Knot with a Chip Log



1 Weighted Log
A weighted log is thrown overboard

2 Knots Tied in the Line
Knots are tied in the line ~ 14.4 m apart

3 Count the Knots
Count the number of knots that pass the ship in 14 seconds

4 14-Second Sand Timer
Use a 14-second sand timer to measure the time

Each Knot ≈ 1 Nautical Mile per Hour

Speed (knots) = Number of Knots Counted in 14 Seconds

How a Ship Measures Speed Today

Speed Through Water

Primary ship handling Reference using ship's log (under hull)

Speed Over the Ground

Uses satellite positioning to calculate speed relative Earth

Shaft RPM and Power

Engineering cross-check with speed estimated from RPM and power

Modern Log Sensor Fitted in the Hull

A modern log sensor is fitted under the water, flush with the hull, to measure the ship's speed through the water

Under the Waterline
Fitted below the waterline and in constant contact with the water

Flush with the Hull
The sensor is mounted flush with the hull for smooth water flow and maximum accuracy

Measures Speed Through Water
Uses Doppler or electromagnetic technology to accurately measure the ship's speed

— 4.0
— 3.5
— 3.0
— 2.5
— 2.0
— 1.5
— 1.0
— 0.5
— 0

SIMRAD

Log Sensor
Fitted under the waterline and flush with the hull

Inside View
The sensor is mounted inside the hull and connected to the ship's navigation system

No Moving Parts Outside the Hull
Nothing protrudes from the hull, reducing wear and maintenance

No Drag
Flush mounting ensures smooth water flow and improved efficiency

Highly Accurate
Provides precise speed data in all conditions

Low Maintenance
Designed for long-term reliability with minimal maintenance

Modern log sensors provide reliable, real-time speed data, essential for safe navigation and fuel efficiency

How do you Measure the Weight of a Ship

Displacement (Actual Weight of the Ship)

Archimedes' principle - weigh the water displaced
In simple terms, it is the ship's weight on a giant scale

Gross Tonnage (GT)

Measurement of the total internal volume of the ship's enclosed spaces. Calculated from the ship's internal cubic metres using a formula defined by the IMO. Used for regulations, fees and port dues

Net Tonnage (NT)

The internal volume that actually carries passengers or cargo. Calculated based on cargo/passenger spaces minus machinery and crew areas. Used for port charges and safety rules for commercial tonnage

Deadweight Tonnage (DWT)

How much the ship can safely carry in weight. Think of it as the difference between the ship floating empty and fully loaded

Displacement

Our cruise ship is about 54,700 tons Displacement - a fully loaded Silver Nova weighs about the same as ~20 Eiffel Towers

Archimedes' Principle
A floating object displaces a volume of water equal in weight to the object's own weight

Volume of Water Displaced = Weight of Ship

The ship pushes aside a volume of water equal to its own weight to stay afloat

More Weight

→ Greater Displacement

→ Deeper Draft

Displacement is the weight of the ship and everything on board
Passengers, crew, fuel, supplies

It is measured in tonnes and represents how much water the ship displaces when floating

What Keeps the Ship Afloat

In Summary

A cruise ship stays afloat thanks to a combination of physics, clever engineering and design principles that harness buoyancy, hull shape, stability and structural strength

Buoyancy

Archimedes Principle. A ship floats because it displaces a volume of water equal to its own weight. **Think of it like a giant metal balloon**

Hull Shape

The broad, rounded hull gives the ship both lift (upward buoyant force) and stability

Stability

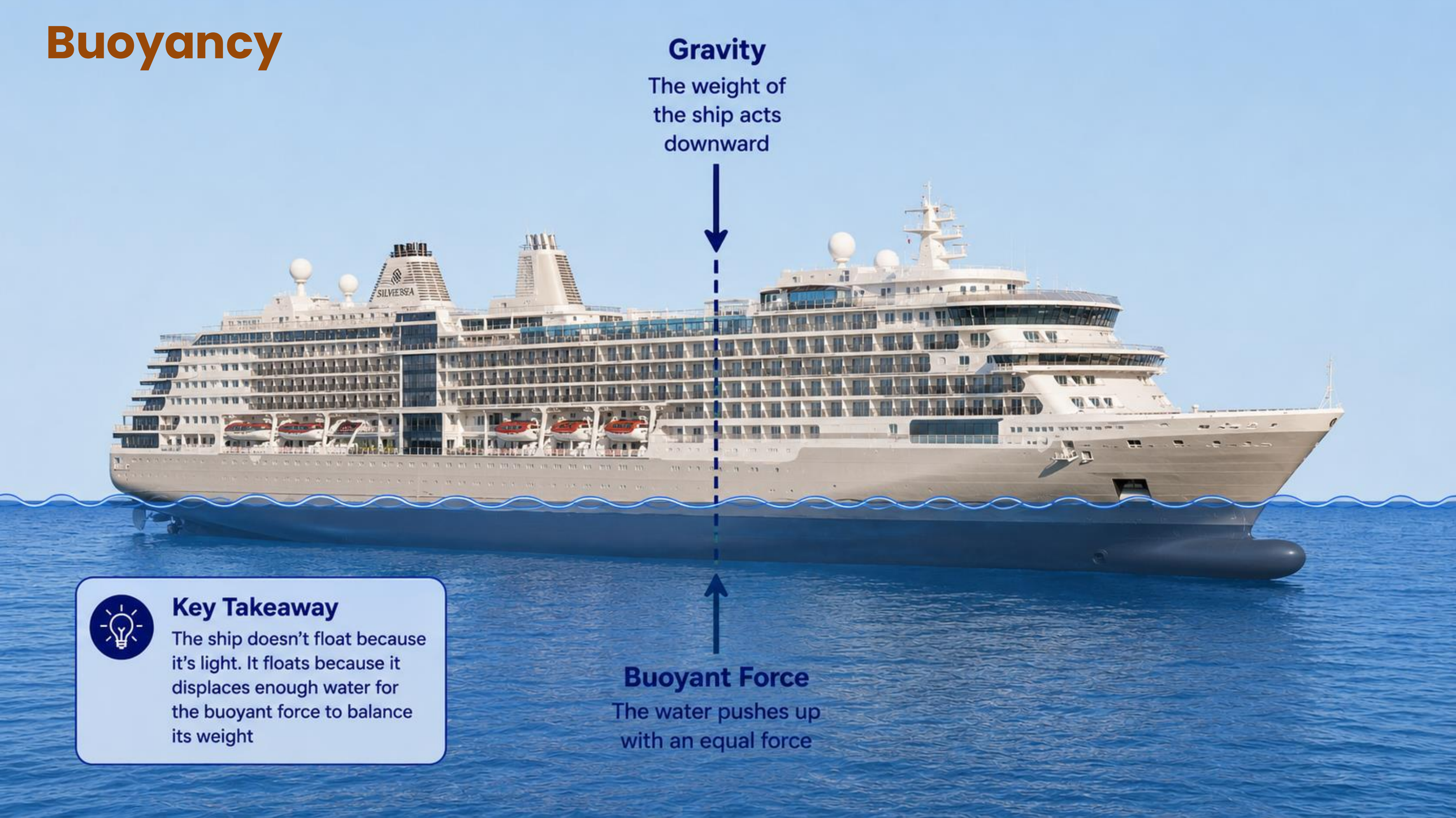
Cruise ships are tall, but remain stable because of a low centre of gravity where heavy machinery (engines, fuel tanks, stabilisers) sit deep in the ship. A wide beam (Width) resists rolling.
Stabiliser Fins act like aircraft wings

Structural Strength

The hull is divided into many compartments.
If one floods, the ship still has enough buoyancy to float. This is essential for survivability even with damage

A cruise ship floats because it:
✓ Displaces enough water to support its weight
✓ Has a wide, buoyant hull filled mostly with air
✓ Keeps heavy items low for stability
✓ Uses stabilisers and engineering features to stay upright
✓ Survives damage using watertight compartments

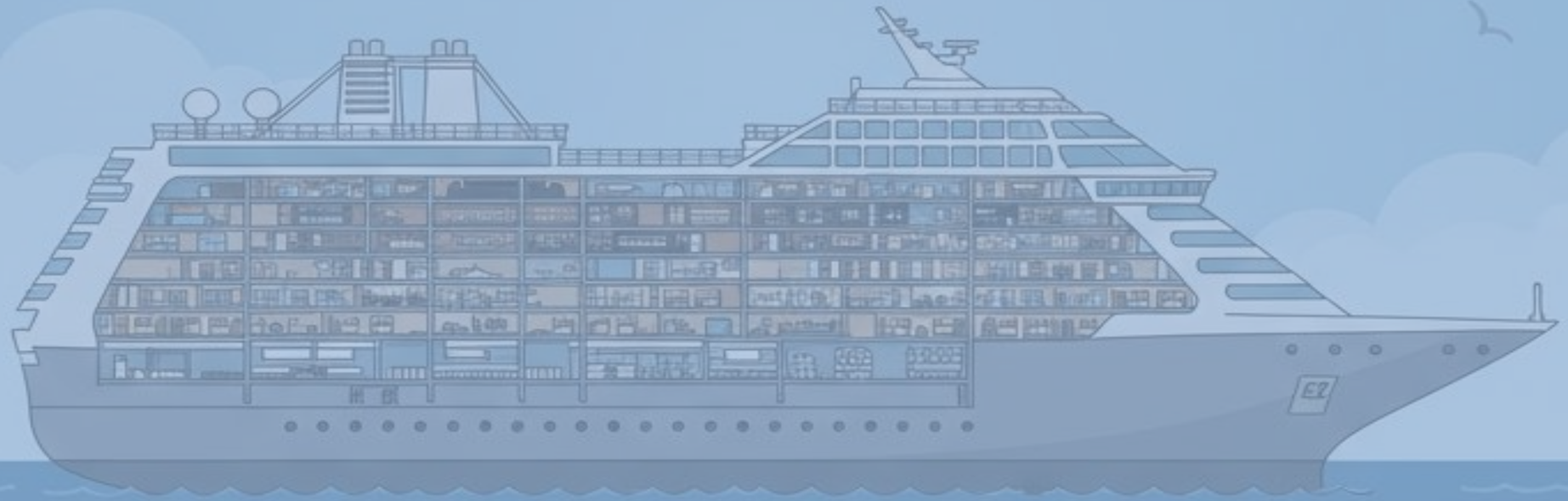
Buoyancy



Key Takeaway

The ship doesn't float because it's light. It floats because it displaces enough water for the buoyant force to balance its weight

The Anatomy of a Cruise Ship



The Things You Can See

Bridge Wings

Enhanced Visibility

Extended platforms for maneuvering visibility

Critical for precise navigation in ports and tight spaces

Used to be open to the elements but now fully enclosed. **Driven by the rapid growth in ship size, more frequent berthing in tight ports, the shift to close-quarters manoeuvring without tugs** and an increased emphasis on pilot–master coordination

Funnel Colours and Logos Define a Cruise Ship Company

RoyalCaribbean INTERNATIONAL

Holland America Line SAVOR THE JOURNEY

Carnival

Costa

VIKING

SILVERSEA

CUNARD

OCEANIA CRUISES

CRYSTAL CRUISES

P&O CRUISES

SEABOURN

AZAMARA CRUISES

NCL NORWEGIAN CRUISE LINE

MSC CRUISES

WINDSTAR CRUISES 180° FROM ORDINARY

AIDA CRUISES

Disney CRUISE LINE

PRINCESS

Regent SEVEN SEAS CRUISES AN UNRIVALED EXPERIENCE

Celebrity X Cruises

MARELLA CRUISES

Our Ship

Funnel Structure

Exhaust Gases
Directs gases away from the ship

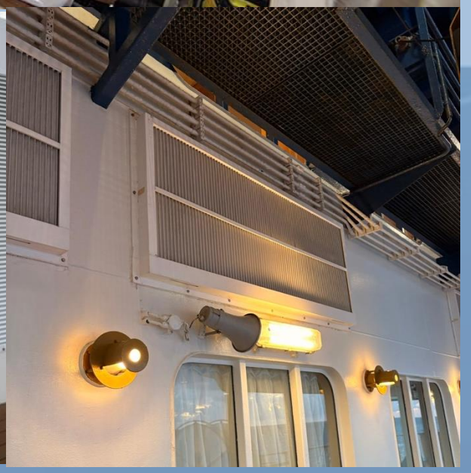
Scrubbers
Reduces emissions of sulfur and pollutants

Engine Noise Control
Reduces engine sound for a more comfortable experience

Heat and Fire Protection
Prevents heat damage and sparks from reaching the ship.

Smoke Deflection
Deflects smoke away from the ship

Ventilation Systems



Fresh Air Circulation

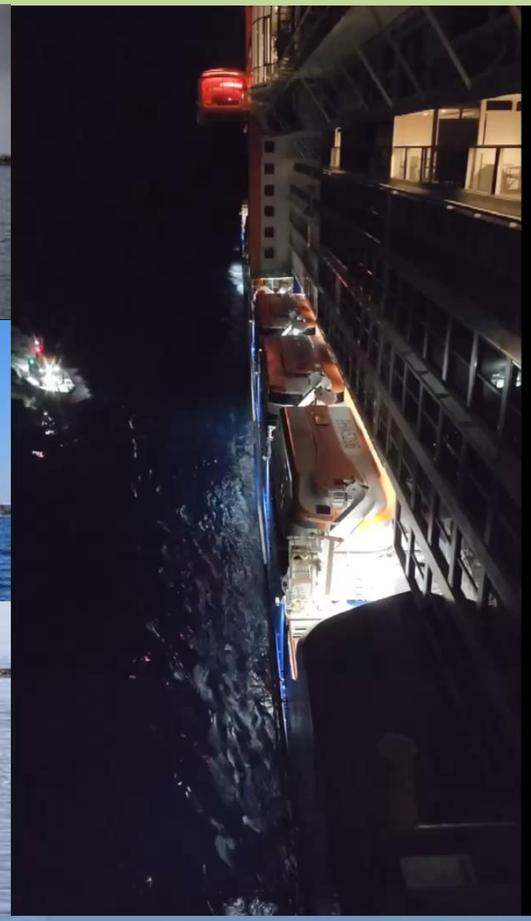
Massive intake systems draw in fresh ocean air

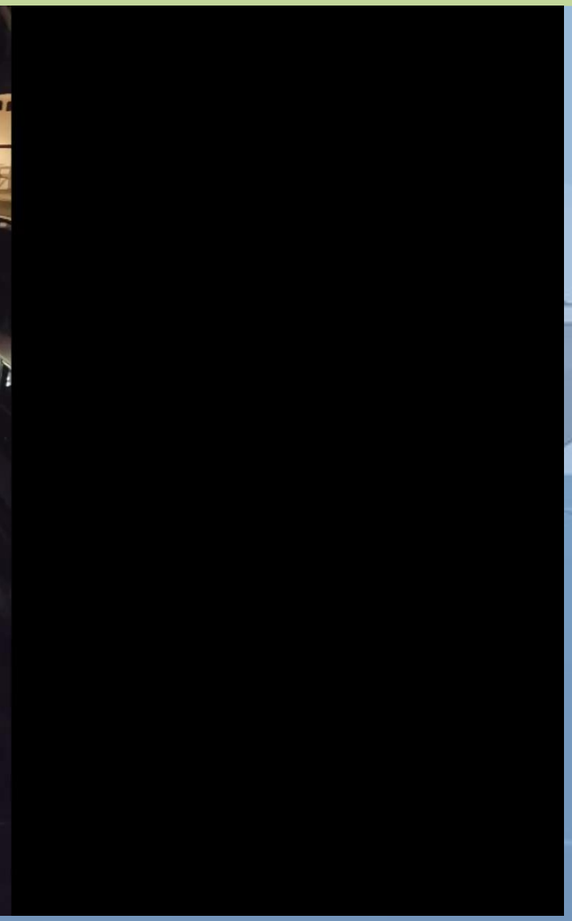
Distributed throughout the ship for passenger comfort

When to Take a Pilot

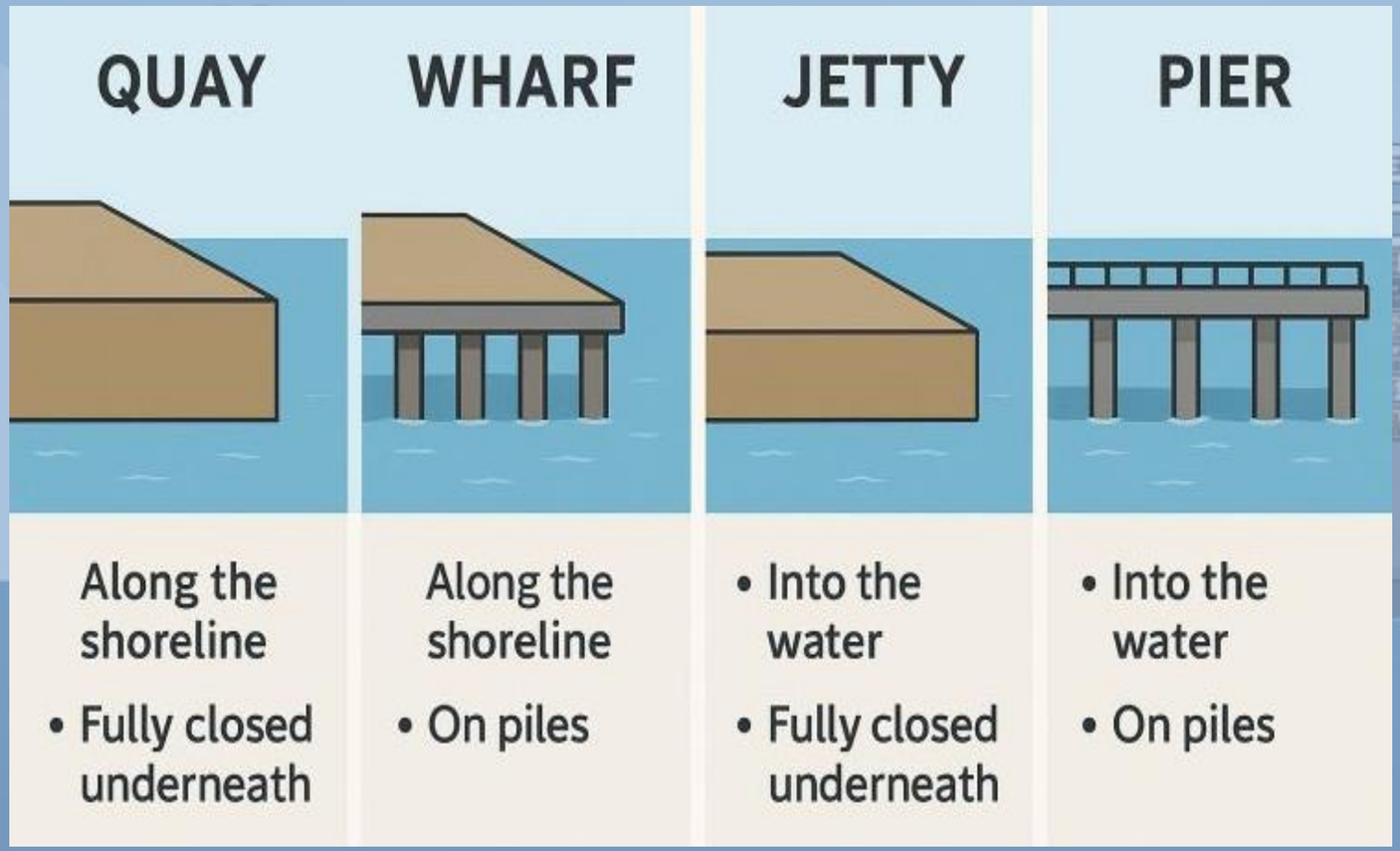
What Is A Pilot

A Harbour pilot is a highly trained mariner who boards ships as they approach or leave a port to guide them safely through local waters. They know every channel, depth, tide, current, shoal, turning point and hazard better than anyone else





Don’t Mix Up Your Piers, Quays and Berths!



Miami/Azores/ Funchal

Speak Fluent Dockside

Harbour - A natural or man-made sheltered area where ships stay safe. It’s the big protected water zone

Port - The commercial area inside the harbour where cargo operations happen. Think cranes, terminals and containers

Quay - A solid dock parallel to the shore. Ships come right next to land to load/unload

Wharf - Like a quay but often on pillars and with open space beneath. Still runs along the shore

Jetty – Built perpendicular to shore to protect from waves—not for docking. Usually made of rock or concrete

Pier - Also perpendicular to shore, but built on pillars, often for fishing or small boats. Water flows underneath

Berth - The exact parking spot for a ship, usually along a quay or wharf

Mooring/Berthing Hawsers

Working Together

- Each line has a specific job, but together they keep the ship firmly alongside
- Mooring teams ashore and onboard adjust line tension to suit conditions such as wind, current, tide and passing traffic

Sternrope(s)
Prevents the ship from moving away from the jetty

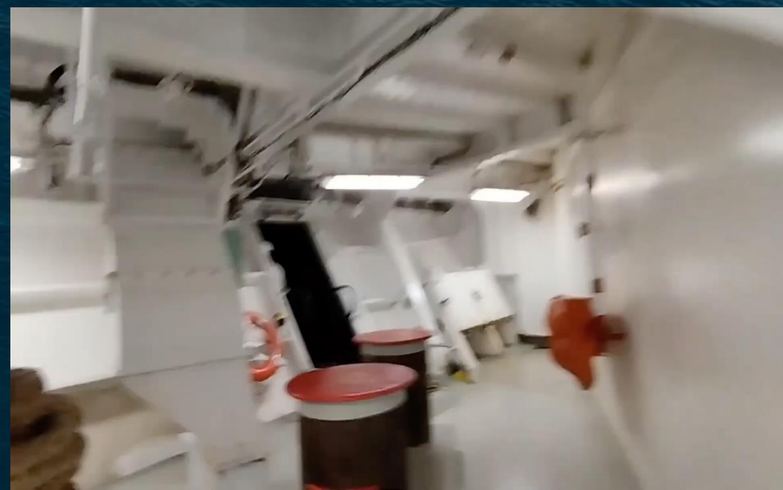
Afterbreast
Keep the ship alongside and prevent it from moving away from the jetty

Backspring
Prevent the ship from moving backwards

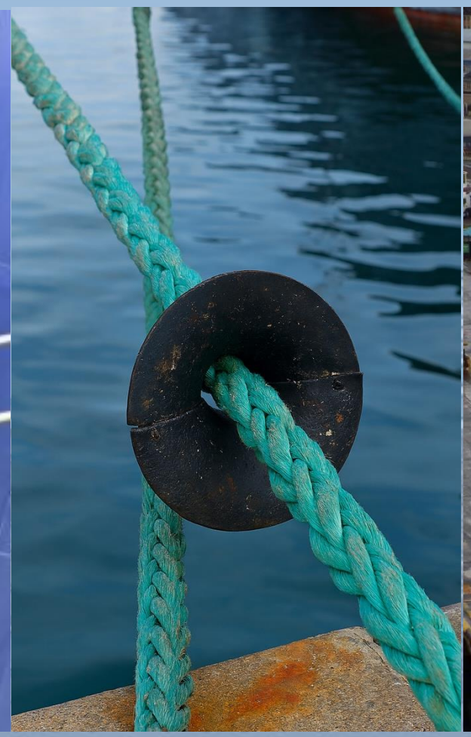
Headrope(s)
Prevents the ship from moving away from the jetty

Forebreast
Keep the ship alongside and prevent it from moving away from the jetty

Forespring
Prevent the ship from moving forward



Rat Guards



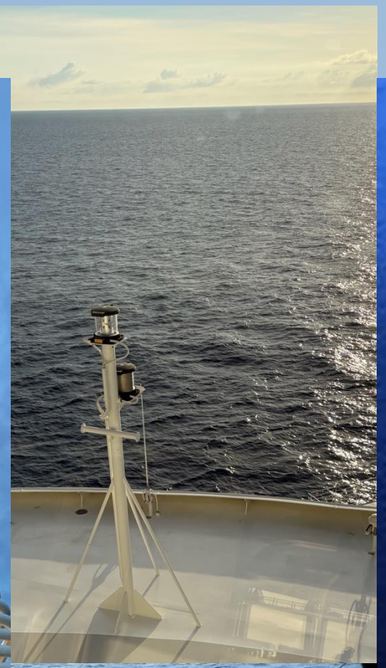
MV Hondius – Outbreak of Hantavirus - Apr 26 - Passed on from rodents and their faeces/saliva/urine

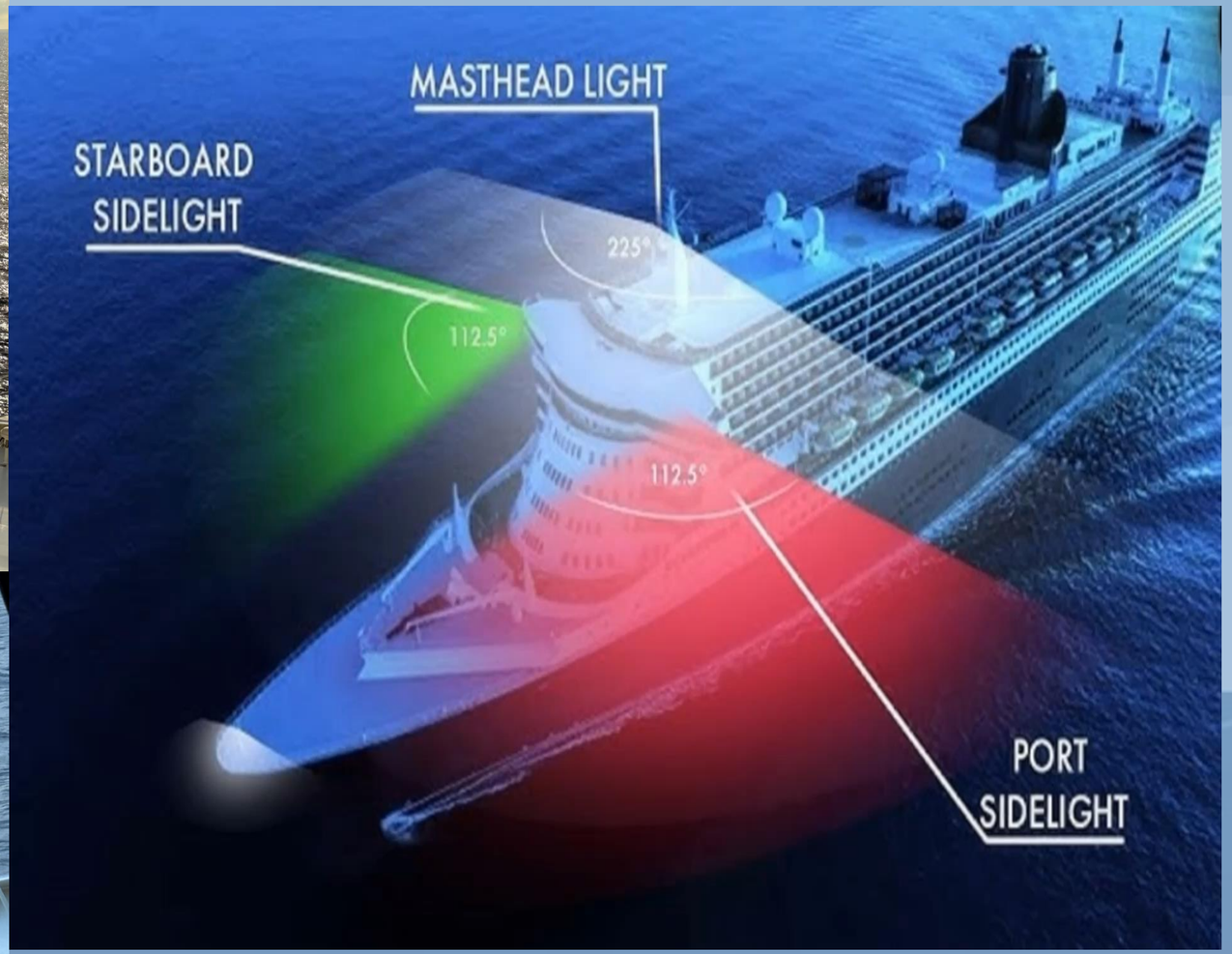
Preventing Unwanted Visitors to Our Cruise Ship

Rat guards are conical or disc-shaped metal shields fitted onto mooring lines (hawsers) when a ship is alongside a berth

Mandatory in many ports - Port health authorities often require rat guards to be fitted as part of quarantine and sanitation regulations

Steaming Lights – Mandatory





Safety and Security

Why Titanic Could Never Happen Again

The Silver Nova has a total lifeboat/liferaft capacity of 1,928. Given the maximum number of passengers is about 728 and the crew count about 556 (total 1,284), this represents 150% capacity

Unsinkable Design

Modern ships feature double hulls, watertight compartments, and damage stability software that prevent sinking even with major hull breaches

GPS and Satellite Tracking

Real-time global positioning, weather monitoring, and ice detection systems provide advance warning of hazards days before encounter

Lifeboat Requirements

125% lifeboat capacity for all passengers and crew, plus modern enclosed lifeboats with GPS beacons and survival equipment

Fully Enclosed Lifeboats

The Minimum

Fully enclosed design protects passengers from fire and weather. Can withstand extreme conditions during evacuation. A ship must have enough lifeboats to carry of 75% of all persons onboard

Systems are designed to evacuate all persons within 30 minutes of abandon-ship order (per SOLAS)

Silver Nova lifeboats carry 132 (4)/150 (4) passengers - so that is a total capacity of 1,128

Marine Evacuation System

Another Essential Part of the Ship's Overall Safety System

The container houses essential life-saving equipment, typically inflatable life rafts, which are stored in cylindrical pods within or on top of the enclosure

There is one of these on each side of the Silver Nova with a capacity of 100 each - so that is 200 in total

Compact Liferafts

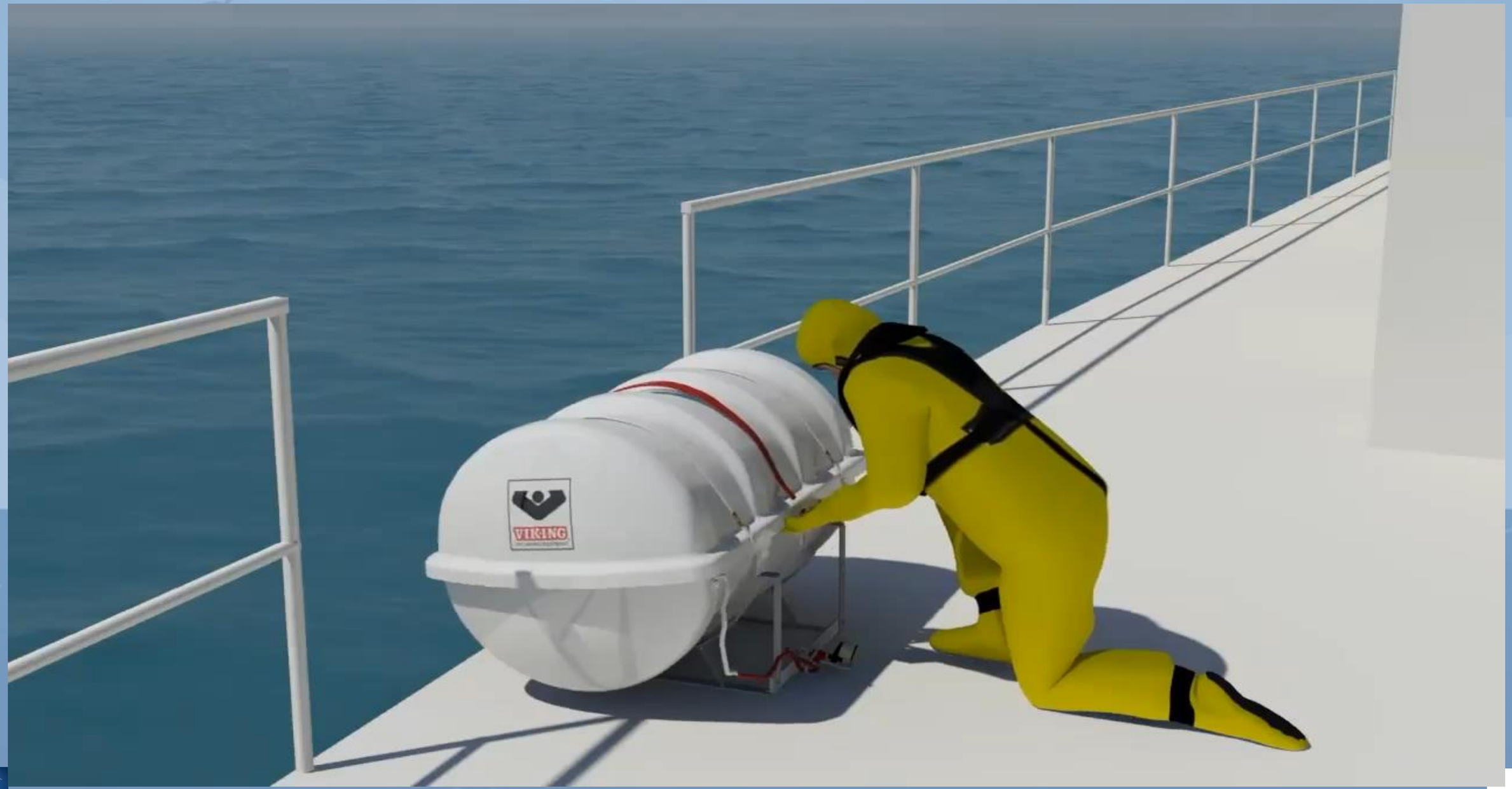
Automatic Deployment

Stored in compact canisters throughout the ship. Automatically deploy when needed for additional capacity

A ship must have enough liferafts to carry 25% of all persons onboard

Silver Nova has 3 liferafts each side, each able to carry 100 personnel - so a total capacity of 600

Compact Life Raft Deployment



Fast Rescue Craft

Rapid Response

Specialised boats for emergency rescue operations. Required quick deployment for rescue missions such as man overboard recovery

A cruise ship must have at least one and most have two

Lifebuoy

Ship's Name

Will always carry the Ship Name

Port of Registry

It's the ship's legal 'birthplace' painted on the stern, showing which nation's laws, safety rules and regulations the ship operates under

Dispersed throughout Upper Deck of Ship

A lifebuoy is a buoyant floating ring designed to be thrown to a person in the water. Its bright orange colour makes it highly visible, and the reflective tape means it can be spotted at night – a cruise ship should have least one every 55-60 m and 15-20 on a ship the size of Silver Nova

It's one of the few pieces of kit that hasn't changed much in 150 years because it works

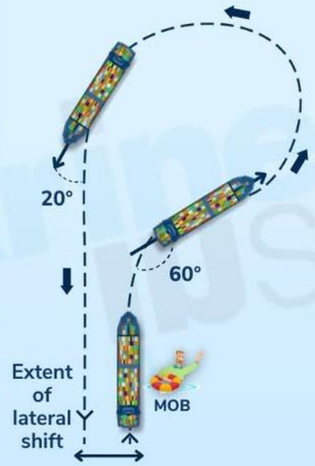
Man Overboard Recovery

3 ALTERNATIVE TURNS FOR RECOVERING MAN OVERBOARD

Anderson Turn

- Use full rudder towards MOB Side
- Slow Down Speed at this point
- Stop engines when the victim is within 15° of bow
- Release lifeboat to recover MOB

Williamson Turn

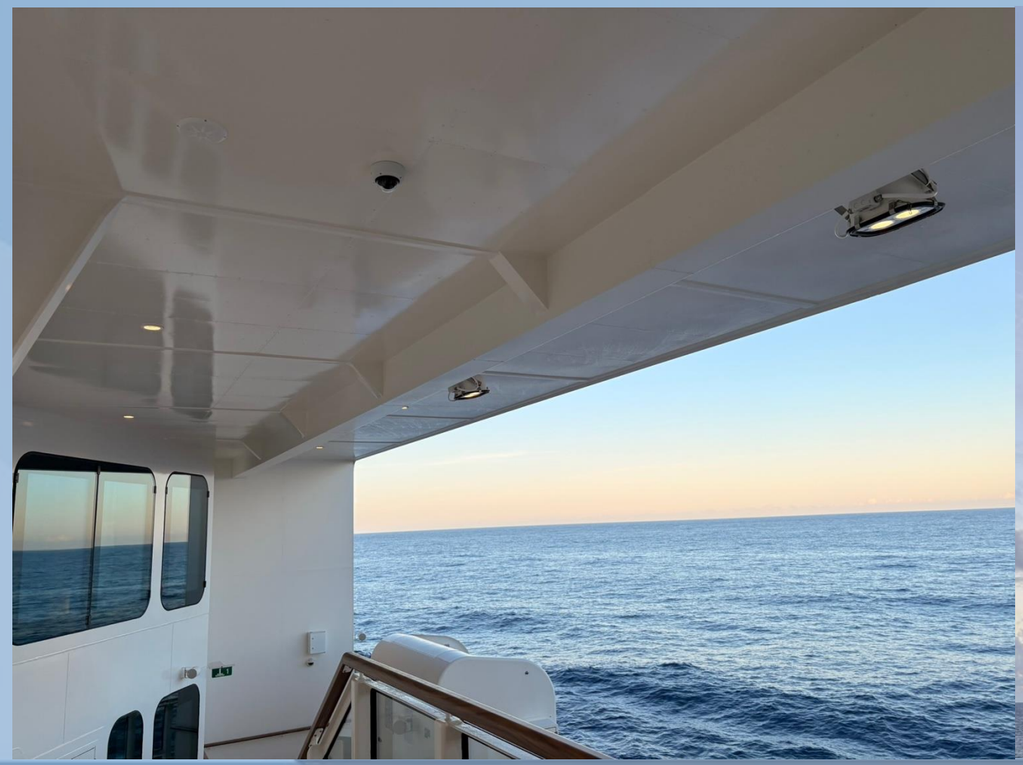


- Turn wheel hard-over to MOB Side
- When 60° off original course, wheel is put hard over in opposite direction
- When 20° short of opposite course, turn rudder to midship position

Scharnow Turn

- Rudder hard over
- After deviating from the original course by 240°, rudder hard over to the opposite side.
- When heading 20° short of opposite course, rudder to midship position so that ship will turn to opposite course

CCTV Security Network



Security Monitoring

Surveillance domes provide comprehensive monitoring. Located throughout the vessel for passenger safety

While the US Cruise Vessel Security and Safety Act (CVSSA) of 2010 requires this technology, the industry has historically moved slowly due to the difficulty of preventing "false positives" caused by the harsh marine environment (salt crusting on lenses, ship vibration, and heavy seas)

Man Overboard Detection

AI Video Analytics
(to support decision making
on body form)

Man Overboard Shield

Micro-Radar Pods
(detects motion)

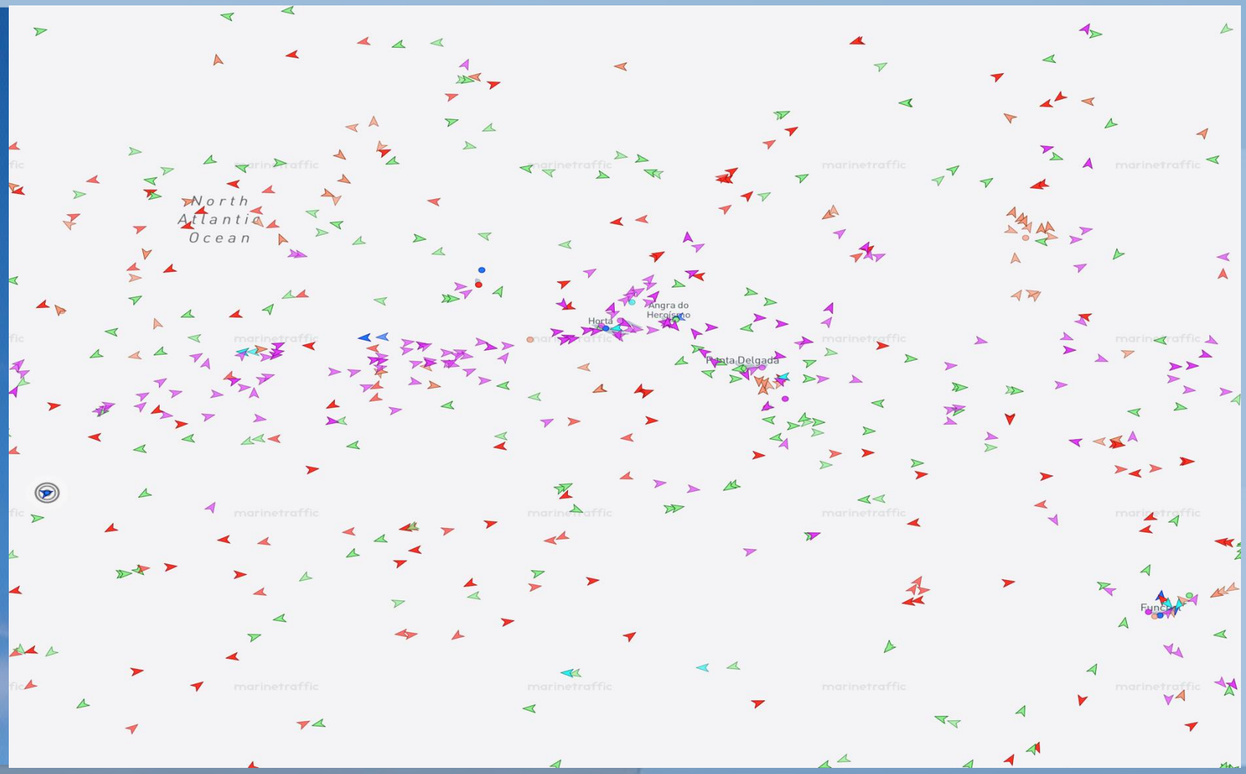
GPS Pin
(to mark the plot)

Infrared Thermal Cameras
(detects body heat)

Virtual Field
(to support rapid response, day or night)

Electronics and Communications

AIS Broadcasting Equipment

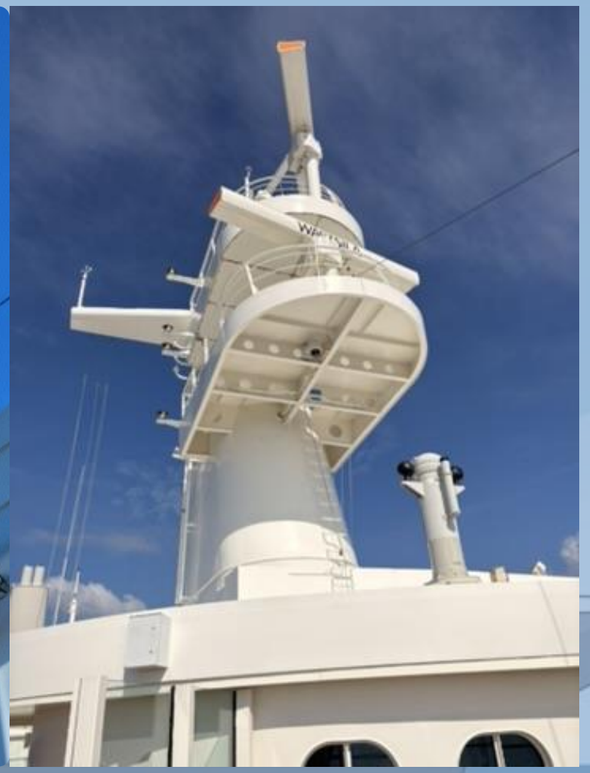


Ship Identity

Automatic **I**dentification **S**ystem broadcasts ship data

Transmits identity, position and speed to other vessels

Emergency Antennas



Global **M**aritime **D**istress and **S**afety **S**ystem antennas

Essential for emergency communications and coordination

Global Maritime Distress and Safety System

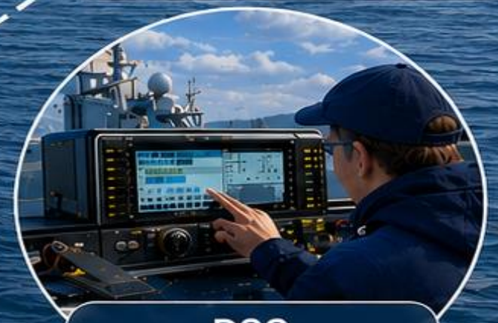
Satellite RCC
Global satellite monitoring and communication

Shore Station RCC
Receives and coordinates distress alerts

Regional Control Centres (RCCs)
Coordinate search and rescue operations

RCCs Work Together
All RCCs share information and coordinate to ensure a rapid and efficient rescue response

EPIRBs
Distress beacons that auto-activate to send the ship's position via satellite

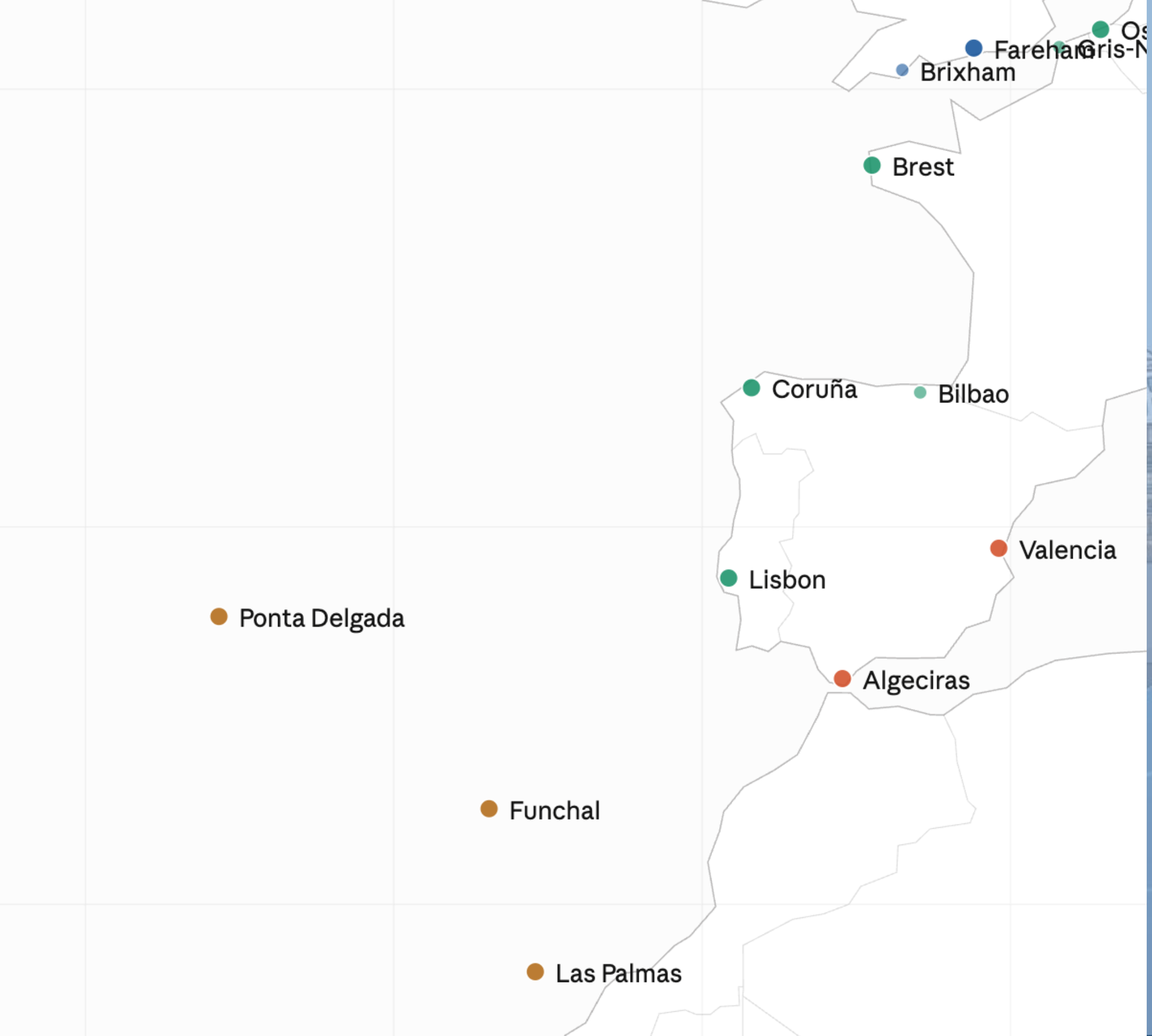


DSC
Digital Selective Calling initiates and receives distress alerts

GMDSS
Global Maritime Distress and Safety System

DSC Distress Calls
Distress alert is transmitted via DSC channels

DSC
Alert received by coast stations and RCCs



Maritime Rescue Control/Coordination Centres (MRCCs)

An MRCC is a type of Rescue Co-ordination Centre dedicated exclusively to organising search and rescue in a maritime environment, responsible for a geographic area known as a Search and Rescue Region (SRR), designated by the International Maritime Organization

Radar – Navigation

In Summary

Cruise ships use two types of radar to stay safe at sea. X-band radar gives a sharp close-range picture for manoeuvring in ports, while S-band radar looks far ahead and sees through rain or fog. Together they track other ships, coastlines, buoys and weather. Integrated with AIS and digital charts, radar forms the bridge's essential safety picture

X-Band Radar

Higher resolution, narrower beam. Excellent for close-quarters manoeuvring, avoiding small craft, buoys and harbour approaches. Better target definition during pilotage, docking, or busy coastal waters. Range is typically up to ~24 NM, though most useful inside 12 NM

S-Band Radar

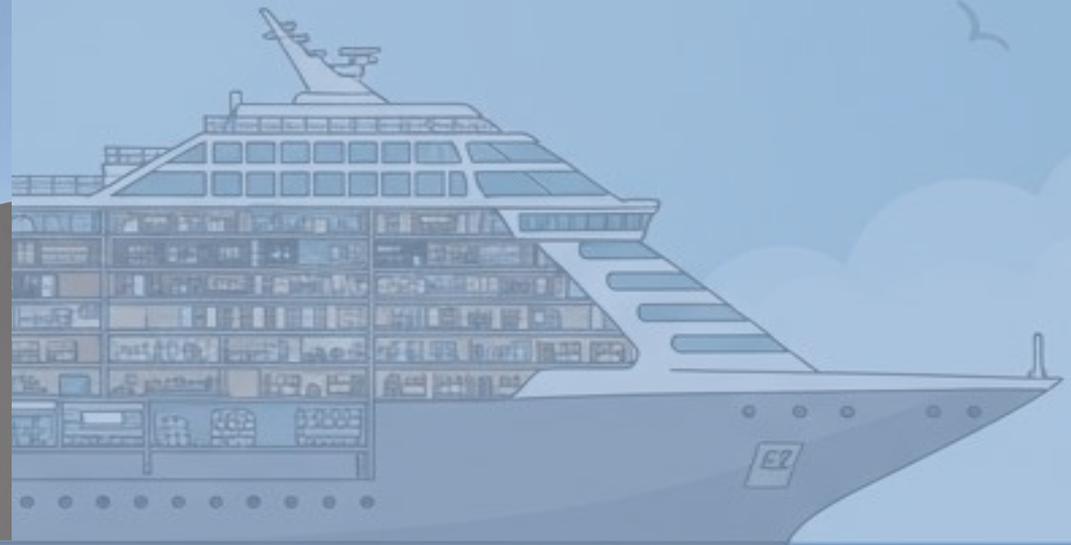
Lower frequency but better in rain, fog, and rough seas. Range is typically up to 48-72 nautical miles (NM)

Radar - Harbour Manouevring

Harbour Safety

Critical for manouevring in harbour, in poor visibility or at night

Marine Multi-Frequency Antenna



The little communications mushroom helps receive and/or transmit several everyday signals from one compact unit, including:

GPS / GNSS positioning / TV
WLAN / Wi-Fi / GSM / 3G / 4G / LTE mobile data

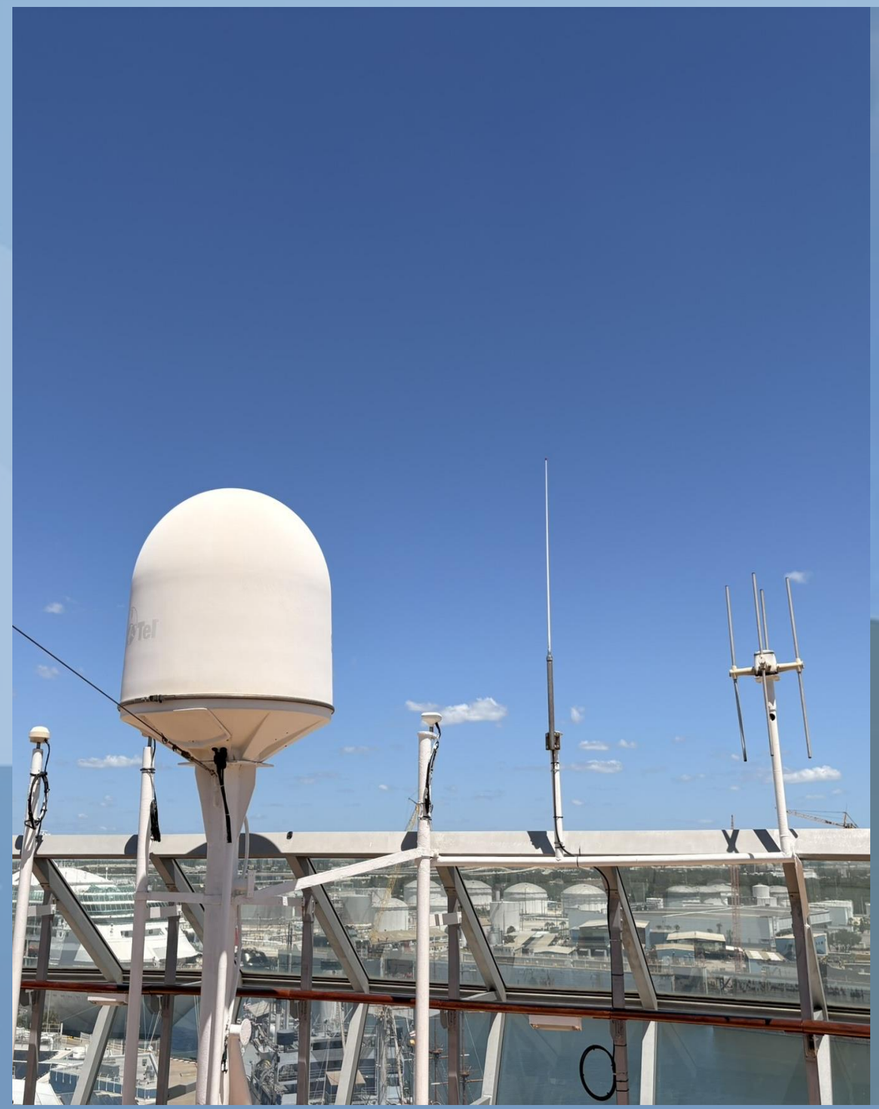
It is a highly integrated antenna designed for marine use, especially where signals reflect off the sea surface and can cause interference

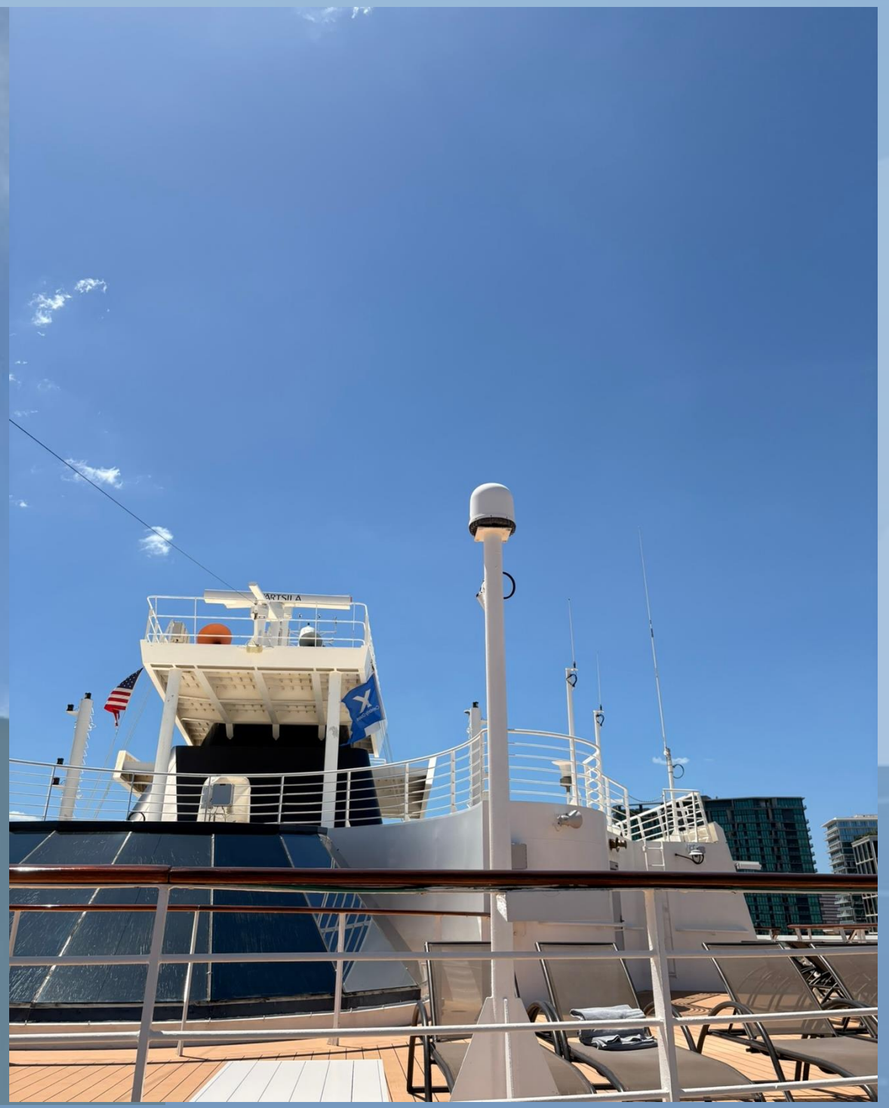
Satellite Communication Domes

TV and Internet

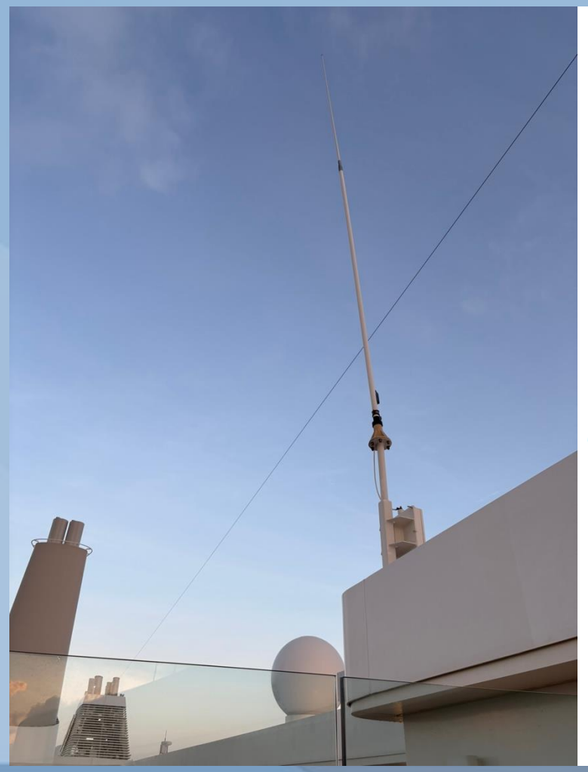
Multiple satellite domes provide television programming as well as high-speed internet connectivity for passengers and crew

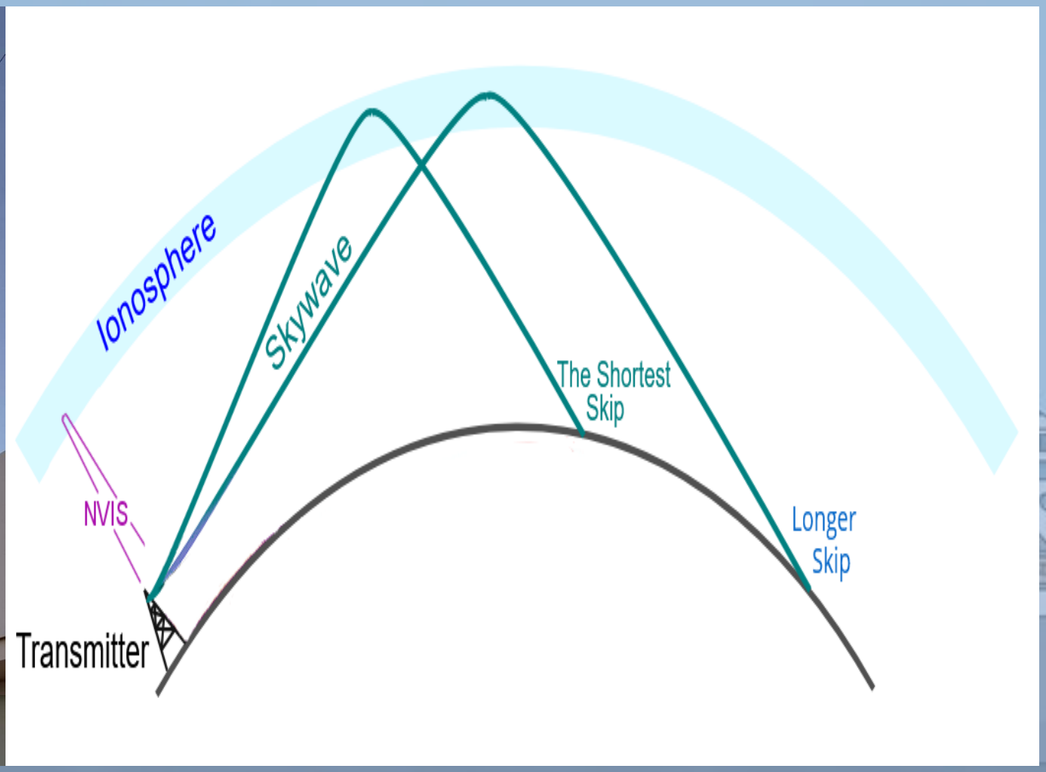
Ship Internet (Satellite) Dish





HF Aerial (Antenna)



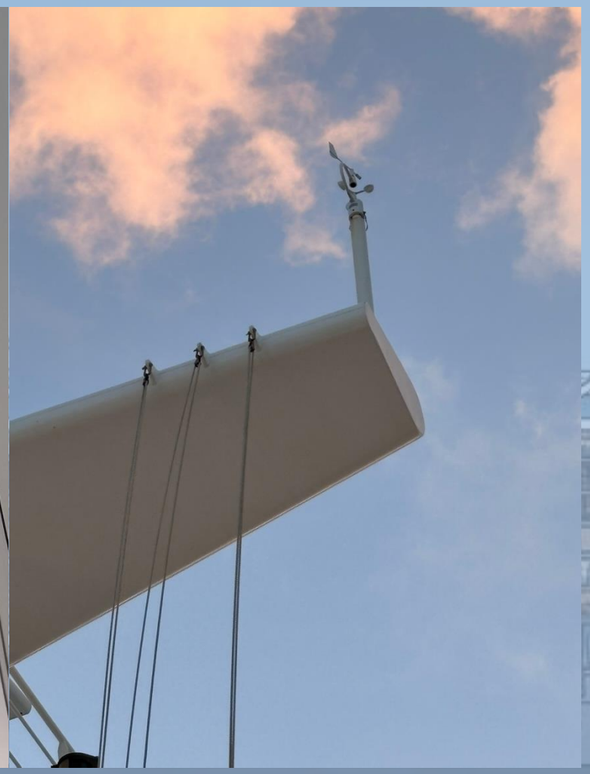


Long Range Radio Communications

Even with satellite comms, HF remains important because It works independently of satellites and provides robust backup during satellite outages or in high latitudes

High Frequency, roughly 3–30 MHz, which can bounce off the ionosphere, allowing ships to for hundreds/thousands of miles

Wind Anemometer



Wind Speed and Direction

- Two, three or four small cups spin around a vertical shaft
- The faster the cups spin, the stronger the wind
- The device converts this rotation into a wind-speed reading in Knots which is transmitted to the Bridge for use both for planning, harbour maneouvering and to show on the ship's TV

Flags – International Signals

International Code Flags

Alpha • — Diver down	**Bravo** — • • • Dangerous cargo on board	**Charlie** — • — • Affirmative - Yes	**Delta** — • • Keep clear	**Echo** • Turning to Starboard	**Foxtrot** • • — • I am disabled. Communicate with me
Golf — — • I require a pilot / Hauling nets.	**Hotel** • • • • Pilot on board	**India** • • Turning to Port	**Juliet** • — — — On fire keep clear	**Kilo** — • — I wish to communicate	**Lima** • — • • Stop your vessel
Mike — — My vessel is stopped	**November** — • Negative - No	**Oscar** — — — Man Overboard	**Papa** • — — • I am proceeding to sea / My nets are stuck fast	**Quebec** — — • — I request free pratique	**Romeo** • — •
Sierra • • • My engines are in astern propulsion	**Tango** — Trawling keep clear	**Uniform** • • — You are running into danger	**Victor** • • • — I require assistance	**Whisky** • — — I require medical assistance	**X Ray** — • • — Stop your intentions and watch my signals
Yankee — • — — I am dragging my anchor	**Zulu** — — • • I require a tug / Shooting nets	**1st Substitute**	**2nd Substitute**	**3rd Substitute**	**Answering Pendant**
1 • — — — —	**2** • • — — —	**3** • • • — —	**4** • • • • —	**5** • • • • •	
6 — • • • •	**7** — — • • •	**8** — — — • •	**9** — — — — •	**0** — — — — —	

Flags - Courtesy

Going into a harbour a cruise ship will generally fly three/four flags:

- **State Flag** of nation in whose harbour/port the ship is entering

- **The Request Free Pratique Flag** (Flag Quebec which is yellow) meaning ship is requesting clearance before formal health clearance when alongside)

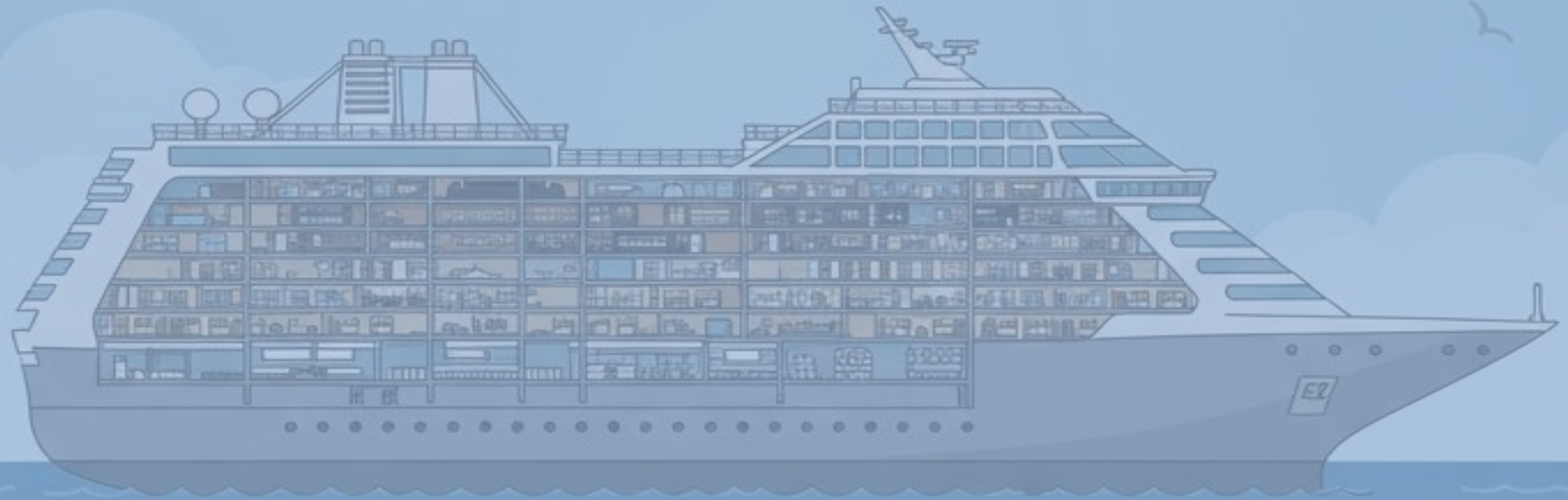
- **The Pilot Flag** (Flag Hotel which white/red)) if the Pilot is embarked

- **Cruise Ship Company Pennant**

Entry into Portuguese Ports

If you remember, look up at the foremast when we enter port Monday, Tuesday, Thursday and Sunday

The Anatomy of a Cruise Ship



And The Things You Won’t Ordinarily See

Silver Nova’s Power Generation System

Power Statistics

4 × Wärtsilä dual-fuel main engines	25,440 kW / 25.4 MW / 34,100 BHP
Freudenberg fuel cell system	4 MW (hotel load in port)
Battery system	1.5 MWh storage / 2 MW for harbour manoeuvring
Total installed	**~31 MW**

Efficient Operation
Multiple power sources work together for maximum efficiency

Lower Emissions
Cleaner energy and optimized systems help reduce emissions

Quieter Experience
Reduced engine running lowers noise and vibration on board

Reliable Power
Integrated systems ensure continuous and reliable power supply

Future Ready
Advanced hybrid technology supporting a sustainable future

Silver Nova Operates a Hybrid Power System with Four Key Technologies Working in Combination:

1 LNG Dual-Fuel Engines
Main power generation source

Silver Nova is fitted with four Wärtsilä dual-fuel engines that run primarily on LNG, with ultra-low-sulphur diesel as backup

2 Fuel Cell System
Provides clean electrical power, especially useful in port

Silver Nova is equipped with a fuel cell system that delivers quiet, low-emission power when in port, helping to reduce emissions and noise.

3 Battery System
Smooths load changes, supports efficiency and reduces engine running

A large battery system stores energy, stabilizes the grid and helps the ship operate more efficiently

4 Shore Power Capability
Allows the ship to plug into port electricity where available

When connected to onshore power, Silver Nova can switch to clean electricity from the grid.

Silver Nova’s Power Generation System

LNG Tanks

Fuel Tanks

4 × Wärtsilä Dual-Fuel Main Engines
25,440 kW / 25.4 MW / 34,100 BHP

Battery System
1.5 MWh Storage / 2 MW
For Harbour Operations

Electric Propulsion
Propulsion demand is supplied from the ship’s electrical grid

High Efficiency
Optimised for low fuel consumption and reduced emissions

Reliable
Redundant systems ensure continuous operation

Efficient Power Management
Intelligent distribution optimises performance and reduces losses

Low Noise and Vibration
Electric propulsion delivers a smooth, quiet and comfortable experience

Excellent Manoeuvrability
Controllable pitch propellers provide precise control and effortless handling

Silver Nova’s LNG System

Management

Silver Nova carries about 1,200 cubic metres of LNG in two tanks

LNG is kept at exactly -162°C (-260°F). At this extreme sub-zero temperature, natural gas condenses into a liquid, shrinking its volume by 600 times to maximise storage efficiency

Engines cannot burn liquid fuel directly. Submerged cryogenic pumps force the liquid LNG out of the tank which .enters a vapouriser and the LNG transitions from a freezing liquid into a dry, warm gas at roughly 20°C to 30°C (68°F to 86°F) - this is used to fuel the engines

LNG - Limited Supply Chain

Americas, Middle East, Asia and Pacific

Coverage thins outside Europe - South Atlantic, Indian Ocean and South Pacific remain largely unserved

North America

- Jacksonville FL — US - established
- Los Angeles / Long Beach — US West
- Houston TX — US Gulf
- New Orleans LA — US Gulf
- Everett / Boston — US East
- Tacoma / Seattle — US NW
- Vancouver BC — Canada
- Quebec City — Canada

Caribbean and LatAm

- Colon — Panama
- Santo Domingo — Dom. Republic
- Montego Bay — Developing
- Cartagena — Colombia - plans
- Santos — Brazil - plans

Middle East and Africa

- Fujairah — UAE - main hub
- Jebel Ali — UAE - developing
- Abu Dhabi — UAE
- Salalah — Oman - plans
- Djibouti — Plans
- Africa — Largely absent

Singapore and SE Asia

- Singapore — World No.1 hub
- Port Klang — Malaysia
- Johor / Pasir Gudang — Malaysia
- Penang — Malaysia
- Jakarta — Indonesia - dev.
- Manila — Philippines - dev.
- Ho Chi Minh City — Vietnam - dev.

NE Asia

- Shanghai — China
- Shenzhen — China
- Ningbo-Zhoushan — China
- Tianjin — China
- Guangzhou — China
- Busan — South Korea
- Incheon — South Korea
- Yokohama / Tokyo — Japan
- Nagoya — Japan
- Osaka / Kobe — Japan

Pacific

- Darwin
- Gladstone
- Brisbane

LNG - Limited Supply Chain

Europe

222 ports globally as of 2026 - Europe leads with the most developed infrastructure

Northern Range / ARA		Scandinavia and Baltic		Mediterranean		Norway (Arctic-capable)		UK and Iberia	
Rotterdam	Netherlands	Stockholm	Sweden	Gibraltar	UK territory	Hammerfest / Polarbase	LNG hub	Southampton	UK - developing
Antwerp-Bruges	Belgium	Gothenburg	Sweden	Barcelona	Spain	Bergen		Immingham	UK - developing
Zeebrugge	Belgium	Helsingborg	Sweden	Valencia	Spain	Stavanger		Milford Haven	UK
Amsterdam	Netherlands	Copenhagen	Denmark	Algeciras	Spain	Tromsø	Arctic	Isle of Grain	UK
Hamburg	Germany	Helsinki	Finland	Bilbao	Spain	Kristiansund		Huelva	Spain
Bremerhaven	Germany	Turku	Finland	Cartagena	Spain	Oslo		Ferrol	Spain
Wilhelmshaven	Germany	Tallinn	Estonia	Sines	Portugal	Fredrikstad		Leixoes (Porto)	Portugal
		Riga	Latvia	Marseille-Fos	France				
		Klaipeda	Lithuania	Le Havre	France				
		Gdansk / Gdynia	Poland	Civitavecchia	Italy				
		Kiel	Germany	Livorno	Italy				
		Rostock / Warnemunde	Germany	Piraeus	Greece				

Propellers (Fixed Pitch)

Azipods

Unlike a traditional fixed propeller and rudder, an Azipod is a giant 360-degree swiveling pod that hangs under the ship. It contains an electric motor that drives the propeller directly. It eliminates the need for rudders and allows a massive ship to turn on a dime or dock without tugboats. The Azipod essentially pulls a ship rather than the traditional propeller that pushes it

Bow and Stern Thrusters

Sideways Movement

Specialised propellers enable precise manoeuvring

Essential for docking without tugboat assistance in wind speeds up to 30-35 knots of wind

Silver Nova has 3 bow thrusters and 2 stern thrusters

Fuel Efficiency of Ships Versus Other Forms of Transport

In Summary

International shipping represents about 2.4% of world carbon dioxide emissions. **If the international shipping were a country, it would be the sixth most polluting country in the World!**

Context

Ships are more 25 times more efficient than aircraft, 6 times more than lorries and 3 more than trains when it comes to kilogrammes of CO_2 per km

Recognition

Industry recognises the growing need to 'go green', and is making efforts to reduce greenhouse gas emissions

Carbon Zero

Environmental potential of converting existing vessels to zero carbon fuels and - technology as part of the transition to a global zero carbon fleet by 2050

Today

In 2025, the International Maritime Organisation attempted to limit emissions to 2008 limits but were threatened by President Trump; they will look at it again next year

Global CO^2 Emitters – The League Table

Rank	Emitter	Mt CO_2 (2023)	Global Share
1	China	13,260	33.0%
—	🚗 **Road vehicles (global)**	**~5,600**	**~15%**
2	United States	4,682	11.6%
3	India	2,955	7.3%
4	Russia	1,769	4.4%
5	Japan	1,068	2.6%
6	🚢 **Shipping (all maritime)**	**~973**	**~2.4%**
—	✈️ **Aviation (global)**	**~950**	**~2.5%**
7	Iran	~750	~1.9%
8	Germany	~674	~1.7%
9	South Korea	~620	~1.5%
10	Canada	~571	~1.4%

Transport Sector Comparison

Fuel Management (Marine Fuel Oil)

Via Azores and Madeira - 14 Nights - 4 Port Days - 10 Sea Days

Total Distance	Sea Days	Port Days	Average Speed	Voyage Duration
~3,960 nm	10 days	4 days	16.5 kts	14 nights

MFO burn at sea

75–95

t VLSFO / day

at 16.5 knots average

diesels - not primary LNG plant

MFO burn in port

18–22

t VLSFO / day

4 port days - hotel load only

diesel alternators replace LNG fuel cells

Total voyage MFO

~930

t VLSFO total

~850t sea + ~80t port

~235t per 1,000 nm vs ~125t LNG equiv

Estimated fuel cost

~$540k

full voyage

~$38.5k / day average

~$290 per person on board

Why MFO - Not LNG?

No LNG bunkering available US East Coast. Ship last fuelled in Singapore 8 weeks ago and will bunker LNG again in Barcelona.
Backup MFO diesel plant used throughout as a practical operational necessity

MFO vs LNG - Same Crossing

Metric	MFO	LNG
Fuel consumed	**~930t VLSFO**	~595t LNG
Fuel cost	**~$540k**	~$387k
Cost / day	**~$38.5k**	~$27.6k
Cost / person	**~$290**	~$168
CO2 per voyage	**~2,950t**	~1,636t
Speed	**16.5 kts**	16.5 kts

Environmental Cost of Switching to MFO

+80%	more fuel by weight vs LNG equivalent
+40%	increase in fuel cost vs planned LNG
+80%	more CO2 emitted (~2,950t vs ~1,636t)
+100%	SOx emissions - VLSFO still ~0.5% S
Zero	fuel cell and battery benefit on MFO

Put It Another Way

If you drove your car for 12,000 miles in a year with an average mpg of 30, then you would need to put in 400 gallons per year.

Or, one day of cruising equals about 125 years of your car's annual driving

Why Seawater Temperature Matters

In Summary

Sea water temperature influences machinery, safety, fuel burn and the ship's behavior in the water. It's far more than just a number on the bridge display - it's something seafarers constantly account for

Engine Cooling Efficiency

Ships rely on seawater to cool their engines (via heat exchangers).
Cold water = better cooling. Warm water = poorer cooling, higher engine temperatures, and sometimes reduced power output to protect machinery

Fuel Efficiency & Speed

Cooler seawater is denser, giving a ship a touch more 'lift' and less hull resistance.
Warmer seawater is less dense, meaning:
slightly deeper draft, more resistance and higher fuel burn for the same speed

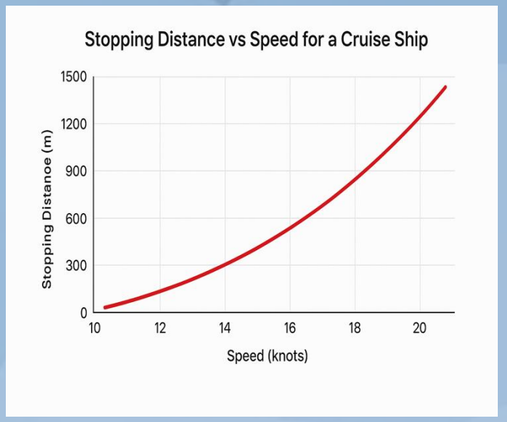
Stability & Buoyancy

Density changes with temperature (and salinity):
Cold water = more buoyant ship
Warm water = less buoyant ship

How Quickly can the Ship Stop

In Summary

Stopping a cruise ship from 16–18 knots isn't instantaneous - it takes quite a distance and time because of the ship's massive inertia. Rule of thumb - cruise ship going 18-22 knots can take roughly 4-5 minutes and about 1-1.6 km (about a mile) to come to a full stop with full astern



Typical De-Acceleration

Large cruise ships use full astern engines to stop. The deceleration is slow, typically around 0.03–0.05 m/s^2. This is small compared to cars because water resistance is much lower relative to mass, and applying brakes is slower

Size of Ship

Larger or faster ships may need longer stopping distances, smaller ships slightly less

Stability & Buoyancy

Density changes with temperature (and salinity):
Cold water = more buoyant ship
Warm water = less buoyant ship

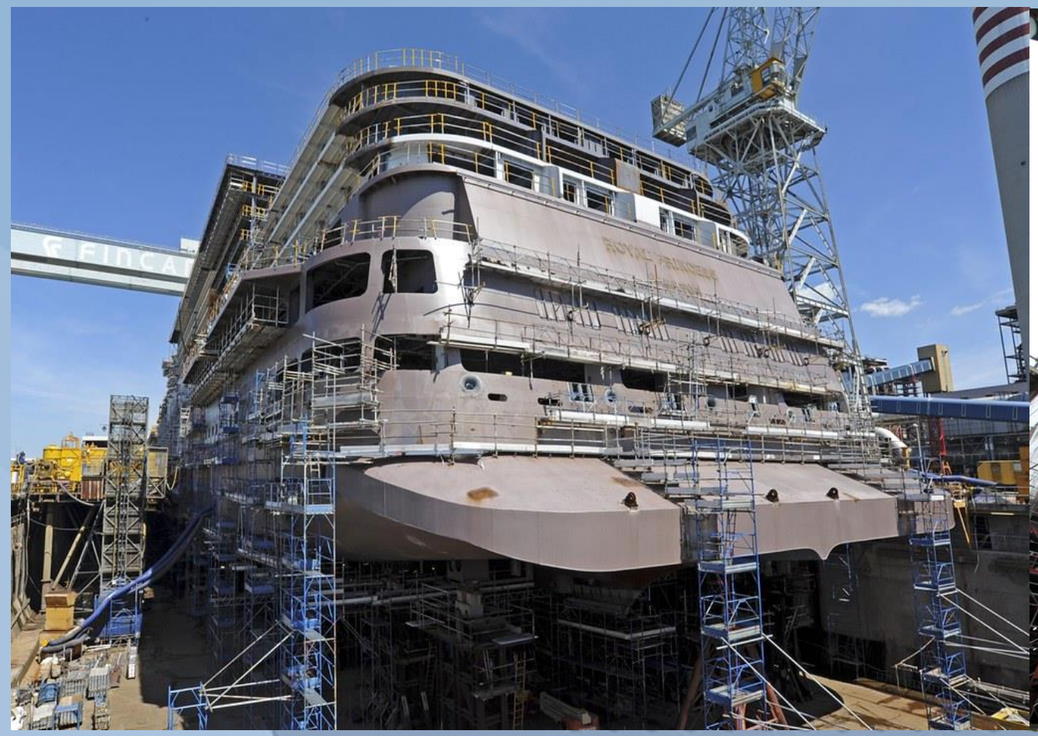
Bow

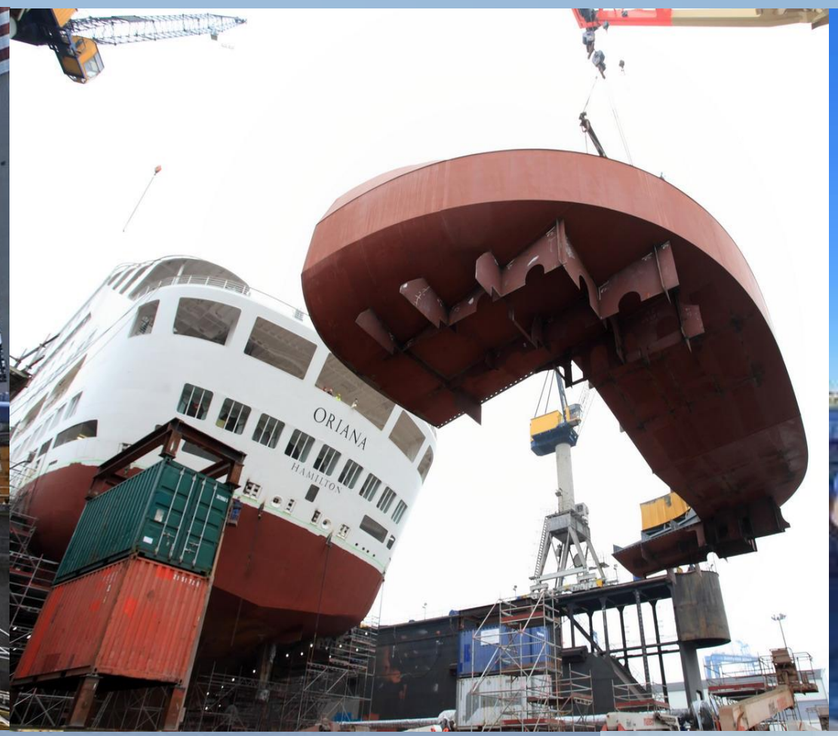
Bulbous Bow

Developed in the late 1890s at the Navy Washington Yard in DC and perfected by the Germans in the 1920s, they reduces drag and improves fuel efficiency, speed and stability on cruise ships

It works by reshaping the water flow around the hull to minimise wave resistance; optimised for speeds of 12 knots or above

Stern Tail



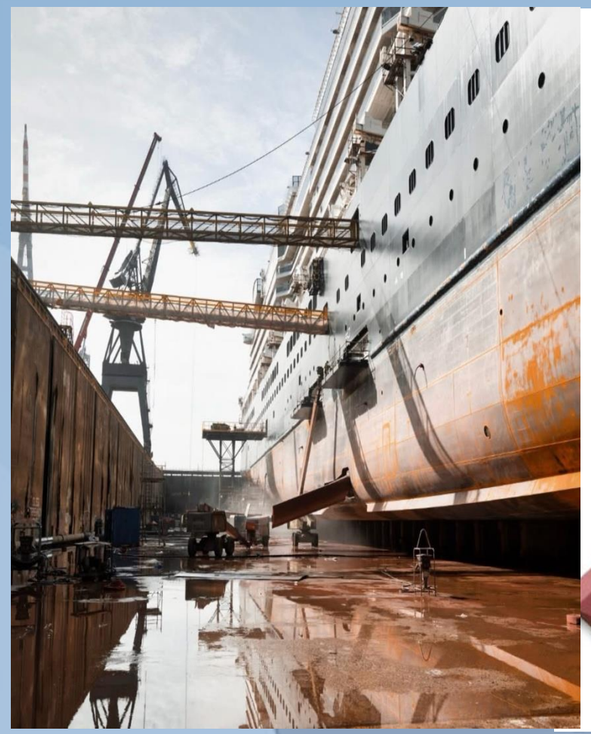


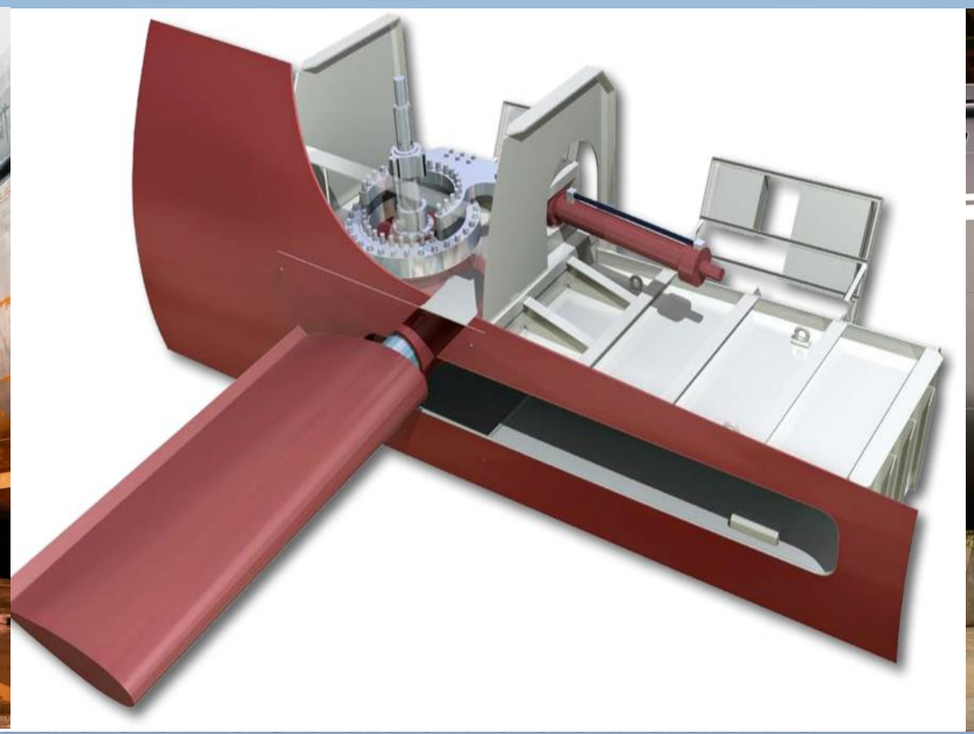
Often Called the Duck Tail

This is an extension added to the stern (rear) of a ship, resembling the upturned tail of a duck

It modifies how water flows off the stern, reducing drag and wave resistance … and so improves fuel efficiency

Stabiliser Fins



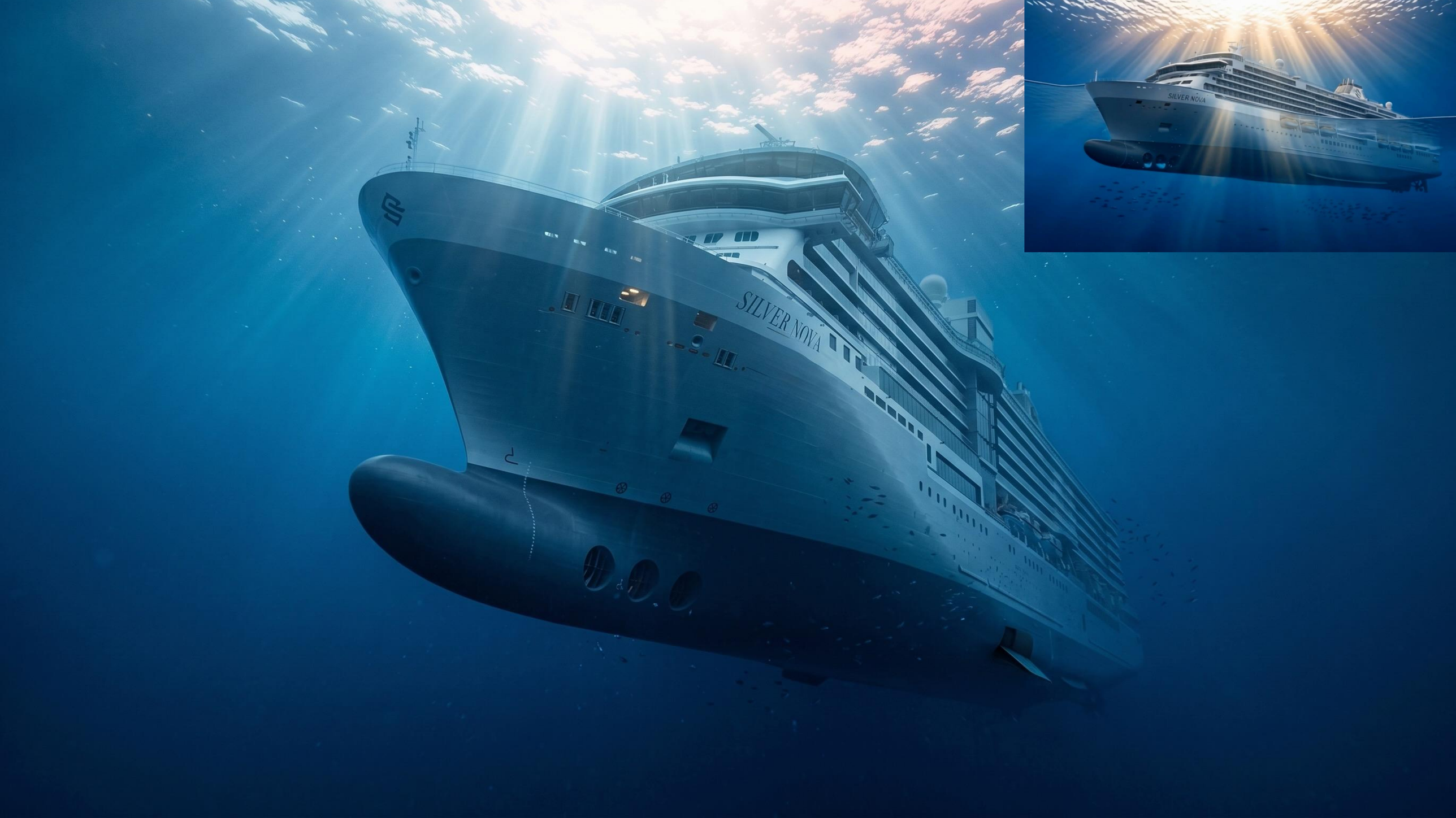


Motion Reduction - Comfort as a Priority

Think of these as underwater wings. They are hydraulic fins (each about 16 ft/5 m in length) that extend from the middle of the hull. Ship needs to be going at a minimum of 6-8 knots for them to be effective

Gyroscopic Sensors detect the ship's roll, and the fins tilt up or down to create lift in the opposite direction, canceling out up to 90% of the movement caused by waves. They soften rather than stop natural ship movement. When deployed, they can reduce the speed of the ship by up to 1 knot due to the drag

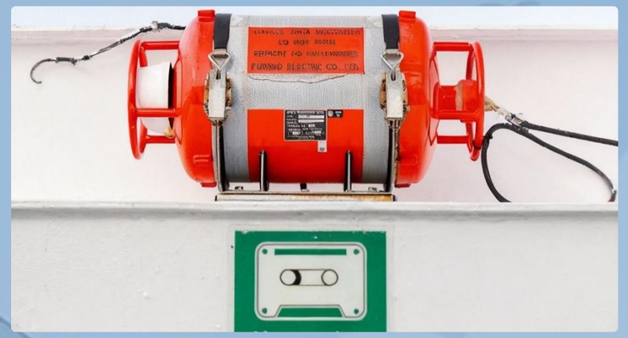
Are retracted approaching a port prior to berthing, in shallow water and at speeds of less than 6-8 knots


SILVER NOVA
SILVER NOVA

Voyage Data Recorder - Maritime Black Box

In Summary

Normally the Voyage Data Recorder is located in one of two places, depending on the ship's design - in a Protected Capsule on the Bridge Wing (most common) or Internally in a Technical or Bridge Equipment Room



Data Acquisition Unit

inside the ship. Receives inputs from radar, AIS, GPS, helm orders, propulsion data, alarms, audio, VHF, weather, etc

Voyage Recorder/Secure Capsule

Outside the ship. Toughened, fire-proof, impact-resistant, float-free. Designed to survive extreme conditions and provide the last 30-48 hours (or more) of data

Location

High up to reduce the chance of being crushed during sinking. It is easier for the capsule to break free and surface automatically. It also better capture of bridge audio and environmental noise

Management of Waste – Regulations

Prevent Oil Pollution

- MARPOL Annex I
- Strict controls for oil discharge and spills

Reduce Garbage

- MARPOL Annex V
- Rules for garbage management & discharge

Reduce Pollution from Ships

- MARPOL Annex II
- Controls for noxious liquid discharges

Minimize Air Pollution

- MARPOL Annex VI
- Limits ship emissions of harmful substances

Reduce Pollution

- MARPOL Annex III
- Strict controls for pollutants

Limit Hazardous Materials

- MARPOL Annex III
- Regulations for transport

Control Sewage

- MARPOL Annex IV
- Limits on sewage discharge

Management of Waste - Capabilities

Food	Glass	Metal	Paper	Black Water	Grey Water
					
• Composting • Bio-Digester	• Crushing • Recycling	• Compacting • Recycling	• Shredding • Recycling	• Sewage • Disinfection	• Filtration • Safe Disposal

Cruise ships effectively manage various types of waste on board to minimise environmental impact

Management of Fresh Water

Water Produced

~525

m3 / day

525,000 litres per day

via reverse osmosis from seawater

Total Onboard

1,284

people

728 guests + 556 crew

Crew-to-guest ratio 1 : 1.3

Per Person Per Day

~500 L

per day

~3x average household daily use

Equivalent to 500 x 1 L bottles

Cabins and Showers

180–220 L

Laundry

120–150 L

Kitchens and Pools

140–180 L

Toilets

80–100 L

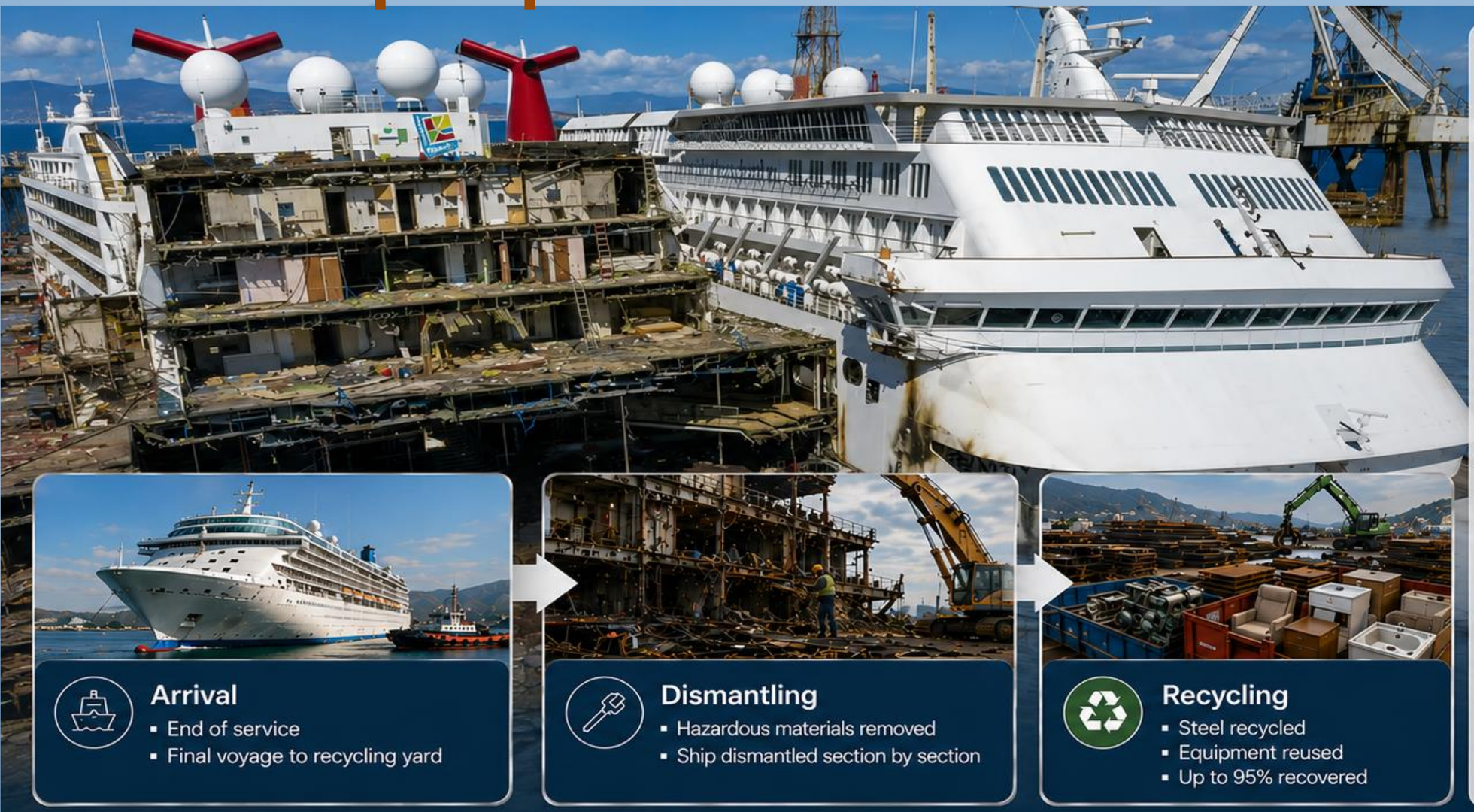
Other Needs

50–70 L

Management of Dirty Water

Must meet strict environmental discharge standards - only possible in waters outside 12 nautical miles above 6 knots … but not in marine protected areas or enclosed seas (like the Baltic)

Cruise Ship Disposal



Arrival
- End of service
- Final voyage to recycling yard

Dismantling
- Hazardous materials removed
- Ship dismantled section by section

Recycling
- Steel recycled
- Equipment reused
- Up to 95% recovered

Where Ships Are Recycled

Most cruise ships are dismantled in specialized yards in

Alang, India

Chittagong, Bangladesh

Aliaga, Turkey

High Safety Standards
Modern yards follow strict safety and environmental standards

Hazardous Materials
Hazardous materials like asbestos oils and refrigerants are carefully removed

Regulated by Law
Regulated by the Hong Kong Convention for safe and environmentally sound recycling

90–95%

Highly Recyclable
Up to 90–95% of a cruise ship can be recycled and given a new life

Thank You