

With
Rear Admiral (Retired) Simon Hardern

# The Evolution of Ship Building

## From Ironclad to Icon - A 175-Year Journey of Maritime Innovation

The nation that shapes the world's ships will shape the world's future - Empires rise behind armies, but they endure behind shipyards

... somebody is a little disappointed this morning!



# What is (Sea) Swell?

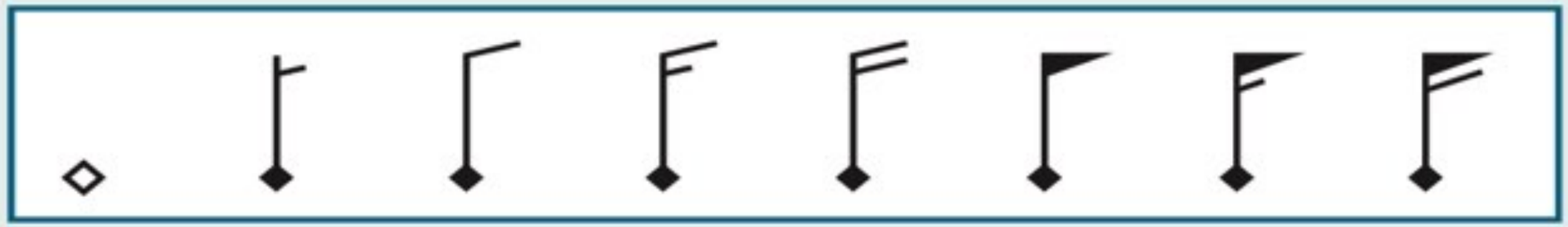


Swell is wave energy created by distant winds and storms that continues travelling across the ocean, often long after leaving the storm behind

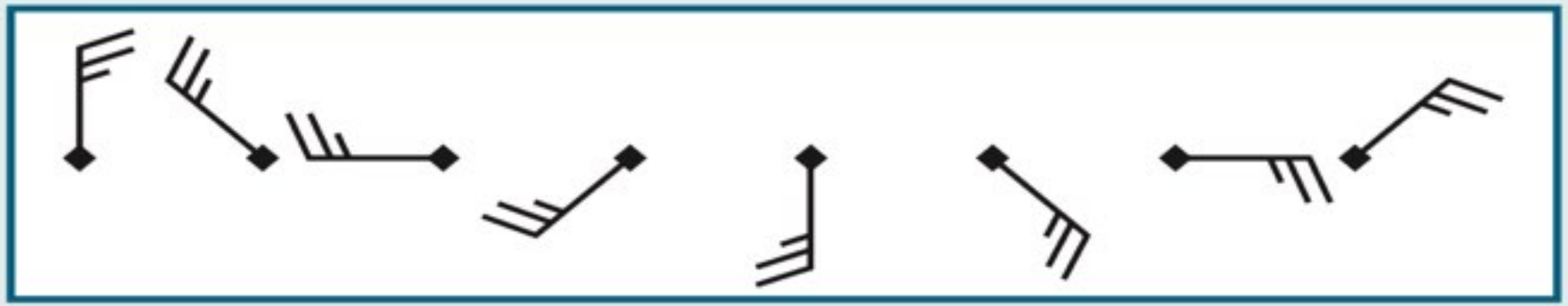
Swell travels a long distance before dissipating

Swell wavelength is long ... which is why a ship can roll and rise slowly

# And Reading the Ship's Weather Displays



| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Speed:** | **calm** | **5** | **10** | **15** | **20** | **50** | **55** | **60** | **units** |
| **Dir (from):** | **NA** | **All blowing *from* the North** | | | | | | | |
| **(toward):** | | **or all *towards* the South** | | | | | | | |



| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Speed:** | **25** | **25** | **25** | **25** | **25** | **25** | **25** | **25** | **units** |
| **Dir (from):** | **N** | **NW** | **W** | **SW** | **S** | **SE** | **E** | **NE** | |
| **(toward):** | **S** | **SE** | **E** | **NE** | **N** | **NW** | **W** | **SW** | |

# Today in Maritime History



**24 October 1944**
Perhaps, in the greatest naval battle of World War II, the US Navy sank the
**Imperial Japanese (battle) Ship Musashi**

It was discovered on 2 March 2025 in a 1,000 metres of water

During the Battle of Leyte Gulf, American carrier aircraft sank the Imperial Japanese (battle) Ship Musashi. The largest battleships ever built, she represented the declining effectiveness of traditional battleship power against massed naval aviation. She was was hit by an estimated 19 torpedoes and 17 bomb which flooded compartments and knocked out all power. Out of a crew of about 2,400, just under half perished

... how she compared to Scarlet Lady




... sorry ... the wrong Scarlet Lady ...

# … that's more like it






The battleship was 14 metre shorter than Scarlet Lady, 1 metre wider and 2 metres deeper in draught - its top speed was also 5 knots quicker and it displaced around 35-45% more water - so weighed substantially more. The ship was also 25% greater displacement than the USN battleships like the fabled NEW JERSEY and IOWA. She could fire an 18-inch shell 26 miles - so from Dover to Calais across the English Channel ... just saying (not trying to give anyone any ideas)!

... tempting though it might sometimes be - but I want the UK to get back in the EU!



Each complete triple-gun turret weighed approximately 2,774 tonnes - comparable to the displacement of a small destroyer.  Each gun barrel was roughly the length of five average family cars, firing a shell weighing nearly one and a half tonnes



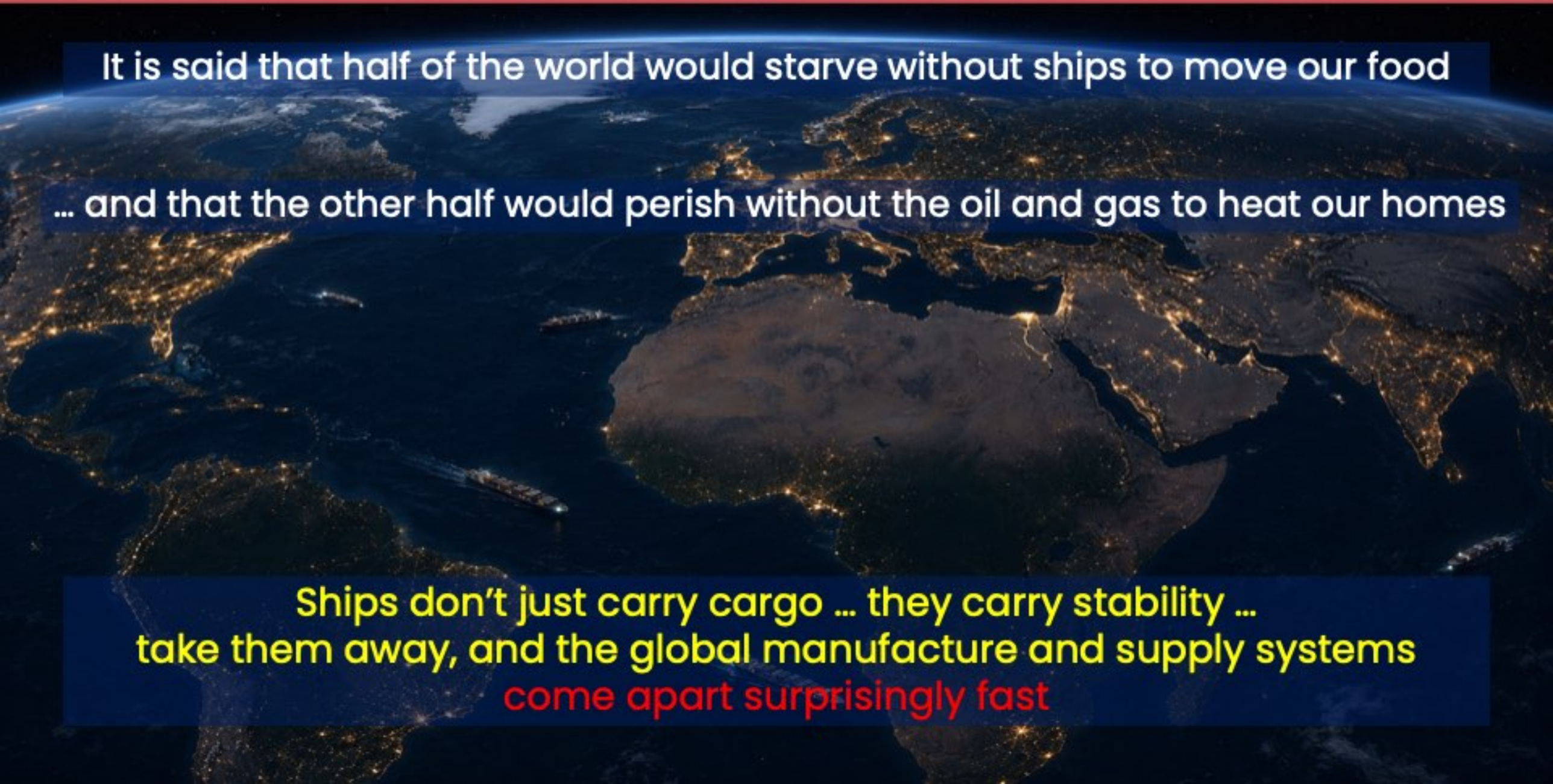
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# The Evolution of Ship Building

## From Ironclad to Icon - A 175-Year Journey of Maritime Innovation

The nation that shapes the world's ships will shape the world's future - Empires rise behind armies, but they endure behind shipyards

# Ships are Important to all of Us



It is said that half of the world would starve without ships to move our food

... and that the other half would perish without the oil and gas to heat our homes

Ships don't just carry cargo ... they carry stability ...
take them away, and the global manufacture and supply systems
come apart surprisingly fast

# Global Shipping Numbers

| Ship Category | Vessel Numbers |
|---|---|
| **Merchant fleet** | ~ 119,000 |
| **Naval and Government** | ~ 50,000 |
| **Fishing Vessels** | ~ 4.9 Million |
| **Recreational Craft** | ~ 30 Million |
| **Approximate total** | ~ 35 Million |

**64 Million Km**
Of Roads Worldwide

**1.6 Billion**
Vehicles

**≈25 Vehicles**
Per Km Of Road

**≈1 Vehicle**
Every 40 Metres

**≈1 Vehicle**
Per 10 Km² Of Ocean





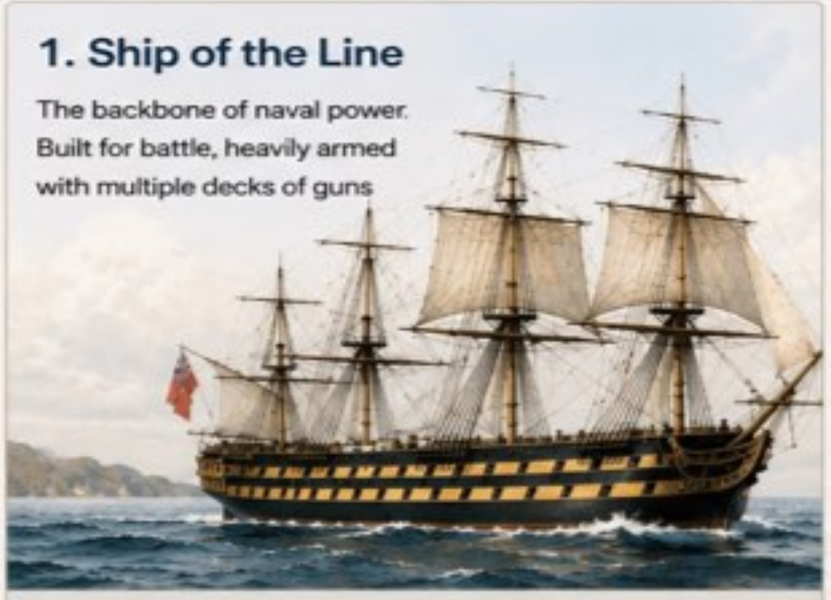

# Shipbuilding Processes Through the Ages



# Main Types of Ship in 1850

## 1. Ship of the Line

The backbone of naval power. Built for battle, heavily armed with multiple decks of guns



Displacement: 1,500 – 3,000+ tons | Crew: 600 – 800+

## 2. Frigate

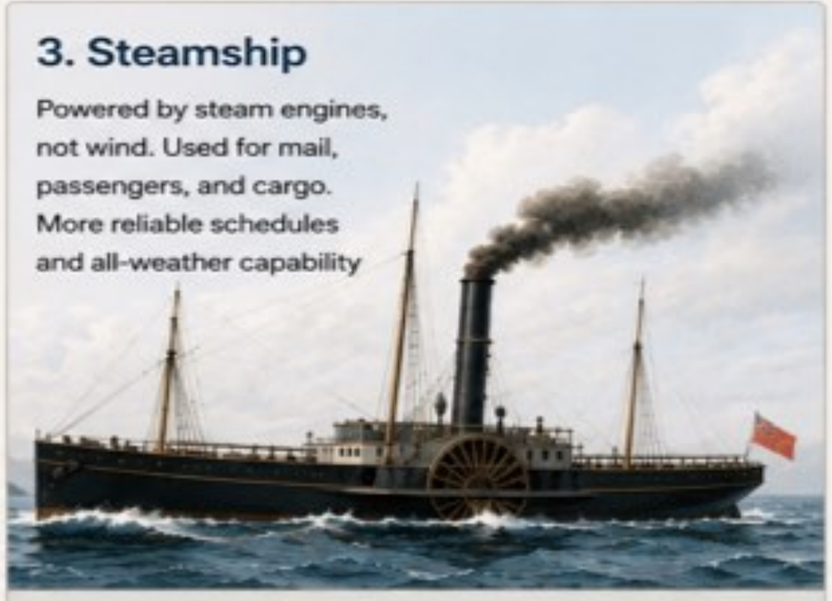
Versatile warships used for scouting, escort, and patrol Faster and smaller than ships of the line, but strongly armed



Displacement: 800 – 1,500 tons | Crew: 200 – 300

## 3. Steamship

Powered by steam engines, not wind. Used for mail, passengers, and cargo. More reliable schedules and all-weather capability



Displacement: 500 – 2,000+ tons | Crew: 50 – 150

## 4. Merchant Sailing Ship

The workhorses of global trade. Carried general cargo, goods, and raw materials across the world



Displacement: 300 – 1,500 tons | Crew: 15 – 40

## 5. Clipper Ship

Fast sailing ships with sleek hulls and large rigs Built for speed, especially for the tea trade and later for routes like China and Australia



Displacement: 800 – 2,000 tons | Crew: 25 – 60

## 6. Coastal / Inland Vessel

Smaller ships used for coastal trade, harbour work, or river and canal transport. Included brigs, schooners, and steamboats.



Displacement: 50 – 300 tons | Crew: 5 – 20

# 1850s - The Age of Transition

## Wooden Ships at Their Peak

By 1850, wooden shipbuilding had reached extraordinary sophistication. Clipper ships like the Flying Cloud (1851) could reach 22 knots, while naval vessels like HMS VICTORY represented the pinnacle of wooden warship design. However, wood's limitations - rot, fire risk and size constraints - were becoming increasingly apparent as global trade demanded larger, more durable vessels





## Material Limitations

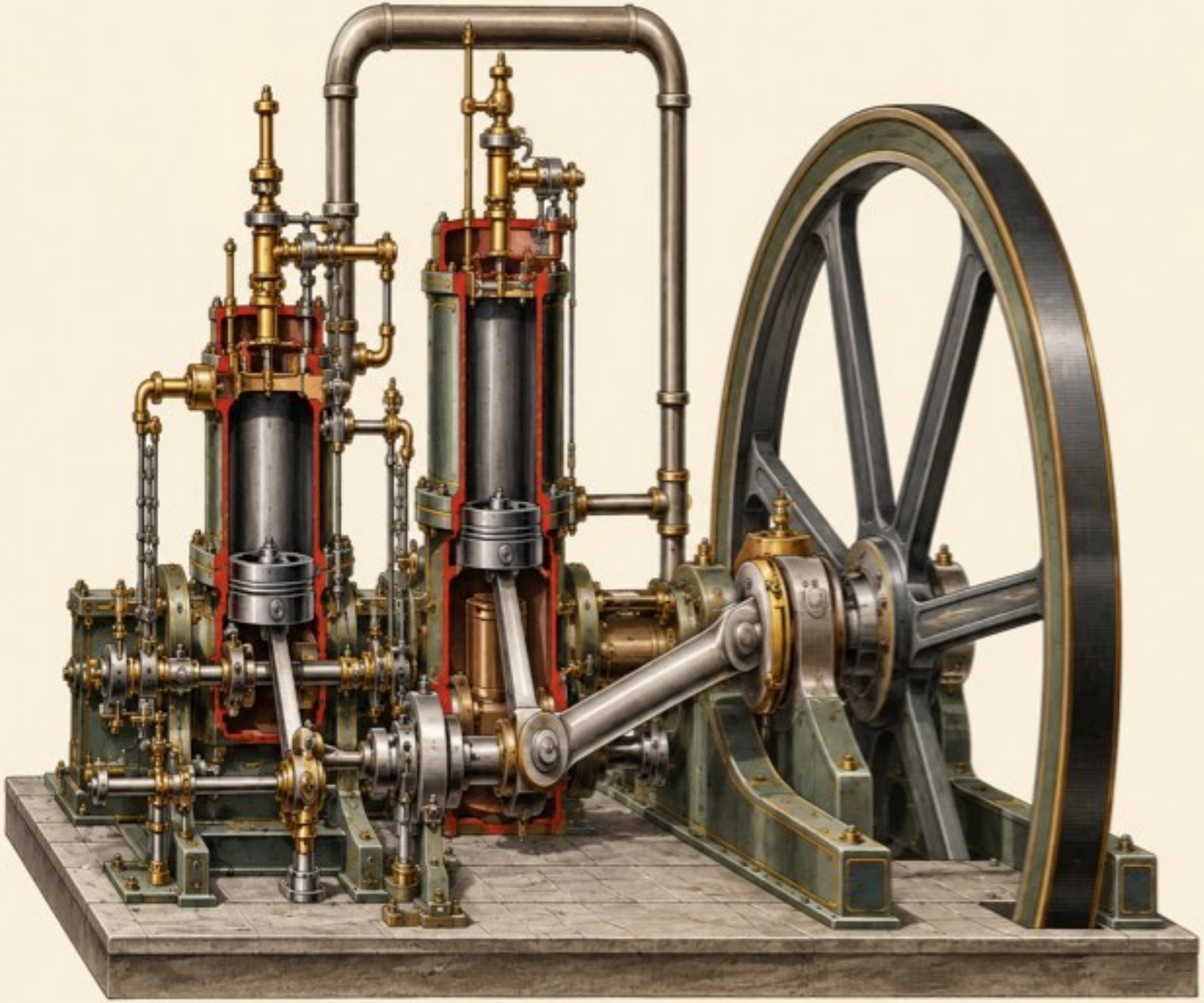
Wood could only support ships up to 5,000 tons maximum

## Fire Hazard

Wooden ships highly susceptible to catastrophic fires at sea

# Engine Efficiency Gains

From the mid 1850's onwards, Compound Steam Engines transformed shipping by using steam in stages, greatly reducing coal consumption. This made long-distance steamship services far more economical and helped steam finally overtake sail on the world's trade routes



# HMS VICTORY - 1765 to Today

Represents the peak of wooden warship construction. Built from thousands of oak timbers and armed with around 100 guns, she became Nelson's flagship at Trafalgar in 1805 and survives today as the world's oldest commissioned naval vessel




Portsmouth Harbour - 1920

# SS Great Western - 1837



SS Great Western, launched in 1837 in the 'Paddle Wheel' era, was the first wooden-hulled steamship purpose-designed for regular transatlantic passenger service. Brunel showed that a large ship could carry enough coal to cross the Atlantic efficiently, helping transform ocean travel from sail to scheduled steam navigation

# The Flying Cloud - 1851

Flying Cloud was the fastest clipper ships ever built. She sailed from New York to San Francisco in just 89 days, setting a record that stood for more than a century





# Iron vs Wood - The Great Debate

## Iron Advantages

Fire-resistant, larger cargo capacity, longer lifespan and immune to rot and shipworm

## Iron Challenges

Higher initial cost, required new construction techniques and compass interference

## Innovation Drivers

Crimean War (1853-56) accelerated ironclad development for military advantage



## Industry Resistance

Traditional shipwrights opposed change, fearing loss of centuries-old craftsmanship

# **The Crimean War of 1855** (not the one now!)



In early July 2026, the Ukrainian armed forces conducted a groundbreaking amphibious raid against Russian-held positions at the Kinburn Split. Executed entirely by unmanned vehicles operating across the sea, land, and air domains, the operation marks the first completely automated amphibious assault in military history conducted under wartime conditions



# Birth of the Ironclad - 1859 to 1862



## La Gloire (France, 1859)

First seagoing ironclad warship, wooden hull with iron armour, sparked naval arms race



## HMS WARRIOR (Britain, 1861)

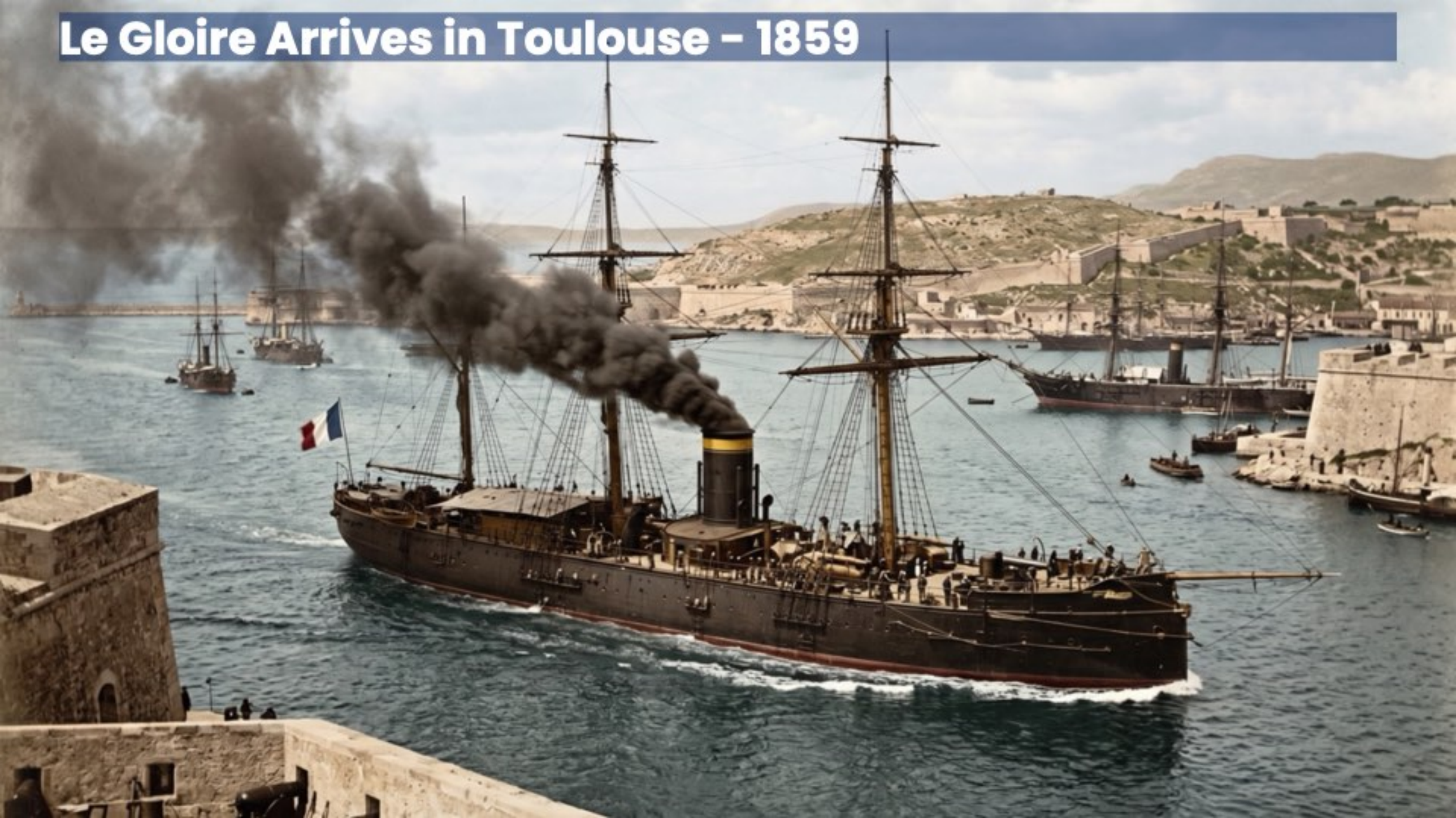
First iron-hulled warship, 9,200 tons, combined steam and sail power, rendered all wooden navies obsolete



## USS Monitor vs CSS Virginia (USA, 1862)

First battle between ironclads at Hampton Roads, proved iron's superiority over wood in combat

# Le Gloire Arrives in Toulouse - 1859



# HMS WARRIOR Arrives in Portsmouth - 1861



June 1987 off Hartlepool enroute to Portsmouth after refit

# American Civil War - Battle of Hampton Roads




The age of Nelson, Trafalgar, wooden walls, broadside sailing fleets was fading into history

# 1860s-1880s - Industrial Shipbuilding Emerges



## Scientific Design

Introduction of naval architecture as engineering discipline, using mathematical calculations for stability and strength

## Mass Production Techniques

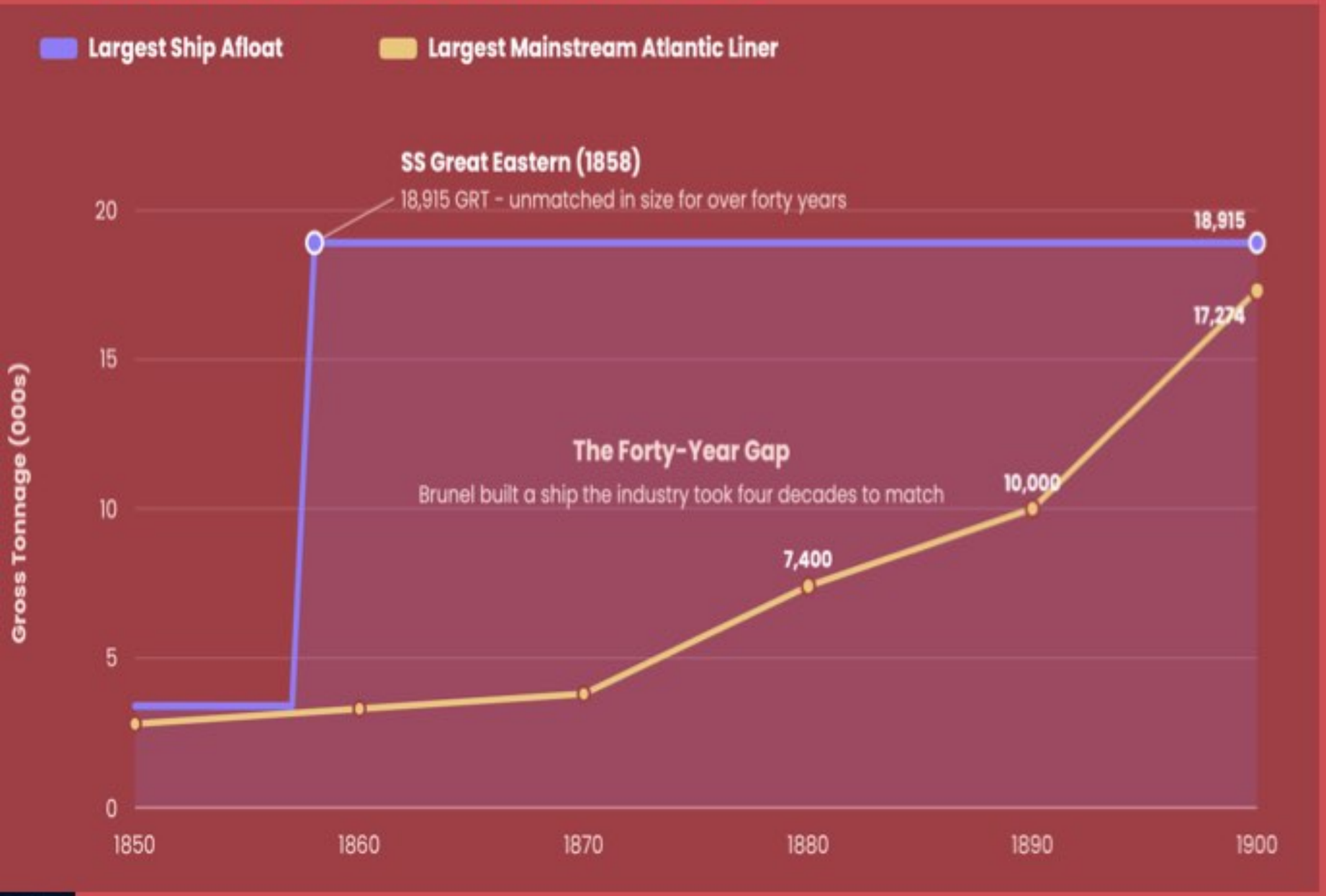
Riveted iron plate construction enabled standardised shipbuilding, reducing construction time from years to months



## Scale Revolution

Ships grew from 5,000 to just about 20,000 tons, enabling transoceanic passenger and cargo service

# Steel Revolution to 1900




## Steel Superiority

Steel provides 3x strength-to-weight ratio of iron, enabling larger ships with thinner hulls

## Bessemer Process

Mass-produced steel plates made large-scale shipbuilding economically viable for the first time

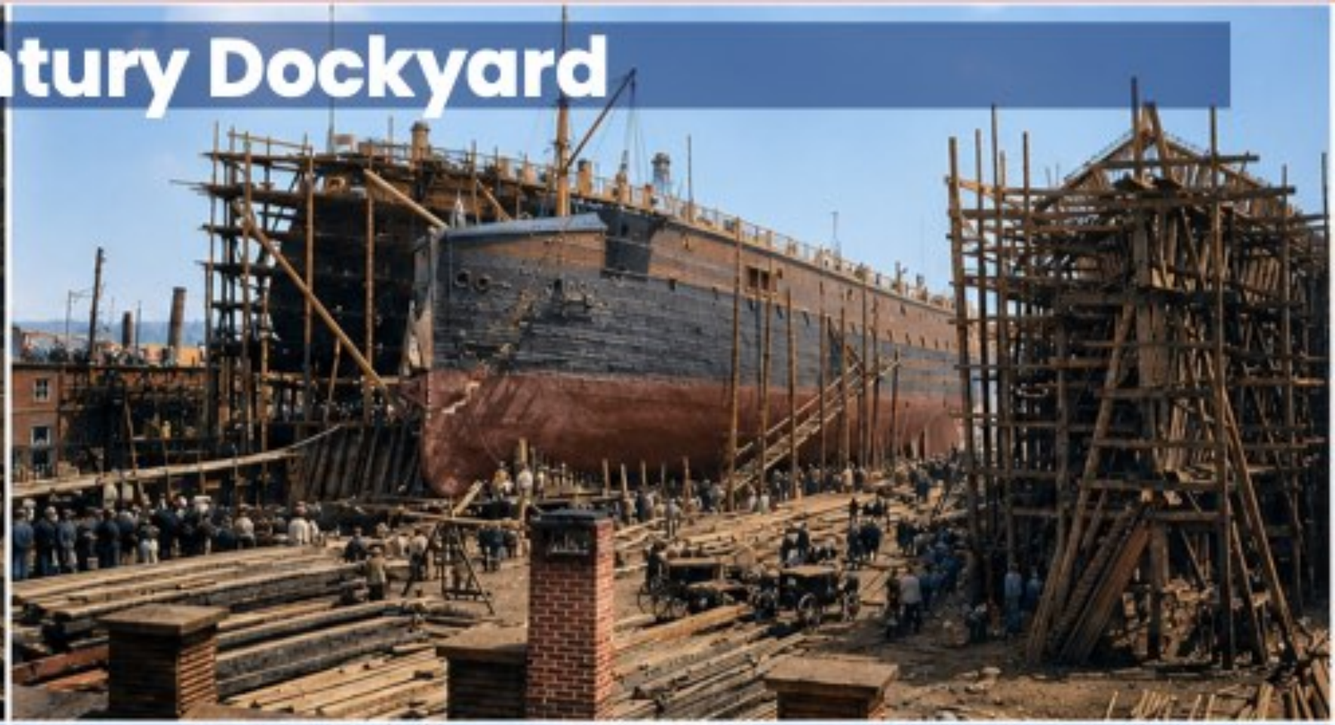
Launched in 1858, **SS Great Eastern** was by far the largest ship in the world, holding that title for four decades. Affectionately called the 'Great Babe' by Brunel



- Due to her weight (c 19,000 tonnes), she became stuck during a sideways launch attempt - it took three months to finally get her afloat
- During her 1859 sea trials, a heater explosion blew off a funnel and killed several firemen. A heartbroken Brunel died just days later

# Stepping into a Late 19th Century Dockyard









# Ships Changing at the Dawn of the 20th Century

SS Goldenfels - 1895

Represents what ships looked like at the turn of the 20th century - both built on the River Tyne - about 5,000 tons with 40 crew - both of these were sunk by German U-Boats in WW1

SS Chancellor - 1895

# Triumph and Tragedy - 1900 to 1914

### Olympic Class Giants

RMS Olympic, Titanic and Britannic represented the pinnacle of luxury shipbuilding, 46,000+ tons, 882 feet long

### Advanced Construction

Riveted steel hulls with 16 watertight compartments, Marconi wireless and steam turbine engines

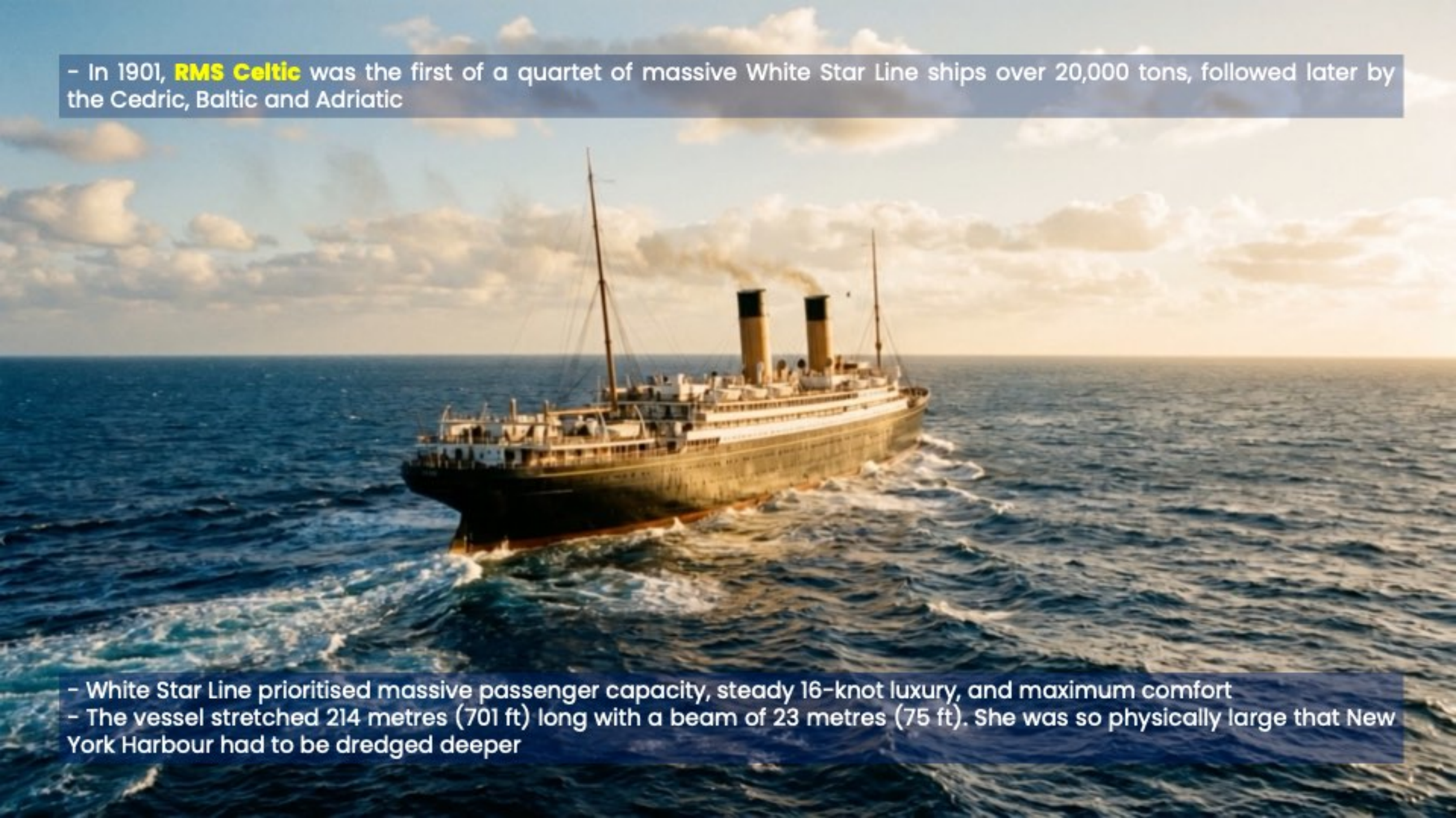
### Titanic Disaster 1912

Sinking revealed critical flaws: insufficient lifeboats, bulkhead design, iceberg warnings ignored

### SOLAS Convention 1914

International safety regulations mandated lifeboats for all, 24-hour radio watch, ice patrol service





- In 1901, **RMS Celtic** was the first of a quartet of massive White Star Line ships over 20,000 tons, followed later by the Cedric, Baltic and Adriatic

- White Star Line prioritised massive passenger capacity, steady 16-knot luxury, and maximum comfort
- The vessel stretched 214 metres (701 ft) long with a beam of 23 metres (75 ft). She was so physically large that New York Harbour had to be dredged deeper



RMS Olympic arriving in New York Harbour on 21 June 1911


SCARLET LADY


SCARLET LADY




| Specification | Scarlet Lady | Titanic |
|---|---|---|
| Length overall | 278 m | 269 m |
| Beam (width) | 38 m | 28 m |
| Height above waterline | 67 m | 53 m |
| Draught | 8 m | 11 m |
| Gross tonnage | 110,000 GT | 46,328 GRT |
| Passenger capacity | 2,770 | 2,435 |
| Crew | 1,160 | 892 |
| Maximum speed | 22 knots | 23 knots |

# The World's Top Shipbuilding Nations - 1850 to Today

| | 1850<br>Order Approximate | 1900 | 1950<br>Ranks 2-5 Approximate | 2000 | Today |
|---|---|---|---|---|---|
| 1st | United States | United Kingdom<br>approx 60% | United Kingdom<br>approx 38% | South Korea<br>approx 40% | China<br>approx 55% |
| 2nd | United Kingdom | United States | Sweden | Japan<br>approx 37% | South Korea<br>approx 20% |
| 3rd | Br. North America | Germany | Japan | Germany | Japan<br>approx 12% |
| 4th | Norway | France | Netherlands | China<br>approx 5% | Philippines |
| 5th | France | Netherlands | France | Poland | Vietnam |

# World War I - Military Innovation Spillover

## Wartime Acceleration

WWI drove rapid advances in shipbuilding technology, mass production techniques, and standardised designs that would revolutionise civilian shipping

## Oil versus Coal

- Steam turbines replaced reciprocating engines
- Oil fuel increased range and reduced crew
- Lighter power plants enabled faster ships

## Welding Revolution

- First welded ships built 1917-1918
- Reduced construction time by 30%
- Stronger hulls with fewer weak points

## Standardised Designs

Liberty ship early concepts emerged for rapid wartime construction

## Mass Production

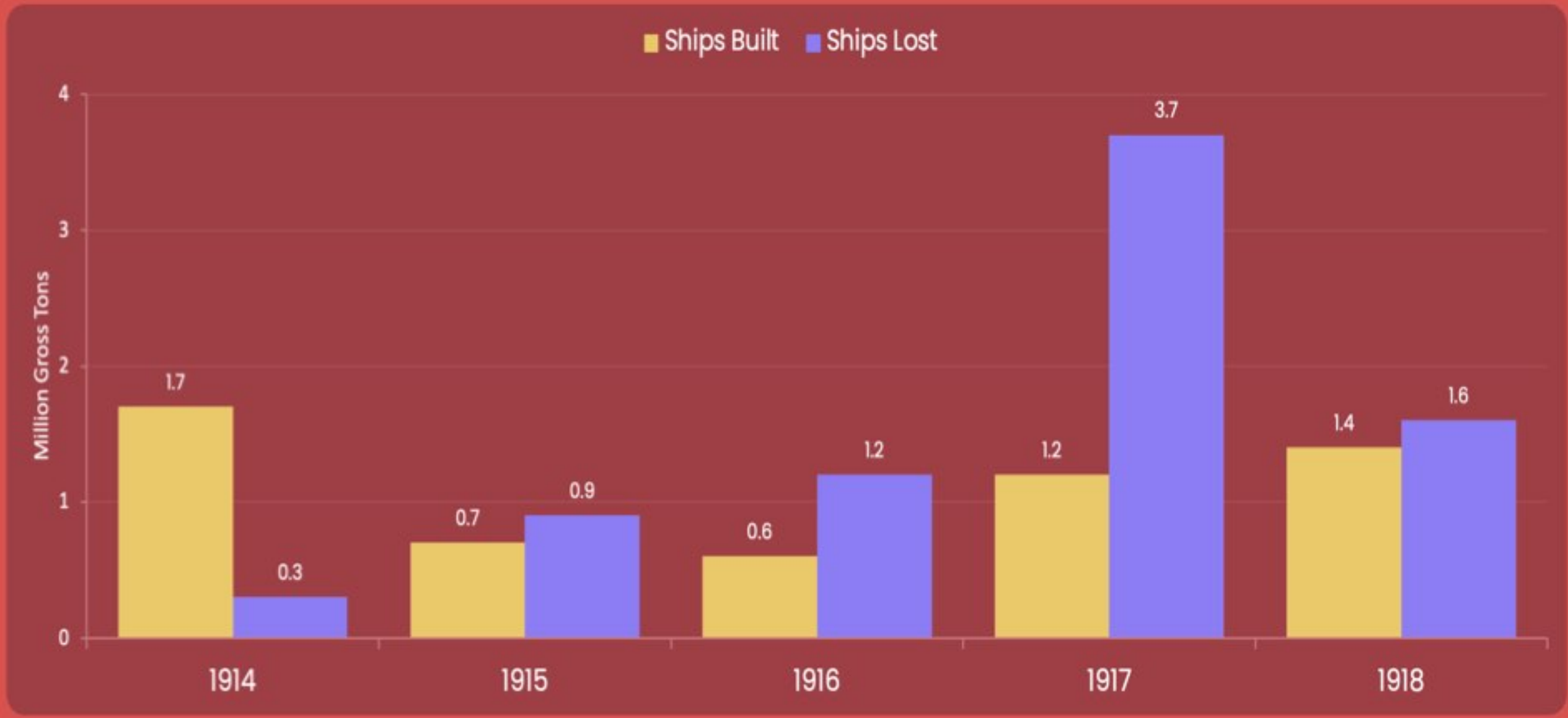
Shipyards adopted assembly line techniques from automotive industry

## Legacy Impact

Post-war surplus ships became first cruise liners

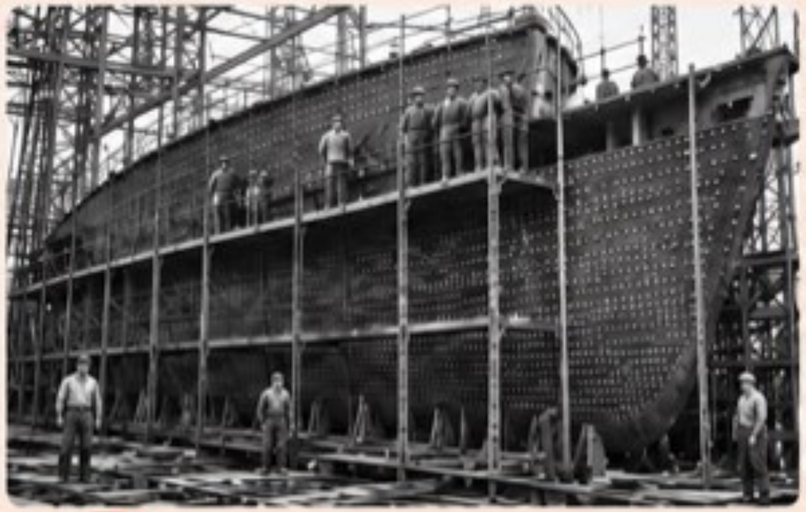


# World War I - Build Rates versus Losses



# From Rivets to Welding

## 1920s - Riveted Construction





- Steel plates fixed together with thousands of rivets
- Very strong, but heavy
- Slower and more labour-intensive to build
- Needed large teams of skilled riveters

## 1930s - Welded Construction





- Steel plates joined by welding
- Fewer joints and less weight
- Faster and cheaper to build
- Helped shipyards build larger ships more quickly

## Why It Mattered

- Ships became lighter and stronger
- Build times fell
- Modern steel shipbuilding took off

**Welding helped create the faster, larger ships of the modern age**

# Welding the Way



- Versailles Treaty limited Germany to 10,000 tons (on paper … though 12,000 tons in reality). Germans were very clever and adopted new shipbuilding techniques including welding
- A top speed of 29 kts
- Heavy Guns - 11-inch main battery
- Built for commerce raiding

Three ships were built:

Deutschland
Admiral Scheer
Admiral Graf Spee

# World War II - Liberty Ships Mass Production




## Production Miracle

Liberty ships revolutionised shipbuilding with standardised design and prefabricated sections. A ship that took 6 months to build in 1941 was completed in just about 40 days by 1943

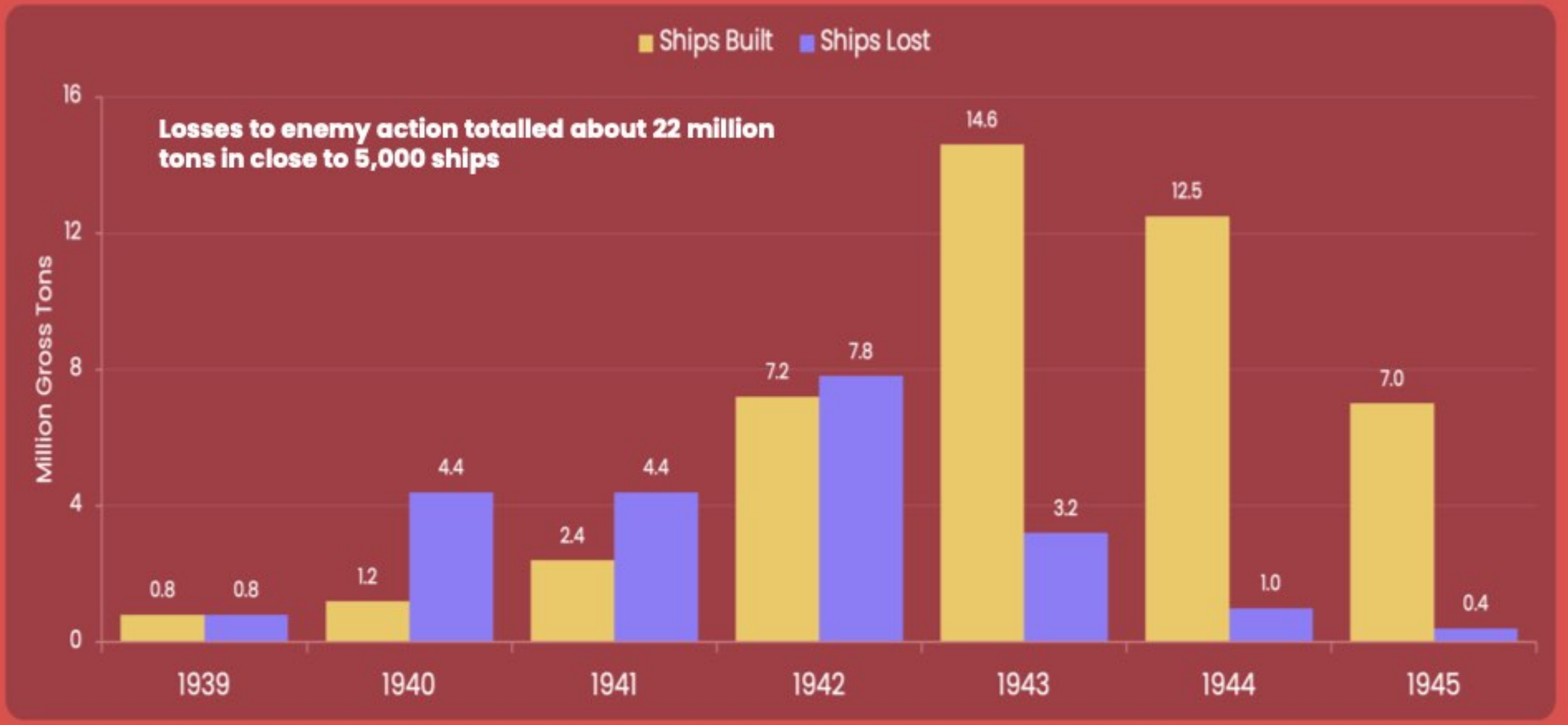
- Welded hull construction
- Modular assembly techniques
- Female workforce integration






Built in just 56 days in 1943, this Liberty ship took part in the D-Day invasion in June 1944. Each Liberty Ship is about half the length and beam and 10% of the tonnage of the Scarlet Lady

# World War II - Build Rates versus Losses



# Container Revolution - 1956 to 1970

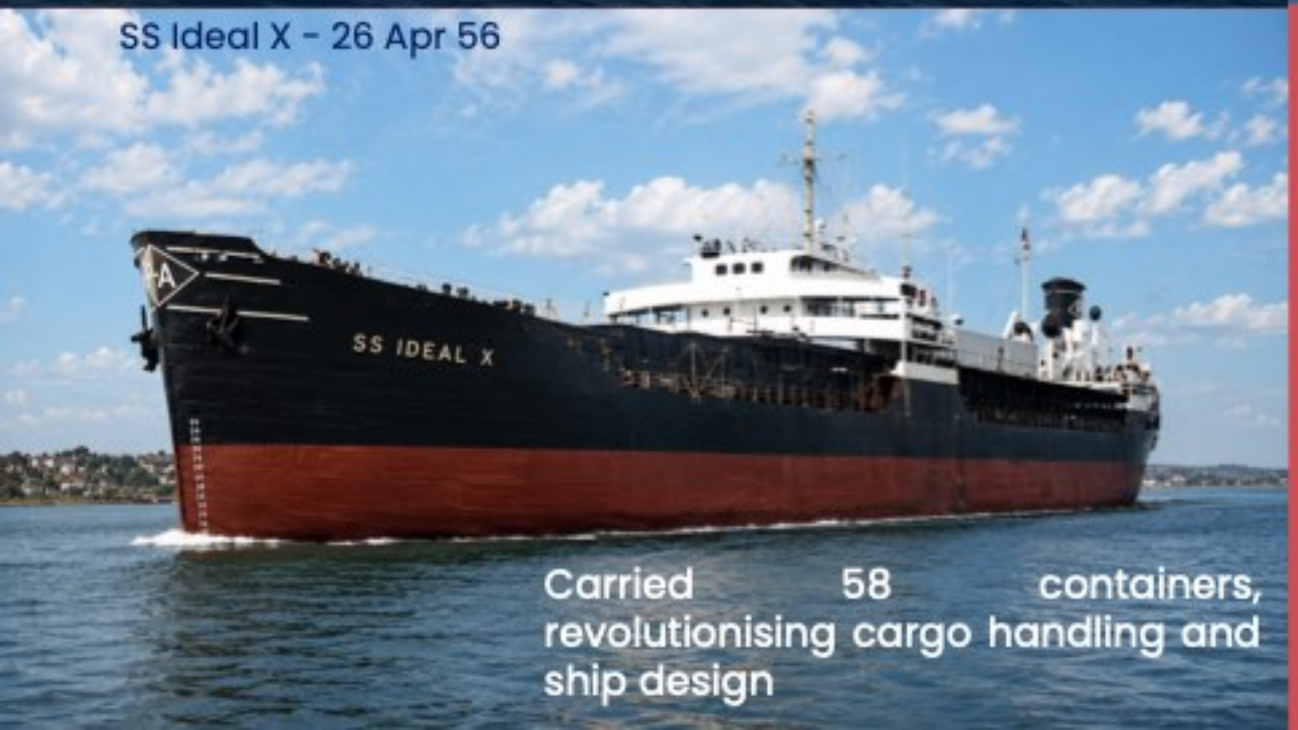


SS Potrero Hills - Jan 45



MV Clifford J Rogers - 1955

SS Ideal X - 26 Apr 56




Carried 58 containers, revolutionising cargo handling and ship design

The **SS Ideal X** was the world's **first commercially successful container ship**. Launched on its historic voyage in April 1956, it fundamentally revolutionised global trade

# Understanding the Container Business

**A TEU is 'Twenty-Foot Equivalent Unit'**



About
**33.6 million TEU**
Total global container ship carrying capacity

About
**6,700**
**container ships**
in service worldwide



**1 x 20-foot container**
**= 1 TEU**



**1 x 40-foot container**
**= 2 TEU**



**Largest container ships:**
**24,000+ TEU**



Around
**45 to 50 million**
**containers worldwide**

## Most container capacity is in Asia



# The Little Things










# Technological Breakthroughs - 1990 to 2000

**Azipod Propulsion (1990)**

Electric podded propulsion revolutionised maneuverability and space efficiency

**Advanced Stabilisers (1995)**

Retractable fin stabilisers dramatically reduced passenger seasickness

**Diesel-Electric Power (1998)**

More efficient, cleaner power systems replaced traditional steam turbines



# Propellor Designs

## Fixed Pitch





**Simple and reliable**

Common on cargo ships and tankers

## Controllable Pitch





**Blades adjust for better control**

Often used on tugs and workboats

## Variable Pitch





**Efficient across different speeds**

Useful for ferries and naval ships

## Ducted Propeller





**Extra thrust and protection**

Good for tugs and shallow waters

## Contra-Rotating





**Two propellers turning opposite ways**

Improves efficiency on large ships

## Waterjet





**High speed and excellent manoeuvrability**

Common on fast ferries


SCARLET LADY
Virgin
SCARLET LADY


SCARLET LADY



# Engineering at its Biggest






# Nuclear Powered Merchant Ships




Mutsu (Japan) - 1972



NS Savannah (US) - 1959



Otto Hahn (West Germany) - 1964




Sevmorput (Russia) - 1988

# Timelines for Building a Ship Today

Construction time versus order-to-delivery wait, by ship type

| Ship Type | Construction Time | Order To Delivery |
|---|---|---|
| **Container Ship** | 12 to 24 Months | About 3 Years |
| **Oil Tanker (VLCC)** | 12 to 18 Months | About 3 Years |
| **LNG Carrier** | 24 to 36 Months | 3 ½ to 5 Years |
| **Bulk Carrier** | 10 to 14 Months | About 3 Years |
| **RoRo / Car Carrier** | 16 to 24 Months | About 3 Years |
| **Cruise Ship** | 20 to 30 Months | **5 to 10+ Years** |

Construction time runs from keel-laying to delivery. Order-to-delivery includes the wait for a yard slot, which now dominates the lead time. With the world orderbook at supercycle levels of around 340 million dwt across roughly 348 active yards, about half the 2007 peak, queues have lengthened across every segment. Cruise ships are the outlier, with four European yards holding almost all global capacity and orders now extending to 2035 and beyond

# The World's Three Largest Ship Builders

| | CSSC (China) | HD Hyundai (Ulsan) | Samsung Heavy Industries (Geoje) |
|---|---|---|---|
| **Established** | 1999, current form 2019 | 1972 | 1974 |
| **Flagship Site** | 20+ yards led by Jiangnan, Shanghai | 7.2 km² over 4 km of Mipo Bay coast | About 4 km² on Geoje Island |
| **Drydocks** | 30+ across the group | 10, largest 672 m by 92 m at 1 million dwt | 9, largest 640 m by 97.5 m by 13 m |
| **Workforce** | About 310,000 group-wide | About 20,000 at Ulsan | About 13,000 at Geoje |
| **Share Of World Orderbook** | About 20% | About 15% (group) | About 10% |
| **Current Orderbook** | 30+ M CGT; 38.9 M dwt of new orders in 2025 | 453 vessels / 41 M dwt; $17.4 bn booked in 2025 | 132 vessels, $28.2 bn, slots filled to late 2029 |
| **Famous Builds** | Aircraft carriers Shandong and Fujian; Adora Magic City, China's first large cruise ship | Over 2,300 vessels to 344 owners in 51 countries; only yard building both LNG types | Prelude FLNG (488 m, largest floating object ever); Q-Max LNG carriers; MSC Gülsün, 23,756 TEU |
| **Stand-Out Fact** | About one in five merchant ships on order globally, plus the entire PLA Navy fleet | Yard and first 260,000 ton VLCC built and delivered together in 1974 | Best dock turnover in the world - ten complete ships per dock per year |

All three are corporate groups, not single sites. CSSC is a Chinese state holding company with 20+ yards; HD Hyundai and Samsung Heavy Industries are private Korean groups, each centred on one mega-yard. Hanwha Ocean, the former Daewoo, sits in close fourth







# China State Shipbuilding Corporation (CSSC) - Shanghai












Hyundai
HD
- Ulsan

VOYAGES











# Samsung Heavy Industries - Geoje

VOYAGES



# Shipbuilding ... for American Passengers

**From The Liberty Ship Miracle To A Single Vessel Built In 2024**

**2,710**

Liberty Ships Built By American Yards between 1941 and 1945, in the largest industrial mobilisation in history

**5**

Large commercial ships built in the United States in 2023 (against 1,800 in China)

**0.05%**

United States share of world commercial shipbuilding today

1850s - **World Leader**: American shipyards built more ships than any other country

1941 to 1945 - **Wartime Miracle**: America built 2,710 Liberty ships, helping win the Battle of the Atlantic

2024 - **Dramatic Decline**: America built just 1 large commercial ship, compared with 717 in China

Today - **Fighting Back**: Washington is trying to revive American shipbuilding after decades of decline



# Pride of America




NCL's Pride of America is the only large US-flagged cruise ship in service. Begun in Mississippi but completed in Germany, she received a special congressional exemption allowing her to qualify for US coastwise service

# Shipbuilding ... for Canadian Passengers

From The Maritimes' Wooden-Ship Heyday To The Western World's Largest Icebreaker Order Book

**3rd**

British North America's rank among world shipbuilders in the 1850s, behind only Britain and the United States

**$6.4 bn**

Polar Icebreaker Contracts awarded to Davie and Seaspan in March 2025

**1825**

Year Chantier Davie was founded, making it Canada's oldest working shipyard

1850s - **World Leader**: Canada was the world's third-largest shipbuilder, famous for its wooden sailing ships

**The Great Decline**: The arrival of iron and steel ships ended Canada's shipbuilding golden age

Today - **A New Direction**: Canada is concentrating on naval ships and icebreakers rather than commercial vessels. Three Major Shipyards: Davie in Quebec, Irving in Halifax and Seaspan in Vancouver lead the revival

2025 - **Arctic Ambitions**: Canada commissioned two new polar icebreakers, costing over C$6 billion combined, while building a new generation of warship



# Icebreaking Giant



# Shipbuilding ... for British Passengers

**From 60% of world tonnage to Spanish-owned Harland & Wolff**

**60%**

Britain's share of world shipbuilding output in 1900, a position held for more than half a century

**1956**

Year Britain lost the world number-one spot to Japan, after UK output grew just 18% against 300 per cent for the world

**1967**

Year QE2 launched at Clydebank, the last large British-built ocean liner

- The decline is best captured in a single comparison. Between 1947 and 1957, UK shipbuilding output rose by 18 %, while world output rose by over 300%. Britain did not shrink, it was overtaken at warp speed. QE2, launched at Clydebank in 1967, was the last large British-built ocean liner

- The news is that Titanic's yard (Harland & Wolff) is back at work. In January 2025, the Spanish state shipbuilder Navantia acquired Harland and Wolff after a second bankruptcy, and £115 million is being invested to modernise Belfast to build three Fleet Solid Support ships for the Royal Navy - the first ships built there since 2003



# New RN Fleet Solid Support Ships



# Shipbuilding ... in Belfast

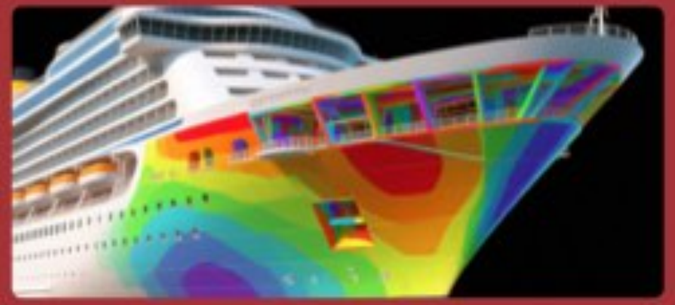


# Advanced Materials and Engineering



## High-Tech Materials

- High-strength steel reduces hull weight by 15% while maintaining strength
- Aluminum superstructures reduce top weight, improving stability
- Composite materials for lifeboats and interior components
- Advanced coatings prevent corrosion, extending hull life to 30+ years



## Computer-Aided Design

- Finite element analysis optimises hull strength and weight
- Computational fluid dynamics improves fuel efficiency by 8-12%
- 3D modeling enables clash detection before construction
- Digital twins monitor ship performance throughout lifetime



## Automation Integration

- Robotic welding ensures consistent quality and speed
- Laser scanning verifies dimensional accuracy
- Automated painting systems reduce environmental impact
- AI-powered quality control detects defects early

# Modular Construction Revolution

## Building Blocks of Giants

Modern ships are constructed like massive LEGO sets. Ships are assembled from 100+ pre-fabricated blocks, each weighing 200-800 tons. These blocks contain complete cabins, restaurants, and technical systems, allowing parallel construction

## Block Assembly

Complete sections built in covered halls, weather-independent

## Quality Control

Systems tested before installation, reducing sea trial failures













# Modern Ship Construction Process - Step-by-Step



## 1 Design and Engineering

Naval architects create 3D models, stability calculations, and regulatory compliance plans



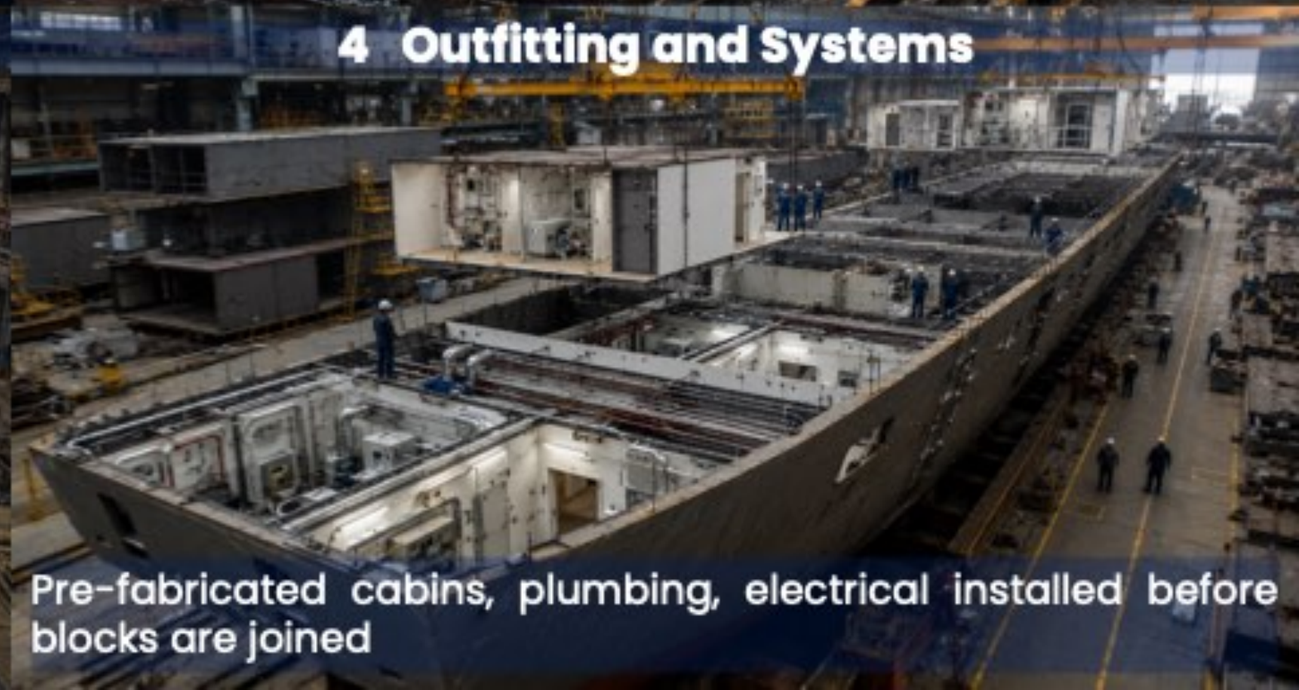
## 2 Steel Cutting and Block Construction

Massive steel plates cut by laser/plasma, assembled into 200+ ton blocks in covered halls



## 3 Keel Laying and Assembly

First block placed on building dock, subsequent blocks lifted by 1,200-ton cranes



## 4 Outfitting and Systems

Pre-fabricated cabins, plumbing, electrical installed before blocks are joined

# Modern Ship Construction Process - Step-by-Step

## 5 Float Out and Dock Transfer



Ship launched and moved to outfitting dock for final construction phases

## 6 Interior Completion



Casinos, restaurants, theaters, pools installed - like building a city in 30 days

## 7 Sea Trials and Testing



Comprehensive testing of all systems, safety drills, speed and maneuvering tests

## 8 Delivery and Christening



Final inspections, crew training, champagne ceremony, first passenger voyage

# Future Shipbuilding Technologies

## Alternative Fuels

The next generation of ships will be powered by revolutionary clean energy systems

- Hydrogen fuel cells for zero-emission operations
- Battery hybrid systems for port navigation
- Synthetic e-fuels from renewable energy
- Ammonia and methanol as marine fuels
- Nuclear

## Autonomous Systems

AI and automation will transform ship operations and passenger experience

- Autonomous navigation systems reduce human error
- AI-powered energy management optimizes efficiency
- Robotic maintenance and cleaning systems
- Predictive maintenance prevents breakdowns



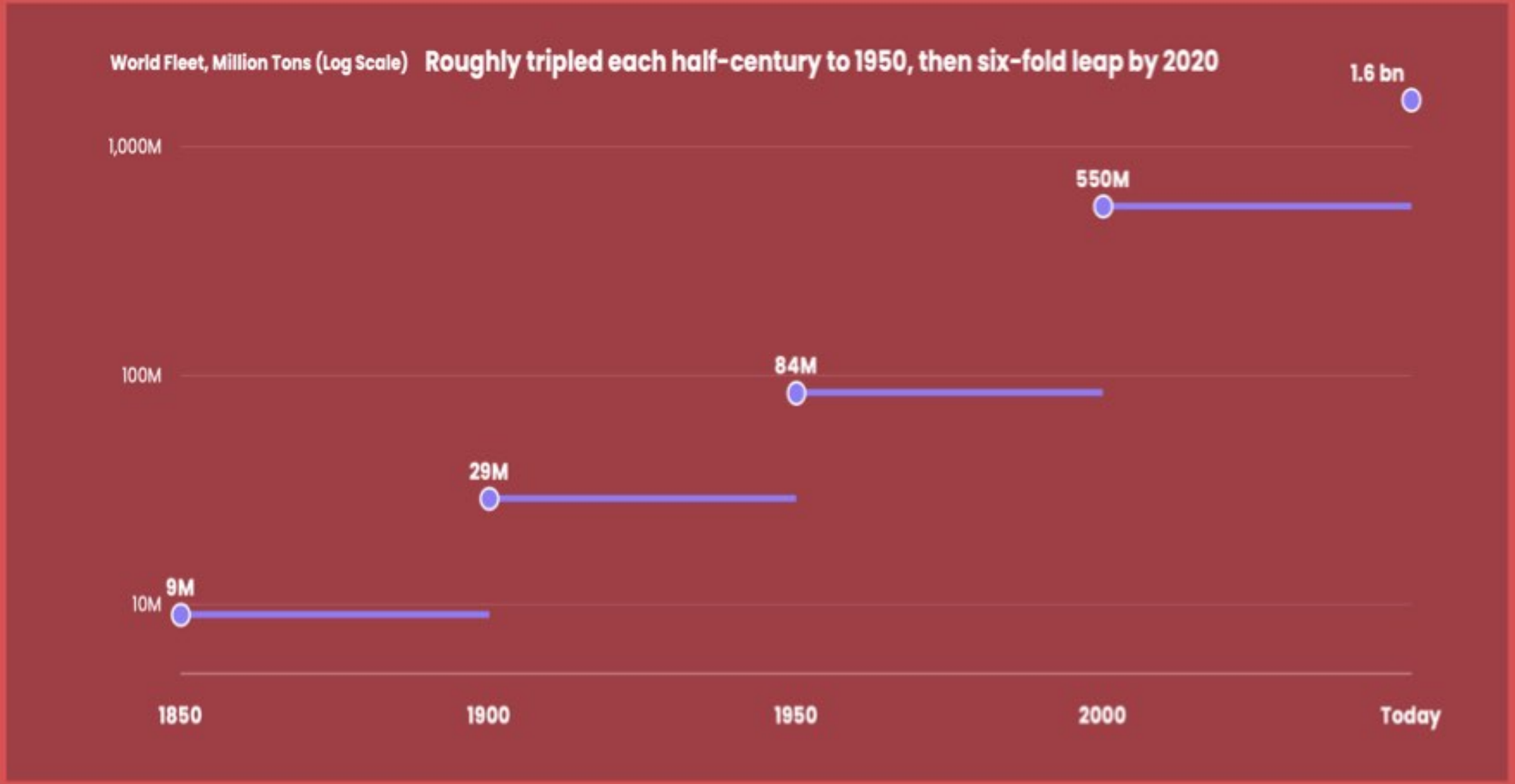
# The ‘Tesla of the Seas’




**Yara Birkeland**

First autonomous and all all-electric cargo ship under long-term trials in Norway

# The World's Merchant Fleet Size – 1850 to Today



# Size Matters!




The world's largest container ship is the MSC Irina, with a maximum carrying capacity of 24,346 TEUs (twenty-foot equivalent units). Delivered in March 2023, it has a tonnage of 236,000 tons and a length of 400 m

The largest tankers in operation as active trading vessels are the four sister ships of the TI-class (TI Europe, TI Oceania, FSO Africa, and FSO Asia), with a tonnage of 442,000 and a length of 380



# New Designs



Sea Shadow (IX-529) was an experimental stealth ship built by Lockheed Martin

Hurtigruten launched its Sea Zero project in 2022 to develop its first zero-emission Coastal Express ship. Following an extensive research and development phase, the project is intended to progress into construction, with the first vessel planned to enter service in 2030



# The Unusual/Novel




Cable Layer

Drill Ship



Semi-submersible ship (a heavy-lift cargo vessel that partially submerges to load cargo



# How Ships Have Changed

## 1850s
The Age of Sail & Steam




Merchant Clipper Ship




Early Steamer / Packet Ship

## 1900s
Steamships and Ocean Liners




Passenger Liner




Cargo Freighter

## 1950s
Mid-Century Maritime Commerce




Streamlined Liner




Bulk Carrier

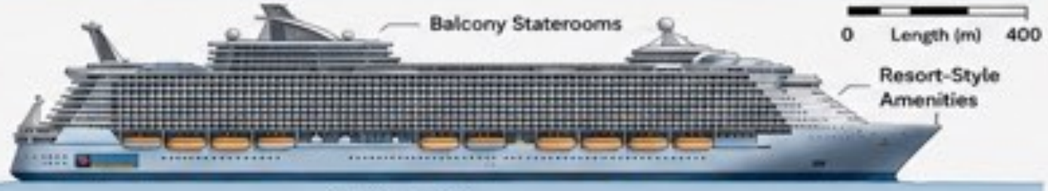



Oil / Product Tanker

## 2000s
Containerisation and Modernisation




Panamax Container Ship




Cruise Ship

## 2025s
Next-Generation Efficiency




ULCV Container Ship




Hybrid Bulk Carrier

# Key Takeaways - Evolution Lessons

## Innovation Drivers

Each major advancement was driven by crisis, competition, or changing passenger expectations

## Safety Evolution

- Every major disaster led to revolutionary safety improvements
- International cooperation essential for global standards
- Technology alone insufficient without proper procedures

## Global Impact

- Shipbuilding advances transformed global trade and tourism
- Standardisation enabled worldwide cruise industry growth
- Environmental leadership drives future innovation

## Future Vision

Autonomous systems, zero-emission fuels, and AI optimisation will define next 50 years

## Human Element

Despite technology, skilled crews and proper training remain irreplaceable

## Continuous Innovation

The evolution continues - tomorrow's ships will be unrecognisable from today's






Side Elevation




Bow View



Top View




Stern View

# The Virgin Voyages Fleet - 'Sisters at Sea'

- 'Sisters at Sea' will take place on 16 February 2027, when all four Lady Ships meet at a fixed point in the Caribbean approximately 44 miles north Cuba
- Will likely be the first time any cruise line or maritime operator has brought its entire fleet to a single coordinate at the same moment in recorded history, bringing together over 15,000 sailors and crew members
- The gathering will feature simultaneous onboard events across all four ships, including coordinated deck parties and a fleet-wide horn salute





We avoided this fate ...





The ghosts of Star Tiger, Star Ariel, Flight 19, USS Cyclops and Marine Sulphur Queen (and Oscar the Octopus) granted us safe transit through the Bermuda Triangle ...

Thank you to the Scarlet Lady Production Team and Cruise Manager



# Thank You to You All

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