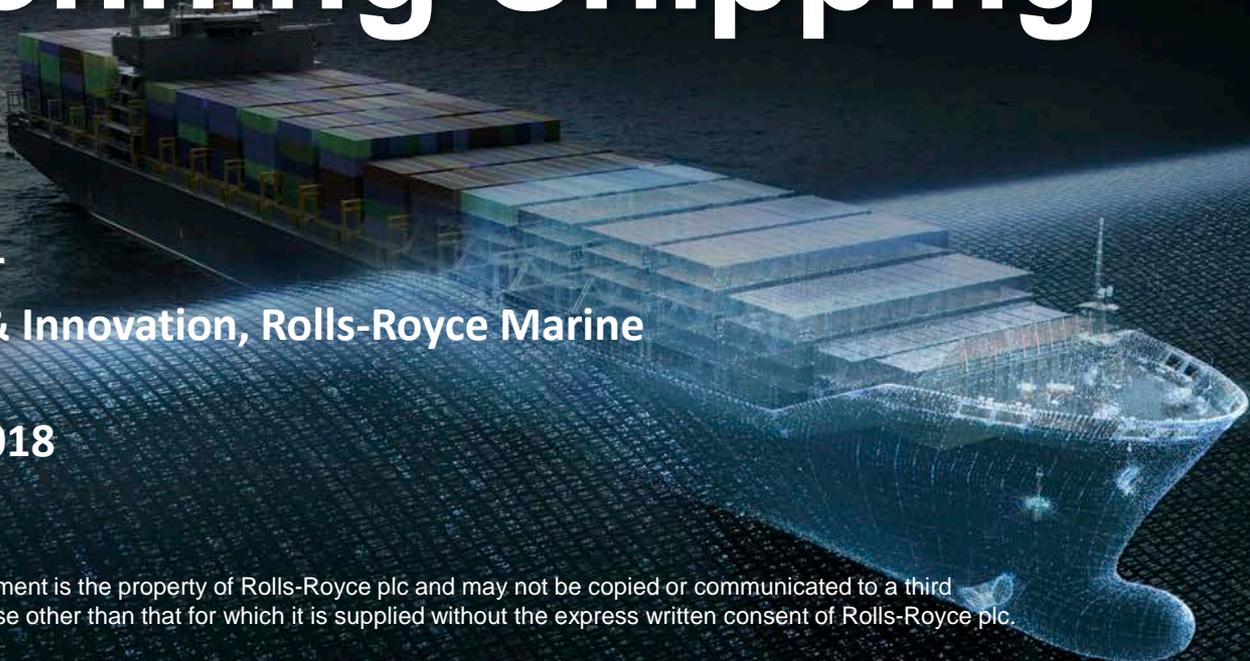


Redefining Shipping



Oskar Levander
SVP Concepts & Innovation, Rolls-Royce Marine

Athens, 30.5.2018

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Disruptive change



Marine 4.0 – the Ship Intelligence era

1.0 Steam engines

1860 – 1910



2.0 Mass production

1940



3.0 Containerization

1957



4.0 Digitalization

2010+



Change driven by digitalization



Operation



Business



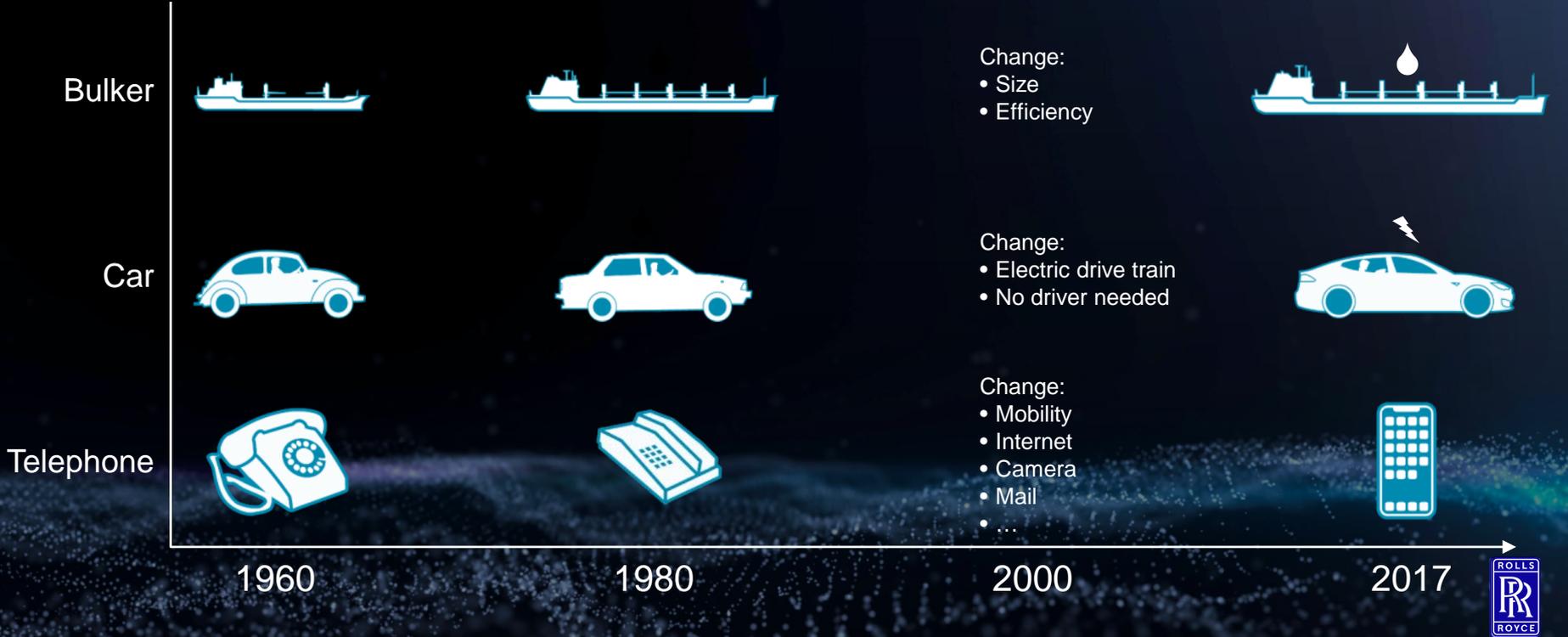
Technology



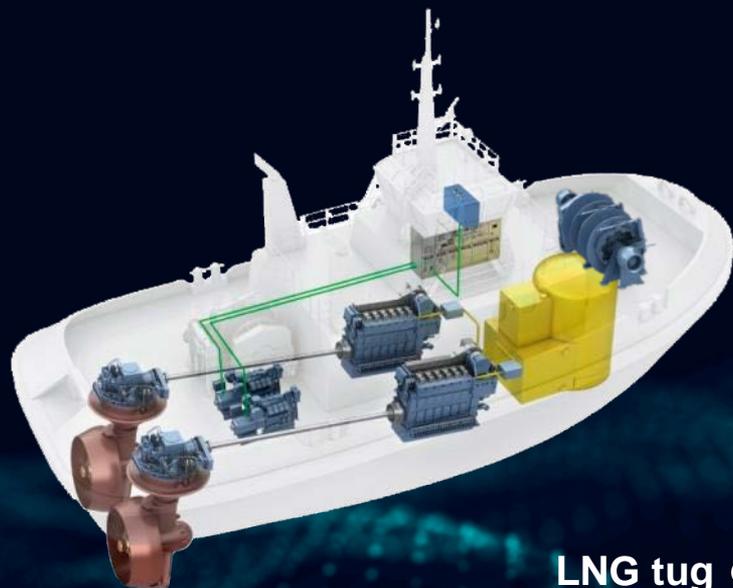
Management



Time for change



Evolution or revolution?

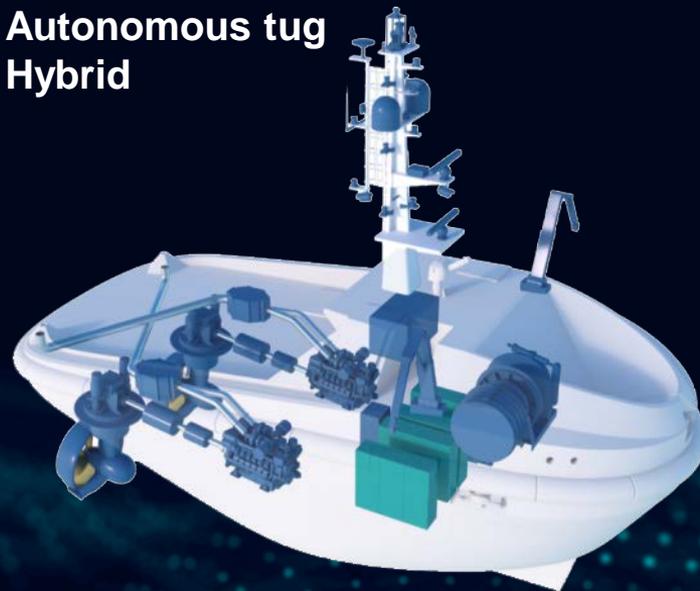


LNG tug ●

Revolution

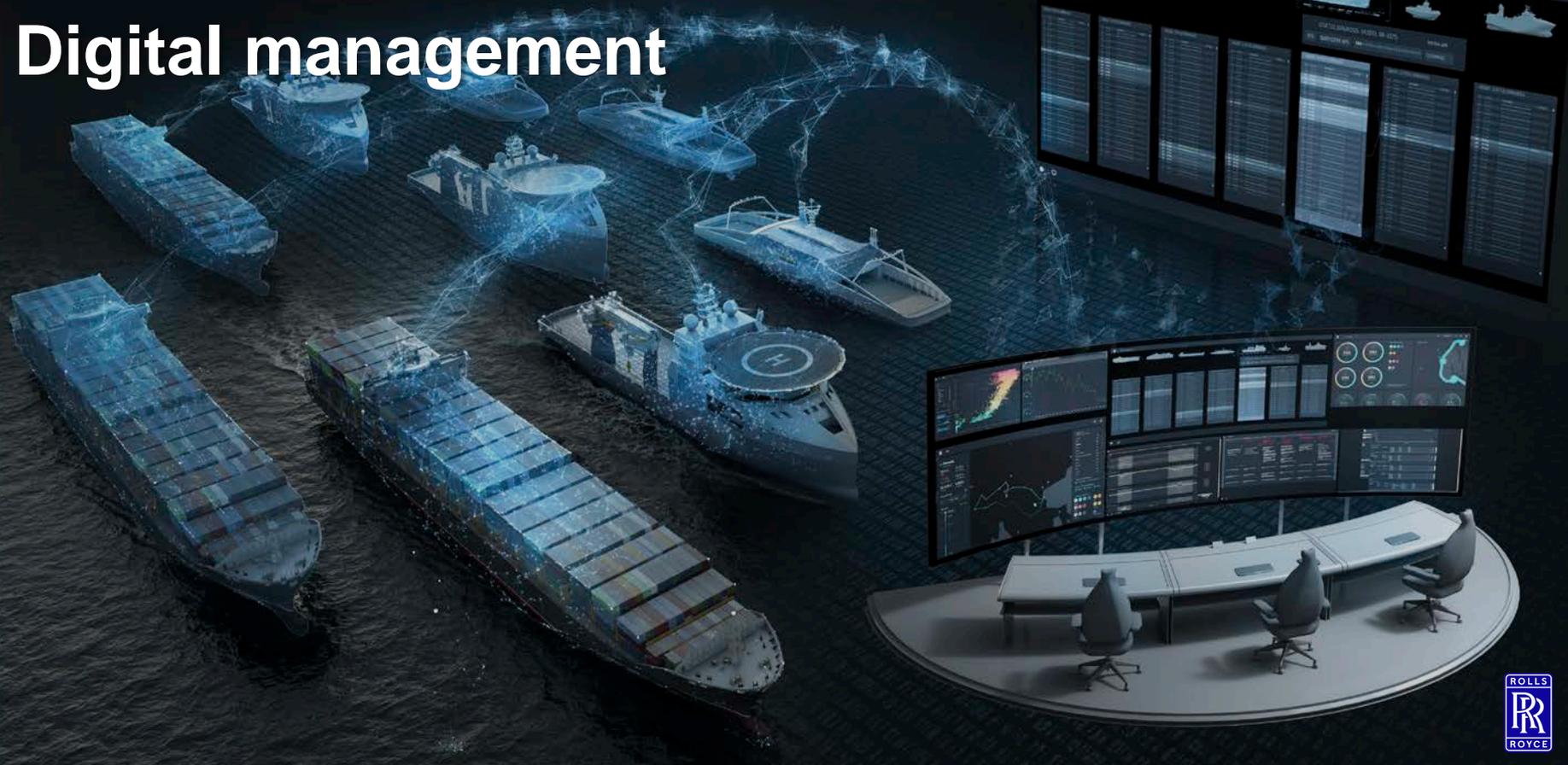


Autonomous tug
Hybrid



Evolution

Digital management



Remote operations



Remote and autonomous shipping



Drivers for R&A shipping



Safety



Business



Cost



Risk

Sustainability





Ship
Intelligence

Safety

Safer than before

Fewer accidents

Human error factor



No piracy victims

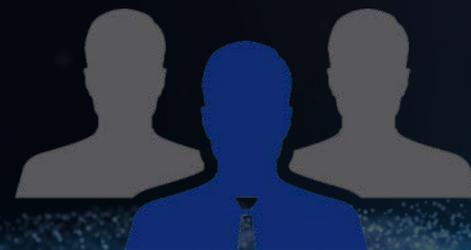
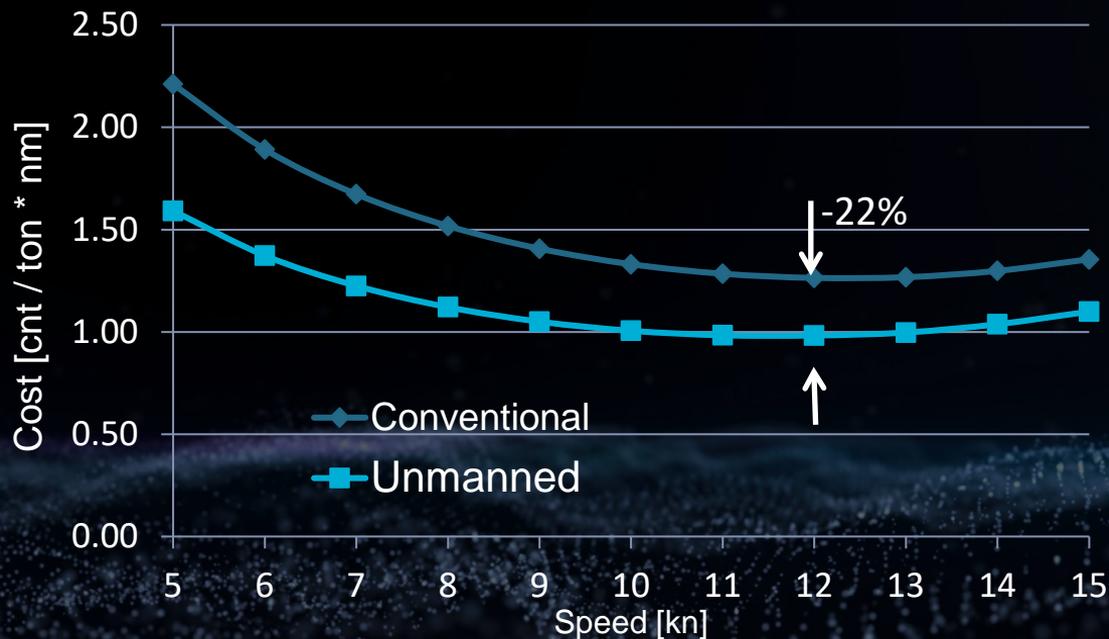
Humans away from danger



Cost - transport

20 000 dwt general cargo vessel

Transport cost (cost / ton * nm)





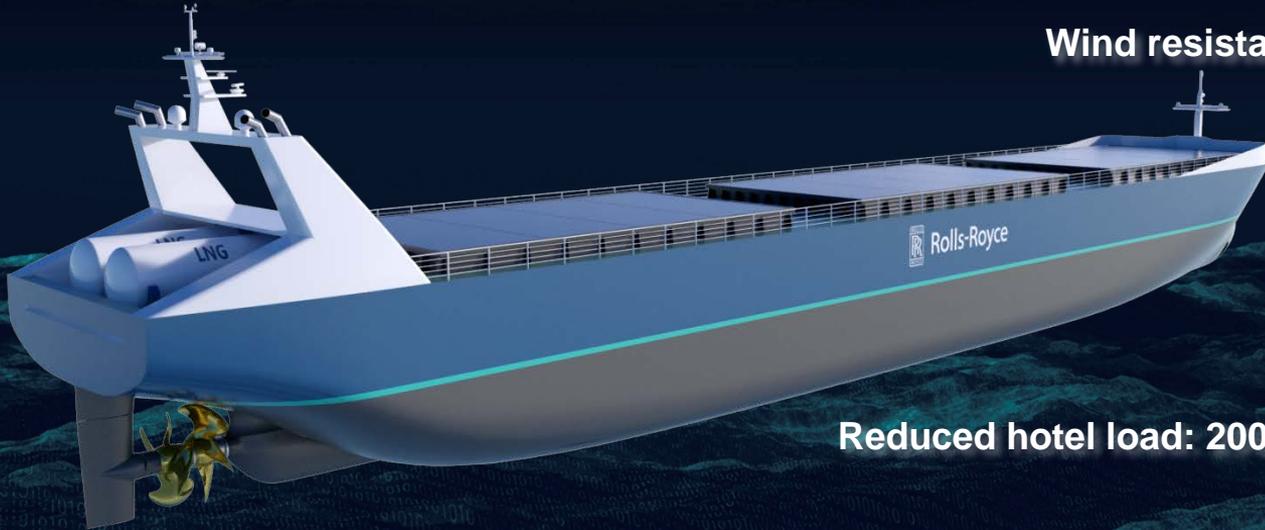
Ship
Intelligence

Energy reduction

Lower weight: 700 – 1.000 ton

Lower operating speed?

Wind resistance: ~1% saving



Reduced hotel load: 200 – 270 kW

10-15% fuel savings



Remote and autonomous shipping

Systems for crew
Sewage
A/C
Galley
Life saving

NON VALUE ADDING

5M \$



VALUE ADDING

Reliability
Sensors
Redundancy
Automation

5M \$



Ship
Intelligence

Reliability

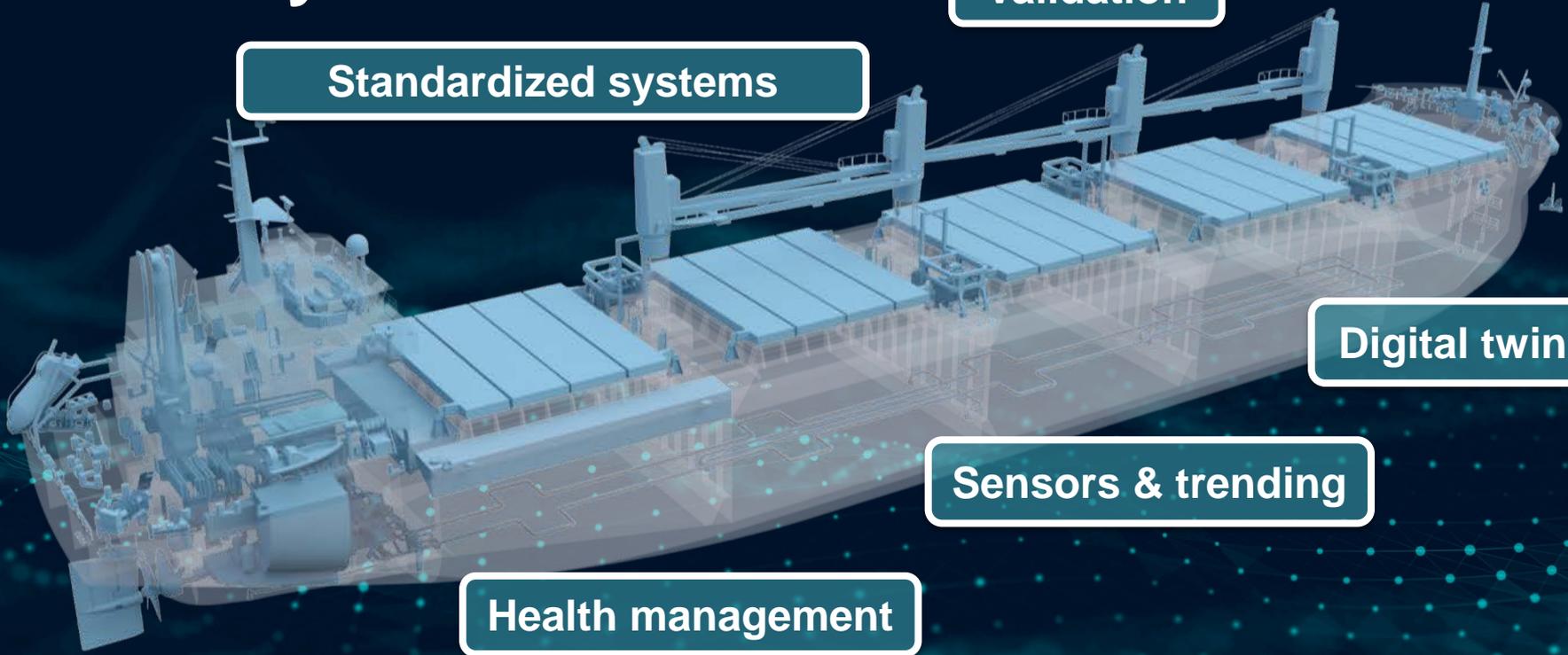
Standardized systems

Validation

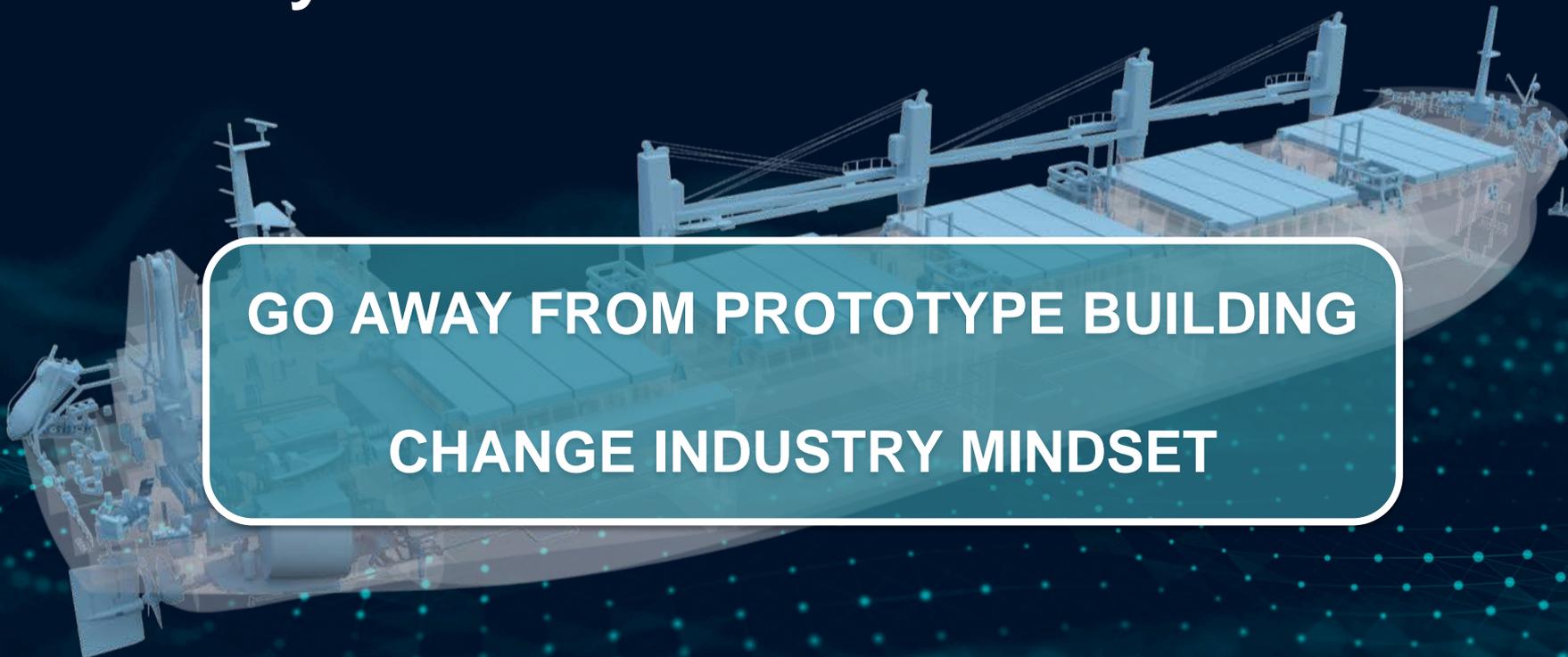
Digital twin

Sensors & trending

Health management



Reliability



**GO AWAY FROM PROTOTYPE BUILDING
CHANGE INDUSTRY MINDSET**

Roadmap towards Remote & Autonomous shipping



REMOTE SUPPORT, OPERATION OF CERTAIN FUNCTIONS

REMOTE AND AUTONOMOUS LOCAL VESSEL

REMOTE AND AUTONOMOUS SHORT SEA VESSEL

REMOTE AND AUTONOMOUS OCEAN GOING VESSEL

Automatic crossing system

- The automatic crossing system ensures safe and energy efficient transit by automatically controlling the vessel's acceleration, deceleration, speed and track.
- The captain will supervise the system, and intervene if needed
- 21 systems in operation or on order



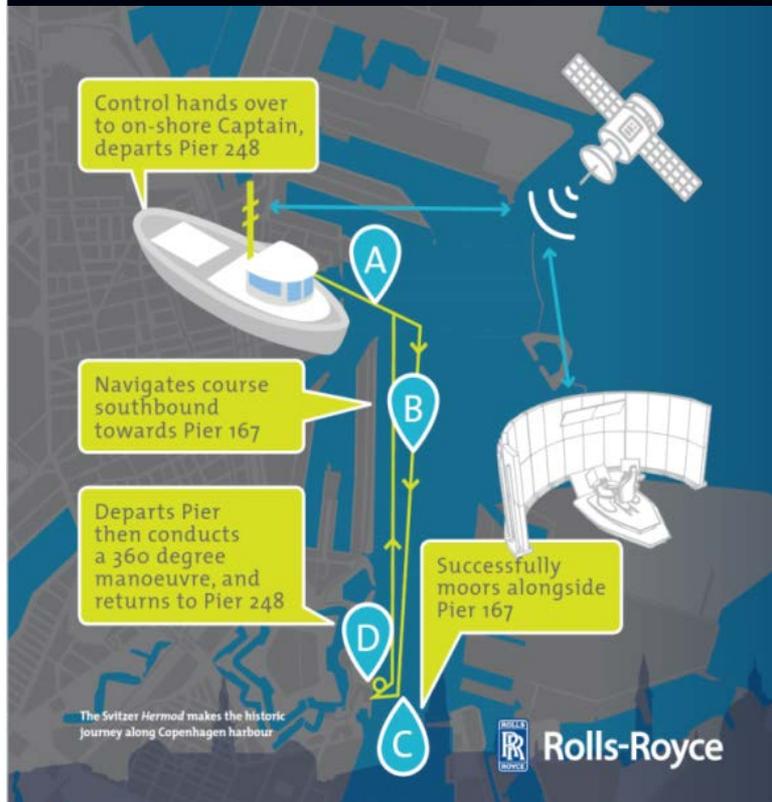
Project SVAN



- Optimize the safety and efficiency of marine operations
- Develop technology for decision support systems
- Demonstrate remote and autonomous ferry operations



World's first remotely controlled commercial tug

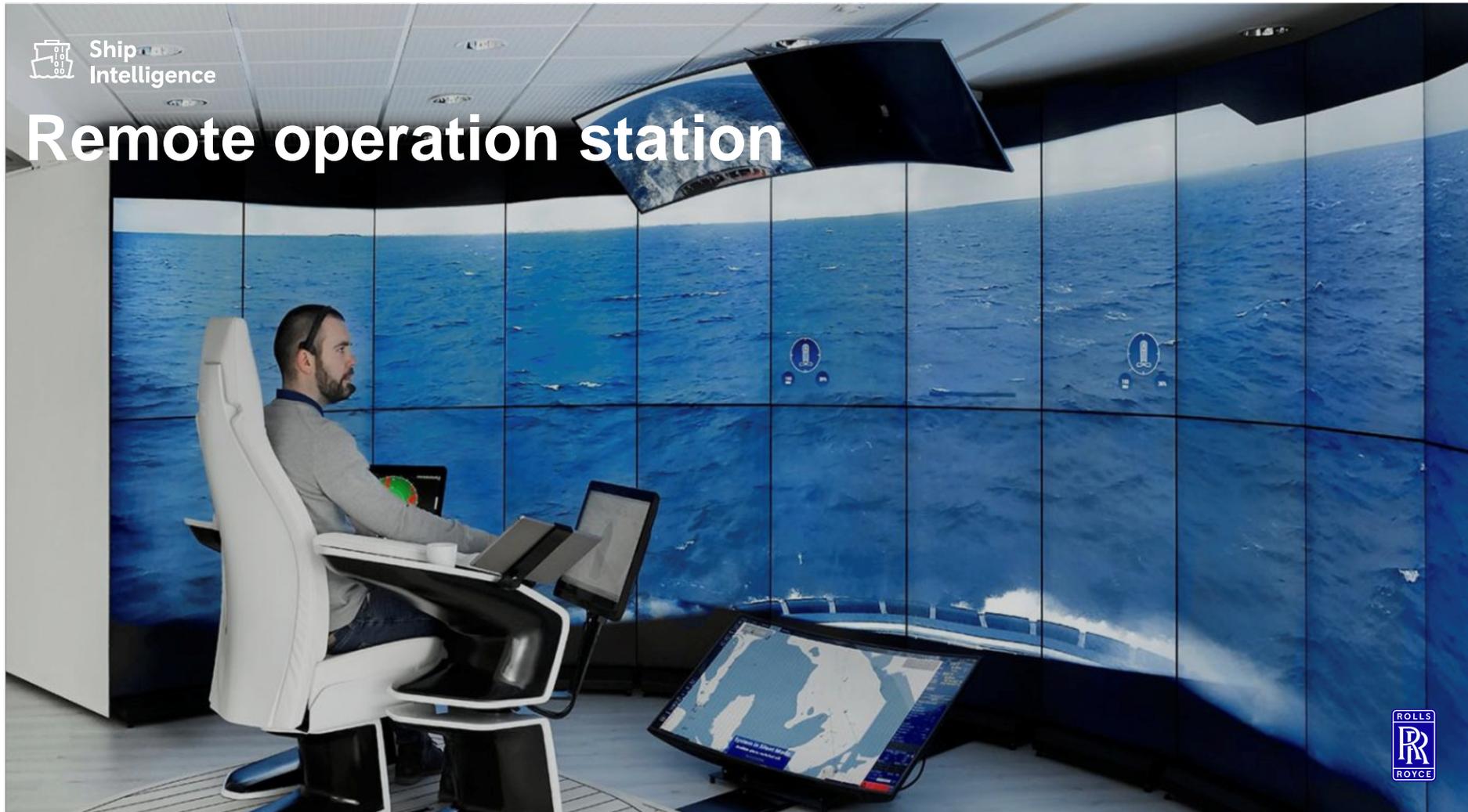


RR/Svitzer
Remote Controlled Tug Demo §



Ship
Intelligence

Remote operation station



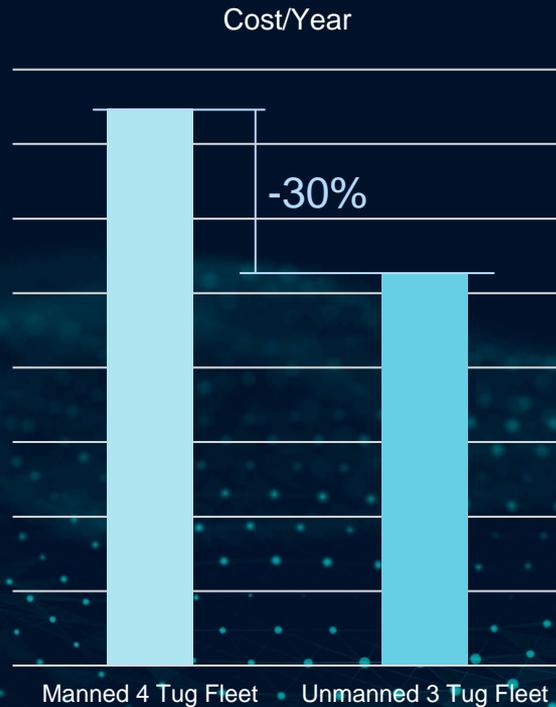
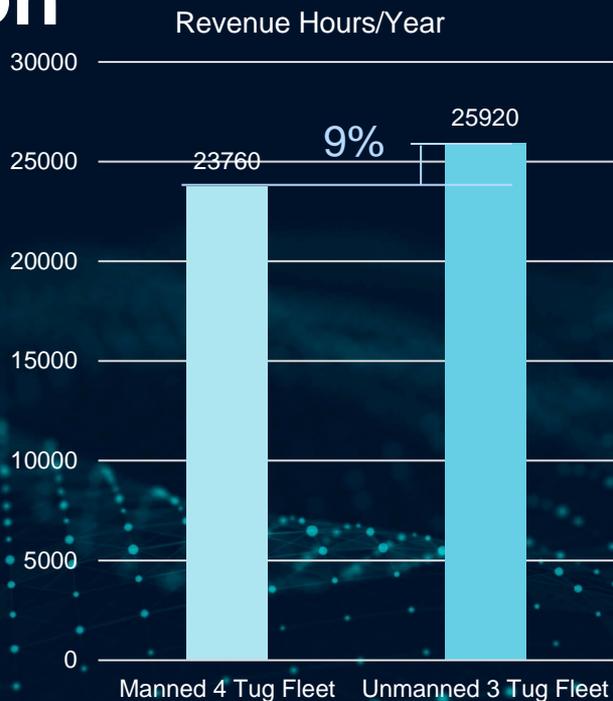
 Ship
Intelligence

Autonomous tug



Fleet comparison

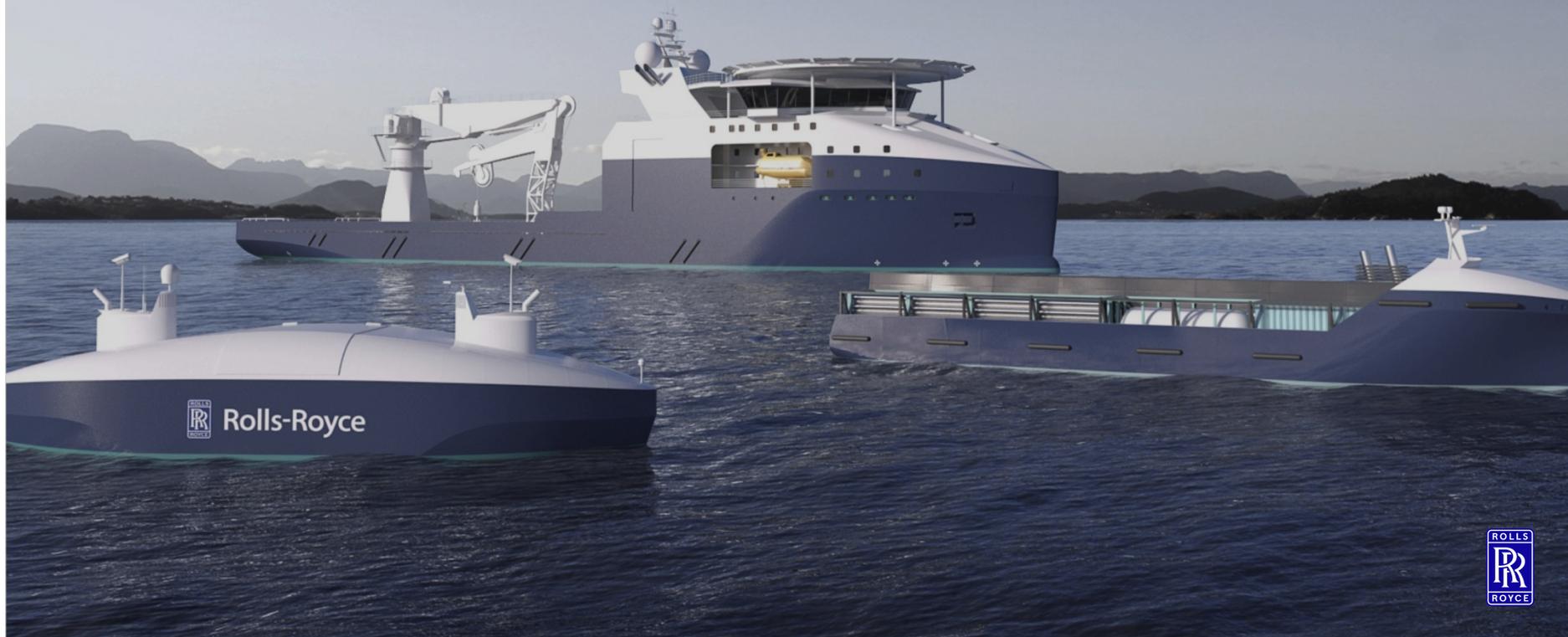
- Manned Fleet
 - 3 x Flex Manned (14hrs)
 - 1 x Double Manned (24 hrs)
- Unmanned Fleet
 - 3 x Unmanned Tugs (24hrs)



Remote and autonomous operation



Unmanned or reduced manning?



R&A markets

	Norm. manning R&A technology	Low manning R&A technology	Unmanned Full scope
Bulker			
General cargo			
Feeder container			
Large container			
Tanker			
LNG/LPG			
OSV			
Tug			
Road ferry			
RoRo			
RoPax			
Cruise			



Intelligent
Awareness

Intelligent awareness



IA Central Unit

R-R antennae



Lidar Unit



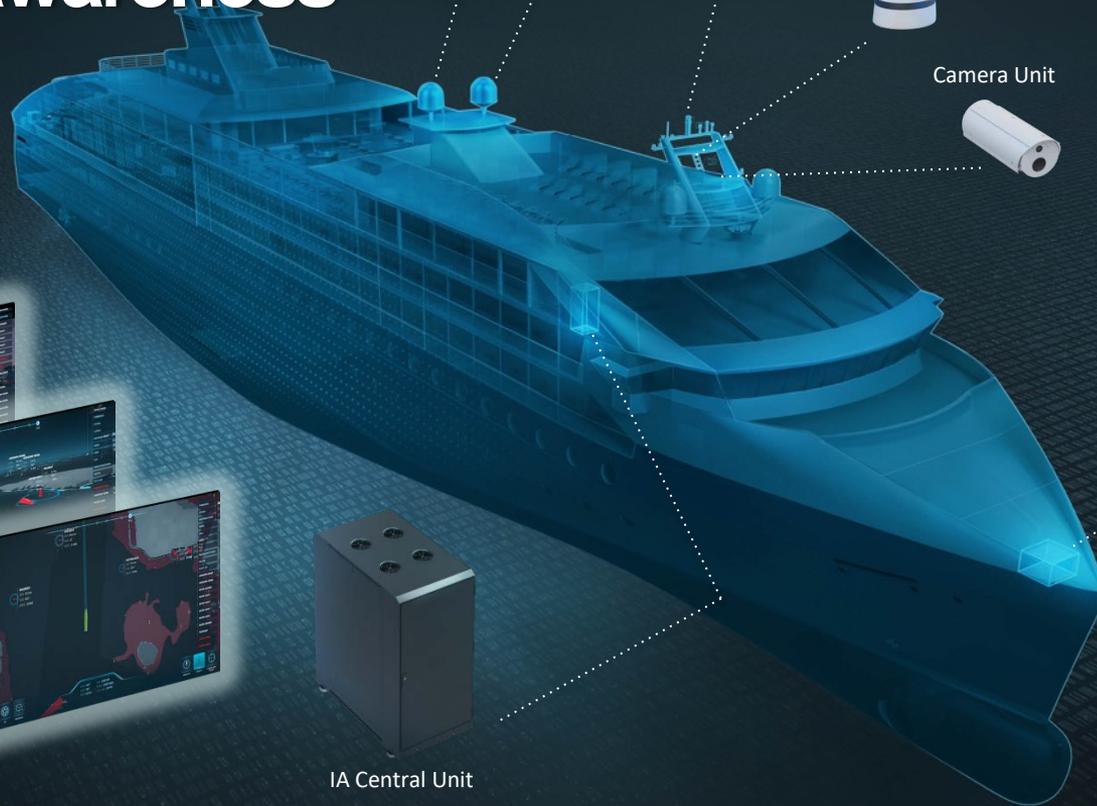
PTZ Unit



Camera Unit



R-R radar

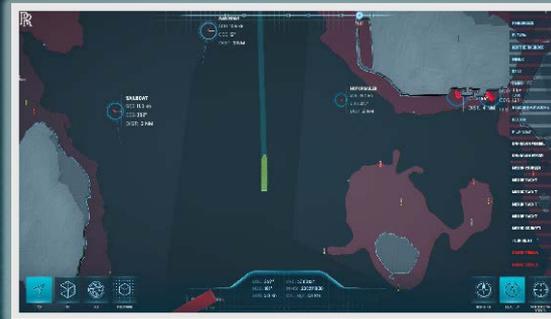




Intelligent
Awareness

Intelligent awareness

IA User Interfaces



Virtual Reality 2D



Virtual Reality 3D



Augmented Reality



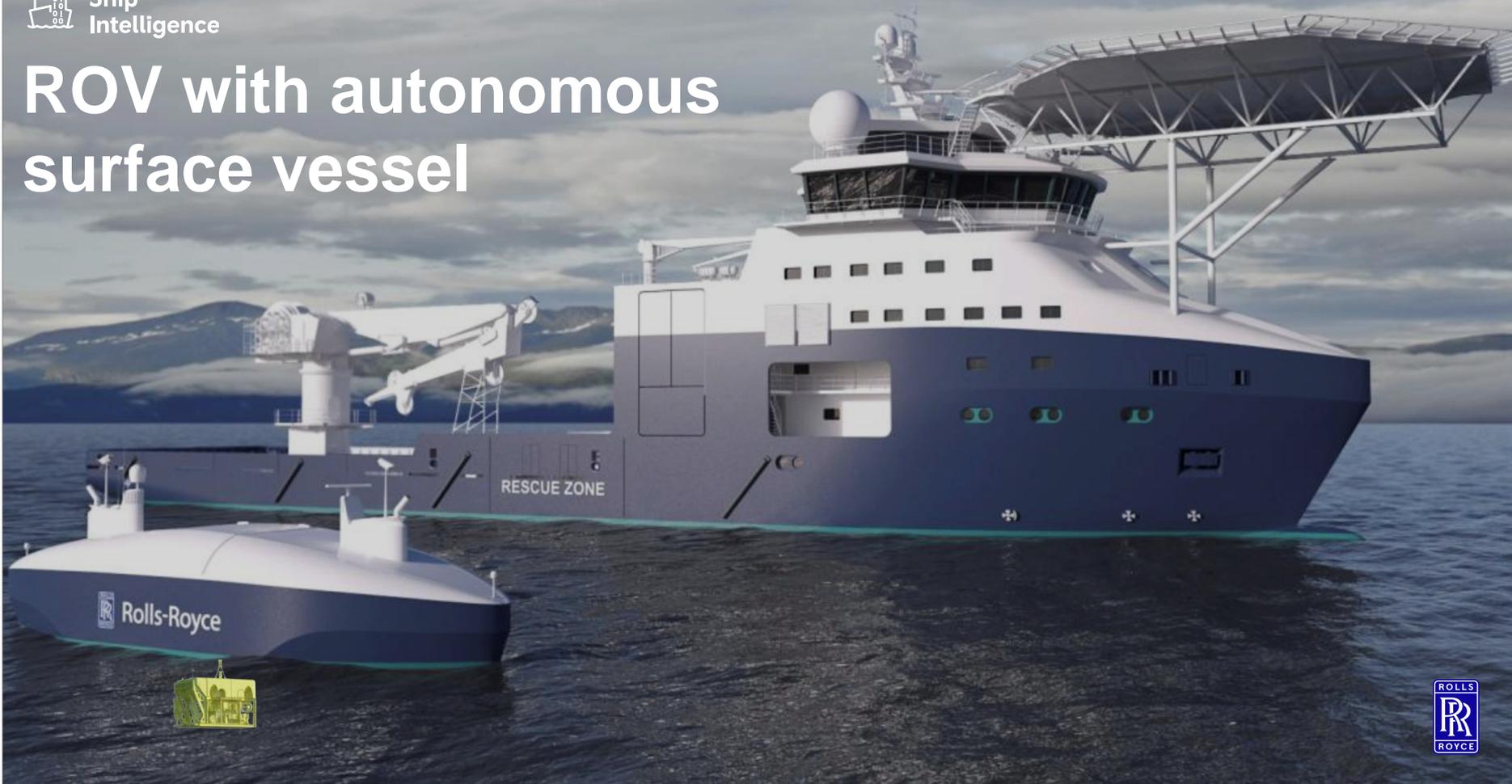
Precision



Autonomous supply vessel drone



ROV with autonomous surface vessel



Learning from aviation - low cost airlines

Internet sales and marketing

Standard - new efficient fleet



Lean organisations

Point-to-point

High utilisation rate of fleet

Low cost smart shipping

Cost is focus

Leasing schemes

Low onboard manning

Ship intelligence
(new way of operating)



Low emissions

New standardized fuel
efficient ships

Point-to-point
routes

Digital market places
“Uber of the sea”

New business models - disruption



Crew



Lean crew



Debt



Brokers



Digital market place



Leasing

Existing shipping

Low cost, smart shipping



New roles in shipping?

Investors



Digital market place



Operation & management



” Redefining shipping

with intelligent ”
solutions