Towards Autonomy & Remote Operations in Ships

Dr Eshan Rajabally, Rolls-Royce Strategic Research Centre

Nautical Institute London Branch Conference 2015
Bristol, 26-27 September 2015

Trusted to deliver excellence

Rolls-Royce

Our businesses

Rolls-Royce

The Rolls-Royce Marine Portfolio

- Over 9 000 employees in 35 countries
- Over 30 000 vessels with our design and/or equipment

Ship design and integrated ship systems

Diesel and gas engines

Gas turbines

Power Electronics, Automation & Control (DP)

Propulsion systems

Steering systems

Electrical podded propulsors

Azimuth thrusters

Tunnel thrusters

Waterjets

Stabilising systems

Automated handling systems

Rolls-Royce

Fundamental Changes in Shipping

- Sail to steam
- Coal to diesel
- Containerisation
- LNG as a mainstream fuel?
- Hybrid and battery propulsion?
- Ship Intelligence?
- Unmanned shipping?

Rolls-Royce

Unmanned Shipping – The Market Pull

- Reduction in manning costs
- No deckhouse => reduced hotel load, weight & drag => fuel savings
- More cargo

Recruitment and retention

Emissions reduction

Safer seafaring

Rolls-Royce

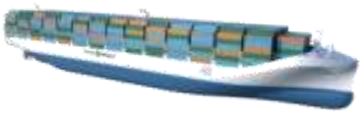
Unmanned Shipping Technologies

Ship health management, safety & security

- Equipment monitoring & maintenance
- Hazard protection
- Emergency handling
- Anti-piracy

Human interfaces

- Keeping the human-in-the-loop
- Control handover
- Multi-party coordination



Sensors

- Data fusion
- Machine interpretation
- Data compression

Tele-comms.

- Global, resilient &high throughput equipment
- Intelligent spectrum usage
- Data security

Navigational & operational decision making

Collision avoidance, Ship-ship & ship-shore coordination, Harbour entry/exit

Rolls-Royce

Potential Products / Services

Rolls-Royce

AAWA – Advanced Autonomous Waterborne Applications

AAWA – Advanced Autonomous Waterborne Applications

- Rolls-Royce led €6.6M collaborative project to pave the way for autonomous ships
- Part funded by ‘Tekes’ (Finnish Funding Agency for Technology and Innovation) to explore the economic, social, legal, regulatory and technological factors

Rolls-Royce

MAchine eXecutable Collision regulations for Marine Autonomous Systems, MAXCMAS

- MAXCMAS is man-in-the-loop simulator based development of ‘COLREG’ compliant path planning for autonomous vessel guidance and control
- COLREGs are the ‘rules-of-the-road’ at sea and were written for human consumption, hence their machine interpretation is non-trivial
- MAXCMAS is a £1.3M Rolls-Royce led industry-academia collaboration part funded by Innovate UK
- The focus above and beyond other similar recent and current initiatives will be robustness to real world complexity
- The end objective is to demonstrate autonomous COLREG compliant behaviour in trials at sea aboard AEUK’s ARCIMS vessel

ATLAS ELEKTRONIK UK
A company of the ATLAS ELEKTRONIK Group

Lloyd’s Register

Southampton Solent University

Warsash Maritime Academy

Queen’s University Belfast

Rolls-Royce

MAchine eXecutable Collision regulations for Marine Autonomous Systems, MAXCMAS

WP1: Project scoping and requirements setting
WP2: COLREGs compliant algorithms development
WP3: Advanced autonomy engine development
WP4: Warsash simulator integration
WP5: Simulator test and algorithm refinement

WP6: Automatic object detection
WP7: At sea trials of COLREG compliant behaviour
WP8: Wider stakeholder engagement
WP9: Risk management and assurance

Rolls-Royce

Better Power for a Changing World

Thank You for Your Attention

Rolls-Royce