

E-Navigation underway 2018

Safety at Sea in an Autonomous Era

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Chairman UK MASRWG

25th January 2018



**UK Marine
Industries
Alliance**

The Maritime Environment

- **Life at sea is 3D**
 - Above, On and Below the waves
- **Well established order for:**
 - Navigational safety
 - Air safety and airspace management
 - Water space management below the waves
- **Maintaining the status quo wherever possible for all manned and unmanned craft using existing principles, laws, rules and regulations is critical.**
 - Principle of 'Equivalence'

Life at sea is dangerous



HMY BRITANNIA



HERALD OF FREE ENTERPRISE



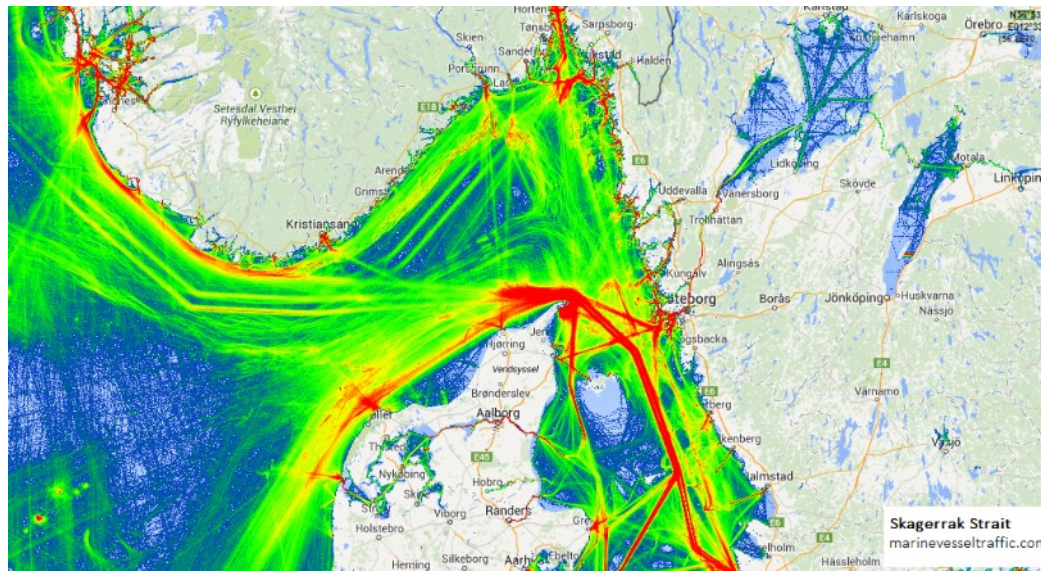
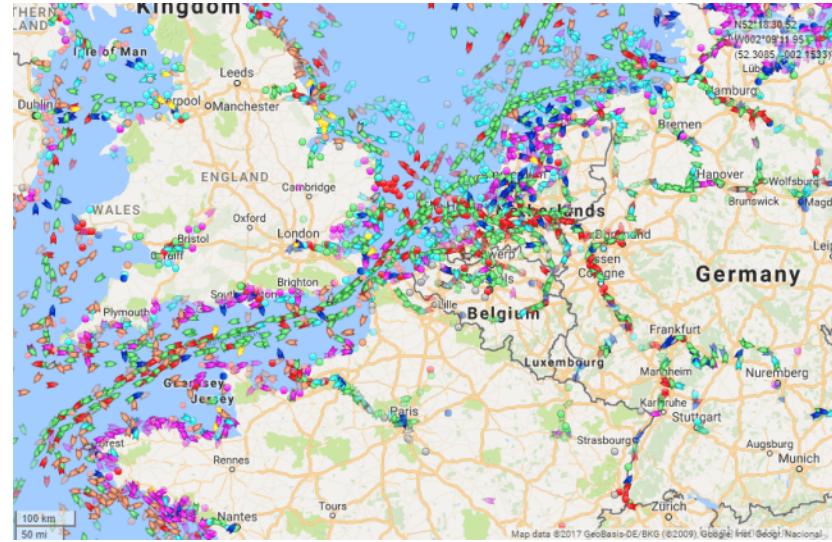
HMS HURWORTH



HMS CLEOPATRA



Maritime Traffic



Maritime Accidents



OCEAN BREEZE 2012



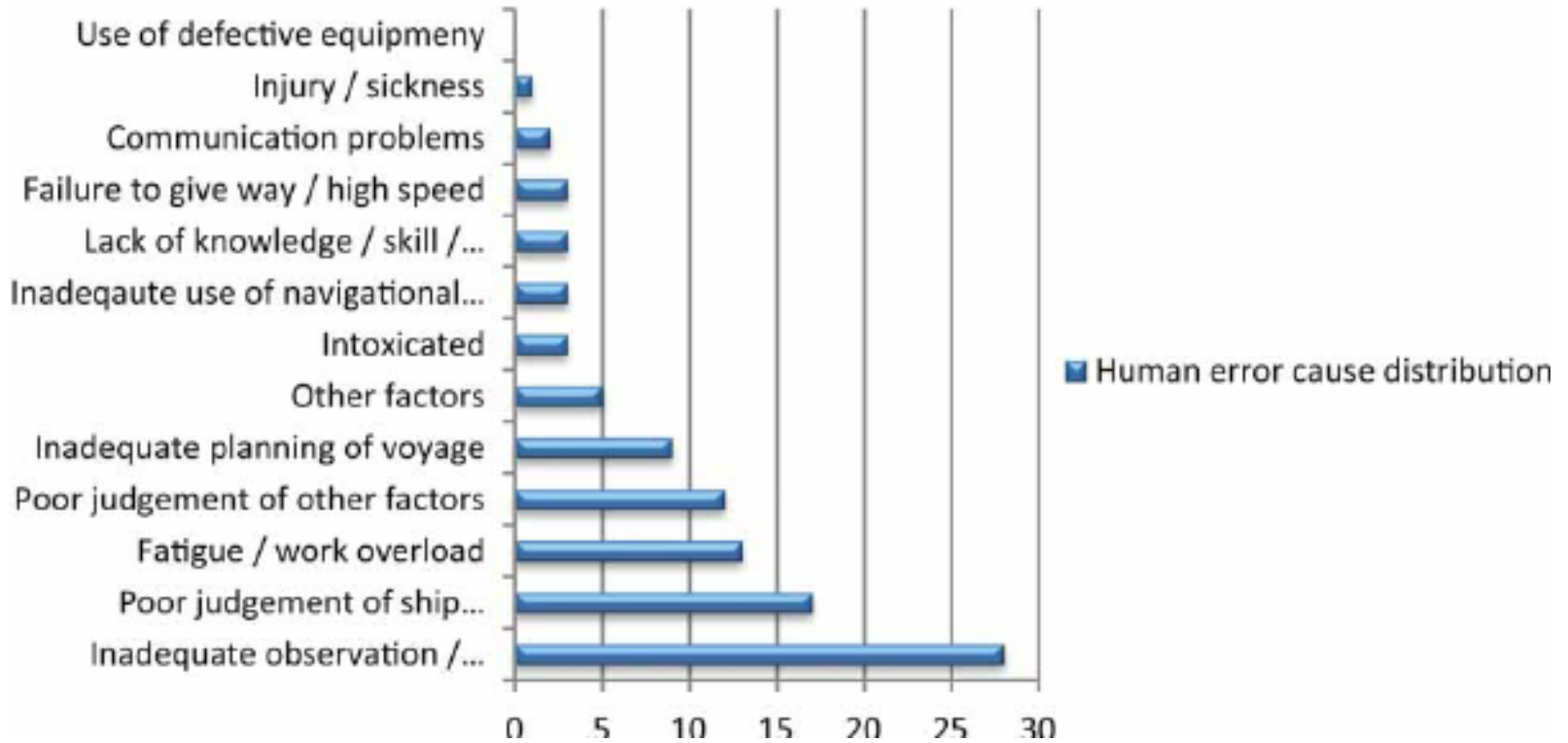
SANCHI 2018

About 75-96% of marine casualties are caused, at least in part, by some form of human error. Studies have shown that human error contributes to:

- 84 - 88% of tanker accidents
- 79% of towing vessel groundings
- 89 - 96% of collisions
- 75% of allisions
- 75% of fires and explosions

Maritime Accidents

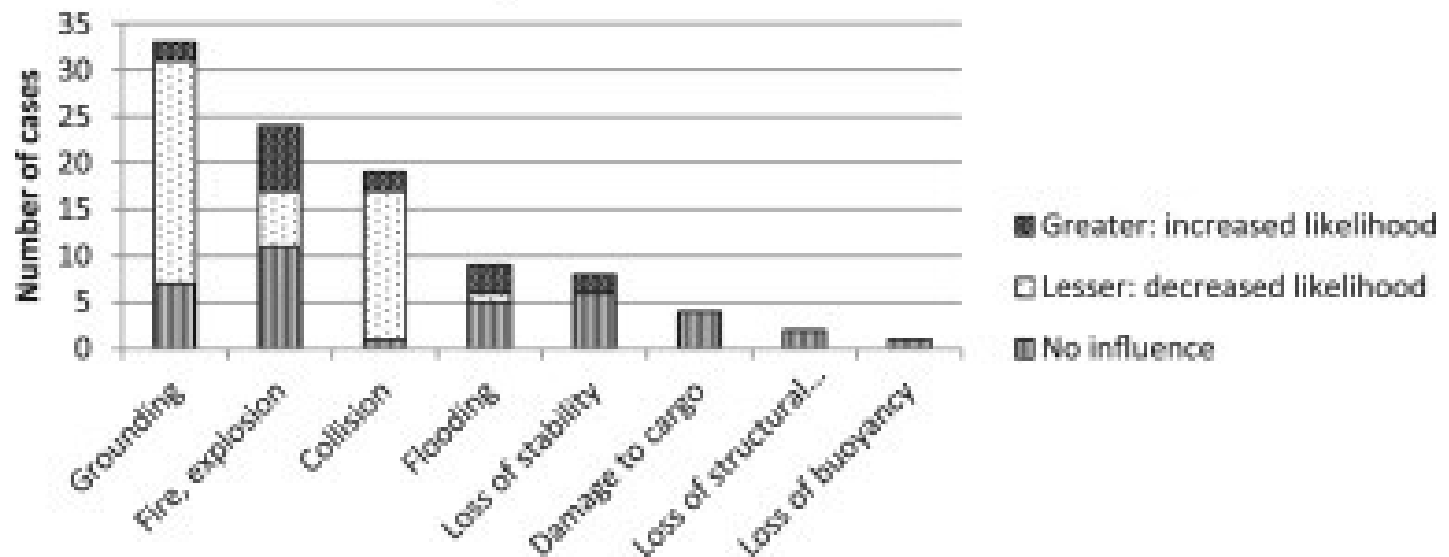
Human error cause distribution



Source: International Maritime Organization, International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, International Maritime Organization, London, 2011, p. 30.

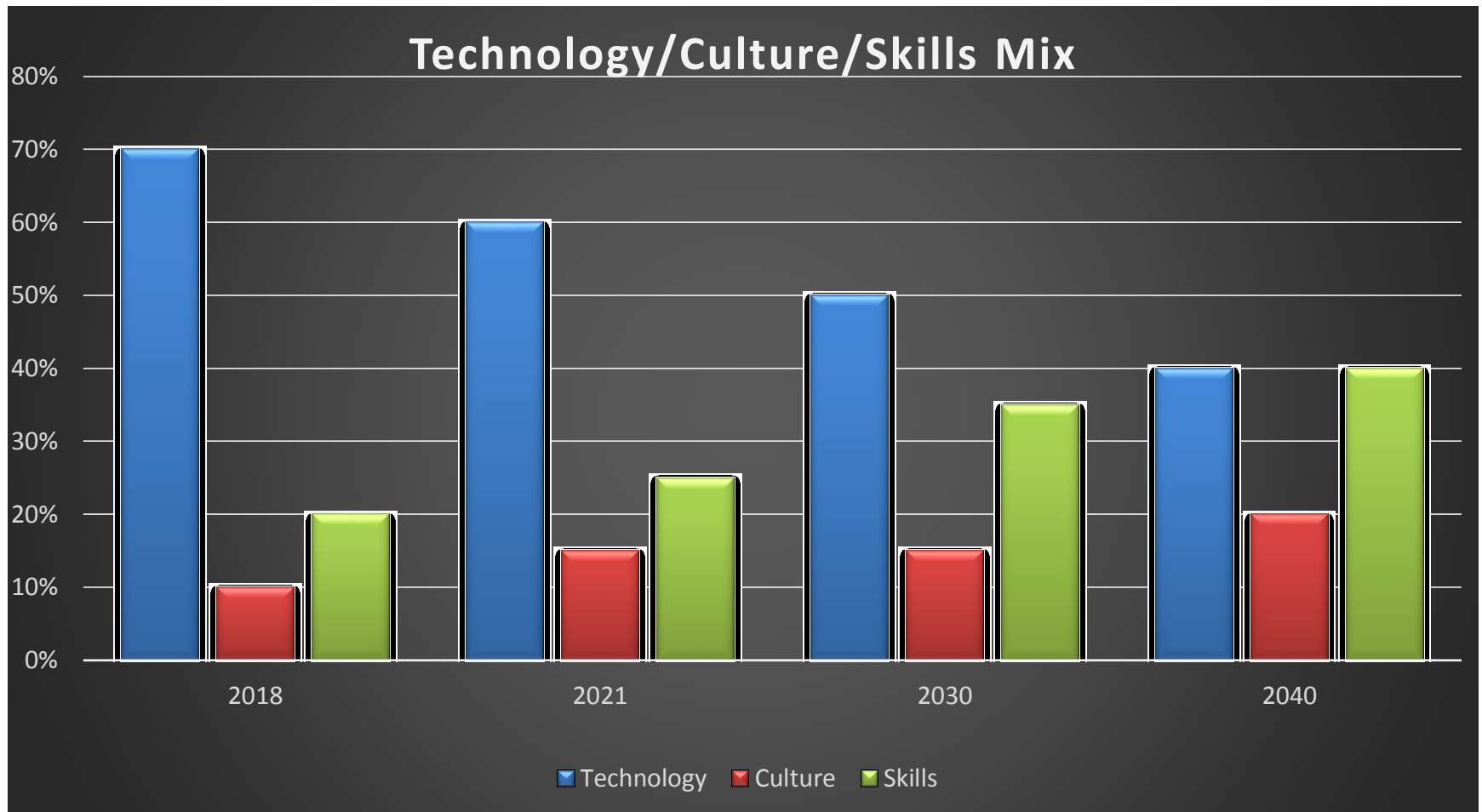
Maritime Accidents

Likelihood of accident for unmanned vessel in compare to traditional one



This conclusion was made by three academics from the Gdynia Maritime University in Poland, the Aalto University in Finland, and the Finnish Geospatial Research Institute

Safety at Sea in **the** Autonomous Era



Maritime Autonomous Systems

- **Commercial operations**
 - **Maritime Transport**
- **Oil and Gas**
- **Marine Scientific Research**
 - **Marine Survey**
 - **Oceanography**
 - **Passive acoustic monitoring**
 - **Offshore research**
 - **Deep sea mining**
 - **Fishing and aquaculture**
- **Underwater asset management**
- **Defence operations**
- **Maritime and Border Security**
- **Communications Relay (e.g. SAR)**



Maritime Autonomous Systems Contributions to Safety at Sea

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Maritime Autonomous Surface Ships (MASS)



AutoNaut



SEA-KIT International



ASV C-Sweep

Maritime Autonomous Surface Ships (MASS)



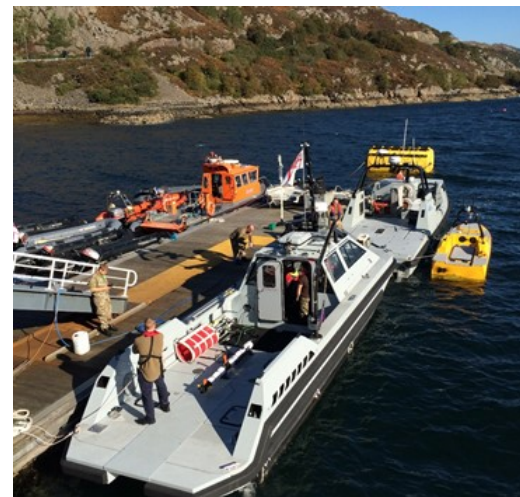
Autonomous Tug in Copenhagen



Automated Ships Ltd and KONGSBERG Hrönn

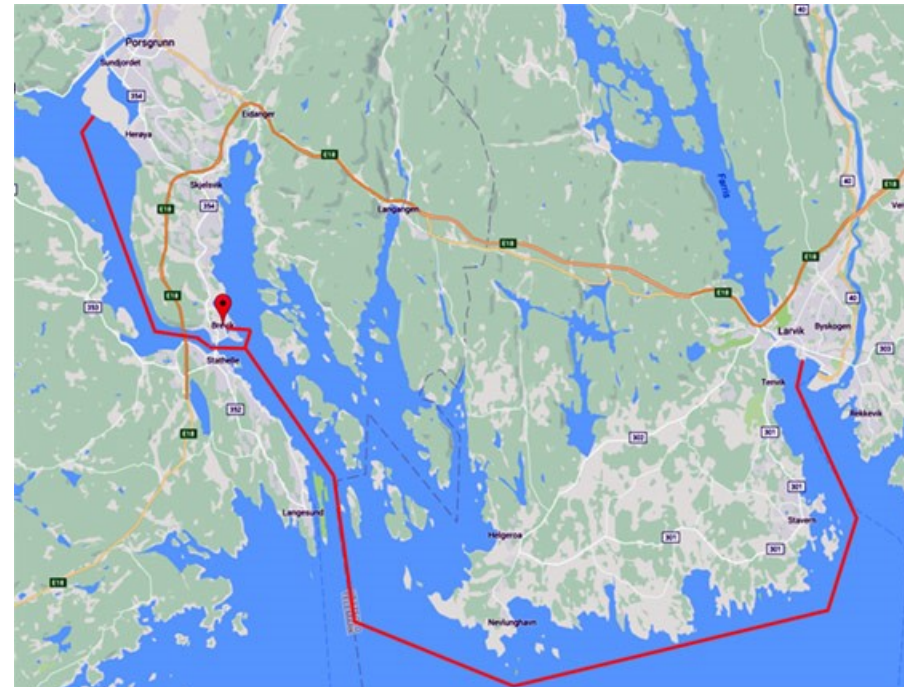
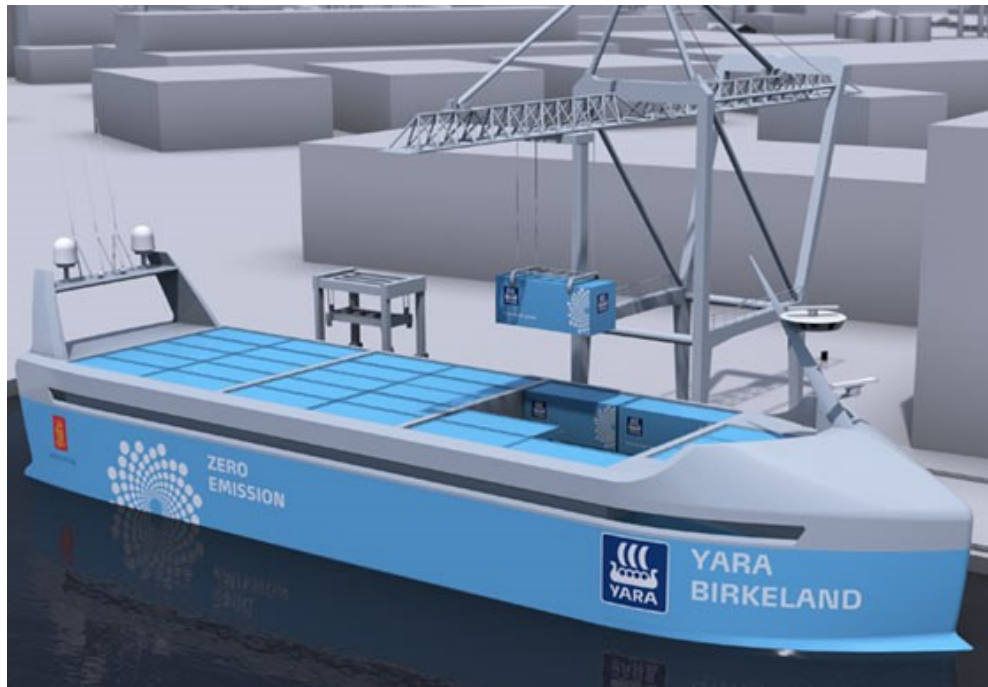


BAE Systems RIB at Unmanned Warrior 2016



QinetiQ operations at Unmanned Warrior 2016

Yara Birkeland



- LOA: 80 m Beam:15 m
- Draught (full): 5 m
- Service speed: 6 knots

•Cargo capacity: 120 TEU

- Propulsion system: Electric
- Thrusters: 2 Tunnel thruster

Depth: 12 m
Draught (ballast): 3 m
Max speed: 10 knots

Capacity

Deadweight: 3 200 mt

Propulsion

Propellers: 2 Azimuth pods
Battery pack: 7,5 – 9 MWh



KONGSBERG

Rolls-Royce



Ship intelligence

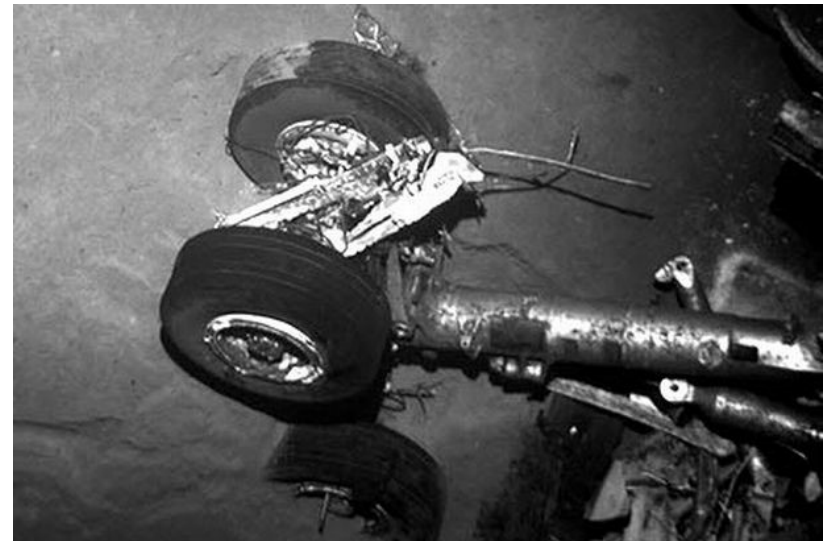
Transforming future marine operations. We are pushing the boundaries of ship technology by harnessing the power of data in order to deliver through life asset optimisation.



ASV Base Control Station



Unmanned Underwater Vehicles and Remotely Operated Vehicles



Unmanned Underwater Vehicles operated from a MASS



SEA-KIT with embarked Hugin UUV

Unmanned Air Systems at Sea



UAV support to shipping



MASS Safety

- **Responsible Ownership**
- **Safe Operation**
- **Recognised Accreditation, Training and Standards**
- **Effective Integration into the Maritime domain**



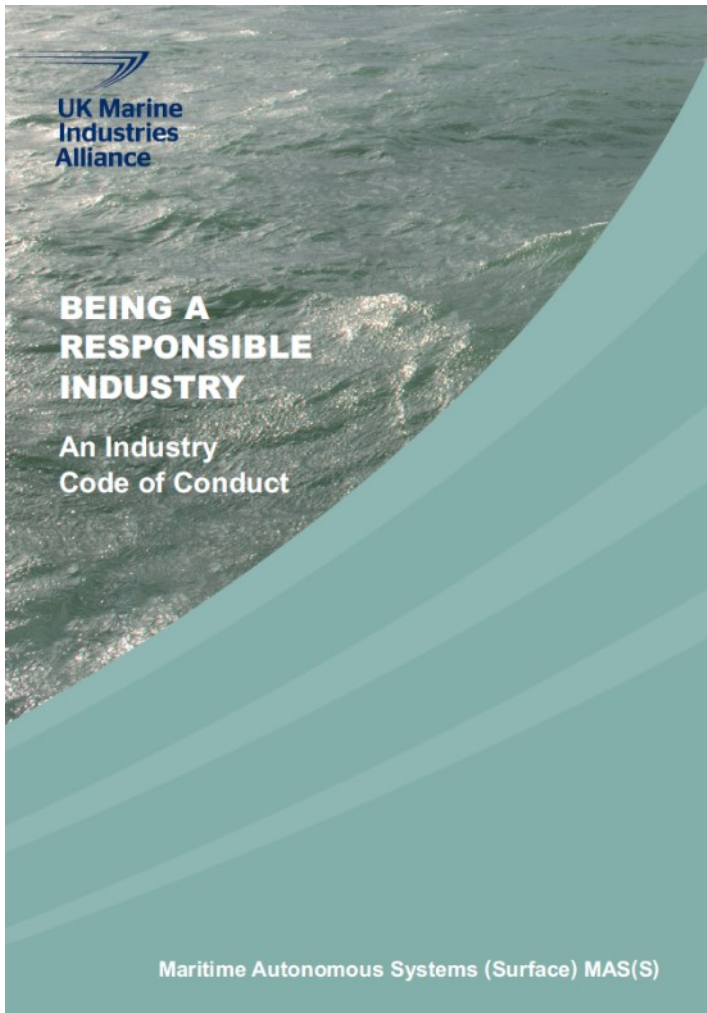
MASS Regulation Challenges

- **Harmonised Definitions**
- **Application**
- **Common Standards**
- **International Consensus**
- **Flexibility, Innovations & Mutual Trust**
- **Legal Precedents**
- **Education of Mariners**

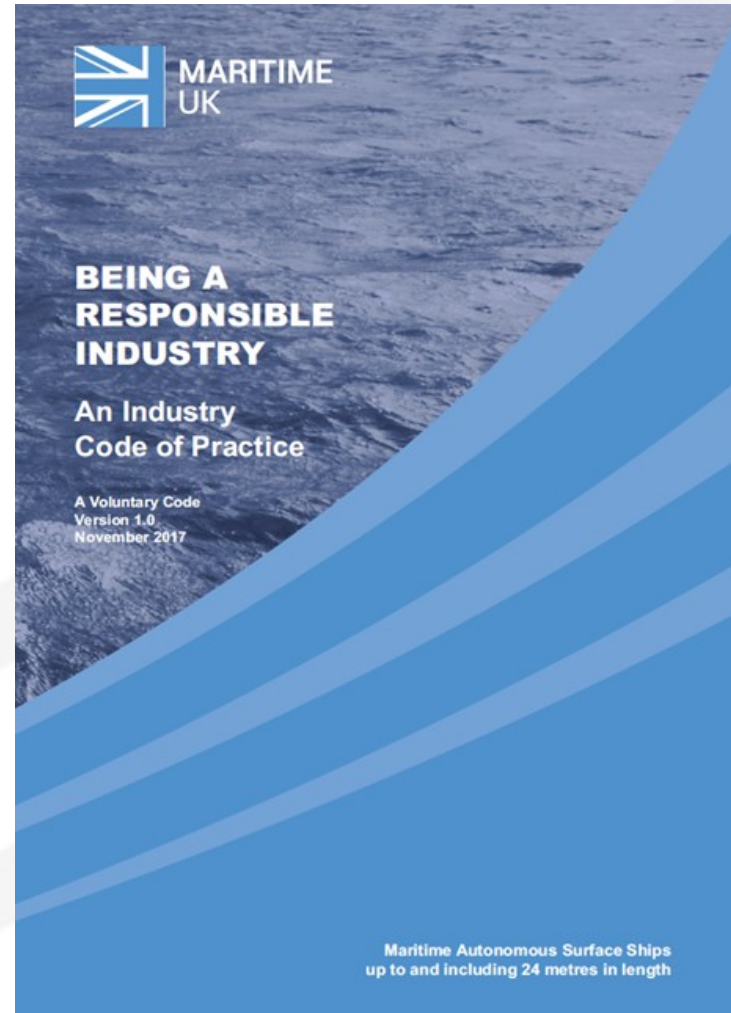
Industry Codes

- **Pan industry agreement on aspects of MASS development, design, production and operation**
- **Best practice**
- **Assurance**
- **Safety and professionalism**
- **Training, conduct and personal responsibility**
- **Compliance and self-regulation**
- **Improved communications within the industry and the wider maritime community**

Codes of Conduct & Practice



Published March 2016



Published November 2017

Lloyds Register



Foresight review of robotics and autonomous systems

There's a revolution. Smart, connected machines are acting as tools to support us, working alongside us or alone, making independent decisions and even learning.

ShipRight Design and Construction

Additional Design Procedures

LR Code for Unmanned Marine Systems

February 2017



Working together
for a safer world

International Regulation

- **IMO Instruments**
 - International Regulations for the Prevention of Collisions at Sea (COLREGS)
 - Marine Pollution (MARPOL)
 - Safety of Life at Sea (SOLAS)
 - Standards of Training Certification and Watchkeeping (STCW)
- **MASRWG IMO Interaction**
 - Short INF Paper – MSC 95, June 2015
 - IMO lunchtime brief – MSC 96, May 2016
 - **Proposal for a Scoping Exercise at MSC 98 by the MCA - June 2017**
- **MASRWG Links with International Partners and Organisations**

Discussion

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