UK Perspective

Norwegian Forum for Autonomous Ships

James Fanshawe CBE
Chairman UK MASRWG

15 June 2017

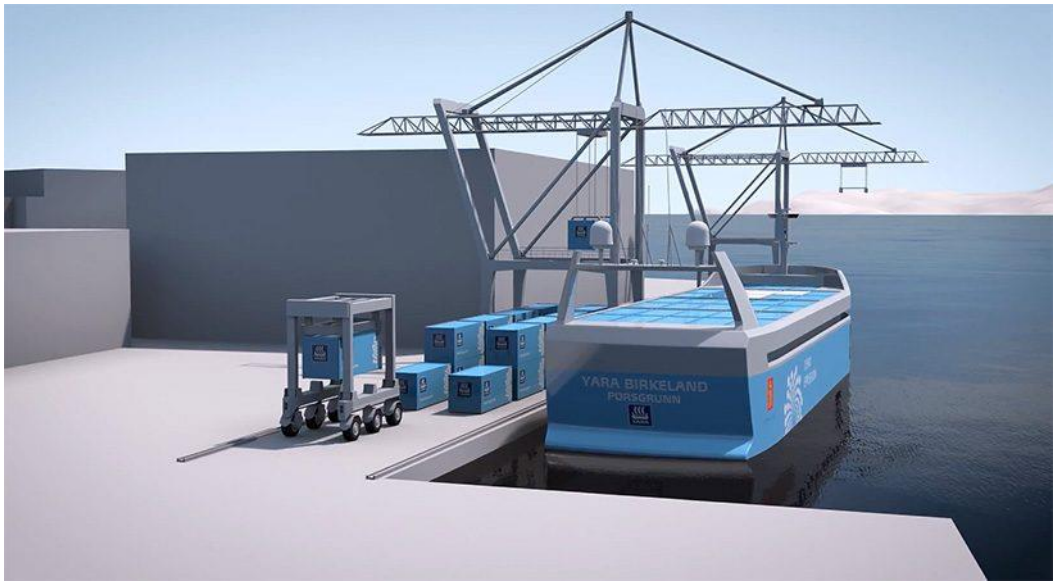
UK Marine Industries Alliance

Maritime Autonomous Systems Capabilities

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

Maritime Autonomous Surface Ships (MASS)

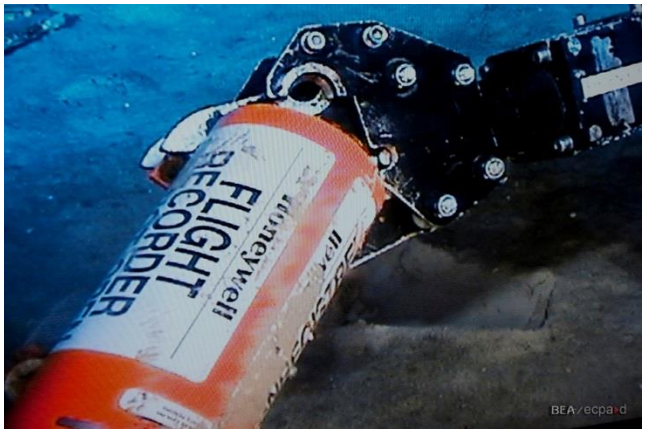
AutoNaut

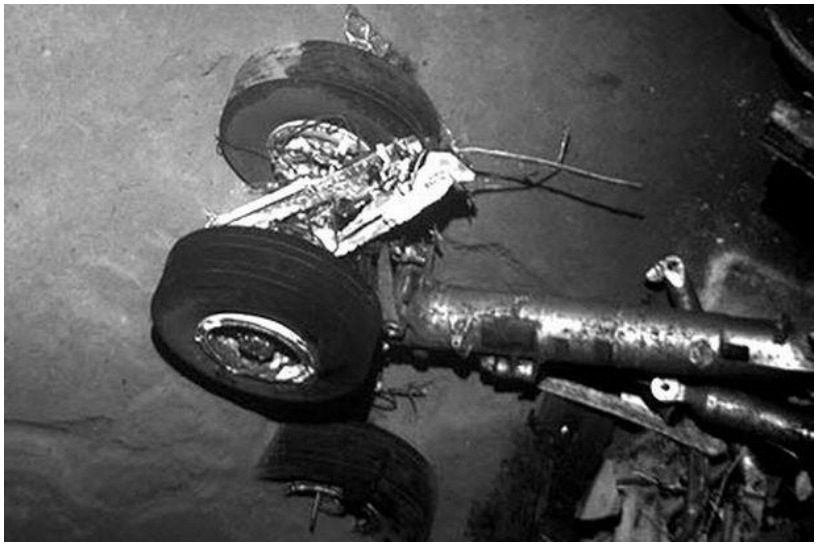


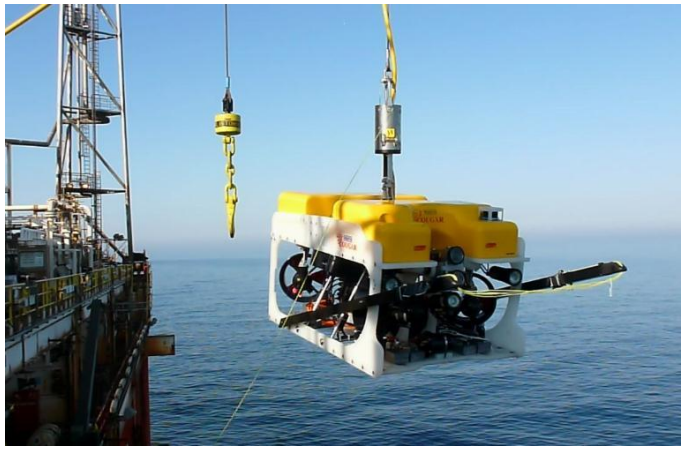
Yara Birkeland

MUNIN

Unmanned Underwater Vehicles and Remotely Operated Vehicles







Unmanned Air Systems at Sea

The Maritime Environment

UK Marine Industries Alliance

- **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'**

UK Marine Industry Priorities

1. Whole-vessel integration to deliver more affordable and optimised running with reduced staff and minimised through-life costs.
2. Design, integration, manufacture and operation of autonomous vessels and systems.
3. Design, manufacture and refit of superyachts, high end powerboats and high-end sailing yachts.
4. Extended use of composites and other novel materials.
5. Design and manufacture of specialist vessels for support of the offshore energy and naval sectors.
6. Through-life operation and equipment insertion (including refits and conversions) to improve vessel efficiency.
7. Decision support systems – including integrated voyage optimisation to deliver just-in-time arrival at port at lowest cost, secure situational awareness and next-generation command and control systems.

Roadmap 2015
Areas for investment

1. Design and manufacturing techniques

2. Electronics, sensors, communications and control and data management

3. Energy efficiency and environmental protection

4. Structures and materials

5. Autonomous systems

Autonomous capability is fundamental to both the design of autonomous vessels and decision support systems.

Investment required in: developments in safety, reliability, endurance, communications and regulatory aspects leading to full individual vessel autonomy, with common underlying information architecture standards

MASS Safety

UK Marine Industries Alliance

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

MASS Regulation Challenges

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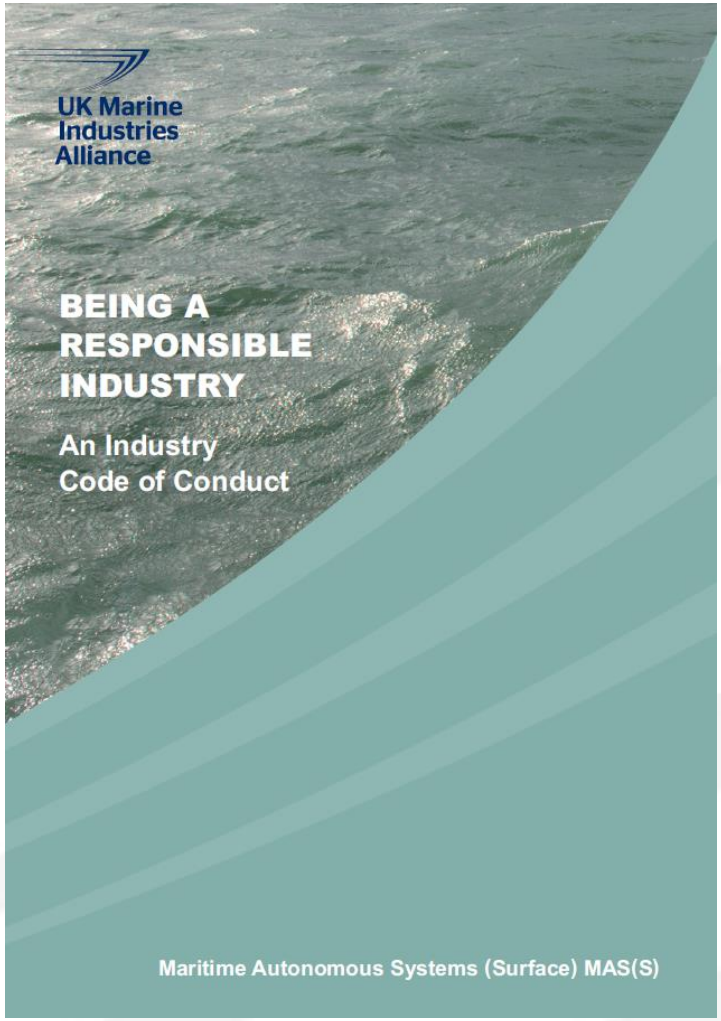
- **Harmonised Definitions**
- **Application**
- **Common Standards**
- **International Consensus**
- **Flexibility, Innovations & Mutual Trust**
- **Legal Precedents**
- **Education of Mariners**

Industry Codes

UK Marine Industries Alliance

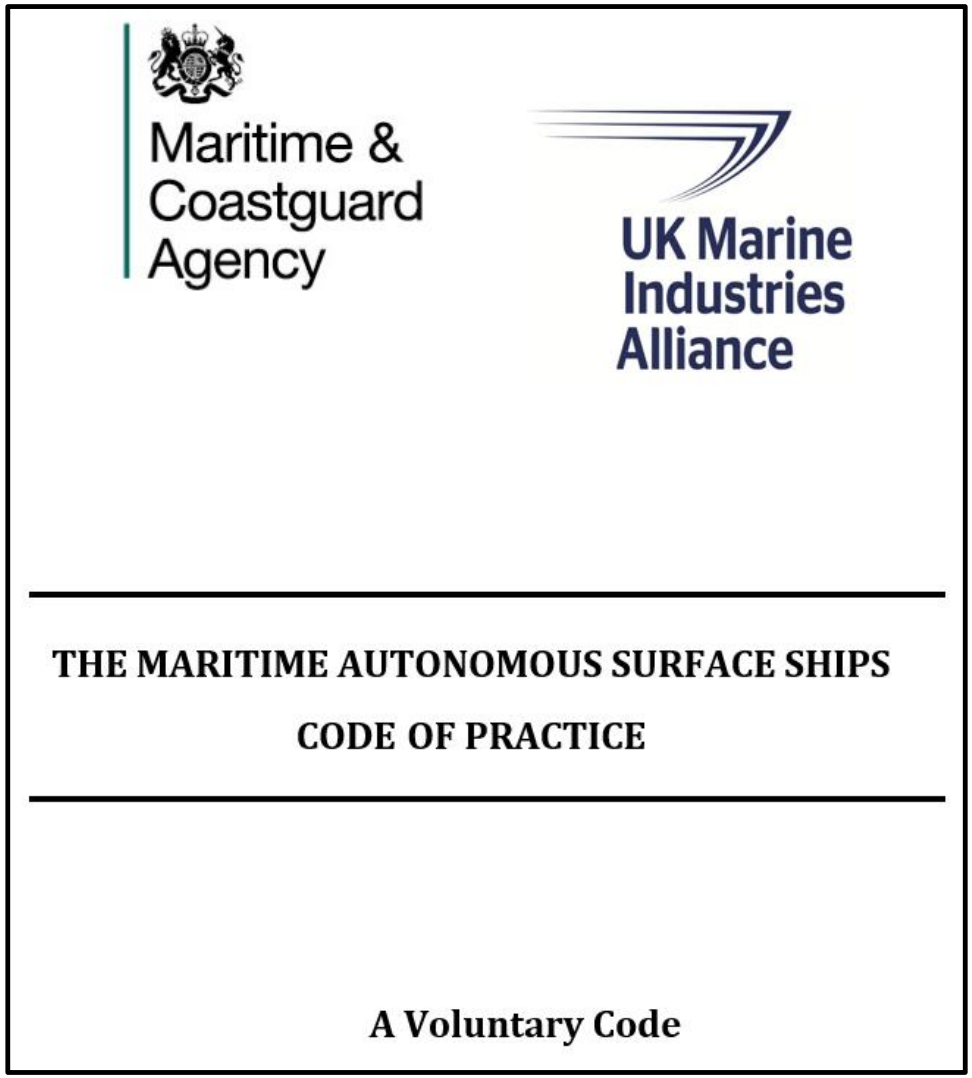
- **Pan industry agreement on aspects of MASS development, design, production and operation**
- **Best practice**
- **Assurance**
- **Safety and professionalism**
- **Training, conduct and personal responsibility**
- **Compliance and Self-regulation**
- **Improved communications within the industry and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

Code of Conduct



Published March 2016

Code of Practice



Code of Practice Chapters

- **Foreword**
- **Definitions**
- **Application**
- **Operations**
- **Vessel Design and Manufacturing Standards**
- **Navigation lights, shapes and sound signals**
- **Situational awareness and control**
- **System integrity test and certification procedures**
- **RF Communication systems**

Code of Practice Chapters

- **Operator standards of training, competence and watchkeeping**
- **Base control station operation**
- **Registration, Certification, Examination, Maintenance And Record-keeping**
- **Security**
- **Prevention of pollution**
- **Carriage and transfer of cargoes (including dangerous goods)**
- **Safety management**
- **Rendering of Assistance to Persons in Distress at Sea**
- **Glossary**

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

Lloyd's Register

Working together for a safer world

International Dimension

UK Marine Industries Alliance

- **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)**
- **IMO Interaction**
  - **Short INF Paper – MSC 95, June 2015**
  - **IMO lunchtime brief – MSC 96, May 2016**
  - **Proposal for a Scoping Exercise at MSC 98 - June 2017**
- **Liaisons with International Partners and Organisations**

IMO Submission

INTERNATIONAL MARITIME ORGANIZATION

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MARITIME SAFETY COMMITTEE
98th session
Agenda item 20

MSC 98/20/2
27 February 2017
Original: ENGLISH

WORK PROGRAMME

Maritime Autonomous Surface Ships
Proposal for a regulatory scoping exercise

Submitted by Denmark, Estonia, Finland, Japan, the Netherlands, Norway, the Republic of Korea, the United Kingdom and the United States

SUMMARY

Executive summary:	The use of Maritime Autonomous Surface Ships (MASS) creates the need for a regulatory framework for such ships and their interaction and co-existence with manned ships. This document invites the Committee to undertake a regulatory scoping exercise to establish the extent of the need to amend the regulatory framework to enable the safe, secure and environmental operation of MASS within the existing IMO instruments.
Strategic direction:	5.2 and 5.4
High-level action:	5.2.1, 5.2.2, 5.2.4 and 5.4.1
Output:	No related provisions
Action to be taken:	Paragraph 25
Related document:	MSC 95/INF.20

AutoNaut

UK Marine Industries Alliance

Discussion

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MASS Ship Classes

The UK Code of Practice identifies several classes of Unmanned Surface Vessel, based on the intended use, size, speed and potential hazard to other shipping.

- **Ultralight** Unmanned Surface Vessels are USV that have all of the following properties :
  - Length overall <7m, mass < 1000kg and maximum operating speed <4 kts.
- **Light** Unmanned Surface Vessels are USV that have all of the following properties :
  - Length overall <12m, Mass <8000kg and maximum operating speed < 7 kts
- **Small** Unmanned Surface Vessels are those USV that have all of the following characteristics :
  - Length overall 24m or less, Mass < 250te, maximum operating speed< than that for a High Speed USV and where overall Kinetic Energy is <4000kNm
- **Large** Unmanned Surface Vessels are USV of >24m and / or > 100 GT displacement
- **High-speed** Unmanned Surface Vessels are USV for which operating speed is not less than :
  - $V = 7{,}19\ \nabla 1/6$ knots

    where

    ∇ = moulded displacement, in m3, of the craft corresponding to the design waterline.